ADVANCED GEOTECHNICAL SOLUTIONS, INC.
485 Corporate Drive, Suite B
Escondido, California 92029
Telephone: (619) 867-0487 Fax: (714) 409-3287

TYLER DEVELOPMENT, LLC
4204 Jutland Drive
San Diego, California 92117

March 15, 2019
P/W 1310-04
Report No. 1310-04-B-6

Attention: **Mr. Marc Harris**

Subject: ***Response to City of Santee Review Comments and Geotechnical Third-Party Review, Tyler Street Residential Development, Southeast of Tyler Avenue and Mesa Heights Road, Santee, California***

References: See Appendix A

Gentlemen:

Advanced Geotechnical Solutions, Inc., (AGS) has prepared this response to City of Santee review comments and third-party geotechnical review (third review) conducted by Geocon Incorporated (Geocon) dated November 27, 2018, on behalf of the City of Santee. The review comments precede AGS' responses. Copies of the City of Santee review memos and the third-party review letter are provided in Appendix A.

City of Santee Planning Division Comment 8: *The geotechnical report still states that earthwork may extend outside of the property and into the ephemeral stream. The consultant's response to comments noted that this was incorrectly stated and that the related drawings had been updated. Please update the text in the geotechnical report reflecting this.*

AGS Response: AGS has revised the subject geotechnical report to indicate that it is feasible to construct the shear key and achieve proposed removals without extending outside of the property limits and into the ephemeral stream. See section "6.1.3 Removals Along Grading Limits and Property Lines" for revised text reflecting this update. A copy of the revised geotechnical report (AGS, 2019) is included in Appendix B.

City of Santee Engineering Division Comment 3: *Geotechnical Study:*
a. The preliminary grading plan within the geotechnical investigation shall be updated to reflect the most recent design.
b. The Geotechnical Engineer and Geologist shall review the proposed water quality facilities and provide recommendations due to the potential geotechnical/geologic hazards that are present within the geologic formations in and adjacent to the project limits.
c. The 3rd party review comments by Geocon are provided under separate letter.

AGS Response: 3a. AGS has updated our Geologic Map and Exploration Location Plan (Plate 1) and associated cross sections (Plates 2 & 3) to reflect the current design prepared by Walsh Engineering and Surveying, Inc., dated March 12, 2019. The updated Plates 1 through 3 are attached to our revised geotechnical report (AGS, 2019) included in Appendix B.

3b. AGS has reviewed the current proposed water quality facilities for the project. The current plans utilize bio-filtration 'rain gardens' that are lined with an impermeable membrane. The use of impermeable membranes provide adequate mitigation for potential geotechnical/geologic hazards that may arise due to the proposed water quality facilities. From a geotechnical perspective, the proposed water quality facilities were designed in accordance with AGS recommendations.

3c. AGS response to 3rd party review comments by Geocon are presented below.

Comment 11: *The project civil engineer is proposing tree wells on the subject lots that appear to allow infiltration adjacent to descending slopes (see Pad Tree Well Detail in the referenced SWQMP). The geotechnical engineering consultant should comment on the suitability of these storm water management devices and provide recommendations to help prevent slope instability and seepage from the planned infiltrated water.*

AGS response: The tree wells have been removed from the current project plans. The project civil engineer is now utilizing bio-filtration 'rain gardens' located at the back of sidewalk. The rain gardens are lined with an impermeable membrane and have a 6-inch diameter underdrain. AGS has reviewed the details presented of Sheet 2 of the subject plans prepared by Walsh Engineering and Surveying, Inc. and considers the rain gardens to be suitable from a geotechnical perspective.

The opportunity to be of service is sincerely appreciated. If you should have any questions, please do not hesitate to contact the undersigned.

JOHN J. DONOVAN
RCE 65051, RGE 2790, Reg. Exp. 6-30-19

PAUL J. DERISI
CEG 2536, Reg. Exp. 5-31-19

REGISTERED PROFESSIONAL ENGINEER
JOHN J. DONOVAN
GE 2790
GEOTECHNICAL
STATE OF CALIFORNIA

PROFESSIONAL GEOLOGIST
PAUL J. DERISI
No. 2536
CERTIFIED
ENGINEERING
GEOLOGIST
STATE OF CALIFORNIA

Distribution: (2) Addressee

Appended: Appendix A: References and Copy of Review Sheet
Appendix B: Revised Geotechnical Investigation

APPENDIX A

REFERENCES AND REVIEW SHEET

APPENDIX A

CITED REFERENCES

Advanced Geotechnical Solutions, Inc. (2019). *Preliminary Geotechnical Investigation for Tyler Street Residential Development, Santee, California*. P/W 1310-04, Report No. 1310-04-B-2, June 30, 2016 (Revised March 15, 2019).

---. (2017). *Response to Geotechnical Third-Party Review, Tyler Street Residential Development, Southeast of Tyler Avenue and Mesa Heights Road, Santee, California*, P/W 1310-04, Report No. 1310-04-B-3, December 8, 2017.

Geocon, Inc. (1989). *Soil and Geologic Investigation for a 36-Lot Subdivision, Santee, California*, File No. D-2657-MO2, dated March 6, 1989.

---. (2017). *Geotechnical Third-Party Review, Tyler Street Residential Development, Southeast of Tyler Avenue and Mesa Heights Road, Santee, California*, Project No. G-1891-52-06, dated August 16, 2017.

---. (2018). *Geotechnical Third-Party Review, Tyler Street Residential Development, Southeast of Tyler Avenue and Mesa Heights Road, Santee, California*, Project No. G-1891-52-06, dated May 1, 2018.

Stark, Timothy D., Choi, Hangseok, and McCone, Sean. (2005). "Drained Shear Strength Parameters for Analysis of Landslides," Journal of Geotechnical and Geoenvironmental Engineering, pgs. 575-588, May 2005.

COPY OF REVIEW SHEET

CITY OF SANTEE
INTER-OFFICE MEMO

TO: John O'Donnell, Principal Planner

FROM: Doug Thomsen, Senior Planner

DATE: November 20, 2018

SUBJECT: **TYLER STREET – TENTATIVE MAP FOR A 14 LOT SUBDIVISION (TM2017-1)**

Planning has reviewed the resubmittal of TM2017-4 and associated applications and deem the application incomplete. The following comments apply:

Application

1. A proposed ordinance amending the Santee General Plan was submitted which would require voter approval of development actions that would increase residential density or intensity of land use over that currently permitted by the General Plan. The proposed Tyler Street TM cannot be heard by the City Council until the outcome of the proposed ordinance is known.

Wall and Fence Plan

2. A standard retaining wall drawing is shown, but a color elevation of the retaining wall similar to the other two proposed fence types will be needed.

3. A gray line is shown in the legend to represent retaining walls, but no gray lines are used on the plan. Show the retaining walls on the plan using gray lines.

Landscaping Plan

4. Street trees were removed from the street biofiltration basins on the grading plans. Make sure the landscaping plans reflect the final design for bioretention shown on the TM and grading plans.

Biological Assessment (October 5, 2018), **Quino Checkerspot Butterfly Report** (April 16, 2013), **and California Gnatcatcher Report** (April 16, 2013) (BLUE consulting Group)

5. Confirm that Lot B will be preserved in an open space easement and identify any maintenance and management plans for this lot.

6. When referring to the City's 2006 Subarea Plan, consistently refer to it as the "draft MSCP Subarea Plan".

7. Quino and Gnatcatcher surveys were conducted over four years ago. The Wildlife Agencies may consider this information outdated. Confirm with the Wildlife Agencies that the 2013 data remains valid and explain that in the report.

Geotechnical Report

8. The geotechnical report still states that earthwork may extend outside of the property and into the ephemeral stream. The consultant's response to comments noted that this was incorrectly stated and that the related drawings had been updated. Please update the text in the geotechnical report reflecting this.

Environmental Review

9. Based on the Application for Environmental Initial Study and technical reports submitted, the project will not have significant impact with mitigation. Therefore, an Initial Study and Mitigated Negative Declaration (MND) shall be prepared by a qualified environmental consultant in accordance with CEQA Guidelines Section 15071. Additional technical studies may be required by the consultant to complete the Initial Study/MND. All costs associated with completion of the CEQA documentation are to be done by the project applicant. A recent example of a final MND can be provided electronically for reference if requested.

CITY OF SANTEE
INTER-OFFICE MEMO

TO: Doug Thomsen, Senior Planner

VIA: Scott A. Johnson, Principal Civil Engineer

FROM: Claire Singh, Associate Civil Engineer

DATE: November 20, 2018

SUBJECT: Tyler Street Subdivision (TM 2017-01, DR 2017-01)

The Engineering Division has reviewed tentative map, TM 2017-01, dated October 22, 2018, applications for a 14-lot single family residential subdivision located at Tyler Street and Mesa Height Road, and recommends that you find the application to be incomplete.

Please request the applicant address the following:

1. Submit a revised tentative map and preliminary grading plan that address the following:

   a. The engineer of work shall sign the preliminary grading plan and the tentative map.

   b. Show the remedial grading limits on the preliminary grading plan.

   c. Show driveways per SDRSD G-14A and slopes of driveways for each lot.

   d. The proposed mailbox location shall be located within the subdivision limits. Currently the mailbox location varies between the preliminary grading plan and the plot plan

   e. Provide another typical street section for Tyler Street showing the proposed biofiltration basin on both sides of the street.

   f. Proposed biofiltration basins shall be constructed within the subdivision limits to avoid impact on adjacent properties.

   g. Add a note on the preliminary grading plan that all biofiltration basins within the public right-of-way to be maintained by homeowner's association.

   h. Revise the basin section to show a total of 15" gravel thickness per Worksheet B.5-1 of the Storm Water Quality Management Plan. The basin detail shall meet the requirements per the BMP Design Fact Sheet BF-1.

   i. Clarify how the biofiltration basins will overflow.

j. Coordinate space in the parkway for utility pedestals, street lights, hydrants, mailbox, driveways, and biofiltration basins.

k. Show the proposed pad tree well detail for individual lots.

l. The proposed pavement section for Tyler Street shall be per the City of Santee's Public Works Standards based upon the proposed street grade. Typical sections between the preliminary grading plan and the tentative map shall match.

2. Coordinate with Padre Dam Municipal Water District for review of the most recent tentative map, and provide updated sewer/water availability letters with conditions on required easements.

3. Geotechnical Study

   a. The preliminary grading plan within the geotechnical investigation shall be updated to reflect the most recent design.

   b. The Geotechnical Engineer and Geologist shall review the proposed water quality facilities and provide recommendations due to the potential geotechnical/geologic hazards that are present within the geologic formations in and adjacent to the project limits.

   c. The 3rd party review comments by Geocon are provided under separate letter.

4. Drainage Study

   a. Update the drainage study submitted on 4/4/2018 as necessary to reflect the most recent design.

5. Storm Water Quality Management Plan (SWQMP) – Refer to the written comments annotated in the returned report.

   a. The project owner shall sign and date the owner's certification page.

   b. Include a discussion on de minimus and self-retaining slope areas to clarify that no treatment is required in these areas.

   c. The O&M plan in Attachment 3A shall be project/site specific and not verbatim from the BMP Design Manual. Specify in the SWQMP that the homeowners association will own and maintain proposed rain gardens.

GEOCON
INCORPORATED
GEOTECHNICAL ■ ENVIRONMENTAL ■ MATERIALS

Project No. G1891-52-06
November 27, 2018

City of Santee
Department of Development Services
10601 Magnolia Avenue
Santee, California 92071

Attention: Ms. Claire Chang

Subject: GEOTECHNICAL THIRD-PARTY REVIEW (THIRD REVIEW)
TYLER STREET RESIDENTIAL DEVELOPMENT
SOUTHEAST OF TYLER AVENUE AND MESA HEIGHTS ROAD
SANTEE, CALIFORNIA

Dear Ms. Chang:

In accordance with your request, we performed a review of the referenced geotechnical documents (see *List of References*) to present our opinion regarding the suitability of the conclusions and recommendations provided within the geotechnical report and subsequent response letters.

REVIEW COMMENTS

Based on our review of the referenced geotechnical documents and plans, the following comments should be addressed by the design team.

1. Previously accepted.

2. Previously accepted.

3. Accepted – The consultant has provided preliminary recommendations for the proposed shoring system and slot-cutting methodology for the shear key excavations. The consultant has also stated that these recommendations will be re-evaluated after completion of proposed additional field exploratory work. We recommend that the consultant review their recommended slot-cutting spacing and sequencing after shoring plans have been prepared to avoid destabilization of the soldier piles during a single cut grouping. The shoring engineer should design the proposed shoring to accommodate the slot-cutting as well. Additionally, the consultant should verify that their recommended lateral earth pressures are adequate for the existing backslope conditions after completion of the additional field exploration.

4. Previously accepted.

5. Previously accepted.

6. Previously accepted.

7. Previously accepted.

8. Previously accepted.

9. Accepted – The consultant has indicated that a review of the strength parameters used for the stability analyses will be performed after additional field explorations are performed.

10. Accepted – The project civil engineer has removed "street trees" from the proposed storm water biofiltration basins.

11. **NEW COMMENT** – The project civil engineer is proposing tree wells on the subject lots that appear to allow infiltration adjacent to descending slopes (see Pad Tree Well Detail in the referenced SWQMP). The geotechnical engineering consultant should comment on the suitability of these storm water management devices and provide recommendations to help prevent slope instability and seepage from the planned infiltrated water.

Should you have any questions regarding this letter, or if we may be of further service, please contact the undersigned at your convenience.

Very truly yours,

GEOCON INCORPORATED

Shawn Foy Weedon
GE 2714

Matthew R. Love
RCE 84154

David B. Evans
CEG 1860

SFW:MRL:DBE:dmc

(e-mail) Addressee

LIST OF REFERENCES

1. *Advanced Geotechnical Solutions, Inc., Response to Geotechnical Third Party Review (2nd), Tyler Street Residential Development, Santee, California.,* dated October 4, 2018 (Report No. 1310-04-B-5).

2. *Advanced Geotechnical Solutions, Inc., Response to Geotechnical Third Party Review(1st), Tyler Street Residential Development, Santee, California.,* dated December 8, 2017 (Report No. 1310-04-B-3).

3. *Advanced Geotechnical Solutions, Inc., Preliminary Geotechnical Investigation for Tyler Street Residential Development, Santee, California.,* dated June 30, 2016 (Report No. 1310-04-B-2).

4. *Geocon Incorporated, Geotechnical Third-Party Review (2nd), Tyler Street Residential Development, Southeast Corner of Tyler Avenue and Mesa Heights Road, Santee, California.,* dated May 1, 2018 (Project No. G1891-52-06).

5. *Geocon Incorporated, Geotechnical Third-Party Review (1st), Tyler Street Residential Development, Southeast Corner of Tyler Avenue and Mesa Heights Road, Santee, California.,* dated August 16, 2017 (Project No. G1891-52-06).

6. Walsh Engineering and Surveying, Incorporated, *Preliminary Grading Plan, Tyler Street Project, Santee, California,* revised October 11, 2018.

7. Walsh Engineering and Surveying, Incorporated, *Slope Analysis, Tyler Street Project, Santee, California,* dated February 27, 2018.

8. Walsh Engineering and Surveying, Incorporated, *Storm Water Quality Management Plan [SWQMP], Tyler Street Project, Santee, California,* dated November 16, 2018.

Project No. G1891-52-06
May 1, 2018

City of Santee
Department of Development Services
10601 Magnolia Avenue
Santee, California 92071

Attention: Ms. Claire Chang

Subject: GEOTECHNICAL THIRD PARTY REVIEW
TYLER STREET RESIDENTIAL DEVELOPMENT
SOUTHEAST OF TYLER AVENUE AND MESA HEIGHTS ROAD
SANTEE, CALIFORNIA

Dear Ms. Chang:

In accordance with your request, we performed a review of the referenced geotechnical documents and plans (see *List of References*) to present our opinion regarding the suitability of the conclusions and recommendations provided within the geotechnical report and subsequent response letter.

REVIEW COMMENTS

Based on our review of the referenced geotechnical documents and plans, the following comments should be addressed by the design team.

1. Accepted.

2. Accepted.

3. ***Previous Comment:***

   Section 6.1.3 discusses remedial grading along the project margins and possible impacts to the currently proposed and existing developments. Specifically, the forecut to construct the proposed shear key along the north, northeast and eastern project margins appears to be constrained by the property line. It is also stated that grading may need to extend off-site and/or "shoring or specialized grading techniques" may be necessary to accomplish the remedial design.

Section 6.2.7 states that "backcuts and forecuts in favorably bedded creep-affected Friars Formation should be made no steeper than 1:1 (horizontal:vertical) to heights of up to 20 feet, and 1½:1 (horizontal:vertical) to heights greater than 20 feet. Flatter backcuts may be necessary where geologic conditions dictate, such as unfavorably oriented discontinuities". Since the proposed shear key excavation is greater than 20 feet, both the forecut and backcut of the shear key is recommended to be inclined at 1½:1 which will impact grading along the project margins and off-site.

The report also states "future studies should present a more detailed evaluation of the stability of temporary cuts adjacent to existing improvements, including the forecuts needed for the stabilization shear keys below off-site adjacent properties". Where improvements may be affected by temporary instability, either on or off-site, further restrictions such as slot cutting, installing shear piles and/or tiebacks" may be necessary.

In light of the consultant recognizing the need for a more detailed evaluation of the boundary conditions, additional subsurface exploration with large-diameter borings, geologic cross-sections and additional analysis is recommended in the vicinity of Lot A, and Lots 1 through 6 to verify that the proposed remedial grading can be accomplished without impacting the adjacent properties. It is our opinion that the "future studies" should be performed prior to the Tentative Map approval to check that there are no geotechnical constraints to developing the property as presently proposed.

At least several additional large-diameter borings should be advanced along the trend of the shear key, and up-slope to enable adequate cross section and slope stability analyses. The information from the borings should be used to analyze the temporary and ultimate stability of the forecut and surrounding areas. Particularly, in an east-west direction directly south of the shear key along the eastern property line. In this area, the property line will constrain grading of the forecut and the driving force from the adjacent property is in a westerly direction at that location. In addition, cross sections should also be oriented in the direction of the maximum driving force (northeast-southwesterly) and consider any seepage conditions, if encountered.

Additional Comment:

The consultant has provided additional cross sections, as requested, and revised the forecut ratios to 1.5:1 (horizontal:vertical). In addition, AGS performed additional slope stability analyses for the temporary forecut conditions along two cross sections; one on the southeast end of the keyway (E-E') and one on the northwest end of the keyway (F-F'). The results yielded factors of safety for a temporary condition greater than and less than the generally accepted requirements for the northwest and southeast sections, respectively. AGS acknowledged that the final geotechnical design is pending additional studies and that forecut ratios may need to be steepened to remove unsuitable materials.

The consultant has proposed that slot cutting or shoring as a potential solution for the instability concerns during a temporary condition for the planned grading operations. We agree that slot cutting is typically an effective and appropriate procedure when there is adequate space to perform the work. In this regard, staged slot cutting from an intermediate grade at the southeast end of the key would be challenging since the excavation is approximately 40-feet-deep. Further slope stability analyses would be required if this procedure is contemplated to evaluate whether or not an appropriate factor of safety for the interim grade can be achieved that would allow deep slot cutting to be performed. These analyses should be completed at this time to determine if the proposed development can be constructed. In addition, the consultant states shoring can be used. The consultant should provide the shoring design recommendations.

The consultant has provided their opinion that "development of the project site as currently proposed is feasible from a geotechnical perspective". The consultant also acknowledges that additional field work will be necessary and that the study can be performed during development of the project grading plans. With respect to the timing of additional studies, it is typical and preferred to determine the means and methods required for project stabilization along the property margins during the Tentative Map process. The reason is that the project may be constrained by the geotechnical conditions and deemed logistically infeasible due to the inability to mitigate the conditions and/or the risk of potential impacts to surrounding improvements/properties. At this time, the consultant can provide recommendations and analysis for slot cutting, temporary shoring, and any other considered methodology for project stabilization along the property margins using the existing data and the additional drilling can be performed during the grading plan submittal process.

4. Accepted.

5. Accepted.

6. Accepted.

7. Accepted.

8. Accepted.

9. ***New Comment:***

The stability analyses for cross sections E-E' and F-F' include a friction angle of 12 degrees and cohesion of 100 pounds per square foot (psf) for the "clay bed" materials in the response letter dated December 8, 2017. The original report dated June 30, 2016 incorporates a friction angle of 8 degrees and cohesion of 100 psf for what appears to be the same materials (identified as "basal rupture surface" in the report). The consultant should provide laboratory testing and/or calculations to justify the increased strength parameters for the basal/clay bed in the stability analyses.

10. ***New Comment:***

Sheet 2 of the referenced preliminary grading plans dated April 4, 2017 present details of the proposed "Street Tree Detail." This detail shows a basin that possesses about 4 feet of "amended soil," a subdrain and an impermeable liner. The proposed tree and root ball are located within the "amended soil," above the planned subdrain and the impermeable liner. Additional details may be required for the planned "Street Tree Detail." The project geotechnical engineer, civil engineer and/or landscape architect should provide specifications for the proposed subdrain and liner that would prevent the subdrain from being clogged from roots and prevent the liner from being punctured from roots.

In addition, the landscape architect should clarify if the tree can be planted and properly grow as planned. We understand the "amended soil" likely will not be compacted to fill specifications and will be relatively loose to help allow water infiltration. If the "amended soil" is not properly compacted, will the tree topple during high winds?

Should you have any questions regarding this letter, or if we may be of further service, please contact the undersigned at your convenience.

Very truly yours,

GEOCON INCORPORATED

Shawn Foy Weedon	Matthew R. Love	David B. Evans
GE 2714	RCE 84154	CEG 1860
REGISTERED PROFESSIONAL ENGINEER SHAWN WEEDON No. 2714 GEOTECHNICAL STATE OF CALIFORNIA	REGISTERED PROFESSIONAL ENGINEER MATTHEW R. LOVE C84154 CIVIL STATE OF CALIFORNIA	PROFESSIONAL GEOLOGIST DAVID B. EVANS NO. 1860 CERTIFIED ENGINEERING GEOLOGIST STATE OF CALIFORNIA

SFW:MRL:DBE:dmc

(e-mail) Addressee

LIST OF REFERENCES

1. *Advanced Geotechnical Solutions, Inc., Response to Geotechnical Third Party Review, Tyler Street Residential Development, Santee, California.,* dated December 8, 2017 (Report No. 1310-04-B-3).

2. *Advanced Geotechnical Solutions, Inc., Preliminary Geotechnical Investigation for Tyler Street Residential Development, Santee, California.,* dated June 30, 2016 (Report No. 1310-04-B-2).

3. *Geocon Incorporated, Geotechnical Third Party Review, Tyler Street Residential Development, Southeast Corner of Tyler Avenue and Mesa Heights Road, Santee, California.,* dated August 16, 2017 (Project No. G1891-52-06).

4. Walsh Engineering and Surveying, Incorporated, *Preliminary Grading Plan, Tyler Street Project, Santee, California,* dated April 4, 2018.

5. Walsh Engineering and Surveying, Incorporated, *Slope Analysis, Tyler Street Project, Santee, California,* dated February 27, 2018.

APPENDIX B

REVISED GEOTECHNICAL INVESTIGATION

ADVANCED GEOTECHNICAL SOLUTIONS, INC.
485 Corporate Drive, Suite B
Escondido, California 92029
Telephone: (619) 867-0487 Fax: (714) 409-3287

TYLER DEVELOPMENT, LLC
4204 Jutland Drive
San Diego, California 92117

(Revised March 15, 2019) June 30, 2016
P/W 1310-04
Report No. 1310-04-B-2R

Attention: Mr. Marc Harris

Subject: Revised Preliminary Geotechnical Investigation for Tyler Street Residential Development, Santee, California

References: See Appendix A

Gentlemen:

Pursuant to your request, presented herein are the results of Advanced Geotechnical Solutions, Inc.'s, (AGS) revised preliminary geotechnical investigation for the Tyler Street Residential Development Project in Santee, California. AGS has been retained to complete the geotechnical services supporting the tentative map approval process for this project.

AGS has conducted field mapping, performed subsurface exploration and laboratory testing, performed additional engineering and geologic analysis, and reviewed the latest Tentative Map for the Tyler Street Project. The purpose of this report is to evaluate the proposed Tentative Map plans relative to the near-site and on-site geologic and geotechnical conditions and provide conclusions and recommendations to aid in the development of the project.

Advanced Geotechnical Solutions, Inc., appreciates the opportunity to provide you with geotechnical consulting services and professional opinions. If you have any questions, please contact the undersigned at (619) 867-0487.

Respectfully Submitted,
Advanced Geotechnical Solutions, Inc.

PHILLIP W. MADRID, EIT
Staff Engineer

REGISTERED PROFESSIONAL ENGINEER · JOHN J. DONOVAN · GE 2790 · GEOTECHNICAL · STATE OF CALIFORNIA

PROFESSIONAL GEOLOGIST · PAUL J. DERISI · No. 2536 · CERTIFIED ENGINEERING GEOLOGIST · STATE OF CALIFORNIA

John Donovan, Vice President
GE 2790, Reg. Exp. 6-30-17

PAUL DE RISI, Vice President
CEG 2536, Reg. Exp. 5-31-17

Distribution: (3) Addressee

TABLE OF CONTENTS

ATTACHMENTS:

1.0 INTRODUCTION

1.1. Background and Purpose

The purpose of this report is to provide a "Tentative Map" (TM) level geotechnical study that may be utilized to support the submittal for the proposed Tentative Map for the Tyler Street Residential Project located in Santee, California. This report has been prepared to address the most current TM conceptual design and preliminary grading plan prepared by Walsh Engineering and Surveying, Inc., in a manner consistent with City of Santee geotechnical report guidelines and current standard of practice. Geotechnical conclusions and recommendations are presented herein, and the items addressed include: 1) Unsuitable soil removals and remedial grading; 2) Cut, fill and natural slope stability; 3) Potential geologic hazards which may be onsite and general mitigation measures for these hazards; 4) Design recommendations for Buttress/Stabilization fills; 5) Cut and cut/fill transition pad overexcavation criteria; 6) Remedial and design grading recommendations; 7) Rippability of the onsite bedrock; and 8) General foundation design recommendations based upon anticipated as graded soil conditions.

1.2. Scope of Study

The scope of this study included the following tasks:

- Review of pertinent published and unpublished geologic and geotechnical literature, maps, and aerial photographs readily available to this firm (Appendix A).
- Review of geotechnical investigation and as-graded reports for adjacent residential developments (Appendix A).
- Excavate, log, and sample nine (9) rubber tire backhoe test pits T-1 through T-9 in January 2016 (Appendix B).
- Excavate, log, and sample four (4) 30-inch diameter bucket auger borings BA-1 through BA-4 in February 2016 (Appendix B).
- Laboratory testing of “undisturbed” and bulk samples including: in-situ moisture content and density; maximum dry density and optimum moisture; “undisturbed” and remolded shear strength; grain size analysis; and Atterberg limits (Appendix C).
- Prepare geologic/geotechnical cross-sections A-A’ through C-C’ as shown on Plate 2.
- Conduct a geotechnical engineering and geologic hazard analysis of the site.
- Provide synopsis of site’s geologic and tectonic settings.
- Conduct a limited seismicity analysis.
- Provide compaction criteria and general earthwork specifications.
- Develop remedial grading recommendations.
- Slope stability analysis of both the highest cut and fill slopes (Appendix D).
- Preliminary design of shear key to stabilize onsite creep-affected soils (Appendix D).

- Evaluation of the excavation characteristics (i.e. rippability) of onsite bedrock materials.
- Discussion of pertinent geologic and geotechnical topics as they relate to the proposed development.
- Prepare general foundation design parameters which can be used for preliminary design.
- Provide preliminary pavement design.
- Prepare this report and associated exhibits summarizing our findings and recommendations. This report is intended for preliminary design support and for your initial regulatory review.

1.3. Geotechnical Study Limitations

The conclusions and recommendations in this report are professional opinions based on the data developed during this investigation. The conclusions presented herein are based upon the current design as reflected on the included Tentative Tract Map. Changes to the plan would necessitate further review.

The materials immediately adjacent to or beneath those observed may have different characteristics than those observed. No representations are made as to the quality or extent of materials not observed. Any evaluation regarding the presence or absence of hazardous material is beyond the scope of this firm's services.

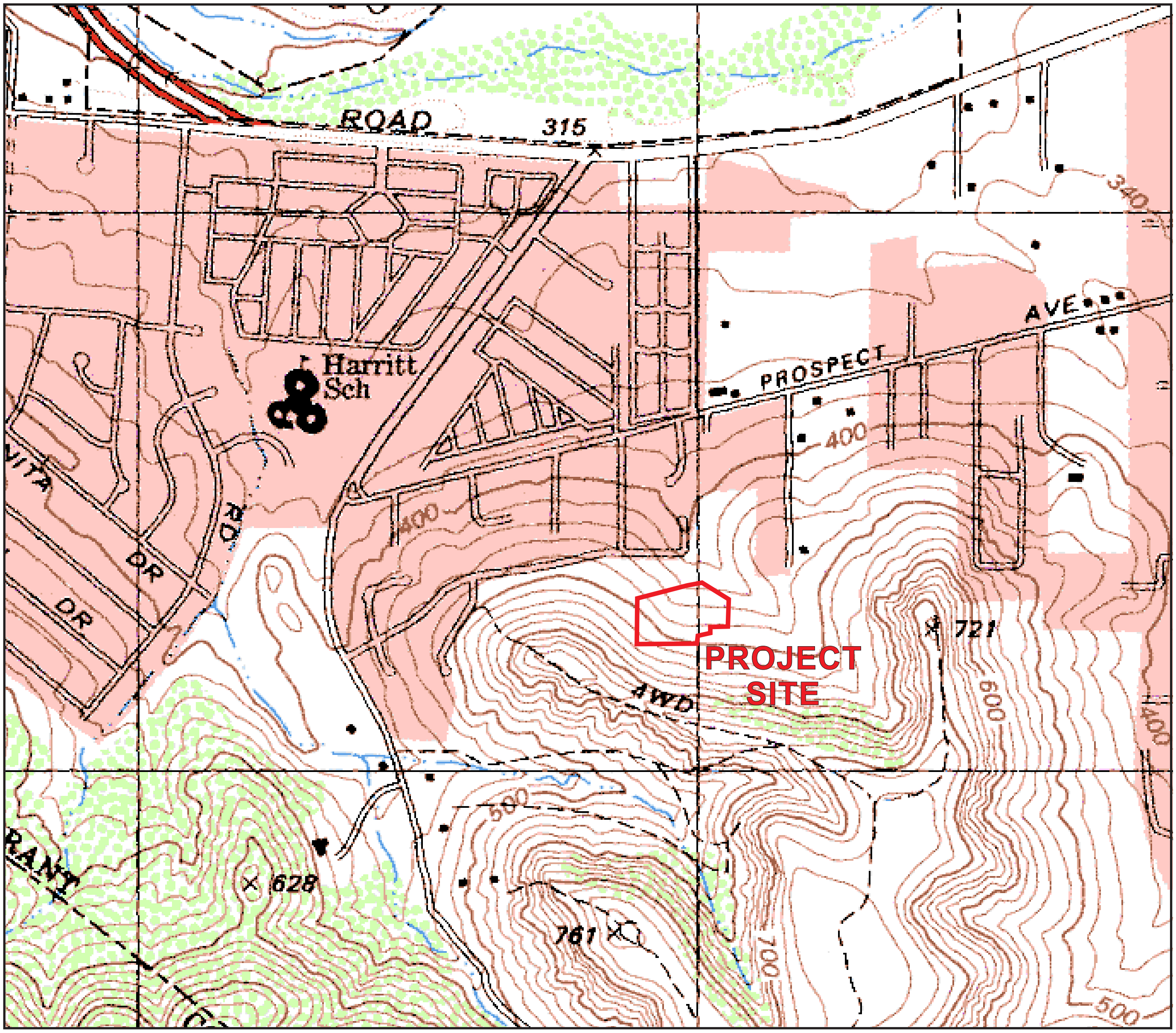
2.0 SITE LOCATION AND DESCRIPTION

2.1. Site Location and Description

The irregularly shaped site is located south of the southerly terminus Tyler Street in Santee, California. The site is bounded to the north by Tyler Street, existing single-family residences, and undeveloped land; to the east by vacant land and existing single family residences; and to the south and west by vacant land. A minor northwesterly flowing drainage occupies the northeast site boundary. The overall project area is situated along the northerly flank of a roughly east-west trending ridge near the southern property limit (Figure 1, U.S.G.S. Site Location Map). The area of proposed site development is limited to the lower and more gradually sloping portion of the site southerly adjacent to the current southerly terminus of Tyler Street. In general, the lower portion of the site adjacent to Tyler Street is gently to moderately sloping with overall drainage flowing to the north. Elevations within the proposed development limits range from a low elevation of 422 msl in the north to a high of 540 msl in the south.

2.2. Proposed Development

Based on the current preliminary grading plans, the site will be graded to support 14 residential lots and associated improvements with access afforded by a south-southeasterly cul-de-sac extension of Tyler Street. As currently designed, fills up to approximately 33 feet are anticipated and the anticipated deepest cuts are approximately 27 feet. Cut and fill slopes are designed at 2:1 (horizontal to vertical) or flatter to maximum heights on the order of 45 feet.



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SITE LOCATION MAP
TYLER STREET PROJECT
SANTEE, CALIFORNIA

P/W 1310-04

FIGURE 1

SOURCE MAP - TOPOGRAPHIC MAP OF THE
LA MESA 7.5 MINUTE QUADRANGLE,
SAN DIEGO COUNTY, CALIFORNIA

AGS
ADVANCED GEOTECHNICAL SOLUTIONS, INC.
485 Corporate Drive, Suite B
Escondido, California 92029
Telephone: (619) 867-0487

3.0 FIELD AND LABORATORY INVESTIGATION

In preparing this report AGS performed a field investigation consisting of the excavation, logging, and sampling of:

- Geologic field mapping of surface exposures.
- Nine (9) rubber tire backhoe test pits T-1 through T-9 in January 2016 to depths up to 15 feet below ground surface.
- Four (4) 30-in. diameter bucket auger borings BA-1 through BA-4 in February 2016 to depths up to 70 feet below ground surface.

Test pit and boring logs are presented in Appendix B. Selected bulk samples and "undisturbed" ring samples obtained during our field investigation were transported to our approved laboratory for testing and analysis. Results of that testing are presented in Appendix C.

4.0 ENGINEERING GEOLOGY

4.1. Geologic Analysis

4.1.1. Literature and Aerial Photograph Review

AGS has reviewed the referenced geologic documents and aerial photographs dating back to 1953 in preparing this study. Where deemed appropriate, this information has been included with this document.

4.1.2. Review of Adjacent Geotechnical Reports

AGS reviewed the following geotechnical investigation and grading reports for adjacent residential developments. Prospect Hills is located to the northeast of the project site. Padre Hills is located to the north/northwest of the project site and shares a common boundary with the site.

Prospect Hills

Sage Engineering, Inc., Geotechnical Investigation, Proposed Prospect Hills II Residential Development, Project No. 6002, dated March 31, 1996

Sage Engineering, Inc., Response to Third Party Review, Project No. 6002, dated February 14, 1997

Sage Engineering, Inc. Final As-Graded Geotechnical Report, Prospect Hills II, Project No. 7051, dated October 30, 1998

Padre Hills

Geocon, Inc., Soil and Geologic Investigation for a 36-Lot Subdivision, Santee, California, File No. D-2657-MO2, dated March 6, 1989

Sage Engineering, Inc., Supplemental Geotechnical Investigation, Padre Hills Residential Development, Project No. 4017, July 21, 1994

Sage Engineering, Inc., Final As-Graded Geotechnical Report, Padre Hills Residential Development, Project No. 4018, May 16, 1995

4.2. Regional Geologic and Geomorphic Setting

The subject site is situated within the Peninsular Ranges Geomorphic Province. The Peninsular Ranges province occupies the southwestern portion of California and extends southward to the southern tip of Baja California. In general, the province consists of young, steeply sloped, northwest trending mountain ranges underlain by metamorphosed Late Jurassic to Early Cretaceous-aged extrusive volcanic rock and Cretaceous-aged igneous plutonic rock of the Peninsular Ranges Batholith. The westernmost portion of the province, where the subject site is located, is predominantly underlain by younger marine and non-marine sedimentary rocks. The Peninsular Ranges' dominant structural feature is northwest-southeast trending crustal blocks bounded by active faults of the San Andreas transform system.

A regional geology map is shown on Figure 2.

4.3. Site Geology

A brief description of the earth materials encountered on this site is presented in the following sections. More detailed description of these materials is provided in the logs included in Appendix B.

Based on our site reconnaissance and subsurface excavations, geologic maps and literature, the area of proposed development is mantled by a thin veneer of undocumented fill, topsoil, alluvium, and colluvium underlain by Friars Formation to the maximum depths explored.

4.3.1. Surficial Units

Surficial units onsite include, Undocumented Fill (map symbol afu), Topsoil (unmapped), Alluvium (map symbol Qal), and Colluvium (map symbol Qcol). Detailed descriptions of these units are presented below.

4.3.1.1. *Undocumented Fill (afu)*

Artificial fill was encountered in test pit T-6 at the northern property limits and is likely associated with previous grading for the residential development to the north. As encountered, these materials can generally be described as light yellowish brown to dark gray sandy clay in a moist and stiff condition. In addition, small localized areas of undocumented fill from previous minor grading and/or agricultural activities are likely present onsite. The undocumented fill soils were found to range from 3 to 8 feet deep.

4.3.1.2. *Topsoil (no map symbol)*

A thin veneer of topsoil was encountered throughout the site. These materials can generally be described as fine-grained, dark brown, silty sand with some clay in a very moist and loose condition. The topsoil was found to range from 1 to 4 feet deep.

4.3.1.3. *Alluvium (Qal)*

Alluvium was encountered within the drainage in the northerly portion of the site. These materials can generally be described as dark gray to dark grayish brown silty sand in a wet and loose condition to dark brown sandy clay in a very moist to wet and loose condition. Some rounded gravel and cobbles up to 2 ft. diameter were encountered in the alluvium. It is anticipated that the alluvium is limited to the narrow drainage along the north and northeasterly boundaries of the site. The depth of the alluvium within the central portion of the drainage could not be determined due to environmental constraints restricting exploration; however, it is anticipated to be on the order of 4 to 8 feet thick.

4.3.1.4. *Colluvium (Qcol)*

Colluvium was encountered in the excavations on the onsite slopes. These materials can generally be described as brown clayey sand and sandy clay in a very moist and soft condition. . The colluvium was found to range from 2 to 7 feet in thickness.

4.3.2. Bedrock Units

4.3.2.1. *Friars Formation - (Tf)*

Friars Formation was encountered at depth in the four recent large diameter borings excavated at the project site by AGS. A thin veneer of surficial soil (topsoil, colluvium, and/or alluvium) was observed to mantle the Friars Formation. As encountered, the Friars Formation generally consists interbedded claystone, siltstone, and sandstone with cobble conglomerate lenses. The upper portion of the Friars Formation exhibited evidence suggesting it has been affected by long term creep. Steeply dipping soil infilled fractures and thin randomly oriented shears and clay seams were commonly observed. These materials do not appear to be related to a large scale translational failure or deep seated landslide and lack geomorphic features common to these types of landslides. However, the presence of a deep seated landslide cannot be precluded. At the surface, the creep-affected areas exhibited a hummocky texture which is common to shallow failures and creep affected slopes. These materials are interpreted to be relatively intact blocks of the Friars Formation which have been affected by ductile deformation within the more plastic facies of the Friars Formation. In general, the creep-affected mass is moderately well indurated and well healed.

A basal shear zone was encountered between elevations 410 and 420 msl and exhibited a shallow northeasterly dip of approximately five degrees below horizontal. These shears were generally paper thin to 1/8-inch thick, composed of highly plastic clay with weakly to well-developed shear fabric (remolding), and were found to be continuous around the borehole. Below the basal shear zone, the Friars Formation generally consists of massively bedded, fine-grained sandy siltstone in a slightly moist and hard to very hard condition. The basal shear zone is interpreted to be the controlling feature and lower boundary for the creep affected materials above. For the purposes of this report, the boring logs and geologic map and cross-sections distinguish the creep-affected Friars Formation (Tf_c) and the intact Friars Formation (Tf_i).

4.4. <u>Geologic Structure</u>

The project site is situated near the easterly limit of the San Diego Embayment. Primary geologic units onsite are Friars Formation and Stadium Conglomerate. The Eocene-aged Friars Formation occupies the lower two-thirds of the overall property and generally consists of massively bedded siltstone, claystone, and sandstone. In the project area it non-conformably overlies Cretaceous-aged granitoid basement rock. The Stadium Conglomerate conformably overlies Friars Formation in the steeper, upper portion of the site but is not exposed within the currently proposed development area. The Stadium Conglomerate generally consists of massively bedded cobble conglomerate and sandstone.

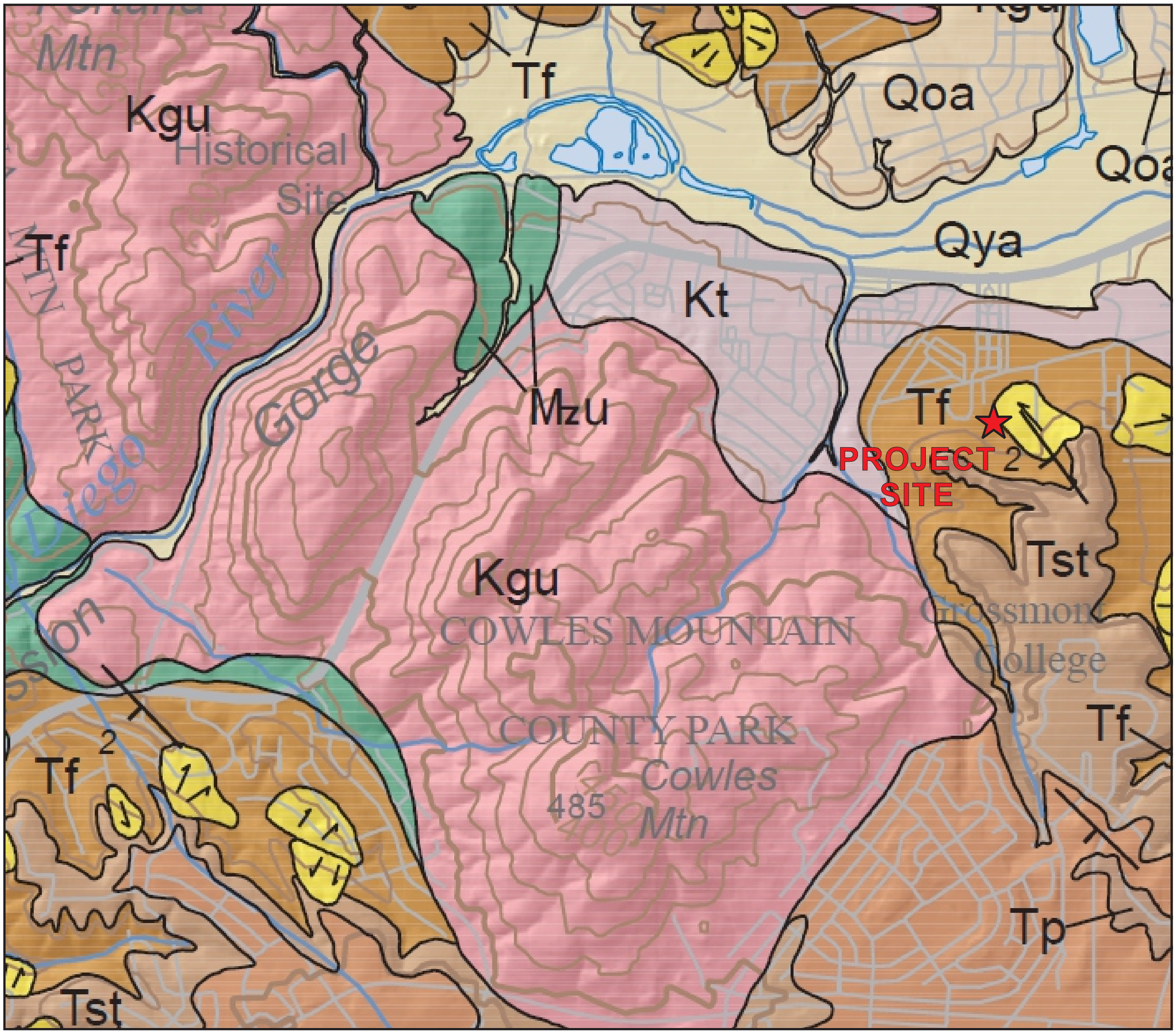
The Friars Formation was observed to be thinly to massively bedded, commonly fractured and contained several remolded clay seams indicative of 'bedding-parallel shears'. Fractures commonly exhibited polished striated surfaces and ranged from tightly spaced with random orientation to singular fractures that were steeply dipping. The basal shear zone was encountered between elevations 410 and 420 msl and exhibited a shallow northeasterly dip of approximately five degrees below horizontal. Regionally, the general dip direction is to the southwest but locally can vary between 7 degrees to the south and 7 degrees to the north. Similarly interpreted features were identified during previous geotechnical investigations for adjacent developments and possess shallow dips to both the north and south. The general dip direction identified during our investigation is out of slope and is considered <u>unfavorable</u> with respect to the current development plans. As such, design measures in the form of shear keys and/or buttresses will be necessary to stabilize the as-graded site and minimize the potential for future failure to acceptable risk levels. These measures are discussed in more detail in Section 6.2 of this report.

4.5. <u>Groundwater</u>

Groundwater was encountered in Boring BA-1 at an elevation of roughly 418 feet. Seepage was encountered at elevations of 431 feet and 420 feet in Boring BA-1, 441 feet in Boring BA-2 and 412 feet and 406 feet in Boring BA-3. It is our opinion that the groundwater encountered at depth will likely not impact the proposed site development. Long-term control of groundwater will be a key aspect in stabilizing the development. It should be noted that localized perched groundwater may develop at a later date, most likely at or near fill/bedrock contacts, due to fluctuations in precipitation, irrigation practices, or factors not evident at the time of our field explorations.

4.6. <u>Faulting and Seismicity</u>

The site is located in the tectonically active Southern California area, and will therefore likely experience shaking effects from earthquakes. The type and severity of seismic hazards affecting the site are to a large degree dependent upon the distance to the causative fault, the intensity of



REGIONAL GEOLOGY MAP
TYLER STREET PROJECT
SANTEE, CALIFORNIA

P/W 1310-04

FIGURE 2

SOURCE MAP - GEOLOGIC MAP OF THE SAN DIEGO 30' X 60' QUADRANGLE, KENNEDY AND TAN 2008, SAN DIEGO COUNTY, CALIFORNIA

AGS
ADVANCED GEOTECHNICAL SOLUTIONS, INC.
485 Corporate Drive, Suite B
Escondido, California 92029
Telephone: (619) 867-0487

the seismic event, and the underlying soil characteristics. The seismic hazard may be primary, such as surface rupture and/or ground shaking, or secondary, such as liquefaction or dynamic settlement. The following is a site-specific discussion of ground motion parameters, earthquake-induced landslide hazards, settlement, and liquefaction. The purpose of this analysis is to identify potential seismic hazards and propose mitigations, if necessary, to reduce the hazard to an acceptable level of risk. The following seismic hazards discussion is guided by the California Building Code (2013), CDMG (2008), and Martin and Lew (1998).

4.6.1. Surface Fault Rupture

Surface rupture is a break in the ground surface during, or as a consequence of, seismic activity. Fault rupture occurs most often along pre-existing fault traces. Based on our observation of the site and review of available geologic maps, there is no known faulting at the subject site. There are no Alquist-Priolo Earthquake Fault Zones within the site vicinity. The nearest known active fault is the Silver Strand section of the Newport-Inglewood-Rose Canyon fault zone which is approximately 11 miles southwest of the subject site. Accordingly, the potential for fault surface rupture on the subject site is considered very low to remote. This conclusion is based on literature and map review.

4.6.2. Seismicity

As noted, the site is within the tectonically active southern California area, and is approximately 11 miles from an active fault, the Silver Strand section of the Newport-Inglewood-Rose Canyon fault zone. The potential exists for strong ground motion that may affect future improvements.

At this point in time, non-critical structures (commercial, residential, and industrial) are usually designed according to the California Building Code (2013) and that of the controlling local agency. However, liquefaction/seismic slope stability analyses, critical structures, water tanks and unusual structural designs will likely require site specific ground motion input.

4.6.3. Liquefaction

Liquefaction is the phenomenon where seismic agitation of loose, saturated sands and silty sands can result in a buildup of pore pressures that, if sufficient to overcome overburden stresses, can produce a temporary quick condition. Localized, loose lenses/layers of sandy soils may be subject to liquefaction when a large, prolonged, seismic event affects the site. As the excess pore water pressure dissipates, the liquefied zones/lenses can consolidate causing settlement. Post liquefaction effects at a site can manifest in several ways and may include: 1) ground deformations; 2) loss of shear strength; 3) lateral spread; 4) dynamic settlement; and 5) flow failure.

In general, the more recent a sediment has been deposited, the more likely it is to be susceptible to liquefaction. Further, liquefaction potential is greatest in loose, poorly graded sands and silty sands with mean grain size in the range of 0.1 to 0.2 mm. Other factors that must be considered are groundwater, confining stresses, relative density, intensity and duration of ground shaking. It is generally held that soils possessing a clay content (particle size < 0.005mm) greater than fifteen (15) to twenty (20) percent may be considered non-liquefiable (Southern California Earthquake Center, 1999).

In consideration of the clayey nature of the onsite soils and the relatively stiff/dense soils, and lack of a shallow groundwater table at the project site, the potential for seismically induced liquefaction is considered remote.

4.6.4. Dynamic Settlement

Dynamic settlement occurs in response to an earthquake event in loose sandy earth materials. This potential of dynamic settlement at the subject site is considered to be remote due to the presence of well consolidated formational materials and the absence of loose, sandy soils after the remedial grading recommended herein is completed.

4.6.5. Seismically Induced Landsliding

The project site is situated in area of known and suspected landslides, and nearby projects have encountered landslides. Creep-affected Friars Formation was encountered in our soil borings and test pits excavated onsite. The possibility of seismically induced landsliding is considered to be "Moderate to High" in the site's current condition. Remedial grading is proposed herein to mitigate the risk of seismically induced landsliding to an acceptable level.

4.6.6. Seiches and Tsunamis

A seiche is a free- or standing-wave oscillation on the surface of water in an enclosed or semi-enclosed basin. The wave can be initiated by an earthquake and can vary in height from several centimeters to a few meters. The potential for a seiche impacting the property is considered to be unlikely due to its distance from an upstream large body of water.

4.7. Non-seismic Geologic Hazards

4.7.1. Mass Wasting

As discussed in Section 4.3.1, creep-affected Friars Formation was identified during our subsurface investigation. Based on our site reconnaissance and subsurface excavations, these materials are up to 58 feet thick and located above a bedding-parallel shear at the contact with the intact Friars Formation. The creep-affected Friars Formation is not considered stable in its current state and will require remedial grading. . Most of the creep-affected Friars Formation will be removed by design cuts and typical benching and keying during grading. To reduce the potential for future movement, mitigative measures in the form of shear keys and/or buttresses will be necessary to stabilize the as-graded site and minimize the potential for future failure to acceptable levels. These measures are discussed in more detail in Section 6.2 below.

4.7.2. Rock Fall

The potential for rock fall is considered to be very low given the lack of rock outcrops within the proposed limits of the development.

4.7.3. Flooding

According to FEMA flood maps, the site is mapped in a "Low to Moderate" Risk Area. In consideration of the proposed grades the potential for flooding is low.

4.7.4. Subsidence and Ground Fissuring

Owing to the relatively intact nature of the landslide debris and the remedial grading proposed herein, the potential for subsidence and ground fissuring after site development is considered low.

5.0 GEOTECHNICAL ENGINEERING

Presented herein is a general discussion of the geotechnical properties of the various soil types and the analytic methods used in this report.

5.1. Material Properties

5.1.1. Excavation Characteristics

Based on our previous experience with similar projects near the subject site and review of the information gathered during this and previous investigations, it is AGS's opinion that the surficial soil units onsite can be readily excavated with conventional grading equipment; however, deeper cuts within the creep-affected and the intact Friars Formation potentially require moderate to heavy ripping.

5.1.2. Compressibility

The onsite materials that are highly compressible include, undocumented fill, topsoil, alluvium, and colluvium. The creep-affected Friars Formation was observed to be relatively intact and accordingly is considered slightly compressible. Although not encountered during our field exploration, in-filled grabens related to translational movements may be encountered during grading. Should loose and compressible grabens be encountered during the mass grading these materials will require removal within structural areas. Highly compressible materials will require removal from fill areas prior to placement of fill and where exposed at grade in cut areas.

5.1.3. Collapse Potential/Hydro-Consolidation

The hydro-consolidation process is a singular response to the introduction of water into collapse-prone sandy soils. Upon initial wetting, the soil structure and apparent strength are altered and a virtually immediate settlement response occurs. Due to the relatively thin veneer of loose surficial soils and the mostly intact creep-affected Friars Formation, and the remedial grading proposed herein the risk of hydro-consolidation is considered "low" to "remote".

5.1.4. Expansion Potential

The subsurface investigation onsite encountered clayey surficial soils and fine-grained bedrock units. Based upon our subsurface investigation and experience on similar projects, the soils onsite are likely to exhibit a "low" to "high" expansion potential, although some thin beds within the bedrock may be encountered that have a "very high" expansion potential. Typical mitigation measures for expansive soils include: structural design, pre-saturation and overexcavation where the higher expansion characteristics are present. Final determination of expansion characteristics should be based on the as-graded conditions.

5.1.5. Shear Strength

Shear strength testing was conducted by AGS on "undisturbed" and remolded samples that were collected during this study (see Appendix C). Multi-cycle direct shear tests were performed to aid in determining residual shear strengths. The shear strengths recommended by AGS for design are presented in Table 5.1.5.

TABLE 5.1.5
RECOMMENDED SHEAR STRENGTHS FOR DESIGN

Material	Cohesion (psf)	Friction Angle (degrees)	Density (pcf)
Artificial Fill Compacted (afc)	200	28	125
Friars Formation – Creep affected (Tfc)	400	23	125
Basal Rupture Surface	100	8	120
Friars Formation (Tfi)	500	26	125
Stadium Conglomerate	500	35	135

5.1.6. Chemical and Resistivity Test Results

Corrosivity testing for sulfates, chlorides, etc. was not conducted as part of the scope of this investigation. Testing should be conducted during and upon completion of grading operations to evaluate the sulfate content and potential corrosivity on the onsite soils.

5.1.7. Earthwork Adjustments

The following average earthwork adjustment factors are presented for use in evaluating earthwork quantities. These numbers are considered approximate and should be refined during grading when actual conditions are better defined. Contingencies should be made to adjust the earthwork balance during grading if these numbers are adjusted.

TABLE 5.1.7 EARTHWORK ADJUSTMENTS	
Geologic Unit	**Approximate Range**
Undocumented Fill, Topsoil, Alluvium, and Colluvium	5% to 10% Shrink
Friars Formation – Creep-affected	5% to 10% Bulk
Friars Formation – Creep-affected (Grabens)	10% to 15% Shrink
Friars Formation – Intact	10% to 12% Bulk

5.1.8. Pavement Support Characteristics

Compacted fill derived from onsite soils and cuts within the Friars Formation is expected to possess “low” to “moderate” pavement support characteristics. Testing should be completed once subgrade elevations are reached for the onsite roadways. For preliminary planning purposes, AGS has used an R-Value of 20 for the preliminary design of roadway pavement sections.

5.2. Analytical Methods

5.2.1. Slope Stability Analysis

Stability analyses were performed for both static and seismic (pseudo-static) conditions using the GSTABL7 computer program. Arcuate failures were considered for fill slopes and for cut slopes exposing bedrock that was modeled to be dipping steeply, dipping into the slopes, or dipping oblique to the slope. In these cases across-bedding strengths were used for the analyzed failure surfaces in bedrock. Where the bedrock was assumed to be dipping out-of-slope or slightly steeper than the slope, wedge-type failures were assumed. The inclination of these beds was modeled in GSTABL7 to be consistent with the interpreted geologic structure in the area. The Modified Bishop method was used to analyze circular type failures and the Simplified Janbu Method was used to analyze block-type failures.

A pseudo-static analysis was used to evaluate the stability of slopes under seismic loading. A horizontal destabilizing seismic coefficient (kh) of 0.15 was selected for the site. The critical failure surface that was determined for the static analysis was also selected for the pseudo-static analysis. Pseudo-static analyses were generally not conducted where bedding angles were less than 12 degrees.

Surficial stability analyses were conducted using an infinite height slope method assuming seepage parallel to the slope surface.

5.2.2. Pavement Design

Preliminary asphalt concrete pavement sections have been designed using the recommendations and methods presented in the Caltrans Highway Design Manual.

5.2.3. Bearing Capacity and Lateral Pressure

Ultimate bearing capacity values were obtained using the graphs and formula presented in NAVFAC DM-7.1. Allowable bearing was determined by applying a factor of safety of at least 3 to the ultimate bearing capacity. Static lateral earth pressures were calculated using Rankine methods for active and passive cases.

6.0 GEOTECHNICAL CONCLUSIONS AND RECOMMENDATIONS

Based on the information presented herein, it is AGS's opinion that the proposed development of the Tyler Street Residential Development is feasible, from a geotechnical point of view, provided that the constraints discussed in this report and in future studies are addressed in the design and construction of the project. Presented below are issues identified by this study as possibly impacting site development. Recommendations to mitigate these issues and geotechnical recommendations for use in planning and design are presented in the following sections of this report.

All grading shall be accomplished under the observation and testing of the project Geotechnical Consultant in accordance with the recommendations contained herein, the current codes practiced by the City of Santee and this firm's Earthwork Specifications (Appendix E).

6.1. Site Preparation and Removals/Overexcavation

Guidelines to determine the depth of removals are presented below; however, the exact extent of the removals must be determined in the field during grading, when observation and evaluation of the greater detail afforded by those exposures can be performed by the Geotechnical Consultant. In general, removed soils will be suitable for reuse as compacted fill when free of deleterious materials and after moisture conditioning.

Removal of unsuitable soils typically should be established at a 1:1 projection to suitable materials outside the proposed engineered fills. Forecuts should be made no steeper than 1:1, except where constrained by other factors such as property lines, adverse geologic conditions, and protected structures, as discussed in Section 6.2.7, below. Flatter forecuts may be required near the existing residential structures to the north and where adverse geologic conditions are encountered. Removals should be initiated at approximately twice the distance of the anticipated removal depth, outside the engineered fills. The bottoms of all removal areas should be observed, mapped, and approved by the Geotechnical Consultant prior to fill placement. It is recommended the bottoms of removals be surveyed and documented.

6.1.1. Site Preparation

Existing vegetation, trash, debris, and other deleterious materials should be removed and wasted from the site prior to commencing removal of unsuitable soils and placement of compacted fill materials.

6.1.2. Unsuitable Soil Removals

Undocumented Fill, Topsoil, Alluvium, Colluvium, and creep-affected/highly weathered Friars Formation should be removed in areas planned to receive compacted fill intended to support settlement-sensitive structures such as buildings, roads and underground improvements. The resulting undercuts should be replaced with engineered fill.

The estimated depths of removals are presented in Table 6.1.2 and are depicted on Plate 1. It should be noted that local variations can be expected requiring an increase in the depth of removal for unsuitable and weathered deposits. The extent of removals can best be determined in the field during grading when observation and evaluation can be performed by the Soil Engineer and/or Engineering Geologist. Removal bottoms should be established in competent formational material/bedrock. The removal bottom should be observed and mapped by the engineering geologist prior to fill placement.

TABLE 6.1.2
ESTIMATED DEPTH OF REMOVALS

Geologic Unit (map symbol)	Estimated Removal Depth(ft)*
Topsoil	1-3
Undocumented Fill (afu)	2-8
Colluvium (Qcol)	2-4
Alluvium (Qal)	2-8
Friars Formation – Creep affected (Tfc)	5-30
Friars Formation – Intact (Tfi)	1-3

*Localized areas could be deeper

6.1.3. Removals Along Grading Limits and Property Lines

Removals of unsuitable soils will be required prior to fill placement along the project grading limits. Construction of the proposed shear key, removals and earthwork is feasible without extending outside of the property and into the ephemeral stream. A 1:1 projection, from toe of slope outward to competent materials should be established, when possible. Shoring or specialized grading techniques will likely be required to complete removals at the northerly limits where existing subjacent single-family residences are located, as discussed in Section 6.2.7, below.

6.1.4. Overexcavation of Building Pads and Streets

6.1.4.1. *Cut Lot Overexcavation*

Cut lots exposing competent Friars Formation should be overexcavated such that a minimum of five (5) feet is placed below the building pad. Where geologic transitions occur and expose non-expansive beds in contact with “medium” to “highly” expansive beds at pad grade, then deeper overexcavation will be required. It is anticipated that the required overexcavation in this case will be on the order of 7 to 10 feet. Deeper overexcavation may be required depending upon building types and loads and should be evaluated by a geotechnical engineer when the structure siting and design information are established. These should be determined during rough grading and when precise grading plans are proposed. To promote subsurface drainage so that the overexcavated lots do not trap infiltrating waters, the overexcavation bottom should be sloped towards the street or subdrainage systems at a minimum gradient of 1 percent. Deeper overexcavation may be considered for structures planned with deeper footings, swimming pools, etc. In addition, where steep cut/fill transitions are created, additional overexcavation and flattening of the transitions may be required.

6.1.4.2. *Cut/Fill Transition Lot Overexcavation*

Where design or remedial grading activities create a cut/fill transition on the lots, excavation of the cut or shallow fill portion should be performed such that at least five (5) feet of compacted fill exists over the pad. In areas where steep topography exists below the fill portion of a transition lot and/or transitions are created by remedial grading, layback of the canyon walls may be required. The undercut overexcavation should maintain a minimum one (1) percent gradient to the front of the lot. In addition, where steep cut/fill transitions are created, additional overexcavation and flattening of the transitions may be recommended. A deeper lot overexcavation is required if the layback transitions any portion of a building pad. The deeper overexcavation will be required such that the shallow fill portion of the lot is at least ⅓ the thickness of the deeper fill portion of the lot to a maximum overexcavation depth of 17 feet.

6.1.4.3. *Street Overexcavation*

Streets that are cut into Friars Formation could potentially pose excavation difficulties during utility and street installation. These materials may potentially require heavy ripping in deeper cut areas in order to get to utility excavation depth. During mass grading, where such materials are exposed, consideration should be given to undercutting the street/utility areas during mass grading to minimize this condition. The undercut should extend at least one foot below the deepest utility. The undercut zone should be replaced with compacted fill in accordance with project standards as outlined herein.

6.2. <u>Slope Stability and Remediation</u>

Proposed maximum slope heights to be created during grading are on the order of 45 feet or less for both cut and fill slopes.

6.2.1. Shear Key

The creep-affected bedrock overlying the basal shear zone will require stabilization. In addition, the bedrock has occasional, weak, clay-lined beds that may require stabilization in some areas. Stabilization of weak bedding planes will be accomplished through total removal and/or shear keys constructed to interrupt the weak bedding planes. Stabilization of the creep-affected bedrock overlying the basal shear zone will be accomplished by constructing a shear key extending below the basal shear zone along the northerly and northeasterly boundary of the site. The approximate location of the shear key is shown on Plate 1 and illustrated on the cross sections on Plate 2. The bottom of the shear key in our preliminary design is approximately 60 feet wide, extending below the basal rupture surface into competent Friars Formation. As more detailed grading plans develop, the design of this shear key will be refined. Additional subsurface exploration should also be performed as discussed in Section 8.0 to better define the limits of the creep-affected Friar's Formation and basal rupture surface. The ultimate design will be based upon the final 40-scale grading plans and data developed during future studies and will depict anticipated elevations at the bottom of the shear key, drain locations and diameters, etc.

6.2.2. Cut Slopes

The highest proposed cut slope is southwesterly superjacent to Lot 14 and is approximately 45 feet at a slope ratio of 2:1 (horizontal: vertical). Cut slopes are planned in creep-affected Friars Formation and intact Friars Formation. Cut slopes will be constructed in portions of the Friars Formation exposing claystone facies. Based upon the currently available information, we anticipate that stabilization fills will be required for all cut slopes onsite. Final determination should be made in the field by the project geologist. All stabilization fills will require backdrain systems as shown on Detail 3 (Appendix E). Additional backdrains could be required in backcuts where geologic contacts daylight in the backcuts. Terrace and downdrains should be constructed on all cuts slopes in conformance to the City of Santee Grading Ordinance.

6.2.3. Fill Slopes

Fill slopes on the project are designed at 2:1 ratios (horizontal to vertical). The highest anticipated fill slope is approximately 45 feet high, located northerly subjacent to Lot 5. Fill slopes, when properly constructed with onsite materials, are expected to be grossly stable as designed. Stability calculations supporting this conclusion are presented in Appendix D (Plates D-1 and D-2). Fill slopes will be subject to surficial erosion and should be landscaped as quickly as possible.

Keys should be constructed at the toe of all fill slopes "toeing" on existing or cut grade. Fill keys should have a minimum width equal to one-half the height of ascending slope, and not less than 15 feet. Unsuitable soil removals below the toe of proposed fill slopes should extend from the catch point of the design toe outward at a minimum 1:1 projection into approved material to establish the location of the key.

Terrace and down drains should be constructed on all cuts slopes in conformance to the City of Santee Grading Ordinance.

6.2.4. Skin Cut and Skin Fill Slopes

A review of the preliminary Grading Plan did not indicate any significant design skin fill and skin cut conditions, however, skin cut or thin fill sections may be created during grading. For all such conditions, it is recommended that a backcut and keyway be established such that a minimum fill thickness equal to one-half the remaining slope height, and not less than 15 feet, is provided. Where the design cut is insufficient to remove all unsuitable materials, overexcavation and replacement with a stabilization fill will be required, as shown on Grading Detail 6 in Appendix E.

6.2.5. Fill Over Cut Slopes

Fill over cut slopes should be constructed such that the cut portion is excavated first for geologic mapping and stability determination. If deemed stable then a "tilt-back" keyway half the remaining slope height or minimally fifteen (15) feet wide should be established. Drains will be required for this condition with the locations determined based upon exposed field conditions.

6.2.6. Surficial Stability

The surficial stability of 2:1 fill slopes, constructed in accordance with the recommendations presented herein, has been analyzed, and the analyses presented in Appendix D (Plate D-3) indicates factors-of-safety in excess of code minimums. When fill are properly constructed and maintained, satisfactory performance can be anticipated although slopes will be subject to erosion, particularly before landscaping is fully established.

6.2.7. Temporary Backcut/Forecut Stability

During grading operations, temporary backcuts/forecuts will occur due to grading logistics and during retaining wall construction. Backcuts and forecuts in favorably bedded creep-affected Friars Formation should be made no steeper than 1:1 (horizontal to vertical) to heights of up to 20 feet, and 1½:1 (horizontal: vertical) for heights greater than 20 feet. Flatter backcuts may be necessary where geologic conditions dictate, such as if unfavorably oriented discontinuities are present, and where minimum width dimensions are to be maintained. Future studies should present a more detailed evaluation of the stability of temporary cuts adjacent to existing improvements, including the forecuts needed for the stabilization shear keys below offsite adjacent properties.

In consideration of the inherent instability created by temporary construction of backcuts, it is imperative that grading schedules be coordinated to minimize the unsupported exposure time of these excavations. Once started these excavations and subsequent fill operations should be maintained to completion without intervening delays imposed by avoidable circumstances. In cases where five-day workweeks comprise a normal schedule, grading should be planned to avoid exposing at-grade or near-grade excavations through a non-work weekend. Where improvements may be affected by temporary instability, either on or offsite, further restrictions such as slot cutting, installing shear piles and/or tiebacks, extending work days, implementing weekend schedules, and/or other requirements considered critical to serving specific circumstances may be imposed.

6.2.8. Observation During Grading

All temporary slope excavations, including front, side and backcuts, and all cut slopes should be mapped to verify the geologic conditions that were modeled prior to grading.

6.3. Survey Control During Grading

Removal bottoms fill keys, stabilization fill keys, and backdrains should be surveyed prior to final observation and approval by the geotechnical engineer/engineering geologist in order to verify locations and gradients.

6.4. Subsurface Drainage

Due to the lack of well-defined drainages within the project site, canyon subdrains are not anticipated.

6.5. Seepage

Seepage, when encountered during grading, should be evaluated by the Geotechnical Consultant. In general, seepage is not anticipated to adversely affect grading. However if significant amounts of seepage is encountered, remedial measures such as horizontal drains or under drains may need to be installed.

6.6. Earthwork Considerations

6.6.1. Compaction Standards

All fills should be compacted at least 90 percent of the maximum dry density as determined by ASTM D1557. All loose and or deleterious soils should be removed to expose firm native soils or bedrock. Prior to the placement of fill, the upper 6 to 8 inches should be ripped, moisture conditioned to optimum moisture or slightly above optimum, and compacted to a minimum of 90 percent of the maximum dry density (ASTM D1557). Fill should be placed in thin (6 to 8-inch) lifts, moisture conditioned to optimum moisture or slightly above, and compacted to 90 percent of the maximum dry density (ASTM D1557) until the desired grade is achieved.

6.6.2. Benching

Where the natural slope is steeper than 5-horizontal to 1-vertical and where determined by the Geotechnical Consultant, compacted fill material shall be keyed and benched into competent materials.

6.6.3. Mixing and Moisture Control

In order to prevent layering of different soil types and/or different moisture contents, mixing and moisture control of materials will be necessary. The preparation of the earth materials through mixing and moisture control should be accomplished prior to and as part of the compaction of each fill lift. Water trucks or other water delivery means may be necessary for moisture control. Discing may be required when either excessively dry or wet materials are encountered.

6.6.4. Haul Roads

All haul roads, ramp fills, and tailing areas shall be removed prior to engineered fill placement.

6.6.5. Import Soils

The project is proposed to balance on site. If this changes the Geotechnical Consultant should be contacted.

6.6.6. Fill Slope Construction

Fill slopes may be constructed by preferably overbuilding and cutting back to the compacted core or by back-rolling and compacting the slope face. The following recommendations should be incorporated into construction of the proposed fill slopes.

Care should be taken to avoid spillage of loose materials down the face of any slopes during grading. Spill fill will require complete removal before compaction, shaping and grid rolling.

Seeding and planting of the slopes should follow as soon as practical to inhibit erosion and deterioration of the slope surfaces. Proper moisture control will enhance the long-term stability of the finish slope surface.

6.6.6.1. *Overbuilding Fill Slopes*

Fill slopes should be overfilled to an extent determined by the contractor, but not less than 2 feet measured perpendicular to the slope face, so that when trimmed back to the compacted core, the compaction of the slope face meets the minimum project requirements for compaction.

Compaction of each lift should extend out to the temporary slope face. The sloped should be back-rolled at fill intervals not exceeding 4 feet in height unless a more extensive overfilling is undertaken.

6.6.6.2. *Compacting the Slope Face*

As an alternative to overbuilding the fill slopes, the slope faces may be back-rolled with a heavy-duty loaded sheepsfoot or vibratory roller at maximum 4-foot fill height intervals. Back-rolling at more frequent intervals may be required. Compaction of each fill should extend to the face of the slope. Upon completion, the slopes should be watered, shaped, and track-walked with a D-8 bulldozer or similar equipment until the compaction of the slope face meets the minimum project requirements. Multiple passes may be required.

6.6.7. Utility Trench Excavation and Backfill

All utility trenches should be shored or laid back in accordance with applicable OSHA standards. Excavations in bedrock areas should be made in consideration of underlying geologic structure. The geotechnical consultant should be consulted on these issues during construction.

Mainline and lateral utility trench backfill should be compacted to at least 90 percent of maximum dry density as determined by ASTM D 1557. Onsite soils will not be suitable for use as bedding material but will be suitable for use in backfill, provided oversized materials are removed. No surcharge loads should be imposed above excavations. This includes spoil piles, lumber, concrete trucks or other construction materials and equipment. Drainage above excavations should be directed away from the banks. Care should be taken to avoid saturation of the soils.

Compaction should be accomplished by mechanical means. Jetting of native soils will not be acceptable.

To reduce moisture penetration beneath the slab-on-grade areas, shallow utility trenches should be backfilled with lean concrete or concrete slurry where they intercept the foundation perimeter, or such excavations can be backfilled with native soils, moisture-conditioned to over optimum, and compacted to a minimum of 90 percent relative compaction.

7.0 DESIGN RECOMMENDATIONS

From a geotechnical perspective, the proposed development is feasible provided the following recommendations are incorporated into the design and construction. Preliminary design recommendations are presented herein and are based on some of the general soils conditions encountered during the recent investigation. As such, recommendations provided herein are considered preliminary and subject to change based on the results of additional observation and testing that will occur during grading operations. Final design recommendations should be provided in a final grading report.

7.1. Foundation Design

Due to the presence of potentially expansive soils and potential for some of the slightly compressible Creep-affected Friars Formation to be left-in-place, it is recommended that the proposed residential structures be supported on post-tensioned slab/foundation systems. Ancillary improvements may be supported on conventionally reinforced foundations. The design of foundation systems should be based on as-graded conditions as determined after grading completion. The following values may be used in preliminary foundation design:

Allowable Bearing: 2000 psf.

Lateral Bearing: 250 psf. per foot of depth to a maximum of 2000 psf. for level conditions. Reduced values may be appropriate for descending slope conditions.

Sliding Coefficient: 0.30

The above values may be increased as allowed by Code to resist transient loads such as wind or seismic. Building code and structural design considerations may govern. Depth and reinforcement requirements and should be evaluated by a qualified engineer.

7.1.1. Conventional Slab Recommendations

The expansion potential is anticipated to range from "Low to High". Based on information supplied by the CBC-2013 conventional foundation systems should be designed in accordance with Section 7.1 and Table 7.1.1.

TABLE 7.1.1
CONVENTIONALLY REINFORCED FOUNDATION DESIGN RECOMMENDATIONS

Expansion Potential	Low to Medium	High
Footing Depth Below Lowest Adjacent Finish Grade	18 inches	24 inches
Footing Width	12 inches	15 inches
Footing Reinforcement		
One-Story	No. 4 rebar, two (2) on top and two (2) on bottom or No. 5 rebar one (1) on top and one (1) on bottom	No. 5 rebar, two (2) on top and two (2) on bottom
Two-Story	No. 4 rebar, two (2) on top and two (2) on bottom or No. 5 rebar one (1) on top and one (1) on bottom	No. 5 rebar, two (2) on top and two (2) on bottom
Slab Thickness	4 inches (actual)	4 inches (actual)
Slab Reinforcement	No. 3 rebar spaced 15 inches on center, each way	No. 3 rebar spaced 12 inches on center, each way
Slab Subgrade Moisture	Minimum of 120% of optimum moisture 24 hours prior to placing concrete.	Minimum of 130% of optimum moisture 48 hours prior to placing concrete.

Footing Embedment Next to Swales and Slopes

If exterior footings adjacent to drainage swales are to exist within five (5) feet horizontally of the swale, the footing should be embedded sufficiently to assure embedment below the swale bottom is maintained. Footings adjacent to slopes should be embedded such that a least seven (7) feet are provided horizontally from edge of the footing to the face of the slope.

Garages

A grade beam reinforced continuously with the garage footings shall be constructed across the garage entrance, tying together the ends of the perimeter footings and between individual spread footings. This grade beam should be embedded at the same depth as the adjacent perimeter footings. A thickened slab, separated by a cold joint from the garage beam, should be provided at the garage entrance. Minimum dimensions of the thickened edge shall be six (6) inches deep. Footing depth, width and reinforcement should be the same as the structure. Slab thickness, reinforcement and underslab treatment should be the same as the structure.

7.1.2. Post-Tensioned Slab Foundation System Design Recommendations

We recommend that Post-Tensioned slab foundation systems be considered for all residential foundations. Minimally, AGS recommends that Post-Tensioned slabs should be considered for lots that exhibit "Medium" to "High" expansion conditions. Final foundation design should be provided by the project geotechnical engineer based upon the as-graded conditions.

Preliminary geotechnical engineering design and construction parameters for post-tensioned slab foundations are foundation systems should be designed in accordance with Section 7.1 and Table 7.1.2.

TABLE 7.1.2
POST TENSIONED DESIGN PARAMETERS

Expansion Potential	Lot Category	Center Lift		Edge Lift	
		Em (ft)	Ym (in)	Em (ft)	Ym (in)
Very Low to Low	I	9	0.23	5.4	0.54
Medium	II	9	0.38	4.6	0.9
High	III	7.5	0.51	3.9	1.26

PRESATURATION

Very Low to Low-
Minimum of 100 percent of optimum moisture prior to placing concrete to a depth of 12 inches

Medium Expansion-
Minimum of 120 percent of optimum moisture 24 hours prior to placing concrete.

High Expansion-
Minimum of 130 percent of optimum moisture 48 hours prior to placing concrete.

- Post-tensioned slabs should incorporate a perimeter-thickened edge to reduce the potential for moisture infiltration, seasonal moisture fluctuation and associated differential movement around the slab perimeter. Design and construction of the post-tensioned foundations should be undertaken by firms experienced in the field. It is the responsibility of the foundation design engineer to select the design methodology and properly design the foundation system for the onsite soils conditions. The slab designer should provide deflection potential to the project architect/structural engineer for incorporation into the design of the structure.
- The project foundation design engineer should use the Post-Tensioning Institute (PTI) foundation design procedures as described in CBC (2013), based upon appropriate soil design parameters relating to edge moisture variation and differential swell provided by the geotechnical consultant at the completion of rough grading operations.
- A vapor/moisture barrier is recommended below all moisture sensitive areas.

7.1.3. Total and Differential Settlement

In addition to the potential effects of expansive soils, the proposed residential structures should be designed in anticipation of total and differential settlements. The following lot categories are presented based upon anticipated settlement, fill thickness and expansion potential.

Category I

"Very low to low" expansion potential and fill depths less than 50 feet. Minimum fill depth meets h/3 criteria where h is the maximum fill thickness.

Total = 3/4 inch

Differential = 3/8 inch in 20 feet

Category II

"Medium" expansion potential and/or fill depths less than 50 feet. Minimum fill depth meets h/5 criteria where h is the maximum fill thickness.

Total = 3/4 inch

Differential = 1/2 inch in 20 feet

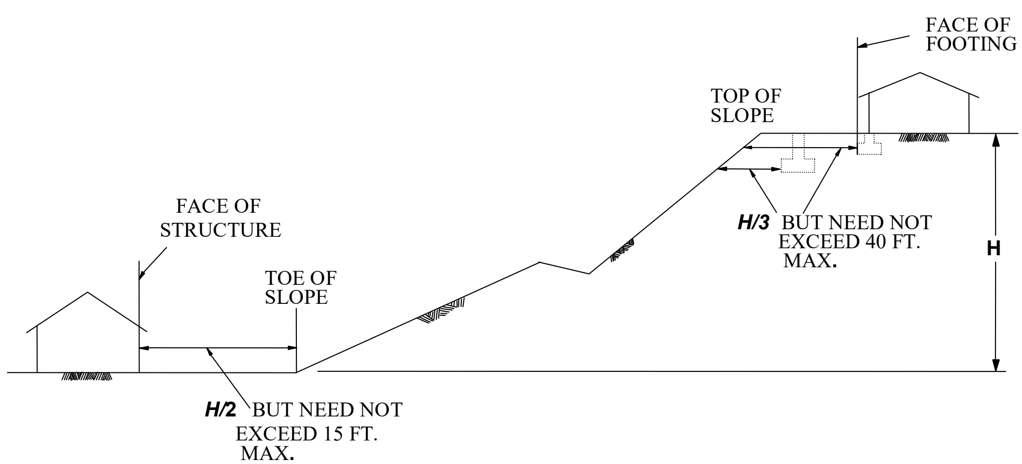
7.1.4. Deepened Footings and Setbacks

Improvements constructed in proximity to natural slopes or properly constructed, manufactured slopes can, over a period of time, be affected by natural processes including gravity forces, weathering of surficial soils and long-term (secondary) settlement. Most building codes, including the California Building Code, require that structures be set back or footings deepened where subject to the influence of these natural processes.

For the subject site, where foundations for residential structures are to exist in proximity to slopes, the footings should be embedded to satisfy the requirements presented in the following figure.

FIGURE 7.1.4

Setback Dimensions (CBC, 2013)



7.1.5. Moisture and Vapor Barrier

A moisture and vapor retarding system should be placed below the slabs-on-grade in portions of the structure considered to be moisture sensitive. The retarder should be of suitable composition, thickness, strength and low permeance to effectively prevent the migration of water and reduce the transmission of water vapor to acceptable levels. Historically, a 10-mil plastic membrane, such as *Visqueen*, placed between one to four inches of clean sand, has been used for this purpose. More recently Stego® Wrap or similar underlayments have been used to lower permeance to effectively prevent the migration of water and reduce the transmission of water vapor to acceptable levels. The use of this system or other systems, materials or techniques can be considered, at the discretion of the designer, provided the system reduces the vapor transmission rates to acceptable levels.

7.2. Retaining Wall Design

The foundations for retaining walls of appurtenant structures structurally separated from the building structure may bear on properly compacted fill. The foundations may be designed in accordance with the recommendations provided in Section 7.1.1, Conventionally Reinforced Foundation Design Parameters. When calculating the lateral resistance, the upper 12 inches of soil cover should be ignored in areas that are not covered with hardscape. Retaining wall footings should be designed to resist the lateral forces by passive soil resistance and/or base friction as recommended for foundation lateral resistance.

Retaining walls should be designed to resist earth pressures presented in the following table. These values assume that the retaining walls will be backfilled with select materials as shown in Detail RTW-A. The type of backfill ("select")) should be specified by the wall designer and shown on the plans. Retaining walls should be designed to resist additional loads such as construction loads, temporary loads, and other surcharges as evaluated by the structural engineer.

TABLE 7. 2
RETAINING WALL EARTH PRESSURES

"Select" Backfill Materials (γ=125pcf, phi=30°, EI$\leq$50)				
	Level Backfill		Sloping (2:1) Backfill	
	Rankine Coefficients	Equivalent Fluid Pressure (psf / lineal foot)	Rankine Coefficients	Equivalent Fluid Pressure (psf / lineal foot)
Active Pressure	K_a = 0.33	42	K_a = 0.54	67
Passive Pressure	K_p = 3.00	375	K_p = 1.49	186
At Rest Pressure	K_o = 0.50	63	K_o = 0.72	90

In addition to the above static pressures, unrestrained retaining walls located should be designed to resist seismic loading as required by the 2013 CBC. The seismic load can be modeled as a thrust load applied at a point 0.6H above the base of the wall, where H is equal to the height of the wall. This seismic load (in pounds per lineal foot of wall) is represented by the following equation:

$$Pe = \frac{3}{8} * \gamma * H^2 * k_h$$

Where:

Pe = Seismic thrust load

H = Height of the wall (feet)

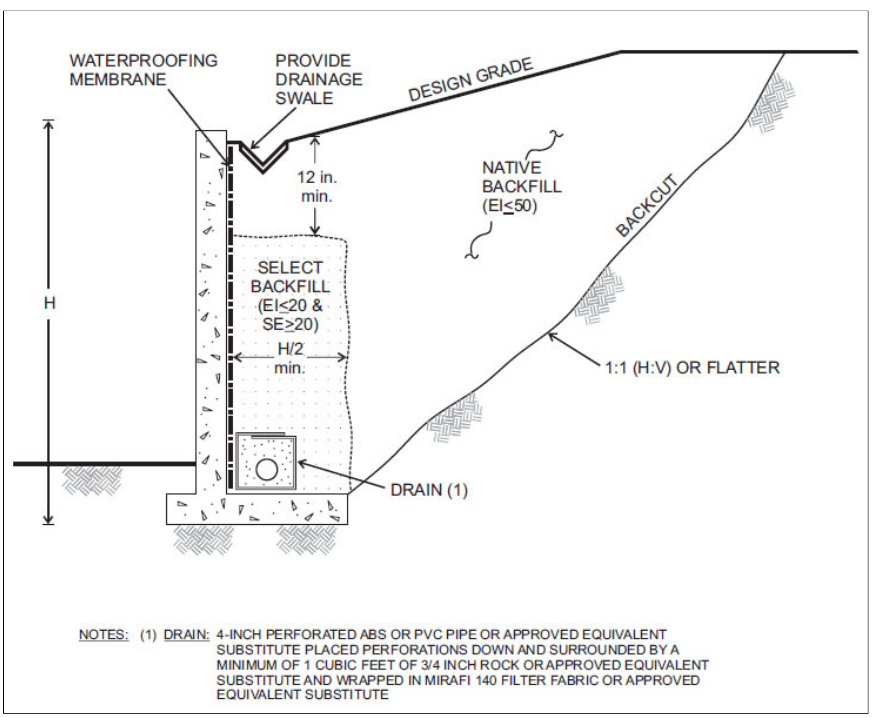
γ = soil density = 125 pounds per cubic foot (pcf)

k_h = seismic pseudostatic coefficient = 0.5 * peak horizontal ground acceleration / g

The peak horizontal ground accelerations are provided in Section 7.3. Walls should be designed to resist the combined effects of static pressures and the above seismic thrust load.

Retaining walls should be provided with a drainage system adequate to prevent the buildup of hydrostatic forces as shown in Details RTW-A. Otherwise, the retaining walls should be designed to resist hydrostatic forces. Proper drainage devices should be installed along the top of the wall backfill and should be properly sloped to prevent surface water ponding adjacent to the wall. In addition to the wall drainage system, for building perimeter walls extending below the finished grade, the wall should be waterproofed and/or damp-proofed to effectively seal the wall from moisture infiltration through the wall section to the interior wall face.

Detail RTW-A



The wall should be backfilled with granular soils placed in loose lifts no greater than 8-inches thick, at or near optimum moisture content, and mechanically compacted to a minimum 90 percent of the maximum dry density as determined by ASTM D1557. Flooding or jetting of backfill materials generally do not result in the required degree and uniformity of compaction and, therefore, is not recommended. No backfill should be placed against concrete until minimum design strengths are achieved as verified by compression tests of cylinders. The geotechnical consultant should observe the retaining wall footings, back drain installation, and be present during placement of the wall backfill to confirm that the walls are properly backfilled and compacted.

7.3. Seismic Design

The following seismic design parameters are presented to be code compliant to the California Building Code (2013). The subject lot has been identified to be Site Class "D" in accordance with CBC, 2013, Section 1613.3.2 and ASCE 7, Chapter 20. The lot is located at Latitude 32.827°N, and Longitude 117.010°W. Utilizing this information, the United States Geological Survey (USGS) web tool (http://earthquake.usgs.gov/hazards/designmaps/) and ASCE 7 criterion, the mapped seismic acceleration parameters S_S, for 0.2 seconds and S_1, for 1.0 second period (CBC, 2013, 1613.3.1) for Risk-Targeted Maximum Considered Earthquake (MCE_R) can be determined. The mapped acceleration parameters are provided for Site Class “B”. Adjustments for other Site Classes are made, as needed, by utilizing Site Coefficients F_a and F_v for determination of MCE_R spectral response acceleration parameters S_{MS} for short periods and S_{M1} for 1.0 second period (CBC, 2013 1613.3.3). Five-percent damped design spectral response acceleration parameters S_{DS} for short periods and S_{D1} for 1.0 second period can be determined from the equations in CBC, 2013, Section 1613.3.4.

TABLE 7.3
SEISMIC DESIGN CRITERIA

Mapped Spectral Acceleration (0.2 sec Period), S_S	0.873g
Mapped Spectral Acceleration (1.0 sec Period), S_1	0.339g
Site Coefficient, F_a	1.151
Site Coefficient, F_v	1.721
MCE Spectral Response Acceleration (0.2 sec Period), SM_S	1.005g
MCE Spectral Response Acceleration (1.0 sec Period), SM_1	0.584g
Design Spectral Response Acceleration (0.2 sec Period), SD_S	0.670g
Design Spectral Response Acceleration (1.0 sec Period), SD_1	0.389g

Using the United States Geological Survey (USGS) web-based ground motion calculator, the site class modified PGA_M (F_{PGA}*PGA) was determined to be 0.387g. This value does not include near-source factors that may be applicable to the design of structures on site.

7.4. Civil Design Recommendations

7.4.1. Drainage

Final site grading should assure positive drainage away from structures. Planter areas should be provided with area drains to transmit irrigation and rain water away from structures. The use of gutters and down spouts to carry roof drainage well away from structures is recommended. Raised planters should be provided with a positive means to remove water through the face of the containment wall.

All water should be diverted along a relatively impervious channel away from the top of the slope as to not impact the stability of the slope nor erode the slope face.

7.4.2. Water Quality Basins

Based on the results of our subsurface exploration and experience with similar projects, infiltration is not recommended. Infiltration of any appreciable rate or volume is not practical due to clayey soils onsite, which when in-situ or used for engineered fill will possess infiltration rates on the order of 0.0 to 0.10 in/hr. Based on our review of NRCS moil maps, the site is mapped as “Diablo Clay – 15 to 30% slopes (DaE)”, which is a USDA hydrologic soil group “D” soil. Type “D” soils generally possess infiltration rates on the order of 0 to 0.5in/hr.

Furthermore, infiltration could substantially increase the risk of geotechnical hazards, such as negatively affect the long term stability of onsite slopes, result in water in utility trenches, etc. Accordingly, we recommend that basins be lined with an impermeable liner.

7.4.3. Pavement Design

Final pavement design should be made based upon sampling and testing of post-grading conditions. For preliminary design and estimating purposes the pavement structural sections presented in Table 7.4.3 can be used for the range of likely traffic indices. The structural sections are based upon an assumed R-Value of 20.

TABLE 7.4.3
PRELIMINARY ASPHALT CONCRETE PAVEMENT SECTIONS

Traffic Index	Asphalt Concrete (inches)	Class 2 Aggregate Base (inches)
5.0	3	8
5.5	3	9
6.0	4	9

Pavement subgrade soils should be at or near optimum moisture content and the upper one foot should be compacted to a minimum of 90 percent of the maximum dry density as determined by ASTM D1557. Aggregate base should be compacted to a minimum of

95 percent of the maximum dry density as determined by ASTM D1557 and should conform with the specifications listed in Section 26 of the *Standard Specifications for the State of California Department of Transportation* (Caltrans) or Section 200-2 of the *Standard Specifications for Public Works Construction* (Green Book). The asphalt concrete should conform to Section 26 of the Caltrans *Standard Specifications* or Section 203-6 of the Green Book.

8.0 FUTURE STUDY NEEDS

This report represents a Tentative Map level review of the Tyler Street project. Additional subsurface exploration will be required to further define the distribution of geologic units onsite and to aid in the design of shear keys, buttresses and other mitigative geotechnical site conditions. Additional data should be obtained to evaluate the limits of the creep-affected Friars Formation and evaluate the presence of grabens and infilled features. Additional data should be obtained about the depth and geometry of the basal shear zone, which will be needed to further evaluate the long-term stability of the site and temporary stability of backcuts and forecuts necessary for removals and to construct shear keys and buttresses. Future geotechnical reviews of grading plans and foundation plans will also be necessary.

These plans should be forwarded to the project geotechnical engineer/geologist for evaluation and comment, as necessary.

9.0 CLOSURE

9.1. Geotechnical Review

As is the case in any grading project, multiple working hypotheses are established utilizing the available data, and the most probable model is used for the analysis. Information collected during the grading and construction operations is intended to evaluate the hypotheses, and some of the assumptions summarized herein may need to be changed as more information becomes available. Some modification of the grading and construction recommendations may become necessary, should the conditions encountered in the field differ significantly than those hypothesized to exist.

AGS should review the pertinent plans and sections of the project specifications, to evaluate conformance with the intent of the recommendations contained in this report.

If the project description or final design varies from that described in this report, AGS must be consulted regarding the applicability of, and the necessity for, any revisions to the recommendations presented herein. AGS accepts no liability for any use of its recommendations if the project description or final design varies and AGS is not consulted regarding the changes.

9.2. Limitations

This report is based on the project as described and the information obtained from the test pits and the borings at the locations indicated on the plan. The findings are based on the review of the field and laboratory data combined with an interpolation and extrapolation of conditions between and beyond the exploratory excavations. The results reflect an interpretation of the direct evidence obtained. Services performed by AGS have been conducted in a manner consistent with that level of care and skill ordinarily exercised by members of the profession currently practicing in the same locality under similar conditions. No other representation, either expressed or implied, and no warranty or guarantee is included or intended.

The recommendations presented in this report are based on the assumption that an appropriate level of field review will be provided by geotechnical engineers and engineering geologists who are familiar with the design and site geologic conditions. That field review shall be sufficient to confirm that geotechnical and geologic conditions exposed during grading are consistent with the geologic representations and corresponding recommendations presented in this report. AGS should be notified of any pertinent changes in the project plans or if subsurface conditions are found to vary from those described herein. Such changes or variations may require a re-evaluation of the recommendations contained in this report.

The data, opinions, and recommendations of this report are applicable to the specific design of this project as discussed in this report. They have no applicability to any other project or to any other location, and any and all subsequent users accept any and all liability resulting from any use or reuse of the data, opinions, and recommendations without the prior written consent of AGS.

AGS has no responsibility for construction means, methods, techniques, sequences, or procedures, or for safety precautions or programs in connection with the construction, for the acts or omissions of the CONTRACTOR, or any other person performing any of the construction, or for the failure of any of them to carry out the construction in accordance with the final design drawings and specifications.

Appendix A

References

References

American Concrete Institute, 2002, Building Code Requirements for Structural Concrete (ACI318M-02) and Commentary (ACI 318RM-02), ACI International, Farmington Hills, Michigan.

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---. Final As-Graded Geotechnical Report, Prospect Hills II, Project No. 7051, dated October 30, 1998.

Appendix B

Subsurface Investigation

BORING NUMBER BA-1

AGS ADVANCED GEOTECHNICAL SOLUTIONS, INC.

CLIENT Tyler Development LLC
PROJECT NAME Tyler Street
PROJECT NUMBER 1310-04
PROJECT LOCATION Santee, CA
DATE STARTED 2/8/16 **COMPLETED** 2/8/16
GROUND ELEVATION 478 ft **HOLE SIZE** 30
DRILLING CONTRACTOR Dave's Drilling
GROUND WATER LEVELS:
DRILLING METHOD Bucket Auger
AT TIME OF DRILLING ---
LOGGED BY PJD **CHECKED BY** PJD
AT END OF DRILLING ---
NOTES 0-27' 4500lbs; 27-51' 3500lbs, 51-82' 2500lbs, >82' 1000lbs
AFTER DRILLING 60.00 ft / Elev 418.00 ft

ELEVATION (ft)	DEPTH (ft)	GRAPHIC LOG	USCS	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	BLOW COUNTS (N VALUE)	DRY UNIT WT. (pcf)	MOISTURE CONTENT (%)	SATURATION (%)	FINES CONTENT (%)	OTHER TESTS
	0		SC	**Topsoil** SANDY CLAY to CLAYEY SAND, fine to medium grained sand, brown, moist, loose/soft.							
475			CL	**Colluvium (Qcol)** SANDY CLAY to CLAYEY SAND, fine to medium grained sand, yellowish brown to grayish brown, moist, stiff/moderately dense.							
	5			**Friars Formation - Creep Affected (Tfc)** SANDSTONE, fine to medium grained sand with some clay, off white to very pale yellowish brown, slightly moist, soft to moderately hard; near vertical clay soil infill/inclusions.	MC	4					
470				@7.25 ft. Clay seam, continuous, weakly remolded 1/8" to 1/2" thick. N66°W/12-14°NE							
	10			@9 ft. Rounded pebble lense with discontinuous clay seam. N18°E/3°NW	MC	10					
465				@11 ft. Cobbly, rounded Poway clasts to 6" diameter in soft SANDSTONE matrix, moist.							
	15			@14.5 ft. Irregular contact with pebble conglomerate in soft SANDSTONE matrix.							
460				@17 ft. Cobble conglomerate, soft; carbonate nodules to 2" diameter.	BU						
	20			@21 ft. CLAYEY SANDSTONE lens, soft to moderately hard; micaceous. N10°E/4-10°NW							
455				@23 ft. Becomes wet, soft carbonate zone. @23.5 ft. Becomes soft.							
	25			@25 ft. Cobble conglomerate in SANDSTONE matrix, wet, soft.							
450				@26.5 ft. Irregular contact; minor clay development; discontinuous, 6" thick highly weathered zone beneath abundant iron oxide. N65°W/3°NE							
				CLAYSTONE, olive brown to medium brown, slightly moist, stiff; tightly fractured; polished surfaces. @28 ft. Soft.							
	30			@30 ft. Thin sandy lens with claystone clasts to 1/2", random angular rock fragments.	MC	5					
445				@31-32 ft. Clay seam, olive green, soft, weakly remolded, continuous, paper thin to 1/8". N70°E/26°NW							
	35										

(Continued Next Page)

CLIENT Tyler Development LLC **PROJECT NAME** Tyler Street

PROJECT NUMBER 1310-04 **PROJECT LOCATION** Santee, CA

ELEVATION (ft)	DEPTH (ft) 35	GRAPHIC LOG	USCS	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	BLOW COUNTS (N VALUE)	DRY UNIT WT. (pcf)	MOISTURE CONTENT (%)	SATURATION (%)	FINES CONTENT (%)	OTHER TESTS
440				@37-39.5 ft. Shear zone, brown to olive, soft, weakly remolded, continuous, paper thin. N35°E/30°NW							
	40			@39.5-41 ft. Highly fractured zone. @40 ft. CLAYSTONE, brown to olive greenish gray, slightly moist, very stiff; plastic, polished surfaces. @41 ft. Fracture, discontinuous, steeply dipping, polished surfaces with striations. N80°E/50°NW	MC	5					
435											
	45			@44 ft. CLAYEY SILTSTONE with fine sand to CLAYEY fine SANDSTONE, dark olive gray, hard; polished surfaces.							
430				@46.5 ft. Steep fracture, seepage, discontinuous. N50°E/15-30°NW							
	50				MC	7					
425											
	55										
420				@58 ft. Basal Shear, paper thin to 1/8" thick, continuous, remolded; iron oxide staning; seepage. N65°W/6°NE							
	60			**Friars Formation - Intact (Tfi)** SANDY SILTSTONE to SILTY SANDSTONE, fine grained sand, dark bluish gray, very hard. @60 ft. Groundwater encountered.							
415											
	65										

TD = 65 ft.
Groundwater encountered at 60 ft.

AGS
ADVANCED GEOTECHNICAL SOLUTIONS, INC.

BORING NUMBER BA-2

- **CLIENT** Tyler Development LLC
- **PROJECT NAME** Tyler Street
- **PROJECT NUMBER** 1310-04
- **PROJECT LOCATION** Santee, CA
- **DATE STARTED** 2/9/16 **COMPLETED** 2/9/16
- **GROUND ELEVATION** 468 ft **HOLE SIZE** 30
- **DRILLING CONTRACTOR** Dave's Drilling
- **GROUND WATER LEVELS:**
- **DRILLING METHOD** Bucket Auger
  - **AT TIME OF DRILLING** ---
- **LOGGED BY** FE **CHECKED BY** PJD
  - **AT END OF DRILLING** ---
- **NOTES**
  - **AFTER DRILLING** ---

ELEVATION (ft)	DEPTH (ft)	GRAPHIC LOG	USCS	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	BLOW COUNTS (N VALUE)	DRY UNIT WT. (pcf)	MOISTURE CONTENT (%)	SATURATION (%)	FINES CONTENT (%)	OTHER TESTS
	0		SC	**Topsoil** CLAYEY SAND, dark brown, very moist, loose; some rounded gravel.							
465											
	4			**Friars Formation - Intact (Tfi)** Highly weathered, SILTSTONE and CLAYEY SANDSTONE, brownish gray, slightly moist, soft to moderately hard.							
	5				MC	5					
460					BU						
	10				MC	5					
				@11 ft. Some CLAYSTONE clasts and abundant rounded Poway clasts to 6" diameter.							
455											
	15										
450											
				@19 ft. Cobbles to 6" diameter.							
	20										
				@21 ft. Rounded gravel and cobbles to 6" diameter in a CLAYEY SANDSTONE matrix, abundant randomly oriented carbonate nodules.							
445											
				@24 ft. Very moist.							
	25			@25 ft. Clay lined cobbles.							
	27			CLAYSTONE, olive and pale red, moist, moderately soft; tightly fractured with well defined striations. Groundwater seepage along steeply dipping fractures. @28 ft. Fracture, N10°E/32°NW							
440											
	30				MC	10					
	32			@32 ft. Grades to CLAYEY SANDSTONE, grayish brown, moist, moderately soft. @33 ft. CLAYSTONE, pale red, moist, moderately soft, fractured, surfaces with polished striations, minor							
435											
	35										

(Continued Next Page)

CLIENT Tyler Development LLC
PROJECT NAME Tyler Street
PROJECT NUMBER 1310-04
PROJECT LOCATION Santee, CA

ELEVATION (ft)	DEPTH (ft)	GRAPHIC LOG	USCS	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	BLOW COUNTS (N VALUE)	DRY UNIT WT. (pcf)	MOISTURE CONTENT (%)	SATURATION (%)	FINES CONTENT (%)	OTHER TESTS
	35			manganese oxide development.							
430											
	40				MC	6					
				@41 ft. Some white carbonate nodules to 1" diameter.							
425											
				@44 ft. Clay seam, discontinuous. N-S/56°W							
	45										
				@46 ft. CLAYEY SILTSTONE, light gray to gray, moist, moderately hard; trace white carbonate nodules to 1/8" diameter.							
420											
	50			@50 ft. SILTY CLAYSTONE, pale red with olive mottling, moderately hard to soft.	MC	8					
				@52 ft. Yellowish brown and olive, trace manganese oxide on polished surfaces.							
415											
				@54 ft. Clay seam, gray, very moist, continuous, remolded, highly plastic. N20°W/65°NE							
	55			SILTSTONE, bluish gray, slightly moist, very hard, massive.							
410											
	60			@60 ft. Tightly fractured, polished surfaces with striations, weak carbonate cementation.	MC	15					
405											
	65										

TD = 65 ft.
Seepage at 27 ft.

BORING NUMBER BA-3

AGS
ADVANCED GEOTECHNICAL SOLUTIONS, INC.

CLIENT Tyler Development LLC
PROJECT NAME Tyler Street
PROJECT NUMBER 1310-04
PROJECT LOCATION Santee, CA
DATE STARTED 2/9/16 **COMPLETED** 2/10/16
GROUND ELEVATION 440 ft **HOLE SIZE** 30
DRILLING CONTRACTOR Dave's Drilling
GROUND WATER LEVELS:
DRILLING METHOD Bucket Auger
AT TIME OF DRILLING ---
LOGGED BY FE **CHECKED BY** PJD
AT END OF DRILLING ---
NOTES
AFTER DRILLING ---

ELEVATION (ft)	DEPTH (ft)	GRAPHIC LOG	USCS	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	BLOW COUNTS (N VALUE)	DRY UNIT WT. (pcf)	MOISTURE CONTENT (%)	SATURATION (%)	FINES CONTENT (%)	OTHER TESTS
440	0			**Artificial Fill - Undocumented (afu)** Rounded GRAVEL and COBBLES to 4" diameter in a SANDY CLAY matrix, brown, moist, soft.							
435	5		CL	**Alluvium (Qal)** SANDY CLAY, dark grayish brown, moist, stiff; some cobbles to 3" diameter.							
				Friars Formation - Creep Affected (Tfc) CLAY, pale red to olive, moist, stiff.							
430	10										
				@13 ft. Abundant carbonate clasts to 5" diameter.							
425	15										
420	20										
415	25										
				@28ft. Undulating contact/weakly developed shear zone, brecciated; minor seepage.							
410	30			SILTSTONE, gray to light gray, moist, tightly fractured, well cemented. @30 ft. Some pale red CLAYSTONE blocks incorporated into SILTSTONE; well healed.							
				@34 ft. Basal Shear, N59°E/20°NW. Olive with iron oxide staining, wet, remolded, continuous.							
405	35										

(Continued Next Page)

ADVANCED GEOTECHNICAL SOLUTIONS, INC.

BORING NUMBER BA-3

CLIENT Tyler Development LLC **PROJECT NAME** Tyler Street

PROJECT NUMBER 1310-04 **PROJECT LOCATION** Santee, CA

ELEVATION (ft)	DEPTH (ft)	GRAPHIC LOG	USCS	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	BLOW COUNTS (N VALUE)	DRY UNIT WT. (pcf)	MOISTURE CONTENT (%)	SATURATION (%)	FINES CONTENT (%)	OTHER TESTS
405	35			**Friars Formation - Intact (Tfi)** SANDY SILTSTONE, gray to bluish gray, hard, massive.							
400	40										

TD = 40 ft.
Seepage at 28 ft. and 34 ft.

ADVANCED GEOTECHNICAL SOLUTIONS, INC.

BORING NUMBER BA-4

CLIENT Tyler Development LLC
PROJECT NAME Tyler Street
PROJECT NUMBER 1310-04
PROJECT LOCATION Santee, CA
DATE STARTED 2/10/16 **COMPLETED** 2/10/16
GROUND ELEVATION 535 ft **HOLE SIZE** 30
DRILLING CONTRACTOR Dave's Drilling
GROUND WATER LEVELS:
DRILLING METHOD Bucket Auger
AT TIME OF DRILLING ---
LOGGED BY FE **CHECKED BY** PJD
AT END OF DRILLING ---
NOTES
AFTER DRILLING ---

ELEVATION (ft)	DEPTH (ft)	GRAPHIC LOG	USCS	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	BLOW COUNTS (N VALUE)	DRY UNIT WT. (pcf)	MOISTURE CONTENT (%)	SATURATION (%)	FINES CONTENT (%)	OTHER TESTS
535	0			**Artificial Fill - Undocumented (afu)** CLAYEY SAND, fine grained, dark brown, very moist, loose.							
				Friars Formation - Creep Affected (Tfc) SANDY CLAY, fine grained sand, brown, moist, stiff; some rounded volcanic clasts to 1.5" diameter.							
530	5			@6 ft. CLAYEY SAND, light yellowish brown, moist, loose.							
				@8 ft. Abundant soil infilling and thin spider fracturing throughout. @9 ft. Discontinuous remnant bedding N80°E/28°SE, grading down CLAYEY SANDSTONE, fine grained, pale yellow, moist, dense.							
525	10			Angular SILTSTONE clasts in a CLAYEY SILT matrix, gray, moist, soft; discontinuous 1/16" thick clay seam.							
520	15			@15 ft. Contact, moist. N20°E/10°NW SILTY CLAYSTONE, olive to strong brown, hard; some very fine steeply dipping carbonate lined fractures.							
515	20			@18 ft. Grades down to CLAYEY SANDSTONE, light gray with some pale red, slightly moist to moist, moderately hard, massive; some thin very steeply dipping irregular fractures lined with manganese oxide.							
510	25			@23 ft. SILTY CLAYSTONE bed, 2" thick, poorly defined, pale yellow with abundant manganese oxide.							
505	30			@32 ft. CLAYEY SANDSTONE, light gray, moist, moderately hard; spheroidal carbonate nodules to 34ft.							
500	35										

(Continued Next Page)

CLIENT Tyler Development LLC **PROJECT NAME** Tyler Street
PROJECT NUMBER 1310-04 **PROJECT LOCATION** Santee, CA

ELEVATION (ft)	DEPTH (ft)	GRAPHIC LOG	USCS	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	BLOW COUNTS (N VALUE)	DRY UNIT WT. (pcf)	MOISTURE CONTENT (%)	SATURATION (%)	FINES CONTENT (%)	OTHER TESTS
500	35										
				@36.5 ft. Contact, flat-lying to slightly undulatory, SILTY CLAYSTONE, dark olive to dark gray, slightly moist, fractured, polished surfaces.							
495	40			@40 ft. Mottled reddish brown and olive, no visible fractures.							
490	45			@45 ft. Clay Seam: 2-2.5" thick, olive to reddish brown, wet, plastic. N40°W/2°NE	GB						
				Friars Formation - Intact (Tfi) SILTSTONE, olive, slightly moist, hard.							
				@48 ft. Light gray.							
485	50			@50 ft. Grades to a SANDY SILTSTONE, fine grained sand, light gray, moist hard, massive.							
480	55										
				@58 ft. Thin gravel lens, rounded volcanic clasts to 3/4" diameter.							
475	60			@60 ft. CLAYEY SANDSTONE, fine grained, light gray, slightly moist, hard, massive.							
470	65										
465	70										

TD = 70 ft.
No Groundwater.

Project Tyler Street
Date Excavated 1/21/2016
Logged by FE
Equipment Case Rubber Tire Backhoe

LOG OF TEST PITS

Test Pit No.	Depth (ft.)	USCS	Description
T-1	0.0 – 5.0	SM	**Alluvium (Qal)** SILTY SAND, dark gray to dark brownish gray, very moist to wet, loose; abundant rounded cobbles and boulders to 18” diameter. @4 ft. Some seepage. @4.5 ft. Quartzite boulder, 2 ft. diameter.
	5.0 – 6.0		**Friars Formation – Creep Affected (Tfc)** Clay, mottled gray and yellowish brown, very moist; some pebbles and cobble, highly weathered. @5.5 ft. pebbles and cobbles in a CLAYEY SAND matrix, hard. @6 ft. Cemented, very hard.
			TD = 6 ft. (Refusal) Seepage at 4 ft.

Test Pit No.	Depth (ft.)	USCS	Description
T-2	0.0 – 3.5	SM	**<u>Alluvium (Qal)</u>** SILTY SAND with some CLAY, fine grained, dark brownish gray, very moist, loose.
		SC	@2 ft. Rounded volcanic cobbles and boulders to 24" diameter in a CLAYEY SAND matrix, dark brownish gray, very moist, loose.
	3.5 – 7.0		**<u>Friars Formation – Creep Affected (Tfc)</u>** CLAY, light gray, very moist; trace of rounded volcanic cobbles; moderately weathered. @6.5 ft. volcanic clasts to 2" diameter in a CLAYEY SAND matrix, light yellowish brown, moist, moderately hard. @6 ft. Cemented, very hard.
			TD = 7 ft. (Refusal) No Water.

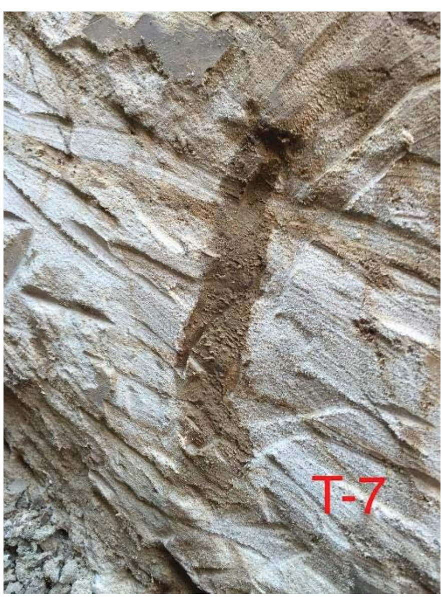
Test Pit No.	Depth (ft.)	USCS	Description
T-3	0.0 – 1.5	SM	**Topsoil** SILTY SAND with some clay, fine grained, dark brown, very moist, loose.
	1.5 – 5.5		**Friars Formation - Intact (Tfi)** Rounded volcanic clasts to 1.5" diameter in a SILTY SAND matrix, light yellowish brown, slightly moist, dense, flat lying; some flat, well rounded pebbles. @4 ft. Black manganese oxide layer, ¼" thick. @4.5 ft. Discontinuous SILTY SAND lens, 6" thick, light gray, moist, moderately hard; flat lying. @5 ft. Well cemented, hard. @5.5 ft. Very hard. TD = 5.5 ft. (Refusal) No Water.

Test Pit No.	Depth (ft.)	USCS	Description
T-4	0.0 – 1.5	SM	**Topsoil** SILTY SAND with some clay, fine grained, brown to dark brown, very moist, loose.
	1.5 – 12.0		**Friars Formation - Intact (Tfi)** Rounded volcanic clasts to 2" diameter, in a CLAYEY SAND matrix, mottled olive and yellowish red, moist, medium dense. @11 ft. carbonate lens, ¾" thick, white, moist, dense. @11.5 ft. CLAYSTONE bed, 1" thick, slightly moist, moderately hard; some black manganese oxide. @12 ft. Rounded volcanic clasts in an olive to light yellowish brown, very hard; well cemented.
			TD = 12 ft. (Practical Refusal) No Water.

Test Pit No.	Depth (ft.)	USCS	Description
T-5	0.0 – 1.5	SM	**Topsoil** SILTY SAND with some clay, dark brown, very moist, loose; one cobble to 12" diameter.
	1.5 – 14.5		**Friars Formation – Creep Affected (Tfc)** CLAY, strong brown, very moist, soft; some rounded pebbles; highly weathered. @4 ft. Mottled olive and yellowish brown, moist to very moist, medium dense to dense, massive; trace rounded pebbles. @10 ft. SANDY CLAY, light reddish brown, dense, moderately fractured, breaks into 2" angular clasts.
			TD = 14.5 ft. No Water.

Test Pit No.	Depth (ft.)	USCS	Description
T-6	0.0 – 8.0	CL	**Artificial Fill – Undocumented (afu)** SANDY CLAY, light yellowish brown to dark gray, moist, stiff; some cobbles to 1" diameter. @5 ft. Very moist.
	8.0 – 14.0		**Alluvium (Qal)** SANDY CLAY, dark brown, very moist, soft, some gravel to 1.5" diameter.
	14.0 – 15.0		**Friars Formation – Creep Affected (Tfc)** CLAYSTONE, trace fine-grained sand, pale yellow, moderately soft.
			TD = 15 ft. No Water.

Test Pit No.	Depth (ft.)	USCS	Description
T-7	0.0 – 2.0	SM	**Topsoil** SILTY SAND, brownish gray. @ 1 ft. Paleosol, CLAYSTONE, iron oxide stained olive, very moist, soft; some rounded cobble to 1" diameter; highly weathered.
	2.0 – 13.0		**Friars Formation – Creep Affected (Tfc)** SANDY CLAYSTONE, olive, moist, moderately soft, massive; some rounded clasts to 1.5" diameter. @3 ft. Very moist, massive; trace pebbles and cobbles. @9 ft. Six-inch thick discontinuous CLAYEY SANDSTONE Bed, fine grained, light gray, moist, moderately hard; one Krotovena-vertical, 2" wide by 11" deep. @9.5 ft. N80°W 12°NE - Contact between fine SANDY CLAYSTONE bed and underlying light gray SANDSTONE. @12 ft. rounded volcanic clasts to 1.5" diameter in a CLAYEY SAND matrix, light yellowish brown, slightly moist, dense; flat lying. TD = 13 ft. No Water.



Test Pit No.	Depth (ft.)	USCS	Description
T-8	0.0 – 7.0	SC	**Colluvium (Qcol)** CLAYEY SAND and SANDY CLAY, brown, very moist; some rounded pebbles, cobbles, and weathered sandstone clasts.
	7.0 – 12.0		**Friars Formation – Creep Affected (Tfc)** SANDY CLAY, olive, very moist, firm, massive; trace rounded pebbles. @11 ft. CLAYEY SAND, light gray, moist, dense; massive. TD = 12 ft. No Water.

Test Pit No.	Depth (ft.)	USCS	Description
T-9	0.0 – 2.0	SC	**Colluvium (Qcol)** SANDY CLAY, brown, very moist, soft; some rounded pebbles.
	2.0 – 12.0		**Friars Formation – Creep Affected (Tfc)** SANDY CLAY, light yellowish brown, moist, soft. @5 ft. CLAYEY SAND, fine grained, light yellowish brown, moist, medium dense; massive; iron oxide staining along thin fractures.
			TD = 12 ft. No Water.

Appendix C

Laboratory Test Results

ADVANCED GEOTECHNICAL SOLUTIONS, INC.

DRY DENSITY AND MOISTURE CONTENT - ASTM D2166

Project Name: Tyler Street
Location: Santee, CA
Project No: 1310-04

Sample Date:	2/8-10/16	By:	FE/PJD
Submittal Date:	2/15/16	By:	PWM
Test Date:	3/5/16	By:	HM

Boring No.	BA-1	BA-1	BA-1	BA-1	BA-1	BA-2	BA-2	BA-2
Depth (ft)	5'	10 '	30 '	40 '	50 '	5 '	50 '	60 '
Moisture Content (%)	14.5	11.0	25.3	22.1	19.5	19.1	23.3	13.2
Dry Density (pcf)	107.6	112.4	98.1	100.0	107.2	105.9	102.0	105.1

Boring No.	BA-3	BA-3
Depth (ft)	30 '	40 '
Moisture Content (%)	15.1	23.2
Dry Density (pcf)	115.6	93.8

ADVANCED GEOTECHNICAL SOLUTIONS, INC.

ATTERBERG LIMITS - ASTM D4318

Project Name: Tyler Street
Location: Santee, CA
Project No: 1310-04
Date: 3/12/16

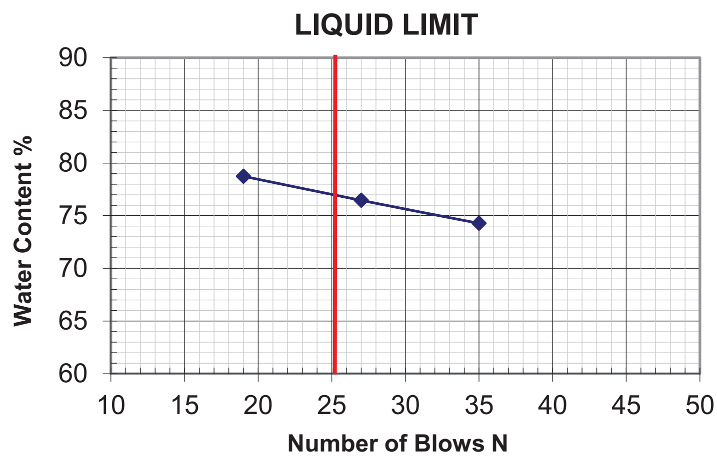
Excavation: BA-4
Depth: 45 '
Description:
By: H-M

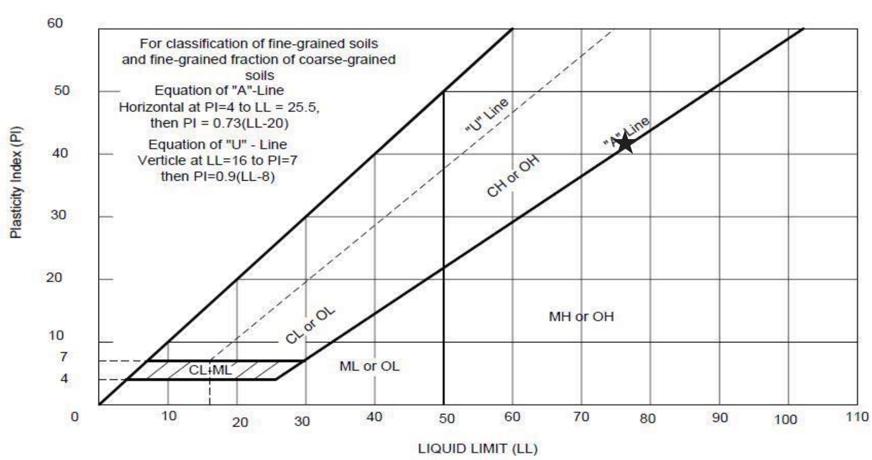
LIQUID LIMIT

Can No.	4	5	14
Wt. wet soil+can (g)	26.14	26.14	22.95
Wt. dry soil+can (g)	19.73	19.71	17.80
Wt. can (g)	11.10	11.30	11.26
Wt. mosture (g)	6.41	6.43	5.15
Wt. dry soil (g)	8.63	8.41	6.54
Water Content %	74.28	76.46	78.75
No. of Blows	35	27	19

PLASTIC LIMIT

3	10
18.37	16.65
16.52	15.23
11.23	11.15
1.85	1.42
5.29	4.08
34.97	34.80





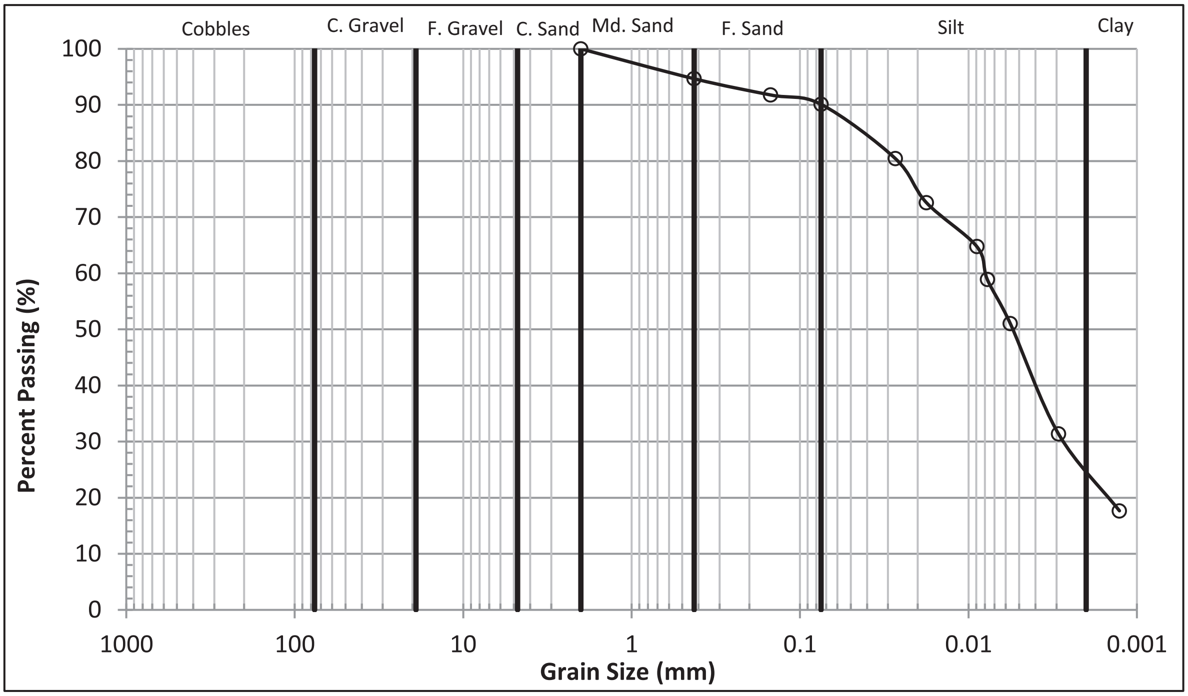
Liquid Limit (LL) 77 Plastic Limit (PL) 35 Plasticity Index (PI) 42

ADVANCED GEOTECHNICAL SOLUTIONS, INC.

PARTICLE SIZE ANALYSIS - ASTM D422

Project Name: Tyler Street
Location: Santee, CA
Project No.: 1310-04
Date: 3/10/16

Excavation: BA-1
Depth: 30 '
By: H M



Grain Size (in/#)	Grain Size (mm)	Amount Passing (%)
3 "	75.00	
2 1/2 "	63.00	
2 "	50.00	
1 1/2 "	37.50	
1 "	25.00	
3/4 "	19.05	
1/2 "	12.70	
3/8 "	9.53	
# 4	4.75	
# 10	2.00	100.00
# 20	0.85	#N/A
# 30	0.60	#N/A
# 40	0.425	94.67
# 50	0.30	#N/A
# 60	0.212	#N/A
# 100	0.15	91.79
# 200	0.075	90.11
Hydro	0.0272	80.46
Hydro	0.0178	72.61
Hydro	0.0089	64.76
Hydro	0.0077	58.88
Hydro	0.0056	51.03
Hydro	0.0029	31.40
Hydro	0.0013	17.66

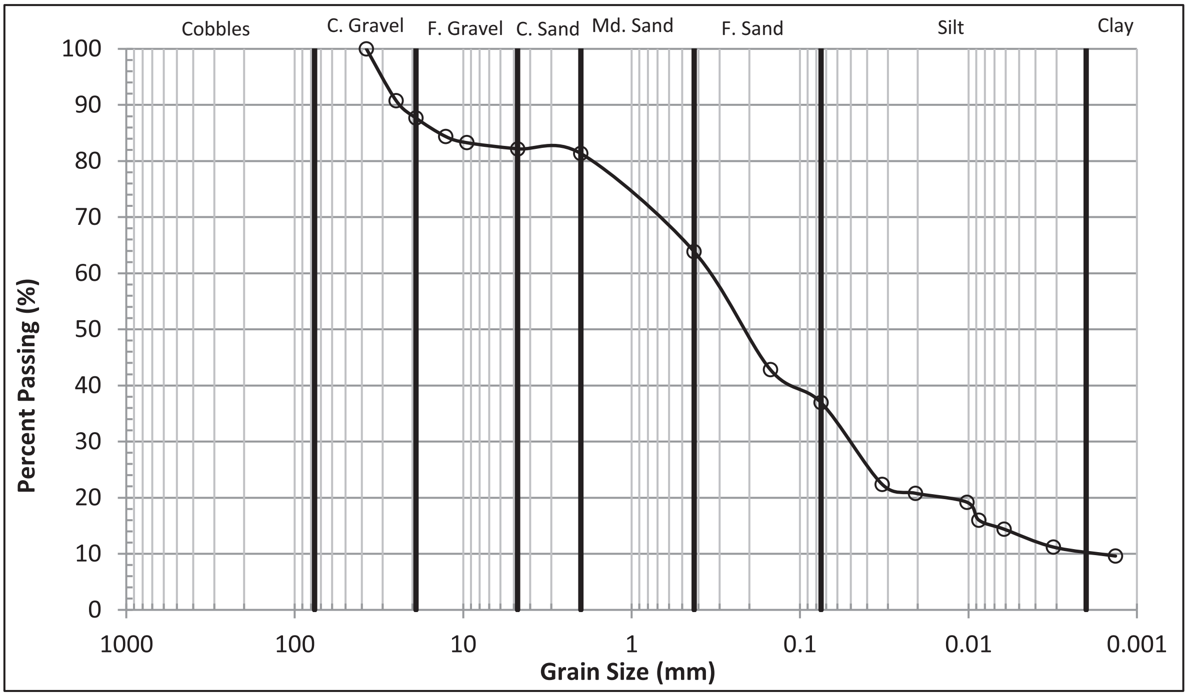
Summary	
% Gravel =	0.0
% Sand =	9.9
% Silt =	65.6
% Clay =	24.5
Sum =	100.0

ADVANCED GEOTECHNICAL SOLUTIONS, INC.

PARTICLE SIZE ANALYSIS - ASTM D422

Project Name: Tyler Street
Location: Santee, CA
Project No.: 1310-04
Date: 10/28/15

Excavation: BA-2
Depth: 9 '
By: H M



Grain Size (in/#)	Grain Size (mm)	Amount Passing (%)
3 "	75.00	
2 1/2 "	63.00	
2 "	50.00	
1 1/2 "	37.50	100.00
1 "	25.00	90.77
3/4 "	19.05	87.67
1/2 "	12.70	84.38
3/8 "	9.53	83.28
# 4	4.75	82.18
# 10	2.00	81.34
# 20	0.85	#N/A
# 30	0.60	#N/A
# 40	0.425	63.84
# 50	0.30	#N/A
# 60	0.212	#N/A
# 100	0.15	42.83
# 200	0.075	36.95
Hydro	0.0326	22.39
Hydro	0.0207	20.79
Hydro	0.0102	19.19
Hydro	0.0087	15.99
Hydro	0.0061	14.39
Hydro	0.0031	11.19
Hydro	0.0013	9.60

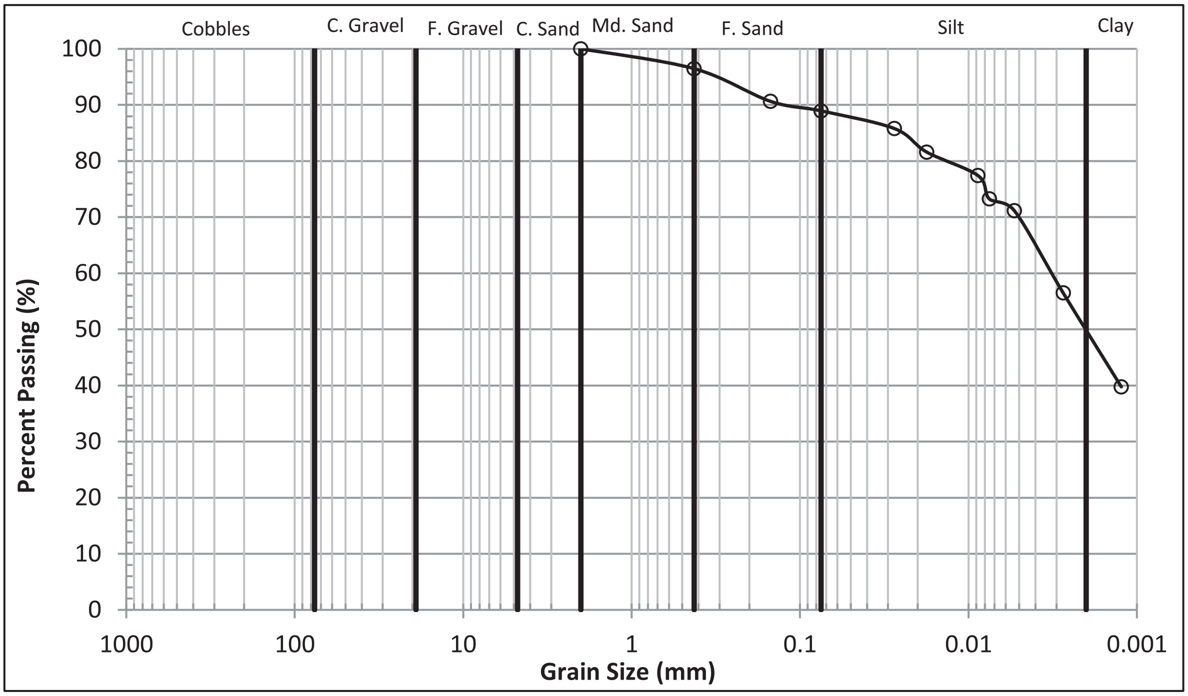
Summary	
% Gravel =	17.8
% Sand =	51.7
% Silt =	20.1
% Clay =	10.4
Sum =	100.0

ADVANCED GEOTECHNICAL SOLUTIONS, INC.

PARTICLE SIZE ANALYSIS - ASTM D422

Project Name: Tyler Street
Location: Santee, CA
Project No.: 1310-04
Date: 3/13/16

Excavation: BA-2
Depth: 40 '
By: H M



Grain Size (in/#)	Grain Size (mm)	Amount Passing (%)
3 "	75.00	
2 1/2 "	63.00	
2 "	50.00	
1 1/2 "	37.50	
1 "	25.00	
3/4 "	19.05	
1/2 "	12.70	
3/8 "	9.53	
# 4	4.75	
# 10	2.00	100.00
# 20	0.85	#N/A
# 30	0.60	#N/A
# 40	0.425	96.47
# 50	0.30	#N/A
# 60	0.212	#N/A
# 100	0.15	90.66
# 200	0.075	88.95
Hydro	0.0275	85.79
Hydro	0.0177	81.61
Hydro	0.0088	77.42
Hydro	0.0075	73.24
Hydro	0.0053	71.15
Hydro	0.0027	56.50
Hydro	0.0012	39.76

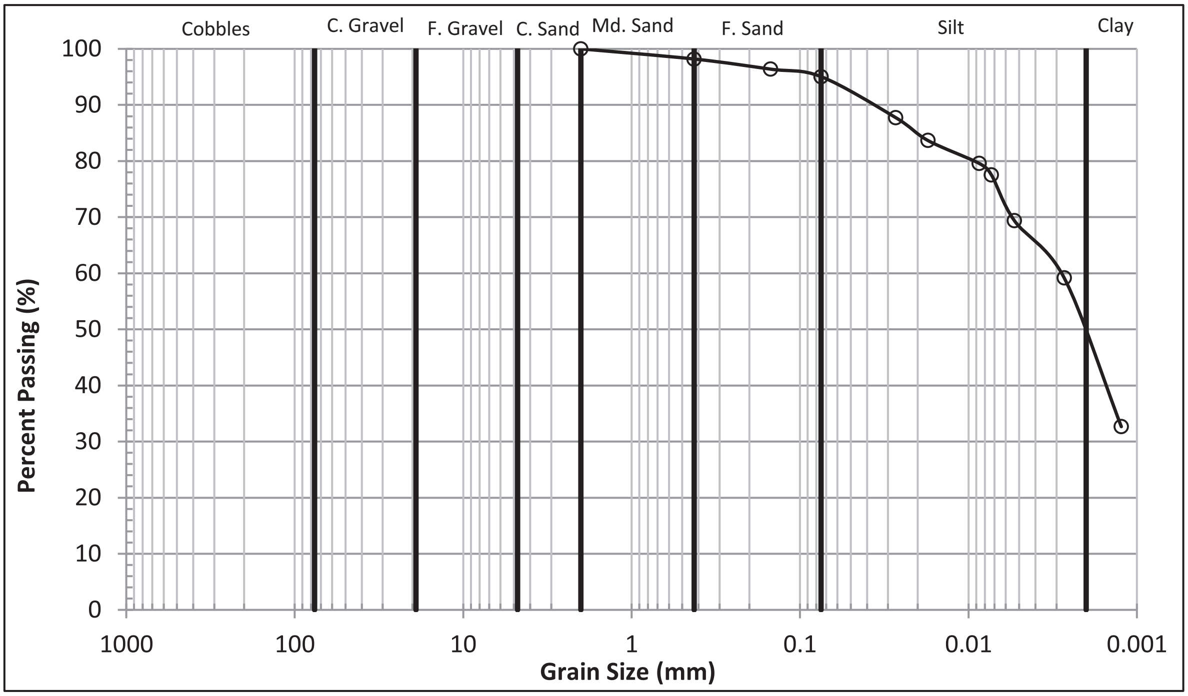
Summary	
% Gravel =	0.0
% Sand =	11.1
% Silt =	40.8
% Clay =	48.1
Sum =	100.0

ADVANCED GEOTECHNICAL SOLUTIONS, INC.

PARTICLE SIZE ANALYSIS - ASTM D422

Project Name: Tyler Street
Location: Santee, CA
Project No.: 1310-04
Date: 3/13/16

Excavation: BA-2
Depth: 50 '
By: H M



Grain Size (in/#)	Grain Size (mm)	Amount Passing (%)
3 "	75.00	
2 1/2 "	63.00	
2 "	50.00	
1 1/2 "	37.50	
1 "	25.00	
3/4 "	19.05	
1/2 "	12.70	
3/8 "	9.53	
# 4	4.75	
# 10	2.00	100.00
# 20	0.85	#N/A
# 30	0.60	#N/A
# 40	0.425	98.19
# 50	0.30	#N/A
# 60	0.212	#N/A
# 100	0.15	96.39
# 200	0.075	95.05
Hydro	0.0271	87.75
Hydro	0.0174	83.67
Hydro	0.0086	79.59
Hydro	0.0073	77.55
Hydro	0.0053	69.38
Hydro	0.0027	59.18
Hydro	0.0012	32.66

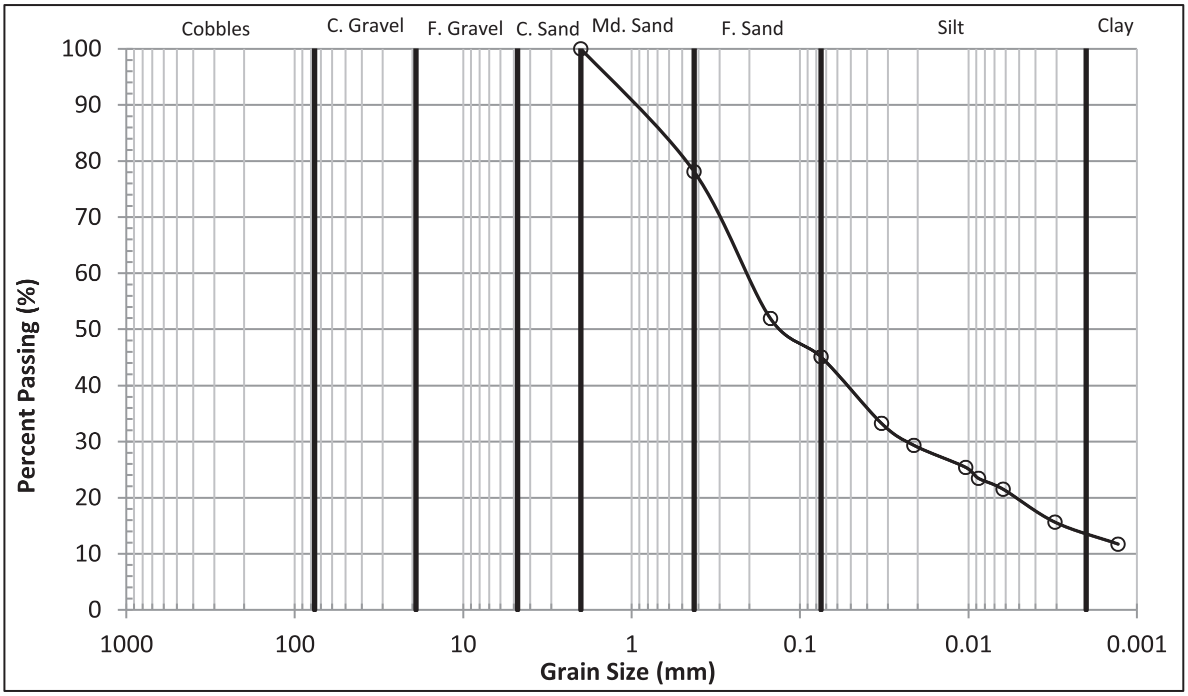
Summary	
% Gravel =	0.0
% Sand =	5.0
% Silt =	49.1
% Clay =	45.9
Sum =	100.0

ADVANCED GEOTECHNICAL SOLUTIONS, INC.

PARTICLE SIZE ANALYSIS - ASTM D422

Project Name: Tyler Street
Location: Santee, CA
Project No.: 1310-04
Date: 3/10/16

Excavation: T-5
Depth: 1 '
By: H M



Grain Size (in/#)	Grain Size (mm)	Amount Passing (%)
3 "	75.00	
2 1/2 "	63.00	
2 "	50.00	
1 1/2 "	37.50	
1 "	25.00	
3/4 "	19.05	
1/2 "	12.70	
3/8 "	9.53	
# 4	4.75	
# 10	2.00	100.00
# 20	0.85	#N/A
# 30	0.60	#N/A
# 40	0.425	78.10
# 50	0.30	#N/A
# 60	0.212	#N/A
# 100	0.15	51.95
# 200	0.075	45.08
Hydro	0.0328	33.24
Hydro	0.0211	29.33
Hydro	0.0104	25.42
Hydro	0.0087	23.46
Hydro	0.0062	21.51
Hydro	0.0031	15.64
Hydro	0.0013	11.73

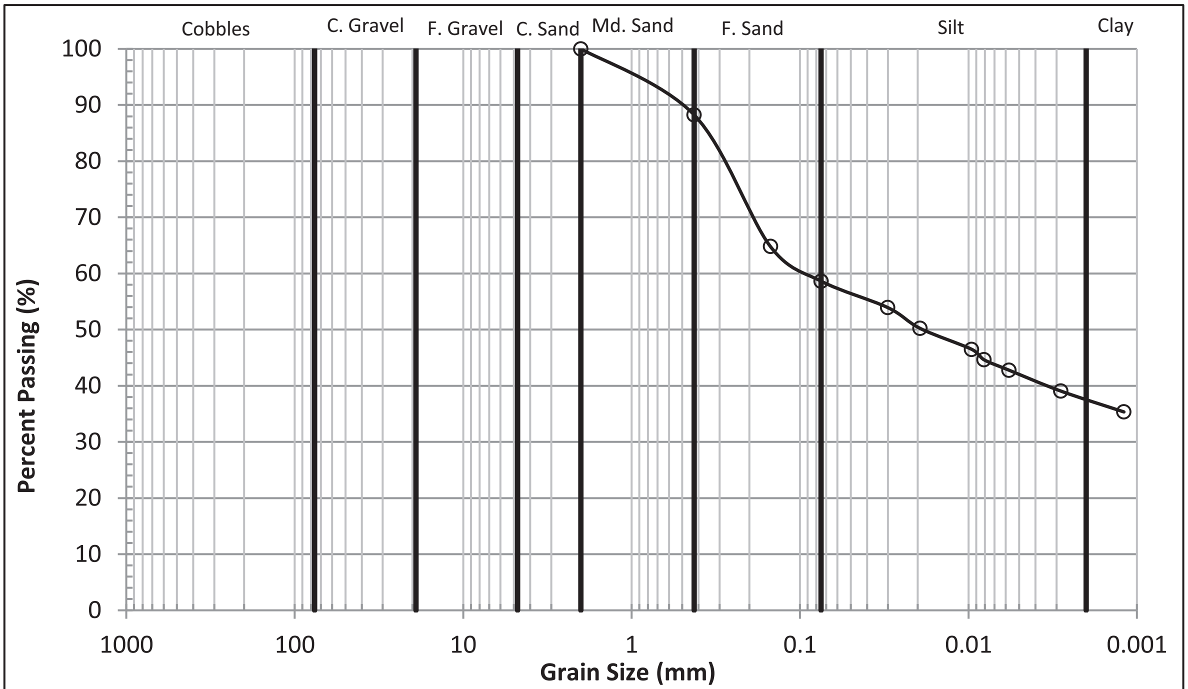
Summary	
% Gravel =	0.0
% Sand =	54.9
% Silt =	31.4
% Clay =	13.7
Sum =	100.0

ADVANCED GEOTECHNICAL SOLUTIONS, INC.

PARTICLE SIZE ANALYSIS - ASTM D422

Project Name: Tyler Street
Location: Santee, CA
Project No.: 1310-04
Date: 3/10/16

Excavation: T-8
Depth: 8 '
By: H M



Grain Size (in/#)	Grain Size (mm)	Amount Passing (%)
3 "	75.00	
2 1/2 "	63.00	
2 "	50.00	
1 1/2 "	37.50	
1 "	25.00	
3/4 "	19.05	
1/2 "	12.70	
3/8 "	9.53	
# 4	4.75	
# 10	2.00	100.00
# 20	0.85	#N/A
# 30	0.60	#N/A
# 40	0.425	88.24
# 50	0.30	#N/A
# 60	0.212	#N/A
# 100	0.15	64.81
# 200	0.075	58.63
Hydro	0.0302	53.93
Hydro	0.0194	50.21
Hydro	0.0096	46.49
Hydro	0.0081	44.63
Hydro	0.0057	42.77
Hydro	0.0028	39.05
Hydro	0.0012	35.34

Summary	
% Gravel =	0.0
% Sand =	41.4
% Silt =	21.4
% Clay =	37.2
Sum =	100.0

ADVANCED GEOTECHNICAL SOLUTIONS, INC.

MAXIMUM DENSITY - ASTM D1557

Project Name: Tyler Street
Location: Santee, CA
Project No.: 1310-04
Date: 2/26/2016

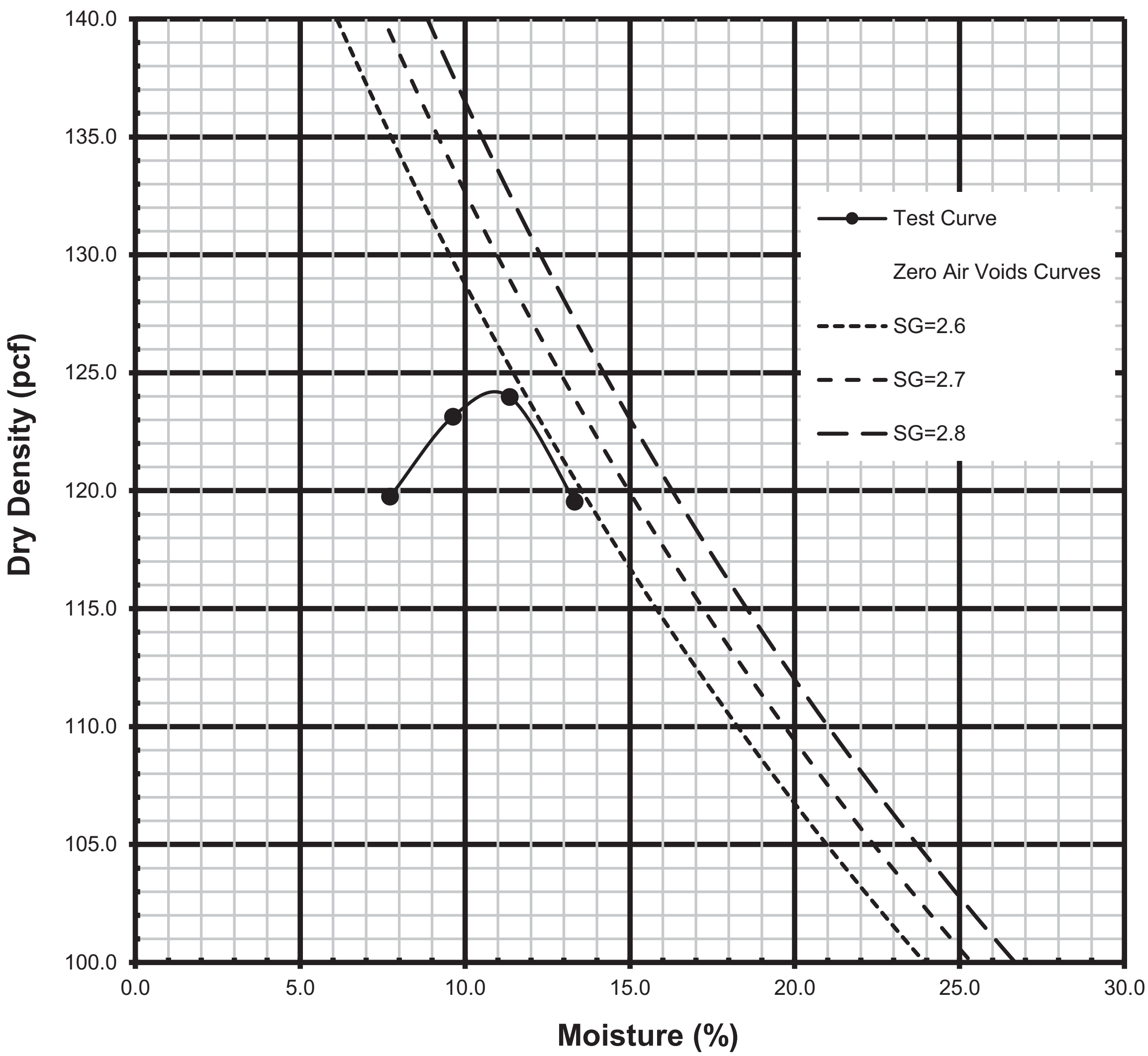
Excavation: T-5
Depth: 1 '
Description: Dark Brown Clayey Sand

By: H-M

Method A

Test Number	1	2	3	4
Dry Density (pcf)	119.8	123.1	124.0	119.5
Moisture Content (%)	7.7	9.6	11.4	13.3

Max Density



Maximum Density **124.0** pcf

Optimum Moisture **11.0** %

ADVANCED GEOTECHNICAL SOLUTIONS, INC.

MAXIMUM DENSITY - ASTM D1557

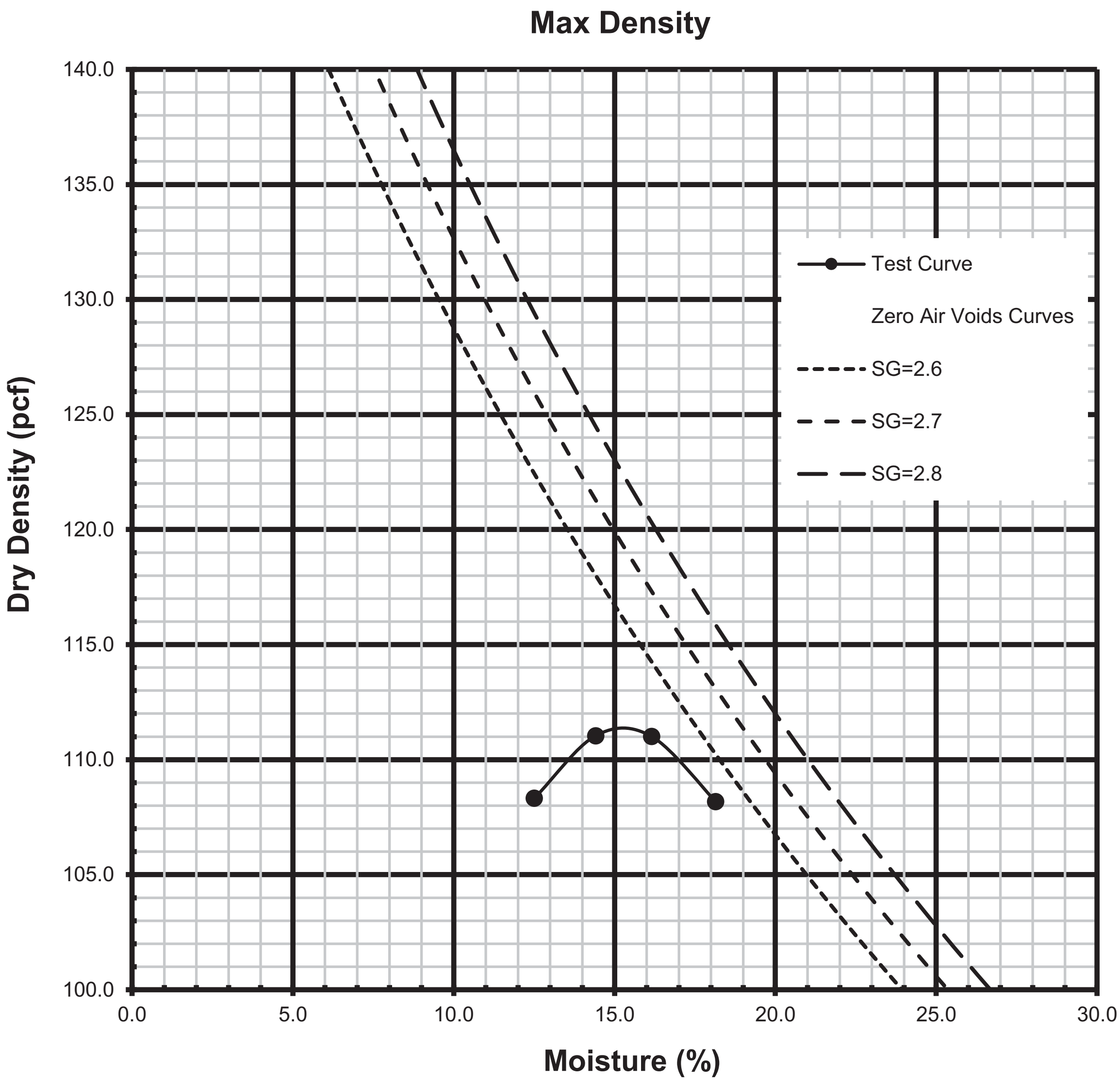
Project Name: Tyler Street
Location: Santee, CA
Project No.: 1310-04
Date: 2/26/2016

Excavation: T-8
Depth: 8 '
Description: Brown Sandy Clay

By: H-M

Method A

Test Number	1	2	3	4
Dry Density (pcf)	108.3	111.0	111.0	108.2
Moisture Content (%)	12.5	14.4	16.1	18.1



Maximum Density **111.0** pcf

Optimum Moisture **15.5** %

ADVANCED GEOTECHNICAL SOLUTIONS, INC.

DIRECT SHEAR - ASTM D3080

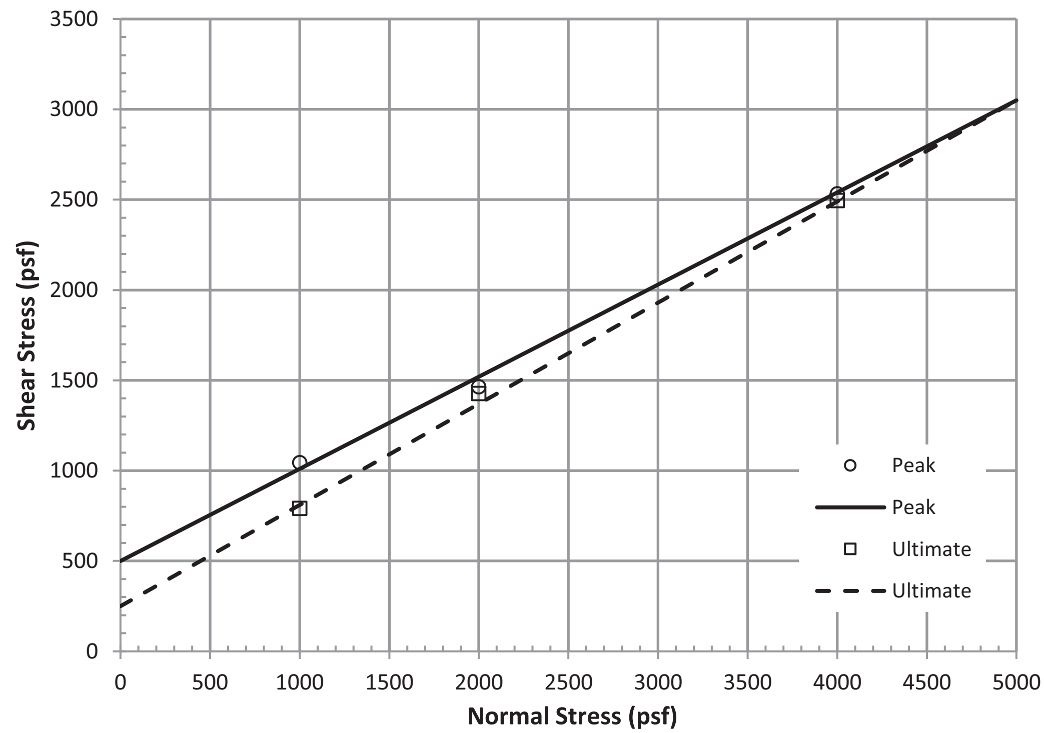
Project Name: Tyler Street
Location: Santee, CA
Project No.: 1310-04
Date: 3/16/16

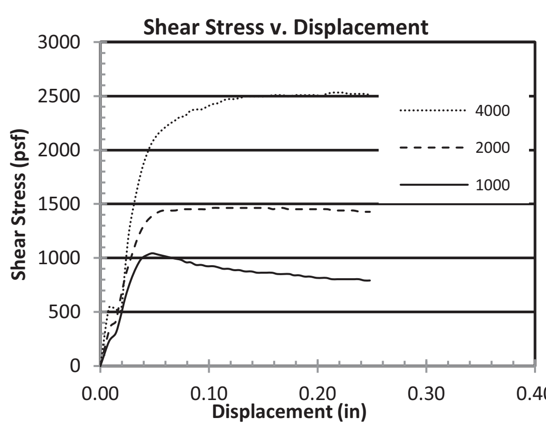
Excavation: T-5
Depth: 1'
Sample Type: Remolded to 90%
By: HM

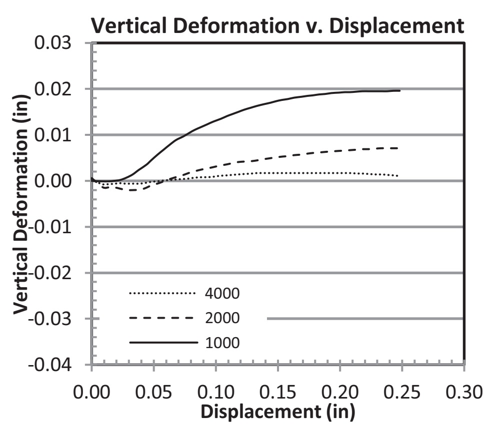
Samples Tested	1	2	3
Normal Stress (psf)	1000	2000	4000
Maximum Shear Stress (psf)	1044	1464	2532
Ultimate Shear Stress (psf)	792	1428	2496
Initial Moisture Content (%)	11.0	11.0	11.0
Initial Dry Density (pcf)	111.6	111.6	111.6

Method: Drained
Consolidation: Yes
Saturation: Yes
Shearing Rate (in/min): 0.04

	Peak	Ultimate
Friction Angle, phi (deg)	27	29
Cohesion (psf)	500	250







ADVANCED GEOTECHNICAL SOLUTIONS, INC.

DIRECT SHEAR - ASTM D3080

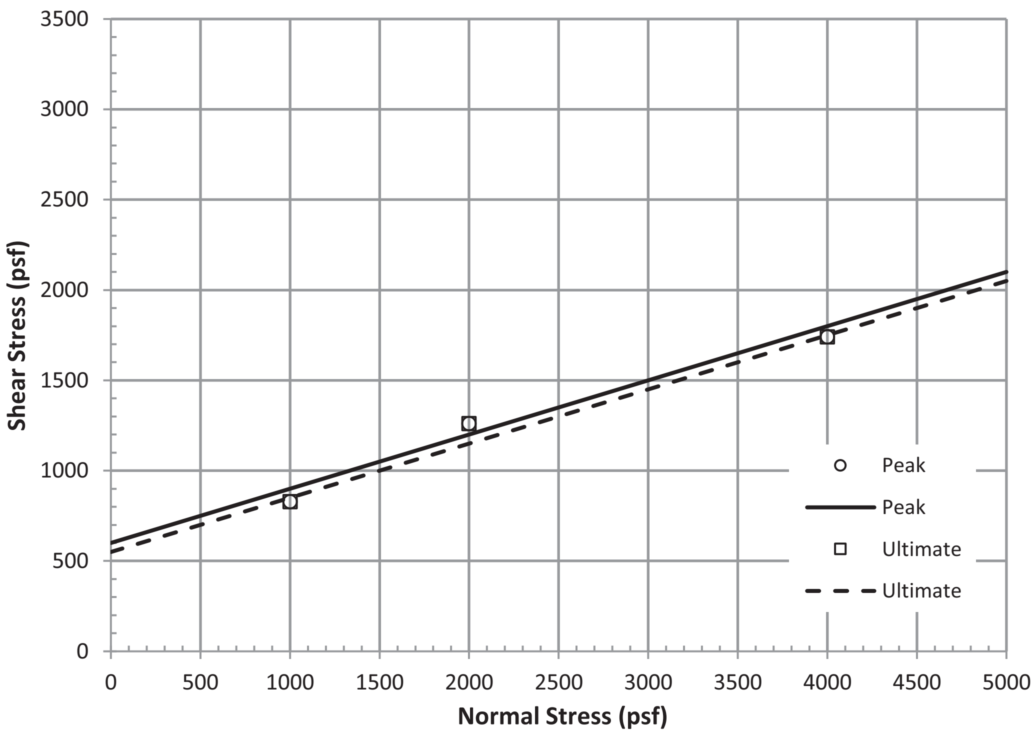
Project Name: Tyler Street
Location: Santee, CA
Project No.: 1310-04
Date: 3/18/16

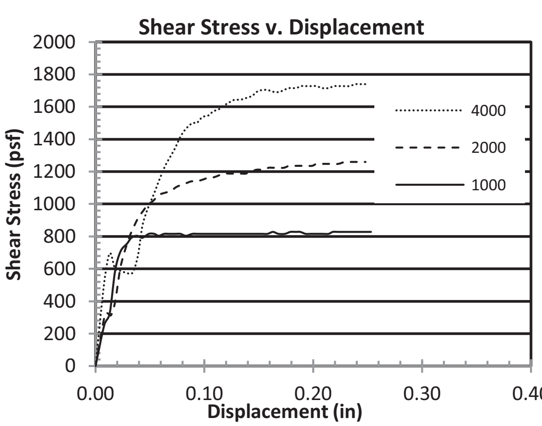
Excavation: T-8
Depth: 8'
Sample Type: Remolded to 90%
By: HM

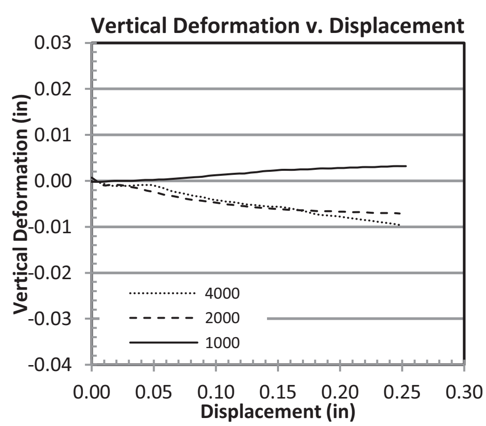
Samples Tested	1	2	3
Normal Stress (psf)	1000	2000	4000
Maximum Shear Stress (psf)	828	1260	1740
Ultimate Shear Stress (psf)	828	1260	1740
Initial Moisture Content (%)	15.5	15.5	15.5
Initial Dry Density (pcf)	99.9	99.9	99.9

Method: Drained
Consolidation: Yes
Saturation: Yes
Shearing Rate (in/min): 0.04

	Peak	Ultimate
Friction Angle, phi (deg)	17	17
Cohesion (psf)	600	550







ADVANCED GEOTECHNICAL SOLUTIONS, INC.

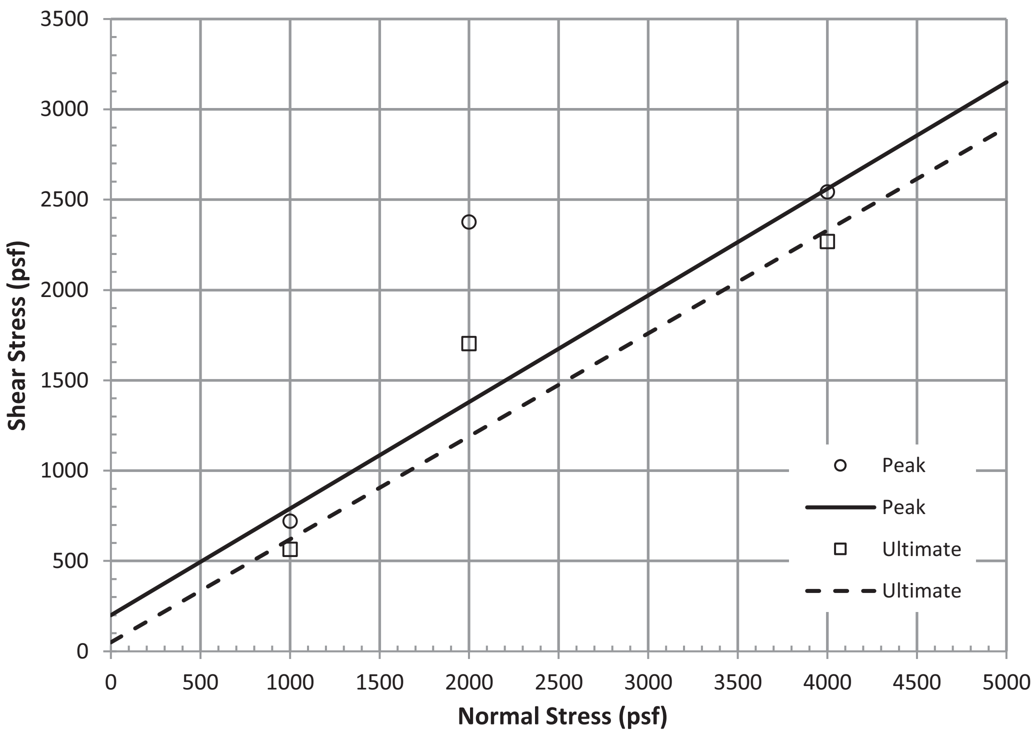
DIRECT SHEAR - ASTM D3080

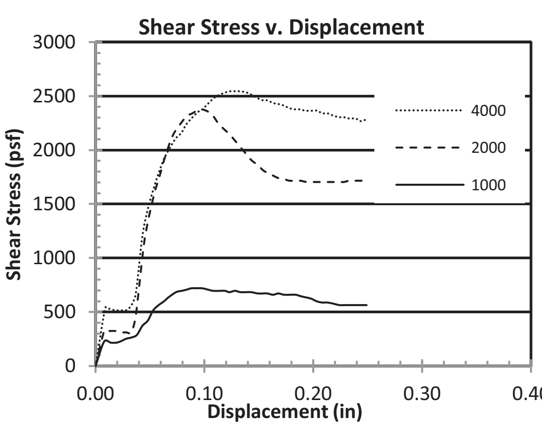
Project Name:	Tyler Street	Excavation:	BA-1
Location:	Santee, CA	Depth:	10'
Project No.:	1310-04	Sample Type:	Undisturbed
Date:	3/11/16	By:	HM

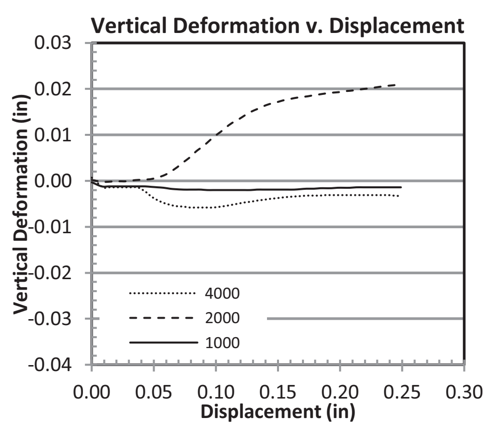
Samples Tested	1	2	3
Normal Stress (psf)	1000	2000	4000
Maximum Shear Stress (psf)	720	2376	2544
Ultimate Shear Stress (psf)	564	1704	2268
Initial Moisture Content (%)	11.0	11.0	11.0
Initial Dry Density (pcf)	108.8	112.4	97.3

Method:	Drained
Consolidation:	Yes
Saturation:	Yes
Shearing Rate (in/min):	0.04

	Peak	Ultimate
Friction Angle, phi (deg)	31	30
Cohesion (psf)	200	50







ADVANCED GEOTECHNICAL SOLUTIONS, INC.

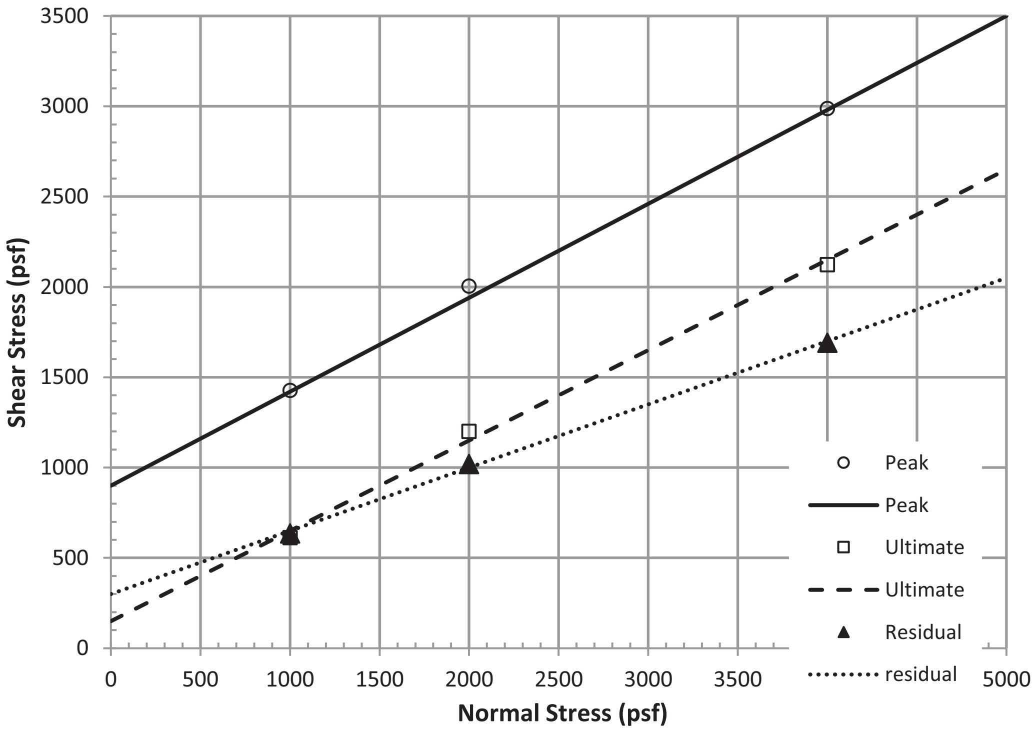
DIRECT SHEAR - ASTM D3080

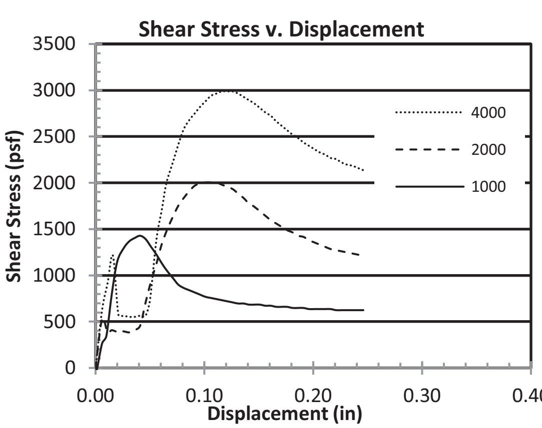
Project Name:	Tyler Street	Excavation:	BA-1
Location:	Santee, CA	Depth:	30
Project No.:	1310-04	Sample Type:	Undisturbed
Date:	3/10/16	By:	HM

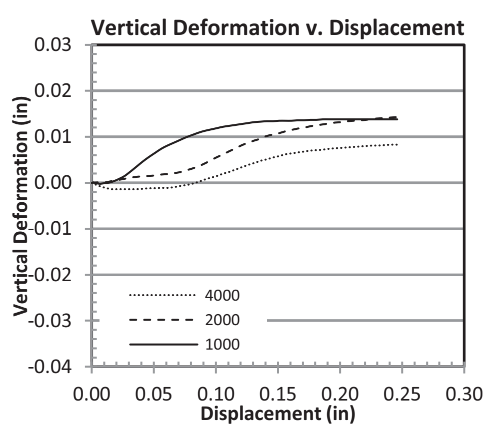
Samples Tested	1	2	3
Normal Stress (psf)	1000	2000	4000
Maximum Shear Stress (psf)	1428	2004	2988
Ultimate Shear Stress (psf)	624	1212	1392
Initial Moisture Content (%)	25.3	25.3	25.3
Initial Dry Density (pcf)	97.0	95.0	96.9

Method:	Drained
Consolidation:	Yes
Saturation:	Yes
Shearing Rate (in/min):	0.04

	Peak	Ultimate	Residual
Friction Angle, phi (deg)	27	27	19
Cohesion (psf)	900	150	300







ADVANCED GEOTECHNICAL SOLUTIONS, INC.

DIRECT SHEAR - ASTM D3080

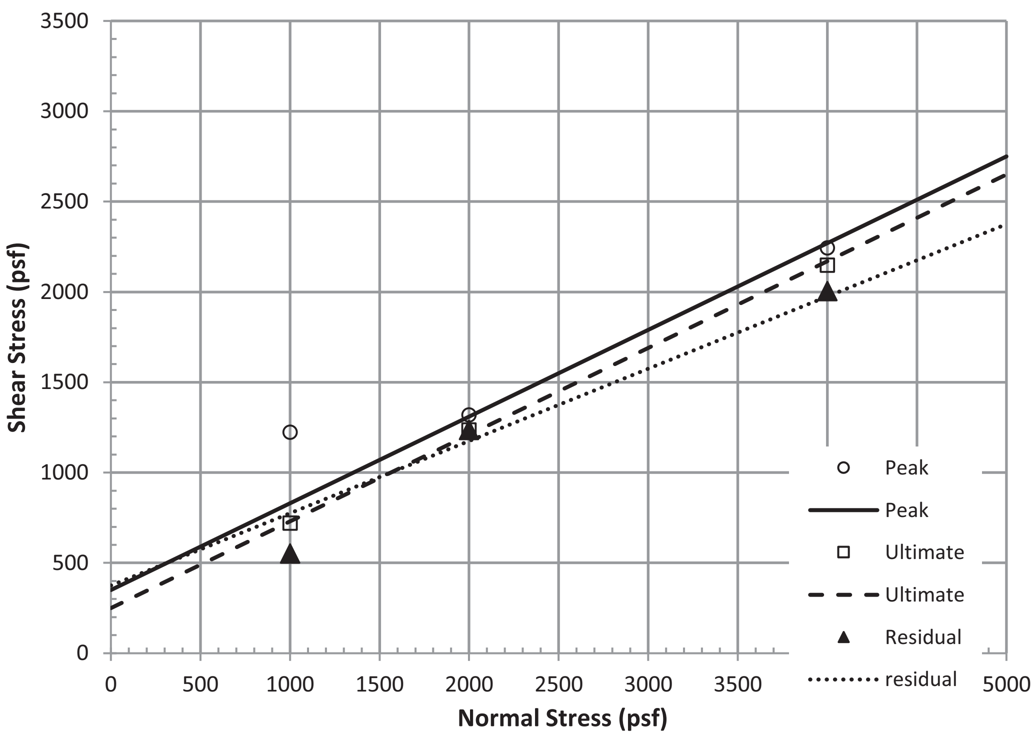
Project Name: Tyler Street
Location: Santee, CA
Project No.: 1310-04
Date: 3/13/16

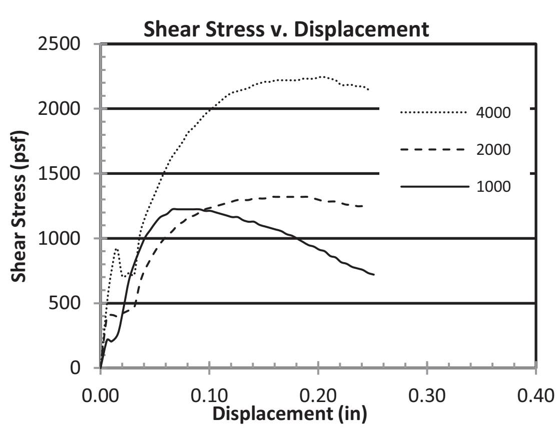
Excavation: BA-2
Depth: 40'
Sample Type: Undisturbed
By: HM

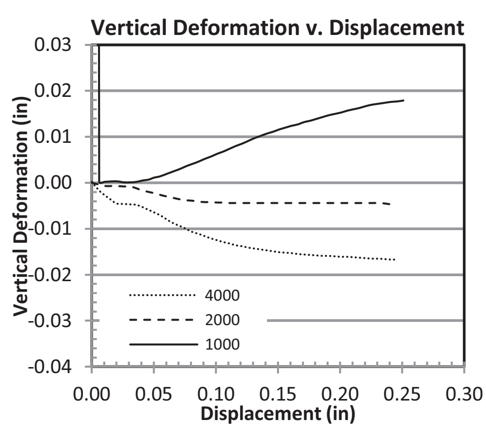
Samples Tested	1	2	3
Normal Stress (psf)	1000	2000	4000
Maximum Shear Stress (psf)	1224	1320	2244
Ultimate Shear Stress (psf)	720	1236	2148
Initial Moisture Content (%)	23.2	23.2	23.2
Initial Dry Density (pcf)	98.9	92.0	88.3

Method: Drained
Consolidation: Yes
Saturation: Yes
Shearing Rate (in/min): 0.04

	Peak	Ultimate	Residual
Friction Angle, phi (deg)	26	26	22
Cohesion (psf)	350	250	375







ADVANCED GEOTECHNICAL SOLUTIONS, INC.

DIRECT SHEAR - ASTM D3080

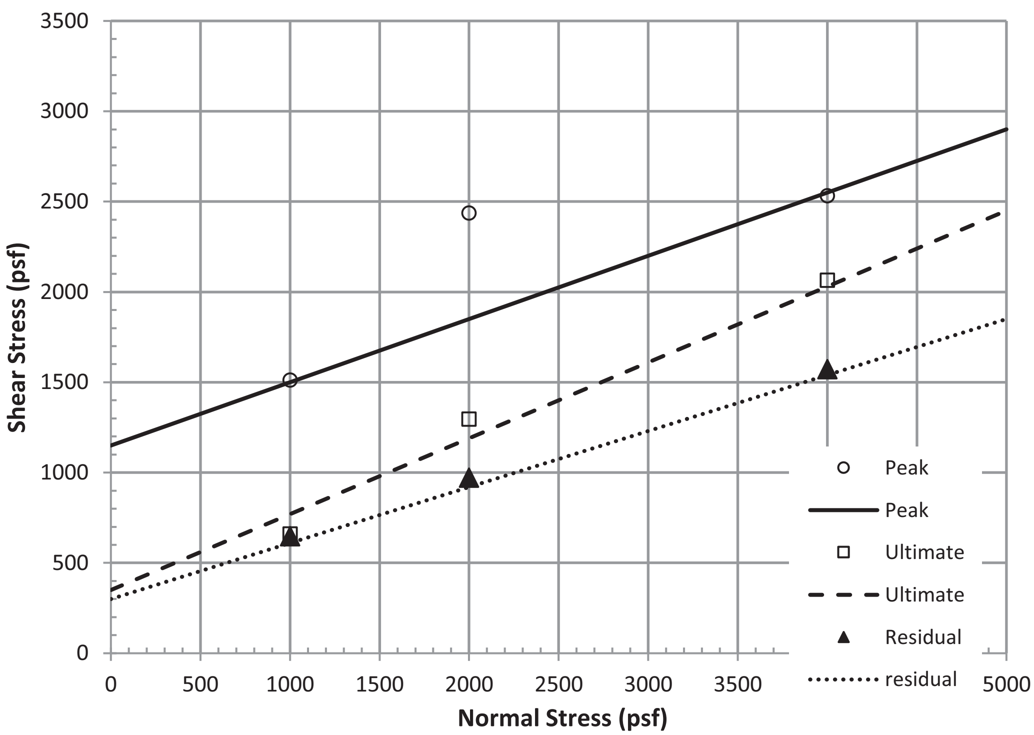
Project Name: Tyler Street
Location: Santee, CA
Project No.: 1310-04
Date: 3/14/16

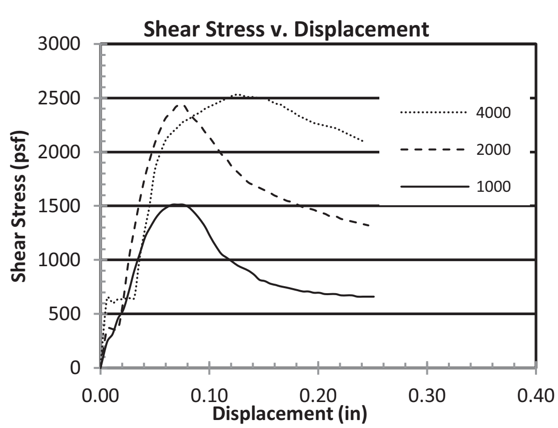
Excavation: BA-2
Depth: 50'
Sample Type: Undisturbed
By: HM

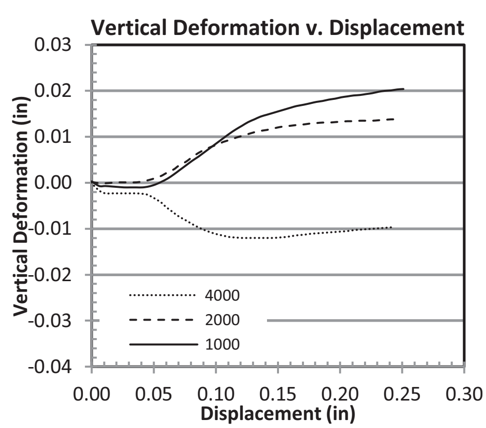
Samples Tested	1	2	3
Normal Stress (psf)	1000	2000	4000
Maximum Shear Stress (psf)	1512	2436	2532
Ultimate Shear Stress (psf)	660	1296	2064
Initial Moisture Content (%)	23.3	23.3	23.3
Initial Dry Density (pcf)	102.9	102.2	93.1

Method: Drained
Consolidation: Yes
Saturation: Yes
Shearing Rate (in/min): 0.04

	Peak	Ultimate	Residual
Friction Angle, phi (deg)	19	23	17
Cohesion (psf)	1150	350	300







Appendix D

Slope Stability Analysis

1310-04 Tyler Street 45 ft Fill Slope

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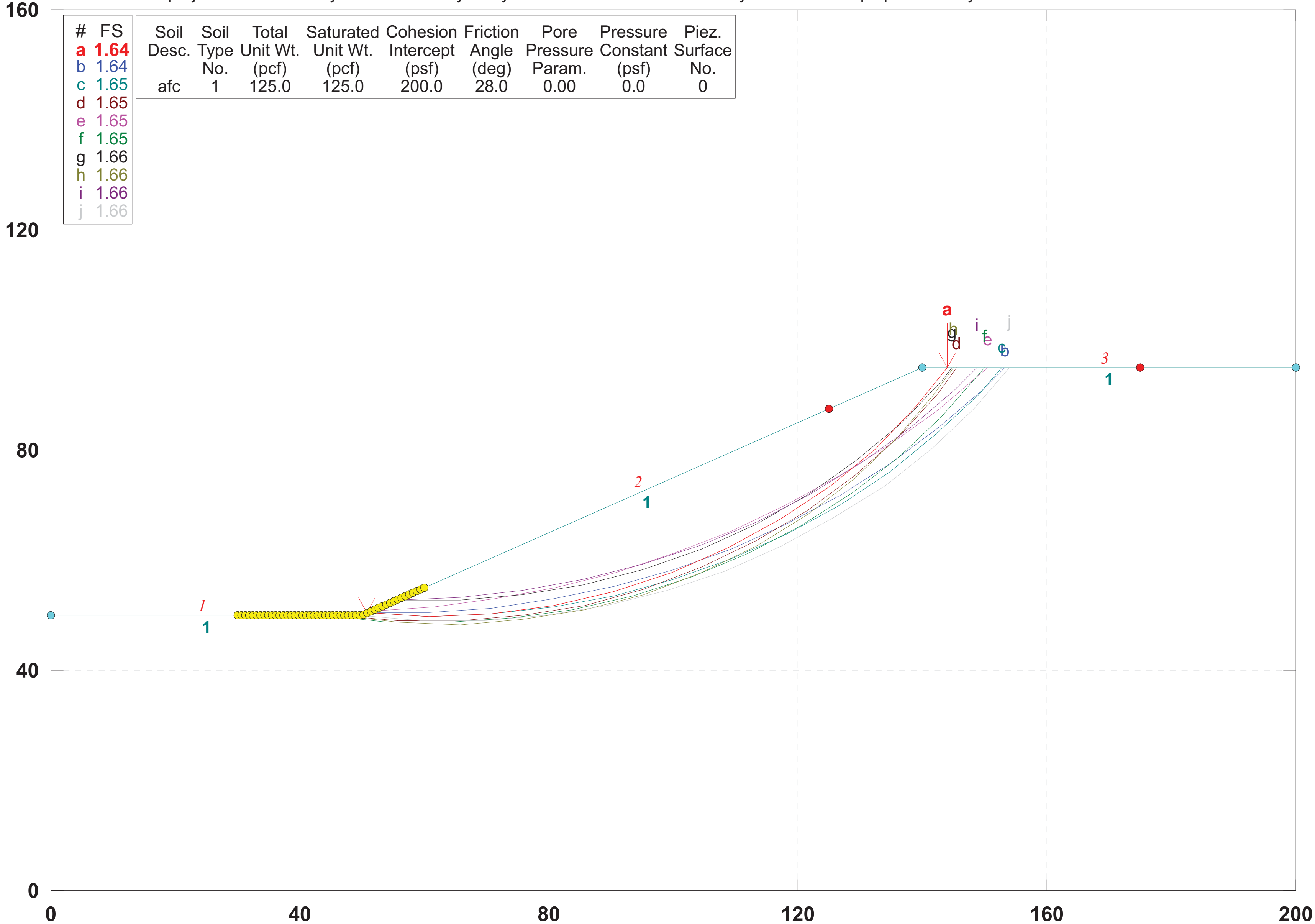


GSTABL7 v.2 FSmin=1.64

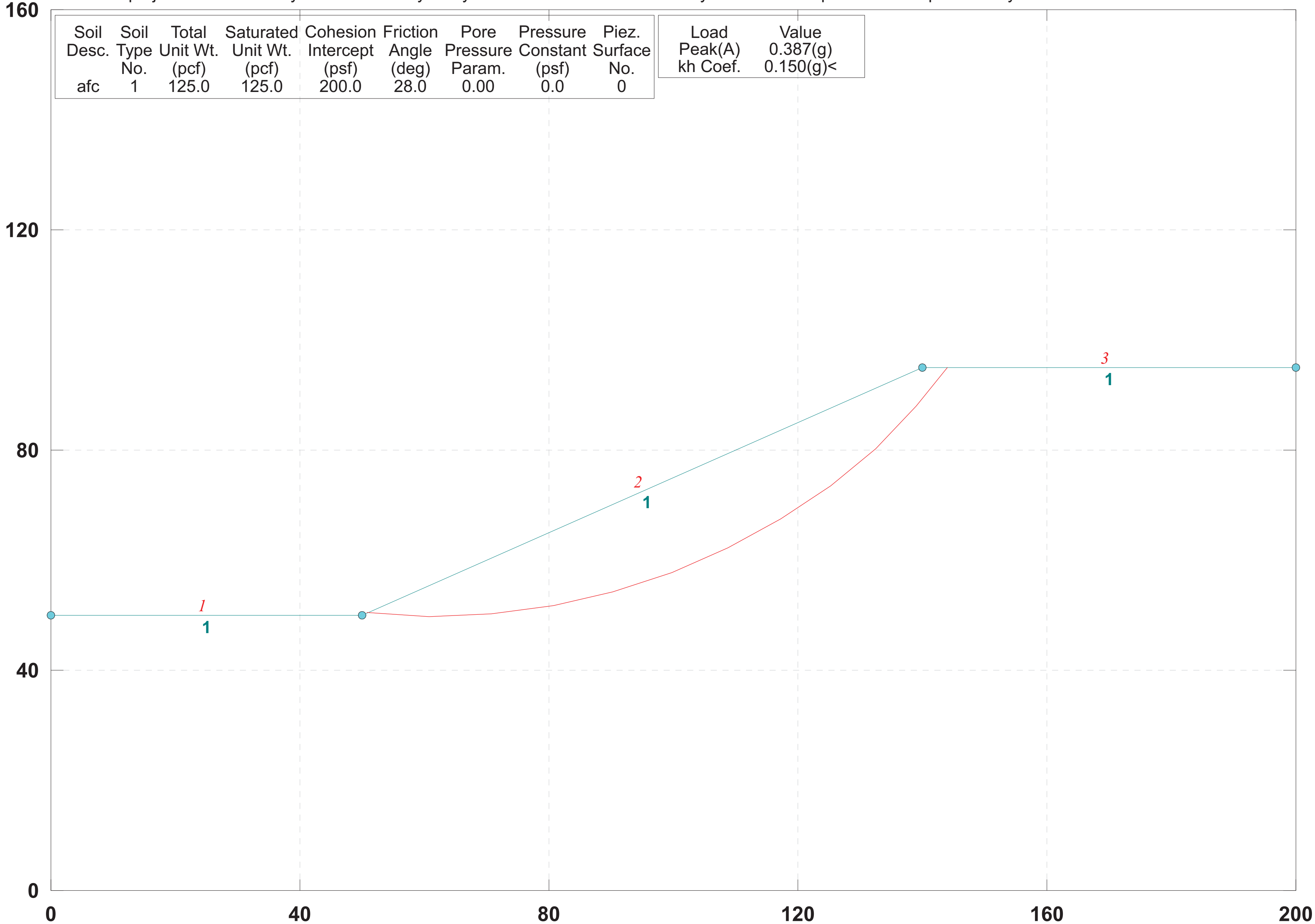
Safety Factors Are Calculated By The Modified Bishop Method

1310-04 Tyler Street 45 ft Fill Slope Pseudostatic

z:\project files\1310-04 tyler street\stability analysis\1310-04-b-2 final\1310-04 tyler street fill slope surface #1.plt Run By: PWM 4/28/2016 11:16AM

Soil Desc.	Soil Type No.	Total Unit Wt. (pcf)	Saturated Unit Wt. (pcf)	Cohesion Intercept (psf)	Friction Angle (deg)	Pore Pressure Param.	Pressure Constant (psf)	Piez. Surface No.
afc	1	125.0	125.0	200.0	28.0	0.00	0.0	0

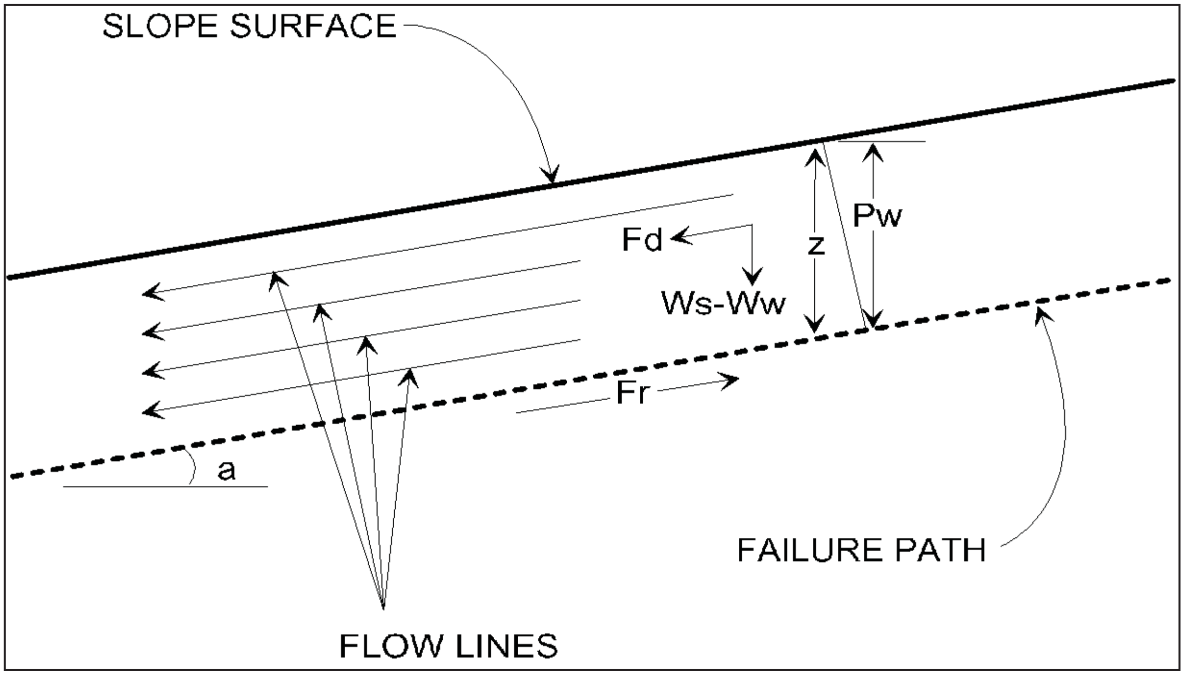
Load	Value
Peak(A)	0.387(g)
kh Coef.	0.150(g)<



GSTABL7 v.2 FSmin=1.21

Factor Of Safety Is Calculated By The Modified Bishop Method

SURFICIAL SLOPE STABILITY - 2:1 FILL



Assume: (1) Saturation To Slope Surface
(2) Sufficient Permeability To Establish Water Flow

Pw = Water Pressure Head=(z)(cos^2(a))
Ws = Saturated Soil Unit Weight
Ww = Unit Weight of Water (62.4 lb/cu.ft.)
u = Pore Water Pressure=(Ww)(z)(cos^2(a))
z = Layer Thickness
a = Angle of Slope
phi = Angle of Friction
c = Cohesion
Fd = (0.5)(z)(Ws)(sin(2a))
Fr = (z)(Ws-Ww)(cos^2(a))(tan(phi)) + c
Factor of Safety (FS) = Fr/Fd

Given:

Ws	z	a		phi		c
(pcf)	(ft)	(degrees)	(radians)	(degrees)	(radians)	(psf)
125	4	26.56505	0.463648	28	0.488692	200

Calculations:

Pw	u	Fd	Fr	**FS**
3.20	199.68	200.00	306.51	**1.53**

1310-04 Tyler Street AA 60 ft shear key

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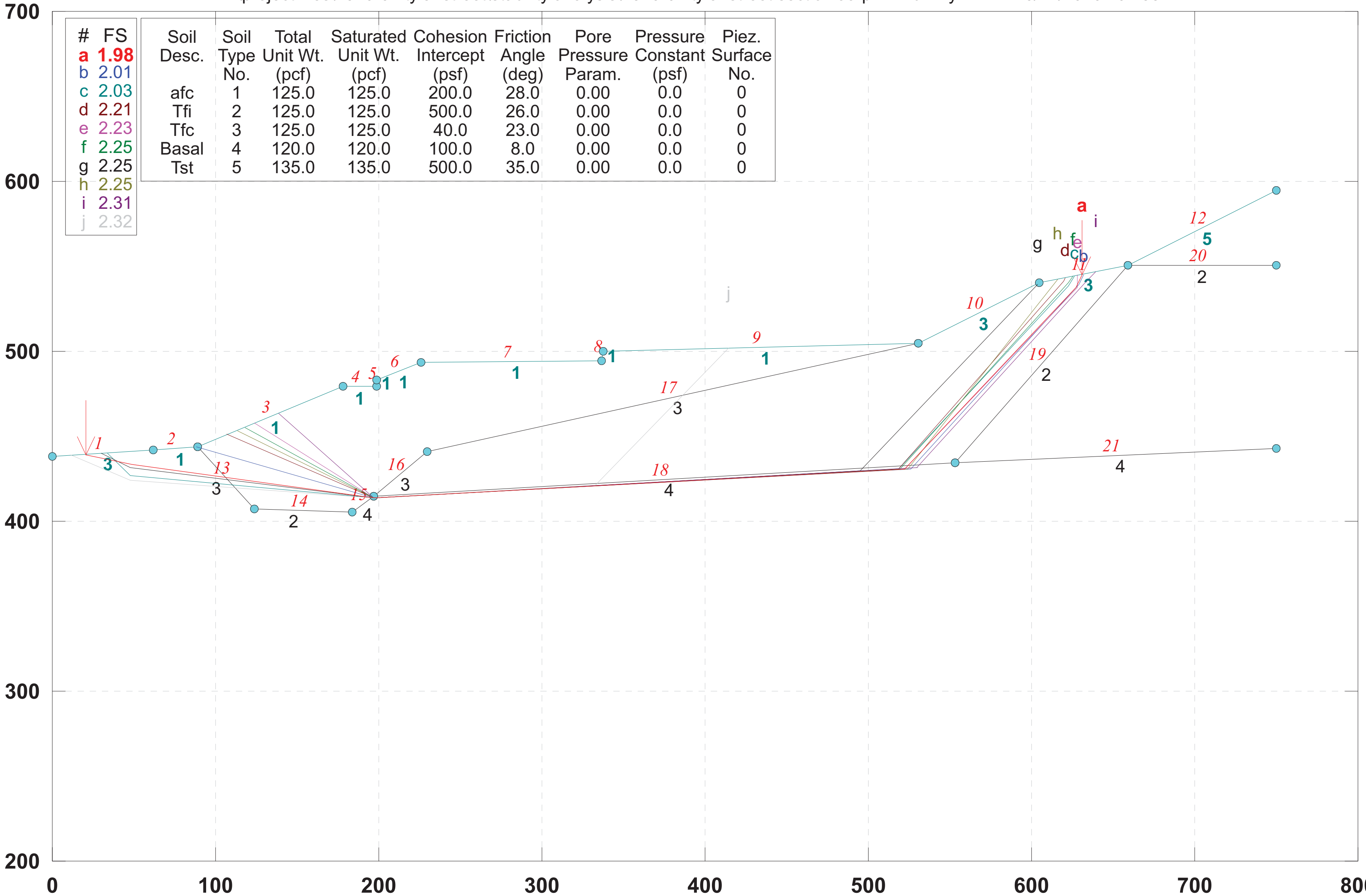

Soil Desc.	Soil Type No.	Total Unit Wt. (pcf)	Saturated Unit Wt. (pcf)	Cohesion Intercept (psf)	Friction Angle (deg)	Pore Pressure Param.	Pressure Constant (psf)	Piez. Surface No.
afc	1	125.0	125.0	200.0	28.0	0.00	0.0	0
Tfi	2	125.0	125.0	500.0	26.0	0.00	0.0	0
Tfc	3	125.0	125.0	40.0	23.0	0.00	0.0	0
Basal	4	120.0	120.0	100.0	8.0	0.00	0.0	0
Tst	5	135.0	135.0	500.0	35.0	0.00	0.0	0

GSTABL7 v.2 FSmin=1.98

Safety Factors Are Calculated By The Simplified Janbu Method

1310-04 Tyler Street BB 60 ft shear key

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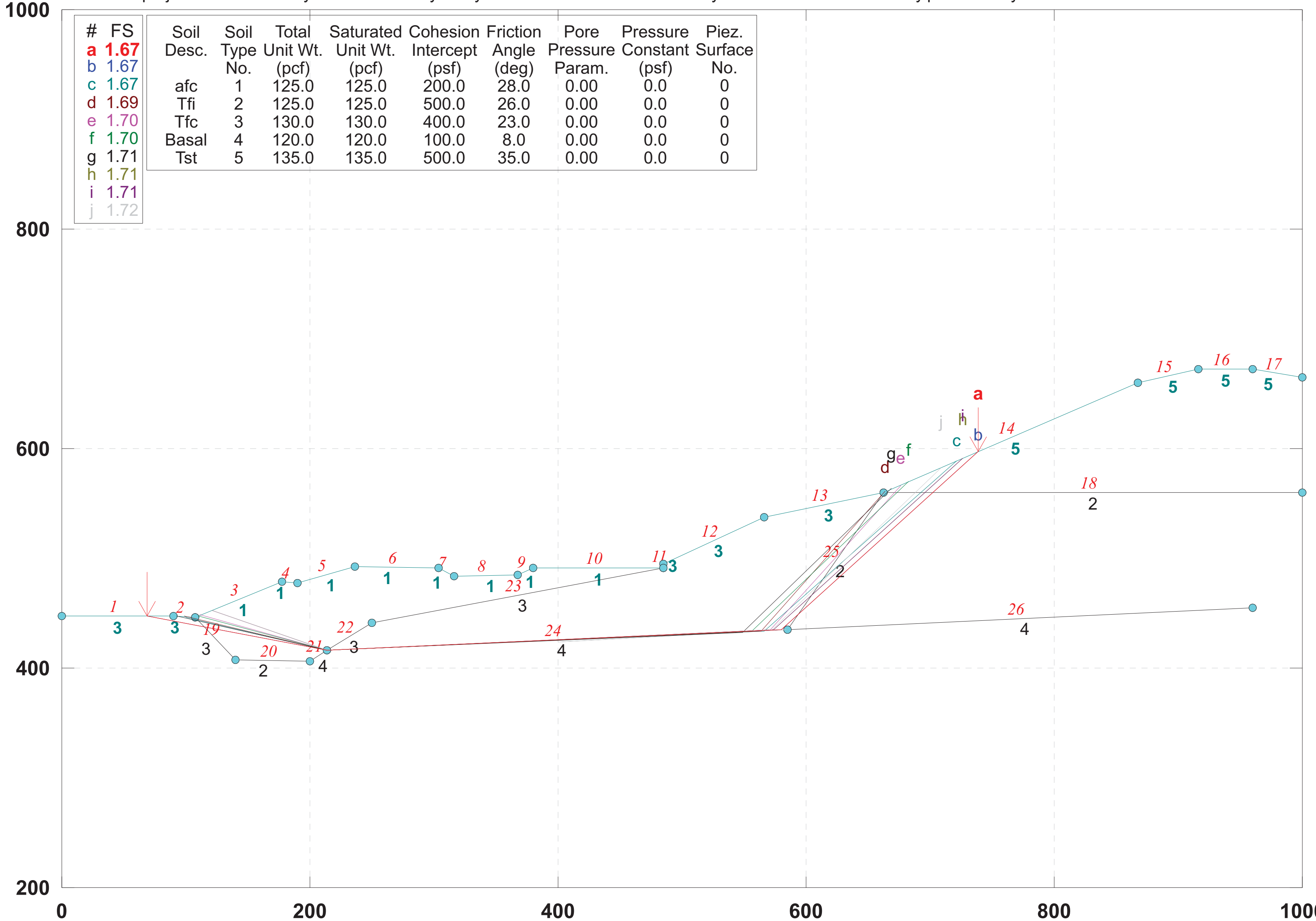


Soil Desc.	Soil Type No.	Total Unit Wt. (pcf)	Saturated Unit Wt. (pcf)	Cohesion Intercept (psf)	Friction Angle (deg)	Pore Pressure Param.	Pressure Constant (psf)	Piez. Surface No.
afc	1	125.0	125.0	200.0	28.0	0.00	0.0	0
Tfi	2	125.0	125.0	500.0	26.0	0.00	0.0	0
Tfc	3	130.0	130.0	400.0	23.0	0.00	0.0	0
Basal	4	120.0	120.0	100.0	8.0	0.00	0.0	0
Tst	5	135.0	135.0	500.0	35.0	0.00	0.0	0

GSTABL7 v.2 FSmin=1.67

Safety Factors Are Calculated By The Simplified Janbu Method

Appendix E

Earthwork Specifications and Grading Details

GENERAL EARTHWORK SPECIFICATIONS

I. General

A. General procedures and requirements for earthwork and grading are presented herein. The earthwork and grading recommendations provided in the geotechnical report are considered part of these specifications, and where the general specifications provided herein conflict with those provided in the geotechnical report, the recommendations in the geotechnical report shall govern. Recommendations provided herein and in the geotechnical report may need to be modified depending on the conditions encountered during grading.

B. The contractor is responsible for the satisfactory completion of all earthwork in accordance with the project plans, specifications, applicable building codes, and local governing agency requirements. Where these requirements conflict, the stricter requirements shall govern.

C. It is the contractor's responsibility to read and understand the guidelines presented herein and in the geotechnical report as well as the project plans and specifications. Information presented in the geotechnical report is subject to verification during grading. The information presented on the exploration logs depict conditions at the particular time of excavation and at the location of the excavation. Subsurface conditions present at other locations may differ, and the passage of time may result in different subsurface conditions being encountered at the locations of the exploratory excavations. The contractor shall perform an independent investigation and evaluate the nature of the surface and subsurface conditions to be encountered and the procedures and equipment to be used in performing his work.

D. The contractor shall have the responsibility to provide adequate equipment and procedures to accomplish the earthwork in accordance with applicable requirements. When the quality of work is less than that required, the Geotechnical Consultant may reject the work and may recommend that the operations be suspended until the conditions are corrected.

E. Prior to the start of grading, a qualified Geotechnical Consultant should be employed to observe grading procedures and provide testing of the fills for conformance with the project specifications, approved grading plan, and guidelines presented herein. All clearing and grubbing, remedial removals, clean-outs, removal bottoms, keyways, and subdrain installations should be observed and documented by the Geotechnical Consultant prior to placing fill. It is the contractor's responsibility to apprise the Geotechnical Consultant of their schedules and notify the Geotechnical Consultant when those areas are ready for observation.

F. The contractor is responsible for providing a safe environment for the Geotechnical Consultant to observe grading and conduct tests.

II. Site Preparation

A. Clearing and Grubbing: Excessive vegetation and other deleterious material shall be sufficiently removed as required by the Geotechnical Consultant, and such materials shall be properly disposed of offsite in a method acceptable to the owner and governing agencies. Where applicable, the contractor may obtain permission from the Geotechnical Consultant, owner, and governing agencies to dispose of vegetation and other deleterious materials in designated areas onsite.

B. Unsuitable Soils Removals: Earth materials that are deemed unsuitable for the support of fill shall be removed as necessary to the satisfaction of the Geotechnical Consultant.

C. Any underground structures such as cesspoles, cisterns, mining shafts, tunnels, septic tanks, wells, pipelines, other utilities, or other structures located within the limits of grading shall be removed and/or abandoned in accordance with the requirements of the governing agency and to the satisfaction of the Geotechnical Consultant. Environmental evaluation of existing conditions is not the responsibility of the Geotechnical Consultant.

D. Preparation of Areas to Receive Fill: After removals are completed, the exposed surfaces shall be processed or scarified to a depth of approximately 8 inches, watered or dried, as needed, to achieve a generally uniform moisture content that is at or near optimum moisture content. The scarified materials shall then be compacted to the project requirements and tested as specified.

E. All areas receiving fill shall be observed and approved by the Geotechnical Consultant prior to the placement of fill. A licensed surveyor shall provide survey control for determining elevations of processed areas and keyways.

III. Placement of Fill

A. Suitability of fill materials: Any materials, derived onsite or imported, may be utilized as fill provided that the materials have been determined to be suitable by the Geotechnical Consultant. Such materials shall be essentially free of organic matter and other deleterious materials, and be of a gradation, expansion potential, and/or strength that is acceptable to the Geotechnical Consultant. Fill materials shall be tested in a laboratory approved by the Geotechnical Consultant, and import materials shall be tested and approved prior to being imported.

B. Generally, different fill materials shall be thoroughly mixed to provide a relatively uniform blend of materials and prevent abrupt changes in material type. Fill materials derived from benching should be dispersed throughout the fill area instead of placing the materials within only an equipment-width from the cut/fill contact.

C. Oversize Materials: Rocks greater than 12 inches in largest dimension shall be disposed of offsite or be placed in accordance with the recommendations by the Geotechnical Consultant in the areas that are designated as suitable for oversize rock placement. Rocks that are smaller than 8 inches in largest dimension may be utilized in the fill provided that they are not nested and are their quantity and distribution are acceptable to the Geotechnical Consultant and do not inhibit the ability to properly compact fill materials.

D. The fill materials shall be placed in thin, horizontal layers such that, when compacted, shall not exceed 6 inches. Each layer shall be spread evenly and shall be thoroughly mixed to obtain a near uniform moisture content and uniform blend of materials.

E. Moisture Content: Fill materials shall be placed at or above the optimum moisture content or as recommended by the geotechnical report. Where the moisture content of the engineered fill is less than recommended, water shall be added, and the fill materials shall be blended so that a near uniform moisture content is achieved. If the moisture content is above the limits specified by the Geotechnical Consultant, the fill materials shall be aerated by discing, blading, or other methods until the moisture content is acceptable.

F. Each layer of fill shall be compacted to the project standards in accordance to the project specifications and recommendations of the Geotechnical Consultant. Unless otherwise specified by the Geotechnical Consultant, the fill shall be compacted to a minimum of 90 percent of the maximum dry density as determined by ASTM Test Method: D1557.

G. Benching: Where placing fill on a slope exceeding a ratio of 5 to 1 (horizontal to vertical), the ground should be keyed or benched. The keyways and benches shall extend through all unsuitable materials into suitable materials such as firm materials or sound bedrock or as recommended by the Geotechnical Consultant. The minimum keyway width shall be 15 feet and extend into suitable materials, or as recommended by the geotechnical report and approved by the Geotechnical Consultant. The minimum keyway width for fill over cut slopes is also 15 feet, or as recommended by the geotechnical report and approved by the Geotechnical Consultant. As a general rule, unless otherwise recommended by the Geotechnical Consultant, the minimum width of the keyway shall be equal to ½ the height of the fill slope.

H. Slope Face: The specified minimum relative compaction shall be maintained out to the finish face of fill and stabilization fill slopes. Generally, this may be achieved by overbuilding the slope and cutting back to the compacted core. The actual amount of overbuilding may vary as field conditions dictate. Alternately, this may be achieved by backrolling the slope face with suitable equipment or other methods that produce the designated result. Loose soil should not be allowed to build up on the slope face. If present, loose soils shall be trimmed to expose the compacted slope face.

I. Slope Ratio: Unless otherwise approved by the Geotechnical Consultant and governing agencies, permanent fill slopes shall be designed and constructed no steeper than 2 to 1 (horizontal to vertical).

J. Natural Ground and Cut Areas: Design grades that are in natural ground or in cuts should be evaluated by the Geotechnical Consultant to determine whether scarification and processing of the ground and/or overexcavation is needed.

K. Fill materials shall not be placed, spread, or compacted during unfavorable weather conditions. When grading is interrupted by rain, filing operations shall not resume until the Geotechnical Consultant approves the moisture and density of the previously placed compacted fill.

IV. Cut Slopes

A. The Geotechnical Consultant shall observe all cut slopes, including fill over cut slopes, and shall be notified by the contractor when cut slopes are started.

B. If adverse or potentially adverse conditions are encountered during grading, the Geotechnical Consultant shall investigate, evaluate, and make recommendations to mitigate the adverse conditions.

C. Unless otherwise stated in the geotechnical report, cut slopes shall not be excavated higher or steeper than the requirements of the local governing agencies. Short-term stability of the cut slopes and other excavations is the contractor's responsibility.

V. Drainage

A. Backdrains and Subdrains: Backdrains and subdrains shall be provided in fill as recommended by the Geotechnical Consultant and shall be constructed in accordance with the governing agency and/or recommendations of the Geotechnical Consultant. The location of subdrains, especially outlets, shall be surveyed and recorded by the Civil Engineer.

B. Top-of-slope Drainage: Positive drainage shall be established away from the top of slope. Site drainage shall not be permitted to flow over the tops of slopes.

C. Drainage terraces shall be constructed in compliance with the governing agency requirements and/or in accordance with the recommendations of the Civil Engineer.

D. Non-erodible interceptor swales shall be placed at the top of cut slopes that face the same direction as the prevailing drainage.

VI. Erosion Control

A. All finish cut and fill slopes shall be protected from erosion and/or planted in accordance with the project specifications and/or landscape architect's recommendations. Such measures to protect the slope face shall be undertaken as soon as practical after completion of grading.

B. During construction, the contractor shall maintain proper drainage and prevent the ponding of water. The contractor shall take remedial measures to prevent the erosion of graded areas until permanent drainage and erosion control measures have been installed.

VII. Trench Excavation and Backfill

A. Safety: The contractor shall follow all OSHA requirements for safety of trench excavations. Knowing and following these requirements is the contractor's responsibility. All trench excavations or open cuts in excess of 5 feet in depth shall be shored or laid back. Trench excavations and open cuts exposing adverse geologic conditions may require further evaluation by the Geotechnical Consultant. If a contractor fails to provide safe access for compaction testing, backfill not tested due to safety concerns may be subject to removal.

B. Bedding: Bedding materials shall be non-expansive and have a Sand Equivalent greater than 30. Where permitted by the Geotechnical Consultant, the bedding materials can be densified by jetting.

C. Backfill: Jetting of backfill materials to achieve compaction is generally not acceptable. Where permitted by the Geotechnical Consultant, the bedding materials can be densified by jetting provided the backfill materials are granular, free-draining and have a Sand Equivalent greater than 30.

VIII. Geotechnical Observation and Testing During Grading

A. Compaction Testing: Fill will be tested and evaluated by the Geotechnical Consultant for evaluation of general compliance with the recommended compaction and moisture conditions. The tests shall be taken in the compacted soils beneath the surface if the surficial materials are disturbed. The contractor shall assist the Geotechnical Consultant by excavating suitable test pits for testing of compacted fill.

B. Where tests indicate that the density of a layer of fill is less than required, or the moisture content is not within specifications, the Geotechnical Consultant shall notify the contractor of the unsatisfactory conditions of the fill. The portions of the fill that are not within specifications shall be reworked until the required density and/or moisture content has been attained. No additional fill shall be placed until the last lift of fill is tested and found to meet the project specifications and approved by the Geotechnical Consultant.

C. If, in the opinion of the Geotechnical Consultant, unsatisfactory conditions, such as adverse weather, excessive rock or deleterious materials being placed in the fill, insufficient equipment, excessive rate of fill placement, results in a quality of work that is unacceptable, the consultant shall notify the contractor, and the contractor shall rectify the conditions, and if necessary, stop work until conditions are satisfactory.

D. Frequency of Compaction Testing: The location and frequency of tests shall be at the Geotechnical Consultant's discretion. Generally, compaction tests shall be taken at intervals approximately two feet in fill height.

E. Compaction Test Locations: The Geotechnical Consultant shall document the approximate elevation and horizontal coordinates of the compaction test locations. The contractor shall coordinate with the surveyor to assure that sufficient grade stakes are established so that the Geotechnical Consultant can determine the test locations. Alternately, the test locations can be surveyed and the results provided to the Geotechnical Consultant.

F. Areas of fill that have not been observed or tested by the Geotechnical Consultant may have to be removed and recompacted at the contractor's expense. The depth and extent of removals will be determined by the Geotechnical Consultant.

G. Observation and testing by the Geotechnical Consultant shall be conducted during grading in order for the Geotechnical Consultant to state that, in his opinion, grading has been completed in accordance with the approved geotechnical report and project specifications.

H. Reporting of Test Results: After completion of grading operations, the Geotechnical Consultant shall submit reports documenting their observations during construction and test results. These reports may be subject to review by the local governing agencies.

Appendix F

Homeowners Maintenance Guidelines

HOMEOWNERS MAINTENANCE GUIDELINES

Homeowners are accustomed to maintaining their homes. They expect to paint their houses periodically, replace wiring, clean out clogged plumbing, and repair roofs. Maintenance of the home site, particularly on hillsides, should be considered on the same basis, or even on a more serious basis because neglect can result in serious consequences. In most cases, lot and site maintenance can be taken care of along with landscaping, and can be carried out more economically than repair after neglect.

Most slope and hillside lot problems are associated with water. Uncontrolled water from a broken pipe, cesspool, or wet weather causes most damage. Wet weather is the largest cause of slope problems, particularly in California where rain is intermittent, but may be torrential. Therefore, drainage and erosion control are the most important aspects of home site stability; these provisions must not be altered without competent professional advice. Further, maintenance must be carried out to assure their continued operation.

As geotechnical engineers concerned with the problems of building sites in hillside developments, we offer the following list of recommended home protection measures as a guide to homeowners.

Expansive Soils

Some of the earth materials on site have been identified as being expansive in nature. As such, these materials are susceptible to volume changes with variations in their moisture content. These soils will swell upon the introduction of water and shrink upon drying. The forces associated with these volume changes can have significant negative impacts (in the form of differential movement) on foundations, walkways, patios, and other lot improvements. In recognition of this, the project developer has constructed homes on these lots on post-tensioned or mat slabs with pier and grade beam foundation systems, intended to help reduce the potential adverse effects of these expansive materials on the residential structures within the project. Such foundation systems are not intended to offset the forces (and associated movement) related to expansive soil, but are intended to help soften their effects on the structures constructed thereon.

Homeowners purchasing property and living in an area containing expansive soils must assume a certain degree of responsibility for homeowner improvements as well as for maintaining conditions around their home. Provisions should be incorporated into the design and construction of homeowner improvements to account for the expansive nature of the onsite soils material. Lot maintenance and landscaping should also be conducted in consideration of the expansive soil characteristics. Of primary importance is minimizing the moisture variation below all lot improvements. Such design, construction and homeowner maintenance provisions should include:

- Employing contractors for homeowner improvements who design and build in recognition of local building code and site specific soils conditions.
- Establishing and maintaining positive drainage away from all foundations, walkways, driveways, patios, and other hardscape improvements.

- Avoiding the construction of planters adjacent to structural improvements. Alternatively, planter sides/bottoms can be sealed with an impermeable membrane and drained away from the improvements via subdrains into approved disposal areas.
- Sealing and maintaining construction/control joints within concrete slabs and walkways to reduce the potential for moisture infiltration into the subgrade soils.
- Utilizing landscaping schemes with vegetation that requires minimal watering. Alternatively, watering should be done in a uniform manner as equally as possible on all sides of the foundation, keeping the soil "moist" but not allowing the soil to become saturated.
- Maintaining positive drainage away from structures and providing roof gutters on all structures with downspouts installed to carry roof runoff directly into area drains or discharged well away from the structures.
- Avoiding the placement of trees closer to the proposed structures than a distance of one-half the mature height of the tree.
- Observation of the soil conditions around the perimeter of the structure during extremely hot/dry or unusually wet weather conditions so that modifications can be made in irrigation programs to maintain relatively constant moisture conditions.

Sulfates

On site soils should be tested for the presence of soluble sulfates. Concrete mixes should be designed based on Code standards based on the results of the testing.

Homeowners should be cautioned against the import and use of certain fertilizers, soil amendments, and/or other soils from offsite sources in the absence of specific information relating to their chemical composition. Some fertilizers have been known to leach sulfate compounds into soils otherwise containing "negligible" sulfate concentrations and increase the sulfate concentrations in near-surface soils to "moderate" or "severe" levels. In some cases, concrete improvements constructed in soils containing high levels of soluble sulfates may be affected by deterioration and loss of strength.

Water - Natural and Man Induced

Water in concert with the reaction of various natural and man-made elements, can cause detrimental effects to your structure and surrounding property. Rain water and flowing water erodes and saturates the ground and changes the engineering characteristics of the underlying earth materials upon saturation. Excessive irrigation in concert with a rainy period is commonly associated with shallow slope failures and deep seated landslides, saturation of near structure soils, local ponding of water, and transportation of water soluble substances that are deleterious to building materials including concrete, steel, wood, and stucco.

Water interacting with the near surface and subsurface soils can initiate several other potentially detrimental phenomena other then slope stability issues. These may include expansion/contraction cycles, liquefaction potential increase, hydro-collapse of soils, ground surface settlement, earth material consolidation, and introduction of deleterious substances.

The homeowners should be made aware of the potential problems which may develop when drainage is altered through construction of retaining walls, swimming pools, paved walkways and patios. Ponded water, drainage over the slope face, leaking irrigation systems, over-watering or other conditions which could lead to ground saturation must be avoided.

- ❖ Before the rainy season arrives, check and clear roof drains, gutters and down spouts of all accumulated debris. Roof gutters are an important element in your arsenal against rain damage. If you do not have roof gutters and down spouts, you may elect to install them. Roofs, with their, wide, flat area can shed tremendous quantities of water. Without gutters or other adequate drainage, water falling from the eaves collects against foundation and basement walls.
- ❖ Make sure to clear surface and terrace drainage ditches, and check them frequently during the rainy season. This task is a community responsibility.
- ❖ Test all drainage ditches for functioning outlet drains. This should be tested with a hose and done before the rainy season. All blockages should be removed.
- ❖ Check all drains at top of slopes to be sure they are clear and that water will not overflow the slope itself, causing erosion.
- ❖ Keep subsurface drain openings (weep-holes) clear of debris and other material which could block them in a storm.
- ❖ Check for loose fill above and below your property if you live on a slope or terrace.
- ❖ Monitor hoses and sprinklers. During the rainy season, little, if any, irrigation is required. Oversaturation of the ground is unnecessary, increases watering costs, and can cause subsurface drainage.
- ❖ Watch for water backup of drains inside the house and toilets during the rainy season, as this may indicate drain or sewer blockage.
- ❖ Never block terrace drains and brow ditches on slopes or at the tops of cut or fill slopes. These are designed to carry away runoff to a place where it can be safely distributed.
- ❖ Maintain the ground surface upslope of lined ditches to ensure that surface water is collected in the ditch and is not permitted to be trapped behind or under the lining.
- ❖ Do not permit water to collect or pond on your home site. Water gathering here will tend to either seep into the ground (loosening or expanding fill or natural ground), or will overflow into the slope and begin erosion. Once erosion is started, it is difficult to control and severe damage may result rather quickly.
- ❖ Never connect roof drains, gutters, or down spouts to subsurface drains. Rather, arrange them so that water either flows off your property in a specially designed pipe or flows out into a paved driveway or street. The water then may be dissipated over a wide surface or, preferably, may be carried away in a paved gutter or storm drain. Subdrains are constructed to take care of ordinary subsurface water and cannot handle the overload from roofs during a heavy rain.
- ❖ Never permit water to spill over slopes, even where this may seem to be a good way to prevent ponding. This tends to cause erosion and, in the case of fill slopes, can eat away carefully designed and constructed sites.

- Do not cast loose soil or debris over slopes. Loose soil soaks up water more readily than compacted fill. It is not compacted to the same strength as the slope itself and will tend to slide when laden with water; this may even affect the soil beneath the loose soil. The sliding may clog terrace drains below or may cause additional damage in weakening the slope. If you live below a slope, try to be sure that loose fill is not dumped above your property.
- Never discharge water into subsurface blanket drains close to slopes. Trench drains are sometimes used to get rid of excess water when other means of disposing of water are not readily available. Overloading these drains saturates the ground and, if located close to slopes, may cause slope failure in their vicinity.
- Do not discharge surface water into septic tanks or leaching fields. Not only are septic tanks constructed for a different purpose, but they will tend, because of their construction, to naturally accumulate additional water from the ground during a heavy rain. Overloading them artificially during the rainy season is bad for the same reason as subsurface subdrains, and is doubly dangerous since their overflow can pose a serious health hazard. In many areas, the use of septic tanks should be discontinued as soon as sewers are made available.
- Practice responsible irrigation practices and do not over-irrigate slopes. Naturally, ground cover of ice plant and other vegetation will require some moisture during the hot summer months, but during the wet season, irrigation can cause ice plant and other heavy ground cover to pull loose. This not only destroys the cover, but also starts serious erosion. In some areas, ice plant and other heavy cover can cause surface sloughing when saturated due to the increase in weight and weakening of the near-surface soil. Planted slopes should be planned where possible to acquire sufficient moisture when it rains.
- Do not let water gather against foundations, retaining walls, and basement walls. These walls are built to withstand the ordinary moisture in the ground and are, where necessary, accompanied by subdrains to carry off the excess. If water is permitted to pond against them, it may seep through the wall, causing dampness and leakage inside the basement. Further, it may cause the foundation to swell up, or the water pressure could cause structural damage to walls.
- Do not try to compact soil behind walls or in trenches by flooding with water. Not only is flooding the least efficient way of compacting fine-grained soil, but it could damage the wall foundation or saturate the subsoil.
- Never leave a hose and sprinkler running on or near a slope, particularly during the rainy season. This will enhance ground saturation which may cause damage.
- Never block ditches which have been graded around your house or the lot pad. These shallow ditches have been put there for the purpose of quickly removing water toward the driveway, street or other positive outlet. By all means, do not let water become ponded above slopes by blocked ditches.
- Seeding and planting of the slopes should be planned to achieve, as rapidly as possible, a well-established and deep-rooted vegetal cover requiring minimal watering.

- It should be the responsibility of the landscape architect to provide such plants initially and of the residents to maintain such planting. Alteration of such a planting scheme is at the resident's risk.
- The resident is responsible for proper irrigation and for maintenance and repair of properly installed irrigation systems. Leaks should be fixed immediately. Residents must undertake a program to eliminate burrowing animals. This must be an ongoing program in order to promote slope stability. The burrowing animal control program should be conducted by a licensed exterminator and/or landscape professional with expertise in hill side maintenance.

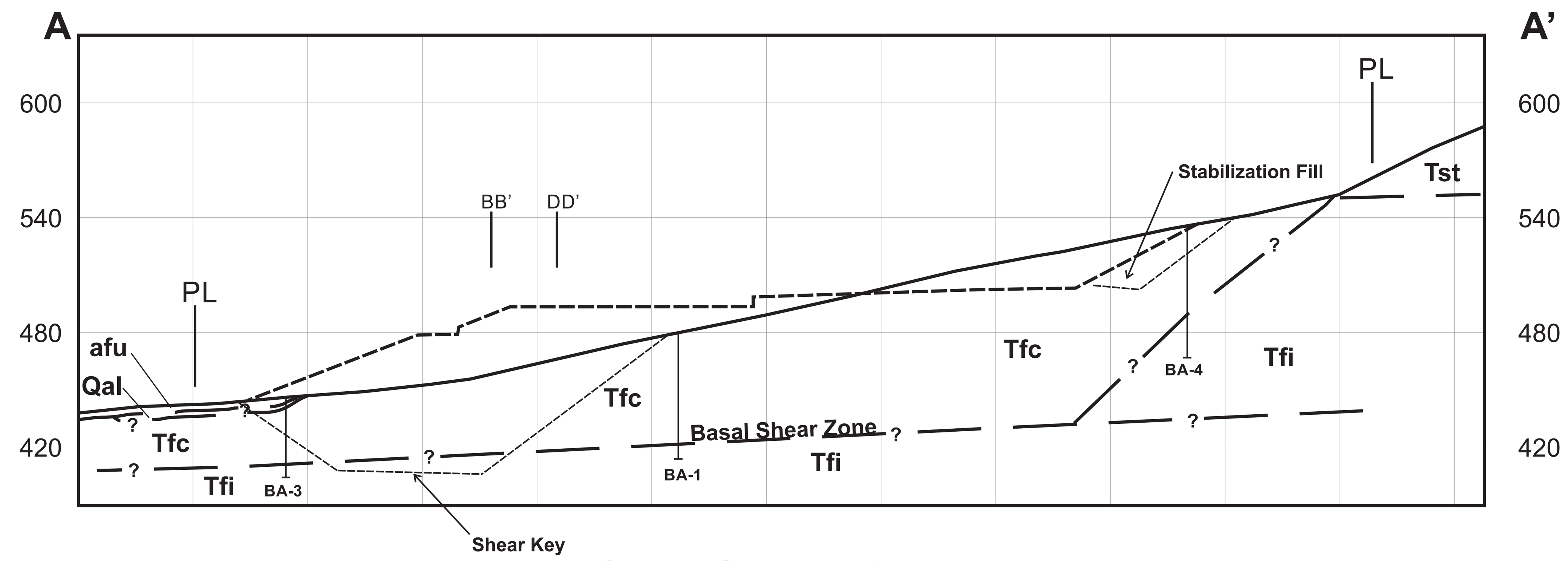
Geotechnical Review

Due to the presence of an adjacent descending slope, potential for expansive soils on site, and the fact that soil types may vary with depth, it is recommended that plans for the construction of rear yard improvements (swimming pools, spas, barbecue pits, patios, etc.), be reviewed by a geotechnical engineer who is familiar with local conditions and the current standard of practice in the vicinity of your home.

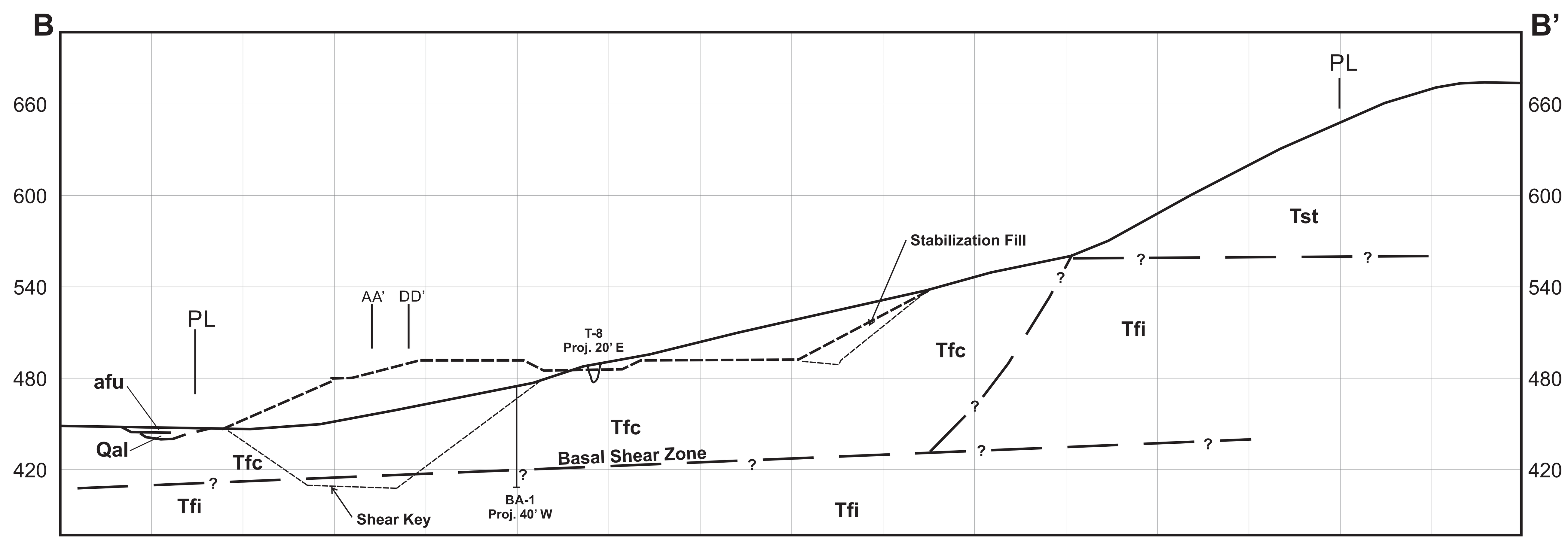
In conclusion, your neighbor's slope, above or below your property, is as important to you as the slope that is within your property lines. For this reason, it is desirable to develop a cooperative attitude regarding hillside maintenance, and we recommend developing a "good neighbor" policy. Should conditions develop off your property, which are undesirable from indications given above, necessary action should be taken by you to insure that prompt remedial measures are taken. Landscaping of your property is important to enhance slope and foundation stability and to prevent erosion of the near surface soils. In addition, landscape improvements should provide for efficient drainage to a controlled discharge location downhill of residential improvements and soil slopes.

Additionally, recommendations contained in the Geotechnical Engineering Study report apply to all future residential site improvements, and we advise that you include consultation with a qualified professional in planning, design, and construction of any improvements. Such improvements include patios, swimming pools, decks, etc., as well as building structures and all changes in the site configuration requiring earth cut or fill construction.

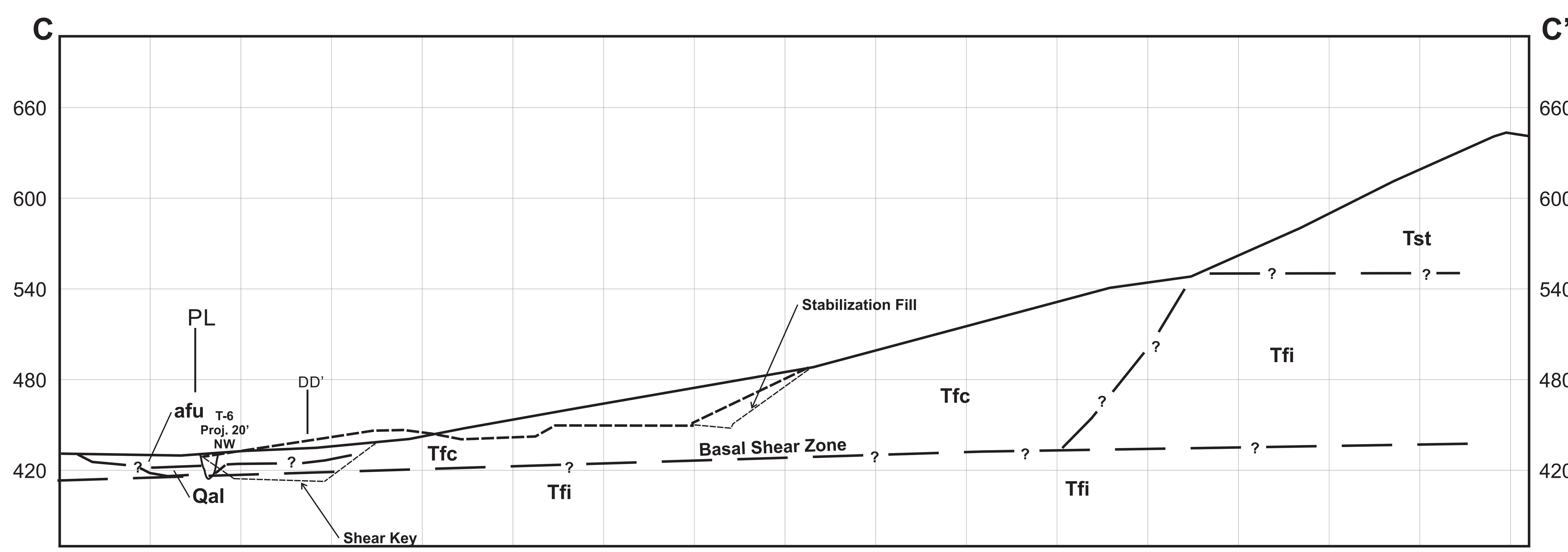
SHEET 1 OF 2
PRELIMINARY GRADING PLAN
TYLER STREET PROJECT
Geotechnical Legend
afu Artificial Fill - Undocumented
afc Artificial Fill- Compacted
Qal Alluvium
Qcol Colluvium
Tfc Friars Formation - Creep affected
Tfi Friars Formation - Intact
Tst Stadium Conglomerate
Geologic Contact, Bracketed where buried, Queried where uncertain
BA-1 Large Diameter Boring (this report)
T-1 Backhoe Test Pit (this report)
Cross Section
Keyway
BA-2
0-4' Soil
4-65' Tfi
TD = 65'
Seepage at 27'
T-4
0-1.5' Soil
1.5-12' Tfi
TD=12' (Pr. Ref)
No GW
T-6
0-8' afu
8-14' Qal
14-15' Tfc
TD=15'
No GW
BA-3
0-4' afu
4-6' Qal
6-34' Tfc
34-40' Tfi
TD = 40'
Seepage at 28' and 34'
60 ft. Shear Key
T-1
0-5' Qal
5-6' Tfc
TD=6' (Ref)
Seepage at 4'
T-3
0-1.5' Soil
1.5-5.5' Tfi
TD=5.5' (Ref)
No GW
Provide Key for Stabilization Fill Slope
T-7
0-2' Soil
2-13' Tfc
TD=13'
No GW
T-2
0-3.5' Qal
3.5-7' Tfc
TD=7' (Ref)
No GW
BA-1
0-1' Soil
1-3.5' Qcol
3.5-59' Tfc
59-65' Tfi
TD = 65'
Seepage at 46.5' and 58'
GW at 60'
T-5
0-1.5' Soil
1.5-14.5' Tfc
TD=14.5'
No GW
T-8
0-7' Qcol
7-12' Tfc
TD=12'
No GW
T-9
0-2' Qcol
2-12' Tfc
TD=12'
No GW
BA-4
0-3' afu
3-45' Tfc
45-70' Tfi
TD = 70'
No GW
MESA HEIGHTS RD
TYLER
BARBARA JEAN STREET
CLIFFORD HEIGHTS ROAD
HOLDEN ROAD
EPHEMERAL DRAINAGE CHANNEL PER BIOLOGIST
LOT 1
LOT 3 463 PAD
LOT 4 479
LOT 5 494 PAD
LOT 6 501 PAD
LOT 7 504.5 PAD
LOT 8 502 PAD
LOT 9 494.5 PAD
LOT 10 478.5 PAD
LOT 11 464.5 PAD
LOT 12 450.5 PAD
LOT 13 438.5 PAD
LOT 14 433 PAD
LOT B
afu (Qal) (Tfc)
afu (Tfc)
Qal (Tfc)
afc (Tfc)
afc (Tfi?)
Tfi
Tfc
Tst (Tfi)
A A'
B B'
C C'
D D'
E E'
F F'
VICINITY MAP
NO SCALE
MISSION GORGE ROAD
MESA ROAD
PROSPECT AVENUE
MESA HEIGHTS ROAD
TYLER ST
SITE
LEGEND:
EXISTING AC PAVEMENT
PROPOSED PAVEMENT
PROPOSED PCC SIDEWALK PER RSD G-7
PROPOSED BIOFILTRATION BASIN PER BF-1 TO BE MAINTAINED BY HOMEOWNER'S ASSOCIATION.
PROPERTY BOUNDARY
PROPOSED PROPERTY LINE
PROPOSED 8" PVC SEWER MAIN
PROPOSED 8" PVC WATER MAIN
CUT/FILL LINE
PROPOSED RETAINING WALL PER RSD C-4
PROPOSED BROW DITCH
2:1 CUT SLOPE
2:1 FILL SLOPE
PROPOSED STORM DRAIN PIPE
PROPOSED RIP RAP
PROPOSED CLEANOUT/CATCH BASIN
EXISTING CONTOUR
PROPOSED CONTOUR
PROPOSED STREET TREE PER DETAIL
PROPOSED SEWER MANHOLE
PROPOSED DRAINAGE PATH
PROPOSED STREET LIGHT
PROPOSED FIRE HYDRANT
TOPOGRAPHY:
TOPOGRAPHY PROVIDED BY PHOTOGEODETIC, INC.
DATE FLOWN: APRIL 18, 2015
SITE APN'S:
386-290-08, 09, 10, 13, 14, 20, 22, 24, 26.
GRADING: CUT = 81,000 CY
BULK = 13,000 CY (7.5%+/-)
FILL = 65,000 CY
EXPORT = 29,000 CY
SCALE: 1"=60'
TYLER STREET
TYPICAL SECTION
NO SCALE
PROPOSED RAIN GARDEN
PROPOSED 6" STORM DRAIN
PROPOSED PAVEMENT & BASE
PROPOSED 8" PVC SEWER MAIN
Walsh Engineering & Surveying, Inc.
607 Aldwych Road, El Cajon, CA 92020
(619) 588-6747 (619) 792-1232 Fax
LAWRENCE W. WALSH
46316
CIVIL
STATE OF CALIFORNIA
REGISTERED PROFESSIONAL ENGINEER
PLATE 1
Geologic Map and Exploration Location Plan
AGS
ADVANCED GEOTECHNICAL SOLUTIONS, INC.
Project: P/W 1310-04
Report: 1310-04-B-2R
Date: March 2019



Cross Section AA'
Scale: 1"=60'



Cross Section BB'
Scale: 1"=60'



Cross Section CC'
Scale: 1"=60'

LEGEND:

- Existing Grade
- Proposed Grade
- Approximate Location of Geologic Contact; Queried where Uncertain
- afu — Artificial Fill - Undocumented
- afc — Artificial Fill - Compacted
- Qal — Alluvium
- Qcol — Colluvium
- Tfc — Friars Formation - Creep Affected
- Tfi — Friars Formation - Intact
- Tst — Stadium Conglomerate

PLATE 2
Geologic Cross Sections AA'-CC'

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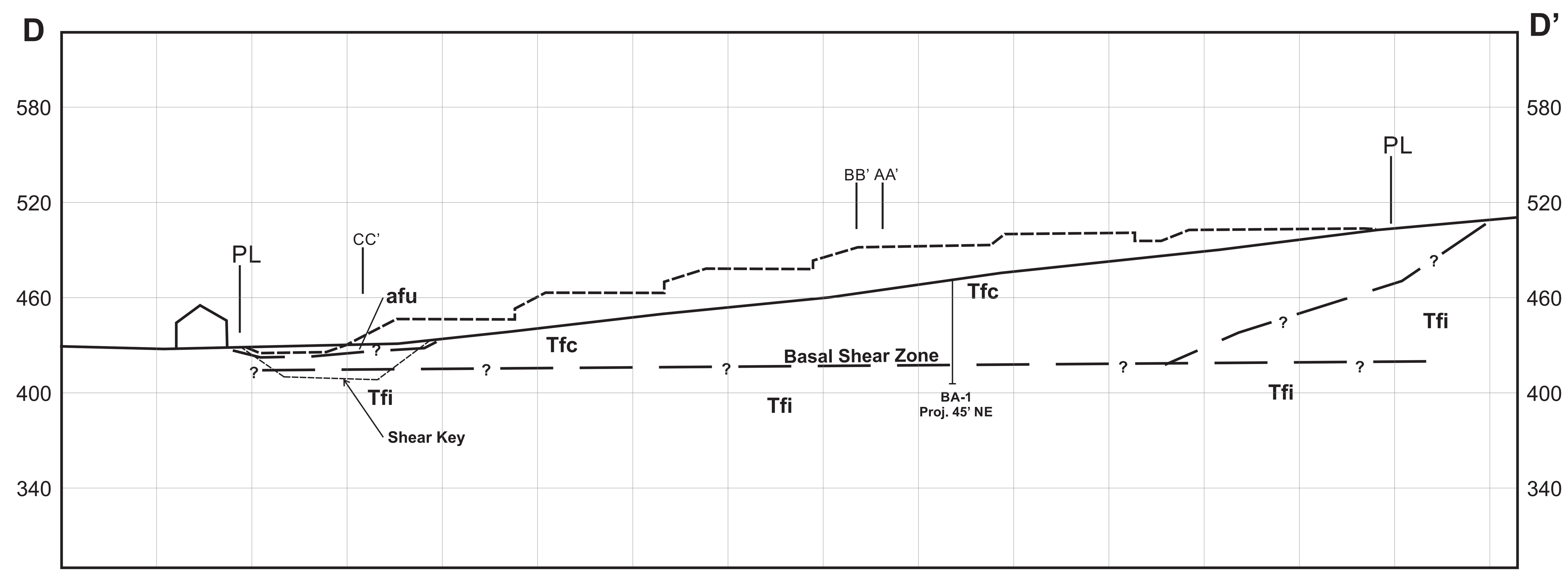
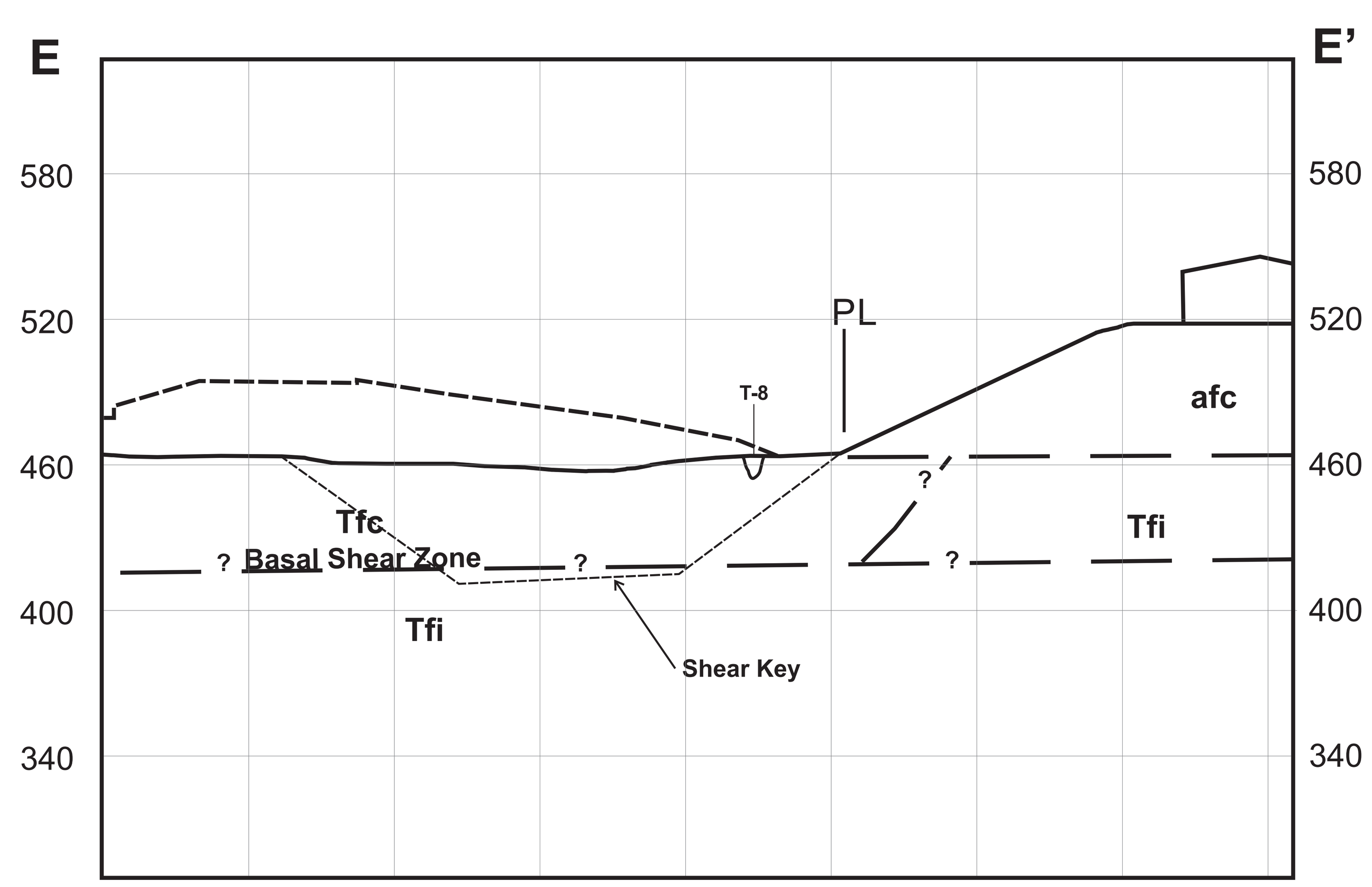
Project:	Report:	Date:
P/W 1310-04	1310-04-B-2R	March 2019

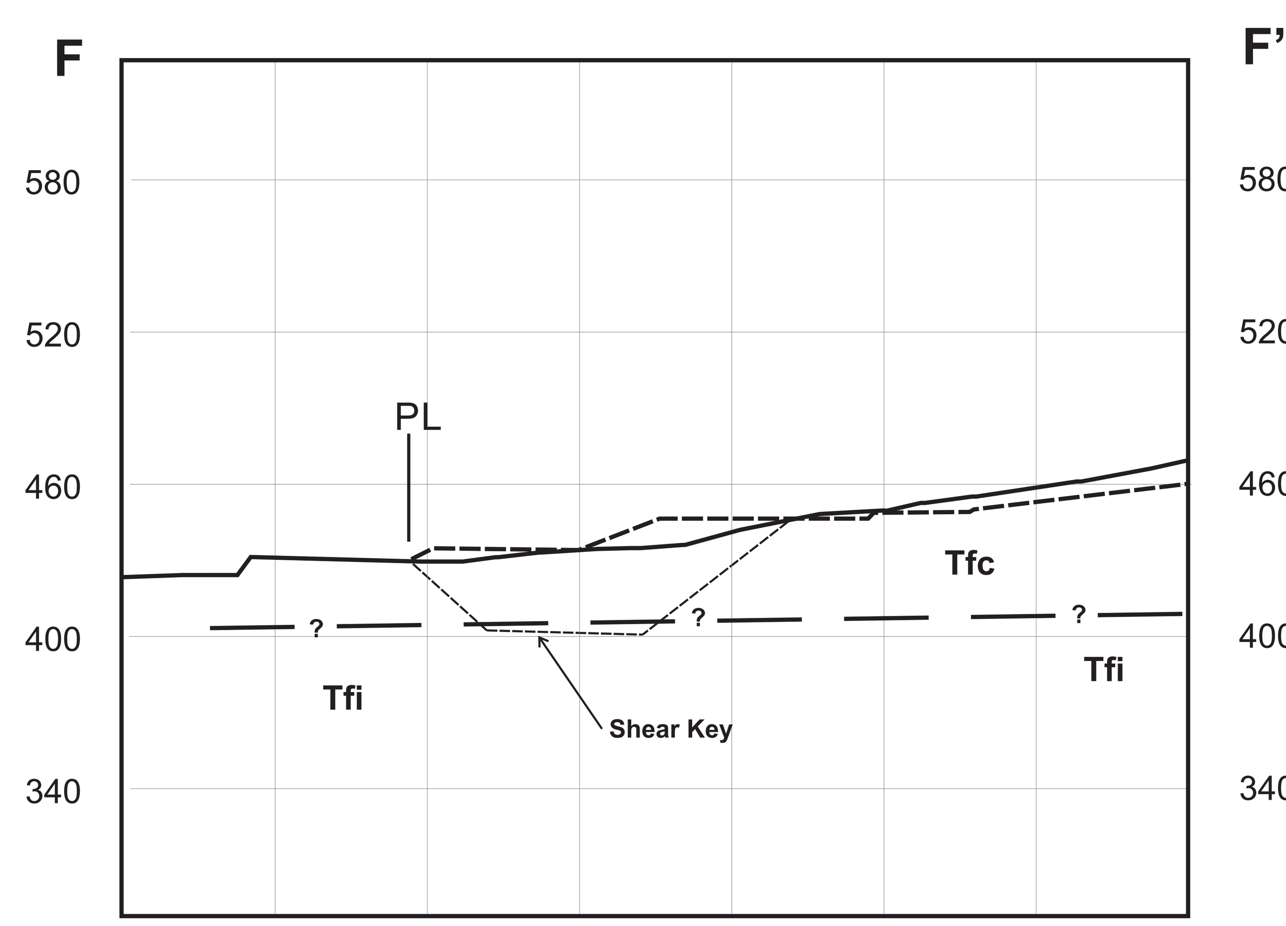
*See Plate 2 for Legend



Cross Section DD'
Scale: 1"=60'



Cross Section EE'
Scale: 1"=60'



Cross Section FF'
Scale: 1"=60'

PLATE 3
Geologic Cross Sections DD'-FF'

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Project:	Report:	Date:
P/W 1310-04	1310-04-B-6	March 2019