APPENDIX F1

Preliminary Geotechnical Investigation Report

PRELIMINARY GEOTECHNICAL INVESTIGATION REPORT
FOR ENTITLEMENT
PROPOSED RESIDENTIAL DEVELOPMENT
TENTATIVE TRACT NO. 72798
ASSESOR'S PARCEL NUMBERS: 8709-093-001, 002, & 003
NORTHEAST CORNER OF NORTH LEMON AVENUE & LA PUENTE ROAD

City of Walnut, California

Prepared for

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Group Delta Project No. LA1579
March 17, 2023

GROUP DELTA

Spring Meadows Homes, LLC.
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March 17, 2023
Group Delta Project No. LA1579

Attention: Mr. Jack Su

Subject: Preliminary Geotechnical Investigation Report for Entitlement
Proposed Residential Development
Tentative Tract No. 72798
Assessor's Parcel Numbers: 8709-093-001, 002, & 003
Northeast corner of North Lemon Avenue & La Puente Road
City of Walnut, California

Dear Mr. Su,

Group Delta Consultants, Inc. (Group Delta) is pleased to submit this preliminary geotechnical investigation report for entitlement of the proposed residential development in the City of Walnut in California. Our scope of work was performed in general accordance with our proposal dated July 6, 2022, and change orders dated August 9, and September 9, 2022.

We appreciate the opportunity to provide geotechnical services for this project. If you have any questions about this report, or if we can be of further service, please do not hesitate to contact us.

Sincerely,

GROUP DELTA CONSULTANTS, INC.

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PRELIMINARY GEOTECHNICAL INVESTIGATION REPORT FOR ENTITLEMENT
PROPOSED RESIDENTIAL DEVELOPMENT
TENTATIVE TRACT NO. 72798
NORTHEAST CORNER OF NORTH LEMON AVENUE & LA PUENTE ROAD
CITY OF WALNUT, CALIFORNIA

1.0 INTRODUCTION

This report was prepared to address the feasibility of the proposed residential development from a geotechnical standpoint in preparation for the project Environmental Impact Report (EIR) submittal. This report includes a review of geotechnical related geological/soils CEQA checklist items for project planning.

The site is located on the northeast corner of North Lemon Avenue and La Puente Road in the City of Walnut, California. The location of the site is shown in Figure 1.

Group Delta previously performed a limited geotechnical investigation for the subject site and presented the results in a report dated August 21, 2013 (Revised on November 6, 2013). An addendum to the report was also provided on March 20, 2019. This report provides updated geology and geotechnical hazard evaluation incorporating the current development plan as well the current California Building Codes (CBC, 2022).

The intent of the assessment is to identify the major geotechnical hazards and geotechnical conditions affecting the site and proposed project. This report **is not sufficient** for final design or for submitting to the building department for design-level approval. A design-level geotechnical investigation will be required for the project.

1.1 Project Description

Location. The project site consists of 25.8 acres located at 800 Meadow Pass Road. It is comprised of Assessor's Parcel Nos. 8709-093-001, -002, and -003 and is bordered by La Puente Road to the south, North Lemon Avenue to the west, Meadow Pass Road to the north, and homes to the east. It is in the southeast portion of the City of Walnut (City), approximately 2.3 miles northwest of the confluence of State Route 60 and State Route 57 (Figure 1). It is depicted on Township 02S, Range 09W, Section 6 of the United States Geological Survey, San Dimas California 7.5-minute quadrangle. The approximate center of the project site is located at latitude 34.024363 °N and longitude -117.866254°W.

Land Use Designations / Proposed Use. The project site has a General Plan designation of Very Low Density and is zoned Residential Planned Development Zone (RPD) with a designation of RPD–28,500–1.3. Pursuant to Section 6.24.030 A2 of the Walnut Municipal Code, the project proposes the development of 27 detached single-family homes under R-1 standards with a minimum lot size of 28,500 square feet. The project requires approval of a Tentative Tract Map and Site Plan/Architectural Review.

Access. All project streets will be public. The northerly 25 homes will take access from Meadow Pass Road and the two most southerly homes will take access from San Vicente Drive, with each street ending in a cul-de-sac to preclude cut-through traffic. A bridge will provide access over Lemon Creek to those homes south of Lemon Creek that will be accessed from Meadow Pass Road.

Open Space. The entirety of Lemon Creek will be preserved and included within 12.2 acres of privately owned and residentially zoned property - over 47% of the site – that will serve as permanent open space. Currently, the site contains approximately 1,876 trees. Through preservation and new plantings, the project will increase the number of trees onsite to approximately 1,936, also increasing the ratio of native to non-native/invasive trees. The developer will improve to City trail standards a public trail that will run through the open space area, passing across the project's primary road. An easement will then be granted to the City for the long-term operation and maintenance of the public trail.

As is common with existing development throughout the City's Residential Planned Development Zone, 9.5 acres of the open space area will be within privately owned residential lots. Those portions of open space, Lemon Creek, and the public trail within private lots will be subject to recorded deed restrictions prohibiting use of the restricted open space by the owners of the private lots, including planting vegetation, installing fencing, or otherwise developing or using the restricted natural open space areas. The restrictions will be enforceable by the City. The remaining 2.7 acres of the open space area will consist of internal slope areas and water quality basins that will be owned by a public agency or the Homeowners Association (HOA) and subject to similar deed restrictions.

The open space will be maintained by a combination of a Lighting and Open Space Maintenance District (LOSMD) through a new zone funded entirely by the project's homeowners (as to the natural open space only), the City (as to the trail only), the flood control district or another public or quasi-public agency (as to stormwater retention basins only), and the project's HOA.

Stormwater / Lemon Creek. Three public storm drain inlets along Meadow Pass Road at the northerly boundary of the project site currently direct offsite stormwater into and through existing public storm drain lines within the project site. That offsite stormwater then enters Lemon Creek through two existing outlets. These public storm drains, which do not capture onsite stormwater now and will not do so when the project is complete, will be realigned under the project streets. One of the existing outlets into Lemon Creek will remain in its current location, while the second will be relocated to a point below the proposed project bridge.

While onsite stormwater historically flows directly into the creek, two water quality basins have been designed to detain any increase in on-site stormwater runoff resulting from the proposed project, up to a 100-year storm event. These basins will treat on-site runoff up to the 85th percentile storm event, consistent with Los Angeles County regulations. One water quality basin will be in the northern portion of the site and will hold and gradually release project stormwater

into an existing public storm drain connection which enters the property from Lemon Avenue. The second water quality basin will be in the southern portion of the site and will hold and gradually release project stormwater into a proposed outlet to Lemon Creek. These water quality basins are designed to assure that project stormwater will enter Lemon Creek onsite at a volume and flow rate no greater than presently occurs. Runoff entering Lemon Creek will then pass offsite into existing public drainage facilities located on public property adjacent to the project site at La Puente Road.

In addition, one of the four existing onsite culverts ("Culvert D," located approximately 100 linear feet upstream of La Puente Road) will be removed, restoring the native creek in this location.

The proposed development plan is shown on Figure 2.

1.2 Scope of Work

Group Delta's scope of work included the following:

- Review available published geotechnical and geologic reports, maps, and subsurface data for the site and surrounding area;
- Perform supplemental geotechnical investigation to evaluate subsurface conditions;
- Evaluate geologic and seismic hazards including local seismicity, surface fault rupture, ground shaking, liquefaction, slope stability, and other considered geologic hazards;
- Provide geotechnical background and evaluation for pertinent geology/soils CEQA Environmental Checklist items;
- Evaluate geotechnical data and perform geotechnical analyses to develop preliminary foundation recommendations for the proposed new construction.
- Prepare a report to present our findings.

Our preliminary recommendations are based on the results of our current and previous field explorations, laboratory tests, and appropriate engineering analyses. The results of current field explorations are presented in Appendix A. The results of current of laboratory tests are presented in Appendix B. The results of previous field explorations and laboratory tests are presented in Appendix C.

2.0 GEOTECHNICAL FIELD EXPLORATION

2.1 Previous Field Investigation

Group Delta previously performed field investigations at the site on 7/19/2013, and on 9/4/2013. The previous field investigation included nine (9) hollow stem auger (HSA) borings to depths ranging from 20 feet to 51.5 feet and eight (8) cone penetration test (CPT) soundings to depths ranging from 8 feet to 50 feet.

In addition, Group delta performed infiltration testing on 2/19/2019 at three locations at depths between 5 to 7 feet below existing ground.

The locations of the previous borings, CPTs, and infiltration tests are shown on Figure 2. Details of the explorations and the logs of the borings are presented in Appendix C.

2.2 Current Field Investigation

The soil conditions beneath the site were further explored by drilling four (4) borings (B-18 to B-21) to depths of 26 to 46 feet below the existing grade using hollow stem auger drilling equipment at the locations shown on Figure 2. In addition, five tests pits were excavated to depths of about 7 to 10 feet below the existing grade at the locations shown on Figure 2. Details of the current explorations and the logs of the borings and test pits are presented in Appendix A.

3.0 LABORATORY TESTING

Laboratory testing was performed on selected soil samples collected from the borings to characterize the subsurface materials and to evaluate their index and engineering properties. The laboratory testing program consisted of the following:

- Soil classification
- Atterberg Limits
- Pocket Penetrometer
- Consolidation
- Direct Shear
- Expansion Index
- Soil Corrosivity

The summary of the current laboratory testing and results with a brief description is presented in Appendix B. The results of the previous laboratory tests are presented in Appendix C.

4.0 SITE AND SUBSURFACE CONDITIONS

4.1 Site and Surface Conditions

The project site is located on the northeast of the intersection of North Lemon Avenue and La Puente Road in the City of Walnut, California. The site is an 'L' shaped parcel over 24 acres in area. Lemon Creek enters the center of the property, flowing from the northeast down to the southwest.

The current site grade varies approximately from an elevation of 640 feet on the north boundary adjacent to Meadowpass Road down to elevation 572 feet on the southern boundary adjacent to La Puente Road. The southern portion of the site is free of any structures and mostly developed by prior agricultural and equestrian use. The northern portion of the site has improvements related to the development of Meadowpass Road and an abandoned equestrian facility. In review of the USGS historical topographic map from 1926, it appears that significant cuts and fills have been placed to develop the current landscape at the site, Figure 2A Historical Topographic Map. Some improvements such as trails and fences are present in the property. The surface is mostly unpaved with grass, trees and shrubs.

4.2 Subsurface Conditions

North of Lemon Creek (Lot 1 through Lot 13 and Basin #1)

The subsurface conditions near north of Lemon Creek (Lot 1 through Lot 13 and Basin #1) consists of existing artificial fill (af) soils underlain by alluvium (Qa), organic rich soils (Qor), and bedrock of the Puente Formation (Tpsq). Artificial fill soils consisting of expansive, stiff clay and fragments of bedrock materials were encountered in about 2 to 5 feet thick. Fill soils become thicker toward the Lemon Creek, and were encountered up to 10 feet thick. The origin and compaction of the fill is unknown, however, it was likely associated with the development of Meadow Pass Road and the current developments.

The fill soils are underlain by alluvium (Qa) which consist predominantly of clayey soils. The clayey soils above groundwater are porous, however they are stiff to very stiff, having unconfined compressive strength (UCS) of at least 2 ksf based on in-situ field tests and CPT correlated data. The clayey soils below groundwater become weaker and compressible, having UCS in a range between 0.5ksf and 1.5ksf.

The alluvium is underlain by organic rich soils (Qor). The organic rich soils are very soft and compressible, having UCS on an order of about 0.25 ksf. The organic rich soils have the potential to continue to decompose when they are not saturated. Continued decomposition of the organics in the soil would result in differential volume changes resulting in variable settlements. However, the amount of organic materials is unknown and should be determine during the design phase geotechnical investigation.

The organic rich soils are underlain by Miocene bedrock materials of the Puente Formation Soquel Member (Tpsq). As described regionally, the unit is a tan to light gray sandstone containing concretions and interbedded siltstone and claystone. As observed in test pit and boring samples, the sandstone is fine grained and friable and the claystone/siltstone is thinly bedded, weathered, and contained hard concreted layers. Bedding orientation was not well observed in test pits due to weathering of the near surface rock. Regional bedding mapped dips to the southeast. General bedding measured in test pits dips to the northeast.

Geologic cross sections north portion of the site are shown on Cross Sections A-A', B-B', D-D', 2-2' and 3-3'.

Lot 14 through Lot 27 and Basing #2

The subsurface soils consist of artificial fill (af), alluvium (Qa) and colluvial (Qc) soils underlain by Monterey (Puente) Formation (Tpsq). The alluvium and colluvium consists predominantly of porus, stiff to very stiff clayey soils. The thickness of alluvium is about 5 feet thick or less in the area between Lot 15 and Lot 18, and becomes greater to more than 35 feet near Lot 27 and Basing #2. Based on the in-situ field tests and CPT corelated data, the alluvium has UCS of 2 to 4 ksf.

The alluvium along the eastern outer bank of Lemon Creek contains loose layers of silty sand and sandy silt which may be susceptible to liquefaction when saturated during a significant earthquake event. The limit of the liquefiable soil should be defined in design level geotechnical investigation.

Geologic cross sections on the southern portion of the site are shown on Cross Sections A-A', 5-5', 6-6', 8-8' and 9-9'.

4.3 Groundwater

Current groundwater was encountered at depths of about 18 feet in boring B-14 to 34.5 feet in Boring B-3, below the existing grade in the explorations. The depth of encountered groundwater is presented in the logs in Appendix A. The estimated existing groundwater depths are shown on the cross-sections in Figure 3.1 to 3.9. There is surface water flowing within the unconfined channel of Lemon Creek.

The historical highest groundwater contours and borehole log data (San Dimas Quadrangle, CGS, 1998) does not have adequate coverage at the project site. The adjacent data indicates that the historical highest groundwater at this area is deeper than 20 feet below ground surface. The CGS (1998) groundwater map is shown in Figure 4.

Since shallowest groundwater encountered in the borings is 18 feet below existing grade, the design groundwater level was assumed to be at a depth of 18 feet.

The design groundwater level is deeper than the bottom of the existing Lemon Creek near CPT-2 location. Therefore, we have conservatively assumed a design groundwater level of 12 feet near CPT-2 location for analyses.

5.0 GEOLOGIC AND SEISMIC SETTINGS

5.1 Geologic Setting

The site is located in the Peninsular Range geomorphic province. This province is characterized by northwest trending ridges and valleys. It is a tectonically complex area accommodating rotation stress imposed by the continental plate boundary along the San Andreas Fault. Ridge and valley defining structures include active strike slips fault zones, including the Newport-Inglewood, Elsinore, and San Jacinto.

Locally, the site is situated along the southern margin of the San Jose Hills, centrally within the Puente Hills block. The South San Jose Creek has incised and filled a relatively narrow southwest trending valley, locally known as Los Nogales. The foothills are comprised of elevated and folded Tertiary sedimentary rock. Lemon Creek flows south through the Project Site in an open channel. Young alluvial deposits (Qa) fill the creek floor and overbank areas. Slopes are comprised of Monterey (Puente) Formation, Miocene-aged silt-and sandstone unit, Soquel Tpsq. Regionally, the bedrock is mapped as Tms, see Figure 5. Regional maps indicate bedding dips 35 to 45 degrees to the south-southeast (Dibblee, 2002).

5.2 Seismic Setting

The site is located within the seismically active area of southern California and has a high potential for the site to experience strong ground shaking from local and regional faults. These hazards and their potential impact can be mitigated with proper seismic design. The intensity of ground shaking is highly dependent upon the distance of the fault to the site, the magnitude of the earthquake, and the underlying soil conditions. Data evaluated for the local fault and seismic hazard at the site was obtained from USGS online earthquake catalog and Quaternary Fault Database resources unless otherwise noted. The site in relation to regional seismic faults and significant historical earthquake epicenters is presented in Figure 6, Regional Fault and Seismicity Map.

A search for local historical earthquakes recorded by USGS earthquake online catalog within a 100 km radius of the site from 1800 to present include 168 recorded events with M4.5 or greater (USGS, accessed 8/10/2022). Of the 168 events, 5 were M6.5 and greater and include the 1971 M6.6 San Fernando Earthquake and the 1994 M6.7 Northridge Earthquake. Fifty-one recorded events were M5.0 to M6.0 earthquakes. The closest recorded earthquakes of 4.5 or greater, are the 1935 M4.6 earthquake about 5.8 miles north and the 2014 M5.1 earthquake about 7.0 miles south of the site. No known earthquake related damage has been reported at the site. Construction in this area should be designed with accepted engineering practices and in compliance with current building codes that accommodate strong seismic ground motion.

While not within the search radius, earthquakes of M7.0 and greater have been recorded in southern California. A M7.5 earthquake occurred in 1952 located about 91 miles northeast of the

site and a M7.3 earthquake in 1992 was located about 83 miles east of the site. Construction in this area should be designed with accepted engineering practices and in compliance with current building codes that accommodate strong seismic ground motion.

A list of faults considered capable of producing significant shaking at the site is provided in Table 1 below:

Table 1: List of Known Earthquake Faults Closest to the Subject Site

Abbreviated Fault Name	Fault Type	Max. Magnitude (Mw)	Approximate Closest Distance (Miles)
San Jose	Reverse	6.5	1.0
Elsinore	Strike-Slip	7.5	5.6
San Andreas	Strike-Slip	8.0	26.4

Source: USGS Qfaults maps, Southern California Earthquake Data Center.

6.0 GEOLOGIC/SOILS GEOTECHNICAL EVALUATION

The findings are discussed in the sections below.

6.1 Earthquake Fault Rupture

The site with respect to Quaternary faults mapped by the CGS are illustrated in Figure 6. The closest active surface fault is the San Jose fault, which is considered capable of generating a M6.5 earthquake. It is mapped about 1.0 miles north of the site and trends roughly northeast-southwest. There are no Earthquake Fault Zones of Required Investigation mapped at the site or trending just outside the site, Figure 7.

Based on our review of available published geologic maps there are no mapped active faults that cross through or project toward the site. The site is not within an Alquist-Priolo Zone. Therefore, the potential for surface fault rupture hazard at the site is low.

6.2 Seismic Induced Ground Failure

Liquefaction involves the sudden loss in strength of a saturated, cohesionless soil (sand and non-plastic silts) caused by the build-up of pore water pressure during cyclic loadings, such as those produced by an earthquake. This increase in pore water pressure can temporarily transform the soil into a fluid mass, resulting in a vertical settlement, and can also cause lateral ground deformations. Typically, liquefaction occurs in areas where there are loose to medium dense sands and silts, and where the depth to groundwater is less than 50 feet from the surface. Additionally, vibration caused by seismic shaking can cause seismic settlement (seismic compaction known as dry sand settlement) of loose to medium dense, dry, clean, and silty granular soils. In summary, three simultaneous conditions are required for liquefaction:

- Loose to medium dense cohesionless soils
- Groundwater within 50 feet of the surface
- Strong shaking, such as caused by an earthquake

The northern portion of the site and southern end of the site is located in a mapped liquefaction hazard zone on the California Seismic Hazard Zone Map for San Dimas 7.5-minute Quadrangle (CGS, 1999), as shown in Figure 7.

Liquefaction triggering analyses was performed per the County of Los Angeles Administrative Manual (GS 045.0, Rev. 10/1/14) and the computer program CLiq (GeoLogismiki, 2021) using simplified procedures recommended by NCEER (Youd et al, 2001) were used. The results of the liquefaction triggering analyses indicate that the potential of liquefaction is high in the southern portion of the site near the Lemon Creek and decreases to the eastern portion of the site where building pad are planned. The potential of liquefaction is low in the northern portion of the site.

The limit of high liquefaction potential areas should be determined design-level geotechnical investigation.

Seismically-induced settlement is often caused by loose to medium-dense granular soils densified during ground shaking. Dry and partially saturated soils as well as saturated granular soils are subject to seismically-induced settlement. Up to 4 inches of seismically-induced settlement is estimated locally near the existing Lemon Creek. Mitigation measures to reduce liquefaction-induced settlements, ground displacements, and loss of bearing capacity may include ground improvement and/or mat foundations for the proposed structures. Preliminary recommendations are discussed further below. The Liquefaction Analyses are presented in Appendix D.

Analysis of open slopes along the Lemon Creek indicate liquefaction-induced lateral spreading may occur during a significant seismic event. Preliminary calculations indicate the potential lateral offsets to be less than 12 inches and may be mitigated through mat foundation design. Preliminary foundation recommendations are discussed further below. The lateral spreading analyses are presented in Appendix D.

6.3 Landslides

6.3.1 Documented Landslides

The site does not include slopes recognized for the potential of seismically induced landslide hazards (CGS, 1999) as shown in Figure 7. However, the CGS landslide inventory map from 1998 documents a dormant landslide in north of North Lemon Avenue and Meadow Pass Road, Figure 8. The dormant landslide is described as a debris flow and portions of the debris flow may be present in the northwestern corner of the site. Currently, the inflow of debris and surface water is controlled through storm drains leading into Lemon Creek at the site.

The dormant landslide area is presently developed by residential homes in Tract No. 48286.. The Tract No. 48286 was developed in 1990. Geotechnical reports listed below were prepared during development:

- Leighton and Associates, Inc., 1990, Preliminary Geotechnical Investigation for Tract No. 48286. “Keystone Ridge Estates”, City of Walnut, California, dated January 9, 1990;

- Leighton and Associates, Inc., 1991, Grading Plan Review for Tract No. 48286. “Keystone Ridge Estates”, City of Walnut, California, dated January 9, 1990;

- Leighton and Associates, Inc., 1993, Final Report of Geotechnical Observation and Testing During Rough Grading of Tract No. 48286. “Rodeo Ridge Estates”, City of Walnut, California, dated April 16, 1993; and

- Leighton and Associates, Inc., 1995, Geotechnical Review of the Precise Grading Plans, and Foundation Plans and Response to City of Walnut Plan Correction Sheet for Precise Grading of Tract No. 48286. "J.M. Peters Company, Inc.", City of Walnut, California, dated August 9, 1995.

The dormant debris flow mapped by the CGS landslide inventory map was not identified by the prior reports, however, localized landslides were mapped within the western slopes ascending from Lemon Creek Avenue. There is a buttress constructed at Lemon Creek Avenue along the ascending slope west of the site. The potential for landslide hazard the offsite western slope to impact the project is considered low considering the improvements in place.

6.3.2 Potential Landslide from the Proposed Development

The site is not within a known landslide hazard zone, however, the proposed development includes cuts and fills near existing slopes based on the current proposed grading plan as shown on Figure 2. Slope stabilities analyses were performed on selected critical sections including cross section 2-2', 3-3', 5-5', and 6-6'. Slope stability analyses for each location are discussed below.

Cross Section 2-2': Cut Slopes along North Property Line

Cross Section 2-2' was prepared to evaluate the global stability of the cut slope along north property line. The maximum height of the cut slope is about 30 feet and the cut slope will be no steeper than 2:1 (horizontal:vertical).

The underlying materials of the cut slope consists predominantly of existing fill soils underlain by alluvium and claystone bedrock. Bedrock is not anticipated to be exposed during excavation and therefore adverse bedding condition is not anticipated.

The static and seismic stability analyses indicates that the factor of safety of the proposed cut slope against global instability are great than 1.5 and 1.1 for static case and seismic case, respectively. Therefore, the potential of impacting the neighboring properties due to the proposed cut slopes are considered low.

An assumed shear strength was used in the analyses for the cut slope along north property line. The shear strength should be verified during design-level geotechnical investigation and the slope stability analyses at this location should be updated. If the results of the updated slope stability analyses are below the County's requirement, the cut slope may need to be mitigated. Mitigation options would include, but not limit to, soil nails or ground improvements to strengthen the shear strength of the existing fill soils. Details design recommendation can be provided in design-level geotechnical report.

Cross Section 3-3': South Facing Slope Near Lots 2 to 5

Analyses on Cross Section 3-3' was performed to evaluate the global stabilities of the existing south facing slope along Lemon Creek that might be impacted from the proposed new fills being planned near Lot 2 to Lot 5. Up to 13 feet of fill are being planned to be placed in this area for the proposed building pads.

The results of the analyses indicate that the existing south facing slope may be capable to support new fills up to 1 foot without special reinforcement. For cases where new fills greater than 1 foot that is being placed on top of the existing south facing slope, the factor of safety against global instability will be lower than the County's requirement. Therefore, we recommend that the south facing slope should be reinforced to mitigate slope instability at the locations when fills soils more than 1 foot is being placed.

We recommend that ground improvement may be constructed near the toe of new fill slopes to increase lateral resistance of the existing slope. Deep cement soil mixing (DCSM) may be one applicable improvement option for this location. The stability analyses indicates that the south facing slope with recommended ground improvement may support new fills up to 15 feet and the factor of safety against global instability great than 1.5 and 1.1 for static case and seismic case, respectively.

The results of slope stability analyses are discussed in Appendix E.

Cross Section 5-5': Cut Slope East of Street B

Cross Section 5-5' was prepared to evaluate the global stability of the cut slope east of the proposed Street B. The maximum height of the cut slope is about 25 feet and the cut slope will be no steeper than 2:1. The cut slope is anticipated to expose massive sandstone bedrock materials.

The static and seismic stability analyses indicates that the factor of safety of the existing slope against global instability are greater than 1.5 and 1.1 for static case and seismic case, respectively. Therefore, the potential of impacting the neighboring properties due to the proposed cut slopes are considered low.

The results of slope stability analyses are discussed in Appendix E.

Cross Section 6-6': Fill Slope Near Lot 15 through 20

Analyses on Cross Section 6-6' was to evaluate the global stabilities of the existing west facing slope along Lemon Creek that might be impacted from the proposed new fills being planned near Lot 15 to Lot 20. Up to 10 feet of fill are being planned to be placed in this area for the proposed building pads. The fill slopes are anticipated to be placed on alluvium.

The static and seismic stability analyses indicates that the factor of safety of the existing slope against global instability are greater than 1.5 and 1.1 for static case and seismic case, respectively. Therefore, the potential of global instability impacting by the new fills are considered low.

The results of slope stability analyses are discussed in Appendix E.

Conclusion

Based on the results of the stability analyses discussed in this Appendix, it is our opinion that global stability is not an issue properly addressed by engineered mitigations. The proposed development may be setback from adjacent slopes in accordance with Section 1808.7 of 2022 California Building Code. No other special structural setback is required.

6.4 Soil Stability

6.4.1 Erosion

Substantial soil erosion can occur along slopes and gentle gradients where loose and weakly vegetated soils are present and exposed to surface water flow and/or wind. The site has a stream cutting through the site that is subject to significant erosion. Between the stream's erosional potential and planned exposed land (not covered by concrete/ established trees) there is significant potential for erosion. Slopes steeper than 2 Horizontal: 1 Vertical are subject to higher probability and rate of erosion as well. However, there are several ways to address erosion; including but not limited to establishing deep-rooted vegetation, or fortifying susceptible areas with rock or concrete.

6.4.2 Collapse and/or Expansion

Soft clays and organic rich soils encountered near Lots 2 through Lot 6 pose the risk of collapsing or settlement under weight of proposed new fills. Mitigation measure would consist of supporting the proposed structure on mat foundations established on ground improvement, or deep foundations.

The onsite soils consist predominantly of clayey alluvium underlain by bedrock. The clayey alluvium and bedrock are not subject to hydroconsolidation. Therefore, potential of hydroconsolidation is considered low.

Subsidence in southern California region is typically associated with groundwater withdraw, oil extraction, and/or peat loss. State and local regulation has allowed for monitor programs and general management to reduce the negative impacts of subsidence due to groundwater and oil withdraw. The site is not mapped in an active subsidence area, as defined by the USGS, online mapped of Areas of Land Subsidence in California. Nor is it within an active oil field as defined by the CalGEM GIS Well-Finder. The potential for subsidence hazard at the project site is considered low.

The clayey soils onsite have a high potential for expansion and can significantly impact building slab support, hardscape, pavement and flat works. Mitigation of expansive soils for building slabs , hardscape, pavement and flat works would consist of excavation and replacing the upper expansive clay with non-expansive import soils and/or reinforced pavements.

6.5 Wastewater Disposal

The city provides wastewater disposal through the city sewer systems. The Project will be served by the City's existing sewer system and does not include septic tanks or alternative wastewater disposal systems. The potential for waste-water disposal to be a hazard at the project site is low.

6.6 Geologic Feature

The Project Site is situated on a developed area. It is moderately vegetated by trees, with an active creek (Lemon Creek) cutting through the site. Lemon Creek is outside of the grading limits of the site and should not be impacted by the proposed grading. The site is bounded by streets to the North, South, and West. The east and southeast boundaries of the site are bordered by residential homes. There is no potential hazard of destroying a natural geological feature of significance.

6.7 Naturally Occurring Methane, Asbestos, and Radon

Naturally occurring hazardous elements within subsurface materials can include asbestos, radon, and oil and methane gas. CalGEM GIS Well-Finder indicates the site is outside of major oil drilling areas. The Walnut oil field is 2.5 miles East of the site, and the Sansinena and Brea-Olienda large oil fields are 7.5 miles South of the site. There are no active wells within a 0.75 mile radius of the Project Site. Therefore, the potential for naturally occurring oil and methane onsite is considered low.

The CGS Map Sheet 59 (USGS, 2011) showing known sites with naturally occurring asbestos indicates there are no known asbestos site within a 1-mile radius of the site. Therefore, the potential hazard of naturally occurring asbestos at the site is considered low.

The California Geological Survey Special Radon Potential Zone Map (CGS, 2005) indicates the site is within a zone designated as having moderate potential for indoor radon levels above 4 picocuries per liter. Four picocuries per liter is recommended to be an action level for radon reduction by the U.S. Environmental Protection Agency. Moderate indoor radon potential is described to be 6 to 20 percent of indoor radon measurements are likely to exceed the radon action level of 4 picocuries per liter. Encountering units that have potential to contain radon may require a radon specialist to determine risk at the site.

7.0 PRELIMINARY GEOTECHNICAL RECOMMENDATIONS

7.1 General

Based on the results of our preliminary geotechnical investigation, it is our opinion that the proposed residential development of the site is feasible from a geotechnical standpoint. Preliminary geotechnical recommendations for design planning are discussed in the following sections. A design-level geotechnical report will be required to develop geotechnical recommendations for final design, including drilling and sampling geotechnical borings, performing laboratory testing to confirm engineering parameters and detailed engineering analyses.

The subsurface conditions near north of Lemon Creek (Lot 1 through Lot 13) consist of soils with a high potential for variable settlements. The proposed structures may be supported on mat foundations established on at least 3 feet thick of mechanically stabilized layer (MSL) to mitigate possible differential settlement. The MSL is a reinforced subgrade which consists of aggregate base reinforced by multiple layers of multi-axial geogrids. Details design of MSL should be performed during design-level geotechnical report.

The subsurface conditions near south of Lemon Creek (Lot 14 through Lot 20) consists of alluvium underlain by sandstone bedrock. The proposed structures may be supported on shallow foundations established on properly compacted fill soils or undisturbed native soils and/or bedrock.

The subsurface soils adjacent to the Lemon Creek and near Lot 20 through Lot 27 consists of alluvial deposits, which are susceptible to liquefaction when saturated. The seismically-induced settlement is estimated to be on an order of 4 inches. In addition, lateral displacement (lateral spread) is estimated to be on an order of 3 inches. The limit of the liquefiable alluvial deposit should be defined in design level geotechnical investigation. If the proposed structures are underlain by soils that are susceptible for liquefaction, the structure may be supported on mat foundations. Alternatively, the structures may be supported on piles.

The proposed single span bridge should be supported on deep foundation extending into bedrock.

Based on the results of the stability analyses discussed in this Appendix, it is our opinion that global stability is not an issue if proper engineered mitigation is developed. The proposed structures may be setback from the adjacent slope in accordance with Section 1808.7 of 2022 California Building Code. No other special structural setback is required.

The onsite soils have expansion indices greater than 50 and may be classified as medium expansion. We recommend that the upper two feet of soils below the floor slab be removed and

replaced with non-expansive compacted soils and the floor slab may be supported on grade. Otherwise, the floor slabs may be designed to accommodate medium expansion subgrade.

The proposed paving, concrete walkways, and hardscapes should be supported on at least 2 feet thick of non-expansive compacted fill soils.

In areas where structures straddle transitions from bedrock to fill or alluvium, a 5 foot removal and recompaction of uniform fill below foundations and floor slabs is recommended.

7.2 Site Preparation and Grading

Any suspected fill or any loose soils should be removed and recompacted. In addition, demolition activities may create disturbance of near surface soils, which will also require removal and recompaction. The actual limits for removals or recompaction should be determined during design-level geotechnical investigation. For preliminary planning, we recommend that a minimum of 5 feet below the building pad and 2 feet below the hardscape, flatworks, or pavement should be overexcavated and replaced with properly compacted fill soils.

Where excavations are deeper than about 4 feet, the sides of the excavations should be sloped back at 1:1 (horizontal to vertical) or shored for safety. Unshored excavations should not extend below a plane drawn at 1½:1 (horizontal to vertical) extending downward from adjacent existing footings. We would be pleased to present data for design of shoring if required.

Structural fill or backfill should be compacted to at least 95 percent of the maximum dry density. Fill placed in non-structural areas should be compacted to at least 90 percent of the maximum dry density. The moisture content of the on-site soils at the time of compaction should vary no more than 2% below or above optimum moisture content. The moisture content of the on-site clayey soils at the time of compaction should be between 2% and 4% above optimum moisture content.

All fills should be keyed and benched through all topsoil, slope wash, alluvium or colluvium or creep material into firm material where the slope receiving fill is steeper than 5:1 (Horizontal: Vertical) or as determined by Geotechnical Engineer. The standard acceptable bench height is four feet into suitable material. The key for side hill fills should be a minimum of 15 feet within alluvium or firm materials, with a minimum toe embankment of 2 feet into firm alluvium, unless otherwise specified by the Geotechnical Engineer.

Recommendations for foundation design provided herein are preliminary.

7.3 Preliminary Foundation Recommendations

7.3.1 Mat Foundation

A mat foundation established on improved ground may be designed to impose an average net dead-plus-live load pressure of up to 2,000 pounds per square foot. The allowable bearing pressure may be increased by one-third when considering temporary loads associated with wind and seismic loading. The recommended bearing value is a net value, and the weight of concrete in the footings can be taken as 50 pounds per cubic foot; the weight of soil backfill can be neglected when determining the downward loads.

7.3.2 Spread Footings

Spread footings extending at least one foot into the undisturbed natural soils or properly compacted fill soils and at least 2 feet below the floor slab or lowest adjacent grade, may be designed to impose a net dead-plus-live load pressure of 2,000 pounds per square foot. The allowable bearing pressure may be increased by one-third when considering temporary loads associated with wind and seismic loading. The recommended bearing value is a net value, and the weight of concrete in the footings can be taken as 50 pounds per cubic foot.

7.3.3 Pile Foundation (Bridge)

The proposed bridge may be supported on cast-in-drilled hole concrete pile foundation extending into bedrock. We recommend that a foundation report (FR) should be prepared during design-level geotechnical investigation when details of bridge structural feature is available. The FR should be prepared in accordance with the Caltrans Geotechnical Manual for Foundation Reports for Bridges. We recommend that a bridge engineer should be involved during design phase of the project.

7.4 Floor Slab

The onsite soils have expansion indices greater than 50, and may be classified as medium expansion. We recommend that the upper two feet of soils below the floor slab be removed and replaced with non-expansive compacted soils and the floor slab may be supported on grade. Otherwise, the floor slabs may be designed to accommodate medium expansion subgrade.

If the proposed residential structures are supported on pile foundations, the floor slabs should be structurally supported.

The slab on grade may be supported on native soils, or properly compacted subgrade. To reduce the potential for moisture transmission through slabs where moisture sensitive covering will be installed, moisture barriers and control may be required.

7.5 Retaining Wall

For design of cantilevered retaining walls (unrestrained along the height of the wall), where the surface of the backfill is level, it may be assumed that drained soils will exert a lateral pressure equal to that developed by a fluid with a density of 35 pounds per cubic foot. In addition to the recommended earth pressure, the walls should be designed to resist any applicable surcharges due to foundation, storage, or traffic loads. For backslope inclination of up to 2:1 behind the retaining wall, it may be assumed that drained soils will exert a lateral pressure equal to that developed by a fluid with a density of 50 pounds per cubic foot.

7.6 Seismic Design Parameters per CBC 2022/ASCE 7-22

Seismic design acceleration parameters were developed per the 2022 California Building Code (CBC) and ASCE 7-22 (ASCE/SEI 7-22) for the proposed project and are presented in Table 2. Based on the underlying geology, subsurface exploration data, and shear wave velocity estimates from the CPTs, the site classification for seismic design is Site Class D per Chapter 20 of ASCE 7-16. The site coordinates used in our seismic hazard analysis are -117.8656 (Longitude) and 34.0236 (Latitude).

Table 3. Mapped Seismic Design Acceleration Parameters

Latitude: 34.0236 ° Longitude: -117.8656°	
Site Class	D
Mapped MCE Spectral Response Acceleration at Short Period (S_S)	1.75g
Mapped MCE Spectral Response Acceleration at Period of 1 Second (S_1)	0.62g
Site Coefficient, F_a	1.0
Site Coefficient, F_v	1.7
Adjusted MCE Spectral Response Acceleration at Short Period (S_{MS})	1.75g
Adjusted MCE Spectral Response Acceleration at Period of 1 Second (S_{M1})	1.05g
Design Earthquake Spectral Response Acceleration at Short Period (S_{DS})	1.17g
Design Earthquake Spectral Response Acceleration at Period of 1 Second (S_{D1})	0.70g
Peak Ground Acceleration Adjusted for Site Class (PGA_M)	0.82g

Per Section 11.4.8 of ASCE 7-16, a site-specific ground motion hazard analysis is required for "structures on Site Class D and E sites with S_1 greater than or equal to 0.2", unless certain exceptions are met.

According to updated Section 11.4.8 of ASCE 7-16 Supplement 3, a site-specific ground motion hazard analyses is not required where the value of the S_{M1} is increased by 50%. Therefore, if site-specific ground motion analysis is not performed for the project, the revised spectral response acceleration at 1 second provided below should be used for design.

- S_{M1} = 1.58g
- S_{D1}= 1.05g

7.7 Soil Corrosion Potential

Two representative sample of the near-surface material were tested for evaluating corrosion characteristics. The results indicate the test sample had pH of 7.5, and 7.8; a water-soluble sulfate content of 0.002 %, and a soluble chloride content of less than 0.01 %. The sulfate results indicate that sulfate exposure to Portland cement is moderate.

The test sample was also found to have a minimum measured electrical resistivity of less than 1,000 Ohm-cm. The following correlation can generally be used between electrical resistivity and corrosion potential:

Electrical Resistivity (Ohm-Cm)	Corrosion Potential
Less than 1,000	Severe
1,000 to 2,000	Corrosive
2,000 to 10,000	Moderate
Greater than 10,000	Mild

Based on the laboratory test results, the test sample is classified as corrosive to buried metals. Further evaluation/testing and recommendations for corrosion protection should be provided by a corrosion consultant during design-level geotechnical investigation.

7.8 Stormwater Infiltration

Infiltration tests were performed at three locations as shown on Figure 2. Test wells were installed in each boring. The wells consisted of 2-inch diameter PVC pipe. The bottom of the pipe was slotted in the zone to be tested. The bottom end of the pipe was capped. In the slotted zone coarse sand backfill was used. Above the slotted zone the backfill bentonite chips were placed.

Before performing the infiltration tests, each well was filled with water to saturate the soils and attempt to develop a steady state of flow within the test zone.

Following saturation, falling head permeability tests were conducted in each test well in accordance with Los Angeles County Administrative Manual (GS200.1, 2021). The well casing was filled with water and then the level of water in the well was recorded at 10 minute intervals until the difference in last three consecutive readings are within 10%.

The determination of the infiltration rates is based upon the test procedure and calculations discussed in the Administrative Manual GS200.1. Both the in-field and calculated infiltration rate for each of our boring percolation test locations is shown in Table 4.

Table 4: Infiltration Rates

Test ID (Boring)	Soil Type	Test Interval Depth (feet)	Calculated Infiltration Rate (in/hr)
I-1	ML/CL	2-5	0.2
I-2	ML/CL	0-5	0.2
I-3	ML/CL	0-5	0.1

Based on the GS200.1, the required minimum design infiltration rate is 0.3 inches per hour. The site soils consist predominantly of fine grained materials. Therefore, storm water infiltration is not considered feasible at the site. In addition, to prevent water saturate the adjacent slope which may potentially result in slope stability, we recommend that the bottom of the bioretention basins should be lined with an impermeable liner.

8.0 LIMITATIONS

This geotechnical feasibility report was prepared in accordance with generally accepted Geotechnical Engineering principles and practice. The professional engineering work and judgments presented in this report meet the standard of care of our profession at this time. No other warranty, expressed or implied, is made. This report has been prepared for the Spring Meadows Homes, LLC, and their consultants. It may not contain sufficient information for other parties for other purposes or other projects and should not be used for other projects without review and approval by Group Delta. ***This feasibility report will not be sufficient to obtain a building permit from the City. A design-level geotechnical investigation will be required prior to developing final plans for the project.***

9.0 REFERENCES

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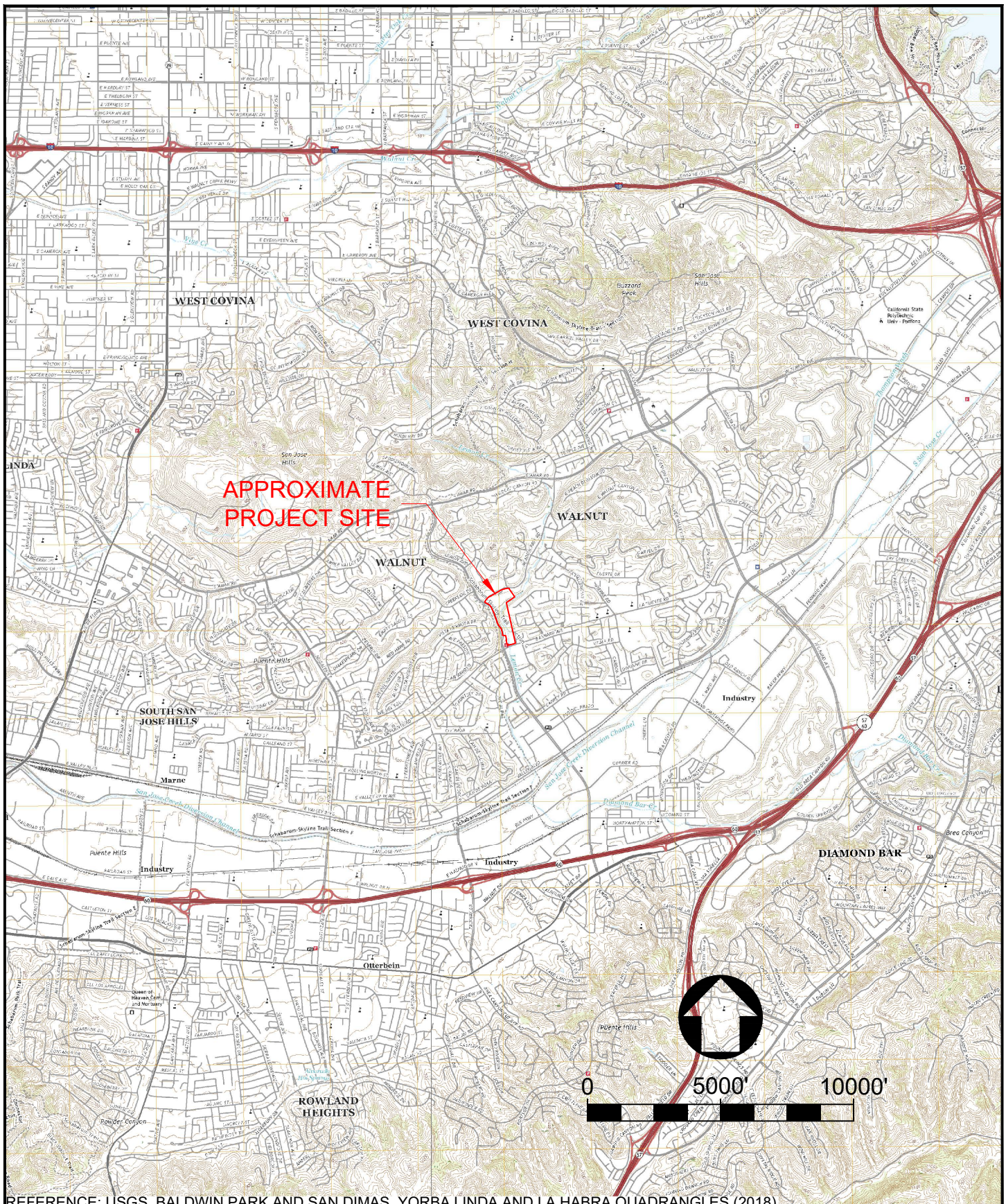
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FIGURES



REFERENCE: USGS, BALDWIN PARK AND SAN DIMAS, YORBA LINDA AND LA HABRA QUADRANGLES (2018)

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PREPARED BY: -				THE BROOKSIDE TENTATIVE TRACK NO. 72798 CITY OF WALNUT, CA	FIGURE NUMBER: 1

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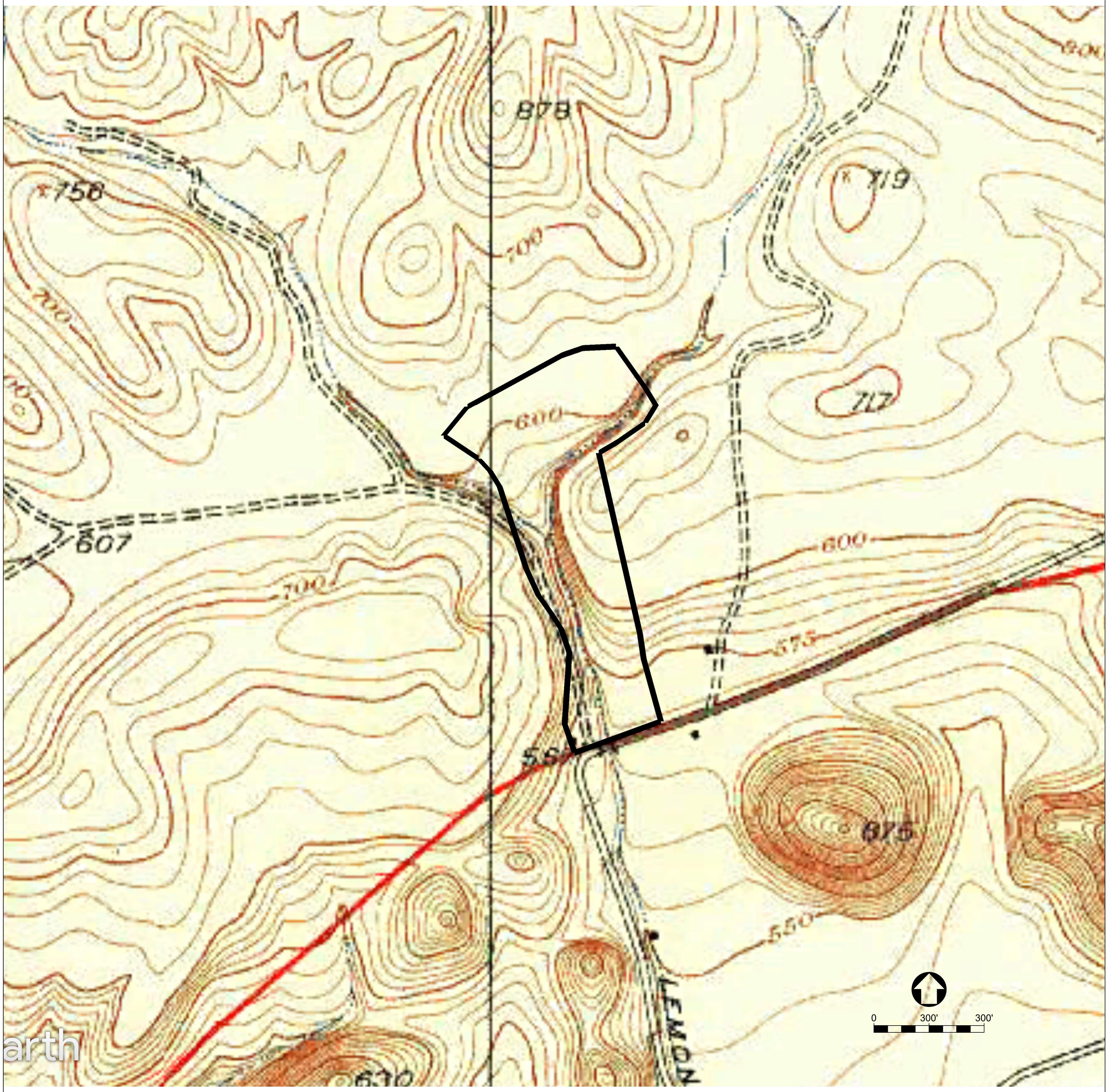


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Qc	COLLUVIAL DEPOSITS, CLAYEY
Tpsq	SOQUEL MEMBER, PUENTE FORMATION, SANDSTONE AND SILTSTONE INTERBEDDED
TP-5	APPROXIMATE TEST PIT LOCATION
B-21	APPROXIMATE BORING LOCATION
I-3	PREVIOUS APPROXIMATE INFILTRATION TEST LOCATION (GROUP DELTA, 2019)
B-14	PREVIOUS APPROXIMATE BORING LOCATION (GROUP DELTA, 2013)
C-17	PREVIOUS APPROXIMATE CPT LOCATION (GROUP DELTA, 2013)
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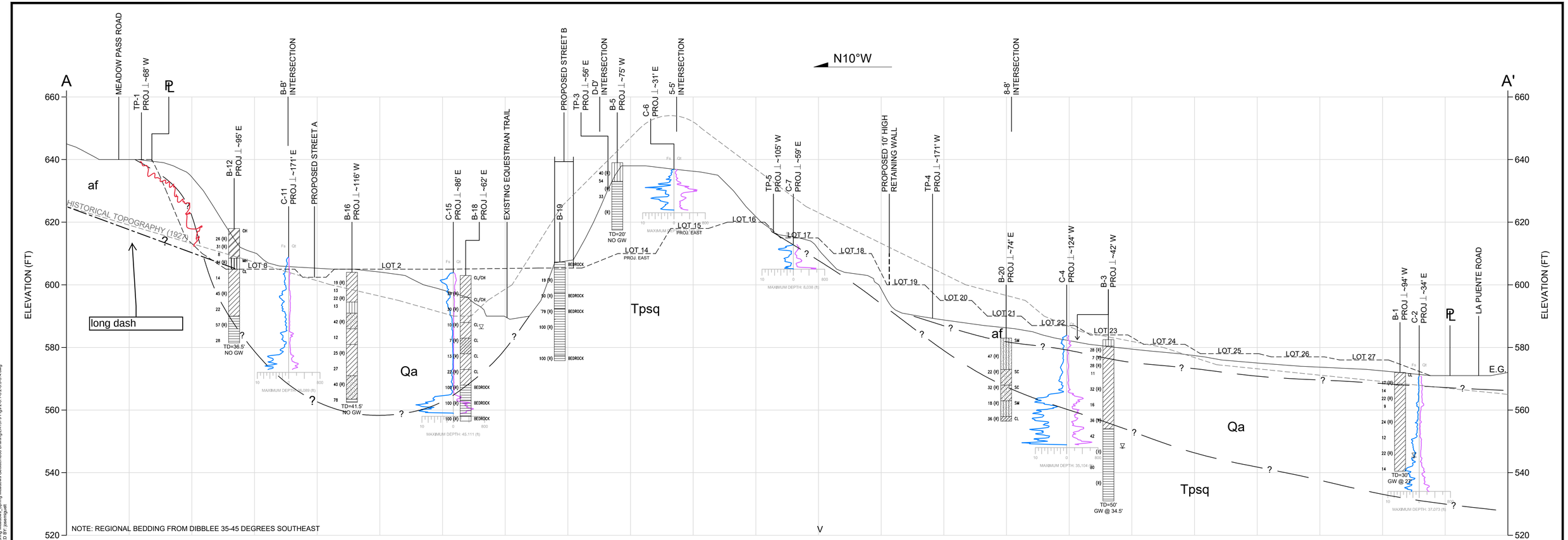
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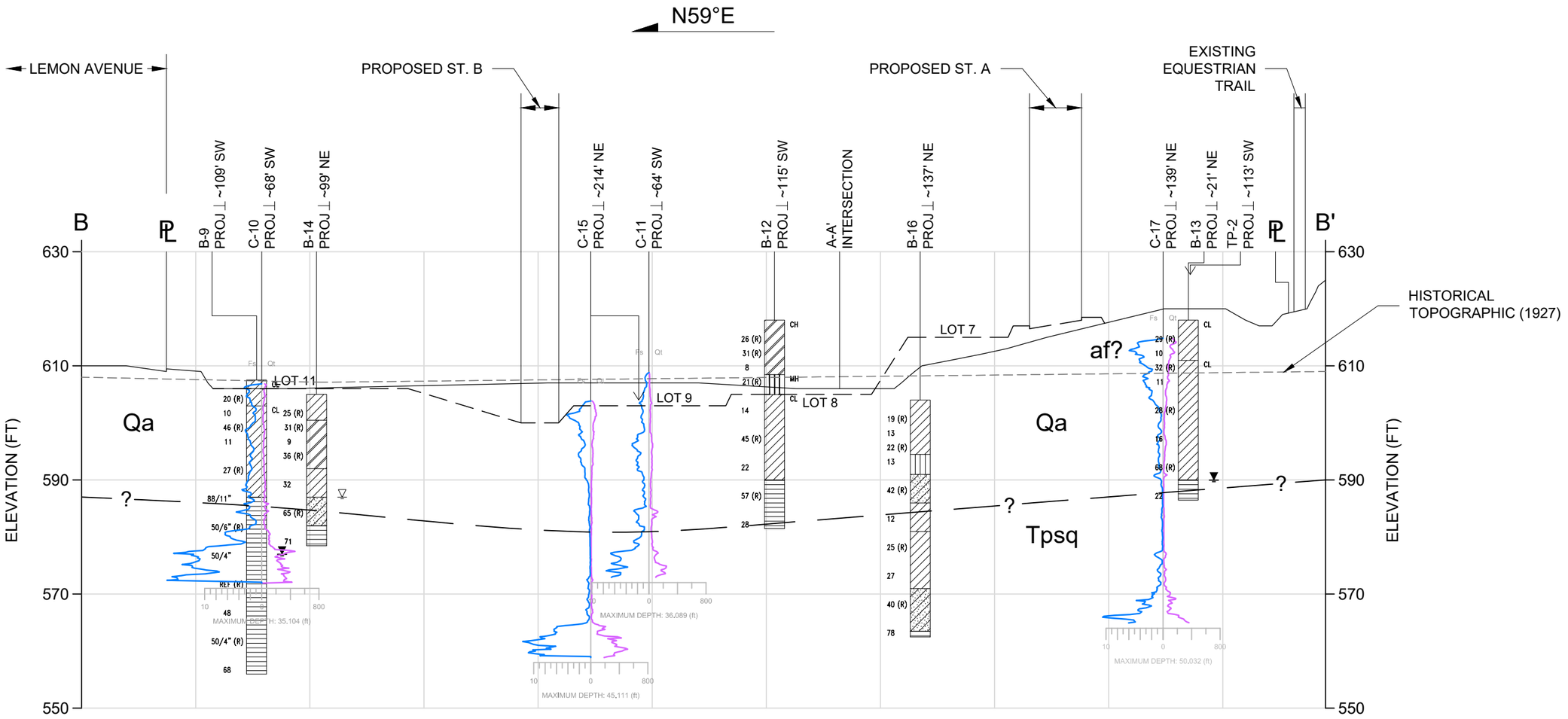
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Qa	ALLUVIUM		HISTORICAL TOPOGRAPHY (1927)
Qor	ORGANIC RICH CLAY AND SILT		EXISTING GRADE
			PROPOSED GRADE
		?	GEOLOGY
			BEDDING OF BEDROCK APPARENT DIP (TRUE DIP)
			GROUNDWATER ENCOUNTERED DURING DRILLING

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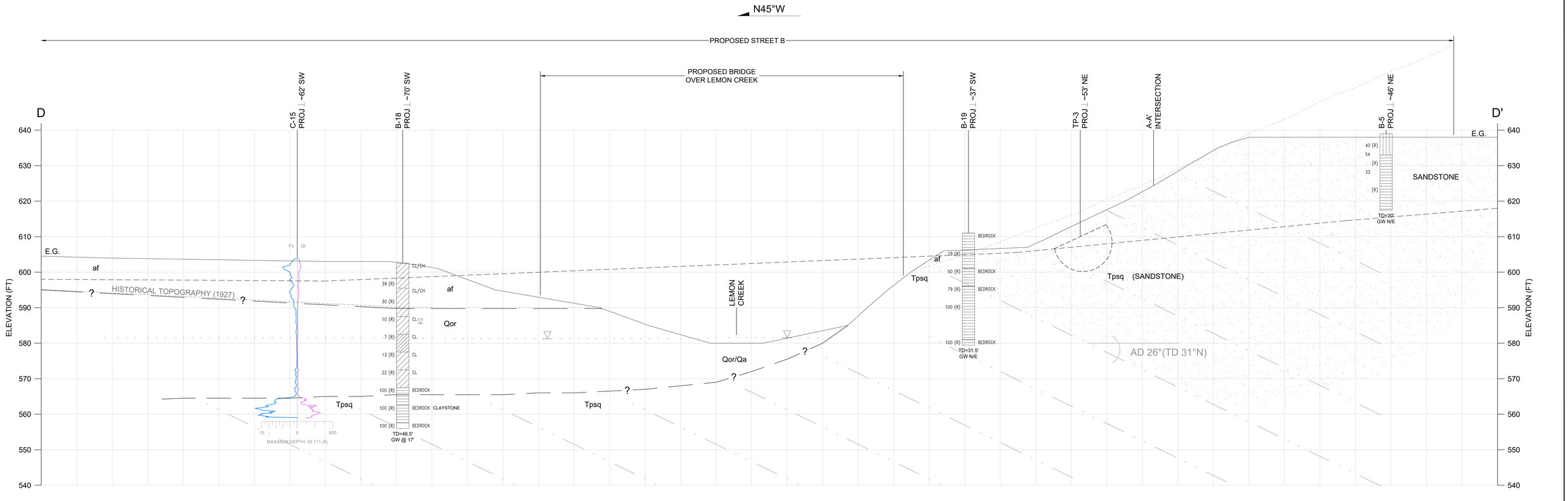
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Qa	ALLUVIUM	▽	GROUNDWATER ENCOUNTERED DURING DRILLING
Qor	ORGANIC RICH CLAY AND SILT		
Tpsq	MONTEREY (PUENTE) FORMATION, SOQUEL MEMBER (SANDSTONE AND CLAYSTONE)		
GL	GRADING LIMIT		
– – – – – –	HISTORICAL TOPOGRAPHY (1927)		
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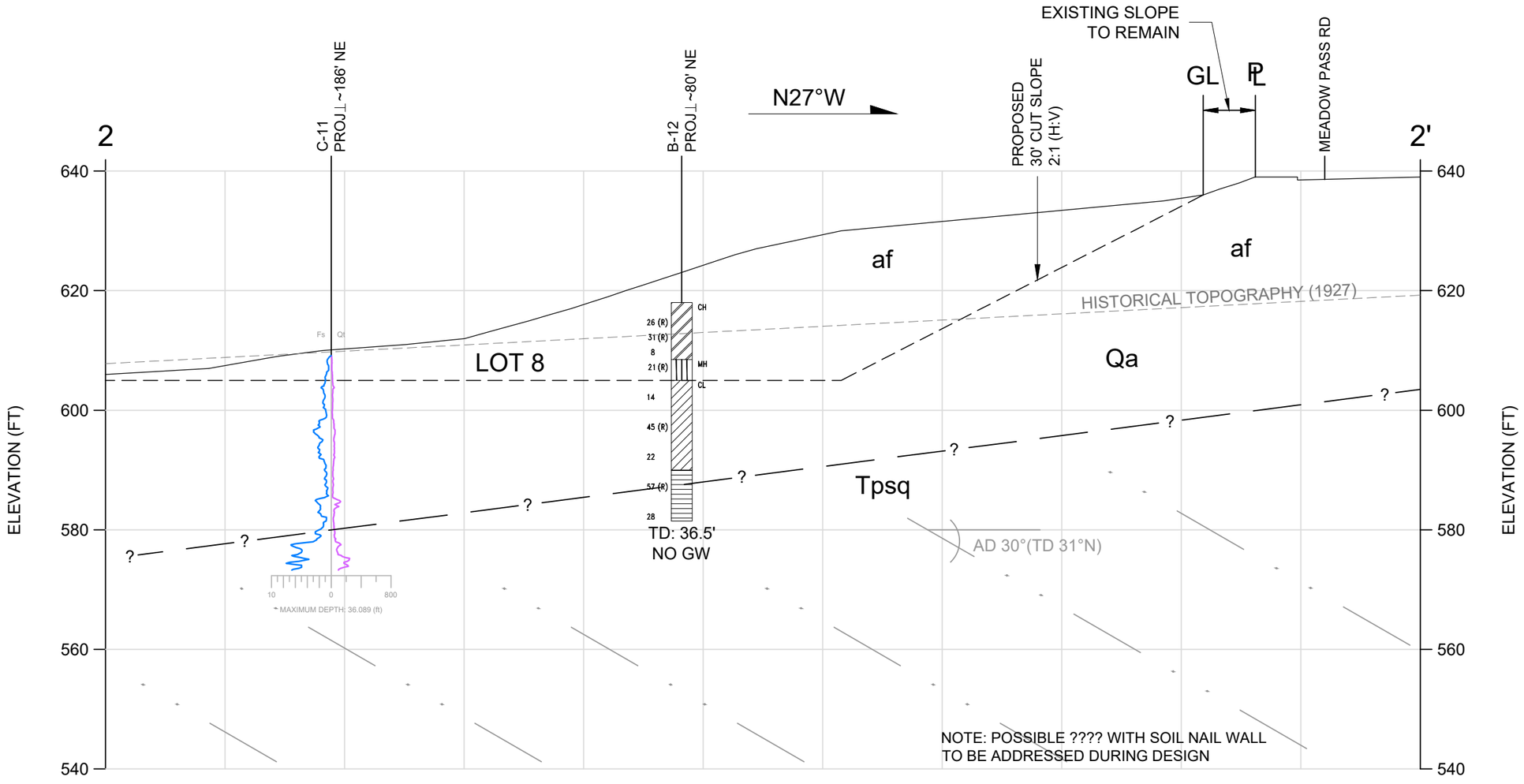
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GL	GRADING LIMIT
	HISTORICAL TOPOGRAPHY (1927) (DOTTED WHERE ADJUSTED)
	PROPOSED GRADE
	EXISTING GRADE
—?—	GEOLOGY
	BEDDING OF BEDROCK APPARENT DIP (TRUE DIP)
	GROUNDWATER ENCOUNTERED DURING DRILLING, DOTTED WHERE INTERPRETED BETWEEN DATA POINTS

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5'
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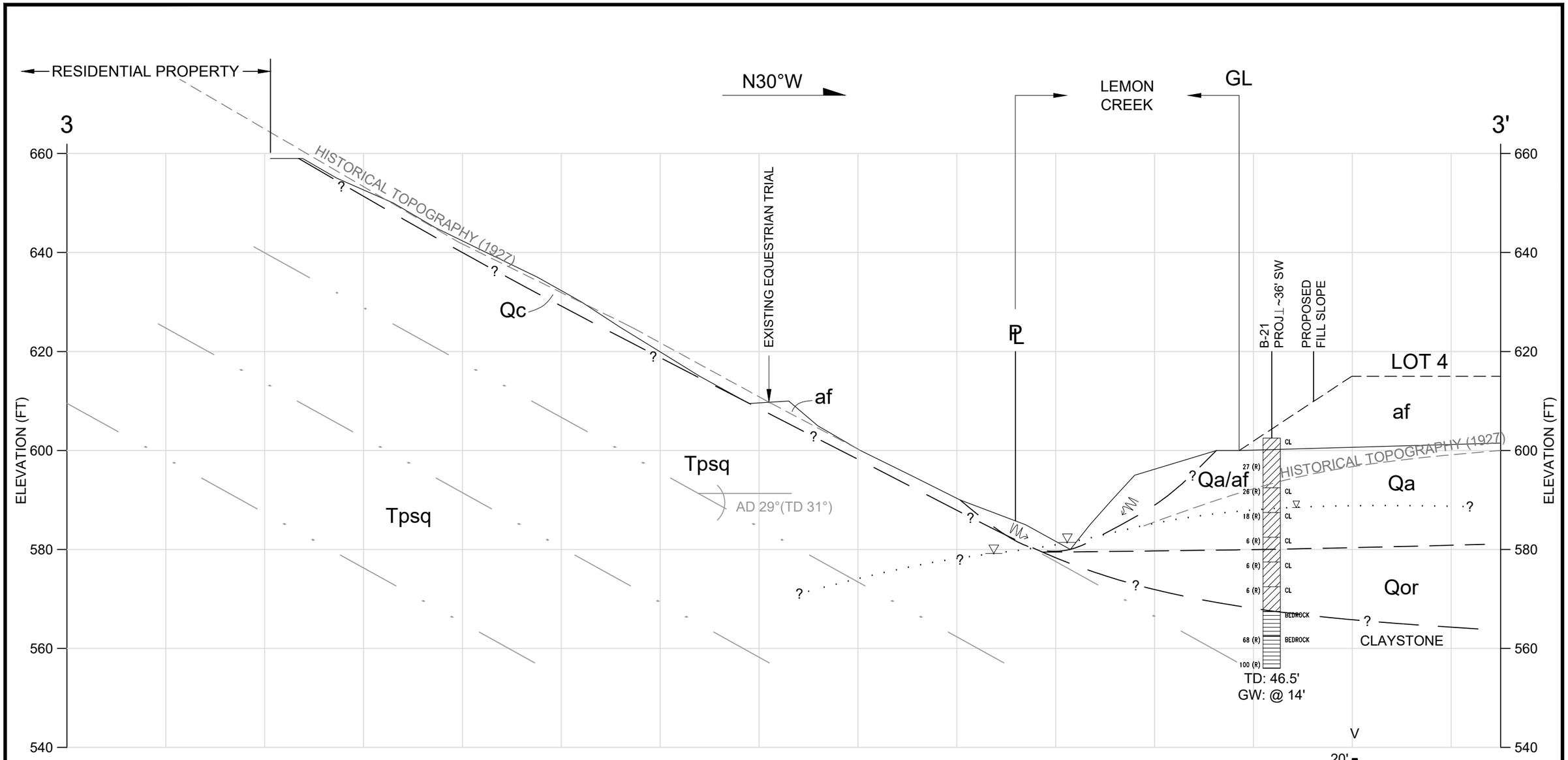
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Qa	ALLUVIUM	▽	GROUNDWATER ENCOUNTERED DURING DRILLING
Qor	ORGANIC RICH CLAY AND SILT		
Tpsq	MONTEREY (PUENTE) FORMATION, SOQUEL MEMBER (SANDSTONE AND CLAYSTONE)		
GL	GRADING LIMIT		
– – – – – –	HISTORICAL TOPOGRAPHY (1927)		
———	EXISTING GRADE		
— — —	PROPOSED GRADE		

V
20'
10'
SCALE (FT):
H
0' 10' 20'

DATE: 03/02/2023	DRAWN BY: JMT	GROUP DELTA CONSULTANTS, INC 370 Amapola Ave. Suite 212 Torrance, CA. 90501	CROSS SECTION 2-2'
REVIEWED BY: MEA/MAS	APPROVED BY: -		THE BROOKSIDE TENTATIVE TRACK NO. 72798 CITY OF WALNUT, CA
REVISED: -			

PROJECT NUMBER: LA1579
SCALE: AS SHOWN
FIGURE NUMBER: 3.4

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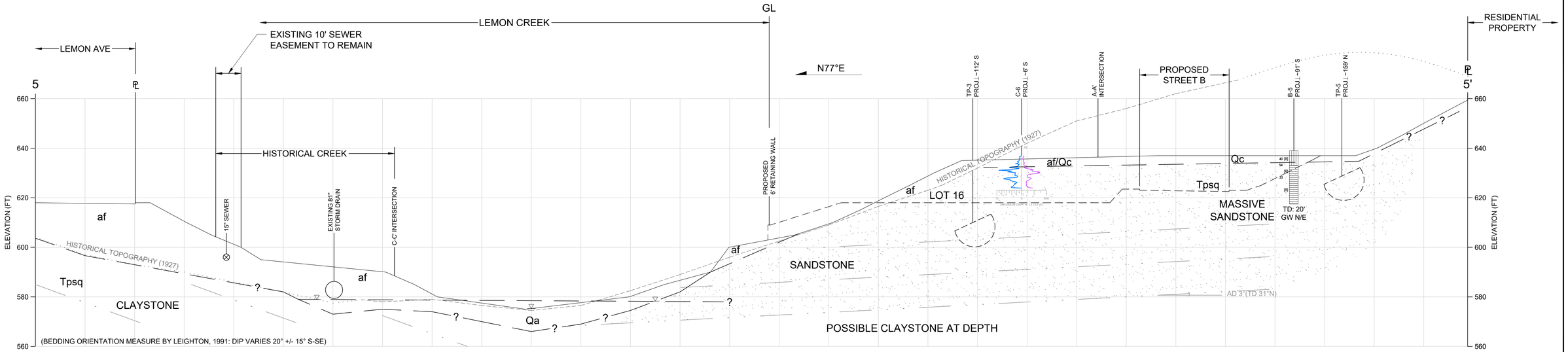


LEGEND:

af	POSSIBLE FILL (CL/ML)	—— ? ——	GEOLOGY
Qc	MASSIVE COLLUVIUM	— · — · —	BEDDING OF BEDROCK APPARENT DIP (TRUE DIP)
Qa	ALLUVIUM	▽	GROUNDWATER ENCOUNTERED DURING DRILLING
Qor	ORGANIC RICH CLAY AND SILT	≈≈	CANYON WALL SLUMP DEBRIS
Tpsq	MONTEREY (PUENTE) FORMATION, SOQUEL MEMBER (SANDSTONE AND CLAYSTONE)		
GL	GRADING LIMIT		
– – – – – –	HISTORICAL TOPOGRAPHY (1927)		
———	EXISTING GRADE		
— — —	PROPOSED GRADE		

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REVISED: -			PROJECT NUMBER: LA1579 SCALE: AS SHOWN FIGURE NUMBER: 3.5

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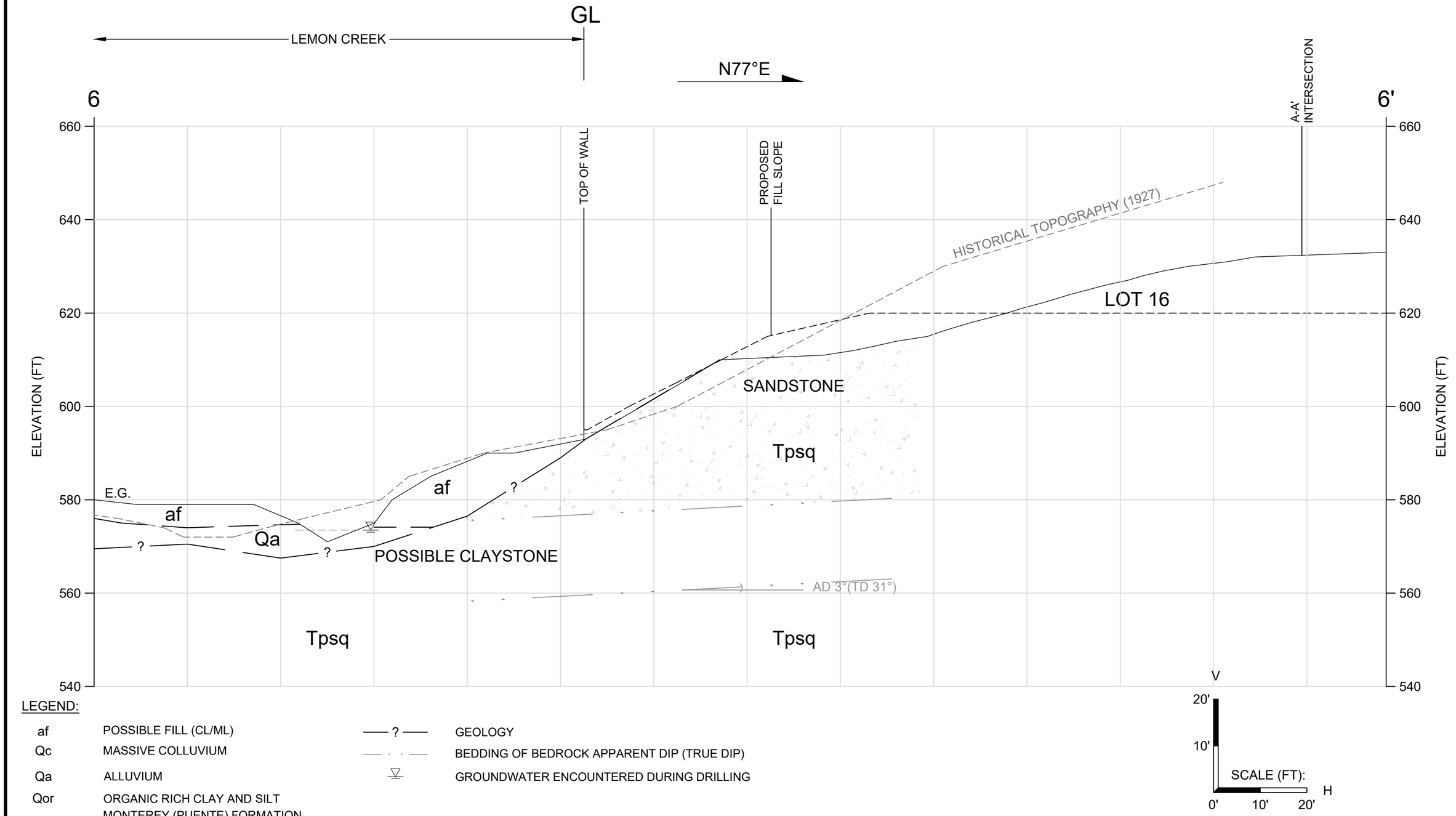
LEGEND:

af	POSSIBLE FILL (CL/ML)
Qc	MASSIVE COLLUVIUM
Qa	ALLUVIUM
Qor	ORGANIC RICH CLAY AND SILT
Tpsq	MONTEREY (PUENTE) FORMATION, SOQUEL MEMBER (SANDSTONE AND CLAYSTONE)
GL	GRADING LIMIT
– – – –	HISTORICAL TOPOGRAPHY (1927)
· · · · · ·	INTERPRETED
———	EXISTING GRADE
— — —	PROPOSED GRADE
— ? —	GEOLOGY
— · · —	BEDDING OF BEDROCK APPARENT DIP (TRUE DIP)
▽	GROUNDWATER ENCOUNTERED DURING DRILLING

V
20'
10'
SCALE (FT):
0' 10' 20' H

DATE: 03/02/2023	DRAWN BY: JMT	GROUP DELTA CONSULTANTS, INC 370 Amapola Ave. Suite 212 Torrance, CA. 90501	CROSS SECTION 5-5'
REVIEWED BY: MEA/MAS	APPROVED BY: -		THE BROOKSIDE TENTATIVE TRACK NO. 72798 CITY OF WALNUT, CA
REVISED: -			PROJECT NUMBER: LA1579 SCALE: AS SHOWN FIGURE NUMBER: 3.5

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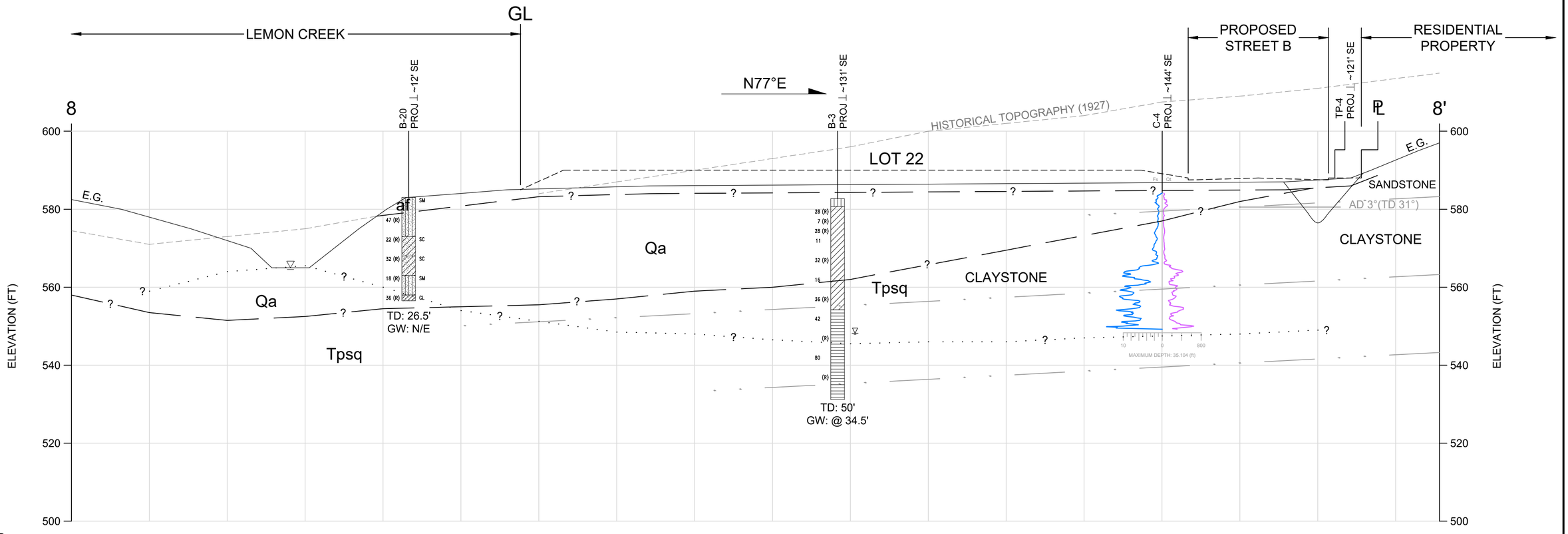
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Qc	MASSIVE COLLUVIUM	—— · ——	BEDDING OF BEDROCK APPARENT DIP (TRUE DIP)
Qa	ALLUVIUM	▽	GROUNDWATER ENCOUNTERED DURING DRILLING
Qor	ORGANIC RICH CLAY AND SILT		
Tpsq	MONTEREY (PUENTE) FORMATION, SOQUEL MEMBER (SANDSTONE AND CLAYSTONE)		
GL	GRADING LIMIT		
– – – – –	HISTORICAL TOPOGRAPHY (1927)		
———	EXISTING GRADE		
— — —	PROPOSED GRADE		

V
20'
10'
SCALE (FT):
H
0' 10' 20'

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REVISED: -			PROJECT NUMBER: LA1579 SCALE: AS SHOWN FIGURE NUMBER: 3.7

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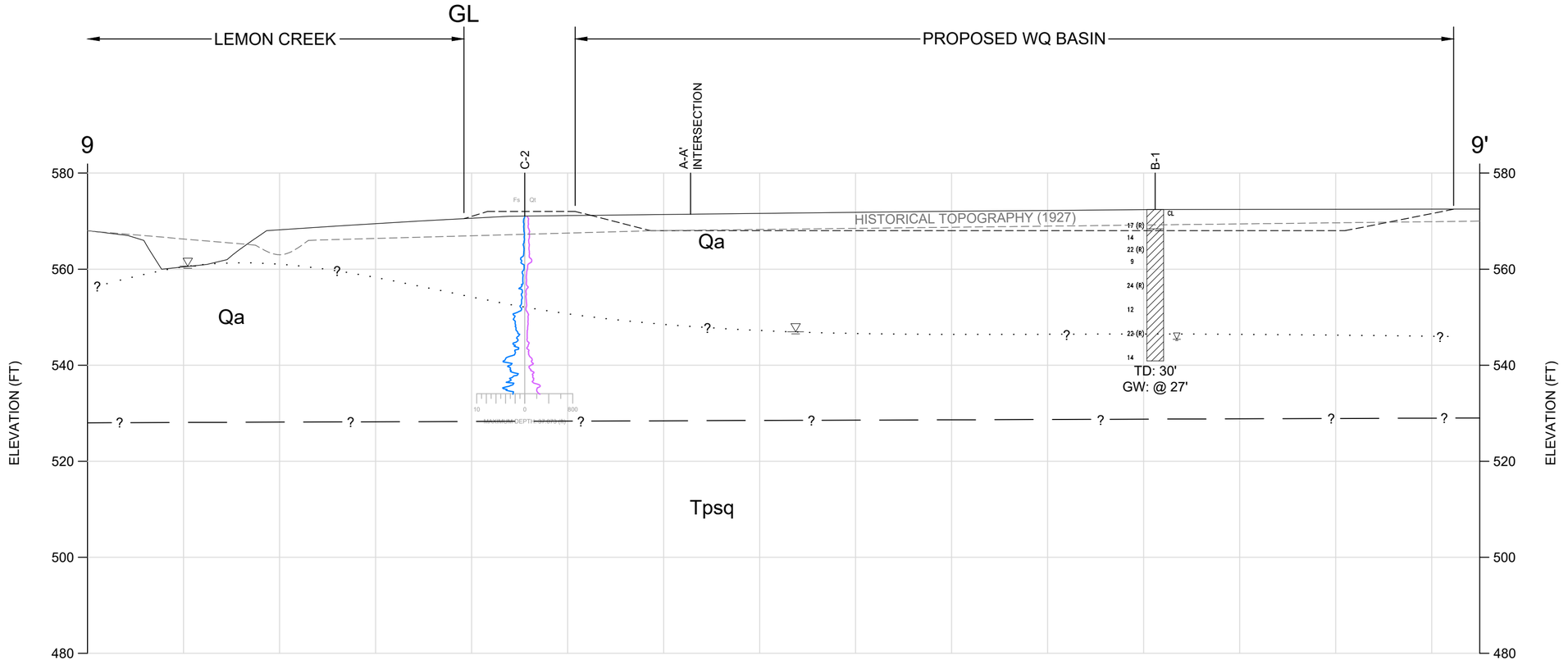
LEGEND:

af	POSSIBLE FILL (CL/ML)	—?—	GEOLOGY
Qc	MASSIVE COLLUVIUM		BEDDING OF BEDROCK APPARENT DIP (TRUE DIP)
Qa	ALLUVIUM		GROUNDWATER ENCOUNTERED DURING DRILLING, DOTTED WHERE INTERPRETED BETWEEN DATA POINTS
Qor	ORGANIC RICH CLAY AND SILT		
Tpsq	MONTEREY (PUENTE) FORMATION, SOQUEL MEMBER (SANDSTONE AND CLAYSTONE)		
GL	GRADING LIMIT		
	HISTORICAL TOPOGRAPHY (1927)		
	EXISTING GRADE		
	PROPOSED GRADE		

V
20'
10'
SCALE (FT):
H
0' 10' 20'

DATE: 03/02/2023	DRAWN BY: JMT	GROUP DELTA CONSULTANTS, INC 370 Amapola Ave. Suite 212 Torrance, CA. 90501	CROSS SECTION 8-8'
REVIEWED BY: MEA/MAS	APPROVED BY: -		THE BROOKSIDE TENTATIVE TRACK NO. 72798 CITY OF WALNUT, CA
REVISED: -			PROJECT NUMBER: LA1579 SCALE: AS SHOWN FIGURE NUMBER: 3.8

FILE PATH: N:\Projects\1500-1599\LA1579 Spring Meadows_Spring Meadows Geotech\600 Drafting\LA1579 Figs 2-3-1-2-3-3-3-4.dwg
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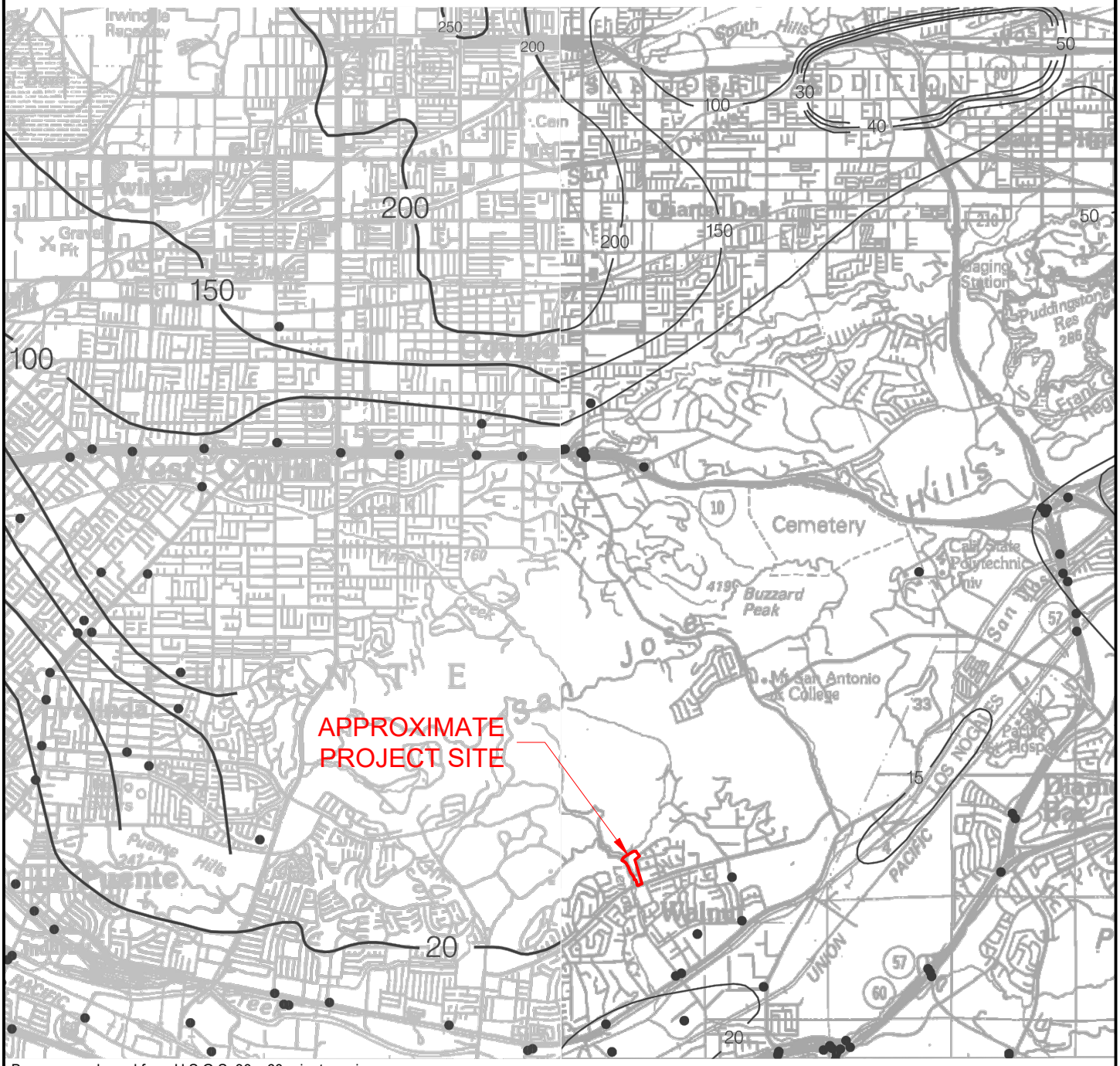
LEGEND:

af	POSSIBLE FILL (CL/ML)	?	GEOLOGY
Qc	MASSIVE COLLUVIUM		BEDDING OF BEDROCK APPARENT DIP (TRUE DIP)
Qa	ALLUVIUM		GROUNDWATER ENCOUNTERED DURING DRILLING, DOTTED WHERE INTERPRETED BETWEEN DATA POINTS
Qor	ORGANIC RICH CLAY AND SILT		
Tpsq	MONTEREY (PUENTE) FORMATION, SOQUEL MEMBER (SANDSTONE AND CLAYSTONE)		
GL	GRADING LIMIT		
	HISTORICAL TOPOGRAPHY (1927)		
	EXISTING GRADE		
	PROPOSED GRADE		

V
20'
10'
SCALE (FT):
H
0' 10' 20'

DATE: 03/02/2023	DRAWN BY: JMT	GROUP DELTA CONSULTANTS, INC 370 Amapola Ave. Suite 212 Torrance, CA. 90501	CROSS SECTION 9-9'
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Base map enlarged from U.S.G.S. 30 x 60-minute series

Plate 1.2 Historically Highest Ground Water Contours and Borehole Log Data Locations, Baldwin Park and San Dimas Quadrangles.

● Borehole Site 30 Depth to ground water in feet

ONE MILE
SCALE

REFERENCE: CGS, 1998, SEISMIC HAZARD ZONE REPORT, PLATE 1.2
GROUND WATER, FOR BALDWIN PARK (SHZR 022) AND SAN DIMAS (SHZR 032)
7.5-MINUTE QUADRANGLES, LOS ANGELES, CALIFORNIA.

DATE: 08/05/2022	DRAWN BY: JMT	GROUP DELTA	GROUP DELTA CONSULTANTS, INC 370 Amapola Ave. Suite 212 Torrance, CA. 90501	HISTORICAL HIGHEST GROUND WATER	PROJECT NUMBER: LA1579
REVIEWED BY: -	APPROVED BY: -			THE BROOKSIDE TENTATIVE TRACK NO. 72798 CITY OF WALNUT, CA	SCALE: AS SHOWN
PREPARED BY: -					FIGURE NUMBER: 4

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SAN DIMAS AND ONTARIO MAP (DF-91)

LEGEND

SURFICIAL SEDIMENTS

af / Qa / Qg

af *artificial fill*
Qg *alluvial gravel and sand of stream channels, some artificially channelized*
Qa *alluvial gravel and sand of valley areas*

Qls

LANDSLIDE AND TALUS RUBBLE

— *UNCONFORMITY* —

Qoa / Qog

OLDER, DISSECTED SURFICIAL SEDIMENTS

Qoa *low remnants of elevated alluvial gravel*
Qog *high remnants of elevated older alluvial gravel, including coarse boulder gravel*

— *UNCONFORMITY* —

SEDIMENTARY AND VOLCANIC ROCKS

Tscg | Tscs

SYCAMORE CANYON FORMATION

Sycamore Canyon Formation (uppermost member of Puente Formation of Durham & Yerkes 1964, Tan 1998) shallow marine clastic; latest Miocene age.
Tscg *conglomerate, light gray, of cobbles and pebbles of plutonic rocks in sandstone matrix.*
Tscs *sandstone, light gray, similar to* ***Tms****. Includes some conglomerate similar to* ***Tscg,*** *and siltstone.*

Tm | Tmy | Tmcg | Tms | Tmlv

MONTEREY (PUENTE) FORMATION

Monterey Formation (Puente form of Eldridge & Arnold, 1907, Durham & Yerkes 1964: Tan 1998, marine biogenic & clastic; late Miocene age, (Mohnian Stage))
Tm *unassigned shale; similar to* ***Tmlv*** *&* ***Tmly***
Tmy *Yorba shale Member – light gray, thin bedded, diatomaceous, semi-siliceous to clay shale, siltstone, minor sandstone; fish scales.*
Tmcg *conglomerate facies of cobbles & pebbles of plutonic rocks in sandstone matrix lenses in unit* ***Tms****, deposited as submarine deltas.*
Tms *Soquel sandstone facies, partly intertongued into* ***Tmy*** *&* ***Tmlv****, light gray to tan, moderately lithified, bedded, arkosic, contains concretions, some interbedded silty shale, derived from plutonic terrane & deposited as submarine fans, unfossiliferous*
Tmlv *La Vida Shale Member, white, weathered; thin bedded, platy, siliceous shale, clay shale, and siltstone, some strata of tan dolomite and sandstone; fish scales, foraminifera.*

Tt | Ttc

TOPANGA FORMATION

(of Shelton, 1955; Tan. 1998; marine clastic; middle Miocene age, unfossiliferous, locally intertongued into Glendora volcanics). age late ? Miocene
Tt *sandstone, light gray to tan, moderately lithified, bedded, arkosic, locally pebbly, includes interbedded siltstone or clay shale.*
Ttc *conglomerate (Buzzard Peak Conglomerate member of Woodford et al. 1946, light gray to tan, semi-lithified, vaguely bedded, composed of cobbles and pebbles of mostly plutonic rocks in sandstone matrix.*

Tgv | Tgvc | Tgvb | Tgvp | Tgvt | Tgva | Tgvr | Tgve

GLENDORA VOLCANIC ROCKS

Glendora Volcanics (of Shelton, 1955, Tan, 1999; extrusive volcanic rocks; middle Miocene age locally intertongued into Topanga Formation). (radiometric age ±16 MA (Weigand, P.W., oral communication 2001)
Tgv *undifferentiated volcanic rock, mostly brown andesitic flows and breccias*
Tgvc *volcanic conglomerate, gray to brown, of volcanic detritus.*
Tgvb *basalt flows, gray to black, massive to vesicular.*
Tgvp *basaltic pelagonitic tuff & pillow lavas.*
Tgvt *rhyolitic tuff breccia, tan to white*
Tgva *andesite flows and flow breccias, brown, porphyritic, massive.*
Tgvr *rhyolitic-dacitic flows, tan to light brown, aphanitic, massive to flow-banded, hard, fractured*
Tgve *rhyolite-dacite breccia exposed only at Elephant Hill.*

— *UNCONFORMITY* —

CRYSTALLINE BASEMENT ROCKS

GRANITIC ROCKS

Tmda

MOUNTAIN MEADOWS DACITE

Mountain Meadows dacite (of Shelton 1955, Tan, 1999 intrusive into qd; early Miocene? Age)
Mda *dacite light gray, hard, massive, fine grained, contains small feldspar phenocrysts and biotite flakes.*

qd | qdb

QUARTZ DIORITIC PLUTONIC ROCKS

quartz diorite: plutonic igneous rock, late Mesozoic- Cretaceous age
qd *biotite quartz diorite, light gray, massive.*
qdb *Bonsall Tonalite of Larsen 1948 similar to* ***qd****, but slightly gneissoid & contains dark gray fine grained xenoliths elongated parallel to gneissoid structure up to 9 in. long.*

gr

GRANITIC ROCKS

leucocratic plutonic rocks range from granite to quartz monzonite, possibly granodiorite; intrusive (locally complexly) into all other crystalline rocks; age Cretaceous
gr *granitic rocks, gray-white to tan-white, hard but brittle, fine to medium grained, massive to rarely gnessoid, composed essentially of sodic plagioclase feldspar, K-feldspar, and quartz in nearly equal proportions, and minor amounts of biotile mica or minute flakes.*

CENOZOIC
- QUATERNARY
  - Holocene
  - Pleistocene
- TERTIARY
  - Miocene

MESOZOIC
- CRETACEOUS

GEOLOGIC SYMBOLS

not all symbols shown on each map

FORMATION CONTACT *dashed where inferred or indefinite, dotted where concealed*

MEMBER CONTACT *between units of a formation*

CONTACT BETWEEN SURFICIAL SEDIMENTS *located only approximately in places*

FAULT: *Dashed where indefinite or inferred, dotted where concealed, queried where existence is doubtful. Parallel arrows indicate inferred relative lateral movement. Relative vertical movement is shown by U/D (U=upthrown side, D=downthrown side). Short arrow indicates dip of fault plane. Sawteeth are on upper plate of low angle thrust fault.*

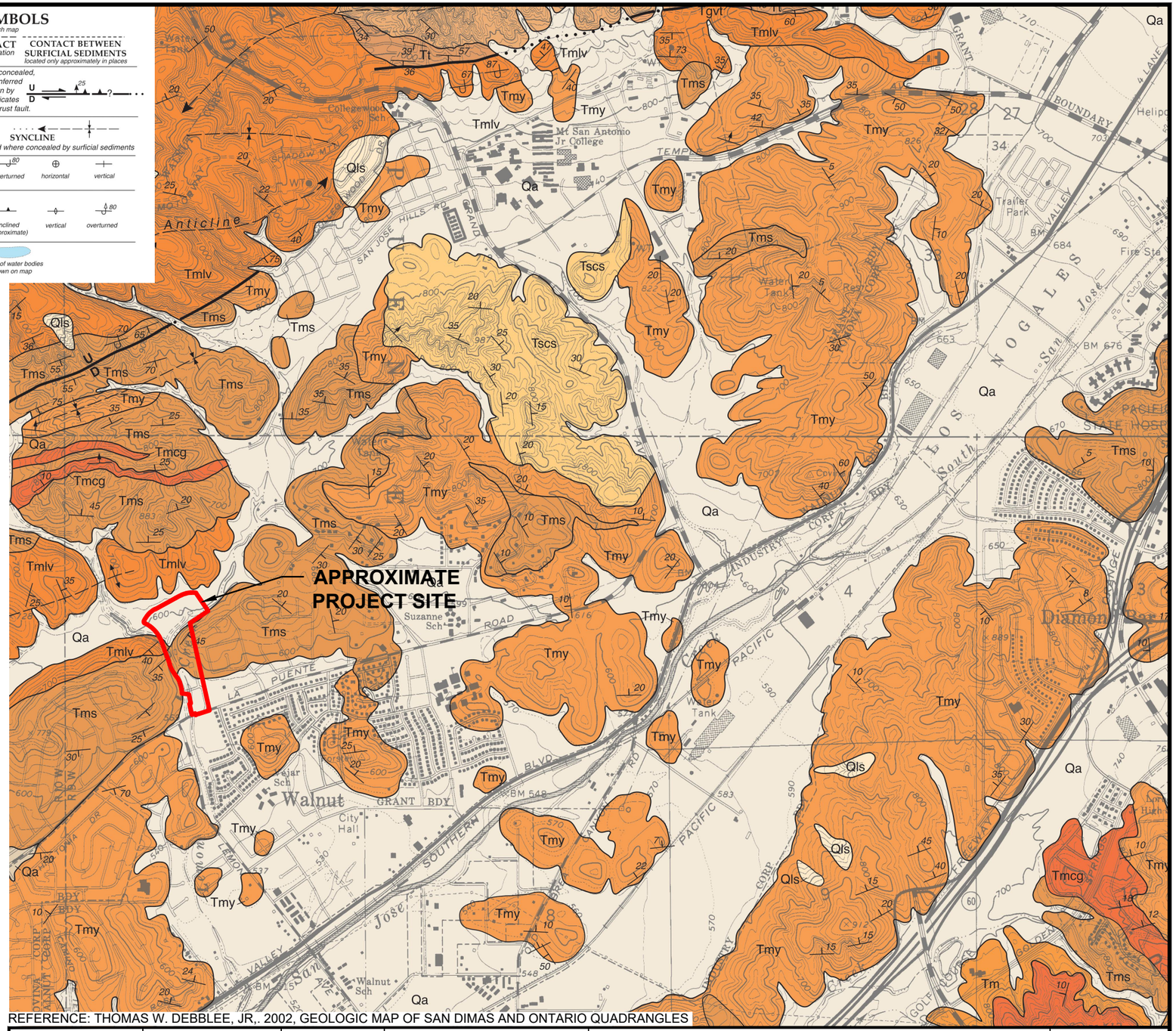
FOLDS: *overturned* — **ANTICLINE** — **SYNCLINE**

arrow on axial trace of fold indicates direction of plunge; dotted where concealed by surficial sediments

Strike and dip of Sedimentary rocks — *inclined* | *inclined (approximate)* | *overturned* | *horizontal* | *vertical*

Strike and dip of metamorphic or igneous rock foliation or flow banding or compositional layers — *inclined* | *inclined (approximate)* | *vertical* | *overturned*

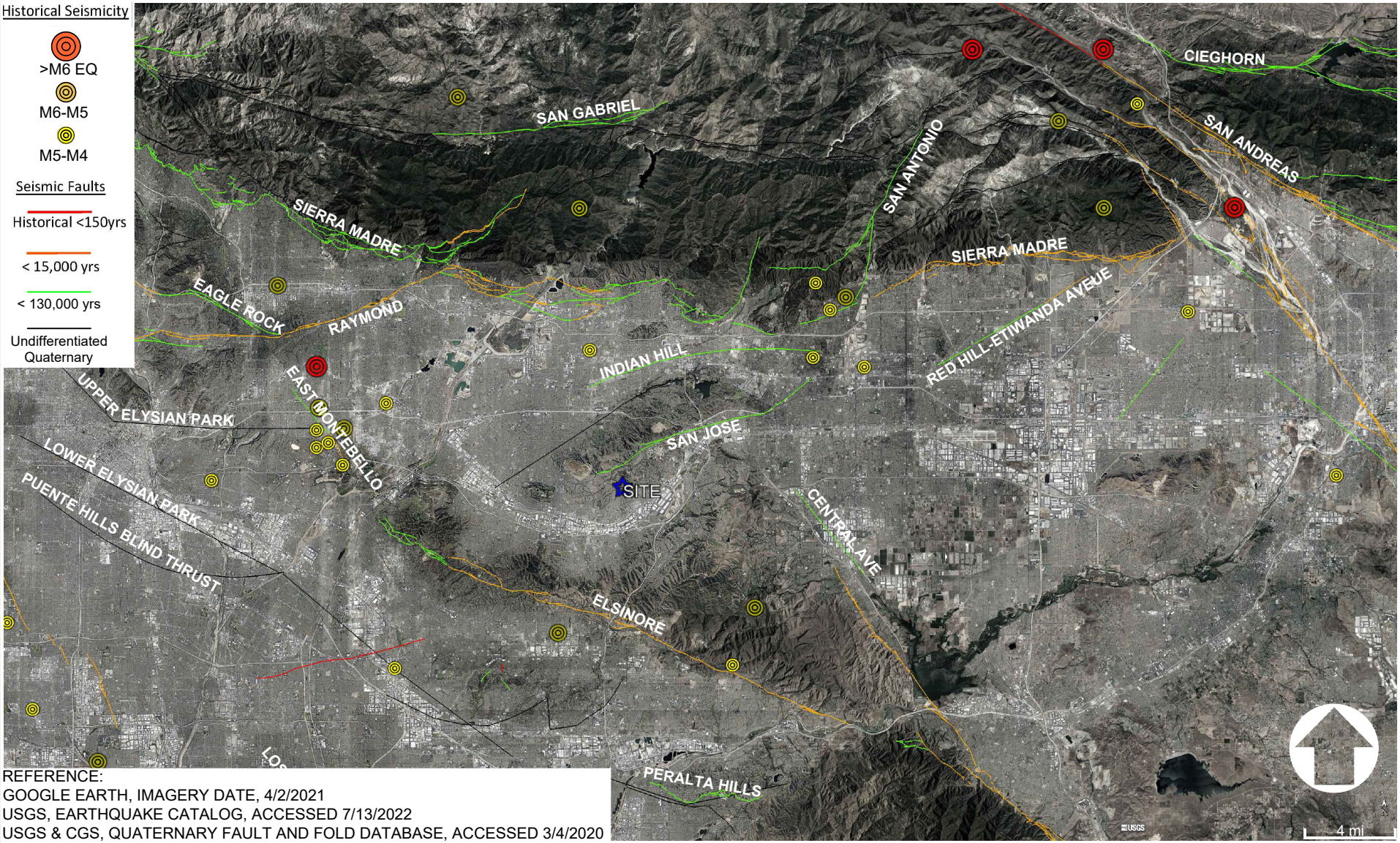
OTHER SYMBOLS: *Direction of landslide movement* — *outline of water bodies shown on map*



REFERENCE: THOMAS W. DEBBLEE, JR,. 2002, GEOLOGIC MAP OF SAN DIMAS AND ONTARIO QUADRANGLES

DATE: 09/14/2022	DRAWN BY: JMT	GROUP DELTA CONSULTANTS, INC 370 Amapola Ave. Suite 212 Torrance, CA. 90501	PROJECT NUMBER: LA1579
REVIEWED BY: -	APPROVED BY: -	REGIONAL GEOLOGY MAP THE BROOKSIDE TENTATIVE TRACK NO. 72798 CITY OF WALNUT, CA	SCALE: ASHOWN
REVISED: -			FIGURE NUMBER: 5

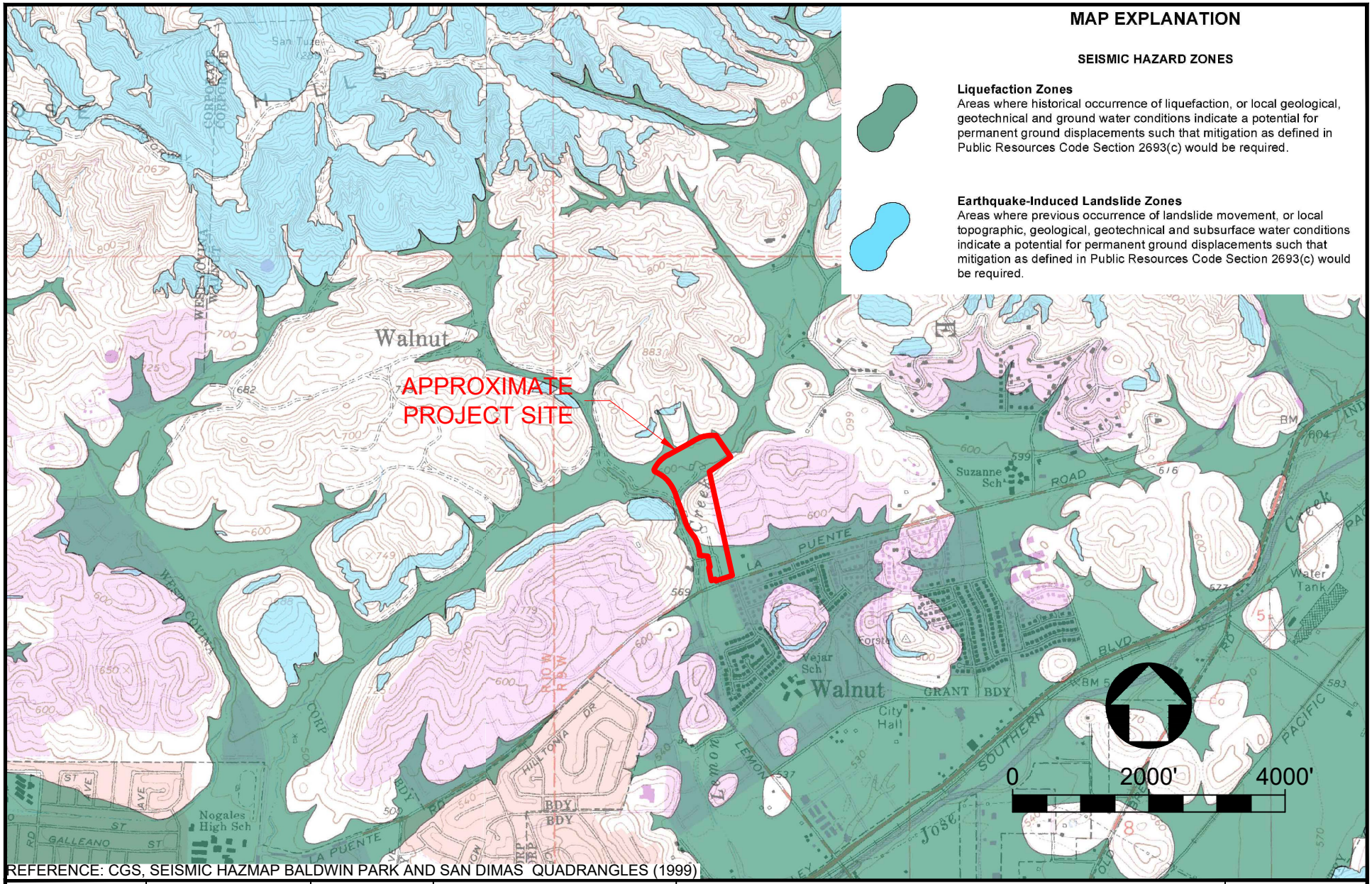
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REFERENCE:
GOOGLE EARTH, IMAGERY DATE, 4/2/2021
USGS, EARTHQUAKE CATALOG, ACCESSED 7/13/2022
USGS & CGS, QUATERNARY FAULT AND FOLD DATABASE, ACCESSED 3/4/2020

DATE: 07/27/2022	DRAWN BY: JMT	GROUP DELTA	GROUP DELTA CONSULTANTS, INC 370 Amapola Ave. Suite 212 Torrance, CA. 90501	REGIONAL FAULT AND SEISMICITY MAP THE BROOKSIDE TENTATIVE TRACK NO. 72798 CITY OF WALNUT, CA	PROJECT NUMBER: LA1579
REVIEWED BY: AP	APPROVED BY: -				SCALE: AS SHOWN
PREPARED BY: -					FIGURE NUMBER: 6

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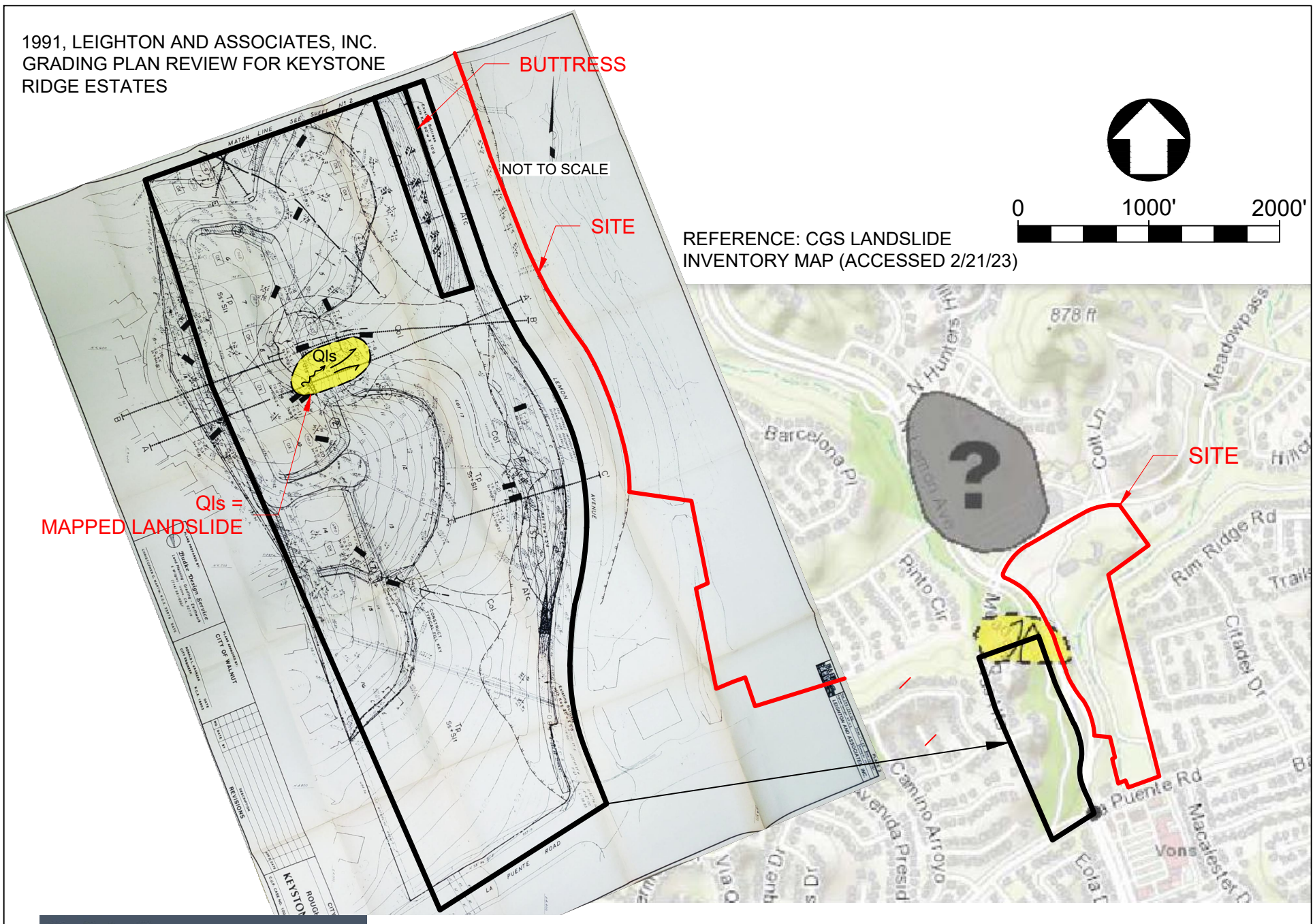


REFERENCE: CGS, SEISMIC HAZMAP BALDWIN PARK AND SAN DIMAS QUADRANGLES (1999)

DATE: 09/14/2022	DRAWN BY: JMT	GROUP DELTA	GROUP DELTA CONSULTANTS, INC 370 Amapola Ave. Suite 212 Torrance, CA. 90501	PROJECT NUMBER: LA1579
REVIEWED BY: AP	APPROVED BY: -		EARTHQUAKE ZONES OF REQUIRED INVESTIGATION MAP THE BROOKSIDE TENTATIVE TRACK NO. 72798 CITY OF WALNUT, CA	SCALE: AS SHOWN
PREPARED BY: -				FIGURE NUMBER: 7

FILE PATH: N:\Projects\1500-1599\LA1579 Spring Meadows_Spring Meadows Geotech\600 Drafting\LA1579 Fig 7.dwg
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1991, LEIGHTON AND ASSOCIATES, INC.
GRADING PLAN REVIEW FOR KEYSTONE
RIDGE ESTATES



Map Explanation

- Earth Flow
- Rock Fall, Rock Topple, or Soil Fall
- Rock Slide
- Rock Spread
- Debris Fan
- Uncertain
- Type Undifferentiated

Interpretation Confidence

Applies to CGS Mapped, Current Standard Deposit and Single Features
Click for more information

- Definite
- Probable
- Questionable

CGS Mapped, Needs Review

Applies to CGS Mapped, Needs Review Single Feature, Deposit, and Source Features

Features with an interpretation confidence of questionable are marked with a "?" at high zoom levels.

- Landslide Source or Scarp
- Landslide Deposit
- Linear Landslide
- Small Landslide

Landslide Activity

Applies to CGS Mapped, Current Standard Deposit and Single Features
Click for more information

- Active/Historic
- Dormant Young
- Dormant Mature
- Dormant Old/Relict
- Dormant Age Not Specified

Map Explanation

Landslide Inventory

- The landslide inventory is a work in progress. Portions of the data need review and cleaning, and data is not available for the entire state.
- The absence of mapped landslides in any particular location is not an indication that there are no landslides or of reduced susceptibility to landsliding.
- Mapping of landslides reflects the standards of the project and time the map was prepared. Many maps show landslide source areas (scarps) separate from landslide deposits, other maps combine scarps and deposits into a single feature. The amount of information recorded about each landslide has increased over time, so more information is available for more recently mapped landslides.

CGS Landslide Mapping

7.5-minute quadrangles that have some form of landslide mapping are indicated with a gray border. Not all quads are available in the inventory at present, and the absence of mapped landslides does not indicate that landslides are not present or that the area is less susceptible to landslides.

Landslide (Single Feature Detail):

Activity	dormant, relative age not specified
Slide Type	rock slide
Interpretation Confidence	probable (75% confident it is a landslide; one or two geomorphic features suggesting a landslide origin; features recognizable but subdued by erosion)
Thickness	moderate - 10 to 50 ft.
Direction of Movement	20
Year Mapped	1998
Citable Product	CGS, Seismic Hazard Zone Report 032

DATE: 03/09/2023	DRAWN BY: JMT	GROUP DELTA	GROUP DELTA CONSULTANTS, INC 370 Amapola Ave. Suite 212 Torrance, CA. 90501	LANDSLIDE INVENTORY MAP THE BROOKSIDE TENTATIVE TRACK NO. 72798 CITY OF WALNUT, CA	PROJECT NUMBER: LA1579
REVIEWED BY: MEA	APPROVED BY: -				SCALE: AS SHOWN
REVISED: -					FIGURE NUMBER: 8

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APPENDIX A
CURRENT FIELD INVESTIGATION

APPENDIX A
CURRENT FIELD EXPLORATION

A.1 Introduction

Group Delta conducted supplemental subsurface explorations in November of 2022 as part of the additional geotechnical investigation for slope stability assessment for the Residential Development (Tentative Tract No. 72798) in Walnut, California. The explorations consisted of four (4) hollow-stem borings and five (5) test pit excavations. The exploration locations and numbers are shown in Figure 2 of the main report. A summary table of the recent field explorations conducted by Group Delta is provided in Table A-1.

Table A-1
Summary of Subsurface Explorations

Exploration No.	Date Performed	*Ground Surface Elevation (feet, MSL)	Total Depth (ft)	Groundwater Depth (ft)	Exploration Type
TP-1	11/1/22	635	8	Not Encountered	Test Pit
TP-2	11/1/22	625	10	Not Encountered	Test Pit
TP-3	11/2/22	610	12	Not Encountered	Test Pit
TP-4	11/2/22	595	10.8	Not Encountered	Test Pit
TP-5	11/2/22	628	7.8	Not Encountered	Test Pit
B-18	11/23/22	603	46.5	17	Hollow-Stem Auger
B-19	11/23/22	605	31.5	Not Encountered	Hollow-Stem Auger
B-20	11/23/22	587	26.5	Not Encountered	Hollow-Stem Auger
B-21	11/23/22	600	46.5	14	Hollow-Stem Auger

*Approximate ground surface elevations taken from Michael Baker International Tentative Tract Map (08/10/2022)

A.2 Borings

Hollow-stem auger borings were advanced to depths of 26.5 to 46.5 feet below the ground surface at different areas of the site. The borings were drilled on November 23, 2022, by 2R Drilling, Inc. (Group Delta's subcontractor) by way of a CME 75 drill rig. Borings B-18 and B-21 were conducted within the northern parcel and Borings B-19 and B-20 within the southern parcel. The ground surface elevations in the area of the borings ranged from approximately of 587 feet to 605 feet. The borings were performed under the supervision of a Group Delta field engineer, who maintained detailed logs of the soils and bedrock encountered, classified the materials in accordance with the Unified Soil Classification System (USCS) and the Caltrans Soil and Rock

Logging, Classification, and Presentation Manual (2010), obtained samples, and measured groundwater levels.

Driven samples and bulk samples of the encountered subsurface materials were obtained from the borings. Driven samples were collected with a Modified California Sampler lined with 1-inch-high brass sample rings. The Modified California sampler has an outside diameter of 3 inches, and a cutting shoe with an inside diameter of 2.42 inches. The driven samples were retained in brass rings, placed in sealed plastic canisters to prevent moisture loss, and transported to Group Delta's laboratory for testing and further evaluation. The Modified California samplers were driven into the soil and/or rock at the bottom of the borehole using a 140-pound hammer free-falling 30 inches. The penetration resistance (or "blow count") in blows per six inches of driving was recorded on the logs. Bulk samples were obtained at various depth ranges and placed into polyethylene bags.

A key for soil classification and a boring record legend are presented in Figures A-1a to A-1b and A-2a to A-2c, respectively. The boring logs are presented in Figures A-3a to A-6b.

A.3 Test Pit Excavations

A total of five (5) exploratory test pits were excavated on November 1 and November 2, 2022 throughout the site to assess the subsurface conditions, particularly as it related to characterizing the contacts between fill materials, native soils, and shallow bedrock. The test pits were excavated by SoCal Underground, Inc. (Group Delta's subcontractor) using a backhoe. The depths of the test pits ranged from 8 to 12 feet below the ground surface. The subsurface materials were visually classified and logged by Group Delta's field geologists. The soil and rock types were documented along with other pertinent physical characteristics (e.g., coloration, moisture condition, texture, presence of organics, etc.). Ring and bulk samples were retrieved from the pits at various depths for laboratory testing. After logging had been completed, the test pits were backfilled with the spoils of the excavations. The test pit logs are presented in Figures A-7 to A-11.

A.4 List of Attached Figures

The following figures are attached and complete this appendix:

Figures A-1a to A-1b Key for Soil Classification

Figures A-2a to A-2c Boring Record Legend

Figures A-3a to A-6b Group Delta Boring Logs

Figures A-7 to A-11 Group Delta Test Pit Logs

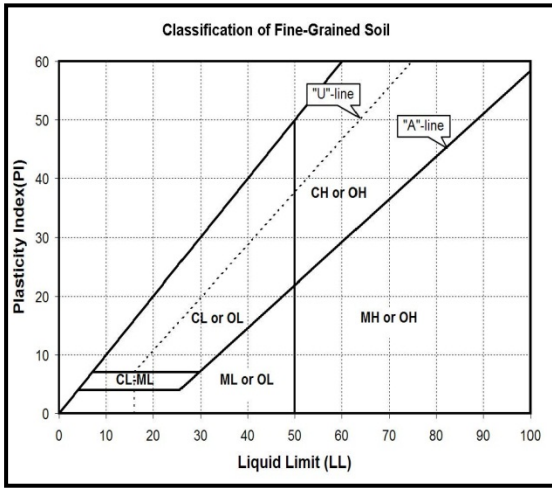
CLASSIFICATION OF INORGANIC FINE GRAINED SOILS (Soils with ≥50% finer than No. 200 Sieve)

GROUP SYMBOL				GROUP NAME
CL	<30% plus No. 200	<15% plus No. 200		Lean clay
		15-25% plus No. 200	%sand ≥%gravel	Lean clay with sand
			%sand <%gravel	Lean clay with gravel
	≥30% plus No. 200	% sand ≥ % gravel	<15% gravel	Sandy lean clay
			≥15% gravel	Sandy lean clay with gravel
		% sand < % gravel	<15% sand	Gravelly lean clay
			≥15% sand	Gravelly lean clay with sand
ML	<30% plus No. 200	<15% plus No. 200		Silt
		15-25% plus No. 200	%sand ≥%gravel	Silt with sand
			%sand <%gravel	Silt with gravel
	≥30% plus No. 200	% sand ≥ % gravel	<15% gravel	Sandy silt
			≥15% gravel	Sandy silt with gravel
		% sand < % gravel	<15% sand	Gravelly silt
			≥15% sand	Gravelly silt with sand
CH	<30% plus No. 200	<15% plus No. 200		Fat clay
		15-25% plus No. 200	%sand ≥%gravel	Fat clay with sand
			%sand <%gravel	Fat clay with gravel
	≥30% plus No. 200	% sand ≥ % gravel	<15% gravel	Sandy fat clay
			≥15% gravel	Sandy fat clay with gravel
		% sand < % gravel	<15% sand	Gravelly fat clay
			≥15% sand	Gravelly fat clay with sand
MH	<30% plus No. 200	<15% plus No. 200		Elastic silt
		15-25% plus No. 200	%sand ≥%gravel	Elastic silt with sand
			%sand <%gravel	Elastic silt with gravel
	≥30% plus No. 200	% sand ≥ % gravel	<15% gravel	Sandy elastic silt
			≥15% gravel	Sandy elastic silt with gravel
		% sand < % gravel	<15% sand	Gravelly elastic silt
			≥15% sand	Gravelly elastic silt with sand

Reference:
ASTM D 2487 and 2488

Laboratory Classification of Clay and Silt

REFERENCE: Caltrans Soil and Rock Logging, Classification, and Presentation Manual (2010).



CL: LL<50; above A-Line.

CH: LL≥50; above A-Line.

ML: LL<50; below A-Line, or PI<4, or Non-Plastic

MH: LL≥50; below A-Line.

CL-ML: above A-Line and PI=4 to 7

CL/CH, ML/MH: at or near LL=50

ML/CL, MH/CH: at or near the A-Line

Field Identification of Clays and Silts

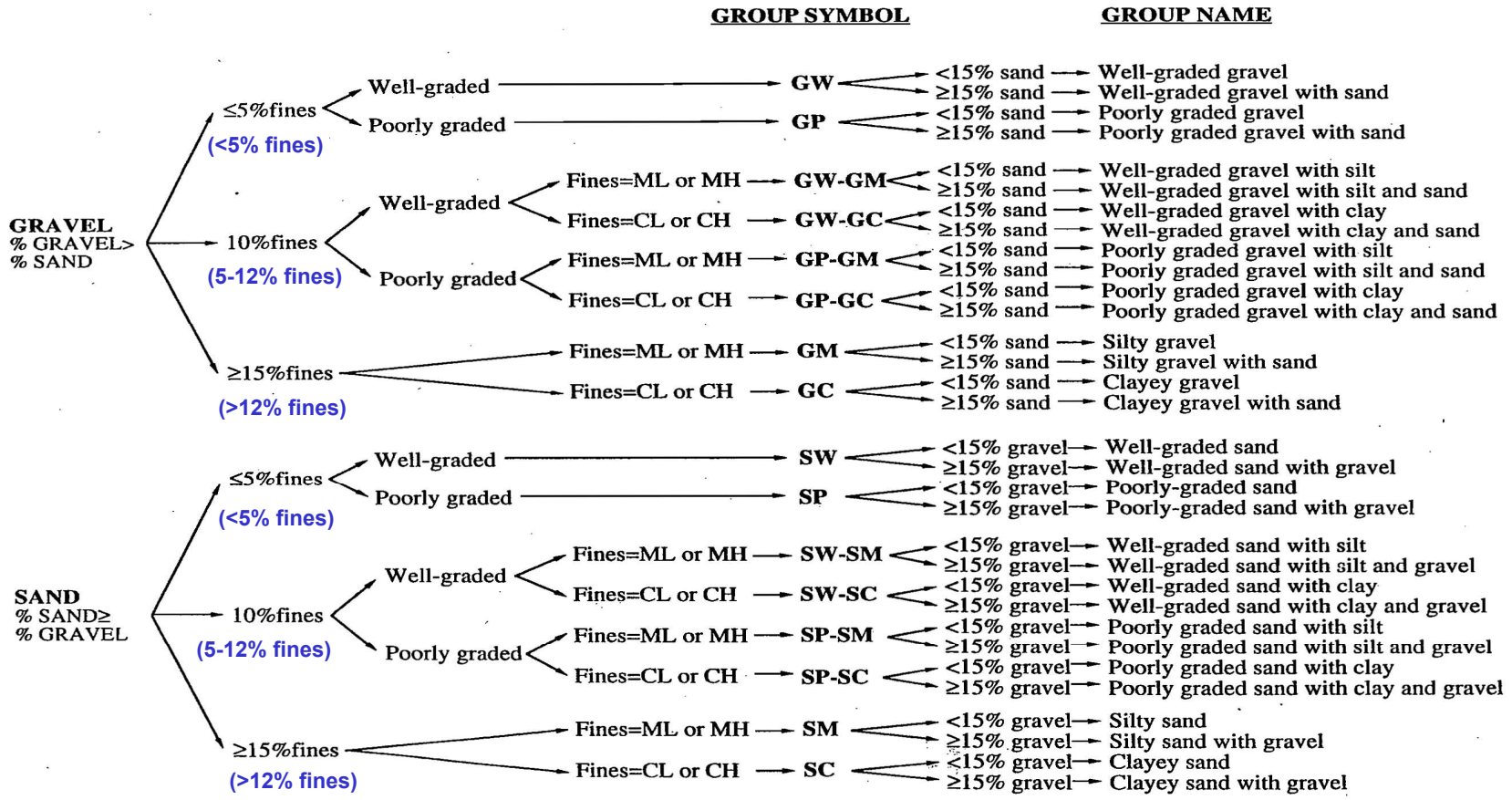
Group Symbol	Dry Strength	Dilatancy	Toughness	Plasticity
ML	None to low	Slow to rapid	Low or thread cannot be formed	Low to nonplastic
CL	Medium to high	None to slow	Medium	Medium
MH	Low to medium	None to slow	Low to medium	Low to medium
CH	High to very high	None	High	High

GROUP DELTA

Project No.: LA-1579

KEY FOR SOIL CLASSIFICATION #1
Figure A-1a

CLASSIFICATION OF COARSE-GRAINED SOILS (Soils with <50% "fines" passing No. 200 Sieve)



Reference:

ASTM D 2487 and 2488

Note: Values estimated to nearest 5% to be used for visual identification, values in parentheses to be used for classification when based on laboratory grain size data.

Granular Soil Gradation Parameters

Coefficient of Uniformity: $C_u = D_{60}/D_{10}$

Coefficient of Curvature: $Cc = D_{30}^2 / (D_{60} \times D_{10})$

D_{10} = 10% of soil is finer than this diameter

D_{30} = 30% of soil is finer than this diameter

D_{60} = 60% of soil is finer than this diameter

Group Symbol	Gradation or Plasticity Requirement
SW	$C_u > 6$ and $1 \leq C_c \leq 3$
GW	$C_u > 4$ and $1 \leq C_c \leq 3$
GP or SP	Clean gravel or sand not meeting requirement for SW or GW
SM or GM	Non-plastic fines or below A-Line or PI<4
SC or GC	Plastic fines or above A-Line and PI>7

GROUP DELTA

Project No.: LA-1579

KEY FOR SOIL CLASSIFICATION #2

Figure A-1b

SOIL IDENTIFICATION AND DESCRIPTION SEQUENCE

Sequence		Refer to Section		Required	Optional
		Field	Lab		
1	Group Name	2.5.2	3.2.2	●	
2	Group Symbol	2.5.2	3.2.2	●	
	Description Components				
3	Consistency of Cohesive Soil	2.5.3	3.2.3	●	
4	Apparent Density of Cohesionless Soil	2.5.4		●	
5	Color	2.5.5		●	
6	Moisture	2.5.6		●	
7	Percent or Proportion of Soil	2.5.7	3.2.4	●	◍
	Particle Size	2.5.8	2.5.8	●	◍
	Particle Angularity	2.5.9			○
	Particle Shape	2.5.10			○
8	Plasticity (for fine-grained soil)	2.5.11	3.2.5		○
9	Dry Strength (for fine-grained soil)	2.5.12			○
10	Dilatency (for fine-grained soil)	2.5.13			○
11	Toughness (for fine-grained soil)	2.5.14			○
12	Structure	2.5.15			○
13	Cementation	2.5.16		●	
14	Percent of Cobbles and Boulders	2.5.17		●	
	Description of Cobbles and Boulders	2.5.18		●	
15	Consistency Field Test Result	2.5.3		●	
16	Additional Comments	2.5.19			○

Describe the soil using descriptive terms in the order shown

Minimum Required Sequence:

USCS Group Name (Group Symbol); Consistency or Density; Color; Moisture; Percent or Proportion of Soil; Particle Size; Plasticity (optional).

◍ = optional for non-Caltrans projects

Where applicable:

Cementation; % cobbles & boulders;
Description of cobbles & boulders;
Consistency field test result

Ref.: Caltrans Soil and Rock Logging Classification, and Presentation Manual (2010)

HOLE IDENTIFICATION

Holes are identified using the following convention:

H-YY-NNN

Where:
H: Hole Type Code
YY: 2-digit year
NNN: 3-digit number (001-999)

Hole Type Code	Description
A	Auger boring (hollow or solid stem, bucket)
R	Rotary drilled boring (conventional)
RC	Rotary core (self-cased wire-line, continuously-sampled)
RW	Rotary core (self-cased wire-line, not continuously sampled)
P	Rotary percussion boring (Air)
HD	Hand driven (1-inch soil tube)
HA	Hand auger
D	Driven (dynamic cone penetrometer)
CPT	Cone Penetration Test
O	Other (note on LOTB)

Description Sequence Examples:

SANDY lean CLAY (CL); very stiff; yellowish brown; moist; mostly fines; some SAND, from fine to medium; few gravels; medium plasticity; PP=2.75.

Well-graded SAND with SILT and GRAVEL and COBBLES (SW-SM); dense; brown; moist; mostly SAND, from fine to coarse; some fine GRAVEL; few fines; weak cementation; 10% GRANITE COBBLES; 3 to 6 inches; hard; subrounded.

Clayey SAND (SC); medium dense, light brown; wet; mostly fine sand,; little fines; low plasticity.

GROUP DELTA

GROUP DELTA CONSULTANTS, INC.
GEOTECHNICAL ENGINEERS AND GEOLOGISTS

FIGURE NUMBER A-2a

PROJECT NAME: Residential Development - Tentative Tract No. 72798

PROJECT NUMBER LA-1579

BORING RECORD LEGEND #1

GROUP SYMBOLS AND NAMES

Graphic / Symbol	Group Names
GW	Well-graded GRAVEL Well-graded GRAVEL with SAND
GP	Poorly graded GRAVEL Poorly graded GRAVEL with SAND
GW-GM	Well-graded GRAVEL with SILT Well-graded GRAVEL with SILT and SAND
GW-GC	Well-graded GRAVEL with CLAY (or SILTY CLAY) Well-graded GRAVEL with CLAY and SAND (or SILTY CLAY and SAND)
GP-GM	Poorly graded GRAVEL with SILT Poorly graded GRAVEL with SILT and SAND
GP-GC	Poorly graded GRAVEL with CLAY (or SILTY CLAY) Poorly graded GRAVEL with CLAY and SAND (or SILTY CLAY and SAND)
GM	SILTY GRAVEL SILTY GRAVEL with SAND
GC	CLAYEY GRAVEL CLAYEY GRAVEL with SAND
GC-GM	SILTY, CLAYEY GRAVEL SILTY, CLAYEY GRAVEL with SAND
SW	Well-graded SAND Well-graded SAND with GRAVEL
SP	Poorly graded SAND Poorly graded SAND with GRAVEL
SW-SM	Well-graded SAND with SILT Well-graded SAND with SILT and GRAVEL
SW-SC	Well-graded SAND with CLAY (or SILTY CLAY) Well-graded SAND with CLAY and GRAVEL (or SILTY CLAY and GRAVEL)
SP-SM	Poorly graded SAND with SILT Poorly graded SAND with SILT and GRAVEL
SP-SC	Poorly graded SAND with CLAY (or SILTY CLAY) Poorly graded SAND with CLAY and GRAVEL (or SILTY CLAY and GRAVEL)
SM	SILTY SAND SILTY SAND with GRAVEL
SC	CLAYEY SAND CLAYEY SAND with GRAVEL
SC-SM	SILTY, CLAYEY SAND SILTY, CLAYEY SAND with GRAVEL
PT	PEAT
	COBBLES COBBLES and BOULDERS BOULDERS

Graphic / Symbol	Group Names
CL	Lean CLAY Lean CLAY with SAND Lean CLAY with GRAVEL SANDY lean CLAY SANDY lean CLAY with GRAVEL GRAVELLY lean CLAY GRAVELLY lean CLAY with SAND
CL-ML	SILTY CLAY SILTY CLAY with SAND SILTY CLAY with GRAVEL SANDY SILTY CLAY SANDY SILTY CLAY with GRAVEL GRAVELLY SILTY CLAY GRAVELLY SILTY CLAY with SAND
ML	SILT SILT with SAND SILT with GRAVEL SANDY SILT SANDY SILT with GRAVEL GRAVELLY SILT GRAVELLY SILT with SAND
OL	ORGANIC lean CLAY ORGANIC lean CLAY with SAND ORGANIC lean CLAY with GRAVEL SANDY ORGANIC lean CLAY SANDY ORGANIC lean CLAY with GRAVEL GRAVELLY ORGANIC lean CLAY GRAVELLY ORGANIC lean CLAY with SAND
OL	ORGANIC SILT ORGANIC SILT with SAND ORGANIC SILT with GRAVEL SANDY ORGANIC SILT SANDY ORGANIC SILT with GRAVEL GRAVELLY ORGANIC SILT GRAVELLY ORGANIC SILT with SAND
CH	Fat CLAY Fat CLAY with SAND Fat CLAY with GRAVEL SANDY fat CLAY SANDY fat CLAY with GRAVEL GRAVELLY fat CLAY GRAVELLY fat CLAY with SAND
MH	Elastic SILT Elastic SILT with SAND Elastic SILT with GRAVEL SANDY elastic SILT SANDY elastic SILT with GRAVEL GRAVELLY elastic SILT GRAVELLY elastic SILT with SAND
OH	ORGANIC fat CLAY ORGANIC fat CLAY with SAND ORGANIC fat CLAY with GRAVEL SANDY ORGANIC fat CLAY SANDY ORGANIC fat CLAY with GRAVEL GRAVELLY ORGANIC fat CLAY GRAVELLY ORGANIC fat CLAY with SAND
OH	ORGANIC elastic SILT ORGANIC elastic SILT with SAND ORGANIC elastic SILT with GRAVEL SANDY elastic ELASTIC SILT SANDY ORGANIC elastic SILT with GRAVEL GRAVELLY ORGANIC elastic SILT GRAVELLY ORGANIC elastic SILT with SAND
OL/OH	ORGANIC SOIL ORGANIC SOIL with SAND ORGANIC SOIL with GRAVEL SANDY ORGANIC SOIL SANDY ORGANIC SOIL with GRAVEL GRAVELLY ORGANIC SOIL GRAVELLY ORGANIC SOIL with SAND

FIELD AND LABORATORY TESTS

C	Consolidation (ASTM D 2435-04)
CL	Collapse Potential (ASTM D 5333-03)
CP	Compaction Curve (CTM 216 - 06)
CR	Corrosion, Sulfates, Chlorides (CTM 643 - 99; CTM 417 - 06; CTM 422 - 06)
CU	Consolidated Undrained Triaxial (ASTM D 4767-02)
DS	Direct Shear (ASTM D 3080-04)
EI	Expansion Index (ASTM D 4829-03)
M	Moisture Content (ASTM D 2216-05)
OC	Organic Content (ASTM D 2974-07)
P	Permeability (CTM 220 - 05)
PA	Particle Size Analysis (ASTM D 422-63 [2002])
PI	Liquid Limit, Plastic Limit, Plasticity Index (AASHTO T 89-02, AASHTO T 90-00)
PL	Point Load Index (ASTM D 5731-05)
PM	Pressure Meter
PP	Pocket Penetrometer
R	R-Value (CTM 301 - 00)
SE	Sand Equivalent (CTM 217 - 99)
SG	Specific Gravity (AASHTO T 100-06)
SL	Shrinkage Limit (ASTM D 427-04)
SW	Swell Potential (ASTM D 4546-03)
TV	Pocket Torvane
UC	Unconfined Compression - Soil (ASTM D 2166-06) Unconfined Compression - Rock (ASTM D 2938-95)
UU	Unconsolidated Undrained Triaxial (ASTM D 2850-03)
UW	Unit Weight (ASTM D 4767-04)
VS	Vane Shear (AASHTO T 223-96 [2004])

SAMPLER GRAPHIC SYMBOLS

- Standard Penetration Test (SPT)
- Standard California Sampler
- Modified California Sampler
- Shelby Tube
- Piston Sampler
- NX Rock Core
- HQ Rock Core
- Bulk Sample
- Other (see remarks)

DRILLING METHOD SYMBOLS

- Auger Drilling
- Rotary Drilling
- Dynamic Cone or Hand Driven
- Diamond Core

WATER LEVEL SYMBOLS

- First Water Level Reading (during drilling)
- Static Water Level Reading (after drilling, date)

DEFINITIONS FOR CHANGE IN MATERIAL

Term	Definition	Symbol
Material Change	Change in material is observed in the sample or core, and the location of change can be accurately measured.	———
Estimated Material Change	Change in material cannot be accurately located because either the change is gradational or because of limitations in the drilling/sampling methods used.	- - - - - - - -
Soil/Rock Boundary	Material changes from soil characteristics to rock characteristics.	~~~~~

Ref.: Caltrans Soil and Rock Logging Classification, and Presentation Manual (2010)

GROUP DELTA

GROUP DELTA CONSULTANTS, INC.
GEOTECHNICAL ENGINEERS AND GEOLOGISTS

FIGURE NUMBER
A-2b

PROJECT NAME:
Residential Development - Tentative Tract No. 72798

PROJECT NUMBER
LA-1579

BORING RECORD LEGEND #2

CONSISTENCY OF COHESIVE SOILS

Descriptor	Shear Strength (tsf)	Pocket Penetrometer, PP Measurement (tsf)	Torvane, TV. Measurement (tsf)	Vane Shear, VS. Measurement (tsf)
Very Soft	< 0.12	< 0.25	< 0.12	< 0.12
Soft	0.12 - 0.25	0.25 - 0.50	0.12 - 0.25	0.12 - 0.25
Medium Stiff	0.25 - 0.50	0.50 - 1.0	0.25 - 0.50	0.25 - 0.50
Stiff	0.50 - 1.0	1.0 - 2.0	0.50 - 1.0	0.50 - 1.0
Very Stiff	1.0 - 2.0	2.0 - 4.0	1.0 - 2.0	1.0 - 2.0
Hard	> 2.0	> 4.0	> 2.0	> 2.0

APPARENT DENSITY OF COHESIONLESS SOILS

Descriptor	SPT N_{60} - Value (blows / foot)
Very Loose	0 - 5
Loose	5 - 10
Medium Dense	10 - 30
Dense	30 - 50
Very Dense	> 50

MOISTURE

Descriptor	Criteria
Dry	No discernable moisture
Moist	Moisture present, but no free water
Wet	Visible free water

PERCENT OR PROPORTION OF SOILS

Descriptor	Criteria
Trace	Particles are present but estimated to be less than 5%
Few	5 to 10%
Little	15 to 25%
Some	30 to 45%
Mostly	50 to 100%

PARTICLE SIZE

Descriptor		Size (in)
Boulder		> 12
Cobble		3 - 12
Gravel	Coarse	3/4 - 3
	Fine	1/5 - 3/4
Sand	Coarse	1/16 - 1/5
	Medium	1/64 - 1/16
	Fine	1/300 - 1/64
Silt and Clay		< 1/300

PLASTICITY OF FINE-GRAINED SOILS

Descriptor	Criteria
Nonplastic	A 1/8-inch thread cannot be rolled at any water content.
Low	The thread can barely be rolled, and the lump cannot be formed when drier than the plastic limit.
Medium	The thread is easy to roll, and not much time is required to reach the plastic limit; it cannot be rerolled after reaching the plastic limit. The lump crumbles when drier than the plastic limit.
High	It takes considerable time rolling and kneading to reach the plastic limit. The thread can be rerolled several times after reaching the plastic limit. The lump can be formed without crumbling when drier than the plastic limit.

CONSISTENCY OF COHESIVE SOILS VS. N_{60}

Description	SPT N_{60} (blows / foot)
Very Soft	0 - 2
Soft	2 - 4
Medium Stiff	4 - 8
Stiff	8 - 15
Very Stiff	15 - 30
Hard	> 30

Ref: Peck, Hansen, and Thornburn, 1974, "Foundation Engineering", Second Edition

Note: Only to be used (with caution) when pocket penetrometer or other data on undrained shear strength are unavailable. Not allowed by Caltrans Soil and Rock Logging and Classificaton Manual, 2010

CEMENTATION

Descriptor	Criteria
Weak	Crumbles or breaks with handling or little finger pressure.
Moderate	Crumbles or breaks with considerable finger pressure.
Strong	Will not crumble or break with finger pressure.

Ref.: Caltrans Soil and Rock Logging Classification, and Presentation Manual (2010), with the exception of consistency of cohesive soils vs. N_{60}.

GROUP DELTA

GROUP DELTA CONSULTANTS, INC.
GEOTECHNICAL ENGINEERS AND GEOLOGISTS

FIGURE NUMBER A-2c

PROJECT NAME: Residential Development - Tentative Tract No. 72798

PROJECT NUMBER LA-1579

BORING RECORD LEGEND #3

BORING RECORD

PROJECT NAME	PROJECT NUMBER	HOLE ID
Spring Meadows Homes, LLC	LA1579	B-18

SITE LOCATION	START	FINISH	SHEET NO.
Intersection of N. Lemon Ave & Meadow Pass Rd, Walnut, CA	11/23/2022	11/23/2022	1 of 2

DRILLING COMPANY	DRILL RIG	DRILLING METHOD	LOGGED BY	CHECKED BY
2R	CME-75	Hollow-Stem Auger	E. Babayan	E. Tsai

HAMMER TYPE (WEIGHT/DROP)	HAMMER EFFICIENCY (ERi)	BORING DIA. (in)	TOTAL DEPTH (ft)	GROUND ELEV (ft)	DEPTH/*ELEV.* GW (ft)
Automatic Trip: 140lb / 30in		8	46.5	603	▽ 17.0 / *586.0* DURING DRILLING

DRIVE SAMPLER TYPE(S) & SIZE (ID)	NOTES	
CAL-Mod (2.4" I.D.)	N_{60}* = 1.0N_{MC}	AFTER DRILLING ▼ N/A / *na*

DEPTH (feet)	ELEVATION (feet)	SAMPLE TYPE	SAMPLE NO.	PENETRATION RESISTANCE (BLOWS / 6 IN)	BLOW/FT "N"	MOISTURE (%)	DRY DENSITY (PCF)	PASSING #200 (%)	ATTERBERG LIMITS (LL:PL:PI)	POCKET PEN (tsf)	OTHER TESTS	DRILLING METHOD	GRAPHIC LOG	DESCRIPTION AND CLASSIFICATION
	600		Bulk-1			22.83					EI			**COLLUVIUM (Qc)** Lean Cay / Fat Clay (CL/CH), hard, light olive brown with mottling, moist, few rock fragments, medium to high plasticity.
5			R-1	4 15 24	39	28.93	83.93			4.25				
	595		Bulk-2			20.92					EI			- very dark grayish brown, trace fine to medium sand, few rock fragments.
10			R-2	7 12 18	30	21.61	102.41			4				
	590		Bulk-3			22.58								
15			R-3	4 4 6	10					0.75	DS			Lean Clay with Sand (CL), medium stiff, dark grayish brown, very moist, mostly fines, little fine sand, medium plasticity. ▽ Groundwater at 17' bgs.
	585													
20			R-4	2 3 4	7					0.5	C DS			Sandy Lean Clay (CL), soft to medium stiff, dark gray, wet, mostly fines, some fine sand, medium plasticity.
	580													

GDC_LOG_BORING_2011 LA1579.GPJ GDCLOG.GDT 2/28/23

GROUP DELTA CONSULTANTS, INC.
370 Amapola Ave., Suite 212
Torrance, CA 90501

THIS SUMMARY APPLIES ONLY AT THE LOCATION OF THIS BORING AND AT THE TIME OF DRILLING. SUBSURFACE CONDITIONS MAY DIFFER AT OTHER LOCATIONS AND MAY CHANGE AT THIS LOCATION WITH THE PASSAGE OF TIME. THE DATA PRESENTED IS A SIMPLIFICATION OF THE ACTUAL CONDITIONS ENCOUNTERED.

FIGURE
A-3 a

BORING RECORD

PROJECT NAME	PROJECT NUMBER	HOLE ID
Spring Meadows Homes, LLC	LA1579	**B-18**

SITE LOCATION	START	FINISH	SHEET NO.
Intersection of N. Lemon Ave & Meadow Pass Rd, Walnut, CA	11/23/2022	11/23/2022	2 of 2

DRILLING COMPANY	DRILL RIG	DRILLING METHOD	LOGGED BY	CHECKED BY
2R	CME-75	Hollow-Stem Auger	E. Babayan	E. Tsai

HAMMER TYPE (WEIGHT/DROP)	HAMMER EFFICIENCY (ERi)	BORING DIA. (in)	TOTAL DEPTH (ft)	GROUND ELEV (ft)	DEPTH/*ELEV.* GW (ft)
Automatic Trip: 140lb / 30in		8	46.5	603	▽ 17.0 / *586.0* DURING DRILLING

DRIVE SAMPLER TYPE(S) & SIZE (ID)	NOTES	AFTER DRILLING
CAL-Mod (2.4" I.D.)	N_{60}* = 1.0N_{MC}	▼ N/A / *na*

DEPTH (feet)	ELEVATION (feet)	SAMPLE TYPE	SAMPLE NO.	PENETRATION RESISTANCE (BLOWS / 6 IN)	BLOW/FT "N"	MOISTURE (%)	DRY DENSITY (PCF)	PASSING #200 (%)	ATTERBERG LIMITS (LL:PL:PI)	POCKET PEN (tsf)	OTHER TESTS	DRILLING METHOD	GRAPHIC LOG	DESCRIPTION AND CLASSIFICATION
			R-5	4 6 7	13	29.79	91.27			1.75				Lean Clay (CL), stiff, very dark grayish brown, moist, mostly fines, few fine sand, medium plasticity.
	575													
30			R-6	5 6 16	22	25.29	99.23			2.25				- very stiff, dark yellowish brown with gray mottling, trace fine gravel.
	570													
35			R-7	12 50/6"	100	14.91	120.61							**MONTEREY FORMATION BEDROCK (Tpsq)** Claystone, moderately hard, light olive brown with mottling, wet, slightly weathered.
	565													
40			R-8	43 50/3"	100	30.32	87.03							- olive brown
	560													
45			R-9	50/5"	100	24.12	93.23							- very dark gray, moderately weathered, some Sandstone interbeds. Total Depth: 46.5 feet bgs Groundwater encountered at 17ft bgs. Boring backfiled with soil cuttings.
	555													

GDC_LOG_BORING_2011 LA1579.GPJ GDCLOG.GDT 2/28/23

GROUP DELTA CONSULTANTS, INC.
370 Amapola Ave., Suite 212
Torrance, CA 90501

THIS SUMMARY APPLIES ONLY AT THE LOCATION OF THIS BORING AND AT THE TIME OF DRILLING. SUBSURFACE CONDITIONS MAY DIFFER AT OTHER LOCATIONS AND MAY CHANGE AT THIS LOCATION WITH THE PASSAGE OF TIME. THE DATA PRESENTED IS A SIMPLIFICATION OF THE ACTUAL CONDITIONS ENCOUNTERED.

FIGURE
A-3 b

BORING RECORD

PROJECT NAME	PROJECT NUMBER	HOLE ID
Spring Meadows Homes, LLC	LA1579	B-19

SITE LOCATION	START	FINISH	SHEET NO.
Intersection of N. Lemon Ave & Meadow Pass Rd, Walnut, CA	11/23/2022	11/23/2022	1 of 2

DRILLING COMPANY	DRILL RIG	DRILLING METHOD	LOGGED BY	CHECKED BY
2R	CME-75	Hollow-Stem Auger	E. Babayan	E. Tsai

HAMMER TYPE (WEIGHT/DROP)	HAMMER EFFICIENCY (ERi)	BORING DIA. (in)	TOTAL DEPTH (ft)	GROUND ELEV (ft)	DEPTH/*ELEV.* GW (ft)
Automatic Trip: 140lb / 30in		8	31.5	611	▽ N/A / *na* DURING DRILLING

DRIVE SAMPLER TYPE(S) & SIZE (ID)	NOTES	
CAL-Mod (2.4" I.D.)	N_{60}* = 1.0N_{MC}	▼ N/A / *na* AFTER DRILLING

DEPTH (feet)	ELEVATION (feet)	SAMPLE TYPE	SAMPLE NO.	PENETRATION RESISTANCE (BLOWS / 6 IN)	BLOW/FT "N"	MOISTURE (%)	DRY DENSITY (PCF)	PASSING #200 (%)	ATTERBERG LIMITS (LL:PL:PI)	POCKET PEN (tsf)	OTHER TESTS	DRILLING METHOD	GRAPHIC LOG	DESCRIPTION AND CLASSIFICATION
0	610		Bulk-1											**COLLUVIUM (Qc)** Silty Sand, moderately hard, brown, dry, intensely weathered, friable, caliche stringers common.
5	605		R-1	4 6 13	19									
10	600		R-2	12 20 30	50									**CLAYSTONE** Moderately soft, friable, light olive brown with mottling, extremely weathered, caliche stringers common.
15	595		R-3	12 37 42	79									- moderately hard, yellow, less weathered
20	590		R-4	37 50/4"	100									

GDC_LOG_BORING_2011 LA1579.GPJ GDCLOG.GDT 2/28/23

GROUP DELTA CONSULTANTS, INC.
370 Amapola Ave., Suite 212
Torrance, CA 90501

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FIGURE
A-4 a

BORING RECORD

PROJECT NAME	PROJECT NUMBER	HOLE ID
Spring Meadows Homes, LLC	LA1579	**B-19**

SITE LOCATION	START	FINISH	SHEET NO.
Intersection of N. Lemon Ave & Meadow Pass Rd, Walnut, CA	11/23/2022	11/23/2022	2 of 2

DRILLING COMPANY	DRILL RIG	DRILLING METHOD	LOGGED BY	CHECKED BY
2R	CME-75	Hollow-Stem Auger	E. Babayan	E. Tsai

HAMMER TYPE (WEIGHT/DROP)	HAMMER EFFICIENCY (ERi)	BORING DIA. (in)	TOTAL DEPTH (ft)	GROUND ELEV (ft)	DEPTH/*ELEV.* GW (ft)
Automatic Trip: 140lb / 30in		8	31.5	611	▽ N/A / *na* DURING DRILLING

DRIVE SAMPLER TYPE(S) & SIZE (ID)	NOTES	
CAL-Mod (2.4" I.D.)	N_{60}* = 1.0N_{MC}	▼ N/A / *na* AFTER DRILLING

DEPTH (feet)	ELEVATION (feet)	SAMPLE TYPE	SAMPLE NO.	PENETRATION RESISTANCE (BLOWS / 6 IN)	BLOW/FT "N"	MOISTURE (%)	DRY DENSITY (PCF)	PASSING #200 (%)	ATTERBERG LIMITS (LL:PL:PI)	POCKET PEN (tsf)	OTHER TESTS	DRILLING METHOD	GRAPHIC LOG	DESCRIPTION AND CLASSIFICATION
30	585													
	580		R-5	19 50/5"	100									- light olive brown with mottling, moderately weathered
														Total Depth: 31.5 feet bgs Groundwater not encountered. Boring backfiled with soil cuttings.
35	575													
40	570													
45	565													

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FIGURE
A-4 b

BORING RECORD

PROJECT NAME	PROJECT NUMBER	HOLE ID
Spring Meadows Homes, LLC	LA1579	**B-20**

SITE LOCATION	START	FINISH	SHEET NO.
Intersection of N. Lemon Ave & Meadow Pass Rd, Walnut, CA	11/23/2022	11/23/2022	1 of 2

DRILLING COMPANY	DRILL RIG	DRILLING METHOD	LOGGED BY	CHECKED BY
2R	CME-75	Hollow-Stem Auger	E. Babayan	E. Tsai

HAMMER TYPE (WEIGHT/DROP)	HAMMER EFFICIENCY (ERi)	BORING DIA. (in)	TOTAL DEPTH (ft)	GROUND ELEV (ft)	DEPTH/*ELEV.* GW (ft)
Automatic Trip: 140lb / 30in		8	26.5	583	▽ N/A / *na* DURING DRILLING

DRIVE SAMPLER TYPE(S) & SIZE (ID)	NOTES	
CAL-Mod (2.4" I.D.)	N_{60}* = 1.0N_{MC}	▼ N/A / *na* AFTER DRILLING

DEPTH (feet)	ELEVATION (feet)	SAMPLE TYPE	SAMPLE NO.	PENETRATION RESISTANCE (BLOWS / 6 IN)	BLOW/FT "N"	MOISTURE (%)	DRY DENSITY (PCF)	PASSING #200 (%)	ATTERBERG LIMITS (LL:PL:PI)	POCKET PEN (tsf)	OTHER TESTS	DRILLING METHOD	GRAPHIC LOG	DESCRIPTION AND CLASSIFICATION
														FILL Silty Sand (SM), medium dense, pale brown, dry, mostly fine sand, some fines, few rock fragments.
	580		Bulk-1			16.49								
5			R-1	8 17 30	47	14.25	101.02							**ALLUVIUM (Qa)** Siltstone rock fragments, chaotic assemblage, angular, silty-clayey material, hard, dry.
	575													Clay, hard, dry, few gravel, some sand, brown.
10			R-2	5 8 14	22						C			Clayey Sand (SC), medium dense, dark brown, moist, mostly fine sand, some fines, few rock fragments, weakly cemented.
	570													
15			R-3	7 14 18	32	14.47	94.38							- yellowish brown
	565													
20			R-4	7 8 10	18						DS			Silty Sand with Gravel (SM), medium dense, pale brown, slightly moist, mostly fine sand, little fines, few gravel, weakly cemented.
	560													

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FIGURE
A-5 a

BORING RECORD

PROJECT NAME	PROJECT NUMBER	HOLE ID
Spring Meadows Homes, LLC	LA1579	**B-20**

SITE LOCATION	START	FINISH	SHEET NO.
Intersection of N. Lemon Ave & Meadow Pass Rd, Walnut, CA	11/23/2022	11/23/2022	2 of 2

DRILLING COMPANY	DRILL RIG	DRILLING METHOD	LOGGED BY	CHECKED BY
2R	CME-75	Hollow-Stem Auger	E. Babayan	E. Tsai

HAMMER TYPE (WEIGHT/DROP)	HAMMER EFFICIENCY (ERi)	BORING DIA. (in)	TOTAL DEPTH (ft)	GROUND ELEV (ft)	DEPTH/*ELEV.* GW (ft)
Automatic Trip: 140lb / 30in		8	26.5	583	▽ N/A / *na* DURING DRILLING

DRIVE SAMPLER TYPE(S) & SIZE (ID)	NOTES	
CAL-Mod (2.4" I.D.)	N_{60}* = 1.0N_{MC}	AFTER DRILLING ▼ N/A / *na*

DEPTH (feet)	ELEVATION (feet)	SAMPLE TYPE	SAMPLE NO.	PENETRATION RESISTANCE (BLOWS / 6 IN)	BLOW/FT "N"	MOISTURE (%)	DRY DENSITY (PCF)	PASSING #200 (%)	ATTERBERG LIMITS (LL:PL:PI)	POCKET PEN (tsf)	OTHER TESTS	DRILLING METHOD	GRAPHIC LOG	DESCRIPTION AND CLASSIFICATION
			R-5	8 15 21	36	16.08	109.30			>4.5				Sandy Lean Clay (CL), hard, dark brown, moist, mostly fines, some fine sand, slightly porous, few rootlets, weakly cemented, caliche stringers common. Total Depth: 26.5 feet bgs Groundwater not encountered. Boring backfiled with soil cuttings.
	555													
30														
	550													
35														
	545													
40														
	540													
45														
	535													

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GROUP DELTA CONSULTANTS, INC.
370 Amapola Ave., Suite 212
Torrance, CA 90501

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FIGURE
A-5 b

BORING RECORD

PROJECT NAME	PROJECT NUMBER	HOLE ID
Spring Meadows Homes, LLC	LA1579	B-21

SITE LOCATION	START	FINISH	SHEET NO.
Intersection of N. Lemon Ave & Meadow Pass Rd, Walnut, CA	11/23/2022	11/23/2022	1 of 2

DRILLING COMPANY	DRILL RIG	DRILLING METHOD	LOGGED BY	CHECKED BY
2R	CME-75	Hollow-Stem Auger	E. Babayan	E. Tsai

HAMMER TYPE (WEIGHT/DROP)	HAMMER EFFICIENCY (ERi)	BORING DIA. (in)	TOTAL DEPTH (ft)	GROUND ELEV (ft)	DEPTH/*ELEV.* GW (ft)
Automatic Trip: 140lb / 30in		8	46.5	602.5	▽ 14.0 / *588.5* DURING DRILLING

DRIVE SAMPLER TYPE(S) & SIZE (ID)	NOTES	AFTER DRILLING
CAL-Mod (2.4" I.D.)		▼ N/A / *na*

DEPTH (feet)	ELEVATION (feet)	SAMPLE TYPE	SAMPLE NO.	PENETRATION RESISTANCE (BLOWS / 6 IN)	BLOW/FT "N"	MOISTURE (%)	DRY DENSITY (PCF)	PASSING #200 (%)	ATTERBERG LIMITS (LL:PL:PI)	POCKET PEN (tsf)	OTHER TESTS	DRILLING METHOD	GRAPHIC LOG	DESCRIPTION AND CLASSIFICATION
	600		Bulk-1			14.54								**FILL** Lean Clay with Sand (CL), very stiff, very dark brown, moist, mostly fines, little fine sand, medium plasticity.
5			R-1	10 12 15	27					4	C DS			
	595													
10			R-2	5 11 15	26	21.21	96.20			3.5				**ALLUVIUM (Qc)** Lean Clay (CL), very stiff, very dark grayish brown, moist, mostly fines, little fine sand, medium plasticity, porous.
	590													Groundwater encountered at 14' bgs. ▽
15			R-3	4 7 9	18	33.46	86.25			2				Dark grayish brown, stiff, wet, caliche stringers common.
	585													
20			R-4	3 2 4	6	39.43	79.61			1				- medium stiff, porous (1/8" wide), caliche stringer casts disolving.
	580													

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370 Amapola Ave., Suite 212
Torrance, CA 90501

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FIGURE
A-6 a

BORING RECORD

PROJECT NAME	PROJECT NUMBER	HOLE ID
Spring Meadows Homes, LLC	LA1579	**B-21**

SITE LOCATION	START	FINISH	SHEET NO.
Intersection of N. Lemon Ave & Meadow Pass Rd, Walnut, CA	11/23/2022	11/23/2022	2 of 2

DRILLING COMPANY	DRILL RIG	DRILLING METHOD	LOGGED BY	CHECKED BY
2R	CME-75	Hollow-Stem Auger	E. Babayan	E. Tsai

HAMMER TYPE (WEIGHT/DROP)	HAMMER EFFICIENCY (ERi)	BORING DIA. (in)	TOTAL DEPTH (ft)	GROUND ELEV (ft)	DEPTH/*ELEV.* GW (ft)
Automatic Trip: 140lb / 30in		8	46.5	602.5	▽ 14.0 / *588.5* DURING DRILLING

DRIVE SAMPLER TYPE(S) & SIZE (ID)	NOTES	AFTER DRILLING
CAL-Mod (2.4" I.D.)		▼ N/A / *na*

DEPTH (feet)	ELEVATION (feet)	SAMPLE TYPE	SAMPLE NO.	PENETRATION RESISTANCE (BLOWS / 6 IN)	BLOW/FT "N"	MOISTURE (%)	DRY DENSITY (PCF)	PASSING #200 (%)	ATTERBERG LIMITS (LL:PL:PI)	POCKET PEN (tsf)	OTHER TESTS	DRILLING METHOD	GRAPHIC LOG	DESCRIPTION AND CLASSIFICATION
			R-5	4 3 3	6	42.89	77.99			0.75				- black, less stiff.
	575													
30			R-6	2 2 4	6					0.25	C			**PEAT (Qor)** soft, wet, sponge texture, trace decomposed organics (peat), sandy, fine sand.
	570													
35			R-7	4 11 50	61									**MONTEREY FORMATION BEDROCK (Tpsq)** Claystone, very dark gray, wet, highly fractured, weathered (No Recovery)
	565													
40			R-8	10 25 43	68	29.42	88.50							- moderately soft, less fractured
	560													
45			R-9	50/5"	100	19.21	102.46							Total Depth: 46.5 feet bgs Groundwater encountered at 14ft bgs. Boring backfiled with soil cuttings.
	555													

GDC_LOG_BORING_2011 LA1579.GPJ GDCLOG.GDT 2/28/23

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FIGURE
A-6 b

Description:

A

A

-

1 1

Samples:

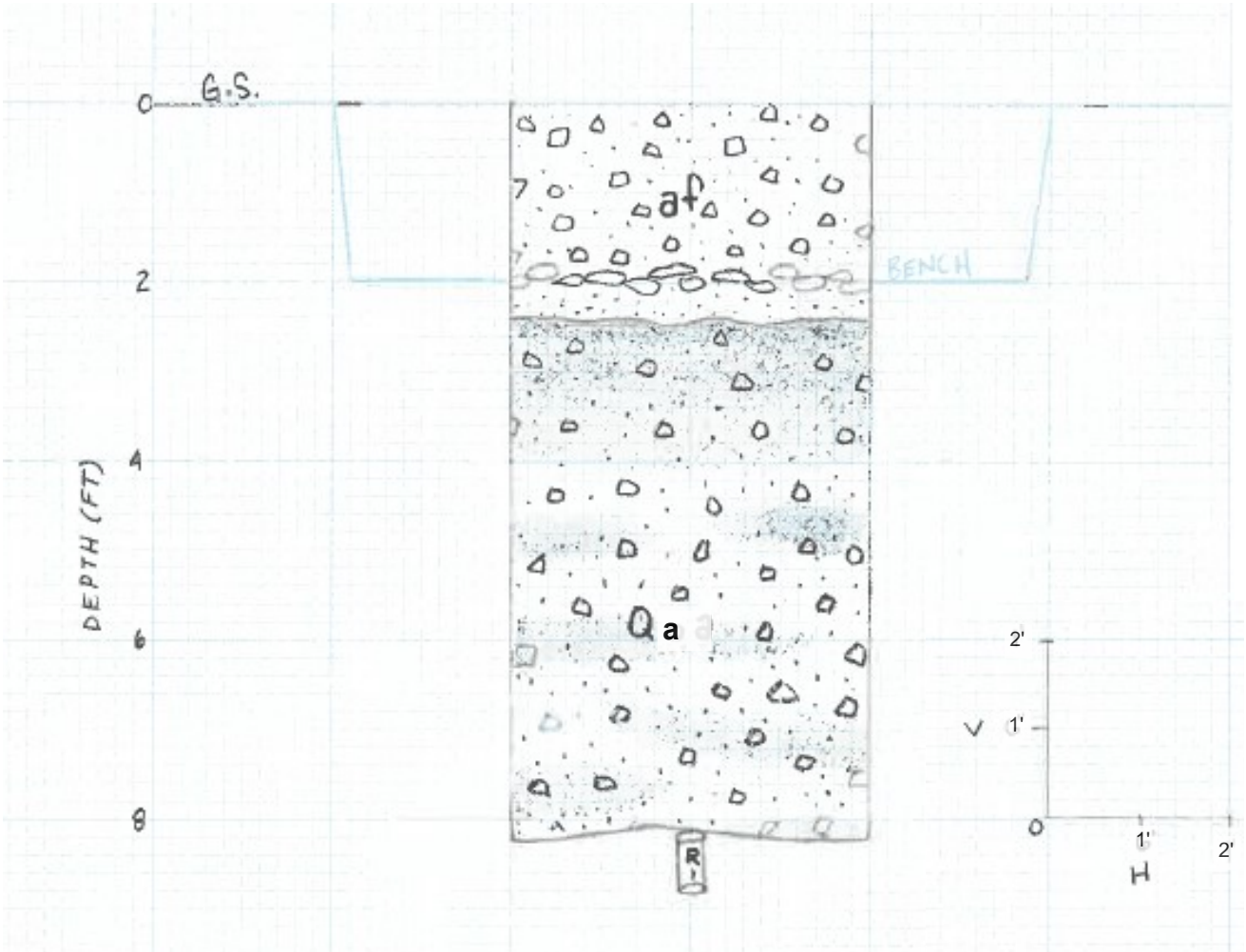
Bulk 0-7'
Ring (R-1) @8'

Measurements:

N/A

Graphic: N78°

TP-1



DATE: 12/05/2022	DRAWN BY: JMT	GROUP DELTA	GROUP DELTA CONSULTANTS, INC 370 Amapola Ave. Suite 212 Torrance, CA. 90501	TEST PIT 1	PROJECT NUMBER: LA1579
REVIEWED BY: MA	APPROVED BY: -				SCALE: AS SHOWN
PREPARED BY: -				THE BROOKSIDE TENTATIVE TRACK NO. 72798 CITY OF WALNUT, CA	FIGURE NUMBER: A-

FILE PATH: N:\Projects\1500-1599\LA1579 Spring Meadows_Spring Meadows Geotech\600 Drafting\LA1579 Test Pits.dwg
PLOTTED DATE: 12/5/2022 11:24:57 AM SAVED BY: josemiguelt

Description:

A -

(a) green plastic tras .

A

Samples:

Bulk 0-10'

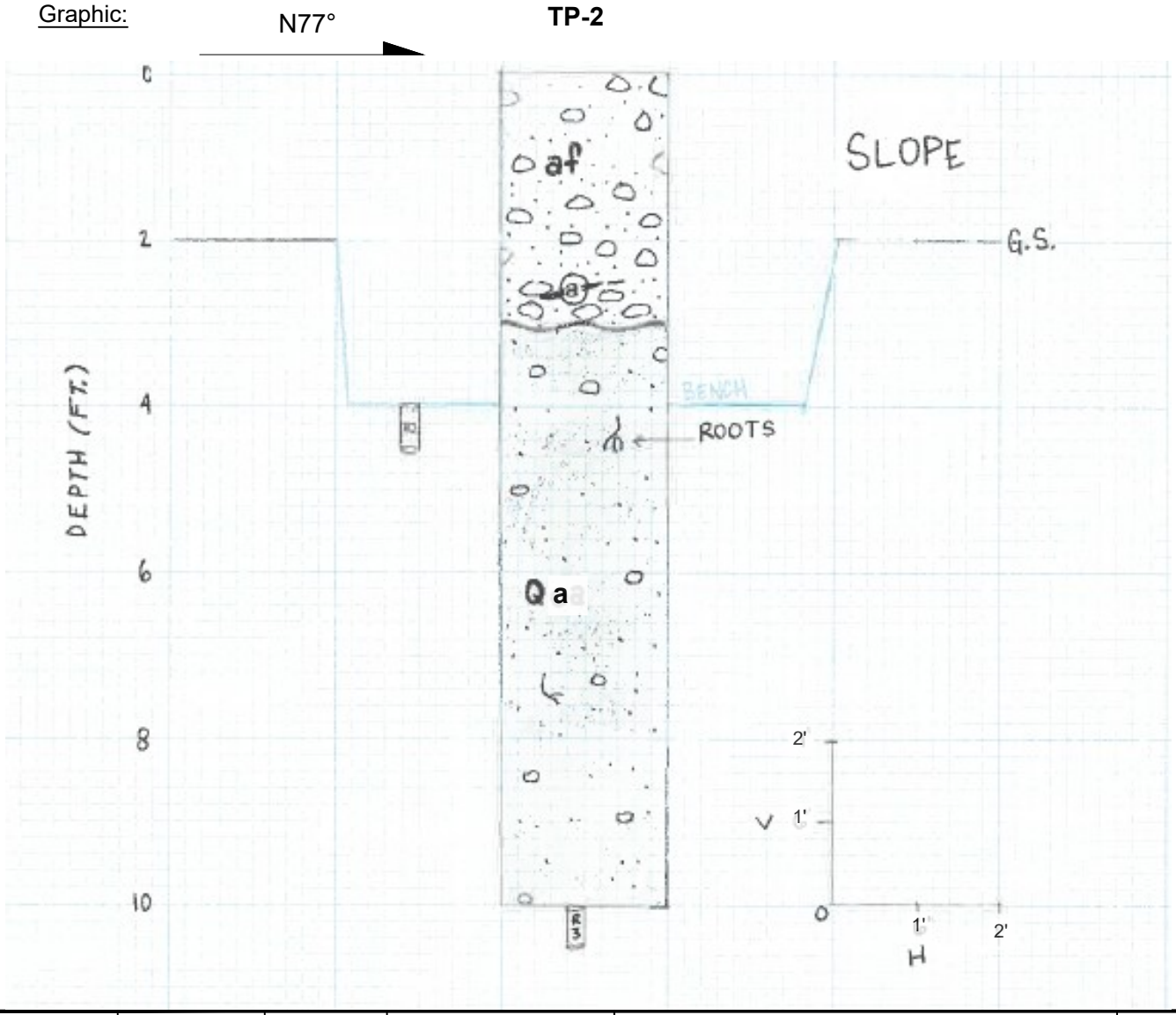
Ring (R-2) @2' below 4'

- 1

Measurements:

N/A

Graphic:



DATE: 12/05/2022	DRAWN BY: JMT	GROUP DELTA	GROUP DELTA CONSULTANTS, INC 370 Amapola Ave. Suite 212 Torrance, CA. 90501	TEST PIT 2	PROJECT NUMBER: LA1579
REVIEWED BY: MA	APPROVED BY: -				SCALE: AS SHOWN
PREPARED BY: -				THE BROOKSIDE TENTATIVE TRACK NO. 72798 CITY OF WALNUT, CA	FIGURE NUMBER: A-

FILE PATH: N:\Projects\1500-1599\LA1579 Spring Meadows_Spring Meadows Geotech\600 Drafting\LA1579 Test Pits.dwg
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Description:

-

-1

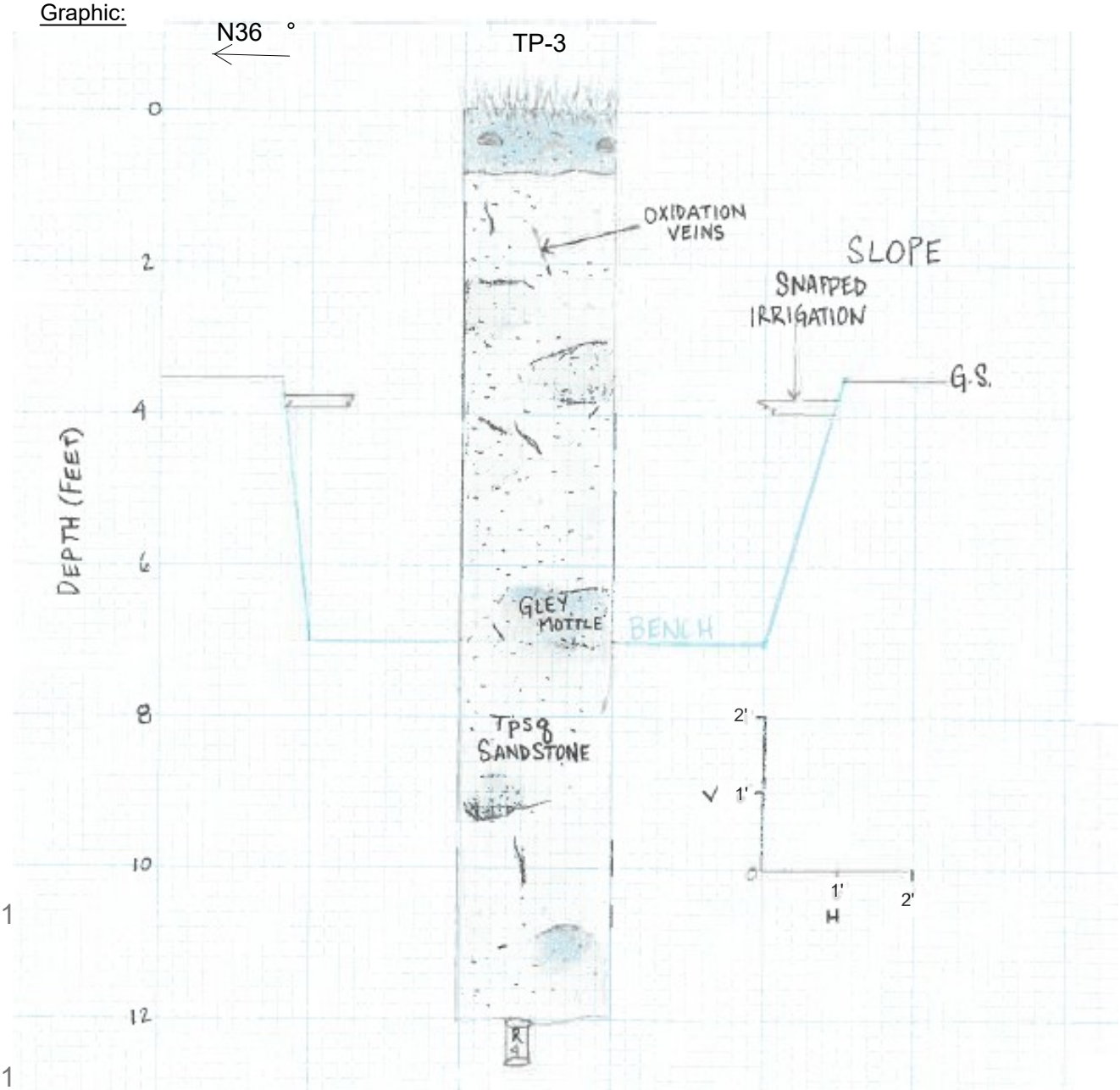
Samples:

Bulk 0-12'
Ring @12' (R-4)

Measurements:

N/A

Graphic:



DATE: 12/07/2022	DRAWN BY: JMT	GROUP DELTA	GROUP DELTA CONSULTANTS, INC 370 Amapola Ave. Suite 212 Torrance, CA. 90501	TEST PIT 3	PROJECT NUMBER: LA1579
REVIEWED BY: MA	APPROVED BY: -				SCALE: AS SHOWN
PREPARED BY: -				THE BROOKSIDE TENTATIVE TRACK NO. 72798 CITY OF WALNUT, CA	FIGURE NUMBER: A-

FILE PATH: N:\Projects\1500-1599\LA1579 Spring Meadows_Spring Meadows Geotech\600 Drafting\LA1579 Test Pits.dwg
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Description:

- 1

1

Samples:

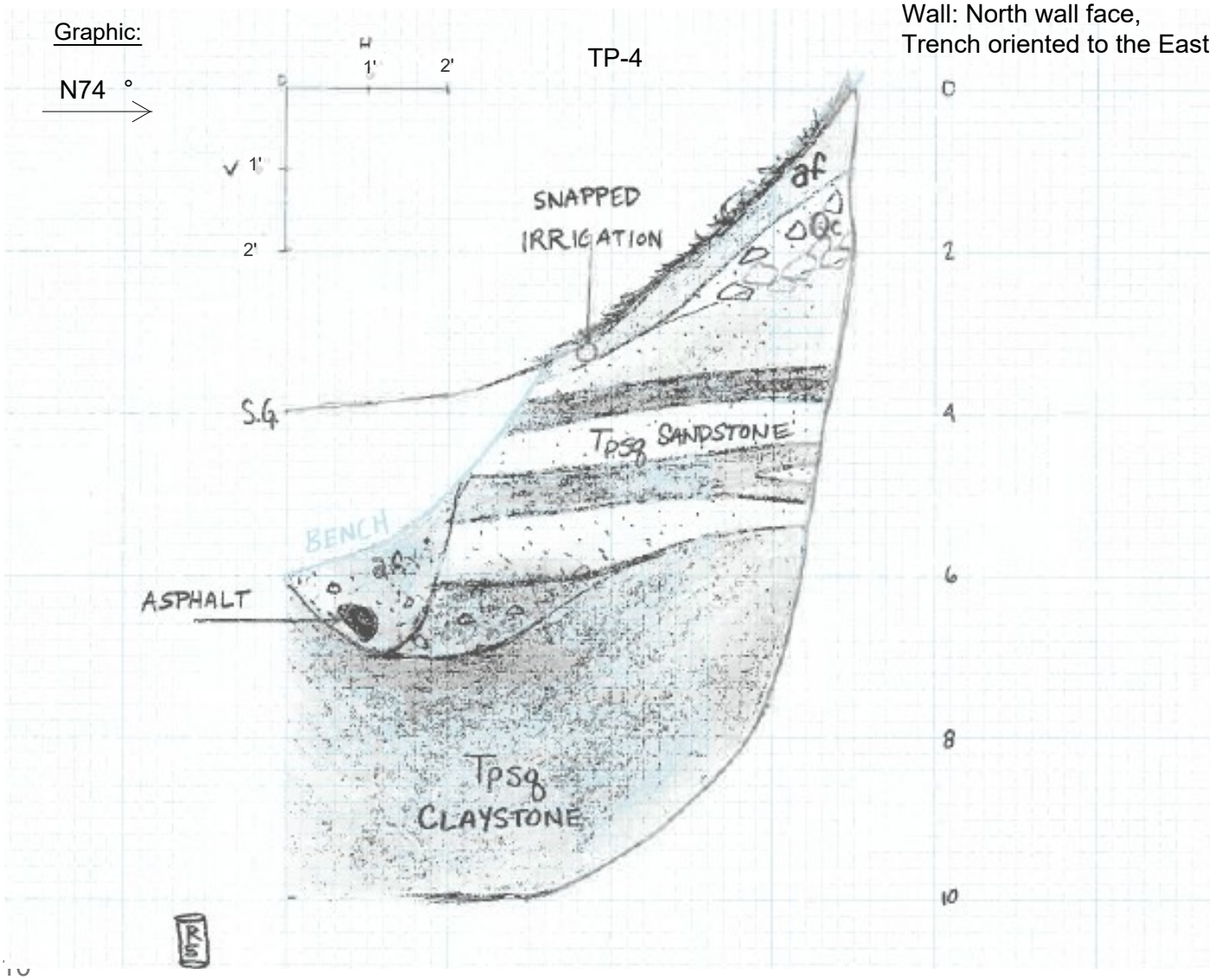
Bulk 0-10'
Ring (R-5) @10.8'

Measurements:

N/A

Graphic:

N74 °



DATE: 12/05/2022	DRAWN BY: JMT	GROUP DELTA	GROUP DELTA CONSULTANTS, INC 370 Amapola Ave. Suite 212 Torrance, CA. 90501	TEST PIT 4	PROJECT NUMBER: LA1579
REVIEWED BY: MA	APPROVED BY: -				SCALE: AS SHOWN
PREPARED BY: -				THE BROOKSIDE TENTATIVE TRACK NO. 72798 CITY OF WALNUT, CA	FIGURE NUMBER: A-1

FILE PATH: N:\Projects\1500-1599\LA1579 Spring Meadows_Spring Meadows Geotech\600 Drafting\LA1579 Test Pits.dwg
PLOTTED DATE: 12/5/2022 1:19:09 PM SAVED BY: josemiguelt

Description:

A

-1 1

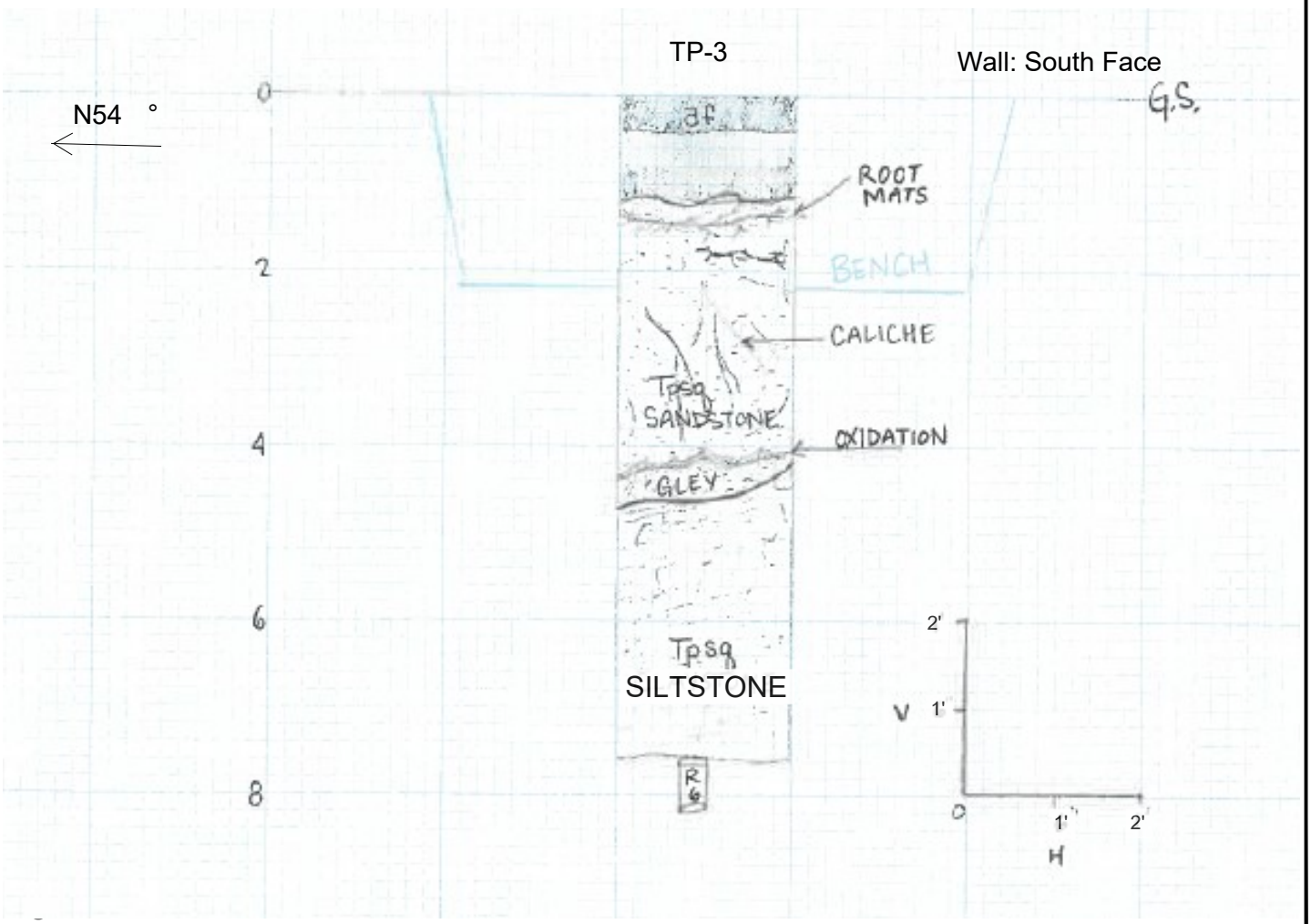
1 1

Bulk @ -
Ring (R-6) @

Measurements:

269 , 35°N
262 , 31°N

Graphic:



DATE: 12/05/2022	DRAWN BY: JMT	GROUP DELTA	GROUP DELTA CONSULTANTS, INC 370 Amapola Ave. Suite 212 Torrance, CA. 90501	TEST PIT 5	PROJECT NUMBER: LA1579
REVIEWED BY: MA	APPROVED BY: -				SCALE: AS SHOWN
PREPARED BY: -				THE BROOKSIDE TENTATIVE TRACK NO. 72798 CITY OF WALNUT, CA	FIGURE NUMBER: A-11

FILE PATH: N:\Projects\1500-1599\LA1579 Spring Meadows_Spring Meadows Geotech\600 Drafting\LA1579 Test Pits.dwg
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APPENDIX B

CURRENT LABORATORY TESTING

APPENDIX B
CURRENT LABORATORY TESTING

B.1 Introduction

Modified California drive samples and bulk samples were collected during the field explorations and transported to Group Delta's laboratory for further evaluation and testing. Tests were performed on selected samples in accordance with American Society for Testing and Materials (ASTM) as an aid in classifying the in-situ earth materials and to evaluate their engineering properties. Laboratory testing for this investigation included:

- Soil Classification: USCS (ASTM D2487) and Visual Manual (ASTM D2488)
- Moisture content (ASTM D2216) and Dry Unit Weight (ASTM D2937)
- Direct Shear (ASTM D3080)
- Expansion Index (ASTM D4829)
- One-Dimensional Consolidation (ASTM D2435)

A brief description of the laboratory testing program and test results are presented below.

B.2 Soil Classification

The subsurface materials were classified visually in the field using the Unified Soil Classification System (USCS), in accordance with ASTM Test Methods D2487 and D2488 and following Caltrans Soil and Logging Classification and Presentation Manual (2010). Soil classifications were modified as necessary based on further inspection and testing in the laboratory. The soil classifications are presented on the key for soil classification and on the boring logs in Appendix A.

B.3 Moisture Content and Dry Unit Weight

The natural moisture content and dry unit weight of selected ring samples were determined in general accordance with ASTM D2216 and ASTM D2937. Results of these tests are presented on the boring log in Appendix A.

B.4 Direct Shear

Direct shear testing was performed on undisturbed ring samples in accordance with ASTM D3080. After the initial weight and volume measurements were made, the sample was placed in a calibrated shear machine and a selected normal load was applied. Each sample was then saturated, allowed to consolidate, and then were sheared under a constant strain to failure. Shear stress and sample deformations were monitored throughout the test. The test results are presented in Figures B-1 through B-7.

B.5 Expansion Index

Representative bulk samples were obtained and tested to evaluate the expansion potential of the in-situ earth materials. The bulk samples were collected from the upper 10 feet of the surficial materials. The tests were conducted in accordance with ASTM D4829, and the results are presented in Figures B-8 to B-9.

B.6 One-Dimensional Consolidation

The compressibility characteristics of the in-situ soils were determined by performing one-dimensional consolidation testing in general accordance with ASTM D2435, using a floating ring consolidometer and deadweight system. The test specimens consisted of undisturbed ring samples from various depths and comprising predominantly of fine-grained, clayey soils. The tests were run under saturated conditions with the specimens being submerged in water. The test results are presented in Figures B-10 to B-13.

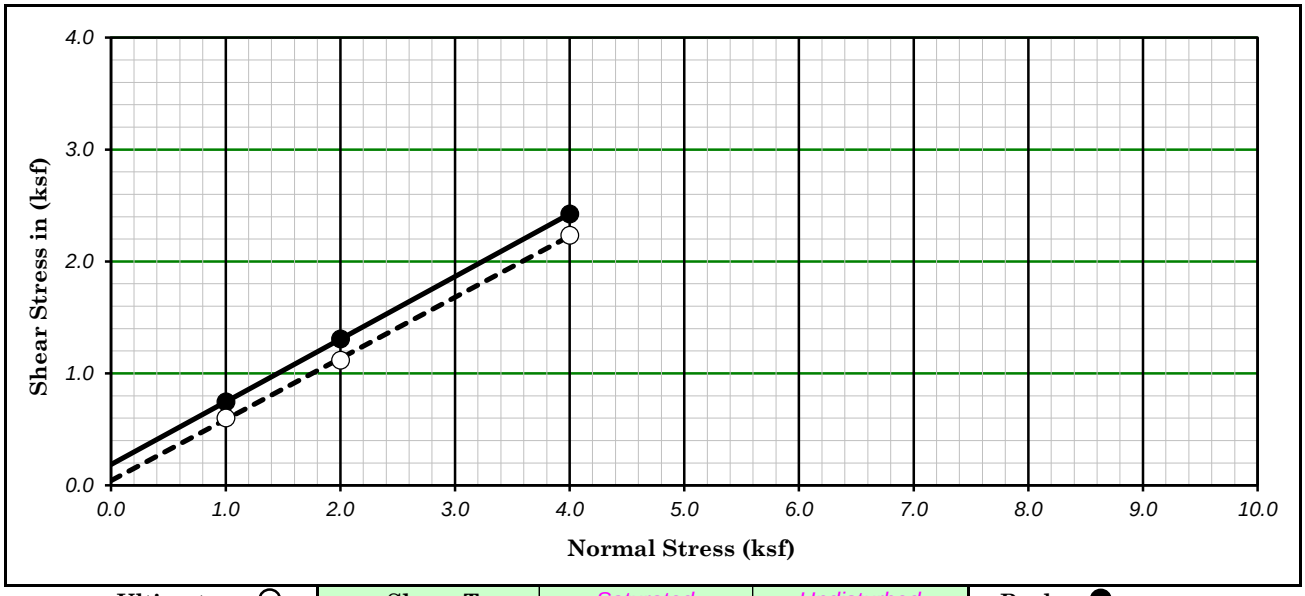
B.7 List of Attached Figures

The following figures are attached and complete this appendix:

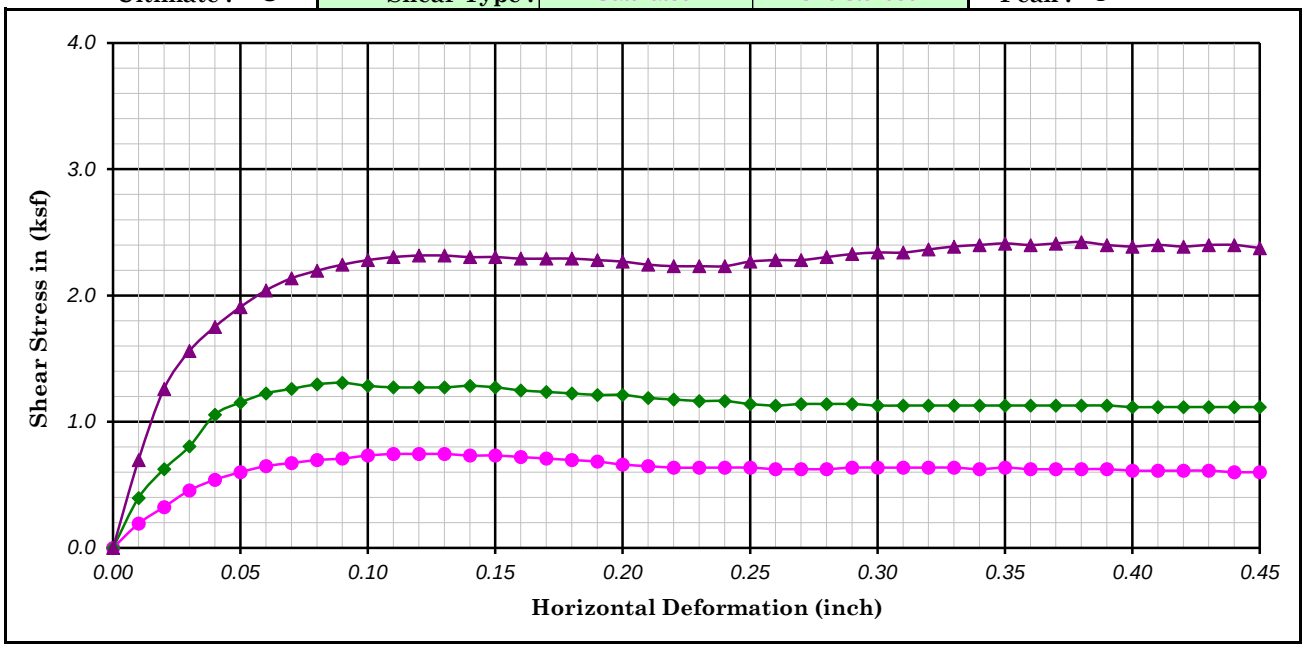
Figures B-1 to B-7 Direct Shear Results

Figures B-8 to B-9 Expansion Index Results

Figures B-10 to B-13 Consolidation Test Results



Ultimate : ○	Shear Type :	Saturated	Undisturbed	Peak : ●



Boring No. : B-18		Strength Intercept (C) :	0.19	(ksf)	Peak	0.04	(ksf)	Ultimate
Sample No. : R-3			8.91	(kPa)		2.01	(kPa)	
Depth (ft/m) : 15.0	4.58	Friction Angle (ϕ) :	29.24	Degree		28.63	Degree	
Description : Olive Brown Sandy Clay					Shear Rate (inch/minute) :		0.0002	

SYMBOL	MOISTURE CONTENT (%)	DRY DENSITY (pcf)	DRY DENSITY (kN/m^3)	VOID RATIO	NORMAL STRESS (ksf)	NORMAL STRESS (kPa)	PEAK STRESS (ksf)	PEAK STRESS (kPa)	ULTIMATE STRESS (ksf)	ULTIMATE STRESS (kPa)
●	31.28	93.31	14.69	0.81	1.00	47.88	0.74	35.62	0.60	28.73
◆	34.35	92.43	14.55	0.82	2.00	95.76	1.31	62.63	1.12	53.43
▲	33.79	92.05	14.49	0.83	4.00	191.52	2.42	116.06	2.23	106.87

GROUP DELTA

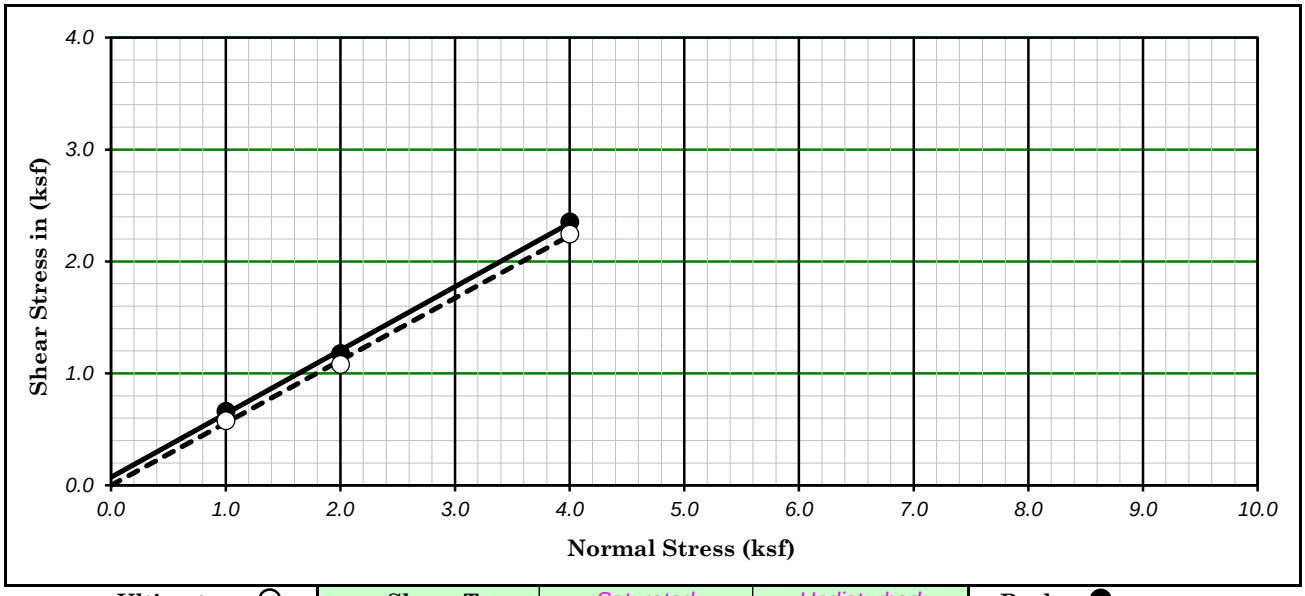
Spring Meadows Homes, LLC

Project No. : LA1579

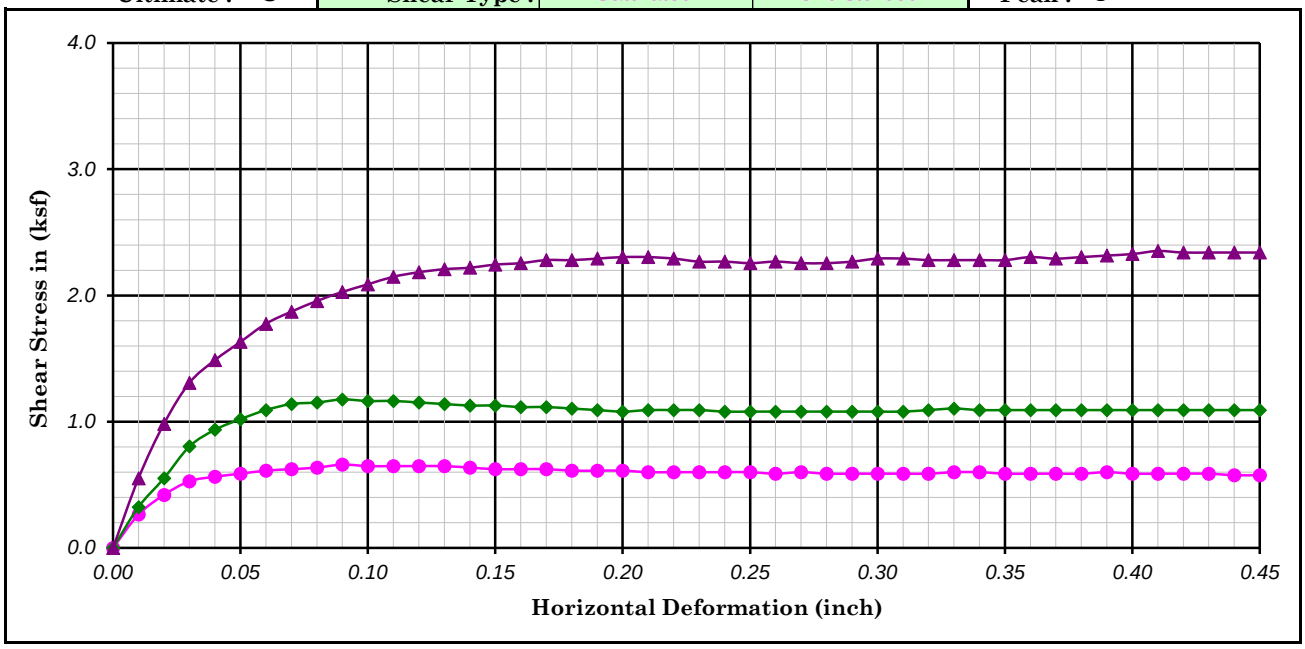
Date : 12/05/22

DIRECT SHEAR TEST
(ASTM D -3080)

Figure No. :



Ultimate : ○ | Shear Type : Saturated | Undisturbed | Peak : ●



Boring No. : B-18		Strength Intercept (C) :	0.07	(ksf)	Peak	0.00	(ksf)	Ultimate
Sample No. : R-4			3.45	(kPa)		0.00	(kPa)	
Depth (ft/m) : 20.0	6.10	Friction Angle (ϕ) :	29.57	Degree		29.15	Degree	

Description : Light Olive Brown Sandy Clay — Shear Rate (inch/minute) : 0.0002

SYMBOL	MOISTURE CONTENT (%)	DRY DENSITY (pcf)	DRY DENSITY (kN/m^3)	VOID RATIO	NORMAL STRESS (ksf)	NORMAL STRESS (kPa)	PEAK STRESS (ksf)	PEAK STRESS (kPa)	ULTIMATE STRESS (ksf)	ULTIMATE STRESS (kPa)
●	33.19	91.49	14.40	0.84	1.00	47.88	0.66	31.60	0.58	27.58
◆	33.30	90.63	14.27	0.86	2.00	95.76	1.18	56.31	1.08	51.71
▲	33.05	93.12	14.66	0.81	4.00	191.52	2.35	112.61	2.24	107.44

GROUP DELTA

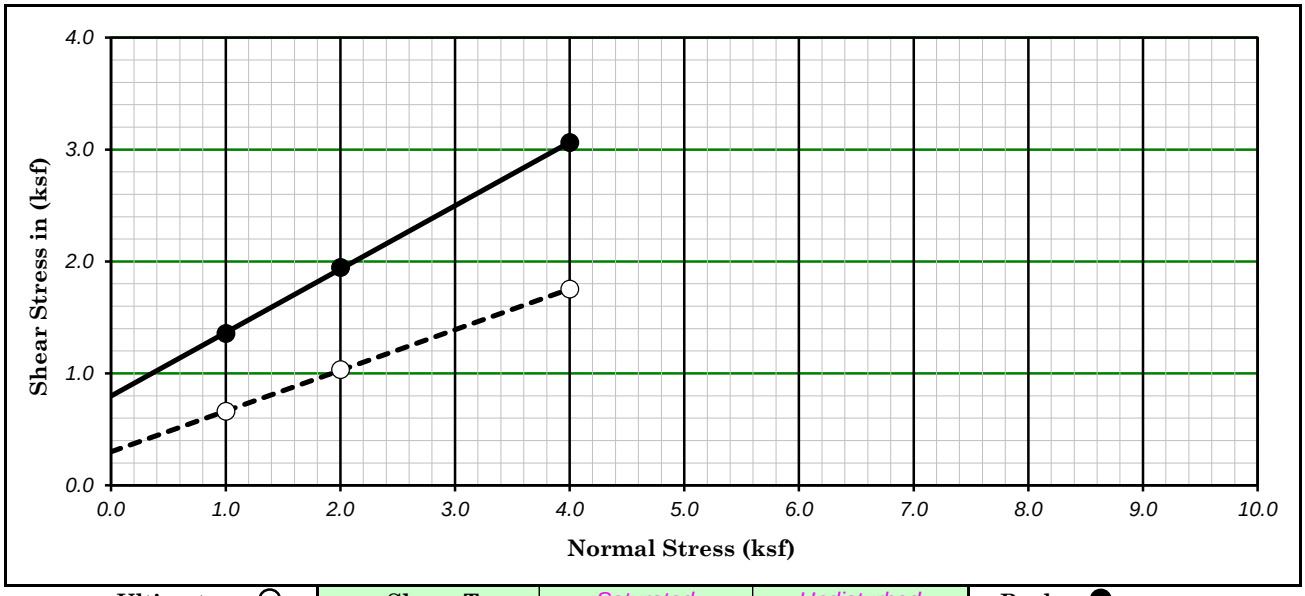
Spring Meadows Homes, LLC

Project No. : LA1579

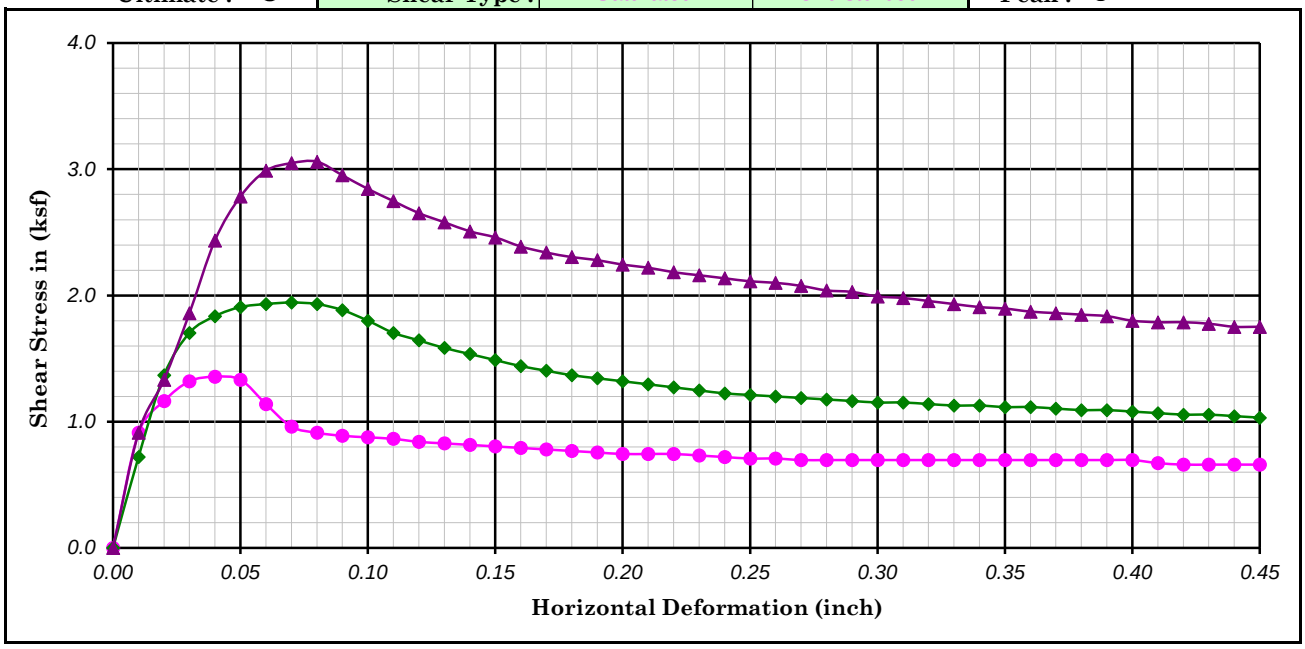
Date : 12/02/22

DIRECT SHEAR TEST
(ASTM D -3080)

Figure No. :



Ultimate : ○ | Shear Type : Saturated | Undisturbed | Peak : ●



Boring No. : B-19		Strength Intercept (C) :	0.80	(ksf)	Peak	0.30	(ksf)	Ultimate
Sample No. : R-2			38.21	(kPa)		14.36	(kPa)	
Depth (ft/m) : 10.0	3.05	Friction Angle (ϕ) :	29.53	Degree		19.97	Degree	

Description : Brown Bedrock / Siltstone, Claystone — Shear Rate (inch/minute) : 0.0004

SYMBOL	MOISTURE CONTENT (%)	DRY DENSITY (pcf)	DRY DENSITY (kN/m^3)	VOID RATIO	NORMAL STRESS (ksf)	NORMAL STRESS (kPa)	PEAK STRESS (ksf)	PEAK STRESS (kPa)	ULTIMATE STRESS (ksf)	ULTIMATE STRESS (kPa)
●	29.61	101.89	16.04	0.65	1.00	47.88	1.36	64.93	0.66	31.60
◆	36.78	98.02	15.43	0.72	2.00	95.76	1.94	93.08	1.03	49.41
▲	34.97	96.99	15.27	0.74	4.00	191.52	3.06	146.51	1.75	83.89

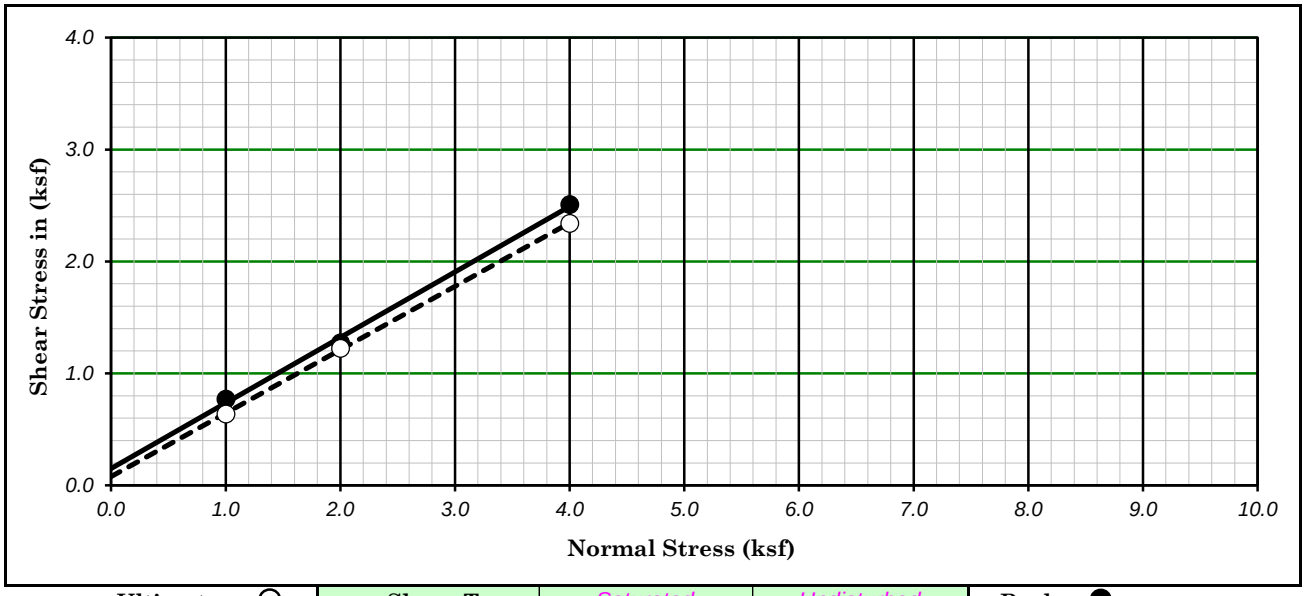
GROUP DELTA

Spring Meadows Homes, LLC

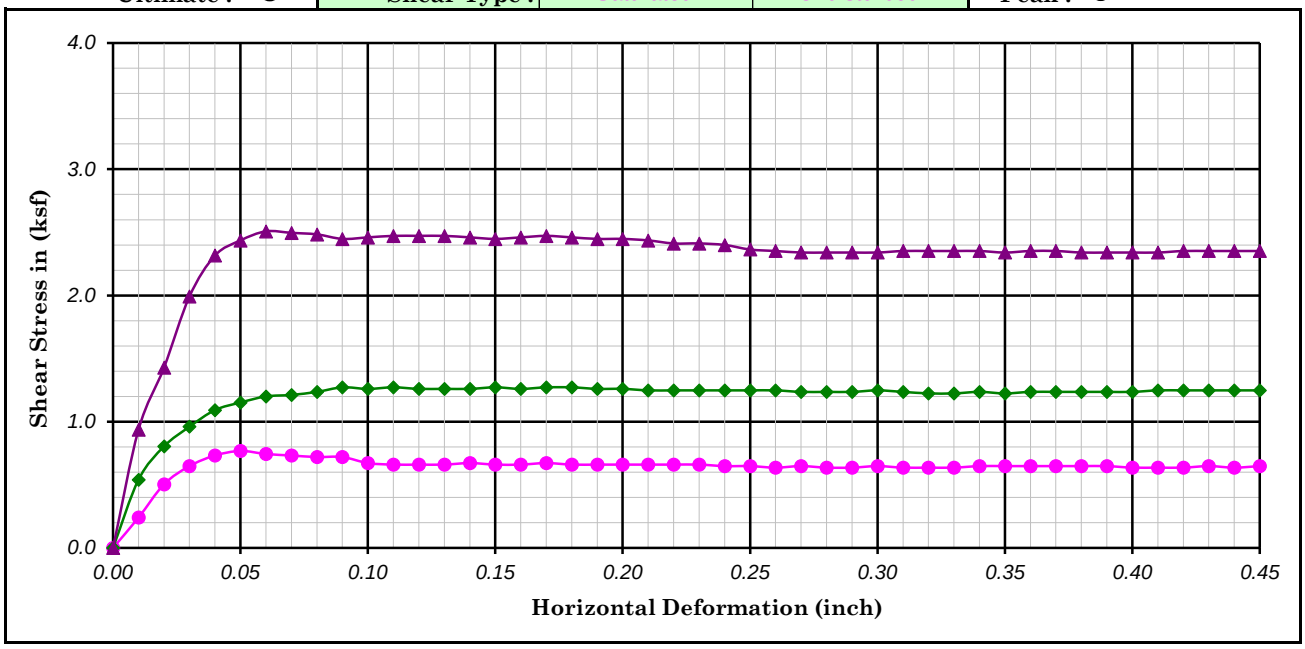
Project No. : LA1579 | Date : 12/06/22

DIRECT SHEAR TEST
(ASTM D -3080)

Figure No. :



Ultimate : ○ | Shear Type : Saturated | Undisturbed | Peak : ●



Boring No. : B-20		Strength Intercept (C) :	0.15	(ksf)	Peak	0.08	(ksf)	Ultimate
Sample No. : R-4			7.18	(kPa)		3.73	(kPa)	
Depth (ft/m) : 20.0	6.10	Friction Angle (ϕ) :	30.35	Degree		29.53	Degree	
Description : Olive Brown Sandy Silt - Sandy Clay					Shear Rate (inch/minute) :	0.0004		

SYMBOL	MOISTURE CONTENT (%)	DRY DENSITY (pcf)	DRY DENSITY (kN/m^3)	VOID RATIO	NORMAL STRESS (ksf)	NORMAL STRESS (kPa)	PEAK STRESS (ksf)	PEAK STRESS (kPa)	ULTIMATE STRESS (ksf)	ULTIMATE STRESS (kPa)
●	26.52	100.23	15.78	0.68	1.00	47.88	0.77	36.77	0.64	30.45
◆	27.05	100.37	15.80	0.68	2.00	95.76	1.27	60.90	1.22	58.61
▲	26.40	102.81	16.18	0.64	4.00	191.52	2.51	120.08	2.34	112.04

GROUP DELTA

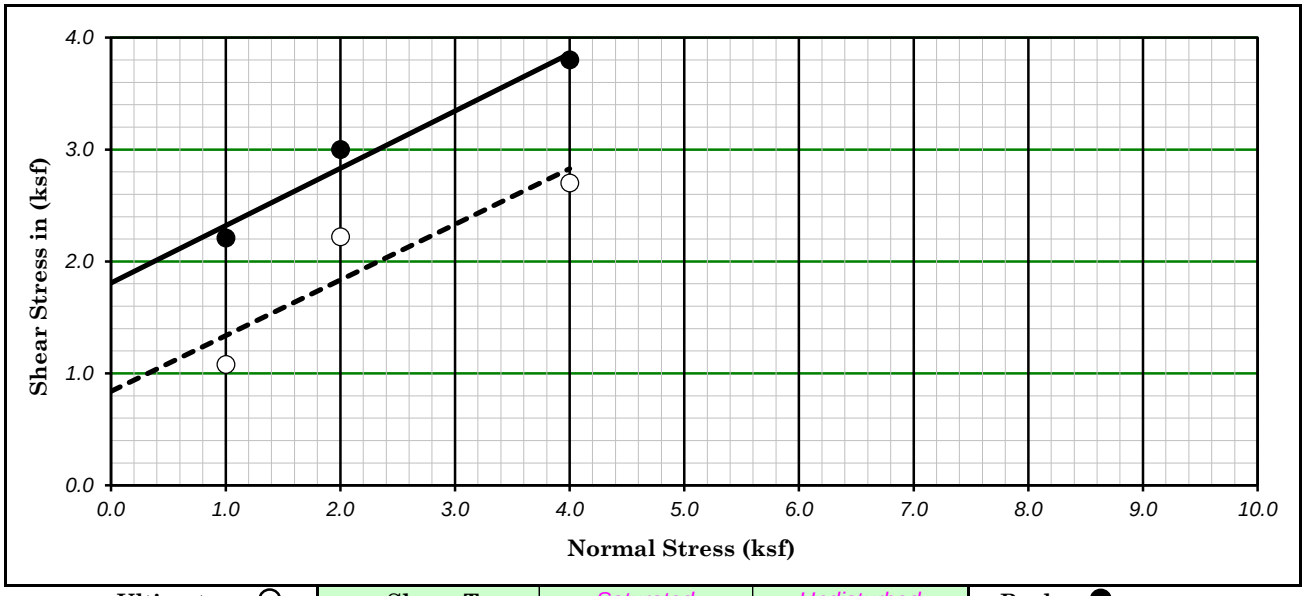
Spring Meadows Homes, LLC

DIRECT SHEAR TEST
(ASTM D -3080)

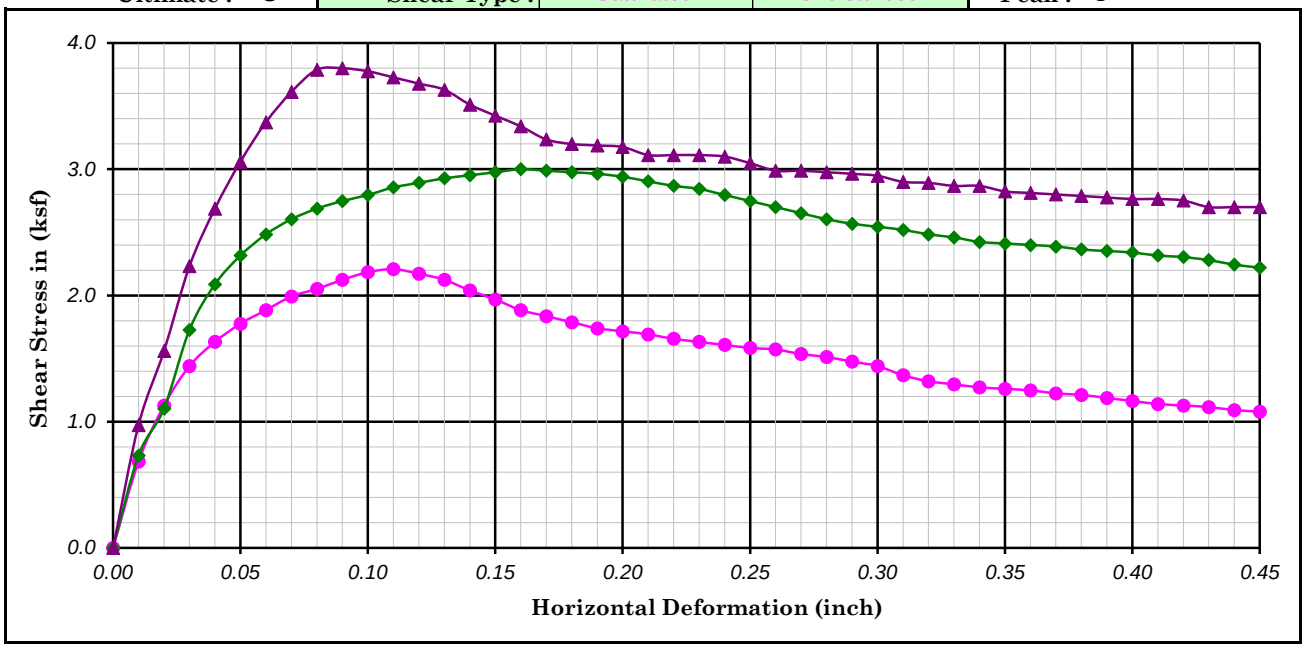
Project No. : LA1579

Date : 12/07/22

Figure No. :



Ultimate : ○ | Shear Type : Saturated | Undisturbed | Peak : ●



Boring No. : B-21		Strength Intercept (C) :	1.81	(ksf)	Peak	0.84	(ksf)	Ultimate
Sample No. : R-1			86.57	(kPa)		40.22	(kPa)	
Depth (ft/m) : 5.0	1.53	Friction Angle (ϕ) :	27.11	Degree		26.43	Degree	
Description : Very Dark Grayish Brown Sandy Clay					Shear Rate (inch/minute) :		0.0003	

SYMBOL	MOISTURE CONTENT (%)	DRY DENSITY (pcf)	DRY DENSITY (kN/m^3)	VOID RATIO	NORMAL STRESS (ksf)	NORMAL STRESS (kPa)	PEAK STRESS (ksf)	PEAK STRESS (kPa)	ULTIMATE STRESS (ksf)	ULTIMATE STRESS (kPa)
●	26.49	108.46	17.07	0.55	1.00	47.88	2.21	105.72	1.08	51.71
◆	24.76	108.75	17.12	0.55	2.00	95.76	3.00	143.64	2.22	106.29
▲	24.97	109.36	17.21	0.54	4.00	191.52	3.80	181.94	2.70	129.28

GROUP DELTA

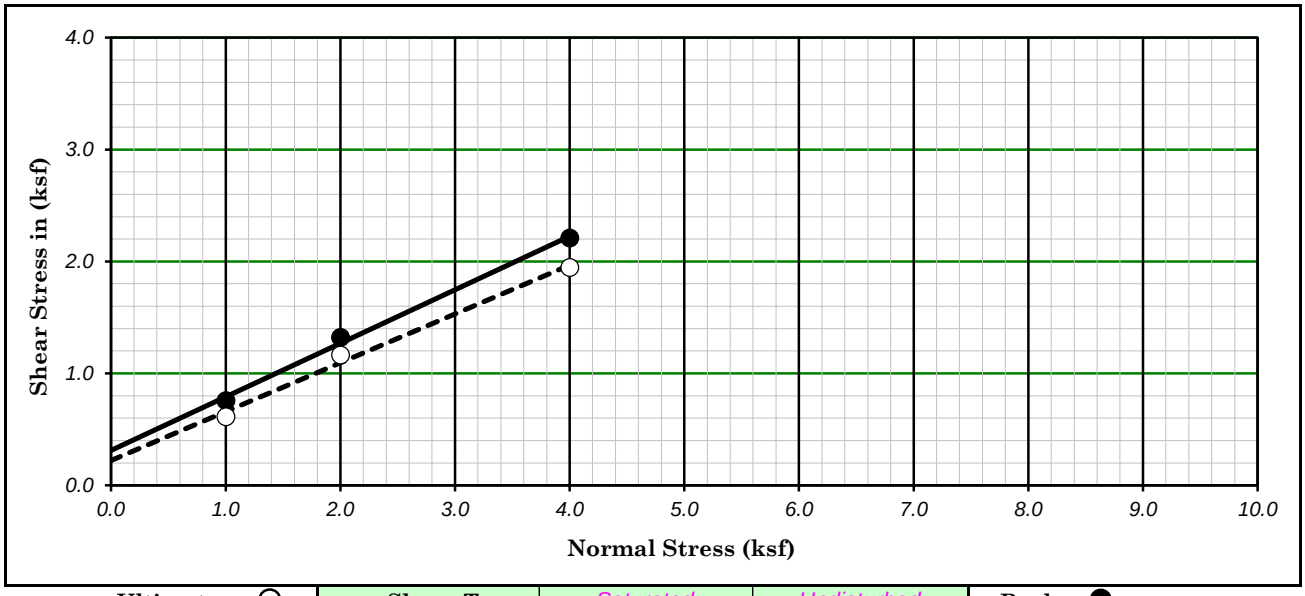
Spring Meadows Homes, LLC

Project No. : LA1579

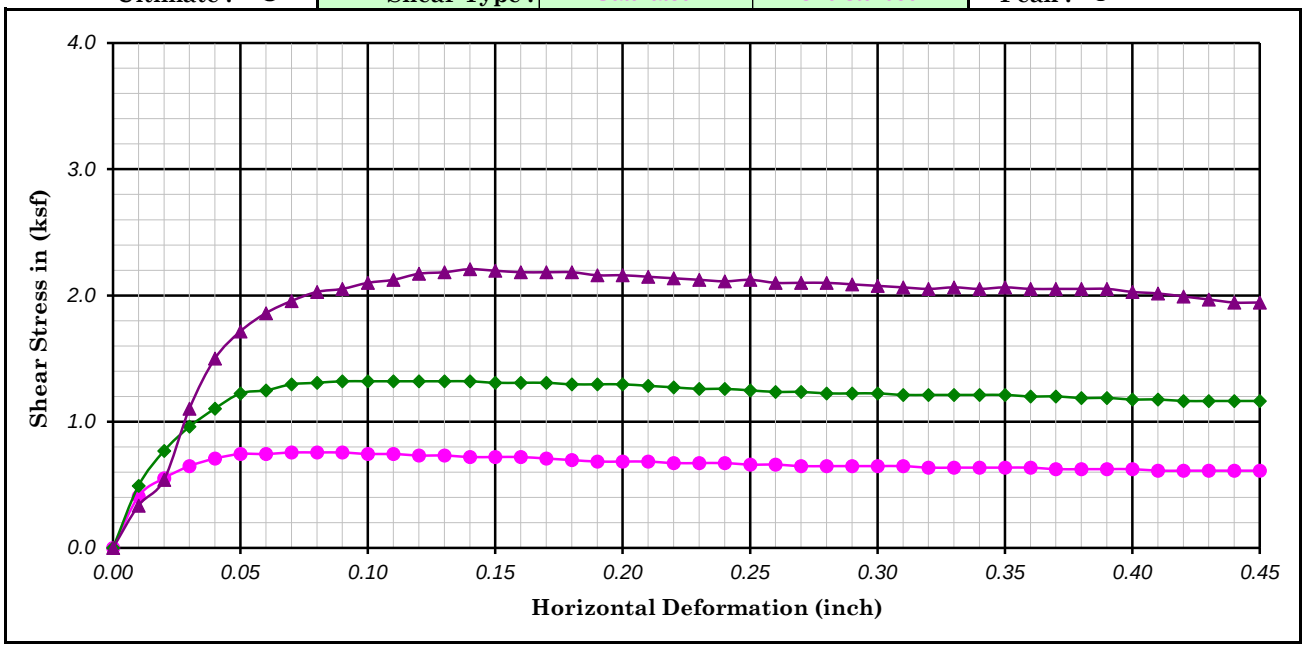
Date : 12/08/22

DIRECT SHEAR TEST
(ASTM D -3080)

Figure No. :



Ultimate : ○ | Shear Type : Saturated | Undisturbed | Peak : ●



Boring No. : TP-1		Strength Intercept (C) :	0.31	(ksf)	Peak	0.22	(ksf)	Ultimate
Sample No. : R-1			14.94	(kPa)		10.63	(kPa)	
Depth (ft/m) : 8.0	2.44	Friction Angle (ϕ) :	25.56	Degree		23.57	Degree	
Description : Dark OliveGray Fat Clay with Sand					Shear Rate (inch/minute) :		0.0002	

SYMBOL	MOISTURE CONTENT (%)	DRY DENSITY (pcf)	DRY DENSITY (kN/m^3)	VOID RATIO	NORMAL STRESS (ksf)	NORMAL STRESS (kPa)	PEAK STRESS (ksf)	PEAK STRESS (kPa)	ULTIMATE STRESS (ksf)	ULTIMATE STRESS (kPa)
●	39.10	85.15	13.40	0.98	1.00	47.88	0.76	36.20	0.61	29.30
◆	39.20	85.11	13.40	0.98	2.00	95.76	1.32	63.20	1.16	55.73
▲	38.52	85.43	13.45	0.97	4.00	191.52	2.21	105.72	1.94	93.08

GROUP DELTA

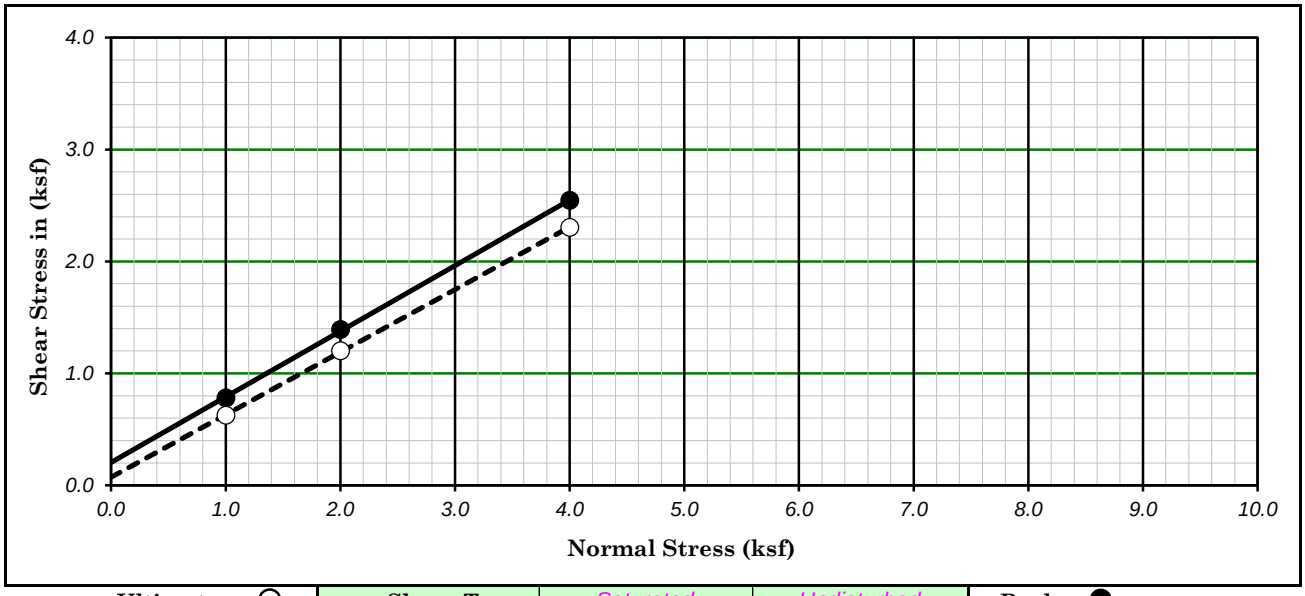
Spring Meadows Homes, LLC

Project No. : LA1579

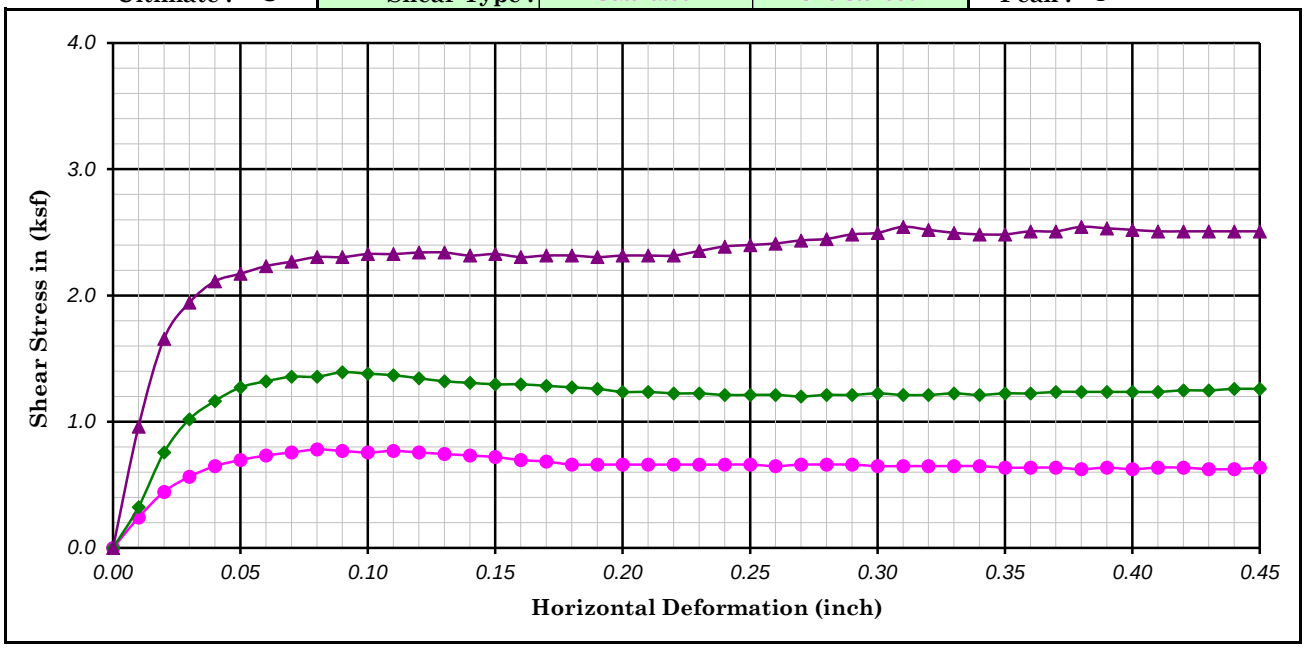
Date : 12/09/22

DIRECT SHEAR TEST
(ASTM D -3080)

Figure No. :



Ultimate : ○ | Shear Type : Saturated | Undisturbed | Peak : ●



Boring No. : TP-4		Strength Intercept (C) :	0.20	(ksf)	Peak	0.07	(ksf)	Ultimate
Sample No. : R-5			9.77	(kPa)		3.45	(kPa)	
Depth (ft/m) : 10.8	3.29	Friction Angle (ϕ) :	30.38	Degree		29.20	Degree	
Description : Brown Clayey Sand					Shear Rate (inch/minute) :		0.0004	

SYMBOL	MOISTURE CONTENT (%)	DRY DENSITY (pcf)	DRY DENSITY (kN/m^3)	VOID RATIO	NORMAL STRESS (ksf)	NORMAL STRESS (kPa)	PEAK STRESS (ksf)	PEAK STRESS (kPa)	ULTIMATE STRESS (ksf)	ULTIMATE STRESS (kPa)
●	17.79	113.07	17.80	0.49	1.00	47.88	0.78	37.35	0.62	29.88
◆	18.17	113.60	17.88	0.48	2.00	95.76	1.39	66.65	1.20	57.46
▲	18.76	113.67	17.89	0.48	4.00	191.52	2.54	121.81	2.30	110.32

GROUP DELTA

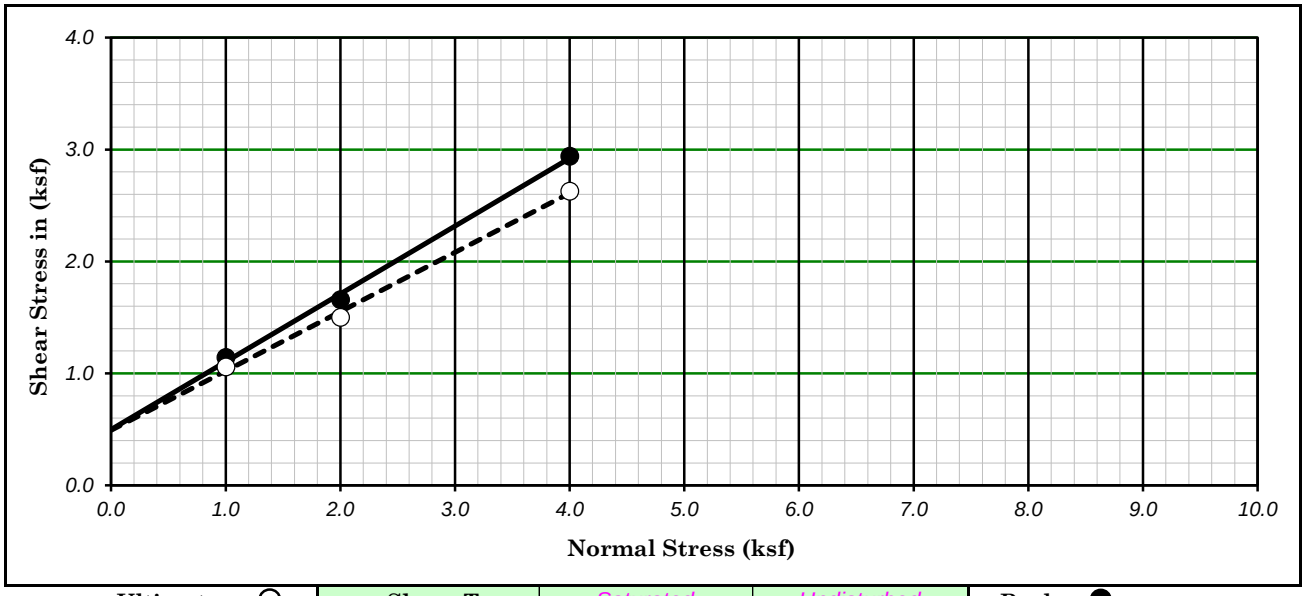
Spring Meadows Homes, LLC

DIRECT SHEAR TEST
(ASTM D -3080)

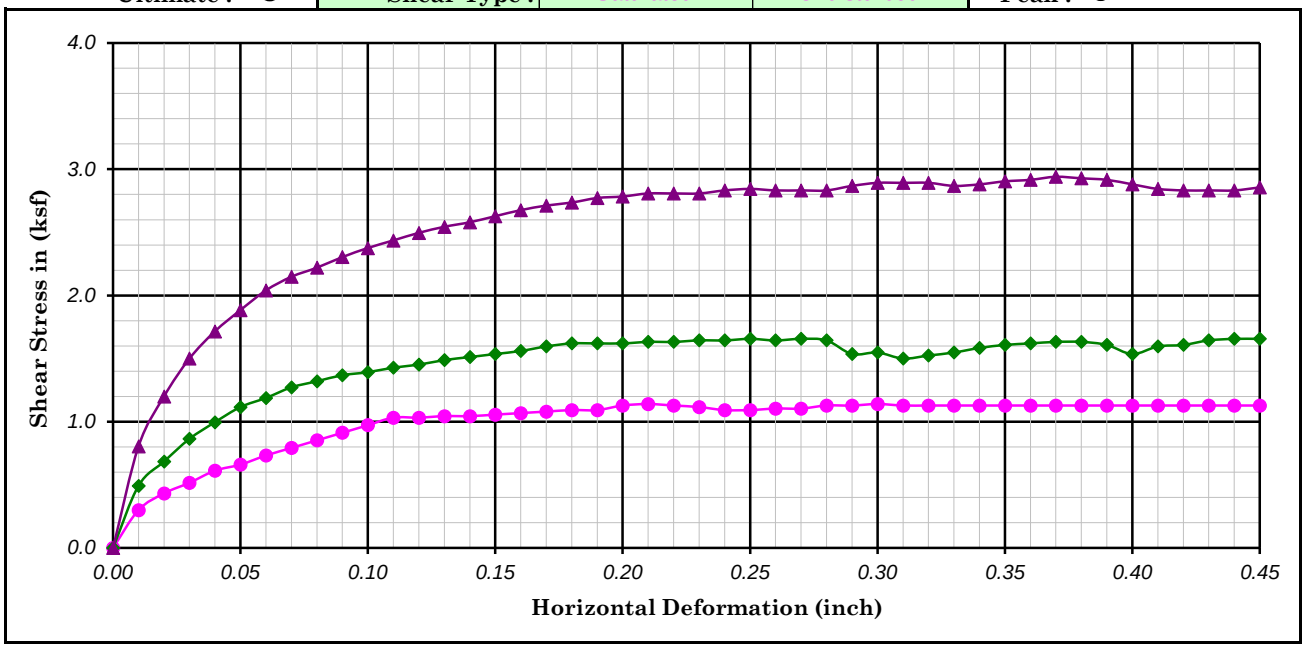
Project No. : LA1579

Date : 12/12/22

Figure No. :



Ultimate : ○ | Shear Type : Saturated | Undisturbed | Peak : ●



Boring No. : TP-5		Strength Intercept (C) :	0.50	(ksf)	Peak	0.49	(ksf)	Ultimate
Sample No. : R-6			23.84	(kPa)		23.56	(kPa)	
Depth (ft/m) : 7.7	2.34	Friction Angle (ϕ) :	31.22	Degree		27.91	Degree	

Description : Yellowish Brown Bedrock (Crushed) — Shear Rate (inch/minute) : 0.0004

SYMBOL	MOISTURE CONTENT (%)	DRY DENSITY (pcf)	DRY DENSITY (kN/m^3)	VOID RATIO	NORMAL STRESS (ksf)	NORMAL STRESS (kPa)	PEAK STRESS (ksf)	PEAK STRESS (kPa)	ULTIMATE STRESS (ksf)	ULTIMATE STRESS (kPa)
●	17.59	106.21	16.72	0.59	1.00	47.88	1.14	54.58	1.06	50.56
◆	19.21	106.47	16.76	0.58	2.00	95.76	1.66	79.29	1.50	71.82
▲	18.88	107.01	16.84	0.58	4.00	191.52	2.94	140.77	2.63	125.83

GROUP DELTA

Spring Meadows Homes, LLC

DIRECT SHEAR TEST
(ASTM D -3080)

Project No. : LA1579

Date : 12/20/22

Figure No. :

GROUP DELTA

EXPANSION INDEX OF SOIL

ASTM D-4829-10 / UBC 29-2

Lab Number: SO6631

Project Name	: Spring Meadows Homes, LLC	**Sampled By :**		**Date :**	
Project No.	: LA1579	**Prepared By :**	Eric Y.	**Date :**	12/1/2022
Boring No.	: B-18	**Tested By :**	Eric Y.	**Date :**	12/2/2022
Sample No.	: Bulk-1	**Calculated By :**	Eric Y.	**Date :**	12/6/2022
Depth (ft.)	: 0 - 5	**Checked By :**		**Date :**	
Description	: Olive Brown Sandy Clay with Siltstone, Claystone, and Gravel				

Sample Preparation

Weight of Total Soil	3463.00	**Weight of Soil Retained on No. 4 Sieve**	629.30	**% Passing No. 4 Sieve**	81.83

Trail	**1**	**2**	**3**	**4**	**Tested**	**M & D After Test**	
Container No.	SB-2					**Container No.**	
Weight of Wet Soil + Container (gm)	833.80					**Wet Soil+Cont.+Ring**	
Weight of Dry Soil + Container (gm)	744.92					**Dry Soil+Cont.+Ring**	
Weight of Container (gm)	228.54					**Wt. of Container**	
Moisture Content (%)	17.21				17.21	**Moisture Content**	
Weight of Wet Soil + Ring (gm)	538.98						
Weight of Ring (gm) **No.** 2.0	198.64				198.64		
Weight of Wet Soil (gm)	340.34						
Wet Density of Soil (pcf)	102.66					**Wet Density (pcf)**	
Dry Density of Soil (pcf)	87.59					**Dry Density (pcf)**	
Precent Saturation of Soil $S_{(Meas.)}$	50.27				50.27	**(%) Saturation**	

Loading Machine No.		**2**		
Date	**Reading Time**	**Elapsed Time**	**Dial Reading**	**Expansion**
12/02/22	12:15:00	0:10:00		0.0000
12/02/22				
12/02/22	12:25:00	**0:00:00**	**0.3000**	**0.0000**
Add Distilled Water to Sample				
12/02/22	13:25:00	1:00:00	0.3709	0.0709
12/02/22	14:25:00	2:00:00	0.3719	0.0719
12/02/22	15:25:00	3:00:00	0.3723	0.0723
12/02/22	16:25:00	4:00:00	0.3726	0.0726
12/05/22	7:25:00	67 hrs.	0.3739	0.0739
12/05/22	9:25:00	69 hrs.	0.3739	0.0739
12/05/22	12:25:00	72 hrs.	0.3739	0.0739

Remark :

1. *Screen sample through* **No. 4** *Sieve*
2. *Sample should be compacted into a metal ring of the Degree of Saturation of* **50 +/- 2% (48 - 52).**
3. *Inundated sample in distilled water to 24 h, or until the rate of expansion > (0.0002 in./h), no less than 3 h.*

Volume of Mold (ft^3)	0.00731	**Specific Gravity**	2.70
Rammer Weight (lb.)	5.0	**Blows/Layer**	15
Vertical Confining Pressure		1.0 (lbf/in^2) / 6.9 (kPa)	

$$(\%)\ S = \frac{S.G. \times W \times Dd}{Wd \times S.G. - Dd}$$

S.G.=Specific Gravity, **W**=Water Content
Dd=Dry Soil Density, **Wd**=Unit Wt. of Water

$$E.I._{(meas)} = \frac{\text{Change in High}}{\text{Initial Thickness}} \times 1000 = \mathbf{73.90}$$

$$\text{Expansion Index}_{(50)} = EI_{(meas.)} - (50 - S_{(meas.)}) \times \frac{65 + EI_{(meas.)}}{220 - S_{(meas.)}}$$

74	**Medium**

Expansion Index	Potential Expansion
0 - 20	*Very Low*
21 - 50	*Low*
51 - 90	*Medium*
91 - 130	*High*
> 130	*Very High*

GROUP DELTA

EXPANSION INDEX OF SOIL

ASTM D-4829-10 / UBC 29-2

Lab Number: SO6631

Project Name	: Spring Meadows Homes, LLC	**Sampled By :**		**Date :**	
Project No.	: LA1579	**Prepared By :**	Eric Y.	**Date :**	12/1/2022
Boring No.	: B-18	**Tested By :**	Eric Y.	**Date :**	12/2/2022
Sample No.	: Bulk-2	**Calculated By :**	Eric Y.	**Date :**	12/6/2022
Depth (ft.)	: 5 - 10	**Checked By :**		**Date :**	
Description	: Very Dark Grayish Brown Sandy Clay with Siltstone, Claystone				

Sample Preparation

Weight of Total Soil	3591.50	**Weight of Soil Retained on No. 4 Sieve**	122.00	**% Passing No. 4 Sieve**	96.60

Trail	**1**	**2**	**3**	**4**	**Tested**	**M & D After Test**	
Container No.	SB-3					**Container No.**	
Weight of Wet Soil + Container (gm)	868.60					**Wet Soil+Cont.+Ring**	
Weight of Dry Soil + Container (gm)	785.43					**Dry Soil+Cont.+Ring**	
Weight of Container (gm)	232.90					**Wt. of Container**	
Moisture Content (%)	15.05				15.05	**Moisture Content**	
Weight of Wet Soil + Ring (gm)	551.44						
Weight of Ring (gm) No. 3.0	200.84				200.84		
Weight of Wet Soil (gm)	350.60						
Wet Density of Soil (pcf)	105.76					**Wet Density (pcf)**	
Dry Density of Soil (pcf)	91.92					**Dry Density (pcf)**	
Precent Saturation of Soil $S_{(Meas.)}$	48.74				48.74	**(%) Saturation**	

Loading Machine No.		**3**		
Date	**Reading Time**	**Elapsed Time**	**Dial Reading**	**Expansion**
12/02/22	9:55:00	0:10:00		0.0000
12/02/22				
12/02/22	10:05:00	**0:00:00**	**0.3000**	**0.0000**
Add Distilled Water to Sample				
12/02/22	11:05:00	1:00:00	0.3662	0.0662
12/02/22	12:05:00	2:00:00	0.3700	0.0700
12/02/22	13:05:00	3:00:00	0.3710	0.0710
12/02/22	14:05:00	4:00:00	0.3715	0.0715
12/02/22	15:05:00	5:00:00	0.3718	0.0718
12/02/22	16:05:00	6:00:00	0.3721	0.0721
12/05/22	8:05:00	70 hrs.	0.3744	0.0744
12/05/22	9:05:00	71 hrs.	0.3744	0.0744
12/05/22	10:05:00	72 hrs.	0.3744	0.0744

Remark :

1. *Screen sample through* **No. 4** *Sieve*
2. *Sample should be compacted into a metal ring of the Degree of Saturation of* **50 +/- 2% (48 - 52).**
3. *Inundated sample in distilled water to 24 h, or until the rate of expansion > (0.0002 in./h), no less than 3 h.*

Volume of Mold (ft^3)	0.00731	**Specific Gravity**	2.70
Rammer Weight (lb.)	5.0	**Blows/Layer**	15
Vertical Confining Pressure		1.0 (lbf/in^2) / 6.9 (kPa)	

$$(\%)\ S = \frac{S.G. \times W \times Dd}{Wd \times S.G. - Dd}$$

S.G.=Specific Gravity, **W**=Water Content
Dd=Dry Soil Density, **Wd**=Unit Wt. of Water

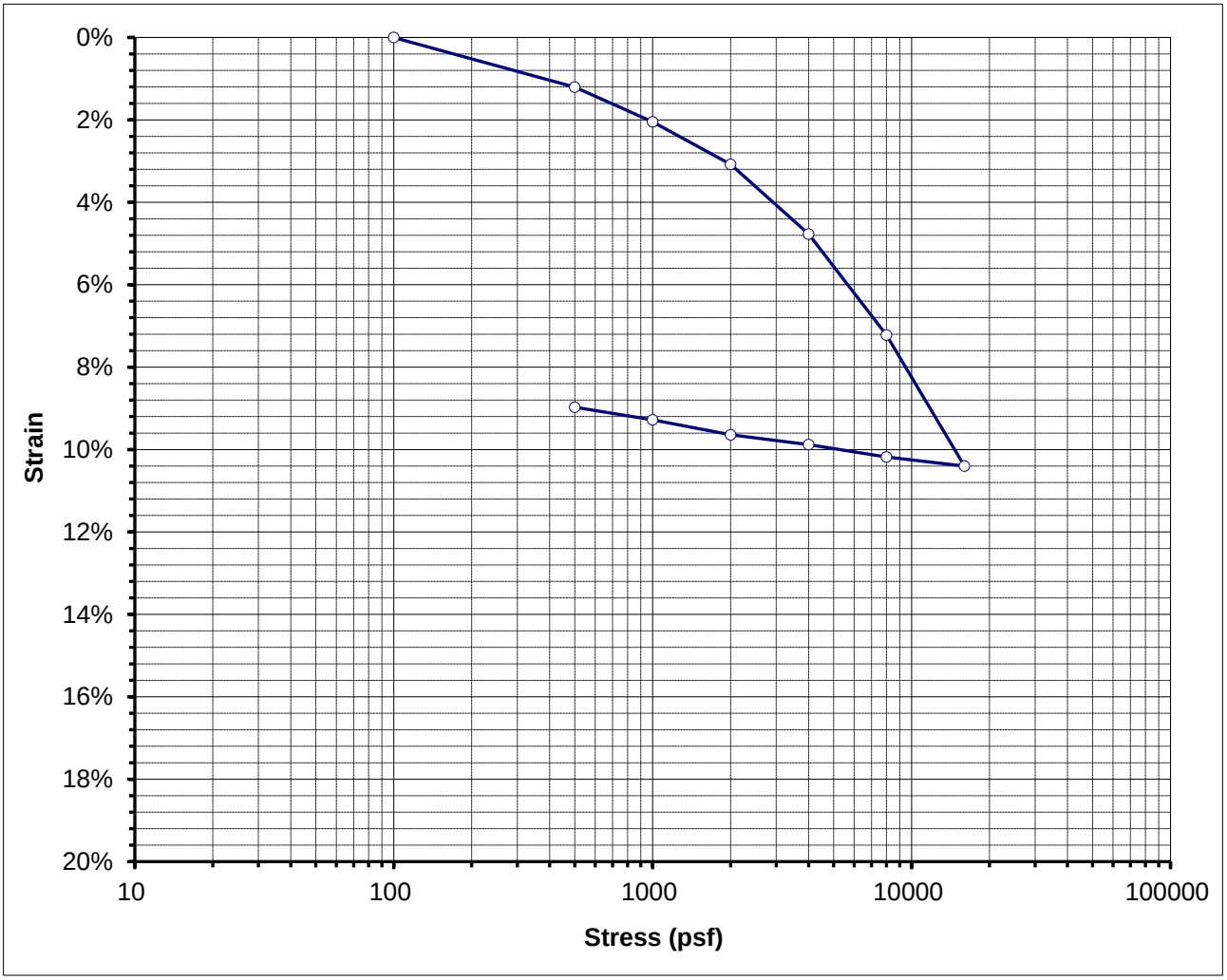
$$E.I._{(meas)} = \frac{\text{Change in High}}{\text{Initial Thickness}} \times 1000 = 74.40$$

$$\text{Expansion Index}_{(50)} = EI_{(meas.)} - (50 - S_{(meas.)}) \times \frac{65 + EI_{(meas.)}}{220 - S_{(meas.)}}$$

73	**Medium**

Expansion Index	**Potential Expansion**
0 - 20	***Very Low***
21 - 50	***Low***
51 - 90	***Medium***
91 - 130	***High***
> 130	***Very High***

CONSOLIDATION TEST RESULTS
ASTM D-2435



Boring No.	B-18	Sample Depth	20'
Sample No.	R-4	USCS	CL

BEFORE TEST

Initial Moisture Content:	30.82%	
Initial Dry Unit Wt:	90.45	pcf
Initial Total Unit Wt.:	118.33	pcf
Initial Void Ratio:	0.84	
Initial Degree of Saturation:	97.6%	

AFTER TEST

Final Moisture Content:	25.40%	
Final Dry Unit Wt:	99.33	pcf
Final Total Unit Wt.:	124.56	pcf
Final Void Ratio:	0.68	
Final Degree of Saturation:	100.0%	

Water Added at: 0 psf

ATTERBERG LIMITS					
LL=		PL=		PI=	

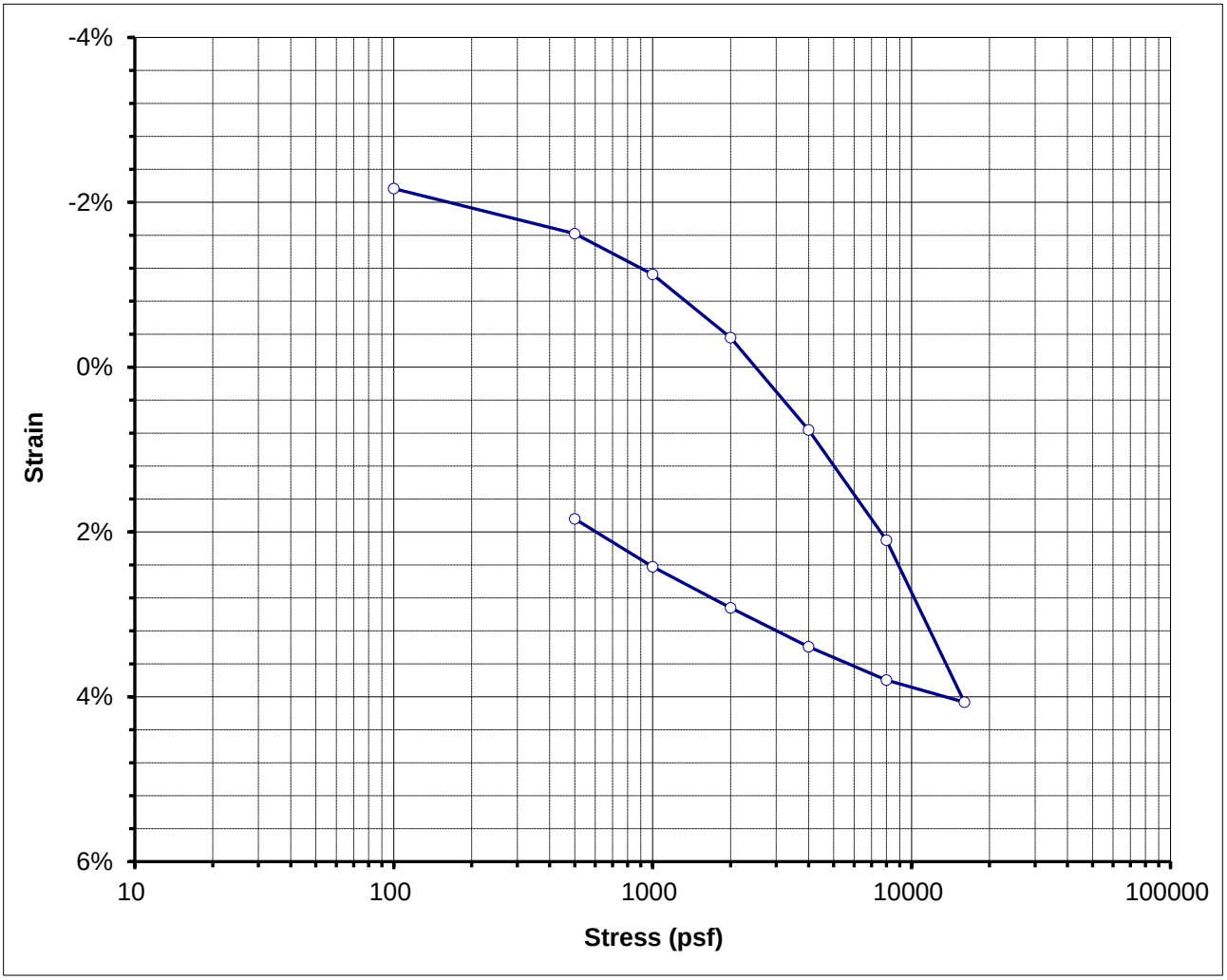
Assumed Specific Gravity of Solids, Gs: 2.67

PRESSURE (psf)	SAMPLE STRAIN	VOID RATIO
100	0.00%	0.844
500	1.20%	0.821
1000	2.05%	0.806
2000	3.08%	0.787
4000	4.77%	0.756
8000	7.22%	0.711
16000	10.40%	0.652
8000	10.18%	0.656
4000	9.88%	0.661
2000	9.64%	0.666
1000	9.28%	0.673
500	8.97%	0.678

PROJECT NUMBER:	PROJECT NAME:	FIGURE NO.
LA1579	Spring Meadows Homes, LLC	B-18 R-4

GROUP DELTA

CONSOLIDATION TEST RESULTS
ASTM D-2435



Boring No.	B-20	Sample Depth	10'
Sample No.	R-2	USCS	CL

BEFORE TEST

Initial Moisture Content:	13.57%	
Initial Dry Unit Wt:	103.45	pcf
Initial Total Unit Wt.:	117.49	pcf
Initial Void Ratio:	0.63	
Initial Degree of Saturation:	58.4%	

AFTER TEST

Final Moisture Content:	19.95%	
Final Dry Unit Wt:	105.35	pcf
Final Total Unit Wt.:	126.37	pcf
Final Void Ratio:	0.60	
Final Degree of Saturation:	90.1%	

Water Added at: 0 psf

ATTERBERG LIMITS					
LL=		PL=		PI=	

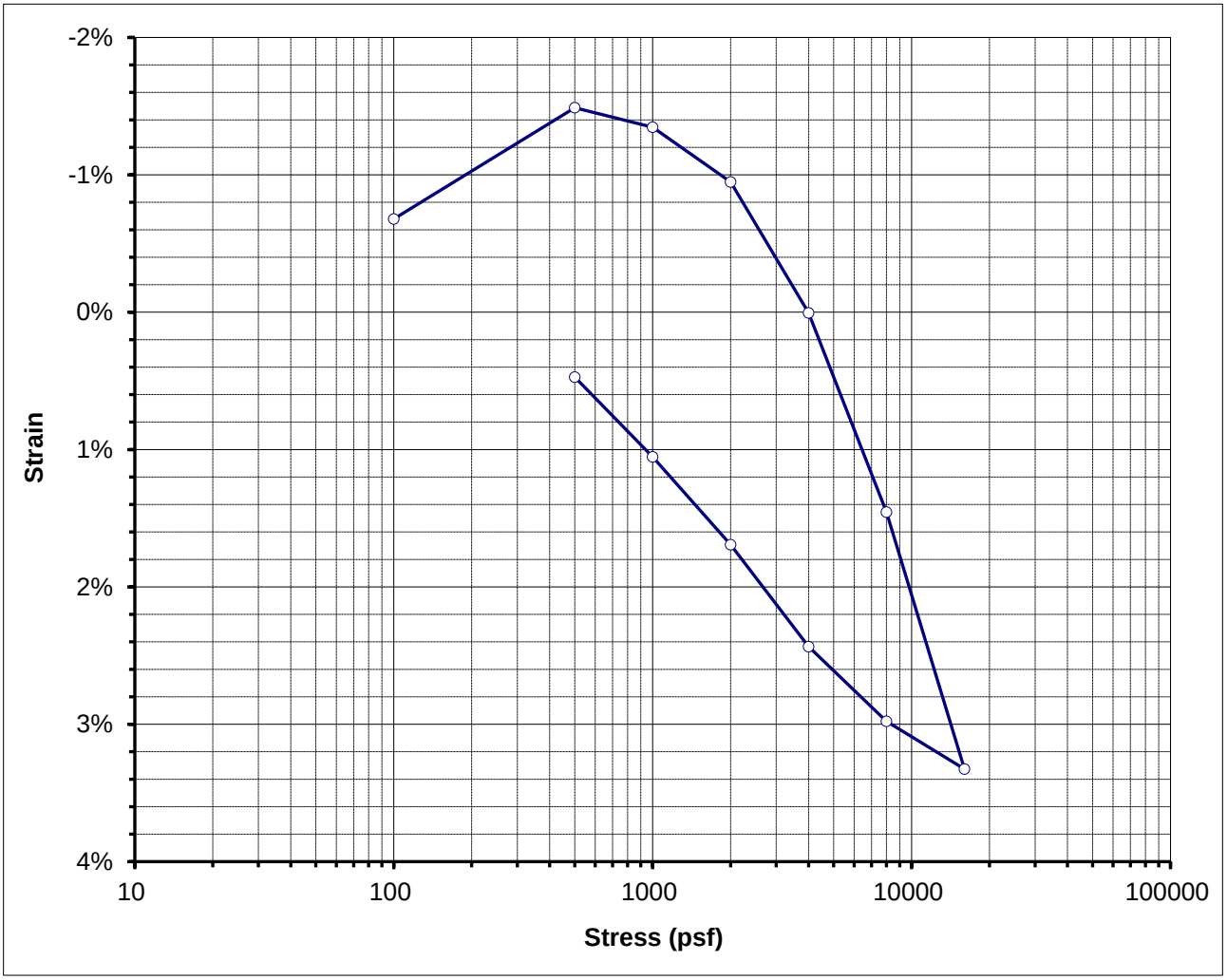
Assumed Specific Gravity of Solids, Gs: 2.70

PRESSURE (psf)	SAMPLE STRAIN	VOID RATIO
100	-2.17%	0.661
500	-1.62%	0.652
1000	-1.13%	0.644
2000	-0.36%	0.632
4000	0.76%	0.614
8000	2.10%	0.592
16000	4.07%	0.560
8000	3.80%	0.564
4000	3.39%	0.571
2000	2.92%	0.579
1000	2.42%	0.587
500	1.84%	0.596

PROJECT NUMBER:	LA1579	PROJECT NAME:	Spring Meadows Homes, LLC	FIGURE NO.	B-20 R-2

GROUP DELTA

CONSOLIDATION TEST RESULTS
ASTM D-2435



Boring No.	B-21	Sample Depth	5'
Sample No.	R-1	USCS	CL

BEFORE TEST

Initial Moisture Content:	17.14%	
Initial Dry Unit Wt:	104.93	pcf
Initial Total Unit Wt.:	122.92	pcf
Initial Void Ratio:	0.58	
Initial Degree of Saturation:	78.2%	

AFTER TEST

Final Moisture Content:	21.66%	
Final Dry Unit Wt:	105.39	pcf
Final Total Unit Wt.:	128.22	pcf
Final Void Ratio:	0.58	
Final Degree of Saturation:	100.0%	

Water Added at: 0 psf

ATTERBERG LIMITS					
LL=		PL=		PI=	

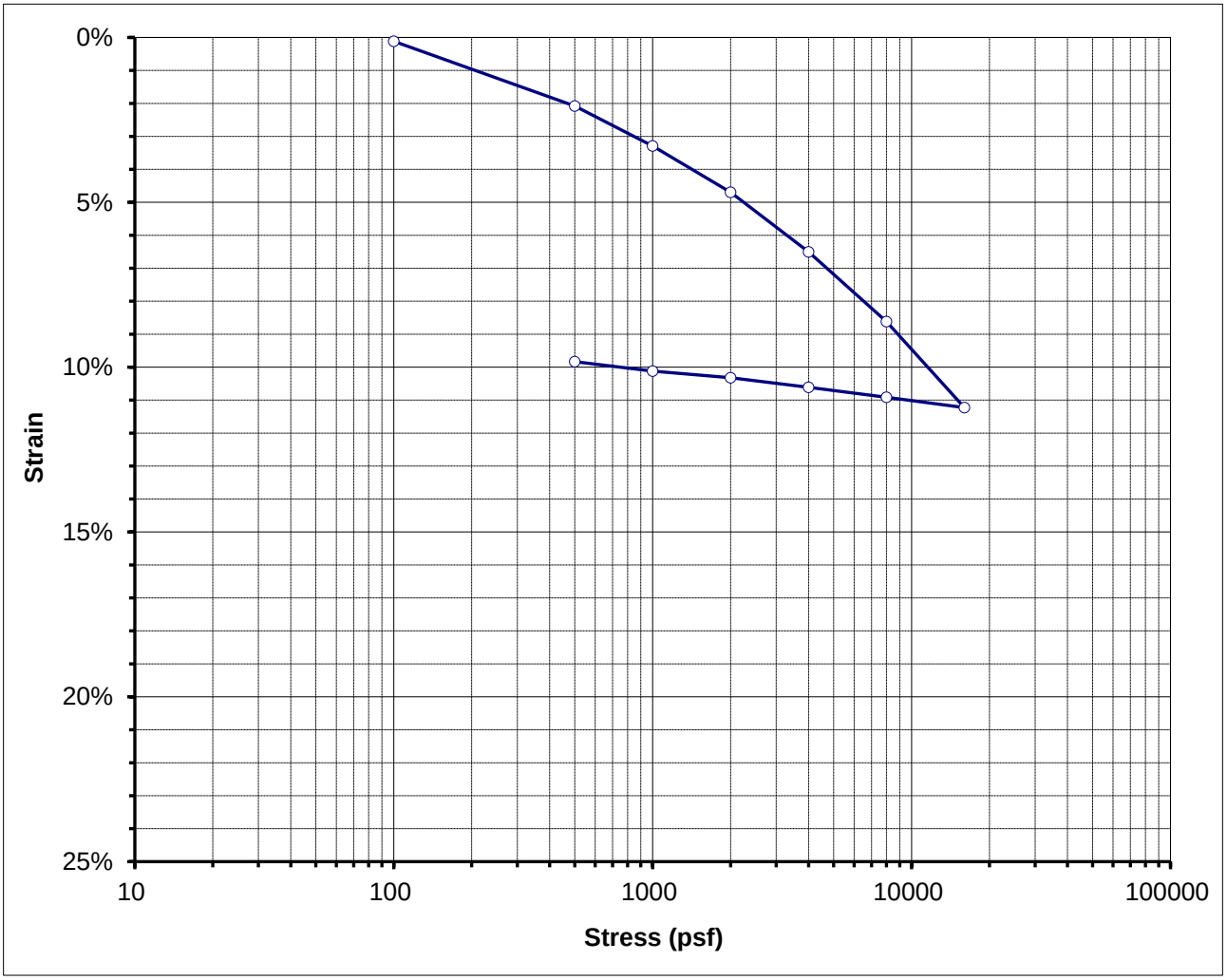
Assumed Specific Gravity of Solids, Gs: 2.66

PRESSURE (psf)	SAMPLE STRAIN	VOID RATIO
100	-0.68%	0.594
500	-1.49%	0.607
1000	-1.35%	0.605
2000	-0.95%	0.599
4000	0.01%	0.584
8000	1.46%	0.561
16000	3.33%	0.531
8000	2.98%	0.537
4000	2.43%	0.545
2000	1.69%	0.557
1000	1.05%	0.567
500	0.47%	0.576

PROJECT NUMBER:	PROJECT NAME:	FIGURE NO.
LA1579	Spring Meadows Homes, LLC	B-21 R-1

GROUP DELTA

CONSOLIDATION TEST RESULTS
ASTM D-2435



Boring No.	B-21	Sample Depth	30'
Sample No.	R-6	USCS	CL

BEFORE TEST

Initial Moisture Content:	31.10%	
Initial Dry Unit Wt:	91.10	pcf
Initial Total Unit Wt.:	119.44	pcf
Initial Void Ratio:	0.87	
Initial Degree of Saturation:	97.7%	

AFTER TEST

Final Moisture Content:	25.13%	
Final Dry Unit Wt:	101.00	pcf
Final Total Unit Wt.:	126.38	pcf
Final Void Ratio:	0.69	
Final Degree of Saturation:	100.0%	

Water Added at: 0 psf

ATTERBERG LIMITS					
LL=		PL=		PI=	

Assumed Specific Gravity of Solids, Gs: 2.73

PRESSURE (psf)	SAMPLE STRAIN	VOID RATIO
100	0.12%	0.867
500	2.08%	0.830
1000	3.29%	0.807
2000	4.70%	0.781
4000	6.51%	0.747
8000	8.62%	0.708
16000	11.23%	0.659
8000	10.92%	0.665
4000	10.61%	0.670
2000	10.32%	0.676
1000	10.12%	0.680
500	9.83%	0.685

PROJECT NUMBER:	LA1579	PROJECT NAME:	Spring Meadows Homes, LLC	FIGURE NO.	B-21 R-6

GROUP DELTA

APPENDIX C

PREVIOUS FIELD INVESTIGATION AND LABORATORY TESTING

APPENDIX C – PREVIOUS FIELD INVESTIGATION DATA & LABORATORY TESTING RESULTS

APPENDIX C

PREVIOUS FIELD INVESTIGATION & LABORATORY TESTING

C.1 INTRODUCTION

Group Delta previously conducted subsurface explorations as part of prior geotechnical investigations at the project site (Project Nos. 1148 and 1148B) on July 19, 2013 and September 4, 2013. The investigation consisted of a total of nine hollow stem auger borings and eight cone penetration tests. The exploration locations are shown in Figure 2 of the main report. A summary of the field investigations is provided in Table C-1.

The laboratory testing program performed for this previous investigation included Moisture Content, Dry Unit Weight, Atterberg Limits, Percent Passing No. 200 Sieve, Consolidation, Direct Shear, Pocket Penetrometer, Expansion Index, and Corrosivity. Results of these tests have been attached as part of this Appendix.

C.2 SOIL BORINGS

Nine hollow stem auger borings were advanced to depths of 20-51.5 feet below ground surface. Subsurface materials were visually classified and recorded by GDC field engineer and geologist in accordance with the Unified Soil Classification System (USCS).

Drive samples and bulk samples of the encountered materials were obtained from the borings and recorded on the boring logs. Drive samples were obtained with a California Sampler lined with 1-inch high metal sample rings or a Standard Penetration Test (SPT) sampler. The California Sampler has an outside diameter of 3-inches, and the inside diameter of the rings is 2.42-inches. The samples were retained in brass rings and placed in sealed plastic canisters to prevent moisture loss. Standard penetration tests (SPT) were conducted using a standard 2-inch outside diameter, 1.375-inch inside diameter, split-spoon sampler in accordance with ASTM D 1586. SPT samples were placed in sealable plastic bags to protect the natural moisture. The SPT and California samplers were driven into the soil at the bottom of the borehole using a 140-pound hammer free-falling 30 inches. The penetration resistance (or “blowcount”) in blows per six inches of driving was recorded on the logs. Bulk samples were obtained by a shovel and placed into polyethylene bags. The boring logs are presented at the end of this Appendix.

C.3 CONE PENETRATION TESTS (CPT)

Four cone penetration test (CPT) soundings were conducted at the site on July 19, 2013 within the area of Lot 1. Additional four CPTs were performed in Lot 2 on September 4, 2013. The CPT soundings were advanced to practical refusal, ranging from 8 feet to 50 feet below existing grades. The CPT soundings were performed in general accordance with ASTM D3441. The locations of the soundings are shown in Figure 2 in the main report.

CPTs are advanced from the ground surface with a truck-mounted hydraulic ram that pushes a steel rod with a conical tip and a cylindrical friction-sleeve into the ground. The conical tip has a 60-degree apex angle and a projected cross-sectional area of 1.55 square inches. The cylindrical friction sleeve has a surface area of 23.25 square inches. Both the tip and the sleeve have outside diameters of 1.4 inches.

As the rod is advanced, electronic instruments measure and record both the tip resistance and the frictional resistance on the sleeve. The tip and frictional resistance are then analyzed, using available correlations, to estimate soil classification, density, strength, and compressibility of the subsurface materials. Unlike soil borings, in which drive samples are typically taken at discrete intervals, the CPT provides a continuous record of soil properties with depth. Hence, the CPT can define the subsurface soil profile with much higher resolution than a soil boring, often detecting thin layers that are easily missed with conventional drilling and sampling. The CPT logs and interpretations are presented at the end of this Appendix.

TABLE C-1

GDC FIELD EXPLORATION SUMMARY

Exploration No.	Date Performed	Ground Surface Elevation (feet, MSL)	Total Depth (ft)	Exploration Type
B-1	7/19/2013	573	30	Hollow Stem Auger
C-2	7/19/2013	572	38	Cone Penetration Test
B-3	7/19/2013	583	50	Hollow Stem Auger
C-4	7/19/2013	588	36	Cone Penetration Test
B-5	7/19/2013	640	20	Hollow Stem Auger
C-6	7/19/203	639	14	Cone Penetration Test
C-7	7/19/2013	618	8	Cone Penetration Test
B-8	9/4/2013	589	22	Hollow Stem Auger
B-9	9/4/2013	608	52	Hollow Stem Auger
C-10	9/4/2013	608	35	Cone Penetration Test
C-11	9/4/2013	609	37	Cone Penetration Test
B-12	9/4/2013	617	37	Hollow Stem Auger
B-13	9/4/2013	619	32	Hollow Stem Auger
B-14	9/4/2013	604	27	Hollow Stem Auger
C-15	9/4/2013	602	45	Cone Penetration Test
B-16	9/4/2013	603	42	Hollow Stem Auger
C-17	9/4/2013	615	50	Cone Penetration Test

KEY FOR SOIL CLASSIFICATION

UNIFIED SOIL CLASSIFICATION SYSTEM (ASTM D-2487)				
PRIMARY DIVISIONS			***GROUP SYMBOL***	***SECONDARY DIVISIONS***
COARSE GRAINED SOILS (less than 50% fines passing the No. 200 Sieve)	GRAVEL (% GRAVEL > % SAND)	CLEAN GRAVEL (Less than 5% fines)	GW	Well-graded gravel, gravel with sand, little or no fines
			GP	Poorly-graded gravel, gravel with sand, little or no fines
		"DIRTY" GRAVEL (More than 12% fines)	GM	Silty gravel, silty gravel with sand, silty or non-plastic fines
			GC	Clayey gravel, clayey gravel with sand, clayey or plastic fines
	SAND (% SAND ≥ % GRAVEL)	CLEAN SAND (Less than 5% fines)	SW	Well-graded sand, sand with gravel, little or no fines
			SP	Poorly-graded sand, sand with gravel, little or no fines
		"DIRTY" SAND (More than 12% fines)	SM	Silty sand, silty sand with gravel, silty or non-plastic fines
			SC	Clayey sand, clayey sand with gravel, clayey or plastic fines
FINE GRAINED SOILS (50% or more fines passing the No. 200 Sieve)	SILTS AND CLAYS (Liquid Limit less than 50)		ML	Inorganic silt, sandy silt, gravelly silt, or clayey silt with low plasticity
			CL	Inorganic clay of low to medium plasticity, sandy clay, gravelly clay, silty clay, Lean Clay
			OL	Low to medium plasticity Silt or Clay with significant organic content (vegetative matter)
	SILTS AND CLAYS (Liquid Limit 50 or more)		MH	Inorganic elastic silt, sandy silt, gravelly silt, or clayey silt of medium to high plasticity
			CH	Inorganic clay of high plasticity, Fat Clay
			OH	Medium to high plasticity Silt or Clay with significant organic content (vegetative matter)
HIGHLY ORGANIC SOILS			PT	Peat or other highly organic soils

Note: Dual symbols are used for coarse grained soils with 5 to 12% fines (ex: SP-SM), and for soils with Atterberg Limits falling in the CL-ML band in the Plasticity Chart. Borderline classifications between groups may be indicated by two symbols separated by a slash (ex: CL/CH, SW/GW).

CONSISTENCY CLASSIFICATION				
COARSE GRAINED SOILS		***FINE GRAINED SOILS***		
Blowcount SPT[1] (CAL)[2]	Consistency	Blowcount[3] SPT[1] (CAL)[2]	Consistency	Undrained Shear Strenth[3], S_u (ksf)
0-4 (0-6)	Very Loose	<2 (<3)	Very Soft	< 0.25
		2-4 (3-6)	Soft	0.25 -0.50
5-10 (7-15)	Loose	5-8 (7-12)	Firm	0.50 - 1.0
11-30 (16-45)	Med. Dense	9-15 (13-22)	Stiff	1.0 - 2
31-50 (46-75)	Dense	16-30 (23-45)	Very Stiff	2.0 - 4.0
>50 (>75)	Very Dense	>31 (>45)	Hard	>4.0

MOISTURE CLASSIFICATION
DRY - Absence of moisture, dusty, dry to the touch **MOIST-** Damp but no visible water **WET-** Visible free water, usually soil is below water table

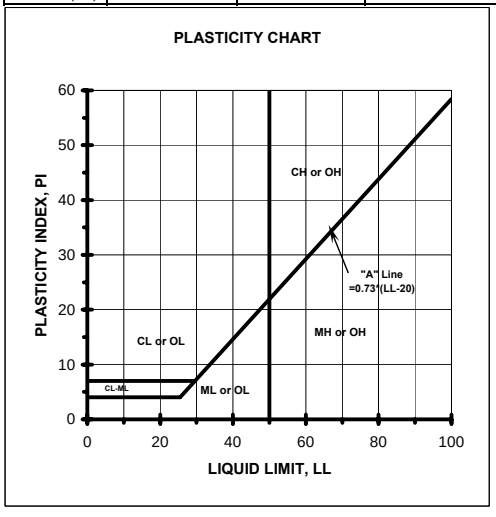
CONSISTENCY NOTES:

1. Number of blows of a 140-lb. hammer falling 30-inches to drive a 2-inch OD (1.375-inch ID) **SPT Sampler** [ASTM D-1585] the final 12-inches of driving
2. Number of blows of a 140-lb. hammer falling 30-inches to drive a 3-inch OD (2.42-inch ID) **California Ring Sampler** the final 12-inches of driving.
3. Undrained shear strength of cohesive soils predicted from field blowcounts is generally unreliable. Where possible, consistency should be based on S_u data from pocket penetrometer, torvane, or laboratory testing.

CLASSIFICATION CRITERIA BASED ON LABORATORY TESTS

Grain Size Classification

CLAY AND SILT	SAND			GRAVEL		COBBLES		BOULDERS	
	Fine	Medium	Coarse	Fine	Coarse				
US Std Sieve	**No. 200**	**No. 40**	**No. 10**	**No. 4**	**3/4"**	**3"**		**12"**		
Grain Size (mm)	0.075	0.425	2	4.75	19.1	76.2		304.8		



Classification of earth materials shown on the logs is based on field inspection and should not be construed to imply laboratory analysis unless so stated.

Granular Soil Gradation Parameters

Coefficient of Uniformity: $C_u = D_{60} / D_{10}$

Coefficient of Curvature: $C_C = (D_{30})^2 / (D_{10} \times D_{60})$

D_{10}= 10% of the soil is finer than this diameter

D_{30}= 30% of the soil is finer than this diameter

D_{30}= 60% of the soil is finer than this diameter

Group Symbol	Gradation or Plasticity Requirement
SW	C_u>6 and C_c between 1 and 3
GW	C_u>4 and C_c between 1 and 3
GP or SP	Clean gravel or sand not meeting requirement for GW or SW
GM or SM	Plots below "A" Line on Plasticity Chart or PI < 4
GC or SC	Plots above "A" Line on Plasticity Chart and PI > 7

FIGURE A- 1A

GROUP SYMBOLS AND NAMES

Graphic / Symbol	Group Names
GW	Well-graded GRAVEL Well-graded GRAVEL with SAND
GP	Poorly graded GRAVEL Poorly graded GRAVEL with SAND
GW-GM	Well-graded GRAVEL with SILT Well-graded GRAVEL with SILT and SAND
GW-GC	Well-graded GRAVEL with CLAY (or SILTY CLAY) Well-graded GRAVEL with CLAY and SAND (or SILTY CLAY and SAND)
GP-GM	Poorly graded GRAVEL with SILT Poorly graded GRAVEL with SILT and SAND
GP-GC	Poorly graded GRAVEL with CLAY (or SILTY CLAY) Poorly graded GRAVEL with CLAY and SAND (or SILTY CLAY and SAND)
GM	SILTY GRAVEL SILTY GRAVEL with SAND
GC	CLAYEY GRAVEL CLAYEY GRAVEL with SAND
GC-GM	SILTY, CLAYEY GRAVEL SILTY, CLAYEY GRAVEL with SAND
SW	Well-graded SAND Well-graded SAND with GRAVEL
SP	Poorly graded SAND Poorly graded SAND with GRAVEL
SW-SM	Well-graded SAND with SILT Well-graded SAND with SILT and GRAVEL
SW-SC	Well-graded SAND with CLAY (or SILTY CLAY) Well-graded SAND with CLAY and GRAVEL (or SILTY CLAY and GRAVEL)
SP-SM	Poorly graded SAND with SILT Poorly graded SAND with SILT and GRAVEL
SP-SC	Poorly graded SAND with CLAY (or SILTY CLAY) Poorly graded SAND with CLAY and GRAVEL (or SILTY CLAY and GRAVEL)
SM	SILTY SAND SILTY SAND with GRAVEL
SC	CLAYEY SAND CLAYEY SAND with GRAVEL
SC-SM	SILTY, CLAYEY SAND SILTY, CLAYEY SAND with GRAVEL
PT	PEAT
	COBBLES COBBLES and BOULDERS BOULDERS

Graphic / Symbol	Group Names
CL	Lean CLAY Lean CLAY with SAND Lean CLAY with GRAVEL SANDY lean CLAY SANDY lean CLAY with GRAVEL GRAVELLY lean CLAY GRAVELLY lean CLAY with SAND
CL-ML	SILTY CLAY SILTY CLAY with SAND SILTY CLAY with GRAVEL SANDY SILTY CLAY SANDY SILTY CLAY with GRAVEL GRAVELLY SILTY CLAY GRAVELLY SILTY CLAY with SAND
ML	SILT SILT with SAND SILT with GRAVEL SANDY SILT SANDY SILT with GRAVEL GRAVELLY SILT GRAVELLY SILT with SAND
OL	ORGANIC lean CLAY ORGANIC lean CLAY with SAND ORGANIC lean CLAY with GRAVEL SANDY ORGANIC lean CLAY SANDY ORGANIC lean CLAY with GRAVEL GRAVELLY ORGANIC lean CLAY GRAVELLY ORGANIC lean CLAY with SAND
OL	ORGANIC SILT ORGANIC SILT with SAND ORGANIC SILT with GRAVEL SANDY ORGANIC SILT SANDY ORGANIC SILT with GRAVEL GRAVELLY ORGANIC SILT GRAVELLY ORGANIC SILT with SAND
CH	Fat CLAY Fat CLAY with SAND Fat CLAY with GRAVEL SANDY fat CLAY SANDY fat CLAY with GRAVEL GRAVELLY fat CLAY GRAVELLY fat CLAY with SAND
MH	Elastic SILT Elastic SILT with SAND Elastic SILT with GRAVEL SANDY elastic SILT SANDY elastic SILT with GRAVEL GRAVELLY elastic SILT GRAVELLY elastic SILT with SAND
OH	ORGANIC fat CLAY ORGANIC fat CLAY with SAND ORGANIC fat CLAY with GRAVEL SANDY ORGANIC fat CLAY SANDY ORGANIC fat CLAY with GRAVEL GRAVELLY ORGANIC fat CLAY GRAVELLY ORGANIC fat CLAY with SAND
OH	ORGANIC elastic SILT ORGANIC elastic SILT with SAND ORGANIC elastic SILT with GRAVEL SANDY elastic ELASTIC SILT SANDY ORGANIC elastic SILT with GRAVEL GRAVELLY ORGANIC elastic SILT GRAVELLY ORGANIC elastic SILT with SAND
OL/OH	ORGANIC SOIL ORGANIC SOIL with SAND ORGANIC SOIL with GRAVEL SANDY ORGANIC SOIL SANDY ORGANIC SOIL with GRAVEL GRAVELLY ORGANIC SOIL GRAVELLY ORGANIC SOIL with SAND

FIELD AND LABORATORY TESTS

C	Consolidation (ASTM D 2435-04)
CL	Collapse Potential (ASTM D 5333-03)
CP	Compaction Curve (CTM 216 - 06)
CR	Corrosion, Sulfates, Chlorides (CTM 643 - 99; CTM 417 - 06; CTM 422 - 06)
CU	Consolidated Undrained Triaxial (ASTM D 4767-02)
DS	Direct Shear (ASTM D 3080-04)
EI	Expansion Index (ASTM D 4829-03)
M	Moisture Content (ASTM D 2216-05)
OC	Organic Content (ASTM D 2974-07)
P	Permeability (CTM 220 - 05)
PA	Particle Size Analysis (ASTM D 422-63 [2002])
PI	Liquid Limit, Plastic Limit, Plasticity Index (AASHTO T 89-02, AASHTO T 90-00)
PL	Point Load Index (ASTM D 5731-05)
PM	Pressure Meter
PP	Pocket Penetrometer
R	R-Value (CTM 301 - 00)
SE	Sand Equivalent (CTM 217 - 99)
SG	Specific Gravity (AASHTO T 100-06)
SL	Shrinkage Limit (ASTM D 427-04)
SW	Swell Potential (ASTM D 4546-03)
TV	Pocket Torvane
UC	Unconfined Compression - Soil (ASTM D 2166-06) Unconfined Compression - Rock (ASTM D 2938-95)
UU	Unconsolidated Undrained Triaxial (ASTM D 2850-03)
UW	Unit Weight (ASTM D 4767-04)
VS	Vane Shear (AASHTO T 223-96 [2004])

SAMPLER GRAPHIC SYMBOLS

- Standard Penetration Test (SPT)
- Standard California Sampler
- Modified California Sampler
- Shelby Tube
- Piston Sampler
- NX Rock Core
- HQ Rock Core
- Bulk Sample
- Other (see remarks)

DRILLING METHOD SYMBOLS

- Auger Drilling
- Rotary Drilling
- Dynamic Cone or Hand Driven
- Diamond Core

WATER LEVEL SYMBOLS

- First Water Level Reading (during drilling)
- Static Water Level Reading (after drilling, date)

DEFINITIONS FOR CHANGE IN MATERIAL

Term	Definition	Symbol
Material Change	Change in material is observed in the sample or core, and the location of change can be accurately measured.	———
Estimated Material Change	Change in material cannot be accurately located because either the change is gradational or because of limitations in the drilling/sampling methods used.	- - - - - - - -
Soil/Rock Boundary	Material changes from soil characteristics to rock characteristics.	~~~~~

Ref.: Caltrans Soil and Rock Logging Classification, and Presentation Manual (2010)

GROUP DELTA CONSULTANTS

GROUP DELTA CONSULTANTS, INC.
GEOTECHNICAL ENGINEERS AND GEOLOGISTS

FIGURE NUMBER **A-1B**

PROJECT NAME

PROJECT NUMBER

BORING RECORD LEGEND

BORING RECORD

PROJECT NAME	PROJECT NUMBER	HOLE ID
Brookside Equestrian	LA-1148	**B-1**

SITE LOCATION	START	FINISH	SHEET NO.
City of Walnut	7/19/2013	7/19/2013	1 of 2

DRILLING COMPANY	DRILL RIG	DRILLING METHOD	LOGGED BY	CHECKED BY
Choice		Hollow Stem Auger	EMH	YL

HAMMER TYPE (WEIGHT/DROP)	HAMMER EFFICIENCY (ERi)	BORING DIA. (in)	TOTAL DEPTH (ft)	GROUND ELEV (ft)	DEPTH/*ELEV.* GW (ft)
Hammer: 140 lbs., Drop: 30 in.	Auto	8"	30	573	▽ 27.0 / *546.0* DURING DRILLING

DRIVE SAMPLER TYPE(S) & SIZE (ID)	NOTES	AFTER DRILLING
SPT (1.4"), CAL (2.4")		▼ / *na*

DEPTH (feet)	ELEVATION (feet)	SAMPLE TYPE	SAMPLE NO.	PENETRATION RESISTANCE (BLOWS / 6 IN)	BLOW/FT "N"	MOISTURE (%)	DRY DENSITY (PCF)	PASSING #200 (%)	ATTERBERG LIMITS (LL:PL:PI)	POCKET PEN (TSF)	OTHER TESTS	DRILLING METHOD	GRAPHIC LOG	DESCRIPTION AND CLASSIFICATION
0	570		R-1	6 8 9	17	19.3	102			3.0	DS			**Artificial Fill (af)** **Lean Clay (CL)**, dark, brown, moist, very stiff, low plasticity, trace fine sand and silt.
5			S-2	6 7 7	14	15.5								**Silty Clay and Sandy Clay (CL)** brown, very stiff and hard, moist and wet, medium plasticity, trace silt and sand, some carbonate stringers.
	565		R-3	7 11 11	22	16.8	98		32 21 11		C			
10			S-4	4 4 5	9	17.9				4.0				
	560													
15			R-5	7 11 13	24	15.8	109			4.5				
	555													
20			S-6	3 5 7	12	22.4			42 19 23	3.0				
	550													

GDC_LOG_BORING_2011 BORING LOGS.GPJ GDCLOG.GDT 8/9/13

GROUP DELTA CONSULTANTS, INC.
370 Amaploa Ave., Suite 212
Torrance, CA 90501

THIS SUMMARY APPLIES ONLY AT THE LOCATION OF THIS BORING AND AT THE TIME OF DRILLING. SUBSURFACE CONDITIONS MAY DIFFER AT OTHER LOCATIONS AND MAY CHANGE AT THIS LOCATION WITH THE PASSAGE OF TIME. THE DATA PRESENTED IS A SIMPLIFICATION OF THE ACTUAL CONDITIONS ENCOUNTERED.

FIGURE

A-2 a

BORING RECORD

PROJECT NAME	PROJECT NUMBER	HOLE ID
Brookside Equestrian	LA-1148	**B-1**

SITE LOCATION	START	FINISH	SHEET NO.
City of Walnut	7/19/2013	7/19/2013	2 of 2

DRILLING COMPANY	DRILL RIG	DRILLING METHOD	LOGGED BY	CHECKED BY
Choice		Hollow Stem Auger	EMH	YL

HAMMER TYPE (WEIGHT/DROP)	HAMMER EFFICIENCY (ERi)	BORING DIA. (in)	TOTAL DEPTH (ft)	GROUND ELEV (ft)	DEPTH/*ELEV.* GW (ft)
Hammer: 140 lbs., Drop: 30 in.	Auto	8"	30	573	▽ 27.0 / *546.0* DURING DRILLING

DRIVE SAMPLER TYPE(S) & SIZE (ID)	NOTES	AFTER DRILLING
SPT (1.4"), CAL (2.4")		▼ / *na*

DEPTH (feet)	ELEVATION (feet)	SAMPLE TYPE	SAMPLE NO.	PENETRATION RESISTANCE (BLOWS / 6 IN)	BLOW/FT "N"	MOISTURE (%)	DRY DENSITY (PCF)	PASSING #200 (%)	ATTERBERG LIMITS (LL:PL:PI)	POCKET PEN (TSF)	OTHER TESTS	DRILLING METHOD	GRAPHIC LOG	DESCRIPTION AND CLASSIFICATION
			R-7	10 10 12	22	33.5	84			3.0				
	545													
30			S-8	3 4 10	14	30.4								
	540													Total depth: 30 ft. Groundwater encountered at 27 feet. Boring backfilled with tamped cuttings.
35														
	535													
40														
	530													
45														
	525													

GDC_LOG_BORING_2011 BORING LOGS.GPJ GDCLOG.GDT 8/9/13

GROUP DELTA CONSULTANTS, INC.
370 Amaploa Ave., Suite 212
Torrance, CA 90501

THIS SUMMARY APPLIES ONLY AT THE LOCATION OF THIS BORING AND AT THE TIME OF DRILLING. SUBSURFACE CONDITIONS MAY DIFFER AT OTHER LOCATIONS AND MAY CHANGE AT THIS LOCATION WITH THE PASSAGE OF TIME. THE DATA PRESENTED IS A SIMPLIFICATION OF THE ACTUAL CONDITIONS ENCOUNTERED.

FIGURE

A-2 b

BORING RECORD

PROJECT NAME	PROJECT NUMBER	HOLE ID
Brookside Equestrian	LA-1148	**B-3**

SITE LOCATION	START	FINISH	SHEET NO.
City of Walnut	7/19/2013	7/19/2013	1 of 3

DRILLING COMPANY	DRILL RIG	DRILLING METHOD	LOGGED BY	CHECKED BY
Choice		Hollow Stem Auger	EMH	YL

HAMMER TYPE (WEIGHT/DROP)	HAMMER EFFICIENCY (ERi)	BORING DIA. (in)	TOTAL DEPTH (ft)	GROUND ELEV (ft)	DEPTH/*ELEV.* GW (ft)
Hammer: 140 lbs., Drop: 30 in.	Auto	8"	50	583	▽ 34.5 / *548.5* DURING DRILLING

DRIVE SAMPLER TYPE(S) & SIZE (ID)	NOTES	AFTER DRILLING
SPT (1.4"), CAL (2.4")		▼ / *na*

DEPTH (feet)	ELEVATION (feet)	SAMPLE TYPE	SAMPLE NO.	PENETRATION RESISTANCE (BLOWS / 6 IN)	BLOW/FT "N"	MOISTURE (%)	DRY DENSITY (PCF)	PASSING #200 (%)	ATTERBERG LIMITS (LL:PL:PI)	POCKET PEN (TSF)	OTHER TESTS	DRILLING METHOD	GRAPHIC LOG	DESCRIPTION AND CLASSIFICATION
														Artificial Fill (af)
														Sandy Silt (ML), tannish brown, slightly moist, low plasticity, some grave and sand, trace clay.
														Lean Clay (CL), brown, moist, medium plasticity, some carbonate stringers, trace sand.
	580		R-1	14 14 14	28	12.0	112			4.0	DS			
5			S-2	3 3 4	7	17.1				4.0				
	575		R-3	7 13 15	28	18.5	106		45 18 27	4.5	C			
10			S-4	4 5 6	11	16.2			45 18 27	4.0				
	570													
15			R-5	7 15 17	32	16.0	107		34 18 16	4.5	C			
	565													
20			S-6	6 7 9	16	15.7				4.0				
	560													

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FIGURE
A-3 a

BORING RECORD

PROJECT NAME	PROJECT NUMBER	HOLE ID
Brookside Equestrian	LA-1148	**B-3**

SITE LOCATION	START	FINISH	SHEET NO.
City of Walnut	7/19/2013	7/19/2013	2 of 3

DRILLING COMPANY	DRILL RIG	DRILLING METHOD	LOGGED BY	CHECKED BY
Choice		Hollow Stem Auger	EMH	YL

HAMMER TYPE (WEIGHT/DROP)	HAMMER EFFICIENCY (ERi)	BORING DIA. (in)	TOTAL DEPTH (ft)	GROUND ELEV (ft)	DEPTH/*ELEV.* GW (ft)
Hammer: 140 lbs., Drop: 30 in.	Auto	8"	50	583	▽ 34.5 / *548.5* DURING DRILLING

DRIVE SAMPLER TYPE(S) & SIZE (ID)	NOTES	AFTER DRILLING
SPT (1.4"), CAL (2.4")		▼ / *na*

DEPTH (feet)	ELEVATION (feet)	SAMPLE TYPE	SAMPLE NO.	PENETRATION RESISTANCE (BLOWS / 6 IN)	BLOW/FT "N"	MOISTURE (%)	DRY DENSITY (PCF)	PASSING #200 (%)	ATTERBERG LIMITS (LL:PL:PI)	POCKET PEN (TSF)	OTHER TESTS	DRILLING METHOD	GRAPHIC LOG	DESCRIPTION AND CLASSIFICATION
			R-7	10 17 19	36	18.8	107			4.5				
	555													
30			S-8	15 19 23	42	21.4								
	550													
35			R-9	50/3"		21.6	99							**Claystone**, grey and brown, thinly laminated, mildy fissile, interbedded with sandstone interbeds.
	545													
40			S-10	15 37 43	80	30								
	540													
45			R-11	31 50/4"		27.1	93							
	535													

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FIGURE

A-3 b

BORING RECORD

PROJECT NAME	PROJECT NUMBER	HOLE ID
Brookside Equestrian	LA-1148	**B-3**

SITE LOCATION	START	FINISH	SHEET NO.
City of Walnut	7/19/2013	7/19/2013	3 of 3

DRILLING COMPANY	DRILL RIG	DRILLING METHOD	LOGGED BY	CHECKED BY
Choice		Hollow Stem Auger	EMH	YL

HAMMER TYPE (WEIGHT/DROP)	HAMMER EFFICIENCY (ERi)	BORING DIA. (in)	TOTAL DEPTH (ft)	GROUND ELEV (ft)	DEPTH/*ELEV.* GW (ft)
Hammer: 140 lbs., Drop: 30 in.	Auto	8"	50	583	▽ 34.5 / *548.5* DURING DRILLING

DRIVE SAMPLER TYPE(S) & SIZE (ID)	NOTES	AFTER DRILLING
SPT (1.4"), CAL (2.4")		▼ / *na*

DEPTH (feet)	ELEVATION (feet)	SAMPLE TYPE	SAMPLE NO.	PENETRATION RESISTANCE (BLOWS / 6 IN)	BLOW/FT "N"	MOISTURE (%)	DRY DENSITY (PCF)	PASSING #200 (%)	ATTERBERG LIMITS (LL:PL:PI)	POCKET PEN (TSF)	OTHER TESTS	DRILLING METHOD	GRAPHIC LOG	DESCRIPTION AND CLASSIFICATION
		X	S-12	31 50/2"		28.7								Total depth: 50 Ft. Groundwater encountered at 34.5 feet. Boring backfilled with tamped cuttings.
	530													
55														
	525													
60														
	520													
65														
	515													
70														
	510													

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FIGURE

A-3 c

BORING RECORD

PROJECT NAME	PROJECT NUMBER	HOLE ID
Brookside Equestrian	LA-1148	**B-5**

SITE LOCATION	START	FINISH	SHEET NO.
City of Walnut	7/19/2013	7/19/2013	1 of 1

DRILLING COMPANY	DRILL RIG	DRILLING METHOD	LOGGED BY	CHECKED BY
Choice		Hollow Stem Auger	EMH	YL

HAMMER TYPE (WEIGHT/DROP)	HAMMER EFFICIENCY (ERi)	BORING DIA. (in)	TOTAL DEPTH (ft)	GROUND ELEV (ft)	DEPTH/*ELEV.* GW (ft)
Hammer: 140 lbs., Drop: 30 in.	Auto	8"	20	640	▽ / *na* DURING DRILLING

DRIVE SAMPLER TYPE(S) & SIZE (ID)	NOTES	
SPT (1.4"), CAL (2.4")		▼ / *na* AFTER DRILLING

DEPTH (feet)	ELEVATION (feet)	SAMPLE TYPE	SAMPLE NO.	PENETRATION RESISTANCE (BLOWS / 6 IN)	BLOW/FT "N"	MOISTURE (%)	DRY DENSITY (PCF)	PASSING #200 (%)	ATTERBERG LIMITS (LL:PL:PI)	POCKET PEN (TSF)	OTHER TESTS	DRILLING METHOD	GRAPHIC LOG	DESCRIPTION AND CLASSIFICATION
			R-1	16 18 22	40	15.2	108							**Sandy Silt (ML)**, light brown, slightly moist, some gravels, possible weathered zone of formation.
5	635		S-2	19 24 30	54	7.9								- with lamination of dark brown silty clay, medium plasticity.
			R-3	5 50/6"		5.4	106							**Sandstone**, tannish brown, weathered, slightly moist, heavily fractured.
10	630		S-4	12 15 18	33	6.6								- hard drilling
15	625		R-5	50/3"		3.0	148							- conglomerate ? gravel to cobble size clasts with sandy silt matrix.
20	620		S-6	60/6"										- no recovery
														Total depth: 20 feet. Groundwater not encountered. Backfilled with cutting.

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FIGURE
A-4

BORING RECORD

PROJECT NAME	PROJECT NUMBER	HOLE ID
Brookside Equestrian - Lot 2	LA-1148B	**B-8**

SITE LOCATION	START	FINISH	SHEET NO.
800 Meadow Pass Rd., Walnut, CA	9/4/2013	9/4/2013	1 of 1

DRILLING COMPANY	DRILL RIG	DRILLING METHOD	LOGGED BY	CHECKED BY
Choice Drilling	CME 75	Hollow Stem Auger	S. Stone	Y. Liu

HAMMER TYPE (WEIGHT/DROP)	HAMMER EFFICIENCY (ERi)	BORING DIA. (in)	TOTAL DEPTH (ft)	GROUND ELEV (ft)	DEPTH/*ELEV.* GW (ft)
Hammer: 140 lbs., Drop: 30 in.	85	8"	21.5	589	▽ / *na* DURING DRILLING

DRIVE SAMPLER TYPE(S) & SIZE (ID)	NOTES	
SPT (1.4"), CAL (2.4")	N60=1.42*Nspt=0.95*Ncal	▼ / *na* AFTER DRILLING

DEPTH (feet)	ELEVATION (feet)	SAMPLE TYPE	SAMPLE NO.	PENETRATION RESISTANCE (BLOWS / 6 IN)	BLOW/FT "N"	MOISTURE (%)	DRY DENSITY (PCF)	PASSING #200 (%)	ATTERBERG LIMITS (LL:PL:PI)	POCKET PEN (TSF)	OTHER TESTS	DRILLING METHOD	GRAPHIC LOG	DESCRIPTION AND CLASSIFICATION
														Silty CLAY (CL), tan, moist, mostly fines, low to medium plasticity.
			R-2	18 26 32	58	12.2	119			4.5				- Hard, light brown and white, with Claystone fragments.
	585													
5			R-3	28 35 45	80	25.0	88			4.5				**Lean CLAY (CL)** hard, dark brown, moist, mostly fines, few pores, caliche stringers, and coarse angular sand, low to medium plasticity.
			S-4	5 6 6	12	11.1				2.5				**Silty SAND (SM),** medium dense, brown, moist, mostly sand, some fines.
	580													
10			R-5	12 15 20	35	12.2	114	40		2.5				- Dense, with micropores
	575													
15			S-6	4 5 5	10	10.1								- Medium dense, medium to light brown, nonplastic.
	570													**Sandy Lean CLAY (CL)** hard, medium to reddish brown, moist, mostly fines, some fine sand, low to medium plasticity.
20			R-7	15 18 23	41	12.7	110			4.5				
														Boring terminated at 21.5 feet bgs. Groundwater not envountered. Boring backfilled with soil cuttings and tamped.
	565													

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FIGURE
A-5

BORING RECORD

PROJECT NAME	PROJECT NUMBER	HOLE ID
Brookside Equestrian - Lot 2	LA-1148B	**B-9**

SITE LOCATION	START	FINISH	SHEET NO.
800 Meadow Pass Rd., Walnut, CA	9/4/2013	9/4/2013	1 of 3

DRILLING COMPANY	DRILL RIG	DRILLING METHOD	LOGGED BY	CHECKED BY
Choice Drilling	CME 75	Hollow Stem Auger	S. Stone	Y. Liu

HAMMER TYPE (WEIGHT/DROP)	HAMMER EFFICIENCY (ERi)	BORING DIA. (in)	TOTAL DEPTH (ft)	GROUND ELEV (ft)	DEPTH/*ELEV.* GW (ft)
Hammer: 140 lbs., Drop: 30 in.	85	8"	51.5	608	▽ 30.5 / *577.5* DURING DRILLING

DRIVE SAMPLER TYPE(S) & SIZE (ID)	NOTES	AFTER DRILLING
SPT (1.4"), CAL (2.4")	N60=1.42*Nspt=0.95*Ncal	▼ / *na*

DEPTH (feet)	ELEVATION (feet)	SAMPLE TYPE	SAMPLE NO.	PENETRATION RESISTANCE (BLOWS / 6 IN)	BLOW/FT "N"	MOISTURE (%)	DRY DENSITY (PCF)	PASSING #200 (%)	ATTERBERG LIMITS (LL:PL:PI)	POCKET PEN (TSF)	OTHER TESTS	DRILLING METHOD	GRAPHIC LOG	DESCRIPTION AND CLASSIFICATION
														Sandy Lean CLAY (CL) light brown, moist; mostly fines, some sand, low to medium plasticity.
	605		R-2	8 10 10	20	29.7	88			2.5				- Stiff, light brown and gray fragments, orange mottling.
5			S-3	4 5 5	10	23.5				4.0				**Lean CLAY with SAND (CL)** very stiff, dark brown, moist, mostly fines, little fine sand, medium plasticity.
	600		R-4	16 20 26	46	19.1	106			4.5				- Hard.
10			S-5	4 5 6	11	18.4			45 18 27	3.5				- Very stiff, medium brown, fine to coarse sand, few gravel fragments.
	595													
15			R-6	10 12 15	27	27.8	91			4.0				- Dark brown, litlte angular coarse sand, medium plasticity.
	590													
20			S-7	20 38 50/5"	88/11"	29.9								CLAYSTONE, hard, laminated, light gray with orange oxide, weathered, moist.
	585													

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FIGURE
A-6 a

BORING RECORD

PROJECT NAME	PROJECT NUMBER	HOLE ID
Brookside Equestrian - Lot 2	LA-1148B	**B-9**

SITE LOCATION	START	FINISH	SHEET NO.
800 Meadow Pass Rd., Walnut, CA	9/4/2013	9/4/2013	2 of 3

DRILLING COMPANY	DRILL RIG	DRILLING METHOD	LOGGED BY	CHECKED BY
Choice Drilling	CME 75	Hollow Stem Auger	S. Stone	Y. Liu

HAMMER TYPE (WEIGHT/DROP)	HAMMER EFFICIENCY (ERi)	BORING DIA. (in)	TOTAL DEPTH (ft)	GROUND ELEV (ft)	DEPTH/*ELEV.* GW (ft)
Hammer: 140 lbs., Drop: 30 in.	85	8"	51.5	608	▽ 30.5 / *577.5* DURING DRILLING

DRIVE SAMPLER TYPE(S) & SIZE (ID)	NOTES	AFTER DRILLING
SPT (1.4"), CAL (2.4")	N60=1.42*Nspt=0.95*Ncal	▼ / *na*

DEPTH (feet)	ELEVATION (feet)	SAMPLE TYPE	SAMPLE NO.	PENETRATION RESISTANCE (BLOWS / 6 IN)	BLOW/FT "N"	MOISTURE (%)	DRY DENSITY (PCF)	PASSING #200 (%)	ATTERBERG LIMITS (LL:PL:PI)	POCKET PEN (TSF)	OTHER TESTS	DRILLING METHOD	GRAPHIC LOG	DESCRIPTION AND CLASSIFICATION
			R-8	28 50/6"	50/6"	33.6	85							
	580													
30			S-9	30 50/4"	50/4"	46.5								
	575													
35			R-10	50/6"	REF	30.6	85							
	570													
40			S-11	15 18 30	48	32.2				2.0				- Very stiff.
	565													
45			R-12	40 50/4"	50/4"	20.2	100							
	560													

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FIGURE
A-6 b

BORING RECORD

PROJECT NAME	PROJECT NUMBER	HOLE ID
Brookside Equestrian - Lot 2	LA-1148B	**B-9**

SITE LOCATION	START	FINISH	SHEET NO.
800 Meadow Pass Rd., Walnut, CA	9/4/2013	9/4/2013	3 of 3

DRILLING COMPANY	DRILL RIG	DRILLING METHOD	LOGGED BY	CHECKED BY
Choice Drilling	CME 75	Hollow Stem Auger	S. Stone	Y. Liu

HAMMER TYPE (WEIGHT/DROP)	HAMMER EFFICIENCY (ERi)	BORING DIA. (in)	TOTAL DEPTH (ft)	GROUND ELEV (ft)	DEPTH/*ELEV.* GW (ft)
Hammer: 140 lbs., Drop: 30 in.	85	8"	51.5	608	▽ 30.5 / *577.5* DURING DRILLING

DRIVE SAMPLER TYPE(S) & SIZE (ID)	NOTES	AFTER DRILLING
SPT (1.4"), CAL (2.4")	N60=1.42*Nspt=0.95*Ncal	▼ / *na*

DEPTH (feet)	ELEVATION (feet)	SAMPLE TYPE	SAMPLE NO.	PENETRATION RESISTANCE (BLOWS / 6 IN)	BLOW/FT "N"	MOISTURE (%)	DRY DENSITY (PCF)	PASSING #200 (%)	ATTERBERG LIMITS (LL:PL:PI)	POCKET PEN (TSF)	OTHER TESTS	DRILLING METHOD	GRAPHIC LOG	DESCRIPTION AND CLASSIFICATION
		X	S-13	16 28 40	68	33.2				2.0				- Cemented, moderately fractured, gray with some weathering on fracture and bedding surfaces.
														Boring terminated at 51.5 feet bgs. Groundwater encountered at 30.5 feet bgs. Boring backfilled with soil cuttings and tamped.
	555													
55														
	550													
60														
	545													
65														
	540													
70														
	535													

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FIGURE

A-6 c

BORING RECORD

PROJECT NAME	PROJECT NUMBER	HOLE ID
Brookside Equestrian - Lot 2	LA-1148B	**B-12**

SITE LOCATION	START	FINISH	SHEET NO.
800 Meadow Pass Rd., Walnut, CA	9/4/2013	9/4/2013	1 of 2

DRILLING COMPANY	DRILL RIG	DRILLING METHOD	LOGGED BY	CHECKED BY
Choice Drilling	CME 75	Hollow Stem Auger	S. Stone	Y. Liu

HAMMER TYPE (WEIGHT/DROP)	HAMMER EFFICIENCY (ERi)	BORING DIA. (in)	TOTAL DEPTH (ft)	GROUND ELEV (ft)	DEPTH/*ELEV.* GW (ft)
Hammer: 140 lbs., Drop: 30 in.	85	8"	36.5	617	▽ / *na* DURING DRILLING

DRIVE SAMPLER TYPE(S) & SIZE (ID)	NOTES	
SPT (1.4"), CAL (2.4")	N60=1.42*Nspt=0.95*Ncal	▼ / *na* AFTER DRILLING

DEPTH (feet)	ELEVATION (feet)	SAMPLE TYPE	SAMPLE NO.	PENETRATION RESISTANCE (BLOWS / 6 IN)	BLOW/FT "N"	MOISTURE (%)	DRY DENSITY (PCF)	PASSING #200 (%)	ATTERBERG LIMITS (LL:PL:PI)	POCKET PEN (TSF)	OTHER TESTS	DRILLING METHOD	GRAPHIC LOG	DESCRIPTION AND CLASSIFICATION
	615													**Fat CLAY (CH)** light olive tan, moist, mostly fines, high plasticity.
			R-2	4 11 15	26	29.5	85			4				- Very stiff, oxidized orange and black angular claystone fragments.
5			R-3	10 14 17	31	30.6	84		65 30 35	4	C			
	610		S-4	3 4 4	8	31.5				2				- Abundant light brown with orange mottling angular claystone fragments.
10			R-5	7 9 12	21	34.7	79		63 34 29	1	C			**Elastic SILT (MH)** medium stiff, medium to light brown, wet, mostly fines, few angular claystone fragments, high plasticity.
	605													**Lean CLAY**, very stiff, dark brown, moist, mostly fines, few claystone fragments, low to medium plasticity.
15			S-6	5 6 8	14	26.1				3				
	600													
20			R-7	15 19 26	45	18.1	105			4.5				- Hard, medium brown, abundant caliche stringers, low plasticity.
	595													

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FIGURE
A-7 a

BORING RECORD

PROJECT NAME	PROJECT NUMBER	HOLE ID
Brookside Equestrian - Lot 2	LA-1148B	**B-12**

SITE LOCATION	START	FINISH	SHEET NO.
800 Meadow Pass Rd., Walnut, CA	9/4/2013	9/4/2013	2 of 2

DRILLING COMPANY	DRILL RIG	DRILLING METHOD	LOGGED BY	CHECKED BY
Choice Drilling	CME 75	Hollow Stem Auger	S. Stone	Y. Liu

HAMMER TYPE (WEIGHT/DROP)	HAMMER EFFICIENCY (ERi)	BORING DIA. (in)	TOTAL DEPTH (ft)	GROUND ELEV (ft)	DEPTH/*ELEV.* GW (ft)
Hammer: 140 lbs., Drop: 30 in.	85	8"	36.5	617	▽ / *na* DURING DRILLING

DRIVE SAMPLER TYPE(S) & SIZE (ID)	NOTES	
SPT (1.4"), CAL (2.4")	N60=1.42*Nspt=0.95*Ncal	▼ / *na* AFTER DRILLING

DEPTH (feet)	ELEVATION (feet)	SAMPLE TYPE	SAMPLE NO.	PENETRATION RESISTANCE (BLOWS / 6 IN)	BLOW/FT "N"	MOISTURE (%)	DRY DENSITY (PCF)	PASSING #200 (%)	ATTERBERG LIMITS (LL:PL:PI)	POCKET PEN (TSF)	OTHER TESTS	DRILLING METHOD	GRAPHIC LOG	DESCRIPTION AND CLASSIFICATION
			S-8	9 10 12	22	27.5				4.5				
	590													**CLAYSTONE**, very stiff, very light brown, laminated, fractured.
30			R-9	18 25 32	57	21.7	98			3				
	585													
35			S-10	10 12 16	28	34.1				2.5				- Gray with orange oxides on fracture surfaces.
	580													Boring terminated at 36.5 feet bgs. Groundwater not encountered. Boring backfilled with soil cuttings and tamped.
40														
	575													
45														
	570													

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FIGURE

A-7 b

BORING RECORD

PROJECT NAME	PROJECT NUMBER	HOLE ID
Brookside Equestrian - Lot 2	LA-1148B	**B-13**

SITE LOCATION	START	FINISH	SHEET NO.
800 Meadow Pass Rd., Walnut, CA	9/4/2013	9/4/2013	1 of 2

DRILLING COMPANY	DRILL RIG	DRILLING METHOD	LOGGED BY	CHECKED BY
Choice Drilling	CME 75	Hollow Stem Auger	S. Stone	Y. Liu

HAMMER TYPE (WEIGHT/DROP)	HAMMER EFFICIENCY (ERi)	BORING DIA. (in)	TOTAL DEPTH (ft)	GROUND ELEV (ft)	DEPTH/*ELEV.* GW (ft)
Hammer: 140 lbs., Drop: 30 in.	85	8"	31.5	619	▽ 28.0 / *591.0* DURING DRILLING

DRIVE SAMPLER TYPE(S) & SIZE (ID)	NOTES	AFTER DRILLING
SPT (1.4"), CAL (2.4")	N60=1.42*Nspt=0.95*Ncal	▼ / *na*

DEPTH (feet)	ELEVATION (feet)	SAMPLE TYPE	SAMPLE NO.	PENETRATION RESISTANCE (BLOWS / 6 IN)	BLOW/FT "N"	MOISTURE (%)	DRY DENSITY (PCF)	PASSING #200 (%)	ATTERBERG LIMITS (LL:PL:PI)	POCKET PEN (TSF)	OTHER TESTS	DRILLING METHOD	GRAPHIC LOG	DESCRIPTION AND CLASSIFICATION
														Lean CLAY (CL) tan, moist, mostly fines, medium plasticity.
			R-2	13 14 15	29	13.4	112		37 17 20	4.5				- Hard, dark brown, moist, little caliche and few coarse sand.
	615													
5			S-3	3 4 6	10	12.2				4.5				
			R-4	11 14 18	32	12.5	109			4.5				**Sandy CLAY (CL)** hard, medium brown, mostly fines, some sand, moist, low plasticity, little caliche.
	610													
10			S-5	4 5 6	11	13.0				4				- Very stiff, light brown with yellow brown.
	605													
15			R-6	11 13 15	28	12.8	99			4.5				- Hard, light to medium brown, some caliche.
	600													
20			S-7	7 7 8	16	18.9				4.5				
	595													

GDC_LOG_BORING_2011 BORING LOGS.GPJ GDCLOG.GDT 10/3/13

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370 Amaploa Ave., Suite 212
Torrance, CA 90501

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FIGURE
A-8 a

BORING RECORD

PROJECT NAME Brookside Equestrian - Lot 2		**PROJECT NUMBER** LA-1148B	**HOLE ID** **B-13**
SITE LOCATION 800 Meadow Pass Rd., Walnut, CA	**START** 9/4/2013	**FINISH** 9/4/2013	**SHEET NO.** 2 of 2
DRILLING COMPANY Choice Drilling	**DRILL RIG** CME 75	**DRILLING METHOD** Hollow Stem Auger	**LOGGED BY** S. Stone	**CHECKED BY** Y. Liu
HAMMER TYPE (WEIGHT/DROP) Hammer: 140 lbs., Drop: 30 in.	**HAMMER EFFICIENCY (ERi)** 85	**BORING DIA. (in)** 8"	**TOTAL DEPTH (ft)** 31.5	**GROUND ELEV (ft)** 619	**DEPTH/*ELEV.* GW (ft)** ▽ 28.0 / *591.0* **DURING DRILLING**
DRIVE SAMPLER TYPE(S) & SIZE (ID) SPT (1.4"), CAL (2.4")	**NOTES** N60=1.42*Nspt=0.95*Ncal				**AFTER DRILLING** ▼ / *na*

DEPTH (feet)	ELEVATION (feet)	SAMPLE TYPE	SAMPLE NO.	PENETRATION RESISTANCE (BLOWS / 6 IN)	BLOW/FT "N"	MOISTURE (%)	DRY DENSITY (PCF)	PASSING #200 (%)	ATTERBERG LIMITS (LL:PL:PI)	POCKET PEN (TSF)	OTHER TESTS	DRILLING METHOD	GRAPHIC LOG	DESCRIPTION AND CLASSIFICATION
			R-8	18 28 40	68	19.8	104			4.5				▽ SANDSTONE, weathered.
30	590		S-9	8 9 13	22	20.7								Boring terminated at 31.5 feet bgs. Groundwater encountered at 28 feet bgs. Boring backfilled with soil cutting and tamped.
35	585													
40	580													
45	575													
	570													

GDC_LOG_BORING_2011 BORING LOGS.GPJ GDCLOG.GDT 10/3/13

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FIGURE
A-8 b

BORING RECORD

PROJECT NAME	PROJECT NUMBER	HOLE ID
Brookside Equestrian - Lot 2	LA-1148B	**B-14**

SITE LOCATION	START	FINISH	SHEET NO.
800 Meadow Pass Rd., Walnut, CA	9/4/2013	9/4/2013	1 of 2

DRILLING COMPANY	DRILL RIG	DRILLING METHOD	LOGGED BY	CHECKED BY
Choice Drilling	CME 75	Hollow Stem Auger	S. Stone	Y. Liu

HAMMER TYPE (WEIGHT/DROP)	HAMMER EFFICIENCY (ERi)	BORING DIA. (in)	TOTAL DEPTH (ft)	GROUND ELEV (ft)	DEPTH/*ELEV.* GW (ft)
Hammer: 140 lbs., Drop: 30 in.	85	8"	26.5	604	▽ 18.0 / *586.0* DURING DRILLING

DRIVE SAMPLER TYPE(S) & SIZE (ID)	NOTES	AFTER DRILLING
SPT (1.4"), CAL (2.4")	N60=1.42*Nspt=0.95*Ncal	▼ / *na*

DEPTH (feet)	ELEVATION (feet)	SAMPLE TYPE	SAMPLE NO.	PENETRATION RESISTANCE (BLOWS / 6 IN)	BLOW/FT "N"	MOISTURE (%)	DRY DENSITY (PCF)	PASSING #200 (%)	ATTERBERG LIMITS (LL:PL:PI)	POCKET PEN (TSF)	OTHER TESTS	DRILLING METHOD	GRAPHIC LOG	DESCRIPTION AND CLASSIFICATION
														Lean CLAY (CL) tan to medium brown, moist, mostly fines, few subangular to subrounded gravels, medium plasticity.
			R-2	10 12 13	25	27.4	89			2.5	DS			- Very stiff, medium brown, few angular claystone fragments and subrounded gravels.
	600													
5			R-3	10 15 16	31	24.7	91		50 25 25	2.5				**Lean CLAY/Fat CLAY (CL/CH)** very stiff, dark brown to gray brown, mostly fines, trace claystone fragments, moist, medium to high plasticity.
			S-4	3 4 5	9	23.4				2.5				
	595													
10			R-5	11 16 20	36	17.2	110			4				- Very stiff, dark brown.
	590													**Sandy Lean CLAY (CL)** medium stiff, dark yellowish brown, wet, mostly fines, some sand, low plasticity, trace claystone fragments, highly weathered.
15			S-6	11 14 18	32	26.9				1.5				
	585													▽ **Clayey SAND (SC)** very dense, medium brown, mostly sand, some fines, trace coarse sand and fine gravel, low plasticity.
20			R-7	16 25 40	65	24.6	99	36	30 21 9		C			
	580													**CLAYSTONE,** Very stiff, gray, wet, thinly interbedded with gray sandstone, fractured and weathered.

GDC_LOG_BORING_2011 BORING LOGS.GPJ GDCLOG.GDT 10/3/13

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FIGURE

A-9 a

BORING RECORD

PROJECT NAME	PROJECT NUMBER	HOLE ID
Brookside Equestrian - Lot 2	LA-1148B	**B-14**

SITE LOCATION	START	FINISH	SHEET NO.
800 Meadow Pass Rd., Walnut, CA	9/4/2013	9/4/2013	2 of 2

DRILLING COMPANY	DRILL RIG	DRILLING METHOD	LOGGED BY	CHECKED BY
Choice Drilling	CME 75	Hollow Stem Auger	S. Stone	Y. Liu

HAMMER TYPE (WEIGHT/DROP)	HAMMER EFFICIENCY (ERi)	BORING DIA. (in)	TOTAL DEPTH (ft)	GROUND ELEV (ft)	DEPTH/*ELEV.* GW (ft)
Hammer: 140 lbs., Drop: 30 in.	85	8"	26.5	604	▽ 18.0 / *586.0* DURING DRILLING

DRIVE SAMPLER TYPE(S) & SIZE (ID)	NOTES	AFTER DRILLING
SPT (1.4"), CAL (2.4")	N60=1.42*Nspt=0.95*Ncal	▼ / *na*

DEPTH (feet)	ELEVATION (feet)	SAMPLE TYPE	SAMPLE NO.	PENETRATION RESISTANCE (BLOWS / 6 IN)	BLOW/FT "N"	MOISTURE (%)	DRY DENSITY (PCF)	PASSING #200 (%)	ATTERBERG LIMITS (LL:PL:PI)	POCKET PEN (TSF)	OTHER TESTS	DRILLING METHOD	GRAPHIC LOG	DESCRIPTION AND CLASSIFICATION
		X	S-8	14 23 48	71	31.6				4				
														Boring terminated at 26.5 feet bgs. Groundwater encountered at 18 feet bgs. Boring backfilled with soil cuttings and tamped.
	575													
30														
	570													
35														
	565													
40														
	560													
45														
	555													

GDC_LOG_BORING_2011 BORING LOGS.GPJ GDCLOG.GDT 10/3/13

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FIGURE

A-9 b

BORING RECORD

PROJECT NAME	PROJECT NUMBER	HOLE ID
Brookside Equestrian - Lot 2	LA-1148B	**B-16**

SITE LOCATION	START	FINISH	SHEET NO.
800 Meadow Pass Rd., Walnut, CA	9/4/2013	9/4/2013	1 of 2

DRILLING COMPANY	DRILL RIG	DRILLING METHOD	LOGGED BY	CHECKED BY
Choice Drilling	CME 75	Hollow Stem Auger	S. Stone	Y. Liu

HAMMER TYPE (WEIGHT/DROP)	HAMMER EFFICIENCY (ERi)	BORING DIA. (in)	TOTAL DEPTH (ft)	GROUND ELEV (ft)	DEPTH/*ELEV.* GW (ft)
Hammer: 140 lbs., Drop: 30 in.	85	8"	41.5	603	▽ / *na* DURING DRILLING

DRIVE SAMPLER TYPE(S) & SIZE (ID)	NOTES	
SPT (1.4"), CAL (2.4")	N60=1.42*Nspt=0.95*Ncal	▼ / *na* AFTER DRILLING

DEPTH (feet)	ELEVATION (feet)	SAMPLE TYPE	SAMPLE NO.	PENETRATION RESISTANCE (BLOWS / 6 IN)	BLOW/FT "N"	MOISTURE (%)	DRY DENSITY (PCF)	PASSING #200 (%)	ATTERBERG LIMITS (LL:PL:PI)	POCKET PEN (TSF)	OTHER TESTS	DRILLING METHOD	GRAPHIC LOG	DESCRIPTION AND CLASSIFICATION
0	600		R-2	7 9 10	19	16.3	105			4.5				**Lean CLAY (CL)** dark brown, moist, mostly fines, slightly porous, few roots and organics, low to medium plasticity,
														- Hard, medium to dark brown, little caliche.
5			S-3	5 6 7	13	18.0				4				- Very stiff.
	595		R-4	7 10 12	22	21.2	100			4.5				- Hard, angular claystone fragments.
10			S-5	5 6 7	13	18.9				0.5				**SILT (ML)** medium stiff, light brown to yellow, moist, mostly fines, claystone fragments.
	590													**Clayey SAND (SC),** dense, medium brown, wet, mostly sand, some fines, trace of claystone fragments, friable, medium plasticity.
15			R-6	15 18 24	42	22.5	98	43	43 19 24	2	C			
	585													**Lean CLAY (CL)** very stiff, gray, moist, mostly fines with claystone fragments.
20			S-7	5 6 6	12	26.7				2				
	580													**Lean CLAY with SAND (CL)** very stiff, medium brown, moist, mostly fines, little sand, medium plasticity.

GDC_LOG_BORING_2011 BORING LOGS.GPJ GDCLOG.GDT 10/3/13

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FIGURE

A-10 a

BORING RECORD

PROJECT NAME	PROJECT NUMBER	HOLE ID
Brookside Equestrian - Lot 2	LA-1148B	**B-16**

SITE LOCATION	START	FINISH	SHEET NO.
800 Meadow Pass Rd., Walnut, CA	9/4/2013	9/4/2013	2 of 2

DRILLING COMPANY	DRILL RIG	DRILLING METHOD	LOGGED BY	CHECKED BY
Choice Drilling	CME 75	Hollow Stem Auger	S. Stone	Y. Liu

HAMMER TYPE (WEIGHT/DROP)	HAMMER EFFICIENCY (ERi)	BORING DIA. (in)	TOTAL DEPTH (ft)	GROUND ELEV (ft)	DEPTH/*ELEV.* GW (ft)
Hammer: 140 lbs., Drop: 30 in.	85	8"	41.5	603	▽ / *na* DURING DRILLING

DRIVE SAMPLER TYPE(S) & SIZE (ID)	NOTES	
SPT (1.4"), CAL (2.4")	N60=1.42*Nspt=0.95*Ncal	▼ / *na* AFTER DRILLING

DEPTH (feet)	ELEVATION (feet)	SAMPLE TYPE	SAMPLE NO.	PENETRATION RESISTANCE (BLOWS / 6 IN)	BLOW/FT "N"	MOISTURE (%)	DRY DENSITY (PCF)	PASSING #200 (%)	ATTERBERG LIMITS (LL:PL:PI)	POCKET PEN (TSF)	OTHER TESTS	DRILLING METHOD	GRAPHIC LOG	DESCRIPTION AND CLASSIFICATION
			R-8	9 11 14	25	32.3	87		46 21 25	2	C			
	575													
30			S-9	10 12 15	27	19.7				4.5				- Hard, light brown.
	570													**Clayey SAND (SC)** dense, light brown, wet, mostly fine sand, some fines, trace claystone fragments, low plasticity.
35			R-10	15 18 22	40	21.4	100	38	35 20 15					
	565													
40			S-11	15 28 50/6"	78	26.9				4.5				**CLAYSTONE,** hard, gray and brown, moist, laminated, some caliche, weathered.
														Boring terminated at 41.5 feet bgs. Groundwater not encountered. Boring backfilled with soil cuttings and tamped.
	560													
45														
	555													

GDC_LOG_BORING_2011 BORING LOGS.GPJ GDCLOG.GDT 10/3/13

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FIGURE

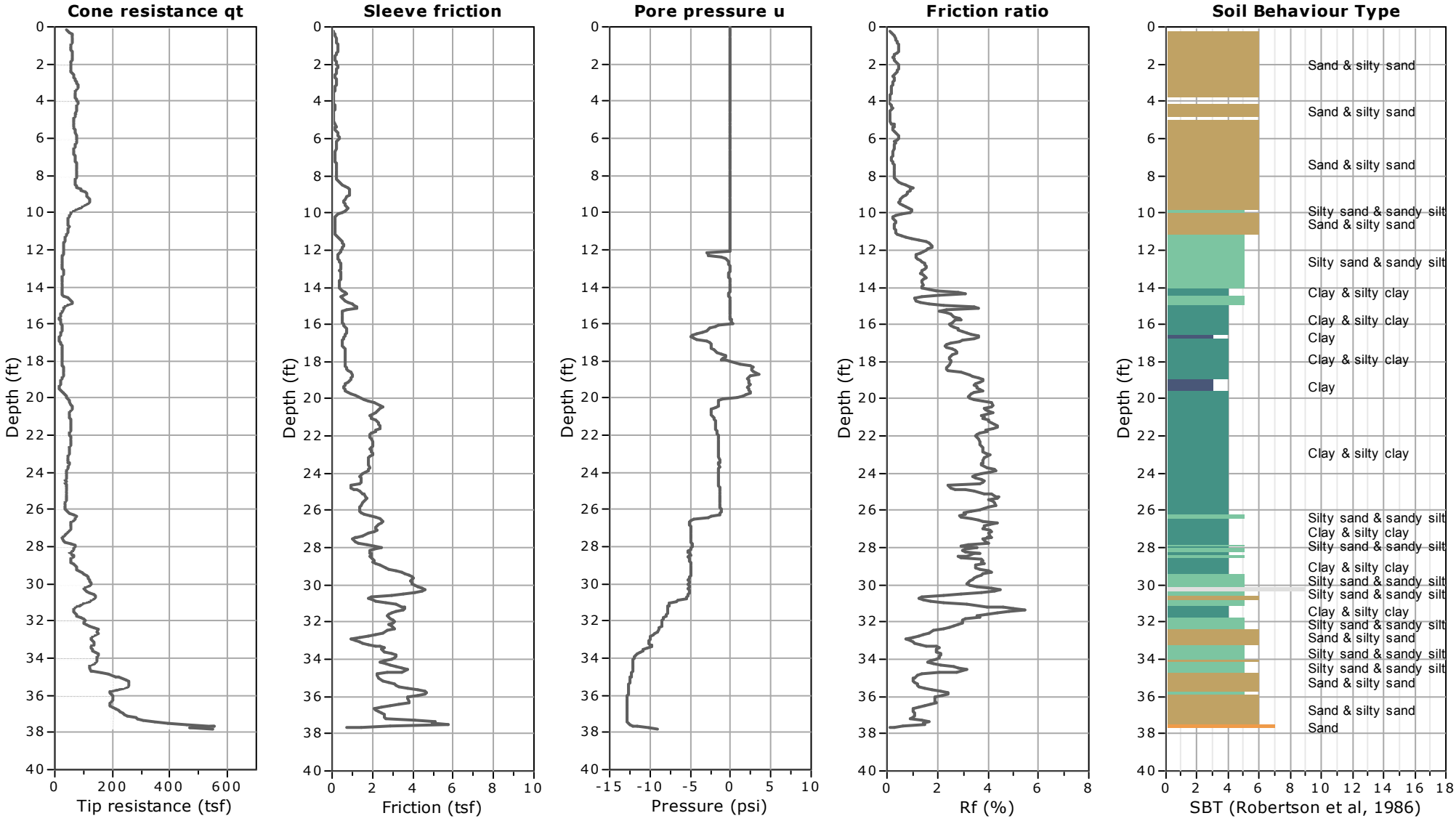
A-10 b

Kehoe Testing and Engineering
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CPT: C- 2

Project: **Group Delta**
Location: **San Vincente Dr. & La Puente Rd. Walnut, CA**

Total depth: 37.84 ft, Date: 7/19/2013
Cone Type: Vertek



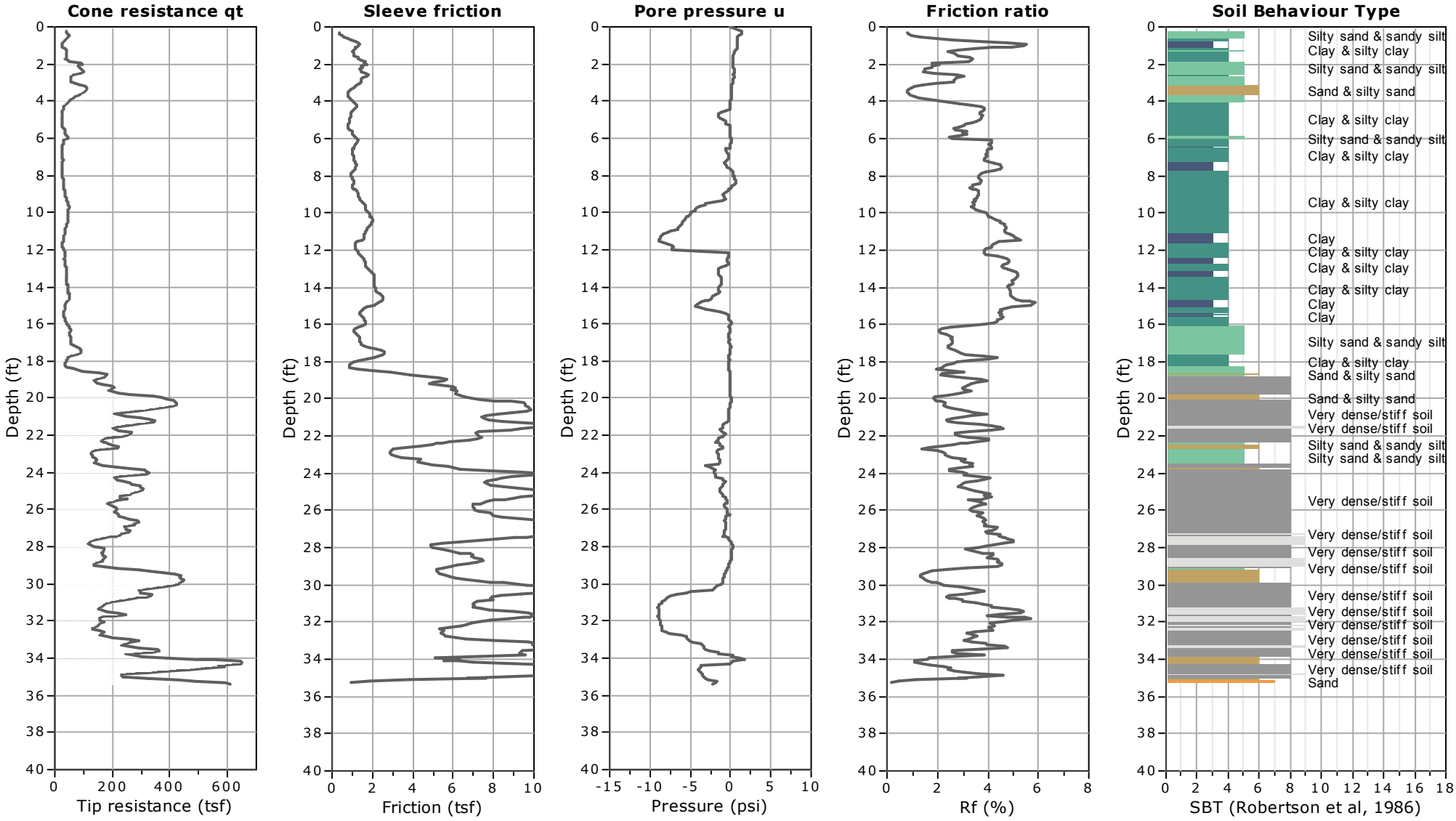
In situ data							Estimations													
Depth (ft)	qc (tsf)	fs (tsf)	SBTn	Ksbt (ft/s)	SPT N60 (blows/ft)	Constrained Mod. (tsf)	Dr (%)	Friction angle (°)	Es (tsf)	Go (tsf)	Nkt	Su (tsf)	Su ratio	Kocr	OCR	Vs (ft/s)	State parameter	Ko	Sensitivity	Peak phi (°)
1	56.9	0.26	6	2.19E-04	12	433.0615	55	40	345.52779	433.0615	0	0	0	0.33	0	502.78934	-0.11437	0	0	20
2	54.2	0.23	6	2.15E-04	11	413.28321	54	40	329.74724	413.28321	0	0	0	0.33	0	493.45132	-0.10747	0	0	20
3	75	0.19	6	1.07E-03	14	427.70972	64	41	341.25775	427.70972	0	0	0	0.33	0	503.38733	-0.1497	0	0	20
4	76.8	0.06	0	0.00E+00	13	383.32472	0	0	305.84419	383.32472	0	0	0	0.33	0	496.05811	0	0	0	20
5	65.5	0.05	0	0.00E+00	12	362.28759	0	0	289.05925	362.28759	0	0	0	0.33	0	486.44958	0	0	0	20
6	75.7	0.34	6	3.44E-04	15	529.24799	60	41	422.27234	529.24799	0	0	0	0.33	0	549.24542	-0.13414	0	0	20
7	69.2	0.12	6	6.78E-04	13	427.39052	54	40	341.00308	427.39052	0	0	0	0.33	0	511.64856	-0.10534	0	0	20
8	75.5	0.18	6	5.44E-04	15	485.16857	56	40	387.10258	485.16857	0	0	0	0.33	0	537.07349	-0.11101	0	0	20
9	111	0.88	6	2.02E-04	24	854.56857	67	42	681.83663	854.56857	0	0	0	0.33	0	674.74921	-0.16921	0	0	20
10	55	0.38	6	4.65E-05	13	549.18931	47	38	438.18296	549.18931	0	0	0	0.33	0	559.41119	-0.08804	0	0	20
11	44.9	0.15	6	6.52E-05	11	420.24428	41	37	335.30129	420.24428	0	0	0	0.33	0	505.96405	-0.04385	0	0	20
12	29.3	0.46	5	2.04E-06	10	401.06094	34	35	405.83579	508.64752	0	0	0	0.33	0	538.69629	-0.07546	0	0	20
13	26.6	0.4	5	1.49E-06	9	362.46111	31	34	388.17689	486.51504	0	0	0	0.33	0	529.8092	-0.06413	0	0	20
14	25.3	0.35	5	1.30E-06	9	343.47411	29	34	376.85214	472.32134	0	0	0	0.33	0	524.61469	-0.05317	0	0	20
15	41.5	1.17	4	9.89E-07	14	569.44427	0	0	656.7671	823.1481	14	2.90533	3.37526	0.33	15.59372	663.09485	0	1.68355	2.43352	20
16	22.6	0.57	4	2.53E-07	9	303.99824	0	0	0	562.35469	14	1.55101	1.72943	0.33	7.98998	564.09015	0	1.33937	2.66665	20
17	19.3	0.49	4	1.44E-07	8	256.64394	0	0	0	525.94018	14	1.30941	1.38649	0.33	6.40557	549.14111	0	1.24186	2.61882	20
18	26.2	0.68	4	2.64E-07	10	352.73421	0	0	0	647.68244	14	1.79966	1.79858	0.33	8.30946	601.02869	0	1.35745	2.59363	20
19	22.7	0.87	3	7.62E-08	10	303.40278	0	0	0	697.32269	14	1.54797	1.46959	0.33	6.7895	619.73688	0	1.26683	1.74369	20
20	43.6	1.46	4	4.30E-07	16	594.82832	0	0	797.55368	999.60062	14	3.03484	2.73976	0.33	12.65771	725.49683	0	1.56762	2.03708	20
21	50.4	1.74	4	5.04E-07	19	688.77043	0	0	897.25709	1124.5622	14	3.51413	3.02607	0.33	13.98043	764.41199	0	1.62182	1.97923	20
22	51.6	1.75	4	4.98E-07	19	704.7728	0	0	920.40225	1153.5708	14	3.59578	2.958	0.33	13.66597	773.8974	0	1.60925	2.01364	20
23	49.9	2.02	4	2.83E-07	19	680.13584	0	0	0	1233.2279	14	3.47008	2.71427	0.33	12.53994	797.06494	0	1.56261	1.6835	20
24	40.1	1.53	4	1.70E-07	16	542.07915	0	0	0	1077.4765	14	2.76571	2.05817	0.33	9.50872	752.80469	0	1.42151	1.7715	20
25	39	1.37	4	1.69E-07	16	525.84915	0	0	0	1045.8745	14	2.6829	1.91398	0.33	8.8426	744.3515	0	1.38663	1.91916	20
26	38.7	1.33	4	1.57E-07	16	520.82936	0	0	0	1050.7733	14	2.65729	1.81762	0.33	8.39741	746.81683	0	1.36235	1.95801	20
27	57.4	2.03	4	3.58E-07	22	781.09919	0	0	0	1356.6884	14	3.9852	2.66215	0.33	12.29914	834.75641	0	1.55229	1.92389	20
28	68.1	2.44	4	4.81E-07	25	930.03011	0	0	1221.9121	1531.4632	14	4.74505	3.07172	0.33	14.19133	880.72211	0	1.63015	1.9058	20
29	71.2	2.5	4	5.13E-07	26	972.5299	0	0	1262.8674	1582.7938	14	4.96189	3.10226	0.33	14.33243	894.35309	0	1.63568	1.94506	20
30	125.5	4.1	5	2.09E-06	41	1731.75355	47	38	1744.5419	2186.4925	0	0	0	0.33	0	1031.11047	-0.17135	0	0	20
31	112.8	2.86	5	2.74E-06	36	1552.72843	44	38	1488.8339	1866.0052	0	0	0	0.33	0	963.14368	-0.14286	0	0	20
32	103.5	3.09	5	1.42E-06	35	1421.37279	41	37	1534.7418	1923.5431	0	0	0	0.33	0	976.54034	-0.14599	0	0	20
33	124.4	1	6	3.51E-05	31	1298.11862	47	38	1035.7329	1298.1186	0	0	0	0.33	0	827.4859	-0.09251	0	0	20
34	143.5	2.96	5	6.37E-06	42	2042.12562	48	39	1629.3555	2042.1256	0	0	0	0.33	0	1004.32709	-0.14219	0	0	20
35	215.6	2.28	6	7.42E-05	50	1977.1974	61	41	1577.5511	1977.1974	0	0	0	0.33	0	991.72406	-0.1571	0	0	20
36	195.6	4.11	5	1.12E-05	54	2523.72949	56	40	2013.614	2523.7295	0	0	0	0.33	0	1103.20593	-0.1667	0	0	20
37	238.7	2.63	6	7.77E-05	55	2171.56162	63	41	1732.629	2171.5616	0	0	0	0.33	0	1034.17126	-0.16491	0	0	20

Kehoe Testing and Engineering
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CPT: C-4

Project: **Group Delta**
Location: **San Vincente Dr. & La Puente Rd. Walnut, CA**

Total depth: 35.40 ft, Date: 7/19/2013
Cone Type: Vertek



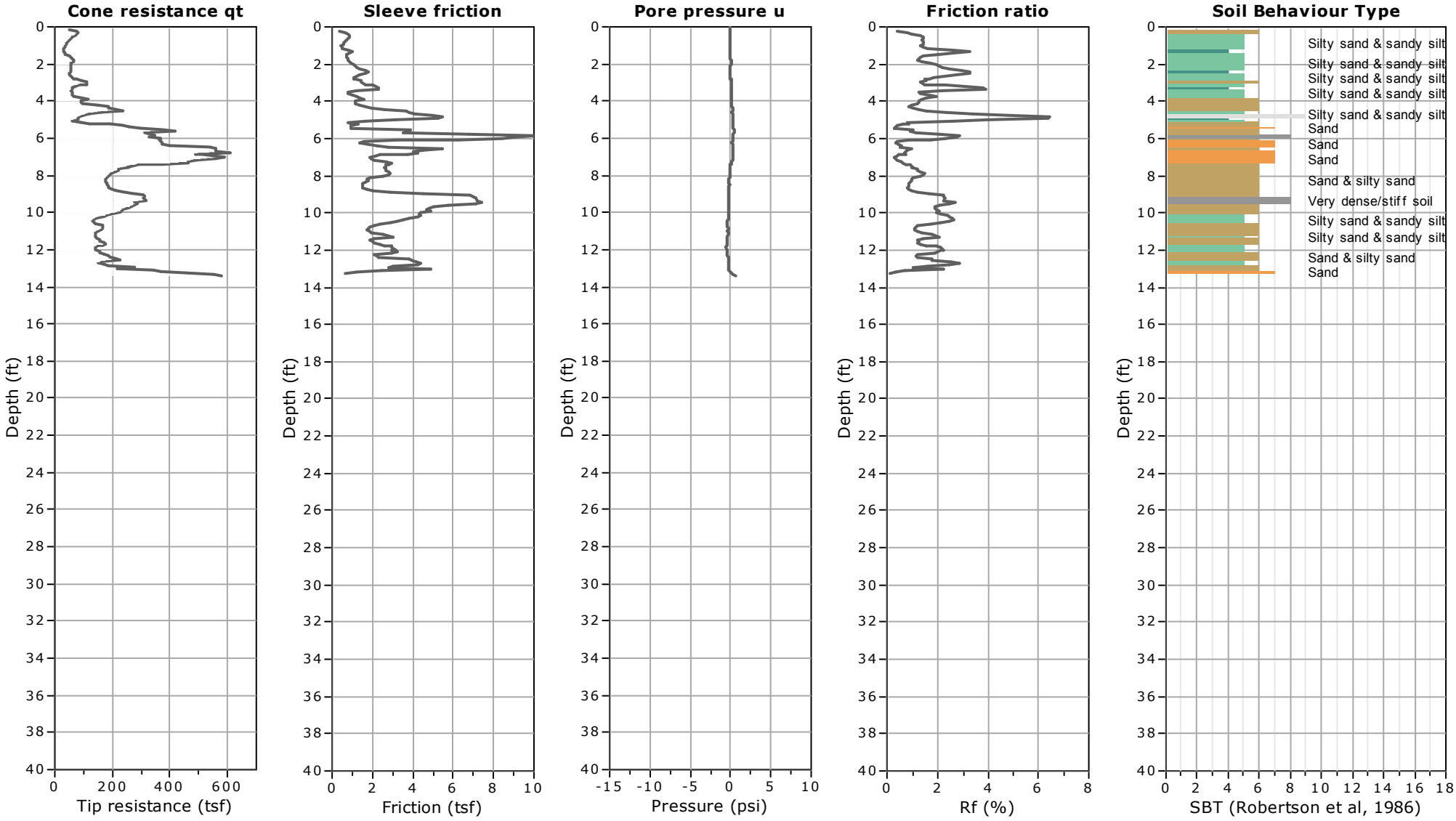
In situ data									Estimations										
Depth (ft)	qc (tsf)	fs (tsf)	SBTn	Ksbt (ft/s)	SPT N60 (blows/ft)	Constrained Mod. (tsf)	Dr (%)	Friction angle (°)	Es (tsf)	Go (tsf)	Nkt	Su (tsf)	Su ratio	Kocr	OCR	Vs (ft/s)	State parameter	Ko	Sensitivity	Peak phi (°)
1	23.2	1.3	3	1.98E-07	9	324.09806	0	0	0	626.50684	14	1.65356	3.12551	0.33	14.43984	580.05261	0	1.63986	1.24653	20
2	94.6	1.73	6	4.31E-05	23	965.86203	71	42	770.6346	965.86203	0	0	0	0.33	0	704.18805	-0.2101	0	0	20
3	66.1	1.46	5	1.37E-05	18	829.66017	60	41	661.9629	829.66017	0	0	0	0.33	0	658.22919	-0.18228	0	0	20
4	48.8	1.02	5	8.17E-06	14	670.65715	51	39	535.09879	670.65715	0	0	0	0.33	0	600.04858	-0.15206	0	0	20
5	24.1	0.88	4	5.22E-07	9	332.99873	0	0	431.12648	540.34519	14	1.69897	3.21134	0.33	14.8364	545.01324	0	1.65512	1.89204	20
6	47.3	1.22	5	4.76E-06	14	657.12388	50	39	570.30899	714.78727	0	0	0	0.33	0	616.31268	-0.16331	0	0	20
7	27.1	1.07	4	5.60E-07	10	373.42364	0	0	477.31251	598.23167	14	1.90522	3.60119	0.33	16.63749	569.30432	0	1.72127	1.74497	20
8	26	0.93	4	5.85E-07	9	357.31807	0	0	453.23648	568.05639	14	1.82305	3.3333	0.33	15.39987	557.40887	0	1.67636	1.92106	20
9	35.6	1.3	4	8.71E-07	13	490.62841	0	0	579.06502	725.7615	14	2.50321	4.09175	0.33	18.90387	621.61444	0	1.79812	1.88703	20
10	46.6	1.81	4	1.10E-06	16	643.09226	0	0	727.9862	912.40937	14	3.28108	4.88176	0.33	22.55375	688.2771	0	1.91003	1.7765	20
11	35.6	1.66	4	3.67E-07	14	487.80162	0	0	673.11464	843.63702	14	2.48878	3.52545	0.33	16.28757	665.30762	0	1.7088	1.46928	20
12	30.9	1.19	4	3.44E-07	12	421.18114	0	0	0	736.98517	14	2.14888	2.82994	0.33	13.07433	629.00525	0	1.58508	1.76967	20
13	37.9	1.79	4	3.02E-07	15	519.31811	0	0	0	930.12076	14	2.64958	3.25725	0.33	15.04851	696.56598	0	1.66318	1.45061	20
14	43.8	2.09	4	3.49E-07	17	601.07135	0	0	0	1049.2872	14	3.06669	3.51906	0.33	16.25807	735.42572	0	1.70774	1.43797	20
15	35.2	1.75	3	1.73E-07	14	479.29765	0	0	0	949.75406	14	2.4454	2.65424	0.33	12.26257	704.87421	0	1.55071	1.36942	20
16	43.5	1.6	4	4.64E-07	16	595.38782	0	0	787.57685	987.09632	14	3.03769	3.09072	0.33	14.27914	718.99402	0	1.63359	1.86059	20
17	54	1.41	5	1.38E-06	18	741.48909	38	36	805.48418	1009.5402	0	0	0	0.33	0	728.30133	-0.12645	0	0	20
18	39.1	1.08	4	5.11E-07	14	532.05066	0	0	691.47254	866.64559	14	2.71454	2.4926	0.33	11.51583	682.46246	0	1.51774	2.4632	20
19	147.6	5.68	8	3.88E-06	45	2050.11995	61	41	1846.3558	2314.0993	0	0	0	0.33	0	1049.79932	-0.22336	0	0	20
20	386.7	7.3	6	1.21E-04	86	3269.29688	98	45	2608.4816	3269.2969	0	0	0	0.33	0	1238.13049	-0.28459	0	0	20
21	247.2	6.89	8	1.93E-05	65	2908.13698	76	43	2320.3221	2908.137	0	0	0	0.33	0	1167.74133	-0.24341	0	0	20
22	244.7	7.35	8	1.46E-05	66	3024.66674	74	43	2413.2979	3024.6667	0	0	0	0.33	0	1190.90747	-0.24256	0	0	20
23	116.2	3.03	5	4.29E-06	35	1606.45988	50	39	1420.9479	1780.9213	0	0	0	0.33	0	939.13104	-0.16181	0	0	20
24	324.5	10.06	8	1.96E-05	86	3806.18035	83	44	3036.846	3806.1804	0	0	0	0.33	0	1335.93066	-0.26738	0	0	20
25	289.3	10.95	8	8.97E-06	82	3906.78478	76	43	3117.1155	3906.7848	0	0	0	0.33	0	1353.47107	-0.26323	0	0	20
26	214.2	6.99	8	7.13E-06	62	3008.99618	64	41	2400.7948	3008.9962	0	0	0	0.33	0	1187.81836	-0.22084	0	0	20
27	242.2	10.5	9	4.05E-06	74	3366.78226	0	0	3008.2575	3770.3494	14	17.17746	11.12371	0.33	51.39155	1329.62769	0	2.53147	1.60323	20
28	127.2	4.64	4	1.60E-06	42	1756.03238	0	0	1857.4323	2327.9818	14	8.95935	5.47397	0.33	25.28974	1060.19421	0	1.98631	1.89228	20
29	126.1	5.93	4	7.82E-07	45	1739.5702	0	0	2093.2719	2623.5674	14	8.87536	5.1336	0.33	23.71723	1118.07788	0	1.94318	1.46675	20
30	429.8	2.59	6	1.57E-03	75	2281.40226	93	45	1820.2678	2281.4023	0	0	0	0.33	0	1054.6759	-0.2601	0	0	20
31	195.5	6.74	5	3.76E-06	60	2707.88977	56	40	2452.9058	3074.3086	0	0	0	0.33	0	1201.4353	-0.20227	0	0	20
32	161.1	7.21	9	1.21E-06	55	2225.28709	0	0	2474.8558	3101.8193	14	11.35351	6.04001	0.33	27.90485	1206.70703	0	2.0543	1.54319	20
33	254.9	7.74	5	8.00E-06	73	3503.76052	63	41	2795.5536	3503.7605	0	0	0	0.33	0	1281.75916	-0.21315	0	0	20
34	438	5.34	6	2.43E-04	91	3257.38277	88	44	2598.9756	3257.3828	0	0	0	0.33	0	1235.87244	-0.24433	0	0	20
35	232	6.89	5	6.21E-06	68	3333.74824	58	40	2659.9055	3333.7482	0	0	0	0.33	0	1250.27527	-0.19766	0	0	20

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CPT: C-6B

Project: **Group Delta**
Location: **San Vincente Dr. & La Puente Rd. Walnut, CA**

Total depth: 13.37 ft, Date: 7/19/2013
Cone Type: Vertek



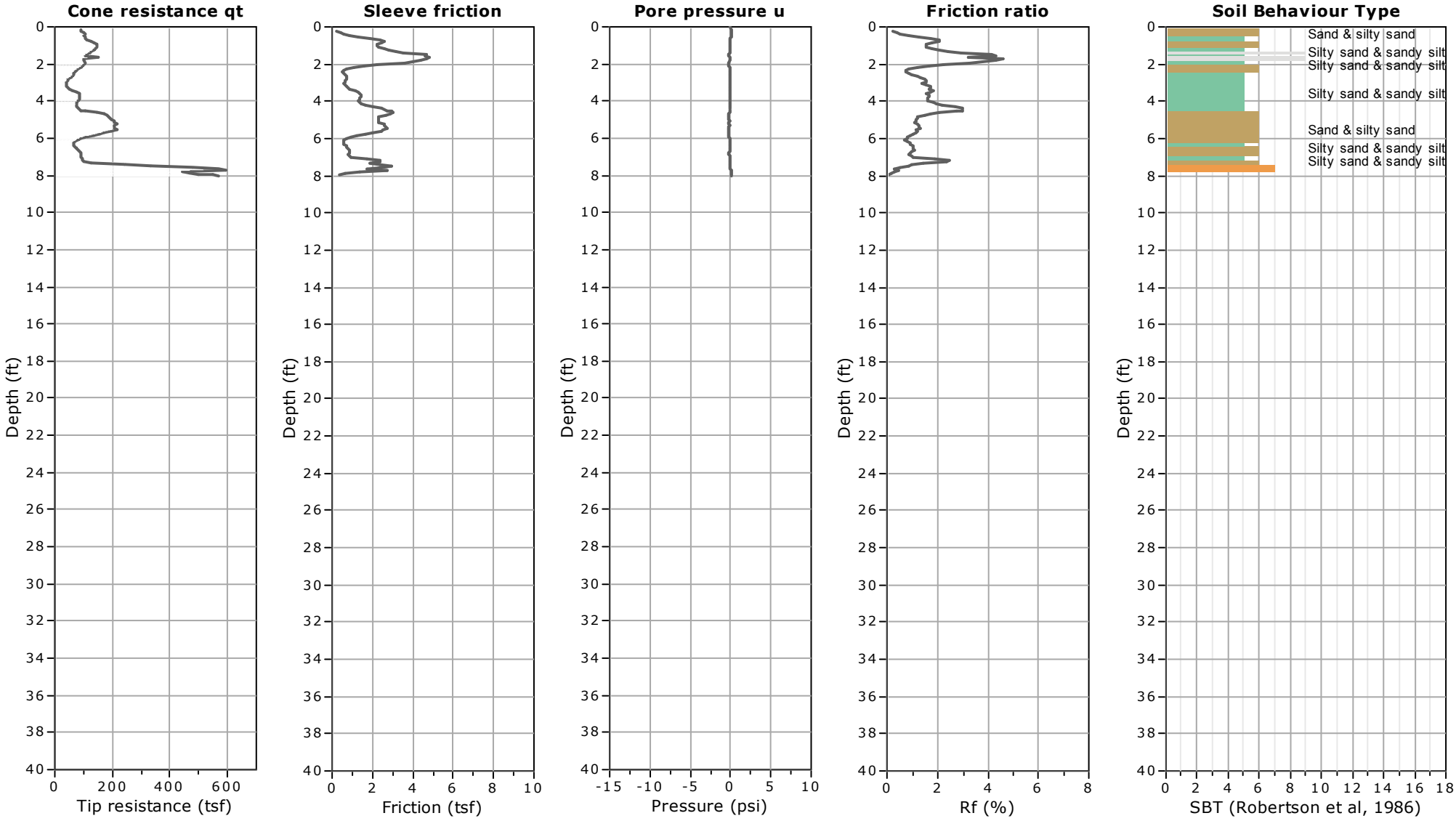
In situ data									Estimations										
Depth (ft)	qc (tsf)	fs (tsf)	SBTn	Ksbt (ft/s)	SPT N60 (blows/ft)	Constrained Mod. (tsf)	Dr (%)	Friction angle (°)	Es (tsf)	Go (tsf)	Nkt	Su (tsf)	Su ratio	Kocr	OCR	Vs (ft/s)	State parameter	Ko	Sensitivity	Peak phi (°)
1	36.1	0.48	5	1.07E-05	10	474.14706	44	38	378.30882	474.14706	0	0	0	0.33	0	518.22546	-0.102	0	0	20
2	48.4	1.02	5	7.97E-06	14	669.81868	51	39	534.4298	669.81868	0	0	0	0.33	0	599.72357	-0.15193	0	0	20
3	110.2	1.45	6	1.25E-04	24	927.92549	77	43	740.36608	927.92549	0	0	0	0.33	0	692.7655	-0.2164	0	0	20
4	84	0.97	6	9.49E-05	19	742.26708	67	42	592.23437	742.26708	0	0	0	0.33	0	628.76758	-0.18095	0	0	20
5	73.3	2.57	8	5.56E-06	22	1021.99396	63	41	862.34822	1080.8098	0	0	0	0.33	0	738.24915	-0.22178	0	0	20
6	367.1	7.78	8	2.05E-04	78	2828.17755	100	48	2256.5246	2828.1776	0	0	0	0.33	0	1151.57593	-0.36013	0	0	20
7	533.3	2.06	7	1.94E-02	74	1802.78995	100	48	1438.3962	1802.79	0	0	0	0.33	0	941.64807	-0.36571	0	0	20
8	192.4	2.75	6	1.68E-04	42	1534.39372	88	44	1224.2503	1534.3937	0	0	0	0.33	0	869.96912	-0.24958	0	0	20
9	270.3	4.73	6	1.63E-04	59	2167.63732	100	46	1729.4979	2167.6373	0	0	0	0.33	0	1015.52234	-0.28955	0	0	20
10	217	4.28	6	7.81E-05	50	1986.43844	89	44	1584.9243	1986.4384	0	0	0	0.33	0	976.73578	-0.2624	0	0	20
11	150.9	1.71	6	1.27E-04	33	1262.68715	71	42	1007.4632	1262.6872	0	0	0	0.33	0	801.79199	-0.19427	0	0	20
12	131	3.13	5	1.68E-05	35	1578.37339	66	42	1259.3405	1578.3734	0	0	0	0.33	0	882.31689	-0.20652	0	0	20
13	221.3	4.76	6	5.02E-05	53	2192.07363	83	44	1748.9949	2192.0736	0	0	0	0.33	0	1022.901	-0.25064	0	0	20

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CPT: C-7B

Project: **Group Delta**
Location: **San Vincente Dr. & La Puente Rd. Walnut, CA**

Total depth: 8.06 ft, Date: 7/19/2013
Cone Type: Vertek



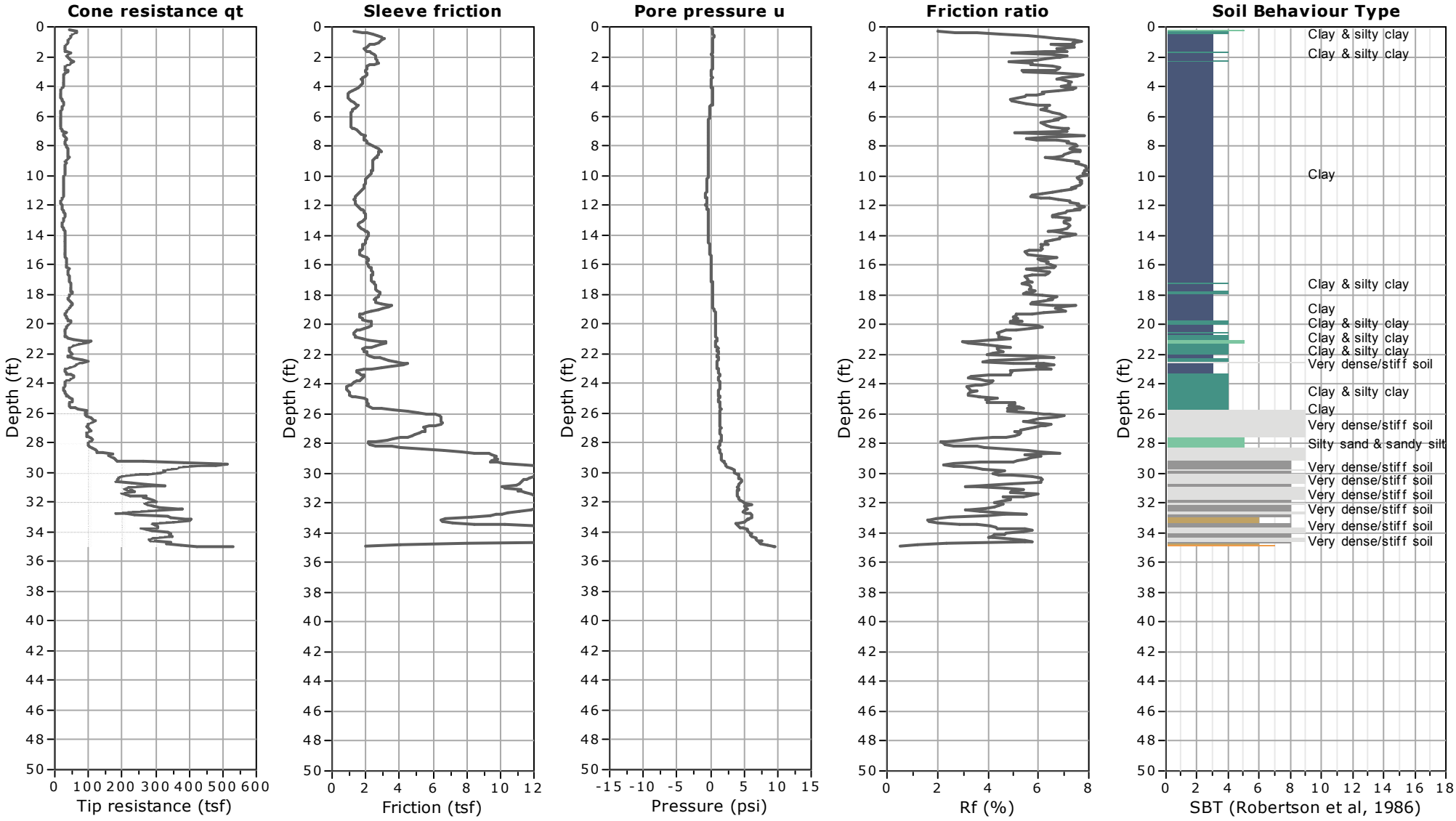
In situ data									Estimations											
Depth (ft)	qc (tsf)	fs (tsf)	SBTn	Ksbt (ft/s)	SPT N60 (blows/ft)	Constrained Mod. (tsf)	Dr (%)	Friction angle (°)	Es (tsf)	Go (tsf)	Nkt	Su (tsf)	Su ratio	Kocr	OCR	Vs (ft/s)	State parameter	Ko	Sensitivity	Peak phi (°)
1	145.6	2.18	6	1.56E-04	32	1178.26286	89	44	940.10334	1178.2629	0	0	0	0.33	0	769.39996	-0.25355	0	0	20
2	99.8	2.21	6	3.02E-05	25	1086.55034	73	43	866.92846	1086.5503	0	0	0	0.33	0	741.22913	-0.22416	0	0	20
3	40	0.5	5	1.51E-05	11	491.89383	46	38	392.46848	491.89383	0	0	0	0.33	0	526.56476	-0.10753	0	0	20
4	79.2	1.17	6	4.88E-05	19	789.13741	65	42	629.63091	789.13741	0	0	0	0.33	0	645.04639	-0.1823	0	0	20
5	194.4	2.1	6	4.67E-04	38	1289.05597	96	45	1028.5021	1289.056	0	0	0	0.33	0	803.40955	-0.26888	0	0	20
6	96.7	0.77	6	2.00E-04	21	745.84242	67	42	595.08704	745.84242	0	0	0	0.33	0	633.82007	-0.16935	0	0	20
7	92.7	0.77	6	1.45E-04	20	756.90915	64	41	603.91687	756.90915	0	0	0	0.33	0	638.78046	-0.15894	0	0	20
8	551.5	0	0	0.00E+00	39	495.52166	0	0	395.36303	495.52166	0	0	0	0.33	0	203.58307	0	0	0	20

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CPT: C-10

Project: **Group Delta/Brookside Equestrian Lot 2**
Location: **800 Meadowpass Heights Rd. Walnut, CA**

Total depth: 35.02 ft, Date: 9/4/2013
Cone Type: Vertek



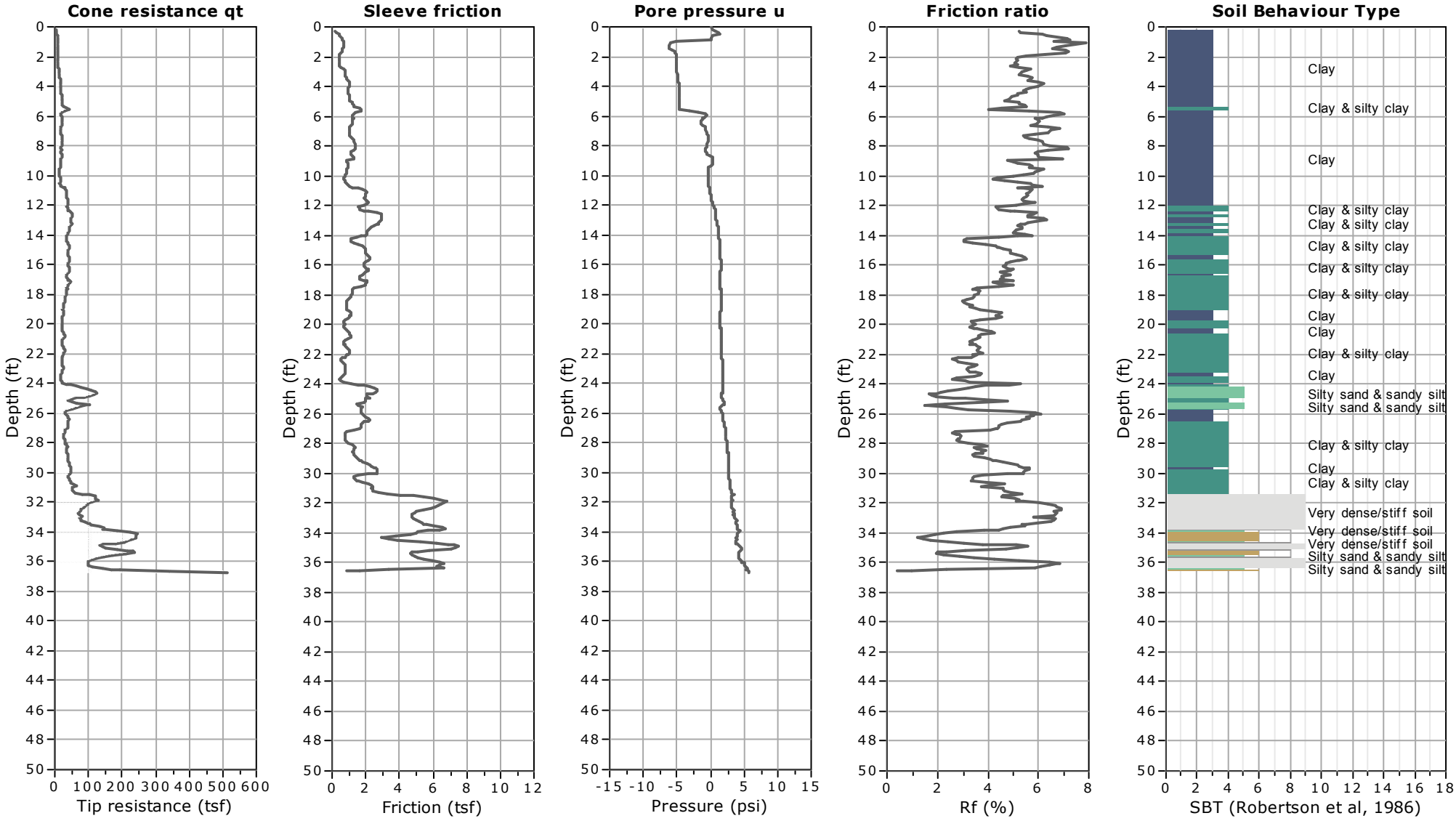
In situ data									Estimations										
Depth (ft)	qc (tsf)	fs (tsf)	SBTn	Ksbt (ft/s)	SPT N60 (blows/ft)	Constrained Mod. (tsf)	Dr (%)	Friction angle (°)	Es (tsf)	Go (tsf)	Nkt	Su (tsf)	Su ratio	Kocr	OCR	Vs (ft/s)	State parameter	Ko	Sensitivity	Peak phi (°)
1	37.5	2.86	9	2.50E-07	15	524.1758	0	0	0	971.86538	14	2.67437	5.055	0.33	23.35409	702.40216	0	1.93295	0.91639	20
2	36	2.55	9	2.74E-07	14	502.2725	0	0	0	915.75099	14	2.56261	4.84377	0.33	22.37821	684.36176	0	1.90493	0.98485	20
3	37.4	2	9	5.69E-07	14	520.98613	0	0	664.10716	832.34765	14	2.65809	5.02424	0.33	23.21197	656.8642	0	1.92892	1.30247	20
4	23.2	1.63	3	1.15E-07	10	321.33895	0	0	0	685.70055	14	1.63948	3.0989	0.33	14.31691	602.69147	0	1.63507	0.9857	20
5	23.6	1.21	4	2.39E-07	9	326.13073	0	0	0	609.564	14	1.66393	3.14511	0.33	14.5304	573.31403	0	1.64337	1.34765	20
6	16.2	1.14	3	5.18E-08	7	221.61889	0	0	0	546.24845	14	1.13071	2.13723	0.33	9.87399	545.82794	0	1.43996	0.97201	20
7	21.4	1.51	3	9.27E-08	9	293.55473	0	0	0	651.23075	14	1.49773	2.83096	0.33	13.07901	589.18604	0	1.58527	0.97204	20
8	32.9	2.47	9	1.91E-07	13	453.68545	0	0	0	883.40049	14	2.31472	4.36424	0.33	20.16277	673.3786	0	1.83821	0.91839	20
9	33.8	2.41	3	1.84E-07	14	465.36727	0	0	0	911.73053	14	2.37432	4.032	0.33	18.62782	684.40277	0	1.7891	0.96549	20
10	28	2.22	3	9.23E-08	12	383.29763	0	0	0	850.90241	14	1.9556	3.23531	0.33	14.94715	663.99298	0	1.65934	0.86328	20
11	25	1.78	3	8.42E-08	11	340.42069	0	0	0	768.3901	14	1.73684	2.75049	0.33	12.70729	635.841	0	1.56972	0.95624	20
12	19.5	1.48	3	3.97E-08	9	262.57114	0	0	0	678.98979	14	1.33965	2.07305	0.33	9.57748	602.54639	0	1.42502	0.88706	20
13	25.6	1.85	3	7.11E-08	11	347.18092	0	0	0	808.0873	14	1.77133	2.58459	0.33	11.9408	651.15332	0	1.53667	0.93833	20
14	29.3	2.18	3	8.05E-08	13	398.08917	0	0	0	905.92658	14	2.03107	2.83228	0.33	13.08514	685.18677	0	1.58553	0.91305	20
15	28.7	1.72	3	1.13E-07	12	388.8733	0	0	0	832.7834	14	1.98405	2.64219	0.33	12.20694	661.71429	0	1.5483	1.13045	20
16	32.7	2.11	3	1.17E-07	14	444.03961	0	0	0	945.06578	14	2.26551	2.90197	0.33	13.40709	699.7486	0	1.59876	1.05223	20
17	41.5	2.34	3	2.38E-07	16	566.37426	0	0	0	1059.6377	14	2.88966	3.52609	0.33	16.29053	736.99255	0	1.70891	1.2102	20
18	47.5	2.76	3	2.72E-07	19	649.5033	0	0	0	1185.5677	14	3.31379	3.89545	0.33	17.99699	774.82831	0	1.76814	1.17664	20
19	40.5	2.81	3	1.22E-07	17	550.64613	0	0	0	1161.4736	14	2.80942	3.22126	0.33	14.88224	767.69196	0	1.65687	0.9798	20
20	44.3	2.33	4	2.55E-07	17	602.99874	0	0	0	1114.1744	14	3.07652	3.38772	0.33	15.65127	755.33459	0	1.68567	1.29399	20
21	44.4	1.97	4	3.46E-07	17	603.57361	0	0	0	1054.9048	14	3.07946	3.28121	0.33	15.15917	738.56934	0	1.66735	1.53191	20
22	51.2	2.04	4	5.60E-07	19	697.9237	0	0	892.27367	1118.3163	14	3.56084	3.67425	0.33	16.97505	758.60828	0	1.73314	1.7106	20
23	34.8	2.18	3	8.28E-08	15	467.45299	0	0	0	1058.4265	14	2.38496	2.41152	0.33	11.14121	739.36395	0	1.50067	1.07214	20
24	29.7	1.13	4	1.52E-07	12	395.26662	0	0	0	801.78649	14	2.01667	1.98104	0.33	9.15241	657.35657	0	1.40306	1.74897	20
25	47.2	2.07	4	3.15E-07	18	639.38479	0	0	0	1136.5152	14	3.26217	3.11341	0.33	14.38396	765.0354	0	1.63769	1.54441	20
26	91.4	5.76	9	5.14E-07	34	1257.23926	0	0	1632.44	2045.9915	14	6.41449	5.94293	0.33	27.45632	991.02997	0	2.04295	1.09135	20
27	91.1	5.44	9	5.50E-07	33	1252.14298	0	0	1605.9924	2012.8438	14	6.38848	5.75439	0.33	26.58526	984.53491	0	2.02054	1.15087	20
28	96	2.1	5	5.91E-06	28	1319.82945	49	39	1101.3868	1380.4048	0	0	0	0.33	0	837.00879	-0.14833	0	0	20
29	172	9.83	9	1.80E-06	57	2382.90962	0	0	2464.9677	3089.4262	14	12.1577	10.46317	0.33	48.33986	1203.58887	0	2.47901	1.21206	20
30	315	12.08	8	1.34E-05	86	3956.00466	87	44	3156.3867	3956.0047	0	0	0	0.33	0	1361.97034	-0.29201	0	0	20
31	219.8	10.3	9	4.22E-06	67	3050.59725	0	0	2705.7122	3391.1592	14	15.56427	12.84436	0.33	59.34095	1260.99487	0	2.65911	1.48087	20
32	289.5	12.28	8	8.35E-06	83	3955.80366	82	44	3156.2263	3955.8037	0	0	0	0.33	0	1361.93567	-0.28541	0	0	20
33	344.9	7.1	6	7.23E-05	81	3192.30169	90	45	2547.0492	3192.3017	0	0	0	0.33	0	1223.46399	-0.26672	0	0	20
34	336	15.87	9	7.40E-06	97	4695.66068	0	0	3746.5378	4695.6607	14	23.85103	18.55894	0.33	85.7423	1483.8418	0	3	1.47284	20
35	498.1	0	0	0.00E+00	35	446.02236	0	0	355.8689	446.02236	0	0	0	0.33	0	193.14731	0	0	0	20

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CPT: C-11

Project: **Group Delta/Brookside Equestrian Lot 2**
Location: **800 Meadowpass Heights Rd. Walnut, CA**

Total depth: 36.72 ft, Date: 9/4/2013
Cone Type: Vertek



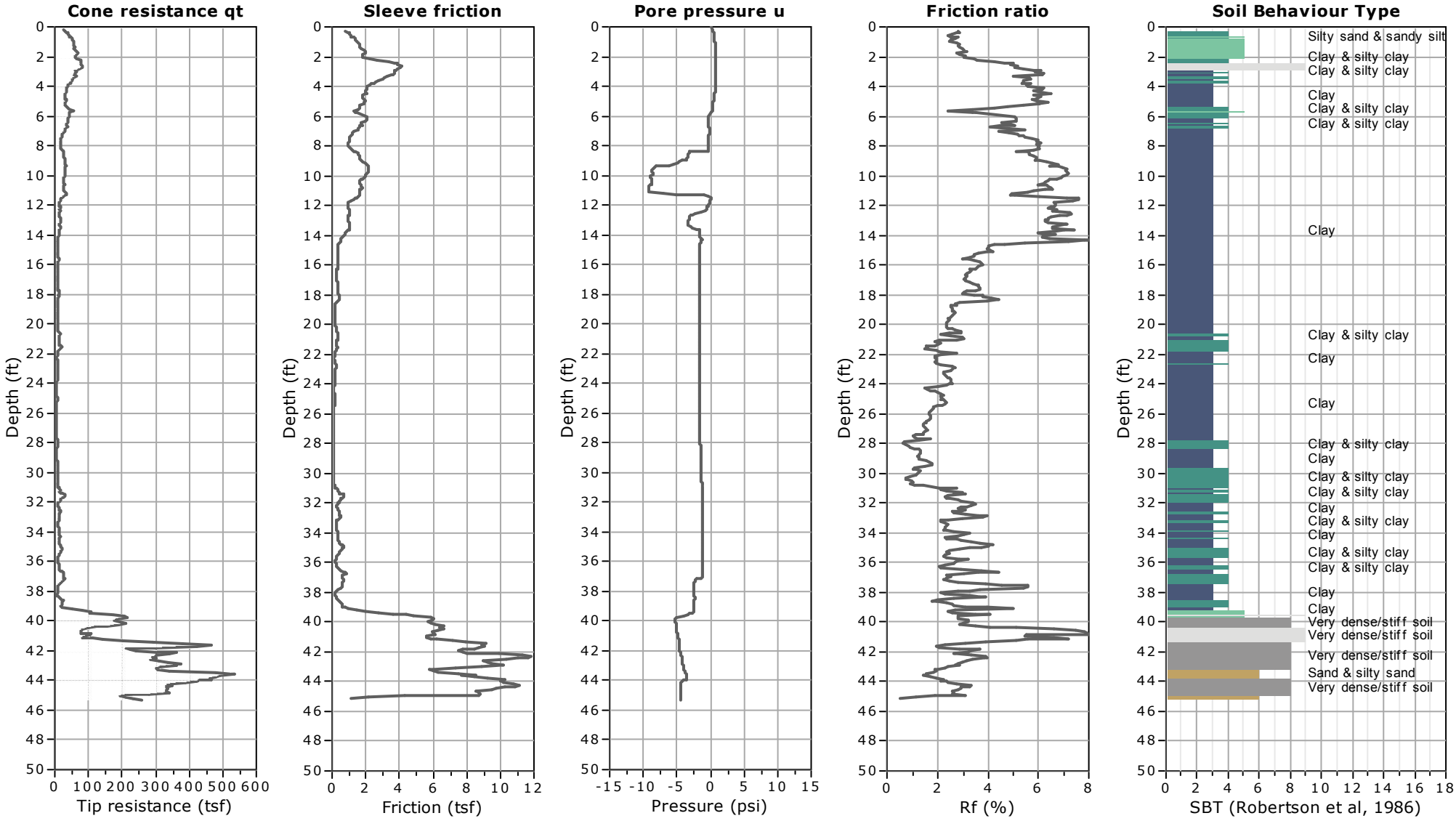
In situ data										Estimations									
Depth (ft)	qc (tsf)	fs (tsf)	SBTn	Ksbt (ft/s)	SPT N60 (blows/ft)	Constrained Mod. (tsf)	Dr (%)	Friction angle (°)	Es (tsf)	Go (tsf)	Nkt	Su (tsf)	Su ratio	Kocr	OCR	Vs (ft/s)	State parameter	Ko	Sensitivity	Peak phi (°)
1	9.9	0.67	3	2.03E-08	5	136.92194	0	0	0	399.77201	14	0.69858	1.32043	0.33	6.10041	477.38593	0	1.2213	1.02181	20
2	7.3	0.41	3	1.41E-08	4	95.98499	0	0	0	311.29124	14	0.50901	0.96211	0.33	4.44494	429.59763	0	1.09596	1.21665	20
3	13.6	0.75	3	6.15E-08	6	187.20139	0	0	0	447.21748	14	0.95511	1.80532	0.33	8.34056	501.37051	0	1.35919	1.24801	20
4	17.2	1	3	9.16E-08	7	236.80839	0	0	0	526.45159	14	1.20821	2.28371	0.33	10.55074	537.71851	0	1.47298	1.18404	20
5	22.6	1.11	4	2.38E-07	9	311.60538	0	0	0	583.046	14	1.58982	3.00503	0.33	13.88324	562.45862	0	1.61796	1.40363	20
6	17.2	1.2	3	6.04E-08	8	235.85416	0	0	0	565.28325	14	1.20334	2.27451	0.33	10.50823	554.03601	0	1.47094	0.98273	20
7	14.7	1	3	4.43E-08	7	200.01925	0	0	0	507.0673	14	1.02051	1.92893	0.33	8.91164	528.57538	0	1.39033	1.0001	20
8	20.5	1.37	3	9.47E-08	9	280.41051	0	0	0	619.60556	14	1.43067	2.7042	0.33	12.49339	576.65631	0	1.56063	1.0234	20
9	18.3	0.82	4	1.56E-07	8	248.94822	0	0	0	502.38882	14	1.27014	2.28859	0.33	10.57329	528.20557	0	1.47405	1.51798	20
10	14.8	0.78	3	6.46E-08	7	199.03852	0	0	0	471.36536	14	1.0155	1.80692	0.33	8.34799	513.60089	0	1.3596	1.27589	20
11	32.9	1.89	3	2.57E-07	13	451.60864	0	0	0	832.74449	14	2.30413	3.72245	0.33	17.19773	658.95209	0	1.74088	1.19473	20
12	37.1	1.89	4	3.85E-07	14	509.64526	0	0	697.02562	873.60544	14	2.60023	3.96729	0.33	18.32888	674.12421	0	1.77922	1.34827	20
13	46.1	2.88	9	3.44E-07	18	634.83088	0	0	0	1110.9839	14	3.23893	4.74212	0.33	21.90861	749.35657	0	1.89117	1.10214	20
14	34.6	1.98	3	2.18E-07	14	472.99604	0	0	0	898.60776	14	2.41325	3.43174	0.33	15.85466	683.23132	0	1.69313	1.19443	20
15	41	2	4	4.01E-07	16	561.76636	0	0	762.99243	956.28385	14	2.86615	3.86349	0.33	17.84933	703.4342	0	1.76316	1.40442	20
16	39.6	1.91	4	3.53E-07	15	541.3242	0	0	0	942.7598	14	2.76186	3.59763	0.33	16.62104	699.62866	0	1.72069	1.41708	20
17	37.8	1.88	4	2.77E-07	15	515.24595	0	0	0	937.41153	14	2.62881	3.3191	0.33	15.33424	698.28735	0	1.67391	1.37033	20
18	32.5	1.13	4	3.89E-07	12	440.23405	0	0	601.05839	753.32652	14	2.24609	2.73096	0.33	12.61703	636.59607	0	1.56589	1.94794	20
19	23.8	0.86	4	1.61E-07	10	317.60204	0	0	0	637.44576	14	1.62042	1.93692	0.33	8.94857	592.45618	0	1.3923	1.84652	20
20	21.1	0.73	4	1.21E-07	9	278.98219	0	0	0	589.97086	14	1.42338	1.65838	0.33	7.66171	573.64142	0	1.32029	1.91084	20
21	24.9	0.81	4	1.90E-07	10	331.3679	0	0	0	645.5524	14	1.69065	1.90377	0.33	8.7954	597.05029	0	1.3841	2.04548	20
22	27	0.92	4	1.97E-07	11	359.96969	0	0	0	696.78714	14	1.83658	2.00962	0.33	9.28444	617.30786	0	1.40995	1.95636	20
23	24	0.75	4	1.62E-07	10	317.18396	0	0	0	636.24159	14	1.61829	1.7266	0.33	7.9769	594.39484	0	1.33862	2.11456	20
24	27.1	1.35	3	8.00E-08	12	359.74719	0	0	0	819.64832	14	1.83544	1.91058	0.33	8.82688	661.65704	0	1.38579	1.3324	20
25	62.8	2	4	1.33E-06	21	858.64854	0	0	938.74242	1176.5572	14	4.38086	4.37451	0.33	20.21023	777.01465	0	1.83969	2.14662	20
26	28.4	1.78	3	4.74E-08	13	376.2071	0	0	0	942.21405	14	1.91942	1.88303	0.33	8.69958	703.19629	0	1.37892	1.05676	20
27	37.4	1.62	4	1.87E-07	15	501.42747	0	0	0	979.88798	14	2.5583	2.4363	0.33	11.2557	717.16913	0	1.50592	1.54762	20
28	31.7	1.14	4	1.72E-07	13	420.83096	0	0	0	834.70316	14	2.1471	1.9941	0.33	9.21276	670.08533	0	1.40622	1.84575	20
29	37.2	1.51	4	1.87E-07	15	497.00361	0	0	0	971.46471	14	2.53573	2.29612	0.33	10.60808	715.62	0	1.47571	1.64571	20
30	48.3	2.64	3	1.70E-07	20	651.51578	0	0	0	1295.7477	14	3.32406	2.92933	0.33	13.53351	810.93604	0	1.6039	1.23393	20
31	52.3	2.41	4	2.80E-07	20	706.6621	0	0	0	1283.6242	14	3.60542	3.1042	0.33	14.34141	808.6424	0	1.63603	1.4661	20
32	107.7	6.62	9	6.19E-07	39	1481.3512	0	0	1859.8818	2331.0518	14	7.55791	6.36273	0.33	29.39583	1052.26526	0	2.0912	1.11885	20
33	79.2	4.76	3	3.34E-07	30	1081.52412	0	0	0	1902.1629	14	5.51798	4.50597	0.33	20.81756	961.83594	0	1.85841	1.13605	20
34	212	5.11	5	2.09E-05	56	2446.8401	71	42	1952.266	2446.8401	0	0	0	0.33	0	1079.0498	-0.22053	0	0	20
35	132.4	7.33	9	1.03E-06	46	1824.57409	0	0	2088.302	2617.3385	14	9.30905	7.30844	0.33	33.765	1109.9071	0	2.1927	1.24459	20
36	95.2	6.66	9	2.87E-07	37	1302.87183	0	0	0	2355.1326	14	6.64731	5.01084	0.33	23.15008	1058.68762	0	1.92716	0.97813	20

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CPT: C-15

Project: **Group Delta/Brookside Equestrian Lot 2**
Location: **800 Meadowpass Heights Rd. Walnut, CA**

Total depth: 45.29 ft, Date: 9/4/2013
Cone Type: Vertek



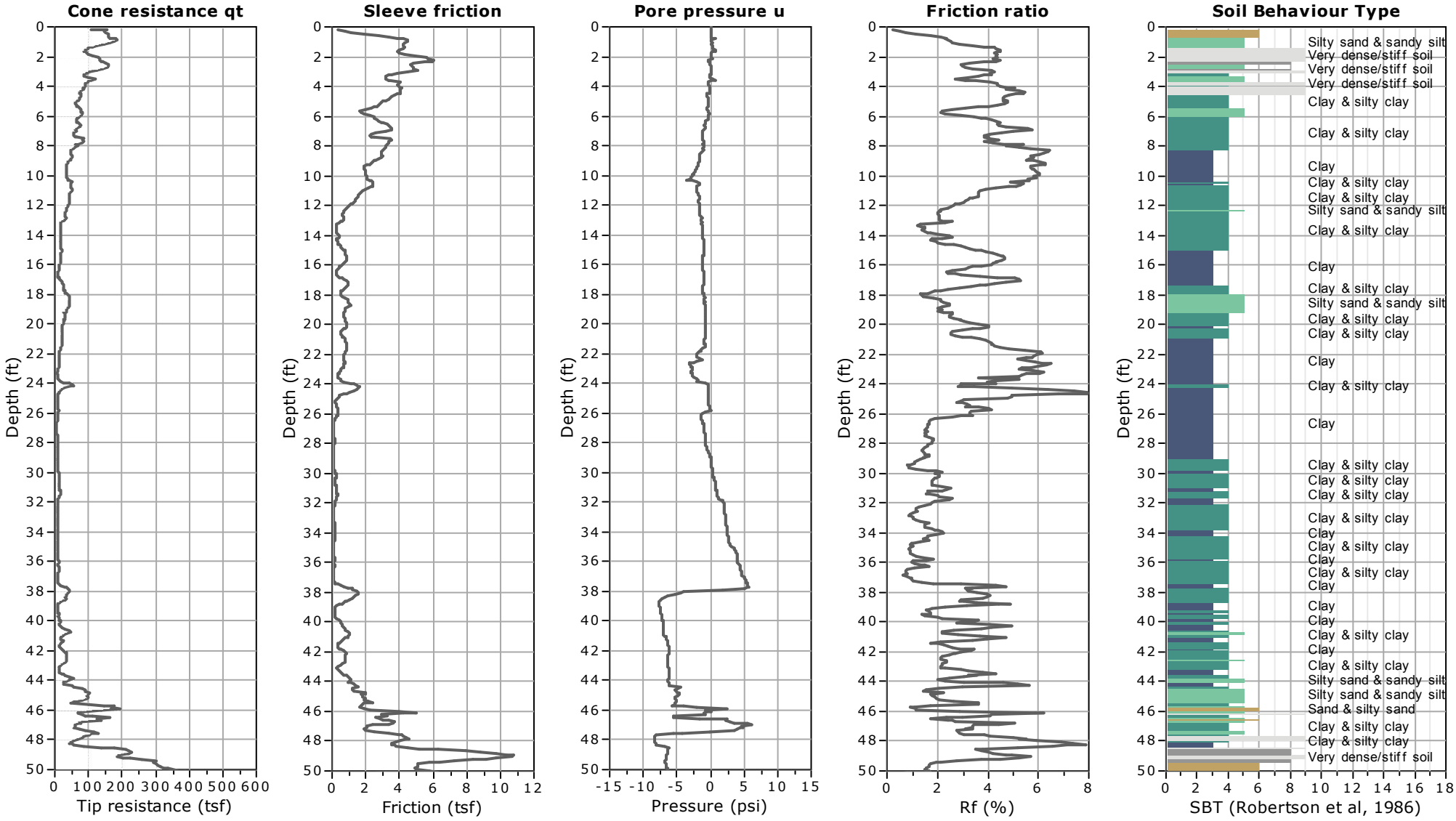
In situ data							Estimations													
Depth (ft)	qc (tsf)	fs (tsf)	SBTn	Ksbt (ft/s)	SPT N60 (blows/ft)	Constrained Mod. (tsf)	Dr (%)	Friction angle (°)	Es (tsf)	Go (tsf)	Nkt	Su (tsf)	Su ratio	Kocr	OCR	Vs (ft/s)	State parameter	Ko	Sensitivity	Peak phi (°)
1	56	1.44	5	6.97E-06	16	795.23271	55	40	634.49418	795.23271	0	0	0	0.33	0	645.75208	-0.17691	0	0	20
2	56.5	1.82	5	4.20E-06	17	789.37892	55	40	700.81505	878.35487	0	0	0	0.33	0	673.91577	-0.19358	0	0	20
3	62.5	3.71	9	1.15E-06	21	872.49668	0	0	978.85763	1226.8349	14	4.45151	8.4141	0.33	38.87315	779.55621	0	2.30094	1.17587	20
4	36.8	2.08	9	4.81E-07	14	511.79829	0	0	672.52458	842.89747	14	2.61122	4.93563	0.33	22.80262	660.35498	0	1.91721	1.23028	20
5	32.6	1.96	4	3.25E-07	13	452.10502	0	0	0	799.33915	14	2.30666	4.35997	0.33	20.14305	644.96204	0	1.83759	1.15333	20
6	41.3	2.02	9	8.35E-07	15	572.91706	0	0	681.35732	853.96785	14	2.92305	5.52504	0.33	25.5257	664.49963	0	1.99263	1.41811	20
7	28.6	1.27	4	4.85E-07	11	394.28766	0	0	517.2906	648.33755	14	2.01167	3.80239	0.33	17.56706	589.24097	0	1.75358	1.55231	20
8	16.1	0.93	3	7.57E-08	7	218.44462	0	0	0	502.66555	14	1.11451	2.10662	0.33	9.73256	526.9715	0	1.43287	1.17443	20
9	29.1	1.76	3	1.95E-07	12	398.92308	0	0	0	773.37117	14	2.03532	3.44402	0.33	15.91139	637.15906	0	1.6952	1.1333	20
10	28.3	1.98	3	1.22E-07	12	386.07265	0	0	0	815.47233	14	1.96976	3.22724	0.33	14.90987	652.17786	0	1.65792	0.97493	20
11	26.8	1.61	3	1.37E-07	11	364.12775	0	0	0	752.96002	14	1.85779	2.8992	0.33	13.39433	630.90771	0	1.59824	1.13083	20
12	14.3	0.96	3	2.55E-08	7	189.84791	0	0	0	532.09596	14	0.96861	1.50922	0.33	6.97261	542.31152	0	1.27841	0.98879	20
13	15.6	0.97	3	3.28E-08	7	206.75947	0	0	0	553.45747	14	1.0549	1.5769	0.33	7.28529	552.4198	0	1.29774	1.06577	20
14	11.5	0.76	3	1.22E-08	6	148.80329	0	0	0	476.62192	14	0.7592	1.09257	0.33	5.04768	518.28259	0	1.14468	0.97897	20
15	8.8	0.36	3	1.34E-08	5	86.38478	0	0	0	346.79677	14	0.56243	0.78363	0.33	3.62038	454.44254	0	1.02169	1.53106	20
16	9.8	0.36	3	2.02E-08	5	105.06834	0	0	0	360.85363	14	0.63013	0.85072	0.33	3.93032	462.99692	0	1.0508	1.71535	20
17	9.1	0.28	3	2.03E-08	5	85.36178	0	0	0	329.78453	14	0.57633	0.75568	0.33	3.49122	446.80078	0	1.00907	2.01716	20
18	11.4	0.39	3	2.94E-08	5	135.31937	0	0	0	394.25843	14	0.73671	0.93714	0.33	4.3296	481.8338	0	1.08615	1.85123	20
19	6.7	0.17	3	8.64E-09	4	38.38734	0	0	0	265.34503	14	0.39729	0.49298	0.33	2.27755	409.33658	0	0.87191	2.29025	20
20	8.5	0.2	3	1.95E-08	4	64.65268	0	0	0	300.90783	14	0.52216	0.63173	0.33	2.91859	432.16687	0	0.9491	2.55856	20
21	11.7	0.36	3	2.99E-08	6	128.67833	0	0	0	398.59589	14	0.74691	0.87898	0.33	4.0609	485.6384	0	1.06261	2.03326	20
22	7.9	0.17	3	1.46E-08	4	50.15532	0	0	0	286.47618	14	0.47176	0.54243	0.33	2.50602	424.48532	0	0.90089	2.71955	20
23	8.1	0.22	3	9.87E-09	4	51.2081	0	0	0	314.56309	14	0.48239	0.54161	0.33	2.50223	440.63394	0	0.90043	2.14882	20
24	6.1	0.15	3	3.84E-09	4	24.31006	0	0	0	259.81906	14	0.33593	0.36921	0.33	1.70577	407.34595	0	0.78983	2.19476	20
25	6.5	0.14	3	5.49E-09	4	27.4859	0	0	0	261.69989	14	0.36092	0.38855	0.33	1.7951	409.52817	0	0.80374	2.52641	20
26	6.1	0.1	3	5.94E-09	3	22.40146	0	0	0	235.07592	14	0.32892	0.34748	0.33	1.60535	393.2952	0	0.77361	3.22343	20
27	5.8	0.09	3	4.78E-09	3	18.79652	0	0	0	226.03491	14	0.30403	0.31543	0.33	1.45729	387.43295	0	0.74843	3.31055	20
28	9.1	0.04	4	1.24E-07	4	57.38941	0	0	0	221.20932	14	0.53646	0.54581	0.33	2.52165	393.20117	0	0.90281	13.14316	20
29	6	0.07	3	6.93E-09	3	19.13631	0	0	0	216.66252	14	0.3117	0.31323	0.33	1.44714	382.79782	0	0.74664	4.36377	20
30	7.4	0.09	3	1.41E-08	4	32.26398	0	0	0	249.64668	14	0.40828	0.40318	0.33	1.86269	405.91913	0	0.81397	4.44576	20
31	10.3	0.29	3	1.15E-08	5	70.85802	0	0	0	387.93007	14	0.61167	0.59104	0.33	2.73059	483.31934	0	0.92773	2.06703	20
32	10.4	0.35	3	8.03E-09	6	70.06516	0	0	0	416.24459	14	0.61495	0.58131	0.33	2.68566	497.40161	0	0.92248	1.72185	20
33	12.9	0.44	3	1.46E-08	7	112.96006	0	0	0	479.72997	14	0.78964	0.72986	0.33	3.37195	528.64349	0	0.99715	1.75875	20
34	11.4	0.34	3	1.15E-08	6	81.69837	0	0	0	430.34615	14	0.67863	0.61422	0.33	2.8377	505.72812	0	0.94002	1.95605	20
35	18.2	0.64	3	3.39E-08	9	227.42657	0	0	0	605.23969	14	1.16034	1.02621	0.33	4.74109	584.38702	0	1.12041	1.77677	20
36	8.5	0.2	3	5.08E-09	5	36.61288	0	0	0	340.9448	14	0.46376	0.40279	0.33	1.86091	460.01593	0	0.8137	2.27243	20
37	23.6	0.63	4	1.06E-07	10	301.47098	0	0	0	652.36873	14	1.53812	1.3114	0.33	6.05865	605.33862	0	1.21843	2.39263	20
38	7.6	0.17	3	3.07E-09	5	24.96996	0	0	0	317.75954	14	0.39057	0.32619	0.33	1.50698	447.27576	0	0.75706	2.25151	20
39	17.6	0.69	3	1.95E-08	9	194.08906	0	0	0	634.77694	14	1.10069	0.89966	0.33	4.15643	597.25793	0	1.07109	1.5633	20
40	153.6	5.32	8	4.66E-06	46	2118.31599	60	41	1845.3076	2312.7855	0	0	0	0.33	0	1050.99109	-0.21334	0	0	20
41	90.2	5.27	9	4.27E-07	34	1229.86265	0	0	1651.1723	2069.4692	14	6.27481	4.95027	0.33	22.87026	999.25452	0	1.91916	1.16685	20
42	236	7.29	8	1.29E-05	65	2969.0293	73	43	2368.9064	2969.0293	0	0	0	0.33	0	1179.90344	-0.24215	0	0	20
43	356.5	8.54	8	4.99E-05	86	3524.22845	90	45	2811.8844	3524.2285	0	0	0	0.33	0	1285.49756	-0.27402	0	0	20
44	426.7	9.83	8	7.24E-05	100	3947.12976	98	45	3149.3057	3947.1298	0	0	0	0.33	0	1360.44165	-0.29253	0	0	20
45	213	0	0	0.00E+00	15	189.0173	0	0	150.81167	189.0173	0	0	0	0.33	0	125.73643	0	0	0	20

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CPT: C-17

Project: **Group Delta/Brookside Equestrian Lot 2**
Location: **800 Meadowpass Heights Rd. Walnut, CA**

Total depth: 50.43 ft, Date: 9/4/2013
Cone Type: Vertek



	In situ data								Estimations											
Depth (ft)	qc (tsf)	fs (tsf)	SBTn	Ksbt (ft/s)	SPT N60 (blows/ft)	Constrained Mod. (tsf)	Dr (%)	Friction angle (°)	Es (tsf)	Go (tsf)	Nkt	Su (tsf)	Su ratio	Kocr	OCR	Vs (ft/s)	State parameter	Ko	Sensitivity	Peak phi (°)
1	175.3	4.48	8	5.48E-05	42	1715.06649	97	45	1368.4041	1715.0665	0	0	0	0.33	0	908.20111	-0.29471	0	0	20
2	121.4	5.31	8	7.59E-06	35	1697.41893	81	44	1354.3236	1697.4189	0	0	0	0.33	0	902.34552	-0.28533	0	0	20
3	107.2	4.55	8	6.71E-06	31	1531.389	76	43	1221.8529	1531.389	0	0	0	0.33	0	861.69482	-0.27096	0	0	20
4	84.5	4	9	3.41E-06	26	1179.23807	0	0	1087.3073	1362.7585	14	6.01652	11.37222	0.33	52.53968	817.57159	0	2.55067	1.47405	20
5	66.2	3.06	9	2.35E-06	21	922.09275	0	0	909.65301	1140.0984	14	4.70455	8.89239	0.33	41.08284	755.19244	0	2.34486	1.50669	20
6	73.5	2.43	8	6.41E-06	21	1054.9312	63	41	841.70042	1054.9312	0	0	0	0.33	0	730.51288	-0.21771	0	0	20
7	62.4	3.33	9	1.38E-06	21	866.98654	0	0	940.94142	1179.3133	14	4.4234	8.09435	0.33	37.39588	766.65918	0	2.27065	1.30178	20
8	67.1	3.19	9	1.71E-06	22	931.87314	0	0	973.211	1219.7578	14	4.75445	7.79185	0.33	35.99836	780.10895	0	2.24126	1.46062	20
9	43.6	2.52	9	4.29E-07	16	601.9072	0	0	807.41034	1011.9543	14	3.07096	4.82393	0.33	22.28654	718.33032	0	1.90226	1.19426	20
10	33.9	2.02	3	2.26E-07	14	465.07122	0	0	0	878.20484	14	2.37281	3.63695	0.33	16.80272	675.17657	0	1.7271	1.15117	20
11	50.1	1.84	4	1.27E-06	17	691.12637	0	0	761.38169	954.26506	14	3.52615	4.94182	0.33	22.83121	703.03992	0	1.91804	1.87806	20
12	39.3	1.03	5	1.42E-06	13	539.13312	39	36	582.11516	729.58434	0	0	0	0.33	0	627.05389	-0.12803	0	0	20
13	27.7	0.59	5	8.86E-07	10	375.97439	32	35	442.33367	554.39154	0	0	0	0.33	0	558.25067	-0.0911	0	0	20
14	15.8	0.37	4	1.74E-07	6	208.65772	0	0	0	412.91975	14	1.06458	1.42017	0.33	6.5612	492.17664	0	1.25209	2.8197	20
15	20	0.72	4	1.31E-07	8	266.66522	0	0	0	555.42971	14	1.36054	1.76657	0.33	8.16155	557.16345	0	1.34914	1.85184	20
16	14.7	0.59	3	4.58E-08	7	191.66076	0	0	0	483.0191	14	0.97786	1.25335	0.33	5.7905	524.63214	0	1.19971	1.62424	20
17	14.2	0.74	3	2.29E-08	7	183.87271	0	0	0	525.38486	14	0.93813	1.16696	0.33	5.39136	543.3858	0	1.17076	1.24238	20
18	38.4	0.45	5	4.04E-06	12	521.87943	35	35	466.56111	584.75659	0	0	0	0.33	0	576.32391	-0.06233	0	0	20
19	35.8	0.78	5	1.04E-06	12	484.68831	33	35	553.83585	694.14093	0	0	0	0.33	0	617.50623	-0.09797	0	0	20
20	23	0.88	4	1.11E-07	10	304.69513	0	0	0	654.07821	14	1.55457	1.7419	0.33	8.04756	599.92535	0	1.34267	1.73122	20
21	20.9	0.78	3	8.50E-08	9	274.46522	0	0	0	618.43322	14	1.40033	1.52904	0.33	7.06415	586.15308	0	1.28413	1.75939	20
22	12	0.72	3	6.87E-09	7	120.68807	0	0	0	528.7586	14	0.7594	0.81085	0.33	3.74612	546.59521	0	1.03369	1.03362	20
23	10.6	0.56	3	5.58E-09	6	87.43858	0	0	0	473.45002	14	0.65484	0.68125	0.33	3.14739	522.15527	0	0.97392	1.14598	20
24	44.1	1.29	4	7.07E-07	16	596.85457	0	0	731.38107	916.66428	14	3.04518	3.04384	0.33	14.06254	697.2583	0	1.62508	2.31339	20
25	7.9	0.37	3	2.74E-09	5	40.19369	0	0	0	387.9755	14	0.4559	0.44981	0.33	2.07813	480.79578	0	0.84501	1.20752	20
26	10.1	0.34	3	8.48E-09	5	69.94483	0	0	0	407.57291	14	0.60814	0.58681	0.33	2.71107	492.84106	0	0.92545	1.75287	20
27	6.2	0.09	3	5.06E-09	4	19.83787	0	0	0	240.32892	14	0.32657	0.30993	0.33	1.43187	399.15527	0	0.74394	3.55598	20
28	7.3	0.13	3	6.61E-09	4	29.5078	0	0	0	281.74641	14	0.40184	0.37465	0.33	1.73088	425.4642	0	0.79379	3.02928	20
29	7.4	0.11	3	8.46E-09	4	29.62774	0	0	0	272.26333	14	0.40608	0.37225	0.33	1.71978	420.74088	0	0.79204	3.6178	20
30	11	0.22	3	2.09E-08	5	76.70609	0	0	0	375.66418	14	0.65975	0.59319	0.33	2.74054	479.80154	0	0.92888	2.93889	20
31	11.7	0.29	3	1.68E-08	6	86.18598	0	0	0	418.52402	14	0.70634	0.62254	0.33	2.87613	501.27457	0	0.94435	2.38695	20
32	8.9	0.16	3	1.01E-08	5	43.04355	0	0	0	326.80725	14	0.50353	0.43614	0.33	2.01497	453.69415	0	0.83614	3.08412	20
33	8.5	0.09	3	1.71E-08	4	37.22945	0	0	0	278.50276	14	0.47187	0.40254	0.33	1.85971	427.96765	0	0.81352	5.13819	20
34	9.4	0.21	3	7.66E-09	5	46.61487	0	0	0	363.63304	14	0.53271	0.44645	0.33	2.06261	473.67422	0	0.84285	2.486	20
35	5.7	0.07	3	2.66E-09	4	11.42437	0	0	0	228.67677	14	0.26552	0.21952	0.33	1.01419	393.47867	0	0.66116	3.71731	20
36	11.4	0.1	4	5.45E-08	5	71.62175	0	0	0	320.67047	14	0.66989	0.54549	0.33	2.52017	455.77039	0	0.90263	6.56488	20
37	9.6	0.09	3	2.48E-08	5	45.64257	0	0	0	297.22085	14	0.53865	0.43232	0.33	1.99734	441.42981	0	0.83363	5.86527	20
38	43.8	1.5	4	2.81E-07	17	582.47573	0	0	0	1057.3841	14	2.97181	2.36625	0.33	10.93208	745.53735	0	1.49097	1.94159	20
39	9.4	0.21	3	4.95E-09	5	38.59003	0	0	0	373.25483	14	0.50532	0.38963	0.33	1.8001	479.97424	0	0.80451	2.35815	20
40	16.4	0.49	3	2.02E-08	8	148.81533	0	0	0	573.69267	14	1.00173	0.75795	0.33	3.50172	574.56934	0	1.01011	2.00347	20
41	19.4	0.91	3	1.38E-08	10	213.50335	0	0	0	744.28869	14	1.21214	0.89866	0.33	4.1518	640.45154	0	1.07069	1.30539	20
42	25.3	0.76	3	6.55E-08	11	319.45985	0	0	0	754.63651	14	1.6299	1.18497	0.33	5.47458	646.73828	0	1.17691	2.10171	20
43	15.7	0.33	3	2.64E-08	8	123.82032	0	0	0	512.92253	14	0.94009	0.672	0.33	3.10464	550.7168	0	0.96937	2.79177	20
44	35.7	1	4	1.82E-07	14	463.41693	0	0	0	910.07482	14	2.36437	1.68347	0.33	7.77761	701.67181	0	1.32709	2.31708	20
45	95.4	1.66	5	6.08E-06	28	1351.62003	44	38	1078.4202	1351.62	0	0	0	0.33	0	833.96826	-0.11927	0	0	20
46	122.4	4.69	4	1.72E-06	40	1676.44315	0	0	1748.693	2191.6952	14	8.55328	6.07672	0.33	28.07443	1028.75305	0	2.05856	1.78725	20
47	48.6	2.04	4	1.53E-07	20	643.48052	0	0	0	1304.0381	14	3.28306	2.18382	0.33	10.08924	819.58838	0	1.45062	1.57716	20
48	64.6	3.99	3	1.20E-07	27	864.0956	0	0	0	1828.9503	14	4.40865	2.85468	0.33	13.18861	949.59961	0	1.5898	1.08283	20
49	200.1	10.82	9	1.73E-06	66	2760.46365	0	0	2878.1654	3607.3006	14	14.084	9.4517	0.33	43.66688	1300.56006	0	2.39429	1.27563	20
50	352.7	5.76	6	1.07E-04	79	3032.03801	85	44	2419.1793	3032.038	0	0	0	0.33	0	1192.35767	-0.24688	0	0	20

APPENDIX B
LABORATORY TESTING

B.1 General

The laboratory testing program performed for this investigation included Moisture Content, Dry Unit Weight, Atterberg Limits, Percent Passing No. 200 Sieve, Consolidation, Direct Shear, Pocket Penetrometer, Expansion Index, and Corrosivity. Descriptions of these tests are given below.

B.2 Moisture Content and Dry Unit Weight

The natural moisture content of selected SPT and California ring samples and dry unit weight of California ring samples were determined in general accordance with ASTM D 2216 and ASTM D2937. Results of these tests are presented on the boring logs in Appendix A.

B.3 Atterberg Limits

Soil plasticity was evaluated by measuring the Atterberg limits. This test includes Liquid Limit (LL) and Plastic Limit (PL) tests to determine the Plasticity Index (PI) in accordance with ASTM D4318. Results of these tests are illustrated in the plasticity charts shown in Figure B-1A through B-1C, and on the boring logs in Appendix A.

B.4 Percent Passing No. 200 Sieve

Determination of fines verses coarser soil particles was performed by the percent #200 Sieve test. Representative samples were dried, weighed, soaked in water until individual soil particles were separated, and then washed on the No. 200 sieve. The percentage of fines (i.e., soil passing #200 sieve) are shown on the boring logs.

B.5 Consolidation

The consolidation characteristics of the foundation soils were determined by performing one-dimensional consolidation in general accordance with ASTM D2435, using a floating ring consolidometer and dead weight system. Results of these tests are presented in Figures B-2A to B-2H.

B.6 Direct Shear Test

To determine the shear strength parameters of the on-site soils, direct shear tests were performed on selected undisturbed drive samples in accordance with ASTM D 3080. After the initial weight and volume measurements were made, the sample was placed in a calibrated shear machine and a selected normal load was applied. The samples were submerged, allowed to consolidate, and then were sheared to failure. Shear stress and sample deformation were monitored throughout the test. The process was repeated under two additional normal loads. The test results are graphically presented in Figures B-3A through B-3C.

B.7 Pocket Penetrometer

Undrained shear strengths (S_u) of cohesive samples were measured using a pocket penetrometer. The measured S_u values (in ksf) are presented in the boring logs of Appendix A.

B.8 Soil Expansion Index

Representative grab samples of existing fill soil was collected from the site and tested to determine the expansion index. Testing was performed according to ASTM D4829. The results of the test are presented in Table B-1.

B.9 Soil Corrosivity

Corrosivity testing included performing soil pH and resistivity (Caltrans Test Method 643), water-soluble chlorides (ASTM D512), and water soluble sulfates (ASTM D516). The test results are summarized in Table B-2.

B.10 List Tables and Figures

The following tables and figures are attached and complete this appendix:

Table B-1	Soil Expansion
Table B-2	Soil Corrosivity
Figures B-1A to B-1C	Atterberg Limits Plot
Figures B-2A to B-2H	Consolidation Plots
Figures B-3A to B-3C	Direct Shear Plots

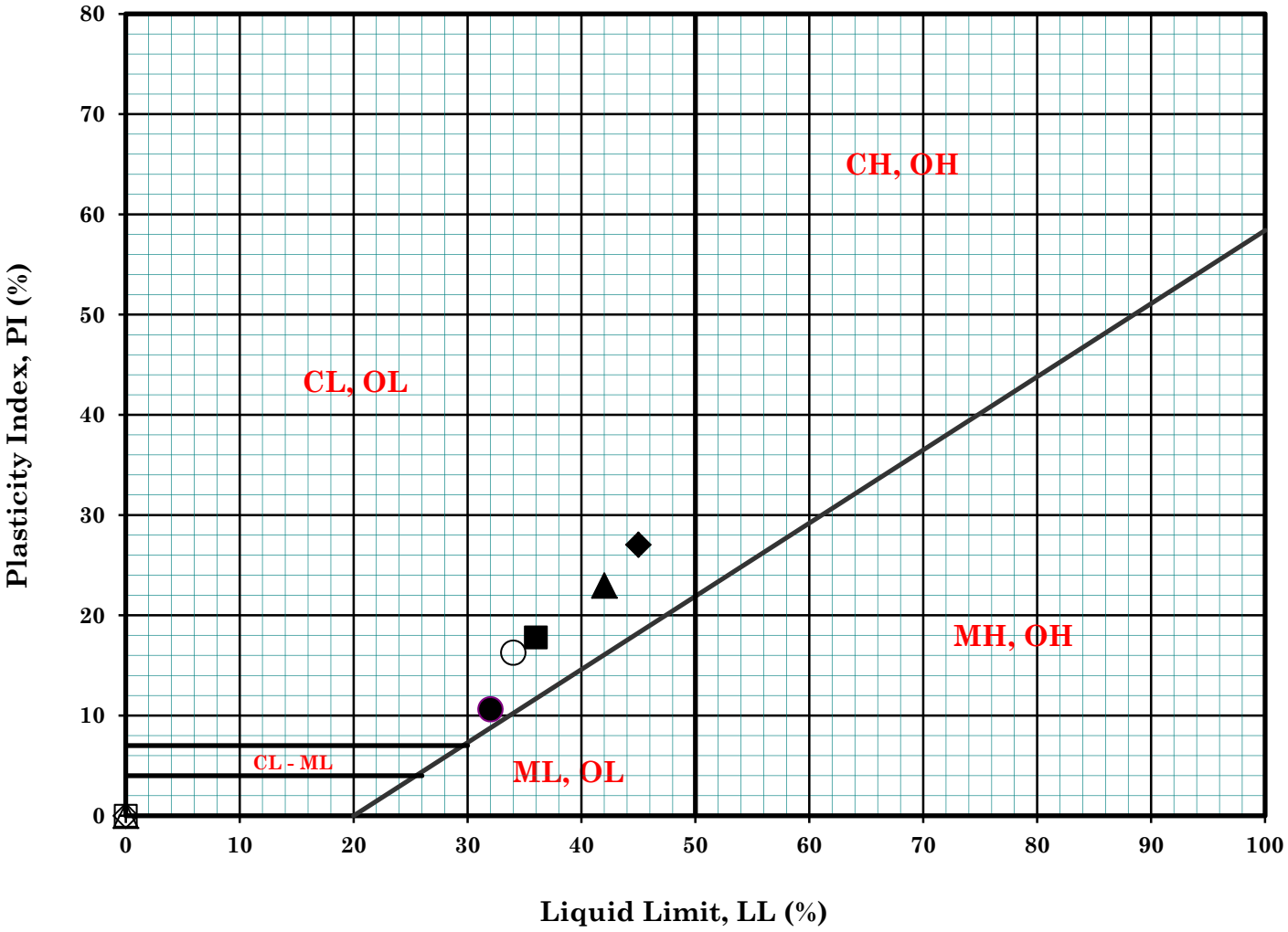
Table B-1. Soil Expansion

Boring	Sample Depth, feet	Expansion Index
B-1	0-5	70 (medium)
B-9	1-3	79 (medium)
B-12	1-5	59 (medium)
B-16	1-3	57 (medium)

Table B-2. Soil Corrosivity

Boring	Sample Depth, feet	pH	Chlorides ppm	Sulfates ppm	Minimum Resistivity ohm-cm
B-1	0 – 5	7.5	46.25	20.5	534
B-16	1 – 3	7.8	0	9.5	673

PLASTICITY CHART



Symbol	Boring No.	Sample No.	Depth (ft)		Depth (m)		MC (%)	LL (%)	PL (%)	PI (%)	Description
●	B-1	R3	7.5	9.0	2.3	2.7	16.75	32	21	11	Dark Yellowish Brown Sandy Clay (CL)
▲	B-1	S6	20.0	21.5	6.1	6.6	22.36	42	19	23	Dark Brown Silty Clay (CL)
◆	B-3	R3	7.5	9.0	2.3	2.7	18.51	45	18	27	Dark Yellowish Brown Sandy Clay (CL)
■	B-3	S4	10.0	11.5	3.1	3.5	16.18	36	18	18	Dark yellowish Brown Sandy Clay (CL)
○	B-3	R5	15.0	16.5	4.6	5.0	15.91	34	18	16	Dark yellowish Brown Sandy Clay (CL)
△											
◇											
□											

Remark :

GROUP DELTA CONSULTANTS

Brookeside Equestrian, Lot 2

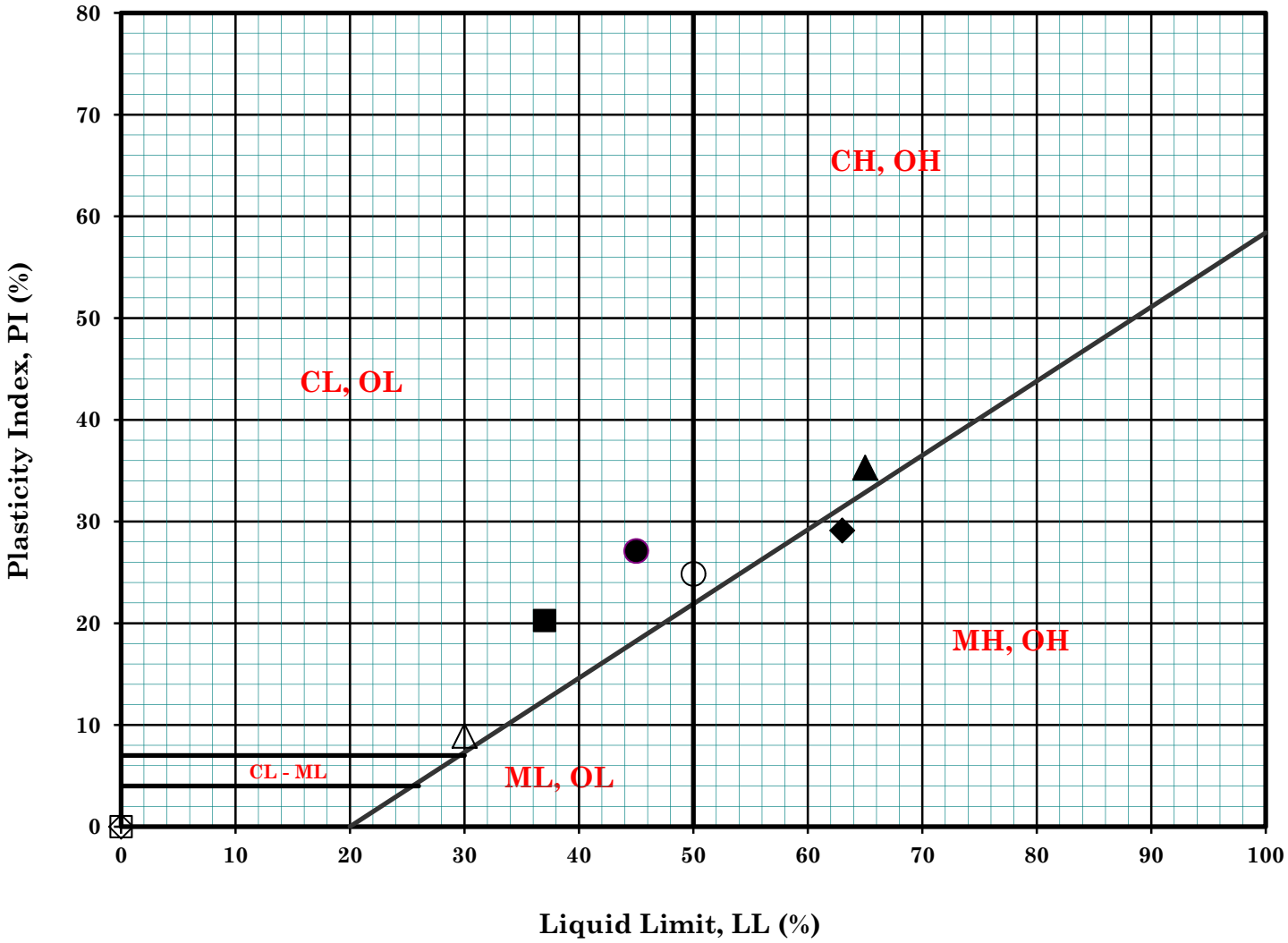
Project No. : LA1148

Date : 8/2/13

ATTERBERG LIMITS
(ASTM D-4318-84)

Fig. NO. B-1A

PLASTICITY CHART



Symbol	Boring No.	Sample No.	Depth (ft)		Depth (m)		MC (%)	LL (%)	PL (%)	PI (%)	Description
●	B-9	S5	10.5	12.0	3.2	3.7	18.38	45	18	27	Lean CLAY with SAND (CL)
▲	B-12	R3	6.0	7.5	1.8	2.3	30.58	65	30	35	Fat CLAY (CH)
◆	B-12	R5	11.0	12.5	3.4	3.8	34.67	63	34	29	Elastic SILT (MH)
■	B-13	R2	3.5	5.0	1.1	1.5	13.42	37	17	20	Lean CLAY (CL)
○	B-14	R3	6.0	7.5	1.8	2.3	24.74	50	25	25	Lean CLAY (CL)/Fat CLAY (CH)
△	B-14	R7	21.0	22.5	6.4	6.9	24.63	30	21	9	Clayey SAND (SC)
◇											
□											

Remark :

GROUP DELTA CONSULTANTS

Brookside Equestrian, Lot 2

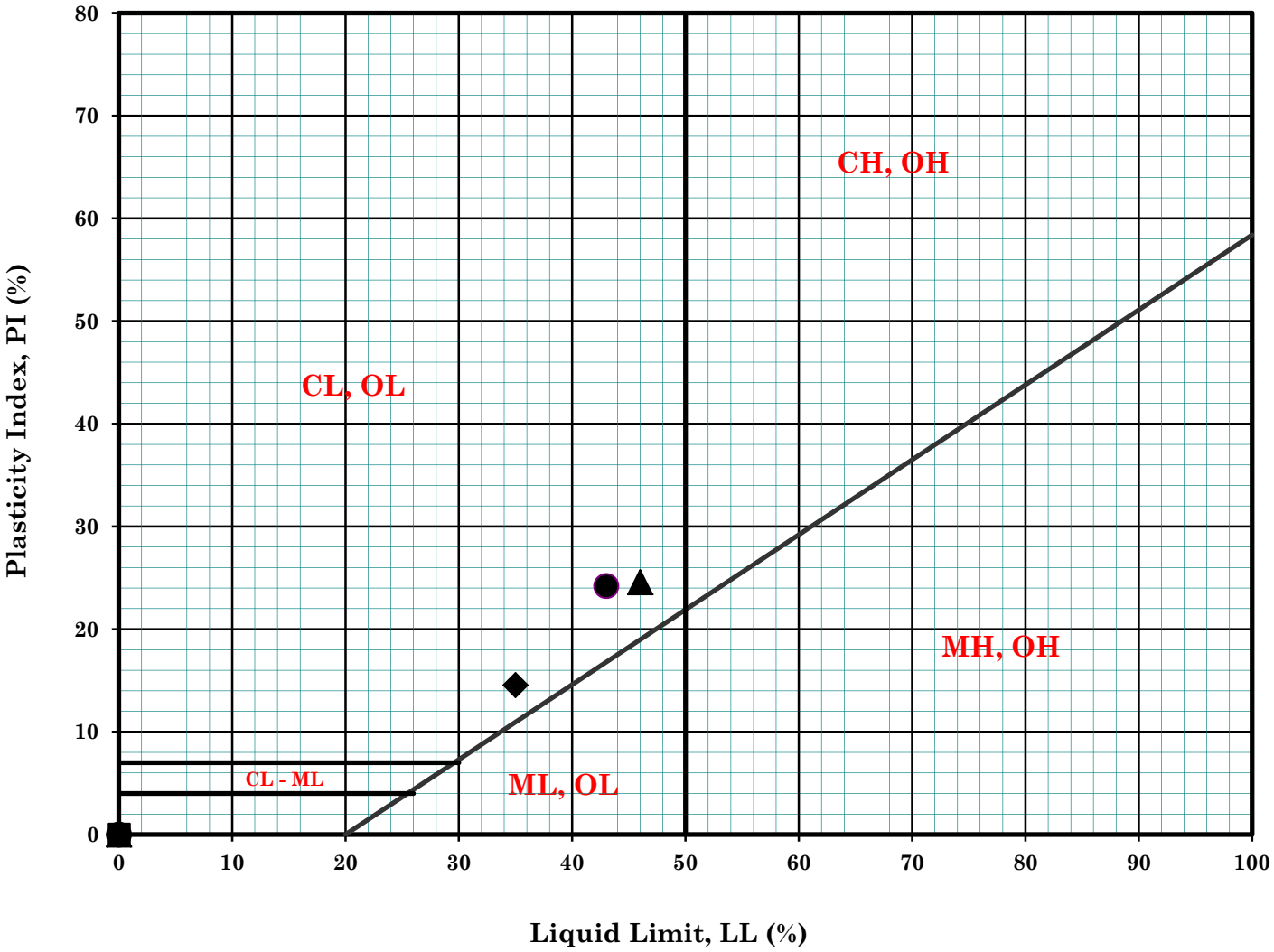
Project No. : LA1148B

Date : 9/23/13

ATTERBERG LIMITS
(ASTM D-4318-84)

Figure No. : B-1B

PLASTICITY CHART



Symbol	Boring No.	Sample No.	Depth (ft)		Depth (m)		MC (%)	LL (%)	PL (%)	PI (%)	Description
●	B-16	R6	16.0	17.5	4.9	5.3	22.51	43	19	24	Clayey SAND (SC)
▲	B-16	R8	26.0	27.5	7.9	8.4	32.26	46	21	25	Lean CLAY with SAND (CL)
◆	B-16	R10	36.0	37.5	11.0	11.4	21.39	35	20	15	Clayey SAND (SC)
■											
○											
△											
◇											
□											

Remark :

GROUP DELTA CONSULTANTS

Brookside Equestrian, Lot 2

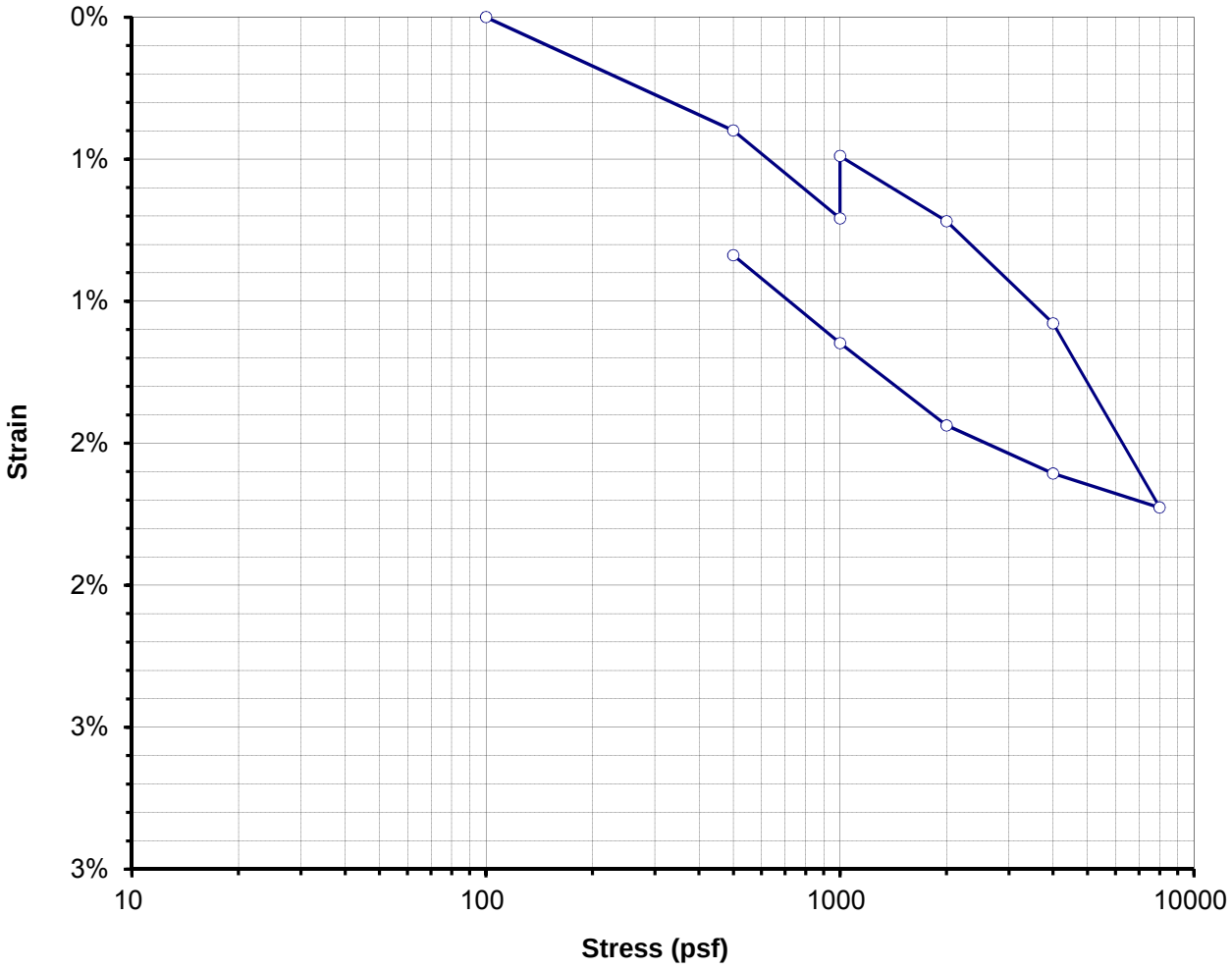
Project No. : LA1148B

Date : 9/24/13

ATTERBERG LIMITS
(ASTM D-4318-84)

Figure No. : B-1C

CONSOLIDATION TEST RESULTS
ASTM D-2435



Boring No.	B-1	**Sample Depth**	7.5 ft
Sample No.	R-3	**USCS**	CL

BEFORE TEST

Initial Moisture Content:	14.5%	
Initial Dry Unit Wt:	106.3	**pcf**
Initial Total Unit Wt.:	121.7	**pcf**
Initial Void Ratio:	0.5087	
Initial Degree of Saturation:	73.2%	

AFTER TEST

Final Moisture Content:	19.6%	
Final Dry Unit Wt:	106.6	**pcf**
Final Total Unit Wt.:	102.4	**pcf**
Final Void Ratio:	0.5042	
Final Degree of Saturation:	99.9%	

Water Added at: 1000 **psf**

ATTERBERG LIMITS					
LL=	32	**PL=**	21	**PI=**	11

Assumed Specific Gravity of Solids, Gs: 2.57

PRESSURE (psf)	SAMPLE STRAIN	VOID RATIO
500	0.40%	0.5027
1000	0.71%	0.4980
1000	0.49%	0.5014
2000	0.72%	0.4979
4000	1.08%	0.4925
8000	1.73%	0.4827
4000	1.61%	0.4845
2000	1.44%	0.4871
1000	1.15%	0.4914
500	0.84%	0.4961

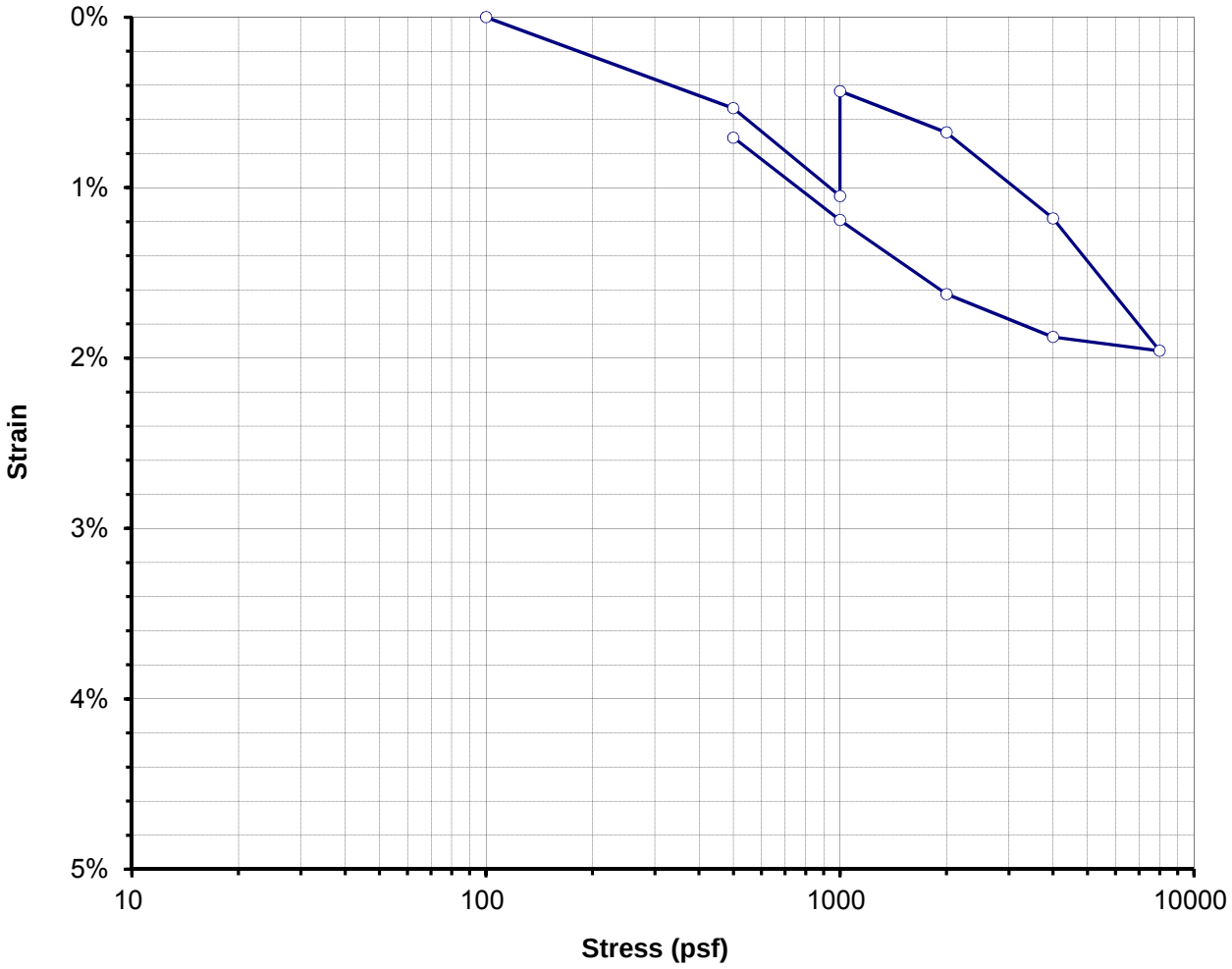
PROJECT NUMBER: LA-1148

PROJECT NAME: Brookside Equestrian

FIGURE NO.
B-2A

GROUP DELTA CONSULTANTS

CONSOLIDATION TEST RESULTS
ASTM D-2435



Boring No.	B-3	**Sample Depth**	7.5 ft
Sample No.	R-3	**USCS**	CL

BEFORE TEST

Initial Moisture Content:	18.8%	
Initial Dry Unit Wt:	106.4	pcf
Initial Total Unit Wt.:	126.4	pcf
Initial Void Ratio:	0.5617	
Initial Degree of Saturation:	89.2%	

AFTER TEST

Final Moisture Content:	21.1%	
Final Dry Unit Wt:	106.4	pcf
Final Total Unit Wt.:	103.3	pcf
Final Void Ratio:	0.5611	
Final Degree of Saturation:	100.0%	

Water Added at: 1000 psf

ATTERBERG LIMITS					
LL=	45	**PL=**	18	**PI=**	27

Assumed Specific Gravity of Solids, Gs: 2.66

PRESSURE (psf)	SAMPLE STRAIN	VOID RATIO
500	0.53%	0.5534
1000	1.05%	0.5454
1000	0.43%	0.5550
2000	0.68%	0.5512
4000	1.18%	0.5433
8000	1.96%	0.5312
4000	1.88%	0.5324
2000	1.62%	0.5364
1000	1.19%	0.5431
500	0.71%	0.5507

PROJECT NUMBER: LA-1148

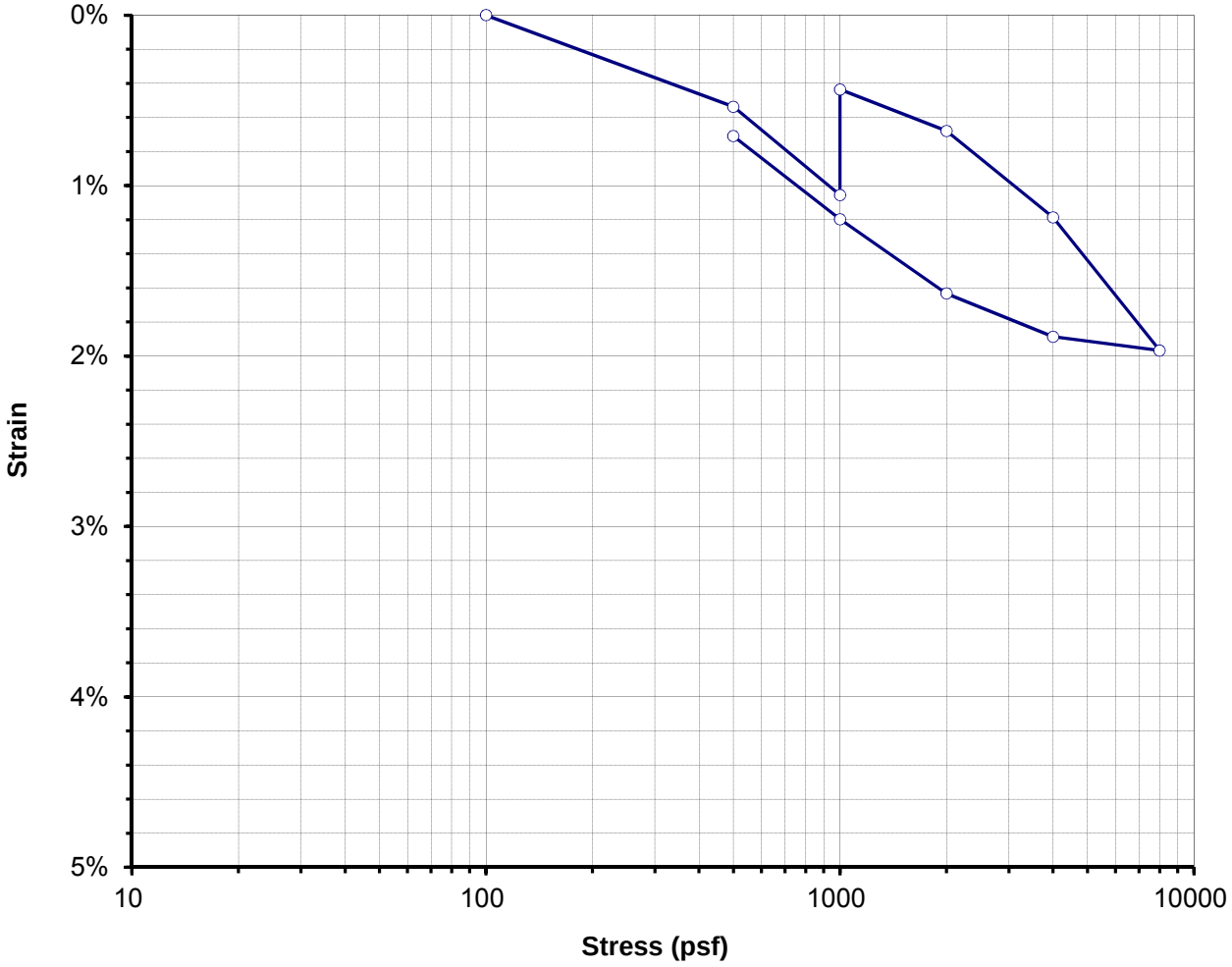
PROJECT NAME: Brookside Equestrian

FIGURE NO.
B-2B

GROUP DELTA CONSULTANTS

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CONSOLIDATION TEST RESULTS
ASTM D-2435



Boring No.	B-3	**Sample Depth**	15 ft
Sample No.	R-5	**USCS**	CL

BEFORE TEST

Initial Moisture Content:	16.1%	
Initial Dry Unit Wt:	110.8	**pcf**
Initial Total Unit Wt.:	128.6	**pcf**
Initial Void Ratio:	0.4756	
Initial Degree of Saturation:	88.5%	

AFTER TEST

Final Moisture Content:	17.9%	
Final Dry Unit Wt:	111.2	**pcf**
Final Total Unit Wt.:	104.2	**pcf**
Final Void Ratio:	0.4696	
Final Degree of Saturation:	99.9%	

Water Added at: 1000 **psf**

ATTERBERG LIMITS					
LL=	34	**PL=**	18	**PI=**	16

Assumed Specific Gravity of Solids, Gs: 2.62

PRESSURE (psf)	SAMPLE STRAIN	VOID RATIO
500	0.54%	0.4676
1000	1.05%	0.4600
1000	0.44%	0.4691
2000	0.68%	0.4655
4000	1.19%	0.4580
8000	1.97%	0.4465
4000	1.89%	0.4477
2000	1.63%	0.4515
1000	1.20%	0.4579
500	0.71%	0.4651

PROJECT NUMBER: LA-1148

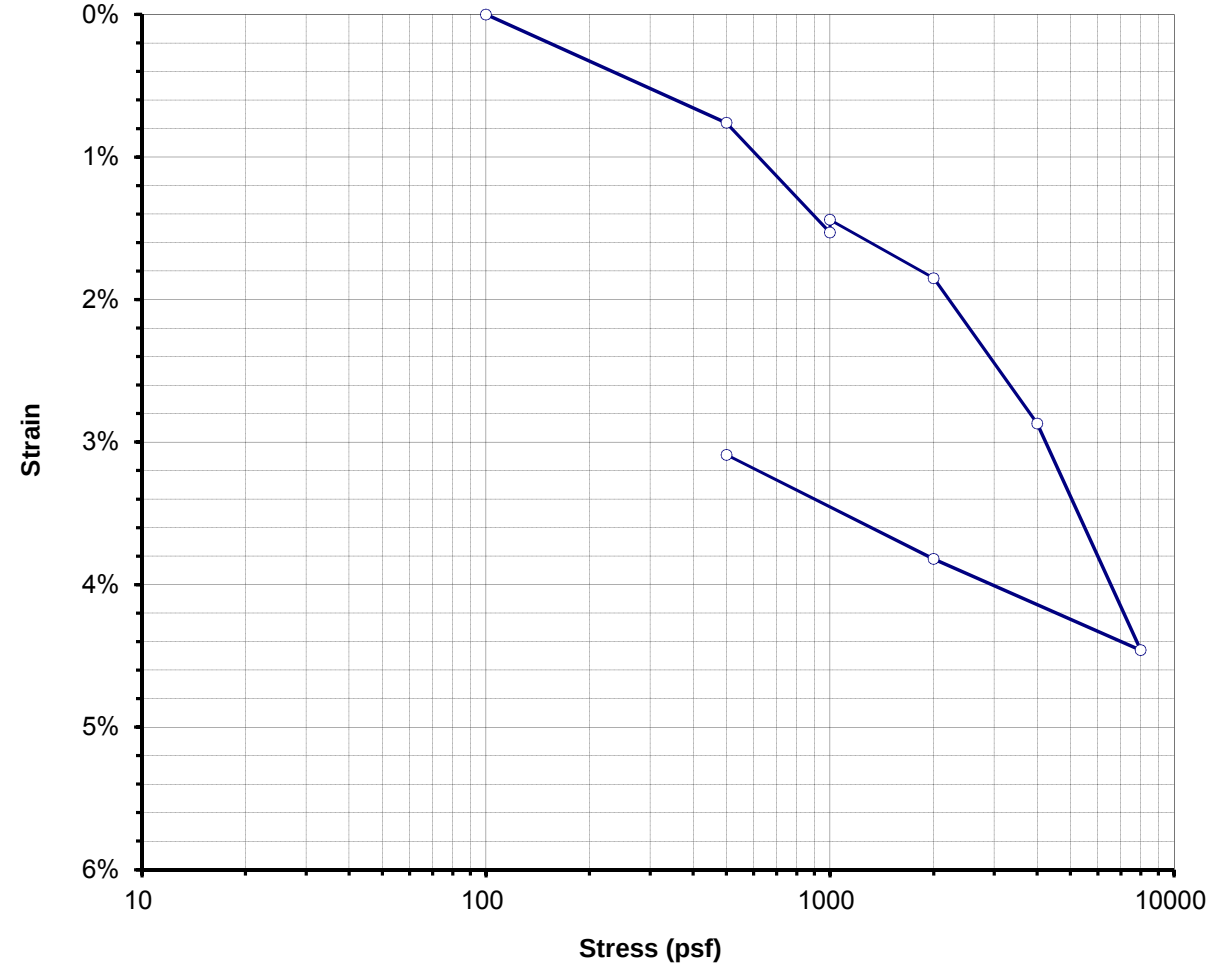
PROJECT NAME: Brookside Equestrian

FIGURE NO.
B-2C

GROUP DELTA CONSULTANTS

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CONSOLIDATION TEST RESULTS
ASTM D-2435



Boring No.	B-12	**Sample Depth**	11
Sample No.	R-5	**USCS**	MH

BEFORE TEST

Initial Moisture Content:	34.9%	
Initial Dry Unit Wt:	80.0	pcf
Initial Total Unit Wt.:	107.9	pcf
Initial Void Ratio:	1.0327	
Initial Degree of Saturation:	88.1%	

AFTER TEST

Final Moisture Content:	37.1%	
Final Dry Unit Wt:	82.7	pcf
Final Total Unit Wt.:	113.3	pcf
Final Void Ratio:	0.9656	
Final Degree of Saturation:	100.0%	

Water Added at: 1000 psf

ATTERBERG LIMITS					
LL=	63	**PL=**	24	**PI=**	39

Assumed Specific Gravity of Solids, Gs: 2.61

PRESSURE (psf)	SAMPLE STRAIN	VOID RATIO
100	0.00%	1.0327
500	0.76%	1.0172
1000	1.53%	1.0016
1000	1.44%	1.0034
2000	1.85%	0.9951
4000	2.87%	0.9743
8000	4.46%	0.9420
2000	3.82%	0.9550
500	3.09%	0.9698
0	2.26%	0.9867

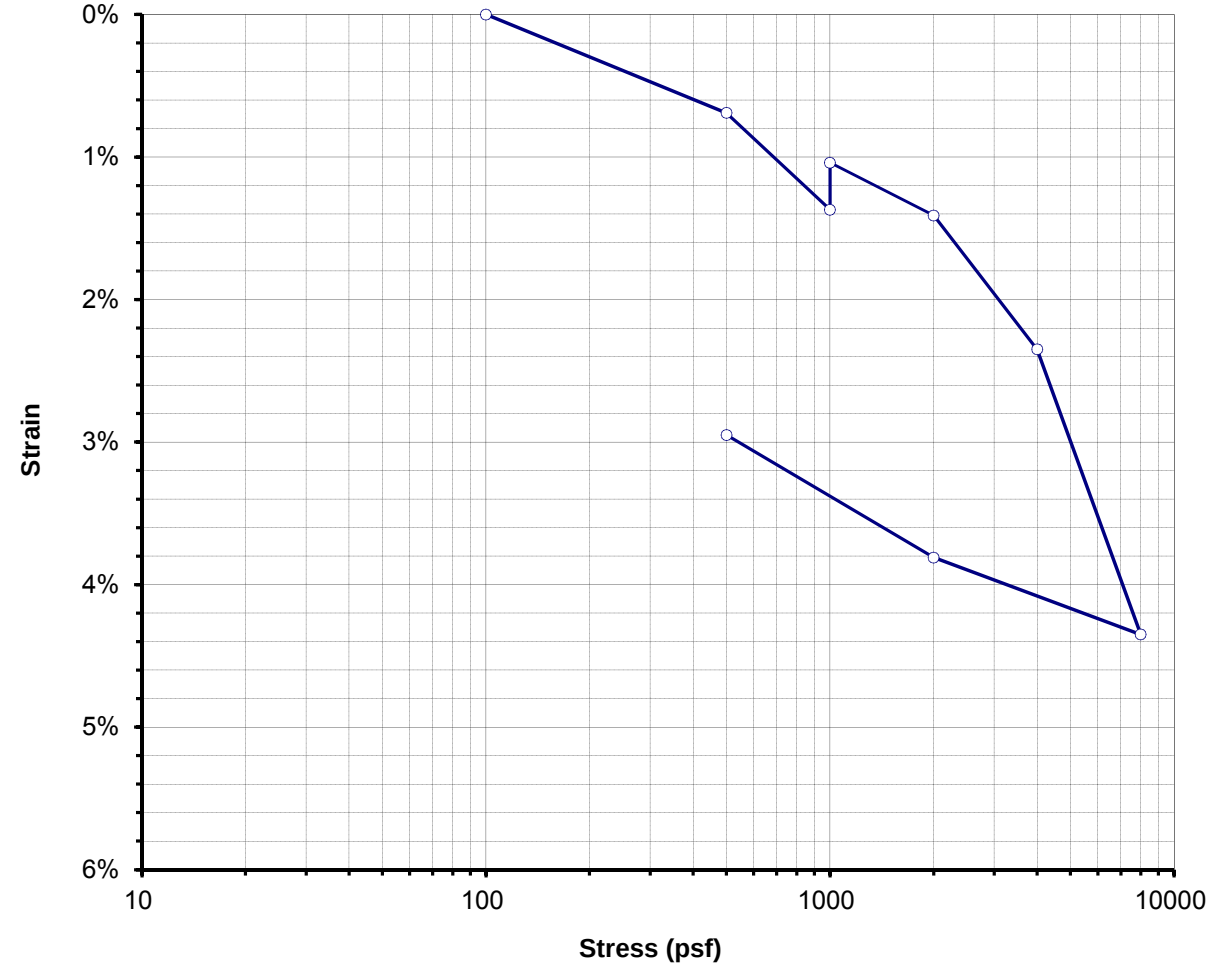
PROJECT NUMBER: LA-1148B

PROJECT NAME: Brookside Equestrian - American Multifamily, Lot 2

FIGURE NO. B-2D

GROUP DELTA CONSULTANTS

CONSOLIDATION TEST RESULTS
ASTM D-2435



Boring No.	B-12	**Sample Depth**	6
Sample No.	R-3	**USCS**	CH

BEFORE TEST

Initial Moisture Content:	30.6%	
Initial Dry Unit Wt:	82.4	**pcf**
Initial Total Unit Wt.:	107.5	**pcf**
Initial Void Ratio:	0.8829	
Initial Degree of Saturation:	86.0%	

AFTER TEST

Final Moisture Content:	33.9%	
Final Dry Unit Wt:	84.2	**pcf**
Final Total Unit Wt.:	112.7	**pcf**
Final Void Ratio:	0.8414	
Final Degree of Saturation:	100.1%	

Water Added at: 1000 **psf**

ATTERBERG LIMITS					
LL=	65	**PL=**	35	**PI=**	30

Assumed Specific Gravity of Solids, Gs: 2.49

PRESSURE (psf)	SAMPLE STRAIN	VOID RATIO
100	0.00%	0.8829
500	0.69%	0.8699
1000	1.37%	0.8571
1000	1.04%	0.8633
2000	1.41%	0.8563
4000	2.35%	0.8386
8000	4.35%	0.8010
2000	3.81%	0.8111
500	2.95%	0.8273
0	1.68%	0.8512

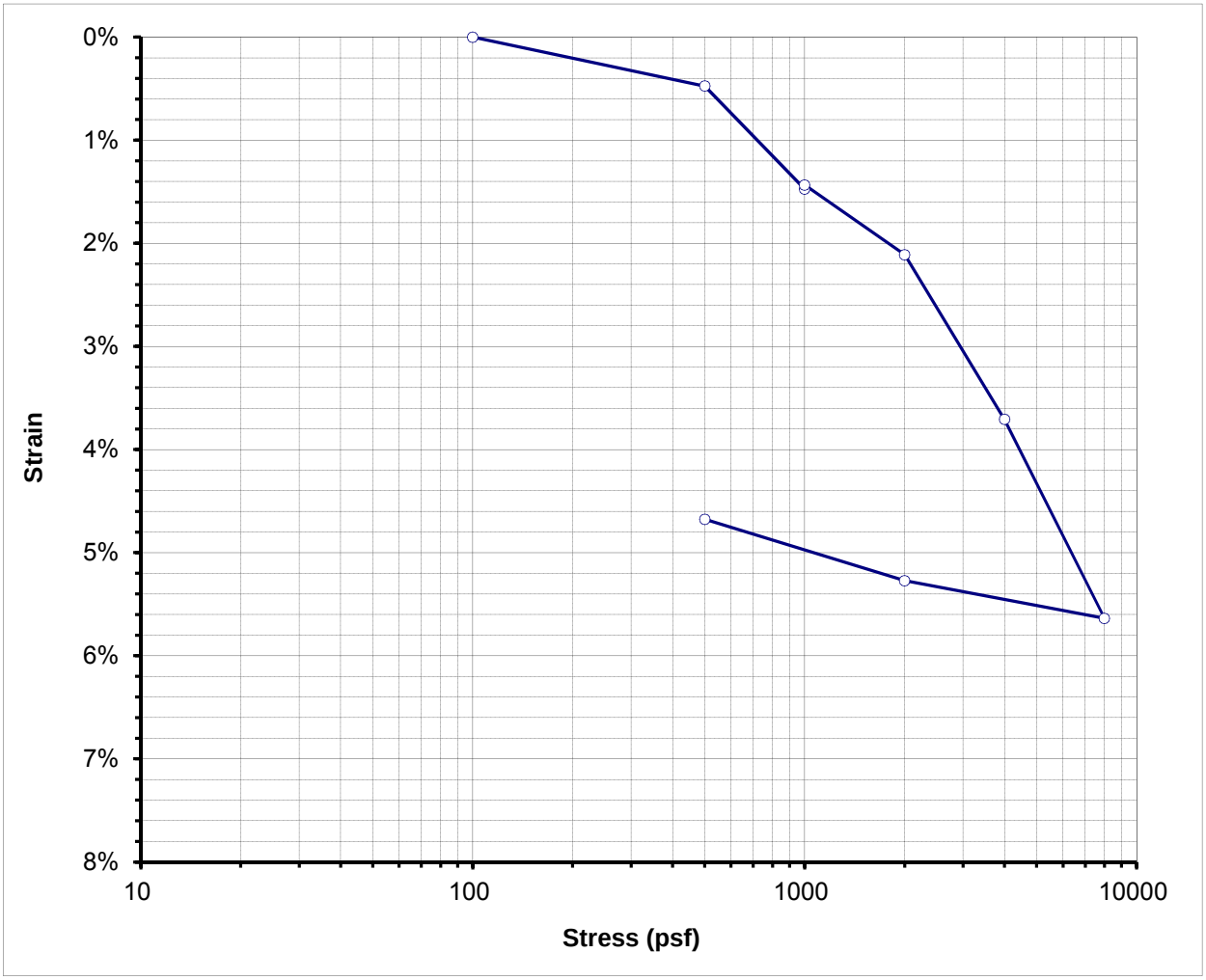
PROJECT NUMBER: LA-1148B

PROJECT NAME: Brookside Equestrian - American Multifamily, Lot 2

FIGURE NO. B-2E

GROUP DELTA CONSULTANTS

CONSOLIDATION TEST RESULTS
ASTM D-2435



Boring No.	B-14	**Sample Depth**	21
Sample No.	R-7	**USCS**	SC

BEFORE TEST

Initial Moisture Content:	24.7%	
Initial Dry Unit Wt:	100.7	pcf
Initial Total Unit Wt.:	125.6	pcf
Initial Void Ratio:	0.7173	
Initial Degree of Saturation:	95.6%	

AFTER TEST

Final Moisture Content:	22.6%	
Final Dry Unit Wt:	106.3	pcf
Final Total Unit Wt.:	130.3	pcf
Final Void Ratio:	0.6271	
Final Degree of Saturation:	100.0%	

Water Added at: 1000 psf

ATTERBERG LIMITS					
LL=	30	**PL=**	21	**PI=**	9

Assumed Specific Gravity of Solids, Gs: 2.77

PRESSURE (psf)	SAMPLE STRAIN	VOID RATIO
100	0.00%	0.7173
500	0.47%	0.7091
1000	1.47%	0.6920
1000	1.43%	0.6927
2000	2.11%	0.6810
4000	3.71%	0.6536
8000	5.64%	0.6205
2000	5.27%	0.6267
500	4.68%	0.6370
0	3.94%	0.6496

PROJECT NUMBER: LA-1148B

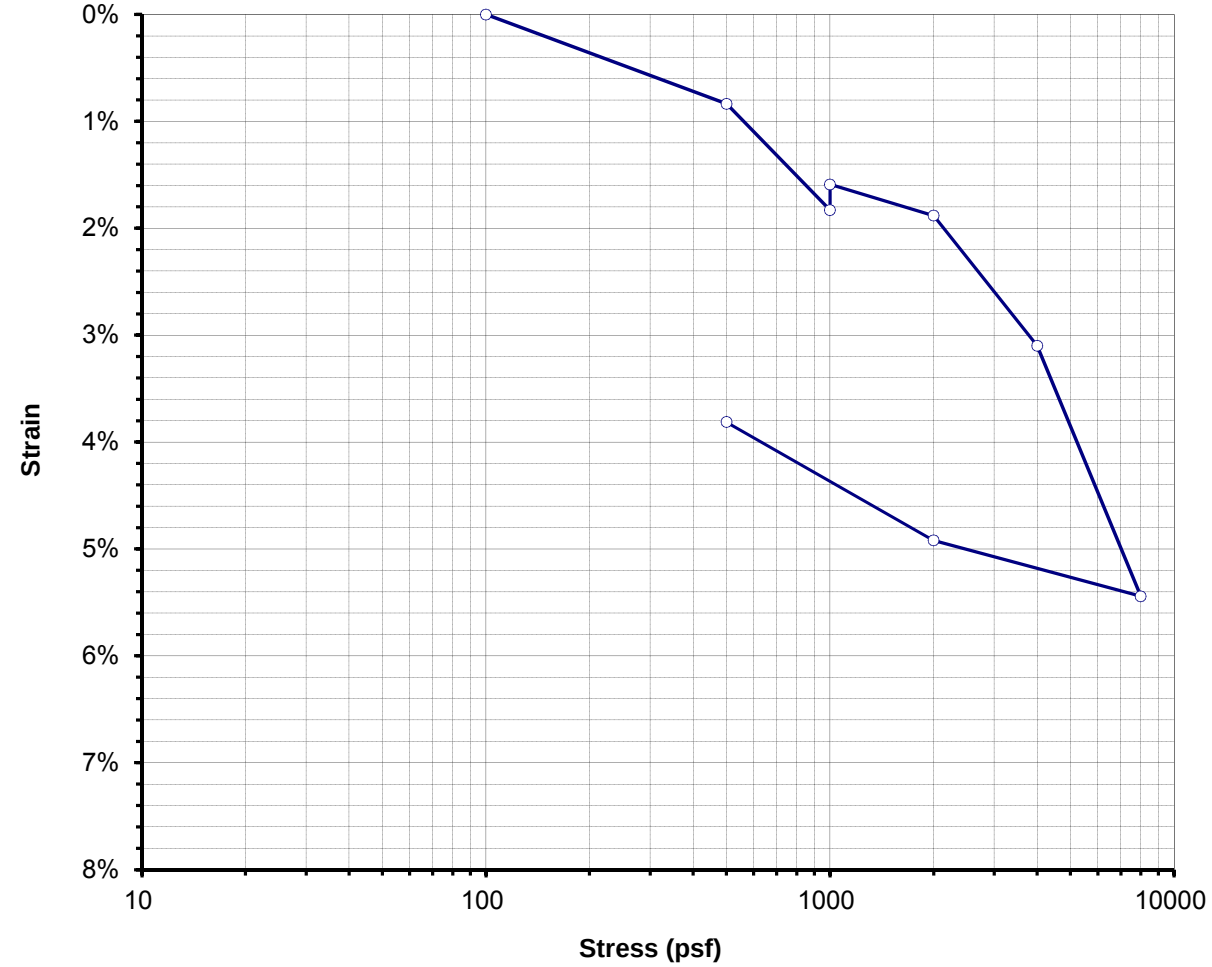
PROJECT NAME: Brookside Equstrian - American Multifamily, Lot 2

FIGURE NO. B-2F

GROUP DELTA CONSULTANTS

N:\Projects\1100-1199\LA-1148B American Multifamily Walnut Lot 2\Laboratory Tests\Consol LA-1148B B-14 @ 21ft.xls

CONSOLIDATION TEST RESULTS
ASTM D-2435



Boring No.	B-16	**Sample Depth**	16
Sample No.	R-6	**USCS**	SC

BEFORE TEST

Initial Moisture Content:	29.5%	
Initial Dry Unit Wt:	92.2	pcf
Initial Total Unit Wt.:	119.4	pcf
Initial Void Ratio:	0.8490	
Initial Degree of Saturation:	94.9%	

AFTER TEST

Final Moisture Content:	28.6%	
Final Dry Unit Wt:	95.6	pcf
Final Total Unit Wt.:	123.0	pcf
Final Void Ratio:	0.7824	
Final Degree of Saturation:	100.0%	

Water Added at: 1000 psf

ATTERBERG LIMITS					
LL=	43	**PL=**	19	**PI=**	24

Assumed Specific Gravity of Solids, Gs: 2.73

PRESSURE (psf)	SAMPLE STRAIN	VOID RATIO
100	0.00%	0.8490
500	0.84%	0.8335
1000	1.83%	0.8151
1000	1.59%	0.8196
2000	1.88%	0.8142
4000	3.10%	0.7917
8000	5.44%	0.7483
2000	4.92%	0.7580
500	3.81%	0.7785
0	2.93%	0.7948

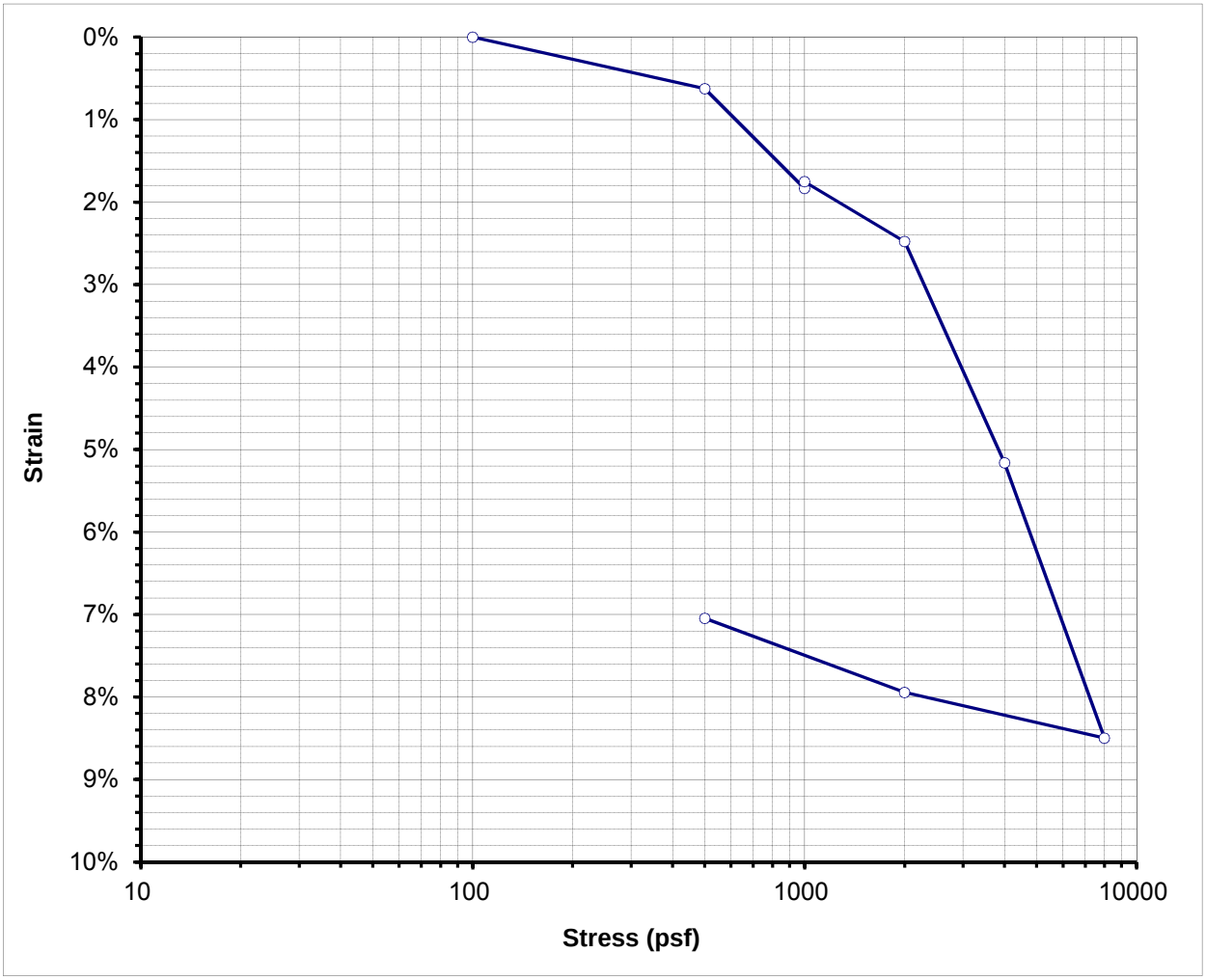
PROJECT NUMBER: LA-1148B

PROJECT NAME: Brookside Equestrian - American Multifamily, Lot 2

FIGURE NO. B-2G

GROUP DELTA CONSULTANTS

CONSOLIDATION TEST RESULTS
ASTM D-2435



Boring No.	B-16	**Sample Depth**	26
Sample No.	R-8	**USCS**	CL

BEFORE TEST

Initial Moisture Content:	36.4%	
Initial Dry Unit Wt:	83.9	pcf
Initial Total Unit Wt.:	114.5	pcf
Initial Void Ratio:	1.0334	
Initial Degree of Saturation:	96.4%	

AFTER TEST

Final Moisture Content:	32.4%	
Final Dry Unit Wt:	90.5	pcf
Final Total Unit Wt.:	119.8	pcf
Final Void Ratio:	0.8854	
Final Degree of Saturation:	100.0%	

Water Added at: 1000 psf

ATTERBERG LIMITS					
LL=	46	**PL=**	21	**PI=**	25

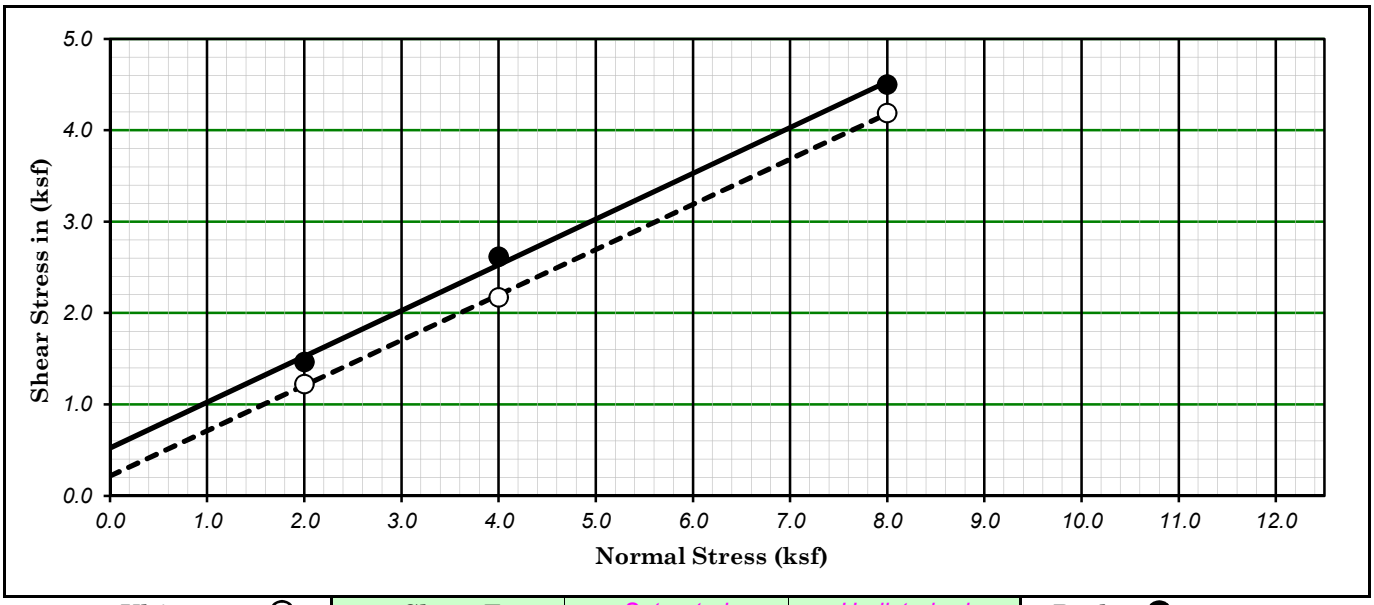
Assumed Specific Gravity of Solids, Gs: 2.74

PRESSURE (psf)	SAMPLE STRAIN	VOID RATIO
100	0.00%	1.0334
500	0.62%	1.0207
1000	1.83%	0.9961
1000	1.75%	0.9978
2000	2.48%	0.9830
4000	5.16%	0.9285
8000	8.50%	0.8606
2000	7.94%	0.8719
500	7.05%	0.8901
0	5.91%	0.9133

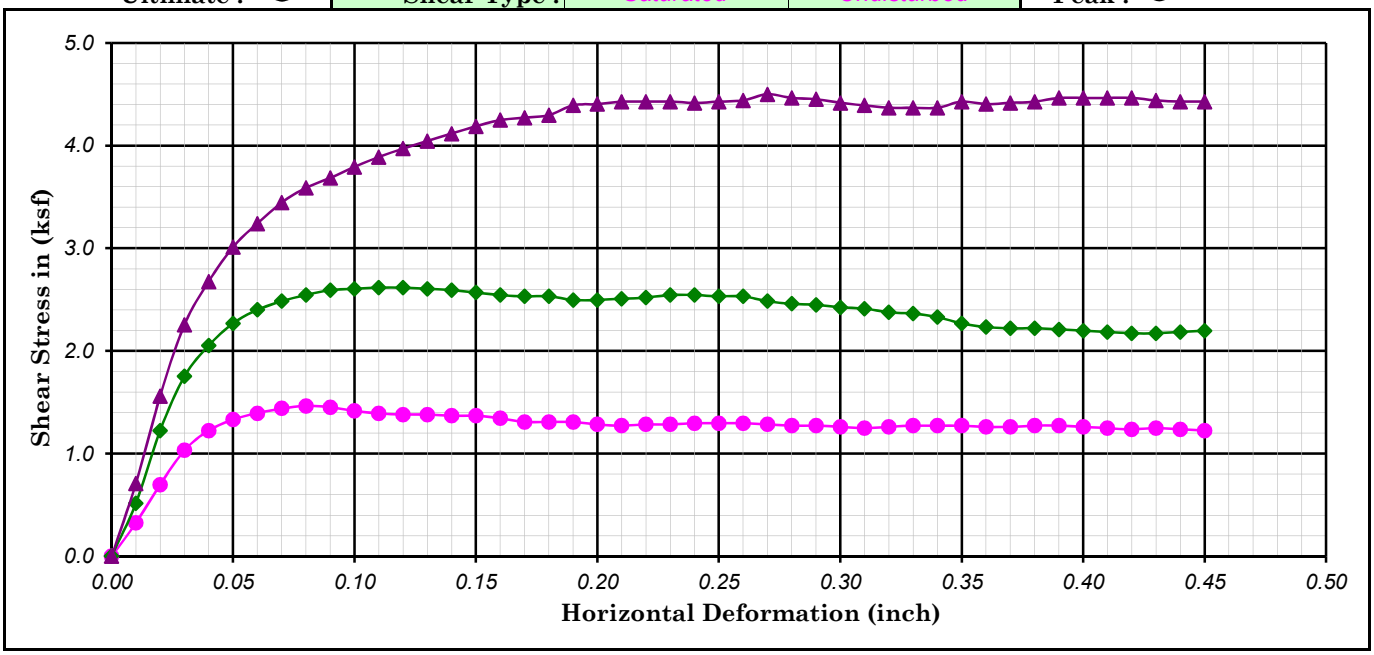
PROJECT NUMBER: LA-1148B

PROJECT NAME: Brookside Equstrian - American Multifamily, Lot 2

FIGURE NO. B-2H



Ultimate : ○ | Shear Type : Saturated | Undisturbed | Peak : ●



Boring No. : B-1		Strength Intercept (C) :	0.52	(ksf)	Peak	0.22	(ksf)	Ultimate
Sample No. : R1			24.99	(kPa)		10.34	(kPa)	
Depth (ft/m) : 2.5	0.76	Friction Angle (ϕ) :	26.61	Degree		26.36	Degree	
Description : Brown Sandy Clay					Shear Rate (inch/minute) :		0.0025	

SYMBOL	MOISTURE CONTENT (%)	DRY DENSITY (pcf)	DRY DENSITY (kN/m^3)	VOID RATIO	NORMAL STRESS (ksf)	NORMAL STRESS (kPa)	PEAK STRESS (ksf)	PEAK STRESS (kPa)	ULTIMATE STRESS (ksf)	ULTIMATE STRESS (kPa)
●	23.63	104.12	16.39	0.62	2.00	95.76	1.46	70.10	1.22	58.61
◆	23.68	105.13	16.55	0.60	4.00	191.52	2.62	125.25	2.17	104.00
▲	21.45	105.74	16.64	0.59	8.00	383.04	4.50	215.46	4.19	200.52

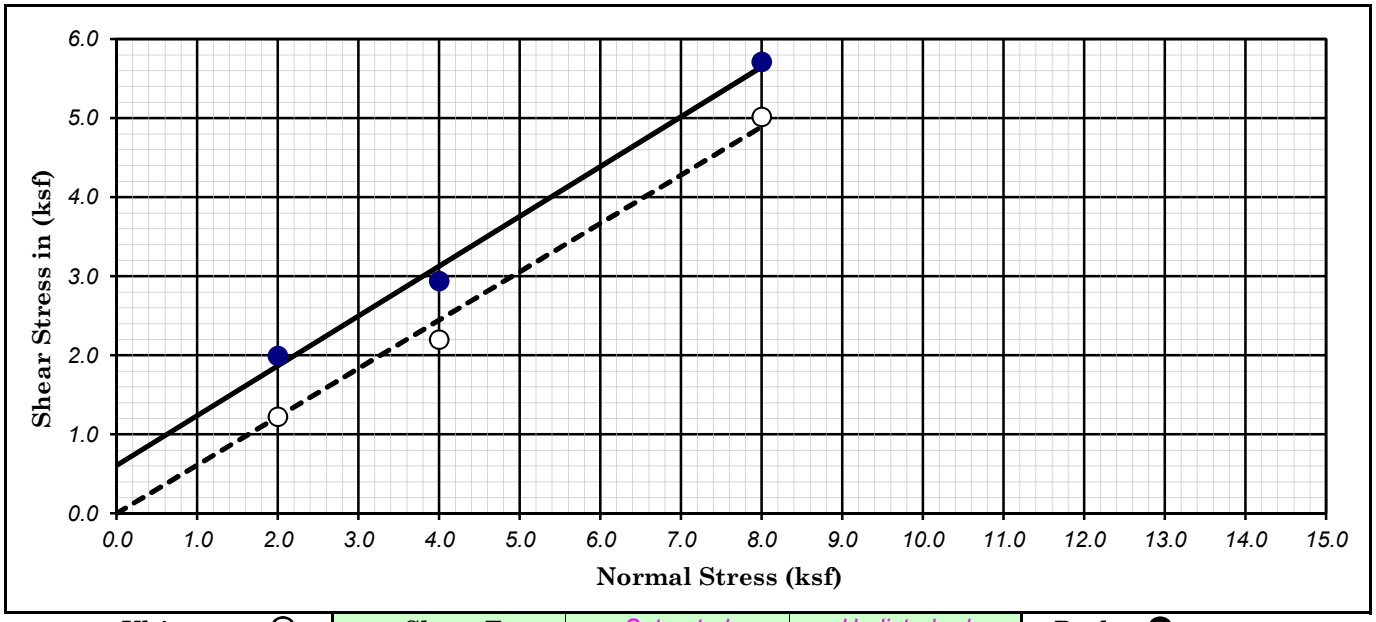
GROUP DELTA CONSULTANTS

Walnut - American Multifamily

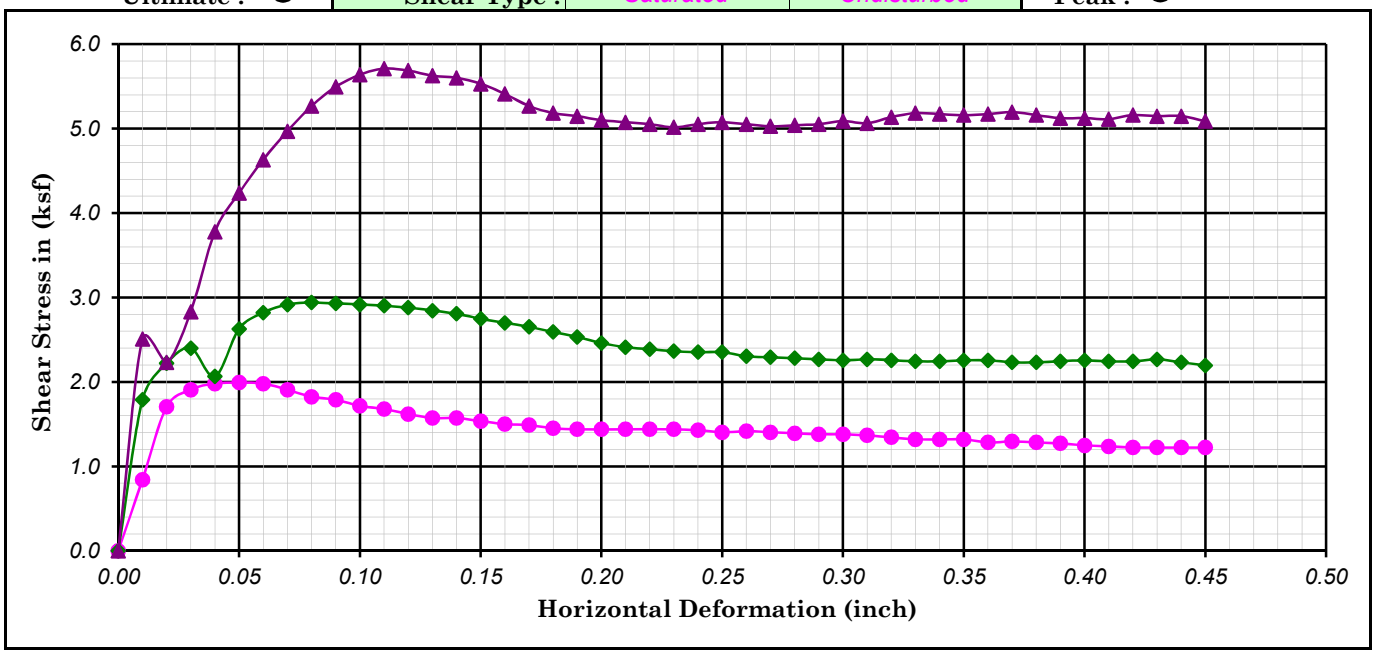
DIRECT SHEAR TEST
(ASTM D -3080)

Project No. : LA1148 | **Date :** 08/01/13

Figure No. B-3A



Ultimate : ○	Shear Type :	Saturated	Undisturbed	Peak : ●



Boring No. : B-3		Strength Intercept (C) :	0.61	(ksf)	Peak	0.00	(ksf)	Ultimate
Sample No. : R1			29.04	(kPa)		0.00	(kPa)	
Depth (ft/m) : 2.5	0.76	Friction Angle (ϕ) :	32.22	Degree		31.44	Degree	
Description : Very Dark Brown Sandy Clay with Traces of Siltstone,Shale					Shear Rate (inch/minute) :			0.0025

SYMBOL	MOISTURE CONTENT (%)	DRY DENSITY (pcf)	DRY DENSITY (kN/m^3)	VOID RATIO	NORMAL STRESS (ksf)	NORMAL STRESS (kPa)	PEAK STRESS (ksf)	PEAK STRESS (kPa)	ULTIMATE STRESS (ksf)	ULTIMATE STRESS (kPa)
●	22.21	107.27	16.88	0.57	2.00	95.76	1.99	95.38	1.22	58.61
◆	20.44	111.36	17.53	0.51	4.00	191.52	2.94	140.77	2.20	105.14
▲	19.57	113.84	17.92	0.48	8.00	383.04	5.71	273.44	5.02	240.17

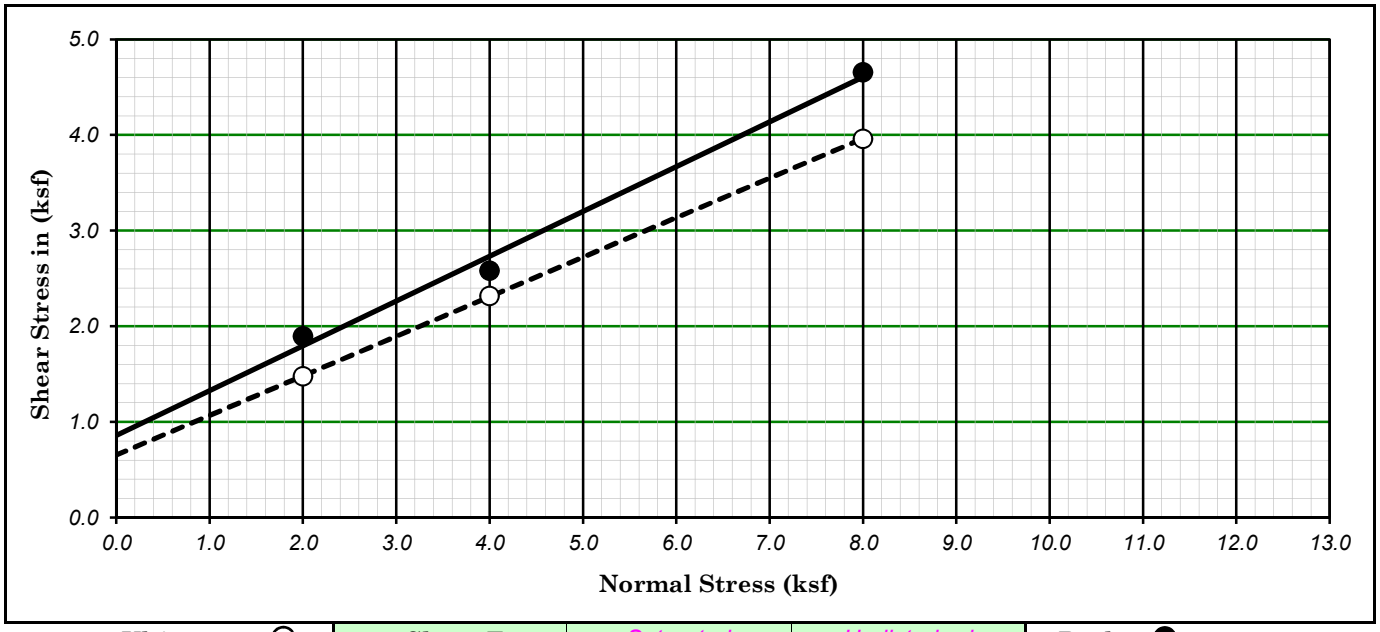
GROUP DELTA CONSULTANTS

Walnut - American Multifamily

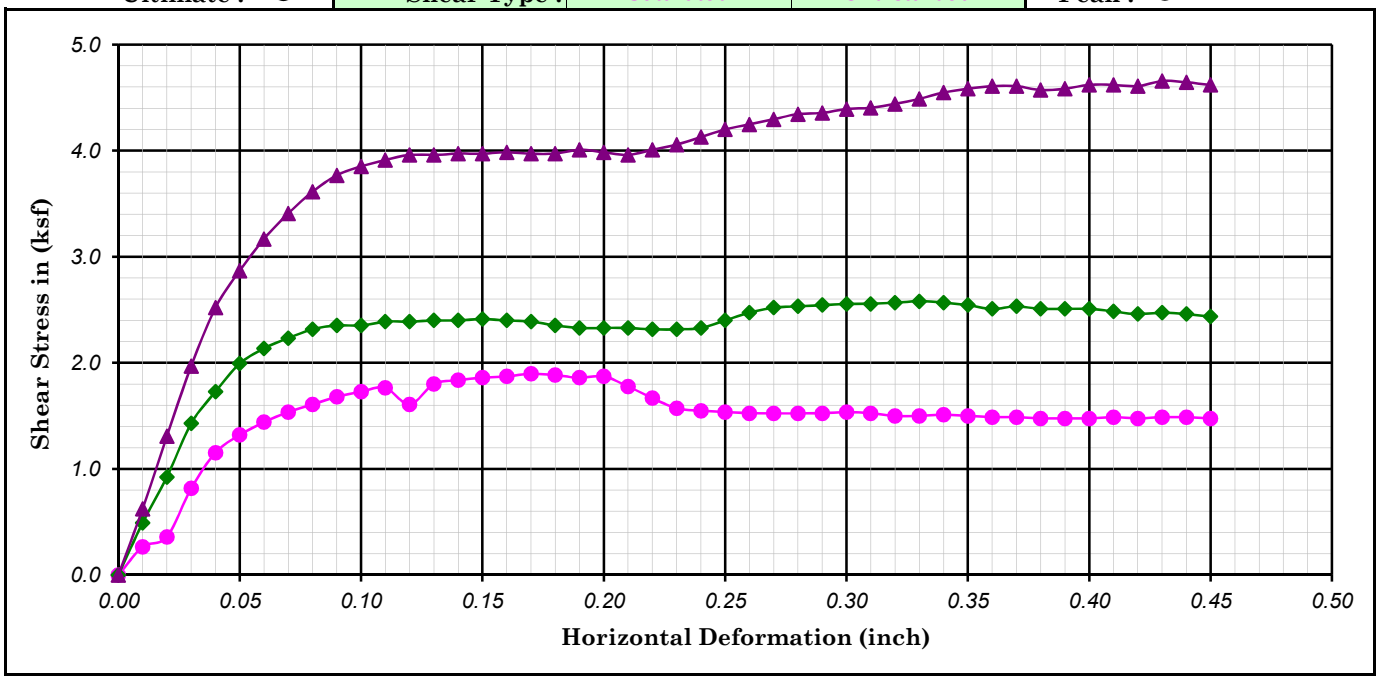
Project No. : LA1148 **Date :** 08/02/13

DIRECT SHEAR TEST
(ASTM D -3080)

Figure No. B-3B



Ultimate : ○	Shear Type :	Saturated	Undisturbed	Peak : ●



Boring No. : B-14		Strength Intercept (C) :	0.86	(ksf)	Peak	0.65	(ksf)	Ultimate
Sample No. : R2			41.1	(kPa)		31.3	(kPa)	
Depth (ft/m) : 3.5	1.07	Friction Angle (ϕ) :	25	Degree		22	Degree	

Description : Medium Brown Lean CLAY (CL) with few Claystone fragments — Shear Rate (inch/minute) : 0.0025

SYMBOL	MOISTURE CONTENT (%)	DRY DENSITY (pcf)	DRY DENSITY (kN/m^3)	VOID RATIO	NORMAL STRESS (ksf)	NORMAL STRESS (kPa)	PEAK STRESS (ksf)	PEAK STRESS (kPa)	ULTIMATE STRESS (ksf)	ULTIMATE STRESS (kPa)
●	37.2	85	13.4	0.97	2.00	96	1.9	90.8	1.5	70.7
◆	35.5	87	13.7	0.94	4.00	192	2.6	123.5	2.3	110.9
▲	32.7	90	14.2	0.87	8.00	383	4.7	222.9	4.0	189.6

GROUP DELTA CONSULTANTS

Brookside Equestrian, American Multifamily, Lot 2

Project No. : LA1148B

Date : 09/17/13

DIRECT SHEAR TEST

(ASTM D -3080)

Figure No. : B-3C

APPENDIX D

LIQUEFACTION ALAYSES

APPENDIX D
LIQUEFACTION EVALUATION

D.1 GENERAL

Liquefaction involves a sudden loss in strength of a saturated, cohesionless soil (predominantly sand) caused by cyclic loading such as an earthquake. This phenomenon results in elevated pore-water pressures that temporarily transform the soil into a fluid mass resulting in vertical settlement and could include lateral deformations. Typically, liquefaction occurs in areas where groundwater is less than 50 feet from the surface and where the soils are comprised of predominantly poorly consolidated sands. Seismic ground motions can also induce settlement without liquefaction occurring, including within dry sands above the water table.

We have evaluated liquefaction potential in accordance with the 2022 CBC and CGS Special Publication 117A (2008).

Lateral spreading analyses have been performed for the cross-section across the Cross Section 9-9', where the encountered site soils are susceptible to liquefaction. This cross-section is shown in Figure 3.9.

D.2 PEAK GROUND ACCELERATION

Los Angeles County Document GS045.0 requires that liquefaction potential should be performed using probabilistic seismic hazard analysis utilizing at least a hazard level of 2 percent probability of exceedance in 50 years. We have used the peak ground acceleration (2% exceedance in 50 years, PGA_M) of 0.82g. We have used a mean magnitude of 6.71 estimated with the USGS Unified Hazard tool (https://earthquake.usgs.gov/hazards/interactive).

D.3 GROUNDWATER

The historical highest groundwater contours and borehole log data (San Dimas Quadrangle, CGS, 1998) does not have adequate coverage at the project site. The adjacent data indicates that the historical highest groundwater at this area is deeper than 20 feet below ground surface. Since shallowest groundwater encountered in the borings is 18 feet below existing grade, the design groundwater level was assumed to be at a depth of 18 feet.

The design groundwater level is deeper than the bottom of the existing Lemon Creek near CPT-2 location. Therefore, we have conservatively assumed a design groundwater level of 12 feet near CPT-2 location.

D.4 LIQUEFACTION POTENTIAL

D.4.1 ANALYSIS PROCEDURE

The liquefaction potential was analyzed using CPT data with the CLiq v.3.5.2.5 (computer program GeoLogismiki). The liquefaction potential was computed using the simplified procedures recommended by Robertson (2009) for CPT data. In addition, the liquefaction potential was also analyzed using SPT data in accordance procedures recommended by Youd (2001). A factor of safety of 1.3 was used in accordance with the Los Angeles County Document GS045.0.

Based on the results of the preliminary liquefaction potential evaluation, the loose young alluvial deposits and young fluvial debris adjacent to Lemon Creek are susceptible to liquefaction.

D.4.2 SEISMIC SETTLEMENT

Seismically-induced settlement is often caused by loose to medium-dense granular soils densified during ground shaking. Dry and partially saturated soils as well as saturated granular soils are subject to seismically-induced settlement. The seismically induced settlement was estimated using the procedures of Ishihara and Yoshimine (1992). The computation of liquefaction potential evaluation and seismically-induced settlement are presented in Figure D.1 through D.11. The total seismically-induced settlements are summarized in Table D.1.

TABLE D.1 SUMMARY OF SEISMICALLY-INDUCED SETTLEMENT

Boring No.	Seismically-Induced Settlement (Inches)		
	Saturated Soils	Unsaturated Soils	Total
B-1	-	-	-
CPT-2	***1.5***	***2.5***	***4***
B-3	-	-	-
CPT-4	0.1	0.1	0.2
B-5	-	-	-
CPT-6	-	-	-
CPT-7	-	-	-
B-8	0	0.2	0.2
B-9	-	-	-
CPT-10	0.2	0	0.2
CPT-11	0.15	0	0.15
B-11	-	-	-
B-12	-	-	-
B-13	-	-	-
B-14	0	<0.1	<0.1
CPT-15	<0.1	<0.1	<0.1
B-16	-	-	-
CPT-17	0.3	<0.1	0.3
B-18	-	-	-
B-19	-	-	-
B-20	**1.1**	**0.1**	**1.3**
B-21	-	-	-

Liquefaction-induced settlement of about 0.5 inches were estimated based on CPT data at depths of 45 to 48 feet at CPT-17. The materials near these elevations consist of claystone bedrock based on nearby borings. Claystone bedrock is not susceptible to liquefaction or seismically-induced settlement. Therefore, it is our opinion that the estimated settlement within these elevations is considered anomaly and we have ignored 0.5 inches of seismically-induced settlement within depths of 45 to 48 feet at CPT-17.

D.5 LATERAL SPREADING DISPLACEMENT

D.5.1 ANALYSIS PROCEDURE

According to "Recommended Procedures for Implementation of DMG Special Publication 117 Guidelines for Analyzing and Mitigating Liquefaction Hazards in California" (1999), Newmark's method was utilized for estimating liquefaction-induced lateral displacements.

The Newmark method involves two distinct steps:

1) A pseudo static slope stability analysis is first performed to evaluate the average horizontal acceleration required to cause slope movement (i.e., reach FS = 1.0). The horizontal acceleration that causes yielding of the slope or free face is referred to as the Yield Acceleration (k_y).
2) Once the yield acceleration is determined, the Newmark displacements are determined by integrating the seismic displacements that occur when the earthquake acceleration momentarily exceeds the yield acceleration of the slope.

D.5.2 GEOMETRY AND SOIL STRENGTH PARAMETERS

Lateral displacement analyses were performed based on information illustrated in Cross-Section 9-9'. The analyses considered the stratigraphy and empirically derived engineering properties of the subsurface materials as well as the variations in grade within the vicinity of the site including the presence of the nearby Lemon Creek.

Liquefiable soils were identified in all the CPTs at intermittent layers ranging from 12 to 34 feet below grade near CPT-2 location. Based on the available data, we understand that the materials that are susceptible to liquefaction do not extend to east of the building pad (B-1). However, we have conservatively assume that the liquifiable layer extend horizontally in our lateral spread model, as shown on Figure D.12.

Soil strength parameters of the material units implemented in our slope stability models are presented in Table D.2.

TABLE D.2 SOIL STRENGTH PARAMETERS

Layer No.	Material Unit	Layer			Soil Strength			
		Depth to Top of Layer (ft)	Depth to Bottom of Layer (ft)	CPT-Correlated (N60)	Estimated $(N1)_{60\text{-}SR}$	Cohesion (psf)	Internal Friction Angle (deg)	Residual Shear Strength (psf)
1	Non-Liquefiable Loose Silty Sand	0	12	10	-	0	30	-
2	Liquefiable Soil Silty Sand	12	15	10	15	-	-	600
3	Alluvium Stiff Clayey Soils	14	26	15	-	1000	0	-
4	Liquefiable Soil Silty Sand	26	30	20	22	-	-	1000
5	Alluvium Stiff Clayey Soils	30	31	30	-	1000	0	-
6	Liquefiable Silty Sand	31	34	30	29	-	-	1000
7	Alluvium Stiff Clayey Soils	34	50	40	-	-	-	-

Soil strength parameters for the non-liquefiable clay, silty sand, and sand layers were estimated based on empirical correlations from the CPT data and engineering judgement. For the potentially liquefiable layers, post-liquefaction residual strengths were computed using the methods from Idriss and Boulanger (2007), Seed and Harder (1990), and Stark and Mesri (1992).

D.5.3 PSEUDOSTATIC ANALYSES

To determine the yield acceleration of the site, pseudo-static slope stability analyses were performed using post-liquefaction residual strength of the liquefiable soils as well as the shear strength of the other material units as summarized in Table D.2 above. Yield accelerations (i.e. horizontal acceleration that causes the slope to have a FS of 1.0) were found to be on 0.32g. The pseudo static slope stability analysis models for determination of the yield accelerations are presented in Figure D.12.

D.5.4 LATERAL SPREADING ANALYSES

To estimate permanent seismic displacement, a deformation analysis using the Bray and Rathje procedure (1998) was performed. The input PGA value corresponded to the PGA at bedrock (Site Class B) for a design seismic event with a 2% probability of exceedance in 50 years. This PGA was determined to be to 0.7g. To estimate the site period (T_S), a shear wave velocity of 250 m/s was utilized for the liquefiable soils with a thickness of 3 meter (9 feet). The shear wave velocity was estimated based on data from the CPT-2. Distance to the controlling fault of 11 km was utilized

based on deaggregation of seismic hazards (USGS). The estimated permanent seismic lateral displacements is estimated to be about 3 inches.

D.6 CONCLUSION

The results indicate that the potential of liquefaction occurred at the site is considered low except at the locations near CPT-2, or within Lots 25 to 27, and B-20, or within Lots 20 to 24. Seismically-induced settlement of up to 4 inches was estimated at CPT-2 and up to 1.3 inches was estimated at B-20. According to the Los Angeles County guidelines for Liquefaction and Lateral Spread (GS 045.0, 2014), structural mitigation alone without ground improvement is acceptable if the total seismically induced settlement of up to 4 inches. Therefore, structures within Lots 21 through 28 should be designed to accommodate total/differential seismically-induced settlement.

In addition, the estimated permanent seismic lateral displacement is about 3 inches which is less than upper limit on permanent horizontal ground displacement, or 18 inches, per Table 12.13-2 of ASCE 7-22. Accordingly, ground improvement may not be required. However, permanent seismic lateral displacement of 3 inches should be considered for structural design for Lots 25 to 28.

The liquefaction analyses and lateral spread was estimated using soil profile developed from CPT-2. However, we understand that the materials that are susceptible to liquefaction do not extend to east of the building pad (B-1). Therefore, estimated lateral spread using CPT-2 only as shown on Figure D.12 is very conservative. We recommend that more comprehensive field program near CPT-2 should be performed during design phase of the project to estimate the limit of soils that are susceptible to liquefaction.

ESTIMATION OF PERMANENT SEISMIC DISPLACEMENT USING THE BRAY AND RATHJE (1998) PROCEDURE.

INPUT PARAMETERS:

Yield Acceleration, ky (g):	0.32		Normalized MHEA Sigma:	0.298	
Vertical Thickness, h (m):	3		Mean Period Sigma:	0.3	
Shear Wave Vel., Vs (m/s):	250		Significant Duration Sigma:	0.3	
Earthquake Magnitude, M:	6.70	*	Normalized Displacement Sigma:	0.35	
Earthquake Accel., Rock (g):	0.7	*			
Earthquake Distance, r (km):	11	*	Allowable screen displacement (cm):	10	*

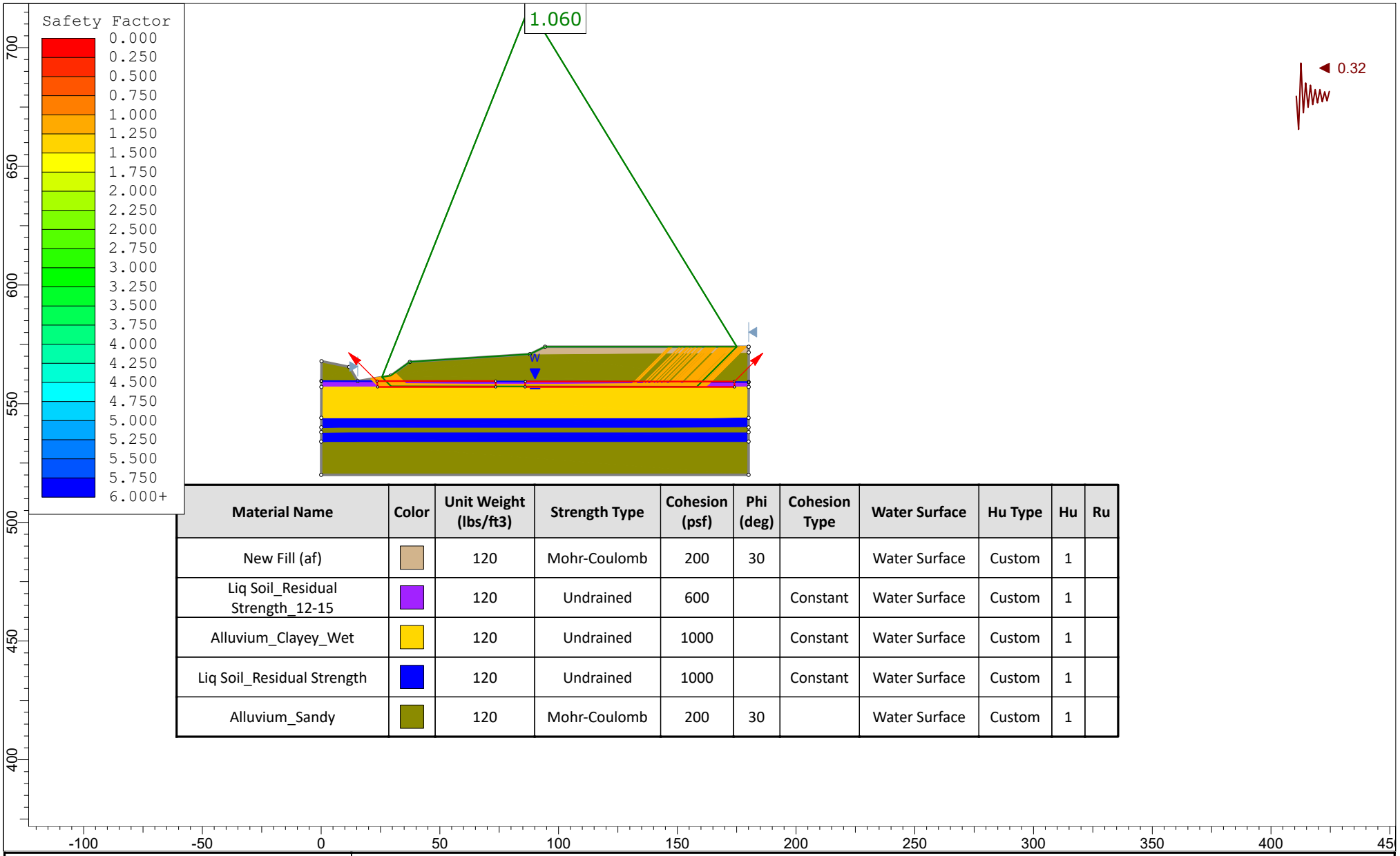
CALCULATIONS:

Site Period (s):	0.048
NRF Factor:	0.813
Mean Period (s):	0.561
Duration, D05-95 (s):	12.647
Ts/Tm:	0.0855
MHEA/MHA*NRF:	1.000
MHEA, kmax:	0.5692
ky/kmax:	0.5622
Normalized Disp. (cm/sec):	1.0908

(Input values marked with asterisks are used for calculation of seismic coefficient for screen)

Estimated Displacement (cm):	7.852	**Median f_{eq} for Screen Procedure:**	0.404	*
Estimated Displacement (in):	3.092	**Seismic Coefficient for Screen Procedure:**	0.283	*

GROUP DELTA



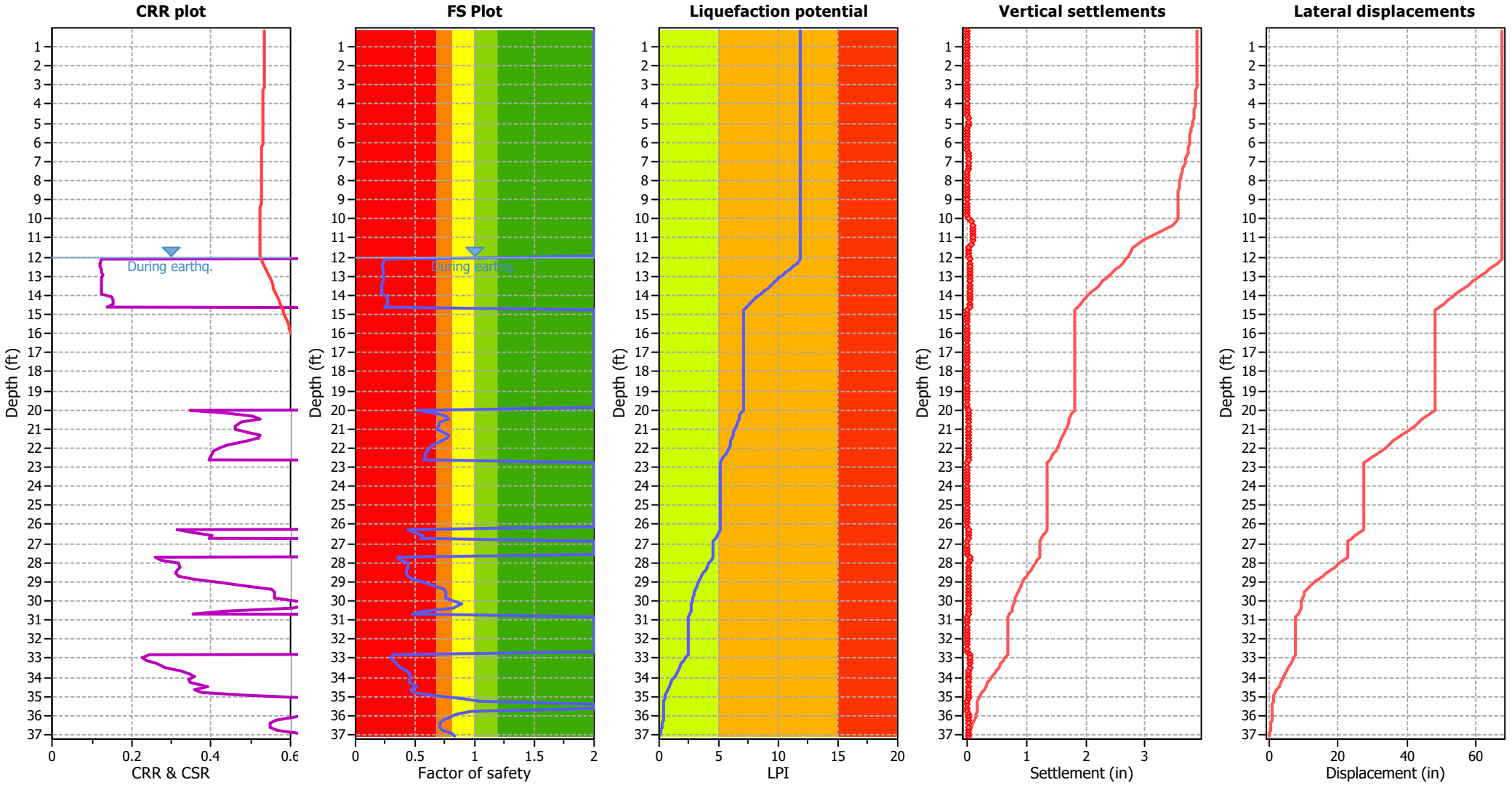
Material Name	Color	Unit Weight (lbs/ft3)	Strength Type	Cohesion (psf)	Phi (deg)	Cohesion Type	Water Surface	Hu Type	Hu	Ru
New Fill (af)		120	Mohr-Coulomb	200	30		Water Surface	Custom	1	
Liq Soil_Residual Strength_12-15		120	Undrained	600		Constant	Water Surface	Custom	1	
Alluvium_Clayey_Wet		120	Undrained	1000		Constant	Water Surface	Custom	1	
Liq Soil_Residual Strength		120	Undrained	1000		Constant	Water Surface	Custom	1	
Alluvium_Sandy		120	Mohr-Coulomb	200	30		Water Surface	Custom	1	

rocscience

SLIDEINTERPRET 8.010

Project	SLIDE - An Interactive Slope Stability Program		
Analysis Description			
Drawn By		Scale 1:670	Company
Date	2/14/2023, 11:26:54 AM		File Name Lateral Spread Calculation.slmd

Liquefaction analysis overall plots



Input parameters and analysis data

Analysis method:	NCEER (1998)	Depth to water table (erthq.):	12.00 ft	Fill weight:	N/A
Fines correction method:	NCEER (1998)	Average results interval:	3	Transition detect. applied:	Yes
Points to test:	Based on Ic value	Ic cut-off value:	2.60	K_σ applied:	Yes
Earthquake magnitude M_w:	6.78	Unit weight calculation:	Based on SBT	Clay like behavior applied:	Sands only
Peak ground acceleration:	0.82	Use fill:	No	Limit depth applied:	No
Depth to water table (insitu):	27.00 ft	Fill height:	N/A	Limit depth:	N/A

F.S. color scheme

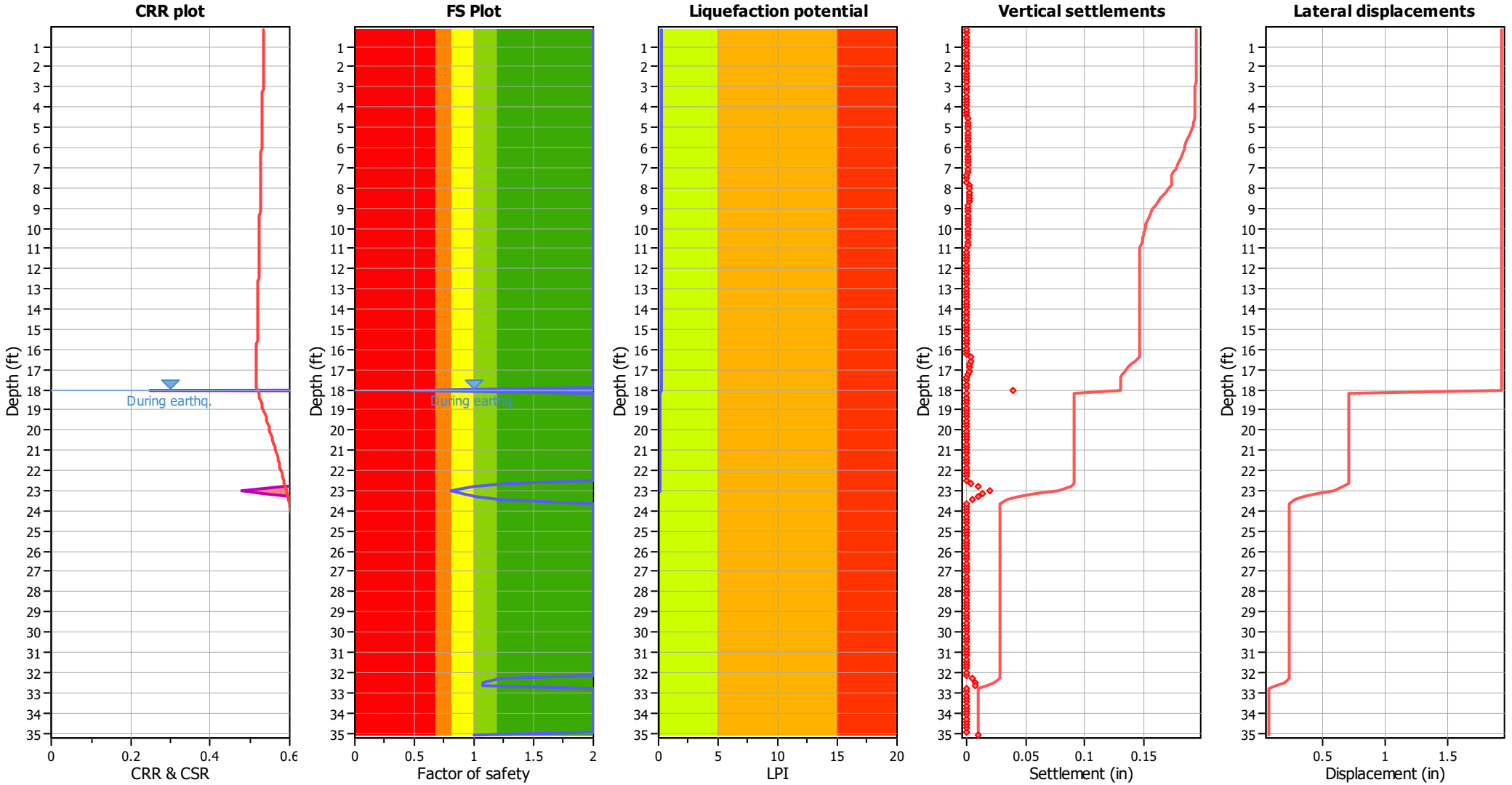
- Almost certain it will liquefy
- Very likely to liquefy
- Liquefaction and no liq. are equally likely
- Unlike to liquefy
- Almost certain it will not liquefy

LPI color scheme

- Very high risk
- High risk
- Low risk

Figure D.1

Liquefaction analysis overall plots



Input parameters and analysis data

Analysis method:	NCEER (1998)	Depth to water table (erthq.):	18.00 ft	Fill weight:	N/A
Fines correction method:	NCEER (1998)	Average results interval:	3	Transition detect. applied:	Yes
Points to test:	Based on Ic value	Ic cut-off value:	2.60	K_σ applied:	Yes
Earthquake magnitude M_w:	6.78	Unit weight calculation:	Based on SBT	Clay like behavior applied:	Sands only
Peak ground acceleration:	0.82	Use fill:	No	Limit depth applied:	No
Depth to water table (insitu):	27.00 ft	Fill height:	N/A	Limit depth:	N/A

F.S. color scheme

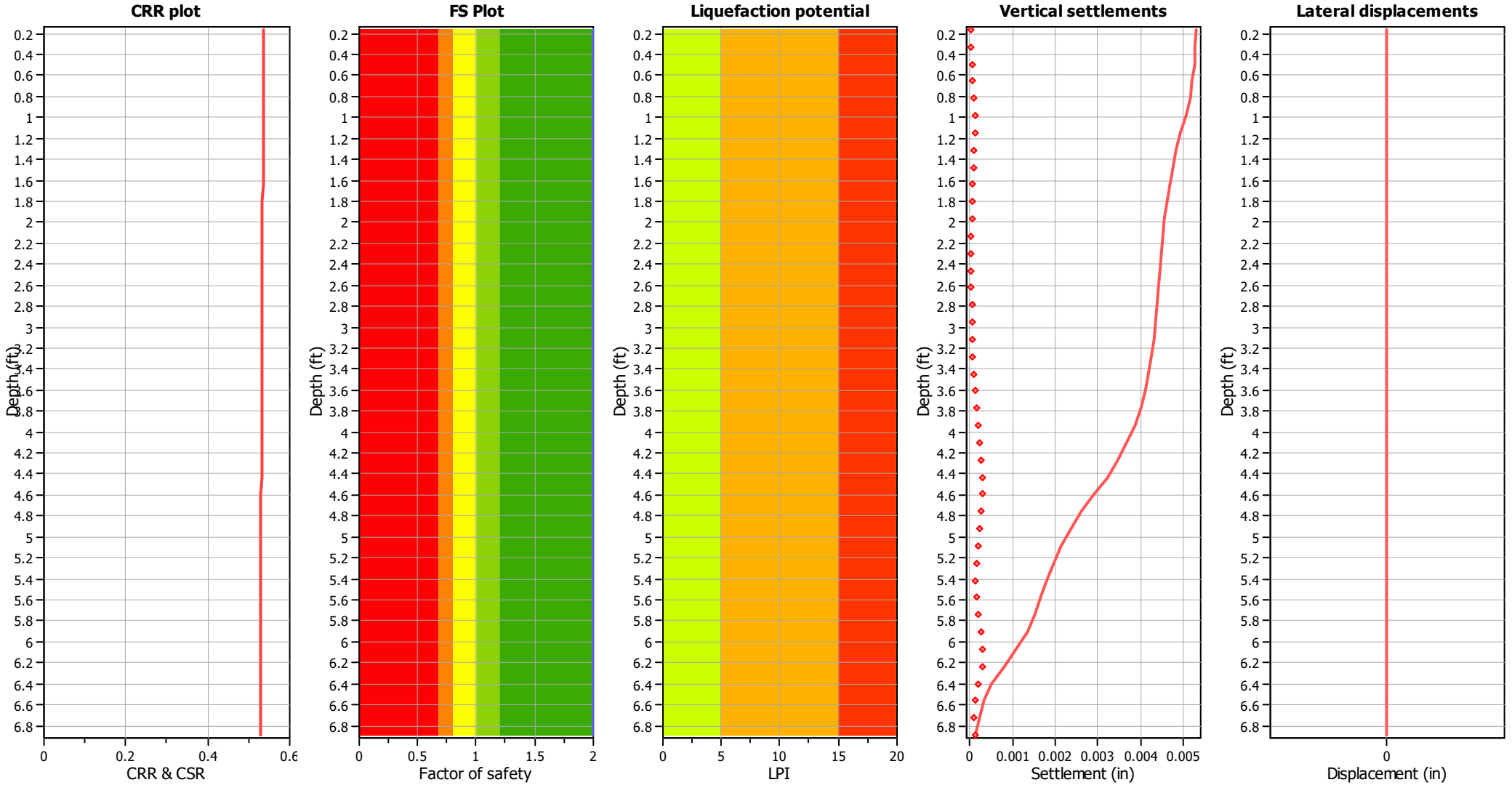
- Almost certain it will liquefy
- Very likely to liquefy
- Liquefaction and no liq. are equally likely
- Unlike to liquefy
- Almost certain it will not liquefy

LPI color scheme

- Very high risk
- High risk
- Low risk

Figure D.2

Liquefaction analysis overall plots



Input parameters and analysis data

Analysis method:	NCEER (1998)	Depth to water table (erthq.):	18.00 ft	Fill weight:	N/A
Fines correction method:	NCEER (1998)	Average results interval:	3	Transition detect. applied:	Yes
Points to test:	Based on Ic value	Ic cut-off value:	2.60	K_σ applied:	Yes
Earthquake magnitude M_w:	6.78	Unit weight calculation:	Based on SBT	Clay like behavior applied:	Sands only
Peak ground acceleration:	0.82	Use fill:	No	Limit depth applied:	No
Depth to water table (insitu):	27.00 ft	Fill height:	N/A	Limit depth:	N/A

F.S. color scheme

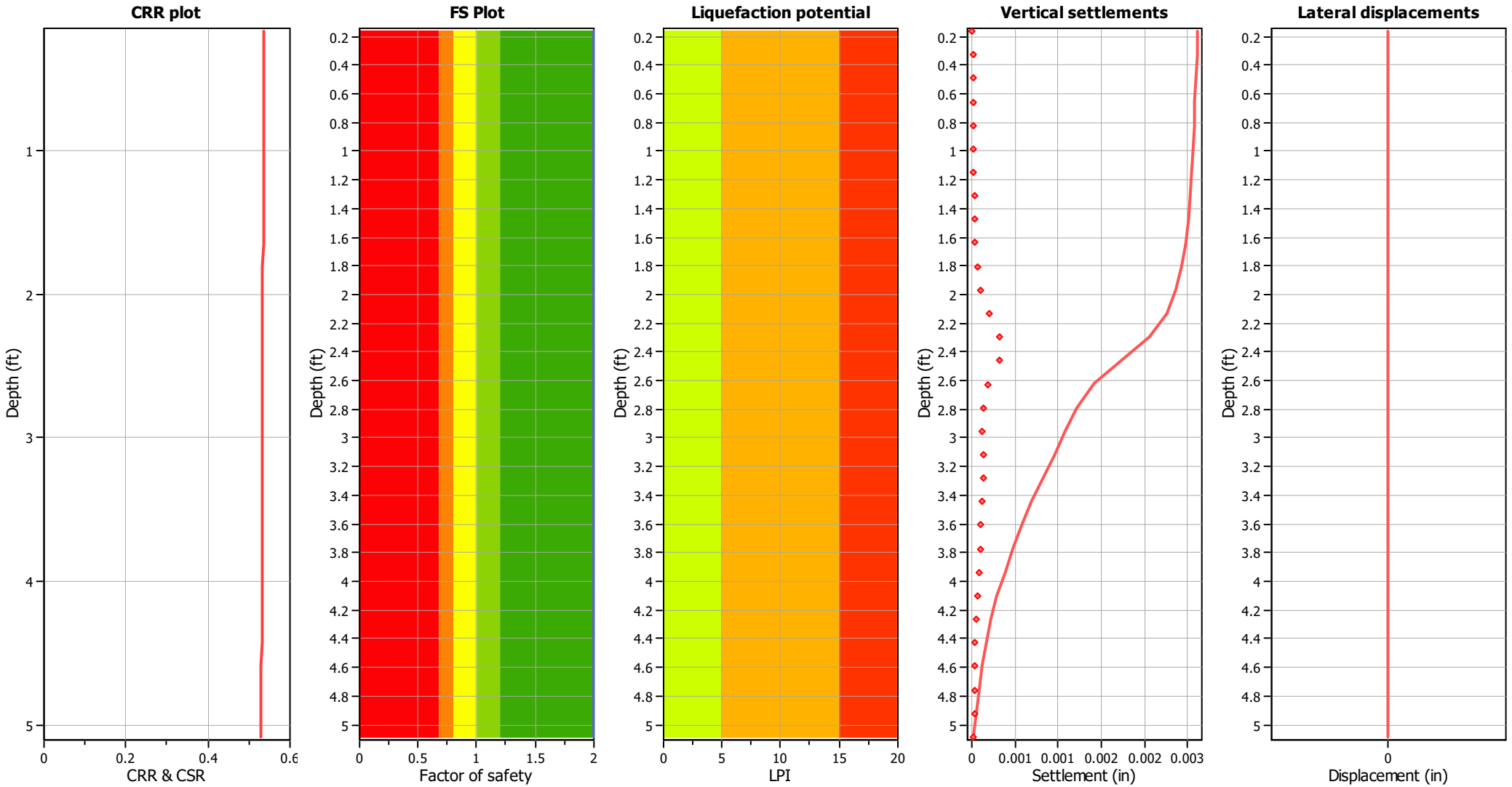
- Almost certain it will liquefy
- Very likely to liquefy
- Liquefaction and no liq. are equally likely
- Unlike to liquefy
- Almost certain it will not liquefy

LPI color scheme

- Very high risk
- High risk
- Low risk

Figure D.3

Liquefaction analysis overall plots



Input parameters and analysis data

Analysis method:	NCEER (1998)	Depth to water table (erthq.):	18.00 ft	Fill weight:	N/A
Fines correction method:	NCEER (1998)	Average results interval:	3	Transition detect. applied:	Yes
Points to test:	Based on Ic value	Ic cut-off value:	2.60	K_σ applied:	Yes
Earthquake magnitude M_w:	6.78	Unit weight calculation:	Based on SBT	Clay like behavior applied:	Sands only
Peak ground acceleration:	0.82	Use fill:	No	Limit depth applied:	No
Depth to water table (insitu):	27.00 ft	Fill height:	N/A	Limit depth:	N/A

F.S. color scheme

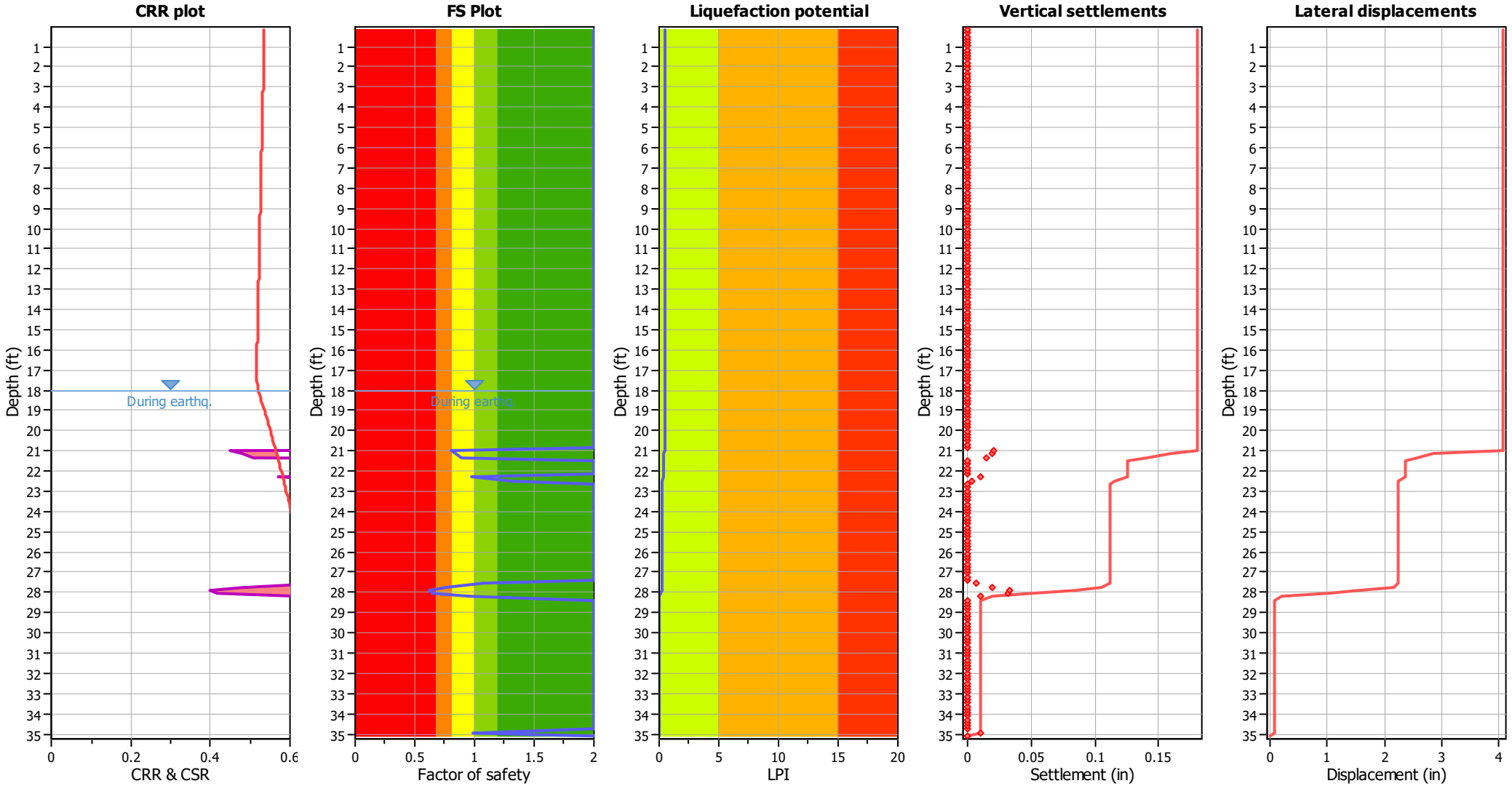
- Almost certain it will liquefy
- Very likely to liquefy
- Liquefaction and no liq. are equally likely
- Unlike to liquefy
- Almost certain it will not liquefy

LPI color scheme

- Very high risk
- High risk
- Low risk

Figure D.4

Liquefaction analysis overall plots



Input parameters and analysis data

Analysis method:	NCEER (1998)	Depth to water table (erthq.):	18.00 ft	Fill weight:	N/A
Fines correction method:	NCEER (1998)	Average results interval:	3	Transition detect. applied:	Yes
Points to test:	Based on Ic value	Ic cut-off value:	2.60	K_σ applied:	Yes
Earthquake magnitude M_w:	6.78	Unit weight calculation:	Based on SBT	Clay like behavior applied:	Sands only
Peak ground acceleration:	0.82	Use fill:	No	Limit depth applied:	No
Depth to water table (insitu):	27.00 ft	Fill height:	N/A	Limit depth:	N/A

F.S. color scheme

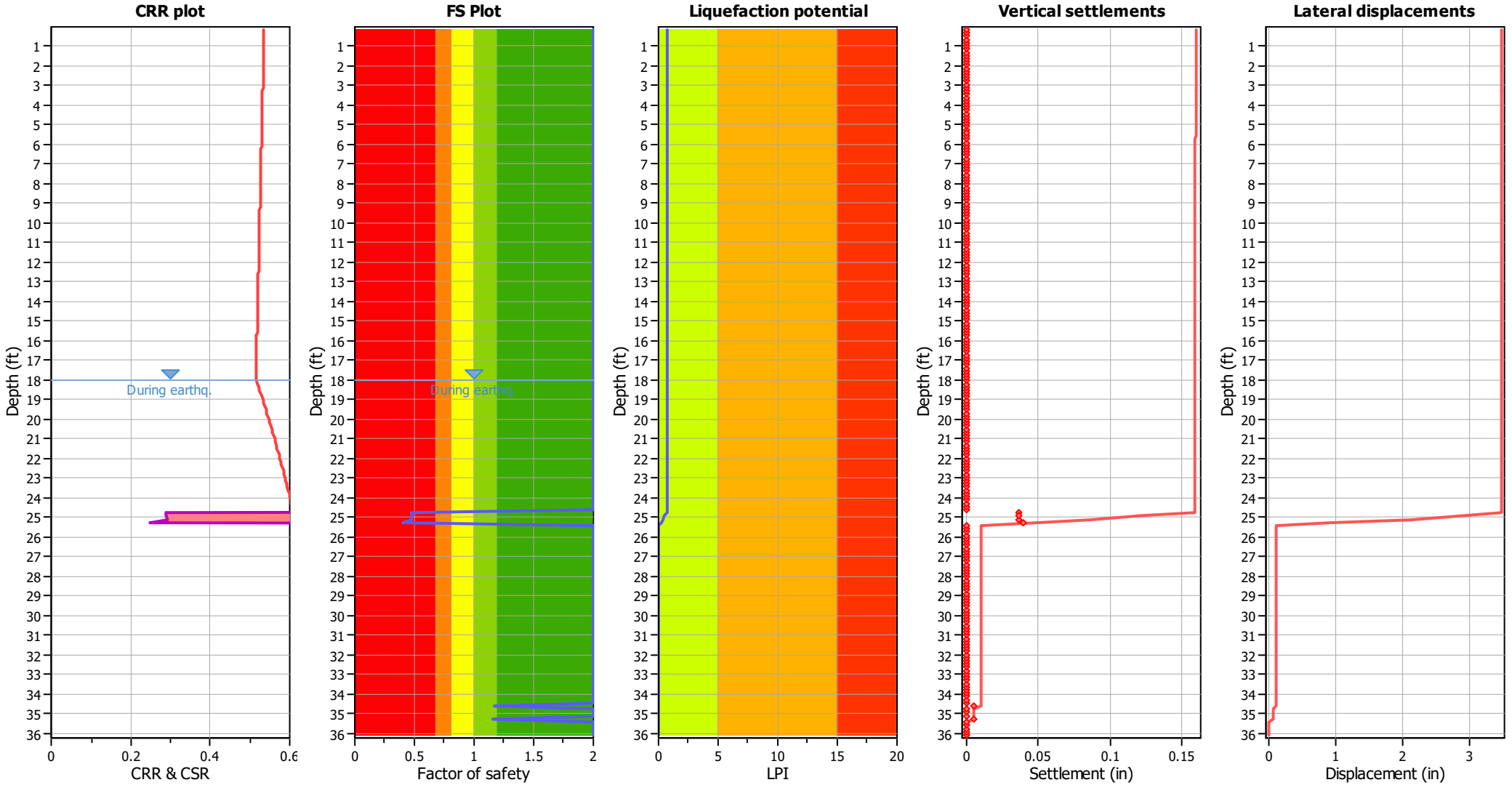
- Almost certain it will liquefy
- Very likely to liquefy
- Liquefaction and no liq. are equally likely
- Unlike to liquefy
- Almost certain it will not liquefy

LPI color scheme

- Very high risk
- High risk
- Low risk

Figure D.5

Liquefaction analysis overall plots



Input parameters and analysis data

Analysis method:	NCEER (1998)	Depth to water table (erthq.):	18.00 ft	Fill weight:	N/A
Fines correction method:	NCEER (1998)	Average results interval:	3	Transition detect. applied:	Yes
Points to test:	Based on Ic value	Ic cut-off value:	2.60	K_σ applied:	Yes
Earthquake magnitude M_w:	6.78	Unit weight calculation:	Based on SBT	Clay like behavior applied:	Sands only
Peak ground acceleration:	0.82	Use fill:	No	Limit depth applied:	No
Depth to water table (insitu):	27.00 ft	Fill height:	N/A	Limit depth:	N/A

F.S. color scheme

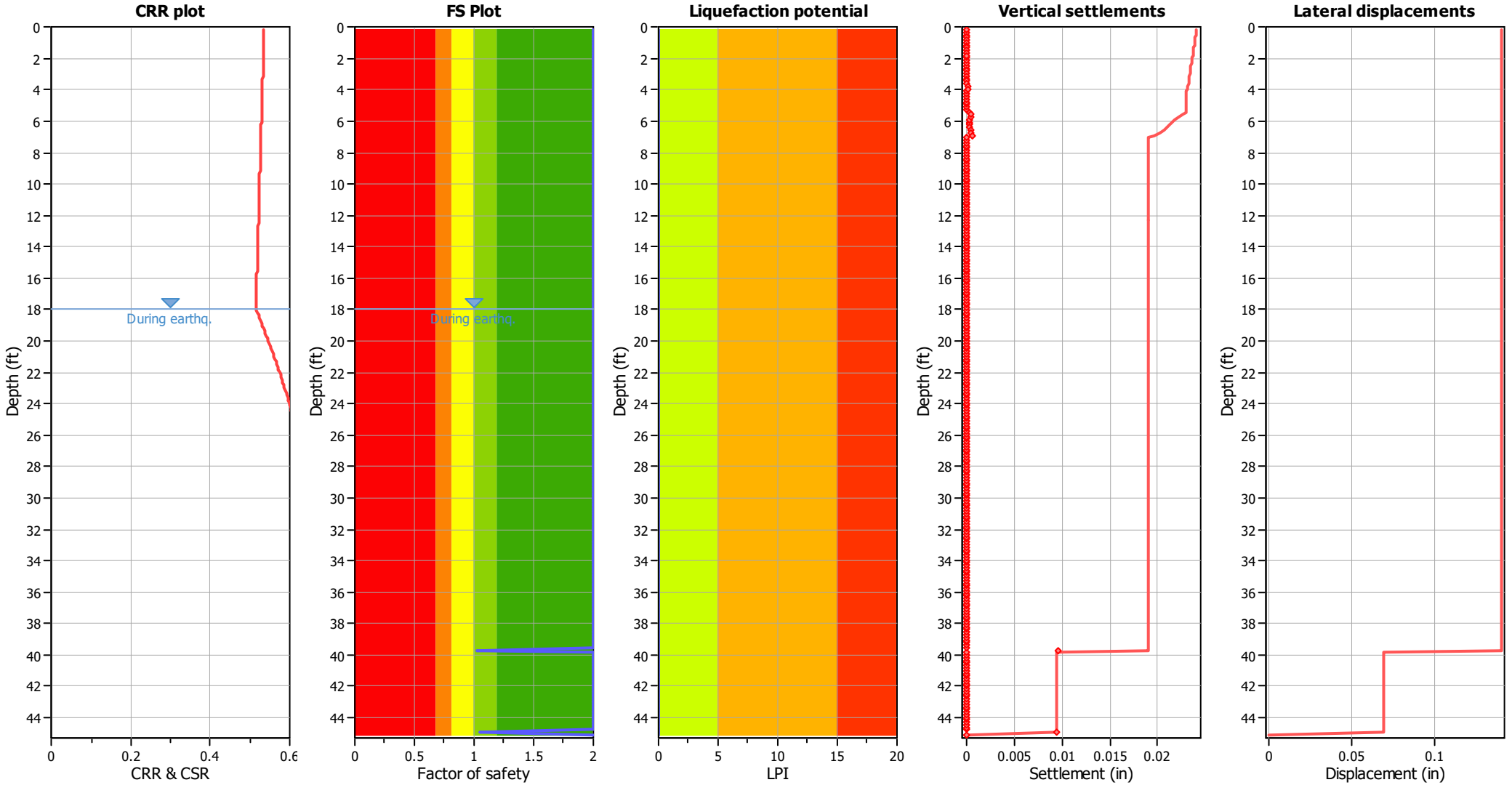
- Almost certain it will liquefy
- Very likely to liquefy
- Liquefaction and no liq. are equally likely
- Unlike to liquefy
- Almost certain it will not liquefy

LPI color scheme

- Very high risk
- High risk
- Low risk

Figure D.6

Liquefaction analysis overall plots



Input parameters and analysis data

Analysis method:	NCEER (1998)	Depth to water table (erthq.):	18.00 ft	Fill weight:	N/A
Fines correction method:	NCEER (1998)	Average results interval:	3	Transition detect. applied:	Yes
Points to test:	Based on Ic value	Ic cut-off value:	2.60	K_σ applied:	Yes
Earthquake magnitude M_w:	6.78	Unit weight calculation:	Based on SBT	Clay like behavior applied:	Sands only
Peak ground acceleration:	0.82	Use fill:	No	Limit depth applied:	No
Depth to water table (insitu):	27.00 ft	Fill height:	N/A	Limit depth:	N/A

F.S. color scheme

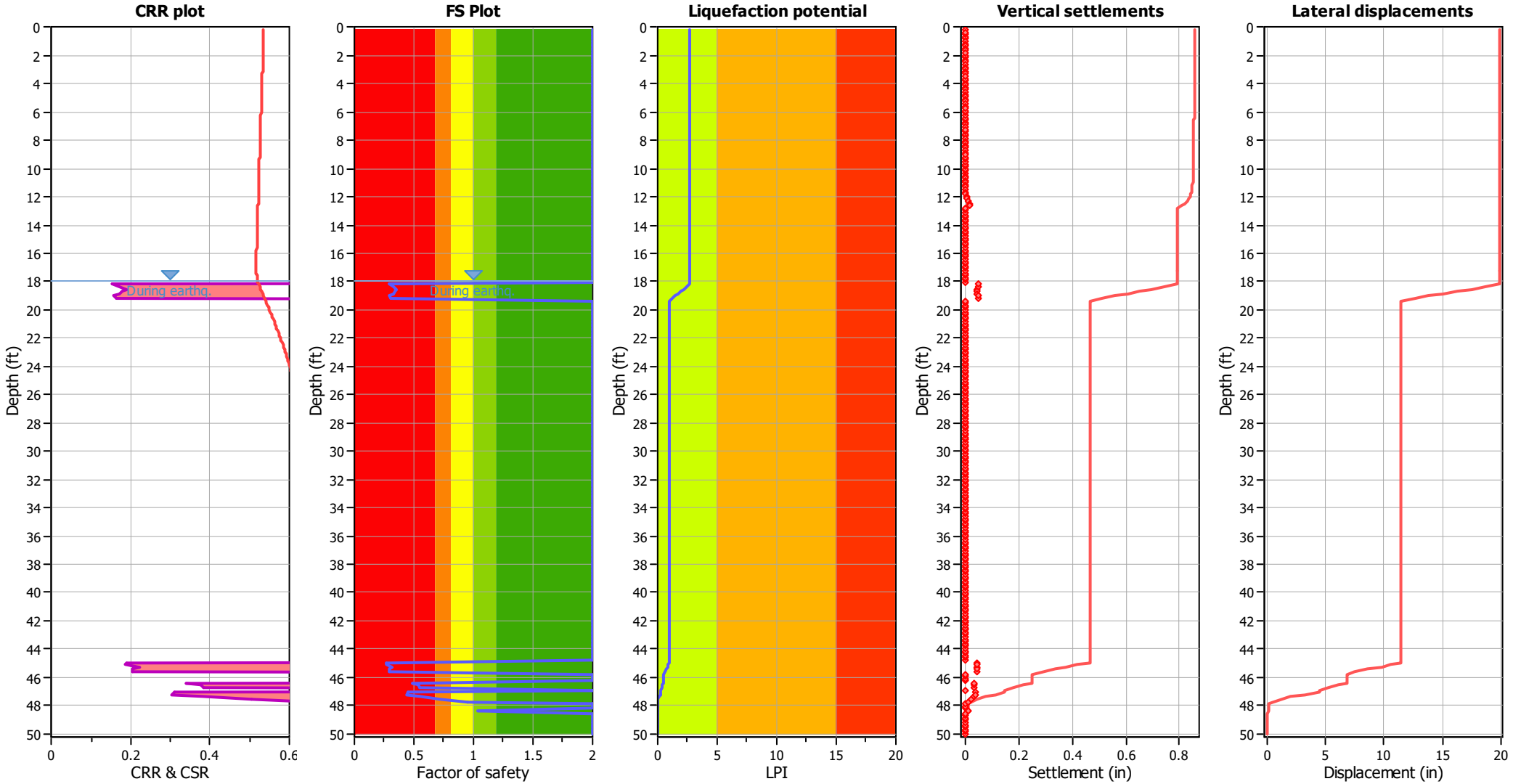
- Almost certain it will liquefy
- Very likely to liquefy
- Liquefaction and no liq. are equally likely
- Unlike to liquefy
- Almost certain it will not liquefy

LPI color scheme

- Very high risk
- High risk
- Low risk

Figure D.7

Liquefaction analysis overall plots



Input parameters and analysis data

Analysis method:	NCEER (1998)	Depth to water table (erthq.):	18.00 ft	Fill weight:	N/A
Fines correction method:	NCEER (1998)	Average results interval:	3	Transition detect. applied:	Yes
Points to test:	Based on Ic value	Ic cut-off value:	2.60	K_σ applied:	Yes
Earthquake magnitude M_w:	6.78	Unit weight calculation:	Based on SBT	Clay like behavior applied:	Sands only
Peak ground acceleration:	0.82	Use fill:	No	Limit depth applied:	No
Depth to water table (insitu):	27.00 ft	Fill height:	N/A	Limit depth:	N/A

F.S. color scheme

- Almost certain it will liquefy
- Very likely to liquefy
- Liquefaction and no liq. are equally likely
- Unlike to liquefy
- Almost certain it will not liquefy

LPI color scheme

- Very high risk
- High risk
- Low risk

Figure D.8

EVALUATION OF LIQUEFACTION POTENTIAL AND EARTHQUAKE-INDUCED GROUND SETTLEMENTS USING SPT DATA

<<---------- GENERAL INPUT DATA ----------

Project Name	Spring Meadow
Location	Walnut, CA
GDC Project Number	LA1579
Exploration No.	B-8
Ground Surf. Elevation	589.00 ft
GWT Depth During Testing, Z_w	30.00 ft
GWT Depth for Design, Z_{wd}	18.00 ft
Soil Unit Weight, γ_t	120.00 pcf
Earthquake Magnitude, M_{eq}	6.78
Peak Ground Acceelration, A_{max}	0.82 g
Required FS	1.30

<< ---------- REFERENCES ---------->

+ Liquefaction Resistance of Soils: Summary Report From the 1996 NCEER and 1998 NCEER/NSF Workshops (Edited by: T.L. Youd and I.M. Idriss, 2001)

++ Combination of corrrection factors for hammer energy ratio (C_E), borehole diameter (C_B), rod length (C_R), and sampling method (C_S). Correction Factor = $C_E\ C_B\ C_R\ C_S$

+++ $CSR = 0.65\ A_{max}\ (\sigma_v/\sigma_v')\ r_d$

* FS = $(CRR_{7.5}/CSR)\ MSF\ K_\sigma\ K_\alpha$ where K_α =1.0 and MSF = 1.29

** S_r value based on extrapolated median curve and limited to a maximum value of 1,200 psf (Seed & Harder, 1990)

*** Based on Tokimatsu and Seed (1987) and Pradel (1998).

Note: This analysis asssumes level ground condition and depth of liquefiable soils does not change.

<<---------- SUMMARY OF RESULTS ---------->>

Total Thickness of Liquefiable Soils =	**0.00 feet**	
Earthquake-Induced Settlements:		
- Liquefaction-Induced Settlement =	**0.00 inches**	**<--- Saturated Sands**
- Seismic Compaction Settlement =	**0.18 inches**	**<--- Dry or Unsaturated Sands**
Total:	**0.18 inches**	

INPUT SOIL PROFILE						SOIL LIQUEFACTION POTENTIAL ANALYSIS (1996 NCEER & 1998 NCEER/NSF WORKSHOPS) +													RESIDUAL STRENGTH **			GROUND SETTLEMENT ***			
Soil Depth Z (ft)	Layer Thickness H (ft)	USCS Soil Type	Equivalent SPT Blow Count N (blows/ft)	Fines Content FC (%)	Combined SPT Correction Factor ++ C	Bottom of Layer Elevation (ft)	Total Vert. Stress (Design) σ_v (psf)	Effective Vert. Stress (Design) $\sigma_{v'}$ (psf)	Effective Vert. Stress (Testing) $\sigma_{v'}$ (psf)	SPT Stress Correction Factor+ C_N	Stress Corrected SPT Blow Count $(N_1)_{60}$	Fines Corrected SPT Blow Count $(N_1)_{60cs}$	Shear Stress Reduction Coeff.+ r_d	Correction for High Overburden Stress+ K_σ	Cyclic Stress Ratio++ CSR	Cyclic Res. Ratio $CRR_{7.5}$	Factor of Safety Against Liqefaction * FS	Liquefy ?	SPT Blow Count Correction $N_{corr.}$	Fines Corrected SPT Blow Count $(N_1)_{60cs}$	Residual Shear Strength S_r (psf)	Cyclic Shear Strain ** γ_c (%)	Vol. Strain ** ε_v (%)	Layer Settlement ** S_i (in.)	Cumulative Settlement
2.50	3	CL	38.0	50	1.33	585.0	300	300	300	1.700	85.9	108.1	0.994	1.000	0.530	N/A	N/A	NO	N/A	N/A	N/A	0.028	0.006	0.000	0.183
5.50	3	CL	52.0	50	1.33	582.0	660	660	660	1.700	117.6	146.1	0.987	1.000	0.526	N/A	N/A	NO	N/A	N/A	N/A	0.035	0.005	0.000	0.183
7.50	3	SM	12.0	30	1.33	580.0	900	900	900	1.491	23.8	32.2	0.983	1.000	0.524	N/A	N/A	NO	N/A	N/A	N/A	0.106	0.096	0.035	0.183
10.50	3	SM	23.0	30	1.33	577.0	1260	1260	1260	1.260	38.5	49.2	0.976	1.000	0.520	N/A	N/A	NO	N/A	N/A	N/A	0.088	0.048	0.017	0.148
15.50	4	SM	10.0	30	1.33	571.5	1860	1860	1860	1.037	13.8	20.6	0.964	1.000	0.514	N/A	N/A	NO	N/A	N/A	N/A	0.177	0.273	0.131	0.131
20.50	3	CL	27.0	50	1.33	567.0	2460	2304	2460	0.902	32.4	43.9	0.952	0.945	0.542	N/A	UNDEF.	NO	N/A	N/A	N/A	N/A	0.000	0.000	0.000

Figure D.9

EVALUATION OF LIQUEFACTION POTENTIAL AND EARTHQUAKE-INDUCED GROUND SETTLEMENTS USING SPT DATA

<<---------- GENERAL INPUT DATA ----------

Project Name	Spring Meadow
Location	Walnut, CA
GDC Project Number	LA1579
Exploration No.	B-14
Ground Surf. Elevation	589.00 ft
GWT Depth During Testing, Z_w	30.00 ft
GWT Depth for Design, Z_{wd}	18.00 ft
Soil Unit Weight, γ_t	120.00 pcf
Earthquake Magnitude, M_{eq}	6.78
Peak Ground Acceelration, A_{max}	0.82 g
Required FS	1.30

<< ---------- REFERENCES ---------->

+ Liquefaction Resistance of Soils: Summary Report From the 1996 NCEER and 1998 NCEER/NSF Workshops (Edited by: T.L. Youd and I.M. Idriss, 2001)

++ Combination of corrrection factors for hammer energy ratio (C_E), borehole diameter (C_B), rod length (C_R), and sampling method (C_S). Correction Factor = $C_E\ C_B\ C_R\ C_S$

+++ CSR = 0.65 A_{max} (σ_v/σ_v') r_d

*** FS = ($CRR_{7.5}$/CSR) MSF K_σ K_α where K_α =1.0 and MSF = 1.29**

**** S_r value based on extrapolated median curve and limited to a maximum value of 1,200 psf (Seed & Harder, 1990)**

***** Based on Tokimatsu and Seed (1987) and Pradel (1998).**

Note: This analysis asssumes level ground condition and depth of liquefiable soils does not change.

<<---------- SUMMARY OF RESULTS ---------->>

Total Thickness of Liquefiable Soils = 0.00 feet

Earthquake-Induced Settlements:

- Liquefaction-Induced Settlement = 0.00 inches <--- Saturated Sands

- Seismic Compaction Settlement = 0.06 inches <--- Dry or Unsaturated Sands

Total: 0.06 inches

INPUT SOIL PROFILE						SOIL LIQUEFACTION POTENTIAL ANALYSIS (1996 NCEER & 1998 NCEER/NSF WORKSHOPS) +													RESIDUAL STRENGTH **			GROUND SETTLEMENT ***			
Soil Depth Z (ft)	Layer Thickness H (ft)	USCS Soil Type	Equivalent SPT Blow Count N (blows/ft)	Fines Content FC (%)	Combined SPT Correction Factor ++ C	Bottom of Layer Elevation (ft)	Total Vert. Stress (Design) σ_v (psf)	Effective Vert. Stress (Design) $\sigma_{v'}$ (psf)	Effective Vert. Stress (Testing) $\sigma_{v'}$ (psf)	SPT Stress Correction Factor+ C_N	Stress Corrected SPT Blow Count $(N_1)_{60}$	Fines Corrected SPT Blow Count $(N_1)_{60cs}$	Shear Stress Reduction Coeff.+ r_d	Correction for High Overburden Stress+ K_σ	Cyclic Stress Ratio++ CSR	Cyclic Res. Ratio $CRR_{7.5}$	Factor of Safety Against Liqefaction * FS	Liquefy ?	SPT Blow Count Correction $N_{corr.}$	Fines Corrected SPT Blow Count $(N_1)_{60cs}$	Residual Shear Strength S_r (psf)	Cyclic Shear Strain ** γ_c (%)	Vol. Strain ** ε_v (%)	Layer Settlement ** S_1(in.)	Cumulative Settlement
2.50	3	CL	16.0	50	1.33	585.0	300	300	300	1.700	36.2	48.4	0.994	1.000	0.530	N/A	N/A	NO	N/A	N/A	N/A	0.049	0.027	0.010	0.061
5.50	2	CH	21.0	50	1.33	582.5	660	660	660	1.700	47.5	62.0	0.987	1.000	0.526	N/A	N/A	NO	N/A	N/A	N/A	0.060	0.025	0.000	0.051
7.50	3	CH	9.0	50	1.33	580.0	900	900	900	1.491	17.8	26.4	0.983	1.000	0.524	N/A	N/A	NO	N/A	N/A	N/A	0.123	0.141	0.051	0.051
10.50	4	CH	23.0	50	1.33	576.5	1260	1260	1260	1.260	38.5	51.2	0.976	1.000	0.520	N/A	N/A	NO	N/A	N/A	N/A	0.085	0.044	0.000	0.000
15.00	5	CL	32.0	50	1.33	571.5	1800	1800	1800	1.054	44.9	58.8	0.965	1.000	0.514	N/A	N/A	NO	N/A	N/A	N/A	0.087	0.038	0.000	0.000
20.00	5	SC	42.0	30	1.33	566.5	2400	2275	2400	0.913	51.0	63.6	0.953	0.950	0.536	N/A	UNDEF.	NO	N/A	N/A	N/A	N/A	0.000	0.000	0.000

Figure D.10

EVALUATION OF LIQUEFACTION POTENTIAL AND EARTHQUAKE-INDUCED GROUND SETTLEMENTS USING SPT DATA

<<---------- GENERAL INPUT DATA ----------<<

Project Name	Spring Meadow	
Location	Walnut, CA	
GDC Project Number	LA1579	
Exploration No.	B-20	
Ground Surf. Elevation	583.00	ft
GWT Depth During Testing, Z_w	30.00	ft
GWT Depth for Design, Z_{wd}	18.00	ft
Soil Unit Weight, γ_t	120.00	pcf
Earthquake Magnitude, M_{eq}	6.78	
Peak Ground Acceelration, A_{max}	0.82	g
Required FS	1.30	

>>---------- REFERENCES ----------<<

+ Liquefaction Resistance of Soils: Summary Report From the 1996 NCEER and 1998 NCEER/NSF Workshops (Edited by: T.L. Youd and I.M. Idriss, 2001)

++ Combination of corrrection factors for hammer energy ratio (C_E), borehole diameter (C_B), rod length (C_R), and sampling method (C_S). Correction Factor = $C_E\ C_B\ C_R\ C_S$

+++ CSR = $0.65\ A_{max}\ (\sigma_v/\sigma_v')\ r_d$

*** FS = $(CRR_{7.5}/CSR)\ MSF\ K_\sigma\ K_\alpha$ where K_α =1.0 and MSF = 1.29**

**** S_r value based on extrapolated median curve and limited to a maximum value of 1,200 psf (Seed & Harder, 1990)**

***** Based on Tokimatsu and Seed (1987) and Pradel (1998).**

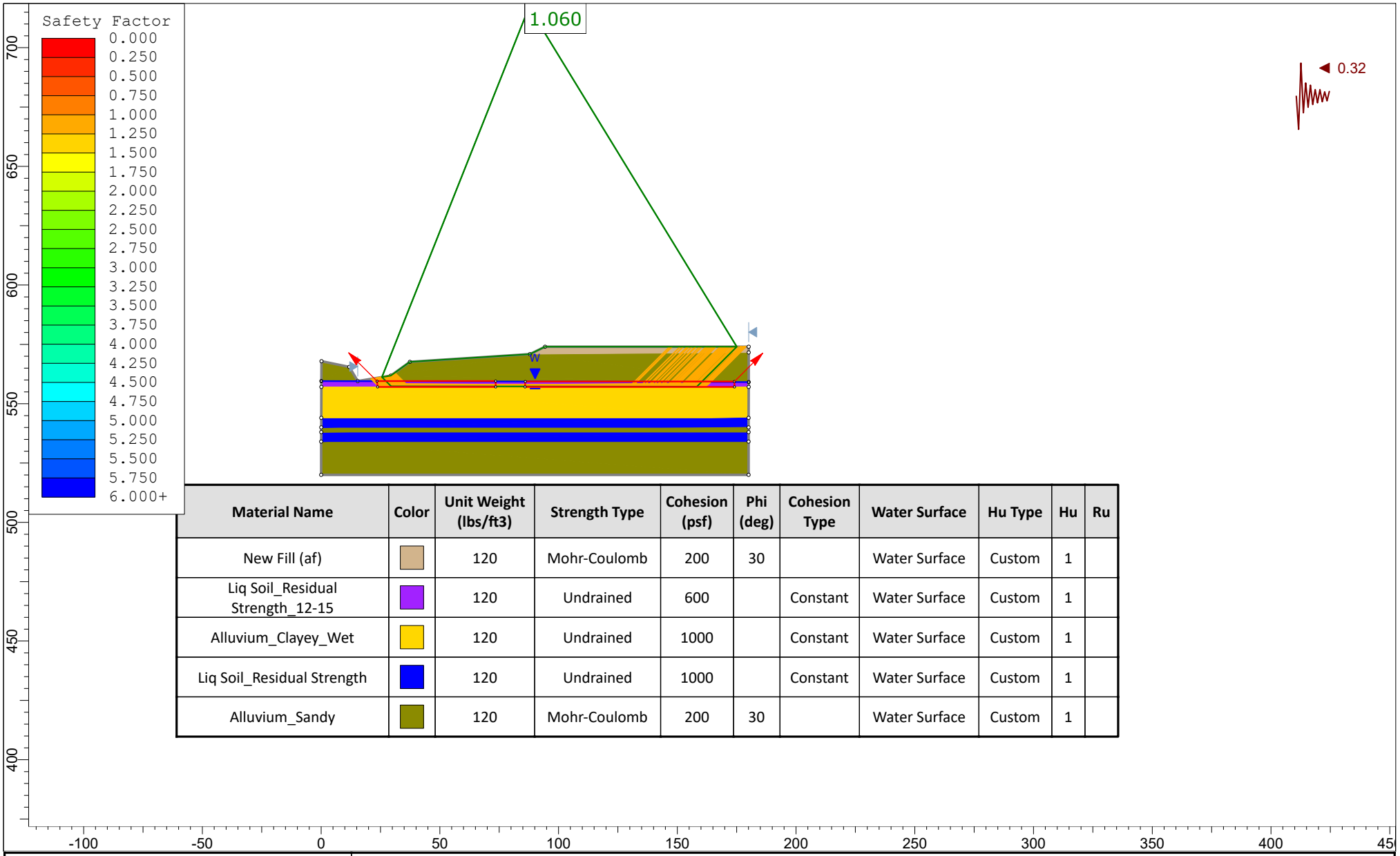
Note: This analysis asssumes level ground condition and depth of liquefiable soils does not change.

<<---------- SUMMARY OF RESULTS ----------<<

Total Thickness of Liquefiable Soils =	**5.00**	**feet**	
Earthquake-Induced Settlements:			
- Liquefaction-Induced Settlement =	**1.13**	**inches**	**<--- Saturated Sands**
- Seismic Compaction Settlement =	**0.13**	**inches**	**<--- Dry or Unsaturated Sands**
Total:	**1.26**	**inches**	

INPUT SOIL PROFILE						SOIL LIQUEFACTION POTENTIAL ANALYSIS (1996 NCEER & 1998 NCEER/NSF WORKSHOPS) +													RESIDUAL STRENGTH **			GROUND SETTLEMENT ***			
Soil Depth Z (ft)	Layer Thickness H (ft)	USCS Soil Type	Equivalent SPT Blow Count N (blows/ft)	Fines Content FC (%)	Combined SPT Correction Factor ++ C	Bottom of Layer Elevation (ft)	Total Vert. Stress (Design) σ_v (psf)	Effective Vert. Stress (Design) $\sigma_{v'}$ (psf)	Effective Vert. Stress (Testing) $\sigma_{v'}$ (psf)	SPT Stress Correction Factor+ C_N	Stress Corrected SPT Blow Count $(N_1)_{60}$	Fines Corrected SPT Blow Count $(N_1)_{60cs}$	Shear Stress Reduction Coeff.+ r_d	Correction for High Overburden Stress+ K_σ	Cyclic Stress Ratio++ CSR	Cyclic Res. Ratio $CRR_{7.5}$	Factor of Safety Against Liqefaction * FS	Liquefy ?	SPT Blow Count Correction $N_{corr.}$	Fines Corrected SPT Blow Count $(N_1)_{60cs}$	Residual Shear Strength S_r (psf)	Cyclic Shear Strain ** γ_c (%)	Vol. Strain ** ε_v (%)	Layer Settlement ** S_i (in.)	Cumulative Settlement
2.50	5	SM	30.0	15	1.33	578.0	300	300	300	1.700	67.8	73.6	0.994	1.000	0.530	N/A	N/A	NO	N/A	N/A	N/A	0.036	0.012	0.000	1.261
7.50	5	CL	30.0	50	1.33	573.0	900	900	900	1.491	59.5	76.4	0.983	1.000	0.524	N/A	N/A	NO	N/A	N/A	N/A	0.059	0.019	0.000	1.261
12.50	5	SC	15.0	30	1.33	568.0	1500	1500	1500	1.155	23.0	31.3	0.971	1.000	0.517	N/A	N/A	NO	N/A	N/A	N/A	0.125	0.117	0.070	1.261
17.50	5	SC	21.0	30	1.33	563.0	2100	2100	2100	0.976	27.3	36.2	0.959	0.981	0.511	N/A	N/A	NO	N/A	N/A	N/A	0.122	0.096	0.058	1.191
22.50	5	SM	12.0	15	1.33	558.0	2700	2419	2700	0.861	13.7	16.9	0.948	0.948	0.564	0.180	0.391	YES	1.3	15.1	707	N/A	1.778	1.067	1.134
27.50	5	CL	23.4	50	1.33	553.0	3300	2707	3300	0.778	24.2	34.1	0.936	0.894	0.608	N/A	UNDEF.	NO	N/A	N/A	N/A	N/A	0.111	0.067	0.067

Figure D.11



Material Name	Color	Unit Weight (lbs/ft3)	Strength Type	Cohesion (psf)	Phi (deg)	Cohesion Type	Water Surface	Hu Type	Hu	Ru
New Fill (af)		120	Mohr-Coulomb	200	30		Water Surface	Custom	1	
Liq Soil_Residual Strength_12-15		120	Undrained	600		Constant	Water Surface	Custom	1	
Alluvium_Clayey_Wet		120	Undrained	1000		Constant	Water Surface	Custom	1	
Liq Soil_Residual Strength		120	Undrained	1000		Constant	Water Surface	Custom	1	
Alluvium_Sandy		120	Mohr-Coulomb	200	30		Water Surface	Custom	1	

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Project	SLIDE - An Interactive Slope Stability Program		
Analysis Description			
Drawn By		Scale 1:670	Company
Date	2/14/2023, 11:26:54 AM		File Name Lateral Spread Calculation.slmd

Figure D.12

ESTIMATION OF PERMANENT SEISMIC DISPLACEMENT USING THE BRAY AND RATHJE (1998) PROCEDURE.

INPUT PARAMETERS:

Yield Acceleration, ky (g):	0.32		Normalized MHEA Sigma:	0.298	
Vertical Thickness, h (m):	3		Mean Period Sigma:	0.3	
Shear Wave Vel., Vs (m/s):	250		Significant Duration Sigma:	0.3	
Earthquake Magnitude, M:	6.70	*	Normalized Displacement Sigma:	0.35	
Earthquake Accel., Rock (g):	0.7	*			
Earthquake Distance, r (km):	11	*	Allowable screen displacement (cm):	10	*

CALCULATIONS:

Site Period (s):	0.048
NRF Factor:	0.813
Mean Period (s):	0.561
Duration, D05-95 (s):	12.647
Ts/Tm:	0.0855
MHEA/MHA*NRF:	1.000
MHEA, kmax:	0.5692
ky/kmax:	0.5622
Normalized Disp. (cm/sec):	1.0908

(Input values marked with asterisks are used for calculation of seismic coefficient for screen)

Estimated Displacement (cm):	7.852	**Median f_{eq} for Screen Procedure:**	0.404	*
Estimated Displacement (in):	3.092	**Seismic Coefficient for Screen Procedure:**	0.283	*

APPENDIX E
SLOPE STABILITY ANALYSES

APPENDIX E
SLOPE STABILITY ANALYSES

E.1 INTRODUCTION

Slope stabilities analyses were performed on selected critical sections on cross section 2-2', 3-3', 5-5', and 6-6'. The locations of these cross sections are shown on Figure 2. The cross section of each section are shown on Figure 3.4, 3.5, 3.6, and 3.7 for Section 2-2', 3-3', 5-5', and 6-6', respectively.

Analyses on Cross Section 2-2' was to evaluate the global stability of the cut slope at north of the property line. Analyses on Cross Section 3-3' was to evaluate the global stabilities of the existing south facing slope along Lemon Creek that might be impacted from the proposed new fills being planned near Lot 2 to Lot 5. Analyses on Cross Section 5-5' was to evaluate the global stabilities of the proposed cut slope east of the Street B. Analyses on Cross Section 6-6' was to evaluate the global stabilities of the existing west facing slope along Lemon Creek that might be impacted from the proposed new fills being planned near Lot 15 to Lot 20. Details of analyses procedures and results are discussed in the following sections.

E.2 SHEAR STRENGTH

Shear strengths of the materials onsite were selected based on the results of both field and laboratory tests. Conservative values were selected for a typical engineered fill. The undrained shear strength of clayey materials were estimated from pocket penetrometer tests and parameters interpolated from cone penetrometer tests. In addition, laboratory tests were performed to evaluate the shear strength values of the bedrock conditions. Cross bedding shear strengths were used for the bedrock based on limited test pit observation.

The results of this shear strength evaluation were utilized in our analysis and is presented in Table E.1.

Table E.1: Recommended Shear Strength Parameters for Stability Analyses

Materials	Unit Weight (pcf)	Friction Angle (deg)	Cohesion/UCS* (psf)
Fill	120	30	200
Alluvium (Clay)	120	-	1,000
Alluvium (Silty Sand)	120	24	200
Organic Soils	110	-	500
Canyon Wash Debris	110	-	200
Claystone Bedrock	120	30	800
Sandstone Bedrock	120	31	500
Ground Improvement Element	120	-	15,000**

*: UCS: Unconfined compressive strength of clayey soils.
**: Assume deep soil mixing columns have UCS of at least 100 psi

E.3 GLOBAL STABILITY ANALYSES

The global stability analyses were performed using Bishop simplified method. For seismic slope stability analyses, we have used horizontal seismic coefficient of 0.15g in accordance with the "Manual for Preparation of Geotechnical Reports (LACDPW, 2013)

E.3.1 Analyses for Cross Section 2-2'

Cross Section 2-2' was to evaluate the global stability of the proposed cut slope along north property line. The maximum height of the cut slope is about 30 feet and the cut slope will be no steeper than 2:1.

The underlying materials of the cut slope consists predominantly of existing fill soils underlain by alluvium and claystone bedrock. Bedrock is not anticipated to be exposed during excavation and therefore adverse bedding condition is not anticipated. Laboratory test was not performed to evaluate the existing fill soils. We have assumed a shear strength value based on the conditions observed in test pits excavated near the slope. The shear strength of the fill soils should be verified during design level geotechnical investigation.

The static and seismic stability analyses indicates that the factor of safety of the proposed cut slope against global instability are great than 1.5 and 1.1 for static case and seismic case, respectively (Figure E.1 and E. 2). Therefore, the potential of impacting the neighboring properties due to the proposed cut slopes are considered low.

The results of slope stability analyses are summarized in Table E.2.

Table E.2. Slope Stability Analyses Summary – Cross Section 2-2'

Cross Section	Case	Description	Factor of Safety	
			Static	Seismic
2-2'	2-1	Cut Slope along North Property Line	1.83	1.34

E.3.2 Analyses for Cross Section 3-3'

Analyses on Cross Section 3-3' was to evaluate the global stabilities of the existing south facing slope along Lemon Creek that might be impacted from the proposed new fills being planned near Lot 2 to Lot 5. Up to 13 feet of fill is planned in this area for the proposed building pads.

We first checked the static stability of the existing slope and both the static and seismic stability. The analysis assumed the existing canyon wall debris would continue to erode and be unstable. The analyses indicates that the factor of safety of the existing slope against global instability are great than 1.5 and 1.1 for static case and seismic case, respectively. The results of the analyses are shown on Figure E.3 and E.4 for static and seismic cases, respectively.

Then, we started to increase the thickness of the proposed fill on top of the existing slope. The results indicated that the slope having up to 1 foot of new fill will have the factor of safety against global instability greater than 1.5 and 1.1 for static case and seismic case, respectively (Figure E.5 and E.6). However, when the thickness of fill increases greater than 1 foot, the factor of safety against the global instability for seismic case becomes less than 1.1, which is lower than the County requirements. Therefore, we conclude that the existing south facing slope may support new fills up to 1 foot without special reinforcement.

For cases where new fills greater than 1 foot is being placed on top of the existing south facing slope, we recommend that ground improvement may be constructed near the toe of new fill slope to increase lateral resistance of the existing slope. Deep cement soil mixing (DCSM) may be an applicable improvement option.

We have assumed at least one row of DCSM columns extending into the top of bedrock may be installed. The typical shear strength of DCSM columns is on an order of 150 psi or greater. We have conservatively used an unconfined compressive strength of 100 psi (or 15,000 psf) for the DCSM columns. The stability analyses indicates that the south facing slope with recommended ground improvement may support new fills up to 15 feet and the factor of safety against global instability great than 1.5 and 1.1 for static case and seismic case, respectively. (Figure E.9 and E.10)

The results of slope stability analyses are summarized in Table E.3.

Table E.3. Slope Stability Analyses Summary – Cross Section 3-3'

Cross Section	Case	Description	Factor of Safety	
			Static	Seismic
3-3'	3-1	Existing Condition	1.60	1.13
	3-2	Thickness of New Fill = 1 feet	1.56	1.13
	3-3	Thickness of New Fill = 15 feet	0.94	0.65
	3-4	Thickness of New Fill = 15 feet with Deep Soil Mixing	1.85	1.13

E.3.3 Analyses for Cross Section 5-5'

Cross Section 5-5' was to evaluate the global stability of the cut slope east of the Street B. The maximum height of the cut slope is about 25 feet and the cut slope will be no steeper than 2:1.

The underlying materials of the cut slope consists predominantly of massive sandstone bedrock based on limited test pit observations. The static and seismic stability analyses indicates that the factor of safety of the existing slope against global instability are great than 1.5 and 1.1 for static case and seismic case, respectively (Figure E.11 and E. 12). Therefore, the potential of impacting the neighboring properties due to the proposed cut slopes are considered low.

The results of slope stability analyses are summarized in Table E.4.

Table E.4. Slope Stability Analyses Summary – Cross Section 5-5'

Cross Section	Case	Description	Factor of Safety	
			Static	Seismic
5-5'	5-1	Cut Slope East of Street B and Lot 16	3.33	2.33

E.3.4 Analyses for Cross Section 6-6'

Analyses on Cross Section 6-6' was to evaluate the global stabilities of the existing west facing slope along Lemon Creek that might be impacted from the proposed new fills being planned near Lot 15 to Lot 20. Up to 10 feet of fill is planned to be placed in this area for the proposed building pads.

We first checked the static stability of the existing slope and both the static and seismic stability analyses indicates that the factor of safety of the existing slope against global instability are greater than 1.5 and 1.1 for static case and seismic case, respectively (Figure E.13 and E.14). The static and seismic stability analyses indicates that the factor of safety of the proposed fill slope against global instability are greater than 1.5 and 1.1 for static case and seismic case, respectively (Figure E.15 and E.16).

The results of slope stability analyses are summarized in Table E.5.

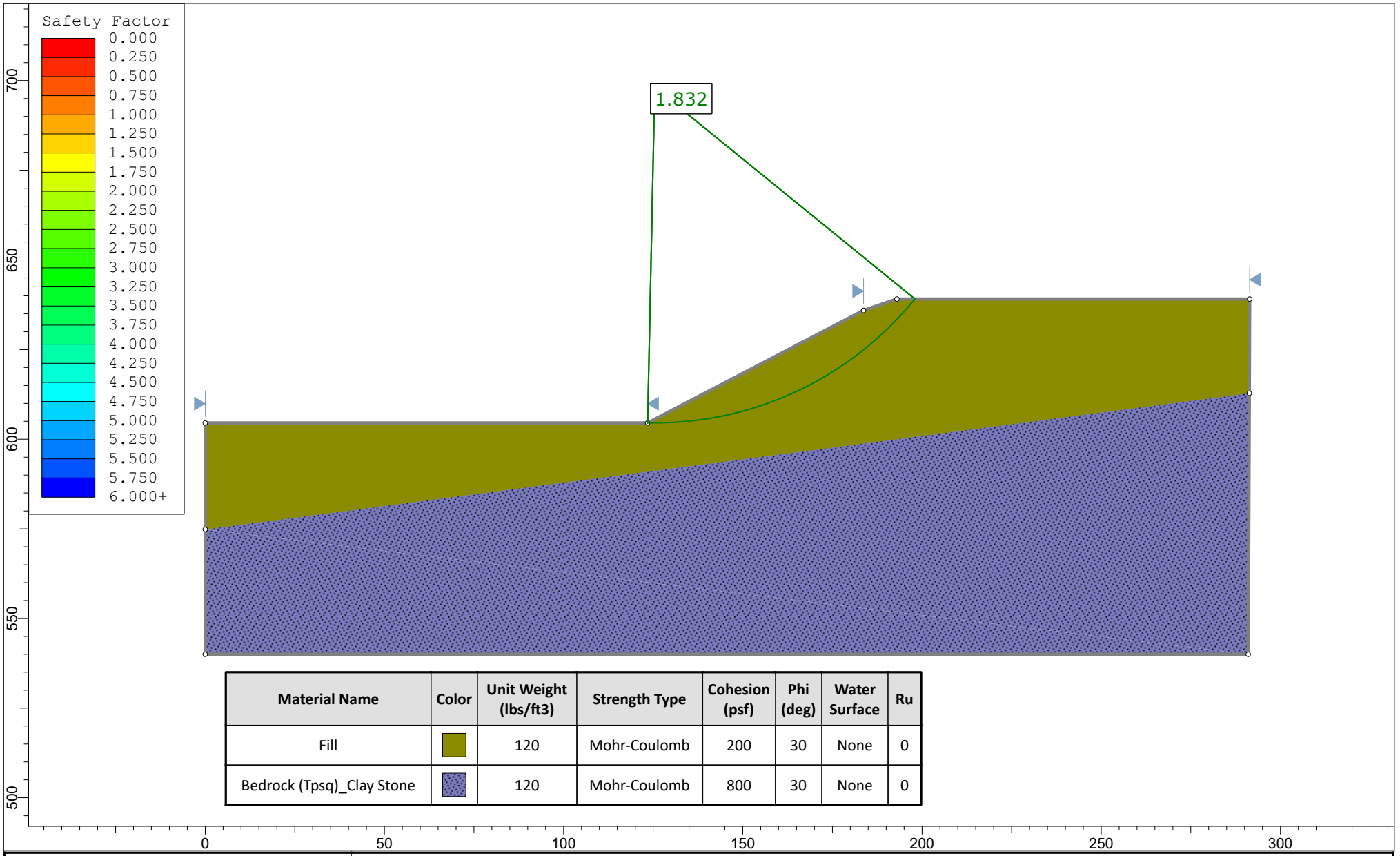
Table E.5. Slope Stability Analyses Summary – Cross Section 6-6'

Cross Section	Case	Description	Factor of Safety	
			Static	Seismic
6-6'	6-1	Existing Condition	1.70	1.29
	6-2	Proposed fill slope	1.76	1.34

E.5 Conclusion

Based on the results of the stability analyses discussed in this Appendix, it is our opinion that global stability is not an issue if the recommended mitigation measure can be followed. The proposed structures may be setback from adjacent slopes in accordance with Section 1808.7 of 2022 California Building Code. No other special structural setback is required.

An assumed shear strength was used in the analyses for the cut slope along north property line (Cross Section 2-2'). The shear strength should be verified during design-level geotechnical investigation and the slope stability analyses at this location should be updated. If the results of the updated slope stability analyses are below the County's requirement, the cut slope may need to be mitigated. Mitigation options would include, but not limit to, soil nails, retaining walls, or ground improvements to strengthen the shear strength of the existing fill soils. Details design recommendation can be provided in design-level geotechnical report.



Material Name	Color	Unit Weight (lbs/ft3)	Strength Type	Cohesion (psf)	Phi (deg)	Water Surface	Ru
Fill		120	Mohr-Coulomb	200	30	None	0
Bedrock (Tpsq)_Clay Stone		120	Mohr-Coulomb	800	30	None	0

SLIDEINTERPRET 8.010

Project: Cross Section 2-2': Case 2-1: Cut Slope north Property Line, Static

Analysis Description:

Drawn By:

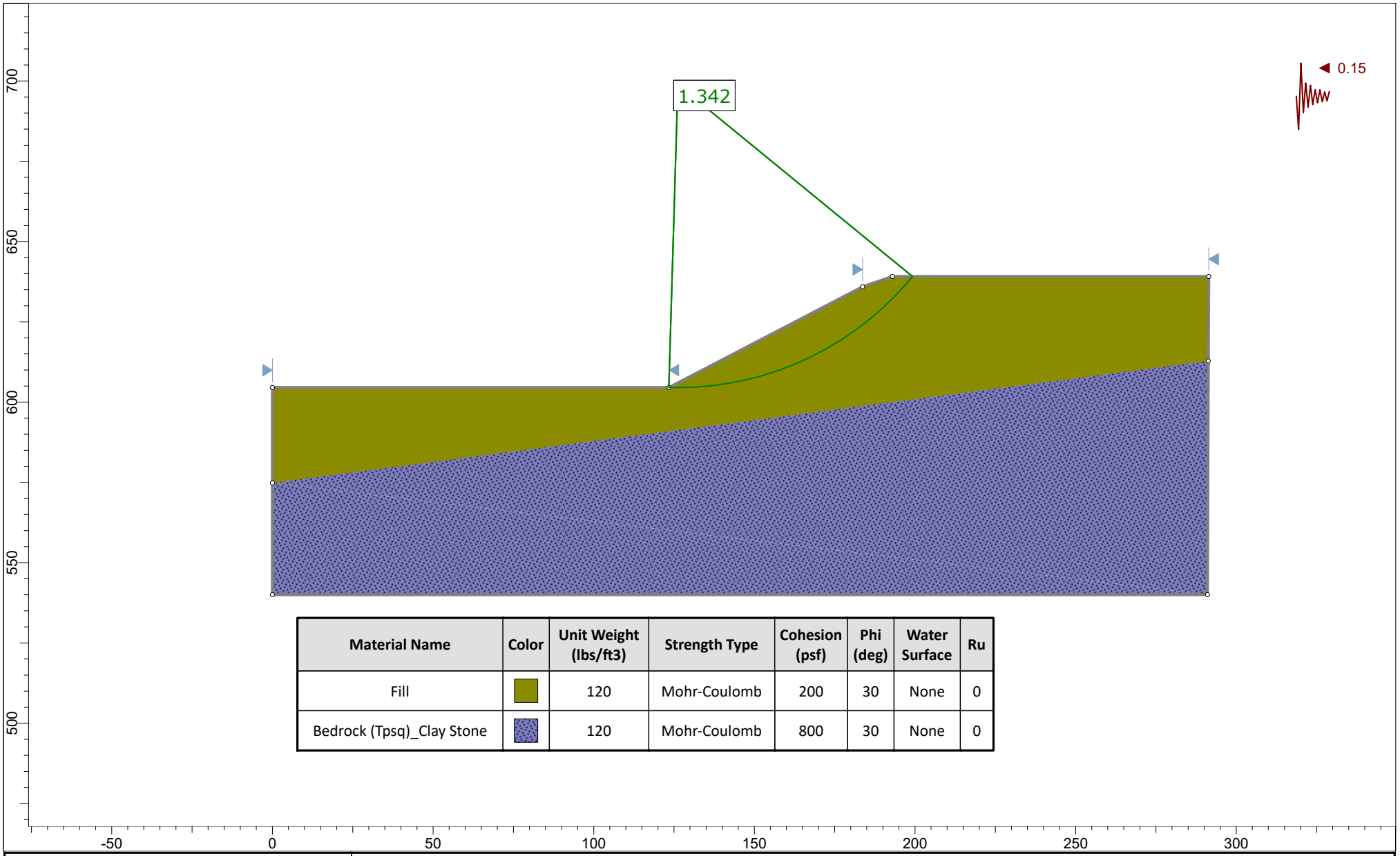
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Company:

Date:

File Name: Cross Section 2-2'.slmd

Figure E.1



Material Name	Color	Unit Weight (lbs/ft3)	Strength Type	Cohesion (psf)	Phi (deg)	Water Surface	Ru
Fill		120	Mohr-Coulomb	200	30	None	0
Bedrock (Tpsq)_Clay Stone		120	Mohr-Coulomb	800	30	None	0

SLIDEINTERPRET 8.010

Project: Cross Section 2-2': Case 2-1: Cut Slope north Property Line, Seismic

Analysis Description:

Drawn By:

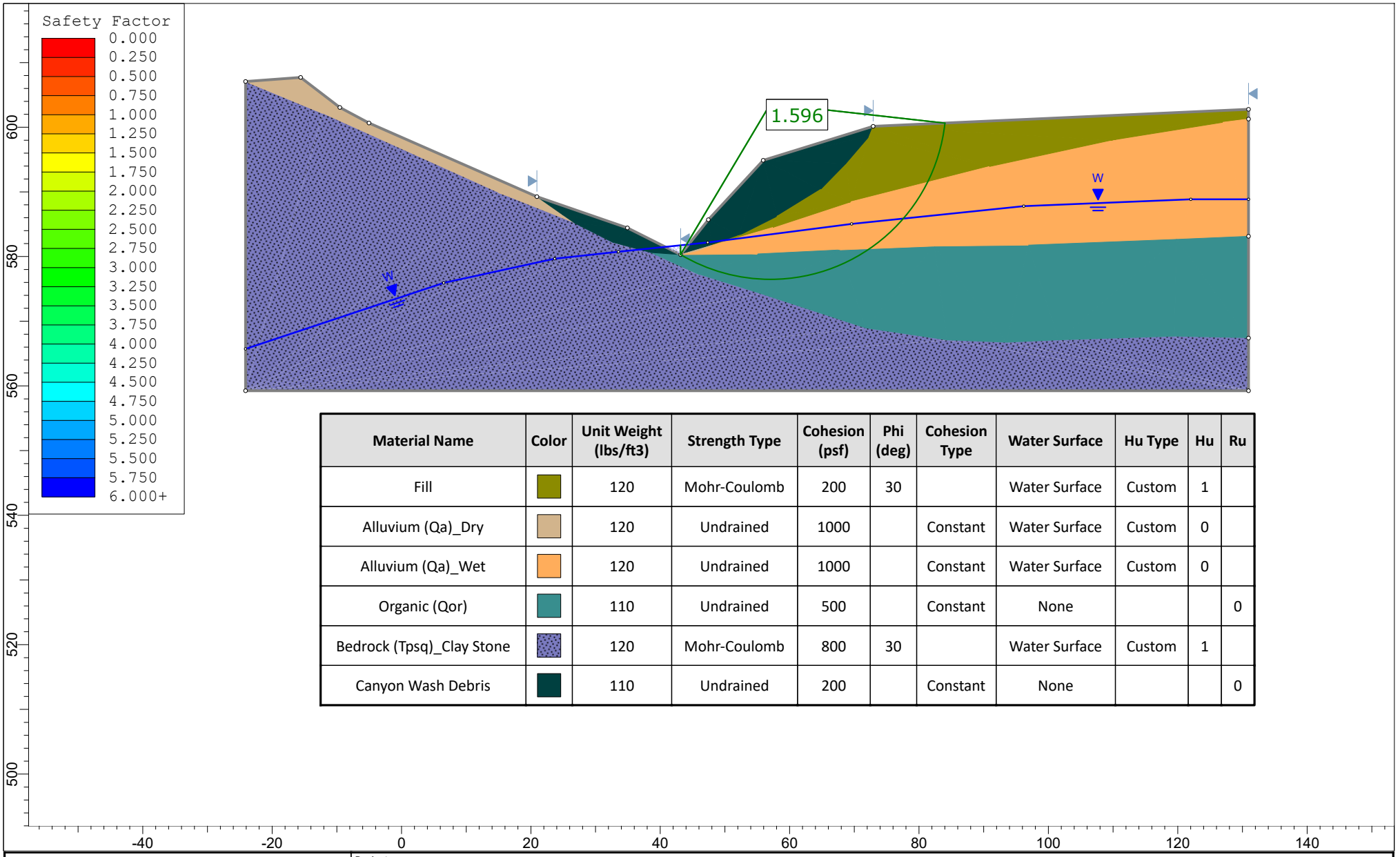
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Date:

File Name: Cross Section 2-2'.slmd

Figure E.2



Material Name	Color	Unit Weight (lbs/ft3)	Strength Type	Cohesion (psf)	Phi (deg)	Cohesion Type	Water Surface	Hu Type	Hu	Ru
Fill		120	Mohr-Coulomb	200	30		Water Surface	Custom	1	
Alluvium (Qa)_Dry		120	Undrained	1000		Constant	Water Surface	Custom	0	
Alluvium (Qa)_Wet		120	Undrained	1000		Constant	Water Surface	Custom	0	
Organic (Qor)		110	Undrained	500		Constant	None			0
Bedrock (Tpsq)_Clay Stone		120	Mohr-Coulomb	800	30		Water Surface	Custom	1	
Canyon Wash Debris		110	Undrained	200		Constant	None			0

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SLIDEINTERPRET 8.010

Project: Cross Section 3-3': Case 3-1: Existing Condition, Static

Analysis Description:

Drawn By:

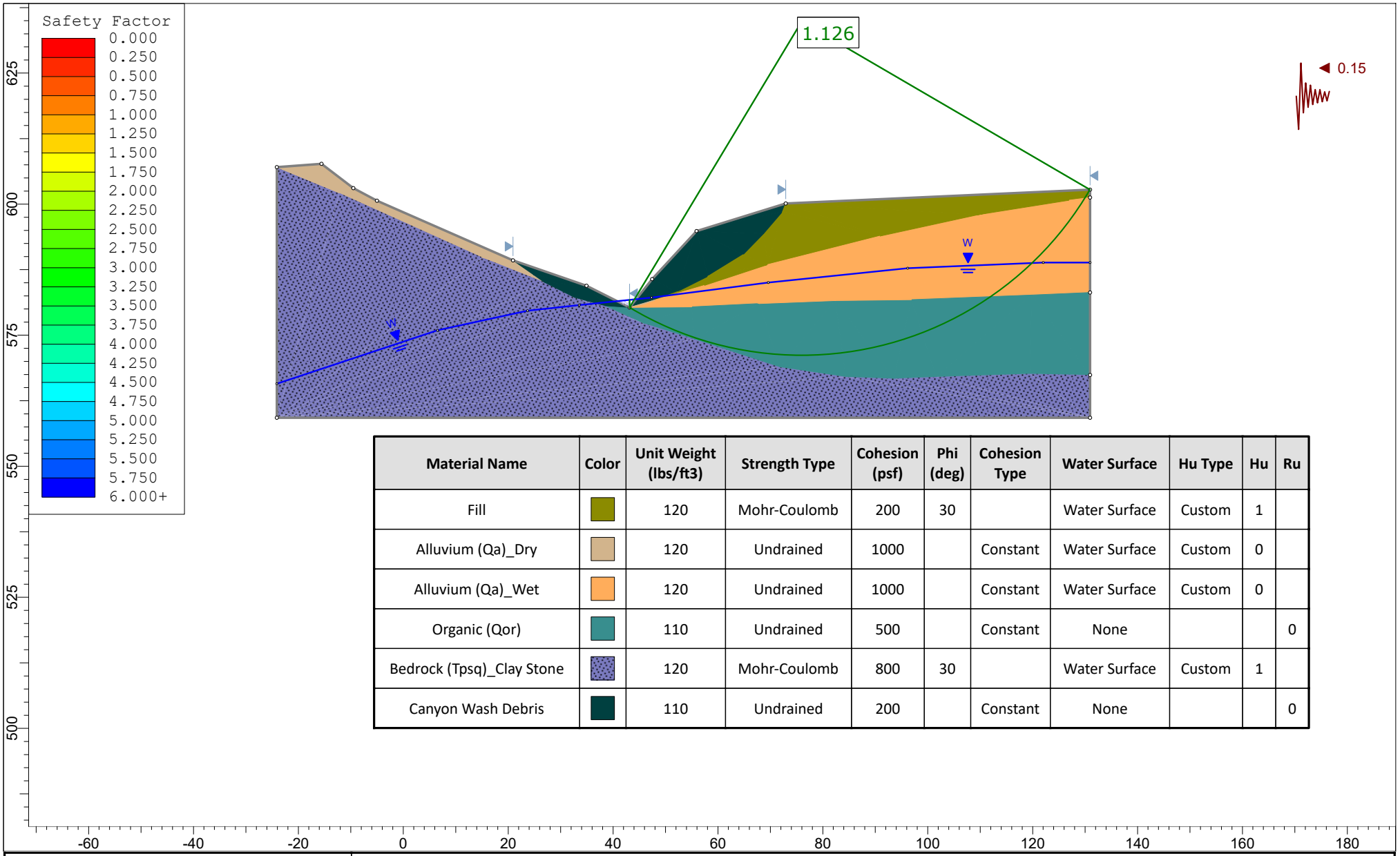
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Company:

Date:

File Name: Cross Section 3-3'.slmd

Figure E.3



Material Name	Color	Unit Weight (lbs/ft3)	Strength Type	Cohesion (psf)	Phi (deg)	Cohesion Type	Water Surface	Hu Type	Hu	Ru
Fill		120	Mohr-Coulomb	200	30		Water Surface	Custom	1	
Alluvium (Qa)_Dry		120	Undrained	1000		Constant	Water Surface	Custom	0	
Alluvium (Qa)_Wet		120	Undrained	1000		Constant	Water Surface	Custom	0	
Organic (Qor)		110	Undrained	500		Constant	None			0
Bedrock (Tpsq)_Clay Stone		120	Mohr-Coulomb	800	30		Water Surface	Custom	1	
Canyon Wash Debris		110	Undrained	200		Constant	None			0

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SLIDEINTERPRET 8.010

Project: Cross Section 3-3': Case 3-1: Existing Condition, Seismic

Analysis Description:

Drawn By:

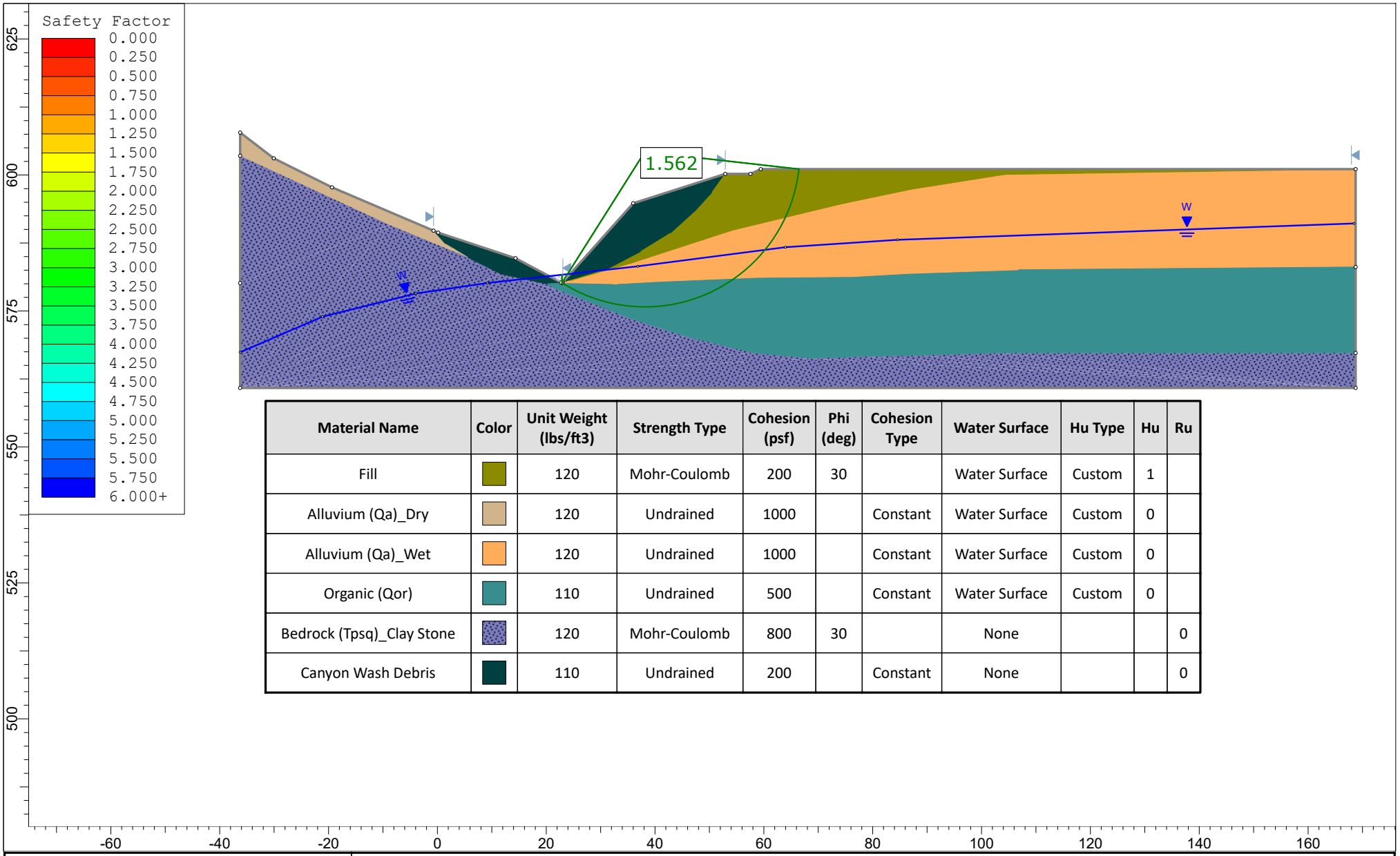
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Company:

Date:

File Name: Cross Section 3-3'.slmd

Figure E.4



Material Name	Color	Unit Weight (lbs/ft3)	Strength Type	Cohesion (psf)	Phi (deg)	Cohesion Type	Water Surface	Hu Type	Hu	Ru
Fill		120	Mohr-Coulomb	200	30		Water Surface	Custom	1	
Alluvium (Qa)_Dry		120	Undrained	1000		Constant	Water Surface	Custom	0	
Alluvium (Qa)_Wet		120	Undrained	1000		Constant	Water Surface	Custom	0	
Organic (Qor)		110	Undrained	500		Constant	Water Surface	Custom	0	
Bedrock (Tpsq)_Clay Stone		120	Mohr-Coulomb	800	30		None			0
Canyon Wash Debris		110	Undrained	200		Constant	None			0

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SLIDEINTERPRET 8.010

Project: Cross Section 3-3': Case 3-2: 1-foot thick new fill, Static

Analysis Description:

Drawn By:

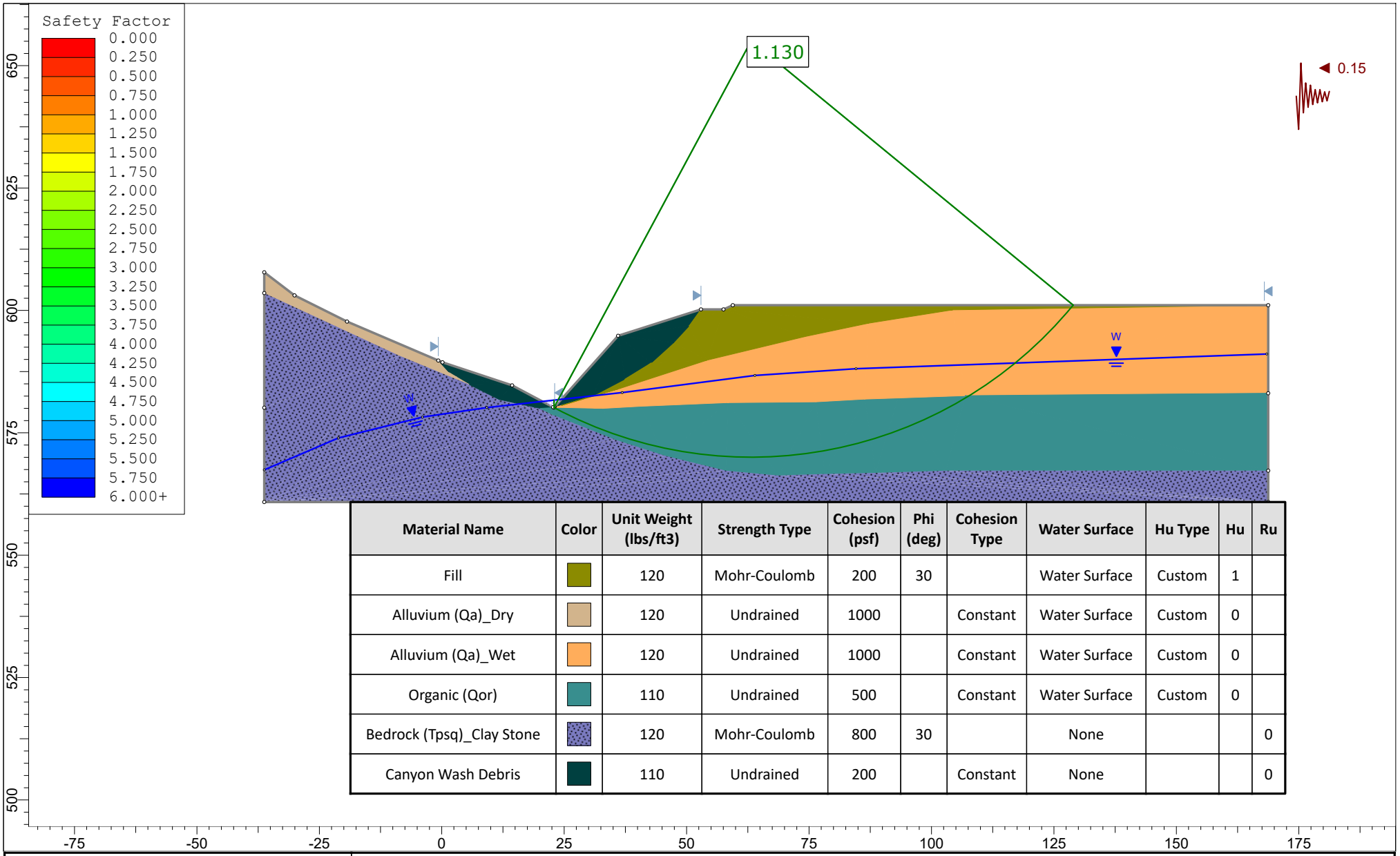
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Company:

Date:

File Name: Cross Section 3-3'.slmd

Figure E.5



Material Name	Color	Unit Weight (lbs/ft3)	Strength Type	Cohesion (psf)	Phi (deg)	Cohesion Type	Water Surface	Hu Type	Hu	Ru
Fill		120	Mohr-Coulomb	200	30		Water Surface	Custom	1	
Alluvium (Qa)_Dry		120	Undrained	1000		Constant	Water Surface	Custom	0	
Alluvium (Qa)_Wet		120	Undrained	1000		Constant	Water Surface	Custom	0	
Organic (Qor)		110	Undrained	500		Constant	Water Surface	Custom	0	
Bedrock (Tpsq)_Clay Stone		120	Mohr-Coulomb	800	30		None			0
Canyon Wash Debris		110	Undrained	200		Constant	None			0

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SLIDEINTERPRET 8.010

Project: Cross Section 3-3': Case 3-2: 1-foot thick new fill, Seismic

Analysis Description:

Drawn By:

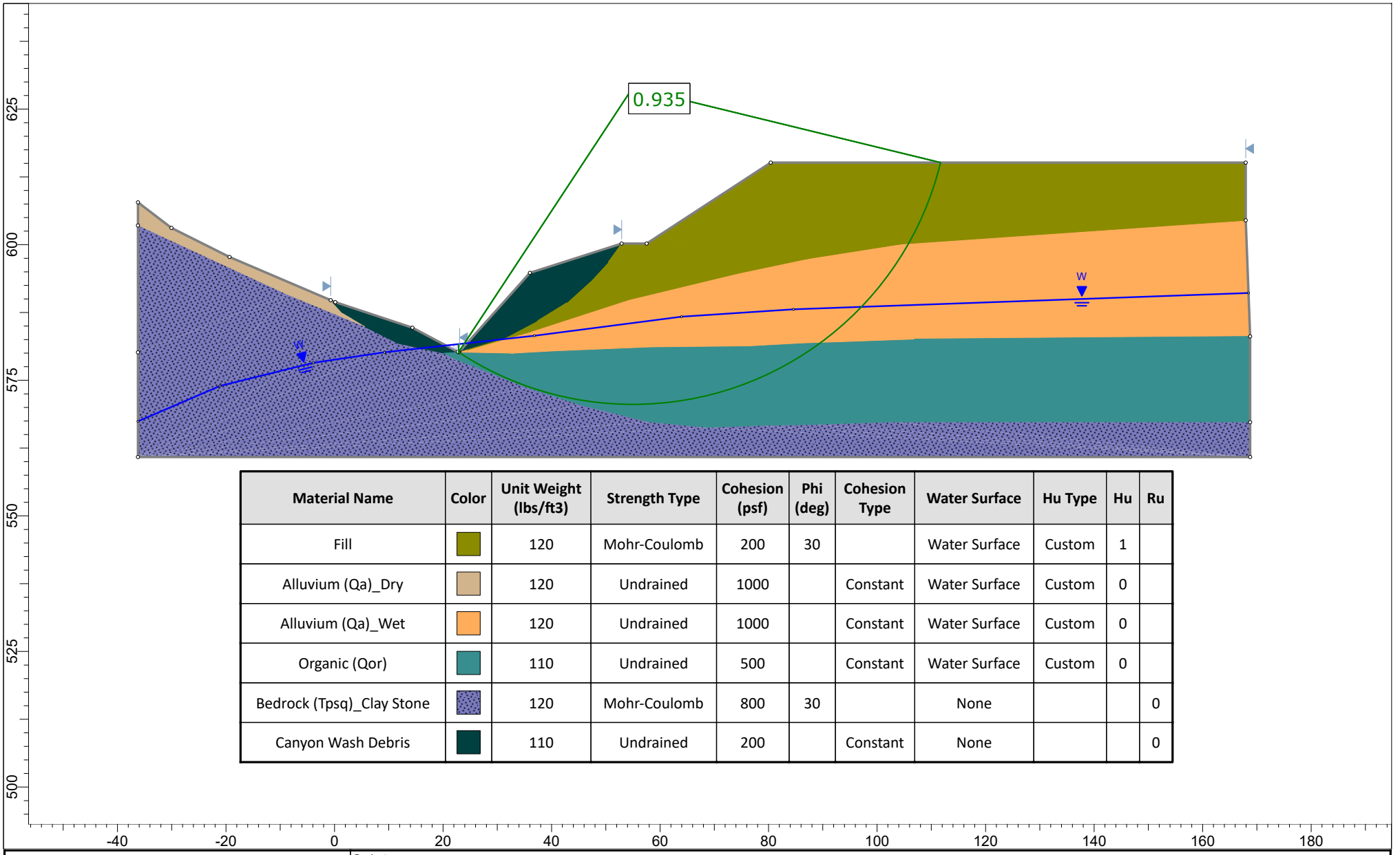
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Company:

Date:

File Name: Cross Section 3-3'.slmd

Figure E.6



Material Name	Color	Unit Weight (lbs/ft3)	Strength Type	Cohesion (psf)	Phi (deg)	Cohesion Type	Water Surface	Hu Type	Hu	Ru
Fill		120	Mohr-Coulomb	200	30		Water Surface	Custom	1	
Alluvium (Qa)_Dry		120	Undrained	1000		Constant	Water Surface	Custom	0	
Alluvium (Qa)_Wet		120	Undrained	1000		Constant	Water Surface	Custom	0	
Organic (Qor)		110	Undrained	500		Constant	Water Surface	Custom	0	
Bedrock (Tpsq)_Clay Stone		120	Mohr-Coulomb	800	30		None			0
Canyon Wash Debris		110	Undrained	200		Constant	None			0

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SLIDEINTERPRET 8.010

Project: Cross Section 3-3': Case 3-3: 15-foot thick new fill, Static

Analysis Description:

Drawn By:

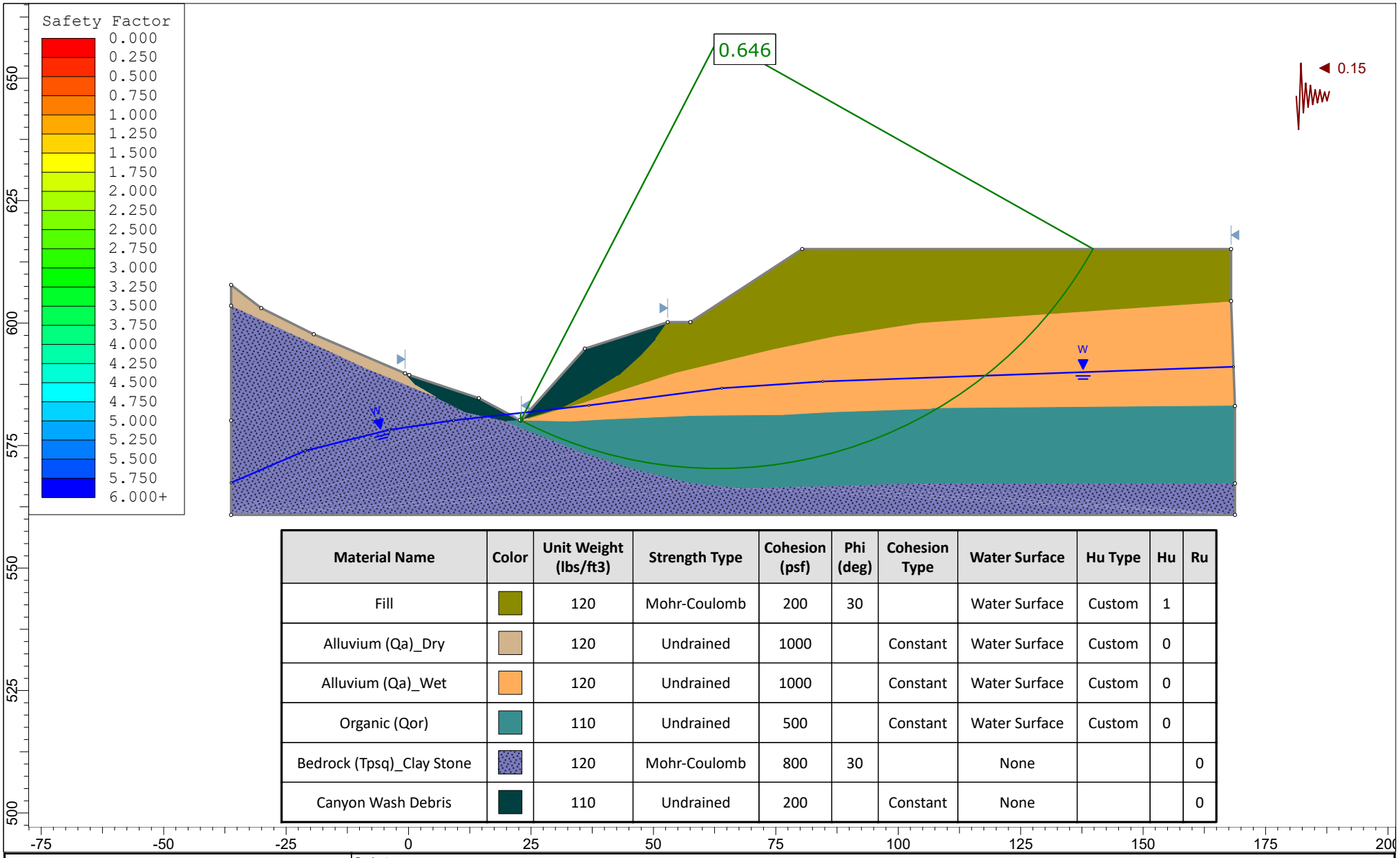
Scale: 1:292

Company:

Date:

File Name: Cross Section 3-3'.slmd

Figure E.7



Material Name	Color	Unit Weight (lbs/ft3)	Strength Type	Cohesion (psf)	Phi (deg)	Cohesion Type	Water Surface	Hu Type	Hu	Ru
Fill		120	Mohr-Coulomb	200	30		Water Surface	Custom	1	
Alluvium (Qa)_Dry		120	Undrained	1000		Constant	Water Surface	Custom	0	
Alluvium (Qa)_Wet		120	Undrained	1000		Constant	Water Surface	Custom	0	
Organic (Qor)		110	Undrained	500		Constant	Water Surface	Custom	0	
Bedrock (Tpsq)_Clay Stone		120	Mohr-Coulomb	800	30		None			0
Canyon Wash Debris		110	Undrained	200		Constant	None			0

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SLIDEINTERPRET 8.010

Project: Cross Section 3-3': Case 3-3: 15-foot thick new fill, Seismic

Analysis Description:

Drawn By:

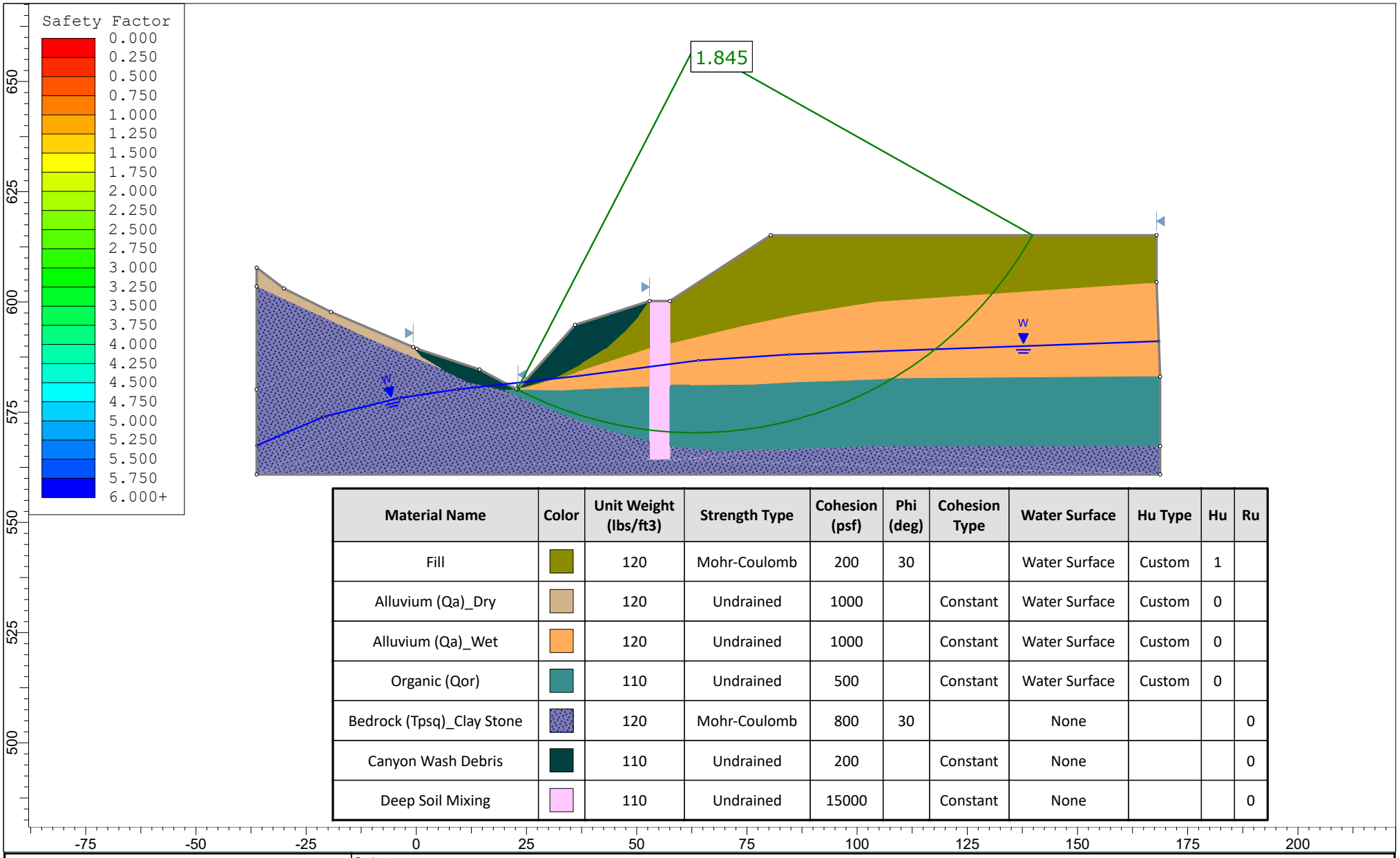
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Company:

Date:

File Name: Cross Section 3-3'.slmd

Figure E.8



Material Name	Color	Unit Weight (lbs/ft3)	Strength Type	Cohesion (psf)	Phi (deg)	Cohesion Type	Water Surface	Hu Type	Hu	Ru
Fill		120	Mohr-Coulomb	200	30		Water Surface	Custom	1	
Alluvium (Qa)_Dry		120	Undrained	1000		Constant	Water Surface	Custom	0	
Alluvium (Qa)_Wet		120	Undrained	1000		Constant	Water Surface	Custom	0	
Organic (Qor)		110	Undrained	500		Constant	Water Surface	Custom	0	
Bedrock (Tpsq)_Clay Stone		120	Mohr-Coulomb	800	30		None			0
Canyon Wash Debris		110	Undrained	200		Constant	None			0
Deep Soil Mixing		110	Undrained	15000		Constant	None			0

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SLIDEINTERPRET 8.010

Project: Cross Section 3-3': Case 3-4: 15-foot thick new fill with Soil Mixing, Static

Analysis Description:

Drawn By:

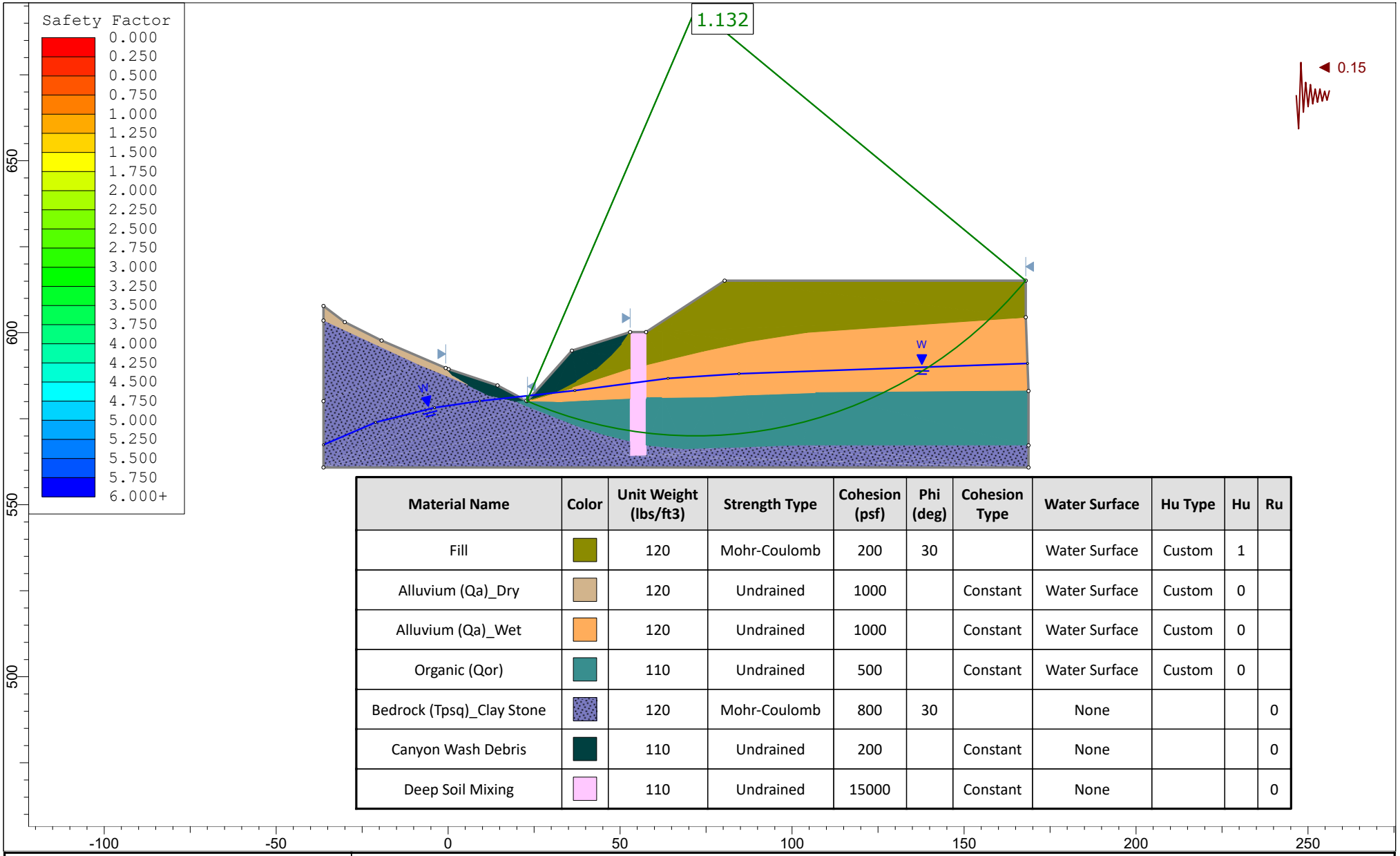
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Company:

Date:

File Name: Cross Section 3-3'.slmd

Figure E.9



Material Name	Color	Unit Weight (lbs/ft3)	Strength Type	Cohesion (psf)	Phi (deg)	Cohesion Type	Water Surface	Hu Type	Hu	Ru
Fill		120	Mohr-Coulomb	200	30		Water Surface	Custom	1	
Alluvium (Qa)_Dry		120	Undrained	1000		Constant	Water Surface	Custom	0	
Alluvium (Qa)_Wet		120	Undrained	1000		Constant	Water Surface	Custom	0	
Organic (Qor)		110	Undrained	500		Constant	Water Surface	Custom	0	
Bedrock (Tpsq)_Clay Stone		120	Mohr-Coulomb	800	30		None			0
Canyon Wash Debris		110	Undrained	200		Constant	None			0
Deep Soil Mixing		110	Undrained	15000		Constant	None			0

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Project: Cross Section 3-3': Case 3-4: 15-foot thick new fill with Soil Mixing, Seismic

Analysis Description:

Drawn By:

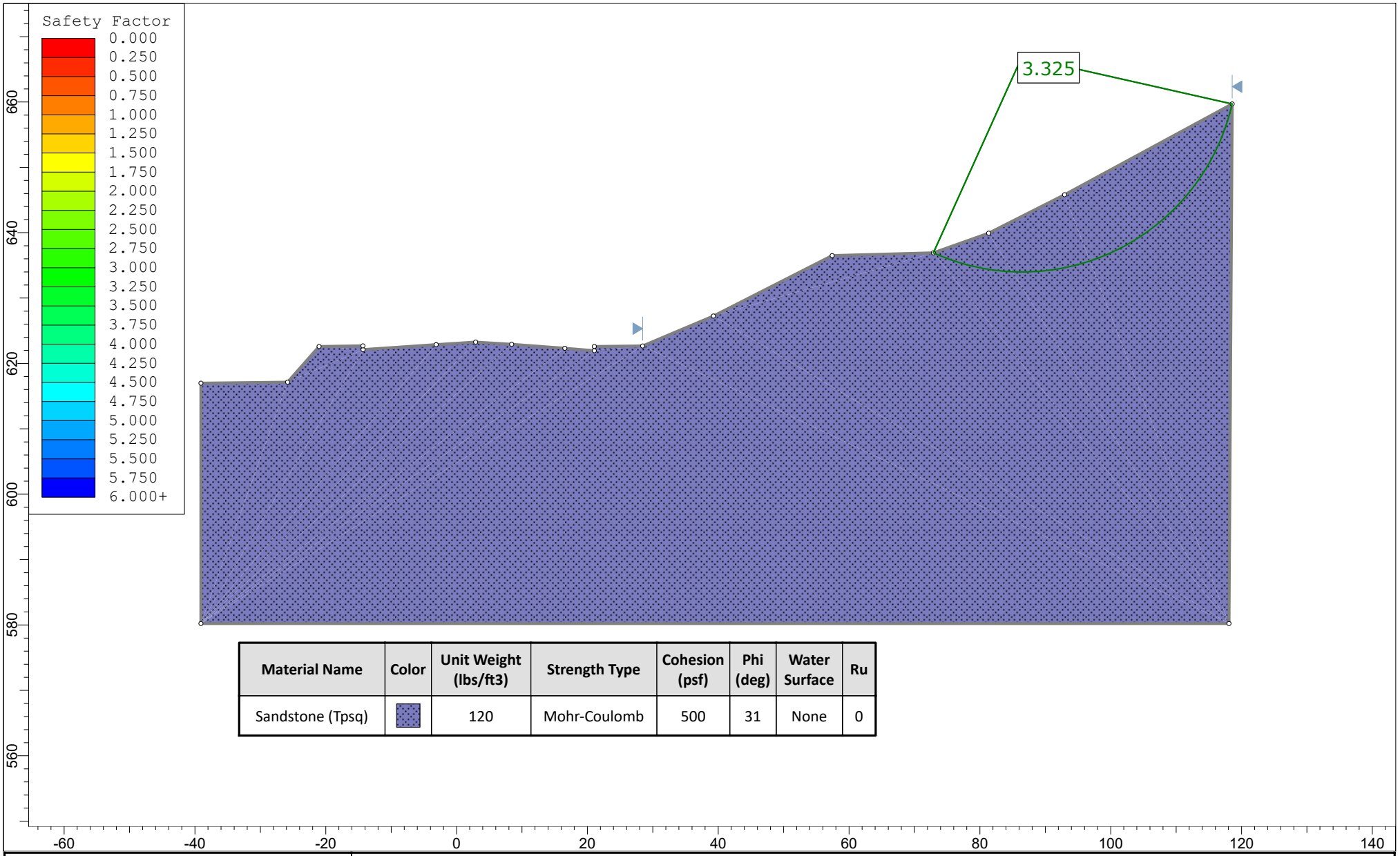
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Company:

Date:

File Name: Cross Section 3-3'.slmd

Figure E.10



Material Name	Color	Unit Weight (lbs/ft3)	Strength Type	Cohesion (psf)	Phi (deg)	Water Surface	Ru
Sandstone (Tpsq)		120	Mohr-Coulomb	500	31	None	0

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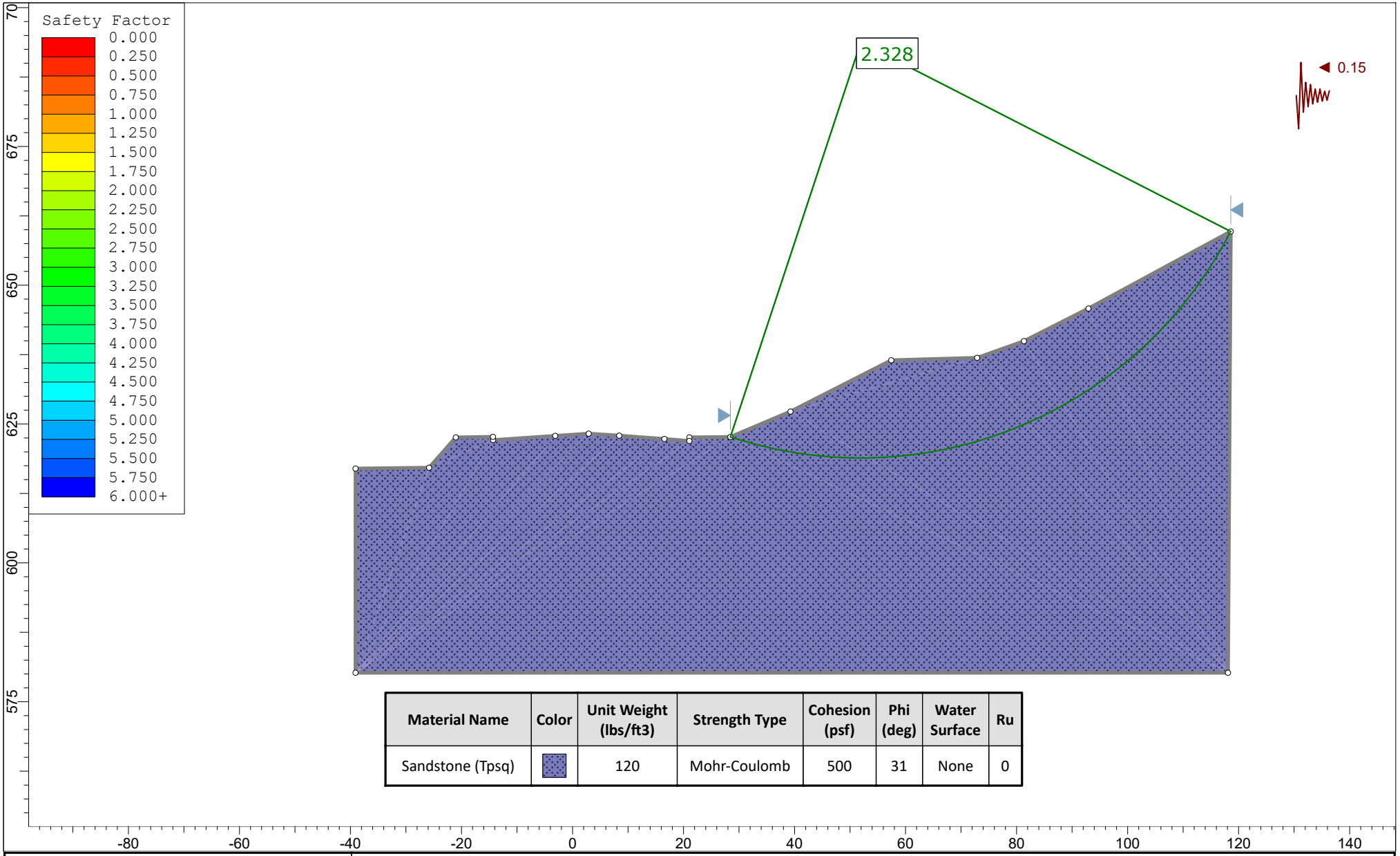
SLIDEINTERPRET 8.010

Project: Cross Section 5-5': Case 5-1: Cut Slope East of Street B, Static

Analysis Description:

Drawn By	Scale	Company
EVB	1:243	Group Delta
Date		File Name: Cross Section 5-5'.slmd

Figure E.11



Material Name	Color	Unit Weight (lbs/ft3)	Strength Type	Cohesion (psf)	Phi (deg)	Water Surface	Ru
Sandstone (Tpsq)		120	Mohr-Coulomb	500	31	None	0

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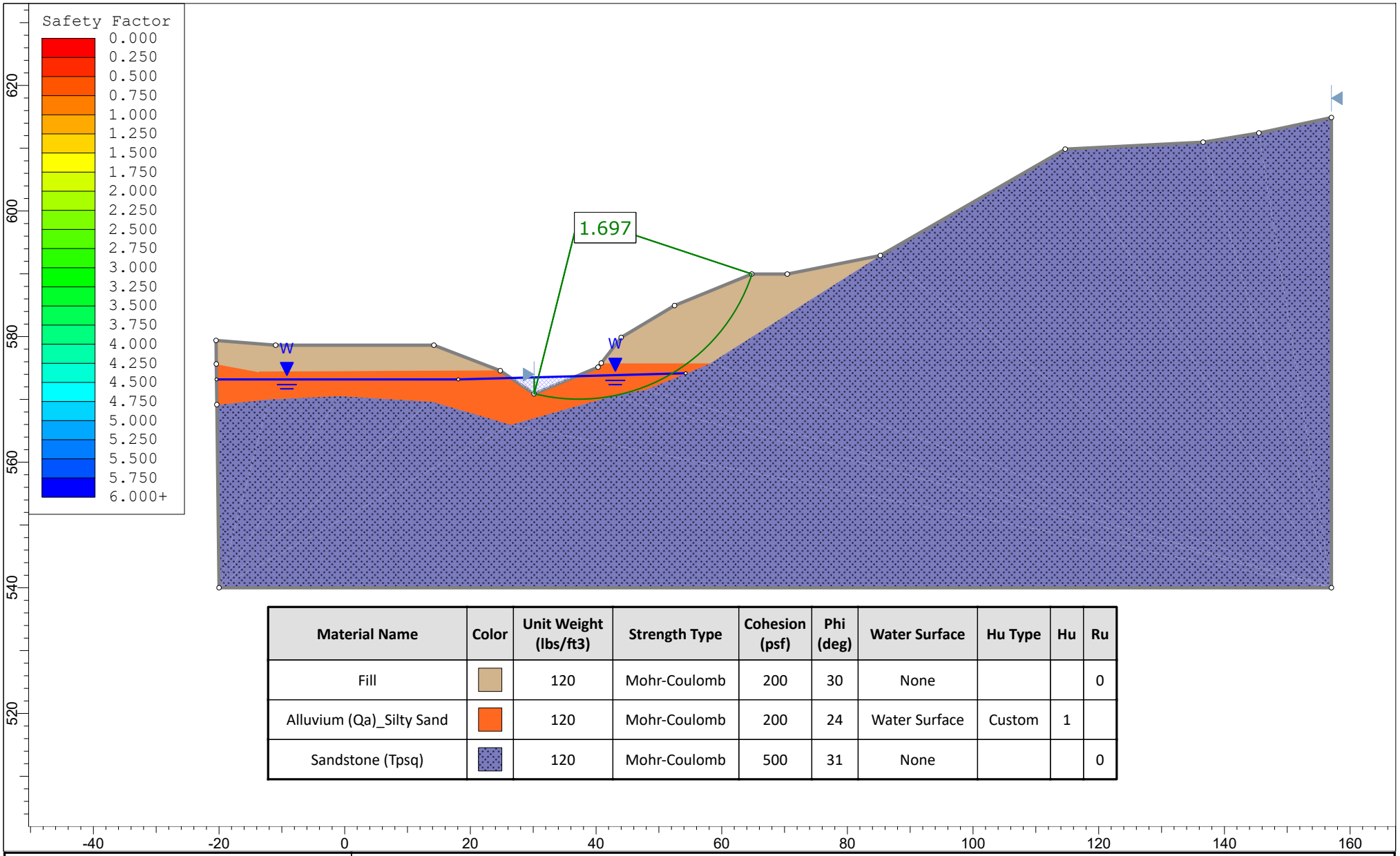
SLIDEINTERPRET 8.010

Project: Cross Section 5-5': Case 5-1: Cut Slope East of Street B, Seismic

Analysis Description:

Drawn By	EVB	Scale	1:287	Company	Group Delta
Date				File Name	Cross Section 5-5'.slmd

Figure E.12



Material Name	Color	Unit Weight (lbs/ft3)	Strength Type	Cohesion (psf)	Phi (deg)	Water Surface	Hu Type	Hu	Ru
Fill		120	Mohr-Coulomb	200	30	None			0
Alluvium (Qa)_Silty Sand		120	Mohr-Coulomb	200	24	Water Surface	Custom	1	
Sandstone (Tpsq)		120	Mohr-Coulomb	500	31	None			0

rocscience

SLIDEINTERPRET 8.010

Project: Cross Section 6-6': Case 6-1: Existing Condition, Static

Analysis Description:

Drawn By: EVB

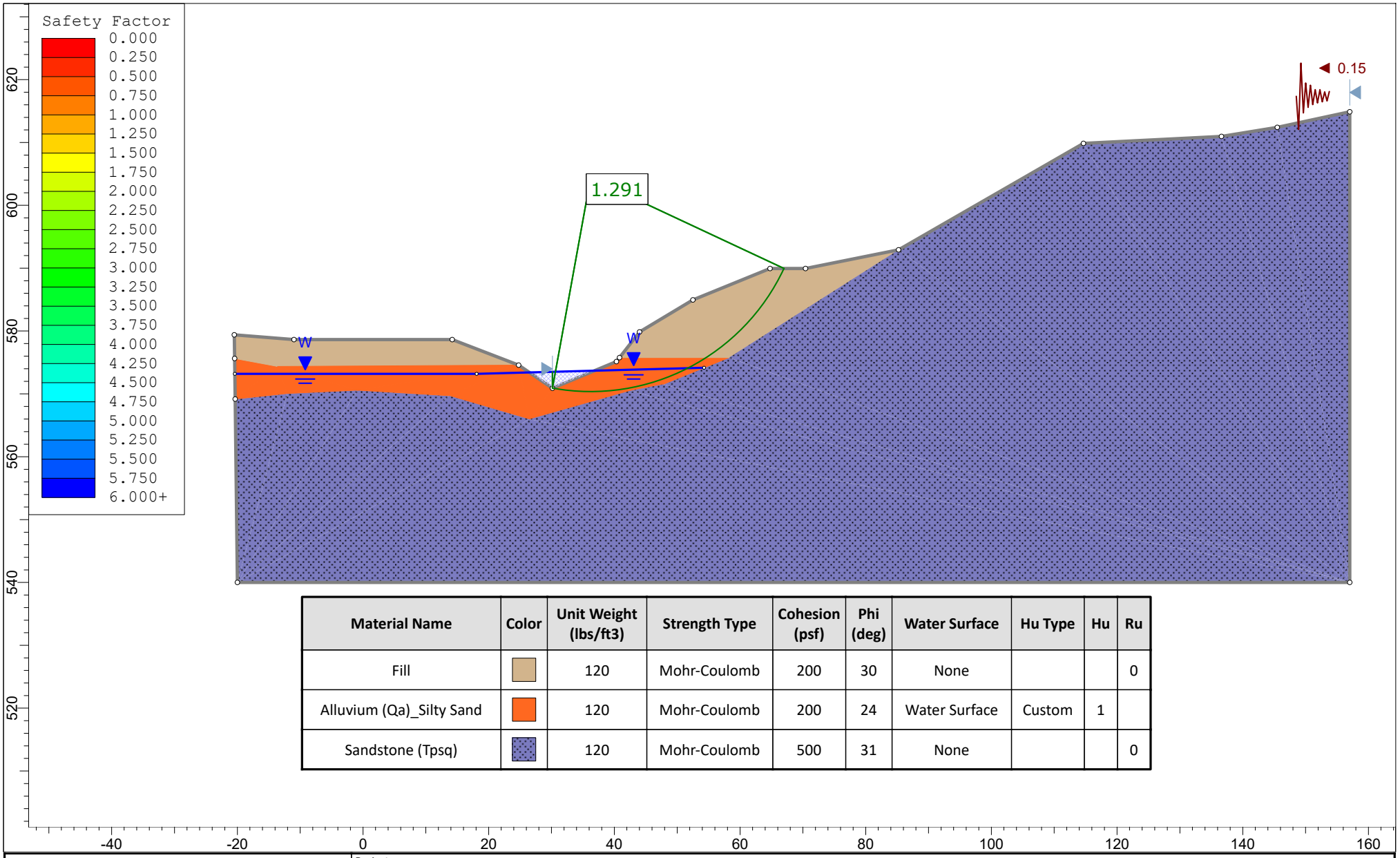
Scale: 1:253

Company: Group Delta

Date:

File Name: Cross Section 6-6'.slmd

Figure E.13



Material Name	Color	Unit Weight (lbs/ft3)	Strength Type	Cohesion (psf)	Phi (deg)	Water Surface	Hu Type	Hu	Ru
Fill		120	Mohr-Coulomb	200	30	None			0
Alluvium (Qa)_Silty Sand		120	Mohr-Coulomb	200	24	Water Surface	Custom	1	
Sandstone (Tpsq)		120	Mohr-Coulomb	500	31	None			0

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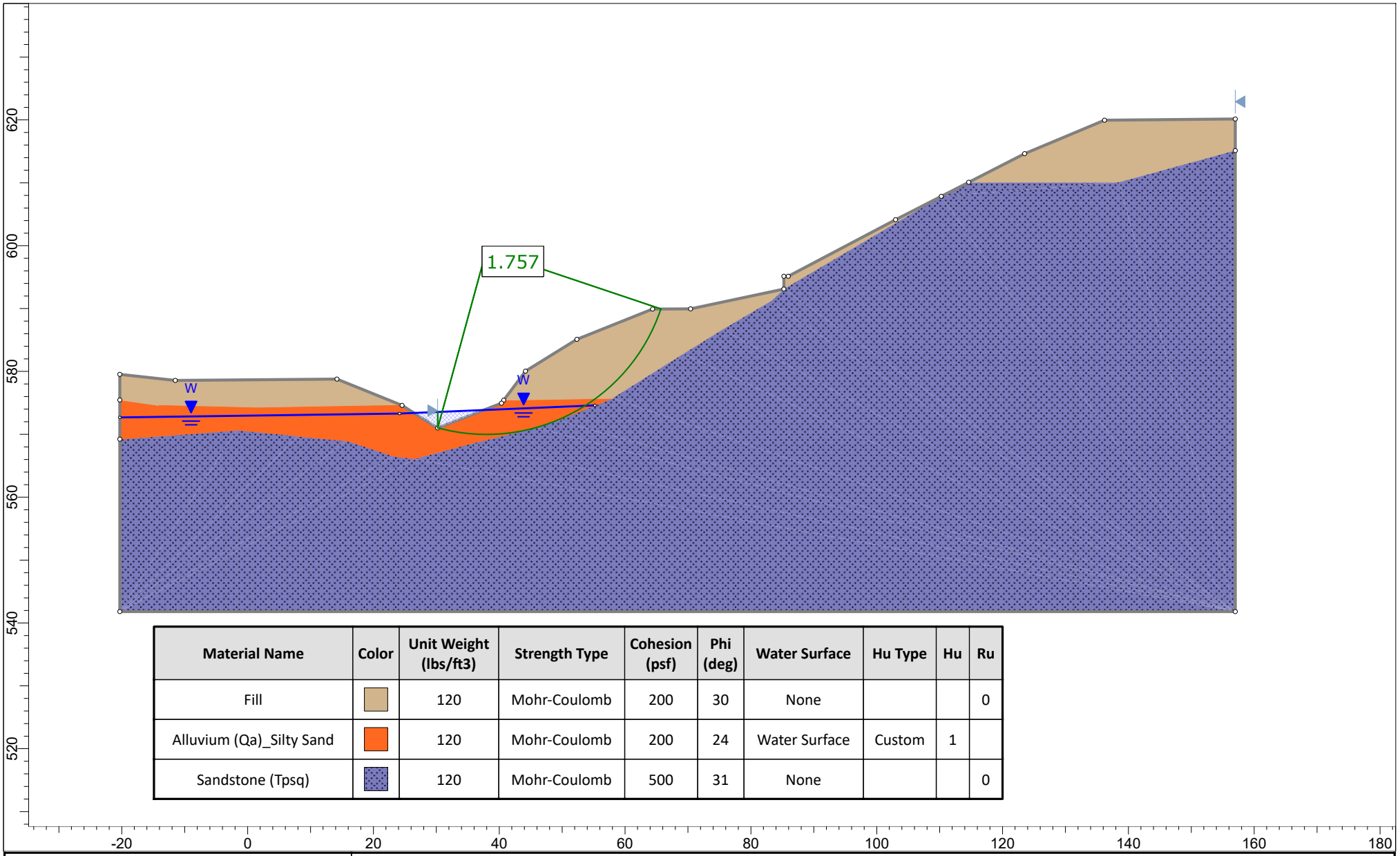
SLIDEINTERPRET 8.010

Project: Cross Section 6-6': Case 6-1: Existing Condition, Seismic

Analysis Description:

Drawn By	EVB	Scale	1:253	Company	Group Delta
Date				File Name	Cross Section 6-6'.slmd

Figure E.14



Material Name	Color	Unit Weight (lbs/ft3)	Strength Type	Cohesion (psf)	Phi (deg)	Water Surface	Hu Type	Hu	Ru
Fill		120	Mohr-Coulomb	200	30	None			0
Alluvium (Qa)_Silty Sand		120	Mohr-Coulomb	200	24	Water Surface	Custom	1	
Sandstone (Tpsq)		120	Mohr-Coulomb	500	31	None			0

rocscience

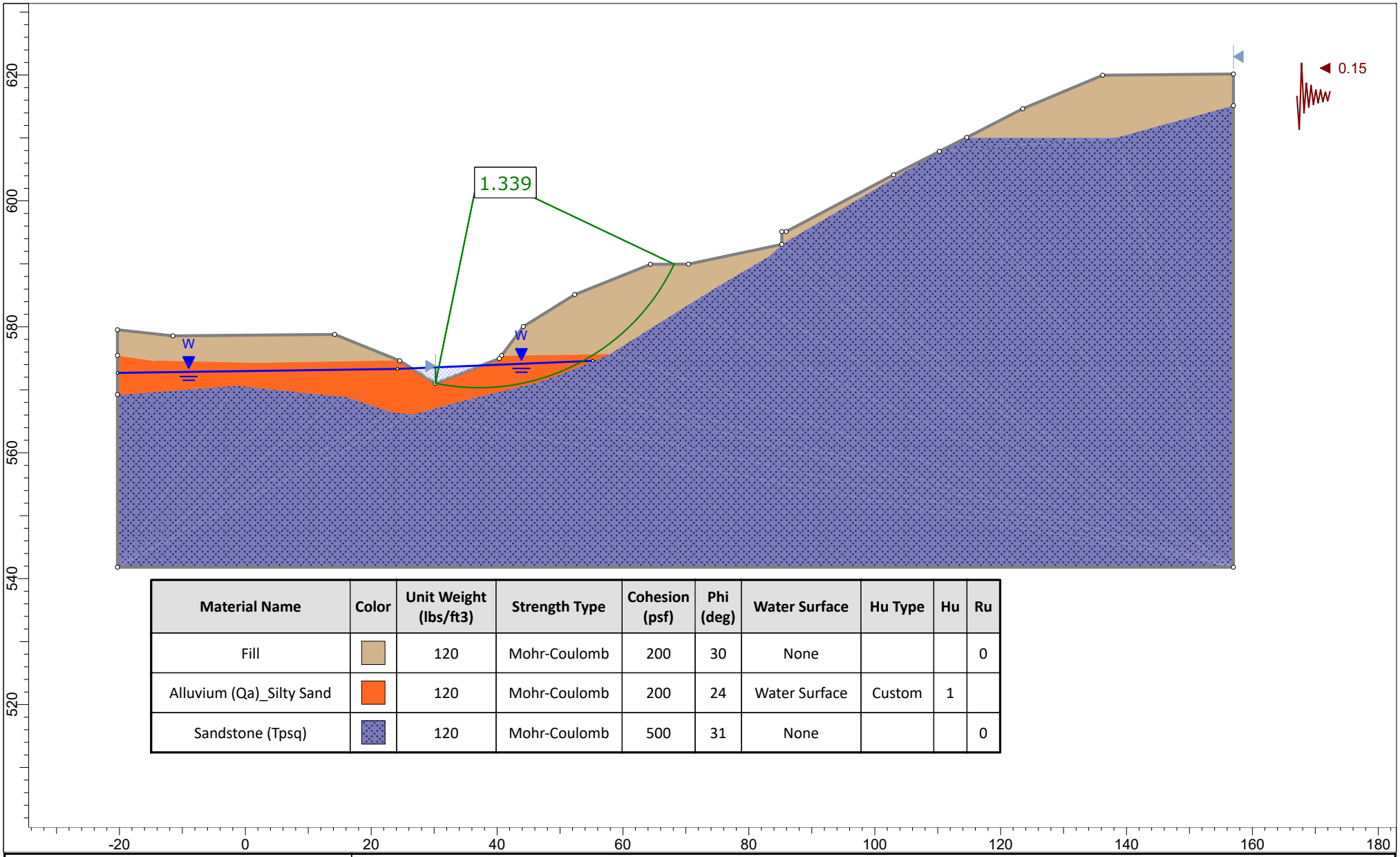
SLIDEINTERPRET 8.010

Project: Cross Section 6-6': Case 6-2: Proposed Fill Slope, Static

Analysis Description:

Drawn By	EVB	Scale	1:253	Company	Group Delta
Date				File Name	Cross Section 6-6'.slmd

Figure E.15



Material Name	Color	Unit Weight (lbs/ft3)	Strength Type	Cohesion (psf)	Phi (deg)	Water Surface	Hu Type	Hu	Ru
Fill		120	Mohr-Coulomb	200	30	None			0
Alluvium (Qa)_Silty Sand		120	Mohr-Coulomb	200	24	Water Surface	Custom	1	
Sandstone (Tpsq)		120	Mohr-Coulomb	500	31	None			0

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SLIDEINTERPRET 8.010

Project: Cross Section 6-6': Case 6-2: Proposed Fill Slope, Seismic

Analysis Description:

Drawn By	EVB	Scale	1:253	Company	Group Delta
Date				File Name	Cross Section 6-6'.slmd

Figure E.16