



ALPINE CITY PLANNING COMMISSION MEETING

NOTICE is hereby given that the **PLANNING COMMISSION** of Alpine City, Utah will hold a **Public Hearing and a Regular Meeting at Alpine City Hall**, 20 North Main, Alpine, Utah on **Tuesday, February 3, 2015 at 7:00 pm** as follows:

I. GENERAL BUSINESS

- | | |
|-----------------------------|---------------|
| A. Welcome and Roll Call: | Steve Cospers |
| B. Prayer/Opening Comments: | Jason Thelin |
| C. Pledge of Allegiance: | By Invitation |

II. PUBLIC COMMENT

Any person wishing to comment on any item not on the agenda may address the Planning Commission at this point by stepping to the microphone and giving his or her name and address for the record.

III. ACTION ITEMS

- A. PUBLIC HEARING - Amendments to Section 3.1.11, Section 3.2.3.3, Article 3.29, Article 3.30 and Article 3.15**
The proposed amendments will be presented to the Planning Commission that would amend the applicable sections regarding group living arrangements. Dan McDonald is the legal counsel on these proposed amendments.
- B. State Farm Office Building Site Plan - 134 South Main Street - Eli Slesk**
The Planning Commission will review the site plan for a new office building; specifically a preliminary architectural design.
- C. Eagle Pointe PRD Preliminary Plan - Mark Wells and Taylor Smith - Approx. 800 W 600 N**
The Planning Commission will review a preliminary plan for the proposed Eagle Pointe planned residential development.
- D. David's Court Final Plat F Reinstatement and Revisions- Approx. 355 East Healey Blvd. - Patterson Construction**
The Planning Commission will consider reinstatement of final approval for plat F of the proposed David's Court subdivision and review proposed revisions to that plat.
- E. PUBLIC HEARING - Article 2.3 Appeal Authority Ordinance Amendment**
A proposed amendment will be presented to the Planning Commission that would eliminate the Board of Adjustment.
- F. PUBLIC HEARING - Article 3.22 Non-Conforming Ordinance Amendment**
A proposed amendment will be presented to the Planning Commission that would amend the Non-Conforming Ordinance.

IV. COMMUNICATIONS

V. APPROVAL OF PLANNING COMMISSION MINUTES: January 20, 2014

ADJOURN

Chairman Steve Cospers
January 30, 2015

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 in three public places within Alpine City limits. These public places being a bulletin board located inside City Hall at 20 North Main and located in the lobby of the Bank of American Fork, Alpine Branch, 133 S. Main, Alpine, UT; and the bulletin board located at The Junction, 400 S. Main, Alpine, UT. The above agenda notice was 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 v. 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: Group Living Amendments

FOR CONSIDERATION ON: 03 February 2015

PETITIONER: Staff

ACTION REQUESTED BY PETITIONER: Provide feedback and make any necessary recommendations for the City Council to consider.

APPLICABLE STATUTE OR ORDINANCE: Section 3.1.9 (Amendments to the Zoning Ordinance)

PETITION IN COMPLIANCE WITH ORDINANCE: Yes

BACKGROUND INFORMATION:

Dan McDonald was the legal counsel for Alpine City in the lawsuit vs. the Alpine Recovery Lodge. After the lawsuit was settled, Mr. McDonald suggested that we address our ordinance in relation to group living arrangements within Alpine City. He has worked with staff to prepare some proposed amendments. This proposal would amend the applicable sections regarding group living arrangements which includes Section 3.1.11, Section 3.2.3.3, Article 3.29, Article 3.30 and Article 3.15 of the Alpine City Development Code. Dan McDonald will be at the Planning Commission meeting to discuss these proposed amendments.

RECOMMENDED ACTION:

That the Planning Commission provide feedback to staff and make any necessary recommendations before the proposed amendment is reviewed by the City Council.

ORDINANCE NO _____

AN ORDINANCE AMENDING SECTION 3.1.11, SECTION 3.2.3.3, ARTICLE 3.29, ARTICLE 3.30 AND ARTICLE 3.15 OF THE ALPINE CITY, UTAH, DEVELOPMENT CODE.

PART I

FINDINGS

1. The City recognizes, through its observation, study and experience, as the United States Supreme Court recognized in *Village of Belle Terre v. Boraas*, 416 U.S. 1, 9, 94 S.Ct. 1536, 1541, 39 L.Ed.2d 797 (1974), that group living, including “[t]he regimes of boarding houses, fraternity houses, and the like present urban problems.” Among other things, “[m]ore people occupy a given space; more cars rather continuously pass by; more cars are parked; noise travels with crowds.” *Id.*

2. The U.S. Supreme Court, in an attempt to help clarify the appropriate role of local government with respect to community planning noted:

“The values it represents are spiritual as well as physical, aesthetic as well as monetary. It is within the power of the legislature to determine that the community should be beautiful as well as healthy, spacious as well as clean, well balanced as well as carefully patrolled.”

Berman v. Parker, 348 U.S. 26, 33, 75 S. Ct. 98, 102-03, 99 L.Ed. 27 (1954).

The Supreme Court subsequently commented further in *Boraas* with respect to the right of a community in the preservation of residential areas:

A quiet place where yards are wide, people few, and motor vehicles restricted are legitimate guidelines in a land use project addressed to family needs. The police power is not confined to elimination of filth, stench, and unhealthy places. It is ample to lay out zones where family values, youth values, and the blessings of quiet seclusion and clean air make the area a sanctuary for people.”

3. The United States Supreme Court and federal appellate courts continue to recognize that “[l]and use planning and the adoption of land use restrictions constitute some of the most important functions performed by local government.” *Bryant Woods Inn, Inc. v. Howard County*, 124 F.3d 597, 603 (4th Cir. 1997) (citing *FERC v. Mississippi*, 456 U.S. 742, 768 n. 30, 102 S.Ct. 2126, 2141 n. 30, 72 L.Ed.2d 532 (1982) (“regulation of land use is perhaps the quintessential state activity”)). These courts continue to recognize that local land use ordinances may legitimately be utilized “to preserve ‘the character of neighborhoods, securing “zones where family values, youth values, and the blessings of quiet seclusion and clean air make the area a sanctuary for people.””” *Id.* (quoting *City of Edmonds v. Oxford House, Inc.*, 514 U.S. 725, 732-33, 115 S.Ct. 1776, 1780, 131 L.Ed.2d 801 (1995) (quoting *Village of Belle Terre v. Boraas*, 416 U.S. 1, 9, 94 S.Ct. 1536, 1541, 39 L.Ed.2d 797 (1974))).

4. The Community Vision Statement & Guiding Principles contained in the City's General Plan state that "[f]uture 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." (Alpine City General Plan, pp. 6-7.)

5. The Land Use Element of the City's General Plan has, as its vision statement, the "desire[] to preserve and maintain the small-town, rural atmosphere of the community by maintaining lower density residential neighborhoods, limited appropriate commercial growth, and preserving and protecting open space and hillsides." (Alpine City General Plan, Land Use Element, p. 10.)

6. One of the goals of the Land Use Element is to "[m]aintain lower density residential neighborhoods with the traditional single-family residence as the principal housing style." (Alpine City General Plan, Land Use Element, p. 10.) Another goal is to "[p]rovide adequate screening or buffers when possible to minimize impacts on residential neighborhoods from commercial uses." (*Id.*)

7. According to the latest U.S. Census data for Alpine City, the average household size is 3.89 persons per household. And, for the years 2007-2011, 85.5% of individuals living in Alpine lived in the same house for 1 year or more.

8. Among other things, Group Living Arrangements tend to introduce transiency, congestion, increased traffic, increased parking and other urban problems and challenges into communities.

9. Regulation of Group Living Arrangements serves to preserve housing densities consistent with both reality (in terms of the average composition of single family households in Alpine) and the goals and objectives of the General Plan. It also promotes permanence and stability in neighborhood composition.

10. Regulating Group Living Arrangements is an essential aspect of fostering the goals of the General Plan and Alpine City's zoning scheme, which seeks uncrowded, stable (non-transitory) single family neighborhoods.

11. The City also recognizes the need, in certain demonstrable circumstances, for individuals with handicaps or disabilities to live in a Group Living Arrangements.

12. In order to fulfill the purposes of the General Plan while accommodating the demonstrable needs of individuals with handicaps or disabilities to live in Group Living Arrangements, which are generally prohibited for individuals without disabilities or handicaps, the City desires to clarify its ordinances and define its practices and policies with regard to these issues.

WHEREFORE, BE IT ORDAINED BY THE CITY COUNCIL OF ALPINE CITY, UTAH, AS FOLLOWS:

PART II

TEXT OF ORDINANCE

SECTION 1. Section **3.1.11** of the Development Code, is hereby amended as follows:

The following definition of “**GROUP LIVING ARRANGEMENT**” is added:

22. GROUP LIVING ARRANGEMENT. A group living or congregate living arrangement where groups of more than four unrelated persons live together in a single dwelling unit, including, but not limited to, a batching apartment, boarding house, Congregate Living Unit, Assisted Living Facility, Nursing Care Facility, Residential Facility for Persons With a Disability, dormitory, student housing, fraternity, club, institutional group, half-way house, or other similar group living or congregate living arrangement.

Paragraphs 22 – 51 are renumbered to paragraphs 23 – 52.

The definition of “**REASONABLE ACCOMMODATION**” is modified as follows:

~~40.~~ **41. REASONABLE ACCOMMODATION.** A reasonable change in any rule, policy, practice, or service necessary to afford a persons with a disability equal opportunity to use and enjoy a dwelling when compared to similarly-situated persons or groups. ~~For the purposes of this and related ordinances, the following words have the following meanings:~~

- ~~_____ A. Reasonable. A requested accommodation that will not undermine the legitimate purpose of existing zoning regulations notwithstanding the benefit that the accommodation will provide to a person with a disability.~~
- ~~_____ B. Necessary. The applicant must show that, but for the accommodation one or more persons with a disability likely will be denied an equal opportunity to enjoy the housing of their choice.~~
- ~~_____ C. Equal Opportunity. Achieving equal results as between a person with a disability and a nondisabled person.~~

The definition of “**RESIDENTIAL FACILITY FOR PERSONS WITH A DISABILITY**” is modified as follows:

~~43.~~ **44. RESIDENTIAL FACILITY FOR PERSONS WITH A DISABILITY.** A residence in which no more than one (1) eight (8) unrelated persons with a disability resides and which is:

- A. Licensed or certified by the Department of Human Services under Title 62A, Chapter 2, of the Utah Code, Licensure of Programs and Facilities; or
- B. Licensed or certified by the Department of Human Health under Title 26, Chapter 21, Health Care Facilities Licensing and Inspection Act.

SECTION 2. Section 3.2.3.3 of the Development Code, is hereby amended as follows:

3. Child care nurseries and group day-care centers, ~~nursing homes;~~

SECTION 3. Article 3.29 of the Development Code is hereby amended as follows:

3.29.1 PURPOSE AND INTENT. It is the intent of the City that this section shall be interpreted and applied in ~~such a way as to effectuate the policy and goals of a manner that is consistent with~~ Title 57, Chapter 21, Utah Fair Housing Act, and the federal Fair Housing Amendments Act of 1988, 42 U.S.C. Sec. 3601 et seq. ~~to allow persons with disabilities to have the same rights and privileges to live in the residential areas of Alpine City as those persons who are not disabled.~~

3.29.2 DEFINITIONS. The definition of disability shall be as defined in Title 57, Chapter 21, Utah Fair Housing Act, and shall include the definition of “Handicap” under the federal Fair Housing Amendments Act of 1988, 42 U.S.C. Sec. 3601 et seq. ~~Residential Facility for persons with a disability shall have the definition found in Utah Code 10-9a-102(43)~~ as may be amended from time to time. All other definitions shall be as found in Chapter 3 Section 3.1.11 of the Alpine City Development Code. If a word or term is not defined in the Development Code that word or term is intended to have the definition found in any good English language dictionary.

3.29.3 PERMITTED USE. ~~A residential facility for persons with a disability~~ Residential Facility for Persons With a Disability shall be a permitted use in any zone in the City where ~~similar residential dwellings that are not residential facilities for persons with a disability~~ Group Living Arrangements are allowed as a permitted or conditional use, subject to the same land use regulations applied to ~~single family residential dwellings~~ other Group Living Arrangements in the zone in which the facility is proposed to be located, except as may be specifically modified in this section.

3.29.4 NOT A BUSINESS. ~~A residential facility for persons with a disability will not be considered a business because a fee is charged to the occupants of the facility for food, treatment, care or for actual and necessary costs of operation and maintenance of the facility.~~

3.29.5 DISPERSAL OF FACILITIES. ~~In order to preserve the residential character of the neighborhoods of Alpine City, and the residential nature of the residential facilities for persons with a disability, and to see that such facilities are reasonably dispersed throughout the City, no residential facility for persons with a disability shall be located within 4,000 feet from an existing residential facility for persons with a disability. The distance shall be measured from the property line of the existing facility to the property line of the proposed facility.~~

3.29.6 NUMBER OF OCCUPANTS. ~~Occupancy of a residential facility for persons with a disability shall be limited to no more than four (4) unrelated persons unless the zone in which the facility is located allows for greater occupancy for single family residences, in which case the occupancy limitations for single family residences in that zone shall~~

~~apply. For purposes of determining the number of occupants of a facility, persons engaged to provide services to the residents of the facility shall not be counted.~~

~~**3.29.7 SECURITY FOR SUBSTANCE ABUSE FACILITIES.** Residential facilities for persons with a disability that are substance abuse facilities and are located within 500 feet of a school, shall provide, in accordance with rules established by the Utah Department of Human Services under Title 62A, Chapter 2, Licensure of Programs and Facilities:~~

~~—— (A) a security plan satisfactory to the Lone Peak Public Safety District authorities;~~

~~—— (B) 24-hour supervision for residents; and~~

~~—— (C) other 24-hour security measures as may be recommended by the Lone Peak Public Safety District.~~

~~**3.29.8 INSPECTIONS AND PERMITS.** All residential facilities for persons with a disability shall obtain permits that verify compliance with the same building, safety, and health regulations as are applicable in the same zone to similar uses that are not residential facilities for persons with a disability.~~

~~**3.29.9 FUNDAMENTAL CHANGE IN THE NEIGHBORHOOD.** A residential facility for persons with a disability that would likely create a fundamental change in the character of a residential neighborhood may be excluded from a zone. The Development Review Committee (DRC) shall determine if a proposed residential facility for persons with a disability will result in a fundamental change in the character of the residential neighborhood in which it is proposed to be located. The criteria to be used to determine whether or not a proposed facility will fundamentally change the character of the neighborhood shall include such things as the look, design and size of any proposed new construction for the facility, but may not include the fact that the potential occupants of the facility are disabled; or that the occupants will require services, care, or treatment at the facility. The decision of the DRC may be appealed to the Alpine City Appeal Authority pursuant to Article 2.3 of the Alpine City Development Code.~~

~~**3.29.10 LICENSES.** The City does not require a license for single family residences and therefore shall not license programs or entities that operate facilities for persons with a disability. The responsibility to license programs or entities that operate facilities for persons with a disability, as well as to require and monitor the provision of adequate services to persons residing in those facilities, shall rest with:~~

~~—— (A) for programs or entities licensed or certified by the Department of Human Services, the Department of Human Services as provided in Title 62A, Chapter 5, Services to People with Disabilities; and~~

~~—— (B) for programs or entities licensed or certified by the Department of Health, the Department of Health under Title 26, Chapter 21, Health Care Facility Licensing and Inspection Act.~~

SECTION 4. Article 3.30 of the Development Code is hereby amended as follows:

3.30.1 PURPOSE. ~~It is the policy of the jurisdiction, pursuant to the Title 57, Chapter 21, Utah Fair Housing Act, and the federal Fair Housing Amendments Act of 1988, 42 U.S.C. Sec. 3601 et seq (hereafter “fair housing laws”), to provide individuals with disabilities reasonable accommodation in rules, policies, practices and procedures to ensure equal access to housing and facilitate the development of housing for individuals with disabilities. This chapter establishes a procedure for making requests for reasonable accommodation in land use, zoning and building regulations, policies, practices and procedures of the City to comply fully with the intent and purpose of fair housing laws.~~

3.30.2 APPLICABILITY. ~~Reasonable accommodation in the land use and zoning context means providing individuals with disabilities or developers of housing for people with disabilities, flexibility in the application of land use and zoning and building regulations, policies, practices and procedures, or even waiving certain requirements, when it is necessary to eliminate barriers to housing opportunities.~~

~~— An individual with a disability is someone who has a physical or mental impairment that limits one or more major life activities; anyone who is regarded as having such impairment; or anyone with a record of such impairment.~~

A request for reasonable accommodation may be made by any individual with a disability, his or her representative, or a developer or provider of housing for individuals with disabilities, ~~when the application of a land use, zoning or building regulation, policy, practice or procedure acts as a barrier to fair housing opportunities.~~

3.30.3 REQUESTING REASONABLE ACCOMMODATION.

~~A. — In order to make housing available to an individual with a disability, any eligible person as defined in above may request a reasonable accommodation in land use, zoning and building regulations, policies, practices and procedures.~~

A.B. Requests for reasonable accommodations shall be in writing and provide the following information:

- (1) Name and address of the individual(s) requesting reasonable accommodation;
- (2) Name and address of the property owner(s);
- (3) Address of the property for which accommodation is requested;
- (4) Description of the requested accommodation and the regulation(s), policy or procedure for which accommodation is sought; ~~and~~
- (5) Reason that the requested accommodation may be necessary for the individual(s) with the disability to use and enjoy the dwelling; and
- (6) All information necessary for the findings set forth in Sec. 3.30.5.

~~B.C.~~ Requests for reasonable accommodations shall be submitted to the Development Review Committee (DRC) ~~fourteen (14) days before a regularly scheduled Planning Commission meeting.~~

~~C.D.~~ Any information identified by an applicant as confidential shall be retained in a manner so as to respect the privacy rights of the applicant and shall not be made available for public inspection.

~~D.E.~~ A request for reasonable accommodation in regulations, policies, practices and procedures may be filed at any time that the accommodation may be necessary to ensure equal access to housing. A reasonable accommodation does not affect an individual's obligations to comply with other applicable regulations not at issue in the requested accommodation.

~~E.F.~~ If an individual needs assistance in making the request for reasonable accommodation, the City will provide assistance to ensure that the process is accessible.

3.30.4 REVIEWING AUTHORITY.

A. Requests for reasonable accommodations shall be reviewed ~~and recommended by the Planning Commission and approved by the City Council~~ using the criteria set forth in Sec. 3.30.5 below.

B. The ~~Alpine City Council~~ DRC shall issue a written decision on a request for reasonable accommodation within thirty (30) days of the date of the application and may either grant, grant with modifications, or deny a request for reasonable accommodation in accordance with the required findings set forth in Sec. 3.30.5 below.

C. ~~If necessary to reach a determination on the request for reasonable accommodation, the Planning Commission and/or City Council may request further information from the applicant consistent with fair housing laws, specifying in detail the information that is required. In the event that a request for additional information is made, the thirty (30) day period to issue a decision is stayed until the applicant responds to the request.~~ It is the applicant's burden to demonstrate that the accommodation is necessary and reasonable under the standards and definitions set forth in federal and state law, including federal and state case law.

3.30.5 REQUIRED FINDINGS.

The written decision to grant, grant with modifications, or deny a request for reasonable accommodation shall be ~~consistent with fair housing laws and~~ based on the following factors:

A. Whether the housing, which is the subject of the request for reasonable accommodation, will be used by an individual with disabilities protected under fair housing laws;

B. Whether the requested accommodation is necessary to ~~make housing available to an individual with disabilities protected under the fair housing laws; to afford persons with a disability equal opportunity to use and enjoy a dwelling when compared to similarly-situated persons or groups without a disability;~~ to afford persons with a disability equal opportunity to use and enjoy a dwelling when compared to similarly-situated persons or groups without a disability;

C. Whether the requested accommodation would impose an undue financial or administrative burden on the City ~~and;~~

D. Whether the requested accommodation would require a fundamental alteration in the nature of the City's land use, ~~and~~ zoning or building programs;

E. Whether the requested accommodation is reasonable;

F. Whether the request for accommodation would result in a dwelling being made available to an individual whose tenancy would constitute a direct threat to the health or safety of other individuals or whose tenancy would result in substantial physical damage to the property of others; and

G. Any other relevant considerations under federal or state law.

3.30.6 WRITTEN DECISION ON THE REQUEST FOR REASONABLE ACCOMMODATION.

- A. The written decision on the request for reasonable accommodation shall explain ~~in detail~~ the basis of the decision, including the reviewing authority's findings on the criteria set forth in Sec. 3.30.5. All written decisions shall give notice of the applicant's right to appeal and to request reasonable accommodation in the appeals process as set forth below. The notice of decision shall be sent to the applicant by certified mail.
- B. The written decision of the ~~City Council~~ DRC shall be final unless an applicant timely appeals it to the Land Use Hearing Officer, as the Alpine City Appeal Authority.
- C. If the ~~City Council~~ DRC fails to render a written decision on the request for reasonable accommodation within the thirty (30) day time period allotted by Sec. 3.30.4(B), the request shall be deemed ~~granted~~ denied based upon the insufficiency of the applicant's information to satisfy the criteria set forth in Sec. 3.30.3.
- D. While a request for reasonable accommodation is pending, all laws and regulations otherwise applicable to the property that is the subject of the request shall remain in full force and effect.

3.30.7 APPEALS.

- A. Within ten (10) days of the date of the ~~City Council's~~ DRC's written decision or expiration of the thirty (30) day time period allotted by Sec. 3.30.4(B), an applicant may appeal an adverse decision to the Alpine City Appeal Authority. Appeals from the adverse decision shall be made in writing.
- B. If an individual needs assistance in filing an appeal on an adverse decision, the City will provide assistance to ensure that the appeals process is accessible.
- C. All appeals shall contain a statement of the grounds for the appeal. Any information identified by an applicant as confidential shall be retained in a manner so as to respect the privacy rights of the applicant and shall not be made available for public inspection.
- D. ~~Nothing in this procedure shall preclude an aggrieved individual from seeking any other state or federal remedy available.~~ The review of all such appeals shall be based upon the record presented to the DRC.

SECTION 4. Article 3.15 of the Development Code, is hereby amended as follows:

ARTICLE 3.15 ~~RESERVED.~~ GROUP LIVING ARRANGEMENTS

3.15.1 GROUP LIVING ARRANGEMENTS PROHIBITED. Group Living Arrangements which are not expressly permitted within a zone or by the Development Code are expressly prohibited.

PASSED AND ORDERED PUBLISHED BY THE CITY COUNCIL OF ALPINE CITY, UTAH, THIS ____ DAY OF _____ 20__.

Don Watkins, Mayor

ATTEST:

City Recorder

ALPINE PLANNING COMMISSION AGENDA

SUBJECT: State Farm Insurance Building Site Plan

FOR CONSIDERATION ON: 03 February 2015

PETITIONER: Eli Slesk and Brandon Maughan

**ACTION REQUESTED BY PETITIONER: Make Recommendation of
Approval to City Council**

**APPLICABLE STATUTE OR ORDINANCE: Article 3.7 (Business/Commercial)
Article 3.11 (Gateway/Historic)**

PETITION IN COMPLIANCE WITH ORDINANCE: Yes

BACKGROUND INFORMATION:

At the January 20, 2015 Planning Commission meeting, the preliminary architectural drawings were discussed extensively. The Planning Commission asked that some new drawings be created implementing some of the ideas that were discussed that night. The Planning Commission will review these new drawings and consider making a recommendation to the City Council regarding the site plan.

STAFF RECOMMENDATION:

Staff recommends that approval of the proposed site plan be granted provided the following items are addressed:

- **The Developer provide a lighting plan.**
- **An exception be considered by the Planning Commission and City Council regarding setbacks.**
- **An exception be considered by the Planning Commission and City Council regarding six (6) parking stalls location within the setback.**
- **An agreement provided between property owners regarding the excess parking stall proposed to be on the adjacent property be considered by the Planning Commission and City Council.**
- **No trees be planted within the sight triangle and other landscaping be placed in a way that will never affect visibility on the Corner of 120 South and Main Street.**
- **The preliminary architectural design drawings be considered by the Planning Commission and City Council.**



Date: January 16, 2015

By: Jason Bond
City Planner

**Subject: Planning and Zoning Review
State Farm Insurance Building Site Plan
134 South Main Street**

Background

The proposed State Farm Insurance office building is located on the corner of Main Street and 120 South. The property is 10,043 square feet and is located in the Business Commercial zone. Office buildings are a permitted use in the BC zone. The proposed building will be 2 stories with 2,000 square feet per floor.

The Gateway/Historic zone will also apply to this proposal. The Gateway/Historic zone gives the Planning Commission the ability to allow flexibility to the requirements set forth in the BC zone. The Planning Commission may recommend exceptions regarding parking, building height, signage, setbacks and use if it finds that the plans proposed better implement the design guidelines to the City Council for approval (Section 3.11.3.3.5).

Location (Section 3.7.5)

The setback requirements in the BC zone are as follows:

Front setback (or from any street) - 30'

Side and Rear setback - 20'

The proposed office building will need an exception from the setback requirements. This requires a recommendation from the Planning Commission and an approval from the City Council where circumstances justify. The applicant is proposing to have a 22' setback (8' exception) from 120 South, a 20' setback (10' exception) from Main Street, and an 8' setback (12' exception) from the property line to the south. From a planning perspective, I offer my support on these exceptions.

Street System/Parking (Sections 3.7.8.3 and 3.24.3)

The off-street parking requirements for an office building are as follows:

Four (4) spaces per 1,000 sf

The site plan shows 15 parking stalls. With the square footage of the building, 16 parking stalls are required. The applicant proposes to use an excess stall on the adjacent property to the south and connect parking lots for traffic circulation. An agreement would be made between the property owners. Based on calculations of the adjacent building received from the applicant's engineer, it appears that there are 4 more parking stalls than are required. From a planning perspective, I offer my support on this proposed agreement.

The site plan proposes to access the site from 120 South. A new drive approach will be created there removing curb, gutter, and sidewalk. The existing drive approach on Main Street will be replaced with standard curb, gutter and sidewalk. To mitigate the negative impact of street parking, it is proposed that the curb fronting 120 South and Main street be painted red to prohibit parking.

The parking stall and aisle dimensions meet the minimum requirements. However, there are 6 stalls that are located within the required 30' setback (Section 3.7.5.1). The Planning Commission will need to recommend an exception to the City Council for approval in order for these 6 stalls to remain on the plan as is. From a planning perspective, I offer my support on this exception.

Special Provisions (Section 3.7.8)

- Trash Storage - The applicant proposes to use residential type storage for garbage and recycling materials. The cans will be in an enclosed area at the southeast corner of the building.
- Landscaping - A landscaping plan has been provided. The site will consist of 2,009 sf of landscaping. A minimum of 20% of the total site is required to be landscaped. The applicant has indicated that they will have 2,800 sf of landscaping and the existing tree at the northwest corner of the property will be removed.
- Design - Preliminary architectural design drawings were submitted and need to be reviewed by the Planning Commission.

RECOMMENDATION

The Planning and Zoning Department recommends approval of the proposed site plan provided the following items are addressed:

- **An exception be considered by the Planning Commission and City Council regarding setbacks.**
- **An exception be considered by the Planning Commission and City Council regarding six (6) parking stalls location within the setback.**
- **An agreement provided between property owners regarding the excess parking stall proposed to be on the adjacent property be considered by the Planning Commission and City Council.**
- **No trees be planted within the sight triangle and other landscaping be placed in a way that will never affect visibility on the Corner of 120 South and Main Street.**
- **The preliminary architectural design drawings be considered by the Planning Commission and City Council.**



Date: January 7, 2015

By: Jed Muhlestein, P.E. *JM*
Assistant City Engineer

**Subject: Engineering Review
State Farm Insurance Building Site Plan
134 South Main Street**

The engineering department received a site plan application for review January 7, 2015 to be on the January 20th Planning Commission meeting. The application is for a State Farm Insurance Building located at 134 S. Main Street. This is a code review from an engineering standpoint; a separate review from the City Planner will also be done for the site plan. The review is as follows:

Street System

The site plan does not propose any new street system but does include a new parking lot with parking stalls. This would fall under section 3.24 of the Development Code, Off-street Parking.

The parking stall dimensions, surface material (asphalt), concrete work, and new ADA ramp at the corner of 120 South and Main appear to meet code. It is not specified on the plan, but it would be required that the new driveway ramp be 6-inch thick concrete, the standard design for a typical commercial driveway approach.

The site plan does not mention any specific lighting plan for the parking; this will need to be discussed prior to approval.

Sewer System

The property is served by an existing 4-inch sewer lateral that connects to the sewer main line in 120 South. Connection to the existing sewer lateral would be required.

Culinary Water System

The property currently has a 3/4-inch water meter service that the structure would be connected to. There is an existing fire hydrant 85 feet south of the property along Main Street that would

serve for fire protection. The Fire Marshall will need to determine if the existing fire protection is adequate or if installation of other means is necessary.

The water policy was met when a previous structure was built on the property. That structure has been demolished and removed from the property.

Pressurized Irrigation System

A 1-inch pressurized irrigation lateral currently serves the property; connection to it would be required.

Storm Water Drainage System

The site plan proposes a sump system to retain all onsite drainage however no calculations or details were provided with this proposal. As a condition of approval, details and calculations would be required.

A storm water pollution prevention plan would be required for the site addressing best management practices that will be implemented to control erosion on the site during construction. A Land Disturbance Permit will be required prior to construction.

General Remarks

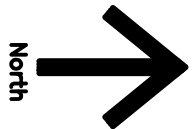
There is an existing power pole on the southern edge of the proposed parking that is shown to be relocated.

There are some minor redlines on the plan to be corrected

RECOMMENDATION

The Engineering Department recommends that approval of the proposed site plan be granted provided the following engineering items are addressed:

- **The Developer provide storm drainage calculations and details for the plan**
- **The Developer address the site plan redlines**
- **The Developer provide a lighting plan**
- **The Fire Marshal approves the site plan**



J&L Endeavors LLC
80 S. Main Street

Red Brick LLC
100 N. Main Street

Craig Carlisle
50 W 120S

120 South Street

NE Cor
Lot 4
Block 2

Main Street

Main Street

100 South

Bank of American Fork
105 S. Main Street

Ross Beck
129 S. Main Street

Mountaineer Academy
147 S. Main Street

State Farm Insurance Building Site Plan

Property Description

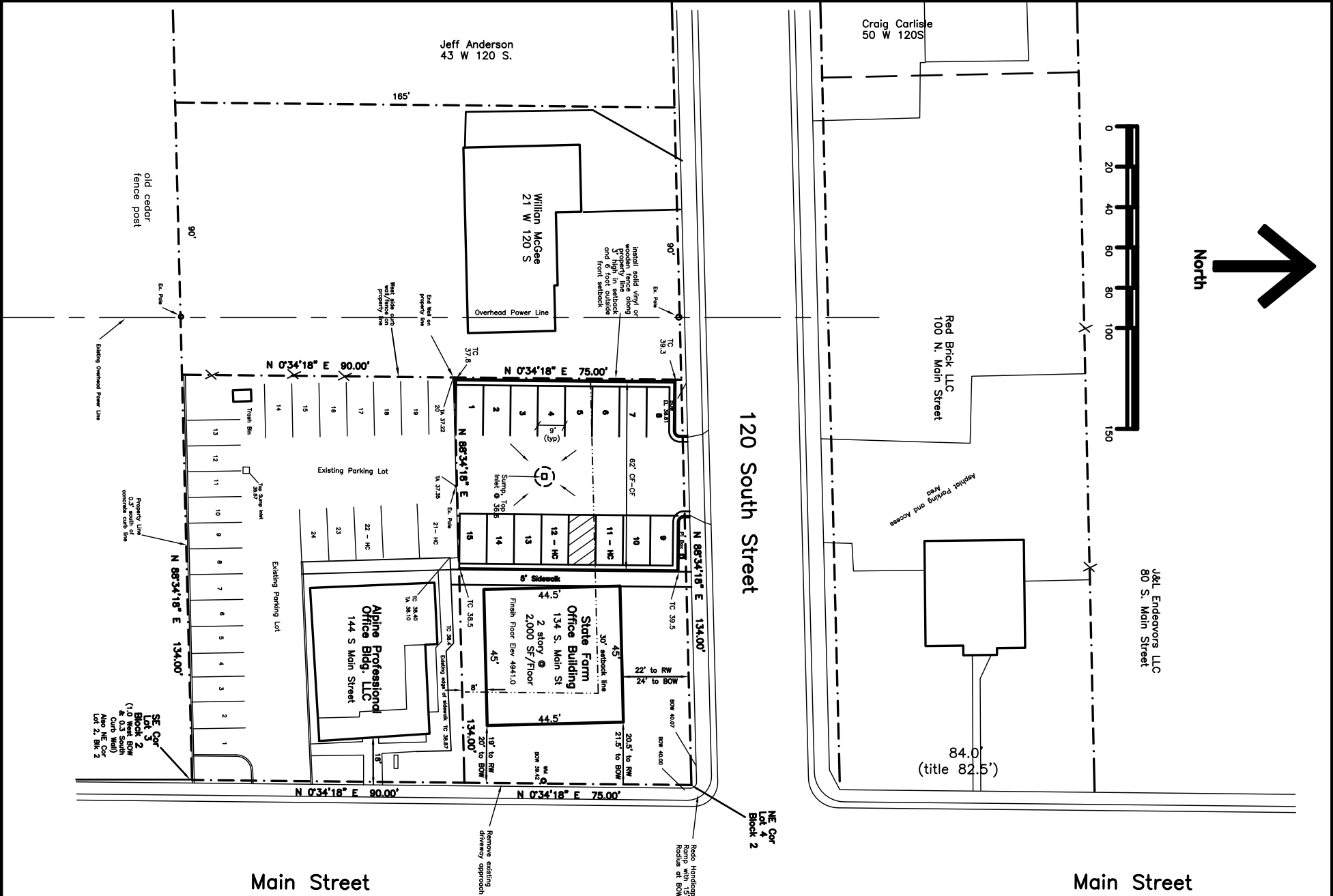
Commencing at the Northeast Corner of Lot 4, Block 2 Alpine City Survey which point is located N 89°46'19" East 1425.06' along the Section Line and North 518.79 feet from the South one-quarter Corner of Section 24, T4S, R1E, SLB&M; thence S 0°34'18" W 75.00' along Main Street; thence S 88°34'18" W 134.00'; thence N 0°34'18" E 75.00'; thence N 88°34'18" E 134.00' along the south boundary of 120 South Street to the point of beginning.
Area = 10,043 SF

General Notes

- Property is located in the Alpine City B-C Zone.
- The Applicant desires to operate an office building which is a permitted use of the zone.
- The Applicant desires to build a 2 story building with 2,000 SF per floor.
- The parking requirement for 4,000 SF building is 16 stalls. The applicant proposes to use an excess stall on the adjacent property to the south and connect parking lots for traffic circulation as shown. There will be an agreement with the adjacent owner.
- The applicant is asking for variance regarding the 30' front yard setback from the street. The desire is to request 20' from Main Street and 22' feet from 120 South Street as shown. The existing bank building and the office to the south of this project has setbacks less than that which is being requested. With the property being a corner lot, makes it difficult to develop without a variance in the setback for the building and the parking lot. Having a setback of 22' from 120 South for the building allows for building separation with the existing building of approximately 15'. The minimum landscaping required is 20% of the parcel or 2,000 SF. The proposed site plan will provide approximately 2,800 SF.
- The minimum landscaping required is 20% of the parcel or 2,000 SF. The proposed site plan will provide approximately 2,800 SF.
- City utility services of water, sewer are at the site and can serve the property adequately. Other utility services of power, gas and telecommunication are at the property.
- The applicant desires to place a solid wooden or vinyl fence along the west property line to buffer to the neighbor to the west.
- The applicant is will improve the existing handicap ramp at the corner and improve the turning radius.
- To mitigate negative impact of street parking the applicant is proposing to red curb the property fronting on 120 South and Main Street.
- All storm water will be retained onsite by installing a deep sump in the parking lot area as shown on the site plan.
- The applicant proposes to use residential type storage for garbage and recycled material. The cans will be in an enclosed area at the southwest corner of the building.

Improvement Notes

- 2' wide standard c&g will border the parking area with drainage away from the curb face as shown.
- The parking area will be improved with 8" road base and 3" asphalt.
- All concrete flatwork (sidewalk, c&g, and other) will be on minimum of 6" road base.
- The existing driveway approach on Main Street will be removed and replaced with standard c&g and sidewalk.
- The existing tree by the northwest corner of the property will be removed.
- The existing combination c&sw will be removed for the new 120 South driveway approach with 6" thick sidewalk.
- The applicant will deed property to the city and improve the turning radius and handicap approach at the corner.
- Parking concrete bumpers will need to be used to prevent damage to the wall and over hanging onto the sidewalk area.
- Landscaping will be mainly grass along 120 South and Main Street to maintain good sight distances. Other types of landscaping will be next to the building to add beauty.
- The existing utility pole in the parking area will be removed.



Site Plan			Utah
State Farm Insurance Building			
Alpine,			
Surveyor/Engineer K. Edward Gifford 6163 W. 9600 N. Highland, Ut. 84003 Phone 801-592-4150	Owner/Representative Owner: Brandon Moughn Rep: Will S. Jones 375 S. Main St, Suite 2 Alpine, Ut 84004 Phone 801-836-7465	Date: 15 Jan 2015	Scale 1"= 30' (24x36)

ALPINE PLANNING COMMISSION AGENDA

SUBJECT: Eagle Pointe PRD Preliminary Site Plan

FOR CONSIDERATION ON: 03 February 2015

PETITIONER: Taylor Smith and Mark Wells

ACTION REQUESTED BY PETITIONER: Approve Preliminary Site Plan

APPLICABLE STATUTE OR ORDINANCE: See Engineer Review

PETITION IN COMPLIANCE WITH ORDINANCE: Yes

BACKGROUND INFORMATION:

This development was formerly known as the Vista Meadows PRD subdivision. The proposed Eagle Pointe PRD Subdivision consists of 14 lots on 32.929 acres. Technically there are only 13 new lots as Lot 14 is an amended Lot 3 of Falcon Ridge Plat A. The lots range in size from 23,190 to 71,766 square feet which meets the minimum lot size requirements as set forth in the PRD section of the Development Code, section 3.9.6. The Development is located west of the Falcon Ridge Development. The proposed development includes approximately 17.54 acres (53.5%) of open space. The proposed development is in the CR-40,000 zone.

STAFF RECOMMENDATION:

Staff recommends that preliminary approval of the proposed development be approved with the following conditions:

- **The Planning Commission recommends and City Council approves the following:**
 - **an exception for the small amounts of property within the lots that contain land sloped greater than 25% (Section 3.9.4)**
 - **an exception to the 50 foot clear zone rule from station 1+00 to 5+00 (Section 4.1.2/4.17)**
 - **an exception to the 2:1 cut/fill slope (Section 4.1.2/4.17)**
 - **approval for the use of retaining walls (Section 3.9.7.4)**
 - **approval in change of use: 931 square feet of current public open space being changed to public right of way in exchange for 7,280 square of public open space.**
- **The Planning Commission and City Council make a recommendation regarding the aesthetics of retaining walls on this subdivision.**
- **The Planning Commission discuss the trail master plan and whether or not something should be incorporated into this plan (Section 3.17)**
- **The Developer coordinate with the City to show what culinary water system improvements will be made to solve the issue of lowering the fire flow level of service to the pressure zone to which it is connected**
- **The Developer submit a retaining wall design based on the Geotechnical Report prior to Final Approval**



Date: January 28, 2015

By: Jed Muhlestein, P.E. *JM*
Assistant City Engineer

Subject: **Eagle Point PRD Subdivision – Preliminary Review**
14 lots on 32.929 acres

Background

This development was formerly known as the Vista Meadows PRD subdivision. The proposed Eagle Point PRD Subdivision consists of 14 lots on 32.929 acres. Technically there are only 13 new lots as Lot 14 is an amended Lot 3 of Falcon Ridge Plat A. The lots range in size from 23,190 to 71,766 square feet which meets the minimum lot size requirements as set forth in the PRD section of the Development Code, section 3.9.6. The development is located west of the Falcon Ridge development. The proposed development includes approximately 17.54 acres (53.3%) of open space. The proposed development is in the CR-40,000 zone.

PRD Requirements

The proposed development was presented before the Planning Commission and City Council to determine if it can be considered as a PRD. Both approved the property to be considered as a PRD.

The developer did not submit a slope analysis for the property as per the PRD, however we completed our own slope analysis in 2010 and again with this submittal. Based on our analysis, we have determined that the allowable base density is 14 units. As currently drawn, the development would provide approximately 17.54 acres of open space, or 53.3 percent of the total development area. This would provide sufficient open space to receive the maximum density bonus of 25 percent. Assuming the maximum density bonus, up to 17.52 lots (rounded to 18 lots) is possible if topography allows it. Because of the topographic challenges of the area, and the Development Code which protects the city from lots being developed on a hillside, the developer has proposed a plan with only 13 new lots. As mentioned earlier, Lot 14 is an existing lot (Lot 3 Falcon Ridge Plat A) which is proposed to be amended to accommodate the secondary access required by code. This existing lot is owned by an LLC which the developer is a part of.

The slope analysis has three main purposes; (1) is used to calculate base density, (2) helps evaluate building pads and (3) shows the percentage of land with slopes greater than 25% within a lot. The Developer has shown the building pads on the proposed Preliminary Plat. The pads appear to meet section 3.1.11.7 which requires no areas of ground greater than 20% slope to be within the buildable area. Section 3.9.4 details how much slope above 25% can be contained within a lot. All the new lots contain ground that is steeper than 25%. **The proposed plan will require an exception be recommended by the Planning Commission and approved by the City Council for this slope as outlined in section 3.9.4 of the Development Code.**

Street System

The proposed development shows access from Lakeview Drive and Hog Hollow (600 North). The general layout of the development meets code in regards of frontage, road alignments, and road design.

The proposed plans show an approximate line where fill material would extend beyond the 50-foot clear zone as identified in the Cut/Fill Ordinance (Section 4.17). The original plan showed three minor retaining walls at the extension of Lakeview Drive so as to not require an exception to the ordinance regarding cut/fill slopes. The Engineering department directed the Developer to eliminate these minor walls and request an exception for the 50-foot clear zone in this area. We are in support of an exception at this location as it is not wise to have a small retaining wall at the end of a long fill/cut slope, when the better design is to simply run the cut/fill slope another 10-20 feet to existing ground. **An exception to the 50-foot clear zone (4.17) to eliminate three minor retaining walls will require a recommendation by the City Engineer, Planning Commission, and approval by the City Council as outlined in section 4.1.2 of the Development Code.**

The plans are showing 2:1 cut/fill slopes on all slopes, which do not meet the Cut/Fill Ordinance as found in section 4.17. A letter from Earthec Engineering was submitted which ensures that the existing geotechnical report is still valid for the development. That report specifies the methods, material, and erosion control standards used to build 2:1 slopes. The City Engineer accepts and recommends the methods described in the report. **An exception to the Cut/Fill Ordinance to allow 2:1 cut/fill slopes to be used within the development will require a recommendation by the City Engineer, Planning Commission, and approval by the City Council as outlined in section 4.1.2 of the Development Code.**

On the lower end of the project there are two retaining walls. The heights of the walls vary as topography requires along the roadway. The wall on the downhill side of the road runs continuously for approximately 1,000 feet ranging in size from 2 to 12 feet tall, the majority of the wall averaging 10 feet high or less. The uphill wall also runs continuously for approximately 1,000 feet and ranges in size from 2 to 28 feet tall, with the majority of the wall being in the 16 foot range. There are two small sections that jump up to 25 and 28 feet high. No indication was given on the plans as to the type of the proposed retaining walls though it has been mentioned

they would be a soil-nail design. For safety, a 6 foot tall chain link style fence is shown to be installed along the top of the upper wall for safety purposes. Guard railing and signage is shown for the lower wall. **The use of retaining walls in a Planned Residential Development (PRD) requires approval. Part of Section 3.9.7.4 of the development code states: “Use of retaining walls is prohibited unless approval is recommended by the City Engineer and the Planning Commission, and approved by the City Council.”**

The City Engineer is required to make a recommendation as to whether or not retaining walls will be allowed in a PRD, however there are no criteria listed in the ordinance to base a recommendation on. From strictly an engineering standpoint, it is likely that walls could be designed and built in this situation. Quality control would be extremely important during construction to insure long term performance of the retaining walls. From an engineering standpoint we believe that it is possible to design retaining walls in this situation and would at least recommend approval for a design to be pursued for the proposed retaining walls. Final recommendation for approval from the City Engineer’s office would be subject to review of a final design. This is with the understanding that the final approval is to be made by the City Council. **A retaining wall design, based on the geotechnical report, outlining the wall type, design, calculations, and construction standards will need to be submitted for the walls prior to Final Approval.**

The aesthetics of the walls has been mentioned and is more subjective, as everyone has their own opinion of what is “aesthetically pleasing”. **Since the ordinance does not list aesthetics as a requirement, we recommend that the Planning Commission and City Council address that issue.**

Due to some roadway cuts/fills that extend well into some of the lots, the developer was asked to and has submitted driveway alignments for lots 1-3 & 14 to show a driveway can be built for the lot that would comply with ordinance (Dev. Code 3.1.11.7).

The improvements for this development cannot take place without an amendment to Lot 3 of Falcon Ridge Plat A. It is proposed that Lot 3 be included in this plat, with a note on the final Eagle Point plat vacating Lot 3 of Falcon Ridge Plat A.

Currently Falcon Ridge Plat A shows an easement alignment for the road dedication of Lakeview Drive through the open space on the northerly road connection. For the southerly road connection there is a small piece of open space (931 SF) proposed to be dedicated to road right-of-way for the new road alignment. The Developer is proposing to change the use of 931 SF of currently dedicated open space to road right of way in exchange for 7,280 SF of new open space taken from the existing Lot 3. **Modifying or changing the use of Open Space requires a recommendation from the Planning Commission and City Council Approval.**

Sewer System

The proposed plans show a new sewer system connecting to the existing line in 600 North which

has been modeled and built to handle the flow. In the proposed Vista Point cul-de-sac, a portion of the new sewer line is shown to be constructed outside of the street. As the City has increased its efforts to flush sewer lines our awareness of the issues associated with lines being constructed outside of the street has also increased. One of these issues is access for maintenance. The plans do show an access road to the manhole being constructed outside the roadway which is acceptable. A commercial grade driveway approach for the access shown. Besides lot 14, which is an existing lot with an existing sewer lateral, new sewer laterals are shown for each new lot.

Culinary Water System

Due to its elevation, this development will need to be served by the Grove pressure zone. Each lot has an area below the 5350 foot elevation, which is the highest elevation the existing water system can serve and still provide the minimum 40 psi required by the ordinance. The only connection available to this zone is an existing 8-inch water line at the end of Lake View Drive. Based on current water modeling (see attached letter), 150' of that 8-inch line would need to be upsized to 12-inch, and that 12-inch line would need to be extended to the intersection of Vista Point and Lakeview Drive. The remaining portions of the development would require 10-inch and 8-inch lines as shown.

As proposed the system would provide minimum fire flows to the development. But on a larger scale, because this development would have service lines which are higher than any other service in the water pressure zone, if developed this development would lower the fire flow level of service to the entire pressure zone to which it is connected (affecting one third of the city). Please see memorandum letter dated October 2, 2014 "Development Hydraulic Modeling Results and Recommendations" from Horrocks Engineers. In order to maintain the existing fire flow level of service to the entire water pressure zone, offsite improvements would be required. There are several options available for offsite improvements; the most likely solution is the construction of a new water tank just above the development. There are also culinary water improvements in the City's master plan that would improve fire flows in this area. However, the timing of construction of these improvements is unknown. **This is a concerning issue that Staff and Developer could work on together prior to Final Approval.**

Lots 1 – 3 currently show areas within the lot above the 5350 elevation. The Public Works department frequently gets low water pressure complaints from home owners who have landscaped above this elevation. The Developer has proposed to put a landscaping restriction on the plat for the portions of these lots which are above the 5350 elevation, which has been discussed at the DRC and is acceptable to the City Engineer's office.

The Fire Chief has approved the locations of the proposed fire hydrants. 1-inch water laterals will need to be constructed for each new lot and are shown on the plan.

Pressurized Irrigation System

With the previous development plan for this property, we reviewed in detail and discussed many

options of how best to provide outdoor water for this development. We have concluded that since this development is towards the upper end of the pressure zone and since we have experienced some pressure issues in the Grove pressure zone on the west side of the City, that the best option would be to require dry pressurized irrigation lines and services to be installed throughout this development that could be used at some point in the future when improvements increase the operating pressure in the irrigation system for this area. In this case, we would provide outdoor water for this development through the culinary system. Since there is a relatively low demand on this water system as opposed to that of the irrigation system, more consistent pressure can be provided for outdoor use. A minimum 6-inch pressurized irrigation main would be required, as shown on the plans, with 1-inch laterals to each lot.

Storm Water Drainage System

Storm drain plans and calculations are required at preliminary review and have been submitted. The existing storm drain line in the Falcon Ridge subdivision and 600 North is shown to be extended to serve the development. As with the sewer system, some storm drain lines are shown to be constructed outside of the City streets. An access road is provided at station 18+00 for maintenance.

All storm water is collected and detained in two local detention ponds, one above Lakeview Drive and one closer to Hog Hollow/600 North, then released at pre-development run-off rates into the existing storm water system in 600 North. Storm drain calculations and a detailed design have been provided for what is shown and are accepted.

A storm water pollution prevention plan has been submitted for the site addressing best management practices that will be implemented to control erosion on the site during construction. Before construction this will be evaluated and any minor corrections would be made at that time. A Land Disturbance Permit and UPDES permit would be required prior to construction.

General Subdivision Remarks

The developer indicated on the application that a request will be made to meet the water policy with cash in lieu of water rights. This will be a condition of final approval, not preliminary.

Section 3.12 of the City's development codes outlines the requirements for areas considered as sensitive land. The applicability of this ordinance to lands is based on hazard maps that have been adopted by the City showing the location and extent of potential hazards with the City and other factors. Upon reviewing the hazard maps, it appears that Geologic Hazards and the Urban/Wildland Interface Overlay areas need to be addressed. The entire property falls within the Geologic Hazards Overlay Zone. The potential hazards identified on this property are debris flow, rockfall and slide hazards. The developer has previously submitted environmental studies for the Vista Meadows development. In addition, a geologic hazards assessment was also submitted. A letter has been submitted by Earthtec Engineering assuring that the previously

submitted studies are valid for what is currently being proposed. We recommend that the documents be kept on file and disclosed to potential lot buyers.

The Urban/Wildland Interface Overlay area (Section 3.12.7 of the development code) outlines the requirements for when property falls within this area, mainly secondary access. The plans show a secondary access as required. This topic has been discussed quite extensively in the past and what is proposed is the result of these discussions. From station 17+00 to 27+80 the road narrows to 26' of asphalt, sidewalk on one side of the road, and no park strip.

The current plan does not show any trail easements within the development. It appears that there are one or more trails shown through this property on the trail master plan. **This should be discussed to provide direction for the Developer.**

We recommend that preliminary approval of the proposed development be approved with the following conditions:

- **The Planning Commission recommends and City Council approves the following:**
 - **an exception for the small amounts of property within the lots that contain land sloped greater than 25% (Section 3.9.4)**
 - **an exception to the 50 foot clear zone rule from station 1+00 to 5+00 (Section 4.1.2/4.17)**
 - **an exception to the 2:1 cut/fill slope (Section 4.1.2/4.17)**
 - **approval for the use of retaining walls (Section 3.9.7.4)**
 - **approval in change of use: 931 square feet of current public open space being changed to public right of way in exchange for 7,280 square of public open space.**
- **The Planning Commission and City Council make a recommendation regarding the aesthetics of retaining walls on this subdivision.**
- **The Planning Commission discuss the trail master plan and whether or not something should be incorporated into this plan (Section 3.17)**
- **The Developer coordinate with the City to show what culinary water system improvements will be made to solve the issue of lowering the fire flow level of service to the pressure zone to which it is connected**
- **The Developer submit a retaining wall design based on the Geotechnical Report prior to Final Approval**

Attached:

John E. Schiess, PE. Horrocks Engineers, "Development Hydraulic Modeling Results and Recommendations" October 2, 2014

Timothy A. Mitchell, PE. Earthtec Engineering, "Update of Geotechnical Report (Revised)" December 5, 2014 (Includes all geotechnical files submitted)



To: Shane Sorensen, P.E.
Jed Muhlestein, P.E.
Alpine City

From: John E. Schiess, P.E.

Date: October 2, 2014

Memorandum

Subject: Development Hydraulic Modeling Results and Recommendations

The proposed Eagle Point development consist of 15 lots at the end of Lakeview Drive in the Northwest part of the City. The proposed culinary water improvements are to connect to the existing 8 inch line in Lakeview Drive and extend 10 inch lines throughout the development. The pressure zone is the Grove Zone. This analysis has been completed in the latest updated water model which includes the latest connections and latest State drinking water supply standards.

Currently the highest service lateral in the Grove Zone is at the east end of Lakeview Drive which is an elevation of 5275 feet. Pressures during the peak day are approximately 67 psi and available fire flow is approximately 1,707 gpm at this location. The proposed Eagle point development as designed will have a high service lateral location of approximately 5314 which is 39 feet higher than the previous high point in the zone. The pressure would be approximately 51 psi with a fire flow available of 950 gpm.

As designed the improvements will meet minimum standards for pressure but will not meet the minimum standards for fire flow (1000 gpm for 3,600 sf home). It is assumed that the proposed homes in the area will be larger than 3,600 sf. In addition the proposed improvements actually decrease the amount of fire flow available in the rest of the pressure zone. At the current high point in the zone the available fire flow decreases from approximately 1,707 gpm to 1,080 gpm. The reason for this decrease is because the definition of available fire flow is the amount of flow available at any one location without dropping the pressure below 20 psi at any point in the pressure zone. This development will have a higher service lateral than anywhere else in the zone and effectively lowers the fire flow available everywhere in the zone.

In order to bring the fire flows up to the minimum standards of 1,000 gpm I recommend replacing the existing 150 feet of 8 inch waterline in Lakeview Drive with 12 inch and extending the 12 inch line to the intersection of Vista Point and Lakeview. This will allow for the construction of 3,600 sf homes in the proposed subdivision. If fire sprinklers are installed the size of home allowed goes up to 6,200 sf. These changes to the proposed water system will not address the reduction in fire flows for the rest of the zone. Significant offsite improvements are required to address the reduction in fire flows and to increase the available fire flows in the subdivision itself.

One possible solution to both the development needs for additional fire flow and the loss of available fire flow in the overall Grove Zone would be the construction of a tank in the northwest portion of the City on the Grove pressure zone. The required elevation of the tank is above the proposed subdivision boundary. In addition the elevation should match the existing Willow Canyon Tank as the master plan calls for the reconstruction of the Grove Tank to match Willow Canyon elevation. The size of the tank should be based on the fire flow needs of the proposed homes to be constructed (a 10,000 sf home would need 330,000 gallons). Another tank location would be up Fort Canyon which would be better for the overall zone but may not provide the fire flow necessary for the Eagle Point without additional pipeline improvements. It would provide up to 2,250 gpm which would be adequate for a 7,700 sf home.

When and if the development moves forward with a tank I should review proposed sizes and locations to fine tune the model and any recommendations. Please let me know if you have any questions.

2162 West Grove Parkway Suite 400 Pleasant Grove, UT 84062 Telephone (801) 763-5100



1497 West 40 South
Lindon, Utah - 84042
Phone (801) 225-5711

3662 West 2100 South
Salt Lake City, Utah - 84120
Phone (801) 808-9310

1596 W. 2650 S. #108
Ogden, Utah - 84401
Phone (801) 399-9516

December 5, 2014

Mr. Taylor Smith
c/o Excel Engineering
12 West 100 North, Suite 201
American Fork, UT 84003

**Re: Update of Geotechnical Report (Revised)
Eagle Pointe Subdivision
Lakeview Drive Extension
Alpine, Utah
Project No. 141303**

Mr. Smith:

A geotechnical study¹ and geological hazards assessment² for the subject site was performed by Earthtec Testing & Engineering, P.C. in 2005 at the time of the original report the subdivision was Summit Hills Development. Since then the name of the subdivision has change to Vista Meadow in 2006, and now is known as Eagle Pointe Subdivision. Multiple design^{3,4}, additional explorations⁵ and multiple response^{6,7,8,9} letters have been written between 2005 and 2007. Since completion of the studies and letters construction activities on the subdivision has not been started. We understand that the plans of Lakeview Drive and Eagle Pointe Subdivision have been slightly modified but have not changed the validity of the work completed. It is our opinion that the referenced geotechnical report and letters remain valid for developing the remainder of the project.

The geotechnical report, responses to UGS and TGE, and the Supplemental Wall design have all included 2H:1V or steeper slopes with multiple slope stability analysis performed for this

¹ Geotechnical Study, Summit Hills Development & Lakeview Drive Extension, Alpine, Utah, Earthtec Testing & Engineering, P.C. Job No. 051709, August, 18, 2005.

² Geological Hazards Assessment, Study, Summit Hills Development, Alpine, Utah, Earthtec Testing & Engineering, P.C. Job No. 051709, September 20, 2005

³ Retaining Wall Recommendations Proposed Lakeview Drive, Summit Hill (Vista Meadows), Alpine, Utah, Earthtec Testing & Engineering, P.C. Job No. 051709, April 19, 2006

⁴ Supplemental Wall Recommendations, Proposed Lakeview Drive, Vista Meadows, Alpine, Utah, Earthtec Testing & Engineering, P.C. Job No. 051709, February 5, 2007

⁵ Additional Field Exploration, Summit Hills Development, Alpine, Utah, Earthtec Testing & Engineering, P.C. Job No. 051709, November 29, 2005

⁶ Response to UGS Review, Summit Hills Development, Alpine, Utah, Earthtec Testing & Engineering, P.C. Job No. 051709, October 17, 2005

⁷ Additional Information, Stability of Slope Below Lot 16, Summit Hills Development, Alpine, Utah, Earthtec Testing & Engineering, P.C. Job No. 051709, January 26, 2006

⁸ Response to Review, Proposed Lakeview Drive, Summit Hills (Vista Meadows), Alpine, Utah, Earthtec Testing & Engineering, P.C. Job No. 051709, October 3, 2006

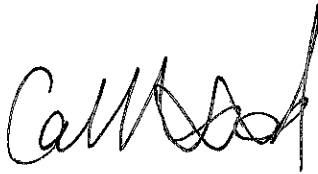
⁹ Response to 2nd TGE Review, Proposed Lakeview Drive, Summit Hills (Vista Meadows), Alpine, Utah, Earthtec Testing & Engineering, P.C. Job No. 051709, November 3, 2006

project. A 2H:1V slope is acceptable provided all of the recommendations are completely followed.

The information presented in this letter applies only to the information that is included in the referenced reports and letters. The update presented in this letter was conducted within the limits prescribed by our client, with the usual thoroughness and competence of the engineering profession in the area. No warranty or representation is intended in our proposals, contracts, reports, or letters.

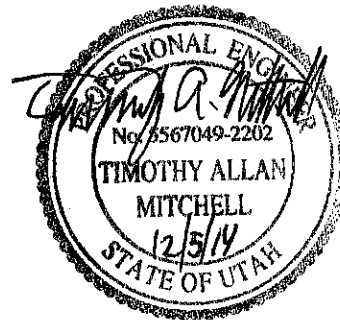
We appreciate the opportunity of providing our services on this project. If we can answer questions or be of further service, please contact us at (801) 225-5711.

Respectfully;
EARTHTEC ENGINEERING



Caleb R. Allred, E.I.T.
Staff Engineer

CA/tm



Timothy A. Mitchell, P.E.
Geotechnical Engineer



1497 West 40 South
Lindon, Utah - 84042
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3662 West 2100 South
Salt Lake City, Utah - 84120
Phone (801) 808-9310

1596 W. 2650 S. #108
Ogden, Utah - 84401
Phone (801) 399-9516

December 5, 2014

Mr. Taylor Smith
c/o Excel Engineering
12 West 100 North, Suite 201
American Fork, UT 84003

**Re: Update of Geotechnical Report (Revised)
Eagle Pointe Subdivision
Lakeview Drive Extension
Alpine, Utah
Project No. 141303**

Mr. Smith:

A geotechnical study¹ and geological hazards assessment² for the subject site was performed by Earthtec Testing & Engineering, P.C. in 2005 at the time of the original report the subdivision was Summit Hills Development. Since then the name of the subdivision has change to Vista Meadow in 2006, and now is known as Eagle Pointe Subdivision. Multiple design^{3,4}, additional explorations⁵ and multiple response^{6,7,8,9} letters have been written between 2005 and 2007. Since completion of the studies and letters construction activities on the subdivision has not been started. We understand that the plans of Lakeview Drive and Eagle Pointe Subdivision have been slightly modified but have not changed the validity of the work completed. It is our opinion that the referenced geotechnical report and letters remain valid for developing the remainder of the project.

The geotechnical report, responses to UGS and TGE, and the Supplemental Wall design have all included 2H:1V or steeper slopes with multiple slope stability analysis performed for this

¹ Geotechnical Study, Summit Hills Development & Lakeview Drive Extension, Alpine, Utah, Earthtec Testing & Engineering, P.C. Job No. 051709, August, 18, 2005.

² Geological Hazards Assessment, Study, Summit Hills Development, Alpine, Utah, Earthtec Testing & Engineering, P.C. Job No. 051709, September 20, 2005

³ Retaining Wall Recommendations Proposed Lakeview Drive, Summit Hill (Vista Meadows), Alpine, Utah, Earthtec Testing & Engineering, P.C. Job No. 051709, April 19, 2006

⁴ Supplemental Wall Recommendations, Proposed Lakeview Drive, Vista Meadows, Alpine, Utah, Earthtec Testing & Engineering, P.C. Job No. 051709, February 5, 2007

⁵ Additional Field Exploration, Summit Hills Development, Alpine, Utah, Earthtec Testing & Engineering, P.C. Job No. 051709, November 29, 2005

⁶ Response to UGS Review, Summit Hills Development, Alpine, Utah, Earthtec Testing & Engineering, P.C. Job No. 051709, October 17, 2005

⁷ Additional Information, Stability of Slope Below Lot 16, Summit Hills Development, Alpine, Utah, Earthtec Testing & Engineering, P.C. Job No. 051709, January 26, 2006

⁸ Response to Review, Proposed Lakeview Drive, Summit Hills (Vista Meadows), Alpine, Utah, Earthtec Testing & Engineering, P.C. Job No. 051709, October 3, 2006

⁹ Response to 2nd TGE Review, Proposed Lakeview Drive, Summit Hills (Vista Meadows), Alpine, Utah, Earthtec Testing & Engineering, P.C. Job No. 051709, November 3, 2006

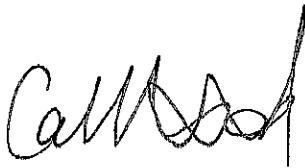
project. A 2H:1V slope is acceptable provided all of the recommendations are completely followed.

The information presented in this letter applies only to the information that is included in the referenced reports and letters. The update presented in this letter was conducted within the limits prescribed by our client, with the usual thoroughness and competence of the engineering profession in the area. No warranty or representation is intended in our proposals, contracts, reports, or letters.

We appreciate the opportunity of providing our services on this project. If we can answer questions or be of further service, please contact us at (801) 225-5711.

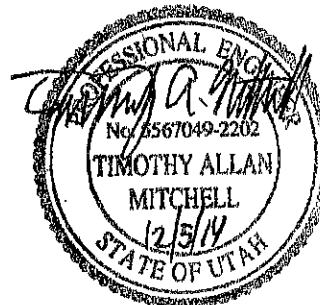
Respectfully;

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GEOTECHNICAL STUDY SUMMIT HILLS DEVELOPMENT & LAKEVIEW DRIVE EXTENSION ALPINE, UTAH

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August 18, 2005

Earthtec

Professional Engineering Services ~ Geotechnical Engineering ~ Drilling Services ~ Construction Materials Inspection / Testing ~ Non-Destructive Examination ~ Failure Analysis
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TABLE OF CONTENTS

Page No.

1.0	INTRODUCTION	1
2.0	CONCLUSIONS	1
3.0	PROPOSED CONSTRUCTION	2
4.0	GENERAL SITE DESCRIPTION	2
5.0	SUBSURFACE EXPLORATION	3
6.0	LABORATORY TESTING	4
7.0	SUBSURFACE CONDITIONS	4
7.1	<u>Soil Types</u>	4
7.2	<u>Groundwater Conditions</u>	5
8.0	SITE GRADING	5
8.1	<u>General Site Grading</u>	5
8.2	<u>Fill Material</u>	6
8.3	<u>Fill Placement and Compaction</u>	7
8.4	<u>Temporary Excavations</u>	7
8.5	<u>Permanent Slopes</u>	8
9.0	SEISMIC CONSIDERATIONS	10
9.1	<u>Faulting</u>	10
9.2	<u>Liquefaction Potential</u>	10
9.3	<u>IRC Seismic Design Category</u>	10
10.0	FOUNDATIONS	11
10.1	<u>General</u>	11
10.2	<u>Estimated Settlement</u>	12
11.0	FLOOR SLABS	12
12.0	SUBSURFACE DRAINAGE	13
13.0	MOISTURE CONTROL AND SURFACE DRAINAGE	13
14.0	PAVEMENT DESIGN	14
15.0	GENERAL CONDITIONS	15

FIGURES

- 1 VICINITY MAP
- 2 SITE PLAN AND LOCATION OF TEST HOLES & PITS
- 3-4 TEST HOLE LOG
- 5-8 TEST PIT LOG
- 9 KEY TO SYMBOLS
- 10-11 CONSOLIDATION-SWELL TEST
- 12-13 STABILITY RESULTS

TABLES

- 1 LABORATORY TEST RESULTS
- 2 PAVEMENT SECTION DESIGN

1.0 INTRODUCTION

This report presents the results of a geotechnical study for a proposed residential development and the extension of Lakeview Drive in Alpine, Utah. The general location of the site is shown on Figure 1, *Vicinity Map*, at the end of this report.

The purposes of this study were to 1) evaluate the subsurface soil conditions at the site, 2) assess the engineering characteristics of the subsurface soils, and 3) to provide geotechnical recommendations for general site grading and the design and construction of foundations, concrete floor slabs, miscellaneous concrete flatwork, retaining walls, and asphalt pavement sections. The scope of work completed for this study included field reconnaissance, subsurface exploration, field and laboratory soil testing, engineering analysis, and the preparation of this report.

2.0 CONCLUSIONS

The following is a brief summary of our findings and conclusions:

1. The soils encountered in the explorations consisted of approximately 12 inches of topsoil and up to 6 feet of fill, followed by Lean Clay (CL), Sand (SM, SC) and Gravel (GC, GP-GC) layers extending to the maximum depths explored of approximately 9 to 41½ feet below the existing surface.
2. Cut slopes up to 40 feet in height will be stable if constructed at 1.5H:1V slopes or flatter. Fill slopes (including rock walls) will be stable if constructed at 1.5H:1V slopes (overall) or flatter. Fill slopes may be constructed as steep as 1H:1V if geogrid is used to stabilize the slopes. More details regarding grading and slope stability are presented in Section 8.0.
3. We recommend that foundations be constructed entirely on undisturbed, uniform native sand/gravel soils, or entirely on a minimum zone of 18 inches of properly placed and compacted structural fill placed on undisturbed native soil. A maximum bearing capacity of 2,000 psf may be used for design of the footings. More details regarding foundation design can be found in Section 10.0 of this report.

These findings and conclusions should not be relied upon without reading and consulting this report for a more detailed description of the geotechnical evaluation and recommendations contained herein.

3.0 PROPOSED CONSTRUCTION

It is our understanding that the proposed project consists of developing 17 hillside lots and extending Lakeview Drive from the current cul-de-sac to its terminus at Hog Hollow Road. As part of the extension, two cul-de-sacs will be constructed off of the proposed Lakeview Drive. We also understand that at least four rock covered slopes/retaining walls will be located along the proposed streets, with two located near the existing cul-de-sac of Lakeview Drive where fill will be placed so the road can cross an existing ravine, one located near Hog Hollow Road to support proposed cut slopes, and one located along Lots B, 12, and 13 to support proposed cut slopes. We anticipate that the residential structures will be of wood frame construction and estimate that foundation loads will not exceed 3 kips per linear foot for bearing walls and 150 pounds per square foot for floor slabs. If structural loads will be greater our office should be notified so that we may review our recommendations and, if necessary, make modifications.

In addition to the structures described above, we anticipate that utilities will be installed to service the proposed residences, and that exterior concrete flatwork will be placed in the form of curb, gutter, sidewalks, and driveways.

4.0 GENERAL SITE DESCRIPTION

At the time of our field exploration, the site consisted of hilly terrain vegetated with sagebrush, grass, and weeds. Some grading (cutting and filling) had already begun at the site. The terrain ranges from slightly to steeply sloping, with existing slopes as steep as 1.5H:1V (Horizontal: Vertical). The site is bounded on the north and west by undeveloped land, on the east by existing residences, and on the south by Hog Hollow Road.

5.0 SUBSURFACE EXPLORATION

Under the direction of a qualified member of our geotechnical staff, subsurface exploration was conducted at the site on July 27, 2005, by excavating 4 test pits to approximate depths of 9 to 10 feet below the existing ground surface using a rubber-tire backhoe. An additional 2 exploratory test holes were drilled at the site on August 10, 2005 to approximate depths of 21½ to 41½ feet below the existing ground surface using an all-terrain hydraulic drill rig. The approximate locations of the test holes and test pits are shown on Figure 2 at the end of this report. Graphical representations and detailed descriptions of the soils encountered are shown on Figures 3 through 8, *Test Hole Log* and *Test Pit Log* at the end of this report. A key to the symbols and terms on the logs is presented on Figure 9, *Key to Symbols*.

The soils exposed in the test pits were classified by visual examination using the guidelines of the Unified Soil Classification System (USCS). Disturbed bag samples and relatively undisturbed block samples of the native soils were collected at various depths in the test pits.

Samples of the subsurface soils below the drill augers were collected at 2½ to 5 foot intervals through the augers. Disturbed samples were collected with a 1⅜ inch inside diameter split spoon sampler. The split spoon sampler was driven 18 inches into undisturbed soil with a 140 pound hammer free-falling through a distance of 30 inches. The blows required to drive the sampler through the final 12 inches of penetration is called the blow count and is recorded on the attached test hole logs at the respective sample depths. However, when 50 blows were achieved for any 6-inch drive increment, sampling was terminated and the number of blows per 6 inch increment were recorded.

The collected samples were classified by visual examination in the field following the guidelines of the Unified Soil Classification System (USCS). The samples were transported to our Orem, Utah laboratory where they will be retained for 30 days following the date of this

report and then discarded, unless a written request for additional holding time is received prior to the 30 day limit.

6.0 LABORATORY TESTING

Selected soil samples were tested in the laboratory to assess pertinent engineering properties and to aid in refining field classifications, if needed. Laboratory testing consisted of natural moisture content and dry density tests, one-dimensional consolidation tests, Atterberg limits determinations, and mechanical gradation tests. The following table summarizes the results of the laboratory testing. Test results are also given on the enclosed test pit logs at the respective sample depths, and on Figures 10 and 11, *Consolidation-Swell Test*, at the end of this report.

Table 1: Laboratory Test Results

TEST PIT NO.	DEPTH (ft.)	NATURAL MOISTURE (%)	NATURAL DRY DENSITY (pcf)	ATTERBERG LIMITS		GRAIN SIZE DISTRIBUTION (%)			SOIL TYPE
				LIQUID LIMIT	PLASTICITY INDEX	GRAVEL #4	SAND	SILT/ CLAY #200	
TP-1	3	8	---	32	15	75	12	13	GC
TP-2	7	16	---	38	23	17	34	49	SC
TP-3	4½	16	88	44	26	---	---	---	CL
TP-3	7½	20	100	37	18	---	---	---	CL
TP-4	8	7	---	26	9	36	51	13	SC

7.0 SUBSURFACE CONDITIONS

7.1 Soil Types

The surface of the site was covered with clayey topsoil and/or fill. We estimated the topsoil to extend approximately 12 inches in depth, and the fill to extend as deep as 6 feet in TP-2, at the exploration locations. Underlying the topsoil and fill, we encountered layers of Lean CLAY (CL), Silty to Clayey SAND (SM to SC) with varying amounts of gravel, Clayey GRAVEL with

sand (GC), and Poorly Graded GRAVEL with clay and sand (GP-GC), extending to the maximum depths explored of about 9 to 41½ feet below the existing surface.

Graphical representations and detailed descriptions of the soils encountered are shown on Figures 3 through 8, *Test Hole Log* and *Test Pit Log* at the end of this report. The stratification lines shown on the logs represent the approximate boundary between soil units, the actual transition may be gradual. Due to potential natural variations inherent in soil deposits, care should be taken in interpolating between and extrapolating beyond exploration points. A key to the symbols and terms on the logs is presented on Figure No. 9, *Key to Symbols*.

7.2 Groundwater Conditions

Groundwater was not encountered in the test holes or test pits at the time of our field explorations. Groundwater levels will fluctuate in response to the season, precipitation and snow melt, irrigation, and other on and off-site influences. Precisely quantifying these fluctuations would require long term monitoring which is beyond the scope of this investigation.

8.0 SITE GRADING

8.1 General Site Grading

Unsuitable soils and vegetation should be removed from below areas which will ultimately support structural loads. These areas include those below foundations, floor slabs, exterior concrete flatwork, retaining walls, and pavements. Unsuitable soils consist of topsoil, organic soils, undocumented fill, soft, loose, or disturbed native soils, and any other inapt materials. The topsoil was estimated to extend approximately 12 inches in depth, and fill (which we believe is undocumented) was encountered in TP-2 to a depth of about 6 feet. The topsoil and fill, even if found to extend deeper, along with any other disturbed or unsuitable soils, should be completely removed in the areas described above.

For hillside grading, it is very important that fill not be placed on any slopes steeper than about 5H:1V. Prior to placing fill on steeper slopes, the hillside beneath the fill footprint should be benched and keyed. The benches should be relatively level and not exceed a vertical height of 4 feet from one bench to the next. A minimum 3-foot deep and 10-foot wide key (bottom bench) should be cut into the native soils to help support the fill that will be placed. Through-drainage should be adequately sized and properly placed to ensure the fill does not become saturated from water flowing through underlying ravines.

The native sand/gravel soils may meet our recommendations for structural fill and could thus be used as such. The native clay soils will not meet those recommendations and should not be used as structural fill. Excavated soils may be stockpiled for use as fill in landscape areas.

8.2 Fill Material

Structural fill should consist of imported material meeting the following requirements:

Maximum particle size:	4 inches
Percent retained on the 3/4 inch sieve (coarse gravel):	30 maximum
Percent passing the No. 200 sieve (fines):	15 maximum
Liquid Limit of fines:	35 maximum
Plasticity Index of fines:	15 maximum

In some situations, particles larger than 4 inches and/or more than 30 percent coarse gravel may be acceptable, however, compaction and compaction testing may be more difficult. As a result more strict quality controls measures than normally used may be required. Such measures may include using thinner lifts, and increased or full time observation of fill placement.

Utility trenches may be backfilled with the native soil or structural fill. If native soil that is predominantly fine grained (clay or silt) is used, it may be difficult and time consuming to adjust the moisture content and obtain the required compaction. All backfill soil should meet the following requirements:

Maximum particle size:	4 inches
Liquid Limit of fines:	35 maximum
Plasticity Index of fines:	15 maximum

8.3 Fill Placement and Compaction

The thickness of each lift should be appropriate for the compaction equipment that is used. We recommend a maximum lift thickness of 4 inches for hand operated equipment, 6 inches for most "trench compactors", and 8 inches for larger rollers, unless it can be demonstrated by in-place density tests that the required compaction can be obtained throughout a thicker lift. The full thickness of each lift of structural fill placed should be compacted to at least the following percentages of the maximum dry density, as determined by ASTM D-1557:

In landscape areas not supporting structural loads:	90%
Less than 5 feet of fill below foundations, flatwork and pavements:	95%
5 or more feet of fill below foundations, flatwork and pavements:	98%

Generally, placing and compacting fill at a moisture content within 2% of the optimum moisture content, as determined by ASTM D-1557, will facilitate compaction. Typically, the further the moisture content is from optimum the more difficult it will be to achieve the required compaction.

We recommend that fill be tested frequently during placement. Early testing is recommended to demonstrate that placement and compaction methods are achieving the required compaction. It is the contractor's responsibility to ensure that fill materials and compaction efforts are consistent so that tested areas are representative of the entire fill.

8.4 Temporary Excavations

For temporary excavations less than 5 feet in depth into the native soils or into structural fill, slopes should not be made steeper than 0.5H:1V. Temporary excavations extending up to 10

feet in depth should not be made steeper than 1H:1V. If unstable conditions or groundwater seepage are encountered, flatter slopes or shoring or bracing may be required.

8.5 Permanent Slopes

Several steep slopes are currently planned as fills to either support Lakeview Drive or as hillside cuts to construct Lakeview Drive. We understand the planned fill slopes will be as high as 50 feet, which will fill in the ravine that the road will cross just west of the current cul-de-sac, and maximum cut heights will be approximately 40 feet. Fill slopes as steep as 1H:1V and cut slopes as steep as 2.5H:1V are planned.

Our engineering analyses of the project included evaluating the stability of the proposed walls. For our analyses, we assigned strength parameters to the native silty sand soils based on published values for, and our experience with, similar soil types. The Bureau of Reclamation¹ has performed large direct shear testing and indicated that compacted clayey gravel soils have an internal friction angle greater than 31°, and clayey sand soils have an internal friction angle of 28° to 34° and a saturated cohesion of 120 to 360 psf. Accordingly, we estimated the following parameters for use in the stability analyses:

Material	Internal Friction Angle (degrees)	Apparent Cohesion (psf)	Saturated Unit Weight (pcf)
Clayey Sand/Gravel	36	150	130
Rock Boulders	45	0	145

We also presumed that no phreatic surface would form behind the walls because of the sandy nature of the native soils. For the seismic evaluation, expected ground motions at the site for site (grid) locations of 40.464° north latitude and -111.794° west longitude were determined by

¹U.S. Bureau of Reclamation, 1987, "Design Standards No. 13, Embankment Dams," Denver, Colorado.

querying the USGS website, which resulted in a value of 0.22g for a 10% probability of exceedance in 50 years. For seismic conditions, this peak acceleration value was used as the psuedostatic coefficient (0.22).

Using these input parameters, we evaluated the global stability of the wall using the computer program PCSTBL6. This program uses a limit equilibrium (Bishop's modified) method for calculating factors of safety against sliding on an assumed failure surface and evaluates numerous potential failure surfaces, with the most critical failure surface identified as the one yielding the lowest factor of safety of those evaluated.

The fill configuration we analyzed consisted of several rock tiers, each approximately 10 feet high, with the overall slope (toe to top) at about 1H:1V. The typical minimum factors of safety (FS) are 1.5 for static conditions and 1.1 for seismic (psuedostatic) conditions. In order to achieve these values, geogrid such as Tensar BX1200 or equivalent will be required for fill slopes steeper than 1.5H:1V. The geogrid layers need to be spaced vertically about 2 feet and extend back behind the wall/slope face a minimum distance equivalent to 70% of the overall slope height. Fill slopes placed at 1.5H:1V or flatter will be stable up to about 50 to 60 feet in height. Note that our analyses assumes the on-site clayey gravel with sand soils will be used to construct the fill embankments.

The cut configuration analyzed consisted of a 40-foot high 1.5H:1V cut slope. Our analyses indicate that this cut configuration provides adequate factors of safety as discussed above. The slope stability results are attached as Figures 12 through 15.

9.0 SEISMIC CONSIDERATIONS

9.1 Faulting

No surficial evidence of faulting across the site was observed during our field reconnaissance. A map produced by Utah County² indicates that the nearest fault trace is the Wasatch Fault, which is located approximately 1½ miles northeast of the site.

9.2 Liquefaction Potential

The site is located in an area mapped by the Utah Geological Survey³ as having very low liquefaction potential. Liquefaction is a phenomenon where a soil loses intergranular strength due to an increase in soil pore water pressures during a dynamic event such as an earthquake. The potential for liquefaction is based on several factors, including 1) the grain size distribution of the soil, 2) the plasticity of the fine fraction of the soil (material passing the No. 200 sieve), 3) relative density of the soil, 4) earthquake strength (magnitude) and duration, and 5) overburden pressures. In addition, the soils must be saturated for liquefaction to occur. As a part of this investigation, the potential for liquefaction to occur in the soils we observed was assessed

Loose, saturated sands are most susceptible to liquefaction, but soft, sensitive silt soils also have the potential to experience failure and movement during a seismic event. The relatively dense and unsaturated soil conditions encountered during our field exploration support a low liquefaction potential designation.

9.3 IRC Seismic Design Category

The Seismic Design Categories in the International Residential Code (IRC) are based upon the short period design accelerations determined using the seismic provisions of the International

²Natural Hazards Overlay Series, Faults/Liquefaction, Urban Corridor, Utah County Government, 2001.

³Liquefaction Potential Map, Utah Geological Survey, Public Information Series 28. 1994.

Building Code (IBC) and the soil properties in the upper 100 feet of the soil profile. These properties are determined from SPT blow counts and undrained shear strength measurements. The IBC code also states that "Where site specific data are not available to a depth of 100 feet, appropriate soil properties may be estimated by the registered design professional preparing the soils report...." We estimate that the soils encountered in the test holes and test pits are best defined using Site Class C.

The site is located at the grid coordinates given above in Section 8.5, which results in $S_D = 1.60$. For Site Class C, $F_a = 1.0$ and $S_{DS} = 1.07$. The Seismic Design Category is D_2 .

10.0 FOUNDATIONS

10.1 General

The foundation recommendations presented in this report are based on the soil conditions encountered at the site, the results of laboratory testing of the native soils, the site grading recommendations presented in this report, and the foundation loading conditions presented in Section 3.0, *Proposed Construction*, of this report. If loading conditions are significantly different, we should be notified in order to re-evaluate our design parameters and estimates, and to provide additional recommendations if necessary.

Foundations should not be installed on topsoil, undocumented fill, debris, combination soils, frozen soil, or in ponded water. If foundation soils become disturbed during construction they should be proof rolled to provide a firm surface for footing construction or fill placement. We recommend that foundations be constructed entirely on undisturbed, uniform native sand/gravel soils, or entirely on a minimum of 18 inches of properly placed and compacted structural fill placed on undisturbed native soils. Note that footings placed on more than 5 feet of fill should be strictly controlled during placement (as described above in Section 8.3) to minimize potential settlements. For design of conventional strip and spread footings, the following parameters are recommended:

Minimum embedment for frost protection:	30 inches
Minimum strip footing width:	20 inches
Minimum spot footing width:	30 inches
Maximum allowable net bearing pressure:	2,000 psf
Bearing pressure increase for transient loading:	33 percent

Structural fill used below foundations should extend laterally a minimum of 6 inches for every 12 vertical inches of structural fill placed. For example, if 18 inches of structural fill are required to bring the excavation to footing grade, the structural fill should extend laterally a minimum of 9 inches beyond the edge of the footings.

10.2 Estimated Settlement

If the proposed foundations are properly designed and constructed using the parameters provided above, total settlement for non-earthquake conditions is estimated not to exceed one inch. Differential settlement is anticipated to be one-half of the total settlement over a 25-foot length of foundation. Note that placing more than about 5 feet of fill above the existing ground surface could also result in additional settlements if fill is not strictly controlled during placement and compaction. Additional settlement could occur due to shaking during a seismic event.

11.0 FLOOR SLABS

To facilitate construction, act as a capillary break, and aid in distributing floor loads we recommend that all at-grade slabs and exterior flatwork be underlain by four inches of free-draining granular material such as "pea" gravel or three-quarters to one-inch minus clean gravel supported on re-compacted native soils or structural fill.

To help control normal shrinkage and stress cracking the floor slabs should have the following features:

1. Adequate reinforcement for the anticipated floor loads with the reinforcement continuous through interior floor joints;
2. Frequent crack control joints; and
3. Non-rigid attachment of the slabs to foundation and bearing walls.

Special precautions should be taken during placement and curing of all concrete slabs and flatwork. Excessive slump (high water-cement ratios) of the concrete and/or improper finishing and curing procedures used during hot or cold weather conditions may lead to excessive shrinkage, cracking, spalling, or curling of slabs. We recommend all concrete placement and curing operations be performed in accordance with American Concrete Institute (ACI) codes and practices.

12.0 SUBSURFACE DRAINAGE

According to Section R405 of the 2003 International Residential Code, "Drains shall be provided around all concrete or masonry foundations that retain earth and enclose habitable or usable spaces located below grade." An exception is allowed when the foundation is installed on well drained ground consisting of Group 1 soils. These soils include those defined by the Unified Soil Classification System as GW, GP, SW, SP, GM, and SM. Some of the sand (SM) layers encountered in the test holes/pits are Group I soils, but other sand (SC), gravel (GC) and clay (CL) soils are not. If floor slabs will be placed at any depth below the existing surface, we recommend that foundation drains be installed.

13.0 MOISTURE CONTROL AND SURFACE DRAINAGE

Precautions should be taken during and after construction to reduce the potential for saturation of foundation soils. We recommend that the following precautions be taken at this site:

1. Adequate compaction of foundation backfill should be provided i.e. a minimum of 90% of ASTM D-1557. **Water consolidation methods should not be used.**

2. The ground surface should be graded to drain away from the residences in all directions. We recommend a minimum fall of 6 inches in the first 10 feet.
3. Roof runoff should be collected in rain gutters with down spouts designed to discharge well outside of the backfill limits, or at least 10 feet from structures, whichever is greater.
4. Sprinklers should be aimed away from foundation walls. Sprinkler systems should be well maintained, checked for leaks frequently, and repaired promptly.
5. Any additional precautions which may become evident during construction.

14.0 PAVEMENT DESIGN

We understand that the proposed streets within the development will consist of asphalt pavement. We have based our design on clayey sand/gravel soil layers which will support the pavement sections on many of the cut areas throughout the site. We estimate that a California Bearing Ratio (CBR) value of 10 is appropriate for these soils.

We have prepared a pavement section design based on this assumed CBR value, an assumed traffic volume of 200 vehicles a day (consisting mostly of cars and pickup trucks, some delivery trucks, a daily school bus, and a weekly garbage truck), a design life of 20 years, and the site grading recommendations presented in this report. Based on these parameters and the procedures outlined in the AASHTO Guide for Design of Pavement Structures (1993), we recommend the minimum asphalt pavement section presented in the table below.

Table 2: Pavement Section Design

ASPHALT THICKNESS (in)	COMPACTED ROADBASE THICKNESS (in)	COMPACTED SUBBASE THICKNESS (in)
3.0	8.0	0.0

This pavement section is not intended to support construction traffic, or heavy trucks. All base material and asphalt should conform to local requirements regarding thickness, gradation, oil content, and any other requirements pertaining to the project. We recommend that all roadbase and subbase be properly processed, moisture conditioned, and compacted to a minimum of 95% of the maximum dry density as determined by ASTM D1557. All asphalt should be compacted to a minimum of 95% of the laboratory Marshal mix design density.

15.0 GENERAL CONDITIONS

The exploratory data presented in this report was collected to provide geotechnical design recommendations for this project. The test holes and test pits may not be indicative of subsurface conditions outside the study area or between points explored and thus have a limited value in depicting subsurface conditions for contractor bidding. Variations from the conditions portrayed in the test holes/pits may occur and which may be sufficient to require modifications in the design. If during construction, conditions are different than presented in this report, please advise us so that the appropriate modifications can be made.

The geotechnical study as presented in this report was conducted within the limits prescribed by our client, with the usual thoroughness and competence of the engineering profession in the area. No other warranty or representation, either expressed or implied, is intended in our proposals, contracts or reports.

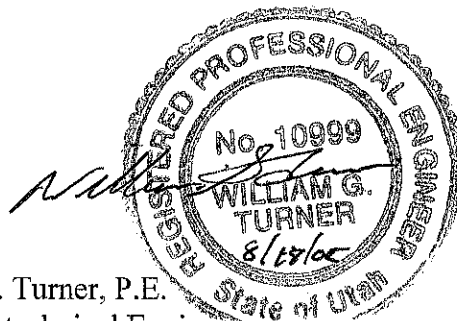
Geotechnical Study
Summit Hills & Lakeview Dr. Extension
Alpine, Utah

Page 16

We appreciate the opportunity of providing our services on this project. If we can answer questions or be of further service, please call.

Respectfully;

EARTHTEC TESTING AND ENGINEERING, P.C.



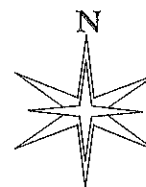
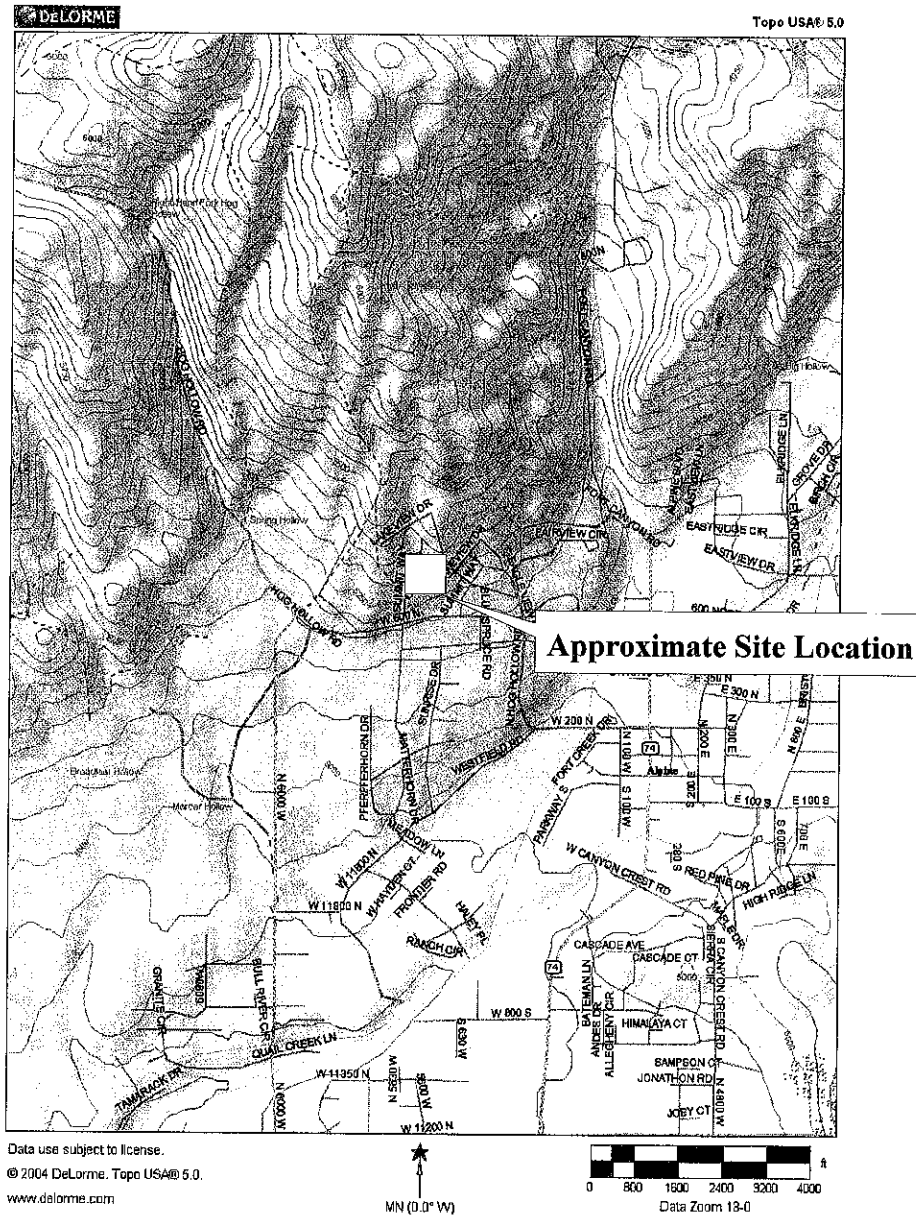
William G. Turner, P.E.
Senior Geotechnical Engineer

A handwritten signature in black ink, appearing to read "JEFFREY J. EGBERT".

Jeffrey J. Egbert, P.E.
Project Engineer

VICINITY MAP

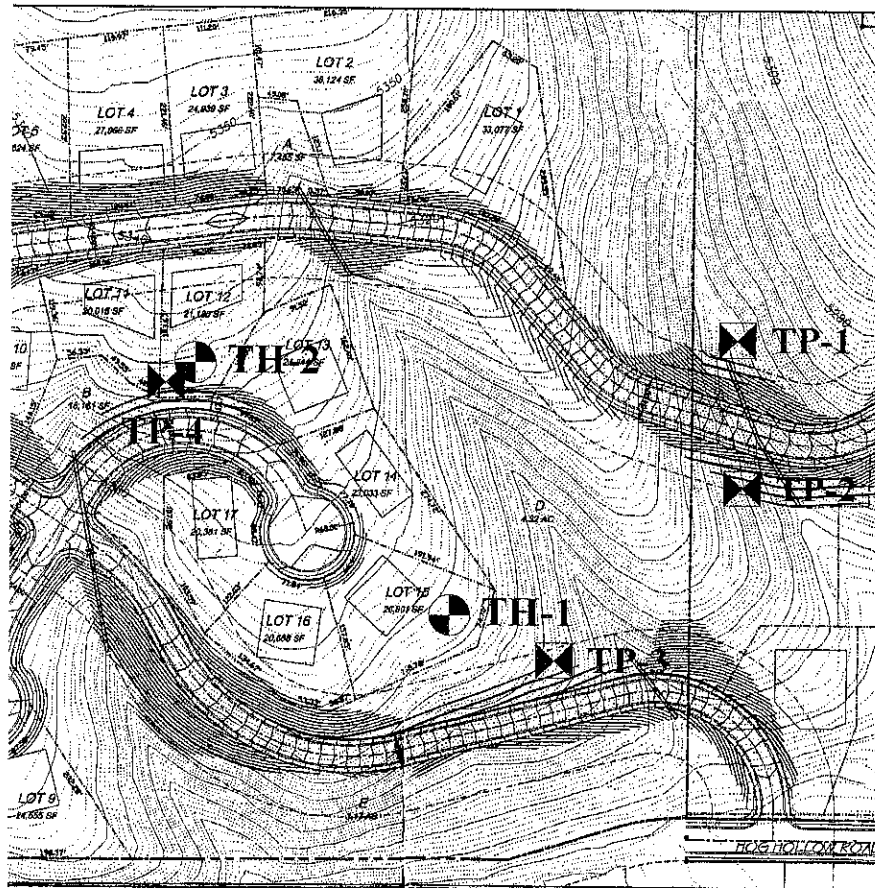
SUMMIT HILLS DEVELOPMENT



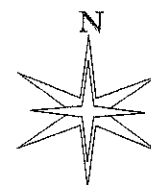
Not to Scale

SITE PLAN & LOCATION OF TEST HOLES AND PITS

SUMMIT HILLS DEVELOPMENT



- ☒ Approximate Test Pit Location
- ⊗ Approximate Test Hole Location



Not to Scale

PROJECT NO.: 051709

Earthtec
Testing and Engineering, P.C.

FIGURE NO.: 2

TEST HOLE LOG

NO.: TH-1

PROJECT: Summit Hills Development
CLIENT: Taylor Smith c/o Sowby & Berg Consultants
LOCATION: See Figure 2
OPERATOR: Raycon
EQUIPMENT: D120 ATV
DEPTH TO WATER; INITIAL ∇ :

PROJECT NO.: 051709
DATE: 08/10/05
ELEVATION: Not Measured
LOGGED BY: S.G.

AT COMPLETION ∇ :

AT COMPLETION 1													
Depth (Ft.)	Graphic Log	USCS	Description	Samples	TEST RESULTS								
					Blows per foot	Dry Dens. (pcf)	Water Cont. (%)	PI	LL	Gravel (%)	Sand (%)	Fines (%)	Other Tests
0			TOPSOIL: Clay, some gravel, trace of sand, roots and organics, moist, brown.										
3		SC	Clayey SAND with gravel: Medium dense, moist, light brown.		28								
6		SM	Silty SAND with gravel: Dense, moist, light brown.		42								
9					37								
12					32								
15													
18		GC	Clayey GRAVEL with sand: Some clay lenses, dense to very dense, moist, brown.		48								
21					31								
24													
27					52								
30													

Notes: No groundwater encountered.

Tests Key

CBR = California Bearing Ratio
 C = Consolidation
 R = Resistivity
 DS = Direct Shear
 SS = Soluble Sulfates
 UC = Unconfined Compressive Strength

PROJECT NO.: 051709



FIGURE NO.: 3a

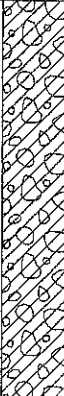
TEST HOLE LOG

NO.: TH-1

PROJECT: Summit Hills Development
CLIENT: Taylor Smith c/o Sowby & Berg Consultants
LOCATION: See Figure 2
OPERATOR: Raycon
EQUIPMENT: D120 ATV
DEPTH TO WATER; INITIAL ∇ :

PROJECT NO.: 051709
DATE: 08/10/05
ELEVATION: Not Measured
LOGGED BY: S.G.

AT COMPLETION ∇ :

Depth (Ft.)	Graphic Log	USCS	Description	Samples	TEST RESULTS								
					Blows per foot	Dry Dens. (pcf)	Water Cont. (%)	PI	LL	Gravel (%)	Sand (%)	Fines (%)	Other Tests
30		GC	Clayey GRAVEL with sand (continued) - reddish brown.		47								
33													
36			- Light brown below 35 feet.		77								
39													
42			Bottom at 40¼ feet.		50/2"								
45													
48													
51													
54													
57													
60													

Notes: No groundwater encountered.

Tests Key

CBR = California Bearing Ratio
 C = Consolidation
 R = Resistivity
 DS = Direct Shear
 SS = Soluble Sulfates
 UC = Unconfined Compressive Strength

PROJECT NO.: 051709



FIGURE NO.: 3b

TEST HOLE LOG

NO.: TH-2

PROJECT: Summit Hills Development
CLIENT: Taylor Smith c/o Sowby & Berg Consultants
LOCATION: See Figure 2
OPERATOR: Raycon
EQUIPMENT: D120 ATV
DEPTH TO WATER; INITIAL ∇ :

PROJECT NO.: 051709
DATE: 08/10/05
ELEVATION: Not Measured
LOGGED BY: S.G.

AT COMPLETION ∇ :

Depth (Ft.) 0	Graphic Log	USCS	Description	Samples	TEST RESULTS								
					Blows per foot	Dry Dens. (pcf)	Water Cont. (%)	PI	LL	Gravel (%)	Sand (%)	Fines (%)	Other Tests
			TOPSOIL: Clay, some gravel and sand, roots and organics, moist, brown.										
3		GP-GC	Poorly Graded GRAVEL with clay and sand: Dense to very dense, moist, light brown.		8 50/6"								
6						44							
9						53							
12						46							
15		GC	Clayey GRAVEL with sand: Very dense, moist, light brown.		9 29 50/6"								
18													
21						58							
			Bottom at 21½ feet.										
24													
27													
30													

Notes: No groundwater encountered.

Tests Key

CBR = California Bearing Ratio
C = Consolidation
R = Resistivity
DS = Direct Shear
SS = Soluble Sulfates
UC = Unconfined Compressive Strength

PROJECT NO.: 051709



FIGURE NO.: 4

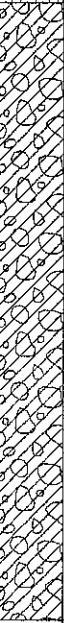
TEST PIT LOG

NO.: TP-1

PROJECT: Summit Hills Development
CLIENT: Taylor Smith c/o Sowby & Berg Consultants
LOCATION: See Figure 2
OPERATOR: Halls Excavating
EQUIPMENT: Rubber-tire backhoe
DEPTH TO WATER; INITIAL ∇ :

PROJECT NO.: 051709
DATE: 07/27/05
ELEVATION: Not Measured
LOGGED BY: J.E.

AT COMPLETION ∇ :

Depth (Ft.)	Graphic Log	USCS	Description	Samples	TEST RESULTS							
					Dry Dens. (pcf)	Water Cont. (%)	PI	LL	Gravel (%)	Sand (%)	Fines (%)	Other Tests
0			TOPSOIL: Clay, silt, sandy and gravelly, roots and organics, dark brown.									
1		GC	Clayey GRAVEL: Some sand, trace of cobbles and boulders, a few clay pockets, medium dense to dense, moist, brown.									
2												
3												
4												
5												
6												
7												
8												
9												
10			Bottom at 9 feet.									
11												
12												
13												
14												
15												

Notes: No groundwater encountered.

Tests Key

CBR = California Bearing Ratio
 C = Consolidation
 R = Resistivity
 DS = Direct Shear
 SS = Soluble Sulfates
 UC = Unconfined Compressive Strength

PROJECT NO.: 051709



FIGURE NO.: 5

TEST PIT LOG

NO.: TP-2

PROJECT: Summit Hills Development
CLIENT: Taylor Smith c/o Sowby & Berg Consultants
LOCATION: See Figure 2
OPERATOR: Halls Excavating
EQUIPMENT: Rubber-tire backhoe
DEPTH TO WATER; INITIAL ∇ :

PROJECT NO.: 051709
DATE: 07/27/05
ELEVATION: Not Measured
LOGGED BY: J.E.

AT COMPLETION $\blacktriangledown$:

AT COMPLETION 1:												
Depth (Ft.)	Graphic Log	USCS	Description	Samples	TEST RESULTS							
					Dry Dens. (pcf)	Water Cont. (%)	PI	LL	Gravel (%)	Sand (%)	Fines (%)	Other Tests
0			FILL: Clay, some sand and gravel, organic debris, pieces of wood, moist, red-brown to gray-black.									
1												
2												
3												
4												
5												
6												
7		SC	Clayey SAND with gravel: Medium dense, moist, gray to brown, some roots.									
8				X		16	23	38	17	34	49	
9												
10			Bottom at 9 feet.									
11												
12												
13												
14												
15												

Notes: No groundwater encountered.

Tests Key

CBR = California Bearing Ratio
 C = Consolidation
 R = Resistivity
 DS = Direct Shear
 SS = Soluble Sulfates
 UC = Unconfined Compressive Strength

PROJECT NO.: 051709



FIGURE NO.: 6

TEST PIT LOG

NO.: TP-3

PROJECT: Summit Hills Development
CLIENT: Taylor Smith c/o Sowby & Berg Consultants
LOCATION: See Figure 2
OPERATOR: Halls Excavating
EQUIPMENT: Rubber-tire backhoe
DEPTH TO WATER; INITIAL ∇ :

PROJECT NO.: 051709
DATE: 07/27/05
ELEVATION: Not Measured
LOGGED BY: J.E.

AT COMPLETION ∇ :

AT COMPLETION 1												
Depth (Ft.)	Graphic Log	USCS	Description	Samples	TEST RESULTS							
					Dry Dens. (pcf)	Water Cont. (%)	PI	LL	Gravel (%)	Sand (%)	Fines (%)	Other Tests
0			TOPSOIL: Clay, gravelly, occasional cobbles and boulders at surface, roots and organics, moist, dark brown.									
1		GC	Clayey GRAVEL with sand and cobbles: Medium dense, moist, dark brown, some roots.									
2												
3		CL	Lean CLAY with sand: Stiff, moist, red-brown, minor to moderate pinholes.									
4												
5					88	16	26	44				
6												
7												
8					100	20	18	37				
9												
10												
11			Bottom at 10 feet.									
12												
13												
14												
15												

Notes: No groundwater encountered.

Tests Key

CBR = California Bearing Ratio
 C = Consolidation
 R = Resistivity
 DS = Direct Shear
 SS = Soluble Sulfates
 UC = Unconfined Compressive Strength

PROJECT NO.: 051709



FIGURE NO.: 7

TEST PIT LOG

NO.: TP-4

PROJECT: Summit Hills Development
CLIENT: Taylor Smith c/o Sowby & Berg Consultants
LOCATION: See Figure 2
OPERATOR: Halls Excavating
EQUIPMENT: Rubber-tire backhoe
DEPTH TO WATER; INITIAL ∇ :

PROJECT NO.: 051709
DATE: 07/27/05
ELEVATION: Not Measured
LOGGED BY: J.E.

AT COMPLETION ∇ :

Depth (Ft.)	Graphic Log	USCS	Description	Samples	TEST RESULTS								
					Dry Dens. (pcf)	Water Cont. (%)	PI	LL	Gravel (%)	Sand (%)	Fines (%)	Other Tests	
0													
1			TOPSOIL: Clay, sandy, gravelly, occasional cobbles and boulders at surface, roots and organics, slightly moist, dark brown.										
2		GC	Clayey GRAVEL with sand and cobbles: Dense, moist, red-brown.										
3													
4													
5													
6													
7		SC	Clayey SAND with gravel: Dense, moist, brown.										
8													
9						X	7	9	26	36	51	13	
10					Bottom at 9 feet.								
11													
12													
13													
14													
15													

Notes: No groundwater encountered.

Tests Key

CBR = California Bearing Ratio
 C = Consolidation
 R = Resistivity
 DS = Direct Shear
 SS = Soluble Sulfates
 UC = Unconfined Compressive Strength

PROJECT NO.: 051709



FIGURE NO.: 8

LEGEND

PROJECT: Summit Hills Development

DATE: 07/27/05

CLIENT: Taylor Smith c/o Sowby & Berg Consultants

LOGGED BY: J.E.

UNIFIED SOIL CLASSIFICATION SYSTEM

MAJOR SOIL DIVISIONS **USCS SYMBOL** **TYPICAL SOIL DESCRIPTIONS**

USCS SYMBOLS - TYPICAL SOIL DESCRIPTIONS					
COARSE GRAINED SOILS (More than 50% retaining on No. 200 Sieve)	GRAVELS (More than 50% of coarse fraction retained on No. 4 Sieve)	CLEAN GRAVELS (Less than 5% fines)		GW	Well Graded Gravel, May Contain Sand, Very Little Fines
				GP	Poorly Graded Gravel, May Contain Sand, Very Little Fines
		GRAVELS WITH FINES (More than 12% fines)		GM	Silty Gravel, May Contain Sand
				GC	Clayey Gravel, May Contain Sand
	SANDS (50% or more of coarse fraction passes No. 4 Sieve)	CLEAN SANDS (Less than 5% fines)		SW	Well Graded Sand, May Contain Gravel, Very Little Fines
				SP	Poorly Graded Sand, May Contain Gravel, Very Little Fines
		SANDS WITH FINES (More than 12% fines)		SM	Silty Sand, May Contain Gravel
				SC	Clayey Sand, May Contain Gravel
FINE GRAINED SOILS (More than 50% passing No. 200 Sieve)	SILTS AND CLAYS (Liquid Limit less than 50)			CL	Lean Clay, Inorganic, May Contain Gravel and/or Sand
				ML	Silt, Inorganic, May Contain Gravel and/or Sand
				OL	Organic Silt or Clay, May Contain Gravel and/or Sand
	SILTS AND CLAYS (Liquid Limit Greater than 50)			CH	Fat Clay, Inorganic, May Contain Gravel and/or Sand
				MH	Elastic Silt, Inorganic, May Contain Gravel and/or Sand
				OH	Organic Clay or Silt, May Contain Gravel and/or Sand
HIGHLY ORGANIC SOILS				PT	Peat, Primarily Organic Matter

SAMPLER DESCRIPTIONS

- SPLIT SPOON SAMPLER
(1 3/8 inch inside diameter)
- MODIFIED CALIFORNIA SAMPLER
(2 1/2 inch outside diameter)
- SHELBY TUBE
(3 inch outside diameter)
- BLOCK SAMPLE
- BAG/BULK SAMPLE

WATER SYMBOLS

- Water level encountered during field exploration
- Water level encountered at completion of field exploration

NOTES:

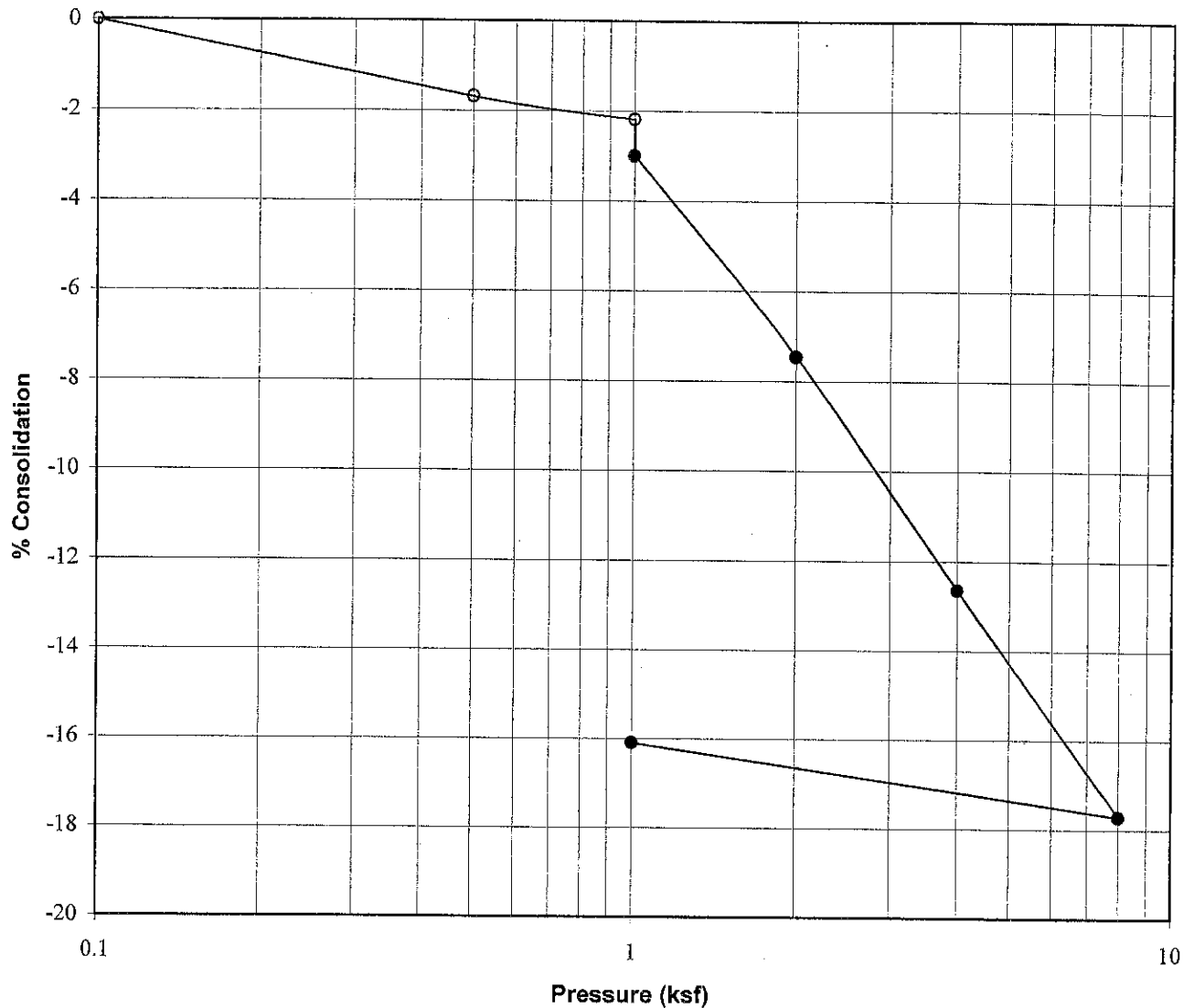
- The logs are subject to the limitations, conclusions, and recommendations in this report.
- Results of tests conducted on samples recovered are reported on the logs and any applicable graphs.
- Strata lines on the logs represent approximate boundaries only. Actual transitions may be gradual.
- In general, USCS symbols shown on the logs are based on visual methods only: actual designations (based on laboratory tests) may vary.

PROJECT NO.: 051709



FIGURE NO.: 9

CONSOLIDATION - SWELL TEST



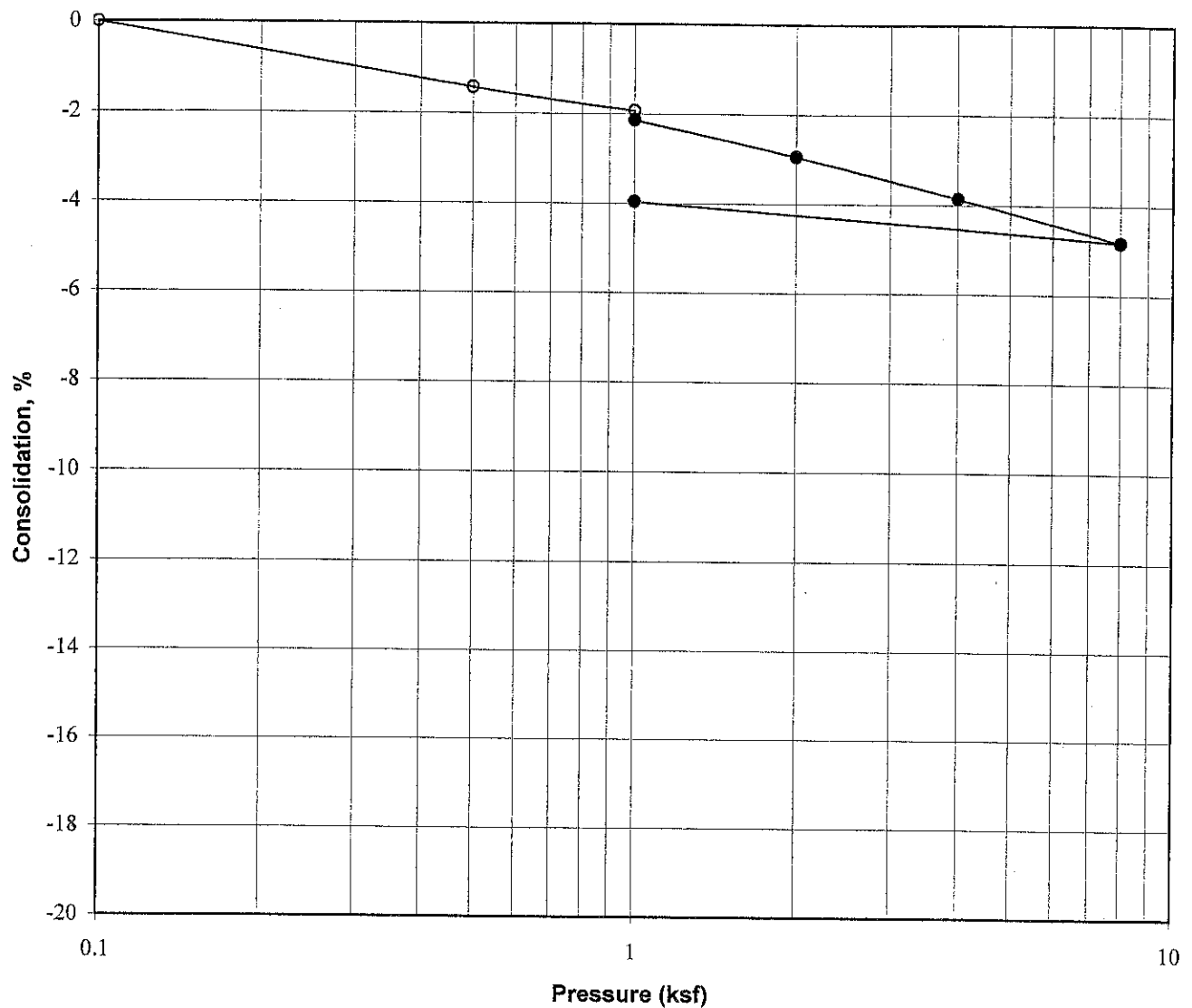
Project: Lakeview Drive Walls
Location: TP-3
Sample Depth: 4½
Description: Block
Soil Type: LEAN CLAY (CL)
Dry Density, pcf: 88
Natural Moisture, %: 16
Liquid Limit: 44
Plasticity Index: 26
Water Added at: 1 ksf
Percent Collapse: 0.8
 (Sample slightly disturbed due to removal of small gravel particles)

PROJECT NO.: 051709



FIGURE NO.: 10

CONSOLIDATION - SWELL TEST



Project:	Lakeview Drive Walls
Location:	TP-3
Sample Depth:	7½
Description:	Block
Soil Type:	LEAN CLAY (CL)
Dry Density, pcf:	100
Natural Moisture, %:	20
Liquid Limit:	37
Plasticity Index:	18
Water Added at:	1 ksf
Percent Collapse:	0.2

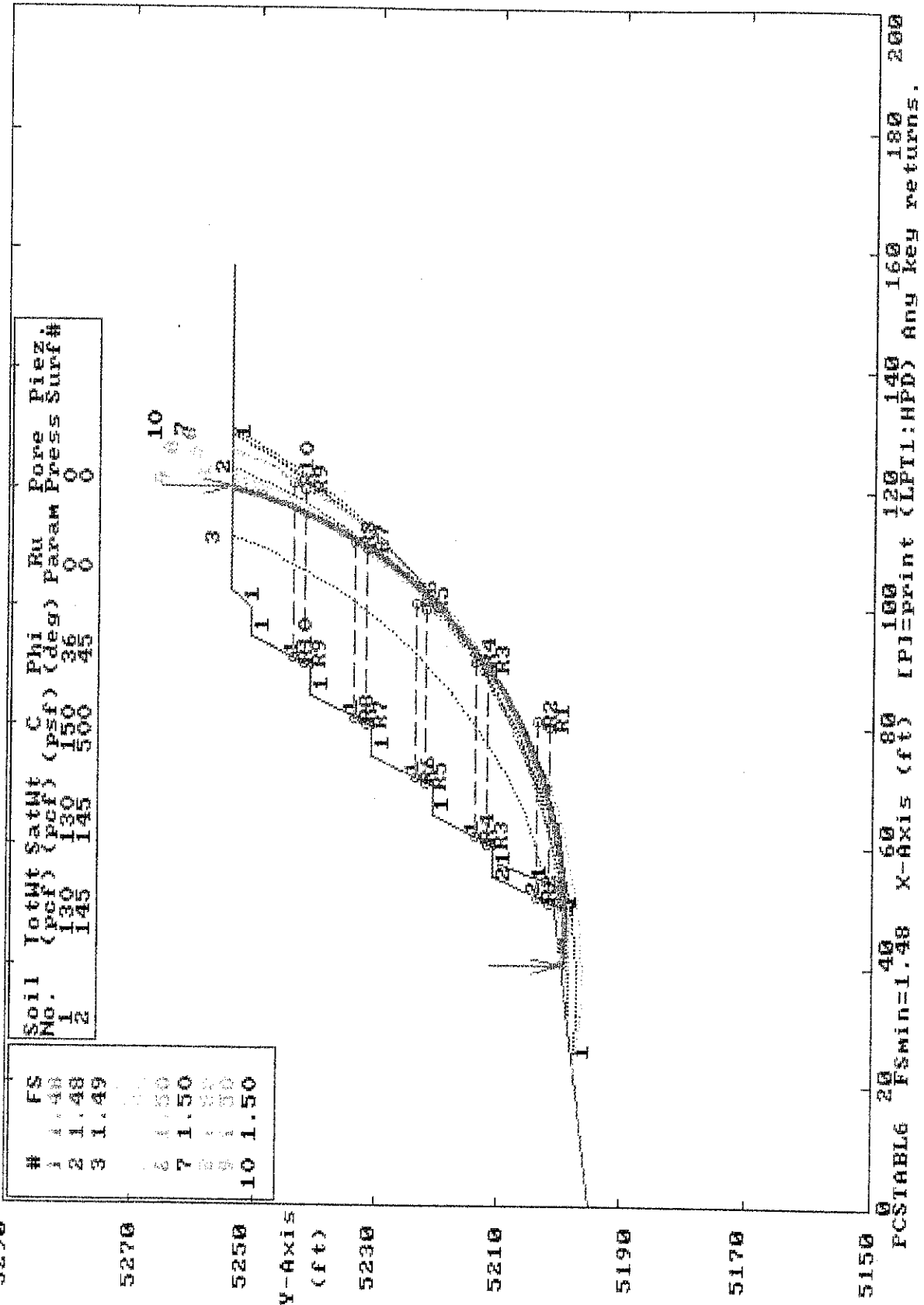
PROJECT NO.: 051709



FIGURE NO.: 11

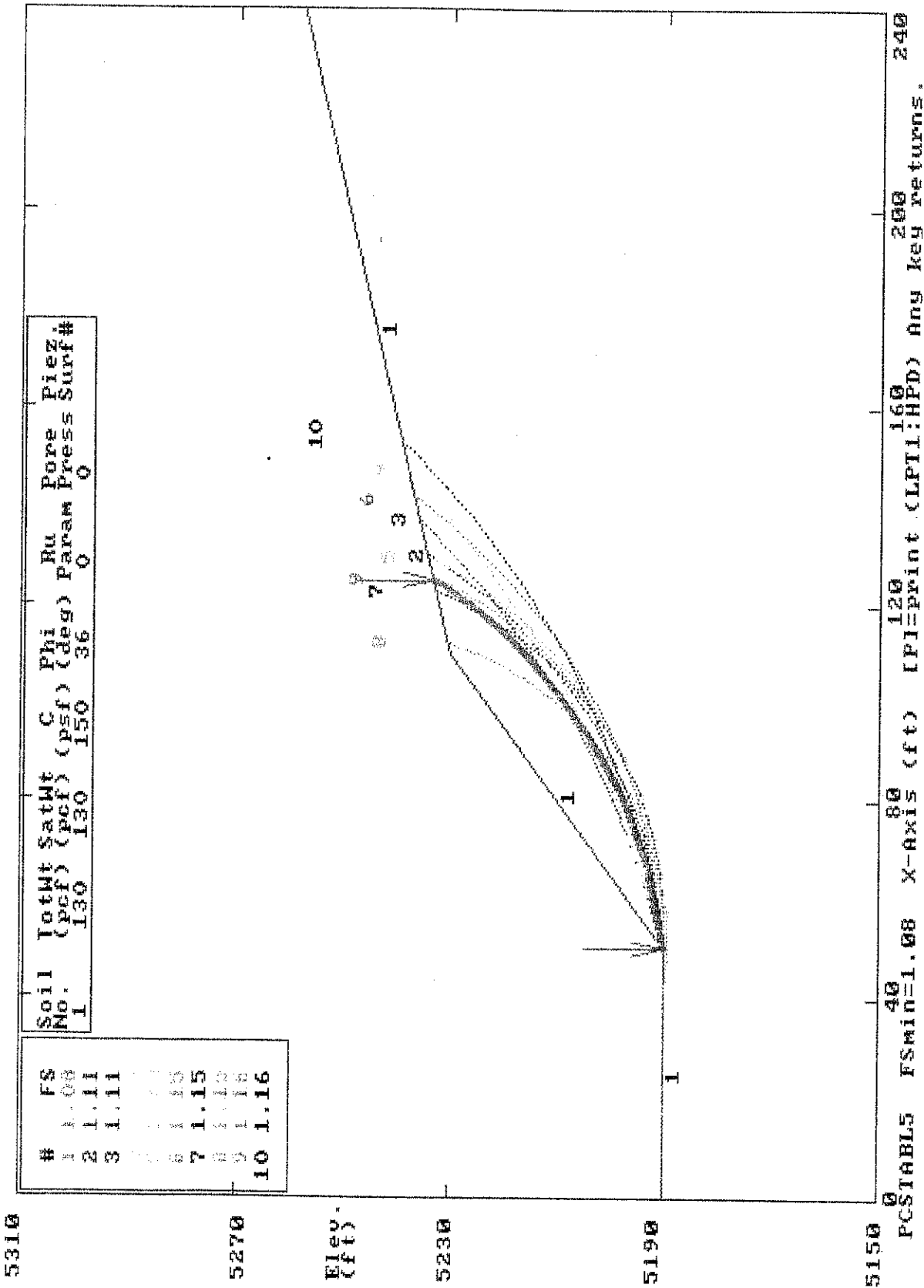
STABILITY RESULTS

Ten Most Critical. Lakeview Drive - Fill Slope 08-18-05 2:18PM
C:\051709A.PLT By: MCTurner



STABILITY RESULTS

Ten Most Critical: C:\051709BS.PLT By: WGTurner 08-18-05 2:41pm Lakeview Drive - Cut Slope Stability (Seismic)





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GEOLOGICAL HAZARDS ASSESSMENT SUMMIT HILLS DEVELOPMENT ALPINE, UTAH

Prepared By:



133 North 1330 West
Orem, Utah 84057

(801) 225-5711

Job No. 051709

Prepared for:

Mr. Taylor Smith
c/o Sowby & Berg Consultants
45 North 490 West
American Fork, UT 84003

September 20, 2005

Earthtec

Professional Engineering Services ~ Geotechnical Engineering ~ Drilling Services ~ Construction Materials Inspection / Testing ~ Non-Destructive Examination ~ Failure Analysis
ICBO ~ ACI ~ AWS

TABLE OF CONTENTS

Page No.

1.0	INTRODUCTION	1
2.0	GENERAL SITE DESCRIPTION	1
3.0	GEOLOGIC SETTING	2
4.0	GEOLOGIC HAZARDS	4
4.1	<u>Surface Fault Rupture</u>	4
4.2	<u>Landslides</u>	5
4.3	<u>Rockfall Hazard</u>	6
4.4	<u>Flooding and Debris Flow</u>	7
4.5	<u>Tectonic Deformation</u>	8
4.6	<u>Surface Water</u>	8
4.7	<u>Radon</u>	9
4.8	<u>Other Geologic Hazards</u>	9
5.0	CONCLUSIONS	9
6.0	GENERAL CONDITIONS	10

FIGURES

No. 1	VICINITY MAP
No. 2	SITE PLAN
No. 3	GEOLOGIC MAP
Nos. 4 & 5	STABILITY RESULTS

1.0 INTRODUCTION

This report presents the results of a geological hazards assessment for the proposed Summit Hills residential development in Alpine, Utah. The approximate location of the site with respect to existing roadways is shown on Figure No. 1, *Vicinity Map*, at the end of this report. The purpose of this assessment is to identify potential geologic hazards at the site, to assess whether such hazards pose a risk to development, and to determine if further evaluation and/or mitigation is warranted. This assessment was aided by a recent geotechnical study (Earthtec, 2005) completed by our office for the site. The findings and conclusions of this assessment are based on a geologic reconnaissance of the site, a review of available topographic, geologic and hazards maps, a review of available aerial photographs, and the findings of the referenced geotechnical study for the site.

2.0 GENERAL SITE DESCRIPTION

A geologic reconnaissance of the site was conducted by the undersigned geologist on September 16, 2005. The subject site is located in the foothills on the southern flank of the Traverse Mountains in northern Utah County. The elevation of the site ranges from approximately 5,200 to 5,380 feet above sea level. The boundaries and topography of the proposed development are shown on Figure No. 2, *Site Plan*. As shown on Figure No. 2, the topography at the site is formed by a series of south-southeast trending ridges and ravines. The sides of the ravines and the south-facing slopes at the southern ends of the ridges are the steepest areas on the site with slopes ranging from approximately 15 to 30 degrees. The areas along the ridge tops where proposed building lots will be sited are less steep with slopes ranging from 3 to 12 degrees. The area is vegetated with grass, sage brush, and patches of scrub oak. No surface water, springs, or seeps were observed at the site. None of the ravine channels showed evidence of recent runoff flow and all the channels were over-grown with grass and brush. The site is bordered on the north and west by open foothills and on the east and south by existing residential development.

3.0 GEOLOGIC SETTING

As discussed above, the subject site is located on the southern flank of the Traverse Mountains at the northern end of Utah Valley. The Traverse Mountains are a major east-west trending bedrock salient that separates the Utah Valley to the south from the Salt Lake Valley to the north (Machette, 1992). The Traverse Mountains abut the Oquirrh Mountains to the west and the Wasatch Mountains to the east. The Wasatch Range to the east forms the eastern boundary of the Basin and Range physiographic province. The north trending Wasatch Fault Zone lies at the base of the Wasatch Range and separates the Basin and Range physiographic province to the west from the Middle Rocky Mountain and Colorado Plateau physiographic provinces to the east. Seismic displacement within the Wasatch Fault Zone during the Tertiary and Quaternary geologic periods has resulted in the uplift of the Wasatch Range and relative down drop of Utah Valley.

Tectonically, the Traverse Mountains are the location of an intersection between the inactive Charleston-Nebo Thrust Fault and the active Wasatch Fault Zone (Stokes, 1986) (Machette, 1992). The mountain range is also the structural boundary between the Salt Lake (north) and Provo (south) segments of the Wasatch Fault Zone. Motion between the two segments of the Wasatch Fault Zone is transferred along the Fort Canyon Fault located approximately 1.5 miles north-northeast of the subject site (Machette, 1992). The Wasatch Fault Zone is considered to be an "active" fault zone. An active fault zone is defined as one that has shown evidence for displacement during Holocene time (past 10,000 years). The Wasatch Fault Zone runs in a southerly direction from near the Utah-Idaho border to central Utah. The fault zone is comprised of six to ten separate segments. As discussed, the subject site is located near the transition between the Salt Lake and Provo Segments of the fault zone. A number of studies have been completed on the Wasatch Fault, including studies by Swan and others (1980), Schwartz and Coppersmith (1984), Lund and others (1991), Machette and others (1991, 1992), McCalpin and others (1994), and Black and others (1995). Evidence of multiple surface rupture events on the five central segments of the fault zone during the late Pleistocene and Holocene has been

documented. Recurrence intervals for these events during the past 5,600 years are on the order of 350 years for the entire fault zone and 1,275 to 2,800 years for individual segments. The most recent surface rupture events on the five central segments of the fault zone appear to have occurred between 620 ± 30 and $2,120 \pm 100$ years ago. These surface rupture events have been estimated to be associated with paleo-earthquakes of surface wave magnitude (M_s) 6.5 to 7.5. (Machette, 1992; McCalpin and Nishenko, 1996).

The surficial geology of the Wasatch Fault Zone and the eastern margin of Utah Valley has been mapped by Machette (1992). A portion of this geologic map showing the location of the subject site and surrounding area is included as Figure No. 3, *Geologic Map*. The surficial geology at the location of the site has been mapped as Neogene sedimentary rocks (Ns) that are overlain on areas of the southeast corner of the site by upper to middle Pleistocene, pre-Bonneville lake cycle fan alluvium (af4). Two younger, Holocene to uppermost Pleistocene alluvial fans (afy) are mapped at the mouths of two ravines to the southeast of the site. These younger alluvial fans are shown to overlie older, upper Pleistocene lacustrine gravels, sands, and clays (lbg, lbs, lbm) to the south of the subject site. Machette (1992) describes the Neogene sedimentary rock (Ns) mapped at the site as “a mixture of fine to coarse grained sandstone and conglomerate in the eastern half of the Traverse Mountains.” The older alluvial fan (af4) deposits at the site are generally a conglomeration of pebble to cobble sized clasts with a few boulders in a matrix of sand, silt, and sandy clays. Machette (1992) did not map any landslide deposits or features at or adjacent to the site and no fault traces were mapped crossing or projecting toward the site.

The surficial deposits observed at the site during the geologic reconnaissance were generally pebble to cobble gravels in a silt or silty clay matrix with a few scattered boulders at the surface. No bedrock outcrops were found at the site. The subsurface deposits encountered during our geotechnical investigation (Earthtec, 2005) at the site generally consisted of medium dense to very dense clayey gravels and clayey sands, and an occasional pocket of stiff sandy clay. The deposits encountered at the site are generally consistent with those mapped by Machette (1992)

and appear to be mostly weathered conglomerate bedrock. However, no contact separation between Neogene bedrock and younger alluvial fan deposits was identified. The ravine channels at the site all contain relatively shallow deposits of young (late Holocene) alluvial and colluvial material eroded from the surrounding hillsides.

4.0 GEOLOGIC HAZARDS

The primary focus of the geologic reconnaissance at the site was to identify, document, and provide an assessment of potential geologic hazards at the site. Our assessment of these potential hazards is discussed in the following paragraphs. It should be noted that some hazard assessments may be preliminary and may require additional study to adequately quantify the hazard. In addition to the site reconnaissance, a review was conducted of available geologic maps, hazard maps, topographic maps, and aerial photographs to aid in the identification of potential hazards at the site. Potential hazards and other issues related to shallow groundwater, soil liquefaction, collapsible or compressible soils, and seismic considerations were addressed in the geotechnical study (Earthtec, 2005) for the site.

4.1 Surface Fault Rupture

Available geologic mapping reviewed as part of this study does not indicate the presence of surface fault rupture traces crossing the site or projecting toward the site (Machette, 1992) (Utah County Natural Hazards Overlay Map, 2001). No evidence of past faulting on the property or surrounding areas was observed during the geologic reconnaissance. The nearest mapped active faults to the site of the proposed development are the Fort Canyon Fault 1.5 miles north-northeast and the Wasatch Fault approximately 2 miles to the east. It is our conclusion that additional surface fault rupture investigations for the site are not warranted and no fault setbacks are recommended for the proposed development.

4.2 Landslides

In addition to the geologic mapping completed by machette (1992) that shows no landslide deposits or features on or in the vicinity of the subject site, a landslide map completed by Harty (1992) also shows no landslide deposits or features on or near the site. However, the steep slopes on the southern edge of the site that slope down toward 600 North Street were identified to have the greatest potential for slope instability due to their steep profile and the observed rock-faced road cuts at the toes of the slopes. The steepest of these slope faces was measured to have a slope of approximately 30 degrees and the highest road cut was estimated to be between 10 and 15 vertical feet. Using the mapped and measured topographic profile for the slope directly south of the proposed Lots 15 and 16 at the site, a computer-aided slope stability analysis was conducted. The soil strength parameters assigned to the native soils at the site in the stability models were based on the subsurface soils observed during our geotechnical study (Earthtec, 2005) and published values for, and our experience with, similar soil types. The U.S. Bureau of Reclamation (1987) has performed large direct shear testing and indicated that compacted clayey gravel soils have an internal friction angle greater than 31°, and clayey sand soils have an internal friction angle of 28° to 34° and a saturated cohesion of 120 to 360 psf. Accordingly, we estimated the following parameters for use in the stability analyses:

Material	Internal Friction Angle (degrees)	Apparent Cohesion (psf)	Saturated Unit Weight (pcf)
Clayey Sand/Gravel	36	150	130

We also presumed that no phreatic surface would form behind the walls because of the sandy nature of the native soils. For the seismic evaluation, expected ground motions at the site for site (grid) locations of 40.464° north latitude and -111.794° west longitude were determined by querying the USGS website, which resulted in a value of 0.22g for a 10% probability of

exceedance in 50 years. For seismic conditions, this peak acceleration value was used as the psuedostatic coefficient (0.22).

Using these input parameters, we evaluated the global stability of the wall using the computer program PCSTBL6. This program uses a limit equilibrium (Bishop's modified) method for calculating factors of safety against sliding on an assumed failure surface and evaluates numerous potential failure surfaces, with the most critical failure surface identified as the one yielding the lowest factor of safety of those evaluated. The typical minimum factors of safety (FS) are 1.5 for static conditions and 1.1 for seismic (psuedostatic) conditions.

The general profile of the slope modeled in the slope stability analysis is shown on Figure Nos. 4 and 5, *Stability Results*. As shown, the factors of safety determined by the analysis for static and psuedostatic conditions are 1.92 and 1.18 respectively.

Stability of the proposed cuts and fills for the extension of Lakeview Drive at the site were addressed in the geotechnical study (Earthtec, 2005) completed by our office.

4.3 Rockfall Hazard

The Utah County Natural Hazards Overlay Map (2001) places the subject site in a rockfall potential area. Based on our site reconnaissance, the subject property, and specifically the proposed building sites, are not located in a rockfall run out zone. There is no potential rockfall source area up-slope to the north of the site. A few scattered boulders were observed on the surface throughout the site. None of the observed boulders were greater than 2 feet in diameter. It is our interpretation that these boulders were transported as alluvium or eroded from the existing deposits at the site, and are not the result of rockfall events due to the lack of any rockfall source areas in the vicinity. It is our conclusion that the proposed building areas at the site are in a low relative rockfall hazard area. Existing loose rocks or rocks excavated during construction activities could roll down steeper slopes at the site into the ravines or possibly onto

600 North Street to the south of the development. It is recommended that any existing loose boulders or excavated rocks over 1 foot in diameter be removed from any locations on or within 25 feet of any slope greater than 15% at the site.

4.4 Flooding and Debris Flow

The ravines that cross the site are all relatively small and do not contain regularly flowing streams. No evidence of recent stream flow or erosion was apparent in the ravine channels at the time of the reconnaissance. The areas drained by the ravines are relatively small, well vegetated, and covered with extensive soil deposits. Based on our observations and empirical analysis, the ravines do have the potential to produce relatively small volumes of water runoff and small volume debris flows. However, all of the proposed building sites in development are located on the ridge crests and are not at risk from flooding or debris flow events that could occur in the ravines. The absence of significant erosion on the slopes at the site and the presence of relatively dense vegetation over most of the slopes suggest that the slope soils are capable of absorbing "normal" amounts of precipitation or snow melt.

The mapped young alluvial fans (afy) (Machette, 1992) at the mouths of the drainage ravines to the east of the site are located to the southeast of the subject site on currently developed areas. It is our opinion that flooding and debris flow events at the site have relatively long recurrence intervals. However, the drainages to the east and those on the site currently empty onto these developed areas, which are, and will continue to be, at greatest risk from any future water runoff or debris flows. The proposed extension of Lakeview Drive will cross the ravines at the site at four locations, as shown on Figure No. 2. It is our understanding that the ravines will be filled at these locations and that drainage structures will be installed to allow water runoff to pass through the fills. However, debris flow material originating up-stream from the road crossings will not likely pass the drainage structures and should be effectively contained on the up-slope sides of the road fill crossings. Therefore, it is our opinion that the proposed residential

development and extension of Lakeview Drive will actually decrease the existing debris flow hazard on the existing development to the south. Water runoff could still affect these off-site areas and will not be significantly affected by the proposed development. We do recommend that the ravine areas directly upstream of the proposed Lakeview Drive fills be periodically cleaned of sediment buildup and loose debris to maintain proper water flow through the planned drainage structures. This should also be completed immediately following any debris flow events.

4.5 Tectonic Deformation

Tectonic deformation could include cracking, surface tilting, and liquefaction with possible subsidence associated with ground motion during an earthquake. There is no evidence of significant ground deformation at the site. The absence of active faulting at or near the site and the presence of shallow bedrock and granular soils suggests that the potential for significant future ground deformation is low. A large magnitude earthquake on one of several active faults in the region could cause relatively intense ground shaking at the site. The recommendations given in Section 9.0 of the geotechnical study (Earthtec, 2005) for the site regarding IBC seismic design should be fully implemented in building design and construction.

4.6 Surface Water

No evidence of springs or seeps was observed on the hilly terrain or in the ravines at the site. No surface water was observed during our reconnaissance. As discussed in Section 4.4, the ravines at the site have the potential to transport surface runoff resulting from locally intense rainfall or heavy, rapid snow melt. Based on our review of the proposed building locations at the site, we do not believe that surface runoff in the ravines will pose a risk to the development.

4.7 Radon

A radon hazard potential map of Utah prepared by Black (1993), indicates that the subject property is located in an area of “high ” radon hazard potential. Radon is a radioactive gas that is a product of the natural radioactive decay of uranium, a trace element commonly found in soils and bedrock. Radon is believed to be a significant cause of lung cancer in humans. Radon can enter groundwater and the atmosphere as it moves upward after being produced naturally in the subsurface. The gas has the potential to enter buildings through cracks and other openings in footings and floor slabs and can affect buildings of any age or type. The radon hazard map reviewed for this report is only intended to be used as a general reference. Radon levels in buildings are influenced by both geological and non-geological factors and levels can vary from site to site. Radon testing would be necessary to determine actual indoor radon levels in any future buildings at the site. However, radon ventilation systems are relatively inexpensive and easy to implement into building plans during construction, if desired.

4.8 Other Geologic Hazards

Other geologic hazards that are not likely to affect the subject site due to the location of the site, the regional geologic setting, or the low probability of occurrence are seismic seiche, snow avalanche, and volcanic eruption. The probability of these hazards affecting the site is rated as low.

5.0 CONCLUSIONS

Based on our site reconnaissance, review of available maps and aerial photographs, and on the slope stability analysis, there do not appear to be any significant or imminent geologic conditions at the site that might threaten the proposed development. The site appears to be suitable for the proposed development from a geologic standpoint provided the recommendations in this report and in the referenced geotechnical study (Earthtec, 2005) are followed and implemented. It is our opinion that additional geologic assessment at the site is not warranted at this time.

6.0 GENERAL CONDITIONS

The observations, conclusions, and recommendations presented in this report were conducted and presented within the limits prescribed by our client and according to the generally accepted practices of the engineering geology profession. No other warranty or representation, either expressed or implied, is intended in our proposals, contracts, reports, and letters.

We appreciate the opportunity of providing our services on this project. If we can answer questions or be of further service, please call.

Respectfully;

EARTHTEC TESTING AND ENGINEERING, P.C.

Mark C. Larsen, P.G.
Project Geologist

William G. Turner, P.E.
Senior Geotechnical Engineer

REFERENCES CITED

- Black, B.D., 1993, *The Radon-Hazard-Potential Map of Utah*; Utah Geological Survey Map 149, scale 1:500,000.
- Black, B.D., Lund, W.R., and Mayes, B.H., 1995, *Summary of New Information From the South Fork Dry Creek Site, Salt Lake County, Utah*; Environmental and Engineering Geology of the Wasatch Front Region, edited by W.R. Lund, Utah Geological Association Pub. 24, p. 11-30.
- Earthtec Testing & Engineering, P.C., 2005, *Geotechnical Study, Summit Hills Development & Lakeview Drive Extension, Alpine, Utah*; Unpublished consultant's report, August 18, 19, 2005.
- Harty, K.M., 1992, *Landslide Map of the Provo 30' x 60' Quadrangle, Utah*; Utah Geological Survey Open-File Report 256, scale: 1:100,000.
- Lund, W.R., Schwartz, D.P., Mulvey, W.E., Budding, K.E., and Black, B.D., 1991, *Fault Behavior and Earthquake Recurrence on the Provo Segment of the Wasatch Fault Zone at Mapleton, Utah County, Utah*; Paleoseismology of Utah, Vol. 1, Utah Geological Survey Special Study 75, 41 pp.
- Machette, M.N., Personius, S.F., Nelson, A.R., Schwartz, D.P., and Lund, W.R., 1991, *Segmentation and History of Holocene Earthquakes, Wasatch Fault Zone, Utah*; Journal of Structural Geology, Vol. 13, p. 137-149.
- Machette, M. N., 1992, *Surficial Geologic map of the Wasatch Fault Zone, Eastern Part of 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.
- McCalpin, J.P., Forman, S.L., and Lowe, M., 1994, *Reevaluation of Holocene Faulting at the Kaysville Site, Weber Segment of the Wasatch Fault Zone, Utah*; Tectonics, Vol. 13, p. 1-16.
- McCalpin, J.P., and Nishenko, S.P., 1996, *Holocene Paleoseismicity, Temporal Clustering, and Probabilities of Future Large ($M > 7$) Earthquakes on the Wasatch Fault Zone, Utah*; Journal of Geophysical Research, Vol. 101, No. B3, p. 6233-6253.
- Schwartz, D.P., and Coppersmith, K.J., 1984, *Fault Behavior and Characteristics of Earthquakes-Examples from the Wasatch and San Andreas Fault Zones*; Journal of Geophysical Research, Vol. 89, No. B7, p. 5681-5698.

Stokes, W.L., 1986, *Geology of Utah*; p.18.

Swan, F.H., III, Schwartz, D.P., and Cluff, L.S., 1980, *Recurrence of Moderate to Large Magnitude Earthquakes Produced by Surface Faulting on the Wasatch Fault Zone, Utah*: Bulletin Seismological Society of America, Vol. 70, p. 1431-1462.

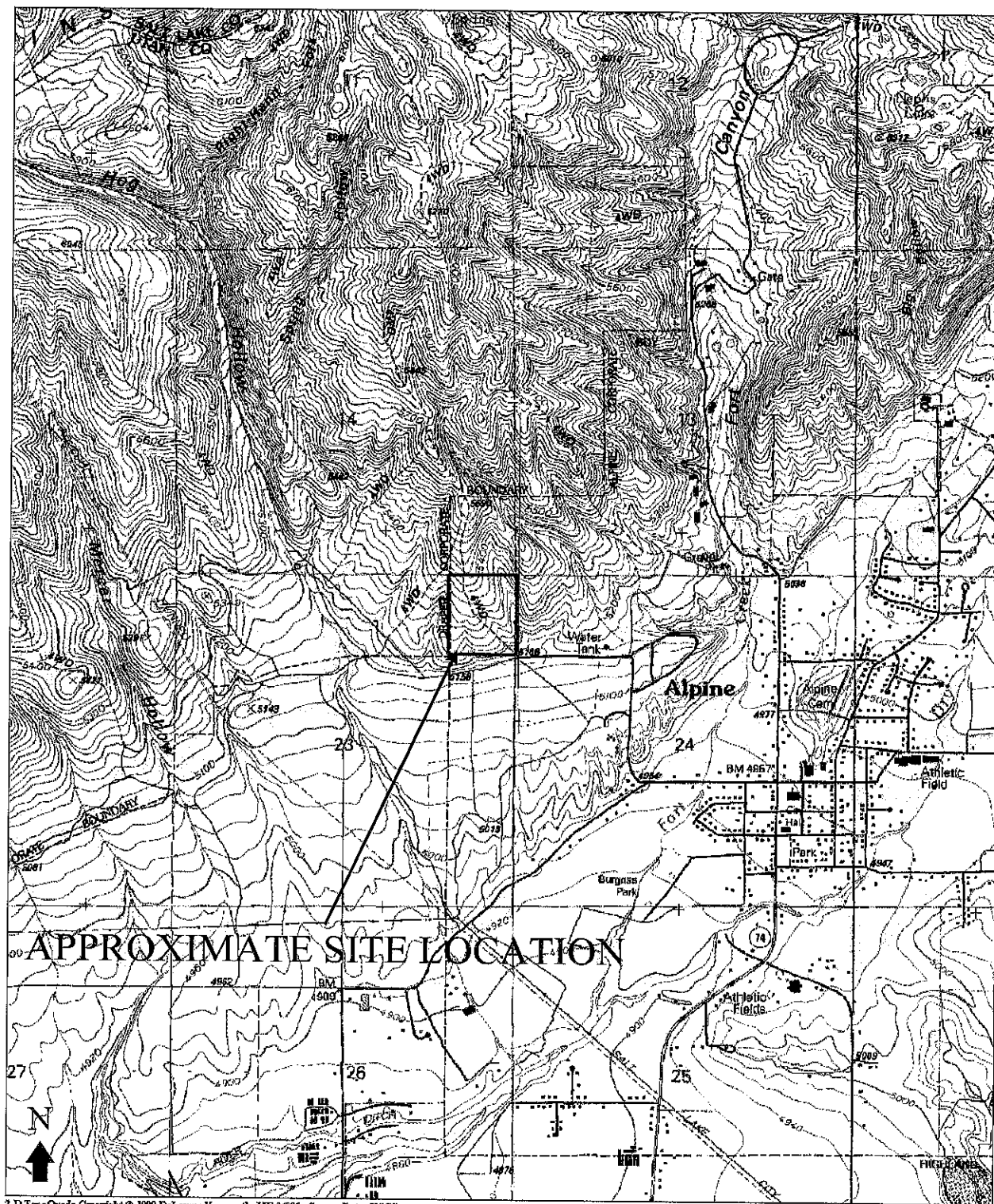
U.S. Bureau of Reclamation, 1987, *Design Standards No. 13, Embankment Dams, Denver, Colorado*.

USGS National Seismic Hazards Mapping Project, World Wide Web Site:
www.geohazards.cr.usgs.gov/eq/.

Utah County Natural Hazards Overlay Map, 2001, *Faults/ Liquefaction*, Utah County Public Works Department Mapping Division, Scale: 1:80,000.

VICINITY MAP

SUMMIT HILLS



3-D TopoQuads Copyright © 1999 DeLorme Yarmouth, ME 04096 Source Data: USGS

700 ft Scale: 1:24,000 Detail: 13.0 Datum: WGS84

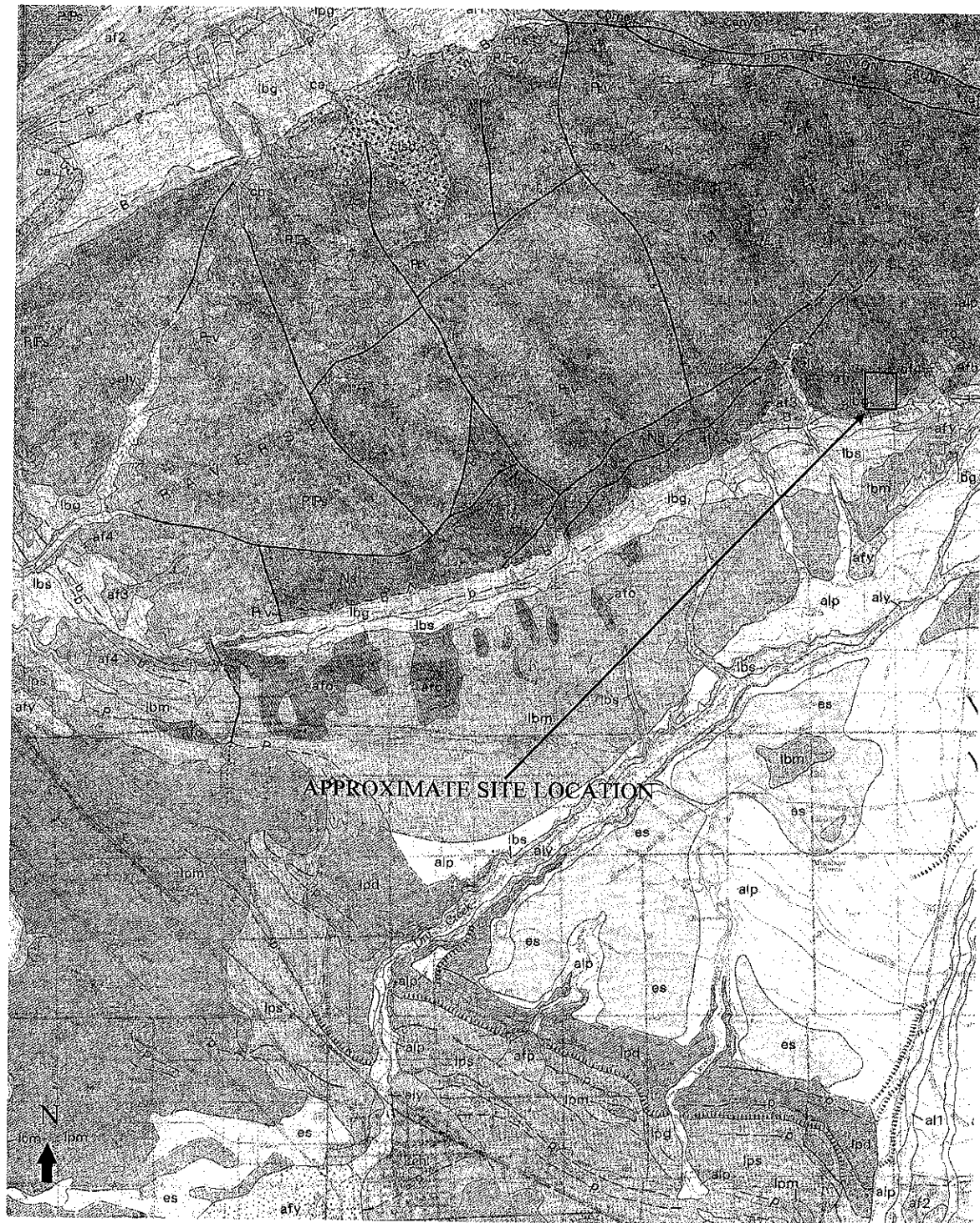
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FIGURE NO.: 1

GEOLOGIC MAP

SUMMIT HILLS



Map Taken From Machette, 1992

PROJECT NO.: 051709

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FIGURE NO.: 3

GEOLOGIC MAP LEGEND

SUMMIT HILLS

LIST OF MAP UNITS

(See Description of Map Units in parentheses for detailed descriptions of units)

LACUSTRINE DEPOSITS

Deposits younger than the Bonneville Lake Cycle (Holocene to upper Pleistocene)

lv	Younger lacustrine and marsh deposits
lly	Lacustrine, marsh, and alluvial deposits, undivided
ld	Deposits of the Provo (regressive) phase of the Bonneville lake cycle (upper Pleistocene)
ldt	Deltic deposits
lgr	Lacustrine gravel
lsc	Lacustrine silt and clay
lbt	Deposits of the Bonneville (transgressive) phase of the Bonneville lake cycle (upper Pleistocene)
lbt	Deltic deposits
lbg	Lacustrine gravel
lbs	Lacustrine sand
lbc	Lacustrine silt and clay
lbt	Deposits of the Bonneville lake cycle, undivided by phase (upper Pleistocene)
lbtg	Lacustrine gravel
lbtb	Lacustrine sand
lbtsc	Lacustrine silt and clay

ALLUVIAL DEPOSITS

Deposits of stream alluvium

al1	Stream alluvium, unit 1 (upper Holocene)
al2	Stream alluvium, unit 2 (middle Holocene to uppermost Pleistocene)
aly	Younger stream alluvium, undivided (Holocene to uppermost Pleistocene)
alp	Stream alluvium related to the Provo phase of the Bonneville lake cycle (uppermost Pleistocene)
alt	Stream alluvium related to the Bonneville phase of the Bonneville lake cycle (upper Pleistocene)
al3	Stream alluvium unit 3, related to undifferentiated phases of the Bonneville lake cycle (upper Pleistocene)
al4	Older stream alluvium, undivided (upper ? to middle Pleistocene; probably pre-Little Valley lake cycle)
af1	Alluvial-fan deposits
af1	Fan alluvium, unit 1 (upper Holocene)
af2	Fan alluvium, unit 2 (middle Holocene to uppermost Pleistocene)
afy	Younger fan alluvium, undivided (Holocene to uppermost Pleistocene)
afp	Fan alluvium related to the Provo phase of the Bonneville lake cycle (uppermost Pleistocene)
alt	Fan alluvium related to Bonneville phase of the Bonneville lake cycle (upper Pleistocene)
af3	Fan alluvium unit 3, related to undivided phases of the Bonneville lake cycle (upper Pleistocene)
af4	Fan alluvium, unit 4 (upper to middle Pleistocene; pre-Bonneville lake cycle)
af5	Fan alluvium, unit 5 (middle Pleistocene; pre-Little Valley lake cycle)
afa	Older fan alluvium, undivided (upper to middle Pleistocene; pre-Bonneville lake cycle)

GLACIAL DEPOSITS

gac	Outwash of the Bulls Canyon advance (upper Pleistocene, Pinadale equivalent)
gbc	Till of the Bulls Canyon advance (upper Pleistocene, Pinadale equivalent)
gdc	Outwash of the Dry Creek advance (uppermost middle Pleistocene, Bull Lake equivalent)
gbc	Till of the Dry Creek advance (uppermost middle Pleistocene, Bull Lake equivalent)

es Eolian sand and silt (Holocene to uppermost Pleistocene)

COLLUVIAL DEPOSITS

cd1	Debris flows, unit 1 (upper Holocene)
cd2	Debris flows, unit 2 (middle Holocene to uppermost Pleistocene)
cdy	Debris flows, undivided (Holocene to uppermost Pleistocene)
cfs	Fault-scarp colluvium (Holocene to uppermost Pleistocene)
chs	Hillside colluvium (Holocene to upper Pleistocene)
cd	Rockfall deposits (Holocene to upper Pleistocene)
cdsh	Lateral-spread deposits (Holocene to upper Pleistocene)
cdy	Younger landslide deposits (Holocene to upper Pleistocene)
cd	Older landslide deposits (upper Pleistocene to upper Tertiary?)
cd	Colluvium and alluvium, undivided (Holocene to middle Pleistocene)

ARTIFICIAL DEPOSITS

f	Artificial fill and associated disturbed ground (historic)
---	--

BEDROCK

ns	Neogene sedimentary rocks
ps	Paleogene volcanic rocks
pt	Paleogene intrusive rocks
pkp	Paleogene and Upper Cretaceous sedimentary rocks, undivided
pu	Paleozoic sedimentary rocks, upper part (Lower Permian)
pm	Paleozoic sedimentary rocks, middle part (Lower Permian and Pennsylvanian)
pl	Paleozoic sedimentary rocks, lower part (Lower Pennsylvanian, Mississippian, Devonian, and Cambrian)—Symbol pattern indicates Manning Canyon Shale
pr	Proterozoic and Archean rocks (Precambrian)

— Contact—Solid where well located or defined; dashed where approximately located; dotted where concealed

--- Gradational contact—Contact between two units that inter-tongue or between two differentiated units (such as al1 and al2) and its undifferentiated counterpart (aly)

Normal fault—Bar and solid bar on down-dropped side along Washed fault zone; bar and hollow ball along other faults. Dashed where approximately located; dotted where concealed. Height of fault scarp and amount of offset of geomorphic surface (in parentheses) shown in meters. Location of exploratory trenches shown by following symbols: AF, American Fork Canyon; RC, Rock Creek; DH, Deadhorse Hollow; HC, Hobbs Creek; MM, Mapleton North; MS, Mapleton South; WC, Water Canyon; and WH, Woodland Hills

Thrust fault—Sawtooth on overriding plate or block (trapped in bedrock only); dashed where approximately located; dotted where concealed

Anticline—Solid arrows show folded lake beds as indicated by geophysical surveys of Utah Lake. Hollow arrows show anticline in surficial units

Syncline—Solid arrows show folded lake beds as indicated by geophysical surveys of Utah Lake. Hollow arrows show syncline in surficial units

Legend, continuing on subsequent sheets in series of the Bonneville lake cycle and its successor, Utah Lake—May coincide with contact, topographic escarpment, or topographic crest of lacustrine bar or spit

— Highest shoreline of the Bonneville (transgressive) phase

— Other shorelines of the Bonneville phase—Mostly transgressive

— Highest shoreline of the Provo (regressive) phase—Dotted where buried by younger units or removed by erosion

— Other shorelines below the highest Provo shoreline—Mostly of the Provo phase, but may include some shorelines of the Bonneville (transgressive) phase

— Shorelines of Utah Lake

— Topographic crest of lacustrine bar or spit

— Topographic crest of lateral- or terminal-glacial moraine (units gbat and gcat)

Topographic escarpment—Escarpment along stream channel, terraces, and deltas; formed primarily by fluvial processes. Where escarpment coincides with the contact between map units, points face upslope; dashed where approximately located; dotted where position of escarpment is poorly located. Height of escarpment (in meters) shown in selected areas

Landslide escarpment—Major headscarp and/or fissure in landslide (unit cly or cld) or lateral spread (unit clsp) deposit; may coincide with geologic contacts

Paleostream channel—Preserved margin of abandoned stream channel or debris-flow levee. Halfhead of arrow on outer edge of feature

— Broadly filled geomorphic surface—Arrow points in general

From Machette (1992)

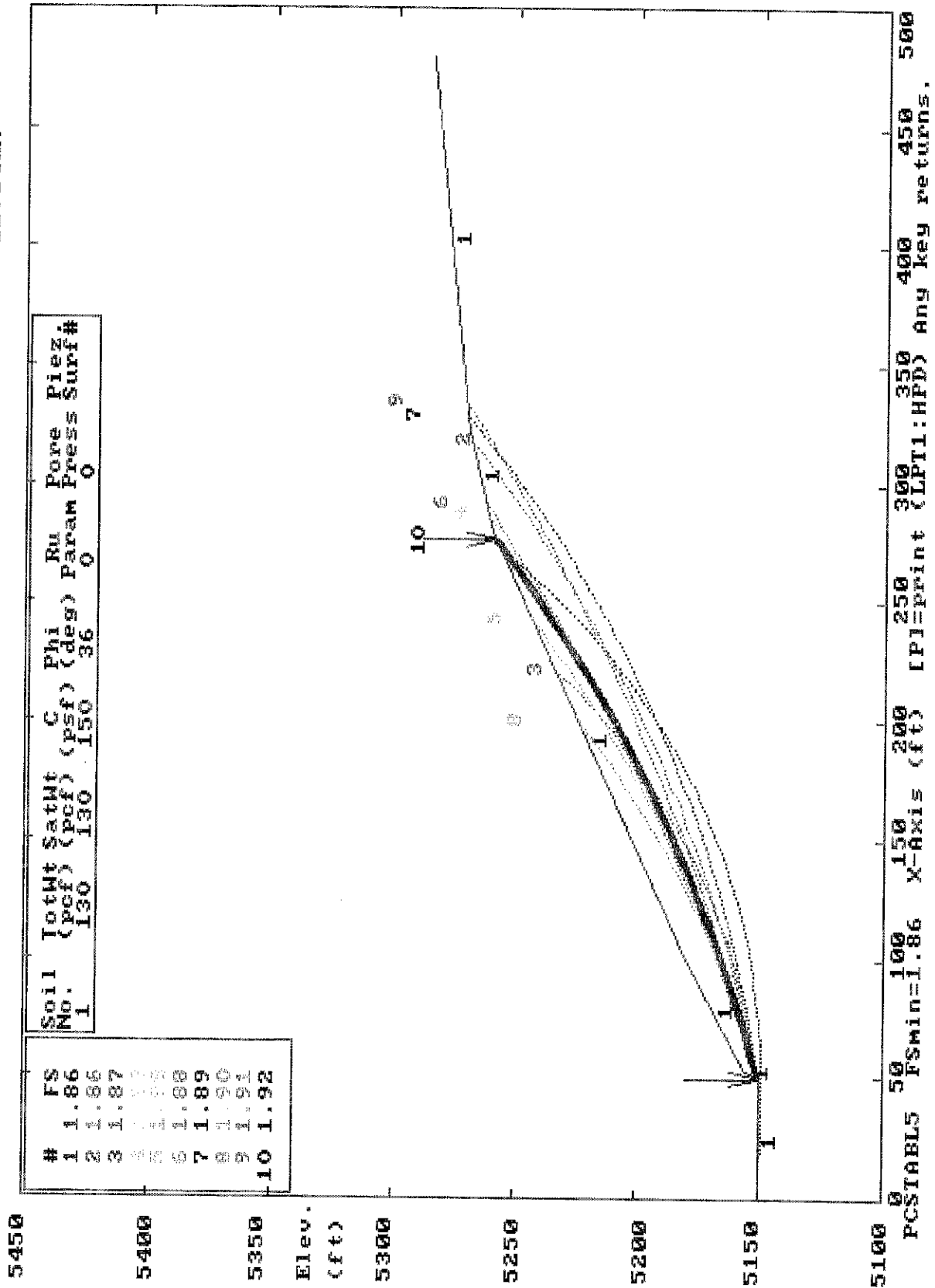
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FIGURE NO.: 3 (CONT.)

STABILITY RESULTS

Ten Most Critical: Lakeview Drive - Slope Stability By: MGI Turner 09-20-05 11:04am



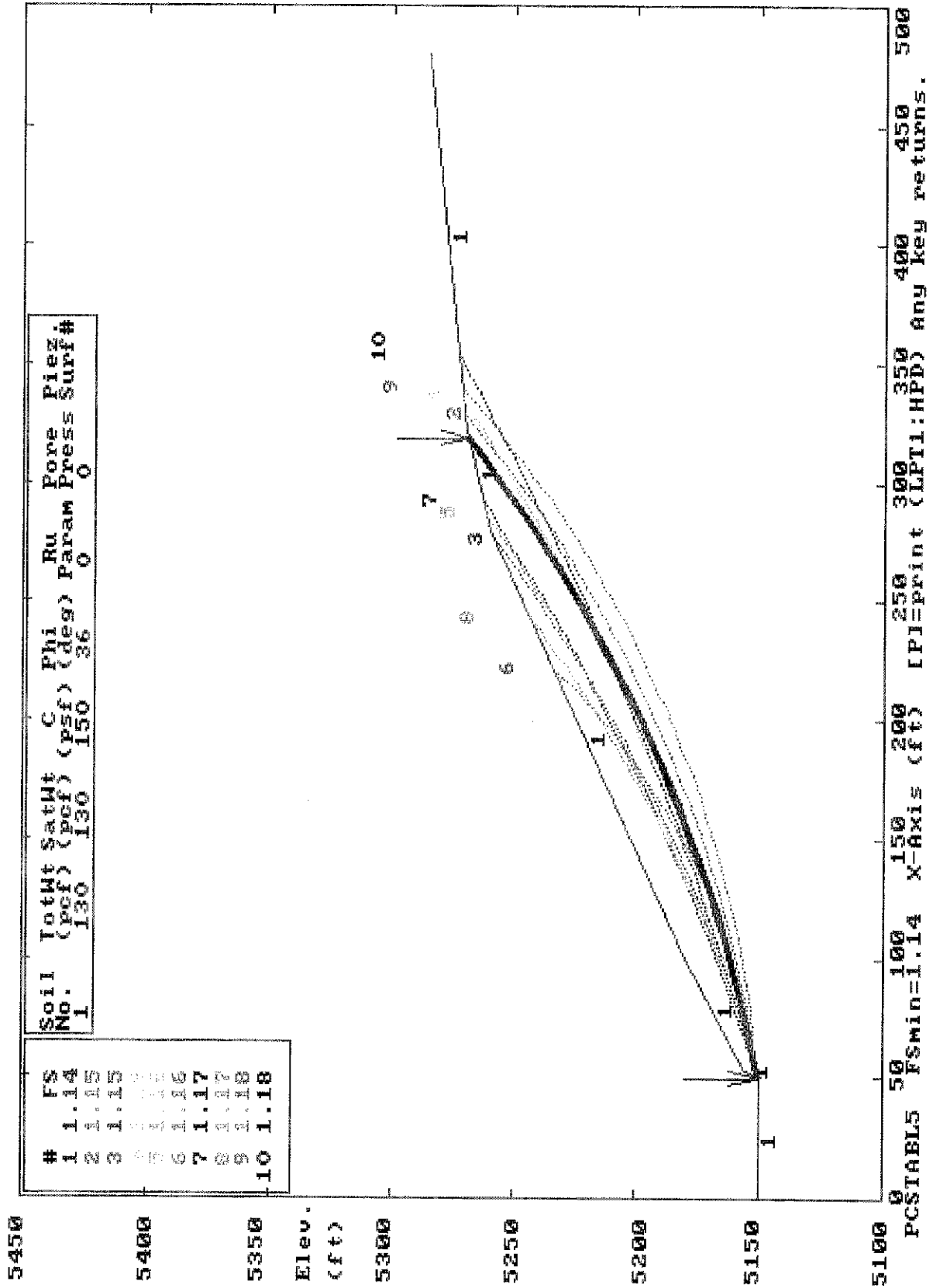
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FIGURE NO.: 4

STABILITY RESULTS

Ten Most Critical Lakeview Drive - Slope Stability (Seis.) By: MGlurner 09-20-05 11:09am



PROJECT NO.: 051709



FIGURE NO.: 5



Earthtec Testing & Engineering, P.C.

133 North 1330 West
Orem, Utah - 84057
Phone (801) 225-5711
Fax (801) 225-3363

1596 W. 2650 S. #108
Ogden, Utah - 84401
Phone (801) 399-9516
Fax (801) 399-9842

April 19, 2006

Mr. Taylor Smith
c/o Sowby & Berg Consultants
45 North 490 West
American Fork, UT 84003

**Subject: Retaining Wall Recommendations
Proposed Lakeview Drive
Summit Hills (Vista Meadows)
Alpine, Utah
Job No. 051709**

Dear Mr. Smith:

As you requested, we have evaluated block retaining walls along the proposed Lakeview Drive at the subject site. We previously prepared a geotechnical report¹ for the project and have performed several stability analyses for the south facing slope on which Lakeview drive will be constructed, with the latest analysis² indicating the overall slope will be stable. The design presented herein is based on our understanding of the retaining wall requirements, soil conditions at the site, and our engineering analyses.

Proposed Construction

Based on current plans provided by Sowby & Berg Consultants, the highest retaining walls in cut areas will be on the order of 27 feet in height (located on the south-facing hillside above Hog Hollow Road). A 2H:1V backslope will be cut into the hillside above the highest wall, extending to as much as 12 feet in height. In fill areas, walls will be constructed up to about 27 feet in height to retain Lakeview Drive on the south-facing hillside above Hog Hollow Road. A higher fill is also planned near the east end of Lakeview Drive, with the maximum fill height of approximately 48 feet.

Stability Analyses

Our engineering analyses for the planned retaining walls consisted of evaluating the stability of the proposed wall. Our stability analyses included sliding, overturning, bearing capacity, and the overall (global) stability of the wall, which were evaluated based on existing soils at the site and assuming that backfill soils will consist of structural fill as discussed in the recommendations below. Typical minimum factors of safety are 1.5 for sliding, 1.5 for overturning and 3.0 for bearing. We considered

¹Geotechnical Study, Summit Hills Development & Lakeview Drive Extension, Alpine, Utah, Job No. 051709, August 18, 2005.

²Additional Information, Stability of Slope Below Lot 16, Summit Hills Development, Alpine, Utah, Job No. 051709, January 26, 2006.

using Redi-Rock and Lock+Load block walls, and selected Lock+Load walls so that a granular backfill can be placed and compacted behind the wall (between the wall and the backcut native soils). The results of our analysis for a Lock+Load block wall indicates that the minimum factors of safety are met with a maximum wall height of about 9⅓ feet in cut areas and about the same in fill areas (see Figures 1 and 2). The retainage heights discussed above can be achieved by placing walls on levels or tiers, with the bottom of each tier offset a minimum 9 feet from the bottom of each lower tier so that the influence from each upper tier does not impose a surcharge on the lower wall tier. It is possible to have higher walls if geogrid reinforcements are placed behind the walls, but this would require additional cutting (and possibly significantly higher cuts) to make room for the geogrid.

Engineering parameters for on-site soils and the computer program for analyses are the same as used in our referenced letter. For the seismic stability analysis, the same pseudostatic coefficient (0.20) was also used for the stability analysis. Since much of the wall in cut areas will be below elevation 5230 feet, we used native clay soil parameters beneath and behind the retaining walls in cuts. In fill areas, we used clayey gravel soil parameters to represent the native soils. A phreatic surface was assumed within the slope behind and/or beneath the walls in native soils.

The configurations analyzed consisted the following:

- Two tiers of 9-foot high Lock+Load walls, with a 2H:1 V cut slope extending above the wall for a height of about 22 feet.
- Three tiers of 9-foot high Lock+Load walls, with a 2H:1 V cut slope extending above the wall for a height of about 12 feet.
- Three tiers of 9-foot high Lock+Load walls retaining the roadway embankment fill (above Hog Hollow Road), with a 250 psf surcharge (to account for traffic loads) on a relatively level backfill.
- Five tiers of 9-foot high Lock+Load walls retaining the roadway embankment fill (near east end of Lakeview Drive), with a 250 psf surcharge (to account for traffic loads) on a relatively level backfill.

Typically, the required global minimum factors of safety (FS) are 1.5 for static conditions and 1.0 for seismic (pseudostatic) conditions. The results of our analyses indicate the configurations analyzed will meet both these requirements, except for the five tier wall retaining fill which will require geogrid to meet these requirements. The slope stability data are attached as Figures 3 through 10.

Conclusions and Recommendations

Based on the results of our analyses, we recommend that a Lock+Load retaining wall be constructed to maximum heights of 9½ feet using the standard Lock+Load blocks, provided granular soils meeting the recommendations for structural fill are used as fill beneath and backfill behind the wall. We recommend the Lock+Load wall blocks be placed on a minimum 12-inch thick pad of structural fill, as shown on the attached Figure 11. Our analyses also indicate that the blocks should be embedded a minimum of 12 inches.

For the five-tier wall near the east end of Lakeview Drive, at least 3 layers of geogrid are required behind the lowest wall tier to achieve the minimum factors of safety. The geogrid material should be placed starting at the bottom of the first row of blocks (base blocks), and between the next two rows of blocks so that three layers of geogrid are placed. The geogrid should extend a minimum length of 22 feet, inserted fully to just behind the face of each block, and should consist of Tensar UX1500MSE or an engineer approved equivalent (different geogrids have properties that could affect the performance of the wall). The geogrid should be rolled out from the face of the wall (machine direction) and pulled taut to remove slack prior to placing fill on the grid. Equipment wheels (if equipment on geogrid is necessary) should not be turned while driving over the geogrid. Overlapping of the geogrid is not required. Figure 12 depicts the design recommendations for the wall with geogrid.

Our analyses were performed assuming that no hydrostatic (water) pressures occur directly behind the wall. We thus recommend that a minimum 12-inch zone of free-draining granular material be placed behind the wall to intercept any possible water. In addition, a minimum 6-inch diameter perforated ADS drain pipe or equivalent should be wrapped in a filter fabric, placed at the bottom of the 12-inch zone at a minimum grade of 2%, and discharged beyond the wall to an appropriate drainage device. The free draining granular material should consist of ¾-inch to 2-inch size gravel with less than 5% passing the No. 200 sieve (see Figure 7).

The fill pad beneath the walls and backfill behind the walls should consist of angular on-site gravel soils having less than 20% fines (percent passing the No. 200 sieve), or angular imported fill material meeting the following recommendations:

Maximum particle size:	3 inches
Percent retained on the ¾ inch sieve (coarse gravel):	30 maximum
Percent passing the No. 4 sieve (total sand):	40 maximum
Percent passing the No. 200 sieve (fines):	10 maximum
Plasticity Index of fines:	non-plastic

Backfill soils should be placed in loose lifts not exceeding a thickness of 12 inches, moisture conditioned to within 2% of optimum, and compacted to a minimum 95% of the maximum dry density as determined by ASTM D698 (Standard Proctor).

Wall movements or even failure can occur if walls are undermined or the backfill soils become saturated. Surface drainage should be provided that directs surface water away from the walls. A drainage ditch should be constructed at the top of the cut slopes above the walls so that water does not flow over the slope face. If water is observed seeping from cut slopes, a blanket drain will be needed to appropriately convey water away from the wall. Should this situation occur, Earthtec should be consulted.

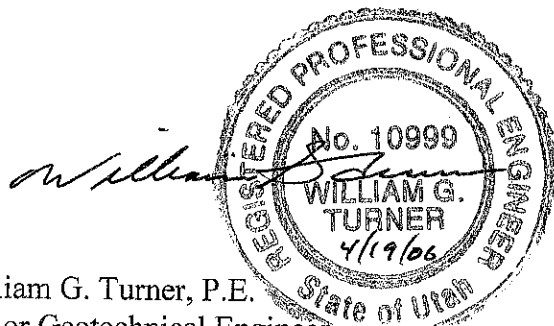
Finally, we recommend that a representative of Earthtec visit the site during construction to observe implementation of these recommendations. Note that Lock+Load blocks should be installed in accordance with the guidelines of each respective manufacturer.

Closure

This letter is considered an addendum to our referenced report and is subject to the same conditions and limitations presented therein. We appreciate the opportunity of providing our services on this project. If we can answer questions or be of further service, please call.

Respectfully;

EARTHTEC TESTING AND ENGINEERING, P.C.



William G. Turner, P.E.
Senior Geotechnical Engineer

Attachments: Figures 1-2, Lock+Load Wall Stability Evaluation
Figures 3-10, Stability Results
Figure 11, Lock+Load Wall Design Without Geogrid
Figure 12, Lock+Load Wall Design With Geogrid

LOCK+LOAD WALL STABILITY EVALUATION

Project: Summit Hills (Vista Meadows) - Cut Slope
Location: Lakeview Drive, Alpine, Utah

Job No.: 051709
Date: 4/7/2006
By: WGT

Backfill slope angle, β : 26 degrees
Batter angle (from vertical): -5.71 degrees
Soil/wall interface friction: 20 degrees
Surcharge pressure: 0 psf
Rows of planter blocks: 0 rows
Embedment depth: 1 feet
Total K_a = 0.225
Horizontal K_{ah} = 0.218

Foundation soil γ_t : 135 pcf
Foundation soil ϕ : 40 degrees
Found. soil cohesion: 0 psf
Retained soil γ : 135 pcf
Retained soil ϕ : 40 degrees
FS against sliding: 1.5
FS against overturning: 1.5
FS for bearing: 3.0
Foundation soil δ : 26.67 degrees

Block depth:	30	inches				Average block wall γ :		
						145 pcf		
Wall Ht (ft)	2.67	4.00	5.33	6.67	8.00	9.33	10.67	12.00
P_{ah} (lbs/ft)	104	235	418	653	940	1280	1672	2116
Wall Wt (lbs)	967	1450	1933	2417	2900	3383	3867	4350
Wall $x_{centroid}$	1.38	1.45	1.52	1.58	1.65	1.72	1.78	1.85
$P_{sliding}$	104	235	418	653	940	1280	1672	2116
$P_{resisting}$	655	914	1180	1453	1732	2019	2312	2611
FS_{sliding}	6.3	3.9	2.8	2.2	1.8	1.6	1.4	1.2
$M_{overturn}$	93	313	743	1451	2508	3982	5944	8464
$M_{resisting}$	1441	2206	3036	3930	4888	5911	6999	8151
FS_{overturn}	15.5	7.0	4.1	2.7	1.9	1.5	1.2	1.0
Vertical Load	349	500	637	763	879	985	1084	1176
Soil Capacity	8444	8444	8444	8444	8444	8444	8444	8444
FS_{bearing}	24.2	16.9	13.2	11.1	9.6	8.6	7.8	7.2

Max. Recommended Wall Height: 9.33 feet for 16-inch high by 30-inch deep blocks

PROJECT NO.: 051709



FIGURE NO.: 1

LOCK+LOAD WALL STABILITY EVALUATION

Project: Summit Hills (Vista Meadows) - Fill Slope
Location: Lakeview Drive, Alpine, Utah

Job No.: 051709
Date: 4/7/2006
By: WGT

Backfill slope angle, β : 0 degrees
Batter angle (from vertical): -5.71 degrees
Soil/wall interface friction: 19 degrees
Surcharge pressure: 250 psf
Rows of planter blocks: 0 rows
Embedment depth: 1 feet
Total K_a = 0.181
Horizontal K_{ah} = 0.176

Foundation soil γ_t : 135 pcf
Foundation soil ϕ : 40 degrees
Found. soil cohesion: 0 psf
Retained soil γ : 135 pcf
Retained soil ϕ : 38 degrees
FS against sliding: 1.5
FS against overturning: 1.5
FS for bearing: 3.0
Foundation soil δ : 26.67 degrees

Block depth:	30	inches		Average block wall γ:				
						145 pcf		
Wall Ht (ft)	2.67	4.00	5.33	6.67	8.00	9.33	10.67	12.00
P_{ah} (lbs/ft)	130	236	384	574	807	1082	1399	1759
Wall Wt (lbs)	967	1450	1933	2417	2900	3383	3867	4350
Wall $x_{centroid}$	1.38	1.45	1.52	1.58	1.65	1.72	1.78	1.85
$P_{sliding}$	130	236	384	574	807	1082	1399	1759
$P_{resisting}$	693	948	1209	1474	1744	2020	2300	2586
FS_{sliding}	5.3	4.0	3.1	2.6	2.2	1.9	1.6	1.5
$M_{overturn}$	115	314	682	1276	2152	3366	4975	7035
$M_{resisting}$	1465	2230	3060	3954	4913	5936	7023	8175
FS_{overturn}	12.7	7.1	4.5	3.1	2.3	1.8	1.4	1.2
Vertical Load	349	500	637	763	879	985	1084	1176
Soil Capacity	8784	8784	8784	8784	8784	8784	8784	8784
FS_{bearing}	25.1	17.6	13.8	11.5	10.0	8.9	8.1	7.5

Max. Recommended Wall Height: 9.33 feet for 16-inch high by 30-inch deep blocks

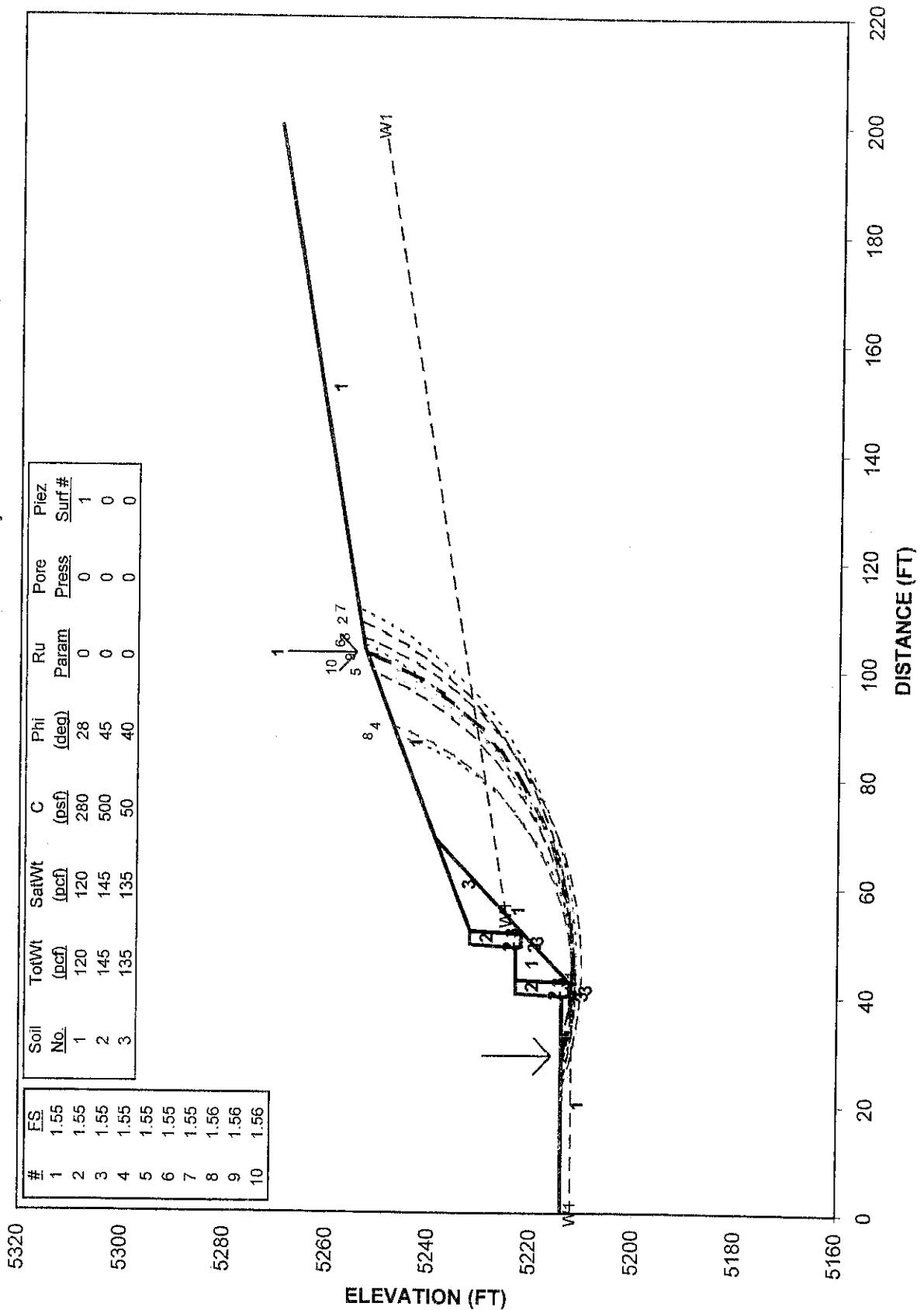
PROJECT NO.: 051709



FIGURE NO.: 2

Lakeview Drive - Stability of Lock+Load Wall in Cut (2 Tiers w/High Backslope)

Ten Most Critical Surfaces. C:051709N.PLT Run By: WGTurner 04-06-06



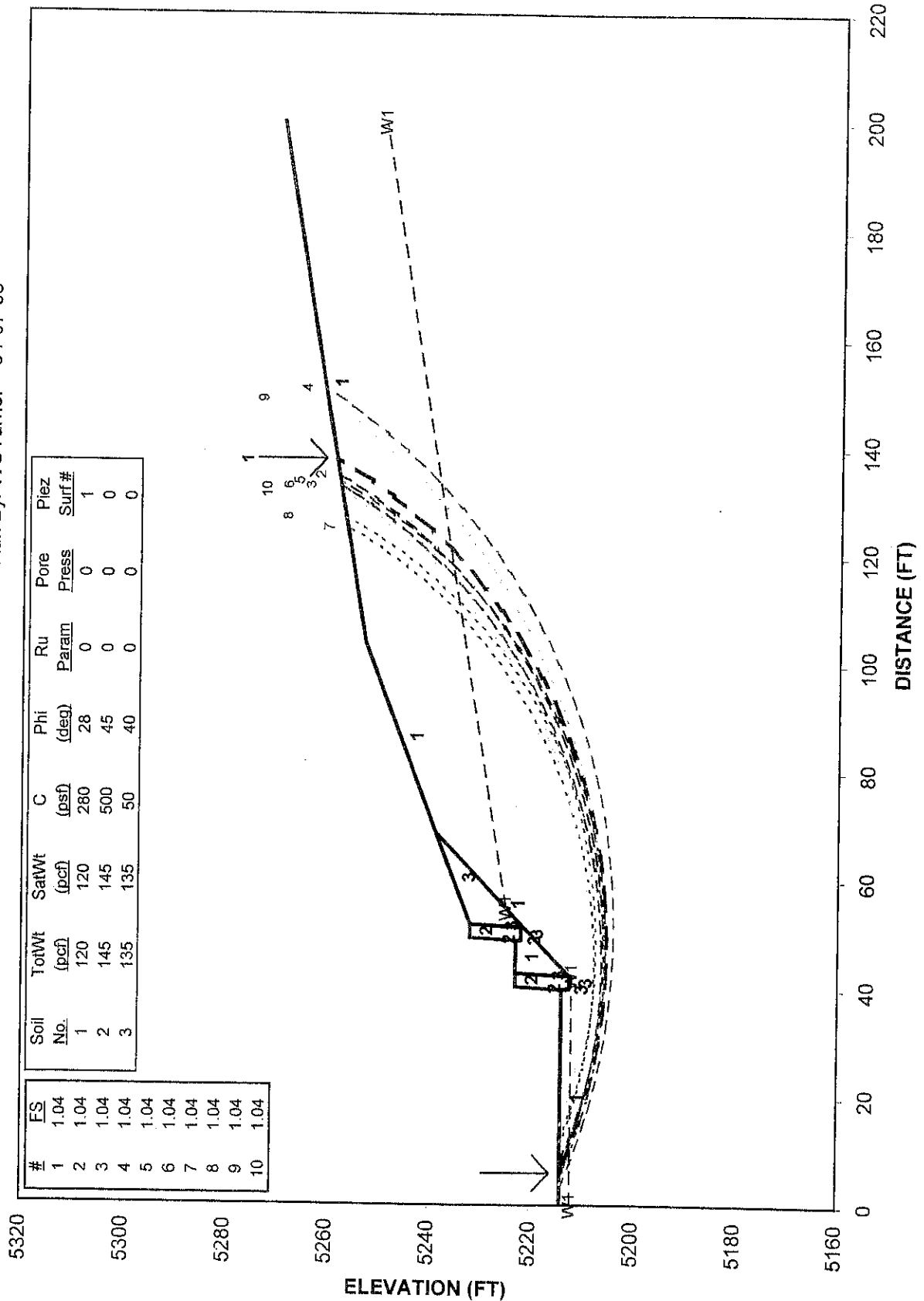
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FIGURE NO.: 3

STABILITY RESULTS

Lakeview Drive - Stability of Lock+Load Wall in Cut (2 Tiers w/Backslope) (Seismic)

Ten Most Critical Surfaces. C:051709NS.PLT Run By: WGTurner 04-07-06



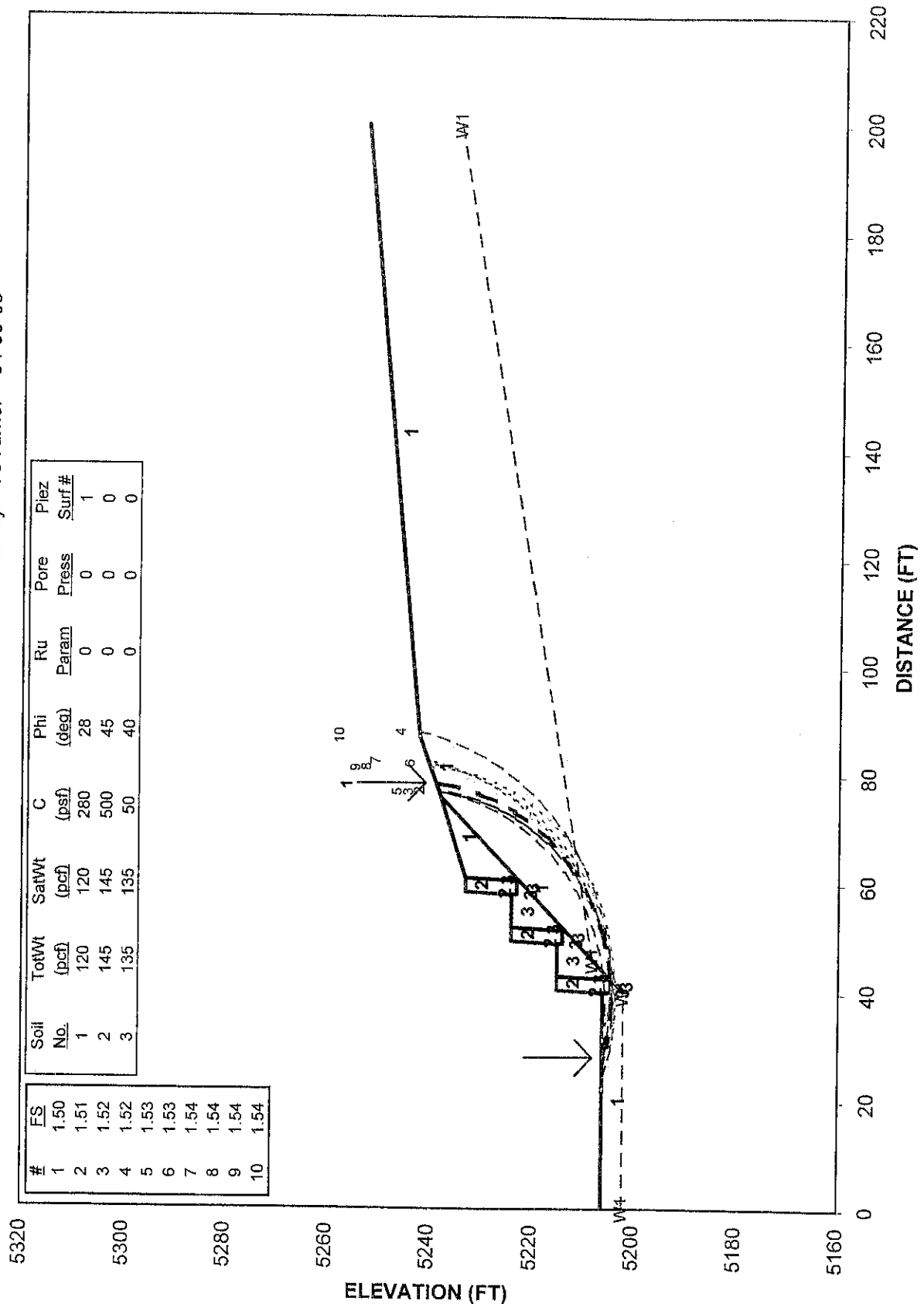
PROJECT NO.: 051709



FIGURE NO.: 4

STABILITY RESULTS

Lakeview Drive - Stability of Lock+Load Wall in Cut (3 Wall Tiers)
 Ten Most Critical Surfaces. C:051709O.PLT Run By: WGTurner 04-06-06



PROJECT NO.: 051709

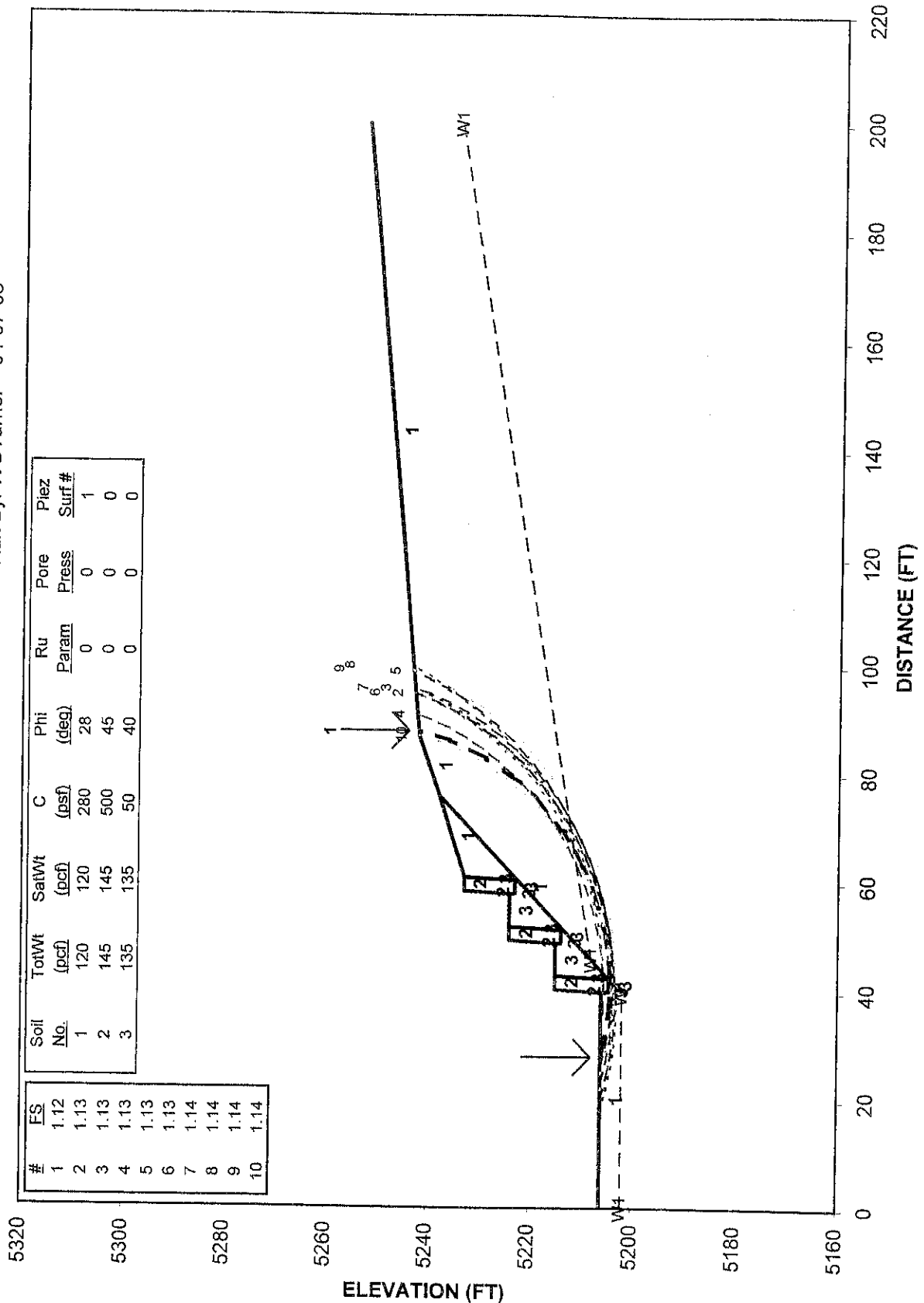


FIGURE NO.: 5

STABILITY RESULTS

Lakeview Drive - Stability of Lock+Load Wall in Cut (3 Wall Tiers) (Seismic)

Ten Most Critical Surfaces. C:051709OS.PLT Run By: WGTurner 04-07-06



PROJECT NO.: 051709

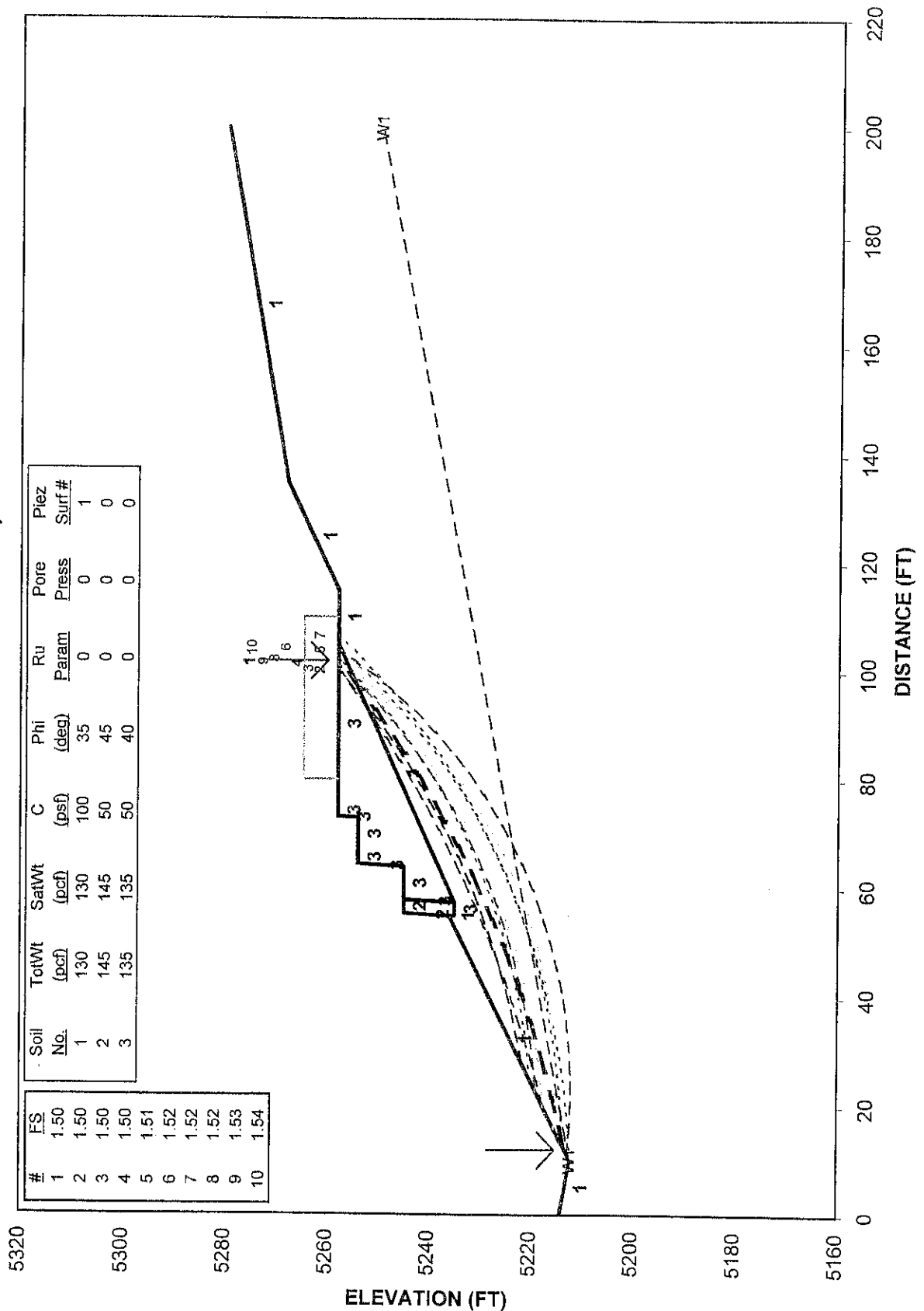


FIGURE NO.: 6

STABILITY RESULTS

Lakeview Drive - Stability of Lock+Load Wall in Fill

Ten Most Critical Surfaces. C:051709P.PLT Run By: WGTurner 04-07-06



PROJECT NO.: 051709

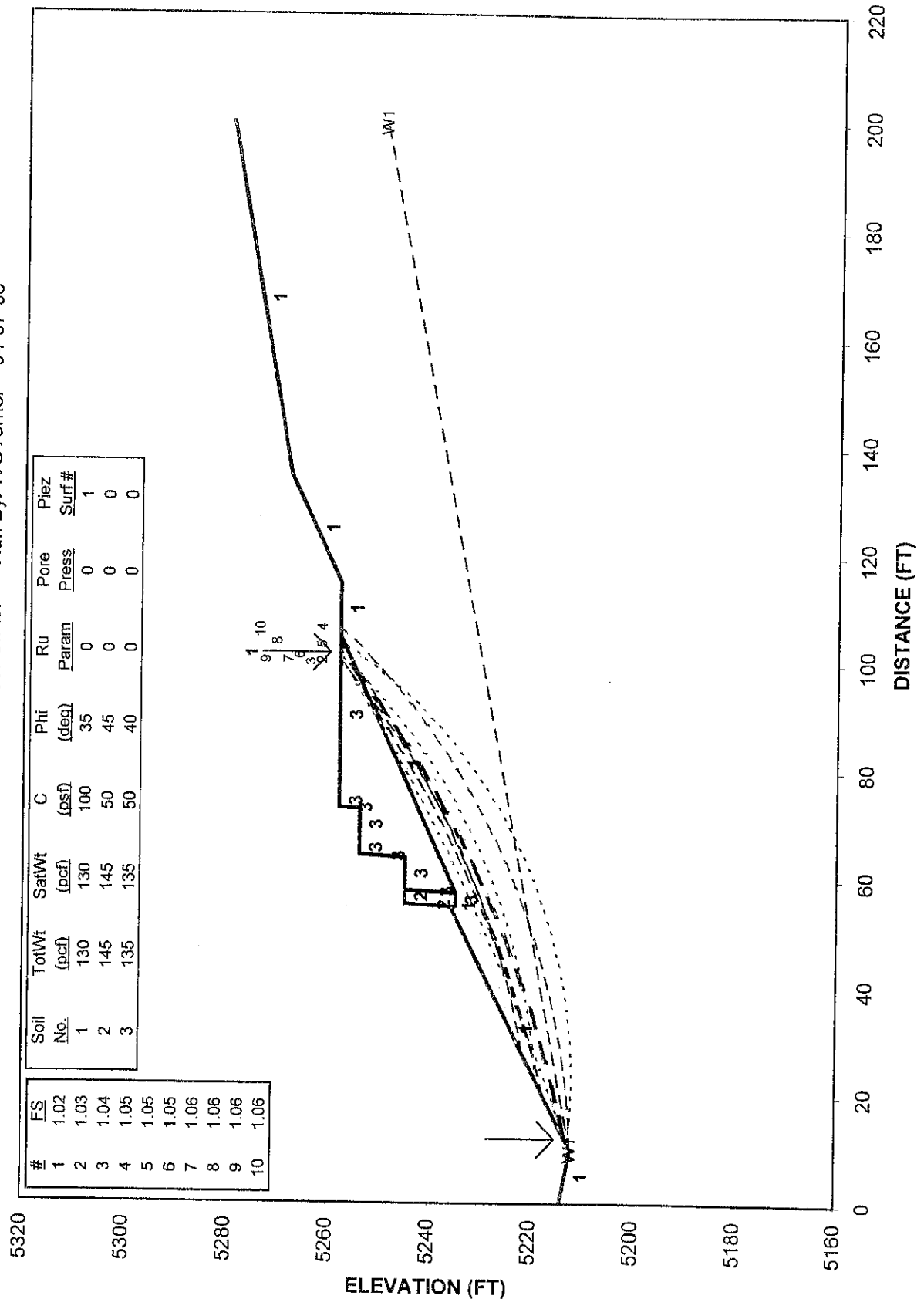
Earthtec
Testing and Engineering, P.C.

FIGURE NO.: 7

STABILITY RESULTS

Lakeview Drive - Stability of Lock+Load Wall in Fill (Seismic)

Ten Most Critical Surfaces. C:051709PS.PLT Run By: WGTurner 04-07-06



PROJECT NO.: 051709

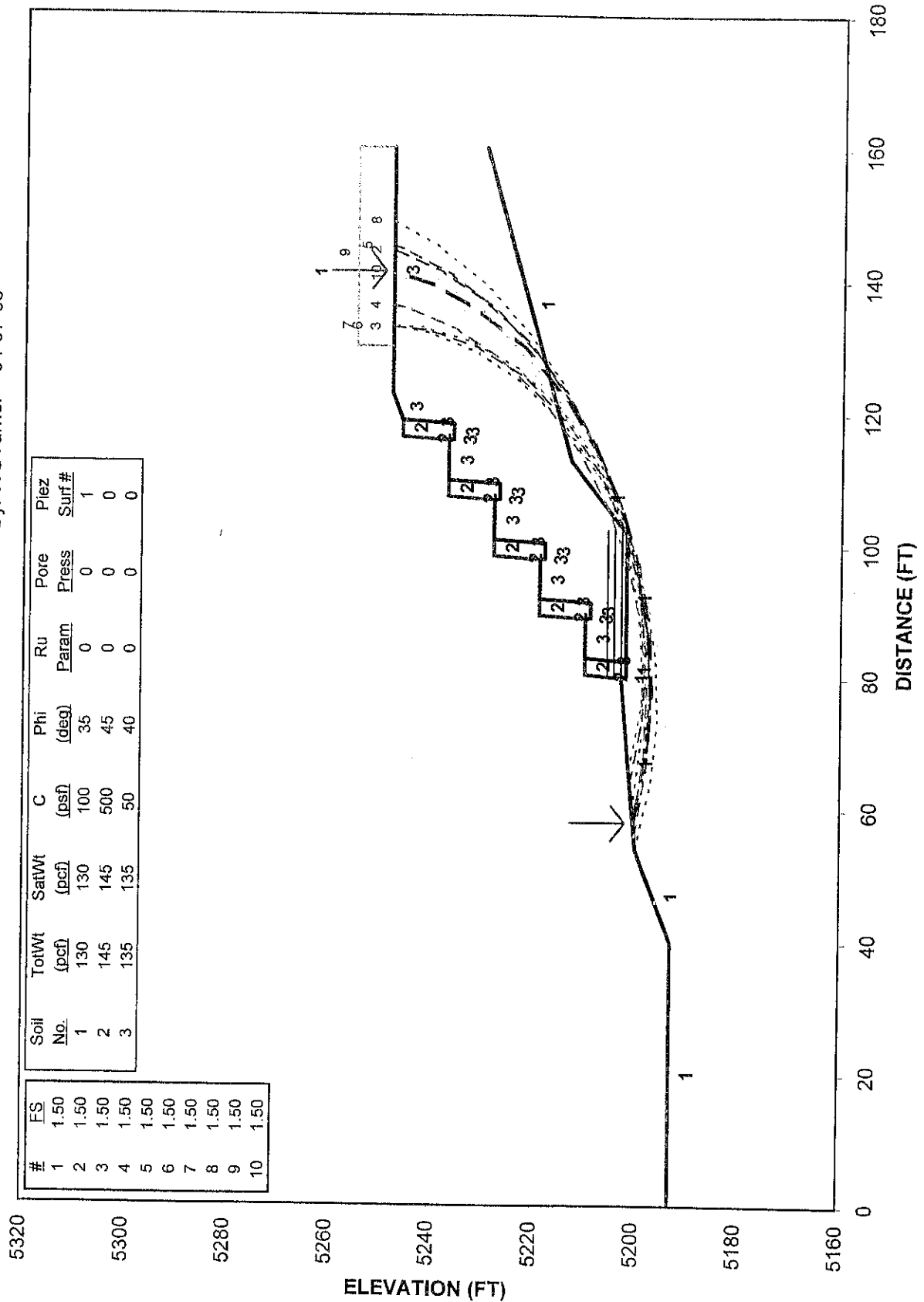


FIGURE NO.: 8

STABILITY RESULTS

Lakeview Dr - Stability of Lock+Load Wall in Fill (East End)

Ten Most Critical Surfaces. C:051709Q.PLT Run By: WGTurner 04-07-06



PROJECT NO.: 051709

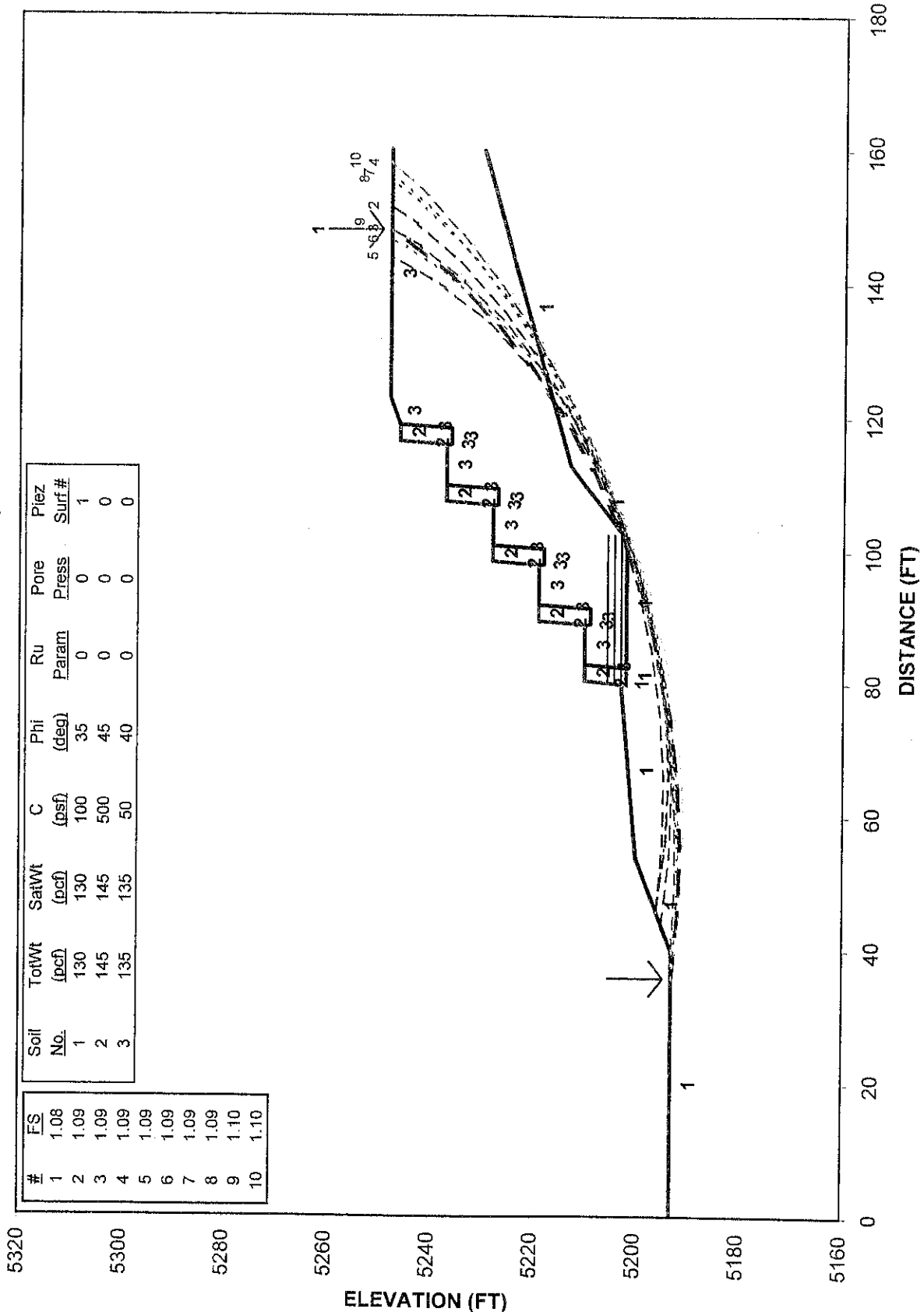


FIGURE NO.: 9

STABILITY RESULTS

Lakeview Dr - Stability of Lock+Load Wall in Fill (East End) (Seismic)

Ten Most Critical Surfaces. C:051709QS.PLT Run By: WGTurner 04-07-06



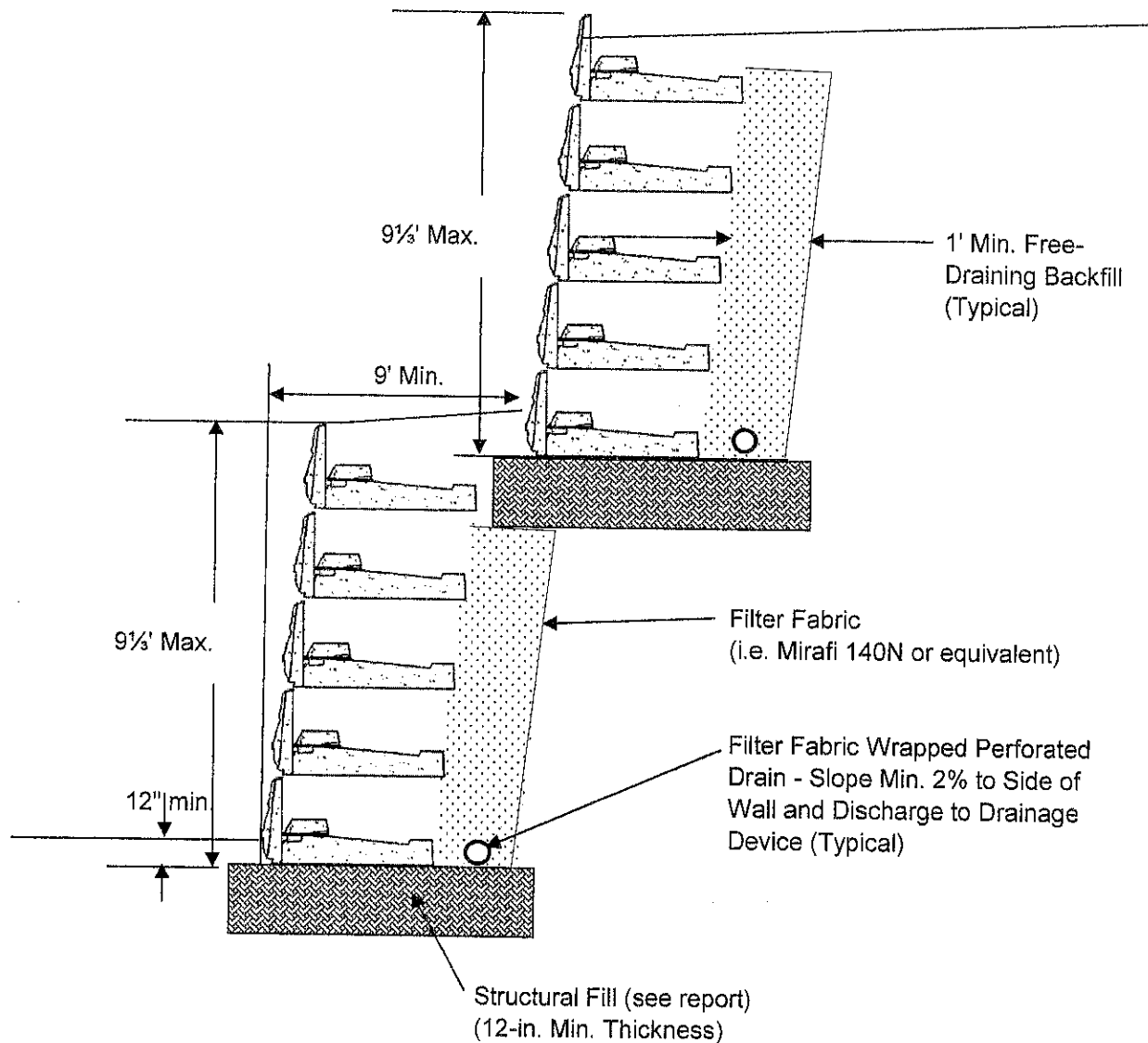
PROJECT NO.: 051709



FIGURE NO.: 10

LOCK+LOAD WALL WITHOUT REINFORCEMENT

PROPOSED LAKEVIEW DRIVE, ALPINE



NOT TO SCALE

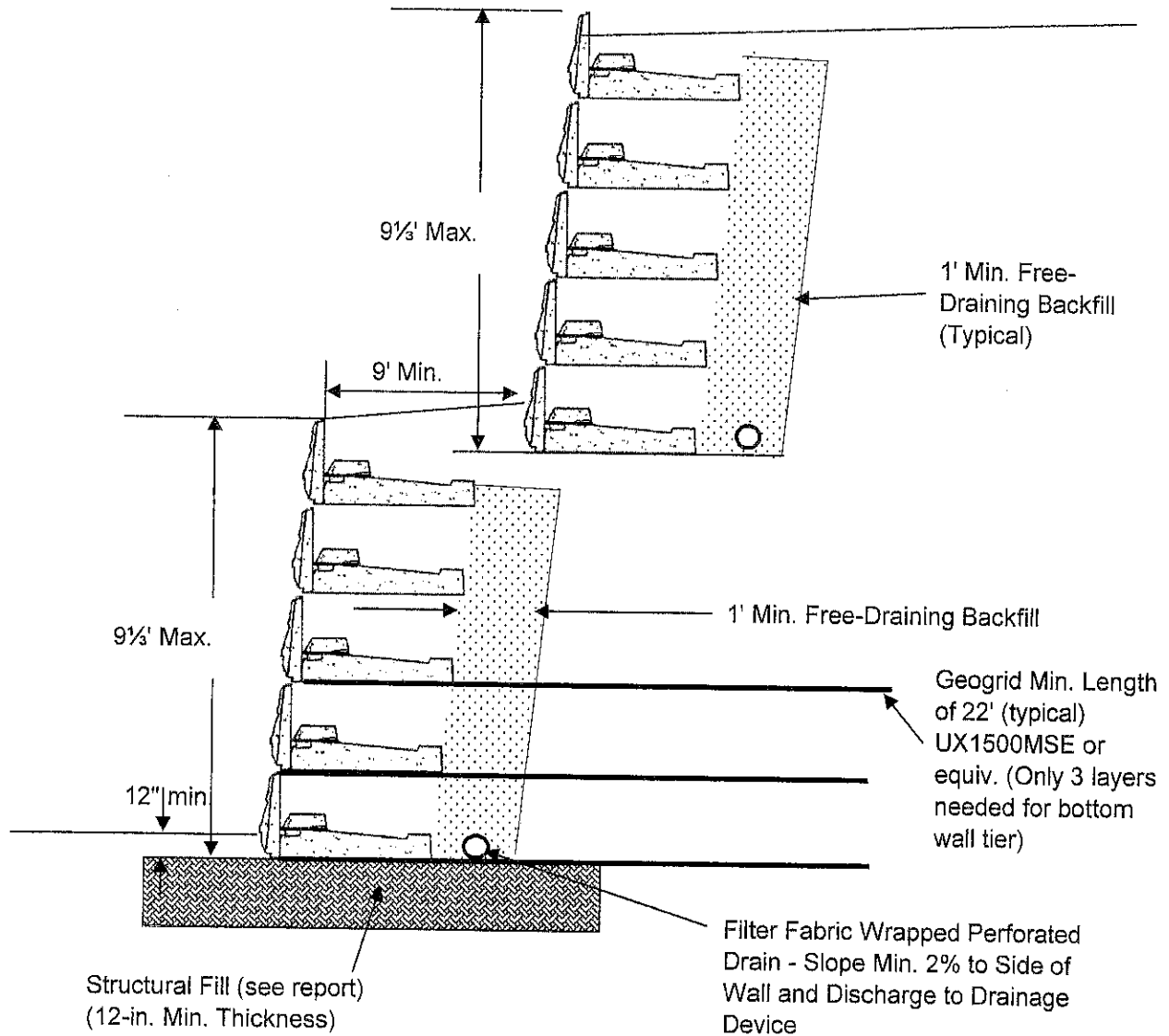
PROJECT NO.: 051709

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FIGURE NO.: 11

LOCK+LOAD WALL WITH REINFORCEMENT

PROPOSED LAKEVIEW DRIVE, ALPINE



NOT TO SCALE

PROJECT NO.: 051709

Earthtec
Testing and Engineering, P.C.

FIGURE NO.: 12



Earthtec Testing & Engineering, P.C.

133 North 1330 West
Orem, Utah - 84057
Phone (801) 225-5711
Fax (801) 225-3363

1596 W. 2650 S. #108
Ogden, Utah - 84401
Phone (801) 399-9516
Fax (801) 399-9842

February 5, 2007

Mr. Taylor Smith
c/o Sowby & Berg Consultants
45 North 490 West
American Fork, UT 84003

**Subject: Supplemental Wall Recommendations
Proposed Lakeview Drive
Vista Meadows
Alpine, Utah
Job No. 051709**

Dear Mr. Smith:

As you requested, we have evaluated the possibility of reducing the number of tiers for the proposed retaining walls within the Vista Meadows Subdivision. We previously provided retaining wall recommendations¹ and associated information^{2,3} for the proposed Lakeview Drive at the subject site.

The biggest change in the number of wall tiers that can be made is the Lock+Load walls, particularly the large fill to be constructed between street Stations 24+00 and 26+00. In this area, at least 47± feet of fill will be placed above the existing ground surface. We analyzed this scenario by evaluating the Lock+Load walls using the same strength parameters and methodologies presented in our referenced reports. The initial results of our *MSEW* analysis indicated that the geogrid would need to extend behind the walls as much as 40 feet or more, which would require overlapping the geogrid since the distance between the upper half of the walls would only be about 55 feet. Therefore, we analyzed the walls in this area as back-to-back walls where the geogrid would extend entirely from one wall to the other wall. The results of our *MSEW* analysis indicated that a single-tier wall can be used up to a retained height of 30 feet, and a double-tier wall can be used up to a retained height of about 50 feet, with the lower wall tier embedment about 10% of the wall height. The horizontal separation between the two wall tiers would need to be a minimum of 10 feet (a geogrid length of about 75 feet between each lower wall tier) in order to provide adequate factors of safety against pullout failure. Results of the *PCSTBL6* analysis indicate minimum factors of safety greater than

¹Retaining Wall Recommendations, Proposed Lakeview Drive, Summit Hills (Vista Meadows), Alpine, Utah, Job No. 051709, April 19, 2006.

²Response to Review, Proposed Lakeview Drive, Summit Hills (Vista Meadows), Alpine, Utah, Job No. 051709, October 3, 2006.

³Response to 2nd TGE Review, Proposed Lakeview Drive, Vista Meadows (was Summit Hills), Alpine, Utah, Job No. 051709, November 3, 2006.

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1.5 for static conditions and 1.1 for seismic conditions (even without modeling all the geogrid layers).

We also analyzed a section of Lock+Load wall on the south side of the street, just south of Lot 16, which was shown as a three-tiered wall. A single-tier wall at this location is possible and will shorten the wall height. However, our initial results of the *PCSTBL6* analysis for this wall using the spacing and lengths obtained from *MSEW* resulted in factors of safety less than the required minimums. Our analyses indicated that four layers of geogrid spaced about one block height apart, starting at the lowest block, would need to extend beneath most of the roadway (approximately 45 feet) in order to provide the required minimum factors of safety. This may require more over-excavation than using two or more tiers.

Stability analysis results for both areas are shown on the attached Figures 1 through 4 and in the Appendix. Cross-sections with recommended geogrid lengths are also shown on Figures 5 through 7, attached. For the Lock+Load walls, Tensar UX1700MSE geogrid or equivalent is recommended for the reinforcement. The geogrid should be placed at mid-height of the Lock+Load blocks as shown on the attached figures.

All other recommendations presented in our October 3, 2006 report, unless specifically superseded herein, remain valid.

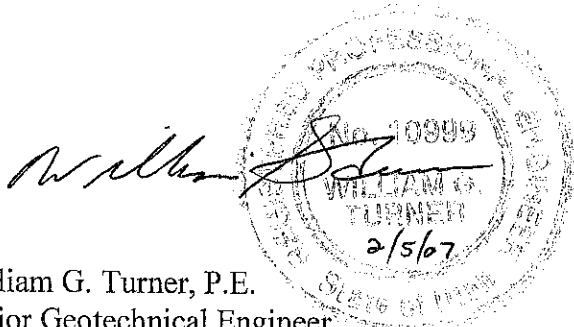
Closure

This letter is considered an addendum to our referenced report and is subject to the same conditions and limitations presented therein. We appreciate the opportunity of providing our services on this project. If we can answer questions or be of further service, please call.

Respectfully;

EARTHTEC TESTING AND ENGINEERING, P.C.

William G. Turner, P.E.
Senior Geotechnical Engineer

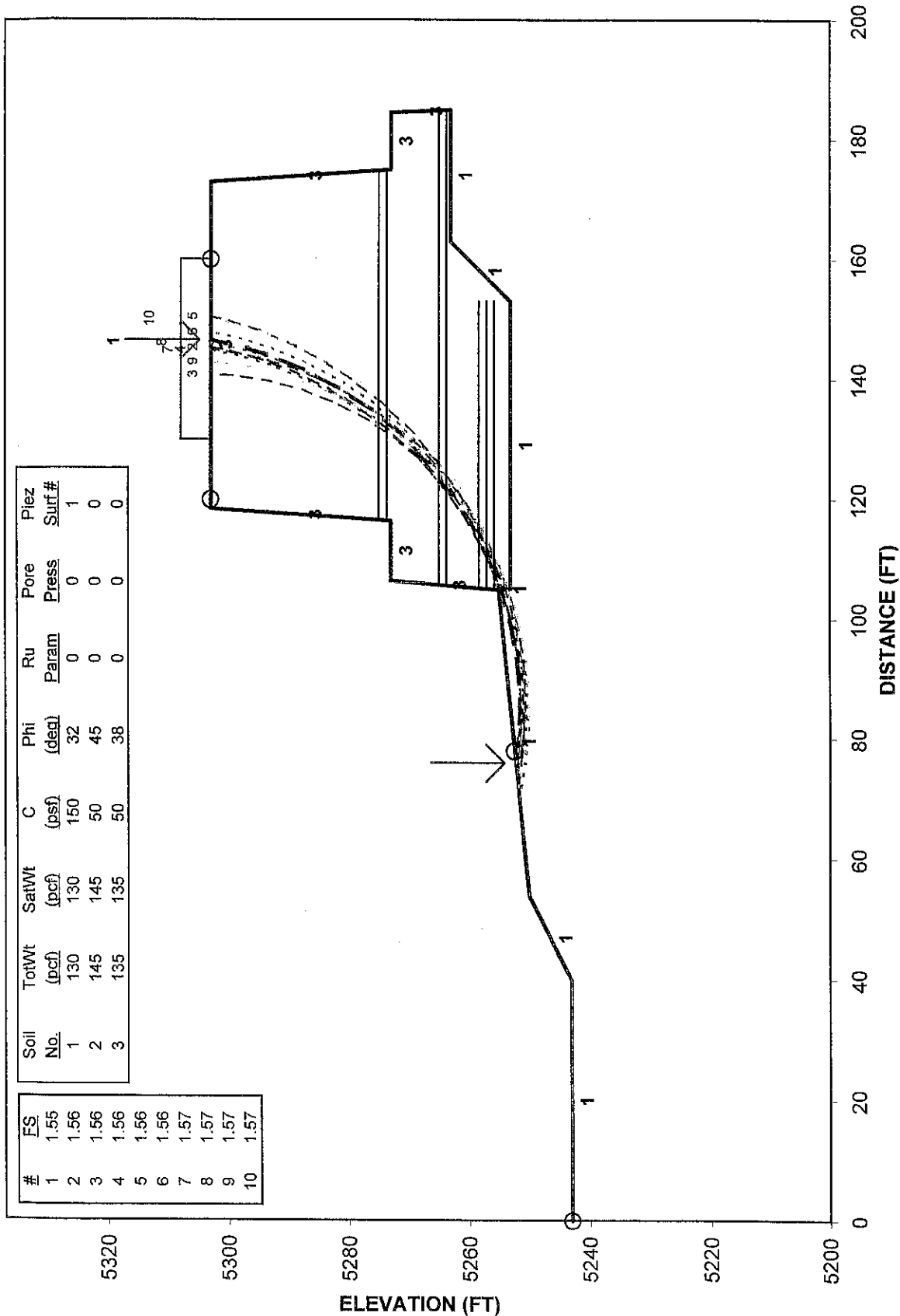


Attachments: Figures 1-4, Stability Results
Figure 5, Lock+Load Wall Design With Geogrid (Back-to-Back Walls)
Figure 6, Lock+Load Wall Design With Geogrid (S. Side of Lakeview Drive)
Appendix: *MSEW* Output Data (12 sheets)

STABILITY RESULTS

Lakeview Dr - Stability of Lock+Load Wall in High Fill (East End)

Ten Most Critical Surfaces. C:051709W.PLT Run By: WGTurner 02-05-07



PROJECT NO.: 051709

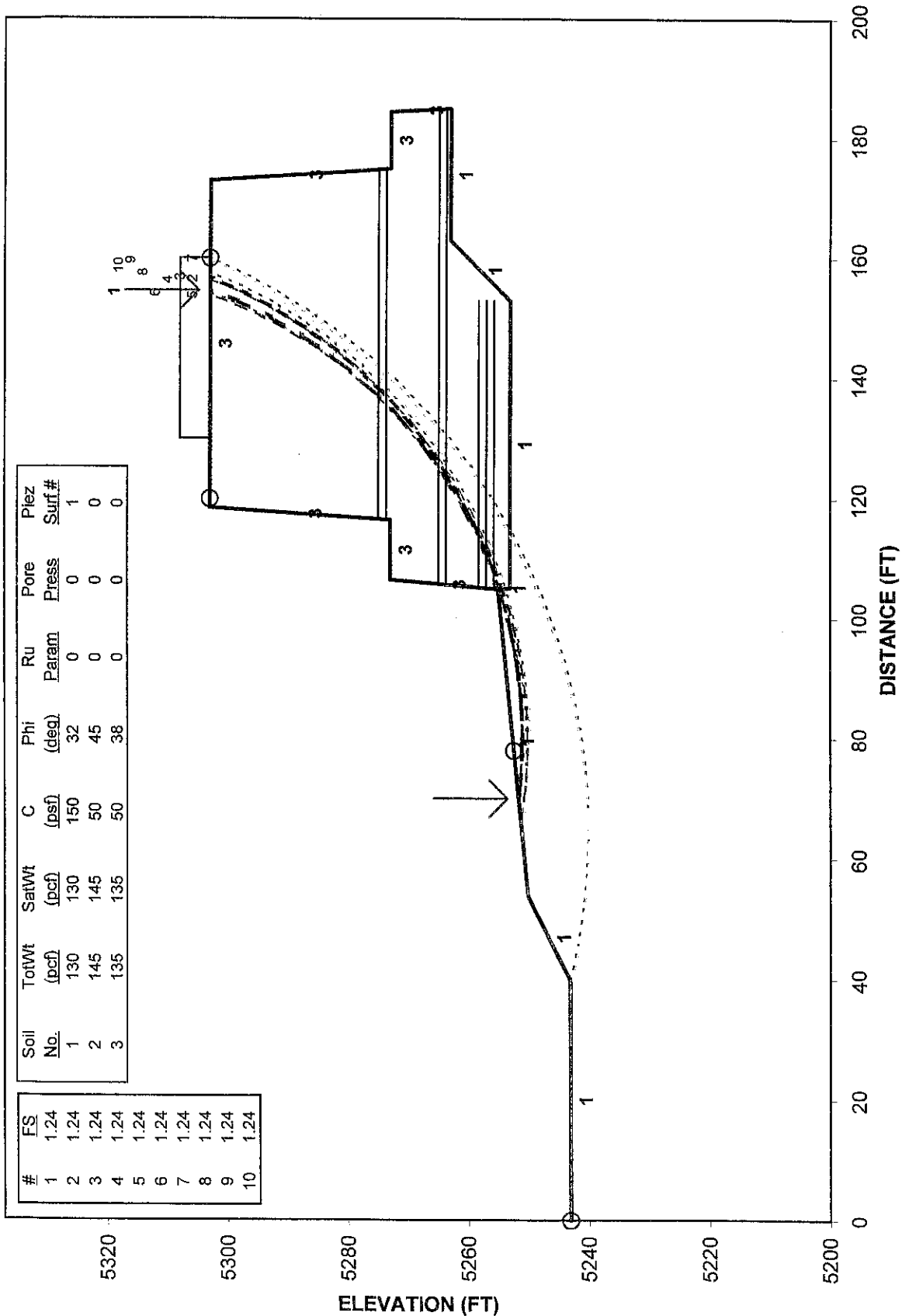


FIGURE NO.: 1

STABILITY RESULTS

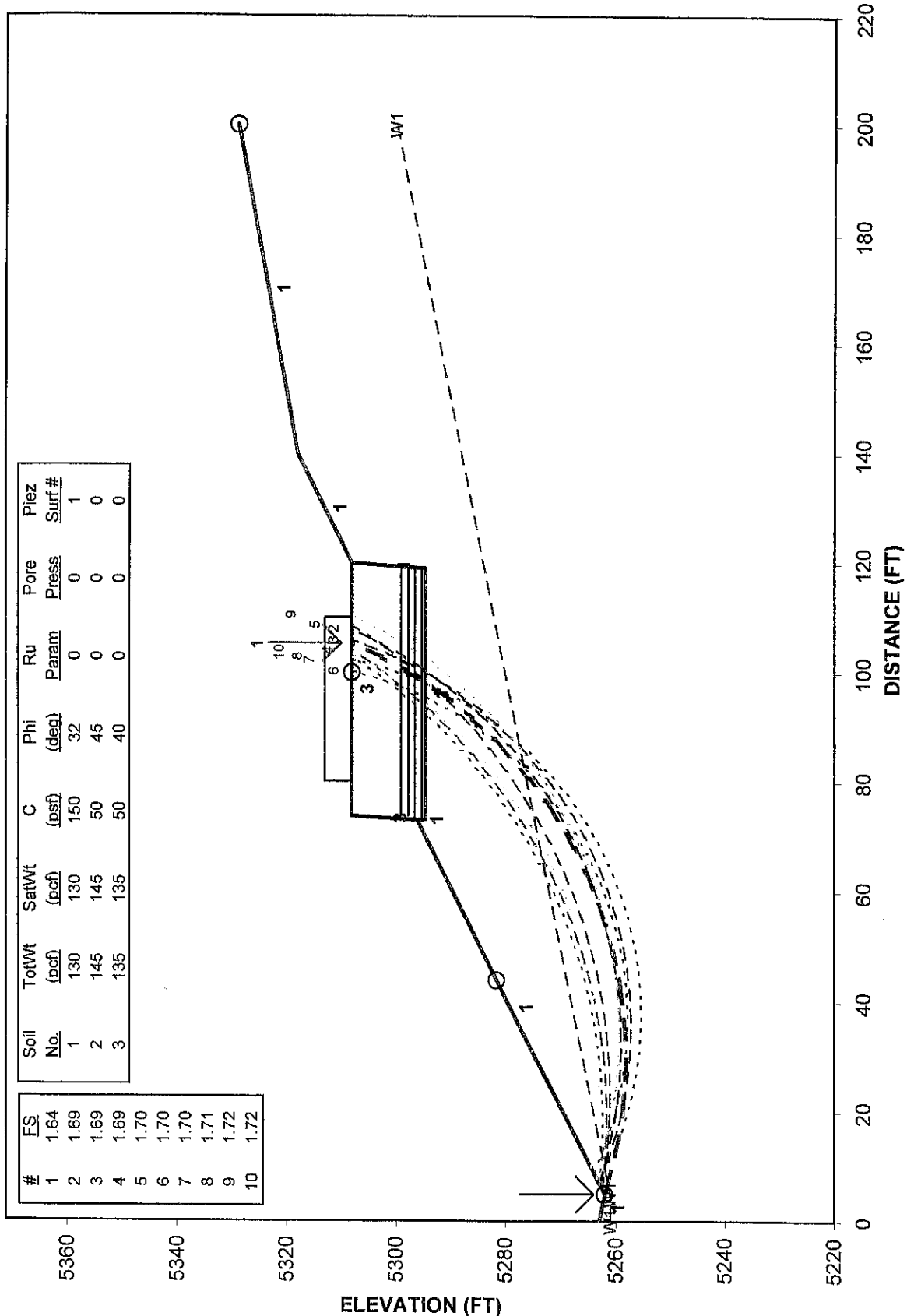
Lakeview Dr - Stability of Lock+Load Wall in High Fill (East End) (Seismic)

Ten Most Critical Surfaces. C:051709WS.PLT Run By: WGTurner 02-05-07



STABILITY RESULTS

Lakeview Drive - Stability of Lock+Load Wall in Fill Placed on Slope
 Ten Most Critical Surfaces. C:051709V.PLT Run By: WGTurner 02-05-07



PROJECT NO.: 051709

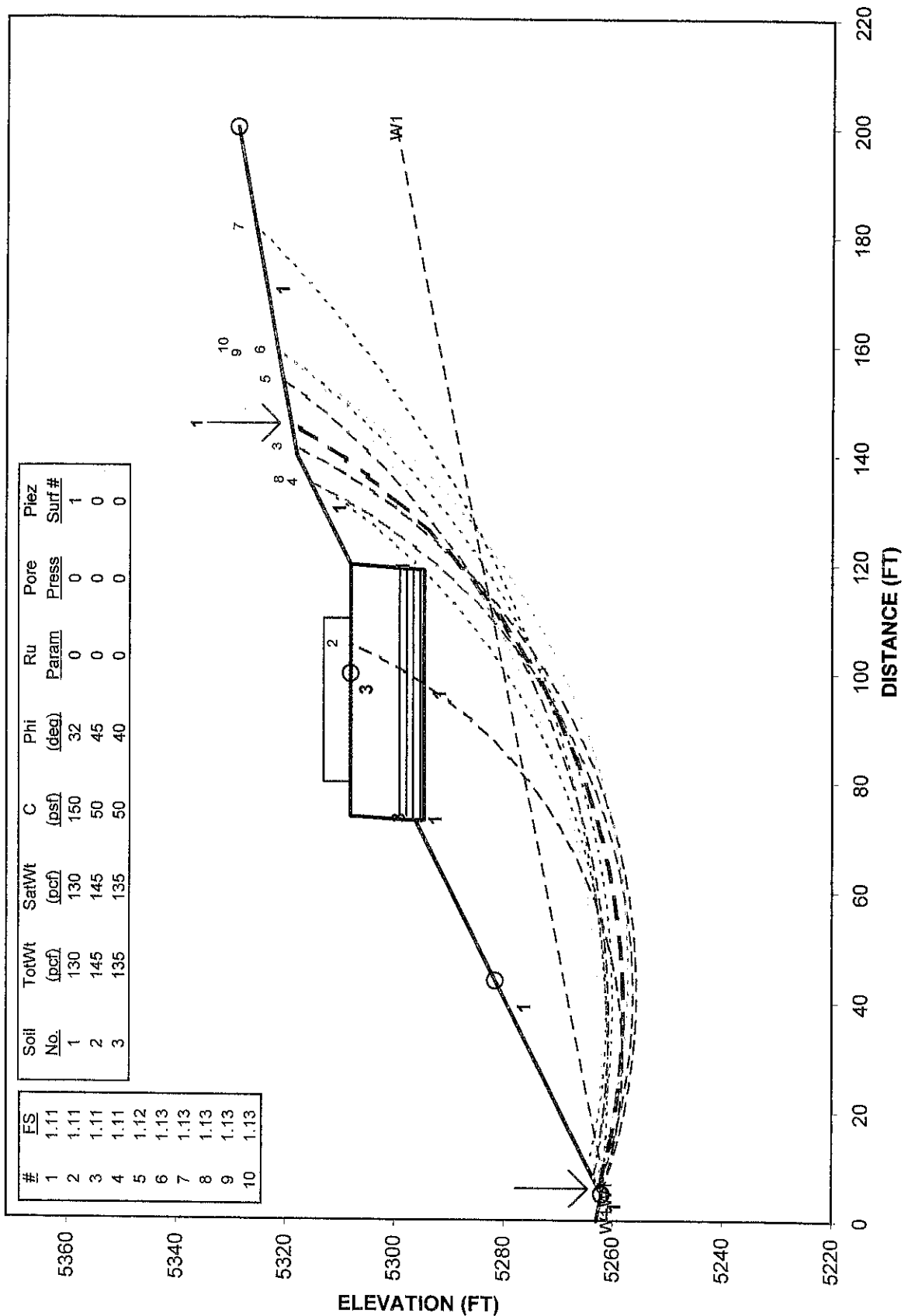


FIGURE NO.: 3

STABILITY RESULTS

Lakeview Drive - Stability of Lock+Load Wall in Fill Placed on Slope (Seismic)

Ten Most Critical Surfaces: C:051709VS.PLT Run By: WGTurner 02-05-07



PROJECT NO.: 051709



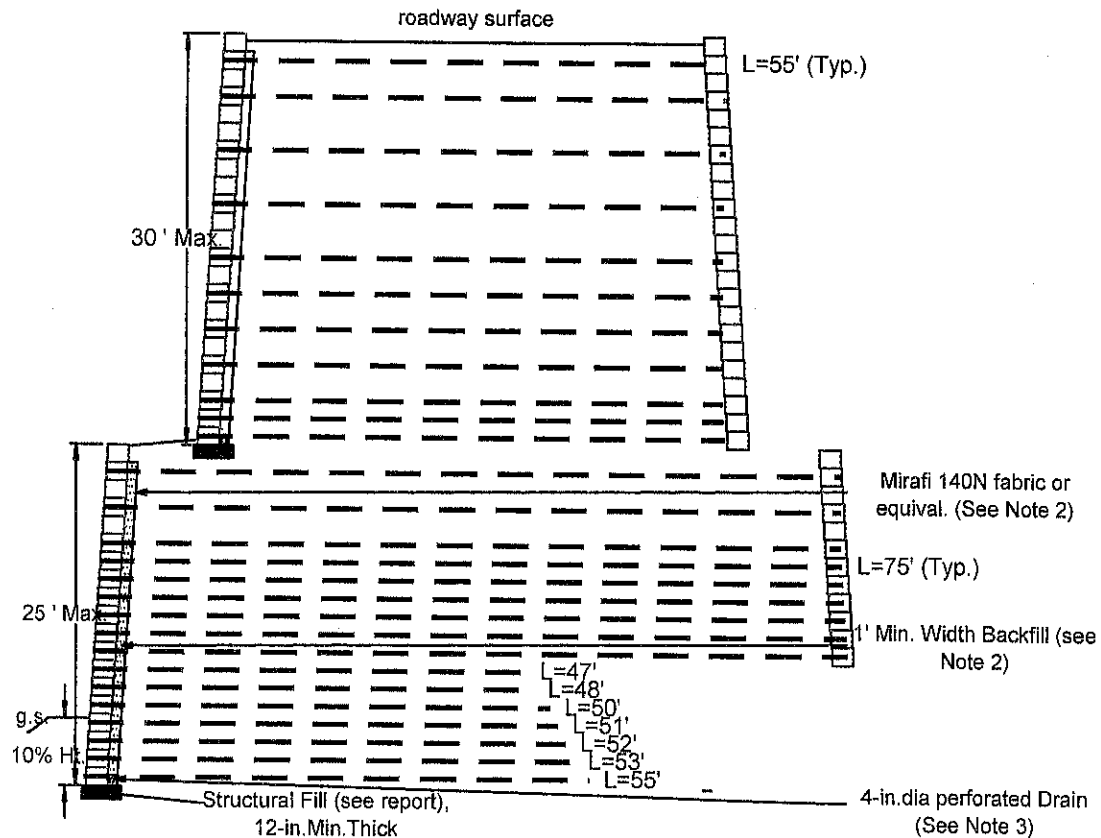
FIGURE NO.: 4

LOCK+LOAD WALL DESIGN WITH GEOGRID

BACK-TO-BACK WALLS, VISTA MEADOWS, ALPINE

NOTES:

1. BACKFILL SOILS SHOULD BE PLACED IN LOOSE LIFTS NOT EXCEEDING A THICKNESS OF 12 INCHES, MOISTURE CONDITIONED TO WITHIN 2% OF OPTIMUM, AND COMPACTED TO A MINIMUM 90% OF THE MAXIMUM DRY DENSITY AS DETERMINED BY ASTM D1557.
2. FREE-DRAINING BACKFILL SHALL CONSIST OF GRAVEL HAVING LESS THAN 5% PASSING No. 200 SIEVE, OR MAY USE MIRADRAIN (OR EQUIVALENT) INSTEAD OF GRAVEL & FABRIC.
3. PERFORATED DRAIN SHALL BE WRAPPED WITH FABRIC, SLOPED A MINIMUM 2% TO SIDE OF WALL, AND DISCHARGED TO APPROPRIATE DRAINAGE DEVICE.
4. FOR LOWER GEOGRID LAYERS WHERE BOTH WALLS DO NOT EXTEND TO THE SAME DEPTH, THE MINIMUM GEOGRID LENGTH SHALL BE THE HEIGHT OF WALL ABOVE THAT LAYER.



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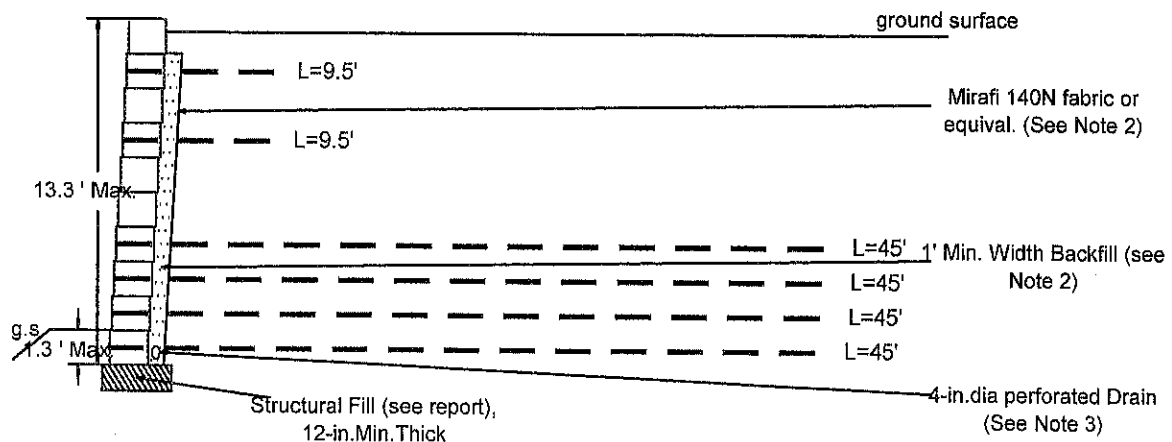
FIGURE NO.: 5

LOCK+LOAD WALL DESIGN WITH GEOGRID

SOUTH SIDE OF LAKEVIEW DRIVE, VISTA MEADOWS, ALPINE

NOTES:

1. BACKFILL SOILS SHOULD BE PLACED IN LOOSE LIFTS NOT EXCEEDING A THICKNESS OF 12 INCHES, MOISTURE CONDITIONED TO WITHIN 2% OF OPTIMUM, AND COMPACTED TO A MINIMUM 90% OF THE MAXIMUM DRY DENSITY AS DETERMINED BY ASTM D1557.
2. FREE-DRAINING BACKFILL SHALL CONSIST OF GRAVEL HAVING LESS THAN 5% PASSING No. 200 SIEVE, OR MAY USE MIRADRAIN (OR EQUIVALENT) INSTEAD OF GRAVEL & FABRIC.
3. PERFORATED DRAIN SHALL BE WRAPPED WITH FABRIC, SLOPED A MINIMUM 2% TO SIDE OF WALL, AND DISCHARGED TO APPROPRIATE DRAINAGE DEVICE.



NOT TO SCALE

PROJECT NO.: 051709

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FIGURE NO.: 6

APPENDIX

MSEW OUTPUT DATA

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ICBO ~ ACI ~ AWS

AASHTO DESIGN METHOD

Lakeview Drive Vista Meadows Subdivision

PROJECT IDENTIFICATION

Title: Lakeview Drive Vista Meadows Subdivision
Project Number: 051709
Client: Taylor Smith
Designer: WGTurner
Station Number:

Description:

Company's information:

Name: Earthtec Testing & Engineering, P.C.
Street: 133 N. 1330 W.

Orem, UT 84057
Telephone #: 801-225-5711
Fax #: 801-225-3363
E-Mail: bgt@earthtectesting.com

Original file path and name: Y:\2005\051709 Lakeview Drive Walls & Summit Hills Subd.....
Original date and time of creating this file: Mon Oct 02 14:49:36 2006

PROGRAM MODE:

DESIGN
of BACK to BACK WALL
using GEOGRID as reinforcing material.

DESIGN DATA**DESIGN OBJECTIVES**

Minimum factor of safety against pullout, F_{s-po}	1.50
Minimum factor of safety against direct sliding, $F_{s-sliding}$	1.50
Maximum allowable eccentricity ratio at each reinforcement level, e/L	0.1667
Minimum factor of safety against compound and overall failure, $F_{s-comp-static}$	1.30
Minimum factor of safety against compound and overall failure, $F_{s-comp-seismic}$	1.10

Prescribed minimum resistive length to prevent pullout, $L_e = 15.00$ ft.

Prescribed minimum normalized length of each layer is: $L/H_d = 0.70 \rightarrow L = 21.93$ ft.

Prescribed minimum absolute total length of each layer is: $L = 15.00$ ft.

BEARING CAPACITY

Bearing capacity is controlled by general shear.

Maximum permissible eccentricity ratio (soil), e/L

Minimum factor of safety with respect to ultimate bearing capacity (Meyerhof approach) 2.50

Bearing capacity coefficients: $N_c = 35.49$ $N_\gamma = 30.21$

SOIL DATA**REINFORCED SOIL**

Unit weight, γ	135.0 lb/ft ³
Design value of internal angle of friction, ϕ	40.0°

RETAINED SOIL

Unit weight, γ	130.0 lb/ft ³
Design value of internal angle of friction, ϕ	32.0°

FOUNDATION SOIL (Considered as an equivalent uniform soil)

Equivalent unit weight, γ_{equiv}	130.0 lb/ft ³
Equivalent internal angle of friction, ϕ_{equiv}	32.0°
Equivalent cohesion, c_{equiv}	150.0 lb/ft ²

Water table does not affect bearing capacity

LATERAL EARTH PRESSURE COEFFICIENTS

K_a (internal stability) = 0.2174 (if batter is less than 10°, K_a is calculated from eq. 15. Otherwise, eq. 38 is utilized)

Inclination of internal slip plane, $\psi = 65.00^\circ$ (see Fig. 28 in DEMO 82).

K_a (external stability) = 0.3073 (if batter is less than 10°, K_a is calculated from eq. 16. Otherwise, eq. 17 is utilized)

SEISMICITY

Maximum ground acceleration coefficient, $\alpha_o = 0.420$

$K_{ae} (\alpha_o > 0) = 0.6932$

$K_{ae} (\alpha_o = 0) = 0.3073$

$\Delta K_{ae} = 0.3859$ (see eq. 37 in DEMO 82)

DIRECT SLIDING / ECCENTRICITY

Seismic safety factor is 67.0% of specified static FS for direct sliding.

Maximum allowable eccentricity, e/L , under seismic conditions is: 0.3300

BEARING CAPACITY

Seismic safety factor is 67.0% of specified static FS for bearing capacity.

Maximum allowable eccentricity, e/L , under seismic conditions is: 0.3300

INTERNAL STABILITY

Seismic soil-geogrid friction coefficient, F^* is 100.0% of its specified static value.

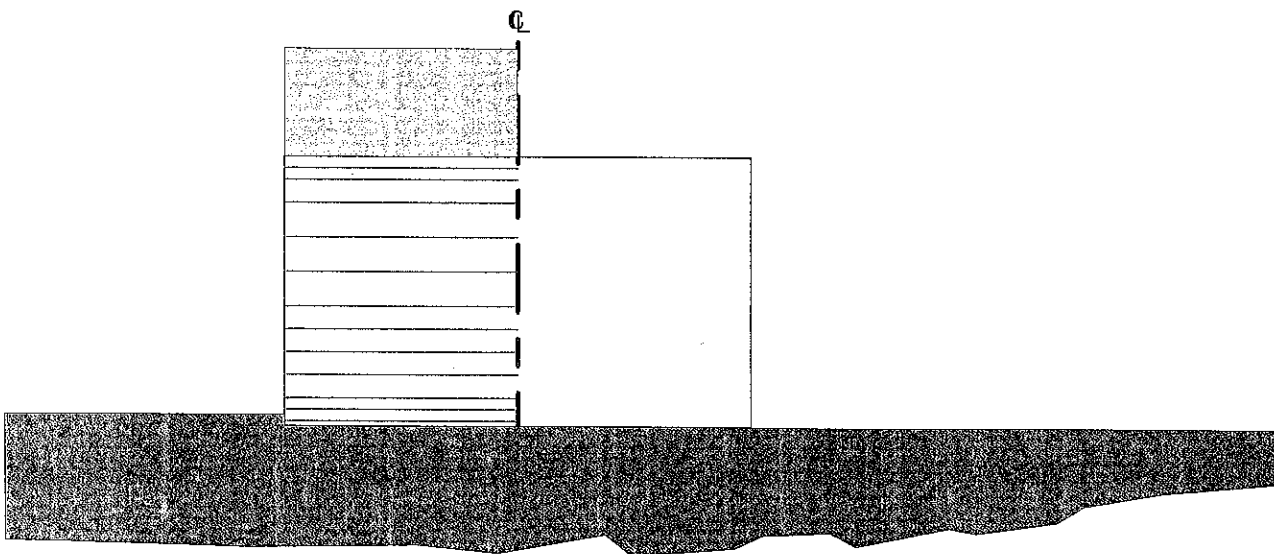
Seismic factor of safety against pullout, F_{s-po} , is 67.0% of its specified static value.

Seismic overall factor of safety, $F_{s-overall}$, is 67.0% of its specified static value.

The reduction of $F_{s-overall}$ pertains to geogrid strength and to connection strength for both break and pullout modes of failure.

Uniformly distributed dead load is 250.0 [lb/ft²]

DESIGNED REINFORCEMENT LAYOUT:



SCALE:

0 5 10 15 20 25 30 [ft]

DESIGN: CALCULATED FACTORS (Static conditions)

Bearing capacity, $F_s = 13.25$, Meyerhof stress = 4480 lb/ft².
 Foundation Interface: Direct sliding, $F_s = 11836298.304$, Eccentricity, $e/L = 0.0000$, F_s -overturning = 94684599.46

GEOGRID				CONNECTION			Geogrid strength F_s	Pullout resistance F_s	Direct sliding F_s	Eccentricity e/L	Product name
#	Elevation [ft]	Length [ft]	Type #	F_s -overall [pullout resistance]	F_s -overall [connection break]	F_s -overall [geogrid strength]					
1	0.67	27.50	1	4.03	4.03	4.03	4.034	100.553	6878655.21	0.0000	UX1700MSE
2	2.00	27.50	1	4.22	4.22	4.22	4.222	98.648	6597262.09	0.0000	UX1700MSE
3	3.33	27.50	1	2.97	2.97	2.97	2.966	64.805	6315868.97	0.0000	UX1700MSE
4	6.00	27.50	1	2.41	2.41	2.41	2.413	45.698	5750967.00	0.0000	UX1700MSE
5	8.67	27.50	1	2.68	2.68	2.68	2.680	43.456	5186065.03	0.0000	UX1700MSE
6	11.33	27.50	1	3.01	3.01	3.01	3.007	41.179	4623278.79	0.0000	UX1700MSE
7	14.00	27.50	1	2.79	2.79	2.79	2.785	31.609	4058376.82	0.0000	UX1700MSE
8	18.00	27.50	1	2.88	2.88	2.88	2.883	23.588	3212081.73	0.0000	UX1700MSE
9	22.00	27.50	1	3.91	3.91	3.91	3.915	21.279	2365786.64	0.0000	UX1700MSE
10	26.00	27.50	1	6.95	6.99	6.99	6.987	21.759	1519491.55	0.0000	UX1700MSE
11	28.67	27.50	1	8.97	18.06	18.06	18.063	32.480	954589.58	0.0000	UX1700MSE
12	30.00	27.50	1	7.65	30.80	30.80	30.803	37.329	673196.46	0.0000	UX1700MSE

DESIGN: CALCULATED FACTORS (Seismic conditions)

Bearing capacity, $F_s = 7.39$, Meyerhof stress = 6095 lb/ft².
 Foundation Interface: Direct sliding, $F_s = 2.830$, Eccentricity, $e/L = 0.1325$, F_s -overturning = 3.77

GEOGRID				CONNECTION			Geogrid strength F_s	Pullout resistance F_s	Direct sliding F_s	Eccentricity e/L	Product name
#	Elevation [ft]	Length [ft]	Type #	F_s -overall [pullout resistance]	F_s -overall [connection break]	F_s -overall [geogrid strength]					
1	0.67	27.50	1	1.51	1.89	1.89	1.886	47.013	1.717	0.1268	UX1700MSE
2	2.00	27.50	1	1.56	1.95	1.95	1.950	45.570	1.800	0.1157	UX1700MSE
3	3.33	27.50	1	1.32	1.65	1.65	1.649	36.019	1.890	0.1052	UX1700MSE
4	6.00	27.50	1	1.19	1.49	1.49	1.490	28.228	2.103	0.0855	UX1700MSE
5	8.67	27.50	1	1.30	1.62	1.62	1.622	26.292	2.370	0.0679	UX1700MSE
6	11.33	27.50	1	1.42	1.78	1.78	1.775	24.313	2.712	0.0524	UX1700MSE
7	14.00	27.50	1	1.39	1.73	1.73	1.734	19.675	3.171	0.0388	UX1700MSE
8	18.00	27.50	1	1.47	1.83	1.83	1.834	15.004	4.242	0.0223	UX1700MSE
9	22.00	27.50	1	1.84	2.30	2.30	2.302	12.510	6.377	0.0104	UX1700MSE
10	26.00	27.50	1	2.63	3.30	3.30	3.303	10.285	12.551	0.0030	UX1700MSE
11	28.67	27.50	1	1.97	4.95	4.95	4.948	8.898	31.657	0.0006	UX1700MSE
12	30.00	27.50	1	1.15	5.79	5.79	5.788	7.015	89.302	0.0001	UX1700MSE

AASHTO DESIGN METHOD

Lakeview Drive Vista Meadows Subdivision

PROJECT IDENTIFICATION

Title: Lakeview Drive Vista Meadows Subdivision
Project Number: 051709
Client: Taylor Smith
Designer: WGTurner
Station Number:

Description:

Company's information:

Name: Earthtec Testing & Engineering, P.C.
Street: 133 N. 1330 W.

Orem, UT 84057
Telephone #: 801-225-5711
Fax #: 801-225-3363
E-Mail: bgt@earthtectesting.com

Original file path and name: Y:\2005\051709 Lakeview Drive Walls & Summit Hills Subd.....
Original date and time of creating this file: Mon Oct 02 14:49:36 2006

PROGRAM MODE:

DESIGN
of BACK to BACK WALL
using GEOGRID as reinforcing material.

DESIGN DATA**DESIGN OBJECTIVES**

Minimum factor of safety against pullout, F_s -po	1.50
Minimum factor of safety against direct sliding, F_s -sliding	1.50
Maximum allowable eccentricity ratio at each reinforcement level, e/L	0.1667
Minimum factor of safety against compound and overall failure, F_s -comp-static	1.30
Minimum factor of safety against compound and overall failure, F_s -comp-seismic	1.10

Prescribed minimum resistive length to prevent pullout, $L_e = 15.00$ ft.

Prescribed minimum normalized length of each layer is: $L/H_d = 0.70 \rightarrow L = 35.00$ ft.

Prescribed minimum absolute total length of each layer is: $L = 15.00$ ft.

BEARING CAPACITY

Bearing capacity is controlled by general shear.

Maximum permissible eccentricity ratio (soil), e/L 0.1667

Minimum factor of safety with respect to ultimate bearing capacity (Meyerhof approach) 2.50

Bearing capacity coefficients: $N_c = 0.00$ $N_\gamma = 14.99$

SOIL DATA**REINFORCED SOIL**

Unit weight, γ	135.0 lb/ft ³
Design value of internal angle of friction, ϕ	40.0 °

RETAINED SOIL

Unit weight, γ	130.0 lb/ft ³
Design value of internal angle of friction, ϕ	32.0 °

FOUNDATION SOIL (Considered as an equivalent uniform soil)

Equivalent unit weight, γ_{equiv}	130.0 lb/ft ³
Equivalent internal angle of friction, ϕ_{equiv}	32.0 °
Equivalent cohesion, c_{equiv}	150.0 lb/ft ²

Water table does not affect bearing capacity

LATERAL EARTH PRESSURE COEFFICIENTS

K_a (internal stability) = 0.2174 (if batter is less than 10°, K_a is calculated from eq. 15. Otherwise, eq. 38 is utilized)

Inclination of internal slip plane, $\psi = 65.00^\circ$ (see Fig. 28 in DEMO 82).

K_a (external stability) = 0.3073 (if batter is less than 10°, K_a is calculated from eq. 16. Otherwise, eq. 17 is utilized)

SEISMICITY

Maximum ground acceleration coefficient, $\alpha_o = 0.420$

$K_{ae} (\alpha_o > 0) = 0.6932$ $K_{ae} (\alpha_o = 0) = 0.3073$ $\Delta K_{ae} = 0.3859$ (see eq. 37 in DEMO 82)

DIRECT SLIDING / ECCENTRICITY

Seismic safety factor is 67.0% of specified static FS for direct sliding.

Maximum allowable eccentricity, e/L , under seismic conditions is: 0.3300

BEARING CAPACITY

Seismic safety factor is 67.0% of specified static FS for bearing capacity.

Maximum allowable eccentricity, e/L , under seismic conditions is: 0.3300

INTERNAL STABILITY

Seismic soil-geogrid friction coefficient, F^* is 100.0% of its specified static value.

Seismic factor of safety against pullout, F_s -po, is 67.0% of its specified static value.

Seismic overall factor of safety, F_s -overall, is 67.0% of its specified static value.

The reduction of F_s -overall pertains to geogrid strength and to connection strength for both break and pullout modes of failure.

INPUT DATA: Geometry and Surcharge loads (of BACK to BACK wall)

Design height, Hd 50.00 [ft] { Embedded depth is E = 3.00 ft, and height above top of finished bottom grade is H = 47.00 ft }

Batter, ω 0.0 [deg]

Backslope, β 0.0 [deg]

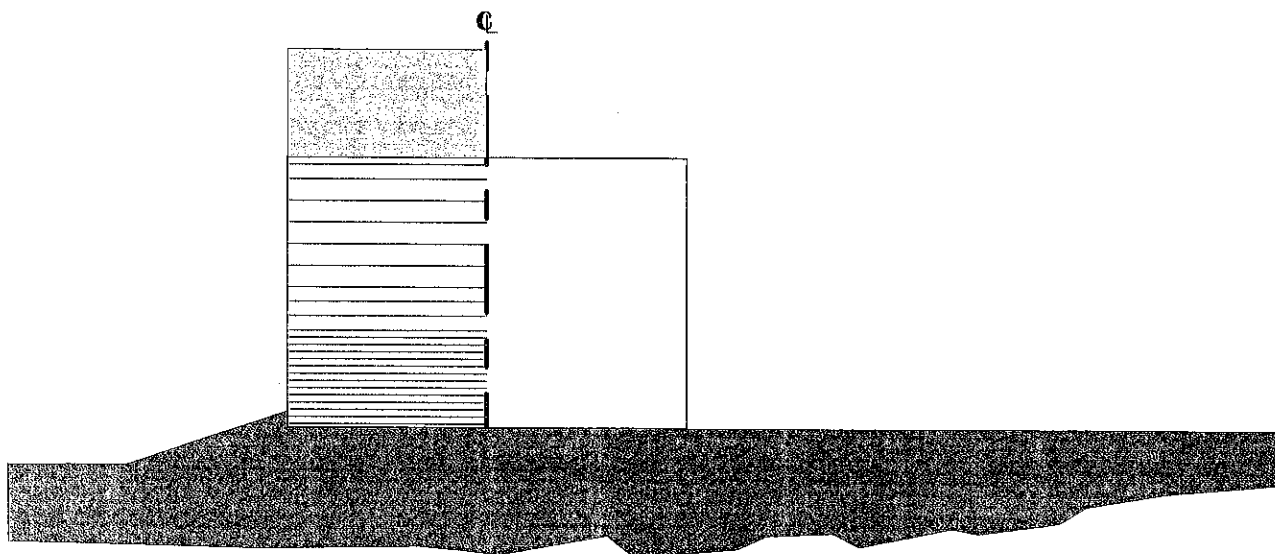
Backslope rise 0.0 [ft] Broken back equivalent angle, I = 0.00° (see Fig. 25 in DEMO 82)

Distance between walls (Back to Back) = 75.0 ft, and Reinforcement length, L = 16.4 ft.

UNIFORM SURCHARGE

Uniformly distributed dead load is 250.0 [lb/ft²]

DESIGNED REINFORCEMENT LAYOUT:



SCALE:

0 5 10 15 20 25 30 [ft]

Foundation Interface: Direct sliding, $F_s = 24760011.459$, Eccentricity, $e/L = 0.0000$, F_s -overturning = 172397329.70

Foundation Interface: Direct sliding, $F_s = 2.324$, Eccentricity, $e/L = 0.1854$, F_s -overturning = 2.70

AASHTO DESIGN METHOD

Lakeview Drive Vista Meadows Subdivision

PROJECT IDENTIFICATION

Title: Lakeview Drive Vista Meadows Subdivision
Project Number: 051709
Client: Taylor Smith
Designer: WGTurner
Station Number:

Description:

Company's information:

Name: Earthtec Testing & Engineering, P.C.
Street: 133 N. 1330 W.

Orem, UT 84057
Telephone #: 801-225-5711
Fax #: 801-225-3363
E-Mail: bgt@earthtectesting.com

Original file path and name: Y:\2005\051709 Lakeview Drive Walls & Summit Hills Subd.....
Original date and time of creating this file: Mon Oct 02 14:49:36 2006

PROGRAM MODE:

DESIGN
of a SIMPLE STRUCTURE
using GEOGRID as reinforcing material.

[illegible]

Bearing capacity, $F_s = 7.28$, Meyerhof stress = 2045 lb/ft².

GEOGRID				CONNECTION							
#	Elevation [ft]	Length [ft]	Type #	Fs-overall [pullout resistance]	Fs-overall [connection break]	Fs-overall [geogrid strength]	Geogrid strength Fs	Pullout resistance Fs	Direct sliding Fs	Eccentricity e/L	Product name
1	0.67	15.99	1	4.73	4.73	4.73	4.735	29.572	2.800	0.0191	UX1700MSE
2	4.67	10.81	1	4.16	4.16	4.16	4.163	11.232	2.638	0.0225	UX1700MSE
3	8.67	9.33	1	6.68	7.68	7.68	7.676	8.682	3.915	0.0045	UX1700MSE
4	11.33	9.33	1	5.58	14.93	14.93	14.930	8.409	7.976	-0.0032	UX1700MSE

Bearing capacity, $F_s = 4.66$, Meyerhof stress = 2555 lb/ft^2 .

GEOGRID				CONNECTION			Geogrid				Product name
#	Elevation [ft]	Length [ft]	Type #	Fs-overall [pullout resistance]	Fs-overall [connection break]	Fs-overall [geogrid strength]	strength Fs	Pullout resistance Fs	Direct sliding Fs	Eccentricity e/L	
1	0.67	15.99	1	2.15	2.69	2.69	2.686	13.420	1.126	0.1044	UX1700MSE
2	4.67	10.81	1	2.40	3.00	3.00	3.001	6.477	1.126	0.1052	UX1700MSE
3	8.67	9.33	1	3.60	5.17	5.17	5.175	4.682	1.899	0.0320	UX1700MSE
4	11.33	9.33	1	2.49	8.33	8.33	8.334	3.755	4.794	0.0004	UX1700MSE



Earthtec Testing & Engineering, P.C.

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1596 W. 2650 S. #108
Ogden, Utah - 84401
Phone (801) 399-9516
Fax (801) 399-9842

November 29, 2005

Mr. Taylor Smith
c/o Sowby & Berg Consultants
45 North 490 West
American Fork, UT 84003

**Re: Additional Field Exploration
Summit Hills Development
Alpine, Utah
Job No. 051709**

Dear Mr. Smith:

As you requested, we have performed additional field exploration at the site. On November 22, 2005, two test pits (TP-5 and TP-6) were excavated at the proposed cut slope below Lot 16 to depths of approximately 12 to 13 feet below the ground surface. The approximate locations of the test pits are shown on the attached Figure 1. The soils encountered consisted of a thin layer of topsoil overlying predominantly gravel (GC, GP-GM) soils, as shown on the attached Test Pit Logs (Figures 2 and 3).

In their most recent review of our geological hazards assessment¹, geotechnical report² and response letter³, the Utah Geological Survey (UGS) indicated that they were concerned about the strength parameters used in our evaluation of the cut slopes, particularly below Lot 16, because of a significant clay layer encountered in TP-3. The results of our additional field exploration at the location of the cut slope below Lot 16 indicates that the soils predominantly consist of gravel, as described above. To evaluate the effects of cutting into these soils, we performed a stability analysis for the subject cut slope, using the same methodology as presented previously and using an internal friction angle of 34° and an apparent cohesion value of 120 psf. Our analysis assumed a long-term phreatic (water) surface exiting from the slope above the roadway, and resulted in a static factor of safety of 2.1. Higher factors of safety are obtained if the phreatic surface is lower than assumed. Using these same parameters and the same pseudostatic coefficient as our referenced geotechnical report, a seismic factor of safety greater than 1.0 is obtained. These factors of safety are considered acceptable (see Figures 5 and 6, attached). We concur, however, with the UGS that Earthtec should

¹Geological Hazards Assessment, Summit Hills Development, Alpine, Utah, Job No. 051709, September 20, 2005.

²Geotechnical Study, Summit Hills Development & Lakeview Drive Extension, Alpine, Utah, Job No. 051709, August 18, 2005.

³Response to UGS Review, Summit Hills Development & Lakeview Drive Extension, Alpine, Utah, Job No. 051709, October 17, 2005.

Earthtec

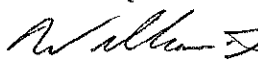
Professional Engineering Services ~ Geotechnical Engineering ~ Drilling Services ~ Construction Materials Inspection / Testing ~ Non-Destructive Examination ~ Failure Analysis
ICBO ~ ACI ~ AWS

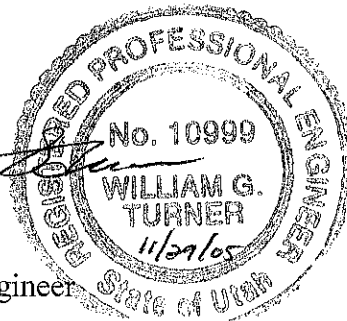
observe the cut slopes during construction, since the cut slopes near the beginning of the roadway connection to 600 North could encounter clay soils, in which case flatter slopes or retaining walls may be necessary (depending on the thickness of the clay layer).

This letter is considered an addendum to our referenced reports and is subject to the same conditions and limitations described therein.

We appreciate the opportunity of providing our services on this project. If we can answer questions or be of further service, please call.

Respectfully;
EARTHTEC TESTING AND ENGINEERING, P.C.


William G. Turner, P.E.
Senior Geotechnical Engineer

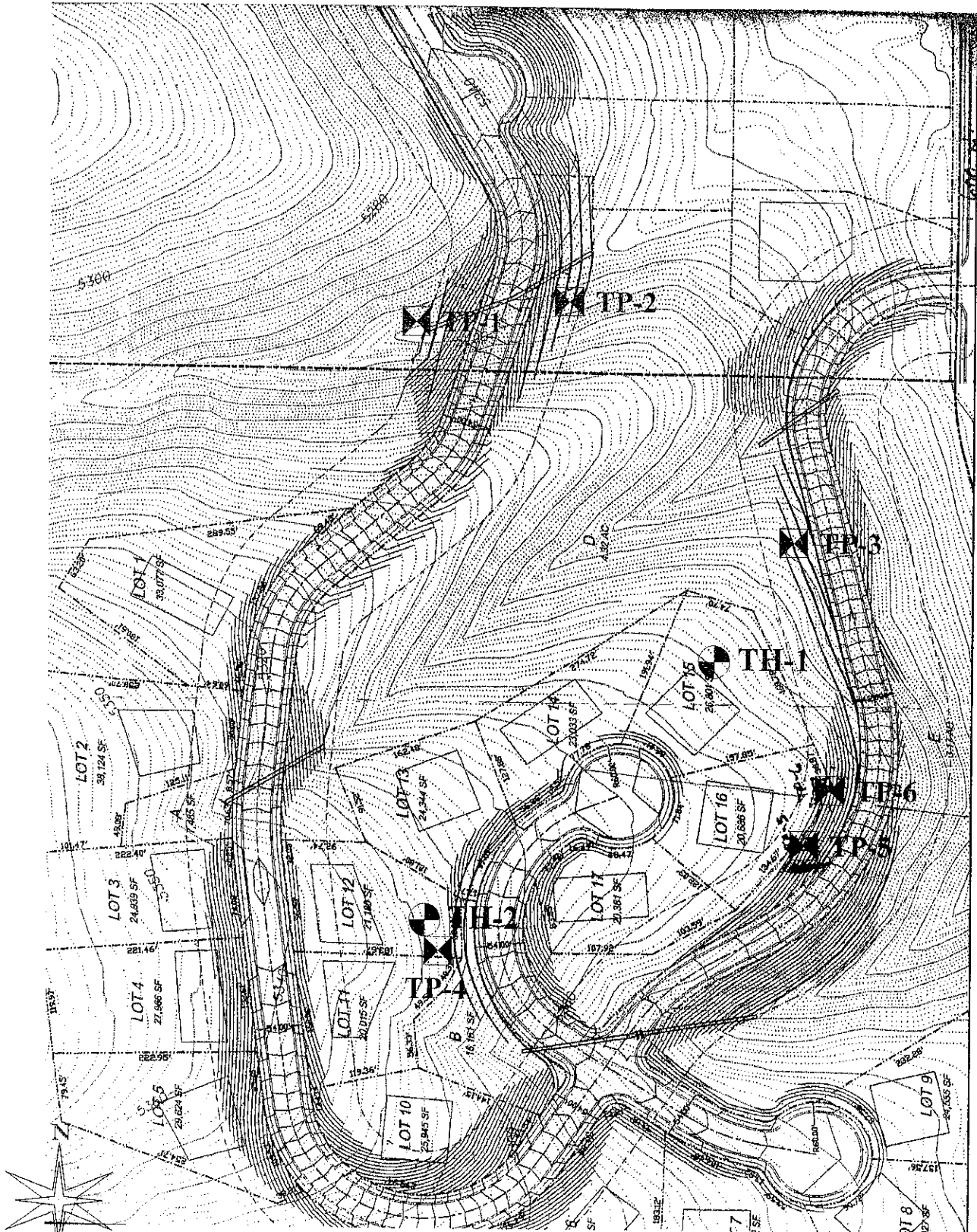



Steven L. Smith, P.E.
Principal Geotechnical Engineer

Attachments: Figure 1, Site Plan & Location of Test Holes and Pits
Figures 2-3, Test Pit Log
Figure 4, Legend
Figures 5-6, Stability Results

SITE PLAN & LOCATION OF TEST HOLES AND PITS

SUMMIT HILLS DEVELOPMENT



Not to Scale

☒ Approximate Test Pit Location

☐ Approximate Test Hole Location

PROJECT NO.: 051709

Earthtec
Testing and Engineering, P.C.

FIGURE NO.: 1

TEST PIT LOG

NO.: TP-5

PROJECT: Summit Hills Development

CLIENT: Taylor Smith

LOCATION: See Figure 2

OPERATOR: Client

EQUIPMENT: Rubber-Tire Backhoe

DEPTH TO WATER; INITIAL ∇ :

PROJECT NO.: 051709

DATE: 11/22/05

ELEVATION: Not Measured

LOGGED BY: M.L.

AT COMPLETION ∇ :

Depth (Ft.)	Graphic Log	USCS	Description	Samples	TEST RESULTS									
					Dry Dens. (pcf)	Water Cont. (%)	PI	LL	Gravel (%)	Sand (%)	Fines (%)	Other Tests		
0			TOPSOIL: Clay, sandy, gravelly, organics, moist, dark brown.											
1		GC	Clayey GRAVEL with sand and cobbles: Dense, slightly moist, light brown.											
2														
3														
4		GP-GM	Poorly Graded GRAVEL with silt, sand and cobbles: Dense, slightly moist, brown, weakly cemented to 5 feet.											
5														
6				X		4			63	27	10			
7														
8														
9														
10														
11				X										
12														
13														
14			Bottom at about 13 feet.											
15														

Notes: No groundwater encountered.

Tests Key

CBR = California Bearing Ratio

C = Consolidation

R = Resistivity

DS = Direct Shear

SS = Soluble Sulfates

UC = Unconfined Compressive Strength

PROJECT NO.: 051709



FIGURE NO.: 2

LOG OF TEST PIT 051709.GPJ EARTHTEC.GDT 11/25/05

TEST PIT LOG

NO.: TP-6

PROJECT: Summit Hills Development

CLIENT: Taylor Smith

LOCATION: See Figure 2

OPERATOR: Client

EQUIPMENT: Rubber-Tire Backhoe

DEPTH TO WATER; INITIAL ∇ :

PROJECT NO.: 051709

DATE: 11/22/05

ELEVATION: Not Measured

LOGGED BY: M.L.

AT COMPLETION ∇ :

Depth (Ft.)	Graphic Log	USCS	Description	Samples	TEST RESULTS							
					Dry Dens. (pcf)	Water Cont. (%)	PI	LL	Gravel (%)	Sand (%)	Fines (%)	Other Tests
0			TOPSOIL: Clay, sandy, gravelly, organics, moist, dark brown.									
1		GC	Clayey GRAVEL with sand and cobbles: Dense, slightly moist, light brown.									
2												
3		GP-GM	Poorly Graded GRAVEL with silt, sand and cobbles: Dense, slightly moist, brown, weakly cemented to 4 feet.									
4												
5												
6												
7												
8												
9												
10												
11												
12												
13			Bottom at about 12 feet.									
14												
15												

Notes: No groundwater encountered.

Tests Key

CBR = California Bearing Ratio

C = Consolidation

R = Resistivity

DS = Direct Shear

SS = Soluble Sulfates

UC = Unconfined Compressive Strength

PROJECT NO.: 051709



FIGURE NO.: 3

LEGEND

PROJECT: Summit Hills Development
CLIENT: Taylor Smith

DATE: 11/22/05
LOGGED BY: M.L.

UNIFIED SOIL CLASSIFICATION SYSTEM

MAJOR SOIL DIVISIONS

USCS

SYMBOL

TYPICAL SOIL DESCRIPTIONS

COARSE GRAINED SOILS (More than 50% retaining on No. 200 Sieve)	GRAVELS (More than 50% of coarse fraction retained on No. 4 Sieve)	CLEAN GRAVELS (Less than 5% fines)		GW	Well Graded Gravel, May Contain Sand, Very Little Fines
				GP	Poorly Graded Gravel, May Contain Sand, Very Little Fines
		GRAVELS WITH FINES (More than 12% fines)		GM	Silty Gravel, May Contain Sand
				GC	Clayey Gravel, May Contain Sand
	SANDS (50% or more of coarse fraction passes No. 4 Sieve)	CLEAN SANDS (Less than 5% fines)		SW	Well Graded Sand, May Contain Gravel, Very Little Fines
				SP	Poorly Graded Sand, May Contain Gravel, Very Little Fines
		SANDS WITH FINES (More than 12% fines)		SM	Silty Sand, May Contain Gravel
				SC	Clayey Sand, May Contain Gravel
FINE GRAINED SOILS (More than 50% passing No. 200 Sieve)	SILTS AND CLAYS (Liquid Limit less than 50)		CL	Lean Clay, Inorganic, May Contain Gravel and/or Sand	
			ML	Silt, Inorganic, May Contain Gravel and/or Sand	
			OL	Organic Silt or Clay, May Contain Gravel and/or Sand	
	SILTS AND CLAYS (Liquid Limit Greater than 50)		CH	Fat Clay, Inorganic, May Contain Gravel and/or Sand	
			MH	Elastic Silt, Inorganic, May Contain Gravel and/or Sand	
			OH	Organic Clay or Silt, May Contain Gravel and/or Sand	
		HIGHLY ORGANIC SOILS			PT

SAMPLER DESCRIPTIONS

- SPLIT SPOON SAMPLER
(1 3/8 inch inside diameter)
- MODIFIED CALIFORNIA SAMPLER
(2 1/2 inch outside diameter)
- SHELBY TUBE
(3 inch outside diameter)
- BLOCK SAMPLE
- BAG/BULK SAMPLE

WATER SYMBOLS

- Water level encountered during field exploration
- Water level encountered at completion of field exploration

- NOTES:**
- The logs are subject to the limitations, conclusions, and recommendations in this report.
 - Results of tests conducted on samples recovered are reported on the logs and any applicable graphs.
 - Strata lines on the logs represent approximate boundaries only. Actual transitions may be gradual.
 - In general, USCS symbols shown on the logs are based on visual methods only: actual designations (based on laboratory tests) may vary.

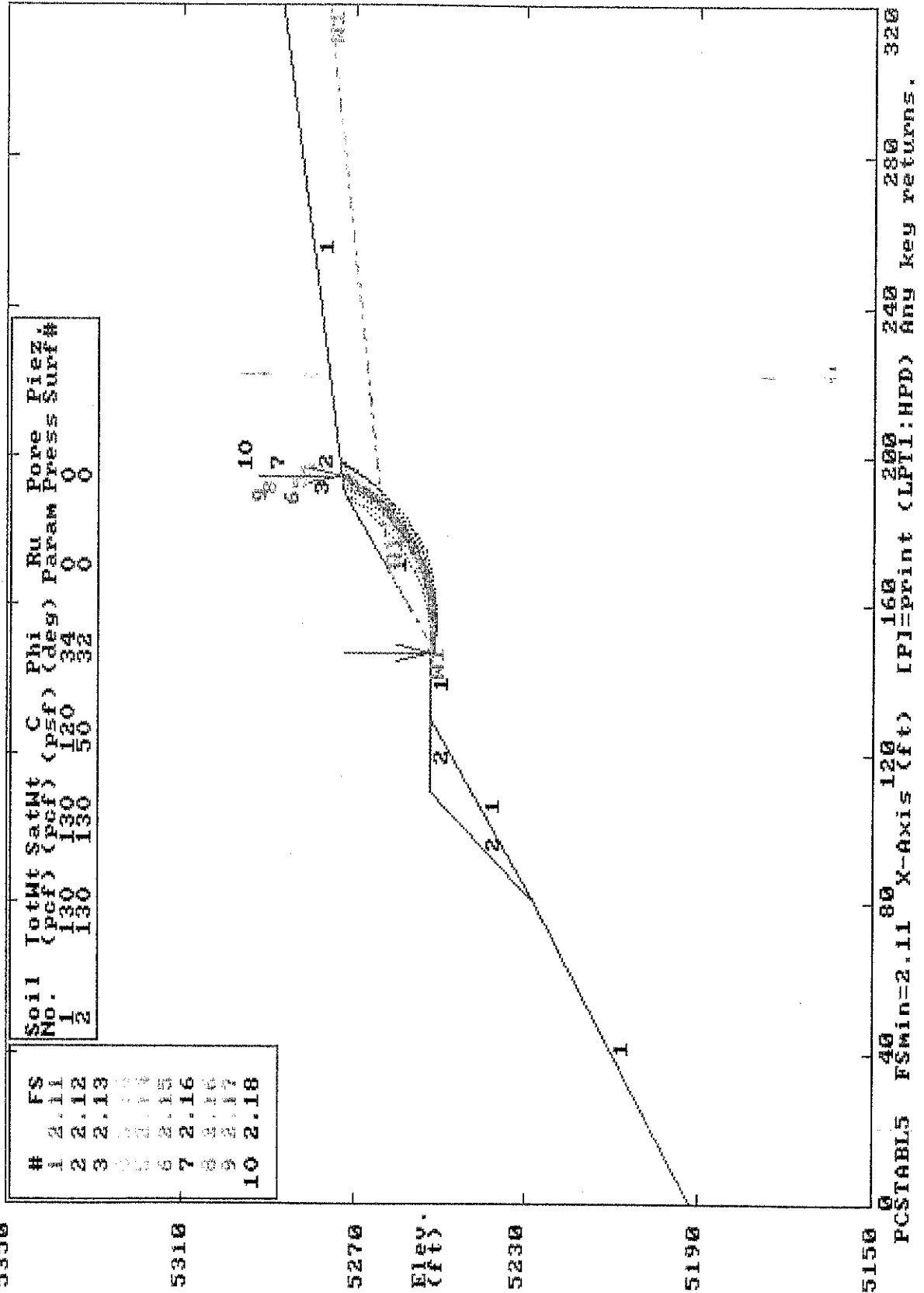
PROJECT NO.: 051709



FIGURE NO.: 4

STABILITY RESULTS

Ten Most Critical. C:051709G.PLT Bg: MGlurner 11-29-05 10:14am



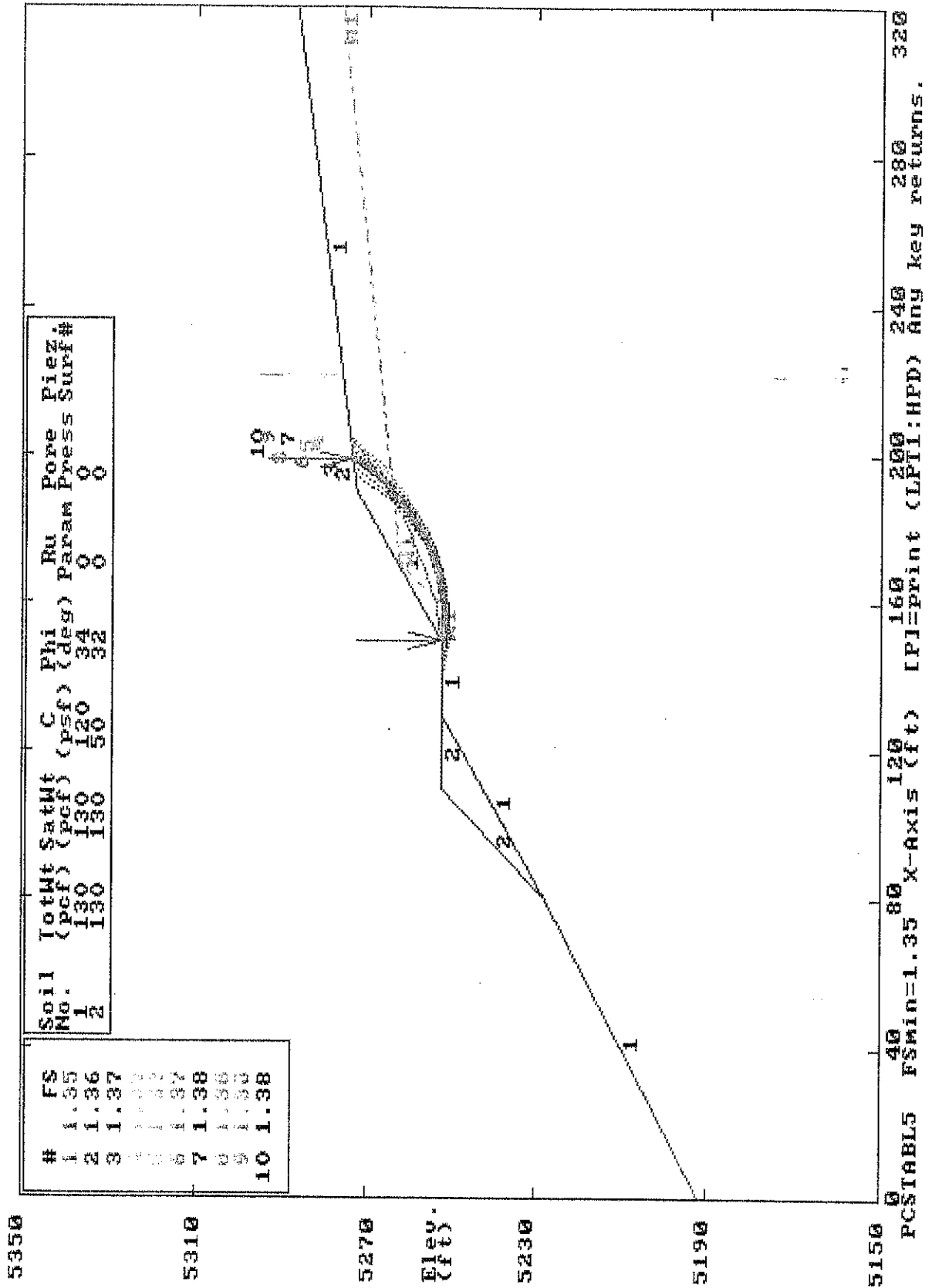
PROJECT NO.: 051709



FIGURE NO.: 5

STABILITY RESULTS

Lakeview Drive - Slope Stability Below Lot 16 (Seismic)
 Ten Most Critical: C:051709Gs.PLT By: MTurner 11-29-05 10:28am



PROJECT NO.: 051709



FIGURE NO.: 6



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Fax (801) 399-9842

October 17, 2005

Mr. Taylor Smith
c/o Sowby & Berg Consultants
45 North 490 West
American Fork, UT 84003

**Re: Response to UGS Review
Summit Hills Development
Alpine, Utah
Job No. 051709**

Dear Mr. Smith:

As you requested, this letter presents our response to a review by the Utah Geological Survey (UGS) of our geological hazards assessment¹ for the proposed Summit Hills residential development located in Alpine, Utah. Earthtec also previously prepared a geotechnical report² for the project. The main concerns that the UGS expressed in their review letter dated October 3, 2005 regarded landslide and radon hazards. Regarding landslides, the UGS indicated:

“Earthtec (2005a) reports that steep (15-30°) slopes in the southern part of the property have the greatest potential for slope failure, and we concur. One of the steepest slopes at the site, located below lots 15 and 16 and above 600 North, may principally consist of clay, based on Earthtec’s (2005b) test pit 3, which was excavated at the east end of the slope. Earthtec (2005a) analyzed the stability of this slope using a topographic profile (location not shown in report) and estimated soil strengths, and determined factors of safety around 1.9 (under static conditions). However, their models use an internal friction angle of 36° despite citing angles of >31° for clayey gravel and 28-34° for clayey sand by U.S. Bureau of Reclamation (1987). Earthtec (2005a) did not consider the strength of lean clay, which may underlie and control the stability of the slope. Some typical published friction angles for drained, compacted, cohesive soils range from about 28±5 for lean clay to 31±5 for clayey sand (U.S. Bureau of Reclamation, 1973; Duncan and Wright, 2005).

“We recommend performing slope-stability analyses using lab-determined strength parameters for material from the site. If such data are not available, we recommend using a range of values, considering the variety of material that may occur in the slope. In general,

¹Geological Hazards Assessment, Summit Hills Development, Alpine, Utah, Job No. 051709, September 20, 2005.

²Geotechnical Study, Summit Hills Development & Lakeview Drive Extension, Alpine, Utah, Job No. 051709, August 18, 2005.

the final calculation of factors of safety should be based on lower range strengths as indicated in Hylland (1996, p. 4), rather than medium or upper range strengths as appears to have been done here. Additionally, Earthtec (2005a) did not include the anticipated shape of the road cut in their profile. We recommend that the topographic profile and stability models include the anticipated road cuts and fills below lots 15 and 16, and that a geotechnical engineer review these and the individual road cut and fill slope stability analyses in Earthtec (2005b). We also recommend that transient shallow-ground-water conditions be addressed in the stability analysis. Earthtec (2005a) did not encounter ground water during their subsurface investigations, but shallow ground water resulting from heavy precipitation or rapid snow melt may negatively affect the stability of the steep slopes, particularly road cuts and fills.”

The UGS review pointed out that the lean clay encountered in test pit TP-3 suggested that the clay may control the stability of the slope. Note that test hole TH-1, which encountered clayey to silty sand with gravel and clayey gravel with sand, was located on Lot 15 not too far from but above test pit TP-3. Lean clay soils also were not encountered in the other test pits and test hole throughout the property. Our observations of the southern slope above 600 North indicated that the exposed soils consisted of clayey gravel with sand and not lean clay. It is our opinion that the lean clay encountered within TP-3 was a localized pocket and not a continuous layer, and that the majority of soils on the steeper south-facing slopes above 600 North consist of clayey gravel with sand.

Testing a representative undisturbed specimen of on-site gravel soils is not plausible since obtaining a representative undisturbed sample is very difficult (and expensive), and since gravel can only be properly tested in a large direct shear machine, which is not readily available in Utah. Thus, we gave estimated parameters for clayey gravel soils in our referenced geotechnical report based on published sources. It is possible that clayey sand with some gravel is more prevalent in some areas of the slope. According to the U.S. Bureau of Reclamation³, clayey sands have internal friction angles between 28° and 34° and saturated cohesion values of 120 to 360 psf. Typically, lower friction angles have higher cohesion values and vice-a-versa. Varying the friction angle from 28° to 34° and respective cohesion values from 360 psf to 120 psf, the factor of safety (FS) ranges from 1.45 to 1.55. This analysis assumes a long-term phreatic (water) surface exiting from the slope above the roadway. Higher factors of safety are obtained if the phreatic surface is lower than assumed. Using average strength parameters, a static FS of 1.5 is obtained (see attached Figure 1). Using these same parameters and the same pseudostatic coefficient as our referenced geotechnical report, a seismic FS greater than 1.0 is obtained. These factors of safety are considered acceptable.

Contrary to what the UGS indicated, we did perform a stability analysis for the anticipated shape of the road cut, as presented in our referenced geotechnical report (see Figures 14 and 15). As described in our report, we analyzed the highest anticipated cut slope (40 feet high and 1.5H:1V cut face). This particular cut slope is located relatively close to TP-3, so we revised the strength parameters to reflect possible lean clay soils for that cut slope (which we believe will be the worst-case scenario), and re-ran the stability for this particular slope using what we believe are appropriate

³U.S. Bureau of Reclamation, 1987, “Design Standards No. 13, Embankment Dams,” Denver, Colorado.

values (internal friction angle of 24° and a cohesion of 400 psf). The results of this analysis indicate a static FS greater than 1.5 and a seismic FS greater than 1.0, which are acceptable (see Figures 3 and 4, attached).

Regarding the potential radon hazard, the UGS indicated the following:

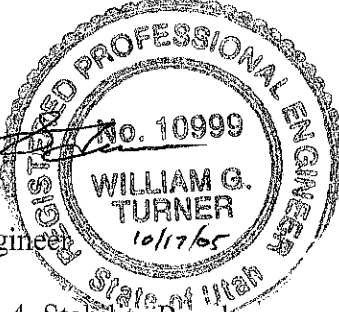
“Earthtec (2005a) reports that the subdivision site is within an area mapped by Black (1993) as having a potentially high radon hazard, and discusses radon testing and radon-resistant building construction. Appendix F of the International Residential Code (IRC) contains requirements for new construction in jurisdictions where radon-resistant construction is required. Geologic factors contributing to elevated indoor-radon levels, such as volcanic clasts within the alluvial-fan unit Taf (Biek, 2005), are found on the subdivision site and we recommend implementing techniques in IRC Appendix F, unless these regulations are superseded by local government requirements. Approval of building permits need not depend upon fulfilling this recommendation, but incorporating radon-resistant techniques in new construction is generally less expensive than adding post-construction radon reduction measures.”

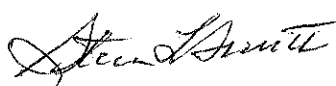
We concur with the UGS that incorporating radon-resistant techniques in new construction is generally less expensive than adding post-construction radon-reduction measures, and recommend that ventilation and other techniques be considered prior to building.

This response letter is considered an addendum to our referenced reports and is subject to the same conditions and limitations described therein.

We appreciate the opportunity of providing our services on this project. If we can answer questions or be of further service, please call.

Respectfully;
EARTHTEC TESTING AND ENGINEERING, P.C.


William G. Turner, P.E.
Senior Geotechnical Engineer


Steven L. Smith, P.E.
Principal Geotechnical Engineer

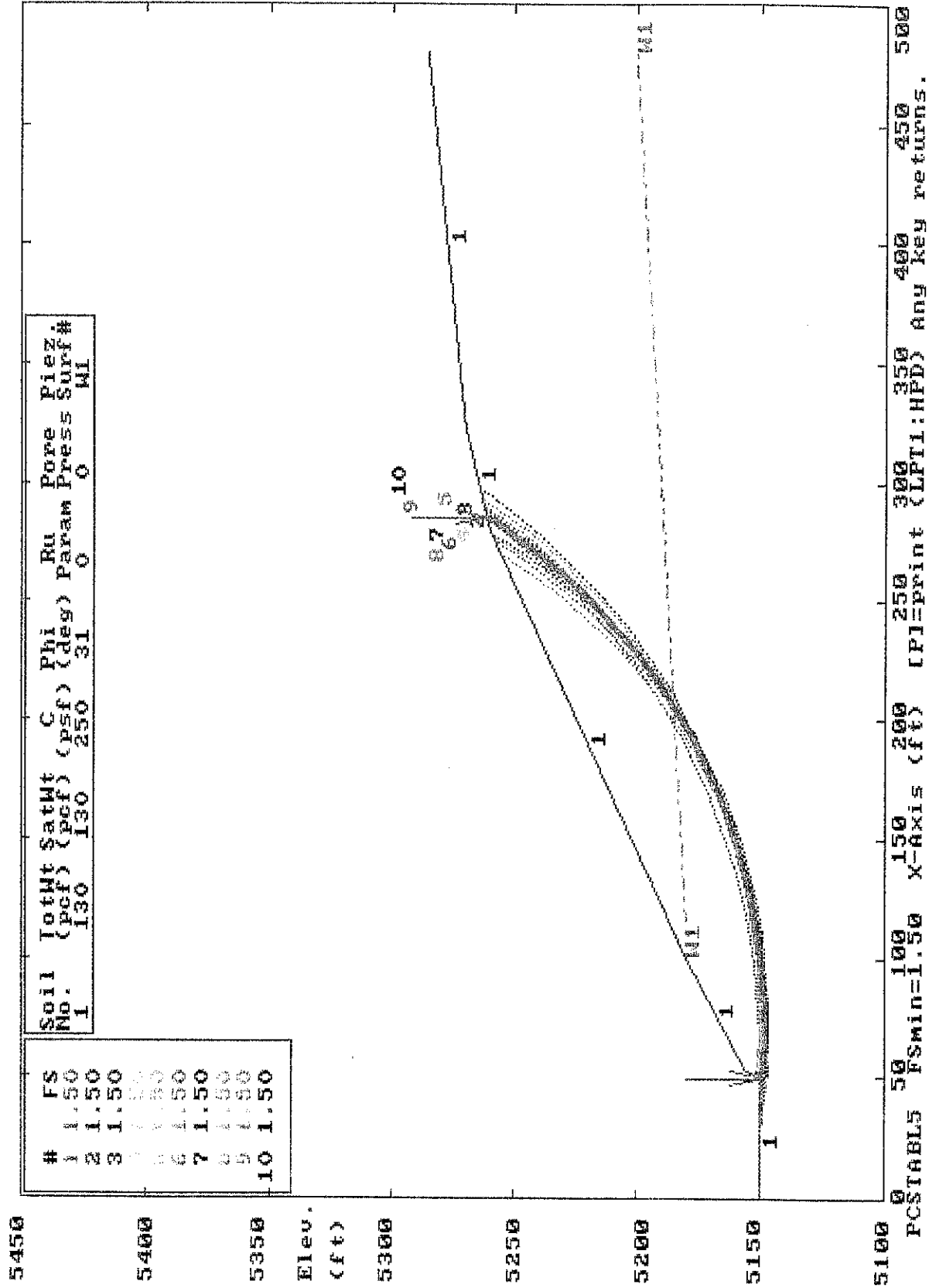
Attachments: Figures 1-4, Stability Results

STABILITY RESULTS

Ten Most Critical. Drive - Slope Stability By: WGTurner 10-17-05 2:50pm

#	FS
1	1.50
2	1.50
3	1.50
4	1.50
5	1.50
6	1.50
7	1.50
8	1.50
9	1.50
10	1.50

Soil No.	TotWt (pcf)	SatWt (pcf)	C (psf)	Phi (deg)	Ru	Pore Press	Piez. Surf#
1	130	130	250	31	0	0	MI



PROJECT NO.: 051709



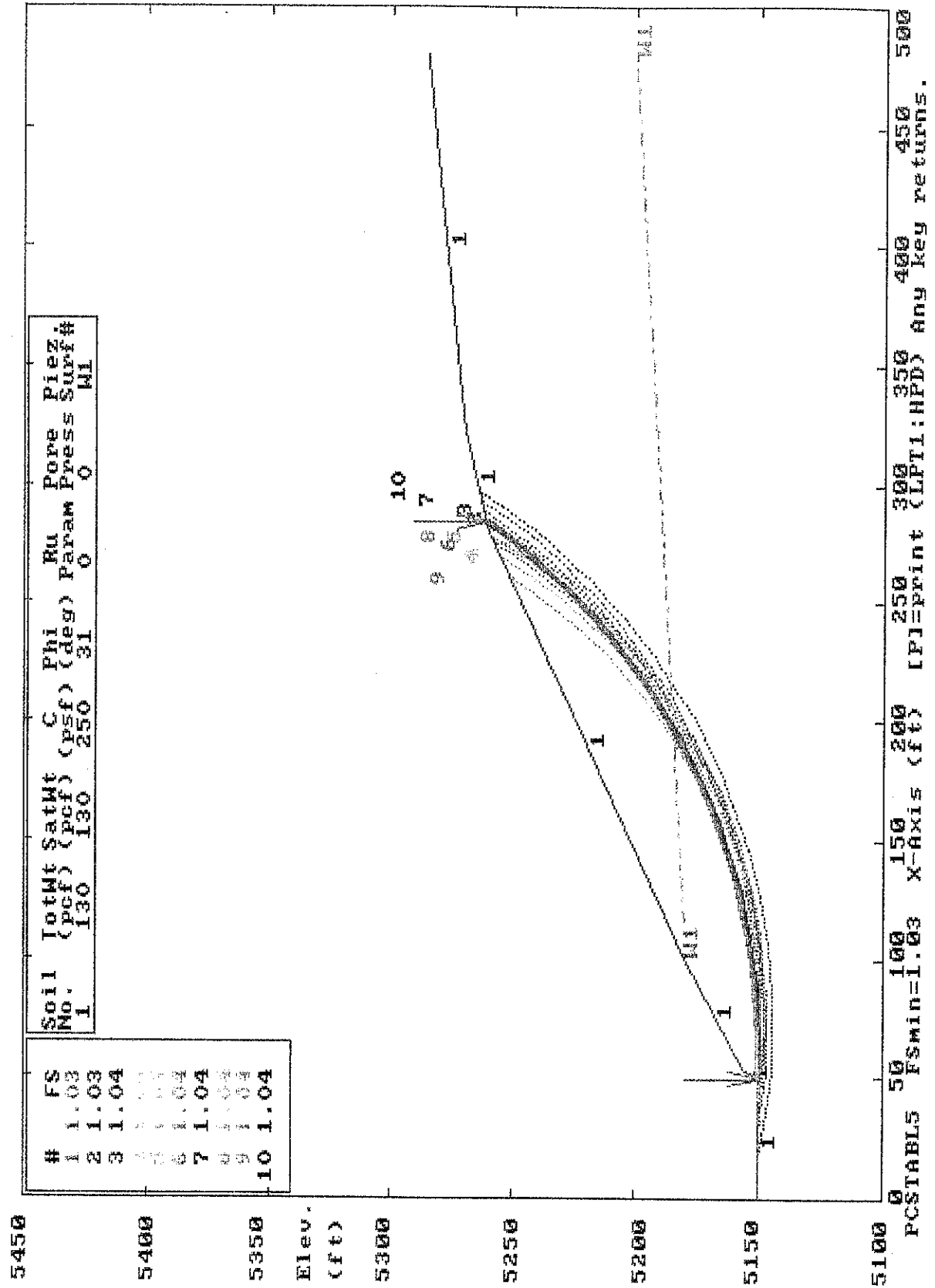
FIGURE NO.: 1

STABILITY RESULTS

Ten Most Critical: Lakeview Drive - Slope Stability (Seismic)
By: MGTurner 10-17-05 3:12pm

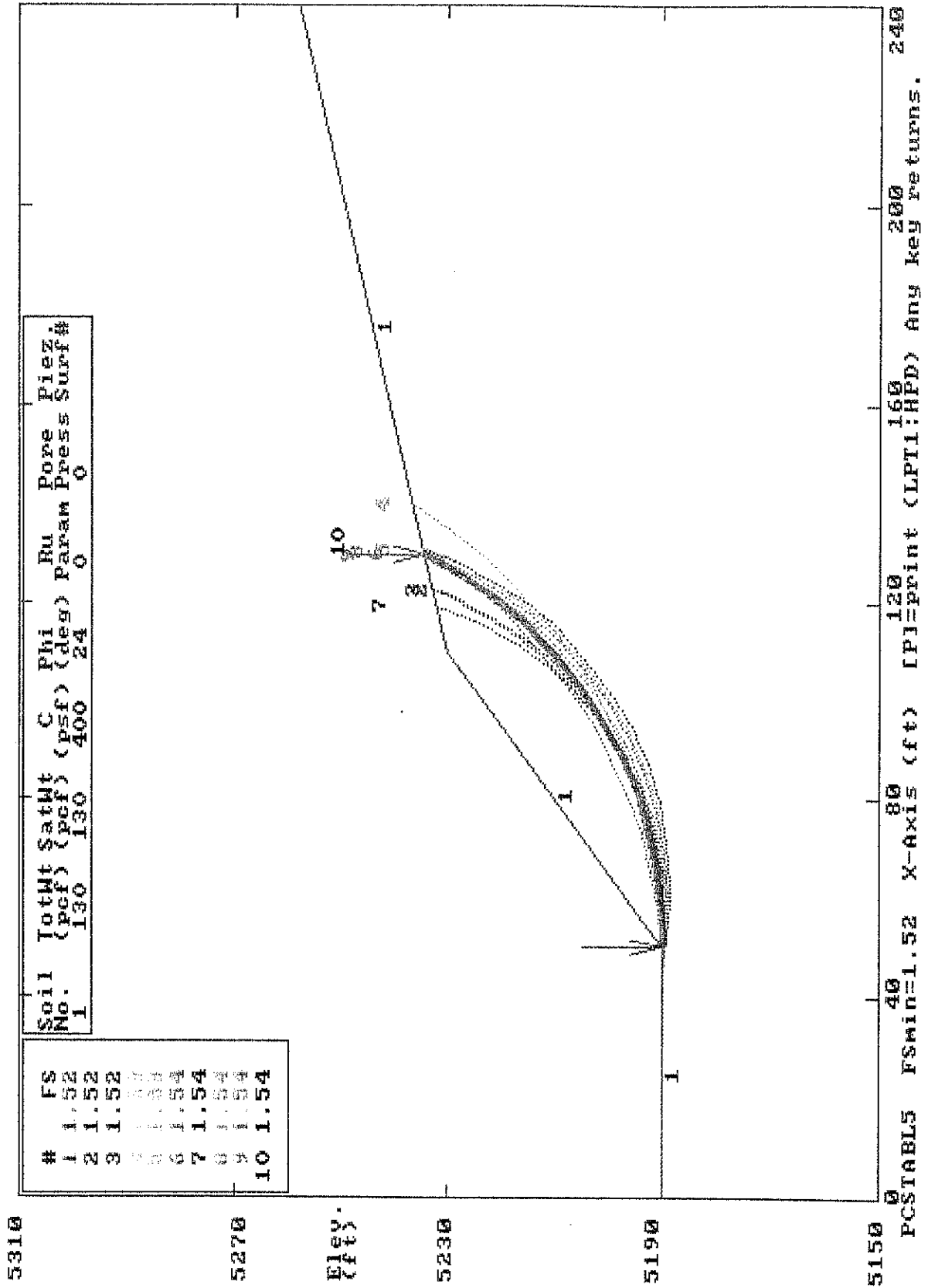
#	FS
1	1.03
2	1.03
3	1.04
4	1.04
5	1.04
6	1.04
7	1.04
8	1.04
9	1.04
10	1.04

Soil No.	TotWt (pcf)	SatWt (pcf)	C (psf)	Phi (deg)	Ru Param	Pore Press	Piez Surf#
1	130	130	250	31	0	0	NI



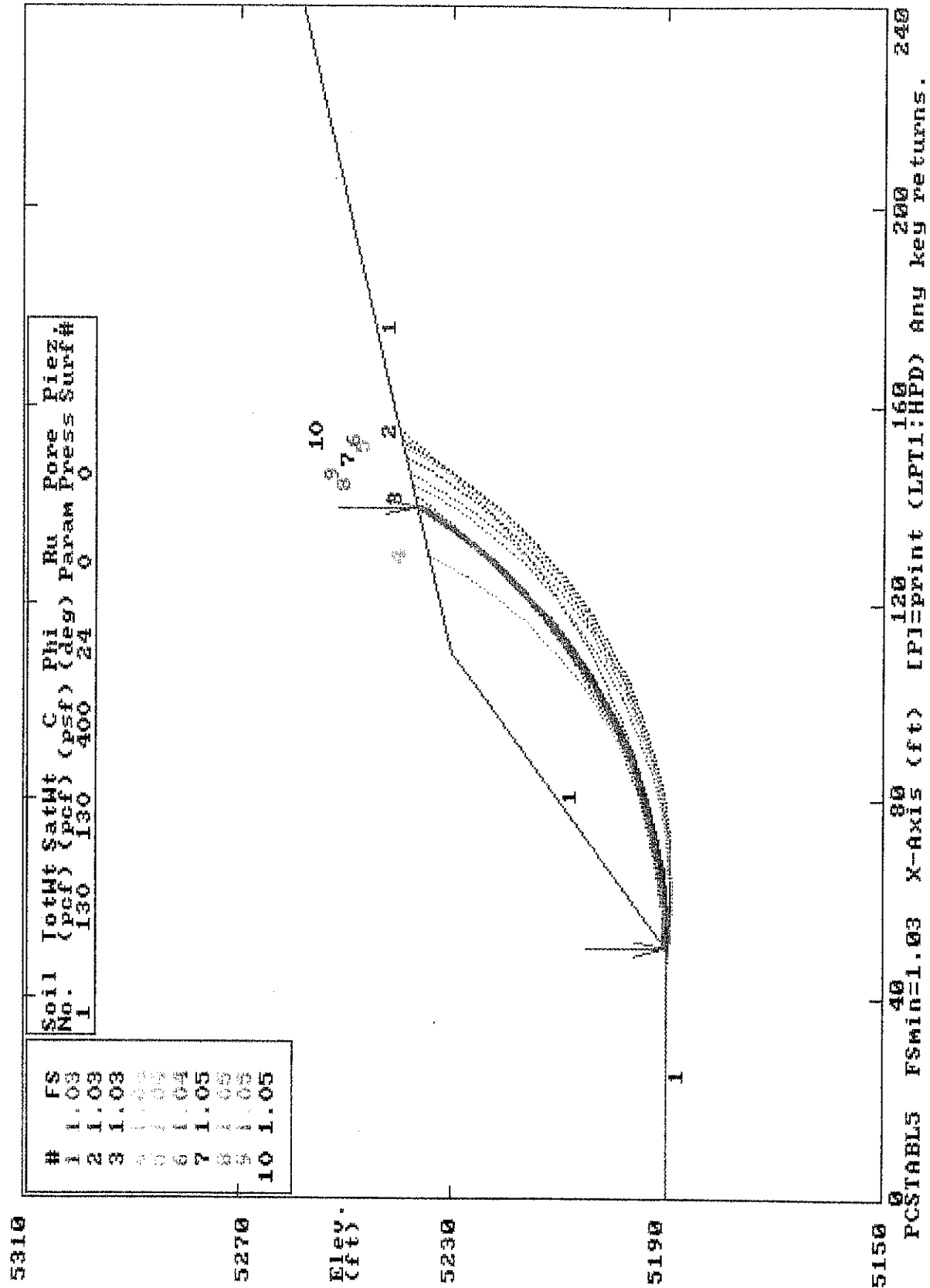
STABILITY RESULTS

Ten Most Critical: Lakeview Drive - Cut Slope Stability
 C:\051709E.PLI By: MGlurner 10-17-05 3:22pm



STABILITY RESULTS

Ten Most Critical. C:\051709ES.PLT By: MGTurner 10-17-05 3:41pm
Lakeview Drive - Cut Slope Stability (Seismic)





Earthtec Testing & Engineering, P.C.

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January 26, 2006

Mr. Taylor Smith
c/o Sowby & Berg Consultants
45 North 490 West
American Fork, UT 84003

**Re: Additional Information
Stability of Slope Below Lot 16
Summit Hills Development
Alpine, Utah
Job No. 051709**

Dear Mr. Smith:

As you requested, this letter addresses the most recent comments dated January 23, 2006 by the Utah Geological Survey (UGS) regarding our last letter¹ which presented our stability analyses for the post-construction slopes below Lot 16. In their last letter, the UGS indicated that our stability analysis did not include the entire slope, but only analyzed the upper 80 feet of the slope below the subject lot. They indicated that the entire 120-foot high slope should be analyzed with "potential landslide failure surfaces daylighting near the base of the slope." The reason we chose the 80-foot high slope configuration for analysis was because that particular cross-section included the highest cut and fill slopes below Lot 16 and it has been our engineering experience that the location where the most change will occur provides the lowest factor of safety.

As suggested by the UGS, we analyzed the highest slope (nearly 120 feet high) below Lot 16 using the existing topography and proposed road cut and fill slopes. Using the same soil strengths, groundwater level, possible clay layer below elevation 5230 feet, and methodology as indicated in our referenced letter, following are the associated factors of safety for this slope:

Soil Type	Internal Friction Angle (degrees)	Apparent Cohesion (psf)	Static Factor of Safety	Seismic Factor of Safety
Lean Clay	26	320	1.59	0.99
Clayey Gravel	32	150		
Lean Clay	28	280	1.68	1.03
Clayey Gravel	35	100		
Lean Clay	30	240	1.77	1.09
Clayey Gravel	38	50		

¹ Stability of Slope Below Lot 16, Summit Hills Development, Alpine, Utah, Job No. 051709, January 17, 2006.

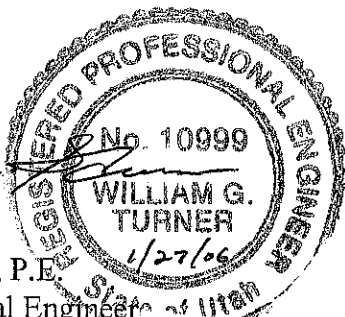
Typically, the minimum acceptable factors of safety (FS) are 1.5 for static conditions and 1.0 for seismic (pseudostatic) conditions. The results of our analyses indicate that the minimum FS are exceeded, except the seismic condition for the lowest friction angle where the FS is slightly less than the minimum. Our analyses indicates that using an average or higher than average friction angle (and a lower cohesion) results in a factor of safety greater than the typical minimum values. This suggests that a slight increase in the friction angle (greater than 26°) will result in a factor of safety that meets the minimum value for the seismic condition. We believe that the average strength values indicated above adequately represent the slope, thus it is our opinion that the post-construction slopes will be stable. Stability results are presented on Figures 1 and 2, attached.

This letter is considered an addendum to our referenced report and is subject to the same conditions and limitations described therein.

We appreciate the opportunity of providing our services on this project. If we can answer questions or be of further service, please call.

Respectfully;

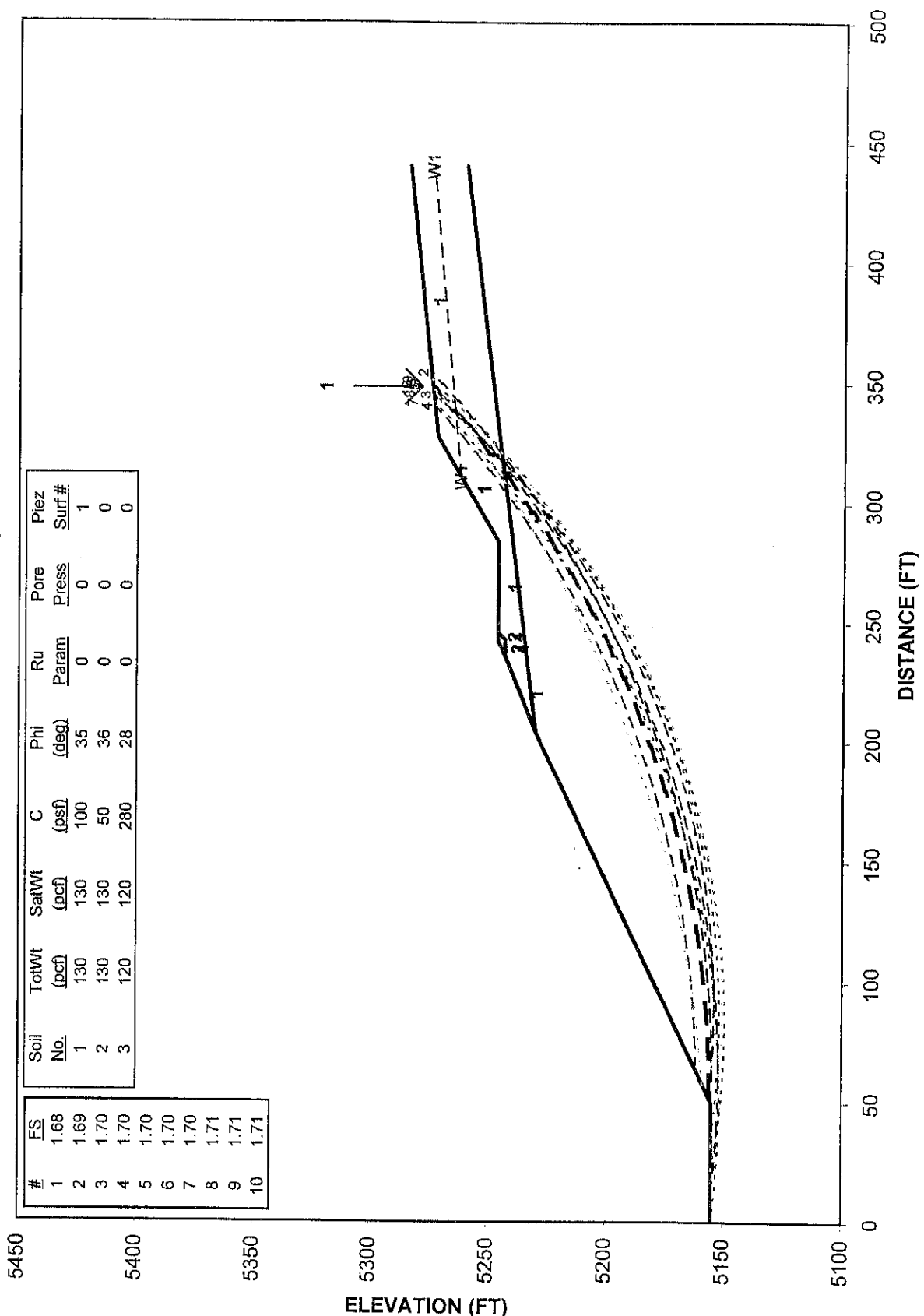
EARTHTEC TESTING AND ENGINEERING, P.C.



William G. Turner, P.E.
Senior Geotechnical Engineer

Attachments: Figures 1-2, Stability Results

STABILITY RESULTS

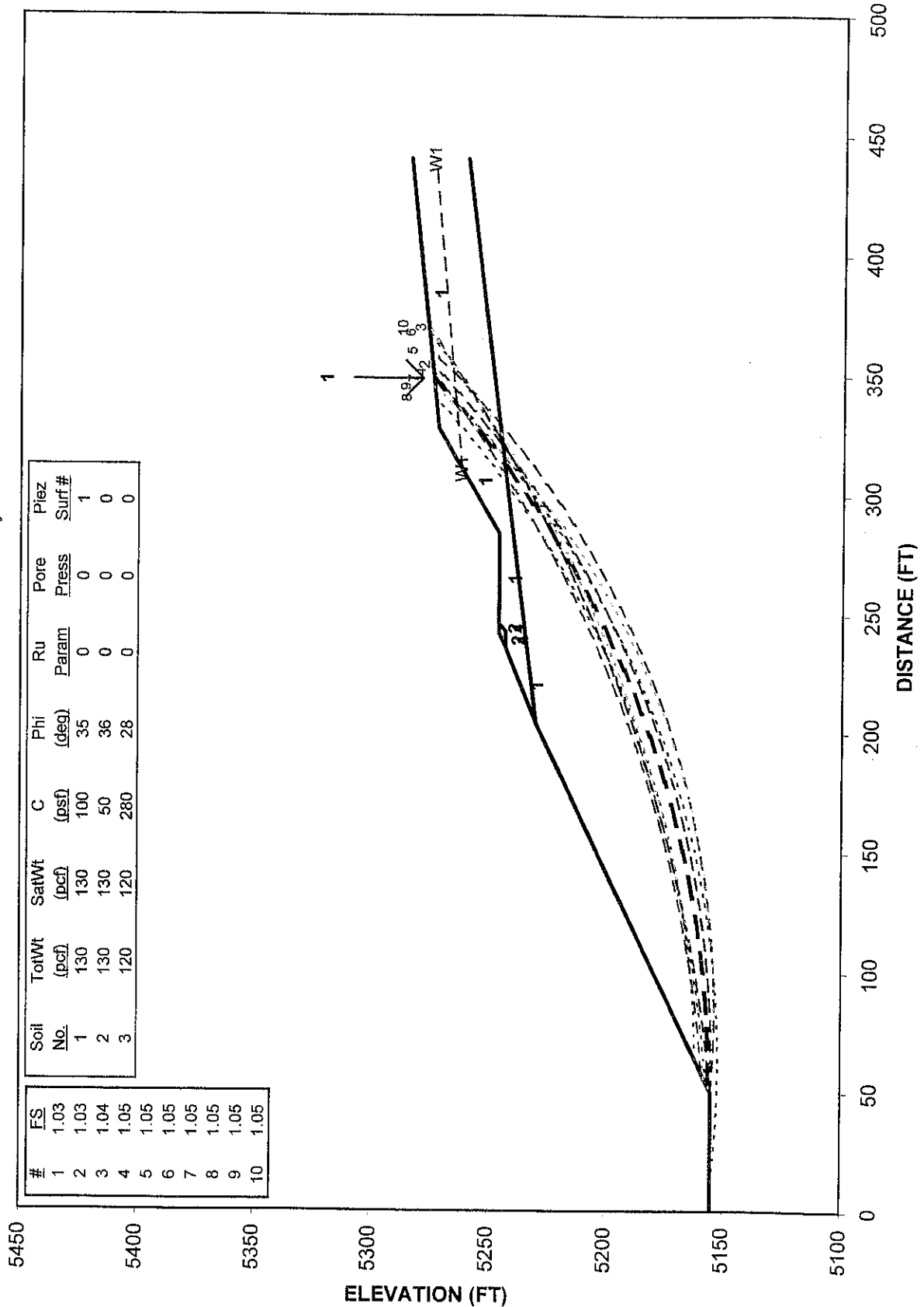
Lakeview Drive - Slope Stability Below Lot 16
 Ten Most Critical Surfaces. C:051709K.PLT Run By: WGTurner 01-27-06



STABILITY RESULTS

Lakeview Drive - Slope Stability Below Lot 16 (Seismic)

Ten Most Critical Surfaces. C:051709KS.PLT Run By: WGTurner 01-27-06



PROJECT NO.: 051709K



FIGURE NO.: 2



Earthtec Testing & Engineering, P.C.

133 North 1330 West
Orem, Utah - 84057
Phone (801) 225-5711
Fax (801) 225-3363

1596 W. 2650 S. #108
Ogden, Utah - 84401
Phone (801) 399-9516
Fax (801) 399-9842

January 17, 2006

Mr. Taylor Smith
c/o Sowby & Berg Consultants
45 North 490 West
American Fork, UT 84003

**Re: Stability of Slope Below Lot 16
Summit Hills Development
Alpine, Utah
Job No. 051709**

Dear Mr. Smith:

At your request, this letter addresses the most recent comments (dated December 21, 2005) by the Utah Geological Survey (UGS) regarding our last letter¹ which presented more information for the proposed cut slopes below Lot 16. The UGS indicated that the stability of the overall slope after construction is completed should be performed. Accordingly, we performed a stability analysis for the overall slope with a post-construction configuration, using the same methodology and phreatic surface as presented in our referenced letter. Since test pits were not excavated within the lower portion of the slope, we assumed that the clay soils encountered in test pit TP-3, which was located on the east side of the slope, extend at about the same elevation around the bottom of the slope.

According to the U.S. Bureau of Reclamation², clays of low to medium plasticity have internal friction angles between 26° and 30° and saturated cohesion values of 240 to 320 psf, and clayey gravel soils have internal friction angles greater than 31°. Typically, lower friction angles have higher cohesion values and vice-a-versa. Following are the parameters used and the associated factors of safety:

Soil Type	Internal Friction Angle (degrees)	Apparent Cohesion (psf)	Static Factor of Safety	Seismic Factor of Safety
Lean Clay	26	320	1.48	0.97
Clayey Gravel	32	150		
Lean Clay	28	280	1.60	1.01
Clayey Gravel	35	100		
Lean Clay	30	240	1.66	1.03
Clayey Gravel	38	50		

¹ Additional Field Exploration, Summit Hills Development, Alpine, Utah, Job No. 051709, November 29, 2005.

² U.S. Bureau of Reclamation, 1987, "Design Standards No. 13, Embankment Dams," Denver, Colorado.

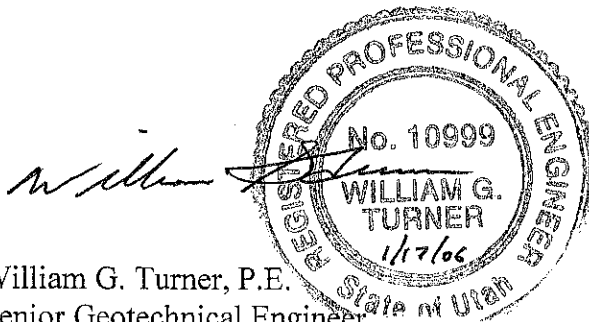
Typically, the minimum acceptable factors of safety (FS) are 1.5 for static conditions and 1.0 for seismic (pseudostatic) conditions. Note that for the lower range of friction angles, the factors of safety for both conditions are slightly less than the minimum. Our analyses indicates that using an average or higher than average friction angle (and a lower cohesion) results in factors of safety greater than the typical minimum values. This suggests that a slight increase in the friction angle (greater than 26°) will result in factors of safety that meet the minimum values. We believe that the average strength values indicated above adequately represent the slope, thus it is our opinion that the post-construction slopes will be stable. Stability results are presented on Figures 1 through 6, attached.

This letter is considered an addendum to our referenced report and is subject to the same conditions and limitations described therein.

We appreciate the opportunity of providing our services on this project. If we can answer questions or be of further service, please call.

Respectfully;

EARTHTEC TESTING AND ENGINEERING, P.C.



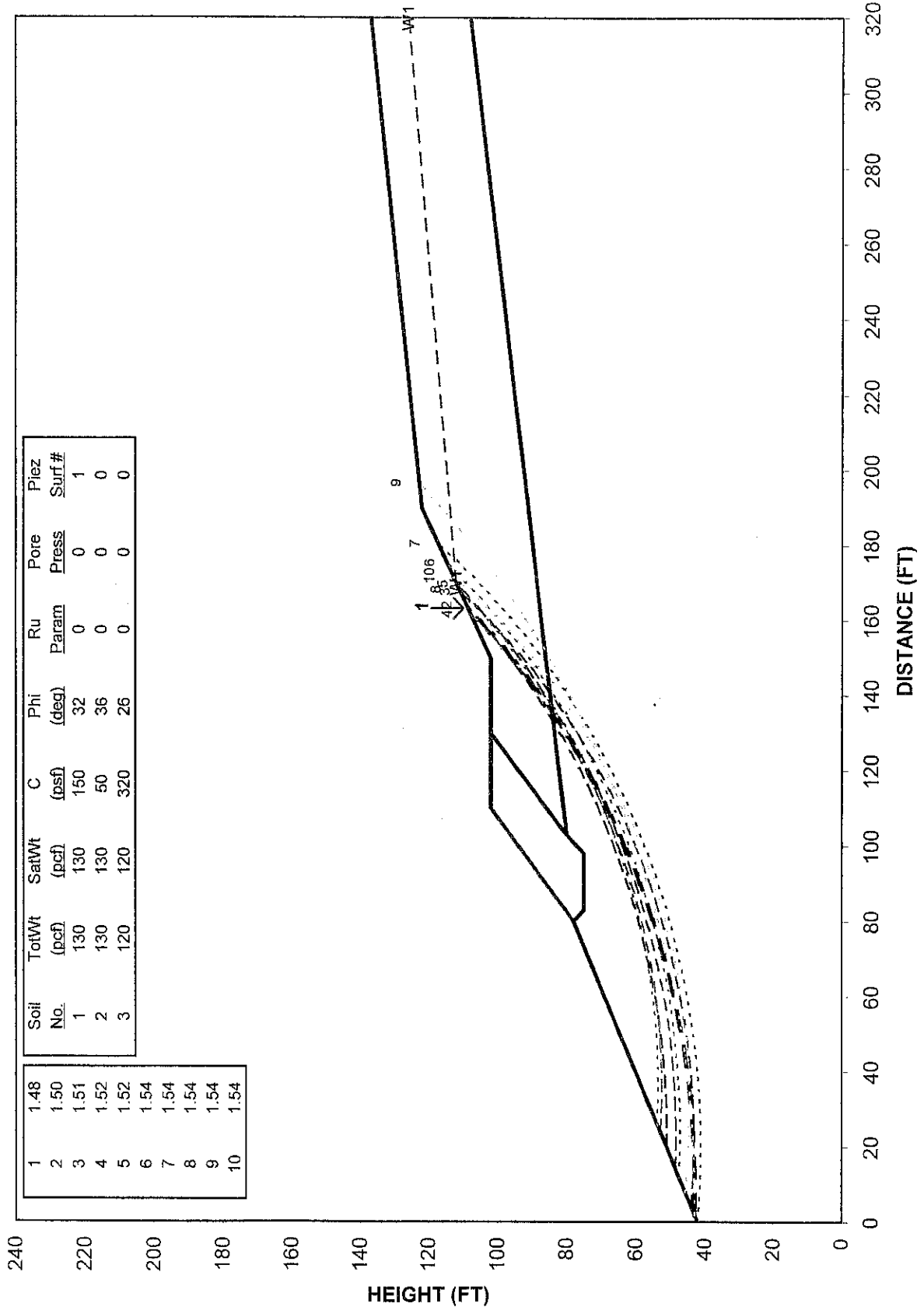
William G. Turner, P.E.
Senior Geotechnical Engineer

Steven L. Smith, P.E.
Principal Geotechnical Engineer

Attachments: Figures 1-6, Stability Results

STABILITY RESULTS

Lakeview Drive - Slope Stability Below Lot 16
 Ten Most Critical Surfaces. C:051709H.PLT Run By: WGTurner 01-18-06



PROJECT NO.: 051709

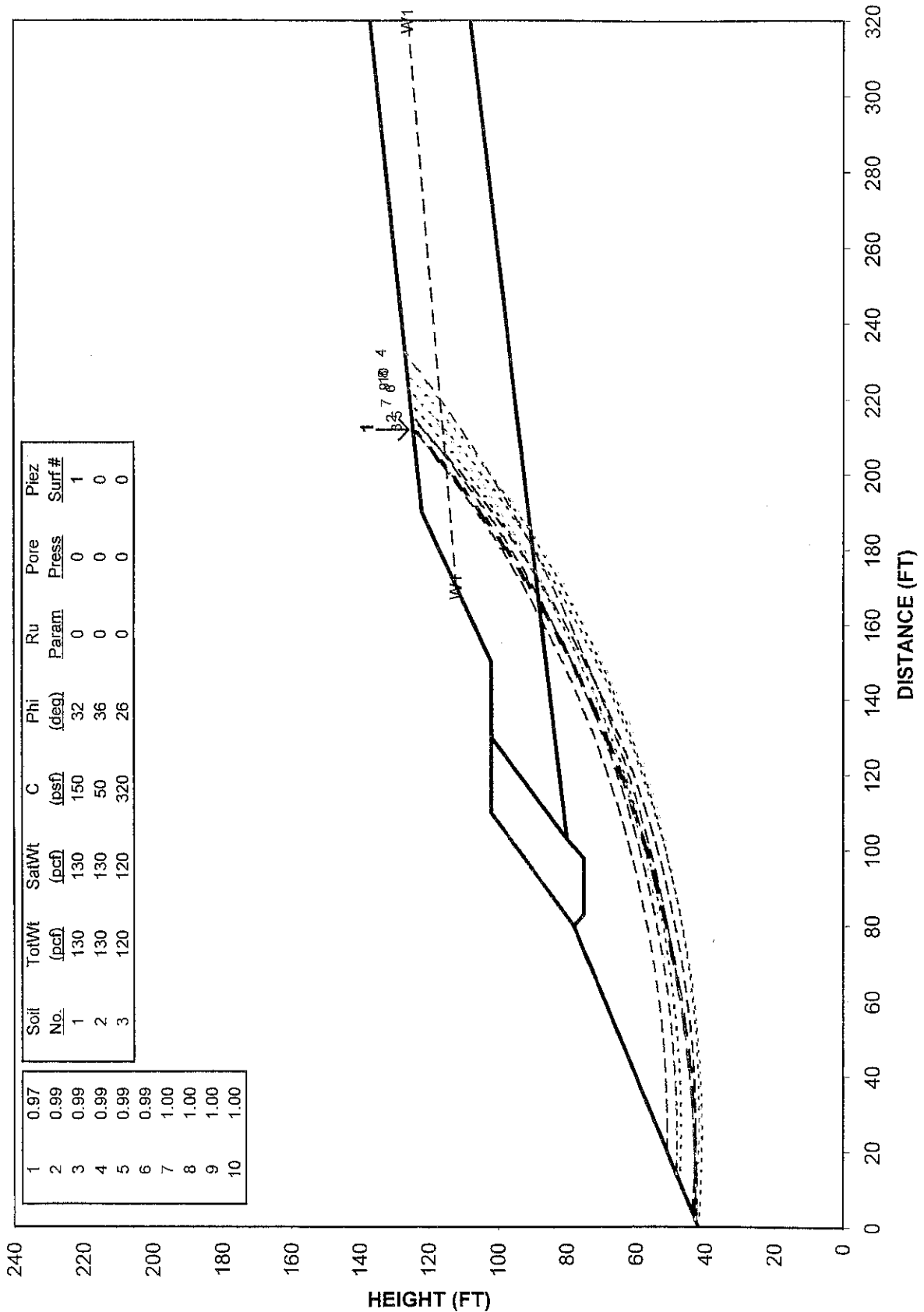


FIGURE NO.:1

STABILITY RESULTS

Lakeview Drive - Slope Stability Below Lot 16 (Seismic)

Ten Most Critical Surfaces. C:051709HS.PLT Run By: WGTurner 01-18-06



PROJECT NO.: 051709H

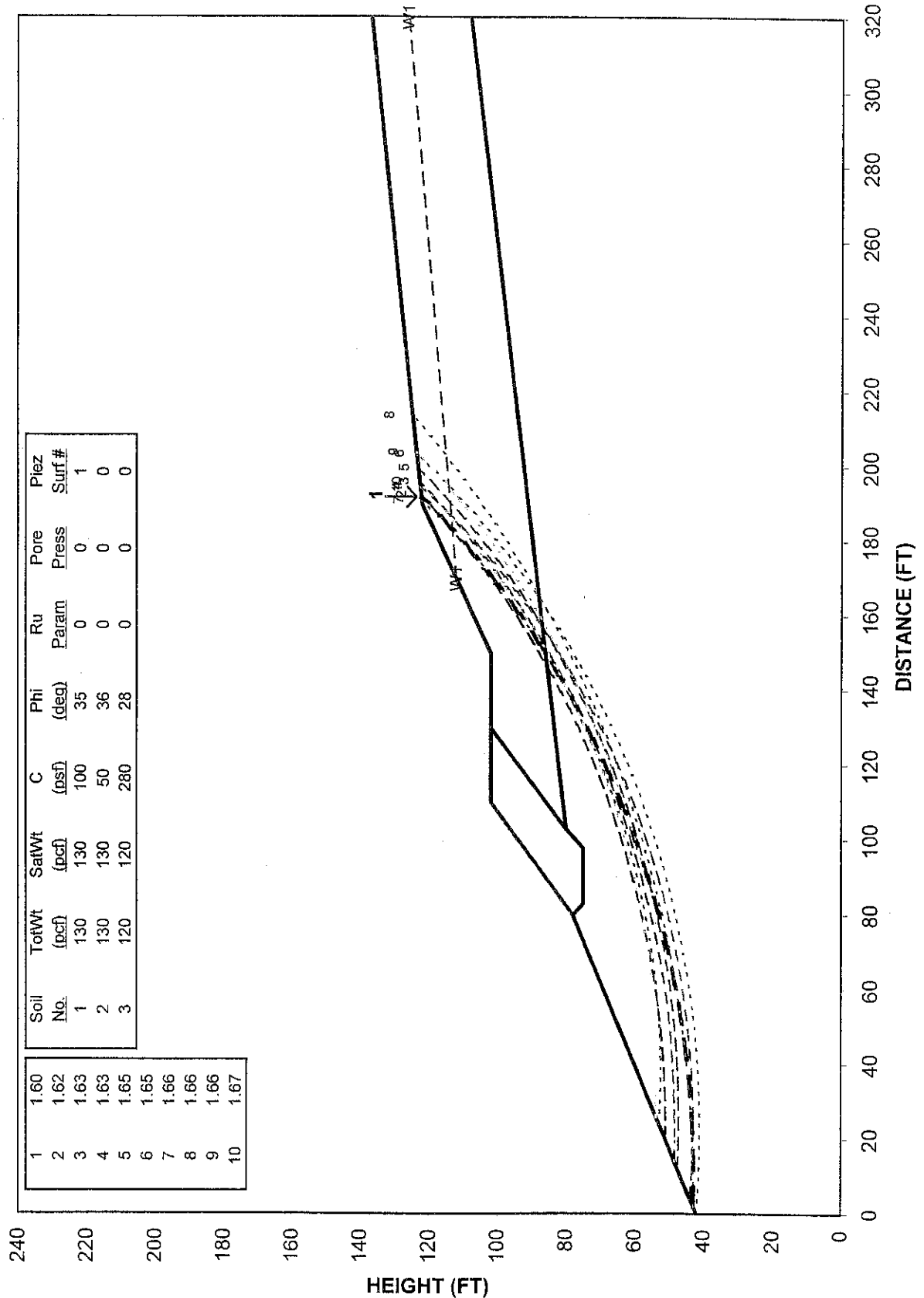


FIGURE NO.:2

STABILITY RESULTS

Lakeview Drive - Slope Stability Below Lot 16

Ten Most Critical Surfaces. C:051709J.PLT Run By: WGTurner 01-18-06



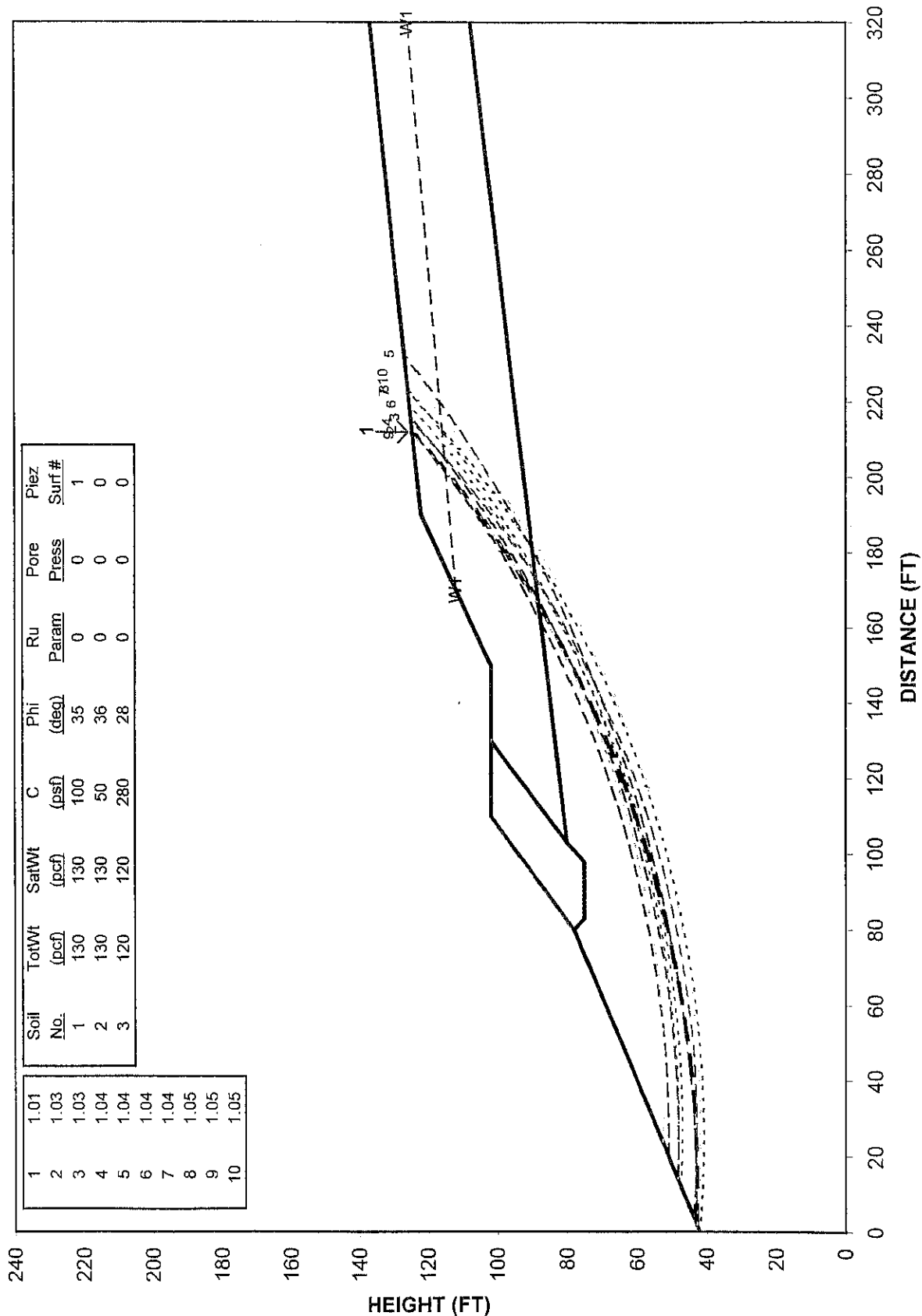
PROJECT NO.: 05170



FIGURE NO.:3

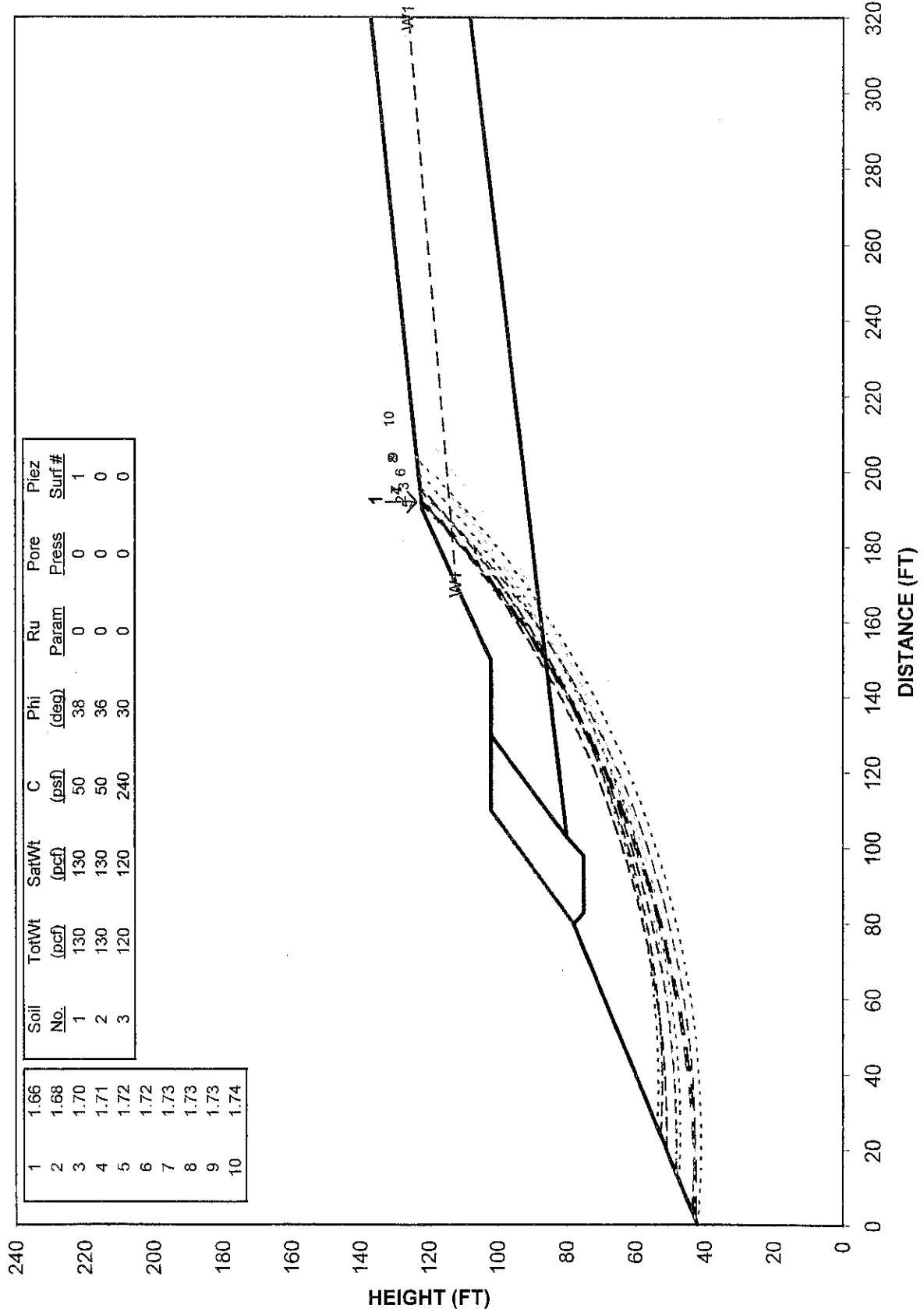
Lakeview Drive - Slope Stability Below Lot 16 (Seismic)

Ten Most Critical Surfaces. C:051709JS.PLT Run By: WGTurner 01-18-06



STABILITY RESULTS

Lakeview Drive - Slope Stability Below Lot 16
 Ten Most Critical Surfaces. C:051709\PLT Run By: WGTurner 01-18-06



PROJECT NO.: 051709

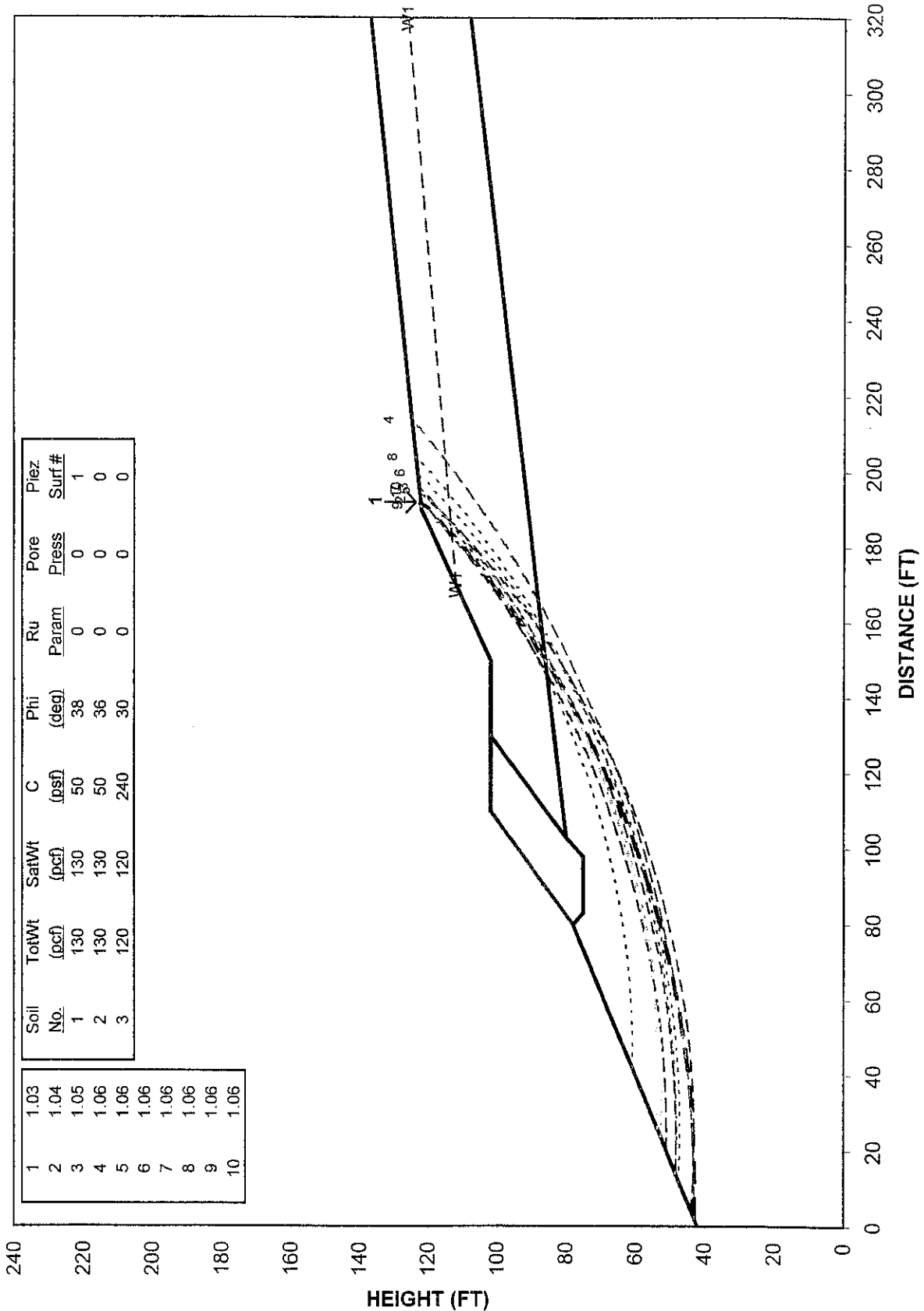


FIGURE NO.: 5

STABILITY RESULTS

Lakeview Drive - Slope Stability Below Lot 16 (Seismic)

Ten Most Critical Surfaces. C:051709IS.PLT Run By: WGTurner 01-18-06



PROJECT NO.: 051709I



FIGURE NO.:6



Earthtec Testing & Engineering, P.C.

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Phone (801) 225-5711
Fax (801) 225-3363

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Ogden, Utah - 84401
Phone (801) 399-9516
Fax (801) 399-9842

October 3, 2006

Mr. Taylor Smith
c/o Sowby & Berg Consultants
45 North 490 West
American Fork, UT 84003

**Subject: Response to Review
 Proposed Lakeview Drive
 Summit Hills (Vista Meadows)
 Alpine, Utah
 Job No. 051709**

Dear Mr. Smith:

As you requested, this letter presents our response to a review prepared by Taylor Geo-Engineering (on behalf of Alpine City) of our retaining wall recommendations¹ for the proposed Lakeview Drive at the subject site. The review expressed three main concerns that we address herein. Those concerns include:

1. Placing geogrid in Lock+Load walls taller than 4 feet and performing internal and external stability analyses of the geogrid.
2. Revising the seismic analyses by using a minimum 1.1 factor of safety and a peak ground acceleration based on the characteristic earthquake at the site.
3. Including a plan showing the locations of the cross-sections for the stability analyses in relation to exploration locations.

We previously prepared a geotechnical report² for the project and have performed several stability analyses³ for the south facing slope on which Lakeview Drive will be constructed, indicating the overall slope will be stable. The design presented herein is based on our understanding of the retaining wall requirements, soil conditions at the site, and our engineering analyses.

¹Retaining Wall Recommendations, Proposed Lakeview Drive, Summit Hills (Vista Meadows), Alpine, Utah, Job No. 051709, April 19, 2006.

²Geotechnical Study, Summit Hills Development & Lakeview Drive Extension, Alpine, Utah, Job No. 051709, August 18, 2005.

³Additional Information, Stability of Slope Below Lot 16, Summit Hills Development, Alpine, Utah, Job No. 051709, January 26, 2006.

Earthtec

Proposed Construction

As indicated in our April 19, 2006 letter, the plans provided by Sowby & Berg Consultants indicated that the highest retaining walls in cut areas will be on the order of 27 feet in height (located on the south-facing hillside above Hog Hollow Road). A 2H:1V backslope will be cut into the hillside above the highest wall, extending to as much as 12 feet in height. In fill areas, walls will be constructed up to about 27 feet in height to retain Lakeview Drive on the south-facing hillside above Hog Hollow Road. A higher fill is also planned near the east end of Lakeview Drive, with the maximum fill height of approximately 48 feet.

Stability Analyses

Our stability analyses included sliding, overturning, bearing capacity, and the overall (global) stability of the proposed walls, which were evaluated based on existing soils at the site and assuming that backfill soils will consist of structural fill as discussed in the recommendations below. Typical minimum factors of safety are 1.5 for sliding, 1.5 for overturning and 3.0 for bearing. We considered using Redi-Rock block walls in cut situations (to minimize the amount of cut behind the wall that would be needed to place geogrid) and using Lock+Load block walls in fill situations. These factors of safety are met for the Lock+Load blocks up to a maximum height of 9½ feet when backfilled with select fill material, as presented in the April 19, 2006 letter. The results of our analyses indicate that these minimum factors of safety are also met with a maximum wall height of about 6 feet for 30-inch deep Redi-Rock blocks and 7½ feet for 40-inch deep Redi-Rock blocks (see Figure 1). The retainage heights discussed in the proposed construction section above can be achieved by placing walls on levels or tiers, with the bottom of each tier offset about 9 feet for Lock+Load walls and 7½ feet for Redi-Rock walls, measured from the bottom of each lower tier. Geogrid will need to be placed behind the Lock+Load walls retaining fill soils, as discussed below.

Engineering parameters for on-site soils and the computer program for analyses are the same as presented in our referenced letter of January 26, 2006, using the lowest (most conservative) friction angles presented therein, as follows:

Material Type	Internal Friction Angle (degrees)	Apparent Cohesion (psf)	Moist Unit Weight (pcf)
Lean Clay	26	320	120
Clayey Gravel	32	150	130
Structural Fill	40	50	135
Redi-Rock	0	5000	145
Lock+Load	45	50	145

Since much of the wall in cut areas will be below elevation 5230 feet, we used native clay soil parameters beneath and behind the retaining walls in cuts. In fill areas, we used clayey gravel soil

parameters to represent the native soils. A phreatic surface was assumed within the slope behind and/or beneath the walls in native soils.

For the seismic (pseudostatic) analyses, we believe a reasonable “characteristic” earthquake event is the acceleration associated with a 5% probability of exceedance in 50 years. A value of 0.42g for the 5% probability of exceedance in 50 years was obtained by querying the USGS website⁴ at site (grid) locations of 40.462° north latitude and -111.794° west longitude. Half of this value, 0.21, was used as the pseudostatic coefficient for the stability analysis.

The internal stability of the geogrid was analyzed using the computer program *MSEW*, which allows modeling of geogrid strengths, geogrid/soil interface strengths and geogrid/block facing interface strengths. *MSEW* is only capable of modeling a two-tiered wall, so for the wall with five tiers we modeled the bottom two tiers by applying a 3600-pound (135 pcf times 27 feet, and rounded off) surcharge load on top of the wall to simulate the weight of the fill to be placed above the wall. The results of this analysis indicate that geogrid used in conjunction with Lock+Load blocks will need to extend at least 24 feet behind the block facing for the bottom tier, and that geogrid is needed at vertical spacings equivalent to one block height for the bottom three tiers. For the upper two tiers, the geogrid used in conjunction with Lock+Load blocks will need to extend at least 16½ feet behind the block facing for the bottom tier, and geogrid is needed at vertical spacings equivalent to two block heights. The analysis results are included in the Appendix.

The configurations analyzed consisted of the following (see Figure 2 for approximate cross-section locations):

- Two tiers of 7½-foot high Redi-Rock walls, with a 2H:1 V cut slope extending above the wall for a height of about 22 feet.
- Three tiers of 7½-foot high Redi-Rock walls, with a 2H:1 V cut slope extending above the wall for a height of about 12 feet.
- Three tiers of 5- to 9-foot high Lock+Load walls retaining the roadway embankment fill (above Hog Hollow Road), with a 250 psf surcharge (to account for traffic loads) on a relatively level backfill and geogrid extending at least 16½ feet behind the wall.
- Five tiers of 9-foot high Lock+Load walls retaining the roadway embankment fill (near east end of Lakeview Drive), with a 250 psf surcharge (to account for traffic loads) on a relatively level backfill and geogrid extending at least 24 feet behind the wall.

In accordance with the FHWA guidelines for MSE walls, the required global minimum factors of safety (FS) are 1.5 for static conditions and 1.1 for seismic (pseudostatic) conditions. The results

⁴USGS, 2005, Earthquake Hazards Program, <http://eqhazmaps.usgs.gov/>

of our analyses indicate the configurations analyzed will meet both these requirements, provided the geogrid extends 45 feet behind the wall face of the bottom tier where the wall/fill will be placed on relatively steep slopes, and extends 35 feet behind the wall face of the bottom tier where the wall/fill will be placed on structural fill. The slope stability data are attached as Figures 3 through 10.

Conclusions and Recommendations

Based on the results of our analyses, we recommend the following:

- To retain cut slopes, we recommend the wall be constructed using 40-inch deep Redi-Rock blocks, with maximum tier heights of 7½ feet and the bottom blocks in each row embedded a minimum 12 inches. The blocks should be placed on a minimum 12-inch thick pad of structural fill, as shown on the attached Figure 11.
- To retain fill slopes, we recommend that the wall be constructed using standard Lock+Load blocks, with maximum tier heights of 9⅓ feet and the bottom blocks in each row embedded a minimum 12 inches. The blocks should be placed on a minimum 12 inches of structural fill as outlined below (see Figure 11, attached). The blocks should be placed on a minimum 12 inches of structural fill as outlined below (also see Figure 12, attached).
- For the Lock+Load walls, geogrid is not needed for walls up to 4 feet high. For higher walls, we recommend that geogrid be placed between every other row of blocks within the upper two tiers, and between every row of blocks for the lower tiers.
- For walls/fill placed on ground sloping steeper than 5H:1V, the geogrid should extend 45 feet behind the wall face for the bottom tier, 36 feet for the next tier, etc., and should consist of Tensar UX1500MSE or an engineer approved equivalent (different geogrids have properties that could affect the performance of the wall).
- For the 5-tier wall to be constructed as part of the fill toward the east end of Lakeview Drive, the geogrid should extend 35 feet behind the wall face for the bottom tier, 26 feet for the next tier, 20 feet for the third tier, 16½ feet for the fourth tier, and 13 feet for the fifth tier. For the bottom two tiers, the top and bottom layers of geogrid for each tier should consist of Tensar UX1600MSE or an engineer approved equivalent. All other layers of geogrid should consist of Tensar UX1500MSE or an engineer approved equivalent.
- For other walls/fill placed on ground sloping at 5H:1V or flatter, the geogrid should extend the same length as described above for the 5-tier wall, with the top tier the same as the fifth tier (13 feet long), the next tier down the same as the fourth tier (16½ feet long), etc. The geogrid should consist of Tensar UX1500MSE or an engineer approved equivalent.
- The geogrid should be rolled out from the face of the wall (machine direction) and pulled taut to remove slack prior to placing fill on the grid. Equipment wheels (if equipment on

geogrid is necessary) should not be turned while driving over the geogrid. Overlapping of the geogrid is not required.

Our analyses were performed assuming that no hydrostatic (water) pressures occur directly behind the wall. We thus recommend that a minimum 12-inch zone of free-draining granular material be placed behind the block walls to intercept any possible water. In addition, a minimum 6-inch diameter perforated ADS drain pipe or equivalent should be wrapped in a filter fabric, placed at the bottom of the 12-inch zone at a minimum grade of 2%, and discharged beyond the wall to an appropriate drainage device. The free draining granular material should consist of 3/4-inch to 2-inch size gravel with less than 5% passing the No. 200 sieve (see Figure 7).

The fill pad beneath and the backfill behind the walls should consist of angular on-site gravel soils having less than 20% fines (percent passing the No. 200 sieve), or angular imported fill material meeting the following recommendations:

Maximum particle size:	3 inches
Percent retained on the 3/4 inch sieve (coarse gravel):	30 maximum
Percent passing the No. 4 sieve (total sand):	40 maximum
Percent passing the No. 200 sieve (fines):	10 maximum
Plasticity Index of fines:	non-plastic

Backfill soils should be placed in loose lifts not exceeding a thickness of 12 inches, moisture conditioned to within 2% of optimum, and compacted to a minimum 95% of the maximum dry density as determined by ASTM D698 (Standard Proctor).

Surface drainage should be provided that directs surface water away from the walls. A drainage ditch should be constructed at the top of the cut slopes above the walls so that water does not flow over the slope face. If water is observed seeping from cut slopes, a blanket drain will be needed to appropriately convey water away from the wall. Should this situation occur, Earthtec should be consulted.

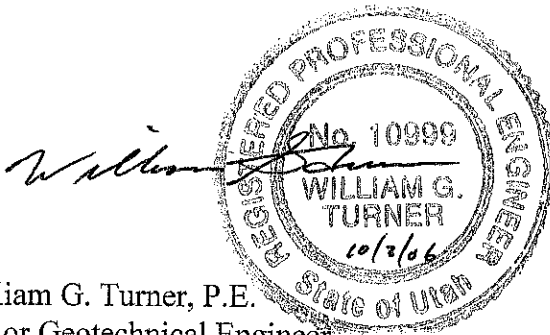
Finally, we recommend that a representative of Earthtec visit the site during construction to observe implementation of these recommendations. Note that Redi-Rock blocks and Lock+Load blocks should be installed in accordance with the guidelines of each respective manufacturer.

Closure

This letter is considered an addendum to our referenced report and is subject to the same conditions and limitations presented therein. We appreciate the opportunity of providing our services on this project. If we can answer questions or be of further service, please call.

Respectfully;

EARTHTEC TESTING AND ENGINEERING, P.C.



William G. Turner, P.E.
Senior Geotechnical Engineer

A handwritten signature in cursive script, reading "Steven L. Smith".

Steven L. Smith, P.E.
Principal Geotechnical Engineer

Attachments: Figure 1, Redi-Rock Wall Stability Evaluation
Figure 2, Approximate Exploration and Cross-Section Locations
Figures 3-10, Stability Results
Figure 11, Redi-Rock Wall Design Without Geogrid
Figure 12, Lock+Load Wall Design With Geogrid
Appendix: MSEW Output Data (8 sheets)

REDI-ROCK WALL STABILITY EVALUATION

Project: Lakeview Drive (Vista Meadows)
Location: Alpine, Utah

Date: 10/3/2006
By: WGT

Backfill slope angle, β : 26 degrees
Batter angle (from vertical): 5.55 degrees
Soil/wall interface friction: 16 degrees
Surcharge pressure: 0 psf
Rows of planter blocks: 0 rows
Embedment depth: 1 feet
Total K_a = 0.379
Horizontal K_{ah} = 0.373
Horizontal K_{ph} = 2.682

Foundation soil γ : 135 pcf
Foundation soil ϕ : 40 degrees
Found. soil cohesion: 0 psf
Retained soil γ : 130 pcf
Retained soil ϕ : 32 degrees
FS against sliding: 1.5
FS against overturning: 1.5
FS for bearing: 3.0
Foundation soil δ : 26.67 degrees

Block depth:	30	inches		Average block wall γ:					145 pcf
Wall Ht (ft)	1.5	3.0	4.5	6.0	7.5	9.0	10.5	12.0	
P_{ah} (lbs/ft)	55	218	491	873	1363	1963	2672	3490	
Wall Wt (lbs)	544	1088	1631	2175	2719	3263	3806	4350	
Wall $x_{centroid}$	1.25	1.40	1.47	1.54	1.61	1.69	1.76	1.83	
$P_{sliding}$	55	218	491	873	1363	1963	2672	3490	
$P_{resisting}$	559	868	1195	1544	1914	2306	2720	3155	
FS_{sliding}	10.3	4.0	2.4	1.8	1.4	1.2	1.0	0.9	
$M_{overturn}$	27	218	736	1745	3408	5890	9353	13961	
$M_{resisting}$	1003	1841	2719	3676	4713	5828	7023	8297	
FS_{overturn}	36.8	8.4	3.7	2.1	1.4	1.0	0.8	0.6	
Vertical Load	218	390	555	705	842	967	1081	1187	
Soil Capacity	11853	11853	11853	11853	11853	11853	11853	11853	
FS_{bearing}	54.5	30.4	21.3	16.8	14.1	12.3	11.0	10.0	

Max. Recommended Wall Height: 6 feet for 30-inch blocks and no planter blocks

Block depth:	40	inches		Average block wall γ:					145 pcf
Wall Ht (ft)	1.5	3.0	4.5	6.0	7.5	9.0	10.5	12.0	
P_{ah} (lbs/ft)	55	218	491	873	1363	1963	2672	3490	
Wall Wt (lbs)	725	1450	2175	2900	3625	4350	5075	5800	
Wall $x_{centroid}$	1.67	1.81	1.89	1.96	2.03	2.10	2.18	2.25	
$P_{sliding}$	55	218	491	873	1363	1963	2672	3490	
$P_{resisting}$	650	1050	1468	1908	2369	2852	3357	3884	
FS_{sliding}	11.9	4.8	3.0	2.2	1.7	1.5	1.3	1.1	
$M_{overturn}$	27	218	736	1745	3408	5890	9353	13961	
$M_{resisting}$	1532	2951	4424	6002	7686	9475	11371	13372	
FS_{overturn}	56.2	13.5	6.0	3.4	2.3	1.6	1.2	1.0	
Vertical Load	218	400	577	740	892	1034	1166	1289	
Soil Capacity	11853	11853	11853	11853	11853	11853	11853	11853	
FS_{bearing}	54.5	29.6	20.5	16.0	13.3	11.5	10.2	9.2	

Max. Recommended Wall Height: 9 feet for 40-inch blocks and no planter blocks

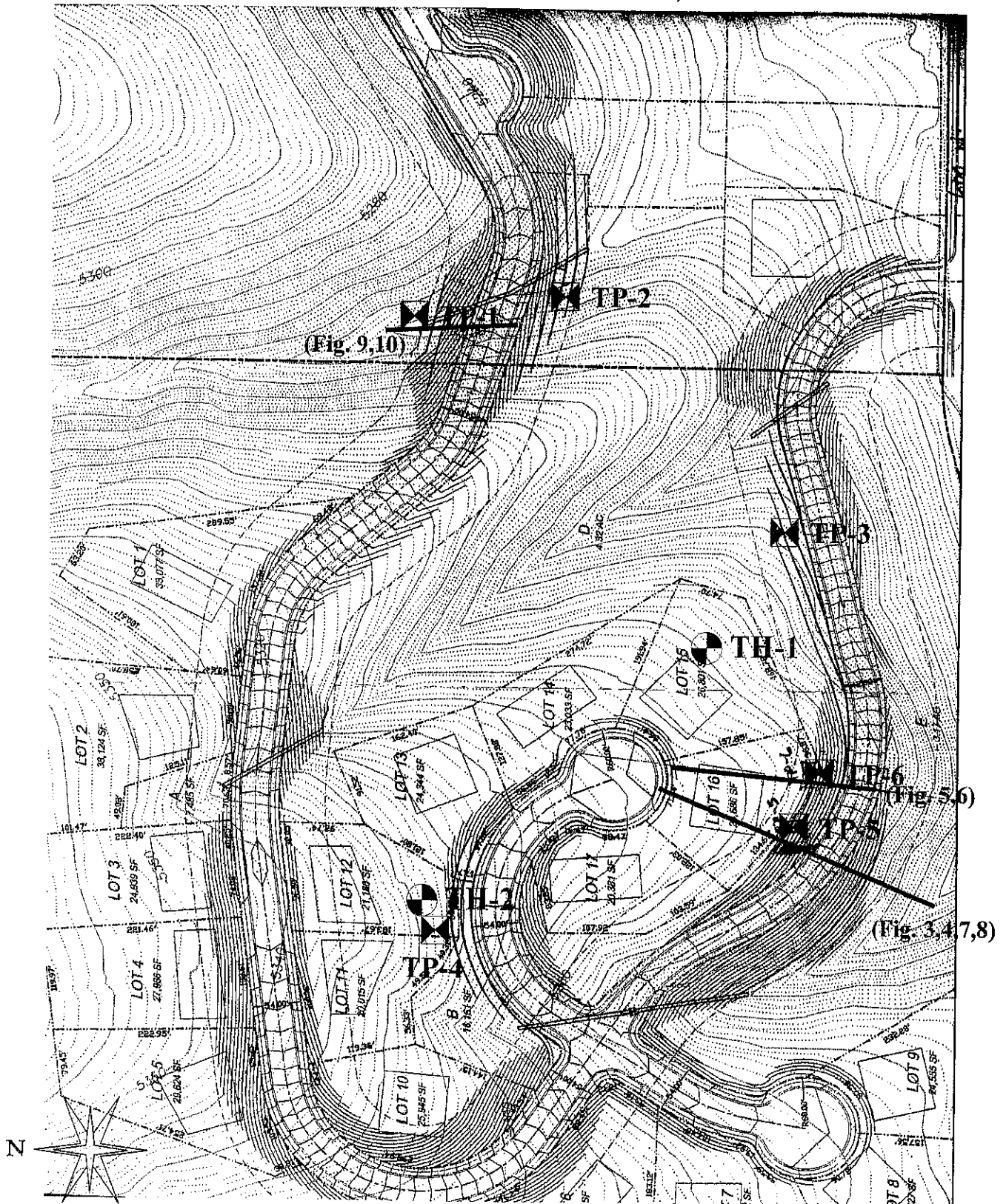
PROJECT NO.: 051709



FIGURE NO.: 1

LOCATION OF EXPLORATIONS & CROSS-SECTIONS

LAKEVIEW DRIVE/VISTA MEADOWS, ALPINE



Not to Scale

— Approximate Cross-Section Location

⊠ Approximate Test Pit Location

⊙ Approximate Test Hole Location

PROJECT NO.: 051709

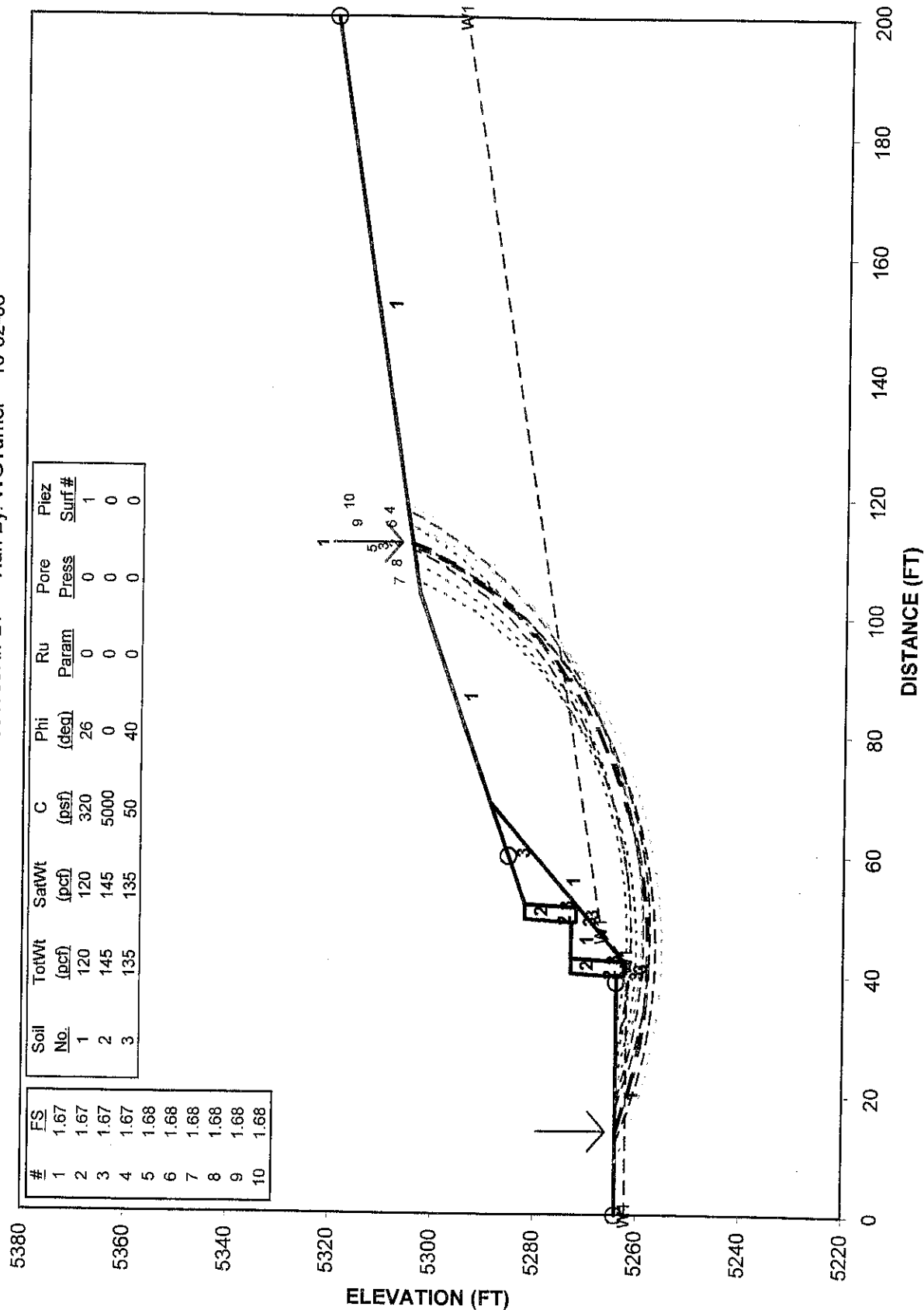
Earthtec
Testing and Engineering, P.C.

FIGURE NO.: 2

STABILITY RESULTS

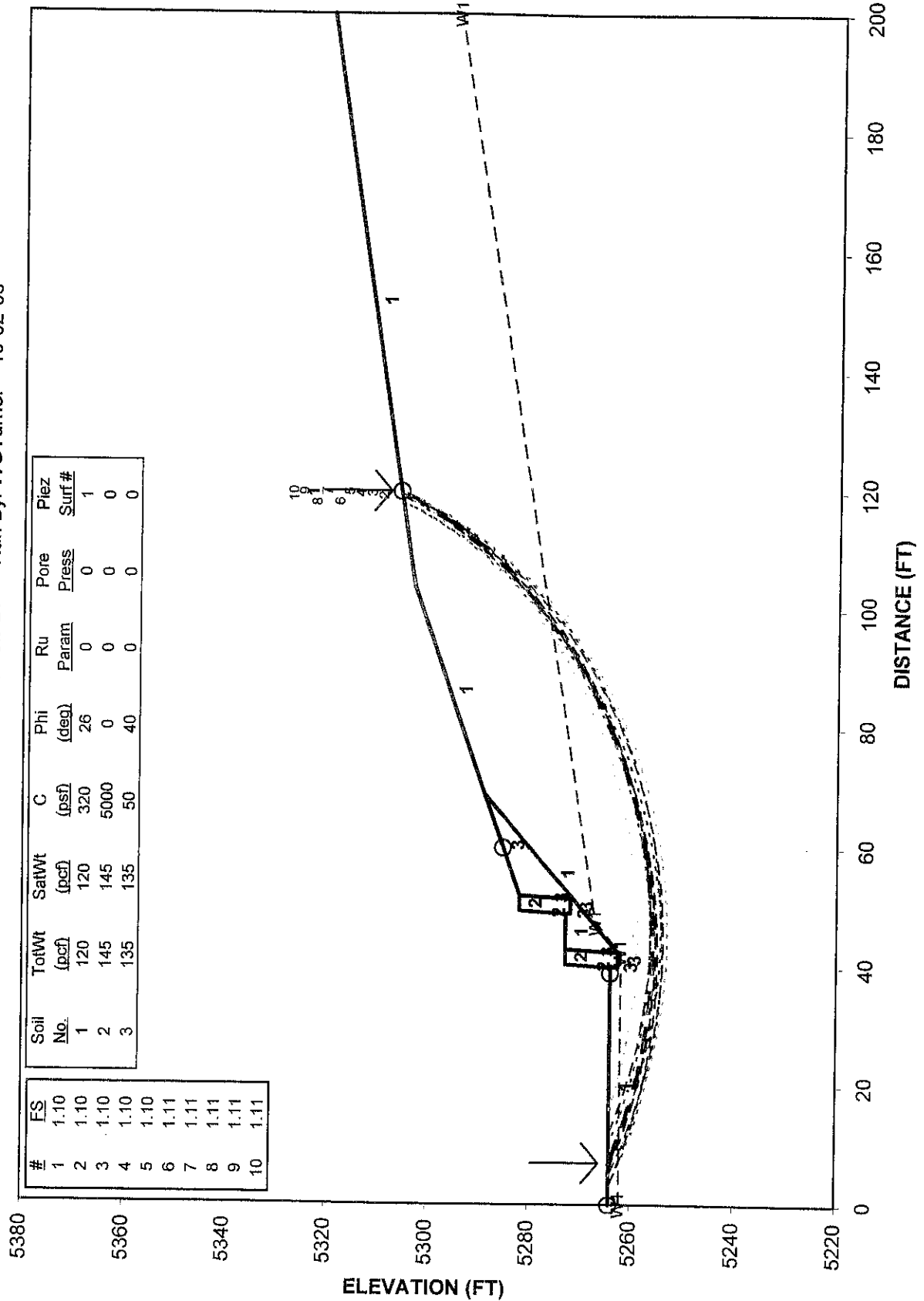
Lakeview Drive - Stability of Redi-Rock Wall in Cut (2 Tiers w/High Backslope)

Ten Most Critical Surfaces. C:051709R.PLT Run By: WGTurner 10-02-06



STABILITY RESULTS

Lakeview Drive - Stability of Redi-Rock Wall in Cut (2 Tiers) (Seismic)
 Ten Most Critical Surfaces. C:051709RS.PLT Run By: WGTurner 10-02-06

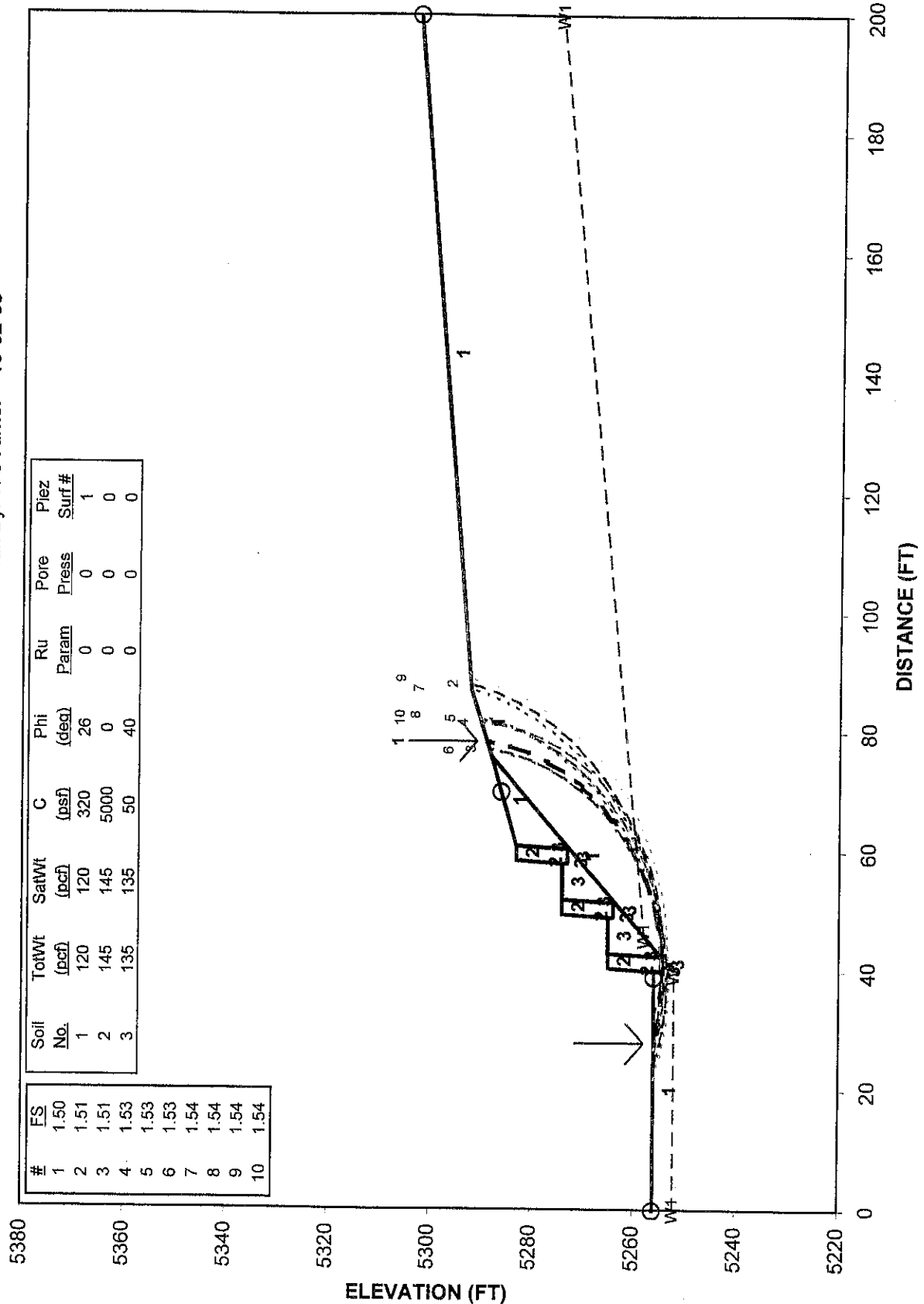


PROJECT NO.: 051709



FIGURE NO.: 4

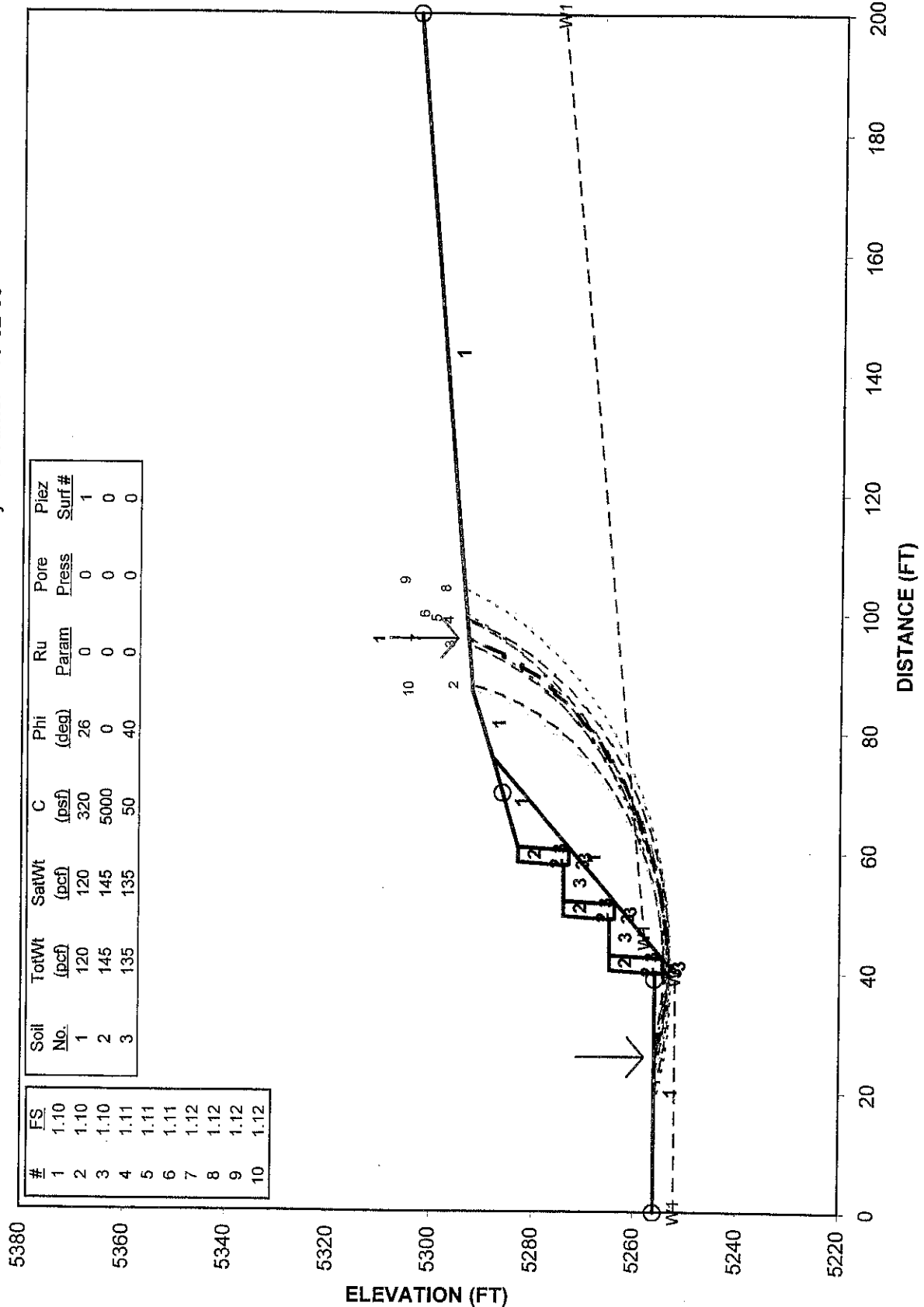
Lakeview Drive - Stability of Redi-Rock Wall in Cut (3 Wall Tiers)
Ten Most Critical Surfaces. C:051709S.PLT Run By: WGTurner 10-02-06



STABILITY RESULTS

Lakeview Drive - Stability of Redi-Rock Wall in Cut (3 Wall Tiers) (Seismic)

Ten Most Critical Surfaces. C:051709SS.PLT Run By: WGTurner 10-02-06



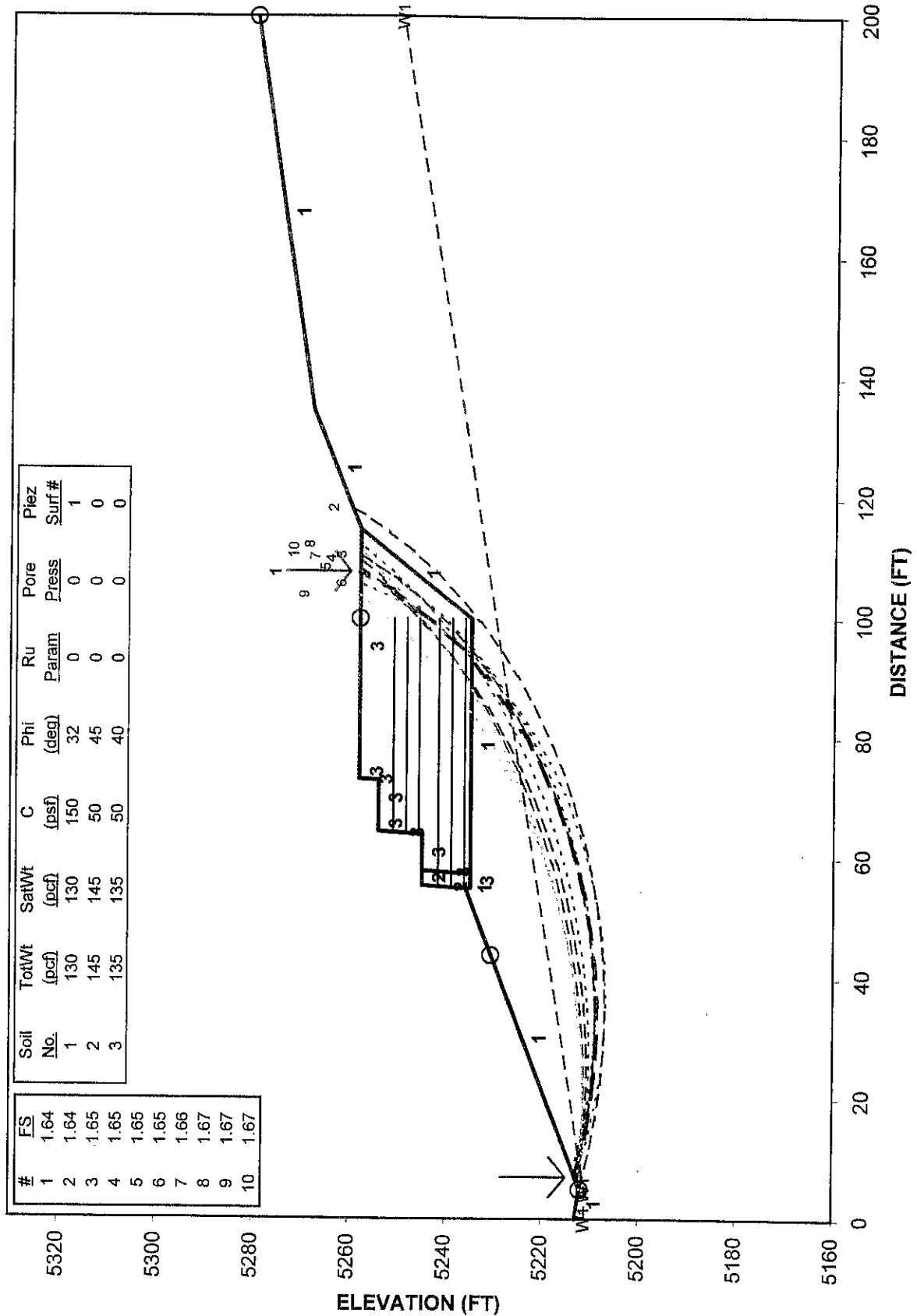
PROJECT NO.: 051709



FIGURE NO.: 6

STABILITY RESULTS

Lakeview Drive - Stability of Lock+Load Wall in Fill Placed on Slope
Ten Most Critical Surfaces. C:051709T.PLT Run By: WGTurner 10-03-06



PROJECT NO.: 051709

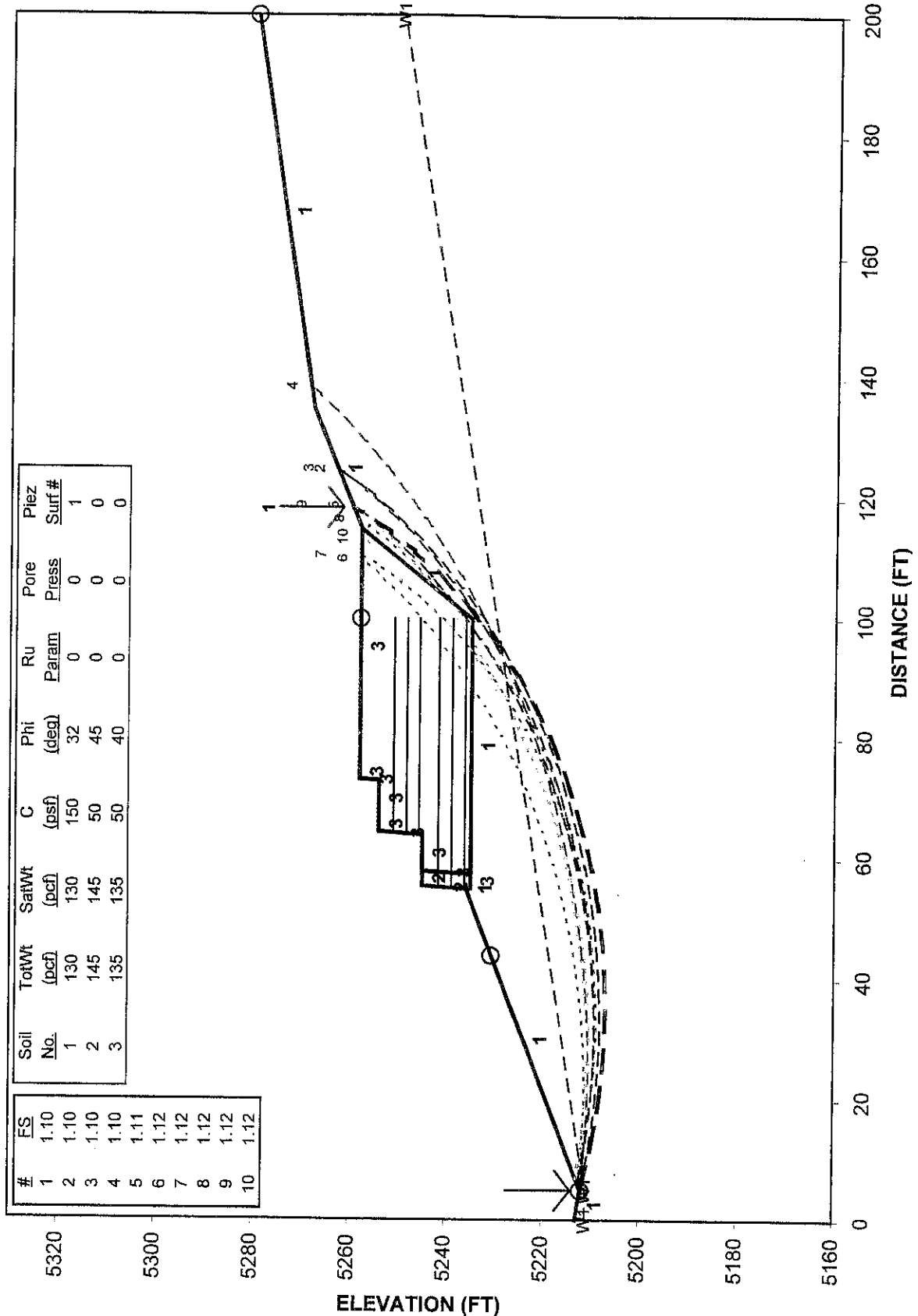


FIGURE NO.: 7

STABILITY RESULTS

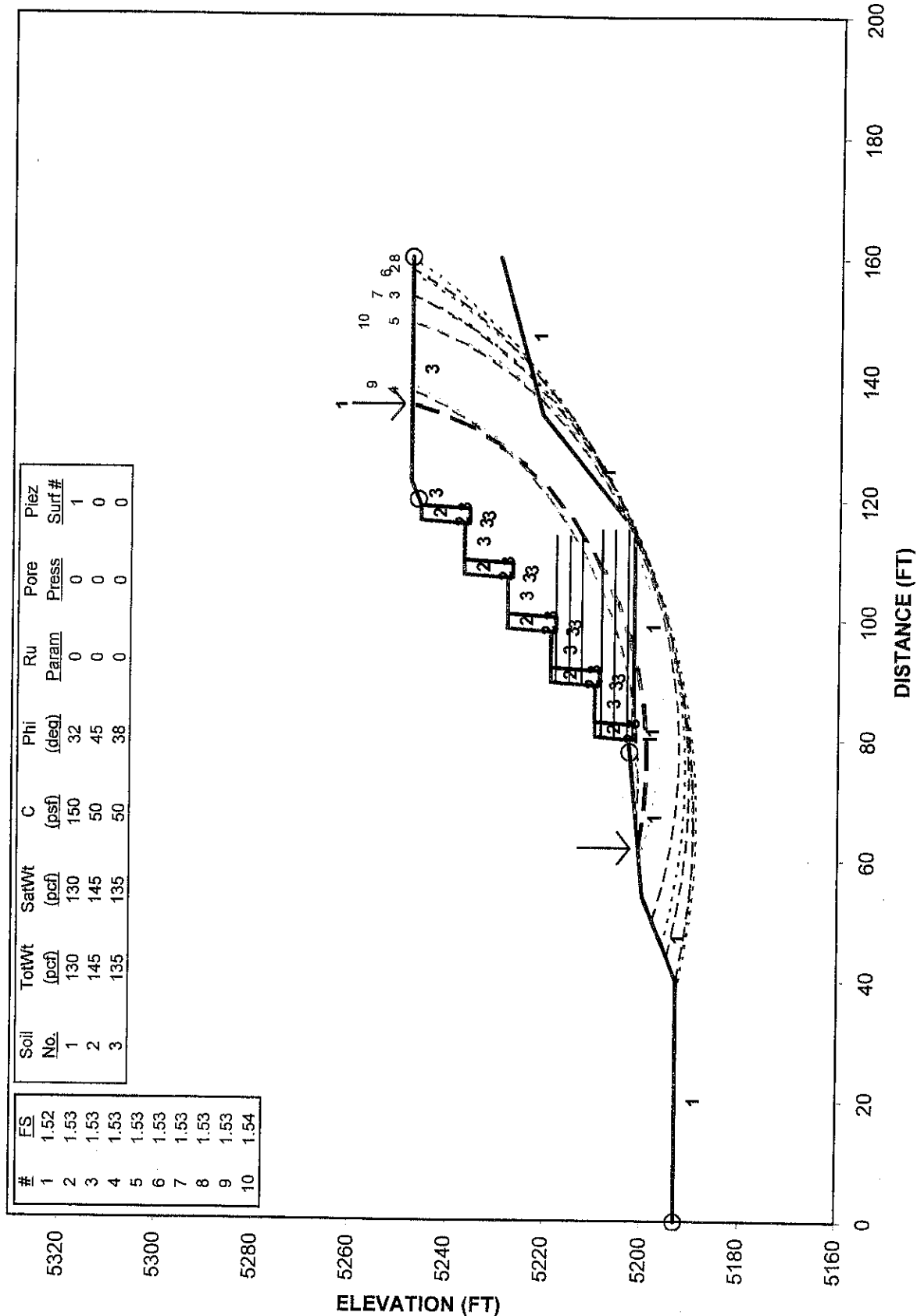
Lakeview Drive - Stability of Lock+Load Wall in Fill Placed on Slope (Seismic)

Ten Most Critical Surfaces. C:051709TS.PLT Run By: WGTurner 10-03-06



STABILITY RESULTS

Lakeview Dr - Stability of Lock+Load Wall in High Fill (East End)
 Ten Most Critical Surfaces. C:051709U.PLT Run By: WGTurner 10-03-06



PROJECT NO.: 051709

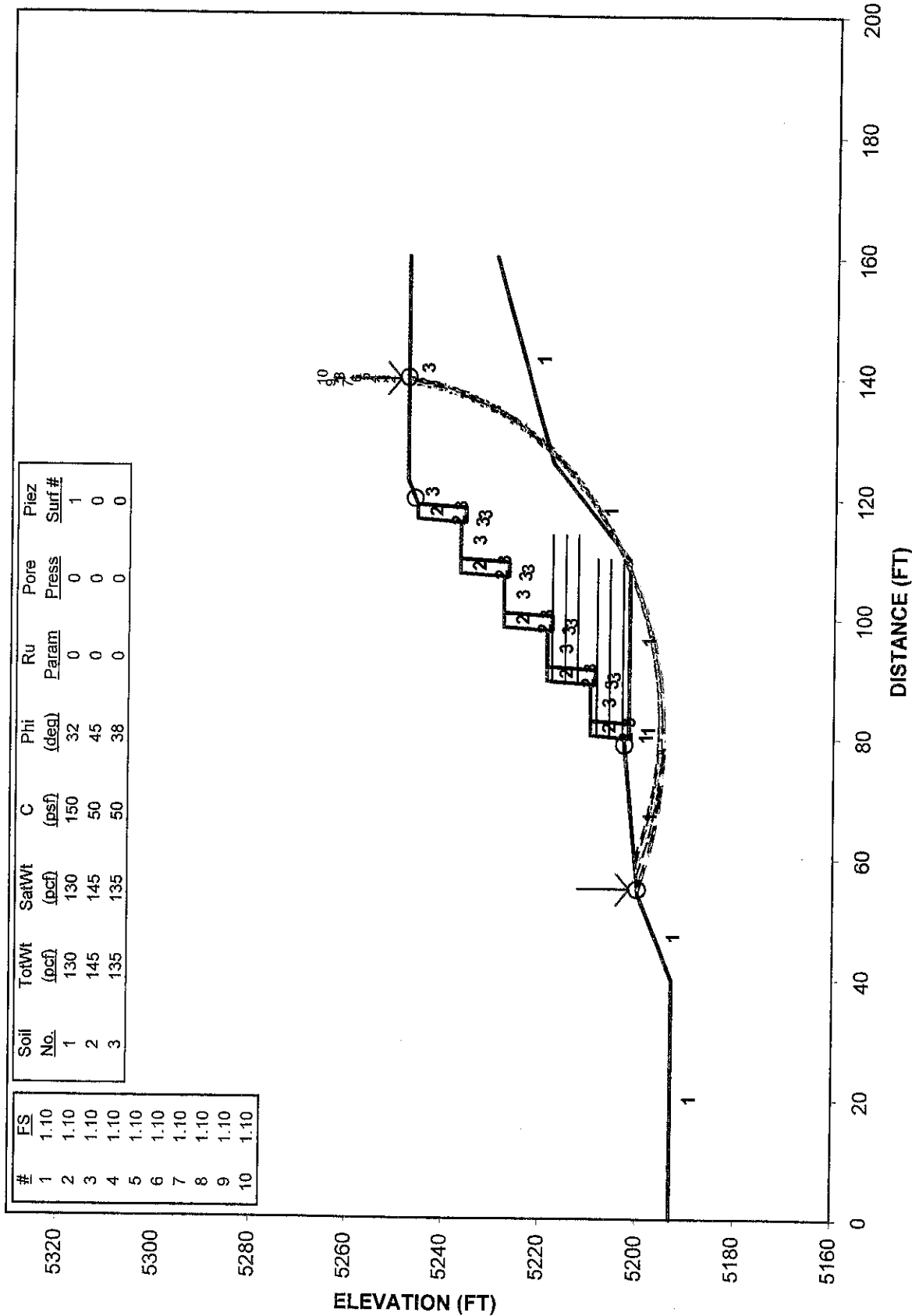


FIGURE NO.: 9

STABILITY RESULTS

Lakeview Dr - Stability of Lock+Load Wall in High Fill (East End) (Seismic)

Ten Most Critical Surfaces. C:051709US.PLT Run By: WGTurner 10-03-06



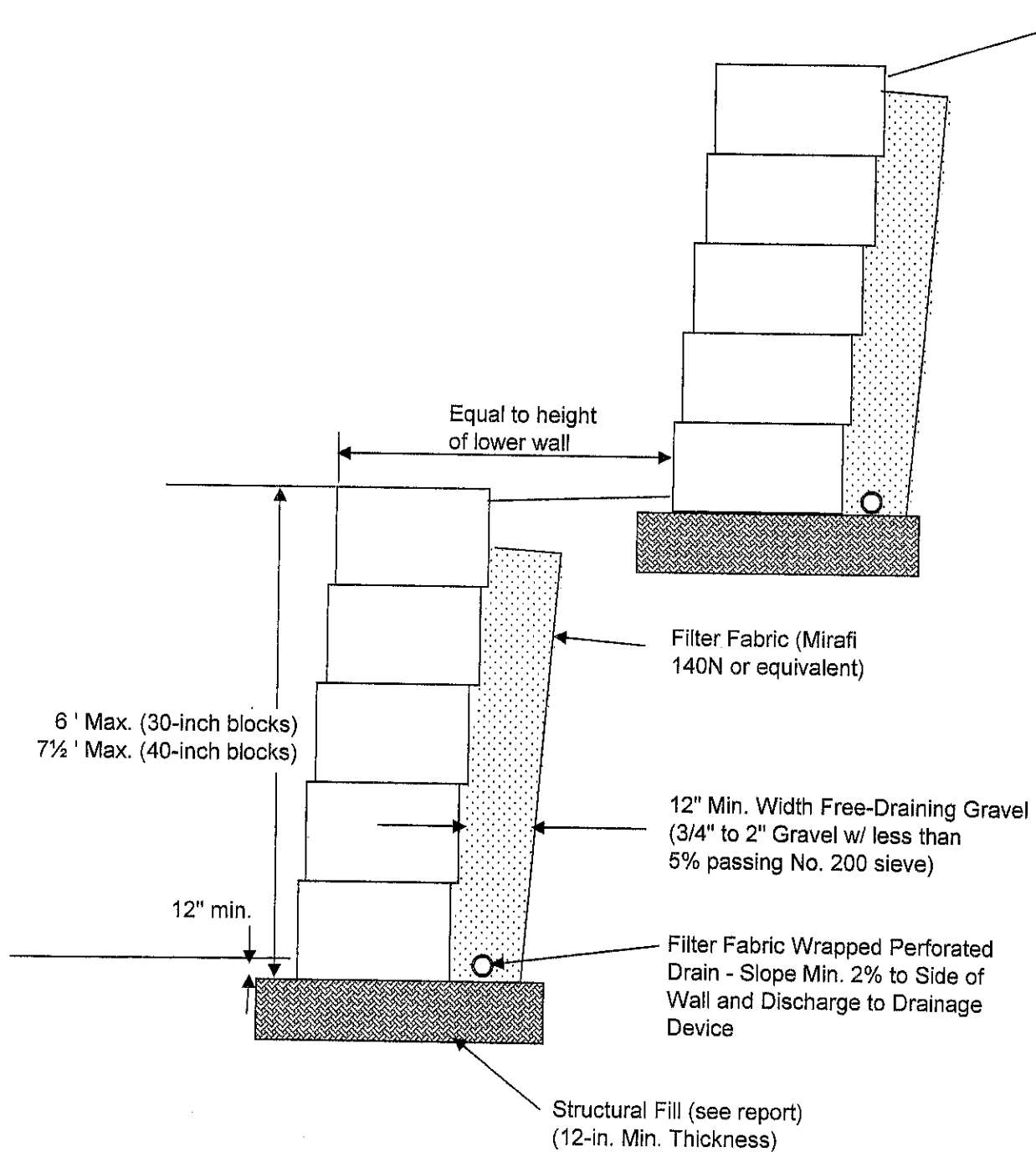
PROJECT NO.: 051709



FIGURE NO.: 10

REDI-ROCK WALL DESIGN WITHOUT GEOGRID

LAKEVIEW DRIVE (VISTA MEADOWS), ALPINE



NOT TO SCALE

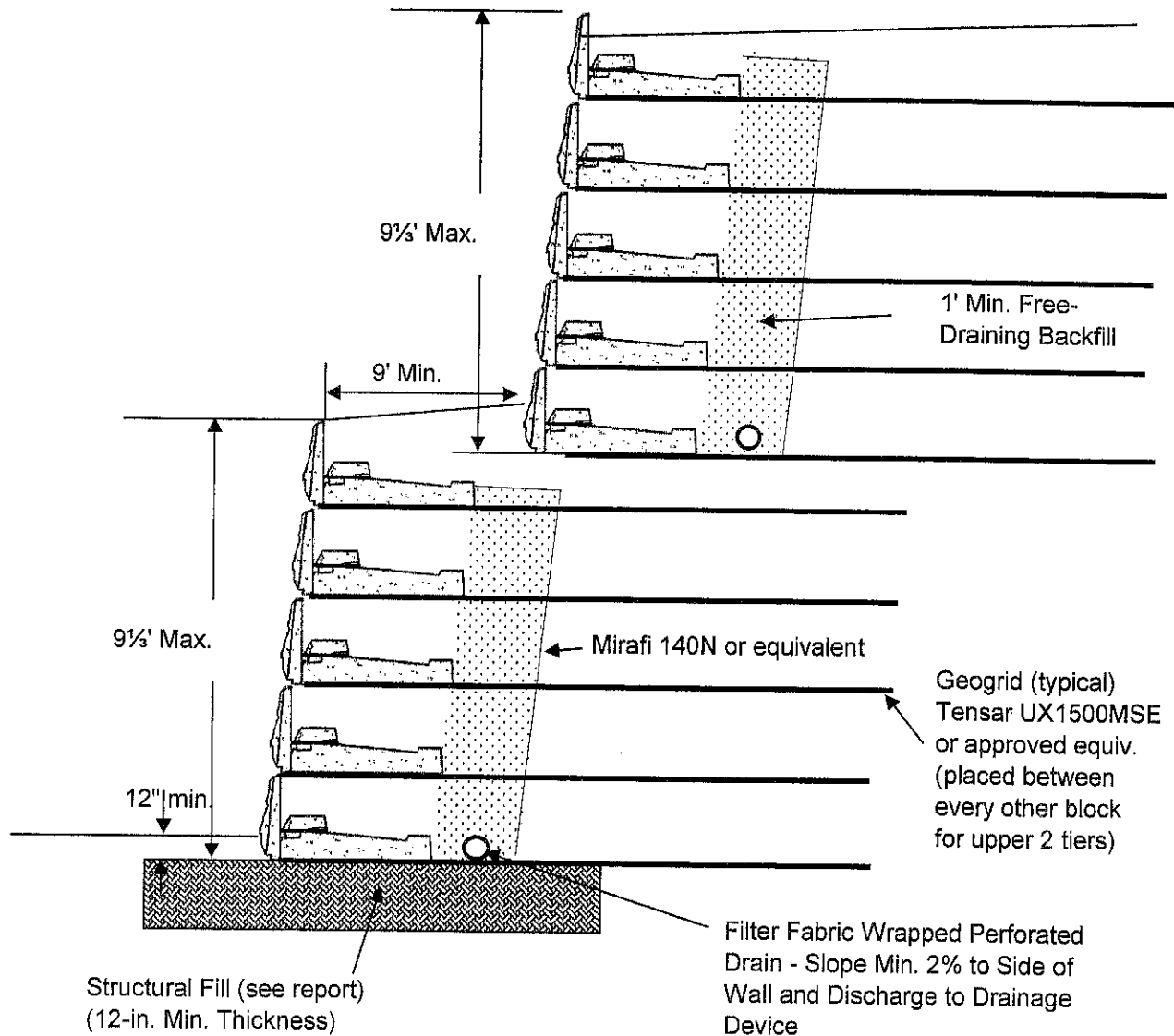
PROJECT NO.: 051709

Earthtec
Testing and Engineering, P.C.

FIGURE NO.: 11

LOCK+LOAD WALL WITH REINFORCEMENT

PROPOSED LAKEVIEW DRIVE, ALPINE



NOT TO SCALE

PROJECT NO.: 051709

Earthtec
Testing and Engineering, P.C.

FIGURE NO.: 12

APPENDIX

MSEW OUTPUT DATA

Earthtec

Professional Engineering Services ~ Geotechnical Engineering ~ Drilling Services ~ Construction Materials Inspection / Testing ~ Non-Destructive Examination ~ Failure Analysis
ICBO ~ ACI ~ AWS

AASHTO DESIGN METHOD

Lakeview Drive Vista Meadows Subdivision

PROJECT IDENTIFICATION

Title: Lakeview Drive Vista Meadows Subdivision
Project Number: 051709
Client: Taylor Smith
Designer: WGTurner
Station Number:

Description:

Company's information:

Name: Earthtec Testing & Engineering, P.C.
Street: 133 N. 1330 W.

Orem, UT 84057
Telephone #: 801-225-5711
Fax #: 801-225-3363
E-Mail: bgt@earthtectesting.com

Original file path and name: Y:\2005\051709 Lakeview Drive Walls & Summit Hills Subd.....
Original date and time of creating this file: Mon Oct 02 14:49:36 2006

PROGRAM MODE:

DESIGN
of SUPERIMPOSED WALL
using GEOGRID as reinforcing material.

DESIGN DATA**DESIGN OBJECTIVES**

Minimum factor of safety against pullout, F_{s-po}	1.50
Minimum factor of safety against direct sliding, $F_{s-sliding}$	1.50
Maximum allowable eccentricity ratio at each reinforcement level, e/L	0.1667
Minimum factor of safety against compound and overall failure, $F_{s-comp-static}$	1.30
Minimum factor of safety against compound and overall failure, $F_{s-comp-seismic}$	1.10

Prescribed minimum resistive length to prevent pullout, $L_e = 3.28$ ft.

Prescribed minimum normalized length of each layer is: $L/H_d = 0.70 \rightarrow L = 13.07$ ft.

Prescribed minimum absolute total length of each layer is: $L = 8.20$ ft.

BEARING CAPACITY

Bearing capacity is controlled by general shear.

Maximum permissible eccentricity ratio (soil), e/L

Minimum factor of safety with respect to ultimate bearing capacity (Meyerhof approach) 0.1667

Bearing capacity coefficients: $N_c = 0.00$ $N_\gamma = 14.99$ 2.50

SOIL DATA**REINFORCED SOIL**

Unit weight, γ	135.0 lb/ft ³
Design value of internal angle of friction, ϕ	40.0 °

RETAINED SOIL

Unit weight, γ	130.0 lb/ft ³
Design value of internal angle of friction, ϕ	32.0 °

FOUNDATION SOIL (Considered as an equivalent uniform soil)

Equivalent unit weight, γ_{equiv}	130.0 lb/ft ³
Equivalent internal angle of friction, ϕ_{equiv}	32.0 °
Equivalent cohesion, c_{equiv}	150.0 lb/ft ²

Water table does not affect bearing capacity

LATERAL EARTH PRESSURE COEFFICIENTS

K_a (internal stability) = 0.2174 (if batter is less than 10°, K_a is calculated from eq. 15. Otherwise, eq. 38 is utilized)

Inclination of internal slip plane, $\psi = 65.00^\circ$ (see Fig. 28 in DEMO 82).

K_a (external stability) = 0.3073 (if batter is less than 10°, K_a is calculated from eq. 16. Otherwise, eq. 17 is utilized)

SEISMICITY

Maximum ground acceleration coefficient, $\alpha_o = 0.420$

$K_{ae} (\alpha_o > 0) = 0.6932$ $K_{ae} (\alpha_o = 0) = 0.3073$

$\Delta K_{ae} = 0.3859$ (see eq. 37 in DEMO 82)

DIRECT SLIDING / ECCENTRICITY

Seismic safety factor is 75.0% of specified static FS for direct sliding.

Maximum allowable eccentricity, e/L , under seismic conditions is: 0.3300

BEARING CAPACITY

Seismic safety factor is 75.0% of specified static FS for bearing capacity.

Maximum allowable eccentricity, e/L , under seismic conditions is: 0.3300

INTERNAL STABILITY

Seismic soil-geogrid friction coefficient, F^* is 80.0% of its specified static value.

Seismic factor of safety against pullout, F_{s-po} , is 75.0% of its specified static value.

Seismic overall factor of safety, $F_{s-overall}$, is 75.0% of its specified static value.

The reduction of $F_{s-overall}$ pertains to geogrid strength and to connection strength for both break and pullout modes of failure.

INPUT DATA: Geometry and Surcharge loads (of SUPERIMPOSED wall)

Design height, Hd 18.67 [ft] { Embedded depth is E = 0.00 ft, and height above top of finished bottom grade is H = 18.67 ft, where H1 = 9.33 and H2 = 9.33 }

Batter, ω 0.0 [deg]

Backslope, β 0.0 [deg]

Backslope rise 0.0 [ft] Broken back equivalent angle, I = 0.00° (see Fig. 25 in DEMO 82)

Offset of upper segment from lower one, Offset = 9.0 ft, Backslope2 = 0.0 deg. and Backslope rise, S2 = 0.0 ft.

UNIFORM SURCHARGE

Uniformly distributed dead load is 3600.0 [lb/ft²]

DESIGNED REINFORCEMENT LAYOUT:**SCALE:**

0 2 4 6 8 10 [ft]

DESIGN: CALCULATED FACTORS (Static conditions)Bearing capacity, $F_s = 4.66$, Meyerhof stress = 4597 lb/ft².Foundation Interface: Direct sliding, $F_s = 2.417$, Eccentricity, $e/L = -0.0354$, F_s -overturning = 6.43

GEOGRID				CONNECTION			Geogrid strength F_s	Pullout resistance F_s	Direct sliding F_s	Eccentricity e/L	Product name
#	Elevation [ft]	Length [ft]	Type #	F_s -overall [pullout resistance]	F_s -overall [connection break]	F_s -overall [geogrid strength]					
1	1.33	23.66	2	4.62	4.62	1.89	1.894	53.567	1.502	-0.0523	UX1600MSE
2	2.67	22.82	1	5.85	5.85	2.33	2.327	77.437	1.502	-0.0667	UX1500MSE
3	4.00	21.98	1	5.81	6.23	2.48	2.475	74.347	1.502	-0.0830	UX1500MSE
4	5.33	21.13	1	4.55	6.50	2.58	2.583	69.038	1.502	-0.1017	UX1500MSE
5	6.67	20.28	1	3.17	6.79	2.70	2.700	63.716	1.502	-0.1235	UX1500MSE
6	8.00	19.42	2	1.62	5.20	2.13	2.134	34.085	1.503	-0.1492	UX1600MSE
7	9.33	13.07	2	14.14	14.14	5.80	5.802	48.035	2.056	0.0646	UX1600MSE
8	10.67	13.07	1	5.75	5.75	2.28	2.285	22.157	2.358	0.0486	UX1500MSE
9	12.00	13.07	1	5.98	5.98	2.38	2.376	20.547	2.779	0.0346	UX1500MSE
10	13.33	13.07	1	5.81	6.23	2.48	2.475	19.593	3.408	0.0227	UX1500MSE
11	14.67	13.07	1	4.55	6.50	2.58	2.583	18.132	4.453	0.0131	UX1500MSE
12	16.00	13.07	1	3.17	6.79	2.70	2.700	16.772	6.535	0.0060	UX1500MSE
13	17.33	13.07	2	1.89	6.08	2.49	2.493	10.887	12.770	0.0015	UX1600MSE

DESIGN: CALCULATED FACTORS (Seismic conditions)Bearing capacity, $F_s = 5.31$, Meyerhof stress = 4306 lb/ft².Foundation Interface: Direct sliding, $F_s = 1.791$, Eccentricity, $e/L = -0.0040$, F_s -overturning = 4.87

GEOGRID				CONNECTION			Geogrid strength F_s	Pullout resistance F_s	Direct sliding F_s	Eccentricity e/L	Product name
#	Elevation [ft]	Length [ft]	Type #	F_s -overall [pullout resistance]	F_s -overall [connection break]	F_s -overall [geogrid strength]					
1	1.33	23.66	2	3.26	4.08	1.67	1.674	37.879	1.358	-0.0474	UX1600MSE
2	2.67	22.82	1	3.91	4.89	1.94	1.943	51.737	1.389	-0.0634	UX1500MSE
3	4.00	21.98	1	3.89	5.21	2.07	2.070	49.742	1.419	-0.0810	UX1500MSE
4	5.33	21.13	1	3.06	5.46	2.17	2.172	46.439	1.449	-0.1007	UX1500MSE
5	6.67	20.28	1	2.15	5.75	2.28	2.284	43.115	1.475	-0.1231	UX1500MSE
6	8.00	19.42	2	1.18	4.72	1.94	1.938	24.773	1.495	-0.1492	UX1600MSE
7	9.33	13.07	2	9.21	11.51	4.72	4.724	31.290	1.579	0.0863	UX1600MSE
8	10.67	13.07	1	4.14	5.17	2.05	2.055	15.943	1.866	0.0627	UX1500MSE
9	12.00	13.07	1	4.31	5.38	2.14	2.140	14.803	2.270	0.0431	UX1500MSE
10	13.33	13.07	1	4.19	5.62	2.23	2.232	14.134	2.880	0.0272	UX1500MSE
11	14.67	13.07	1	3.29	5.87	2.33	2.332	13.099	3.903	0.0151	UX1500MSE
12	16.00	13.07	1	2.29	6.14	2.44	2.442	12.135	5.963	0.0066	UX1500MSE
13	17.33	13.07	2	1.41	5.68	2.33	2.330	8.139	12.172	0.0016	UX1600MSE

AASHTO DESIGN METHOD

Lakeview Drive Vista Meadows Subdivision

PROJECT IDENTIFICATION

Title: Lakeview Drive Vista Meadows Subdivision
Project Number: 051709
Client: Taylor Smith
Designer: WGTurner
Station Number:

Description:

Company's information:

Name: Earthtec Testing & Engineering, P.C.
Street: 133 N. 1330 W.

Orem, UT 84057
Telephone #: 801-225-5711
Fax #: 801-225-3363
E-Mail: bgt@earthtectesting.com

Original file path and name: Y:\2005\051709 Lakeview Drive Walls & Summit Hills Subd....
Original date and time of creating this file: Mon Oct 02 14:49:36 2006

PROGRAM MODE:

DESIGN
of SUPERIMPOSED WALL
using GEOGRID as reinforcing material.

DESIGN DATA**DESIGN OBJECTIVES**

Minimum factor of safety against pullout, F_{s-po}	1.50
Minimum factor of safety against direct sliding, $F_{s-sliding}$	1.50
Maximum allowable eccentricity ratio at each reinforcement level, e/L	0.1667
Minimum factor of safety against compound and overall failure, $F_{s-comp-static}$	1.30
Minimum factor of safety against compound and overall failure, $F_{s-comp-seismic}$	1.10

Prescribed minimum resistive length to prevent pullout, $L_e = 3.28$ ft.

Prescribed minimum normalized length of each layer is: $L/H_d = 0.70 \rightarrow L = 13.07$ ft.

Prescribed minimum absolute total length of each layer is: $L = 8.20$ ft.

BEARING CAPACITY

Bearing capacity is controlled by general shear.

Maximum permissible eccentricity ratio (soil), e/L 0.1667

Minimum factor of safety with respect to ultimate bearing capacity (Meyerhof approach) 2.50

Bearing capacity coefficients: $N_c = 0.00$ $N_\gamma = 14.99$

SOIL DATA**REINFORCED SOIL**

Unit weight, γ	135.0 lb/ft ³
Design value of internal angle of friction, ϕ	40.0 °

RETAINED SOIL

Unit weight, γ	130.0 lb/ft ³
Design value of internal angle of friction, ϕ	32.0 °

FOUNDATION SOIL (Considered as an equivalent uniform soil)

Equivalent unit weight, γ_{equiv}	130.0 lb/ft ³
Equivalent internal angle of friction, ϕ_{equiv}	32.0 °
Equivalent cohesion, C_{equiv}	150.0 lb/ft ²

Water table does not affect bearing capacity

LATERAL EARTH PRESSURE COEFFICIENTS

K_a (internal stability) = 0.2174 (if batter is less than 10°, K_a is calculated from eq. 15. Otherwise, eq. 38 is utilized)

Inclination of internal slip plane, $\psi = 65.00^\circ$ (see Fig. 28 in DEMO 82).

K_a (external stability) = 0.3073 (if batter is less than 10°, K_a is calculated from eq. 16. Otherwise, eq. 17 is utilized)

SEISMICITY

Maximum ground acceleration coefficient, $\alpha_o = 0.420$

K_{ae} ($\alpha_o > 0$) = 0.6932 K_{ae} ($\alpha_o = 0$) = 0.3073

$\Delta K_{ae} = 0.3859$ (see eq. 37 in DEMO 82)

DIRECT SLIDING / ECCENTRICITY

Seismic safety factor is 75.0% of specified static FS for direct sliding.

Maximum allowable eccentricity, e/L , under seismic conditions is: 0.3300

BEARING CAPACITY

Seismic safety factor is 75.0% of specified static FS for bearing capacity.

Maximum allowable eccentricity, e/L , under seismic conditions is: 0.3300

INTERNAL STABILITY

Seismic soil-geogrid friction coefficient, F^* is 80.0% of its specified static value.

Seismic factor of safety against pullout, F_{s-po} , is 75.0% of its specified static value.

Seismic overall factor of safety, $F_{s-overall}$, is 75.0% of its specified static value.

The reduction of $F_{s-overall}$ pertains to geogrid strength and to connection strength for both break and pullout modes of failure.

DESIGN: CALCULATED FACTORS (Static conditions)

Foundation Interface: Direct sliding, $F_s = 2.664$, Eccentricity, $e/L = 0.0122$, F_s -overturning = 5.49

GEOGRID				CONNECTION			Geogrid strength Fs	Pullout resistance Fs	Direct sliding Fs	Eccentricity e/L	Product name
#	Elevation [ft]	Length [ft]	Type #	Fs-overall [pullout resistance]	Fs-overall [connection break]	Fs-overall [geogrid strength]					
1	1.33	16.40	N/A	8.84	8.84	3.51	3.515	47.211	1.539	-0.0086	UX1500MSE
2	4.00	15.45	N/A	11.78	12.62	5.02	5.018	49.584	1.503	-0.0452	UX1500MSE
3	6.67	15.08	N/A	3.64	7.80	3.10	3.099	22.432	1.503	-0.1102	UX1500MSE
4	10.67	13.07	N/A	10.11	10.11	4.02	4.020	20.122	3.585	0.0258	UX1500MSE
5	13.33	13.07	N/A	12.94	13.87	5.51	5.512	17.359	5.062	0.0127	UX1500MSE
6	16.00	13.07	N/A	8.05	17.25	6.85	6.854	10.878	8.973	0.0038	UX1500MSE

DESIGN: CALCULATED FACTORS (Seismic conditions)

Bearing capacity, $F_s = 3.89$, Meyerhof stress = 2824 lb/ft².

Foundation Interface: Direct sliding, $F_s = 1.240$, Eccentricity, $e/L = 0.1563$, F_s -overturning = 2.36

GEOGRID				CONNECTION			Geogrid strength Fs	Pullout resistance Fs	Direct sliding Fs	Eccentricity e/L	Product name
#	Elevation [ft]	Length [ft]	Type #	Fs-overall [pullout resistance]	Fs-overall [connection break]	Fs-overall [geogrid strength]					
1	1.33	16.40	N/A	4.52	5.65	2.24	2.244	24.113	1.128	0.0153	UX1500MSE
2	4.00	15.45	N/A	5.56	7.44	2.96	2.958	23.387	1.233	-0.0348	UX1500MSE
3	6.67	15.08	N/A	2.11	5.66	2.25	2.248	13.014	1.394	-0.1083	UX1500MSE
4	10.67	13.07	N/A	5.36	6.69	2.66	2.661	10.655	1.487	0.0757	UX1500MSE
5	13.33	13.07	N/A	6.35	8.51	3.38	3.381	8.518	2.286	0.0330	UX1500MSE
6	16.00	13.07	N/A	3.79	10.16	4.04	4.039	5.128	4.835	0.0079	UX1500MSE



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November 3, 2006

Mr. Taylor Smith
c/o Sowby & Berg Consultants
45 North 490 West
American Fork, UT 84003

**Subject: Response to 2nd TGE Review
 Proposed Lakeview Drive
 Vista Meadows (was Summit Hills)
 Alpine, Utah
 Job No. 051709**

Dear Mr. Smith:

As you requested, this letter presents our response to a review prepared by Taylor Geo-Engineering (on behalf of Alpine City) of our most recent retaining wall recommendations¹ for the proposed Lakeview Drive at the subject site. Following are the TGE review comments (in italics) and our responses:

- 1. The soil parameters used for the Redi-Rock stability evaluation and the Lock+Load evaluation varied from that used for the global stability analysis and varied from the previous submitted reports. Earthtec needs to substantiate the reasoning for the soil parameter changes from the April 19, 2006 and October 3, 2006 and October 18, 2006 Earthtec documents. Earthtec references a January 26, 2006 report for the soil parameters used in the October 3, 2006 report but does not provide a reason why they were not used in the April 19, 2006 report.*

The January 26, 2006 report presented a range of possible parameters for the on-site lean clay and clayey gravel soils, and we presented our analyses of the slope below Lot 16 using the low, median and high ranges of internal friction angles and cohesion values. The median values for these ranges were used for the stability analyses to model the on-site soils in our April 19, 2006 report. The low internal friction angles and associated cohesion values for both soil types were used for the stability analyses to model the on-site soils in our October 3, 2006 report. In this latter report, the parameters for the lean clay were used in cut situations and the parameters for the clayey gravel were used in fill situations. This was consistent for both our global stability and *MSEW* geogrid analyses (including the October 18, 2006 data), but with Redi-Rock being proposed in cut situations, we inadvertently

¹Response to Review, Proposed Lakeview Drive, Summit Hills (Vista Meadows), Alpine, Utah, Job No. 051709, October 3, 2006.

applied the clayey gravel parameters instead of the lean clay parameters to the Redi-Rock wall evaluation shown in Figure 1 of the reviewed report.

Attached is a revised Figure 1 with the lean clay parameters for retained soils and structural fill (bottom row of blocks should be placed on a 1-foot thick structural fill pad) for the foundation interface. The analysis shown on the revised Figure 1 applies to the top row of Redi-Rock blocks, which would retain an approximate 2H:1V slope, and indicates that both 30-inch and 40-inch deep blocks would be stable up to 3 feet high in such situations. The lower blocks would retain level backfill but would also be subject to the surcharge imposed from the adjacent upper Redi-Rock wall tier. This analysis, shown on the attached Figure 1A, indicates that 30-inch blocks should not be used in these situations but that 40-inch blocks would be stable up to 7½ feet high for each tier, given a surcharge of 943 psf (145 pcf times 6½ feet of wall above the ground surface, which subtracts the 1 foot of embedment). Figure 11 has also been revised to reflect these changes.

2. *On Figure No. 1 of the October 3, 2006 report ETE used a batter angle of 5.55 degrees for the Redi-Rock walls. This is an incorrect value. The batter for Redi-Rock walls is 4 degrees. The soil values used in the Redi-Rock analysis used a phi of 32 degrees, representative of the clayey gravel soils. The locations of the proposed cuts are in the location of TP-3 of the original soils report. As indicated by ETE on page 2, the soils in that area are clay. Although some backfill behind the Redi-Rock blocks may be structural fill or on-site borrow clayey gravel, a majority of the soils will be native clay soils.*

TGE recommends that ETE complete the Redi-Rock stability evaluation using the appropriate soil parameters. Additionally, the Redi-Rock manufacture recommends that NCMA design procedure be used when designing the Redi-Rock retaining walls.

We understand that there has been some confusion about the batter angle for Redi-Rock walls because the manufacturer's standard Redi-Rock block detail indicates the setback for each row of blocks is 1.75 inches, which would be a batter angle of 5.55° (the value we used in our previous calculations). Upon discussion with the Redi-Rock manufacturer, the setback should be 1.25 inches which corresponds with a 4° batter angle. We have revised our analyses accordingly (see Figures 1 and 1A, attached), which also assumes that the majority of the soils to be retained by the Redi-Rock walls will consist of clay.

With respect to the last review comment, our Redi-Rock evaluation is a spreadsheet that is based on the Coulomb method for obtaining lateral pressures behind walls, which is the same method used in the NCMA design procedure. The lateral pressure is applied behind the entire wall height, measured from the top of the leveling pad (bottom of the lowest row of blocks) to the top of the wall (highest row of blocks), in the same manner as the NCMA design procedure.

3. *TGE recommends to Alpine City that Earthtec or the developer provide a cross-section of each of the planned walls to aid Alpine City and the Contractor in the construction and inspection of the walls. This would include a correction to Figure No. 12 of the October 3, 2006 report and the correction of sheet VW10 of the subdivision plan sheets submitted by Sowby and Berg dated August 17, 2006.*

Figure 12 has been revised to show the geogrid layers at the mid-height of each Lock+Load block where such geogrid is needed. Additional figures (11A, 12A, 12B and 12C) also show cross-sections for each set of wall tiers.

4. *Earthtec indicated on page (4) of the October 3, 2006 report, "For the 5-tier wall to be constructed as part of the fill toward the east end of Lakeview Drive, the geogrid should extend 35 feet behind the wall face for the bottom tier, 26 feet for the next tier, 20 feet for the third tier, 16½ feet for the fourth tier, and 13 feet for the fifth tier. For the bottom two tiers, the top and bottom layers of geogrid for each tier should consist of Tensar UX1600MSE or an engineer approved equivalent. All other layers of geogrid should consist of Tensar UX1500MSE or an engineer approved equivalent." In the analysis of the walls for this portion of the design, Earthtec used a UX1700MSE not a UX1600MSE. TGE request that Earthtec clarify the geogrid to be used for the bottom layers of soil reinforcement.*

Subsequent to our October 3, 2006 report, we submitted to the reviewer revised MSEW results (included in the Appendix, attached) wherein UX1700MSE geogrid was used in the bottom and top layers of soil reinforcement due to placing geogrid at mid-height of the Lock+Load blocks. The geogrid type that should be used for the bottom and top layers of reinforcement for all but the upper wall tier is UX1700MSE. This change is shown on the revised Figure 12 (and 12A, 12B, 12C as well), attached.

5. *TGE recommends to Alpine City to have Earthtec comment on the surficial stability of the 1H:1V cut slopes and fill slopes and provide mitigation recommendations to sloughing. During spring runoff, the upper soil layers of slopes can become saturated and the analysis of the slopes based on shallow saturation should be reviewed for long term solutions during the revegetation period. This can be accomplished by completing an infinite slope analyses.*

Using the same strength parameters as used in our global stability analyses, the results of our infinite slope stability analysis² indicate a factor of safety (FS) of at least 3.2 for the native clay soils and a FS of about 1.5 for the native clayey gravel soils (using only the cohesion side of the equation), assuming a saturated depth of 2 feet. Typically, the required minimum FS for surficial stability is 1.5. These calculations are included in the Appendix.

²Infinite FS = $(c' / \gamma d) \sec \beta \operatorname{cosec} \beta + (\tan \phi' / \tan \beta)(1 - r_u \sec^2 \beta)$

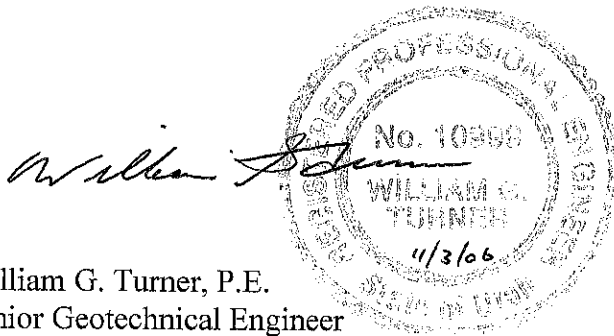
All other recommendations presented in our October 3, 2006 report, unless specifically superceded herein, remain valid.

Closure

This letter is considered an addendum to our referenced report and is subject to the same conditions and limitations presented therein. We appreciate the opportunity of providing our services on this project. If we can answer questions or be of further service, please call.

Respectfully;

EARTHTEC TESTING AND ENGINEERING, P.C.



William G. Turner, P.E.
Senior Geotechnical Engineer

Attachments: (all are revised from our October 3, 2006 report except as noted)
Figure 1, Redi-Rock Wall Stability Evaluation
Figure 1A, Redi-Rock Wall Stability Evaluation (new)
Figure 11, Redi-Rock Wall Design Without Geogrid
Figure 12, Lock+Load Wall Design With Geogrid (A through C are new)
Appendix: *MSEW* Output Data (8 sheets) & Infinite Slope Analysis (1 sheet)

REDI-ROCK WALL STABILITY EVALUATION

Project: Lakeview Drive, Vista Meadows
Location: Alpine, Utah

Date: 11/3/2006
By: WGT

Backfill slope angle, β : 26 degrees
Batter angle (from vertical): 4 degrees
Soil/wall interface friction: 13 degrees
Surcharge pressure: 0 psf
Rows of planter blocks: 0 rows
Embedment depth: 1 feet
Total K_a = 0.763
Horizontal K_{ah} = 0.754
Horizontal K_{ph} = 1.327

Foundation soil γ_t : 135 pcf
Foundation soil ϕ : 40 degrees
Found. soil cohesion: 0 psf
Retained soil γ : 120 pcf
Retained soil ϕ : 26 degrees
FS against sliding: 1.5
FS against overturning: 2.0
FS for bearing: 3.0
Foundation soil δ : 26.67 degrees

Block depth:	30 inches		Average block wall γ:					
			145 pcf					
Wall Ht (ft)	1.5	3.0	4.5	6.0	7.5	9.0	10.5	12.0
P_{ah} (lbs/ft)	102	407	916	1628	2544	3663	4986	6512
Wall Wt (lbs)	544	1088	1631	2175	2719	3263	3806	4350
Wall $x_{centroid}$	1.25	1.35	1.41	1.46	1.51	1.56	1.62	1.67
$P_{sliding}$	102	407	916	1628	2544	3663	4986	6512
$P_{resisting}$	330	654	1005	1387	1801	2246	2722	3229
FS_{sliding}	3.2	1.6	1.1	0.9	0.7	0.6	0.5	0.5
$M_{overturn}$	51	407	1374	3256	6359	10988	17449	26047
$M_{resisting}$	710	1503	2326	3205	4141	5135	6185	7292
FS_{overturn}	13.9	3.7	1.7	1.0	0.7	0.5	0.4	0.3
Vertical Load	218	401	580	745	899	1043	1177	1303
Soil Capacity	10941	10941	10941	10941	10941	10941	10941	10941
FS_{bearing}	50.3	27.3	18.9	14.7	12.2	10.5	9.3	8.4

Max. Recommended Wall Height: 3 feet for 30-inch blocks and no planter blocks

Block depth:	40 inches		Average block wall γ:					
			145 pcf					
Wall Ht (ft)	1.5	3.0	4.5	6.0	7.5	9.0	10.5	12.0
P_{ah} (lbs/ft)	102	407	916	1628	2544	3663	4986	6512
Wall Wt (lbs)	725	1450	2175	2900	3625	4350	5075	5800
Wall $x_{centroid}$	1.67	1.77	1.82	1.88	1.93	1.98	2.03	2.09
$P_{sliding}$	102	407	916	1628	2544	3663	4986	6512
$P_{resisting}$	421	836	1278	1751	2256	2792	3359	3958
FS_{sliding}	4.1	2.1	1.4	1.1	0.9	0.8	0.7	0.6
$M_{overturn}$	51	407	1374	3256	6359	10988	17449	26047
$M_{resisting}$	1238	2599	3997	5472	7022	8649	10351	12130
FS_{overturn}	24.3	6.4	2.9	1.7	1.1	0.8	0.6	0.5
Vertical Load	218	409	596	773	940	1098	1248	1390
Soil Capacity	10941	10941	10941	10941	10941	10941	10941	10941
FS_{bearing}	50.3	26.7	18.4	14.2	11.6	10.0	8.8	7.9

Max. Recommended Wall Height: 3 feet for 40-inch blocks and no planter blocks

PROJECT NO.: 051709



FIGURE NO.: 1

REDI-ROCK WALL STABILITY EVALUATION

Project: Lakeview Drive, Vista Meadows
Location: Alpine, Utah

Date: 11/3/2006
By: WGT

Backfill slope angle, β : 0 degrees
Batter angle (from vertical): 4 degrees
Soil/wall interface friction: 13 degrees
Surcharge pressure: 943 psf
Rows of planter blocks: 0 rows
Embedment depth: 1 feet
Total K_a = 0.326
Horizontal K_{ah} = 0.322
Horizontal K_{ph} = 3.103

Foundation soil γ : 135 pcf
Foundation soil ϕ : 40 degrees
Found. soil cohesion: 0 psf
Retained soil γ : 120 pcf
Retained soil ϕ : 26 degrees
FS against sliding: 1.5
FS against overturning: 2.0
FS for bearing: 3.0
Foundation soil δ : 26.67 degrees

Block depth:	30	inches		Average block wall γ:				
						145	pcf	
Wall Ht (ft)	1.5	3.0	4.5	6.0	7.5	9.0	10.5	12.0
P_{ah} (lbs/ft)	347	478	696	1000	1392	1870	2436	3089
Wall Wt (lbs)	544	1088	1631	2175	2719	3263	3806	4350
Wall $x_{centroid}$	1.25	1.35	1.41	1.46	1.51	1.56	1.62	1.67
$P_{sliding}$	347	478	696	1000	1392	1870	2436	3089
$P_{resisting}$	419	725	1031	1351	1684	2031	2391	2764
FS_{sliding}	1.2	1.5	1.5	1.4	1.2	1.1	1.0	0.9
$M_{overturn}$	174	478	1043	2000	3479	5611	8526	12355
$M_{resisting}$	749	1543	2366	3245	4181	5175	6225	7332
FS_{overturn}	4.3	3.2	2.3	1.6	1.2	0.9	0.7	0.6
Vertical Load	218	401	580	745	899	1043	1177	1303
Soil Capacity	10941	10941	10941	10941	10941	10941	10941	10941
FS_{bearing}	50.3	27.3	18.9	14.7	12.2	10.5	9.3	8.4

DO NOT USE

Block depth:	40	inches		Average block wall γ:				
						145	pcf	
Wall Ht (ft)	1.5	3.0	4.5	6.0	7.5	9.0	10.5	12.0
P_{ah} (lbs/ft)	347	478	696	1000	1392	1870	2436	3089
Wall Wt (lbs)	725	1450	2175	2900	3625	4350	5075	5800
Wall $x_{centroid}$	1.67	1.77	1.82	1.88	1.93	1.98	2.03	2.09
$P_{sliding}$	347	478	696	1000	1392	1870	2436	3089
$P_{resisting}$	510	907	1304	1715	2139	2577	3028	3492
FS_{sliding}	1.5	1.9	1.9	1.7	1.5	1.4	1.2	1.1
$M_{overturn}$	174	478	1043	2000	3479	5611	8526	12355
$M_{resisting}$	1278	2639	4037	5512	7062	8689	10391	12170
FS_{overturn}	7.4	5.5	3.9	2.8	2.0	1.5	1.2	1.0
Vertical Load	218	409	596	773	940	1098	1248	1390
Soil Capacity	10941	10941	10941	10941	10941	10941	10941	10941
FS_{bearing}	50.3	26.7	18.4	14.2	11.6	10.0	8.8	7.9

Max. Recommended Wall Height: 7.5 feet for 40-inch blocks and no planter blocks

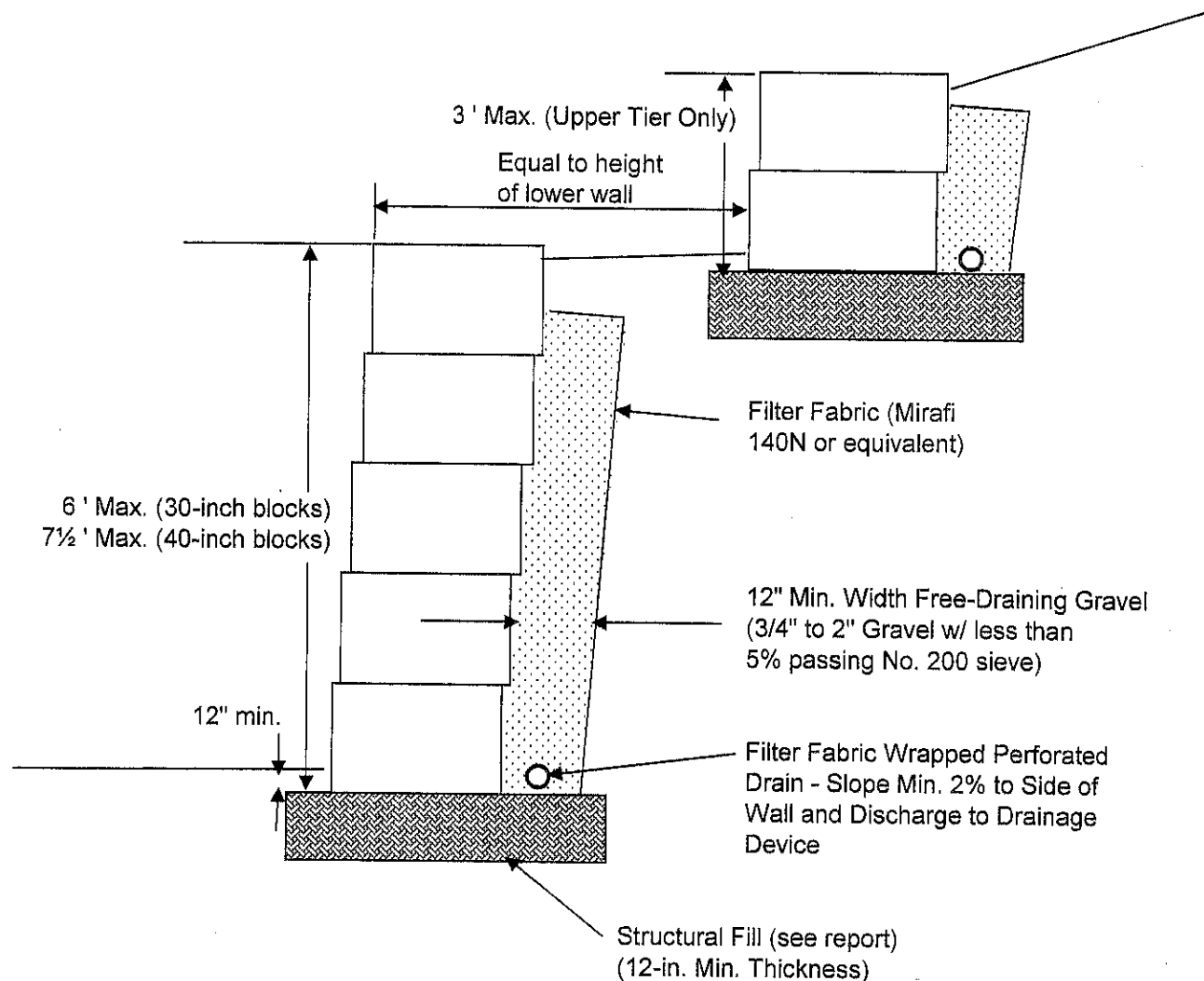
PROJECT NO.: 051709



FIGURE NO.: 1A

REDI-ROCK WALL DESIGN WITHOUT GEOGRID

LAKEVIEW DRIVE (VISTA MEADOWS), ALPINE



NOT TO SCALE

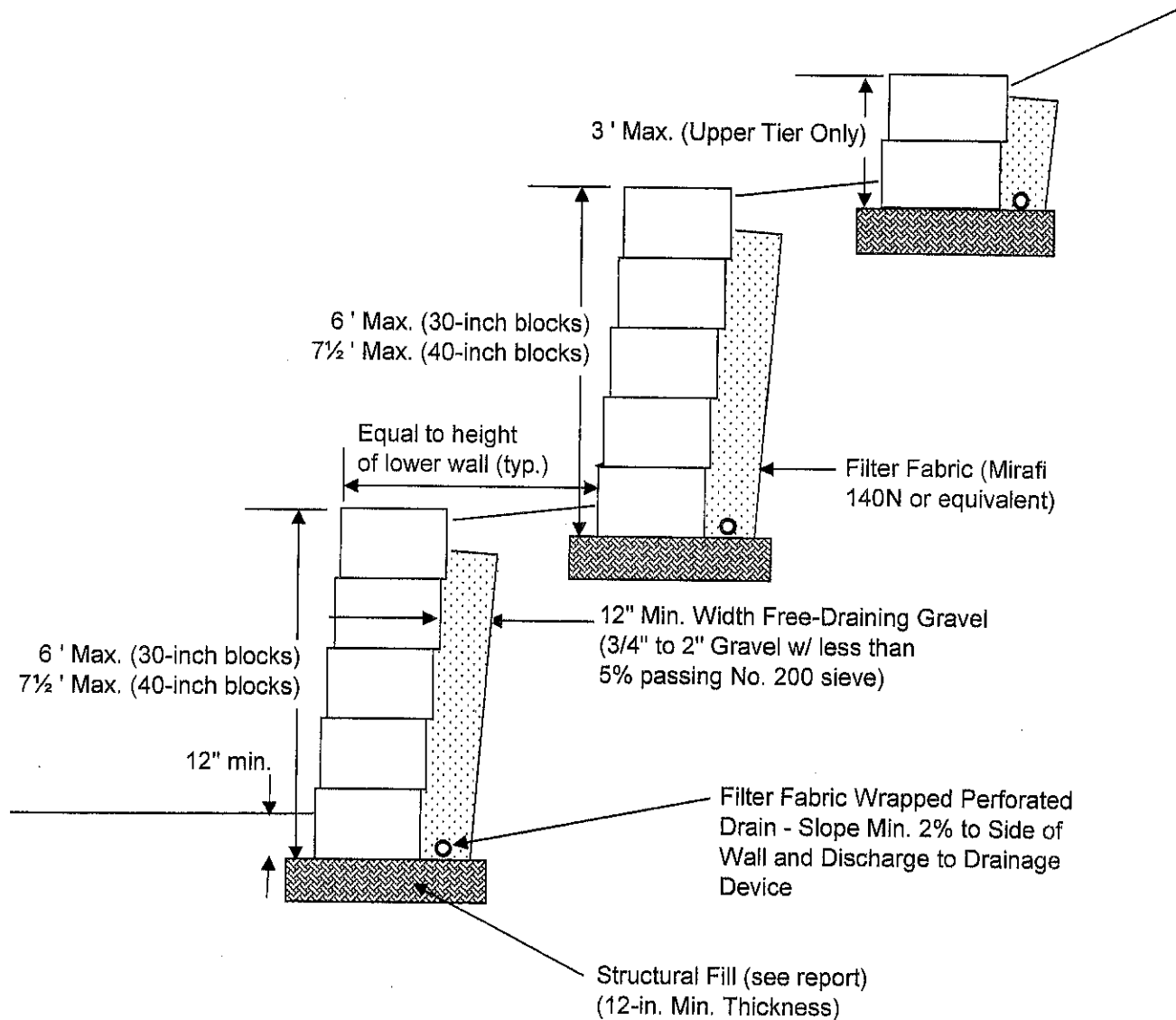
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Testing and Engineering, P.C.

FIGURE NO.: 11

REDI-ROCK WALL DESIGN WITHOUT GEOGRID

LAKEVIEW DRIVE (VISTA MEADOWS), ALPINE



NOT TO SCALE

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FIGURE NO.: 11A

PROPOSED LAKEVIEW DRIVE, ALPINE (5 TIERS)

GEOGRID SHALL CONSIST OF TENSAR UX1500MSE OR APPROVED EQUIVALENT, EXCEPT THOSE LAYERS SHOWN WHICH SHALL BE TENSAR UX1700MSE OR APPROVED EQUIVALENT.

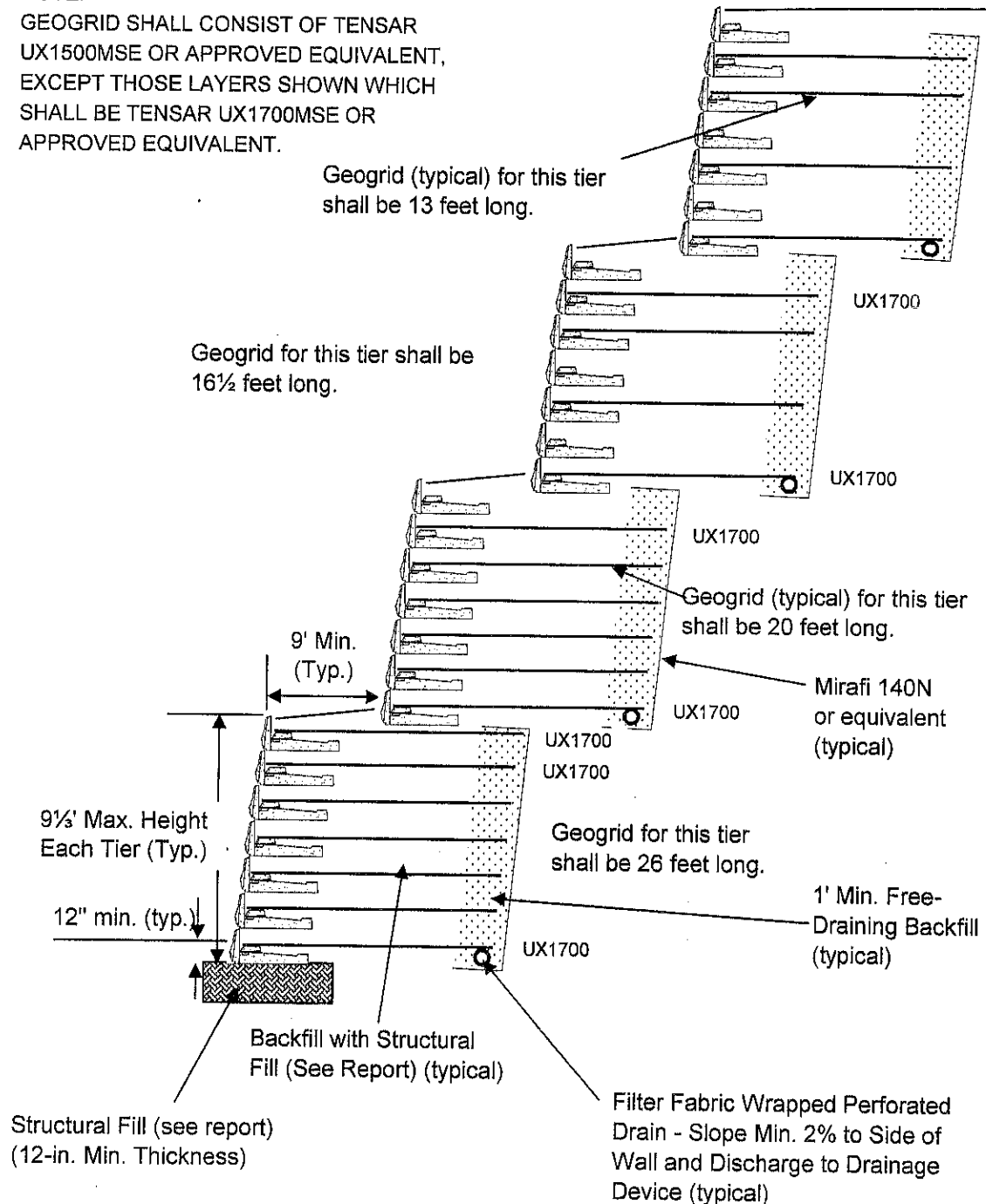


LOCK+LOAD WALL WITH REINFORCEMENT

PROPOSED LAKEVIEW DRIVE, ALPINE (4 TIERS)

NOTE:

GEOGRID SHALL CONSIST OF TENSAR UX1500MSE OR APPROVED EQUIVALENT, EXCEPT THOSE LAYERS SHOWN WHICH SHALL BE TENSAR UX1700MSE OR APPROVED EQUIVALENT.



NOT TO SCALE

PROJECT NO.: 051709

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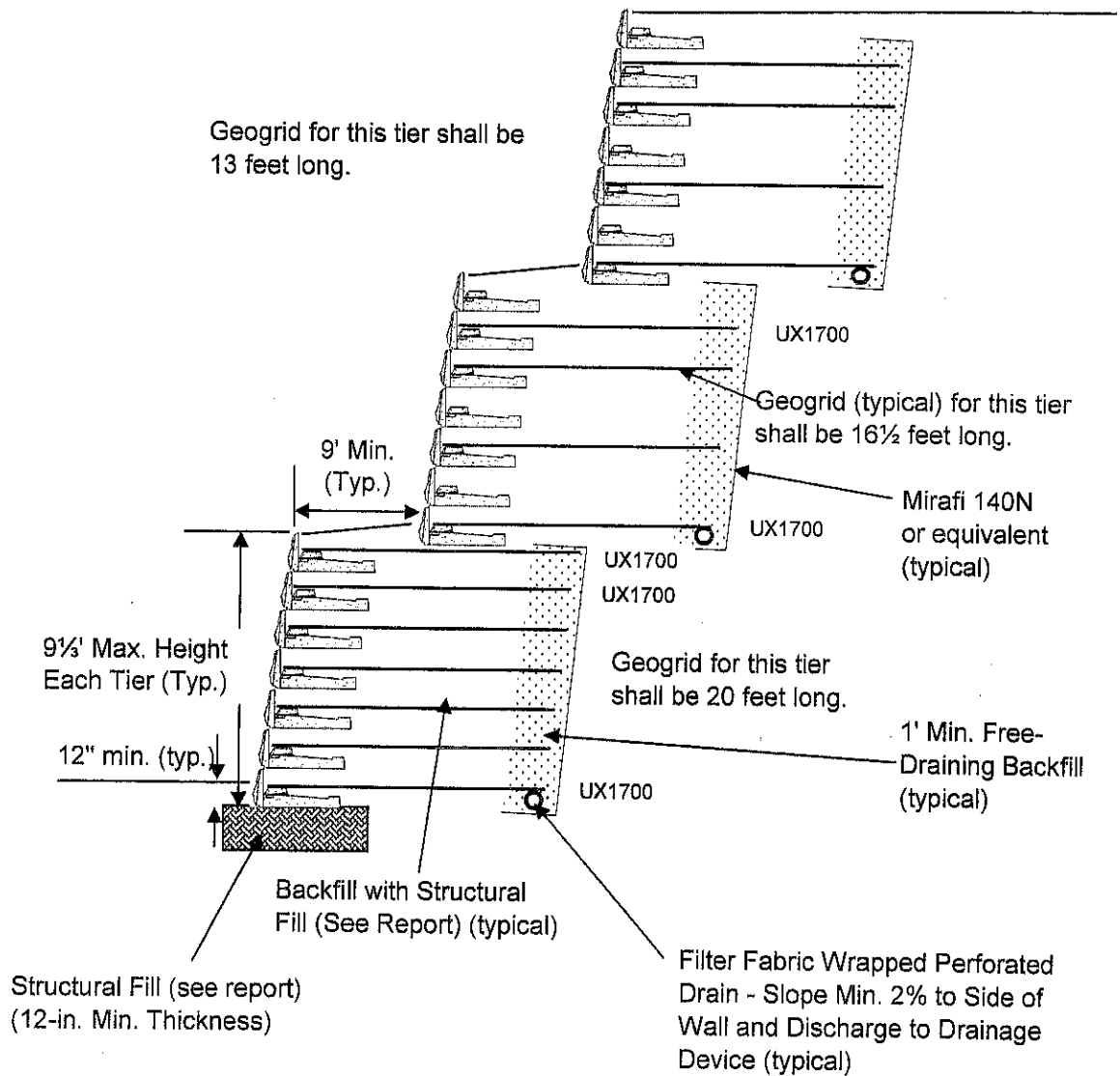
FIGURE NO.: 12A

LOCK+LOAD WALL WITH REINFORCEMENT

PROPOSED LAKEVIEW DRIVE, ALPINE (3 TIERS)

NOTE:

GEOGRID SHALL CONSIST OF TENSAR
UX1500MSE OR APPROVED EQUIVALENT,
EXCEPT THOSE LAYERS SHOWN WHICH
SHALL BE TENSAR UX1700MSE OR
APPROVED EQUIVALENT.



PROJECT NO.: 051709



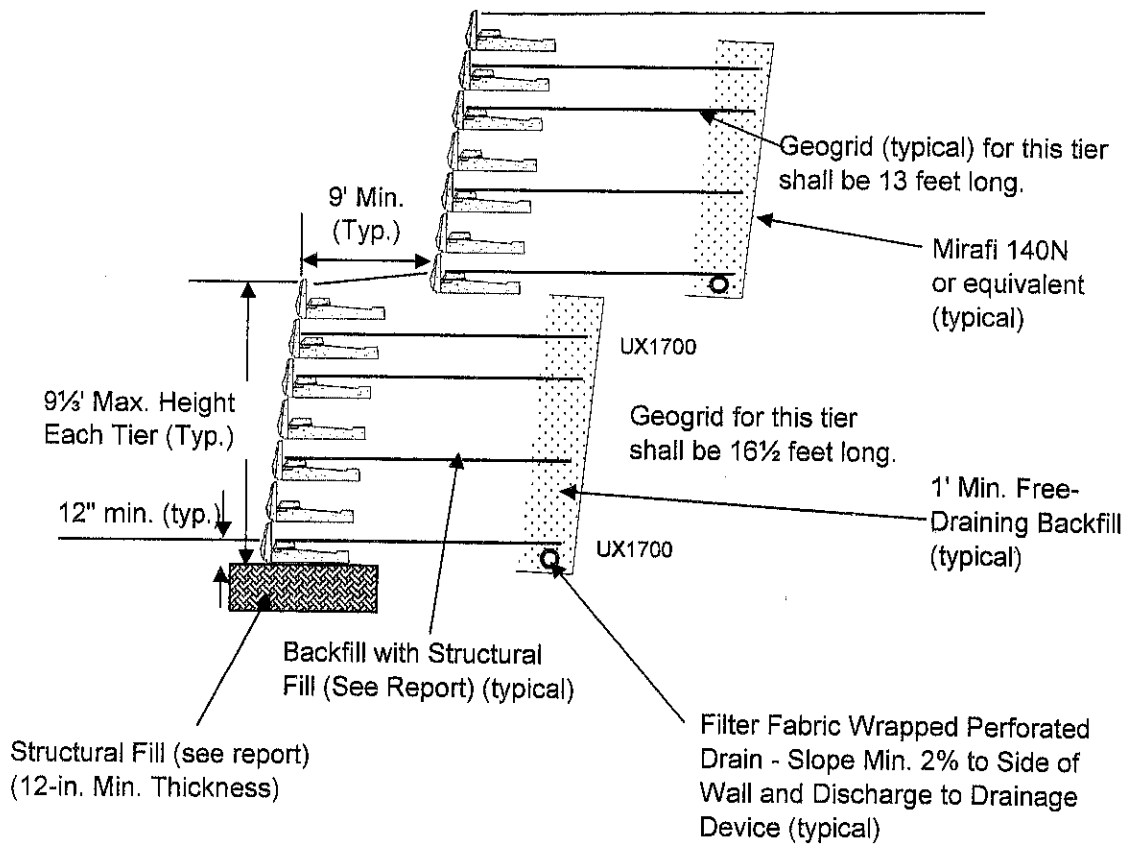
FIGURE NO.: 12B

LOCK+LOAD WALL WITH REINFORCEMENT

PROPOSED LAKEVIEW DRIVE, ALPINE (LESS THAN 3 TIERS)

NOTE:

GEOGRID SHALL CONSIST OF TENSAR UX1500MSE OR APPROVED EQUIVALENT, EXCEPT THOSE LAYERS SHOWN WHICH SHALL BE TENSAR UX1700MSE OR APPROVED EQUIVALENT.



NOT TO SCALE

PROJECT NO.: 051709

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Testing and Engineering, P.C.

FIGURE NO.: 12C

APPENDIX

MSEW OUTPUT DATA INFINITE SLOPE ANALYSIS

AASHTO DESIGN METHOD

Lakeview Drive Vista Meadows Subdivision

PROJECT IDENTIFICATION

Title: Lakeview Drive Vista Meadows Subdivision
Project Number: 051709
Client: Taylor Smith
Designer: WGTurner
Station Number:

Description:

Company's information:

Name: Earthtec Testing & Engineering, P.C.
Street: 133 N. 1330 W.

Orem, UT 84057
Telephone #: 801-225-5711
Fax #: 801-225-3363
E-Mail: bgt@earthtectesting.com

Original file path and name: Y:\2005\051709 Lakeview Drive Walls & Summit Hills Subd.....
Original date and time of creating this file: Mon Oct 02 14:49:36 2006

PROGRAM MODE:

DESIGN
of SUPERIMPOSED WALL
using GEOGRID as reinforcing material.

DESIGN DATA**DESIGN OBJECTIVES**

Minimum factor of safety against pullout, F_{s-po}	1.50
Minimum factor of safety against direct sliding, $F_{s-sliding}$	1.50
Maximum allowable eccentricity ratio at each reinforcement level, e/L	0.1667
Minimum factor of safety against compound and overall failure, $F_{s-comp-static}$	1.30
Minimum factor of safety against compound and overall failure, $F_{s-comp-seismic}$	1.10

Prescribed minimum resistive length to prevent pullout, $L_e = 3.28$ ft.

Prescribed minimum normalized length of each layer is: $L/H_d = 0.70 \rightarrow L = 13.07$ ft.

Prescribed minimum absolute total length of each layer is: $L = 8.20$ ft.

BEARING CAPACITY

Bearing capacity is controlled by general shear.

Maximum permissible eccentricity ratio (soil), e/L 0.1667

Minimum factor of safety with respect to ultimate bearing capacity (Meyerhof approach) 2.50

Bearing capacity coefficients: $N_c = 0.00$ $N_\gamma = 14.99$

SOIL DATA**REINFORCED SOIL**

Unit weight, γ	135.0 lb/ft ³
Design value of internal angle of friction, ϕ	40.0 °

RETAINED SOIL

Unit weight, γ	130.0 lb/ft ³
Design value of internal angle of friction, ϕ	32.0 °

FOUNDATION SOIL (Considered as an equivalent uniform soil)

Equivalent unit weight, γ_{equiv}	130.0 lb/ft ³
Equivalent internal angle of friction, ϕ_{equiv}	32.0 °
Equivalent cohesion, c_{equiv}	150.0 lb/ft ²

Water table does not affect bearing capacity

LATERAL EARTH PRESSURE COEFFICIENTS

K_a (internal stability) = 0.2174 (if batter is less than 10°, K_a is calculated from eq. 15. Otherwise, eq. 38 is utilized)

Inclination of internal slip plane, $\psi = 65.00^\circ$ (see Fig. 28 in DEMO 82).

K_a (external stability) = 0.3073 (if batter is less than 10°, K_a is calculated from eq. 16. Otherwise, eq. 17 is utilized)

SEISMICITY

Maximum ground acceleration coefficient, $\alpha_n = 0.420$

K_{ae} ($\alpha_o > 0$) = 0.6932 K_{ae} ($\alpha_o = 0$) = 0.3073

$\Delta K_{ae} = 0.3859$ (see eq. 37 in DEMO 82)

DIRECT SLIDING / ECCENTRICITY

Seismic safety factor is 75.0% of specified static FS for direct sliding.

Maximum allowable eccentricity, e/L , under seismic conditions is: 0.3300

BEARING CAPACITY

Seismic safety factor is 75.0% of specified static FS for bearing capacity.

Maximum allowable eccentricity, e/L , under seismic conditions is: 0.3300

INTERNAL STABILITY

Seismic soil-geogrid friction coefficient, F^* is 80.0% of its specified static value.

Seismic factor of safety against pullout, F_{s-po} , is 75.0% of its specified static value.

Seismic overall factor of safety, $F_{s-overall}$, is 75.0% of its specified static value.

The reduction of $F_{s-overall}$ pertains to geogrid strength and to connection strength for both break and pullout modes of failure.

INPUT DATA: Geometry and Surcharge loads (of SUPERIMPOSED wall)

Design height, Hd 18.67 [ft] { Embedded depth is E = 0.00 ft, and height above top of finished bottom grade is H = 18.67 ft, where H1 = 9.33 and H2 = 9.33 }

Batter, ω 0.0 [deg]

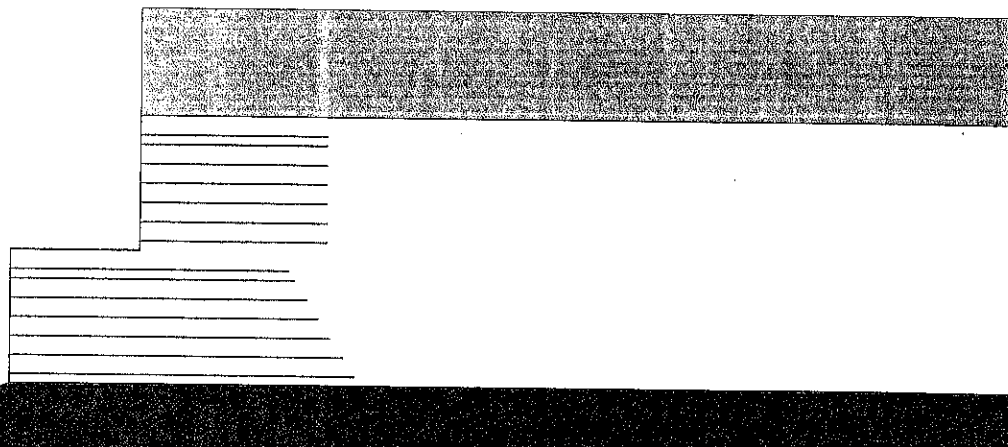
Backslope, β 0.0 [deg]

Backslope rise 0.0 [ft] Broken back equivalent angle, I = 0.00° (see Fig. 25 in DEMO 82)

Offset of upper segment from lower one, Offset = 9.0 ft, Backslope2 = 0.0 deg. and Backslope rise, S2 = 0.0 ft.

UNIFORM SURCHARGE

Uniformly distributed dead load is 3600.0 [lb/ft²]

DESIGNED REINFORCEMENT LAYOUT:**SCALE:**

0 2 4 6 8 10 [ft]

DESIGN: CALCULATED FACTORS (Static conditions)Bearing capacity, $F_s = 4.66$, Meyerhof stress = 4653 lb/ft².Foundation Interface: Direct sliding, $F_s = 2.477$, Eccentricity, $e/L = -0.0376$, F_s -overturning = 6.68

GEOGRID				CONNECTION			Geogrid strength F_s	Pullout resistance F_s	Direct sliding F_s	Eccentricity e/L	Product name
#	Elevation [ft]	Length [ft]	Type #	F_s -overall [pullout resistance]	F_s -overall [connection break]	F_s -overall [geogrid strength]					
1	0.67	24.08	2	3.57	3.57	3.57	3.569	83.314	1.502	-0.0458	UX1700MSE
2	2.00	23.25	1	2.24	2.24	2.24	2.242	78.947	1.502	-0.0593	UX1500MSE
3	3.33	22.40	1	2.37	2.37	2.37	2.370	75.006	1.502	-0.0745	UX1500MSE
4	4.67	21.55	1	2.20	2.52	2.52	2.525	71.274	1.502	-0.0920	UX1500MSE
5	6.00	20.70	2	2.73	4.39	4.39	4.388	66.837	1.502	-0.1121	UX1700MSE
6	7.33	19.85	2	2.27	6.07	6.07	6.072	81.356	1.502	-0.1357	UX1700MSE
7	8.00	19.42	2	0.81	3.26	3.26	3.263	41.072	1.503	-0.1492	UX1700MSE
8	10.00	13.07	2	3.72	3.72	3.72	3.721	22.737	2.195	0.0563	UX1700MSE
9	11.33	13.07	1	2.33	2.33	2.33	2.327	21.604	2.549	0.0413	UX1500MSE
10	12.67	13.07	1	2.42	2.42	2.42	2.422	20.027	3.061	0.0283	UX1500MSE
11	14.00	13.07	1	2.21	2.53	2.53	2.534	18.595	3.856	0.0176	UX1500MSE
12	15.33	13.07	1	1.64	2.64	2.64	2.637	17.731	5.281	0.0093	UX1500MSE
13	16.67	13.07	2	2.26	6.07	6.07	6.073	21.765	8.629	0.0034	UX1700MSE
14	17.33	13.07	2	0.95	3.82	3.82	3.821	13.147	12.739	0.0016	UX1700MSE

DESIGN: CALCULATED FACTORS (Seismic conditions)Bearing capacity, $F_s = 5.29$, Meyerhof stress = 4369 lb/ft².Foundation Interface: Direct sliding, $F_s = 1.836$, Eccentricity, $e/L = -0.0074$, F_s -overturning = 5.07

GEOGRID				CONNECTION			Geogrid strength F_s	Pullout resistance F_s	Direct sliding F_s	Eccentricity e/L	Product name
#	Elevation [ft]	Length [ft]	Type #	F_s -overall [pullout resistance]	F_s -overall [connection break]	F_s -overall [geogrid strength]					
1	0.67	24.08	2	2.41	3.01	3.01	3.015	56.297	1.343	-0.0399	UX1700MSE
2	2.00	23.25	1	1.52	1.90	1.90	1.900	53.530	1.374	-0.0552	UX1500MSE
3	3.33	22.40	1	1.61	2.01	2.01	2.013	50.953	1.404	-0.0719	UX1500MSE
4	4.67	21.55	1	1.50	2.15	2.15	2.147	48.492	1.435	-0.0906	UX1500MSE
5	6.00	20.70	2	1.87	3.75	3.75	3.750	45.686	1.462	-0.1115	UX1700MSE
6	7.33	19.85	2	1.49	4.99	4.99	4.993	53.510	1.485	-0.1356	UX1700MSE
7	8.00	19.42	2	0.58	2.94	2.94	2.937	29.575	1.495	-0.1492	UX1700MSE
8	10.00	13.07	2	2.70	3.37	3.37	3.374	16.492	1.711	0.0740	UX1700MSE
9	11.33	13.07	1	1.69	2.11	2.11	2.112	15.691	2.048	0.0525	UX1500MSE
10	12.67	13.07	1	1.76	2.20	2.20	2.201	14.563	2.542	0.0347	UX1500MSE
11	14.00	13.07	1	1.61	2.31	2.31	2.305	13.534	3.317	0.0207	UX1500MSE
12	15.33	13.07	1	1.20	2.40	2.40	2.403	12.926	4.721	0.0104	UX1500MSE
13	16.67	13.07	2	1.61	5.39	5.39	5.389	15.450	8.044	0.0037	UX1700MSE
14	17.33	13.07	2	0.71	3.55	3.55	3.546	9.762	12.141	0.0016	UX1700MSE

AASHTO DESIGN METHOD

Lakeview Drive Vista Meadows Subdivision

PROJECT IDENTIFICATION

Title: Lakeview Drive Vista Meadows Subdivision
Project Number: 051709
Client: Taylor Smith
Designer: WGTurner
Station Number:

Description:

Company's information:

Name: Earthtec Testing & Engineering, P.C.
Street: 133 N. 1330 W.

Orem, UT 84057
Telephone #: 801-225-5711
Fax #: 801-225-3363
E-Mail: bgt@earthtectesting.com

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Original date and time of creating this file: Mon Oct 02 14:49:36 2006

PROGRAM MODE:

DESIGN
of SUPERIMPOSED WALL
using GEOGRID as reinforcing material.

DESIGN DATA**DESIGN OBJECTIVES**

Minimum factor of safety against pullout, Fs-po	1.50
Minimum factor of safety against direct sliding, Fs-sliding	1.50
Maximum allowable eccentricity ratio at each reinforcement level, e/L	0.1667
Minimum factor of safety against compound and overall failure, Fs-comp-static	1.30
Minimum factor of safety against compound and overall failure, Fs-comp-seismic	1.10

Prescribed minimum resistive length to prevent pullout, $L_e = 3.28$ ft.

Prescribed minimum normalized length of each layer is: $L/H_d = 0.70 \rightarrow L = 13.07$ ft.

Prescribed minimum absolute total length of each layer is: $L = 8.20$ ft.

BEARING CAPACITY

Bearing capacity is controlled by general shear.

Maximum permissible eccentricity ratio (soil), e/L

0.1667

Minimum factor of safety with respect to ultimate bearing capacity (Meyerhof approach)

2.50

Bearing capacity coefficients: $N_c = 0.00$ $N_\gamma = 14.99$

SOIL DATA**REINFORCED SOIL**

Unit weight, γ	135.0 lb/ft ³
Design value of internal angle of friction, ϕ	40.0°

RETAINED SOIL

Unit weight, γ	130.0 lb/ft ³
Design value of internal angle of friction, ϕ	32.0°

FOUNDATION SOIL (Considered as an equivalent uniform soil)

Equivalent unit weight, γ_{equiv}	130.0 lb/ft ³
Equivalent internal angle of friction, ϕ_{equiv}	32.0°
Equivalent cohesion, C_{equiv}	150.0 lb/ft ²

Water table does not affect bearing capacity

LATERAL EARTH PRESSURE COEFFICIENTS

K_a (internal stability) = 0.2174 (if batter is less than 10°, K_a is calculated from eq. 15. Otherwise, eq. 38 is utilized)

Inclination of internal slip plane, $\psi = 65.00^\circ$ (see Fig. 28 in DEMO 82).

K_a (external stability) = 0.3073 (if batter is less than 10°, K_a is calculated from eq. 16. Otherwise, eq. 17 is utilized)

SEISMICITY

Maximum ground acceleration coefficient, $\alpha_o = 0.420$

$K_{ae} (\alpha_o > 0) = 0.6932$ $K_{ae} (\alpha_o = 0) = 0.3073$

$\Delta K_{ae} = 0.3859$ (see eq. 37 in DEMO 82)

DIRECT SLIDING / ECCENTRICITY

Seismic safety factor is 75.0% of specified static FS for direct sliding.

Maximum allowable eccentricity, e/L, under seismic conditions is: 0.3300

BEARING CAPACITY

Seismic safety factor is 75.0% of specified static FS for bearing capacity.

Maximum allowable eccentricity, e/L, under seismic conditions is: 0.3300

INTERNAL STABILITY

Seismic soil-geogrid friction coefficient, F^* is 80.0% of its specified static value.

Seismic factor of safety against pullout, Fs-po, is 75.0% of its specified static value.

Seismic overall factor of safety, Fs-overall, is 75.0% of its specified static value.

The reduction of Fs-overall pertains to geogrid strength and to connection strength for both break and pullout modes of failure.

INPUT DATA: Geometry and Surcharge loads (of SUPERIMPOSED wall)

Design height, Hd 18.67 [ft] { Embedded depth is E = 0.00 ft, and height above top of finished bottom grade is H = 18.67 ft, where H1 = 9.33 and H2 = 9.33 }

Batter, ω 0.0 [deg]

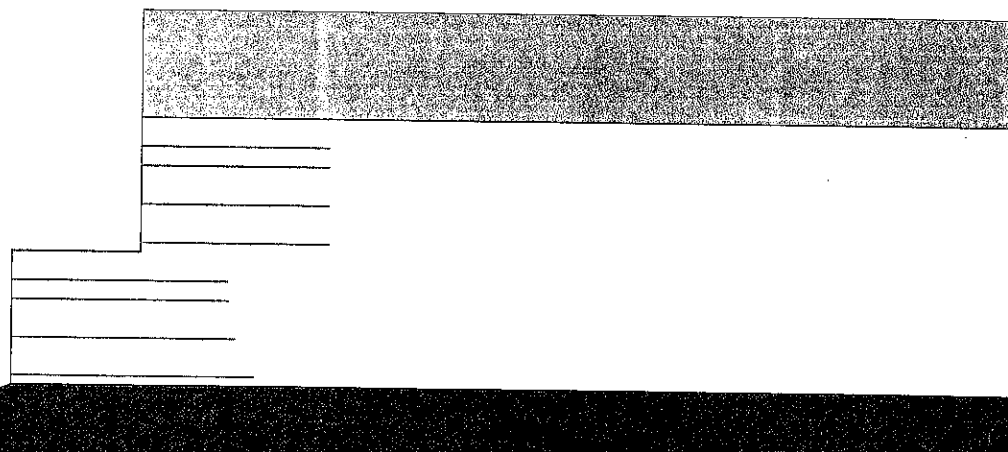
Backslope, β 0.0 [deg]

Backslope rise 0.0 [ft] Broken back equivalent angle, I = 0.00° (see Fig. 25 in DEMO 82)

Offset of upper segment from lower one, Offset = 9.0 ft, Backslope2 = 0.0 deg. and Backslope rise, S2 = 0.0 ft.

UNIFORM SURCHARGE

Uniformly distributed dead load is 250.0 [lb/ft²]

DESIGNED REINFORCEMENT LAYOUT:**SCALE:**

0 2 4 6 8 10 [ft]

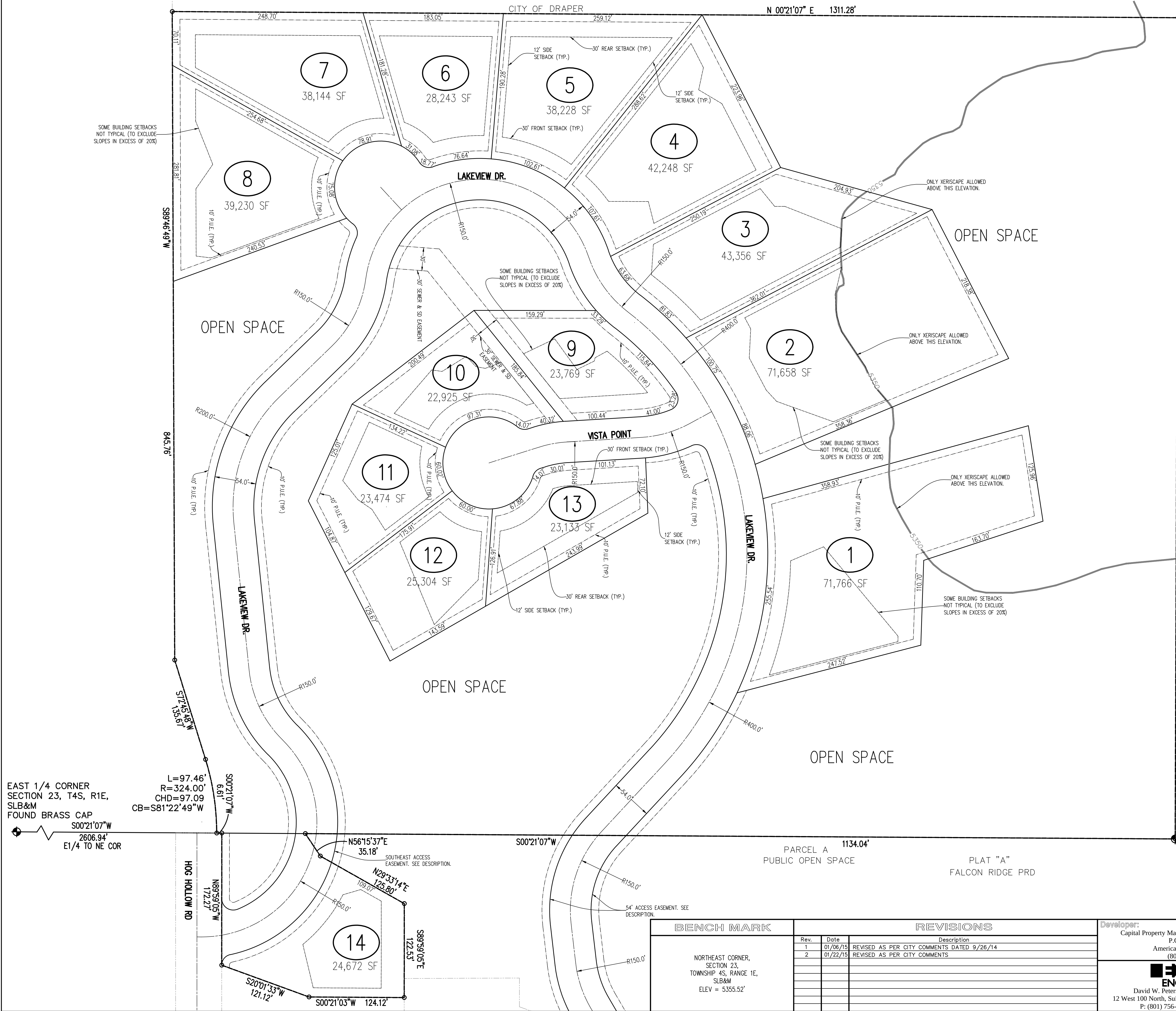
DESIGN: CALCULATED FACTORS (Static conditions)Bearing capacity, $F_s = 8.20$, Meyerhof stress = 1987 lb/ft².Foundation Interface: Direct sliding, $F_s = 2.776$, Eccentricity, $e/L = 0.0053$, F_s -overturning = 5.90

GEOGRID				CONNECTION			Geogrid strength F_s	Pullout resistance F_s	Direct sliding F_s	Eccentricity e/L	Product name
#	Elevation [ft]	Length [ft]	Type #	F_s -overall [pullout resistance]	F_s -overall [connection break]	F_s -overall [geogrid strength]					
1	0.67	16.90	1	4.55	4.55	4.55	4.552	66.622	1.576	-0.0046	UX1500MSE
2	3.33	15.59	1	4.63	4.63	4.63	4.629	49.217	1.501	-0.0333	UX1500MSE
3	6.00	15.12	1	5.95	9.57	9.57	9.565	74.960	1.501	-0.0903	UX1500MSE
4	7.33	15.07	2	3.13	8.36	8.36	8.357	33.755	1.503	-0.1333	UX1700MSE
5	10.00	13.07	1	5.18	5.18	5.18	5.180	28.562	3.345	0.0298	UX1500MSE
6	12.67	13.07	1	5.05	5.05	5.05	5.047	18.061	4.586	0.0156	UX1500MSE
7	15.33	13.07	1	5.96	9.57	9.57	9.568	18.734	7.467	0.0056	UX1500MSE
8	16.67	13.07	1	4.63	12.43	12.43	12.434	15.550	11.378	0.0023	UX1500MSE

DESIGN: CALCULATED FACTORS (Seismic conditions)Bearing capacity, $F_s = 4.36$, Meyerhof stress = 2725 lb/ft².Foundation Interface: Direct sliding, $F_s = 1.292$, Eccentricity, $e/L = 0.1393$, F_s -overturning = 2.54

GEOGRID				CONNECTION			Geogrid strength F_s	Pullout resistance F_s	Direct sliding F_s	Eccentricity e/L	Product name
#	Elevation [ft]	Length [ft]	Type #	F_s -overall [pullout resistance]	F_s -overall [connection break]	F_s -overall [geogrid strength]					
1	0.67	16.90	1	2.30	2.87	2.87	2.872	33.627	1.127	0.0223	UX1500MSE
2	3.33	15.59	1	2.46	3.08	3.08	3.079	26.192	1.195	-0.0197	UX1500MSE
3	6.00	15.12	1	2.49	5.00	5.00	4.999	31.340	1.351	-0.0869	UX1500MSE
4	7.33	15.07	2	1.72	5.74	5.74	5.744	18.562	1.433	-0.1324	UX1700MSE
5	10.00	13.07	1	2.74	3.43	3.43	3.426	15.113	1.367	0.0892	UX1500MSE
6	12.67	13.07	1	2.78	3.48	3.48	3.481	9.964	2.017	0.0419	UX1500MSE
7	15.33	13.07	1	2.71	5.43	5.43	5.433	8.509	3.788	0.0125	UX1500MSE
8	16.67	13.07	1	1.92	6.45	6.45	6.445	6.449	6.637	0.0043	UX1500MSE

INFINITE SLOPE ANALYSIS				
				Prepared By: <u>Jeff Egbert, P.E.</u>
				Reviewed By: <u>Bill Turner, P.E.</u>
Project:	Vista Meadows - Job #051709			
Soil Type:	Lean Clay			
Depth, d:	2 feet (usually 2 to 4 feet)			
Soil wt, γ :	120	pcf		
Cohesion, c' :	320	psf		
Phi angle, ϕ :	26	deg.	=	0.453786 radians
Slope angle, β :	26	deg.	=	0.453786 radians
r_u factor:	0.5	(0 to 1)		
Infinite FS = $(c' / \gamma d)(\sec \beta)(\operatorname{cosec} \beta) + (\tan \phi' / \tan \beta)(1 - r_u \sec^2 \beta)$				
Infinite FS:				
cohesion side=	3.384049			
frict. angle side=	0.381058			
Total FS =	3.765107			
Soil Type:	Clayey Gravel			
Depth, d:	2 feet (usually 2 to 4 feet)			
Soil wt, γ :	130	pcf		
Cohesion, c' :	150	psf		
Phi angle, ϕ :	32	deg.	=	0.558505 radians
Slope angle, β :	26	deg.	=	0.453786 radians
r_u factor:	0.5	(0 to 1)		
Infinite FS = $(c' / \gamma d)(\sec \beta)(\operatorname{cosec} \beta) + (\tan \phi' / \tan \beta)(1 - r_u \sec^2 \beta)$				
Infinite FS:				
cohesion side=	1.464252			
frict. angle side=	0.488201			
Total FS =	1.952453			



PROPERTY DESCRIPTION
COMMENCING AT THE NORTHEAST CORNER OF SECTION 23, TOWNSHIP 4 SOUTH, RANGE 1 EAST, SALT LAKE BASE AND MERIDIAN; THENCE SOUTH 00°21'07" WEST ALONG THE SECTION LINE 1134.04 FEET; THENCE NORTH 56°15'37" EAST 35.18 FEET; THENCE NORTH 29°33'14" EAST 125.80 FEET; THENCE SOUTH 89°59'05" EAST 122.53 FEET; THENCE SOUTH 00°21'03" WEST 124.12 FEET; THENCE SOUTH 20°01'33" WEST 121.12 FEET; THENCE NORTH 89°59'05" WEST 172.27 FEET; THENCE SOUTH 00°21'07" WEST 6.61 FEET; THENCE ALONG THE ARC OF A 324.00 FOOT RADIUS CURVE TO THE LEFT 97.46 FEET (CHORD BEARS SOUTH 81°22'49" WEST 97.09 FEET); THENCE SOUTH 72°45'48" WEST 135.67 FEET; THENCE SOUTH 89°46'49" WEST 845.76 FEET; THENCE NORTH 00°21'07" EAST 1311.28 FEET; THENCE SOUTH 89°48'06" EAST 1070.95 FEET TO THE POINT OF BEGINNING.
(INCLUDES LOT 3, PLAT "A", FALCON RIDGE P.R.D.)

AREA = 32.929 ACRES

54' ACCESS EASEMENT THRU PARCEL A & LOT 4 OF FALCON RIDGE PLAT 'A'
COMMENCING AT A POINT LOCATED SOUTH 00°21'07" WEST ALONG THE SECTION LINE 715.85 FEET FROM THE NORTHWEST CORNER OF SECTION 24, TOWNSHIP 4 SOUTH, RANGE 1 EAST, SALT LAKE BASE AND MERIDIAN; THENCE SOUTH 47°09'34" EAST, A DISTANCE OF 18.93 FEET; THENCE ALONG THE ARC OF A 123.00 FEET RADIUS CURVE TO THE LEFT THROUGH A CENTRAL ANGLE OF 49°26'37" FOR 106.14 FEET (CHORD BEARS SOUTH 71°52'52" EAST 102.88 FEET); THENCE NORTH 83°23'49" EAST, A DISTANCE OF 51.84 FEET; THENCE ALONG THE ARC OF A 123.00 FEET RADIUS CURVE TO THE LEFT THROUGH A CENTRAL ANGLE OF 23°37'03" FOR 50.70 FEET (CHORD BEARS NORTH 71°35'17" EAST 50.34 FEET); THENCE NORTH 59°46'46" EAST, A DISTANCE OF 96.56 FEET TO THE POINT OF CURVE OF A NON TANGENT CURVE; THENCE ALONG THE ARC OF THE 50.00 FEET RADIUS CURVE TO THE LEFT THROUGH A CENTRAL ANGLE OF 94°35'19" FOR 82.54 FEET (CHORD BEARS SOUTH 12°29'07" WEST 73.48 FEET); THENCE SOUTH 59°46'46" WEST, A DISTANCE OF 46.72 FEET; THENCE ALONG THE ARC OF A 177.00 FEET RADIUS CURVE TO THE RIGHT THROUGH A CENTRAL ANGLE OF 23°37'03" FOR 72.96 FEET (CHORD BEARS SOUTH 71°35'18" WEST 72.44 FEET); THENCE SOUTH 83°23'49" WEST, A DISTANCE OF 51.84 FEET; THENCE ALONG THE ARC OF A 177.00 FEET RADIUS CURVE TO THE RIGHT THROUGH A CENTRAL ANGLE OF 40°12'09" FOR 124.20 FEET (CHORD BEARS NORTH 76°30'06" WEST 121.66 FEET); THENCE NORTH 00°21'07" EAST, A DISTANCE OF 70.11 FEET TO THE POINT OF BEGINNING.

CONTAINING 15,890 SQUARE FEET OR 0.3648 ACRES, MORE OR LESS.

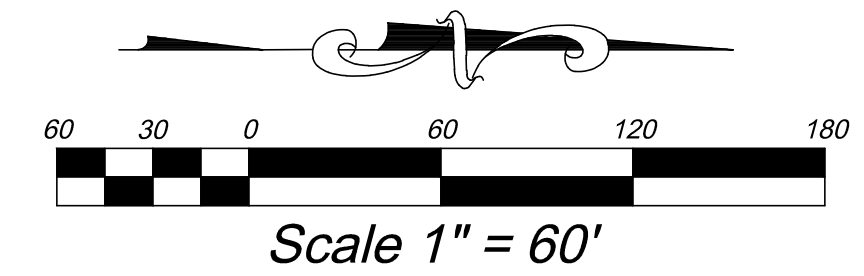
SOUTHEAST ACCESS EASEMENT THRU PARCEL A OF FALCON RIDGE PLAT 'A'
COMMENCING AT A POINT LOCATED SOUTH 00°21'07" WEST ALONG THE SECTION LINE 1092.59 FEET FROM THE NORTHWEST CORNER OF SECTION 24, TOWNSHIP 4 SOUTH, RANGE 1 EAST, SALT LAKE BASE AND MERIDIAN; THE BEGINNING OF A CURVE TO THE RIGHT, OF WHICH THE RADIUS POINT LIES SOUTH 05°00'59" WEST, A RADIAL DISTANCE OF 177.00 FEET; THENCE EASTERLY ALONG THE ARC, THROUGH A CENTRAL ANGLE OF 12°18'53", A DISTANCE OF 38.04 FEET (CHORD BEARS SOUTH 78°49'35" EAST 37.97 FEET); THENCE SOUTH 29°33'14" WEST, A DISTANCE OF 16.73 FEET; THENCE SOUTH 56°15'37" WEST, A DISTANCE OF 35.18 FEET; THENCE NORTH 00°21'07" EAST, A DISTANCE OF 41.45 FEET TO THE POINT OF BEGINNING.

CONTAINING 931 SQUARE FEET OR 0.0214 ACRES, MORE OR LESS.

LOT 3 OF FALCON RIDGE PLAT 'A' NOTE:
LOT 3 OF FALCON RIDGE PLAT 'A' WILL BE VACATED WITH THE FINAL PLAT FOR THIS SUBDIVISION. THIS LOT IS LOCATED WHERE LOT 14 OF THIS SUBDIVISION IS PROPOSED.

GENERAL NOTES

- ALL LOTS ARE SUBJECT TO A 5' UTILITY EASEMENT (P.U.E.) ALONG ALL SIDE LOT LINES AND A 10' UTILITY EASEMENT ALONG ALL STREET FRONTS AND REAR LOT LINES, IN ADDITION TO ANY EASEMENTS SHOWN ON THIS PRELIMINARY PLAT.
- ALL BUILDINGS SHALL BE LOCATED WITHIN THE DESIGNATED BUILDING AREA AS SHOWN ON THIS PRELIMINARY PLAT. (SEE SEPARATE SLOPE ANALYSIS PLAN TO SEE AREAS WITH SLOPE GREATER THAN 20% SLOPE WHICH FORCED TYPICAL SETBACK LINES TO MOVE.)



EAST 1/4 CORNER SECTION 23, T4S, R1E, SLB&M
FOUND BRASS CAP
S00°21'07"W
2606.94'
E1/4 TO NE COR

L=97.46'
R=324.00'
CHD=97.09
CB=S81°22'49"W

S00°21'07"W
6.61'

N89°59'05"W
172.27'

S20°01'33"W
121.12'

S00°21'03"W
124.12'

N56°15'37"E
35.18'

N29°33'14"E
125.80'

S89°59'05"E
122.53'

SOUTHEAST ACCESS EASEMENT. SEE DESCRIPTION.

54' ACCESS EASEMENT. SEE DESCRIPTION.

NORTHEAST CORNER SECTION 23, T4S, R1E, SLB&M
FOUND BRASS CAP

BENCH MARK		REVISIONS		
NORTHEAST CORNER, SECTION 23, TOWNSHIP 4S, RANGE 1E, SLB&M ELEV = 5355.52'	Rev.	Date	Description	
	1	01/06/15	REVISED AS PER CITY COMMENTS DATED 9/26/14	
	2	01/22/15	REVISED AS PER CITY COMMENTS	

Developer:
Capital Property Management Series Eagle Pointe
P.O. Box 1212
American Fork, UT 84003
(801) 367-1636

ENGINEERING
David W. Peterson, P.E., License #270393
12 West 100 North, Suite 201, American Fork, UT 84003
P: (801) 756-4504; F: (801) 756-4511

EAGLE POINTE SUBDIVISION

ALPINE CITY HOG HOLLOW RD/MATTERHORN DR. UTAH

Drawn by: D.W.P.

Designed by: D.W.P.

Checked by: D.W.P.

PRELIMINARY PLAT

Scale: 1"=60'

Date: 09/03/14

CV2

ALPINE PLANNING COMMISSION AGENDA

SUBJECT: David's Court Final Plat F Approval Reinstatement and Revisions

FOR CONSIDERATION ON: 03 February 2015

PETITIONER: Patterson Construction

**ACTION REQUESTED BY PETITIONER: Reinstatement Final Approval and
Approve the Proposed Revisions**

APPLICABLE STATUTE OR ORDINANCE: See Engineer Review

PETITION IN COMPLIANCE WITH ORDINANCE: Yes

BACKGROUND INFORMATION:

The Planning Commission and City Council have previously approved the David's Court Subdivision consisting 15 lots on 16.42 acres which is located north of Healey Blvd. and east of Canyon Crest Road. The proposed development is in the CR-40,000 zone.

Since that approval, the Developer was approached by a purchaser who is willing to buy the eastern half of the property and requested to have it remain as one lot for the time being. See the attached layout. This sale would combine several lots leaving a total of 9 lots on 16.42 acres to be platted. In order to accommodate the purchaser, the Developer revised the westerly lot layout slightly. The developer still proposes two cul-de-sacs for David's Court (see attached construction drawings) but will only record and build 9 lots for the time being. This is essentially a phased development proposal as we do not know if/when the easterly half of the development will ever be developed in the future by the land owner.

The approval has since expired (Paragraph 4.6.3.12). Because there are proposed revisions to the Final Plat, the approval will need to be reinstated with a recommendation from the Planning Commission and approval from the City Council (Paragraph 4.6.3.13).

The proposed David's Court Subdivision (revised) consists of 9 lots on 16.42 acres, with the future potential of 15 lots. The lots range in size from 40,003 to 361,865 square feet. This plan will require the vacation of David's Court Plats A thru C to allow property lines to be adjusted to the current plan. The development is not located within any sensitive lands overlay.

NOTE: The Engineer's review letter is written as if the development were fully developed with 15 lots and two new cul-de-sac streets being built.

STAFF RECOMMENDATION:

Staff recommends that final approval of the proposed development be approved with the following conditions:

- **The Developer meet the water policy**
- **The previous Final Plat approval be reinstated with a recommendation from the Planning Commission and approval from the City council.**



Date: January 27, 2015

By: Jed Muhlestein, P.E. *JW*
Assistant City Engineer

**Subject: David's Court Subdivision – REVISED Final Review
9 lots on 16.42 acres**

Background

The Planning Commission and City Council have previously approved the David's Court Subdivision consisting 15 lots on 16.42 acres which is located north of Healey Boulevard and east of Canyon Crest Road. The proposed development is in the CR-40,000 zone.

Since that approval the Developer was approached by a purchaser who was willing to buy the eastern half of the property and requested to have it remain as one lot for the time being. See the attached layout. This sale would combine several lots leaving a total of 9 lots on 16.42 acres to be platted. In order to accommodate the purchaser, the Developer revised the westerly lot layout slightly. The Developer still proposes two cul-de-sacs for David's Court (see attached construction drawings) but will only record and build 9 lots for the time being. This is essentially a phased development proposal as we do not know if/when the easterly half of the development will ever be developed in the future by the land owner.

The proposed David's Court Subdivision consists of 9 lots on 16.42 acres, with the future potential of 15 lots. The lots range in size from 40,003 to 361,865 square feet. This plan will require the vacation of David's Court Plats A thru C to allow property lines to be adjusted to the current plan. The development is not located within any sensitive lands overlay zone.

The rest of this review letter is written as if the development were fully developed with 15 lots and two new cul-de-sac streets being built.

Street System

The proposed development shows access from Healey Boulevard with two new cul-de-sacs. Both cul-de-sacs are less than 450' in length. All lots, except Lot 3, will have frontage on these

new cul-de-sacs. Lot 3 has frontage and will access off Canyon Crest Road which is an arterial road. Lot 3 will be required to have a driveway design such that backing out onto Canyon Crest will not occur (Development Code 4.7.4.14) and will require the recommendation of DRC, Planning Commission, and approval of the City Council. A note is shown on the plat for this requirement. A note is also shown on the plat to move the driveway as far south along the frontage of Lot 3 as possible to give the proper sight distance for south bound traffic on Canyon Crest. The DRC recommends this approach for Lot 3. This was previously recommended and approved by the Planning Commission and City Council. Previous redlines regarding street design have been addressed by the developer.

Sewer System

There is an existing 8-inch sewer line running in Healey Boulevard that can serve all but Lot 3 of the development. Some sewer laterals were installed northward off Healey Boulevard in anticipation for the development and most will be used. There is one on Healey Blvd at the intersection of the proposed cul-de-sac Austin Circle that will be or will remain capped as it is in an un-usable location for the site plan. In order to provide sewer service to Lot 3 an extension of the sewer system in Canyon Crest would need to be built as the nearest sewer manhole to that lot is about 175' to the south. The sewer design is provided and approved. Redlines from Preliminary have been addressed.

Culinary Water System

The subdivision is well below the 5350 foot elevation, which is the highest elevation the existing water system can serve and still provide a minimum 40 psi required by ordinance. There is currently an 8-inch water line running in Healey Boulevard that can serve the development.

At Preliminary Review the topic of available fire flows was discussed. Based on the International Fire Code, which the City has adopted, fire flows dictate the size of home that can be built with or without having to install automatic fire sprinklers. After Preliminary Review the developer has upsized the proposed size of lines in the cul-de-sacs to provide enough fire flow to support a 7,700 square foot home in the westerly cul-de-sac and a 6,200 square foot home in the easterly cul-de-sac. Whether or not automatic fire sprinklers, or other means, are required to protect a home due to available fire flow is checked at the building permit stage.

Redlines from Preliminary have been addressed and the water design is acceptable. The Fire Marshall has approved the location of the proposed fire hydrants. 3/4-inch service lines with 3/4-inch water meters are shown to be constructed for each new lot where existing services cannot be utilized. Where existing services cannot be utilized, they shall be removed.

Pressurized Irrigation System

There is currently a 12-inch pressurized irrigation line running in Healey Boulevard that could serve the development. Additionally, there are five pressurized irrigation boxes on the north side

of the Healey Boulevard, four are shown to be used, one will be removed. There is currently no service for Lot 3, one will have to be installed and connected to the 12-inch main line that is running in Canyon Crest. The construction drawings align with previous calculations on the pressurized water system model which show 6-inch lines serving the cul-de-sacs. 1 inch laterals will be required for each lot where they are not currently installed. Where existing services cannot be utilized, they shall be removed.

Storm Water Drainage System

A storm drain design was provided. It shows catchment at the lower end of each cul-de-sac with a detention basin which releases at a controlled rate into the existing system in Healey Blvd. Storm drain easements are provided for the city to perform routine maintenance when needed. Redlines on the storm drain design have been addressed.

A storm water pollution prevention plan would be required for the site addressing best management practices that will be implemented to control erosion on the site during construction. A UPDES and Land Disturbance Permit will be required prior to construction.

General Subdivision Remarks

The water policy will need to be met for this development. The applicant shows they plan to use credits, which are acceptable.

We recommend that Final Approval of the proposed development be approved with the following conditions:

- **The Developer meet the water policy**



January 27, 2015

Jason Bond, City Planner
Alpine City
20 North Main
Alpine, Utah 84004

Subject: David's Court Plat F - Water Requirement
9 lots on 16.42 acres

Dear Jason:

We have calculated the water requirement for Phase A of the David's Court subdivision. The subdivision consists of 9 lots on 16.42 acres.

The developer will be required to provide **3.87** acre-feet of water to meet the water policy for the development. The total required is 30.20 acre-feet but the developer had previously met the water policy for most of the property on prior plats.

Please contact me if you have any questions.

Sincerely,
ALPINE CITY

A handwritten signature in blue ink, appearing to read "Jed Muhlestein", is written over the printed name.

Jed Muhlestein, P.E.
Assistant City Engineer

cc: File
Developer

Alpine City Engineering
20 North Main
Alpine, Utah 84004



Water Requirements

David's Court Plat F

January 28, 2015

Lot	Area (sf)	Indoor Requirement (0.45 ac-ft per home)	Outdoor Requirement (1.66 ac-ft/acre)	Total (ac-ft)
1	40,003	0.45	1.52	1.97
2	42,059	0.45	1.60	2.05
3	40,012	0.45	1.52	1.97
4	41,320	0.45	1.57	2.02
5	40,738	0.45	1.55	2.00
6	40,214	0.45	1.53	1.98
7	40,007	0.45	1.52	1.97
8	40,009	0.45	1.52	1.97
9	361,865	0.45	13.79	14.24

Total	30.20
Credits Previously given	26.33
Total Needed	3.87

Jed Muhlestein, P.E.
Asistant City Engineer

11038 N
Highland Blvd
#400 Highland,
UT 84003



DAVID'S COURT PLAT "F" BOND ESTIMATE

RECEIVED JAN 20 2015

9/4/14

Line #	Item Description	Estimated	Unit	Unit Price	Total Price
GENERAL					
1	Mobilization	1.00	LS	\$4,500.00	\$4,500.00
Total Price for above GENERAL Items:					\$4,500.00
SWPPP					
2	Silt Fence: Maintenance	1095.00	LF	\$0.85	\$930.75
3	Curb Inlet Box Protection	4.00	EACH	\$80.30	\$321.20
4	Gravel Construction Entrance: Maintenance Cobble Added;	12.00	TON	\$24.60	\$295.20
Total Price for above SWPPP Items:					\$1,547.15
ASPHALT & CONCRETE					
5	Asphalt 3" - Standard road	18,887.00	SF	\$1.17	\$22,097.79
6	Roadbase 9" Hauled, Placed & Compacted	22,029.00	SF	\$0.48	\$10,573.92
7	24" HB Curb & Gutter	1,052.00	LF	\$10.25	\$10,783.00
8	5' Sidewalk 4" Thick	1,260.00	SF	\$2.71	\$3,414.60
9	ADA Ramps	2.00	EACH	\$487.00	\$974.00
Total Price for above ASPHALT & CONCRETE Items:					\$47,843.31
SEWER					
10	8" PVC Sewer 10'-12' Deep	651.00	LF	\$25.10	\$16,340.10
11	4" PVC Sewer Lateral Complete (40 LF)	6.00	EACH	\$975.00	\$5,850.00
12	4' SWR Manhole Precast	4.00	EACH	\$2,422.00	\$9,688.00
Total Price for above SEWER Items:					\$31,878.10
DRAINAGE					
13	15" RCP Storm Drain	272.00	LF	\$31.26	\$8,502.72
14	Curb Inlet 2' X 3' X 4'	3.00	EACH	\$3,500.00	\$10,500.00
15	5' SD Manhole	1.00	EACH	\$2,750.00	\$2,750.00
16	4' Juntion Box	1.00	EACH	\$2,500.00	\$2,500.00
Total Price for above DRAINAGE Items:					\$24,252.72
CULINARY WATER					
17	10" DI Culinary Water	481.00	LF	\$30.00	\$14,430.00
18	10" Gate Valves W/ Hot tap	1.00	EACH #	\$1,383.00	\$1,383.00
19	Fire Hydrant	2.00	EACH	\$4,155.00	\$8,310.00
20	1" Water Service	6.00	EACH	\$465.00	\$2,790.00
Total Price for above CULINARY WATER Items:					\$26,913.00
PRESSURE IRRIGATION					
21	6" PVC Irrigation Water	438.00	LF	\$28.00	\$12,264.00
22	6" Gate Valve w/ Hot Tap	1.00	EACH	\$1,527.00	\$1,527.00
23	6" Plug	1.00	EACH	\$350.00	\$350.00
24	1" Irrigation Service	6.00	EACH	\$430.00	\$2,580.00
Total Price for above PRESSURE IRRIGATION Items:					\$16,721.00
DRY UTILITIES					
25	Dry Utility Trenching & Power conduit	1,052.00	LF	\$4.61	\$4,849.72
26	Utility Sleeve Trenching	60.00	LF	\$3.80	\$228.00
27	Gas Sleeve	60.00	LF	\$2.40	\$144.00
28	Phone Sleeve	60.00	LF	\$2.40	\$144.00
Total Price for above DRY UTILITIES Items:					\$5,365.72

11038 N
Highland Blvd
#400 Highland,
UT 84003



MISCELLANEOUS

29 Street sign / traffic signs	2.00	EACH	\$225.00	\$450.00
30 Street Light	1.00	EACH	\$2,500.00	\$2,500.00
31 Mail Box	1.00	EACH	\$1,500.00	\$1,500.00
32 Subdivision monument	2.00	EACH	\$450.00	\$900.00

Total Price for above Miscellaneous Items: \$5,350.00

CONSTRUCTION MANAGEMENT

33 As-Builts as per city standards	1.00	LS	\$1,500.00	\$1,500.00
34 Construction Staking	1.00	LS	\$2,150.00	\$2,150.00
35 Testing, Cleaning, Inspections	1.00	LS	\$800.00	\$800.00

Total Price for above Construction Management Items: \$3,650.00

BOND ESTIMATE



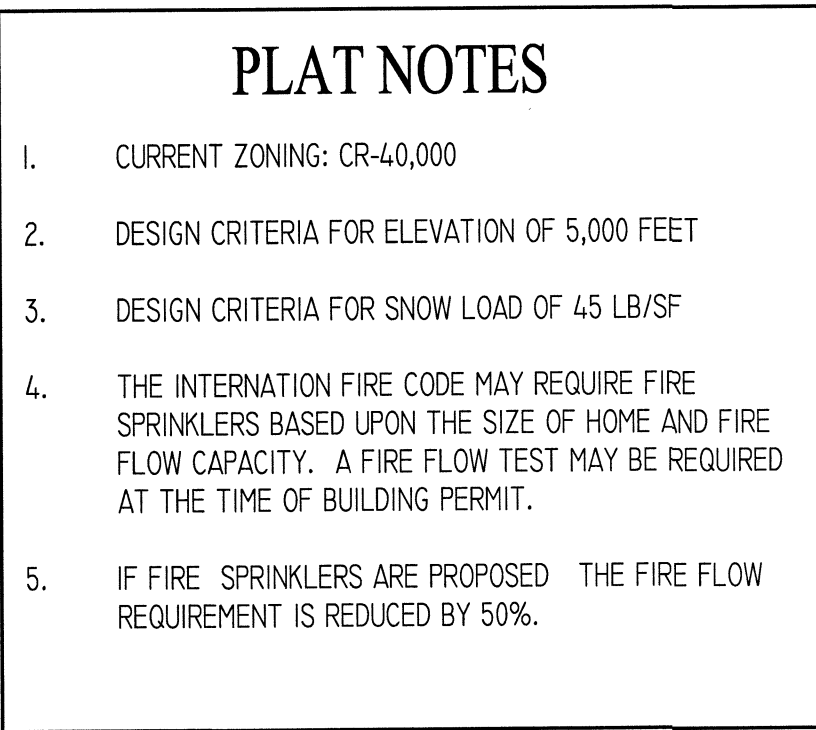
SUMMARY

GENERAL	\$4,500.00
SWPPP	\$1,547.15
ASPHALT & CONCRETE	\$47,843.31
SEWER	\$31,878.10
DRAINAGE	\$24,252.72
CULINARY WATER	\$26,913.00
PRESSURE IRRIGATION	\$16,721.00
DRY UTILITIES	\$5,365.72
MISCELLANEOUS	\$5,350.00
CONSTRUCTION MANAGEMENT	\$3,650.00

Total Improvement Estimate:	\$168,021.00
Bonding for 25%	\$ 42,005.25

TOTAL IMPROVEMENT BOND AMOUNT:	\$210,026.25
---------------------------------------	---------------------

AND A VACATION OF DAVID'S COURT PLATS "A", "B" & "C"
LOCATED IN THE SW 1/4 OF SECTION 30, T4S, R2E, S.L.B.&M
ALPINE CITY, UTAH COUNTY, STATE OF UTAH



CURVE TABLE					
CURVE	RADIUS	LENGTH	DELTA	CHORD	BEARING
C1	1030.00	415.90	23°01'22"	411.12	N 78°35'45" W
C2	200.00	143.53	41°07'09"	140.47	S 21°02'07" E
C3	15.00	23.66	90°22'03"	21.28	N 44°42'29" E
C4	173.00	59.00	19°32'26"	58.72	N 10°14'45" W
C5	15.00	23.85	91°06'36"	21.42	N 65°34'46" W
C6	100.63	106.63	99°51'49"	91.87	N 6°10'09" W
C7	60.00	93.38	89°10'13"	84.24	N 33°22'22" E
C8	60.00	64.60	61°29'38"	61.35	S 71°17'42" E
C9	60.00	26.89	23°46'13"	24.71	S 28°39'46" E
C10	15.00	5.30	20°14'14"	5.27	S 26°53'46" E
C11	227.00	76.69	19°12'22"	76.32	S 27°20'15" E
C12	227.00	68.08	17°11'00"	67.82	S 09°04'02" E
C13	15.00	23.47	89°33'57"	21.15	S 45°17'31" E
C14	270.00	158.00	33°31'42"	155.75	N 83°50'53" W
C15	1030.00	117.87	06°33'25"	117.81	N 86°49'46" W
C16	1030.00	296.03	16°28'02"	295.01	S 75°19'03" E

ADDRESS TABLE		
LOT #	ADDRESS	
1	806 SOUTH	MALAN COURT
2	774 SOUTH	MALAN COURT
3	735 SOUTH	CANYON CREST ROAD
4	748 SOUTH	MALAN COURT
5	727 SOUTH	MALAN COURT
6	759 SOUTH	MALAN COURT
7	781 SOUTH	MALAN COURT
8	809 SOUTH	MALAN COURT
9	452 EAST	HEALEY BLVD.

APPROVAL AS TO FORM

APPROVED AS TO FORM THIS _____
DAY OF _____ A.D., 20 _____

CITY ATTORNEY

DC-FINAL PLAT F.DWG 30.DEC.2014

I, _____, DO HEREBY CERTIFY THAT I AM A REGISTERED LAND SURVEYOR, AND THAT I HOLD CERTIFICATE NO. _____ AS PRESCRIBED BY THE LAWS OF THE STATE OF UTAH. I FURTHER CERTIFY BY AUTHORITY OF THE OWNERS, 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, BLOCKS, STREETS, OPEN SPACES, AND EASEMENTS AND THAT THE SAME HAS BEEN CORRECTLY SURVEYED AND STAKED ON THE GROUND AS SHOWN ON THIS PLAT AND THAT THIS PLAT IS TRUE AND CORRECT.

DATE _____ SURVEYOR _____ (SEE SEAL BELOW)

BEGINNING AT A POINT WHICH IS S 87°28'45" E 26.30 FEET FROM THE WEST QUARTER CORNER OF SECTION 30, TOWNSHIP 4 SOUTH, RANGE 2 EAST, SLB8M;

RUNNING THENCE N 89°54'20" E & 223.60 FEET; THENCE S 89°45'14" E 6.64 FEET; THENCE S 89°53'27" E 99.81 FEET; THENCE S 89°49'52" E 189.04 FEET; THENCE N 89°43'59" E 43.51 FEET; THENCE S 89°07'33" E 70.27 FEET; THENCE S 89°50'20" E 239.01 FEET; THENCE N 89°18'50" E 77.00 FEET; THENCE S 00°02'42" E 47.52 FEET; THENCE S 00°02'42" E 265.24 FEET; ALONG THE ARC OF A NON-TANGENT 210.00 FOOT RADIUS CURVE TO THE RIGHT 188.00 FEET (CURVE HAS A CENTRAL ANGLE OF 33°51'42" AND A CHORD THAT BEARS N 83°50'35" E 155.75 FEET); THENCE N 67°05'22" E 100.00 FEET; THENCE ALONG THE ARC OF A TANGENT 188.00 FEET (CURVE HAS A CENTRAL ANGLE OF 33°51'42" AND A CHORD THAT BEARS N 83°50'35" E 155.75 FEET); THENCE S 89°53'27" E 32.69 FEET; THENCE NORTH 22°47.22 FEET; THENCE EAST 72.08 FEET; THENCE N 75°47'10" E 6.63 FEET; THENCE N 58°47'00" E 90.40 FEET; THENCE N 65°50'00" E 269.08 FEET; THENCE N 76°20'00" E 72.39 FEET; THENCE N 01°23'23" E 202.64 FEET TO THE POINT OF BEGINNING.

CONTAINING 16.42 ACRES OF LAND.
BASIS OF BEARINGS = STATE PLANE

KNOWN ALL MEN BY THESE PRESENTS THAT WE, ALL THE UNDERSIGNED OWNERS OF ALL OF THE PROPERTY DESCRIBED IN THE SURVEYOR'S CERTIFICATE HEREON AND SHOWN ON THIS MAP, HAVE CAUSED THE SAME TO BE SUBDIVIDED INTO LOTS, STREETS, OPEN SPACE, AND EASEMENTS AND DO HEREBY DEDICATE THE STREETS AND OTHER PUBLIC AREAS AS INDICATED HEREON FOR PERPETUAL USE OF THE PUBLIC.

IN WITNESS WHEREOF WE HAVE HEREUNTO SET OUR HANDS THIS _____ DAY OF _____, A.D. 20____

STATE OF UTAH
COUNTY OF UTAH

ON THE _____ DAY OF _____, A.D. 20____ PERSONALLY APPEARED BEFORE ME THE SIGNERS
OF THE FOREGOING DEDICATION WHO DULY ACKNOWLEDGE TO ME THAT THEY DID EXECUTE THE SAME.

MY COMMISSION EXPIRES _____

NOTARY PUBLIC

THE CITY COUNCIL OF ALPINE CITY, COUNTY OF UTAH, APPROVES THIS SUBDIVISION AND HEREBY ACCEPTS THE DEDICATION OF ALL STREETS, EASEMENTS, OPEN SPACES, AND OTHER PARCELS OF LAND INTENDED FOR PUBLIC PURPOSES FOR THE PERPETUAL USE OF THE PUBLIC THIS _____ DAY OF _____ A.D. 20____

APPROVED _____ ATTEST _____
CITY ENGINEER CLERK - RECORDER
(SEE SEAL BELOW) (SEE SEAL BELOW)

APPROVED THIS _____ DAY OF _____, A.D. 20 ____ BY THE ALPINE CITY PLANNING COMMISSION

DIRECTOR - SECRETARY

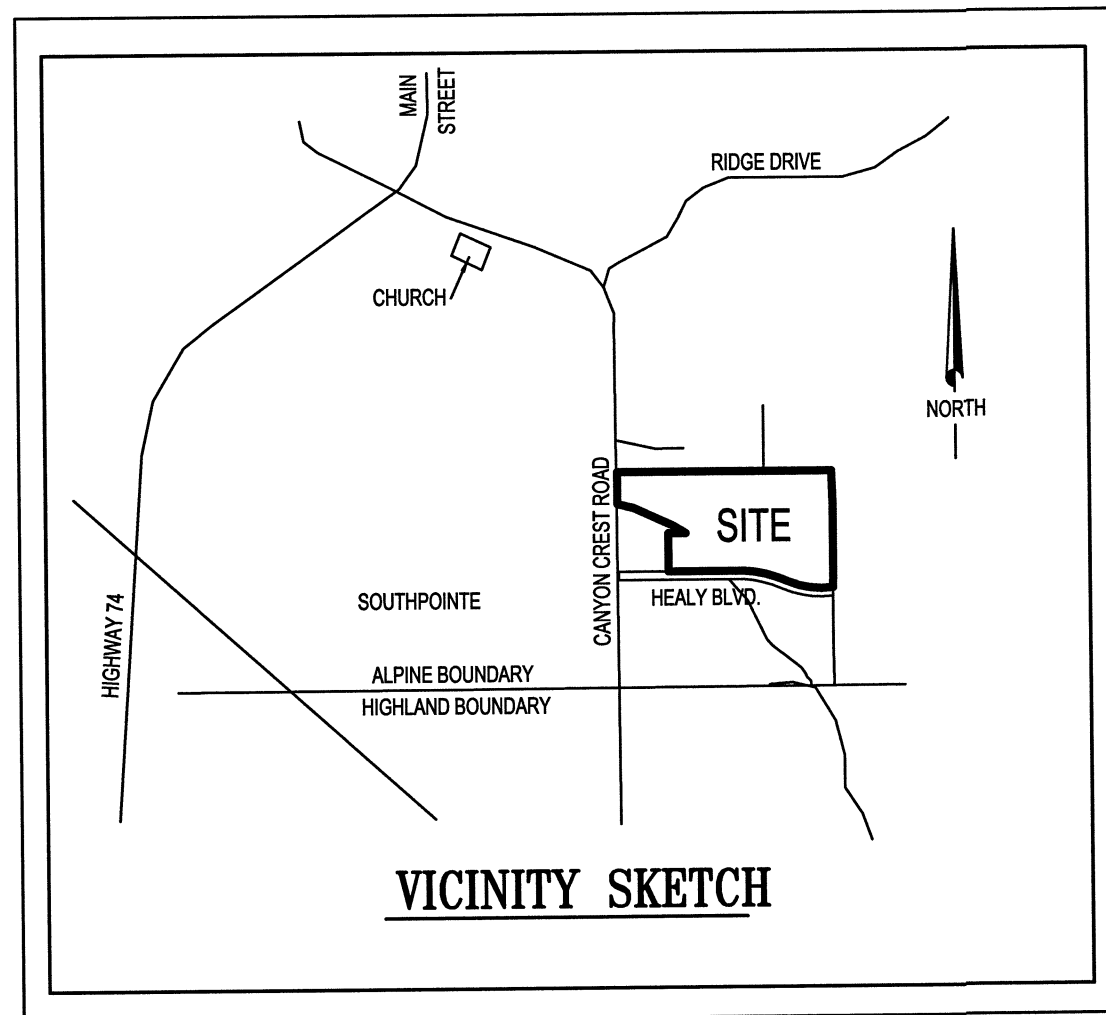
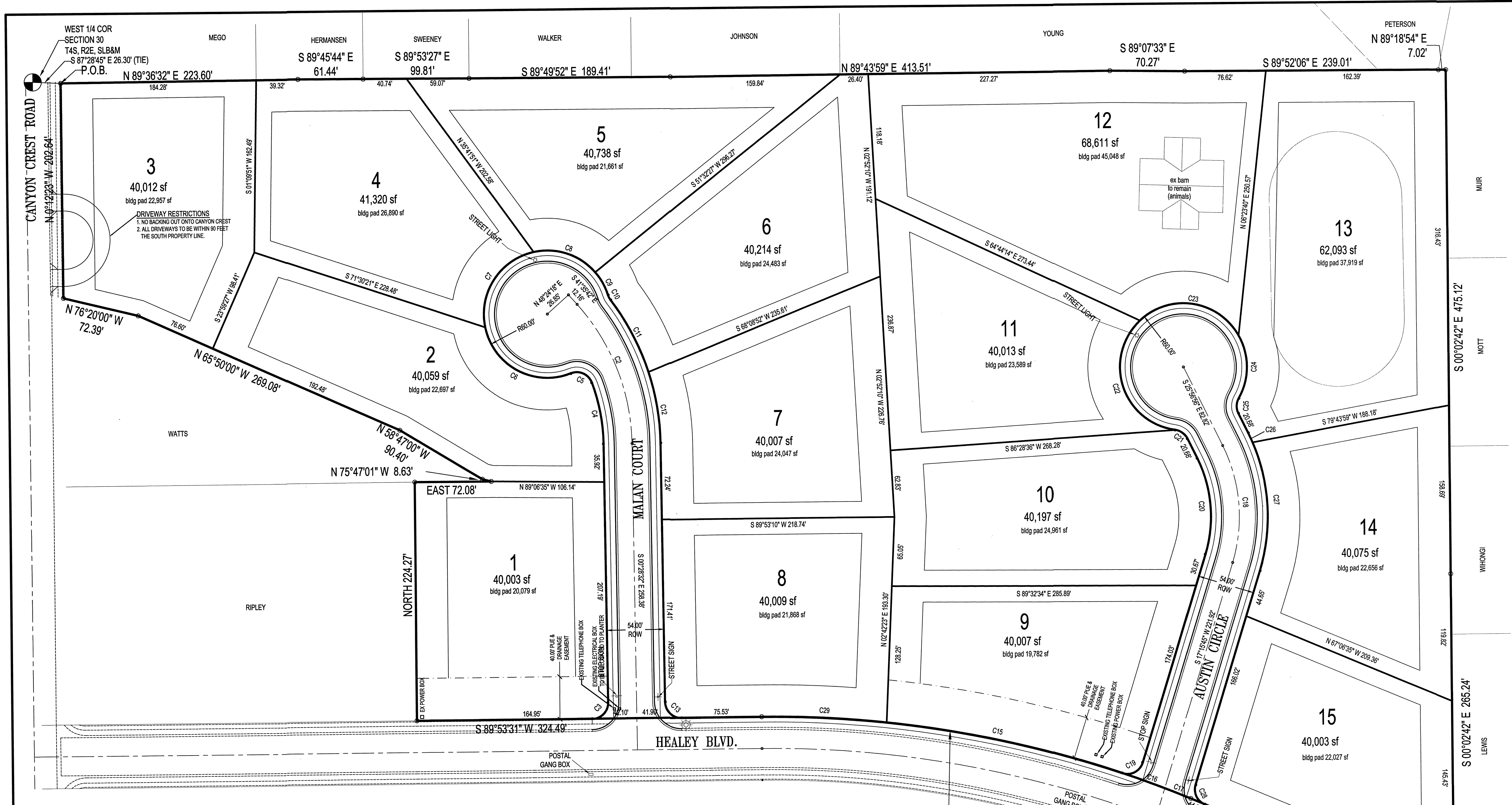
AND A VACATION OF DAVID'S COURT PLATS "A", "B" & "C"
LOCATED IN THE SW 1/4 OF SECTION 30, T4S, R2E, S.L.B.8M

ALPINE CITY, UTAH COUNTY, STATE OF UTAH

SCALE: 1"= 60 FEET

SURVEYOR'S SEAL	NOTARY PUBLIC SEAL	CITY ENGINEER SEAL	CLERK - RECORDER SEAL

VICINITY SKETCH



- NOTES**
1. ALL CONSTRUCTION TO CONFORM WITH ALPINE CITY STANDARDS AND SPECIFICATIONS. THIS DEVELOPMENT CONFORMS TO REQUIREMENTS OF CR-40,000 ZONE AND IS A STANDARD SUBDIVISION, NOT A PRD.
 2. 2' CONTOURS ARE FROM A RESURVEY COMPLETED IN APR 2014
 3. ALL STREETS AND SEWER LINES TO HAVE MINIMUM SLOPES OF 0.4%
 4. SOIL TYPES ON PROPERTY = WeD2 AND WeC = WELBY SILTY LOAM MODERATELY PERMEABLE, WELL-DRAINED, SLIGHT EROSION HAZARD.
 5. WATER, SEWER, PRESSURE IRRIGATION, FIRE PROTECTION, AND SOLID WASTE SERVICE TO BE PROVIDED BY ALPINE CITY.
 6. ALL CATCH BASINS TO BE STANDARD PRE-TREATMENT TYPE WITH OIL/WATER SEPARATOR.
 7. NONE OF THIS SITE IS IN ZONE A 100-YEAR FLOOD PLAIN BOUNDARY.
 8. EXISTING WATER RIGHT CREDITS WILL BE USED TO PROVIDE WATER FOR THE DEVELOPMENT.
 9. A SOILS REPORT HAS BEEN PREPARED FOR THE PROJECT AND NO GEOLOGIC HAZARDS ARE KNOWN ON-SITE.
 10. THIS PRELIMINARY PLAN REQUIRES THE VACATION OF THE FOLLOWING PLATS:
(1) DAVID'S COURT PLAT "A" - (LOT 1)
(2) DAVID'S COURT PLAT "B"
(3) DAVID'S COURT PLAT "C"
 11. DITCH ALONG WEST BOUNDARY HAS BEEN VACATED. DITCH HAS BEEN ABANDONED AND CULVERT CROSSING AT CANYON CREST HAS BEEN FILLED WITH CONCRETE.

TABULATIONS

ZONING	CR-40,000
TOTAL AREA	16.42 ac
# OF LOTS	15

DEVELOPMENT

DAVID'S COURT PLAT F SUBDIVISION

CANYON CREST & HEALEY BLVD

DEVELOPER

www.phutah.com

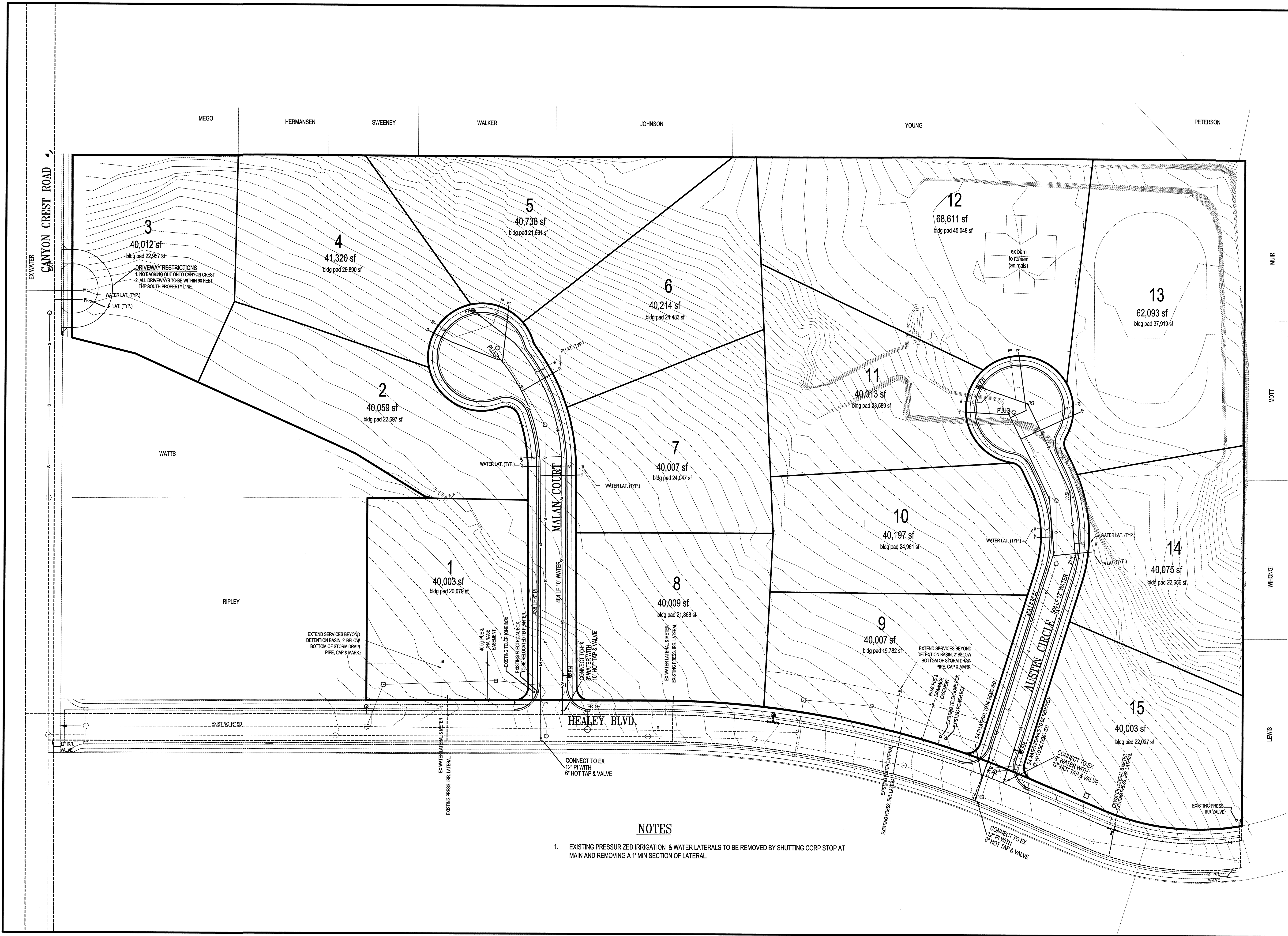
11038 N. Highland Blvd Suite 100
Highland, UT 84003
(801) 642-0119

SCALE: 1" = 50'

CIVIL ENGINEERING
11038 N Highland Blvd Suite 400
Highland UT 84003
office (801) 492-1277
cell (801) 616-1677

PROJECT STATUS			SEAL
NO.	DATE	DESCRIPTION	
1			
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ACTION		DATE	
FINAL		12/31/14	
PROJECT			
DAVID'S COURT PLAT F SUBDIVISION			
DESCRIPTION			
CONSTRUCTION DRAWINGS			
SHEET NAME		SHEET NUMBER	
COVER		C1	

©2014 david's court plat f.dwg



DEVELOPMENT

DAVID'S COURT PLAT F SUBDIVISION

CANYON CREST & HEALEY BLVD

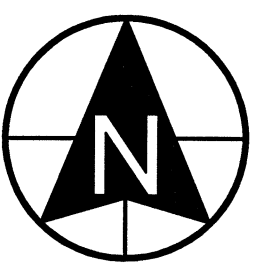
DEVELOPER



PATTERSON HOMES
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1"= 50'



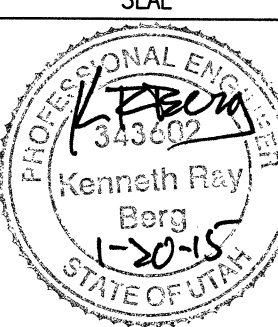
SCALE: 1"= 50'

BERG

CIVIL ENGINEERING

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office (801) 492-1277
cell (801) 616-1677

PROJECT STATUS		SEAL
NO.	DATE	DESCRIPTION
1		
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Kenneth Ray Berg
1-20-15
STATE OF UTAH

ACTION	DATE
FINAL	12/31/14

PROJECT

DAVID'S COURT PLAT F SUBDIVISION

DESCRIPTION

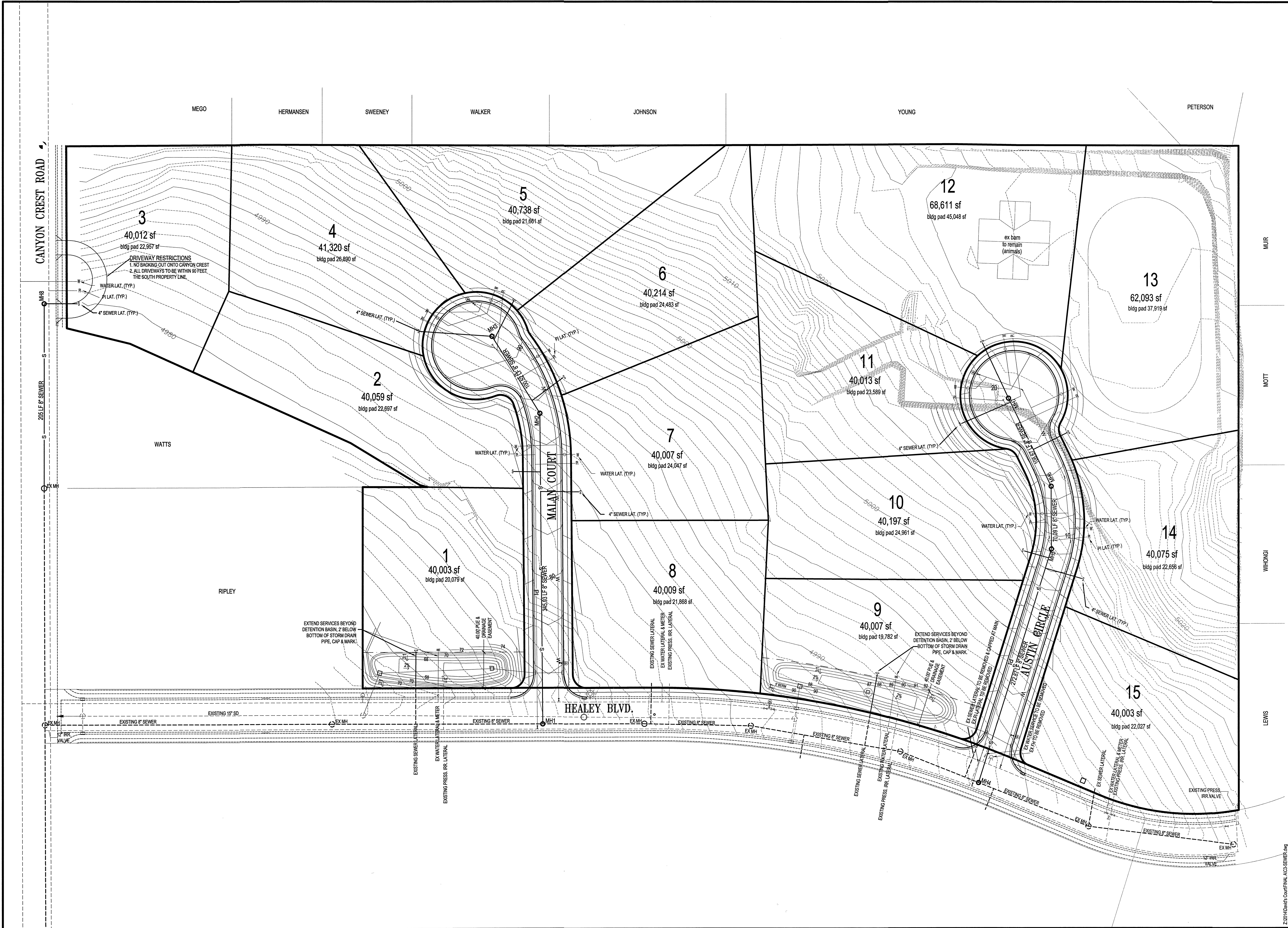
CONSTRUCTION DRAWINGS

SHEET NAME	SHEET NUMBER
UTILITY	C2

©2014 David's Court Plat F Subdivision

NOTES

- EXISTING PRESSURIZED IRRIGATION & WATER LATERALS TO BE REMOVED BY SHUTTING CORP STOP AT MAIN AND REMOVING A 1' MIN SECTION OF LATERAL.



DEVELOPMENT

DAVID'S COURT
PLAT F
SUBDIVISION
CANYON CREST & HEALEY BLVD

DEVELOPER

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(801) 642-0119

SCALE: 1"= 50'

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Highland Ut, 84003
office (801) 492-1277
cell (801) 616-1677

PROJECT STATUS			SEAL
NO.	DATE	DESCRIPTION	
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ACTION	DATE
FINAL	12/31/14

PROJECT

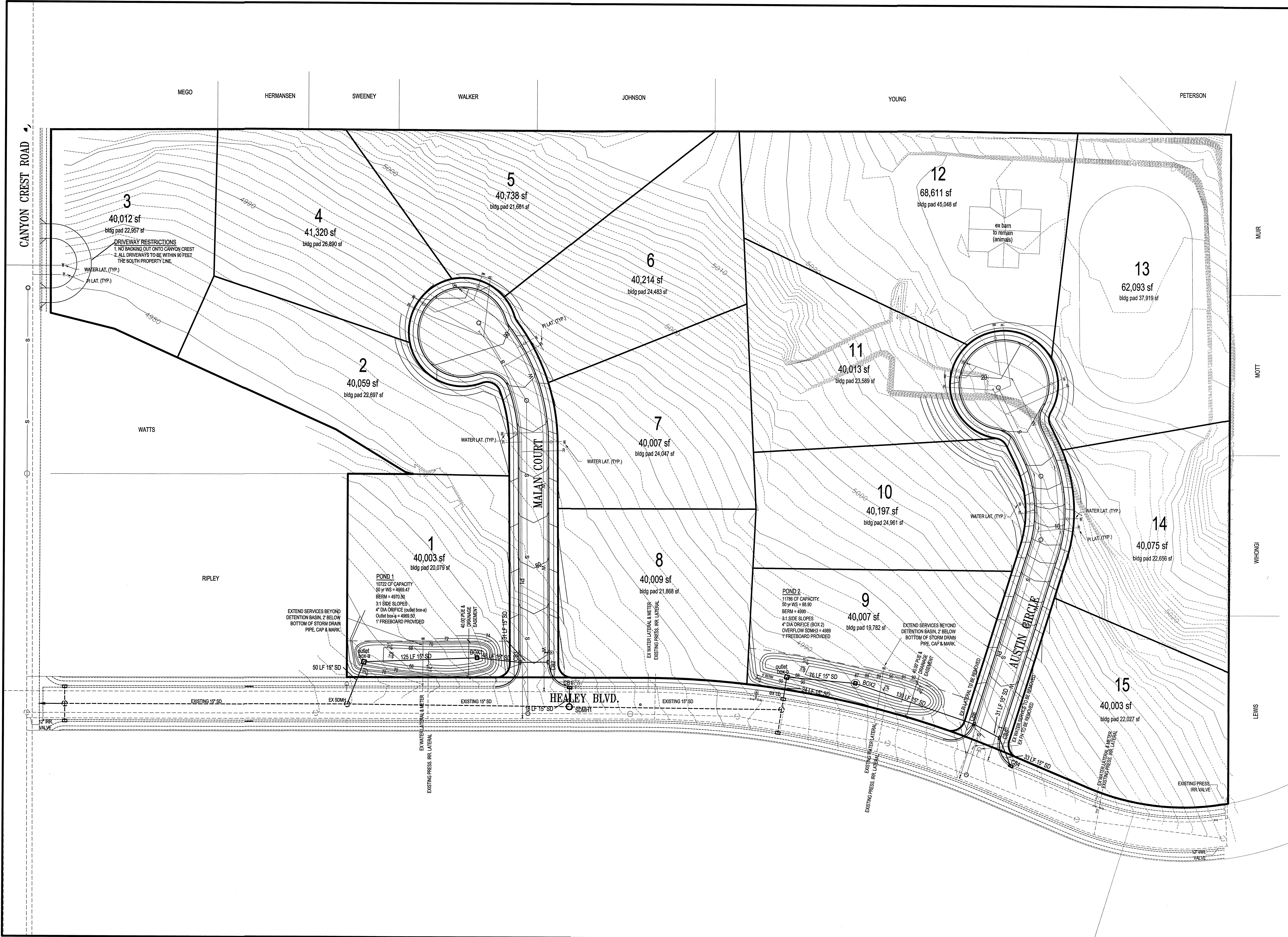
DAVID'S COURT
PLAT F
SUBDIVISION

DESCRIPTION

CONSTRUCTION
DRAWINGS

SHEET NAME	SHEET NUMBER
SEWER PLAN	C3

Z:\2014\David's Court\PLAT F\AC3-SEWER.dwg



DEVELOPMENT

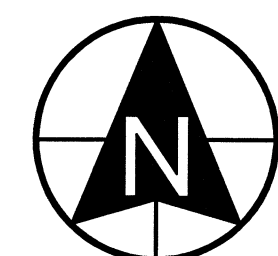
DAVID'S COURT
PLAT F
SUBDIVISION

CANYON CREST & HEALEY BLVD

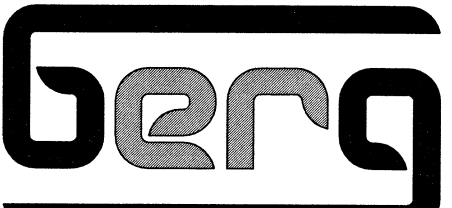
DEVELOPER


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HOMES
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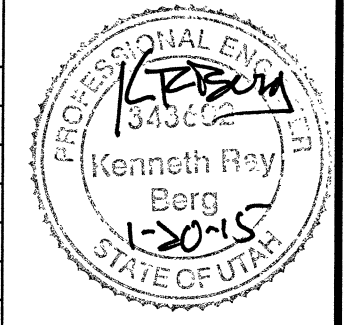
11038 N. Highland Blvd Suite 100
Highland, UT 84003
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SCALE: 1"= 50'

0 25 50 100 150


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11038 N. Highland Blvd Suite 400
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office (801) 492-1277
cell (801) 616-1677

PROJECT STATUS			SEAL
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ACTION	DATE
FINAL	12/31/14

PROJECT

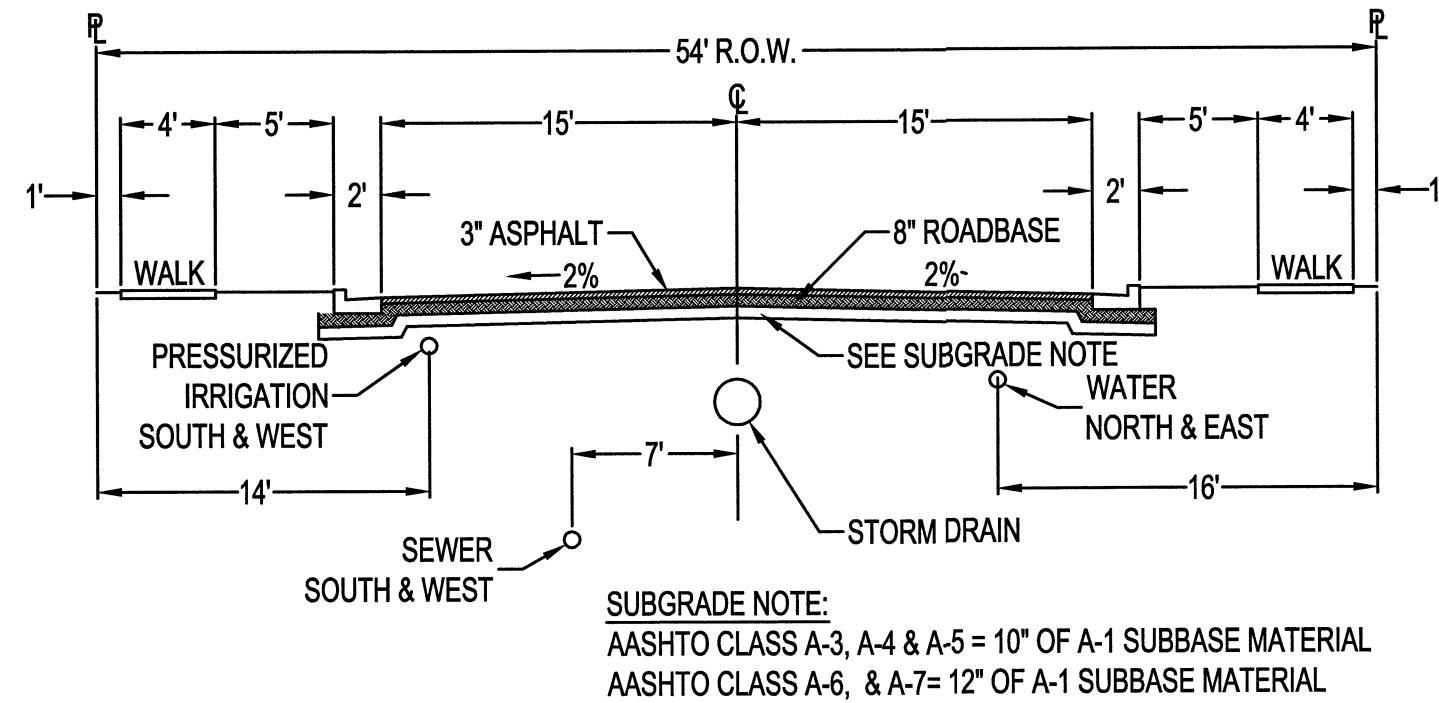
DAVID'S COURT
PLAT F
SUBDIVISION

DESCRIPTION

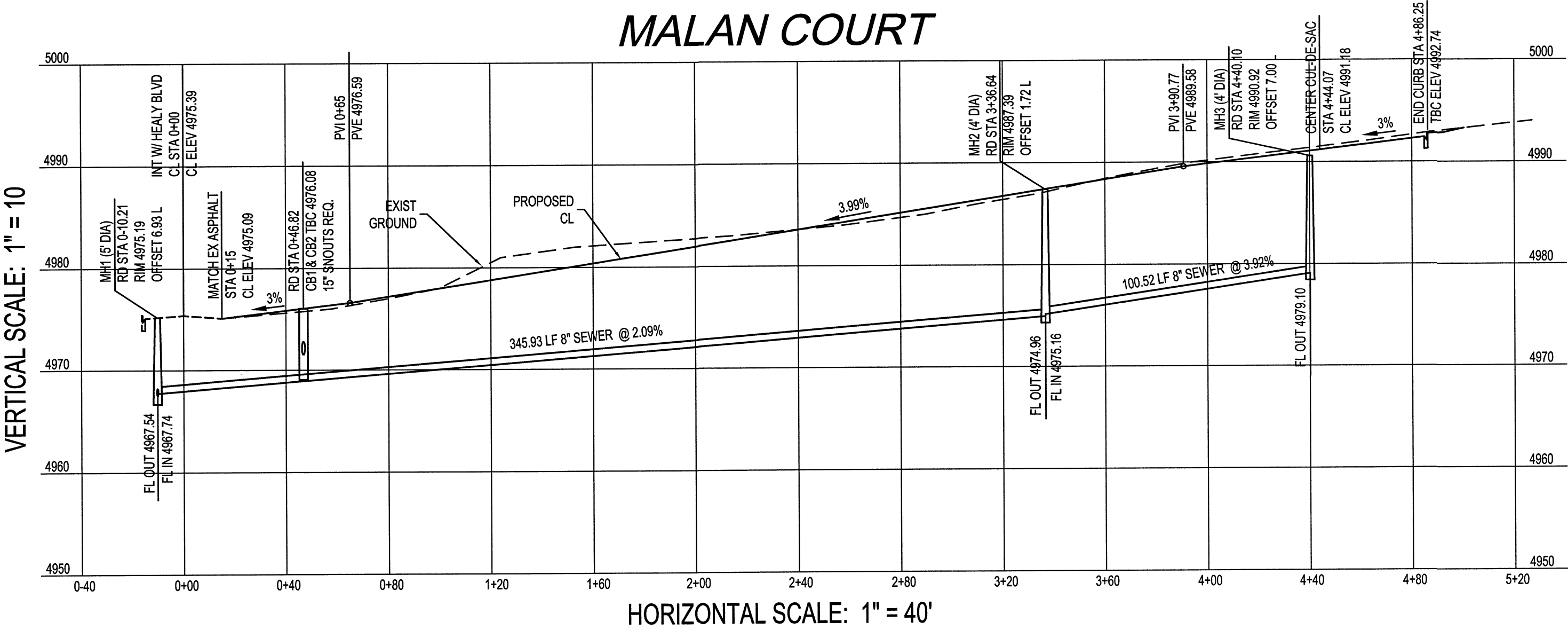
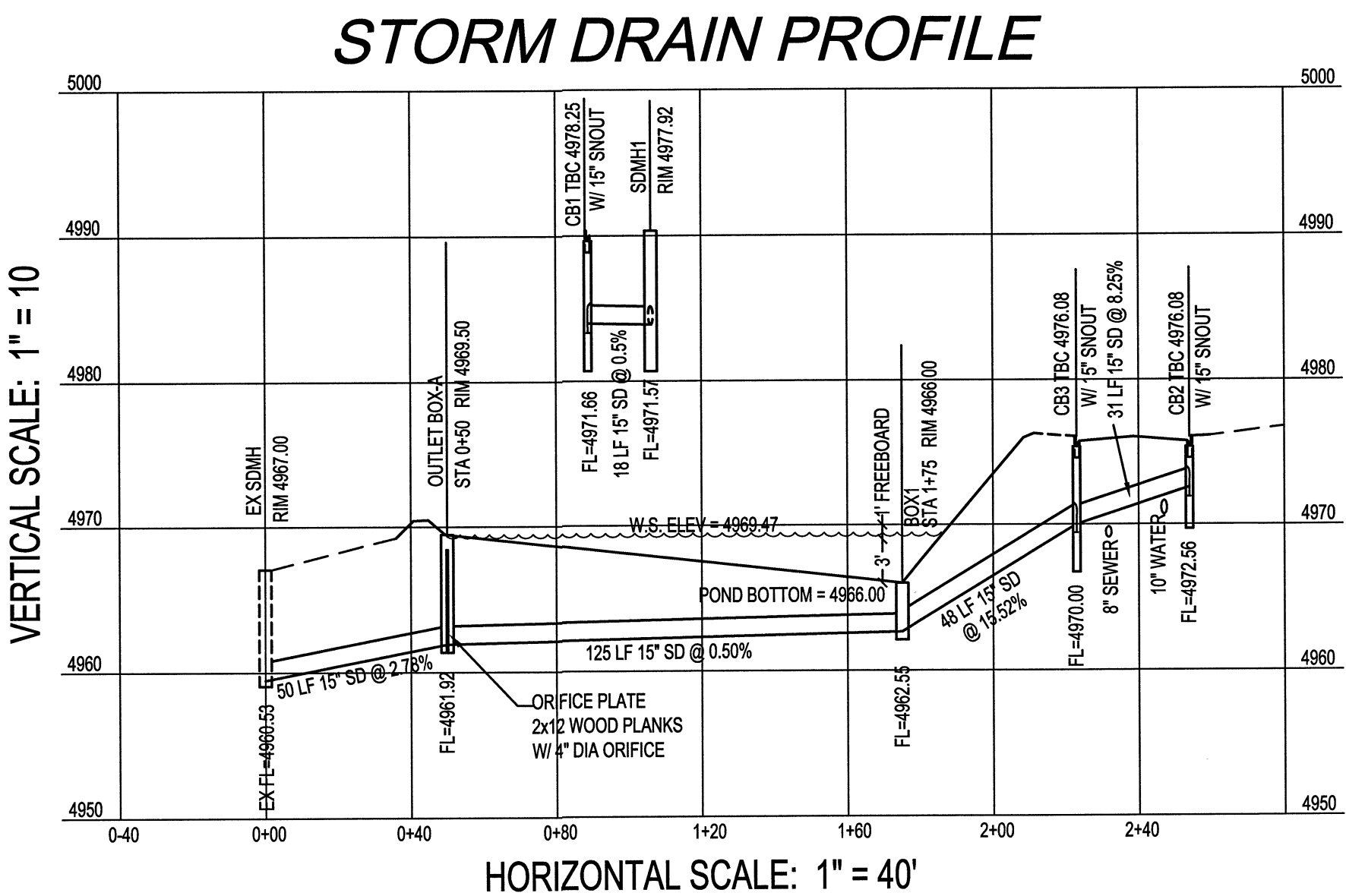
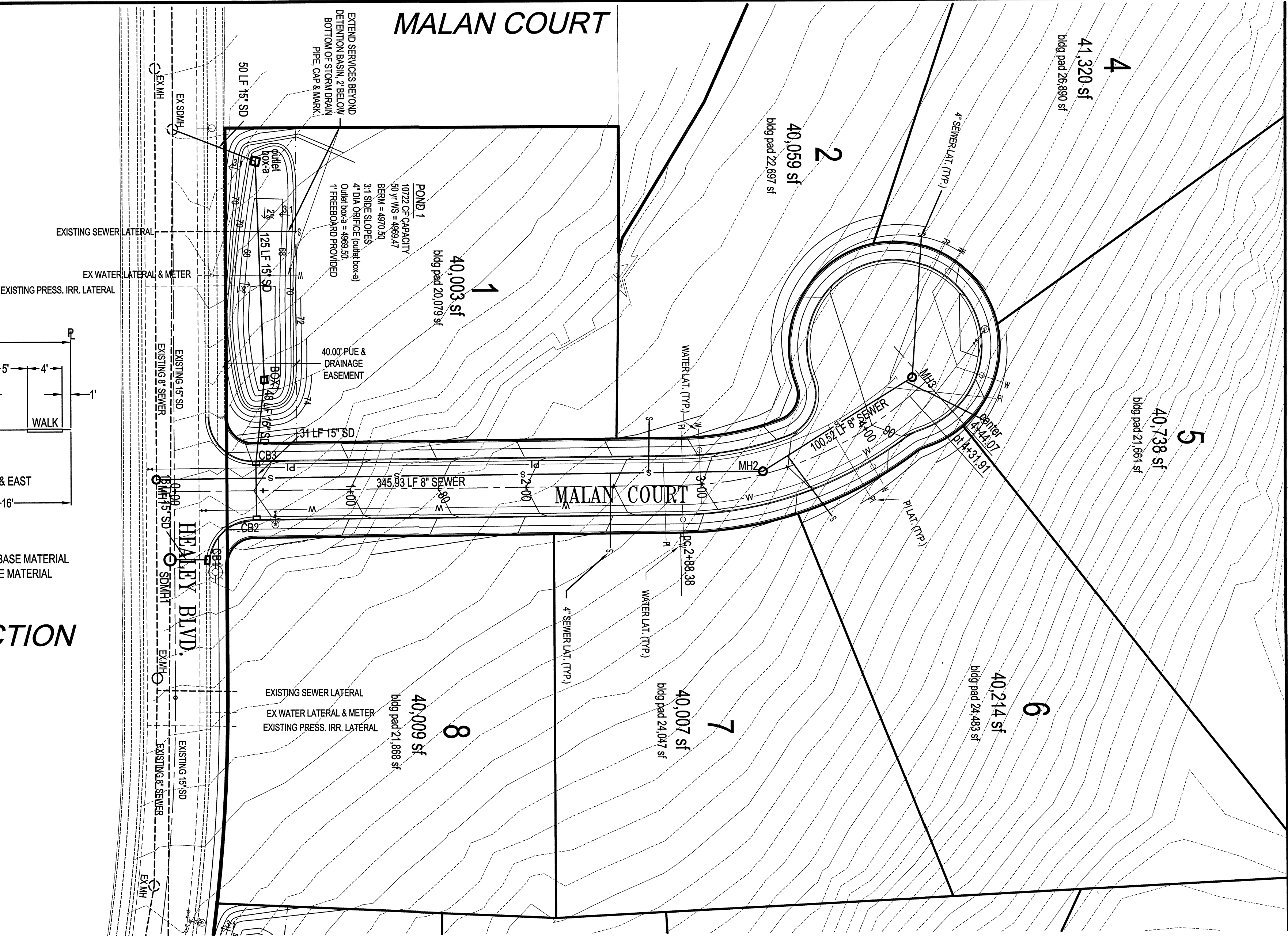
CONSTRUCTION
DRAWINGS

SHEET NAME	SHEET NUMBER
GRADING & DRAINAGE	C4

2/20/15 David's Court Plat F - GRADING.dwg



MALAN COURT CROSS-SECTION



DEVELOPMENT

DAVID'S COURT PLAT F SUBDIVISION

CANYON CREST & HEALEY BLVD

DEVELOPER

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cell (801) 616-1677

PROJECT STATUS			SEAL
NO.	DATE	DESCRIPTION	
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ACTION			DATE
FINAL			12/31/14

PROJECT

DAVID'S COURT PLAT F SUBDIVISION

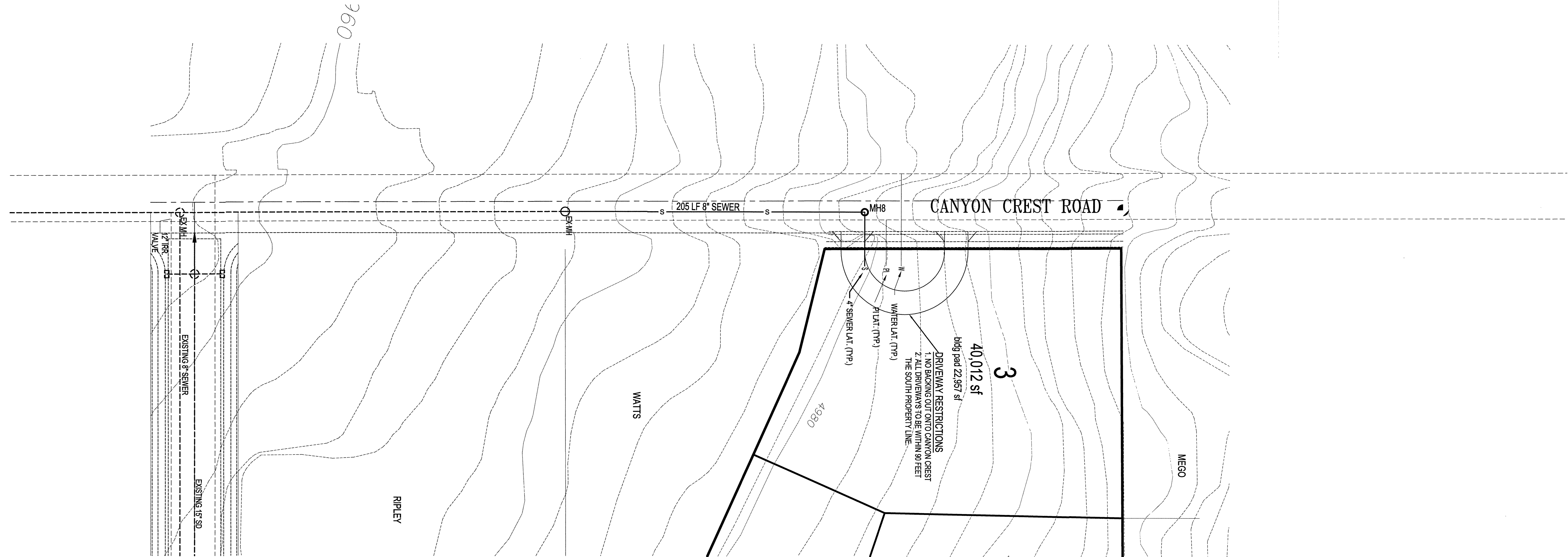
DESCRIPTION

CONSTRUCTION DRAWINGS

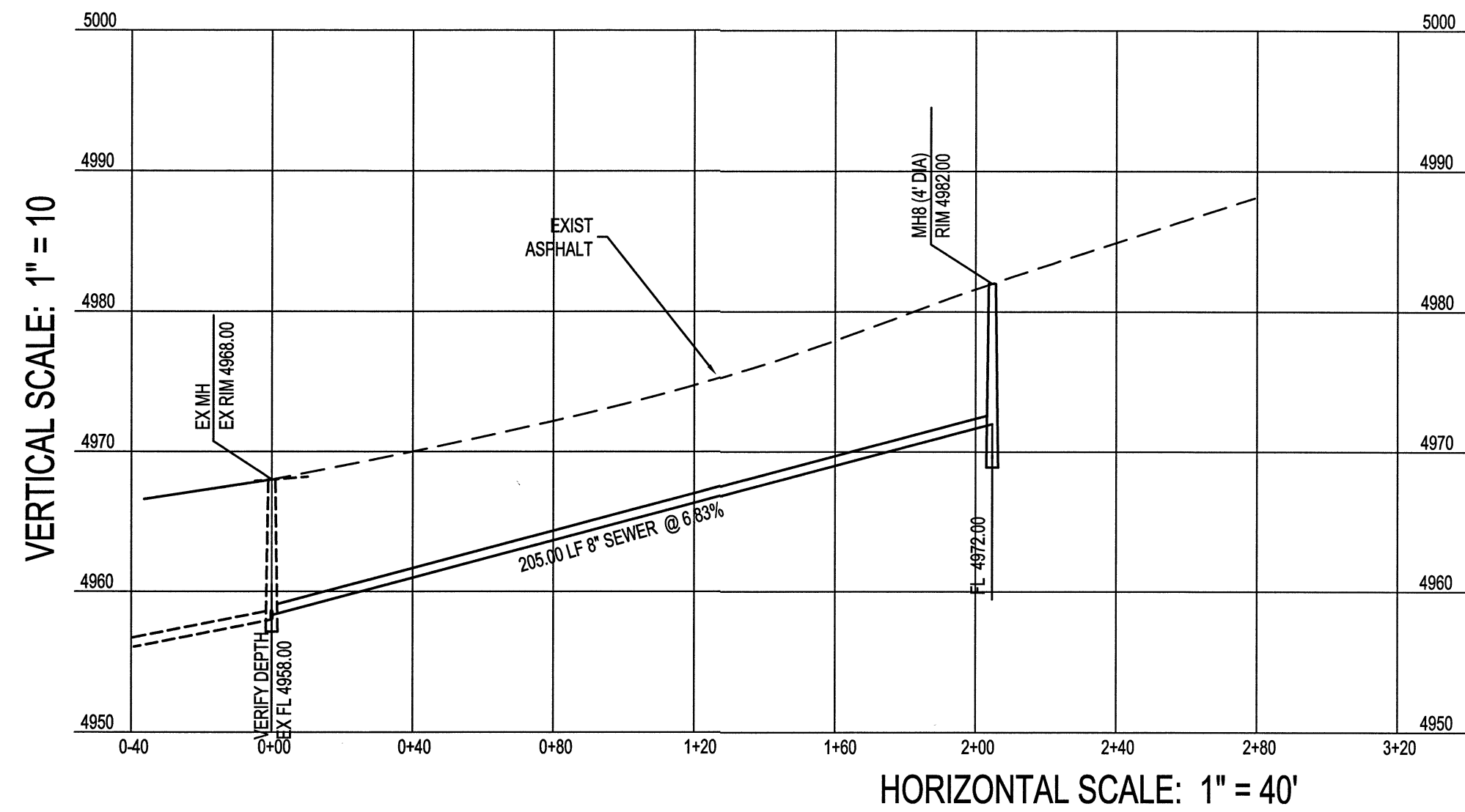
SHEET NAME	SHEET NUMBER
MALAN COURT PROFILE	C5

2:2010 David Court Plat F ACS - MALAN HEIGHTS.dwg

CANYON CREST - SEWER PLAN



CANYON CREST - SEWER PROFILE



DEVELOPMENT

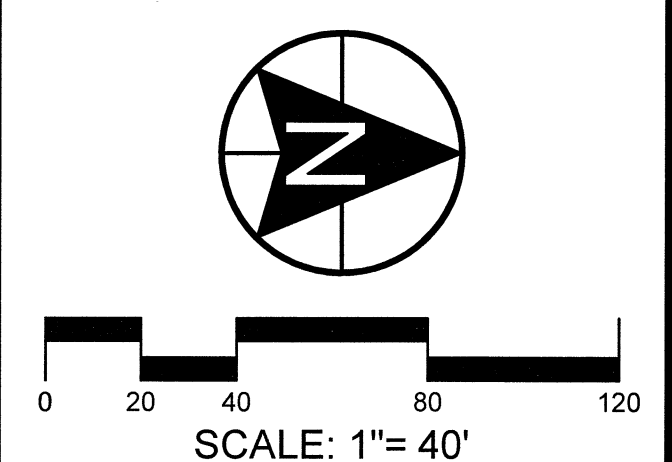
**DAVID'S
COURT
PLAT F
SUBDIVISION**

CANYON CREST & HEALEY BLVD

DEVELOPER

**PATTERSON
HOMES**
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berg

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office (801) 492-1277
cell (801) 616-1677

PROJECT STATUS			SEAL
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ACTION	DATE
FINAL	12/31/14

PROJECT

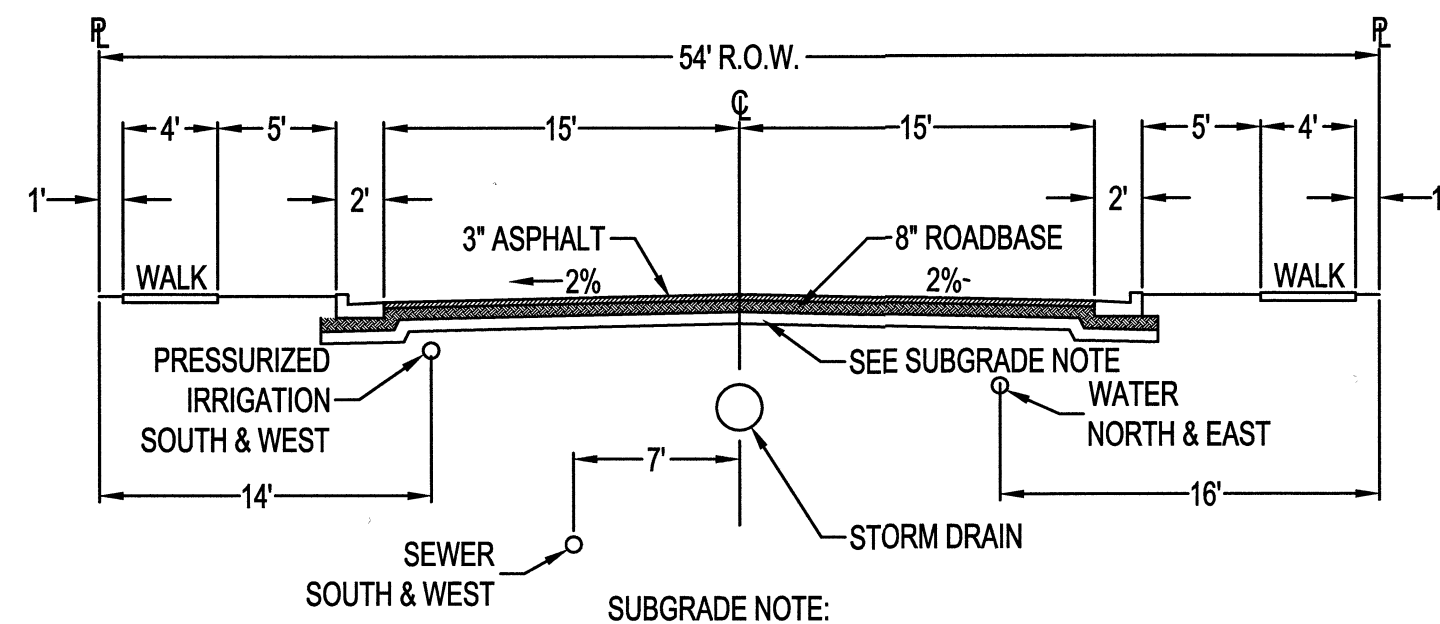
**DAVID'S
COURT
PLAT F
SUBDIVISION**

DESCRIPTION

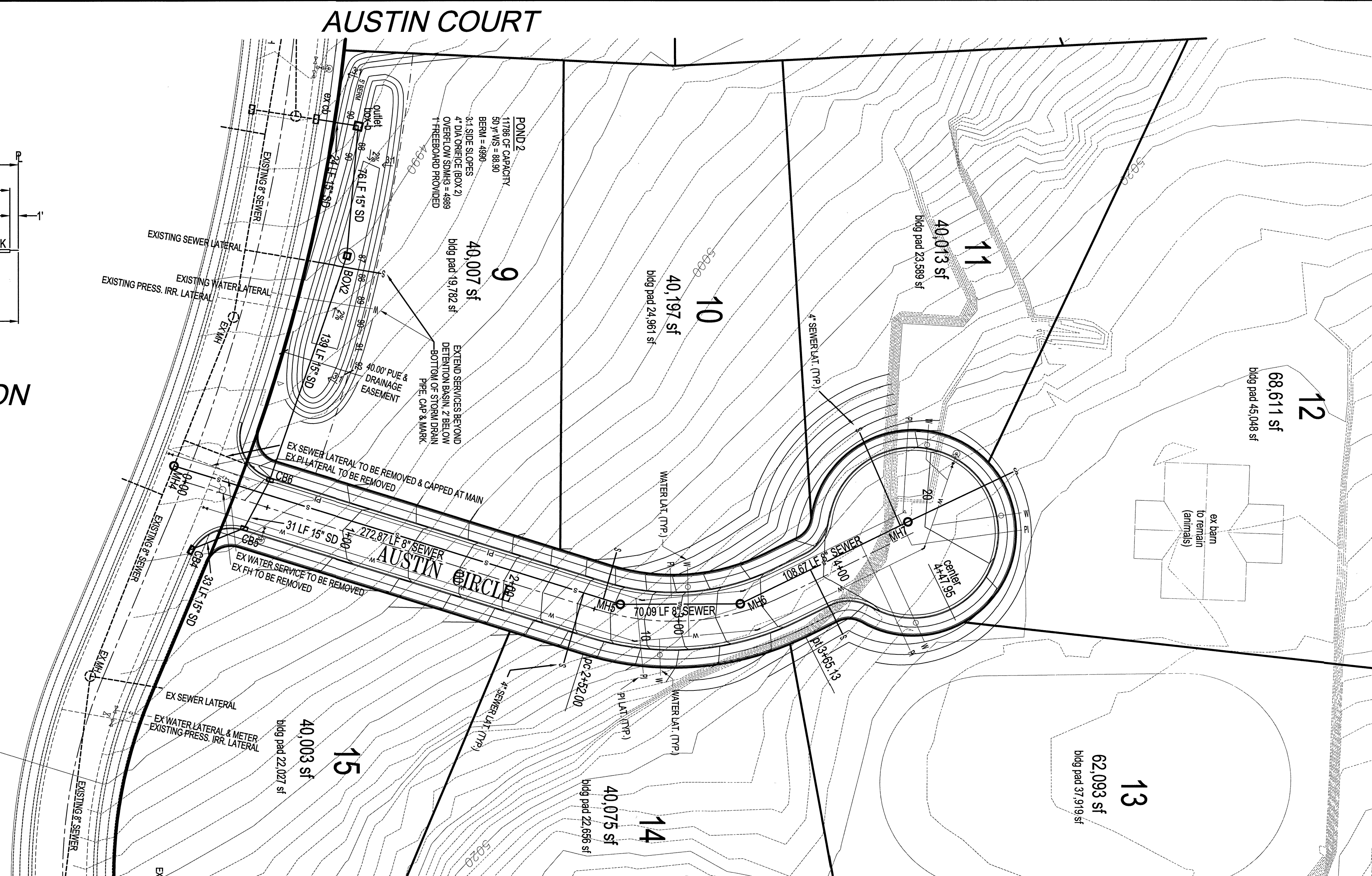
**CONSTRUCTION
DRAWINGS**

SHEET NAME	SHEET NUMBER
CANYON CREST SEWER	C6

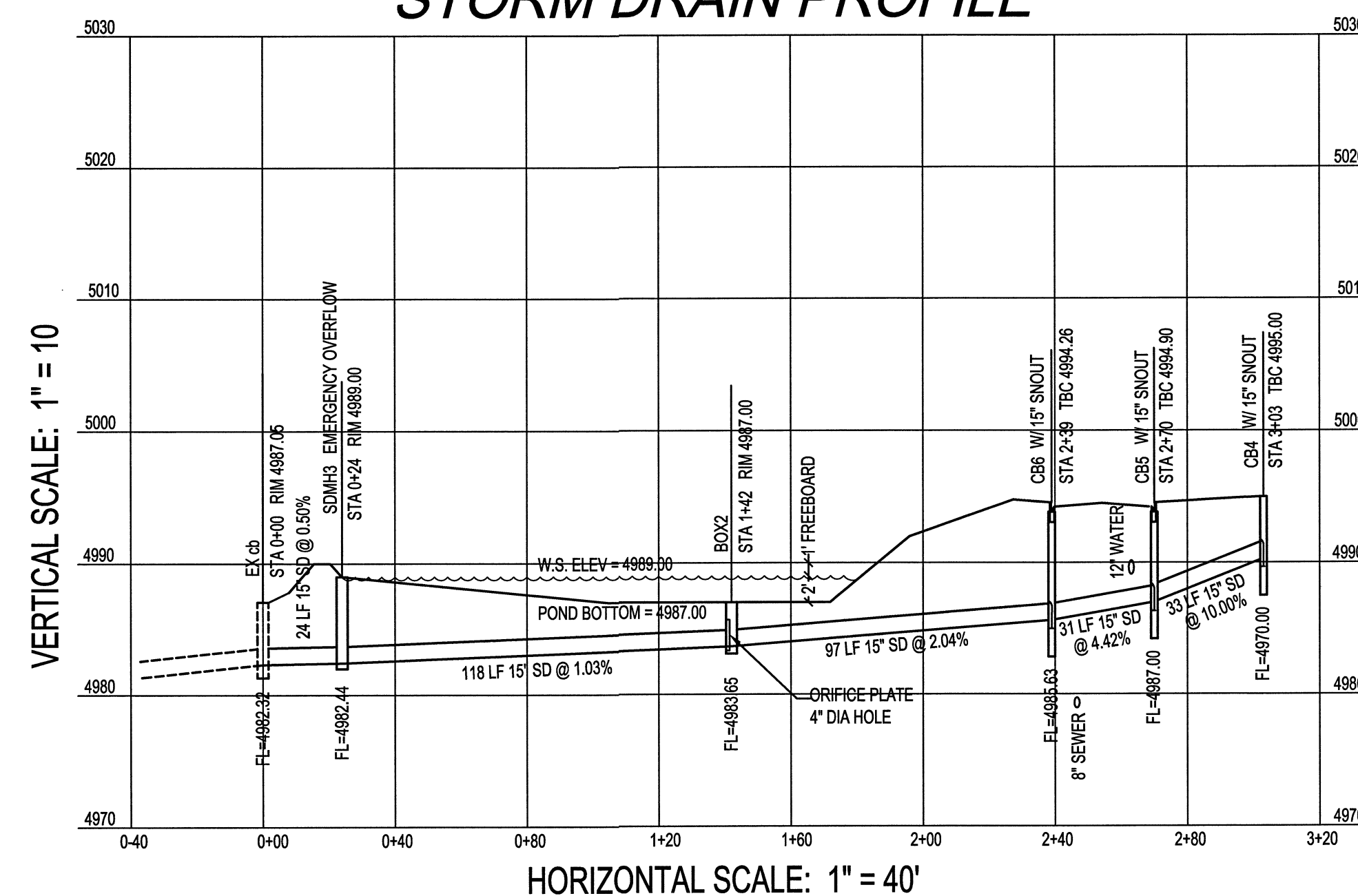
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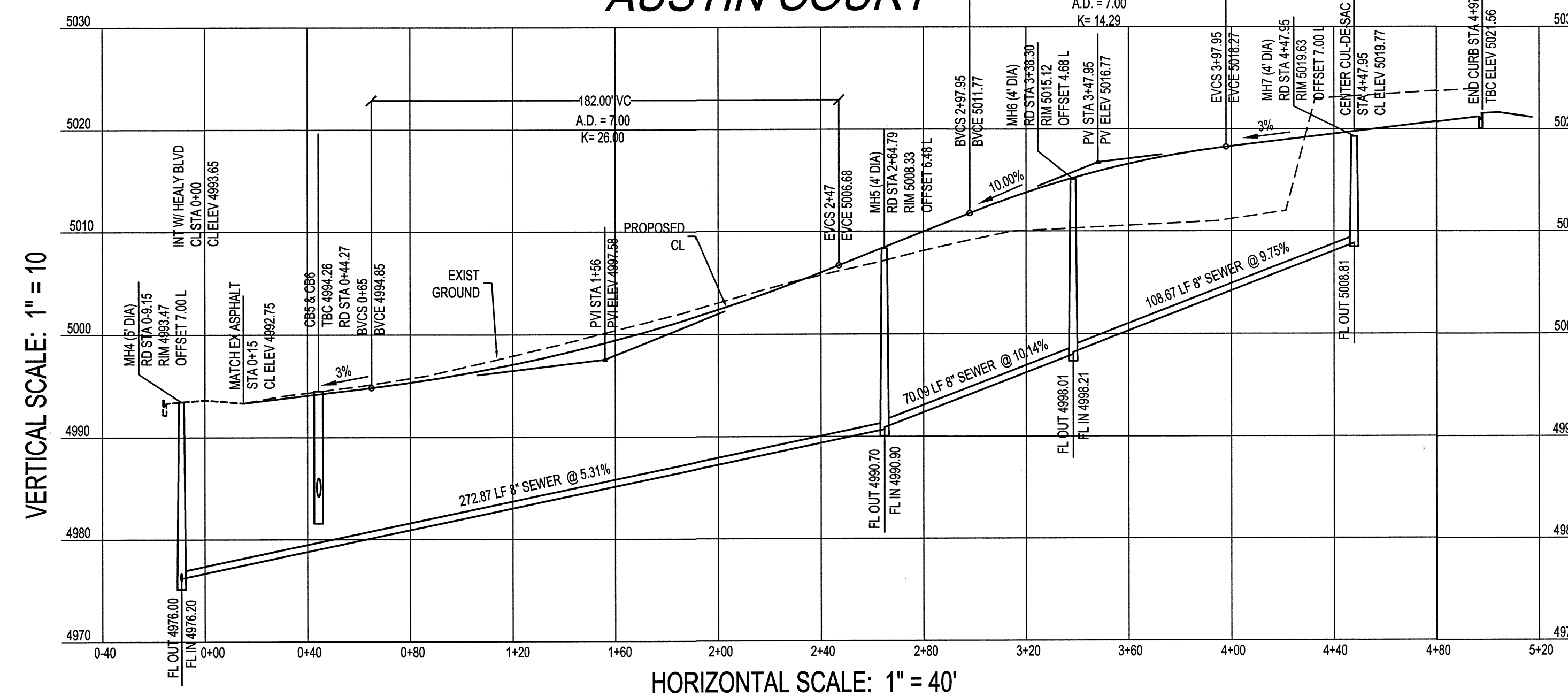
AUSTIN COURT CROSS-SECTION



STORM DRAIN PROFILE



AUSTIN COURT

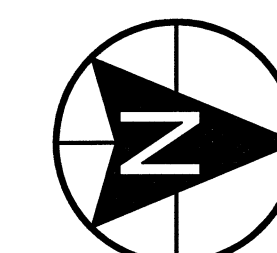


DAVID'S COURT PLAT F SUBDIVISION
CANYON CREST & HEALEY BLVD

DEVELOPER



11038 N. Highland Blvd Suite 100
Highland, UT 84003
(801) 642-0119



SCALE: 1" = 40'



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Highland UT, 84003
office (801) 492-1277
cell (801) 616-1677

PROJECT STATUS			SEAL
NO.	DATE	DESCRIPTION	
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ACTION	DATE
FINAL	12/31/14

DAVID'S COURT PLAT F SUBDIVISION

CONSTRUCTION DRAWINGS

SHEET NAME	SHEET NUMBER
AUSTIN COURT PROFILE	C7

ALPINE PLANNING COMMISSION AGENDA

SUBJECT: Appeal Authority Amendment

FOR CONSIDERATION ON: 03 February 2015

PETITIONER: Staff

ACTION REQUESTED BY PETITIONER: Provide feedback and make any necessary recommendations for the City Council to consider.

APPLICABLE STATUTE OR ORDINANCE: Article 2.3 (Appeal Authorities)

PETITION IN COMPLIANCE WITH ORDINANCE: Yes

BACKGROUND INFORMATION:

The proposed amendment would be eliminating the Board of Adjustment. The Board of Adjustment is not needed often for variances. The appointed Hearing Officer would handle anything that requires an Appeal Authority.

RECOMMENDED ACTION:

That the Planning Commission provide feedback to staff and make any necessary recommendations before the proposed amendment is reviewed by the City Council.

ARTICLE 2.3 **APPEAL AUTHORITY (Ord. 98-02:1/13/98, Amended Ord. 2006-17, 11/14/06; Ord. 2013-03, 3/12/13)**

2.3.1 **APPEAL AUTHORITY**

- 2.3.1.1** There is hereby created an Appeal Authority, consisting an appointed Hearing Officer and a Board of Adjustment, which shall act in a quasi-judicial manner to hear appeals regarding the interpretation or application of Alpine City land use ordinances.

2.3.2 **HEARING OFFICER**

- 2.3.2.1** **Establishment and Appointment of Hearing Officer.** There is hereby created the officer of Land Use Hearing Officer. The Alpine City Hearing Officers shall be appointed by the mayor with the advice and consent of the Council. The individual appointed as a hearing officer shall be a person who is trained in or familiar with the disciplines of planning or law.
- 2.3.2.2** **Term of Office.** The hearing officer shall serve at the pleasure of the City for an indefinite term. The Land Use Hearing Officer may be dismissed from officer by the mayor, with the advice and consent of the council, with or without cause at anytime.
- 2.3.2.3** **Duties and Powers.** The Land Use Hearing Officer, as the Appeal Authority, shall
1. hear and decide appeals from decisions granting or denying reasonable accommodations for persons with disabilities from land use regulations; and
 2. hear and decide appeals from land use decisions applying or interpreting the land use ordinances.

~~**2.3.2** **BOARD OF ADJUSTMENT**~~

- ~~**2.3.2.1** **Establishment and Organization of Board of Adjustment.** The Board of Adjustment shall consist of five members to be appointed by the Mayor with the advice and consent of the City Council, and two alternate members who shall sit as members of the Board at the call of the Chair of the Board of Adjustment in the temporary absence of a regular member. At least three members of this Board must be present to form a quorum. The Board of Adjustment shall organize and elect a Chair and adopt rules for its activities in accordance with this Code. The Rules shall include at a minimum that the Board:~~

- ~~1. shall notify each of its members of any meeting or hearing;~~
- ~~2. provide each of its members with the same information and access to City resources as any other member;~~
- ~~3. convene only if a quorum of its members is present; and~~
- ~~4. act only upon the vote of a majority of its convened members.~~

~~Meetings of the Board shall be held at the call of the Chair and at such times as the Board may determine. All meetings of the Board shall be open to the public. The concurring vote of three members of the Board of Adjustment is necessary to reverse any order, requirement, decision, or determination of any administrative official or agency, or to decide in favor of the appellant.~~

- ~~**2.3.2.2** **Term of Office.** Each member and alternate member shall serve for a term of five years, provided that the term of members of the first Board shall be such that the term of one member shall expire each year. The term of office of each member shall commence the first day of February. Any vacancy occurring on said Board shall be filled in the same manner as an original appointment for the unexpired term. The Mayor, with the advice and consent of the City Council, may remove any member of the Board of Adjustment for~~

~~cause if written charges against the member are filed with the Mayor and after a public hearing, if such hearing is requested by the member.~~

~~2.3.2.3 Duties and Powers.~~ The Board of Adjustment, as the Appeal Authority, shall

- ~~1. hear and decide variances from the terms of the land use ordinances, and~~
- ~~2. hear and decide appeals from land use decisions applying or interpreting the land use ordinances.~~

2.3.3 VARIANCES

1. Any person or entity desiring a waiver or modification of the requirements of a land use ordinance as applied to a parcel of property that he owns, leases, or in which he holds some other beneficial interest may apply to the ~~Board of Adjustment~~ Hearing Officer for a variance from the terms of the ordinance.
2. An appeal for a variance shall be filed with the Zoning Administrator.
3. The ~~Board of Adjustment~~ Hearing Officer shall fix a reasonable time for the hearing of the appeal, and give at least ten (10) days public notice thereof, as well as due notice to the parties in interest and adjacent property owners within 300 feet, and shall decide the same within a reasonable time. Upon the hearing, any party may appear in person, by agent, or by attorney.
4. The ~~Chair, or in his or her absence the acting Chair,~~ Hearing Officer may administer oaths and compel the attendance of witnesses.
5. The ~~Board~~ Hearing Officer shall ~~keep~~ cause minutes of ~~its~~ his/her proceedings ~~to be kept, showing the vote of each member upon each question, or if absent or failing to vote,~~ indicating such fact, and shall ~~keep~~ cause records or ~~its~~ his/her examinations and other official actions ~~to be kept;~~ all of which shall be immediately filed ~~in the office of the Board at Alpine City Hall~~ and shall be public record.
6. Decisions of the ~~Board of Adjustment~~ Hearing Officer regarding variances become effective at the meeting in which the decision is made, unless a different time is designated in the ~~Board's~~ Officer's rules or at the time the decision is made.
7. The ~~Board of Adjustment~~ Hearing Officer may grant a variance only if:
 - (1) Literal enforcement of the ordinance would cause an unreasonable hardship for the applicant that is not necessary to carry out the general purpose of the land use ordinances;
 - (2) There are special circumstances attached to the property that do not generally apply to other properties in the same zone;
 - (3) Granting the variance is essential to the enjoyment of a substantial property right possessed by other property in the same zone;
 - (4) The variance will not substantially affect the general plan and will not be contrary to the public interest; and
 - (5) The spirit of the land use ordinance is observed and substantial justice done.
8. In determining whether or not enforcement of the land use ordinance would cause unreasonable hardship under Subsection 2.3.3 #7, the ~~Board of Adjustment~~ Hearing Officer may not find an unreasonable hardship unless the alleged hardship:

- (1) Is located on or associated with the property for which the variance is sought; and
 - (2) Comes from circumstances peculiar to the property, not from conditions that are general to the neighborhood.
9. In determining whether or not enforcement of the land use ordinance would cause unreasonable hardship under Subsection 2.3.3 #7, the ~~Board of Adjustment~~ Hearing Officer may not find an unreasonable hardship if the hardship is self-imposed or economic.
10. In determining whether or not there are special circumstances attached to the property under Subsection 2.3.3 #7, the ~~Board of Adjustment~~ Hearing Officer may find that special circumstances exist only if the special circumstances:
 - (1) Relate to the hardship complained of; and
 - (2) Deprive the property of privileges granted to other properties granted in the same zone.
11. The applicant shall bear the burden of proving that all of the conditions justifying a variance have been met.
12. Variances run with the land.
13. The ~~Board of Adjustment~~ Hearing Officer may not grant a use variance.
14. In granting a variance, the ~~Board of Adjustment~~ Hearing Officer may impose additional requirements on the applicant that will:
 - (1) Mitigate any harmful effects of the variance; or
 - (2) Serve the purpose of the standard or requirement that is waived or modified.

2.3.4 APPEALS FROM LAND USE DECISIONS

2.3.4.1 Standards for Review of Appeals. The Hearing Officer shall hear and decide appeals from land use decisions applying or interpreting the land use ordinances, and shall comply with the following standards:

1. The applicant, a board or officer of the City, or any person adversely affected by the Land Use Authority's decision administering or interpreting a land use ordinance may appeal that decision to the Hearing Officer by alleging that there is error in any order, requirement, decision, or determination made by the Land Use Authority in the administration or interpretation of the land use ordinance.
2. The appeal must be filed within ten (10) days from the date of such decision by filing with the Zoning Administrator and with the Hearing Officer a written notice of appeal specifying the grounds thereof. The Zoning Administrator shall forthwith transmit to the Hearing Officer all the papers constituting the record upon which the action appealed from was taken.
3. An appeal filed in accordance with this section stays all proceedings in the appeal action, unless the Zoning Administrator certifies to the Hearing Officer, after the notice of appeal shall have been filed with him, that by reason of facts stated in the certificate a stay would, in his opinion, cause imminent peril to life or property. In such case, proceedings shall not be stayed otherwise than by restraining order which may

be granted by the Hearing Officer or by the district court on application and notice and on due cause shown.

4. The Hearing Officer shall fix a reasonable time for the hearing of any appeal within thirty (30) days of the date of filing such appeal with the Zoning Administrator.
5. Proceedings and hearings before the Hearing Officer shall be public and held pursuant to rules adopted by the City and in conformance with the Utah Open and Public Meetings Act and with the general principles of due process. The person or entity filing the appeal may appear at such hearing in person, by agent, or by an attorney of his/her choice and may present to the Hearing Officer any evidence or argument to support the contentions on appeal. The Land Use Authority that rendered the decision that is being appealed shall appear and present any evidence or argument it finds necessary to justify its decision. The Hearing Officer shall cause a record of his/her proceedings to be kept and shall make written findings and conclusions of all of his/her decisions.
6. The appellant has the burden of proving that the Land Use Authority erred.
7. The Hearing Officer shall presume that the decision of the Land Use Authority that is being appealed is correct, and shall only modify the decision if there is substantial evidence presented at the hearing of the Hearing Officer that the Land Use Authority erred in its application or interpretation of the land use ordinances.
8. Only decisions applying and interpreting the adopted land use ordinances of the City or requesting reasonable accommodations for persons with disabilities may be appealed to the Hearing Officer. A person may not appeal, and the Hearing Officer, in his/her duties as an Appeal Authority, may not consider, any appeal of a legislative decision of the City Council, such as a decision to adopt or amend any land use (zoning or subdivision) ordinance of the City.
9. Appeals may not be used to waive or modify the terms of requirements of the land use ordinance, except as specifically allowed by the ordinance.
10. The Hearing Officer shall render his/her decision on the appeal within fifteen (15) days from the date that the hearing is held. The Officer may affirm, wholly or partly, or may modify the order, requirement, decision or determination of the Land Use Authority.
11. A decision of the Hearing Officer takes effect on the date when the Officer issues a written decision, or as otherwise provided by ordinance. A written decision, or other event as provided by ordinance, constitutes a final decision under Subsection 10-9a-802(2)(a) or a final action under Subsection 10-9a-801(4) of the Utah State Code.

2.3.5 DISTRICT COURT REVIEW OF APPEAL AUTHORITY DECISIONS.

1. Any person adversely affected by any decision of the Hearing Officer may petition the district court for a review of the decision. However, no person may challenge in district court the City's land use decision until that person has exhausted the person's administrative remedies as provided in Utah State Code Title 10, Chapter 9a, Part 7, Appeal Authority and Variances, if applicable.
2. In the petition, the petitioner may only allege that the Hearing Officer's decision was arbitrary, capricious, or illegal.
3. (a) The petition is barred unless it is filed within 30 days after the Hearing Officer's decision is

final.

(b)(i) The time under 3(a) to file a petition is tolled from the date a property owner files a request for arbitration of a constitutional taking issue with the private property ombudsman under Utah Code Annotated 13-43-204 until 30 days after:

A. the arbitrator issues a final award; or

B. the private property ombudsman issues a written statement under Utah Code Annotated 13-43-204(3)(b) declining to arbitrate or to appoint an arbitrator.

(ii) A tolling under Subsection 3(b)(i) operates only as to the specific constitutional taking issues that are the subject of the request for arbitration filed with the private property ombudsman by a property owner.

(iii) A request for arbitration filed with the private property ombudsman after the time under Subsection 3(a) to file a petition has expired does not affect the time to file a petition.

4. (a) The Hearing Officer shall transmit to the district court the record of his/her proceedings including its minutes, findings, orders, and if available, a true and correct transcript of its proceedings.

(b) If the proceeding was taped, a transcript of that tape recording is a true and correct transcript for purposes of this subsection.

5. (a)(i) If there is a record, the district court's review is limited to the record provided by the Hearing Officer.

(ii) The court may not accept or consider any evidence outside the Hearing Officer record unless that evidence was offered to the Officer and the court determines that it was improperly excluded by the Hearing Officer.

(b) If there is no record, the court may call witnesses and take evidence.

6. The court shall affirm the decision of the Hearing Officer if the decision is supported by substantial evidence in the record and is not arbitrary, capricious, or illegal.

7. (a) The filing of a petition does not stay the decision of the Hearing Officer.

(b)(i) Before filing a petition under this section or a request for mediation or arbitration of a constitutional taking issue under Utah Code Annotated 13-43-204, the aggrieved party may petition the Hearing Officer to stay his/her decision.

(ii) Upon receipt of a petition to stay, the Hearing Officer may order its decision stayed pending district court review if the Board of Adjustment finds it to be in the best interest of the City.

(iii) After a petition is filed under this section or a request for mediation or arbitration of a constitutional taking issue is filed under Utah Code Annotated 13-43-204, the petitioner may seek an injunction from the district court staying the Hearing Officer's decision.

ALPINE PLANNING COMMISSION AGENDA

SUBJECT: Non-Conforming Amendment

FOR CONSIDERATION ON: 03 February 2015

PETITIONER: Staff

ACTION REQUESTED BY PETITIONER: Provide feedback and make any necessary recommendations for the City Council to consider.

APPLICABLE STATUTE OR ORDINANCE: Article 3.22 (Non-Conforming)

PETITION IN COMPLIANCE WITH ORDINANCE: Yes

BACKGROUND INFORMATION:

The proposed amendment will clarify the City's position on non-conforming buildings and uses in Alpine City.

RECOMMENDED ACTION:

That the Planning Commission provide feedback to staff and make any necessary recommendations before the proposed amendment is reviewed by the City Council.

ARTICLE 3.22

NON-CONFORMING BUILDINGS AND USES

3.22.1 Purpose. This chapter describes the status of the uses of land or structures which were lawful before this ordinance was passed but which are now prohibited or restricted. It is the purpose of this ordinance to prevent the expansion or enlargement of non-conforming uses.

3.22.2 Status of Pre-existing Illegal Uses. Any building or use of land or any construction thereon, or any subdivision of land, which was not authorized by or under the pre-existing zoning or subdivision regulations, as amended, or which is illegal under such regulations, shall remain unauthorized and illegal unless expressly authorized or permitted in the provisions of this Ordinance.

3.22.3 Uses on Leased Land to Comply With Ordinance. Any person who may obtain State or Federal properties by purchase, lease or other arrangement must utilize such properties in accordance with the provisions of this Ordinance.

3.22.4 Non-conforming Buildings and Uses May Be Continued - Repair Permitted. The owners of land and buildings shall not be deprived of any use of property for the purpose to which it is lawfully devoted at the time of enactment of this ordinance.

Any building, structure or use of land, including but not limited to the raising of livestock, which is existing and lawful at the time of the enactment of this Ordinance, but which does not conform to the provisions of this Ordinance, shall be considered a non-conforming use and shall be allowed to continue, to the same extent and character as that which legally existed on the effective day of the application regulations, although such use does not conform to provisions of the Ordinance or amendment.

Repairs may be made to a non-conforming building or structure, or to a building or structure housing a non-conforming use, provided such repair: 1) shall be made in accordance with the provisions of the City building regulations, when applicable, and 2) does not have the effect of increasing the size or altering the character of the non-conforming building, structure or use.

3.22.5 Damaged Building and Structure May Be Restored. A non-conforming building or structure or a building or structure occupied by a non-conforming use which is damaged or destroyed by fire, flood or other calamity or act of nature may be restored or reconstructed and the use thereof resumed, provided that such restoration or reconstruction:

- 1) Is commenced within a period of two years from the date of occurrence of the damage, and
- 2) Does not have the effect of increasing the size of the building or structure or the floor space in excess of that which existed at the time the building became non-conforming, except when approved in accordance with the provisions of Section 3.1.6.6 below.

Any such restored or reconstructed structure shall be constructed in accordance with the provisions of the current City building regulations.

3.22.6 Expansion of Non-conforming Uses Within Existing Structures Permitted. A non-conforming use located within a building may be extended through the same building in which said non-conforming use is located, provided no structural change is made or proposed in the building for the purpose of accommodating such extension.

3.22.7 Extension (Enlargement) and Reconstruction of Non-conforming Buildings - Conditions. A non-conforming building or structure or a building housing a non-conforming use may be extended or enlarged or reconstructed, subject to the prior approval by the City Council, after recommendation of the Planning Commission and such compliance with the following:

1. The proposed extension or replacement shall be located entirely on the same lot or parcel as the present non-conforming structure and will conform with all existing setback and location requirements.
2. The applicant shall submit a detail site plan showing the location of existing and proposed structures on the site and in the vicinity, existing lot boundaries, roads, driveways, parking areas, utilities and other significant features on the site and in the immediate vicinity.
3. A finding made by a majority vote of the Council that:
 - a. The proposed enlargement or extension will not significantly alter the character of the building or use or its impact upon the area.
 - b. The building or use, if extended, will not have the effect of diminishing the value of property or the quality of living environment of adjacent properties.
 - c. The proposed enlargement will not significantly increase the number of vehicles or pedestrians, or result in the establishment or increase of a safety hazard to the area.
 - d. The proposed enlargement will not result in the establishment of a condition incompatible with the neighborhood area and the stated objective of the zone in which it is located.

The Council may attach such conditions to its approval as are necessary to adequately protect the property and uses in the surrounding territory and the intent of the zone, including but not limited to, the providing of off-street parking access ways, landscaping features and additional setback of structures.

3.22.8 Substitution of Non-conforming Uses. A non-conforming use or building may be changed to a conforming use or building. Any non-conforming building or use, which has been changed to a conforming building or use shall not thereafter be changed back to a non-conforming use.

A non-conforming use of a building or lot shall not be changed to another non-conforming use whatsoever. Changes in the use shall be made only to a conforming use.

3.22.9 Discontinuance or Abandonment. A non-conforming building or structure or portion thereof, or a lot occupied by a non-conforming use which is, or which hereafter becomes, abandoned or discontinued for a continuous period of two (2) years or more shall not thereafter be occupied, except by a use which conforms to the regulations of the zone in which it is located. Provided, the City Council may, upon appeal, authorize the re-establishment of a non-conforming use which as been discontinued for a period longer than provided herein, where the weight of evidence clearly shows that the owner had no intention to terminate the non-conforming use and that the longer period of discontinuance was beyond the control of the owner.

3.22.10 Reclassification of Territory. The provisions pertaining to non-conforming uses of land and buildings shall also apply to land and buildings which hereafter become non-conforming due to an amendment of this Ordinance or the zone map.

3.22.11 Non-conforming Lots of Record. In all zones where one-family dwellings are listed as a permitted use, a one-family dwelling may be constructed on any lot or parcel of land, even though such lot or parcel does not comply with the area or width requirements for one-family dwellings within the zone, subject to a determination by the Zoning Administrator that the lot complies with all of the following:

1. The lot or parcel qualifies as a non-conforming lot of record (existed as separately described parcel on the records of the County Recorder prior to the effective date of the Ordinance) and the parcel does not constitute an illegal subdivision lot.
2. One-family dwellings are listed as a permitted use in the present zone, and
3. All setbacks, height, access, building size, utility and special provision requirements of the existing zone and all applicable supplementary regulations can be met.

The authorization in this Section 3.22.11 shall be applicable only in the instance of one-family dwellings. The Board of Adjustment shall not have the authority to approve a dwelling having two or more dwelling units on a parcel which does not fully comply with the requirements applicable thereto.

**ALPINE CITY PLANNING COMMISSION MEETING at
Alpine City Hall, 20 North Main, Alpine, Utah
Jan 20, 2015**

I. GENERAL BUSINESS

A. Welcome and Roll Call: The meeting was called to order at 7:00pm by Chairman Jason Thelin. The following commission members were present and constituted a quorum.

Chairman: Jason Thelin

Commission Members: Bryce Higbee, Steve Cosper, David Fotheringham, Jason Thelin, Chuck Castleton, Steve Swanson, Judi Pickell

Commission Members Not Present:

Staff: Jason Bond, Jed Muhlestein, Marla Fox

Others: Andrew Peterson, Eli Slesk, Brandon Maughan, Will Jones, Earl Cline, Greg Ketch

B. Prayer/Opening Comments: Steve Cosper

C. Pledge of Allegiance: By Invitation

II. PUBLIC COMMENT

No comment

III. PLANNING COMMISSION ELECTION OF CHAIR AND VICE-CHAIR

Steve Swanson nominated Steve Cosper to be the Planning Commission Chairman.

David Fotheringham nominated Judi Pickell to be the Vice-Chairman

The Planning Commission was unanimous with this decision.

IV. ACTION ITEMS

A. Legal Non-Conforming Apartment Extension Request –Lomoin Partners

Lomoin Partners is preparing to purchase the property located at 201 West Center Street. The property contains a legal non-conforming apartment building that was built in 1978. However, there are 6 units in the building but only 4 units are legal according to the previous ordinance that was in place at the time the building was built. The applicant is proposing to renovate the apartment building in a way that enhances the property and the neighborhood. This will include a full interior renovation and a new asphalt parking lot. The applicant claims that in order for this to be financially feasible for them to purchase and renovate, they will need the 5th and 6th units to be legal and available for rent.

Jason Bond said at the time this building was approved; only four units were legal. Sometime in the past, someone renovated the apartment and made six units in the building without coming to the city to get a building permit.

Greg Ketch said an old laundry unit was converted into a unit but he's not sure how the sixth unit came to be. He said there are six meters and six mailboxes and it's been like this for years. Jason Bond said the applicant would like to make these units legal and in doing so, he would like to renovate the building, units, parking lot and landscaping.

Jason Bond said this could be a win/win situation for everyone and something that could enhance the neighborhood.

Greg Ketch said it's obvious that management has been lacking with this building. He said he lives in Alpine and would like to renovate the building and make it nice for the neighborhood and the community. He said there are three stairwells and said there had to be five units in there to begin with. He said as far as they can tell; only the laundry room was converted.

Judi Pickell said our ordinance allows for this as long as the building footprint is not changed too much or causes a negative impact on the neighborhood. Steve Swanson that means the units can increase in size but you can't increase the number of units. He doesn't think its right that someone running an illegal apartment can do this and then sell this as an illegal building just to make more money. The Planning Commission had a discussion about whether they

wanted to give an exception and whether they want to set a precedent. Bryce Higbee said he would like to enforce what was approved when this building was built. If that is five units then someone will have to move out.

The applicant said the city has already set precedent when they allowed basement apartments to be legal. Jason Thelin said that is not the same thing because you can only rent out your basement if the home is owner occupied. The city does not allow anyone to rent out the top and bottom of a home because it then turns out to be a duplex.

Chuck Castleton said he lives close to this building and it's not in good condition and any improvement would be great. The applicant said the building was not changed to put in the sixth apartment. He said it has been this way for at least ten years and nothing would change if it was to become legal. The Planning Commission reviewed the ordinance and discussed what they thought the meaning was. They said there are conflicting ordinances that tie their hands. Jason Bond said the ordinances need to be revised so they make sense.

MOTION: Bryce Higbee recommended that approval of the proposed legal non-conforming extension be approved with the following conditions as long as it does not violate our ordinance.

1. Only 4 units be rented out until all of the proposed renovations and any other items as deemed necessary are completed according to the building code and are approved by the Building Inspector.
2. The parking lot be asphalted as proposed with the approval from the City Engineer.
3. All units be given new cabinets, appliances, floor coverings, and paint as proposed.
4. All units be given an enlarged bathroom, washer/dryer, additional cabinets, new bar, and other kitchen improvements as proposed.
5. Adequate off-street parking for 6 units be provided (12 parking stalls).
6. A landscaping plan be submitted and approved by the City Planner.

The applicant mentioned that there are other items that need to be addressed and repaired such as the stairs. Jason Bond said that condition number one would cover those items as long as they met the building code and were approved by the Building Inspector. The applicant said all of these units have leases and it will be complicated to kick someone out. Bryce Higbee asked what the plan was to get work completed when people are still living in the units. The applicant said their plan would be to give an incentive and try to buy the renters out of their lease so they will move out. He said they would tear out two units at a time and work to get them completed and then move on to the next two units until all work was completed.

The Planning Commission said they do not want to see anyone get kicked out based on this recommendation. Jason Bond said if the applicant buys this building then we need to make it a condition that they operate as it was approved and as it is legal until the renovations happen and then they can do the six units. Bryce Higbee said this proposal needs to go to the City Council because it's unique enough and David Church needs to be there and have input on it.

Judi Pickell seconded the motion. The motion passed with 6 Ayes and 1 Nays. Bryce Higbee, Steve Cosper, David Fotheringham, Chuck Castleton Steve Swanson and Judi Pickell all voted Aye. Jason Thelin voted Nay. Jason Thelin said he is voting Nay because he is not in favor of having a six-plex in that area or increasing density.

B. State Farm Office Building Site Plan – Eli Slesk

The proposed State Farm Insurance office building is located on the corner of Main Street and 120 south. The property is 10.043 square feet and is located in the Business Commercial zone. Office buildings are a permitted use in the BC zone. The proposed building will be 2 stories with 2,000 square feet per floor.

The Gateway Historic zone will also apply to this proposal. The Gateway Historic zone gives the Planning Commission the ability to allow flexibility to the requirements set forth in the BC zone. The Planning Commission may recommend exceptions regarding parking; building height, signage, setbacks and use if it finds that the plans proposed better implement the design guidelines to the City Council for approval.

Jason Bond said the applicant is asking for setback exceptions on three sides of the building in order to get it to fit on the lot. They are asking for ten less feet on the front, eight less on the side and twelve less on the back setbacks. They have all the parking required with the exception of one lot. They would like to use one parking lot from their neighbor.

Jed Muhlestein said the lot had a pre existing home on it and all of the utilities are in place. He said the Fire Marshall has approved this with the removal of a power pole. He said all that needs to be submitted is a parking lot lighting plan. Jason Thelin asked if the Planning Commission would be deciding the Gateway Historic and does that need to be approved tonight. Steve Cosper said we need to have some design standards to follow for the future.

Judi Pickell asked if the building could have a Main Street entrance to give the building a Main Street feel. She said they can't have a Main Street address if the building faces 120 South. The Planning Commission asked for a Main Street front and put a door in the back so customers can come in the back door. The applicant said they had talked about doing that but don't want customers to have to walk from the back of the building to get to the front door. They said the lot is so small the only way they could get the building to fit was to put the front of the building to the side lot.

Jason Thelin said it makes sense to give the setback exceptions and parking because the lot is so small and it will be difficult for any business to build there. He asked if this business would be required to have a dumpster. Jason Bond read from the ordinance where it states that it is up to the city whether the business would be required to have a dumpster or a regular garbage can. Jason Bond said the business would have to designate an area for the garbage or dumpster. The applicant said they do not need a dumpster and do not have room in the parking lot for one.

Staff recommends that approval of the proposed site plan be granted provided the following items are addressed:

1. The Developer provide a lighting plan.
2. An exception be considered by the Planning Commission and City council regarding setbacks.
3. An exception be considered by the Planning Commission and City council regarding six (6) parking stalls location within the setback.
4. An agreement provided between property owners regarding the excess parking stall proposed to be on the adjacent property be considered by the Planning Commission and the City Council.
5. No trees be planted within the sight triangle and other landscaping be placed in a way that will never affect visibility on the corner of 120 South and Main Street.
6. The preliminary architectural design drawings be considered by the Planning Commission and City Council.

The Planning Commission postponed this proposal and asked the applicant to bring in renderings of the building and be more detailed with the materials. Jed Muhlestein also reminded them to bring in a lighting plan.

V. COMMUNICATIONS

Jason Bond asked how we can get the ordinances updated. He asked the Planning Commission if they wanted to each take a different one and work on it and bring it back. The Planning Commission said they would rather have Jason Bond work on the ordinances and then bring them back to them for review.

VI. APPROVAL OF PLANNING COMMISSION MINUTES OF: Dec 2, 2014

MOTION: Steve Swanson moved to approve the Planning Commission Minutes for Dec 2, 2014 subject to changes.

Chuck Castleton seconded the motion. The motion passed unanimously with 7 Ayes and 0 Nays. Bryce Higbee, Steve Cosper, David Fotheringham, Jason Thelin, Chuck Castleton, Steve Swanson and Judi Pickell all voted Aye.

Jason Thelin stated that the Planning Commission had covered all of the items on the agenda and adjourned the meeting at 9:00pm.