
Appendix D:

Geology and Soils Supporting Information

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GEOTECHNICAL

OPTIMIZED SOIL ENGINEERING

June 3, 2024

Project No. 24064-01

To: Meritage Homes
5 Peters Canyon Road, Suite 310
Irvine, California 92606

Attention: Ms. Johanna Crooker

Subject: Geotechnical Exploration and Preliminary Design Recommendations, Proposed Residential Development, 400 - 700 Freedom Lane, Lots 2 through 5 of Tract No. 18080, City of Aliso Viejo, California

At your request, SA Geotechnical, Inc. (SA GEO) has conducted a geotechnical subsurface exploration and due diligence study for the subject proposed residential development at 400 - 700 Freedom Lane in the City of Aliso Viejo, California (Figure 1), legally described as Lots 2 through 5 of Tract No. 18080, Assessor's Parcel Numbers (APNs) 632-141-12, -13, -14, and -15. The purpose of this study was to evaluate the geotechnical site conditions considering the proposed grading and improvements in order to provide a geotechnical summary and preliminary geotechnical recommendations for project design, grading, and construction. Our evaluation included review of background geologic and geotechnical engineering maps and reports for the subject site; a site-specific subsurface exploration; laboratory testing; geotechnical analysis and preparation of this report.

The subject site was previously mass graded during the 1980s but has remained undeveloped since that time. No documentation of this grading was recovered during our archive search of City records. Based on our exploration, the mass grading resulted in bedrock at or near existing grades throughout a majority of the site, while the southeastern corner of the site and southerly slope was filled to current grades. The primary geotechnical constraints include the presence of friable sands prone to caving in steep-sided excavations (Niguel Formation), presence of highly expansive earth materials (Monterey Formation) within the northern portion of the site, existing onsite utilities that must be protected in place during grading, and the potential for seismic shaking during a strong seismic event. Groundwater was not encountered during this or prior subsurface exploration to a maximum depth of 75 feet. Seepage was encountered at depths ranging from 18.5 to 27 feet below ground surface in one boring (B-2).

This report presents our findings, conclusions, and preliminary design recommendations for the proposed residential development. Based on our review, the proposed grading and development is considered geotechnically feasible provided the recommendations in this report are implemented during design, grading, and construction. Additional geotechnical evaluation and analysis will need to be performed once the project plans for grading, utility improvements and foundations are developed. Stormwater infiltration at the subject site is not considered feasible from a geotechnical viewpoint.

References pertinent to the site are included in Appendix A. Boring and test pit logs are included in Appendix B. Laboratory test data is included in Appendix C. Seismic design parameters are presented in Appendix D. Slope stability analysis is attached as Appendix E. General earthwork and grading specifications are presented in Appendix F.

If you have any questions regarding this report, please contact our office. We appreciate the opportunity to provide our services.

Respectfully submitted,

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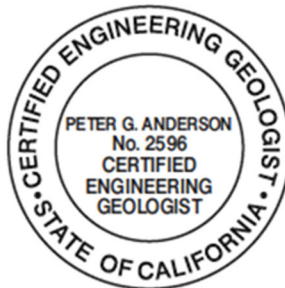


TABLE OF CONTENTS

EXECUTIVE SUMMARY	1
1.0 INTRODUCTION.....	2
1.1 Introduction and Scope of Services.....	2
1.2 Site Condition and History	2
1.3 Proposed Grading and Improvements	4
1.4 Prior Geotechnical Studies	4
1.5 Subsurface Exploration	4
1.6 Laboratory Testing	5
2.0 GEOTECHNICAL FINDINGS.....	6
2.1 Geologic Setting and Earth Units.....	6
2.2 Geotechnical Conditions	7
2.3 Groundwater and Surface Water	8
2.4 Regional Faulting and Seismicity	8
2.5 Slope Stability	9
2.6 Settlement and Foundation Considerations	9
2.7 Stormwater Infiltration Feasibility	10
2.8 Shrinkage and Bulking	10
2.9 Existing Utilities.....	10
3.0 CONCLUSION AND PRELIMINARY RECOMMENDATIONS.....	11
3.1 General Conclusion and Recommendation	11
3.2 Site Preparation and Earthwork.....	11
3.2.1 Site Demolition and Clearing	11
3.2.2 Protection of Existing Improvements and Utilities.....	11
3.2.3 Remedial Grading Measures.....	12
3.2.4 Placement of Oversize Material.....	12
3.2.5 Fill Placement	13
3.2.6 Import.....	13
3.3 Settlement Potential.....	13
3.4 Foundation Design	14
3.5 Caisson Design.....	15
3.6 Retaining Wall Design and Lateral Earth Pressures	16
3.7 Seismic Design Parameters	17
3.8 Slope Stability and Slope Setback.....	18
3.9 Corrosivity.....	18
3.10 Expansion Potential.....	19
3.11 Interior Slab Moisture Mitigation.....	19
3.12 Exterior Concrete	20
3.13 Preliminary Asphalt Concrete Pavement Design	20
3.14 Vehicular PCC Pavements	21
3.15 Concrete Paver Section	21
3.16 Trench Excavation and Backfill.....	22
3.17 Groundwater.....	23
3.18 Stormwater Infiltration Feasibility	23
3.19 Surface Drainage and Irrigation	23
3.20 Slope Maintenance, Lot Drainage, and Erosion Control.....	24
3.21 Additional Subsurface Exploration and Laboratory Testing.....	24
3.22 Review of Future Plans	24
3.23 Observation and Testing during Grading and Construction.....	24
4.0 LIMITATIONS	26

TABLE OF CONTENTS (Continued)

List of Illustrations

Figure 1 – Site Location Map – Rear of Text
Figure 2 – Regional Geologic Map – Rear of Text
Figure 3 – Regional Fault Map – Rear of Text
Figure 4 – Retaining Wall Drainage Detail – Rear of Text

Appendices

Appendix A – References
Appendix B – Boring and Test Pit Logs
Appendix C – Laboratory Test Results,
Appendix D – Seismicity Data
Appendix E – Slope Stability Analysis
Appendix F – General Earthwork and Grading Specifications

Plates

Plate 1 – Geotechnical Map – Rear of Appendices
Plate 2 – Remedial Measures Map – Rear of Appendices
Plates 3 and 4 – Geotechnical Cross Sections A-A' and B-B' – Rear of Appendices

EXECUTIVE SUMMARY

The subject site is underlain by bedrock of the Niguel and Monterey Formations and partially by artificial fill material as a result of mass grading in the 1980s. The majority of the site is underlain by bedrock at or near existing grades. The southerly perimeter and southeastern corner of the site were brought to current grades with compacted artificial fill. The artificial fill materials generally consisted of yellowish brown, brown, olive brown, and grayish brown fine to medium-grained, sand that was damp to very moist, and medium dense. Bedrock of the Niguel and Monterey Formations were encountered during our exploration. The Niguel Formation generally consisted of silty to clean sandstone with minor amounts of siltstone; the Monterey Formation consisted of diatomaceous clayey siltstone with minor amounts of silty sandstone.

The primary geotechnical constraints for the proposed site redevelopment include the following:

- Presence of highly expansive earth materials (Monterey Formation) within the northern portion of the site;
- Presence of friable sands prone to caving in steep-sided excavations;
- Existing onsite utilities that must be protected in place; and,
- Potential for strong seismic shaking during an earthquake event.

Remedial grading for the site should consist of the removal and recompaction of all undocumented fill materials and near-surface weathered/disturbed or highly faulted bedrock. In general, remedial removals are anticipated to range from 1 to 7 feet below existing grades. Remedial removal/overexcavation within the building pads is recommended 3 to 5 feet below design grades or existing grades, whichever is lower. For areas underlain by faulted, highly expansive diatomaceous bedrock (Monterey Formation), we recommended a 7-foot removal/overexcavation. Remedial grading within the proposed drive areas may be limited to removal and recompaction of the upper 1 to 2 feet (see Plate 2).

Static groundwater was not encountered during our exploration. Seepage was encountered in Boring B-2 at depths between 18.5 and 27 feet below ground surface. In general, groundwater is anticipated to remain more than 20 feet below design grades upon the completion of grading. However, seepage/groundwater may be present at shallow depth locally and fluctuates on an annual and seasonal basis.

Building foundations and slabs should be designed to tolerate a total settlement of 1-inch and differential settlement of ½-inch over a span of 40 feet. The site is categorized as Site Class "C" for seismic design. Onsite soils are anticipated to have "Medium" expansion potential at the completion of grading. Onsite soils are not anticipated to be corrosive to concrete but are anticipated to be corrosive to metals.

Based on our findings, we conclude that the proposed residential development is feasible from a geotechnical viewpoint, provided it is designed and constructed in accordance with the recommendations presented in this report and any future design/plan review reports. The site is not considered suitable for infiltration of stormwater.

1.0 INTRODUCTION

1.1 Introduction and Scope of Services

At your request, SA Geotechnical, Inc. (SA GEO) has conducted geotechnical exploration and due diligence study for the subject proposed residential development at 400-700 Freedom Lane in the city of Aliso Viejo, California (Figure 1). The purpose of our review was to assess the onsite geologic and geotechnical conditions and provide preliminary recommendations for design, grading, and construction of the proposed improvements. We have reviewed the Conceptual Site Plan, dated May 2024, and the site topographic survey prepared by X Engineering & Consulting, Inc., received on May 15, 2024, which was used as the base for our Geotechnical Map and Remedial Measures Map (Plates 1 and 2). The Conceptual Site Plan was also used as the base for our Remedial Measures Map (Plate 2).

Our scope of services for this study included the following tasks:

- Review of available geologic and geotechnical maps, reports, and data for the subject site and surrounding area, including an archive search of City of Aliso Viejo records. A list of references is included in Appendix A.
- Review of available historic aerial photographs dating back to 1931.
- Subsurface exploration consisting of two bucket auger borings (B-1 and B-2) to depths of 65 and 75 feet bgs, twelve test pits (TP-1 through TP-3, TP-3a, TP-3b, and TP-4 through TP-10) to depths ranging from 4 to 14 feet bgs, and three hand auger borings (HA-1 through HA-3) to depths ranging from 10 to 13 feet below ground surface (bgs).
- Laboratory testing of selected samples to determine engineering properties of onsite soils, including in-situ moisture and density, grain size distribution, Atterberg limits, consolidation, shear strength, maximum density and optimum moisture content, expansion potential, and soluble sulfate content.
- Geotechnical evaluation and analysis of the compiled data regarding the proposed grading and development.
- Evaluation of faulting, seismicity, and seismic and static settlement in accordance with the 2022 California Building Code (CBC).
- Preparation of this report including our findings, conclusions, preliminary recommendations, and accompanying illustrations.
- Consultations with the project team.

SA GEO's expertise and scope of services do not include assessment of potential subsurface environmental contaminants or environmental health hazards.

1.2 Site Condition and History

The approximately 7.1-acre (4.3 net acres), roughly triangular-shaped site is located in Aliso Viejo, California (Figure 1), and is legally described as Lots 2 through 5 of Tract No. 18080, Assessor's Parcel Numbers (APNs) 632-141-12, -13, -14, and -15. The site is bound to the north by Freedom Lane, Belmont Village Senior Living to the east, undeveloped land to the west, and to the south by a Moulton Niguel Water District reservoir tank.

Overall site topography is relatively flat, with grade changes on the order of 5 feet, aside from an approximately 12-foot-high stockpile in the northern portion of the site. An approximately 5- to 6-foot-deep temporary desilting basin is present in the eastern portion of the site. A descending slope is present along the entire southern portion of the property approximately 40 to 70 feet in height, extending beyond the property boundary. The slope is generally 2H:1V (horizontal:vertical) or flatter, and includes terrace drains (v-ditches) every 30 vertical feet. During our site reconnaissance we observed the presence of scattered 2- to 4- foot-diameter boulders at the ground surface, presumed to have been placed concurrent with the onsite undocumented fill stockpile. The site is variably vegetated with large, mature trees on the southern slope, and scrubs, grasses, and bushes in the flat portion of the landscape.

The subject site was mass graded in the 1980s, resulting in the current topography but has remained undeveloped since that time. Based on our review of historic and current topography, during mass grading the flat portion of the site was cut on the order of 40 to 100 feet below original grades, while the southeastern corner of the site and southerly slope was filled to current grades. Following grading, dry utilities and a 12-inch domestic water pipeline were installed in the northern and central portions of the site, respectively. An existing temporary 18-inch storm drain pipe/riser is present draining the desilting basin to a junction structure adjacent to Freedom Lane.

Based on our review of available historic aerial photographs dating back to 1931, the following summarizes our understanding of the site history:

- **1931-1987:** The site and surrounding area were undeveloped natural scrubland. A natural descending slope and drainage were present in the southernmost portion of the site, in approximate alignment with the present-day slope. A northeast trending ridgeline is present just north of the site. The site remained undeveloped during this period except for various dirt access roads traversing the site and surrounding area.
- **1988-1995:** Mass grading began for the site and the surrounding area to the north, east, and south, encompassing a large portion of the City of Aliso Viejo. Grading onsite was completed by 1990. The water reservoir tank and light industrial facilities to the south were constructed by 1990. The existing southerly slope was landscaped with trees around 1993.
- **1996-2015:** No changes were observed onsite.
- **2016-2018:** Grading and construction of Freedom Lane began in late 2016; grading/paving was completed in 2017. The construction of the senior living development (Liberty at Aliso and Belmont Village) and Aliso Ridge Behavioral Health Center, north and east of the subject site began in 2017. Beginning in 2016, the subject site was utilized as an equipment/materials storage yard and staging area for the adjacent construction. It was during this time that the onsite artificial fill stockpile was placed, likely generated from excavations associated with the adjacent developments. The onsite desilting basin and storm drain improvements were constructed by late 2017.
- **2019-Present:** The adjacent senior living developments were completed by 2019 and the health center by 2021. The subject site was utilized as a storage yard/staging area through 2019. Temporary fencing associated with the storage yard was removed by 2020. The site has remained largely unchanged since 2020.

1.3 Proposed Grading and Improvements

Based on our review of the Conceptual Site Plan, the site is proposed to be developed for residential use. The Conceptual Site Plan shows 12 multifamily residential buildings with approximately 124 total units proposed. The project will also include stormwater quality/filtration devices, paved drive aisles and parking, and utility infrastructure improvements to support the development. We anticipate that the proposed attached units will be 3- to 4-story and consist of wood-framed construction.

The planned earthwork/grading is currently unknown; however, considering the relatively flat topographic relief across the site, we anticipate design cuts and fills generally on the order of 1 to 3 feet will be required to create a relatively level site and building pads. Locally deeper cuts/fills (i.e., stockpile area, temporary desilting basin) on the order of 4 to 12 feet will be required.

1.4 Prior Geotechnical Studies

Southern California Geotechnical, Inc. (SCG) performed a geotechnical exploration at the subject site in 2021. The subsurface exploration program included four hollow-stem auger borings (SB-1 through SB-4) to depths ranging from 20 to 40 feet below ground surface (bgs), and two bucket auger borings (SBA-1 and SBA-2), to depths of 31 and 66 feet. An additional boring (SB-3) was also included in the report from a prior 2014 study that was performed by SCG; however, the report associated with that boring was not available for our review. The boring and laboratory data included in the 2021 exploration report were reviewed as part of study.

The approximate boring locations are shown on the Boring Location Map (Plate 1). The associated boring logs are provided in Appendix B. Laboratory testing included in-situ moisture content and dry density, maximum density and optimum moisture content, consolidation, and direct shear. The associated laboratory test data is provided in Appendix C.

1.5 Subsurface Exploration

Our field exploration was performed between May 3 and May 9, 2024, and included excavation of two bucket auger borings (B-1 and B-2) to depths of 65 and 75 feet bgs, twelve test pits (TP-1 through TP-3, TP-3a, TP-3b, and TP-4 through TP-10) to depths ranging from 4 to 14 feet bgs, and three hand auger borings (HA-1 through HA-3) to depths ranging from 10 to 13 feet bgs. The borings and trenches were geologically logged, and samples were obtained at selected intervals. After completion of boring and test pit logging, the excavations were backfilled with soil cuttings. The approximate boring and test pit locations are shown on the Geotechnical Map (Plate 1). Boring and trench logs are included in Appendix B.

Soil sampling was performed using a Modified California ring sampler. Relatively undisturbed ring samples were obtained from the borings at various depths with a 2.5-inch inside-diameter, split-barrel sampler. The sampler was driven using the kelly bar, free falling 12 inches. The hammer weights varied with depth due to the telescoping kelly bar, with drive weights of 2500 pounds (lbs) from 0-25 feet bgs, 1500 lbs from 25 to 45 feet bgs, 750 lbs from 45 to 65 feet bgs, and 1500 lbs from 65 to 90 feet bgs. The sampling was used to assess the soil beneath the site as well as to obtain a measure of resistance of the soil to penetration (recorded as blows-per-foot on

the geotechnical boring logs). Representative bulk samples of onsite soils were also collected from soil cuttings and used for additional soil identification purposes and laboratory testing.

1.6 Laboratory Testing

Representative samples of onsite soils collected during our field exploration were tested to characterize the engineering properties. Laboratory tests performed on selected relatively undisturbed and bulk soil samples included:

- Moisture content and dry density;
- Sieve analysis;
- Atterberg limits;
- Direct shear;
- Consolidation;
- Maximum density and optimum moisture content;
- Expansion potential; and
- Soluble sulfate.

Laboratory tests were conducted in general conformance with applicable ASTM International standards. The laboratory test results for this and prior studies are provided in Appendix C.

2.0 GEOTECHNICAL FINDINGS

2.1 Geologic Setting and Earth Units

The subject site is located on the eastern foothills of the San Joaquin Hills range, within the Peninsular Ranges geomorphic province of Southern California. The site is mapped by the United States Geologic Survey (2006) as underlain by Tertiary-age sedimentary bedrock of the Niguel Formation. Based on our subsurface exploration and understanding of the site history, the subject site was mass graded in the 1980's resulting in a relatively flat lot with bedrock at or near existing grades. The southeastern corner of the site and southerly slope were constructed with compacted fill materials overlying bedrock. No alluvium/colluvium was encountered in any of our borings and is assumed to have been removed during mass grading. The earth unit distribution and our interpretation of the subsurface conditions are shown on the Geotechnical Map (Plate 1) and Geotechnical Cross-Sections A-A' and B-B' (Plates 3 and 4).

Within the southern portion of the site, the bedrock is overlain by compacted **Artificial Fill (Af)** associated with prior mass grading. The artificial fill was found to be up to 22 feet thick and generally consisted of pale brown, yellowish brown, dark brown, and olive brown silty fine to medium sand that was damp to very moist and medium dense. The stockpile in the northern portion of the site is composed of **Undocumented Artificial Fill (Afu)** presumed to have been placed during grading and construction of the neighboring developments. The undocumented artificial fill (stockpile) encountered was up to 12.5 feet thick and generally consisted of pale brown, yellowish brown, and pale yellowish gray silty to clean fine to coarse sand and sandy silt that was damp to moist and loose to medium dense. The limits of artificial fill and undocumented artificial fill are shown on the Geotechnical Map (Plate 1).

The **Niguel Formation (Tn)** is mapped throughout the majority of the site. The bedrock was found to consist of pale olive brown, yellowish brown, pale gray, and white fine to coarse-grained sandstone that was massive to poorly bedded. Crossbedding and variable structure (strike/dip) was observed throughout the site with dips at generally low inclination. The sandstone is weakly indurated and friable, resulting in minor caving in Boring B-1 and some test pits. A minor siltstone package (with clay beds) was encountered in Boring B-2 and was olive brown to gray and massive to thinly laminated. The siltstone package was found to be hard and moderately indurated/cemented. Seepage was also encountered at varying depths within the siltstone package.

The **Monterey Formation (Tm)** is not mapped onsite per published geologic mapping by the United States Geological Survey (USGS, 2006), nor was the formation encountered during the prior onsite exploration by others (SCG, 2021). We encountered Monterey Formation in three test pits (TP-3, TP-3a, and TP-3b) which consisted of pale brownish gray, bluish gray, and white diatomaceous siltstone with minor claystone and silty sandstone. The bedrock was generally damp to very moist and locally wet. Bedding was observed to be laminated/thinly bedded with variable structure, similar to the Niguel Formation. The contact between Monterey and Niguel Formations was found to be fault controlled, with several faults/fault zones observed in Test Pits TP-3a and TP-3b. The Monterey Formation exhibits very different engineering properties ("high" expansion) compared to Niguel Formation ("very low" expansion) and will require additional remedial grading (see Section 3.2).

2.2 Geotechnical Conditions

Based on our geotechnical exploration and laboratory testing data (Appendix C), the geotechnical conditions are generally as follows:

Soil Moisture Content and Dry Density: The collected samples show that dry densities of the Niguel Formation bedrock generally vary from 87.5 to 120.5 pcf with moisture contents in the range of 2.0 to 30.6 percent. Dry densities of the artificial fill material varied from 106.1 to 117.3 pcf with moisture contents in the range of 8.8 to 14.8 percent.

Soil Properties: A grain-size distribution test was conducted on three samples, representative of the Niguel Formation, Monterey Formation, and existing artificial fill material. The Niguel Formation sample had a fines content (passing Sieve No. 200) of 14 percent, the Monterey Formation sample had a fines content of 72 percent, and the artificial fill sample had a fines content of 26 percent. The samples were classified as silty sand (SM), highly plastic silt (MH), and clayey sand (SC), respectively, per the Unified Soil Classification System (USCS).

Soil plasticity testing was performed on the bulk sample representative of Monterey Formation and was classified as highly plastic silt (MH) with a Plasticity Index of 30 and Liquid Limit of 75 percent. Plasticity testing was also performed on the fines portion of the sample representative of the Niguel Formation and indicated the fines were highly plastic silt (MH); however, considering the fines content of less than 50 percent, the sample was classified as SM.

Maximum density testing was performed on a bulk sample representative of the existing artificial fill materials and indicates a maximum dry density of 117.4 pcf at an optimum moisture content of 12.1 percent. Testing by Southern California Geotechnical (SCG, 2021) conducted on one sample taken from the uppermost 5 feet (Boring SB-2), representative of the Niguel Formation, shows a maximum dry density of 114 pcf at an optimum moisture content of 12 percent.

Shear Strength: Direct shear testing was conducted on four relatively undisturbed samples representative of the existing fill materials along the southerly slope and of the Niguel Formation. Direct shear testing was also performed by SCG during their prior study, generally representing the Niguel Formation. The following table includes the direct shear test results for various earth units and soil types:

Earth Unit	Soil Type	Ultimate Strengths		Peak Strengths		Residual Strengths	
		ϕ	C (psf)	ϕ	C (psf)	ϕ	C (psf)
Fill (Af)	Silty/Clayey Sand (SM)	31	170	34	450	--	--
	Silty/Clayey Sand (SM)	31	300	33	825	--	--
Niguel Formation (Tn)	Sandstone	36	800	40	1265	--	--
	Sandstone	37	100	41	300	--	--
	Siltstone (Silt Beds)	31	405	43	240	--	--
	Fine Grained Sandstone	34	200	39	335	31	200

Expansion Potential: Two samples were tested to determine the expansion potential of the onsite artificial fill materials and Monterey Formation. The artificial fill sample had an Expansion Index of 10, indicating "Very Low" expansion potential. The Monterey Formation sample had an Expansion Index of 106, indicating "High" expansion potential.

Chemical Properties: Soluble sulfate content of the soil was measured in two samples, one representative of the artificial fill materials and one of the Monterey Formation. Soluble sulfate content testing indicates the samples may be classified as "S0" per Table 19.3.1.1 of ACI-318-14.

Consolidation: Tests were performed on two samples at depths of 5 and 10 feet bgs, representative of existing fill materials. The testing shows that the fill materials have low compressibility. The samples had minor collapse upon the addition of water at a load of 0.8 ksf which is most likely related to sandy/disturbed nature of the soil.

Consolidation tests were performed on four samples collected by SCG (2021), from depths of 1, 3, 5, and 7 feet bgs, representative of the Niguel Formation. The testing showed that the materials have low compressibility. The tests show minor collapse (less than one-quarter percent) upon the addition of water at a load of 1.6 ksf.

2.3 Groundwater and Surface Water

Groundwater was not encountered in any of our onsite borings to a maximum depth of 75 feet bgs. Seepage was encountered in Boring B-2 at depths between 18.5 to 27 feet. Historic high groundwater mapping by the State shows high groundwater depths greater than 20 feet bgs (CDMG, 2001a).

Groundwater levels may fluctuate on an annual and seasonal basis based on rainfall and variations in future residential irrigation and/or adjacent land use. Perched water may be encountered during grading for deepened foundation elements or deep utility lines.

2.4 Regional Faulting and Seismicity

Regional Faults: The site is not located within a fault-rupture hazard zone as defined by the Alquist-Priolo Special Studies Zones Act (CGS, 2018). Also, based on mapping by the State (Jennings and Bryant, 2010), there are no active faults mapped at the site. Regional faults are presented on Figure 3. Several inactive (Pre-Quaternary-age) faults were observed during our subsurface exploration as shown on Plate 1 and the boring/test pit logs.

Seismicity: Properties in southern California are subject to seismic hazards of varying degrees depending upon the proximity, degree of activity, and capability of nearby faults. These hazards can be primary (i.e., directly related to the energy release of an earthquake) or secondary (i.e., related to the effect of earthquake energy on the physical world). Since there are no active faults at the site, the potential for primary ground rupture is considered very low. The primary seismic hazard for this site is ground shaking during a future earthquake. The maximum moment magnitude for the controlling fault is 7.1 M_w , which would be generated from the San Joaquin Hills Fault. Using the site coordinates of 33.56181 degrees latitude and -117.72862 degrees

longitude, the San Joaquin Hills Fault is the closest fault to the site, approximately 2.7 miles to the west.

The site is not located within a mapped potential liquefaction hazard zone per the State's Seismic Hazard Mapping (CDMG, 2001b). A portion of the southerly slope is located adjacent to a potential earthquake-induced landslide zone; however, this potential hazard has been mitigated during mass grading as the original slope inclination was flattened to the current 2H:1V configuration. Slope stability was reviewed as part of our study and is discussed in the following section (Section 2.5). The attached Site Location and Seismic Hazards Map (Figure 1) depicts the site relative to County mapped potential seismic hazard zones. Other secondary seismic hazards, such as tsunami and seiche are considered nil due to site elevation and distance from the ocean or other confined bodies of water (CGS, 2022).

2.5 Slope Stability

The site geologic/geotechnical conditions are generally favorable for overall stability of the existing slope along the southerly portion of the site. The existing fill/stabilization fill slope ranges in height from approximately 40 to 70 feet at an inclination of 2H:1V or flatter. We prepared two cross-sections (Plates 3 and 4) depicting the existing descending slope at the site. Slope stability analysis was performed on cross-section B-B', which represents the highest portion of the perimeter slope at the site. The soil strength parameters were developed during this study per the direct shear test results and our experience with the earth units. The following table includes the strength parameters used for slope stability analysis:

Earth Unit	Soil Type	Ultimate Strength		Peak Strength	
		ϕ	C (psf)	ϕ	C (psf)
Fill (Af)	Silty/Clayey Sand (SM)	31	200	33	350
Niguel Formation (Tn)	Sandstone	34	200	39	350
	Siltstone with Along Bedding Strength	28	200	32	240

For pseudo-static analysis, we applied a seismic horizontal coefficient (k_h) of 0.22 in accordance with Special Publication 117A, Guidelines for Evaluation and Mitigating Seismic Hazards in California (CGS, 2008).

The results of the slope stability analysis are presented in Appendix E. The existing slope at the site was found to be grossly stable with a factor of safety of more than 1.5 under static conditions and a factor of safety of 1.1 or greater for pseudo-static conditions.

2.6 Settlement and Foundation Considerations

In general, the anticipated settlements depend upon the building loads, type of foundations, and the geotechnical properties of the supporting subgrade. Considering the subsurface soil conditions, laboratory test data, and anticipated lightly loaded residential structures, we estimate total settlement (combined static and seismic) to be on the order of 1-inch with differential settlement of ½-inch over a 40-foot span. The settlement estimate assumes remedial grading measures recommended in Section 3.2 of this report are implemented during grading.

2.7 Stormwater Infiltration Feasibility

The southern portion of the site is underlain by variably thick artificial fill overlying bedrock. The remainder of the site is generally underlain by shallow bedrock. County of Orange guidelines prohibit stormwater infiltration in compacted fill (OCPW, 2013). Additionally, infiltration of stormwater in bedrock can result in migration of subsurface water along bedding, faults, or lithologic contacts, resulting in seepage or springs in where previously none existed, potentially impacting offsite properties and slopes. Stormwater infiltration is not considered feasible from a geotechnical viewpoint.

2.8 Shrinkage and Bulking

The shrinkage and bulking (reduction or increase in volume of excavated materials upon recompaction and replacement as fill) varies by soil type, earth unit, and location. The volume change primarily depends on in-situ density and the maximum dry density of the soil type. We anticipate that shrinkage/bulking of the bedrock and compacted artificial fill (Af) will be relatively minor, and shrinkage of the undocumented fill/stockpile materials will be on the order of 5 to 15 percent. Ground subsidence at the site is estimated to be on the order of 0.1 foot.

2.9 Existing Utilities

Based on our review of the ALTA Survey and the DigAlert markings provided during the utility clearance procedure, there are several dry utility services present along the northern property boundary, adjacent to Freedom Lane. An exiting 12-inch water pipeline transects the site from east to west. Within the temporary desilting basin at the southeastern corner of the site, an 18-inch storm drain/tin whistle drains the basin to a junction structure located adjacent to Freedom Lane.

3.0 CONCLUSION AND PRELIMINARY RECOMMENDATIONS

3.1 General Conclusion and Recommendation

Construction of the proposed residential development, as described herein, is considered geotechnically feasible provided the preliminary recommendations in this report are implemented during design, grading, and construction. Additional geotechnical exploration is not considered necessary provided there are no significant plan changes. Grading, foundation, utility/street improvements, structural and wall plans for the project should be reviewed by the geotechnical consultant during the design phase. Updated recommendations may be provided once the project plans are finalized and as needed.

The recommendations in this report should be considered minimum and may be superseded by more restrictive requirements of others. In addition to the following recommendations, General Earthwork and Grading Specifications are provided in Appendix F.

3.2 Site Preparation and Earthwork

Site preparation and grading should be performed in accordance with the recommendations herein and the requirements of the City of Aliso Viejo.

3.2.1 Site Demolition and Clearing

Prior to remedial grading, any existing structures and utilities to be abandoned should be demolished. Deleterious materials and debris should be cleared and disposed of offsite. Excavations for the removal of existing utilities (i.e. temporary storm drain line, etc.) and vegetation, including any onsite trees, should be observed by the geotechnical consultant. Large roots, highly organic soils, and utility/pipeline debris should be removed and should not be incorporated into new fills.

Soil that is disturbed as part of excavations or during removal of trees or underground utilities should be evaluated by the geotechnical consultant. Excavations that require backfill should be properly documented and compacted under the observation and testing of the geotechnical consultant in accordance with the recommendations provided in Section 3.2.5.

3.2.2 Protection of Existing Improvements and Utilities

Existing buildings, improvements, and utilities adjacent to the site that are to be protected in place should be located and visually marked prior to grading operations. Excavations adjacent to improvements to be protected in-place or any utility easement should be performed with care, so as not to undermine existing foundations or destabilize the adjacent ground.

Stockpiling of soils more than 5 feet in height at or near existing structures and over utility lines should not be allowed. If deep excavation/removals are required, shoring or other special measures (i.e., setback or laybacks) to provide safety and mitigate the potential for lateral/vertical movements may be required.

3.2.3 Remedial Grading Measures

Remedial grading at the site should consist of removal of highly weathered/disturbed/ faulted bedrock and all undocumented fill materials. Remedial removals are anticipated to range from 1 to 7 feet below existing grades. In general, remedial removal/overexcavation within the building pads is recommended to extend 3 to 5 feet below design grades or existing grades, whichever is lower. For areas underlain by faulted, highly expansive diatomaceous bedrock (Monterey Formation), we recommended a 7-foot removal/overexcavation. Remedial grading within the proposed drive areas may be limited to removal and recompaction of the upper 1 to 2 feet. The recommended remedial grading is shown on the Remedial Measures Map (Plate 2).

Considering the very different geotechnical conditions between the bedrock of Monterey Formation (northern portion of the site) and Miguel Formation, we recommend that the grading contractor attempt to mix the materials during the remedial grading/fill placement to achieve a more uniform subsurface soil conditions across the site. If that is not achieved, the geotechnical design parameters provided herein will be re-evaluated at the completion of grading and more stringent recommendations will need to be provided for the building pads underlain by highly expansive soils.

The geotechnical consultant should review and approve the removal bottoms prior to fill placement and should provide specific recommendations based on actual conditions, as necessary.

Excavations deeper than 4 feet will need to be laid back a minimum inclination of 1H:1V (horizontal to vertical) or provided with shoring. Shallow, unconfined excavations (4 feet or less) may consist of near-vertical excavation. In general, the excavation within the existing bedrock and fill materials should be in accordance with Cal/OSHA requirements for Soil Type "C". Friable sands prone to caving should be anticipated throughout the site. The contractor's qualified person should verify compliance with Cal/OSHA requirements. Excavations near existing structures (within a 1:1 projection) should be provided with shoring that is designed to support the surcharge load of the existing structure. Otherwise, excavations may be performed in sections (A/B/C slot cuts). The conditions should be reviewed in the field by the project geotechnical consultant. Additional recommendations will be provided based on the actual conditions encountered during excavation and grading, as needed.

3.2.4 Placement of Oversize Material

In general, bedrock at the site is friable and can be broken down. However, as discussed previously, boulders on the order of 2 to 4 feet in diameter are present at the ground surface (approximately two truckloads). If grading equipment cannot break down the material into smaller pieces, oversize rock will need to be disposed of in deeper fill areas, if any, or disposed offsite. Oversize rocks may be placed in fills deeper than 10 feet below design grades. The grading contractor should consider performing deeper remedial removals within design fill areas to facilitate placement of oversize rocks. Rocks larger than 6 inches and smaller than 12 inches in the largest dimension may be placed at depth between 4 and 10 feet below design finish grades or 1 foot below the deepest utility line, whichever is deeper. Rocks greater than 3 inches in dimension are typically not suitable for backfill of utility

trench excavations (unless accepted by the agency/utility owner). Thus, we recommend that the grading contractor consider placement of rocks larger than 3 inches in dimension, if any, outside of proposed utility alignments.

The Grading and Earthwork Specifications in Appendix F include details for placement of oversize rock.

3.2.5 Fill Placement

Upon the completion of remedial grading measures, the approved removal/overexcavation bottoms should be scarified a minimum of 6 inches. The removal bottoms and fill materials should be compacted to at least 90 percent of maximum dry density, as determined by ASTM Test Method D1557. Fill materials should be placed in loose lifts no thicker than 8 inches.

Considering the very different geotechnical conditions between the bedrock of Monterey Formation (northern portion of the site) and Niguel Formation, we recommend that the grading contractor attempt to mix the materials during the remedial grading/fill placement to achieve a more uniform subsurface soil conditions across the site. If that is not achieved, the geotechnical design parameters provided herein will be re-evaluated at the completion of grading and more stringent recommendations will need to be provided for the building pads underlain by highly expansive soils.

Fill materials should be relatively free of deleterious material. The onsite artificial fill and bedrock materials are considered suitable for re-use as compacted fill provided any deleterious material is removed.

We recommend that the moisture content of new compacted fill soils be above the optimum moisture content but should be within the compactable moisture range. Appropriate equipment should be used and other measures (e.g., mixing, stockpiling, drying) may be needed to achieve the uniform and correct moisture content for fill placement. If the soils become extremely wet, special measures for mixing and drying may be required that will need to be determined based on the actual field conditions.

3.2.6 Import

The geotechnical consultant should evaluate and accept any import soils prior to transportation to the subject site. We recommend that import soils have similar engineering properties as onsite soils. At minimum, the import materials should have Expansion Index of less than 50, Plasticity Index of less than 15, fines content (passing Sieve 200) of less than 50 percent, and negligible soluble sulfate content.

3.3 Settlement Potential

The amount of settlement will depend upon the type of foundation(s) selected and future loading by additional fill and structures. Based on the subsurface exploration and laboratory data, our review and analysis, considering the remedial grading recommendations provided in this report are implemented during grading, and the anticipated structural loads typically associated with the proposed structures, we estimate that total and differential settlement (combined static and seismic) will be less than 1-inch and ½-inch over a span of 40 feet, respectively.

SA GEO should be provided with the foundation plans and structural loads, once available, to further evaluate the potential for post-construction settlement of the proposed buildings and associated improvements. The parameters provided herein will then be confirmed/updated based on the planned foundation layout and loads and any additional testing/analysis.

3.4 Foundation Design

The slab and foundations should be designed by the project structural engineer based on the proposed structure type and the anticipated loading conditions. Onsite soils are anticipated to have "Medium" expansion potential at the completion of grading. However, this will need to be confirmed upon the completion of grading as the northern portion of the site is underlain by highly expansive bedrock of the Monterey Formation. The following foundation recommendations are provided with the assumption that the recommendations included in Section 3.2 of this report are implemented during grading.

The recommended net allowable bearing capacity for continuous and isolated footings may be calculated based on the following equation:

$$q_{all} = 800 D + 300 B + 700 \text{ (but not to exceed 4,000 psf)}$$

where:

D = embedment depth of footing, in feet

B = width of footing, in feet

Also, the following parameters may be used for design of foundation and slabs:

- Soil unit weight = 120 pcf
- Soil internal friction angle = 30 degrees
- Coefficient of Friction = 0.38
- Subgrade modulus (k) of 100 pci (corrected for large slabs)
- Soil elastic modulus (Es) of 1,500 psi

The dead load of concrete below adjacent grades (buried concrete foundations) may be neglected. The allowable bearing pressure and friction coefficient may be increased by one-third for wind and seismic loading.

We recommend that strip and isolated footings for the buildings have a minimum embedment depth of 18 inches below the lowest adjacent grade. Continuous footings should be at least 12 inches wide and isolated column footings should be at least 24 inches wide. The footings of freestanding and isolated structures, such as walls and pilasters, should have a minimum embedment depth of 18 inches into approved soils.

The following table provides our general guidelines and preliminary recommendations for design of post-tensioned foundations and slabs on expansive soil in accordance with the 2022 CBC and Post-Tension Institute (PTI) DC 10.5 Edition provisions.

GEOTECHNICAL GUIDELINES FOR DESIGN OF POST-TENSIONED SLABS*

<i>Parameter</i>	<i>Recommendation</i>
Center Lift	
* Edge Moisture Variation Distance, e_m	9.00 feet
* Center Lift, y_m	0.70 inches
Edge Lift	
* Edge Moisture Variation Distance, e_m	4.5 feet
* Edge Lift, y_m	0.80 inch
Presaturation, as needed, to obtain the minimum moisture down to the minimum depth	1.2 x optimum down to 12 inches
*Based on method in CBC 2022	

For post-tensioned slabs, we recommend that the slabs have a thickened edge such that the slab is embedded a minimum of 12 inches below the lowest adjacent grade. The thickened edge should be tapered and have a minimum width of 12 inches.

In addition, as indicated in the DC 10.5 Edition of PTI, shape factor calculations should be performed by the project structural engineer in order to determine if strengthening/modification of foundations are necessary. Per PTI guidelines, the modifications to the foundations design should be considered if the shape factor (ratio of square of foundation perimeter over foundation area) exceeds 24.

If non-post-tensioned slabs-on-grade and foundations are considered at the site in accordance with Wire Reinforcement Institute (WRI) method (per the 2022 CBC), an effective Plasticity Index of 25 is considered appropriate for the upper 15 feet of soil materials. For non-post-tensioned slabs, we recommend a minimum embedment of 12 inches below the lowest adjacent grade for the perimeter footings. Also, the upper 12 inches of subgrade soil should be moisture conditioned to 120 percent of optimum moisture content prior to placement of moisture barrier and concrete.

The foundations and slabs should be designed to tolerate the total and differential settlements discussed in Section 3.3 of these recommendations.

For the design of pole-type foundations (i.e., light poles, shade structures, etc.), an allowable soil-bearing pressure (s_1) of 360 psf/ft may be used for Equation 18-1 (the "pole" equation) of the 2022 CBC Section 1807.3.2.1 to determine the depth of embedment for the footings, considering level ground conditions. The equation is applicable for designed embedment depths of less than 12 feet for the purpose of computing lateral pressure. Also, for vertical loads on pole-type foundations, an allowable skin friction of 300 pounds per square foot may be used. For cast-in-place pole-type foundations, the vertical end bearing pressure should be neglected.

3.5 Caisson Design

All caissons, if any, should have a minimum embedment of 5 feet into competent fill or bedrock materials. An average skin friction value of 300 pounds per square foot may be utilized to calculate the axial capacity of caissons. The lateral capacity of caissons may be computed using a value of 360 psf/ft but should not exceed 5,400 psf/ft for level conditions. For caissons near the existing

descending slope with passive envelope impacted by the slope, the passive pressure should be limited to 180 psf/ft. Passive resistance may be doubled for isolated piles/caissons spaced a minimum of 3 diameters apart center-to-center. The allowable bearing pressure (both axial and lateral) may be increased by one-third for wind or seismic loading. Other minimum footing dimensions should be provided by the Structural Engineer and should comply with Table 1809.7 of the 2022 CBC.

Caissons should be designed in accordance with ACI recommendations and applicable building code requirements. The accepted criteria for caisson installation are detailed below:

- Caissons should be constructed as pre-drilled cast-in-place elements. A representative of the geotechnical consultant should be present during drilling of all caisson excavations in order to verify proper embedment and to geotechnically review appropriate drilling methods.
- Caisson excavations should be cleaned of loose soil, cuttings and groundwater and should be reviewed by the project geologist prior to placement of steel or concrete.
- No caisson boring shall be excavated within 6 feet from the nearest edge of a completed caisson unless the completed caisson has been filled with concrete for more than 24 hours.

3.6 Retaining Wall Design and Lateral Earth Pressures

Recommendations for lateral earth pressures for permanent retaining walls and structures with approved onsite drained soils and above groundwater table (drained condition) are as follows:

<i>Conditions</i>	<i>Level (pcf)</i>	<i>2:1 Sloping</i>
Active	40	65
At-Rest	60	85
Passive	360	180 (sloping down)

parameters provided above are based on a soil internal friction angle of 30 degrees and soil unit weight of 120 pcf.

To design an unrestrained retaining wall, such as a cantilever wall, the active earth pressure may be used. For a restrained retaining wall, the at-rest pressure should be used. Passive pressure is used to compute lateral soils resistance developed against lateral structural movement. The passive pressures provided above may be increased by one-third for wind and seismic loads. The passive resistance is taken into account only if it is ensured that the soil against embedded structure will remain intact with time. Future landscaping/planting and improvements adjacent to the retaining walls should also be taken into account in the design of the retaining walls. Excessive soil disturbance, trenches (excavation and backfill), future landscaping adjacent to footings and over-saturation can adversely impact retaining structures and result in reduced lateral resistance.

For sliding resistance, the friction coefficient of 0.38 may be used at the concrete and soil interface. The coefficient of friction may be increased by one-third for wind and seismic loading. The retaining walls may also need to be designed for additional lateral loads if other structures or walls are planned within a 1H:1V projection.

The seismic lateral earth pressure for walls retaining more than 6 feet of soil may be estimated to be an additional 18 pcf for active and at-rest conditions. The earthquake soil pressure has a triangular distribution and is added to the static pressures. For the active and at-rest conditions, the additional earthquake loading is zero at the top and maximum at the base. The seismic lateral earth pressure does not apply to walls retaining less than, or equal to, 6 feet of soil (2022 CBC Section 1803.5.12).

Drainage behind retaining walls (retaining more than 30 inches of soil) should also be provided in accordance with the attached Figure 4. Specific drainage connections, outlets and avoiding open joints should be considered for the retaining wall design.

3.7 Seismic Design Parameters

The following table summarizes the seismic design criteria for the subject site. The seismic design parameters are developed in accordance with ASCE 7-16 and 2022 CBC. Considering shallow bedrock across the site, the site is classified as Site Class "C". Please note that, considering the proposed structures and anticipated structural periods, site-specific ground-motion hazard analysis was not performed for the site. The seismic response coefficient, C_s , should be determined per the parameters provided below and using equation 12.8-2 of ASCE 7-16.

<i>Selected Seismic Design Parameters from 2022 CBC/ASCE 7-16</i>	<i>Seismic Design Values</i>	<i>Reference</i>
Latitude	33.56181 North	
Longitude	-117.72862 West	
Controlling Seismic Source	San Joaquin Hills	USGS, 2024
Site Class per Table 20.3-1 of ASCE 7-16	C	
Spectral Acceleration for Short Periods (S_s)	1.244 g	SEA/OSHPD, 2024
Spectral Accelerations for 1-Second Periods (S_1)	0.444 g	SEA/OSHPD, 2024
Site Coefficient F_a , Table 11.4-1 of ASCE 7-16	1.2	SEA/OSHPD, 2024
Site Coefficient F_v , Table 11.4-2 of ASCE 7-16	1.5	SEA/OSHPD, 2024
Design Spectral Response Acceleration at Short Periods (S_{DS}) from Equation 11.4-4 of ASCE 7-16	0.995 g	SEA/OSHPD, 2024
Design Spectral Response Acceleration at 1-Second Period (S_{D1}) from Equation 11.4-4 of ASCE 7-16	0.444 g	SEA/OSHPD, 2024
$T_s, S_{D1}/S_{DS}$ 11.4.6 of ASCE 7-16	0.446 sec	
T_L , Long-Period Transition Period	8 sec	SEA/OSHPD, 2024
Peak Ground Acceleration Corrected for Site Class Effects ($PGAM$) from Equation 11.8-1 of ASCE 7-16	0.639 g	SEA/OSHPD, 2024
Seismic Design Category Section 11.6 of ASCE 7-16	D	SEA/OSHPD, 2024

3.8 Slope Stability and Slope Setback

No significant modifications to the existing slope are planned as part of this project. The existing slope generally consists of artificial fill and Niguel Formation bedrock. The proposed improvements are not anticipated to adversely impact the slope. Based on our slope stability analysis (Appendix E), the existing slope was found to be grossly stable. In general, slopes are considered susceptible to surficial instability in the form of erosion, raveling, and slumping. Special care should be taken to ensure that onsite runoff is controlled and directed offsite in a non-erosive manner and that site drainage, and slopes are maintained over the life of the project.

Footings for structures located above descending slopes should be set back from the slope face in accordance with the minimum requirements of the City of Aliso Viejo and section 1808.7.1 of the 2022 CBC, whichever is greater. The setback distance is measured from the outside edge of the footing bottom along a horizontal line to the face of the slope.

The tables below summarize the minimum setback criteria for structures above descending slopes:

Case A – Building and Retaining Wall Footings Above Descending Slopes	
<i>Slope Height [H] (feet)</i>	<i>Minimum Setback from Slope face (feet)</i>
Less than 10	5
10 to 20	$\frac{1}{2} * H$
20 to 30	10
Greater than 30	$\frac{1}{3} * H$ (maximum of 40')
Case B – Freestanding Wall Footings Above Descending Slopes	
<i>Slope Height [H] (feet)</i>	<i>Minimum Setback from Slope face (feet)</i>
Less than 10	5
10 to 20	$\frac{1}{2} * H$
Greater than 20	Maximum of 10

For freestanding walls and other structures that are sensitive to lateral movement (e.g., smooth stucco finish, glass screens, etc.), SA GEO recommends that the structural setback requirements in accordance with Case A above be followed or that additional design measures be used to help control the potential for cracking and displacements. Otherwise, typical freestanding walls may have a setback in accordance with Case B.

3.9 Corrosivity

Based on laboratory testing, soluble sulfate exposure in the onsite soils may be classified as "S0" per Table 19.3.1.1 of ACI-318-14. Structural concrete elements in contact with soil include footings and building slabs-on-grade. The flatwork and sidewalk concrete are typically not considered structural elements. Concrete mix for structural elements should be based on the "S0"

soluble sulfate exposure class of Table 19.3.2.1 in ACI-318-14. Other ACI guidelines for structural concrete are recommended. Also, onsite soils are anticipated to be corrosive to metals.

3.10 Expansion Potential

At the completion of grading, we anticipate that onsite soils will have "Medium" expansion potential. The geotechnical recommendations provided in this report including the design parameters for foundations, slab-on-grade and flatwork improvement should be implemented during design and construction. Updated recommendations will be provided upon additional testing at the completion of grading at the site and as needed.

3.11 Interior Slab Moisture Mitigation

In addition to geotechnical and structural considerations, the project owner should also consider interior moisture mitigation when designing and constructing slabs-on-grade.

The intended use of the interior space, type of flooring, and type of goods in contact with the floor may dictate the need for, and design of, measures to mitigate potential effects of moisture emission from and/or moisture vapor transmission through the slab. Typically, for human occupied structures, a vapor retarder or barrier is recommended under the slab to help mitigate moisture transmission through slabs. The most recent guidelines by the American Concrete Institute (ACI 302.1R-04) suggest that the vapor retarder be placed directly under the slab (no sand layer). However, the location of the vapor retarder may also be subject to the builder's past successful practice. Placement of 1 or 2 inches of sand over the moisture retardant has been common practice by builders in southern California. Specifying the strength of the retarder to resist puncture and its permeance rating is important. These qualities are not necessarily a function of the retarder thickness. A minimum of 10-mil is typical but some materials, such as 10-mil polyethylene ("Visqueen"), may not meet the desired standards for toughness and permeance.

Vapor retarders, when used, should be installed in accordance with standards such as ASTM E 1643 and/or those specified by the manufacturer.

Concrete mix design and curing are also significant factors in mitigating slab moisture problems. Concrete with lower water/cement ratios results in denser, less permeable slabs that also "dry" faster with regard to when flooring can be installed (reduced moisture emissions quantities and rates). Rewetting of the slab following curing should be avoided since it can result in additional drying time required prior to flooring installation. Proper concrete slab testing prior to flooring installation is also important.

Concrete mix design, the type and location of the vapor retarder should be determined in coordination with all parties involved in the finished product, including the project owner, architect, structural engineer, geotechnical consultant, concrete subcontractors, and flooring subcontractors.

3.12 Exterior Concrete

The driveway, patio slabs and other flatwork elements should be at least 4 inches thick. We recommend that the concrete be reinforced with No. 3 rebars placed at 24 inches on center both ways. Equivalent wire mesh reinforcement may also be used. Concrete slabs should be provided with construction or weakened plane control joints at a maximum spacing of 8 feet. The control joints should have a thickness that is $\frac{1}{4}$ of the total concrete thickness. The subgrade soils in the upper 12 inches should be pre-saturated to 120 percent of optimum moisture content.

For exterior slabs, the use of a granular sublayer is primarily intended to facilitate presaturation and subsequent construction by providing a better working surface over the saturated soil. It also helps retain the added moisture in the native soil in the event that the slab is not placed immediately. Where these factors are not significant, the layer may be omitted. If used, we recommend placement of 2 to 4 inches of granular material over subgrade soils.

Exterior concrete elements such as curb and gutter, driveways, sidewalks and patios are susceptible to lifting and cracking when constructed over expansive soils. With expansive soils, the impacts to flatwork/hardscape can be significant, generally requiring removal and replacement of the affected improvements. Please also note that reducing concrete problems is often a function of proper slab design, concrete mix design, placement, and curing/finishing practices. Adherence to guidelines of the American Concrete Institute (ACI) is recommended. Also, the amount of post-construction watering, or lack thereof, can have a very significant impact on the adjacent concrete flatwork.

On projects with expansive soils, additional measures such as thickened concrete edges/footings, subdrains and/or moisture barriers should be considered where planter or natural areas with irrigation are located adjacent to the concrete improvements. Design and maintenance of proper surface drainage is also very important. If the concrete will be subject to heavy loading from cars/trucks or other heavy objects, thicker pavement section will be required the design of which should be performed by the geotechnical consultant, as needed.

3.13 Preliminary Asphalt Concrete Pavement Design

Final structural pavement sections should be based on R-value testing after the completion of grading and in accordance with City of Aliso Viejo/County of Orange requirements. Using a design R-value of 15 and estimated traffic indices (TIs), we recommend the following preliminary pavement sections:

<i>Street Location</i>	<i>Estimated TIs</i>	<i>Pavement Section</i>
Parking Stalls	TI – 4.0	3 inches of AC / 6 inches of AB
General Drives	TI – 5.5	4 inches of AC / 9 inches of AB
<i>AC = Asphalt Concrete, AB = Aggregate Base</i>		

Please note that for two-stage paving operations, we recommend that the final AC cap be a minimum of 0.10 foot thick and the base AC course have a minimum thickness of 0.25 foot.

If pavement repair is needed within the adjacent streets, the section should match the existing section and follow standard City/County guidelines for trench/pavement repair. The new pavement section should at minimum consist of 4 inches of AC over 9 inches of AB unless approved otherwise by the geotechnical consultant and based on evaluation of subgrade soils.

Asphalt concrete pavement should be placed in accordance with the requirements of Sections 301 and 302 of the Standard Specifications of Public Works Construction (the Greenbook). Prior to construction of pavement sections, the subgrade soils should be scarified to a minimum depth of 6 inches, moisture-conditioned as needed, and recompact in-place to a minimum of 90 percent relative compaction (per ASTM D1557). Subgrade should be firm prior to AB placement.

AB materials can be crushed aggregate base or crushed miscellaneous base in accordance with the Greenbook (Section 200-2). The materials should be free of any deleterious materials. Aggregate base materials should be placed in 6- to 8-inch-thick loose lifts, moisture-conditioned as necessary, and compacted to a minimum of 95 percent relative compaction (per ASTM D1557). Asphalt concrete should also be compacted to a minimum relative compaction of 95 percent.

Unpaved median and parkway areas should be provided with vertical moisture barriers.

3.14 Vehicular PCC Pavements

If trash enclosures or truck loading areas are to be constructed at the site, we recommend 6 inches of PCC reinforced with No. 4 rebar at 18 inches on-center, both ways, over compacted subgrade. For parking stalls, the section may consist of 4 inches of PCC reinforced with No. 4 rebar at 18 inches on-center, both ways, over compacted subgrade.

The subgrade soils should be scarified to a minimum depth of 6 inches, moisture-conditioned as needed, and recompact in place to a minimum of 90 percent relative compaction (per ASTM D1557).

Aggregate base materials can be crushed aggregate base or crushed miscellaneous base in accordance with the Greenbook (Section 200-2). The materials should be free of any deleterious materials. Aggregate base materials should be placed in 6- to 8-inch-thick loose lifts, moisture-conditioned as necessary, and compacted to a minimum of 95 percent relative compaction (per ASTM D1557).

3.15 Concrete Paver Section

For concrete pavers within **pedestrian** walkways, we recommend 60-millimeter-thick concrete pavers over approximately 1 inch of sand, over a minimum of 6 inches of AB, over compacted subgrade. This should also accommodate the rare maintenance cart or light truck that might drive up on these areas.

For concrete pavers within **vehicular** drive areas, if any, we recommend 80-millimeter-thick concrete pavers over 6 inches of concrete reinforced with No. 3 rebar at 24 inches on-center, over compacted subgrade. Alternatively, the concrete low pour slab may be replaced with a minimum

of 13 inches of AB over compacted subgrade; or 10 inches of AB over a layer of geotextile (e.g., Mirafi 600X or equivalent), over compacted subgrade.

A concrete band along the perimeter of the pavers should be provided for lateral restraint. The concrete band should, at minimum, be 12 inches deep and deepened to below the depth of disturbed soil, if adjacent to landscape/planter areas.

Also, a drainage system consisting of a 2-inch PVC drainage pipe should be installed at the low end of the concrete low pour at 10-foot intervals through the slab and filled with pea gravel. The PVC drainage pipe should drain to a minimum of 6-inch-diameter by 12-inch-deep drain pit filled with pea gravel below the pipe. The paver surfaces should slope away from structures a minimum of 2 percent. The concrete underlayment for the drive areas should be provided with weakened plane joints at maximum 8-foot intervals. If the pavers are to be set in mortar or are underlain with AB, this drainage system is not required.

Prior to construction of the paver sections, the subgrade soils should be scarified to a minimum depth of 6 inches, moisture conditioned as needed, and recompact in place to a minimum of 90 percent relative compaction (per ASTM D1557). The upper 12 inches of subgrade for pedestrian walkway and patio areas should then be presaturated to 120 percent of optimum moisture content. Subgrade for vehicular pavers need not be pre-saturated.

Aggregate base materials can be crushed aggregate base or crushed miscellaneous base in accordance with the Greenbook (Section 200-2). The materials should be free of deleterious materials. Aggregate base materials should be placed in 6- to 8-inch-thick loose lifts, moisture-conditioned as necessary, and compacted to a minimum of 95 percent relative compaction (per ASTM D1557).

3.16 Trench Excavation and Backfill

Excavations should be performed in accordance with the requirements set forth by Cal/OSHA Excavation Safety Regulations (Construction Safety Orders, Section 1504, 1539 through 1547, Title 8, California Code of Regulations). In general, onsite soils may be classified as Type "C" soils for excavations into compacted fill and/or bedrock. Cal/OSHA regulations indicate that, for workmen in confined conditions, the steepest allowable slopes in Type "C" soils is 1.5H:1V (horizontal to vertical), respectively, for excavations less than 20 feet deep. Where there is no room for these layback slopes, we anticipate that shoring will be necessary. The subsurface soils are generally sandy and may be friable, locally loose, and prone to caving. This condition should also be anticipated for excavations within the streets adjacent to the site. Adequate shoring/shield should be provided, as deemed necessary. Backfilling may require sand-cement slurry in order to reduce the potential of caving during the removal of shoring. Excavations should be reviewed periodically by the contractor's qualified person to confirm compliance with Cal/OSHA requirements.

Onsite soils should be suitable for use as trench backfill. Utility trench backfill should be in accordance with City of Aliso Viejo and/or the governing jurisdiction's specifications. Backfill materials should be compacted to a minimum of 90 percent relative compaction (per ASTM D1557). Rocks greater than 3 inches in largest diameter should generally not be used as trench backfill unless approved by the agency and geotechnical consultant of record. Excavation and

backfilling of HDPE pipes (if any) should be in accordance with the manufacturer's requirement and the Greenbook. Select granular backfill (i.e., clean sand with SE 30 or better) may be used in lieu of native soils but should also be compacted or densified with water jetting and flooding.

Trenches excavated next to structures and foundations should also be properly backfilled and compacted to provide full lateral support and reduce settlement potential.

3.17 Groundwater

In general, groundwater is anticipated to remain more than 20 feet below design grades upon the completion of grading. However, shallow, perched groundwater/seepage may occur on an annual and seasonal basis as a result of rainfall, irrigation and/or seepage from adjacent properties, and along earth unit contacts (i.e., artificial fill and bedrock). Groundwater is not expected to be encountered during grading or utility construction; however, the presence of locally saturated soils and/or perched water cannot be ruled out, especially during rainy seasons.

3.18 Stormwater Infiltration Feasibility

Considering that the site is underlain by very dense bedrock and artificial fill, and the presence of a relatively large perimeter slope along the southern property boundary, infiltration of stormwater is not feasible at the site from a geotechnical viewpoint and is considered a geotechnical hazard per County of Orange's guidelines (OCPW, 2013). Other methods of stormwater treatment, such as detention and biofiltration basins, should be evaluated by the project civil engineer.

3.19 Surface Drainage and Irrigation

Maintaining adequate surface drainage, proper disposal of run-off water, and control of irrigation will help reduce the potential for future moisture-related problems and differential movements from soil heave/settlement.

Surface drainage should be carefully taken into consideration during grading, landscaping, and building construction. Positive surface drainage should be provided to direct surface water away from structures and slopes and toward the street or suitable drainage devices. Ponding of water adjacent to the structures should not be allowed. Buildings should have roof gutter systems and the run-off should be directed to parking lot/street gutters by area drainpipes or by sheet flow over paved areas. Paved areas should be provided with adequate drainage devices, gradients, and curbing to prevent run-off flowing from paved areas onto adjacent unpaved areas.

Considering the climatic conditions in southern California and provided that the recommendations included in this report are implemented during grading and construction, a minimum two-percent slope away from structures is considered acceptable and in substantial compliance with the 2022 CBC. Also, swales with one-percent slopes are acceptable from a geotechnical standpoint and are common practice in this locale.

Construction of planter areas immediately adjacent to structures should be avoided if possible. If planter boxes are constructed adjacent to or near buildings, the planters should be provided with controls to prevent excessive penetration of the irrigation water into the foundation and flatwork

subgrades. Provisions should be made to drain excess irrigation water from the planters without saturating the subgrade below or adjacent to the planters. Raised planter boxes may be drained with weepholes. Deep planters (such as palm tree planters) should be drained with below-ground, water-tight drainage lines connected to a suitable outlet. Moisture barriers should also be considered.

It is also important to maintain a consistent level of soil moisture, not allowing the subgrade soils to become overly dry or overly wet. Properly designed landscaping and irrigation systems can help in that regard.

3.20 Slope Maintenance, Lot Drainage, and Erosion Control

Maintenance of proper pad drainage, the design and construction of property improvements in accordance with sound engineering practices, and proper maintenance of landscaping, including regular pad and slope irrigation, should be performed. Irrigation should not be excessive or sporadic; maintaining a relatively constant level of soil moisture around structures and improvements is important. Oversteepening of slopes should be avoided.

Planters and landscape areas adjacent to structures should be avoided or provided with measures to mitigate the potential for water getting under the foundations and slabs. Water should not be allowed to pond and drainage should be maintained away from structures and tops of slopes.

Establishing and maintaining a rodent-control program is also recommended to reduce surficial slope deterioration often associated with rodent burrowing. The improvements at or near the tops of slopes may be subject to varying degrees of slope-creep related movements and should be designed with that in mind.

3.21 Additional Subsurface Exploration and Laboratory Testing

Additional subsurface exploration during the design phase of the project is not anticipated provided no significant plan changes occur. Additional laboratory testing should be performed during and upon completion of the grading to confirm/update the design parameters provided herein.

3.22 Review of Future Plans

The project grading, foundation, street improvement, wall, and landscape plans should be reviewed and accepted by the geotechnical consultant prior to grading and construction. Additional recommendations should be provided upon the review of the project plans and as needed.

3.23 Observation and Testing during Grading and Construction

Geotechnical observation and testing should be performed by SA GEO during the following phases of grading and construction:

- During site demolition, preparation and clearing;
- During excavations performed for remedial grading and to relocate or remove existing underground improvements and structures;

- During earthwork, including observation and acceptance of remedial removal/overexcavation bottoms and fill placement, including import material (if any);
- Following the completion of grading, in order to verify soil properties for foundations, slab-on-grade and pavement areas;
- Upon completion of any foundation or structural excavation, prior to pouring concrete;
- During slab and flatwork subgrade preparation including pre-saturation, prior to pouring of concrete;
- During placement of backfill for utility trenches;
- During construction of the stormwater filtration devices/basins;
- During placement of backfill for retaining structures, if any;
- During installation and backfill of subdrainage systems; and
- When any unusual soil conditions are encountered.

4.0 LIMITATIONS

This report has been prepared for the exclusive use of our client, Meritage Homes, within the scope of services requested for the subject property described herein. This report or its contents should not be used or relied upon for other projects or purposes, or by other parties without the acknowledgement of SA GEO and the consultation of a geotechnical professional. The means and methods used by SA GEO for this study are based on local geotechnical standards of practice, care, and requirements of governing agencies. No warranty or guarantee, expressed or implied, is given.

Our findings, conclusions, and recommendations are professional opinions based on interpretations and inferences made from geologic and engineering data from specific locations and depths, observed or collected at a given time. By nature, geologic conditions can vary from point to point, can be very different in-between exploration points, and can also change over time. Our conclusions and recommendations are, by nature, preliminary and subject to verification and/or modification during grading and construction when more subsurface data is exposed.



Source: Seismic Hazard Zones, San Juan Capistrano Quadrangle (CDMG, 2001b)



Liquefaction

Areas where historic occurrence of liquefaction, or local geological, geotechnical and groundwater conditions indicate a potential for permanent ground displacements such that mitigation as defined in Public Resource Code Section 2693(c) would be required.



Earthquake-Induced Landslides

Areas where previous occurrence of landslide movement, or local topographic, geological, geotechnical and subsurface water conditions indicate a potential for permanent ground displacements such that mitigation as defined in Public Resource Code Section 2693(c) would be required.

Site Location and Seismic Hazard Map

Meritage Homes
Proposed Residential Development
400-700 Freedom Lane
Aliso Viejo, California

Project Number: 24064-01
Date: June 3, 2024
Figure 1





Source: Fault Activity Map of California (Jennings and Bryant, 2010)



Holocene fault displacement (during past 11,700 years) without historic record. Geomorphic evidence for Holocene faulting includes sag ponds, scarps showing little erosion, or the following features in Holocene age deposits: offset stream courses, linear scarps, shutter ridges, and triangular faceted spurs. Recency of faulting offshore is based on the interpreted age of the youngest strata displaced by faulting.



Late Quaternary fault displacement (during past 700,000 years). Geomorphic evidence similar to that described for Holocene faults except features are less distinct. Faulting may be younger, but lack of younger overlying deposits precludes more accurate age classification.



Quaternary fault (age undifferentiated). Most faults of this category show evidence of displacement sometime during the past 1.6 million years; possible exceptions are faults which displace rocks of undifferentiated Plio-Pleistocene age. Unnumbered Quaternary faults were based on Fault Map of California, 1975. See Bulletin 201, Appendix D for source data.



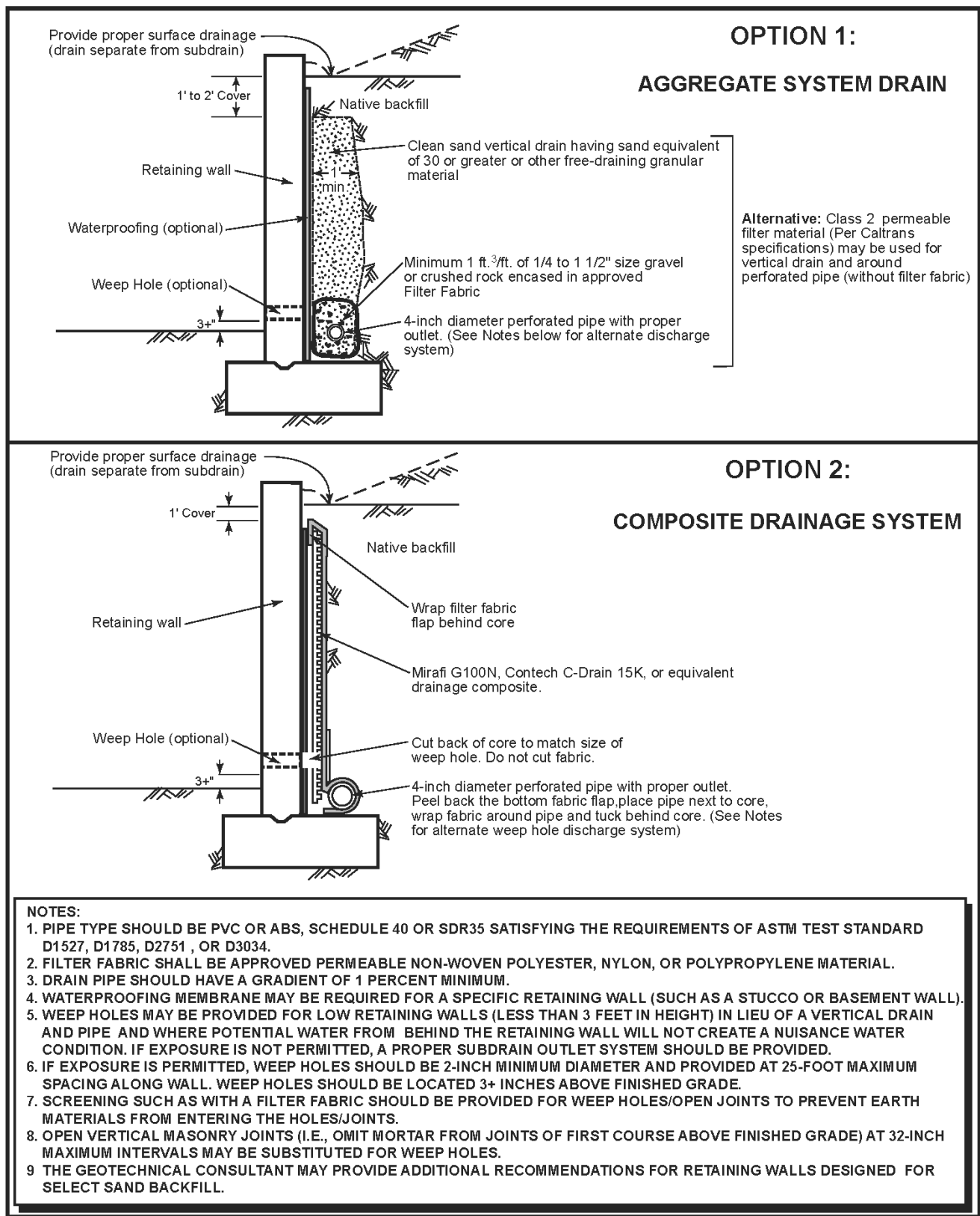
Pre-Quaternary fault (older than 1.6 million years) or fault without recognized Quaternary displacement. Some faults are shown in this category because the source of mapping used was of reconnaissance nature, or was not done with the object of dating fault displacements. Faults in this category are not necessarily inactive.

Regional Fault Map

Meritage Homes
Proposed Residential Development
400-700 Freedom Lane
Aliso Viejo, California

Project Number: 24064-01
Date: June 3, 2024
Figure 3





Retaining Wall Drainage Detail



Figure 4

Appendix A

APPENDIX A

REFERENCES

- California Division of Mines and Geology (CDMG), 2001a, Seismic Hazard Zone Report for the San Juan Capistrano 7.5-Minute Quadrangle, Orange County, California, Seismic Hazard Zone Report 053.
- California Division of Mines and Geology (CDMG), 2001b, Seismic Hazard Zones, San Juan Capistrano Quadrangle, Official Map dated December 21, 2001.
- California Geological Survey (CGS), 2008, Guidelines for Evaluation and Mitigating Seismic Hazards in California, Special Publication 117A.
- California Geological Survey (CGS), 2018, Earthquake Fault Zones, A Guide for Government Agencies, Property Owners / Developers, and Geoscience Practitioners for Assessing Fault Rupture Hazards in California, Special Publication 42, Revised 2018.
- California Geological Survey (CGS), 2021, Tsunami Hazard Area Map, County of Orange, California, Official Map dated July 8, 2021.
- Jennings, Charles W. and Bryant W.A., 2010, Fault Activity Map of California, Department of Conservation, California Geological Survey, Geologic Data Map No. 6.
- Nationwide Environmental Title Research, LLC (NETR), 2024, Historic Aerials by NETR Online, Date Accessed: May 24, 2024; website address: <http://historicaerials.com>
- Orange County Public Works (OCPW), 2013, Orange County Watersheds Water Quality Management Plan (WQMP) Technical Guidance Document for the Preparation of Conceptual/Preliminary and/or Project Water Quality Management Plans, Exhibit 7.III, Dated December 20, 2013.
- Orange County Public Works (OCPW), 2024, County of Orange, Historic Aerial Imagery, Date Accessed: May 24, 2024; website address: <https://www.ocgis.com/ocpw/historicalimagery/>
- Southern California Geotechnical, Inc., 2021, Geotechnical Investigation, Proposed Commercial/Industrial Development, 400-700 Freedom Lane, Aliso Viejo, California, Project No.: 21G167-1, dated July 2, 2021.
- Structural Engineers Association/Office of Statewide Health Planning and Development (SEA/OSHDP), 2024, U.S. Seismic Design Maps, web site address: <https://seismicmaps.org/>; Date Accessed: May 31, 2024.

APPENDIX A (Cont'd)

REFERENCES

- U.S. Geological Survey, 2006, Geologic Map of the San Bernardino and Santa Ana 30' X 60' Quadrangles, California, dated 2006, Open File Report 2006-1217.
- U.S. Geological Survey, 2024, Unified Hazard Tool, NSHM 2014 Dynamic Deaggregation Program; web site address: <https://earthquake.usgs.gov/hazards/interactive/>; Date Accessed: May 31, 2024.

Appendix B

SOIL CLASSIFICATION CHART

MAJOR DIVISIONS			SYMBOLS	TYPICAL DESCRIPTIONS
COARSE GRAINED SOILS MORE THAN 50% OF MATERIAL IS LARGER THAN NO. 200 SIEVE SIZE	GRAVEL AND GRAVELLY SOILS	CLEAN GRAVELS (LITTLE OR NO FINES)	GW	WELL-GRADED GRAVELS, GRAVEL - SAND MIXTURES, LITTLE OR NO FINES
			GP	POORLY GRADED GRAVELS, GRAVEL - SAND MIXTURES, LITTLE OR NO FINES
		GRAVELS WITH FINES (APPRECIABLE AMOUNT OF FINES)	GM	SILTY GRAVELS, GRAVEL - SAND - SILT MIXTURES
			GC	CLAYEY GRAVELS, GRAVEL - SAND - CLAY MIXTURES
	SAND AND SANDY SOILS	CLEAN SANDS (LITTLE OR NO FINES)	SW	WELL-GRADED SANDS, GRAVELLY SANDS, LITTLE OR NO FINES
			SP	POORLY GRADED SANDS, GRAVELLY SANDS, LITTLE OR NO FINES
		SANDS WITH FINES (APPRECIABLE AMOUNT OF FINES)	SM	SILTY SANDS, SAND - SILT MIXTURES
			SC	CLAYEY SANDS, SAND - CLAY MIXTURES
FINE GRAINED SOILS MORE THAN 50% OF MATERIAL IS SMALLER THAN NO. 200 SIEVE SIZE	SILTS AND CLAYS	LIQUID LIMIT LESS THAN 50	ML	INORGANIC SILTS AND VERY FINE SANDS, ROCK FLOUR, SILTY OR CLAYEY FINE SANDS OR CLAYEY SILTS WITH SLIGHT PLASTICITY
			CL	INORGANIC CLAYS OF LOW TO MEDIUM PLASTICITY, GRAVELLY CLAYS, SANDY CLAYS, SILTY CLAYS, LEAN CLAYS
			OL	ORGANIC SILTS AND ORGANIC SILTY CLAYS OF LOW PLASTICITY
	SILTS AND CLAYS	LIQUID LIMIT GREATER THAN 50	MH	INORGANIC SILTS, MICACEOUS OR DIATOMACEOUS FINE SANDY OR SILTY SOILS, ELASTIC SILTS
			CH	INORGANIC CLAYS OF HIGH PLASTICITY
			OH	ORGANIC CLAYS OF MEDIUM TO HIGH PLASTICITY, ORGANIC SILTS
HIGHLY ORGANIC SOILS			PT	PEAT, HUMUS, SWAMP SOILS WITH HIGH ORGANIC CONTENTS

NOTE: Dual symbols are used to indicate gravels or sand with 5-12% fines and soils with fines classifying as CL-ML. Symbols separated by a slash indicate borderline soil classifications.

Sampler and Symbol Descriptions

- Modified California sample (D-#)
 - ▣ Standard Penetration Test (S-#)
 - ▢ Shelby tube sample (T-#)
 - ▣ Large bulk sample (B-#)
 - ▣ Small bulk sample (SB-#)
 - ▽ Approximate depth of groundwater during drilling
 - ▽ Approximate depth of static groundwater
- Note: Number of blows required to advance driven sample 12 inches (or length noted).

Laboratory and Field Test Abbreviations

- AL** Atterberg limits (plasticity)
- CC** Chemical Testing incl. Soluble Sulfate
- CN** Consolidation
- DS** Direct Shear
- EI** Expansion Index
- GS** Grain Size Analysis (Sieve, Hydro. and/or -No. 200)
- MD** Maximum Density and Optimum Moisture
- RV** Resistance Value (R-Value)
- SE** Sand Equivalent
- UU** Unconsolidated Undrained Shear Strength

Notes:

- Soil classifications are based on the Unified Soil Classification System and include color, moisture, and relative density or consistency. Field descriptions have been modified to reflect results of laboratory tests where deemed appropriate. Bedrock descriptions are based on visual classification and include rock type, moisture, color, grain size, strength, and weathering.
- Descriptions on these boring logs apply only at the specific boring locations and at the time the borings were drilled. They are not warranted to be representative of subsurface conditions at other locations or times.



KEY TO LOG OF BORING

Date(s) Drilled: 05-07/08-2024	Logged By: AC/PA/AZ	B-1
Drilling Method: Bucket Auger	Drill Bit Size/Type: 24"	
Drill Rig Type: Cal Weld	Hammer Drive Drop (in.): 12"	
Drive Weight (lbs.): 0-25': 2500, 25-45': 1500, 45-65': 750, 65-90': 1300		Total Depth Drilled (ft): 75
Drilling Company: Big Johnny's		Approximate Ground Surface Elevation (ft): 460.5
Comments:		

Depth (ft)	SAMPLES		Graphic Log S N	Attitudes	USCS	DESCRIPTION	Moisture Content (%)	Dry Density (pcf)	Remarks
	Type and Number	Blows Per Foot							
5	D-1	3				Artificial Fill (Af) @0': Yellowish brown silty fine to medium SAND, moist, medium dense. Visible fill lifts 4 to 6 inches thick. Roots in the upper 1.5'. Trace bedrock fragments 2 to 4 inches in diameter.			
					SM	@5' SAMPLE: Yellowish brown silty fine to medium SAND, moist, medium dense, clean sand stringers, iron staining. @6.5': 8-inch-thick clean sand layer, damp.	14.8	112.5	DS, CN
10	D-2	9			SM	@10' SAMPLE: Dark brown to pale gray silty fine to coarse SAND, moist, medium dense. @10.7': Dark brown silty clayey SAND, moist, medium dense.	10.3	117.3	DS, CN
						@12.9': Undulatory fill lift/contact, friable sand below.			
15	D-3	4			SM	@14.8': Brown silty SAND, about 1' thick. @15' SAMPLE: Pale olive brown to pale brown silty fine to medium SAND with gravel, damp, medium dense. @15.7': Pale yellowish brown SAND, slightly friable.	14.6	108.7	
20	D-4	3			SP-SM	@20' SAMPLE: Pale brownish gray to olive brown fine to coarse SAND with silt, moist to very moist, medium dense, trace bedrock fragments. @ 22.0'-22.5': Undulatory contact with bedrock below (Tn).	8.8	106.1	
						Niguel Formation (Tn) @22.5': Pale yellow fine to medium SANDSTONE, slightly friable, damp, about 16" thick, jarosite staining. @23.8': Olive yellow silty fine to medium SANDSTONE, damp, dense, weakly cemented, flame structure/soft-sediment deformation. @24.1': Pale yellow to white silty fine to medium SAND, slightly friable. @25': Open joint/fracture, 1/2-inch thick, steeply dipping, iron staining. @24.3-28.3': Fault set, massive on hanging wall, iron stained bedding on foot wall. @29': Fine to medium SANDSTONE, trace silt, massive, friable, damp,			
25									
30									

Geotechnical Log Of Boring

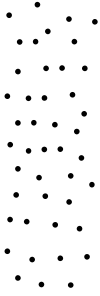
Project Number: 24064-01
Project Name: Meritage Homes
400-700 Freedom Lane



Date(s) Drilled: 05-08-2024		Logged By: AC/AZ		B-1 Page 2 of 3	
Drilling Method: Bucket Auger		Drill Bit Size/Type: 24"			
Drill Rig Type: Cal Weld		Hammer Drive Drop (in.): 12"			
Drive Weight (lbs.): 0-25': 2500, 25-45': 1500, 45-65': 750, 65-90': 1300				Total Depth Drilled (ft): 75	
Drilling Company: Big Johnny's				Approximate Ground Surface Elevation (ft): 460.5	
Comments:					

Depth (ft)	SAMPLES		Graphic Log	Attitudes	USCS	DESCRIPTION	Moisture Content (%)	Dry Density (pcf)	Remarks
	Type and Number	Blows Per Foot							
35	D-5	6		@30.2 B: N13W, 19W @31.8 B: Flat @34.8 B: Flat @36.6 B: N77E, 3N	SP	@30' SAMPLE: White to pale yellowish gray fine to coarse SANDSTONE, damp, medium dense, iron staining, slightly micaceous, friable. @30.2': Iron staining along bedding, cross bedded. @30.6-32.9': Vertical fault on southeast wall, 1-inch of apparent offset on sand/iron stained beds. @34.8': Yellow fine to medium SANDSTONE, little to no silt, damp, friable, erosional/undulatory contact with SANDSTONE below. @37': Color change to pale yellow, dense, friable SANDSTONE, very massive. @39.2': Color change to olive yellow.	2.0	103.0	
40	D-6	10		@39.2 B: N88W, 4N @39.0 B: N84W, 4N	SP	@40' SAMPLE: Pale yellowish brown to white fine to medium SANDSTONE, moist to very moist, dense, iron staining, friable. @40': Interbedded pale yellow, olive yellow, reddish yellow clean fine to medium SANDSTONE, moist to very moist, friable. @43': Interbedded pale yellow and reddish yellow SANDSTONE, very moist to wet. @46': Fine to coarse SANDSTONE, moist, massive, shells.	4.7	108.4	DS
50	D-7	13		@48.0 B: N65W, 6NE @51.1 B: Flat @53.5 B: N31W, 2N	SP	@50' SAMPLE: Pale yellowish gray to white fine to coarse SANDSTONE with fine gravel, moist, very dense, trace iron staining, trace shell fragments, slightly friable. @51.1: 8-inch-thick SANDSTONE bed highlighted by iron staining along bedding, damp. Horizontal/flat bedding. @58: Very massive, no iron staining.	3.8	105.8	

Geotechnical Log Of Boring		Project Number: 24064-01 Project Name: Meritage Homes 400-700 Freedom Lane			
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Date(s) Drilled: 05-08-2024			Logged By: AC/AZ			B-1 Page 3 of 3			
Drilling Method: Bucket Auger			Drill Bit Size/Type: 24"						
Drill Rig Type: Cal Weld			Hammer Drive Drop (in.): 12"						
Drive Weight (lbs.): 0-25': 2500, 25-45': 1500, 45-65': 750, 65-90': 1300						Total Depth Drilled (ft): 75			
Drilling Company: Big Johnny's						Approximate Ground Surface Elevation (ft): 460.5			
Comments:									
Depth (ft)	SAMPLES		Graphic Log S N	Attitudes	USCS	DESCRIPTION	Moisture Content (%)	Dry Density (pcf)	Remarks
	Type and Number	Blows Per Foot							
65	D-8	17			SP	@60' SAMPLE: Pale olive brown to white fine to coarse SANDSTONE, very moist, very dense, trace iron staining, trace fine gravel, friable.	3.3	108.5	
70	D-9	19			SP	@70' SAMPLE: Yellowish brown to pale yellowish gray medium to coarse SANDSTONE, very moist, very dense, trace iron staining, friable.	5.9	120.5	
75						Notes: Total Depth: 75' (Caved in to 71'). Downhole Logged to 67'. No Groundwater. Backfilled With Cuttings And Tamped.			
80									
85									
90									
Geotechnical Log Of Boring						Project Number: 24064-01 Project Name: Meritage Homes 400-700 Freedom Lane			

Date(s) Drilled: 05-09-2024		Logged By: AC/PA		B-2 Page 1 of 3	
Drilling Method: Bucket Auger		Drill Bit Size/Type: 24"			
Drill Rig Type: Cal Weld		Hammer Drive Drop (in.): 12"			
Drive Weight (lbs.): 0-25': 2500, 25-45': 1500, 45-65': 750, 65-90': 1300				Total Depth Drilled (ft): 65	
Drilling Company: Big Johnny's				Approximate Ground Surface Elevation (ft): 468	
Comments: Seepage at 18.4, 19.6-28.4.					

Depth (ft)	SAMPLES		Graphic Log	Attitudes	USCS	DESCRIPTION	Moisture Content (%)	Dry Density (pcf)	Remarks
	Type and Number	Blows Per Foot							
5	D-1	3				<u>Niguel Formation (Tn)</u> @0-0.7': Top soil. @0.7'-5': Pale olive brown silty SANDSTONE, moist, medium dense, iron staining, scattered roots, jointed.	11.6	107.6	
10	D-2	7			SP	@5': SAMPLE: Pale olive brown fine to medium SANDSTONE, moist to very moist, medium dense, iron staining, trace silt, massive. @7': Iron stained layer/bedding, siltstone ripup clasts, wet. @8': Pale olive brown silty SANDSTONE, moist, iron and manganese staining. @8.8-9.3': Contact with SILTSTONE below, slight seepage on downdip side, manganese staining, cemented along bedding. @10' SAMPLE: Yellowish brown to pale gray silty fine SANDSTONE/sandy SILTSTONE, very moist, dense, iron staining, fractured.	19.3	106.6	
15					SM/ML	@9.7': Iron stained contact with pale gray silty fine SANDSTONE, moist, massive. @11': Near-vertical parallel joints, manganese stained, roots. @14.5': Gradational contact with gray massive siltstone.			
20	D-3	6			ML	@16.0 B: N76E, 8N @18.5 J: N28W, 90E @19.6 B: E-W, 9N @20' SAMPLE: Olive brown to yellowish brown sandy SILTSTONE, very moist to wet, hard, thinly laminated, well bedded. @21.5': Clay bed 1/8" thick, slightly sheared. @22': Clay bed 1/8" thick, gray, slightly sheared, plastic.	30.6	87.5	GS, AL, DS
25						@21.5 CB: N78W, 9N @22.0 CB: N65W, 6N @22': Pale gray massive iron stained SILTSTONE, seepage.			
30						@27': Seepage. @27.8': Undulatory contact, pale gray to brown SANDSTONE, clean, massive.			

Geotechnical Log Of Boring		Project Number: 24064-01 Project Name: Meritage Homes 400-700 Freedom Lane	
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Date(s) Drilled: 05-09-2024		Logged By: AC/PA		B-2 Page 2 of 3	
Drilling Method: Bucket Auger		Drill Bit Size/Type: 24"			
Drill Rig Type: Cal Weld		Hammer Drive Drop (in.): 12"			
Drive Weight (lbs.): 0-25': 2500, 25-45': 1500, 45-65': 750, 65-90': 1300				Total Depth Drilled (ft): 65	
Drilling Company: Big Johnny's				Approximate Ground Surface Elevation (ft): 468	
Comments:					

Depth (ft)	SAMPLES		Graphic Log S N	Attitudes	USCS	DESCRIPTION	Moisture Content (%)	Dry Density (pcf)	Remarks
	Type and Number	Blows Per Foot							
35	D-4	12			SP	@30' SAMPLE: Pale gray to white fine to medium SANDSTONE, damp, dense, iron staining, massive, slightly friable. – Sample Disturbed - @30.5': Iron stained cross bedding. @32': Pale gray SANDSTONE, damp, dense, slightly friable, trace silt, little to no iron staining, massive.	2.3	81.5	
40	D-5	9		@33.5 B: N58W, 10N @38.0 B: N67W, 7N	SP	@38': Iron staining along bedding. @40'-42': Siltstone rip-up clasts along bedding. @40' SAMPLE: Pale gray to white fine to medium SANDSTONE, damp, dense, some iron staining, slightly friable. @41': Scattered shell fragments.	5.3	107.8	
50	D-6	20		@41.0 B: N86E, 9N @50.0 B: Flat	SP	@50' SAMPLE: Pale yellowish gray to white SANDSTONE, damp to moist, dense to very dense, trace iron staining, slightly friable. @50': Pale gray slightly silty SANDSTONE, moist, dense, slightly friable, massive, iron staining along bedding.	6.6	106.5	
60				@58.0 B: N48E, 3N		@58': Increasingly friable, banded iron staining.			

Geotechnical Log Of Boring		Project Number: 24064-01 Project Name: Meritage Homes 400-700 Freedom Lane			
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Date(s) Drilled: 05-09-2024			Logged By: AC/PA			B-2 Page 3 of 3		
Drilling Method: Bucket Auger			Drill Bit Size/Type: 24"					
Drill Rig Type: Cal Weld			Hammer Drive Drop (in.): 12"					
Drive Weight (lbs.): 0-25': 2500, 25-45': 1500, 45-65': 750, 65-90': 1300						Total Depth Drilled (ft): 65		
Drilling Company: Big Johnny's						Approximate Ground Surface Elevation (ft): 468		
Comments:								

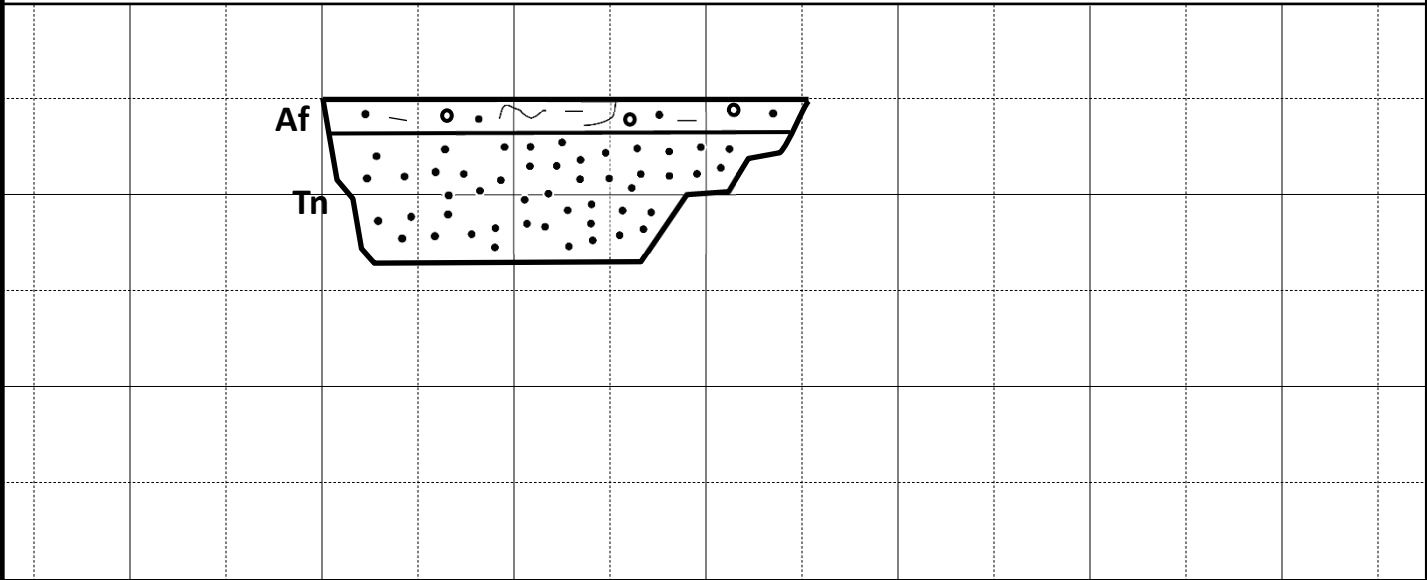
Depth (ft)	SAMPLES		Graphic Log S N	Attitudes	USCS	DESCRIPTION	Moisture Content (%)	Dry Density (pcf)	Remarks
	Type and Number	Blows Per Foot							
65	D-7	18			SP	@60' SAMPLE: Pale olive brown fine to coarse SANDSTONE, damp to moist, dense to very dense, some iron staining, micaceous, trace shell fragments. @60': Pale gray SANDSTONE, moist, trace silt, banded iron staining.	6.9	111.5	
70						Notes: Total Depth: 65'. Downhole Logged to 63'. No Groundwater. Backfilled With Cuttings And Tamped.			
75									
80									
85									
90									

Geotechnical Log Of Boring		Project Number: 24064-01 Project Name: Meritage Homes 400-700 Freedom Lane			
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Date(s)Excavated: 05-03-2024	Logged By: AC/AZ	TP-1
Excavation Method: Backhoe		
Equipment Type: Deere 310 SL		
Sampling Method(s): Bulk		Total Depth (ft): 4
Approximate Groundwater Depth: Groundwater Not Encountered.		Approximate Ground Surface Elevation (ft): 464.5
Comments:		

Sample Depth (ft)	SAMPLES				USCS	Log Of Test Pit	Moisture Content (%)	Dry Density (pcf)	REMARKS
	Type	Number	Blows	Per Foot					
0	B-1					Surface: Weeds			
					SM	<u>Artificial Fill (Af)</u> @ 0-0.6': Pale olive gray to pale brown silty fine SAND with coarse gravel, dry, loose, vegetation and roots.			Bulk Bag @ 1-4'
					SM	<u>Niguel Formation (Tn)</u> @ 0.6'-4': Yellowish gray to reddish yellow fine to coarse SANDSTONE, damp, medium dense, banded iron staining, friable, slight caving, massive.			
5									
10						Notes: Total Depth: 4 Feet. Groundwater Not Encountered. Backfilled with Cuttings and Rolled.			
15									

Graphic Orientation: North Wall	Trend: E-W	Scale: 1"=5'
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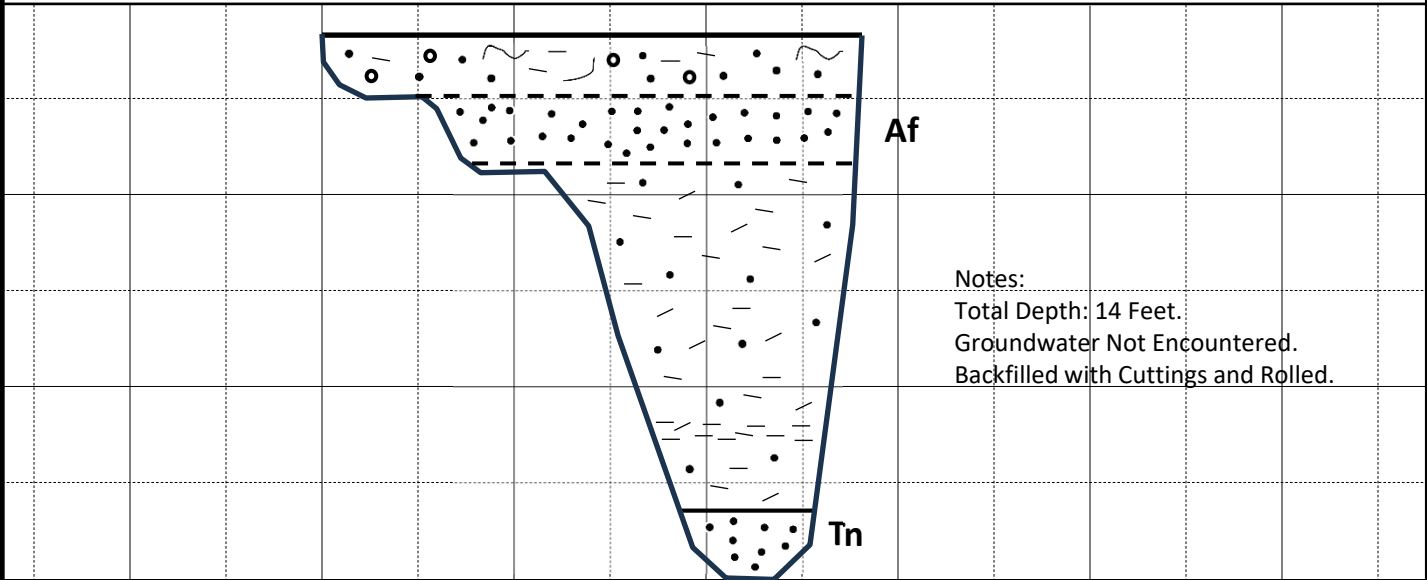


Log Of Test Pit		
Meritage Homes Proposed Residential Development 400-700 Freedom Lane Aliso Viejo, California	Project Number: 24064-01 Appendix B	

Date(s)Excavated: 05-03-2024	Logged By: AC/AZ	TP-2
Excavation Method: Backhoe		
Equipment Type: Deere 310 SL		
Sampling Method(s):		Total Depth (ft): 14
Approximate Groundwater Depth: Groundwater Not Encountered.		Approximate Ground Surface Elevation (ft): 475
Comments:		

Sample Depth (ft)	SAMPLES				Log Of Test Pit	Moisture Content (%)	Dry Density (pcf)	REMARKS
	Type	Number	Blows	Per Foot				
0					Surface: Weeds			
					Undocumented Artificial Fill (Afu)			
					@ 0-1.5': Yellowish gray to pale brown silty fine SAND dry, loose, little coarse gravel, roots, scattered vegetation.			
					@ 1.5-3': Pale yellowish gray to white fine to coarse SAND, damp, loose, friable/caving.			
5					@ 3-12.5': Pale brown to yellowish brown silty fine to coarse SAND, damp to moist, medium dense, trace clay and asphalt debris.			
10					@ 10': Moist to very moist.			
					@ 11': Brown sandy SILT.			
					Niguel Formation (Tn)			
					@ 12.5-14': Pale yellowish gray to white fine to coarse SANDSTONE, moist, dense, iron staining, friable, caving, massive.			
15								

Graphic Orientation: North Wall	Trend: <-N69W-	Scale: 1"=5'
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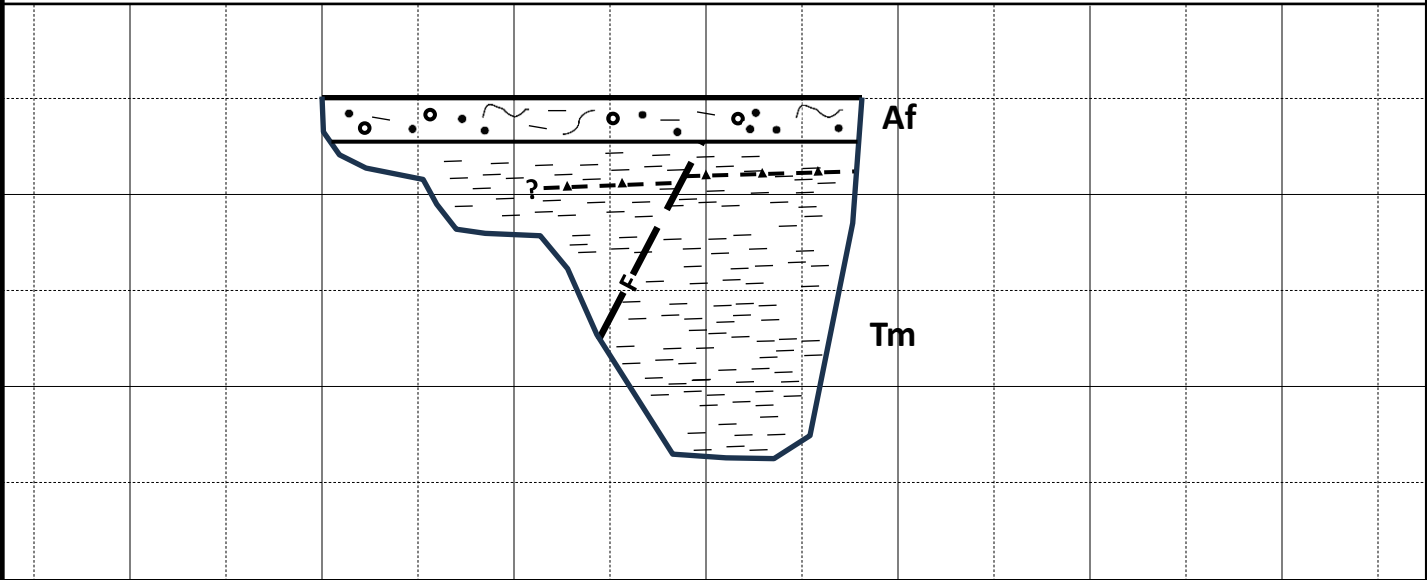


Log Of Test Pit		
Meritage Homes Proposed Residential Development 400-700 Freedom Lane Aliso Viejo, California	Project Number: 24064-01 Appendix B	

Date(s)Excavated: 05-03-2024	Logged By: AC/AZ	TP-3
Excavation Method: Backhoe		
Equipment Type: Deere 310 SL		
Sampling Method(s): Bulk		Total Depth (ft): 9
Approximate Groundwater Depth: Groundwater Not Encountered.		Approximate Ground Surface Elevation (ft): 461.5
Comments:		

Sample Depth (ft)	SAMPLES				USCS	Log Of Test Pit	Moisture Content (%)	Dry Density (pcf)	REMARKS
	Type	Number	Blows	Per Foot					
0	B-1				SM	Surface: Weeds			Artificial Fill (Af) @ 0-1': Pale brown silty fine SAND with gravel, dry, loose. Monterey Formation (Tm) @ 1-9': Pale brown to white SILTSTONE, moist, medium dense, well laminated, diatomaceous. @ 2': 0.25-inch-thick olive gray CLAY, very moist, slightly plastic, offset by fault 1 to 2 inches, pinches out north of fault. Notes: Total Depth: 9 Feet. Groundwater Not Encountered. Backfilled with Cuttings and Rolled.
5					MH				Bulk Bag @ 1-4' GS, AL, EI, CC @ 2' CB: N62E, 4W @ 2.5' F: N40W, 78SW @ 4' J: N44E, 82E
10									
15									

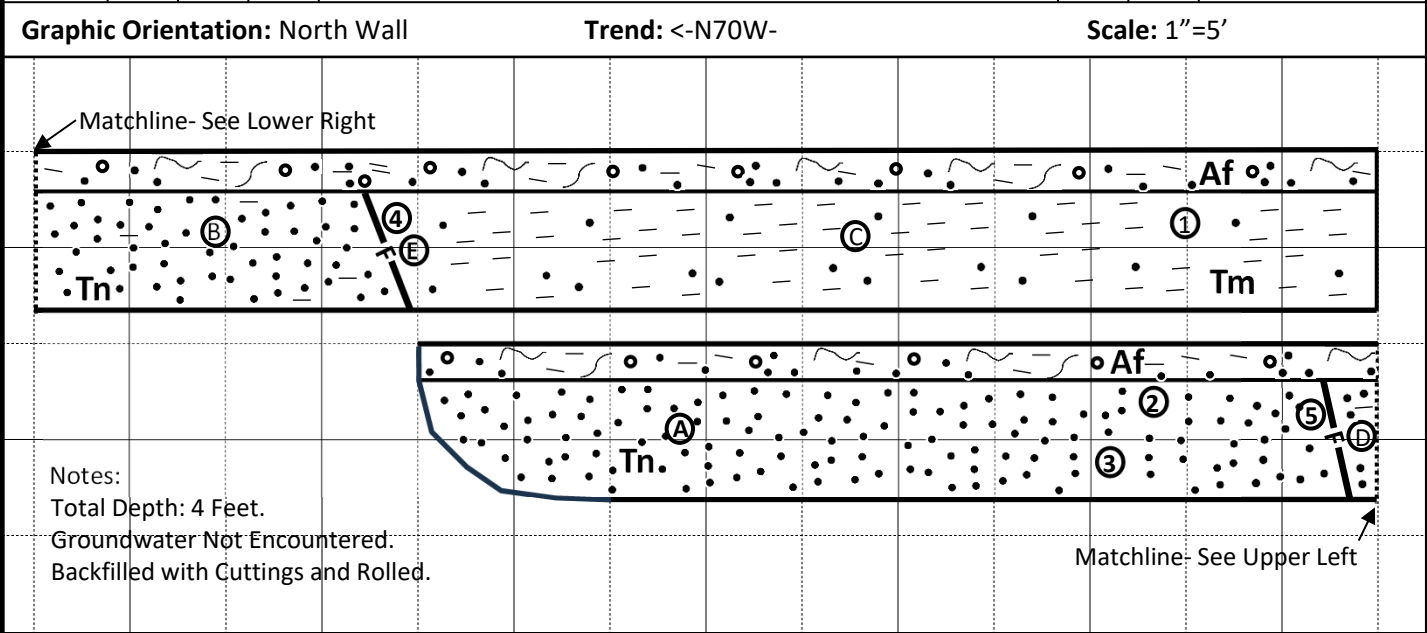
Graphic Orientation: North Wall	Trend: <-N45W-	Scale: 1"=5'
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Log Of Test Pit		
Meritage Homes Proposed Residential Development 400-700 Freedom Lane Aliso Viejo, California	Project Number: 24064-01 Appendix B	

Date(s)Excavated: 05-07-2024	Logged By: AC/AZ	TP-3a
Excavation Method: Backhoe		
Equipment Type: Deere 310 SL		
Sampling Method(s):		Total Depth (ft): 4
Approximate Groundwater Depth: Groundwater Not Encountered.		Approximate Ground Surface Elevation (ft): 464
Comments:		

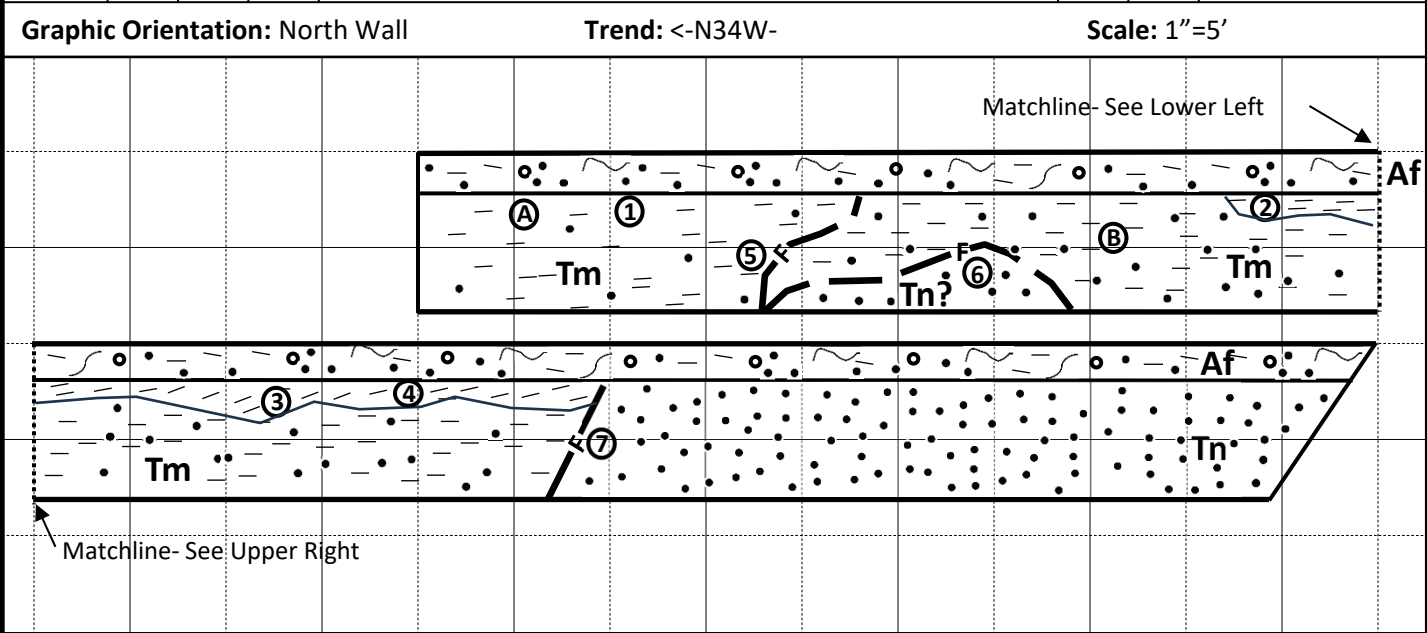
Sample Depth (ft)	SAMPLES				Log Of Test Pit	Moisture Content (%)	Dry Density (pcf)	REMARKS
	Type	Number	Blows Per Foot	USCS				
0					Surface: Weeds			
				SM	<u>Artificial Fill (Af)</u> Pale brown silty fine SAND with coarse gravel, dry, loose, vegetation and roots.			(1) B: N88W, 14N
				SP	<u>Niguel Formation (Tn)</u> (A) Pale brownish gray to white fine to coarse SANDSTONE, damp to moist, medium dense, iron staining, friable, caving, locally crossbedded.			(2) B: N46E, 18S
5				SM-SP	(B) Pale brownish gray to pale brown slightly silty fine to coarse SANDSTONE, moist, medium dense, friable, caving, massive.			(3) B: N24E, 12NE
				SM/ML	<u>Monterey Formation (Tm)</u> (C) Pale brown to reddish brown silty fine to medium SANDSTONE/SILTSTONE, moist to very moist, medium dense, well bedded.			(4) F: N8W, 63E
10					(D) <u>Fault</u> : olive brown, clay-filled, roots, very plastic, 0.25" thick			(5) F: N4E, 60E
					(E) <u>Fault</u> : dark brown-olive brown, clay-filled, roots, very plastic, 0.25" thick, soft			
15								



Log Of Test Pit		
Meritage Homes Proposed Residential Development 400-700 Freedom Lane Aliso Viejo, California	Project Number: 24064-01 Appendix B	

Date(s)Excavated: 05-07-2024	Logged By: AC/AZ	TP-3b
Excavation Method: Backhoe		
Equipment Type: Deere 310 SL		
Sampling Method(s): None		Total Depth (ft): 4
Approximate Groundwater Depth: Groundwater Not Encountered.		Approximate Ground Surface Elevation (ft): 461.5
Comments:		

Sample Depth (ft)	SAMPLES				Log Of Test Pit	Moisture Content (%)	Dry Density (pcf)	REMARKS
	Type	Number	Blows Per Foot	USCS				
0					Surface: Weeds			
				SM	Artificial Fill (Af) Pale brown silty fine to coarse SAND with gravel, dry to damp, loose, entrained vegetation and debris.			(1) B: N60W, 6NE (2) B: N18W, 7E (3) B: N12W, 36W (4) B: N3W, 32W (5) F: N2W, 82W (6) F: N3W, 52E (7) F: N5W, 72W
				SP	Niguel Formation (Tn) Pale brown to white fine to coarse SANDSTONE, very moist to wet, medium dense, iron staining, friable, micaceous, caving, mild crossbedding. In fault contact with Monterey. Fault is clay-lined with abundant roots, planar. Bedrock on either side of fault is broken/weathered.			
5								
				ML	Monterey Formation (Tm) (A) Pale bluish gray clayey SILTSTONE, moist, dense, thinly bedded, well bedded.			
10				SM	(B) Reddish brown silty SANDSTONE, very moist to wet, medium dense to dense, massive.			
					Notes: Total Depth: 4 Feet. Groundwater Not Encountered. Backfilled with Cuttings and Rolled.			
15								

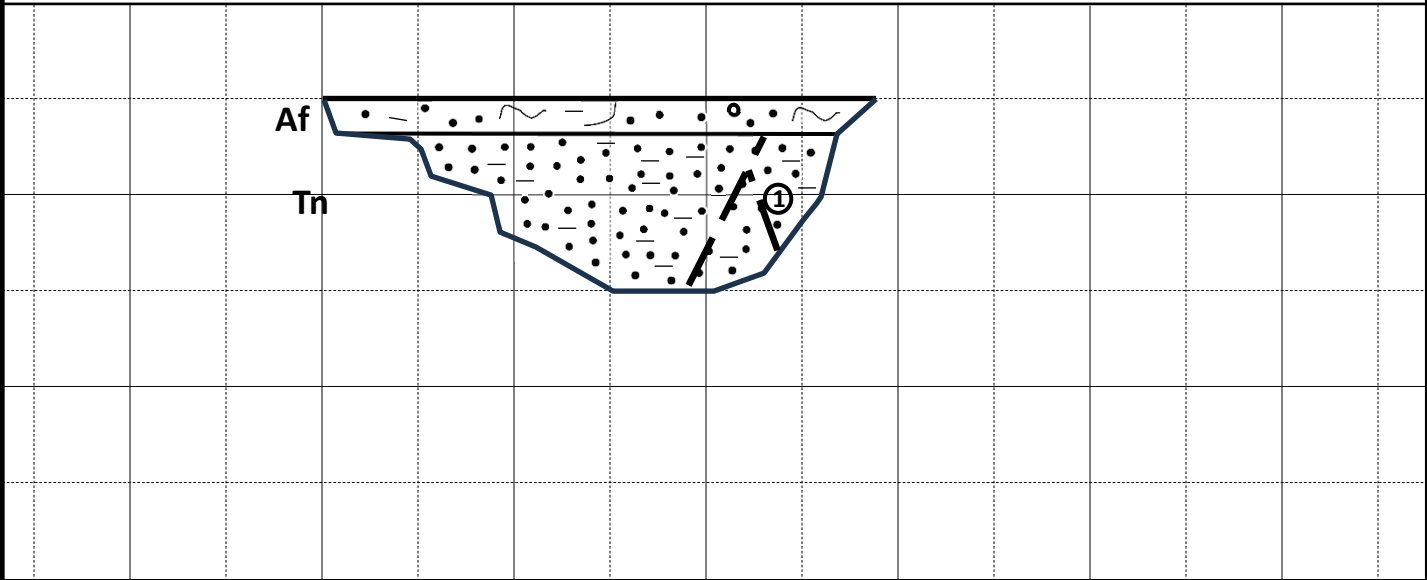


Log Of Test Pit		
Meritage Homes Proposed Residential Development 400-700 Freedom Lane Aliso Viejo, California	Project Number: 24064-01 Appendix B	

Date(s)Excavated: 05-03-2024		Logged By: AZ	TP-4
Excavation Method: Backhoe			
Equipment Type: Deere 310 SL			
Sampling Method(s):			Total Depth (ft): 5
Approximate Groundwater Depth: Groundwater Not Encountered.			Approximate Ground Surface Elevation (ft): 466.5
Comments:			

Sample Depth (ft)	SAMPLES				USCS	Log Of Test Pit	Moisture Content (%)	Dry Density (pcf)	REMARKS
	Type	Number	Blows	Per Foot					
0						Surface: Weeds			
					SP-SM	Artificial Fill (Af) @ 0-1': Yellowish brown fine to medium SAND with silt, moist, medium dense, some roots, trace coarse gravel.			(1) J: N34E, 83W
5					SM	Niguel Formation (Tn) @ 1'-5': Gray and pale yellow silty fine to medium SANDSTONE, damp to moist, medium dense, trace root hairs, iron staining, fractured/conjugate joints, massive.			
10						Notes: Total Depth: 5 Feet. Groundwater Not Encountered. Backfilled with Cuttings and Rolled.			
15									

Graphic Orientation: East Wall	Trend: N-S	Scale: 1"=5'
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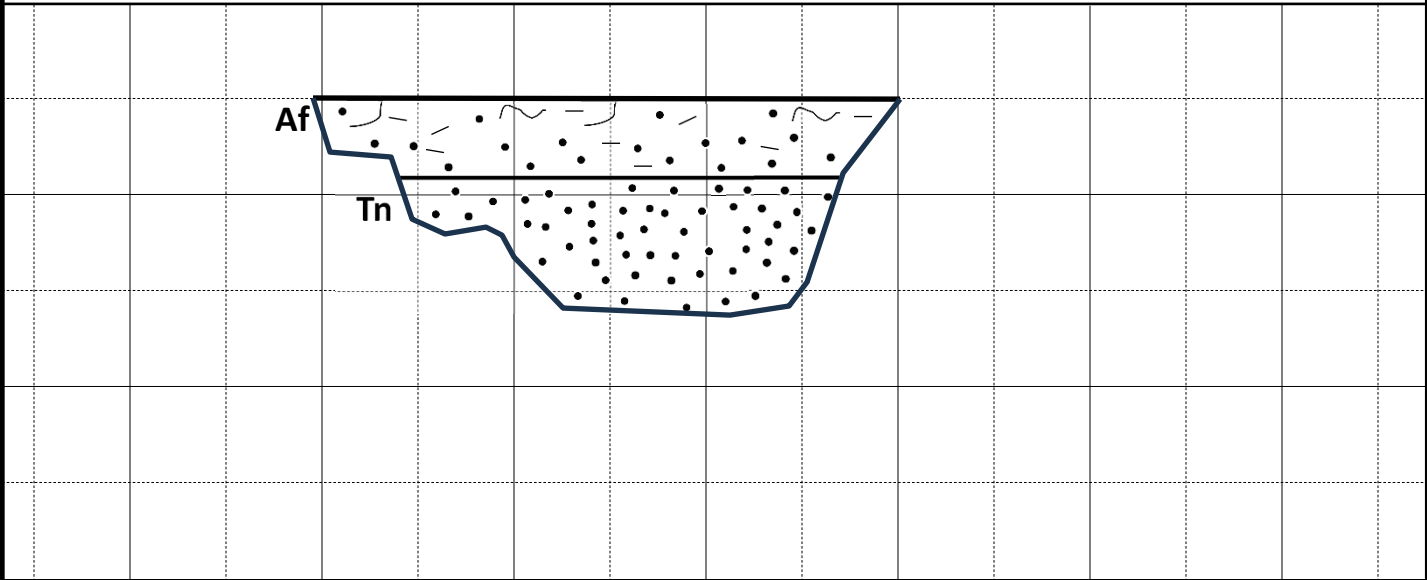


Log Of Test Pit		
Meritage Homes Proposed Residential Development 400-700 Freedom Lane Aliso Viejo, California	Project Number: 24064-01 Appendix B	

Date(s)Excavated: 05-03-2024		Logged By: AZ	TP-5
Excavation Method: Backhoe			
Equipment Type: Deere 310 SL			
Sampling Method(s):			Total Depth (ft): 5.5
Approximate Groundwater Depth: Groundwater Not Encountered.			Approximate Ground Surface Elevation (ft): 466.5
Comments:			

Sample Depth (ft)	SAMPLES				Log Of Test Pit	Moisture Content (%)	Dry Density (pcf)	REMARKS
	Type	Number	Blows Per Foot	USCS				
0					Surface: Weeds			
				SM	<u>Artificial Fill (Af)</u> @ 0-2.5': Yellowish brown silty fine to medium SAND, moist, medium dense, roots in upper 6 inches.			
				SP	<u>Niguel Formation (Tn)</u> @ 2.5-5.5': Light gray fine to medium SANDSTONE, damp to moist, medium dense, friable, massive.			
5					Notes: Total Depth: 5.5 Feet. Groundwater Not Encountered. Backfilled with Cuttings and Rolled.			
10								
15								

Graphic Orientation: East Wall	Trend: <-N50W-	Scale: 1"=5'
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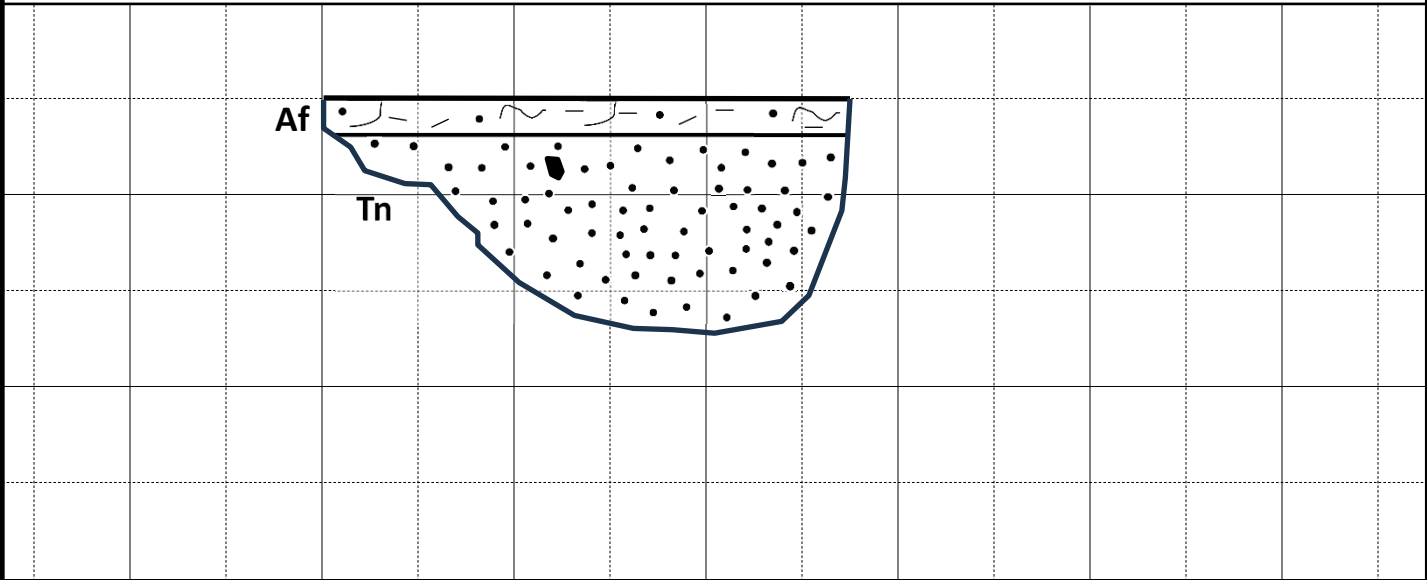


Log Of Test Pit		
Meritage Homes Proposed Residential Development 400-700 Freedom Lane Aliso Viejo, California	Project Number: 24064-01 Appendix B	

Date(s)Excavated: 05-03-2024		Logged By: AC/AZ	TP-6
Excavation Method: Backhoe			
Equipment Type: Deere 310 SL			
Sampling Method(s): Bulk			Total Depth (ft): 6
Approximate Groundwater Depth: Groundwater Not Encountered.			Approximate Ground Surface Elevation (ft): 461.5
Comments:			

Sample Depth (ft)	SAMPLES			USCS	Log Of Test Pit	Moisture Content (%)	Dry Density (pcf)	REMARKS					
	Type	Number	Blows Per Foot										
0	 B-1			SM	Surface: Weeds			Bulk Bag @ 0-5' @2.5' B: N5E, 8W					
					<u>Artificial Fill (Af)</u>								
					@ 0-1': Pale brown silty fine SAND with gravel, dry, loose, vegetation/debris.								
					<u>Niguel Formation (Tn)</u>								
					@ 1-6': Pale yellowish gray and pale reddish brown fine to coarse SANDSTONE, moist to very moist, medium dense, iron staining along bedding. Krotovina @ 1.5'.								
5													
10													
15													

Graphic Orientation: North Wall	Trend: <-N16W-	Scale: 1"=5'
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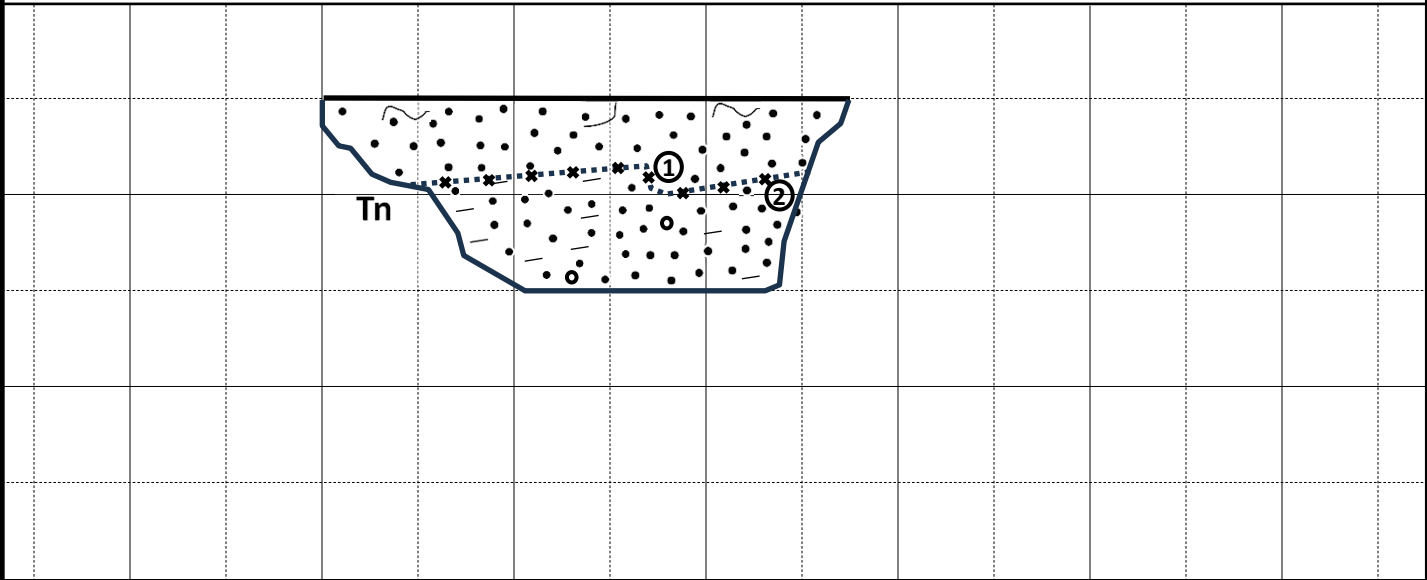


Log Of Test Pit		
Meritage Homes Proposed Residential Development 400-700 Freedom Lane Aliso Viejo, California	Project Number: 24064-01 Appendix B	

Date(s)Excavated: 05-03-2024	Logged By: AC/AZ	TP-7
Excavation Method: Backhoe		
Equipment Type: Deere 310 SL		
Sampling Method(s):		Total Depth (ft): 5
Approximate Groundwater Depth: Groundwater Not Encountered.		Approximate Ground Surface Elevation (ft): 454
Comments:		

Sample Depth (ft)	SAMPLES				Log Of Test Pit	Moisture Content (%)	Dry Density (pcf)	REMARKS
	Type	Number	Blows	Per Foot				
0					Surface: Weeds/Vegetation.			
					Niguel Formation (Tn)			
				SP	@ 0-2': Pale yellow fine to medium SANDSTONE, damp to moist, medium dense to dense, friable, massive, root hairs in upper 6".			(1) B: N68E, 10NW
				SM	@ 2-2.5': Dark reddish brown to dark brown weakly cemented SANDSTONE, iron staining.			(2) B: N40E, 2NW
5				SM	@ 2.5-5': Grayish yellow silty fine SANDSTONE, moist, dense, trace iron staining and jarosite, trace rounded fine gravel.			
10					Notes: Total Depth: 5 Feet. Groundwater Not Encountered. Backfilled with Cuttings and Rolled.			
15								

Graphic Orientation: East Wall	Trend: <-N9E-	Scale: 1"=5'
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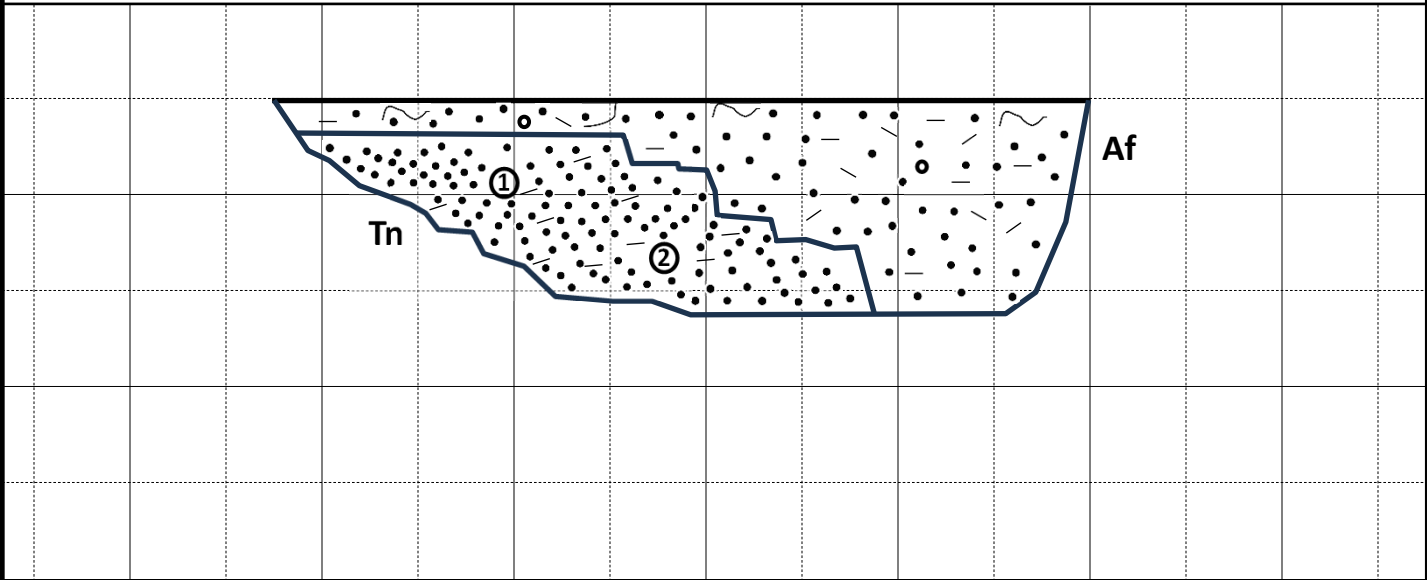


Log Of Test Pit		
Meritage Homes Proposed Residential Development 400-700 Freedom Lane Aliso Viejo, California	Project Number: 24064-01 Appendix B	

Date(s)Excavated: 05-03-2024	Logged By: AC/AZ	TP-8
Excavation Method: Backhoe		
Equipment Type: Deere 310 SL		
Sampling Method(s):		Total Depth (ft): 5.5
Approximate Groundwater Depth: Groundwater Not Encountered.		Approximate Ground Surface Elevation (ft): 467
Comments:		

Sample Depth (ft)	SAMPLES				Log Of Test Pit	Moisture Content (%)	Dry Density (pcf)	REMARKS
	Type	Number	Blows Per Foot	USCS				
0					Surface: Weeds/sand			
				SM	<u>Artificial Fill (Af)</u> Mottled yellowish brown, brown, and grayish brown silty fine to medium SAND, moist to very moist, medium dense, probes firm, trace fine gravel.			(1) B: N80E, 19N
5				SP	<u>Niguel Formation (Tn)</u> Pale yellow to reddish yellow SANDSTONE, damp, medium dense to dense, friable, iron staining, cross bedded.			(2) B: N28E, 7NW
10					Notes: Total Depth: 5.5 Feet. Groundwater Not Encountered. Backfilled with Cuttings and Rolled.			
15								

Graphic Orientation: North Wall	Trend: <-N20W-	Scale: 1"=5'
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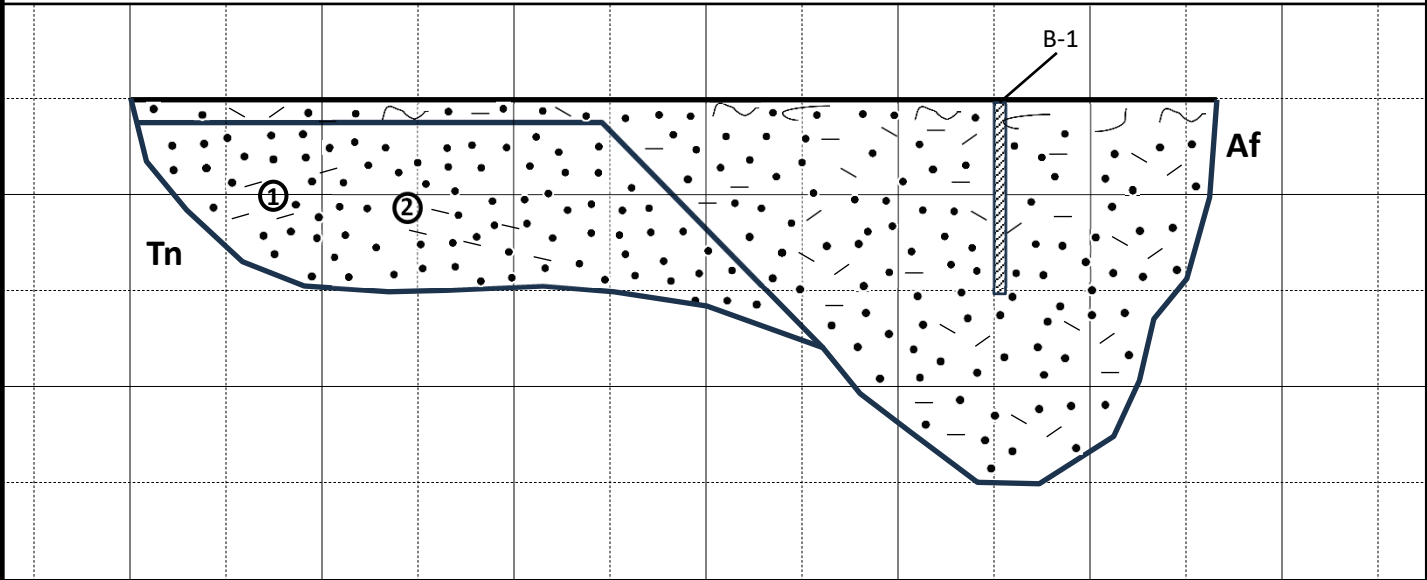


Log Of Test Pit		
Meritage Homes Proposed Residential Development 400-700 Freedom Lane Aliso Viejo, California	Project Number: 24064-01 Appendix B	

Date(s)Excavated: 05-03-2024		Logged By: AC/AZ	TP-9
Excavation Method: Backhoe			
Equipment Type: Deere 310 SL			
Sampling Method(s): Bulk			Total Depth (ft): 10
Approximate Groundwater Depth: Groundwater Not Encountered.			Approximate Ground Surface Elevation (ft): 465
Comments:			

Sample Depth (ft)	SAMPLES				Log Of Test Pit	Moisture Content (%)	Dry Density (pcf)	REMARKS
	Type	Number	Blows Per Foot	USCS				
0	B-1			SM	<u>Artificial Fill (Af)</u> Mottled dark brown and yellowish gray silty fine to medium SAND, damp to moist, medium dense, abundant roots in upper 12".			Bulk Bag @ 0-5' GS, MD, EI, CC
5				SP	<u>Niguel Formation (Tn)</u> Pale yellowish gray to white fine to coarse SANDSTONE, moist to very moist, dense, iron staining, friable, caving, cross bedded.			(1) B: N43E, 18W (2) B: E-W, 13S
10					Notes: Total Depth: 10 Feet. Groundwater Not Encountered. Backfilled with Cuttings and Rolled.			
15								

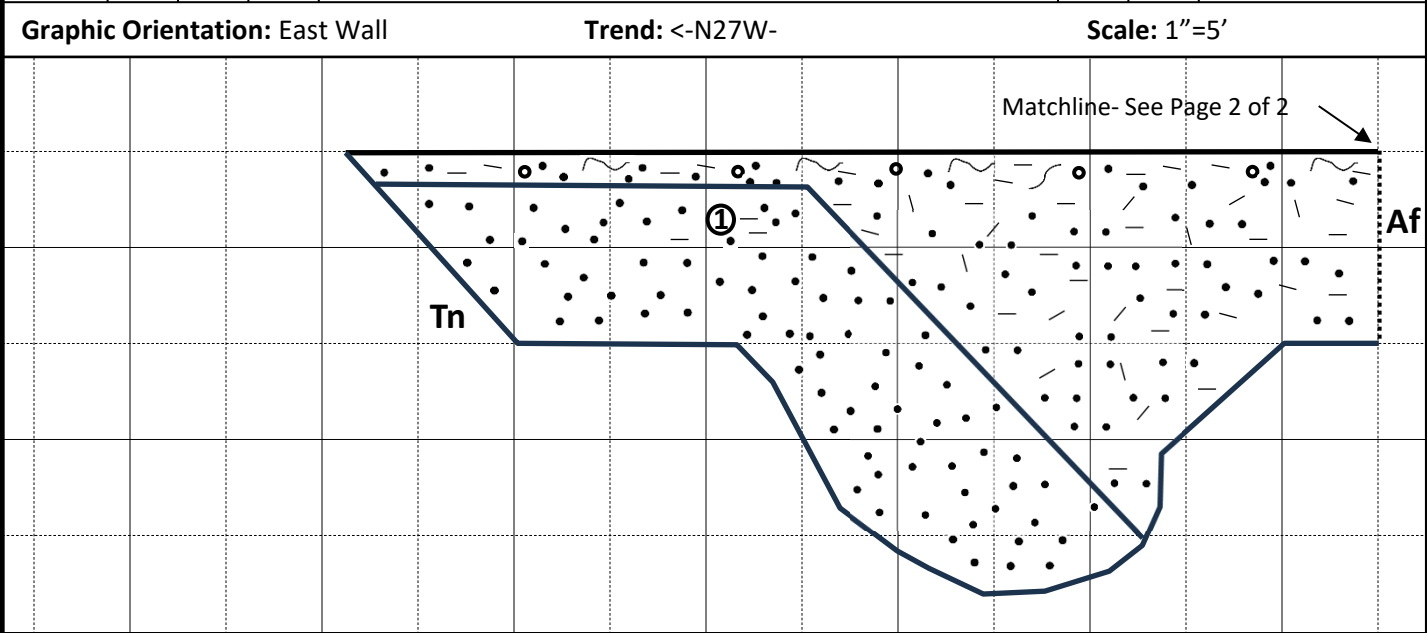
Graphic Orientation: North Wall	Trend: <-N20W-	Scale: 1"=5'
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Log Of Test Pit		
Meritage Homes Proposed Residential Development 400-700 Freedom Lane Aliso Viejo, California	Project Number: 24064-01 Appendix B	

Date(s)Excavated: 05-03-2024		Logged By: AC/AZ	TP-10	Page 1 of 2
Excavation Method: Backhoe				
Equipment Type: Deere 310 SL				
Sampling Method(s):			Total Depth (ft): 12	
Approximate Groundwater Depth: Groundwater Not Encountered.			Approximate Ground Surface Elevation (ft): 461	
Comments:				

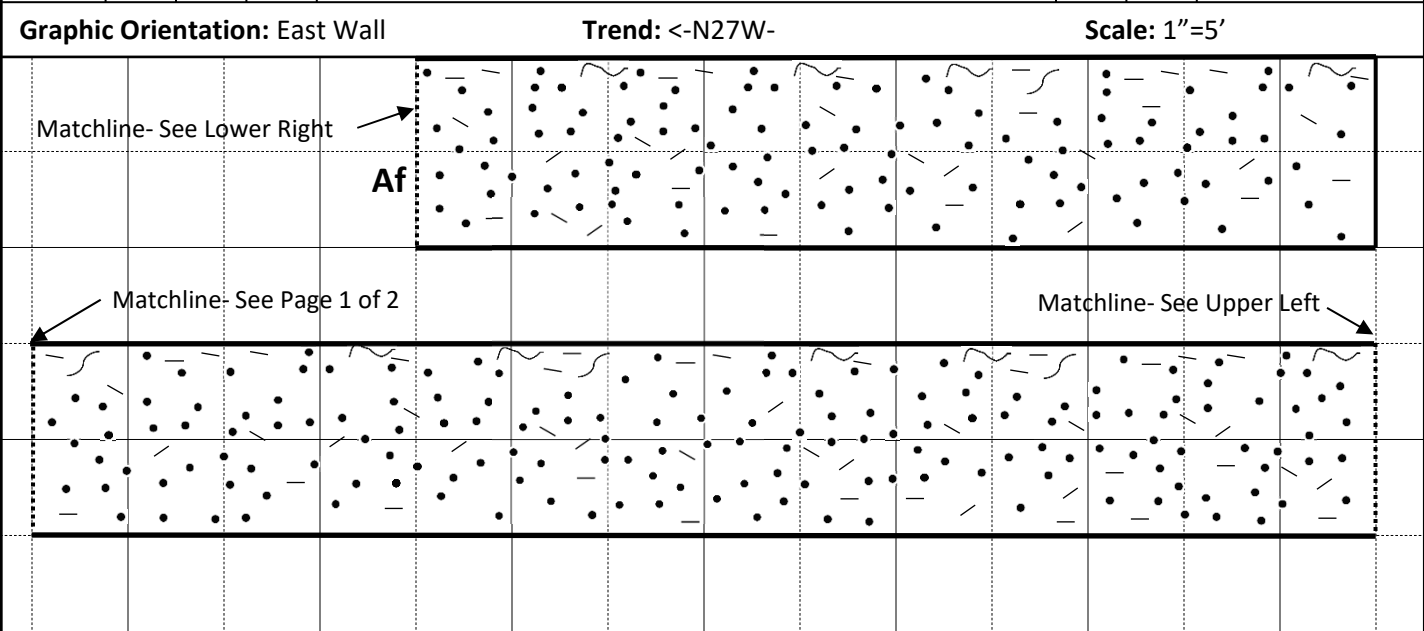
Sample Depth (ft)	SAMPLES				Log Of Test Pit	Moisture Content (%)	Dry Density (pcf)	REMARKS
	Type	Number	Blows Per Foot	USCS				
0					Surface: Weeds			
				SM	<u>Artificial Fill (Af)</u> Mottled olive brown and dark brown silty fine to medium SAND, moist to very moist, medium dense, predominantly bedrock derived with local lifts of topsoil, lift thickness 2-7", probes firm throughout, upper 1-1.5' weathered, roots, damp.			(1) B: N9W, 6NE
5				SP	<u>Niguel Formation (Tn)</u> Pale gray and pale reddish brown fine to coarse SANDSTONE, moist to wet, dense, banded iron staining, friable, locally cross bedded, caving.			
10					*Continued on Page 2 of 2.			
15					Notes: Total Depth: 12 Feet. Groundwater Not Encountered. Backfilled with Cuttings and Rolled.			



Log Of Test Pit		
Meritage Homes Proposed Residential Development 400-700 Freedom Lane Aliso Viejo, California	Project Number: 24064-01 Appendix B	

Date(s) Excavated: 05-03-2024		Logged By: AC/AZ		TP-10	Page 2 of 2
Excavation Method: Backhoe					
Equipment Type: Deere 310 SL					
Sampling Method(s):				Total Depth (ft): 12	
Approximate Groundwater Depth: Groundwater Not Encountered.				Approximate Ground Surface Elevation (ft): 461	
Comments:					

Sample Depth (ft)	SAMPLES				Log Of Test Pit	Moisture Content (%)	Dry Density (pcf)	REMARKS
	Type	Number	Blows Per Foot	USCS				
0				SM	Surface: Weeds/Vegetation. <u>Artificial Fill (Af)</u> Mottled olive brown and dark brown silty fine to medium SAND, moist to very moist, medium dense, predominantly bedrock (Tn) derived with local lifts topsoil derived, lift thickness 2-7", probes firm throughout. Upper 1-1.5' weathered, roots, damp.			
5								
10								
15								



Log Of Test Pit		
Meritage Homes Proposed Residential Development 400-700 Freedom Lane Aliso Viejo, California	Project Number: 24064-01 Appendix B	

Date(s) Drilled: 05-14-2024		Logged By: AC/PA		HA-1 Page 1 of 1	
Drilling Method: Hand Auger		Drill Bit Size/Type: 3" Hand Auger			
Drill Rig Type: Manual		Hammer Type:			
Sampling Method(s):				Total Depth Drilled (ft) 11.5	
Approximate Groundwater Depth: Groundwater Not Encountered				Approximate Ground Surface Elevation (ft) 445	
Comments:					

Depth (ft)	SAMPLES			USCS	MATERIAL DESCRIPTION	Moisture Content (%)	Dry Density (pcf)	REMARKS
	Type	Number	Blows Per Foot					
0					Surface: Grass/weeds.			
				SM	Artificial Fill (Af) @ 0-4.5': Dark brown to brownish black silty fine to medium SAND, moist to very moist, medium dense, trace organics/vegetation. @ 3.5': Bedrock fragments.			
5				SM-SP	@ 4.5-8': Mottled yellowish brown and olive gray fine to coarse SAND with silt, moist to very moist, medium dense, bedrock fragments, trace iron staining.			
				SC	@ 8-9': Reddish brown clayey fine to coarse SAND, moist to very moist, medium dense.			
10				SM	@ 9-10': Mottled yellowish gray and olive brown silty fine to coarse SAND, moist, medium dense, trace clay.			
				SP	Niguel Formation (Tn) @ 10-11.5': Pale yellow and yellowish orange fine to medium SAND, damp to moist, dense, banded iron staining.			
15					Notes: Total Depth: 11.5 Feet. Groundwater Not Encountered. Backfilled With Cuttings.			
20								

Log Of Boring		
Meritage Homes Proposed Residential Development 400-700 Freedom Lane Aliso Viejo, California	Project Number: 24064-01 Appendix B	

Date(s) Drilled: 05-14-2024		Logged By: AC/PA		HA-2 Page 1 of 1		
Drilling Method: Hand Auger		Drill Bit Size/Type: 3" Hand Auger				
Drill Rig Type: Manual		Hammer Type:				
Sampling Method(s):				Total Depth Drilled (ft) 13		
Approximate Groundwater Depth: Groundwater Not Encountered				Approximate Ground Surface Elevation (ft) 426		
Comments:						

Depth (ft)	SAMPLES			USCS	MATERIAL DESCRIPTION	Moisture Content (%)	Dry Density (pcf)	REMARKS
	Type	Number	Blows Per Foot					
0					Surface: Grass/weeds			
				SM	<u>Artificial Fill (Af)</u> @ 0-1.5': Brown silty fine to medium SAND, dry, loose, weathered in upper 6", trace gravel, slight caving, roots.			
				SP-SM	@ 1.5-5': Mottled yellowish brown and brown slightly silty fine to coarse SAND, moist, medium dense, trace iron staining.			
5				SM	@ 5-13': Mottled yellowish gray and olive brown silty fine to medium SAND, moist, medium dense, trace clay and coarse gravel, trace bedrock fragments. @ 8.5': Clean sand layer, 4 inches thick. @ 10.3': Pale olive grey siltstone fragment. @ 11-12': Clean sand, very moist.			
10								
15					Notes: Total Depth: 13 Feet. Groundwater Not Encountered. Backfilled With Cuttings.			
20								

Log Of Boring		
Meritage Homes Proposed Residential Development 400-700 Freedom Lane Aliso Viejo, California	Project Number: 24064-01 Appendix B	

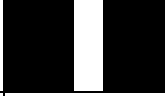
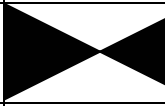
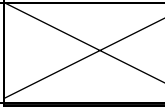
Date(s) Drilled: 05-14-2024	Logged By: AC/PA	HA-3 Page 1 of 1
Drilling Method: Hand Auger	Drill Bit Size/Type: 3" Hand Auger	
Drill Rig Type: Manual	Hammer Type:	
Sampling Method(s):		Total Depth Drilled (ft) 10
Approximate Groundwater Depth: Groundwater Not Encountered		Approximate Ground Surface Elevation (ft) 429
Comments:		

Depth (ft)	SAMPLES				USCS	MATERIAL DESCRIPTION	Moisture Content (%)	Dry Density (pcf)	REMARKS
	Type	Number	Blows	Per Foot					
0						Surface: Mulch/pine needles.			
					SM	Artificial Fill (Af) @ 0-5.5: Yellowish brown to brown silty fine to medium SAND, damp to moist, medium dense, some coarse gravel and bedrock fragments, roots/vegetation in upper 2'.			
5					SM	@ 5.5-10': Mottled yellowish brown, reddish brown, and white silty fine to coarse SAND, moist, medium dense, trace fine gravel, micaceous.			
10						Notes: Total Depth: 10 Feet. Groundwater Not Encountered. Backfilled With Cuttings.			
15									
20									

Log Of Boring		
Meritage Homes Proposed Residential Development 400-700 Freedom Lane Aliso Viejo, California	Project Number: 24064-01 Appendix B	

Boring Logs by
Southern California
Geotechnical (2021)

BORING LOG LEGEND

SAMPLE TYPE	GRAPHICAL SYMBOL	SAMPLE DESCRIPTION
AUGER		SAMPLE COLLECTED FROM AUGER CUTTINGS, NO FIELD MEASUREMENT OF SOIL STRENGTH. (DISTURBED)
CORE		ROCK CORE SAMPLE: TYPICALLY TAKEN WITH A DIAMOND-TIPPED CORE BARREL. TYPICALLY USED ONLY IN HIGHLY CONSOLIDATED BEDROCK.
GRAB		SOIL SAMPLE TAKEN WITH NO SPECIALIZED EQUIPMENT, SUCH AS FROM A STOCKPILE OR THE GROUND SURFACE. (DISTURBED)
CS		CALIFORNIA SAMPLER: 2-1/2 INCH I.D. SPLIT BARREL SAMPLER, LINED WITH 1-INCH HIGH BRASS RINGS. DRIVEN WITH SPT HAMMER. (RELATIVELY UNDISTURBED)
NSR		NO RECOVERY: THE SAMPLING ATTEMPT DID NOT RESULT IN RECOVERY OF ANY SIGNIFICANT SOIL OR ROCK MATERIAL.
SPT		STANDARD PENETRATION TEST: SAMPLER IS A 1.4 INCH INSIDE DIAMETER SPLIT BARREL, DRIVEN 18 INCHES WITH THE SPT HAMMER. (DISTURBED)
SH		SHELBY TUBE: TAKEN WITH A THIN WALL SAMPLE TUBE, PUSHED INTO THE SOIL AND THEN EXTRACTED. (UNDISTURBED)
VANE		VANE SHEAR TEST: SOIL STRENGTH OBTAINED USING A 4 BLADED SHEAR DEVICE. TYPICALLY USED IN SOFT CLAYS-NO SAMPLE RECOVERED.

COLUMN DESCRIPTIONS

DEPTH:

Distance in feet below the ground surface.

SAMPLE:

Sample Type as depicted above.

BLOW COUNT:

Number of blows required to advance the sampler 12 inches using a 140 lb hammer with a 30-inch drop. 50/3" indicates penetration refusal (>50 blows) at 3 inches. WH indicates that the weight of the hammer was sufficient to push the sampler 6 inches or more.

POCKET PEN.:

Approximate shear strength of a cohesive soil sample as measured by pocket penetrometer.

GRAPHIC LOG:

Graphic Soil Symbol as depicted on the following page.

DRY DENSITY:

Dry density of an undisturbed or relatively undisturbed sample in lbs/ft³.

MOISTURE CONTENT:

Moisture content of a soil sample, expressed as a percentage of the dry weight.

LIQUID LIMIT:

The moisture content above which a soil behaves as a liquid.

PLASTIC LIMIT:

The moisture content above which a soil behaves as a plastic.

PASSING #200 SIEVE:

The percentage of the sample finer than the #200 standard sieve.

UNCONFINED SHEAR:

The shear strength of a cohesive soil sample, as measured in the unconfined state.

SOIL CLASSIFICATION CHART

MAJOR DIVISIONS			SYMBOLS		TYPICAL DESCRIPTIONS
			GRAPH	LETTER	
COARSE GRAINED SOILS MORE THAN 50% OF MATERIAL IS LARGER THAN NO. 200 SIEVE SIZE	GRAVEL AND GRAVELLY SOILS MORE THAN 50% OF COARSE FRACTION RETAINED ON NO. 4 SIEVE	CLEAN GRAVELS (LITTLE OR NO FINES)		GW	WELL-GRADED GRAVELS, GRAVEL - SAND MIXTURES, LITTLE OR NO FINES
				GP	POORLY-GRADED GRAVELS, GRAVEL - SAND MIXTURES, LITTLE OR NO FINES
		GRAVELS WITH FINES (APPRECIABLE AMOUNT OF FINES)		GM	SILTY GRAVELS, GRAVEL - SAND - SILT MIXTURES
				GC	CLAYEY GRAVELS, GRAVEL - SAND - CLAY MIXTURES
	SAND AND SANDY SOILS MORE THAN 50% OF COARSE FRACTION PASSING ON NO. 4 SIEVE	CLEAN SANDS (LITTLE OR NO FINES)		SW	WELL-GRADED SANDS, GRAVELLY SANDS, LITTLE OR NO FINES
				SP	POORLY-GRADED SANDS, GRAVELLY SAND, LITTLE OR NO FINES
		SANDS WITH FINES (APPRECIABLE AMOUNT OF FINES)		SM	SILTY SANDS, SAND - SILT MIXTURES
				SC	CLAYEY SANDS, SAND - CLAY MIXTURES
FINE GRAINED SOILS MORE THAN 50% OF MATERIAL IS SMALLER THAN NO. 200 SIEVE SIZE	SILTS AND CLAYS LIQUID LIMIT LESS THAN 50			ML	INORGANIC SILTS AND VERY FINE SANDS, ROCK FLOUR, SILTY OR CLAYEY FINE SANDS OR CLAYEY SILTS WITH SLIGHT PLASTICITY
				CL	INORGANIC CLAYS OF LOW TO MEDIUM PLASTICITY, GRAVELLY CLAYS, SANDY CLAYS, SILTY CLAYS, LEAN CLAYS
				OL	ORGANIC SILTS AND ORGANIC SILTY CLAYS OF LOW PLASTICITY
	SILTS AND CLAYS LIQUID LIMIT GREATER THAN 50			MH	INORGANIC SILTS, MICACEOUS OR DIATOMACEOUS FINE SAND OR SILTY SOILS
				CH	INORGANIC CLAYS OF HIGH PLASTICITY
				OH	ORGANIC CLAYS OF MEDIUM TO HIGH PLASTICITY, ORGANIC SILTS
HIGHLY ORGANIC SOILS			PT	PEAT, HUMUS, SWAMP SOILS WITH HIGH ORGANIC CONTENTS	

NOTE: DUAL SYMBOLS ARE USED TO INDICATE BORDERLINE SOIL CLASSIFICATIONS



JOB NO.: 21G167-1	DRILLING DATE: 5/13/21	WATER DEPTH: Dry
PROJECT: Proposed C/I Development	DRILLING METHOD: Hollow Stem Auger	CAVE DEPTH: 37 feet
LOCATION: Aliso Viejo, California	LOGGED BY: Daryl Kas	READING TAKEN: At Completion

FIELD RESULTS				GRAPHIC LOG	DESCRIPTION	LABORATORY RESULTS						COMMENTS
DEPTH (FEET)	SAMPLE	BLOW COUNT	POCKET PEN. (TSF)			DRY DENSITY (PCF)	MOISTURE CONTENT (%)	LIQUID LIMIT	PLASTIC LIMIT	PASSING #200 SIEVE (%)	ORGANIC CONTENT (%)	
SURFACE ELEVATION: 463 feet MSL												
		78			<u>FILL:</u> Brown Silty fine Sand, mottled, dense to very dense-damp	122	3					EI = 0 0 to 5 feet
		28			<u>NIGUEL FORMATION (Tn):</u> Light Gray fine grained Sandstone, trace Silt, trace Iron oxide staining, weakly cemented, medium dense-dry to damp	99	2					
5		32				102	2					
		25				82	2					
10		26				102	3					
15		56			Light Brown fine grained Sandstone, trace to little Silt, trace Iron oxide staining, weakly cemented, dense-damp	101	5					
20		65				113	6					
25		48			Brown fine grained Sandstone, trace medium Sand, trace Silt, trace Iron oxide staining, weakly cemented, dense-damp to moist	110	6					
30		78/11"			Gray Brown fine to medium grained Sandstone, trace Iron oxide staining, weakly cemented, very dense-damp	111	6					
		98/11"				112	6					

TBL 21G167-1.GPJ SOCALGEO.GDT 7/2/21



JOB NO.: 21G167-1	DRILLING DATE: 5/13/21	WATER DEPTH: Dry
PROJECT: Proposed C/I Development	DRILLING METHOD: Hollow Stem Auger	CAVE DEPTH: 37 feet
LOCATION: Aliso Viejo, California	LOGGED BY: Daryl Kas	READING TAKEN: At Completion

FIELD RESULTS					LABORATORY RESULTS							COMMENTS
DEPTH (FEET)	SAMPLE	BLOW COUNT	POCKET PEN. (TSF)	GRAPHIC LOG	DESCRIPTION (Continued)	DRY DENSITY (PCF)	MOISTURE CONTENT (%)	LIQUID LIMIT	PLASTIC LIMIT	PASSING #200 SIEVE (%)	ORGANIC CONTENT (%)	
40		79			Gray Brown fine to medium grained Sandstone, trace Iron oxide staining, weakly cemented, very dense-damp	114	6					
					Boring Terminated at 40'							

TBL 21G167-1.GPJ SOCALGEO.GDT 7/2/21



JOB NO.: 21G167-1	DRILLING DATE: 5/13/21	WATER DEPTH: Dry
PROJECT: Proposed C/I Development	DRILLING METHOD: Hollow Stem Auger	CAVE DEPTH: 18 feet
LOCATION: Aliso Viejo, California	LOGGED BY: Daryl Kas	READING TAKEN: At Completion

FIELD RESULTS				GRAPHIC LOG	DESCRIPTION	LABORATORY RESULTS						COMMENTS		
DEPTH (FEET)	SAMPLE	BLOW COUNT	POCKET PEN. (TSF)			DRY DENSITY (PCF)	MOISTURE CONTENT (%)	LIQUID LIMIT	PLASTIC LIMIT	PASSING #200 SIEVE (%)	ORGANIC CONTENT (%)			
SURFACE ELEVATION: 466 feet MSL														
5		33			NIGUEL FORMATION (Tn): Light Brown fine grained Sandstone, trace Iron oxide staining, weakly cemented, medium dense to dense-damp	101	5					EI = 0 0 to 5 feet		
		28				103	6							
		34				102	4							
		67				110	5							
		41				105	7							
10						@ 7 to 8 feet, dense								
15		53				Light Gray fine grained Sandy Siltstone, abundant Iron oxide staining, weakly cemented, dense-very moist	100	23						
20		91/10"				Light Gray fine grained Sandstone, trace Iron oxide staining, weakly cemented, very dense-moist	102	13						
Boring Terminated at 20'														

TBL 21G167-1.GPJ SOCALGEO.GDT 7/2/21



JOB NO.: 21G167-1
PROJECT: Proposed C/I Development
LOCATION: Aliso Viejo, California

DRILLING DATE: 5/13/21
DRILLING METHOD: Hollow Stem Auger
LOGGED BY: Daryl Kas

WATER DEPTH: Dry
CAVE DEPTH: 17 feet
READING TAKEN: At Completion

FIELD RESULTS				GRAPHIC LOG	DESCRIPTION	LABORATORY RESULTS						COMMENTS
DEPTH (FEET)	SAMPLE	BLOW COUNT	POCKET PEN. (TSF)			DRY DENSITY (PCF)	MOISTURE CONTENT (%)	LIQUID LIMIT	PLASTIC LIMIT	PASSING #200 SIEVE (%)	ORGANIC CONTENT (%)	
					SURFACE ELEVATION: 461 feet MSL							
5		23			NIGUEL FORMATION (Tn): Light Gray fine grained Sandstone, weakly cemented, medium dense to dense-damp		3					
		30					5					
		35			Light Gray Silty fine grained Sandstone, trace Iron oxide staining, weakly cemented, dense-moist to very moist		15					
		30			Light Gray fine grained Sandstone, trace Iron oxide staining, weakly cemented, dense to very dense-damp		6					
10												
15		46					4					
20		70/11"					5					
					Boring Terminated at 20'							

TBL 21G167-1.GPJ SOCALGEO.GDT 7/2/21



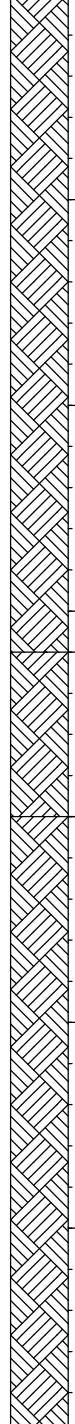
JOB NO.: 21G167-1	DRILLING DATE: 5/13/21	WATER DEPTH: Dry
PROJECT: Proposed C/I Development	DRILLING METHOD: Hollow Stem Auger	CAVE DEPTH: 20 feet
LOCATION: Aliso Viejo, California	LOGGED BY: Daryl Kas	READING TAKEN: At Completion

FIELD RESULTS				GRAPHIC LOG	DESCRIPTION	LABORATORY RESULTS						COMMENTS
DEPTH (FEET)	SAMPLE	BLOW COUNT	POCKET PEN. (TSF)			DRY DENSITY (PCF)	MOISTURE CONTENT (%)	LIQUID LIMIT	PLASTIC LIMIT	PASSING #200 SIEVE (%)	ORGANIC CONTENT (%)	
					SURFACE ELEVATION: 466 feet MSL							
		27			FILL: Brown Silty fine Sand, trace medium Sand, medium dense-damp	105	6					
		64			NIGUEL FORMATION (Tn): Light Gray to Light Brown fine grained Sandstone, trace Silt, trace Iron oxide staining, weakly cemented, dense-damp to moist	97	8					
5		55					99	9				
		55					100	11				
10		67					111	9				
					Brown Silty fine grained Sandstone, weakly cemented, dense-damp							
15		53			Light Gray fine grained Sandstone, trace Iron oxide staining, weakly cemented, dense-damp	104	8					
					Brown Silty fine grained Sandstone, weakly cemented, very dense-damp							
20		95/9"				113	7					
					Light Gray fine grained Sandstone, weakly cemented, dense-damp							
25		63				106	5					
					Gray Brown fine grained Sandy Siltstone, trace Iron oxide staining, weakly cemented, dense-damp							
					Boring Terminated at 25'							

TBL 21G167-1.GPJ SOCALGEO.GDT 7/2/21



JOB NO.: 21G167-1	DRILLING DATE: 5/13/21	WATER DEPTH: Dry
PROJECT: Proposed C/I Development	DRILLING METHOD: Bucket Auger	CAVE DEPTH: 60 feet
LOCATION: Aliso Viejo, California	LOGGED BY: Daryl Kas	READING TAKEN: At Completion

FIELD RESULTS				GRAPHIC LOG	DESCRIPTION	LABORATORY RESULTS						COMMENTS	
DEPTH (FEET)	SAMPLE	BLOW COUNT	POCKET PEN. (TSF)			DRY DENSITY (PCF)	MOISTURE CONTENT (%)	LIQUID LIMIT	PLASTIC LIMIT	PASSING #200 SIEVE (%)	ORGANIC CONTENT (%)		
					SURFACE ELEVATION: 465.5 feet MSL								
5		7			<u>NIGUEL FORMATION (Tn):</u> Light Gray fine grained Sandstone, weakly cemented, dense-damp	98	5					Kelly Bar Weight @ 0 to 29' = 4,800 lbs	
			@ 8 feet, very moist										
10		4			@ 10 feet, little Iron oxide staining, moderately cemented, moist	111	12						
15		2			@ 15 feet, no sample recovery								
					Light Gray Silty Claystone, little Iron oxide staining, stiff-moist Bedding: S03W, 30E								
20		11			Light Gray fine grained Sandstone, moderately cemented, dense-damp	110	7						
25		12			@ 25 feet, little Iron oxide staining	110	6						
30		13		@ 29 feet, (4) 2- to 7- inch Light Gray Silty fine grained Sandstone lenses with Iron oxide staining @ 30 to 40 feet, coarsening downward	111	4					Kelly Bar Weight @ 30 to 58' = 3,350 lbs		
				@ 32 feet 3 inches, trace Iron oxide staining Bedding: N60E, 5E									

TBL 21G167-1.GPJ, SOCALGEO.GDT 7/2/21



JOB NO.: 21G167-1	DRILLING DATE: 5/13/21	WATER DEPTH: Dry
PROJECT: Proposed C/I Development	DRILLING METHOD: Bucket Auger	CAVE DEPTH: 60 feet
LOCATION: Aliso Viejo, California	LOGGED BY: Daryl Kas	READING TAKEN: At Completion

FIELD RESULTS				GRAPHIC LOG	DESCRIPTION (Continued)	LABORATORY RESULTS						COMMENTS
DEPTH (FEET)	SAMPLE	BLOW COUNT	POCKET PEN. (TSF)			DRY DENSITY (PCF)	MOISTURE CONTENT (%)	LIQUID LIMIT	PLASTIC LIMIT	PASSING #200 SIEVE (%)	ORGANIC CONTENT (%)	
		11			Light Gray fine grained Sandstone, trace coarse Sand, dense-damp	106	3					
					Light Gray fine grained Sandstone, trace medium Sand, weakly cemented, dense-damp							
40		11			@ 39 feet, Iron oxide layering, Bedding: S0W, 3W	114	6					
					@ 42 feet, gradual color change to Orange Brown							
45		15			@ 43 feet, ¼- inch thick Green Silty fine grained Sandstone lense, Bedding: N40W, 5W	108	6					
50		20			Light Yellow Brown fine grained Sandstone, weakly cemented, very dense-moist, Bedding: N20W, 4W	105	7					
					Light Orange Brown fine grained Sandstone, weakly cemented, very dense-damp, Bedding: N12W, 6W							
					Light Gray fine grained Sandstone, very dense-damp							
55		21			Yellow fine grained Sandstone, moist, Bedding: N10W, 4W							
					Interbedded Yellow fine grained Sandstone, and ½- inch Claystone lenses with Iron oxide staining, damp	92	6					
					Light Gray Silty fine grained Sandstone, little Iron oxide staining, very dense-damp							
60		23			Brown to Orange Brown Silty fine grained Sandstone, little Clay, very dense-very moist, Bedding: S40W, 8W	99	21					
65		13			Light Gray fine grained Sandy Claystone, weakly cemented, dense-very moist	114	25					
Boring Terminated at 66'												

Kelly Bar Weight
@ 59 to 71' =
2,045 lbs

TBL 21G167-1.GPJ, SOCALGEO.GDT 7/2/21



JOB NO.: 21G167-1	DRILLING DATE: 5/13/21	WATER DEPTH: Dry
PROJECT: Proposed C/I Development	DRILLING METHOD: Bucket Auger	CAVE DEPTH: 28 feet
LOCATION: Aliso Viejo, California	LOGGED BY: Daryl Kas	READING TAKEN: At Completion

FIELD RESULTS				GRAPHIC LOG	DESCRIPTION	LABORATORY RESULTS						COMMENTS
DEPTH (FEET)	SAMPLE	BLOW COUNT	POCKET PEN. (TSF)			DRY DENSITY (PCF)	MOISTURE CONTENT (%)	LIQUID LIMIT	PLASTIC LIMIT	PASSING #200 SIEVE (%)	ORGANIC CONTENT (%)	
SURFACE ELEVATION: 466.5 feet MSL												
					FILL: Gray Brown fine to medium Sand, trace coarse Sand, little fine root fibers, trace Asphaltic concrete fragments, trace Brick fragments, mottled, loose to medium dense-dry							Kelly Bar Weight @ 0 to 29' = 4,800 lbs
					NIGUEL FORMATION (Tn): Light Gray fine grained Sandstone, trace Silt, trace to little Iron oxide staining dense-dry, Bedding: S20W, 11E							
5					Light Brown fine grained Sandstone, trace medium Sand, trace Iron oxide staining, dense-dry							
		9			Light Gray fine to medium grained Sandstone, little Iron oxide staining, weakly cemented, dense-dry to damp, undulated contact, Bedding: N25W, 4W	104	2					
10		8			@ 10 feet, damp	106	3					
					@ 11 feet 10 inches, Iron oxide staining lense, Bedding: N10E, 5W							
					@ 13 feet, Iron oxide staining lense, Bedding: S35W, 6W							
15		7			@ 15 feet, Light Orange to Light Gray	109	3					
					Orange fine to medium Sandstone, dense-dry to damp Bedding Contact: Horizontal							
20		7			Light Gray fine grained Sandstone, dense-damp	105	3					
					@ 25 to 31 feet, trace medium Sand, trace Iron oxide staining	106	4					
25		8										
					Boring Terminated at 31'	105	4					Kelly Bar Weight @ 30 - 58' = 3,350 lbs
30		10										
Boring Terminated at 31'												

TBL 21G167-1.GPJ SOCALGEO.GDT 7/2/21

Boring Log by Southern
California Geotechnical
(2014)



JOB NO.: 14G176	DRILLING DATE: 8/1/14	WATER DEPTH: Dry
PROJECT: C/I Development	DRILLING METHOD: Hollow Stem Auger	CAVE DEPTH: 18 feet
LOCATION: Aliso Viejo, California	LOGGED BY: Eric Torres	READING TAKEN: At Completion

FIELD RESULTS				GRAPHIC LOG	DESCRIPTION	LABORATORY RESULTS						COMMENTS
DEPTH (FEET)	SAMPLE	BLOW COUNT	POCKET PEN. (TSF)			DRY DENSITY (PCF)	MOISTURE CONTENT (%)	LIQUID LIMIT	PLASTIC LIMIT	PASSING #200 SIEVE (%)	UNCONFINED SHEAR (TSF)	
SURFACE ELEVATION: --- MSL												
5		51			<u>NIGUEL FORMATION BEDROCK:</u> Light Brown to White Silty fine grained Sandstone, highly weathered, weakly cemented, Iron oxide staining, dense to very dense-damp		4					
		51				4						
		56				3						
10		44			Light Brown fine grained Sandstone, trace Silt, highly weathered, weakly cemented, trace Iron oxide staining, dense-damp		3					
15		45				3						
20		79/11"		Orange Brown Silty fine grained Sandstone, highly weathered, weakly cemented, abundant Iron oxide staining, very dense-moist		15						
				Light Gray fine grained Sandstone, weathered, weakly cemented, very dense-damp		4						
25												
		55		Brown fine to medium grained Sandstone, weakly cemented, weathered, very dense-damp		3						
Boring Terminated at 25'												

TBL 14G176.GPJ, SOCALGEO.GDT 8/21/14

Appendix C



MATERIALS FINER THAN 75- μ m (No. 200) SIEVE by WASHING

ASTM D1140

Client: SA Geotechnical, Inc
Project: Freedom Lane
Project No.: 24064-01

HAI Project No.: SAG-24-022
Performed by: GA
Checked by: KL
Date: 5/14/2024

Boring No.	Sample No.	Depth (ft)	Sample Description (USCS)	Dry Soil before Wash + $W_{\text{Container}}$	Dry Soil after #200 Wash + $W_{\text{Container}}$	$W_{\text{Container}}$	Wt of soil retained on # 200 sieve	Initial wt of dry soil	Soil % passing 200 sieve
				g	g	g	g	g	%
TP-3	B-1	1-4	Olive, Elastic Silt with Sand (MH)	504.87	303.55	223.46	80.09	281.41	71.54
TP-9	B-1	0-5	Olive, Clayey Sand (SC)	591.94	494.11	221.45	272.66	370.49	26.41
B-2	D-3	20	Olive, Silty Sand (SM)	403.62	377.34	221.13	156.21	182.49	14.40



Liquid Limit, Plastic Limit, and Plasticity Index of Soils

ASTM D4318

Client: SA Geotechnical, Inc
Project Name: Freedom Lane
Project No.: 24064-01
Boring No.: TP-3
Sample No.: B-1
Depth (ft): 1-4
Soil Description: Olive, Elastic Silt with Sand (MH)

HAI Project No.: SAG-24-022

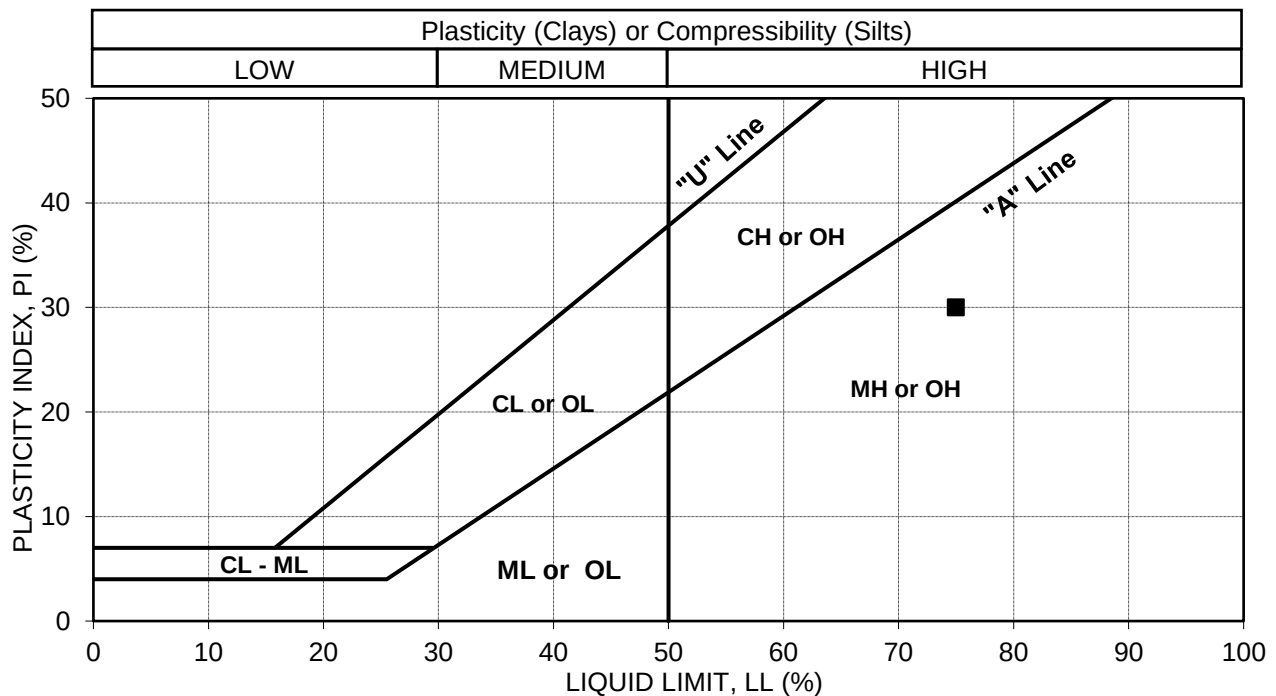
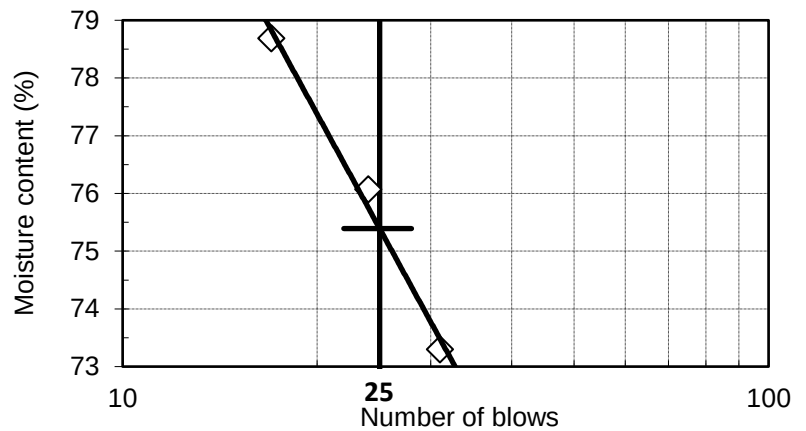
Tested by: GA

Checked by: KL

Date: 05/14/24

Test		LL	LL	LL	PL	PL
No. of blows	-	31	24	17	-	-
Wt. of Wet Soil + Container	(g)	24.16	24.38	24.6	9.62	9.34
Wt. of Dry soil + Container	(g)	18.67	18.69	18.73	7.02	6.78
Wt. of Container	(g)	11.18	11.21	11.27	1.16	1.1
Water content	(%)	73.3	76.1	78.7	44.4	45.1

Liquid Limit (LL)	75
Plastic Limit (PL)	45
Plasticity Index (PI)	30
USCS	MH
Remarks:	





Liquid Limit, Plastic Limit, and Plasticity Index of Soils

ASTM D4318

Client: SA Geotechnical, Inc
 Project Name: Freedom Lane
 Project No.: 24064-01
 Boring No.: B-2
 Sample No.: D-3
 Depth (ft): 20.0
 Soil Description: Olive, Silty Sand (SM)

HAI Project No.: SAG-24-022

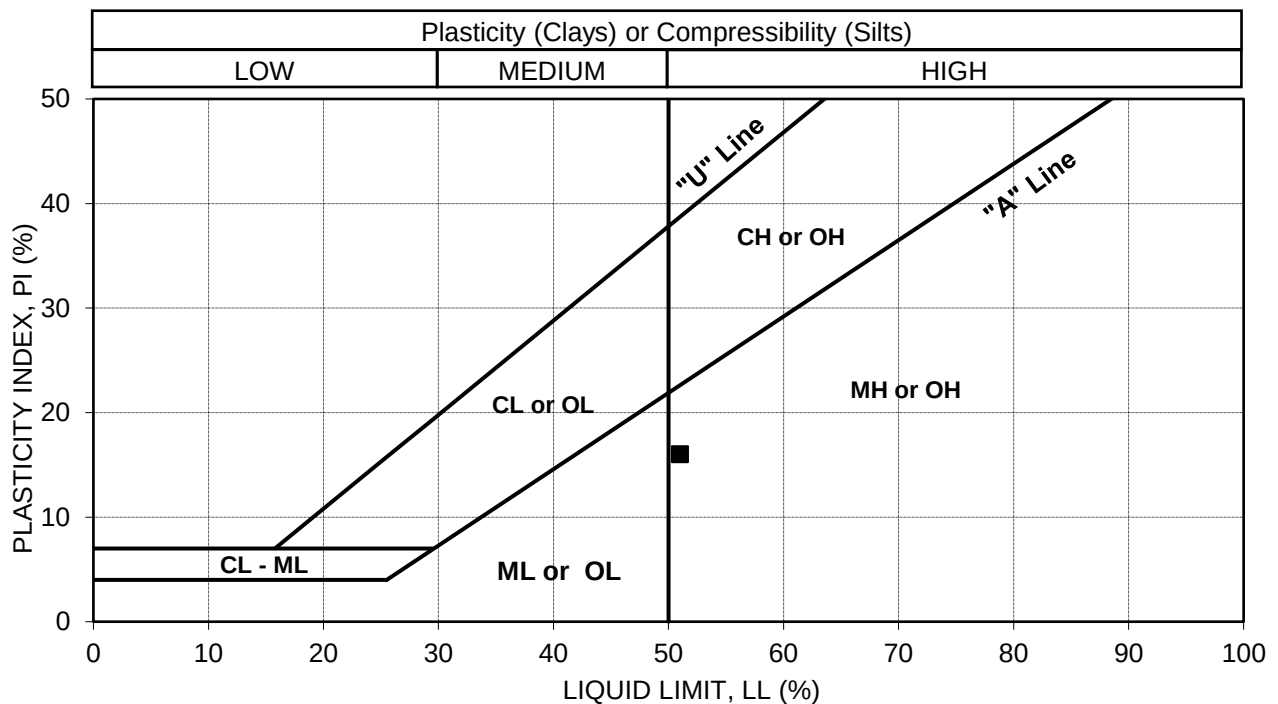
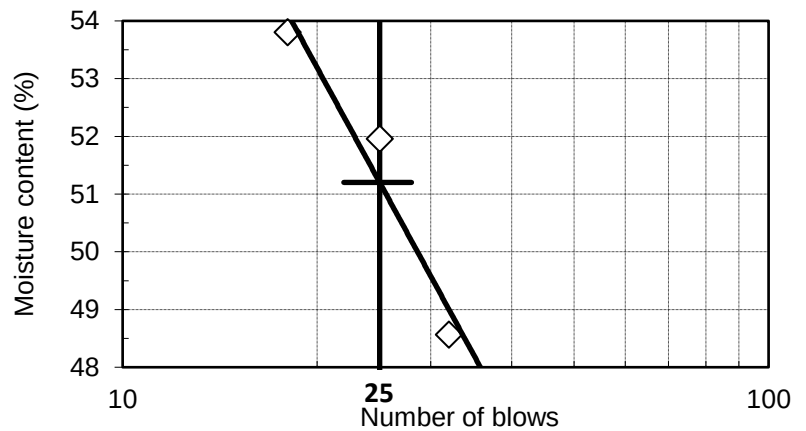
Tested by: GA

Checked by: KL

Date: 05/14/24

Test		LL	LL	LL	PL	PL
No. of blows	-	32	25	18	-	-
Wt. of Wet Soil + Container	(g)	25.56	25.68	25.52	9.49	9.6
Wt. of Dry soil + Container	(g)	20.81	20.77	20.36	7.29	7.41
Wt. of Container	(g)	11.03	11.32	10.77	1.09	1.11
Water content	(%)	48.6	52.0	53.8	35.5	34.8

Liquid Limit (LL)	51
Plastic Limit (PL)	35
Plasticity Index (PI)	16
USCS	MH
Remarks: - Fine Sample is Less than 50% of Passing #200	





Compaction Characteristics of Soils Using Modified Effort

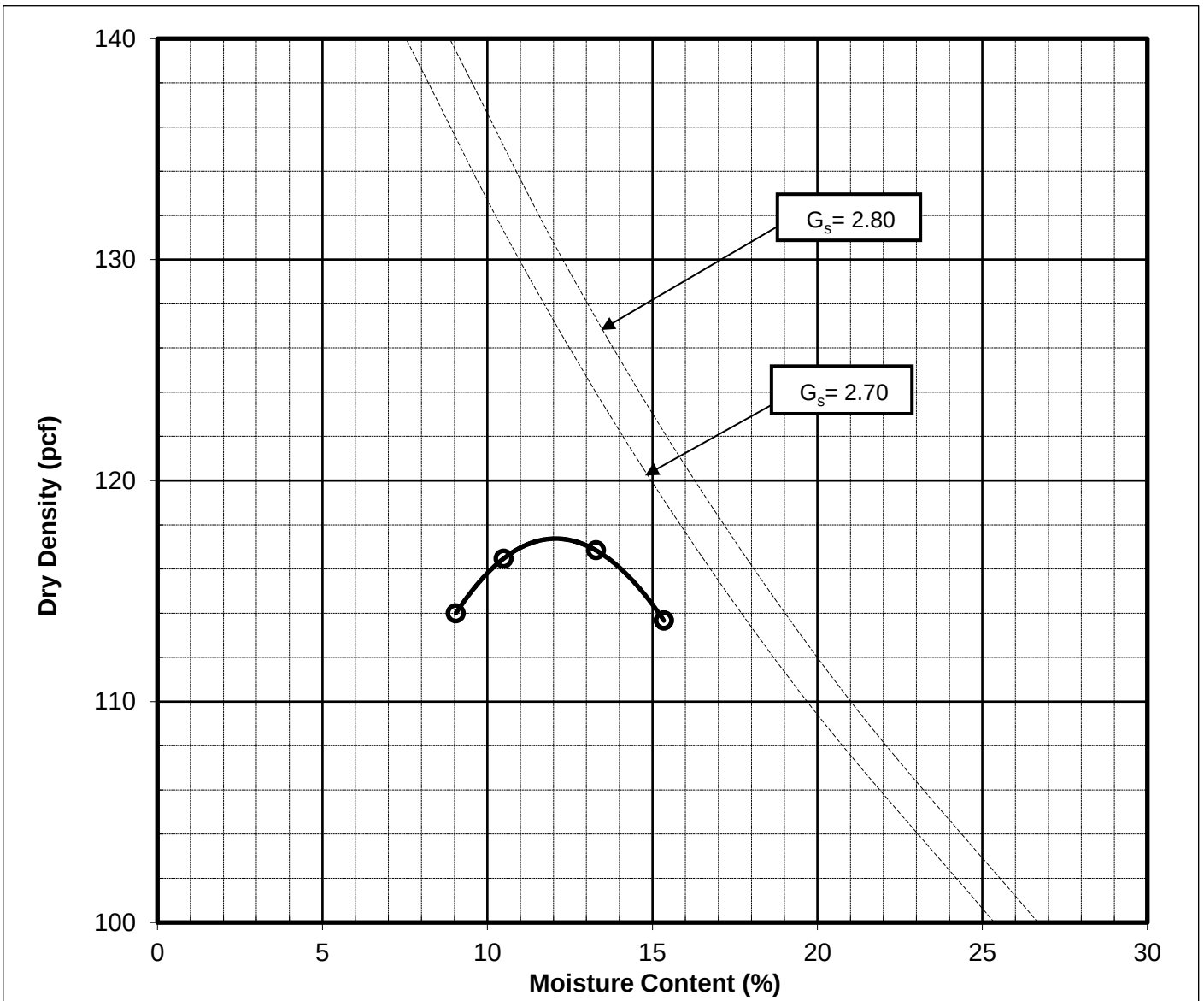
ASTM D1557

Client: SA Geotechnical, Inc
 Project: Freedom Lane
 Project No.: 24064-01
 Boring Number: TP-9
 Sample Number: B-1
 Depth (ft) : 0-5
 Soil Description: Olive Brown, Clayey Sand (SC)

HAI Project No.: SAG-24-022
 Tested by: GA
 Checked by: KL
 Date: 05/14/24

Mold size (in)	4"
Procedure	B
Weight Retained on:	0.0
Remarks:	

Maximum Dry Density (pcf)	117.4
Optimum Moisture Content (%)	12.1
Corrected Maximum Dry Density (pcf)	-
Corrected Optimum Moisture Content (%)	-





EXPANSION INDEX

ASTM D4829

Client: SA Geotechnical, Inc

HAI Project No.: SAG-24-022

Project Name: Freedom Lane

Tested by: GA

Project No.: 24064-01

Checked by: KL

Boring No.: TP-3

Date: 5/14/2024

Sample No.: B-1

Depth (ft): 1-4

Apparatus No.: 1

Soil Description: Olive, Sandy Silt (MH)

Initial Specimen Info		
Wt. of wet soil + cont.	154.03	g
Wt. of dry soil + cont.	125.48	g
Wt. of container	11.89	g
Wt. of water	28.55	g
Wt. of dry soil	113.59	g
Moisture Content	25.1	%

Wt. of wet soil + ring	497.58	g
Wt. of ring	206.33	g
Wt. of wet soil	291.25	g
Wet density of soil	90.7	pcf
Dry density of soil	72.5	pcf
Specific gravity of soil	2.68	-
Saturation	51.5	%

Final Specimen Info		
Wt. of wet soil + cont.	580.39	g
Wt. of dry soil + cont.	433.48	g
Wt. of container	206.33	g
Wt. of water	146.91	g
Wt. of dry soil	227.15	g
Moisture Content	64.7	%

Date & Time	Elapsed Time (min)	Dial Reading	Δh , Expansion
5/21/2024 9:30	0	0	0
5/21/2024 9:40	10	0.0000	0
Add Distilled Water to Sample			
5/22/2024 9:30	1440	0.1059	0.1059

Expansion Index =

106

High



EXPANSION INDEX

ASTM D4829

Client: SA Geotechnical, Inc

HAI Project No.: SAG-24-022

Project Name: Freedom Lane

Tested by: GA

Project No.: 24064-01

Checked by: KL

Boring No.: TP-9

Date: 5/14/2024

Sample No.: B-1

Depth (ft): 0-5

Apparatus No.: 2

Soil Description: Olive Brown, Clayey Sand (SC)

Initial Specimen Info		
Wt. of wet soil + cont.	205.59	g
Wt. of dry soil + cont.	188.15	g
Wt. of container	11.96	g
Wt. of water	17.44	g
Wt. of dry soil	176.19	g
Moisture Content	9.9	%

Wt. of wet soil + ring	603.05	g
Wt. of ring	206.53	g
Wt. of wet soil	396.52	g
Wet density of soil	121.6	pcf
Dry density of soil	110.6	pcf
Specific gravity of soil	2.68	-
Saturation	51.9	%

Final Specimen Info		
Wt. of wet soil + cont.	629.84	g
Wt. of dry soil + cont.	565.21	g
Wt. of container	206.53	g
Wt. of water	64.63	g
Wt. of dry soil	358.68	g
Moisture Content	18.0	%

Date & Time	Elapsed Time (min)	Dial Reading	Δh , Expansion
5/21/2024 10:00	0	0	0
5/21/2024 10:10	10	0.0000	0
Add Distilled Water to Sample			
5/22/2024 10:00	1440	0.0099	0.0099

Expansion Index =

10

Very Low

DIRECT SHEAR TEST

ASTM D3080

HAI Project No.: SAG-24-022

Client: SA Geotechnical, Inc
Project Name: Freedom Lane
Project Number: 24064-01
Boring No.: B-1
Sample No.: D-1
Sample Type: Undisturbed Ring
Depth (ft): 5
Soil Description: Olive Brown, Silty Sand (SM)

Tested by: GA

Checked by: KL

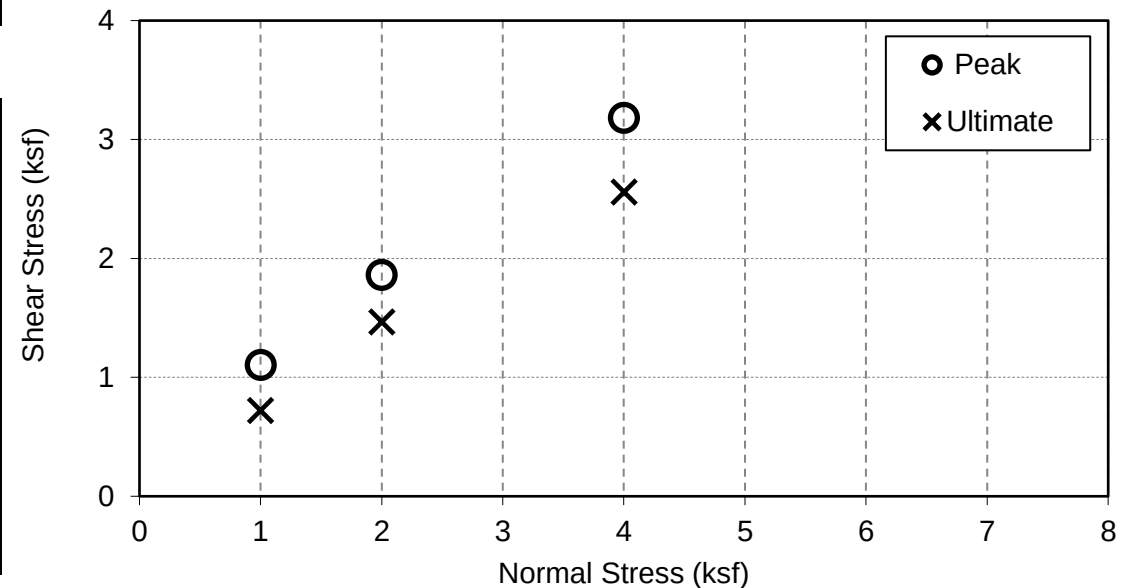
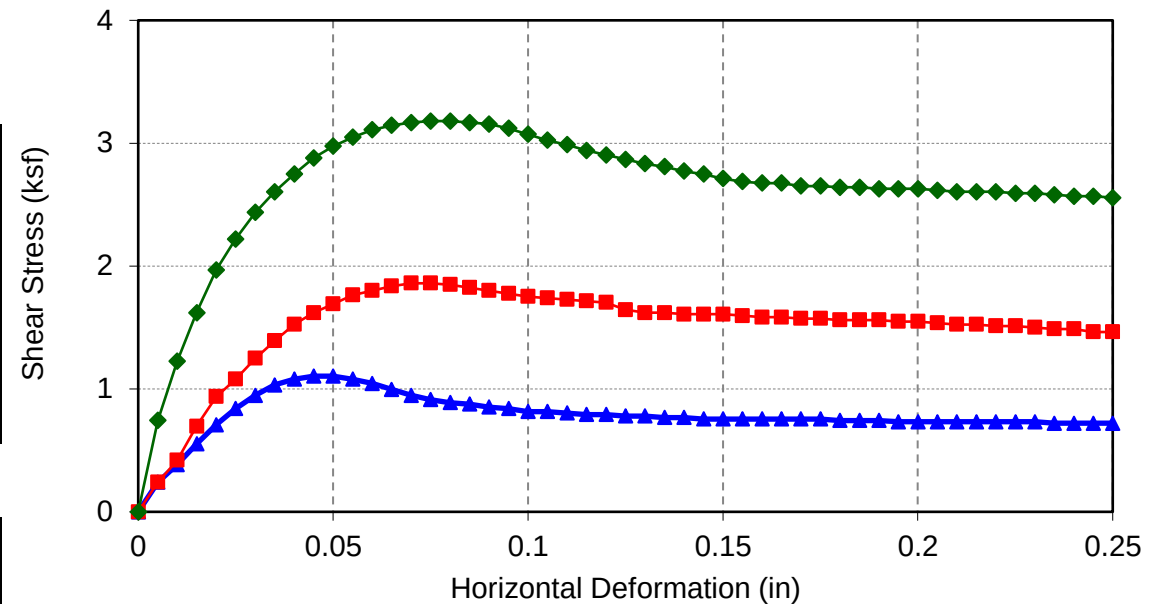
Date: 5/14/2024

Type of test: Consolidated, Drained

Test No.	1	2	3
Symbol	▲	■	◆
Normal Stress (ksf)	1	2	4
Deformation Rate (in/min)	0.002	0.002	0.002

Peak Shear Stress (ksf)	O	1.10	1.86	3.18
Shear Stress @ End of Test (ksf)	X	0.72	1.46	2.56

Initial Height of Sample (in)	1.000	1.000	1.000
Height of Sample before Shear (in)	0.9967	0.9953	0.9867
Diameter of Sample (in)	2.416	2.416	2.416
Initial Moisture Content (%)	14.8	14.8	14.8
Final Moisture Content (%)	21.5	19.2	20.3
Dry Density (pcf)	109.6	110.6	111.3



DIRECT SHEAR TEST

ASTM D3080

HAI Project No.: SAG-24-022

Client: SA Geotechnical, Inc
Project Name: Freedom Lane
Project Number: 24064-01
Boring No.: B-1
Sample No.: D-2
Sample Type: Undisturbed Ring
Depth (ft): 10
Soil Description: Brown, Clayey Sand (SC)

Tested by: GA

Checked by: KL

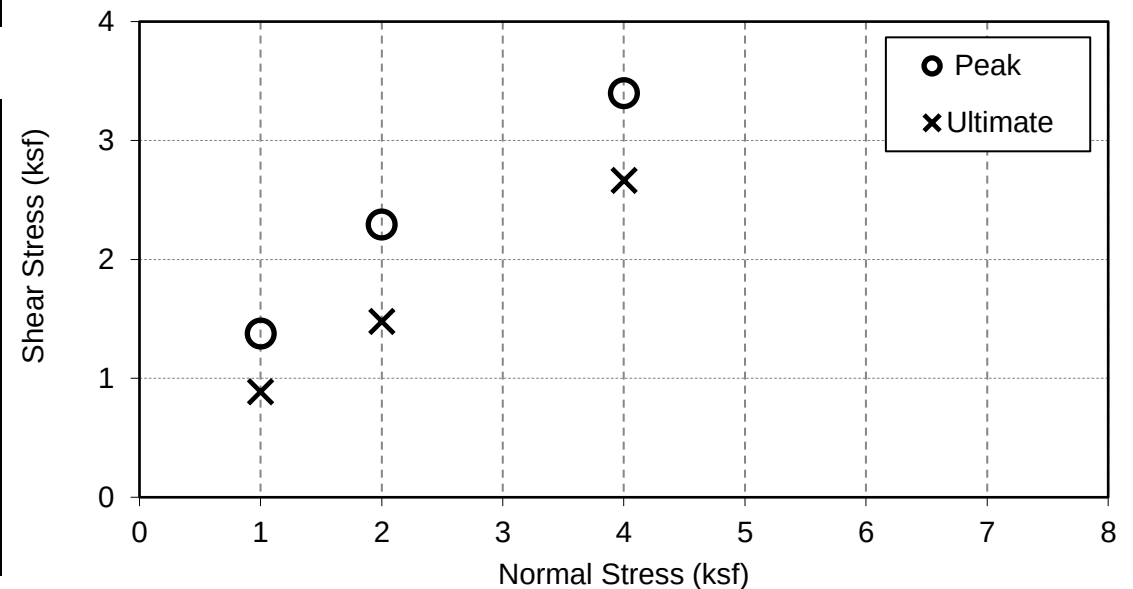
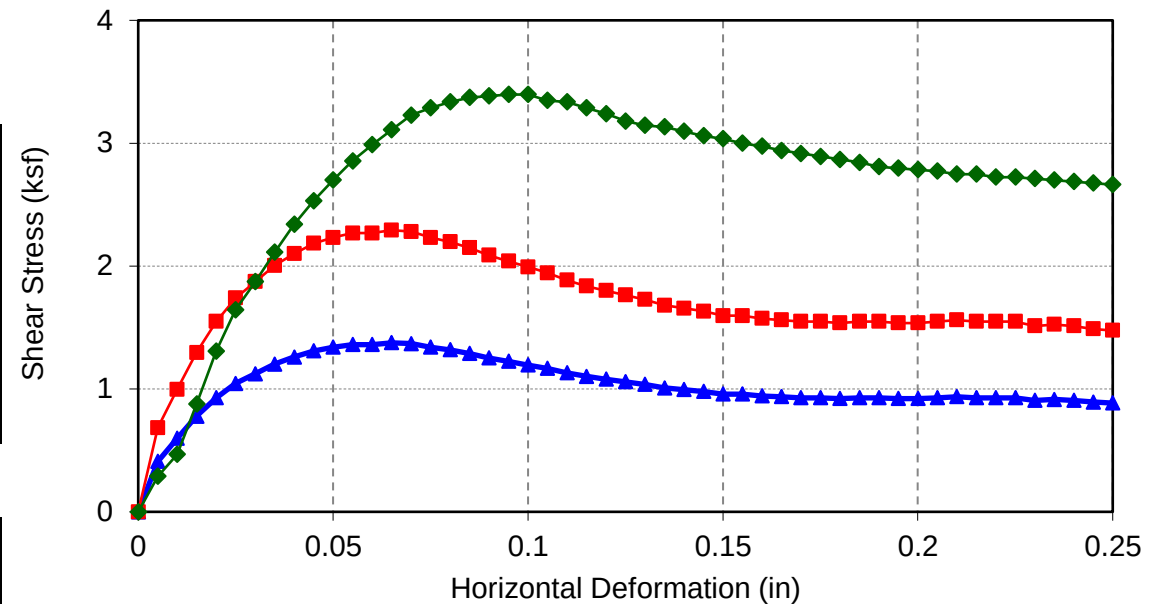
Date: 5/14/2024

Type of test: Consolidated, Drained

Test No.	1	2	3
Symbol	▲	■	◆
Normal Stress (ksf)	1	2	4
Deformation Rate (in/min)	0.002	0.002	0.002

Peak Shear Stress (ksf)	O	1.38	2.29	3.40
Shear Stress @ End of Test (ksf)	X	0.89	1.48	2.66

Initial Height of Sample (in)	1.000	1.000	1.000
Height of Sample before Shear (in)	0.9916	0.9969	0.9893
Diameter of Sample (in)	2.416	2.416	2.416
Initial Moisture Content (%)	10.3	10.3	10.3
Final Moisture Content (%)	21.8	18.3	13.3
Dry Density (pcf)	107.8	114.2	116.9



DIRECT SHEAR TEST

ASTM D3080

HAI Project No.: SAG-24-022

Client: SA Geotechnical, Inc
Project Name: Freedom Lane
Project Number: 24064-01
Boring No.: B-1
Sample No.: D-6
Sample Type: Undisturbed Ring
Depth (ft): 40
Soil Description: Light Brown, Silty Sand (SM)

Tested by: GA

Checked by: KL

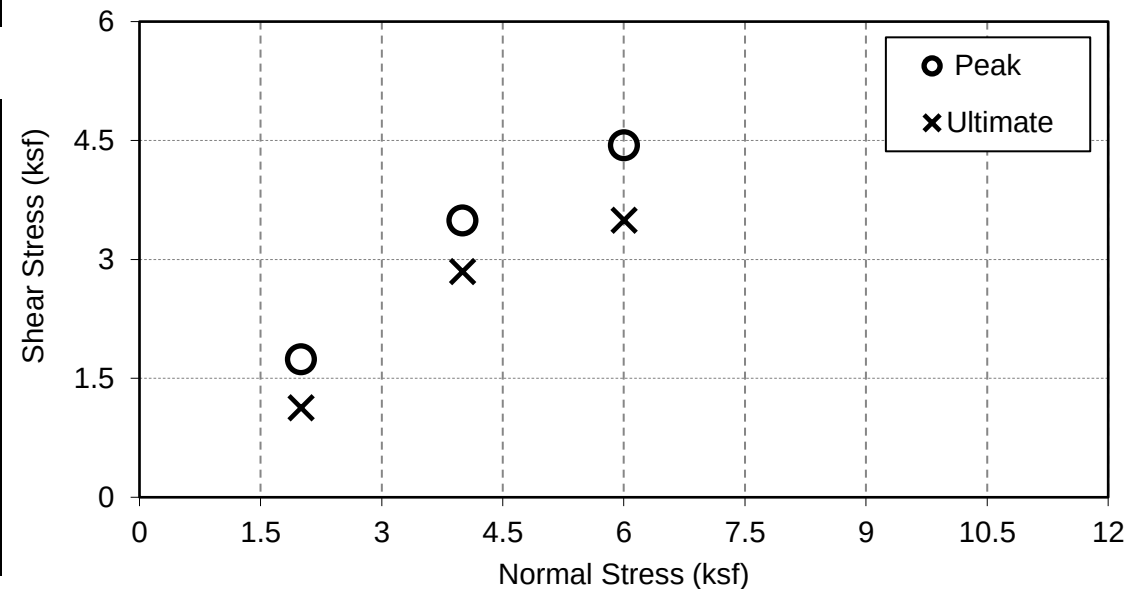
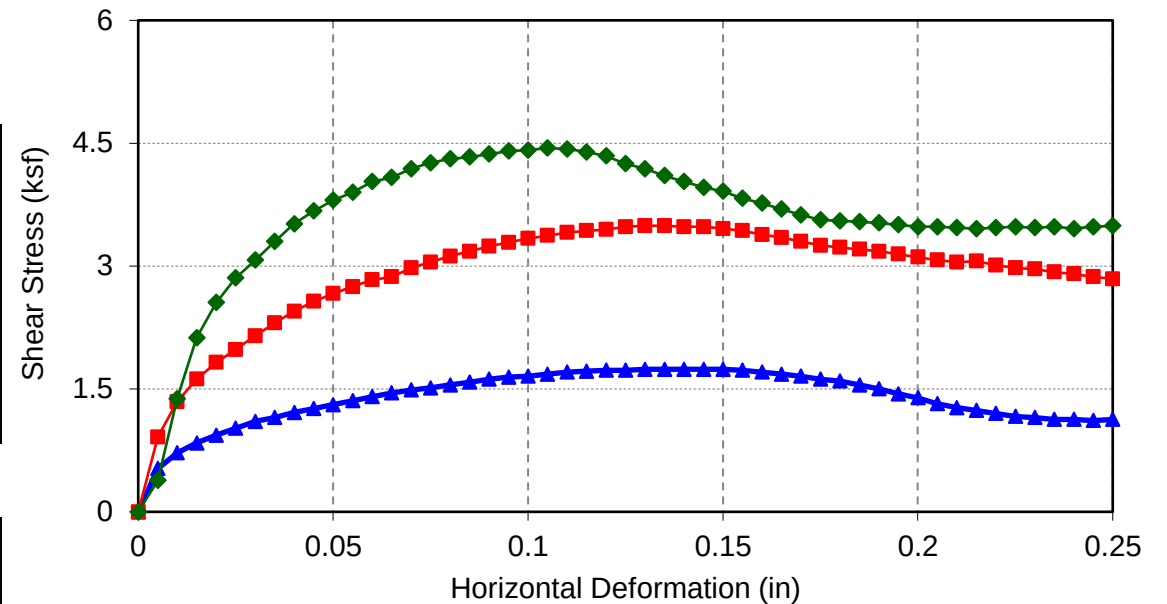
Date: 5/14/2024

Type of test: Consolidated, Drained

Test No.	1	2	3
Symbol	▲	■	◆
Normal Stress (ksf)	2	4	6
Deformation Rate (in/min)	0.002	0.002	0.002

Peak Shear Stress (ksf)	O	1.74	3.49	4.44
Shear Stress @ End of Test (ksf)	X	1.13	2.84	3.49

Initial Height of Sample (in)	1.000	1.000	1.000
Height of Sample before Shear (in)	0.9919	0.9969	0.9856
Diameter of Sample (in)	2.416	2.416	2.416
Initial Moisture Content (%)	4.7	4.7	4.7
Final Moisture Content (%)	21.4	19.6	18.7
Dry Density (pcf)	104.4	107.2	110.9



DIRECT SHEAR TEST

ASTM D3080

HAI Project No.: SAG-24-022

Client: SA Geotechnical, Inc

Project Name: Freedom Lane

Project Number: 24064-01

Boring No.: B-2

Sample No.: D-3

Sample Type: Undisturbed Ring

Depth (ft): 20

Soil Description: Olive, Silty Sand (SM)

Type of test: Consolidated, Drained

Tested by: GA

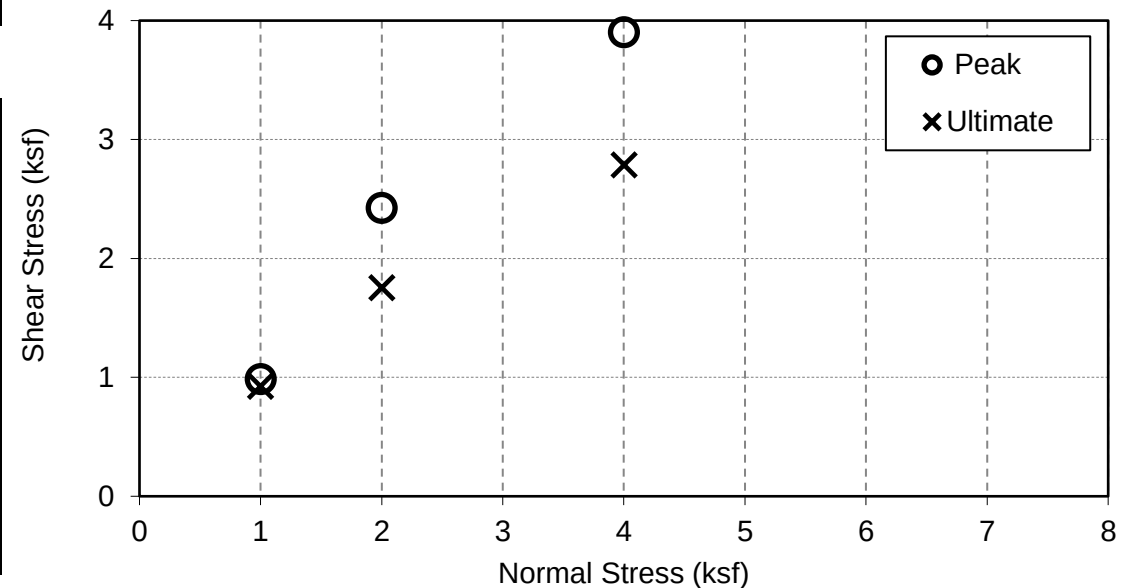
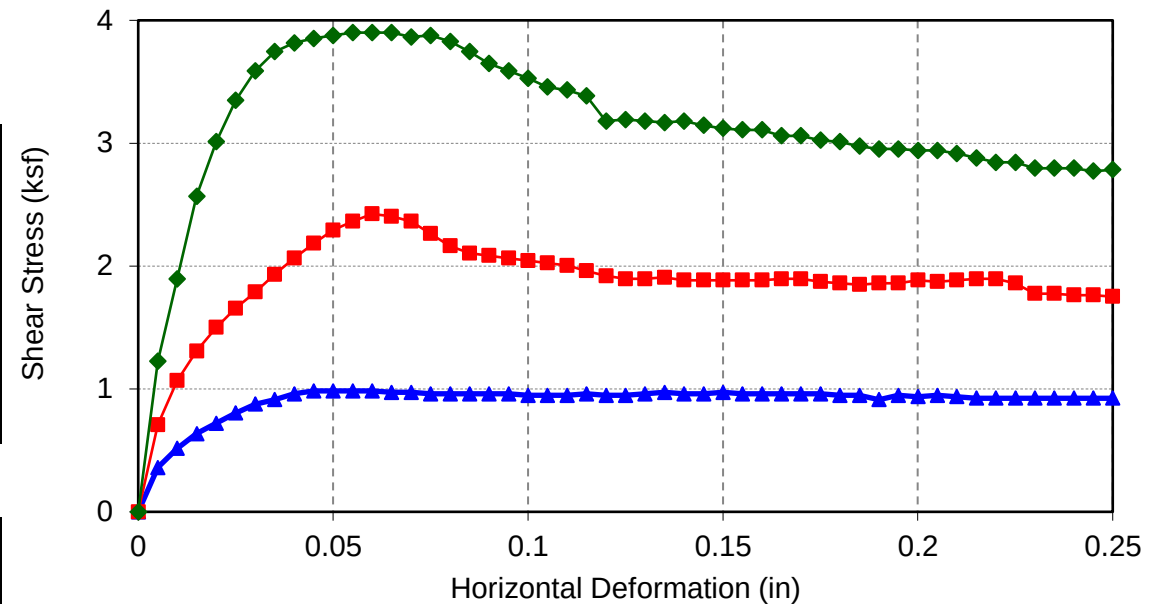
Checked by: KL

Date: 5/14/2024

Test No.	1	2	3
Symbol	▲	■	◆
Normal Stress (ksf)	1	2	4
Deformation Rate (in/min)	0.002	0.002	0.002

Peak Shear Stress (ksf)	O	0.98	2.42	3.90
Shear Stress @ End of Test (ksf)	X	0.92	1.75	2.78

Initial Height of Sample (in)	1.000	1.000	1.000
Height of Sample before Shear (in)	0.9976	1.0056	0.9981
Diameter of Sample (in)	2.416	2.416	2.416
Initial Moisture Content (%)	30.6	30.6	30.6
Final Moisture Content (%)	40.1	37.2	27.6
Dry Density (pcf)	83.6	85.6	88.8





CONSOLIDATION TEST

ASTM D2435

Client : SA Geotechnical, Inc
 Project Name: Freedom Lane
 Project Number: 24064-01
 Boring No.: B-1
 Sample No.: D-1
 Type of Sample: Undisturbed ring
 Depth (ft): 5
 Soil Description: Yellowish Brown, Clayey Sand (SC)

HAI Project No.: SAG-24-022

Tested by: GA

Checked by: KL

Date: 05/14/24

Initial Total Weight	Final Total Weight	Final Dry Weight
(g)	(g)	(g)
148.19	149.81	125.11

Initial Conditions			Final Conditions	
Height	H	(in)	1.000	0.952
Height of Solids	H _s	(in)	0.608	0.608
Height of Water	H _w	(in)	0.307	0.329
Height of Air	H _a	(in)	0.085	0.015
Dry Density	(pcf)		103.9	114.8
Water Content	(%)		18.4	19.7
Saturation	(%)		78.3	95.6

* Saturation is calculated based on G_s= 2.74

Load (ksf)	ΔH (in)	H (in)	Voids (in)	e	Consol. (%)	a _v (ksf ⁻¹)	M _v (ksf ⁻¹)	Comment
0.01	-----	1.0000	0.392	0.645	0			
0.2	0.0025	0.9975	0.390	0.641	0.3	2.2E-02	1.3E-02	
0.4	0.0055	0.9945	0.387	0.636	0.6	2.5E-02	1.5E-02	
0.8	0.0084	0.9916	0.384	0.631	0.8	1.2E-02	7.4E-03	
0.8	0.0103	0.9897	0.382	0.628	1.0	Water Added		
1.6	0.0140	0.9860	0.378	0.622	1.4	7.6E-03	4.7E-03	
3.2	0.0236	0.9765	0.369	0.607	2.4	9.8E-03	6.1E-03	
6.4	0.0346	0.9655	0.358	0.588	3.5	5.7E-03	3.6E-03	
12.8	0.0464	0.9537	0.346	0.569	4.6	3.0E-03	1.9E-03	
25.6	0.0643	0.9358	0.328	0.540	6.4	2.3E-03	1.5E-03	
6.4	0.0604	0.9397	0.332	0.546	6.0	Unloaded		
1.6	0.0537	0.9463	0.339	0.557	5.4			
0.4	0.0484	0.9516	0.344	0.566	4.8			



CONSOLIDATION TEST

ASTM D2435

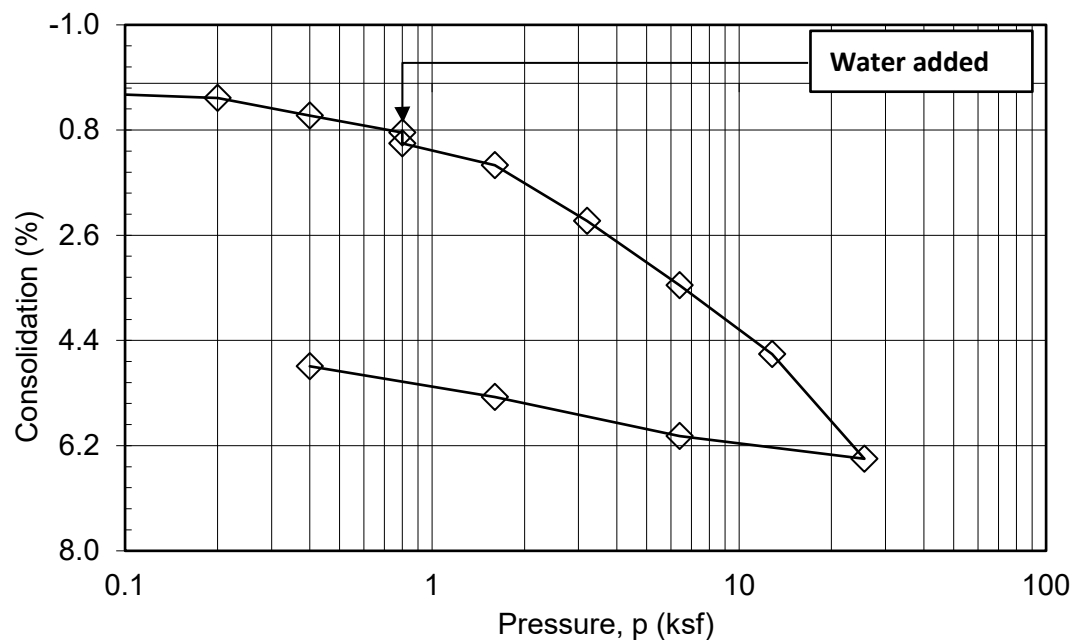
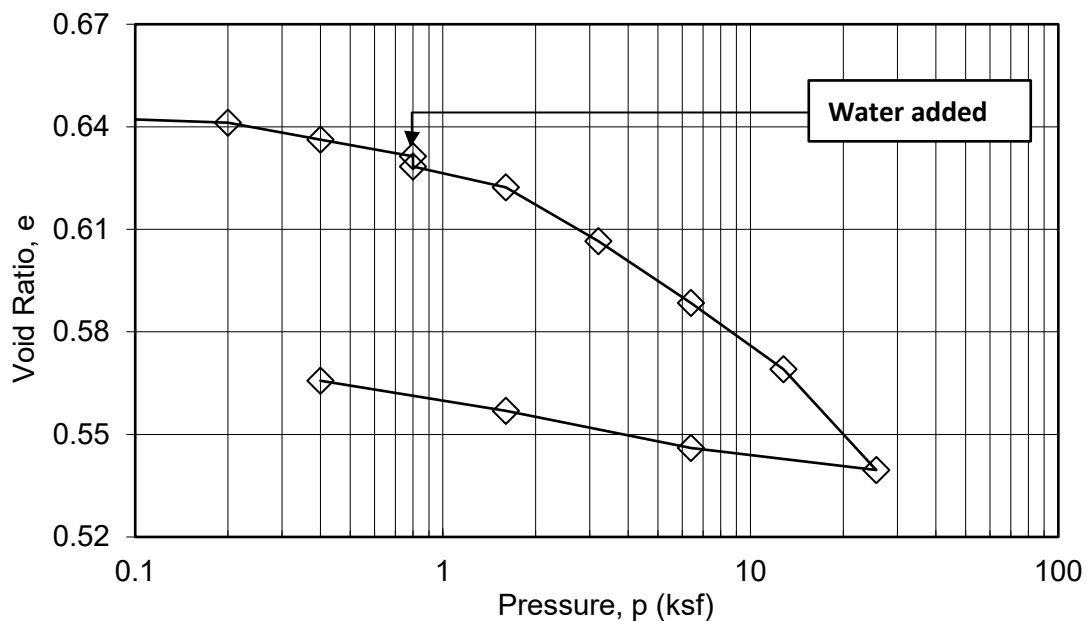
Client : SA Geotechnical, Inc
Project Name: Freedom Lane
Project Number: 24064-01
Boring No.: B-1
Sample No.: D-1
Type of Sample: Undisturbed ring
Depth (ft): 5
Soil Description: Yellowish Brown, Clayey Sand (SC)

HAI Project No.: SAG-24-022

Tested by: GA

Checked by: KL

Date: 05/14/24





CONSOLIDATION TEST

ASTM D2435

Client : SA Geotechnical, Inc
 Project Name: Freedom Lane
 Project Number: 24064-01
 Boring No.: B-1
 Sample No.: D-2
 Type of Sample: Undisturbed ring
 Depth (ft): 10
 Soil Description: Yellowish Brown, Clayey Sand (SC)

HAI Project No.: SAG-24-022

Tested by: GA

Checked by: KL

Date: 05/14/24

Initial Total Weight	Final Total Weight	Final Dry Weight
(g)	(g)	(g)
163.25	167.80	150.89

Initial Conditions			Final Conditions	
Height	H	(in)	1.000	0.959
Height of Solids	H _s	(in)	0.733	0.733
Height of Water	H _w	(in)	0.165	0.225
Height of Air	H _a	(in)	0.102	0.001
Dry Density	(pcf)		125.3	136.3
Water Content	(%)		8.2	11.2
Saturation	(%)		61.6	99.6

* Saturation is calculated based on G_s= 2.74

Load (ksf)	ΔH (in)	H (in)	Voids (in)	e	Consol. (%)	a _v (ksf ⁻¹)	M _v (ksf ⁻¹)	Comment
0.01	-----	1.0000	0.267	0.364	0			
0.2	0.0011	0.9989	0.266	0.363	0.1	7.9E-03	5.8E-03	
0.4	0.0033	0.9968	0.264	0.360	0.3	1.5E-02	1.1E-02	
0.8	0.0052	0.9948	0.262	0.357	0.5	6.7E-03	4.9E-03	
0.8	0.0083	0.9917	0.259	0.353	0.8	Water Added		
1.6	0.0121	0.9879	0.255	0.348	1.2	6.5E-03	4.8E-03	
3.2	0.0209	0.9792	0.246	0.336	2.1	7.5E-03	5.6E-03	
6.4	0.0348	0.9652	0.232	0.317	3.5	5.9E-03	4.5E-03	
12.8	0.0464	0.9536	0.221	0.301	4.6	2.5E-03	1.9E-03	
25.6	0.0540	0.9461	0.213	0.291	5.4	8.0E-04	6.2E-04	
6.4	0.0503	0.9497	0.217	0.296	5.0	Unloaded		
1.6	0.0456	0.9544	0.221	0.302	4.6			
0.4	0.0411	0.9590	0.226	0.308	4.1			



CONSOLIDATION TEST

ASTM D2435

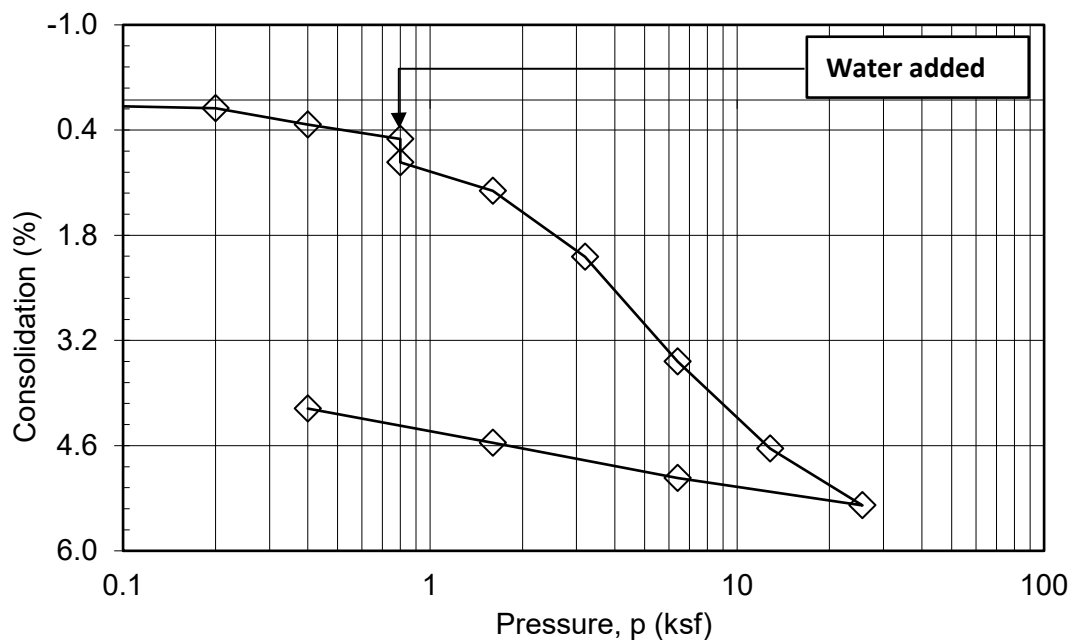
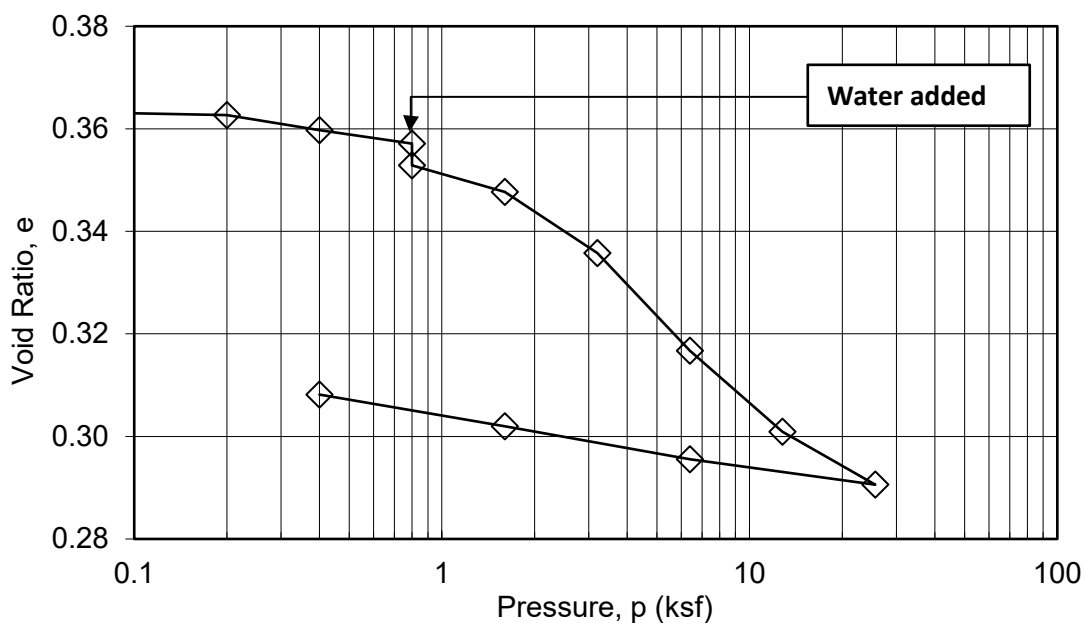
Client : SA Geotechnical, Inc
Project Name: Freedom Lane
Project Number: 24064-01
Boring No.: B-1
Sample No.: D-2
Type of Sample: Undisturbed ring
Depth (ft): 10
Soil Description: Yellowish Brown, Clayey Sand (SC)

HAI Project No.: SAG-24-022

Tested by: GA

Checked by: KL

Date: 05/14/24





Soil Analysis Lab Results

Client: HAI
Job Name: Freedom Lane
Client Job Number: SAG-24-022 / 24064-01
Project X Job Number: S240517E
May 20, 2024

	Method	ASTM D4327		ASTM D4327	
Bore# / Description	Depth	Sulfates SO_4^{2-}		Chlorides Cl^-	
	(ft)	(mg/kg)	(wt%)	(mg/kg)	(wt%)
TP-3 B-1	1-4	107.5	0.0108	199.4	0.0199
TP-9 B-1	0-5	51.3	0.0051	25.2	0.0025

Cations and Anions, except Sulfide and Bicarbonate, tested with Ion Chromatography
mg/kg = milligrams per kilogram (parts per million) of dry soil weight
ND = 0 = Not Detected | NT = Not Tested | Unk = Unknown
Chemical Analysis performed on 1:3 Soil-To-Water extract
PPM = mg/kg (soil) = mg/L (Liquid)

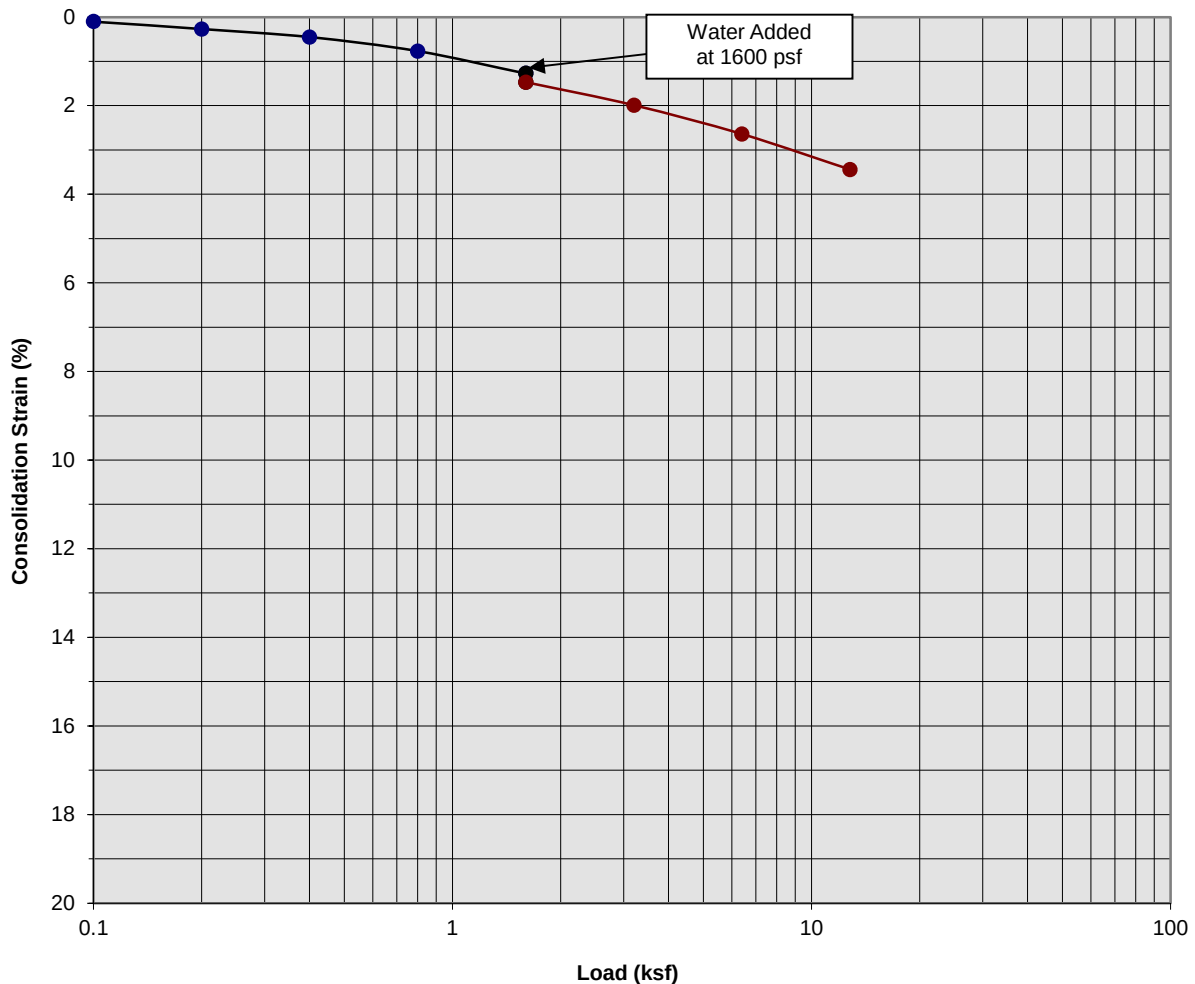
Note: Sometimes a bad sulfate hit is a contaminated spot. Typical fertilizers are Potassium chloride, ammonium sulfate or ammonium sulfate nitrate (ASN). So this is another reason why testing full corrosion series is good because we then have the data to see if those other ingredients are present meaning the soil sample is just fertilizer-contaminated soil. This can happen often when the soil samples collected are simply surface scoops. This is why it's best to dig in a foot, throw away the top and test the deeper stuff. Dairy farms are also notorious for these items.

If one sample pops up much more corrosive than all others, we would recommend collecting more samples surrounding the problem sample location to determine if the peak is isolated to it. This allows us to conclude it was a contaminated sample and able to declare it an outlier.

Try out our new online forms: [SOIL CORROSIVITY & THERMAL RESISTIVITY LAB REQUEST FORM](#) & [IN-SITU WENNER 4 PIN QUOTE REQUEST FORM](#)

Laboratory Test Results
by Southern California
Geotechnical (2021)

Consolidation/Collapse Test Results



Classification: BEDROCK: Light Brown fine-grained Sandstone

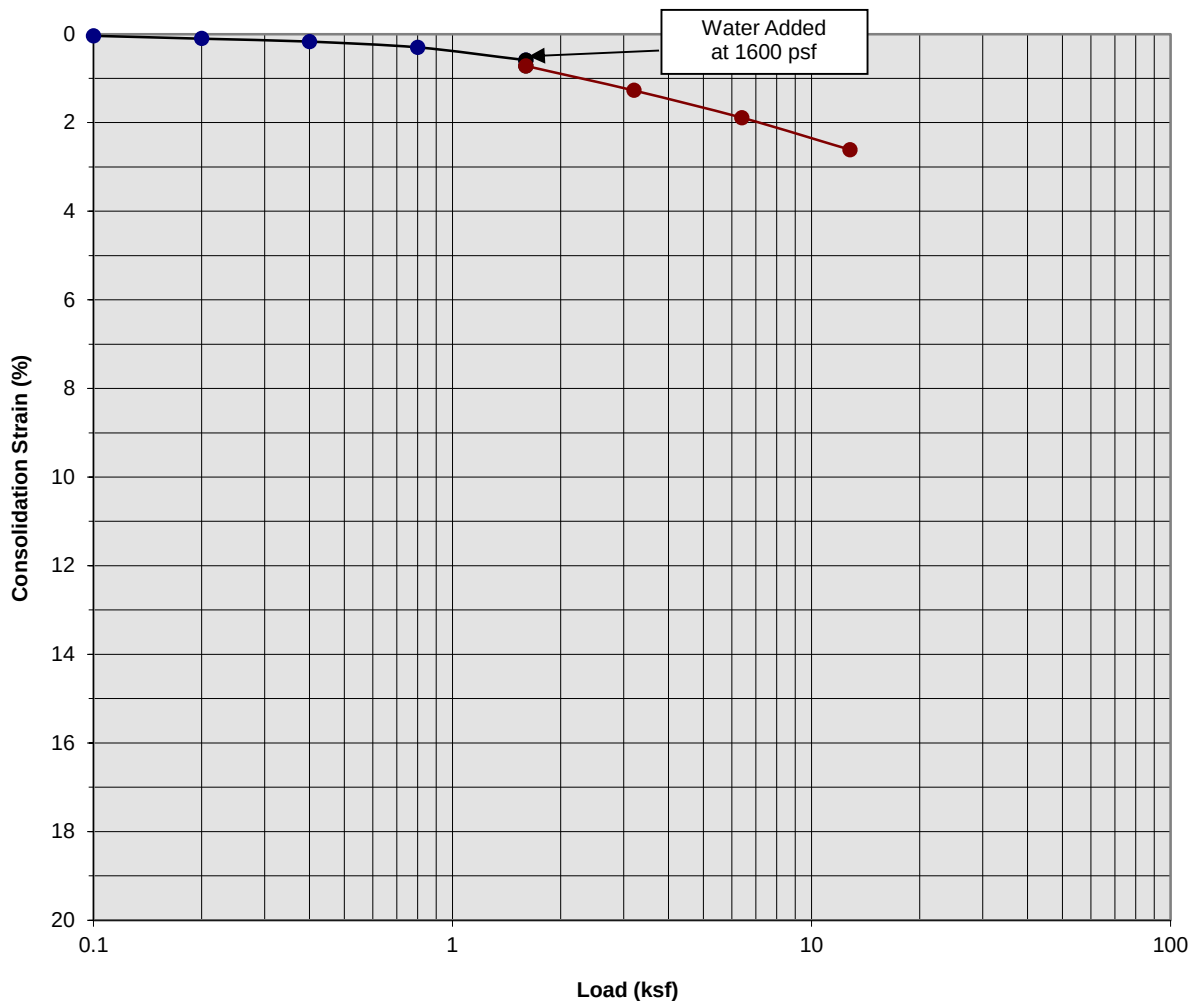
Boring Number:	B-2	Initial Moisture Content (%)	4
Sample Number:	---	Final Moisture Content (%)	20
Depth (ft)	1 to 2	Initial Dry Density (pcf)	102.4
Specimen Diameter (in)	2.4	Final Dry Density (pcf)	104.7
Specimen Thickness (in)	1.0	Percent Collapse (%)	0.20

Proposed Commercial/Industrial Development
 Aliso Viejo, California
 Project No. 21G167-1
PLATE C- 1



**SOUTHERN
 CALIFORNIA
 GEOTECHNICAL**
A California Corporation

Consolidation/Collapse Test Results



Classification: BEDROCK: Light Brown fine-grained Sandstone

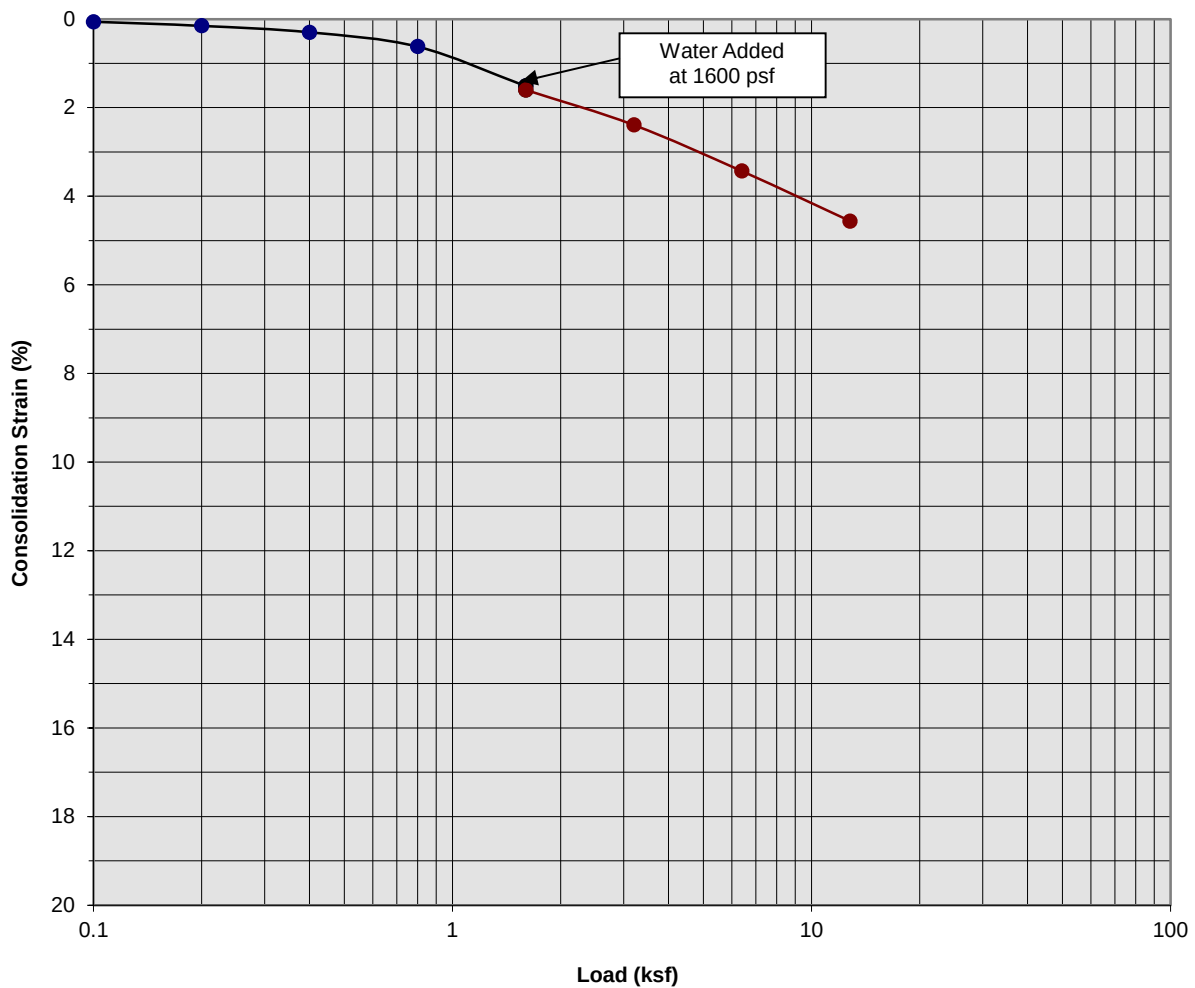
Boring Number:	B-2	Initial Moisture Content (%)	6
Sample Number:	---	Final Moisture Content (%)	21
Depth (ft)	3 to 4	Initial Dry Density (pcf)	103.0
Specimen Diameter (in)	2.4	Final Dry Density (pcf)	101.7
Specimen Thickness (in)	1.0	Percent Collapse (%)	0.13

Proposed Commercial/Industrial Development
 Aliso Viejo, California
 Project No. 21G167-1
PLATE C- 2



**SOUTHERN
 CALIFORNIA
 GEOTECHNICAL**
A California Corporation

Consolidation/Collapse Test Results



Classification: BEDROCK: Light Brown fine-grained Sandstone

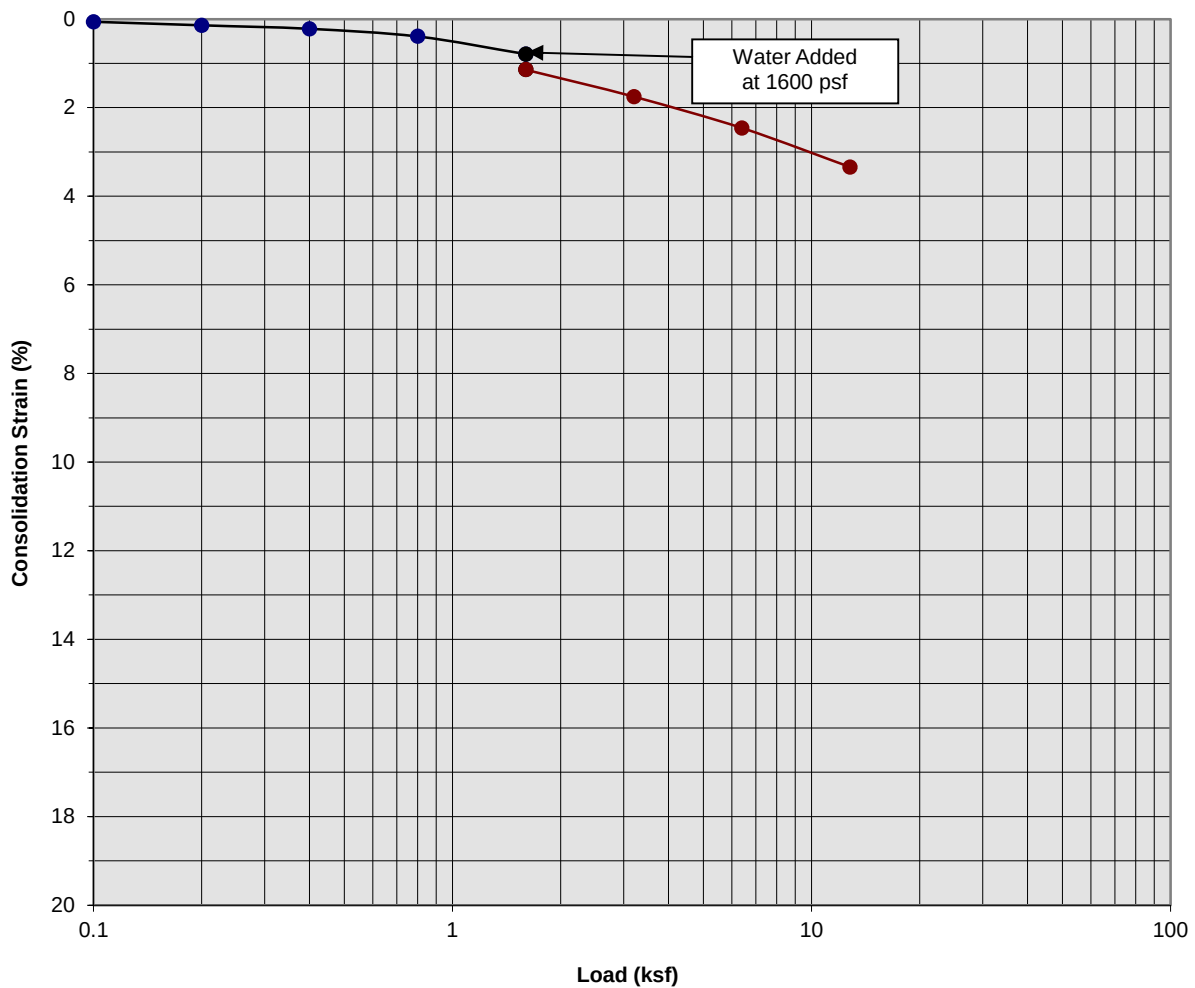
Boring Number:	B-2	Initial Moisture Content (%)	4
Sample Number:	---	Final Moisture Content (%)	19
Depth (ft)	5 to 6	Initial Dry Density (pcf)	102.2
Specimen Diameter (in)	2.4	Final Dry Density (pcf)	106.6
Specimen Thickness (in)	1.0	Percent Collapse (%)	0.09

Proposed Commercial/Industrial Development
 Aliso Viejo, California
 Project No. 21G167-1
PLATE C- 3



**SOUTHERN
 CALIFORNIA
 GEOTECHNICAL**
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Consolidation/Collapse Test Results



Classification: BEDROCK: Light Brown fine-grained Sandstone

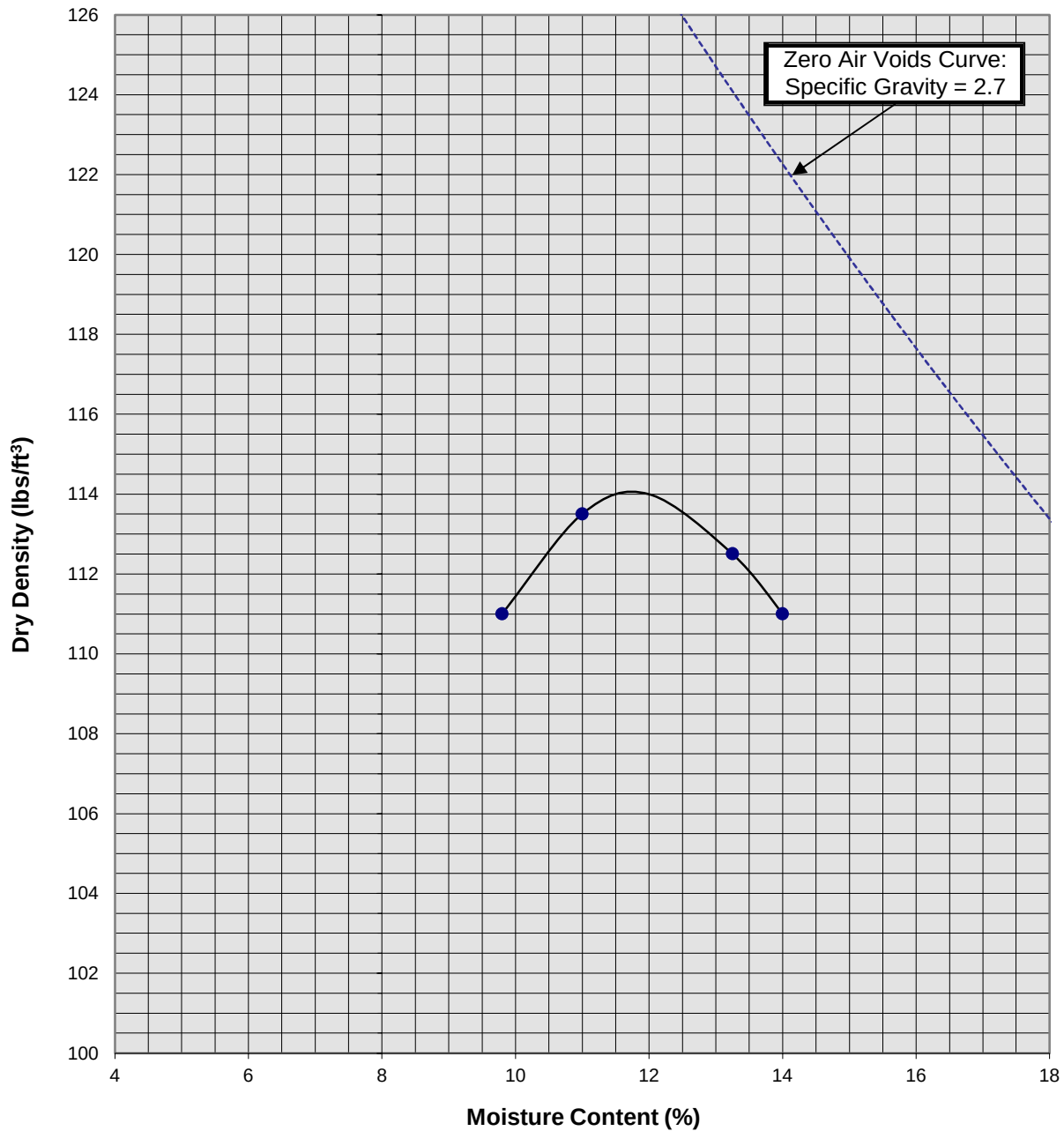
Boring Number:	B-2	Initial Moisture Content (%)	5
Sample Number:	---	Final Moisture Content (%)	16
Depth (ft)	7 to 8	Initial Dry Density (pcf)	106.6
Specimen Diameter (in)	2.4	Final Dry Density (pcf)	110.6
Specimen Thickness (in)	1.0	Percent Collapse (%)	0.35

Proposed Commercial/Industrial Development
 Aliso Viejo, California
 Project No. 21G167-1
PLATE C- 4



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A California Corporation

Moisture/Density Relationship ASTM D-1557



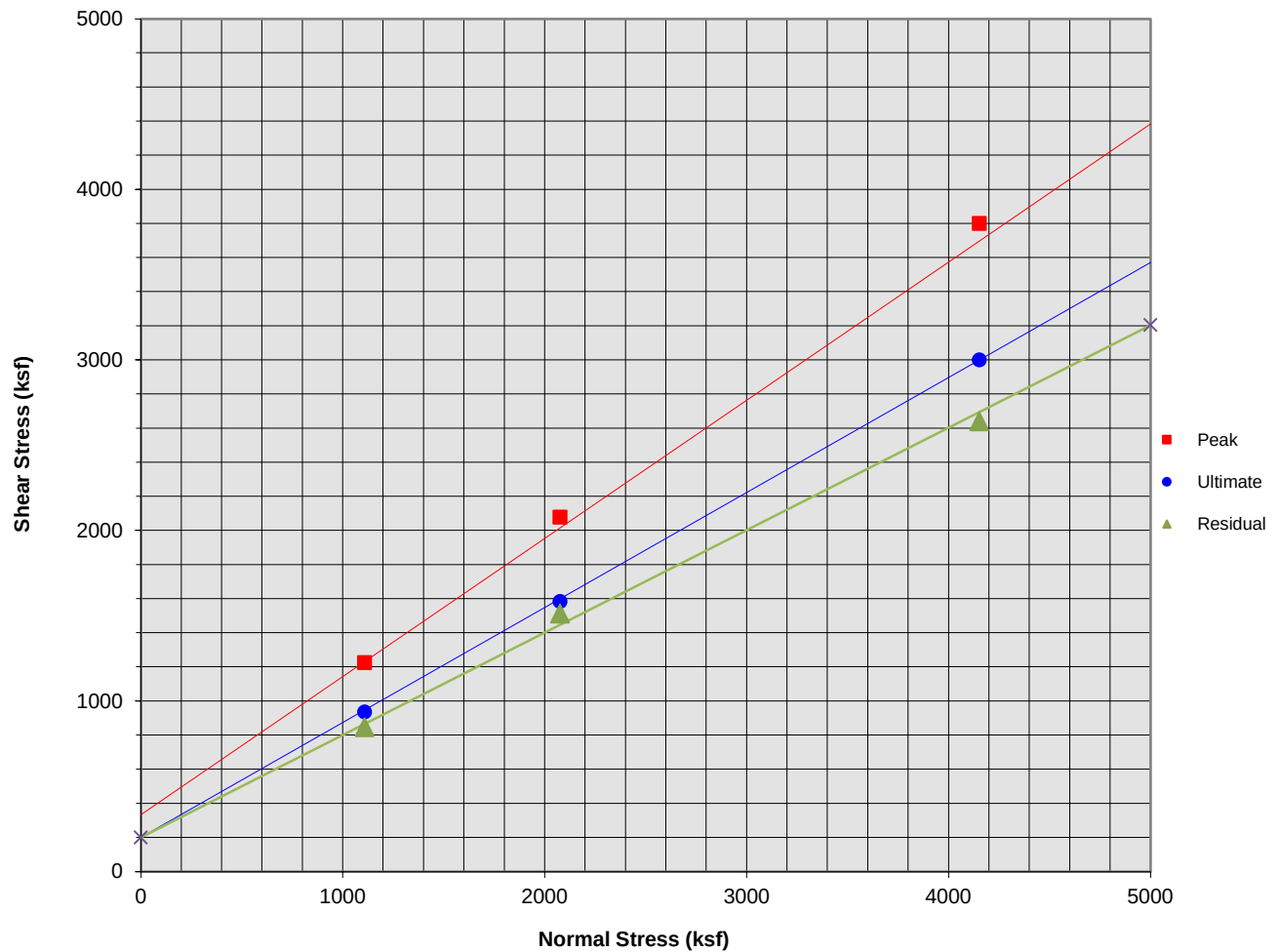
Soil ID Number	B-2 @ 0-5'
Optimum Moisture (%)	12
Maximum Dry Density (pcf)	114
Soil Classification	BEDROCK: Light Brown fine-grained Sandstone

Proposed Commercial/Industrial Development
Aliso Viejo, California
Project No. 21G167-1
PLATE C-5



**SOUTHERN
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Direct Shear Test Results (Undisturbed)



Sample Description: BA-1 @ 10'

Classification: Bedrock: Light Gray fine grained Sandstone

Sample Data

Initial Moisture Content	12.0
Final Moisture Content	20.0
Initial Dry Density	111.0
Final Dry Density	--
Specimen Diameter (in)	2.4
Specimen Thickness (in)	1.0

Test Results

	Peak	Ultimate	Residual
ϕ (°)	39.0	34.0	31.0
C (psf)	335	200	200

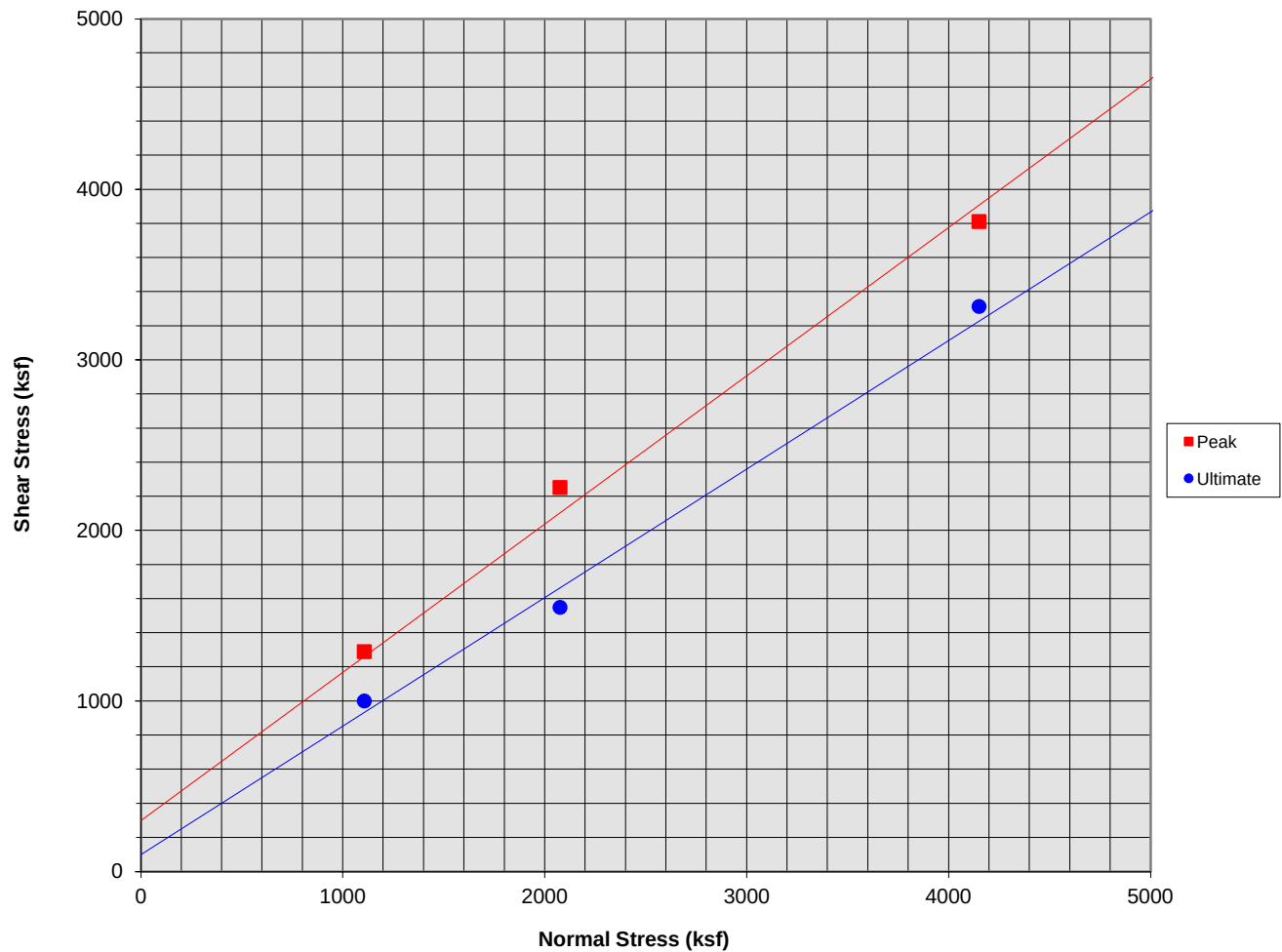
Proposed Commercial/Industrial Development
Aliso Viejo, California
Project No. 21G167

PLATE C- 6



**SOUTHERN
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Direct Shear Test Results (Undisturbed)



Sample Description: B-1 @ 24 to 25 feet

Classification: BEDROCK: Brown fine-grained Sandstone

Sample Data

Initial Moisture Content	6.0
Final Moisture Content	19.0
Initial Dry Density	110.0
Final Dry Density	---
Specimen Diameter (in)	2.4
Specimen Thickness (in)	1.0

Test Results

	Peak	Ultimate
ϕ (°)	41.0	37.0
C (psf)	300	100

Proposed Commercial/Industrial Development
Aliso Viejo, California
Project No. 21G167

PLATE C-7



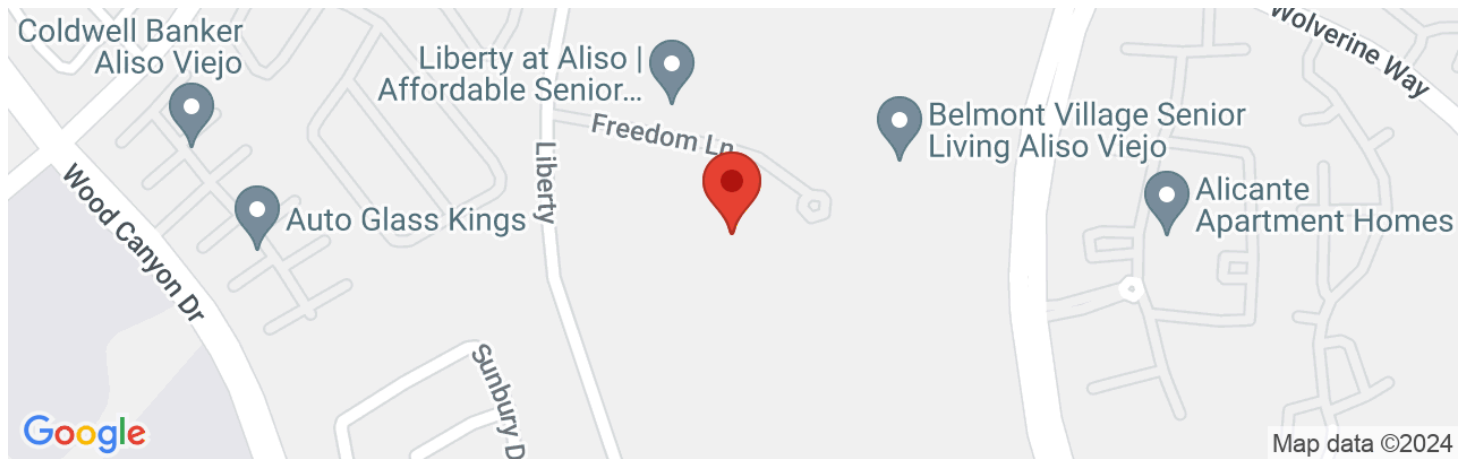
**SOUTHERN
CALIFORNIA
GEOTECHNICAL**
A California Corporation

Appendix D

USGS web services were down for some period of time and as a result this tool wasn't operational, resulting in *timeout error*.
USGS web services are now operational so this tool should work as expected.



Latitude, Longitude: 33.56181, -117.72862



Date	5/31/2024, 4:29:32 PM
Design Code Reference Document	ASCE7-16
Risk Category	II
Site Class	C - Very Dense Soil and Soft Rock

Type	Value	Description
S_S	1.244	MCE_R ground motion. (for 0.2 second period)
S_1	0.444	MCE_R ground motion. (for 1.0s period)
S_{MS}	1.493	Site-modified spectral acceleration value
S_{M1}	0.667	Site-modified spectral acceleration value
S_{DS}	0.995	Numeric seismic design value at 0.2 second SA
S_{D1}	0.444	Numeric seismic design value at 1.0 second SA

Type	Value	Description
SDC	D	Seismic design category
F_a	1.2	Site amplification factor at 0.2 second
F_v	1.5	Site amplification factor at 1.0 second
PGA	0.533	MCE_G peak ground acceleration
F_{PGA}	1.2	Site amplification factor at PGA
PGA_M	0.639	Site modified peak ground acceleration
T_L	8	Long-period transition period in seconds
S_{sRT}	1.244	Probabilistic risk-targeted ground motion. (0.2 second)
S_{sUH}	1.342	Factored uniform-hazard (2% probability of exceedance in 50 years) spectral acceleration
S_{sD}	2.6	Factored deterministic acceleration value. (0.2 second)
S_{1RT}	0.444	Probabilistic risk-targeted ground motion. (1.0 second)
S_{1UH}	0.477	Factored uniform-hazard (2% probability of exceedance in 50 years) spectral acceleration.
S_{1D}	0.869	Factored deterministic acceleration value. (1.0 second)
PGA_d	1.061	Factored deterministic acceleration value. (Peak Ground Acceleration)
PGA_{UH}	0.533	Uniform-hazard (2% probability of exceedance in 50 years) Peak Ground Acceleration
C_{RS}	0.927	Mapped value of the risk coefficient at short periods

Type	Value	Description
C _{R1}	0.932	Mapped value of the risk coefficient at a period of 1 s
C _V	1.149	Vertical coefficient

DISCLAIMER

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Unified Hazard Tool



Please do not use this tool to obtain ground motion parameter values for the design code reference documents covered by the [U.S. Seismic Design Maps web tools](#) (e.g., the International Building Code and the ASCE 7 or 41 Standard). The values returned by the two applications are not identical.

Please also see the new [USGS Earthquake Hazard Toolbox](#) for access to the most recent NSHMs for the conterminous U.S. and Hawaii.

^ Input

Edition

Dynamic: Conterminous U.S. 2014 (u...

Spectral Period

Peak Ground Acceleration

Latitude

Decimal degrees

33.56181

Time Horizon

Return period in years

2475

Longitude

Decimal degrees, negative values for western longitudes

-117.72862

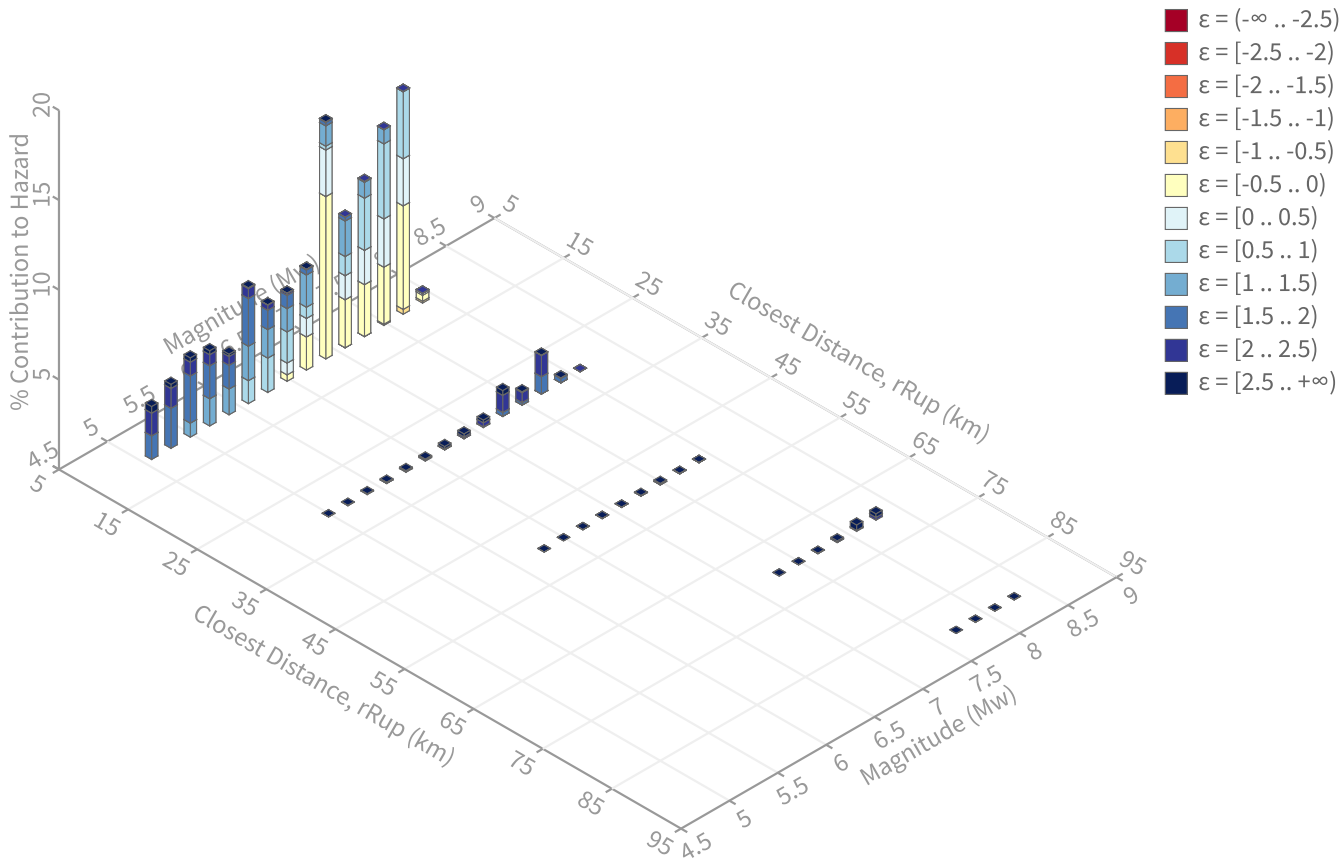
Site Class

537 m/s (Site class C)

^ Deaggregation

Component

Total



Summary statistics for, Deaggregation: Total

Deaggregation targets

Return period: 2475 yrs

Exceedance rate: 0.0004040404 yr⁻¹

PGA ground motion: 0.59756496 g

Recovered targets

Return period: 2750.0871 yrs

Exceedance rate: 0.00036362485 yr⁻¹

Totals

Binned: 100 %

Residual: 0 %

Trace: 0.07 %

Mean (over all sources)

m: 6.79

r: 9.39 km

ε₀: 0.85 σ

Mode (largest m-r bin)

m: 6.89

r: 5.23 km

ε₀: 0.06 σ

Contribution: 13.2 %

Mode (largest m-r-ε₀ bin)

m: 6.89

r: 4.51 km

ε₀: -0.19 σ

Contribution: 9.04 %

Discretization

r: min = 0.0, max = 1000.0, Δ = 20.0 km

m: min = 4.4, max = 9.4, Δ = 0.2

ε: min = -3.0, max = 3.0, Δ = 0.5 σ

Epsilon keys

ε₀: [-∞ .. -2.5)

ε₁: [-2.5 .. -2.0)

ε₂: [-2.0 .. -1.5)

ε₃: [-1.5 .. -1.0)

ε₄: [-1.0 .. -0.5)

ε₅: [-0.5 .. 0.0)

ε₆: [0.0 .. 0.5)

ε₇: [0.5 .. 1.0)

ε₈: [1.0 .. 1.5)

ε₉: [1.5 .. 2.0)

ε₁₀: [2.0 .. 2.5)

ε₁₁: [2.5 .. +∞]

Deaggregation Contributors

Source Set 	Source	Type	r	m	ϵ_0	lon	lat	az	%
UC33brAvg_FM32		System							34.37
	San Joaquin Hills [2]		4.45	7.11	-0.11	117.699°W	33.588°N	42.77	19.34
	Newport-Inglewood (Offshore) [3]		8.90	7.29	0.92	117.798°W	33.507°N	226.82	8.25
	Oceanside alt2 [12]		5.38	7.53	-0.18	117.802°W	33.515°N	232.65	1.51
	Elsinore (Glen Ivy) rev [1]		31.74	7.65	2.07	117.488°W	33.765°N	44.60	1.07
UC33brAvg_FM31		System							31.13
	San Joaquin Hills [2]		4.45	7.52	-0.08	117.699°W	33.588°N	42.77	11.47
	Newport-Inglewood (Offshore) [3]		8.90	7.29	0.91	117.798°W	33.507°N	226.82	8.56
	Oceanside alt1 [6]		5.52	6.98	-0.01	117.802°W	33.514°N	232.26	5.92
	Elsinore (Glen Ivy) rev [1]		31.74	7.62	2.10	117.488°W	33.765°N	44.60	1.03
UC33brAvg_FM31 (opt)		Grid							17.31
	PointSourceFinite: -117.729, 33.629		8.73	5.73	1.57	117.729°W	33.629°N	0.00	2.88
	PointSourceFinite: -117.729, 33.629		8.73	5.73	1.57	117.729°W	33.629°N	0.00	2.88
	PointSourceFinite: -117.729, 33.611		7.14	5.83	1.25	117.729°W	33.611°N	0.00	2.41
	PointSourceFinite: -117.729, 33.611		7.14	5.83	1.25	117.729°W	33.611°N	0.00	2.41
	PointSourceFinite: -117.729, 33.647		10.02	5.82	1.69	117.729°W	33.647°N	0.00	1.05
	PointSourceFinite: -117.729, 33.647		10.02	5.82	1.69	117.729°W	33.647°N	0.00	1.05
UC33brAvg_FM32 (opt)		Grid							17.18
	PointSourceFinite: -117.729, 33.629		8.73	5.73	1.57	117.729°W	33.629°N	0.00	2.85
	PointSourceFinite: -117.729, 33.629		8.73	5.73	1.57	117.729°W	33.629°N	0.00	2.85
	PointSourceFinite: -117.729, 33.611		7.15	5.82	1.25	117.729°W	33.611°N	0.00	2.39
	PointSourceFinite: -117.729, 33.611		7.15	5.82	1.25	117.729°W	33.611°N	0.00	2.39
	PointSourceFinite: -117.729, 33.647		10.02	5.82	1.69	117.729°W	33.647°N	0.00	1.05
	PointSourceFinite: -117.729, 33.647		10.02	5.82	1.69	117.729°W	33.647°N	0.00	1.05

Appendix E

Summary of Slope Stability Analysis

Cross-Section B-B'

Filename	Description	Factor of Safety (FS)	
		Static	Pseudostatic
01, 01p	Global Stability of the Existing Slope, Block Search through Bedrock with along-bedding strengths	1.88	1.22
02, 02p	Global Stability of the Existing Slope, Circular Search through Bedrock with along-bedding strengths	1.59	1.11

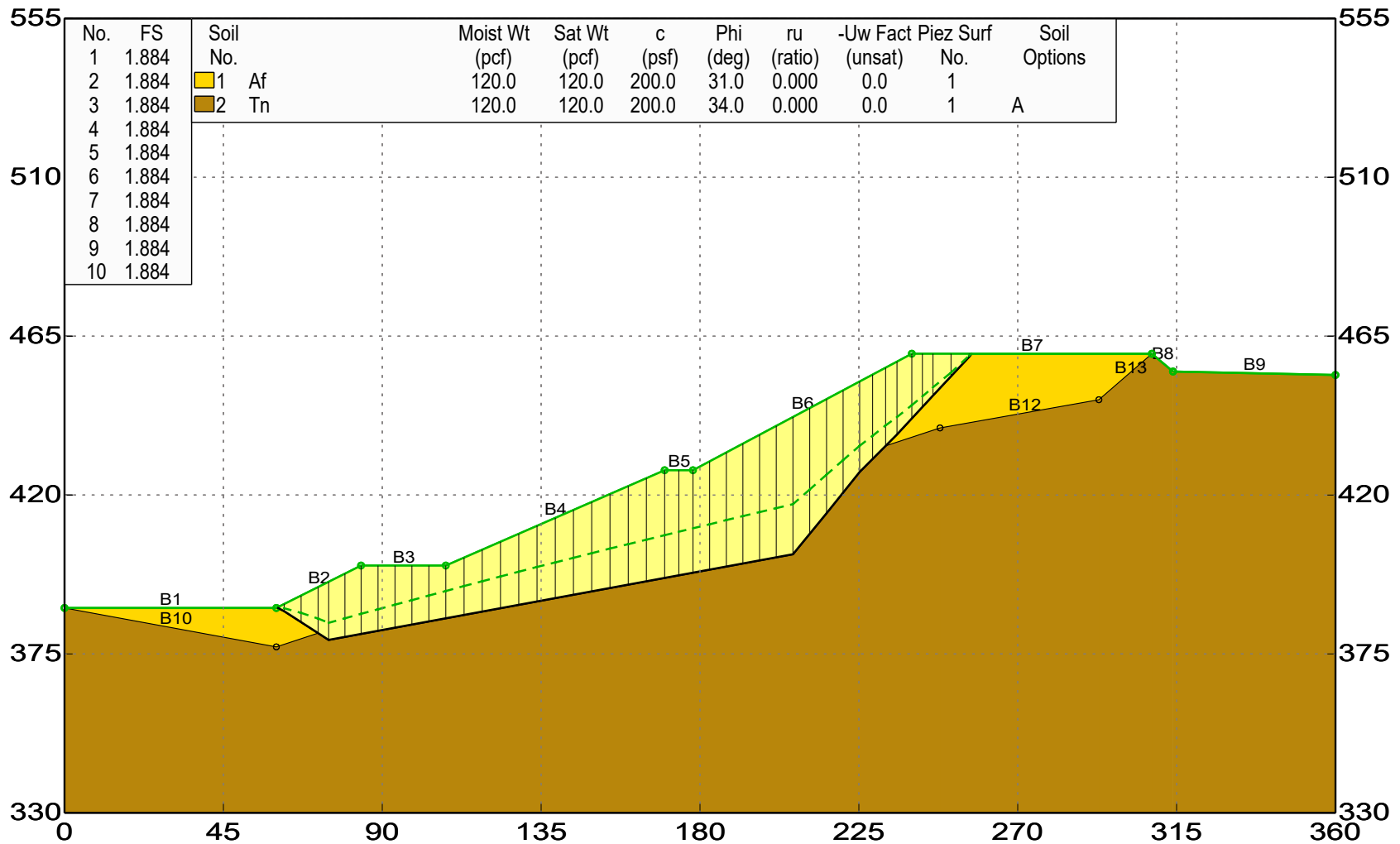
Project No.: 24064-01
Project Name: Meritage/ Freedom Lane, Aliso Viejo



X-Section B-B' - Freedom Lane Global Stability of Existing Slope

SA Geotechnical, Inc., RS

\01.gsd



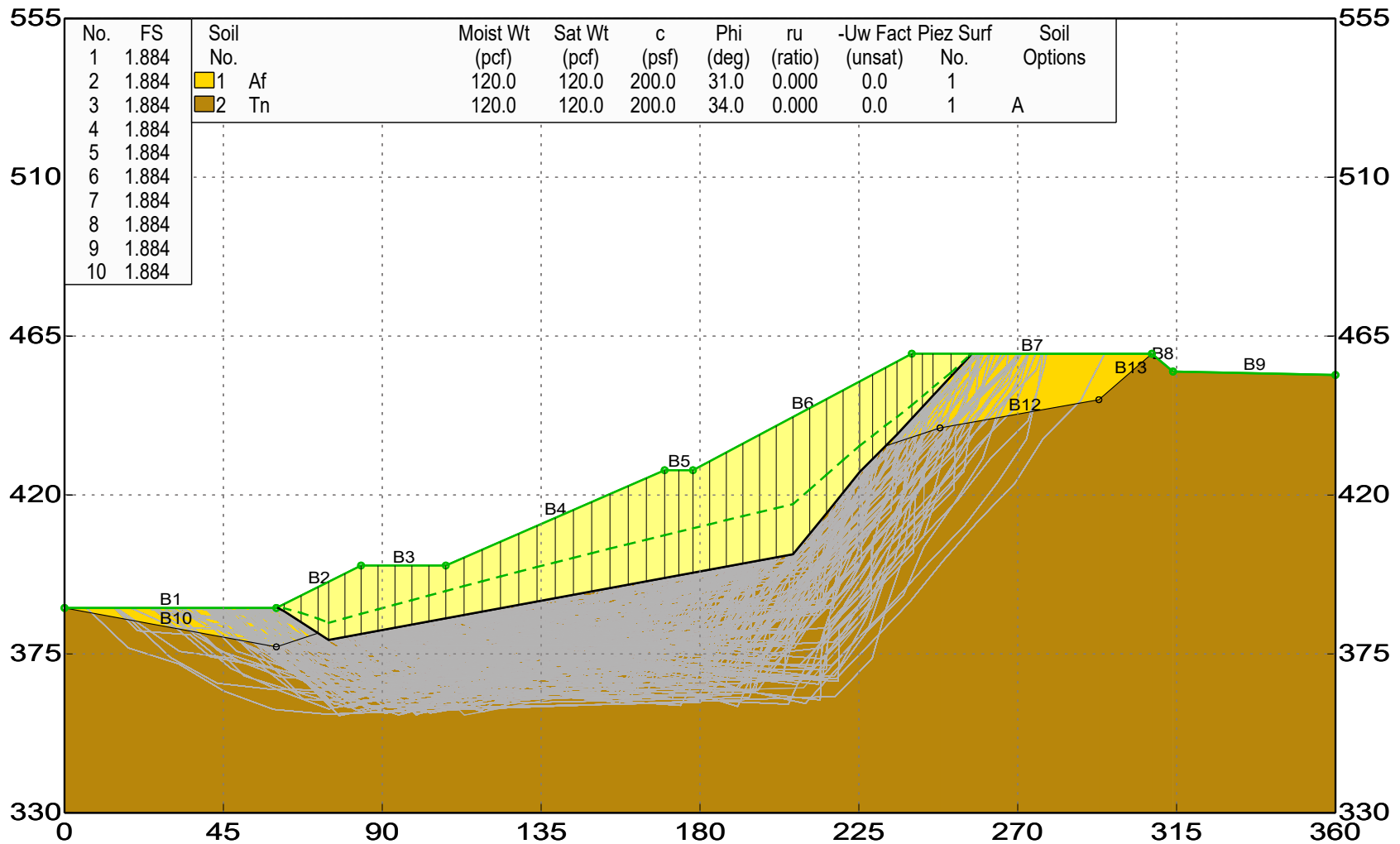
GEOSTASE FS = 1.884

Spencer Method

X-Section B-B' - Freedom Lane Global Stability of Existing Slope

SA Geotechnical, Inc., RS

\01.gsd



GEOSTASE FS = 1.884

Spencer Method

*** GEOSTASE(R) ***

** GEOSTASE(R) (c)Copyright by Garry H. Gregory, Ph.D.,P.E.,S.E.,BC.GE **

** Current Version 4.30.32-Double Precision, Sept 2023 **
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SLOPE STABILITY ANALYSIS SOFTWARE (2D & 3D)

Simplified Bishop, Simplified Janbu, or General Equilibrium (GE) Options.

(Spencer, Morgenstern-Price, USACE, and Lowe & Karafiath)

Including Pier/Pile, Planar Reinf, Nail, Tieback, Line Loads

Applied Forces, Fiber-Reinforced Soil (FRS), Distributed Loads

Nonlinear Undrained Shear Strength, Curved Strength Envelope,

Anisotropic Strengths, Water Surfaces, 3-Stage Rapid Drawdown

2- or 3-Stage Pseudo-Static & Simplified Newmark Seismic Analyses.

Analysis Date: 6/ 3/ 2024
Analysis Time:
Analysis By: SA Geotechnical, Inc., RS

Input File Name: C:\Users\Reza Saberi\SA Geotechnical, Inc\SA Geotechnical -
Projects\2024\24064-01 Meritage - 400-700 Freedom Ln, Aliso Viejo\Engineering\Sted\B-B'\01.gsd

Output File Name: C:\Users\Reza Saberi\SA Geotechnical, Inc\SA Geotechnical -
Projects\2024\24064-01 Meritage - 400-700 Freedom Ln, Aliso Viejo\Engineering\Sted\B-B'\01.OUT

Unit System: English

PROJECT: X-Section B-B' - Freedom Lane

DESCRIPTION: Global Stability of Existing Slope

PROFILE BOUNDARY DATA

9 Surface Boundaries
13 Total Boundaries

Boundary No.	X - 1 (ft)	Y - 1 (ft)	X - 2 (ft)	Y - 2 (ft)	Soil Type Below Bnd
1	0.000	388.000	60.000	388.000	1
2	60.000	388.000	84.000	400.000	1
3	84.000	400.000	108.000	400.000	1
4	108.000	400.000	170.000	427.000	1
5	170.000	427.000	178.000	427.000	1
6	178.000	427.000	240.000	460.000	1
7	240.000	460.000	308.000	460.000	1
8	308.000	460.000	314.000	455.000	2
9	314.000	455.000	360.000	454.000	2
10	0.000	388.000	60.000	377.000	2
11	60.000	377.000	248.000	439.000	2
12	248.000	439.000	293.000	447.000	2
13	293.000	447.000	308.000	460.000	2

User Specified X-Origin = 0.000(ft)

User Specified Y-Origin = 330.000(ft)

SURFACE BOUNDARY POINT COORDINATES (Information Only-Not Used Directly)

Point No.	X-COORD	Y-COORD
1	0.000	388.000
2	60.000	388.000
3	84.000	400.000
4	108.000	400.000
5	170.000	427.000
6	178.000	427.000
7	240.000	460.000
8	308.000	460.000
9	314.000	455.000

10 360.000 454.000

SUBSURFACE BOUNDARY POINT COORDINATES

(Information Only-Not Used Directly)

Point No.	X-COORD	Y-COORD
Surface boundary point 11	0.000	388.000
12	60.000	377.000
13	248.000	439.000
14	293.000	447.000
Surface boundary point 15	308.000	460.000

1 and Subsurface boundary point 11 are duplicate points.

8 and Subsurface boundary point 15 are duplicate points.

PROFILE BOUNDARY SLOPES AND ANGLES

BND No.	Slope	Angle(Deg.)
1	0.000	0.000
2	0.500	26.565
3	0.000	0.000
4	0.435	23.532
5	0.000	0.000
6	0.532	28.025
7	0.000	0.000
8	-0.833	-39.806
9	-0.022	-1.245
10	-0.183	-10.389
11	0.330	18.252
12	0.178	10.081
13	0.867	40.914

MOHR-COULOMB SOIL PARAMETERS

2 Type(s) of Soil Defined

Soil Number and Description	Moist Unit Wt. (pcf)	Saturated Unit Wt. (pcf)	Cohesion Intercept (psf)	Friction Angle (deg)	Pore Pressure Ratio(ru)	(-Uw) Fact.	Water Surface No.	Water Option
1 Af	120.0	120.0	200.00	31.00	0.000	0.0	1	0

2 Tn	120.0	120.0	200.00	34.00	0.000	0.0	1	0
------	-------	-------	--------	-------	-------	-----	---	---

ANISOTROPIC STRENGTH PARAMETERS

```
1 soil type(s)
```

Soil Type 2 Is Anisotropic

Number Of Direction Ranges Specified = 3

Direction Range No.	Counterclockwise Direction Limit (deg)	Cohesion Intercept (psf)	Friction Angle (deg)
1	-5.0	200.00	34.00
2	8.0	200.00	28.00
3	90.0	200.00	24.00

A Non-Circular Zone Search Has Been Selected For Analysis Using Random Generation Within Specified Zones.

2 Zones Defined For Generation Of Non-Circular Surfaces

4000 Trial Surfaces Have Been Generated.

Length Of Line Segments For Active And Passive Portions Of
Non-Circular Zone Search = 15.00(ft)

Zone No.	X - 1 (ft)	Y - 1 (ft)	X - 2 (ft)	Y - 2 (ft)	Height (ft)
1	70.00	375.00	125.00	375.00	35.00
2	140.00	385.00	220.00	385.00	50.00

The Spencer Method Was Selected for FS Analysis.

Selected fx function = Constant (1.0)

SELECTED CONVERGENCE PARAMETERS FOR SPENCER METHOD:

Initial estimate of FS = 1.500

FS tolerance = 0.000001000

Initial estimate of theta(deg) = 15.00

Theta tolerance(radians) = 0.0001000

Minimum theta(deg) = -45.00 ; Maximum theta(deg) = 45.00

Theta convergence Step Factor = 5000.00

Maximum number of iterations = 50

Allowable negative side force = -1000.0(lbs)

Maximum force imbalance = 100.000000(lbs)

Maximum moment imbalance = 100.000000 (ft/lbs)

Selected Lambda Coefficient = 1.00

Specified Tension Crack Water Depth Factor = 0.000

Total Number of Trial Surfaces Attempted = 4000

WARNING! The Factor of Safety Calculation for one or More Trial Surfaces
Did Not Converge in 50 Iterations.

Number of Trial Surfaces with Non-Converged FS = 386

Number of Trial Surfaces With Valid FS = 3614

Percentage of Trial Surfaces With Non-Converged and/or
Non-Valid FS Solutions of the Total Attempted = 9.7 %

Statistical Data On All Valid FS Values:

FS Max = 9.496 FS Min = 1.884 FS Ave = 3.964

Standard Deviation = 1.407 Coefficient of Variation = 35.51 %

Critical Surface is Sequence Number 231 of Those Analyzed.

*****BEGINNING OF DETAILED GEOSTASE OUTPUT FOR CRITICAL SURFACE FROM A SEARCH*****

Iter. No.	Theta (deg) (fx=1.0)	FS (Moment)	FS (Force)	Lambda	Delta FS
1	15.0000	1.947195	1.841694	0.268	0.1055008E+00
2	19.9500	1.746420	1.951656	0.363	0.2052360E+00
3	16.6803	1.898327	1.875861	0.300	0.2246659E-01
4	17.0035	1.887104	1.882767	0.306	0.4336580E-02
5	17.0808	1.884320	1.884436	0.307	0.1153620E-03
6	17.0788	1.884393	1.884393	0.307	0.5047168E-06

Factor Of Safety For The Preceding Specified Surface = 1.884

Theta (fx = 1.0) = 17.08 Deg Lambda = 0.307

The Spencer Method Has Been Selected For Analysis.

Selected fx function = Constant (1.0)

SELECTED CONVERGENCE PARAMETERS FOR ANALYSIS METHOD:

Initial estimate of FS = 1.500

FS tolerance = 0.000001000

Initial estimate of theta(deg) = 15.00

Theta tolerance(radians) = 0.0001000

Minimum theta(deg) = -45.00 ; Maximum theta(deg) = 45.00

Theta convergence Step Factor = 5000.00

Maximum number of iterations = 50

Maximum force imbalance = 100.000000(lbs)

Maximum moment imbalance(if Applicable) = 100.000000 (ft/lbs)

Selected Lambda Coefficient = 1.00

Tension Crack Water Force = 0.00(lbs)

Specified Tension Crack Water Depth Factor = 0.000 (0.00% Filled)

Depth of Tension Crack (zo) at Side of Last Slice = 0.000(ft)

Depth of Water in Tension Crack = 0.000(ft)

Theoretical Tension Crack Depth = 5.892(ft)



NOTE: In Table 1 following, when a tension crack with water is present on the first slice (right facing slope) or on the last slice (left facing slope), the "side force" in the tension crack is set equal to the water pressure resultant.

*** Table 1 - Line of Thrust(if applicable) and Slice Force Data ***

Slice No.	X Coord.	Y Coord.	h/H	Side Force (lbs)	fx	Force Angle (Deg)	Vert. Shear Force(lbs)
1	62.21	387.91	0.406	854.72	1.000	17.08	251.0
2	67.01	386.62	0.349	7925.95	1.000	17.08	2327.7
3	71.82	385.00	0.315	21412.46	1.000	17.08	6288.5
4	74.82	383.82	0.296	34501.64	1.000	17.08	10132.7
5	79.41	385.09	0.295	35512.75	1.000	17.08	10429.6
6	84.00	386.34	0.294	36565.89	1.000	17.08	10738.9
7	88.80	387.64	0.330	37675.41	1.000	17.08	11064.7
8	93.60	388.93	0.370	38758.07	1.000	17.08	11382.7
9	98.40	390.23	0.414	39813.85	1.000	17.08	11692.8
10	103.20	391.52	0.463	40842.77	1.000	17.08	11995.0
11	108.00	392.81	0.518	41844.81	1.000	17.08	12289.2
12	113.17	394.20	0.503	42930.11	1.000	17.08	12608.0
13	118.33	395.57	0.490	44057.75	1.000	17.08	12939.1
14	123.50	396.93	0.478	45227.71	1.000	17.08	13282.8
15	128.67	398.27	0.466	46440.00	1.000	17.08	13638.8
16	133.83	399.60	0.456	47694.63	1.000	17.08	14007.3
17	139.00	400.92	0.446	48991.59	1.000	17.08	14388.2
18	144.17	402.23	0.437	50330.88	1.000	17.08	14781.5
19	149.33	403.53	0.428	51712.50	1.000	17.08	15187.2

20	154.50	404.82	0.420	53136.45	1.000	17.08	15605.4
21	159.67	406.10	0.412	54602.74	1.000	17.08	16036.1
22	164.83	407.37	0.404	56111.36	1.000	17.08	16479.1
23	170.00	408.63	0.397	57662.31	1.000	17.08	16934.6
24	174.00	409.61	0.415	58870.10	1.000	17.08	17289.3
25	178.00	410.59	0.434	60059.23	1.000	17.08	17638.6
26	182.72	411.74	0.420	61477.04	1.000	17.08	18055.0
27	187.45	412.89	0.407	62943.87	1.000	17.08	18485.7
28	192.17	414.02	0.395	64459.74	1.000	17.08	18930.9
29	196.90	415.15	0.384	66024.64	1.000	17.08	19390.5
30	201.62	416.27	0.374	67638.57	1.000	17.08	19864.5
31	206.34	417.38	0.364	69301.54	1.000	17.08	20352.9
32	211.09	421.58	0.353	56385.44	1.000	17.08	16559.6
33	215.84	425.76	0.338	44678.85	1.000	17.08	13121.6
34	220.53	429.88	0.317	34147.61	1.000	17.08	10028.7
35	225.22	433.93	0.288	24862.88	1.000	17.08	7301.9
36	228.89	436.74	0.273	19490.75	1.000	17.08	5724.2
37	232.56	439.65	0.260	14532.06	1.000	17.08	4267.9
38	235.82	442.07	0.238	11109.58	1.000	17.08	3262.7
39	240.00	445.44	0.204	6805.32	1.000	17.08	1998.6
40	242.99	447.92	0.198	4229.29	1.000	17.08	1242.1
41	245.99	450.45	0.192	2243.42	1.000	17.08	658.9
42	251.11	454.69	0.162	233.37	1.000	17.08	68.5
43	256.24	459.48	0.390	-94.45	1.000	17.08	-27.7
44	256.90	460.00	0.000	0.02	1.000	17.08	-0.0

NOTE: A value of 0.000- for h/H indicates that the line of thrust is at or below the lower boundary of the sliding mass. A value of 1.000+ for h/H indicates that the line of thrust is at or above the upper boundary of the sliding mass.

↑

Table 2 - Geometry Data on the 44 Slices

Slice No.	Width (ft)	Height (ft)	X-Cntr (ft)	Y-Cntr-Base (ft)	Y-Cntr-Top (ft)	Alpha (deg)	Beta (deg)	Base Length (ft)
1	1.95	1.01	61.23	387.61	388.62	-27.92	26.57	2.21

2	4.80	4.76	64.61	385.54	390.31	-32.82	26.57	5.72
3	4.80	10.26	69.42	382.45	392.71	-32.82	26.57	5.72
4	3.00	14.73	73.32	379.93	394.66	-32.82	26.57	3.57
5	4.59	17.17	77.11	379.39	396.56	10.46	26.57	4.67
6	4.59	18.62	81.70	380.23	398.85	10.46	26.57	4.67
7	4.80	18.90	86.40	381.10	400.00	10.46	0.00	4.88
8	4.80	18.01	91.20	381.99	400.00	10.46	0.00	4.88
9	4.80	17.13	96.00	382.87	400.00	10.46	0.00	4.88
10	4.80	16.24	100.80	383.76	400.00	10.46	0.00	4.88
11	4.80	15.36	105.60	384.64	400.00	10.46	0.00	4.88
12	5.17	15.56	110.58	385.56	401.12	10.46	23.53	5.25
13	5.17	16.86	115.75	386.52	403.38	10.46	23.53	5.25
14	5.17	18.16	120.92	387.47	405.62	10.46	23.53	5.25
15	5.17	19.45	126.08	388.42	407.88	10.46	23.53	5.25
16	5.17	20.75	131.25	389.38	410.12	10.46	23.53	5.25
17	5.17	22.04	136.42	390.33	412.38	10.46	23.53	5.25
18	5.17	23.34	141.58	391.28	414.62	10.46	23.53	5.25
19	5.17	24.64	146.75	392.24	416.88	10.46	23.53	5.25
20	5.17	25.93	151.92	393.19	419.12	10.46	23.53	5.25
21	5.17	27.23	157.08	394.14	421.38	10.46	23.53	5.25
22	5.17	28.53	162.25	395.10	423.62	10.46	23.53	5.25
23	5.17	29.82	167.42	396.05	425.88	10.46	23.53	5.25
24	4.00	30.10	172.00	396.90	427.00	10.46	0.00	4.07
25	4.00	29.37	176.00	397.63	427.00	10.46	0.00	4.07
26	4.72	29.82	180.36	398.44	428.26	10.46	28.02	4.80
27	4.72	31.46	185.09	399.31	430.77	10.46	28.02	4.80
28	4.72	33.10	189.81	400.18	433.29	10.46	28.02	4.80
29	4.72	34.75	194.53	401.05	435.80	10.46	28.02	4.80
30	4.72	36.39	199.26	401.93	438.31	10.46	28.02	4.80
31	4.72	38.03	203.98	402.80	440.83	10.46	28.02	4.80
32	4.75	37.21	208.72	406.14	443.35	50.70	28.02	7.50
33	4.75	33.94	213.47	411.94	445.88	50.70	28.02	7.50
34	4.69	30.62	218.19	417.77	448.39	51.32	28.02	7.50
35	4.69	27.26	222.87	423.62	450.88	51.32	28.02	7.50
36	3.67	24.72	227.05	428.39	453.11	45.05	28.02	5.20
37	3.67	22.99	230.73	432.07	455.06	45.05	28.02	5.20
38	3.25	21.37	234.19	435.54	456.91	45.05	28.02	4.60
39	4.18	19.45	237.91	439.43	458.89	47.29	28.02	6.17
40	2.99	16.68	241.50	443.32	460.00	47.29	0.00	4.42

41	2.99	13.43	244.49	446.57	460.00	47.29	0.00	4.42
42	5.12	9.07	248.55	450.93	460.00	46.92	0.00	7.50
43	5.12	3.59	253.67	456.41	460.00	46.92	0.00	7.50
44	0.66	0.43	256.57	459.57	460.00	52.24	0.00	1.08



Table 2A - Coordinates of Slice Points Defining the Slip Surface

Point No.	X-Pt (ft)	Y-Pt (ft)
1	60.257545	388.128772
2	62.211895	387.093284
3	67.014846	383.995322
4	71.817798	380.897359
5	74.817200	378.962708
6	79.408600	379.809998
7	84.000000	380.657289
8	88.800000	381.543074
9	93.600000	382.428859
10	98.400000	383.314645
11	103.200000	384.200430
12	108.000000	385.086215
13	113.166667	386.039665
14	118.333333	386.993114
15	123.500000	387.946563
16	128.666667	388.900013
17	133.833333	389.853462
18	139.000000	390.806912
19	144.166667	391.760361
20	149.333333	392.713811
21	154.500000	393.667260
22	159.666667	394.620709
23	164.833333	395.574159
24	170.000000	396.527608
25	174.000000	397.265763
26	178.000000	398.003917

27	182.723796	398.875640
28	187.447591	399.747362
29	192.171387	400.619085
30	196.895182	401.490808
31	201.618978	402.362530
32	206.342773	403.234253
33	211.093152	409.038037
34	215.843530	414.841821
35	220.531029	420.696508
36	225.218527	426.551195
37	228.891303	430.230313
38	232.564078	433.909430
39	235.815976	437.166943
40	240.000000	441.700130
41	242.994790	444.944839
42	245.989579	448.189548
43	251.112358	453.667426
44	256.235137	459.145303
45	256.897193	460.000000



Table 3 - Force and Pore Pressure Data On The 44 Slices (Excluding Reinforcement)

Slice No.	Weight (lbs)	Ubeta Force	Ubeta Stress	Ualpha Force	Pore Pressure (psf)	-Uw (psf)	Earthquake Force		Distributed Load (psf)
		Top (lbs)	Top (psf)	Bot (lbs)			Horiz (lbs)	Vert (lbs)	
1	236.0	0.0	0.0	0.0	0.00	0.00	0.0	0.0	0.00
2	2744.8	0.0	0.0	0.0	0.00	0.00	0.0	0.0	0.00
3	5914.4	0.0	0.0	0.0	0.00	0.00	0.0	0.0	0.00
4	5301.3	0.0	0.0	0.0	0.00	0.00	0.0	0.0	0.00
5	9460.2	0.0	0.0	0.0	0.00	0.00	0.0	0.0	0.00
6	10258.2	0.0	0.0	0.0	0.00	0.00	0.0	0.0	0.00
7	10886.3	0.0	0.0	0.0	0.00	0.00	0.0	0.0	0.00
8	10376.1	0.0	0.0	0.0	0.00	0.00	0.0	0.0	0.00
9	9865.9	0.0	0.0	0.0	0.00	0.00	0.0	0.0	0.00
10	9355.7	0.0	0.0	0.0	0.00	0.00	0.0	0.0	0.00
11	8845.4	0.0	0.0	0.0	0.00	0.00	0.0	0.0	0.00

12	9648.5	0.0	0.0	0.0	0.00	0.00	0.0	0.0	0.00
13	10452.3	0.0	0.0	0.0	0.00	0.00	0.0	0.0	0.00
14	11256.2	0.0	0.0	0.0	0.00	0.00	0.0	0.0	0.00
15	12060.1	0.0	0.0	0.0	0.00	0.00	0.0	0.0	0.00
16	12863.9	0.0	0.0	0.0	0.00	0.00	0.0	0.0	0.00
17	13667.8	0.0	0.0	0.0	0.00	0.00	0.0	0.0	0.00
18	14471.6	0.0	0.0	0.0	0.00	0.00	0.0	0.0	0.00
19	15275.5	0.0	0.0	0.0	0.00	0.00	0.0	0.0	0.00
20	16079.4	0.0	0.0	0.0	0.00	0.00	0.0	0.0	0.00
21	16883.2	0.0	0.0	0.0	0.00	0.00	0.0	0.0	0.00
22	17687.1	0.0	0.0	0.0	0.00	0.00	0.0	0.0	0.00
23	18491.0	0.0	0.0	0.0	0.00	0.00	0.0	0.0	0.00
24	14449.6	0.0	0.0	0.0	0.00	0.00	0.0	0.0	0.00
25	14095.3	0.0	0.0	0.0	0.00	0.00	0.0	0.0	0.00
26	16902.1	0.0	0.0	0.0	0.00	0.00	0.0	0.0	0.00
27	17833.2	0.0	0.0	0.0	0.00	0.00	0.0	0.0	0.00
28	18764.3	0.0	0.0	0.0	0.00	0.00	0.0	0.0	0.00
29	19695.4	0.0	0.0	0.0	0.00	0.00	0.0	0.0	0.00
30	20626.5	0.0	0.0	0.0	0.00	0.00	0.0	0.0	0.00
31	21557.6	0.0	0.0	0.0	0.00	0.00	0.0	0.0	0.00
32	21213.5	0.0	0.0	0.0	0.00	0.00	0.0	0.0	0.00
33	19346.4	0.0	0.0	0.0	0.00	0.00	0.0	0.0	0.00
34	17224.2	0.0	0.0	0.0	0.00	0.00	0.0	0.0	0.00
35	15334.4	0.0	0.0	0.0	0.00	0.00	0.0	0.0	0.00
36	10894.5	0.0	0.0	0.0	0.00	0.00	0.0	0.0	0.00
37	10134.6	0.0	0.0	0.0	0.00	0.00	0.0	0.0	0.00
38	8338.9	0.0	0.0	0.0	0.00	0.00	0.0	0.0	0.00
39	9767.0	0.0	0.0	0.0	0.00	0.00	0.0	0.0	0.00
40	5993.5	0.0	0.0	0.0	0.00	0.00	0.0	0.0	0.00
41	4827.4	0.0	0.0	0.0	0.00	0.00	0.0	0.0	0.00
42	5576.6	0.0	0.0	0.0	0.00	0.00	0.0	0.0	0.00
43	2209.1	0.0	0.0	0.0	0.00	0.00	0.0	0.0	0.00
44	34.0	0.0	0.0	0.0	0.00	0.00	0.0	0.0	0.00

TOTAL WEIGHT OF SLIDING MASS = 526899.03(lbs)

EFFECTIVE WEIGHT OF SLIDING MASS = 526899.03(lbs)

TOTAL AREA OF SLIDING MASS = 4390.83(ft2)



TABLE 4 - SOIL STRENGTH & SOIL OPTIONS DATA ON THE 44 SLICES

Slice No.	Soil Type	Cohesion (psf)	Phi(Deg)	Options
1	1	200.00	31.00	
2	1	200.00	31.00	
3	1	200.00	31.00	
4	2	200.00	34.00	A
5	2	200.00	24.00	A
6	2	200.00	24.00	A
7	2	200.00	24.00	A
8	2	200.00	24.00	A
9	2	200.00	24.00	A
10	2	200.00	24.00	A
11	2	200.00	24.00	A
12	2	200.00	24.00	A
13	2	200.00	24.00	A
14	2	200.00	24.00	A
15	2	200.00	24.00	A
16	2	200.00	24.00	A
17	2	200.00	24.00	A
18	2	200.00	24.00	A
19	2	200.00	24.00	A
20	2	200.00	24.00	A
21	2	200.00	24.00	A
22	2	200.00	24.00	A
23	2	200.00	24.00	A
24	2	200.00	24.00	A
25	2	200.00	24.00	A
26	2	200.00	24.00	A
27	2	200.00	24.00	A
28	2	200.00	24.00	A
29	2	200.00	24.00	A
30	2	200.00	24.00	A
31	2	200.00	24.00	A
32	2	200.00	24.00	A

33	2	200.00	24.00	A
34	2	200.00	24.00	A
35	2	200.00	24.00	A
36	2	200.00	24.00	A
37	2	200.00	24.00	A
38	1	200.00	31.00	
39	1	200.00	31.00	
40	1	200.00	31.00	
41	1	200.00	31.00	
42	1	200.00	31.00	
43	1	200.00	31.00	
44	1	200.00	31.00	

SOIL OPTIONS:

A = ANISOTROPIC SHEAR STRENGTH

C = CURVED STRENGTH ENVELOPE (TANGENT PHI & C)

F = FIBER-REINFORCED SOIL (FRS)

M = INDEPENDENT MULTI-STAGE SHEAR STRENGTH

N = NONLINEAR UNDRAINED SHEAR STRENGTH

R = RAPID DRAWDOWN OR RAPID LOADING (SEISMIC) SHEAR STRENGTH

S = SHANSEP UNDRAINED SHEAR STRENGTH

NOTE: Phi and C in Table 4 are modified values based on specified Soil Options (if any).



TABLE 5 - Total Base Stress Data on the 44 Slices

Slice No. *	Alpha (deg)	X-Coord. Slice Cntr (ft)	Base Leng. (ft)	Total Normal Stress (psf)	Total Vert. Stress (psf)	Total Normal/Vert. Stress Ratio
1	-27.92	61.23	2.21	367.53	120.76	3.043
2	-32.82	64.61	5.72	1349.98	571.49	2.362
3	-32.82	69.42	5.72	2674.63	1231.42	2.172
4	-32.82	73.32	3.57	4053.37	1767.45	2.293
5	10.46	77.11	4.67	2017.53	2060.41	0.979
6	10.46	81.70	4.67	2186.66	2234.22	0.979

7	10.46	86.40	4.88	2219.50	2267.98	0.979
8	10.46	91.20	4.88	2116.08	2161.68	0.979
9	10.46	96.00	4.88	2012.65	2055.39	0.979
10	10.46	100.80	4.88	1909.22	1949.10	0.980
11	10.46	105.60	4.88	1805.79	1842.80	0.980
12	10.46	110.58	5.25	1829.77	1867.45	0.980
13	10.46	115.75	5.25	1981.16	2023.03	0.979
14	10.46	120.92	5.25	2132.55	2178.62	0.979
15	10.46	126.08	5.25	2283.95	2334.21	0.978
16	10.46	131.25	5.25	2435.34	2489.79	0.978
17	10.46	136.42	5.25	2586.73	2645.38	0.978
18	10.46	141.58	5.25	2738.12	2800.96	0.978
19	10.46	146.75	5.25	2889.51	2956.55	0.977
20	10.46	151.92	5.25	3040.90	3112.14	0.977
21	10.46	157.08	5.25	3192.30	3267.72	0.977
22	10.46	162.25	5.25	3343.69	3423.31	0.977
23	10.46	167.42	5.25	3495.08	3578.89	0.977
24	10.46	172.00	4.07	3527.68	3612.40	0.977
25	10.46	176.00	4.07	3441.49	3523.82	0.977
26	10.46	180.36	4.80	3494.29	3578.08	0.977
27	10.46	185.09	4.80	3686.08	3775.19	0.976
28	10.46	189.81	4.80	3877.87	3972.30	0.976
29	10.46	194.53	4.80	4069.67	4169.40	0.976
30	10.46	199.26	4.80	4261.46	4366.51	0.976
31	10.46	203.98	4.80	4453.25	4563.62	0.976
32	50.70	208.72	7.50	2745.05	4465.65	0.615
33	50.70	213.47	7.50	2498.08	4072.61	0.613
34	51.32	218.19	7.50	2225.40	3674.50	0.606
35	51.32	222.87	7.50	1974.40	3271.33	0.604
36	45.05	227.05	5.20	1965.27	2966.29	0.663
37	45.05	230.73	5.20	1824.69	2759.38	0.661
38	45.05	234.19	4.60	1628.69	2564.33	0.635
39	47.29	237.91	6.17	1424.96	2334.36	0.610
40	47.29	241.50	4.42	1214.21	2001.30	0.607
41	47.29	244.49	4.42	967.84	1611.94	0.600
42	46.92	248.55	7.50	641.22	1088.58	0.589
43	46.92	253.67	7.50	222.94	431.24	0.517
44	52.24	256.57	1.08	-31.06	51.28	-0.606



TABLE 5A - Total Base Force Data on the 44 Slices

Slice No. *	Alpha (deg)	X-Coord. Slice Cntr (ft)	Base Leng. (ft)	Total Normal Force (lbs)	Total Vert. Force (lbs)	Total Normal/Vert. Force Ratio
1	-27.92	61.23	2.21	812.87	236.01	3.444
2	-32.82	64.61	5.72	7715.66	2744.82	2.811
3	-32.82	69.42	5.72	15286.54	5914.44	2.585
4	-32.82	73.32	3.57	14467.33	5301.28	2.729
5	10.46	77.11	4.67	9419.71	9460.17	0.996
6	10.46	81.70	4.67	10209.34	10258.20	0.995
7	10.46	86.40	4.88	10833.51	10886.30	0.995
8	10.46	91.20	4.88	10328.67	10376.08	0.995
9	10.46	96.00	4.88	9823.83	9865.87	0.996
10	10.46	100.80	4.88	9318.99	9355.66	0.996
11	10.46	105.60	4.88	8814.15	8845.45	0.996
12	10.46	110.58	5.25	9613.45	9648.48	0.996
13	10.46	115.75	5.25	10408.84	10452.34	0.996
14	10.46	120.92	5.25	11204.24	11256.20	0.995
15	10.46	126.08	5.25	11999.64	12060.06	0.995
16	10.46	131.25	5.25	12795.03	12863.92	0.995
17	10.46	136.42	5.25	13590.43	13667.78	0.994
18	10.46	141.58	5.25	14385.82	14471.65	0.994
19	10.46	146.75	5.25	15181.22	15275.51	0.994
20	10.46	151.92	5.25	15976.62	16079.37	0.994
21	10.46	157.08	5.25	16772.01	16883.23	0.993
22	10.46	162.25	5.25	17567.41	17687.09	0.993
23	10.46	167.42	5.25	18362.81	18490.95	0.993
24	10.46	172.00	4.07	14348.97	14449.59	0.993
25	10.46	176.00	4.07	13998.39	14095.28	0.993
26	10.46	180.36	4.80	16785.01	16902.13	0.993
27	10.46	185.09	4.80	17706.30	17833.23	0.993
28	10.46	189.81	4.80	18627.59	18764.32	0.993
29	10.46	194.53	4.80	19548.87	19695.41	0.993
30	10.46	199.26	4.80	20470.16	20626.50	0.992
31	10.46	203.98	4.80	21391.45	21557.59	0.992

32	50.70	208.72	7.50	20587.91	21213.52	0.971
33	50.70	213.47	7.50	18735.61	19346.42	0.968
34	51.32	218.19	7.50	16690.50	17224.22	0.969
35	51.32	222.87	7.50	14808.01	15334.37	0.966
36	45.05	227.05	5.20	10216.58	10894.53	0.938
37	45.05	230.73	5.20	9485.78	10134.60	0.936
38	45.05	234.19	4.60	7496.64	8338.94	0.899
39	47.29	237.91	6.17	8790.48	9767.00	0.900
40	47.29	241.50	4.42	5361.40	5993.48	0.895
41	47.29	244.49	4.42	4273.52	4827.41	0.885
42	46.92	248.55	7.50	4809.16	5576.56	0.862
43	46.92	253.67	7.50	1672.03	2209.13	0.757
44	52.24	256.57	1.08	-33.58	33.95	-0.989

↑

TABLE 6 - Effective and Base Shear Stress Data on the 44 Slices

Slice No. *	Alpha (deg)	X-Coord. Slice Cntr (ft)	Base Leng. (ft)	Effective Normal Stress (psf)	Available Shear Strength (psf)	Mobilized Shear Stress (psf)
1	-27.92	61.23	2.21	367.53	420.83	223.33
2	-32.82	64.61	5.72	1349.98	1011.15	536.59
3	-32.82	69.42	5.72	2674.63	1807.08	958.97
4	-32.82	73.32	3.57	4053.37	2934.03	1557.02
5	10.46	77.11	4.67	2017.53	1098.26	582.82
6	10.46	81.70	4.67	2186.66	1173.56	622.78
7	10.46	86.40	4.88	2219.50	1188.19	630.54
8	10.46	91.20	4.88	2116.08	1142.14	606.10
9	10.46	96.00	4.88	2012.65	1096.09	581.67
10	10.46	100.80	4.88	1909.22	1050.04	557.23
11	10.46	105.60	4.88	1805.79	1003.99	532.79
12	10.46	110.58	5.25	1829.77	1014.67	538.46
13	10.46	115.75	5.25	1981.16	1082.07	574.23
14	10.46	120.92	5.25	2132.55	1149.47	610.00
15	10.46	126.08	5.25	2283.95	1216.88	645.77
16	10.46	131.25	5.25	2435.34	1284.28	681.54
17	10.46	136.42	5.25	2586.73	1351.69	717.31

18	10.46	141.58	5.25	2738.12	1419.09	753.08
19	10.46	146.75	5.25	2889.51	1486.49	788.84
20	10.46	151.92	5.25	3040.90	1553.90	824.61
21	10.46	157.08	5.25	3192.30	1621.30	860.38
22	10.46	162.25	5.25	3343.69	1688.71	896.15
23	10.46	167.42	5.25	3495.08	1756.11	931.92
24	10.46	172.00	4.07	3527.68	1770.62	939.63
25	10.46	176.00	4.07	3441.49	1732.25	919.26
26	10.46	180.36	4.80	3494.29	1755.76	931.74
27	10.46	185.09	4.80	3686.08	1841.15	977.05
28	10.46	189.81	4.80	3877.87	1926.54	1022.37
29	10.46	194.53	4.80	4069.67	2011.93	1067.68
30	10.46	199.26	4.80	4261.46	2097.32	1113.00
31	10.46	203.98	4.80	4453.25	2182.72	1158.31
32	50.70	208.72	7.50	2745.05	1422.18	754.71
33	50.70	213.47	7.50	2498.08	1312.22	696.36
34	51.32	218.19	7.50	2225.40	1190.81	631.93
35	51.32	222.87	7.50	1974.40	1079.06	572.63
36	45.05	227.05	5.20	1965.27	1074.99	570.47
37	45.05	230.73	5.20	1824.69	1012.40	537.26
38	45.05	234.19	4.60	1628.69	1178.62	625.46
39	47.29	237.91	6.17	1424.96	1056.20	560.50
40	47.29	241.50	4.42	1214.21	929.57	493.30
41	47.29	244.49	4.42	967.84	781.54	414.74
42	46.92	248.55	7.50	641.22	585.28	310.60
43	46.92	253.67	7.50	222.94	333.95	177.22
44	52.24	256.57	1.08	-31.06	181.34	96.23

↑

TABLE 6A - Effective and Base Shear Force Data on the 44 Slices

Slice No. *	Alpha (deg)	X-Coord. Slice Cntr (ft)	Base Leng. (ft)	Effective Normal Force (lbs)	Available Shear Force (lbs)	Mobilized Shear Force (lbs)
1	-27.92	61.23	2.21	812.87	930.76	493.93
2	-32.82	64.61	5.72	7715.66	5779.11	3066.83
3	-32.82	69.42	5.72	15286.54	10328.16	5480.90

4	-32.82	73.32	3.57	14467.33	10472.18	5557.32
5	10.46	77.11	4.67	9419.71	5127.71	2721.15
6	10.46	81.70	4.67	10209.34	5479.27	2907.71
7	10.46	86.40	4.88	10833.51	5799.60	3077.70
8	10.46	91.20	4.88	10328.67	5574.83	2958.42
9	10.46	96.00	4.88	9823.83	5350.06	2839.14
10	10.46	100.80	4.88	9318.99	5125.29	2719.86
11	10.46	105.60	4.88	8814.15	4900.52	2600.58
12	10.46	110.58	5.25	9613.45	5330.96	2829.01
13	10.46	115.75	5.25	10408.84	5685.10	3016.94
14	10.46	120.92	5.25	11204.24	6039.23	3204.87
15	10.46	126.08	5.25	11999.64	6393.36	3392.80
16	10.46	131.25	5.25	12795.03	6747.50	3580.73
17	10.46	136.42	5.25	13590.43	7101.63	3768.66
18	10.46	141.58	5.25	14385.82	7455.76	3956.59
19	10.46	146.75	5.25	15181.22	7809.90	4144.52
20	10.46	151.92	5.25	15976.62	8164.03	4332.45
21	10.46	157.08	5.25	16772.01	8518.16	4520.37
22	10.46	162.25	5.25	17567.41	8872.30	4708.30
23	10.46	167.42	5.25	18362.81	9226.43	4896.23
24	10.46	172.00	4.07	14348.97	7202.08	3821.96
25	10.46	176.00	4.07	13998.39	7045.99	3739.13
26	10.46	180.36	4.80	16785.01	8433.88	4475.65
27	10.46	185.09	4.80	17706.30	8844.06	4693.32
28	10.46	189.81	4.80	18627.59	9254.25	4911.00
29	10.46	194.53	4.80	19548.87	9664.43	5128.67
30	10.46	199.26	4.80	20470.16	10074.61	5346.34
31	10.46	203.98	4.80	21391.45	10484.80	5564.02
32	50.70	208.72	7.50	20587.91	10666.33	5660.35
33	50.70	213.47	7.50	18735.61	9841.63	5222.71
34	51.32	218.19	7.50	16690.50	8931.09	4739.51
35	51.32	222.87	7.50	14808.01	8092.95	4294.73
36	45.05	227.05	5.20	10216.58	5588.43	2965.64
37	45.05	230.73	5.20	9485.78	5263.05	2792.97
38	45.05	234.19	4.60	7496.64	5425.00	2878.91
39	47.29	237.91	6.17	8790.48	6515.64	3457.69
40	47.29	241.50	4.42	5361.40	4104.56	2178.19
41	47.29	244.49	4.42	4273.52	3450.90	1831.30
42	46.92	248.55	7.50	4809.16	4389.63	2329.47

43	46.92	253.67	7.50	1672.03	2504.66	1329.16
44	52.24	256.57	1.08	-33.58	196.05	104.04

Average Effective Normal Stress = 2381.3459(psf)
 Average Available Shear Strength = 1313.3673(psf)
 Total Length of Failure Surface = 227.0392(ft)

INPUT PARAMETERS FOR SIMPLIFIED 3D ANALYSIS

Composite Phi (deg)= 28.878
 3D Depth (Vertical difference between ends of Slip Surface) = 71.87(ft)
 L/D(1): L = 71.87(ft) L/D(2): L = 143.74(ft) L/D(3): L = 215.61(ft)
 L/D(4): L = 287.48(ft) L/D(5): L = 359.36(ft) L/D(6): L = 431.23(ft)

SUM OF MOMENTS = -0.709305E-01 (ft/lbs); Imbalance (Fraction of Total Weight) = -0.1346188E-06
 SUM OF FORCES = -.138636E-03 (lbs); Imbalance (Fraction of Total Weight) = -0.2631160E-09

Sum of Available Shear Forces = 298185.85(lbs)

Sum of Mobilized Shear Forces = 158239.76(lbs)

FS Balance Check: FS = 1.884393

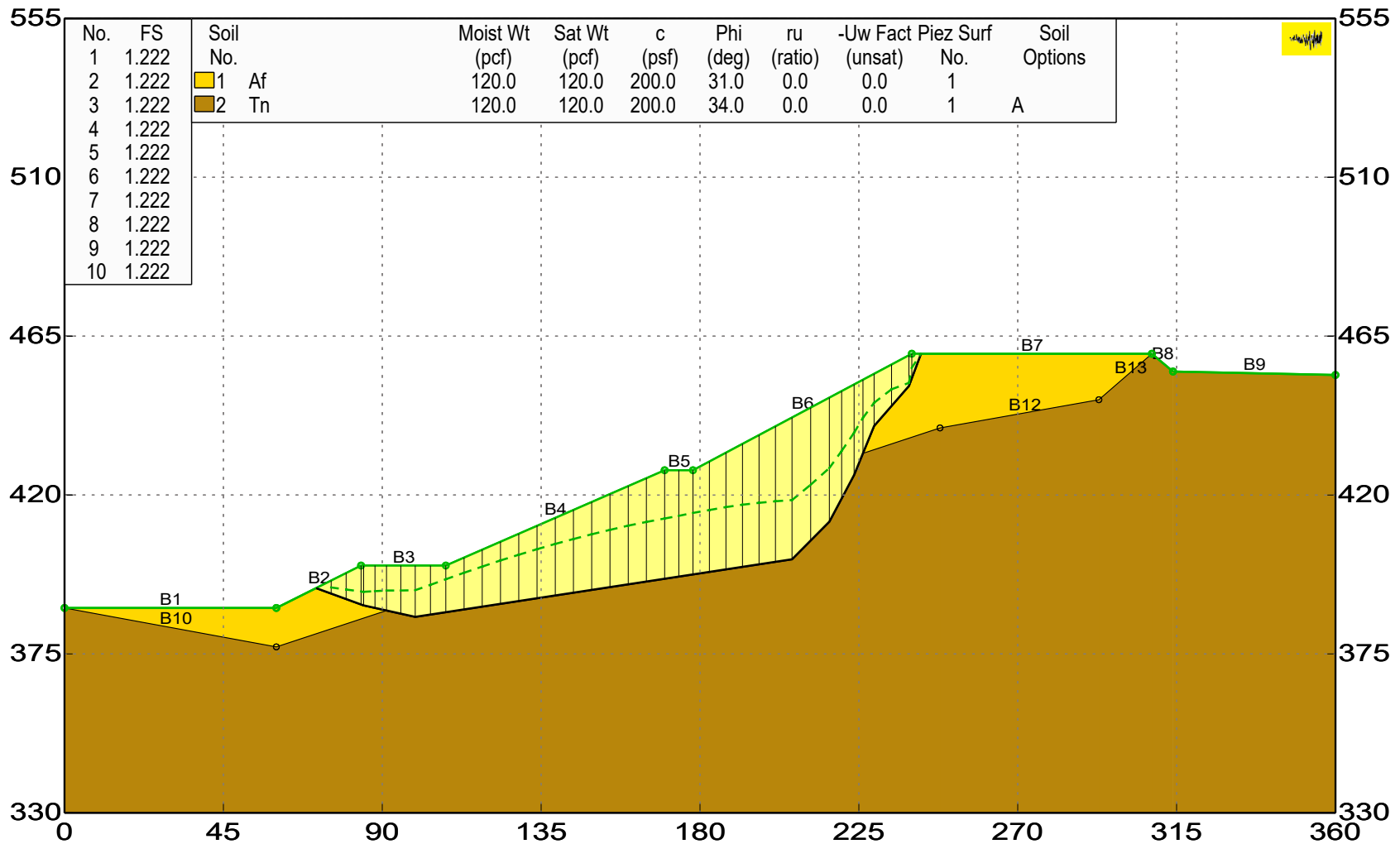
**** END OF GEOSTASE OUTPUT ****

X-Section B-B' - Freedom Lane

Global Stability of Existing Slope - Pseudo Static

SA Geotechnical, Inc., RS

\01p.gsd



GEOSTASE FS = 1.222

Spencer Method

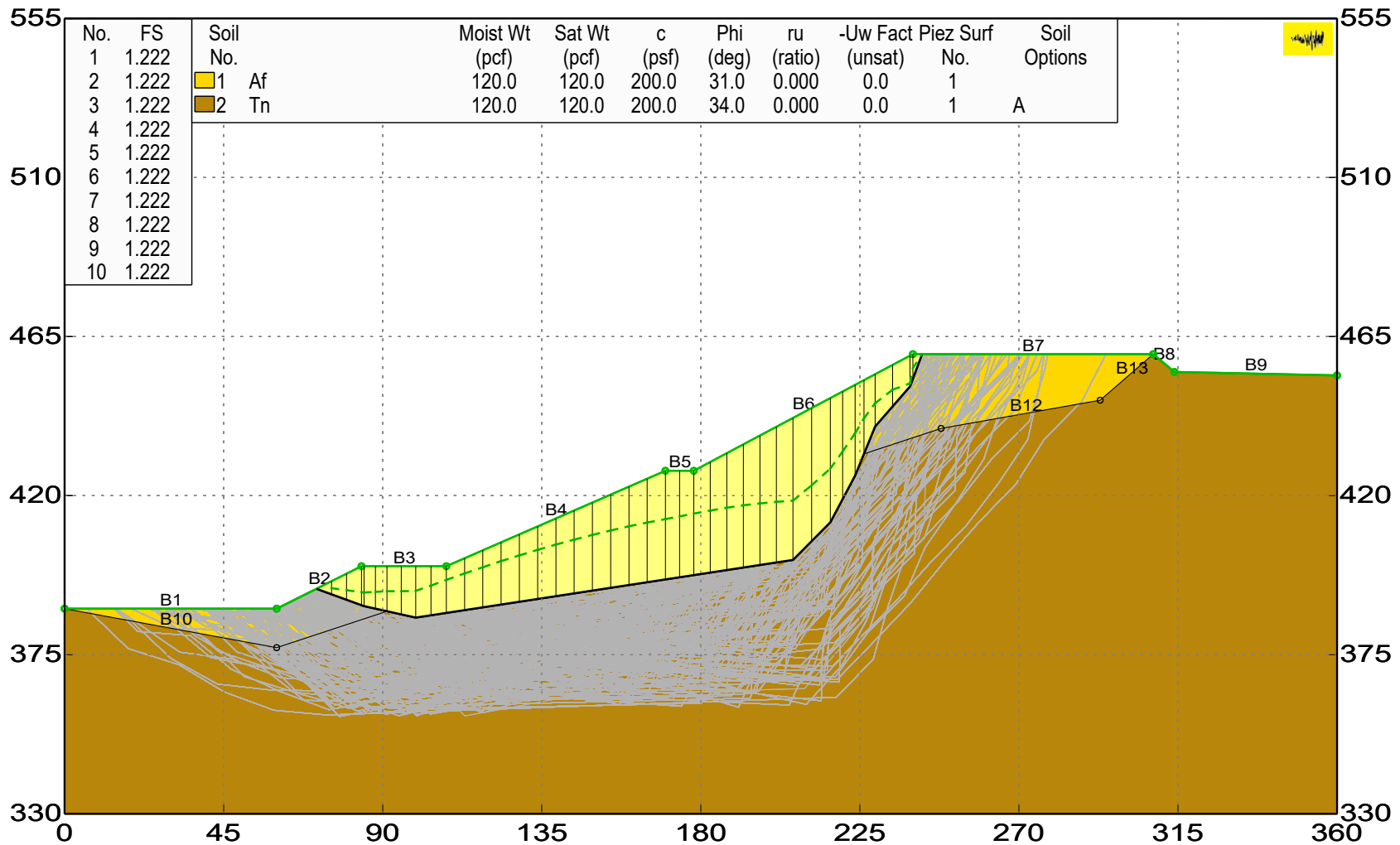
kh = 0.22000

X-Section B-B' - Freedom Lane

Global Stability of Existing Slope - Pseudo Static

SA Geotechnical, Inc., RS

\01p.gsd



GEOSTASE FS = 1.222

Spencer Method

kh = 0.22000

*** GEOSTASE(R) ***

** GEOSTASE(R) (c)Copyright by Garry H. Gregory, Ph.D.,P.E.,S.E.,BC.GE **

** Current Version 4.30.32-Double Precision, Sept 2023 **
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SLOPE STABILITY ANALYSIS SOFTWARE (2D & 3D)

Simplified Bishop, Simplified Janbu, or General Equilibrium (GE) Options.

(Spencer, Morgenstern-Price, USACE, and Lowe & Karafiath)

Including Pier/Pile, Planar Reinf, Nail, Tieback, Line Loads

Applied Forces, Fiber-Reinforced Soil (FRS), Distributed Loads

Nonlinear Undrained Shear Strength, Curved Strength Envelope,

Anisotropic Strengths, Water Surfaces, 3-Stage Rapid Drawdown

2- or 3-Stage Pseudo-Static & Simplified Newmark Seismic Analyses.

Analysis Date: 6/ 3/ 2024
Analysis Time:
Analysis By: SA Geotechnical, Inc., RS

Input File Name: C:\Users\Reza Saberi\SA Geotechnical, Inc\SA Geotechnical -
Projects\2024\24064-01 Meritage - 400-700 Freedom Ln, Aliso Viejo\Engineering\Sted\B-B'\01p.gsd

Output File Name: C:\Users\Reza Saberi\SA Geotechnical, Inc\SA Geotechnical -
Projects\2024\24064-01 Meritage - 400-700 Freedom Ln, Aliso Viejo\Engineering\Sted\B-B'\01p.OUT

Unit System: English

PROJECT: X-Section B-B' - Freedom Lane

DESCRIPTION: Global Stability of Existing Slope - Pseudo Static

PROFILE BOUNDARY DATA

9 Surface Boundaries
13 Total Boundaries

Boundary No.	X - 1 (ft)	Y - 1 (ft)	X - 2 (ft)	Y - 2 (ft)	Soil Type Below Bnd
1	0.000	388.000	60.000	388.000	1
2	60.000	388.000	84.000	400.000	1
3	84.000	400.000	108.000	400.000	1
4	108.000	400.000	170.000	427.000	1
5	170.000	427.000	178.000	427.000	1
6	178.000	427.000	240.000	460.000	1
7	240.000	460.000	308.000	460.000	1
8	308.000	460.000	314.000	455.000	2
9	314.000	455.000	360.000	454.000	2
10	0.000	388.000	60.000	377.000	2
11	60.000	377.000	248.000	439.000	2
12	248.000	439.000	293.000	447.000	2
13	293.000	447.000	308.000	460.000	2

User Specified X-Origin = 0.000(ft)

User Specified Y-Origin = 330.000(ft)

SURFACE BOUNDARY POINT COORDINATES (Information Only-Not Used Directly)

Point No.	X-COORD	Y-COORD
1	0.000	388.000
2	60.000	388.000
3	84.000	400.000
4	108.000	400.000
5	170.000	427.000
6	178.000	427.000
7	240.000	460.000
8	308.000	460.000
9	314.000	455.000

10 360.000 454.000

SUBSURFACE BOUNDARY POINT COORDINATES

(Information Only-Not Used Directly)

Point No.	X-COORD	Y-COORD
Surface boundary point 11	0.000	388.000
12	60.000	377.000
13	248.000	439.000
14	293.000	447.000
Surface boundary point 15	308.000	460.000

1 and Subsurface boundary point 11 are duplicate points.
8 and Subsurface boundary point 15 are duplicate points.

PROFILE BOUNDARY SLOPES AND ANGLES

BND No.	Slope	Angle(Deg.)
1	0.000	0.000
2	0.500	26.565
3	0.000	0.000
4	0.435	23.532
5	0.000	0.000
6	0.532	28.025
7	0.000	0.000
8	-0.833	-39.806
9	-0.022	-1.245
10	-0.183	-10.389
11	0.330	18.252
12	0.178	10.081
13	0.867	40.914

MOHR-COULOMB SOIL PARAMETERS

2 Type(s) of Soil Defined

Soil Number and Description	Moist Unit Wt. (pcf)	Saturated Unit Wt. (pcf)	Cohesion Intercept (psf)	Friction Angle (deg)	Pore Pressure Ratio(ru)	(-Uw) Fact.	Water Surface No.	Water Option
1 Af	120.0	120.0	200.00	31.00	0.000	0.0	1	0

2 Tn	120.0	120.0	200.00	34.00	0.000	0.0	1	0
------	-------	-------	--------	-------	-------	-----	---	---

ANISOTROPIC STRENGTH PARAMETERS

1 soil type(s)

Soil Type 2 Is Anisotropic

Number Of Direction Ranges Specified = 3

Direction Range No.	Counterclockwise Direction Limit (deg)	Cohesion Intercept (psf)	Friction Angle (deg)
1	-5.0	200.00	34.00
2	8.0	200.00	28.00
3	90.0	200.00	24.00

SEISMIC (EARTHQUAKE) DATA

Specified Peak Ground Acceleration Coefficient (PGA) = 0.220(g)

Default Velocity = 1.100(ft) per second

Specified Horizontal Earthquake Coefficient (kh) = 0.22000(g)

Specified Vertical Earthquake Coefficient (k_v) = 0.000(g)

(NOTE: Input Velocity = 0.0 will result in default Peak

Velocity = 2 times(PGA) times 2.5 fps or 0.762 mps)

Specified Seismic Pore-Pressure Factor = 0.000

Horizontal Seismic Force is Applied at Center of Gravity of Slices

A Non-Circular Zone Search Has Been Selected For Analysis

Using Random Generation Within Specified Zones.

2 Zones Defined For Generation Of Non-Circular Surfaces

4000 Trial Surfaces Have Been Generated.

Length Of Line Segments For Active And Passive Portions Of
Non-Circular Zone Search = 15.00(ft)

Zone No.	X - 1 (ft)	Y - 1 (ft)	X - 2 (ft)	Y - 2 (ft)	Height (ft)
1	70.00	375.00	125.00	375.00	35.00
2	140.00	385.00	220.00	385.00	50.00

The Spencer Method Was Selected for FS Analysis.

Selected fx function = Constant (1.0)

SELECTED CONVERGENCE PARAMETERS FOR SPENCER METHOD:

Initial estimate of FS = 1.500

FS tolerance = 0.000001000

Initial estimate of theta(deg) = 15.00

Theta tolerance(radians) = 0.0001000

Minimum theta(deg) = -45.00 ; Maximum theta(deg) = 45.00

Theta convergence Step Factor = 5000.00

Maximum number of iterations = 50

Allowable negative side force = -1000.0(lbs)

Maximum force imbalance = 100.000000(lbs)

Maximum moment imbalance = 100.000000 (ft/lbs)

Selected Lambda Coefficient = 1.00

Specified Tension Crack Water Depth Factor = 0.000

Total Number of Trial Surfaces Attempted = 4000

WARNING! The Factor of Safety Calculation for one or More Trial Surfaces
Did Not Converge in 50 Iterations.

Number of Trial Surfaces with Non-Converged FS = 957

Number of Trial Surfaces With Valid FS = 3043

Percentage of Trial Surfaces With Non-Converged and/or
Non-Valid FS Solutions of the Total Attempted = 23.9 %

Statistical Data On All Valid FS Values:

FS Max = 7.305 FS Min = 1.222 FS Ave = 2.338
Standard Deviation = 0.719 Coefficient of Variation = 30.74 %

Critical Surface is Sequence Number 148 of Those Analyzed.

*****BEGINNING OF DETAILED GEOSTASE OUTPUT FOR CRITICAL SURFACE FROM A SEARCH*****

Iter. No.	Theta (deg) (fx=1.0)	FS (Moment)	FS (Force)	Lambda	Delta FS
1	15.0000	1.348413	1.141704	0.268	0.2067092E+00
2	19.9500	1.304609	1.185213	0.363	0.1193963E+00
3	26.7175	1.017047	1.258643	0.503	0.2415957E+00
4	22.1879	1.261483	1.207332	0.408	0.5415105E-01
5	23.0180	1.238678	1.216021	0.425	0.2265762E-01
6	23.6151	1.218998	1.222450	0.437	0.3452577E-02
7	23.5362	1.221783	1.221591	0.436	0.1919497E-03
8	23.5403	1.221638	1.221637	0.436	0.9067323E-06

Factor Of Safety For The Preceding Specified Surface = 1.222
Theta (fx = 1.0) = 23.54 Deg Lambda = 0.436

The Spencer Method Has Been Selected For Analysis.

Selected fx function = Constant (1.0)

SELECTED CONVERGENCE PARAMETERS FOR ANALYSIS METHOD:
Initial estimate of FS = 1.500

FS tolerance = 0.000001000
 Initial estimate of theta(deg) = 15.00
 Theta tolerance(radians) = 0.0001000
 Minimum theta(deg) = -45.00 ; Maximum theta(deg) = 45.00
 Theta convergence Step Factor = 5000.00
 Maximum number of iterations = 50
 Maximum force imbalance = 100.000000(lbs)
 Maximum moment imbalance(if Applicable) = 100.000000 (ft/lbs)

Selected Lambda Coefficient = 1.00

Tension Crack Water Force = 0.00(lbs)

Specified Tension Crack Water Depth Factor = 0.000 (0.00% Filled)

Depth of Tension Crack (zo) at Side of Last Slice = 0.000(ft)

Depth of Water in Tension Crack = 0.000(ft)

Theoretical Tension Crack Depth = 5.892(ft)



NOTE: In Table 1 following, when a tension crack with water is present on the first slice (right facing slope) or on the last slice (left facing slope), the "side force" in the tension crack is set equal to the water pressure resultant.

*** Table 1 - Line of Thrust(if applicable) and Slice Force Data ***

Slice No.	X Coord.	Y Coord.	h/H	Side Force (lbs)	fx	Force Angle (Deg)	Vert. Shear Force(lbs)
1	75.53	393.80	0.463	3467.86	1.000	23.54	1385.0
2	79.77	393.23	0.366	10025.50	1.000	23.54	4004.1
3	84.00	392.67	0.334	19672.93	1.000	23.54	7857.3
4	84.70	392.57	0.340	21530.95	1.000	23.54	8599.3
5	87.95	392.76	0.396	27021.23	1.000	23.54	10792.1
6	91.20	392.94	0.444	32788.51	1.000	23.54	13095.6

7	95.27	392.96	0.483	41776.30	1.000	23.54	16685.2
8	99.34	393.04	0.521	51286.26	1.000	23.54	20483.5
9	103.67	394.58	0.609	51934.85	1.000	23.54	20742.5
10	108.00	396.14	0.708	52591.52	1.000	23.54	21004.8
11	113.17	397.97	0.708	53368.93	1.000	23.54	21315.3
12	118.33	399.74	0.705	54125.11	1.000	23.54	21617.3
13	123.50	401.45	0.698	54860.08	1.000	23.54	21910.8
14	128.67	403.08	0.689	55573.82	1.000	23.54	22195.9
15	133.83	404.64	0.678	56266.34	1.000	23.54	22472.5
16	139.00	406.13	0.665	56937.64	1.000	23.54	22740.6
17	144.17	407.55	0.650	57587.71	1.000	23.54	23000.2
18	149.33	408.88	0.633	58216.56	1.000	23.54	23251.4
19	154.50	410.13	0.616	58824.19	1.000	23.54	23494.1
20	159.67	411.30	0.597	59410.60	1.000	23.54	23728.3
21	164.83	412.37	0.577	59975.78	1.000	23.54	23954.0
22	170.00	413.36	0.556	60519.74	1.000	23.54	24171.3
23	174.00	414.11	0.572	60936.10	1.000	23.54	24337.5
24	178.00	414.90	0.590	61359.34	1.000	23.54	24506.6
25	182.68	415.79	0.562	61846.69	1.000	23.54	24701.2
26	187.36	416.57	0.534	62310.68	1.000	23.54	24886.5
27	192.03	417.24	0.505	62751.32	1.000	23.54	25062.5
28	196.71	417.80	0.476	63168.59	1.000	23.54	25229.2
29	201.39	418.24	0.447	63562.50	1.000	23.54	25386.5
30	206.07	418.55	0.417	63933.06	1.000	23.54	25534.5
31	211.35	422.91	0.420	49676.74	1.000	23.54	19840.6
32	216.63	427.65	0.433	36416.11	1.000	23.54	14544.4
33	220.15	432.46	0.441	25509.51	1.000	23.54	10188.4
34	223.66	437.63	0.466	16364.77	1.000	23.54	6536.0
35	226.15	441.89	0.485	10711.62	1.000	23.54	4278.2
36	229.33	446.13	0.444	6091.67	1.000	23.54	2433.0
37	234.26	449.98	0.405	2583.29	1.000	23.54	1031.8
38	239.18	451.77	0.100	134.16	1.000	23.54	53.6
39	240.00	455.99	0.420	-189.13	1.000	23.54	-75.5
40	242.58	460.00	0.000	0.09	1.000	23.54	-0.0

NOTE: A value of 0.000- for h/H indicates that the line of thrust is at or below the lower boundary of the sliding mass. A value of 1.000+ for h/H indicates that the line of thrust is at or above the upper boundary of the sliding mass.



Table 2 - Geometry Data on the 40 Slices

Slice No.	Width (ft)	Height (ft)	X-Cntr (ft)	Y-Cntr-Base (ft)	Y-Cntr-Top (ft)	Alpha (deg)	Beta (deg)	Base Length (ft)
1	4.23	1.83	73.41	392.87	394.71	-20.12	26.57	4.51
2	4.23	5.50	77.65	391.32	396.82	-20.12	26.57	4.51
3	4.23	9.17	81.88	389.77	398.94	-20.12	26.57	4.51
4	0.70	11.13	84.35	388.87	400.00	-20.12	0.00	0.74
5	3.25	11.62	86.32	388.38	400.00	-12.58	0.00	3.33
6	3.25	12.35	89.57	387.65	400.00	-12.58	0.00	3.33
7	4.07	13.16	93.23	386.84	400.00	-12.58	0.00	4.17
8	4.07	14.07	97.30	385.93	400.00	-12.58	0.00	4.17
9	4.33	14.19	101.50	385.81	400.00	8.69	0.00	4.38
10	4.33	13.53	105.83	386.47	400.00	8.69	0.00	4.38
11	5.17	13.93	110.58	387.19	401.12	8.69	23.53	5.23
12	5.17	15.39	115.75	387.98	403.38	8.69	23.53	5.23
13	5.17	16.85	120.92	388.77	405.62	8.69	23.53	5.23
14	5.17	18.31	126.08	389.56	407.88	8.69	23.53	5.23
15	5.17	19.77	131.25	390.35	410.12	8.69	23.53	5.23
16	5.17	21.23	136.42	391.14	412.38	8.69	23.53	5.23
17	5.17	22.69	141.58	391.93	414.62	8.69	23.53	5.23
18	5.17	24.15	146.75	392.72	416.88	8.69	23.53	5.23
19	5.17	25.61	151.92	393.51	419.12	8.69	23.53	5.23
20	5.17	27.07	157.08	394.30	421.38	8.69	23.53	5.23
21	5.17	28.53	162.25	395.09	423.62	8.69	23.53	5.23
22	5.17	29.99	167.42	395.88	425.88	8.69	23.53	5.23
23	4.00	30.42	172.00	396.58	427.00	8.69	0.00	4.05
24	4.00	29.80	176.00	397.20	427.00	8.69	0.00	4.05
25	4.68	30.39	180.34	397.86	428.25	8.69	28.02	4.73
26	4.68	32.16	185.02	398.57	430.74	8.69	28.02	4.73
27	4.68	33.93	189.70	399.29	433.23	8.69	28.02	4.73
28	4.68	35.71	194.37	400.01	435.72	8.69	28.02	4.73
29	4.68	37.48	199.05	400.72	438.21	8.69	28.02	4.73
30	4.68	39.26	203.73	401.44	440.70	8.69	28.02	4.73
31	5.28	38.89	208.71	404.46	443.35	45.23	28.02	7.50

32	5.28	36.38	213.99	409.78	446.16	45.23	28.02	7.50
33	3.51	32.74	218.39	415.76	448.50	62.08	28.02	7.50
34	3.51	27.98	221.90	422.38	450.37	62.08	28.02	7.50
35	2.49	23.22	224.90	428.75	451.96	67.76	28.02	6.59
36	3.18	17.79	227.74	435.69	453.48	67.76	28.02	8.41
37	4.92	13.22	231.80	442.41	455.63	48.98	28.02	7.50
38	4.92	10.19	236.72	448.07	458.25	48.98	28.02	7.50
39	0.82	7.79	239.59	451.99	459.78	69.51	28.02	2.34
40	2.58	3.45	241.29	456.55	460.00	69.51	0.00	7.38

↑

Table 2A - Coordinates of Slice Points Defining the Slip Surface

Point No.	X-Pt (ft)	Y-Pt (ft)
1	71.297267	393.648634
2	75.531512	392.097592
3	79.765756	390.546550
4	84.000000	388.995508
5	84.696237	388.740470
6	87.948087	388.014906
7	91.199937	387.289341
8	95.268090	386.381639
9	99.336243	385.473938
10	103.668121	386.136298
11	108.000000	386.798659
12	113.166667	387.588661
13	118.333333	388.378664
14	123.500000	389.168666
15	128.666667	389.958668
16	133.833333	390.748671
17	139.000000	391.538673
18	144.166667	392.328676
19	149.333333	393.118678
20	154.500000	393.908681
21	159.666667	394.698683

22	164.833333	395.488686
23	170.000000	396.278688
24	174.000000	396.890303
25	178.000000	397.501918
26	182.678223	398.217235
27	187.356445	398.932553
28	192.034668	399.647871
29	196.712891	400.363188
30	201.391113	401.078506
31	206.069336	401.793823
32	211.351608	407.118070
33	216.633881	412.442317
34	220.145225	419.069568
35	223.656570	425.696820
36	226.150332	431.794259
37	229.334806	439.580538
38	234.257473	445.238927
39	239.180140	450.897315
40	240.000000	453.090994
41	242.582156	460.000000

↑

Table 3 - Force and Pore Pressure Data On The 40 Slices (Excluding Reinforcement)

Slice No.	Weight (lbs)	Ubeta Force	Ubeta Stress	Ualpha Force	Pore Pressure (psf)	Earthquake Force			Distributed Load (psf)
		Top (lbs)	Top (psf)	Bot (lbs)		-Uw (psf)	Horiz (lbs)	Vert (lbs)	
1	931.9	0.0	0.0	0.0	0.00	0.00	205.0	0.0	0.00
2	2795.7	0.0	0.0	0.0	0.00	0.00	615.1	0.0	0.00
3	4659.6	0.0	0.0	0.0	0.00	0.00	1025.1	0.0	0.00
4	930.1	0.0	0.0	0.0	0.00	0.00	204.6	0.0	0.00
5	4535.3	0.0	0.0	0.0	0.00	0.00	997.8	0.0	0.00
6	4818.4	0.0	0.0	0.0	0.00	0.00	1060.1	0.0	0.00
7	6426.6	0.0	0.0	0.0	0.00	0.00	1413.9	0.0	0.00
8	6869.7	0.0	0.0	0.0	0.00	0.00	1511.3	0.0	0.00
9	7378.9	0.0	0.0	0.0	0.00	0.00	1623.3	0.0	0.00
10	7034.5	0.0	0.0	0.0	0.00	0.00	1547.6	0.0	0.00

11	8637.4	0.0	0.0	0.0	0.00	0.00	1900.2	0.0	0.00
12	9542.6	0.0	0.0	0.0	0.00	0.00	2099.4	0.0	0.00
13	10447.8	0.0	0.0	0.0	0.00	0.00	2298.5	0.0	0.00
14	11353.0	0.0	0.0	0.0	0.00	0.00	2497.7	0.0	0.00
15	12258.2	0.0	0.0	0.0	0.00	0.00	2696.8	0.0	0.00
16	13163.4	0.0	0.0	0.0	0.00	0.00	2896.0	0.0	0.00
17	14068.6	0.0	0.0	0.0	0.00	0.00	3095.1	0.0	0.00
18	14973.8	0.0	0.0	0.0	0.00	0.00	3294.2	0.0	0.00
19	15879.0	0.0	0.0	0.0	0.00	0.00	3493.4	0.0	0.00
20	16784.2	0.0	0.0	0.0	0.00	0.00	3692.5	0.0	0.00
21	17689.4	0.0	0.0	0.0	0.00	0.00	3891.7	0.0	0.00
22	18594.6	0.0	0.0	0.0	0.00	0.00	4090.8	0.0	0.00
23	14599.4	0.0	0.0	0.0	0.00	0.00	3211.9	0.0	0.00
24	14305.9	0.0	0.0	0.0	0.00	0.00	3147.3	0.0	0.00
25	17058.0	0.0	0.0	0.0	0.00	0.00	3752.8	0.0	0.00
26	18054.3	0.0	0.0	0.0	0.00	0.00	3971.9	0.0	0.00
27	19050.6	0.0	0.0	0.0	0.00	0.00	4191.1	0.0	0.00
28	20046.9	0.0	0.0	0.0	0.00	0.00	4410.3	0.0	0.00
29	21043.2	0.0	0.0	0.0	0.00	0.00	4629.5	0.0	0.00
30	22039.5	0.0	0.0	0.0	0.00	0.00	4848.7	0.0	0.00
31	24651.3	0.0	0.0	0.0	0.00	0.00	5423.3	0.0	0.00
32	23058.5	0.0	0.0	0.0	0.00	0.00	5072.9	0.0	0.00
33	13796.1	0.0	0.0	0.0	0.00	0.00	3035.1	0.0	0.00
34	11791.1	0.0	0.0	0.0	0.00	0.00	2594.0	0.0	0.00
35	6948.4	0.0	0.0	0.0	0.00	0.00	1528.6	0.0	0.00
36	6797.6	0.0	0.0	0.0	0.00	0.00	1495.5	0.0	0.00
37	7811.5	0.0	0.0	0.0	0.00	0.00	1718.5	0.0	0.00
38	6016.7	0.0	0.0	0.0	0.00	0.00	1323.7	0.0	0.00
39	766.2	0.0	0.0	0.0	0.00	0.00	168.6	0.0	0.00
40	1070.4	0.0	0.0	0.0	0.00	0.00	235.5	0.0	0.00

TOTAL WEIGHT OF SLIDING MASS = 458678.54(lbs)

EFFECTIVE WEIGHT OF SLIDING MASS = 458678.54(lbs)

TOTAL AREA OF SLIDING MASS = 3822.32(ft2)



TABLE 4 - SOIL STRENGTH & SOIL OPTIONS DATA ON THE 40 SLICES

Slice No.	Soil Type	Cohesion (psf)	Phi(Deg)	Options
1	1	200.00	31.00	
2	1	200.00	31.00	
3	1	200.00	31.00	
4	1	200.00	31.00	
5	1	200.00	31.00	
6	1	200.00	31.00	
7	2	200.00	34.00	A
8	2	200.00	34.00	A
9	2	200.00	24.00	A
10	2	200.00	24.00	A
11	2	200.00	24.00	A
12	2	200.00	24.00	A
13	2	200.00	24.00	A
14	2	200.00	24.00	A
15	2	200.00	24.00	A
16	2	200.00	24.00	A
17	2	200.00	24.00	A
18	2	200.00	24.00	A
19	2	200.00	24.00	A
20	2	200.00	24.00	A
21	2	200.00	24.00	A
22	2	200.00	24.00	A
23	2	200.00	24.00	A
24	2	200.00	24.00	A
25	2	200.00	24.00	A
26	2	200.00	24.00	A
27	2	200.00	24.00	A
28	2	200.00	24.00	A
29	2	200.00	24.00	A
30	2	200.00	24.00	A
31	2	200.00	24.00	A
32	2	200.00	24.00	A
33	2	200.00	24.00	A
34	2	200.00	24.00	A
35	2	200.00	24.00	A

36	1	200.00	31.00
37	1	200.00	31.00
38	1	200.00	31.00
39	1	200.00	31.00
40	1	200.00	31.00

SOIL OPTIONS:

A = ANISOTROPIC SHEAR STRENGTH

C = CURVED STRENGTH ENVELOPE (TANGENT PHI & C)

F = FIBER-REINFORCED SOIL (FRS)

M = INDEPENDENT MULTI-STAGE SHEAR STRENGTH

N = NONLINEAR UNDRAINED SHEAR STRENGTH

R = RAPID DRAWDOWN OR RAPID LOADING (SEISMIC) SHEAR STRENGTH

S = SHANSEP UNDRAINED SHEAR STRENGTH

NOTE: Phi and C in Table 4 are modified values based on specified Soil Options (if any).

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TABLE 5 - Total Base Stress Data on the 40 Slices

Slice No. *	Alpha (deg)	X-Coord. Slice Cntr (ft)	Base Leng. (ft)	Total Normal Stress (psf)	Total Vert. Stress (psf)	Total Normal/Vert. Stress Ratio
1	-20.12	73.41	4.51	740.60	220.09	3.365
2	-20.12	77.65	4.51	1633.00	660.27	2.473
3	-20.12	81.88	4.51	2525.41	1100.45	2.295
4	-20.12	84.35	0.74	3002.64	1335.84	2.248
5	-12.58	86.32	3.33	2365.08	1394.68	1.696
6	-12.58	89.57	3.33	2501.09	1481.75	1.688
7	-12.58	93.23	4.17	2849.72	1579.74	1.804
8	-12.58	97.30	4.17	3032.42	1688.67	1.796
9	8.69	101.50	4.38	1646.40	1703.39	0.967
10	8.69	105.83	4.38	1571.82	1623.90	0.968
11	8.69	110.58	5.23	1616.73	1671.76	0.967
12	8.69	115.75	5.23	1781.13	1846.96	0.964
13	8.69	120.92	5.23	1945.53	2022.16	0.962

14	8.69	126.08	5.23	2109.92	2197.36	0.960
15	8.69	131.25	5.23	2274.32	2372.56	0.959
16	8.69	136.42	5.23	2438.72	2547.76	0.957
17	8.69	141.58	5.23	2603.12	2722.96	0.956
18	8.69	146.75	5.23	2767.51	2898.16	0.955
19	8.69	151.92	5.23	2931.91	3073.36	0.954
20	8.69	157.08	5.23	3096.31	3248.56	0.953
21	8.69	162.25	5.23	3260.71	3423.76	0.952
22	8.69	167.42	5.23	3425.11	3598.96	0.952
23	8.69	172.00	4.05	3472.87	3649.86	0.952
24	8.69	176.00	4.05	3404.00	3576.47	0.952
25	8.69	180.34	4.73	3469.49	3646.25	0.952
26	8.69	185.02	4.73	3669.32	3859.22	0.951
27	8.69	189.70	4.73	3869.15	4072.18	0.950
28	8.69	194.37	4.73	4068.99	4285.15	0.950
29	8.69	199.05	4.73	4268.82	4498.11	0.949
30	8.69	203.73	4.73	4468.66	4711.07	0.949
31	45.23	208.71	7.50	2504.01	4666.79	0.537
32	45.23	213.99	7.50	2338.55	4365.27	0.536
33	62.08	218.39	7.50	1409.74	3929.01	0.359
34	62.08	221.90	7.50	1190.18	3358.01	0.354
35	67.76	224.90	6.59	782.93	2786.30	0.281
36	67.76	227.74	8.41	524.33	2134.62	0.246
37	48.98	231.80	7.50	711.67	1586.84	0.448
38	48.98	236.72	7.50	533.66	1222.25	0.437
39	69.51	239.59	2.34	146.36	934.52	0.157
40	69.51	241.29	7.38	2.47	414.54	0.006

↑

TABLE 5A - Total Base Force Data on the 40 Slices

Slice No. *	Alpha (deg)	X-Coord. Slice Cntr (ft)	Base Leng. (ft)	Total Normal Force (lbs)	Total Vert. Force (lbs)	Total Normal/Vert. Force Ratio
1	-20.12	73.41	4.51	3339.64	931.91	3.584
2	-20.12	77.65	4.51	7363.85	2795.74	2.634
3	-20.12	81.88	4.51	11388.05	4659.57	2.444

4	-20.12	84.35	0.74	2226.39	930.06	2.394
5	-12.58	86.32	3.33	7879.99	4535.28	1.737
6	-12.58	89.57	3.33	8333.17	4818.41	1.729
7	-12.58	93.23	4.17	11878.19	6426.63	1.848
8	-12.58	97.30	4.17	12639.69	6869.75	1.840
9	8.69	101.50	4.38	7214.92	7378.86	0.978
10	8.69	105.83	4.38	6888.08	7034.55	0.979
11	8.69	110.58	5.23	8450.18	8637.43	0.978
12	8.69	115.75	5.23	9309.45	9542.63	0.976
13	8.69	120.92	5.23	10168.71	10447.83	0.973
14	8.69	126.08	5.23	11027.97	11353.03	0.971
15	8.69	131.25	5.23	11887.23	12258.22	0.970
16	8.69	136.42	5.23	12746.49	13163.42	0.968
17	8.69	141.58	5.23	13605.75	14068.62	0.967
18	8.69	146.75	5.23	14465.01	14973.82	0.966
19	8.69	151.92	5.23	15324.27	15879.02	0.965
20	8.69	157.08	5.23	16183.53	16784.22	0.964
21	8.69	162.25	5.23	17042.79	17689.42	0.963
22	8.69	167.42	5.23	17902.05	18594.61	0.963
23	8.69	172.00	4.05	14052.93	14599.44	0.963
24	8.69	176.00	4.05	13774.26	14305.87	0.963
25	8.69	180.34	4.73	16419.66	17057.98	0.963
26	8.69	185.02	4.73	17365.40	18054.27	0.962
27	8.69	189.70	4.73	18311.13	19050.57	0.961
28	8.69	194.37	4.73	19256.87	20046.87	0.961
29	8.69	199.05	4.73	20202.60	21043.16	0.960
30	8.69	203.73	4.73	21148.34	22039.46	0.960
31	45.23	208.71	7.50	18780.07	24651.28	0.762
32	45.23	213.99	7.50	17539.12	23058.54	0.761
33	62.08	218.39	7.50	10573.09	13796.10	0.766
34	62.08	221.90	7.50	8926.34	11791.13	0.757
35	67.76	224.90	6.59	5157.72	6948.38	0.742
36	67.76	227.74	8.41	4410.83	6797.64	0.649
37	48.98	231.80	7.50	5337.50	7811.50	0.683
38	48.98	236.72	7.50	4002.42	6016.74	0.665
39	69.51	239.59	2.34	342.76	766.17	0.447
40	69.51	241.29	7.38	18.25	1070.41	0.017



TABLE 6 - Effective and Base Shear Stress Data on the 40 Slices

Slice No. *	Alpha (deg)	X-Coord. Slice Cntr (ft)	Base Leng. (ft)	Effective Normal Stress (psf)	Available Shear Strength (psf)	Mobilized Shear Stress (psf)
1	-20.12	73.41	4.51	740.60	645.00	527.98
2	-20.12	77.65	4.51	1633.00	1181.21	966.91
3	-20.12	81.88	4.51	2525.41	1717.42	1405.84
4	-20.12	84.35	0.74	3002.64	2004.17	1640.56
5	-12.58	86.32	3.33	2365.08	1621.08	1326.98
6	-12.58	89.57	3.33	2501.09	1702.81	1393.87
7	-12.58	93.23	4.17	2849.72	2122.16	1737.15
8	-12.58	97.30	4.17	3032.42	2245.39	1838.02
9	8.69	101.50	4.38	1646.40	933.03	763.75
10	8.69	105.83	4.38	1571.82	899.82	736.57
11	8.69	110.58	5.23	1616.73	919.81	752.94
12	8.69	115.75	5.23	1781.13	993.01	812.85
13	8.69	120.92	5.23	1945.53	1066.20	872.77
14	8.69	126.08	5.23	2109.92	1139.40	932.68
15	8.69	131.25	5.23	2274.32	1212.59	992.60
16	8.69	136.42	5.23	2438.72	1285.79	1052.51
17	8.69	141.58	5.23	2603.12	1358.98	1112.43
18	8.69	146.75	5.23	2767.51	1432.18	1172.34
19	8.69	151.92	5.23	2931.91	1505.37	1232.26
20	8.69	157.08	5.23	3096.31	1578.57	1292.17
21	8.69	162.25	5.23	3260.71	1651.76	1352.09
22	8.69	167.42	5.23	3425.11	1724.96	1412.00
23	8.69	172.00	4.05	3472.87	1746.22	1429.41
24	8.69	176.00	4.05	3404.00	1715.56	1404.31
25	8.69	180.34	4.73	3469.49	1744.71	1428.18
26	8.69	185.02	4.73	3669.32	1833.69	1501.01
27	8.69	189.70	4.73	3869.15	1922.66	1573.84
28	8.69	194.37	4.73	4068.99	2011.63	1646.67
29	8.69	199.05	4.73	4268.82	2100.60	1719.50
30	8.69	203.73	4.73	4468.66	2189.57	1792.33
31	45.23	208.71	7.50	2504.01	1314.86	1076.31
32	45.23	213.99	7.50	2338.55	1241.19	1016.00

33	62.08	218.39	7.50	1409.74	827.66	677.50
34	62.08	221.90	7.50	1190.18	729.90	597.48
35	67.76	224.90	6.59	782.93	548.58	449.06
36	67.76	227.74	8.41	524.33	515.05	421.61
37	48.98	231.80	7.50	711.67	627.61	513.75
38	48.98	236.72	7.50	533.66	520.65	426.19
39	69.51	239.59	2.34	146.36	287.94	235.70
40	69.51	241.29	7.38	2.47	201.49	164.93

↑

TABLE 6A - Effective and Base Shear Force Data on the 40 Slices

Slice No. *	Alpha (deg)	X-Coord. Slice Cntr (ft)	Base Leng. (ft)	Effective Normal Force (lbs)	Available Shear Force (lbs)	Mobilized Shear Force (lbs)
1	-20.12	73.41	4.51	3339.64	2908.53	2380.85
2	-20.12	77.65	4.51	7363.85	5326.52	4360.15
3	-20.12	81.88	4.51	11388.05	7744.51	6339.45
4	-20.12	84.35	0.74	2226.39	1486.05	1216.44
5	-12.58	86.32	3.33	7879.99	5401.14	4421.23
6	-12.58	89.57	3.33	8333.17	5673.44	4644.13
7	-12.58	93.23	4.17	11878.19	8845.57	7240.75
8	-12.58	97.30	4.17	12639.69	9359.22	7661.21
9	8.69	101.50	4.38	7214.92	4088.73	3346.93
10	8.69	105.83	4.38	6888.08	3943.21	3227.81
11	8.69	110.58	5.23	8450.18	4807.61	3935.38
12	8.69	115.75	5.23	9309.45	5190.18	4248.54
13	8.69	120.92	5.23	10168.71	5572.74	4561.70
14	8.69	126.08	5.23	11027.97	5955.31	4874.86
15	8.69	131.25	5.23	11887.23	6337.88	5188.02
16	8.69	136.42	5.23	12746.49	6720.45	5501.18
17	8.69	141.58	5.23	13605.75	7103.01	5814.34
18	8.69	146.75	5.23	14465.01	7485.58	6127.50
19	8.69	151.92	5.23	15324.27	7868.15	6440.66
20	8.69	157.08	5.23	16183.53	8250.72	6753.82
21	8.69	162.25	5.23	17042.79	8633.28	7066.98
22	8.69	167.42	5.23	17902.05	9015.85	7380.14

23	8.69	172.00	4.05	14052.93	7066.07	5784.10
24	8.69	176.00	4.05	13774.26	6941.99	5682.53
25	8.69	180.34	4.73	16419.66	8257.02	6758.98
26	8.69	185.02	4.73	17365.40	8678.09	7103.66
27	8.69	189.70	4.73	18311.13	9099.16	7448.33
28	8.69	194.37	4.73	19256.87	9520.23	7793.01
29	8.69	199.05	4.73	20202.60	9941.30	8137.68
30	8.69	203.73	4.73	21148.34	10362.37	8482.36
31	45.23	208.71	7.50	18780.07	9861.43	8072.30
32	45.23	213.99	7.50	17539.12	9308.92	7620.04
33	62.08	218.39	7.50	10573.09	6207.44	5081.25
34	62.08	221.90	7.50	8926.34	5474.26	4481.09
35	67.76	224.90	6.59	5157.72	3613.90	2958.24
36	67.76	227.74	8.41	4410.83	4332.76	3546.68
37	48.98	231.80	7.50	5337.50	4707.09	3853.10
38	48.98	236.72	7.50	4002.42	3904.90	3196.44
39	69.51	239.59	2.34	342.76	674.33	551.99
40	69.51	241.29	7.38	18.25	1486.12	1216.50

Average Effective Normal Stress = 2188.2627(psf)
 Average Available Shear Strength = 1242.5299(psf)
 Total Length of Failure Surface = 206.9608(ft)

INPUT PARAMETERS FOR SIMPLIFIED 3D ANALYSIS

Composite Phi (deg)= 29.589
 3D Depth (Vertical difference between ends of Slip Surface) = 66.35(ft)
 L/D(1): L = 66.35(ft) L/D(2): L = 132.70(ft) L/D(3): L = 199.05(ft)
 L/D(4): L = 265.41(ft) L/D(5): L = 331.76(ft) L/D(6): L = 398.11(ft)

Average Elevation of Point of Application of kh on Sliding Mass = 412.883(ft)

SUM OF MOMENTS = -0.740419E-01 (ft/lbs); Imbalance (Fraction of Total Weight) = -0.1614244E-06
 SUM OF FORCES = 0.338929E-03 (lbs); Imbalance (Fraction of Total Weight) = 0.7389253E-09

Sum of Available Shear Forces = 257155.05(lbs)

Sum of Mobilized Shear Forces = 210500.36(lbs)

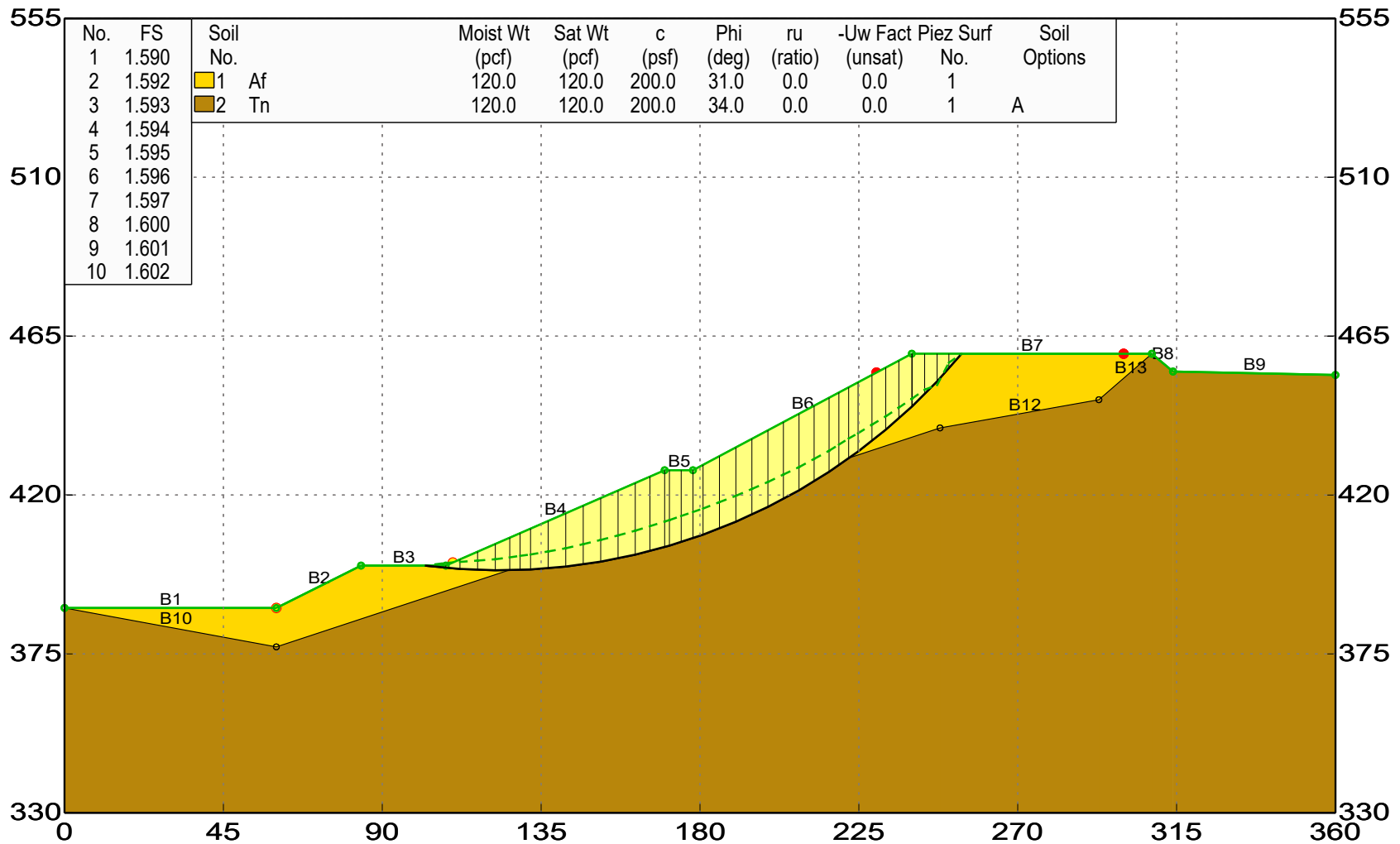
FS Balance Check: FS = 1.221637

**** END OF GEOSTASE OUTPUT ****

X-Section B-B' - Freedom Lane Global Stability of Existing Slope

SA Geotechnical, Inc., RS

\02.gsd



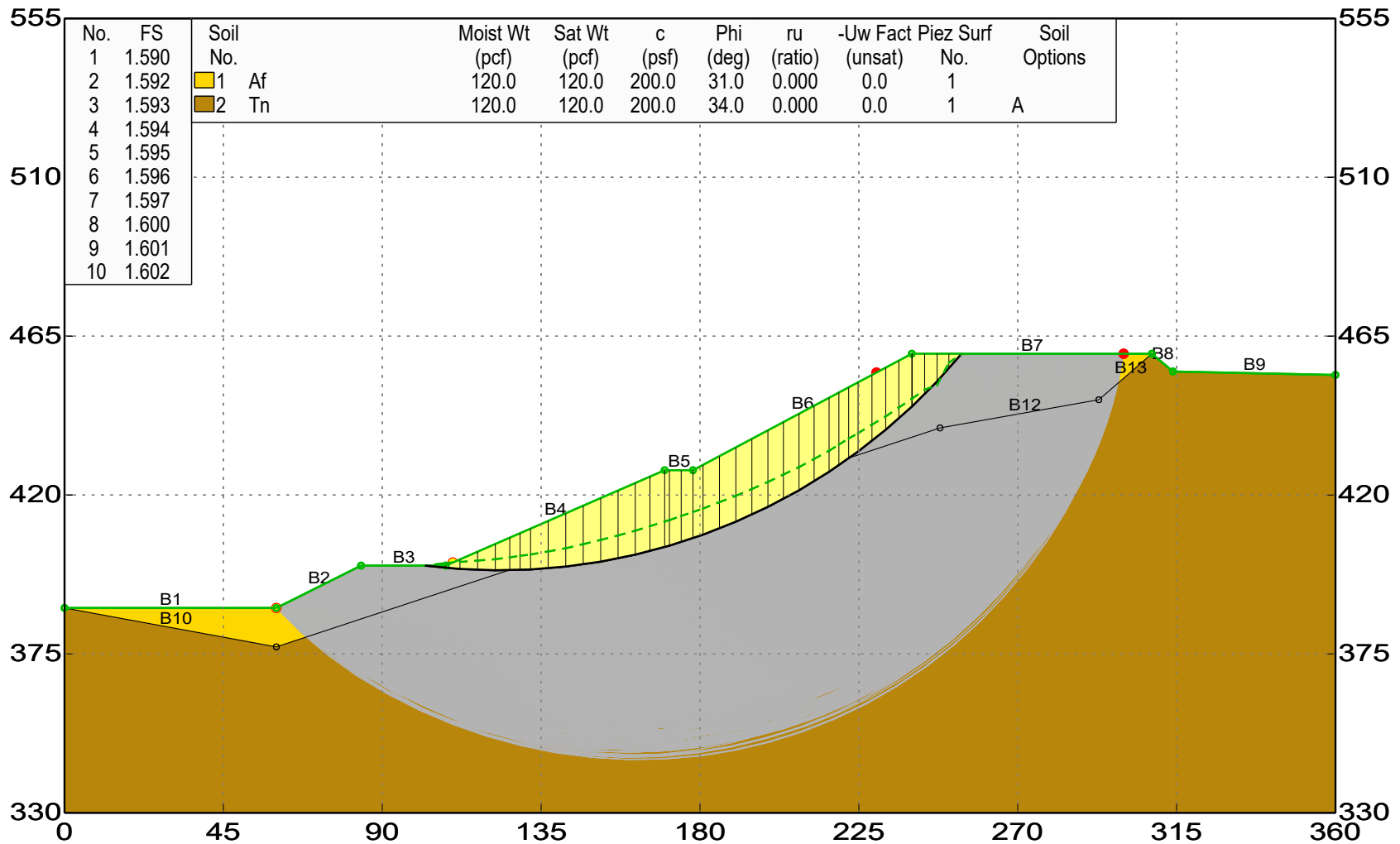
GEOSTASE FS = 1.590

Spencer Method

X-Section B-B' - Freedom Lane Global Stability of Existing Slope

SA Geotechnical, Inc., RS

\02.gsd



GEOSTASE FS = 1.590

Spencer Method

*** GEOSTASE(R) ***

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** Current Version 4.30.32-Double Precision, Sept 2023 **
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SLOPE STABILITY ANALYSIS SOFTWARE (2D & 3D)

Simplified Bishop, Simplified Janbu, or General Equilibrium (GE) Options.

(Spencer, Morgenstern-Price, USACE, and Lowe & Karafiath)

Including Pier/Pile, Planar Reinf, Nail, Tieback, Line Loads

Applied Forces, Fiber-Reinforced Soil (FRS), Distributed Loads

Nonlinear Undrained Shear Strength, Curved Strength Envelope,

Anisotropic Strengths, Water Surfaces, 3-Stage Rapid Drawdown

2- or 3-Stage Pseudo-Static & Simplified Newmark Seismic Analyses.

Analysis Date: 6/ 3/ 2024
Analysis Time:
Analysis By: SA Geotechnical, Inc., RS

Input File Name: C:\Users\Reza Saberi\SA Geotechnical, Inc\SA Geotechnical -
Projects\2024\24064-01 Meritage - 400-700 Freedom Ln, Aliso Viejo\Engineering\Sted\B-B'\02.gsd

Output File Name: C:\Users\Reza Saberi\SA Geotechnical, Inc\SA Geotechnical -
Projects\2024\24064-01 Meritage - 400-700 Freedom Ln, Aliso Viejo\Engineering\Sted\B-B'\02.OUT

Unit System: English

PROJECT: X-Section B-B' - Freedom Lane

DESCRIPTION: Global Stability of Existing Slope

PROFILE BOUNDARY DATA

9 Surface Boundaries
13 Total Boundaries

Boundary No.	X - 1 (ft)	Y - 1 (ft)	X - 2 (ft)	Y - 2 (ft)	Soil Type Below Bnd
1	0.000	388.000	60.000	388.000	1
2	60.000	388.000	84.000	400.000	1
3	84.000	400.000	108.000	400.000	1
4	108.000	400.000	170.000	427.000	1
5	170.000	427.000	178.000	427.000	1
6	178.000	427.000	240.000	460.000	1
7	240.000	460.000	308.000	460.000	1
8	308.000	460.000	314.000	455.000	2
9	314.000	455.000	360.000	454.000	2
10	0.000	388.000	60.000	377.000	2
11	60.000	377.000	248.000	439.000	2
12	248.000	439.000	293.000	447.000	2
13	293.000	447.000	308.000	460.000	2

User Specified X-Origin = 0.000(ft)

User Specified Y-Origin = 330.000(ft)

SURFACE BOUNDARY POINT COORDINATES (Information Only-Not Used Directly)

Point No.	X-COORD	Y-COORD
1	0.000	388.000
2	60.000	388.000
3	84.000	400.000
4	108.000	400.000
5	170.000	427.000
6	178.000	427.000
7	240.000	460.000
8	308.000	460.000
9	314.000	455.000

10 360.000 454.000

SUBSURFACE BOUNDARY POINT COORDINATES

(Information Only-Not Used Directly)

Point No.	X-COORD	Y-COORD
Surface boundary point 11	0.000	388.000
12	60.000	377.000
13	248.000	439.000
14	293.000	447.000
Surface boundary point 15	308.000	460.000

1 and Subsurface boundary point 11 are duplicate points.

8 and Subsurface boundary point 15 are duplicate points.

PROFILE BOUNDARY SLOPES AND ANGLES

BND No.	Slope	Angle(Deg.)
1	0.000	0.000
2	0.500	26.565
3	0.000	0.000
4	0.435	23.532
5	0.000	0.000
6	0.532	28.025
7	0.000	0.000
8	-0.833	-39.806
9	-0.022	-1.245
10	-0.183	-10.389
11	0.330	18.252
12	0.178	10.081
13	0.867	40.914

MOHR-COULOMB SOIL PARAMETERS

2 Type(s) of Soil Defined

Soil Number and Description	Moist Unit Wt. (pcf)	Saturated Unit Wt. (pcf)	Cohesion Intercept (psf)	Friction Angle (deg)	Pore Pressure Ratio(ru)	(-Uw) Fact.	Water Surface No.	Water Option
1 Af	120.0	120.0	200.00	31.00	0.000	0.0	1	0

2 Tn 120.0 120.0 200.00 34.00 0.000 0.0 1 0

ANISOTROPIC STRENGTH PARAMETERS

1 soil type(s)

Soil Type 2 Is Anisotropic

Number Of Direction Ranges Specified = 3

Direction Range No.	Counterclockwise Direction Limit (deg)	Cohesion Intercept (psf)	Friction Angle (deg)
1	-5.0	200.00	34.00
2	8.0	200.00	28.00
3	90.0	200.00	24.00



TRIAL FAILURE SURFACE DATA

Circular Trial Failure Surfaces Have Been Generated Using A Random Procedure.



3000 Trial Surfaces Have Been Generated.

3000 Surfaces Generated at Increments of 0.2001(in) Equally Spaced Within the Start Range

Along The Specified Surface Between X = 60.00(ft)
and X = 110.00(ft)

Each Surface ends within a Range Between X = 230.00(ft)
and X = 300.00(ft)

All surfaces are generated left to right for both a left and right sliding slope.

Unless XCLUDE Lines Were Specified, The Minimum Elevation
To Which A Surface Extends Is Y = 330.00(ft)

Specified Maximum Radius = 100000.000(ft)

10.000(ft) Line Segments Were Used For Each Trial Failure Surface.

The Spencer Method Was Selected for FS Analysis.

Selected fx function = Constant (1.0)

SELECTED CONVERGENCE PARAMETERS FOR SPENCER METHOD:

Initial estimate of FS = 1.500

FS tolerance = 0.000001000

Initial estimate of theta(deg) = 15.00

Theta tolerance(radians) = 0.0001000

Minimum theta(deg) = -45.00 ; Maximum theta(deg) = 45.00

Theta convergence Step Factor = 5000.00

Maximum number of iterations = 50

Allowable negative side force = -1000.0(lbs)

Maximum force imbalance = 100.000000(lbs)

Maximum moment imbalance = 100.000000 (ft/lbs)

Selected Lambda Coefficient = 1.00

Specified Tension Crack Water Depth Factor = 0.000

Total Number of Trial Surfaces Attempted = 3000

WARNING! The Factor of Safety Calculation for one or More Trial Surfaces
Did Not Converge in 50 Iterations.

Number of Trial Surfaces with Non-Converged FS = 22

Number of Trial Surfaces With Valid FS = 2978

Percentage of Trial Surfaces With Non-Converged and/or
Non-Valid FS Solutions of the Total Attempted = 0.7 %

Statistical Data On All Valid FS Values:

FS Max = 3.586 FS Min = 1.590 FS Ave = 2.272
Standard Deviation = 0.392 Coefficient of Variation = 17.25 %

Critical Surface is Sequence Number 2511 of Those Analyzed.

*****BEGINNING OF DETAILED GEOSTASE OUTPUT FOR CRITICAL SURFACE FROM A SEARCH*****

BACK-CALCULATED CIRCULAR SURFACE PARAMETERS:

Circle Center At X = 123.076892(ft) ; Y = 569.335713(ft); and Radius = 170.634476(ft)

Circular Trial Failure Surface Generated With 19 Coordinate Points

Point No.	X-Coord. (ft)	Y-Coord. (ft)
1	102.06402	400.00000
2	112.01973	399.05987
3	122.01342	398.70455
4	132.01075	398.93527
5	141.97741	399.75124
6	151.87915	401.14964
7	161.68197	403.12569
8	171.35220	405.67258
9	180.85662	408.78159
10	190.16260	412.44202
11	199.23817	416.64130
12	208.05217	421.36502
13	216.57431	426.59694
14	224.77534	432.31911
15	232.62708	438.51186
16	240.10257	445.15393

17	247.17613	452.22250
18	253.82347	459.69330
19	254.06571	460.00000

Iter. No.	Theta (deg) (fx=1.0)	FS (Moment)	FS (Force)	Lambda	Delta FS
1	15.0000	1.697190	1.569875	0.268	0.1273156E+00
2	19.9500	1.573454	1.592315	0.363	0.1886023E-01
3	19.3115	1.594540	1.589299	0.350	0.5241175E-02
4	19.4504	1.590117	1.589952	0.353	0.1656185E-03
5	19.4550	1.589971	1.589973	0.353	0.1493052E-05
6	19.4549	1.589973	1.589973	0.353	0.3546542E-08

Factor Of Safety For The Preceding Specified Surface = 1.590

Theta (fx = 1.0) = 19.45 Deg Lambda = 0.353

The Spencer Method Has Been Selected For Analysis.

Selected fx function = Constant (1.0)

SELECTED CONVERGENCE PARAMETERS FOR ANALYSIS METHOD:

Initial estimate of FS = 1.500

FS tolerance = 0.000001000

Initial estimate of theta(deg) = 15.00

Theta tolerance(radians) = 0.0001000

Minimum theta(deg) = -45.00 ; Maximum theta(deg) = 45.00

Theta convergence Step Factor = 5000.00

Maximum number of iterations = 50

Maximum force imbalance = 100.000000(lbs)

Maximum moment imbalance(if Applicable) = 100.000000 (ft/lbs)

Selected Lambda Coefficient = 1.00

Tension Crack Water Force = 0.00(lbs)

Specified Tension Crack Water Depth Factor = 0.000 (0.00% Filled)

Depth of Tension Crack (zo) at Side of Last Slice = 0.000(ft)

Depth of Water in Tension Crack = 0.000(ft)

Theoretical Tension Crack Depth = 5.892(ft)



NOTE: In Table 1 following, when a tension crack with water is present on the first slice (right facing slope) or on the last slice (left facing slope), the "side force" in the tension crack is set equal to the water pressure resultant.

*** Table 1 - Line of Thrust(if applicable) and Slice Force Data ***

Slice No.	X Coord.	Y Coord.	h/H	Side Force (lbs)	fx	Force Angle (Deg)	Vert. Shear Force(lbs)
1	105.03	400.38	1.000+	532.28	1.000	19.45	177.3
2	108.00	400.73	1.000+	1127.27	1.000	19.45	375.5
3	112.02	401.03	0.734	2298.27	1.000	19.45	765.5
4	117.02	401.43	0.505	4302.21	1.000	19.45	1432.9
5	122.01	401.82	0.422	7042.44	1.000	19.45	2345.6
6	126.10	402.32	0.388	9381.26	1.000	19.45	3124.6
7	129.06	402.75	0.377	11085.03	1.000	19.45	3692.0
8	132.01	403.16	0.367	12947.80	1.000	19.45	4312.5
9	136.99	404.04	0.354	15778.48	1.000	19.45	5255.3
10	141.98	404.91	0.343	18910.00	1.000	19.45	6298.3
11	146.93	406.10	0.342	20982.74	1.000	19.45	6988.6
12	151.88	407.26	0.340	23184.09	1.000	19.45	7721.8
13	156.78	408.59	0.338	24727.01	1.000	19.45	8235.7
14	161.68	409.91	0.335	26324.47	1.000	19.45	8767.8
15	165.84	411.19	0.332	27050.14	1.000	19.45	9009.5
16	170.00	412.47	0.330	27781.73	1.000	19.45	9253.1
17	171.35	412.89	0.338	28020.06	1.000	19.45	9332.5
18	174.68	414.04	0.360	28089.43	1.000	19.45	9355.6

19	178.00	415.19	0.384	28178.34	1.000	19.45	9385.2
20	180.86	416.18	0.375	28258.62	1.000	19.45	9412.0
21	185.51	417.97	0.361	27711.34	1.000	19.45	9229.7
22	190.16	419.77	0.348	27126.35	1.000	19.45	9034.8
23	194.70	421.72	0.336	25869.76	1.000	19.45	8616.3
24	199.24	423.68	0.325	24585.28	1.000	19.45	8188.5
25	203.65	425.79	0.314	22689.75	1.000	19.45	7557.2
26	208.05	427.93	0.304	20796.09	1.000	19.45	6926.4
27	212.31	430.22	0.293	18390.84	1.000	19.45	6125.3
28	216.57	432.56	0.285	16034.43	1.000	19.45	5340.5
29	219.35	434.26	0.280	14172.42	1.000	19.45	4720.3
30	222.12	436.01	0.277	12360.71	1.000	19.45	4116.9
31	224.78	437.49	0.264	11187.46	1.000	19.45	3726.2
32	228.70	439.88	0.241	9063.36	1.000	19.45	3018.7
33	232.63	442.28	0.215	7082.45	1.000	19.45	2358.9
34	236.31	444.75	0.182	4991.48	1.000	19.45	1662.5
35	240.00	447.25	0.146	3108.02	1.000	19.45	1035.2
36	240.10	447.32	0.146	3058.70	1.000	19.45	1018.7
37	243.64	449.84	0.102	1358.70	1.000	19.45	452.5
38	247.18	451.13	0.000-	277.63	1.000	19.45	92.5
39	250.50	457.51	0.383	-232.57	1.000	19.45	-77.5
40	253.82	459.80	0.360	-44.59	1.000	19.45	-14.9
41	254.07	460.00	0.000	0.00	1.000	19.45	0.0

NOTE: A value of 0.000- for h/H indicates that the line of thrust is at or below the lower boundary of the sliding mass. A value of 1.000+ for h/H indicates that the line of thrust is at or above the upper boundary of the sliding mass.



Table 2 - Geometry Data on the 41 Slices

Slice No.	Width (ft)	Height (ft)	X-Cntr (ft)	Y-Cntr-Base (ft)	Y-Cntr-Top (ft)	Alpha (deg)	Beta (deg)	Base Length (ft)
1	2.97	0.14	103.55	399.86	400.00	-5.39	0.00	2.98
2	2.97	0.42	106.52	399.58	400.00	-5.39	0.00	2.98
3	4.02	1.63	110.01	399.25	400.88	-5.39	23.53	4.04

4	5.00	3.87	114.52	398.97	402.84	-2.04	23.53	5.00
5	5.00	6.22	119.51	398.79	405.01	-2.04	23.53	5.00
6	4.09	8.24	124.06	398.75	406.99	1.32	23.53	4.09
7	2.96	9.69	127.58	398.83	408.53	1.32	23.53	2.96
8	2.96	10.91	130.53	398.90	409.81	1.32	23.53	2.96
9	4.98	12.40	134.50	399.14	411.54	4.68	23.53	5.00
10	4.98	14.16	139.49	399.55	413.71	4.68	23.53	5.00
11	4.95	15.77	144.45	400.10	415.87	8.04	23.53	5.00
12	4.95	17.23	149.40	400.80	418.03	8.04	23.53	5.00
13	4.90	18.53	154.33	401.64	420.18	11.40	23.53	5.00
14	4.90	19.68	159.23	402.63	422.31	11.40	23.53	5.00
15	4.16	20.61	163.76	403.67	424.28	14.76	23.53	4.30
16	4.16	21.33	167.92	404.77	426.09	14.76	23.53	4.30
17	1.35	21.51	170.68	405.49	427.00	14.76	0.00	1.40
18	3.32	20.78	173.01	406.22	427.00	18.11	0.00	3.50
19	3.32	19.70	176.34	407.30	427.00	18.11	0.00	3.50
20	2.86	19.45	179.43	408.31	427.76	18.11	28.02	3.01
21	4.65	20.06	183.18	409.70	429.76	21.47	28.02	5.00
22	4.65	20.71	187.84	411.53	432.24	21.47	28.02	5.00
23	4.54	21.19	192.43	413.49	434.68	24.83	28.02	5.00
24	4.54	21.51	196.97	415.59	437.10	24.83	28.02	5.00
25	4.41	21.65	201.44	417.82	439.48	28.19	28.02	5.00
26	4.41	21.64	205.85	420.18	441.82	28.19	28.02	5.00
27	4.26	21.46	210.18	422.67	444.13	31.55	28.02	5.00
28	4.26	21.11	214.44	425.29	446.40	31.55	28.02	5.00
29	2.77	20.71	217.96	427.56	448.27	34.90	28.02	3.38
30	2.77	20.25	220.73	429.50	449.74	34.90	28.02	3.38
31	2.66	19.80	223.45	431.39	451.19	34.90	28.02	3.24
32	3.93	19.07	226.74	433.87	452.94	38.26	28.02	5.00
33	3.93	18.07	230.66	436.96	455.03	38.26	28.02	5.00
34	3.69	16.91	234.47	440.15	457.06	41.62	28.02	4.93
35	3.69	15.59	238.16	443.43	459.02	41.62	28.02	4.93
36	0.10	14.89	240.05	445.11	460.00	41.62	0.00	0.14
37	3.54	13.08	241.87	446.92	460.00	44.98	0.00	5.00
38	3.54	9.54	245.41	450.46	460.00	44.98	0.00	5.00
39	3.32	5.91	248.84	454.09	460.00	48.34	0.00	5.00
40	3.32	2.17	252.16	457.83	460.00	48.34	0.00	5.00
41	0.24	0.15	253.94	459.85	460.00	51.70	0.00	0.39



Table 2A - Coordinates of Slice Points Defining the Slip Surface

Point No.	X-Pt (ft)	Y-Pt (ft)
1	102.064021	400.000000
2	105.032011	399.719728
3	108.000000	399.439457
4	112.019731	399.059867
5	117.016574	398.882209
6	122.013416	398.704551
7	126.099758	398.798856
8	129.055256	398.867064
9	132.010754	398.935271
10	136.994082	399.343254
11	141.977409	399.751236
12	146.928279	400.450439
13	151.879149	401.149642
14	156.780558	402.137665
15	161.681967	403.125687
16	165.840984	404.221069
17	170.000000	405.316450
18	171.352196	405.672585
19	174.676098	406.759870
20	178.000000	407.847155
21	180.856621	408.781587
22	185.509611	410.611802
23	190.162601	412.442016
24	194.700387	414.541658
25	199.238173	416.641300
26	203.645170	419.003158
27	208.052168	421.365017
28	212.313240	423.980979
29	216.574313	426.596942
30	219.345430	428.530455
31	222.116547	430.463968

32	224.775339	432.319107
33	228.701209	435.415483
34	232.627079	438.511859
35	236.313540	441.787327
36	240.000000	445.062795
37	240.102567	445.153928
38	243.639347	448.688215
39	247.176128	452.222502
40	250.499797	455.957903
41	253.823466	459.693304
42	254.065711	460.000000

↑

Table 3 - Force and Pore Pressure Data On The 41 Slices (Excluding Reinforcement)

Slice No.	Weight (lbs)	Ubeta Force Top (lbs)	Ubeta Stress Top (psf)	Ualpha Force Bot (lbs)	Pore Pressure (psf)	-Uw (psf)	Earthquake Force		Distributed Load (psf)
							Horiz (lbs)	Vert (lbs)	
1	49.9	0.0	0.0	0.0	0.00	0.00	0.0	0.0	0.00
2	149.7	0.0	0.0	0.0	0.00	0.00	0.0	0.0	0.00
3	784.1	0.0	0.0	0.0	0.00	0.00	0.0	0.0	0.00
4	2319.0	0.0	0.0	0.0	0.00	0.00	0.0	0.0	0.00
5	3730.4	0.0	0.0	0.0	0.00	0.00	0.0	0.0	0.00
6	4040.9	0.0	0.0	0.0	0.00	0.00	0.0	0.0	0.00
7	3437.6	0.0	0.0	0.0	0.00	0.00	0.0	0.0	0.00
8	3869.9	0.0	0.0	0.0	0.00	0.00	0.0	0.0	0.00
9	7416.5	0.0	0.0	0.0	0.00	0.00	0.0	0.0	0.00
10	8470.2	0.0	0.0	0.0	0.00	0.00	0.0	0.0	0.00
11	9371.3	0.0	0.0	0.0	0.00	0.00	0.0	0.0	0.00
12	10236.8	0.0	0.0	0.0	0.00	0.00	0.0	0.0	0.00
13	10900.1	0.0	0.0	0.0	0.00	0.00	0.0	0.0	0.00
14	11574.4	0.0	0.0	0.0	0.00	0.00	0.0	0.0	0.00
15	10286.0	0.0	0.0	0.0	0.00	0.00	0.0	0.0	0.00
16	10643.2	0.0	0.0	0.0	0.00	0.00	0.0	0.0	0.00
17	3489.6	0.0	0.0	0.0	0.00	0.00	0.0	0.0	0.00
18	8290.0	0.0	0.0	0.0	0.00	0.00	0.0	0.0	0.00
19	7856.3	0.0	0.0	0.0	0.00	0.00	0.0	0.0	0.00

20	6665.9	0.0	0.0	0.0	0.00	0.00	0.0	0.0	0.00
21	11201.8	0.0	0.0	0.0	0.00	0.00	0.0	0.0	0.00
22	11562.7	0.0	0.0	0.0	0.00	0.00	0.0	0.0	0.00
23	11538.4	0.0	0.0	0.0	0.00	0.00	0.0	0.0	0.00
24	11710.3	0.0	0.0	0.0	0.00	0.00	0.0	0.0	0.00
25	11451.9	0.0	0.0	0.0	0.00	0.00	0.0	0.0	0.00
26	11443.3	0.0	0.0	0.0	0.00	0.00	0.0	0.0	0.00
27	10971.3	0.0	0.0	0.0	0.00	0.00	0.0	0.0	0.00
28	10793.4	0.0	0.0	0.0	0.00	0.00	0.0	0.0	0.00
29	6885.2	0.0	0.0	0.0	0.00	0.00	0.0	0.0	0.00
30	6732.7	0.0	0.0	0.0	0.00	0.00	0.0	0.0	0.00
31	6316.5	0.0	0.0	0.0	0.00	0.00	0.0	0.0	0.00
32	8985.9	0.0	0.0	0.0	0.00	0.00	0.0	0.0	0.00
33	8511.6	0.0	0.0	0.0	0.00	0.00	0.0	0.0	0.00
34	7479.3	0.0	0.0	0.0	0.00	0.00	0.0	0.0	0.00
35	6898.3	0.0	0.0	0.0	0.00	0.00	0.0	0.0	0.00
36	183.3	0.0	0.0	0.0	0.00	0.00	0.0	0.0	0.00
37	5550.9	0.0	0.0	0.0	0.00	0.00	0.0	0.0	0.00
38	4050.9	0.0	0.0	0.0	0.00	0.00	0.0	0.0	0.00
39	2357.1	0.0	0.0	0.0	0.00	0.00	0.0	0.0	0.00
40	867.2	0.0	0.0	0.0	0.00	0.00	0.0	0.0	0.00
41	4.5	0.0	0.0	0.0	0.00	0.00	0.0	0.0	0.00

TOTAL WEIGHT OF SLIDING MASS = 279078.37(lbs)

EFFECTIVE WEIGHT OF SLIDING MASS = 279078.37(lbs)

TOTAL AREA OF SLIDING MASS = 2325.65(ft2)



TABLE 4 - SOIL STRENGTH & SOIL OPTIONS DATA ON THE 41 SLICES

Slice No.	Soil Type	Cohesion (psf)	Phi(Deg)	Options
1	1	200.00	31.00	
2	1	200.00	31.00	
3	1	200.00	31.00	
4	1	200.00	31.00	

5	1	200.00	31.00	
6	1	200.00	31.00	
7	2	200.00	28.00	A
8	2	200.00	28.00	A
9	2	200.00	28.00	A
10	2	200.00	28.00	A
11	2	200.00	24.00	A
12	2	200.00	24.00	A
13	2	200.00	24.00	A
14	2	200.00	24.00	A
15	2	200.00	24.00	A
16	2	200.00	24.00	A
17	2	200.00	24.00	A
18	2	200.00	24.00	A
19	2	200.00	24.00	A
20	2	200.00	24.00	A
21	2	200.00	24.00	A
22	2	200.00	24.00	A
23	2	200.00	24.00	A
24	2	200.00	24.00	A
25	2	200.00	24.00	A
26	2	200.00	24.00	A
27	2	200.00	24.00	A
28	2	200.00	24.00	A
29	2	200.00	24.00	A
30	2	200.00	24.00	A
31	1	200.00	31.00	
32	1	200.00	31.00	
33	1	200.00	31.00	
34	1	200.00	31.00	
35	1	200.00	31.00	
36	1	200.00	31.00	
37	1	200.00	31.00	
38	1	200.00	31.00	
39	1	200.00	31.00	
40	1	200.00	31.00	
41	1	200.00	31.00	

SOIL OPTIONS:

A = ANISOTROPIC SHEAR STRENGTH
 C = CURVED STRENGTH ENVELOPE (TANGENT PHI & C)
 F = FIBER-REINFORCED SOIL (FRS)
 M = INDEPENDENT MULTI-STAGE SHEAR STRENGTH
 N = NONLINEAR UNDRAINED SHEAR STRENGTH
 R = RAPID DRAWDOWN OR RAPID LOADING (SEISMIC) SHEAR STRENGTH
 S = SHANSEP UNDRAINED SHEAR STRENGTH
 NOTE: Phi and C in Table 4 are modified values based on specified
 Soil Options (if any).

↑

TABLE 5 - Total Base Stress Data on the 41 Slices

Slice No. *	Alpha (deg)	X-Coord. Slice Cntr (ft)	Base Leng. (ft)	Total Normal Stress (psf)	Total Vert. Stress (psf)	Total Normal/Vert. Stress Ratio
1	-5.39	103.55	2.98	91.70	16.82	5.453
2	-5.39	106.52	2.98	133.87	50.45	2.654
3	-5.39	110.01	4.04	315.23	195.07	1.616
4	-2.04	114.52	5.00	610.35	464.10	1.315
5	-2.04	119.51	5.00	946.38	746.55	1.268
6	1.32	124.06	4.09	1166.44	988.88	1.180
7	1.32	127.58	2.96	1341.87	1163.13	1.154
8	1.32	130.53	2.96	1504.80	1309.39	1.149
9	4.68	134.50	5.00	1622.72	1488.25	1.090
10	4.68	139.49	5.00	1848.12	1699.71	1.087
11	8.04	144.45	5.00	1937.89	1892.85	1.024
12	8.04	149.40	5.00	2114.38	2067.67	1.023
13	11.40	154.33	5.00	2180.29	2223.87	0.980
14	11.40	159.23	5.00	2314.02	2361.45	0.980
15	14.76	163.76	4.30	2326.58	2473.18	0.941
16	14.76	167.92	4.30	2407.02	2559.08	0.941
17	14.76	170.68	1.40	2427.22	2580.66	0.941
18	18.11	173.01	3.50	2253.44	2494.05	0.904
19	18.11	176.34	3.50	2135.71	2363.58	0.904
20	18.11	179.43	3.01	2108.57	2333.50	0.904

21	21.47	183.18	5.00	2088.73	2407.45	0.868
22	21.47	187.84	5.00	2156.17	2485.01	0.868
23	24.83	192.43	5.00	2117.89	2542.73	0.833
24	24.83	196.97	5.00	2149.61	2580.61	0.833
25	28.19	201.44	5.00	2076.30	2598.57	0.799
26	28.19	205.85	5.00	2074.74	2596.63	0.799
27	31.55	210.18	5.00	1970.75	2574.78	0.765
28	31.55	214.44	5.00	1938.38	2533.02	0.765
29	34.90	217.96	3.38	1817.88	2484.63	0.732
30	34.90	220.73	3.38	1776.91	2429.60	0.731
31	34.90	223.45	3.24	1694.22	2375.69	0.713
32	38.26	226.74	5.00	1548.06	2288.89	0.676
33	38.26	230.66	5.00	1464.34	2168.07	0.675
34	41.62	234.47	4.93	1293.77	2028.86	0.638
35	41.62	238.16	4.93	1189.82	1871.26	0.636
36	41.62	240.05	0.14	1134.24	1787.00	0.635
37	44.98	241.87	5.00	931.80	1569.47	0.594
38	44.98	245.41	5.00	666.25	1145.36	0.582
39	48.34	248.84	5.00	362.65	709.18	0.511
40	48.34	252.16	5.00	97.14	260.93	0.372
41	51.70	253.94	0.39	-53.80	18.40	-2.924

↑

TABLE 5A - Total Base Force Data on the 41 Slices

Slice No. *	Alpha (deg)	X-Coord. Slice Cntr (ft)	Base Leng. (ft)	Total Normal Force (lbs)	Total Vert. Force (lbs)	Total Normal/Vert. Force Ratio
1	-5.39	103.55	2.98	273.37	49.91	5.477
2	-5.39	106.52	2.98	399.10	149.73	2.665
3	-5.39	110.01	4.04	1272.76	784.14	1.623
4	-2.04	114.52	5.00	3051.73	2319.04	1.316
5	-2.04	119.51	5.00	4731.92	3730.37	1.268
6	1.32	124.06	4.09	4767.73	4040.91	1.180
7	1.32	127.58	2.96	3966.96	3437.62	1.154
8	1.32	130.53	2.96	4448.61	3869.90	1.150
9	4.68	134.50	5.00	8113.59	7416.45	1.094

10	4.68	139.49	5.00	9240.58	8470.23	1.091
11	8.04	144.45	5.00	9689.46	9371.28	1.034
12	8.04	149.40	5.00	10571.92	10236.78	1.033
13	11.40	154.33	5.00	10901.45	10900.10	1.000
14	11.40	159.23	5.00	11570.11	11574.41	1.000
15	14.76	163.76	4.30	10006.26	10286.00	0.973
16	14.76	167.92	4.30	10352.20	10643.25	0.973
17	14.76	170.68	1.40	3394.01	3489.55	0.973
18	18.11	173.01	3.50	7880.78	8289.99	0.951
19	18.11	176.34	3.50	7469.05	7856.30	0.951
20	18.11	179.43	3.01	6337.47	6665.93	0.951
21	21.47	183.18	5.00	10443.66	11201.83	0.932
22	21.47	187.84	5.00	10780.85	11562.74	0.932
23	24.83	192.43	5.00	10589.45	11538.38	0.918
24	24.83	196.97	5.00	10748.05	11710.25	0.918
25	28.19	201.44	5.00	10381.52	11451.91	0.907
26	28.19	205.85	5.00	10373.69	11443.35	0.907
27	31.55	210.18	5.00	9853.77	10971.33	0.898
28	31.55	214.44	5.00	9691.91	10793.40	0.898
29	34.90	217.96	3.38	6142.61	6885.21	0.892
30	34.90	220.73	3.38	6004.15	6732.72	0.892
31	34.90	223.45	3.24	5492.71	6316.47	0.870
32	38.26	226.74	5.00	7740.29	8985.87	0.861
33	38.26	230.66	5.00	7321.71	8511.56	0.860
34	41.62	234.47	4.93	6380.08	7479.32	0.853
35	41.62	238.16	4.93	5867.48	6898.34	0.851
36	41.62	240.05	0.14	155.62	183.29	0.849
37	44.98	241.87	5.00	4658.98	5550.88	0.839
38	44.98	245.41	5.00	3331.25	4050.88	0.822
39	48.34	248.84	5.00	1813.26	2357.07	0.769
40	48.34	252.16	5.00	485.69	867.24	0.560
41	51.70	253.94	0.39	-21.03	4.46	-4.717

↑

TABLE 6 - Effective and Base Shear Stress Data on the 41 Slices

Slice No.	Alpha (deg)	X-Coord. Slice Cntr	Base Leng.	Effective Normal Stress	Available Shear Strength	Mobilized Shear Stress
-----------	-------------	---------------------	------------	-------------------------	--------------------------	------------------------

*		(ft)	(ft)	(psf)	(psf)	(psf)
1	-5.39	103.55	2.98	91.70	255.10	160.44
2	-5.39	106.52	2.98	133.87	280.44	176.38
3	-5.39	110.01	4.04	315.23	389.41	244.91
4	-2.04	114.52	5.00	610.35	566.73	356.44
5	-2.04	119.51	5.00	946.38	768.64	483.43
6	1.32	124.06	4.09	1166.44	900.87	566.59
7	1.32	127.58	2.96	1341.87	913.49	574.53
8	1.32	130.53	2.96	1504.80	1000.11	629.01
9	4.68	134.50	5.00	1622.72	1062.81	668.45
10	4.68	139.49	5.00	1848.12	1182.66	743.82
11	8.04	144.45	5.00	1937.89	1062.81	668.44
12	8.04	149.40	5.00	2114.38	1141.38	717.86
13	11.40	154.33	5.00	2180.29	1170.73	736.32
14	11.40	159.23	5.00	2314.02	1230.27	773.77
15	14.76	163.76	4.30	2326.58	1235.86	777.28
16	14.76	167.92	4.30	2407.02	1271.67	799.81
17	14.76	170.68	1.40	2427.22	1280.67	805.47
18	18.11	173.01	3.50	2253.44	1203.30	756.80
19	18.11	176.34	3.50	2135.71	1150.88	723.84
20	18.11	179.43	3.01	2108.57	1138.80	716.24
21	21.47	183.18	5.00	2088.73	1129.96	710.68
22	21.47	187.84	5.00	2156.17	1159.99	729.57
23	24.83	192.43	5.00	2117.89	1142.95	718.85
24	24.83	196.97	5.00	2149.61	1157.07	727.73
25	28.19	201.44	5.00	2076.30	1124.43	707.20
26	28.19	205.85	5.00	2074.74	1123.73	706.76
27	31.55	210.18	5.00	1970.75	1077.44	677.64
28	31.55	214.44	5.00	1938.38	1063.02	668.58
29	34.90	217.96	3.38	1817.88	1009.37	634.84
30	34.90	220.73	3.38	1776.91	991.13	623.36
31	34.90	223.45	3.24	1694.22	1217.99	766.05
32	38.26	226.74	5.00	1548.06	1130.17	710.81
33	38.26	230.66	5.00	1464.34	1079.87	679.17
34	41.62	234.47	4.93	1293.77	977.37	614.71
35	41.62	238.16	4.93	1189.82	914.92	575.43
36	41.62	240.05	0.14	1134.24	881.52	554.42
37	44.98	241.87	5.00	931.80	759.88	477.92

38	44.98	245.41	5.00	666.25	600.32	377.57
39	48.34	248.84	5.00	362.65	417.90	262.84
40	48.34	252.16	5.00	97.14	258.37	162.50
41	51.70	253.94	0.39	-53.80	167.67	105.46

↑

TABLE 6A - Effective and Base Shear Force Data on the 41 Slices

Slice No. *	Alpha (deg)	X-Coord. Slice Cntr (ft)	Base Leng. (ft)	Effective Normal Force (lbs)	Available Shear Force (lbs)	Mobilized Shear Force (lbs)
1	-5.39	103.55	2.98	273.37	760.50	478.31
2	-5.39	106.52	2.98	399.10	836.04	525.82
3	-5.39	110.01	4.04	1272.76	1572.28	988.87
4	-2.04	114.52	5.00	3051.73	2833.67	1782.21
5	-2.04	119.51	5.00	4731.92	3843.22	2417.16
6	1.32	124.06	4.09	4767.73	3682.22	2315.90
7	1.32	127.58	2.96	3966.96	2700.53	1698.47
8	1.32	130.53	2.96	4448.61	2956.62	1859.54
9	4.68	134.50	5.00	8113.59	5314.07	3342.24
10	4.68	139.49	5.00	9240.58	5913.30	3719.12
11	8.04	144.45	5.00	9689.46	5314.03	3342.21
12	8.04	149.40	5.00	10571.92	5706.92	3589.32
13	11.40	154.33	5.00	10901.45	5853.64	3681.60
14	11.40	159.23	5.00	11570.11	6151.34	3868.84
15	14.76	163.76	4.30	10006.26	5315.24	3342.98
16	14.76	167.92	4.30	10352.20	5469.27	3439.85
17	14.76	170.68	1.40	3394.01	1790.77	1126.29
18	18.11	173.01	3.50	7880.78	4208.19	2646.71
19	18.11	176.34	3.50	7469.05	4024.88	2531.41
20	18.11	179.43	3.01	6337.47	3422.74	2152.70
21	21.47	183.18	5.00	10443.66	5649.82	3553.40
22	21.47	187.84	5.00	10780.85	5799.94	3647.83
23	24.83	192.43	5.00	10589.45	5714.73	3594.23
24	24.83	196.97	5.00	10748.05	5785.34	3638.64
25	28.19	201.44	5.00	10381.52	5622.15	3536.00
26	28.19	205.85	5.00	10373.69	5618.66	3533.81

27	31.55	210.18	5.00	9853.77	5387.18	3388.22
28	31.55	214.44	5.00	9691.91	5315.11	3342.90
29	34.90	217.96	3.38	6142.61	3410.66	2145.11
30	34.90	220.73	3.38	6004.15	3349.02	2106.34
31	34.90	223.45	3.24	5492.71	3948.75	2483.54
32	38.26	226.74	5.00	7740.29	5650.83	3554.04
33	38.26	230.66	5.00	7321.71	5399.33	3395.86
34	41.62	234.47	4.93	6380.08	4819.82	3031.39
35	41.62	238.16	4.93	5867.48	4511.82	2837.67
36	41.62	240.05	0.14	155.62	120.95	76.07
37	44.98	241.87	5.00	4658.98	3799.40	2389.60
38	44.98	245.41	5.00	3331.25	3001.61	1887.84
39	48.34	248.84	5.00	1813.26	2089.52	1314.18
40	48.34	252.16	5.00	485.69	1291.83	812.49
41	51.70	253.94	0.39	-21.03	65.53	41.22

Average Effective Normal Stress = 1565.0769(psf)

Average Available Shear Strength = 962.6192(psf)

Total Length of Failure Surface = 170.3908(ft)

INPUT PARAMETERS FOR SIMPLIFIED 3D ANALYSIS

Composite Phi (deg)= 31.594

3D Depth (Vertical difference between ends of Slip Surface) = 60.00(ft)

L/D(1): L = 60.00(ft) L/D(2): L = 120.00(ft) L/D(3): L = 180.00(ft)

L/D(4): L = 240.00(ft) L/D(5): L = 300.00(ft) L/D(6): L = 360.00(ft)

SUM OF MOMENTS = -0.217357E-03 (ft/lbs); Imbalance (Fraction of Total Weight) = -0.7788389E-09

SUM OF FORCES = -.431746E-07 (lbs); Imbalance (Fraction of Total Weight) = -0.1547042E-12

Sum of Available Shear Forces = 164021.48(lbs)

Sum of Mobilized Shear Forces = 103159.93(lbs)

FS Balance Check: FS = 1.589973

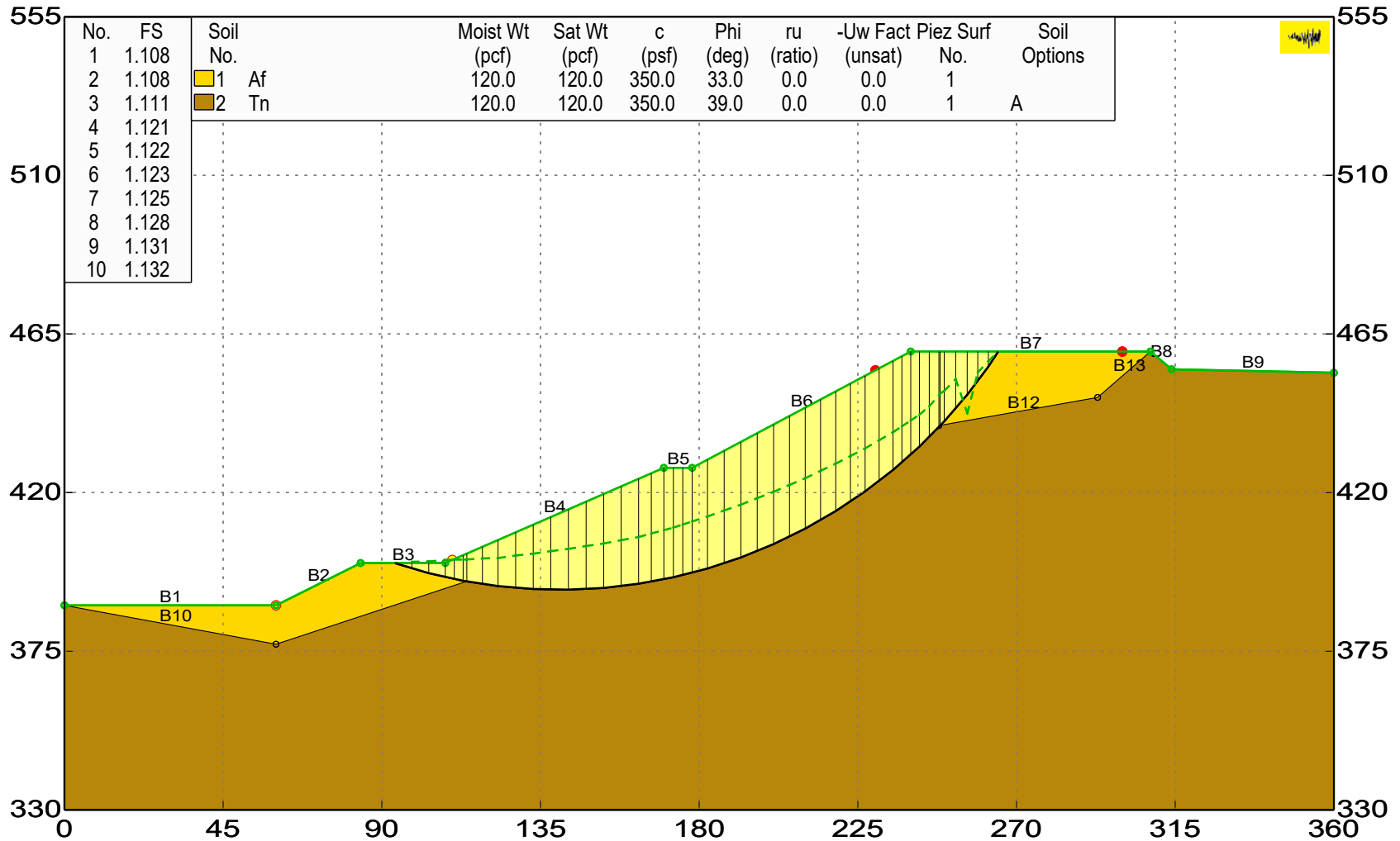
**** END OF GEOSTASE OUTPUT ****

X-Section B-B' - Freedom Lane

Global Stability of Existing Slope - Pseudo Static

SA Geotechnical, Inc., RS

\02p.gsd



GEOSTASE FS = 1.108

Spencer Method

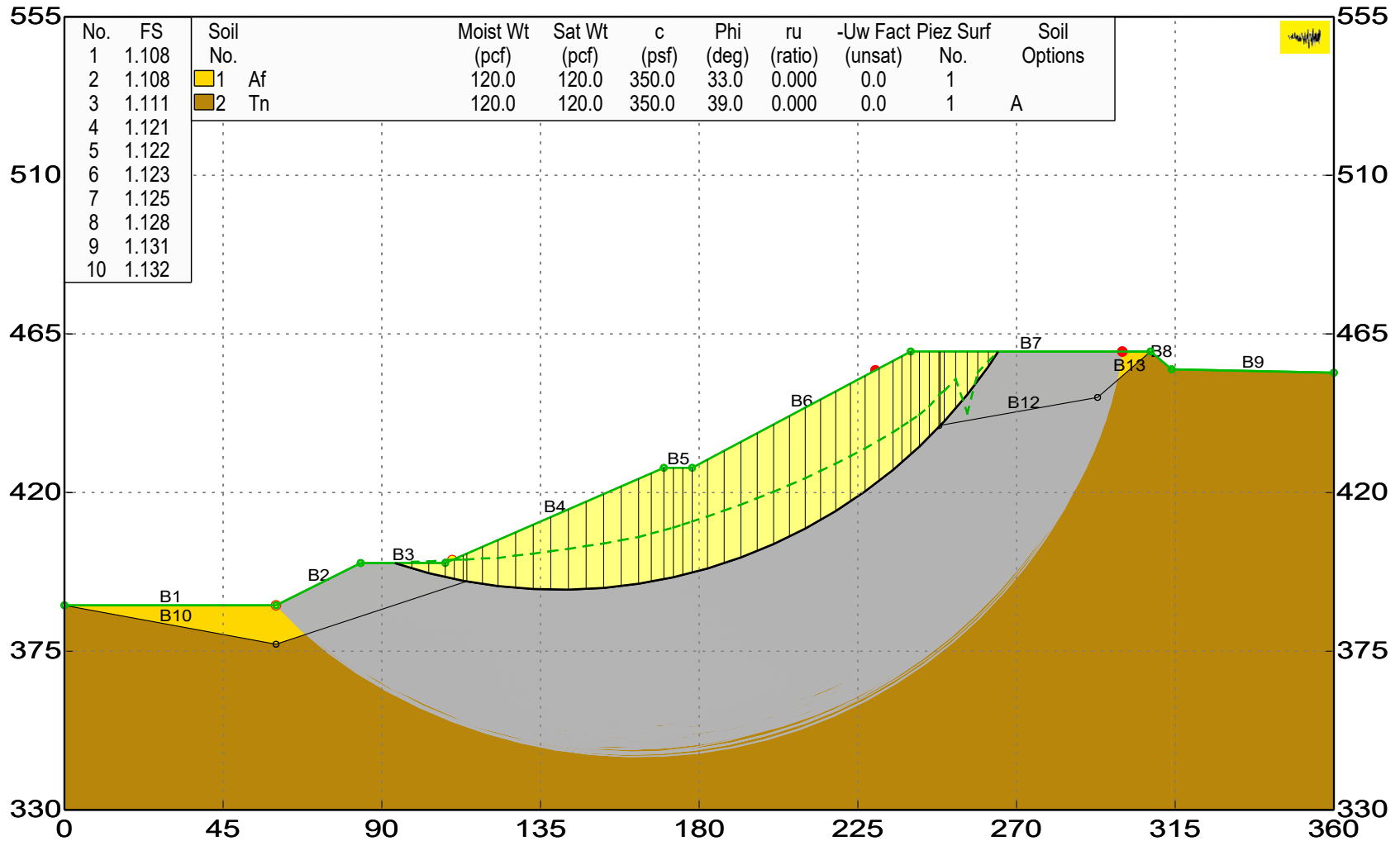
kh = 0.22000

X-Section B-B' - Freedom Lane

Global Stability of Existing Slope - Pseudo Static

SA Geotechnical, Inc., RS

\02p.gsd



GEOSTASE FS = 1.108

Spencer Method

kh = 0.22000

*** GEOSTASE(R) ***

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** Current Version 4.30.32-Double Precision, Sept 2023 **
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SLOPE STABILITY ANALYSIS SOFTWARE (2D & 3D)

Simplified Bishop, Simplified Janbu, or General Equilibrium (GE) Options.

(Spencer, Morgenstern-Price, USACE, and Lowe & Karafiath)

Including Pier/Pile, Planar Reinf, Nail, Tieback, Line Loads

Applied Forces, Fiber-Reinforced Soil (FRS), Distributed Loads

Nonlinear Undrained Shear Strength, Curved Strength Envelope,

Anisotropic Strengths, Water Surfaces, 3-Stage Rapid Drawdown

2- or 3-Stage Pseudo-Static & Simplified Newmark Seismic Analyses.

Analysis Date: 6/ 3/ 2024
Analysis Time:
Analysis By: SA Geotechnical, Inc., RS

Input File Name: C:\Users\Reza Saberi\SA Geotechnical, Inc\SA Geotechnical -
Projects\2024\24064-01 Meritage - 400-700 Freedom Ln, Aliso Viejo\Engineering\Sted\B-B'\02p.gsd

Output File Name: C:\Users\Reza Saberi\SA Geotechnical, Inc\SA Geotechnical -
Projects\2024\24064-01 Meritage - 400-700 Freedom Ln, Aliso Viejo\Engineering\Sted\B-B'\02p.OUT

Unit System: English

PROJECT: X-Section B-B' - Freedom Lane

DESCRIPTION: Global Stability of Existing Slope - Pseudo Static

PROFILE BOUNDARY DATA

9 Surface Boundaries
13 Total Boundaries

Boundary No.	X - 1 (ft)	Y - 1 (ft)	X - 2 (ft)	Y - 2 (ft)	Soil Type Below Bnd
1	0.000	388.000	60.000	388.000	1
2	60.000	388.000	84.000	400.000	1
3	84.000	400.000	108.000	400.000	1
4	108.000	400.000	170.000	427.000	1
5	170.000	427.000	178.000	427.000	1
6	178.000	427.000	240.000	460.000	1
7	240.000	460.000	308.000	460.000	1
8	308.000	460.000	314.000	455.000	2
9	314.000	455.000	360.000	454.000	2
10	0.000	388.000	60.000	377.000	2
11	60.000	377.000	248.000	439.000	2
12	248.000	439.000	293.000	447.000	2
13	293.000	447.000	308.000	460.000	2

User Specified X-Origin = 0.000(ft)

User Specified Y-Origin = 330.000(ft)

SURFACE BOUNDARY POINT COORDINATES (Information Only-Not Used Directly)

Point No.	X-COORD	Y-COORD
1	0.000	388.000
2	60.000	388.000
3	84.000	400.000
4	108.000	400.000
5	170.000	427.000
6	178.000	427.000
7	240.000	460.000
8	308.000	460.000
9	314.000	455.000

10 360.000 454.000

SUBSURFACE BOUNDARY POINT COORDINATES

(Information Only-Not Used Directly)

Point No.	X-COORD	Y-COORD
Surface boundary point 11	0.000	388.000
12	60.000	377.000
13	248.000	439.000
14	293.000	447.000
Surface boundary point 15	308.000	460.000

1 and Subsurface boundary point 11 are duplicate points.
8 and Subsurface boundary point 15 are duplicate points.

PROFILE BOUNDARY SLOPES AND ANGLES

BND No.	Slope	Angle(Deg.)
1	0.000	0.000
2	0.500	26.565
3	0.000	0.000
4	0.435	23.532
5	0.000	0.000
6	0.532	28.025
7	0.000	0.000
8	-0.833	-39.806
9	-0.022	-1.245
10	-0.183	-10.389
11	0.330	18.252
12	0.178	10.081
13	0.867	40.914

MOHR-COULOMB SOIL PARAMETERS

2 Type(s) of Soil Defined

Soil Number and Description	Moist Unit Wt. (pcf)	Saturated Unit Wt. (pcf)	Cohesion Intercept (psf)	Friction Angle (deg)	Pore Pressure Ratio(ru)	(-Uw) Fact.	Water Surface No.	Water Option
1 Af	120.0	120.0	350.00	33.00	0.000	0.0	1	0

2 Tn	120.0	120.0	350.00	39.00	0.000	0.0	1	0
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ANISOTROPIC STRENGTH PARAMETERS

1 soil type(s)

Soil Type 2 Is Anisotropic

Number Of Direction Ranges Specified = 3

Direction Range No.	Counterclockwise Direction Limit (deg)	Cohesion Intercept (psf)	Friction Angle (deg)
1	-5.0	200.00	34.00
2	8.0	200.00	28.00
3	90.0	200.00	24.00

SEISMIC (EARTHQUAKE) DATA

Specified Peak Ground Acceleration Coefficient (PGA) = 0.220(g)

Default Velocity = 1.100(ft) per second

Specified Horizontal Earthquake Coefficient (kh) = 0.22000(g)

Specified Vertical Earthquake Coefficient (k_v) = 0.000(g)

(NOTE: Input Velocity = 0.0 will result in default Peak

Velocity = 2 times(PGA) times 2.5 fps or 0.762 mps)

Specified Seismic Pore-Pressure Factor = 0.000

Horizontal Seismic Force is Applied at Center of Gravity of Slices



TRIAL FAILURE SURFACE DATA

Circular Trial Failure Surfaces Have Been Generated Using A Random Procedure.



3000 Trial Surfaces Have Been Generated.

3000 Surfaces Generated at Increments of 0.2001(in) Equally Spaced Within the Start Range

Along The Specified Surface Between X = 60.00(ft)
and X = 110.00(ft)

Each Surface ends within a Range Between X = 230.00(ft)
and X = 300.00(ft)

All surfaces are generated left to right for both a left and right sliding slope.

Unless XCLUDE Lines Were Specified, The Minimum Elevation
To Which A Surface Extends Is Y = 330.00(ft)

Specified Maximum Radius = 100000.000(ft)

10.000(ft) Line Segments Were Used For Each Trial Failure Surface.

The Spencer Method Was Selected for FS Analysis.

Selected fx function = Constant (1.0)

SELECTED CONVERGENCE PARAMETERS FOR SPENCER METHOD:

Initial estimate of FS = 1.500

FS tolerance = 0.000001000

Initial estimate of theta(deg) = 15.00

Theta tolerance(radians) = 0.0001000

Minimum theta(deg) = -45.00 ; Maximum theta(deg) = 45.00

Theta convergence Step Factor = 5000.00

Maximum number of iterations = 50

Allowable negative side force = -1000.0(lbs)

Maximum force imbalance = 100.000000(lbs)

Maximum moment imbalance = 100.000000 (ft/lbs)

Selected Lambda Coefficient = 1.00

Specified Tension Crack Water Depth Factor = 0.000

Total Number of Trial Surfaces Attempted = 3000

WARNING! The Factor of Safety Calculation for one or More Trial Surfaces
Did Not Converge in 50 Iterations.

Number of Trial Surfaces with Non-Converged FS = 1290

Number of Trial Surfaces With Valid FS = 1710

Percentage of Trial Surfaces With Non-Converged and/or
Non-Valid FS Solutions of the Total Attempted = 43.0 %

Statistical Data On All Valid FS Values:

FS Max = 1.992 FS Min = 1.108 FS Ave = 1.529
Standard Deviation = 0.231 Coefficient of Variation = 15.12 %

Critical Surface is Sequence Number 1164 of Those Analyzed.

*****BEGINNING OF DETAILED GEOSTASE OUTPUT FOR CRITICAL SURFACE FROM A SEARCH*****

BACK-CALCULATED CIRCULAR SURFACE PARAMETERS:

Circle Center At X = 140.459292(ft) ; Y = 540.808412(ft); and Radius = 148.360476(ft)

Circular Trial Failure Surface Generated With 21 Coordinate Points

Point No.	X-Coord. (ft)	Y-Coord. (ft)
1	93.72791	400.00000
2	103.31964	397.17180
3	113.08010	394.99617
4	122.96495	393.48299
5	132.92929	392.63915

6	142.92783	392.46847
7	152.91516	392.97174
8	162.84590	394.14666
9	172.67493	395.98789
10	182.35760	398.48707
11	191.84991	401.63286
12	201.10875	405.41094
13	210.09204	409.80417
14	218.75898	414.79258
15	227.07018	420.35350
16	234.98789	426.46168
17	242.47614	433.08936
18	249.50090	440.20643
19	256.03027	447.78056
20	262.03457	455.77734
21	264.78078	460.00000

Iter. No.	Theta (deg) (fx=1.0)	FS (Moment)	FS (Force)	Lambda	Delta FS
1	15.0000	1.291645	1.044096	0.268	0.2475488E+00
2	19.9500	1.246158	1.076049	0.363	0.1701093E+00
3	30.8214	0.000000	1.174142	0.597	0.1174142E+01
4	21.3254	1.218683	1.086005	0.390	0.1326779E+00
5	22.2912	1.191824	1.093328	0.410	0.9849529E-01
6	25.0736	1.035421	1.116179	0.468	0.8075842E-01
7	23.8203	1.127785	1.105543	0.441	0.2224254E-01
8	24.0912	1.112154	1.107791	0.447	0.4362695E-02
9	24.1572	1.108064	1.108344	0.449	0.2804869E-03
10	24.1532	1.108314	1.108311	0.448	0.3299130E-05
11	24.1533	1.108311	1.108311	0.448	0.4713012E-07

Factor Of Safety For The Preceding Specified Surface = 1.108

Theta (fx = 1.0) = 24.15 Deg Lambda = 0.448

The Spencer Method Has Been Selected For Analysis.

Selected fx function = Constant (1.0)

SELECTED CONVERGENCE PARAMETERS FOR ANALYSIS METHOD:

Initial estimate of FS = 1.500

FS tolerance = 0.000001000

Initial estimate of theta(deg) = 15.00

Theta tolerance(radians) = 0.0001000

Minimum theta(deg) = -45.00 ; Maximum theta(deg) = 45.00

Theta convergence Step Factor = 5000.00

Maximum number of iterations = 50

Maximum force imbalance = 100.000000(lbs)

Maximum moment imbalance(if Applicable) = 100.000000 (ft/lbs)

Selected Lambda Coefficient = 1.00

Tension Crack Water Force = 0.00(lbs)

Specified Tension Crack Water Depth Factor = 0.000 (0.00% Filled)

Depth of Tension Crack (zo) at Side of Last Slice = 0.000(ft)

Depth of Water in Tension Crack = 0.000(ft)

Theoretical Tension Crack Depth = 10.744(ft)



NOTE: In Table 1 following, when a tension crack with water is present on the first slice (right facing slope) or on the last slice (left facing slope), the "side force" in the tension crack is set equal to the water pressure resultant.

*** Table 1 - Line of Thrust(if applicable) and Slice Force Data ***

Slice No.	X Coord.	Y Coord.	h/H	Side Force (lbs)	fx	Force Angle (Deg)	Vert. Shear Force(lbs)
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1	98.52	400.37	1.000+	4894.84	1.000	24.15	2002.9
2	103.32	400.48	1.000+	11231.63	1.000	24.15	4595.8
3	108.00	400.86	1.000+	17100.76	1.000	24.15	6997.3
4	110.54	400.96	0.973	20838.81	1.000	24.15	8526.8
5	113.08	400.94	0.824	25257.79	1.000	24.15	10335.0
6	114.10	401.01	0.789	26815.38	1.000	24.15	10972.3
7	118.53	401.31	0.685	33691.61	1.000	24.15	13785.9
8	122.96	401.39	0.607	42081.26	1.000	24.15	17218.8
9	127.95	402.15	0.582	48184.21	1.000	24.15	19716.0
10	132.93	402.70	0.552	55136.77	1.000	24.15	22560.8
11	137.93	403.41	0.530	61031.69	1.000	24.15	24972.9
12	142.93	404.01	0.507	67465.54	1.000	24.15	27605.5
13	147.92	404.82	0.491	72475.38	1.000	24.15	29655.4
14	152.92	405.55	0.473	77795.07	1.000	24.15	31832.1
15	157.88	406.51	0.460	81484.57	1.000	24.15	33341.8
16	162.85	407.41	0.446	85322.29	1.000	24.15	34912.1
17	166.42	408.40	0.444	85748.77	1.000	24.15	35086.6
18	170.00	409.36	0.440	86165.79	1.000	24.15	35257.3
19	172.67	410.07	0.454	86476.10	1.000	24.15	35384.2
20	175.34	410.92	0.470	85991.47	1.000	24.15	35185.9
21	178.00	411.79	0.487	85529.81	1.000	24.15	34997.0
22	182.36	413.20	0.477	84760.36	1.000	24.15	34682.2
23	187.10	414.92	0.467	82530.99	1.000	24.15	33770.0
24	191.85	416.59	0.457	80204.95	1.000	24.15	32818.2
25	196.48	418.42	0.447	76598.27	1.000	24.15	31342.4
26	201.11	420.22	0.437	72912.87	1.000	24.15	29834.4
27	205.60	422.17	0.427	68108.16	1.000	24.15	27868.4
28	210.09	424.09	0.417	63270.93	1.000	24.15	25889.1
29	214.43	426.16	0.407	57524.76	1.000	24.15	23537.9
30	218.76	428.20	0.396	51814.92	1.000	24.15	21201.6
31	222.91	430.39	0.384	45441.37	1.000	24.15	18593.7
32	227.07	432.55	0.372	39190.11	1.000	24.15	16035.8
33	231.03	434.85	0.360	32541.06	1.000	24.15	13315.1
34	234.99	437.13	0.346	26111.82	1.000	24.15	10684.4
35	237.49	438.77	0.336	21688.83	1.000	24.15	8874.6
36	240.00	440.42	0.327	17410.69	1.000	24.15	7124.1
37	242.48	442.10	0.335	13432.57	1.000	24.15	5496.3
38	245.24	444.48	0.356	9014.69	1.000	24.15	3688.6
39	248.00	447.58	0.417	5153.60	1.000	24.15	2108.7

40	248.38	448.13	0.433	4670.87	1.000	24.15	1911.2
41	249.50	448.87	0.438	3800.36	1.000	24.15	1555.0
42	252.77	452.21	0.514	1424.88	1.000	24.15	583.0
43	256.03	442.52	0.000-	-158.57	1.000	24.15	-64.9
44	259.03	454.07	0.278	-966.33	1.000	24.15	-395.4
45	262.03	457.27	0.354	-924.93	1.000	24.15	-378.5
46	264.78	460.00	0.000	0.01	1.000	24.15	0.0

NOTE: A value of 0.000- for h/H indicates that the line of thrust is at or below the lower boundary of the sliding mass. A value of 1.000+ for h/H indicates that the line of thrust is at or above the upper boundary of the sliding mass.



Table 2 - Geometry Data on the 46 Slices

Slice No.	Width (ft)	Height (ft)	X-Cntr (ft)	Y-Cntr-Base (ft)	Y-Cntr-Top (ft)	Alpha (deg)	Beta (deg)	Base Length (ft)
1	4.80	0.71	96.13	399.29	400.00	-16.43	0.00	5.00
2	4.80	2.12	100.92	397.88	400.00	-16.43	0.00	5.00
3	4.68	3.35	105.66	396.65	400.00	-12.57	0.00	4.80
4	2.54	4.71	109.27	395.85	400.55	-12.57	23.53	2.60
5	2.54	6.38	111.81	395.28	401.66	-12.57	23.53	2.60
6	1.02	7.52	113.59	394.92	402.43	-8.70	23.53	1.03
7	4.43	9.12	116.31	394.50	403.62	-8.70	23.53	4.49
8	4.43	11.73	120.75	393.82	405.55	-8.70	23.53	4.49
9	4.98	14.33	125.46	393.27	407.60	-4.84	23.53	5.00
10	4.98	16.92	130.44	392.85	409.77	-4.84	23.53	5.00
11	5.00	19.35	135.43	392.60	411.94	-0.98	23.53	5.00
12	5.00	21.61	140.43	392.51	414.12	-0.98	23.53	5.00
13	4.99	23.70	145.42	392.59	416.30	2.88	23.53	5.00
14	4.99	25.63	150.42	392.85	418.47	2.88	23.53	5.00
15	4.97	27.38	155.40	393.27	420.64	6.75	23.53	5.00
16	4.97	28.95	160.36	393.85	422.80	6.75	23.53	5.00
17	3.58	30.18	164.63	394.48	424.66	10.61	23.53	3.64
18	3.58	31.07	168.21	395.15	426.22	10.61	23.53	3.64
19	2.67	31.26	171.34	395.74	427.00	10.61	0.00	2.72

20	2.66	30.67	174.01	396.33	427.00	14.47	0.00	2.75
21	2.66	29.98	176.67	397.02	427.00	14.47	0.00	2.75
22	4.36	30.23	180.18	397.92	428.16	14.47	28.02	4.50
23	4.75	31.31	184.73	399.27	430.58	18.34	28.02	5.00
24	4.75	32.26	189.48	400.85	433.11	18.34	28.02	5.00
25	4.63	33.03	194.16	402.58	435.60	22.20	28.02	5.00
26	4.63	33.60	198.79	404.47	438.07	22.20	28.02	5.00
27	4.49	33.99	203.35	406.51	440.50	26.06	28.02	5.00
28	4.49	34.18	207.85	408.71	442.89	26.06	28.02	5.00
29	4.33	34.18	212.26	411.05	445.23	29.92	28.02	5.00
30	4.33	34.00	216.59	413.55	447.54	29.92	28.02	5.00
31	4.16	33.62	220.84	416.18	449.80	33.79	28.02	5.00
32	4.16	33.05	224.99	418.96	452.01	33.79	28.02	5.00
33	3.96	32.29	229.05	421.88	454.17	37.65	28.02	5.00
34	3.96	31.34	233.01	424.93	456.28	37.65	28.02	5.00
35	2.51	30.43	236.24	427.57	458.00	41.51	28.02	3.35
36	2.51	29.54	238.75	429.79	459.33	41.51	28.02	3.35
37	2.48	28.01	241.24	431.99	460.00	41.51	0.00	3.31
38	2.76	25.51	243.86	434.49	460.00	45.37	0.00	3.93
39	2.76	22.71	246.62	437.29	460.00	45.37	0.00	3.93
40	0.38	21.12	248.19	438.88	460.00	45.37	0.00	0.54
41	1.12	20.36	248.94	439.64	460.00	45.37	0.00	1.60
42	3.26	17.90	251.13	442.10	460.00	49.24	0.00	5.00
43	3.26	14.11	254.40	445.89	460.00	49.24	0.00	5.00
44	3.00	10.22	257.53	449.78	460.00	53.10	0.00	5.00
45	3.00	6.22	260.53	453.78	460.00	53.10	0.00	5.00
46	2.75	2.11	263.41	457.89	460.00	56.96	0.00	5.04



Table 2A - Coordinates of Slice Points Defining the Slip Surface

Point No.	X-Pt (ft)	Y-Pt (ft)
1	93.727909	400.000000
2	98.523774	398.585899
3	103.319638	397.171797

4	108.000000	396.128533
5	110.540051	395.562350
6	113.080101	394.996167
7	114.096999	394.840500
8	118.530976	394.161746
9	122.964953	393.482993
10	127.947120	393.061072
11	132.929286	392.639151
12	137.928558	392.553812
13	142.927830	392.468474
14	147.921494	392.720105
15	152.915158	392.971737
16	157.880527	393.559196
17	162.845897	394.146655
18	166.422948	394.816730
19	170.000000	395.486805
20	172.674928	395.987889
21	175.337464	396.675114
22	178.000000	397.362339
23	182.357597	398.487075
24	187.103754	400.059966
25	191.849912	401.632857
26	196.479330	403.521900
27	201.108749	405.410944
28	205.600395	407.607557
29	210.092042	409.804171
30	214.425510	412.298375
31	218.758978	414.792579
32	222.914580	417.573042
33	227.070182	420.353505
34	231.029038	423.407594
35	234.987894	426.461683
36	237.493947	428.679734
37	240.000000	430.897786
38	242.476141	433.089363
39	245.238071	435.887586
40	248.000000	438.685808
41	248.376114	439.066865
42	249.500904	440.206435

43	252.765586	443.993499
44	256.030267	447.780563
45	259.032417	451.778950
46	262.034566	455.777337
47	264.780782	460.000000



Table 3 - Force and Pore Pressure Data On The 46 Slices (Excluding Reinforcement)

Slice No.	Weight (lbs)	Ubeta Force	Ubeta Stress	Ualpha Force	Pore Pressure (psf)	Earthquake Force		Distributed Load (psf)
		Top (lbs)	Top (psf)	Bot (lbs)		-Uw (psf)	Horiz (lbs)	
1	406.9	0.0	0.0	0.0	0.00	0.00	89.5	0.00
2	1220.7	0.0	0.0	0.0	0.00	0.00	268.6	0.00
3	1881.4	0.0	0.0	0.0	0.00	0.00	413.9	0.00
4	1434.9	0.0	0.0	0.0	0.00	0.00	315.7	0.00
5	1944.7	0.0	0.0	0.0	0.00	0.00	427.8	0.00
6	917.1	0.0	0.0	0.0	0.00	0.00	201.8	0.00
7	4852.3	0.0	0.0	0.0	0.00	0.00	1067.5	0.00
8	6240.8	0.0	0.0	0.0	0.00	0.00	1373.0	0.00
9	8567.2	0.0	0.0	0.0	0.00	0.00	1884.8	0.00
10	10116.6	0.0	0.0	0.0	0.00	0.00	2225.7	0.00
11	11607.3	0.0	0.0	0.0	0.00	0.00	2553.6	0.00
12	12964.6	0.0	0.0	0.0	0.00	0.00	2852.2	0.00
13	14204.1	0.0	0.0	0.0	0.00	0.00	3124.9	0.00
14	15356.5	0.0	0.0	0.0	0.00	0.00	3378.4	0.00
15	16311.6	0.0	0.0	0.0	0.00	0.00	3588.5	0.00
16	17249.9	0.0	0.0	0.0	0.00	0.00	3795.0	0.00
17	12955.4	0.0	0.0	0.0	0.00	0.00	2850.2	0.00
18	13336.4	0.0	0.0	0.0	0.00	0.00	2934.0	0.00
19	10035.0	0.0	0.0	0.0	0.00	0.00	2207.7	0.00
20	9798.7	0.0	0.0	0.0	0.00	0.00	2155.7	0.00
21	9579.1	0.0	0.0	0.0	0.00	0.00	2107.4	0.00
22	15810.2	0.0	0.0	0.0	0.00	0.00	3478.2	0.00
23	17831.7	0.0	0.0	0.0	0.00	0.00	3923.0	0.00
24	18374.6	0.0	0.0	0.0	0.00	0.00	4042.4	0.00
25	18347.1	0.0	0.0	0.0	0.00	0.00	4036.4	0.00

26	18666.6	0.0	0.0	0.0	0.00	0.00	4106.6	0.0	0.00
27	18318.3	0.0	0.0	0.0	0.00	0.00	4030.0	0.0	0.00
28	18423.0	0.0	0.0	0.0	0.00	0.00	4053.0	0.0	0.00
29	17775.8	0.0	0.0	0.0	0.00	0.00	3910.7	0.0	0.00
30	17678.2	0.0	0.0	0.0	0.00	0.00	3889.2	0.0	0.00
31	16764.1	0.0	0.0	0.0	0.00	0.00	3688.1	0.0	0.00
32	16480.5	0.0	0.0	0.0	0.00	0.00	3625.7	0.0	0.00
33	15340.3	0.0	0.0	0.0	0.00	0.00	3374.9	0.0	0.00
34	14890.4	0.0	0.0	0.0	0.00	0.00	3275.9	0.0	0.00
35	9150.6	0.0	0.0	0.0	0.00	0.00	2013.1	0.0	0.00
36	8884.8	0.0	0.0	0.0	0.00	0.00	1954.6	0.0	0.00
37	8321.7	0.0	0.0	0.0	0.00	0.00	1830.8	0.0	0.00
38	8455.3	0.0	0.0	0.0	0.00	0.00	1860.2	0.0	0.00
39	7527.9	0.0	0.0	0.0	0.00	0.00	1656.1	0.0	0.00
40	953.4	0.0	0.0	0.0	0.00	0.00	209.7	0.0	0.00
41	2748.5	0.0	0.0	0.0	0.00	0.00	604.7	0.0	0.00
42	7012.5	0.0	0.0	0.0	0.00	0.00	1542.8	0.0	0.00
43	5528.9	0.0	0.0	0.0	0.00	0.00	1216.4	0.0	0.00
44	3681.9	0.0	0.0	0.0	0.00	0.00	810.0	0.0	0.00
45	2241.5	0.0	0.0	0.0	0.00	0.00	493.1	0.0	0.00
46	695.8	0.0	0.0	0.0	0.00	0.00	153.1	0.0	0.00

TOTAL WEIGHT OF SLIDING MASS = 470885.03(lbs)

EFFECTIVE WEIGHT OF SLIDING MASS = 470885.03(lbs)

TOTAL AREA OF SLIDING MASS = 3924.04(ft2)



TABLE 4 - SOIL STRENGTH & SOIL OPTIONS DATA ON THE 46 SLICES

Slice No.	Soil Type	Cohesion (psf)	Phi(Deg)	Options
1	1	350.00	33.00	
2	1	350.00	33.00	
3	1	350.00	33.00	
4	1	350.00	33.00	
5	1	350.00	33.00	

6	1	350.00	33.00	
7	2	200.00	34.00	A
8	2	200.00	34.00	A
9	2	200.00	28.00	A
10	2	200.00	28.00	A
11	2	200.00	28.00	A
12	2	200.00	28.00	A
13	2	200.00	28.00	A
14	2	200.00	28.00	A
15	2	200.00	28.00	A
16	2	200.00	28.00	A
17	2	200.00	24.00	A
18	2	200.00	24.00	A
19	2	200.00	24.00	A
20	2	200.00	24.00	A
21	2	200.00	24.00	A
22	2	200.00	24.00	A
23	2	200.00	24.00	A
24	2	200.00	24.00	A
25	2	200.00	24.00	A
26	2	200.00	24.00	A
27	2	200.00	24.00	A
28	2	200.00	24.00	A
29	2	200.00	24.00	A
30	2	200.00	24.00	A
31	2	200.00	24.00	A
32	2	200.00	24.00	A
33	2	200.00	24.00	A
34	2	200.00	24.00	A
35	2	200.00	24.00	A
36	2	200.00	24.00	A
37	2	200.00	24.00	A
38	2	200.00	24.00	A
39	2	200.00	24.00	A
40	2	200.00	24.00	A
41	1	350.00	33.00	
42	1	350.00	33.00	
43	1	350.00	33.00	
44	1	350.00	33.00	

45	1	350.00	33.00
46	1	350.00	33.00

SOIL OPTIONS:

A = ANISOTROPIC SHEAR STRENGTH

C = CURVED STRENGTH ENVELOPE (TANGENT PHI & C)

F = FIBER-REINFORCED SOIL (FRS)

M = INDEPENDENT MULTI-STAGE SHEAR STRENGTH

N = NONLINEAR UNDRAINED SHEAR STRENGTH

R = RAPID DRAWDOWN OR RAPID LOADING (SEISMIC) SHEAR STRENGTH

S = SHANSEP UNDRAINED SHEAR STRENGTH

NOTE: Phi and C in Table 4 are modified values based on specified Soil Options (if any).



TABLE 5 - Total Base Stress Data on the 46 Slices

Slice No. *	Alpha (deg)	X-Coord. Slice Cntr (ft)	Base Leng. (ft)	Total Normal Stress (psf)	Total Vert. Stress (psf)	Total Normal/Vert. Stress Ratio
1	-16.43	96.13	5.00	719.98	84.85	8.486
2	-16.43	100.92	5.00	1073.83	254.54	4.219
3	-12.57	105.66	4.80	1133.53	401.98	2.820
4	-12.57	109.27	2.60	1423.38	564.92	2.520
5	-12.57	111.81	2.60	1780.38	765.60	2.325
6	-8.70	113.59	1.03	1732.31	901.85	1.921
7	-8.70	116.31	4.49	1936.97	1094.34	1.770
8	-8.70	120.75	4.49	2436.32	1407.50	1.731
9	-4.84	125.46	5.00	2330.78	1719.57	1.355
10	-4.84	130.44	5.00	2727.67	2030.56	1.343
11	-0.98	135.43	5.00	2830.55	2321.80	1.219
12	-0.98	140.43	5.00	3148.76	2593.30	1.214
13	2.88	145.42	5.00	3169.22	2844.43	1.114
14	2.88	150.42	5.00	3419.33	3075.19	1.112
15	6.75	155.40	5.00	3376.13	3285.06	1.028
16	6.75	160.36	5.00	3566.52	3474.05	1.027

17	10.61	164.63	3.64	3382.26	3621.80	0.934
18	10.61	168.21	3.64	3480.32	3728.32	0.933
19	10.61	171.34	2.72	3501.67	3751.52	0.933
20	14.47	174.01	2.75	3224.79	3680.22	0.876
21	14.47	176.67	2.75	3153.27	3597.75	0.876
22	14.47	180.18	4.50	3179.68	3628.20	0.876
23	18.34	184.73	5.00	3093.26	3757.07	0.823
24	18.34	189.48	5.00	3186.86	3871.47	0.823
25	22.20	194.16	5.00	3067.86	3963.16	0.774
26	22.20	198.79	5.00	3121.16	4032.16	0.774
27	26.06	203.35	5.00	2969.07	4078.31	0.728
28	26.06	207.85	5.00	2986.06	4101.60	0.728
29	29.92	212.26	5.00	2806.62	4101.99	0.684
30	29.92	216.59	5.00	2791.11	4079.47	0.684
31	33.79	220.84	5.00	2589.71	4034.09	0.642
32	33.79	224.99	5.00	2545.42	3965.86	0.642
33	37.65	229.05	5.00	2327.24	3874.92	0.601
34	37.65	233.01	5.00	2257.84	3761.29	0.600
35	41.51	236.24	3.35	2043.10	3651.42	0.560
36	41.51	238.75	3.35	1982.28	3545.32	0.559
37	41.51	241.24	3.31	1876.49	3360.77	0.558
38	45.37	243.86	3.93	1580.71	3061.38	0.516
39	45.37	246.62	3.93	1400.68	2725.60	0.514
40	45.37	248.19	0.54	1298.41	2534.84	0.512
41	45.37	248.94	1.60	1133.87	2443.60	0.464
42	49.24	251.13	5.00	883.46	2148.00	0.411
43	49.24	254.40	5.00	672.01	1693.56	0.397
44	53.10	257.53	5.00	390.78	1226.43	0.319
45	53.10	260.53	5.00	186.29	746.62	0.250
46	56.96	263.41	5.04	-49.66	253.36	-0.196

↑

TABLE 5A - Total Base Force Data on the 46 Slices

Slice No. *	Alpha (deg)	X-Coord. Slice Cntr (ft)	Base Leng. (ft)	Total Normal Force (lbs)	Total Vert. Force (lbs)	Total Normal/Vert. Force Ratio
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1	-16.43	96.13	5.00	3599.88	406.91	8.847
2	-16.43	100.92	5.00	5369.14	1220.73	4.398
3	-12.57	105.66	4.80	5435.51	1881.41	2.889
4	-12.57	109.27	2.60	3704.19	1434.92	2.581
5	-12.57	111.81	2.60	4633.23	1944.65	2.383
6	-8.70	113.59	1.03	1782.11	917.09	1.943
7	-8.70	116.31	4.49	8688.54	4852.27	1.791
8	-8.70	120.75	4.49	10928.41	6240.82	1.751
9	-4.84	125.46	5.00	11653.90	8567.21	1.360
10	-4.84	130.44	5.00	13638.36	10116.61	1.348
11	-0.98	135.43	5.00	14152.76	11607.33	1.219
12	-0.98	140.43	5.00	15743.80	12964.60	1.214
13	2.88	145.42	5.00	15846.11	14204.11	1.116
14	2.88	150.42	5.00	17096.65	15356.46	1.113
15	6.75	155.40	5.00	16880.63	16311.55	1.035
16	6.75	160.36	5.00	17832.59	17249.94	1.034
17	10.61	164.63	3.64	12308.96	12955.37	0.950
18	10.61	168.21	3.64	12665.83	13336.40	0.950
19	10.61	171.34	2.72	9529.65	10035.04	0.950
20	14.47	174.01	2.75	8867.53	9798.72	0.905
21	14.47	176.67	2.75	8670.86	9579.15	0.905
22	14.47	180.18	4.50	14309.85	15810.22	0.905
23	18.34	184.73	5.00	15466.31	17831.66	0.867
24	18.34	189.48	5.00	15934.30	18374.59	0.867
25	22.20	194.16	5.00	15339.29	18347.15	0.836
26	22.20	198.79	5.00	15605.81	18666.58	0.836
27	26.06	203.35	5.00	14845.33	18318.33	0.810
28	26.06	207.85	5.00	14930.28	18422.95	0.810
29	29.92	212.26	5.00	14033.09	17775.84	0.789
30	29.92	216.59	5.00	13955.56	17678.24	0.789
31	33.79	220.84	5.00	12948.53	16764.07	0.772
32	33.79	224.99	5.00	12727.10	16480.52	0.772
33	37.65	229.05	5.00	11636.22	15340.26	0.759
34	37.65	233.01	5.00	11289.19	14890.39	0.758
35	41.51	236.24	3.35	6837.55	9150.65	0.747
36	41.51	238.75	3.35	6633.99	8884.75	0.747
37	41.51	241.24	3.31	6204.98	8321.74	0.746
38	45.37	243.86	3.93	6214.87	8455.32	0.735
39	45.37	246.62	3.93	5507.05	7527.90	0.732

40	45.37	248.19	0.54	695.18	953.39	0.729
41	45.37	248.94	1.60	1815.52	2748.54	0.661
42	49.24	251.13	5.00	4417.29	7012.55	0.630
43	49.24	254.40	5.00	3360.03	5528.92	0.608
44	53.10	257.53	5.00	1953.92	3681.92	0.531
45	53.10	260.53	5.00	931.47	2241.47	0.416
46	56.96	263.41	5.04	-250.15	695.78	-0.360

↑

TABLE 6 - Effective and Base Shear Stress Data on the 46 Slices

Slice No. *	Alpha (deg)	X-Coord. Slice Cntr (ft)	Base Leng. (ft)	Effective Normal Stress (psf)	Available Shear Strength (psf)	Mobilized Shear Stress (psf)
1	-16.43	96.13	5.00	719.98	817.56	737.66
2	-16.43	100.92	5.00	1073.83	1047.35	945.00
3	-12.57	105.66	4.80	1133.53	1086.12	979.98
4	-12.57	109.27	2.60	1423.38	1274.35	1149.82
5	-12.57	111.81	2.60	1780.38	1506.19	1359.00
6	-8.70	113.59	1.03	1732.31	1474.98	1330.83
7	-8.70	116.31	4.49	1936.97	1506.51	1359.28
8	-8.70	120.75	4.49	2436.32	1843.32	1663.18
9	-4.84	125.46	5.00	2330.78	1439.30	1298.64
10	-4.84	130.44	5.00	2727.67	1650.33	1489.05
11	-0.98	135.43	5.00	2830.55	1705.03	1538.40
12	-0.98	140.43	5.00	3148.76	1874.23	1691.06
13	2.88	145.42	5.00	3169.22	1885.11	1700.88
14	2.88	150.42	5.00	3419.33	2018.09	1820.87
15	6.75	155.40	5.00	3376.13	1995.12	1800.14
16	6.75	160.36	5.00	3566.52	2096.35	1891.48
17	10.61	164.63	3.64	3382.26	1705.88	1539.17
18	10.61	168.21	3.64	3480.32	1749.54	1578.56
19	10.61	171.34	2.72	3501.67	1759.05	1587.14
20	14.47	174.01	2.75	3224.79	1635.77	1475.91
21	14.47	176.67	2.75	3153.27	1603.93	1447.18
22	14.47	180.18	4.50	3179.68	1615.68	1457.79
23	18.34	184.73	5.00	3093.26	1577.21	1423.07

24	18.34	189.48	5.00	3186.86	1618.88	1460.67
25	22.20	194.16	5.00	3067.86	1565.90	1412.87
26	22.20	198.79	5.00	3121.16	1589.63	1434.28
27	26.06	203.35	5.00	2969.07	1521.91	1373.18
28	26.06	207.85	5.00	2986.06	1529.48	1380.01
29	29.92	212.26	5.00	2806.62	1449.59	1307.92
30	29.92	216.59	5.00	2791.11	1442.68	1301.70
31	33.79	220.84	5.00	2589.71	1353.01	1220.79
32	33.79	224.99	5.00	2545.42	1333.29	1203.00
33	37.65	229.05	5.00	2327.24	1236.16	1115.35
34	37.65	233.01	5.00	2257.84	1205.25	1087.47
35	41.51	236.24	3.35	2043.10	1109.65	1001.21
36	41.51	238.75	3.35	1982.28	1082.57	976.77
37	41.51	241.24	3.31	1876.49	1035.47	934.27
38	45.37	243.86	3.93	1580.71	903.78	815.45
39	45.37	246.62	3.93	1400.68	823.62	743.13
40	45.37	248.19	0.54	1298.41	778.09	702.05
41	45.37	248.94	1.60	1133.87	1086.34	980.18
42	49.24	251.13	5.00	883.46	923.72	833.45
43	49.24	254.40	5.00	672.01	786.41	709.55
44	53.10	257.53	5.00	390.78	603.78	544.77
45	53.10	260.53	5.00	186.29	470.98	424.95
46	56.96	263.41	5.04	-49.66	317.75	286.70

↑

TABLE 6A - Effective and Base Shear Force Data on the 46 Slices

Slice No. *	Alpha (deg)	X-Coord. Slice Cntr (ft)	Base Leng. (ft)	Effective Normal Force (lbs)	Available Shear Force (lbs)	Mobilized Shear Force (lbs)
1	-16.43	96.13	5.00	3599.88	4087.79	3688.30
2	-16.43	100.92	5.00	5369.14	5236.76	4724.99
3	-12.57	105.66	4.80	5435.51	5208.19	4699.22
4	-12.57	109.27	2.60	3704.19	3316.36	2992.27
5	-12.57	111.81	2.60	4633.23	3919.69	3536.64
6	-8.70	113.59	1.03	1782.11	1517.37	1369.09
7	-8.70	116.31	4.49	8688.54	6757.62	6097.23

8	-8.70	120.75	4.49	10928.41	8268.43	7460.39
9	-4.84	125.46	5.00	11653.90	7196.49	6493.20
10	-4.84	130.44	5.00	13638.36	8251.64	7445.24
11	-0.98	135.43	5.00	14152.76	8525.15	7692.02
12	-0.98	140.43	5.00	15743.80	9371.13	8455.32
13	2.88	145.42	5.00	15846.11	9425.53	8504.41
14	2.88	150.42	5.00	17096.65	10090.45	9104.35
15	6.75	155.40	5.00	16880.63	9975.59	9000.71
16	6.75	160.36	5.00	17832.59	10481.76	9457.42
17	10.61	164.63	3.64	12308.96	6208.16	5601.46
18	10.61	168.21	3.64	12665.83	6367.05	5744.82
19	10.61	171.34	2.72	9529.65	4787.17	4319.33
20	14.47	174.01	2.75	8867.53	4498.04	4058.46
21	14.47	176.67	2.75	8670.86	4410.47	3979.45
22	14.47	180.18	4.50	14309.85	7271.24	6560.65
23	18.34	184.73	5.00	15466.31	7886.04	7115.37
24	18.34	189.48	5.00	15934.30	8094.41	7303.37
25	22.20	194.16	5.00	15339.29	7829.49	7064.35
26	22.20	198.79	5.00	15605.81	7948.15	7171.41
27	26.06	203.35	5.00	14845.33	7609.57	6865.91
28	26.06	207.85	5.00	14930.28	7647.39	6900.04
29	29.92	212.26	5.00	14033.09	7247.94	6539.62
30	29.92	216.59	5.00	13955.56	7213.42	6508.48
31	33.79	220.84	5.00	12948.53	6765.06	6103.94
32	33.79	224.99	5.00	12727.10	6666.47	6014.98
33	37.65	229.05	5.00	11636.22	6180.78	5576.75
34	37.65	233.01	5.00	11289.19	6026.27	5437.35
35	41.51	236.24	3.35	6837.55	3713.60	3350.69
36	41.51	238.75	3.35	6633.99	3622.97	3268.91
37	41.51	241.24	3.31	6204.98	3423.98	3089.37
38	45.37	243.86	3.93	6214.87	3553.38	3206.12
39	45.37	246.62	3.93	5507.05	3238.24	2921.78
40	45.37	248.19	0.54	695.18	416.60	375.89
41	45.37	248.94	1.60	1815.52	1739.43	1569.44
42	49.24	251.13	5.00	4417.29	4618.62	4167.26
43	49.24	254.40	5.00	3360.03	3932.03	3547.77
44	53.10	257.53	5.00	1953.92	3018.89	2723.87
45	53.10	260.53	5.00	931.47	2354.90	2124.77
46	56.96	263.41	5.04	-250.15	1600.54	1444.13

Average Effective Normal Stress = 2288.6476(psf)
Average Available Shear Strength = 1371.6376(psf)
Total Length of Failure Surface = 195.0371(ft)

INPUT PARAMETERS FOR SIMPLIFIED 3D ANALYSIS

Composite Phi (deg)= 30.935
3D Depth (Vertical difference between ends of Slip Surface) = 60.00(ft)
L/D(1): L = 60.00(ft) L/D(2): L = 120.00(ft) L/D(3): L = 180.00(ft)
L/D(4): L = 240.00(ft) L/D(5): L = 300.00(ft) L/D(6): L = 360.00(ft)

Average Elevation of Point of Application of kh on Sliding Mass = 422.231(ft)

SUM OF MOMENTS = -0.466948E-02 (ft/lbs); Imbalance (Fraction of Total Weight) = -0.9916386E-08
SUM OF FORCES = -.116072E-03 (lbs); Imbalance (Fraction of Total Weight) = -0.2464971E-09

Sum of Available Shear Forces = 267520.24(lbs)

Sum of Mobilized Shear Forces = 241376.51(lbs)

FS Balance Check: FS = 1.108311

**** END OF GEOSTASE OUTPUT ****

Appendix F

APPENDIX F

GENERAL EARTHWORK AND GRADING SPECIFICATIONS

1.0 GENERAL

- 1.1 **Intent:** These General Earthwork and Grading Specifications are for the grading and earthwork shown on the approved grading plan(s) and/or indicated in the geotechnical report(s). These Specifications are a part of the recommendations contained in the geotechnical report(s). In case of conflict, the specific recommendations in the geotechnical report shall supersede these general Specifications. Observations of the earthwork by the project Geotechnical Consultant during grading may result in new or revised recommendations that could supersede these specifications or the recommendations in the geotechnical report(s).
- 1.2 **Geotechnical Consultant:** Prior to commencement of work, the project owner shall employ a geotechnical consultant. The geotechnical consultant shall be responsible for reviewing the approved geotechnical report(s) and accepting the adequacy of the preliminary geotechnical findings, conclusions, and recommendations prior to the commencement of grading.

Prior to commencement of grading, the Geotechnical Consultant shall review the "work plan" prepared by the Earthwork Contractor (Contractor) and schedule sufficient personnel to perform the appropriate level of observation, mapping, and compaction testing.

During grading and earthwork operations, the Geotechnical Consultant shall observe, map, and document the subsurface exposures to verify the geotechnical design assumptions. If the observed conditions are found to be significantly different than the interpreted assumptions during the design phase, the Geotechnical Consultant shall inform the owner, recommend appropriate changes in design to accommodate the observed conditions, and notify the review agency where required. Subsurface areas to be geotechnically observed, mapped, elevations recorded, and/or tested include natural ground after it has been cleared for receiving fill but before fill is placed, bottoms of all "remedial removal" areas, all keyway bottoms, and benches made on sloping ground to receive fill.

The Geotechnical Consultant shall observe the moisture-conditioning and processing of subgrade and fill materials and perform adequate relative compaction testing of fill to determine the attained level of compaction and assess if, in their opinion, if the work was performed in substantial compliance

with the geotechnical report(s) and these specifications. The Geotechnical Consultant shall provide test results to the owner on a routine and frequent basis.

- 1.3 The Earthwork Contractor:** The Earthwork Contractor (Contractor) shall be qualified, experienced, and knowledgeable in earthwork logistics, preparation and processing of ground to receive fill, moisture-conditioning and processing of fill, and compacting fill. The Contractor shall review and accept the plans, geotechnical report(s), and these Specifications prior to commencement of grading. The Contractor shall be solely responsible for performing the grading in accordance with applicable grading codes, the project plans, and these specifications.

The Contractor shall prepare and submit to the owner and the Geotechnical Consultant a work plan that indicates the sequence of earthwork grading, the number of "spreads" of work and the estimated quantities of daily earthwork planned for the site prior to commencement of grading. The Contractor shall inform the owner and the Geotechnical Consultant of changes in work schedules and updates to the work plan at least 24 hours in advance of such changes so that appropriate observations and tests can be planned and accomplished. The Contractor shall not assume that the Geotechnical Consultant is aware of all grading operations.

The Contractor shall have the sole responsibility to provide adequate equipment and methods to accomplish the earthwork in accordance with the applicable grading codes and agency ordinances, these Specifications, and the recommendations in the approved geotechnical report(s) and grading plan(s). If, in the opinion of the Geotechnical Consultant, unsatisfactory conditions, such as unsuitable soil, improper moisture condition, inadequate compaction, insufficient buttress key size, adverse weather, etc., are resulting in a quality of work less than required in these specifications, the Geotechnical Consultant shall reject the work and may recommend to the owner that construction be stopped until the conditions are corrected.

2.0 PREPARATION OF FILL AREAS

- 2.1 Clearing and Grubbing:** Areas to be excavated and filled shall be cleared and grubbed. Vegetation, such as brush, grass, roots, and other deleterious material, man-made structures, and similar debris shall be sufficiently removed and properly disposed of in a method acceptable to the owner, governing agencies, and the Geotechnical Consultant. Borrow areas shall be cleared and grubbed to the extent necessary to provide a suitable fill material.

Concrete fragments that are free of reinforcing steel may be placed in fills, provided they are placed in accordance with Section 3 and 4. Earth fill material

shall not contain more than 1 percent of organic materials (by volume). No fill lift shall contain more than 5 percent organic matter. Nesting of organic materials shall not be allowed.

If potentially hazardous materials are encountered, the Contractor shall stop work in the affected area, and a hazardous material specialist shall be informed immediately for proper evaluation and handling of these materials prior to continuing to work in that area. As presently defined by the State of California, most refined petroleum products (gasoline, diesel fuel, motor oil, grease, etc.) have chemical constituents that are considered hazardous waste. As such, the indiscriminate dumping or spillage of such fluids may constitute a misdemeanor, punishable by fines and/or imprisonment, and shall not be allowed.

The Geotechnical Consultant shall not be responsible for the identification or analysis of potentially hazardous materials; however, if observations, odors, or soil discoloration are suspect, the Geotechnical Consultant may request from the owner the termination of grading operations until such materials are deemed not hazardous as defined by applicable laws and regulations.

2.2 Evaluation/Acceptance of Fill Areas: All areas to receive fill, including removal and processed areas, key bottoms, and benches, shall be observed, mapped, elevations recorded, and/or tested prior to being accepted by the Geotechnical Consultant as suitable to receive fill. The Contractor shall obtain a written acceptance from the Geotechnical Consultant prior to fill placement. A licensed surveyor shall provide the survey control for determining elevations of processed areas, keys, and benches.

2.3 Processing: Ground that has been declared satisfactory for support of fill by the Geotechnical Consultant shall be scarified to a minimum depth of 6 inches. Ground that is not satisfactory shall be removed/overexcavated as specified in the following section. Scarification shall continue until soils are broken down and free of large clay lumps or clods and the working surface is reasonably uniform, flat, and free of uneven features that would inhibit uniform compaction. After scarification, the surface should be moisture conditioned, as necessary, to achieve the proper moisture content and compacted in accordance with Section 4 of these specifications.

2.4 Overexcavation: In addition to removals and overexcavations recommended in the approved geotechnical report(s) and the grading plan, soft, loose, dry, saturated, spongy, organic-rich, highly fractured, or otherwise unsuitable ground shall be overexcavated to competent ground as recommended by the Geotechnical Consultant during grading.

- 2.5 **Benching:** Fills to be placed on ground sloping steeper than 5H:1V (horizontal to vertical units) shall be stepped or benched. The lowest bench or key shall be a minimum of 15 feet wide and at least 2 feet deep, into competent material as evaluated by the Geotechnical Consultant. Other benches shall be excavated a minimum height of 4 feet into competent material or as otherwise recommended by the Geotechnical Consultant. Fill placed on ground sloping flatter than 5:1 shall also be benched or otherwise overexcavated to provide a flat subgrade for fill placement.

3.0 **FILL MATERIAL**

- 3.1 **General:** Material to be used as fill shall be essentially free of organic matter and other deleterious substances evaluated and accepted by the Geotechnical Consultant prior to placement. Soils of poor quality, such as those with unacceptable gradation, high expansion potential, or low strength shall be placed in areas acceptable to the Geotechnical Consultant or mixed with other soils to achieve satisfactory fill material.
- 3.2 **Oversize:** Oversize material defined as rock, or other irreducible material with a maximum dimension greater than 12 inches, shall not be buried or placed in fill unless location, materials, and placement methods are specifically accepted by the Geotechnical Consultant. Placement operations shall be such that nesting of oversized material does not occur and that oversize material is completely surrounded by compacted or densified fill. Oversize material shall not be placed within 10 vertical feet of finish grade or within 2 feet of future utilities or other underground construction.
- 3.3 **Import:** If importing of fill material is required for grading, proposed import material shall meet the requirements of Section 3.1 and/or requirements defined in the project geotechnical report(s). The potential import source shall be given to the Geotechnical Consultant at least 48 hours (2 working days) before import begins so that suitability can be determined, and appropriate laboratory tests performed.

4.0 **FILL PLACEMENT AND COMPACTION**

- 4.1 **Fill Layers:** Approved fill material shall be placed in areas prepared to receive fill (per Section 3.0) in near-horizontal layers not exceeding 8 inches in loose thickness. The Geotechnical Consultant may accept thicker layers if testing indicates the grading procedures can adequately compact the thicker layers. Each layer shall be spread evenly and mixed thoroughly to attain relative uniformity of material and moisture throughout.

- 4.2 **Fill Moisture Conditioning:** Fill soils shall be watered, dried back, blended, and/or mixed, as necessary to attain a relatively uniform moisture content at or slightly over optimum. Maximum density and optimum soil moisture content tests shall be performed in accordance with ASTM International (ASTM Test Method D1557).
- 4.3 **Compaction of Fill:** After each layer has been moisture-conditioned, mixed, and evenly spread, it shall be uniformly compacted to not less than 90 percent of maximum dry density (ASTM Test Method D1557). Compaction equipment shall be adequately sized and be either specifically designed for soil compaction or of proven reliability to efficiently achieve the specified level of compaction and uniformity.
- Compaction of Fill Slopes:** In addition to normal compaction procedures specified above, compaction of slopes shall be accomplished by backrolling of slopes with sheepsfoot rollers at increments of 3 to 4 feet in fill elevation, or by other methods producing satisfactory results acceptable to the Geotechnical Consultant. Upon completion of grading, relative compaction of the fill, out to the slope face, shall be at least 90 percent of maximum density per ASTM Test Method D1557.
- 4.4 **Compaction Testing:** Field tests for moisture content and relative compaction of the fill soils shall be performed by the Geotechnical Consultant. Location and frequency of tests shall be at the Consultant's discretion based on field conditions encountered. Compaction test locations will not necessarily be selected on a random basis. Test locations shall be selected to verify adequacy of compaction levels in areas that are judged to be prone to inadequate compaction (such as close to slope faces and at the fill/bedrock benches).
- 4.5 **Frequency of Compaction Testing:** Tests shall be taken at intervals required by the governing agency and as deemed necessary by the Geotechnical Consultant in order to adequately qualify the fill material. In general, it should be anticipated that tests will be taken at intervals not exceeding 2 feet in vertical rise and/or 1,000 cubic yards of compacted fill, unless recommended otherwise by the Geotechnical Consultant. In addition, test(s) shall be taken on slope faces and/or each 10 feet of vertical height of slope as deemed necessary by the Geotechnical Consultant. The Contractor shall assure that fill construction is such that the testing schedule can be accomplished by the Geotechnical Consultant. The Contractor shall stop or slow down the earthwork construction if these minimum standards are not met.

- 4.6 Compaction Test Locations:** The Geotechnical Consultant shall document the approximate elevation and location of each compaction test. The Contractor shall coordinate with the project surveyor to assure that sufficient grade stakes are established so the Geotechnical Consultant can determine the test locations with sufficient accuracy. At a minimum, two grade stakes within a horizontal distance of 100 feet and vertically less than 5 feet apart from potential test locations shall be provided. Alternatively, GPS units may be used to determine the approximate location/coordinates of the field density tests.

5.0 SUBDRAIN INSTALLATION

Subdrain systems shall be installed in accordance with the approved geotechnical report(s), the grading plan, and standard details. The Geotechnical Consultant may recommend additional subdrains and/or changes in subdrain extent, location, grade, or material depending on conditions encountered during grading. All subdrains shall be surveyed for line and grade after installation and prior to burial. Sufficient time should be allowed by the Contractor for these surveys. The Contractor should consider videoing the subdrains shortly after burial to check proper installation and functionality. The Contractor is responsible for the performance of subdrains.

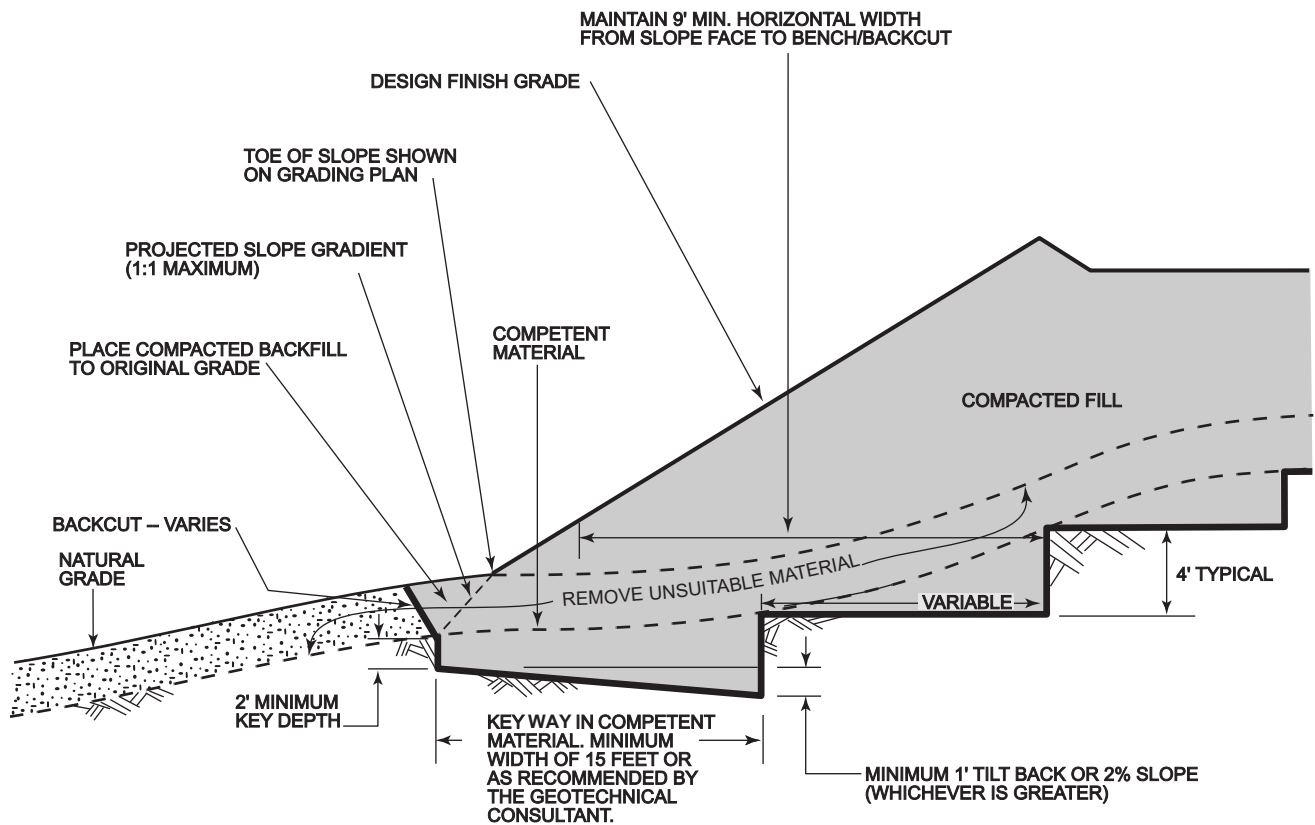
6.0 EXCAVATION

Excavations, including over-excavation for remedial purposes, shall be evaluated by the Geotechnical Consultant during grading. Remedial removal depths shown on geotechnical report(s) and plans are estimates. The actual extent of removal shall be determined by the Geotechnical Consultant based on the field evaluation of exposed conditions during grading. Where fill-over-cut slopes are to be graded, the cut portion of the slope shall be made, evaluated, and accepted by the Geotechnical Consultant prior to placement of materials for construction of the fill portion of the slope, unless otherwise recommended by the Geotechnical Consultant.

7.0 TRENCH BACKFILLS

- 7.1** Contractor shall follow all OHSA and Cal/OSHA requirements for safety of trench excavations.
- 7.2** Bedding and backfill of utility trenches shall be done in accordance with the applicable provisions of Standard Specifications of Public Works Construction. Bedding material shall have a Sand Equivalent greater than 30 (SE>30). The bedding shall be placed to 1 foot over the top of the conduit and densified by jetting. Backfill shall be placed and densified to a minimum 90 percent of maximum from 1 foot above the top of the conduit to the surface, except in traveled ways (see Section 7.6 below).

- 7.3** Jetting of the bedding around the conduits shall be observed by the Geotechnical Consultant.
- 7.4** Geotechnical Consultant shall test the trench backfill for relative compaction. At least one test should be made for every 300 feet of trench and 2 feet of fill, unless required differently by the governing agency or the Geotechnical Consultant.
- 7.5** Lift thickness of trench backfill shall not exceed those allowed in the Standard Specifications of Public Works Construction unless the Contractor can demonstrate to the Geotechnical Consultant that the fill lift can be compacted to the minimum relative compaction by his alternative equipment and method.
- 7.6** Trench backfill in the upper foot measured from finish grade within existing or future traveled way, shoulder, and other paved areas (or areas to receive pavement) should be placed to a minimum 95 percent relative compaction.

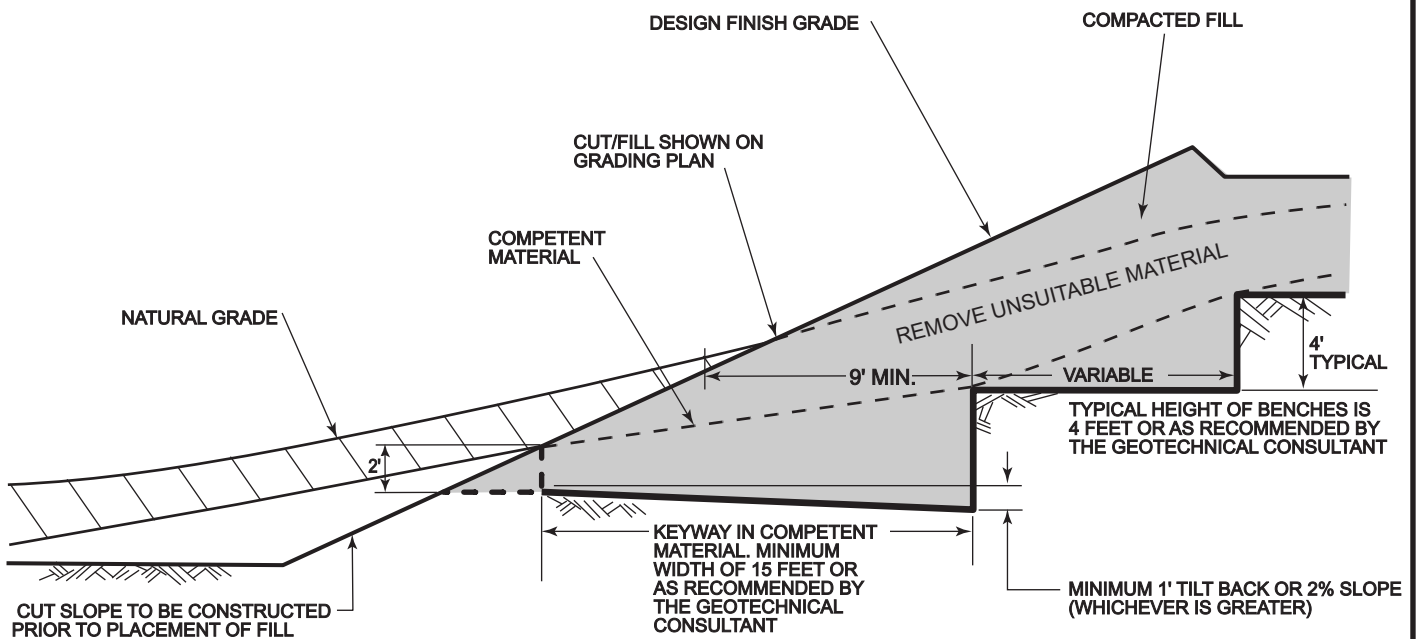


NOTE: BENCHING SHALL BE REQUIRED WHEN SLOPES ARE EQUAL TO OR STEEPER THAN 5H:1V OR WHEN RECOMMENDED BY THE GEOTECHNICAL CONSULTANT. WHERE THE NATURAL SLOPE APPROACHES OR EXCEEDS THE DESIGN SLOPE RATIO, SPECIFIC RECOMMENDATIONS SHOULD BE PROVIDED BY THE GEOTECHNICAL CONSULTANT.

FIGURE 1

TYPICAL FILL KEY ABOVE NATURAL SLOPE MINIMUM STANDARD GRADING DETAIL



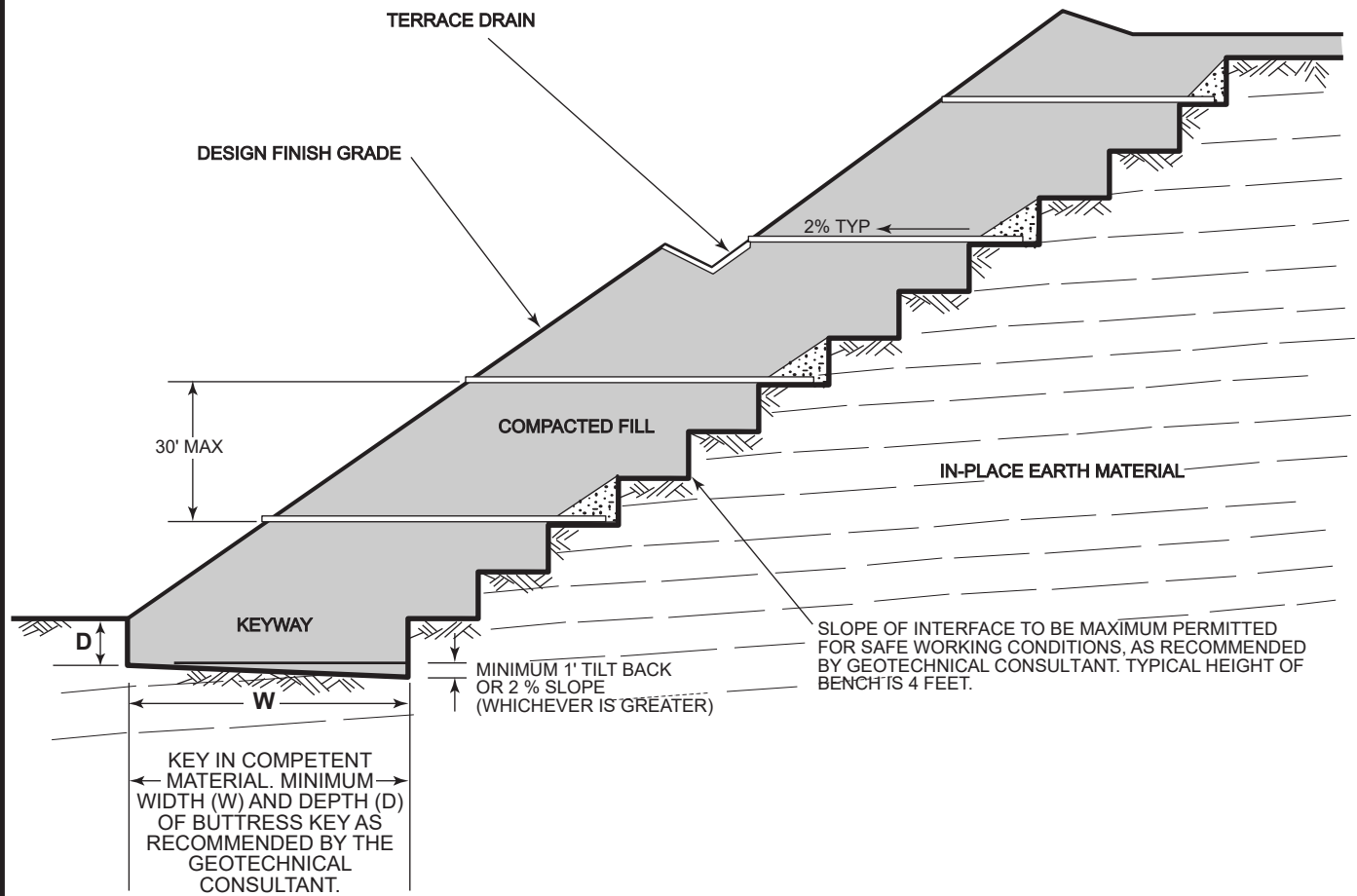


NOTE: BENCHING SHALL BE REQUIRED WHEN SLOPES ARE EQUAL TO OR STEEPER THAN 5H:1V OR WHEN RECOMMENDED BY THE GEOTECHNICAL CONSULTANT. WHERE THE NATURAL SLOPE APPROACHES OR EXCEEDS THE DESIGN SLOPE RATIO, SPECIFIC RECOMMENDATIONS SHOULD BE PROVIDED BY THE GEOTECHNICAL CONSULTANT.

FIGURE 2

**TYPICAL FILL ABOVE CUT SLOPE
MINIMUM STANDARD GRADING DETAIL**

S/A

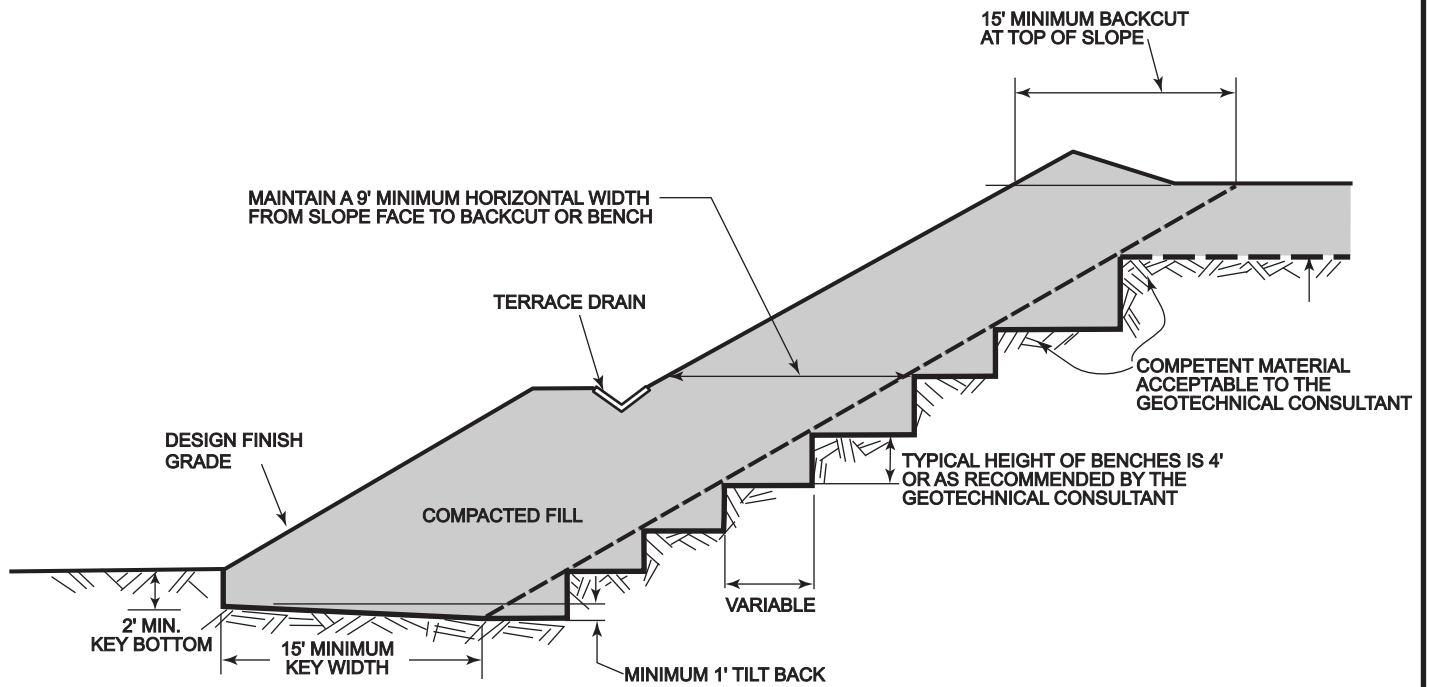


NOTE: FOR SUBDRAIN DETAILS, SEE FIGURE 5.

FIGURE 3

TYPICAL BUTTRESS FILL MINIMUM STANDARD GRADING DETAIL



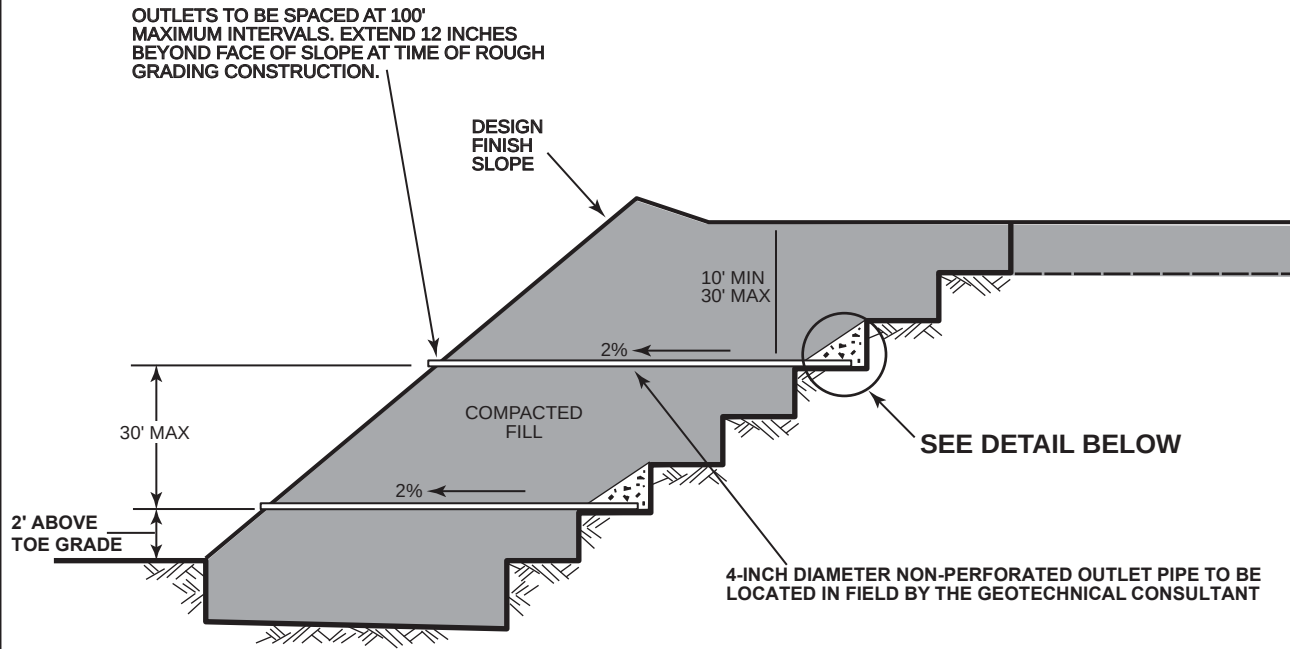


NOTE: FOR SUBDRAIN DETAILS, SEE FIGURE 5.

FIGURE 4

TYPICAL STABILIZATION FILL MINIMUM STANDARD GRADING DETAIL

S
A



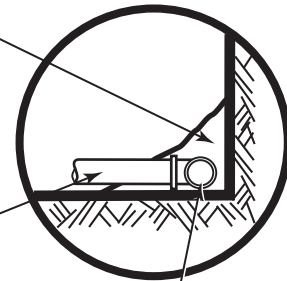
FILTER MATERIAL - MINIMUM OF THREE CUBIC FEET PER FOOT OF PIPE. SEE FILTER MATERIAL SPECIFICATION.

ALTERNATE: IN LIEU OF FILTER MATERIAL, THREE CUBIC FEET OF GRAVEL PER FOOT OF SUBDRAIN (WITHOUT PIPE) MAY BE ENCASED IN FILTER FABRIC.

GRAVEL TO CONSIST OF 1/2" TO 1" CRUSHED ROCK PER STANDARD SPECIFICATIONS FOR PUBLIC WORKS CONSTRUCTION. FIGURE 6 FOR FILTER FABRIC SPECIFICATION

FILTER FABRIC SHALL BE LAPPED A MINIMUM OF 12 INCHES ON ALL JOINTS. SEE FIGURE 6 FOR FILTER FABRIC SPECIFICATION

DETAIL



OUTLET PIPE TO BE CONNECTED TO SUBDRAIN PIPE WITH TEE OR ELBOW

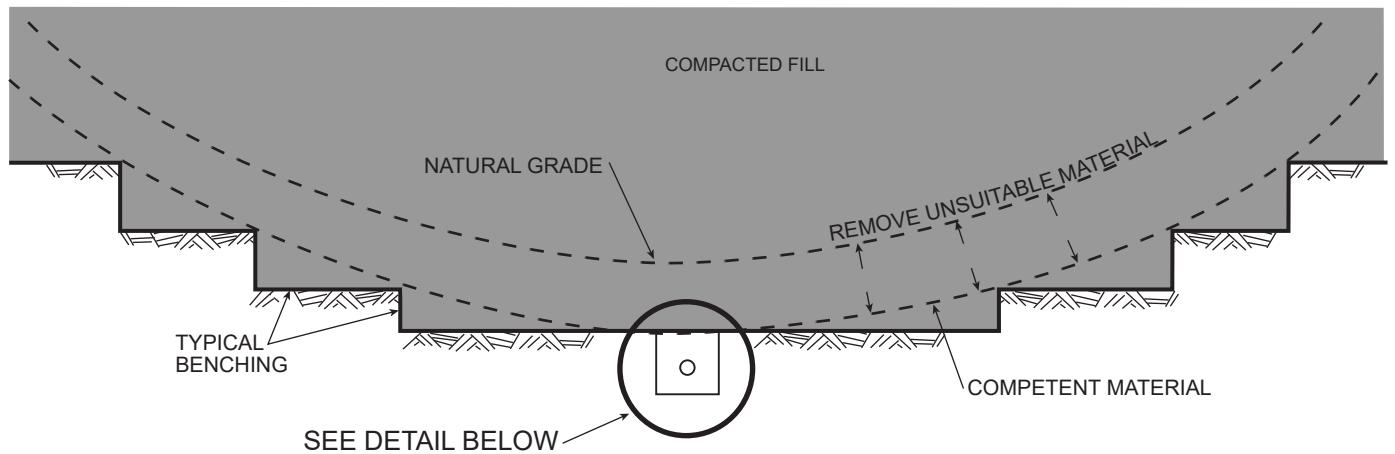
MINIMUM 4-INCH DIAMETER SCHEDULE 40 ASTM D1527 OR D1785 OR SDR 35 ASTM D2751 OR D 3034. FOR FILL DEPTH OF 60 FEET OR GREATER, USE ONLY SCHEDULE 40 OR EQUIVALENT. THERE SHALL BE A MINIMUM OF 8 UNIFORMLY SPACED PERFORATIONS PER FOOT OF PIPE INSTALLED WITH PERFORATIONS ON BOTTOM OF PIPE. PROVIDE CAP AT UPSTREAM END OF PIPE. SLOPE A MINIMUM OF 2 PERCENT TO OUTLET PIPE.

"FILTER MATERIAL" TO MEET FOLLOWING SPECIFICATION OR APPROVED EQUIVALENT.	
SIEVE SIZE	PERCENTAGE PASSING
1"	100
3/4"	90-100
3/8"	40-100
NO. 4	25-40
NO. 8	18-33
NO. 30	5-15
NO. 50	0-7
NO. 200	0-3

FIGURE 5

TYPICAL STABILIZATION AND BUTTRESS FILL
SUBDRAINS MINIMUM STANDARD GRADING DETAIL





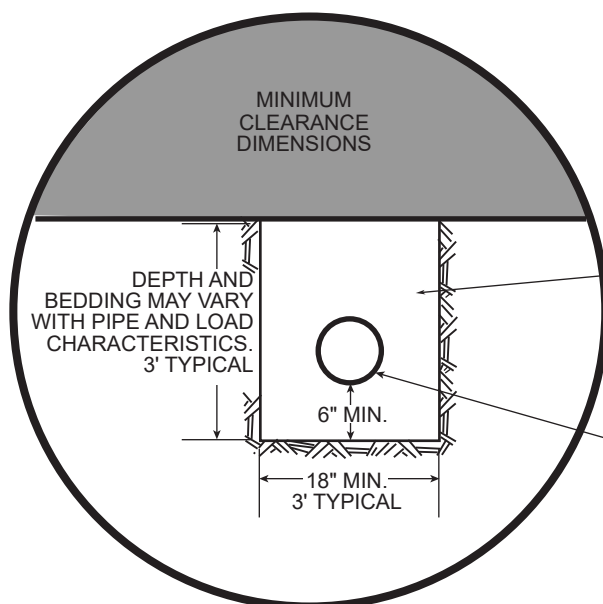
FILTER FABRICS SHALL BE PERMEABLE NON-WOVEN POLYESTER, NYLON, OR POLYPROPYLENE MATERIAL CONFORMING TO THE FOLLOWING:

- 1) GRAB TENSILE STRENGTH, POUNDS, MIN. ASTM D 4632.....90
- 2) ELONGATION, AT PEAK LOAD, PERCENT, MIN. ASTM D 4632.....50
- 3) PUNCTURE STRENGTH, LBS., MIN. ASTM D 3787.....45
- 4) COEFFICIENT OF WATER PERMITTIVITY, 1/SEC. ASTM D 4491.....>0.7
- 5) BURST STRENGTH, P.S.I., MIN. ASTM D 3786.....180

NOTES: DOWNSTREAM 20' OF PIPE AT OUTLET SHALL BE NON-PERFORATED AND BACKFILLED WITH FINE-GRAINED MATERIAL

PIPE SHALL BE A MINIMUM OF 4-INCH DIAMETER. FOR RUNS OF 500 FEET OR MORE, USE 6-INCH DIAMETER PIPE, OR AS RECOMMENDED BY THE GEOTECHNICAL CONSULTANT

DETAIL



FILTER MATERIAL - MINIMUM OF NINE CUBIC FEET PER FOOT OF PIPE. SEE FIGURE 5 FOR FILTER MATERIAL SPECIFICATIONS.

ALTERNATE: IN LIEU OF FILTER MATERIAL, NINE CUBIC FEET OF GRAVEL PER FOOT OF SUBDRAIN (WITHOUT PIPE) MAY BE ENCASED IN FILTER FABRIC. SEE FIGURE 5 TO GRAVEL SPECIFICATION. SEE ABOVE FOR FILTER FABRIC SPECIFICATION. FILTER FABRIC SHALL BE LAPPED MINIMUM OF 12 INCHES ON ALL JOINTS.

MINIMUM 4 INCH DIAMETER SCHEDULE 40 ASTM D 1527, OR D 1785, OR SDR 35 ASTM 2751 OR D 3034. FOR FILL DEPTH OF 60 FEET OR GREATER, USE ONLY SCHEDULE 40 OR APPROVED EQUIVALENT. THERE SHALL BE A MINIMUM OF 8 UNIFORMLY SPACED PERFORATIONS PER FOOT OF PIPE INSTALLED WITH PERFORATIONS ON BOTTOM OF PIPE.

FIGURE 6

**TYPICAL CANYON SUBDRAIN
MINIMUM STANDARD GRADING DETAIL**



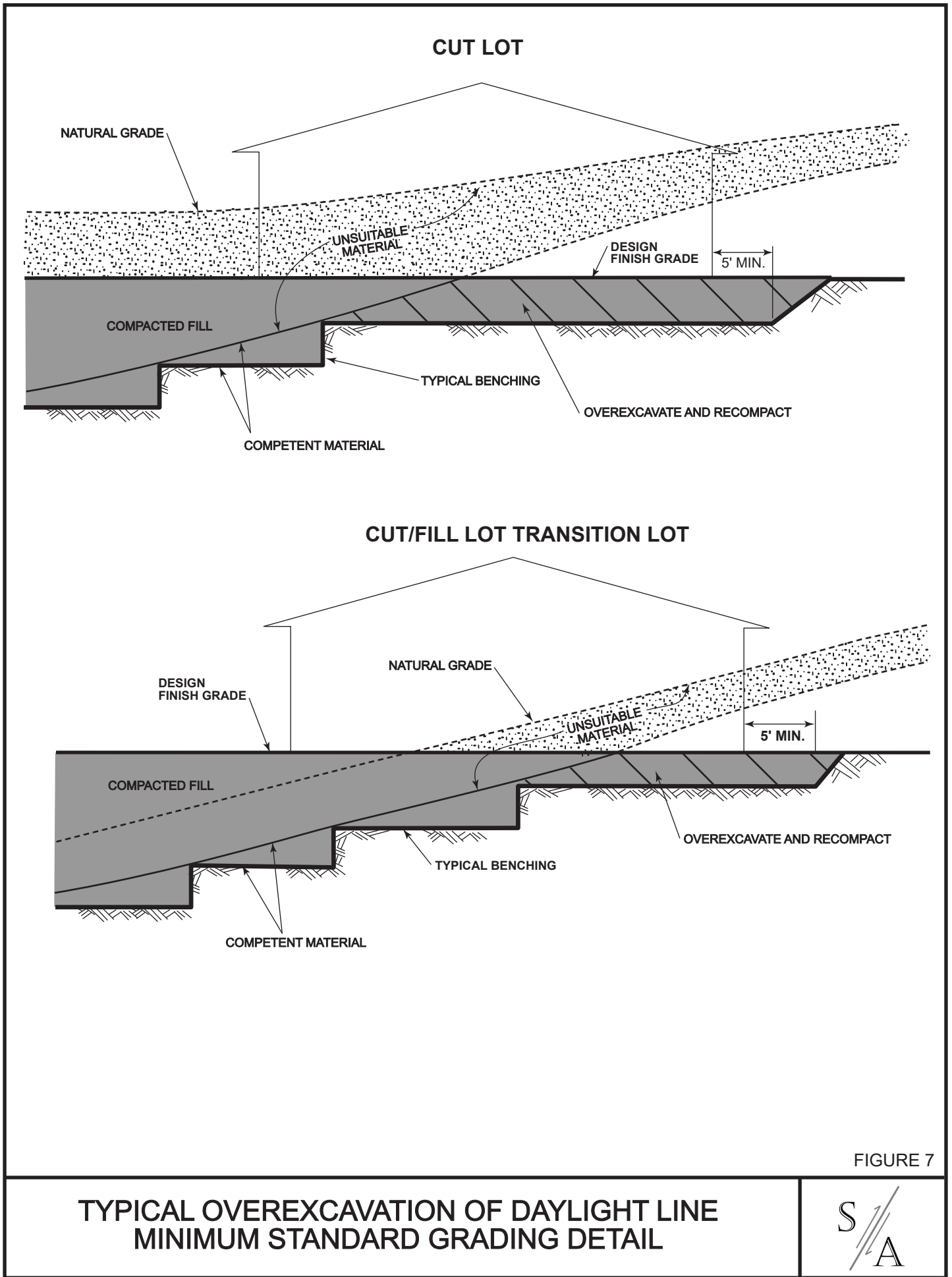
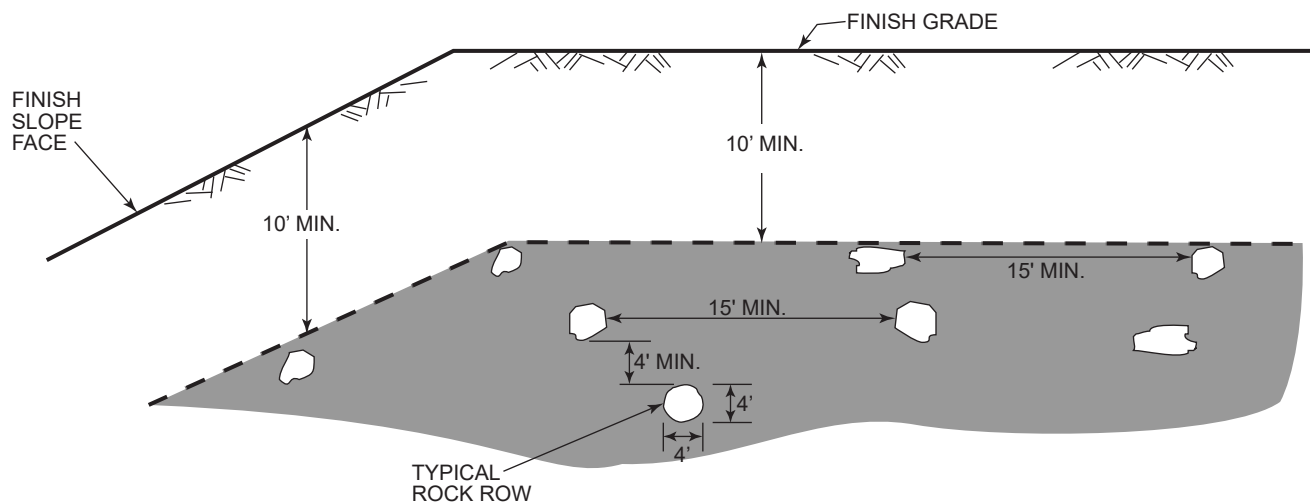


FIGURE 7

TYPICAL OVEREXCAVATION OF DAYLIGHT LINE
MINIMUM STANDARD GRADING DETAIL

S
A



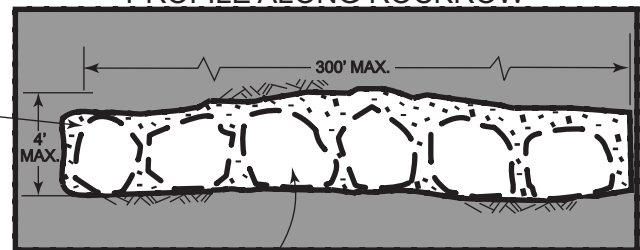
SECTION THROUGH ROCKROW



FILL VOIDS WITH SELECT GRANULAR SOIL PLACED BY WATER DENSIFICATION AND MECHANICAL COMPACTION.
NESTING OR STACKING OF OVERSIZE MATERIAL IS NOT ACCEPTABLE.

PLACE OVERSIZE MATERIAL IN TRENCH. FALSE SLOPE OR CUT SLOT INTO APPROVED MATERIAL. OVERSIZE MATERIAL MAY BE PLACED SIDE BY SIDE IF SIZE PERMITS.

PROFILE ALONG ROCKROW



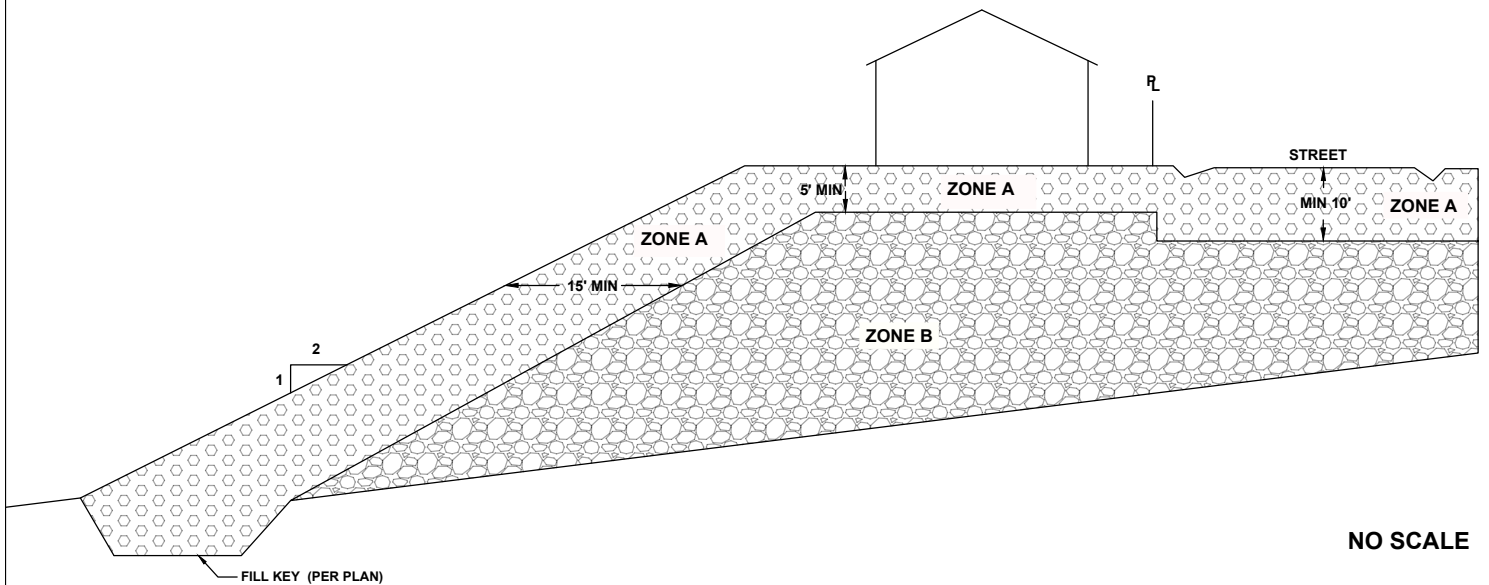
NOTES:

- A) OVERSIZED ROCK IS DEFINED AS LARGER THAN 12" IN SIZE IN GREATEST DIMENSION.
- B) SPACE BETWEEN ROCKROWS SHOULD BE ONE EQUIPMENT WIDTH OR A MINIMUM OF 15 FEET.
- C) THE WIDTH AND HEIGHT OF THE ROCKROW SHALL BE LIMITED TO FOUR FEET AND THE LENGTH LIMITED TO 300 FEET UNLESS APPROVED OTHERWISE BY THE GEOTECHNICAL CONSULTANT. OVERSIZE SHOULD BE PLACED WITH FLATEST SIDE ON THE BOTTOM.
- D) OVERSIZE MATERIAL EXCEEDING FOUR FEET MAY BE PLACED ON AN INDIVIDUAL BASIS IF APPROVED BY THE GEOTECHNICAL CONSULTANT.
- E) FILLING OF VOIDS WILL REQUIRE SELECT GRANULAR SOIL (SE > 20, OR LESS THAN 20 PERCENT FINES) AS APPROVED BY THE GEOTECHNICAL CONSULTANT. VOIDS IN THE ROCKROW TO BE FILLED BY WATER DENSIFYING GRANULAR SOIL INTO PLACE ALONG WITH MECHANICAL COMPACTION EFFORT.
- F) IF APPROVED BY THE GEOTECHNICAL CONSULTANT, ROCKROWS MAY BE PLACED DIRECTLY ON COMPETENT MATERIALS OR BEDROCK, PROVIDED ADEQUATE SPACE IS AVAILABLE FOR COMPACTION.
- G) THE FIRST LIFT OF MATERIAL ABOVE THE ROCKROW SHALL CONSIST OF GRANULAR MATERIAL AND SHALL BE PROOF-ROLLED WITH A D-8 OR LARGER DOZER OR EQUIVALENT.
- H) ROCKROWS NEAR SLOPES SHOULD BE ORIENTED PARALLEL TO SLOPE FACE.
- I) NESTING OR STACKING OF ROCKS IS NOT ACCEPTABLE.

FIGURE 8

**TYPICAL OVERSIZE ROCK PLACEMENT METHOD
MINIMUM STANDARD GRADING DETAIL**





LEGEND

- ZONE A:**
- THE UPPER 5 FEET OF FILL UNDER PADS SHOULD NOT HAVE ROCKS GREATER THAN 12 INCHES IN THE LARGEST DIMENSION (12-INCH MINUS).
 - FILLS IN PUBLIC STREETS, RIGHT OF WAYS AND EASEMENTS SHOULD CONTAIN ONLY 12-INCH MINUS MATERIALS TO A DEPTH OF 10 FEET BELOW FINISH GRADE OR 2 FEET BELOW THE DEEPEST UTILITY, WHICHEVER IS DEEPER.
 - FILLS IN SLOPE AREAS MAY HAVE OVERSIZE ROCK PLACED PER ROCK BLANKET DETAIL TO WITHIN 15 FEET OF SLOPE FACE. FILL WITHIN 15 FEET OF SLOPE FACE SHOULD ONLY CONSIST OF 12-INCH MINUS MATERIAL.
- ZONE B:**
- ROCKS UP TO 2 FEET IN HEIGHT (LYING FLAT) WITH OCCASIONAL INDIVIDUAL FRAGMENTS UP TO 4 FEET MAXIMUM DIMENSION MAY BE PLACED WITHIN ZONE B AREA.
 - ROCKS EXCEEDING 2 FEET IN THE SMALLEST DIMENSION MAY BE PLACED IN ROWS WITH THE FLATTEST SIDE DOWN (SEE NEXT PAGE). THE WIDTH OF THE ROWS MAY EXCEED 4 FEET PROVIDED THE FILL OPERATION CAN ACCOMMODATE A MINIMUM OF 15 FEET BETWEEN ROWS, AND PROVIDED THAT THERE IS SUFFICIENT EQUIPMENT TO PLACE FILL AGAINST AND OVER THE ROWS.
 - FILL SOILS PLACED AGAINST OR OVER ROCK ROWS SHOULD BE FREE OF ROCKS THAT MAY CAUSE NESTING/VOIDS WITHIN THE ROCK ROWS AND ROCK FILL. THIS CONDITION SHOULD BE CAREFULLY REVIEWED IN THE FIELD BY THE GEOTECHNICAL CONSULTANT TO VERIFY SATISFACTORY OPERATIONS.
 - ROCKS UP TO 10 FEET IN THE LEAST DIMENSION MAY BE PLACED AS INDIVIDUAL ROCKS WITHIN THE COMPACTED FILL. THE FILL SOILS NEAR AND AGAINST THESE ROCKS SHOULD BE FREE OF ROCKS THAT MAY CAUSE NESTING/VOIDS WITH THE LARGER ROCKS. THIS CONDITION SHOULD BE CAREFULLY REVIEWED IN THE FIELD BY THE GEOTECHNICAL CONSULTANT TO VERIFY SATISFACTORY OPERATIONS.
 - ROCKS, LARGER THAN 10 FEET IN THE SMALLEST DIMENSION, SHOULD BE REDUCED IN SIZE TO MEET THE SPECIFIED DIMENSIONS FOR INDIVIDUAL ROCK PLACEMENT AND/OR FOR PLACEMENT IN ROCK ROWS.

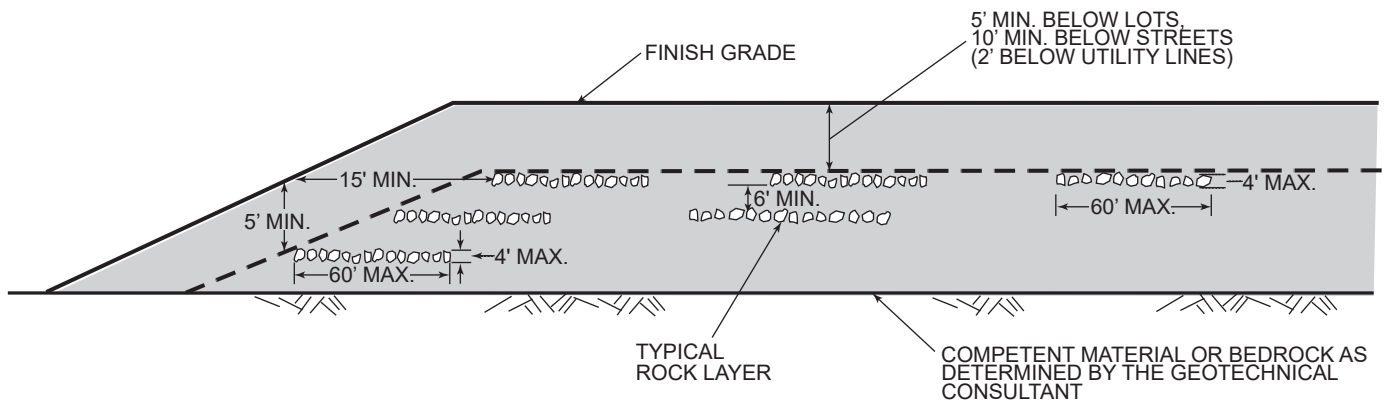
NOTES: CONTINUOUS OBSERVATION IS REQUIRED BY GEOTECHNICAL CONSULTANT DURING ROCK PLACEMENT.

FIGURE 9

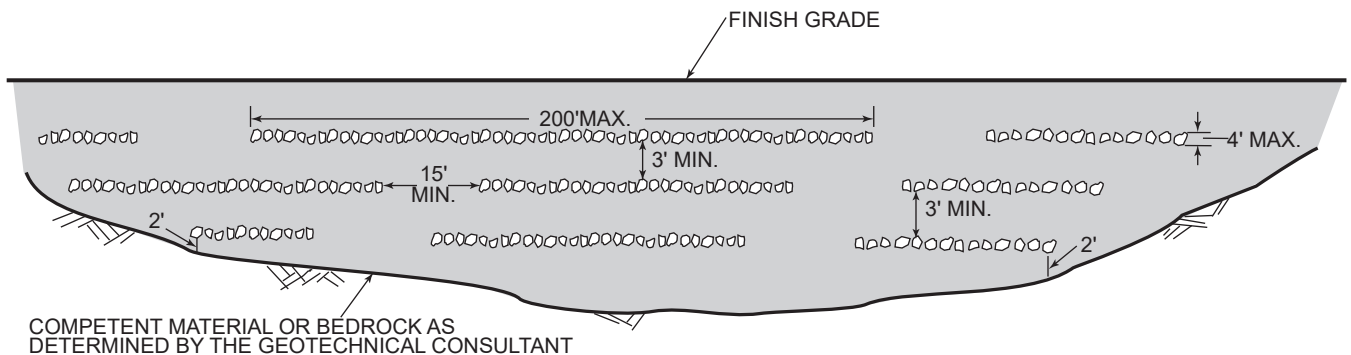
STRUCTURAL ROCK FILL PLACEMENT DETAIL



VIEW NORMAL TO SLOPE FACE



VIEW PARALLEL TO SLOPE FACE



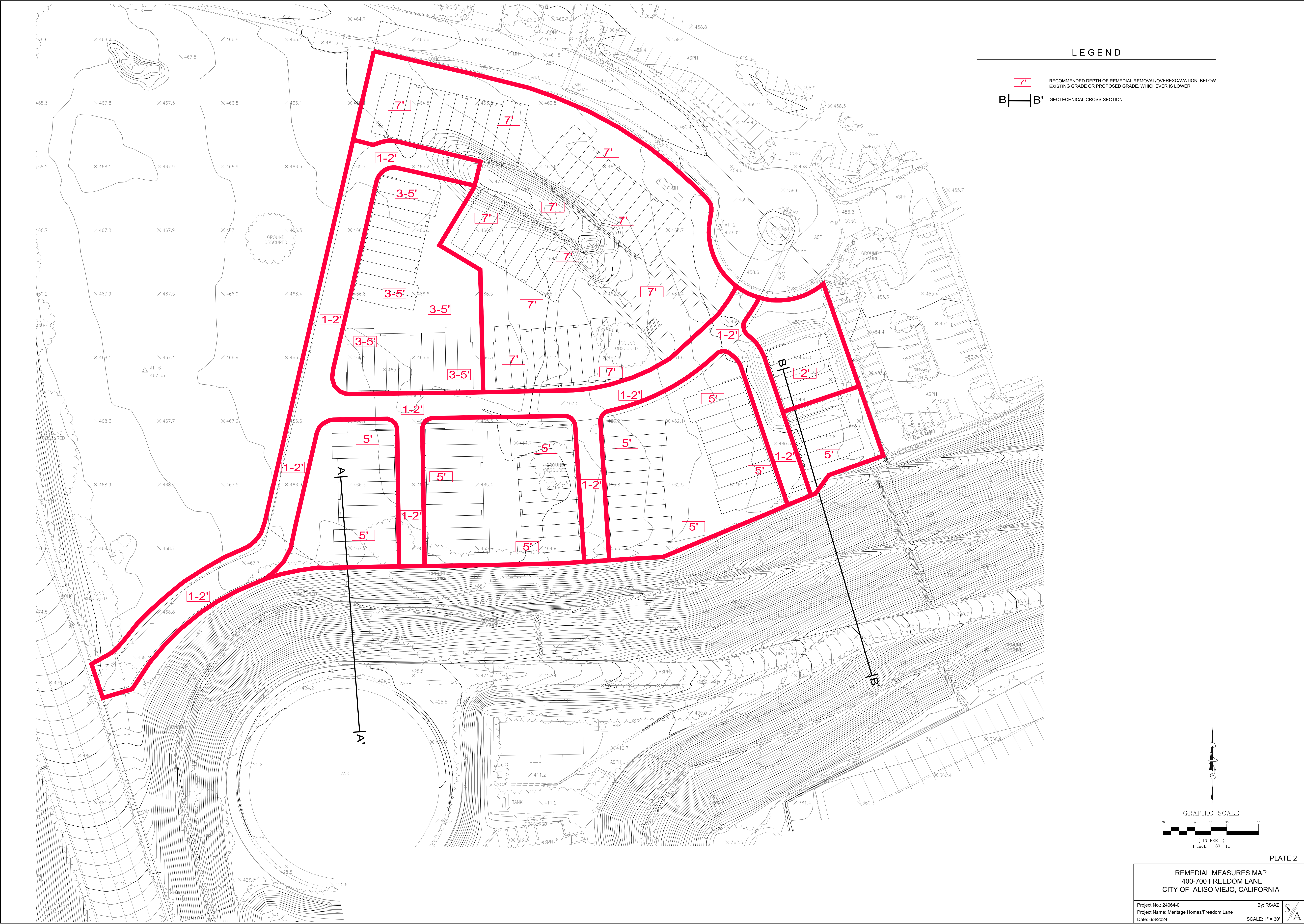
NOTES:

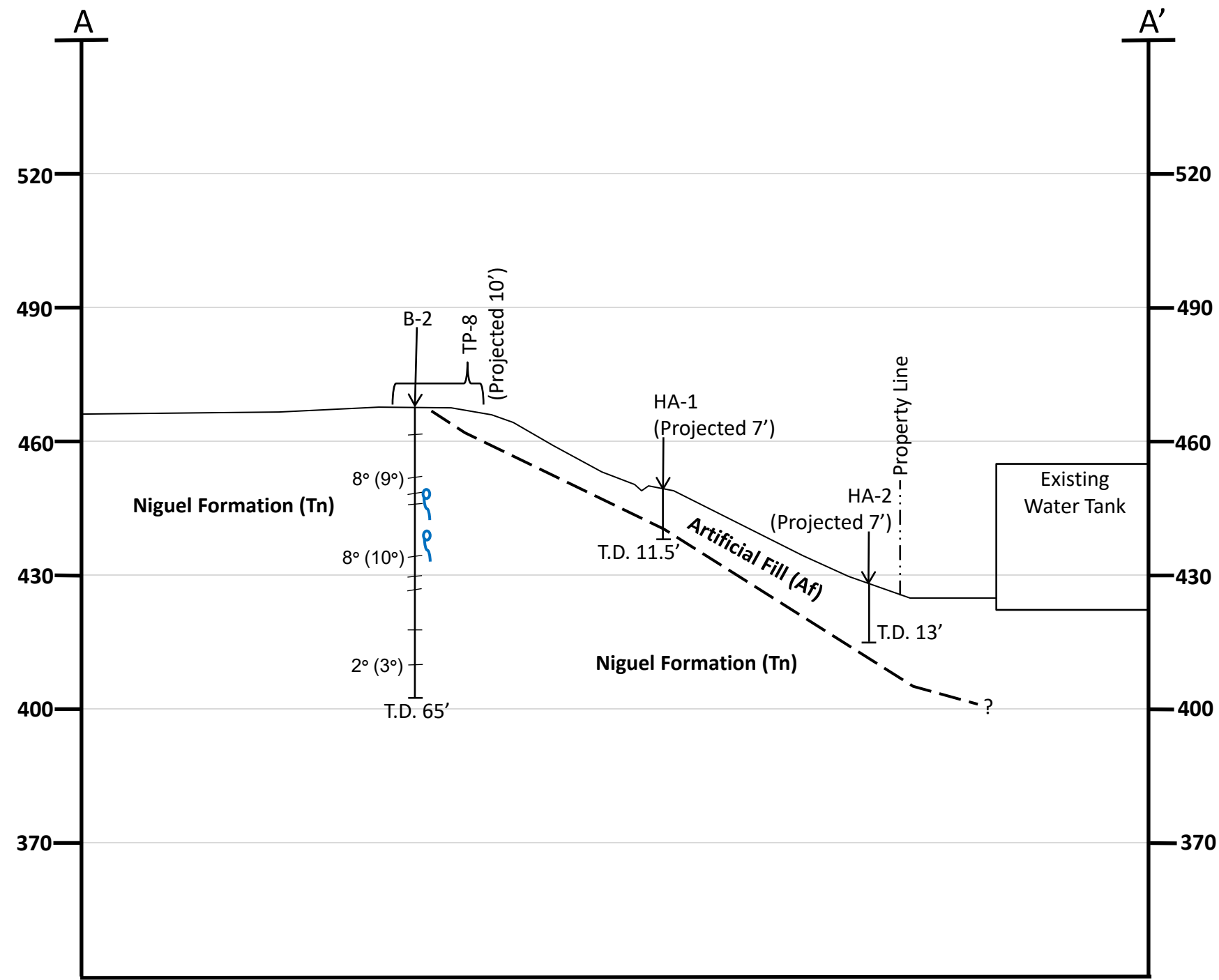
- 1) ORIENTATION AND STAGGERING MAY VARY, BUT SHALL BE AS RECOMMENDED BY THE GEOTECHNICAL CONSULTANT.
- 2) ROCK LAYERS SHALL NOT BE MORE THAN 4 FEET IN HEIGHT. ROCK SHALL NOT BE STACKED OR NESTED.
- 3) EACH ROCK CELL MUST BE COVERED WITH A GRANULAR SOIL WITH A MINIMUM SAND EQUIVALENT (SE) OF 20 OR WITH LESS THAN 10% PASSING THE NO. 200 SIEVE AS DETERMINED BY THE GEOTECHNICAL CONSULTANT. THE GRANULAR SOIL IS TO BE FLUSHED, FLOODED, AND JETTED IN THE ROCK LAYER IN ORDER TO FILL THE VOIDS. ADDITIONAL LIFTS OF GRANULAR SOIL SHALL BE PLACED AS NECESSARY TO ALLOW FOR THE FILLING OF VOIDS BY FLOODING, AND JETTING. THE ROCK LAYER SHALL THEN BE ADEQUATELY COMPACTED WITH HEAVY EARTH MOVING EQUIPMENT.
- 4) ADEQUACY OF ABOVE PROCEDURE SHALL BE VERIFIED BY THE GEOTECHNICAL CONSULTANT.
- 5) ROCKS EXCEEDING 2 FEET IN THE SMALLEST DIMENSION MAY BE PLACED IN ROWS AS SHOWN IN THE FIGURE WITH THE FLATTEST SIDE DOWN. THE WIDTH OF THE ROWS MAY EXCEED 4 FEET PROVIDED THE FILL OPERATION CAN ACCOMMODATE A MINIMUM OF 15 FEET BETWEEN ROWS, AND PROVIDED THAT THERE IS SUFFICIENT EQUIPMENT TO PLACE FILL AGAINST AND OVER THE ROWS. THE FILL SOILS SHOULD BE FREE OF ROCKS THAT MAY CAUSE NESTING/VOIDS WITHIN THE ROCK ROWS. THIS CONDITION SHOULD BE CAREFULLY REVIEWED IN THE FIELD BY THE GEOTECHNICAL CONSULTANT TO VERIFY SATISFACTORY OPERATIONS.
- 6) ROCKS UP TO 10 FEET IN THE LEAST DIMENSION MAY BE PLACED AS INDIVIDUAL ROCKS WITHIN THE COMPACTED FILL. THE FILL SOILS NEAR AND AGAINST THESE ROCKS SHOULD BE FREE OF ROCKS THAT MAY CAUSE NESTING/VOIDS WITH THE LARGER ROCKS. THIS CONDITION SHOULD BE CAREFULLY REVIEWED IN THE FIELD BY THE GEOTECHNICAL CONSULTANT TO VERIFY SATISFACTORY OPERATIONS.
- 7) ROCKS, LARGER THAN 10 FEET IN THE SMALLEST DIMENSION, SHOULD BE REDUCED IN SIZE TO MEET THE SPECIFIED DIMENSIONS FOR INDIVIDUAL ROCK PLACEMENT AND/OR FOR PLACEMENT IN ROCK ROWS.

FIGURE 10

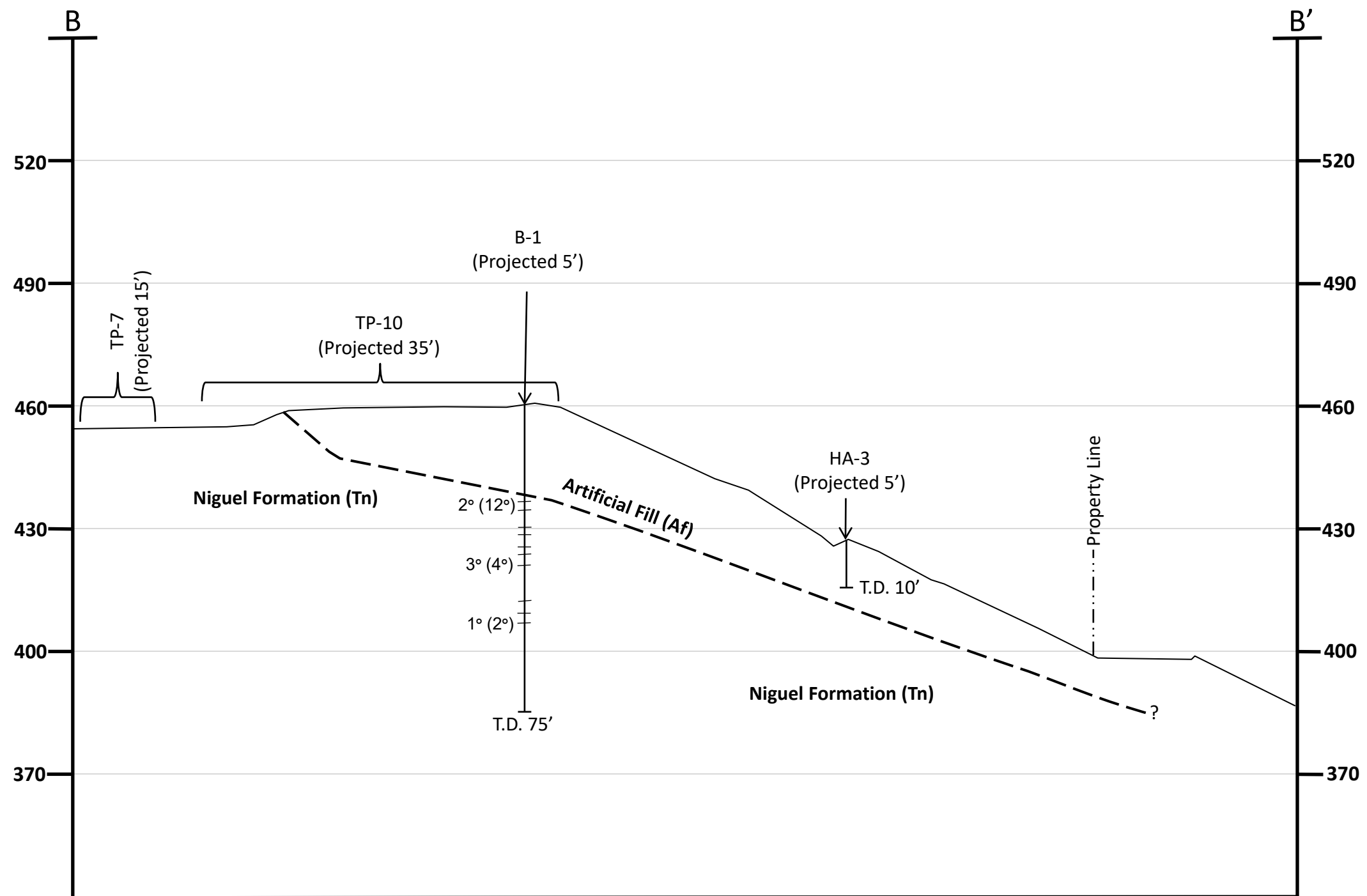
OVERSIZE ROCK ROW PLACEMENT
FOR ZONE B STRUCTURAL ROCK FILL







Legend	Geotechnical Cross-Section A-A'		
	Meritage Homes Proposed Residential Development 400-700 Freedom Lane Aliso Viejo, California	Project Number: 24064-01 Date: June 3, 2024 Plate 3	



Legend	Geotechnical Cross-Section B-B'		S A
	N15W ← Scale: 1 inch=30 feet	Meritage Homes Proposed Residential Development 400-700 Freedom Lane Aliso Viejo, California	Project Number: 24064-01 Date: June 3, 2024 Plate 4