GEOCON
INCORPORATED

GEOTECHNICAL
ENVIRONMENTAL
MATERIALS

GEOTECHNICAL INVESTIGATION

PORTOLA CENTER SOUTH
TENTATIVE TRACT NO. 15353
LAKE FOREST, CALIFORNIA

PREPARED FOR

SUNRANCH CAPITAL PARTNERS
SAN DIEGO, CALIFORNIA

JULY 6, 2012
PROJECT NO. G1218-52-01A

GEOCON
INCORPORATED
GEOTECHNICAL ■ ENVIRONMENTAL ■ MATERIALS

Project No. G1218-52-01A
July 6, 2012

SunRanch Capital Partners, LLC
610 West Ash Street, Suite 1500
San Diego, California 92101

Attention: Mr. Scott Molloy

Subject: GEOTECHNICAL INVESTIGATION
PORTOLA CENTER SOUTH
TENTATIVE TRACT NO. 15353
LAKE FOREST, CALIFORNIA

Dear Mr. Molloy:

In accordance with the authorization of our change order dated November 18, 2011, we have performed a geotechnical investigation for the subject project. The accompanying report presents the findings of our study and our conclusions and recommendations relative to the geotechnical aspects of developing the property as presently proposed. Based on the results of our investigation, it is our opinion that the site can be developed as planned, provided the recommendations of this report are followed.

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

Very truly yours,

GEOCON INCORPORATED

John Hoobs
CEG 1524

JOHN HOOBS
No. 1524

Shawn Foy Weedon
GE 2714

SHAWN WEEDON
No. 2714
Exp. 06/30/13

JH:SFW:dmc

(3/del) Addressee
(1/del) Hunsaker & Associates, Irvine
Attention: Mr. Joe Wightman

TABLE OF CONTENTS

TABLE OF CONTENTS (Continued)

TABLE OF CONTENTS (Continued)

GEOTECHNICAL INVESTIGATION

1. PURPOSE AND SCOPE

This report presents the results of a geotechnical investigation for the proposed Portola Center South Tentative Tract No. 15353 development located south of Glenn Ranch Road at Saddleback Ranch Road in the City of Lake Forest, California (see Vicinity Map, Figure 1). The purpose of the investigation is to evaluate subsurface soil and geologic conditions at the site and, based on the conditions encountered provide recommendations pertaining to the geotechnical aspects of developing the property. We understand the Portola Center South development will consist of a 626-unit, single-family and multi-family townhome residential subdivision with commercial/mixed use and four park areas. Plans for the proposed development are presented on the Geologic Map (Figures 2 and 3, map pocket).

The scope of our investigation included geologic mapping, subsurface exploration, laboratory testing, engineering analyses, and the preparation of this report. As a part of our investigation, we have reviewed aerial photographs, geologic maps, published geologic reports, and previous geotechnical reports related to the property. A summary of the background information reviewed for this study is presented in the *List of References*.

The field investigation performed for the Portola Center project, which was divided into north and south, included geologic mapping and the excavation of 66 exploratory borings, 40 exploratory test pits, and one fault trench. Appendix A presents a discussion of the field investigation and logs of the exploratory borings, test pits, and fault trench for the Portola Center project. We performed laboratory tests on soil samples obtained from the borings and test pits to evaluate pertinent physical and chemical properties for engineering analysis. The results of the laboratory testing are presented on the boring logs in Appendix A and Appendix B.

Hunsaker & Associates Irvine, Incorporated provided proposed development plans dated June 12, 2012 and topographic information obtained in 2011 for this project. We used these plans during our field investigation for the preparation of the Geologic Map and Geologic Cross-Sections. References to elevations presented in this report are based on the referenced topographic information. Geocon Incorporated does not practice in the field of land surveying and is not responsible for the accuracy of such topographic information.

2. SITE AND PROJECT DESCRIPTION

Portola Center South is located south of Glenn Ranch Road, west of El Toro Road, and south of the southern terminus of Saddleback Ranch Road in the City of Lake Forest, California (see Vicinity Map, Figure 1). The property is bordered by open space on the west, south and east and Portola

Center North and Glenn Ranch Road to the north. The site consists of both graded and natural topography. A large-sheet-graded pad is located in the central portion of the site created by the placement of fill soil within former canyon drainages. Natural canyon drainages and ridge topography still exist on the northern, southern, and eastern portions of the site that will require excavation within formational materials, remedial grading, and the placement of canyon subdrains and fill to achieve the proposed grades. A large drainage basin is located in the western corner of the site, southwest of the intersection of Glenn Ranch Road and Saddleback Ranch Road. The basin accommodates storm water flows from the Portola Hills planned community to the north of the project site and, to a lesser extent, flows from the Portola North site. Drainage from the basin is ultimately directed toward Aliso Creek. Surface drainage from the natural canyons flows to the west and south also into Aliso Creek. Elevations range from a high of approximately 1,150 feet above mean sea level (MSL) at the peak of the ridge on the north portion of the site to a low of approximately 885 feet MSL in the southwest portion below Lots 188 and 189 and at the western edge of the existing basin below Lot G slope and the sports park.

Portola Center South is approximately 96 acres. The development plan for this area is a detached single-family residential neighborhood, multi-family townhomes, and commercial/mixed use including four public parks with local streets and infrastructure. A total of 309 single-family homes, 260 multi-family units, and 57 commercial/mixed use units are proposed. The single-family lots range in size from 2,975 to 6,829 square-feet. A 6.3 acre sports park is proposed on the northern portion of the site and three smaller parks of 2.1, 1.8, and 0.5 acres are proposed within the development. Access to the site will be from two driveways from Glenn Ranch Road. The existing basin on the north portion of the site will be replaced with a new basin located on the west portion of the property. Several areas of hydro-modification and water quality features are proposed. Private open space of 17.5 acres located within and around the project site is generally used for internal slopes, habitat restoration and fuel modification zone purposes. Internal public streets comprise 14.7 acres of the project. Glenn Ranch Road and the detention basin account for 6.3 acres of the site.

Site grading will consist of cuts and fills with a maximum depth of 122 feet and 115 feet, respectively. Fill slopes, some containing integrated mechanically stabilized earth (MSE) retaining walls, are proposed to maximum heights of approximately 95 feet located at the southeast portion of the site below Lots 56 through 62 and along portions of the southwestern boundary of the site, including below the proposed sports park. Cut slopes will have a maximum height of 35 feet located below Glenn Ranch Road. Cut and fill slopes within Portola Center South are proposed with maximum slope inclinations of 2:1 (horizontal:vertical). Several retaining wall heights would range up to a maximum of about 30 feet. The retaining systems will consist of mechanically stabilized earth (MSE) walls and will be an important factor in designing and constructing the planned development. The total cut grading yardage is approximately 1,889,880 cubic yards with approximately 412,000 cubic yards of remedial grading. Select MSE wall backfill material obtained onsite within sandstone units will be required behind the MSE walls to provide adequate slope stability factors-of-safety. We also expect that 413,246 cubic yards of additional sandstone material will be exported to Portola Center North with the same volume of fine-grained soils imported back from the north. The project civil engineer estimates 368,000 cubic yards of select backfill will be required within the reinforced grid zone of the MSE walls.

The locations, site descriptions, and proposed development herein are based on a site reconnaissance, review of published geologic literature, our field investigation, and discussions with you as the project applicant, the City of Lake Forest, the City's third party reviewers, and Hunsaker & Associates Irvine. If development plans differ from those described herein, Geocon Incorporated should be contacted for review of the plans and possible revisions to this report.

3. PREVIOUS SITE DEVELOPMENT

A significant portion of the property has been subject to prior investigations and grading within the previous 25 years associated with the overall construction of Glenn Ranch Road, Saddleback Ranch Road, and the Portola Hills neighborhoods to the north and east of the Portola Center North property. The site is identified as Tentative Tract No. 15353, which combined the existing approved Tentative Tract Nos. 13491 (Phase I), 13491 (Phase II), and 13490. The large sheet-graded pad includes Phase II of the existing approved Tentative Tract No. 13491. The Saddleback Ranch Road and Glenn Ranch Road alignments were graded during the late 1980's and early 1990's. Grading included filling two large drainages, cutting ridges and constructing fill slopes to the south of Glenn Ranch Road, installing improvements at various locations, and constructing a bridge spanning Aliso Creek. Several landslides, which were mapped by Fife (1974) and Morton and Miller (1981), were removed during the grading of the road alignments and sheet graded pad areas, and a drained stability fill slope was constructed on the east portion of the site.

Geotechnical reports regarding the grading activities at the site were prepared by Pacific Soils Engineering, Inc. The reports reviewed as a part of this study are presented in the *List of References*. We were able to obtain sufficient data to adequately document the placement of properly compacted fills, construction of a stability fill, construction of canyon subdrains, and remedial grading bottom elevations and landslide removals on the project. According to the geotechnical grading reports, remedial grading of surficial soil and landslide debris was performed within the graded portions of the site, fill was placed with engineering observation and compaction testing, subdrains were installed within the previous canyon drainages in the area of existing fill, and a drained stability fill was constructed. As such, the fill placed at the site is considered "Engineered Artificial Fill" (afe). Some undocumented fill also exists on the western and eastern portions of the site and a stockpile of scattered boulders is present in the central portion. The approximate lateral extent of the previously placed fill, undocumented fill, and the approximate subdrain locations with their pipe diameters are presented on the Geologic Map.

4. REGIONAL GEOLOGIC SETTING

The site is part of a larger structurally geologic complicated area of southern California. The regional structure of the area is dominated by homoclinal structure dipping to the southwest and south that involves a full range of clastic sedimentary rocks and layered volcanic rocks present from late Jurassic to late Miocene.

The study area comprises a part of the southwestern flank of the Santa Ana Mountains, which is a portion of the Peninsular Range province of southern California. A sequence of Tertiary-age sedimentary rocks, including the Topanga, Puente, and Capistrano Formations, as well as younger sediments, were deposited in a marine basin that was subsequently faulted and downwarped during later Miocene time into a north-trending structural trough known as the Capistrano Embayment. The embayment extended north to the Santa Ana Mountains and received a thick sequence of sediments. Broad, gentle folding, complex north-south faulting, and regional uplift in the last 4 million years then brought these bedrock units to the surface. At present, the bedrock formations are locally capped by Quaternary surficial units including Terrace Deposits, alluvium, colluvium, topsoil, landslide debris, and man-made engineered fill and undocumented fill.

The oldest rocks in the area, the Jurassic units, are exposed at the higher elevations of the Santa Ana Mountains. Often referred to as the basement complex or subjacent series, the Bedford Canyon Formation and the Santiago Peak Volcanic or Mesozoic Metavolcanic Rocks are generally mildly metamorphosed, complexly structured rocks, which supplied most of the material for the younger sedimentary formational units overlying them to the west.

Faults in the region displace rocks at least as late as the Miocene and probably younger. The Cristianitos fault, shown on the Geologic Map, Figures 2 and 3, extends adjacent to the western boundary of the property, and is structurally the most significant fault in the local region. However, the Cristianitos fault is considered inactive from a seismicity standpoint.

Based on review of the California Division of Mines and Geology reports and maps and previous Pacific Soils Engineering, Inc. reports and maps, the Portola Hills area is and was underlain by several large landslide complexes. The nearest remaining large landslide to the site is located to the north within the Whiting Ranch Wilderness Park. The landslides in the local area have been heavily altered by erosion and are likely related to periods of significantly higher rainfall during the geologic time period of the Wisconsin Glacial Episode. Movement may have been initiated by seismic activity. Similar landslides in South Orange County have been dated by radiocarbon methods at 10,000 to

17,000 years before present. Most major bedrock landslides in the vicinity have failed as block-glide landslides in stratified siltstone and shale layers within the La Vida and Soquel members of the Puente Formation, and because of a regional southwest dip, most of the landslides are on west to southwesterly facing slopes.

The primary geologic unit encountered on the site is the upper Miocene-age Puente Formation which has been regionally subdivided into four members based on its type section in the Puente Hills. The basal unit is the La Vida member consisting of deep marine shale, mudstone, and thin turbidite sandstone beds. The Soquel member conformably overlies the La Vida member and consists of interfingering siltstone and graded sandstone layers. The next member in the sequence is the Yorba consisting of fine-grained deposits of siltstone and mudstone. The upper member consists of the Sycamore Canyon composed of a wide variety of soils consisting of mudstone, sandstone, and conglomerate beds. The lower three members of the Puente Formation are present on Portola Center South.

5. SOIL AND GEOLOGIC CONDITIONS

5.1 General

Seven surficial soil types and three geologic formations have been mapped or were encountered during our investigation. The surficial units consist of undocumented fill, previously placed engineered fill, topsoil, alluvium, colluvium, landslide debris, and Terrace Deposits. Formational units include the Oso member of the late Miocene- to early Pliocene-age Capistrano Formation, the Yorba, Soquel and La Vida members of the late Miocene-age Puente Formation, and the early Miocene-age Topanga Formation. The formational and surficial units are discussed in order of increasing age. The approximate lateral extent of the surficial soil and formational materials are presented on the Geologic Map, Figures 2 and 3 (map pocket). The subsurface relationships between the geologic units are presented on the Geologic Cross-Sections, Figures 4 through 8 (map pocket).

5.2 Undocumented Fill (afu)

Undocumented fill was placed and end dumped at several locations within the graded portions of the site with thicknesses ranging from a few feet to approximately 25 feet. Some minor undocumented fill also exists on the western portion of the site and extends offsite to the southwest. In general, the undocumented fill consists of loose, damp to moist, silt and sand with rock fragments and cobbles up to approximately 1½ feet in diameter. In addition, scattered boulders of cemented formational material and concrete with a maximum size of 3 to 4 feet in diameter are present at the surface in the central portion of the site with the approximate limits shown on Figures 2 and 3. In its present condition, the undocumented fill soil is not suitable for support of additional fill or structures and remedial grading will be necessary. Undocumented fill is generally suitable for reuse as compacted fill; however, the remedial grading of the undocumented fill areas may generate some debris unsuitable for reuse as compacted fill. Oversize material generated during grading operations may be placed in the deeper fills. In addition, the oversize boulders can be buried within compacted fill if placed in accordance with our grading specifications.

5.3 Engineered Artificial Fill (afe)

Previously placed engineered fill underlies the sheet-graded area of the central portion of the site and south of Glenn Ranch Road south of the southern terminus of Saddleback Ranch Road and at the eastern portion of the site. Engineered fill was placed at the site under the observation of Pacific Soils Engineering, Inc. Geocon has reviewed the geotechnical reports related to the placement of the fill, a stability fill, and subdrain placement (see *List of References)*. Geocon has also performed sufficient field investigation to confirm the reported extent, depth, and suitability of the existing fill soil and geologic conditions. In general, previously placed fill consists of silty and clayey sand, silt, and clay, contains gravel- to cobble-size rock fragments, and varies from less than 5 feet to a maximum reported thickness of approximately 125 feet. The majority of the previously placed fill appears to be suitable in its present condition for the support of additional compacted fill and structural loads; however, the upper 3 to 5 feet of the soil has been disturbed due to discing, vegetation, and burrowing animals. Partial removal and recompaction of previously placed fill within areas of proposed grading and improvement should be expected.

5.4 Topsoil (Unmapped)

Topsoil is present as a thin veneer overlying the natural, ungraded slopes and bedrock materials across the site. The topsoil has an average thickness of approximately 2 to 3 feet based on our exploratory excavations. The topsoil consists of soft to stiff, loose to medium dense, dry to slightly moist, dark brown, porous, sandy clay to clayey sand with varying amounts of roots and rootlets. Removal of the topsoil will be necessary in areas to support fill or structures. Due to the relatively thin thickness and discontinuity of these deposits, the topsoil is not shown on the Geologic Map.

5.5 Alluvium (Qal)

Alluvium is stream-deposited material found in the canyon drainages and generally varies in thickness depending on the size of the canyon and extent of the drainage area. The alluvium consists of firm to stiff, light to dark brown, sandy clay and loose to medium dense, silty to clayey sand. The thickness of the alluvium encountered at the site ranged from approximately 4 feet to more than 10 feet. Alluvial deposits may be deeper in the bottom of the drainages along the southern and western margins of the site. Due to the relatively unconsolidated nature of the alluvial deposits, remedial grading will be necessary in areas to receive fill or structures.

5.6 Colluvium (Qcol)

Colluvium, derived from weathering of the underlying bedrock materials at higher elevations and deposited by gravity and sheet-flow, is present on the side slopes of canyons and the upper portions of the canyon drainages. The colluvium is generally stiff to hard, dry to moist, light to dark brown, sandy clay, and loose to medium dense, clayey to silty sand and clayey silt. The thickness of colluvium generally ranges from approximately 2 to 5 feet. Removal of the colluvium is required in areas that will support fill or structures. Due to the relatively thin thickness and discontinuity of the deposits, only the larger areas of colluvium are shown on the Geologic Map.

5.7 Landslide Debris (Qls)

Two areas of recent landslide debris exist within the site. The landslides have generally occurred within the thinly bedded siltstone and claystone layers of the La Vida and Soquel members of the Puente Formation. The landslide debris encountered during our investigation varied from a few feet to about 16 feet thick and consisted of a mixture of discontinuous rock clasts within a matrix of silt and sand. The landslides are located along the lower portions of the canyon drainages. Landslide debris is not suitable for the support of compacted fill or structures in its present condition and may be subject to further slope instability. The landslide debris should be removed and replaced with compacted fill during remedial grading operations in areas of the planned development. The landslide debris is generally suitable for use as compacted fill; however, some of the clayey portions may possess a “high” expansion potential (Expansion Index of 91 to 130) and should be placed in the deeper fill areas, where practical.

5.8 Terrace Deposits (Qt)

Holocene- to Pleistocene-age, fluvial-derived Terrace Deposits are located on the southwestern portion of the site. We encounter Terrace Deposits in Boring B-21 to a depth of 8 feet during our subsurface investigation. The deposits generally consist of medium dense to dense, damp to moist, brown to yellowish brown, silty sand with gravel and cobble size material. Localized areas within this unit have been reported to have cemented zones. In addition, loose sand and gravel layers are known to exist. The granular dense portions of the Terrace Deposits typically exhibit favorable shear strength and “very low” to “low” expansive characteristics (expansion index of 50 or less). The Terrace Deposits are generally suitable for the support of compacted fill and structural loads. However, layers of loose sand and gravel, if encountered, may be subject to raveling and erosion where exposed on slopes, and may be prone to settlement. The loose portions of the Terrace Deposits will require remedial grading where engineered fill or structural loads are planned, if encountered.

5.9 Capistrano Formation-Oso Member (Tco)

Late Miocene- to early Pliocene-age Oso Member of the Capistrano Formation is located along the natural slopes on the western portion of the site. The Capistrano Formation is in high-angle fault contact with the older Puente Formation along the Cristianitos Fault in the western portion of the site. The Oso Member of the Capistrano Formation generally consists of fine- to medium-grained sandstone that is white to light yellowish brown, poorly bedded to massive, and weakly to moderately cemented. In general, the sediments of the Oso Member exhibit favorable shear strength and “very low” to “medium” expansion characteristics (expansion index of 90 or less). The Capistrano Formation is suitable for the support of compacted fill and structural loads. Oversize material may be generated from this unit during excavation because of matrix cementation.

5.10 Puente Formation-Yorba Member (Tpy)

The upper Miocene-age Yorba Member of the Puente Formation is exposed on the north portion of the site at the top and along the west side of the ridge south of Glenn Ranch Road. This unit is the highest member in the sequence within the Puente Formation exposed on the site. The Yorba Member conformably overlies the older Soquel Member of the Puente Formation. The contact between the two members is generally dipping from south to west. The Yorba Member typically consists of light olive to grayish brown, thinly bedded, moderately indurated, sandy to clayey siltstone. Some of the beds contain high concentrations of evaporate minerals such as carbonates and gypsum. A thin, light gray ash bed was also present approximately 2 inches thick. Some of the siltstone beds encountered in Boring B-59 have been subject to bedding plane shearing and are weak.

In general, the sediments of the Yorba Member of the Puente Formation exhibit low to moderate shear strength and “medium” to “high” expansion characteristics (expansion index of 51 to 130). The Yorba Member is suitable for the support of compacted fill and structural loads. The La Vida Member contains minerals that may be corrosive to steel or concrete. Laboratory tests related to corrosivity are presented in Appendix B. This unit will be predominately encountered in a cut area and is suitable for use as fill material.

5.11 Puente Formation-Soquel Member (Tps and Tps-slt)

The upper Miocene-age Soquel Member of the Puente Formation is exposed on the majority of the natural exposures on the site and is the middle member in the sequence. The Soquel Member conformably overlies the older La Vida Member of the Puente Formation. The contact between the two members is generally dipping from south to west. The Soquel Member consists of white to light yellowish brown, massively bedded, weakly to moderately cemented, fine- to coarse-grained (arkosic) sandstone (Tps) and thinly bedded diatomaceous shale and siltstone (Tps-slt). The sandstone portions of this unit are exposed in cut slopes along Glenn Ranch Road and on the lower portions of the natural slopes on the south and western portions of the site. Siltstone layers where observed to interfinger within this unit.

Where exposed within existing cut and natural slopes, the sandstone portions of the Soquel Member (Tps) have been stable, but have been subject to minor raveling and erosion. In general, the granular sediments of the Soquel Member exhibit favorable shear strength and “very low” to “low” expansion characteristics (expansion index of 50 or less). The Soquel Member sandstone is suitable for the support of compacted fill and structural loads. The sandstone is moderately to well cemented and oversize material may be generated in this unit during grading operations because of matrix cementation. Granular material from this unit may be used as select backfill within the reinforced zone for the proposed MSE retaining walls.

The siltstone portions of the Soquel Member (Tps-slt) exhibit relatively low to moderate shear strength and “medium” to “high” expansion characteristics (expansion index of 51 to 130). The siltstone unit of the Soquel Member is suitable for the support of compacted fill and structural loads; however, stability fills will be required where siltstone is exposed in cut slopes. This unit is typically prone to slope instability and has been subject to slope failures and landslides. The stability of proposed slopes composed of Soquel Member siltstone units are evaluated in subsequent sections of this report.

5.12 Puente Formation-La Vida Member (Tplv)

The late Miocene-age La Vida Member of the Puente Formation is present on the natural slope areas on the southeastern portion of the site. The La Vida Member is conformably overlain by the younger Soquel Member. The contact between the two siltstone members is generally dipping from south to west and is sometimes difficult to distinguish. The La Vida Member typically consists of interbedded siltstone, shale, claystone, and sandstone beds. We observed the majority of the formation as light olive brown to grayish brown, thinly bedded, moderately indurated, sandy to clayey siltstone. Some of the beds are highly calcareous or diatomaceous and contain high concentrations of evaporate minerals such as carbonates and gypsum. Thin, light gray, ash beds are also present ranging from ½ to 8 inches thick. Deeper within the formation, the siltstone beds are generally unoxidized, very dark gray, well indurated, and shaley. Some of the claystone beds encountered in the borings have been subject to bedding plane shearing and are weak. The La Vida Member is prone to slope instability and has been subject to slope failures and landsliding.

In general, the sediments of the La Vida Member of the Puente Formation exhibit low to moderate shear strength and “medium” to “high” expansion characteristics (expansion index of 51 to 130). The La Vida Member is suitable for the support of compacted fill and structural loads; however, stability fills should be constructed where the La Vida Member is exposed in cut slopes. The stability of proposed slopes composed of La Vida Member materials are evaluated in subsequent sections of this report. The unit has locally been subject to deep weathering and slope creep. Deeply weathered and creep-affected areas are compressible and should be removed during remedial grading in areas to receive compacted fill or structural loads. The La Vida Member also contains minerals that may be corrosive to steel or concrete. Laboratory tests related to corrosivity are presented in Appendix B.

5.13 Topanga Formation (Tt)

The middle Miocene-age Topanga Formation is mapped in the southeast margins of the site underlying the La Vida Member of the Puente Formation (Fife, 1974 and Morton and Miller, 1981). We did not encounter the Topanga Formation during our subsurface investigation, but this unit typically consists of moderately to well cemented, fine- to medium-grained sandstone. We do not expect to encounter the Topanga Formation during the proposed site development.

6. GEOLOGIC STRUCTURE

The geologic structure within the project area is characterized by a series of regional fault blocks within the Tertiary-age sedimentary units, which have been tilted generally to the south and west to form dipping bedding. Bedding attitudes observed within formational materials encountered during the investigation range from 2 to 33 degrees generally dipping from south to west with most dips ranging 10 to 25 degrees from horizontal. Bedding plan shear (BPS) dips and directions tend to be more variable when measured within each borings but are believed to be generally parallel to bedding when compared regionally between borings. However, BPS are commonly discontinuous between adjacent borings. Bedding and structural orientations measured during our field investigation are presented on the Geologic Map (Figures 2 and 3) and in the boring and test pit logs in Appendix A. Interpretations of subsurface structure are depicted on the Geologic Cross-Sections (Figures 4 through 8).

The granular portions of the sandstone formational units within the Puente and Capistrano Formations (Tps and Tco) are typically massive to poorly bedded. The interbedded siltstone and sandstone units within the Puente Formation (Tplv) and the siltstone units of the Soquel Member (Tps-slt) typically are thinly bedded (less than 2 inches) and are frequently jointed or fractured. Sheared claystone beds exist within the siltstone units, generally along bedding (referred to as bedding plane shears) and frequently with “out-of-slope” orientations. Shear zones create a possibility for slope instability and, where encountered in cut slopes during grading, will necessitate slope stabilization measures. Adverse geologic structure does not present a significant geologic hazard to the proposed development provided the recommended use of buttresses, stability fills, shear pins and/or soils nails are incorporated into design and construction.

The Cristianitos Fault extends along the western portions of the site, juxtaposing the underlying Puente Formation with the younger Oso Member of the Capistrano Formation. Dips should be expected to be considerably steeper in the vicinity of the Cristianitos Fault. Pacific Soils Engineering (1996) mapped fault strands and shear zones encountered during previous grading operations at several locations on the site, but are not expected to impact the proposed development.

7. GROUNDWATER

A review of the Seismic Hazard Evaluation of the El Toro 7.5 Minute Quadrangle, Orange County, California (California Division of Mines and Geology, 2000), indicates that the site is not located within a groundwater basin. The site is located within the southern portion of Portola Hills and is underlain by bedrock units that are not considered water bearing. Groundwater information presented in this document is generated from data collected in the early 1900’s to present.

With the exception of the existing debris basin and drainage structure located on the northwest portion of the site, we did not observe evidence of near surface water, such as seeps, springs, or phreatophytes within the existing drainages. We did not encounter a static groundwater table in the exploratory excavations performed for this investigation. However, we did encounter localized layers of seepage within the exploratory borings. We do not expect groundwater to adversely impact the development of the property. It is not uncommon for groundwater seepage conditions to develop where none previously existed due to the permeability characteristics of the geologic units encountered on site. During the rainy season, perched water conditions are likely to develop within the drainage areas that may require special consideration during grading operations. Groundwater elevations are dependent on seasonal precipitation, irrigation, and land use, among other factors, and vary as a result. Proper surface and subsurface drainage will be critical to future performance of the development.

8. GEOLOGIC HAZARDS

8.1 Faulting

The numerous faults in Southern California include active, potentially active, and inactive faults. The criteria for these major groups are based on criteria developed by the California Division of Mines and Geology (CDMG). By definition, an active fault is one that has had surface displacement within Holocene time (about the last 11,000 years). A potentially active fault has demonstrated surface displacement during Quaternary time (approximately the last 1.6 million years), but has had no known Holocene movement. Faults that have not moved in the last 1.6 million years are considered inactive. The site is not located within a State of California Earthquake Fault Zone (CDMG, 2010). The location of the site with respect to local active and potentially active faults is shown on Figure 9, Regional Fault Map.

Active or potentially active faults with the potential for surface fault rupture are not known to pass directly beneath the site. Therefore, the potential for surface rupture due to faulting occurring beneath the site during the design life of the proposed development is considered low. The site, however, is located in the seismically active Southern California region, and could be subjected to moderate to strong ground shaking in the event of an earthquake on one of the many active Southern California faults.

The San Joaquin Hills Thrust, located approximately 5½ miles west of the site, is the closest known active fault. The San Joaquin Hills Thrust is a recently discovered blind thrust fault (fault with no surface expression) having an expected maximum earthquake magnitude (Mw) of 7.1. The fault extends roughly between Huntington Beach and Dana Point, is not exposed at the ground surface, and is typically identified at depths greater than 3 kilometers. This fault and other blind thrust faults are not exposed at the surface and do not present a potential surface fault rupture hazard; however, these active features are capable of generating future earthquakes and ground shaking.

The Cristianitos Fault has been mapped extending along the western margins of the site (see Figures 2 and 3). We encountered the fault within the fault trench (FT-1) excavated as a part of this study. The fault offsets the Oso Member of the Capistrano Formation and the Soquel Member of the Puente Formation. The fault trends roughly north and dips at high-angles to nearly vertical. A log of Geocon's fault trench FT-1 is presented in Appendix A. We observed continuous "A" and "AB" topsoil units extending across the fault trace with no evidence of offset. Pacific Soils Engineering, Inc. (1996) performed a fault trench north of Glenn Ranch Road in Portola Center North. The fault trench encountered the Cristianitos Fault as a zone of faulting approximately 80 feet wide composed of approximately nine thin fault strands offsetting beds within the Soquel Member of the Puente Formation. Evidence was not observed within the recent and previous fault trenches, and no evidence is present in the literature that suggests the fault offsets Holocene-age material. The Cristianitos Fault is locally overlain by Quaternary terrace deposits ranging in age from an estimated 34,000 to 120,000 years before present and has not been offset by faulting (Shlemon, 1987). The onshore portion of the Cristianitos Fault is considered "inactive" by the State Geologist. We do not expect the Cristianitos Fault to affect the proposed development and structural setbacks will not be required.

8.2 Seismicity

According to the computer program *EZ-FRISK (Version 7.62),* 27 known active faults are located within a search radius of 50 miles from the property. We used the 2008 USGS fault database that provides several models and combinations of fault data to evaluate the fault information. Based on this database, the San Joaquin Hills Thrust, located approximately 5½ miles west of the site, is the nearest known active fault and is the dominant source of potential ground motion. Earthquakes that might occur on the San Joaquin Hills Thrust or other faults within the southern California and northern Baja California area are potential generators of significant ground motion at the site. The estimated maximum earthquake magnitude and peak ground acceleration for the San Joaquin Hills Thrust are 7.1 and 0.40g, respectively. The location of the site in relation to historic earthquake activity is presented in Figure 10, California Seismicity Map. Table 8.2.1 lists the estimated maximum earthquake magnitude and peak ground acceleration for the 10 most dominant faults in relation to the site location. We calculated peak ground acceleration (PGA) using Boore-Atkinson (2008) NGA USGS2008, Campbell-Bozorgnia (2008) NGA USGS 2008, and Chiou-Youngs (2008) NGA acceleration-attenuation relationships.

TABLE 8.2.1
DETERMINISTIC SPECTRA SITE PARAMETERS

Fault Name	Distance from Site (miles)	Maximum Earthquake Magnitude (Mw)	Peak Ground Acceleration		
			Boore-Atkinson 2008 (g)	Campbell-Bozorgnia 2008 (g)	Chiou-Youngs 2008 (g)
San Joaquin Hills Thrust	5½	7.1	0.28	0.38	0.40
Chino	10	6.8	0.21	0.19	0.21
Elsinore	11	7.85	0.26	0.21	0.28
Newport Inglewood	15	7.5	0.20	0.15	0.19
Puente Hills (Coyote Hills)	20	6.9	0.13	0.13	0.12
Puente Hills	22	7.1	0.13	0.13	0.14
Puente Hills (Santa Fe Springs)	28	6.7	0.09	0.09	0.07
Palos Verdes	29	7.3	0.12	0.08	0.08
Palos Verdes Connected	29	7.7	0.14	0.10	0.12
San Jose	29	6.7	0.09	0.07	0.06

In the event of a major earthquake on the referenced faults or other significant faults in the southern California and northern Baja California area, the site could be subjected to moderate to severe ground shaking. With respect to this hazard, the site is considered comparable to others in the general vicinity.

We performed a site-specific probabilistic seismic hazard analysis using *EZ-FRISK*. Geologic parameters not addressed in the deterministic analysis are included in this analysis. The program operates under the assumption that the occurrence rate of earthquakes on each mapped Quaternary fault is proportional to the faults' slip rate. The program accounts for fault rupture length as a function of earthquake magnitude, and site acceleration estimates are made using the earthquake magnitude and distance from the site to the rupture zone. The program also accounts for uncertainty in each of following: (1) earthquake magnitude, (2) rupture length for a given magnitude, (3) location of the rupture zone, (4) maximum possible magnitude of a given earthquake, and (5) acceleration at the site from a given earthquake along each fault. By calculating the expected accelerations from considered earthquake sources, the program calculates the total average annual expected number of occurrences of site acceleration greater than a specified value. We utilized acceleration-attenuation relationships suggested by Boore-Atkinson (2008), Campbell-Bozorgnia (2008) and Chiou-Youngs (2008) in the analysis. Table 8.2.2 presents the site-specific probabilistic seismic hazard parameters including acceleration-attenuation relationships and the probability of exceedence.

TABLE 8.2.2
PROBABILISTIC SEISMIC HAZARD PARAMETERS

Probability of Exceedence	**Peak Ground Acceleration**		
	Boore-Atkinson, 2008 (g)	**Campbell-Bozorgnia, 2008 (g)**	**Chiou-Youngs, 2008 (g)**
2% in a 50 Year Period	0.53	0.52	0.58
5% in a 50 Year Period	0.41	0.40	0.44
10% in a 50 Year Period	0.33	0.31	0.33

The California Geologic Survey (CGS) has a program that calculates the ground motion for a 10 percent probability of exceedence in a 50-year period based on an average of several attenuation relationships. Table 8.2.3 presents the calculated results from the Probabilistic Seismic Hazards Mapping Ground Motion Page from the CGS website.

TABLE 8.2.3
PROBABILISTIC SITE PARAMETERS FOR SELECTED FAULTS
CALIFORNIA GEOLOGIC SURVEY

Calculated Acceleration (g) Firm Rock	**Calculated Acceleration (g) Soft Rock**	**Calculated Acceleration (g) Alluvium**
0.34	0.36	0.39

While listing peak accelerations is useful for comparison of potential effects of fault activity in a region, other considerations are important in seismic design, including the frequency and duration of motion and the soil conditions underlying the site. Seismic design of the structures should be performed in accordance with the 2010 California Building Code (CBC) guidelines currently adopted by the City of Lake Forest.

8.3 Liquefaction

Liquefaction typically occurs when a site is subjected to strong seismic shaking, on-site soils are cohesionless or are silt and clay with low plasticity, groundwater is encountered within 50 feet of the surface, and soil relative densities are less than about 70 percent. If the four criteria are met, a seismic event could result in a rapid pore water pressure increase from the earthquake-generated ground accelerations. According to mapping produced by the State of California (California Division of Mines and Geology, 2001), there are no areas susceptible to liquefaction mapped at the site. The potential for liquefaction is considered to be very low due to the presence of drained compacted fill, dense formational units, and the absence of a permanent groundwater table in the upper 50 feet. The site location is presented on Figure 11 in relation to areas with a potential for liquefaction, based on the Seismic Hazard Zones map prepared by the California Division of Mines and Geology (CDMG, 2010).

8.4 Landslides

Based on our field reconnaissance and our subsurface investigation, two areas of recent landslide deposits exist at the site, originating in the La Vida Member and the siltstone portions of the Soquel Member of the Puente Formation. The approximate limits and dimensions of the landslides are depicted on the Geologic Map (Figures 2 and 3) and the Geologic Cross-Sections (Figures 4 through 8).

Pacific Soils Engineering Inc. (1996) encountered a landslide 1,350 feet north of the site at its closest point within the Whiting Ranch Wilderness Park. We prepared geologic cross-sections provided within the Portola Center North report to illustrate the relationship between the existing landslide and the proposed development to the north. This landslide, in its present orientation, does not pose a geologic hazard to proposed development of the site in the current configuration or if the offsite landslide were to re-activate. Previous mapping performed by Fife (1974) and Morton and Miller (1981) indicate that several large areas of landslide debris previously existed at the site prior to development. According to our review of the prior geotechnical investigations by Pacific Soils Engineering, these landslides have been removed during the previous grading operations. The site location is presented on Figure 11 in relation to areas with a potential for earthquake-induced landslides, based on the Seismic Hazard Zones map prepared by the California Division of Mines and Geology (CDMG, 2001).

Siltstone portions of the Puente Formation contain out-of-slope bedding orientations and bedding plane shears and are prone to slope instability. The landslide deposits observed at the site should be removed in the areas of proposed development. The potential for future landsliding adversely affecting the proposed improvements is low, provided the recommendations presented in this report for removal and compaction of landslide debris and for stabilization of proposed slopes are followed.

8.5 Slope Stability

We evaluated the proposed slope configurations, as depicted on the Geologic Map, to calculate both surficial and global stability based on the current geologic information. Adverse geologic conditions including out-of-slope-bedding, bedding plane shears, and weak discontinuous claystone layers exist within the Yorba and La Vida Members of the Puente Formation (Tpy and Tplv) and the siltstone portions of the Soquel Member (Tps-slt). Slopes composed of siltstone formational material should be considered potentially unstable if weak layers or adverse bedding orientations are present. Proposed cut slopes within the granular sandstone units of the Puente (Tps) and Capistrano (Tco) Formations should be stable. Overall, the proposed cut and fill slopes can be constructed as planned; however, due to the discontinuous nature of the weak layers within the siltstone portions of the formational materials, predicting or locating isolated layers is difficult. Fill slopes, typically containing integrated MSE retaining walls, are proposed to maximum heights of approximately 95 feet throughout the development. Buttress and stability fills will be required during grading operations where out-of-slope bedding orientations or bedding plane shears detrimentally affect the stability of the proposed slopes.

We performed the slope stability analyses using the two-dimensional computer program *GeoStudio2004* created by Geo-Slope International Ltd. Stability fills will be required along cut slopes exposing siltstone units with bedding plane shears and out-of-slope bedding orientations. The approximate shear key widths for the proposed buttress slopes are presented on the Geologic Map. The proposed slopes should be stable from shallow sloughing conditions provided the recommendations for grading and drainage are incorporated into the design and construction of the proposed slopes. Buttress grading plans showing proposed subdrain locations, tie-in and outlet points, and bottom and subdrain elevations will be prepared once the 40-scale grading plans and improvement plans are available to detail this information.

Buttress fills will be required as evaluated using Cross-Sections E-E′, H-H′, L-L′ and N-N′. The computer slope stability output in Appendix C presents the approximate location of the buttresses. In addition, the approximate widths of the buttresses are presented on the Geologic Map and the Geologic Cross-Sections. We should evaluate the limits of the buttresses prior to construction of the project and after the 40-scale grading plans have been prepared.

We included preliminary information for the planned MSE walls in our slope stability analyses. The reinforcement geogrid type, length, and spacing presented on the slope stability analyses are the estimated minimum requirements for the required factor of 1.5 and 1.1 for static and seismic conditions, respectively. We should review the retaining wall plans after the walls have been designed.

8.6 Hydroconsolidation

Hydroconsolidation is the tendency of unsaturated soil structure to collapse upon saturation resulting in the overall settlement of the affected soil and overlying foundations or improvements supported thereon. Potentially compressible surficial soil underlying the proposed structures and existing fill is typically removed and recompacted during remedial site grading. However, if compressible soil is left in-place, a potential for settlement due to hydroconsolidation of the soil exists.

The results of the laboratory consolidation tests for the fill materials indicate a range of 0.8 percent swell to about 1.3 percent collapse with an average of zero consolidation when water is added. We calculated an approximate average degree of saturation of 80 percent on the samples obtained during our investigation. Therefore, based on the results of the laboratory tests and the calculated degree of saturation of the existing fill materials, we do not expect settlement due to hydroconsolidation will affect the planned development.

9. CONCLUSIONS AND RECOMMENDATIONS

9.1 General

9.1.1 No soil or geologic conditions were encountered that would preclude the development of the property as presently planned, provided the recommendations of this report are followed. The proposed development of the property will not have an adverse impact to adjacent properties or improvements provided the recommendations of this report are implemented.

9.1.2 Potential geologic hazards at the site include seismic shaking, fill settlement, and slope instability. Based on our investigation and available geologic information, active faults are not present underlying or trending toward the site. Pacific Soils Engineering (1996) encountered and investigated a relatively large landslide located 1,350 feet north of the site within the Whiting Ranch Wilderness Park. Based on our review of the geologic map and cross-sections, it is our opinion that this landslide does not pose a geologic hazard to the proposed development even if the landslide were to re-activate. The other minor landslide deposits observed within the site boundary will be removed during grading operations and should not impact the proposed development.

9.1.3 The surficial soil (consisting of undocumented artificial fill, the upper 3 to 5 feet of previously placed fill, topsoil, colluvium, alluvium, landslide debris, creep-affected formational material, and loose Terrace Deposits) are not considered suitable for the support of fill or structural loads in its present condition and will require remedial grading in the form of removal, moisture conditioning as necessary, and compaction within the limits of grading. The majority of the previously placed fill, the Terrace Deposits, and formational materials of the Puente and Capistrano Formations are suitable for the support of structures and compacted fill.

9.1.4 Remedial grading operations are generally not planned to extend beyond the limits of grading presented on the tentative tract map with the exception small areas along the west, south, and east portions of the site where removal of landslide debris and alluvium will extend to the property line (see Geologic Map, Figures 2 and 3).

9.1.5 In general, cut slopes composed of Terrace Deposits, sandstone formational materials, siltstone formational materials with favorable geologic structure, and properly compacted fill, should possess factors of safety of at least 1.5 at inclinations of 2:1 (horizontal to vertical), or flatter. The results of our slope stability analyses are presented in Appendix C.

9.1.6 Based on our slope stability analyses, the proposed slopes along the western, southern and eastern portions of the project are potentially unstable and will require slope stabilization consisting of the construction of buttress fills with a shear key with a maximum width of about 105 feet. Most of the slopes with MSE walls will require lengthening the reinforcement grids to achieve an appropriate factor of safety. Soil nail walls can be used where MSE wall grid reinforcement cannot be constructed due to property line constraints. The approximate buttress widths of slopes requiring stabilization are presented on the Geologic Map. Recommendations for slope stabilization are presented herein. Additional subsurface investigation and slope stability analyses may be necessary when 40-scale grading plans are finalized to provide final recommendations for buttress width design. Cut slopes exposing siltstone units with weak claystone beds, bedding plane shears, or out-of-slope bedding are potentially unstable and will require the construction of buttress and stability fills.

9.1.7 MSE walls and wall-slope combinations are expected to possess factors of safety of at least 1.5 provided the geotechnical recommendations presented in this report are followed. Selective grading will be necessary to provide backfill materials that exceed the minimum shear strength used in wall design. Close coordination between the grading and wall construction contractors and the engineering consultants will be necessary for efficient wall construction operations. Slopes incorporating MSE retaining walls may be subject to relaxation and settlement beyond the top of the slope. If estimated settlements are greater than the design tolerances of the planned residential structures and utilities, structural slope setbacks or significant construction waiting periods may be required.

9.1.8 The existing constructed slopes along and south of Glenn Ranch Road were designed and constructed with a factor of safety of at least 1.5 based our review of the grading reports and slope stability analyses. The planned grading and proposed buttresses and stability fills will provide adequate stability for the proposed development achieving a minimum factor of safety of 1.5.

9.1.9 The proposed structures and site retaining walls may be supported on shallow foundations bearing in either competent bedrock or engineered fill. Building pads with a fill/formational contact should be undercut as described herein. General recommendations for the design of shallow foundations are provided herein.

9.1.10 The on-site geologic units possess physical and chemical characteristics that may adversely affect the proposed development in their present condition. Laboratory tests indicate that the soil locally possesses a “very low” to “high” expansion potential, and moderate to severe corrosion potential. Recommendations to mitigate these adverse soil conditions are provided herein.

9.1.11 Proper surface and subsurface drainage should be maintained in order to preserve the engineered properties of the fill in the building pads, slope areas, and retaining wall areas.

9.1.12 Grading plans indicate that local area parks, multi-family, and commercial/mixed use area will be constructed to a sheet-graded condition. Preparation of update geotechnical reports will be necessary prior to the fine grading of these projects.

9.2 Soil and Excavation Characteristics

9.2.1 Based on the results of the field investigation and our experience in the general area, we expect the surficial soil and formational materials can generally be excavated with moderate to heavy effort using conventional heavy-duty excavation equipment. Cemented zones requiring very heavy effort to excavate may be encountered at random locations in the formational materials; however, we expect the extent will be localized. Difficult ripping conditions and the generation of oversize material should be expected within these cemented zones. Cemented zones and concretions will likely be present in the formational materials.

9.2.2 We expect the soil within the upper five feet of proposed grade to be “expansive” (Expansion Index [EI] greater than 20) as defined by 2010 California Building Code (CBC) Section 1803.5.3. Table 9.2.1 presents soil classifications based on the expansion index.

TABLE 9.2.1
SOIL CLASSIFICATION BASED ON EXPANSION INDEX

Expansion Index (EI)	Expansion Classification	2010 CBC Expansion Classification
0 – 20	Very Low	Non-Expansive
21 – 50	Low	Expansive
51 – 90	Medium	
91 – 130	High	
Greater Than 130	Very High	

9.2.3 We performed laboratory Expansion Index testing on several samples of material expected to be exposed near the proposed grades. The test results are summarized in Appendix B and indicate the on-site material is expected to possess an Expansion Index of 130 or less corresponding to a "very low" to "high" expansion potential. Additional testing for expansion potential should be performed during grading once final grades are achieved.

9.2.4 We performed laboratory tests on samples of the site materials to evaluate the percentage of water-soluble sulfate content. Results from the laboratory water-soluble sulfate content tests are presented in Appendix B. The results indicate that the on-site materials at the locations tested possess "moderate" to "severe" sulfate exposure to concrete structures as defined by 2010 CBC Section 1904.3 and ACI 318. Table 9.2.2 presents a summary of concrete requirements set forth by 2010 CBC Section 1904.3 and ACI 318. The presence of water-soluble sulfates is not a visually discernible characteristic; therefore, other soil samples from the site could yield different concentrations. Additionally, landscaping activities (i.e., addition of fertilizers and other soil nutrients) may affect the concentration over time.

TABLE 9.2.2
REQUIREMENTS FOR CONCRETE EXPOSED TO SULFATE-CONTAINING SOLUTIONS

Sulfate Exposure	**Exposure Class**	**Water-Soluble Sulfate Percent by Weight**	**Cement Type**	**Maximum Water to Cement Ratio by Weight**	**Minimum Compressive Strength (psi)**
Not Applicable	S0	0.00-0.10	--	--	2,500
Moderate	S1	0.10-0.20	II	0.50	4,000
Severe	S2	0.20-2.00	V	0.45	4,500
Very Severe	S3	> 2.00	V+ Pozzolan or Slag	0.45	4,500

9.2.5 We selected samples to perform potential of hydrogen (pH), resistivity, and water-soluble chloride testing to help evaluate the corrosion potential of the planned improvements. The laboratory test results are presented in Appendix B and should be considered for the design of underground structures.

9.2.6 Geocon Incorporated does not practice in the field of corrosion engineering. Therefore, a registered corrosion engineer may be retained if improvements that could be susceptible to corrosion are planned. Their study should evaluate corrosion test results and incorporate the necessary precautions to avoid premature corrosion on buried metal pipes and concrete structures in direct contact with the soils.

9.3 Seismic Design Criteria

9.3.1 We used the computer program Seismic Hazard Curves and Uniform Hazard Response Spectra, provided by the USGS to calculate the seismic design parameters. Table 9.3 summarizes design criteria obtained from the 2010 CBC (based on the 2009 International Building Code [IBC]), Chapter 16 Structural Design, Section 1613 Earthquake Loads. The short spectral response uses a period of 0.2 second. The structures should be designed using Site Class C where there is less than 20 feet of fill and Site Class D where the fill thickness is 20 feet or greater. We evaluated the site class in accordance with Section 1613.5.5 of the CBC. We will evaluate the structure site class for each residential and commercial building once the final grading has been completed.

TABLE 9.3
2010 CBC SEISMIC DESIGN PARAMETERS

Parameter	Value		2010 CBC Reference
Site Class	C	D	Table 1613.5.2
Spectral Response – Class B (short), S_S	1.396g	1.396g	Table 1613.5(3)
Spectral Response – Class B (1 sec), S_1	0.504g	0.504g	Table 1613.5(4)
Site Coefficient, F_A	1.000	1.000	Figure 1613.5.3(1)
Site Coefficient, F_V	1.300	1.500	Figure 1613.5.3(2)
Maximum Considered Earthquake Spectral Response Acceleration (short), S_{MS}	1.396g	1.396g	Section 1613.5.3 (Eqn 16-36)
Maximum Considered Earthquake Spectral Response Acceleration – (1 sec), S_{M1}	0.655g	0.756g	Section 1613.5.3 (Eqn 16-37)
5% Damped Design Spectral Response Acceleration (short), S_{DS}	0.931g	0.931g	Section 1613.5.4 (Eqn 16-38)
5% Damped Design Spectral Response Acceleration (1 sec), S_{D1}	0.437g	0.504g	Section 1613.5.4 (Eqn 16-39)

9.3.2 Conformance to the criteria in Tables 9.3 for seismic design does not constitute any kind of guarantee or assurance that significant structural damage or ground failure will not occur if a large earthquake occurs. The primary goal of seismic design is to protect life, not to avoid all damage, since such design may be economically prohibitive.

9.4 Slope Stability Analyses

9.4.1 We performed slope stability analyses using the two-dimensional computer program *GeoStudio2004* created by Geo-Slope International Ltd. We calculated the factor of safety for the planned slopes for rotational-mode and block-mode analyses using the Spencer's method. Output of the computer program including the calculated factor of safety and the failure surface is presented in Appendix C.

9.4.2 We used average drained direct shear strength parameters based on laboratory tests and our experience with similar soil types in nearby areas for the slope stability analyses. Our calculations indicate the proposed slopes, constructed of on-site materials, should have calculated factors of safety (FOS) of at least 1.5 and 1.1 under static and pseudo-static conditions, respectively, for both deep-seated failure and shallow sloughing conditions when the recommendations of this report are followed.

9.4.3 We selected Cross-Sections E-E′, F-F′, H-H′, I-I′, L-L′ , M-M′, N-N′, O-O′, and P-P′ to perform the slope stability analyses. Appendix C presents the results of the slope stability analyses.

9.4.4 The shallow landslide deposits and alluvium encountered within the site, as depicted on the Geologic Map, Figures 2 and 3 will require remedial grading in areas beyond the limits of grading within the western, southern, and eastern portions of the site generally at the toes of slopes.

9.4.5 The proposed fill slopes with MSE walls will require slope stabilization measures to achieve acceptable slope stability. The general configuration of the zones required to be reinforced are shown on figures in Appendix C. Recommendations regarding the geotechnical aspects of the proposed MSE walls are provided herein.

9.4.6 Among the slopes analyzed for acceptable calculated factors of safety, Cross-Sections E-E′, H-H′, L-L′, and N-N′ will require buttresses due to the presence of bedding plane shears, out-of-slope bedding orientations, and weak siltstone layers. Buttress designs have assumed a 1:1 (horizontal:vertical) frontcut and backcut extending down to intercept the critical bedding plane shears or weak zones.

9.4.7 MSE wall reinforcements should be designed by the wall contractor. For the purposes of this report, reinforcements with Geosynthetic grids were incorporated into the slope stability analyses as provided in Appendix C. The wall contractor should provide design details and alternatives based on the geotechnical data presented in this report. However, the required lengths and grid types presented in Appendix C should be incorporated into the design of the walls.

9.4.8 Due to the very light loads expected from the planned homes and improvements, the loads are considered negligible with no appreciable impact to the slope stability analyses and, therefore were not incorporated into the analyses.

9.4.9 Buttress and stability fill shear keys and associated subdrains should be surveyed during construction and depicted on the final as-built 40-scale grading plans.

9.4.10 Excavations including buttresses, shear keys, and stability fills should be observed during grading by an engineering geologist to evaluate whether soil and geologic conditions do not differ significantly from those expected or identified in this report.

9.4.11 We performed the slope stability analyses based on the interpretation of geologic conditions encountered during our field investigation. In certain areas, the geologic conditions such as the localized or continuous features of the bedding plane shears may need to be further defined by additional borings based on our review of the 40-scale grading plans.

9.5 Grading

9.5.1 Grading should be performed in accordance with the *Recommended Grading Specifications* contained in Appendix D and the City of Lake Forest Grading Ordinance. Where the recommendations of Appendix D conflict with this section, the recommendations of this section should take precedence.

9.5.2 Prior to commencing grading, a preconstruction conference should be held at the site with the owner or developer, grading contractor, city representative, civil engineer, and geotechnical engineer in attendance. Special soil handling and/or the grading plans can be discussed at that time.

9.5.3 Site preparation should begin with the removal of deleterious material, debris and vegetation. The depth of removal should be such that material exposed in cut areas or soil to be used as fill is relatively free of organic matter. Material generated during stripping and/or site demolition should be exported from the site.

9.5.4 Topsoil, colluvium, alluvium, landslide debris, undocumented fill, and the unsuitable portions of previously placed fill and formational materials within the limits of grading should be removed to expose firm, formational materials or moist, dense previously placed fill. Removals will be required beyond the toe of slope and extend to the property line to remove landslide debris and alluvium along the west, south, and east portions of the site (see Figures 2 and 3). The approximate thickness of the surficial soil is presented on the Geologic Map. We estimate that the upper approximately 3 to 5 feet of the previously placed fill will require remedial grading. We should evaluate the actual depth of removal during grading operations. The bottom of the excavation should be scarified at least 1 foot, moisture conditioned as necessary, and compacted prior to the placement of fill material. Excavated soil with an expansion index greater than 90 should be kept at least 4 feet below finish grade in areas of the structural fill, where possible.

9.5.5 To reduce the potential for differential settlement, the building pads with cut-fill transitions should be undercut at least 3 feet and sloped 1 percent to the adjacent street or deepest fill. Where the thickness of the fill below the building pad exceeds 15 feet, the depth of the undercut should be increased to one-fifth of the maximum fill thickness. In addition, cut pads that expose expansive siltstone and claystone or cemented formational materials should also be undercut at least 3 feet to mitigate soil expansion and facilitate future trenching.

9.5.6 Wet soil conditions should be expected within the existing detention basin. Remedial grading may be difficult in this area and may require top loading with the use of an excavator. The excavated materials can then be properly moisture conditioned prior to placing as fill material. This may require mixing with dryer materials to achieve proper compaction. We expect deeper removals within the basin due to the wet conditions.

9.5.7 Fill placed within the upper 40 vertical feet of proposed finish grade during the planned grading operations should be compacted to a dry density of at least 90 percent of the laboratory maximum dry density, near to slightly above optimum moisture content, as determined by ASTM Test Method D 1557. Fill placed 40 feet and deeper should be compacted to a dry density of at least 92 percent of the laboratory maximum dry density near to slightly above optimum moisture content. The siltstone and claystone soil materials should be placed at least 2 percent to 5 percent above optimum moisture content. The upper 12 inches of fill beneath the pavement structural section should be moisture conditioned and compacted to a dry density of at least 95 percent of the laboratory maximum dry density near to slightly above optimum moisture content shortly before paving operations. If construction delays or the weather results in the surface of the fill drying, the surface should be scarified and moisture conditioned before the next layer of fill is placed.

9.5.8 Cobbles or concretions greater than 1 foot in maximum dimension should not be placed within 5 feet of finish grade or 3 feet of the deepest utility. Cobbles and concretions greater than 6 inches in maximum dimension should not be placed within 3 feet of finish grade.

9.5.9 The proposed slopes will locally require buttressing and stability fills to obtain a factor of safety of at least 1.5 due to the presence of bedding plane shears and weak clay layers with out-of-slope orientations. We should perform additional slope stability analyses during preparation of the 40-scale grading plans in the areas of the buttress slopes to further evaluate the limits of the buttresses. Buttress plans will be prepared using these plans that will include proposed buttress widths, subdrain locations and elevations, tie-in and outlet points, and bottom elevations.

9.5.10 Stability fills will be required where formational siltstone/claystone is exposed in the proposed cut slopes during grading operations. A Typical Stability Fill Detail is presented on Figure 12 and should be used for design and construction of stability fills, where required. The backcut for the stability fills should commence at least 10 feet from the top of the proposed finish-graded slope and should extend at least 3 feet below adjacent pad grade, to a maximum depth of 15 feet below finish-pad grade. Lots adjacent to the stability fills may require undercutting due to the installation of the stability fill. Stability fills may also be required on cut slopes where cohesionless sand is encountered.

9.5.11 Cut slope excavations including buttresses and shear keys should be observed during grading operations to check that soil and geologic conditions do not differ significantly from those expected. During the construction of buttresses and during landslide removals, there is a risk that the temporary backcut slopes will become unstable. This risk can be reduced by grading the buttress fill in short segments and/or flattening the inclination of the temporary slopes. These excavations should be backfilled as soon as possible after establishing the shear key.

9.5.12 The outer 15 feet (or a distance equal to the height of the slope, whichever is less) of fill slopes should be composed of properly compacted granular soil to reduce the potential for surficial sloughing. In general, soil with an expansion index of 90 or less or at least 35 percent sand-size particles should be acceptable as granular fill. Soil of questionable strength to satisfy surficial stability should be tested in the laboratory for acceptable drained shear strength. The use of cohesionless soil in the outer portion of fill slopes should be avoided. Fill slopes should be overbuilt at least 3 feet and cut back to establish the finished sloped. Track walking of fill slopes will not be acceptable.

9.5.13 Finished slopes should be landscaped with drought-tolerant vegetation having variable root depths and requiring minimal landscape irrigation. In addition, the slopes should be drained and properly maintained to reduce erosion.

9.6 Temporary Excavations

9.6.1 The stability of the excavations is dependent on the design and construction of the shoring system. Therefore, Geocon Incorporated cannot be responsible for site safety and the stability of the proposed excavations. It is the responsibility of the contractor to follow all applicable safety standards and industry protocols when performing excavations during the construction of the proposed project.

9.6.2 Temporary slopes should be made in conformance with OSHA requirements. The undocumented fill and surficial soil should be considered a Type C soil, properly compacted fill should be considered a Type B soil (Type C soil if seepage is encountered), and the formational materials should be considered a Type A soil (Type B soil if seepage is encountered) in accordance with OSHA requirements. In general, special shoring requirement will not be necessary if temporary excavations will be less than 4 feet high. However, temporary excavation depths greater than 4 feet should be laid back at an appropriate inclination in accordance with OSHA recommendations. These excavations should not be allowed to become saturated or allowed to dry appreciably. Surcharge loads should not be permitted within a distance equal to the depth of the excavation from the top of the excavation. The top of the excavation should be a minimum of 15 feet from the edge of existing improvements. Excavations steeper than those recommended or closer than 15 feet from an existing surface improvement should be shored in accordance with applicable OSHA codes and regulations.

9.7 Settlement of Existing and Proposed Fill

9.7.1 Previously placed engineered fill encountered on the site with thicknesses ranging up to approximately 125 feet was placed at the site approximately 16 to 25 years ago for the roadways and sheet-graded pads. Geocon installed 10 surface settlement monuments in April 2007 to monitor the amount of surface settlement occurring in the previously placed engineered fill areas. The approximate locations of the settlement monuments for areas within Portola Center South are depicted on the Geologic Map (Figures 2 and 3). These monuments have been surveyed by Hunsaker & Associates Irvine, Incorporated on a periodic basis. Table 9.7 presents the results of the settlement monitoring for both Portola Center North and South. The existing fill at the locations of the monuments have experienced settlements of 0.12 to 0.84 inch with an average of 0.43 inch between April 2007 and October 2011. The percentage of settlement to fill thickness is 0.01 to 0.08 with an average of 0.04 percent. The monitoring data suggests that long term settlement due to consolidation of the fill is near completion.

TABLE 9.7
SETTLEMENT OF EXISTING FILL

Monument Number and Location	Approximate Depth of Fill Below Monument (feet)	Monument Elevation April, 2007 (feet above MSL)	Monument Elevation October, 2011 (feet above MSL)	Elevation Differential (feet [%])
SM-10001 (South)	90	1013.24	1013.23	-0.01 [-0.01]
SM-10002 (South)	110	1053.71	1053.65	-0.06 [-0.05]
SM-10003 (South)	85	1069.41	1069.37	-0.04 [-0.05]
SM-10004 (North)	130	1123.10	1123.06	-0.04 [-0.03]
SM-10005 (North)	70	1130.32	1130.31	-0.01 [-0.01]
SM-10006 (North)	95	1079.88	1079.82	-0.07 [-0.07]
SM-10007 (North)	105	1057.43	1057.41	-0.02 [-0.02]
SM-10008 (North)	60	1080.93	1080.88	-0.05 [-0.08]
SM-10009 (South)	80	1019.06	1019.04	-0.02 [-0.02]
SM-10010 (North)	110	1060.70	1060.65	-0.04 [-0.04]

9.7.2 Planned grading will result in the placement of up to 115 feet of new fill for the proposed development. In addition, the maximum depth of new fill placed on existing fill soil is approximately 80 feet resulting in a maximum fill thickness of 105 feet. Based on the results of our laboratory tests, we expect the existing fill will settle up to about 1½ inches where 80 feet of new fill will be placed over the existing 25 feet of fill. The estimated settlement will occur relatively quickly during the placement of the fill; however, settlement monitoring should occur on the fill as discussed herein.

9.7.3 The post-grading settlement (hydrocompression) of properly compacted new fill with a maximum thickness of 115 feet could reach up to about 5½ inches. We expect the settlement will occur over 20+ years depending on the influx of rain and irrigation water into the fill mass. This settlement will likely be linear from the time the fill is placed to the end of the settlement period. We do not expect the settlement will impact proposed utilities with proposed gradients of 1 percent or greater.

9.7.4 Settlement deformations should be expected for MSE walls with extensive Geosynthetic reinforcements. The estimated vertical and horizontal deformations due to the construction of the planned MSE walls will be provided in a separate report. The calculated deflections should be provided to the project structural engineer to determine if the planned structures can tolerate the expected movement. Significant construction waiting periods of up to 3 to 9 months may be required if the structures cannot handle the estimated deflections.

9.7.5 Additional surface settlement and lateral deflection monuments should be installed in fill areas deeper than 30 feet subsequent to grading. The project surveyor should record the movements every two weeks until data indicates that the rate of primary fill compression is essentially non-detrimental to proposed improvements. Based on our experience, we expect the monuments will be required to be monitored for at least 90 days. At that time, we expect development can begin for settlement-sensitive underground utilities with less than one percent gradient and structures in new fill areas deeper than 30 feet. Underground utilities with a gradient of one percent or greater will not have a waiting period and can start construction after finish grade is achieved. Geocon should evaluate the locations and number of monuments once 40-scale grading plans have been developed and based on the final configuration of the proposed MSE walls and geologic conditions.

9.8 Earthwork Grading Factors

9.8.1 Estimates of embankment shrink-swell factors are based on comparing laboratory compaction tests with the density of the material in its natural state and experience with similar soil types. Variations in natural soil density and in compacted fill render shrinkage value estimates very approximate. As an example, the contractor can compact fill to a density of 90 percent or higher of the laboratory maximum dry density. Thus, the contractor has at least a 10 percent range of control over the fill volume. Based on the work performed to date and considering the discussion herein, the earthwork factors in Table 9.8 may be used as a basis for estimating how much the on-site soils may shrink or bulk when removed from their natural state and placed in compacted fill.

TABLE 9.8
SHRINKAGE AND BULK FACTORS

Soil Unit	Shrink/Bulk Factor
Undocumented Fill	5-10 percent shrink
Previously Placed Fill	0-2 percent shrink
Topsoil, Alluvium and Colluvium	10-15 percent shrink
Landslide Debris	10-15 percent shrink
Terrace Deposits	2 percent shrink to 2 percent bulk
Capistrano Formation and Sandstone Units of Puente Formation	3-5 percent bulk
Siltstone Units of Puente Formation	3-5 percent bulk

9.9 Subdrains

9.9.1 Conditions encountered prior to and during grading do not necessarily reveal the conditions that will be realized once construction of the proposed development is completed.

Specifically, irrigation both on site and within up gradient areas cannot be reasonably predicted. Therefore, the design and implementation of additional drainage mechanisms will be necessary. The geologic units encountered on the site have permeability characteristics and/or fracture systems that could be susceptible under certain conditions to seepage. Building pad areas adjacent to ascending slopes may experience wet to saturated soil conditions due to water migration or seepage. To reduce the potential for this to occur, a toe drain should be placed along the base of ascending slopes to collect potential seepage and convey it to a suitable outlet. The drain should be sufficiently deep to intercept the seepage (on the order of 3 feet below finish grade). The necessity for the drains should be discussed prior to grading on a slope specific basis. In addition, the project civil engineer should be consulted to evaluate the appropriate drain locations and necessary easements, building restriction zones or disclosure requirements that may be necessary. The drains should be surveyed for location and shown on the project as-built drawings. As an alternative, a small retaining wall approximately 3 to 4 feet in height that contains subsurface drainage behind the wall can be placed at the toe of ascending slopes.

9.9.2 Canyon subdrains within the major drainages and a stability fill were constructed during previous grading operations. The reported locations, pipe diameters, and elevations are presented on the Geologic Map. The existing subdrain outlets were surveyed for location by the civil engineer. The pipe size and diameter were verified in the field by Geocon Incorporated. It is our opinion that the existing subdrains were properly constructed and in adequate condition to accommodate the proposed development and addition of new fill soils.

9.9.3 Proposed grading will remove some existing drains or require the placement of additional fill soil. The outlet locations of the subdrains are shown on the geologic maps. Some of the outlets will need future tie-ins or extensions. Specific locations for future tie-ins, connection points and elevations will be analyzed once 40-scale grading and improvement plans are prepared. Two new subdrains in natural drainages will be necessary to mitigate the potential for adverse impacts associated with seepage conditions. Some removal of existing fill soil may be required to provide an adequate subdrain tie-in or removal of segments of pipe. In addition, excavations within existing fill areas may expose the upper portions of the existing canyon subdrains that will require removal and repair of the existing pipes to at least 10 feet below new finish grade. The locations of proposed canyon subdrains and subdrain extensions are presented on the Geologic Map. A typical canyon subdrain detail is presented in Figure 13. Subdrains less than 750 feet in length and located at the base of fill less than 100 feet in depth should use 6-inch-diameter schedule 40 PVC perforated pipes. Other subdrains should use 8-inch-diameter schedule 80 PVC perforated pipe. Subdrain extensions should be connected to the existing canyon subdrain at their intersection point using pipes with the same diameter. Subdrains within the buttress and stability fill keyways can use Schedule 40 PVC perforated pipes with a diameter of at least 4 inches.

9.9.4 Prior to outletting, the final 20-foot segment of subdrain should consist of non-perforated drain pipe. At the non-perforated/perforated interface, a seepage cutoff wall should be constructed on the downslope side of the junction in accordance with Figure 14. Subdrains that discharge into a natural drainage course or open space area should be provided with a permanent headwall structure in accordance with Figure 15. Coordination between the MSE wall and grading contractors will be required to allow the proper outlet of canyon subdrains and wall drains and mitigate conflicts during construction. Verification of proper flow of the existing subdrain outlets should be performed with the addition of a permanent headwalls once finish grades have been achieved.

9.9.5 The final 40-scale grading plans should show the location of proposed subdrains. Upon completion of remedial excavations and subdrain installation, the project civil engineer should survey the drain locations and prepare an “as-built” map depicting the existing conditions. The final outlet and connection locations should be evaluated during grading operations.

9.10 Foundation and Concrete Slabs-On-Grade Recommendations

9.10.1 The foundation recommendations presented herein are for proposed one- to three-story residential structures. We separated the foundation recommendations into three categories based on either the maximum and differential fill thickness or Expansion Index. The foundation category criteria are presented in Table 9.10.1. We will evaluate the Final foundation categories once site grading has been completed.

TABLE 9.10.1
FOUNDATION CATEGORY CRITERIA

Foundation Category	Maximum Fill Thickness, T (Feet)	Differential Fill Thickness, D (Feet)	Expansion Index (EI)
I	T<20	--	EI≤50
II	20≤T<50	10≤D<20	50<EI≤90
III	T≥50	D≥20	90<EI≤130

9.10.2 Table 9.10.2 presents minimum foundation and interior concrete slab design criteria for conventional foundation systems. This foundation system should only be used on cut lots with a very low to low expansion potential within the sandstone portions of the formational units.

TABLE 9.10.2
CONVENTIONAL FOUNDATION RECOMMENDATIONS BY CATEGORY

Foundation Category	Minimum Footing Embedment Depth (inches)	Continuous Footing Reinforcement	Interior Slab Reinforcement
I	12	Two No. 4 bars, one top and one bottom	6 x 6 - 10/10 welded wire mesh at slab mid-point
II	18	Four No. 4 bars, two top and two bottom	No. 3 bars at 24 inches on center, both directions at slab mid-point
III	24	Four No. 5 bars, two top and two bottom	No. 3 bars at 18 inches on center, both directions at slab mid-point

9.10.3 The embedment depths presented in Table 9.10.2 should be measured from the lowest adjacent pad grade for both interior and exterior footings. The conventional foundations should have a minimum width of 12 inches and 24 inches for continuous and isolated footings, respectively. Figure 16 presents a wall/column footing dimension detail.

9.10.4 Slabs that may receive moisture-sensitive floor coverings or may be used to store moisture-sensitive materials should be underlain by a vapor retarder. The vapor retarder design should be consistent with the guidelines presented in the American Concrete Institute’s (ACI) *Guide for Concrete Slabs that Receive Moisture-Sensitive Flooring Materials* (ACI 302.2R-06). In addition, the membrane should be installed in accordance with manufacturer’s recommendations and ASTM requirements and installed in a manner that prevents puncture. The vapor retarder used should be specified by the project architect or developer based on the type of floor covering that will be installed and if the structure will possess a humidity controlled environment.

9.10.5 The bedding sand thickness should be determined by the project foundation engineer, architect, and/or developer. It is typical to have 3 inches and 4 inches of sand for 5-inch thick and 4-inch thick slabs, respectively, in the southern California area. The foundation engineer should provide appropriate concrete mix design criteria and curing measures to assure proper curing of the slab by reducing the potential for rapid moisture loss and subsequent cracking and/or slab curl. We suggest that the foundation engineer present the concrete mix design and proper curing methods on the foundation plans. It is critical that the foundation contractor understands and follows the recommendations presented on the foundation plans.

9.10.6 Post-tensioned concrete slab and foundation systems should be used for the support of the proposed structures on fill soils or building pads with a medium to high expansion potential. The 2010 CBC has updated the design requirements for post-tensioned foundation systems. The post-tensioned systems should be designed by a structural engineer experienced in post-tensioned slab design and design criteria of the Post-Tensioning Institute (PTI), Third Edition, as required by the 2010 California Building Code (CBC Section 1805.8). Although this procedure was developed for expansive soil conditions, it can also be used to reduce the potential for foundation distress due to differential fill settlement. The post-tensioned design should incorporate the geotechnical parameters presented on Table 9.10.3 for the particular Foundation Category designated. The parameters presented in Table 9.10.3 are based on the guidelines presented in the PTI, Third Edition design manual. The foundations for the post-tensioned slabs should be embedded in accordance with the recommendations of the structural engineer.

TABLE 9.10.3
POST-TENSIONED FOUNDATION SYSTEM DESIGN PARAMETERS

Post-Tensioning Institute (PTI) Third Edition Design Parameters	**Foundation Category**		
	I	**II**	**III**
Thornthwaite Index	-20	-20	-20
Equilibrium Suction	3.9	3.9	3.9
Edge Lift Moisture Variation Distance, e_M (feet)	5.3	5.1	4.9
Edge Lift, y_M (inches)	0.61	1.10	1.58
Center Lift Moisture Variation Distance, e_M (feet)	9.0	9.0	9.0
Center Lift, y_M (inches)	0.30	0.47	0.66

9.10.7 If the structural engineer proposes a post-tensioned foundation design method other than the 2010 CBC:

- The criteria presented in Table 9.10.3 are still applicable.
- Interior stiffener beams should be used for Foundation Categories II and III.
- The width of the perimeter foundations should be at least 12 inches.
- The perimeter footing embedment depths should be at least 12 inches, 18 inches and 24 inches for foundation categories I, II, and III, respectively. The embedment depths should be measured from the lowest adjacent pad grade.

9.10.8 We recommend that a post-tensioned mat foundation system be used where the MSE wall grids within the reinforced zone extend into the building pads. The slab should possess a thickened edge with a minimum width of 12 inches and extend below the clean sand or crushed rock layer.

9.10.9 Our experience indicates post-tensioned slabs can be susceptible to edge lift, regardless of the underlying soil conditions. Placing reinforcing steel at the bottom of the perimeter footings and the interior stiffener beams may mitigate this potential. Current PTI design procedures primarily address the potential center lift of slabs but, because of the placement of the reinforcing tendons in the top of the slab, the resulting eccentricity after tensioning reduces the ability of the system to mitigate edge lift. The structural engineer should design and the contractor should properly construct the foundation system to reduce the potential of edge lift occurring for the proposed structures.

9.10.10 During the construction of the post-tension foundation system, the concrete should be placed monolithically. Under no circumstances should cold joints form between the footings/grade beams and the slab during the construction of the post-tension foundation system.

9.10.11 Category I, II, or III foundations may be designed for an allowable soil bearing pressure of 2,000 pounds per square foot (psf) (dead plus live load). This bearing pressure may be increased by one-third for transient loads due to wind or seismic forces.

9.10.12 Isolated footings, if present, should have the minimum embedment depth and width recommended for conventional foundations for a particular foundation category. The use of isolated footings, which are located beyond the perimeter of the building slab and support structural elements connected to the building, are not recommended. Where this condition cannot be avoided, the isolated footings should be connected to the building foundation system with grade beams.

9.10.13 For Foundation Category III, consideration should be given to using interior stiffening beams and connecting isolated footings and/or increasing the slab thickness. In addition, consideration should be given to connecting patio slabs, which exceed 5 feet in width, to the building foundation to reduce the potential for future separation to occur.

9.10.14 Special subgrade presaturation is not deemed necessary prior to placing concrete; however, the exposed foundation and slab subgrade soil should be moisture conditioned, as necessary, to maintain a moist condition as would be expected in such concrete placement.

9.10.15 Where buildings or other improvements are planned near the top of a slope steeper than 3:1 (horizontal:vertical), special foundations and/or design considerations are recommended due to the tendency for lateral soil movement to occur.

- For fill slopes less than 20 feet high, building footings should be deepened such that the bottom outside edge of the footing is at least 7 feet horizontally from the face of the slope.
- When located next to a descending 3:1 (horizontal:vertical) fill slope or steeper, the foundations should be extended to a depth where the minimum horizontal distance is equal to H/3 (where H equals the vertical distance from the top of the fill slope to the base of the fill soil) with a minimum of 7 feet but need not exceed 40 feet. The horizontal distance is measured from the outer, deepest edge of the footing to the face of the slope. An acceptable alternative to deepening the footings would be the use of a post-tensioned slab and foundation system or increased footing and slab reinforcement. Specific design parameters or recommendations for either of these alternatives can be provided once the building location and fill slope geometry have been determined.
- Geocon Incorporated should be contacted to review the pool plans and the specific site conditions to provide additional recommendations, if necessary.
- Swimming pools located within 7 feet of the top of cut or fill slopes are not recommended. Where such a condition cannot be avoided, the portion of the swimming pool wall within 7 feet of the slope face should be designed assuming that the adjacent soil provides no lateral support. This recommendation applies to fill slopes up to 30 feet in height, and cut slopes regardless of height.
- Although other improvements, which are relatively rigid or brittle, such as concrete flatwork or masonry walls, may experience some distress if located near the top of a slope, it is generally not economical to mitigate this potential. It may be possible, however, to incorporate design measures that would permit some lateral soil movement without causing extensive distress. Geocon Incorporated should be consulted for specific recommendations.

9.10.16 The recommendations of this report are intended to reduce the potential for cracking of slabs due to expansive soil (if present), differential settlement of existing soil or soil with varying thicknesses. However, even with the incorporation of the recommendations presented herein, foundations, stucco walls, and slabs-on-grade placed on such conditions may still exhibit some cracking due to soil movement and/or shrinkage. The occurrence of concrete shrinkage cracks is independent of the supporting soil characteristics. Their occurrence may be reduced and/or controlled by limiting the slump of the concrete, proper concrete placement and curing, and by the placement of crack control joints at periodic intervals, in particular, where re-entrant slab corners occur.

9.10.17 Geocon Incorporated should be consulted to provide additional design parameters as required by the structural engineer.

9.11 Exterior Concrete Flatwork

9.11.1 Exterior concrete flatwork not subject to vehicular traffic should be constructed in accordance with the recommendations herein. Slab panels should be a minimum of 4 inches thick and when in excess of 8 feet square should be reinforced with 6x6-W2.9/W2.9 (6x6-6/6) welded wire mesh or No. 3 reinforcing bars spaced 18 inches on center in both directions placed in the middle of the slab to reduce the potential for cracking. In addition, concrete flatwork should be provided with crack control joints to reduce and/or control shrinkage cracking. Crack control spacing should be determined by the project structural engineer based upon the slab thickness and intended usage. Criteria of the American Concrete Institute (ACI) should be taken into consideration when establishing crack control spacing. Subgrade soil for exterior slabs not subjected to vehicle loads should be compacted in accordance with criteria presented in the grading section prior to concrete placement. Subgrade soil should be properly compacted and the moisture content of subgrade soil should be verified prior to placing concrete.

9.11.2 Even with the incorporation of the recommendations of this report, the exterior concrete flatwork has a potential to experience some uplift due to expansive soil beneath grade. The reinforcing steel should overlap continuously in flatwork to reduce the potential for vertical offsets within flatwork. Additionally, flatwork should be structurally connected to the curbs, where possible, to reduce the potential for offsets between the curbs and the flatwork.

9.11.3 Where exterior flatwork abuts the structure at entrant or exit points, the exterior slab should be dowelled into the structure’s foundation stemwall. This recommendation is intended to reduce the potential for differential elevations that could result from differential settlement or minor heave of the flatwork. Dowelling details should be designed by the project structural engineer. In addition, concrete sidewalks that are placed adjacent to curbs should be dowelled into the curb to reduce the potential for vertical offsets.

9.11.4 The recommendations presented herein are intended to reduce the potential for cracking of exterior slabs as a result of differential movement. However, even with the incorporation of the recommendations presented herein, slabs-on-grade will still crack. The occurrence of concrete shrinkage cracks is independent of the soil supporting characteristics. Their occurrence may be reduced and/or controlled by limiting the slump of the concrete, the use of crack control joints and proper concrete placement and curing. Crack control joints should be spaced at intervals no greater than 12 feet. Literature provided by the Portland

Concrete Association (PCA) and American Concrete Institute (ACI) present recommendations for proper concrete mix, construction, and curing practices, and should be incorporated into project construction.

9.12 Retaining Wall Recommendations

9.12.1 Retaining walls that are allowed to rotate more than 0.001H (where H equals the height of the retaining portion of the wall in feet) at the top of the wall and having a level backfill surface should be designed for an active soil pressure equivalent to the pressure exerted by a fluid density of 40 pounds per cubic foot (pcf). Where the backfill will be inclined at no steeper than 2:1 (horizontal:vertical), an active soil pressure of 55 pcf is recommended. These soil pressures assume that the backfill materials within an area bounded by the wall and a 1:1 plane extending upward from the base of the wall possess an expansion index of 90 or less.

9.12.2 Unrestrained walls are those that are allowed to rotate more than 0.001H (where H equals the height of the retaining portion of the wall) at the top of the wall. Where walls are restrained from movement at the top, an additional uniform pressure of 7H psf should be added to the above active soil pressure. For retaining walls subject to vehicular loads within a horizontal distance equal to two-thirds the wall height, a surcharge equivalent to 2 feet of fill soil should be added.

9.12.3 Retaining walls should be provided with a drainage system adequate to prevent the buildup of hydrostatic forces and waterproofed as required by the project architect. The use of drainage openings through the base of the wall (weep holes) is not recommended where the seepage could be a nuisance or otherwise adversely affect the property adjacent to the base of the wall. The recommendations herein assume a properly compacted backfill material (EI of 90 or less) with no hydrostatic forces or imposed surcharge load. Figure 17 presents a typical retaining wall drainage detail. If conditions different than those described are expected, or if specific drainage details are desired, Geocon Incorporated should be contacted for additional recommendations.

9.12.4 In general, wall foundations founded in properly compacted fill or formational materials should possess a minimum depth and width of one foot and may be designed for an allowable soil bearing pressure of 2,000 psf, provided the soil within three feet below the base of the wall has an expansion index of 90 or less. The proximity of the foundation to the top of a slope steeper than 3:1 could impact the allowable soil bearing pressure. Therefore, Geocon Incorporated should be consulted where such a condition is expected.

9.12.5 The structural engineer should determine the seismic design category for the project. If the project possesses a seismic design category of D, E, or F, the proposed retaining walls should be designed with seismic lateral pressure. A seismic load of 16H should be used for design. The seismic load is dependent on the retained height where H is the height of the wall, in feet, and the calculated loads result in pounds per square foot (psf) exerted at the top of the wall and zero at the base of the wall. We used a peak site acceleration of 0.37g calculated from the 2010 California Building Code (S_{DS}/2.5) and applying a pseudo-static coefficient of 0.33.

9.12.6 The recommendations presented herein are generally applicable to the design of rigid concrete or masonry retaining walls having a maximum height of 8 feet. In the event that walls higher than 8 feet or other types of walls (such as crib-type walls) are planned, Geocon Incorporated should be consulted for additional recommendations.

9.12.7 Unrestrained walls will move laterally when backfilled and loading is applied. The amount of lateral deflection is dependent on the wall height, the type of soil used for backfill, and loads acting on the wall. The retaining walls and improvements above the retaining walls should be designed to incorporate an appropriate amount of lateral deflection as determined by the structural engineer.

9.12.8 The recommendations presented herein are generally applicable to the design of rigid concrete or masonry retaining walls having a maximum height of 8 feet. Recommendations for MSE, soldier pile, and soil nail retaining walls are presented herein.

9.13 Mechanically Stabilized Earth (MSE) Retaining Walls

9.13.1 Mechanized stabilized earth (MSE) retaining walls are associated with proposed fill slopes to a maximum height of approximately 95 feet throughout the development. Combined retaining wall heights are expected to range up to a maximum of 95 feet, with a maximum geogrid length of approximately 105 feet. Mechanically stabilized earth (MSE) retaining walls are alternative walls that consist of modular block facing units with geogrid reinforced earth behind the block. The reinforcement grid attaches to the block units and is typically placed at specified vertical intervals and embedment lengths. For the purposes of this report, the spacing and lengths and types of the geogrid were assumed based on the expected type of soil used for the backfill, and the slope stability requirements to achieve an acceptable factor of safety.

9.13.2 The geotechnical parameters listed in Table 9.13 can be used for preliminary design of the MSE walls.

TABLE 9.13
GEOTECHNICAL PARAMETERS FOR MSE WALLS

Parameter	Reinforced Zone	Retained Zone	Foundation Zone
Angle of Internal Friction	32 degrees	28 degrees	28 degrees
Cohesion	500 psf	500 psf	500 psf
Wet Unit Density	120 pcf	120 pcf	120 pcf

9.13.3 The soil parameters presented in Table 9.13 are based on our experience and direct shear-strength tests performed during the geotechnical investigation and represent some of the on-site materials. The wet unit density values presented in Table 9.13 can be used for design but actual in-place densities may range from approximately 90 to 135 pounds per cubic foot. Geocon has no way of knowing whether these materials will actually be used as backfill behind the wall during construction. The wall designers should use their judgment in selection of the design parameters. As such, once backfill materials have been selected and/or stockpiled, sufficient shear tests should be conducted on samples of the proposed backfill materials to check that they conform to actual design values. Results should be provided to the designer to re-evaluate stability of the walls. Dependent upon test results, the designer may require modifications to the original wall design (e.g., longer reinforcement embedment lengths and/or steel reinforcement).

9.13.4 The foundation zone is the area where the footing is embedded, the reinforced zone is the area of the backfill that possesses the reinforcing fabric, and the retained zone is the area behind the reinforced zone.

9.13.5 Wall foundations having a minimum depth and width of one foot may be designed for an allowable soil bearing pressure of 2,000 psf. This soil pressure may be increased by 300 psf and 500 psf for each additional foot of foundation width and depth, respectively, up to a maximum allowable soil bearing pressure of 4,000 psf.

9.13.6 Backfill materials within the reinforced zone should be compacted to a dry density of at least 90 percent of the laboratory maximum dry density near to slightly above optimum moisture content in accordance with ASTM D 1557. This is applicable to the entire embedment width of the reinforcement. Typically, wall designers specify no heavy compaction equipment within 3 feet of the face of the wall. However, smaller equipment (e.g., walk-behind, self-driven compactors or hand whackers) can be used to compact the materials without causing deformation of the wall. If the designer specifies no compactive effort for this zone, the materials are essentially not properly compacted and the reinforcement grid within the uncompacted zone should not be relied upon for reinforcement, and overall embedment lengths will have to be increased to account for the difference.

9.13.7 Select backfill materials will be required to be in accordance with the MSE retaining wall system. Materials as outlined in the specifications of the retaining wall plans may be generated and stockpiled during grading, if encountered, or may require import. Geocon should perform laboratory tests during the backfill materials to check that soil properties are in accordance with the retaining wall plans and specifications. Based on the results of our field investigation and laboratory testing, materials within the Puente Formation-Soquel Member (Tps) and the Capistrano Formation (Tco) will be potential sources of granular material to create select backfill.

9.13.8 The wall should be provided with a drainage system sufficient to prevent excessive seepage through the wall and the base of the wall, thus preventing hydrostatic pressures behind the wall. The perforated drainage pipe should be wrapped in an approved filter fabric.

9.13.9 Geosynthetic reinforcement must elongate to develop full tensile resistance. This elongation generally results in movement at the top of the wall. The amount of movement is dependent upon the height of the wall (e.g., higher walls rotate more) and the type of reinforcing grid used. In addition, over time the reinforcement grid has been known to exhibit creep (sometimes as much as 5 percent) and can undergo additional movement. Given this condition, the owner should be aware that structures and pavement placed within the reinforced and retained zones of the wall may undergo movement. A separate report will include the estimated vertical and horizontal deflections of the planned MSE retaining walls. The estimated movements should be provided to the project structural engineer to determine if the planned structures can tolerate the expected movements.

9.13.10 A geotechnical *in situ* monitoring program should be performed during the site grading and long term post-grading to observe the settlement of the fill slopes and the vertical and horizontal movements of MSE walls. The observation instrumentations should include settlement and lateral deflection monuments/survey points on the tops of retaining walls. Information regarding the progress of fill placement should also be recorded as a part of monitoring program.

9.13.11 MSE walls can be constructed using metallic reinforcement in the reinforced zone to prevent the significant deformations that would be expected in similar-height walls reinforced with extensive Geosynthetic reinforcements. The wall designer should evaluate the alternative with steel reinforcement during the design of the planned MSE walls.

9.13.12 Proposed retaining walls that are located near adjacent properties or property lines along the eastern boundary of the property will likely need to be supported by soil nail walls or soldier pile walls. The proposed MSE walls at these locations may not have sufficient space to install the horizontal grids to support the facing and will need to be constructed using top down methods. This supporting wall system will need to be designed by the structural engineer.

9.14 Soldier Pile Walls

9.14.1 Soldier pile walls can be constructed adjacent to property lines and improvements where the reinforcement grid may not be allowed to extend behind the face of the wall.

9.14.2 In general, ground conditions are moderately suited for soldier pile wall construction techniques. However, gravel, cobble, cemented zones, and oversized material may be encountered in the existing materials that could be difficult to drill. Additionally, if cohesionless sands are encountered, some raveling may result along the unsupported portions of excavations.

9.14.3 Geocon Incorporated should observe the drilled shafts for the soldier piles prior to the placement of steel reinforcement to check that the exposed soil conditions are similar to those expected and that footing excavations have been extended to the appropriate bearing strata and design depths. If unexpected soil conditions are encountered, foundation modifications may be required.

9.14.4 A wall drain system should be incorporated into the design of the soldier pile wall. Figure 18 presents a typical soldier pile wall drainage detail.

9.14.5 Lateral movement of shoring is associated with vertical ground settlement outside of the excavation. Therefore, it is essential that the soldier pile system allow very limited amounts of lateral displacement. Earth pressures acting on a lagging wall can cause movement of the shoring toward the excavation and result in ground subsidence outside of the excavation.

9.14.6 Lagging should keep pace with the excavation operations. The excavation should not be advanced deeper than three feet below the bottom of lagging at any time. These unlagged gaps of up to three feet should only be allowed to stand for short periods of time in order to decrease the probability of soil sloughing and caving and should never be unsupported overnight. Backfilling should be conducted between the back of lagging and excavation sidewalls to reduce sloughing in this zone and voids should be filled by the end of each day.

9.14.7 Prior to the commencement of excavation activities that have the potential to affect existing buildings, streets, sidewalks, and other structures/improvements, the condition of these existing structures, pavements, and/or improvements should be documented prior to the start of work. Special attention should be given to documenting existing cracks or other indications of differential settlement within these adjacent structures, pavements and other improvements. Underground utilities sensitive to settlement should be videotaped prior to construction to check the integrity of pipes. In addition, monitoring points should be established indicating location and elevation around the excavation.

9.15 Soil Nail Wall

9.15.1 Soil nail walls can be used where MSE walls cannot be constructed. Soil nail walls consist of installing closely spaced steel bars (nails) into a slope or excavation in a top-down construction sequence. Following installation of a horizontal row of nails, drains, waterproofing and wall reinforcing steel are placed and shotcrete applied to create a final wall.

9.15.2 The wall should be designed by an engineer familiar with the design of soil nail walls.

9.15.3 In general, ground conditions are moderately suited to soil nail wall construction techniques. However, localized gravel, cobble, cemented zones, and oversized material could be encountered in the existing materials that could be difficult to drill. Additionally, relatively clean sands may be encountered within the existing soil that may result in some raveling of the unsupported excavation.

9.15.4 A wall drain system should be incorporated into the design of the soil nail wall. Corrosion protection should be provided for the nails where the wall will be a permanent structure. Figure 19 presents a typical soil nail wall drainage detail.

9.15.5 Testing of the soil nails should be performed in accordance with the guidelines of the Federal Highway Administration or similar guidelines. At least two passing verification tests should be performed to confirm design assumptions for each soil/rock type encountered. Verification tests of soil nails should be sacrificial and should not be used to support the proposed wall. The bond length should be adjusted to allow for pullout testing of the verification nails to evaluate the ultimate bond stress. A minimum of 5 percent of the production nails should also be proof tested and a minimum of 4 sacrificial nails should be tested at the discretion of Geocon Incorporated. Consideration should be given to testing sacrificial nails with an adjusted bond length rather than testing production nails. Geocon Incorporated should observe the nail installation and perform the nail testing.

9.15.6 The soil strength parameters listed in Table 9.15 can be used in design of the soil nails.

TABLE 9.15
SOIL STRENGTH PARAMETERS FOR SOIL NAIL WALLS

Description	Cohesion (psf)	Friction Angle (degrees)	Ultimate Bond Stress (psi)
Engineered Artificial Fill (afe)	500	28	10
Puente Formation (Tps)	400	33	20
Puente Formation – Siltstone (Tps [slt] and Tplv)	300	30	20

9.16 Lateral Loads

9.16.1 For resistance to lateral loads, an allowable passive earth pressure equivalent to a fluid density of 350 pounds per cubic foot (pcf) is recommended for footings or shear keys poured neat against properly compacted fill. The allowable passive pressure assumes a horizontal surface extending away from the base of the wall at least 5 feet or three times the height of the surface generating the passive pressure, whichever is greater. The upper 12 inches of material not protected by floor slabs or pavement should not be included in the design for lateral resistance.

9.16.2 An allowable friction coefficient of 0.35 may be used for resistance to sliding between soil and concrete. This friction coefficient may be combined with the allowable passive earth pressure when determining resistance to lateral loads.

9.17 Preliminary Pavement Recommendations

9.17.1 We calculated the flexible pavement sections in general conformance with the *Caltrans Method of Flexible Pavement Design* (Highway Design Manual, Section 608.4) using an estimated Traffic Index (TI) of 5.0, 5.5, 6.0, and 7.0 for the planned roadways. The project civil and traffic engineer and developer should review the pavement designations to determine appropriate locations for pavement thickness. The final pavement sections should be based on the R-Value of the subgrade soil encountered at final subgrade elevations. Streets should be designed in accordance with applicable standards when final Traffic Indices and R-value tests on subgrade soil are completed. We have assumed R-Values of 10 and 78 for the subgrade soil and base materials, respectively, for the purpose of the preliminary analyses. Table 9.17.1 presents options for asphalt concrete over base and full-depth asphalt concrete for the planned roadways.

TABLE 9.17.1
PRELIMINARY FLEXIBLE PAVEMENT SECTION

Assumed Traffic Index	**Assumed Subgrade R-Value**	**Option 1**		**Option 2**
		Asphalt Concrete (inches)	**Class 2 Aggregate Base (inches)**	**Full-Depth Asphalt Concrete Thickness (inches)**
5.0	10	3.0	9	7.5
5.5	10	3.0	11	8.0
6.0	10	3.5	12	9.0
7.0	10	4.0	15	10.5

9.17.2 The upper 12 inches of the subgrade soil should be compacted to a dry density of at least 95 percent of the laboratory maximum dry density near to slightly above optimum moisture shortly before paving operations. Base materials should conform to Section 26-1.028 of the *Standard Specifications for The State of California Department of Transportation* (*Caltrans*) with a ¾-inch maximum size aggregate. The base materials should be compacted to a dry density of at least 95 percent of the laboratory maximum dry density near to slightly above optimum moisture content. The asphalt concrete should conform to Section 203-6 of the *Standard Specifications for Public Works Construction* (*Greenbook*). The asphalt concrete should be compacted to a density of at least 95 percent of the laboratory Hveem density in accordance with ASTM D 2726.

9.17.3 A rigid Portland cement concrete (PCC) pavement section should be placed in cross-gutters, private driveways, and driveway entrance aprons. We calculated the rigid pavement section in general conformance with the procedure recommended by the American Concrete Institute report ACI 330R-08 Guide for Design and Construction of Concrete Parking Lots using the parameters presented in Table 9.17.2.

TABLE 9.17.2
RIGID PAVEMENT DESIGN PARAMETERS

Design Parameter	**Design Value**
Modulus of subgrade reaction, k	100 pci
Modulus of rupture for concrete, M_R	500 psi
Traffic Category, TC	A and C
Average daily truck traffic, ADTT	10 and 100

9.17.4 Based on the criteria presented herein, the PCC pavement sections should have a minimum thickness as presented in Table 9.17.3.

TABLE 9.17.3
RIGID PAVEMENT RECOMMENDATIONS

Location	**Portland Cement Concrete (inches)**
Private driveways and aprons	5.5
Cross-gutters and public driveway aprons (TC=C)	7

9.17.5 The PCC pavement should be placed over subgrade soil that is compacted to a dry density of at least 95 percent of the laboratory maximum dry density near to slightly above optimum moisture content. This pavement section is based on a minimum concrete compressive strength of approximately 3,000 psi (pounds per square inch).

9.17.6 A thickened edge or integral curb should be constructed on the outside of concrete slabs subjected to wheel loads. The thickened edge should be 1.2 times the slab thickness or a minimum thickness of 2 inches, whichever results in a thicker edge, and taper back to the recommended slab thickness 4 feet behind the face of the slab (e.g., a 7-inch-thick slab would have a 9-inch-thick edge). Reinforcing steel will not be necessary within the concrete for geotechnical purposes with the possible exception of dowels at construction joints as discussed herein.

9.17.7 To control the location and spread of concrete shrinkage cracks, crack-control joints (weakened plane joints) should be included in the design of the concrete pavement slab. Crack-control joints should not exceed 30 times the slab thickness with a maximum spacing of 12.5 feet and 15 feet for the 5.5 and 7-inch-thick slabs, respectively (e.g., a 7-inch-thick slab would have a 15-foot spacing pattern), and should be sealed with an appropriate sealant to prevent the migration of water through the control joint to the subgrade materials. The depth of the crack-control joints should be determined by the referenced ACI report.

9.17.8 To provide load transfer between adjacent pavement slab sections, a butt-type construction joint should be constructed. The butt-type joint should be thickened by at least 20 percent at the edge and taper back at least 4 feet from the face of the slab. As an alternative to the butt-type construction joint, dowelling can be used between construction joints for pavements of 7 inches or thicker. As discussed in the referenced ACI guide, dowels should consist of smooth, 1-inch-diameter reinforcing steel 14 inches long embedded a minimum of 6 inches into the slab on either side of the construction joint. Dowels should be located at the midpoint of the slab, spaced at 12 inches on center and lubricated to allow joint movement while still transferring loads. In addition, tie bars should be installed as recommended in Section 3.8.3 of the referenced ACI guide. The structural engineer should provide other alternative recommendations for load transfer.

9.17.9 The performance of pavement is highly dependent on providing positive surface drainage away from the edge of the pavement. Water that is allowed to pond on or adjacent to roadway pavement areas will likely result in pavement distress and subgrade failure. Drainage from landscaped areas should be directed to controlled drainage structures. Landscape areas adjacent to the edge of asphalt pavements are not recommended due to the potential for surface or irrigation water to infiltrate the underlying permeable aggregate base and cause distress. Where such a condition cannot be avoided, consideration should be given to incorporating measures that will significantly reduce the potential for subsurface water migration into the aggregate base. If planter islands are planned, the perimeter curb should extend at least 6 inches below the level of the base materials.

9.18 Site Drainage and Moisture Protection

9.18.1 Adequate site drainage is critical to reduce the potential for differential soil movement, erosion and subsurface seepage. Under no circumstances should water be allowed to pond adjacent to footings. The site should be graded and maintained such that surface drainage is directed away from structures in accordance with 2010 CBC 1804.3 and guidelines of the city of Lake Forest. In addition, surface drainage should be directed away from the top of slopes into swales or other controlled drainage devices. Roof and pavement drainage should be directed into conduits that carry runoff away from the proposed structure.

9.18.2 Conditions encountered prior to and during grading do not necessarily reveal the conditions that will be encountered once construction of the proposed development is completed. Specifically, irrigation both on site and within up gradient areas cannot be reasonably predicted. Therefore the design and implementation of additional drainage mechanisms may be necessitated. The geologic units encountered on the site have permeability characteristics and/or fracture systems that could be susceptible under certain conditions to groundwater seepage. Building pad areas adjacent to ascending slopes may experience wet to saturated soil conditions due to water migration or seepage. To reduce the potential for this to occur, consideration should be given to placing a subdrain along the base of the slopes to collect potential seepage and convey it to a suitable outlet. The drain should be sufficiently deep to intercept the seepage (on the order of 3 feet below finish grade). The necessity for the drains should be discussed prior to grading on a slope specific basis. In addition, the project civil engineer should be consulted to evaluate the appropriate drain locations and necessary easements, building restriction zones or disclosure requirements that may be necessary. The drains should be surveyed for location and shown on the project as-built drawings.

9.18.3 Underground utilities should be leak-free. Utility and irrigation lines should be checked periodically for leaks, and detected leaks should be repaired promptly. Detrimental soil movement could occur if water is allowed to infiltrate the soil for prolonged periods of time.

9.18.4 Landscaping planters adjacent to paved areas are not recommended due to the potential for surface or irrigation water to infiltrate the pavement’s subgrade and base course. We recommend that area drains to collect excess irrigation water and transmit it to drainage structures or impervious above-grade planter boxes be used. In addition, where landscaping is planned adjacent to the pavement, we recommend construction of a cutoff wall along the edge of the pavement that extends at least 6 inches below the bottom of the base material.

9.18.5 We understand the property may incorporate storm water management devices that promote water storage but not water infiltration. The existing and planned soil conditions are not conducive to water infiltration and infiltration should not be performed. In addition, if water is allowed to infiltrate the soil, seepage may occur through the planned retaining walls and could cause slope instability. Water storage devices can be installed to reduce the velocity and amount of water entering the storm drain system but liners will be required if water in contact with soil. Distress may be caused to planned improvements and properties located hydrologically downstream if water infiltrates the soil. The distress depends on the amount of water to be detained, its residence time, soil permeability, and other factors. We have not performed a hydrogeology study at the site. If infiltration of storm water runoff was incorporated into the project design, downstream properties may be subjected to seeps, springs, slope instability, raised groundwater, movement of foundations and slabs, or other undesirable impacts as a result of this water infiltration.

9.18.6 Storm water management devices should be properly constructed to prevent water infiltration and lined with an impermeable liner (e.g. High-density polyethylene, HDPE, with a thickness of about 12 mil or equivalent Polyvinyl Chloride, PVC, liner). The devices should also be installed in accordance with the manufacturer’s recommendations.

9.18.7 We recommend roof drains be connected to subsurface drains that direct the water to a storm drain system. However, we understand that the SUSMP and Leadership in Engineering and Environmental Design (LEED) requests disconnecting the roof drains to help obtain certification. The water from the roof drains should be directed away from buildings. Consideration should be given to draining roofs to lined planter boxes or placing liners below the proposed landscape areas to prevent infiltration of the water. Erosion control devices should be installed at the outlets to prevent soil migration during rain events. Geocon Incorporated can be contacted for additional recommendations.

9.18.8 If detention basins, bioswales, retention basins, or water infiltration devices are being considered, Geocon Incorporated should be retained to provide recommendations pertaining to the geotechnical aspects of possible impacts and design. Distress may be caused to planned improvements and properties located hydrologically downstream. The distress depends on the amount of water to be detained, its residence time, soil permeability, and other factors. We have not performed a hydrogeology study at the site. If infiltration of storm water runoff was incorporated into project design, downstream properties may be subjected to seeps, springs, slope instability, raised groundwater, movement of foundations and slabs, or other impacts as a result of water infiltration.

9.19 Grading, Improvement and Foundation Plan Review

9.19.1 Geocon should review the 40-scale grading plans, improvement and MSE wall plans, and foundation plans prior to finalization to verify their compliance with the recommendations of this report and determine the need for additional comments, recommendations, and/or analysis.

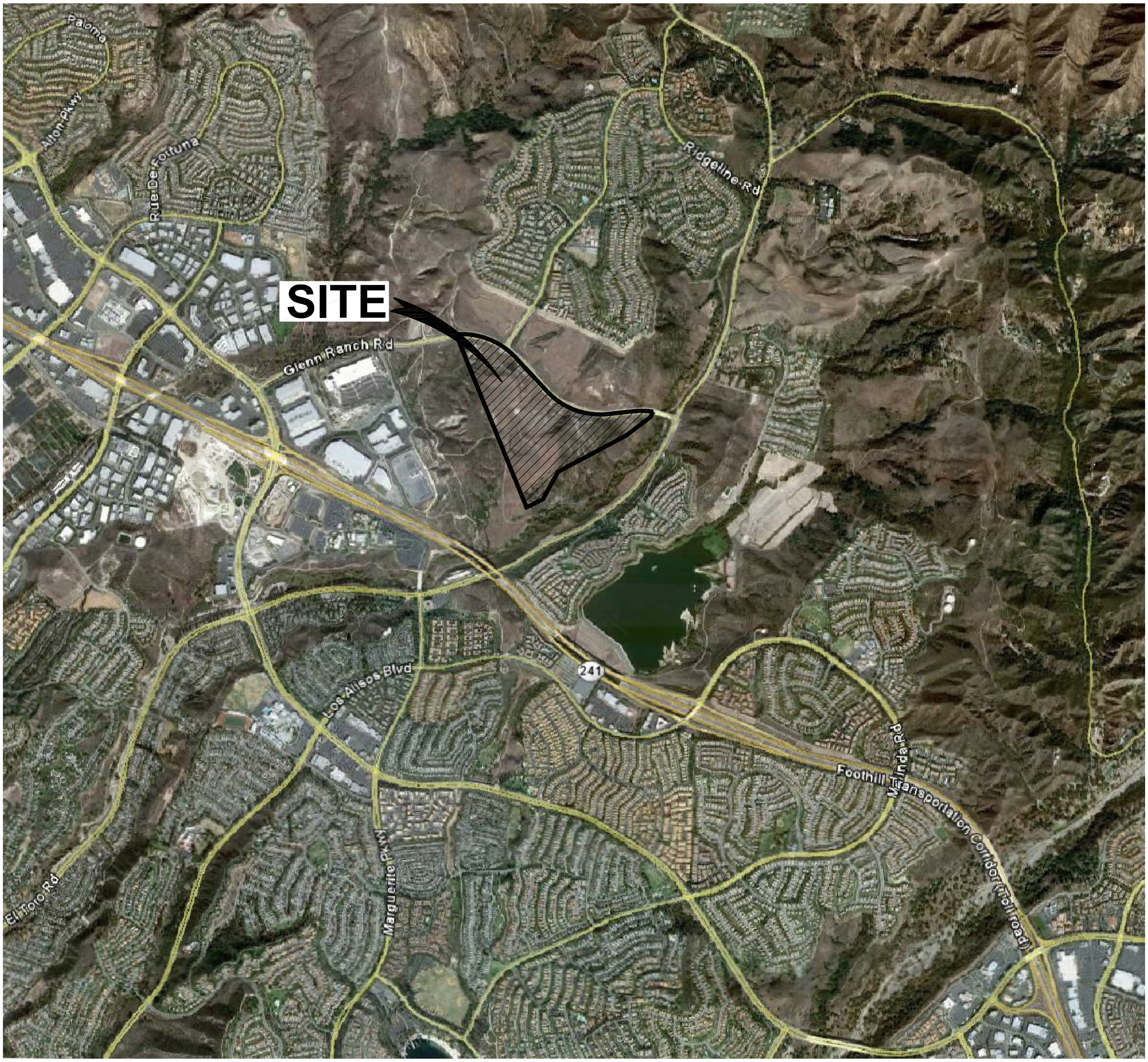
LIMITATIONS AND UNIFORMITY OF CONDITIONS

1. The recommendations of this report pertain only to the site investigated and are based upon the assumption that the soil conditions do not deviate from those disclosed in the investigation. If any variations or undesirable conditions are encountered during construction, or if the proposed construction will differ from that anticipated herein, Geocon Incorporated should be notified so that supplemental recommendations can be given. The evaluation or identification of the potential presence of hazardous or corrosive materials was not part of the scope of services provided by Geocon Incorporated.

2. This report is issued with the understanding that it is the responsibility of the owner, or of his representative, to ensure that the information and recommendations contained herein are brought to the attention of the architect and engineer for the project and incorporated into the plans, and the necessary steps are taken to see that the contractor and subcontractors carry out such recommendations in the field.

3. The findings of this report are valid as of the present date. However, changes in the conditions of a property can occur with the passage of time, whether they are due to natural processes or the works of man on this or adjacent properties. In addition, changes in applicable or appropriate standards may occur, whether they result from legislation or the broadening of knowledge. Accordingly, the findings of this report may be invalidated wholly or partially by changes outside our control. Therefore, this report is subject to review and should not be relied upon after a period of three years.

4. The firm that performed the geotechnical investigation for the project should be retained to provide testing and observation services during construction to provide continuity of geotechnical interpretation and to check that the recommendations presented for geotechnical aspects of site development are incorporated during site grading, construction of improvements, and excavation of foundations. If another geotechnical firm is selected to perform the testing and observation services during construction operations, that firm should prepare a letter indicating their intent to assume the responsibilities of project geotechnical engineer of record. A copy of the letter should be provided to the regulatory agency for their records. In addition, that firm should provide revised recommendations concerning the geotechnical aspects of the proposed development, or a written acknowledgement of their concurrence with the recommendations presented in our report. They should also perform additional analyses deemed necessary to assume the role of Geotechnical Engineer of Record.



THE GEOGRAPHICAL INFORMATION MADE AVAILABLE FOR DISPLAY WAS PROVIDED BY GOOGLE EARTH, SUBJECT TO A LICENSING AGREEMENT. THE INFORMATION IS FOR ILLUSTRATIVE PURPOSES ONLY; IT IS NOT INTENDED FOR CLIENT'S USE OR RELIANCE AND SHALL NOT BE REPRODUCED BY CLIENT. CLIENT SHALL INDEMNIFY, DEFEND AND HOLD HARMLESS GEOCON FROM ANY LIABILITY INCURRED AS A RESULT OF SUCH USE OR RELIANCE BY CLIENT.

N

NO SCALE

GEOCON
INCORPORATED

GEOTECHNICAL CONSULTANTS
6960 FLANDERS DRIVE - SAN DIEGO, CALIFORNIA 92121 - 2974
PHONE 858 558-6900 - FAX 858 558-6159

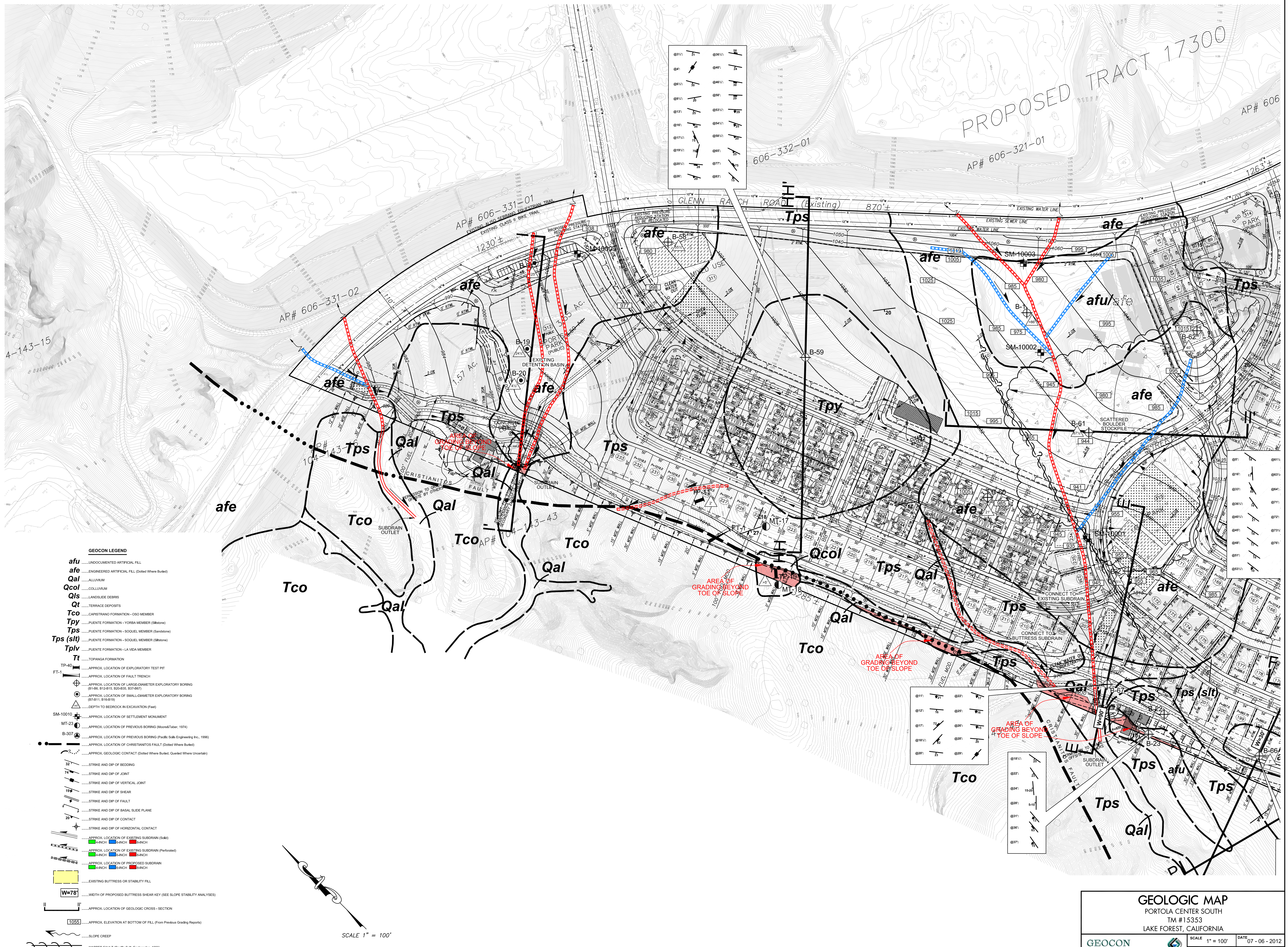
VICINITY MAP

PORTOLA CENTER SOUTH
TM #15353
LAKE FOREST, CALIFORNIA

CL / RA		DSK/GTYPD	DATE 07 - 06 - 2012	PROJECT NO. G1218 - 52 - 01A	FIG. 1

Vicinity Map

Y:/PROJECTS/G1218-52-01A PORTOLA CENTER SOUTH TM 15353/DETAILS/G1218_GVicinity Map (PortolaSouth).dwg



GEOCON LEGEND

afu	........UNDOCUMENTED ARTIFICIAL FILL
afe	........ENGINEERED ARTIFICIAL FILL (Dotted Where Buried)
Qal	........ALLUVIUM
Qcol	........COLLUVIUM
Qls	........LANDSLIDE DEBRIS
Qt	........TERRACE DEPOSITS
Tco	........CAPISTRANO FORMATION - OSO MEMBER
Tpy	........PUENTE FORMATION - YORBA MEMBER (Siltstone)
Tps	........PUENTE FORMATION - SOQUEL MEMBER (Sandstone)
Tps (slt)	........PUENTE FORMATION - SOQUEL MEMBER (Siltstone)
Tplv	........PUENTE FORMATION - LA VIDA MEMBER
Tt	........TOPANGA FORMATION
TP-40	........APPROX. LOCATION OF EXPLORATORY TEST PIT
FT-1	........APPROX. LOCATION OF FAULT TRENCH
⊕	........APPROX. LOCATION OF LARGE-DIAMETER EXPLORATORY BORING (B1-B6, B12-B15, B20-B35, B37-B67)
◉	........APPROX. LOCATION OF SMALL-DIAMETER EXPLORATORY BORING (B7-B11, B16-B19)
140'	........DEPTH TO BEDROCK IN EXCAVATION (Feet)
SM-10010	........APPROX. LOCATION OF SETTLEMENT MONUMENT
MT-23	........APPROX. LOCATION OF PREVIOUS BORING (Moore&Taber, 1974)
B-307	........APPROX. LOCATION OF PREVIOUS BORING (Pacific Soils Engineering Inc., 1996)
● ●▬ ▬	........APPROX. LOCATION OF CHRISTIANITOS FAULT (Dotted Where Buried)
?.....	........APPROX. GEOLOGIC CONTACT (Dotted Where Buried, Queried Where Uncertain)
32	........STRIKE AND DIP OF BEDDING
74	........STRIKE AND DIP OF JOINT
	........STRIKE AND DIP OF VERTICAL JOINT
19	........STRIKE AND DIP OF SHEAR
	........STRIKE AND DIP OF FAULT
	........STRIKE AND DIP OF BASAL SLIDE PLANE
20	........STRIKE AND DIP OF CONTACT
	........STRIKE AND DIP OF HORIZONTAL CONTACT
	........APPROX. LOCATION OF EXISTING SUBDRAIN (Solid) 🟩 4-INCH 🟦 6-INCH 🟥 8-INCH
	........APPROX. LOCATION OF EXISTING SUBDRAIN (Perforated) 🟩 4-INCH 🟦 6-INCH 🟥 8-INCH
	........APPROX. LOCATION OF PROPOSED SUBDRAIN 🟩 4-INCH 🟦 6-INCH 🟥 8-INCH
🟨	........EXISTING BUTTRESS OR STABILITY FILL
W=78'	........WIDTH OF PROPOSED BUTTRESS SHEAR KEY (SEE SLOPE STABILITY ANALYSES)
II II'	........APPROX. LOCATION OF GEOLOGIC CROSS - SECTION
1055	........APPROX. ELEVATION AT BOTTOM OF FILL (From Previous Grading Reports)
	........SLOPE CREEP
	........MAPPED FAULT (Pacific Soils Engineering, 1996)

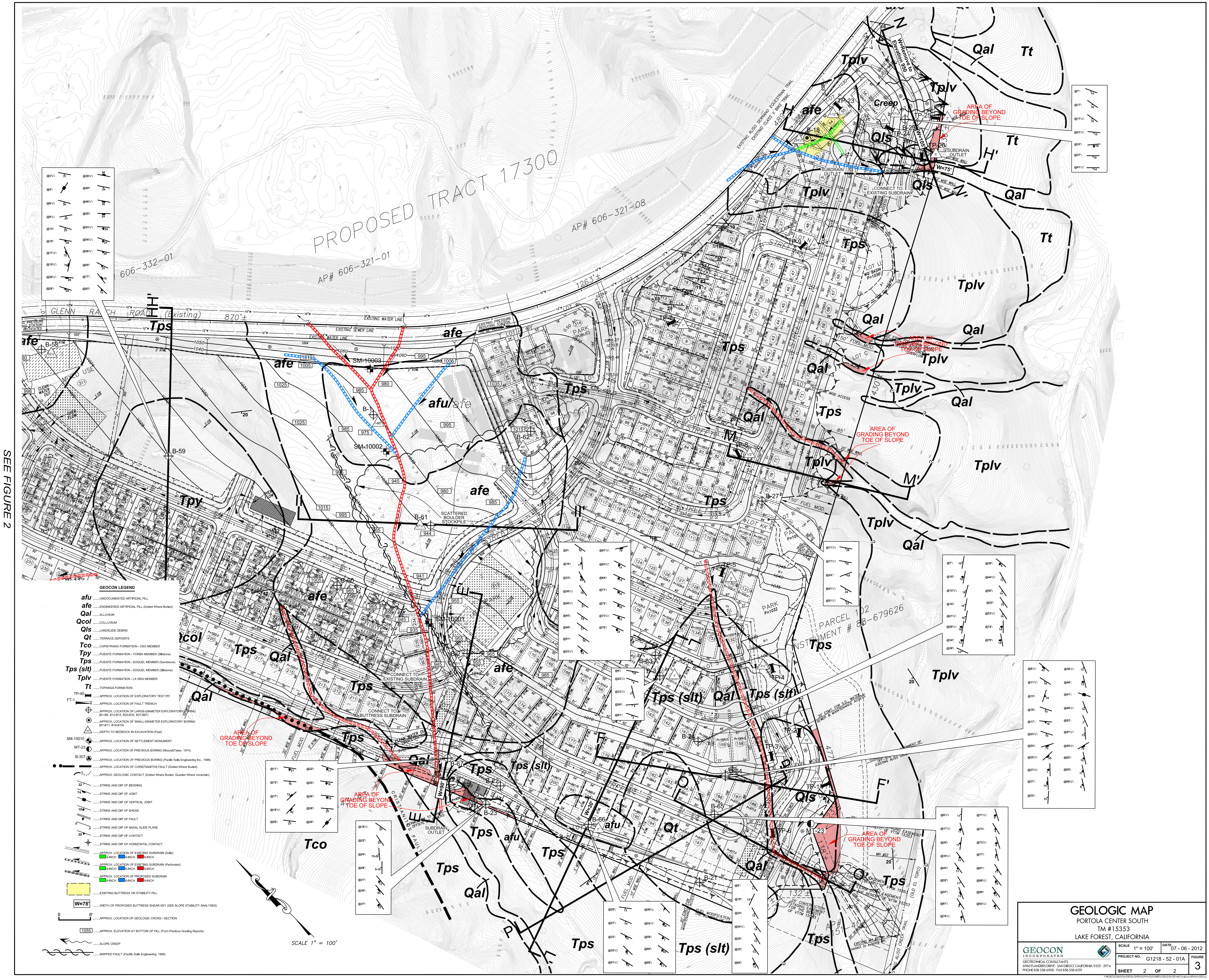
GEOLOGIC MAP

PORTOLA CENTER SOUTH
TM #15353
LAKE FOREST, CALIFORNIA

GEOCON
INCORPORATED
GEOTECHNICAL CONSULTANTS
6960 FLANDERS DRIVE - SAN DIEGO, CALIFORNIA 92121 - 2974
PHONE 858 558-6900 - FAX 858 558-6159

SCALE 1" = 100'
DATE 07 - 06 - 2012
PROJECT NO. G1218 - 52 - 01A
FIGURE 2
SHEET 1 OF 2

Y:/PROJECTS/G1218-52-01A PORTOLA CENTER SOUTH TM 15353/SHEETS/G1218-52-01A GEO-MAP_PortolaSouth (UPD-06-14-2012).dwg



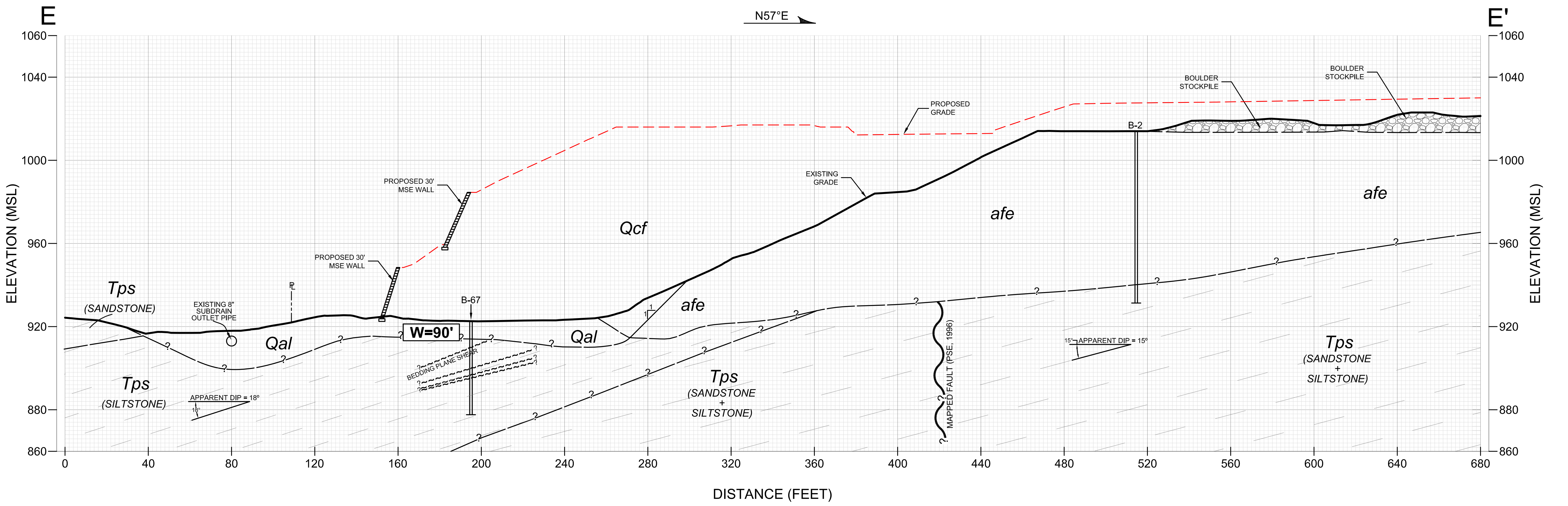
GEOLOGIC MAP

PORTOLA CENTER SOUTH
TM #15353
LAKE FOREST, CALIFORNIA

GEOCON
INCORPORATED
GEOTECHNICAL CONSULTANTS
6960 FLANDERS DRIVE - SAN DIEGO, CALIFORNIA 92121 - 2974
PHONE 858 558-6900 - FAX 858 558-6159

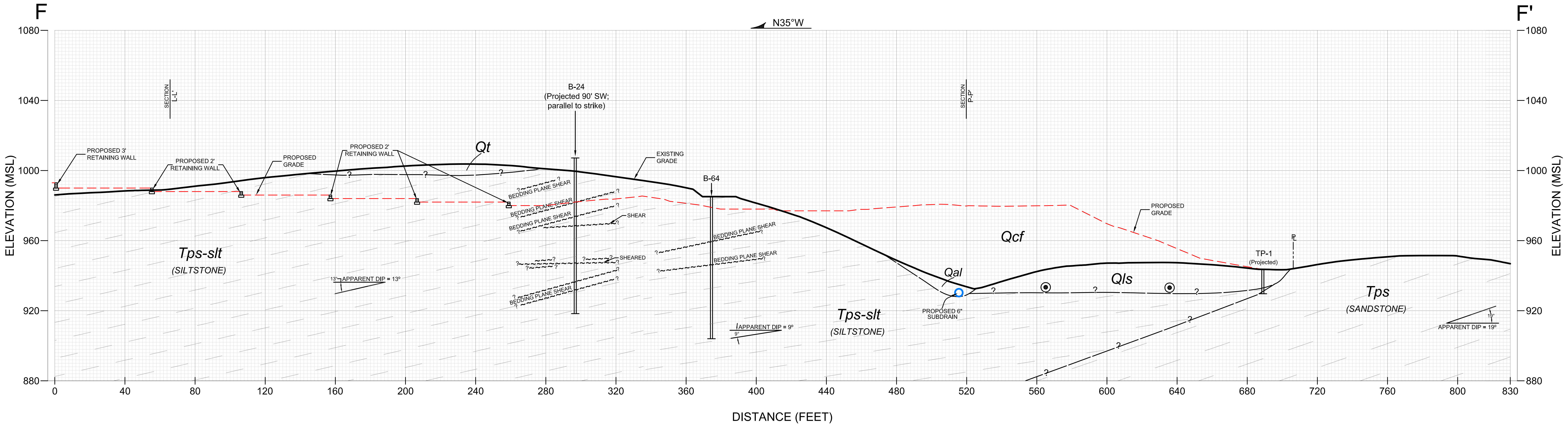
SCALE 1" = 100'
DATE 07 - 06 - 2012
PROJECT NO. G1218 - 52 - 01A
SHEET 2 OF 2
FIGURE 3

Y:/PROJECTS/G1218-52-01A PORTOLA CENTER SOUTH TM 15353/SHEETS/G1218-52-01A GEO-MAP_PortolaSouth (UPD-06-14-2012).dwg



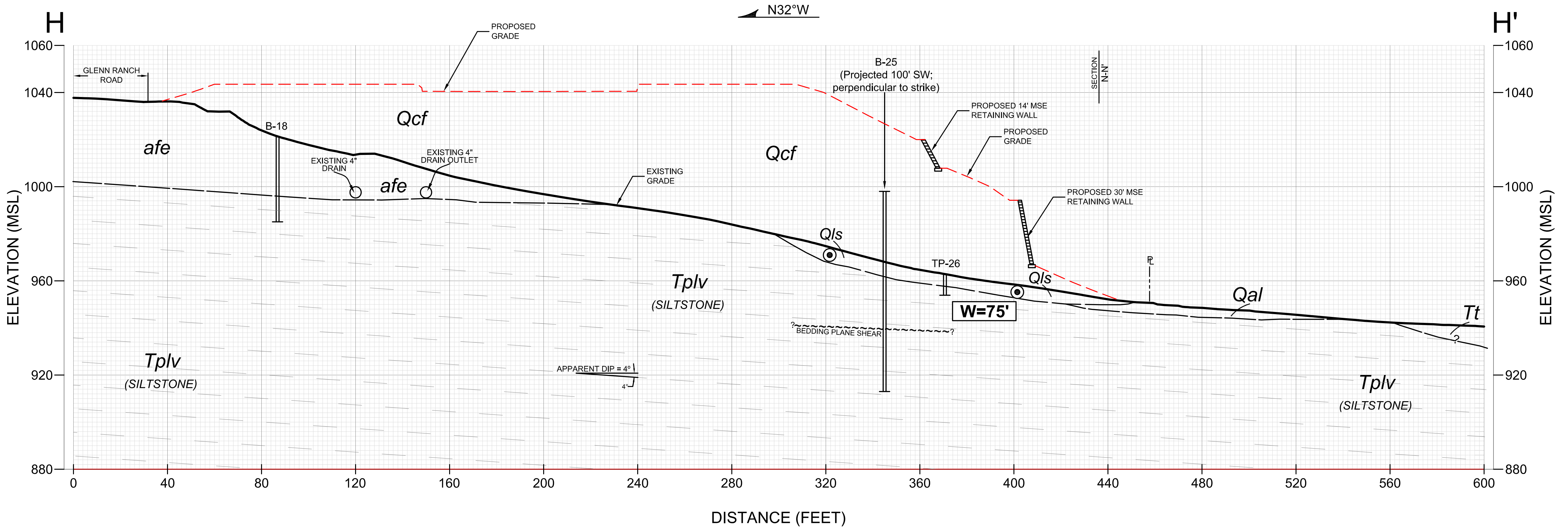
GEOLOGIC CROSS-SECTION E-E'

SCALE: 1" = 40' (Vert. = Horiz.)



GEOLOGIC CROSS-SECTION F-F'

SCALE: 1" = 40' (Vert. = Horiz.)



GEOLOGIC CROSS-SECTION H-H'

SCALE: 1" = 40' (Vert. = Horiz.)

LEGEND

Qcf	........COMPACTED FILL (Proposed)
afu	........UNDOCUMENTED ARTIFICIAL FILL
afe	........ENGINEERED ARTIFICIAL FILL
Qal	........ALLUVIUM
Qls	........LANDSLIDE DEBRIS
Qt	........TERRACE DEPOSITS
Tco	........CAPISTRANO FORMATION
Tpy	........PUENTE FORMATION - YORBA MEMBER (Siltstone)
Tps	........PUENTE FORMATION - SOQUEL MEMBER (Sandstone)
Tps (slt)	........PUENTE FORMATION - SOQUEL MEMBER (Siltstone)
Tplv	........PUENTE FORMATION - LA VIDA MEMBER
B-26	........APPROX. LOCATION OF EXPLORATORY EXCAVATION
15°	......APPROX. APPARENT DIP OF BEDDING
?	........APPROX. LOCATION OF GEOLOGIC CONTACT (Queried Where Uncertain)
⦿	........SENSE OF MOVEMENT OUT OF SECTION
?~~~~~~~~~	........APPROX. LOCATION OF BEDDING PLANE SHEAR (Queried Where Uncertain)
W=75'	........APPROX. WIDTH OF REQUIRED BUTTRESS IN FEET, SEE SLOPE STABILITY ANALYSES

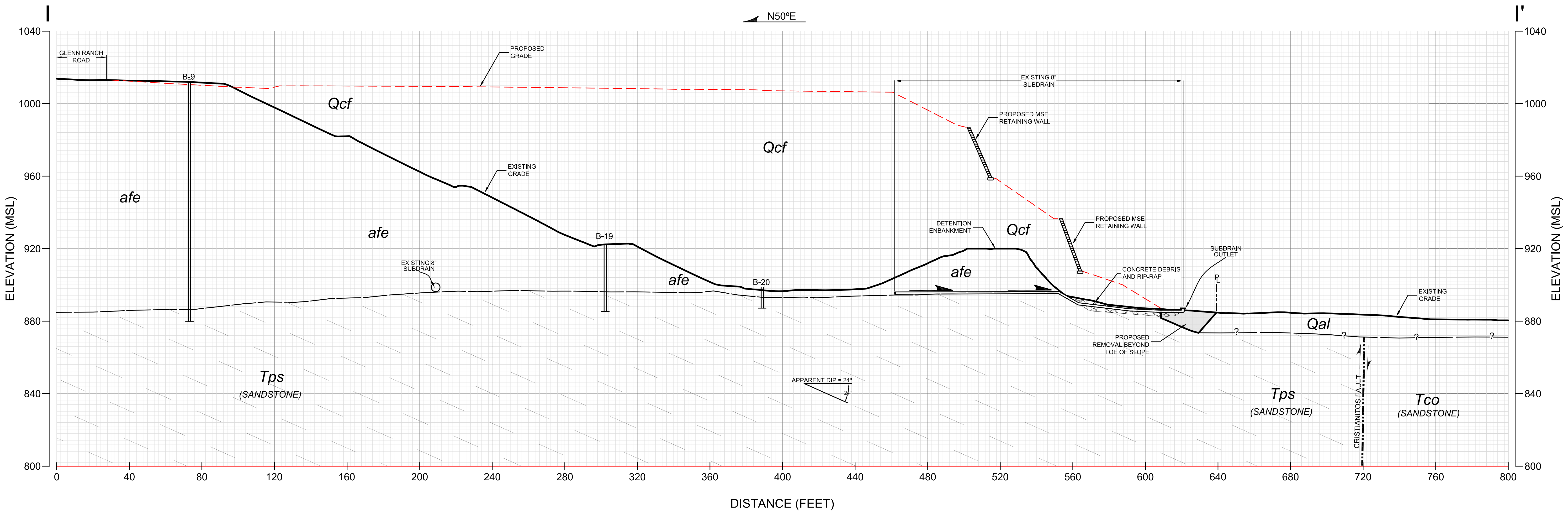
GEOLOGIC CROSS - SECTIONS

PORTOLA CENTER SOUTH
TM #15353
LAKE FOREST, CALIFORNIA

GEOCON
INCORPORATED
GEOTECHNICAL CONSULTANTS
6960 FLANDERS DRIVE - SAN DIEGO, CALIFORNIA 92121 - 2974
PHONE 858 558-6900 - FAX 858 558-6159

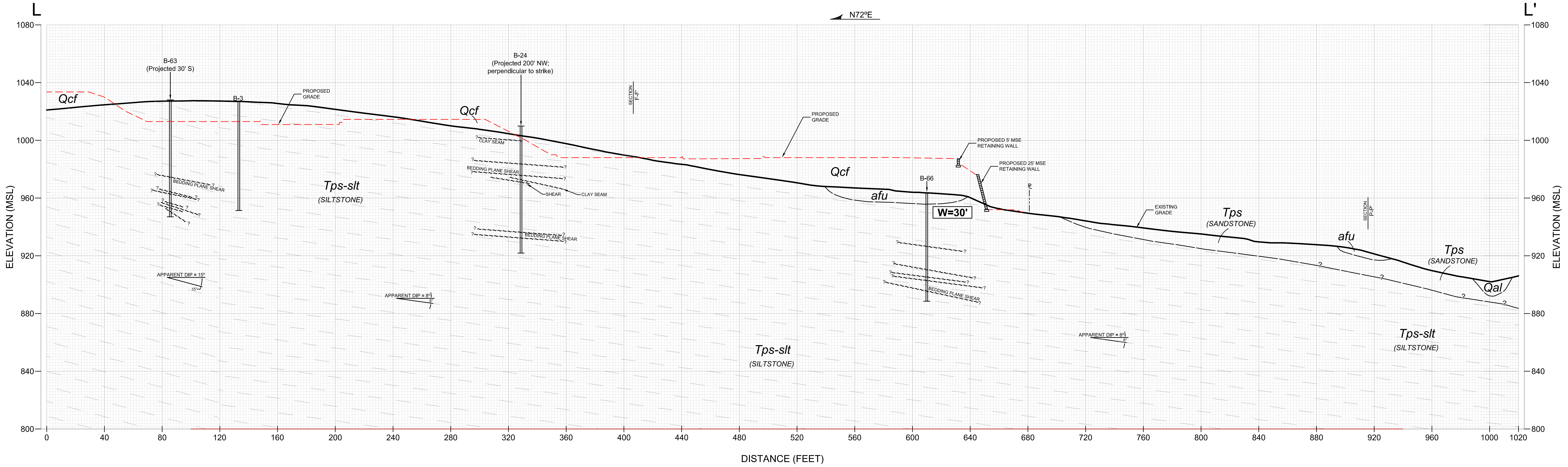
SCALE 1" = 40'
DATE 07 - 06 - 2012
PROJECT NO. G1218 - 52 - 01A
FIGURE 4
SHEET 1 OF 5

Y:/PROJECTS/G1218-52-01A PORTOLA CENTER SOUTH TM 15353/SHEETS/G1218-52-01A X-Sectns_PortolaSouth (UPD-06-14-2012).dwg



GEOLOGIC CROSS-SECTION I-I'

SCALE: 1" = 40' (Vert. = Horiz.)



GEOLOGIC CROSS-SECTION L-L'

SCALE: 1" = 40' (Vert. = Horiz.)

LEGEND

Qcf	COMPACTED FILL (Proposed)
afu	UNDOCUMENTED ARTIFICIAL FILL
afe	ENGINEERED ARTIFICIAL FILL
Qal	ALLUVIUM
Qls	LANDSLIDE DEBRIS
Qt	TERRACE DEPOSITS
Tco	CAPISTRANO FORMATION
Tpy	PUENTE FORMATION - YORBA MEMBER (Siltstone)
Tps	PUENTE FORMATION - SOQUEL MEMBER (Sandstone)
Tps (slt)	PUENTE FORMATION - SOQUEL MEMBER (Siltstone)
Tplv	PUENTE FORMATION - LA VIDA MEMBER
B-26	APPROX. LOCATION OF EXPLORATORY EXCAVATION
15°	APPROX. APPARENT DIP OF BEDDING
?	APPROX. LOCATION OF GEOLOGIC CONTACT (Queried Where Uncertain)
⦿	SENSE OF MOVEMENT OUT OF SECTION
?~~~~~~~~~	APPROX. LOCATION OF BEDDING PLANE SHEAR (Queried Where Uncertain)
W=75'	APPROX. WIDTH OF REQUIRED BUTTRESS IN FEET, SEE SLOPE STABILITY ANALYSES

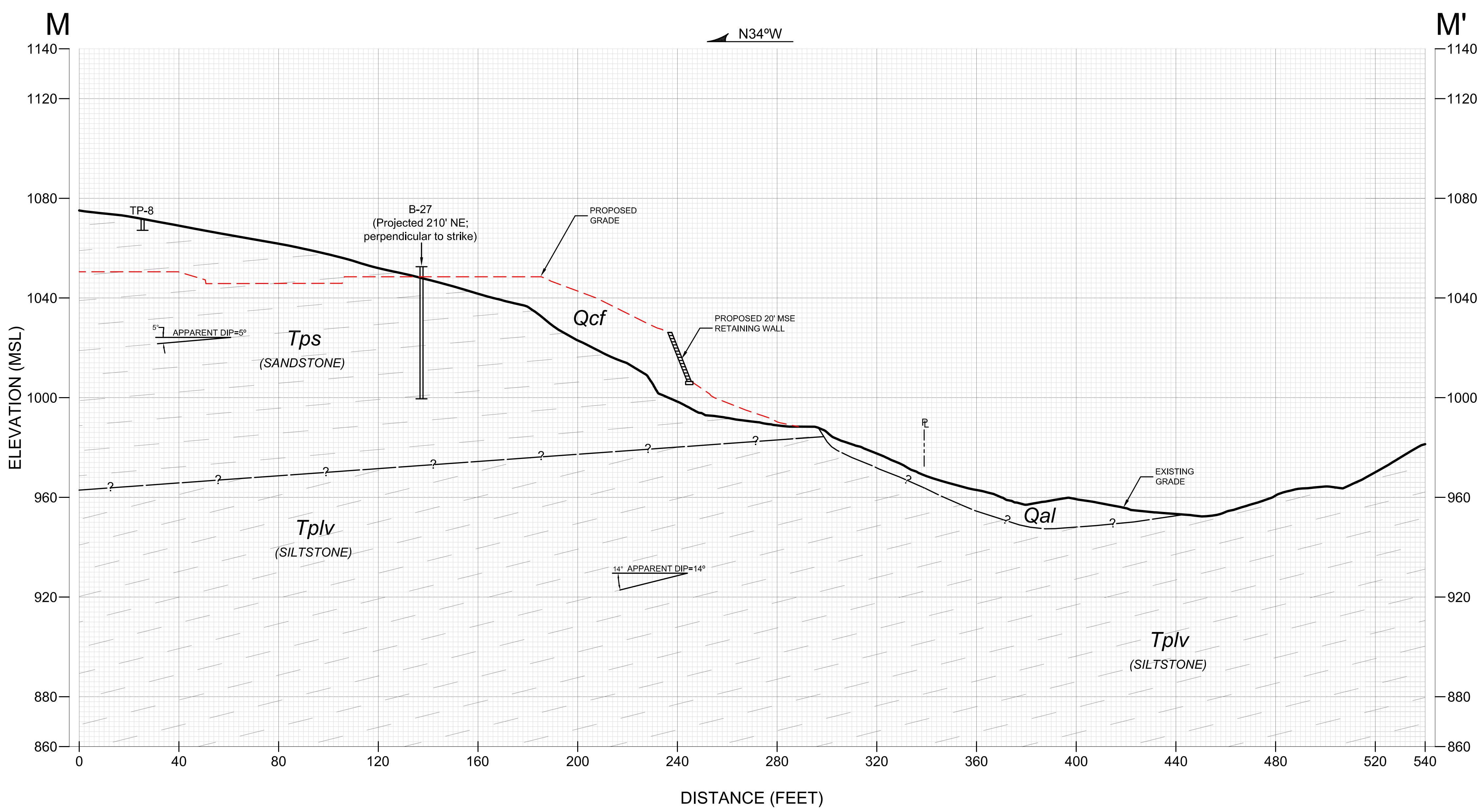
GEOLOGIC CROSS - SECTIONS

PORTOLA CENTER SOUTH
TM #15353
LAKE FOREST, CALIFORNIA

GEOCON
INCORPORATED
GEOTECHNICAL CONSULTANTS
6960 FLANDERS DRIVE - SAN DIEGO, CALIFORNIA 92121 - 2974
PHONE 858 558-6900 - FAX 858 558-6159

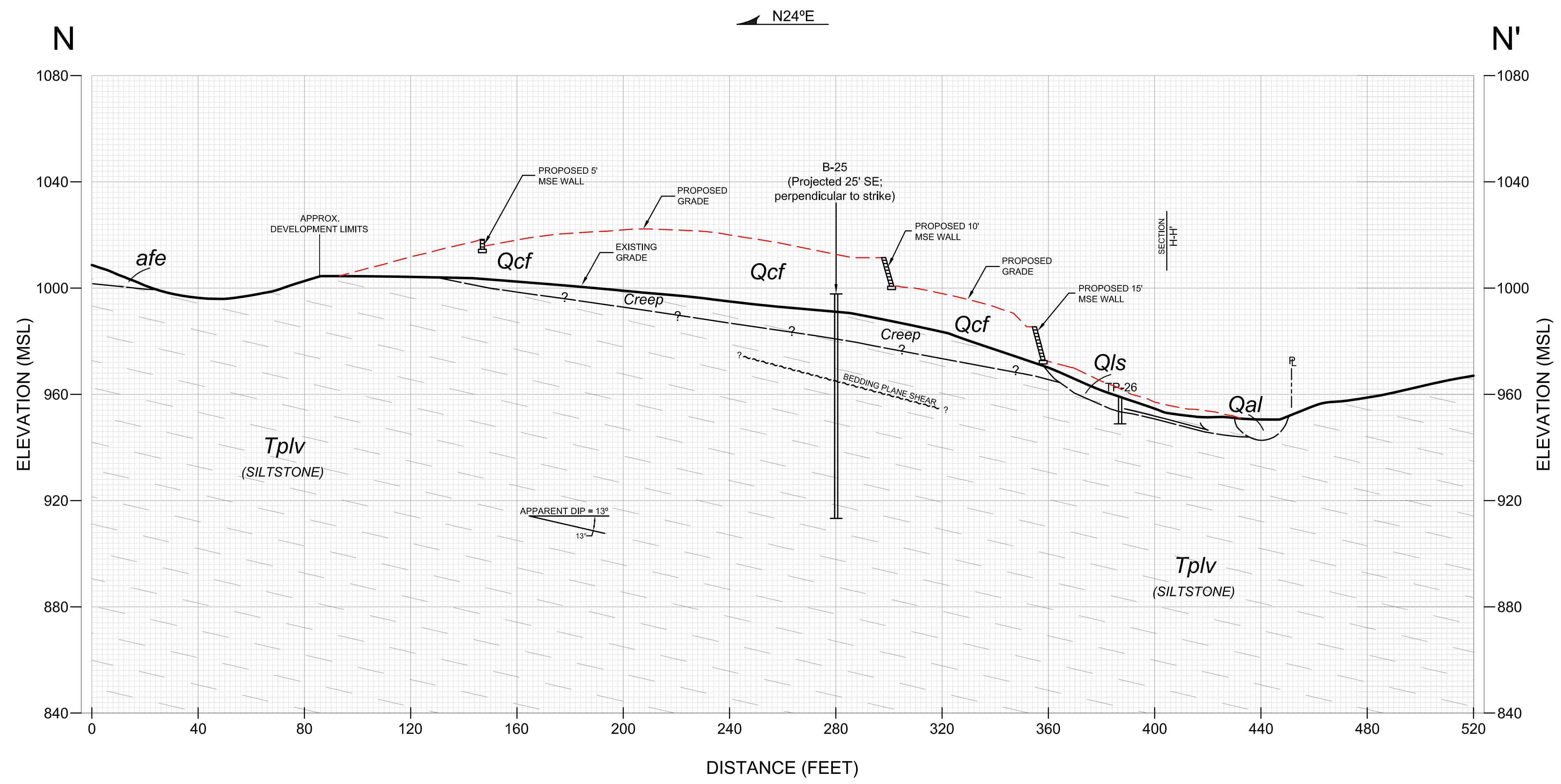
SCALE 1" = 40'
DATE 07 - 06 - 2012
PROJECT NO. G1218 - 52 - 01A
FIGURE 5
SHEET 2 OF 5

Y:/PROJECTS/G1218-52-01A PORTOLA CENTER SOUTH TM 15353/SHEETS/G1218-52-01A X-Sectns_PortolaSouth (UPD-06-14-2012).dwg



GEOLOGIC CROSS-SECTION M-M'

SCALE: 1" = 40' (Vert. = Horiz.)



GEOLOGIC CROSS-SECTION N-N'

SCALE: 1" = 40' (Vert. = Horiz.)

LEGEND

Qcf	........COMPACTED FILL (Proposed)
afu	........UNDOCUMENTED ARTIFICIAL FILL
afe	........ENGINEERED ARTIFICIAL FILL
Qal	........ALLUVIUM
Qls	........LANDSLIDE DEBRIS
Qt	........TERRACE DEPOSITS
Tco	........CAPISTRANO FORMATION
Tpy	........PUENTE FORMATION - YORBA MEMBER (Siltstone)
Tps	........PUENTE FORMATION - SOQUEL MEMBER (Sandstone)
Tps (slt)	........PUENTE FORMATION - SOQUEL MEMBER (Siltstone)
Tplv	........PUENTE FORMATION - LA VIDA MEMBER
B-26 ‖	........APPROX. LOCATION OF EXPLORATORY EXCAVATION
15°	......APPROX. APPARENT DIP OF BEDDING
?	........APPROX. LOCATION OF GEOLOGIC CONTACT (Queried Where Uncertain)
⦿	........SENSE OF MOVEMENT OUT OF SECTION
?~~~~~~~~	........APPROX. LOCATION OF BEDDING PLANE SHEAR (Queried Where Uncertain)
W=75'	........APPROX. WIDTH OF REQUIRED BUTTRESS IN FEET, SEE SLOPE STABILITY ANALYSES

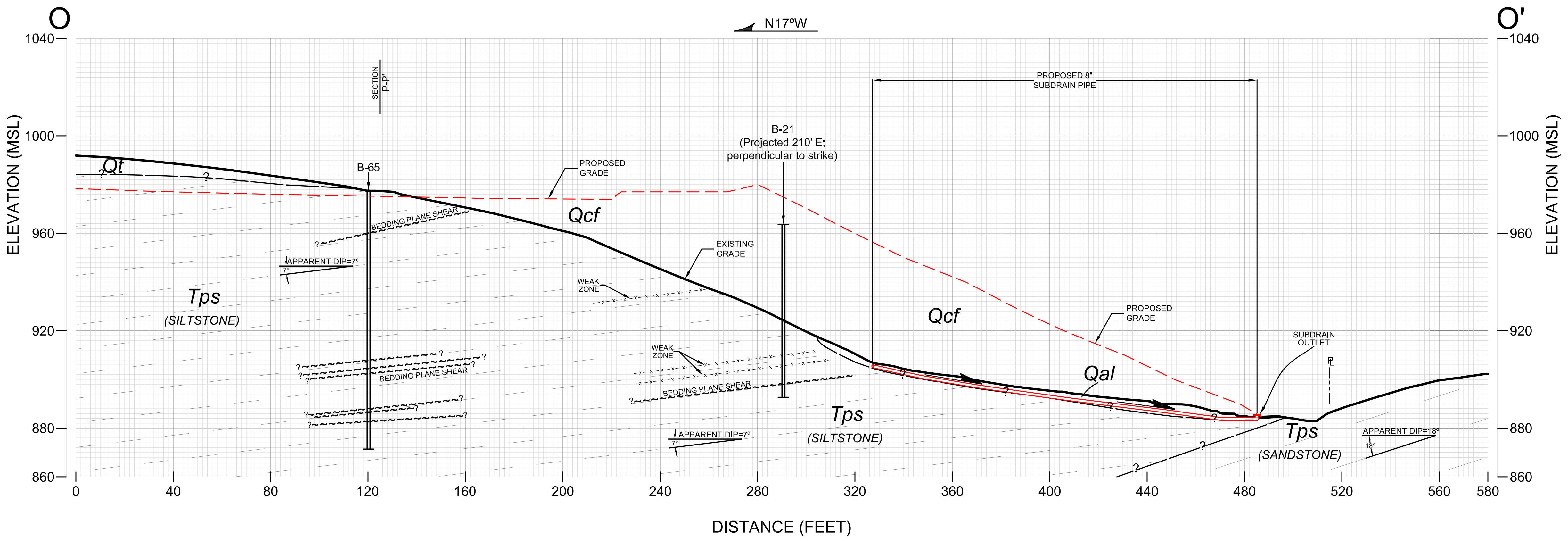
GEOLOGIC CROSS - SECTIONS

PORTOLA CENTER SOUTH
TM #15353
LAKE FOREST, CALIFORNIA

GEOCON
INCORPORATED
GEOTECHNICAL CONSULTANTS
6960 FLANDERS DRIVE - SAN DIEGO, CALIFORNIA 92121 - 2974
PHONE 858 558-6900 - FAX 858 558-6159

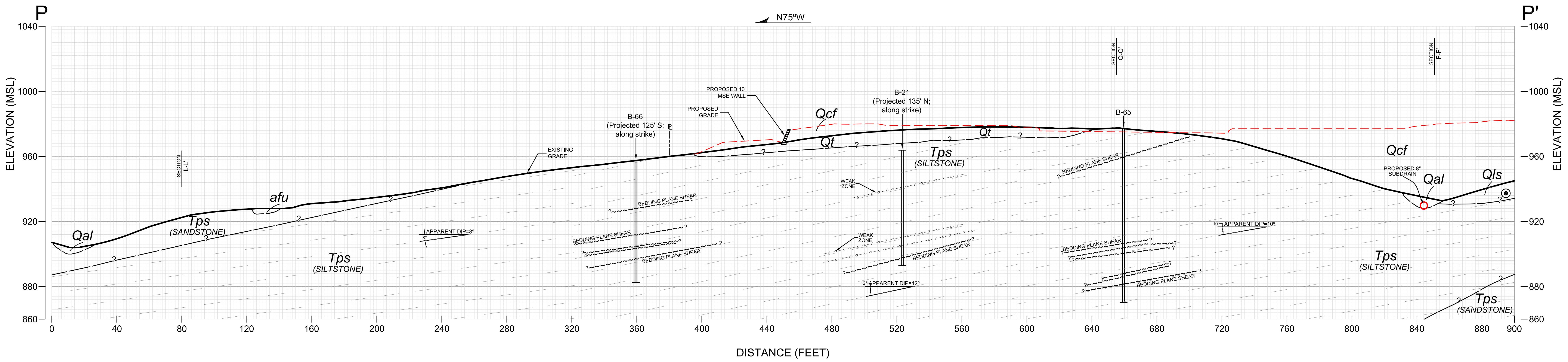
SCALE 1" = 40'
DATE 07 - 06 - 2012
PROJECT NO. G1218 - 52 - 01A
FIGURE 6
SHEET 3 OF 5

Y:/PROJECTS/G1218-52-01A PORTOLA CENTER SOUTH TM 15353/SHEETS/G1218-52-01A X-Sectns_PortolaSouth (UPD-06-14-2012).dwg



GEOLOGIC CROSS-SECTION O-O'

SCALE: 1" = 40' (Vert. = Horiz.)



GEOLOGIC CROSS-SECTION P-P'

SCALE: 1" = 40' (Vert. = Horiz.)

LEGEND

Qcf	COMPACTED FILL (Proposed)
afu	UNDOCUMENTED ARTIFICIAL FILL
afe	ENGINEERED ARTIFICIAL FILL
Qal	ALLUVIUM
Qls	LANDSLIDE DEBRIS
Qt	TERRACE DEPOSITS
Tco	CAPISTRANO FORMATION
Tpy	PUENTE FORMATION - YORBA MEMBER (Siltstone)
Tps	PUENTE FORMATION - SOQUEL MEMBER (Sandstone)
Tps (slt)	PUENTE FORMATION - SOQUEL MEMBER (Siltstone)
Tplv	PUENTE FORMATION - LA VIDA MEMBER
B-26 ╨	APPROX. LOCATION OF EXPLORATORY EXCAVATION
15°	APPROX. APPARENT DIP OF BEDDING
⁀?‿	APPROX. LOCATION OF GEOLOGIC CONTACT (Queried Where Uncertain)
⦿	SENSE OF MOVEMENT OUT OF SECTION
?~~~~~~~~	APPROX. LOCATION OF BEDDING PLANE SHEAR (Queried Where Uncertain)
W=75'	APPROX. WIDTH OF REQUIRED BUTTRESS IN FEET, SEE SLOPE STABILITY ANALYSES

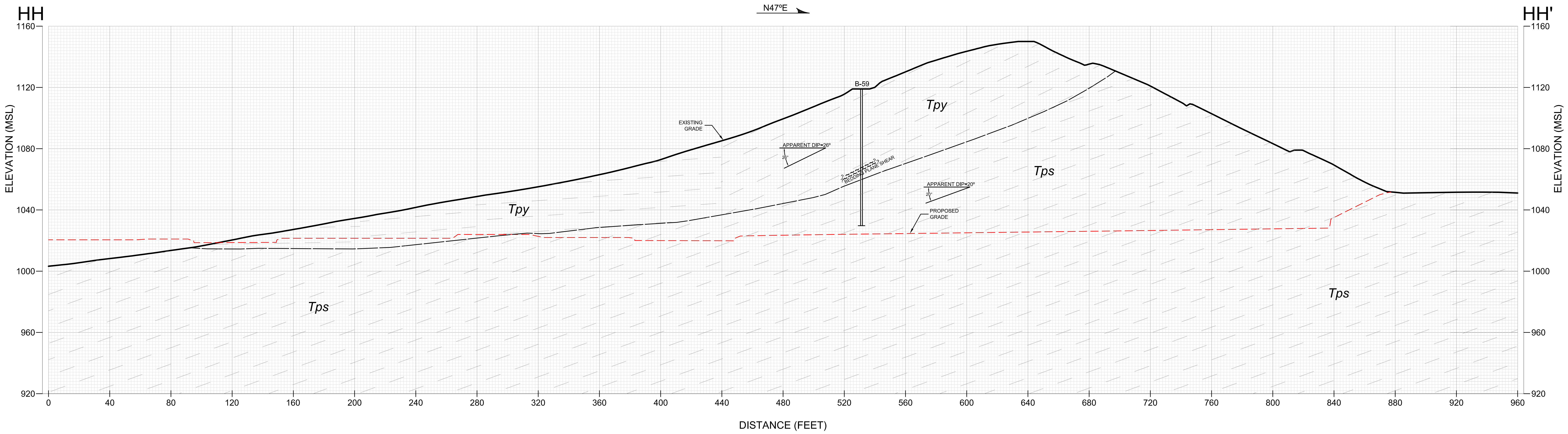
GEOLOGIC CROSS - SECTIONS

PORTOLA CENTER SOUTH
TM #15353
LAKE FOREST, CALIFORNIA

GEOCON
INCORPORATED
GEOTECHNICAL CONSULTANTS
6960 FLANDERS DRIVE - SAN DIEGO, CALIFORNIA 92121 - 2974
PHONE 858 558-6900 - FAX 858 558-6159

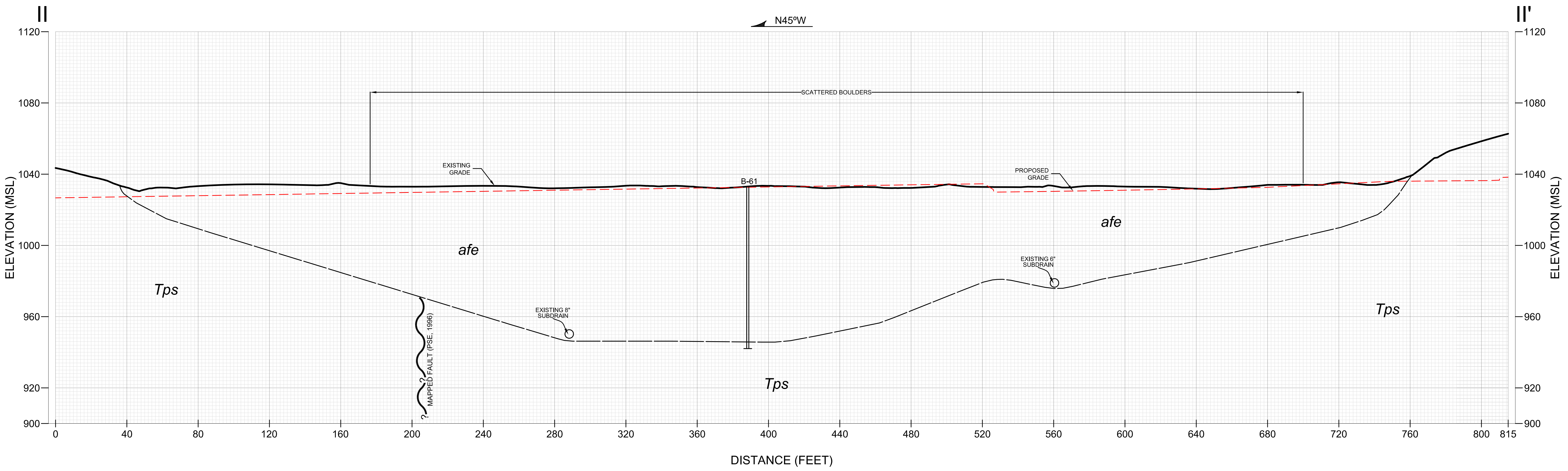
SCALE 1" = 40'
DATE 07 - 06 - 2012
PROJECT NO. G1218 - 52 - 01A
FIGURE 7
SHEET 4 OF 5

Y:/PROJECTS/G1218-52-01A PORTOLA CENTER SOUTH TM 15353/SHEETS/G1218-52-01A X-Sectns_PortolaSouth (UPD-06-14-2012).dwg



GEOLOGIC CROSS-SECTION HH-HH'

SCALE: 1" = 40' (Vert. = Horiz.)



GEOLOGIC CROSS-SECTION II-II'

SCALE: 1" = 40' (Vert. = Horiz.)

LEGEND

Qcf	........COMPACTED FILL (Proposed)
afu	........UNDOCUMENTED ARTIFICIAL FILL
afe	........ENGINEERED ARTIFICIAL FILL
Qal	........ALLUVIUM
Qls	........LANDSLIDE DEBRIS
Qt	........TERRACE DEPOSITS
Tco	........CAPISTRANO FORMATION
Tpy	........PUENTE FORMATION - YORBA MEMBER (Siltstone)
Tps	........PUENTE FORMATION - SOQUEL MEMBER (Sandstone)
Tps (slt)	........PUENTE FORMATION - SOQUEL MEMBER (Siltstone)
Tplv	........PUENTE FORMATION - LA VIDA MEMBER
B-26 ‖	........APPROX. LOCATION OF EXPLORATORY EXCAVATION
15°	......APPROX. APPARENT DIP OF BEDDING
⁀?‿	........APPROX. LOCATION OF GEOLOGIC CONTACT (Queried Where Uncertain)
⦿	........SENSE OF MOVEMENT OUT OF SECTION
?~~~~~~~~~	........APPROX. LOCATION OF BEDDING PLANE SHEAR (Queried Where Uncertain)
W=75'	........APPROX. WIDTH OF REQUIRED BUTTRESS IN FEET, SEE SLOPE STABILITY ANALYSES

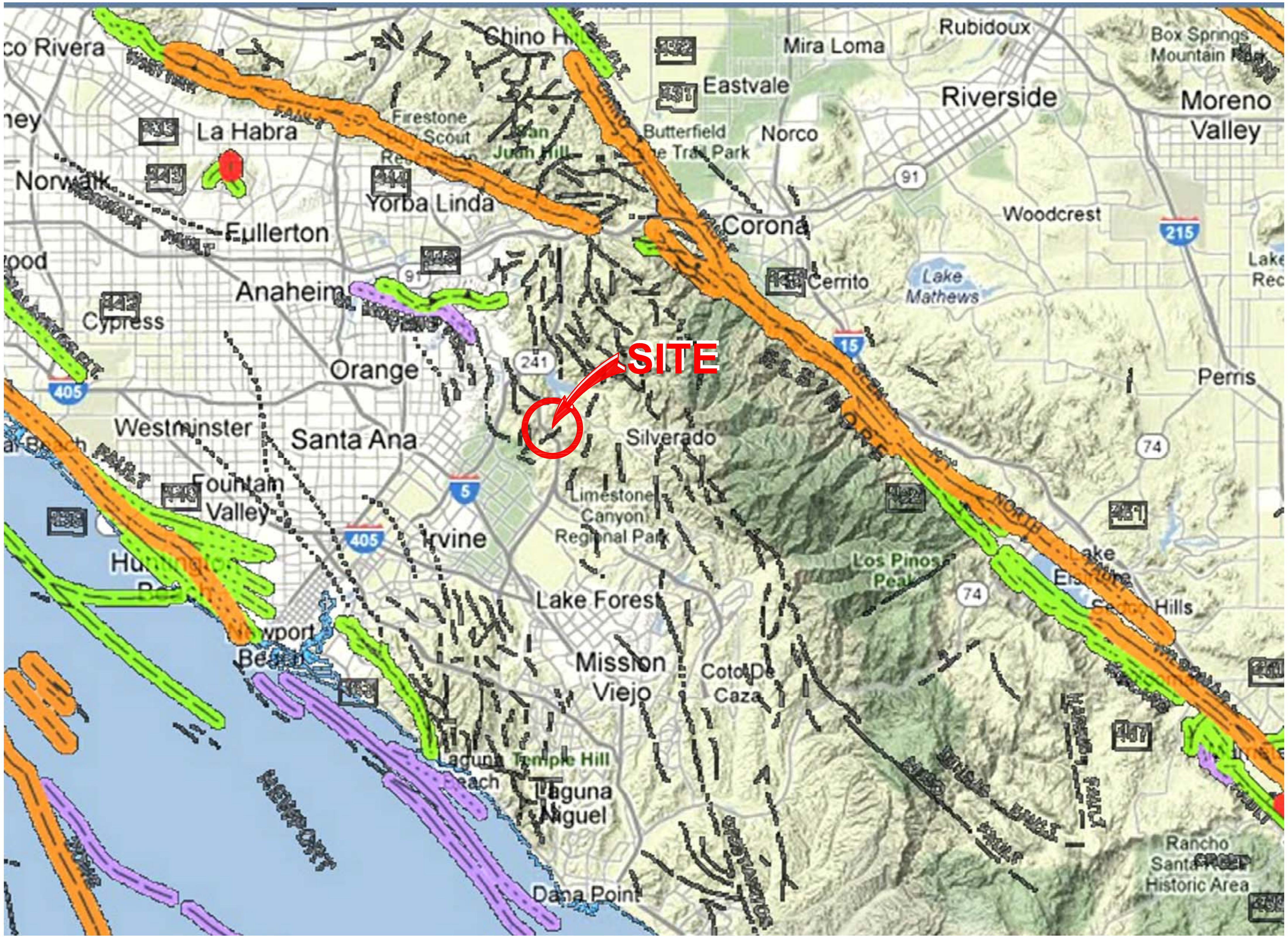
GEOLOGIC CROSS - SECTIONS

PORTOLA CENTER SOUTH
TM #15353
LAKE FOREST, CALIFORNIA

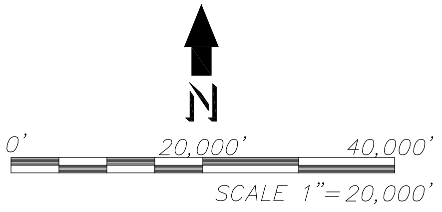
GEOCON
INCORPORATED
GEOTECHNICAL CONSULTANTS
6960 FLANDERS DRIVE - SAN DIEGO, CALIFORNIA 92121 - 2974
PHONE 858 558-6900 - FAX 858 558-6159

SCALE 1" = 40'
DATE 07 - 06 - 2012
PROJECT NO. G1218 - 52 - 01A
FIGURE 8
SHEET 5 OF 5

Y:/PROJECTS/G1218-52-01A PORTOLA CENTER SOUTH TM 15353/SHEETS/G1218-52-01A X-Sectns_PortolaSouth (UPD-06-14-2012).dwg



SOURCE: *2010 Fault Activity Map of California;* California Geological Survey, Geologic Data Map No.6
Compilation and Interpretation by: Charles W. Jennings and William A. Bryant



Explanation

Fault traces on land are indicated by solid lines where well located, by dashed lines where approximately located or inferred, and by dotted lines where concealed by younger rocks or by lakes or bays. Fault traces are queried where continuation or existence is uncertain.

FAULT CLASSIFICATION COLOR CODE

(Indicating Recency of Movement)

🟥 Fault along which historic (last 200 years) displacement has occurred.

🟧 Holocene fault displacement (during past 11,700 years) without historic record.

🟩 Late Quaternary fault displacement (during past 700,000 years).

🟪 Quaternary fault (age undifferentiated).

———— — — —.......?. Pre-Quaternary fault (older that 1.6 million years) or fault without recognized Quaternary displacement.

ADDITIONAL FAULT SYMBOLS

Bar and ball on downthrown side (relative or apparent).

Arrows along fault indicate relative or apparent direction of lateral movement.

Arrow on fault indicates direction of dip.

Low angle fault (barbs on upper plate).

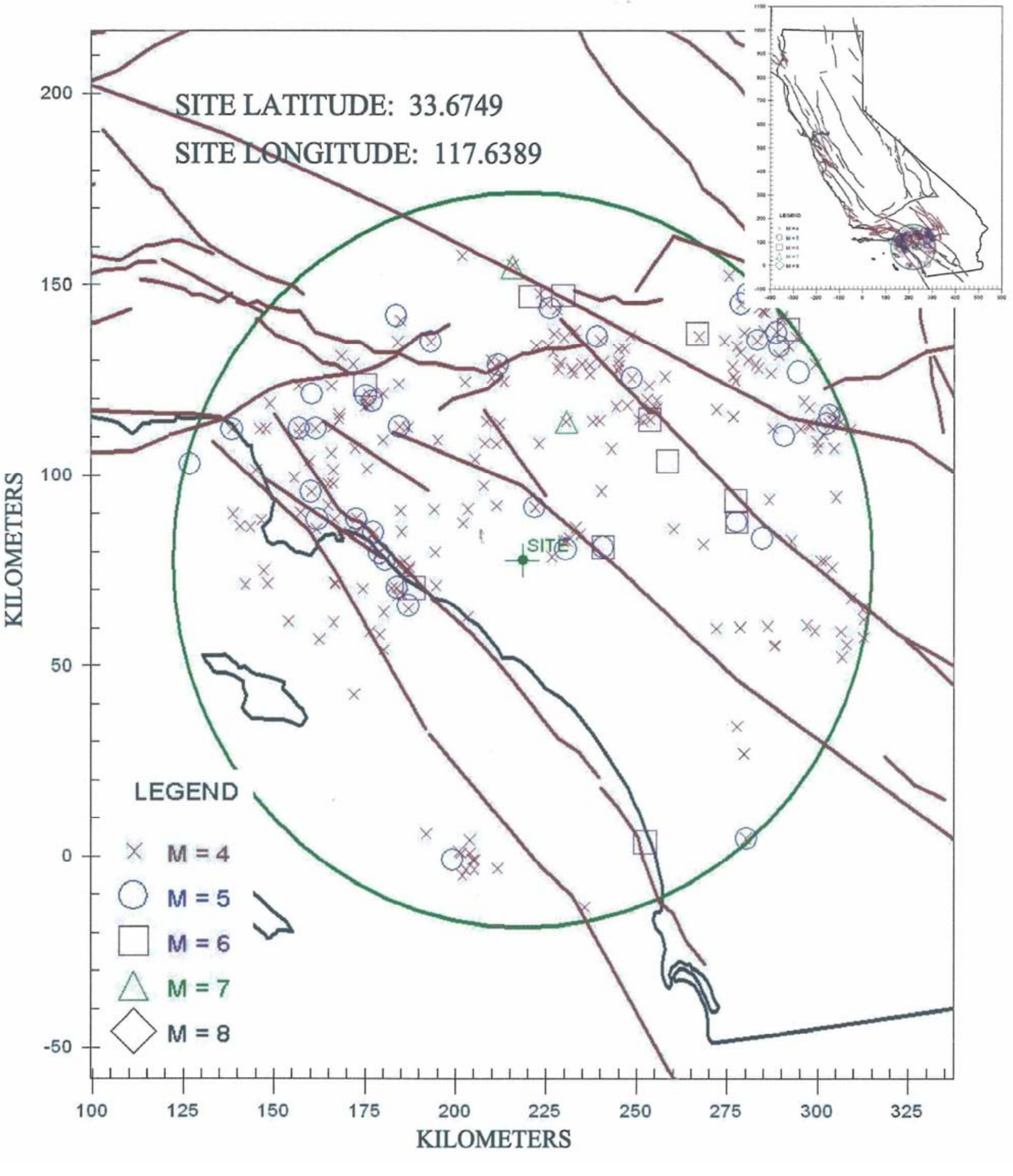
REGIONAL FAULT MAP

PORTOLA CENTER SOUTH
TM #15353
LAKE FOREST, CALIFORNIA

GEOCON
INCORPORATED
GEOTECHNICAL CONSULTANTS
6960 FLANDERS DRIVE - SAN DIEGO, CALIFORNIA 92121 - 2974
PHONE 858 558-6900 - FAX 858 558-6159

SCALE 1" = 20,000'
DATE 07 - 06 - 2012
PROJECT NO. G1218 - 52 - 01A
FIGURE 9
SHEET 1 OF 1

Y:\PROJECTS\G1218-52-01A PORTOLA CENTER SOUTH TM 15353\DETAILS\G1218 RegionalFaultMap (PortolaCenterSouth).dwg



GEOCON
INCORPORATED

GEOTECHNICAL CONSULTANTS
6960 FLANDERS DRIVE - SAN DIEGO, CALIFORNIA 92121 - 2974
PHONE 858 558-6900 - FAX 858 558-6159

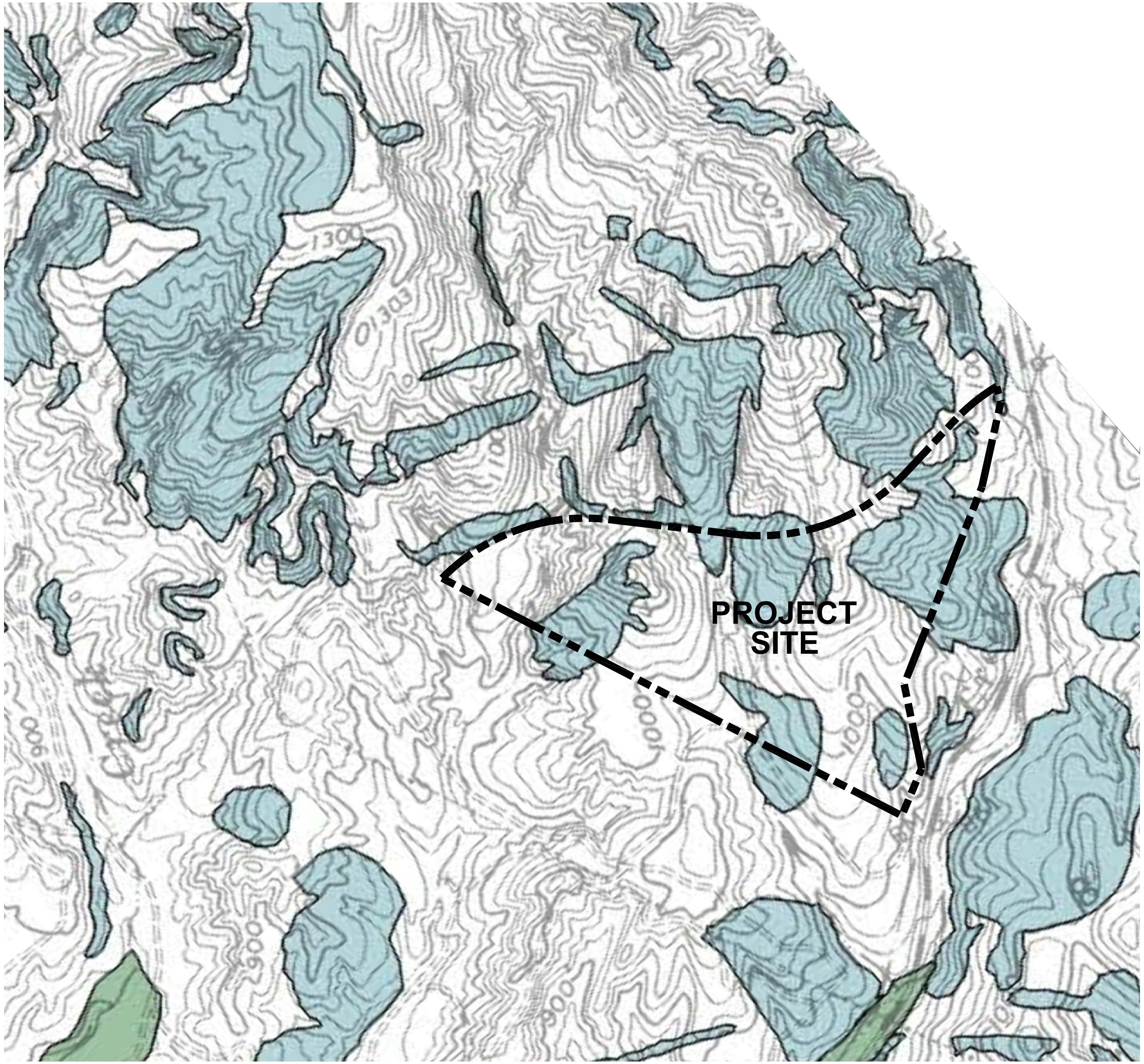
CALIFORNIA SEISMICITY MAP

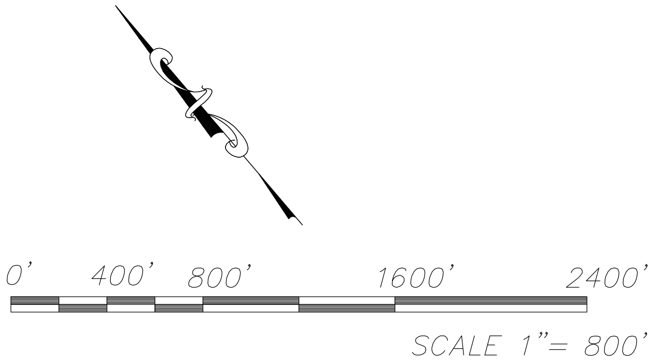
PORTOLA CENTER SOUTH
TM #15353
LAKE FOREST, CALIFORNIA

JH/RA		DSK/GTYPD	DATE 07 - 06 - 2012	PROJECT NO. G1218 - 52 - 01A	FIG. 10

Y:/PROJECTS/G1218-52-01A PORTOLA CENTER SOUTH TM 15353/DETAILS/G1218_CaliforniaSeismicityMap-PortolaCenter.dwg

PORTOLA CENTER SOUTH
TM #15353
LAKE FOREST, CALIFORNIA





Zones of Required Investigation:

Liquefaction

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

Earthquake-Induced Landslides

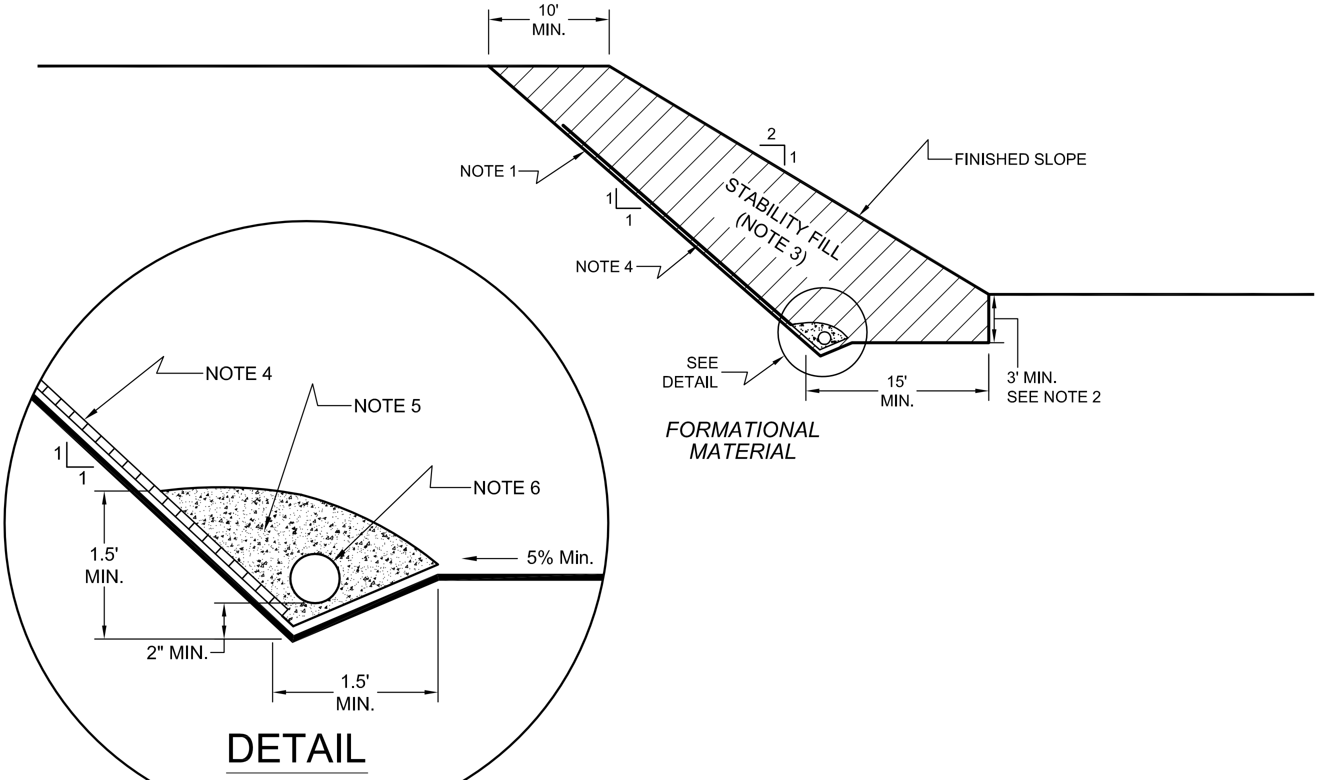
🟦 Areas where previous occurrence of landslide movement, or local topographic, geological, geotechnical and subsurface water conditions indicate a potential for permanent ground displacements such that mitigation as defined in Public Resources Code Section 2693(c) would be required.

REFERENCE:
STATE OF CALIFORNIA SEISMIC HAZARD ZONES
EL TORO QUADRANGLE OFFICIAL MAP
RELEASED: JANUARY 17, 2001

SEISMIC HAZARDS ZONES MAP

GEOCON
INCORPORATED
GEOTECHNICAL CONSULTANTS
6960 FLANDERS DRIVE - SAN DIEGO, CALIFORNIA 92121 - 2974
PHONE 858 558-6900 - FAX 858 558-6159

PROJECT NO. G1218 - 52 - 01A
FIGURE 11
DATE 07 - 06 - 2012



NOTES:

1.....EXCAVATE BACKCUT AT 1:1 INCLINATION (UNLESS OTHERWISE NOTED).

2.....BASE OF STABILITY FILL TO BE 3 FEET INTO FORMATIONAL MATERIAL, SLOPING A MINIMUM 5% INTO SLOPE.

3.....STABILITY FILL TO BE COMPOSED OF PROPERLY COMPACTED GRANULAR SOIL.

4.....CHIMNEY DRAINS TO BE APPROVED PREFABRICATED CHIMNEY DRAIN PANELS (MIRADRAIN G200N OR EQUIVALENT) SPACED APPROXIMATELY 20 FEET CENTER TO CENTER AND 4 FEET WIDE. CLOSER SPACING MAY BE REQUIRED IF SEEPAGE IS ENCOUNTERED.

5.....FILTER MATERIAL TO BE 3/4-INCH, OPEN-GRADED CRUSHED ROCK ENCLOSED IN APPROVED FILTER FABRIC (MIRAFI 140NC).

6.....COLLECTOR PIPE TO BE 4-INCH MINIMUM DIAMETER, PERFORATED, THICK-WALLED PVC SCHEDULE 40 OR EQUIVALENT, AND SLOPED TO DRAIN AT 1 PERCENT MINIMUM TO APPROVED OUTLET.

NO SCALE

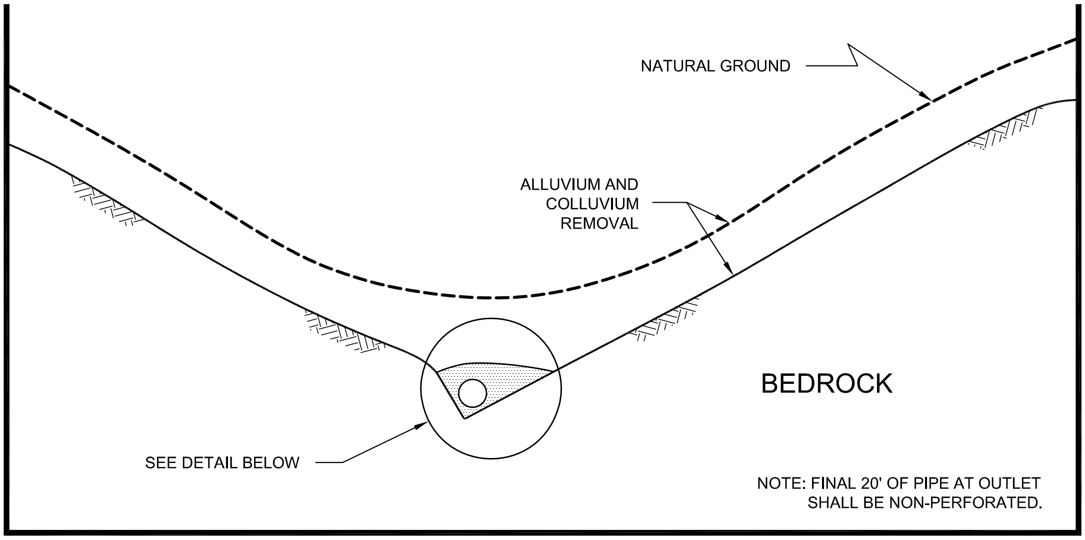
TYPICAL STABILITY FILL DETAIL

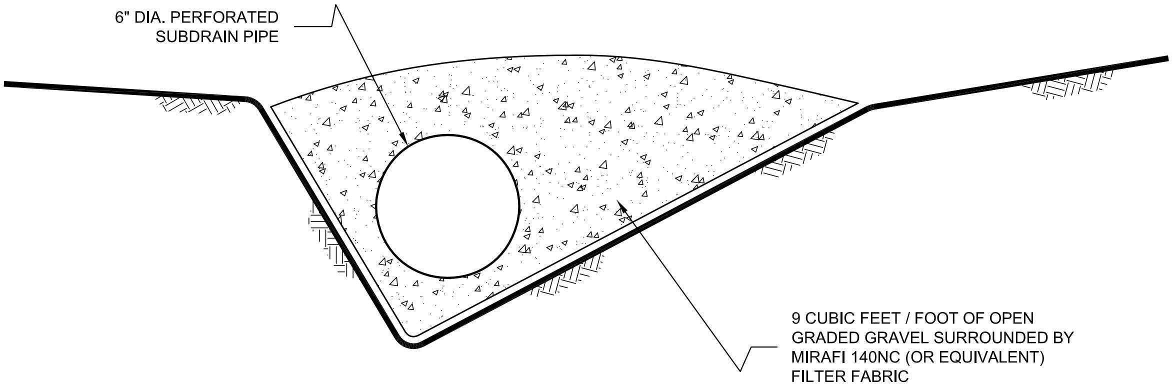
GEOCON
INCORPORATED
GEOTECHNICAL CONSULTANTS
6960 FLANDERS DRIVE - SAN DIEGO, CALIFORNIA 92121 - 2974
PHONE 858 558-6900 - FAX 858 558-6159

PORTOLA CENTER SOUTH
TM #15353
LAKE FOREST, CALIFORNIA

CL / RA		DSK/GTYPD	DATE 07 - 06 - 2012	PROJECT NO. G1218 - 52 - 01A	FIG. 12

Y:/PROJECTS/G1218-52-01A PORTOLA CENTER SOUTH TM 15353/DETAILS/STABFIL3.dwg





NOTES:

1......8-INCH DIAMETER, SCHEDULE 80 PVC PERFORATED PIPE FOR FILLS IN EXCESS OF 100-FEET IN DEPTH OR A PIPE LENGTH OF LONGER THAN 750 FEET.

2......6-INCH DIAMETER, SCHEDULE 40 PVC PERFORATED PIPE FOR FILLS LESS THAN 100-FEET IN DEPTH OR A PIPE LENGTH SHORTER THAN 750 FEET.

NO SCALE

TYPICAL CANYON SUBDRAIN DETAIL

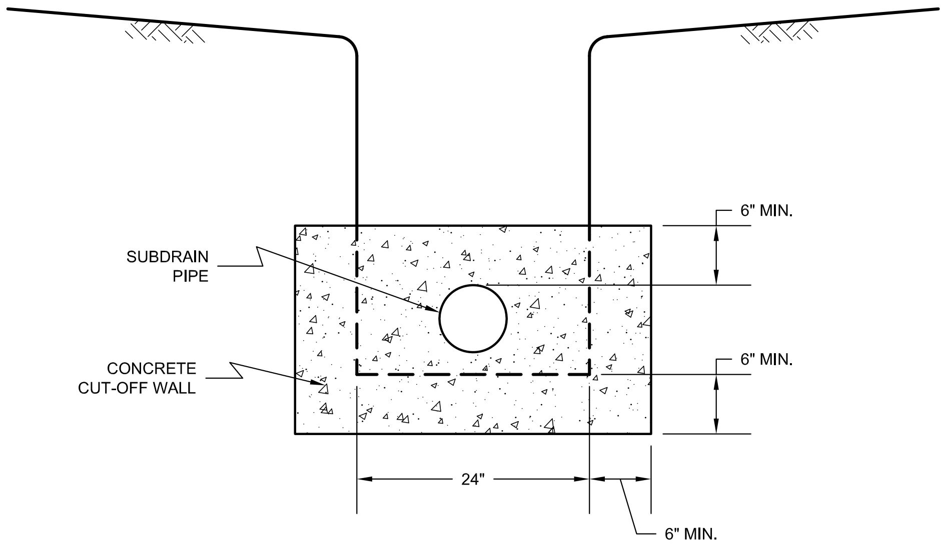
GEOCON
INCORPORATED
GEOTECHNICAL CONSULTANTS
6960 FLANDERS DRIVE - SAN DIEGO, CALIFORNIA 92121 - 2974
PHONE 858 558-6900 - FAX 858 558-6159

PORTOLA CENTER SOUTH
TM #15353
LAKE FOREST, CALIFORNIA

CL / RA		DSK/E0000	DATE 07 - 06 - 2012	PROJECT NO. G1218 - 52 - 01A	FIG. 13

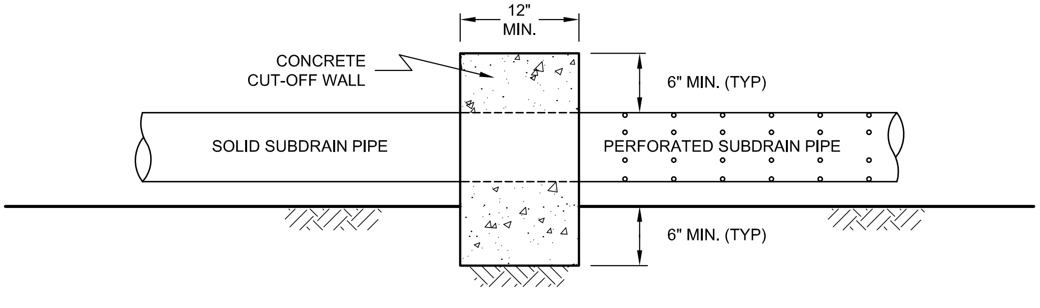
Y:/PROJECTS/G1218-52-01A PORTOLA CENTER SOUTH TM 15353/DETAILS/TCSD2.dwg

FRONT VIEW



NO SCALE

SIDE VIEW



NO SCALE

RECOMMENDED SUBDRAIN CUT-OFF WALL

GEOCON
INCORPORATED

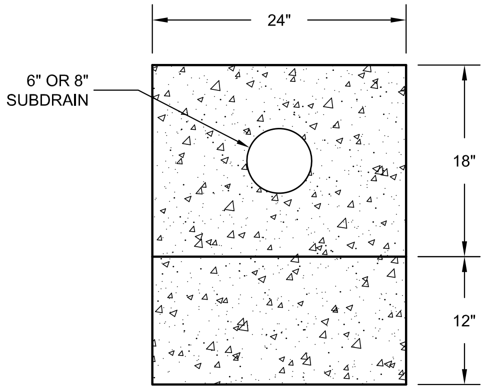
GEOTECHNICAL CONSULTANTS
6960 FLANDERS DRIVE - SAN DIEGO, CALIFORNIA 92121 - 2974
PHONE 858 558-6900 - FAX 858 558-6159

PORTOLA CENTER SOUTH
TM #15353
LAKE FOREST, CALIFORNIA

CL / RA		DSK/E0000	DATE 07 - 06 - 2012	PROJECT NO. G1218 - 52 - 01A	FIG. 14

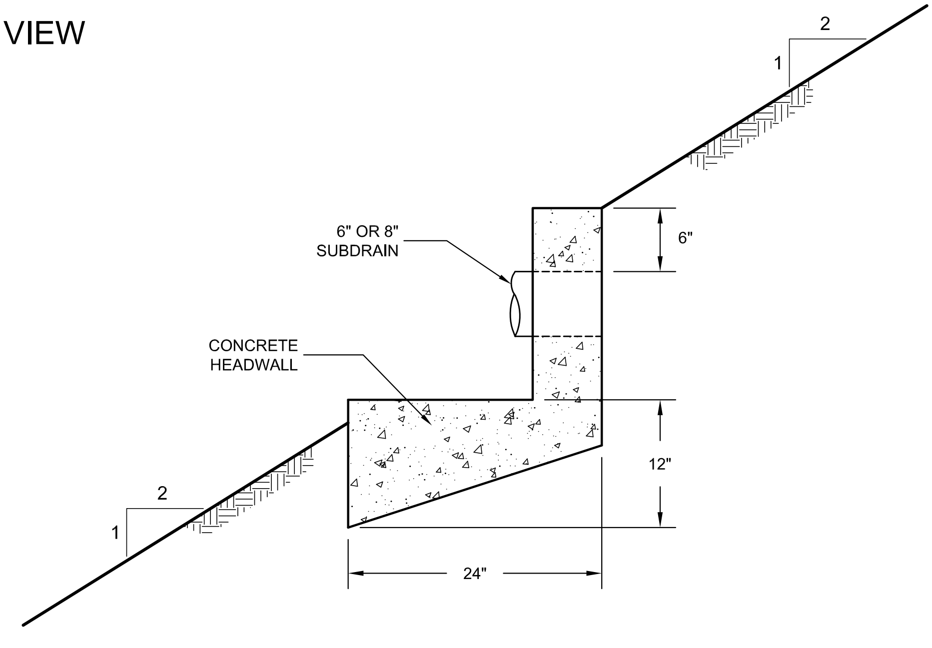
Y:/PROJECTS/G1218-52-01A PORTOLA CENTER SOUTH TM 15353/DETAILS/RSCOW.dwg

FRONT VIEW



NO SCALE

SIDE VIEW



NOTE: HEADWALL SHOULD OUTLET AT TOE OF FILL SLOPE
OR INTO CONTROLLED SURFACE DRAINAGE

NO SCALE

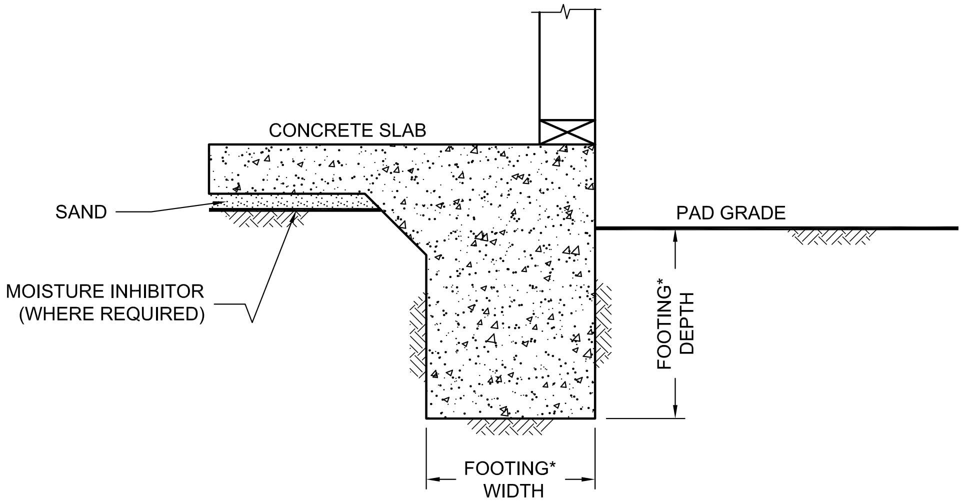
SUBDRAIN OUTLET HEADWALL DETAIL

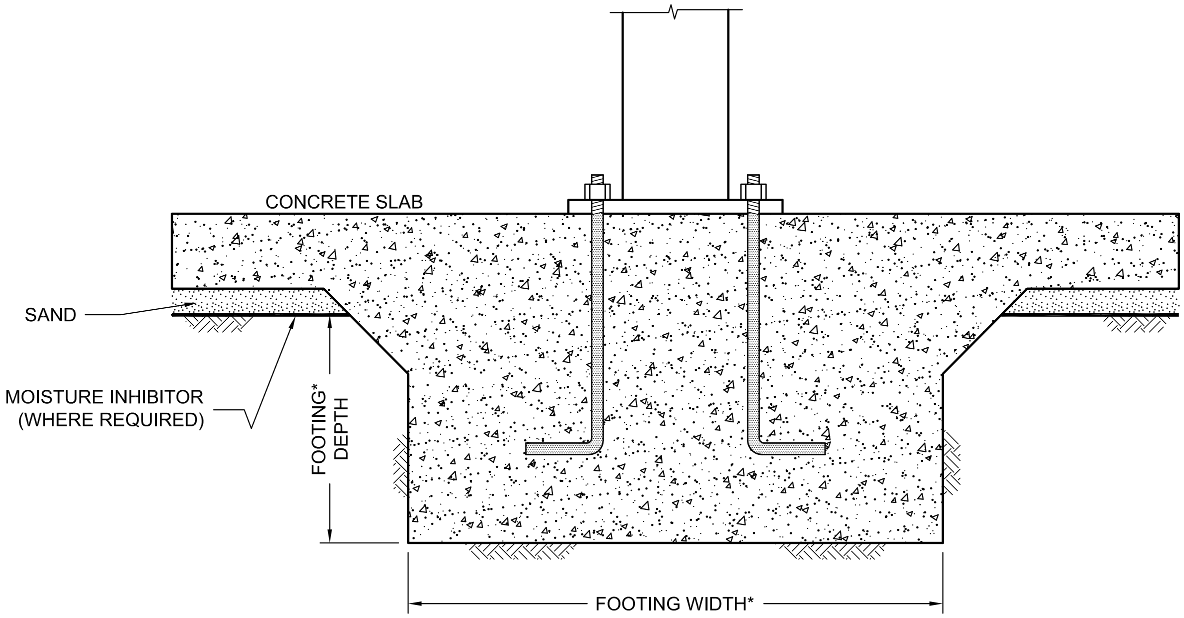
GEOCON
INCORPORATED
GEOTECHNICAL CONSULTANTS
6960 FLANDERS DRIVE - SAN DIEGO, CALIFORNIA 92121 - 2974
PHONE 858 558-6900 - FAX 858 558-6159

PORTOLA CENTER SOUTH
TM #15353
LAKE FOREST, CALIFORNIA

CL / RA		DSK/E0000	DATE 07 - 06 - 2012	PROJECT NO. G1218 - 52 - 01A	FIG. 15

Y:/PROJECTS/G1218-52-01A PORTOLA CENTER SOUTH TM 15353/DETAILS/SOHD.dwg





*....SEE REPORT FOR FOUNDATION WITDH AND DEPTH RECOMMENDATION

NO SCALE

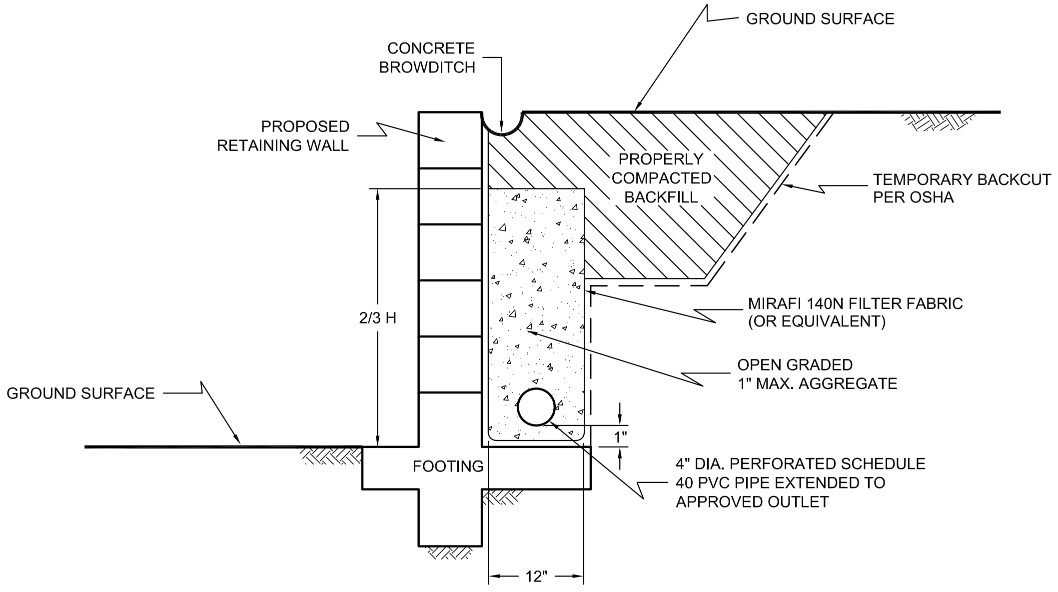
WALL / COLUMN FOOTING DIMENSION DETAIL

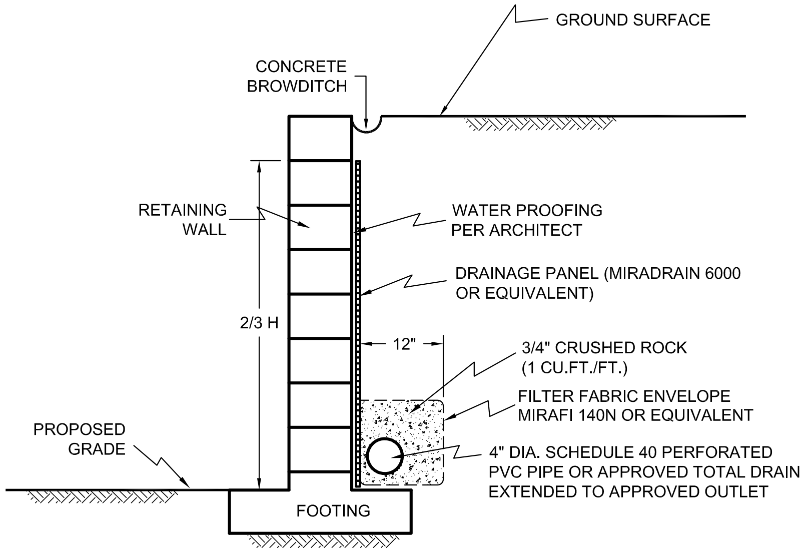
GEOCON
INCORPORATED
GEOTECHNICAL CONSULTANTS
6960 FLANDERS DRIVE - SAN DIEGO, CALIFORNIA 92121 - 2974
PHONE 858 558-6900 - FAX 858 558-6159

PORTOLA CENTER SOUTH
TM #15353
LAKE FOREST, CALIFORNIA

CL / RA		DSK/GTYPD	DATE 07 - 06 - 2011	PROJECT NO. G1218 - 52 - 01A	FIG. 16

Y:/PROJECTS/G1218-52-01A PORTOLA CENTER SOUTH TM 15353/DETAILS/COLFOOT2.dwg





NOTE :

DRAIN SHOULD BE UNIFORMLY SLOPED TO GRAVITY OUTLET
OR TO A SUMP WHERE WATER CAN BE REMOVED BY PUMPING

NO SCALE

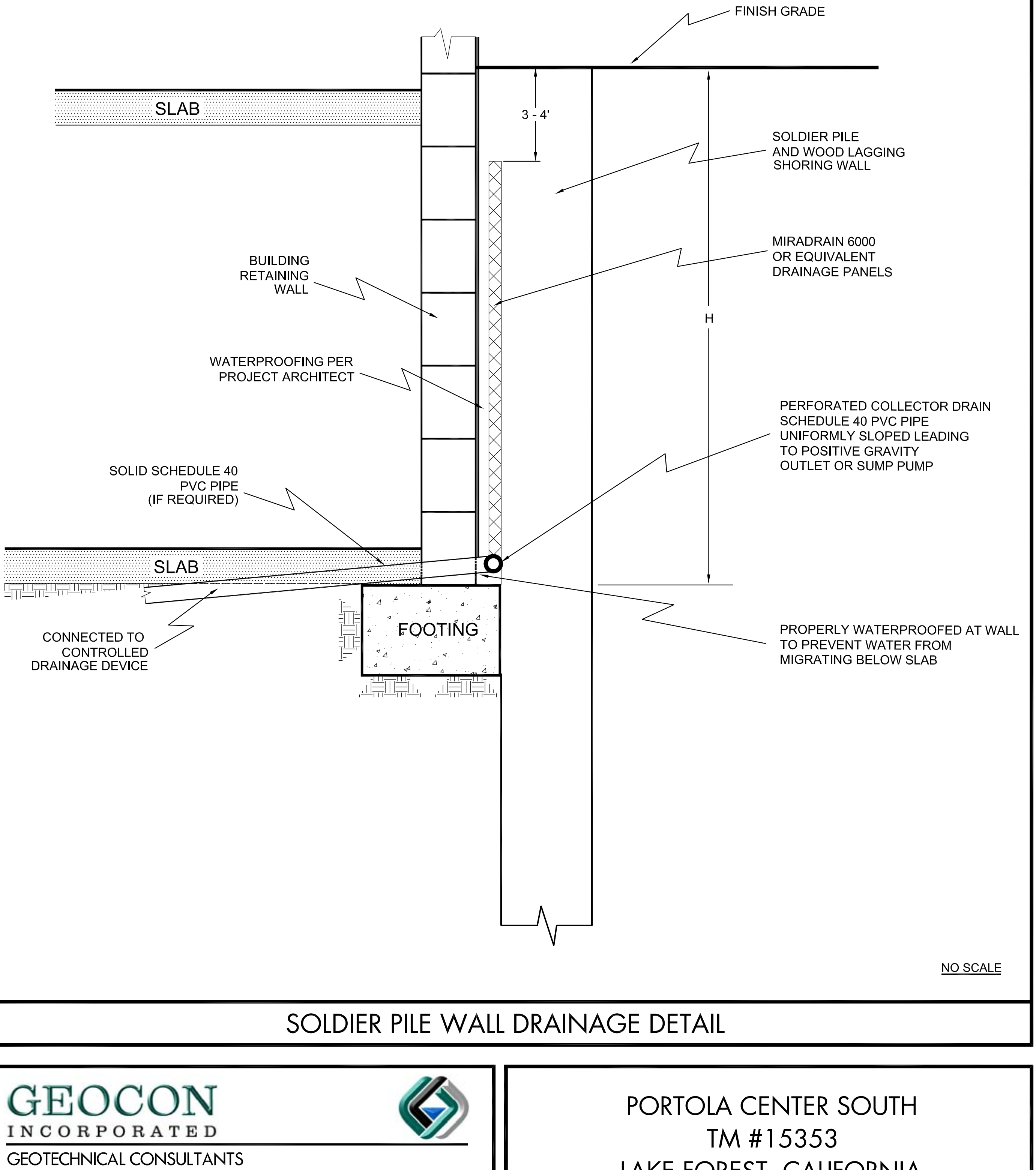
TYPICAL RETAINING WALL DRAIN DETAIL

GEOCON
INCORPORATED
GEOTECHNICAL CONSULTANTS
6960 FLANDERS DRIVE - SAN DIEGO, CALIFORNIA 92121 - 2974
PHONE 858 558-6900 - FAX 858 558-6159

PORTOLA CENTER SOUTH
TM #15353
LAKE FOREST, CALIFORNIA

CL / RA		DSK/GTYPD	DATE 07 - 06 - 2012	PROJECT NO. G1218 - 52 - 01A	FIG. 17

Y:/PROJECTS/G1218-52-01A PORTOLA CENTER SOUTH TM 15353/DETAILS/RET WALL DRAIN DETAILS_2.dwg



NO SCALE

SOLDIER PILE WALL DRAINAGE DETAIL

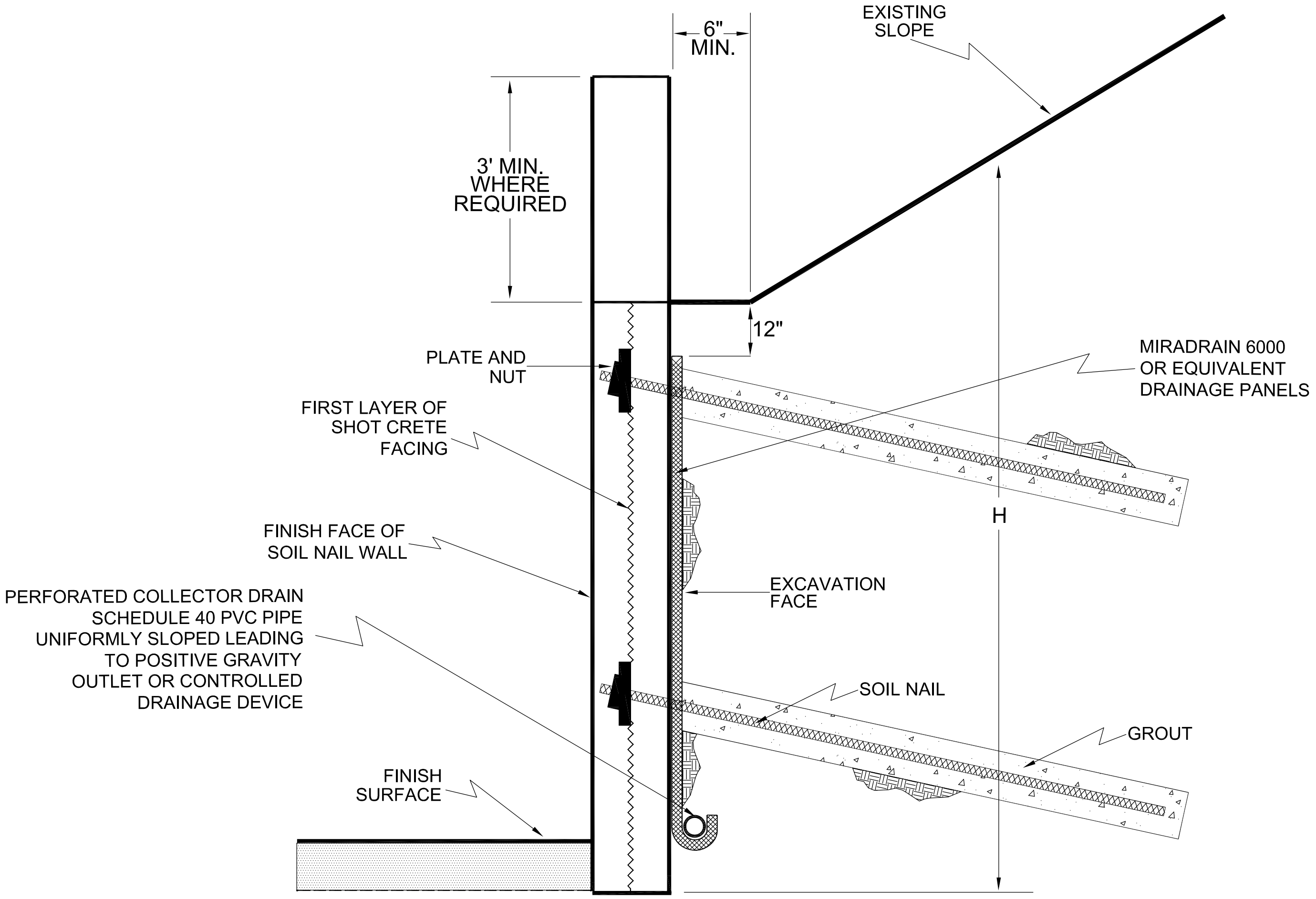
GEOCON
INCORPORATED

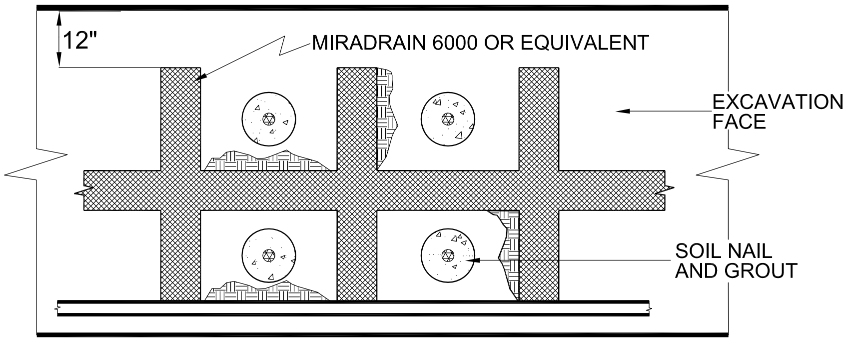
GEOTECHNICAL CONSULTANTS
6960 FLANDERS DRIVE - SAN DIEGO, CALIFORNIA 92121 - 2974
PHONE 858 558-6900 - FAX 858 558-6159

PORTOLA CENTER SOUTH
TM #15353
LAKE FOREST, CALIFORNIA

CL / RA		DSK/GTYPD	DATE 07 - 06 - 2012	PROJECT NO. G1218 - 52 - 01A	FIG. 18

Y:/PROJECTS/G1218-52-01A PORTOLA CENTER SOUTH TM 15353/DETAILS/SPWDD3.dwg





DRAINAGE PANELS PER SOIL NAIL WALL ENGINEER

SOIL NAIL WALL DRAINAGE DETAIL

GEOCON
INCORPORATED

GEOTECHNICAL CONSULTANTS
6960 FLANDERS DRIVE - SAN DIEGO, CALIFORNIA 92121 - 2974
PHONE 858 558-6900 - FAX 858 558-6159

PORTOLA CENTER SOUTH
TM #15353
LAKE FOREST, CALIFORNIA

CL / RA		DSK/GTYPD	DATE 07 - 06 - 2012	PROJECT NO. G1218 - 52 - 01A	FIG. 19

Y:/PROJECTS/G1218-52-01A PORTOLA CENTER SOUTH TM 15353/DETAILS/SNWDD.dwg

APPENDIX A

APPENDIX A

FIELD INVESTIGATION

The field investigation was performed from December 2006 through November, 2011 and consisted of geologic mapping and the excavation of 57 large diameter borings, 9 small diameter borings, 40 exploratory test pits, and one fault trench. The approximate locations of the excavations are shown on the Geologic Map, Figures 2 and 3. We located the exploratory borings and test pits in the field using a compass and measuring tape. The large diameter exploratory borings were excavated to a maximum depth of approximately 106 feet with a truck-mounted drill rig using a 26-inch or 30-inch-diameter bucket auger. The small diameter borings were excavated to a maximum depth of 140½ feet using a truck-mounted drill rig equipped with 8-inch diameter hollow stem augers. The exploratory test pits and fault trench were excavated to a maximum depth of approximately 18 feet with a JD 555 tracked backhoe equipped with a 24-inch-wide bucket. As drilling and trenching proceeded, the soil and geologic conditions encountered were logged and sampled.

We visually examined, classified and logged the soil conditions encountered in the excavations in general accordance with the Unified Soil Classification System (USCS). Logs of the exploratory borings are presented on Figures A-1 through A-67 and exploratory test pits are presented on Figures A-68 through A-107. The fault trench log FT-1 is presented on Figure A-108. The logs depict the general soil and geologic conditions encountered and the depth at which samples were obtained.

We obtained samples during our boring excavations using a California split-spoon sampler or a Standard Penetration Test (SPT) sampler. Both samplers are composed of steel and are driven to obtain the soil samples. The California sampler has an inside diameter of 2.5 inches and an outside diameter of 2.875 inches. Up to 18 rings are placed inside the sampler that is 2.4 inches in diameter and 1 inch in height. The SPT sampler has an inside diameter of 1.5 inches and an outside diameter of 2 inches. Ring samples at appropriate intervals were retained in moisture-tight containers and transported to the laboratory for testing. Bulk samples were also retained from the borings and trenches for laboratory testing. The type of sample is noted on the exploratory boring logs.

For the small diameter borings, the sampler was driven 18 inches into the bottom of the excavations with the use of a cathead hammer and the use of A rods. The sampler is connected to the A rods and driven into the bottom of the excavation using a 140-pound hammer with a 30-inch drop. Blow counts are recorded for every 6 inches the sampler is driven. The penetration resistances shown on the boring logs are shown in terms of blows per foot. The values indicated on the boring logs are the sum of the last 12 inches of the sampler if driven 18 inches. If the sampler was not driven for 18 inches, an approximate value is calculated in term of blows per foot or the final 6-inch interval is reported. These values are not to be taken as N-values, adjustments have not been applied.

For the large diameter borings, the samplers were driven 12 inches into the bottom of the excavations with the use of a telescoping Kelly bar. The weight of the Kelly bar (2,400 lbs. maximum) drives the sampler and varies with depth. The height of drop is usually 12 inches. Blow counts are recorded for every 12 inches the sampler is driven. The penetration resistance values shown on the boring logs are shown in terms of blows per foot. These values are not to be taken as N-values; adjustments have not been applied. Elevations shown on the boring logs were determined either from a topographic map or by using a benchmark.

Well Construction Permits were issued for the exploratory excavations by the County of Orange Health Care Agency and are shown after the figures in this appendix.

PROJECT NO. G1218-52-01

BORING B 1

ELEV. (MSL.) **1065'** DATE COMPLETED **12-18-2006**

EQUIPMENT **26" DIAMETER BUCKET AUGER** BY: **G.K.**

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	MATERIAL DESCRIPTION	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
0				SM	**UNDOCUMENTED ARTIFICIAL FILL (afu)** Medium dense, slightly moist, light brown, Silty, fine SAND, trace coarse-grained			
2								
4					-Brown			
6	B1-1				-Roots and rootlets	4	91.0	16.8
8								
10								
	B1-2					2	77.4	15.1
12					-Concrete fragments and boulders, some cobbles			
14				ML	**ENGINEERED ARTIFICIAL FILL (afe)** Firm, moist, olive brown, fine to coarse Sandy SILT; moderate plasticity			
16	B1-3					6	114.1	15.4
					-Yellowish to olive brown			
18								
20					Firm, moist, olive brown, fine Sandy SILT			
	B1-4			ML	-Decrease in sand, olive brown	7	107.8	17.2
22					-Gravel and cobbles			
24					-Increase in sand, fine- to medium-grained			

Figure A-1,
Log of Boring B 1, Page 1 of 4

G1218-52-01 (UPD-04-17-2012).GPJ

SAMPLE SYMBOLS

☐ ... SAMPLING UNSUCCESSFUL
◧ ... STANDARD PENETRATION TEST
■ ... DRIVE SAMPLE (UNDISTURBED)
☒ ... DISTURBED OR BAG SAMPLE
◩ ... CHUNK SAMPLE
▼ ... WATER TABLE OR SEEPAGE

NOTE: THE LOG OF SUBSURFACE CONDITIONS SHOWN HEREON APPLIES ONLY AT THE SPECIFIC BORING OR TRENCH LOCATION AND AT THE DATE INDICATED. IT IS NOT WARRANTED TO BE REPRESENTATIVE OF SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND TIMES.

GEOCON

PROJECT NO. G1218-52-01

BORING B 1

ELEV. (MSL.) **1065'** DATE COMPLETED **12-18-2006**

EQUIPMENT **26" DIAMETER BUCKET AUGER** BY: **G.K.**

DEPTH IN FEET	SAMPLE NO.	GROUNDWATER	SOIL CLASS (USCS)	MATERIAL DESCRIPTION	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
26	B1-5 ■		ML	-Some coarse gravel	11	84.6	28.9
			SC-CL	Dense to very dense, moist, dark gray, Clayey SAND to Sandy CLAY			
28							
30							
	B1-6 ⊠		SM	Dense to very dense, moist to wet, light brown, Silty, fine to medium SAND with coarse grains and gravel	8	93.5	24.9
32							
				-Light to reddish brown			
34							
36	B1-7 ■			-Brown to light brown	15	119.4	12.5
38							
40							
	B1-8 ■			-Light reddish brown	7	76.5	39.6
42				-Increase in silt, light brown			
44							
46	B1-9 ■			-Some coarse gravel, medium dense	26	77.0	30.5
48							
				-Few cobbles			

Figure A-1,
Log of Boring B 1, Page 2 of 4

G1218-52-01 (UPD-04-17-2012).GPJ

SAMPLE SYMBOLS

☐ ... SAMPLING UNSUCCESSFUL
◧ ... STANDARD PENETRATION TEST
■ ... DRIVE SAMPLE (UNDISTURBED)
⊠ ... DISTURBED OR BAG SAMPLE
◩ ... CHUNK SAMPLE
▼ ... WATER TABLE OR SEEPAGE

NOTE: THE LOG OF SUBSURFACE CONDITIONS SHOWN HEREON APPLIES ONLY AT THE SPECIFIC BORING OR TRENCH LOCATION AND AT THE DATE INDICATED. IT IS NOT WARRANTED TO BE REPRESENTATIVE OF SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND TIMES.

GEOCON

PROJECT NO. G1218-52-01

BORING B 1

ELEV. (MSL.) **1065'** DATE COMPLETED **12-18-2006**

EQUIPMENT **26" DIAMETER BUCKET AUGER** BY: **G.K.**

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	MATERIAL DESCRIPTION	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
50	B1-18 ☒			SM				
	B1-10 ■				-No gravel, few wood fragments	25	99.1	20.6
52								
54								
56	B1-11 ■				-Few gravel, light brown	26	107.5	17.8
58								
60								
	B1-12 ■					27	96.7	23.3
					-Yellow to olive to light brown			
62								
					-Light brown, decrease in silt			
64								
66	B1-13 ■				-Brown, increase in silt, wood fragments	18	95.5	19.9
68								
					-Plastic debris, some roots and rootlets			
70	B1-19 ☒				-Mild organic odor			
	B1-14 ■			ML	Very stiff to hard, moist, brown to dark gray, fine Sandy SILT; some roots and rootlets, strong organic odor	13	97.7	22.1
72								
74				SM	Dense to very dense, moist, brown, Silty, fine SAND; some wood fragments, slight organic odor			

Figure A-1,
Log of Boring B 1, Page 3 of 4

G1218-52-01 (UPD-04-17-2012).GPJ

SAMPLE SYMBOLS			
	☐ ... SAMPLING UNSUCCESSFUL	◧ ... STANDARD PENETRATION TEST	■ ... DRIVE SAMPLE (UNDISTURBED)
	☒ ... DISTURBED OR BAG SAMPLE	◪ ... CHUNK SAMPLE	▼ ... WATER TABLE OR SEEPAGE

NOTE: THE LOG OF SUBSURFACE CONDITIONS SHOWN HEREON APPLIES ONLY AT THE SPECIFIC BORING OR TRENCH LOCATION AND AT THE DATE INDICATED. IT IS NOT WARRANTED TO BE REPRESENTATIVE OF SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND TIMES.

GEOCON

BORING B 1

ELEV. (MSL.) **1065'** DATE COMPLETED **12-18-2006**

EQUIPMENT **26" DIAMETER BUCKET AUGER** BY: **G.K.**

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	MATERIAL DESCRIPTION	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
				SM				
76	B1-15					18	105.8	15.1
				ML	Very stiff to hard, slightly moist, dark brown, Sandy SILT, some wood fragments, slight organic odor			
78								
80								
	B1-16			SM	Dense to very dense, slightly moist, light brown to brown, Silty, fine SAND; some roots and rootlets, trace wood fragments	19	112.3	10.5
82								
84								
86	B1-17					29	120.4	9.4
					BORING TERMINATED AT 86 FEET No groundwater encountered Backfilled and tamped with soil cuttings interlayered with bentonite chips			

Figure A-1,
Log of Boring B 1, Page 4 of 4

SAMPLE SYMBOLS
☐ ... SAMPLING UNSUCCESSFUL
◧ ... STANDARD PENETRATION TEST
■ ... DRIVE SAMPLE (UNDISTURBED)
☒ ... DISTURBED OR BAG SAMPLE
◪ ... CHUNK SAMPLE
▼ ... WATER TABLE OR SEEPAGE

NOTE: THE LOG OF SUBSURFACE CONDITIONS SHOWN HEREON APPLIES ONLY AT THE SPECIFIC BORING OR TRENCH LOCATION AND AT THE DATE INDICATED. IT IS NOT WARRANTED TO BE REPRESENTATIVE OF SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND TIMES.

GEOCON

BORING B 2

ELEV. (MSL.) **1013'** DATE COMPLETED **12-18-2006**

EQUIPMENT **26" DIAMETER BUCKET AUGER** BY: **G.K.**

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	MATERIAL DESCRIPTION	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
0				SM	**ENGINEERED ARTIFICIAL FILL (afe)** Medium dense, slightly moist, brown, Silty, fine SAND, few fine to coarse gravel and cobbles			
2								
4								
					Very stiff, moist, dark brown, fine Sandy SILT; interlayered with clayey sand			
6	B2-1			ML		6	90.2	28.4
8								
10				SM	Dense, moist, olive brown, fine Silty SAND			
	B2-2					5	108.8	12.4
				SC	Dense, moist, light brown, Clayey, fine to coarse SAND			
12								
				SM	Dense to very dense, moist, dark brown, fine Silty SAND, few wood fragments			
14								
16	B2-3					11	122.6	11.4
				SM+SC	Dense, slightly moist to moist, dark brown, fine Silty SAND, interlayered with Clayey SAND, poorly graded			
18								
20	B2-4					8	121.2	7.0
					-Medium- to coarse-grained			
22				SM+ML	Dense to very dense, moist, olive gray to olive brown, Sandy SILT and Silty SAND, 12-inch cobble			
24								

Figure A-2,
Log of Boring B 2, Page 1 of 4

G1218-52-01 (UPD-04-17-2012).GPJ

SAMPLE SYMBOLS			
	☐ ... SAMPLING UNSUCCESSFUL	◧ ... STANDARD PENETRATION TEST	■ ... DRIVE SAMPLE (UNDISTURBED)
	☒ ... DISTURBED OR BAG SAMPLE	◪ ... CHUNK SAMPLE	▼ ... WATER TABLE OR SEEPAGE

NOTE: THE LOG OF SUBSURFACE CONDITIONS SHOWN HEREON APPLIES ONLY AT THE SPECIFIC BORING OR TRENCH LOCATION AND AT THE DATE INDICATED. IT IS NOT WARRANTED TO BE REPRESENTATIVE OF SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND TIMES.

GEOCON

PROJECT NO. G1218-52-01

BORING B 2

ELEV. (MSL.) **1013'** DATE COMPLETED **12-18-2006**

EQUIPMENT **26" DIAMETER BUCKET AUGER** BY: **G.K.**

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	MATERIAL DESCRIPTION	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
26	B2-5 ■			SM+ML	-Trace gravel	10	123.1	9.5
28				SM	Dense to very dense, moist, yellowish brown, Silty SAND, some cobbles (6" to 10") and boulders			
30								
	B2-6 ■					13	112.0	6.7
32								
				CL-ML	Very stiff, moist, dark brown, Silty CLAY to fine Sandy SILT, trace caliche, moderate plasticity, scattered gravel size fragments of sandstone, siltstone and claystone			
34								
36	B2-7 ■					7	99.0	20.0
38								
40	B2-8 ⊠							
					-Cobbles and boulders in matrix of silt and clay, no evidence of voids or nesting			
42								
44								
46	B2-9 ■				-Very stiff, moist, dark olive brown, medium- to coarse-grained, some gravel size rock fragments, trace roots and rootlets	22	73.7	37.9
48					-Some cobbles (3" to 6"), thin layers of silty sand			

G1218-52-01 (UPD-04-17-2012).GPJ

Figure A-2,
Log of Boring B 2, Page 2 of 4

SAMPLE SYMBOLS

☐ ... SAMPLING UNSUCCESSFUL
◧ ... STANDARD PENETRATION TEST
■ ... DRIVE SAMPLE (UNDISTURBED)
⊠ ... DISTURBED OR BAG SAMPLE
◪ ... CHUNK SAMPLE
▼ ... WATER TABLE OR SEEPAGE

NOTE: THE LOG OF SUBSURFACE CONDITIONS SHOWN HEREON APPLIES ONLY AT THE SPECIFIC BORING OR TRENCH LOCATION AND AT THE DATE INDICATED. IT IS NOT WARRANTED TO BE REPRESENTATIVE OF SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND TIMES.

PROJECT NO. G1218-52-01

BORING B 2

ELEV. (MSL.) **1013'** DATE COMPLETED **12-18-2006**

EQUIPMENT **26" DIAMETER BUCKET AUGER** BY: **G.K.**

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	MATERIAL DESCRIPTION	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
50				SM	Dense to very dense, moist to wet, brown to olive brown, Silty, fine to coarse SAND; trace carbonate deposits			
	B2-10					27(6")	72.1	39.9
52								
54								
	B2-11				-Olive brown to yellowish brown	37	79.8	28.8
56				ML+SM	Very stiff to hard, moist to wet, Clayey to Sandy SILT, interlayered with fine- to coarse-grained Silty SAND, some bedrock clasts (3" to 6")			
58								
60	B2-12					40	65.9	49.9
					-Trace gypsum deposits, increase in silt			
62								
				CL-ML	Very stiff to hard, moist, dark grayish brown, Silty CLAY to Clayey SILT, rock fragments, trace roots and rootlets			
64								
66	B2-13					20	78.2	35.0
					-Olive brown, to yellowish brown			
68								
70				ML	Very stiff to hard, moist to wet, olive brown, fine to coarse Sandy SILT; trace carbonate deposits			
	B2-14					29	67.1	47.5
72								
74					-Some cobbles (6" to 9") and boulders, no topsoil or organics observed at base of fill, no water perched			

Figure A-2,
Log of Boring B 2, Page 3 of 4

G1218-52-01 (UPD-04-17-2012).GPJ

SAMPLE SYMBOLS

☐ ... SAMPLING UNSUCCESSFUL
◧ ... STANDARD PENETRATION TEST
■ ... DRIVE SAMPLE (UNDISTURBED)
☒ ... DISTURBED OR BAG SAMPLE
◪ ... CHUNK SAMPLE
▼ ... WATER TABLE OR SEEPAGE

NOTE: THE LOG OF SUBSURFACE CONDITIONS SHOWN HEREON APPLIES ONLY AT THE SPECIFIC BORING OR TRENCH LOCATION AND AT THE DATE INDICATED. IT IS NOT WARRANTED TO BE REPRESENTATIVE OF SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND TIMES.

GEOCON

PROJECT NO. G1218-52-01

BORING B 2

ELEV. (MSL.) **1013'** DATE COMPLETED **12-18-2006**

EQUIPMENT **26" DIAMETER BUCKET AUGER** BY: **G.K.**

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	MATERIAL DESCRIPTION	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
				ML				
76 78	B2-15 ■			SM+ML	**PUENTE FORMATION (Tps)** Hard, moderately weathered, light brown to olive brown, fine-grained, interbedded Sandy SILTSTONE and Silty SANDSTONE, thinly bedded and laminated, beds dipping toward SW at angle ~20, some carbonate mineralization within thin beds	27	73.5	40.8
80 82				SM	Very dense, moist, olive gray, fine-grained, Silty SANDSTONE, massive, localized iron oxide staining			
84	B2-16 ■					15(3")	102.8	20.1
					BORING TERMINATED AT 84 FEET No groundwater encountered Backfilled and tamped with soil cuttings interlayered with bentonite chips			

Figure A-2,
Log of Boring B 2, Page 4 of 4

G1218-52-01 (UPD-04-17-2012).GPJ

SAMPLE SYMBOLS

☐ ... SAMPLING UNSUCCESSFUL

◧ ... STANDARD PENETRATION TEST

■ ... DRIVE SAMPLE (UNDISTURBED)

☒ ... DISTURBED OR BAG SAMPLE

◪ ... CHUNK SAMPLE

▼ ... WATER TABLE OR SEEPAGE

NOTE: THE LOG OF SUBSURFACE CONDITIONS SHOWN HEREON APPLIES ONLY AT THE SPECIFIC BORING OR TRENCH LOCATION AND AT THE DATE INDICATED. IT IS NOT WARRANTED TO BE REPRESENTATIVE OF SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND TIMES.

GEOCON

BORING B 3

ELEV. (MSL.) **1028'** DATE COMPLETED **12-19-2006**

EQUIPMENT **26" DIAMETER BUCKET AUGER** BY: **G.K.**

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	MATERIAL DESCRIPTION	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
0				SM	**TOPSOIL** Medium dense, slightly moist, brown, fine Silty SAND, some cobbles, trace roots and rootlets			
2				SM	**PUENTE FORMATION-SOQUEL MEMBER (Tps-slt)** Dense, light brown, fine-grained, Silty SANDSTONE, poorly bedded, moderately weathered			
4				SM+ML	Dense to very dense, moist, SANDSTONE and Sandy to Clayey SILTSTONE, fine-grained with trace medium- to coarse-grained, poorly bedded			
6	■ B3-1				-At 3½' Bedding: N36W, 19SW	12	101.8	11.0
8				ML	Hard, moist, light reddish brown, Clayey to Sandy SILTSTONE, fine-grained, thinly bedded, trace carbonate deposits, some tight joints, thin laminations			
10	■ B3-2				-Sandstone bed, continuous around hole, no offset, light yellowish gray, few thin roots in joints	9	98.9	19.3
14				CL+ML	Hard, moist, dark gray and reddish brown, Silty CLAYSTONE interbedded with Sandy to Clayey SILTSTONE, thinly bedded, carbonate-rich, well indurated			
16	■ B3-3					10	95.9	24.6
18					-Discontinuous layer of gypsum mineralization, layer of cemented sandstone, olive brown			
20	☒ B3-14 ■ B3-4			SM+ML	Dense, moist, olive to dark gray, fine-grained, Sandy SILTSTONE and Silty SANDSTONE, thin gypsum layers -Reddish brown to olive, fine-grained, hard, few thin beds of silty claystone	10	94.5	26.8
22					-At 22½' Bedding: N27W, 9SW, silty sandstone bed			
24				SM	Dense, reddish brown to brown, Silty SANDSTONE, fine-grained, thinly bedded, hard, trace carbon deposits, thin interbeds of yellowish brown to dark gray claystone and siltstone; fine laminations			
26	■ B3-5					10 (3")	108.9	11.7
28								

Figure A-3,
Log of Boring B 3, Page 1 of 3

G1218-52-01 (UPD-04-17-2012).GPJ

SAMPLE SYMBOLS

☐ ... SAMPLING UNSUCCESSFUL
◧ ... STANDARD PENETRATION TEST
■ ... DRIVE SAMPLE (UNDISTURBED)
☒ ... DISTURBED OR BAG SAMPLE
◩ ... CHUNK SAMPLE
▼ ... WATER TABLE OR SEEPAGE

PROJECT NO. G1218-52-01

BORING B 3

ELEV. (MSL.) **1028'** DATE COMPLETED **12-19-2006**

EQUIPMENT **26" DIAMETER BUCKET AUGER** BY: **G.K.**

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	MATERIAL DESCRIPTION	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
30				SM-ML	Hard, moist to wet, reddish to dark brown, Sandy to Clayey SILTSTONE to Silty SANDSTONE, fine-grained, thinly bedded			
	B3-6					13	103.4	21.7
32								
34				ML+SM	Hard, moist, thinly bedded Clayey to Sandy SILTSTONE interbedded with thickly bedded SANDSTONE, well indurated, some gypsum stringers -At 33½' Bedding: N32W, 11SW			
36	B3-7					15	98.7	24.2
					-Becomes pale olive to yellowish brown			
38				CL-ML	Hard, moist, dark gray to dark olive brown, Clayey SILTSTONE to Silty CLAYSTONE, very thinly bedded			
40				SM	Dense, moist, yellowish brown, Silty SANDSTONE, continuous around hole, no offset, thin gypsum stringers			
	B3-8					24	102.5	21.4
				ML	Hard, moist, dark gray, Clayey to Sandy SILTSTONE, fine-grained, massive, well indurated			
42								
44								
46	B3-9					20 (3")	99.3	15.5
48								
50								
	B3-10				-Isolated gypsum stringers	30 (3")	94.6	19.5
52	B3-11							
54								
56					-Thin interbeds of laminated sandstone and siltstone, light gray to yellowish brown -At 56' Bedding: N50W, 4SW			
58								
				SM+ML				

Figure A-3,
Log of Boring B 3, Page 2 of 3

G1218-52-01 (UPD-04-17-2012).GPJ

SAMPLE SYMBOLS

☐ ... SAMPLING UNSUCCESSFUL
◧ ... STANDARD PENETRATION TEST
■ ... DRIVE SAMPLE (UNDISTURBED)
⊠ ... DISTURBED OR BAG SAMPLE
◣ ... CHUNK SAMPLE
▼ ... WATER TABLE OR SEEPAGE

NOTE: THE LOG OF SUBSURFACE CONDITIONS SHOWN HEREON APPLIES ONLY AT THE SPECIFIC BORING OR TRENCH LOCATION AND AT THE DATE INDICATED. IT IS NOT WARRANTED TO BE REPRESENTATIVE OF SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND TIMES.

BORING B 3

ELEV. (MSL.) **1028'** DATE COMPLETED **12-19-2006**

EQUIPMENT **26" DIAMETER BUCKET AUGER** BY: **G.K.**

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	MATERIAL DESCRIPTION	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
60	B3-12 ■			SM	Dense, damp to moist, light gray to yellowish brown, fine- to medium-grained, Silty SANDSTONE with siltstone interbeds -Fine-grained, olive to reddish brown, thinly bedded, moderate plasticity -At 60' bedding: N29W, 2SW	20 (2")	109.1	13.7
62					Dense, light gray, fine- to medium-grained, Silty SANDSTONE, massive, moderately cemented, iron oxide staining			
64								
66				ML	Hard, moist, dark olive gray, fine-grained Sandy to Clayey SILTSTONE with light olive brown, thinly bedded to laminated, subhorizontal bedding, gypsum stringers			
68								
70	B3-13 ■					20 (3")	92.5	20.1
				ML	Hard, moist, olive brown to gray, Sandy SILTSTONE, massive, moderate plasticity			
72								
74								
76					REFUSAL AT 76 FEET No groundwater encountered Backfilled and tamped with soil cuttings interlayered with bentonite chips			

Figure A-3,
Log of Boring B 3, Page 3 of 3

G1218-52-01 (UPD-04-17-2012).GPJ

SAMPLE SYMBOLS			
	☐ ... SAMPLING UNSUCCESSFUL	◧ ... STANDARD PENETRATION TEST	■ ... DRIVE SAMPLE (UNDISTURBED)
	☒ ... DISTURBED OR BAG SAMPLE	◪ ... CHUNK SAMPLE	▼ ... WATER TABLE OR SEEPAGE

NOTE: THE LOG OF SUBSURFACE CONDITIONS SHOWN HEREON APPLIES ONLY AT THE SPECIFIC BORING OR TRENCH LOCATION AND AT THE DATE INDICATED. IT IS NOT WARRANTED TO BE REPRESENTATIVE OF SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND TIMES.

GEOCON

PROJECT NO. G1218-52-01

BORING B 4

ELEV. (MSL.) **1212'** DATE COMPLETED **12-20-2006**

EQUIPMENT **26" DIAMETER BUCKET AUGER** BY: **G.K.**

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	MATERIAL DESCRIPTION	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
0				ML	**TOPSOIL** Soft, dry, light grayish brown, fine- to very fine-grained, Sandy SILT, porous, some roots and rootlets, abundant clasts of diatomaceous shale			
2				ML	**LANDSLIDE DEBRIS (Qls)** Soft, moist, olive gray, SILT; abundant discontinuous beds of siltstone and diatomaceous shale with highly porous soil infilling			
4				ML	-At 3': Basal Shear: N68W, 24SW, 1-inch clay layer with striations oriented down dip			
6	B4-1				**PUENTE FORMATION (Tplv)** Stiff, moist to wet, brown to olive brown, fine-grained, Sandy SILTSTONE, thinly bedded, highly weathered, moderately iron oxide coating along fracture faces -At 3½' Bedding: E-W, 17S -At 4' Joint: N11E, 84SE -**BEDDING PLANE SHEAR** at 4.5 feet; (N70W, 19SW), ~2mm clay infilling -4" ash bed, oxidized, strong brown -Stiff to very stiff, grayish brown, clayey siltstone, thinly bedded, soft to moderately hard, moderately weathered and fractured -**BEDDING PLANE SHEAR** at 7 feet; (N61W, 21SW)	8	60.9	55.6
10	B4-2				-1/4" gypsum layer overlying an 8" very hard white siliceous siltstone bed		75.0	40.2
12					-At 12½' Bedding: N76W, 23SW, 2" ash layer, yellow to strong brown			
14					-At 14' Joint: N12E, 71NW -**BEDDING PLANE SHEAR** at 14.6 feet; (N74W, 28SW) 1/4 to 1/2" clay infilling			
16	B4-3				-Randomly oriented gypsum seams	5	87.8	26.9
18					-At 19½' Bedding: N78W, 20 SW			
20	B4-4			SM	Dense, moist, gray, fine-grained, Silty SANDSTONE, thinly bedded	5	87.8	26.9
22				SM+ML	Moderately hard, moist to wet, gray to dark brown, fine-grained, interbedded Silty SANDSTONE and Sandy SILTSTONE, slightly to moderately weathered -Gypsum along bedding to 1/4-inch thick			
24								

Figure A-4,
Log of Boring B 4, Page 1 of 4

G1218-52-01 (UPD-04-17-2012).GPJ

SAMPLE SYMBOLS			
	☐ ... SAMPLING UNSUCCESSFUL	◧ ... STANDARD PENETRATION TEST	■ ... DRIVE SAMPLE (UNDISTURBED)
	☒ ... DISTURBED OR BAG SAMPLE	◪ ... CHUNK SAMPLE	▼ ... WATER TABLE OR SEEPAGE

NOTE: THE LOG OF SUBSURFACE CONDITIONS SHOWN HEREON APPLIES ONLY AT THE SPECIFIC BORING OR TRENCH LOCATION AND AT THE DATE INDICATED. IT IS NOT WARRANTED TO BE REPRESENTATIVE OF SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND TIMES.

GEOCON

BORING B 4

ELEV. (MSL.) **1212'** DATE COMPLETED **12-20-2006**

EQUIPMENT **26" DIAMETER BUCKET AUGER** BY: **G.K.**

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	MATERIAL DESCRIPTION	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
26	B4-5 ■			ML	Hard, moist, reddish brown, fine-grained, Sandy SILTSTONE, thinly bedded, few gypsum layers along bedding and randomly oriented joints	11	81.7	31.4
28					-At 28.2' Bedding: N53W, 23SW along an 18" ash bed, light gray to white			
30					-1/2-inch ash layer parallel to bedding			
	B4-6 ■				-Interbedded silty sandstone to sandy siltstone, gray to brown, fine-grained, thinly bedded	9	76.5	39.9
32								
					-Randomly oriented carbonate and gypsum below 33 feet			
34								
36	B4-7 ■				-Brown to dark brown, hard, slightly weathered, unoxidized	21	82.2	34.3
38								
					-Poorly bedded			
40								
	B4-8 ■				-Becomes increasingly hard; brown, trace calcium carbonate, trace carbon	12 (4")	62.8	55.7
42								
					-At 43' Bedding: N53W, 23SW			
44								
46	B4-9 ■					30 (3")	49.1	80.8
48								

Figure A-4,
Log of Boring B 4, Page 2 of 4

SAMPLE SYMBOLS

☐ ... SAMPLING UNSUCCESSFUL
◧ ... STANDARD PENETRATION TEST
■ ... DRIVE SAMPLE (UNDISTURBED)
☒ ... DISTURBED OR BAG SAMPLE
◪ ... CHUNK SAMPLE
▼ ... WATER TABLE OR SEEPAGE

NOTE: THE LOG OF SUBSURFACE CONDITIONS SHOWN HEREON APPLIES ONLY AT THE SPECIFIC BORING OR TRENCH LOCATION AND AT THE DATE INDICATED. IT IS NOT WARRANTED TO BE REPRESENTATIVE OF SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND TIMES.

PROJECT NO. G1218-52-01

BORING B 4

ELEV. (MSL.) **1212'** DATE COMPLETED **12-20-2006**

EQUIPMENT **26" DIAMETER BUCKET AUGER** BY: **G.K.**

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	MATERIAL DESCRIPTION	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
50				ML				
	B4-10	■			-Some gypsum		74.6	37.2
52					-At 52' Bedding: N74W, 23 SW on 10" siliceous siltstone layer, dark brown			
54								
56	B4-11	■						
58								
60								
	B4-12	■				20 (4")	70.9	44.1
					-Brown to olive brown, trace gypsum, slight oxidation			
62								
64								
66					-3" siliceous siltstone layer -At 66' Bedding: N56W, 16SW			
68					-Brown to dark brown, slightly to unoxidized			
70								
	B4-13	■				16 (3")	72.0	33.2
72								
74								

Figure A-4,
Log of Boring B 4, Page 3 of 4

G1218-52-01 (UPD-04-17-2012).GPJ

SAMPLE SYMBOLS			
	☐ ... SAMPLING UNSUCCESSFUL	◧ ... STANDARD PENETRATION TEST	■ ... DRIVE SAMPLE (UNDISTURBED)
	☒ ... DISTURBED OR BAG SAMPLE	◩ ... CHUNK SAMPLE	▼ ... WATER TABLE OR SEEPAGE

NOTE: THE LOG OF SUBSURFACE CONDITIONS SHOWN HEREON APPLIES ONLY AT THE SPECIFIC BORING OR TRENCH LOCATION AND AT THE DATE INDICATED. IT IS NOT WARRANTED TO BE REPRESENTATIVE OF SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND TIMES.

BORING B 4

ELEV. (MSL.) **1212'** DATE COMPLETED **12-20-2006**

EQUIPMENT **26" DIAMETER BUCKET AUGER** BY: **G.K.**

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	MATERIAL DESCRIPTION	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
				ML				
76								
78								
80								
	B4-14 ■				-Refusal due to difficult drilling			

BORING TERMINATED AT 81 FEET
No groundwater encountered
Backfilled and tamped with soil cuttings interlayered with bentonite chips

Figure A-4,
Log of Boring B 4, Page 4 of 4

SAMPLE SYMBOLS

☐ ... SAMPLING UNSUCCESSFUL
◧ ... STANDARD PENETRATION TEST
■ ... DRIVE SAMPLE (UNDISTURBED)
☒ ... DISTURBED OR BAG SAMPLE
◪ ... CHUNK SAMPLE
▼ ... WATER TABLE OR SEEPAGE

NOTE: THE LOG OF SUBSURFACE CONDITIONS SHOWN HEREON APPLIES ONLY AT THE SPECIFIC BORING OR TRENCH LOCATION AND AT THE DATE INDICATED. IT IS NOT WARRANTED TO BE REPRESENTATIVE OF SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND TIMES.

GEOCON

PROJECT NO. G1218-52-01

BORING B 5

ELEV. (MSL.) **1150'** DATE COMPLETED **12-20-2006**

EQUIPMENT **26" DIAMETER BUCKET AUGER** BY: **G.K.**

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	MATERIAL DESCRIPTION	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
0				ML	**TOPSOIL** Stiff, slightly moist, brown, fine Sandy SILT; trace roots and rootlets			
2	B5-1 ⊠			ML	**PUENTE FORMATION-LA VIDA MEMBER (Tplv)** Very stiff to hard, moist to wet, light brown and white, fine-grained, Sandy SILTSTONE with minor interbeds of diatomaceous shale, thinly bedded, highly weathered, highly fractured, oxidation common along bedding and fractures			
4					-At 4' Bedding: N49W, 8SW			
6	B5-2 ■				-At 5.7' Bedding: N54W, 15SW, 1" ash layer, oxidized, yellow, very shaly cleavage	7	62.8	56.2
8					-At 8' Bedding: N47W, 15SW, siltstone bed			
10					-Decreasing diatomaceous shale			
	B5-3 ■				-Some ash, trace oxidation, yellow to orange	8	80.8	35.8
12					-Well bedded, moderately weathered, moderately fractured -At 12': Bedding: N43W, 21SW, thin clay film along bedding -At 12.5': 4½-inch ash bed, oxidized along upper and lower contacts			
14								
16	B5-4 ■				-At 15.4': 8-inch discontinuous siliceous siltstone layer, N side of boring -Light gray, poorly bedded, oxidized	13	69.7	45.1
18								
20	B5-5 ■				-At 19': 1½' fine-grained sandstone layer, oxidized, strong brown -At 19.4': 6-inch discontinuous siliceous siltstone layer, N side of boring -Gray to dark grayish brown, thinly bedded, slightly weathered, moderately fractured, hard, randomly oriented joints -**SHEAR** at 20 feet; (N31W, 24SW)			
22								
24				SM	Dense to very dense, moist to wet, gray, fine-grained, Silty SANDSTONE, thinly bedded, slight oxidation -At 24.3': 4-inch ash bed, white with slight oxidation on lower and upper			

**Figure A-5,
Log of Boring B 5, Page 1 of 3**

G1218-52-01 (UPD-04-17-2012).GPJ

SAMPLE SYMBOLS			
	☐ ... SAMPLING UNSUCCESSFUL	◧ ... STANDARD PENETRATION TEST	■ ... DRIVE SAMPLE (UNDISTURBED)
	⊠ ... DISTURBED OR BAG SAMPLE	◪ ... CHUNK SAMPLE	▼ ... WATER TABLE OR SEEPAGE

NOTE: THE LOG OF SUBSURFACE CONDITIONS SHOWN HEREON APPLIES ONLY AT THE SPECIFIC BORING OR TRENCH LOCATION AND AT THE DATE INDICATED. IT IS NOT WARRANTED TO BE REPRESENTATIVE OF SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND TIMES.

GEOCON

PROJECT NO. G1218-52-01

BORING B 5

ELEV. (MSL.) **1150'** DATE COMPLETED **12-20-2006**

EQUIPMENT **26" DIAMETER BUCKET AUGER** BY: **G.K.**

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	MATERIAL DESCRIPTION	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
				ML	contacts			
26	B5-6				-1" ash layer	9	65.8	30.6
				ML	Hard, moist to wet, light gray to brown, fine-grained, Sandy SILTSTONE, thinly bedded, some oxidation along bedding and joints			
28					-Randomly oriented gypsum seams			
30								
	B5-7				-Brown, trace gypsum	19	106.0	18.2
32								
					-14" thick ash bed			
34					-34' Bedding: N51W, 19SW, 2-inch ash bed			
36	B5-8					12	71.4	43.8
38								
40					-30" layer of siliceous siltstone, light gray			
	B5-9					16	72.7	43.6
					-Gypsum stringers, 1/4" thick, randomly oriented along joints and bedding			
42								
44								
46					-At 45.5' Bedding: N56W, 15SW			
					-Dark brown, thinly bedded, fresh			
48								

Figure A-5,
Log of Boring B 5, Page 2 of 3

G1218-52-01 (UPD-04-17-2012).GPJ

SAMPLE SYMBOLS

☐ ... SAMPLING UNSUCCESSFUL
◧ ... STANDARD PENETRATION TEST
■ ... DRIVE SAMPLE (UNDISTURBED)
⊠ ... DISTURBED OR BAG SAMPLE
◪ ... CHUNK SAMPLE
▼ ... WATER TABLE OR SEEPAGE

NOTE: THE LOG OF SUBSURFACE CONDITIONS SHOWN HEREON APPLIES ONLY AT THE SPECIFIC BORING OR TRENCH LOCATION AND AT THE DATE INDICATED. IT IS NOT WARRANTED TO BE REPRESENTATIVE OF SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND TIMES.

GEOCON

BORING B 5

ELEV. (MSL.) **1150'** DATE COMPLETED **12-20-2006**

EQUIPMENT **26" DIAMETER BUCKET AUGER** BY: **G.K.**

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	MATERIAL DESCRIPTION	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
50	B5-10 ☒			ML		24	69.3	41.1
52								
54					-Poorly bedded to massive, unoxidized			
56	☐				-No recovery			
58								
60					BORING TERMINATED AT 60 FEET No groundwater encountered Backfilled and tamped with soil cuttings interlayered with bentonite chips			

Figure A-5,
Log of Boring B 5, Page 3 of 3

G1218-52-01 (UPD-04-17-2012).GPJ

SAMPLE SYMBOLS
☐ ... SAMPLING UNSUCCESSFUL
◧ ... STANDARD PENETRATION TEST
■ ... DRIVE SAMPLE (UNDISTURBED)
☒ ... DISTURBED OR BAG SAMPLE
◩ ... CHUNK SAMPLE
▼ ... WATER TABLE OR SEEPAGE

NOTE: THE LOG OF SUBSURFACE CONDITIONS SHOWN HEREON APPLIES ONLY AT THE SPECIFIC BORING OR TRENCH LOCATION AND AT THE DATE INDICATED. IT IS NOT WARRANTED TO BE REPRESENTATIVE OF SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND TIMES.

PROJECT NO. G1218-52-01

BORING B 6

ELEV. (MSL.) **1046'** DATE COMPLETED **12-21-2006**

EQUIPMENT **26" DIAMETER BUCKET AUGER** BY: **G.K.**

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	MATERIAL DESCRIPTION	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
0				SM	**TOPSOIL** Medium dense, slightly moist, light reddish brown, fine to coarse Silty SAND; trace cobbles			
	B6-1 ▨			SM	**PUENTE FORMATION-SOQUEL MEMBER (Tps)** Dense to very dense, damp to moist, yellowish brown, fine- to medium-grained, Silty SANDSTONE, few coarse-grains and fine gravel, massive, moderately weathered, slightly friable			
2								
4								
					-Massive, poorly cemented, fine- to coarse-grained, few pebbles			
6	B6-2 ■				-Bedding: N34W, 12SW -Light brown, increase in medium- to coarse-grained, moderately weathered	12 (6")	106.5	5.1
8								
					-Oxidation rinds common, orange and yellow			
10								
	B6-3 ■				-Light brown, slight oxidation, orange, decrease in medium- to coarse-grained	15 (6")	111.1	6.2
12								
14					-Bedding along lamination: N55W, 31SW			
	☐				-No recovery			
16								
18					-Joint: N13E, 53SE, iron oxide coating			
20								
	B6-4 ■				-Reddish brown	12 (6")	107.4	5.2
22								
24								

Figure A-6,
Log of Boring B 6, Page 1 of 3

G1218-52-01 (UPD-04-17-2012).GPJ

SAMPLE SYMBOLS			
	☐ ... SAMPLING UNSUCCESSFUL	◧ ... STANDARD PENETRATION TEST	■ ... DRIVE SAMPLE (UNDISTURBED)
	▨ ... DISTURBED OR BAG SAMPLE	◪ ... CHUNK SAMPLE	▼ ... WATER TABLE OR SEEPAGE

NOTE: THE LOG OF SUBSURFACE CONDITIONS SHOWN HEREON APPLIES ONLY AT THE SPECIFIC BORING OR TRENCH LOCATION AND AT THE DATE INDICATED. IT IS NOT WARRANTED TO BE REPRESENTATIVE OF SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND TIMES.

GEOCON

PROJECT NO. G1218-52-01

BORING B 6

ELEV. (MSL.) **1046'** DATE COMPLETED **12-21-2006**

EQUIPMENT **26" DIAMETER BUCKET AUGER** BY: **G.K.**

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	MATERIAL DESCRIPTION	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
				SM	-Increase in medium- to coarse-grained			
26								
28								
30					-Yellowish brown			
	B6-5 ■					25 (5")	107.9	4.6
32					-Gray to dark brown			
34								
36								
					-Light yellowish brown			
38								
40								
	B6-6 ■				-Decrease in coarse-grained	15 (6")	106.2	5.7
42								
44								
46								
48								

Figure A-6,
Log of Boring B 6, Page 2 of 3

G1218-52-01 (UPD-04-17-2012).GPJ

SAMPLE SYMBOLS

☐ ... SAMPLING UNSUCCESSFUL
◧ ... STANDARD PENETRATION TEST
■ ... DRIVE SAMPLE (UNDISTURBED)
☒ ... DISTURBED OR BAG SAMPLE
◪ ... CHUNK SAMPLE
▼ ... WATER TABLE OR SEEPAGE

NOTE: THE LOG OF SUBSURFACE CONDITIONS SHOWN HEREON APPLIES ONLY AT THE SPECIFIC BORING OR TRENCH LOCATION AND AT THE DATE INDICATED. IT IS NOT WARRANTED TO BE REPRESENTATIVE OF SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND TIMES.

GEOCON

PROJECT NO. G1218-52-01

BORING B 6

ELEV. (MSL.) **1046'** DATE COMPLETED **12-21-2006**

EQUIPMENT **26" DIAMETER BUCKET AUGER** BY: **G.K.**

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	MATERIAL DESCRIPTION	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
50				SM				
	B6-7 ■					50 (4")	104.9	6.5
52					-Some oxidation, yellow, trace carbon deposits			
54					-Bedding: N62W, 37SW, 1½" sandy siltstone layer			
56					-Very dense			
58								
60					-Olive brown, increase in fine-grained			
62								
64					BORING TERMINATED AT 64 FEET No groundwater encountered Backfilled and tamped with soil cuttings interlayered with bentonite chips			

Figure A-6,
Log of Boring B 6, Page 3 of 3

G1218-52-01 (UPD-04-17-2012).GPJ

SAMPLE SYMBOLS

☐ ... SAMPLING UNSUCCESSFUL
◧ ... STANDARD PENETRATION TEST
■ ... DRIVE SAMPLE (UNDISTURBED)
☒ ... DISTURBED OR BAG SAMPLE
◩ ... CHUNK SAMPLE
▼ ... WATER TABLE OR SEEPAGE

PROJECT NO. G1218-52-01

BORING B 7

ELEV. (MSL.) 1077' DATE COMPLETED 01-04-2007

EQUIPMENT HOLLOW STEM AUGER BY: H.D.

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	MATERIAL DESCRIPTION	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
0				SM	**ENGINEERED ARTIFICIAL FILL (afe)** Dense to very dense, moist, light brown, fine to coarse Silty SAND			
2								
4								
					-Abundant roots and rootlets			
	B7-1 ■					84		9.4
6					-Trace coarse gravel			
8								
				ML	Hard, moist, light olive brown to reddish brown, fine Sandy SILT, moderate plasticity			
10	B7-2 ■					77	104.7	18.1
					-Firm, slightly moist, olive brown			
12								
14								
	B7-3 ■					50 (6")	92.1	27.4
16					-Trace roots and rootlets, dark brown to reddish brown			
18								
20	B7-4 ■			CL	Hard, moist, dark brown, fine Sandy CLAY	72	109.3	15.7
	B7-5 ⊠				-Reddish brown			
22								
24								
	☐				-Some cobbles; no recovery	50 (6")		
26								
28								

Figure A-7,
Log of Boring B 7, Page 1 of 4

G1218-52-01 (UPD-04-17-2012).GPJ

SAMPLE SYMBOLS

☐ ... SAMPLING UNSUCCESSFUL
◧ ... STANDARD PENETRATION TEST
■ ... DRIVE SAMPLE (UNDISTURBED)
⊠ ... DISTURBED OR BAG SAMPLE
◪ ... CHUNK SAMPLE
▼ ... WATER TABLE OR SEEPAGE

NOTE: THE LOG OF SUBSURFACE CONDITIONS SHOWN HEREON APPLIES ONLY AT THE SPECIFIC BORING OR TRENCH LOCATION AND AT THE DATE INDICATED. IT IS NOT WARRANTED TO BE REPRESENTATIVE OF SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND TIMES.

GEOCON

BORING B 7

ELEV. (MSL.) **1077'** DATE COMPLETED **01-04-2007**

EQUIPMENT **HOLLOW STEM AUGER** BY: **H.D.**

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	MATERIAL DESCRIPTION	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
30	B7-6			ML	Hard, moist, dark brown to brown, fine Sandy SILT, trace fine to coarse gravel, high plasticity	50 (6")	101.6	22.6
				SM	Dense to very dense, slightly moist, dark brown to reddish brown, Silty, fine to medium SAND			
32								
34					-Some oxidation			
	B7-7					50 (6")	115.6	7.3
36					-Dark brown to gray, thinly layered, trace coarse-grained			
38								
40					-Reddish brown			
	B7-8				-Reddish brown to gray	50 (6")	112.9	10.3
42								
44					-Light reddish brown, few cobbles			
	B7-9					50 (5")	99.1	18.1
46								
48								
				ML	Hard, moist, dark brown to gray, fine to coarse Sandy SILT; slight oxidation			
50	B7-10					50 (6")	92.3	25.8
					-Dark gray, some oxidation			
52								
54					-Dark gray to dark brown, ash fragments			
	B7-11					50 (4")	102.0	19.1
56					-Dark brown			
58								

Figure A-7,
Log of Boring B 7, Page 2 of 4

G1218-52-01 (UPD-04-17-2012).GPJ

SAMPLE SYMBOLS			
	☐ ... SAMPLING UNSUCCESSFUL	◧ ... STANDARD PENETRATION TEST	■ ... DRIVE SAMPLE (UNDISTURBED)
	☒ ... DISTURBED OR BAG SAMPLE	◪ ... CHUNK SAMPLE	▼ ... WATER TABLE OR SEEPAGE

NOTE: THE LOG OF SUBSURFACE CONDITIONS SHOWN HEREON APPLIES ONLY AT THE SPECIFIC BORING OR TRENCH LOCATION AND AT THE DATE INDICATED. IT IS NOT WARRANTED TO BE REPRESENTATIVE OF SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND TIMES.

BORING B 7

ELEV. (MSL.) **1077'** DATE COMPLETED **01-04-2007**

EQUIPMENT **HOLLOW STEM AUGER** BY: **H.D.**

DEPTH IN FEET	SAMPLE NO.	SOIL CLASS (USCS)	MATERIAL DESCRIPTION	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
60	B7-12	ML	-Light gray, slight oxidation	50 (4")	93.1	23.3
			-Gray to brown, medium- to coarse-grained			
62						
64						
	B7-13		-Brown, some gypsum fragments, few ash fragments	50 (6")	85.3	29.1
66						
68						
70	B7-14		-No gypsum, few gravel	50 (5")	77.4	37.8
72						
74						
	B7-15		-Increase in caliche	50 (6")	71.1	44.5
76		SM	Dense to very dense, moist, light reddish brown, Silty, fine to coarse SAND; slight oxidation			
78						
80	B7-16		-Light reddish brown to dark brown	50 (6")	96.4	21.2
			-Some coarse-grained, fine gravel			
82						
84						
	B7-17	SM	Very dense, moist to wet, brown to dark reddish brown, Silty, fine SAND	50 (4")	84.1	30.0
86		SM	**PUENTE FORMATION-LA VIDA MEMBER (Tplv)** Dense to very dense, moist, light reddish brown, Silty SANDSTONE, well bedded, thinly bedded			
88						

G1218-52-01 (UPD-04-17-2012).GPJ

Figure A-7,
Log of Boring B 7, Page 3 of 4

SAMPLE SYMBOLS

☐ ... SAMPLING UNSUCCESSFUL
◧ ... STANDARD PENETRATION TEST
■ ... DRIVE SAMPLE (UNDISTURBED)
☒ ... DISTURBED OR BAG SAMPLE
◪ ... CHUNK SAMPLE
▼ ... WATER TABLE OR SEEPAGE

NOTE: THE LOG OF SUBSURFACE CONDITIONS SHOWN HEREON APPLIES ONLY AT THE SPECIFIC BORING OR TRENCH LOCATION AND AT THE DATE INDICATED. IT IS NOT WARRANTED TO BE REPRESENTATIVE OF SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND TIMES.

PROJECT NO. G1218-52-01

BORING B 7

ELEV. (MSL.) **1077'** DATE COMPLETED **01-04-2007**

EQUIPMENT **HOLLOW STEM AUGER** BY: **H.D.**

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	MATERIAL DESCRIPTION	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
90	B7-18			ML	Hard, moist to wet, gray to dark brown, fine-grained, Sandy SILTSTONE, thinly bedded, moderately weathered, oxidized, some carbon deposits	50 (4")	79.4	34.9
92								
94								
	B7-19					50 (4")	69.3	47.0
96					-Decrease in caliche, decrease in carbon deposits			
98								
100	B7-20			CL	Hard, moist, dark gray, fine-grained, Sandy CLAYSTONE, thinly bedded	50 (5")	66.8	47.1
					BORING TERMINATED AT 100.5 FEET No groundwater encountered Backfilled and tamped with soil cuttings to 20 feet. Upper 20 feet backfilled with bentonite grout			

Figure A-7,
Log of Boring B 7, Page 4 of 4

G1218-52-01 (UPD-04-17-2012).GPJ

SAMPLE SYMBOLS

☐ ... SAMPLING UNSUCCESSFUL

◧ ... STANDARD PENETRATION TEST

■ ... DRIVE SAMPLE (UNDISTURBED)

⊠ ... DISTURBED OR BAG SAMPLE

◥ ... CHUNK SAMPLE

▼ ... WATER TABLE OR SEEPAGE

NOTE: THE LOG OF SUBSURFACE CONDITIONS SHOWN HEREON APPLIES ONLY AT THE SPECIFIC BORING OR TRENCH LOCATION AND AT THE DATE INDICATED. IT IS NOT WARRANTED TO BE REPRESENTATIVE OF SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND TIMES.

GEOCON

PROJECT NO. G1218-52-01

BORING B 8

ELEV. (MSL.) **1050'** DATE COMPLETED **01-04-2007**

EQUIPMENT **HOLLOW STEM AUGER** BY: **H.D.**

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	MATERIAL DESCRIPTION	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
0				SM	**ENGINEERED ARTIFICIAL FILL (afe)** Medium dense, moist, brown, Silty, fine to coarse SAND with fine gravel			
2								
4								
	■ B8-1				-Few coarse gravel, slight oxidation	35	97.0	19.6
6								
8								
10	■ B8-2			ML	Hard, moist, gray, SILT with fine sand	58	91.7	29.0
				SM	Dense, moist, dark brown to light brown, Silty, fine to coarse SAND			
12								
14								
	■ B8-3				-Gray, increase in silt -Gray to dark brown, fine-grained, trace roots	53	108.3	18.3
				ML	Very stiff, moist, gray, Sandy SILT, trace roots			
16								
18								
20	■ B8-4			SM	Dense to very dense, moist, gray to light brown, Silty, fine to coarse SAND; trace roots and rootlets	50 (5")	114.9	13.4
22								
24				ML	Very stiff to hard, moist, gray, SILT with fine sand, trace rootlets, moderate plasticity			

Figure A-8,
Log of Boring B 8, Page 1 of 4

G1218-52-01 (UPD-04-17-2012).GPJ

SAMPLE SYMBOLS			
	☐ ... SAMPLING UNSUCCESSFUL	◧ ... STANDARD PENETRATION TEST	■ ... DRIVE SAMPLE (UNDISTURBED)
	☒ ... DISTURBED OR BAG SAMPLE	◪ ... CHUNK SAMPLE	▼ ... WATER TABLE OR SEEPAGE

NOTE: THE LOG OF SUBSURFACE CONDITIONS SHOWN HEREON APPLIES ONLY AT THE SPECIFIC BORING OR TRENCH LOCATION AND AT THE DATE INDICATED. IT IS NOT WARRANTED TO BE REPRESENTATIVE OF SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND TIMES.

GEOCON

BORING B 8

ELEV. (MSL.) 1050' DATE COMPLETED 01-04-2007

EQUIPMENT HOLLOW STEM AUGER BY: H.D.

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	MATERIAL DESCRIPTION	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
	B8-5 ■			ML		50	103.2	21.8
26					-Brown to gray, laminated			
28								
30	B8-6 ☒					46	112.3	17.0
32								
34								
					-Brown to dark brown, slight oxidation			
	B8-7 ■					46	102.8	21.2
36					-Gray to brown to dark brown, increase in coarse-grained with trace medium-grained			
38								
40	B8-8 ■				-Brown to dark brown	86	96.8	22.6
					-Slight oxidation			
42								
44								
					-Light brown to dark gray			
	B8-9 ■					54	107.8	16.0
46					-Mottled dark brown to gray, fine-grained with trace coarse-grained, high plasticity			
48								
					-Mottled, brown to dark brown to olive brown, some coarse-grained, fine			

Figure A-8,
Log of Boring B 8, Page 2 of 4

SAMPLE SYMBOLS			
	☐ ... SAMPLING UNSUCCESSFUL	◧ ... STANDARD PENETRATION TEST	■ ... DRIVE SAMPLE (UNDISTURBED)
	☒ ... DISTURBED OR BAG SAMPLE	◪ ... CHUNK SAMPLE	▼ ... WATER TABLE OR SEEPAGE

PROJECT NO. G1218-52-01

BORING B 8

ELEV. (MSL.) 1050' DATE COMPLETED 01-04-2007

EQUIPMENT HOLLOW STEM AUGER BY: H.D.

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	MATERIAL DESCRIPTION	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
50	B8-10			ML	gravel, high plasticity	66	87.4	29.3
					-Brown to olive brown, trace ash deposits			
52								
54								
	B8-11				-Mottled, gray to dark brown to reddish brown, trace gravel, trace rootlets, high plasticity	75	106.9	21.0
56					-Brown to gray to dark brown, laminated, decrease in coarse-fraction			
58								
60	B8-12 B8-20				-Reddish brown, no coarse-grained, trace medium-grained -Reddish brown to gray	50 (6")	107.7	18.7
62								
64								
				CL	Hard, moist, dark gray, CLAY, trace coarse-grained sand			
	B8-13					67	105.4	19.7
66				ML	Hard, moist, reddish brown, fine Sandy SILT, high plasticity			
68								
				CL	Hard, slightly moist, dark gray, CLAY, trace coarse-grained, sand and wood fragments			
70	B8-14					54	93.9	26.8
				ML	Hard, slightly moist, dark brown to brown, SILT with sand, laminated, moderate plasticity			
72								
74								
					-Gray to dark brown, high plasticity			

Figure A-8,
Log of Boring B 8, Page 3 of 4

G1218-52-01 (UPD-04-17-2012).GPJ

SAMPLE SYMBOLS

☐ ... SAMPLING UNSUCCESSFUL
◧ ... STANDARD PENETRATION TEST
■ ... DRIVE SAMPLE (UNDISTURBED)
▨ ... DISTURBED OR BAG SAMPLE
◪ ... CHUNK SAMPLE
▼ ... WATER TABLE OR SEEPAGE

NOTE: THE LOG OF SUBSURFACE CONDITIONS SHOWN HEREON APPLIES ONLY AT THE SPECIFIC BORING OR TRENCH LOCATION AND AT THE DATE INDICATED. IT IS NOT WARRANTED TO BE REPRESENTATIVE OF SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND TIMES.

GEOCON

BORING B 8

ELEV. (MSL.) **1050'** DATE COMPLETED **01-04-2007**

EQUIPMENT **HOLLOW STEM AUGER** BY: **H.D.**

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	MATERIAL DESCRIPTION	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
	B8-15	■		ML		82	96.8	27.3
76					-Reddish brown to gray, laminated			
78								
80	B8-16	■			-Dark brown	80	94.1	30.0
					-Gray			
82								
84								
	B8-17	■		ML	**PUENTE FORMATION-LA VIDA MEMBER (Tplv)** Hard, slightly moist to moist, gray, Sandy SILTSTONE; thinly bedded	50 (6")	101.0	16.9
86								
88								
90	B8-18	■				50 (3")	111.2	16.6
92								
94								
	B8-19	■				50 (2")	103.3	12.5
					BORING TERMINATED AT 95.5 FEET No groundwater encountered Backfilled and tamped with soil cuttings to 20 feet. Upper 20 feet backfilled with bentonite grout			

Figure A-8,
Log of Boring B 8, Page 4 of 4

SAMPLE SYMBOLS			
	☐ ... SAMPLING UNSUCCESSFUL	◧ ... STANDARD PENETRATION TEST	■ ... DRIVE SAMPLE (UNDISTURBED)
	☒ ... DISTURBED OR BAG SAMPLE	◪ ... CHUNK SAMPLE	▼ ... WATER TABLE OR SEEPAGE

NOTE: THE LOG OF SUBSURFACE CONDITIONS SHOWN HEREON APPLIES ONLY AT THE SPECIFIC BORING OR TRENCH LOCATION AND AT THE DATE INDICATED. IT IS NOT WARRANTED TO BE REPRESENTATIVE OF SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND TIMES.

PROJECT NO. G1218-52-01

BORING B 9

ELEV. (MSL.) **1013'** DATE COMPLETED **01-02-2007**

EQUIPMENT **HOLLOW STEM AUGER** BY: **G.K.**

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	MATERIAL DESCRIPTION	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
0				SM	**ENGINEERED ARTIFICIAL FILL (afe)** Dense, moist, brown, Silty, fine to medium SAND with fine to coarse gravel			
2								
4								
	B9-1 ■					76	108.3	6.3
6					-Poorly graded, fine-grained, trace fine gravel			
8								
10	B9-2 ■					44	107.5	11.0
					-Medium dense, slightly moist, olive brown, fine-grained, moderate plasticity			
12								
14					-Gray to brown, fine-grained			
	B9-3 ■					38	109.4	12.9
16				ML	Very stiff to hard, moist, dark brown to olive brown, fine to medium Sandy SILT with gravel			
18								
20	B9-4 ■					39	81.3	33.7
22								
24								
					-Slight oxidation			

Figure A-9,
Log of Boring B 9, Page 1 of 6

G1218-52-01 (UPD-04-17-2012).GPJ

SAMPLE SYMBOLS

☐ ... SAMPLING UNSUCCESSFUL
◧ ... STANDARD PENETRATION TEST
■ ... DRIVE SAMPLE (UNDISTURBED)
☒ ... DISTURBED OR BAG SAMPLE
◩ ... CHUNK SAMPLE
▼ ... WATER TABLE OR SEEPAGE

NOTE: THE LOG OF SUBSURFACE CONDITIONS SHOWN HEREON APPLIES ONLY AT THE SPECIFIC BORING OR TRENCH LOCATION AND AT THE DATE INDICATED. IT IS NOT WARRANTED TO BE REPRESENTATIVE OF SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND TIMES.

GEOCON

PROJECT NO. G1218-52-01

BORING B 9

ELEV. (MSL.) **1013'** DATE COMPLETED **01-02-2007**

EQUIPMENT **HOLLOW STEM AUGER** BY: **G.K.**

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	MATERIAL DESCRIPTION	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
	B9-5	■		ML		43	70.6	44.6
26								
28								
30					-Roots and rootlets			
	B9-6	■				54	77.2	41.1
					-Ash deposits			
32								
34								
	B9-7	■				50	68.7	48.2
36					-Carbon deposits, trace gypsum			
38								
					-Gray to olive brown, some medium- to coarse-grained sand			
40	B9-8	■			-Dark brown to olive brown	68	102.5	21.7
42								
44								
		☐			-No recovery	50 (4")		
46								
48								

Figure A-9,
Log of Boring B 9, Page 2 of 6

G1218-52-01 (UPD-04-17-2012).GPJ

SAMPLE SYMBOLS	☐ ... SAMPLING UNSUCCESSFUL	◧ ... STANDARD PENETRATION TEST	■ ... DRIVE SAMPLE (UNDISTURBED)
	⊠ ... DISTURBED OR BAG SAMPLE	◪ ... CHUNK SAMPLE	▼ ... WATER TABLE OR SEEPAGE

NOTE: THE LOG OF SUBSURFACE CONDITIONS SHOWN HEREON APPLIES ONLY AT THE SPECIFIC BORING OR TRENCH LOCATION AND AT THE DATE INDICATED. IT IS NOT WARRANTED TO BE REPRESENTATIVE OF SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND TIMES.

GEOCON

PROJECT NO. G1218-52-01

BORING B 9

ELEV. (MSL.) **1013'** DATE COMPLETED **01-02-2007**

EQUIPMENT **HOLLOW STEM AUGER** BY: **G.K.**

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	MATERIAL DESCRIPTION	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
50				ML	-No recovery	50 (6")		
52								
54				SM	Dense, moist, reddish brown to olive brown, fine Silty SAND			
	B9-9 ■					45	110.5	16.2
56					-Light brown			
58								
				SC	Dense to very dense, moist, olive brown, Clayey, fine to coarse SAND with gravel, high plasticity			
60	B9-10 ■					56	92.6	31.1
62					-Groundwater seepage encountered			
				SM	Medium dense, moist to wet, light brown, Silty, fine SAND, poorly graded			
64								
	B9-11 ■					38	90.0	31.1
66					-Dark brown			
68								
70	B9-12 ■					39	105.2	20.8
					-Gray to dark brown			
72								
74				ML	Very stiff to hard, moist to wet, dark brown, SILT, moderate plasticity, some medium- to coarse-grained sand			

Figure A-9,
Log of Boring B 9, Page 3 of 6

G1218-52-01 (UPD-04-17-2012).GPJ

SAMPLE SYMBOLS			
	☐ ... SAMPLING UNSUCCESSFUL	◧ ... STANDARD PENETRATION TEST	■ ... DRIVE SAMPLE (UNDISTURBED)
	☒ ... DISTURBED OR BAG SAMPLE	◪ ... CHUNK SAMPLE	▼ ... WATER TABLE OR SEEPAGE

BORING B 9

ELEV. (MSL.) **1013'** DATE COMPLETED **01-02-2007**

EQUIPMENT **HOLLOW STEM AUGER** BY: **G.K.**

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	MATERIAL DESCRIPTION	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
	B9-13 ■			ML		42	78.4	41.2
76								
78								
80	B9-14 ■				-Trace fine sand and gravel	36	65.5	52.1
82								
84								
	B9-15 ■				-Rootlets, carbon deposits, decrease in fine content, few gravel	38	73.1	44.2
86								
88								
90	B9-16 ■				-Gray to dark brown, hard, some fine gravel	43	59.8	58.6
92								
94								
	☐				-No recovery	58		
96								
98								

Figure A-9,
Log of Boring B 9, Page 4 of 6

G1218-52-01 (UPD-04-17-2012).GPJ

SAMPLE SYMBOLS			
	☐ ... SAMPLING UNSUCCESSFUL	◧ ... STANDARD PENETRATION TEST	■ ... DRIVE SAMPLE (UNDISTURBED)
	☒ ... DISTURBED OR BAG SAMPLE	◪ ... CHUNK SAMPLE	▼ ... WATER TABLE OR SEEPAGE

NOTE: THE LOG OF SUBSURFACE CONDITIONS SHOWN HEREON APPLIES ONLY AT THE SPECIFIC BORING OR TRENCH LOCATION AND AT THE DATE INDICATED. IT IS NOT WARRANTED TO BE REPRESENTATIVE OF SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND TIMES.

PROJECT NO. G1218-52-01

BORING B 9

ELEV. (MSL.) **1013'** DATE COMPLETED **01-02-2007**

EQUIPMENT **HOLLOW STEM AUGER** BY: **G.K.**

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	MATERIAL DESCRIPTION	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
100				ML	-Some gravel; no recovery	50 (6")		
102								
104				SM	Very dense, moist, light to olive brown, Silty, fine SAND			
	B9-17					50 (5")	100.9	20.9
106				ML	Hard, moist, dark brown, SILT; low plasticity			
108								
				SM	Dense to very dense, moist, gray to dark brown, Silty, fine SAND			
110	B9-18					50 (6")	104.3	22.1
					-Gray, trace coarse-grained			
112								
114								
					-Few gravel and roots			
	B9-19					50 (6")	109.6	17.6
116								
118								
120					-No recovery	50 (6")		
122								
124								

Figure A-9,
Log of Boring B 9, Page 5 of 6

G1218-52-01 (UPD-04-17-2012).GPJ

SAMPLE SYMBOLS			
	☐ ... SAMPLING UNSUCCESSFUL	◧ ... STANDARD PENETRATION TEST	■ ... DRIVE SAMPLE (UNDISTURBED)
	☒ ... DISTURBED OR BAG SAMPLE	◪ ... CHUNK SAMPLE	▼ ... WATER TABLE OR SEEPAGE

NOTE: THE LOG OF SUBSURFACE CONDITIONS SHOWN HEREON APPLIES ONLY AT THE SPECIFIC BORING OR TRENCH LOCATION AND AT THE DATE INDICATED. IT IS NOT WARRANTED TO BE REPRESENTATIVE OF SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND TIMES.

GEOCON

BORING B 9

ELEV. (MSL.) **1013'** DATE COMPLETED **01-02-2007**

EQUIPMENT **HOLLOW STEM AUGER** BY: **G.K.**

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	MATERIAL DESCRIPTION	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
	B9-20 ■			ML	**PUENTE FORMATION-LA VIDA MEMBER (Tplv)** Hard, moist, gray, fine-grained, Sandy SILTSTONE; thinly bedded	50 (6")		26.9
126								
128								
130	B9-21 ■				-Gray to light gray, fine-grained	50 (6")		29.6

BORING TERMINATED AT 130.5 FEET
Groundwater seepage encountered between 61.5 to 72 feet
Backfilled and tamped with soil cuttings to 20 feet.
Upper 20 feet backfilled with bentonite grout

Figure A-9,
Log of Boring B 9, Page 6 of 6

SAMPLE SYMBOLS

☐ ... SAMPLING UNSUCCESSFUL
◧ ... STANDARD PENETRATION TEST
■ ... DRIVE SAMPLE (UNDISTURBED)
☒ ... DISTURBED OR BAG SAMPLE
◪ ... CHUNK SAMPLE
▼ ... WATER TABLE OR SEEPAGE

NOTE: THE LOG OF SUBSURFACE CONDITIONS SHOWN HEREON APPLIES ONLY AT THE SPECIFIC BORING OR TRENCH LOCATION AND AT THE DATE INDICATED. IT IS NOT WARRANTED TO BE REPRESENTATIVE OF SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND TIMES.

PROJECT NO. G1218-52-01

BORING B 10

ELEV. (MSL.) 1078' DATE COMPLETED 01-03-2007

EQUIPMENT HOLLOW STEM AUGER BY: G.K.

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	MATERIAL DESCRIPTION	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
0				SM	**ENGINEERED ARTIFICIAL FILL (afe)** Dense to very dense, moist, light brown, Silty, fine to coarse SAND with fine gravel, low plasticity			
2								
4								
	B10-1 ■					51	106.9	12.1
6					-Light brown to dark brown			
8								
10					-Dense, dark brown to yellowish brown			
	B10-2 ■					88	107.4	20.0
					-Decrease in medium- to coarse-grained			
12								
14								
					-Moderate plasticity			
	B10-3 ■				-Poorly graded, very dense, slightly moist, light brown, fine-grained	50 (6")	112.2	15.0
16								
18								
20					-Dense, slightly moist, dark brown, fine-grained, moderate plasticity			
	B10-4 ■					65	102.8	16.9
22								
24				ML	Hard, moist, dark brown, fine Sandy SILT, moderate plasticity, trace coarse gravel			
	B10-5 ■					83	75.0	39.7
26								
28								

Figure A-10,
Log of Boring B 10, Page 1 of 3

G1218-52-01 (UPD-04-17-2012).GPJ

SAMPLE SYMBOLS

☐ ... SAMPLING UNSUCCESSFUL	◧ ... STANDARD PENETRATION TEST	■ ... DRIVE SAMPLE (UNDISTURBED)
☒ ... DISTURBED OR BAG SAMPLE	◪ ... CHUNK SAMPLE	▼ ... WATER TABLE OR SEEPAGE

NOTE: THE LOG OF SUBSURFACE CONDITIONS SHOWN HEREON APPLIES ONLY AT THE SPECIFIC BORING OR TRENCH LOCATION AND AT THE DATE INDICATED. IT IS NOT WARRANTED TO BE REPRESENTATIVE OF SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND TIMES.

GEOCON

PROJECT NO. G1218-52-01

BORING B 10

ELEV. (MSL.) **1078'** DATE COMPLETED **01-03-2007**

EQUIPMENT **HOLLOW STEM AUGER** BY: **G.K.**

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	MATERIAL DESCRIPTION	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
30	B10-6					50 (6")	74.1	38.4
				SM	Very dense, moist to wet, reddish to light olive brown, Silty, fine SAND			
32								
34								
	B10-7				-Trace carbon deposits	47	73.2	39.7
36								
38								
40	B10-8					50 (3")	66.3	45.2
				ML	Hard, moist to wet, dark brown, fine, Sandy SILT, moderate plasticity, trace carbon deposits			
42								
44								
	B10-9					82 (6")	61.4	57.7
46					-No carbon deposits			
48								
				SM	Very dense, moist to wet, gray to dark brown to reddish brown, fine to coarse Silty SAND			
50	B10-10					89 (6")	68.7	45.3
	B10-16							
52								
54								
					-Trace coarse gravel, reddish brown to olive brown, laminated	122 (6")	62.2	59.9
	B10-11			SM	**PUENTE FORMATION-LA VIDA MEMBER (Tplv)** Very dense, moist to wet, brown to olive brown, fine-grained, Silty SANDSTONE			
56								
58								

Figure A-10,
Log of Boring B 10, Page 2 of 3

G1218-52-01 (UPD-04-17-2012).GPJ

SAMPLE SYMBOLS			
	☐ ... SAMPLING UNSUCCESSFUL	◧ ... STANDARD PENETRATION TEST	■ ... DRIVE SAMPLE (UNDISTURBED)
	☒ ... DISTURBED OR BAG SAMPLE	◪ ... CHUNK SAMPLE	▼ ... WATER TABLE OR SEEPAGE

NOTE: THE LOG OF SUBSURFACE CONDITIONS SHOWN HEREON APPLIES ONLY AT THE SPECIFIC BORING OR TRENCH LOCATION AND AT THE DATE INDICATED. IT IS NOT WARRANTED TO BE REPRESENTATIVE OF SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND TIMES.

GEOCON

PROJECT NO. G1218-52-01

BORING B 10

ELEV. (MSL.) **1078'** DATE COMPLETED **01-03-2007**

EQUIPMENT **HOLLOW STEM AUGER** BY: **G.K.**

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	MATERIAL DESCRIPTION	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
60	B10-12			SM	-Trace carbon deposits, brown	50 (1")	63.4	55.5
62								
64								
	B10-13					50 (2")	69.0	44.9
66					-Dark brown to yellowish brown, fine-grained, slightly moist, well bedded, thinly bedded			
68								
				ML	Hard, moist to wet, dark brown, fine-grained, Sandy SILTSTONE, thinly bedded			
70	B10-14					50 (5")	78.7	41.2
72								
74								
	B10-15				-Gray to reddish brown, trace calcium carbonate deposits -Reddish brown to olive brown	50 (3")	70.3	43.4

BORING TERMINATED AT 75.5 FEET
No groundwater encountered
Backfilled and tamped with soil cuttings to 20 feet.
Upper 20 feet backfilled with bentonite grout

Figure A-10,
Log of Boring B 10, Page 3 of 3

G1218-52-01 (UPD-04-17-2012).GPJ

SAMPLE SYMBOLS
☐ ... SAMPLING UNSUCCESSFUL
◧ ... STANDARD PENETRATION TEST
■ ... DRIVE SAMPLE (UNDISTURBED)
☒ ... DISTURBED OR BAG SAMPLE
◪ ... CHUNK SAMPLE
▼ ... WATER TABLE OR SEEPAGE

NOTE: THE LOG OF SUBSURFACE CONDITIONS SHOWN HEREON APPLIES ONLY AT THE SPECIFIC BORING OR TRENCH LOCATION AND AT THE DATE INDICATED. IT IS NOT WARRANTED TO BE REPRESENTATIVE OF SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND TIMES.

GEOCON

PROJECT NO. G1218-52-01

BORING B 11

ELEV. (MSL.) **1124'** DATE COMPLETED **01-03-2007**

EQUIPMENT **HOLLOW STEM AUGER** BY: **G.K.**

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	MATERIAL DESCRIPTION	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
0				SM	**ENGINEERED ARTIFICIAL FILL (afe)** Medium dense, moist, brown, Silty, fine SAND, trace fine gravel and rootlets			
2								
4								
	B11-1	■				45	86.5	25.3
6				ML	Stiff to very stiff, moist to wet, dark brown, fine to medium Sandy SILT			
8								
10	B11-2	■			-Gray, trace coarse-grained	30	74.6	41.8
					-Brown to dark brown, trace coarse-grained sand, slight oxidation, high plasticity			
12								
14					-Hard, trace gypsum and gravel			
	B11-3	■				80	75.9	40.2
16								
18								
20					-Increase in gypsum, moderate plasticity			
	B11-4	■				45	67.0	50.5
					-Increase in coarse-grained			
22								
24								
					-No gypsum, no gravel, stiff			

Figure A-11,
Log of Boring B 11, Page 1 of 6

G1218-52-01 (UPD-04-17-2012).GPJ

SAMPLE SYMBOLS			
	☐ ... SAMPLING UNSUCCESSFUL	◧ ... STANDARD PENETRATION TEST	■ ... DRIVE SAMPLE (UNDISTURBED)
	⊠ ... DISTURBED OR BAG SAMPLE	◪ ... CHUNK SAMPLE	▼ ... WATER TABLE OR SEEPAGE

NOTE: THE LOG OF SUBSURFACE CONDITIONS SHOWN HEREON APPLIES ONLY AT THE SPECIFIC BORING OR TRENCH LOCATION AND AT THE DATE INDICATED. IT IS NOT WARRANTED TO BE REPRESENTATIVE OF SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND TIMES.

GEOCON

PROJECT NO. G1218-52-01

BORING B 11

ELEV. (MSL.) 1124' DATE COMPLETED 01-03-2007

EQUIPMENT HOLLOW STEM AUGER BY: G.K.

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	MATERIAL DESCRIPTION	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
	B11-5			ML		40	67.9	50.6
26					-Olive brown			
28								
30					-Brown			
	B11-6					27	72.0	46.9
32								
34								
	B11-7				-Olive brown, trace roots	45	81.3	38.2
36					-Olive brown, dark brown to brown, trace fine gravel			
38								
40	B11-8				-Trace coarse gravel, olive brown	54	73.3	45.1
					-Stiff to hard, slightly moist, brown to dark brown, slight oxidation			
42								
44								
					-Some ash deposits, slight oxidation			
	B11-9				-Increase in ash deposits, moderately oxidized, high plasticity	61	93.0	30.1
46					-Decrease in ash deposits, slight oxidation, brown to dark brown			
48								
					-Some oxidation, dark brown to olive brown			

Figure A-11,
Log of Boring B 11, Page 2 of 6

G1218-52-01 (UPD-04-17-2012).GPJ

SAMPLE SYMBOLS

☐ ... SAMPLING UNSUCCESSFUL

◧ ... STANDARD PENETRATION TEST

■ ... DRIVE SAMPLE (UNDISTURBED)

☒ ... DISTURBED OR BAG SAMPLE

◪ ... CHUNK SAMPLE

▼ ... WATER TABLE OR SEEPAGE

NOTE: THE LOG OF SUBSURFACE CONDITIONS SHOWN HEREON APPLIES ONLY AT THE SPECIFIC BORING OR TRENCH LOCATION AND AT THE DATE INDICATED. IT IS NOT WARRANTED TO BE REPRESENTATIVE OF SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND TIMES.

GEOCON

PROJECT NO. G1218-52-01

BORING B 11

ELEV. (MSL.) **1124'** DATE COMPLETED **01-03-2007**

EQUIPMENT **HOLLOW STEM AUGER** BY: **G.K.**

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	MATERIAL DESCRIPTION	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
50	☒ B11-10			ML		59	91.4	30.1
					-Hard, moist, olive brown, slight oxidation, high plasticity			
52								
54				SM	Dense, moist, light reddish brown, fine, Silty SAND, trace medium- to coarse-grained			
	■ B11-11					45	85.8	22.6
				ML	Very stiff, moist, light brown to dark brown, SILT with fine to coarse sand, laminated			
56								
58								
60	■ B11-12				-Few gravel	53	73.8	30.9
62								
64					-Ash deposits			
	■ B11-13					59	84.3	24.4
66					-Few gravel			
68								
70	■ B11-14				-Hard, moist to wet, dark brown, medium-grained sand, calcium carbonate deposits, ash deposits, high plasticity	86	70.4	37.6
72								
74								
					-Trace carbon deposits, light gray to dark brown			

Figure A-11,
Log of Boring B 11, Page 3 of 6

G1218-52-01 (UPD-04-17-2012).GPJ

SAMPLE SYMBOLS	☐ ... SAMPLING UNSUCCESSFUL	◧ ... STANDARD PENETRATION TEST	■ ... DRIVE SAMPLE (UNDISTURBED)
	☒ ... DISTURBED OR BAG SAMPLE	◪ ... CHUNK SAMPLE	▼ ... WATER TABLE OR SEEPAGE

NOTE: THE LOG OF SUBSURFACE CONDITIONS SHOWN HEREON APPLIES ONLY AT THE SPECIFIC BORING OR TRENCH LOCATION AND AT THE DATE INDICATED. IT IS NOT WARRANTED TO BE REPRESENTATIVE OF SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND TIMES.

GEOCON

PROJECT NO. G1218-52-01

BORING B 11

ELEV. (MSL.) **1124'** DATE COMPLETED **01-03-2007**

EQUIPMENT **HOLLOW STEM AUGER** BY: **G.K.**

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	MATERIAL DESCRIPTION	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
	B11-15 ■			ML		104 (4")	75.6	33.9
76					-Dark brown to dark brown, laminated			
78								
					-Brown to olive brown, fine to medium-grained, trace ash deposits, slight oxidation, moderate plasticity			
80	B11-16 ■					98	89.7	26.9
82								
84								
					-Decrease in medium-grained fraction			
	B11-17 ■					72	68.4	34.9
86								
88								
					-Dark brown, high plasticity, trace calcium carbonate deposits, laminated			
90	B11-18 ■					75	74.4	35.4
92								
94				SM	Very dense, moist, light brown to brown, Silty, fine SAND			
	B11-19 ■					92	87.4	19.6
				ML	Hard, moist, dark brown, fine Sandy SILT; moderate plasticity, some ash deposits			
96								
98								
					-Olive brown, moderate plasticity, trace roots and rootlets			

Figure A-11,
Log of Boring B 11, Page 4 of 6

G1218-52-01 (UPD-04-17-2012).GPJ

SAMPLE SYMBOLS

☐ ... SAMPLING UNSUCCESSFUL
◧ ... STANDARD PENETRATION TEST
■ ... DRIVE SAMPLE (UNDISTURBED)
☒ ... DISTURBED OR BAG SAMPLE
◪ ... CHUNK SAMPLE
▼ ... WATER TABLE OR SEEPAGE

NOTE: THE LOG OF SUBSURFACE CONDITIONS SHOWN HEREON APPLIES ONLY AT THE SPECIFIC BORING OR TRENCH LOCATION AND AT THE DATE INDICATED. IT IS NOT WARRANTED TO BE REPRESENTATIVE OF SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND TIMES.

GEOCON

BORING B 11

ELEV. (MSL.) 1124' DATE COMPLETED 01-03-2007

EQUIPMENT HOLLOW STEM AUGER BY: G.K.

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	MATERIAL DESCRIPTION	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
100	B11-20			ML	-Dark brown to dark brown	108	92.1	22.5
102								
104								
	B11-21				-Gray to olive brown, fine-grained, trace medium- to coarse-grained, high plasticity	124	91.3	24.1
				SM	Very dense, slightly moist, light brown to olive brown, Silty, fine SAND; trace rootlets			
106								
108								
110					-Some shale fragments and rootlets; no recovery	50 (2")		
112								
114								
					-Dense, slightly moist, reddish brown to olive brown			
	B11-22					75	109.9	5.9
116					-Light brown, slight oxidation			
118								
120	B11-23					77	87.1	28.1
				ML	Hard, moist, brown, fine to coarse Sandy SILT; moderate plasticity			
122								
124								
					-Trace gypsum, olive brown to reddish brown			

Figure A-11,
Log of Boring B 11, Page 5 of 6

SAMPLE SYMBOLS			
	☐ ... SAMPLING UNSUCCESSFUL	◧ ... STANDARD PENETRATION TEST	■ ... DRIVE SAMPLE (UNDISTURBED)
	⊠ ... DISTURBED OR BAG SAMPLE	◣ ... CHUNK SAMPLE	▼ ... WATER TABLE OR SEEPAGE

NOTE: THE LOG OF SUBSURFACE CONDITIONS SHOWN HEREON APPLIES ONLY AT THE SPECIFIC BORING OR TRENCH LOCATION AND AT THE DATE INDICATED. IT IS NOT WARRANTED TO BE REPRESENTATIVE OF SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND TIMES.

BORING B 11

ELEV. (MSL.) **1124'** DATE COMPLETED **01-03-2007**

EQUIPMENT **HOLLOW STEM AUGER** BY: **G.K.**

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	MATERIAL DESCRIPTION	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
	B11-24			ML		62(6")	75.6	34.0
126								
128								
130	B11-25			SM	**PUENTE FORMATION-LA VIDA MEMBER (Tplv)** Very dense, moist to wet, brown, fine-grained, Silty SANDSTONE; thinly bedded, few ash beds	50 (3")	62.6	52.5
132								
134								
					-No recovery	50 (2")		
136								
138					-Light reddish brown			
140	B11-26					50 (2")	70.8	32.9

BORING TERMINATED AT 140.5 FEET
No groundwater encountered
Backfilled and tamped with soil cuttings to 20 feet.
Upper 20 feet backfilled with bentonite grout

Figure A-11,
Log of Boring B 11, Page 6 of 6

G1218-52-01 (UPD-04-17-2012).GPJ

SAMPLE SYMBOLS

☐ ... SAMPLING UNSUCCESSFUL
◧ ... STANDARD PENETRATION TEST
■ ... DRIVE SAMPLE (UNDISTURBED)
☒ ... DISTURBED OR BAG SAMPLE
◪ ... CHUNK SAMPLE
▼ ... WATER TABLE OR SEEPAGE

NOTE: THE LOG OF SUBSURFACE CONDITIONS SHOWN HEREON APPLIES ONLY AT THE SPECIFIC BORING OR TRENCH LOCATION AND AT THE DATE INDICATED. IT IS NOT WARRANTED TO BE REPRESENTATIVE OF SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND TIMES.

GEOCON

PROJECT NO. G1218-52-01

BORING B 12

ELEV. (MSL.) **1134'** DATE COMPLETED **09-18-2007**

EQUIPMENT **26" DIAMETER BUCKET AUGER** BY: **G.K.**

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	MATERIAL DESCRIPTION	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
0				ML	**PUENTE FORMATION-LA VIDA MEMBER (Tplv)** Hard, moist to wet, light gray, fine-grained, SILTSTONE; thinly bedded, diatomaceous			
2								
4					-At 3.2' Bedding: N80W, 17SW			
	B12-1 ■				-North side of hole: Top 3 inches interbedded siltstone contact with 8-inch ash bed, N72W, wavy contact possible 45N, everything below is well bedded siltstone, clayey siltstone	10 (7")	71.9	50.5
6					-At 3.5' Joint: N32W, 56NE -Joint: N54W, 35SW -Oxidation along joint surface			
8					-At 5.5': 8" thick siliceous bed continuous around hole, very hard, light gray to white -At 7': well bedded siltstone with thin diatomaceous layers of bedding, olive gray			
10	B12-2 ■				-At 8' Bedding: N73W, 18SW, clay continuing along bedding -Locally diatomaceous siltstone	10 (8")	59.8	56.2
12					-At 12' Gypsum along bedding and fractures (8" thick)			
14					-**BEDDING PLANE SHEAR** at 13.5 feet; (N67W, 15SW); clay seam along bedding, striations oriented down-dip, 1/2" thick gypsum			
	B12-3 ■					10 (7")	59.9	58.5
16								
18								
20					-At 19.5': 4-inch thick siliceous siltstone, slightly oxidized, medium brown, poorly bedded -No sample			
22					-At 21': iron oxide staining along bedding and fractures -Some gypsum			
24								
	B12-4 ■				-Brown to olive brown	20 (10")	55.2	69.7
26								
28					-At 28' Bedding: N55W, 14S, continuous ash bed along N wall 6" to 22" thick			

Figure A-12,
Log of Boring B 12, Page 1 of 2

G1218-52-01 (UPD-04-17-2012).GPJ

SAMPLE SYMBOLS			
	☐ ... SAMPLING UNSUCCESSFUL	◧ ... STANDARD PENETRATION TEST	■ ... DRIVE SAMPLE (UNDISTURBED)
	☒ ... DISTURBED OR BAG SAMPLE	◪ ... CHUNK SAMPLE	▼ ... WATER TABLE OR SEEPAGE

NOTE: THE LOG OF SUBSURFACE CONDITIONS SHOWN HEREON APPLIES ONLY AT THE SPECIFIC BORING OR TRENCH LOCATION AND AT THE DATE INDICATED. IT IS NOT WARRANTED TO BE REPRESENTATIVE OF SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND TIMES.

GEOCON

BORING B 12

ELEV. (MSL.) **1134'** DATE COMPLETED **09-18-2007**

EQUIPMENT **26" DIAMETER BUCKET AUGER** BY: **G.K.**

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	MATERIAL DESCRIPTION	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
30	■ B12-5 ▨ B12-10			ML	-Diatomaceous	30 (12")	77.6	37.2
32								
					-Brown to dark brown, unoxidized			
34								
	■ B12-6					30 (9")	82.7	29.7
36					-At 36' Bedding: N55W, 15.5S			
38								
40	■ B12-7					30 (4")	55.2	60.3
42								
44					-At 44' Bedding: N55W, 19S on a 4" ash bed			
	■ B12-8				-Very hard	50 (5")		
46								
48								
50	■ B12-9					10 (8")		

BORING TERMINATED AT 50.5 FEET
No groundwater encountered
Backfilled and tamped with soil cuttings interlayered with bentonite chips

Figure A-12,
Log of Boring B 12, Page 2 of 2

G1218-52-01 (UPD-04-17-2012).GPJ

SAMPLE SYMBOLS			
	☐ ... SAMPLING UNSUCCESSFUL	◧ ... STANDARD PENETRATION TEST	■ ... DRIVE SAMPLE (UNDISTURBED)
	☒ ... DISTURBED OR BAG SAMPLE	◪ ... CHUNK SAMPLE	▼ ... WATER TABLE OR SEEPAGE

NOTE: THE LOG OF SUBSURFACE CONDITIONS SHOWN HEREON APPLIES ONLY AT THE SPECIFIC BORING OR TRENCH LOCATION AND AT THE DATE INDICATED. IT IS NOT WARRANTED TO BE REPRESENTATIVE OF SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND TIMES.

PROJECT NO. G1218-52-01

BORING B 13

ELEV. (MSL.) **1106'** DATE COMPLETED **09-18-2007**

EQUIPMENT **26" DIAMETER BUCKET AUGER** BY: **G.K.**

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	MATERIAL DESCRIPTION	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
0				SM	**FILL** Medium dense, slightly moist, dark brown, Silty, fine to medium SAND; some cobbles, 3-6"			
2				ML	**PUENTE FORMATION-LA VIDA MEMBER (Tplv)** Hard, damp to moist, olive brown, fine-grained, SILTSTONE, thinly bedded, unoxidized, intensely fractured, highly weathered, interbedded with shale, cherty, abundant concretions to 24" thick; upper 9" on south side well bedded, diatomaceous shale			
	B13-1				-At 1' Bedding: N82W, 26S	10 (8")	105.5	16.5
6					-At 3' Joint set: N side 4' wide, N18E, vertical -Olive brown to strong chocolate brown -At 4' dark gray to black			
8					-Below 5', unoxidized, slightly fractured, dark gray to black siltstone, moderately hard to hard -At 9' Bedding: N81E, 22S			
10	B13-2					12 (6")	96.2	18.6
12					-At 11½': Siliceous concretion measures 20" in longest dimension			
14					-Trace ash -At 13½': ¼-inch thick ash bed -At 14' Bedding: N81W, 13S			
	B13-3					10 (4")	101.5	13.8
16								
18					-At 18' Concretion on SE side, approximately 22" in longest dimension			
20	B13-4				-At 20' 4 to 6-inch concretion, grades to sandy siltstone	10 (4")	111.4	14.7
22					-Trace ash			
24	B13-5					30 (7")	104.0	17.5

BORING TERMINATED AT 24.5 FEET
No groundwater encountered
Backfilled and tamped with soil cuttings interlayered with bentonite chips

Figure A-13,
Log of Boring B 13, Page 1 of 1

G1218-52-01 (UPD-04-17-2012).GPJ

SAMPLE SYMBOLS

☐ ... SAMPLING UNSUCCESSFUL
◧ ... STANDARD PENETRATION TEST
■ ... DRIVE SAMPLE (UNDISTURBED)
☒ ... DISTURBED OR BAG SAMPLE
◪ ... CHUNK SAMPLE
▼ ... WATER TABLE OR SEEPAGE

NOTE: THE LOG OF SUBSURFACE CONDITIONS SHOWN HEREON APPLIES ONLY AT THE SPECIFIC BORING OR TRENCH LOCATION AND AT THE DATE INDICATED. IT IS NOT WARRANTED TO BE REPRESENTATIVE OF SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND TIMES.

GEOCON

PROJECT NO. G1218-52-01

BORING B 14

ELEV. (MSL.) **1218'** DATE COMPLETED **09-18-2007**

EQUIPMENT **26" DIAMETER BUCKET AUGER** BY: **G.K.**

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	MATERIAL DESCRIPTION	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
0				ML	**PUENTE FORMATION-LA VIDA MEMBER (Tplv)** Hard, moist to wet, brown to light gray, fine-grained, SILTSTONE; slightly moist, thinly bedded, medium hard -Bedding at 6": N51E, 16SE			
2					-Olive brown to brown, diatomaceous -Below 3', highly fractured and sheared along bedding and joints -Shear zone 3-4' -At 4' Shear: 18S, abundant polished surfaces			
4	B14-1 ■				-Joint set: N28E, 61N, minor gypsum coating along joint surfaces N-S, vertical -Joint set 4'-8', gypsum and iron oxide along surfaces -Siliceous zone 6.8 to 9.2; well bedded, gypsum along fractures to ¼"	6 (12")	58.0	58.2
8					-Interbedded siltstone and sandstone -At 9' few sandstone beds			
10	B14-2 ■				-Reddish brown to brown, hard, trace gypsum -At 10½' Bedding: N81W, 22S	10 (8")	53.2	60.9
	B14-11 ▨				-At 11' South side: 1½" joint N80W, 58N; and possible old shear zone mineralized with iron oxide on edge, top and bottom -At 12-15' South side: bedrock highly fractured; abundant calcium carbonate and gypsum to 1"; very soft, bedding continues in same direction underlain by 6-8" thick siliceous bed			
14	B14-3 ☐				-Siliceous -No recovery			
16					At 17' **BEDDING PLANE SHEAR**: EW, 18S, highly sheared, abundant striations oriented along fractures and shears			
20	B14-4 ■				-Light olive brown to light gray	7 (17")		
24					-At 24' Bedding: N88E, 19SE, bedding is still highly fractured and sheared			

Figure A-14,
Log of Boring B 14, Page 1 of 3

G1218-52-01 (UPD-04-17-2012).GPJ

SAMPLE SYMBOLS

☐ ... SAMPLING UNSUCCESSFUL
◧ ... STANDARD PENETRATION TEST
■ ... DRIVE SAMPLE (UNDISTURBED)
▨ ... DISTURBED OR BAG SAMPLE
◩ ... CHUNK SAMPLE
▼ ... WATER TABLE OR SEEPAGE

BORING B 14

ELEV. (MSL.) **1218'** DATE COMPLETED **09-18-2007**

EQUIPMENT **26" DIAMETER BUCKET AUGER** BY: **G.K.**

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	MATERIAL DESCRIPTION	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
	■ B14-5			ML	-Trace carbon deposits	50		
26								
					-Below 27'; less sheared			
28	⊠ B14-11				-Shear at 28 feet; (N75W, 28S), 1.5" zone clay seam; dark gray to black, abundant slicken sides			
30	■ B14-6					26 (12")		
					-Some gypsum			
32								
34								
	■ B14-7					30 (12")	57.7	61.9
36								
38								
					-At 39' Bedding: N72E, 29S -At 39½': 10-inch thick ash bed			
40	■ B14-8				-Iron oxide coating along bedding and joints	30 (12")	76.0	39.2
42								
44								
					-Olive brown to brown			
	■ B14-9					50 (6")	71.8	44.2
46								
48								

Figure A-14,
Log of Boring B 14, Page 2 of 3

SAMPLE SYMBOLS

☐ ... SAMPLING UNSUCCESSFUL
◧ ... STANDARD PENETRATION TEST
■ ... DRIVE SAMPLE (UNDISTURBED)
⊠ ... DISTURBED OR BAG SAMPLE
◣ ... CHUNK SAMPLE
▼ ... WATER TABLE OR SEEPAGE

NOTE: THE LOG OF SUBSURFACE CONDITIONS SHOWN HEREON APPLIES ONLY AT THE SPECIFIC BORING OR TRENCH LOCATION AND AT THE DATE INDICATED. IT IS NOT WARRANTED TO BE REPRESENTATIVE OF SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND TIMES.

GEOCON

BORING B 14

ELEV. (MSL.) **1218'** DATE COMPLETED **09-18-2007**

EQUIPMENT **26" DIAMETER BUCKET AUGER** BY: **G.K.**

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	MATERIAL DESCRIPTION	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
50	B14-10 ■			ML		50 (7")		
					-At 51' Bedding: N80W, 16S; on 6-inch thick ash bed			
52								
54								
56								
					-Light yellowish brown, thinly bedded, hard			
58								
60								
62					BORING TERMINATED AT 62 FEET No groundwater encountered Backfilled and tamped with soil cuttings interlayered with bentonite chips			

Figure A-14,
Log of Boring B 14, Page 3 of 3

SAMPLE SYMBOLS

☐ ... SAMPLING UNSUCCESSFUL
◧ ... STANDARD PENETRATION TEST
■ ... DRIVE SAMPLE (UNDISTURBED)
☒ ... DISTURBED OR BAG SAMPLE
◪ ... CHUNK SAMPLE
▼ ... WATER TABLE OR SEEPAGE

NOTE: THE LOG OF SUBSURFACE CONDITIONS SHOWN HEREON APPLIES ONLY AT THE SPECIFIC BORING OR TRENCH LOCATION AND AT THE DATE INDICATED. IT IS NOT WARRANTED TO BE REPRESENTATIVE OF SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND TIMES.

GEOCON

PROJECT NO. G1218-52-01

BORING B 15

ELEV. (MSL.) **1235'** DATE COMPLETED **09-18-2007**

EQUIPMENT **26" DIAMETER BUCKET AUGER** BY: **G.K.**

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	MATERIAL DESCRIPTION	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
0				ML	**PUENTE FORMATION-LA VIDA MEMBER (Tplv)** Hard, moist to wet, light brown to light gray, SILTSTONE interbedded with shale, fine-grained, slightly moist, thinly bedded			
2					-At 2' Joint: N35W, 82SW -At 2½' Bedding: N75W, 25SW, Joint: N2W, 85E; gypsum ½"-1" thick follows bedding and fracture planes			
4								
6					-Between 4-5' diatomaceous bed ~4" thick Bedding: N70W, 32S; offset along fractures at 5½'; continues through hole; striations on one of fracture planes toward the SW, 30SW -At 6' Joint: N29E, 85SE, shear has gypsum infill -At 6-8' Bedding: N61W, 34SW (¼" offset), 3½" thick chalk layer			
8					-At 8' dark reddish brown, multiple shears, continues fractures at top of hole, striations still visible -At 9' Joint: N5E, 85NW, clay gouge 6" thick			
10	B15-1	■			-At 9½' Bedding: N86W, 20SW, intensely fractured -At 9.7' to 11.2' ash bed -At 10' fracture along bedding (gypsum ¼" along bedding) -Reddish brown to light yellowish brown to brown, fine-grained	10 (9")	80.8	19.2
12								
14					-At 13' Bedding: N70W, 25SW -Clayey SILTSTONE -Olive brown, fine-grained, thinly bedded, ash along fractures			
	B15-2	■			-At 14' dark reddish brown to light olive brown, dark yellowish brown to dark reddish brown, silt layer 4" thick	4 (6")	70.9	44.8
16					-At 16' Joint: N75E, 85NW on silt layer offset about 4" translates to other side of hole; infill along fractures to approximately 1"			
18					-At 17.5' Joint: N35W, 75NE			
20	B15-3	■			-At 20½' Fractures: N85E, 43S, along bedding	7 (6")	88.7	23.9
22								
24					-At 23' Jointing: N40E, 87SE and N30E, 86W, Fracture: N47E, 47NW, Bedding: N69W, 25SW -At 24' less fractures, harder			
	B15-4	■			-Grey to brown	30 (10")	67.6	41.8
26					-At 26' light gray, diatomaceous siltstone, sandy siltstone (3" thick) Bedding: N76W, 27W, slight offset along fracture ¼"-½"; Fracture: N20E, 74SE			
28								
					-At 29' less fractures			

Figure A-15,
Log of Boring B 15, Page 1 of 2

G1218-52-01 (UPD-04-17-2012).GPJ

SAMPLE SYMBOLS			
	☐ ... SAMPLING UNSUCCESSFUL	◧ ... STANDARD PENETRATION TEST	■ ... DRIVE SAMPLE (UNDISTURBED)
	☒ ... DISTURBED OR BAG SAMPLE	◪ ... CHUNK SAMPLE	▼ ... WATER TABLE OR SEEPAGE

NOTE: THE LOG OF SUBSURFACE CONDITIONS SHOWN HEREON APPLIES ONLY AT THE SPECIFIC BORING OR TRENCH LOCATION AND AT THE DATE INDICATED. IT IS NOT WARRANTED TO BE REPRESENTATIVE OF SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND TIMES.

GEOCON

PROJECT NO. G1218-52-01

BORING B 15

ELEV. (MSL.) **1235'** DATE COMPLETED **09-18-2007**

EQUIPMENT **26" DIAMETER BUCKET AUGER** BY: **G.K.**

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	MATERIAL DESCRIPTION	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
30	B15-5 ■			ML	-Gypsum along bedding, olive brown -At 30' increase in gypsum along bedding	22 (12")	75.9	40.9
32					-At 32' thin clay film along bedding -At 32.5 Bedding: N77W, 27SW, Fractures: N36E, 78SE			
34					-Siliceous bed -No sample			
	B15-6 ■				-At 35.5' continuous layer of sandy silt, dark yellowish brown to olive brown to dark brown			
36					-At 36' concretion layer between 3-5" thick, bedding continuous along hole 1/8"-1/4" offset at one of the joints			
38								
40	B15-7 ■					13 (12")		
42								
44								
	B15-8 ■				-Diatomaceous	50 (12")		
46					-At 46' Bedding: N79W, 23SW, jointing along bedding N9W, 75SW			
48					-At 47½' sandy siltstone layer, slightly offset ¼" along fracture			
					-At 49' Bedding: N85SE, 28SE			
50								
52					BORING TERMINATED AT 52 FEET No groundwater encountered Backfilled and tamped with soil cuttings interlayered with bentonite chips			

Figure A-15,
Log of Boring B 15, Page 2 of 2

G1218-52-01 (UPD-04-17-2012).GPJ

SAMPLE SYMBOLS			
	☐ ... SAMPLING UNSUCCESSFUL	◧ ... STANDARD PENETRATION TEST	■ ... DRIVE SAMPLE (UNDISTURBED)
	▨ ... DISTURBED OR BAG SAMPLE	◪ ... CHUNK SAMPLE	▼ ... WATER TABLE OR SEEPAGE

NOTE: THE LOG OF SUBSURFACE CONDITIONS SHOWN HEREON APPLIES ONLY AT THE SPECIFIC BORING OR TRENCH LOCATION AND AT THE DATE INDICATED. IT IS NOT WARRANTED TO BE REPRESENTATIVE OF SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND TIMES.

GEOCON

PROJECT NO. G1218-52-01

BORING B 16

ELEV. (MSL.) **1135'** DATE COMPLETED **09-18-2007**

EQUIPMENT **HOLLOW STEM AUGER** BY: **G.K.**

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	MATERIAL DESCRIPTION	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
0	B16-13	⊠		ML	**ENGINEERED ARTIFICIAL FILL (Afe)** Very stiff, moist, light brown, fine to coarse Sandy SILT; moderate plasticity, some shale fragments			
2					-Brown to light brown			
4								
	B16-1	■			-Light brown	37	66.9	25.1
6								
8								
10	B16-2	■			-Rootlets, brown to dark brown, trace shale and gypsum fragments	32	77.9	32.9
12								
14								
	B16-3	■				39	75.0	52.7
16								
18								
20	B16-4	■				33	75.4	31.6
22								
24								
					-Moderate to high plasticity, rootlets, olive brown to brown			

Figure A-16,
Log of Boring B 16, Page 1 of 3

G1218-52-01 (UPD-04-17-2012).GPJ

SAMPLE SYMBOLS

☐ ... SAMPLING UNSUCCESSFUL
◧ ... STANDARD PENETRATION TEST
■ ... DRIVE SAMPLE (UNDISTURBED)
⊠ ... DISTURBED OR BAG SAMPLE
◪ ... CHUNK SAMPLE
▼ ... WATER TABLE OR SEEPAGE

NOTE: THE LOG OF SUBSURFACE CONDITIONS SHOWN HEREON APPLIES ONLY AT THE SPECIFIC BORING OR TRENCH LOCATION AND AT THE DATE INDICATED. IT IS NOT WARRANTED TO BE REPRESENTATIVE OF SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND TIMES.

GEOCON

PROJECT NO. G1218-52-01

BORING B 16

ELEV. (MSL.) **1135'** DATE COMPLETED **09-18-2007**

EQUIPMENT **HOLLOW STEM AUGER** BY: **G.K.**

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	MATERIAL DESCRIPTION	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
	B16-5 ■			ML		46	76.8	39.2
26					-Silt with sand			
28								
30	B16-6 ■				-Trace gypsum	45	74.3	38.2
32								
34					-Dark brown to brown to light gray			
	B16-7 ■					48	72.3	39.5
36					-Olive brown to brown to light gray			
38								
				SM	Medium dense to dense, moist to wet, light yellowish brown to light reddish brown, Silty, fine to medium SAND			
40	B16-8 ■					44	98.0	19.1
				ML	Very stiff, moist, brown, fine to medium Sandy SILT; moderate to high plasticity			
42								
44								
	B16-9 ■				-Olive brown to light brown	47	84.6	27.4
46								
48								

Figure A-16,
Log of Boring B 16, Page 2 of 3

G1218-52-01 (UPD-04-17-2012).GPJ

SAMPLE SYMBOLS			
	☐ ... SAMPLING UNSUCCESSFUL	◧ ... STANDARD PENETRATION TEST	■ ... DRIVE SAMPLE (UNDISTURBED)
	☒ ... DISTURBED OR BAG SAMPLE	◪ ... CHUNK SAMPLE	▼ ... WATER TABLE OR SEEPAGE

PROJECT NO. G1218-52-01

BORING B 16

ELEV. (MSL.) **1135'** DATE COMPLETED **09-18-2007**

EQUIPMENT **HOLLOW STEM AUGER** BY: **G.K.**

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	MATERIAL DESCRIPTION	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
50	B16-10					50 (5")	99.4	11.8
				SM	**PUENTE FORMATION-LA VIDA MEMBER (Tplv)** Very dense, damp, light gray to light yellowish brown, fine-grained, Silty SANDSTONE; thinly bedded			
52								
54								
	B16-11				-Light yellow to light gray, medium-coarse grained	50 (5")	107.1	6.8
56								
58								
					-Light brown to light gray, damp to moist			
60	B16-12					50 (5")		

BORING TERMINATED AT 60.5 FEET
No groundwater encountered
Backfilled and tamped with soil cuttings interlayered with bentonite chips

Figure A-16,
Log of Boring B 16, Page 3 of 3

G1218-52-01 (UPD-04-17-2012).GPJ

SAMPLE SYMBOLS

☐ ... SAMPLING UNSUCCESSFUL
◧ ... STANDARD PENETRATION TEST
■ ... DRIVE SAMPLE (UNDISTURBED)
☒ ... DISTURBED OR BAG SAMPLE
◪ ... CHUNK SAMPLE
▼ ... WATER TABLE OR SEEPAGE

NOTE: THE LOG OF SUBSURFACE CONDITIONS SHOWN HEREON APPLIES ONLY AT THE SPECIFIC BORING OR TRENCH LOCATION AND AT THE DATE INDICATED. IT IS NOT WARRANTED TO BE REPRESENTATIVE OF SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND TIMES.

GEOCON

PROJECT NO. G1218-52-01

BORING B 17

ELEV. (MSL.) 1085' DATE COMPLETED 09-18-2007

EQUIPMENT HOLLOW STEM AUGER BY: G.K.

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	MATERIAL DESCRIPTION	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
0				ML	**ENGINEERED ATRTIFICIAL FILL (Afe)** Very stiff to hard, moist to wet, light brown, fine to medium Sandy SILT; moderate plasticity, some shale fragments			
2								
4								
	B17-1	■				72	78.3	29.5
6								
8					-Trace shale fragments, brown to light brown			
10	B17-2	■				33	70.9	38.6
12								
14					-Olive brown, high plasticity			
	B17-3	■				38	74.1	39.9
					-Olive brown to brown to yellowish brown, some shale fragments			
16								
18					-Olive brown, some coarse grains			
20	B17-4	■				45	74.8	40.1
22								
24								

Figure A-17,
Log of Boring B 17, Page 1 of 2

G1218-52-01 (UPD-04-17-2012).GPJ

SAMPLE SYMBOLS

☐ ... SAMPLING UNSUCCESSFUL
◧ ... STANDARD PENETRATION TEST
■ ... DRIVE SAMPLE (UNDISTURBED)
☒ ... DISTURBED OR BAG SAMPLE
◪ ... CHUNK SAMPLE
▼ ... WATER TABLE OR SEEPAGE

NOTE: THE LOG OF SUBSURFACE CONDITIONS SHOWN HEREON APPLIES ONLY AT THE SPECIFIC BORING OR TRENCH LOCATION AND AT THE DATE INDICATED. IT IS NOT WARRANTED TO BE REPRESENTATIVE OF SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND TIMES.

PROJECT NO. G1218-52-01

BORING B 17

ELEV. (MSL.) **1085'** DATE COMPLETED **09-18-2007**

EQUIPMENT **HOLLOW STEM AUGER** BY: **G.K.**

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	MATERIAL DESCRIPTION	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
	B17-5				-Olive brown to dark brown, trace shale fragments	28	65.0	50.4
26								
28								
30								
	B17-6				-Trace gypsum	9	60.4	51.5
32				ML	**PUENTE FORMATION-LA VIDA MEMBER (Tplv)** Hard, moist to wet, dark gray, SILTSTONE, unoxidized; thinly bedded			
34								
	B17-7				-Diatomaceous	50 (6")	75.5	32.3
36								
38								
40								
	B17-8					50 (8")	71.4	37.4

BORING TERMINATED AT 40.5 FEET
No groundwater encountered
Backfilled and tamped with soil cuttings interlayered with bentonite chips

Figure A-17,
Log of Boring B 17, Page 2 of 2

G1218-52-01 (UPD-04-17-2012).GPJ

SAMPLE SYMBOLS			
	☐ ... SAMPLING UNSUCCESSFUL	◧ ... STANDARD PENETRATION TEST	■ ... DRIVE SAMPLE (UNDISTURBED)
	☒ ... DISTURBED OR BAG SAMPLE	◪ ... CHUNK SAMPLE	▼ ... WATER TABLE OR SEEPAGE

NOTE: THE LOG OF SUBSURFACE CONDITIONS SHOWN HEREON APPLIES ONLY AT THE SPECIFIC BORING OR TRENCH LOCATION AND AT THE DATE INDICATED. IT IS NOT WARRANTED TO BE REPRESENTATIVE OF SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND TIMES.

GEOCON

PROJECT NO. G1218-52-01

BORING B 18

ELEV. (MSL.) **1024'** DATE COMPLETED **09-18-2007**

EQUIPMENT **HOLLOW STEM AUGER** BY: **G.K.**

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	MATERIAL DESCRIPTION	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
0	B18-8 ▨			ML	**ENGINEERED ARTIFICIAL FILL (afe)** Very stiff, moist to wet, light olive brown, fine to medium Sandy SILT, moderate plasticity			
2								
4					-Decrease in sand content, olive brown to light yellowish brown to light brown, high plasticity			
	B18-1 ■					72	72.3	29.3
6								
8					-Trace coarse grains			
10	B18-2 ■				-Brown to olive brown	33	104.1	20.1
12								
14					-Some coarse grains and bedrock fragments			
	B18-3 ■					38	74.6	35.1
16								
18					-Trace gypsum			
20	B18-4 ■					45	71.0	42.7
22								
24								
				ML				

Figure A-18,
Log of Boring B 18, Page 1 of 2

G1218-52-01 (UPD-04-17-2012).GPJ

SAMPLE SYMBOLS	☐ ... SAMPLING UNSUCCESSFUL	◧ ... STANDARD PENETRATION TEST	■ ... DRIVE SAMPLE (UNDISTURBED)
	▨ ... DISTURBED OR BAG SAMPLE	◪ ... CHUNK SAMPLE	▼ ... WATER TABLE OR SEEPAGE

NOTE: THE LOG OF SUBSURFACE CONDITIONS SHOWN HEREON APPLIES ONLY AT THE SPECIFIC BORING OR TRENCH LOCATION AND AT THE DATE INDICATED. IT IS NOT WARRANTED TO BE REPRESENTATIVE OF SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND TIMES.

GEOCON

BORING B 18

ELEV. (MSL.) **1024'** DATE COMPLETED **09-18-2007**

EQUIPMENT **HOLLOW STEM AUGER** BY: **G.K.**

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	MATERIAL DESCRIPTION	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
	B18-5 ■			ML	**PUENTE FORMATION-LA VIDA MEMBER (Tplv)** Hard, moist, light olive brown, SILTSTONE, fine-grained, thinly bedded, diatomaceous	50 (6")	82.1	31.4
26								
28								
30	B18-6 ■				-Brown to light gray, shaley	50 (8")	71.8	33.2
32								
34					-Brown to dark brown, gypsum along bedding, diatomaceous			
	B18-7 ■					50 (6")	66.3	43.5
					BORING TERMINATED AT 35.5 FEET No groundwater encountered Backfilled and tamped with soil cuttings interlayered with bentonite chips			

Figure A-18,
Log of Boring B 18, Page 2 of 2

G1218-52-01 (UPD-04-17-2012).GPJ

SAMPLE SYMBOLS

☐ ... SAMPLING UNSUCCESSFUL	◧ ... STANDARD PENETRATION TEST	■ ... DRIVE SAMPLE (UNDISTURBED)
▨ ... DISTURBED OR BAG SAMPLE	◪ ... CHUNK SAMPLE	▼ ... WATER TABLE OR SEEPAGE

PROJECT NO. G1218-52-01

BORING B 19

ELEV. (MSL.) **924'** DATE COMPLETED **09-18-2007**

EQUIPMENT **HOLLOW STEM AUGER** BY: **G.K.**

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	MATERIAL DESCRIPTION	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
0	B19-8			ML	**ENGINEERED ARTIFICIAL FILL (afe)** Stiff to very stiff, damp to moist, light olive brown, fine to coarse Sandy SILT; moderate plasticity			
2								
4								
	B19-1					52	113.1	12.3
6								
8								
10	B19-2				-Trace gypsum fragments	47	84.0	13.4
12								
14					-Decrease in sand content, high plasticity			
	B19-3					42	77.4	30.2
16								
18								
				SM	Dense, moist, light brown to yellow brown to olive brown, Silty, fine to medium SAND; trace coarse grains			
20	B19-4					48	96.9	22.9
				SM	Medium dense, moist, light brown to reddish brown to yellowish brown, Silty, fine to medium SAND			
22								
24								
				SM+ML				

Figure A-19,
Log of Boring B 19, Page 1 of 2

G1218-52-01 (UPD-04-17-2012).GPJ

SAMPLE SYMBOLS

☐ ... SAMPLING UNSUCCESSFUL

◧ ... STANDARD PENETRATION TEST

■ ... DRIVE SAMPLE (UNDISTURBED)

▩ ... DISTURBED OR BAG SAMPLE

◪ ... CHUNK SAMPLE

▼ ... WATER TABLE OR SEEPAGE

NOTE: THE LOG OF SUBSURFACE CONDITIONS SHOWN HEREON APPLIES ONLY AT THE SPECIFIC BORING OR TRENCH LOCATION AND AT THE DATE INDICATED. IT IS NOT WARRANTED TO BE REPRESENTATIVE OF SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND TIMES.

GEOCON

PROJECT NO. G1218-52-01

BORING B 19

ELEV. (MSL.) **924'** DATE COMPLETED **09-18-2007**

EQUIPMENT **HOLLOW STEM AUGER** BY: **G.K.**

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	MATERIAL DESCRIPTION	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
	B19-5 ■				**PUENTE FORMATION-SOQUEL MEMBER (Tps)** Hard, damp, light yellowish brown to brown, interbedded SANDSTONE and SILTSTONE, fine- to medium-grained, thinly bedded	18	106.0	10.4
26								
28								
30	B19-6 ■			SM	Dense, damp, light yellowish brown to light gray, SANDSTONE, medium- to coarse-grained, thinly bedded, some gypsum along bedding	50 (5")	104.1	6.3
32								
34								
	B19-7 ■					50 (5")	113.5	7.2
					BORING TERMINATED AT 35.5 FEET No groundwater encountered Backfilled and tamped with soil cuttings interlayered with bentonite chips			

Figure A-19,
Log of Boring B 19, Page 2 of 2

G1218-52-01 (UPD-04-17-2012).GPJ

SAMPLE SYMBOLS

☐ ... SAMPLING UNSUCCESSFUL
◧ ... STANDARD PENETRATION TEST
■ ... DRIVE SAMPLE (UNDISTURBED)
▨ ... DISTURBED OR BAG SAMPLE
◪ ... CHUNK SAMPLE
▼ ... WATER TABLE OR SEEPAGE

NOTE: THE LOG OF SUBSURFACE CONDITIONS SHOWN HEREON APPLIES ONLY AT THE SPECIFIC BORING OR TRENCH LOCATION AND AT THE DATE INDICATED. IT IS NOT WARRANTED TO BE REPRESENTATIVE OF SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND TIMES.

GEOCON

PROJECT NO. G1218-52-01

BORING B 20

ELEV. (MSL.) **898'** DATE COMPLETED **09-18-2007**

EQUIPMENT **26" DIAMETER BUCKET AUGER** BY: **G.K.**

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	MATERIAL DESCRIPTION	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
0				ML	**ENGINEERED ARTIFICIAL FILL (afe)** Stiff, damp, light brown, fine, Sandy SILT			
2								
					-Some boulders and cobbles			
4								
	■ B20-1			SM	**PUENTE FORMATION-LA VIDA MEMBER (Tplv)** Very dense, damp, light yellowish brown to light gray, medium- to coarse-grained Silty SANDSTONE, thinly bedded, some gypsum along bedded	25 (6")	112.7	4.9
6								
8								
					-Interbedded with siltstone, olive brown to light gray, thinly bedded			
10	■ B20-2					50 (5")	99.9	10.3

BORING TERMINATED AT 10.5 FEET
No groundwater encountered
Backfilled and tamped with soil cuttings interlayered with bentonite chips

Figure A-20,
Log of Boring B 20, Page 1 of 1

G1218-52-01 (UPD-04-17-2012).GPJ

SAMPLE SYMBOLS			
	☐ ... SAMPLING UNSUCCESSFUL	◧ ... STANDARD PENETRATION TEST	■ ... DRIVE SAMPLE (UNDISTURBED)
	☒ ... DISTURBED OR BAG SAMPLE	◪ ... CHUNK SAMPLE	▼ ... WATER TABLE OR SEEPAGE

NOTE: THE LOG OF SUBSURFACE CONDITIONS SHOWN HEREON APPLIES ONLY AT THE SPECIFIC BORING OR TRENCH LOCATION AND AT THE DATE INDICATED. IT IS NOT WARRANTED TO BE REPRESENTATIVE OF SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND TIMES.

PROJECT NO. G1218-52-01

BORING B 21

ELEV. (MSL.) **964'** DATE COMPLETED **12-03-2007**

EQUIPMENT **30" DIAMETER BUCKET RIG** BY: **T. REIST**

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	MATERIAL DESCRIPTION	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
0				SM	**TERRACE DEPOSIT (Qt)** Dense to medium dense, damp to moist, mottled orange brown and brown, Silty, fine to coarse SAND, with 30% subrounded to subangular gravel and cobble up to 14-inches; unable to sample due to cobbles			
2	B21-1 ☒							
4								
6								
					-Contact slightly scoured and undulating (17, S80E)			
8				ML	**PUENTE FORMATION-SOQUEL MEMBER (Tps-slt)** Hard, damp to moist, light brown and orange, fine, Sandy SILTSTONE; laminated to thinly laminated -Two 1/4-inch thick, gray-green, very stiff clay lenses with no apparent remolding at 10 feet (N70E, 13N)			
10	B21-19 ☒							
12	B21-2 ■					3	94.1	26.3
14								
	B21-3 ■					3		
16								
18	B21-4 ☒				-Random gypsum veins present below 18 feet			
20	B21-5 ■					3	100.4	22.9
22								
24				SM	Dense to very dense, damp to moist, gray and orange, Silty, fine to medium SANDSTONE -**WEAK ZONE** at 24 feet (N15E, 12N); 4-inch thick, thinly laminated			

Figure A-21,
Log of Boring B 21, Page 1 of 3

G1218-52-01 (UPD-04-17-2012).GPJ

SAMPLE SYMBOLS

☐ ... SAMPLING UNSUCCESSFUL
◧ ... STANDARD PENETRATION TEST
■ ... DRIVE SAMPLE (UNDISTURBED)
☒ ... DISTURBED OR BAG SAMPLE
◪ ... CHUNK SAMPLE
▼ ... WATER TABLE OR SEEPAGE

NOTE: THE LOG OF SUBSURFACE CONDITIONS SHOWN HEREON APPLIES ONLY AT THE SPECIFIC BORING OR TRENCH LOCATION AND AT THE DATE INDICATED. IT IS NOT WARRANTED TO BE REPRESENTATIVE OF SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND TIMES.

GEOCON

PROJECT NO. G1218-52-01

BORING B 21

ELEV. (MSL.) **964'** DATE COMPLETED **12-03-2007**

EQUIPMENT **30" DIAMETER BUCKET RIG** BY: **T. REIST**

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	MATERIAL DESCRIPTION	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
	B21-6			SM	siltstone bed with 1/4 to 1/8-inch thick discontinuous stiff clay beds that were poorly remolded in areas -Bedding at 24.5 feet (N10E, 14N)	5	112.1	15.0
26								
28					-Sharp contact (N15E, 12N)			
				ML				
30	B21-7				Hard, moist, light olive green and orange, fine, Sandy SILTSTONE, with clay; laminated in areas	5	79.3	35.0
32								
34					-1-foot thick, white and orange, sandstone bed at 35 feet; (N10E, 13N)			
	B21-8					8	114.2	16.2
36					-Becomes olive green and pale yellow and laminated below 36 feet			
38								
40					-1-foot cemented zone at 40 feet			
	B21-9					6	99.2	24.7
42								
44								
	B21-10					5		
46								
48								
					-6-inch thick orange-brown sandstone bed at 50 feet			

Figure A-21,
Log of Boring B 21, Page 2 of 3

G1218-52-01 (UPD-04-17-2012).GPJ

SAMPLE SYMBOLS	☐ ... SAMPLING UNSUCCESSFUL	◧ ... STANDARD PENETRATION TEST	■ ... DRIVE SAMPLE (UNDISTURBED)
	☒ ... DISTURBED OR BAG SAMPLE	◪ ... CHUNK SAMPLE	▼ ... WATER TABLE OR SEEPAGE

NOTE: THE LOG OF SUBSURFACE CONDITIONS SHOWN HEREON APPLIES ONLY AT THE SPECIFIC BORING OR TRENCH LOCATION AND AT THE DATE INDICATED. IT IS NOT WARRANTED TO BE REPRESENTATIVE OF SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND TIMES.

GEOCON

PROJECT NO. G1218-52-01

BORING B 21

ELEV. (MSL.) **964'** DATE COMPLETED **12-03-2007**

EQUIPMENT **30" DIAMETER BUCKET RIG** BY: **T. REIST**

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	MATERIAL DESCRIPTION	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
50	B21-11			SM		6	110.5	18.2
	B21-12							
52					-Undulating slightly scoured contact			
	B21-13			ML	Very hard, moist, dark charcoal gray, Clayey/fine Sandy SILTSTONE; laminated to thinly laminated			
54	B21-20				**WEAK ZONE** at 53.8 feet; 4-inch zone of very stiff to stiff, siltstone and claystone lenses with discontinuous poorly remolded clay gouge up to 1/4-inch thick; poorly developed			
	B21-14					7	97.4	23.9
56								
					WEAK ZONE at 57.5 feet, 4-inch thick zone of very stiff siltstone and claystone lenses with no apparent remolding			
58								
60	B21-15					25/11"	90.9	26.9
62								
64								
	B21-16					25/9"	97.9	23.3
66	B21-17				**BEDDING PLANE SHEAR** at 66 feet (N15E,12N); 1/4 to 1/2-inch thick, soft, dark gray, continuous, moderately developed, highly remolded plastic clay gouge			
68								
70	B21-18					25/9"	110.8	17.9

BORING TERMINATED AT 71 FEET
No groundwater encountered
Backfilled and tamped with soil cuttings interlayered with
bentonite chips

Figure A-21,
Log of Boring B 21, Page 3 of 3

G1218-52-01 (UPD-04-17-2012).GPJ

SAMPLE SYMBOLS			
	☐ ... SAMPLING UNSUCCESSFUL	◧ ... STANDARD PENETRATION TEST	■ ... DRIVE SAMPLE (UNDISTURBED)
	☒ ... DISTURBED OR BAG SAMPLE	◪ ... CHUNK SAMPLE	▼ ... WATER TABLE OR SEEPAGE

NOTE: THE LOG OF SUBSURFACE CONDITIONS SHOWN HEREON APPLIES ONLY AT THE SPECIFIC BORING OR TRENCH LOCATION AND AT THE DATE INDICATED. IT IS NOT WARRANTED TO BE REPRESENTATIVE OF SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND TIMES.

BORING B 22

ELEV. (MSL.) **945'** DATE COMPLETED **12-04-2007**

EQUIPMENT **30" DIAMETER BUCKET RIG** BY: **T. REIST**

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	MATERIAL DESCRIPTION	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
0	B22-1 ▨			SM	**TOPSOIL** Loose to medium dense, damp, brown, Silty, fine to coarse SAND			
2								
				SM	**PUENTE FORMATION-SOQUEL MEMBER (Tps)** Dense, damp, light brown with darker brown webbing, Silty, fine to medium SANDSTONE, very friable with little cohesion and abundant sand webbing randomly oriented throughout from 1-inch to 12-inch wide; logged to 4.5 feet due to spoils			
4								
	B22-2 ■					2	114.8	7.1
6					BORING TERMINATED AT 6 FEET No groundwater encountered Backfilled and tamped with soil cuttings interlayered with bentonite chips			

Figure A-22,
Log of Boring B 22, Page 1 of 1

G1218-52-01 (UPD-04-17-2012).GPJ

SAMPLE SYMBOLS

☐ ... SAMPLING UNSUCCESSFUL
◧ ... STANDARD PENETRATION TEST
■ ... DRIVE SAMPLE (UNDISTURBED)
▨ ... DISTURBED OR BAG SAMPLE
◪ ... CHUNK SAMPLE
▼ ... WATER TABLE OR SEEPAGE

NOTE: THE LOG OF SUBSURFACE CONDITIONS SHOWN HEREON APPLIES ONLY AT THE SPECIFIC BORING OR TRENCH LOCATION AND AT THE DATE INDICATED. IT IS NOT WARRANTED TO BE REPRESENTATIVE OF SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND TIMES.

PROJECT NO. G1218-52-01

BORING B 23

ELEV. (MSL.) 939' DATE COMPLETED 12-04-2007

EQUIPMENT 30" DIAMETER BUCKET RIG BY: T. REIST

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	MATERIAL DESCRIPTION	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
0				SM/SC	**UNDOCUMENTED FILL** Loose to medium dense, damp to moist, brown to light brown, layers of Silty, fine to medium SAND and Clayey, fine to medium SAND, with some gravel			
2								
				SM	**TOPSOIL** Medium dense, damp, brown, Silty, fine to coarse SAND			
4								
	B23-1	■				2	120.8	7.8
6	B23-2	☒						
				SM	**PUENTE FORMATION-SOQUEL MEMBER (Tps)** Dense, damp, light brown, Silty, fine to coarse SANDSTONE, very friable with little cohesion and abundant webbing with no distinct pattern; webbing consists of dark brown, Silty, fine to coarse SANDSTONE 1/4 to 12-inches wide; no fracturing observed -No discernible bedding; massive -Webbing decreases with depth			
8								
10	B23-3	■				3		
12								
14								
	B23-4	■				3	118.1	5.3
16								
18					-Sharp slightly scoured and undulating contact (N10W, 25S)			
				ML	**PUENTE FORMATION-SOQUEL MEMBER (Tps-slt)** Hard, moist, gray with orange oxidation, fine, Sandy/Clayey SILTSTONE; with 1/16 to 1/4-inch thick sandstone interbeds			
20					-6 inch thick orange fine to coarse sandstone bed at 21 feet			
	B23-5	■				3	95.3	30.0
22					-2 foot thick light brown and orange sandstone bed between 22 and 24 feet; sharp contact at 22 feet C: N10E, 23N			
24					-Heavily scoured and undulating contact at 24 feet C: N40E, 15-20N			

Figure A-23,
Log of Boring B 23, Page 1 of 2

G1218-52-01 (UPD-04-17-2012).GPJ

SAMPLE SYMBOLS			
	☐ ... SAMPLING UNSUCCESSFUL	◧ ... STANDARD PENETRATION TEST	■ ... DRIVE SAMPLE (UNDISTURBED)
	☒ ... DISTURBED OR BAG SAMPLE	◪ ... CHUNK SAMPLE	▼ ... WATER TABLE OR SEEPAGE

BORING B 23

ELEV. (MSL.) **939'** DATE COMPLETED **12-04-2007**

EQUIPMENT **30" DIAMETER BUCKET RIG** BY: **T. REIST**

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	MATERIAL DESCRIPTION	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
26	B23-6 B23-7 B23-8			ML	**WEAK ZONE** at 26 feet; 6-inch zone of stiff to very stiff, moist, thinly laminated siltstone and claystone beds with polished parting surfaces; no apparent remolding -18-inch thick, light brown and orange, silty, fine to medium sandstone bed at 26.5 feet; undulating contact with slight seepage at 28 feet C: N45E, 5-10N -Becomes gray with orange and yellow oxidation and clayier below 28 feet	3	127.3	11.0
28	B23-9		∇					
30	B23-10					6	99.0	24.2
32	B23-16				**POORLY DEVELOPED BEDDING PLANE SHEAR** at 31.1 feet S: N5E, 13N; 1/8 to 1/4-inch thick, stiff, moist, gray, continuous, poorly developed with poorly remolded plastic clay gouge in areas, with 10-inch zone of very stiff thinly laminated siltstone and claystone beds below BPS -Gradually becomes very dark gray below 33 feet			
34	B23-11							
36	B23-12				-Becomes very hard below 35 feet -Fracture with slight seepage at 36 feet f: N5E, 63N	15	103.2	20.3
38	B23-13 B23-14				**BEDDING PLANE SHEAR** at 37.2 S: N10E, 15N; 1/4 to 1/2-inch thick, soft, black, continuous, highly remolded plastic clay gouge; very hard above and below BPS	8	106.5	19.1
40					-Geotechnically logged to 41 feet due to spoils			
42								
44	B23-15			SM	Dense, moist, light brown to white, Silty, fine to coarse SANDSTONE	12	102.3	18.1

BORING TERMINATED AT 44 FEET
Backfilled and tamped with soil cuttings interlayered with bentonite chips

Figure A-23,
Log of Boring B 23, Page 2 of 2

G1218-52-01 (UPD-04-17-2012).GPJ

SAMPLE SYMBOLS

☐ ... SAMPLING UNSUCCESSFUL
▨ ... DISTURBED OR BAG SAMPLE
◧ ... STANDARD PENETRATION TEST
◪ ... CHUNK SAMPLE
■ ... DRIVE SAMPLE (UNDISTURBED)
▼ ... WATER TABLE OR SEEPAGE

NOTE: THE LOG OF SUBSURFACE CONDITIONS SHOWN HEREON APPLIES ONLY AT THE SPECIFIC BORING OR TRENCH LOCATION AND AT THE DATE INDICATED. IT IS NOT WARRANTED TO BE REPRESENTATIVE OF SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND TIMES.

BORING B 24

ELEV. (MSL.) 1007' DATE COMPLETED 12-05-2007

EQUIPMENT 30" DIAMETER BUCKET RIG BY: T. REIST

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	MATERIAL DESCRIPTION	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
0	B24-1 ⊠			CL	**TOPSOIL** Stiff, moist, dark brown, Sandy CLAY, with trace gravel			
2				ML	**PUENTE FORMATION-SOQUEL MEMBER (Tps-slt)** Hard, damp to moist, pale green-gray with orange oxidation, Clayey/fine Sandy SILTSTONE; laminated to thinly laminated with 1/16 to 1/4-inch thick fine sandstone beds			
4								
	B24-2 ■			SM+ML	Dense, moist to wet, orange brown to light brown, Silty, fine to medium SANDSTONE interbedded with hard, damp to moist, pale green gray, fine, Sandy/Clayey SILTSTONE; alternating beds vary between 2 to 24-inch thick -Bedding contact at 7 feet C: N55E, 10N -6-inch cemented zone at 8 feet **BEDDING PLANE SHEAR** at 9.8 feet; S: N55E, 18N; 1/4 to 3/4-inch thick, stiff, pale green, continuous, well developed, very poorly remolded plastic clay gouge	2	97.1	21.0
6								
8								
10	B24-30 ⊠ B24-3 ■				-Numerous gypsum veins oriented with bedding below 10.5 feet	3	105.2	22.8
	B24-4 ⊠							
12					-Bedding contact at 12.5 feet B: N60E, 18N			
					-Gradational contact			
14				ML	Hard, damp to moist, gray-green with orange oxidation, fine, Sandy SILTSTONE, with clay; random 2 to 4-inch orange to light brown sandstone beds present throughout and gypsum veins			
	B24-5 ■					2		
16	B24-6 ⊠							
18					-Bedding contact with 2-inch sandstone bed at 18 feet B: N55E, 16N			
20								
	B24-7 ■				-Bedding contact with 8-inch sandstone bed at 21.5 feet B: N55E, 18N	4	110.2	18.5
22								
24								

Figure A-24,
Log of Boring B 24, Page 1 of 4

G1218-52-01 (UPD-04-17-2012).GPJ

SAMPLE SYMBOLS	☐ ... SAMPLING UNSUCCESSFUL	◧ ... STANDARD PENETRATION TEST	■ ... DRIVE SAMPLE (UNDISTURBED)
	⊠ ... DISTURBED OR BAG SAMPLE	◩ ... CHUNK SAMPLE	▼ ... WATER TABLE OR SEEPAGE

NOTE: THE LOG OF SUBSURFACE CONDITIONS SHOWN HEREON APPLIES ONLY AT THE SPECIFIC BORING OR TRENCH LOCATION AND AT THE DATE INDICATED. IT IS NOT WARRANTED TO BE REPRESENTATIVE OF SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND TIMES.

GEOCON

PROJECT NO. G1218-52-01

BORING B 24

ELEV. (MSL.) **1007'** DATE COMPLETED **12-05-2007**

EQUIPMENT **30" DIAMETER BUCKET RIG** BY: **T. REIST**

DEPTH IN FEET	SAMPLE NO.	SOIL CLASS (USCS)	MATERIAL DESCRIPTION	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
	B24-8	ML		4		
26	B24-23		**BEDDING PLANE SHEARS** at 26.5 and 26.7 feet S: N55E, 18N; 2 BPS, both 1/2 to 1/4-inch thick, stiff, moist, gray-green, continuous, highly irregular thickness, moderately to well developed and poorly to moderately remolded; portions replaced by gypsum -Becomes very hard with spotty very dark gray beds			
28						
30	B24-9			13	107.1	19.8
32						
34	B24-24		**BEDDING PLANE SHEAR** at 34.3 feet S: N55E, 12N; 1/4 to 3/4-inch thick, soft to stiff, moist, dark gray, continuous in 3/4 of boring, moderately remolded plastic clay gouge and well developed where present			
	B24-10			12	105.5	20.6
36						
38	B24-25		-Clay seam at 38.1 feet B: N20W, 12S; 1/8 to 1/2-inch thick, stiff, moist, gray-green to gray, continuous; no apparent remolding **SHEAR** at 39 feet S: N5W, 8S; 1/16 to 1-inch thick, soft, moist, pale green to dark gray, highly irregular thickness, continuous, moderately remolded in thinner sections, becomes plastic clay with little to no remolding in thicker portions; some areas replaced by gypsum			
	B24-26					
40	B24-11			15	108.2	17.8
42						
		SM+ML	Dense, damp, orange-brown to light brown, Silty, fine to medium SANDSTONE and hard, damp to moist, orange-brown to gray, fine Sandy/Clayey SILTSTONE beds that vary between 1/4 to 24-inches thick -Bedding contact with 2-inch gray sandstone bed at 44.5 feet B: N15E, 13N			
44						
	B24-12			12	114.6	7.6
46	B24-13					
48						

Figure A-24,
Log of Boring B 24, Page 2 of 4

G1218-52-01 (UPD-04-17-2012).GPJ

SAMPLE SYMBOLS

☐ ... SAMPLING UNSUCCESSFUL
◧ ... STANDARD PENETRATION TEST
■ ... DRIVE SAMPLE (UNDISTURBED)
☒ ... DISTURBED OR BAG SAMPLE
◪ ... CHUNK SAMPLE
▼ ... WATER TABLE OR SEEPAGE

BORING B 24

ELEV. (MSL.) **1007'** DATE COMPLETED **12-05-2007**

EQUIPMENT **30" DIAMETER BUCKET RIG** BY: **T. REIST**

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	MATERIAL DESCRIPTION	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
50	B24-14			SM+ML	-Bedding contact at 50.2 feet B: N10E, 14N	5	98.8	24.3
52								
					-Contact C: N10E, 14N			
	B24-27			ML	Hard, moist, gray with orange oxidation, fine, Sandy/Clayey SILTSTONE; laminated in areas			
54					-1/2 to 1-inch thick stiff clay seam with no apparent remolding at 53.2 feet; B: N10E, 14N			
	B24-15					8	108.2	21.3
56								
58					-12-inch cemented zone at 58 feet			
					-Becomes very hard and dark charcoal gray below 59 feet			
60								
	B24-16				**SHEAR** at 61.3 feet (undulating, with 3 to 4 dip); 1/4 to 1½-inch thick, soft, moist, dark gray, continuous in 90% of boring, highly to moderately remolded and well developed to poorly developed plastic clay gouge	20	91.2	22.7
	B24-28							
62								
64								
	B24-17					25	112.0	17.3
66								
68								
70								
	B24-18					25/10"	90.9	27.1
72								
74					-Becomes extremely hard below 74 feet			
	B24-19				**BEDDING PLANE SHEAR** at 74.1 feet S: N45E, 14N; 1/16 to 1¼-inch thick, soft, moist, gray, highly irregular thickness, continuous, moderately			

Figure A-24,
Log of Boring B 24, Page 3 of 4

SAMPLE SYMBOLS			
	☐ ... SAMPLING UNSUCCESSFUL	◧ ... STANDARD PENETRATION TEST	■ ... DRIVE SAMPLE (UNDISTURBED)
	☒ ... DISTURBED OR BAG SAMPLE	◪ ... CHUNK SAMPLE	▼ ... WATER TABLE OR SEEPAGE

NOTE: THE LOG OF SUBSURFACE CONDITIONS SHOWN HEREON APPLIES ONLY AT THE SPECIFIC BORING OR TRENCH LOCATION AND AT THE DATE INDICATED. IT IS NOT WARRANTED TO BE REPRESENTATIVE OF SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND TIMES.

GEOCON

PROJECT NO. G1218-52-01

BORING B 24

ELEV. (MSL.) **1007'** DATE COMPLETED **12-05-2007**

EQUIPMENT **30" DIAMETER BUCKET RIG** BY: **T. REIST**

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	MATERIAL DESCRIPTION	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
	B24-20 ■			ML	remolded and moderately developed plastic clay gouge, 1/16-inch incipient BPS at 74.8 feet	25/10"	93.6	24.8
76								
			▽		-Slight seepage at 77.5 feet			
78	B24-29 ⊠				**BEDDING PLANE SHEAR ZONE** at 78.3 feet S: N35E, 14N; main BPS 1/16 to 1/2-inch thick, soft, moist, gray, continuous, moderately remolded plastic clay gouge, with incipient BPS at 78.1 and 78.6 feet; 1/4-inch to paper thin, discontinuous and moderately remolded in areas			
80	B24-21 ■					25/9"	109.5	17.2
82								
					-Geotechnically logged to 83.5 feet due to spoils			
84								
					-24-inch orange brown sandstone bed at 85 feet			
86								
88	B24-22 ■					25/10"	98.3	24.0

BORING TERMINATED AT 88.5 FEET
Backfilled and tamped with soil cuttings interlayered with
bentonite chips

Figure A-24,
Log of Boring B 24, Page 4 of 4

G1218-52-01 (UPD-04-17-2012).GPJ

SAMPLE SYMBOLS

☐ ... SAMPLING UNSUCCESSFUL
◧ ... STANDARD PENETRATION TEST
■ ... DRIVE SAMPLE (UNDISTURBED)
⊠ ... DISTURBED OR BAG SAMPLE
◪ ... CHUNK SAMPLE
▼ ... WATER TABLE OR SEEPAGE

NOTE: THE LOG OF SUBSURFACE CONDITIONS SHOWN HEREON APPLIES ONLY AT THE SPECIFIC BORING OR TRENCH LOCATION AND AT THE DATE INDICATED. IT IS NOT WARRANTED TO BE REPRESENTATIVE OF SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND TIMES.

GEOCON

PROJECT NO. G1218-52-01

BORING B 25

ELEV. (MSL.) 998' DATE COMPLETED 12-06-2007

EQUIPMENT 30" DIAMETER BUCKET RIG BY: T. REIST

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	MATERIAL DESCRIPTION	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
0				SM/SC	**DRILL PAD FILL** Loose, damp to moist, dark brown, Silty/Clayey SAND			
2				SM	**TOPSOIL** Loose, damp, dark brown, Silty, fine to medium SAND, with clay			
4				ML	**BEDROCK CREEP** Very stiff, damp, white to pale olive, fine, Sandy SILT/SILTSTONE heavily fractured, avg 1/2 to 1-inch wide with calcium carbonate infilling with variable orientation and abundant krotovina			
	■ B25-1					1	102.9	14.0
6					-Becomes olive gray below 7 feet; contact (N25W, 14S)			
8					-Becomes very stiff to hard below 8 feet with weathered fabric but competent			
	⊠ B25-2							
10					-Multiple gypsum filled fractures with variable orientation below 10 feet			
	■ B25-3					1		
12								
	⊠ B25-16							
14								
	■ B25-4				-6-inch thick concretion in half of boring			
16					-Sharp 1/2 to 1-inch thick orange-brown oxidized sandstone lense at 17 feet (N10W, 16S) -Distinct change in fabric below subtle contact at 17.5 feet C: N10W, 16S			
18				ML	**PUENTE FORMATION-LA VIDA MEMBER (Tplv)** Hard, moist, olive gray, Clayey/fine, Sandy SILTSTONE, with random gypsum veins throughout and manganese oxide on fractures; moderately indurated			
20					-Gypsum veins reduced significantly below 20 feet			
	■ B25-5				-6-inch continuous orange-brown and gray, fine sandstone bed at 21.5 feet B: N40W, 15S	4	100.7	18.7
22								
24					-Slightly diatomaceous with calcium carbonate stringers			

Figure A-25,
Log of Boring B 25, Page 1 of 4

G1218-52-01 (UPD-04-17-2012).GPJ

SAMPLE SYMBOLS

☐ ... SAMPLING UNSUCCESSFUL	◧ ... STANDARD PENETRATION TEST	■ ... DRIVE SAMPLE (UNDISTURBED)
⊠ ... DISTURBED OR BAG SAMPLE	◪ ... CHUNK SAMPLE	▼ ... WATER TABLE OR SEEPAGE

NOTE: THE LOG OF SUBSURFACE CONDITIONS SHOWN HEREON APPLIES ONLY AT THE SPECIFIC BORING OR TRENCH LOCATION AND AT THE DATE INDICATED. IT IS NOT WARRANTED TO BE REPRESENTATIVE OF SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND TIMES.

GEOCON

PROJECT NO. G1218-52-01

BORING B 25

ELEV. (MSL.) **998'** DATE COMPLETED **12-06-2007**

EQUIPMENT **30" DIAMETER BUCKET RIG** BY: **T. REIST**

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	MATERIAL DESCRIPTION	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
	■ B25-6			ML		3	102.8	21.5
26					-Becomes predominately clayey siltstone below 26 feet			
28								
30	■ B25-7				-Becomes thinly laminated with abundant gypsum veins from 30 to 32 feet **BEDDING PLANE SHEAR ZONE** at 33 feet S: N50W, 16S; 2 to 3-inch thick, soft, moist, olive gray, continuous, highly to moderately remolded plastic clay gouge; discontinuous incipient BPS at 33.4 feet, sandwiched in between orange-brown sandstone bed	4	93.0	27.6
32								
	⊠ B25-17							
34								
	■ B25-8					4	98.9	25.2
36								
					-4-inch reddish brown sandstone bed at 37 feet B: N45W, 18S			
38					-Becomes very hard and chocolate brown below 38 feet			
40								
	■ B25-9				-6-inch gray, fine to medium sandstone bed at 41.5 feet B: N45W, 14S	15/8"	121.9	13.1
42					-Undulating scoured contact			
				SM	Very dense, damp to moist, chocolate brown, very Silty, fine SANDSTONE			
44								
	■ B25-10					15/11"	103.8	20.8
				ML	Hard to very hard, damp, dark charcoal gray, fine, Sandy/Clayey SILTSTONE, with random concretionary pods			
46								
48								
					-1-foot concretionary zone at 49.5 feet			

Figure A-25,
Log of Boring B 25, Page 2 of 4

G1218-52-01 (UPD-04-17-2012).GPJ

SAMPLE SYMBOLS
☐ ... SAMPLING UNSUCCESSFUL
◧ ... STANDARD PENETRATION TEST
■ ... DRIVE SAMPLE (UNDISTURBED)
⊠ ... DISTURBED OR BAG SAMPLE
◪ ... CHUNK SAMPLE
▼ ... WATER TABLE OR SEEPAGE

PROJECT NO. G1218-52-01

BORING B 25

ELEV. (MSL.) **998'** DATE COMPLETED **12-06-2007**

EQUIPMENT **30" DIAMETER BUCKET RIG** BY: **T. REIST**

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	MATERIAL DESCRIPTION	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
50	B25-11			ML	-Slight seepage on south half of boring	13	110.9	15.9
			▽					
52								
54								
56					-Discontinuous 12-inch thick, cemented gray sandstone bed at 57 feet			
58								
60	B25-12					25/8"	104.6	17.9
62								
64				SM/ML	Dense, moist, gray, Silty, fine to medium SANDSTONE and hard, damp, very dark gray, fine Sandy SILTSTONE; beds are marbled from 63.5 to 70.5 feet			
66					-Moderate seepage that increases with depth at 67 feet			
	B25-13					25/10"	92.5	24.1
68								
70								
				SM	Dense, moist, gray, Silty, fine to medium SANDSTONE			
72	B25-14					25/10"	118.8	14.9
74				ML	Hard, moist, very dark gray, fine Sandy SILTSTONE			

Figure A-25, Log of Boring B 25, Page 3 of 4

G1218-52-01 (UPD-04-17-2012).GPJ

SAMPLE SYMBOLS
☐ ... SAMPLING UNSUCCESSFUL
◧ ... STANDARD PENETRATION TEST
■ ... DRIVE SAMPLE (UNDISTURBED)
☒ ... DISTURBED OR BAG SAMPLE
◪ ... CHUNK SAMPLE
▼ ... WATER TABLE OR SEEPAGE

NOTE: THE LOG OF SUBSURFACE CONDITIONS SHOWN HEREON APPLIES ONLY AT THE SPECIFIC BORING OR TRENCH LOCATION AND AT THE DATE INDICATED. IT IS NOT WARRANTED TO BE REPRESENTATIVE OF SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND TIMES.

GEOCON

BORING B 25

ELEV. (MSL.) **998'** DATE COMPLETED **12-06-2007**

EQUIPMENT **30" DIAMETER BUCKET RIG** BY: **T. REIST**

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	MATERIAL DESCRIPTION	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
76				ML				
				SM	Dense, moist, gray, Silty, fine to medium SANDSTONE			
78	B25-15 ■					25/9"	112.6	18.3
80								
82								
84								
					BORING TERMINATED AT 85 FEET Backfilled and tamped with soil cuttings interlayered with bentonite chips			

Figure A-25,
Log of Boring B 25, Page 4 of 4

SAMPLE SYMBOLS

☐ ... SAMPLING UNSUCCESSFUL	◧ ... STANDARD PENETRATION TEST	■ ... DRIVE SAMPLE (UNDISTURBED)
☒ ... DISTURBED OR BAG SAMPLE	◪ ... CHUNK SAMPLE	▼ ... WATER TABLE OR SEEPAGE

NOTE: THE LOG OF SUBSURFACE CONDITIONS SHOWN HEREON APPLIES ONLY AT THE SPECIFIC BORING OR TRENCH LOCATION AND AT THE DATE INDICATED. IT IS NOT WARRANTED TO BE REPRESENTATIVE OF SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND TIMES.

GEOCON

PROJECT NO. G1218-52-01

BORING B 26

ELEV. (MSL.) **1190'** DATE COMPLETED **12-13-2007**

EQUIPMENT **30" DIAMETER BUCKET AUGER** BY: **T. REIST**

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	MATERIAL DESCRIPTION	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
0				ML	**TOPSOIL** Loose, damp, dark brown, Clayey SILT			
2								
4				ML	**PUENTE FORMATION-LA VIDA MEMBER (Tplv)** Hard, moist, gray brown, fine, Silty/Clayey SILTSTONE; laminated to thinly laminated			
6					-Bedding with 2-inch orange sandstone bed at 6 feet B: N65W, 19S			
8					-Random 1/4 to 1/16-inch thick, gypsum veins with variable orientation present below			
10					-2-inch thick gray ash bed (non-plastic) at 11 feet B: N70W, 25S			
12								
14					-Becomes chocolate brown to gray brown below 15 feet			
16					-Several high angle minor fractures with calcium carbonate and gypsum infilling up to 1/8 wide below 16 feet			
18								
20					-16-inch thick gray ash bed (non-plastic) at 21 feet B: N70W, 25S			
22								
24								

Figure A-26,
Log of Boring B 26, Page 1 of 4

G1218-52-01 (UPD-04-17-2012).GPJ

SAMPLE SYMBOLS			
	☐ ... SAMPLING UNSUCCESSFUL	◧ ... STANDARD PENETRATION TEST	■ ... DRIVE SAMPLE (UNDISTURBED)
	☒ ... DISTURBED OR BAG SAMPLE	◣ ... CHUNK SAMPLE	▼ ... WATER TABLE OR SEEPAGE

NOTE: THE LOG OF SUBSURFACE CONDITIONS SHOWN HEREON APPLIES ONLY AT THE SPECIFIC BORING OR TRENCH LOCATION AND AT THE DATE INDICATED. IT IS NOT WARRANTED TO BE REPRESENTATIVE OF SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND TIMES.

PROJECT NO. G1218-52-01

BORING B 26

ELEV. (MSL.) **1190'** DATE COMPLETED **12-13-2007**

EQUIPMENT **30" DIAMETER BUCKET AUGER** BY: **T. REIST**

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	MATERIAL DESCRIPTION	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
				ML				
26					-Bedding with 6-inch thick orange and gray sandstone bed at 26 feet B: N65W, 25S -Becomes gray brown, below 26.5 feet			
28								
					-6-inch cemented zone covering ½ of boring at 29 feet -Bedding with green clayey siltstone bed with calcium carbonate along thin bedding B: N70W, 23S			
30								
32								
34								
36								
					-Some charcoal pieces present below 37 feet			
38					-Becomes green gray and chocolate brown below 38 feet -Prominent Fault/Fracture from 37.1 to 46.5 feet f: N53W, 80S; with some 1/4 to 1/2-inch thick clay gouge along trace; offsets orange sandstone bed at 42 feet with 12-inches of throw			
40								
42								
44								
46								
48								

Figure A-26,
Log of Boring B 26, Page 2 of 4

G1218-52-01 (UPD-04-17-2012).GPJ

SAMPLE SYMBOLS

☐ ... SAMPLING UNSUCCESSFUL
☒ ... DISTURBED OR BAG SAMPLE
◧ ... STANDARD PENETRATION TEST
◪ ... CHUNK SAMPLE
■ ... DRIVE SAMPLE (UNDISTURBED)
▼ ... WATER TABLE OR SEEPAGE

NOTE: THE LOG OF SUBSURFACE CONDITIONS SHOWN HEREON APPLIES ONLY AT THE SPECIFIC BORING OR TRENCH LOCATION AND AT THE DATE INDICATED. IT IS NOT WARRANTED TO BE REPRESENTATIVE OF SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND TIMES.

GEOCON

PROJECT NO. G1218-52-01

BORING B 26

ELEV. (MSL.) 1190' DATE COMPLETED 12-13-2007

EQUIPMENT 30" DIAMETER BUCKET AUGER BY: T. REIST

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	MATERIAL DESCRIPTION	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
50				ML	-Bedding with 6-inch light brown diatomaceous bed at 50.5 feet B: N60W, 23S			
52					-Gradationally becomes very hard and very dark gray and dark olive, fine sandy siltstone below 52 feet			
54								
56					-Becomes extremely hard and predominantly very dark gray and fossilferous below 56 feet			
58								
60								
62								
64								
66								
68	B26-1 ☒				-**BEDDING PLANE SHEAR** at 67.3 feet S: N65W, 26S-1/8 to 1/4-inch thick, soft to stiff, moist, very dark gray, continuous, moderately to highly remolded plastic clay gouge; material above and below BPS extremely hard			
70								
72								
74								

Figure A-26,
Log of Boring B 26, Page 3 of 4

G1218-52-01 (UPD-04-17-2012).GPJ

SAMPLE SYMBOLS

☐ ... SAMPLING UNSUCCESSFUL
◧ ... STANDARD PENETRATION TEST
■ ... DRIVE SAMPLE (UNDISTURBED)
☒ ... DISTURBED OR BAG SAMPLE
◣ ... CHUNK SAMPLE
▼ ... WATER TABLE OR SEEPAGE

NOTE: THE LOG OF SUBSURFACE CONDITIONS SHOWN HEREON APPLIES ONLY AT THE SPECIFIC BORING OR TRENCH LOCATION AND AT THE DATE INDICATED. IT IS NOT WARRANTED TO BE REPRESENTATIVE OF SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND TIMES.

GEOCON

PROJECT NO. G1218-52-01

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	**BORING B 26** ELEV. (MSL.) **1190'** DATE COMPLETED **12-13-2007** EQUIPMENT **30" DIAMETER BUCKET AUGER** BY: **T. REIST**	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
					MATERIAL DESCRIPTION			
76 78 80 82 84				ML	-4-inch thick gray ash bed (non-plastic) at 83 feet; geotechnically logged to 83 feet due to spoils			
86				SM	Dense, damp, gray, Silty, fine to medium SANDSTONE			
					BORING TERMINATED AT 87 FEET No groundwater encountered Backfilled and tamped with soil cuttings interlayered with bentonite chips			

Figure A-26,
Log of Boring B 26, Page 4 of 4

G1218-52-01 (UPD-04-17-2012).GPJ

SAMPLE SYMBOLS

☐ ... SAMPLING UNSUCCESSFUL
◧ ... STANDARD PENETRATION TEST
■ ... DRIVE SAMPLE (UNDISTURBED)
⊠ ... DISTURBED OR BAG SAMPLE
◣ ... CHUNK SAMPLE
▼ ... WATER TABLE OR SEEPAGE

NOTE: THE LOG OF SUBSURFACE CONDITIONS SHOWN HEREON APPLIES ONLY AT THE SPECIFIC BORING OR TRENCH LOCATION AND AT THE DATE INDICATED. IT IS NOT WARRANTED TO BE REPRESENTATIVE OF SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND TIMES.

GEOCON

PROJECT NO. G1218-52-01

BORING B 27

ELEV. (MSL.) **1054'** DATE COMPLETED **12-14-2007**

EQUIPMENT **30" DIAMETER BUCKET AUGER** BY: **T. REIST**

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	MATERIAL DESCRIPTION	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
0				SM	**TOPSOIL** Loose, moist, dark brown, Silty, fine to medium SAND with clay			
				SP	**PUENTE FORMATION-SOQUEL MEMBER (Tps)** Very dense, damp, light brown, fine to coarse SAND; moderately cemented throughout; grain size varies with depth			
2								
4								
6								
8								
10								
12					-Bedding with 2½-foot thick, hard, gray, siltstone bed at 11.5 feet B: N35W, 26S			
14					-Becomes white and light brown below 14 feet			
16								
18					-Bedding with 3-foot thick, orange brown, very silty, fine sandstone bed at 17.5 feet B: N35W, 18S			
20								
22								
24					-Bedding with 1-foot thick, orange-brown, clayey siltstone bed at 24 feet B: N65W, 18S			
26								
28								
					-Becomes predominantly white and fine to coarse below 29 feet			

Figure A-27,
Log of Boring B 27, Page 1 of 2

G1218-52-01 (UPD-04-17-2012).GPJ

SAMPLE SYMBOLS

- ☐ ... SAMPLING UNSUCCESSFUL
- ◧ ... STANDARD PENETRATION TEST
- ■ ... DRIVE SAMPLE (UNDISTURBED)
- ☒ ... DISTURBED OR BAG SAMPLE
- ◩ ... CHUNK SAMPLE
- ▼ ... WATER TABLE OR SEEPAGE

PROJECT NO. G1218-52-01

BORING B 27

ELEV. (MSL.) **1054'** DATE COMPLETED **12-14-2007**

EQUIPMENT **30" DIAMETER BUCKET AUGER** BY: **T. REIST**

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	MATERIAL DESCRIPTION	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
30				SP				
32								
34								
36								
38								
40								
42					-Bedding with 2-foot thick, olive brown, fine sandstone bed at 41.5 feet B: N15W, 22S			
44								
46					-Multiple 1-foot thick cemented zones from 46 to 55 feet; auger used throughout, very difficult and slow drilling (1½ hrs to drill 9 feet)			
48								
50								
52					-Bedding with 2-inch thick orange oxidized lense at 51.5 feet B: N20W, 22S			
54								

BORING TERMINATED AT 55 FEET
DUE TO DIFFICULT DRILLING CONDITIONS
No groundwater encountered
Backfilled and tamped with soil cuttings interlayered with bentonite chips

Figure A-27,
Log of Boring B 27, Page 2 of 2

G1218-52-01 (UPD-04-17-2012).GPJ

SAMPLE SYMBOLS

☐ ... SAMPLING UNSUCCESSFUL
◧ ... STANDARD PENETRATION TEST
■ ... DRIVE SAMPLE (UNDISTURBED)
☒ ... DISTURBED OR BAG SAMPLE
◪ ... CHUNK SAMPLE
▼ ... WATER TABLE OR SEEPAGE

NOTE: THE LOG OF SUBSURFACE CONDITIONS SHOWN HEREON APPLIES ONLY AT THE SPECIFIC BORING OR TRENCH LOCATION AND AT THE DATE INDICATED. IT IS NOT WARRANTED TO BE REPRESENTATIVE OF SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND TIMES.

PROJECT NO. G1218-52-01

BORING B 28

ELEV. (MSL.) **1080'** DATE COMPLETED **05-10-2010**

EQUIPMENT **30" DIAMETER BUCKET RIG** BY: **T. REIST**

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	MATERIAL DESCRIPTION	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
0				ML	**FILL** Stiff, moist, brown to light brown, Clayey SILT, with abundant siltstone chunks			
2				ML	**PUENTE FORMATION-SOQUEL MEMBER (Tps-slt)** Hard, moist, light brown, fine, Sandy SILTSTONE and Clayey SILTSTONE -Bedding at 2.5 feet (N20W, 26S)			
4								
	B28-1				Bedding with 2-3" thick white sandstone bed; irregular contact (due North, 43W)	4	105.3	19.3
6								
8								
10					-Bedding with 2½" thick orange sandstone bed (N30W, 24S)			
12					-Becomes very hard and dark maroon below 12 feet			
14								
16					-Bedding with 3-4" thick gray non-plastic ash bed (N40W, 15S)			
18					-Becomes dark charcoal gray with high angle fractures and brown weathering and gypsum veins along surfaces			
20	B28-2					10	73.0	34.5
22								
24					-Bedding with 10" thick gray non-plastic ash bed; slightly irregular contact (N55W, 13S)			

Figure A-28,
Log of Boring B 28, Page 1 of 4

G1218-52-01 (UPD-04-17-2012).GPJ

SAMPLE SYMBOLS

☐ ... SAMPLING UNSUCCESSFUL	◧ ... STANDARD PENETRATION TEST	■ ... DRIVE SAMPLE (UNDISTURBED)
☒ ... DISTURBED OR BAG SAMPLE	◪ ... CHUNK SAMPLE	▼ ... WATER TABLE OR SEEPAGE

NOTE: THE LOG OF SUBSURFACE CONDITIONS SHOWN HEREON APPLIES ONLY AT THE SPECIFIC BORING OR TRENCH LOCATION AND AT THE DATE INDICATED. IT IS NOT WARRANTED TO BE REPRESENTATIVE OF SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND TIMES.

GEOCON

BORING B 28

ELEV. (MSL.) **1080'** DATE COMPLETED **05-10-2010**

EQUIPMENT **30" DIAMETER BUCKET RIG** BY: **T. REIST**

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	MATERIAL DESCRIPTION	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
26								
28					-1 foot thick concretion at 28 feet			
30								
32								
34								
36					-Bedding with light brown siltstone beds at 36 feet (N40W, 20S)			
38					-**BEDDING PLANE SHEAR** at 38.1 feet; (N50W, 21S); paper thin, soft, moist, dark gray, very poorly remolded, poorly developed plastic clay gouge; able to trace across only half of boring; very hard above and below BPS			
40								
42								
44								
46								
48								

Figure A-28,
Log of Boring B 28, Page 2 of 4

G1218-52-01 (UPD-04-17-2012).GPJ

SAMPLE SYMBOLS

☐ ... SAMPLING UNSUCCESSFUL
◧ ... STANDARD PENETRATION TEST
■ ... DRIVE SAMPLE (UNDISTURBED)
☒ ... DISTURBED OR BAG SAMPLE
◩ ... CHUNK SAMPLE
▼ ... WATER TABLE OR SEEPAGE

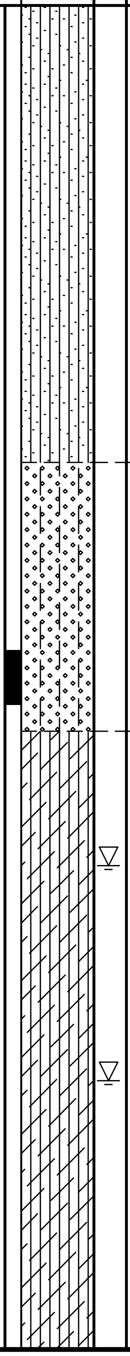
NOTE: THE LOG OF SUBSURFACE CONDITIONS SHOWN HEREON APPLIES ONLY AT THE SPECIFIC BORING OR TRENCH LOCATION AND AT THE DATE INDICATED. IT IS NOT WARRANTED TO BE REPRESENTATIVE OF SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND TIMES.

GEOCON

BORING B 28

ELEV. (MSL.) **1080'** DATE COMPLETED **05-10-2010**

EQUIPMENT **30" DIAMETER BUCKET RIG** BY: **T. REIST**



DEPTH IN FEET	SAMPLE NO.	SOIL CLASS (USCS)	MATERIAL DESCRIPTION	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
50						
52			-**FAULT/FRACTURE** at 51 feet (high angle); offsets 8-inch thick gray, fine sandstone bed with 1" of throw -Bedding at 52 feet (N45W, 23S)			
54						
56			-**WEAK ZONE** at 55 feet; zone of thinly bedded siltstone and claystone with areas having poorly remolded plastic clay gouge			
58						
		SM	-Irregular contact offset by fractures and interbedding of siltstone beds Dense, moist, gray, Silty, fine SANDSTONE			
60						
62	B28-3		-Bedding with darker gray sandstone bed at 62 feet (N55W, 24S)	22	100.7	22.5
		ML	-Contact (N50W, 26S) Very hard, damp, dark charcoal gray, interbedded Clayey SILTSTONE and fine, Sandy SILTSTONE			
64						
66			-Moderate seepage present at 66 feet			
68						
70			-Very heavy seepage at 70 feet; seepage emanating from high angle fractures			
72						
74						

Figure A-28,
Log of Boring B 28, Page 3 of 4

SAMPLE SYMBOLS

☐ ... SAMPLING UNSUCCESSFUL
◧ ... STANDARD PENETRATION TEST
■ ... DRIVE SAMPLE (UNDISTURBED)
☒ ... DISTURBED OR BAG SAMPLE
◩ ... CHUNK SAMPLE
▼ ... WATER TABLE OR SEEPAGE

PROJECT NO. G1218-52-01

BORING B 28

ELEV. (MSL.) **1080'** DATE COMPLETED **05-10-2010**

EQUIPMENT **30" DIAMETER BUCKET RIG** BY: **T. REIST**

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	MATERIAL DESCRIPTION	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
76								
78			∇	SM	-Extremely heavy seepage at 78 feet; emanating from numerous open fractures with 1/4" to 1/2" aperture Dense, moist, gray, Silty, fine SANDSTONE			
80								
82					-Geotechnically logged to 82 feet due to seepage filling up hole			
84								
86								
88								
90								
92					PRACTICAL REFUSAL AT 92 FEET			

Figure A-28,
Log of Boring B 28, Page 4 of 4

G1218-52-01 (UPD-04-17-2012).GPJ

SAMPLE SYMBOLS			
	☐ ... SAMPLING UNSUCCESSFUL	◧ ... STANDARD PENETRATION TEST	■ ... DRIVE SAMPLE (UNDISTURBED)
	☒ ... DISTURBED OR BAG SAMPLE	◪ ... CHUNK SAMPLE	▼ ... WATER TABLE OR SEEPAGE

NOTE: THE LOG OF SUBSURFACE CONDITIONS SHOWN HEREON APPLIES ONLY AT THE SPECIFIC BORING OR TRENCH LOCATION AND AT THE DATE INDICATED. IT IS NOT WARRANTED TO BE REPRESENTATIVE OF SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND TIMES.

GEOCON

PROJECT NO. G1218-52-01

BORING B 29

ELEV. (MSL.) **1061'** DATE COMPLETED **05-10-2010**

EQUIPMENT **30" DIAMETER BUCKET RIG** BY: **T. REIST**

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	MATERIAL DESCRIPTION	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
0				ML	**TOPSOIL** Stiff, dry to damp, brown, fine, Sandy SILT			
2								
				SM	**PUENTE FORMATION-SOQUEL MEMBER (Tps)** Very dense, damp, light brown to white, Silty, fine to coarse SANDSTONE; massive; little to no discernable bedding			
4								
	B29-1					6/6"	122.6	3.0
6								
					-Several high angle fractures with varing attitudes present throughout unit; some have 1-4" of displacement			
8								
10								
					-Bedding with oxidized orange lense (N55W, 23S) -1/2" wide fracture with several incipient fractures at 11 feet (avg. N10W, 75S)			
12								
14								
16								
18								
20								
					-Bedding 21.8 feet with orange oxidized lense (N55W, 28S)			
22								
					-Becomes predominantly yellow with white and orange lenses below 23 feet			
24								

Figure A-29,
Log of Boring B 29, Page 1 of 3

G1218-52-01 (UPD-04-17-2012).GPJ

SAMPLE SYMBOLS

☐ ... SAMPLING UNSUCCESSFUL
◧ ... STANDARD PENETRATION TEST
■ ... DRIVE SAMPLE (UNDISTURBED)
☒ ... DISTURBED OR BAG SAMPLE
◣ ... CHUNK SAMPLE
▼ ... WATER TABLE OR SEEPAGE

BORING B 29

ELEV. (MSL.) **1061'** DATE COMPLETED **05-10-2010**

EQUIPMENT **30" DIAMETER BUCKET RIG** BY: **T. REIST**

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	MATERIAL DESCRIPTION	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
26								
28								
30								
32								
34					-Bedding at 33 feet with orange oxidized lense (N55W, 23S)			
36					-Becomes orange, yellow and white below 36 feet			
38								
40					-Bedding at 40.8 feet with orange oxidized lense (N55W, 23S)			
42								
44					-Becomes gray, orange and light brown -**FRACTURE/FAULT** at 45 feet (N20W, 70S)			
46								
48					-**BEDDING PLANE SHEAR** at 46.5 feet (N20W, 28S); paper thin, soft, moist, dark gray, very poorly developed in areas in 3/4 of boring and offset by fault/fracture above; however can trace gouge through fault trace -Bedding 48.3 feet (N50W, 28S)			

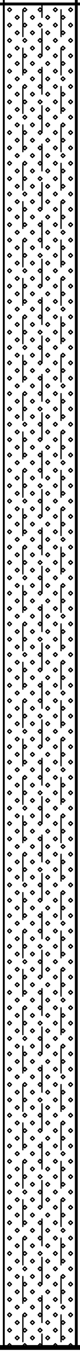


Figure A-29,
Log of Boring B 29, Page 2 of 3

SAMPLE SYMBOLS			
	☐ ... SAMPLING UNSUCCESSFUL	◧ ... STANDARD PENETRATION TEST	■ ... DRIVE SAMPLE (UNDISTURBED)
	☒ ... DISTURBED OR BAG SAMPLE	◣ ... CHUNK SAMPLE	▼ ... WATER TABLE OR SEEPAGE

PROJECT NO. G1218-52-01

BORING B 29

ELEV. (MSL.) **1061'** DATE COMPLETED **05-10-2010**

EQUIPMENT **30" DIAMETER BUCKET RIG** BY: **T. REIST**

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	MATERIAL DESCRIPTION	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
50								
					-Contact (N50W, 28S)			
52				ML	**PUENTE FORMATION-SOQUEL MEMBER (Tps-slt)** Very hard, damp, dark charcoal gray, fine Sandy SILTSTONE			
54								
					-24" thick orange and gray fine to medium sandstone bed at 55 feet			
56								
58								
					-Several concretions below 59 feet, extremely slow drilling			
60								
					-Becomes clayey silt below			
62								
					-Below 63 feet becomes interbedded with gray, fine, sandstone			
64				SM	Very dense, damp to moist, gray, Silty, fine SANDSTONE			
66								
			∇		-Minor seepage at 67 feet; geotechnically logged to 67 feet due to spoils			
68								
70								
					PRACTICAL REFUSAL AT 71 FEET			

Figure A-29,
Log of Boring B 29, Page 3 of 3

G1218-52-01 (UPD-04-17-2012).GPJ

SAMPLE SYMBOLS			
	☐ ... SAMPLING UNSUCCESSFUL	◧ ... STANDARD PENETRATION TEST	■ ... DRIVE SAMPLE (UNDISTURBED)
	☒ ... DISTURBED OR BAG SAMPLE	◪ ... CHUNK SAMPLE	▼ ... WATER TABLE OR SEEPAGE

NOTE: THE LOG OF SUBSURFACE CONDITIONS SHOWN HEREON APPLIES ONLY AT THE SPECIFIC BORING OR TRENCH LOCATION AND AT THE DATE INDICATED. IT IS NOT WARRANTED TO BE REPRESENTATIVE OF SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND TIMES.

GEOCON

PROJECT NO. G1218-52-01

BORING B 30

ELEV. (MSL.) 1142' DATE COMPLETED 05-11-2010

EQUIPMENT 30" DIAMETER BUCKET RIG BY: T. REIST

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	MATERIAL DESCRIPTION	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
0				ML	**BEDROCK CREEP ?** Hard to very hard, damp, light brown, fine, Sandy SILTSTONE; cemented between 0-3 feet; topsoil removed during grading for drill pad			
2								
4				ML	Zone of weathered/disturbed chaotic bedding with siltstone clasts and moist orange sand lenses between 3 and 7 feet			
6	B30-1	■				1	101.8	16.9
					-Distinct change in competency below 7 feet			
8				CL&ML	**PUENTE FORMATION-SOQUEL MEMBER (Tps-slt)** Very stiff to hard, moist, gray and light brown with yellow sulfide stringers, interbedded Silty CLAYSTONE and Clayey SILTSTONE; bedding alternates between thinly bedded and moderately bedded; moist clay films along some parting surfaces; several high angle fractures with up to 1/4" aperture -At 8.5 feet, bedding with 2-3" thick non-plastic gray ash bed (N55W, 30S)			
10	B30-2	■				3	78.2	35.8
12								
14								
16								
18					-Discontinuous 12-inch thick white sandstone bed at 17 feet			
20	B30-3	■				2	76.4	42.6
22					-**BEDDING PLANE SHEAR** at 23 feet; (N55W, 9S) 1-2½" thick, soft, moist, olive green, continuous poorly to moderately remolded, well developed, plastic clay gouge; fractures terminate at BPS			
24	B30-4	⊠		ML/CL	Very hard to hard, damp, olive green and dark brown, Clayey SILTSTONE/Silty CLAYSTONE -Bedding with 3" thick orange sandstone bed (N50W, 15S)			
26								
28								

Figure A-30,
Log of Boring B 30, Page 1 of 2

G1218-52-01 (UPD-04-17-2012).GPJ

SAMPLE SYMBOLS

☐ ... SAMPLING UNSUCCESSFUL

◧ ... STANDARD PENETRATION TEST

■ ... DRIVE SAMPLE (UNDISTURBED)

⊠ ... DISTURBED OR BAG SAMPLE

◩ ... CHUNK SAMPLE

▼ ... WATER TABLE OR SEEPAGE

NOTE: THE LOG OF SUBSURFACE CONDITIONS SHOWN HEREON APPLIES ONLY AT THE SPECIFIC BORING OR TRENCH LOCATION AND AT THE DATE INDICATED. IT IS NOT WARRANTED TO BE REPRESENTATIVE OF SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND TIMES.

GEOCON

PROJECT NO. G1218-52-01

BORING B 30

ELEV. (MSL.) **1142'** DATE COMPLETED **05-11-2010**

EQUIPMENT **30" DIAMETER BUCKET RIG** BY: **T. REIST**

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	MATERIAL DESCRIPTION	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
30	B30-5	■ ▨				3	78.7	40.4
32		▨			-Bedding at 32.5 feet (N75W, 25S)			
34		▨						
36		▨			-Bedding with 3-5" thick non-plastic gray ash bed with irregular deposition (avg. N50W, 19S) at 36.5 feet -Becomes very hard, dark brown and black below ash bed			
38		▨						
40	B30-6	■ ▨				4	77.8	39.8
42		▨			-Bedding with 20" thick non-plastic gray ash bed at 43 feet			
44		▨			-Geotechnically logged to 44 feet due to spoils			
46		▨						
48		▨			-Very difficult drilling rippers used below 48 feet			
50					PRACTICAL REFUSAL AT 50 FEET			

Figure A-30,
Log of Boring B 30, Page 2 of 2

G1218-52-01 (UPD-04-17-2012).GPJ

SAMPLE SYMBOLS

☐ ... SAMPLING UNSUCCESSFUL
◧ ... STANDARD PENETRATION TEST
■ ... DRIVE SAMPLE (UNDISTURBED)
☒ ... DISTURBED OR BAG SAMPLE
◪ ... CHUNK SAMPLE
▼ ... WATER TABLE OR SEEPAGE

PROJECT NO. G1218-52-01

BORING B 31

ELEV. (MSL.) **1098'** DATE COMPLETED **05-11-2010**

EQUIPMENT **30" DIAMETER BUCKET RIG** BY: **T. REIST**

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	MATERIAL DESCRIPTION	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
0				CL	**TOPSOIL** Stiff, moist, dark brown, Silty CLAY			
2				ML	**PUENTE FORMATION-SOQUEL MEMBER (Tps-slt)** Very hard, damp, pale orange, fine, Sandy SILTSTONE			
4								
	B31-1				-Zone of chaotic deposition from 5 to 11.5 feet with brown and gray siltstone clasts, concretions and high angle fractures (competent)	6/8"	123.0	9.3
6								
8								
10	B31-2					6/10"	117.6	13.9
					-Slightly undulating and scoured contact (N50W, 20S)			
12				ML	Hard to very hard, damp, white, fine, Sandy SILTSTONE; massive, no discernable bedding			
14								
16								
18								
					-Slightly scoured and undulating contact (N55W, 30S)			
20	B31-3		▽	CL&ML	Very stiff, moist, olive gray-green and brown, thinly bedded Silty CLAYSTONE and Clayey SILTSTONE with moist clay films along parting surfaces -Localized soft zone of weathered siltstone due to slight seepage	PUSH	76.1	43.9
22					-Becomes hard to very hard, dark chocolate brown and black below 22 feet			
24								

Figure A-31,
Log of Boring B 31, Page 1 of 2

G1218-52-01 (UPD-04-17-2012).GPJ

SAMPLE SYMBOLS

☐ ... SAMPLING UNSUCCESSFUL	◧ ... STANDARD PENETRATION TEST	■ ... DRIVE SAMPLE (UNDISTURBED)
☒ ... DISTURBED OR BAG SAMPLE	◪ ... CHUNK SAMPLE	▼ ... WATER TABLE OR SEEPAGE

NOTE: THE LOG OF SUBSURFACE CONDITIONS SHOWN HEREON APPLIES ONLY AT THE SPECIFIC BORING OR TRENCH LOCATION AND AT THE DATE INDICATED. IT IS NOT WARRANTED TO BE REPRESENTATIVE OF SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND TIMES.

GEOCON

BORING B 31

ELEV. (MSL.) **1098'** DATE COMPLETED **05-11-2010**

EQUIPMENT **30" DIAMETER BUCKET RIG** BY: **T. REIST**

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	MATERIAL DESCRIPTION	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
26								
28								
30								
	B31-4				-**BEDDING PLANE SHEAR** at 30.9 feet (N30W, 24S); 1-2" thick, soft, dark charcoal gray, continuous, moderately remolded, well developed plastic clay gouge Extremely hard clayey/fine, sandy silt below			
32								
34								
36								
38								
					REFUSAL AT 39 FEET			

Figure A-31,
Log of Boring B 31, Page 2 of 2

G1218-52-01 (UPD-04-17-2012).GPJ

SAMPLE SYMBOLS

☐ ... SAMPLING UNSUCCESSFUL
◧ ... STANDARD PENETRATION TEST
■ ... DRIVE SAMPLE (UNDISTURBED)
☒ ... DISTURBED OR BAG SAMPLE
◪ ... CHUNK SAMPLE
▼ ... WATER TABLE OR SEEPAGE

NOTE: THE LOG OF SUBSURFACE CONDITIONS SHOWN HEREON APPLIES ONLY AT THE SPECIFIC BORING OR TRENCH LOCATION AND AT THE DATE INDICATED. IT IS NOT WARRANTED TO BE REPRESENTATIVE OF SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND TIMES.

GEOCON

PROJECT NO. G1218-52-01

BORING B 32

ELEV. (MSL.) **1096'** DATE COMPLETED **05-12-2010**

EQUIPMENT **30" DIAMETER BUCKET RIG** BY: **T. REIST**

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	MATERIAL DESCRIPTION	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
0 2				CL	**TOPSOIL** Stiff, moist, dark brown, Silty CLAY -Gradational contact			
4 6				SM	**PUENTE FORMATION-SOQUEL MEMBER (Tps)** Very dense, damp, light brown with orange oxidation, Silty, fine to medium SANDSTONE -Bedding at 3.5 feet (N55W, 28S) -Becomes white at 7 feet; bedding (N55W, 26S) -Contact (N50W, 40S)			
8 10 12 14 16 18				CL&ML	**PUENTE FORMATION-SOQUEL MEMBER (Tps-slt)** Very hard, damp to moist, olive green and gray, thinly bedded Silty CLAYSTONE and Clayey SILTSTONE with interbeds of 1-2" thick fine, sandy siltstone beds -Zone of chaotic deposition from 13-16 feet with concretions (very competent) -Becomes light brown below 16 feet -**POORLY DEVELOPED SHEAR** at 17 feet (avg. N60W, 40S); paper thin to 1/8" thick, poorly remolded in areas, continuous within 90% of boring; poorly developed plastic clay gouge; highly irregular bedding within 2-6" thick thinly bedded clayey siltstone -Contact scoured and undulating (avg. N55W, 25S)			
20				ML	Very hard, damp, white, fine Sandy SILTSTONE			
22 24				CL&ML	**PUENTE FORMATION-LA VIDA MEMBER (Tplv)** Hard to very stiff, moist, chocolate brown and black, Silty CLAYSTONE and Clayey SILTSTONE; thinly bedded from 22-24 feet -Becomes very hard below 24 feet			
					PRACTICAL REFUSAL AT 25 FEET			

**Figure A-32,
Log of Boring B 32, Page 1 of 1**

G1218-52-01 (UPD-04-17-2012).GPJ

SAMPLE SYMBOLS

☐ ... SAMPLING UNSUCCESSFUL

◧ ... STANDARD PENETRATION TEST

■ ... DRIVE SAMPLE (UNDISTURBED)

☒ ... DISTURBED OR BAG SAMPLE

◪ ... CHUNK SAMPLE

▼ ... WATER TABLE OR SEEPAGE

NOTE: THE LOG OF SUBSURFACE CONDITIONS SHOWN HEREON APPLIES ONLY AT THE SPECIFIC BORING OR TRENCH LOCATION AND AT THE DATE INDICATED. IT IS NOT WARRANTED TO BE REPRESENTATIVE OF SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND TIMES.

GEOCON

PROJECT NO. G1218-52-01

BORING B 33

ELEV. (MSL.) **1162'** DATE COMPLETED **05-12-2010**

EQUIPMENT **30" DIAMETER BUCKET RIG** BY: **T. REIST**

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	MATERIAL DESCRIPTION	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
0				ML	**PUENTE FORMATION-SOQUEL MEMBER (Tps-slt)** Hard, damp, brown, Clayey SILTSTONE and Sandy SILTSTONE; topsoil removed during pad construction; caliche and gypsum veins present below, also with several high angle fractures; diatomaceous			
2								
4								
	B33-1					2	62.8	54.1
6								
					-Bedding at 7.5 feet with 10" thick gray non-plastic ash bed (N40W, 18S)			
8								
10								
	B33-2					4	74.9	40.6
12								
					-**BEDDING PLANE SHEAR** at 13.4 feet (N40W, 18S); 1/2-1" thick, soft, olive green, continuous, moderately remolded, well developed plastic clay gouge; located below 3-4 feet white, fine sandstone lense			
	B33-3							
14								
16								
					-Fracture 17-21 feet (N30W, 66NE) -Bedding at 18.5 feet with 3-4" diatameceous bed (N40W, 18); bed is truncated by prominent 4-6" wide fracture infilled with gray fine sand and non-plastic ash material			
18								
20	B33-4				-Poor recovery	3	N/A	23.6
22								
24					-2' thick non-plastic gray cemented ash bed at 24 feet			

Figure A-33,
Log of Boring B 33, Page 1 of 3

G1218-52-01 (UPD-04-17-2012).GPJ

SAMPLE SYMBOLS			
	☐ ... SAMPLING UNSUCCESSFUL	◧ ... STANDARD PENETRATION TEST	■ ... DRIVE SAMPLE (UNDISTURBED)
	☒ ... DISTURBED OR BAG SAMPLE	◣ ... CHUNK SAMPLE	▼ ... WATER TABLE OR SEEPAGE

NOTE: THE LOG OF SUBSURFACE CONDITIONS SHOWN HEREON APPLIES ONLY AT THE SPECIFIC BORING OR TRENCH LOCATION AND AT THE DATE INDICATED. IT IS NOT WARRANTED TO BE REPRESENTATIVE OF SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND TIMES.

GEOCON

PROJECT NO. G1218-52-01

BORING B 33

ELEV. (MSL.) **1162'** DATE COMPLETED **05-12-2010**

EQUIPMENT **30" DIAMETER BUCKET RIG** BY: **T. REIST**

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	MATERIAL DESCRIPTION	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
26					-Bedding with ash bed (N40W, 18) at 26 feet -Becomes chocolate brown and dark olive green below 26 feet			
28								
					-Bedding with ash bed at 29.1 feet (N40W, 20)			
30	B33-5 ■					3	67.2	51.5
32								
34								
36								
38					-Bedding with 3" thick non-plastic gray ash bed (N50W, 18S)			
40								
	B33-6 ⊠				-**BEDDING PLANE SHEAR** at 41.1 feet (N50W, 18S); 1/2-1" thick, soft, moist, dark olive green, continuous, moderately to poorly remolded in majority of boring; some areas completely replaced with caliche, poorly developed -Becomes very hard, chocolate brown and black below 41.5 feet			
42								
44								
46								
48					-Random gray discontinous and continuous gray fine sandstone beds present below			

Figure A-33,
Log of Boring B 33, Page 2 of 3

G1218-52-01 (UPD-04-17-2012).GPJ

SAMPLE SYMBOLS
☐ ... SAMPLING UNSUCCESSFUL
◧ ... STANDARD PENETRATION TEST
■ ... DRIVE SAMPLE (UNDISTURBED)
⊠ ... DISTURBED OR BAG SAMPLE
◪ ... CHUNK SAMPLE
▼ ... WATER TABLE OR SEEPAGE

NOTE: THE LOG OF SUBSURFACE CONDITIONS SHOWN HEREON APPLIES ONLY AT THE SPECIFIC BORING OR TRENCH LOCATION AND AT THE DATE INDICATED. IT IS NOT WARRANTED TO BE REPRESENTATIVE OF SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND TIMES.

GEOCON

BORING B 33

ELEV. (MSL.) **1162'** DATE COMPLETED **05-12-2010**

EQUIPMENT **30" DIAMETER BUCKET RIG** BY: **T. REIST**

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	MATERIAL DESCRIPTION	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
50		▨			-Bullet auger, rippers, core barrel used below			
52		▨						
54		▨						
56		▨						
58		▨						
60		▨						
62		▨						
64		▨	▽		-Moderate seepage at 64.5 feet			
66		▨			-Geotechnically logged to 66 feet due to standing water and spoils			
68		▨						
70					BORING TERMINATED AT 70 FEET			

Figure A-33,
Log of Boring B 33, Page 3 of 3

G1218-52-01 (UPD-04-17-2012).GPJ

SAMPLE SYMBOLS

☐ ... SAMPLING UNSUCCESSFUL
◧ ... STANDARD PENETRATION TEST
■ ... DRIVE SAMPLE (UNDISTURBED)
☒ ... DISTURBED OR BAG SAMPLE
◪ ... CHUNK SAMPLE
▼ ... WATER TABLE OR SEEPAGE

NOTE: THE LOG OF SUBSURFACE CONDITIONS SHOWN HEREON APPLIES ONLY AT THE SPECIFIC BORING OR TRENCH LOCATION AND AT THE DATE INDICATED. IT IS NOT WARRANTED TO BE REPRESENTATIVE OF SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND TIMES.

PROJECT NO. G1218-52-01

BORING B 34

ELEV. (MSL.) **1098'** DATE COMPLETED **05-12-2010**

EQUIPMENT **30" DIAMETER BUCKET RIG** BY: **T. REIST**

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	MATERIAL DESCRIPTION	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
0				ML	**TOPSOIL** Stiff, damp, Clayey SILT; no fabric			
2					-Contact (N65E, 12SE)			
4				ML	**WEATHERED PUENTE FORMATION-SOQUEL MEMBER (Tps-slt)** Soft to stiff, damp pale gray to white, fine, Sandy/Clayey SILT with abundant caliche and gypsum veins; shattered appearance			
6	B34-1	■			-Becomes olive green, clayey silt/silty clay below 5 feet	1	100.1	18.3
8								
10	B34-2	■				PUSH	95.7	22.9
12					-Distinct change in competency below 11.8 feet; contact undulating (avg. N30W, 25S)			
				CL&ML	**PUENTE FORMATION-SOQUEL MEMBER (Tps-slt)** Hard to very stiff, moist, gray, Silty CLAYSTONE and Clayey SILTSTONE; thinly bedded in areas			
14								
16	B34-3	■				1	93.0	23.6
18								
20	B34-4	■				2	103.5	19.6
22					-Bedding at 23.5 feet with 5-6" thick orange diatamaceous bed (N15W, 19S)			
24					-Hard, damp, gray/green, clayey siltstone beds, with gypsum veins below 24 feet			

Figure A-34,
Log of Boring B 34, Page 1 of 2

G1218-52-01 (UPD-04-17-2012).GPJ

SAMPLE SYMBOLS			
	☐ ... SAMPLING UNSUCCESSFUL	◧ ... STANDARD PENETRATION TEST	■ ... DRIVE SAMPLE (UNDISTURBED)
	☒ ... DISTURBED OR BAG SAMPLE	◣ ... CHUNK SAMPLE	▼ ... WATER TABLE OR SEEPAGE

NOTE: THE LOG OF SUBSURFACE CONDITIONS SHOWN HEREON APPLIES ONLY AT THE SPECIFIC BORING OR TRENCH LOCATION AND AT THE DATE INDICATED. IT IS NOT WARRANTED TO BE REPRESENTATIVE OF SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND TIMES.

GEOCON

PROJECT NO. G1218-52-01

BORING B 34

ELEV. (MSL.) **1098'** DATE COMPLETED **05-12-2010**

EQUIPMENT **30" DIAMETER BUCKET RIG** BY: **T. REIST**

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	MATERIAL DESCRIPTION	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
26								
28								
			▽		-Slight seepage along multiple high angle fractures below 29 feet			
30	B34-5 ■					3		
32								
34								
					-**BEDDING PLANE SHEAR** at 35.5 feet (N15W, 19S); 1/2-1" thick, soft, black to dark olive green, continuous, moderately to highly remolded plastic clay gouge; well developed			
36	B34-6 ⊠		▽		-Becomes black and very hard below 36 feet Minor seepage along high angle fracture at 36.5 feet			
38								
40					-Geotech logged 40 feet due to spoils -Extremely difficult drilling; rippers and core barell used; 1 hour to drill 3 feet			
42								
					REFUSAL AT 43 FEET			

Figure A-34,
Log of Boring B 34, Page 2 of 2

G1218-52-01 (UPD-04-17-2012).GPJ

SAMPLE SYMBOLS			
	☐ ... SAMPLING UNSUCCESSFUL	◧ ... STANDARD PENETRATION TEST	■ ... DRIVE SAMPLE (UNDISTURBED)
	⊠ ... DISTURBED OR BAG SAMPLE	◣ ... CHUNK SAMPLE	▼ ... WATER TABLE OR SEEPAGE

NOTE: THE LOG OF SUBSURFACE CONDITIONS SHOWN HEREON APPLIES ONLY AT THE SPECIFIC BORING OR TRENCH LOCATION AND AT THE DATE INDICATED. IT IS NOT WARRANTED TO BE REPRESENTATIVE OF SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND TIMES.

GEOCON

PROJECT NO. G1218-52-01

BORING B 35

ELEV. (MSL.) **1069'** DATE COMPLETED **12-14-2011**

EQUIPMENT **30" DIAMETER BUCKET RIG** BY: **P. THERIAULT**

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	MATERIAL DESCRIPTION	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
0				SM	**TOPSOIL/UNDOCUMENTED ARTIFICIAL FILL (Afu)** Damp, brown, Silty, fine to medium SAND			
2								
4				SM	**PUENTE FORMATION-SOQUEL MEMBER-Tps** Dense, yellowish, light brown, Silty, fine- to coarse-grained SANDSTONE; moderately cemented; micaceous; some clay-filled fractures near contact with overlying unit			
6					-Fracture, 1/4 inch thick: N13W/46NE -Decrease in coarse-grained sand -Becomes very dense			
8								
	B35-1 ☒							
10	B35-2 ■				-Fault, 2 inches thick white with iron staining; gray sand layer offset 4 inches in a normal sense: N2W/44SW -Becomes well cemented -Iron staining	6/5"	127.6	7.4
12								
14								
					-Fracture: N10W/47NE			
16								
					-Zone of iron staining 4 inches thick; fine- to medium-grained			
18					-Bedding: N34W/18SW -Zone of interbedded iron stained sand, 1 inch thick, olive silty sand, 1 inch thick, and pale yellow fine- to coarse-grained sand, 8 inches thick; sequence repeats to approximately 25 feet			
20	B35-3 ■					6/7"	83.3	35.8
22								
24								
26					-Increase in mica and iron staining -8 inch thick siltstone layer; contact with lower unit: N33W/21SW -Very dense, moist, white, Silty, fine- to coarse-grained sandstone			
28					-Zone of interbedded iron stained sand, 1 inch thick, olive silty sand, 2 inches thick, and pale yellow fine- to coarse-grained sand, 2 inches thick; sequence repeats to approximately 32 feet			

Figure A-35,
Log of Boring B 35, Page 1 of 3

G1218-52-01 (UPD-04-17-2012).GPJ

SAMPLE SYMBOLS

☐ ... SAMPLING UNSUCCESSFUL
◧ ... STANDARD PENETRATION TEST
■ ... DRIVE SAMPLE (UNDISTURBED)
☒ ... DISTURBED OR BAG SAMPLE
◪ ... CHUNK SAMPLE
▼ ... WATER TABLE OR SEEPAGE

BORING B 35

ELEV. (MSL.) **1069'** DATE COMPLETED **12-14-2011**

EQUIPMENT **30" DIAMETER BUCKET RIG** BY: **P. THERIAULT**

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	MATERIAL DESCRIPTION	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
30	B35-4 ■					8/6"	114.1	8.8
32					-8 inch thick dark brown siltstone layer; some pinpoint size white crystallization; contact with overlying unit: N50W/19SW			
34				ML	**PUENTE FORMATION-SOQUEL MEMBER (slt)** Hard, moist, gray, fine-grained, Sandy, SILTSTONE; well indurated; micaceous; fossiliferous (scales); contact with overlying unit: N35W/20SW			
36					-Slow advance, began using auger			
38					-Concretion, 4 inches thick			
40	B35-5 ■				-Numerous fractures, varying orientations, some reddish brown stain and gypsum	10/5"	116.4	12.4
42					-Some reddish brown, silty, fine-grained, sandstone clasts			
44								
46					Very dense, moist, reddish brown, Silty, fine-grained, SANDSTONE; undulatory, subhorizontal contact with overlying unit -Fracture, thin, gypsum filled: N29E/84NW -Becomes fine- to medium grained -Fracture, thin, gypsum filled: N30E/78NW			
48				ML	Hard, moist, dark brown, SILTSTONE **BEDDING PLANE SHEAR**-1/8 inch thick gray remolded clay N43W/18SW -Some small (pinpoint) white crystals			
50	B35-6 ■					10/8"	105.1	16.9
52								
54				SM	Very dense, moist, reddish brown, Silty, fine-grained SANDSTONE; micaceous; contact with overlying unit: N43W/18SW			
56								
58					-Fracture: N81W/84NE			
				ML	Hard, moist, gray, fine-grained, Sandy SILTSTONE			

Figure A-35,
Log of Boring B 35, Page 2 of 3

G1218-52-01 (UPD-04-17-2012).GPJ

SAMPLE SYMBOLS

☐ ... SAMPLING UNSUCCESSFUL
◧ ... STANDARD PENETRATION TEST
■ ... DRIVE SAMPLE (UNDISTURBED)
☒ ... DISTURBED OR BAG SAMPLE
◪ ... CHUNK SAMPLE
▼ ... WATER TABLE OR SEEPAGE

NOTE: THE LOG OF SUBSURFACE CONDITIONS SHOWN HEREON APPLIES ONLY AT THE SPECIFIC BORING OR TRENCH LOCATION AND AT THE DATE INDICATED. IT IS NOT WARRANTED TO BE REPRESENTATIVE OF SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND TIMES.

GEOCON

PROJECT NO. G1218-52-01

BORING B 35

ELEV. (MSL.) 1069' DATE COMPLETED 12-14-2011

EQUIPMENT 30" DIAMETER BUCKET RIG BY: P. THERIAULT

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	MATERIAL DESCRIPTION	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
60	■ B35-7			ML		15/8"	109.0	17.1
62								
					-Becomes wet			
64								
66								
68								
70	■ B35-8					15/6"	76.0	31.5
					-Saturated -Groudwater rapidly filling hole; stabilized at 64 feet			
72								
74								

BORING TERMINATED AT 75 FEET
Groundwater encountered at 71 feet, stabilized at 64 feet
No caving
Backfilled with a mix of cuttings and bentonite in accordance with Orange County Department of Environmental Health

Figure A-35,
Log of Boring B 35, Page 3 of 3

SAMPLE SYMBOLS

☐ ... SAMPLING UNSUCCESSFUL
◧ ... STANDARD PENETRATION TEST
■ ... DRIVE SAMPLE (UNDISTURBED)
⊠ ... DISTURBED OR BAG SAMPLE
◪ ... CHUNK SAMPLE
▼ ... WATER TABLE OR SEEPAGE

NOTE: THE LOG OF SUBSURFACE CONDITIONS SHOWN HEREON APPLIES ONLY AT THE SPECIFIC BORING OR TRENCH LOCATION AND AT THE DATE INDICATED. IT IS NOT WARRANTED TO BE REPRESENTATIVE OF SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND TIMES.

GEOCON

PROJECT NO. G1218-52-01

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	**BORING B 36** ELEV. (MSL.)_______ DATE COMPLETED___________ EQUIPMENT___________________________ BY:___________	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
					MATERIAL DESCRIPTION			
					BORING SKIPPED			

Figure A-36,
Log of Boring B 36, Page 1 of 1

G1218-52-01 (UPD-04-17-2012).GPJ

SAMPLE SYMBOLS	☐ ... SAMPLING UNSUCCESSFUL	◧ ... STANDARD PENETRATION TEST	■ ... DRIVE SAMPLE (UNDISTURBED)
	☒ ... DISTURBED OR BAG SAMPLE	◪ ... CHUNK SAMPLE	▼ ... WATER TABLE OR SEEPAGE

NOTE: THE LOG OF SUBSURFACE CONDITIONS SHOWN HEREON APPLIES ONLY AT THE SPECIFIC BORING OR TRENCH LOCATION AND AT THE DATE INDICATED. IT IS NOT WARRANTED TO BE REPRESENTATIVE OF SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND TIMES.

PROJECT NO. G1218-52-01

BORING B 37

ELEV. (MSL.) **1114'** DATE COMPLETED **12-14-2011**

EQUIPMENT **30" DIAMETER BUCKET RIG** BY: **P. THERIAULT**

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	MATERIAL DESCRIPTION	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
0				ML	**TOPSOIL** Medium stiff, damp, brown, fine to medium Sandy, SILT; grass and shrubs at surface; some siltstone clasts			
2				ML	**PUENTE FORMATION SOQUEL MEMBER (Tsp-slt)** Very stiff, dry, yellowish white, SILTSTONE; some fine- to medium -grained sand; weathered to 4 feet			
4					-Becomes damp, pale yellow, well indurated			
					-Becomes moist, some staining			
6					-Bedding: N34W/20SW -Fracture: N27W/54NE			
8					-Becomes olive, fractures into cobble size clasts Fractures: N33W/63SW; N52E/54NW; N32W/83SW Bedding: N37W/19SW -Concretion, six inches thick			
10	B37-1	■				1	81.7	35.2
					-Bedding: N35W/20SW			
12								
					-Light gray silty sandstone with red nodules; abundant siltstone rip up clasts chaotic upper contact -Brown siltstone, moderately indurated; trace sand nodules; trace white crystals (pinpoint)			
14								
16								
18					-Fracture: N12W/70SW			
20	B37-2	■			-Fracture, sand filled, anastomosing	3	69.9	46.9
					-Fracture: N83E/87NW Becomes well indurated			
22								
24								

Figure A-37,
Log of Boring B 37, Page 1 of 4

G1218-52-01 (UPD-04-17-2012).GPJ

SAMPLE SYMBOLS			
	☐ ... SAMPLING UNSUCCESSFUL	◧ ... STANDARD PENETRATION TEST	■ ... DRIVE SAMPLE (UNDISTURBED)
	☒ ... DISTURBED OR BAG SAMPLE	◪ ... CHUNK SAMPLE	▼ ... WATER TABLE OR SEEPAGE

NOTE: THE LOG OF SUBSURFACE CONDITIONS SHOWN HEREON APPLIES ONLY AT THE SPECIFIC BORING OR TRENCH LOCATION AND AT THE DATE INDICATED. IT IS NOT WARRANTED TO BE REPRESENTATIVE OF SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND TIMES.

GEOCON

PROJECT NO. G1218-52-01

BORING B 37

ELEV. (MSL.) **1114'** DATE COMPLETED **12-14-2011**

EQUIPMENT **30" DIAMETER BUCKET RIG** BY: **P. THERIAULT**

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	MATERIAL DESCRIPTION	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
26								
28					-Ash layer, four inches thick, soft, wet; contact: N32W/22SW -Sand lense, steeply dipping (70) to the southwest; laterally discontinuous			
30	B37-3	■		ML		6/8"	77.5	29.8
32								
34								
36					-Reddish yellow silty sand, four inches thick, sharp upper contact, chaotic lower (possible flame structures): N42W/18SW;sequence repeats to 41 feet			
38								
40	B37-4	■				6/8"	103.1	11.8
42					-Becomes well indurated			
44					-Loose, damp, gray silty sand/sand silt (diatomaceous); sixteen inches thick; contact: N52W/19SW			
46								
48					-Well indurated			
					-Concretion, 1 foot thick, discontinuous around hole, some wet, soft silt			

Figure A-37,
Log of Boring B 37, Page 2 of 4

G1218-52-01 (UPD-04-17-2012).GPJ

SAMPLE SYMBOLS			
	☐ ... SAMPLING UNSUCCESSFUL	◧ ... STANDARD PENETRATION TEST	■ ... DRIVE SAMPLE (UNDISTURBED)
	☒ ... DISTURBED OR BAG SAMPLE	◪ ... CHUNK SAMPLE	▼ ... WATER TABLE OR SEEPAGE

NOTE: THE LOG OF SUBSURFACE CONDITIONS SHOWN HEREON APPLIES ONLY AT THE SPECIFIC BORING OR TRENCH LOCATION AND AT THE DATE INDICATED. IT IS NOT WARRANTED TO BE REPRESENTATIVE OF SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND TIMES.

PROJECT NO. G1218-52-01

BORING B 37

ELEV. (MSL.) **1114'** DATE COMPLETED **12-14-2011**

EQUIPMENT **30" DIAMETER BUCKET RIG** BY: **P. THERIAULT**

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	MATERIAL DESCRIPTION	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
50	B37-5 ■					7	69.7	41.9
					-Becomes dark brown, well indurated siltstone; bedding: N41W/21SW			
52								
54					-Fracture; 0N/42W			
56								
58								
					-Sand lense, six inches thick, laterally discontinuous			
60	B37-6 ■			ML	-Bedding: N39W/19SW -Fracture: N5W/75NE -Sand layer, steeply dipping: N70E/51NW	10/5"	92.1	19.9
62								
64								
					-Slow advance, began alternating ripper, auger, core barrel			
66					-Wet zone, one foot thick			
					-Concretion, one foot thick			
68								
70	B37-7 ■				-Dark brown, laminated; trace white gypsum nodules (pinpoint)	10	67.4	40.7
72								
					-Ash layer, gray, seven inches thick: contact with lower unit: N39W/15SW			
74								

Figure A-37,
Log of Boring B 37, Page 3 of 4

G1218-52-01 (UPD-04-17-2012).GPJ

SAMPLE SYMBOLS

☐ ... SAMPLING UNSUCCESSFUL
◧ ... STANDARD PENETRATION TEST
■ ... DRIVE SAMPLE (UNDISTURBED)
⊠ ... DISTURBED OR BAG SAMPLE
◪ ... CHUNK SAMPLE
▼ ... WATER TABLE OR SEEPAGE

NOTE: THE LOG OF SUBSURFACE CONDITIONS SHOWN HEREON APPLIES ONLY AT THE SPECIFIC BORING OR TRENCH LOCATION AND AT THE DATE INDICATED. IT IS NOT WARRANTED TO BE REPRESENTATIVE OF SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND TIMES.

GEOCON

PROJECT NO. G1218-52-01

BORING B 37

ELEV. (MSL.) **1114'** DATE COMPLETED **12-14-2011**

EQUIPMENT **30" DIAMETER BUCKET RIG** BY: **P. THERIAULT**

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	MATERIAL DESCRIPTION	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
					-Ash layer, dark gray, 8 inches thick; contact with lower unit: N5W/13SW			
76								
78					-Bedding: N47W21SW			
80	B37-8	■			-Ash layer, gray; contact with lower unit: N38W/20SW	25/5"	105.7	14.1
82					-Becomes brown			
					-Becomes dark gray			
84					-Becomes dark gray			
86								
					-Seepage			
88					-Slow advance			
90				ML				

REFUSAL AT 91 FEET
No groundwater encounterd
No caving
Backfilled with a mix of cuttings and bentonite in accordance with Orange County Department of Environmental Health

Figure A-37,
Log of Boring B 37, Page 4 of 4

G1218-52-01 (UPD-04-17-2012).GPJ

SAMPLE SYMBOLS			
	☐ ... SAMPLING UNSUCCESSFUL	◧ ... STANDARD PENETRATION TEST	■ ... DRIVE SAMPLE (UNDISTURBED)
	☒ ... DISTURBED OR BAG SAMPLE	◣ ... CHUNK SAMPLE	▼ ... WATER TABLE OR SEEPAGE

NOTE: THE LOG OF SUBSURFACE CONDITIONS SHOWN HEREON APPLIES ONLY AT THE SPECIFIC BORING OR TRENCH LOCATION AND AT THE DATE INDICATED. IT IS NOT WARRANTED TO BE REPRESENTATIVE OF SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND TIMES.

GEOCON

PROJECT NO. G1218-52-01

BORING B 38

ELEV. (MSL.) **1110'** DATE COMPLETED **12-15-2011**

EQUIPMENT **30" DIAMETER BUCKET RIG** BY: **P. THERIAULT**

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	MATERIAL DESCRIPTION	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
0				ML	**TOPSOIL** Soft, damp, dark brown, fine to medium Sandy SILT; some gravel size siltstone chunks; roots; grass and shrubs			
2				SM	**PUENTE FORMATION-SOQUEL MEMBER (Tps)** Hard, damp, yellowish light brown, Silty, fine-grained, SANDSTONE; moderately cemented			
4					-Concretion, 6 inches thick			
6								
8					-Some brown siltstone clasts -Fracture: N25E/43SE			
10	B38-1					5/6"	110.0	13.2
12				ML	**PUENTE FORMATION-SOQUEL MEMBER (slt)** Hard, damp, brown, SILTSTONE; contact with overlying unit: N63W/13SW			
14					-Bedding: N10W/11SW -Fractures, multiple subparallel iron stained: N85E/62NW			
16								
18					-6 inch thick, discontinuous lense of diatomaceous silt; whitish pale yellow; soft; dips to the southeast; pinches out to the northeast; contact where present: N57W/27SW			
20	B38-2				-Becomes fine-grained siltstone; well indurated; minor sandy interbeds; some white crystallization (pin point size)	4/10"	75.7	38.2
22					-Weak zone-1 inch thick pale green siltstone with clay; contact with overlying unit: N52W/36S -Becomes well indurated			
24					-Weak zone-1 inch thick pale green siltstone with clay; discontinuous -Some minor discontinuous sandstone lenses -Sandstone lense, 6 inches thick, medium dense, moist, reddish yellow			
26					-Siltstone becomes dark brown			
28					-Sandstone lense, 4 inches thick, semi-continuous, pale yellow with iron staining; contact with overlying unit: N47W/23SW			

Figure A-38,
Log of Boring B 38, Page 1 of 3

G1218-52-01 (UPD-04-17-2012).GPJ

SAMPLE SYMBOLS			
	☐ ... SAMPLING UNSUCCESSFUL	◧ ... STANDARD PENETRATION TEST	■ ... DRIVE SAMPLE (UNDISTURBED)
	☒ ... DISTURBED OR BAG SAMPLE	◩ ... CHUNK SAMPLE	▼ ... WATER TABLE OR SEEPAGE

NOTE: THE LOG OF SUBSURFACE CONDITIONS SHOWN HEREON APPLIES ONLY AT THE SPECIFIC BORING OR TRENCH LOCATION AND AT THE DATE INDICATED. IT IS NOT WARRANTED TO BE REPRESENTATIVE OF SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND TIMES.

GEOCON

PROJECT NO. G1218-52-01

BORING B 38

ELEV. (MSL.) **1110'** DATE COMPLETED **12-15-2011**

EQUIPMENT **30" DIAMETER BUCKET RIG** BY: **P. THERIAULT**

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	MATERIAL DESCRIPTION	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
30	B38-3			ML	-Fracture, thin iron stained: N5W/49NE -Concretion, 8 inches thick	5/6"	78.2	30.5
32								
					-Increase in fractures; some are green stained			
34								
					-Fractures, several sub parallel: N60E/88SE; N40W/62SW; N65E/45SW			
36								
38								
40	B38-4					8/8"	84.0	26.8
					-Ash layer, 4 inches thick, light gray; contact with overlying unit: N50W/25SW			
42								
44					-Fractures, thin, iron stained: N8E/54SE; EW/85S			
46								
48					-Ash layer, 1 inch thick, discontinuous; southwest dipping			
50	B38-5					6/6"		
					-Sand layer, 7 inches thick, yellowish brown; contact with overlying unit: N46W/25SW			
52								
54					-Ash layer, gray, 2 inches thick; discontinuous -Becomes very hard; difficult digging; began alternating between, ripper, auger and bucket			
56					-Fracture, thin, iron stained: N10E/64NW			
58								

Figure A-38,
Log of Boring B 38, Page 2 of 3

G1218-52-01 (UPD-04-17-2012).GPJ

SAMPLE SYMBOLS			
	☐ ... SAMPLING UNSUCCESSFUL	◧ ... STANDARD PENETRATION TEST	■ ... DRIVE SAMPLE (UNDISTURBED)
	⊠ ... DISTURBED OR BAG SAMPLE	◩ ... CHUNK SAMPLE	▼ ... WATER TABLE OR SEEPAGE

NOTE: THE LOG OF SUBSURFACE CONDITIONS SHOWN HEREON APPLIES ONLY AT THE SPECIFIC BORING OR TRENCH LOCATION AND AT THE DATE INDICATED. IT IS NOT WARRANTED TO BE REPRESENTATIVE OF SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND TIMES.

GEOCON

BORING B 38

ELEV. (MSL.) **1110'** DATE COMPLETED **12-15-2011**

EQUIPMENT **30" DIAMETER BUCKET RIG** BY: **P. THERIAULT**

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	MATERIAL DESCRIPTION	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
60	B38-6 ■					10/5"	63.8	32.2
					-Ash layer, gray, 1 inch thick; discontinuous			
62								
64					-Ash layer, gray, 1 foot thick; contact: N30W/22SW			
66					-Ash layer, gray, 11 inches thick; contact: N30W/21SW			
68								
70	B38-7 ■			ML		10/6"	77.3	27.8
72								
74								
					-Refusal			

BORING TERMINATED AT 75 FEET (REFUSAL)
No groundwater encountered
No caving
Backfilled with a mix of cuttings and bentonite in accordance with Orange County Department of Environmental Health

Figure A-38,
Log of Boring B 38, Page 3 of 3

SAMPLE SYMBOLS
☐ ... SAMPLING UNSUCCESSFUL
◧ ... STANDARD PENETRATION TEST
■ ... DRIVE SAMPLE (UNDISTURBED)
☒ ... DISTURBED OR BAG SAMPLE
◩ ... CHUNK SAMPLE
▼ ... WATER TABLE OR SEEPAGE

NOTE: THE LOG OF SUBSURFACE CONDITIONS SHOWN HEREON APPLIES ONLY AT THE SPECIFIC BORING OR TRENCH LOCATION AND AT THE DATE INDICATED. IT IS NOT WARRANTED TO BE REPRESENTATIVE OF SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND TIMES.

PROJECT NO. G1218-52-01

BORING B 39

ELEV. (MSL.) **1081'** DATE COMPLETED **12-15-2011**

EQUIPMENT **30" DIAMETER BUCKET RIG** BY: **P. THERIAULT**

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	MATERIAL DESCRIPTION	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
0				SM	**UNDOCUMENTED FILL (afu)** Medium dense, damp, light brown, Silty, fine to medium SAND; grass and roots			
2				CL	**TOPSOIL** Stiff, damp, dark brown, fine Sandy CLAY; some coarse sand; some fine-grained gravel			
6				SM	**PUENTE FORMATION-SOQUEL MEMBER (Tps)** Medium dense, damp, yellow brown, Silty, fine- to medium-grained SANDSTONE			
10	B39-1				-Becomes dense, moist, pale yellow, silty sandstone; well cemented -Concretion, 1.5 feet thick, contact: N64W/18SW	5/5"	109.6	8.9
14				ML	Hard, moist, medium brown, fine-grained Sandy, SILTSTONE; moderately indurated			
16					-Becomes well indurated			
					-Silty sand layer, varies from one to eight inches in thickness, wavy undulatory contact both upper and lower: ave N20W/39NE			
20	B39-2				-Becomes brown; trace visible gypsum nodules	5/10"	99.9	22.4
					-Sandstone layer, yellow brown; 2 inches thick; contact with overlying unit: N39W/17SW -Becomes dark brown			
					-Trace seepage -Fracture, iron stained: N34E/81SE -Slow advance; began using auger			
					-Ash layer, gray, 2 inches thick, pinches out to the south; bedding:			

Figure A-39,
Log of Boring B 39, Page 1 of 3

G1218-52-01 (UPD-04-17-2012).GPJ

SAMPLE SYMBOLS			
	☐ ... SAMPLING UNSUCCESSFUL	◧ ... STANDARD PENETRATION TEST	■ ... DRIVE SAMPLE (UNDISTURBED)
	☒ ... DISTURBED OR BAG SAMPLE	◪ ... CHUNK SAMPLE	▼ ... WATER TABLE OR SEEPAGE

NOTE: THE LOG OF SUBSURFACE CONDITIONS SHOWN HEREON APPLIES ONLY AT THE SPECIFIC BORING OR TRENCH LOCATION AND AT THE DATE INDICATED. IT IS NOT WARRANTED TO BE REPRESENTATIVE OF SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND TIMES.

PROJECT NO. G1218-52-01

BORING B 39

ELEV. (MSL.) **1081'** DATE COMPLETED **12-15-2011**

EQUIPMENT **30" DIAMETER BUCKET RIG** BY: **P. THERIAULT**

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	MATERIAL DESCRIPTION	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
30	B39-3 ■			ML	N39W/18SW	6/5"	72.2	35.7
32					-Weak zone; friable and blocky			
34					-Fracture: N64E/43NW -Clay seam, paper thin, discontinuous; laterally traceable for two feet			
36								
38					-Ash layer, 1 inch thick; only observed in northern half of boring: contact: N25W/15S -Concretion; 4 inches thick; only observed in the southern half of boring; pinches out -Fracture: N36E/67SE			
40	B39-4 ■					6/8"	83.9	12.6
42					-Ash layer, two inches thick; bedding: N49W/21SW -Very well indurated; began alternating with ripper, auger, and bucket			
44								
46								
48					-Ash layer, 13 inches thick; contact with upper unit: N38W/21SW			
50	B39-5 ■				-Ash layer, thin and discontinuous, pinched out laterally -Weak zone, four inches thick; friable gravel sized siltstone clasts	6/8"	81.7	26.7
52								
54					-Ash layer, half-inch thick; laterally discontinuous			
56					-Fracture; N35W/80SW -Concretion, one foot thick, very hard			
58								

Figure A-39,
Log of Boring B 39, Page 2 of 3

SAMPLE SYMBOLS

☐ ... SAMPLING UNSUCCESSFUL
◧ ... STANDARD PENETRATION TEST
■ ... DRIVE SAMPLE (UNDISTURBED)
☒ ... DISTURBED OR BAG SAMPLE
◣ ... CHUNK SAMPLE
▼ ... WATER TABLE OR SEEPAGE

NOTE: THE LOG OF SUBSURFACE CONDITIONS SHOWN HEREON APPLIES ONLY AT THE SPECIFIC BORING OR TRENCH LOCATION AND AT THE DATE INDICATED. IT IS NOT WARRANTED TO BE REPRESENTATIVE OF SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND TIMES.

GEOCON

PROJECT NO. G1218-52-01

BORING B 39

ELEV. (MSL.) **1081'** DATE COMPLETED **12-15-2011**

EQUIPMENT **30" DIAMETER BUCKET RIG** BY: **P. THERIAULT**

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	MATERIAL DESCRIPTION	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
60	B39-6	■		ML		10/5"	68.0	34.7
					-Seepage; moderate			
62								
64								
66								
68					-Seepage; rapid			
70	B39-7	■				15/7"	80.7	26.2
72								
74								
76								
78								
80	B39-8	■				20/5"	104.0	22.3

BORING TERMINATED AT 80 FEET
Groundwater stabilized at 62.8 feet
Boring geotechnically logged to 61 feet
No caving
Backfilled with a mix of cuttings and bentonite in accordance with Orange County Department of Environmental Health

Figure A-39,
Log of Boring B 39, Page 3 of 3

G1218-52-01 (UPD-04-17-2012).GPJ

SAMPLE SYMBOLS

☐ ... SAMPLING UNSUCCESSFUL	◧ ... STANDARD PENETRATION TEST	■ ... DRIVE SAMPLE (UNDISTURBED)
⊠ ... DISTURBED OR BAG SAMPLE	◪ ... CHUNK SAMPLE	▼ ... WATER TABLE OR SEEPAGE

NOTE: THE LOG OF SUBSURFACE CONDITIONS SHOWN HEREON APPLIES ONLY AT THE SPECIFIC BORING OR TRENCH LOCATION AND AT THE DATE INDICATED. IT IS NOT WARRANTED TO BE REPRESENTATIVE OF SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND TIMES.

GEOCON

BORING B 40

ELEV. (MSL.) **1076'** DATE COMPLETED **11-23-2011**

EQUIPMENT **30" DIAMETER BUCKET RIG** BY: **P. THERIAULT**

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	MATERIAL DESCRIPTION	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
0				SM	**ENGINEERED ARTIFICIAL FILL (afe)** Medium dense, moist, grayish brown, Silty, fine to medium SAND; surface grass; some brown siltstone clasts; trace cobbles			
2								
4					-Becomes brownish yellow			
	B40-1 ■					2	105.3	18.4
6								
8					-Some gray silty sand			
	B40-2 ■							
10	B40-3 ■					1	102.5	19.5
12					-Silt layer, six inches thick -Increase in silt contect			
				ML	Hard, moist, gray, Sandy, SILT			
14								
	B40-4 ☒							
16								
	B40-5 ■					1	93.2	28.3
18					-Minor thinly bedded (4 inches thick) sand layers between sandy silt layers (8 inched thick)			
20	B40-6 ■					1	92.1	26.5
22				SM	Medium dense, moist, yellowish brown, Silty, fine to medium SAND			
24								

Figure A-40,
Log of Boring B 40, Page 1 of 3

G1218-52-01 (UPD-04-17-2012).GPJ

SAMPLE SYMBOLS			
	☐ ... SAMPLING UNSUCCESSFUL	◧ ... STANDARD PENETRATION TEST	■ ... DRIVE SAMPLE (UNDISTURBED)
	☒ ... DISTURBED OR BAG SAMPLE	◪ ... CHUNK SAMPLE	▼ ... WATER TABLE OR SEEPAGE

NOTE: THE LOG OF SUBSURFACE CONDITIONS SHOWN HEREON APPLIES ONLY AT THE SPECIFIC BORING OR TRENCH LOCATION AND AT THE DATE INDICATED. IT IS NOT WARRANTED TO BE REPRESENTATIVE OF SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND TIMES.

BORING B 40

ELEV. (MSL.) **1076'** DATE COMPLETED **11-23-2011**

EQUIPMENT **30" DIAMETER BUCKET RIG** BY: **P. THERIAULT**

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	MATERIAL DESCRIPTION	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
	B40-7					1	100.9	22.5
26								
28				ML	Hard, moist, grayish brown, fine to medium Sandy, SILT; trace clay			
30	B40-8			ML		1	74.2	43.0
32								
34					-Slow advance on concretions			
				SM	Medium dense, moist, yellow brown, Silty, fine to medium SAND			
	B40-9					2	119.1	12.0
36								
					-some gray sand -yellow sand			
38					-gray sand			
					-yellow sand			
40	B40-10				-Concretion, fourteen inches thick; slow advance	NR		
42					-grayish yellowish brown; some coarse sand			
44								
	B40-11			CL	Very stiff, moist, dark, fine to medium, Sandy CLAY	1	97.8	22.7
46	B40-12							
48				ML	Very stiff, moist, grayish brown, fine to medium Sandy, SILT			
					-Becomes dark brown			

Figure A-40,
Log of Boring B 40, Page 2 of 3

G1218-52-01 (UPD-04-17-2012).GPJ

SAMPLE SYMBOLS	☐ ... SAMPLING UNSUCCESSFUL	◧ ... STANDARD PENETRATION TEST	■ ... DRIVE SAMPLE (UNDISTURBED)
	☒ ... DISTURBED OR BAG SAMPLE	◩ ... CHUNK SAMPLE	▼ ... WATER TABLE OR SEEPAGE

NOTE: THE LOG OF SUBSURFACE CONDITIONS SHOWN HEREON APPLIES ONLY AT THE SPECIFIC BORING OR TRENCH LOCATION AND AT THE DATE INDICATED. IT IS NOT WARRANTED TO BE REPRESENTATIVE OF SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND TIMES.

PROJECT NO. G1218-52-01

BORING B 40

ELEV. (MSL.) **1076'** DATE COMPLETED **11-23-2011**

EQUIPMENT **30" DIAMETER BUCKET RIG** BY: **P. THERIAULT**

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	MATERIAL DESCRIPTION	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
50	B40-13			SM	Medium dense, moist, gray, Silty, fine to medium SAND	2	104.0	19.3
					-Becomes yellow brown			
52								
54					-Becomes gray; trace roots (up to 1/16 inch diameter)			
	B40-14				-Increase in silt	6	98.1	21.5
56					-Becomes yellow brown			
				ML	Very stiff, moist gray, fine to medium Sandy SILT			
58				SM	Medium dense, moist, grayish brown, Silty, fine to medium SAND			
60	B40-15			ML	Hard, moist, brown fine to medium Sandy SILT; common siltstone clasts; trace organics near contact with underlying unit	5	91.0	26.5
62								
64								
				SM	**PUENTE FORMATION-SOQUEL MEMBER (Tps)** Dense, moist, reddish yellow, Silty, fine- to medium-grained SANDSTONE; trace root hairs in a single krotovina; contact is subhorizontal and undulatory bedding: N44W/27SW			
66	B40-16					10/8"	122.9	11.0
68								
70					BORING TERMINATED AT 70 FEET No water No caving Backfilled with a mix of cuttings and bentonite in accordance with Orange County Department of Environmental Health			

Figure A-40,
Log of Boring B 40, Page 3 of 3

G1218-52-01 (UPD-04-17-2012).GPJ

SAMPLE SYMBOLS

☐ ... SAMPLING UNSUCCESSFUL
◧ ... STANDARD PENETRATION TEST
■ ... DRIVE SAMPLE (UNDISTURBED)
☒ ... DISTURBED OR BAG SAMPLE
◪ ... CHUNK SAMPLE
▼ ... WATER TABLE OR SEEPAGE

NOTE: THE LOG OF SUBSURFACE CONDITIONS SHOWN HEREON APPLIES ONLY AT THE SPECIFIC BORING OR TRENCH LOCATION AND AT THE DATE INDICATED. IT IS NOT WARRANTED TO BE REPRESENTATIVE OF SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND TIMES.

GEOCON

PROJECT NO. G1218-52-01

BORING B 41

ELEV. (MSL.) 1064' DATE COMPLETED 11-22-2011

EQUIPMENT 30" DIAMETER BUCKET RIG BY: P. THERIAULT

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	MATERIAL DESCRIPTION	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
0				SM	**ENGINEERED ARTIFICIAL FILL (afe)** Medium dense, damp, brown, Silty, fine to medium SAND; grass at surface			
2					-Becomes moist, yellow brown; abundant brown siltstone clasts			
4								
	B41-1 ■					PUSH	68.9	49.7
6				ML	**PUENTE FORMATION SOQUEL MEMBER -siltstone (Tpsslt)** Very stiff, moist, brown, fine-grained Sandy, SILTSTONE; carbonate filled fractures: N40E/70sw; others parallel to bedding Bedding:N45W/17SW			
8								
10	B41-2 ■					1	60.2	60.2
12								
14								
					BORING TERMINATED AT 15 FEET No water No caving Backfilled with a mix of cuttings and bentonite in accordance with Orange County Department of Environmental Health			

Figure A-41,
Log of Boring B 41, Page 1 of 1

G1218-52-01 (UPD-04-17-2012).GPJ

SAMPLE SYMBOLS

☐ ... SAMPLING UNSUCCESSFUL
◧ ... STANDARD PENETRATION TEST
■ ... DRIVE SAMPLE (UNDISTURBED)
☒ ... DISTURBED OR BAG SAMPLE
◪ ... CHUNK SAMPLE
▼ ... WATER TABLE OR SEEPAGE

NOTE: THE LOG OF SUBSURFACE CONDITIONS SHOWN HEREON APPLIES ONLY AT THE SPECIFIC BORING OR TRENCH LOCATION AND AT THE DATE INDICATED. IT IS NOT WARRANTED TO BE REPRESENTATIVE OF SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND TIMES.

GEOCON

PROJECT NO. G1218-52-01

BORING B 42

ELEV. (MSL.) **1066'** DATE COMPLETED **11-22-2011**

EQUIPMENT **30" DIAMETER BUCKET RIG** BY: **P. THERIAULT**

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	MATERIAL DESCRIPTION	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
0				SM	**ENGINEERED ARTIFICIAL FILL (afe)** Medium dense, damp, light brown, Silty, fine to medium SAND; surface grass; minor brown siltstone clasts			
2								
				ML	Very stiff, moist, brown, fine to medium Sandy SILT; mostly siltstone clasts with little sand matrix			
4								
	■ B42-1					1	97.2	22.8
6								
8								
10	■ B42-2					1	79.4	36.8
12					-Becomes light brown			
					-Becomes brown			
14								
	■ B42-3					2	80.3	36.1
16								
18								
				SM	Dense, moist, reddish yellowish brown, Silty, fine to medium SAND			
20	■ B42-4				-Becomes gray brown	2	116.5	5.9
22					-Becomes yellow brown			
	⊠ B42-5				-Becomes gray brown			
24				CL	Very stiff, moist, brown, fine Sandy CLAY; trace roots (up to half inch diameter)			
	■ B42-6			ML	Very stiff, moist brown, fine to medium Sandy SILT; mostly siltstone chunks	2	74.2	40.2
26								
28								

Figure A-42,
Log of Boring B 42, Page 1 of 2

G1218-52-01 (UPD-04-17-2012).GPJ

SAMPLE SYMBOLS			
	□ ... SAMPLING UNSUCCESSFUL	◧ ... STANDARD PENETRATION TEST	■ ... DRIVE SAMPLE (UNDISTURBED)
	⊠ ... DISTURBED OR BAG SAMPLE	◪ ... CHUNK SAMPLE	▼ ... WATER TABLE OR SEEPAGE

PROJECT NO. G1218-52-01

BORING B 42

ELEV. (MSL.) **1066'** DATE COMPLETED **11-22-2011**

EQUIPMENT **30" DIAMETER BUCKET RIG** BY: **P. THERIAULT**

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	MATERIAL DESCRIPTION	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
30	B42-7 ■			ML		2	89.2	29.6
32				SM	Dense, moist, yellow brown, Silty, fine to medium, SAND			
				ML	Very stiff, moist, brown, fine to medium Sandy, SILT			
34								
	B42-8 ■					3	80.9	34.0
36								
38								
40	B42-9 ■					2	82.0	18.8
42								
44								
	B42-10 ■			ML	**PUENTE FORMATION SOQUEL MEMBER -siltstone (Tpsslt)** Hard, moist, brown, fine-grained Sandy, SILTSTONE; well indurated; contact with overlying fill is approximately horizontal Bedding: N45W/14SW -Becomes light gray; some fossils (fish scales)	2	73.2	45.2
46								
48								
50					BORING TERMINATED AT 50 FEET No water No caving Backfilled with a mix of cuttings and bentonite in accordance with Orange County Department of Environmental Health			

Figure A-42,
Log of Boring B 42, Page 2 of 2

G1218-52-01 (UPD-04-17-2012).GPJ

SAMPLE SYMBOLS			
	☐ ... SAMPLING UNSUCCESSFUL	◧ ... STANDARD PENETRATION TEST	■ ... DRIVE SAMPLE (UNDISTURBED)
	☒ ... DISTURBED OR BAG SAMPLE	◪ ... CHUNK SAMPLE	▼ ... WATER TABLE OR SEEPAGE

NOTE: THE LOG OF SUBSURFACE CONDITIONS SHOWN HEREON APPLIES ONLY AT THE SPECIFIC BORING OR TRENCH LOCATION AND AT THE DATE INDICATED. IT IS NOT WARRANTED TO BE REPRESENTATIVE OF SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND TIMES.

GEOCON

PROJECT NO. G1218-52-01

BORING B 43

ELEV. (MSL.) 1118' DATE COMPLETED 12-01-2011

EQUIPMENT 30" DIAMETER BUCKET RIG BY: P. THERIAULT

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	MATERIAL DESCRIPTION	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
0				SM/ML	**ENGINEERED ARTIFICIAL FILL (afe)** Interlayers of medium dense to dense, moist to wet, gray, Silty, fine to medium SAND and stiff, moist, brown, fine to medium Sandy SILT; siltstone clasts, trace concretion clasts (up to 4 inches)			
2								
					-Some clay			
4	B43-1 ☒				-Gray sand layer; two inches thick			
	B43-2 ■					1	73.6	40.3
6								
					-Becomes grayish brown, abundant siltstone clasts			
8								
10	B43-3 ■				-increase in size of siltstone clasts (up to 14 inches)	1	76.0	36.2
12					-Gray sand layer; six inches thick			
					-Becomes grayish brown			
14								
	B43-4 ■					1	78.0	37.6
16					-Alternating layers of brown and grayish brown sandy silt			
					-Becomes grayish brown sandy silt			
18					-Yellowish brown silt sand layer; six inches thick			
20	B43-5 ■					1	73.7	42.6
22					-Brown clay layer; two inches thick			
					-Boulder; fourteen inches in diameter			
24								
					-Increase in fin sand			

Figure A-43,
Log of Boring B 43, Page 1 of 2

SAMPLE SYMBOLS

☐ ... SAMPLING UNSUCCESSFUL
◧ ... STANDARD PENETRATION TEST
■ ... DRIVE SAMPLE (UNDISTURBED)
☒ ... DISTURBED OR BAG SAMPLE
◪ ... CHUNK SAMPLE
▼ ... WATER TABLE OR SEEPAGE

NOTE: THE LOG OF SUBSURFACE CONDITIONS SHOWN HEREON APPLIES ONLY AT THE SPECIFIC BORING OR TRENCH LOCATION AND AT THE DATE INDICATED. IT IS NOT WARRANTED TO BE REPRESENTATIVE OF SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND TIMES.

PROJECT NO. G1218-52-01

BORING B 43

ELEV. (MSL.) **1118'** DATE COMPLETED **12-01-2011**

EQUIPMENT **30" DIAMETER BUCKET RIG** BY: **P. THERIAULT**

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	MATERIAL DESCRIPTION	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
	B43-6					1	80.5	36.6
26								
					-Decrease in siltstone clasts			
28								
30	B43-7			SM		1	56.5	63.1
					-Alternating layers of of brown and grayish brown sandy silt			
32								
34								
	B43-8				-Becomes gray	1	67.9	46.2
36								
38								
40	B43-9					1	100.6	22.5
42				ML	**PUENTE FORMATION SOQUEL MEMBER (Tps-slt)** Hard, moist, gray, SILTSTONE; moderately indurated; clean horizontal contact with overlying fill Some gypsum filled fractures 1/4 inch thick: N40E/37SE; N38E/V; N25E/28SE Some concretions up to fourteen inches thick			
44								
	B43-10					4		
46								
					BORING TERMINATED AT 47 FEET No water No caving Backfilled with a mix of cuttings and bentonite in accordance with Orange County Department of Environmental Health			

Figure A-43,
Log of Boring B 43, Page 2 of 2

G1218-52-01 (UPD-04-17-2012).GPJ

SAMPLE SYMBOLS

☐ ... SAMPLING UNSUCCESSFUL
◧ ... STANDARD PENETRATION TEST
■ ... DRIVE SAMPLE (UNDISTURBED)
☒ ... DISTURBED OR BAG SAMPLE
◣ ... CHUNK SAMPLE
▼ ... WATER TABLE OR SEEPAGE

NOTE: THE LOG OF SUBSURFACE CONDITIONS SHOWN HEREON APPLIES ONLY AT THE SPECIFIC BORING OR TRENCH LOCATION AND AT THE DATE INDICATED. IT IS NOT WARRANTED TO BE REPRESENTATIVE OF SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND TIMES.

GEOCON

PROJECT NO. G1218-52-01

BORING B 44

ELEV. (MSL.) **1133'** DATE COMPLETED **12-01-2011**

EQUIPMENT **30" DIAMETER BUCKET RIG** BY: **P. THERIAULT**

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	MATERIAL DESCRIPTION	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
0				SM	**ENGINEERED ARTIFICIAL FILL (afe)** Medium dense, moist, yellowish brown, Silty, fine to medium SAND; some siltstone clasts			
					-Some gray sand			
2				ML	Very stiff, moist, brown, fine to medium Sandy SILT; mostly siltstone clasts			
				SM	Dense, moist, gray, Silty, fine to medium SAND			
4				ML	Very stiff, moist, brown, fine to medium Sandy SILT			
	B44-1 ■					1	79.5	30.6
6								
				SM	Dense, moist, yellowish brown, Silty, fine to medium SAND			
				ML	Hard, moist, brown, fine to medium Sandy SILT; mostly siltstone clasts			
8								
					-Some gray, sandy silt			
10	B44-2 ■				-Brown, fine to medium, sandy silt	1	80.9	35.4
12					-Increase in sand			
14					-Some brownish gray clay			
	B44-3 ■					1	70.9	44.6
16								
18					-Increase in sand			
					-Trace clay -Decrease in siltstone clasts			
20	B44-4 ■					2	75.0	41.6
	B44-5 ⊠				-Becomes dark brown			
22					-Increase in siltstone clasts			
					-Sand layer, gray, four inches thick			
24				SM	Dense, moist, brownish yellow, Silty, fine to medium SAND; few siltstone clasts			

Figure A-44,
Log of Boring B 44, Page 1 of 3

G1218-52-01 (UPD-04-17-2012).GPJ

SAMPLE SYMBOLS			
	☐ ... SAMPLING UNSUCCESSFUL	◧ ... STANDARD PENETRATION TEST	■ ... DRIVE SAMPLE (UNDISTURBED)
	⊠ ... DISTURBED OR BAG SAMPLE	◩ ... CHUNK SAMPLE	▼ ... WATER TABLE OR SEEPAGE

NOTE: THE LOG OF SUBSURFACE CONDITIONS SHOWN HEREON APPLIES ONLY AT THE SPECIFIC BORING OR TRENCH LOCATION AND AT THE DATE INDICATED. IT IS NOT WARRANTED TO BE REPRESENTATIVE OF SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND TIMES.

GEOCON

PROJECT NO. G1218-52-01

BORING B 44

ELEV. (MSL.) 1133' DATE COMPLETED 12-01-2011

EQUIPMENT 30" DIAMETER BUCKET RIG BY: P. THERIAULT

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	MATERIAL DESCRIPTION	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
	B44-6 ■					2	108.1	15.2
26				ML	Very stiff, moist, brown, fine Sandy SILT; mostly siltstone clasts			
28								
30	B44-7 ■			ML		2	89.4	30.7
					-Sand layer, gray, four inches thick			
32								
					-Some clay -Some yellow brown, sandy silt			
34								
	B44-8 ■				-Becomes grayish brown	4	99.6	14.8
36					-Sand layer, gray, six inches thick			
					-Increase in siltstone clasts			
38								
					-Sand layer, laterally discontinuous			
40	B44-9 ■					2	77.5	38.0
42					-Silty sand layer, grayish yellow, six inches thick			
44								
	B44-10 ☐					2	NR	
46					-Becomes wet			
48								

Figure A-44,
Log of Boring B 44, Page 2 of 3

G1218-52-01 (UPD-04-17-2012).GPJ

SAMPLE SYMBOLS

☐ ... SAMPLING UNSUCCESSFUL
◧ ... STANDARD PENETRATION TEST
■ ... DRIVE SAMPLE (UNDISTURBED)
☒ ... DISTURBED OR BAG SAMPLE
◪ ... CHUNK SAMPLE
▼ ... WATER TABLE OR SEEPAGE

NOTE: THE LOG OF SUBSURFACE CONDITIONS SHOWN HEREON APPLIES ONLY AT THE SPECIFIC BORING OR TRENCH LOCATION AND AT THE DATE INDICATED. IT IS NOT WARRANTED TO BE REPRESENTATIVE OF SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND TIMES.

BORING B 44

ELEV. (MSL.) **1133'** DATE COMPLETED **12-01-2011**

EQUIPMENT **30" DIAMETER BUCKET RIG** BY: **P. THERIAULT**

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	MATERIAL DESCRIPTION	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
50	B44-11			ML	-Clean contact C: approx. N75ºW/12ºSW **PUENTE FORMATION SOQUEL MEMBER -siltstone (Tpsslt)** Hard, moist, dark brown, fine Sandy SILTSTONE, well indurated,laminated, fossiliferous; some fractures: N8W/75NE; N20E/40NW Clean contact with overlying fill: N75W/12SW Bedding: N30W/25SW	6/7"		
52								
54								

BORING TERMINATED AT 55 FEET
No water
No caving
Backfilled with a mix of cuttings and bentonite in accordance with Orange County Department of Environmental Health

Figure A-44,
Log of Boring B 44, Page 3 of 3

G1218-52-01 (UPD-04-17-2012).GPJ

SAMPLE SYMBOLS			
	☐ ... SAMPLING UNSUCCESSFUL	◧ ... STANDARD PENETRATION TEST	■ ... DRIVE SAMPLE (UNDISTURBED)
	☒ ... DISTURBED OR BAG SAMPLE	◪ ... CHUNK SAMPLE	▼ ... WATER TABLE OR SEEPAGE

NOTE: THE LOG OF SUBSURFACE CONDITIONS SHOWN HEREON APPLIES ONLY AT THE SPECIFIC BORING OR TRENCH LOCATION AND AT THE DATE INDICATED. IT IS NOT WARRANTED TO BE REPRESENTATIVE OF SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND TIMES.

GEOCON

PROJECT NO. G1218-52-01

BORING B 45

ELEV. (MSL.) **1147'** DATE COMPLETED **11-30-2011**

EQUIPMENT **30" DIAMETER BUCKET RIG** BY: **P. THERIAULT**

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	MATERIAL DESCRIPTION	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
0				ML	**ENGINEERED ARTIFICIAL FILL (afe)** Stiff, moist, brown, fine to medium, Sandy SILT; little siltstone clasts; sparse grass and shrubs (boring is on a bench cut into 2:1 slope)			
2								
4								
	B45-1	■				2	94.3	21.4
6					-Between 6 and 7 feet, 2 thin (approx. 2" thick) gray, silty sand layers			
8	B45-2	▨			-Increase in siltstone clasts			
10	B45-3	■				1	80.8	37.3
12								
					-Yellow brown, silty sand layer -Dark brown, clay layer, four inches thick			
14								
	B45-4	■			-Becomes brown sand y silt	1	99.3	23.3
16					-Becomes grayish brown -Becomes dark brown -Some clasts of concretion fragments -Becomes yellowish brown			
18								
					-Becomes grayish brown			
20	B45-5	■				1	60.2	58.6
22								
24					-Some clay -Yellowish gray, silty, fine to medium sand, two inches thick			

Figure A-45,
Log of Boring B 45, Page 1 of 2

G1218-52-01 (UPD-04-17-2012).GPJ

SAMPLE SYMBOLS			
	☐ ... SAMPLING UNSUCCESSFUL	◧ ... STANDARD PENETRATION TEST	■ ... DRIVE SAMPLE (UNDISTURBED)
	▨ ... DISTURBED OR BAG SAMPLE	◪ ... CHUNK SAMPLE	▼ ... WATER TABLE OR SEEPAGE

NOTE: THE LOG OF SUBSURFACE CONDITIONS SHOWN HEREON APPLIES ONLY AT THE SPECIFIC BORING OR TRENCH LOCATION AND AT THE DATE INDICATED. IT IS NOT WARRANTED TO BE REPRESENTATIVE OF SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND TIMES.

GEOCON

PROJECT NO. G1218-52-01

BORING B 45

ELEV. (MSL.) **1147'** DATE COMPLETED **11-30-2011**

EQUIPMENT **30" DIAMETER BUCKET RIG** BY: **P. THERIAULT**

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	MATERIAL DESCRIPTION	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
	B45-6				-Brown, fine sandy, clay, two inches thick -Becomes very stiff, brown, fine to medium sandy, silt	1	79.6	35.5
26								
28								
30	B45-7			ML		2	81.1	37.2
					-Intermittent sand layers (approx. four inches thick) between silt layers			
32								
34					-Decrease in siltstone clasts			
	B45-8					2	69.5	47.1
36					-Increase in siltstone clasts			
38					-Some clay			
40	B45-9					PUSH	73.7	39.1
					-Yellowish brown, clayey sandy silt; common siltstsone clasts			
42				ML	**PUENTE FORMATION-SOQUEL MEMBER (Tps-slt)** Hard, moist, dark brown, fine Sandy SILTSTONE; fossiliferous; upper foot fractured and blocky; then becomes well indurated Bedding: N10W/11SW			
44								
46					-Yellow brown, silty sand; undulatory and laterally discontinuous; varying thickness from two to ten inches			
					BORING TERMINATED AT 47 FEET No water No caving Backfilled with a mix of cuttings and bentonite in accordance with Orange County Department of Environmental Health			

Figure A-45,
Log of Boring B 45, Page 2 of 2

G1218-52-01 (UPD-04-17-2012).GPJ

SAMPLE SYMBOLS

☐ ... SAMPLING UNSUCCESSFUL
▨ ... DISTURBED OR BAG SAMPLE
◧ ... STANDARD PENETRATION TEST
◣ ... CHUNK SAMPLE
■ ... DRIVE SAMPLE (UNDISTURBED)
▼ ... WATER TABLE OR SEEPAGE

NOTE: THE LOG OF SUBSURFACE CONDITIONS SHOWN HEREON APPLIES ONLY AT THE SPECIFIC BORING OR TRENCH LOCATION AND AT THE DATE INDICATED. IT IS NOT WARRANTED TO BE REPRESENTATIVE OF SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND TIMES.

GEOCON

PROJECT NO. G1218-52-01

BORING B 46

ELEV. (MSL.) **1074'** DATE COMPLETED **11-30-2011**

EQUIPMENT **30" DIAMETER BUCKET RIG** BY: **P. THERIAULT**

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	MATERIAL DESCRIPTION	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
0				ML	**ENGINEERED ARTIFICIAL FILL (afe)** Medium stiff, moist, brown, fine to medium Sandy, SILT; some cobbles; abundant siltstone clasts; grass on surface, upper 1' numerous gopher holes			
2								
4								
	B46-1 ■					PUSH	75.1	41.6
6	B46-2 ☒							
8								
					-Clean horizontal contact at 9 feet			
				ML	**PUENTE FORMATION SOQUEL MEMBER -siltstone (Tpsslt)** Very stiff, moist, grayish brown, fine-grained Sandy SILTSTONE; moderately indurated; some gypsum filled fractures: N40W/61NE			
10	B46-3 ■					2		
12								
14								
	B46-4 ☐					8/10"	NR	

BORING TERMINATED AT 15 FEET
No water
No caving
Backfilled with a mix of cuttings and bentonite in accordance with Orange County Department of Environmental Health

Figure A-46,
Log of Boring B 46, Page 1 of 1

G1218-52-01 (UPD-04-17-2012).GPJ

SAMPLE SYMBOLS			
	☐ ... SAMPLING UNSUCCESSFUL	◧ ... STANDARD PENETRATION TEST	■ ... DRIVE SAMPLE (UNDISTURBED)
	☒ ... DISTURBED OR BAG SAMPLE	◪ ... CHUNK SAMPLE	▼ ... WATER TABLE OR SEEPAGE

NOTE: THE LOG OF SUBSURFACE CONDITIONS SHOWN HEREON APPLIES ONLY AT THE SPECIFIC BORING OR TRENCH LOCATION AND AT THE DATE INDICATED. IT IS NOT WARRANTED TO BE REPRESENTATIVE OF SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND TIMES.

GEOCON

PROJECT NO. G1218-52-01

BORING B 47

ELEV. (MSL.) **1077'** DATE COMPLETED **11-30-2011**

EQUIPMENT **30" DIAMETER BUCKET RIG** BY: **P. THERIAULT**

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	MATERIAL DESCRIPTION	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
0				ML	**ENGINEERED ARTIFICIAL FILL (afe)** Medium stiff, moist, grayish brown, fine Sandy SILT; some siltstone clasts			
2								
					-Approx. 4" silty sand layer			
4								
	B47-1 ■				-Gray	PUSH	95.8	26.8
6								
				ML	-Clean contact C:N83W/25NE **PUENTE FORMATION SOQUEL MEMBER (Tps-slt)** Hard, moist, brown, fine Sandy SILTSTONE; several fractures: N45W/72NE; N15V; N60E/47NW			
8								
10								
12					BORING TERMINATED AT 12 FEET No water No caving Backfilled with a mix of cuttings and bentonite in accordance with Orange County Department of Environmental Health			

Figure A-47,
Log of Boring B 47, Page 1 of 1

G1218-52-01 (UPD-04-17-2012).GPJ

SAMPLE SYMBOLS			
	☐ ... SAMPLING UNSUCCESSFUL	◧ ... STANDARD PENETRATION TEST	■ ... DRIVE SAMPLE (UNDISTURBED)
	⊠ ... DISTURBED OR BAG SAMPLE	◪ ... CHUNK SAMPLE	▼ ... WATER TABLE OR SEEPAGE

NOTE: THE LOG OF SUBSURFACE CONDITIONS SHOWN HEREON APPLIES ONLY AT THE SPECIFIC BORING OR TRENCH LOCATION AND AT THE DATE INDICATED. IT IS NOT WARRANTED TO BE REPRESENTATIVE OF SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND TIMES.

GEOCON

PROJECT NO. G1218-52-01

BORING B 48

ELEV. (MSL.) **1074'** DATE COMPLETED **11-30-2011**

EQUIPMENT **30" DIAMETER BUCKET RIG** BY: **P. THERIAULT**

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	MATERIAL DESCRIPTION	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
0 2				ML	**ENGINEERED ARTIFICIAL FILL (afe)** Medium stiff, moist, grayish brown, fine Sandy SILT; some siltstone clasts; surface grass			
4 6				ML	-Contact with underlying unit varies from two feet eight inches on northwest side to three feet eight inches on southeast side trace of gravel on northwest side at contact **PUENTE FORMATION SOQUEL MEMBER (Tps-slt)** Hard, moist, brown, fine grained Sandy SILTSTONE; laminated			
					BORING TERMINATED AT 7 FEET No water No caving Backfilled with a mix of cuttings and bentonite in accordance with Orange County Department of Environmental Health			

Figure A-48,
Log of Boring B 48, Page 1 of 1

G1218-52-01 (UPD-04-17-2012).GPJ

SAMPLE SYMBOLS

☐ ... SAMPLING UNSUCCESSFUL
◧ ... STANDARD PENETRATION TEST
■ ... DRIVE SAMPLE (UNDISTURBED)
☒ ... DISTURBED OR BAG SAMPLE
◪ ... CHUNK SAMPLE
▼ ... WATER TABLE OR SEEPAGE

NOTE: THE LOG OF SUBSURFACE CONDITIONS SHOWN HEREON APPLIES ONLY AT THE SPECIFIC BORING OR TRENCH LOCATION AND AT THE DATE INDICATED. IT IS NOT WARRANTED TO BE REPRESENTATIVE OF SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND TIMES.

GEOCON

PROJECT NO. G1218-52-01

BORING B 49

ELEV. (MSL.) **1236'** DATE COMPLETED **11-16-2011**

EQUIPMENT **30" DIAMETER BUCKET RIG** BY: **P. THERIAULT**

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	MATERIAL DESCRIPTION	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
0				SM	**ENGINEERED ARTIFICIAL FILL (afe)** Medium dense, moist, grayish light brown, Silty, fine to medium SAND; sparse grasses on surface; some siltstone clasts			
2								
4					-Brown, fine sandy silt, six inches thick			
	■ B49-1					6	102.4	20.5
6								
8					-Brown fine sandy silt, six inches thick			
10	■ B49-2					4	94.1	24.0
					-Some brown siltstone clasts			
12					-Brown fine sandy silt, six inches thick			
14	⊠ B49-3							
	■ B49-4					5	98.8	23.5
16					-Increase in siltstone clasts			
18								
20	■ B49-5			SM	Medium dense, wet, grayish brown, Silty, fine to medium SAND; trace clay	4	97.8	22.7
22								
				CL	Very stiff, moist, light brown, fine Sandy, CLAY			
24				ML	Very stiff, moist, brown, fine to medium Sandy SILT			

Figure A-49,
Log of Boring B 49, Page 1 of 2

G1218-52-01 (UPD-04-17-2012).GPJ

SAMPLE SYMBOLS

☐ ... SAMPLING UNSUCCESSFUL
◧ ... STANDARD PENETRATION TEST
■ ... DRIVE SAMPLE (UNDISTURBED)
⊠ ... DISTURBED OR BAG SAMPLE
◩ ... CHUNK SAMPLE
▼ ... WATER TABLE OR SEEPAGE

NOTE: THE LOG OF SUBSURFACE CONDITIONS SHOWN HEREON APPLIES ONLY AT THE SPECIFIC BORING OR TRENCH LOCATION AND AT THE DATE INDICATED. IT IS NOT WARRANTED TO BE REPRESENTATIVE OF SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND TIMES.

GEOCON

BORING B 49

ELEV. (MSL.) **1236'** DATE COMPLETED **11-16-2011**

EQUIPMENT **30" DIAMETER BUCKET RIG** BY: **P. THERIAULT**

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	MATERIAL DESCRIPTION	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
26	B49-6 ■					7	91.8	26.3
				SM	-Eight inch diameter perforated schedule 40 pvc pipe, surrounded by pea gravel			
					PUENTE FORMATION-LA VIDA MEMBER (Tplv) Very well cemented, dry, yellowish light brown, SANDSTONE; concretion Refusal at 26.5 feet			

BORING TERMINATED AT 26.5 FEET (REFUSAL)
No water
No caving
Backfilled with a mix of cuttings and bentonite in accordance with Orange County Department of Environmental Health

Figure A-49,
Log of Boring B 49, Page 2 of 2

SAMPLE SYMBOLS

☐ ... SAMPLING UNSUCCESSFUL
◧ ... STANDARD PENETRATION TEST
■ ... DRIVE SAMPLE (UNDISTURBED)
⊠ ... DISTURBED OR BAG SAMPLE
◪ ... CHUNK SAMPLE
▼ ... WATER TABLE OR SEEPAGE

NOTE: THE LOG OF SUBSURFACE CONDITIONS SHOWN HEREON APPLIES ONLY AT THE SPECIFIC BORING OR TRENCH LOCATION AND AT THE DATE INDICATED. IT IS NOT WARRANTED TO BE REPRESENTATIVE OF SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND TIMES.

BORING B 50

ELEV. (MSL.) 1246' DATE COMPLETED 11-16-2011

EQUIPMENT 30" DIAMETER BUCKET RIG BY: P. THERIAULT

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	MATERIAL DESCRIPTION	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
0				SM	**ENGINEERED ARTIFICIAL FILL (afe)** Medium dense, moist, brown, Silty, fine to medium SAND; some siltstone clasts			
2								
4								
	B50-1	■				4	100.3	22.4
6								
8					-Sandy silt layer, six inches thick			
					-Sandy silt layer, six inches thick			
10					-Sandy silt layer, six inches thick			
	B50-2	■				5	102.7	20.9
					-Sandy silt layer, six inches thick			
12					-Some siltstone clasts			
					-Becomes grayish brown			
14								
	B50-3	■				4	99.9	23.2
	B50-4	⊠						
16								
					-Some clay			
18					-Some siltstone clasts -Becomes yellowish brown			
					-Sandy silt layer, six inches thick			
20	B50-5	■				5	101.4	22.1
22								
24				ML	Very stiff, moist, brown, fine to medium Sandy SILT			

Figure A-50,
Log of Boring B 50, Page 1 of 2

SAMPLE SYMBOLS

☐ ... SAMPLING UNSUCCESSFUL
◧ ... STANDARD PENETRATION TEST
■ ... DRIVE SAMPLE (UNDISTURBED)
⊠ ... DISTURBED OR BAG SAMPLE
◪ ... CHUNK SAMPLE
▼ ... WATER TABLE OR SEEPAGE

NOTE: THE LOG OF SUBSURFACE CONDITIONS SHOWN HEREON APPLIES ONLY AT THE SPECIFIC BORING OR TRENCH LOCATION AND AT THE DATE INDICATED. IT IS NOT WARRANTED TO BE REPRESENTATIVE OF SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND TIMES.

GEOCON

PROJECT NO. G1218-52-01

BORING B 50

ELEV. (MSL.) **1246'** DATE COMPLETED **11-16-2011**

EQUIPMENT **30" DIAMETER BUCKET RIG** BY: **P. THERIAULT**

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	MATERIAL DESCRIPTION	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
	B50-6				-Silty sand layer, six inches thick	13	101.9	22.3
26								
28								
				SM	Dense, moist, yellowish brown, Silty, fine to medium SAND; some siltstone clasts			
30	B50-7			SM	Concretion, three inches thick; sampler bouncing	11/10"	106.8	20.0
32				ML	Very stiff, moist, brown, fine to medium Sandy SILT			
34								
	B50-8				-Becomes grayish brown, fine sandy silt	7	93.0	26.5
36								
38				ML	**PUENTE FORMATION-LA VIDA MEMBER (Tplv)** Very dense, moist, grayish brown, fine-grained Sandy, SILTSTONE; clean undulatory contact with overlying fill			
40	B50-9					30/10"		
42								

BORING TERMINATED AT 43 FEET
No water
No caving
Backfilled with a mix of cuttings and bentonite in accordance with Orange County Department of Environmental Health

Figure A-50,
Log of Boring B 50, Page 2 of 2

G1218-52-01 (UPD-04-17-2012).GPJ

SAMPLE SYMBOLS

☐ ... SAMPLING UNSUCCESSFUL
◧ ... STANDARD PENETRATION TEST
■ ... DRIVE SAMPLE (UNDISTURBED)
☒ ... DISTURBED OR BAG SAMPLE
◪ ... CHUNK SAMPLE
▼ ... WATER TABLE OR SEEPAGE

NOTE: THE LOG OF SUBSURFACE CONDITIONS SHOWN HEREON APPLIES ONLY AT THE SPECIFIC BORING OR TRENCH LOCATION AND AT THE DATE INDICATED. IT IS NOT WARRANTED TO BE REPRESENTATIVE OF SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND TIMES.

GEOCON

PROJECT NO. G1218-52-01

BORING B 51

ELEV. (MSL.) **1229'** DATE COMPLETED **11-16-2011**

EQUIPMENT **28"** BY: **P. THERIAULT**

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	MATERIAL DESCRIPTION	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
0				SM	**ENGINEERED ARTIFICIAL FILL (afe)** Medium dense, moist, brown, Silty, fine to medium SAND; some siltstone clasts; sparse surface grass; krotovina			
2								
4								
	■ B51-1 ☒ B51-2					4	102.9	18.3
6								
8					-Brown sandy silt layer, six inches thick -Becomes yellow brown, silty, fine to medium sand			
10	■ B51-3				-Some dark brown siltstone clasts -Brown sandy silt layer, six inches thick	5	96.6	25.4
12								
					-Becomes yellowish brown			
14					-Brown sandy silt layer, six inches thick			
	■ B51-4				-Brown sandy silt layer, six inches thick -Some dark brown siltstone clasts	5	100.0	22.3
16								
					-Some cobbles			
18								
20	■ B51-5				-Becomes grayish brown	4	98.8	24.3
22	☒ B51-6							
24								

Figure A-51,
Log of Boring B 51, Page 1 of 2

G1218-52-01 (UPD-04-17-2012).GPJ

SAMPLE SYMBOLS

☐ ... SAMPLING UNSUCCESSFUL
◧ ... STANDARD PENETRATION TEST
■ ... DRIVE SAMPLE (UNDISTURBED)
☒ ... DISTURBED OR BAG SAMPLE
◪ ... CHUNK SAMPLE
▼ ... WATER TABLE OR SEEPAGE

NOTE: THE LOG OF SUBSURFACE CONDITIONS SHOWN HEREON APPLIES ONLY AT THE SPECIFIC BORING OR TRENCH LOCATION AND AT THE DATE INDICATED. IT IS NOT WARRANTED TO BE REPRESENTATIVE OF SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND TIMES.

GEOCON

PROJECT NO. G1218-52-01

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	**BORING B 51** ELEV. (MSL.) **1229'** DATE COMPLETED **11-16-2011** EQUIPMENT **28"** BY: **P. THERIAULT**	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
					MATERIAL DESCRIPTION			
	B51-7 ■					15	96.0	20.6
26				ML	**PUENTE FORMATION-LA VIDA MEMBER (Tplv)** Hard, moist, brown, fine-grained Sandy, SILTSTONE; clean subhorizontal contact with overlying fill			
28	B51-8 ☒							
					-Thin, laterally discontinuous clay seam			
30	B51-9 ■			ML		11	92.0	26.8

BORING TERMINATED AT 31 FEET
No water
No caving
Backfilled with a mix of cuttings and bentonite in accordance with Orange County Department of Environmental Health

Figure A-51,
Log of Boring B 51, Page 2 of 2

G1218-52-01 (UPD-04-17-2012).GPJ

SAMPLE SYMBOLS

☐ ... SAMPLING UNSUCCESSFUL	◧ ... STANDARD PENETRATION TEST	■ ... DRIVE SAMPLE (UNDISTURBED)
☒ ... DISTURBED OR BAG SAMPLE	◪ ... CHUNK SAMPLE	▼ ... WATER TABLE OR SEEPAGE

NOTE: THE LOG OF SUBSURFACE CONDITIONS SHOWN HEREON APPLIES ONLY AT THE SPECIFIC BORING OR TRENCH LOCATION AND AT THE DATE INDICATED. IT IS NOT WARRANTED TO BE REPRESENTATIVE OF SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND TIMES.

GEOCON

PROJECT NO. G1218-52-01

BORING B 52

ELEV. (MSL.) **1224'** DATE COMPLETED **11-18-2011**

EQUIPMENT **28"** BY: **P. THERIAULT**

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	MATERIAL DESCRIPTION	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
0				SM	**ENGINEERED ARTIFICIAL FILL (afe)** Medium dense, moist, yellowish brown, Silty, fine to medium SAND; some cobbles, some siltstone clasts; few boulders			
2								
				ML	Very stiff, moist, brown, fine to medium Sandy, SILT; trace gravel and cobble size siltstone clasts			
4								
	B52-1 ■					5	97.8	23.1
6					-Decrease in siltstone clasts			
	B52-2 ☒							
8								
10	B52-3 ■				-Decrease in sand; trace clay	4	87.1	33.6
12					-Becomes light gray			
					-Concretions clasts, up to 12 inches			
14				ML	**PUENTE FORMATION-LA VIDA MEMBER (Tplv)** Hard, moist, gray, fine-grained Sandy, SILTSTONE; clean undulatory, subhorizontal contact with overlying fill			
	B52-4 ■					10/8"	113.4	16.1
16								
18								
20					BORING TERMINATED AT 20 FEET No water No caving Backfilled with a mix of cuttings and bentonite in accordance with Orange County Department of Environmental Health			

Figure A-52,
Log of Boring B 52, Page 1 of 1

G1218-52-01 (UPD-04-17-2012).GPJ

SAMPLE SYMBOLS			
	☐ ... SAMPLING UNSUCCESSFUL	◧ ... STANDARD PENETRATION TEST	■ ... DRIVE SAMPLE (UNDISTURBED)
	☒ ... DISTURBED OR BAG SAMPLE	◩ ... CHUNK SAMPLE	▼ ... WATER TABLE OR SEEPAGE

NOTE: THE LOG OF SUBSURFACE CONDITIONS SHOWN HEREON APPLIES ONLY AT THE SPECIFIC BORING OR TRENCH LOCATION AND AT THE DATE INDICATED. IT IS NOT WARRANTED TO BE REPRESENTATIVE OF SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND TIMES.

GEOCON

PROJECT NO. G1218-52-01

BORING B 53

ELEV. (MSL.) **1131'** DATE COMPLETED **10-20-2011**

EQUIPMENT **28"** BY: **P. THERIAULT**

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	MATERIAL DESCRIPTION	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
0				SM	**ENGINEERED ARTIFICIAL FILL (afe)** Loose, damp, yellow brown, Silty, fine to medium SAND; grass			
2				SM	-Becomes medium dense, moist, yellow			
					-Becomes gray sandy silt, one foot thick			
4					-Becomes moist, gray sandy clay, 1 foot thick			
6								
					-Concretion, 14 inches thick -Some siltstone clasts			
8					-Becomes brownish yellow, silty sand			
10	B53-1 ■					5	118.1	10.3
				SM	**PUENTE FORMATION-LA VIDA MEMBER (Tplv)** Dense, moist, reddish yellow, Silty, fine- to medium-grained SANDSTONE; moderately cemented			
12				ML SM	-Some staining **BEDDING PLANE SHEAR** Light gray, remolded clay approx. 1/4 inch thick: N53W/19S			
14					Very stiff, moist, gray, SILTSTONE; moderately indurated			
					Dense, moist, yellowish brown, Silty fine- to medium-grained SANDSTONE; contact is gradational over approx. one foot			
16					-Gray, silty sandstone, four inches thick; contact with overlying unit: N53W/19S Then becomes yellowish brown -Fracture, brown clay filled, 1/4 inch wide: N30E/68SE			
18					-Gray, sandy siltstone, one foot thick; contact with overlying unit: N55W/22SW -Becomes silty fine- to coarse-grained sandstone; trace mica			
20	B53-2 ■				-Gray sandy siltstone layer, four inches thick; contact with overlying unit: N55W/21SW	4	116.5	10.7
22					-Fault, two inch wide, clay filled; minor offset (approx one inch): N50E/85SE			
24								

Figure A-53,
Log of Boring B 53, Page 1 of 2

G1218-52-01 (UPD-04-17-2012).GPJ

SAMPLE SYMBOLS

☐ ... SAMPLING UNSUCCESSFUL
◧ ... STANDARD PENETRATION TEST
■ ... DRIVE SAMPLE (UNDISTURBED)
☒ ... DISTURBED OR BAG SAMPLE
◪ ... CHUNK SAMPLE
▼ ... WATER TABLE OR SEEPAGE

NOTE: THE LOG OF SUBSURFACE CONDITIONS SHOWN HEREON APPLIES ONLY AT THE SPECIFIC BORING OR TRENCH LOCATION AND AT THE DATE INDICATED. IT IS NOT WARRANTED TO BE REPRESENTATIVE OF SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND TIMES.

GEOCON

PROJECT NO. G1218-52-01

BORING B 53

ELEV. (MSL.) **1131'** DATE COMPLETED **10-20-2011**

EQUIPMENT **28"** BY: **P. THERIAULT**

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	MATERIAL DESCRIPTION	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
26		▨						
28		▨			-Gray silty sandstone, one inch thick; contact with overlying unit: N52W/20S Then becomes yellowish brown, silty, fine- to coarse-grained sandstone			
30	B53-3 ■	▨		SM		4	117.7	12.5
32		▨						
34		▨			-Faults, F1-1/2 inch thick, one inch normal offset: N45E/85NW F2-1/2 inch thick, one and a half inches normal offset: N15E/55NW			
36		▨			-Becomes fine- to medium-grained, silty sandstone; bedding: N54W/20S			
38		▨						
40	B53-4 ■	▨			-Some coarse-grained sand, some mica; bedding: N52W/19S	14	120.2	7.7
42		▨						
44		▨						
					BORING TERMINATED AT 45 FEET No water No caving Backfilled with a mix of cuttings and bentonite in accordance with Orange County Department of Environmental Health			

Figure A-53,
Log of Boring B 53, Page 2 of 2

G1218-52-01 (UPD-04-17-2012).GPJ

SAMPLE SYMBOLS			
	☐ ... SAMPLING UNSUCCESSFUL	◧ ... STANDARD PENETRATION TEST	■ ... DRIVE SAMPLE (UNDISTURBED)
	☒ ... DISTURBED OR BAG SAMPLE	◣ ... CHUNK SAMPLE	▼ ... WATER TABLE OR SEEPAGE

NOTE: THE LOG OF SUBSURFACE CONDITIONS SHOWN HEREON APPLIES ONLY AT THE SPECIFIC BORING OR TRENCH LOCATION AND AT THE DATE INDICATED. IT IS NOT WARRANTED TO BE REPRESENTATIVE OF SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND TIMES.

GEOCON

PROJECT NO. G1218-52-01

BORING B 54

ELEV. (MSL.) **1161'** DATE COMPLETED **10/20-10/21/11**

EQUIPMENT **28"** BY: **P. THERIAULT**

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	MATERIAL DESCRIPTION	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
0				SM	**PUENTE FORMATION-LA VIDA MEMBER (Tplv)** Moderately cemented, damp, brownish yellow, Silty, fine to medium SANDSTONE; micaceous, trace coarse-grained sand; some staining; some laterally discontinuous gypsum filled fractures; some interbeds of light grayish yellow silty sandstone (approx. six to eight inches thick); contact: N72W19SW			
2								
4					-Becomes moist, pale yellow, silty fine- to coarse-grained sandstone; micaceous; thin iron stained beds at six to eight inch intervals: bedding: N60W22SW			
6					-Fracture, 1/8th inch thick, clay filled: N34E/75NW			
					-Gray clayey sandstone, six inches thick; more clay at top and bottom contacts			
8					-Ash bed, gray, 2 inches thick: N75W14SW -Gray clay (not remolded) 1/8 inch thick: N68W/17SW			
10	B54-1 ■				-Some yellow staining -Sharp undulatory contact with light gray sandy siltstone -Thin reddish orange stained bed	9	117.9	7.8
12								
					-Light gray siltstone, three inches thick; bedding: N75W/19SW			
14								
					-Laminated maific mica beds in pale yellow sandstone			
16	B54-2 ⊠							
18					**BEDDING PLANE SHEAR** gray, 1/4 inch thick remolded clay: N72W/26SW			
					-Contact between silty sandstone and overlying red stained sandstone: N70W/25SW			
20	B54-3 ■					7	119.5	12.3
					-Interbedded siltstone and sandstone; seepage within sandstone beds; beds are approx. one to four inches thick			
22								
24					-Becomes dark brown siltstone			
				SM				

Figure A-54,
Log of Boring B 54, Page 1 of 4

G1218-52-01 (UPD-04-17-2012).GPJ

SAMPLE SYMBOLS			
	☐ ... SAMPLING UNSUCCESSFUL	◧ ... STANDARD PENETRATION TEST	■ ... DRIVE SAMPLE (UNDISTURBED)
	⊠ ... DISTURBED OR BAG SAMPLE	◣ ... CHUNK SAMPLE	▼ ... WATER TABLE OR SEEPAGE

NOTE: THE LOG OF SUBSURFACE CONDITIONS SHOWN HEREON APPLIES ONLY AT THE SPECIFIC BORING OR TRENCH LOCATION AND AT THE DATE INDICATED. IT IS NOT WARRANTED TO BE REPRESENTATIVE OF SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND TIMES.

GEOCON

PROJECT NO. G1218-52-01

BORING B 54

ELEV. (MSL.) **1161'** DATE COMPLETED **10/20-10/21/11**

EQUIPMENT **28"** BY: **P. THERIAULT**

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	MATERIAL DESCRIPTION	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
26					Dense, moist, yellowish light brown, Silty, fine- to medium-grained SANDSTONE; well cemented			
				ML	Hard, moist, black, fine-grained, Sandy SILTSTONE; well indurated; chaotic contact with overlying sandstone			
28					-Concretions, minor, one inch diameter nodules			
30	B54-4	■		ML	-Concretion, very hard, 14 inches thick	9	114.2	12.5
32								
34								
36					-Fault, approx. 1/2 inch thick: N85E/50SE			
38					-Concretion, fourteen inches thick, difficult digging, began using core barrel			
40								
42					-Fossiliferous (fish scales and imprints on laminae), laminated Fracture: N76E/77SE			
44					-Concretion, very difficult digging **BEDDING PLANE SHEAR**gray, remolded clay, 1/4 inch thick: N55W/20SW			
46								
48					-Ash layer, one inch thick: N54W/19SW			

Figure A-54,
Log of Boring B 54, Page 2 of 4

G1218-52-01 (UPD-04-17-2012).GPJ

SAMPLE SYMBOLS			
	☐ ... SAMPLING UNSUCCESSFUL	◧ ... STANDARD PENETRATION TEST	■ ... DRIVE SAMPLE (UNDISTURBED)
	☒ ... DISTURBED OR BAG SAMPLE	◪ ... CHUNK SAMPLE	▼ ... WATER TABLE OR SEEPAGE

NOTE: THE LOG OF SUBSURFACE CONDITIONS SHOWN HEREON APPLIES ONLY AT THE SPECIFIC BORING OR TRENCH LOCATION AND AT THE DATE INDICATED. IT IS NOT WARRANTED TO BE REPRESENTATIVE OF SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND TIMES.

GEOCON

BORING B 54

ELEV. (MSL.) **1161'** DATE COMPLETED **10/20-10/21/11**

EQUIPMENT **28"** BY: **P. THERIAULT**

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	MATERIAL DESCRIPTION	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
50	B54-5 ■				-Bedding: N65W/13SW -Fracture: N10W/V	8	74.0	28.6
52								
54								
56					-Fault, approx. 1/4 thick, 2 inches normal offset: N20W/70S			
58	B54-6 ⊠							
60	B54-7 ■			ML		19	79.1	35.4
62					-Becomes dark brown			
64					-Concretion, thirteen inches thick, approximately horizontal, with undulatory contacts			
66								
68					-Ash bed, 2 inches thick, bedding: N57W/20SW			
70	B54-8 ■				-Abundant platy, white (opaque) gypsum crystals approx. 1/16 inch	21	104.3	18.3
72					-Seepage, approx. one foot thick zone			
74								

Figure A-54,
Log of Boring B 54, Page 3 of 4

G1218-52-01 (UPD-04-17-2012).GPJ

SAMPLE SYMBOLS

☐ ... SAMPLING UNSUCCESSFUL
◧ ... STANDARD PENETRATION TEST
■ ... DRIVE SAMPLE (UNDISTURBED)
⊠ ... DISTURBED OR BAG SAMPLE
◪ ... CHUNK SAMPLE
▼ ... WATER TABLE OR SEEPAGE

NOTE: THE LOG OF SUBSURFACE CONDITIONS SHOWN HEREON APPLIES ONLY AT THE SPECIFIC BORING OR TRENCH LOCATION AND AT THE DATE INDICATED. IT IS NOT WARRANTED TO BE REPRESENTATIVE OF SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND TIMES.

GEOCON

PROJECT NO. G1218-52-01

BORING B 54

ELEV. (MSL.) **1161'** DATE COMPLETED **10/20-10/21/11**

EQUIPMENT **28"** BY: **P. THERIAULT**

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	MATERIAL DESCRIPTION	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
76								
78					-Ash bed, three inches thick, gray: N74W/24SW			
80					-Concretion, one foot thick, difficult digging			
82								
84					-Ash bed, one inch thick: N55W/16SW			
86								
88					-Concretion, six inches thick, only on south side			
					-Ash bed, gray, three inches thick: N70W/18SW			
90	B54-9 ■			ML		24	83.6	24.6
92								
94								
					TOTAL DEPTH 95 FEET No groundwater encountered No caving Backfilled with a mix of cuttings and bentonite in accordance with Orange County Department of Environmental Health			

Figure A-54,
Log of Boring B 54, Page 4 of 4

G1218-52-01 (UPD-04-17-2012).GPJ

SAMPLE SYMBOLS

☐ ... SAMPLING UNSUCCESSFUL
◧ ... STANDARD PENETRATION TEST
■ ... DRIVE SAMPLE (UNDISTURBED)
☒ ... DISTURBED OR BAG SAMPLE
◪ ... CHUNK SAMPLE
▼ ... WATER TABLE OR SEEPAGE

NOTE: THE LOG OF SUBSURFACE CONDITIONS SHOWN HEREON APPLIES ONLY AT THE SPECIFIC BORING OR TRENCH LOCATION AND AT THE DATE INDICATED. IT IS NOT WARRANTED TO BE REPRESENTATIVE OF SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND TIMES.

GEOCON

PROJECT NO. G1218-52-01

BORING B 55

ELEV. (MSL.) **1165'** DATE COMPLETED **10-31-2011**

EQUIPMENT **28"** BY: **P. THERIAULT**

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	MATERIAL DESCRIPTION	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
0				CL	**TOPSOIL** Stiff, damp, dark brown, fine to medium, Sandy CLAY; grass; krotovina			
2				SM	**PUENTE FORMATION-LA VIDA MEMBER (Tplv)** Medium dense, damp, brownish yellow, Silty, fine- to medium-grained SANDSTONE; micaceous; trace coarse-grained sand; some krotovina in upper 3 feet; laminated with mafic mica interbeds			
4					-Fault, thin, clay filled, approx. 2 inches normal offset: N12W/75SW -Bedding on iron stained silty sandstone: N70W/19S			
6					-Becomes whitish pale yellow, massive; micaceous -Bedding on mafic layer: N75W/16SW			
8					-Becomes moderately to well cemented -Hard gray clay, 1/4 inch thick, not remolded: N70W/20SW			
10	B55-1 ■				-Increase in staining	11	115.9	14.1
12					-Bedding: N75W/18SW -Alternating beds of silty sandstone and sandy siltstone to 15 feet.			
14								
16					-Chaotic contact between silty sandstone and gray ash layer; approx 4 inches thick -Ash layer, gray, four inches thick: N65W/15SW			
18					-Ash layer, gray, two inches thick -Some dark brown siltstone clasts within a silty sanstone matrix			
20	B55-2 ■				-Abundant staining Concretion, shattered, six inches thick	10	114.5	12.8
22				ML	Very stiff, moist, dark brown, fine-grained Sandy, SILTSTONE; moderately indurated; micaceous; some clay; undulatory contact with overlying sandstone			
24								
26								
28					-Fracture, discontinuous, gypsum filled, 1/2 inch thick Slow advance; began using core barrel -Slightly fossiliferous Some red staining -Fracture, 1/2 inch thick, gray fine sand filled wit some gypsum: N10W/57SW			

Figure A-55,
Log of Boring B 55, Page 1 of 3

G1218-52-01 (UPD-04-17-2012).GPJ

SAMPLE SYMBOLS			
	☐ ... SAMPLING UNSUCCESSFUL	◧ ... STANDARD PENETRATION TEST	■ ... DRIVE SAMPLE (UNDISTURBED)
	☒ ... DISTURBED OR BAG SAMPLE	◪ ... CHUNK SAMPLE	▼ ... WATER TABLE OR SEEPAGE

NOTE: THE LOG OF SUBSURFACE CONDITIONS SHOWN HEREON APPLIES ONLY AT THE SPECIFIC BORING OR TRENCH LOCATION AND AT THE DATE INDICATED. IT IS NOT WARRANTED TO BE REPRESENTATIVE OF SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND TIMES.

GEOCON

PROJECT NO. G1218-52-01

BORING B 55

ELEV. (MSL.) **1165'** DATE COMPLETED **10-31-2011**

EQUIPMENT **28"** BY: **P. THERIAULT**

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	MATERIAL DESCRIPTION	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
30	B55-3	■		ML		8/6"	109.5	16.9
					-Concretion, 5 inches thick, very difficult digging			
32								
					-Concretion, 5 inches thick, very difficult digging -Ash bed, light gray, moist, diffuse upper contact, sharp lower contact: N45W30S			
34					-Grayish reddish yellow, silty sandstone; contact with overlying unit: N75W/18SW			
36					-Becomes alternating reddish yellow and gray, silty, fine sandstone			
38				ML	Hard, moist, dark brown, fine-grained Sandy, SILTSTONE -Fracture, 1/2 inch thick, gypsum filled, with trace gray clay: N65W/21SW			
40	B55-4	■				16	67.7	41.5
					-Becomes fossiliferous, trace gypsum nodules up to 1/16 inch; some minor shallow dipping to the south, gypsum filled fractures			
42								
44								
					-Some red stained fractures along various strikes and dips			
46								
48								
50	B55-5	■			**BEDDING PLANE SHEAR**Paper thin, gray clay: N57W, 21SW	9	82.8	30.5
52					-Structure becomes blocky/lenticular, clay films on polished surfaces			
54								
56								
58					**BEDDING PLANE SHEAR**Paper thin, gray clay: N58W/21SW			

Figure A-55,
Log of Boring B 55, Page 2 of 3

G1218-52-01 (UPD-04-17-2012).GPJ

SAMPLE SYMBOLS

☐ ... SAMPLING UNSUCCESSFUL
◧ ... STANDARD PENETRATION TEST
■ ... DRIVE SAMPLE (UNDISTURBED)
⊠ ... DISTURBED OR BAG SAMPLE
◪ ... CHUNK SAMPLE
▼ ... WATER TABLE OR SEEPAGE

NOTE: THE LOG OF SUBSURFACE CONDITIONS SHOWN HEREON APPLIES ONLY AT THE SPECIFIC BORING OR TRENCH LOCATION AND AT THE DATE INDICATED. IT IS NOT WARRANTED TO BE REPRESENTATIVE OF SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND TIMES.

BORING B 55

ELEV. (MSL.) **1165'** DATE COMPLETED **10-31-2011**

EQUIPMENT **28"** BY: **P. THERIAULT**

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	MATERIAL DESCRIPTION	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
60	B55-6 ■			ML	**BEDDING PLANE SHEAR**1/8 inch thick gray clay: N58W/22S	13	64.1	46.5
62								
					BEDDING PLANE SHEAR Paper thin gray clay: N68W/16SW			
64								
66								
68								
					-Trace seepage			
70	B55-7 ■					20/7"	90.6	22.4
72					Hard, slow advance, began using core barrel			
74								

BORING TERMINATED AT 75 FEET
No water
No caving
Backfilled with a mix of cuttings and bentonite in accordance with Orange County Department of Environmental Health

Figure A-55,
Log of Boring B 55, Page 3 of 3

SAMPLE SYMBOLS

☐ ... SAMPLING UNSUCCESSFUL
◧ ... STANDARD PENETRATION TEST
■ ... DRIVE SAMPLE (UNDISTURBED)
☒ ... DISTURBED OR BAG SAMPLE
◪ ... CHUNK SAMPLE
▼ ... WATER TABLE OR SEEPAGE

GEOCON

PROJECT NO. G1218-52-01

BORING B 56

ELEV. (MSL.) **1225'** DATE COMPLETED **11-01-2011**

EQUIPMENT **28"** BY: **P. THERIAULT**

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	MATERIAL DESCRIPTION	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
0				ML	**PUENTE FORMATION-LA VIDA MEMBER (Tplv)** Very stiff, damp, olive, fine-grained Sandy, SILTSTONE; some red staining; some gypsum nodules; weathered to three feet			
2								
4					-Bedding: N85W/27SW -Fractures, carbonate filled: N83W/88SW; N18W/70SW; N20W/V			
6					-Bedding: N85W/19SW -Fractures: N50W/V; N42W/V			
8	B56-1 ☒				-Very thinly bedded yellowish brown siltstone between olive siltstone			
10	B56-2 ■					2	60.0	61.2
					-Bedding: N85W/19SW			
12					-Fractures: N14W/75SW; N10E/85SE -Trace carbonate nodules			
14					-Bedding on one foot thick, moderately indurated olive siltstone: N83W/24SW			
16								
					-Four inch thick pale yellow, silty sandstone Brown, laminated siltstone; bedding: N83W24SW			
18								
20	B56-3 ■					4	88.7	31.1
22								
24								

Figure A-56,
Log of Boring B 56, Page 1 of 4

SAMPLE SYMBOLS

☐ ... SAMPLING UNSUCCESSFUL
◧ ... STANDARD PENETRATION TEST
■ ... DRIVE SAMPLE (UNDISTURBED)
☒ ... DISTURBED OR BAG SAMPLE
◪ ... CHUNK SAMPLE
▼ ... WATER TABLE OR SEEPAGE

GEOCON

BORING B 56

ELEV. (MSL.) **1225'** DATE COMPLETED **11-01-2011**

EQUIPMENT **28"** BY: **P. THERIAULT**

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	MATERIAL DESCRIPTION	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
26					-Four inch thick yellowish brown silty sandstone -Becomes brown fine-grained sandy siltstone			
28								
					-Concretion, six inches thick, difficult digging			
30	B56-4 ■			ML		3	61.0	56.8
32					-Ash layer, two inches thick: N84W/22SW			
34					-Fracture, 1/4 ich thick, gypsum filled: N20E/V			
36								
38					-Ash layer, gray, three inches thick; 81W/22SW			
40	B56-5 ■					4	59.0	62.6
42								
44								
46					-Ash layer, gray, seventeen inches thick: N72W/25SW			
48					-Ash layer, gray, two inches thick, gypsum lined: N78W/23SW			

Figure A-56,
Log of Boring B 56, Page 2 of 4

SAMPLE SYMBOLS			
	☐ ... SAMPLING UNSUCCESSFUL	◧ ... STANDARD PENETRATION TEST	■ ... DRIVE SAMPLE (UNDISTURBED)
	☒ ... DISTURBED OR BAG SAMPLE	◩ ... CHUNK SAMPLE	▼ ... WATER TABLE OR SEEPAGE

NOTE: THE LOG OF SUBSURFACE CONDITIONS SHOWN HEREON APPLIES ONLY AT THE SPECIFIC BORING OR TRENCH LOCATION AND AT THE DATE INDICATED. IT IS NOT WARRANTED TO BE REPRESENTATIVE OF SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND TIMES.

PROJECT NO. G1218-52-01

BORING B 56

ELEV. (MSL.) **1225'** DATE COMPLETED **11-01-2011**

EQUIPMENT **28"** BY: **P. THERIAULT**

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	MATERIAL DESCRIPTION	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
50	B56-6	■				6	105.3	20.8
					-Ash layer, gray, two inches thick, gypsum lined: N84W/20SW			
52								
54								
					-Concretion, seven inches thick			
					-Fracture, 1/4 inch thick, gypsum filled: N10W/82SW			
56								
58								
					-Dark brown, siltstone; well indurated			
60	B56-7	■		ML	-Dark brown rip up clasts	16	79.5	32.2
62								
64								
					-Ash layer, two inches thick, pinches out after a length of ten inches			
66								
68					-Ash layer, gray, one inch thick: N68W/21SW			
70	B56-8	■				17/10"	75.0	39.2
					-Ash layer, gray, three inches thick: N82W/20SW			
72								
74								

Figure A-56,
Log of Boring B 56, Page 3 of 4

G1218-52-01 (UPD-04-17-2012).GPJ

SAMPLE SYMBOLS

☐ ... SAMPLING UNSUCCESSFUL
▨ ... DISTURBED OR BAG SAMPLE
◧ ... STANDARD PENETRATION TEST
◩ ... CHUNK SAMPLE
■ ... DRIVE SAMPLE (UNDISTURBED)
▼ ... WATER TABLE OR SEEPAGE

PROJECT NO. G1218-52-01

BORING B 56

ELEV. (MSL.) **1225'** DATE COMPLETED **11-01-2011**

EQUIPMENT **28"** BY: **P. THERIAULT**

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	MATERIAL DESCRIPTION	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
76					-Concretion, one foot thick			
78								
80	■ B56-9				**BEDDING PLANE SHEAR**Paper thin, light gray, remolded clay: N82W/20SW	32/4"	65.9	45.9
82								
84								

BORING TERMINATED AT 85 FEET
No water
No caving
Backfilled with a mix of cuttings and bentonite in accordance with Orange County Department of Environmental Health

Figure A-56,
Log of Boring B 56, Page 4 of 4

SAMPLE SYMBOLS			
	☐ ... SAMPLING UNSUCCESSFUL	◧ ... STANDARD PENETRATION TEST	■ ... DRIVE SAMPLE (UNDISTURBED)
	☒ ... DISTURBED OR BAG SAMPLE	◣ ... CHUNK SAMPLE	▼ ... WATER TABLE OR SEEPAGE

PROJECT NO. G1218-52-01

BORING B 57

ELEV. (MSL.) **1090'** DATE COMPLETED **12-09-2011**

EQUIPMENT **30" DIAMETER BUCKET RIG** BY: **P. THERIAULT**

DEPTH IN FEET	SAMPLE NO.	SOIL CLASS (USCS)	MATERIAL DESCRIPTION	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
0		ML	**TOPSOIL** Soft, damp, brown, fine to medium, Sandy SILT; shrubs and grass			
2		ML	**PUENTE FORMATION-LA VIDA MEMBER (Tplv)** Medium stiff, damp, white, fine-grained Sandy, SILTSTONE; krotovina; weathered to four feet			
4			-Becomes olive, moist, some carbonate filled fractures			
6						
8			-Becomes moderately indurated			
10	B57-1		-Becomes olive gray, moist	3	71.7	42.8
12						
14						
16						
18						
	B57-2		-Sand layer, two inches thick, laterally discontinuous			
20	B57-3			2	90.8	30.9
22						
			Fracture: N33W/88SW			
24						

Figure A-57,
Log of Boring B 57, Page 1 of 4

G1218-52-01 (UPD-04-17-2012).GPJ

SAMPLE SYMBOLS

☐ ... SAMPLING UNSUCCESSFUL	◧ ... STANDARD PENETRATION TEST	■ ... DRIVE SAMPLE (UNDISTURBED)
☒ ... DISTURBED OR BAG SAMPLE	◩ ... CHUNK SAMPLE	▼ ... WATER TABLE OR SEEPAGE

NOTE: THE LOG OF SUBSURFACE CONDITIONS SHOWN HEREON APPLIES ONLY AT THE SPECIFIC BORING OR TRENCH LOCATION AND AT THE DATE INDICATED. IT IS NOT WARRANTED TO BE REPRESENTATIVE OF SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND TIMES.

GEOCON

BORING B 57

ELEV. (MSL.) **1090'** DATE COMPLETED **12-09-2011**

EQUIPMENT **30" DIAMETER BUCKET RIG** BY: **P. THERIAULT**

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	MATERIAL DESCRIPTION	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
26								
					BEDDING PLANE SHEAR1/4 inch thick, olive gray, remolded clay: N10W/7SW			
28								
					-Concretion, six inches thick, very hard			
30	B57-4	■		ML		5	90.8	29.6
32								
					-Ash layer, seven inches thick, light gray: N10W/15SW			
34								
					BEDDING PLANE SHEAR1/16 inch thick, olive gray, remolded clay: N12W/10SW			
36								
					-Becomes dark brown, well indurated			
38					-Fracture, 1/4 inch thick, gypsum filled: N60 E/20SE			
40	B57-5	■			-Becomes dark grayish brown -Fracture, inron stained: N35E/78SE	50/6"	103.0	19.3
42					-Trace seepage to forty four and one half feet			
44								
					BEDDING PLANE SHEAR Paper thin, gray, remolded clay: N15W/14SW			
46								
48					-Ash layer, two inches thick, dark gray, laterally discontinuous			

Figure A-57,
Log of Boring B 57, Page 2 of 4

G1218-52-01 (UPD-04-17-2012).GPJ

SAMPLE SYMBOLS			
	☐ ... SAMPLING UNSUCCESSFUL	◧ ... STANDARD PENETRATION TEST	■ ... DRIVE SAMPLE (UNDISTURBED)
	☒ ... DISTURBED OR BAG SAMPLE	◪ ... CHUNK SAMPLE	▼ ... WATER TABLE OR SEEPAGE

GEOCON

BORING B 57

ELEV. (MSL.) **1090'** DATE COMPLETED **12-09-2011**

EQUIPMENT **30" DIAMETER BUCKET RIG** BY: **P. THERIAULT**

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	MATERIAL DESCRIPTION	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
50	B57-6 ■				-Slow advance	8/6"	103.4	19.1
					-Concretion, eleven inches thick			
52								
54								
					-Silty sandstone layer, five inches thick, gradational contact			
56								
58								
60	B57-7 ■			ML		12/6"	101.5	19.6
62								
64					-Some gypsum nodules, up to half inch diameter			
66								
68								
					-Fossiliferous (fish scales)			
70	B57-8 ■					20/5"	104.0	18.6
72								
74					-Concretion, six inches thick			

Figure A-57,
Log of Boring B 57, Page 3 of 4

SAMPLE SYMBOLS			
	☐ ... SAMPLING UNSUCCESSFUL	◧ ... STANDARD PENETRATION TEST	■ ... DRIVE SAMPLE (UNDISTURBED)
	☒ ... DISTURBED OR BAG SAMPLE	◪ ... CHUNK SAMPLE	▼ ... WATER TABLE OR SEEPAGE

NOTE: THE LOG OF SUBSURFACE CONDITIONS SHOWN HEREON APPLIES ONLY AT THE SPECIFIC BORING OR TRENCH LOCATION AND AT THE DATE INDICATED. IT IS NOT WARRANTED TO BE REPRESENTATIVE OF SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND TIMES.

PROJECT NO. G1218-52-01

BORING B 57

ELEV. (MSL.) **1090'** DATE COMPLETED **12-09-2011**

EQUIPMENT **30" DIAMETER BUCKET RIG** BY: **P. THERIAULT**

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	MATERIAL DESCRIPTION	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
				SM	Dense, moist, Silty, fine-grained SANDSTONE; contact with overlying unit: 0N/37W			
76								
78								
					-Two inch thick dark brown, siltstone layer			
80	B57-9					30/5"	105.2	16.6
82								
84								
86								
88				ML	-Seepage			
					Hard, moist, brown SILTSTONE			
					-Becomes dark brown			
90	B57-10				BORING TERMINATED AT 90 FEET No water No caving Backfilled with a mix of cuttings and bentonite in accordance with Orange County Department of Environmental Health	30/6"	96.0	22.4

Figure A-57,
Log of Boring B 57, Page 4 of 4

G1218-52-01 (UPD-04-17-2012).GPJ

SAMPLE SYMBOLS

☐ ... SAMPLING UNSUCCESSFUL

◧ ... STANDARD PENETRATION TEST

■ ... DRIVE SAMPLE (UNDISTURBED)

⊠ ... DISTURBED OR BAG SAMPLE

◩ ... CHUNK SAMPLE

▼ ... WATER TABLE OR SEEPAGE

NOTE: THE LOG OF SUBSURFACE CONDITIONS SHOWN HEREON APPLIES ONLY AT THE SPECIFIC BORING OR TRENCH LOCATION AND AT THE DATE INDICATED. IT IS NOT WARRANTED TO BE REPRESENTATIVE OF SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND TIMES.

GEOCON

PROJECT NO. G1218-52-01

BORING B 58

ELEV. (MSL.) **1033'** DATE COMPLETED **11-22-2011**

EQUIPMENT **30" DIAMETER BUCKET RIG** BY: **P. THERIAULT**

DEPTH IN FEET	SAMPLE NO.	SOIL CLASS (USCS)	MATERIAL DESCRIPTION	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
0		SM	**ENGINEERED ARTIFICIAL FILL (afe)** Medium dense, damp, yellowish brown, Silty, fine to medium SAND; some brown siltstone clasts			
2						
			-Becomes dense, moist			
4						
	B58-1 ■			2	67.8	50.2
6			-10" thick concretion clast -Decrease in silt; some coarse sand			
8	B58-2 ☒		-Becomes brownish yellow			
10	B58-3 ■			4	112.7	8.0
12			-5 inch thick layer of stiff, moist, brown clay -Becomes grayish brown, silty sand; some clay			
14			-Becomes gray, silty sand			
	B58-4 ■	ML	Hard, moist, brown, fine Sandy, SILT	2	114.5	13.0
16						
		CL	Hard, moist, brown, fine Sandy, CLAY			
18	B58-5 ☒					
		SM	Dense, moist, brown, Silty, fine to medium SAND; some siltstone clasts			
20	B58-6 ■			2	69.0	42.2
			-Increase in siltstone clasts (approximately 40%)			
22						
24						

Figure A-58,
Log of Boring B 58, Page 1 of 3

G1218-52-01 (UPD-04-17-2012).GPJ

SAMPLE SYMBOLS
☐ ... SAMPLING UNSUCCESSFUL
◧ ... STANDARD PENETRATION TEST
■ ... DRIVE SAMPLE (UNDISTURBED)
☒ ... DISTURBED OR BAG SAMPLE
◩ ... CHUNK SAMPLE
▼ ... WATER TABLE OR SEEPAGE

NOTE: THE LOG OF SUBSURFACE CONDITIONS SHOWN HEREON APPLIES ONLY AT THE SPECIFIC BORING OR TRENCH LOCATION AND AT THE DATE INDICATED. IT IS NOT WARRANTED TO BE REPRESENTATIVE OF SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND TIMES.

GEOCON

PROJECT NO. G1218-52-01

BORING B 58

ELEV. (MSL.) **1033'** DATE COMPLETED **11-22-2011**

EQUIPMENT **30" DIAMETER BUCKET RIG** BY: **P. THERIAULT**

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	MATERIAL DESCRIPTION	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
	B58-7 ■			SM		1	69.5	48.5
26								
					-Decrease in siltstone clasts (approximately 10%)			
28								
30								
	B58-8 ■					2	78.7	38.1
					-Trace gray sandy clay			
32								
					-6 inch thick yellow brown silty fine to medium sand			
					-8 inch thick brown sandy silt			
					-2 inch thick gray silty sand			
34								
					-6 inch thick brownish yellow silty sand			
					dense, moist, grayish brown, silty, fine to medium sand; some siltstone clasts			
	B58-9 ■					2	74.9	41.8
36								
38								
	B58-10 ☒							
					-Becomes dark brown; trace organics (roots up to 1-inch diameter)			
40								
	B58-11 ☐				-Several concretion clasts; no recovery	3		
42								
					-Becomes yellowish brown			
					-Becomes grayish brown			
44								
					-Becomes light grayish brown to yellowish brown			
	B58-12 ■			CL	Hard, moist, grayish brown, fine Sandy, CLAY	1	69.9	50.1
46								
				SM	Dense, moist, yellowish brown, Silty, fine to medium SAND			
48								
					-Some silstone clasts			

Figure A-58,
Log of Boring B 58, Page 2 of 3

G1218-52-01 (UPD-04-17-2012).GPJ

SAMPLE SYMBOLS

☐ ... SAMPLING UNSUCCESSFUL
◧ ... STANDARD PENETRATION TEST
■ ... DRIVE SAMPLE (UNDISTURBED)
☒ ... DISTURBED OR BAG SAMPLE
◪ ... CHUNK SAMPLE
▼ ... WATER TABLE OR SEEPAGE

PROJECT NO. G1218-52-01

BORING B 58

ELEV. (MSL.) **1033'** DATE COMPLETED **11-22-2011**

EQUIPMENT **30" DIAMETER BUCKET RIG** BY: **P. THERIAULT**

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	MATERIAL DESCRIPTION	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
50	B58-13					1	121.6	7.7
					-Becomes gray			
52								
				ML	Hard, moist, gray, fine Sandy, SILT			
54								
	B58-14					10	80.2	34.2
56					**PUENTE FORMATION-SOQUEL MEMBER (Tps)** Very dense, moist, brownish yellow, Silty, fine- to medium-grained SANDSTONE; trace of coarse-grained sand; moderately cemented; undulatory contact dips to the southwest			
58								
60					BORING TERMINATED AT 60 FEET No groundwater encounterd No caving Backfilled with a mix of cuttings and bentonite in accordance with Orange County Department of Environmental Health			

Figure A-58,
Log of Boring B 58, Page 3 of 3

G1218-52-01 (UPD-04-17-2012).GPJ

SAMPLE SYMBOLS			
	☐ ... SAMPLING UNSUCCESSFUL	◧ ... STANDARD PENETRATION TEST	■ ... DRIVE SAMPLE (UNDISTURBED)
	☒ ... DISTURBED OR BAG SAMPLE	◪ ... CHUNK SAMPLE	▼ ... WATER TABLE OR SEEPAGE

NOTE: THE LOG OF SUBSURFACE CONDITIONS SHOWN HEREON APPLIES ONLY AT THE SPECIFIC BORING OR TRENCH LOCATION AND AT THE DATE INDICATED. IT IS NOT WARRANTED TO BE REPRESENTATIVE OF SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND TIMES.

GEOCON

BORING B 59

ELEV. (MSL.) **1119'** DATE COMPLETED **11-14-2011**

EQUIPMENT **28"** BY: **P. THERIAULT**

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	MATERIAL DESCRIPTION	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
0				CL	**TOPSOIL** Stiff, damp, dark brown, fine to medium Sandy, CLAY; roots; surface grass			
2					**PUENTE FORMATION-YORBA MEMBER (Tpy)** Very stiff, damp, light grayish olive, fine-grained Sandy, SILTSTONE; laminated; blocky; fractures along and perpendicular to bedding; some reddish yellow staining; weathered			
4					-Bedding: N35W/31SW -Fracture; carbonate filled: N80E/V -Becomes unweathered, hard, moist, some carbonates			
6					-Bedding: N30W/30SW			
8								
10	B59-1				-Bedding: N55W/20SW -Concretion; very hard, 8 inches thick	7	110.2	15.2
12					-Bedding: N28W/25SW			
14					-Gypsum filled fracture along bedding -1 inch thick reddish yellow silty fine- to medium-grained sandstone layer -Contact: N35W/28SW			
16					-Fracture, gypsum filled, 1/4 inch thick: N20E/75NW			
18					-Several parallel fractures, gypsum filled, 1/8 to 1/4 inch thick: N58E/70NW			
20	B59-2				-Fracture; gypsum filled, along bedding, 1 1/2 inches thick: N39W/28SW -4 inch thick zone of increase in sand	4	94.7	25.6
22								
24					-Numerous gypsum filled fractures along varying strikes and dips -8 inch thick concretion			

Figure A-59,
Log of Boring B 59, Page 1 of 4

SAMPLE SYMBOLS

☐ ... SAMPLING UNSUCCESSFUL
◧ ... STANDARD PENETRATION TEST
■ ... DRIVE SAMPLE (UNDISTURBED)
☒ ... DISTURBED OR BAG SAMPLE
◩ ... CHUNK SAMPLE
▼ ... WATER TABLE OR SEEPAGE

PROJECT NO. G1218-52-01

BORING B 59

ELEV. (MSL.) **1119'** DATE COMPLETED **11-14-2011**

EQUIPMENT **28"** BY: **P. THERIAULT**

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	MATERIAL DESCRIPTION	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
26					-1/2 inch thick gypsum filled fracture along bedding, overlying 7 inch thick concretion: N27W/29SW			
28					-Increase in sand content			
30	■ B59-3					7	84.4	30.4
32								
34								
36					-Fracture: N4W/58NE			
38								
40	■ B59-4				-2 inch thick gray ash bed: N33W/24SW	9	97.8	21.9
42								
44								
46					-Fracture, gypsum filled, along bedding, 2 inches thick: N32W/30SW			
48								
					-Fracture, gypsum filled, along bedding, 1/2 inch thick: N34W/29SW			

Figure A-59,
Log of Boring B 59, Page 2 of 4

SAMPLE SYMBOLS

☐ ... SAMPLING UNSUCCESSFUL
◧ ... STANDARD PENETRATION TEST
■ ... DRIVE SAMPLE (UNDISTURBED)
▨ ... DISTURBED OR BAG SAMPLE
◩ ... CHUNK SAMPLE
▼ ... WATER TABLE OR SEEPAGE

NOTE: THE LOG OF SUBSURFACE CONDITIONS SHOWN HEREON APPLIES ONLY AT THE SPECIFIC BORING OR TRENCH LOCATION AND AT THE DATE INDICATED. IT IS NOT WARRANTED TO BE REPRESENTATIVE OF SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND TIMES.

PROJECT NO. G1218-52-01

BORING B 59

ELEV. (MSL.) **1119'** DATE COMPLETED **11-14-2011**

EQUIPMENT **28"** BY: **P. THERIAULT**

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	MATERIAL DESCRIPTION	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
50	B59-5				-Increase in moisture	4	70.9	45.4
52								
					BEDDING PLANE SHEAR remolded clay less than 1/4 inch thick: N41W/29SW **BEDDING PLANE SHEAR** remolded clay less than 1/4 inch thick: N40W/25SW			
54								
56								
58								
					PUENTE FORMATION-SOQUEL MEMBER (Tps) Very dense, moist, whitish light brown, Silty, fine- to medium-grained SANDSTONE; some coarse-grained sand; moderately cemented; micaceous; some reddish yellow staining; contact with overlying siltstone: N24W/20SW -Concretion, very dense, 8 inches thick			
60								
	B59-6						121.1	11.5
62					-Well cemented, difficult digging			
64								
					-6 inch thick yellowish light brown silty fine- to coarse-grained sanstone; contact: N30W/23SW			
66					-Becomes light gray; moderately cemented; micaceous; reddish yellow staining (spotted up to 1/4 inch diameter) -Slow advance, began using core barrel			
68								
					-Concretion Very dense, moist, light gray, fine- to medium-grained sandstone			
70								
72					Grades into a very dense, moist, yellowish light brown, fine to coarse-grained sandstone; well cemented; gradation occurs over 2 inches			
74								

Figure A-59,
Log of Boring B 59, Page 3 of 4

G1218-52-01 (UPD-04-17-2012).GPJ

SAMPLE SYMBOLS

☐ ... SAMPLING UNSUCCESSFUL
◧ ... STANDARD PENETRATION TEST
■ ... DRIVE SAMPLE (UNDISTURBED)
☒ ... DISTURBED OR BAG SAMPLE
◪ ... CHUNK SAMPLE
▼ ... WATER TABLE OR SEEPAGE

NOTE: THE LOG OF SUBSURFACE CONDITIONS SHOWN HEREON APPLIES ONLY AT THE SPECIFIC BORING OR TRENCH LOCATION AND AT THE DATE INDICATED. IT IS NOT WARRANTED TO BE REPRESENTATIVE OF SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND TIMES.

GEOCON

PROJECT NO. G1218-52-01

BORING B 59

ELEV. (MSL.) 1119' DATE COMPLETED 11-14-2011

EQUIPMENT 28" BY: P. THERIAULT

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	MATERIAL DESCRIPTION	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
76								
					-Fracture; iron stained: N10E/75SE -Trace brown siltstone rip up clasts			
78								
					-Increase in coarse sand			
80	B59-7 ■				-Sampler bouncing, partial return		119.0	5.5
82								
					-Sharp contact with very dense, moist, light brown, silty, fine- to medium-grained sandstone: NS/15W			
84								
86								
88					BORING TERMINATED AT 88 FEET (REFUSAL) No groundwater encounterd No caving Backfilled with a mix of cuttings and bentonite in accordance with Orange County Department of Environmental Health			

Figure A-59,
Log of Boring B 59, Page 4 of 4

G1218-52-01 (UPD-04-17-2012).GPJ

SAMPLE SYMBOLS			
	☐ ... SAMPLING UNSUCCESSFUL	◧ ... STANDARD PENETRATION TEST	■ ... DRIVE SAMPLE (UNDISTURBED)
	☒ ... DISTURBED OR BAG SAMPLE	◪ ... CHUNK SAMPLE	▼ ... WATER TABLE OR SEEPAGE

NOTE: THE LOG OF SUBSURFACE CONDITIONS SHOWN HEREON APPLIES ONLY AT THE SPECIFIC BORING OR TRENCH LOCATION AND AT THE DATE INDICATED. IT IS NOT WARRANTED TO BE REPRESENTATIVE OF SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND TIMES.

GEOCON

PROJECT NO. G1218-52-01

BORING B 60

ELEV. (MSL.) 1022' DATE COMPLETED 11-11-2011

EQUIPMENT 28" BY: P. THERIAULT

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	MATERIAL DESCRIPTION	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
0				SM	**ENGINEERED ARTIFICIAL FILL (afe)** Medium dense, damp, yellowish brown, Silty, fine to coarse SAND; micaceous; roots; grass and shrubs at surface -14 inch diameter boulder			
2					-Becomes moist			
4								
	■ B60-1			ML	Hard, moist, mottled olive and yellowish red, fine to medium Sandy, SILT, with clay; partial return	2	112.3	12.7
6								
				CL	Very stiff, moist, dark brown, CLAY; some fine to medium sand			
8								
				SM	Dense, moist, yellow, Silty, fine to coarse SAND			
10	■ B60-2						127.1	10.2
	☒ B60-3					3		
					-Some cobble sized clasts			
12				CL	Very stiff, moist, brown, fine Sandy, CLAY			
				SM	Dense, moist, yellowish brown, Silty, fine to medium SAND			
14								
	■ B60-4			ML	Hard, moist, yellowish red and olive, fine Sandy, SILT	2	106.3	18.2
16	☒ B60-5							
					-Some cobbles (up to 10 inch diameter) to 19 feet			
18				SM	Dense, moist, yellowish brown, Silty, fine to coarse SAND			
20	■ B60-6					2	106.2	17.4
					PUENTE FORMATION-SOQUEL MEMBER (Tsp-slt) Hard, moist, light gray, fine-grained Sandy, SILTSTONE; trace yellowish red staining; some carbonate filled fractures -Bedding: N30W/22SW			
22								
24								

Figure A-60,
Log of Boring B 60, Page 1 of 2

G1218-52-01 (UPD-04-17-2012).GPJ

SAMPLE SYMBOLS			
	☐ ... SAMPLING UNSUCCESSFUL	◧ ... STANDARD PENETRATION TEST	■ ... DRIVE SAMPLE (UNDISTURBED)
	☒ ... DISTURBED OR BAG SAMPLE	◪ ... CHUNK SAMPLE	▼ ... WATER TABLE OR SEEPAGE

NOTE: THE LOG OF SUBSURFACE CONDITIONS SHOWN HEREON APPLIES ONLY AT THE SPECIFIC BORING OR TRENCH LOCATION AND AT THE DATE INDICATED. IT IS NOT WARRANTED TO BE REPRESENTATIVE OF SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND TIMES.

GEOCON

PROJECT NO. G1218-52-01

BORING B 60

ELEV. (MSL.) **1022'** DATE COMPLETED **11-11-2011**

EQUIPMENT **28"** BY: **P. THERIAULT**

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	MATERIAL DESCRIPTION	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
	B60-7 ■					5	104.7	18.4
26								
28					BORING TERMINATED AT 28 FEET No groundwater encounterd No caving Backfilled with a mix of cuttings and bentonite in accordance with Orange County Department of Environmental Health			

Figure A-60,
Log of Boring B 60, Page 2 of 2

G1218-52-01 (UPD-04-17-2012).GPJ

SAMPLE SYMBOLS			
	☐ ... SAMPLING UNSUCCESSFUL	◧ ... STANDARD PENETRATION TEST	■ ... DRIVE SAMPLE (UNDISTURBED)
	▨ ... DISTURBED OR BAG SAMPLE	◪ ... CHUNK SAMPLE	▼ ... WATER TABLE OR SEEPAGE

NOTE: THE LOG OF SUBSURFACE CONDITIONS SHOWN HEREON APPLIES ONLY AT THE SPECIFIC BORING OR TRENCH LOCATION AND AT THE DATE INDICATED. IT IS NOT WARRANTED TO BE REPRESENTATIVE OF SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND TIMES.

GEOCON

PROJECT NO. G1218-52-01

BORING B 61

ELEV. (MSL.) **1032'** DATE COMPLETED **11-11-2011**

EQUIPMENT **28"** BY: **P. THERIAULT**

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	MATERIAL DESCRIPTION	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
0				SM	**ENGINEERED ARTFICIAL FILL (afe)** Medium dense, moist, yellowish brown, Silty, fine to coarse SAND; trace gravel; some well cemented sandstone clasts; some roots; grass and shrubs on surface; krotovina			
2								
				ML	Very stiff, moist, gray, fine to medium Sandy, SILT			
4				SM	Dense, moist, yellowish brown, Silty, fine to medium SAND			
	B61-1 B61-2				-Some brown silt	1	105.1	20.1
6								
8				ML	Very stiff, moist, brown, fine to medium Sandy, SILT			
10	B61-3				-Becomes dark brown	1	94.9	18.3
				SM	Medium dense, moist, yellowish brown, Silty, fine to medium SAND			
12				ML	Very stiff, moist, grayish brown, fine to medium Sandy, SILT			
14				SM	Dense, moist, yellowish brown, Silty, fine to medium SAND			
	B61-4				-14 inch diamter boulder	2	115.5	15.8
16								
18								
					-Cobble layer 1 foot thick (up to 8 inch diameter)			
20	B61-5					5	119.2	12.2
22								
					-Increase in silt content			
24								

Figure A-61,
Log of Boring B 61, Page 1 of 4

G1218-52-01 (UPD-04-17-2012).GPJ

SAMPLE SYMBOLS
☐ ... SAMPLING UNSUCCESSFUL
◧ ... STANDARD PENETRATION TEST
■ ... DRIVE SAMPLE (UNDISTURBED)
☒ ... DISTURBED OR BAG SAMPLE
◩ ... CHUNK SAMPLE
▼ ... WATER TABLE OR SEEPAGE

NOTE: THE LOG OF SUBSURFACE CONDITIONS SHOWN HEREON APPLIES ONLY AT THE SPECIFIC BORING OR TRENCH LOCATION AND AT THE DATE INDICATED. IT IS NOT WARRANTED TO BE REPRESENTATIVE OF SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND TIMES.

GEOCON

PROJECT NO. G1218-52-01

BORING B 61

ELEV. (MSL.) **1032'** DATE COMPLETED **11-11-2011**

EQUIPMENT **28"** BY: **P. THERIAULT**

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	MATERIAL DESCRIPTION	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
	B61-6 ■				-Becomes brown	1	103.5	18.7
26								
28								
30	B61-7 ■			ML	Hard, moist, grayish brown, fine to medium Sandy, SILT	2	105.3	18.4
32	B61-8 ⊠							
34					-Cobble layer 6 inches thick (up to 6 inch diameter) -6 inch thick yellowish brown silty sand layer			
	B61-9 ■				-Becomes gray, fine sandy silt	3	80.3	33.8
36								
38					-Becomes grayish brown			
40	B61-10 ■					3	89.4	28.8
42								
					-Increase in sand content			
44								
	B61-11 ■					2	77.2	34.6
46								
48								
					-4 inch thick yellowish brown, silty, fine to coarse sand			

Figure A-61,
Log of Boring B 61, Page 2 of 4

G1218-52-01 (UPD-04-17-2012).GPJ

SAMPLE SYMBOLS
☐ ... SAMPLING UNSUCCESSFUL
◧ ... STANDARD PENETRATION TEST
■ ... DRIVE SAMPLE (UNDISTURBED)
⊠ ... DISTURBED OR BAG SAMPLE
◪ ... CHUNK SAMPLE
▼ ... WATER TABLE OR SEEPAGE

NOTE: THE LOG OF SUBSURFACE CONDITIONS SHOWN HEREON APPLIES ONLY AT THE SPECIFIC BORING OR TRENCH LOCATION AND AT THE DATE INDICATED. IT IS NOT WARRANTED TO BE REPRESENTATIVE OF SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND TIMES.

GEOCON

PROJECT NO. G1218-52-01

BORING B 61

ELEV. (MSL.) **1032'** DATE COMPLETED **11-11-2011**

EQUIPMENT **28"** BY: **P. THERIAULT**

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	MATERIAL DESCRIPTION	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
50	B61-12				-Becomes gray	3	75.0	39.9
52								
54								
	B61-13				-Some gray siltstone clasts (up to 4 inches in diameter)	6	97.6	17.4
56								
58								
					-6 inch thick yellowish brown, silty, fine to coarse sand			
60	B61-14					5	113.1	13.4
				SM	Dense, moist, brown, Silty, fine to medium SAND; trace clay			
62								
					-6 inch thick yellowish brown, silty fine to coarse sand			
64					-Debris (single sand bag)			
	B61-15					6	107.0	16.1
66								
					-6 inch thick yellowish brown, silty fine to coarse sand			
68					-Becomes grayish light brown			
					-Trace cobbles			
70	B61-16					5	99.8	20.6
72								
74								

Figure A-61,
Log of Boring B 61, Page 3 of 4

G1218-52-01 (UPD-04-17-2012).GPJ

SAMPLE SYMBOLS			
	☐ ... SAMPLING UNSUCCESSFUL	◧ ... STANDARD PENETRATION TEST	■ ... DRIVE SAMPLE (UNDISTURBED)
	☒ ... DISTURBED OR BAG SAMPLE	◪ ... CHUNK SAMPLE	▼ ... WATER TABLE OR SEEPAGE

NOTE: THE LOG OF SUBSURFACE CONDITIONS SHOWN HEREON APPLIES ONLY AT THE SPECIFIC BORING OR TRENCH LOCATION AND AT THE DATE INDICATED. IT IS NOT WARRANTED TO BE REPRESENTATIVE OF SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND TIMES.

PROJECT NO. G1218-52-01

BORING B 61

ELEV. (MSL.) **1032'** DATE COMPLETED **11-11-2011**

EQUIPMENT **28"** BY: **P. THERIAULT**

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	MATERIAL DESCRIPTION	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
	B61-17				-Becomes brown	9	126.4	8.3
76								
					-Some brown fine sandy silt			
78								
80	B61-18					3	96.5	24.5
82								
84								
	B61-19					9	117.2	6.6
86								
88					**PUENTE FORMATION-SOQUEL MEMBER (Tps)** Very dense, damp, yellowish light brown, Silty, fine- to medium-grained SANDSTONE; micaceous			
90					BORING TERMINATED AT 90 FEET No groundwater encounterd No caving Backfilled with a mix of cuttings and bentonite in accordance with Orange County Department of Environmental Health			

Figure A-61,
Log of Boring B 61, Page 4 of 4

G1218-52-01 (UPD-04-17-2012).GPJ

SAMPLE SYMBOLS

☐ ... SAMPLING UNSUCCESSFUL
◧ ... STANDARD PENETRATION TEST
■ ... DRIVE SAMPLE (UNDISTURBED)
☒ ... DISTURBED OR BAG SAMPLE
◪ ... CHUNK SAMPLE
▼ ... WATER TABLE OR SEEPAGE

NOTE: THE LOG OF SUBSURFACE CONDITIONS SHOWN HEREON APPLIES ONLY AT THE SPECIFIC BORING OR TRENCH LOCATION AND AT THE DATE INDICATED. IT IS NOT WARRANTED TO BE REPRESENTATIVE OF SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND TIMES.

GEOCON

PROJECT NO. G1218-52-01

BORING B 62

ELEV. (MSL.) **1051'** DATE COMPLETED **11-10-2011**

EQUIPMENT **28"** BY: **P. THERIAULT**

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	MATERIAL DESCRIPTION	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
0				SM	**ENGINEERED ARTIFICIAL FILL (afe)** Medium dense, damp, light grayish brown, Silty, fine to coarse SAND; some boulders in upper 2 feet; some boulders and concrete debris at surface			
2					-Some debris (sand bags)			
					-Becomes yellowish red, moist, silty, fine to medium sand; some clasts of gray siltstone			
4								
	B62-1 ■				-Some yellow, fine sandy clay	2	101.0	23.3
6								
					-Few boulders (up to 14 inch diameter)			
8				ML	Very stiff, moist, gray, fine to medium Sandy, SILT			
				SM	Dense, moist, yellow, Silty, fine to medium SAND			
				ML	Very stiff, moist, gray, fine Sandy, SILT -Some yellow sand			
10	B62-2 ■			SC	Dense, moist, yellowish brown, Clayey, fine to medium SAND	1	83.6	37.9
12					-Some gray silt			
	B62-3 ☒			CL	Very stiff, moist, gray, fine Sandy, CLAY; some silt			
14								
	B62-4 ■					1	82.5	35.0
16					-Decrease in silt; trace cobbles			
18					-4 inch thick yellow, silty, fine to medium sand			
20	B62-5 ■				-Becomes yellowish brown	1	92.7	29.7
22								
				SM	Dense, moist, yellowish brown, Silty, fine to medium SAND; some clay			
24					Very stiff, moist, brown, fine to medium Sandy, SILT			

Figure A-62,
Log of Boring B 62, Page 1 of 2

G1218-52-01 (UPD-04-17-2012).GPJ

SAMPLE SYMBOLS			
	☐ ... SAMPLING UNSUCCESSFUL	◧ ... STANDARD PENETRATION TEST	■ ... DRIVE SAMPLE (UNDISTURBED)
	☒ ... DISTURBED OR BAG SAMPLE	◪ ... CHUNK SAMPLE	▼ ... WATER TABLE OR SEEPAGE

NOTE: THE LOG OF SUBSURFACE CONDITIONS SHOWN HEREON APPLIES ONLY AT THE SPECIFIC BORING OR TRENCH LOCATION AND AT THE DATE INDICATED. IT IS NOT WARRANTED TO BE REPRESENTATIVE OF SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND TIMES.

GEOCON

PROJECT NO. G1218-52-01

BORING B 62

ELEV. (MSL.) **1051'** DATE COMPLETED **11-10-2011**

EQUIPMENT **28"** BY: **P. THERIAULT**

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	MATERIAL DESCRIPTION	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
	B62-6					1	94.0	27.1
26								
	B62-7							
28								
30	B62-8					2	84.2	28.8
32								
34								
	B62-9			SM	Dense, moist, light brown to brown, Silty, fine to medium SAND	2	107.8	11.0
36								
38								
40	B62-10				**PUENTE FORMATION-SOQUEL MEMBER (Tps)** Very dense, moist, light yellowish brown, Silty, fine- to medium-grained SANDSTONE; moderately cemented	15/9"		
42								
					-Becomes well cemented			
44								

BORING TERMINATED AT 45 FEET
No groundwater encounterd
No caving
Backfilled with a mix of cuttings and bentonite in accordance with Orange County Department of Environmental Health

Figure A-62,
Log of Boring B 62, Page 2 of 2

G1218-52-01 (UPD-04-17-2012).GPJ

SAMPLE SYMBOLS			
	☐ ... SAMPLING UNSUCCESSFUL	◧ ... STANDARD PENETRATION TEST	■ ... DRIVE SAMPLE (UNDISTURBED)
	☒ ... DISTURBED OR BAG SAMPLE	◪ ... CHUNK SAMPLE	▼ ... WATER TABLE OR SEEPAGE

NOTE: THE LOG OF SUBSURFACE CONDITIONS SHOWN HEREON APPLIES ONLY AT THE SPECIFIC BORING OR TRENCH LOCATION AND AT THE DATE INDICATED. IT IS NOT WARRANTED TO BE REPRESENTATIVE OF SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND TIMES.

BORING B 63

ELEV. (MSL.) **1028'** DATE COMPLETED **11-02-2011**

EQUIPMENT **28"** BY: **P. THERIAULT**

DEPTH IN FEET	SAMPLE NO.	SOIL CLASS (USCS)	MATERIAL DESCRIPTION	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
0		CL	**TOPSOIL** Stiff, dry, dark brown, fine to medium Sandy, CLAY; moderately blocky structure, roots; krotovina			
2			**PUENTE FORMATION-SOQUEL MEMBER (Tps-slt)** Very stiff, moist, yellowish olive, fine-grained Sandy, SILTSTONE; moderately indurated; some minor sandy interbeds; some gypsum crystals; upper 3 feet weathered			
4			-Bedding: N12W/18S			
6	☒ B63-1		-10 inch thick concretion			
8			-Predominately gray siltstone with some fine-grained sand			
10	■ B63-2			4	102.5	22.5
12						
14			Dense, moist, light gray with some pale yellow mottling, Silty, fine-grained SANDSTONE; uncemented; undulatory north dipping upper contact; chaotic lower contact with some siltstone rip-up clasts			
16			Very stiff, moist, fine-grained Sandy, SILTSTONE; well indurated; some gypsum filled fractues; some reddish yellow staining; sharp contact with overlying sandstone below rip up clasts: N40E/17NW			
18			Dense, moist, light gray with some pale yellow, Silty, fine-grained SANDSTONE; uncemented; chaotic contact			
			Very stiff, moist, gray, fine-grained Sandy, SILTSTONE; well indurated; some gypsum filled fractues; some reddish yellow staining -Increase in amount of staining; increase in fracture frequency			
20	■ B63-3			4	106.3	19.9
22						
24						

Figure A-63,
Log of Boring B 63, Page 1 of 4

G1218-52-01 (UPD-04-17-2012).GPJ

SAMPLE SYMBOLS
- ☐ ... SAMPLING UNSUCCESSFUL
- ◧ ... STANDARD PENETRATION TEST
- ■ ... DRIVE SAMPLE (UNDISTURBED)
- ☒ ... DISTURBED OR BAG SAMPLE
- ◩ ... CHUNK SAMPLE
- ▼ ... WATER TABLE OR SEEPAGE

PROJECT NO. G1218-52-01

BORING B 63

ELEV. (MSL.) 1028' DATE COMPLETED 11-02-2011

EQUIPMENT 28" BY: P. THERIAULT

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	MATERIAL DESCRIPTION	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
26								
28								
30	B63-4					9	107.9	19.6
32								
					-Fracture: N13E/69NW			
34								
36					-Bedding: N8E/15NW			
38								
40	B63-5				-Gray remolded clay 1/4 inch thick with some gypum crystals: N10W/21S	11		
42								
44								
					-2 inch thick, pale yellow, silty fine-grained sandstone; some flame structures visible at contact with underlying siltstone: N13W/18S			
46								
					-13 inch thick, pale yellow, silty fine- to coarse-grained sandstone: N10W/17S			
48								

**Figure A-63,
Log of Boring B 63, Page 2 of 4**

G1218-52-01 (UPD-04-17-2012).GPJ

SAMPLE SYMBOLS

☐ ... SAMPLING UNSUCCESSFUL
☒ ... DISTURBED OR BAG SAMPLE
◧ ... STANDARD PENETRATION TEST
◩ ... CHUNK SAMPLE
■ ... DRIVE SAMPLE (UNDISTURBED)
▼ ... WATER TABLE OR SEEPAGE

NOTE: THE LOG OF SUBSURFACE CONDITIONS SHOWN HEREON APPLIES ONLY AT THE SPECIFIC BORING OR TRENCH LOCATION AND AT THE DATE INDICATED. IT IS NOT WARRANTED TO BE REPRESENTATIVE OF SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND TIMES.

GEOCON

PROJECT NO. G1218-52-01

BORING B 63

ELEV. (MSL.) **1028'** DATE COMPLETED **11-02-2011**

EQUIPMENT **28"** BY: **P. THERIAULT**

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	MATERIAL DESCRIPTION	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
50	■ B63-6					7	109.3	6.5
					-24 inch thick, pale yellow, damp, silty, fine- to coarse-grained sandstone; micaceous; uncemented; some olive siltstone rip-up clasts; contact with underlying siltstone: N13W/16S			
52					-Becomes olive, fine-grained sandy, siltstone; some iron staining			
					BEDDING PLAN SHEAR 1/4 inch thick, gray, remolded clay: N10W/10S -Becomes gray; laminated; white film along bedding surfaces; fossiliferous			
54								
56								
58								
60	☐ B63-7				-No recovery	20/10"		
					-Fracture, gypsum filled : N60W/70S			
62								
					BEDDING PLANE SHEAR 1/2 inch thick, gray remoled clay: N20W/14S			
64					**BEDDING PLANE SHEAR** 1/2 inch thick, gray remolded clay : N22W/12S			
66								
68								
70	☐ B63-8				-No recovery	20/9"		
					BEDDING PLANE SHEAR 1/8 inch thick gray remolded clay: N22W/16S			
72					**BEDDING PLANE SHEAR** 1/8 inch thick gray remolded clay: N24W/16S			
					BEDDING PLANE SHEAR 1/4 inch thick gray remolded clay: N30W/15S			
74								

Figure A-63,
Log of Boring B 63, Page 3 of 4

SAMPLE SYMBOLS

☐ ... SAMPLING UNSUCCESSFUL
◧ ... STANDARD PENETRATION TEST
■ ... DRIVE SAMPLE (UNDISTURBED)
⊠ ... DISTURBED OR BAG SAMPLE
◪ ... CHUNK SAMPLE
▼ ... WATER TABLE OR SEEPAGE

NOTE: THE LOG OF SUBSURFACE CONDITIONS SHOWN HEREON APPLIES ONLY AT THE SPECIFIC BORING OR TRENCH LOCATION AND AT THE DATE INDICATED. IT IS NOT WARRANTED TO BE REPRESENTATIVE OF SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND TIMES.

GEOCON

PROJECT NO. G1218-52-01

BORING B 63

ELEV. (MSL.) **1028'** DATE COMPLETED **11-02-2011**

EQUIPMENT **28"** BY: **P. THERIAULT**

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	MATERIAL DESCRIPTION	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
76					**BEDDING PLANE SHEAR** 1/8 inch thick gray remolded clay: N24W/22S			
78								
80	B63-9 ■					20	82.1	33.2

BORING TERMINATED AT 81 FEET
No groundwater encounterd
No caving
Backfilled with a mix of cuttings and bentonite in accordance with Orange County Department of Environmental Health

Figure A-63,
Log of Boring B 63, Page 4 of 4

SAMPLE SYMBOLS

☐ ... SAMPLING UNSUCCESSFUL	◧ ... STANDARD PENETRATION TEST	■ ... DRIVE SAMPLE (UNDISTURBED)
☒ ... DISTURBED OR BAG SAMPLE	◪ ... CHUNK SAMPLE	▼ ... WATER TABLE OR SEEPAGE

NOTE: THE LOG OF SUBSURFACE CONDITIONS SHOWN HEREON APPLIES ONLY AT THE SPECIFIC BORING OR TRENCH LOCATION AND AT THE DATE INDICATED. IT IS NOT WARRANTED TO BE REPRESENTATIVE OF SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND TIMES.

GEOCON

PROJECT NO. G1218-52-01

BORING B 64

ELEV. (MSL.) **985'** DATE COMPLETED **11/3-11/07/11**

EQUIPMENT **28"** BY: **P. THERIAULT**

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	MATERIAL DESCRIPTION	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
0	B64-1 ☒			CL	**TOPSOIL** Stiff, damp, dark brown, fine to medium Sandy, CLAY; roots; krotovina; surface grass and shrubs			
2					**PUENTE FORMATION-SOQUEL MEMBER (Tps-slt)** Very stiff, moist, olive with some reddish yellow staining, fine-grained Sandy, SILTSTONE; weathered to 5 feet; trace carbonates			
8					-Fracture, gypsum filled: subhorizontal -Fracture, gypsum filled: N8W/43SW			
10	B64-2 ■					2	102.1	21.1
11					-Bedding: N15W/10S			
12					-Some discontinuous sand lenses, approximately 1/2 inch thick			
15					-4 inch thick, dense, moist, light brown, Silty, fine- to medium-grained SANDSTONE; sharp contact with underlying siltstone: N60E/10S			
16					-Interbeds of approximately 4 inch thick siltstone and sandstone continue to 17 feet 2 inches. Bedding within sandstone: N30W/15S			
17					Grayish olive, fine-grained Sandy, SILTSTONE; laminated; some reddish yellow staining; trace clay. Contact with overlying sandstone: N43W/10S			
20	B64-3 ■					8	114.3	15.9
24					-Bedding: N30E/15S -Thin, reddish yellow stained fractue: N64W/75S			

Figure A-64,
Log of Boring B 64, Page 1 of 4

G1218-52-01 (UPD-04-17-2012).GPJ

SAMPLE SYMBOLS			
	☐ ... SAMPLING UNSUCCESSFUL	◧ ... STANDARD PENETRATION TEST	■ ... DRIVE SAMPLE (UNDISTURBED)
	☒ ... DISTURBED OR BAG SAMPLE	◪ ... CHUNK SAMPLE	▼ ... WATER TABLE OR SEEPAGE

NOTE: THE LOG OF SUBSURFACE CONDITIONS SHOWN HEREON APPLIES ONLY AT THE SPECIFIC BORING OR TRENCH LOCATION AND AT THE DATE INDICATED. IT IS NOT WARRANTED TO BE REPRESENTATIVE OF SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND TIMES.

GEOCON

PROJECT NO. G1218-52-01

BORING B 64

ELEV. (MSL.) **985'** DATE COMPLETED **11/3-11/07/11**

EQUIPMENT **28"** BY: **P. THERIAULT**

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	MATERIAL DESCRIPTION	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
					-Thin, reddish yellow stained fractue: N90W/55S			
26					-Thin, shallow undulatory southwest dipping gypsum filled fracture			
					BEDDING PLANE SHEAR Gray remolded clay 1/4 inch thick: N40E/7N			
28								
30	B64-4					7	108.7	19.5
					-Iron stained fracture: N40E/75N			
32								
					-Bedding on olive siltstone: N45E/12N			
34					-Slight increase in fine-grained sand			
					-Some undulatory gypsum-filled fractures			
36								
					-Decrease in sand			
38					-Bedding: N20E/15NW			
40	B64-5				**BEDDING PLANE SHEAR** gray remolded clay: N30E/13N -Fracture: N30W/V	8	98.9	24.3
42								
44								
46								
48								
					Bedding: N20E/14N			

Figure A-64,
Log of Boring B 64, Page 2 of 4

G1218-52-01 (UPD-04-17-2012).GPJ

SAMPLE SYMBOLS

☐ ... SAMPLING UNSUCCESSFUL
◧ ... STANDARD PENETRATION TEST
■ ... DRIVE SAMPLE (UNDISTURBED)
☒ ... DISTURBED OR BAG SAMPLE
◩ ... CHUNK SAMPLE
▼ ... WATER TABLE OR SEEPAGE

PROJECT NO. G1218-52-01

BORING B 64

ELEV. (MSL.) **985'** DATE COMPLETED **11/3-11/07/11**

EQUIPMENT **28"** BY: **P. THERIAULT**

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	MATERIAL DESCRIPTION	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
50					-Very well indurated, no recovery (samler bouncing)			
					-Concretion, 1 foot thick			
52					-Bedding: N20E/7N			
54					-6 inch thich sandstone layer -Common sand filled worm burrows, up 3/4 inch diameter			
56								
58					-18 inch thick sand layer. Contact with overlying siltstone: N40E/15N			
					-Fracture: N78W/75S			
60	B64-6					10	72.7	45.1
62					-Ash layer, 2 inches thick, light gray, moist. Contact with overlying siltstone: N30E/10N -Moist to wet, olive, fine-grained sandy, siltstone; laminated -8 inch thick, dark brown siltstone			
64					-3 inch thick, silty fine- to medium-grained sandstone. Contact with overlying siltstone: N30E/17N -Becomes dark brown siltstone			
66								
68					-Becomes olive with reddish yellow staining, fine-grained sandy siltstone			
					Dense, moist, light brown, Silty, fine- to medium-grained SANDSTONE. Contact with overlying siltstone: N30E/8N			
70	B64-7				-some interbeds of siltstone up to 2 inches thick	15/10"	115.6	12.8
72								
74					Hard, moist, olive with some reddish yellow staining, fine-grained Sandy SILTSTONE; few sand-filled worm burrows up to 1/2 inch diameter.			

Figure A-64,
Log of Boring B 64, Page 3 of 4

G1218-52-01 (UPD-04-17-2012).GPJ

SAMPLE SYMBOLS

☐ ... SAMPLING UNSUCCESSFUL
◧ ... STANDARD PENETRATION TEST
■ ... DRIVE SAMPLE (UNDISTURBED)
☒ ... DISTURBED OR BAG SAMPLE
◩ ... CHUNK SAMPLE
▼ ... WATER TABLE OR SEEPAGE

NOTE: THE LOG OF SUBSURFACE CONDITIONS SHOWN HEREON APPLIES ONLY AT THE SPECIFIC BORING OR TRENCH LOCATION AND AT THE DATE INDICATED. IT IS NOT WARRANTED TO BE REPRESENTATIVE OF SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND TIMES.

GEOCON

PROJECT NO. G1218-52-01

BORING B 64

ELEV. (MSL.) **985'** DATE COMPLETED **11/3-11/07/11**

EQUIPMENT **28"** BY: **P. THERIAULT**

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	MATERIAL DESCRIPTION	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
76								
					-3 inch thick pale yellow sandstone -Becomes dark brown siltstone			
78								
					-Becomes gray			
80	B64-8 ■					20/10"	100.2	19.2
					BORING TERMINATED AT 81 FEET No groundwater encounterd No caving Backfilled with a mix of cuttings and bentonite in accordance with Orange County Department of Environmental Health			

Figure A-64,
Log of Boring B 64, Page 4 of 4

G1218-52-01 (UPD-04-17-2012).GPJ

SAMPLE SYMBOLS			
	☐ ... SAMPLING UNSUCCESSFUL	◧ ... STANDARD PENETRATION TEST	■ ... DRIVE SAMPLE (UNDISTURBED)
	☒ ... DISTURBED OR BAG SAMPLE	◪ ... CHUNK SAMPLE	▼ ... WATER TABLE OR SEEPAGE

NOTE: THE LOG OF SUBSURFACE CONDITIONS SHOWN HEREON APPLIES ONLY AT THE SPECIFIC BORING OR TRENCH LOCATION AND AT THE DATE INDICATED. IT IS NOT WARRANTED TO BE REPRESENTATIVE OF SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND TIMES.

GEOCON

PROJECT NO. G1218-52-01

BORING B 65

ELEV. (MSL.) 977' DATE COMPLETED 11/07-11/08/2011

EQUIPMENT 28" BY: P. THERIAULT

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	MATERIAL DESCRIPTION	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
0				CL/S	**TOPSOIL** Stiff, moist, dark brown, fine to medium, Sandy, CLAY; some coarse sand; roots; surface grass and shrubs; krotovina			
2								
					PUENTE FORMATION SOQUEL MEMBER (Tsp-slt) Stiff, moist, light gray, fine-grained Sandy SILTSTONE; weathered to 5 feet			
4								
					-Some carbonate filled fractures; some iron stained fractures			
6					-Some olive, fine sandy siltstone approximately 6 inches thick, interbedded with gray, fine-grained sandy siltstone approximately 2 inches thick. Bedding: N50E/11NW			
8								
10	B65-1	■				2	101.2	23.7
12								
					-Trace carbonate nodules, up to 1/16 inch thick; trace fossils (scales and scale imprints)			
14								
					Olive siltstone grades into gray clayey siltstone grades into reddish yellow fine-grained sandy siltstone Concretion, 1 inch thick			
16					**BEDDING PLANE SHEAR** Olive remolded clay, 1/16 inch thick: N30E/17NW -Becomes olive gray, fine-grained sandy siltstone; some reddish yellow staining			
18					-Decrease in staining			
20	B65-2	■			-Becomes laminated -1/4 inch thick gypsum-filled fracture (only on northeast part of boring)	4	98.9	25.3
22					-5 inch thick sand layer, contains siltstone rip up clasts. Contact is undulatory			
24					Very dense, moist, pale yellowish light brown, Silty, fine- to medium-grained SANDSTONE; weakly cemented; some reddish yellow staining; some dark			

Figure A-65,
Log of Boring B 65, Page 1 of 5

G1218-52-01 (UPD-04-17-2012).GPJ

SAMPLE SYMBOLS

☐ ... SAMPLING UNSUCCESSFUL
◧ ... STANDARD PENETRATION TEST
■ ... DRIVE SAMPLE (UNDISTURBED)
☒ ... DISTURBED OR BAG SAMPLE
◪ ... CHUNK SAMPLE
▼ ... WATER TABLE OR SEEPAGE

NOTE: THE LOG OF SUBSURFACE CONDITIONS SHOWN HEREON APPLIES ONLY AT THE SPECIFIC BORING OR TRENCH LOCATION AND AT THE DATE INDICATED. IT IS NOT WARRANTED TO BE REPRESENTATIVE OF SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND TIMES.

GEOCON

BORING B 65

ELEV. (MSL.) **977'** DATE COMPLETED **11/07-11/08/2011**

EQUIPMENT **28"** BY: **P. THERIAULT**

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	MATERIAL DESCRIPTION	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
26					red sandy nodules (possibly Mg) up to 1 inch in diameter; micaceous. Conact with overlying siltstone: N56E/11NW -6 inch thick zone of chaotic siltstone rip up clasts within the sandstone			
28								
					-Trace siltstone rip up clasts			
30	B65-3					6	103.0	20.0
					-Some claystone rip up clasts; continue to 34 feet			
32								
34								
36					Hard, moist, gray, fine-grained Sandy, SILTSTONE. Contact with overlying sandstone: N12E/13NW -Becomes laminated; some reddish yellow staining			
38								
					-Increase in fine-grained sand			
40	B65-4					4	98.1	24.9
					-1/4 inch thick gypsum filled fracture, parallel to bedding			
					-Concretion, 3 inches thick; only in southwest portion of boring			
42								
					-8 inch thick dense, moist, pale yellow, Silty, fine- to medium-grained SANDSTONE. Contact with overlying siltstone: N18E/13NW			
44					-Hard, moist, gray, SILTSTONE; gradational contact with overlying sansdstone; some sandy interbeds at approximately 6 inch spacing; some gypsum along bedding planes in the siltstone			
46								
					20 inch thick brown siltstone			
48								
					Gray siltstone lense, up to 2 inches thick in northwest portion of boring, pinches out laterally; some polished clay films on parting surfaces -Becomes brown siltstone			

Figure A-65,
Log of Boring B 65, Page 2 of 5

G1218-52-01 (UPD-04-17-2012).GPJ

SAMPLE SYMBOLS	☐ ... SAMPLING UNSUCCESSFUL	◧ ... STANDARD PENETRATION TEST	■ ... DRIVE SAMPLE (UNDISTURBED)
	⊠ ... DISTURBED OR BAG SAMPLE	◩ ... CHUNK SAMPLE	▼ ... WATER TABLE OR SEEPAGE

NOTE: THE LOG OF SUBSURFACE CONDITIONS SHOWN HEREON APPLIES ONLY AT THE SPECIFIC BORING OR TRENCH LOCATION AND AT THE DATE INDICATED. IT IS NOT WARRANTED TO BE REPRESENTATIVE OF SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND TIMES.

GEOCON

BORING B 65

ELEV. (MSL.) 977' DATE COMPLETED 11/07-11/08/2011

EQUIPMENT 28" BY: P. THERIAULT

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	MATERIAL DESCRIPTION	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
50	B65-5				-Concretion, 4 inches thick -Gray, fine sandy siltstone	8	107.4	17.3
52					-Becomes dark brown, then gray, then reddish yellow, then gypsum, then reddish yellow, then gray, then dark brown. Sharp contact between color changes; each approximately 1 inch thick; Bedding N15E/11NW -Becomes olive gray sandy siltstone; few sand filled worm burrows approximately 1/2 inch diameter			
54								
56					-1/4 inch thick, dicontinuous gypsum and gray clay filled fracture: N27E/13NW -Becomes brown siltstone; reddish yellow staining; few randomly oriented gypsum filled fractures -Concretion, 4 inches thick			
58								
60	B65-6						113.0	4.3
					Dense, moist, light gray, fine- to medium-grained SANDSTONE; contact with overlying siltstone: N14E/8 NW			
62					Hard, moist, dark grayish brown, fine-grained Sandy SILTSTONE			
64					-Sand lense, 2 inches thick, discontinuous -Some reddish yellow staining			
66								
68					-Becomes light gray, fine-grained sandy, siltstone; some reddish yellow staining -Becomes well indurated, laminated			
70	B65-7				**BEDDING PLANE SHEAR** Thin, light gray, remolded clay: N30E/8NW **BEDDING PLANE SHEAR** Thin, light gray, remolded clay: N30E/8NW	14	90.9	27.8
72					-Ash bed, 2 inches thick; contact: N16E/9NW **BEDDING PLANE SHEAR** Thin, light gray, remolded clay: N28E/8NW -Becomes dark brown, fine-grained sandy siltstone			
74								

Figure A-65,
Log of Boring B 65, Page 3 of 5

SAMPLE SYMBOLS

☐ ... SAMPLING UNSUCCESSFUL
◧ ... STANDARD PENETRATION TEST
■ ... DRIVE SAMPLE (UNDISTURBED)
☒ ... DISTURBED OR BAG SAMPLE
◪ ... CHUNK SAMPLE
▼ ... WATER TABLE OR SEEPAGE

BORING B 65

ELEV. (MSL.) 977' DATE COMPLETED 11/07-11/08/2011

EQUIPMENT 28" BY: P. THERIAULT

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	MATERIAL DESCRIPTION	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
76					-Increase in sand to become sandy siltone to silty sandstone			
					Dense, moist yellowish brown, Silty, fine- to medium-grained SANDSTONE; micaceous; contact with overlying unit: N35E/9NW			
78					Hard, moist, light gray, fine-grained Sandy, SILTSTONE; some medium-grained sand; micaceous -Several interbeds of fine sandy siltstone, approximately 2 to 4 inches thick; some sand filled worm burrows			
80	B65-8 ■				-Becomes wet	24	116.5	12.2
82					Dense, moist, gray, Silty, fine-grained SANSTONE; some medium-grained sand filled worm burrows; contact with overlying unit: N14E/11NW -Becomes well cemented			
84					Hard, moist, dark brown, fine-grained Sandy, SILTSTONE; well indurated			
86					-Laterally discontiuous, 3 inch thick, sandstone lense, pinches out to the northwest and northeast -Medium dense, moist light gray silty fine sandy ash bed; contact with overlying unit: N15E/13NW			
88					**BEDDING PLANE SHEAR** 1/8 inch thick, gray remolded clay: N8E/14NW **BEDDING PLANE SHEAR** 1/8 inch thick, gray remolded clay: N10E/13NW			
90	B65-9 ■				-Becomes gray fine-grained sandy siltstone; well indurated		103.3	14.4
92					-2 inch thick sandstone lense			
94					**BEDDING PLANE SHEAR** 1/8 inch thick, gray remolded clay: N6E/8NW			
96								
98								
					Hard, moist gray, CLAYSTONE; some polished parting surfaces			

Figure A-65,
Log of Boring B 65, Page 4 of 5

SAMPLE SYMBOLS

☐ ... SAMPLING UNSUCCESSFUL
◧ ... STANDARD PENETRATION TEST
■ ... DRIVE SAMPLE (UNDISTURBED)
☒ ... DISTURBED OR BAG SAMPLE
◪ ... CHUNK SAMPLE
▼ ... WATER TABLE OR SEEPAGE

NOTE: THE LOG OF SUBSURFACE CONDITIONS SHOWN HEREON APPLIES ONLY AT THE SPECIFIC BORING OR TRENCH LOCATION AND AT THE DATE INDICATED. IT IS NOT WARRANTED TO BE REPRESENTATIVE OF SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND TIMES.

PROJECT NO. G1218-52-01

BORING B 65

ELEV. (MSL.) 977' DATE COMPLETED 11/07-11/08/2011

EQUIPMENT 28" BY: P. THERIAULT

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	MATERIAL DESCRIPTION	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
100	B65-10 ■	▨			Hard, moist, gray, fine-grained Sandy SILTSTONE; well indurated; seepage		97.7	19.2
102		▨						
104		▨			-Some sand, wet			
		▨	▽		Ground water encountered, satbilized at 103 feet			
106					BORING TERMINATED AT 106 FEET Boring logged to 100 FEET Groundwater stabilized at 103 FEET No caving Backfilled with a mix of cuttings and bentonite in accordance with Orange County Department of Environmental Health			

Figure A-65,
Log of Boring B 65, Page 5 of 5

G1218-52-01 (UPD-04-17-2012).GPJ

SAMPLE SYMBOLS

☐ ... SAMPLING UNSUCCESSFUL

◧ ... STANDARD PENETRATION TEST

■ ... DRIVE SAMPLE (UNDISTURBED)

☒ ... DISTURBED OR BAG SAMPLE

◪ ... CHUNK SAMPLE

▼ ... WATER TABLE OR SEEPAGE

NOTE: THE LOG OF SUBSURFACE CONDITIONS SHOWN HEREON APPLIES ONLY AT THE SPECIFIC BORING OR TRENCH LOCATION AND AT THE DATE INDICATED. IT IS NOT WARRANTED TO BE REPRESENTATIVE OF SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND TIMES.

GEOCON

PROJECT NO. G1218-52-01

BORING B 66

ELEV. (MSL.) 964' DATE COMPLETED 11-08-2011

EQUIPMENT 28" BY: P. THERIAULT

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	MATERIAL DESCRIPTION	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
0				CL	**TOPSOIL** Stiff, moist, dark brown, fine to medium Sandy, CALY; roots; grass and shrubs			
2				SM	**UNDOCUMENTED FILL? (afu?)** Medium dense, moist, brown, Silty, fine SAND -Becomes whitish light brown -Becomes brown, silty fine to medium sand; some whitish light brown clasts up to 1 1/2 inch diameter; rare active burrows approximantely 2 inches in diameter -Becomes dark brown -Becomes brown, some whitish light brown clasts			
8					**PUENTE FORMATION-SOQUEL MEMBER (Tps)** Medium dense, wet, reddish brown, Clayey SANDSTONE -Reddish yellow sandstone bed offset 8 inches in a normal sense -1/2 inch thick discontinuos clay, soft, olive; 8 inches normal offset			
10	B66-1				Medium dense, moist, yellowish brown, Silty, fine- to medium-grained SANDSTONE; micaceous	4	121.5	11.1
12					-discontiuous gravel bed			
14					-Grades into yellowish light brown, silty fine- to medium-grained sandstone; some reddish yellow staining; anastomosing brown staining 2 to 4 inches thick; unconsolidated			
18					-Some coarse-grained sand; some gray siltstone rip up clasts approximately 1 inch thick			
20	B66-2				-Very chaotic, undulatory contact with hard, moist, gray, Clayey SILTSTONE and discontiuous alternating brown sand and silt to 21 feet 10 inches; then gradational conatct to hard; wet, gray siltstone; laminated and blocky	4	112.5	14.5
24					-Gradational contact into dense, moist, light brown, Silty, fine-grained			

Figure A-66,
Log of Boring B 66, Page 1 of 3

G1218-52-01 (UPD-04-17-2012).GPJ

SAMPLE SYMBOLS			
	☐ ... SAMPLING UNSUCCESSFUL	◧ ... STANDARD PENETRATION TEST	■ ... DRIVE SAMPLE (UNDISTURBED)
	☒ ... DISTURBED OR BAG SAMPLE	◪ ... CHUNK SAMPLE	▼ ... WATER TABLE OR SEEPAGE

NOTE: THE LOG OF SUBSURFACE CONDITIONS SHOWN HEREON APPLIES ONLY AT THE SPECIFIC BORING OR TRENCH LOCATION AND AT THE DATE INDICATED. IT IS NOT WARRANTED TO BE REPRESENTATIVE OF SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND TIMES.

GEOCON

PROJECT NO. G1218-52-01

BORING B 66

ELEV. (MSL.) 964' DATE COMPLETED 11-08-2011

EQUIPMENT 28" BY: P. THERIAULT

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	MATERIAL DESCRIPTION	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
26					SANDSTONE -Increase in silt content -1/4 inch thick gray siltstone layer: N40W/13SW			
28					-Seepage at conact bewteen upper unit and very stiff, gray moist, fine-grained Sandy SILTSTONE; conatct (average due to moderately unulatory nature) N25W/14SW -Common reddish yellow staining -Becomes dark gray, micaceous; laminated; moderately indurated -Becomes dark brown -Fossiliferous (fish scales); some carbonate nodules up to 1/16 inch diameter			
30	B66-3				-Ash bed, 2 inches thick; contact: N20W/10SW	11	96.8	21.6
32								
34					Concretion, 6 inches thick; difficult drilling			
36					**BEDDING PLANE SHEAR** Gray remoled clay, 1/8 ich thick: N4W/8SW			
38								
40	B66-4				-Becomes brown, increase in sand content	12		
42					Dense, moist, browninsh yellow, Silty, fine- to medium-grained SANDSTONE; some coarse-grained sand; some reddish yellow staining; contact with overlying unit: N16W/10SW -Some brown siltstone interbeds, approximately 2 iches thick			
44								
46								
48					Hard, moist, dark brown, SILTSTONE; contact is sharp, slightly undulatory with overlying unit (approximate contact) NS/7W -1/2 inch thick, discontinuous sand layer			

Figure A-66,
Log of Boring B 66, Page 2 of 3

G1218-52-01 (UPD-04-17-2012).GPJ

SAMPLE SYMBOLS
☐ ... SAMPLING UNSUCCESSFUL
◧ ... STANDARD PENETRATION TEST
■ ... DRIVE SAMPLE (UNDISTURBED)
☒ ... DISTURBED OR BAG SAMPLE
◪ ... CHUNK SAMPLE
▼ ... WATER TABLE OR SEEPAGE

PROJECT NO. G1218-52-01

BORING B 66

ELEV. (MSL.) **964'** DATE COMPLETED **11-08-2011**

EQUIPMENT **28"** BY: **P. THERIAULT**

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	MATERIAL DESCRIPTION	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
50	B66-5				-Trace gray siltstone rip up clasts approximately 1/4 inch thick -1 1/2 inch thick, discontinuous sand layer	12	105.6	20.4
52					**BEDDING PLANE SHEAR** Gray remolded clay, 1/16 inch thick: N16W/10SW -Becomes well indurated			
54								
56								
58					**BEDDING PLANE SHEAR** Dark brown remolded clay, 1/8 inch thick: N15W/7SW			
60	B66-6				**BEDDING PLANE SHEAR** Dark brown remolded clay, 1/16 inch thick: N12W/10SW	21	105.9	19.1
62								
64								
66								
68					**BEDDING PLANE SHEAR** Brown remolded clay, 1/16 inch thick: N5W/11SW			
70	B66-7					34	125.2	8.1
72					BORING TERMINATED AT 75 FEET No groundwater No caving Backfilled with a mix of cuttings and bentonite in accordance with Orange County Department of Environmental Health			
74								

Figure A-66,
Log of Boring B 66, Page 3 of 3

G1218-52-01 (UPD-04-17-2012).GPJ

SAMPLE SYMBOLS			
	☐ ... SAMPLING UNSUCCESSFUL	◧ ... STANDARD PENETRATION TEST	■ ... DRIVE SAMPLE (UNDISTURBED)
	☒ ... DISTURBED OR BAG SAMPLE	◣ ... CHUNK SAMPLE	▼ ... WATER TABLE OR SEEPAGE

NOTE: THE LOG OF SUBSURFACE CONDITIONS SHOWN HEREON APPLIES ONLY AT THE SPECIFIC BORING OR TRENCH LOCATION AND AT THE DATE INDICATED. IT IS NOT WARRANTED TO BE REPRESENTATIVE OF SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND TIMES.

GEOCON

PROJECT NO. G1218-52-01

BORING B 67

ELEV. (MSL.) **923'** DATE COMPLETED **11-09-2011**

EQUIPMENT **28"** BY: **P. THERIAULT**

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	MATERIAL DESCRIPTION	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
0				SC	**ALLUVIUM** Medium dense, damp, dark brown, Clayey, fine to medium SAND; some siltstone clasts (gravel size)			
2								
	B67-1 ■							
4					-1 inch thick soft, damp, brown, CLAY			
					-Becomes light brown, some gravel -Becomes mottled yellow brown and brown			
6					8 inch thick brown clayey fine to medium sand			
					-Some gravel			
8								
				ML	**PUENTE FORMATION-SOQUEL MEMBER (Tps-slt)** Very stiff, moist, light gray, fine-grained Sandy, SILTSTONE			
10	B67-2 ■					1	102.3	22.7
					BEDDING PLANE SHEAR Dark grayish brown remolded clay, 1/16 inch thick: N39W/21SW -Bedding: N43W/16SW			
12								
14					-1 inch thick, soft, moist, olive, clay; discontinuous; overall dip to the southwest			
					-By 15 feet, grades into very stiff, moist, dark gray, fine-grained sandy, siltstone Fracture: N90W/72N			
16								
18					-Seepage along fracture: N80E/82SE			
20	B67-3 ☐				-Bedding: N40W/23SW No recovery	6		
22					**BEDDING PLANE SHEAR** Dark grayish brown remolded clay, 1/16 inch thick: N30W/17SW			
24					-Seepage **BEDDING PLANE SHEAR**			

Figure A-67,
Log of Boring B 67, Page 1 of 2

G1218-52-01 (UPD-04-17-2012).GPJ

SAMPLE SYMBOLS			
	☐ ... SAMPLING UNSUCCESSFUL	◧ ... STANDARD PENETRATION TEST	■ ... DRIVE SAMPLE (UNDISTURBED)
	☒ ... DISTURBED OR BAG SAMPLE	◪ ... CHUNK SAMPLE	▼ ... WATER TABLE OR SEEPAGE

PROJECT NO. G1218-52-01

BORING B 67

ELEV. (MSL.) **923'** DATE COMPLETED **11-09-2011**

EQUIPMENT **28"** BY: **P. THERIAULT**

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	MATERIAL DESCRIPTION	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
					Dark grayish brown remolded clay, 1/16 inch thick: N42W/16SW			
26					**BEDDING PLANE SHEAR** Dark grayish brown remolded clay, 1/16 inch thick: N44W/15SW			
28					-Bedding: N45W/20SW -Fracture: N79E/V			
30	B67-4	■		ML	-Becomes gray	6	106.6	20.4
32								
34								
36								
38								
40	B67-5	☐			-No recovery	13	NR	
42								
44								
					BORING TERMINATED AT 45 FEET No Groundwater No caving Backfilled with a mix of cuttings and bentonite in accordance with Orange County Department of Environmental Health			

Figure A-67,
Log of Boring B 67, Page 2 of 2

G1218-52-01 (UPD-04-17-2012).GPJ

SAMPLE SYMBOLS			
	☐ ... SAMPLING UNSUCCESSFUL	◧ ... STANDARD PENETRATION TEST	■ ... DRIVE SAMPLE (UNDISTURBED)
	☒ ... DISTURBED OR BAG SAMPLE	◪ ... CHUNK SAMPLE	▼ ... WATER TABLE OR SEEPAGE

NOTE: THE LOG OF SUBSURFACE CONDITIONS SHOWN HEREON APPLIES ONLY AT THE SPECIFIC BORING OR TRENCH LOCATION AND AT THE DATE INDICATED. IT IS NOT WARRANTED TO BE REPRESENTATIVE OF SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND TIMES.

GEOCON

PROJECT NO. G1218-52-01

TEST PIT TP 1

ELEV. (MSL.) 947' DATE COMPLETED 12-18-2006

EQUIPMENT JD450C TRACK MOUNTED BACKHOE BY: N.A.A.

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	MATERIAL DESCRIPTION	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
0				CL+SC	**LANDSLIDE DEBRIS (Qls)** Loose to medium dense, moist, mottled, olive brown and dark brown, Clayey SAND to Sandy CLAY with randomly oriented bedrock fragments, rootlets, porous; Colluvium-filled graben area thickening toward west end of trench			
2								
4								
6					-Shattered and displaced siltstone beds with abundant clay filled fractures			
8								
10					-Basal shear surface: N10W, 16SW, 1½-inch clay layer, highly plastic, slickensides oriented parallel to dip direction			
12					**PUENTE FORMATION - LA VIDA MEMBER (Tplv)** Very stiff, olive gray to brown, Sandy to Clayey SILTSTONE, fine-grained, slightly moist, thinly bedded to laminated			

TRENCH TERMINATED AT 12 FEET
No groundwater encountered
Backfilled and tamped with soil cuttings

Figure A-68,
Log of Test Pit TP 1, Page 1 of 1

G1218-52-01 (UPD-04-17-2012).GPJ

SAMPLE SYMBOLS			
	☐ ... SAMPLING UNSUCCESSFUL	◧ ... STANDARD PENETRATION TEST	■ ... DRIVE SAMPLE (UNDISTURBED)
	☒ ... DISTURBED OR BAG SAMPLE	◪ ... CHUNK SAMPLE	▼ ... WATER TABLE OR SEEPAGE

NOTE: THE LOG OF SUBSURFACE CONDITIONS SHOWN HEREON APPLIES ONLY AT THE SPECIFIC BORING OR TRENCH LOCATION AND AT THE DATE INDICATED. IT IS NOT WARRANTED TO BE REPRESENTATIVE OF SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND TIMES.

GEOCON

PROJECT NO. G1218-52-01

TEST PIT TP 2

ELEV. (MSL.) **964'** DATE COMPLETED **12-18-2006**

EQUIPMENT **JD450C TRACK MOUNTED BACKHOE** BY: **N.A.A.**

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	MATERIAL DESCRIPTION	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
0				CL-ML	**LANDSLIDE DEBRIS (Qls)** Loose, moist, mottled, Clayey SILT to Silty CLAY with bedrock clasts and cobbles, some roots and rootlets, porous. Cobbles of volcanic origin derived from terrace deposits			
2								
4								
6					-Mixture of silt and clay with fragments of sandstone and siltstone			
8								
10								
12					-Fractured and shattered sandstone and siltstone beds with clay and silt infilling, local beds of diatomaceous siltstone			
14								
16					-Basal slip surface: 1-inch clay seam, moist, sheared with slickensides, olive gray at 16 feet			
					PUENTE FORMATION - LA VIDA MEMBER (Tplv) Firm to very stiff, damp, olive to grayish brown, Sandy SILTSTONE, thinly bedded intact beds			

TRENCH TERMINATED AT 17.5 FEET
No groundwater encountered
Backfilled and tamped with soil cuttings

Figure A-69,
Log of Test Pit TP 2, Page 1 of 1

G1218-52-01 (UPD-04-17-2012).GPJ

SAMPLE SYMBOLS

☐ ... SAMPLING UNSUCCESSFUL
◧ ... STANDARD PENETRATION TEST
■ ... DRIVE SAMPLE (UNDISTURBED)
☒ ... DISTURBED OR BAG SAMPLE
◪ ... CHUNK SAMPLE
▼ ... WATER TABLE OR SEEPAGE

NOTE: THE LOG OF SUBSURFACE CONDITIONS SHOWN HEREON APPLIES ONLY AT THE SPECIFIC BORING OR TRENCH LOCATION AND AT THE DATE INDICATED. IT IS NOT WARRANTED TO BE REPRESENTATIVE OF SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND TIMES.

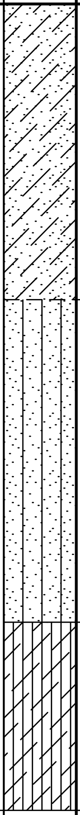
GEOCON

PROJECT NO. G1218-52-01

TEST PIT TP 3

ELEV. (MSL.) 946' DATE COMPLETED 12-18-2006

EQUIPMENT JD450C TRACK MOUNTED BACKHOE BY: N.A.A.



DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	MATERIAL DESCRIPTION	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
0				SC	**LANDSLIDE DEBRIS (Qls)** Stiff, moist, mottled, Clayey SAND with bedrock clasts, cobbles, and colluvium, some rootlets, porous			
2								
4								
6				SM+ML	Loose, moist, grayish brown, mixture of SILT and Sand, abundant bedrock fragments, fractured and offset with no distinguishable bedding, loose, slightly moist, light olive to grayish brown			
8								
10					-Becomes highly fractured and offset sandstone and siltstone beds -No evident basal slip surface			
12					**PUENTE FORMATION - LA VIDA MEMBER (Tplv)** Slightly moist, olive to grayish brown, SILTSTONE and CLAYSTONE, thinly bedded with some diatomaceous and cemented beds			
14								

TRENCH TERMINATED AT 15 FEET
No groundwater encountered
Backfilled and tamped with soil cuttings

Figure A-70,
Log of Test Pit TP 3, Page 1 of 1

G1218-52-01 (UPD-04-17-2012).GPJ

SAMPLE SYMBOLS			
	☐ ... SAMPLING UNSUCCESSFUL	◧ ... STANDARD PENETRATION TEST	■ ... DRIVE SAMPLE (UNDISTURBED)
	☒ ... DISTURBED OR BAG SAMPLE	◪ ... CHUNK SAMPLE	▼ ... WATER TABLE OR SEEPAGE

NOTE: THE LOG OF SUBSURFACE CONDITIONS SHOWN HEREON APPLIES ONLY AT THE SPECIFIC BORING OR TRENCH LOCATION AND AT THE DATE INDICATED. IT IS NOT WARRANTED TO BE REPRESENTATIVE OF SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND TIMES.

GEOCON

PROJECT NO. G1218-52-01

TEST PIT TP 4

ELEV. (MSL.) **994'** DATE COMPLETED **12-18-2006**

EQUIPMENT **JD450C TRACK MOUNTED BACKHOE** BY: **N.A.A.**

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	MATERIAL DESCRIPTION	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
0 2				SC+CL	**TOPSOIL** Loose, slightly moist, dark brown, Clayey SAND to Sandy CLAY; porous, roots and rock fragments			
4 6				ML	**PUENTE FORMATION - LA VIDA MEMBER (Tplv)** Dense, damp, olive brown to olive gray, Clayey and Sandy SILTSTONE, thinly bedded, moderately to intensely weathered in upper 2 feet			
					TRENCH TERMINATED AT 7 FEET No groundwater encountered Backfilled and tamped with soil cuttings			

Figure A-71, Log of Test Pit TP 4, Page 1 of 1

G1218-52-01 (UPD-04-17-2012).GPJ

SAMPLE SYMBOLS

☐ ... SAMPLING UNSUCCESSFUL
◧ ... STANDARD PENETRATION TEST
■ ... DRIVE SAMPLE (UNDISTURBED)
☒ ... DISTURBED OR BAG SAMPLE
◪ ... CHUNK SAMPLE
▼ ... WATER TABLE OR SEEPAGE

NOTE: THE LOG OF SUBSURFACE CONDITIONS SHOWN HEREON APPLIES ONLY AT THE SPECIFIC BORING OR TRENCH LOCATION AND AT THE DATE INDICATED. IT IS NOT WARRANTED TO BE REPRESENTATIVE OF SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND TIMES.

GEOCON

PROJECT NO. G1218-52-01

TEST PIT TP 5

ELEV. (MSL.) **1010'** DATE COMPLETED **12-18-2006**

EQUIPMENT **JD450C TRACK MOUNTED BACKHOE** BY: **N.A.A.**

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	MATERIAL DESCRIPTION	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
0 2		▨		CL	**TOPSOIL** Loose, slightly moist, dark brown, Sandy CLAY; porous, abundant roots, some gravel-sized rock fragments			
4		▩		SM	**PUENTE FORMATION - SOQUEL MEMBER (Tps)** Hard, damp, gray, fine-grained Silty SANDSTONE, moderately bedded to massive, moderately hard, slightly moist, highly weathered in upper foot with caliche mineralization			
					TRENCH TERMINATED AT 5 FEET No groundwater encountered Backfilled and tamped with soil cuttings			

Figure A-72,
Log of Test Pit TP 5, Page 1 of 1

G1218-52-01 (UPD-04-17-2012).GPJ

SAMPLE SYMBOLS			
	☐ ... SAMPLING UNSUCCESSFUL	◧ ... STANDARD PENETRATION TEST	■ ... DRIVE SAMPLE (UNDISTURBED)
	☒ ... DISTURBED OR BAG SAMPLE	◣ ... CHUNK SAMPLE	▼ ... WATER TABLE OR SEEPAGE

NOTE: THE LOG OF SUBSURFACE CONDITIONS SHOWN HEREON APPLIES ONLY AT THE SPECIFIC BORING OR TRENCH LOCATION AND AT THE DATE INDICATED. IT IS NOT WARRANTED TO BE REPRESENTATIVE OF SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND TIMES.

GEOCON

PROJECT NO. G1218-52-01

TEST PIT TP 6

ELEV. (MSL.) 915' DATE COMPLETED 12-18-2006

EQUIPMENT JD450C TRACK MOUNTED BACKHOE BY: N.A.A.

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	MATERIAL DESCRIPTION	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
0				SC	**ALLUVIUM (Qal)** Loose, damp, grayish brown to dark brown, medium Clayey SAND; abundant roots, porous, few gravel			
2								
4				SM+ML	**PUENTE FORMATION - LA VIDA MEMBER (Tplv)** Dense, damp, grayish brown, Clayey to Sandy SILTSTONE interbedded with Silty SANDSTONE, well bedded, highly fractured, intensely weathered in upper 4 feet with roots and clay infilling along fractures, some roots			
6								
8					-Moderately to slightly weathered, thinly bedded at 8 feet			
					TRENCH TERMINATED AT 9 FEET No groundwater encountered Backfilled and tamped with soil cuttings			

Figure A-73,
Log of Test Pit TP 6, Page 1 of 1

G1218-52-01 (UPD-04-17-2012).GPJ

SAMPLE SYMBOLS	☐ ... SAMPLING UNSUCCESSFUL	◧ ... STANDARD PENETRATION TEST	■ ... DRIVE SAMPLE (UNDISTURBED)
	☒ ... DISTURBED OR BAG SAMPLE	◪ ... CHUNK SAMPLE	▼ ... WATER TABLE OR SEEPAGE

NOTE: THE LOG OF SUBSURFACE CONDITIONS SHOWN HEREON APPLIES ONLY AT THE SPECIFIC BORING OR TRENCH LOCATION AND AT THE DATE INDICATED. IT IS NOT WARRANTED TO BE REPRESENTATIVE OF SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND TIMES.

GEOCON

PROJECT NO. G1218-52-01

TEST PIT TP 7

ELEV. (MSL.) **1134'** DATE COMPLETED **12-18-2006**

EQUIPMENT **JD450C TRACK MOUNTED BACKHOE** BY: **N.A.A.**

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	MATERIAL DESCRIPTION	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
0				SC	**TOPSOIL** Loose, dry to slightly moist, brown, fine to medium Clayey SAND			
				SM	**PUENTE FORMATION - SOQUEL MEMBER (Tps)** Dense, moist, light gray, fine- to medium-grained Silty SANDSTONE, weakly to moderately cemented			
2								
4					-Arkosic sandstone, hard, massive, moderately to well cemented			
					TRENCH TERMINATED AT 4.5 FEET No groundwater encountered Backfilled and tamped with soil cuttings			

Figure A-74,
Log of Test Pit TP 7, Page 1 of 1

G1218-52-01 (UPD-04-17-2012).GPJ

SAMPLE SYMBOLS

☐ ... SAMPLING UNSUCCESSFUL

◧ ... STANDARD PENETRATION TEST

■ ... DRIVE SAMPLE (UNDISTURBED)

☒ ... DISTURBED OR BAG SAMPLE

◪ ... CHUNK SAMPLE

▼ ... WATER TABLE OR SEEPAGE

NOTE: THE LOG OF SUBSURFACE CONDITIONS SHOWN HEREON APPLIES ONLY AT THE SPECIFIC BORING OR TRENCH LOCATION AND AT THE DATE INDICATED. IT IS NOT WARRANTED TO BE REPRESENTATIVE OF SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND TIMES.

GEOCON

PROJECT NO. G1218-52-01

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	**TEST PIT TP 8** ELEV. (MSL.) **1072'** DATE COMPLETED **12-18-2006** EQUIPMENT **JD450C TRACK MOUNTED BACKHOE** BY: **N.A.A.**	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
					MATERIAL DESCRIPTION			
0				SC	**TOPSOIL** Loose, slightly moist, grayish brown, Clayey SAND; porous, common roots			
2 4				SM	**PUENTE FORMATION - SOQUEL MEMBER (Tps)** Dense, moist, light grayish brown, fine- to medium-grained Silty SANDSTONE, massive and arkosic, moderately weathered in foot			
					TRENCH TERMINATED AT 4.5 FEET No groundwater encountered Backfilled and tamped with soil cuttings			

Figure A-75,
Log of Test Pit TP 8, Page 1 of 1

G1218-52-01 (UPD-04-17-2012).GPJ

SAMPLE SYMBOLS

☐ ... SAMPLING UNSUCCESSFUL	◧ ... STANDARD PENETRATION TEST	■ ... DRIVE SAMPLE (UNDISTURBED)
☒ ... DISTURBED OR BAG SAMPLE	◪ ... CHUNK SAMPLE	▼ ... WATER TABLE OR SEEPAGE

NOTE: THE LOG OF SUBSURFACE CONDITIONS SHOWN HEREON APPLIES ONLY AT THE SPECIFIC BORING OR TRENCH LOCATION AND AT THE DATE INDICATED. IT IS NOT WARRANTED TO BE REPRESENTATIVE OF SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND TIMES.

PROJECT NO. G1218-52-01

TEST PIT TP 9

ELEV. (MSL.) **1079'** DATE COMPLETED **12-18-2006**

EQUIPMENT **JD450C TRACK MOUNTED BACKHOE** BY: **N.A.A.**

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	MATERIAL DESCRIPTION	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
0		▨		SM	**PUENTE FORMATION - SOQUEL MEMBER (Tps)** Dense, moist, brown to reddish brown, fine- to medium-grained Silty SANDSTONE, highly weathered in upper 6 inches			
2		▨			-Light gray to yellowish brown			
4					TRENCH TERMINATED AT 4 FEET No groundwater encountered Backfilled and tamped with soil cuttings			

Figure A-76,
Log of Test Pit TP 9, Page 1 of 1

G1218-52-01 (UPD-04-17-2012).GPJ

SAMPLE SYMBOLS

☐ ... SAMPLING UNSUCCESSFUL
☒ ... DISTURBED OR BAG SAMPLE
◧ ... STANDARD PENETRATION TEST
◩ ... CHUNK SAMPLE
■ ... DRIVE SAMPLE (UNDISTURBED)
▼ ... WATER TABLE OR SEEPAGE

NOTE: THE LOG OF SUBSURFACE CONDITIONS SHOWN HEREON APPLIES ONLY AT THE SPECIFIC BORING OR TRENCH LOCATION AND AT THE DATE INDICATED. IT IS NOT WARRANTED TO BE REPRESENTATIVE OF SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND TIMES.

GEOCON

PROJECT NO. G1218-52-01

TEST PIT TP 10

ELEV. (MSL.) **1000'** DATE COMPLETED **12-19-2006**

EQUIPMENT **JD450C TRACK MOUNTED BACKHOE** BY: **N.A.A.**

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	MATERIAL DESCRIPTION	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
0				SC	**COLLUVIUM (Qcol)** Loose, dry, dark brown, Clayey SAND; roots and few gravels			
2	TP10-1	▨		SM+SC	Dense, slightly moist, brown to grayish brown, Silty and Clayey SAND, fine- to medium-grained, slightly porous, scattered coarse grains, thin carbonate stringers, weak cementation			
4								
					TRENCH TERMINATED AT 5 FEET No groundwater encountered Backfilled and tamped with soil cuttings			

Figure A-77,
Log of Test Pit TP 10, Page 1 of 1

G1218-52-01 (UPD-04-17-2012).GPJ

SAMPLE SYMBOLS			
	☐ ... SAMPLING UNSUCCESSFUL	◧ ... STANDARD PENETRATION TEST	■ ... DRIVE SAMPLE (UNDISTURBED)
	☒ ... DISTURBED OR BAG SAMPLE	◣ ... CHUNK SAMPLE	▼ ... WATER TABLE OR SEEPAGE

NOTE: THE LOG OF SUBSURFACE CONDITIONS SHOWN HEREON APPLIES ONLY AT THE SPECIFIC BORING OR TRENCH LOCATION AND AT THE DATE INDICATED. IT IS NOT WARRANTED TO BE REPRESENTATIVE OF SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND TIMES.

GEOCON

PROJECT NO. G1218-52-01

TEST PIT TP 11

ELEV. (MSL.) **990'** DATE COMPLETED **12-19-2006**

EQUIPMENT **JD450C TRACK MOUNTED BACKHOE** BY: **N.A.A.**

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	MATERIAL DESCRIPTION	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
0		▨		SC	**TOPSOIL** Loose, slightly moist, dark brown, Clayey SAND, fine- to medium-grained, porous, thin roots			
2		▦		SM	**PUENTE FORMATION - SOQUEL MEMBER (Tps)** Dense, moist, olive gray to grayish brown, fine- to medium-grained Silty SANDSTONE; massive, weakly to moderately cemented			
4								
6					TRENCH TERMINATED AT 6 FEET No groundwater encountered Backfilled and tamped with soil cuttings			

Figure A-78,
Log of Test Pit TP 11, Page 1 of 1

G1218-52-01 (UPD-04-17-2012).GPJ

SAMPLE SYMBOLS			
	☐ ... SAMPLING UNSUCCESSFUL	◧ ... STANDARD PENETRATION TEST	■ ... DRIVE SAMPLE (UNDISTURBED)
	☒ ... DISTURBED OR BAG SAMPLE	◪ ... CHUNK SAMPLE	▼ ... WATER TABLE OR SEEPAGE

NOTE: THE LOG OF SUBSURFACE CONDITIONS SHOWN HEREON APPLIES ONLY AT THE SPECIFIC BORING OR TRENCH LOCATION AND AT THE DATE INDICATED. IT IS NOT WARRANTED TO BE REPRESENTATIVE OF SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND TIMES.

GEOCON

PROJECT NO. G1218-52-01

TEST PIT TP 12

ELEV. (MSL.) **1190'** DATE COMPLETED **12-20-2006**

EQUIPMENT **JD450C TRACK MOUNTED BACKHOE** BY: **N.A.A.**

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	MATERIAL DESCRIPTION	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
0				SM+ML	**PUENTE FORMATION - LA VIDA MEMBER (Tplv)** Soft, dry, olive brown, interbedded Sandy SILTSTONE and Silty SANDSTONE in a silt and clay matrix, intensely weathered, porous with thin roots			
2					-Olive to grayish brown, thinly bedded and laminated, moderately weathered in upper foot, well indurated, common stringers of calcium carbonate and gypsum primarily along bedding			
4								
6					-Bedding: N42W, 85SW, 4 to 6-inch ash bed, continuous across trench, light gray to white			
					TRENCH TERMINATED AT 7.5 FEET No groundwater encountered Backfilled and tamped with soil cuttings			

Figure A-79,
Log of Test Pit TP 12, Page 1 of 1

G1218-52-01 (UPD-04-17-2012).GPJ

SAMPLE SYMBOLS

☐ ... SAMPLING UNSUCCESSFUL
◧ ... STANDARD PENETRATION TEST
■ ... DRIVE SAMPLE (UNDISTURBED)
☒ ... DISTURBED OR BAG SAMPLE
◪ ... CHUNK SAMPLE
▼ ... WATER TABLE OR SEEPAGE

NOTE: THE LOG OF SUBSURFACE CONDITIONS SHOWN HEREON APPLIES ONLY AT THE SPECIFIC BORING OR TRENCH LOCATION AND AT THE DATE INDICATED. IT IS NOT WARRANTED TO BE REPRESENTATIVE OF SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND TIMES.

GEOCON

PROJECT NO. G1218-52-01

TEST PIT TP 13

ELEV. (MSL.) **1211'** DATE COMPLETED **12-20-2006**

EQUIPMENT **JD450C TRACK MOUNTED BACKHOE** BY: **N.A.A.**

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	MATERIAL DESCRIPTION	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
0		▨		SM+ML	**ENGINEERED ARTIFICIAL FILL (afe)** Medium dense to dense, moist, olive brown to olive gray, Silty SAND to Sandy SILT, fine- to medium-grained, fragments of Sandstone and Siltstone, generally less than 3 inches in diameter, fill in overall good condition with adequate moisture			
2		▨						
4		▨						
6		▨			-Increase in rock fragments to 6-12 inches in diameter, ~10-20%			
8		▨						
10		▨						
12					TRENCH TERMINATED AT 12 FEET No groundwater encountered Backfilled and tamped with soil cuttings			

Figure A-80,
Log of Test Pit TP 13, Page 1 of 1

G1218-52-01 (UPD-04-17-2012).GPJ

SAMPLE SYMBOLS

☐ ... SAMPLING UNSUCCESSFUL
◧ ... STANDARD PENETRATION TEST
■ ... DRIVE SAMPLE (UNDISTURBED)
☒ ... DISTURBED OR BAG SAMPLE
◩ ... CHUNK SAMPLE
▼ ... WATER TABLE OR SEEPAGE

NOTE: THE LOG OF SUBSURFACE CONDITIONS SHOWN HEREON APPLIES ONLY AT THE SPECIFIC BORING OR TRENCH LOCATION AND AT THE DATE INDICATED. IT IS NOT WARRANTED TO BE REPRESENTATIVE OF SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND TIMES.

GEOCON

PROJECT NO. G1218-52-01

TEST PIT TP 14

ELEV. (MSL.) **1218'** DATE COMPLETED **12-20-2006**

EQUIPMENT **JD450C TRACK MOUNTED BACKHOE** BY: **N.A.A.**

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	MATERIAL DESCRIPTION	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
0 2 4					**PUENTE FORMATION - LA VIDA MEMBER (Tplv)** Hard, moist, very dark gray to black, Sandy SHALE with minor interbeds of Siltstone, fine-grained, fissile cleavage, well indurated, moderately weathered in upper 1½ feet, scattered discontinuous lenses of yellowish brown to light gray Silty Sandstone -Difficult excavation, refusal			
					TRENCH TERMINATED AT 4.5 FEET No groundwater encountered Backfilled and tamped with soil cuttings			

Figure A-81,
Log of Test Pit TP 14, Page 1 of 1

G1218-52-01 (UPD-04-17-2012).GPJ

SAMPLE SYMBOLS			
	☐ ... SAMPLING UNSUCCESSFUL	◧ ... STANDARD PENETRATION TEST	■ ... DRIVE SAMPLE (UNDISTURBED)
	▨ ... DISTURBED OR BAG SAMPLE	◣ ... CHUNK SAMPLE	▼ ... WATER TABLE OR SEEPAGE

NOTE: THE LOG OF SUBSURFACE CONDITIONS SHOWN HEREON APPLIES ONLY AT THE SPECIFIC BORING OR TRENCH LOCATION AND AT THE DATE INDICATED. IT IS NOT WARRANTED TO BE REPRESENTATIVE OF SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND TIMES.

GEOCON

PROJECT NO. G1218-52-01

TEST PIT TP 15

ELEV. (MSL.) **1216'** DATE COMPLETED **12-20-2006**

EQUIPMENT **JD450C TRACK MOUNTED BACKHOE** BY: **N.A.A.**

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	MATERIAL DESCRIPTION	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
0 2				SM+ML	**ENGINEERED ARTIFICIAL FILL (afe)** Medium dense, moist, olive brown to grayish brown, Sandy SILT to Silty SAND, rock fragments up to 12 inches in diameter composed of Siltstone, with thin roots, loose and disturbed in upper foot			
4 6				ML	**PUENTE FORMATION - LA VIDA MEMBER (Tplv)** Hard, damp, olive brown to olive gray, Sandy SILTSTONE, thinly bedded and well indurated, some carbonate mineralization -Bedding: N70E, 19SE, some diatomaceous Siltstone beds -Well cemented fine-grained sandstone layer with subrounded cobble sized clasts; difficult excavation			
					TRENCH TERMINATED AT 7 FEET No groundwater encountered Backfilled and tamped with soil cuttings			

Figure A-82,
Log of Test Pit TP 15, Page 1 of 1

G1218-52-01 (UPD-04-17-2012).GPJ

SAMPLE SYMBOLS			
	☐ ... SAMPLING UNSUCCESSFUL	◧ ... STANDARD PENETRATION TEST	■ ... DRIVE SAMPLE (UNDISTURBED)
	☒ ... DISTURBED OR BAG SAMPLE	◪ ... CHUNK SAMPLE	▼ ... WATER TABLE OR SEEPAGE

NOTE: THE LOG OF SUBSURFACE CONDITIONS SHOWN HEREON APPLIES ONLY AT THE SPECIFIC BORING OR TRENCH LOCATION AND AT THE DATE INDICATED. IT IS NOT WARRANTED TO BE REPRESENTATIVE OF SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND TIMES.

GEOCON

PROJECT NO. G1218-52-01

TEST PIT TP 16

ELEV. (MSL.) **1210'** DATE COMPLETED **12-20-2006**

EQUIPMENT **JD450C TRACK MOUNTED BACKHOE** BY: **N.A.A.**

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	MATERIAL DESCRIPTION	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
0 2				SM+ML	**COLLUVIUM (Qcol)** Loose, dry to slightly moist, grayish brown, Sandy SILT to Silty SAND with Siltstone clasts; abundant thin roots, porous			
4					**PUENTE FORMATION - LA VIDA MEMBER (Tplv)** Hard, damp, dark olive gray, fine-grained Sandy SILTSTONE, thinly bedded to laminated, intensely weathered in upper 2 feet of unit, prominent jointing with carbonate and gypsum infilling, local diatomaceous beds -Bedding: N76W, 38SW -Joint: N32W, 74NE			
6					TRENCH TERMINATED AT 6 FEET No groundwater encountered Backfilled and tamped with soil cuttings			

Figure A-83,
Log of Test Pit TP 16, Page 1 of 1

G1218-52-01 (UPD-04-17-2012).GPJ

SAMPLE SYMBOLS			
	☐ ... SAMPLING UNSUCCESSFUL	◧ ... STANDARD PENETRATION TEST	■ ... DRIVE SAMPLE (UNDISTURBED)
	☒ ... DISTURBED OR BAG SAMPLE	◪ ... CHUNK SAMPLE	▼ ... WATER TABLE OR SEEPAGE

NOTE: THE LOG OF SUBSURFACE CONDITIONS SHOWN HEREON APPLIES ONLY AT THE SPECIFIC BORING OR TRENCH LOCATION AND AT THE DATE INDICATED. IT IS NOT WARRANTED TO BE REPRESENTATIVE OF SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND TIMES.

GEOCON

PROJECT NO. G1218-52-01

TEST PIT TP 17

ELEV. (MSL.) **1194'** DATE COMPLETED **12-20-2006**

EQUIPMENT **JD450C TRACK MOUNTED BACKHOE** BY: **N.A.A.**

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	MATERIAL DESCRIPTION	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
0 2 4				SM+ML	**LANDSLIDE DEBRIS (Qls)** Loose, dry, jumbled mass of SILT and SAND, roots, rock fragments, recent shallow slide debris -Back rotated block of Bedrock Siltstone with abundant voids and fractures, thin roots, no defined slide plane -Bedding: N34W, 26NE			
6					**PUENTE FORMATION - LA VIDA MEMBER (Tplv)** Hard, damp, dark olive gray, fine-grained Sandy SILTSTONE; thinly bedded			
					TRENCH TERMINATED AT 7.5 FEET No groundwater encountered Backfilled and tamped with soil cuttings			

Figure A-84,
Log of Test Pit TP 17, Page 1 of 1

G1218-52-01 (UPD-04-17-2012).GPJ

SAMPLE SYMBOLS

☐ ... SAMPLING UNSUCCESSFUL

◧ ... STANDARD PENETRATION TEST

■ ... DRIVE SAMPLE (UNDISTURBED)

☒ ... DISTURBED OR BAG SAMPLE

◩ ... CHUNK SAMPLE

▼ ... WATER TABLE OR SEEPAGE

NOTE: THE LOG OF SUBSURFACE CONDITIONS SHOWN HEREON APPLIES ONLY AT THE SPECIFIC BORING OR TRENCH LOCATION AND AT THE DATE INDICATED. IT IS NOT WARRANTED TO BE REPRESENTATIVE OF SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND TIMES.

GEOCON

PROJECT NO. G1218-52-01

TEST PIT TP 18

ELEV. (MSL.) **1166'** DATE COMPLETED **12-20-2006**

EQUIPMENT **JD450C TRACK MOUNTED BACKHOE** BY: **N.A.A.**

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	MATERIAL DESCRIPTION	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
0				ML	**PUENTE FORMATION - LA VIDA MEMBER (Tplv)** Stiff to hard, moist, brown, fine-grained Sandy SILTSTONE, thinly bedded and laminated, moderately weathered in upper 2 feet of unit with thin roots and carbonate -Bedding: N70W, 12SW -Bedding: N79W, 18SW, 4 inch thick bed of light gray, ashy Sandstone, continuous throughout trench, offset 6 inches along subvertical fracture -Siltstone dark olive gray, massive and jointed, hard			
2								
4								
6				SM	Dense, moist, light gray, moderately cemented Silty SANDSTONE; difficult excavation			

TRENCH TERMINATED AT 6 FEET
No groundwater encountered
Backfilled and tamped with soil cuttings

Figure A-85,
Log of Test Pit TP 18, Page 1 of 1

G1218-52-01 (UPD-04-17-2012).GPJ

SAMPLE SYMBOLS	☐ ... SAMPLING UNSUCCESSFUL	◧ ... STANDARD PENETRATION TEST	■ ... DRIVE SAMPLE (UNDISTURBED)
	☒ ... DISTURBED OR BAG SAMPLE	◩ ... CHUNK SAMPLE	▼ ... WATER TABLE OR SEEPAGE

NOTE: THE LOG OF SUBSURFACE CONDITIONS SHOWN HEREON APPLIES ONLY AT THE SPECIFIC BORING OR TRENCH LOCATION AND AT THE DATE INDICATED. IT IS NOT WARRANTED TO BE REPRESENTATIVE OF SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND TIMES.

PROJECT NO. G1218-52-01

TEST PIT TP 19

ELEV. (MSL.) **1142'** DATE COMPLETED **12-20-2006**

EQUIPMENT **JD450C TRACK MOUNTED BACKHOE** BY: **N.A.A.**

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	MATERIAL DESCRIPTION	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
0		▤		ML	**PUENTE FORMATION - LA VIDA MEMBER (Tplv)** Very stiff to hard, moist, olive gray to grayish brown, fine-grained Sandy SILTSTONE, thinly bedded, moderately weathered in upper 18 inches, gypsum and carbonate mineralization along bedding and joints			
2		▤			-Bedding: N52W, 19SW			
4		▤			-Bedding: N39W, 22SW, 6 inch Silty Sandstone bed, light olive gray, fine-grained and continuous throughout trench, gypsum stringers throughout with local black carbon nodules			
6	T19-1 ▨	▤			-Dark olive gray, fine-grained, thinly bedded, slightly weathered with carbonate and gypsum stringers throughout, moderatel fractured			
8					TRENCH TERMINATED AT 8 FEET No groundwater encountered Backfilled and tamped with soil cuttings			

Figure A-86,
Log of Test Pit TP 19, Page 1 of 1

G1218-52-01 (UPD-04-17-2012).GPJ

SAMPLE SYMBOLS			
	☐ ... SAMPLING UNSUCCESSFUL	◧ ... STANDARD PENETRATION TEST	■ ... DRIVE SAMPLE (UNDISTURBED)
	▨ ... DISTURBED OR BAG SAMPLE	◪ ... CHUNK SAMPLE	▼ ... WATER TABLE OR SEEPAGE

NOTE: THE LOG OF SUBSURFACE CONDITIONS SHOWN HEREON APPLIES ONLY AT THE SPECIFIC BORING OR TRENCH LOCATION AND AT THE DATE INDICATED. IT IS NOT WARRANTED TO BE REPRESENTATIVE OF SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND TIMES.

GEOCON

TEST PIT TP 20

ELEV. (MSL.) **1110'** DATE COMPLETED **12-20-2006**

EQUIPMENT **JD450C TRACK MOUNTED BACKHOE** BY: **N.A.A.**

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	MATERIAL DESCRIPTION	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
0				SM+ML	**ENGINEERED ARTIFICIAL FILL (afe)** Loose, slightly moist, olive brown, Silty SAND and Sandy SILT, rock fragments to 6 inches in diameter			
2								
				ML	**PUENTE FORMATION - LA VIDA MEMBER (Tplv)** Hard, damp, dark gray to black, SILTSTONE, shaley, hard, slightly moist, fissile cleavage			
4								
6					TRENCH TERMINATED AT 6 FEET No groundwater encountered Backfilled and tamped with soil cuttings			

Figure A-87,
Log of Test Pit TP 20, Page 1 of 1

G1218-52-01 (UPD-04-17-2012).GPJ

SAMPLE SYMBOLS

☐ ... SAMPLING UNSUCCESSFUL
◧ ... STANDARD PENETRATION TEST
■ ... DRIVE SAMPLE (UNDISTURBED)
☒ ... DISTURBED OR BAG SAMPLE
◪ ... CHUNK SAMPLE
▼ ... WATER TABLE OR SEEPAGE

NOTE: THE LOG OF SUBSURFACE CONDITIONS SHOWN HEREON APPLIES ONLY AT THE SPECIFIC BORING OR TRENCH LOCATION AND AT THE DATE INDICATED. IT IS NOT WARRANTED TO BE REPRESENTATIVE OF SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND TIMES.

GEOCON

PROJECT NO. G1218-52-01

TEST PIT TP 21

ELEV. (MSL.) **1172'** DATE COMPLETED **12-20-2006**

EQUIPMENT **JD450C TRACK MOUNTED BACKHOE** BY: **N.A.A.**

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	MATERIAL DESCRIPTION	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
0 2				SC	**TOPSOIL** Loose, slightly moist, dark brown, Clayey SAND, fine- to medium-grained, porous, thin roots, scattered carbonate pods			
4				SM	**PUENTE FORMATION - LA VIDA MEMBER (Tplv)** Dense, damp, yellowish to light olive brown and brown, fine- to medium-grained Silty SANDSTONE, thinly bedded to laminated, weakly to moderately cemented, minor interbeds of Siltstone -Bedding N74W, 30SW			
					TRENCH TERMINATED AT 5 FEET No groundwater encountered Backfilled and tamped with soil cuttings			

Figure A-88,
Log of Test Pit TP 21, Page 1 of 1

G1218-52-01 (UPD-04-17-2012).GPJ

SAMPLE SYMBOLS			
	☐ ... SAMPLING UNSUCCESSFUL	◧ ... STANDARD PENETRATION TEST	■ ... DRIVE SAMPLE (UNDISTURBED)
	☒ ... DISTURBED OR BAG SAMPLE	◪ ... CHUNK SAMPLE	▼ ... WATER TABLE OR SEEPAGE

NOTE: THE LOG OF SUBSURFACE CONDITIONS SHOWN HEREON APPLIES ONLY AT THE SPECIFIC BORING OR TRENCH LOCATION AND AT THE DATE INDICATED. IT IS NOT WARRANTED TO BE REPRESENTATIVE OF SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND TIMES.

GEOCON

PROJECT NO. G1218-52-01

TEST PIT TP 22

ELEV. (MSL.) **1190'** DATE COMPLETED **12-20-2006**

EQUIPMENT **JD450C TRACK MOUNTED BACKHOE** BY: **N.A.A.**

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	MATERIAL DESCRIPTION	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
0		▨		SC	**TOPSOIL** Medium dense, slightly moist, dark brown, Clayey SAND, fine- to medium-grained, porous, thin roots			
2 4		▩		SM	**PUENTE FORMATION - LA VIDA MEMBER (Tplv)** Dense, damp, yellow to light gray, fine-grained Silty SANDSTONE; iron oxide staining -Interbedded Sandy Siltstone and Silty Sandstone, olive gray to light grayish brown, fine-grained, hard, moderately cemented			
6					TRENCH TERMINATED AT 6 FEET No groundwater encountered Backfilled and tamped with soil cuttings			

Figure A-89,
Log of Test Pit TP 22, Page 1 of 1

G1218-52-01 (UPD-04-17-2012).GPJ

SAMPLE SYMBOLS

☐ ... SAMPLING UNSUCCESSFUL
◧ ... STANDARD PENETRATION TEST
■ ... DRIVE SAMPLE (UNDISTURBED)
☒ ... DISTURBED OR BAG SAMPLE
◣ ... CHUNK SAMPLE
▼ ... WATER TABLE OR SEEPAGE

NOTE: THE LOG OF SUBSURFACE CONDITIONS SHOWN HEREON APPLIES ONLY AT THE SPECIFIC BORING OR TRENCH LOCATION AND AT THE DATE INDICATED. IT IS NOT WARRANTED TO BE REPRESENTATIVE OF SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND TIMES.

GEOCON

PROJECT NO. G1218-52-01

TEST PIT TP 23

ELEV. (MSL.) **1028'** DATE COMPLETED **12-21-2006**

EQUIPMENT **JD450C TRACK MOUNTED BACKHOE** BY: **N.A.A.**

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	MATERIAL DESCRIPTION	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
0				SM+ML	**ENGINEERED ARTIFICIAL FILL (afe)** Medium dense, moist, olive brown to olive gray, Sandy SILT and Silty SAND, rock fragments of Siltstone and Sandstone to 6 inches in diameter (~30% of material)			
2								
4								
6					-Becomes dry to slightly moist and somewhat powdery			
8								
10								
12					TRENCH TERMINATED AT 12 FEET No groundwater encountered Backfilled and tamped with soil cuttings			

Figure A-90,
Log of Test Pit TP 23, Page 1 of 1

G1218-52-01 (UPD-04-17-2012).GPJ

SAMPLE SYMBOLS

- ☐ ... SAMPLING UNSUCCESSFUL
- ☒ ... DISTURBED OR BAG SAMPLE
- ◧ ... STANDARD PENETRATION TEST
- ◪ ... CHUNK SAMPLE
- ■ ... DRIVE SAMPLE (UNDISTURBED)
- ▼ ... WATER TABLE OR SEEPAGE

NOTE: THE LOG OF SUBSURFACE CONDITIONS SHOWN HEREON APPLIES ONLY AT THE SPECIFIC BORING OR TRENCH LOCATION AND AT THE DATE INDICATED. IT IS NOT WARRANTED TO BE REPRESENTATIVE OF SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND TIMES.

GEOCON

PROJECT NO. G1218-52-01

TEST PIT TP 24

ELEV. (MSL.) **1002'** DATE COMPLETED **12-21-2006**

EQUIPMENT **JD450C TRACK MOUNTED BACKHOE** BY: **N.A.A.**

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	MATERIAL DESCRIPTION	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
0 2		░		ML	**TOPSOIL** Soft, slightly moist, dark brown, Sandy SILT; thin roots, animal burrows			
4 6		▥		ML	**BEDROCK CREEP** Very stiff, slightly moist, light olive to yellowish brown, Sandy SILTSTONE, intensely weathered and fractured, abundant carbonate pods and stringers, disturbed by slope creep			
8 10 12		▨		CL+ML	Moderately hard, moist, dark gray to dark olive gray, Silty CLAYSTONE with Clayey Siltstone interbeds, bedding appears moderately disturbed with polished surfaces along bedding planes and joints, creep affected -Some subrounded Sandstone fragments with iron oxide rinds			
		▥		ML	**PUENTE FORMATION - LA VIDA MEMBER (Tplv)** Hard, cemented bed of calcareous SILTSTONE, difficult excavation, scattered shell fossils, intact bedrock			
14					TRENCH TERMINATED AT 14 FEET No groundwater encountered Backfilled and tamped with soil cuttings			

Figure A-91,
Log of Test Pit TP 24, Page 1 of 1

G1218-52-01 (UPD-04-17-2012).GPJ

SAMPLE SYMBOLS

☐ ... SAMPLING UNSUCCESSFUL

◧ ... STANDARD PENETRATION TEST

■ ... DRIVE SAMPLE (UNDISTURBED)

☒ ... DISTURBED OR BAG SAMPLE

◪ ... CHUNK SAMPLE

▼ ... WATER TABLE OR SEEPAGE

NOTE: THE LOG OF SUBSURFACE CONDITIONS SHOWN HEREON APPLIES ONLY AT THE SPECIFIC BORING OR TRENCH LOCATION AND AT THE DATE INDICATED. IT IS NOT WARRANTED TO BE REPRESENTATIVE OF SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND TIMES.

GEOCON

PROJECT NO. G1218-52-01

TEST PIT TP 25

ELEV. (MSL.) **982'** DATE COMPLETED **12-21-2006**

EQUIPMENT **JD450C TRACK MOUNTED BACKHOE** BY: **N.A.A.**

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	MATERIAL DESCRIPTION	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
0				CL+ML	**TOPSOIL** Stiff, moist, dark brown, Clayey SILT to Silty CLAY, porous, thin roots, blocky pedogenic development			
2								
4				ML	**PUENTE FORMATION - LA VIDA MEMBER (Tplv)** Moderately hard, moist, olive brown to olive gray, fine-grained Sandy SILTSTONE, highly fractured, intensely weathered to 6 feet			
6								
8					-Bedding: N66W, 14SW; hard calcereous Siltstone bed, moderately bedded, moderately to slightly weathered, well indurated, interbedded with Clayey Siltstone			
10					-Layer of subrounded Siltstone concretions, difficult excavation			
					TRENCH TERMINATED AT 10.5 FEET No groundwater encountered Backfilled and tamped with soil cuttings			

Figure A-92,
Log of Test Pit TP 25, Page 1 of 1

G1218-52-01 (UPD-04-17-2012).GPJ

SAMPLE SYMBOLS

☐ ... SAMPLING UNSUCCESSFUL
◧ ... STANDARD PENETRATION TEST
■ ... DRIVE SAMPLE (UNDISTURBED)
☒ ... DISTURBED OR BAG SAMPLE
◪ ... CHUNK SAMPLE
▼ ... WATER TABLE OR SEEPAGE

NOTE: THE LOG OF SUBSURFACE CONDITIONS SHOWN HEREON APPLIES ONLY AT THE SPECIFIC BORING OR TRENCH LOCATION AND AT THE DATE INDICATED. IT IS NOT WARRANTED TO BE REPRESENTATIVE OF SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND TIMES.

GEOCON

PROJECT NO. G1218-52-01

TEST PIT TP 26

ELEV. (MSL.) **960'** DATE COMPLETED **12-21-2006**

EQUIPMENT **JD450C TRACK MOUNTED BACKHOE** BY: **N.A.A.**

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	MATERIAL DESCRIPTION	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
0 2 4				SM+SC	**LANDSLIDE DEBRIS (Qls)** Loose, slightly moist, grayish brown, Silty to Clayey SAND, porous, common fragments of Siltstone and Sandstone, carbonate minerlization and thin roots, surficial slide debris			
6 8				ML	**PUENTE FORMATION - LA VIDA MEMBER (Tplv)** Loose, dry, olive gray, Clayey SILTSTONE, intensely weathered and fractured, carbonate minerlization -4 inch thick bed of yellow to reddish brown fine-grained Sandstone, continuous -Bedding N24W, 19SW becomes very stiff, slightly moist, dark olive gray, jointed with carbonate minerlization, relatively massive, moderately weathered			
					TRENCH TERMINATED AT 9.5 FEET No groundwater encountered Backfilled and tamped with soil cuttings			

Figure A-93,
Log of Test Pit TP 26, Page 1 of 1

G1218-52-01 (UPD-04-17-2012).GPJ

SAMPLE SYMBOLS

☐ ... SAMPLING UNSUCCESSFUL ◧ ... STANDARD PENETRATION TEST ■ ... DRIVE SAMPLE (UNDISTURBED)

☒ ... DISTURBED OR BAG SAMPLE ◩ ... CHUNK SAMPLE ▼ ... WATER TABLE OR SEEPAGE

NOTE: THE LOG OF SUBSURFACE CONDITIONS SHOWN HEREON APPLIES ONLY AT THE SPECIFIC BORING OR TRENCH LOCATION AND AT THE DATE INDICATED. IT IS NOT WARRANTED TO BE REPRESENTATIVE OF SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND TIMES.

PROJECT NO. G1218-52-01

TEST PIT TP 27

ELEV. (MSL.) **1080'** DATE COMPLETED **05-03-2010**

EQUIPMENT **TRACKHOE** BY: **T. REIST**

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	MATERIAL DESCRIPTION	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
0 2 4				ML	**ENGINEERED ARTIFICIAL FILL (afe)** Medium dense, moist, light gray, dark gray to light brown, fine, Sandy/Clayey SILT with trace gravel -Clean contact; dipping south west			
6 8				SM	**PUENTE FORMATION - SOQUEL MEMBER (Tps)** Very dense, damp, light brown with orange oxidation, Silty, fine to medium SANDSTONE -Bedding contact at 7.5 feet dipping approx. 18ºSW			
					TRENCH TERMINATED AT 8.5 FEET			

Figure A-94,
Log of Test Pit TP 27, Page 1 of 1

G1218-52-01 (UPD-04-17-2012).GPJ

SAMPLE SYMBOLS

☐ ... SAMPLING UNSUCCESSFUL
◧ ... STANDARD PENETRATION TEST
■ ... DRIVE SAMPLE (UNDISTURBED)
☒ ... DISTURBED OR BAG SAMPLE
◩ ... CHUNK SAMPLE
▼ ... WATER TABLE OR SEEPAGE

NOTE: THE LOG OF SUBSURFACE CONDITIONS SHOWN HEREON APPLIES ONLY AT THE SPECIFIC BORING OR TRENCH LOCATION AND AT THE DATE INDICATED. IT IS NOT WARRANTED TO BE REPRESENTATIVE OF SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND TIMES.

GEOCON

PROJECT NO. G1218-52-01

TEST PIT TP 28

ELEV. (MSL.) **1058'** DATE COMPLETED **05-03-2010**

EQUIPMENT **TRACKHOE** BY: **T. REIST**

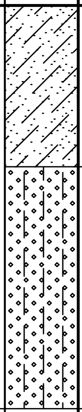
DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	MATERIAL DESCRIPTION	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
0 2				SC	**TOPSOIL** Loose to medium dense, damp to moist, dark brown, Clayey, fine to medium SAND -Gradational contact			
4 6				SM	**PUENTE FORMATION - SOQUEL MEMBER (Tps)** Dense, damp, light brown, Silty, fine to coarse SANDSTONE; massive; no discernable bedding			
					TRENCH TERMINATED AT 7.5 FEET			

Figure A-95,
Log of Test Pit TP 28, Page 1 of 1

G1218-52-01 (UPD-04-17-2012).GPJ

SAMPLE SYMBOLS

☐ ... SAMPLING UNSUCCESSFUL
◧ ... STANDARD PENETRATION TEST
■ ... DRIVE SAMPLE (UNDISTURBED)
☒ ... DISTURBED OR BAG SAMPLE
◩ ... CHUNK SAMPLE
▼ ... WATER TABLE OR SEEPAGE

NOTE: THE LOG OF SUBSURFACE CONDITIONS SHOWN HEREON APPLIES ONLY AT THE SPECIFIC BORING OR TRENCH LOCATION AND AT THE DATE INDICATED. IT IS NOT WARRANTED TO BE REPRESENTATIVE OF SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND TIMES.

GEOCON

PROJECT NO. G1218-52-01

TEST PIT TP 29

ELEV. (MSL.) **1098'** DATE COMPLETED **05-03-2010**

EQUIPMENT **TRACKHOE** BY: **T. REIST**

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	MATERIAL DESCRIPTION	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
0		▨		CL	**TOPSOIL** Stiff, moist, dark brown, Silty CLAY			
2		░		ML&CL	**PUENTE FORMATION - SOQUEL MEMBER (Tps-slt)** Hard, damp, dark gray to grayish brown, interbedded, fine, Sandy/Clayey SILTSTONE and Silty CLAYSTONE; thinly bedded			
4		░						
6		░			-Bedding (N20W, 21S)			
					TRENCH TERMINATED AT 7 FEET			

Figure A-96,
Log of Test Pit TP 29, Page 1 of 1

G1218-52-01 (UPD-04-17-2012).GPJ

SAMPLE SYMBOLS			
	☐ ... SAMPLING UNSUCCESSFUL	◧ ... STANDARD PENETRATION TEST	■ ... DRIVE SAMPLE (UNDISTURBED)
	☒ ... DISTURBED OR BAG SAMPLE	◪ ... CHUNK SAMPLE	▼ ... WATER TABLE OR SEEPAGE

NOTE: THE LOG OF SUBSURFACE CONDITIONS SHOWN HEREON APPLIES ONLY AT THE SPECIFIC BORING OR TRENCH LOCATION AND AT THE DATE INDICATED. IT IS NOT WARRANTED TO BE REPRESENTATIVE OF SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND TIMES.

GEOCON

PROJECT NO. G1218-52-01

TEST PIT TP 30

ELEV. (MSL.) **1068'** DATE COMPLETED **05-03-2010**

EQUIPMENT **TRACKHOE** BY: **T. REIST**

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	MATERIAL DESCRIPTION	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
0 2				CL	**TOPSOIL** Stiff, moist, dark brown, Silty CLAY			
4 6				ML	**PUENTE FORMATION - SOQUEL MEMBER (Tps-slt)** Hard, damp to moist, grayish brown, interbedded, fine, Sandy SILTSTONE/Clayey SILTSTONE; thinly bedded			
				SM	-Sharp contact (N20W, 21S) Very dense, damp, light brown, Silty, fine to medium SANDSTONE; cemented			
					TRENCH TERMINATED AT 7.5 FEET			

Figure A-97,
Log of Test Pit TP 30, Page 1 of 1

G1218-52-01 (UPD-04-17-2012).GPJ

SAMPLE SYMBOLS	☐ ... SAMPLING UNSUCCESSFUL	◧ ... STANDARD PENETRATION TEST	■ ... DRIVE SAMPLE (UNDISTURBED)
	☒ ... DISTURBED OR BAG SAMPLE	◪ ... CHUNK SAMPLE	▼ ... WATER TABLE OR SEEPAGE

NOTE: THE LOG OF SUBSURFACE CONDITIONS SHOWN HEREON APPLIES ONLY AT THE SPECIFIC BORING OR TRENCH LOCATION AND AT THE DATE INDICATED. IT IS NOT WARRANTED TO BE REPRESENTATIVE OF SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND TIMES.

GEOCON

PROJECT NO. G1218-52-01

TEST PIT TP 31

ELEV. (MSL.) **1101'** DATE COMPLETED **05-03-2010**

EQUIPMENT **TRACKHOE** BY: **T. REIST**

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	MATERIAL DESCRIPTION	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
0				CL	**LANDSLIDE DEBRIS (Qls)** Soft to stiff, moist, dark brown, Silty CLAY			
2					-Sand clasts blobs present with siltstone breccia clasts above basal slip surface			
4				ML&CL	-**BASAL SLIP SURFACE** at 3.5 feet; and contact (N20W, 24S); no apparent clay gouge; sharp contact **PUENTE FORMATION - SOQUEL MEMBER (Tps-slt)** Hard, damp, pale green and light brown, fine, Sandy SILTSTONE and Silty CLAYSTONE; thinly bedded			
6					TRENCH TERMINATED AT 6 FEET			

Figure A-98,
Log of Test Pit TP 31, Page 1 of 1

G1218-52-01 (UPD-04-17-2012).GPJ

SAMPLE SYMBOLS			
	☐ ... SAMPLING UNSUCCESSFUL	◧ ... STANDARD PENETRATION TEST	■ ... DRIVE SAMPLE (UNDISTURBED)
	☒ ... DISTURBED OR BAG SAMPLE	◪ ... CHUNK SAMPLE	▼ ... WATER TABLE OR SEEPAGE

NOTE: THE LOG OF SUBSURFACE CONDITIONS SHOWN HEREON APPLIES ONLY AT THE SPECIFIC BORING OR TRENCH LOCATION AND AT THE DATE INDICATED. IT IS NOT WARRANTED TO BE REPRESENTATIVE OF SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND TIMES.

PROJECT NO. G1218-52-01

TEST PIT TP 32

ELEV. (MSL.) 1126' DATE COMPLETED 05-03-2010

EQUIPMENT TRACKHOE BY: T. REIST

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	MATERIAL DESCRIPTION	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
0		▨		CL	**TOPSOIL** Stiff, moist to damp, dark brown, Silty CLAY			
		░		ML	**PUENTE FORMATION - SOQUEL MEMBER (Tps-slt)**			
2		░			Very hard, damp, light brown, fine, Sandy SILT			
4		░			-Bedding (N10W, 24S)			
		░			-Grades into clayey siltstone below 5 feet			
6		░						
					TRENCH TERMINATED AT 7 FEET			

Figure A-99,
Log of Test Pit TP 32, Page 1 of 1

G1218-52-01 (UPD-04-17-2012).GPJ

SAMPLE SYMBOLS

☐ ... SAMPLING UNSUCCESSFUL
◧ ... STANDARD PENETRATION TEST
■ ... DRIVE SAMPLE (UNDISTURBED)
☒ ... DISTURBED OR BAG SAMPLE
◩ ... CHUNK SAMPLE
▼ ... WATER TABLE OR SEEPAGE

NOTE: THE LOG OF SUBSURFACE CONDITIONS SHOWN HEREON APPLIES ONLY AT THE SPECIFIC BORING OR TRENCH LOCATION AND AT THE DATE INDICATED. IT IS NOT WARRANTED TO BE REPRESENTATIVE OF SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND TIMES.

GEOCON

PROJECT NO. G1218-52-01

TEST PIT TP 33

ELEV. (MSL.) **1098'** DATE COMPLETED **05-03-2010**

EQUIPMENT **TRACKHOE** BY: **T. REIST**

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	MATERIAL DESCRIPTION	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
0		▨		CL	**LANDSLIDE DEBRIS (Qls)** Soft to stiff, moist, dark brown, Silty CLAY			
2		▨			-1/2-3" siltstone breccia fragments present at 2.5 feet; no clay gouge -**BASAL SLIP SURFACE** at 3 feet			
4		▥		ML	**PUENTE FORMATION - SOQUEL MEMBER (Tps-slt)** Very hard, damp, light brown, fine, Sandy/Clayey SILTSTONE; moderate bedding			
					TRENCH TERMINATED AT 5 FEET			

Figure A-100,
Log of Test Pit TP 33, Page 1 of 1

G1218-52-01 (UPD-04-17-2012).GPJ

SAMPLE SYMBOLS			
	☐ ... SAMPLING UNSUCCESSFUL	◧ ... STANDARD PENETRATION TEST	■ ... DRIVE SAMPLE (UNDISTURBED)
	⊠ ... DISTURBED OR BAG SAMPLE	◪ ... CHUNK SAMPLE	▼ ... WATER TABLE OR SEEPAGE

NOTE: THE LOG OF SUBSURFACE CONDITIONS SHOWN HEREON APPLIES ONLY AT THE SPECIFIC BORING OR TRENCH LOCATION AND AT THE DATE INDICATED. IT IS NOT WARRANTED TO BE REPRESENTATIVE OF SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND TIMES.

GEOCON

PROJECT NO. G1218-52-01

TEST PIT TP 34

ELEV. (MSL.) **1048'** DATE COMPLETED **05-03-2010**

EQUIPMENT **TRACKHOE** BY: **T. REIST**

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	MATERIAL DESCRIPTION	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
0				SM/ML	**ENGINEERED ARTIFICIAL FILL (afe)** Medium dense/very stiff, moist, lightbrown, Silty, fine SANDSTONE/fine, Sandy SILT with some clay			
2								
4								
					-Clean contact			
6				SM	**PUENTE FORMATION - SOQUEL MEMBER (Tps)** Dense, damp, brown, Silty, fine to medium SANDSTONE			
					TRENCH TERMINATED AT 7 FEET			

Figure A-101,
Log of Test Pit TP 34, Page 1 of 1

G1218-52-01 (UPD-04-17-2012).GPJ

SAMPLE SYMBOLS			
	☐ ... SAMPLING UNSUCCESSFUL	◧ ... STANDARD PENETRATION TEST	■ ... DRIVE SAMPLE (UNDISTURBED)
	☒ ... DISTURBED OR BAG SAMPLE	◪ ... CHUNK SAMPLE	▼ ... WATER TABLE OR SEEPAGE

NOTE: THE LOG OF SUBSURFACE CONDITIONS SHOWN HEREON APPLIES ONLY AT THE SPECIFIC BORING OR TRENCH LOCATION AND AT THE DATE INDICATED. IT IS NOT WARRANTED TO BE REPRESENTATIVE OF SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND TIMES.

GEOCON

PROJECT NO. G1218-52-01

TEST PIT TP 35

ELEV. (MSL.) **1143'** DATE COMPLETED **05-05-2010**

EQUIPMENT **TRACKHOE** BY: **T. REIST**

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	MATERIAL DESCRIPTION	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
0				ML	**LANDSLIDE DEBRIS (Qls)** Soft, damp, gray, fine, Sandy SILT with siltstone breccia clasts up to 10"			
2								
4					-No defined basal slip surface			
6				ML&CL	**PUENTE FORMATION - SOQUEL MEMBER (Tps-slt)** Hard, damp, gray and light brown, interbedded, fine, Sandy SILTSTONE and Silty CLAYSTONE; thinly bedded			
8					TRENCH TERMINATED AT 8 FEET			

Figure A-102,
Log of Test Pit TP 35, Page 1 of 1

G1218-52-01 (UPD-04-17-2012).GPJ

SAMPLE SYMBOLS			
	☐ ... SAMPLING UNSUCCESSFUL	◧ ... STANDARD PENETRATION TEST	■ ... DRIVE SAMPLE (UNDISTURBED)
	☒ ... DISTURBED OR BAG SAMPLE	◪ ... CHUNK SAMPLE	▼ ... WATER TABLE OR SEEPAGE

NOTE: THE LOG OF SUBSURFACE CONDITIONS SHOWN HEREON APPLIES ONLY AT THE SPECIFIC BORING OR TRENCH LOCATION AND AT THE DATE INDICATED. IT IS NOT WARRANTED TO BE REPRESENTATIVE OF SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND TIMES.

GEOCON

PROJECT NO. G1218-52-01

TEST PIT TP 36

ELEV. (MSL.) **1152'** DATE COMPLETED **05-05-2010**

EQUIPMENT **TRACKHOE** BY: **T. REIST**

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	MATERIAL DESCRIPTION	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
0				ML	**TOPSOIL** Soft, damp, gray, Clayey, fine, Sandy SILT			
2				ML&CL	**PUENTE FORMATION - SOQUEL MEMBER (Tps-slt)** Hard, damp, gray and brown, Clayey SILTSTONE and Silty CLAYSTONE; thinly bedded			
4					-Bedding (East-West 32S)			
6								
					TRENCH TERMINATED AT 6.5 FEET			

Figure A-103,
Log of Test Pit TP 36, Page 1 of 1

G1218-52-01 (UPD-04-17-2012).GPJ

SAMPLE SYMBOLS			
	☐ ... SAMPLING UNSUCCESSFUL	◧ ... STANDARD PENETRATION TEST	■ ... DRIVE SAMPLE (UNDISTURBED)
	☒ ... DISTURBED OR BAG SAMPLE	◩ ... CHUNK SAMPLE	▼ ... WATER TABLE OR SEEPAGE

NOTE: THE LOG OF SUBSURFACE CONDITIONS SHOWN HEREON APPLIES ONLY AT THE SPECIFIC BORING OR TRENCH LOCATION AND AT THE DATE INDICATED. IT IS NOT WARRANTED TO BE REPRESENTATIVE OF SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND TIMES.

GEOCON

TEST PIT TP 37

ELEV. (MSL.) **1137'** DATE COMPLETED **05-05-2010**

EQUIPMENT **TRACKHOE** BY: **T. REIST**

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	MATERIAL DESCRIPTION	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
0				ML	**ALLUVIUM (Qal)** Soft, moist, brown and gray, Clayey SILT			
2								
4								
				ML	**PUENTE FORMATION - SOQUEL MEMBER (Tps-slt)** Hard, damp, dark gray and brown, Clayey SILTSTONE; thinly bedded			
6								
					TRENCH TERMINATED AT 6.5 FEET			

Figure A-104,
Log of Test Pit TP 37, Page 1 of 1

SAMPLE SYMBOLS			
	☐ ... SAMPLING UNSUCCESSFUL	◧ ... STANDARD PENETRATION TEST	■ ... DRIVE SAMPLE (UNDISTURBED)
	▨ ... DISTURBED OR BAG SAMPLE	◣ ... CHUNK SAMPLE	▼ ... WATER TABLE OR SEEPAGE

NOTE: THE LOG OF SUBSURFACE CONDITIONS SHOWN HEREON APPLIES ONLY AT THE SPECIFIC BORING OR TRENCH LOCATION AND AT THE DATE INDICATED. IT IS NOT WARRANTED TO BE REPRESENTATIVE OF SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND TIMES.

GEOCON

PROJECT NO. G1218-52-01

TEST PIT TP 38

ELEV. (MSL.) **1120'** DATE COMPLETED **05-05-2010**

EQUIPMENT **TRACKHOE** BY: **T. REIST**

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	MATERIAL DESCRIPTION	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
0				ML	**LANDSLIDE DEBRIS/COLLUVIUM (Qls/Qc)** Soft, damp, gray brown, Clayey/fine, Sandy SILT			
2								
					-Siltstone clasts up to 6"			
4								
6				ML	**PUENTE FORMATION - SOQUEL MEMBER (Tps-slt)** Hard, damp, gray brown, Clayey, SILTSTONE; thinly bedded			
8					TRENCH TERMINATED AT 8 FEET			

Figure A-105,
Log of Test Pit TP 38, Page 1 of 1

SAMPLE SYMBOLS

☐ ... SAMPLING UNSUCCESSFUL
◧ ... STANDARD PENETRATION TEST
■ ... DRIVE SAMPLE (UNDISTURBED)
☒ ... DISTURBED OR BAG SAMPLE
◪ ... CHUNK SAMPLE
▼ ... WATER TABLE OR SEEPAGE

NOTE: THE LOG OF SUBSURFACE CONDITIONS SHOWN HEREON APPLIES ONLY AT THE SPECIFIC BORING OR TRENCH LOCATION AND AT THE DATE INDICATED. IT IS NOT WARRANTED TO BE REPRESENTATIVE OF SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND TIMES.

GEOCON

PROJECT NO. G1218-52-01

TEST PIT TP 39

ELEV. (MSL.) **1065'** DATE COMPLETED **05-05-2010**

EQUIPMENT **TRACKHOE** BY: **T. REIST**

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	MATERIAL DESCRIPTION	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
0				ML/CL	**LANDSLIDE DEBRIS (Qls)** Soft, moist, dark brown, Clayey SILT/Silty CLAY -Becomes orange brown, brown and gray with chaotic appearance below			
2								
4								
6					-**BASAL SLIP SURFACE** at 6.5 feet; estimated based on excavated material; zone of plastic clay with 1/4-1/2" breccia clasts			
				ML	**PUENTE FORMATION - SOQUEL MEMBER (Tps-slt)** Hard, damp, white, fine, Sandy SILTSTONE			
8								

TRENCH TERMINATED AT 9 FEET
Unable to log due to unsafe condition

Figure A-106,
Log of Test Pit TP 39, Page 1 of 1

G1218-52-01 (UPD-04-17-2012).GPJ

SAMPLE SYMBOLS

☐ ... SAMPLING UNSUCCESSFUL
◧ ... STANDARD PENETRATION TEST
■ ... DRIVE SAMPLE (UNDISTURBED)
☒ ... DISTURBED OR BAG SAMPLE
◩ ... CHUNK SAMPLE
▼ ... WATER TABLE OR SEEPAGE

NOTE: THE LOG OF SUBSURFACE CONDITIONS SHOWN HEREON APPLIES ONLY AT THE SPECIFIC BORING OR TRENCH LOCATION AND AT THE DATE INDICATED. IT IS NOT WARRANTED TO BE REPRESENTATIVE OF SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND TIMES.

GEOCON

PROJECT NO. G1218-52-01

TEST PIT TP 40

ELEV. (MSL.) **1068'** DATE COMPLETED **05-05-2010**

EQUIPMENT **TRACKHOE** BY: **T. REIST**

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	MATERIAL DESCRIPTION	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
0				CL	**LANDSLIDE DEBRIS (Qls)** Soft, moist, brown, Silty CLAY			
2					-Becomes grayish brown and clayier below 2 feet			
4					-Distinct change in fabric and color below 5 feet			
				CL	**ALLUVIUM (Qal)** Stiff, moist, dark brown, Silty CLAY			
6								
8				ML	**PUENTE FORMATION - SOQUEL MEMBER (Tps-slt)** Hard to very stiff, moist, yellowish brown, fine, Sandy SILTSTONE			
10					TRENCH TERMINATED AT 10 FEET			

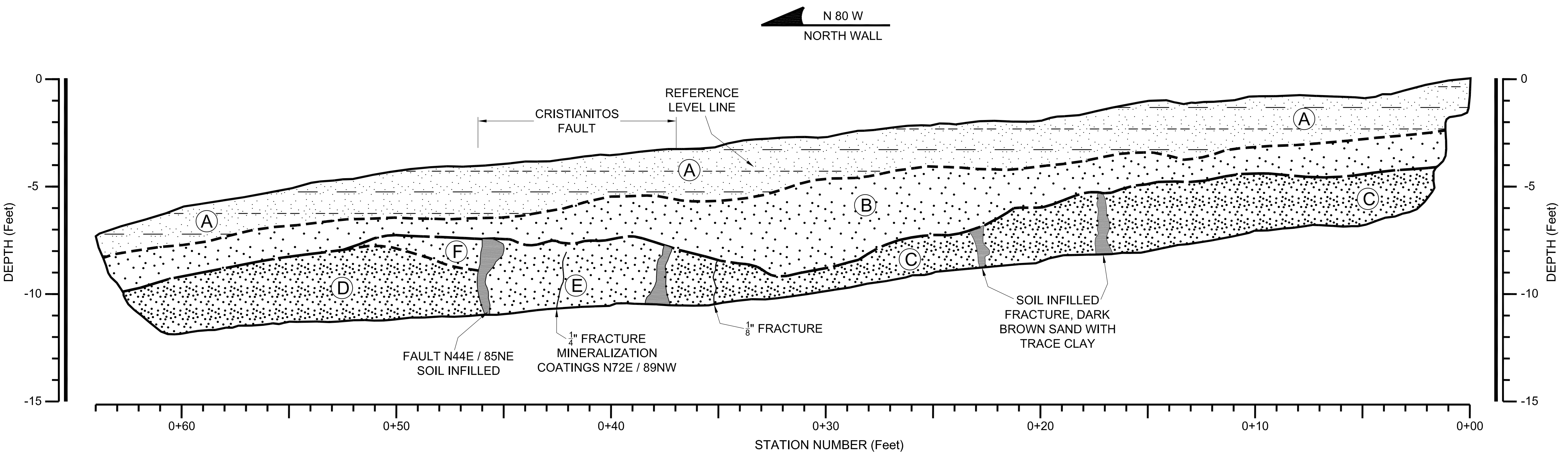
Figure A-107,
Log of Test Pit TP 40, Page 1 of 1

G1218-52-01 (UPD-04-17-2012).GPJ

SAMPLE SYMBOLS			
	☐ ... SAMPLING UNSUCCESSFUL	◧ ... STANDARD PENETRATION TEST	■ ... DRIVE SAMPLE (UNDISTURBED)
	⊠ ... DISTURBED OR BAG SAMPLE	◩ ... CHUNK SAMPLE	▼ ... WATER TABLE OR SEEPAGE

NOTE: THE LOG OF SUBSURFACE CONDITIONS SHOWN HEREON APPLIES ONLY AT THE SPECIFIC BORING OR TRENCH LOCATION AND AT THE DATE INDICATED. IT IS NOT WARRANTED TO BE REPRESENTATIVE OF SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND TIMES.

PORTOLA CENTER SOUTH
TM #15353
LAKE FOREST, CALIFORNIA



FAULT TRENCH FT-1

SCALE: 1" = 5' (Horiz. = Vert.)

Ⓐ **TOPSOIL:** Sandy SILT to Silty SAND, fine- to medium-grained, firm to stiff, dark brown, porous, thin roots; few animal burrows; scattered coarse grains; "A" soil horizon; no evidence of offset or displacement

Ⓑ **TOPSOIL:** Silty SAND with CLAY; fine- to medium-grained, medium dense to dense, olive gray to olive brown, weakly developed pedogenic profile, translocated clay; "AB" to "BTj" soil

Ⓒ **PUENTE FORMATION - SOQUEL MEMBER:** SANDSTONE, fine- to medium-grained with some coarse grains, medium dense to dense, moderately to highly weathered, poorly cemented, scattered clasts of sandy siltstone, massive, light yellowish brown to olive brown

Ⓓ **CAPISTRANO FORMATION:** SANDSTONE, fine- to medium-grained with few coarse grains, dense, moderately weathered, poorly cemented and friable, slightly micaceous, light olive gray to light yellowish gray, massive

Ⓔ **CRISTIANITOS FAULT:** Zone of highly fractured, crushed SANDSTONE bounded on the west by a soil-filled fault ~ 12" wide at station 0+46 and on the east at station 0+38 by a soil-filled fracture; minor clay gouge and crushed matrix within fractures; some mineralization within fractures; juxtaposing Capistrano Formation (west) and Puente Formation (east); no vertical displacement measurable; trending roughly NE with near-vertical dip

Ⓕ Wedge of crushed Capistrano Formation infilled with clay and sand and highly fractured; soil infilling with clayey basal contact forming upper surface of Capistrano Formation toward the west end of the trench

GEOCON
INCORPORATED
GEOTECHNICAL CONSULTANTS
6960 FLANDERS DRIVE - SAN DIEGO, CALIFORNIA 92121 - 2974
PHONE 858 558-6900 - FAX 858 558-6159

LOG OF TRENCH FT-1
PROJECT NO. G1218 - 52 - 01A
FIGURE A-108
DATE 07 - 06 - 2012

COUNTY OF ORANGE
HEALTH CARE AGENCY

REGULATORY HEALTH SERVICES
ENVIRONMENTAL HEALTH

Excellence
Integrity
Service

JULIETTE A. POULSON, RN, MN
DIRECTOR

MIKE SPURGEON
DEPUTY AGENCY DIRECTOR
REGULATORY HEALTH SERVICES

STEVEN K. WONG, REHS, MPH
DIRECTOR
ENVIRONMENTAL HEALTH

MAILING ADDRESS:
1241 E. Dyer Road, Suite 120
SANTA ANA, CA 92705-5611

TELEPHONE: (714) 433-6000
FAX: (714) 433-6481
E-MAIL: ehealth@ochca.com

December 14, 2006

Gerald Kasman
Geocon Inland Empire, Inc.
3303 N. San Fernando Blvd., Ste. 100
Burbank, CA 91504

Re: Proper Destruction of Soil Borings for Well Construction Permit # 06-12-09.

Dear Gerald Kasman:

All soil borings that are permitted by this Agency must be destroyed according to the California Well Standards Bulletins 74-81 and 74-90. All exploratory borings located in areas where there is a possibility of surface contamination (from known or potential sources of pollution and contamination) shall be adequately abandoned. The top 20 feet (minimum) shall be sealed with an approved, impervious sealant. If contaminated soil or groundwater is encountered in any of the exploratory borings, in-situ soil shall not be used as part of the sealing material. Exploratory borings shall be completely filled with appropriate sealing material from bottom to top. All drilling shall be undertaken in such a manner as to not impair the quality of the groundwater.

If no groundwater is encountered in the six – 24-inch diameter soil borings (total estimated boring depth of 80 feet below ground surface) the following variance will be given for the destruction of the borings. Begin with backfilling the bottom of the hole with two feet of bentonite grout. A half-foot of bentonite grout must be place after every five feet of clean native material. In circumstances where the soil formation is well known, one foot of bentonite grout after every ten feet of clean native material is also acceptable. The top section between five feet and ten feet below grade shall also be filled with bentonite grout. The registered professional as the 'generator' of the waste (soil cuttings) must determine by observation and if necessary appropriate analytical tests that the native soil is clean before it is used for backfilling.

Sincerely,

Dan Yokoyama

Dan Yokoyama, REHS
Environmental Health Specialist II
Water Quality Section
Environmental Health Division

Attachments

COUNTY OF ORANGE
HEALTH CARE AGENCY

REGULATORY HEALTH SERVICES
ENVIRONMENTAL HEALTH

Excellence
Integrity
Service

JULIETTE A. POULSON, RN, MN
DIRECTOR

DAVID M. SOULELES, MPH
DEPUTY AGENCY DIRECTOR

RICHARD SANCHEZ, REHS, MPH
DIRECTOR
ENVIRONMENTAL HEALTH

MAILING ADDRESS:
1241 E. DYER ROAD
SUITE 120
SANTA ANA, CA 92705-5611

TELEPHONE: (714) 433-6000
FAX: (714) 433-6481
E-MAIL: ehealth@ochca.com

November 6, 2007

Damien Gonsman
Geocon Incorporated
6960 Flanders Drive
San Diego, CA 92121

Re: Proper destruction of soil borings for Well Construction Permit # 07-11-09.

Dear Damien Gonsman:

All soil borings that are permitted by this Agency must be destroyed according to the California Well Standards Bulletins 74-81 and 74-90. All exploratory borings located in areas where there is a possibility of surface contamination (from known or potential sources of pollution and contamination) shall be adequately abandoned. The top 20 feet (minimum) shall be sealed with an approved, impervious sealant. If contaminated soil or groundwater is encountered in any of the exploratory borings, in-situ soil shall not be used as part of the sealing material. Exploratory borings shall be completely filled with appropriate sealing material from bottom to top. All drilling shall be undertaken in such a manner as to not impair the quality of the groundwater.

If no groundwater is encountered in the five – 30-inch diameter soil borings (total estimated boring depth of 100 feet below ground surface) the following variance will be given for the destruction of the borings. Begin with backfilling the bottom of the hole with two feet of bentonite grout. A half-foot of bentonite grout must be placed after every five feet of clean native material. In circumstances where the soil formation is well known, one foot of bentonite grout after every ten feet of clean native material is also acceptable. The top section between five feet and ten feet below grade shall also be filled with bentonite grout. The registered professional as the 'generator' of the waste (soil cuttings) must determine by observation and if necessary appropriate analytical tests that the native soil is clean before it is used for backfilling.

Sincerely,

Dan Yokoyama

Dan Yokoyama, REHS
Environmental Health Specialist II
Water Quality Section
Environmental Health

Attachments

COUNTY OF ORANGE
HEALTH CARE AGENCY

PUBLIC HEALTH SERVICES
ENVIRONMENTAL HEALTH

Excellence
Integrity
Service

DAVID L. RILEY
DIRECTOR

BOB WILSON
ASSISTANT AGENCY DIRECTOR

DAVID M. SOULELES, MPH
DEPUTY AGENCY DIRECTOR

RICHARD SANCHEZ, REHS, MPH
DIRECTOR
ENVIRONMENTAL HEALTH

MAILING ADDRESS:
1241 E. DYER RD., #120
SANTA ANA, CA 92705-5611

TELEPHONE: (714) 433-6288
FAX: (714) 433-6481
E-MAIL: ehealth@ochca.com

October 14, 2011

Paul D. Theriault
GEOCON West, Inc.
41571 Corning Place, Suite 101
Murrieta, CA 92562-7065

Re: Proper destruction of large diameter soil borings for Well Construction Permit # 11-10-15 (Saddleback Ranch Rd. and Glen Ranch Rd. in Lake Forest, CA).

Dear Paul Theriault:

All soil borings that are permitted by this Agency must be destroyed according to the California Well Standards Bulletins 74-81 and 74-90. All exploratory borings located in areas where there is a possibility of surface contamination (from known or potential sources of pollution and contamination) must be adequately abandoned. The top 20 feet (minimum) must be sealed with an approved, impervious sealant. If contaminated soil or groundwater is encountered in any of the exploratory borings, in-situ soil must not be used as part of the sealing material. Exploratory borings must be completely filled with appropriate sealing material from bottom to top. All drilling must be undertaken in such a manner as to not impair the quality of the groundwater.

If no groundwater is encountered in the ten – 30-inch diameter soil borings (total estimated boring depth of 60-95 feet below ground surface) the following variance will be given for the destruction of the borings. Begin with backfilling the bottom of the hole with two feet of bentonite grout. A half-foot of bentonite grout must be placed after every five feet of clean native material. In circumstances where the soil formation is well known, one foot of bentonite grout after every ten feet of clean native material is also acceptable. The top section between five feet and ten feet below grade must also be filled with bentonite grout. The registered professional as the 'generator' of the waste (soil cuttings) must determine by observation and if necessary appropriate analytical tests that the native soil is clean before it is used for backfilling.

Sincerely,

Dan Yokoyama

Dan Yokoyama, REHS
Environmental Health Specialist II
Water Quality Program
Environmental Health

Attachments

cc: Mike Fennessy, Supervisor, Water Quality Program
Juan Anzora, Water Quality Inspector

COUNTY OF ORANGE
HEALTH CARE AGENCY

PUBLIC HEALTH SERVICES
ENVIRONMENTAL HEALTH

Excellence
Integrity
Service

DAVID L. RILEY
DIRECTOR

BOB WILSON
ASSISTANT AGENCY DIRECTOR

DAVID M. SOULELES, MPH
DEPUTY AGENCY DIRECTOR

RICHARD SANCHEZ, REHS, MPH
DIRECTOR
ENVIRONMENTAL HEALTH

MAILING ADDRESS:
1241 E. DYER RD., #120
SANTA ANA, CA 92705-5611

TELEPHONE: (714) 433-6288
FAX: (714) 433-6481
E-MAIL: ehealth@ochca.com

October 14, 2011

Paul D. Theriault
GEOCON West, Inc.
41571 Corning Place, Suite 101
Murrieta, CA 92562-7065

Re: Proper destruction of large diameter soil borings for Well Construction Permit # 11-10-16 (Saddleback Ranch Rd. and Glen Ranch Rd. in Lake Forest, CA).

Dear Paul Theriault:

All soil borings that are permitted by this Agency must be destroyed according to the California Well Standards Bulletins 74-81 and 74-90. All exploratory borings located in areas where there is a possibility of surface contamination (from known or potential sources of pollution and contamination) must be adequately abandoned. The top 20 feet (minimum) must be sealed with an approved, impervious sealant. If contaminated soil or groundwater is encountered in any of the exploratory borings, in-situ soil must not be used as part of the sealing material. Exploratory borings must be completely filled with appropriate sealing material from bottom to top. All drilling must be undertaken in such a manner as to not impair the quality of the groundwater.

If no groundwater is encountered in the eight – 30-inch diameter soil borings (total estimated boring depth of 50-130 feet below ground surface) the following variance will be given for the destruction of the borings. Begin with backfilling the bottom of the hole with two feet of bentonite grout. A half-foot of bentonite grout must be placed after every five feet of clean native material. In circumstances where the soil formation is well known, one foot of bentonite grout after every ten feet of clean native material is also acceptable. The top section between five feet and ten feet below grade must also be filled with bentonite grout. The registered professional as the 'generator' of the waste (soil cuttings) must determine by observation and if necessary appropriate analytical tests that the native soil is clean before it is used for backfilling.

Sincerely,

Dan Yokoyama

Dan Yokoyama, REHS
Environmental Health Specialist II
Water Quality Program
Environmental Health

Attachments

cc: Mike Fennessy, Supervisor, Water Quality Program
Juan Anzora, Water Quality Inspector

APPENDIX B

APPENDIX B

LABORATORY TESTING

We performed laboratory tests in accordance with current generally accepted test methods of the American Society for Testing and Materials (ASTM) or other suggested procedures. Selected soil samples were analyzed for *in situ* dry density and moisture content, maximum dry density and optimum moisture content, shear strength, expansion potential, Atterberg limits, water-soluble sulfate, water-soluble chloride, pH and resistivity, gradation, and consolidation characteristics. The results of the laboratory tests are presented on Tables B-I through B-VII and graphically on Figures B-1 through B-77. The in-place dry density and moisture content of the samples tested are presented in the boring logs in Appendix A.

TABLE B-I
SUMMARY OF LABORATORY MAXIMUM DRY DENSITY AND OPTIMUM MOISTURE CONTENT TEST RESULTS
ASTM D 1557

Sample No.	Description (Geologic Unit)	Maximum Dry Density (pcf)	Optimum Moisture Content (% dry wt.)
B1-6	Yellowish brown, Sandy SILT (afe)	118.5	13.0
B1-18	Olive, Sandy SILT (afe)	108.5	16.0
B1-19	Dark gray, Sandy SILT (afe)	113.0	14.5
B2-4	Brown, Silty to Clayey SAND (afe)	130.5	9.5
B2-8	Light Brown, Sandy SILT (afe)	101.0	21.0
B2-12	Yellowish brown, Sandy SILT (afe)	87.0	30.0
B3-14	Olive gray, Silty SAND (Tps)	106.0	17.5
B5-1	Light brown, Sandy SILT (Tplv)	79.0	38.0
B6-1	Yellowish brown, Silty, fine to medium SAND (Tps)	121.5	8.5
B7-5	Dark gray, Sandy SILT (afe)	109.0	18.5
B7-10	Dark gray, Sandy CLAY (afe)	124.0	12.5
B8-6	Gray, Sandy CLAY (afe)	115.0	15.0
B8-20	Dark brown, Sandy SILT (afe)	124.0	12.0
B10-16	Gray, Silty SAND (afe)	97.0	23.5
B11-5	Dark gray, Sandy SILT (afe)	82.5	33.0
B11-10	Olive, Sandy SILT (afe)	111.0	16.0
B12-10	Grayish brown, fine to medium, Sandy SILT (Tplv)	75.0	37.5
B14-11	Yellowish brown, fine, Sandy SILT (Tplv)	83.0	31.0

TABLE B-I (Continued)
SUMMARY OF LABORATORY MAXIMUM DRY DENSITY AND OPTIMUM MOISTURE CONTENT TEST RESULTS
ASTM D 1557

Sample No.	Description (Geologic Unit)	Maximum Dry Density (pcf)	Optimum Moisture Content (% dry wt.)
B16-13	Brown, fine, Sandy SILT (afe)	83.5	27.0
B18-8	Light olive brown, Clayey SAND (afe)	83.5	30.5
B19-8	Olive brown, Fine, Silty SAND (afe)	127.0	8.0
B40-4	Brown, fine to medium Sandy SILT (afe)	109.0	16.7
B40-12	Dark brown, Sandy CLAY (afe)	109.6	16.1
B42-5	Olive brown, Silty SAND; trace gravel (afe)	128.9	10.2
B43-1	Dark olive brown, Clayey SAND (afe)	83.6	33.0
B44-5	Olive brown, Sandy SILT; trace gravel (afe)	109.5	17.6
B45-2	Olive brown, Sandy SILT; trace gravel (afe)	87.3	29.1
B49-3	Olive brown, Sandy SILT; trace gravel (afe)	113.4	15.6
B50-4	Olive brown, Clayey SILT; trace gravel (afe)	113.5	16.8
B51-6	Olive gray, Sandy SILT (afe)	106.5	18.5
B54-6	Very dark grayish brown, Sandy SILT (Tplv)	77.9	33.8
B58-2	Dark olive brown, Silty SAND (afe)	119.8	12.6
B58-5	Very dark gray, Sandy CLAY (afe)	118.3	13.2
B60-5	Olive brown, Sandy SILT (afe)	112.7	15.4
B61-2	Dark grayish brown, Silty SAND; trace gravel (afe)	116.1	14.6
B61-8	Dark olive brown, Sandy SILT (afe)	110.5	17.7
B62-3	Olive brown, Sandy CLAY; trace gravel (afe)	105.6	18.6

TABLE B-II
SUMMARY OF LABORATORY DIRECT SHEAR TEST RESULTS
ASTM D 3080

Sample No.	Geologic Unit	Depth of Sample (Feet)	Dry Density (pcf)	Moisture Content (%)		Peak (Ultimate) Cohesion (psf)	Peak (Ultimate) Angle of Shear Resistance (degrees)
				Initial	Final		
B3-1	Tps-slt	6	97.7	23.9	22.9	425	40
B3-2	Tps-slt	11	94.1	26.3	32.3	780	20
B4-4	Tplv	21	82.7	36.1	33.6	1670	24
B4-7**	Tplv	36	82.8	39.0	36.7	550	7
B5-1*	Tplv	1-5	72.1	35.5	44.8	480	23
B5-4**	Tplv	16	68.4	64.4	56.9	630	25
B6-1*	Tps	1-5	108.6	9.0	16.7	630	30
B6-3	Tps	11	111.1	7.3	20.8	270	39
B7-4	afe	20	101.2	23.6	19.9	720	21
B7-5*	afe	21-25	102.1	13.6	22.8	770	9
B7-6	afe	30	101.6	22.6	24.8	700	31
B10-1	afe	5	102.5	21.6	23.5	420	27
B12-8	Tplv	45	69.9	35.0	44.7	1200 (850)	27 (26)
B12-9	Tplv	51	67.0	38.0	48.0	155 (490)	53 (41)
B12-10*	Tplv	31-35	64.0	43.9	62.6	430	31
B14-5**	Tplv	25	69.7	49.7	56.5	200 (240)	24 (20)
B14-6	Tplv	30	79.5	40.4	42.7	730 (630)	33 (33)
B14-10	Tplv	50	54.9	63.0	71.0	500 (90)	40 (39)
B14-11*	Tplv	28-29	70.0	39.4	54.1	310	35
B15-7	Tplv	40	78.5	39.9	44.5	260 (50)	39 (26)
B15-8	Tplv	45	68.7	46.6	51.8	550 (490)	32 (23)
B16-2	afe	10	78.0	32.9	55.6	380	43
B16-5	afe	25	74.0	43.1	48.3	1060	24
B16-8	afe	40	67.0	50.7	53.4	1140	33
B16-11	afe	55	107.1	6.9	15.6	580	34
B16-13*	afe	0-5	71.2	33.4	55.6	370	32
B18-8*	afe	0-5	64.6	27.8	52.2	360	36
B19-8*	afe	0-5	113.6	8.6	17.5	440	27
B21-3	Tps-slt	15	99.9	23.2	30.7	450 (450)	32 (30)
B21-10	Tps-slt	45	78.1	38.8	43.4	225 (220)	43 (36)
B23-3	Tps	10	109.9	5.5	14.9	400 (210)	43 (39)
B23-10	Tps-slt	29	93.6	27.1	31.1	675 (525)	25 (21)

TABLE B-II (Continued)
SUMMARY OF LABORATORY DIRECT SHEAR TEST RESULTS
ASTM D 3080

Sample No.	Geologic Unit	Depth of Sample (Feet)	Dry Density (pcf)	Moisture Content (%)		Peak (Ultimate) Cohesion (psf)	Peak (Ultimate) Angle of Shear Resistance (degrees)
				Initial	Final		
B24-5	Tps-slt	15	91.0	29.5	35.7	200 (0)	39 (39)
B24-8	Tps-slt	25	102.1	20.9	25.4	1210 (570)	30 (30)
B35-3	Tps	20	83.3	35.8	39.5	855 (490)	34 (37)
B35-6	Tps-slt	50	105.1	16.9	21.2	955 (870)	38 (38)
B37-2	Tps-slt	20	69.9	46.9	51.8	1110 (1180)	39 (37)
B38-1	Tps	10	110.0	13.2	18.8	590 (545)	48 (48)
B43-3	afe	10	76.0	36.2	43.4	0 (0)	51 (50)
B44-4	afe	20	75.0	41.6	46.7	205 (125)	45 (41)
B45-3	afe	10	80.8	37.3	39.8	900 (700)	41 (39)
B49-4	afe	15	98.9	23.3	28.0	670 (670)	35 (30)
B50-3	afe	15	99.9	23.2	25.0	600 (500)	38 (38)
B51-4	afe	15	100.0	22.3	27.3	1050 (965)	24 (24)
B57-3	Tplv	20	90.8	30.9	41.9	500 (400)	27 (24)
B57-5	Tplv	40	103.0	19.3	26.7	900 (600)	27 (27)

*Sample remolded to approximately 90 percent of maximum dry density at near optimum moisture content.
**Residual Shear Test Results.

TABLE B-III
SUMMARY OF LABORATORY EXPANSION INDEX TEST RESULTS
ASTM D 4829

Sample No.	Moisture Content (%)		Dry Density (pcf)	Expansion Index	Soil Expansion Classification	2010 CBC Expansion Classification
	Before Test	After Test				
B5-1	23.2	36.8	82.9	102	High	Expansive
B5-2	27.3	37.3	84.6	54	Medium	Expansive
B6-1	10.0	18.2	109.6	0	Very low	Non-Expansive
B7-5	7.4	27.1	103.6	127	High	Expansive
B7-6	7.2	24.7	106.4	105	High	Expansive
B11-5	13.4	36.5	85.4	113	High	Expansive
B12-10	21.5	50.4	71.1	73	Medium	Expansive
B14-11	24.9	43.0	77.0	81	Medium	Expansive
B15-2	27.2	50.9	73.9	110	High	Expansive
T10-1	7.6	18.5	114.0	53	Medium	Expansive

TABLE B-IV
SUMMARY OF LABORATORY ATTERBERG LIMITS TEST RESULTS
ASTM D 4318

Sample No.	Liquid Limit	Plastic Limit	Plasticity Index
B12-4	96	58	38
B14-1	108	70	38
B14-5	99	56	43
B14-11	116	43	73
B14-6	74	43	31
B21-17	87	33	54
B23-6	83	38	45
B23-13	76	34	42
B24-23	104	35	69
B24-26	91	34	57
B25-17	99	33	66
B26-1	82	32	50
B30-4	80	33	47
B31-4	82	37	45
B33-3	101	40	61
B33-6	110	44	66
B34-6	103	39	64

TABLE B-V
SUMMARY OF LABORATORY WATER-SOLUBLE SULFATE TEST RESULTS
CALIFORNIA TEST NO. 417

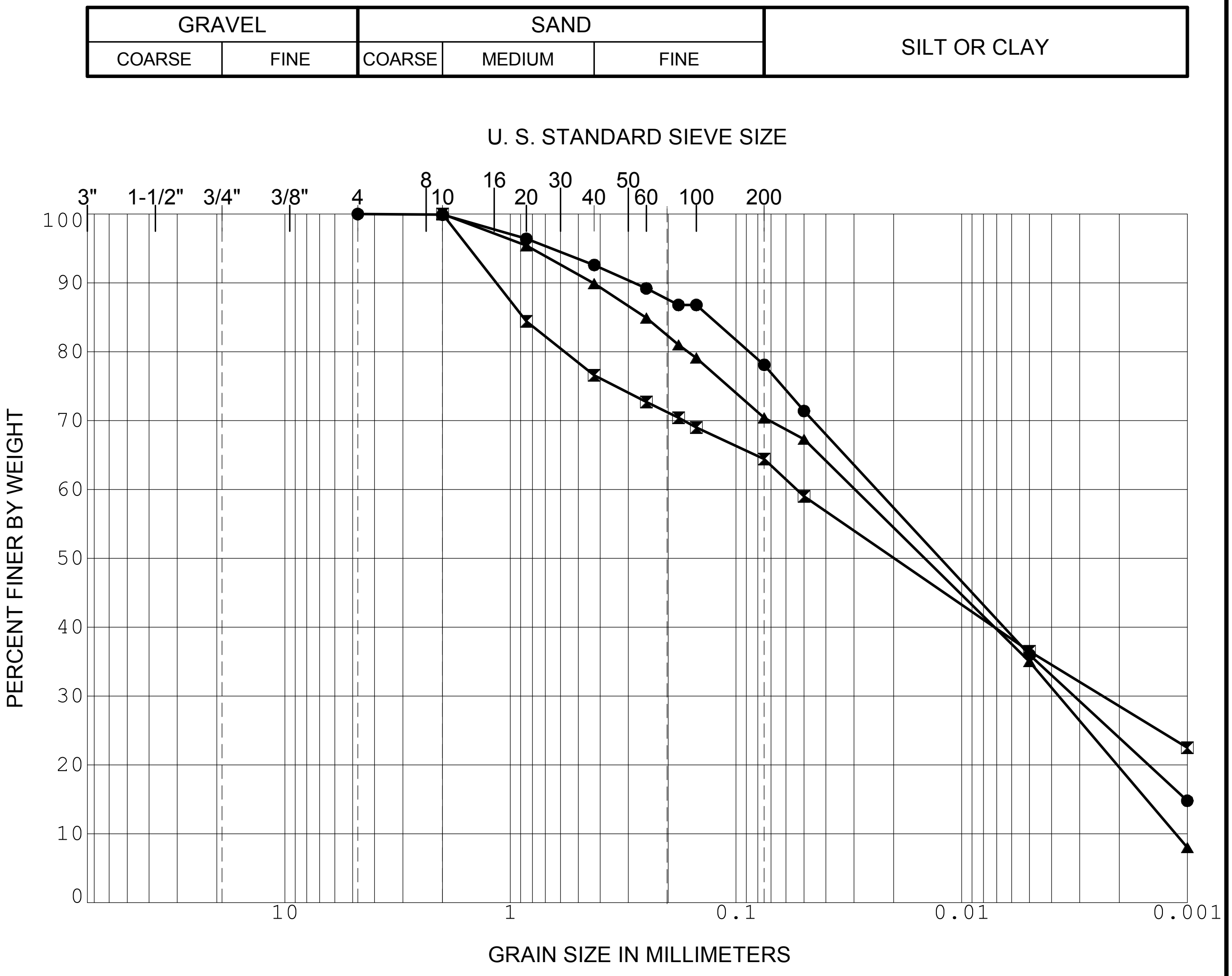
Sample No.	Water-Soluble Sulfate (%)	Sulfate Exposure
T19-1	0.645	Severe (S2)
B12-4	0.647	Severe (S2)
B14-1	0.111	Moderate (S1)

TABLE B-VI
SUMMARY OF LABORATORY WATER-SOLUBLE CHLORIDE ION CONTENT TEST RESULTS
AASHTO TEST NO. T 291

Sample No.	Chloride Ion Content ppm (%)
T19-1	820 (0.082)

TABLE B-VII
SUMMARY OF LABORATORY POTENTIAL OF HYDROGEN (pH) AND RESISTIVITY TEST RESULTS
CALIFORNIA TEST METHOD 643

Sample No.	pH	Minimum Resistivity (ohm-centimeters)
T19-1	6.9	615



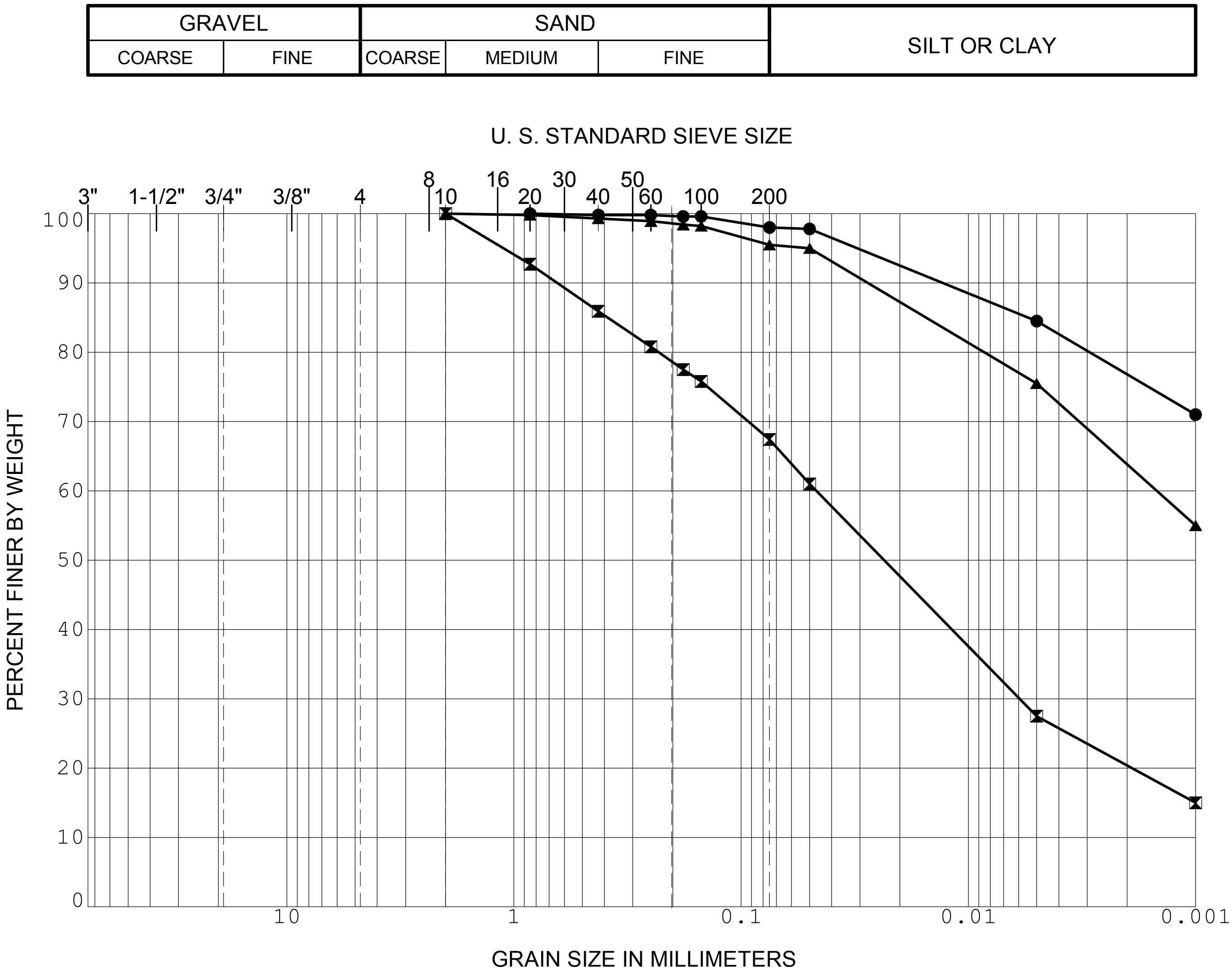
	SAMPLE	DEPTH (ft)	CLASSIFICATION	NAT WC	LL	PL	PI
●	B12-4	25.0	MH		96	58	38
⧗	B14-1	5.0	MH		108	70	38
▲	B14-5	25.0	MH		99	56	43

GRADATION CURVE

PORTOLA CENTER

LAKE FOREST, CALIFORNIA

Figure B-1



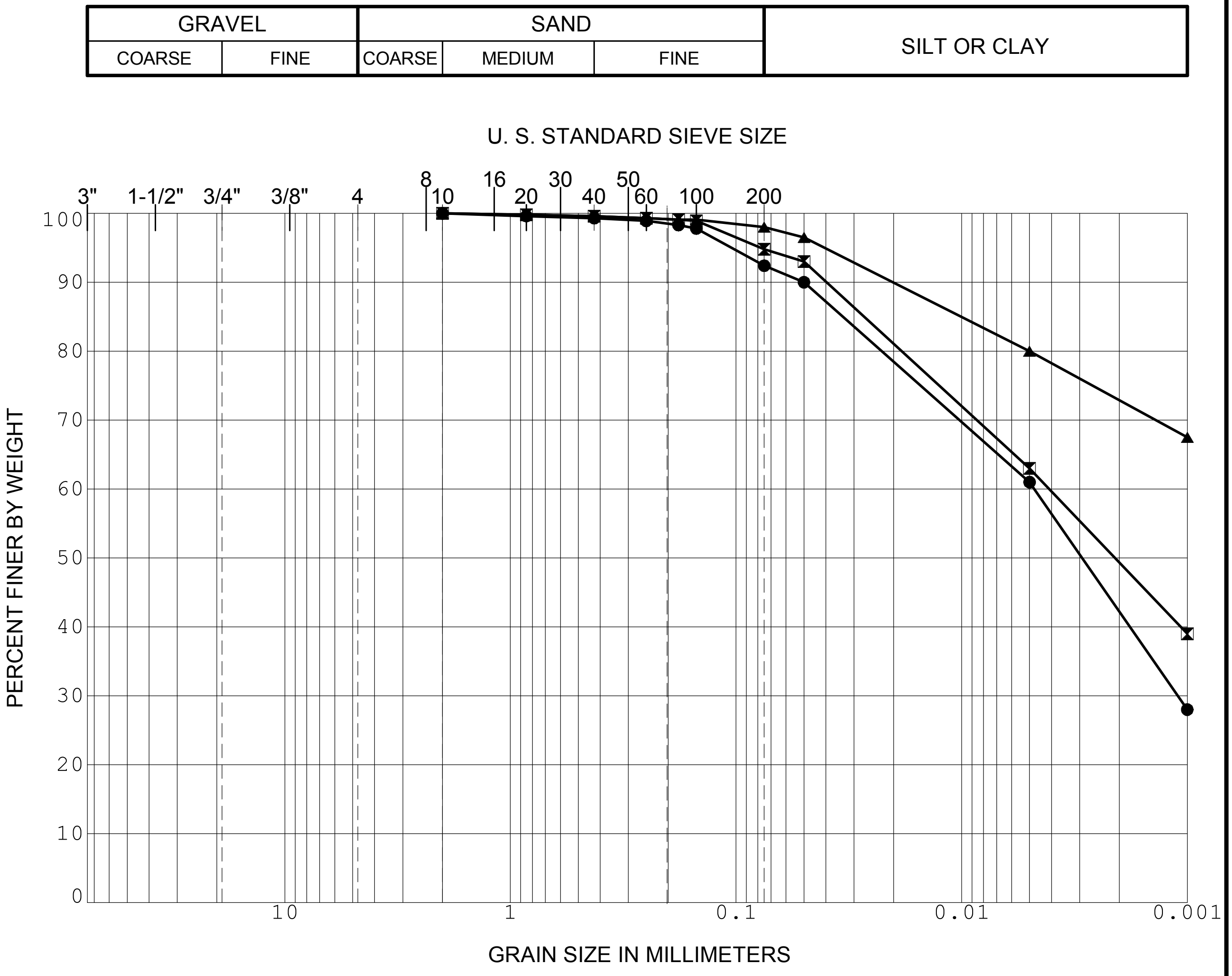
	SAMPLE	DEPTH (ft)	CLASSIFICATION	NAT WC	LL	PL	PI
●	B14-11	28.0	CH		116	43	73
⧗	B14-6	30.0	MH		74	43	31
▲	B21-17	66.0	CH		87	33	54

GRADATION CURVE

PORTOLA CENTER

LAKE FOREST, CALIFORNIA

PROJECT NO. G1218-52-01



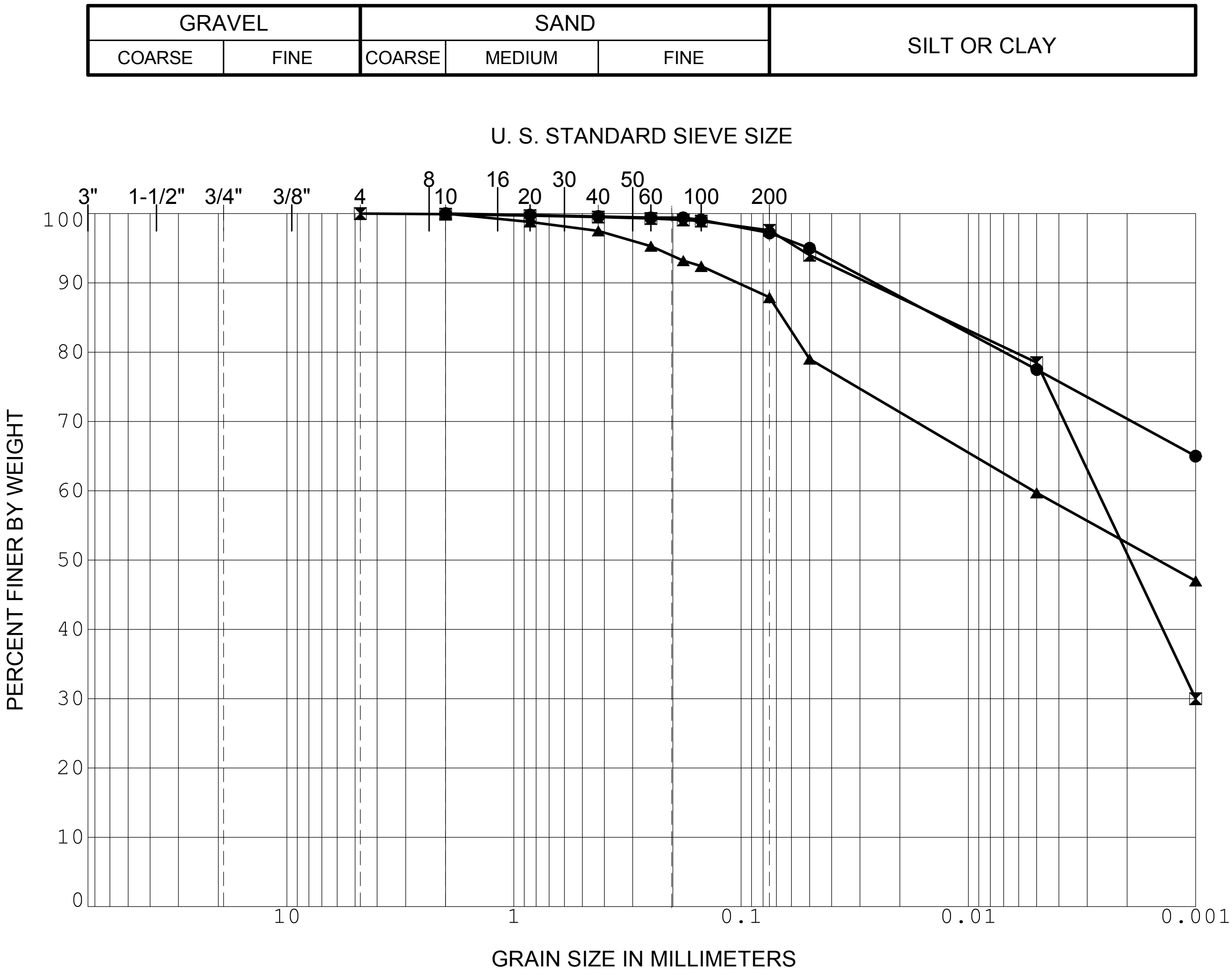
	SAMPLE	DEPTH (ft)	CLASSIFICATION	NAT WC	LL	PL	PI
●	B23-6	25.6	MH		83	38	45
⧗	B23-13	37.0	MH		76	34	42
▲	B24-23	26.5	CH		104	35	69

GRADATION CURVE

PORTOLA CENTER

LAKE FOREST, CALIFORNIA

PROJECT NO. G1218-52-01



	SAMPLE	DEPTH (ft)	CLASSIFICATION	NAT WC	LL	PL	PI
●	B24-26	39.0	CH		91	34	57
⧗	B25-17	33.0	CH		99	33	66
▲	B26-1	67.0	CH		82	32	50

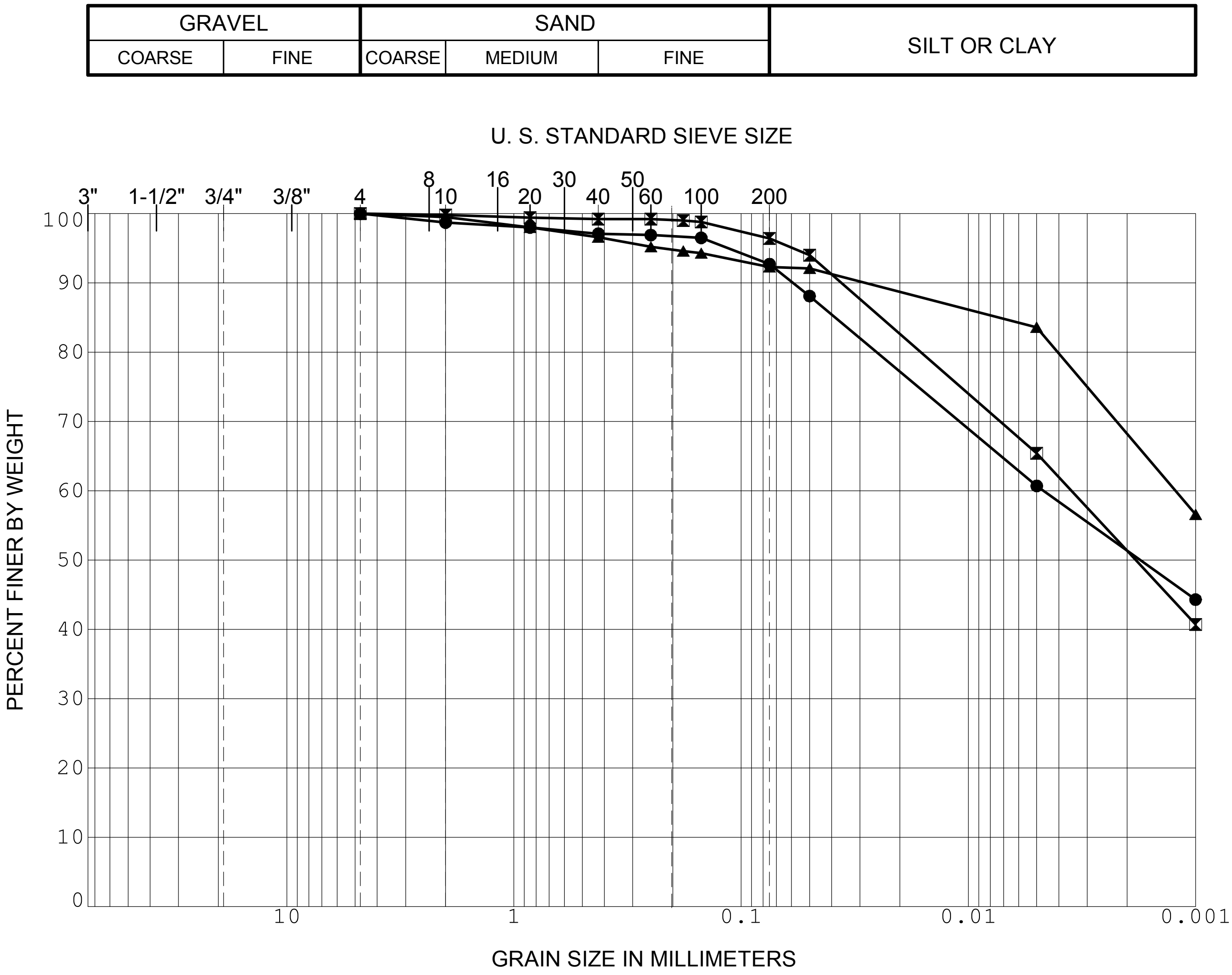
GRADATION CURVE

PORTOLA CENTER

LAKE FOREST, CALIFORNIA

Figure B-4

PROJECT NO. G1218-52-01



	SAMPLE	DEPTH (ft)	CLASSIFICATION	NAT WC	LL	PL	PI
●	B30-4	23.0	CH		80	33	47
⧗	B31-4	30.5	ML		82	37	45
▲	B33-3	13.5	CH		101	40	61

GRADATION CURVE

PORTOLA CENTER

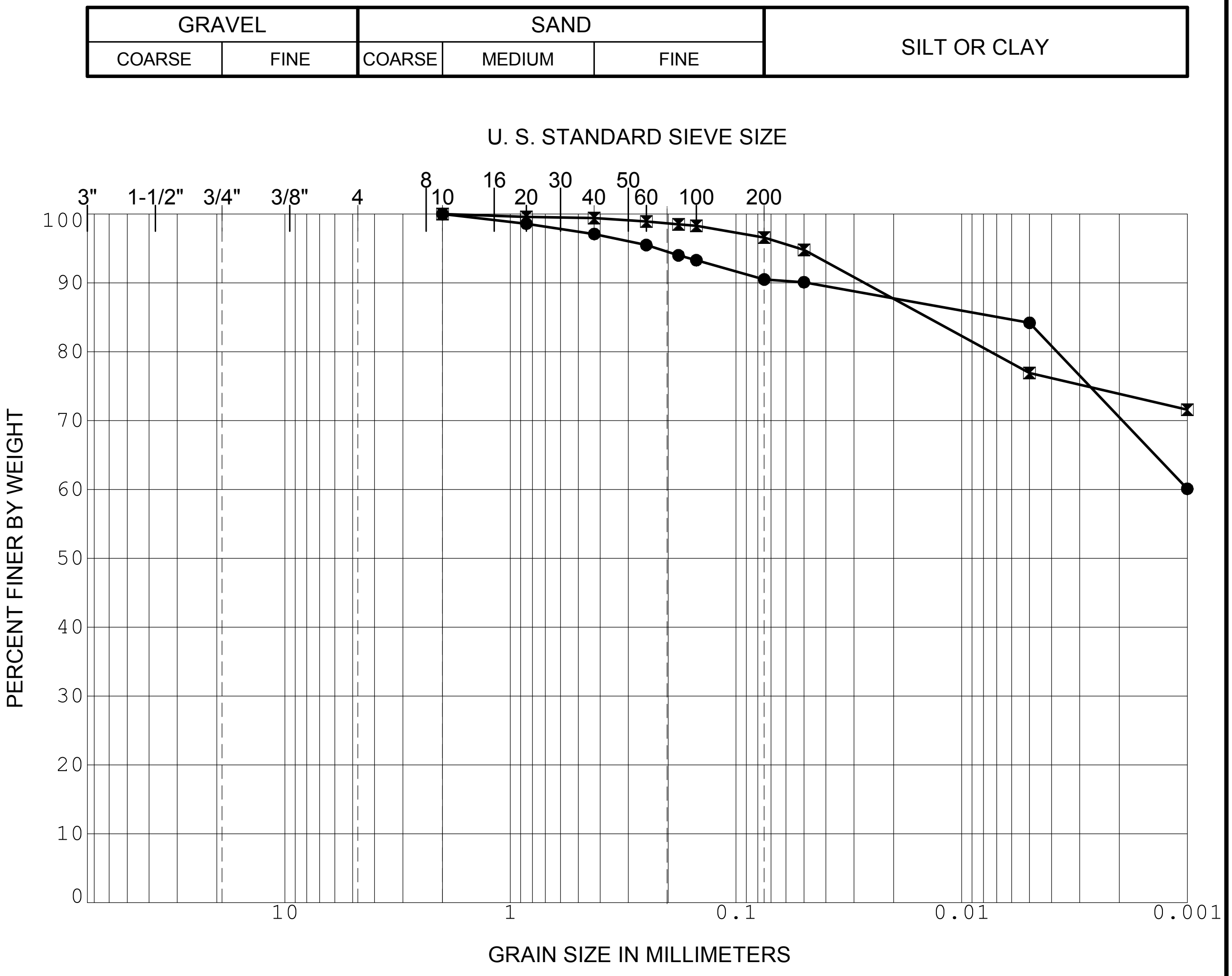
LAKE FOREST, CALIFORNIA

G1218-52-01 (UPD-04-17-2012).GPJ

Figure B-5

GEOCON

PROJECT NO. G1218-52-01

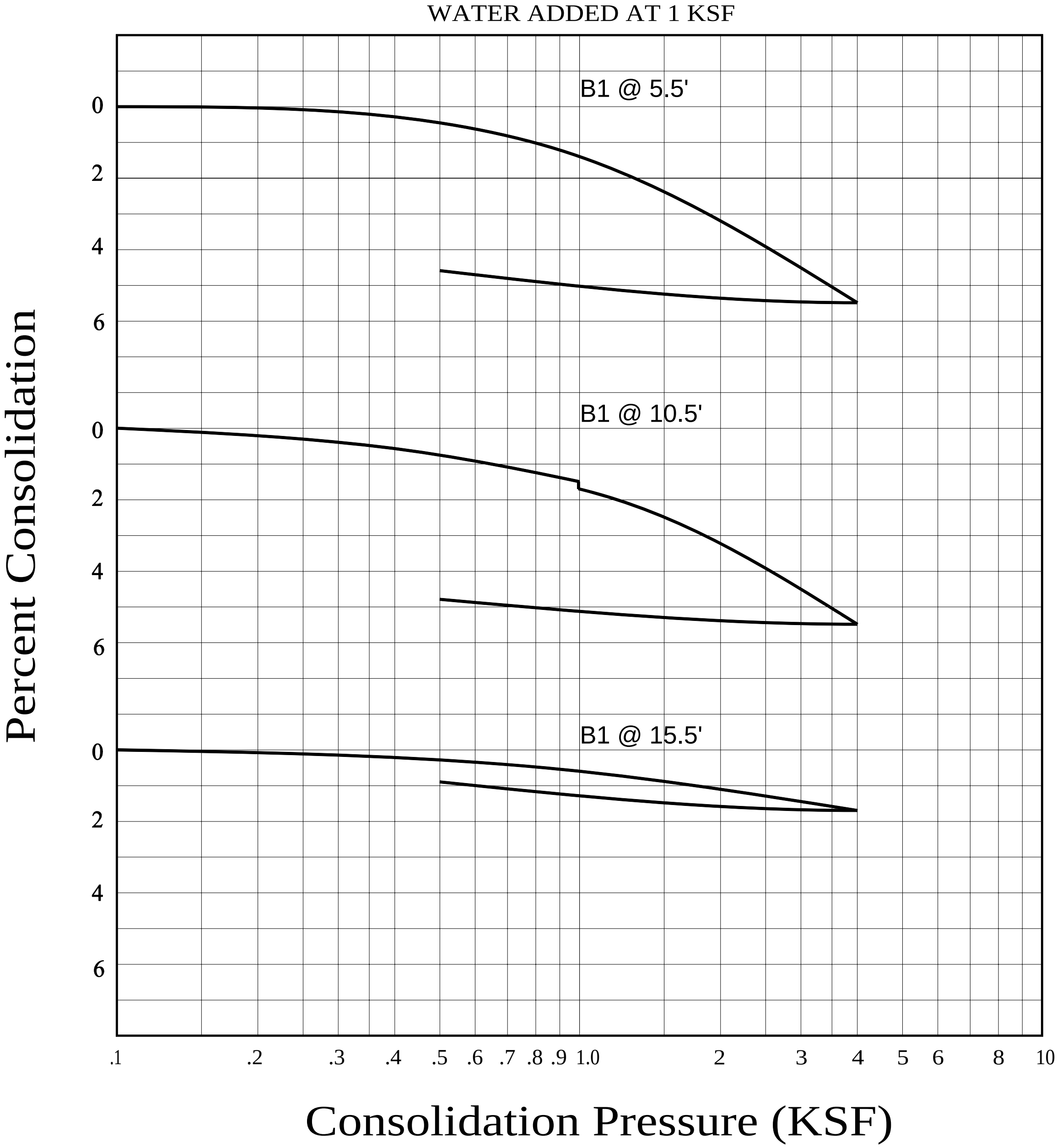


	SAMPLE	DEPTH (ft)	CLASSIFICATION	NAT WC	LL	PL	PI
●	B33-6	41.0	MH		110	44	66
⧗	B34-6	35.5	CH		103	39	64
▲							

GRADATION CURVE

PORTOLA CENTER

LAKE FOREST, CALIFORNIA



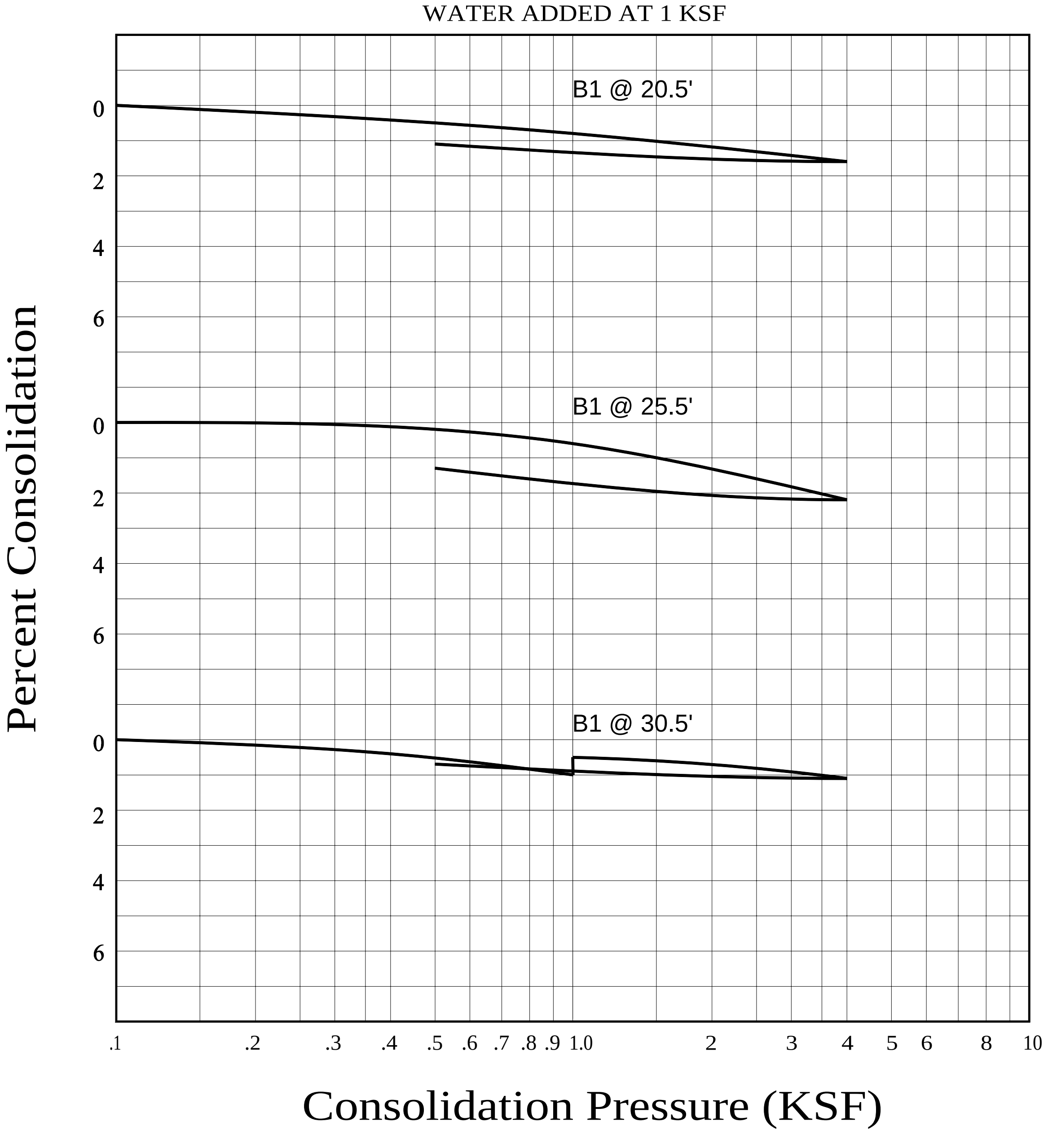
GEOCON
INCORPORATED

GEOTECHNICAL CONSULTANTS
6960 FLANDERS DRIVE - SAN DIEGO, CALIFORNIA 92121 - 2974
PHONE 858 558-6900 - FAX 858 558-6159

CONSOLIDATION TEST RESULTS

PORTOLA CENTER
LAKE FOREST, CALIFORNIA

BRG		DSK/GTYPD		PROJECT NO. G1218-52-01	FIG. B-7

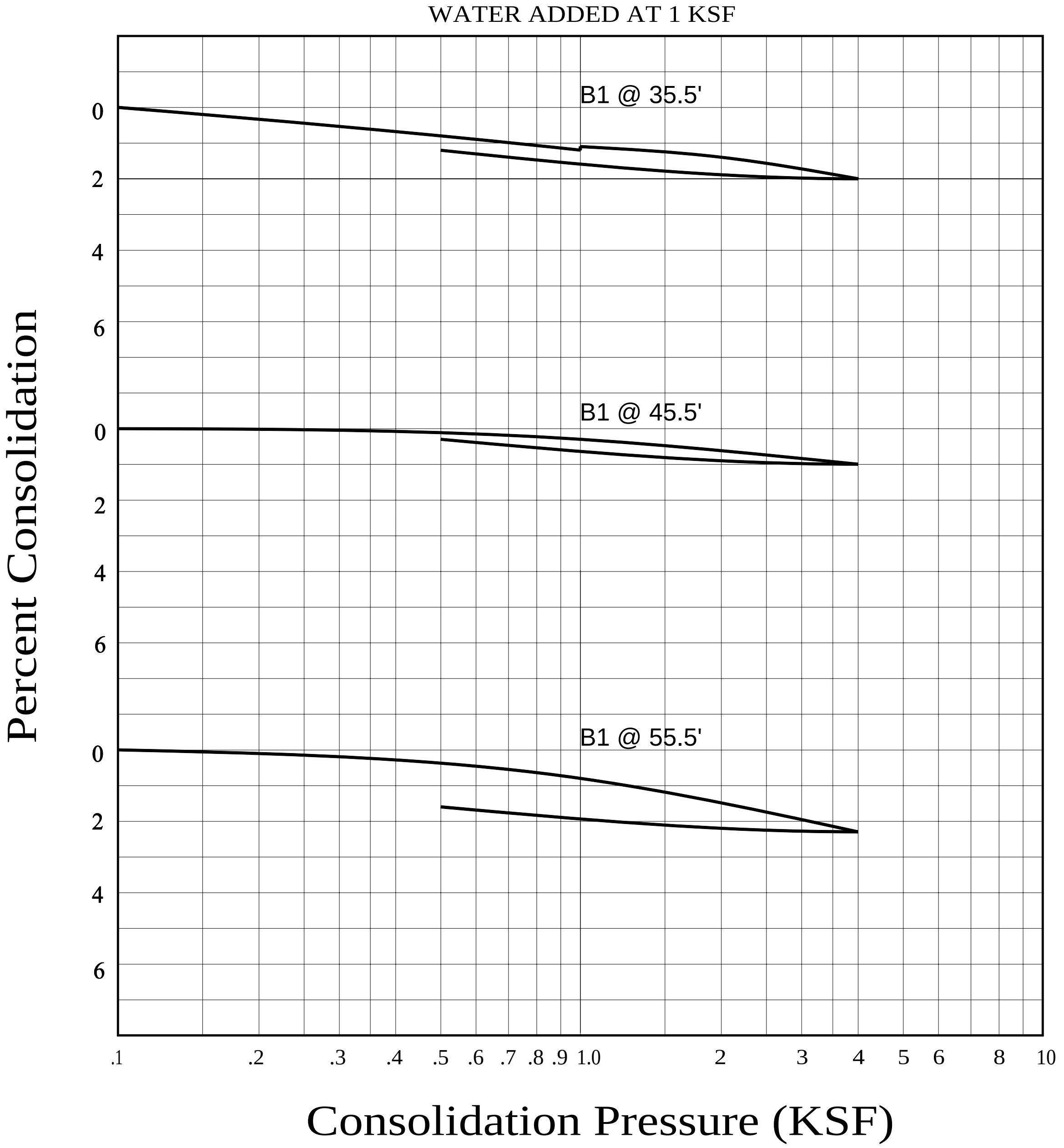


GEOCON
INCORPORATED
GEOTECHNICAL CONSULTANTS
6960 FLANDERS DRIVE - SAN DIEGO, CALIFORNIA 92121 - 2974
PHONE 858 558-6900 - FAX 858 558-6159

CONSOLIDATION TEST RESULTS

PORTOLA CENTER
LAKE FOREST, CALIFORNIA

BRG		DSK/GTYPD		PROJECT NO. G1218-52-01	FIG. B-8



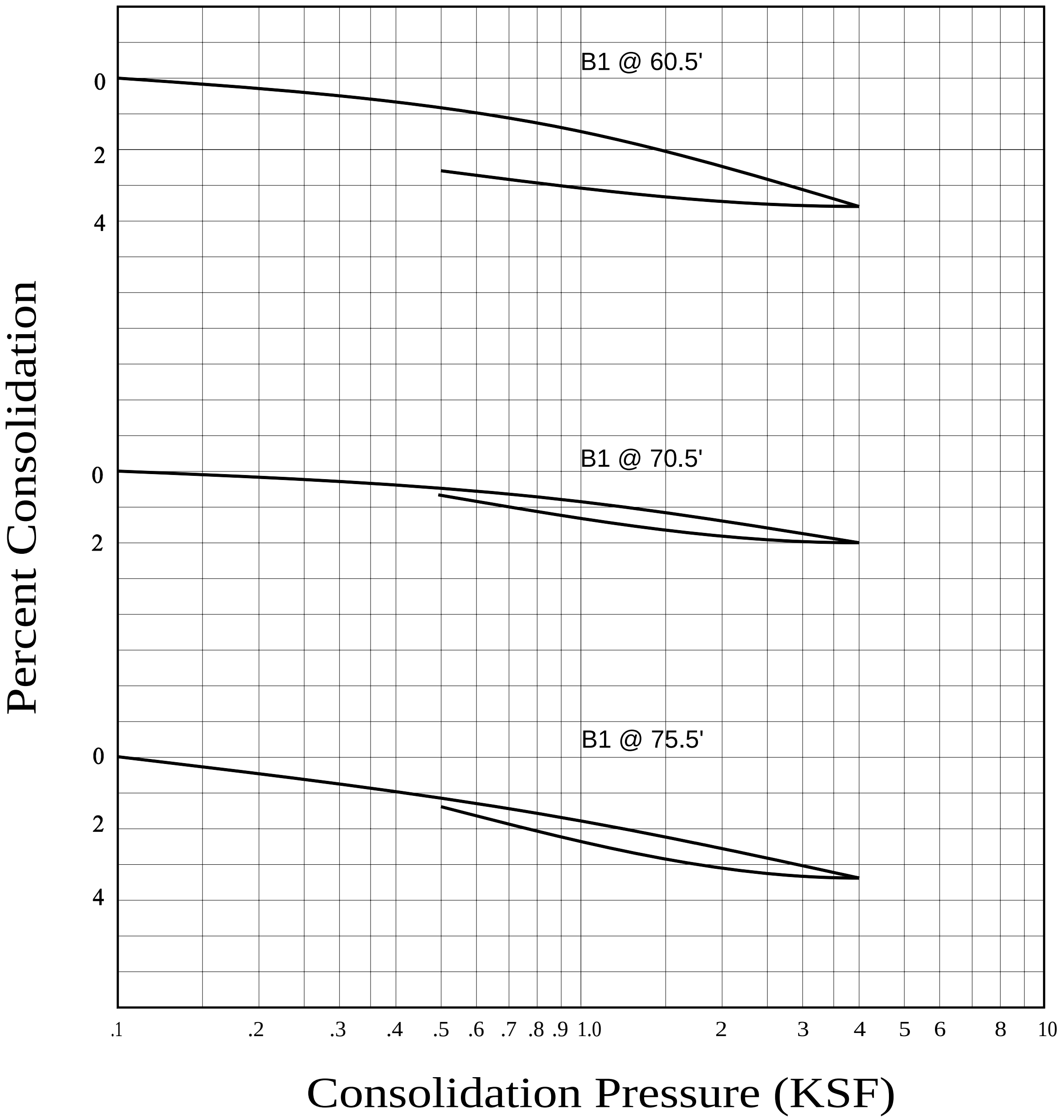
GEOCON
INCORPORATED
GEOTECHNICAL CONSULTANTS
6960 FLANDERS DRIVE - SAN DIEGO, CALIFORNIA 92121 - 2974
PHONE 858 558-6900 - FAX 858 558-6159

CONSOLIDATION TEST RESULTS

PORTOLA CENTER
LAKE FOREST, CALIFORNIA

BRG		DSK/GTYPD		PROJECT NO. G1218-52-01	FIG. B-9

WATER ADDED AT 1 KSF



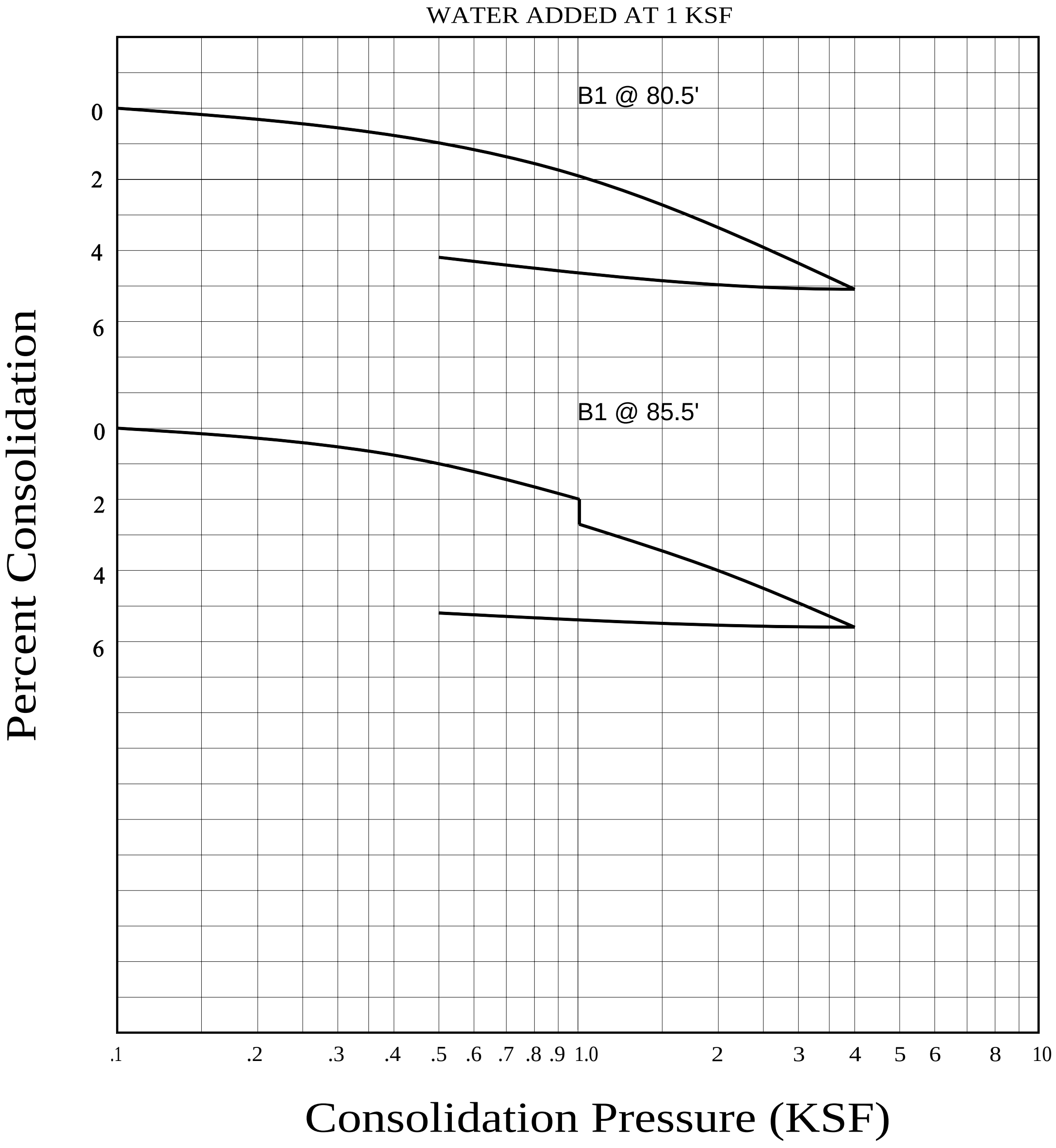
GEOCON
INCORPORATED

GEOTECHNICAL CONSULTANTS
6960 FLANDERS DRIVE - SAN DIEGO, CALIFORNIA 92121 - 2974
PHONE 858 558-6900 - FAX 858 558-6159

CONSOLIDATION TEST RESULTS

PORTOLA CENTER
LAKE FOREST, CALIFORNIA

BRG		DSK/GTYPD		PROJECT NO. G1218-52-01	FIG. B-10



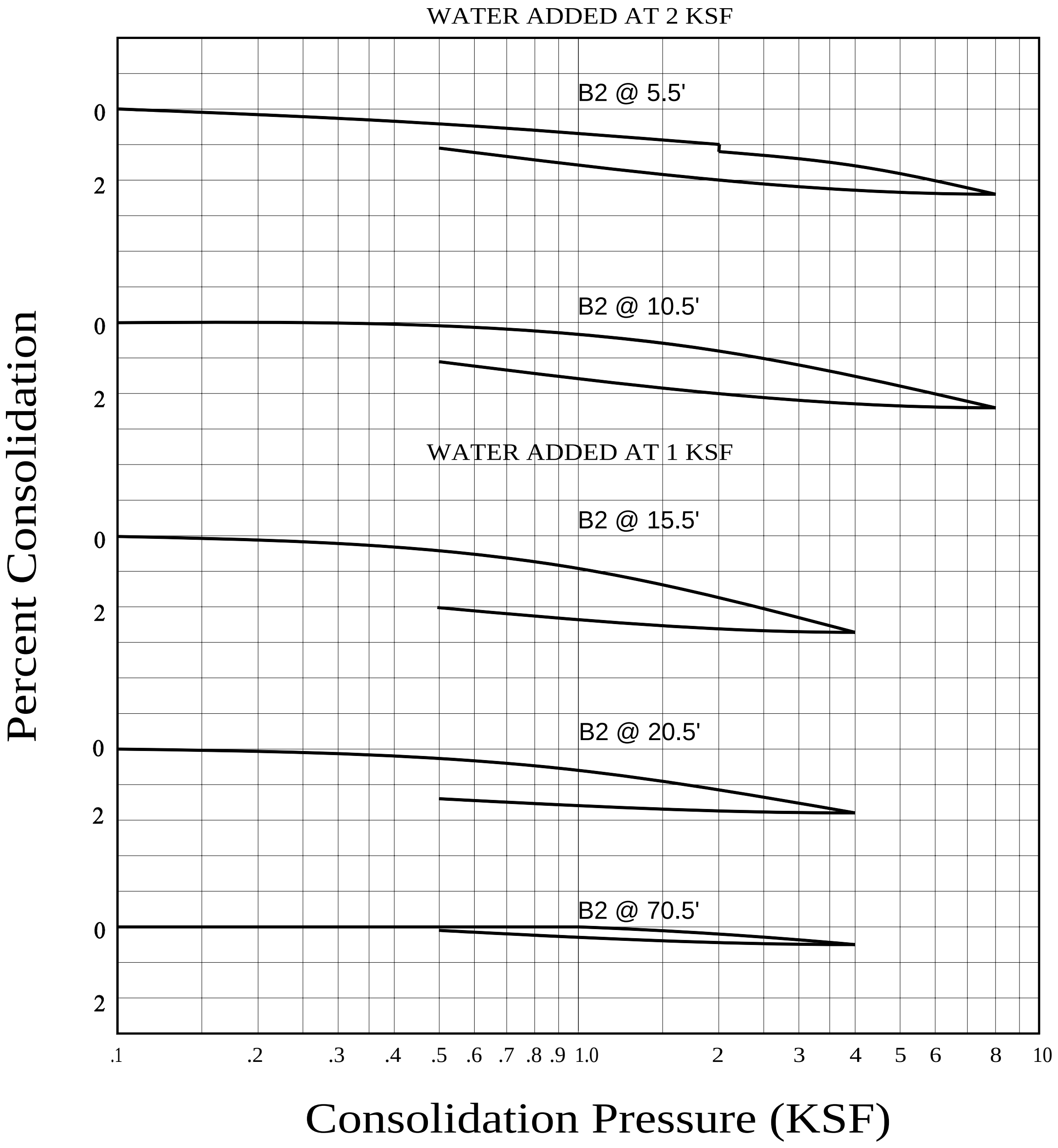
GEOCON
INCORPORATED
GEOTECHNICAL CONSULTANTS
6960 FLANDERS DRIVE - SAN DIEGO, CALIFORNIA 92121 - 2974
PHONE 858 558-6900 - FAX 858 558-6159

CONSOLIDATION TEST RESULTS

PORTOLA CENTER
LAKE FOREST, CALIFORNIA

BRG		DSK/GTYPD

	PROJECT NO. G1218-52-01	FIG. B-11



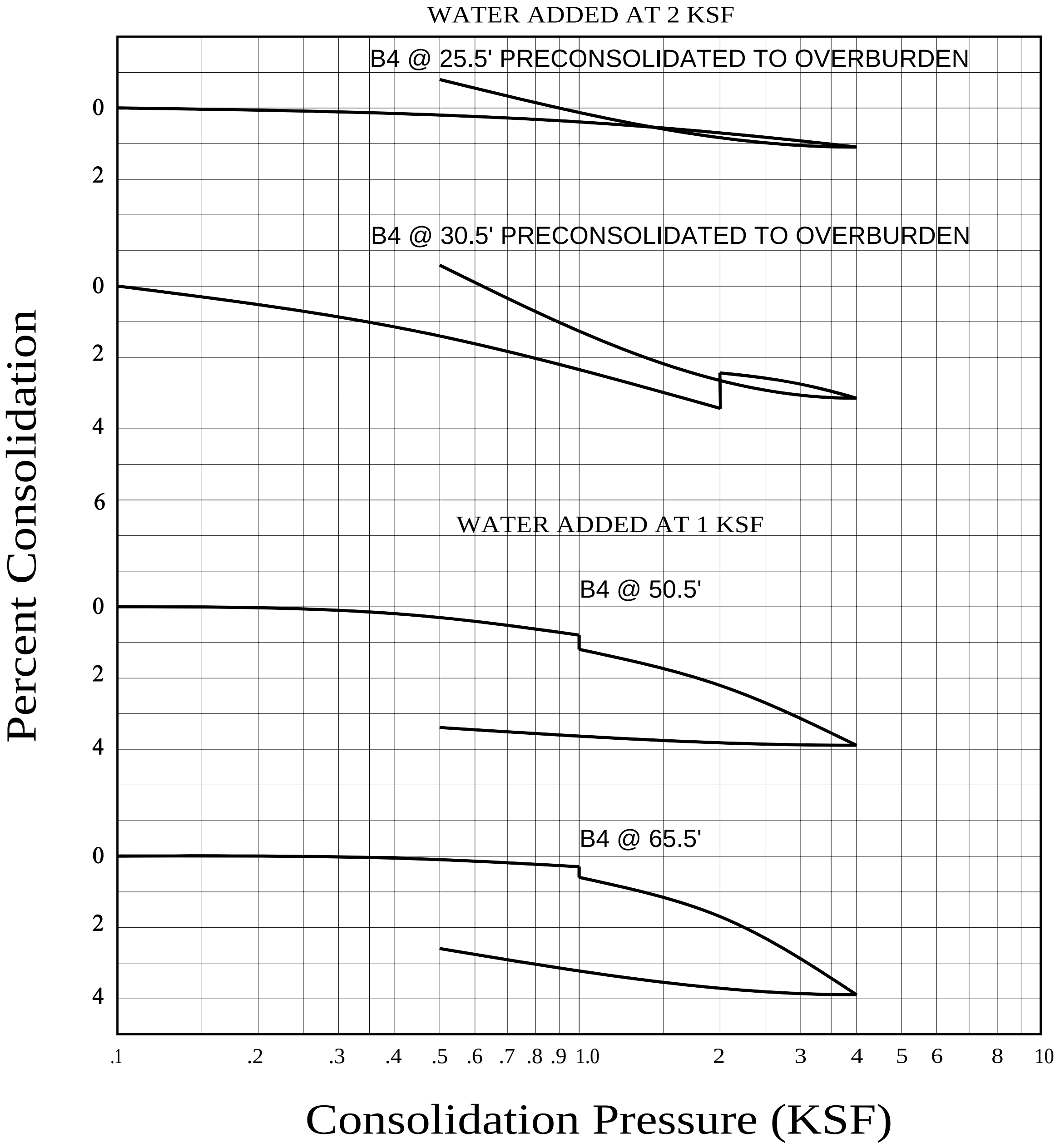
GEOCON
INCORPORATED

GEOTECHNICAL CONSULTANTS
6960 FLANDERS DRIVE - SAN DIEGO, CALIFORNIA 92121 - 2974
PHONE 858 558-6900 - FAX 858 558-6159

CONSOLIDATION TEST RESULTS

PORTOLA CENTER
LAKE FOREST, CALIFORNIA

BRG		DSK/GTYPD		PROJECT NO. G1218-52-01	FIG. B-12

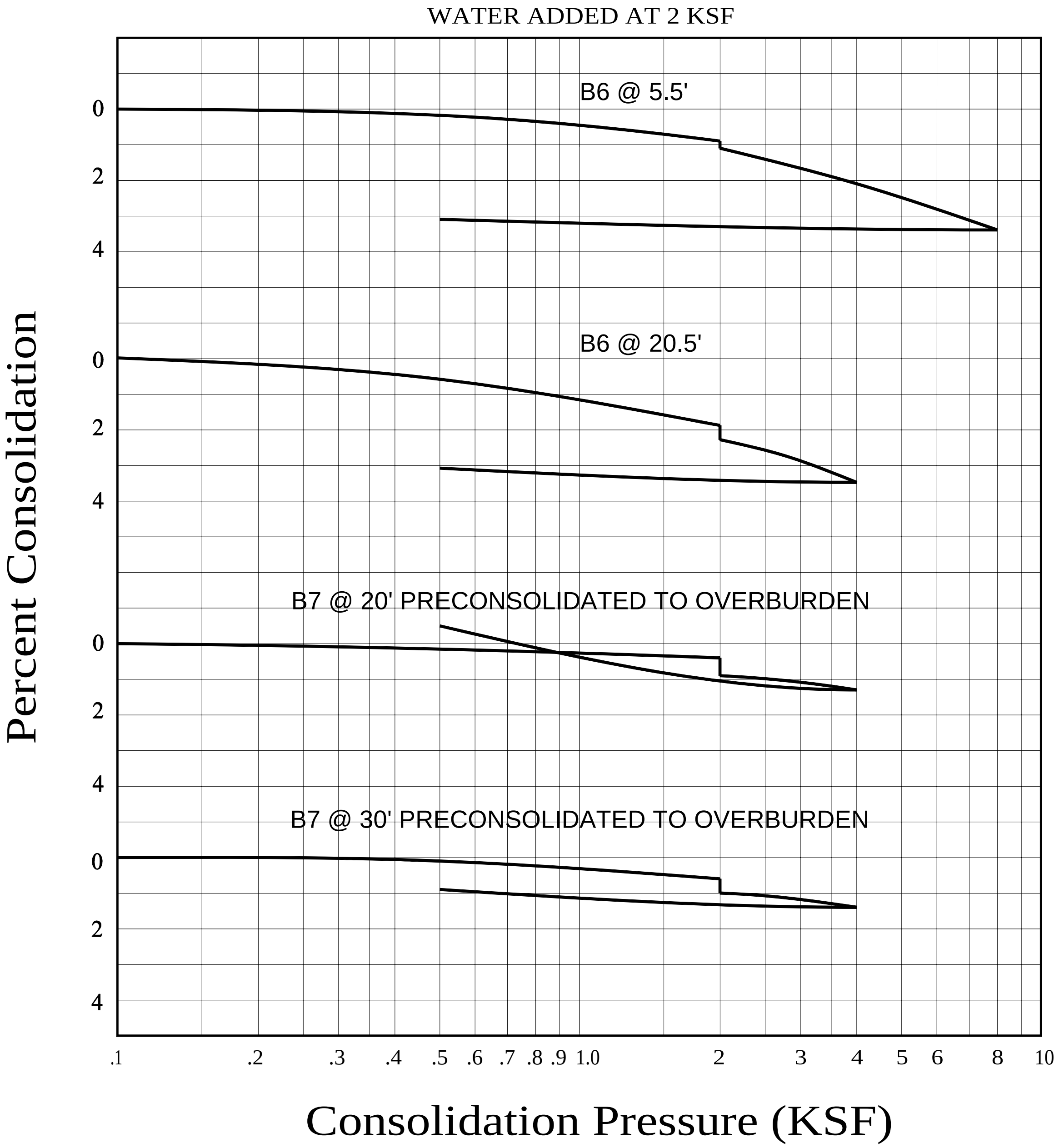


GEOCON
INCORPORATED
GEOTECHNICAL CONSULTANTS
6960 FLANDERS DRIVE - SAN DIEGO, CALIFORNIA 92121 - 2974
PHONE 858 558-6900 - FAX 858 558-6159

CONSOLIDATION TEST RESULTS

PORTOLA CENTER
LAKE FOREST, CALIFORNIA

BRG		DSK/GTYPD		PROJECT NO. G1218-52-01	FIG. B-13



GEOCON
INCORPORATED

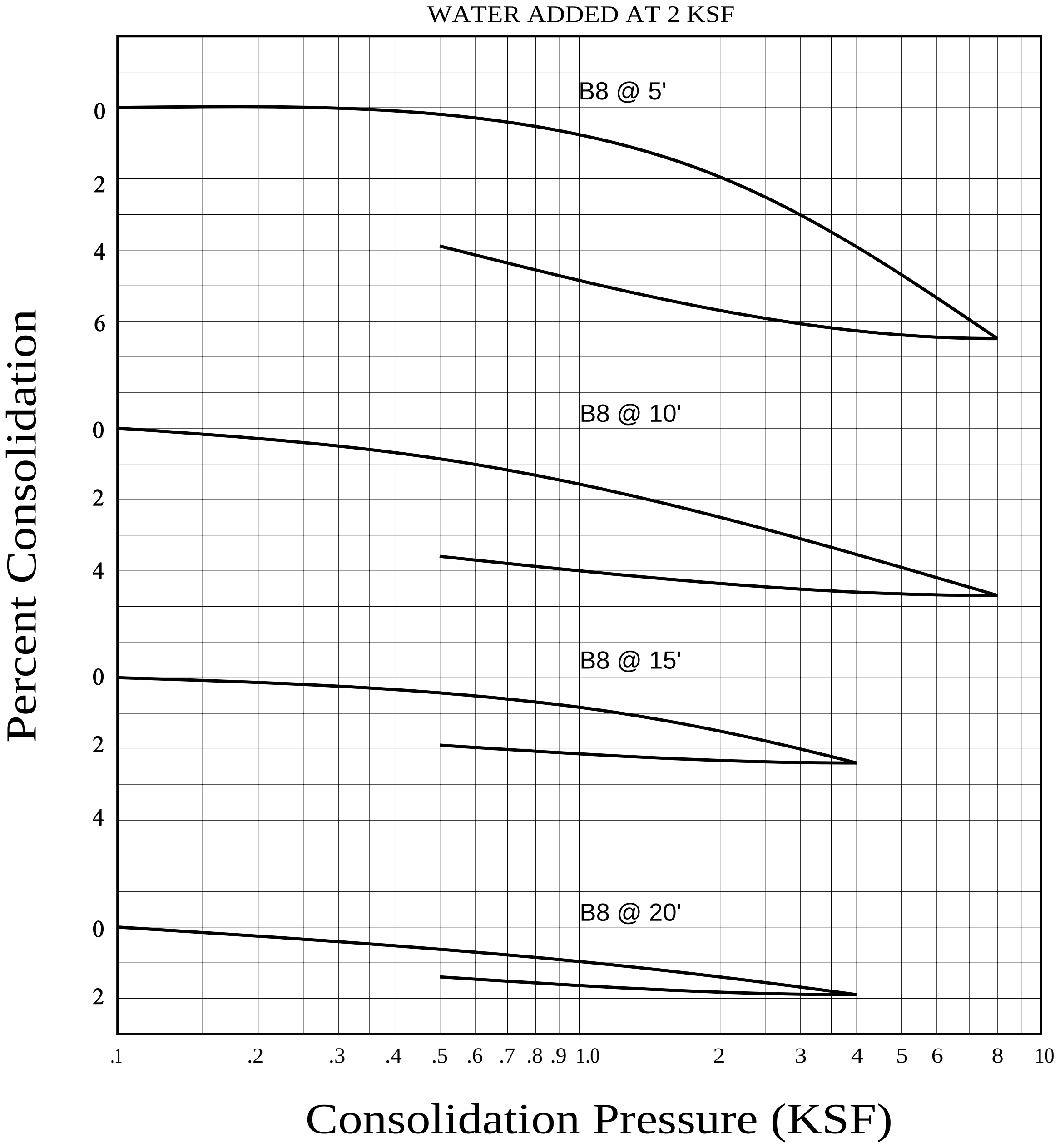
GEOTECHNICAL CONSULTANTS
6960 FLANDERS DRIVE - SAN DIEGO, CALIFORNIA 92121 - 2974
PHONE 858 558-6900 - FAX 858 558-6159

BRG		DSK/GTYPD

CONSOLIDATION TEST RESULTS

PORTOLA CENTER
LAKE FOREST, CALIFORNIA

	PROJECT NO. G1218-52-01	FIG. B-14



GEOCON
INCORPORATED

GEOTECHNICAL CONSULTANTS
6960 FLANDERS DRIVE - SAN DIEGO, CALIFORNIA 92121 - 2974
PHONE 858 558-6900 - FAX 858 558-6159

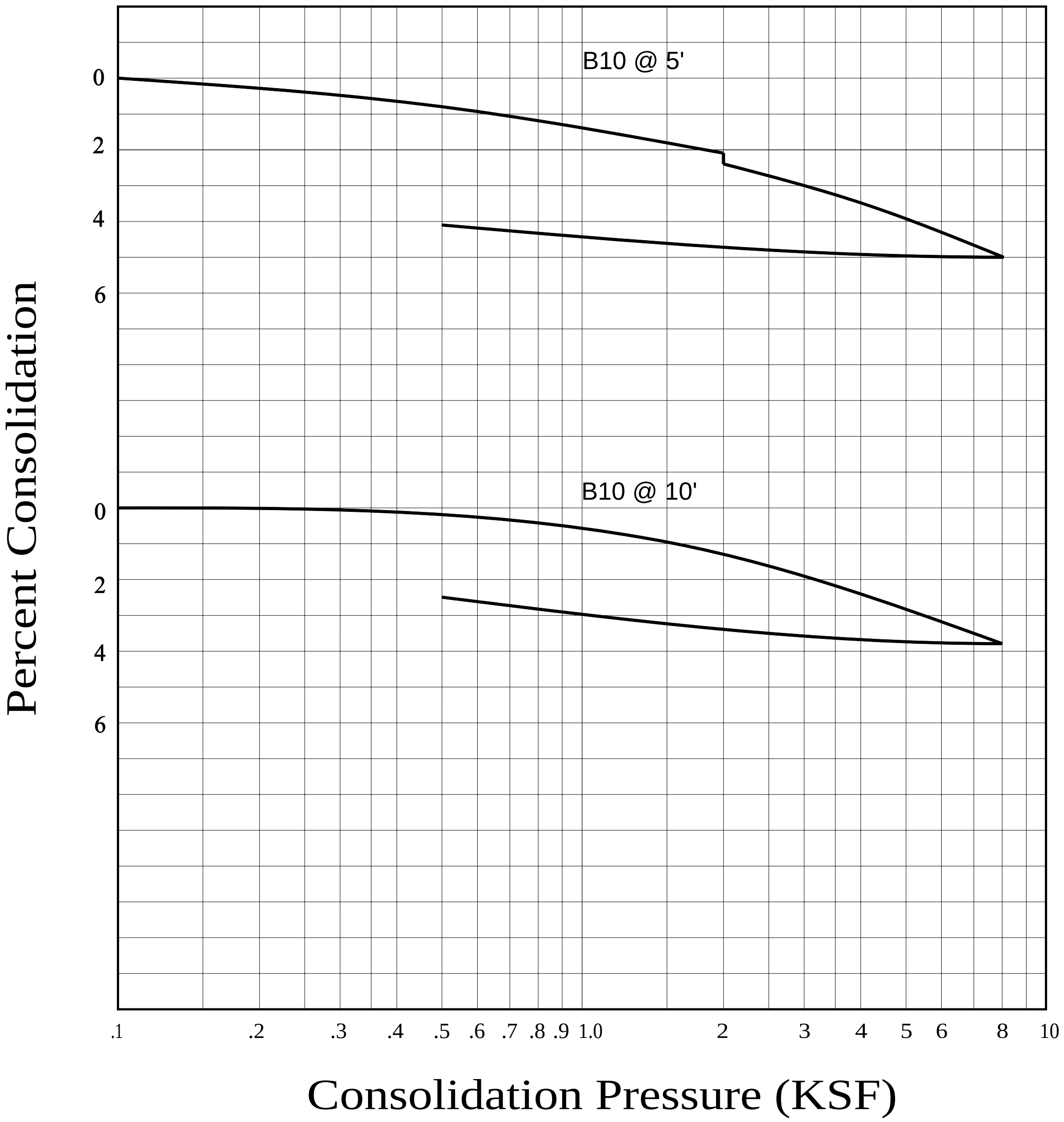
CONSOLIDATION TEST RESULTS

PORTOLA CENTER
LAKE FOREST, CALIFORNIA

BRG		DSK/GTYPD

	PROJECT NO. G1218-52-01	FIG. B-15

WATER ADDED AT 2 KSF



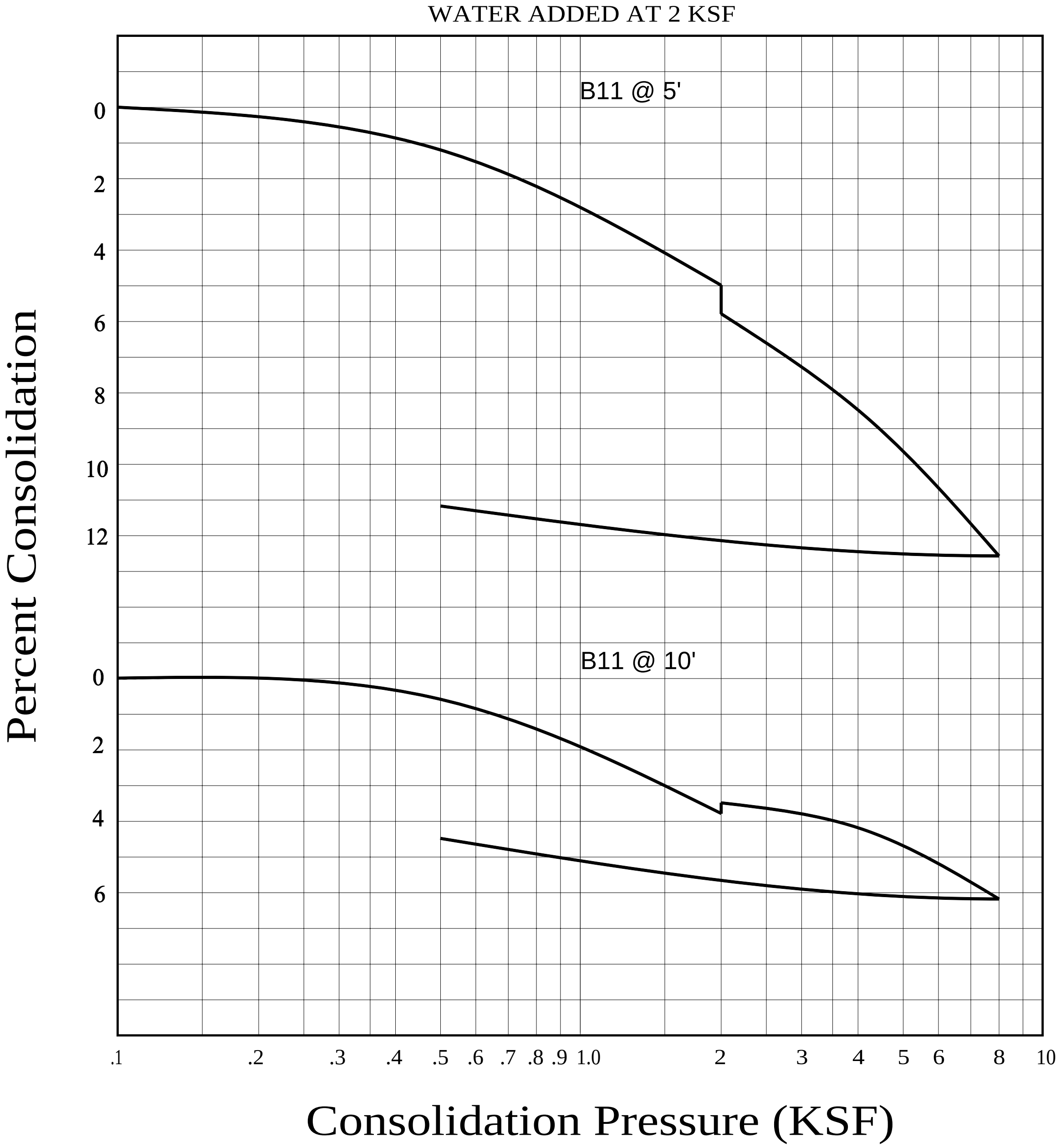
GEOCON
INCORPORATED

GEOTECHNICAL CONSULTANTS
6960 FLANDERS DRIVE - SAN DIEGO, CALIFORNIA 92121 - 2974
PHONE 858 558-6900 - FAX 858 558-6159

CONSOLIDATION TEST RESULTS

PORTOLA CENTER
LAKE FOREST, CALIFORNIA

BRG		DSK/GTYPD		PROJECT NO. G1218-52-01	FIG. B-16



GEOCON
INCORPORATED

GEOTECHNICAL CONSULTANTS
6960 FLANDERS DRIVE - SAN DIEGO, CALIFORNIA 92121 - 2974
PHONE 858 558-6900 - FAX 858 558-6159

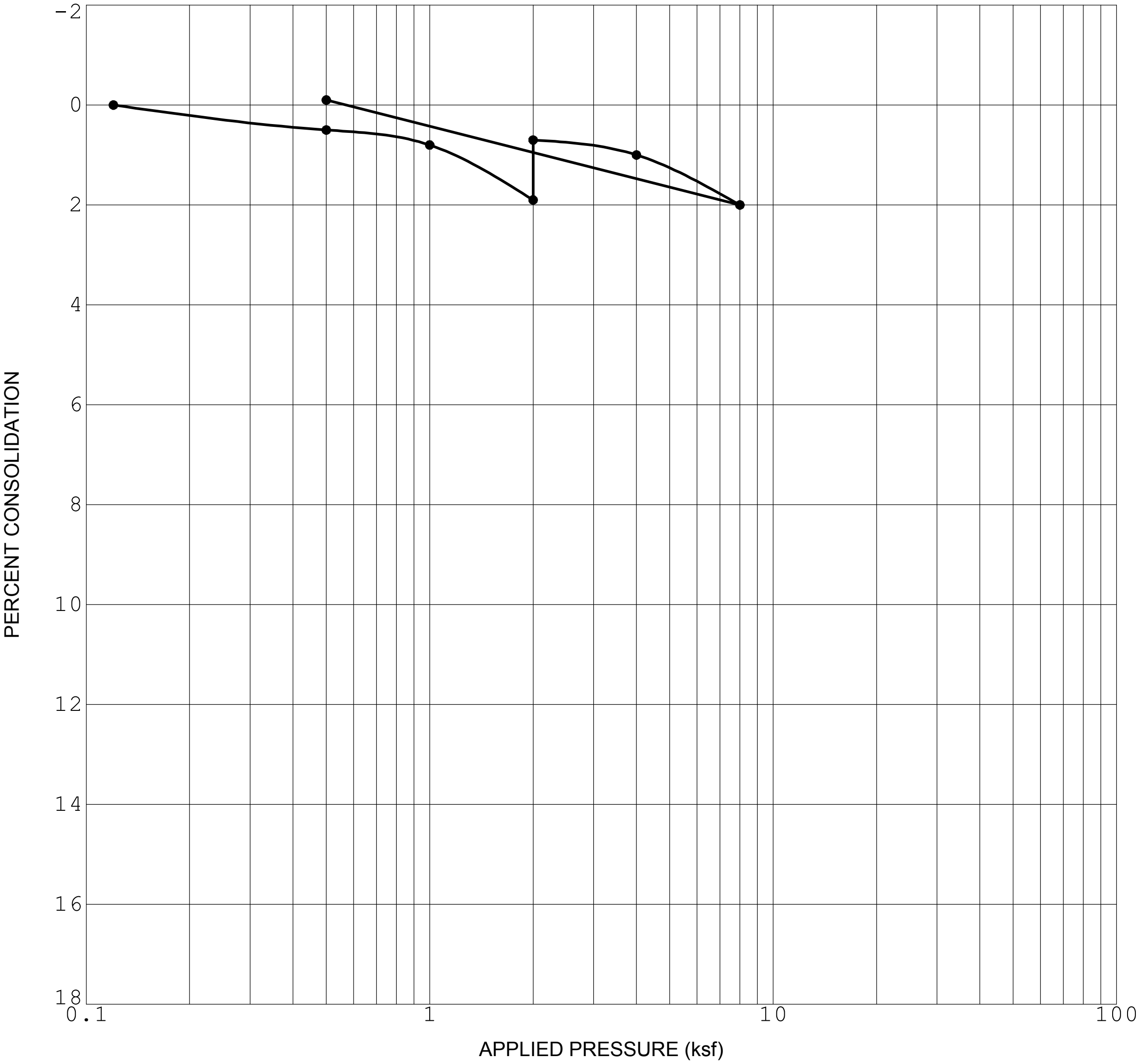
CONSOLIDATION TEST RESULTS

PORTOLA CENTER
LAKE FOREST, CALIFORNIA

BRG		DSK/GTYPD		PROJECT NO. G1218-52-01	FIG. B-17

PROJECT NO. G1218-52-01

SAMPLE NO. B25-3



Initial Dry Density (pcf)	92.1
Initial Water Content (%)	30.0

Initial Saturation (%)	99.6
Sample Saturated at (ksf)	2.0

CONSOLIDATION CURVE

PORTOLA CENTER

LAKE FOREST, CALIFORNIA

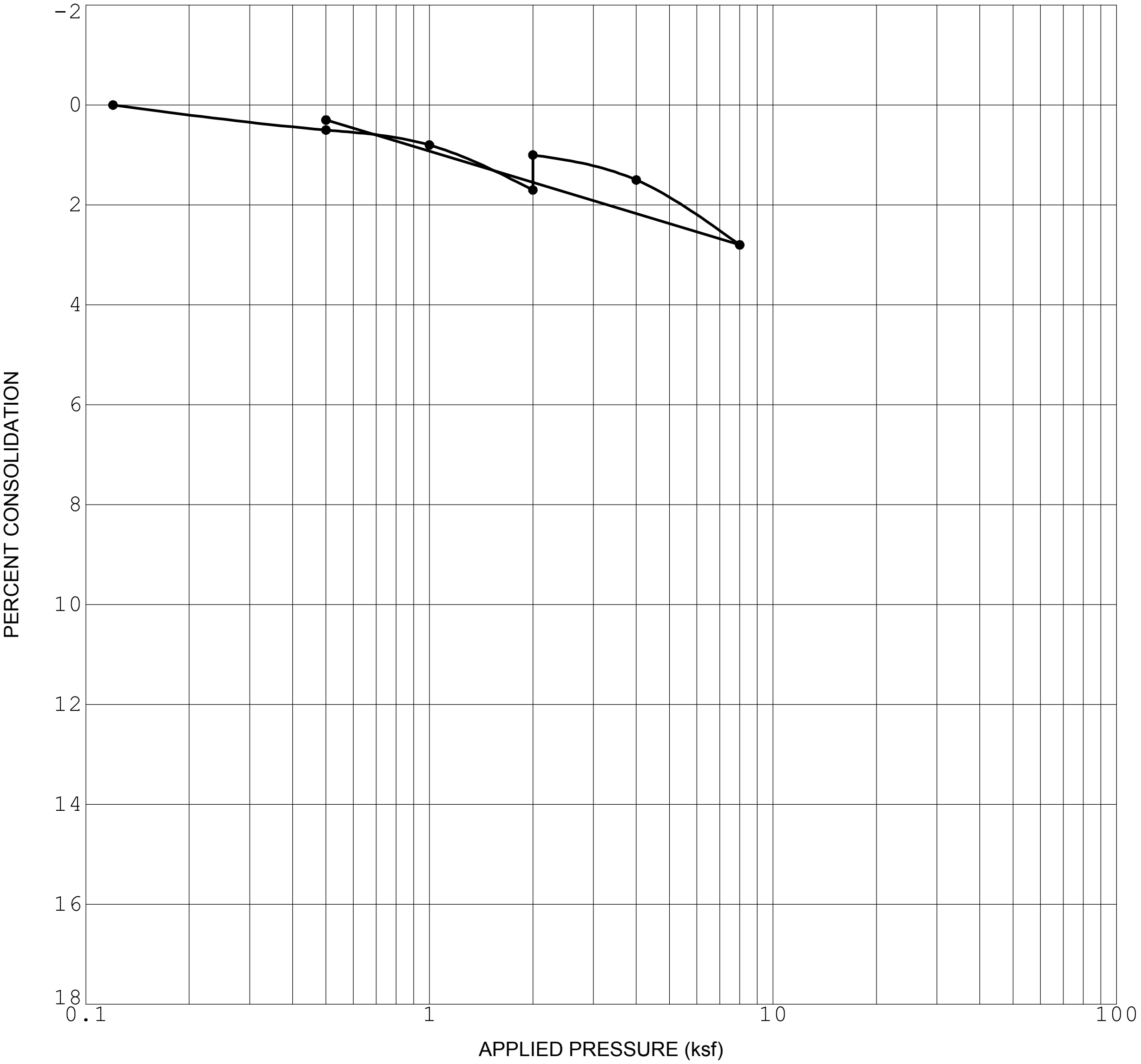
G1218-52-01 (UPD-04-17-2012).GPJ

Figure B-18

GEOCON

PROJECT NO. G1218-52-01

SAMPLE NO. B25-4



Initial Dry Density (pcf)	83.9
Initial Water Content (%)	33.4

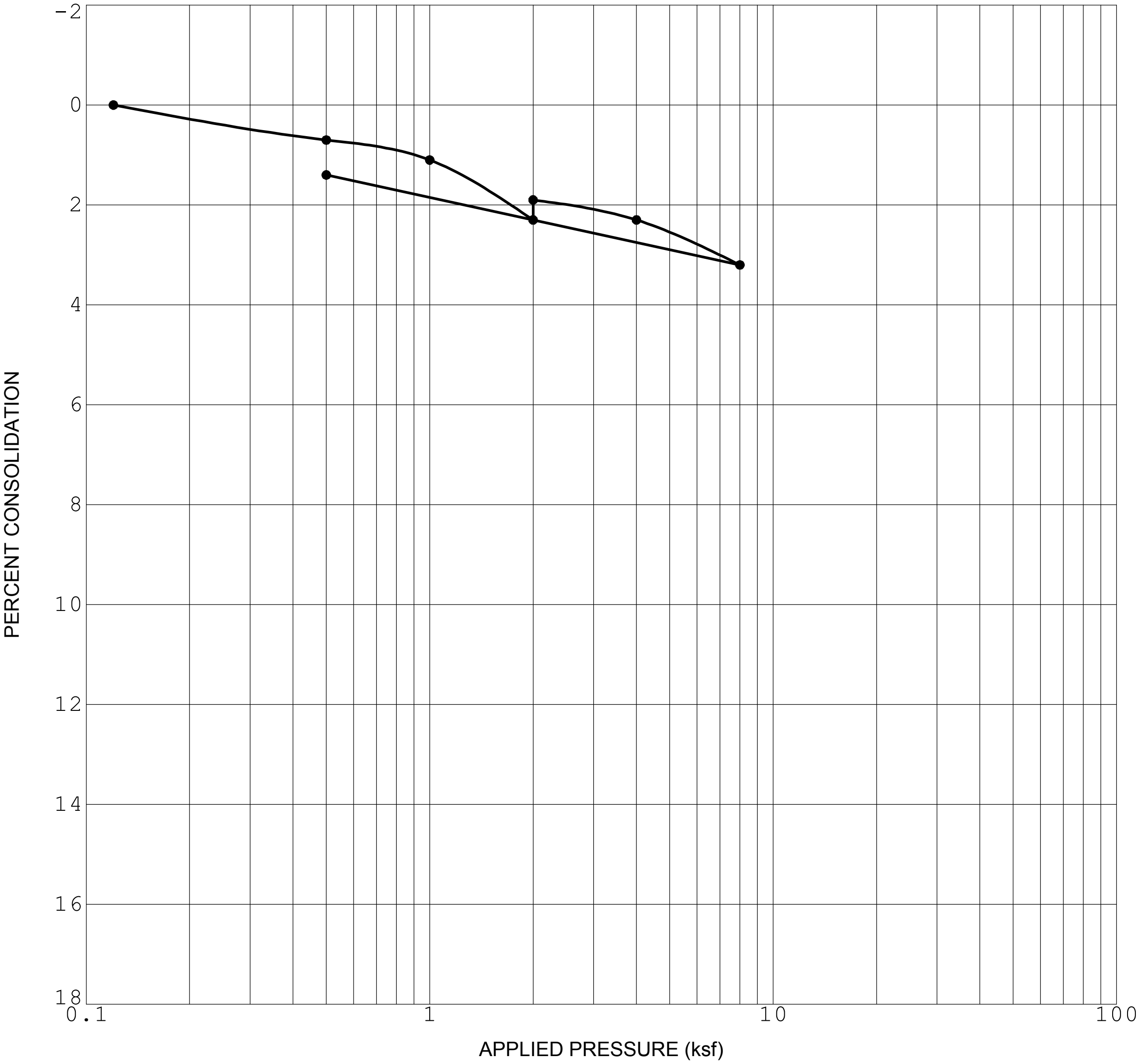
Initial Saturation (%)	90.7
Sample Saturated at (ksf)	2.0

CONSOLIDATION CURVE

PORTOLA CENTER

LAKE FOREST, CALIFORNIA

SAMPLE NO. B40-5



Initial Dry Density (pcf)	93.2		**Initial Saturation (%)**	96.3
Initial Water Content (%)	28.3		**Sample Saturated at (ksf)**	2.0

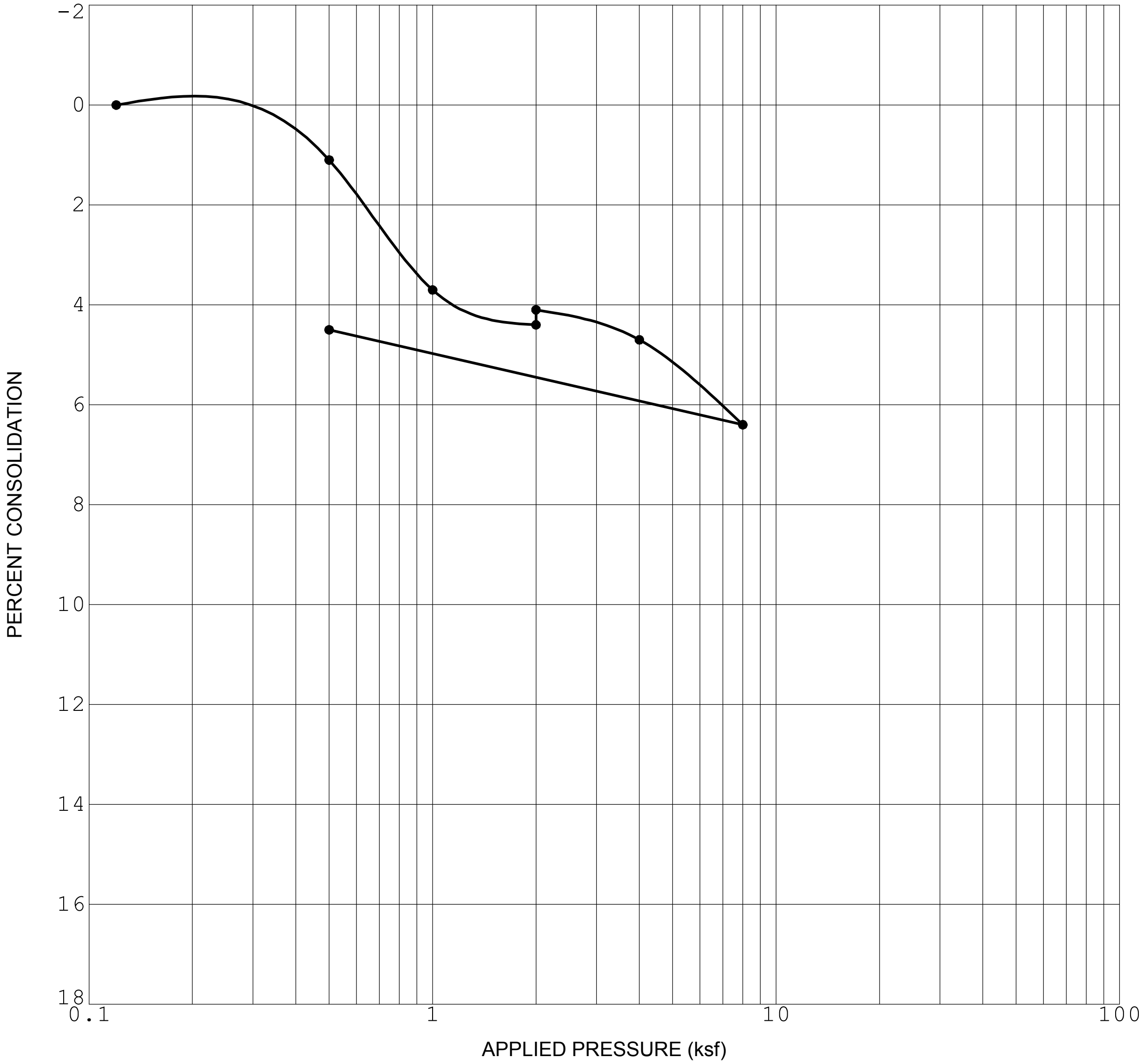
CONSOLIDATION CURVE

PORTOLA CENTER

LAKE FOREST, CALIFORNIA

PROJECT NO. G1218-52-01

SAMPLE NO. B40-8



Initial Dry Density (pcf)	74.2
Initial Water Content (%)	43.0

Initial Saturation (%)	92.3
Sample Saturated at (ksf)	2.0

CONSOLIDATION CURVE

PORTOLA CENTER

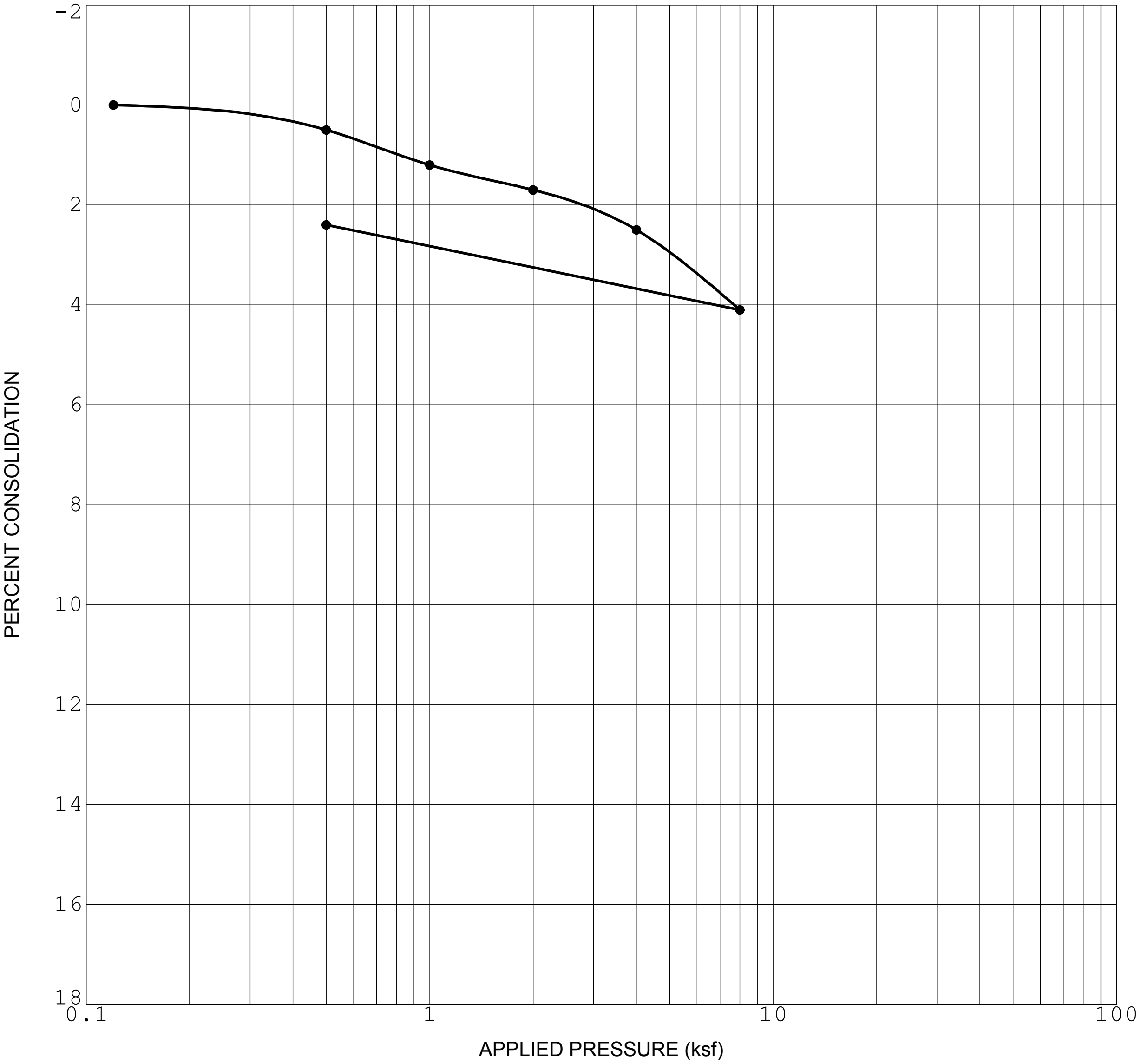
LAKE FOREST, CALIFORNIA

G1218-52-01 (UPD-04-17-2012).GPJ

Figure B-21

GEOCON

SAMPLE NO. B42-7



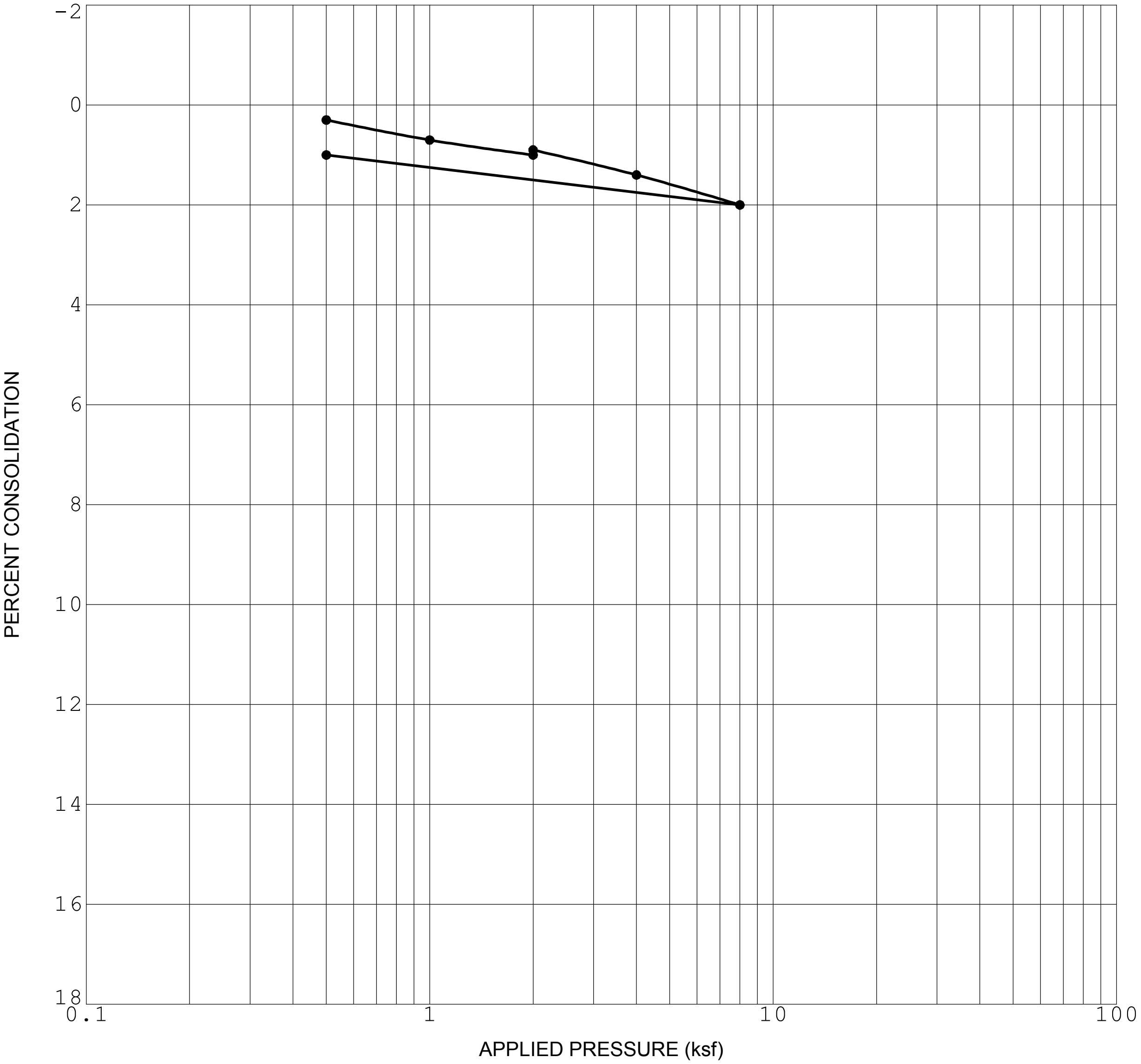
Initial Dry Density (pcf)	89.2		**Initial Saturation (%)**	91.3
Initial Water Content (%)	29.6		**Sample Saturated at (ksf)**	2.0

CONSOLIDATION CURVE

PORTOLA CENTER

LAKE FOREST, CALIFORNIA

SAMPLE NO. B58-6



Initial Dry Density (pcf)	69.0
Initial Water Content (%)	42.2

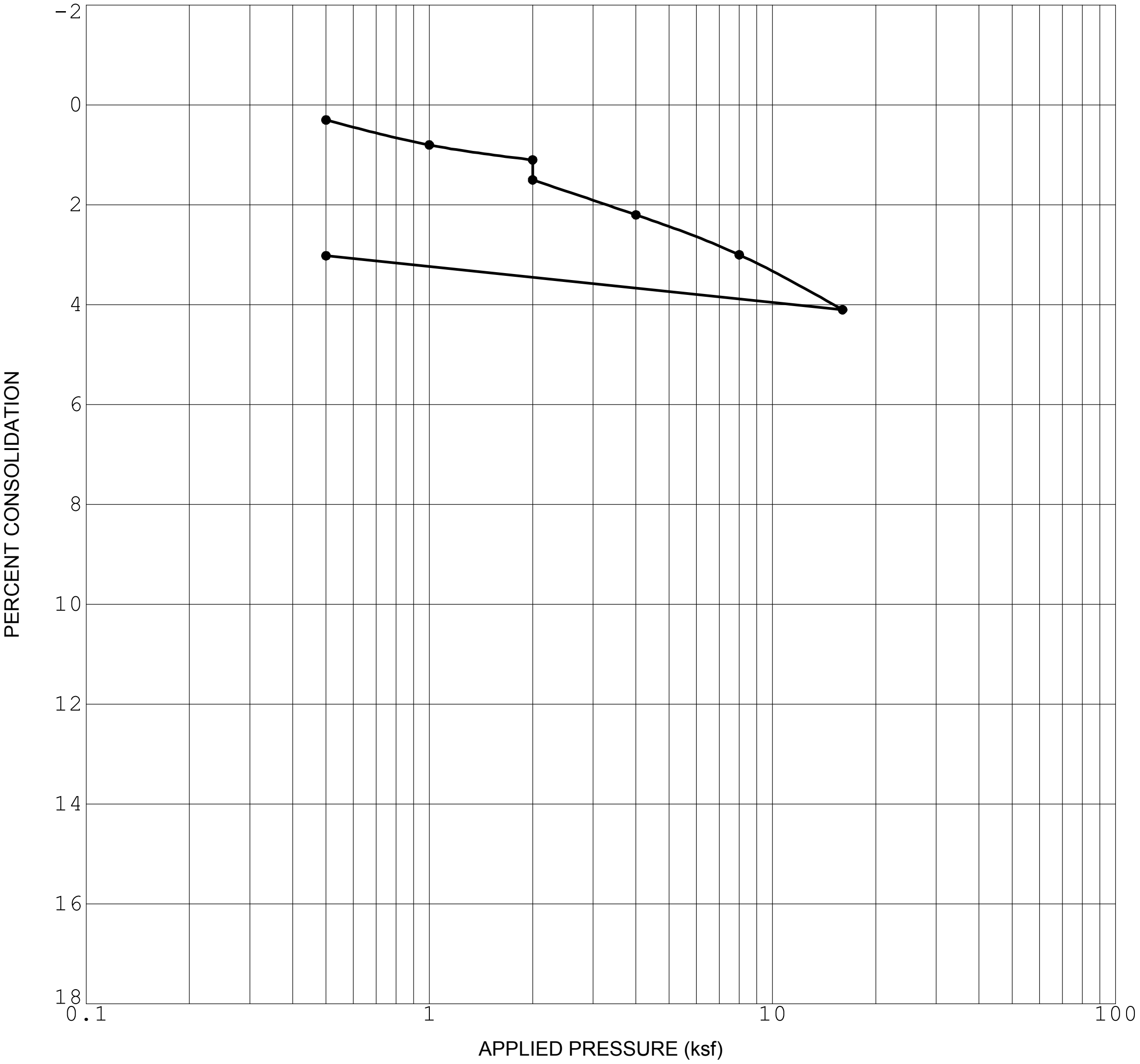
Initial Saturation (%)	90.0
Sample Saturated at (ksf)	2.0

CONSOLIDATION CURVE

PORTOLA CENTER

LAKE FOREST, CALIFORNIA

SAMPLE NO. B59-7



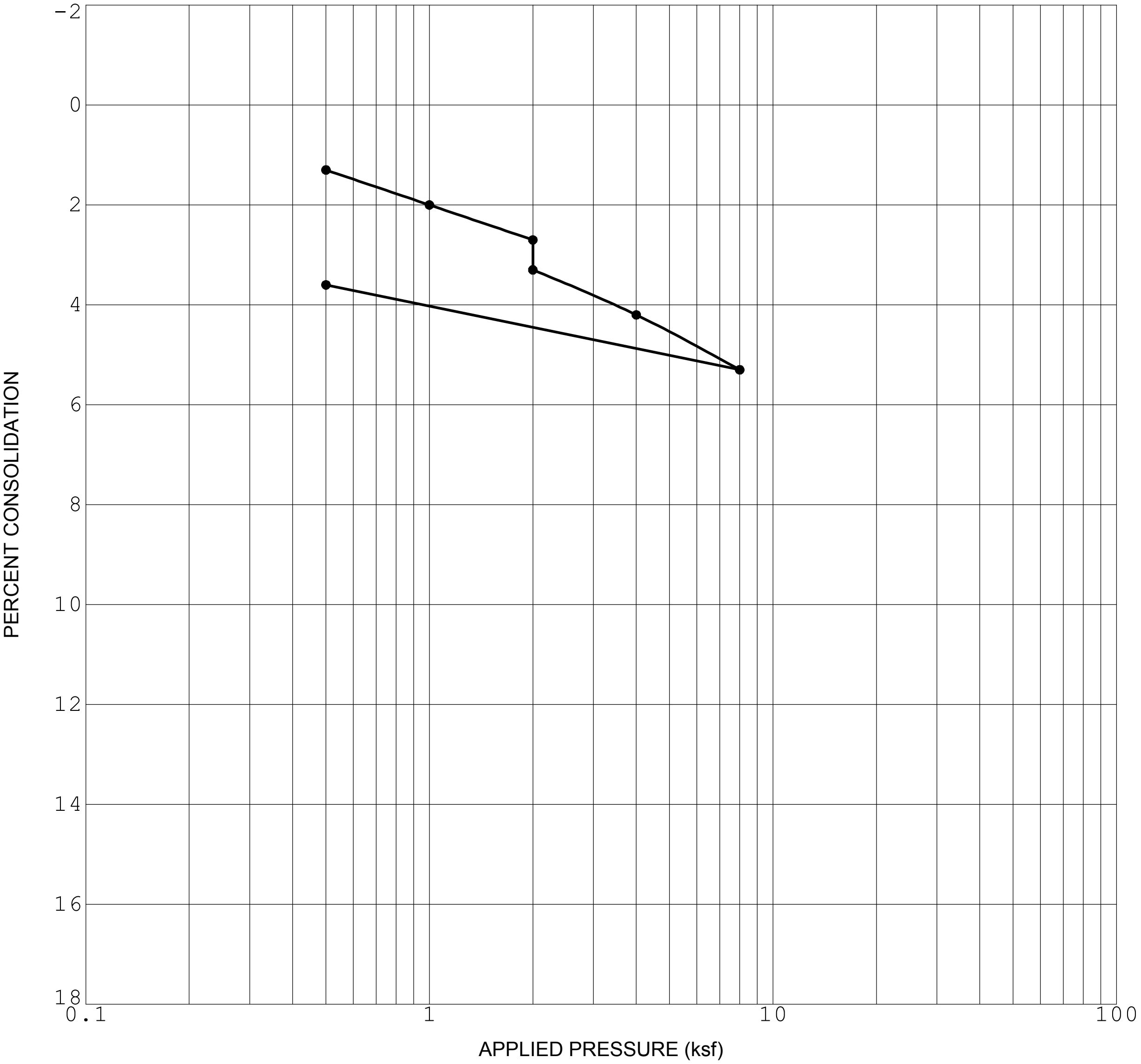
Initial Dry Density (pcf)	119.0		**Initial Saturation (%)**	42.0
Initial Water Content (%)	5.5		**Sample Saturated at (ksf)**	2.0

CONSOLIDATION CURVE

PORTOLA CENTER

LAKE FOREST, CALIFORNIA

SAMPLE NO. B60-2



Initial Dry Density (pcf)	127.1
Initial Water Content (%)	10.2

Initial Saturation (%)	90.3
Sample Saturated at (ksf)	2.0

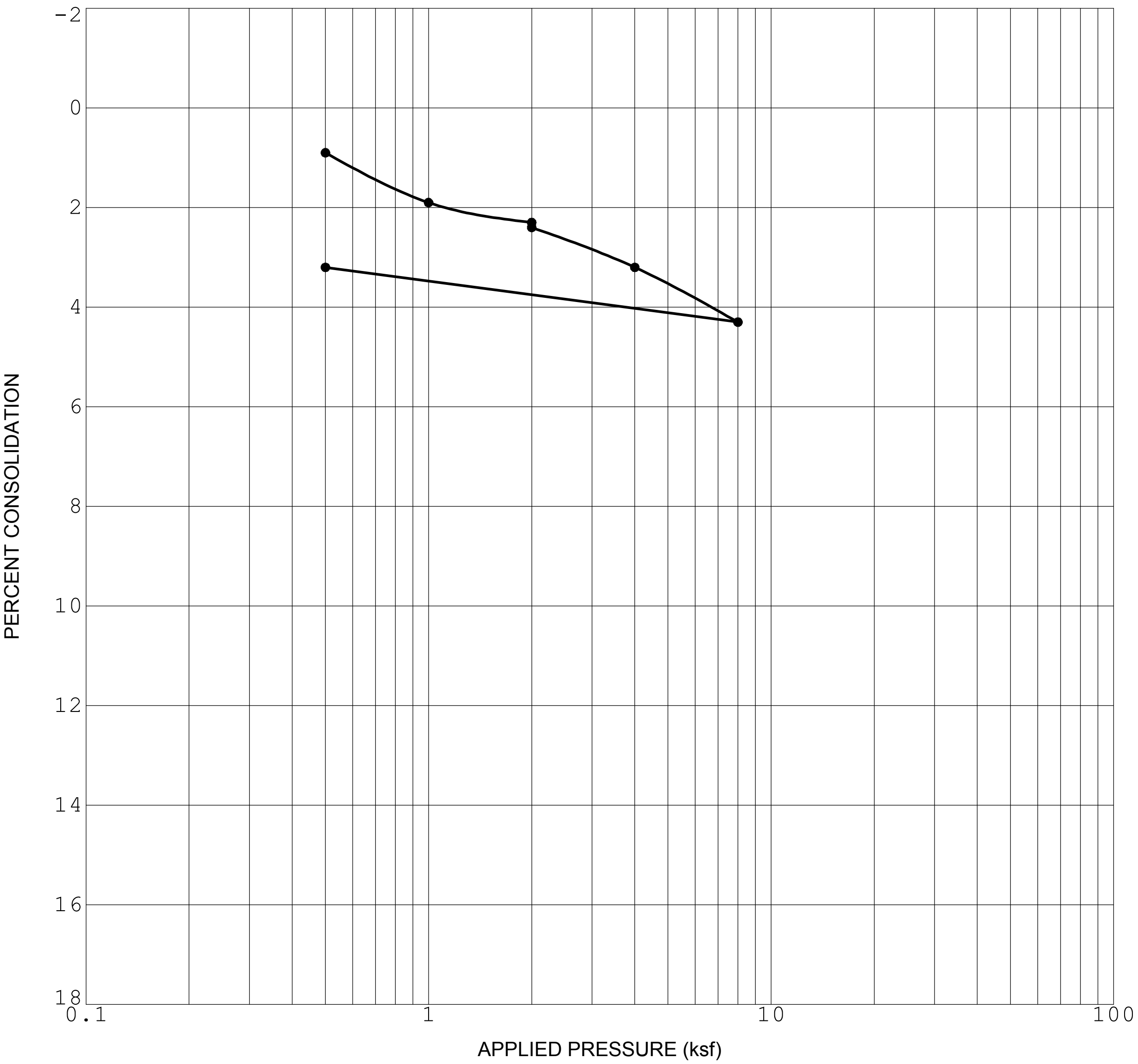
CONSOLIDATION CURVE

PORTOLA CENTER

LAKE FOREST, CALIFORNIA

PROJECT NO. G1218-52-01

SAMPLE NO. B61-4



Initial Dry Density (pcf)	115.5
Initial Water Content (%)	15.8

Initial Saturation (%)	96.4
Sample Saturated at (ksf)	2.0

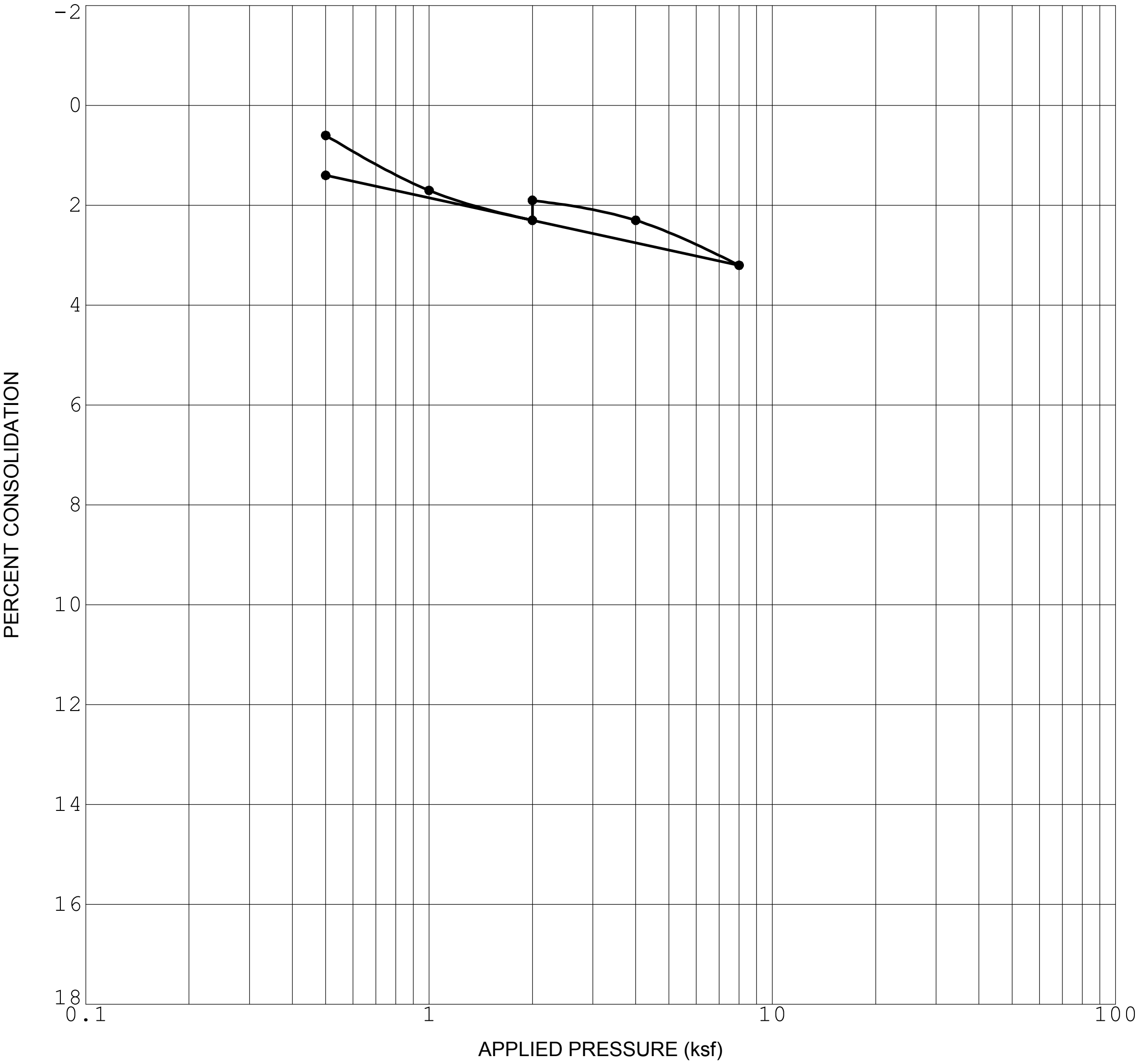
CONSOLIDATION CURVE

PORTOLA CENTER

LAKE FOREST, CALIFORNIA

GEOCON

SAMPLE NO. B61-10



Initial Dry Density (pcf)	134.9		**Initial Saturation (%)**	94.4
Initial Water Content (%)	28.8		**Sample Saturated at (ksf)**	2.0

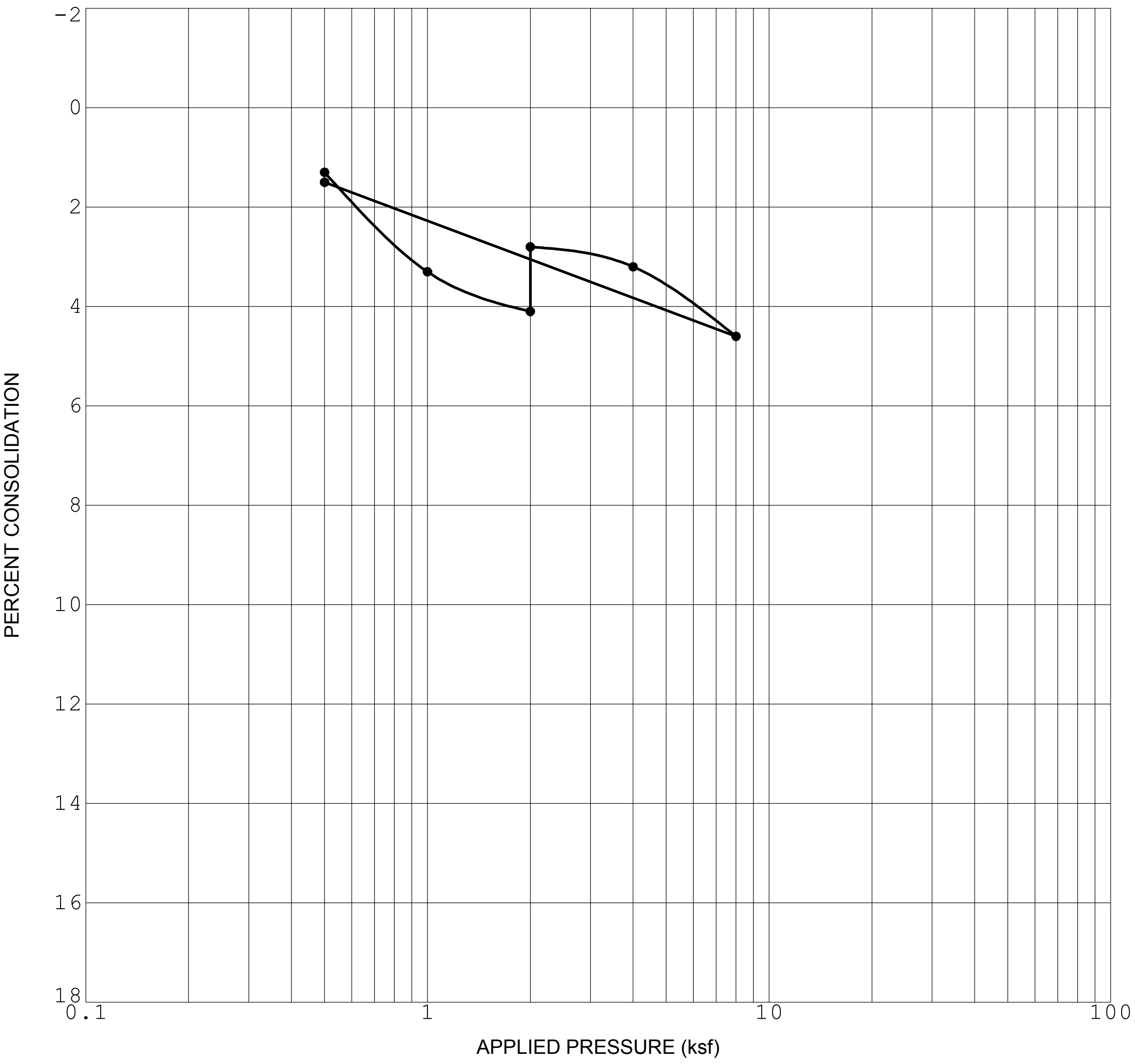
CONSOLIDATION CURVE

PORTOLA CENTER

LAKE FOREST, CALIFORNIA

PROJECT NO. G1218-52-01

SAMPLE NO. B62-2



Initial Dry Density (pcf)	83.6
Initial Water Content (%)	37.9

Initial Saturation (%)	100±
Sample Saturated at (ksf)	2.0

CONSOLIDATION CURVE

PORTOLA CENTER

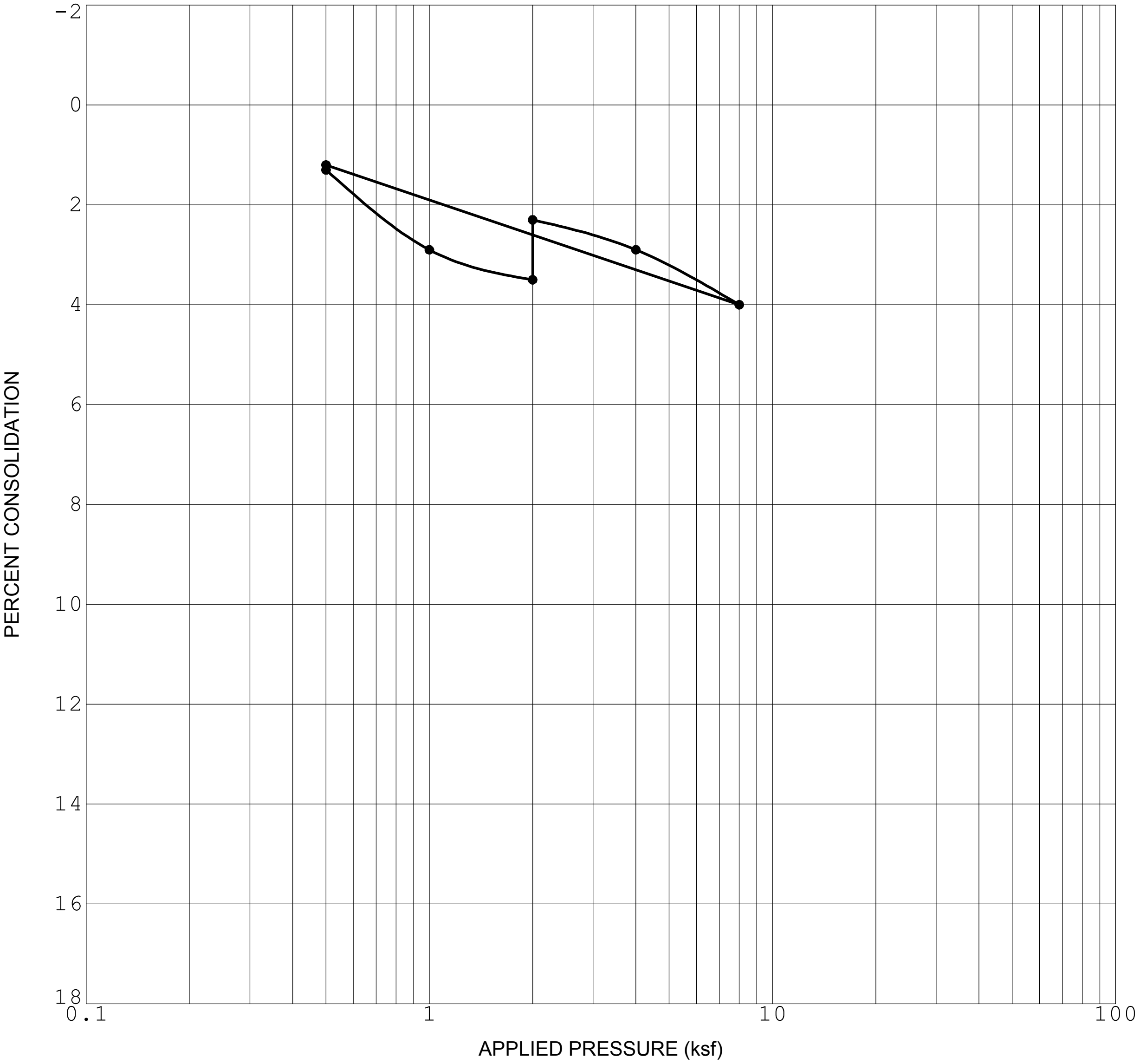
LAKE FOREST, CALIFORNIA

G1218-52-01 (UPD-04-17-2012).GPJ

Figure B-28

GEOCON

SAMPLE NO. B62-5



Initial Dry Density (pcf)	92.7		**Initial Saturation (%)**	99.7
Initial Water Content (%)	29.7		**Sample Saturated at (ksf)**	2.0

CONSOLIDATION CURVE

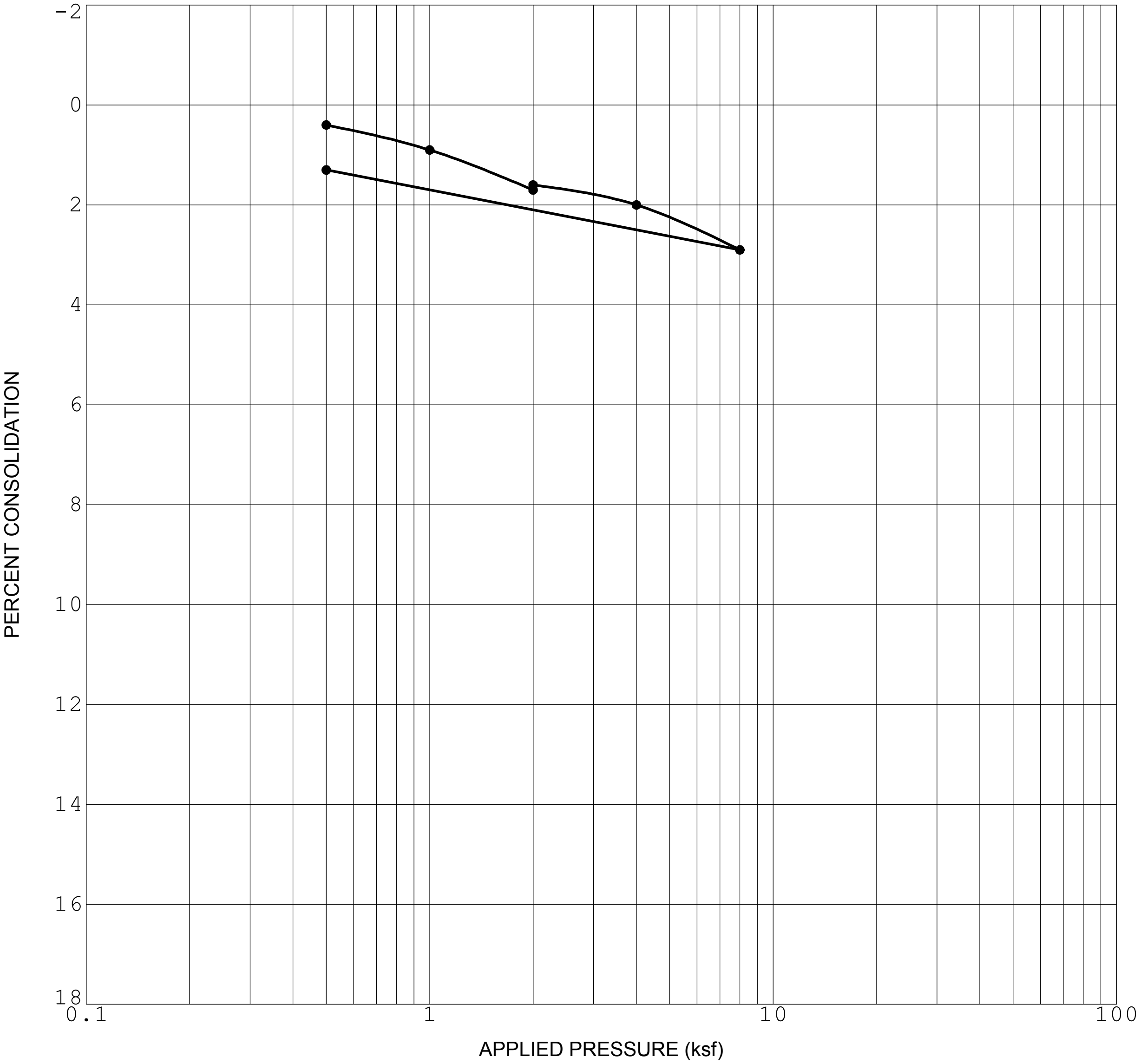
PORTOLA CENTER

LAKE FOREST, CALIFORNIA

GEOCON

PROJECT NO. G1218-52-01

SAMPLE NO. B64-2



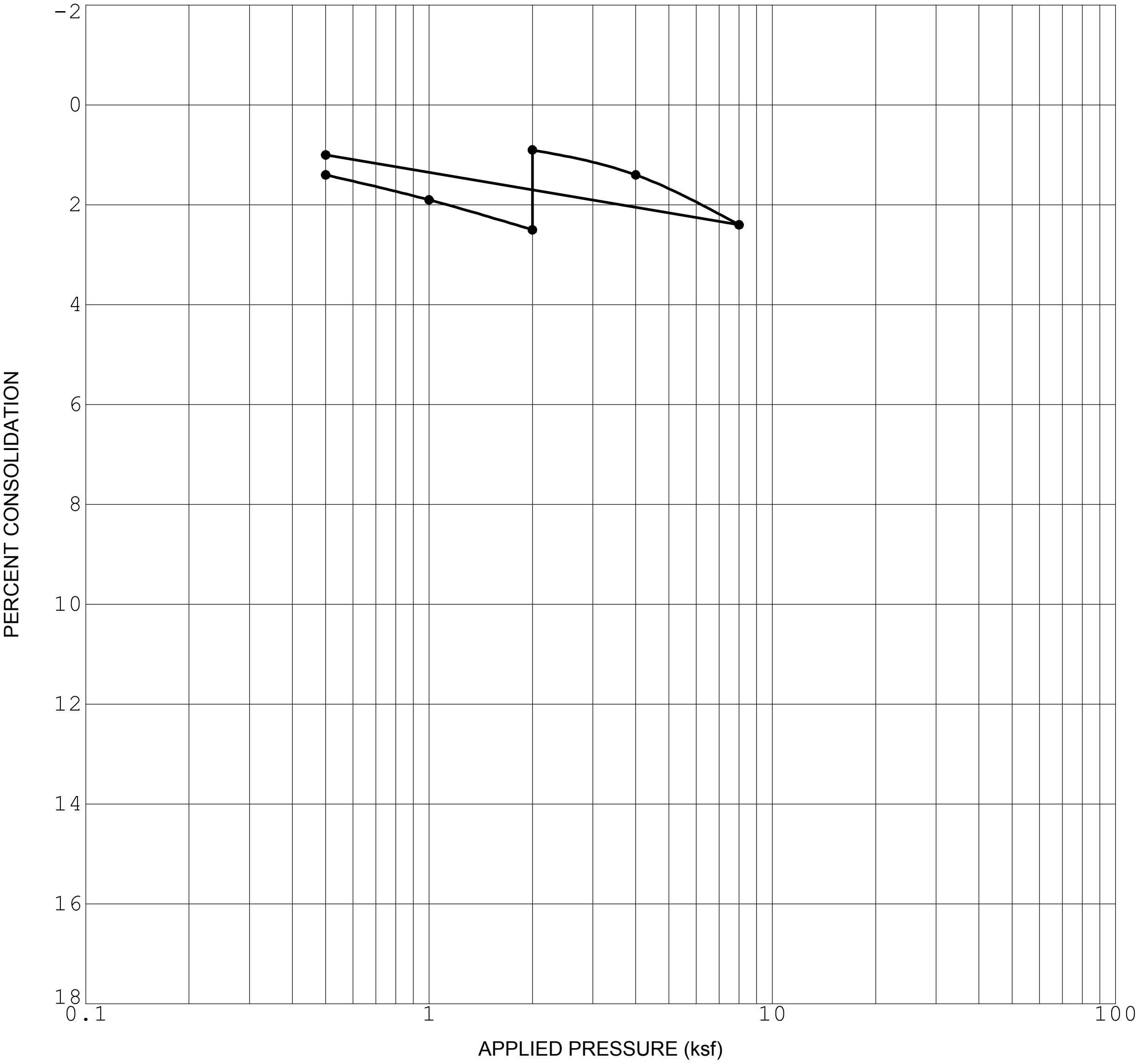
Initial Dry Density (pcf)	102.1		**Initial Saturation (%)**	83.1
Initial Water Content (%)	21.1		**Sample Saturated at (ksf)**	2.0

CONSOLIDATION CURVE

PORTOLA CENTER

LAKE FOREST, CALIFORNIA

SAMPLE NO. B65-2



Initial Dry Density (pcf)	98.9		**Initial Saturation (%)**	99.0
Initial Water Content (%)	25.3		**Sample Saturated at (ksf)**	2.0

CONSOLIDATION CURVE

PORTOLA CENTER

LAKE FOREST, CALIFORNIA

Figure B-31

SAMPLE NO.: B3-1

Test Data			
Load	1 K	3 K	5 K
INITIAL			
Water Content	23.9%	23.9%	23.9%
Dry Density (pcf)	97.7	97.7	97.7
Saturation*	91.4%	91.4%	91.4%
Height (inches)	1	1	1
AFTER TEST			
Water Content	22.9%	22.9%	22.9%
Dry Density (pcf)	97.7	97.7	97.7
FAILURE			
Normal Stress (psf)	1000	3000	5000
Shear Stress (psf)	1283	3000	4667
Rate (in/min)	0.01	0.01	0.01

*Degree of saturation calculated with a specific gravity of 2.65

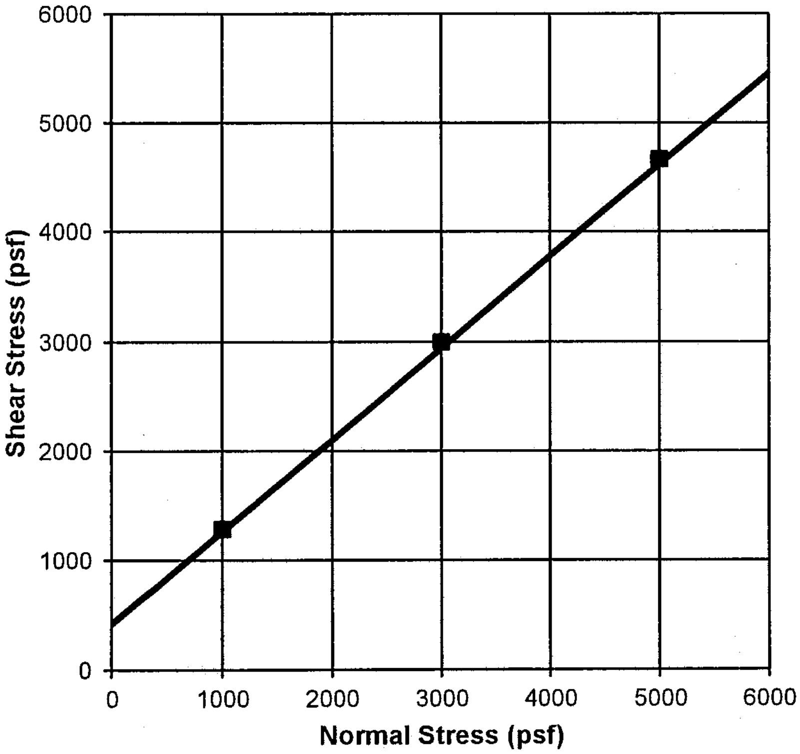
Results	
ϕ	40 degrees
c	425 psf

DATE: 5/6/2007

DESCRIPTION: Tps-slt - SM/ML

☑ Natural

☐ Remold



GEOCON
INCORPORATED
GEOTECHNICAL CONSULTANTS
6960 FLANDERS DRIVE - SAN DIEGO, CALIFORNIA 92121-2974
PHONE 858 558-6900 - FAX 858 558-6159

SW/SW

DIRECT SHEAR TEST DATA

PORTOLA CENTER
LAKE FOREST, CALIFORNIA

PROJECT NO. G1218-52-01

FIG. B-32

SAMPLE NO.: B3-2

Test Data			
Load	1 K	3 K	5 K
INITIAL			
Water Content	26.3%	26.3%	26.3%
Dry Density (pcf)	94.1	94.1	94.1
Saturation*	92.0%	92.0%	92.0%
Height (inches)	1	1	1
AFTER TEST			
Water Content	32.3%	32.3%	32.3%
Dry Density (pcf)	94.1	94.1	94.1
FAILURE			
Normal Stress (psf)	1000	3000	5000
Shear Stress (psf)	1133	1867	2583
Rate (in/min)	0.01	0.01	0.01

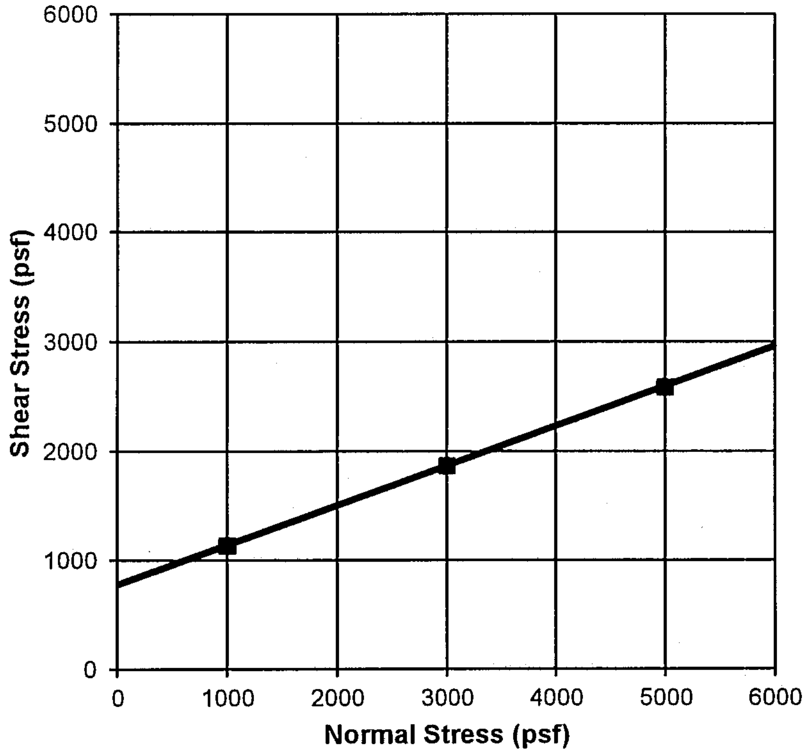
*Degree of saturation calculated with a specific gravity of 2.65

Results	
ϕ	20 degrees
c	780 psf

DATE: 5/6/2007
DESCRIPTION: Tps-slt - SM

☑ Natural

☐ Remold



GEOCON
INCORPORATED
GEOTECHNICAL CONSULTANTS
6960 FLANDERS DRIVE - SAN DIEGO, CALIFORNIA 92121-2974
PHONE 858 558-6900 - FAX 858 558-6159

SW/SW

DIRECT SHEAR TEST DATA

PORTOLA CENTER
LAKE FOREST, CALIFORNIA

PROJECT NO. G1218-52-01

FIG. B-33

SAMPLE NO.: B4-4

Test Data			
Load	1 K	3 K	5 K
INITIAL			
Water Content	36.1%	36.1%	36.1%
Dry Density (pcf)	82.7	82.7	82.7
Saturation*	95.6%	95.6%	95.6%
Height (inches)	1	1	1
AFTER TEST			
Water Content	33.6%	33.6%	33.6%
Dry Density (pcf)	82.7	82.7	82.7
FAILURE			
Normal Stress (psf)	1000	3000	5000
Shear Stress (psf)	2117	3000	3900
Rate (in/min)	0.01	0.01	0.01

*Degree of saturation calculated with a specific gravity of 2.65

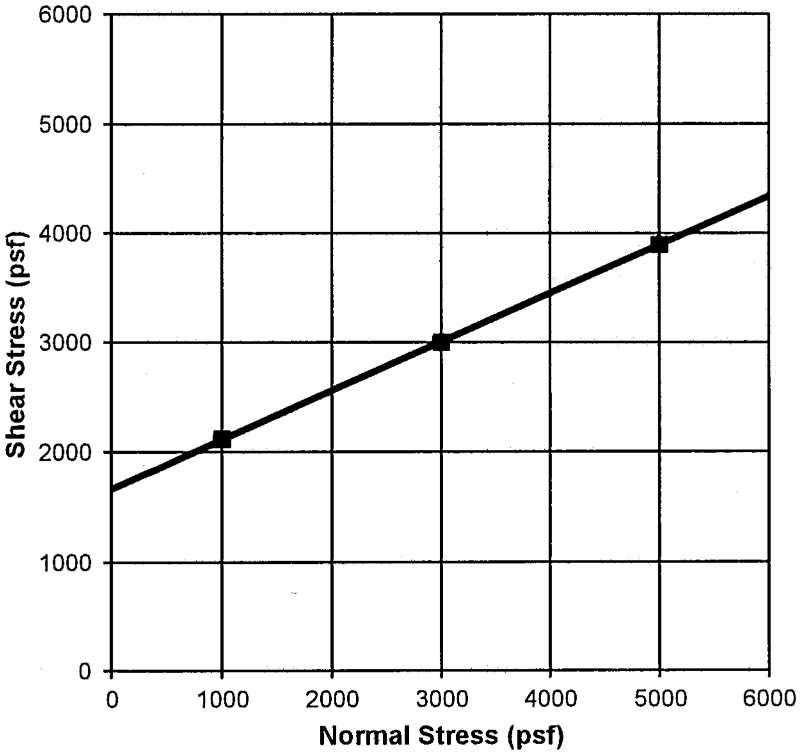
Results	
ϕ	24 degrees
c	1670 psf

DATE: 5/6/2007

DESCRIPTION: Tplv - SM

☑ Natural

☐ Remold



GEOCON
INCORPORATED
GEOTECHNICAL CONSULTANTS
6960 FLANDERS DRIVE - SAN DIEGO, CALIFORNIA 92121-2974
PHONE 858 558-6900 - FAX 858 558-6159

SW/SW

DIRECT SHEAR TEST DATA

PORTOLA CENTER
LAKE FOREST, CALIFORNIA

PROJECT NO. G1218-52-01

FIG. B-34

SAMPLE NO.: B4-7

Test Data			
Load	1 K	3 K	5 K
INITIAL			
Water Content	39.0%	39.0%	39.0%
Dry Density (pcf)	82.8	82.8	82.8
Saturation*	103.6%	103.6%	103.6%
Height (inches)	1	1	1
AFTER TEST			
Water Content	36.7%	36.7%	36.7%
Dry Density (pcf)	82.8	82.8	82.8
FAILURE			
Normal Stress (psf)	1000	3000	5000
Shear Stress (psf)	667	917	1150
Rate (in/min)	0.01	0.01	0.01

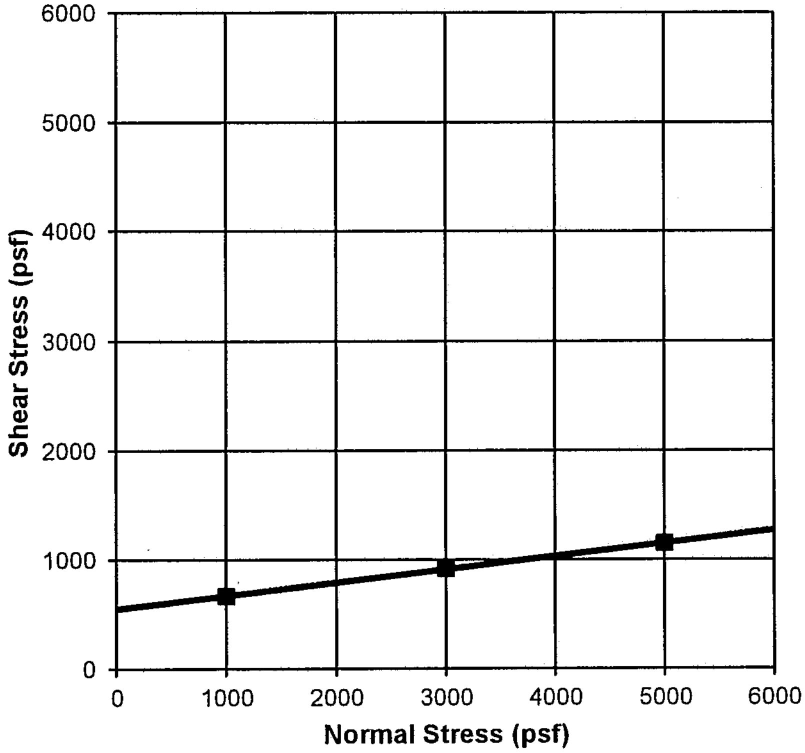
*Degree of saturation calculated with a specific gravity of 2.65

Results	
ϕ	7 degrees
c	550 psf

DATE: 5/6/2007
DESCRIPTION: Tplv - SM
*Residual Shear

☑ Natural

☐ Remold



GEOCON
INCORPORATED
GEOTECHNICAL CONSULTANTS
6960 FLANDERS DRIVE - SAN DIEGO, CALIFORNIA 92121-2974
PHONE 858 558-6900 - FAX 858 558-6159

SW/SW

DIRECT SHEAR TEST DATA

PORTOLA CENTER
LAKE FOREST, CALIFORNIA

PROJECT NO. G1218-52-01

FIG. B-35

SAMPLE NO.: B5-1

Test Data			
Load	1 K	3 K	5 K
INITIAL			
Water Content	35.5%	35.5%	35.5%
Dry Density (pcf)	72.1	72.1	72.1
Saturation*	72.7%	72.7%	72.7%
Height (inches)	1	1	1
AFTER TEST			
Water Content	44.8%	44.8%	44.8%
Dry Density (pcf)	72.1	72.1	72.1
FAILURE			
Normal Stress (psf)	1000	3000	5000
Shear Stress (psf)	900	1767	2600
Rate (in/min)	0.01	0.01	0.01

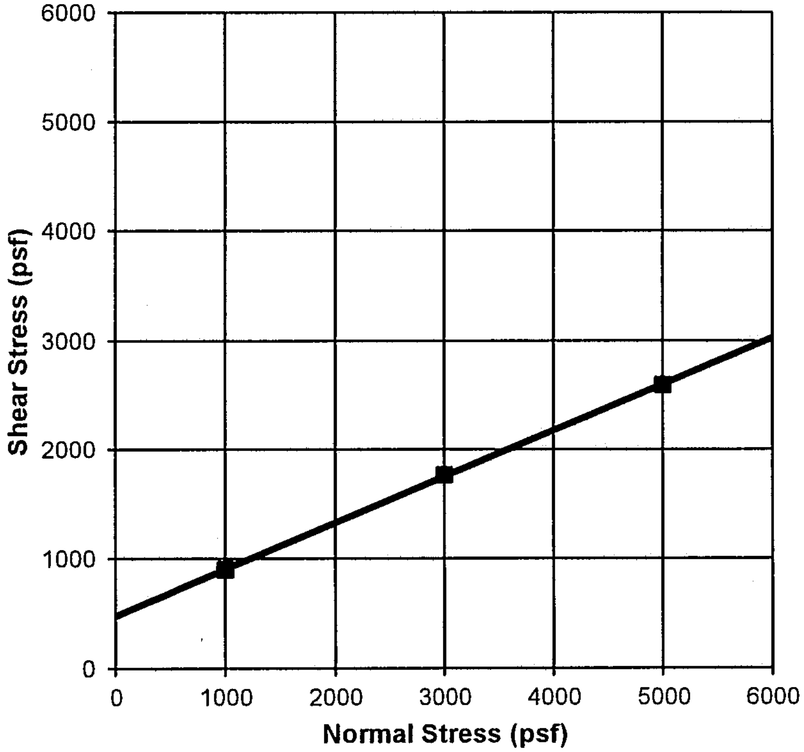
*Degree of saturation calculated with a specific gravity of 2.65

Results	
ϕ	23 degrees
c	480 psf

DATE: 3/6/2007
DESCRIPTION: Tplv - ML

☐ Natural

☑ Remold



GEOCON
INCORPORATED
GEOTECHNICAL CONSULTANTS
6960 FLANDERS DRIVE - SAN DIEGO, CALIFORNIA 92121-2974
PHONE 858 558-6900 - FAX 858 558-6159

SW/SW

DIRECT SHEAR TEST DATA

PORTOLA CENTER
LAKE FOREST, CALIFORNIA

PROJECT NO. G1218-52-01

FIG. B-36

SAMPLE NO.: B5-4

Test Data			
Load	1 K	3 K	5 K
INITIAL			
Water Content	64.4%	64.4%	64.4%
Dry Density (pcf)	68.4	68.4	68.4
Saturation*	120.3%	120.3%	120.3%
Height (inches)	1	1	1
AFTER TEST			
Water Content	56.9%	56.9%	56.9%
Dry Density (pcf)	68.4	68.4	68.4
FAILURE			
Normal Stress (psf)	1000	3000	5000
Shear Stress (psf)	1117	1950	2950
Rate (in/min)	0.01	0.01	0.01

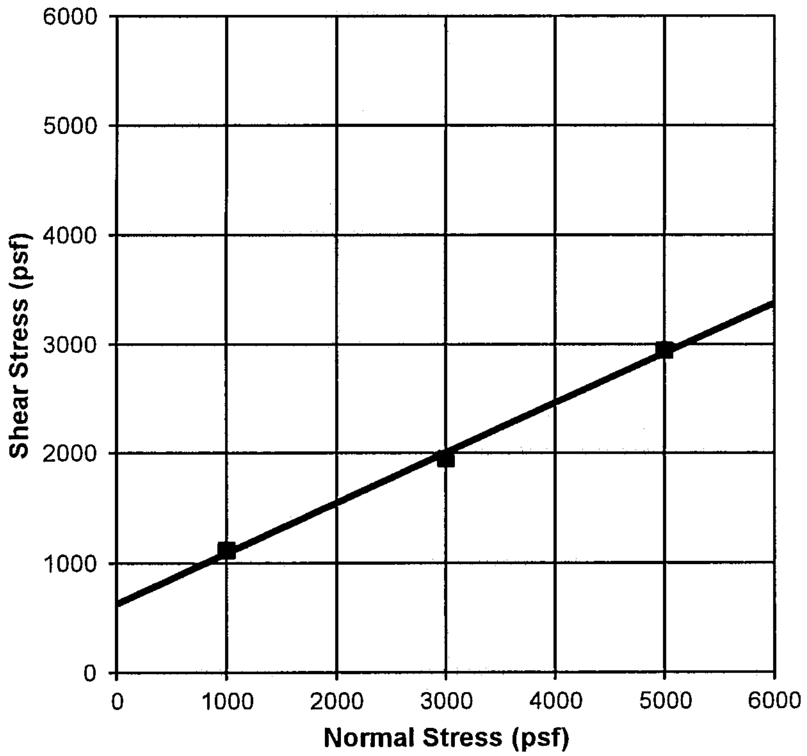
*Degree of saturation calculated with a specific gravity of 2.65

Results	
ϕ	25 degrees
c	630 psf

DATE: 5/6/2007
DESCRIPTION: Tplv - SM
*Residual Shear

☑ Natural

☐ Remold



GEOCON
INCORPORATED
GEOTECHNICAL CONSULTANTS
6960 FLANDERS DRIVE - SAN DIEGO, CALIFORNIA 92121-2974
PHONE 858 558-6900 - FAX 858 558-6159

SW/SW

DIRECT SHEAR TEST DATA

PORTOLA CENTER
LAKE FOREST, CALIFORNIA

PROJECT NO. G1218-52-01

FIG. B-37

SAMPLE NO.: B6-1

Test Data			
Load	1 K	3 K	5 K
INITIAL			
Water Content	9.0%	9.0%	9.0%
Dry Density (pcf)	108.6	108.6	108.6
Saturation*	45.6%	45.6%	45.6%
Height (inches)	1	1	1
AFTER TEST			
Water Content	16.7%	16.7%	16.7%
Dry Density (pcf)	108.6	108.6	108.6
FAILURE			
Normal Stress (psf)	1000	3000	5000
Shear Stress (psf)	1217	2367	3533
Rate (in/min)	0.01	0.01	0.01

*Degree of saturation calculated with a specific gravity of 2.65

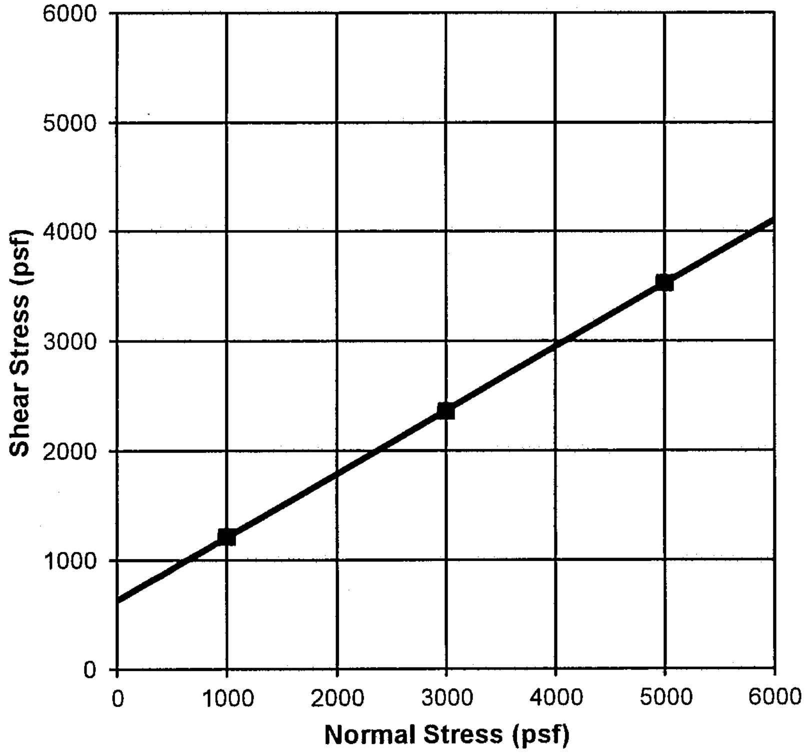
Results	
ϕ	30 degrees
c	630 psf

DATE: 3/6/2007

DESCRIPTION: Tps - SM

☐ Natural

☑ Remold



GEOCON
INCORPORATED
GEOTECHNICAL CONSULTANTS
6960 FLANDERS DRIVE - SAN DIEGO, CALIFORNIA 92121-2974
PHONE 858 558-6900 - FAX 858 558-6159

SW/SW

DIRECT SHEAR TEST DATA

PORTOLA CENTER
LAKE FOREST, CALIFORNIA

PROJECT NO. G1218-52-01

FIG. B-38

SAMPLE NO.: B6-3

Test Data			
Load	1 K	3 K	5 K
INITIAL			
Water Content	36.1%	36.1%	36.1%
Dry Density (pcf)	82.7	82.7	82.7
Saturation*	95.6%	95.6%	95.6%
Height (inches)	1	1	1
AFTER TEST			
Water Content	33.6%	33.6%	33.6%
Dry Density (pcf)	82.7	82.7	82.7
FAILURE			
Normal Stress (psf)	1000	3000	5000
Shear Stress (psf)	1083	2733	4350
Rate (in/min)	0.01	0.01	0.01

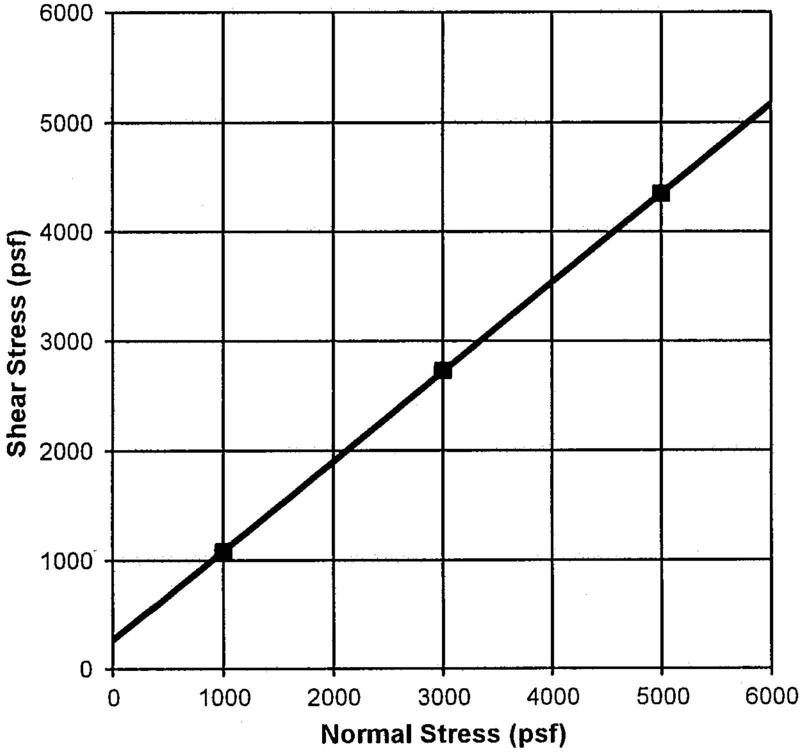
*Degree of saturation calculated with a specific gravity of 2.65

Results	
ϕ	39 degrees
c	270 psf

DATE: 5/6/2007
DESCRIPTION: Tps - SM

☑ Natural

☐ Remold



GEOCON
INCORPORATED
GEOTECHNICAL CONSULTANTS
6960 FLANDERS DRIVE - SAN DIEGO, CALIFORNIA 92121-2974
PHONE 858 558-6900 - FAX 858 558-6159

SW/SW

DIRECT SHEAR TEST DATA

PORTOLA CENTER
LAKE FOREST, CALIFORNIA

PROJECT NO. G1218-52-01

FIG. B-39

SAMPLE NO.: B7-4

Test Data			
Load	1 K	3 K	5 K
INITIAL			
Water Content	23.6%	23.6%	23.6%
Dry Density (pcf)	101.2	101.2	101.2
Saturation*	98.6%	98.6%	98.6%
Height (inches)	1	1	1
AFTER TEST			
Water Content	19.9%	19.9%	19.9%
Dry Density (pcf)	101.2	101.2	101.2
FAILURE			
Normal Stress (psf)	1000	3000	5000
Shear Stress (psf)	1100	1883	2633
Rate (in/min)	0.01	0.01	0.01

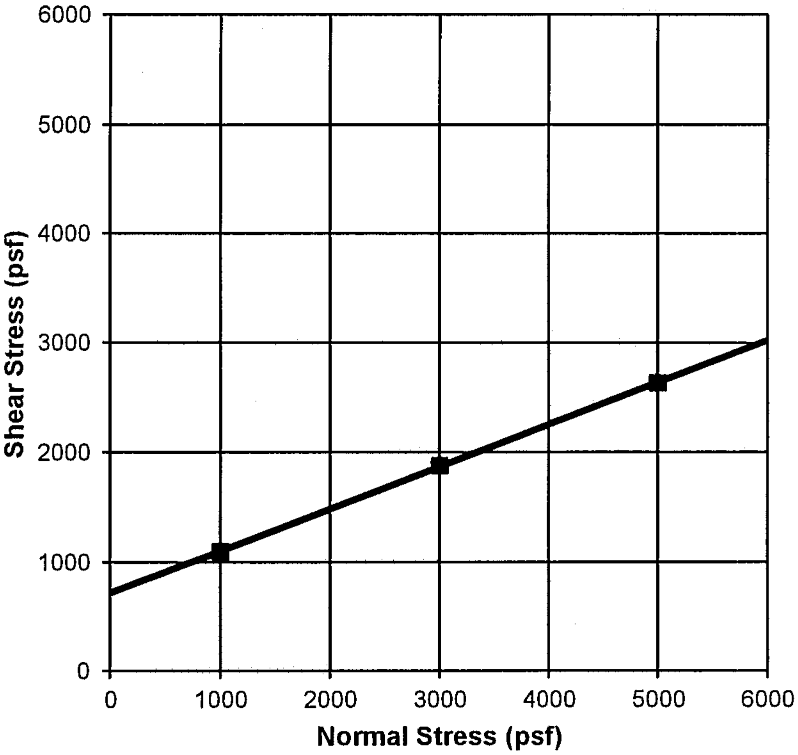
*Degree of saturation calculated with a specific gravity of 2.65

Results	
ϕ	21 degrees
c	720 psf

DATE: 3/6/2007
DESCRIPTION: afe - ML

☑ Natural

☐ Remold



GEOCON
INCORPORATED
GEOTECHNICAL CONSULTANTS
6960 FLANDERS DRIVE - SAN DIEGO, CALIFORNIA 92121-2974
PHONE 858 558-6900 - FAX 858 558-6159

SW/SW

DIRECT SHEAR TEST DATA

PORTOLA CENTER
LAKE FOREST, CALIFORNIA

PROJECT NO. G1218-52-01

FIG. B-40

SAMPLE NO.: B7-5

Test Data			
Load	1 K	3 K	5 K
INITIAL			
Water Content	13.6%	13.6%	13.6%
Dry Density (pcf)	102.1	102.1	102.1
Saturation*	58.1%	58.1%	58.1%
Height (inches)	1	1	1
AFTER TEST			
Water Content	22.8%	22.8%	22.8%
Dry Density (pcf)	102.1	102.1	102.1
FAILURE			
Normal Stress (psf)	1000	3000	5000
Shear Stress (psf)	900	1283	1517
Rate (in/min)	0.01	0.01	0.01

*Degree of saturation calculated with a specific gravity of 2.65

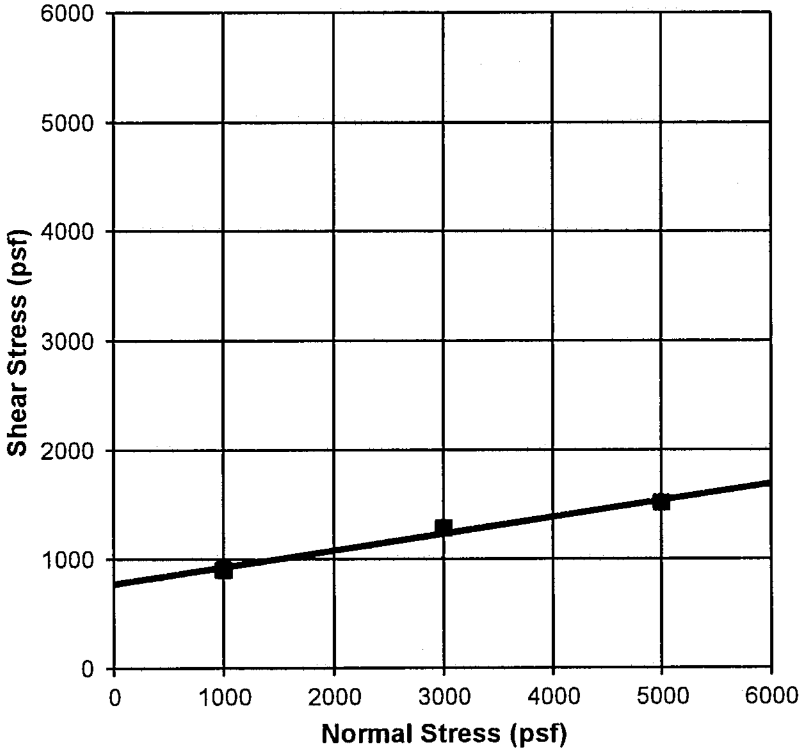
Results	
ϕ	9 degrees
c	770 psf

DATE: 3/6/2007

DESCRIPTION: ML

☐ Natural

☑ Remold



GEOCON
INCORPORATED
GEOTECHNICAL CONSULTANTS
6960 FLANDERS DRIVE - SAN DIEGO, CALIFORNIA 92121-2974
PHONE 858 558-6900 - FAX 858 558-6159

SW/SW

DIRECT SHEAR TEST DATA

PORTOLA CENTER
LAKE FOREST, CALIFORNIA

PROJECT NO. G1218-52-01

FIG. B-41

SAMPLE NO.: B7-6

Test Data			
Load	1 K	3 K	5 K
INITIAL			
Water Content	22.6%	22.6%	22.6%
Dry Density (pcf)	101.6	101.6	101.6
Saturation*	95.4%	95.4%	95.4%
Height (inches)	1	1	1
AFTER TEST			
Water Content	24.8%	24.8%	24.8%
Dry Density (pcf)	101.6	101.6	101.6
FAILURE			
Normal Stress (psf)	1000	3000	5000
Shear Stress (psf)	1300	2500	3700
Rate (in/min)	0.01	0.01	0.01

*Degree of saturation calculated with a specific gravity of 2.65

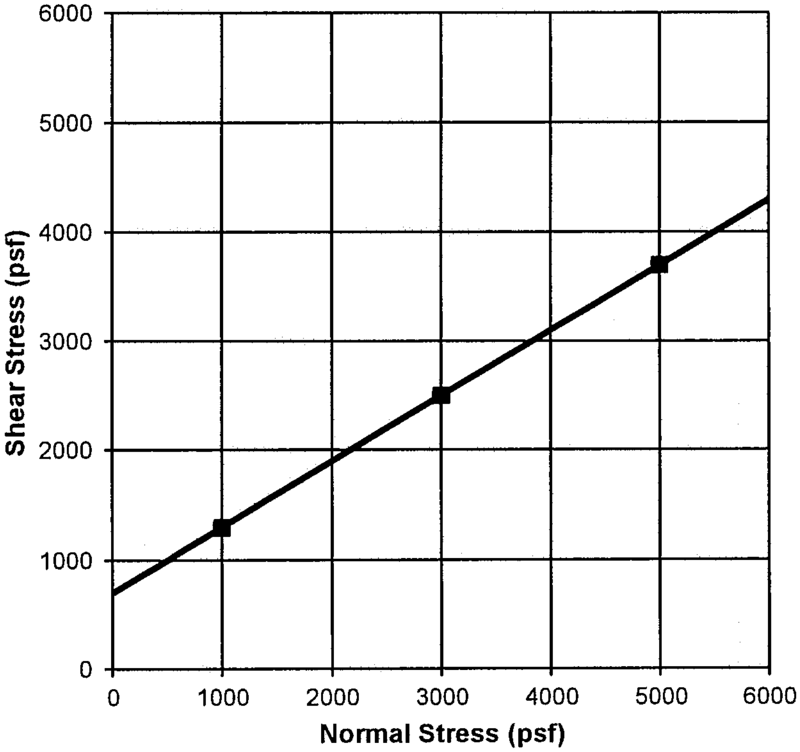
Results	
ϕ	31 degrees
c	700 psf

DATE: 3/6/2007

DESCRIPTION: afe - ML

☑ Natural

☐ Remold



GEOCON
INCORPORATED
GEOTECHNICAL CONSULTANTS
6960 FLANDERS DRIVE - SAN DIEGO, CALIFORNIA 92121-2974
PHONE 858 558-6900 - FAX 858 558-6159

SW/SW

DIRECT SHEAR TEST DATA

PORTOLA CENTER
LAKE FOREST, CALIFORNIA

PROJECT NO. G1218-52-01

FIG. B-42

SAMPLE NO.: B10-1

Test Data			
Load	1 K	3 K	5 K
INITIAL			
Water Content	21.6%	21.6%	21.6%
Dry Density (pcf)	102.5	102.5	102.5
Saturation*	93.3%	93.3%	93.3%
Height (inches)	1	1	1
AFTER TEST			
Water Content	23.5%	23.5%	23.5%
Dry Density (pcf)	102.5	102.5	102.5
FAILURE			
Normal Stress (psf)	1000	3000	5000
Shear Stress (psf)	933	1983	3005
Rate (in/min)	0.01	0.01	0.01

*Degree of saturation calculated with a specific gravity of 2.65

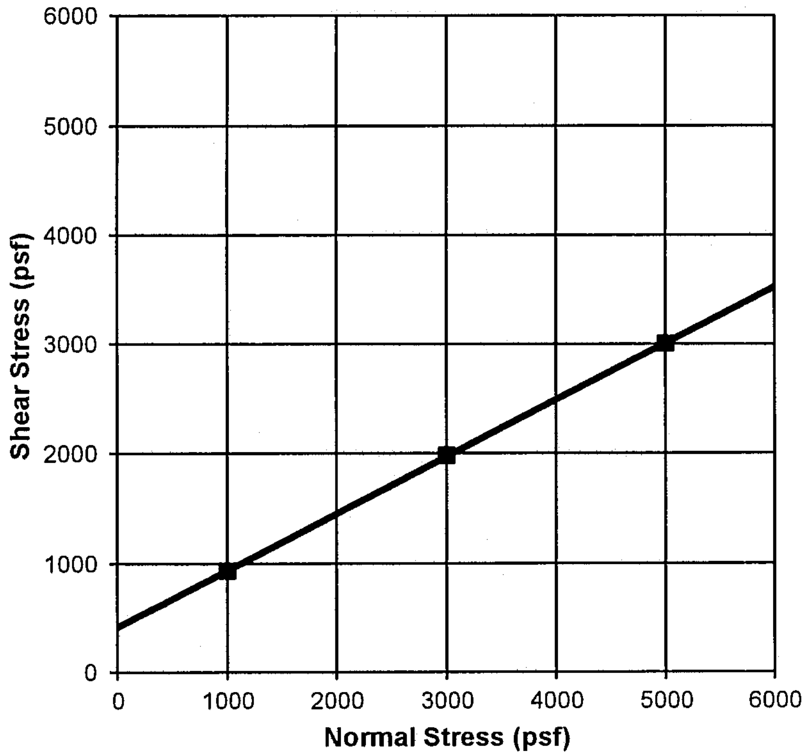
Results	
ϕ	27 degrees
c	420 psf

DATE: 3/6/2007

DESCRIPTION: afe - ML

☑ Natural

☐ Remold



GEOCON
INCORPORATED
GEOTECHNICAL CONSULTANTS
6960 FLANDERS DRIVE - SAN DIEGO, CALIFORNIA 92121-2974
PHONE 858 558-6900 - FAX 858 558-6159

SW/SW

DIRECT SHEAR TEST DATA

PORTOLA CENTER
LAKE FOREST, CALIFORNIA

PROJECT NO. G1218-52-01

FIG. B-43

SAMPLE NO.: B12-8

Test Data			
Load	1 K	2 K	4 K
INITIAL			
Water Content	35.2%	35.7%	34.1%
Dry Density (pcf)	71.5	67.2	70.9
Saturation*	71.1%	64.8%	67.8%
Height (inches)	1	1	1
AFTER TEST			
Water Content	42.4%	47.8%	43.9%
Dry Density (pcf)	68.8	66.2	68.8
FAILURE			
Normal Stress (psf)	1000	2000	4000
Ultimate Stress (psf)	1331	1810	3828
Peak Stress (psf)	1731	2247	5601
Rate (in/min)	0.01	0.01	0.01

*Degree of saturation calculated with a specific gravity of 2.65

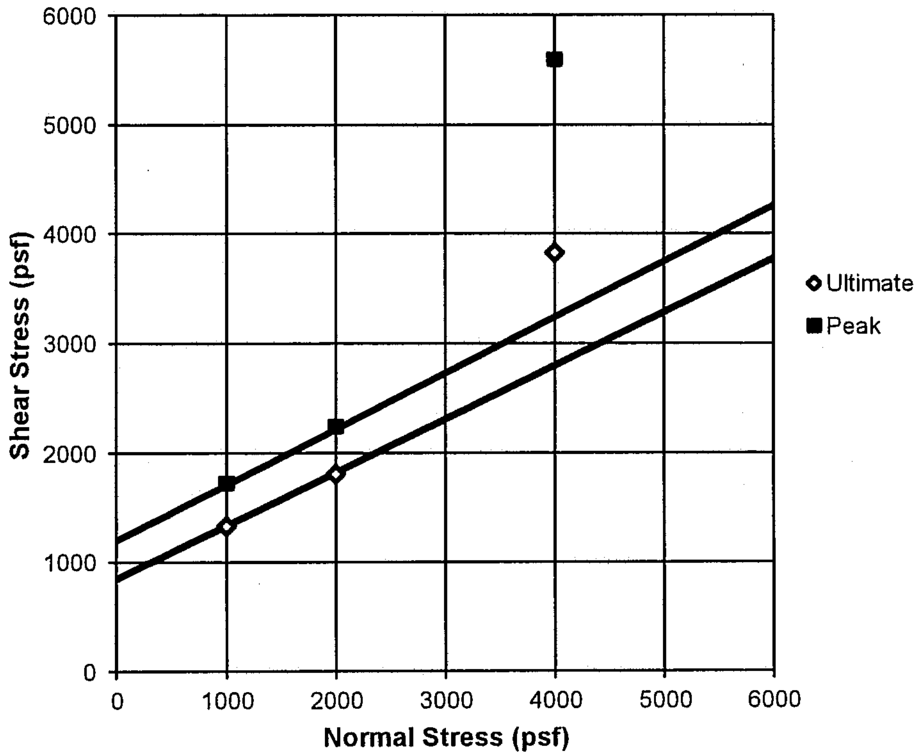
Results	
ϕ (Ultimate)	26 degrees
ϕ (Peak)	27 degrees
c (Ultimate)	850 psf
c (Peak)	1200 psf

DATE: 10/11/2007

DESCRIPTION: Tplv - CL

☑ Natural

☐ Remold



GEOCON
INCORPORATED
GEOTECHNICAL CONSULTANTS
6960 FLANDERS DRIVE - SAN DIEGO, CALIFORNIA 92121-2974
PHONE 858 558-6900 - FAX 858 558-6159

SW/SW

DIRECT SHEAR TEST DATA

PORTOLA CENTER
LAKE FOREST, CALIFORNIA

PROJECT NO. G1218-52-01

FIG. B-44

SAMPLE NO.: B12-9

Test Data			
Load	1 K	2 K	4 K
INITIAL			
Water Content	37.8%	40.3%	36.0%
Dry Density (pcf)	70.1	64.2	66.6
Saturation*	73.6%	67.7%	64.1%
Height (inches)	1	1	1
AFTER TEST			
Water Content	45.6%	51.3%	47.1%
Dry Density (pcf)	64.5	62.9	64.3
FAILURE			
Normal Stress (psf)	1000	2000	4000
Ultimate Stress (psf)	1488	2082	4079
Peak Stress (psf)	1574	2726	5564
Rate (in/min)	0.01	0.01	0.01

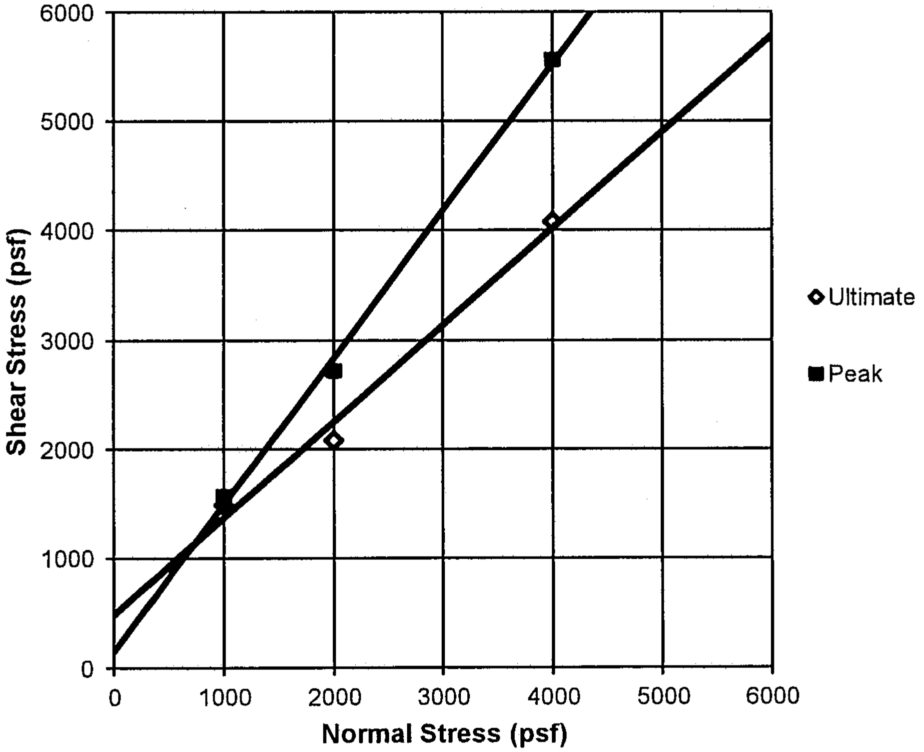
*Degree of saturation calculated with a specific gravity of 2.65

Results	
ϕ (Ultimate)	41 degrees
ϕ (Peak)	53 degrees
c (Ultimate)	490 psf
c (Peak)	155 psf

DATE: 10/15/2007
DESCRIPTION: Tplv - ML

☑ Natural

☐ Remold



GEOCON
INCORPORATED
GEOTECHNICAL CONSULTANTS
6960 FLANDERS DRIVE - SAN DIEGO, CALIFORNIA 92121-2974
PHONE 858 558-6900 - FAX 858 558-6159

SW/SW

DIRECT SHEAR TEST DATA

PORTOLA CENTER
LAKE FOREST, CALIFORNIA

PROJECT NO. G1218-52-01

FIG. B-45

SAMPLE NO.: B12-10

Test Data			
Load	1 K	3 K	5 K
INITIAL			
Water Content	43.9%	43.9%	43.9%
Dry Density (pcf)	64.0	64.0	64.0
Saturation*	73.4%	73.4%	73.4%
Height (inches)	1	1	1
AFTER TEST			
Water Content	62.6%	62.6%	62.6%
Dry Density (pcf)	64.0	64.0	64.0
FAILURE			
Normal Stress (psf)	1000	3000	5000
Shear Stress (psf)	1025	2322	3488
Rate (in/min)	0.01	0.01	0.01

*Degree of saturation calculated with a specific gravity of 2.65

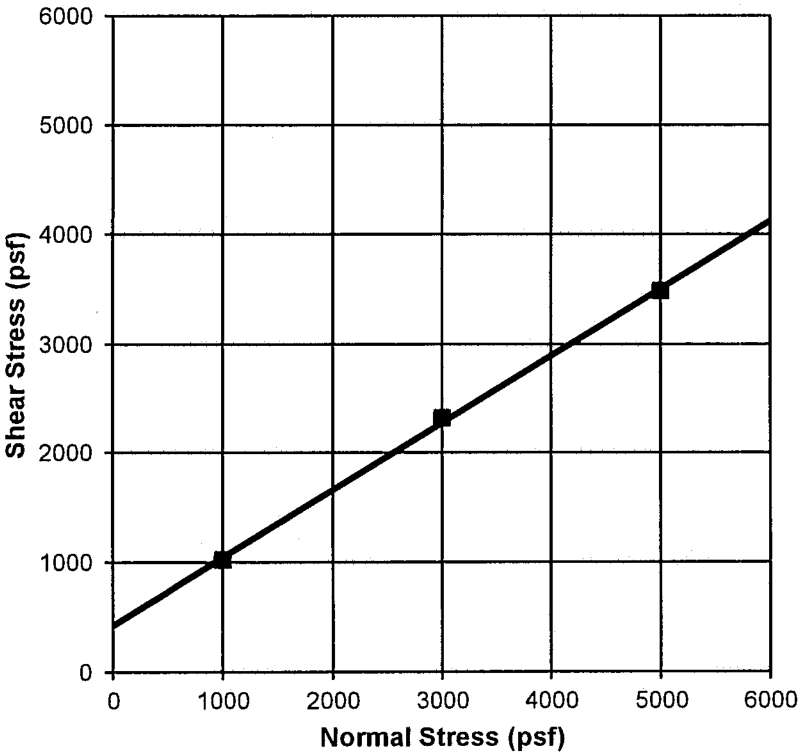
Results	
ϕ	31 degrees
c	430 psf

DATE: 10/4/2007

DESCRIPTION: Tplv - SM

☐ Natural

☑ Remold



GEOCON
INCORPORATED
GEOTECHNICAL CONSULTANTS
6960 FLANDERS DRIVE - SAN DIEGO, CALIFORNIA 92121-2974
PHONE 858 558-6900 - FAX 858 558-6159

SW/SW

DIRECT SHEAR TEST DATA

PORTOLA CENTER
LAKE FOREST, CALIFORNIA

PROJECT NO. G1218-52-01

FIG. B-46

SAMPLE NO.: B14-5

Test Data			
Load	1 K	2 K	4 K
INITIAL			
Water Content	49.7%	49.7%	49.7%
Dry Density (pcf)	69.7	69.7	69.7
Saturation*	96.0%	96.0%	96.0%
Height (inches)	1	1	1
AFTER TEST			
Water Content	56.5%	56.5%	56.5%
Dry Density (pcf)	69.5	69.8	69.9
FAILURE			
Normal Stress (psf)	1000	2000	4000
Ultimate Stress (psf)	558	1009	1646
Peak Stress (psf)	622	1109	1939
Rate (in/min)	0.01	0.01	0.01

*Degree of saturation calculated with a specific gravity of 2.65

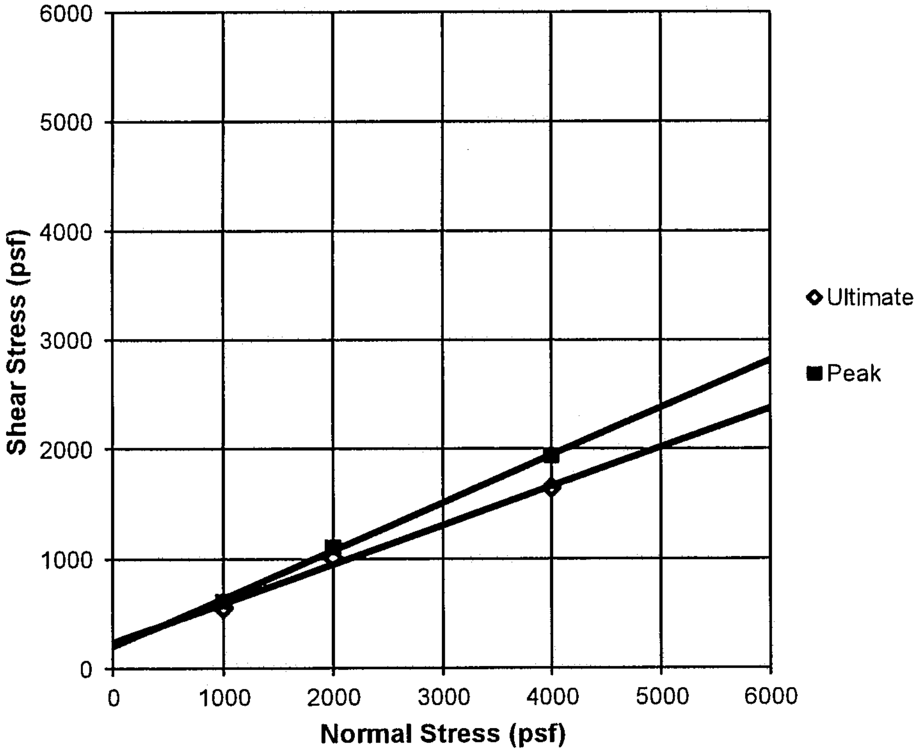
Results	
ϕ (Ultimate)	20 degrees
ϕ (Peak)	24 degrees
c (Ultimate)	240 psf
c (Peak)	200 psf

DATE: 10/3/2007

DESCRIPTION: Tplv - CL

☑ Natural

☐ Remold



GEOCON
INCORPORATED
GEOTECHNICAL CONSULTANTS
6960 FLANDERS DRIVE - SAN DIEGO, CALIFORNIA 92121-2974
PHONE 858 558-6900 - FAX 858 558-6159

SW/SW

DIRECT SHEAR TEST DATA

PORTOLA CENTER
LAKE FOREST, CALIFORNIA

PROJECT NO. G1218-52-01

FIG. B-47

SAMPLE NO.: B14-6

Test Data			
Load	1 K	2 K	4 K
INITIAL			
Water Content	40.4%	40.4%	40.4%
Dry Density (pcf)	79.5	79.5	79.5
Saturation*	99.2%	99.2%	99.2%
Height (inches)	1	1	1
AFTER TEST			
Water Content	42.7%	42.7%	42.7%
Dry Density (pcf)	80.3	80.3	80.7
FAILURE			
Normal Stress (psf)	1000	2000	4000
Ultimate Stress (psf)	1266	2075	3341
Peak Stress (psf)	1352	2089	3341
Rate (in/min)	0.01	0.01	0.01

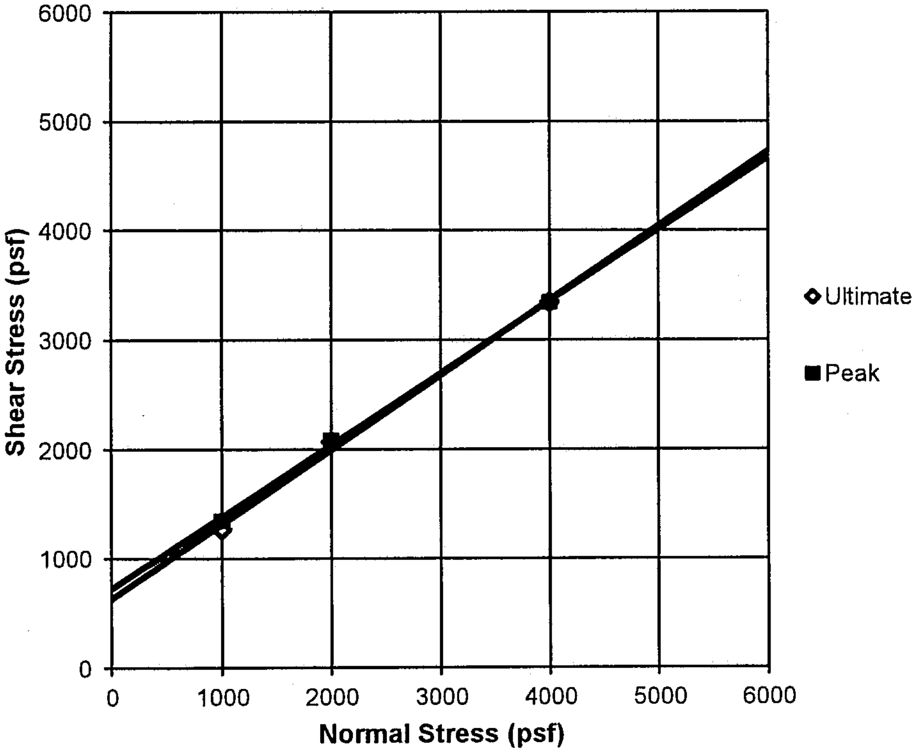
*Degree of saturation calculated with a specific gravity of 2.65

Results	
ϕ (Ultimate)	33 degrees
ϕ (Peak)	33 degrees
c (Ultimate)	630 psf
c (Peak)	730 psf

DATE: 10/5/2007
DESCRIPTION: Tplv - CL

☑ Natural

☐ Remold



GEOCON
INCORPORATED
GEOTECHNICAL CONSULTANTS
6960 FLANDERS DRIVE - SAN DIEGO, CALIFORNIA 92121-2974
PHONE 858 558-6900 - FAX 858 558-6159

SW/SW

DIRECT SHEAR TEST DATA

PORTOLA CENTER
LAKE FOREST, CALIFORNIA

PROJECT NO. G1218-52-01

FIG. B-48

SAMPLE NO.: B14-10

Test Data			
Load	1 K	2 K	4 K
INITIAL			
Water Content	65.8%	62.9%	60.2%
Dry Density (pcf)	54.5	53.7	56.4
Saturation*	85.7%	80.2%	82.6%
Height (inches)	1	1	1
AFTER TEST			
Water Content	72.6%	72.0%	68.3%
Dry Density (pcf)	53.8	54.0	55.8
FAILURE			
Normal Stress (psf)	1000	2000	4000
Ultimate Stress (psf)	1030	1531	3413
Peak Stress (psf)	1553	1875	3950
Rate (in/min)	0.01	0.01	0.01

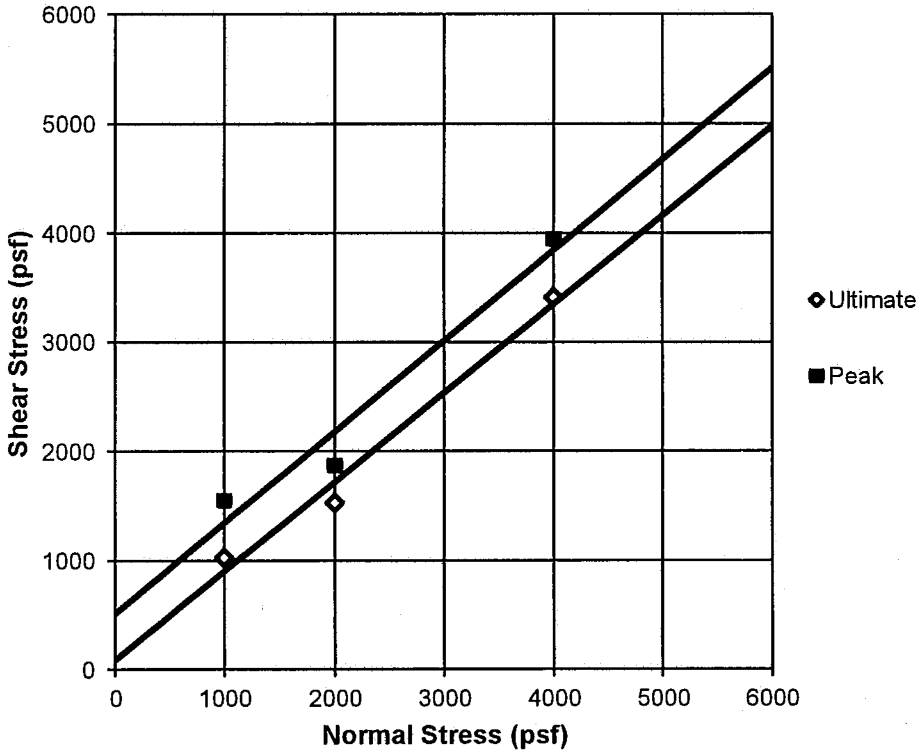
*Degree of saturation calculated with a specific gravity of 2.65

Results	
ϕ (Ultimate)	39 degrees
ϕ (Peak)	40 degrees
c (Ultimate)	90 psf
c (Peak)	500 psf

DATE: 10/17/2007
DESCRIPTION: Tplv - CL

☑ Natural

☐ Remold



GEOCON
INCORPORATED
GEOTECHNICAL CONSULTANTS
6960 FLANDERS DRIVE - SAN DIEGO, CALIFORNIA 92121-2974
PHONE 858 558-6900 - FAX 858 558-6159

SW/SW

DIRECT SHEAR TEST DATA

PORTOLA CENTER
LAKE FOREST, CALIFORNIA

PROJECT NO. G1218-52-01

FIG. B-49

SAMPLE NO.: B14-11

Test Data			
Load	1 K	3 K	5 K
INITIAL			
Water Content	39.4%	39.4%	39.4%
Dry Density (pcf)	70.0	70.0	70.0
Saturation*	76.6%	76.6%	76.6%
Height (inches)	1	1	1
AFTER TEST			
Water Content	43.9%	43.9%	43.8%
Dry Density (pcf)	70.0	70.0	70.0
FAILURE			
Normal Stress (psf)	1000	3000	5000
Shear Stress (psf)	1046	2343	3851
Rate (in/min)	0.01	0.01	0.01

*Degree of saturation calculated with a specific gravity of 2.65

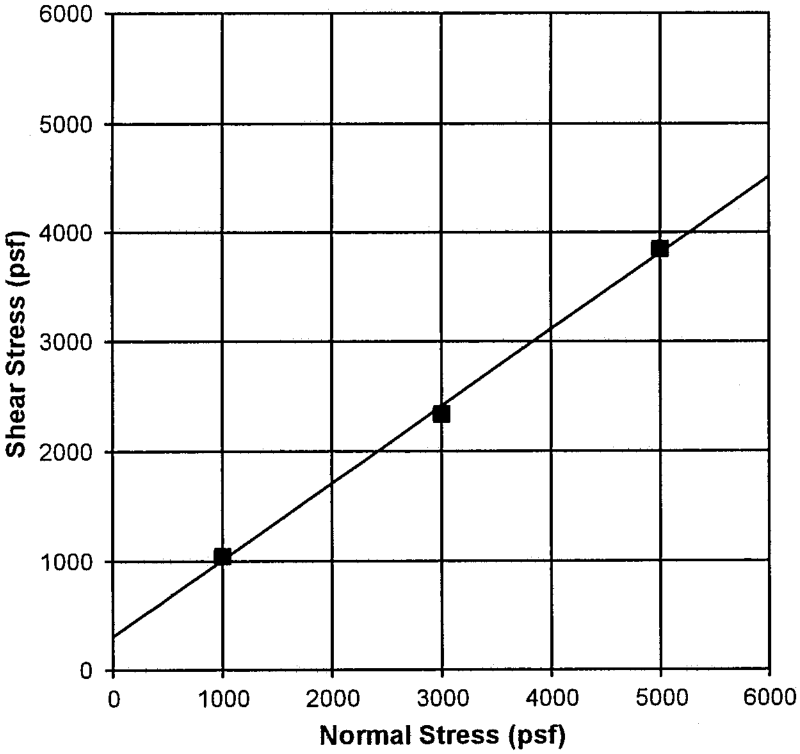
Results	
ϕ	35 degrees
c	310 psf

DATE: 5/6/2007

DESCRIPTION: Tplv - ML

☐ Natural

☑ Remold



GEOCON
INCORPORATED
GEOTECHNICAL CONSULTANTS
6960 FLANDERS DRIVE - SAN DIEGO, CALIFORNIA 92121-2974
PHONE 858 558-6900 - FAX 858 558-6159

SW/SW

DIRECT SHEAR TEST DATA

PORTOLA CENTER
LAKE FOREST, CALIFORNIA

PROJECT NO. G1218-52-01

FIG. B-50

SAMPLE NO.: B15-7

Test Data			
Load	1 K	2 K	4 K
INITIAL			
Water Content	38.7%	43.6%	37.5%
Dry Density (pcf)	81.2	74.8	79.6
Saturation*	98.7%	95.3%	92.2%
Height (inches)	1	1	1
AFTER TEST			
Water Content	42.1%	47.9%	43.5%
Dry Density (pcf)	81.1	74.5	79.8
FAILURE			
Normal Stress (psf)	1000	2000	4000
Ultimate Stress (psf)	408	1195	1910
Peak Stress (psf)	959	2068	3470
Rate (in/min)	0.01	0.01	0.01

*Degree of saturation calculated with a specific gravity of 2.65

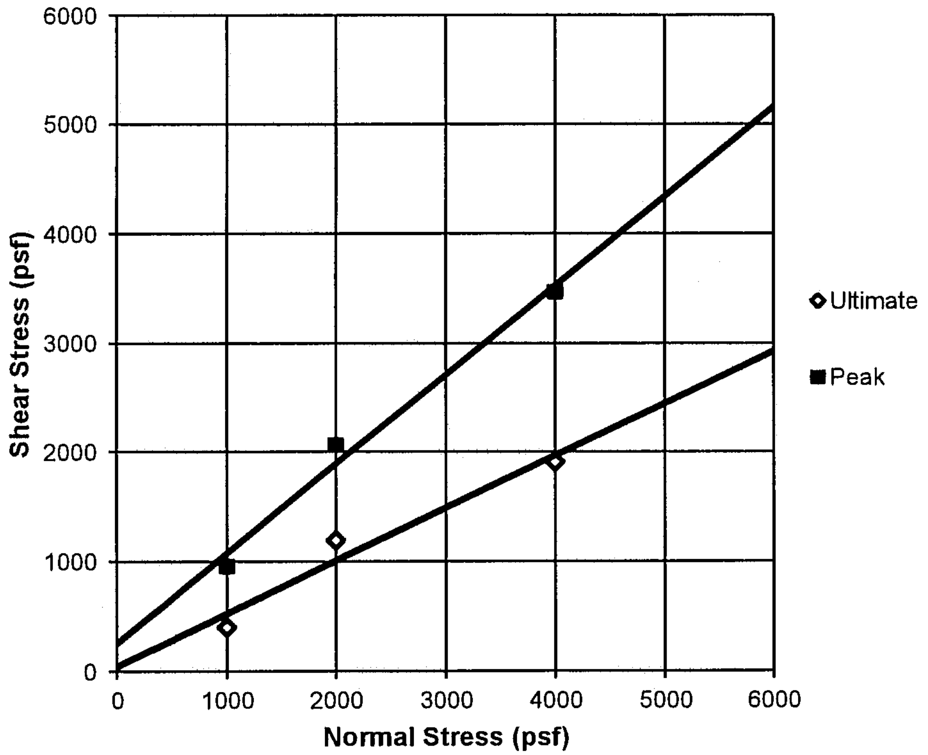
Results	
ϕ (Ultimate)	26 degrees
ϕ (Peak)	39 degrees
c (Ultimate)	50 psf
c (Peak)	260 psf

DATE: 10/23/2007

DESCRIPTION: Tplv - CL

☑ Natural

☐ Remold



GEOCON
INCORPORATED
GEOTECHNICAL CONSULTANTS
6960 FLANDERS DRIVE - SAN DIEGO, CALIFORNIA 92121-2974
PHONE 858 558-6900 - FAX 858 558-6159

SW/SW

DIRECT SHEAR TEST DATA

PORTOLA CENTER
LAKE FOREST, CALIFORNIA

PROJECT NO. G1218-52-01

FIG. B-51

SAMPLE NO.: B15-8

Test Data			
Load	1 K	2 K	4 K
INITIAL			
Water Content	46.4%	44.4%	49.0%
Dry Density (pcf)	70.4	67.8	67.8
Saturation*	91.1%	81.7%	90.4%
Height (inches)	1	1	1
AFTER TEST			
Water Content	50.4%	51.0%	54.0%
Dry Density (pcf)	69.0	68.1	68.8
FAILURE			
Normal Stress (psf)	1000	2000	4000
Ultimate Stress (psf)	794	1517	2118
Peak Stress (psf)	1159	1796	3019
Rate (in/min)	0.01	0.01	0.01

*Degree of saturation calculated with a specific gravity of 2.65

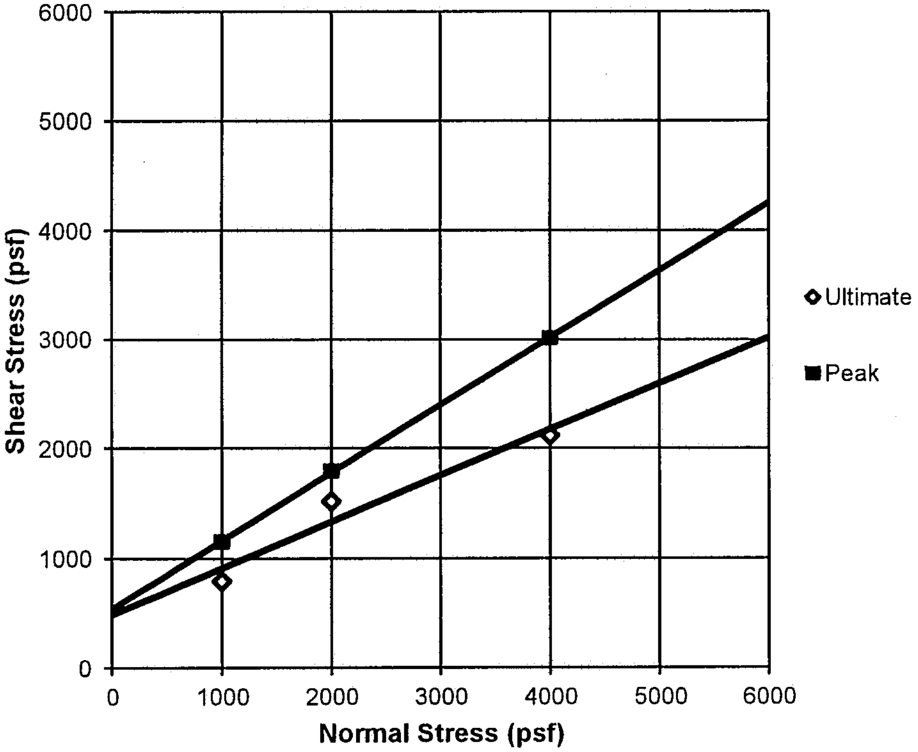
Results	
ϕ (Ultimate)	23 degrees
ϕ (Peak)	32 degrees
c (Ultimate)	490 psf
c (Peak)	550 psf

DATE: 10/9/2007

DESCRIPTION: Tplv - CL

☑ Natural

☐ Remold



GEOCON INCORPORATED

GEOTECHNICAL CONSULTANTS
6960 FLANDERS DRIVE - SAN DIEGO, CALIFORNIA 92121-2974
PHONE 858 558-6900 - FAX 858 558-6159

SW/SW

DIRECT SHEAR TEST DATA

PORTOLA CENTER
LAKE FOREST, CALIFORNIA

PROJECT NO. G1218-52-01

FIG. B-52

SAMPLE NO.: B16-2

Test Data			
Load	1 K	3 K	5 K
INITIAL			
Water Content	32.9%	32.9%	32.9%
Dry Density (pcf)	78.0	78.0	78.0
Saturation*	77.8%	77.8%	77.8%
Height (inches)	1	1	1
AFTER TEST			
Water Content	40.9%	40.9%	40.9%
Dry Density (pcf)	78.0	78.0	78.0
FAILURE			
Normal Stress (psf)	1000	3000	5000
Shear Stress (psf)	1287	3267	5056
Rate (in/min)	0.01	0.01	0.01

*Degree of saturation calculated with a specific gravity of 2.65

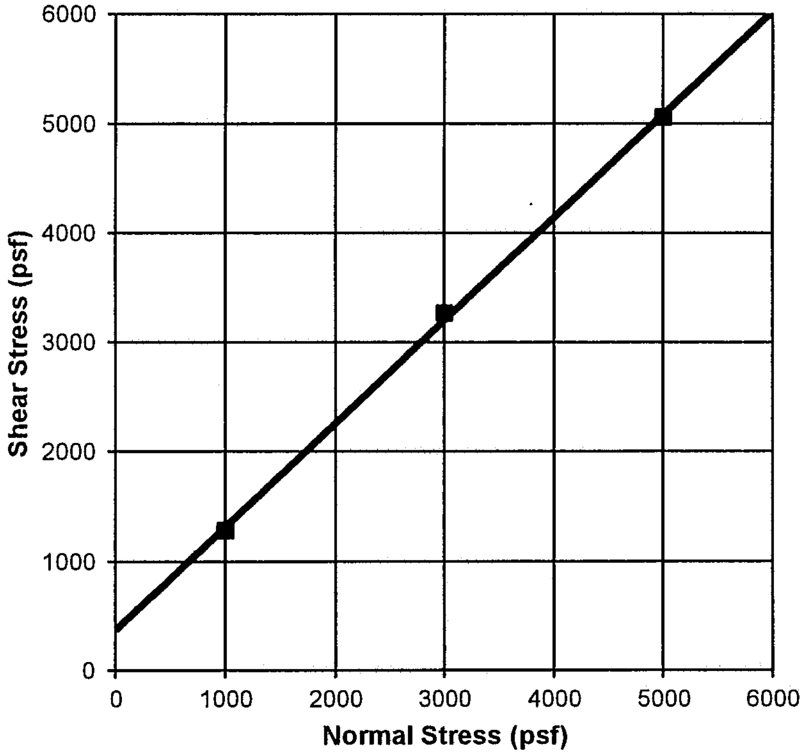
Results	
ϕ	43 degrees
c	380 psf

DATE: 10/2/2007

DESCRIPTION: afe - ML

☑ Natural

☐ Remold



GEOCON
INCORPORATED
GEOTECHNICAL CONSULTANTS
6960 FLANDERS DRIVE - SAN DIEGO, CALIFORNIA 92121-2974
PHONE 858 558-6900 - FAX 858 558-6159

SW/SW

DIRECT SHEAR TEST DATA

PORTOLA CENTER
LAKE FOREST, CALIFORNIA

PROJECT NO. G1218-52-01

FIG. B-53

SAMPLE NO.: B16-5

Test Data			
Load	1 K	3 K	5 K
INITIAL			
Water Content	43.1%	43.1%	43.1%
Dry Density (pcf)	74.0	74.0	74.0
Saturation*	92.5%	92.5%	92.5%
Height (inches)	1	1	1
AFTER TEST			
Water Content	48.3%	48.3%	48.3%
Dry Density (pcf)	74.0	74.0	74.0
FAILURE			
Normal Stress (psf)	1000	3000	5000
Shear Stress (psf)	1569	2302	3368
Rate (in/min)	0.01	0.01	0.01

*Degree of saturation calculated with a specific gravity of 2.65

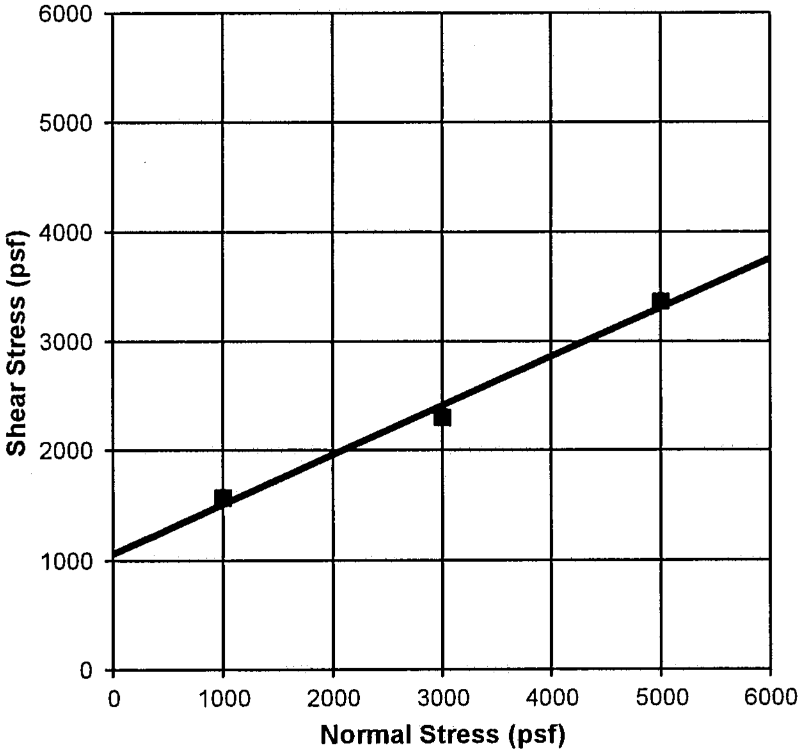
Results	
ϕ	24 degrees
c	1060 psf

DATE: 5/6/2007

DESCRIPTION: afe - ML

☑ Natural

☐ Remold



GEOCON
INCORPORATED
GEOTECHNICAL CONSULTANTS
6960 FLANDERS DRIVE - SAN DIEGO, CALIFORNIA 92121-2974
PHONE 858 558-6900 - FAX 858 558-6159

SW/SW

DIRECT SHEAR TEST DATA

PORTOLA CENTER
LAKE FOREST, CALIFORNIA

PROJECT NO. G1218-52-01

FIG. B-54

SAMPLE NO.: B16-8

Test Data			
Load	1 K	3 K	5 K
INITIAL			
Water Content	50.7%	50.7%	50.7%
Dry Density (pcf)	67.0	67.0	67.0
Saturation*	91.5%	91.5%	91.5%
Height (inches)	1	1	1
AFTER TEST			
Water Content	53.4%	53.4%	53.4%
Dry Density (pcf)	67.0	67.0	67.0
FAILURE			
Normal Stress (psf)	1000	3000	5000
Shear Stress (psf)	1800	3050	4388
Rate (in/min)	0.01	0.01	0.01

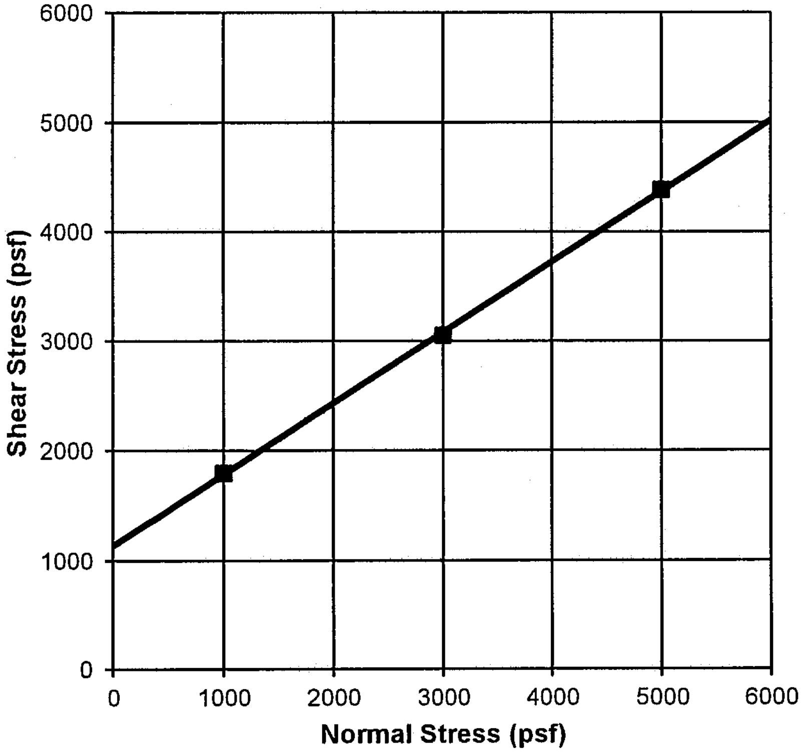
*Degree of saturation calculated with a specific gravity of 2.65

Results	
ϕ	33 degrees
c	1140 psf

DATE: 10/4/2007
DESCRIPTION: afe - SM

☑ Natural

☐ Remold



GEOCON
INCORPORATED
GEOTECHNICAL CONSULTANTS
6960 FLANDERS DRIVE - SAN DIEGO, CALIFORNIA 92121-2974
PHONE 858 558-6900 - FAX 858 558-6159

SW/SW

DIRECT SHEAR TEST DATA

PORTOLA CENTER
LAKE FOREST, CALIFORNIA

PROJECT NO. G1218-52-01

FIG. B-55

SAMPLE NO.: B16-11

Test Data			
Load	1 K	3 K	5 K
INITIAL			
Water Content	6.9%	6.9%	6.9%
Dry Density (pcf)	107.1	107.1	107.1
Saturation*	33.6%	33.6%	33.6%
Height (inches)	1	1	1
AFTER TEST			
Water Content	15.6%	15.6%	15.6%
Dry Density (pcf)	107.1	107.1	107.1
FAILURE			
Normal Stress (psf)	1000	3000	5000
Shear Stress (psf)	1146	2916	3920
Rate (in/min)	0.01	0.01	0.01

*Degree of saturation calculated with a specific gravity of 2.65

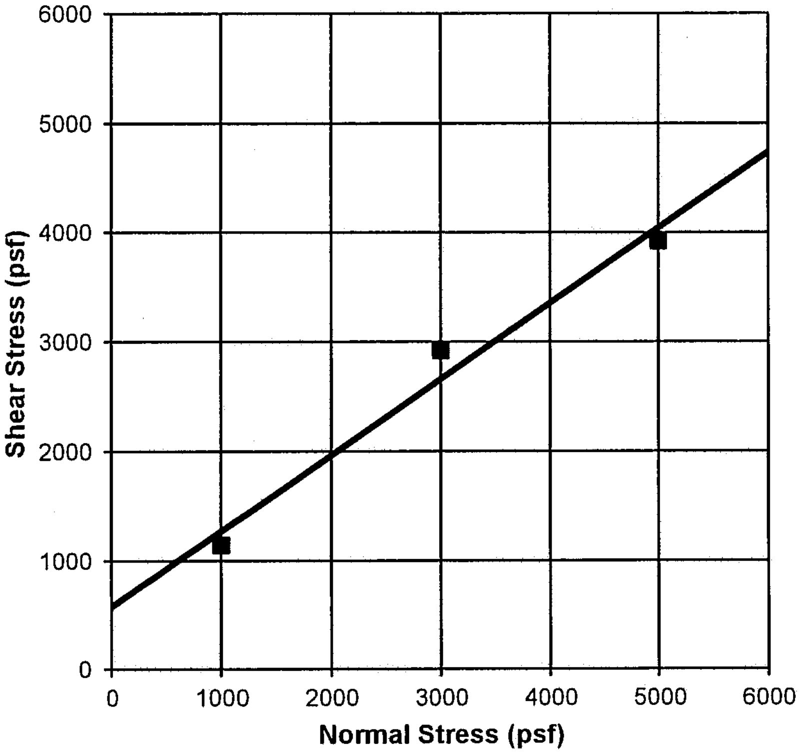
Results	
ϕ	34 degrees
c	580 psf

DATE: 5/6/2007

DESCRIPTION: afe - SM

☑ Natural

☐ Remold



GEOCON
INCORPORATED
GEOTECHNICAL CONSULTANTS
6960 FLANDERS DRIVE - SAN DIEGO, CALIFORNIA 92121-2974
PHONE 858 558-6900 - FAX 858 558-6159

SW/SW

DIRECT SHEAR TEST DATA

PORTOLA CENTER
LAKE FOREST, CALIFORNIA

PROJECT NO. G1218-52-01

FIG. B-56

SAMPLE NO.: B16-13

Test Data			
Load	1 K	3 K	5 K
INITIAL			
Water Content	33.4%	33.4%	33.4%
Dry Density (pcf)	71.2	71.2	71.2
Saturation*	66.9%	66.9%	66.9%
Height (inches)	1	1	1
AFTER TEST			
Water Content	55.6%	55.6%	55.6%
Dry Density (pcf)	71.2	71.2	71.2
FAILURE			
Normal Stress (psf)	1000	3000	5000
Shear Stress (psf)	965	2322	3479
Rate (in/min)	0.01	0.01	0.01

*Degree of saturation calculated with a specific gravity of 2.65

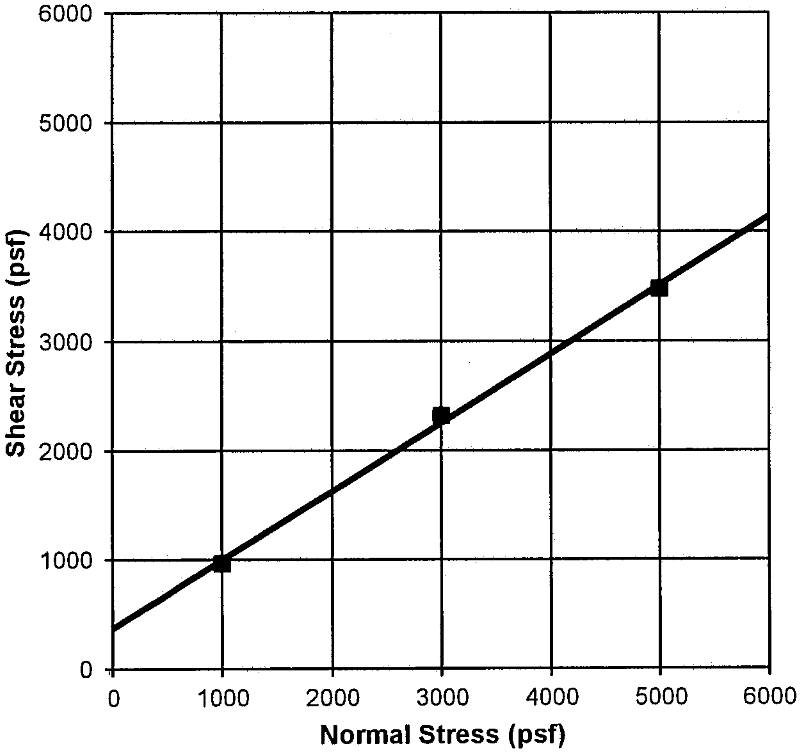
Results	
ϕ	32 degrees
c	370 psf

DATE: 10/4/2007

DESCRIPTION: afe - ML

☐ Natural

☑ Remold



GEOCON
INCORPORATED
GEOTECHNICAL CONSULTANTS
6960 FLANDERS DRIVE - SAN DIEGO, CALIFORNIA 92121-2974
PHONE 858 558-6900 - FAX 858 558-6159

SW/SW

DIRECT SHEAR TEST DATA

PORTOLA CENTER
LAKE FOREST, CALIFORNIA

PROJECT NO. G1218-52-01

FIG. B-57

SAMPLE NO.: B18-8

Test Data			
Load	1 K	3 K	5 K
INITIAL			
Water Content	27.8%	27.8%	27.8%
Dry Density (pcf)	74.6	74.6	74.6
Saturation*	60.5%	60.5%	60.5%
Height (inches)	1	1	1
AFTER TEST			
Water Content	52.2%	52.2%	52.2%
Dry Density (pcf)	71.2	71.2	71.2
FAILURE			
Normal Stress (psf)	1000	3000	5000
Shear Stress (psf)	1055	2563	3931
Rate (in/min)	0.01	0.01	0.01

*Degree of saturation calculated with a specific gravity of 2.65

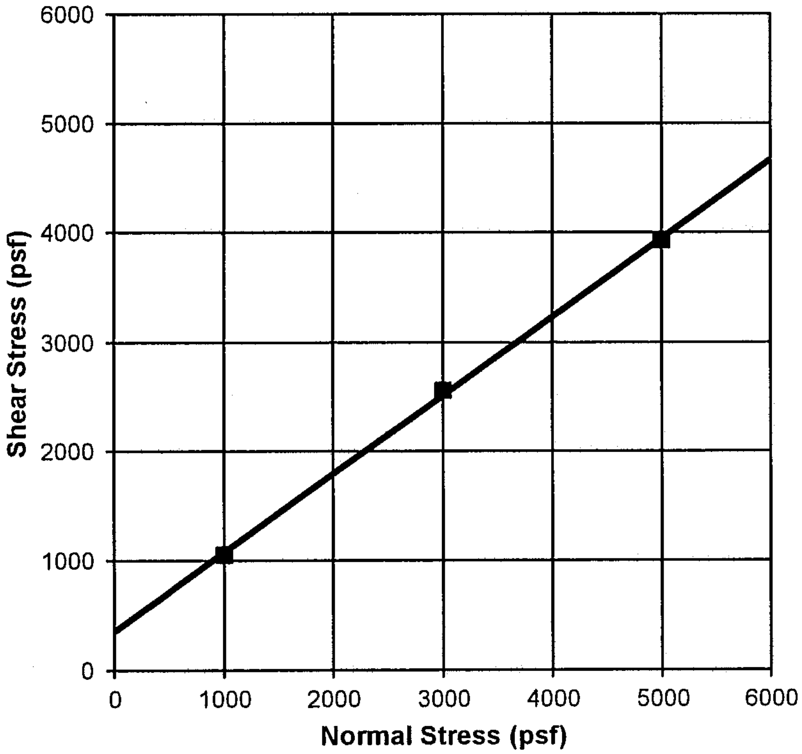
Results	
ϕ	36 degrees
c	360 psf

DATE: 10/3/2007

DESCRIPTION: afe - ML

☐ Natural

☑ Remold



GEOCON
INCORPORATED
GEOTECHNICAL CONSULTANTS
6960 FLANDERS DRIVE - SAN DIEGO, CALIFORNIA 92121-2974
PHONE 858 558-6900 - FAX 858 558-6159

SW/SW

DIRECT SHEAR TEST DATA

PORTOLA CENTER
LAKE FOREST, CALIFORNIA

PROJECT NO. G1218-52-01

FIG. B-58

SAMPLE NO.: B19-8

Test Data			
Load	1 K	3 K	5 K
INITIAL			
Water Content	8.6%	8.6%	8.6%
Dry Density (pcf)	113.6	113.6	113.6
Saturation*	50.0%	50.0%	50.0%
Height (inches)	1	1	1
AFTER TEST			
Water Content	17.5%	17.5%	17.5%
Dry Density (pcf)	113.6	113.6	113.6
FAILURE			
Normal Stress (psf)	1000	3000	5000
Shear Stress (psf)	975	1890	2986
Rate (in/min)	0.01	0.01	0.01

*Degree of saturation calculated with a specific gravity of 2.65

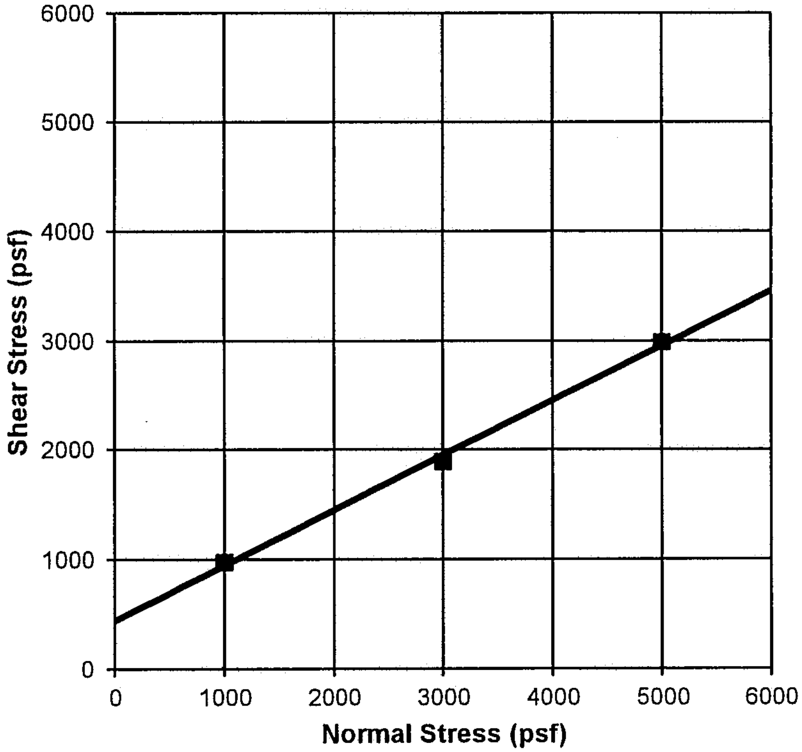
Results	
ϕ	27 degrees
c	440 psf

DATE: 10/3/2007

DESCRIPTION: afe - SM

☐ Natural

☑ Remold



GEOCON
INCORPORATED
GEOTECHNICAL CONSULTANTS
6960 FLANDERS DRIVE - SAN DIEGO, CALIFORNIA 92121-2974
PHONE 858 558-6900 - FAX 858 558-6159

SW/SW

DIRECT SHEAR TEST DATA

PORTOLA CENTER
LAKE FOREST, CALIFORNIA

PROJECT NO. G1218-52-01

FIG. B-59

SAMPLE NO.: B21-3

Test Data			
Load	1 K	2 K	4 K
INITIAL			
Water Content	23.7%	24.2%	21.7%
Dry Density (pcf)	99.7	98.3	101.6
Saturation*	95.3%	94.0%	91.8%
Height (inches)	1	1	1
AFTER TEST			
Water Content	30.5%	32.4%	29.2%
Dry Density (pcf)	89.0	132.3	123.3
FAILURE			
Normal Stress (psf)	1000	2000	4000
Ultimate Stress (psf)	1128	1442	2807
Peak Stress (psf)	1128	1574	2925
Rate (in/min)	0.01	0.01	0.01

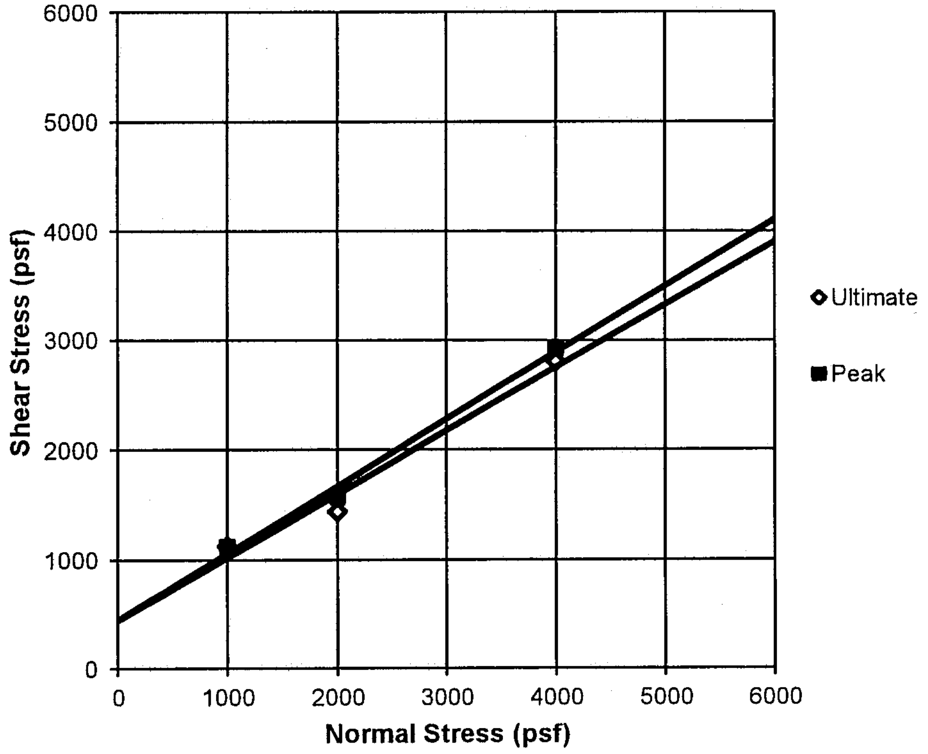
*Degree of saturation calculated with a specific gravity of 2.65

Results	
ϕ (Ultimate)	30 degrees
ϕ (Peak)	32 degrees
c (Ultimate)	450 psf
c (Peak)	450 psf

DATE: 12/11/2007
DESCRIPTION: Tps-slt - ML

☑ Natural

☐ Remold



GEOCON
INCORPORATED
GEOTECHNICAL CONSULTANTS
6960 FLANDERS DRIVE - SAN DIEGO, CALIFORNIA 92121-2974
PHONE 858 558-6900 - FAX 858 558-6159

SW/SW

DIRECT SHEAR TEST DATA

PORTOLA CENTER
LAKE FOREST, CALIFORNIA

PROJECT NO. G1218-52-01

FIG. B-60

SAMPLE NO.: B21-10

Test Data			
Load	1 K	2 K	4 K
INITIAL			
Water Content	41.3%	32.4%	42.7%
Dry Density (pcf)	76.0	85.3	73.1
Saturation*	93.0%	91.3%	89.6%
Height (inches)	1	1	1
AFTER TEST			
Water Content	44.0%	36.9%	49.3%
Dry Density (pcf)	62.6	93.6	131.5
FAILURE			
Normal Stress (psf)	1000	2000	4000
Ultimate Stress (psf)	1016	1534	3129
Peak Stress (psf)	1128	2148	3931
Rate (in/min)	0.01	0.01	0.01

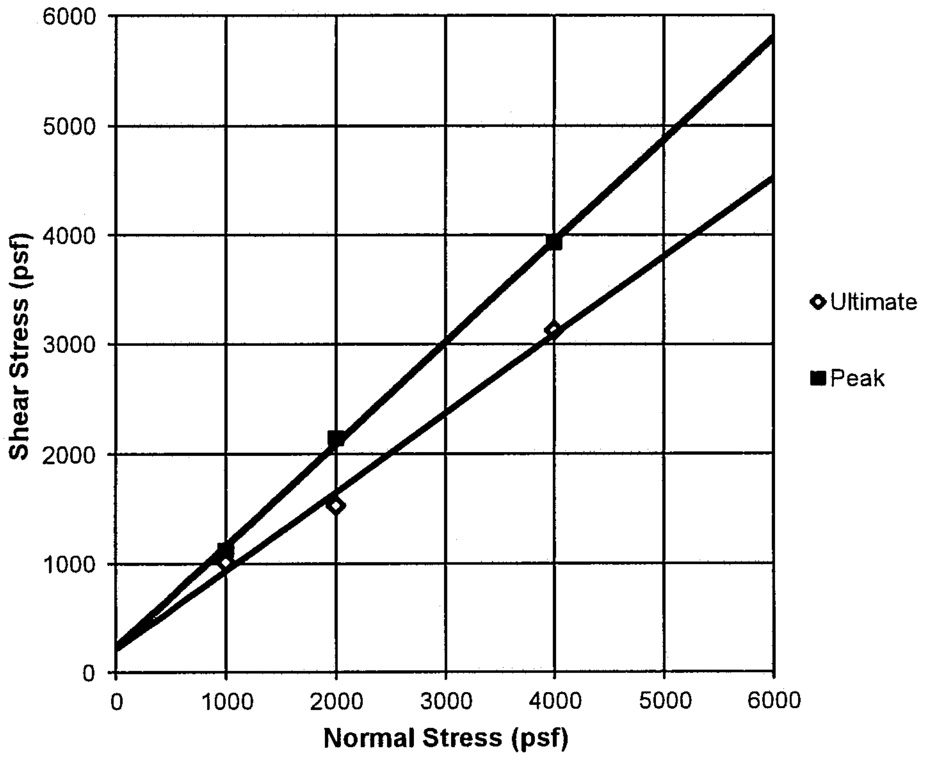
*Degree of saturation calculated with a specific gravity of 2.65

Results	
ϕ (Ultimate)	36 degrees
ϕ (Peak)	43 degrees
c (Ultimate)	220 psf
c (Peak)	225 psf

DATE: 12/11/2007
DESCRIPTION: Tps-slt - ML

☑ Natural

☐ Remold



GEOCON
INCORPORATED
GEOTECHNICAL CONSULTANTS
6960 FLANDERS DRIVE - SAN DIEGO, CALIFORNIA 92121-2974
PHONE 858 558-6900 - FAX 858 558-6159

SW/SW

DIRECT SHEAR TEST DATA

PORTOLA CENTER
LAKE FOREST, CALIFORNIA

PROJECT NO. G1218-52-01

FIG. B-61

SAMPLE NO.: B23-3

Test Data			
Load	1 K	2 K	4 K
INITIAL			
Water Content	4.5%	5.9%	6.1%
Dry Density (pcf)	108.6	113.3	107.8
Saturation*	22.9%	34.1%	30.5%
Height (inches)	1	1	1
AFTER TEST			
Water Content	14.9%	13.4%	16.4%
Dry Density (pcf)	84.3	117.0	116.1
FAILURE			
Normal Stress (psf)	1000	2000	4000
Ultimate Stress (psf)	1067	1828	3535
Peak Stress (psf)	1361	2235	4165
Rate (in/min)	0.01	0.01	0.01

*Degree of saturation calculated with a specific gravity of 2.65

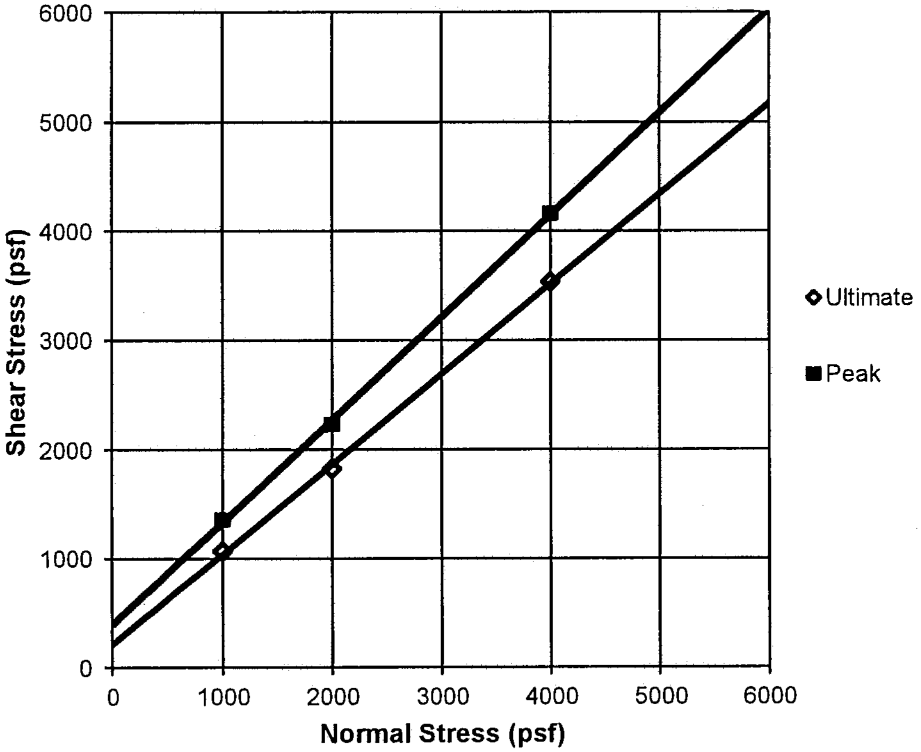
Results	
ϕ (Ultimate)	39 degrees
ϕ (Peak)	43 degrees
c (Ultimate)	210 psf
c (Peak)	400 psf

DATE: 12/11/2007

DESCRIPTION: Tps - ML

☑ Natural

☐ Remold



GEOCON INCORPORATED

GEOTECHNICAL CONSULTANTS
6960 FLANDERS DRIVE - SAN DIEGO, CALIFORNIA 92121-2974
PHONE 858 558-6900 - FAX 858 558-6159

SW/SW

DIRECT SHEAR TEST DATA

PORTOLA CENTER
LAKE FOREST, CALIFORNIA

PROJECT NO. G1218-52-01

FIG. B-62

SAMPLE NO.: B23-10

Test Data			
Load	1 K	2 K	4 K
INITIAL			
Water Content	24.7%	28.9%	27.8%
Dry Density (pcf)	97.2	90.6	93.1
Saturation*	93.1%	92.5%	94.9%
Height (inches)	1	1	1
AFTER TEST			
Water Content	27.3%	34.1%	31.9%
Dry Density (pcf)	89.6	130.7	131.9
FAILURE			
Normal Stress (psf)	1000	2000	4000
Ultimate Stress (psf)	863	1371	2011
Peak Stress (psf)	1219	1483	2550
Rate (in/min)	0.01	0.01	0.01

*Degree of saturation calculated with a specific gravity of 2.65

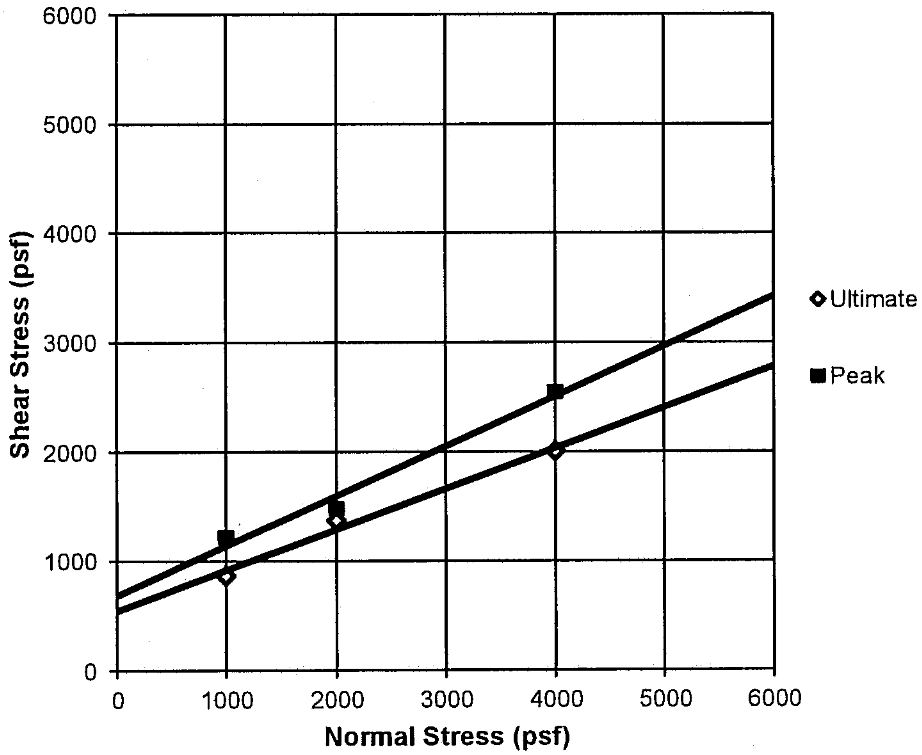
Results	
ϕ (Ultimate)	21 degrees
ϕ (Peak)	25 degrees
c (Ultimate)	525 psf
c (Peak)	675 psf

DATE: 12/13/2007

DESCRIPTION: Tps-slt - ML

☑ Natural

☐ Remold



GEOCON
INCORPORATED
GEOTECHNICAL CONSULTANTS
6960 FLANDERS DRIVE - SAN DIEGO, CALIFORNIA 92121-2974
PHONE 858 558-6900 - FAX 858 558-6159

SW/SW

DIRECT SHEAR TEST DATA

PORTOLA CENTER
LAKE FOREST, CALIFORNIA

PROJECT NO. G1218-52-01

FIG. B-63

SAMPLE NO.: B24-5

Test Data			
Load	1 K	2 K	4 K
INITIAL			
Water Content	32.1%	27.2%	29.2%
Dry Density (pcf)	88.4	91.2	93.5
Saturation*	97.6%	88.8%	100.4%
Height (inches)	1	1	1
AFTER TEST			
Water Content	37.5%	35.0%	34.5%
Dry Density (pcf)	90.1	162.9	321.2
FAILURE			
Normal Stress (psf)	1000	2000	4000
Ultimate Stress (psf)	792	1676	3322
Peak Stress (psf)	1117	1676	3494
Rate (in/min)	0.01	0.01	0.01

*Degree of saturation calculated with a specific gravity of 2.65

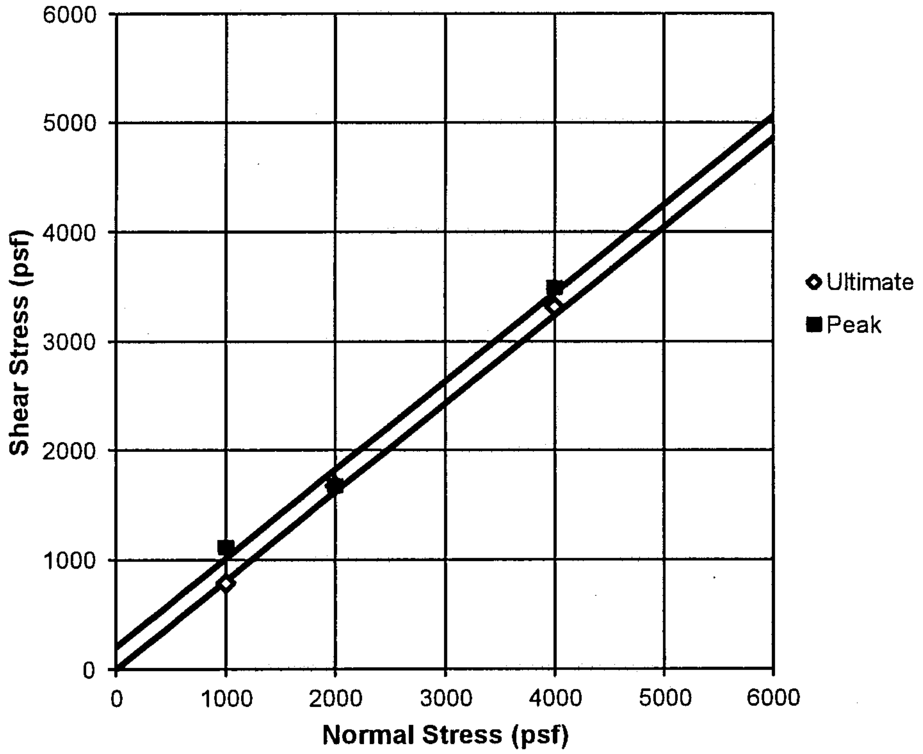
Results	
ϕ (Ultimate)	39 degrees
ϕ (Peak)	39 degrees
c (Ultimate)	0 psf
c (Peak)	200 psf

DATE: 12/11/2007

DESCRIPTION: Tps-slt - ML

☑ Natural

☐ Remold



GEOCON INCORPORATED

GEOTECHNICAL CONSULTANTS
6960 FLANDERS DRIVE - SAN DIEGO, CALIFORNIA 92121-2974
PHONE 858 558-6900 - FAX 858 558-6159

SW/SW

DIRECT SHEAR TEST DATA

PORTOLA CENTER
LAKE FOREST, CALIFORNIA

PROJECT NO. G1218-52-01

FIG. B-64

SAMPLE NO.: B24-8

Test Data			
Load	1 K	2 K	4 K
INITIAL			
Water Content	16.9%	22.3%	23.6%
Dry Density (pcf)	107.7	98.8	99.9
Saturation*	83.2%	87.6%	95.3%
Height (inches)	1	1	1
AFTER TEST			
Water Content	21.2%	26.6%	28.3%
Dry Density (pcf)	90.4	124.1	200.6
FAILURE			
Normal Stress (psf)	1000	2000	4000
Ultimate Stress (psf)	1148	1757	2905
Peak Stress (psf)	1656	2570	3454
Rate (in/min)	0.01	0.01	0.01

*Degree of saturation calculated with a specific gravity of 2.65

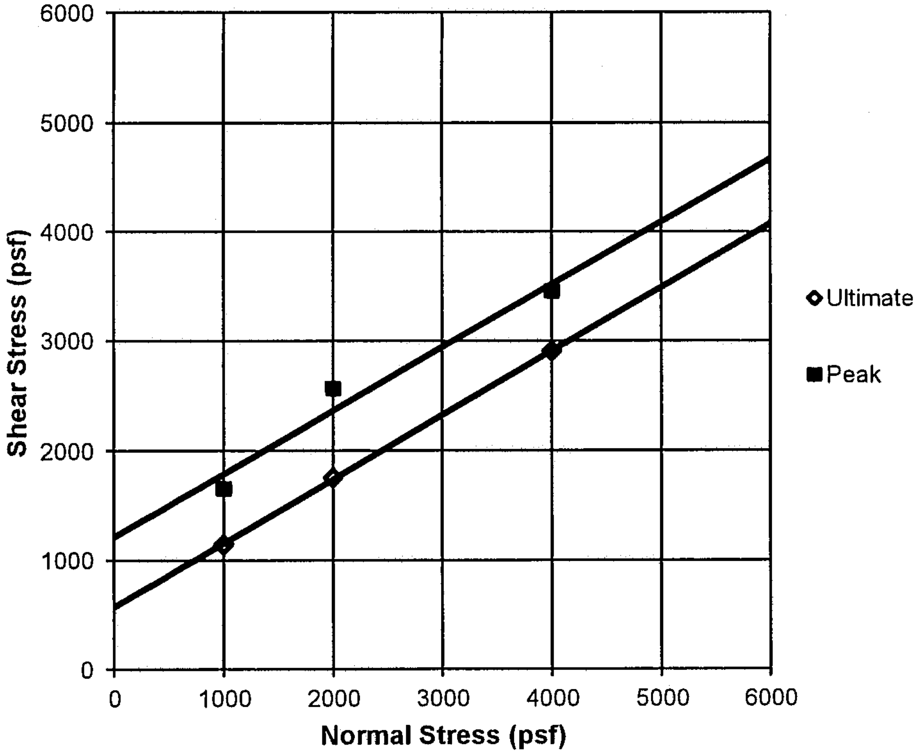
Results	
ϕ (Ultimate)	30 degrees
ϕ (Peak)	30 degrees
c (Ultimate)	570 psf
c (Peak)	1210 psf

DATE: 12/11/2007

DESCRIPTION: Tps-slt - ML

☑ Natural

☐ Remold



GEOCON
INCORPORATED
GEOTECHNICAL CONSULTANTS
6960 FLANDERS DRIVE - SAN DIEGO, CALIFORNIA 92121-2974
PHONE 858 558-6900 - FAX 858 558-6159

SW/SW

DIRECT SHEAR TEST DATA

PORTOLA CENTER
LAKE FOREST, CALIFORNIA

PROJECT NO. G1218-52-01

FIG. B-65

SAMPLE NO.: B35-3

Test Data			
Load	1 K	2 K	4 K
INITIAL			
Water Content	35.6%	35.7%	36.0%
Dry Density (pcf)	84.4	83.2	82.4
Saturation*	98.1%	95.9%	94.7%
Height (inches)	1	1	1
AFTER TEST			
Water Content	39.6%	38.6%	40.4%
Dry Density (pcf)	83.0	81.9	83.3
FAILURE			
Normal Stress (psf)	1000	2000	4000
Ultimate Stress (psf)	1100	2322	3534
Peak Stress (psf)	1456	2342	3544
Rate (in/min)	0.01	0.01	0.01

*Degree of saturation calculated with a specific gravity of 2.65

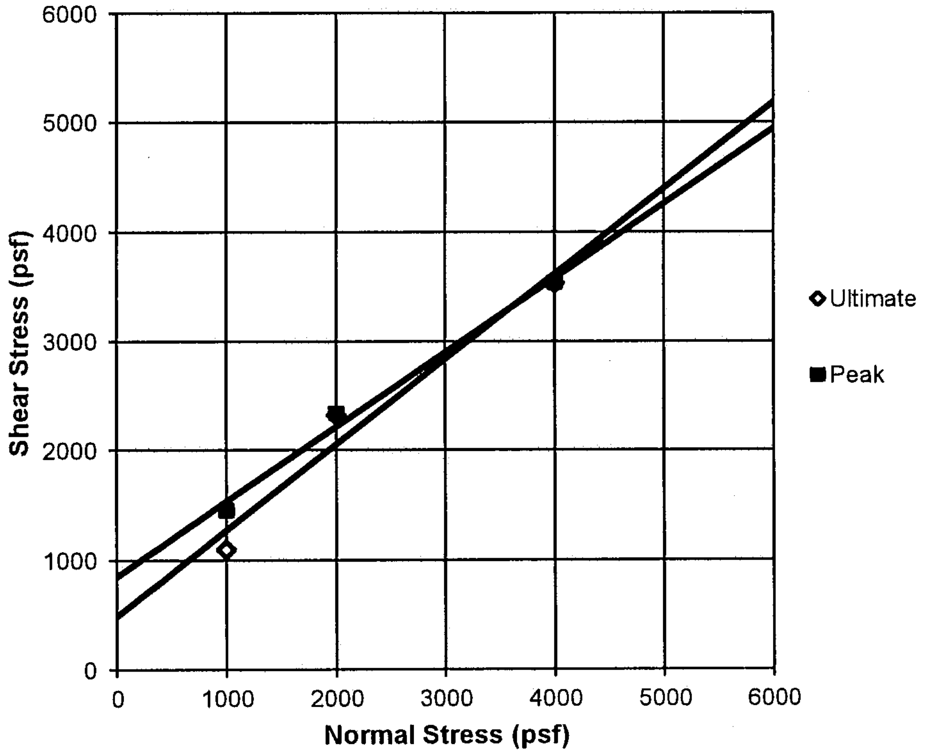
Results	
ϕ (Ultimate)	37 degrees
ϕ (Peak)	34 degrees
c (Ultimate)	490 psf
c (Peak)	855 psf

DATE: 1/5/2012

DESCRIPTION: Tps - SM

☑ Natural

☐ Remold



GEOCON
INCORPORATED
GEOTECHNICAL CONSULTANTS
6960 FLANDERS DRIVE - SAN DIEGO, CALIFORNIA 92121-2974
PHONE 858 558-6900 - FAX 858 558-6159

SW/SW

DIRECT SHEAR TEST DATA

PORTOLA CENTER
LAKE FOREST, CALIFORNIA

PROJECT NO. G1218-52-01

FIG. B-66

SAMPLE NO.: B35-6

Test Data			
Load	1 K	2 K	4 K
INITIAL			
Water Content	12.2%	21.6%	16.9%
Dry Density (pcf)	112.8	97.0	105.6
Saturation*	69.3%	81.2%	79.2%
Height (inches)	1	1	1
AFTER TEST			
Water Content	17.3%	25.0%	21.4%
Dry Density (pcf)	110.4	95.1	108.2
FAILURE			
Normal Stress (psf)	1000	2000	4000
Ultimate Stress (psf)	1517	2729	4022
Peak Stress (psf)	1609	2729	4033
Rate (in/min)	0.01	0.01	0.01

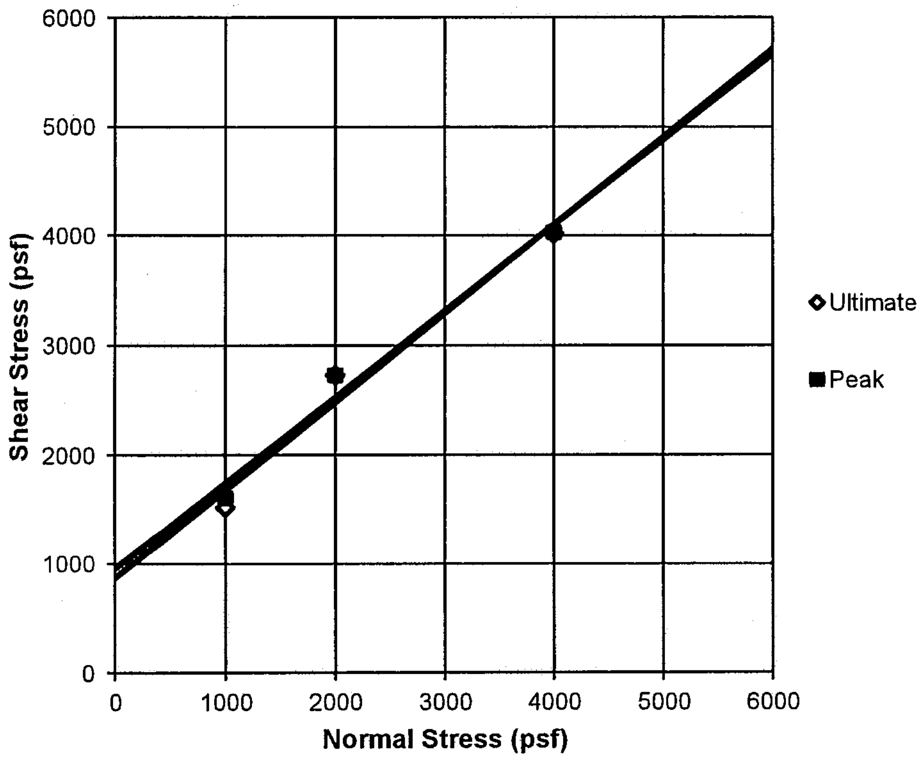
*Degree of saturation calculated with a specific gravity of 2.65

Results	
ϕ (Ultimate)	38 degrees
ϕ (Peak)	38 degrees
c (Ultimate)	870 psf
c (Peak)	955 psf

DATE: 12/29/2011
DESCRIPTION: Tps-slt - ML

☑ Natural

☐ Remold



GEOCON
INCORPORATED
GEOTECHNICAL CONSULTANTS
6960 FLANDERS DRIVE - SAN DIEGO, CALIFORNIA 92121-2974
PHONE 858 558-6900 - FAX 858 558-6159

SW/SW

DIRECT SHEAR TEST DATA

PORTOLA CENTER
LAKE FOREST, CALIFORNIA

PROJECT NO. G1218-52-01

FIG. B-67

SAMPLE NO.: B37-2

Test Data			
Load	1 K	2 K	4 K
INITIAL			
Water Content	46.6%	47.8%	46.2%
Dry Density (pcf)	70.3	69.3	70.0
Saturation*	91.3%	91.3%	89.8%
Height (inches)	1	1	1
AFTER TEST			
Water Content	51.3%	53.1%	51.0%
Dry Density (pcf)	66.8	68.3	69.8
FAILURE			
Normal Stress (psf)	1000	2000	4000
Ultimate Stress (psf)	2006	2597	4246
Peak Stress (psf)	2026	2607	4440
Rate (in/min)	0.01	0.01	0.01

*Degree of saturation calculated with a specific gravity of 2.65

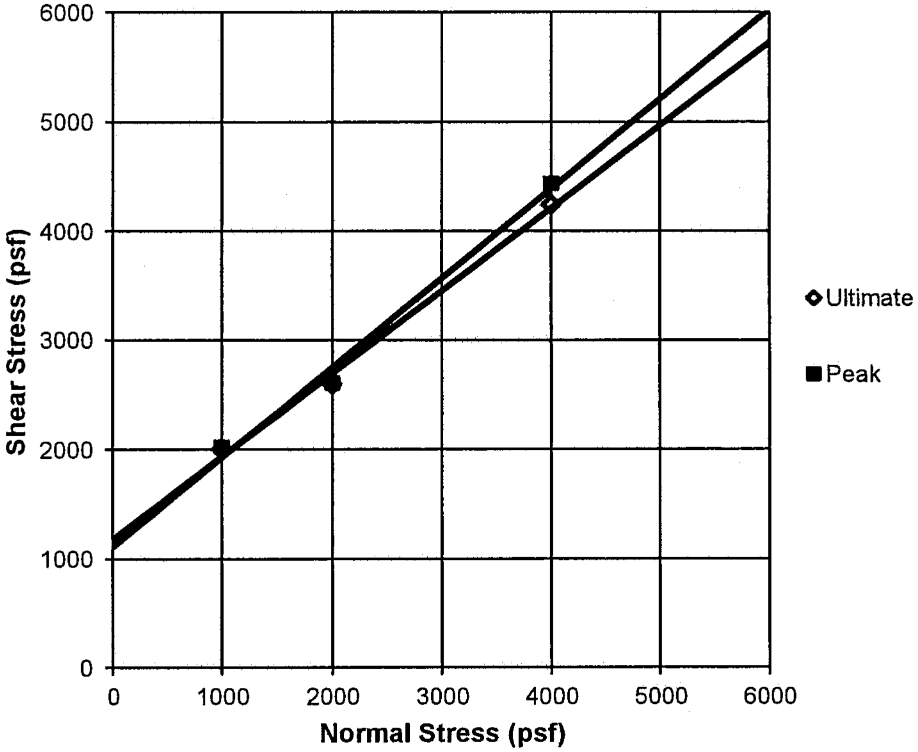
Results	
ϕ (Ultimate)	37 degrees
ϕ (Peak)	39 degrees
c (Ultimate)	1180 psf
c (Peak)	1110 psf

DATE: 12/29/2011

DESCRIPTION: Tps-slt - ML

☑ Natural

☐ Remold



GEOCON
INCORPORATED
GEOTECHNICAL CONSULTANTS
6960 FLANDERS DRIVE - SAN DIEGO, CALIFORNIA 92121-2974
PHONE 858 558-6900 - FAX 858 558-6159

SW/SW

DIRECT SHEAR TEST DATA

PORTOLA CENTER
LAKE FOREST, CALIFORNIA

PROJECT NO. G1218-52-01

FIG. B-68

SAMPLE NO.: B38-1

Test Data			
Load	1 K	2 K	4 K
INITIAL			
Water Content	13.4%	13.3%	12.9%
Dry Density (pcf)	113.9	103.0	113.0
Saturation*	78.8%	58.1%	73.4%
Height (inches)	1	1	1
AFTER TEST			
Water Content	17.4%	21.3%	17.6%
Dry Density (pcf)	109.1	104.1	113.4
FAILURE			
Normal Stress (psf)	1000	2000	4000
Ultimate Stress (psf)	2037	2128	5104
Peak Stress (psf)	2067	2149	5104
Rate (in/min)	0.01	0.01	0.01

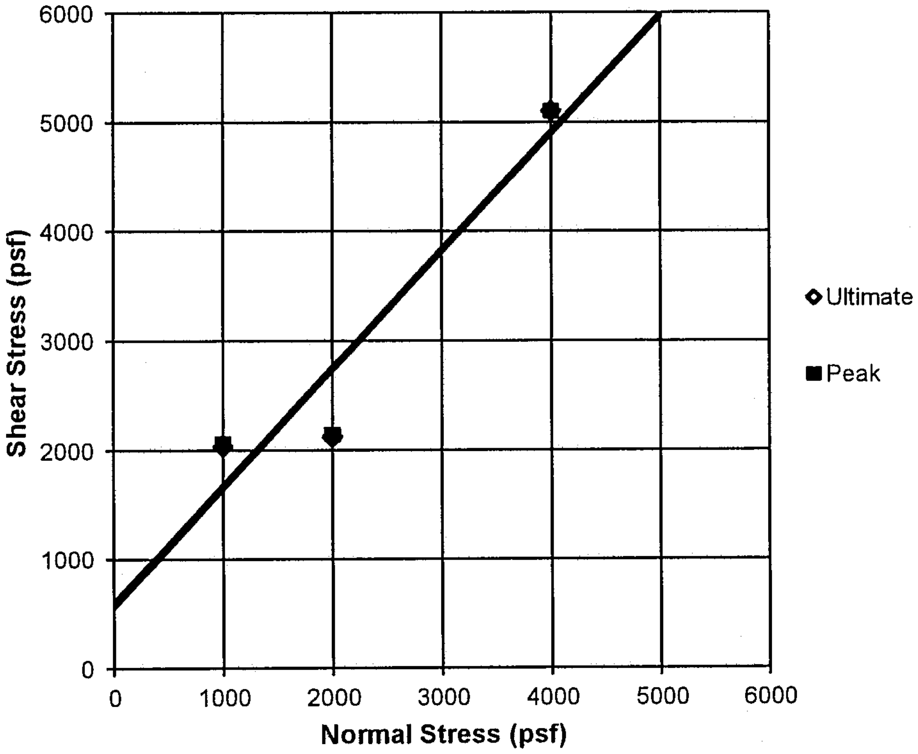
*Degree of saturation calculated with a specific gravity of 2.65

Results	
ϕ (Ultimate)	48 degrees
ϕ (Peak)	48 degrees
c (Ultimate)	545 psf
c (Peak)	590 psf

DATE: 12/29/2011
DESCRIPTION: Tps - SM

☑ Natural

☐ Remold



GEOCON
INCORPORATED
GEOTECHNICAL CONSULTANTS
6960 FLANDERS DRIVE - SAN DIEGO, CALIFORNIA 92121-2974
PHONE 858 558-6900 - FAX 858 558-6159

SW/SW

DIRECT SHEAR TEST DATA

PORTOLA CENTER
LAKE FOREST, CALIFORNIA

PROJECT NO. G1218-52-01

FIG. B-69

SAMPLE NO.: B43-3

Test Data			
Load	1 K	2 K	4 K
INITIAL			
Water Content	36.3%	30.0%	42.4%
Dry Density (pcf)	74.6	81.9	71.4
Saturation*	79.1%	78.0%	85.3%
Height (inches)	1	1	1
AFTER TEST			
Water Content	44.2%	37.5%	48.6%
Dry Density (pcf)	75.7	84.3	72.6
FAILURE			
Normal Stress (psf)	1000	2000	4000
Ultimate Stress (psf)	1065	2587	4749
Peak Stress (psf)	1085	2587	4885
Rate (in/min)	0.01	0.01	0.01

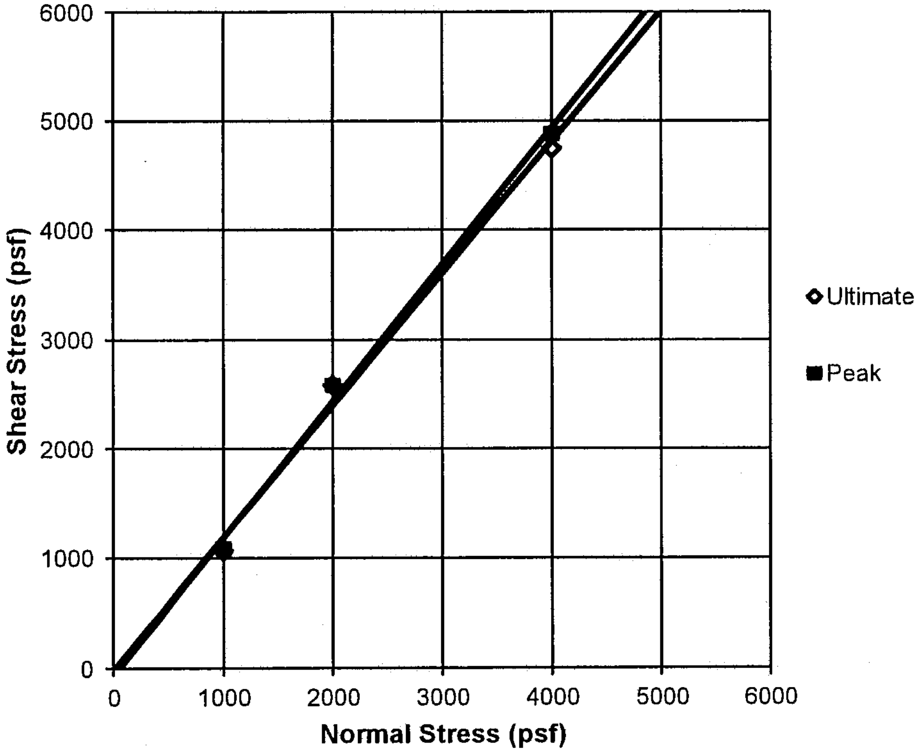
*Degree of saturation calculated with a specific gravity of 2.65

Results	
ϕ (Ultimate)	50 degrees
ϕ (Peak)	51 degrees
c (Ultimate)	0 psf
c (Peak)	0 psf

DATE: 12/29/2011
DESCRIPTION: afe - SM

☑ Natural

☐ Remold



GEOCON
INCORPORATED
GEOTECHNICAL CONSULTANTS
6960 FLANDERS DRIVE - SAN DIEGO, CALIFORNIA 92121-2974
PHONE 858 558-6900 - FAX 858 558-6159

SW/SW

DIRECT SHEAR TEST DATA

PORTOLA CENTER
LAKE FOREST, CALIFORNIA

PROJECT NO. G1218-52-01

FIG. B-70

SAMPLE NO.: B44-4

Test Data			
Load	1 K	2 K	4 K
INITIAL			
Water Content	39.9%	44.4%	40.4%
Dry Density (pcf)	76.4	72.7	76.0
Saturation*	90.6%	92.1%	91.0%
Height (inches)	1	1	1
AFTER TEST			
Water Content	45.6%	50.4%	44.2%
Dry Density (pcf)	73.9	72.4	74.4
FAILURE			
Normal Stress (psf)	1000	2000	4000
Ultimate Stress (psf)	1036	1836	3654
Peak Stress (psf)	1308	1972	4177
Rate (in/min)	0.01	0.01	0.01

*Degree of saturation calculated with a specific gravity of 2.65

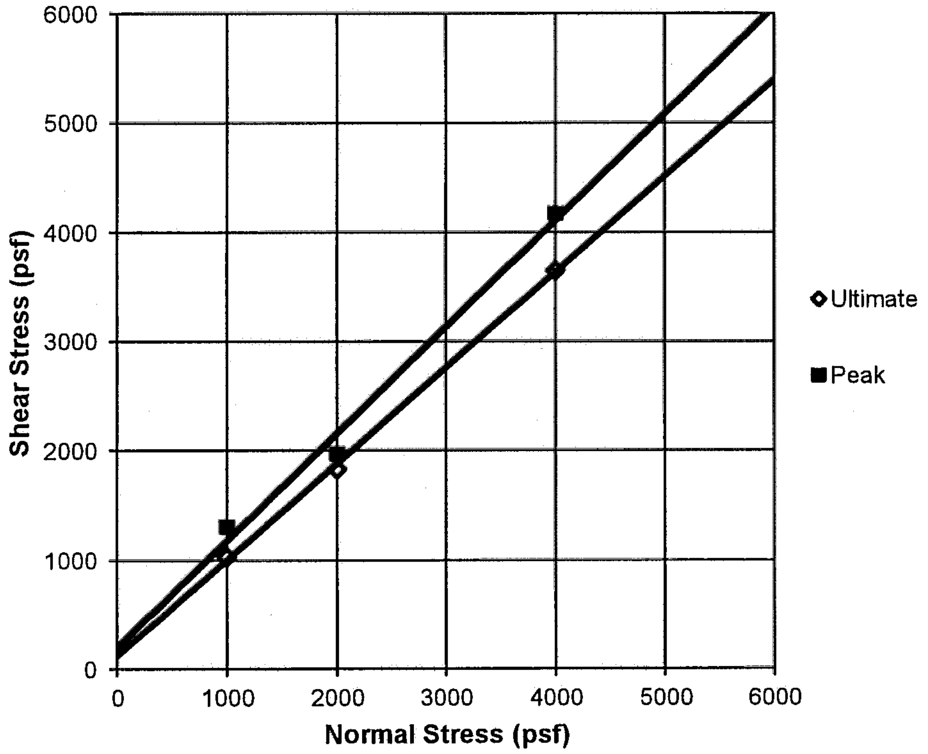
Results	
ϕ (Ultimate)	41 degrees
ϕ (Peak)	45 degrees
c (Ultimate)	125 psf
c (Peak)	205 psf

DATE: 12/29/2011

DESCRIPTION: afe - ML

☑ Natural

☐ Remold



GEOCON
INCORPORATED

GEOTECHNICAL CONSULTANTS
6960 FLANDERS DRIVE - SAN DIEGO, CALIFORNIA 92121-2974
PHONE 858 558-6900 - FAX 858 558-6159

SW/SW

DIRECT SHEAR TEST DATA

PORTOLA CENTER
LAKE FOREST, CALIFORNIA

PROJECT NO. G1218-52-01

FIG. B-71

SAMPLE NO.: B45-3

Test Data			
Load	1 K	2 K	4 K
INITIAL			
Water Content	39.2%	33.7%	39.0%
Dry Density (pcf)	79.2	84.4	78.7
Saturation*	95.4%	93.1%	93.8%
Height (inches)	1	1	1
AFTER TEST			
Water Content	41.5%	36.8%	41.0%
Dry Density (pcf)	77.4	85.2	78.3
FAILURE			
Normal Stress (psf)	1000	2000	4000
Ultimate Stress (psf)	1487	1935	5203
Peak Stress (psf)	1864	1965	5203
Rate (in/min)	0.01	0.01	0.01

*Degree of saturation calculated with a specific gravity of 2.65

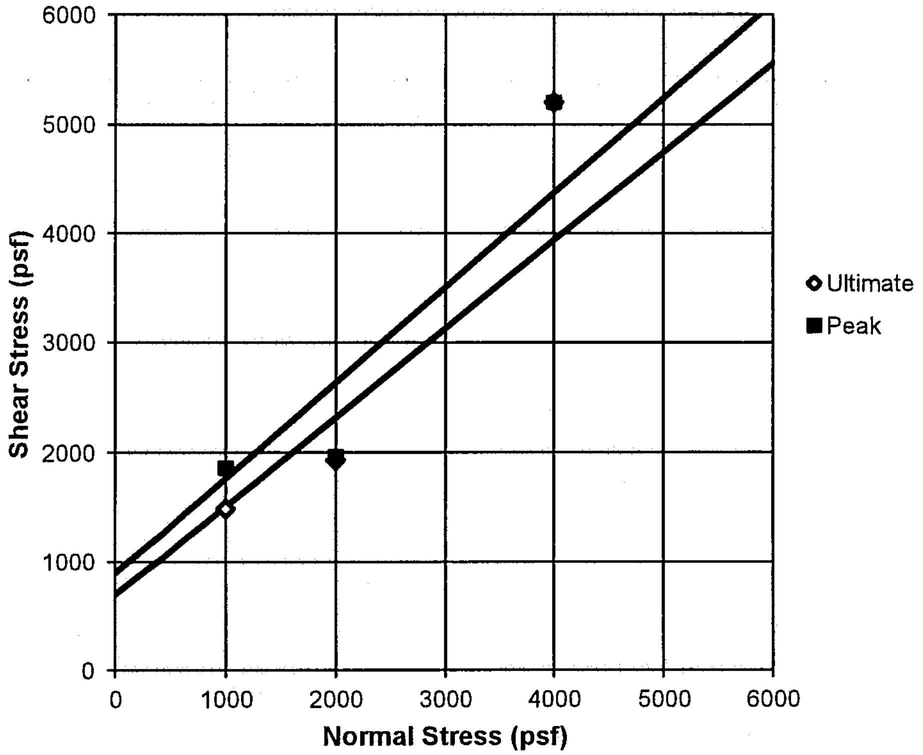
Results	
ϕ (Ultimate)	39 degrees
ϕ (Peak)	41 degrees
c (Ultimate)	700 psf
c (Peak)	900 psf

DATE: 12/29/2011

DESCRIPTION: afe - ML

☑ Natural

☐ Remold



GEOCON
INCORPORATED
GEOTECHNICAL CONSULTANTS
6960 FLANDERS DRIVE - SAN DIEGO, CALIFORNIA 92121-2974
PHONE 858 558-6900 - FAX 858 558-6159

SW/SW

DIRECT SHEAR TEST DATA

PORTOLA CENTER
LAKE FOREST, CALIFORNIA

PROJECT NO. G1218-52-01

FIG. B-72

SAMPLE NO.: B49-4

Test Data			
Load	1 K	2 K	4 K
INITIAL			
Water Content	22.6%	22.6%	25.4%
Dry Density (pcf)	102.2	98.2	96.0
Saturation*	96.5%	87.4%	93.2%
Height (inches)	1	1	1
AFTER TEST			
Water Content	26.3%	27.0%	30.8%
Dry Density (pcf)	100.5	98.5	97.6
FAILURE			
Normal Stress (psf)	1000	2000	4000
Ultimate Stress (psf)	1221	1923	2979
Peak Stress (psf)	1408	1930	3429
Rate (in/min)	0.01	0.01	0.01

*Degree of saturation calculated with a specific gravity of 2.65

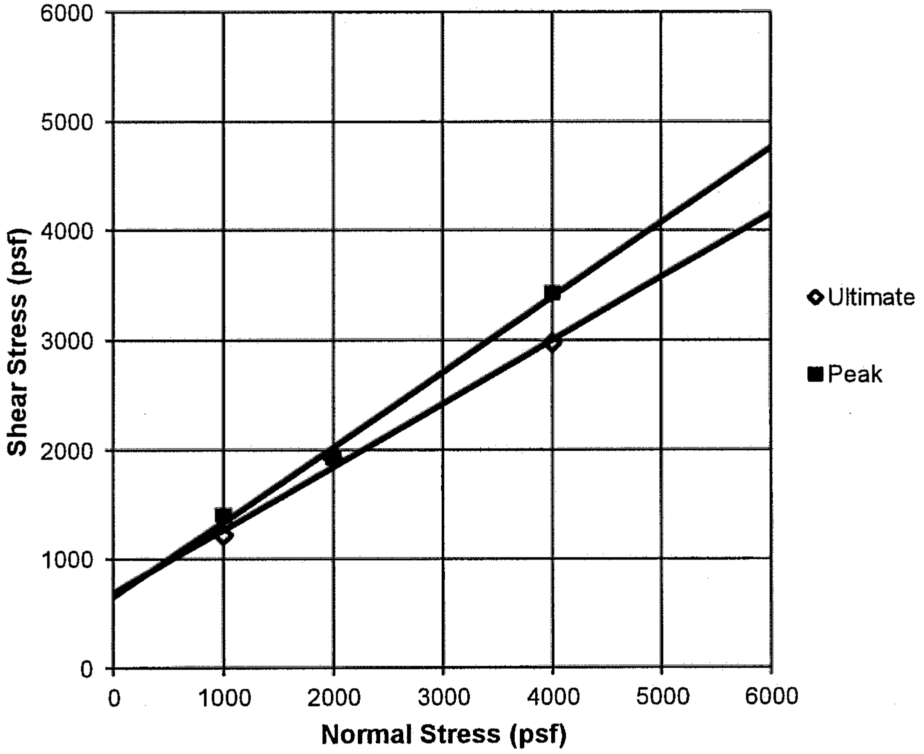
Results	
ϕ (Ultimate)	30 degrees
ϕ (Peak)	35 degrees
c (Ultimate)	670 psf
c (Peak)	670 psf

DATE: 12/12/2011

DESCRIPTION: afe - SM

☑ Natural

☐ Remold



GEOCON
INCORPORATED
GEOTECHNICAL CONSULTANTS
6960 FLANDERS DRIVE - SAN DIEGO, CALIFORNIA 92121-2974
PHONE 858 558-6900 - FAX 858 558-6159

SW/SW

DIRECT SHEAR TEST DATA

PORTOLA CENTER
LAKE FOREST, CALIFORNIA

PROJECT NO. G1218-52-01

FIG. B-73

SAMPLE NO.: B50-3

Test Data			
Load	1 K	2 K	4 K
INITIAL			
Water Content	22.6%	24.7%	22.4%
Dry Density (pcf)	101.2	99.1	99.4
Saturation*	94.4%	97.9%	89.4%
Height (inches)	1	1	1
AFTER TEST			
Water Content	24.1%	26.2%	24.8%
Dry Density (pcf)	98.6	100.0	102.2
FAILURE			
Normal Stress (psf)	1000	2000	4000
Ultimate Stress (psf)	1110	2179	3595
Peak Stress (psf)	1375	2189	3605
Rate (in/min)	0.01	0.01	0.01

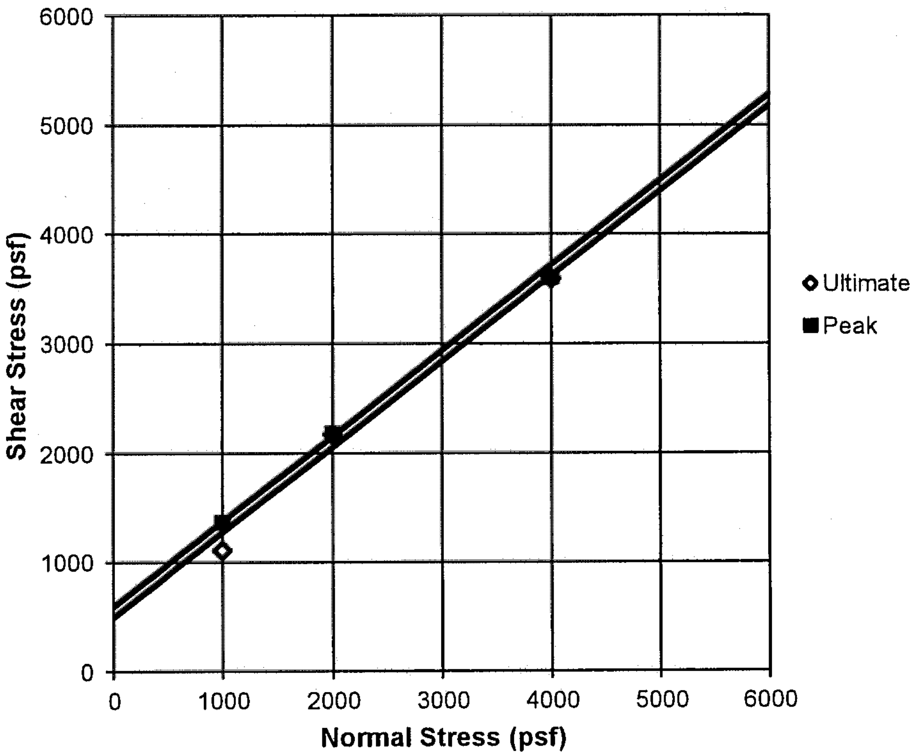
*Degree of saturation calculated with a specific gravity of 2.65

Results	
ϕ (Ultimate)	38 degrees
ϕ (Peak)	38 degrees
c (Ultimate)	500 psf
c (Peak)	600 psf

DATE: 12/9/2011
DESCRIPTION: afe - SM

☑ Natural

☐ Remold



GEOCON
INCORPORATED
GEOTECHNICAL CONSULTANTS
6960 FLANDERS DRIVE - SAN DIEGO, CALIFORNIA 92121-2974
PHONE 858 558-6900 - FAX 858 558-6159

SW/SW

DIRECT SHEAR TEST DATA

PORTOLA CENTER
LAKE FOREST, CALIFORNIA

PROJECT NO. G1218-52-01

FIG. B-74

SAMPLE NO.: B51-4

Test Data			
Load	1 K	2 K	4 K
INITIAL			
Water Content	22.5%	21.0%	23.4%
Dry Density (pcf)	98.7	101.3	100.1
Saturation*	88.1%	87.8%	94.9%
Height (inches)	1	1	1
AFTER TEST			
Water Content	27.7%	26.7%	27.4%
Dry Density (pcf)	96.1	100.3	101.8
FAILURE			
Normal Stress (psf)	1000	2000	4000
Ultimate Stress (psf)	1301	2078	2752
Peak Stress (psf)	1301	2337	2843
Rate (in/min)	0.01	0.01	0.01

*Degree of saturation calculated with a specific gravity of 2.65

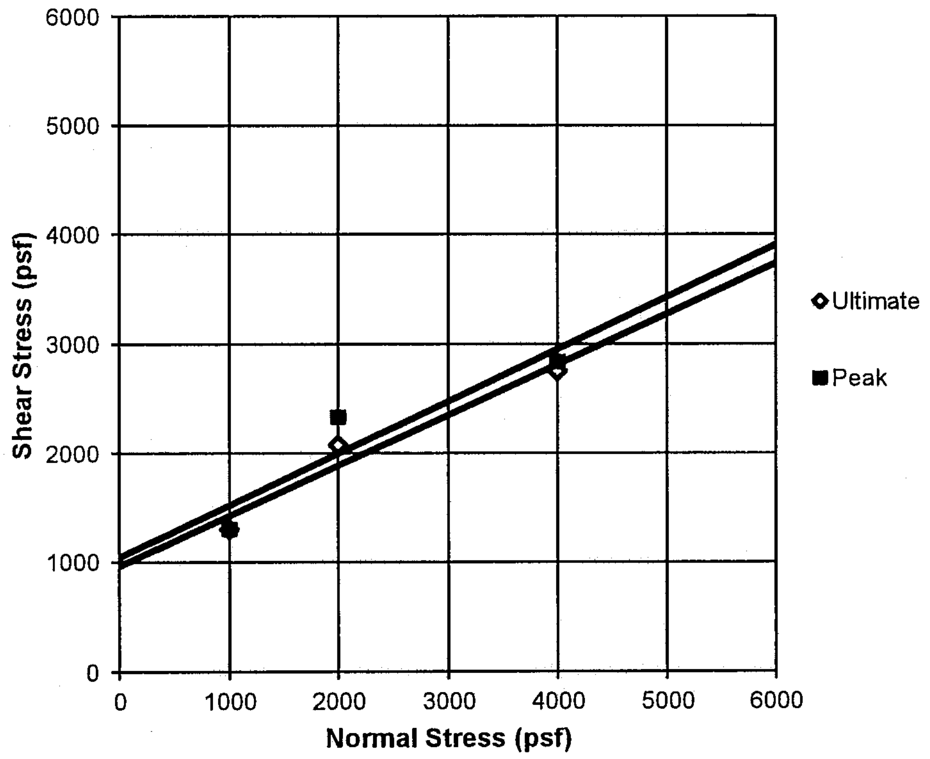
Results	
ϕ (Ultimate)	24 degrees
ϕ (Peak)	24 degrees
c (Ultimate)	965 psf
c (Peak)	1050 psf

DATE: 12/12/2011

DESCRIPTION: afe - SM

☑ Natural

☐ Remold



GEOCON
INCORPORATED
GEOTECHNICAL CONSULTANTS
6960 FLANDERS DRIVE - SAN DIEGO, CALIFORNIA 92121-2974
PHONE 858 558-6900 - FAX 858 558-6159

SW/SW

DIRECT SHEAR TEST DATA

PORTOLA CENTER
LAKE FOREST, CALIFORNIA

PROJECT NO. G1218-52-01

FIG. B-75

SAMPLE NO.: B57-3

Test Data			
Load	1 K	2 K	4 K
INITIAL			
Water Content	29.4%	31.0%	32.4%
Dry Density (pcf)	91.8	89.7	90.9
Saturation*	97.1%	97.2%	104.6%
Height (inches)	1	1	1
AFTER TEST			
Water Content	42.3%	41.3%	42.2%
Dry Density (pcf)	97.5	94.3	98.4
FAILURE			
Normal Stress (psf)	1000	2000	4000
Ultimate Stress (psf)	1130	1085	2036
Peak Stress (psf)	1159	1266	2700
Rate (in/min)	0.01	0.01	0.01

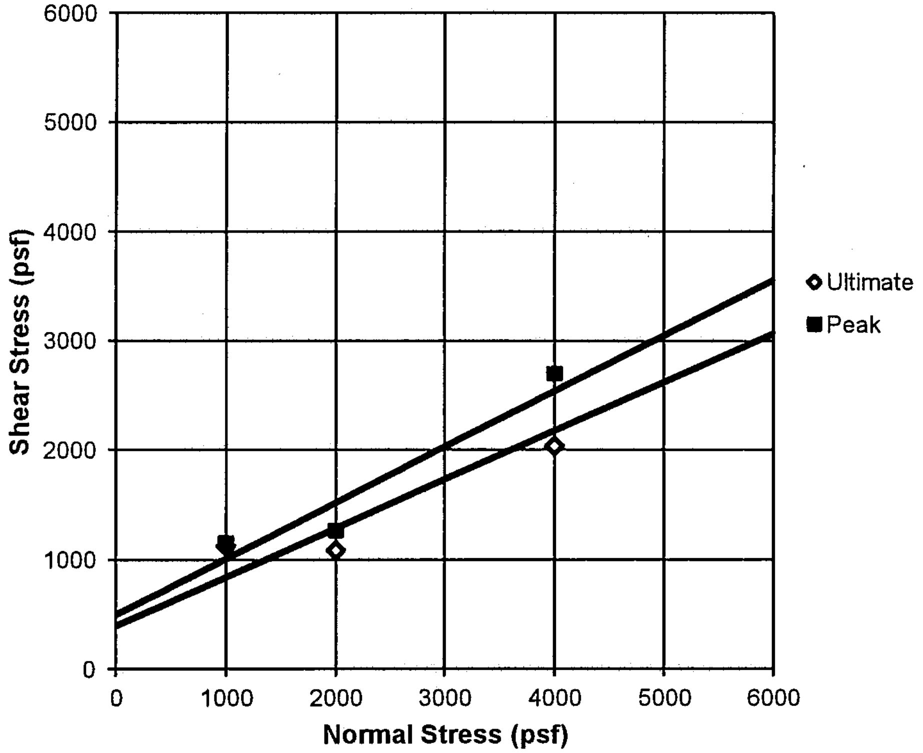
*Degree of saturation calculated with a specific gravity of 2.65

Results	
ϕ (Ultimate)	24 degrees
ϕ (Peak)	27 degrees
c (Ultimate)	400 psf
c (Peak)	500 psf

DATE: 12/29/2011
DESCRIPTION: Tplv - ML

☑ Natural

☐ Remold



GEOCON
INCORPORATED
GEOTECHNICAL CONSULTANTS
6960 FLANDERS DRIVE - SAN DIEGO, CALIFORNIA 92121-2974
PHONE 858 558-6900 - FAX 858 558-6159

SW/SW

DIRECT SHEAR TEST DATA

PORTOLA CENTER
LAKE FOREST, CALIFORNIA

PROJECT NO. G1218-52-01

FIG. B-76

SAMPLE NO.: B57-5

Test Data			
Load	1 K	2 K	4 K
INITIAL			
Water Content	18.8%	18.9%	20.2%
Dry Density (pcf)	102.2	104.6	102.2
Saturation*	80.3%	86.1%	86.4%
Height (inches)	1	1	1
AFTER TEST			
Water Content	42.3%	41.3%	42.2%
Dry Density (pcf)	97.5	94.3	98.4
FAILURE			
Normal Stress (psf)	1000	2000	4000
Ultimate Stress (psf)	794	1721	2994
Peak Stress (psf)	1629	1731	3004
Rate (in/min)	0.01	0.01	0.01

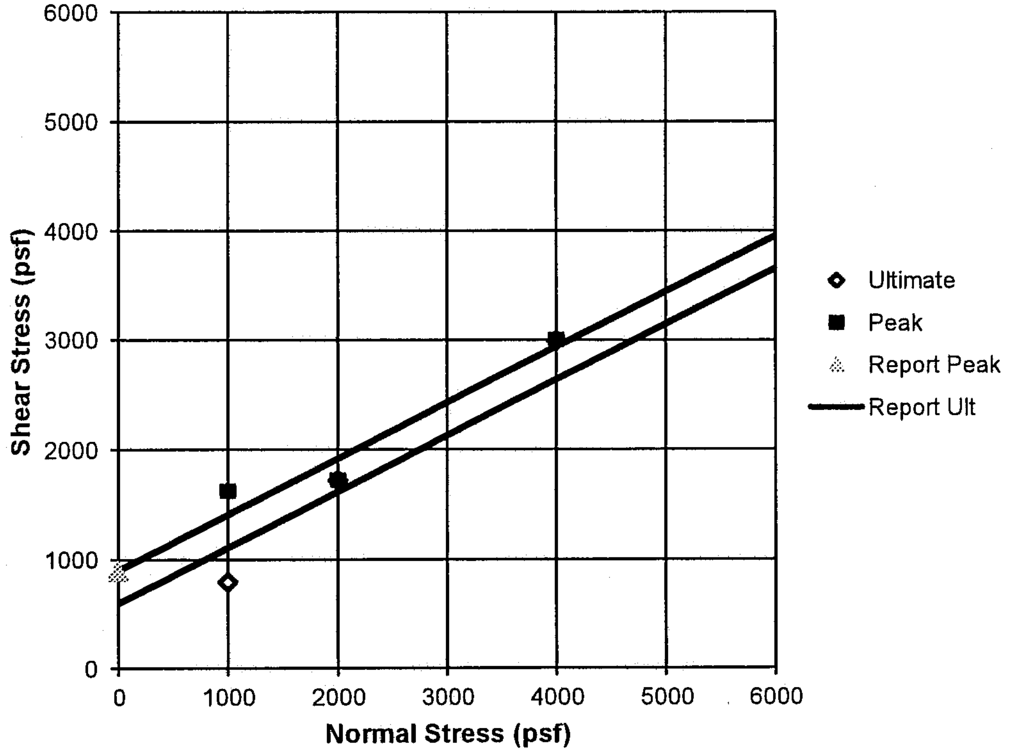
*Degree of saturation calculated with a specific gravity of 2.65

Results	
ϕ (Ultimate)	27 degrees
ϕ (Peak)	27 degrees
c (Ultimate)	600 psf
c (Peak)	900 psf

DATE: 11/29/2011
DESCRIPTION: Tplv - ML

☑ Natural

☐ Remold



GEOCON
INCORPORATED
GEOTECHNICAL CONSULTANTS
6960 FLANDERS DRIVE - SAN DIEGO, CALIFORNIA 92121-2974
PHONE 858 558-6900 - FAX 858 558-6159

SW/SW

DIRECT SHEAR TEST DATA

PORTOLA CENTER
LAKE FOREST, CALIFORNIA

PROJECT NO. G1218-52-01

FIG. B-77

APPENDIX C

APPENDIX C

SLOPE STABILITY ANALYSES

We performed the slope stability analyses using the two-dimensional computer software *GeoStudio2004* developed by Geo-Slope International Ltd. We analyzed the critical modes of potential slip surfaces including rotational-mode and block-mode based on Spencer's method. The soil parameters used, case conditions, and the calculated factors of safety are presented herein. Plots of analyses' results, including the soil stratigraphy, potential failure surfaces, and calculated factors of safety, are attached within this appendix.

We estimated the shear strength characteristics of the existing geologic units based on laboratory direct shear tests on samples obtained during our field investigation in accordance with ASTM D 3080 (see Appendix B). The soil parameters used for the stability analyses were presented in Table C-I.

TABLE C-I
SUMMARY OF SOIL PROPERTIES USED FOR SLOPE STABILITY ANALYSES

Geologic Unit/Material	Density (pcf)	Cohesion (psf)	Friction Angle (degrees)
Compacted Fill/Engineered Fill (Qcf/Afe)	120	500	28
MSE Wall backfill (MSE)	120	500	32
Alluvium (Qal)	120	500	23
Terrace Deposits (Qt)	120	300	29
Puente Formation-Soquel Member (Tps)	125	400	33
Puente Formation-Soquel Member (Tps-slt)	115	300	30
Puente Formation-La Vida Member (Tplv)	115	300	30
Puente Formation-Soquel Member/La Vida Member along Bedding (Tps-slt/Tplv along bedding)	115	250	24
Bedding Plane Shear (BPS)	115	30	9

We selected Cross Sections E-E′, F-F′, H-H′, I-I′, L-L′, M-M′, N-N′, O-O′, and P-P′ to perform the slope stability analyses. Table C-II provides a summary of cases analyzed and calculated factors of safety. The case conditions, including the assumed buttresses, shear pins, reinforced MSE walls, and soil nail walls are also indicated in the table. A minimum factor of safety of 1.5 and 1.1 under static and pseudo-static conditions, respectively, is currently required by the City of Lake Forest for slope stability. Results of slope stability analyses are plotted on Figures C-1 through C-48. Surficial slope stability calculations are presented on Figure C-49. The selected shear strength parameters of soil based on the laboratory test results is presented on Figures C-50 through C-54.

TABLE C-II
SUMMARY OF SLOPE STABILITY ANALYSES

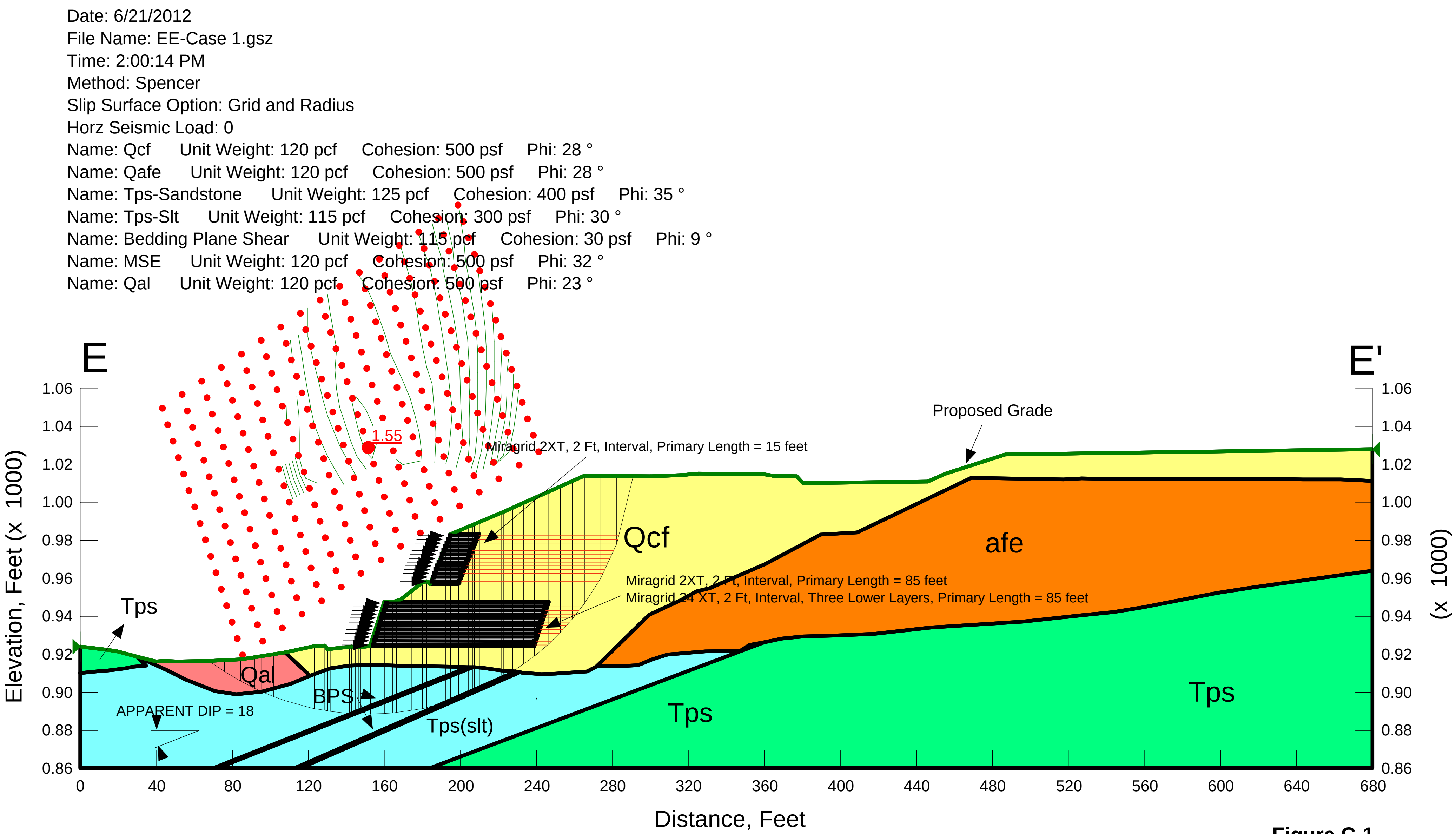
Cross Section	File Name	Condition of Slope Stability Analyses	Calculated Factor of Safety	Figure Number
E-E′	EE-Case1	MSE Wall (Miragrid 2XT/15’ and 20XT&24XY/85’), rotational-mode analysis, static condition	1.55	C-1
E-E′	EE-Case1s	MSE Wall (Miragrid 2XT/15’ and 20XT&24XY/85’), rotational-mode analysis, seismic condition	1.23	C-2
E-E′	EE-Case2	Upper MSE Walls (Miragrid 2XT/25’), rotational-mode analysis, static condition	1.62	C-3
E-E′	EE-Case2s	Upper MSE Walls (Miragrid 2XT/25’), rotational-mode analysis, seismic condition	1.25	C-4
E-E′	EE-Case4	MSE Wall (Miragrid 2XT/15’ and 20XT&24XY/85’), block-mode analysis along upper BPS, static condition	1.39	C-5
E-E′	EE-Case4-1	MSE Wall (Miragrid 2XT/15’ and 20XT&24XY/85’), block-mode analysis along upper BPS with buttress, static condition	1.64	C-6
E-E′	EE-Case4-2	MSE Wall (Miragrid 2XT/15’ and 20XT&24XY/85’), block-mode analysis along lower BPS with buttress, static condition	1.35	C-7
E-E′	EE-Case4-3	MSE Wall (Miragrid 2XT/15’ and 20XT&24XY/85’), block-mode analysis along lower BPS with 90-foot buttress, static condition	1.55	C-8
E-E′	EE-Case4-3s	MSE Wall (Miragrid 2XT/15’ and 20XT&24XY/85’), block-mode analysis along lower BPS with 90-foot buttress, seismic condition	1.27	C-9
F-F′	FF-Case1	Rotational-mode analysis, static condition	3.03	C-10
F-F′	FF-Case1s	Rotational-mode analysis, seismic condition	2.08	C-11
H-H′	HH-Case1	Upper MSE Wall (Miragrid 10XT/15’), rotational-mode analysis, static condition	1.86	C-12
H-H′	HH-Case1s	Upper MSE Wall (Miragrid 10XT/15’), rotational-mode analysis, seismic condition	1.42	C-13
H-H′	HH-Case2	MSE Walls (Miragrid 10XT/15’ and 10XT&24XT/25’&75’) and 70-foot buttress, rotational-mode analysis, static condition	1.50	C-14
H-H′	HH-Case2s	MSE Walls (Miragrid 10XT/15’ and 10XT&24XT/25’&75’) and 70-foot buttress, rotational-mode analysis, seismic condition	1.16	C-15
H-H′	HH-Case3-1	MSE Walls (Miragrid 10XT/15’ and 10XT/25’&75’), block-mode analysis along BPS, static condition	0.91	C-16

TABLE C-II (Continued)
SUMMARY OF SLOPE STABILITY ANALYSES

Cross Section	File Name	Condition of Slope Stability Analyses	Calculated Factor of Safety	Figure Number
H-H′	HH-Case3	MSE Walls (Miragrid 10XT/15’ and 10XT/25’&75’), 70-foot buttress, block-mode analysis along BPS, static condition	1.54	C-17
H-H′	HH-Case3s	MSE Walls (Miragrid 10XT/15’ and 10XT/25’&75’), 70-foot buttress, block-mode analysis along BPS, seismic condition	1.11	C-18
I-I′	II-Case1	MSE Walls (Miragrid 10XT/40’ and 10XT&24XT/100’), rotational-mode analysis, static condition	1.51	C-19
I-I′	II-Case2	Upper MSE Wall (Miragrid 10XT/55’), rotational-mode analysis, static condition	1.52	C-20
I-I′	II-Case2s	Upper MSE Wall (Miragrid 10XT/55’), rotational-mode analysis, seismic condition	1.15	C-21
I-I′	II-Case2-1	MSE Walls (Miragrid 10XT/55’ and 10XT&, 24XT/105’), block-mode analysis along bedding, static condition	1.52	C-22
I-I′	II-Case2s-1	MSE Walls (Miragrid 10XT/55’ and 10XT&, 24XT/105’), block-mode analysis along bedding, seismic condition	1.21	C-23
L-L′	LL-Case1	MSE Walls (Miragrid 2XT/5’ and 10XT/15’) and 30-foot buttress, rotational-mode analysis, static condition	1.60	C-24
L-L′	LL-Case1s	MSE Walls (Miragrid 2XT/5’ and 10XT/15’) and 30-foot buttress, rotational-mode analysis, seismic condition	1.33	C-25
L-L′	LL-Case4	MSE Walls (Miragrid 2XT/5’ and 10XT/15’) and 30-foot buttress, block-mode analysis along lower BPS downslope, static condition	1.61	C-26
L-L′	LL-Case2	MSE Walls (Miragrid 2XT/5’ and 10XT/15’) and buttress (30’), block-mode analysis in upper BPS downslope, static condition	1.58	C-27
L-L′	LL-Case2s	MSE Walls (Miragrid 2XT/5’ and 10XT/15’) and buttress (30’), block-mode analysis in upper BPS downslope, seismic condition	0.95	C-28
L-L′	LL-Case3s	MSE Walls (Miragrid 2XT/5’ and 10XT/70’) and buttress (30’), block-mode analysis in upper BPS downslope, seismic condition	1.10	C-29
L-L′	LL-Case5	MSE Walls (Miragrid 2XT/5’ and 10XT/70’) and buttress (30’), block-mode analysis in upper BPS upslope, static condition	2.59	C-30
M-M′	MM-Case2	MSE (Miragrid 10XT/15’), shear key benching 15’ wide, rotational-mode analysis, static condition	1.64	C-31
M-M′	MM-Case2s	MSE (Miragrid 10XT/15’), shear key benching 15’ wide, rotational-mode analysis, seismic condition	1.29	C-32

TABLE C-II (Continued)
SUMMARY OF SLOPE STABILITY ANALYSES

Cross Section	File Name	Condition of Slope Stability Analyses	Calculated Factor of Safety	Figure Number
N-N′	NN-Case1	MSE (Miragrid 10XT/10’ and 10XT/20’) rotational-mode analysis, static condition	1.79	C-33
N-N′	NN-Case2	MSE (Miragrid 10XT/10’ and 10XT/20’), block-mode analysis along BPS, static condition	1.81	C-34
N-N′	NN-Case3	MSE (Miragrid 10XT/10’ and 10XT/20’), block-mode analysis along BPS, static condition	1.11	C-35
N-N′	NN-Case5	Temporary excavation condition, block-mode analysis along BPS, static condition	0.69	C-36
N-N′	NN-Case6-1	MSE (Miragrid 10XT/10’ and 10XT/20’) and 105-foot buttress, block-mode analysis along BPS downslope, static condition	1.56	C-37
N-N′	NN-Case6s-1	MSE (Miragrid 10XT/10’ and 10XT/20’) and 105-foot buttress, block-mode analysis along BPS downslope, seismic condition	1.18	C-38
N-N′	NN-Case7-1	MSE (Miragrid 10XT/10’ and 10XT/20’) and 105-foot buttress, rotational-mode analysis, static condition	1.79	C-39
N-N′	NN-Case7s-1	MSE (Miragrid 10XT/10’ and 10XT/20’) and 105-foot buttress, rotational-mode analysis, seismic condition	1.31	C-40
N-N′	NN-Case9	MSE (Miragrid 10XT/10’ and 10XT/20’) and 105-foot buttress, block-mode analysis along bedding, static condition	1.99	C-41
N-N′	NN-Case9s	MSE (Miragrid 10XT/10’ and 10XT/20’) and 105-foot buttress, block-mode analysis along bedding, seismic condition	1.43	C-42
O-O′	OO-Case1	Rotational-mode analysis, static condition	1.85	C-43
O-O′	OO-Case1s	Rotational-mode analysis, seismic condition	1.33	C-44
P-P′	PP-Case1	MSE wall (2XT/5’), rotational-mode analysis, static condition	4.44	C-45
P-P′	PP-Case1s	MSE wall (2XT/5’), rotational-mode analysis, seismic condition	2.12	C-46
P-P′	PP-Case2	MSE wall (2XT/5’), block-mode analysis along upper BPS, static condition	2.12	C-47
P-P′	PP-Case2s	MSE wall (2XT/5’), block-mode analysis along upper BPS, seismic condition	1.13	C-48



Date: 6/21/2012
File Name: EE-Case 1.gsz
Time: 2:00:14 PM
Method: Spencer
Slip Surface Option: Grid and Radius
Horz Seismic Load: 0
Name: Qcf Unit Weight: 120 pcf Cohesion: 500 psf Phi: 28 °
Name: Qafe Unit Weight: 120 pcf Cohesion: 500 psf Phi: 28 °
Name: Tps-Sandstone Unit Weight: 125 pcf Cohesion: 400 psf Phi: 35 °
Name: Tps-Slt Unit Weight: 115 pcf Cohesion: 300 psf Phi: 30 °
Name: Bedding Plane Shear Unit Weight: 115 pcf Cohesion: 30 psf Phi: 9 °
Name: MSE Unit Weight: 120 pcf Cohesion: 500 psf Phi: 32 °
Name: Qal Unit Weight: 120 pcf Cohesion: 500 psf Phi: 23 °

Figure C-1

Date: 6/21/2012
File Name: EE-Case 1s.gsz
Time: 2:01:35 PM
Method: Spencer
Slip Surface Option: Grid and Radius
Horz Seismic Load: 0.15
Name: Qcf Unit Weight: 120 pcf Cohesion: 500 psf Phi: 28 °
Name: Qafe Unit Weight: 120 pcf Cohesion: 500 psf Phi: 28 °
Name: Tps-Sandstone Unit Weight: 125 pcf Cohesion: 400 psf Phi: 35 °
Name: Tps-Slt Unit Weight: 115 pcf Cohesion: 300 psf Phi: 30 °
Name: Bedding Plane Shear Unit Weight: 115 pcf Cohesion: 30 psf Phi: 9 °
Name: MSE Unit Weight: 120 pcf Cohesion: 500 psf Phi: 32 °
Name: Qal Unit Weight: 120 pcf Cohesion: 500 psf Phi: 23 °

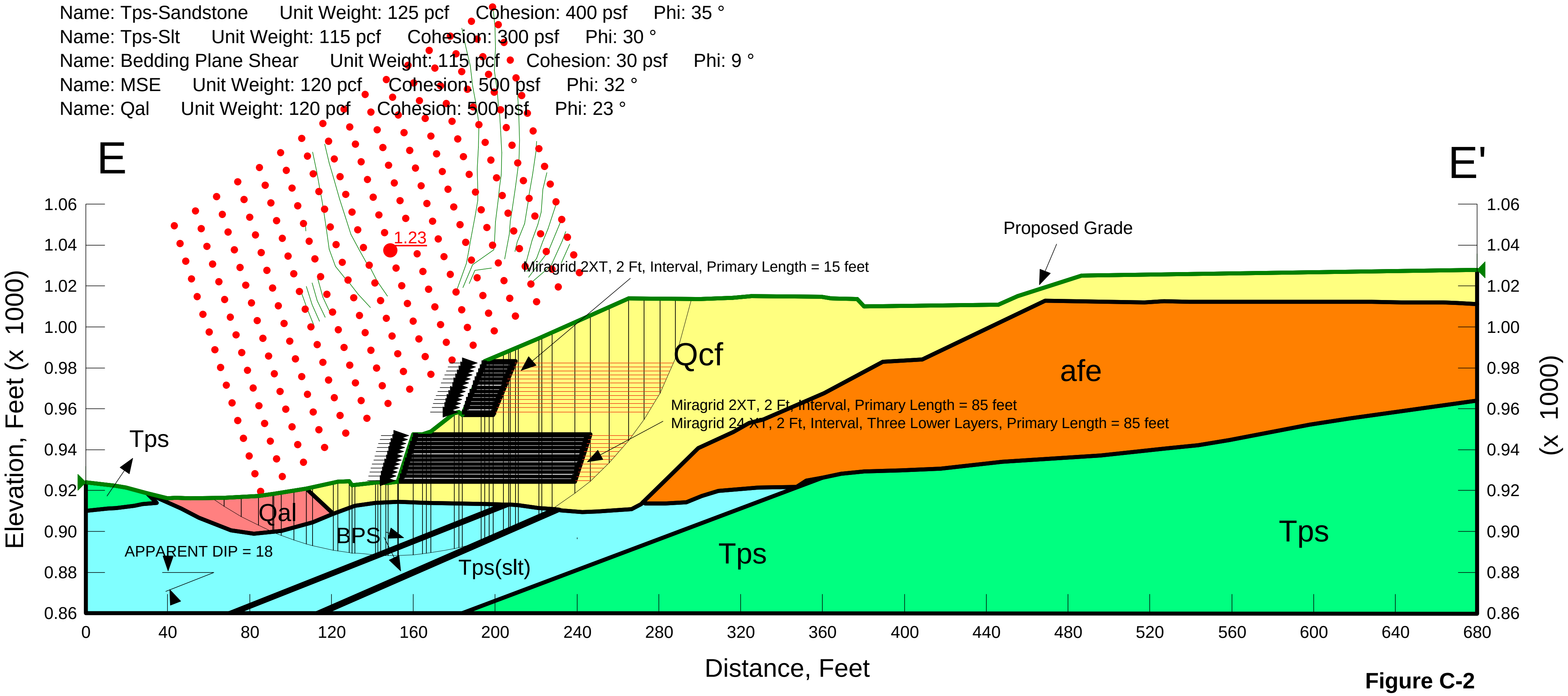


Figure C-2

Date: 6/21/2012
File Name: EE-Case 2.gsz
Time: 1:34:04 PM
Method: Spencer
Slip Surface Option: Grid and Radius
Horz Seismic Load: 0
Name: Qcf   Unit Weight: 120 pcf   Cohesion: 500 psf   Phi: 28 °
Name: Qafe   Unit Weight: 120 pcf   Cohesion: 500 psf   Phi: 28 °
Name: Tps-Sandstone   Unit Weight: 125 pcf   Cohesion: 400 psf   Phi: 35 °
Name: Tps-Slt   Unit Weight: 115 pcf   Cohesion: 300 psf   Phi: 30 °
Name: Bedding Plane Shear   Unit Weight: 115 pcf   Cohesion: 30 psf   Phi: 9 °
Name: MSE   Unit Weight: 120 pcf   Cohesion: 500 psf   Phi: 32 °
Name: Qal   Unit Weight: 120 pcf   Cohesion: 500 psf   Phi: 23 °

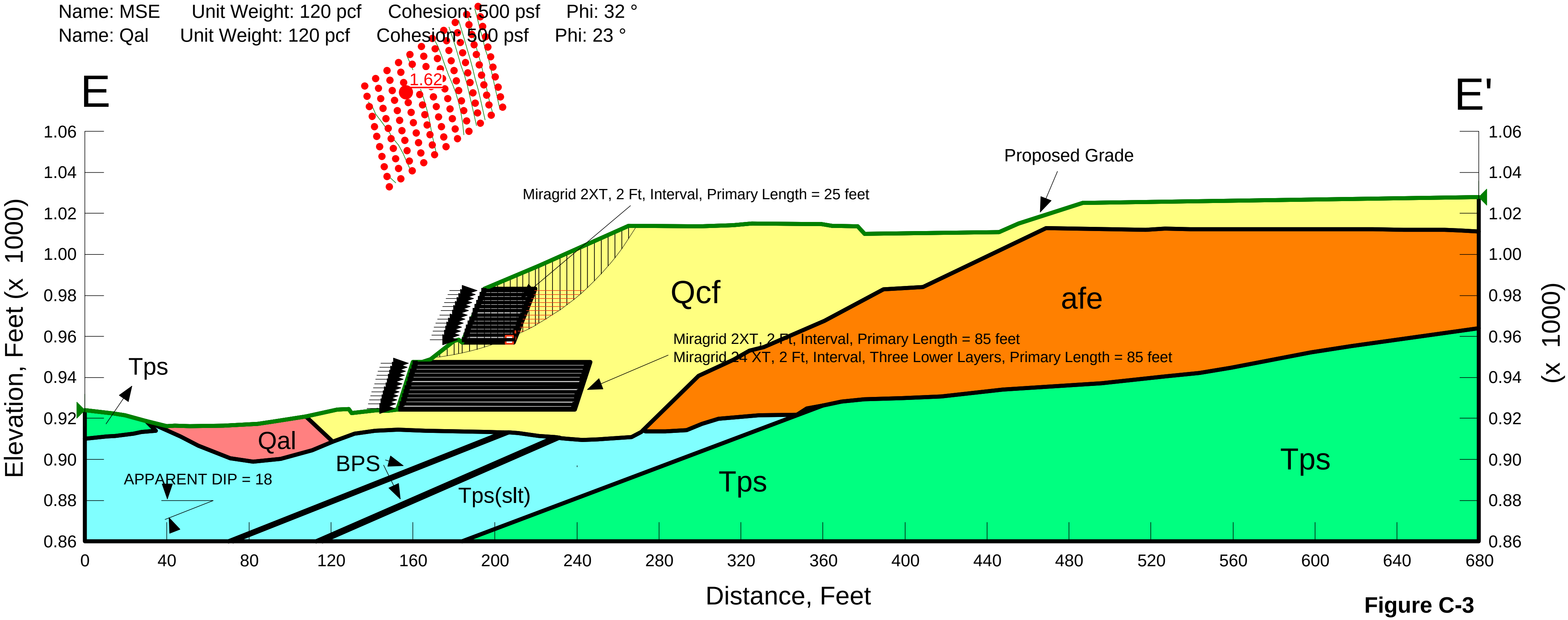


Figure C-3

Date: 6/21/2012
File Name: EE-Case 2s.gsz
Time: 1:35:26 PM
Method: Spencer
Slip Surface Option: Grid and Radius
Name: Qcf   Unit Weight: 120 pcf   Cohesion: 500 psf   Phi: 28 °
Name: Qafe   Unit Weight: 120 pcf   Cohesion: 500 psf   Phi: 28 °
Name: Tps-Sandstone   Unit Weight: 125 pcf   Cohesion: 400 psf   Phi: 35 °
Name: Tps-Slt   Unit Weight: 115 pcf   Cohesion: 300 psf   Phi: 30 °
Name: Bedding Plane Shear   Unit Weight: 115 pcf   Cohesion: 30 psf   Phi: 9 °
Name: MSE   Unit Weight: 120 pcf   Cohesion: 500 psf   Phi: 32 °
Name: Qal   Unit Weight: 120 pcf   Cohesion: 500 psf   Phi: 23 °
Horz Seismic Load: 0.15

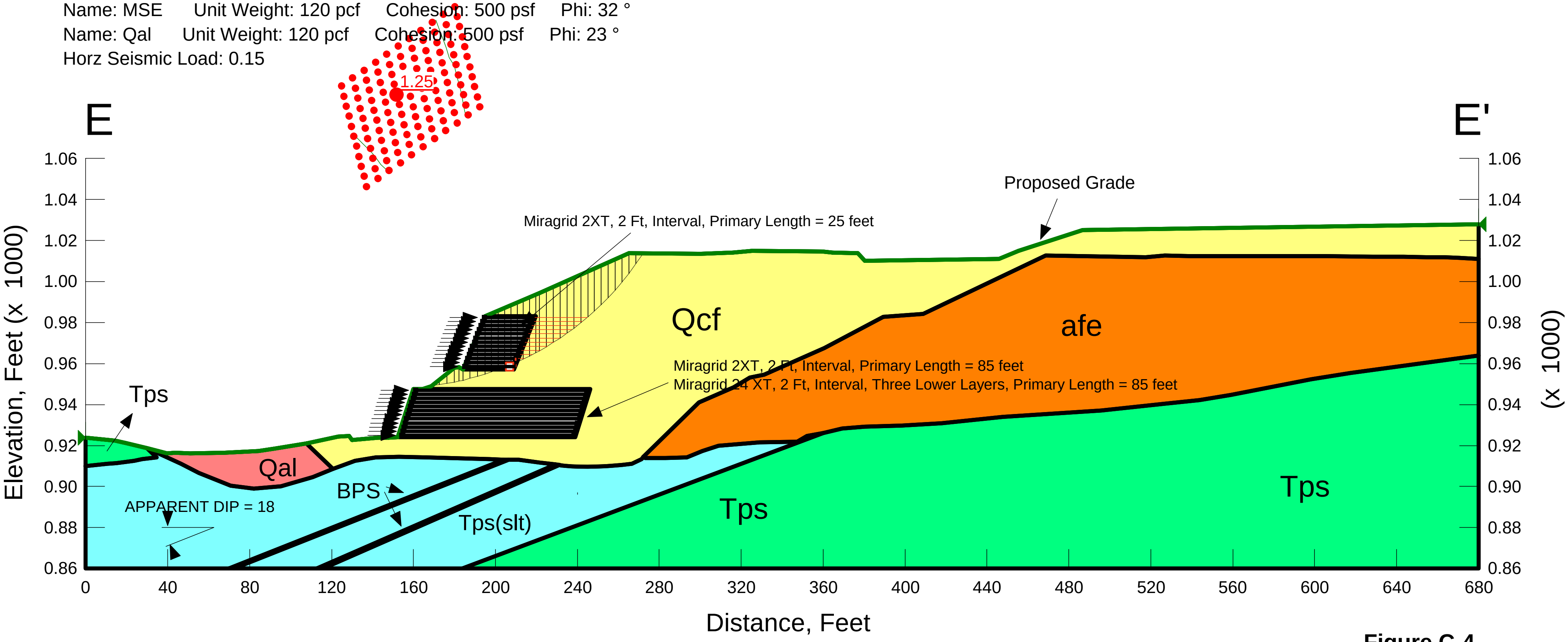


Figure C-4

Date: 6/21/2012
File Name: EE-Case 4.gsz
Time: 1:27:04 PM
Method: Spencer
Slip Surface Option: Block
Horz Seismic Load: 0
Name: Qcf Unit Weight: 120 pcf Cohesion: 500 psf Phi: 28 °
Name: Qafe Unit Weight: 120 pcf Cohesion: 500 psf Phi: 28 °
Name: Tps-Sandstone Unit Weight: 125 pcf Cohesion: 400 psf Phi: 35 °
Name: Tps-Slt Unit Weight: 115 pcf Cohesion: 300 psf Phi: 30 °
Name: Bedding Plane Shear Unit Weight: 115 pcf Cohesion: 30 psf Phi: 9 °
Name: MSE Unit Weight: 120 pcf Cohesion: 500 psf Phi: 32 °
Name: Qal Unit Weight: 120 pcf Cohesion: 500 psf Phi: 23 °

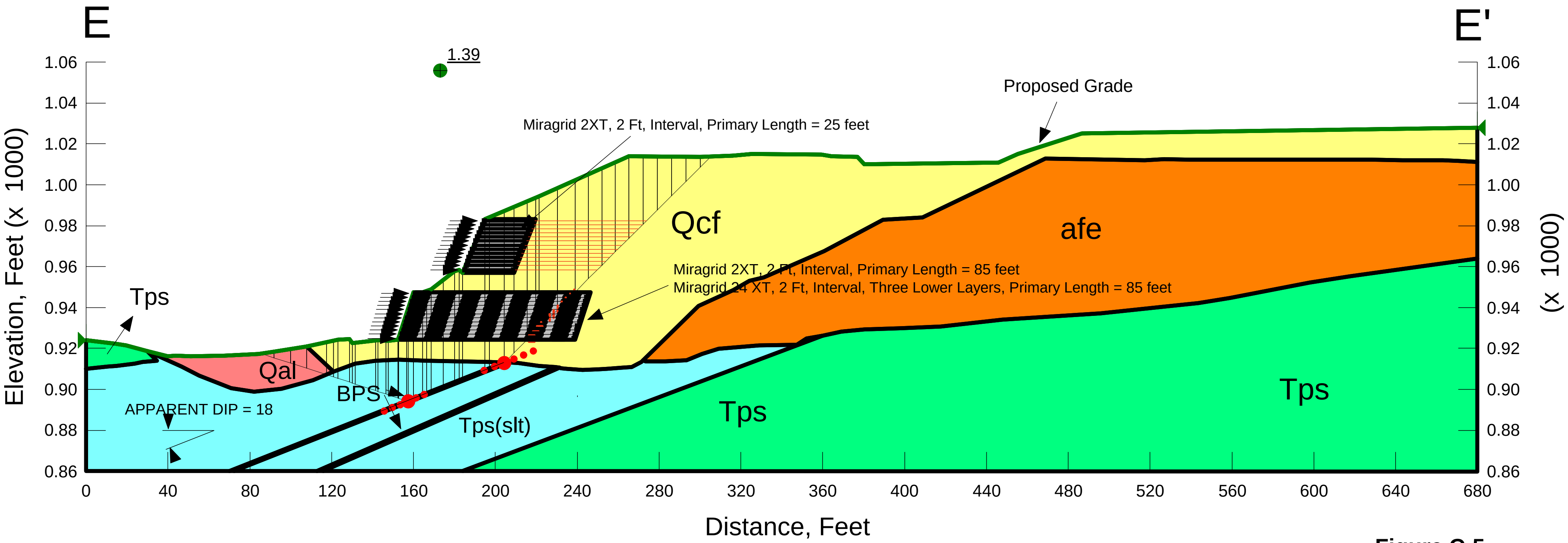


Figure C-5

Date: 6/21/2012
File Name: EE-Case 4-1.gsz
Time: 1:29:04 PM
Method: Spencer
Slip Surface Option: Block
Horz Seismic Load: 0
Name: Qcf Unit Weight: 120 pcf Cohesion: 500 psf Phi: 28 °
Name: Qafe Unit Weight: 120 pcf Cohesion: 500 psf Phi: 28 °
Name: Tps-Sandstone Unit Weight: 125 pcf Cohesion: 400 psf Phi: 35 °
Name: Tps-Slt Unit Weight: 115 pcf Cohesion: 300 psf Phi: 30 °
Name: Bedding Plane Shear Unit Weight: 115 pcf Cohesion: 30 psf Phi: 9 °
Name: MSE Unit Weight: 120 pcf Cohesion: 500 psf Phi: 32 °
Name: Qal Unit Weight: 120 pcf Cohesion: 500 psf Phi: 23 °

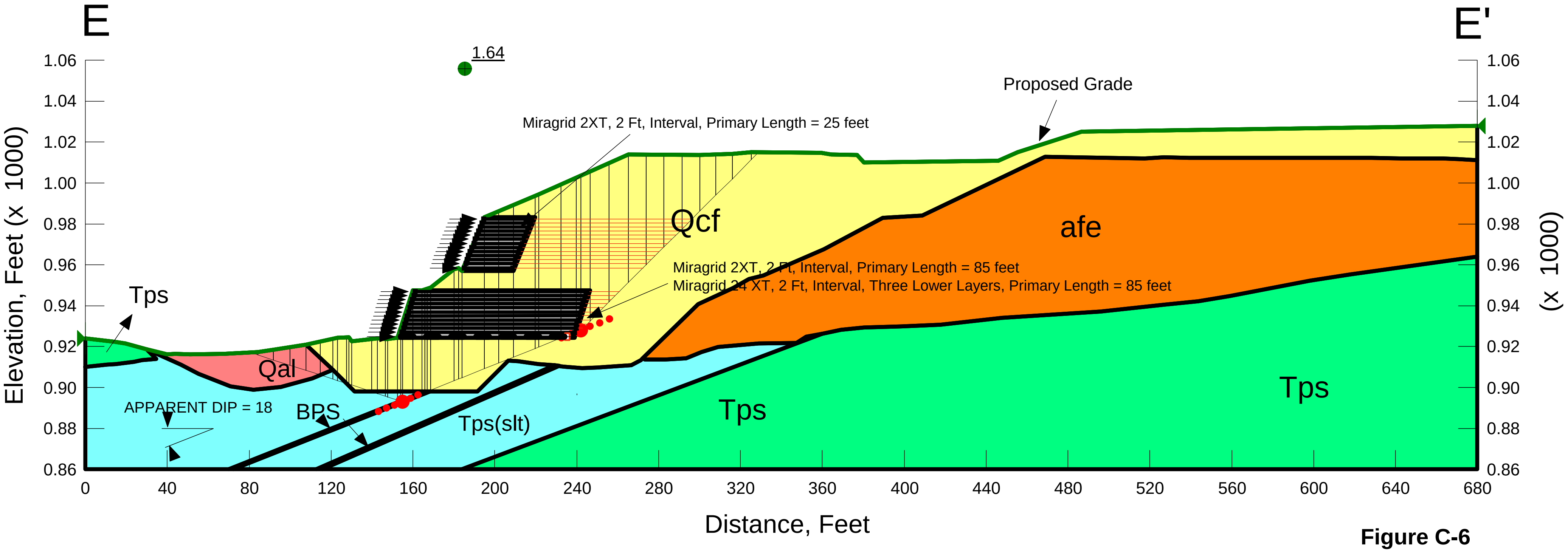


Figure C-6

Date: 6/21/2012
File Name: EE-Case 4-2.gsz
Time: 1:38:08 PM
Method: Spencer
Slip Surface Option: Block
Horz Seismic Load: 0

Name: Qcf	Unit Weight: 120 pcf	Cohesion: 500 psf	Phi: 28 °
Name: Qafe	Unit Weight: 120 pcf	Cohesion: 500 psf	Phi: 28 °
Name: Tps-Sandstone	Unit Weight: 125 pcf	Cohesion: 400 psf	Phi: 35 °
Name: Tps-Slt	Unit Weight: 115 pcf	Cohesion: 300 psf	Phi: 30 °
Name: Bedding Plane Shear	Unit Weight: 115 pcf	Cohesion: 30 psf	Phi: 9 °
Name: MSE	Unit Weight: 120 pcf	Cohesion: 500 psf	Phi: 32 °
Name: Qal	Unit Weight: 120 pcf	Cohesion: 500 psf	Phi: 23 °

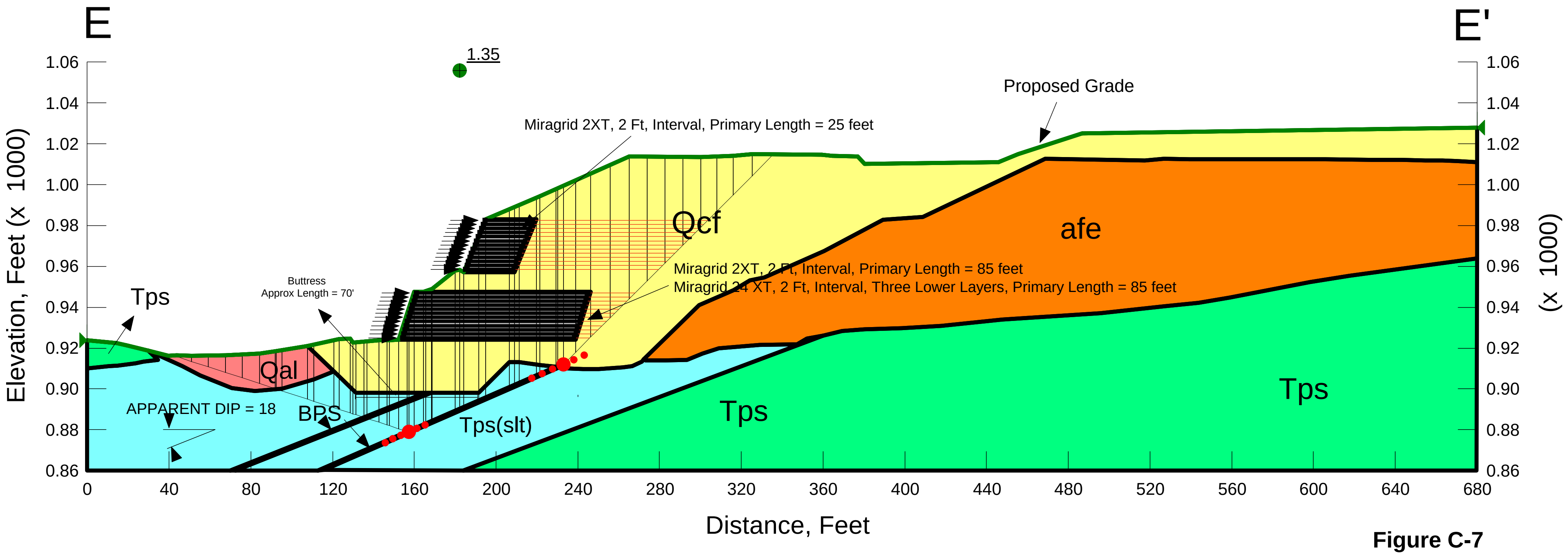


Figure C-7

Date: 6/21/2012
File Name: EE-Case 4-3.gsz
Time: 1:39:45 PM
Method: Spencer
Slip Surface Option: Block
Horz Seismic Load: 0

Name: Qcf	Unit Weight: 120 pcf	Cohesion: 500 psf	Phi: 28 °
Name: Qafe	Unit Weight: 120 pcf	Cohesion: 500 psf	Phi: 28 °
Name: Tps-Sandstone	Unit Weight: 125 pcf	Cohesion: 400 psf	Phi: 35 °
Name: Tps-Slt	Unit Weight: 115 pcf	Cohesion: 300 psf	Phi: 30 °
Name: Bedding Plane Shear	Unit Weight: 115 pcf	Cohesion: 30 psf	Phi: 9 °
Name: MSE	Unit Weight: 120 pcf	Cohesion: 500 psf	Phi: 32 °
Name: Qal	Unit Weight: 120 pcf	Cohesion: 500 psf	Phi: 23 °

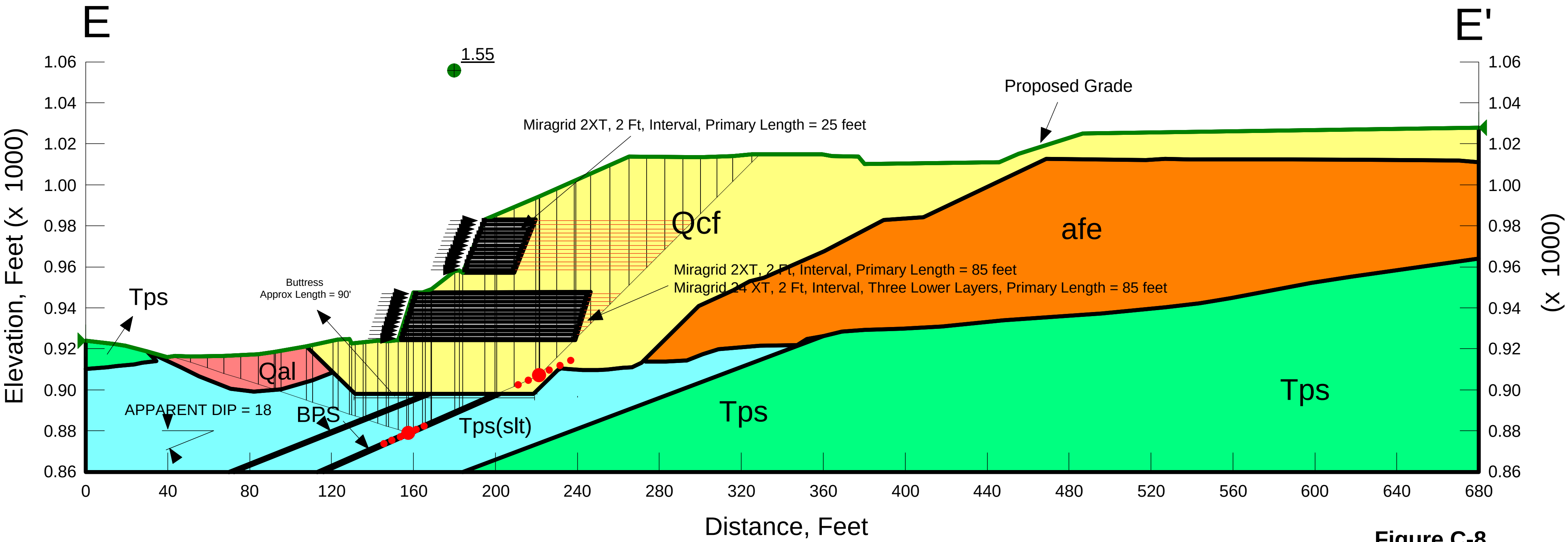


Figure C-8

Date: 6/21/2012
File Name: EE-Case 4-3s.gsz
Time: 1:41:31 PM
Method: Spencer
Slip Surface Option: Block
Horz Seismic Load: 0.15
Name: Qcf Unit Weight: 120 pcf Cohesion: 500 psf Phi: 28 °
Name: Qafe Unit Weight: 120 pcf Cohesion: 500 psf Phi: 28 °
Name: Tps-Sandstone Unit Weight: 125 pcf Cohesion: 400 psf Phi: 35 °
Name: Tps-Slt Unit Weight: 115 pcf Cohesion: 300 psf Phi: 30 °
Name: Bedding Plane Shear Unit Weight: 115 pcf Cohesion: 30 psf Phi: 9 °
Name: MSE Unit Weight: 120 pcf Cohesion: 500 psf Phi: 32 °
Name: Qal Unit Weight: 120 pcf Cohesion: 500 psf Phi: 23 °

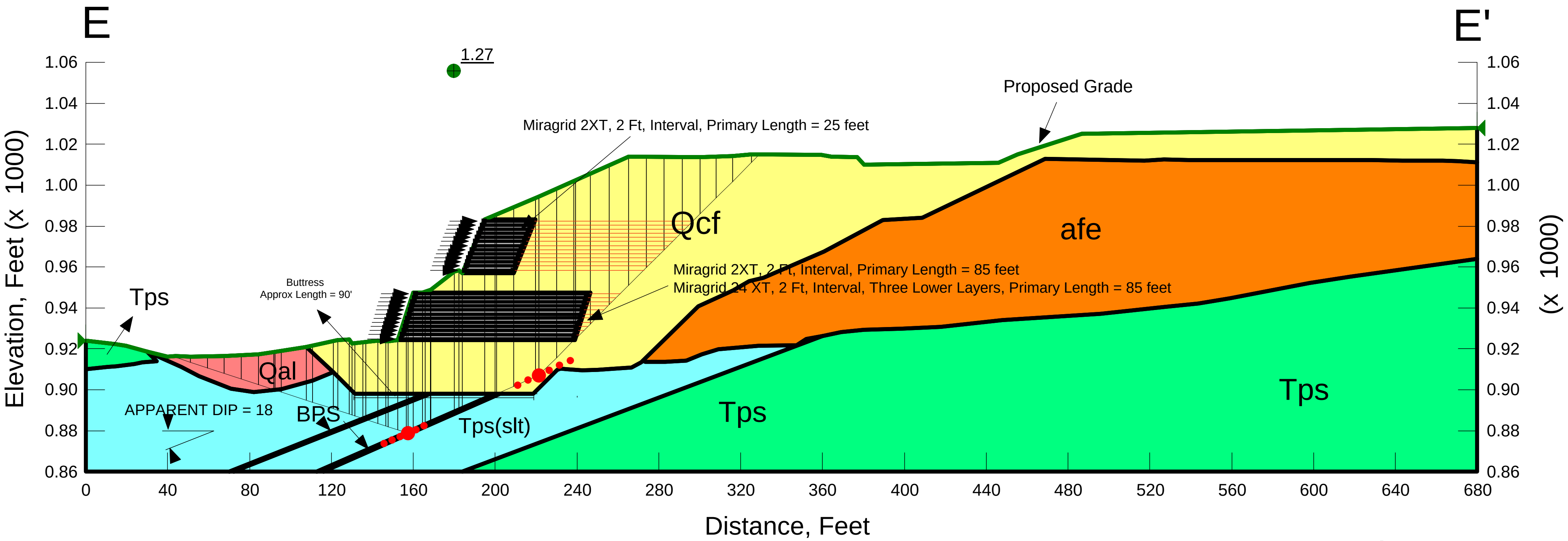


Figure C-9

Portola Center South
Project No. G1218-52-01A
Section F-F'
Name: FF-Case 1.gsz
Date: 6/19/2012
Time: 1:47:06 PM
Name: Tps - Slt (15 degrees) Unit Weight: 115 pcf Cohesion: 300 psf Phi: 30 °
Name: Tps Unit Weight: 125 pcf Cohesion: 400 psf Phi: 33 °
Name: Qcf Unit Weight: 120 pcf Cohesion: 500 psf Phi: 28 °
Horz Seismic Load: 0

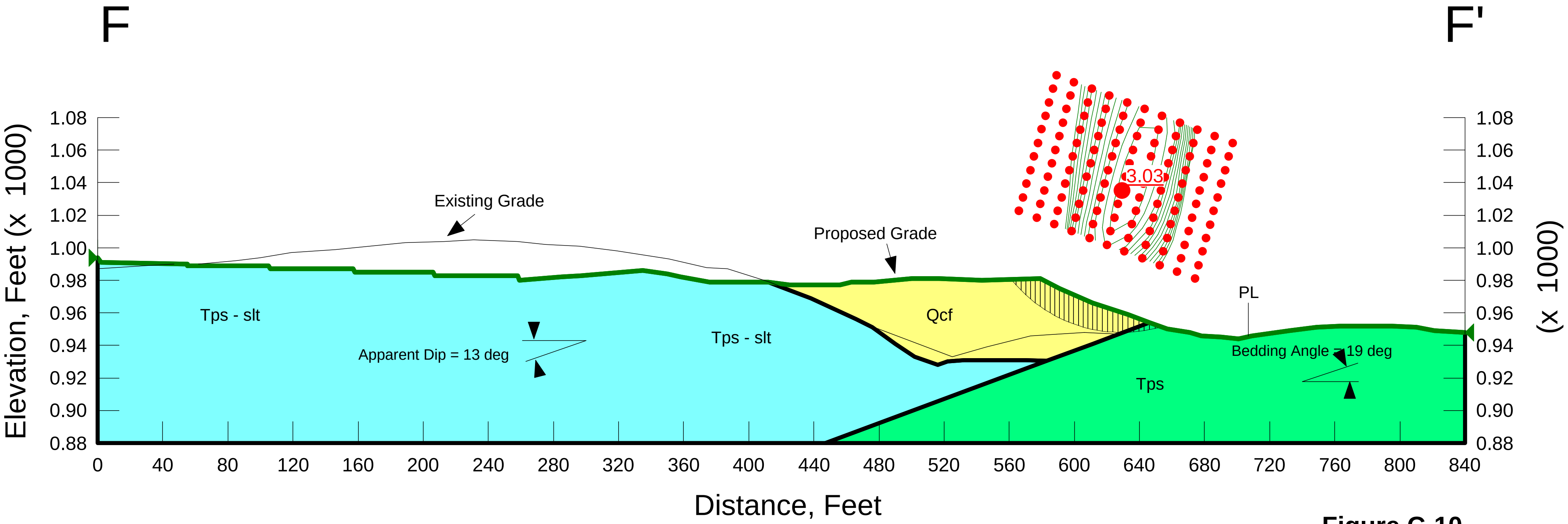


Figure C-10

Portola Center South
Project No. G1218-52-01A
Section F-F'
Name: FF-Case 1s.gsz
Date: 6/19/2012
Time: 1:48:38 PM
Name: Tps - Slt (15 degrees) Unit Weight: 115 pcf Cohesion: 300 psf Phi: 30 °
Name: Tps Unit Weight: 125 pcf Cohesion: 400 psf Phi: 33 °
Name: Qcf Unit Weight: 120 pcf Cohesion: 500 psf Phi: 28 °
Horz Seismic Load: 0.15

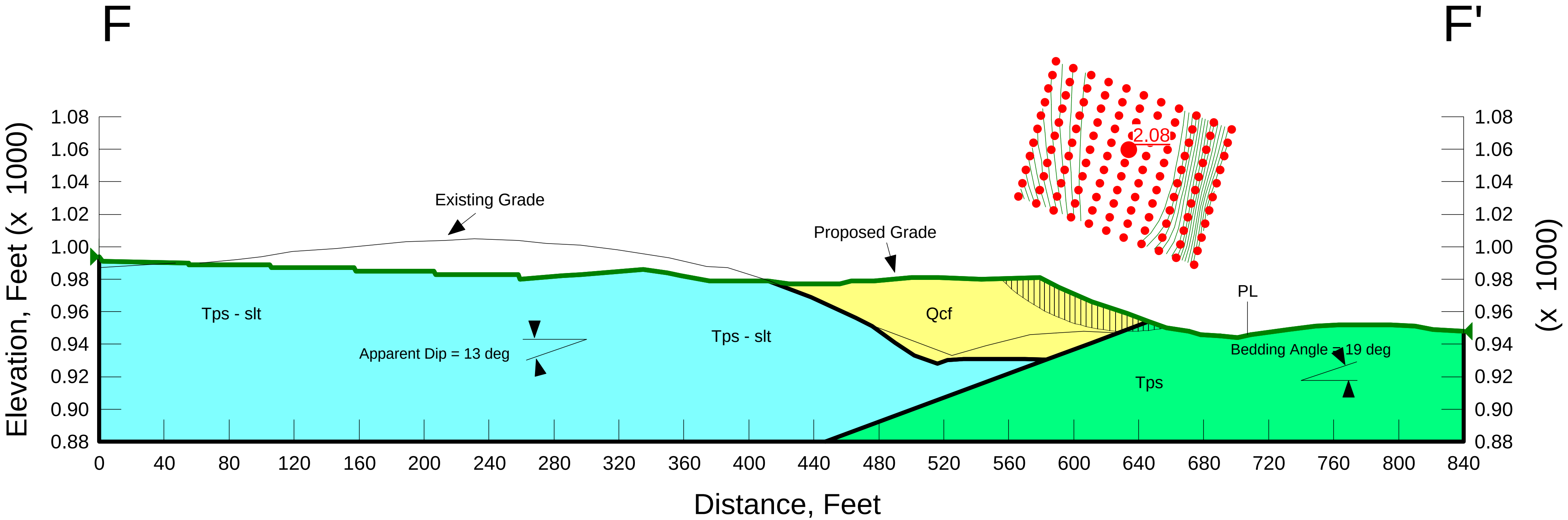


Figure C-11

Portola Center South
Project No. G1218-52-01A
Section H-H'
Name: HH-Case 1.gsz
Date: 6/21/2012 Time: 2:25:43 PM
Name: Qcf Unit Weight: 120 pcf Cohesion: 500 psf Phi: 28 °
Name: Qal Unit Weight: 120 pcf Cohesion: 500 psf Phi: 23 °
Name: Tplv (2 degrees) Unit Weight: 115 pcf Cohesion: 300 psf Phi: 30 °
Name: MSE Unit Weight: 120 pcf Cohesion: 500 psf Phi: 32 °
Name: Bedding Plane Shear Unit Weight: 115 pcf Cohesion: 30 psf Phi: 9 °
Name: Tps Unit Weight: 125 pcf Cohesion: 400 psf Phi: 33 °
Name: afe Unit Weight: 120 pcf Cohesion: 500 psf Phi: 28 °
Horz Seismic Load: 0

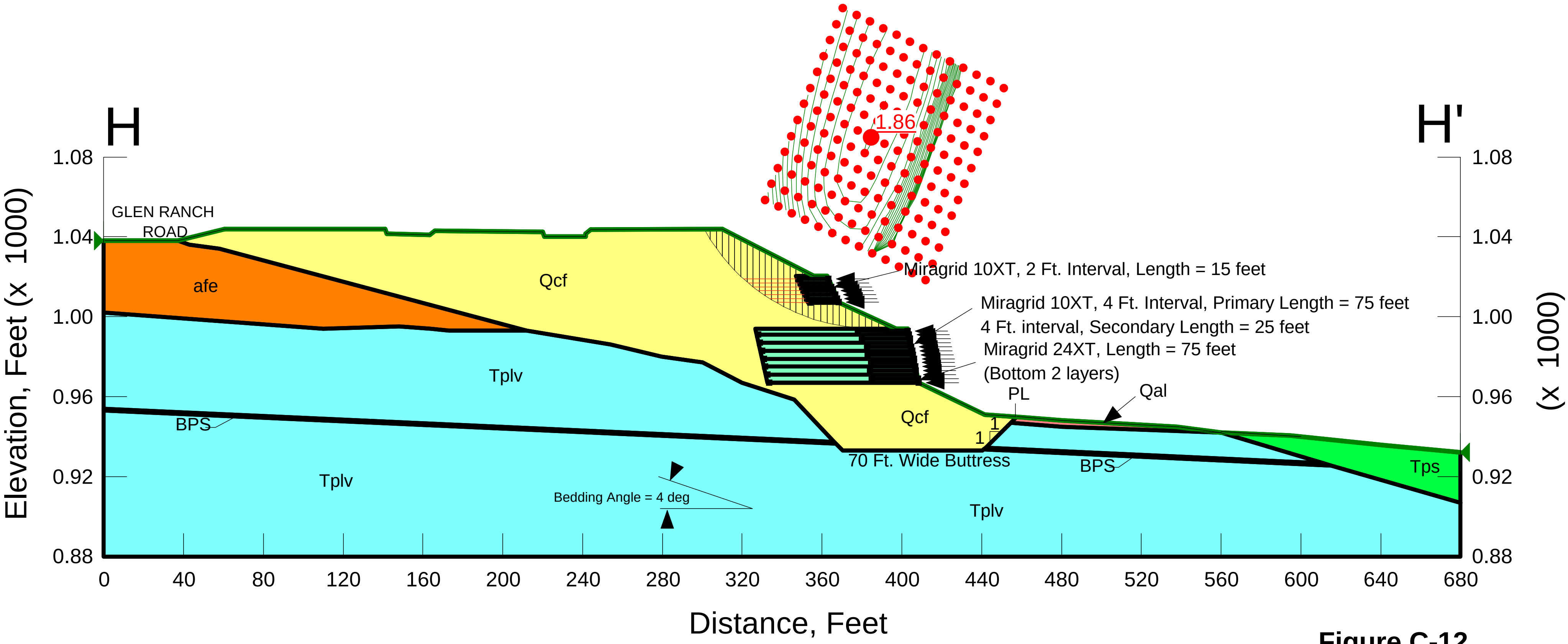


Figure C-12

Portola Center South
Project No. G1218-52-01A
Section H-H'
Name: HH-Case 1s.gsz
Date: 6/21/2012 Time: 2:28:03 PM
Name: Qcf Unit Weight: 120 pcf Cohesion: 500 psf Phi: 28 °
Name: Qal Unit Weight: 120 pcf Cohesion: 500 psf Phi: 23 °
Name: Tplv (2 degrees) Unit Weight: 115 pcf Cohesion: 300 psf Phi: 30 °
Name: MSE Unit Weight: 120 pcf Cohesion: 500 psf Phi: 32 °
Name: Bedding Plane Shear Unit Weight: 115 pcf Cohesion: 30 psf Phi: 9 °
Name: Tps Unit Weight: 125 pcf Cohesion: 400 psf Phi: 33 °
Name: afe Unit Weight: 120 pcf Cohesion: 500 psf Phi: 28 °
Horz Seismic Load: 0.15

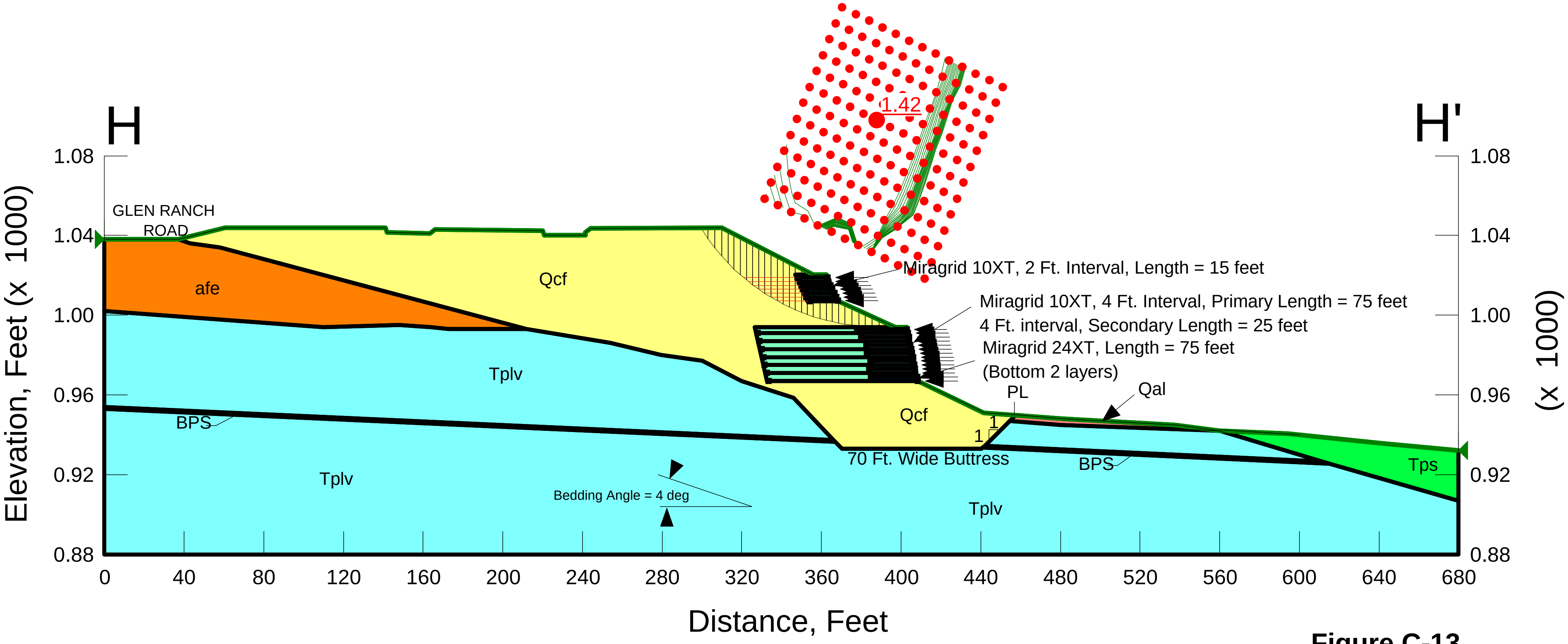


Figure C-13

Portola Center South
Project No. G1218-52-01A
Section H-H'
Name: HH-Case 2.gsz
Date: 6/21/2012 Time: 2:20:36 PM
Name: Qcf Unit Weight: 120 pcf Cohesion: 500 psf Phi: 28 °
Name: Qal Unit Weight: 120 pcf Cohesion: 500 psf Phi: 23 °
Name: Tplv (2 degrees) Unit Weight: 115 pcf Cohesion: 300 psf Phi: 30 °
Name: MSE Unit Weight: 120 pcf Cohesion: 500 psf Phi: 32 °
Name: Bedding Plane Shear Unit Weight: 115 pcf Cohesion: 30 psf Phi: 9 °
Name: Tps Unit Weight: 125 pcf Cohesion: 400 psf Phi: 33 °
Name: afe Unit Weight: 120 pcf Cohesion: 500 psf Phi: 28 °
Horz Seismic Load: 0

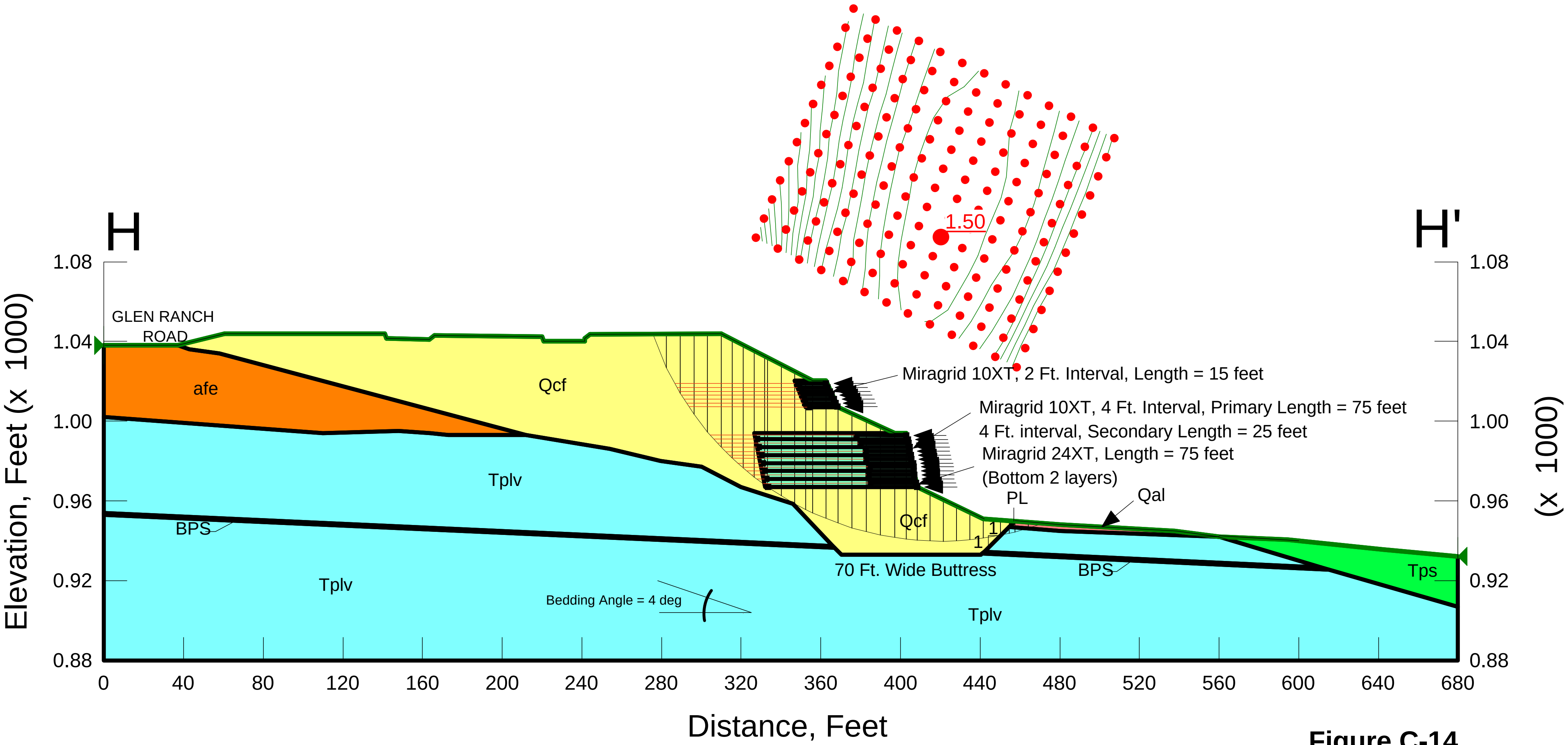


Figure C-14

Portola Center South
Project No. G1218-52-01A
Section H-H'
Name: HH-Case 2s.gsz
Date: 6/21/2012 Time: 2:23:39 PM
Name: Qcf Unit Weight: 120 pcf Cohesion: 500 psf Phi: 28 °
Name: Qal Unit Weight: 120 pcf Cohesion: 500 psf Phi: 23 °
Name: Tplv (2 degrees) Unit Weight: 115 pcf Cohesion: 300 psf Phi: 30 °
Name: MSE Unit Weight: 120 pcf Cohesion: 500 psf Phi: 32 °
Name: Bedding Plane Shear Unit Weight: 115 pcf Cohesion: 30 psf Phi: 9 °
Name: Tps Unit Weight: 125 pcf Cohesion: 400 psf Phi: 33 °
Name: afe Unit Weight: 120 pcf Cohesion: 500 psf Phi: 28 °
Horz Seismic Load: 0.15

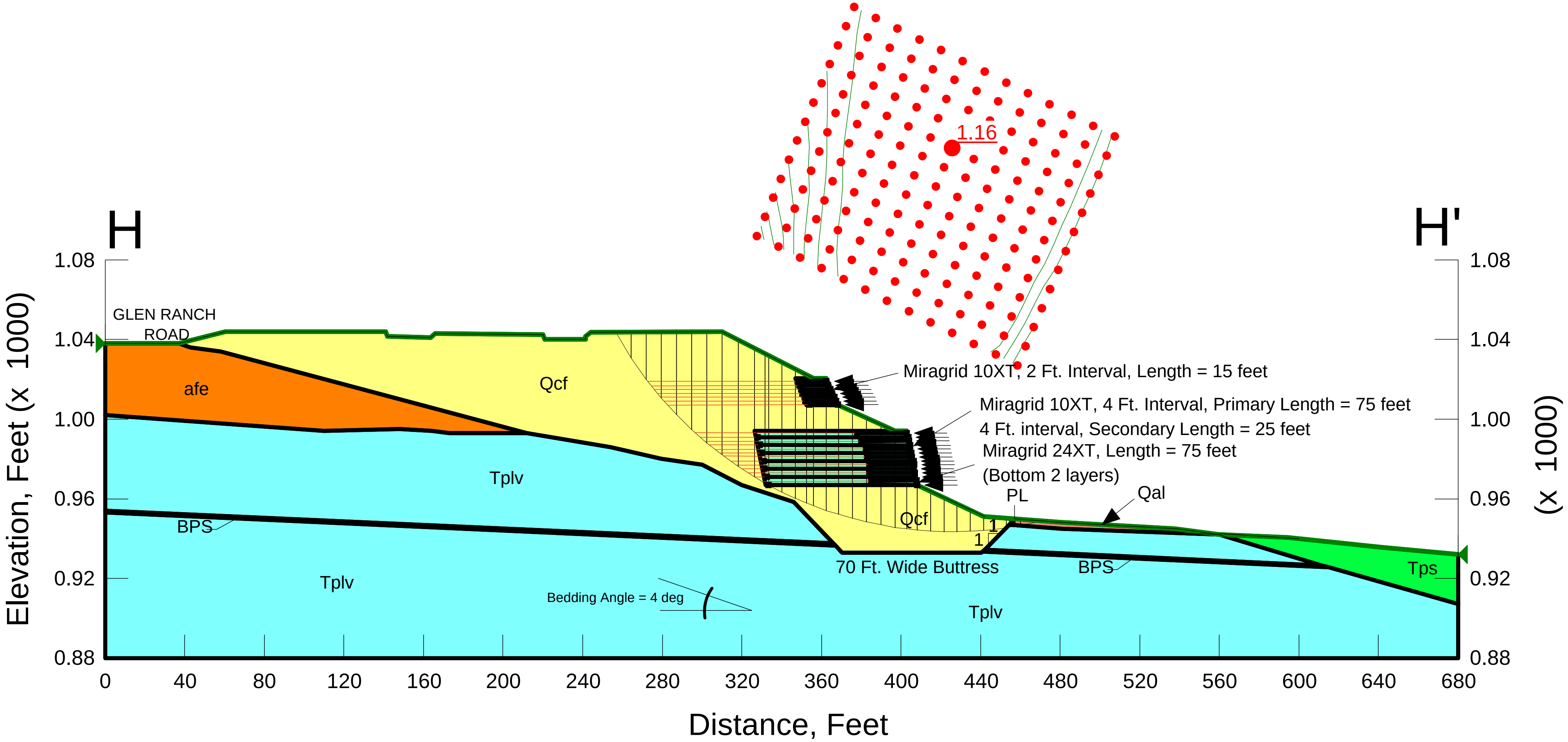


Figure C-15

Project No. G1218-52-01A
Section H-H'
Name: HH-Case 3-1.gsz
Date: 6/21/2012 Time: 2:29:52 PM
Name: Qcf Unit Weight: 120 pcf Cohesion: 500 psf Phi: 28 °
Name: Qal Unit Weight: 120 pcf Cohesion: 500 psf Phi: 23 °
Name: Tplv (2 degrees) Unit Weight: 115 pcf Cohesion: 300 psf Phi: 30 °
Name: MSE Unit Weight: 120 pcf Cohesion: 500 psf Phi: 32 °
Name: Bedding Plane Shear Unit Weight: 115 pcf Cohesion: 30 psf Phi: 9 °
Name: afe Unit Weight: 120 pcf Cohesion: 500 psf Phi: 28 °
Horz Seismic Load: 0

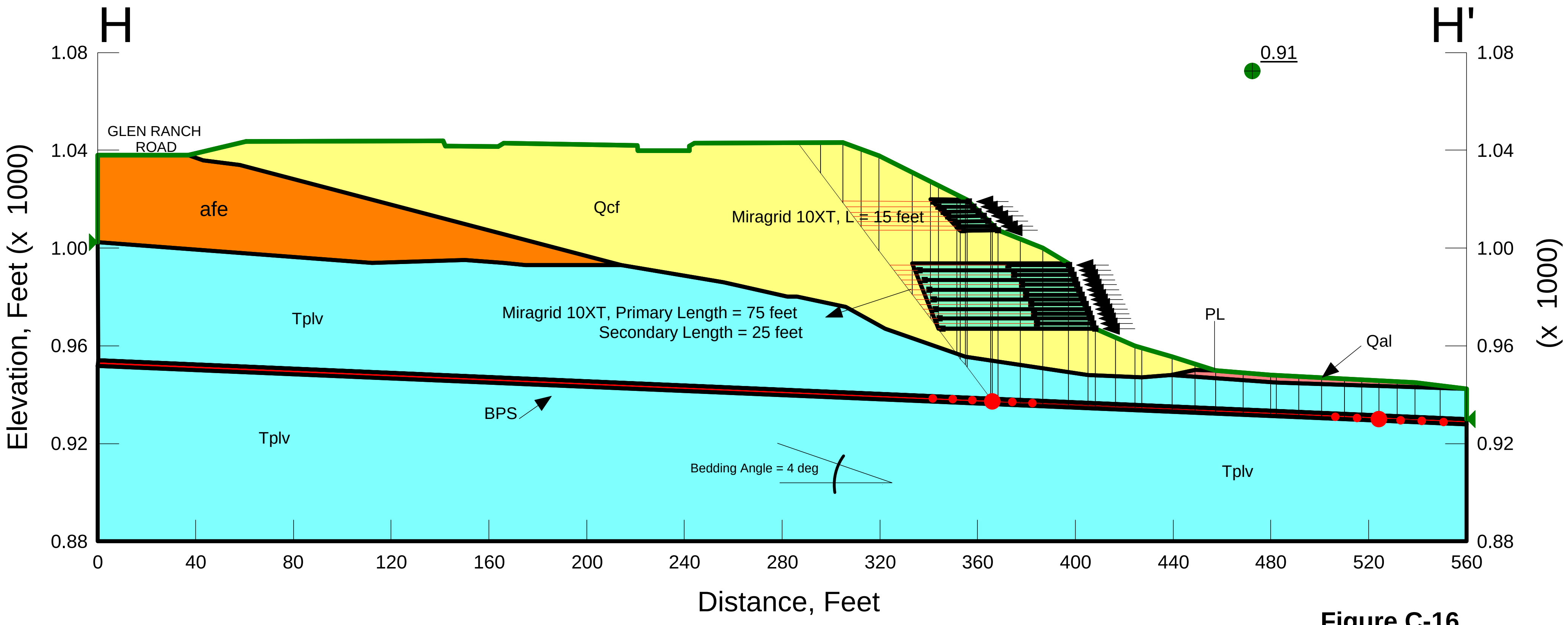


Figure C-16

Portola Center South

Project No. G1218-52-01A

Section H-H'

Name: HH-Case 3.gsz

Date: 6/21/2012 Time: 2:31:50 PM

Name: Qcf Unit Weight: 120 pcf Cohesion: 500 psf Phi: 28 °

Name: Qal Unit Weight: 120 pcf Cohesion: 500 psf Phi: 23 °

Name: Tplv (2 degrees) Unit Weight: 115 pcf Cohesion: 300 psf Phi: 30 °

Name: MSE Unit Weight: 120 pcf Cohesion: 500 psf Phi: 32 °

Name: Bedding Plane Shear Unit Weight: 115 pcf Cohesion: 30 psf Phi: 9 °

Name: Tps Unit Weight: 125 pcf Cohesion: 400 psf Phi: 33 °

Name: afe Unit Weight: 120 pcf Cohesion: 500 psf Phi: 28 °

Horz Seismic Load: 0

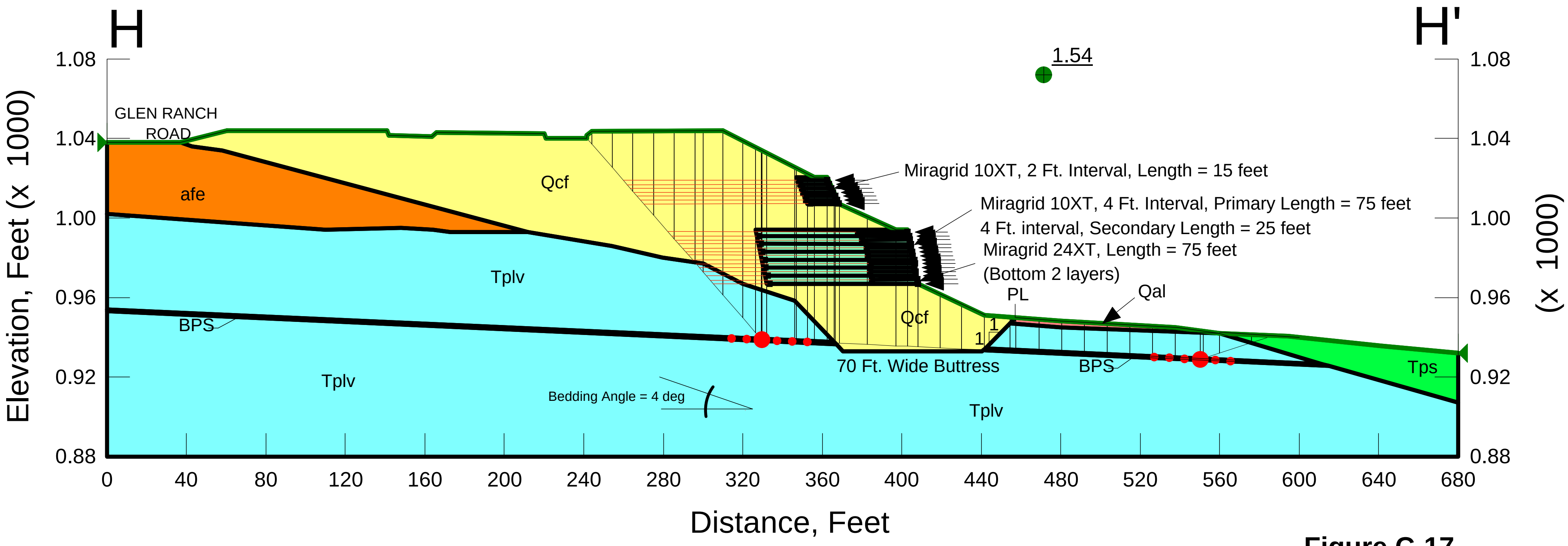


Figure C-17

Portola Center South
Project No. G1218-52-01A
Section H-H'
Name: HH-Case 3s.gsz
Date: 6/21/2012 Time: 2:33:13 PM
Name: Qcf Unit Weight: 120 pcf Cohesion: 500 psf Phi: 28 °
Name: Qal Unit Weight: 120 pcf Cohesion: 500 psf Phi: 23 °
Name: Tplv (2 degrees) Unit Weight: 115 pcf Cohesion: 300 psf Phi: 30 °
Name: MSE Unit Weight: 120 pcf Cohesion: 500 psf Phi: 32 °
Name: Bedding Plane Shear Unit Weight: 115 pcf Cohesion: 30 psf Phi: 9 °
Name: Tps Unit Weight: 125 pcf Cohesion: 400 psf Phi: 33 °
Name: afe Unit Weight: 120 pcf Cohesion: 500 psf Phi: 28 °
Horz Seismic Load: 0.15

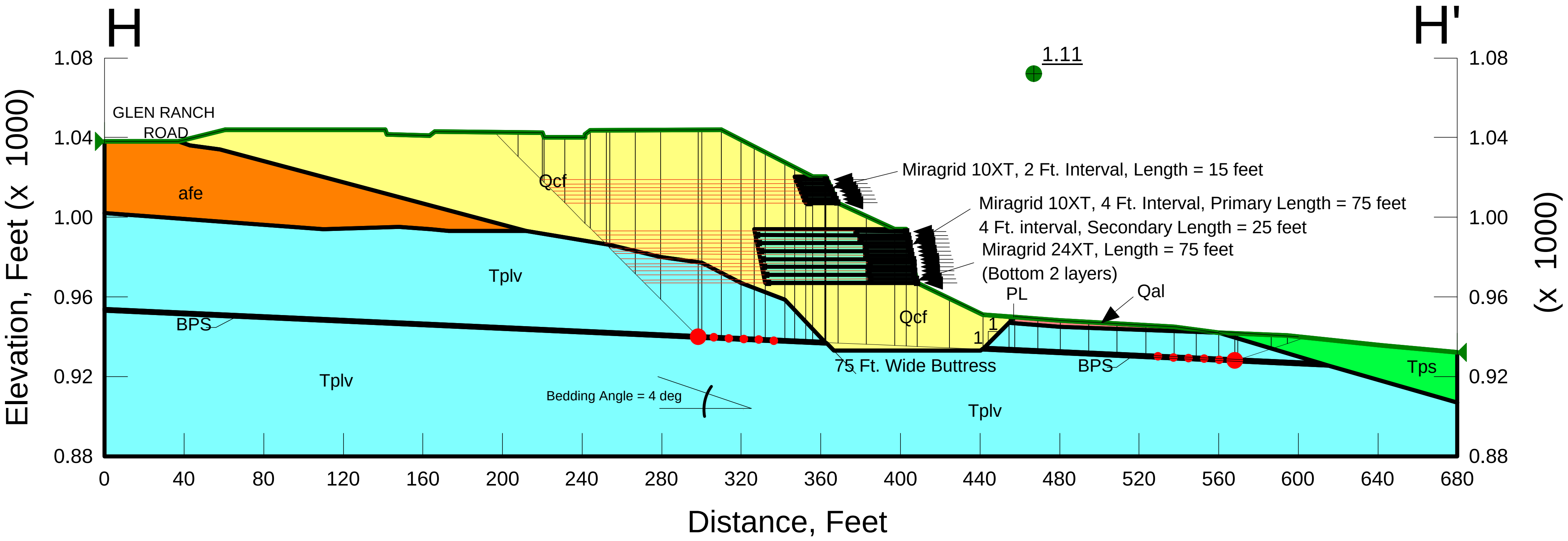


Figure C-18

Portola Center South
Project No. G1218-52-01A
Section I-I'
Name: II-Case 1.gsz
Date: 6/21/2012 Time: 2:34:37 PMue}

Name: Qcf	Unit Weight: 120 pcf	Cohesion: 500 psf	Phi: 28 °
Name: Qal	Unit Weight: 120 pcf	Cohesion: 500 psf	Phi: 23 °
Name: Tps	Unit Weight: 125 pcf	Cohesion: 400 psf	Phi: 33 °
Name: MSE	Unit Weight: 120 pcf	Cohesion: 500 psf	Phi: 32 °
Name: Tco	Unit Weight: 125 pcf	Cohesion: 400 psf	Phi: 33 °
Name: afe	Unit Weight: 120 pcf	Cohesion: 500 psf	Phi: 28 °

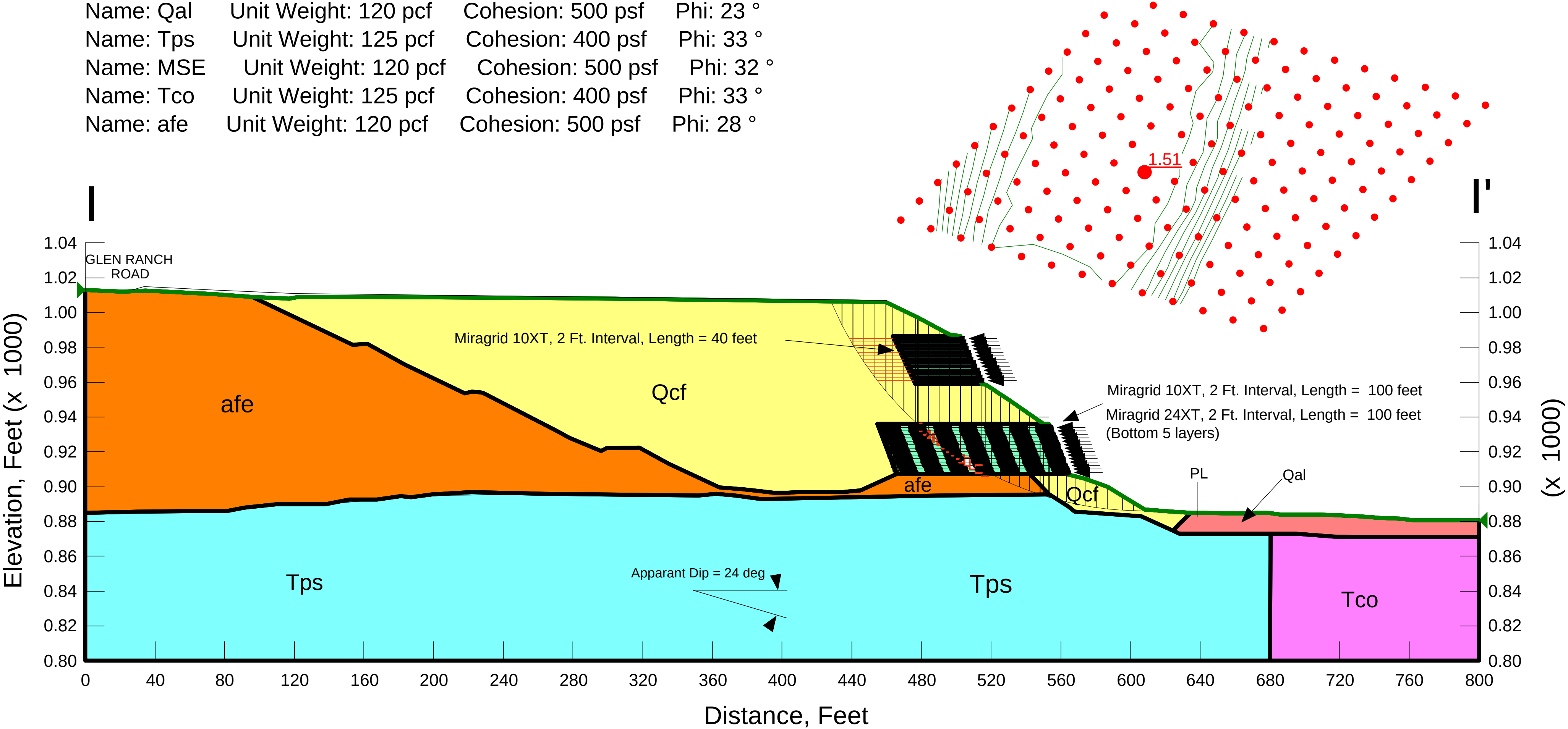


Figure C-19

Portola Center South
Project No. G1218-52-01A
Section I-I'
Name: II-Case 2.gsz
Date: 6/21/2012 Time: 2:35:59 PM
Name: Qcf Unit Weight: 120 pcf Cohesion: 500 psf Phi: 28 °
Name: Qal Unit Weight: 120 pcf Cohesion: 500 psf Phi: 23 °
Name: Tps Unit Weight: 125 pcf Cohesion: 400 psf Phi: 33 °
Name: MSE Unit Weight: 120 pcf Cohesion: 500 psf Phi: 32 °
Name: Tco Unit Weight: 125 pcf Cohesion: 400 psf Phi: 33 °
Name: afe Unit Weight: 120 pcf Cohesion: 500 psf Phi: 28 °

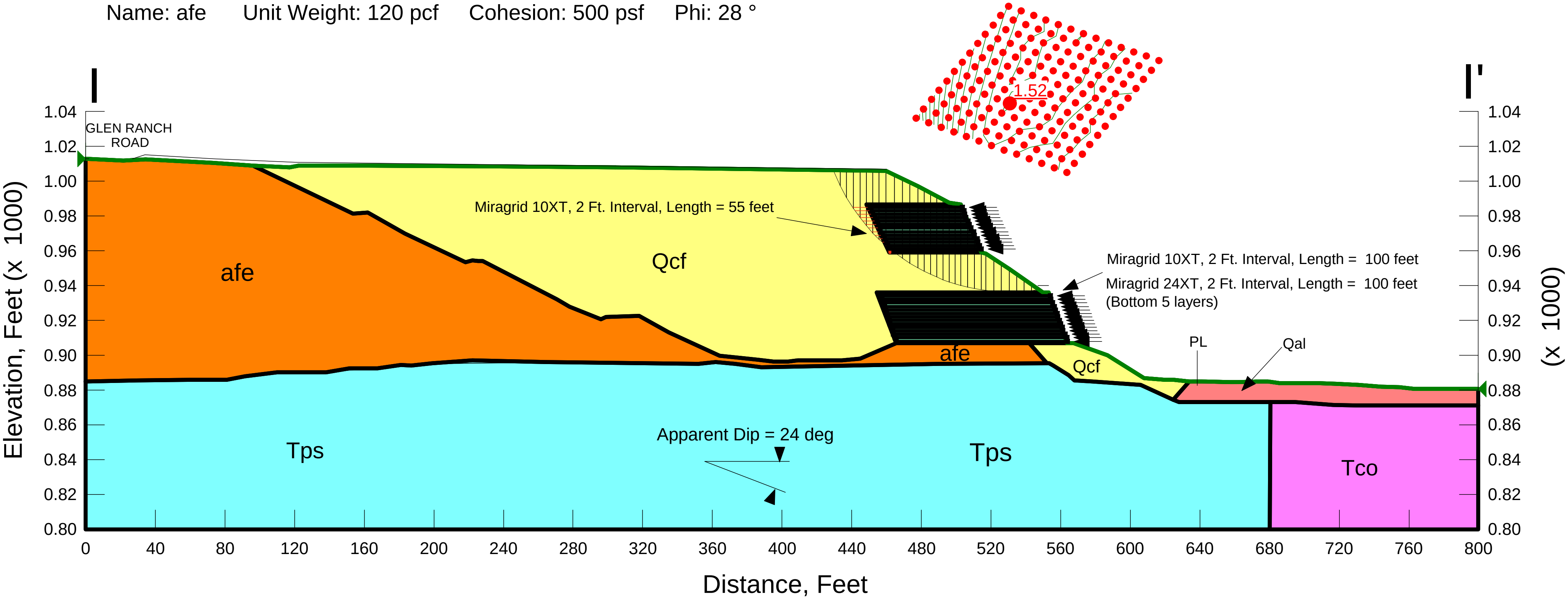


Figure C-20

Portola Center South
Project No. G1218-52-01A
Section I-I'
Name: II-Case 1s.gsz
Date: 6/21/2012 Time: 2:37:32 PM
Name: Qcf Unit Weight: 120 pcf Cohesion: 500 psf Phi: 28 °
Name: Qal Unit Weight: 120 pcf Cohesion: 500 psf Phi: 23 °
Name: Tps Unit Weight: 125 pcf Cohesion: 400 psf Phi: 33 °
Name: MSE Unit Weight: 120 pcf Cohesion: 500 psf Phi: 32 °
Name: Tco Unit Weight: 125 pcf Cohesion: 400 psf Phi: 33 °
Name: afe Unit Weight: 120 pcf Cohesion: 500 psf Phi: 28 °

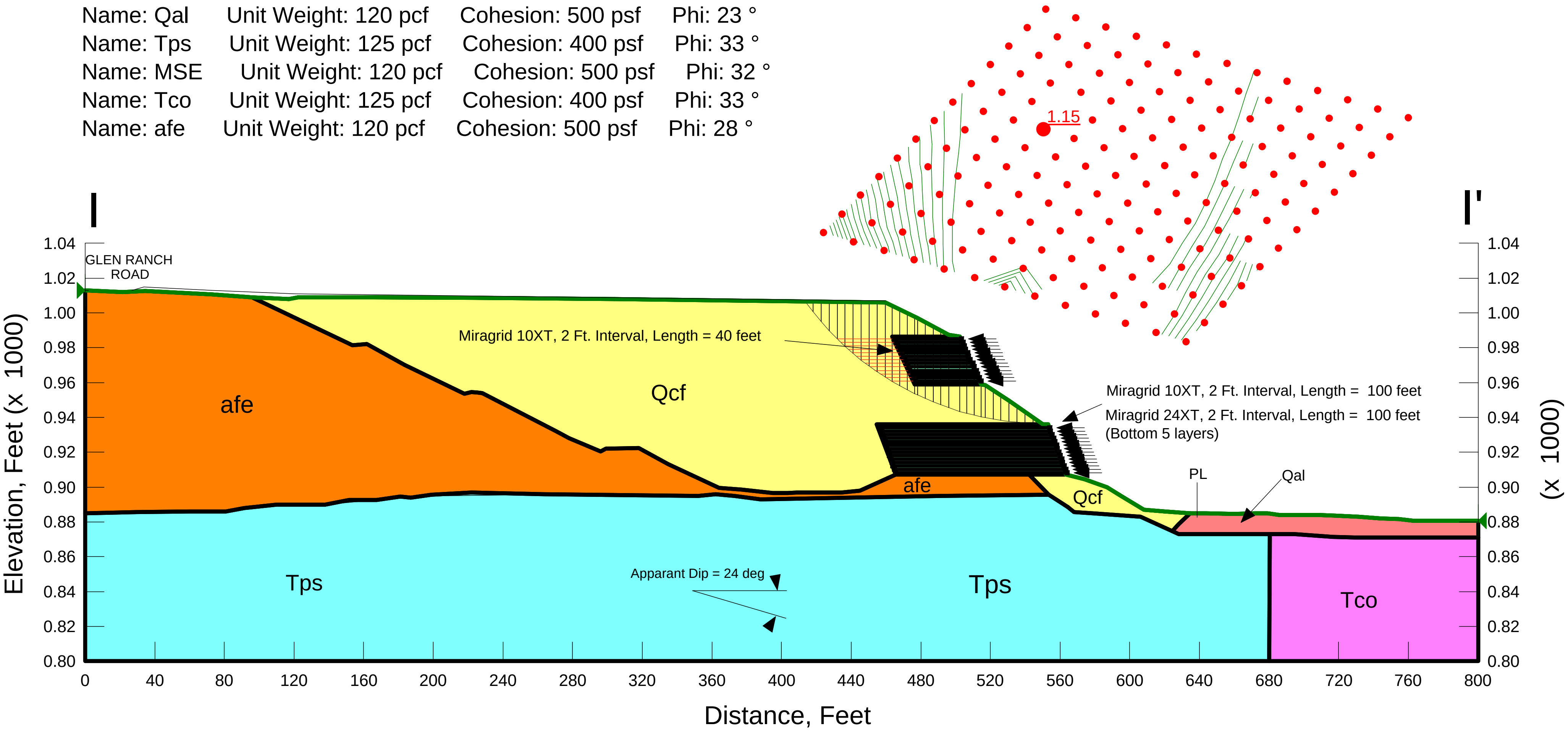


Figure C-21

Portola Center South
Project No. G1218-52-01A
Section I-I'
Name: II-Case 2-1.gsz
Date: 6/21/2012 Time: 2:38:54 PM
Name: Qcf Unit Weight: 120 pcf Cohesion: 500 psf Phi: 28 °
Name: Qal Unit Weight: 120 pcf Cohesion: 500 psf Phi: 23 °
Name: Tps Unit Weight: 125 pcf Cohesion: 400 psf Phi: 33 °
Name: MSE Unit Weight: 120 pcf Cohesion: 500 psf Phi: 32 °
Name: Tco Unit Weight: 125 pcf Cohesion: 400 psf Phi: 33 °
Name: afe Unit Weight: 120 pcf Cohesion: 500 psf Phi: 28 °
Horz Seismic Load: 0

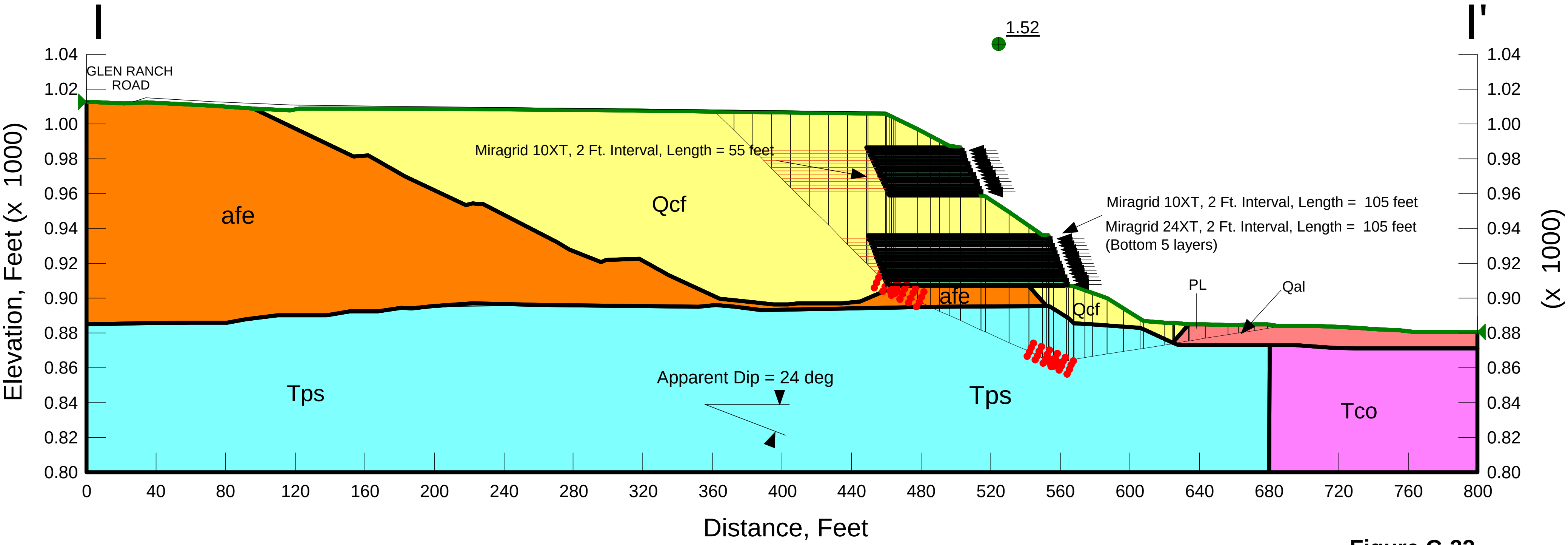


Figure C-22

Portola Center South
Project No. G1218-52-01A
Section I-I'
Name: II-Case 2s-1.gsz
Date: 6/21/2012 Time: 2:40:41 PM
Name: Qcf Unit Weight: 120 pcf Cohesion: 500 psf Phi: 28 °
Name: Qal Unit Weight: 120 pcf Cohesion: 500 psf Phi: 23 °
Name: Tps Unit Weight: 125 pcf Cohesion: 400 psf Phi: 33 °
Name: MSE Unit Weight: 120 pcf Cohesion: 500 psf Phi: 32 °
Name: Tco Unit Weight: 125 pcf Cohesion: 400 psf Phi: 33 °
Name: afe Unit Weight: 120 pcf Cohesion: 500 psf Phi: 28 °
Horz Seismic Load: 0.15

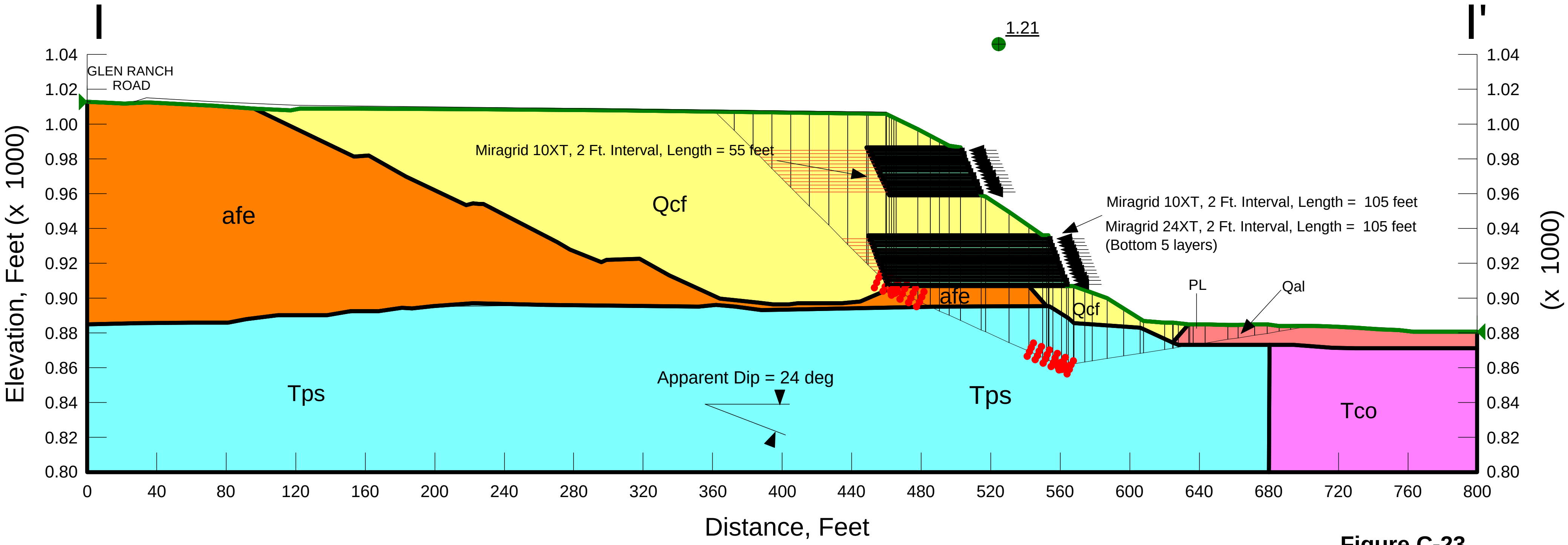


Figure C-23

Portola Center South
Project No. G1218-52-01A
Section L-L'
Name: LL-Case 1.gsz
Date: 6/12/2012 Time: 3:00:25 PM
Name: Qcf Unit Weight: 120 pcf Cohesion: 500 psf Phi: 28 °
Name: Tps-slt (8 degrees) Unit Weight: 115 pcf Cohesion: 300 psf Phi: 30 °
Name: Bedding Plane Shear Unit Weight: 115 pcf Cohesion: 30 psf Phi: 9 °
Name: MSE Unit Weight: 120 pcf Cohesion: 500 psf Phi: 32 °
Name: Qal Unit Weight: 120 pcf Cohesion: 500 psf Phi: 23 °
Name: Tps Unit Weight: 125 pcf Cohesion: 400 psf Phi: 33 °

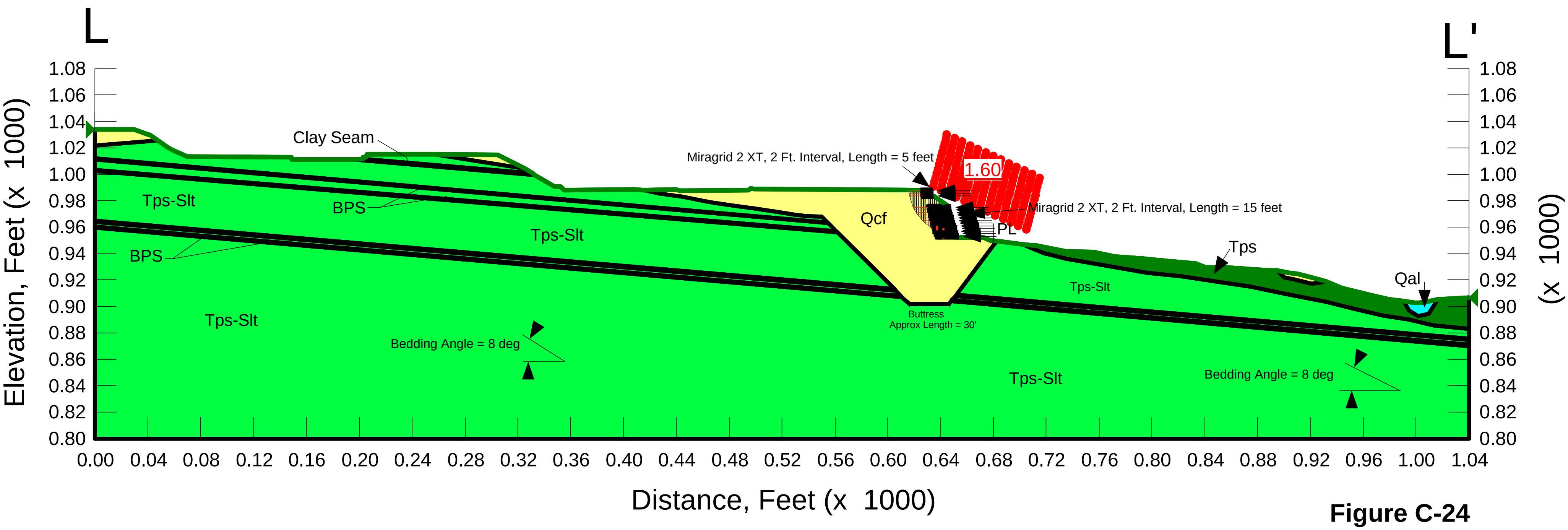


Figure C-24

Portola Center South
Project No. G1218-52-01A
Section L-L'
Name: LL-Case 1s.gsz
Date: 6/19/2012 Time: 3:20:40 PM
Name: Qcf Unit Weight: 120 pcf Cohesion: 500 psf Phi: 28 °
Name: Tps-slt (8 degrees) Unit Weight: 115 pcf Cohesion: 300 psf Phi: 30 °
Name: Bedding Plane Shear Unit Weight: 115 pcf Cohesion: 30 psf Phi: 9 °
Name: MSE Unit Weight: 120 pcf Cohesion: 500 psf Phi: 32 °
Name: Qal Unit Weight: 120 pcf Cohesion: 500 psf Phi: 23 °
Name: Tps Unit Weight: 125 pcf Cohesion: 400 psf Phi: 33 °
Horz Seismic Load: 0.15

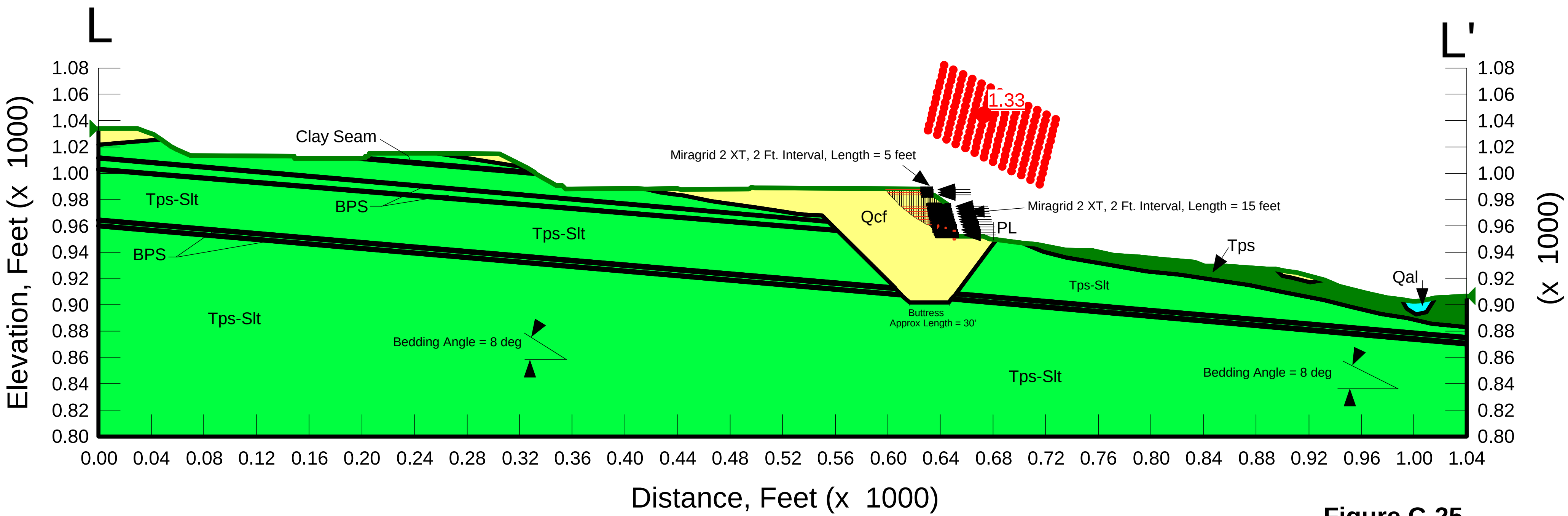


Figure C-25

Portola Center South
Project No. G1218-52-01A
Section L-L'
Name: LL-Case 4.gsz
Date: 6/12/2012 Time: 3:17:15 PM
Name: Qcf Unit Weight: 120 pcf Cohesion: 500 psf Phi: 28 °
Name: Tps-slt (8 degrees) Unit Weight: 115 pcf Cohesion: 300 psf Phi: 30 °
Name: Bedding Plane Shear Unit Weight: 115 pcf Cohesion: 30 psf Phi: 9 °
Name: MSE Unit Weight: 120 pcf Cohesion: 500 psf Phi: 32 °
Name: Qal Unit Weight: 120 pcf Cohesion: 500 psf Phi: 23 °
Name: Tps Unit Weight: 125 pcf Cohesion: 400 psf Phi: 33 °

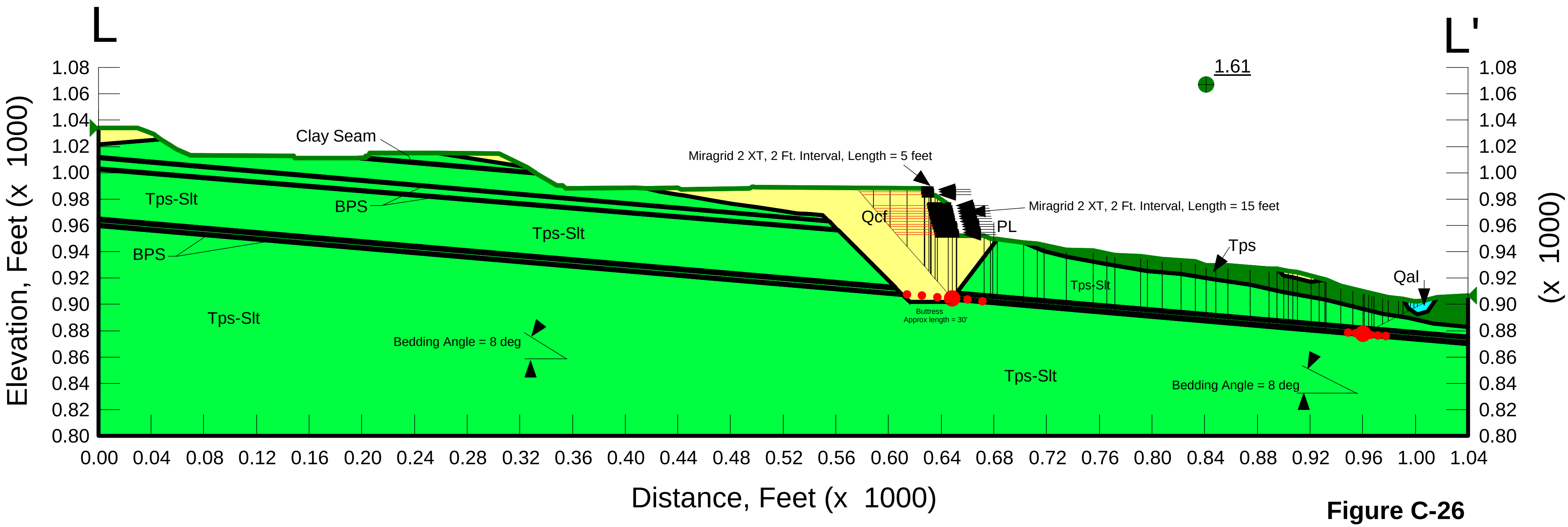


Figure C-26

Portola Center South
Project No. G1218-52-01A
Section L-L'
Name: LL-Case 2.gsz
Date: 6/12/2012 Time: 3:19:13 PM
Name: Qcf Unit Weight: 120 pcf Cohesion: 500 psf Phi: 28 °
Name: Tps-slt (8 degrees) Unit Weight: 115 pcf Cohesion: 300 psf Phi: 30 °
Name: Bedding Plane Shear Unit Weight: 115 pcf Cohesion: 30 psf Phi: 9 °
Name: MSE Unit Weight: 120 pcf Cohesion: 500 psf Phi: 32 °
Name: Qal Unit Weight: 120 pcf Cohesion: 500 psf Phi: 23 °
Name: Tps Unit Weight: 125 pcf Cohesion: 400 psf Phi: 33 °

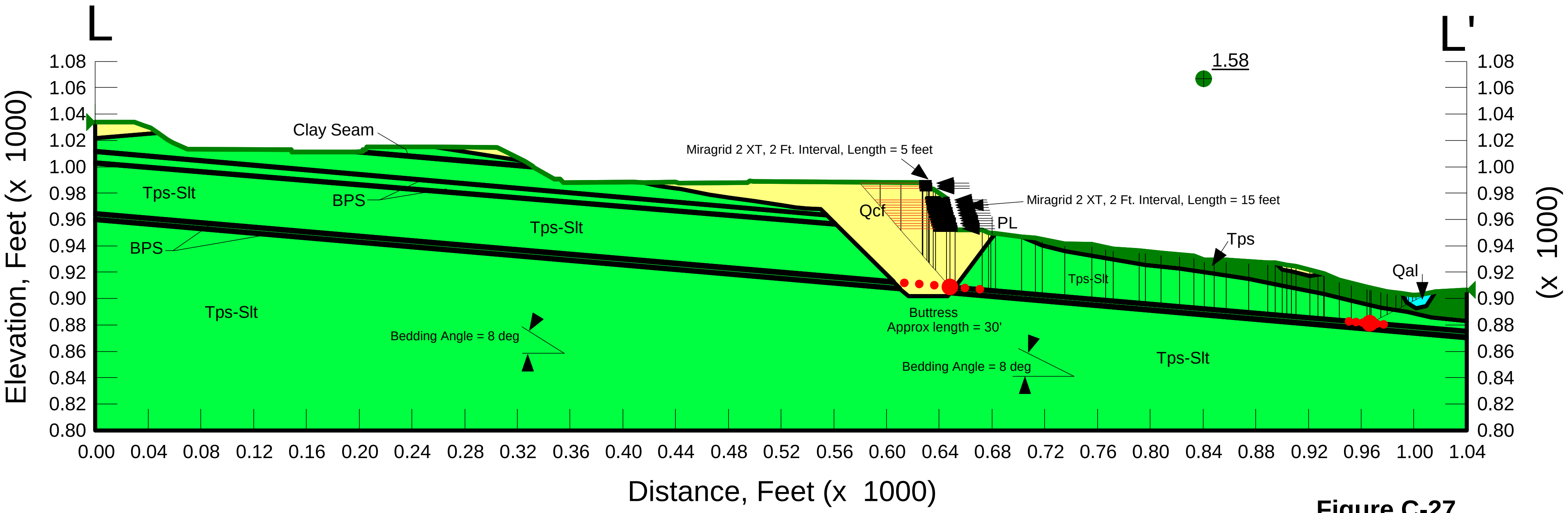


Figure C-27

Portola Center South
Project No. G1218-52-01A
Section L-L'
Name: LL-Case 3s.gsz
Date: 6/22/2012 Time: 10:36:28 AM
Name: Qcf Unit Weight: 120 pcf Cohesion: 500 psf Phi: 28 °
Name: Tps-slt (8 degrees) Unit Weight: 115 pcf Cohesion: 300 psf Phi: 30 °
Name: Bedding Plane Shear Unit Weight: 115 pcf Cohesion: 30 psf Phi: 9 °
Name: MSE Unit Weight: 120 pcf Cohesion: 500 psf Phi: 32 °
Name: Qal Unit Weight: 120 pcf Cohesion: 500 psf Phi: 23 °
Name: Tps Unit Weight: 125 pcf Cohesion: 400 psf Phi: 33 °
Horz Seismic Load: 0.15

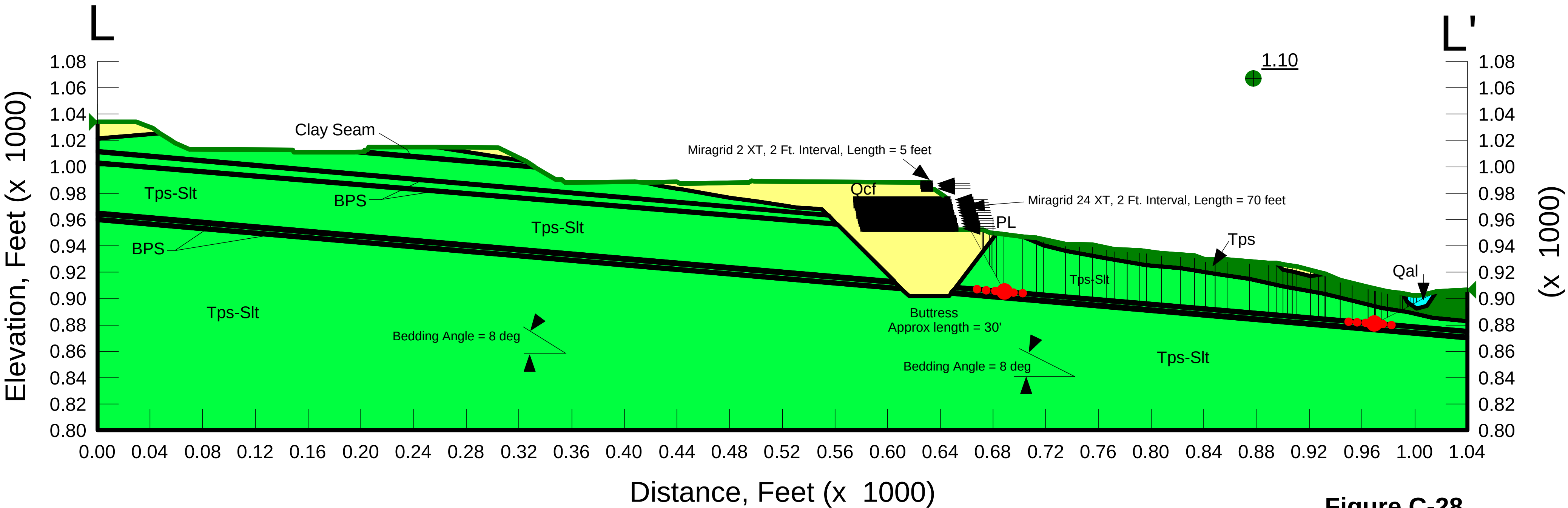


Figure C-28

Portola Center South
Project No. G1218-52-01A
Section L-L'
Name: LL-Case 3s.gsz
Date: 6/22/2012 Time: 10:58:56 AM
Name: Qcf Unit Weight: 120 pcf Cohesion: 500 psf Phi: 28 °
Name: Tps-slt (8 degrees) Unit Weight: 115 pcf Cohesion: 300 psf Phi: 30 °
Name: Bedding Plane Shear Unit Weight: 115 pcf Cohesion: 30 psf Phi: 9 °
Name: MSE Unit Weight: 120 pcf Cohesion: 500 psf Phi: 32 °
Name: Qal Unit Weight: 120 pcf Cohesion: 500 psf Phi: 23 °
Name: Tps Unit Weight: 125 pcf Cohesion: 400 psf Phi: 33 °
Horz Seismic Load: 0.15

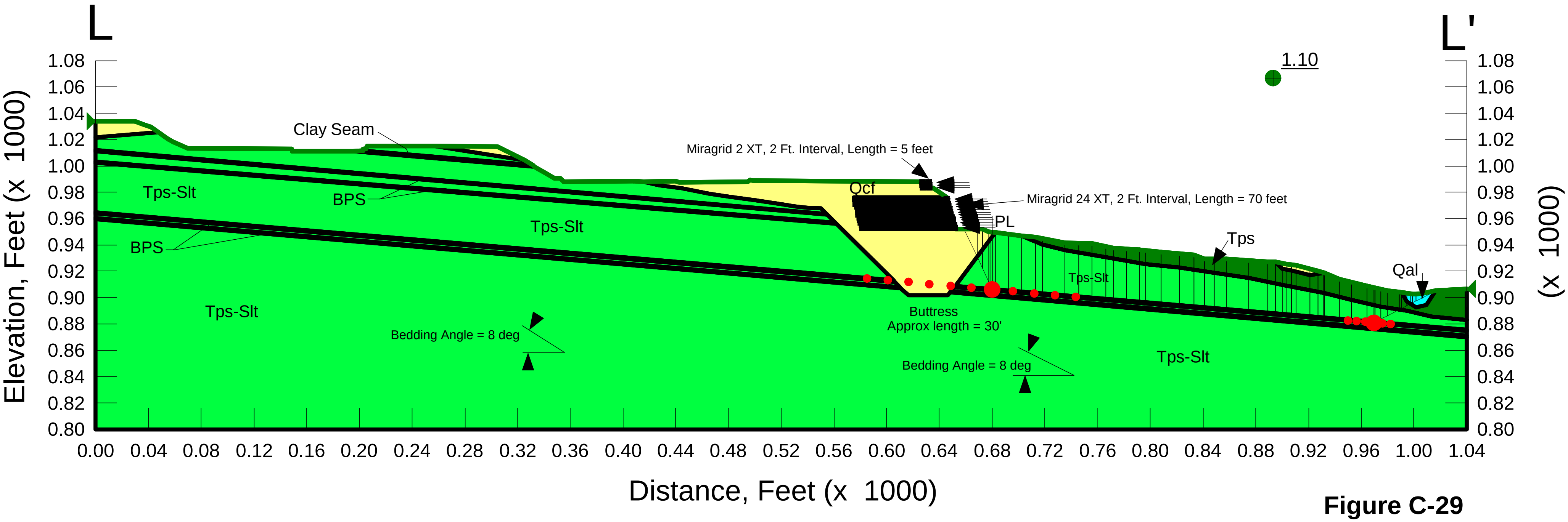


Figure C-29

Project No. G1218-52-01A
Section L-L'
Name: LL-Case 5.gsz
Date: 6/22/2012 Time: 10:43:32 AM
Name: Qcf Unit Weight: 120 pcf Cohesion: 500 psf Phi: 28 °
Name: Tps-slt (8 degrees) Unit Weight: 115 pcf Cohesion: 300 psf Phi: 30 °
Name: Bedding Plane Shear Unit Weight: 115 pcf Cohesion: 30 psf Phi: 9 °
Name: MSE Unit Weight: 120 pcf Cohesion: 500 psf Phi: 32 °
Name: Qal Unit Weight: 120 pcf Cohesion: 500 psf Phi: 23 °
Name: Tps Unit Weight: 125 pcf Cohesion: 400 psf Phi: 33 °
Horz Seismic Load: 0

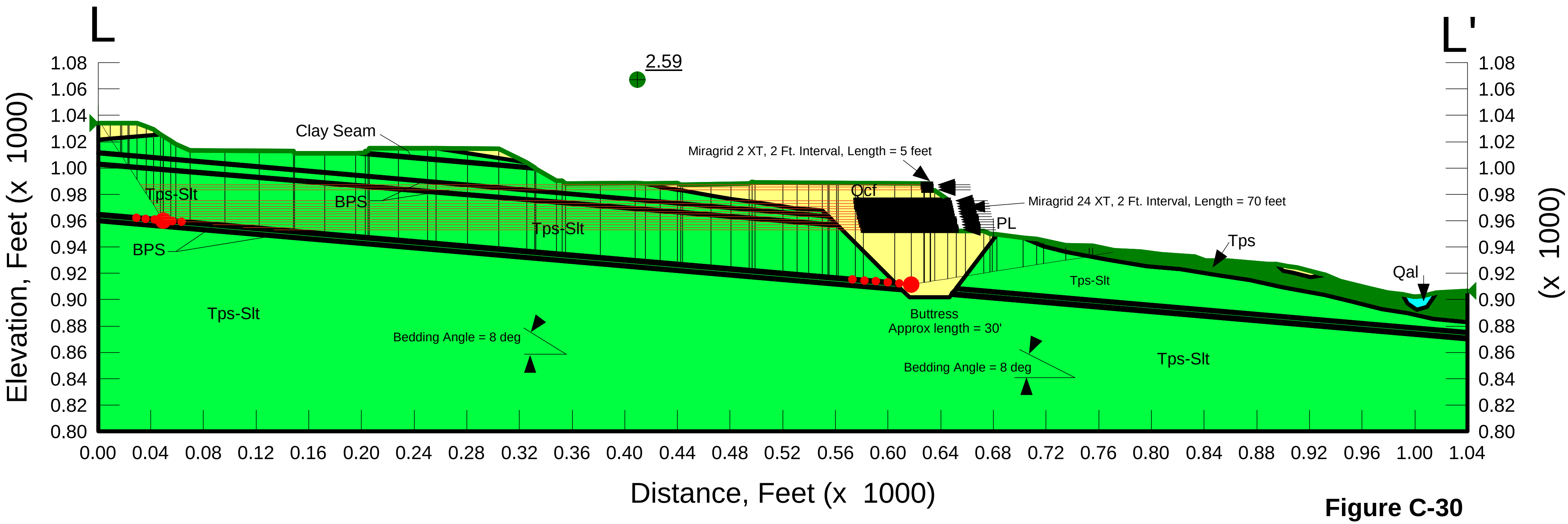


Figure C-30

Portola Center South
Project No. G1218-52-01A
Section M-M'
Name: MM-Case 2.gsz
Date: 6/19/2012 Time: 4:33:18 PM
Description: Qcf C: 0psf Phi: 28deg. Wt: 120pcf
Description: Qal C: 0psf Phi: 23deg. Wt: 120pcf
Description: Tps C: 0psf Phi: 33deg. Wt: 125pcf
Description: Tplv (14 degrees) C: 0psf Phi: 30deg. Wt: 115pcf (Along Bedding - C: 250psf Phi: 24deg)
Description: MSE C: 0psf Phi: 32deg. Wt: 120pcf

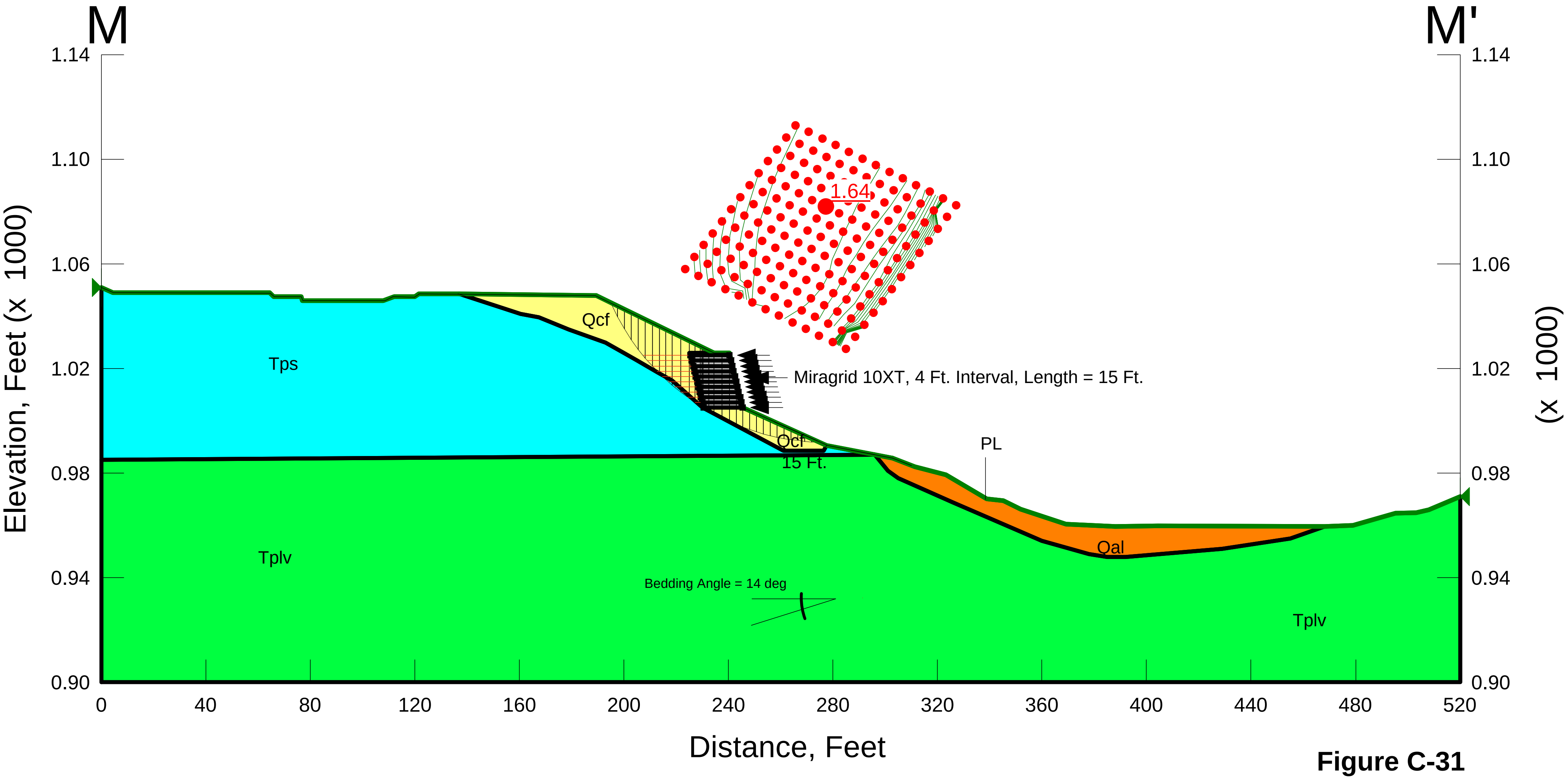


Figure C-31

Portola Center South
Project No. G1218-52-01A
Section M-M'
Name: MM-Case 2s.gsz
Date: 6/19/2012 Time: 4:37:03 PM
Name: Qcf Unit Weight: 120 pcf Cohesion: 500 psf Phi: 28 °
Name: Qal Unit Weight: 120 pcf Cohesion: 500 psf Phi: 23 °
Name: Tps Unit Weight: 125 pcf Cohesion: 400 psf Phi: 33 °
Name: Tplv (14 degrees) Unit Weight: 115 pcf Cohesion: 300 psf Phi: 30 °
Name: MSE Unit Weight: 120 pcf Cohesion: 500 psf Phi: 32 °
Horz Seismic Load: 0.15

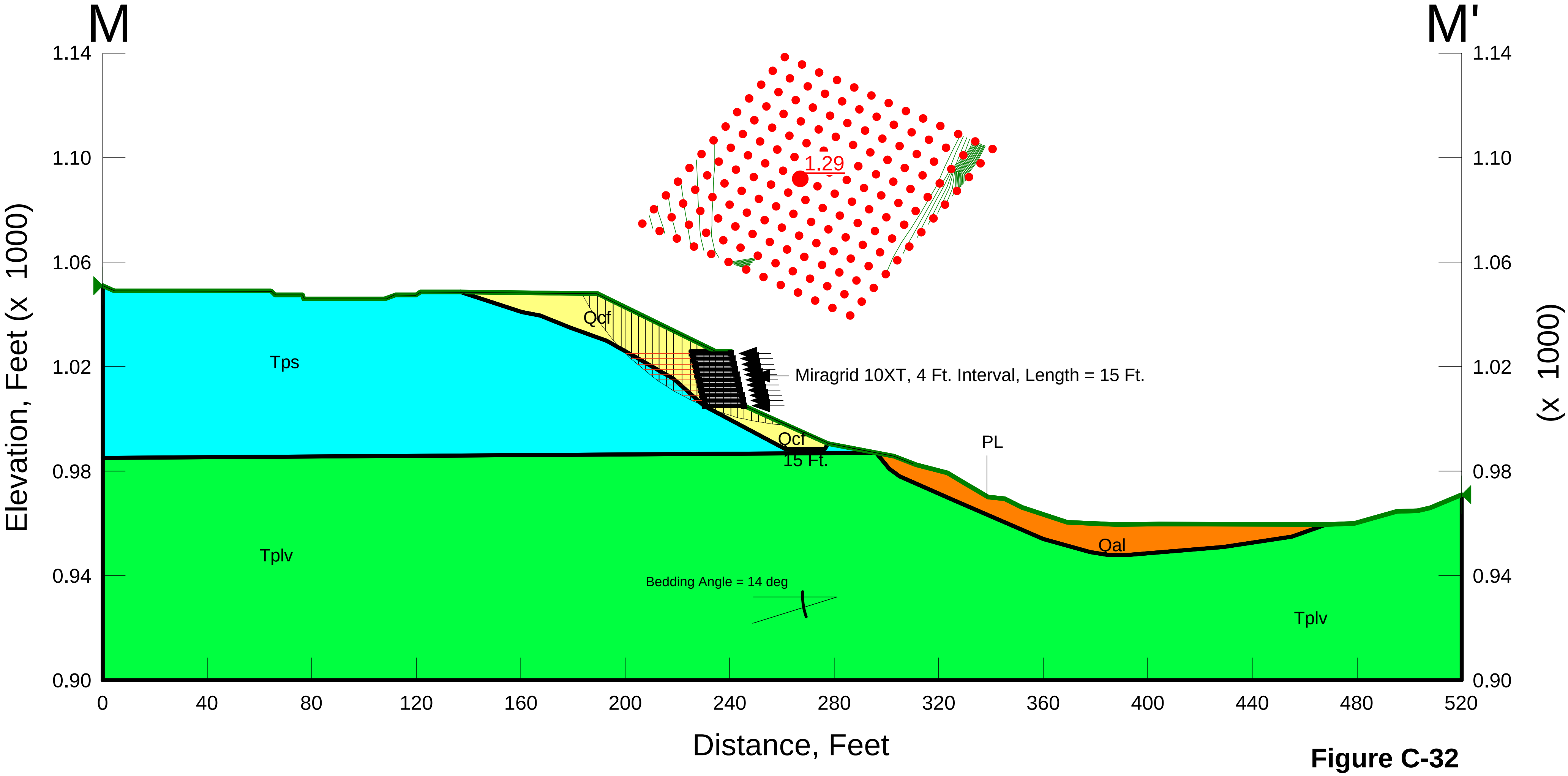


Figure C-32

Portola Center South
Project No. G1218-52-01A
Section N-N'
Name: NN-Case 1.gsz
Date: 6/21/2012 Time: 8:59:46 AM

Name: Qcf	Unit Weight: 120 pcf	Cohesion: 500 psf	Phi: 28 °
Name: Qal	Unit Weight: 120 pcf	Cohesion: 500 psf	Phi: 23 °
Name: Tplv (13 degrees)	Unit Weight: 115 pcf	Cohesion: 300 psf	Phi: 30 °
Name: Bedding Plane Shear	Unit Weight: 115 pcf	Cohesion: 30 psf	Phi: 9 °
Name: MSE	Unit Weight: 120 pcf	Cohesion: 500 psf	Phi: 32 °

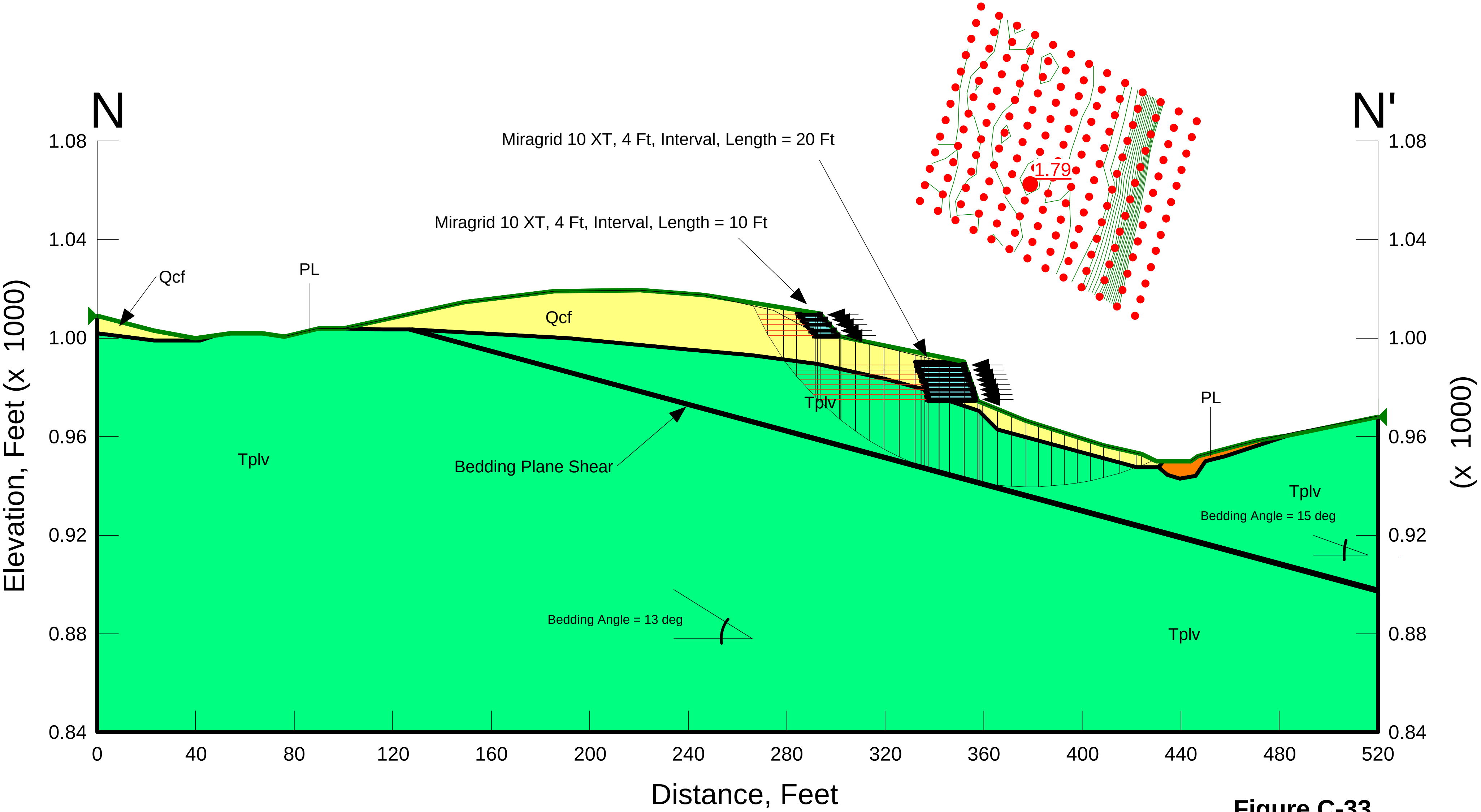


Figure C-33

Portola Center South
Project No. G1218-52-01A
Section N-N'
Name: NN-Case2.gsz
Date: 6/21/2012 Time: 9:01:19 AM
Name: Qcf Unit Weight: 120 pcf Cohesion: 500 psf Phi: 28 °
Name: Qal Unit Weight: 120 pcf Cohesion: 500 psf Phi: 23 °
Name: Tplv (13 degrees) Unit Weight: 115 pcf Cohesion: 300 psf Phi: 30 °
Name: Bedding Plane Shear Unit Weight: 115 pcf Cohesion: 30 psf Phi: 9 °
Name: MSE Unit Weight: 120 pcf Cohesion: 500 psf Phi: 32 °

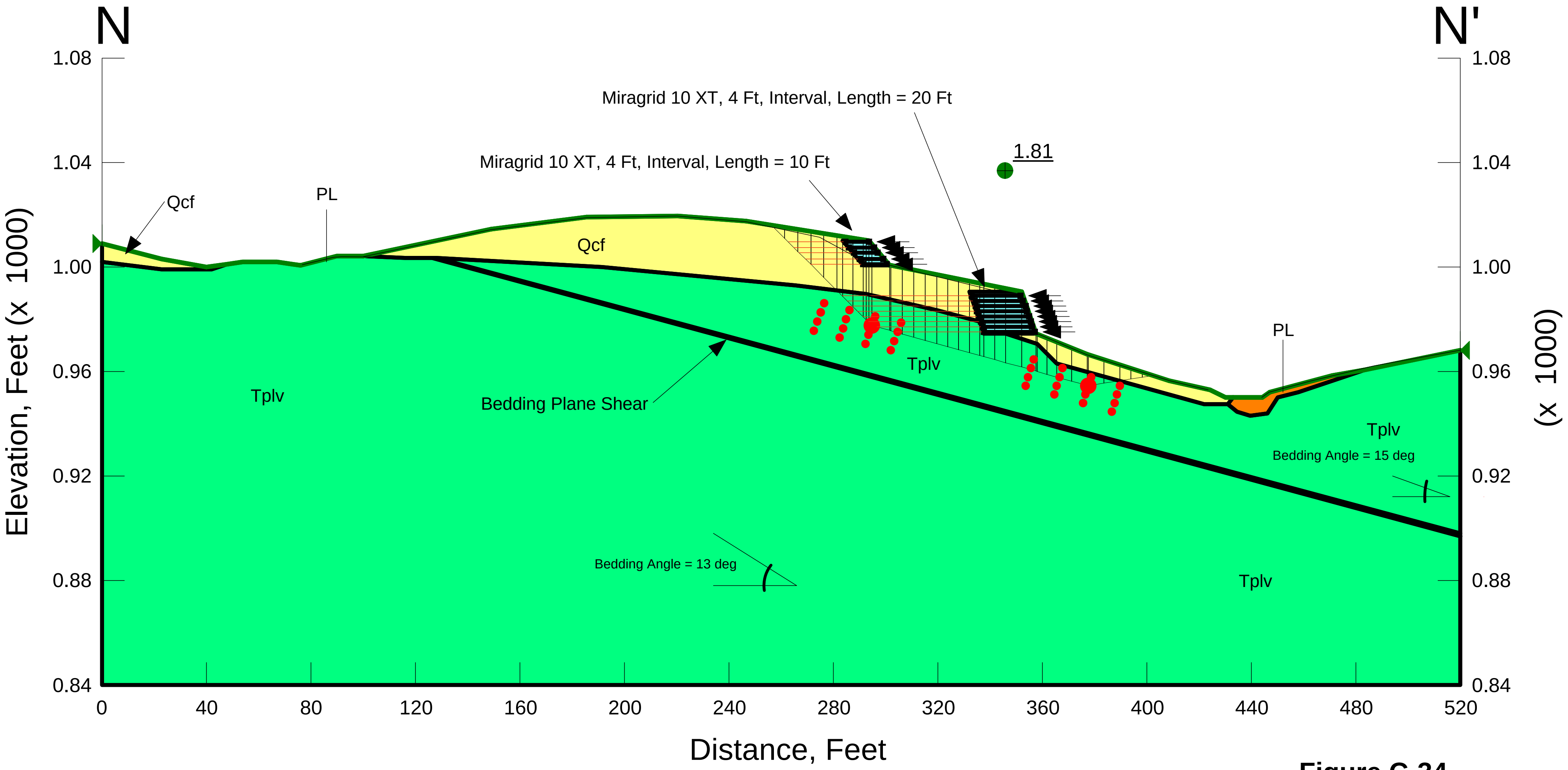


Figure C-34

Portola Center South
Project No. G1218-52-01A
Section N-N'
Name: NN-Case3.gsz
Date: 6/21/2012 Time: 8:58:53 AM
Name: Qcf Unit Weight: 120 pcf Cohesion: 500 psf Phi: 28 °
Name: Qal Unit Weight: 120 pcf Cohesion: 500 psf Phi: 23 °
Name: Tplv (13 degrees) Unit Weight: 115 pcf Cohesion: 300 psf Phi: 30 °
Name: Bedding Plane Shear Unit Weight: 115 pcf Cohesion: 30 psf Phi: 9 °
Name: MSE Unit Weight: 120 pcf Cohesion: 500 psf Phi: 32 °

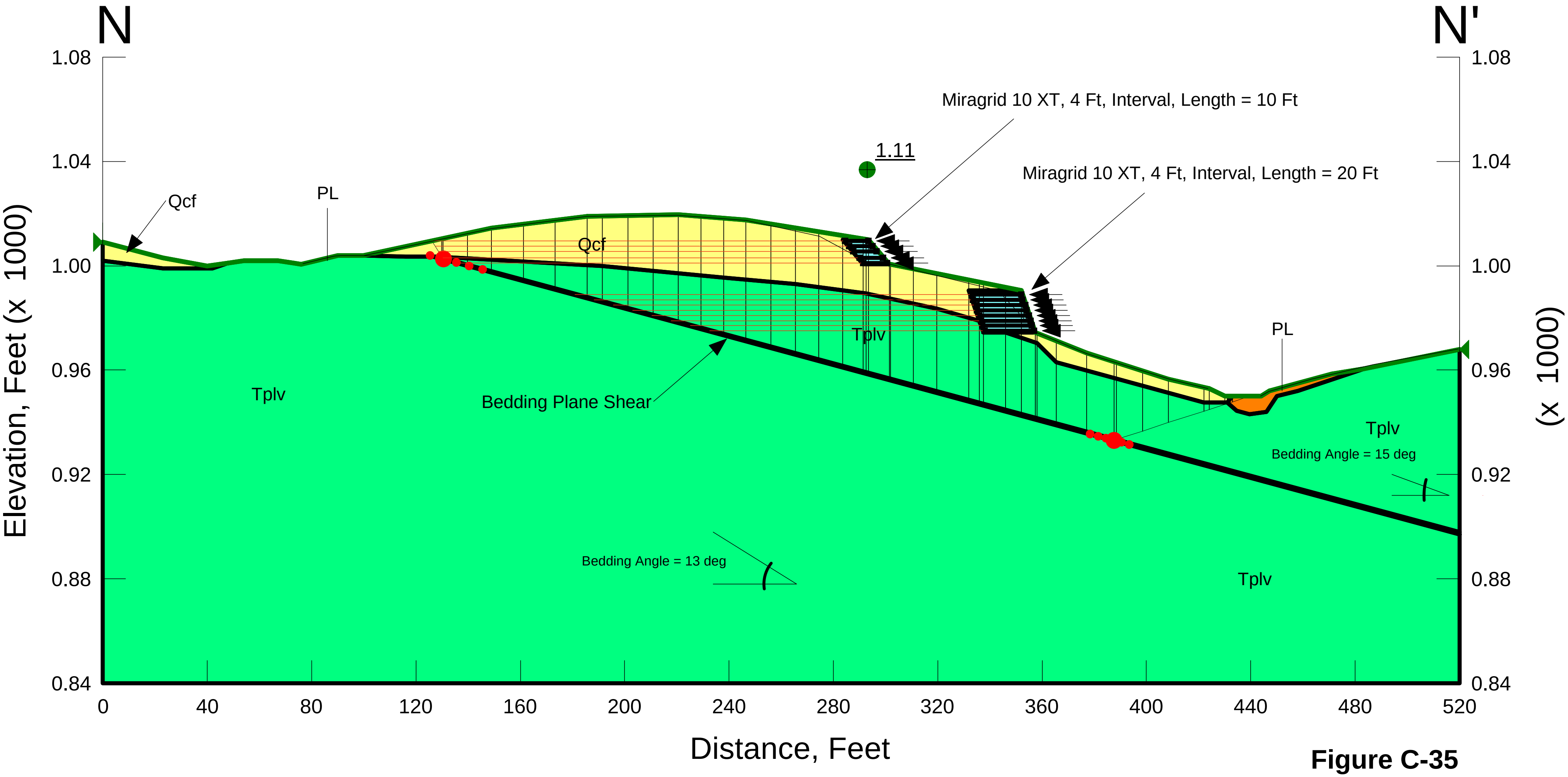


Figure C-35

Portola Center
Project No. A8494-06-01
Section N-N'
Name: NN-Case5.gsz
Date: 6/21/2012 Time: 1:50:43 PM
Name: Qcf Unit Weight: 120 pcf Cohesion: 500 psf Phi: 28 °
Name: Qal Unit Weight: 120 pcf Cohesion: 500 psf Phi: 23 °
Name: Tplv (13 degrees) Unit Weight: 115 pcf Cohesion: 300 psf Phi: 30 °
Name: Bedding Plane Shear Unit Weight: 115 pcf Cohesion: 30 psf Phi: 9 °

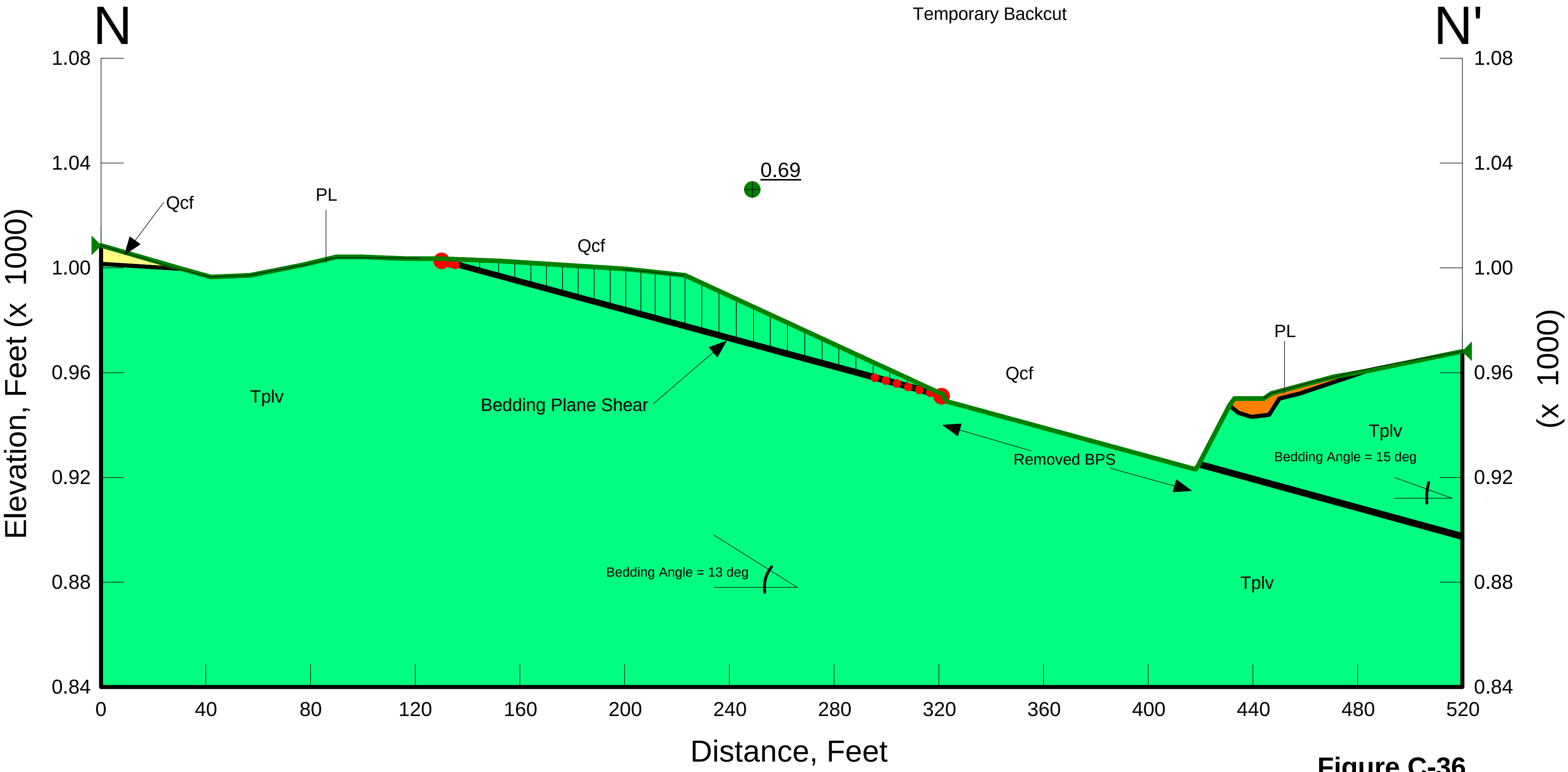


Figure C-36

Portola Center South
Project No. G1218-52-01A
Section N-N'
Name: NN-Case6-1.gsz
Date: 6/21/2012 Time: 9:03:37 AM

Name: Qcf	Unit Weight: 120 pcf	Cohesion: 500 psf	Phi: 28 °
Name: Qal	Unit Weight: 120 pcf	Cohesion: 500 psf	Phi: 23 °
Name: Tplv (13 degrees)	Unit Weight: 115 pcf	Cohesion: 300 psf	Phi: 30 °
Name: Bedding Plane Shear	Unit Weight: 115 pcf	Cohesion: 30 psf	Phi: 9 °
Name: MSE	Unit Weight: 120 pcf	Cohesion: 500 psf	Phi: 32 °

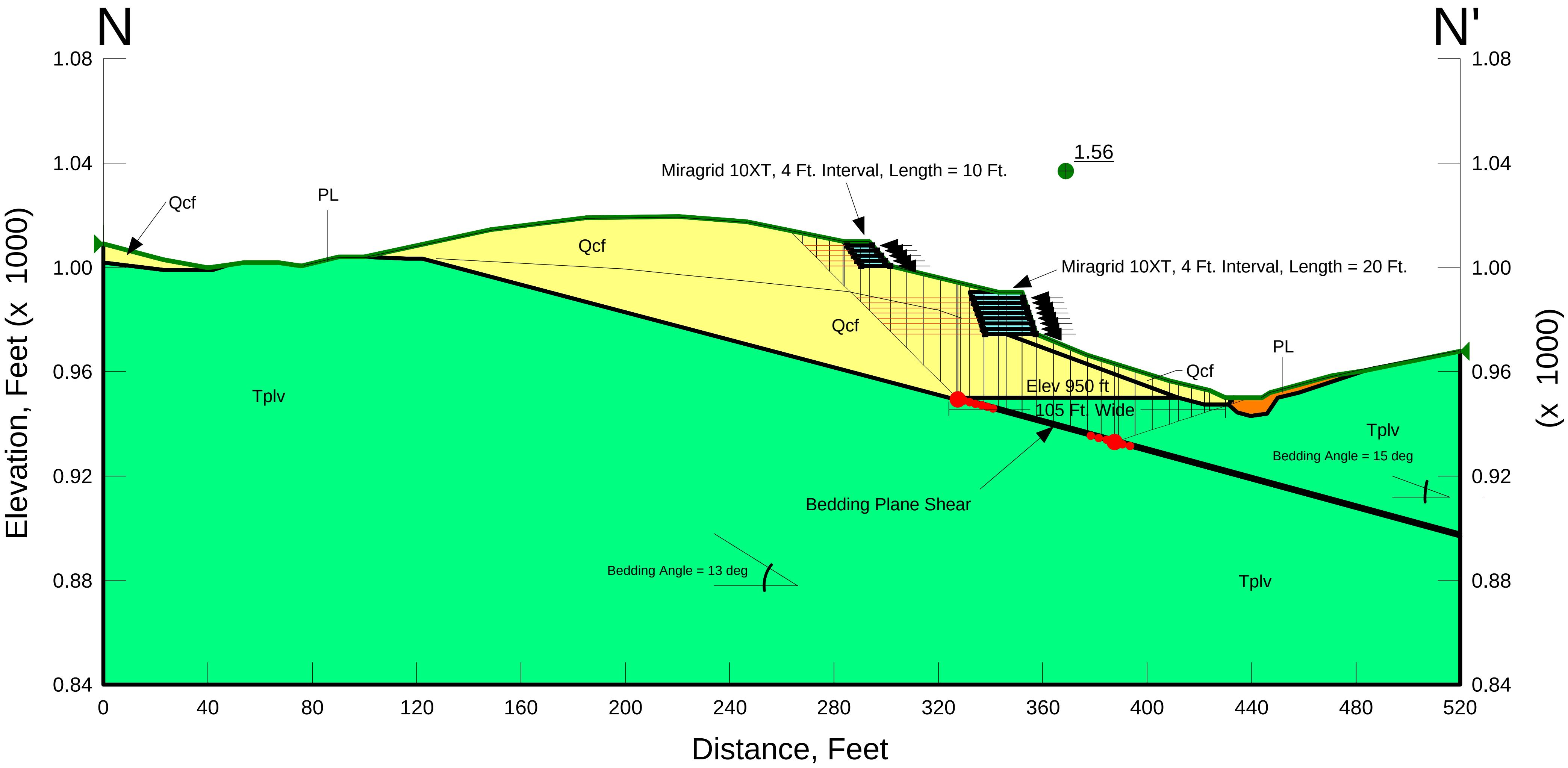


Figure C-37

Portola Center South
Project No. G1218-52-01A
Section N-N'
Name: NN-Case6s-1.gsz
Date: 6/21/2012 Time: 9:05:16 AM
Name: Qcf Unit Weight: 120 pcf Cohesion: 500 psf Phi: 28 °
Name: Qal Unit Weight: 120 pcf Cohesion: 500 psf Phi: 23 °
Name: Tplv (13 degrees) Unit Weight: 115 pcf Cohesion: 300 psf Phi: 30 °
Name: Bedding Plane Shear Unit Weight: 115 pcf Cohesion: 30 psf Phi: 9 °
Name: MSE Unit Weight: 120 pcf Cohesion: 500 psf Phi: 32 °
Horz Seismic Load: 0.15

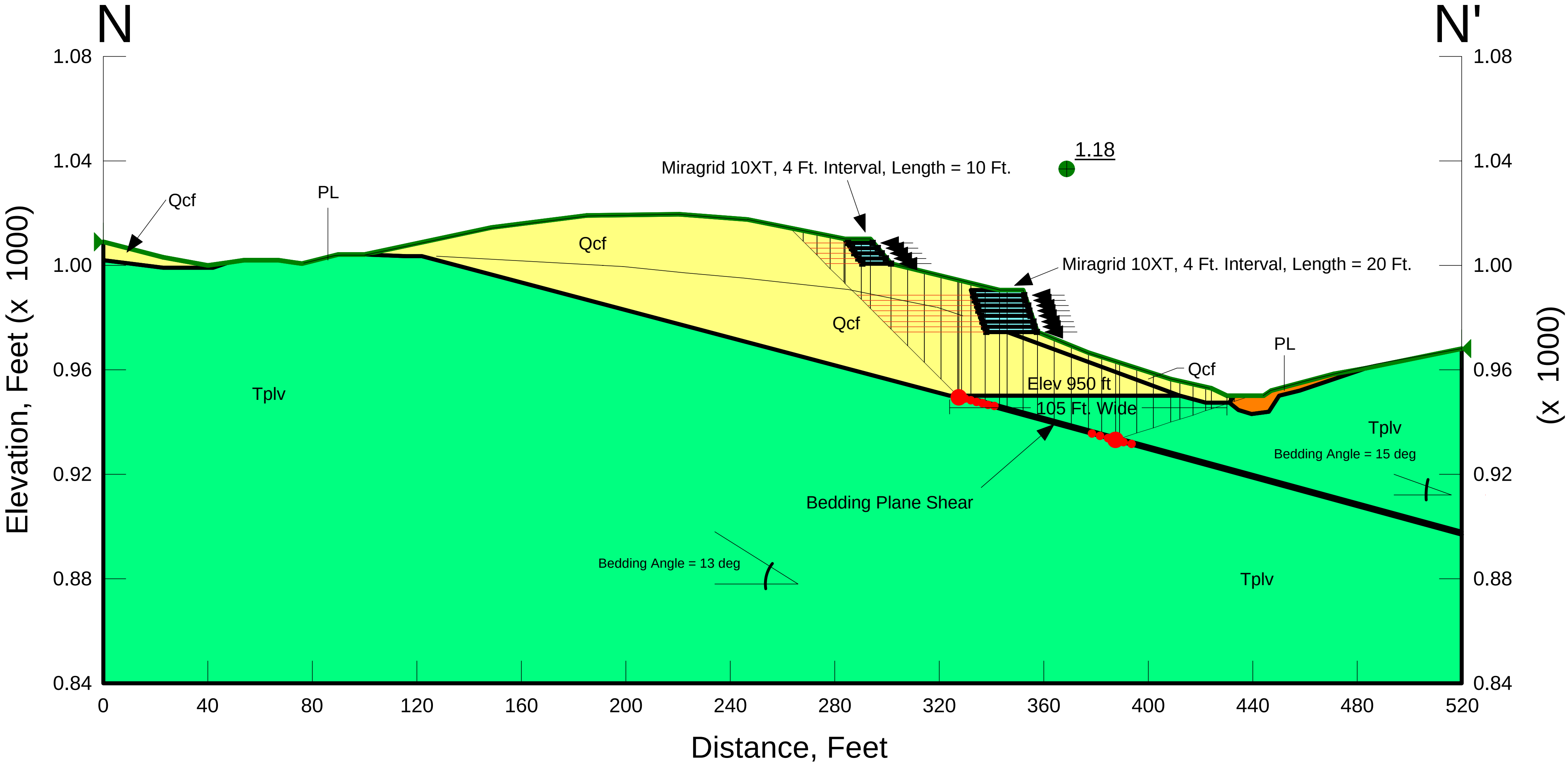


Figure C-38

Portola Center South
Project No. G1218-52-01A
Section N-N'
Name: NN-Case7-1.gsz
Date: 6/21/2012 Time: 9:08:30 AM

Name: Qcf	Unit Weight: 120 pcf	Cohesion: 500 psf	Phi: 28 °
Name: Qal	Unit Weight: 120 pcf	Cohesion: 500 psf	Phi: 23 °
Name: Tplv (13 degrees)	Unit Weight: 115 pcf	Cohesion: 300 psf	Phi: 30 °
Name: Bedding Plane Shear	Unit Weight: 115 pcf	Cohesion: 30 psf	Phi: 9 °
Name: MSE	Unit Weight: 120 pcf	Cohesion: 500 psf	Phi: 32 °

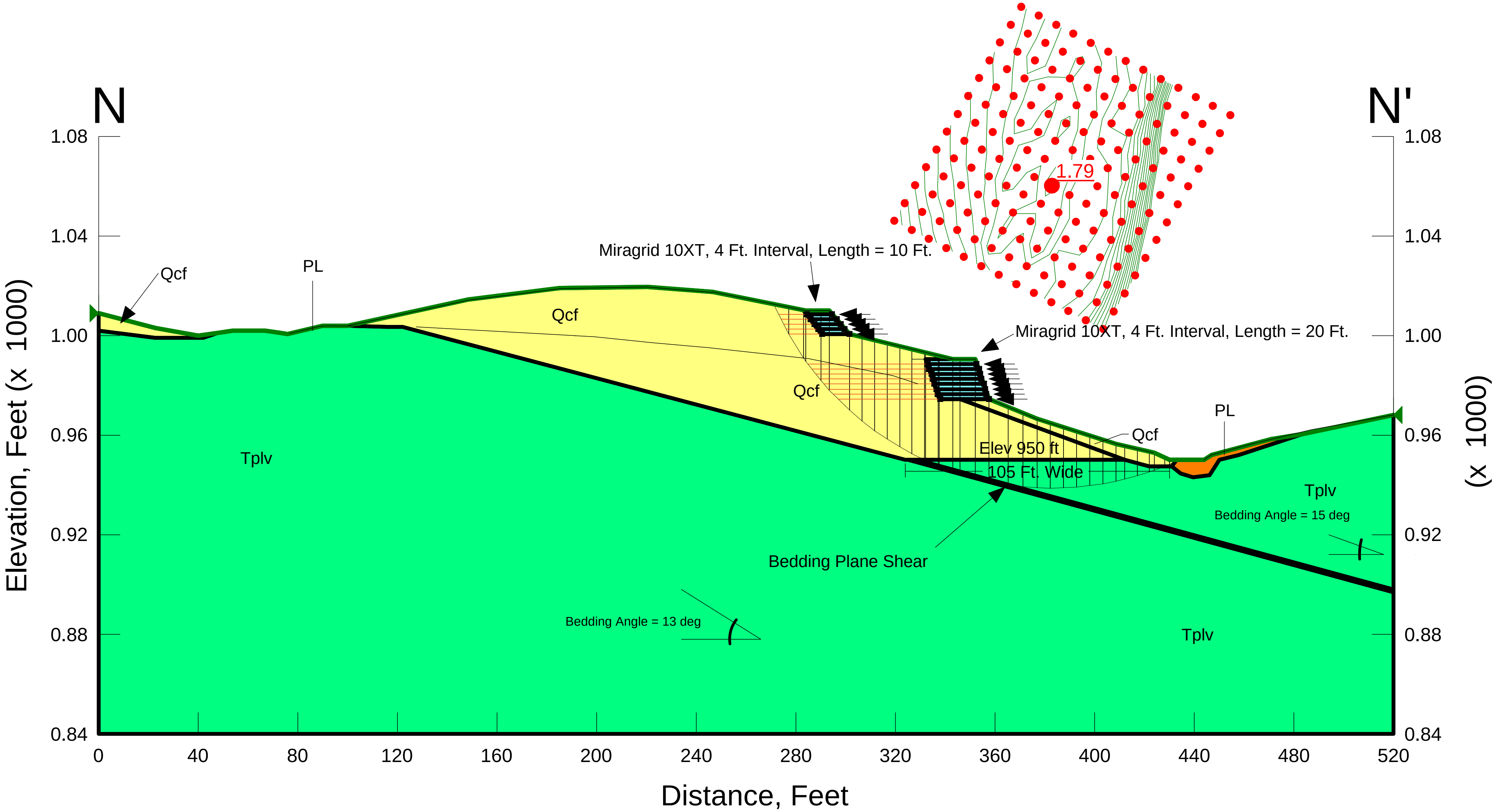


Figure C-39

Portola Center South
Project No. G1218-52-01A
Section N-N'
Name: NN-Case7s-1.gsz
Date: 6/21/2012 Time: 9:09:26 AM
Name: Qcf Unit Weight: 120 pcf Cohesion: 500 psf Phi: 28 °
Name: Qal Unit Weight: 120 pcf Cohesion: 500 psf Phi: 23 °
Name: Tplv (13 degrees) Unit Weight: 115 pcf Cohesion: 300 psf Phi: 30 °
Name: Bedding Plane Shear Unit Weight: 115 pcf Cohesion: 30 psf Phi: 9 °
Name: MSE Unit Weight: 120 pcf Cohesion: 500 psf Phi: 32 °
Horz Seismic Load: 0.15

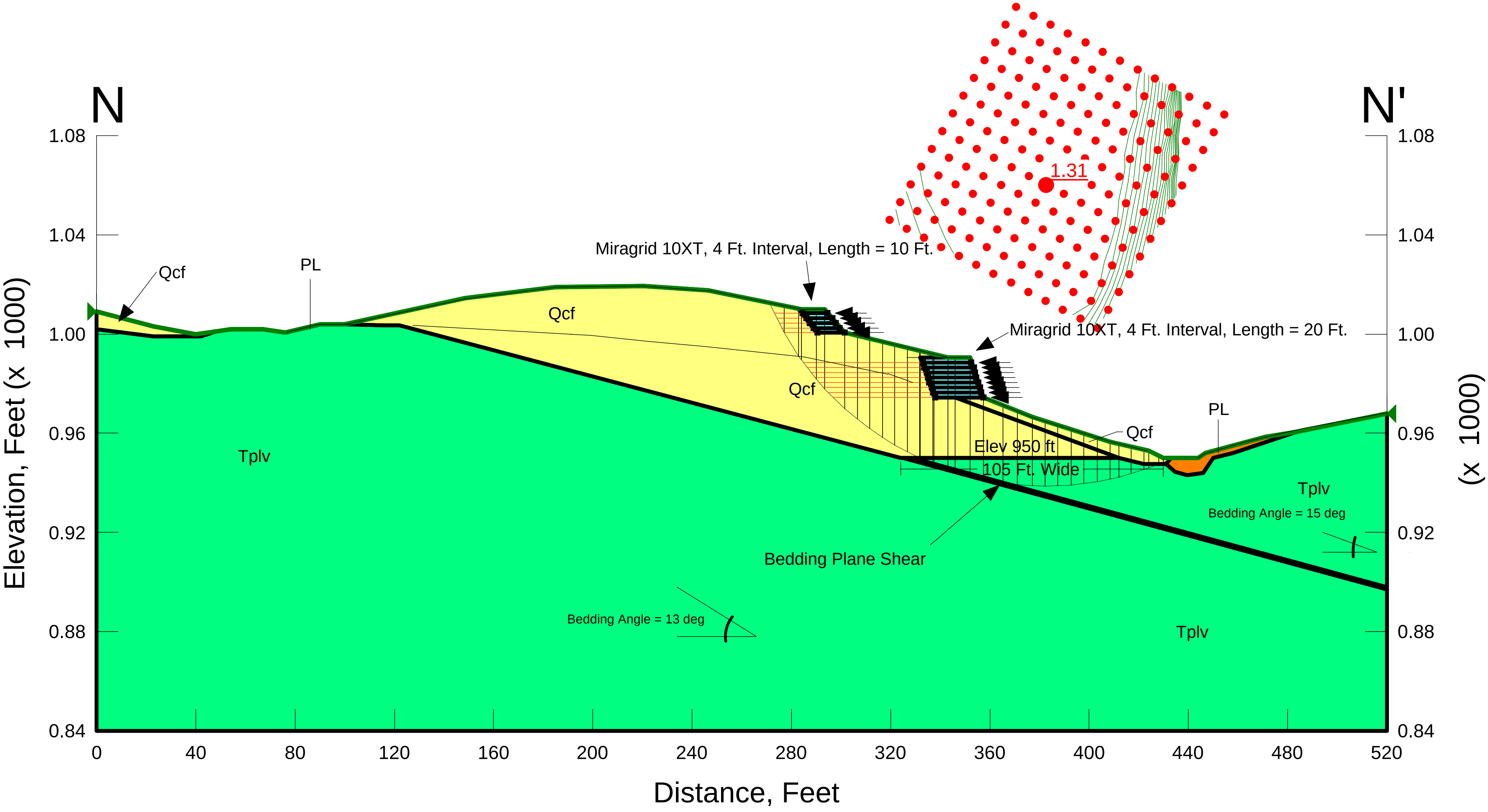


Figure C-40

Portola Center South
Project No. G1218-52-01A
Section O-O'
Name: OO-Case 1s.gsz
Date: 6/11/2012 Time: 4:53:15 PM
Name: Qcf Unit Weight: 120 pcf Cohesion: 500 psf Phi: 28 °
Name: Tps-Slt (7 degrees) Unit Weight: 115 pcf Cohesion: 300 psf Phi: 30 °
Name: Tps Unit Weight: 125 pcf Cohesion: 400 psf Phi: 33 °
Name: Bedding Plane Shear Unit Weight: 115 pcf Cohesion: 30 psf Phi: 9 °
Horz Seismic Load: 0.15

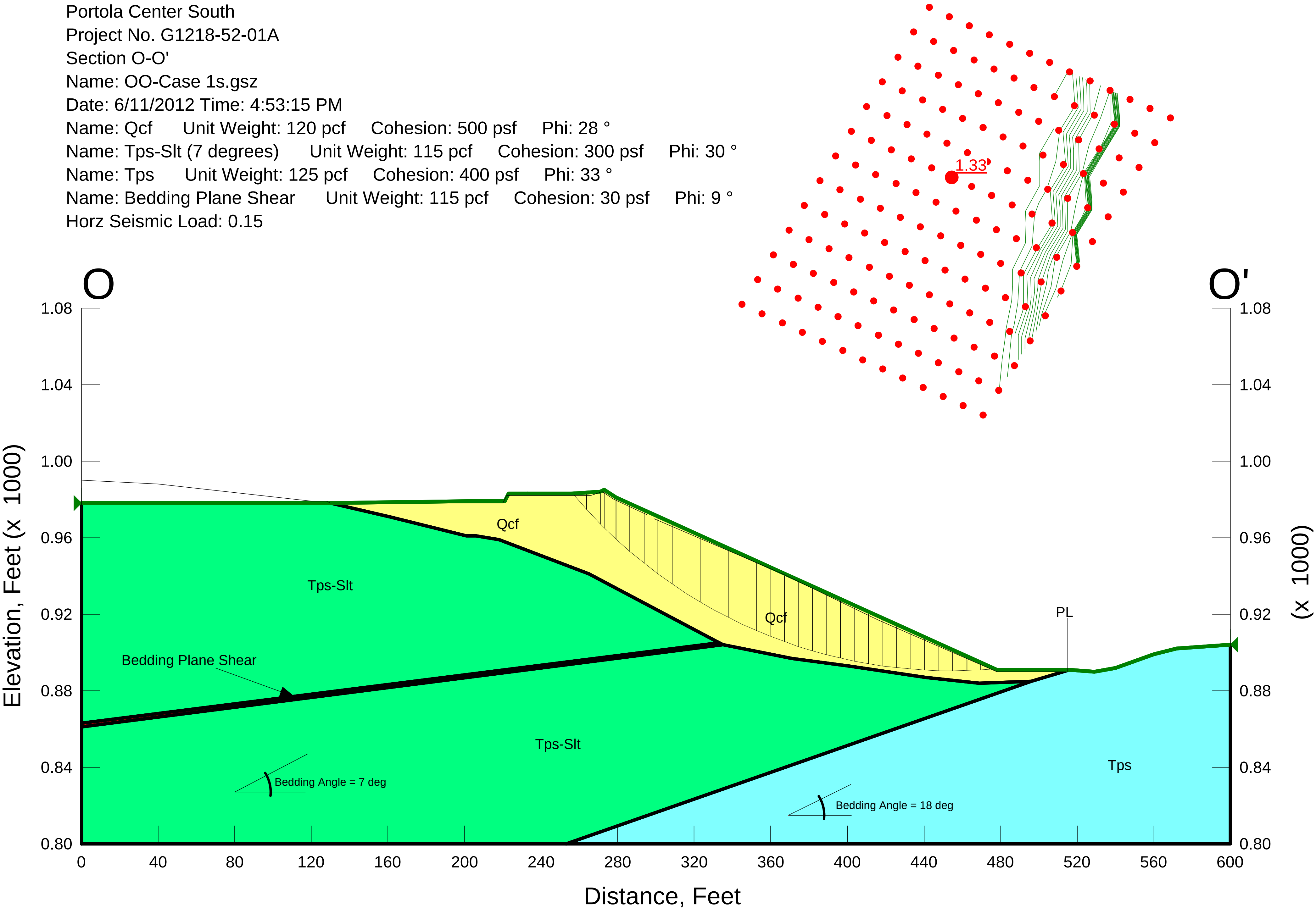


Figure C-44

Portola Center South
Project No. G1218-52-01A
Section O-O'
Name: OO-Case 1.gsz
Date: 6/11/2012 Time: 4:52:40 PM
Name: Qcf Unit Weight: 120 pcf Cohesion: 500 psf Phi: 28 °
Name: Tps-Slt (7 degrees) Unit Weight: 115 pcf Cohesion: 300 psf Phi: 30 °
Name: Tps Unit Weight: 125 pcf Cohesion: 400 psf Phi: 33 °
Name: Bedding Plane Shear Unit Weight: 115 pcf Cohesion: 30 psf Phi: 9 °

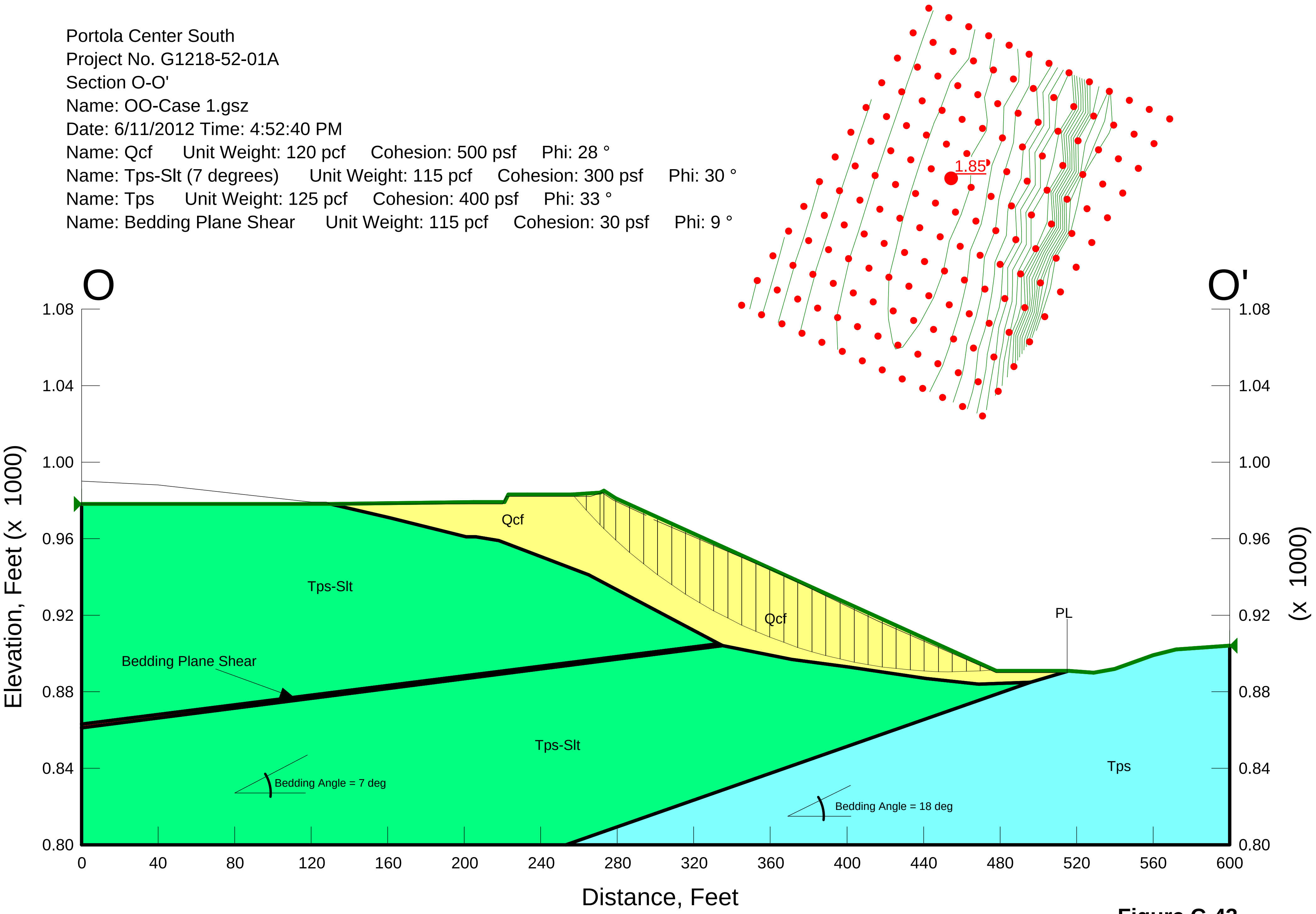


Figure C-43

Portola Center South
Project No. G1218-52-01A
Section N-N'
Name: NN-Case9s.gsz
Date: 6/21/2012 Time: 9:15:15 AM
Name: Qcf Unit Weight: 120 pcf Cohesion: 500 psf Phi: 28 °
Name: Qal Unit Weight: 120 pcf Cohesion: 500 psf Phi: 23 °
Name: Tplv (13 degrees) Unit Weight: 115 pcf Cohesion: 300 psf Phi: 30 °
Name: Bedding Plane Shear Unit Weight: 115 pcf Cohesion: 30 psf Phi: 9 °
Name: MSE Unit Weight: 120 pcf Cohesion: 500 psf Phi: 32 °
Horz Seismic Load: 0.15

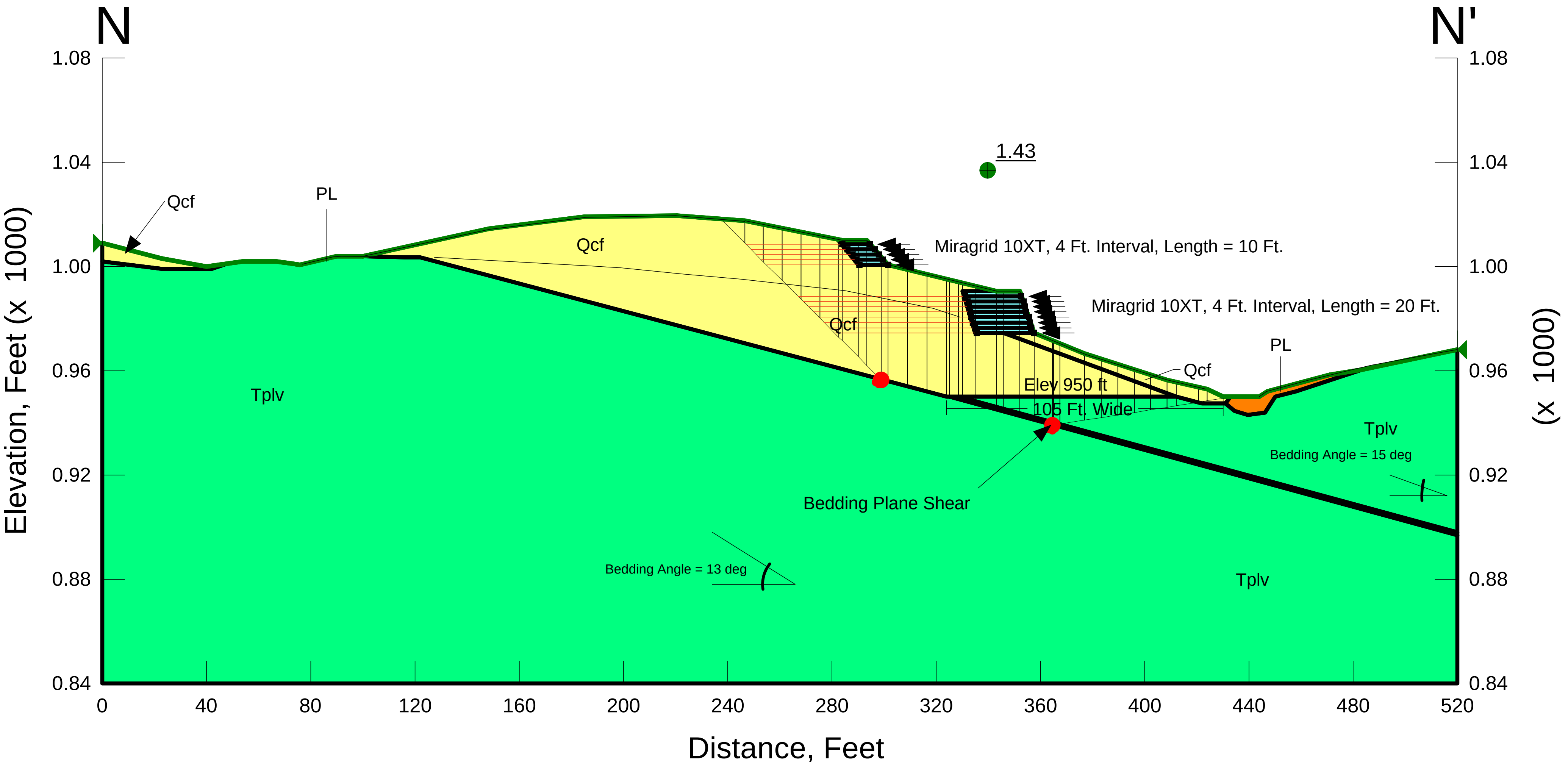


Figure C-42

Portola Center South
Project No. G1218-52-01A
Section N-N'
Name: NN-Case9.gsz
Date: 6/21/2012 Time: 9:12:37 AM
Name: Qcf Unit Weight: 120 pcf Cohesion: 500 psf Phi: 28 °
Name: Qal Unit Weight: 120 pcf Cohesion: 500 psf Phi: 23 °
Name: Tplv (13 degrees) Unit Weight: 115 pcf Cohesion: 300 psf Phi: 30 °
Name: Bedding Plane Shear Unit Weight: 115 pcf Cohesion: 30 psf Phi: 9 °
Name: MSE Unit Weight: 120 pcf Cohesion: 500 psf Phi: 32 °

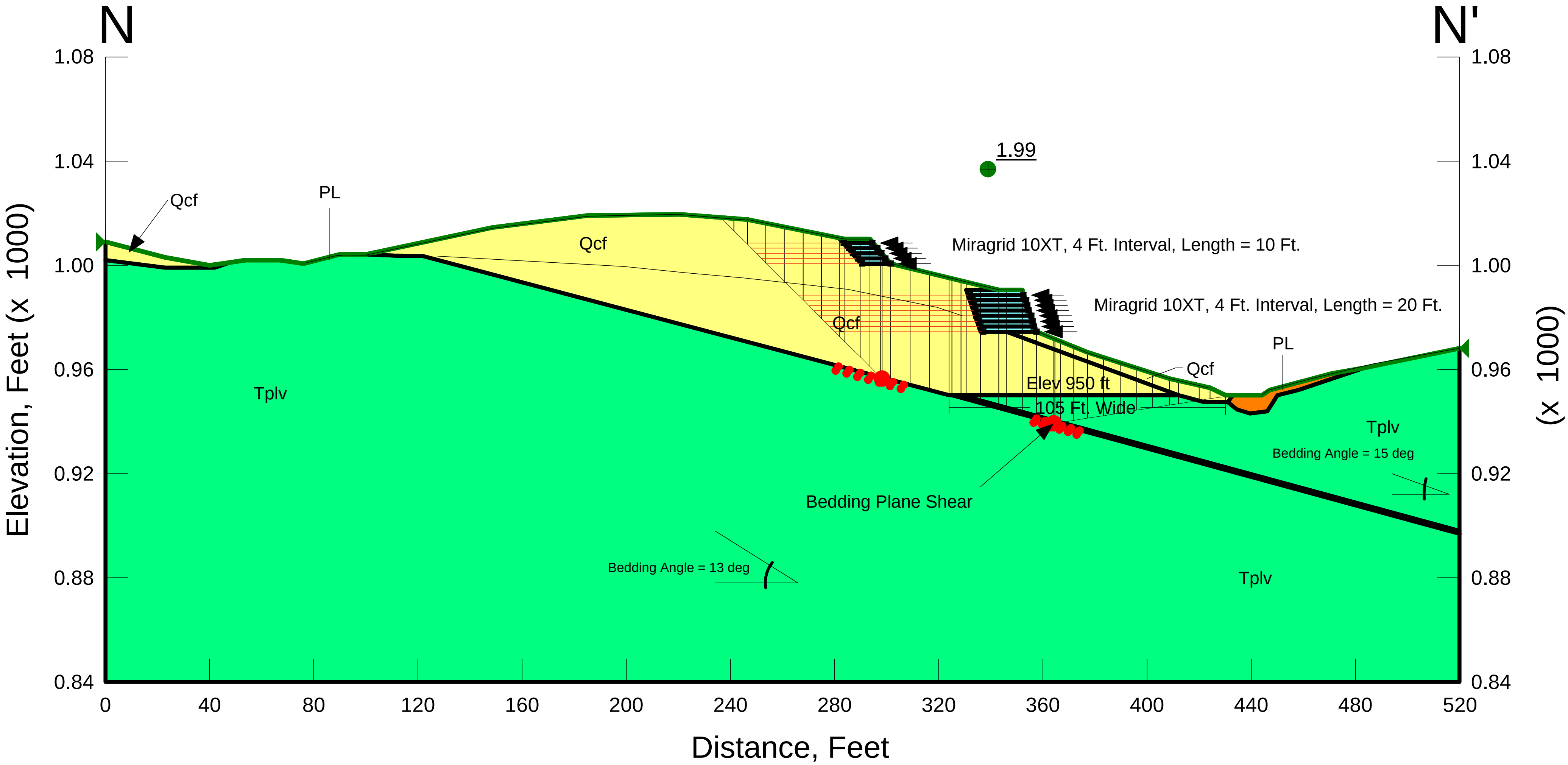


Figure C-41

Portola Center South
Project No. G1218-52-01A
Section P-P'
Name: PP-Case 1.gsz
Date: 6/20/2012 Time: 10:25:31 AM
Name: Qcf Unit Weight: 120 pcf Cohesion: 500 psf Phi: 28 °
Name: Qal Unit Weight: 120 pcf Cohesion: 500 psf Phi: 23 °
Name: Qt Unit Weight: 120 pcf Cohesion: 300 psf Phi: 29 °
Name: Tps Unit Weight: 125 pcf Cohesion: 400 psf Phi: 33 °
Name: Tps-Slt (12 degrees) Unit Weight: 115 pcf Cohesion: 300 psf Phi: 30 °
Name: Bedding Plane Shear Unit Weight: 115 pcf Cohesion: 30 psf Phi: 9 °
Name: MSE Unit Weight: 120 pcf Cohesion: 500 psf Phi: 32 °

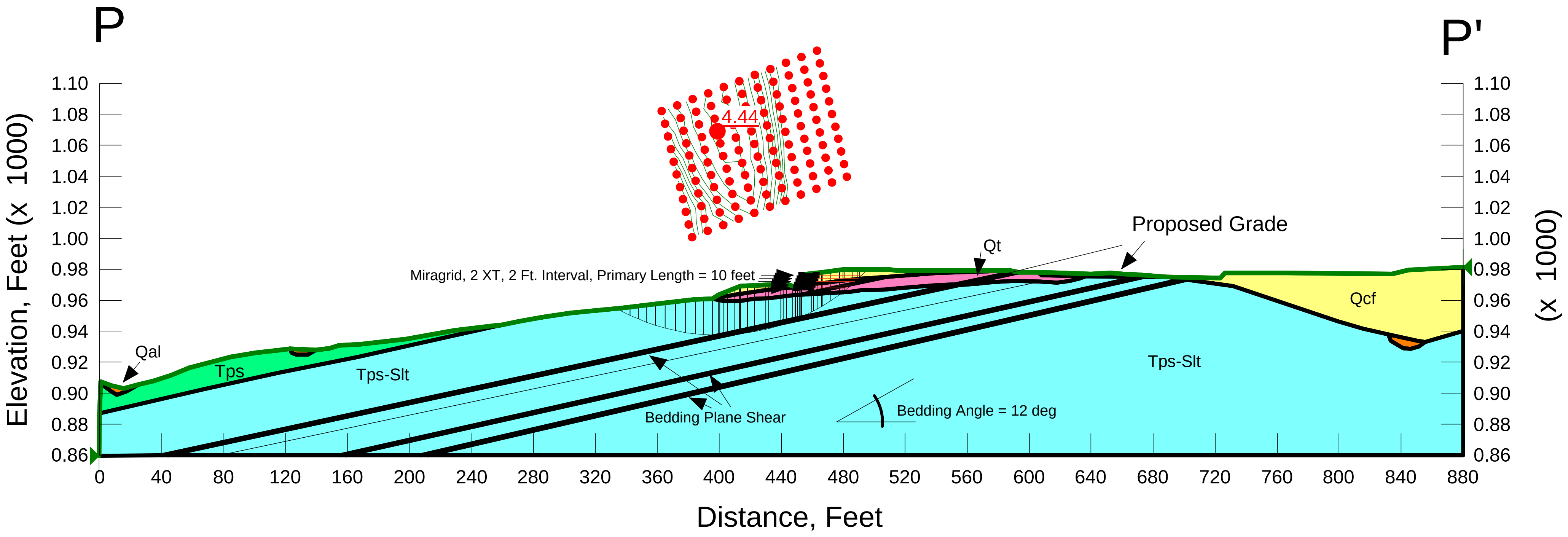


Figure C-45

Portola Center South
Project No. G1218-52-01A
Section P-P'
Name: PP-Case 1s.gsz
Date: 6/12/2012 Time: 10:18:56 AM
Name: Qcf Unit Weight: 120 pcf Cohesion: 500 psf Phi: 28 °
Name: Qal Unit Weight: 120 pcf Cohesion: 500 psf Phi: 23 °
Name: Qt Unit Weight: 120 pcf Cohesion: 300 psf Phi: 29 °
Name: Tps Unit Weight: 125 pcf Cohesion: 400 psf Phi: 33 °
Name: Tps-Slt (12 degrees) Unit Weight: 115 pcf Cohesion: 300 psf Phi: 30 °
Name: Bedding Plane Shear Unit Weight: 115 pcf Cohesion: 30 psf Phi: 9 °
Name: MSE Unit Weight: 120 pcf Cohesion: 500 psf Phi: 32 °
Horz Seismic Load: 0.15

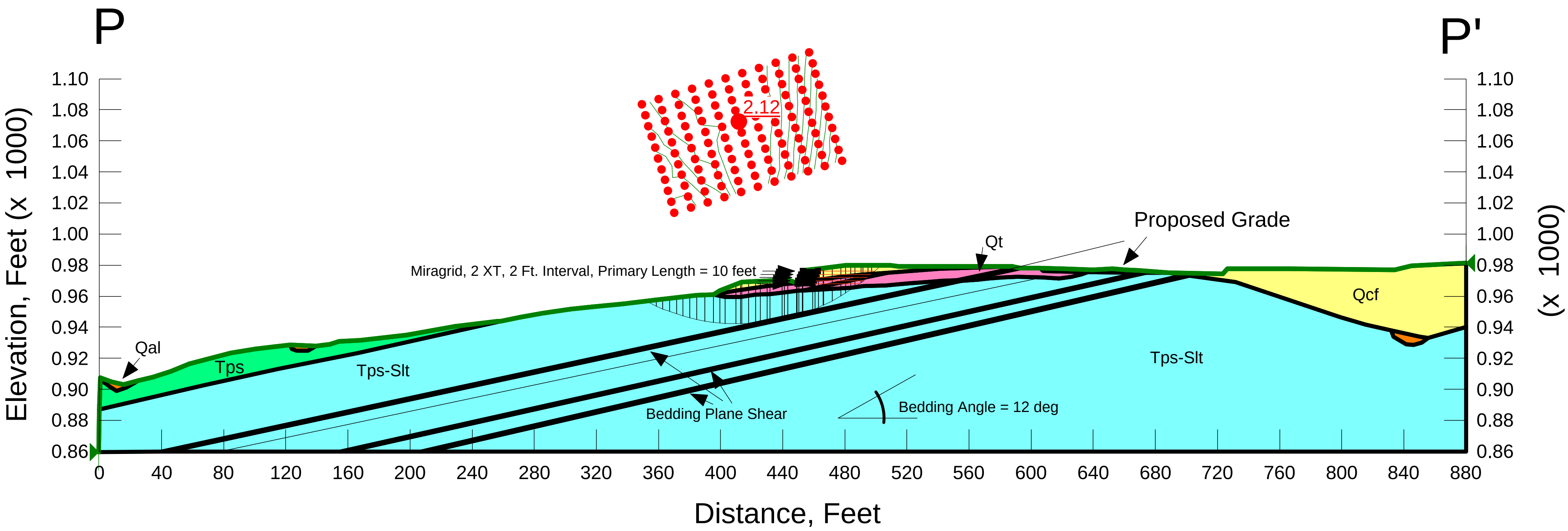


Figure C-46

Portola Center South
Project No. G1218-52-01A
Section P-P'
Name: PP-Case 2.gsz
Date: 6/12/2012 Time: 10:23:49 AM
Name: Qcf   Unit Weight: 120 pcf   Cohesion: 500 psf   Phi: 28 °
Name: Qal   Unit Weight: 120 pcf   Cohesion: 500 psf   Phi: 23 °
Name: Qt   Unit Weight: 120 pcf   Cohesion: 300 psf   Phi: 29 °
Name: Tps   Unit Weight: 125 pcf   Cohesion: 400 psf   Phi: 33 °
Name: Tps-Slt (12 degrees)   Unit Weight: 115 pcf   Cohesion: 300 psf   Phi: 30 °
Name: Bedding Plane Shear   Unit Weight: 115 pcf   Cohesion: 30 psf   Phi: 9 °
Name: MSE   Unit Weight: 120 pcf   Cohesion: 500 psf   Phi: 32 °

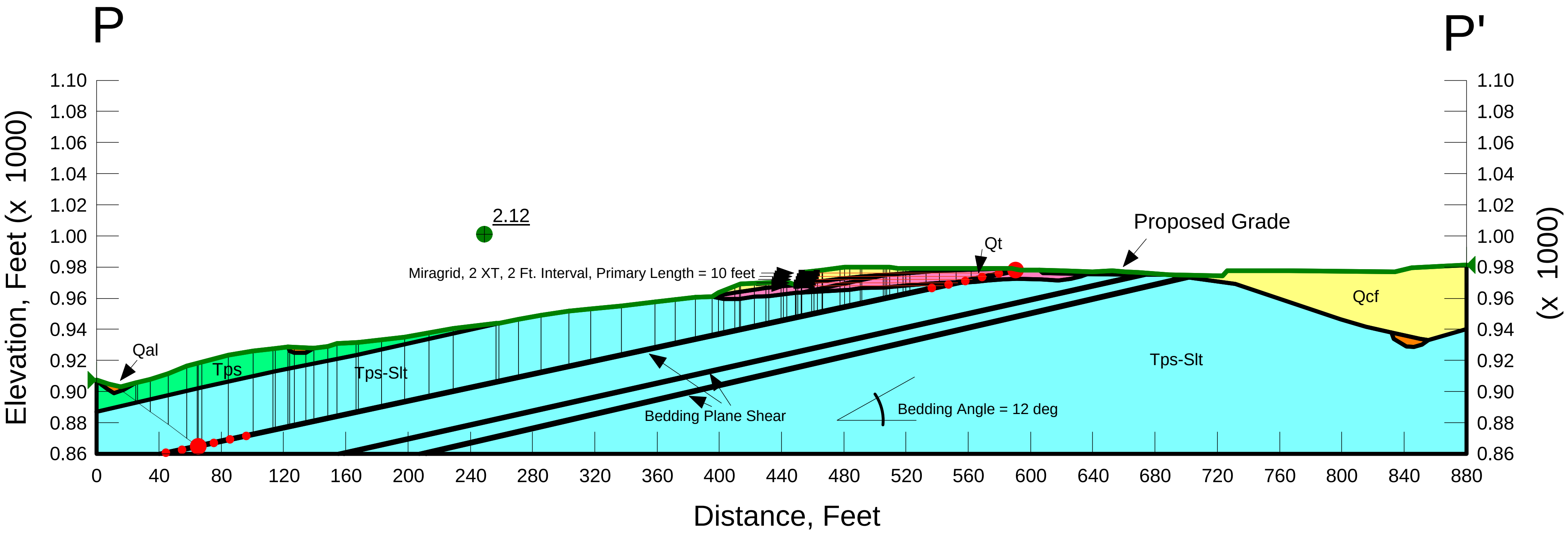


Figure C-47

Portola Center South
Project No. G1218-52-01A
Section P-P'
Name: PP-Case 2s.gsz
Date: 6/12/2012 Time: 10:26:13 AM

Name: Qcf	Unit Weight: 120 pcf	Cohesion: 500 psf	Phi: 28 °
Name: Qal	Unit Weight: 120 pcf	Cohesion: 500 psf	Phi: 23 °
Name: Qt	Unit Weight: 120 pcf	Cohesion: 300 psf	Phi: 29 °
Name: Tps	Unit Weight: 125 pcf	Cohesion: 400 psf	Phi: 33 °
Name: Tps-Slt (12 degrees)	Unit Weight: 115 pcf	Cohesion: 300 psf	Phi: 30 °
Name: Bedding Plane Shear	Unit Weight: 115 pcf	Cohesion: 30 psf	Phi: 9 °
Name: MSE	Unit Weight: 120 pcf	Cohesion: 500 psf	Phi: 32 °

Horz Seismic Load: 0.15

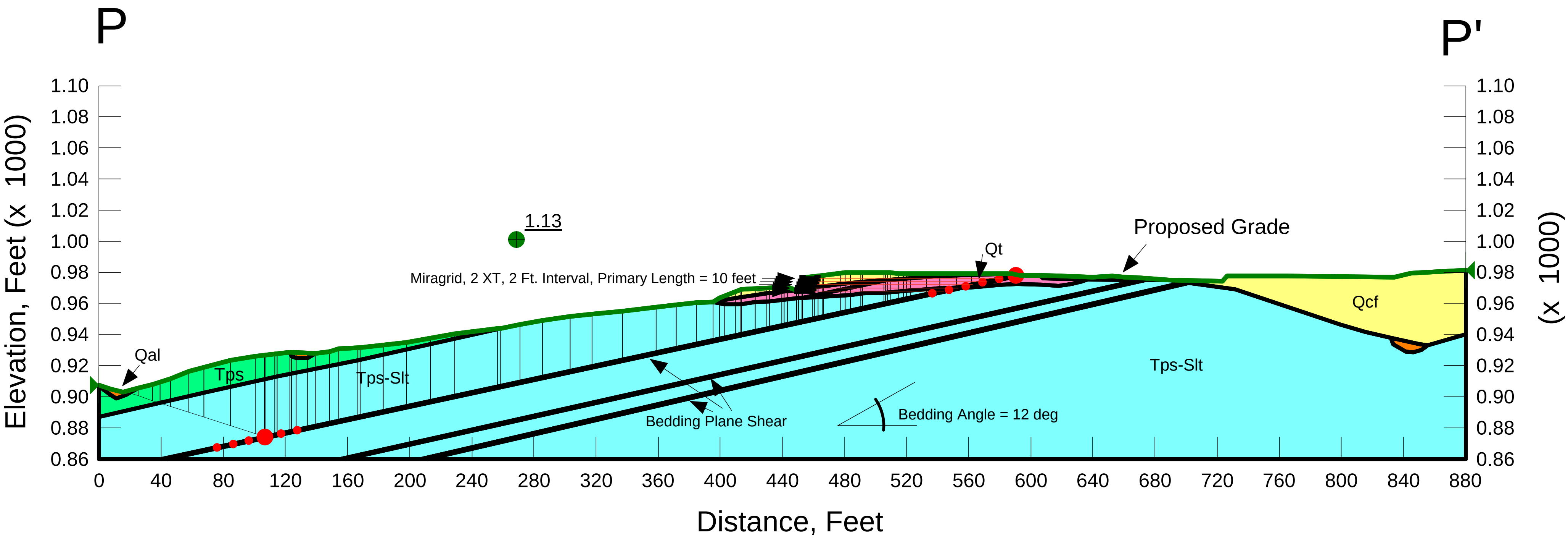


Figure C-48

ASSUMED CONDITIONS :

SLOPE HEIGHT H = Infinite

DEPTH OF SATURATION Z = 3 feet

SLOPE INCLINATION 2.0 : 1.0 (Horizontal : Vertical)

SLOPE ANGLE i = 26.6 degrees

UNIT WEIGHT OF WATER γ_w = 62.4 pounds per cubic foot

TOTAL UNIT WEIGHT OF SOIL γ_t = 120.0 pounds per cubic foot

ANGLE OF INTERNAL FRICTION ϕ = 28 degrees

APPARENT COHESION C = 500 pounds per square foot

SLOPE SATURATED TO VERTICAL DEPTH Z BELOW SLOPE FACE
SEEPAGE FORCES PARALLEL TO SLOPE FACE

ANALYSIS :

$$FS = \frac{C + (\gamma_t - \gamma_w)\ Z\ cos^2\ i\ tan\ \phi}{\gamma_t\ Z\ sin\ i\ cos\ i} = 4.0$$

REFERENCES :

1......Haefeli, R. *The Stability of Slopes Acted Upon by Parallel Seepage*, Proc. Second International Conference, SMFE, Rotterdam, 1948, 1, 57-62

2......Skempton, A. W., and F.A. Delory, *Stability of Natural Slopes in London Clay*, Proc. Fourth International Conference, SMFE, London, 1957, 2, 378-81

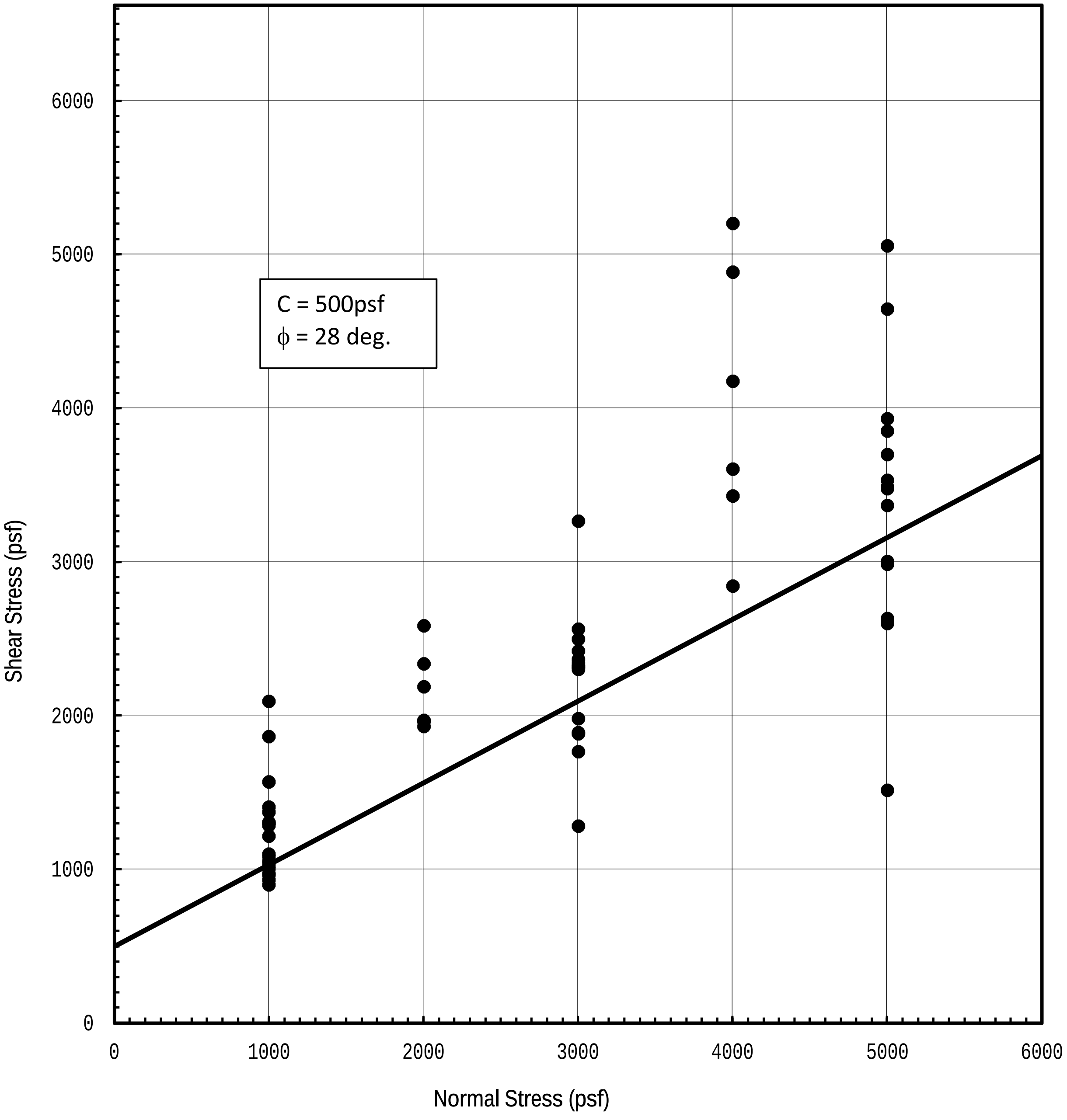
SURFICIAL SLOPE STABILITY ANALYSIS - FILL SLOPES

GEOCON
INCORPORATED
GEOTECHNICAL ■ ENVIRONMENTAL ■ MATERIALS
6960 FLANDERS DRIVE - SAN DIEGO, CALIFORNIA 92121 - 2974
PHONE 858 558-6900 - FAX 858 558-6159

PORTOLA CENTER SOUTH
TM #15353
LAKE FOREST, CALIFORNIA

SW / RA		DSK/GTYPD	PROJECT NO. G1218 - 52 - 01A	FIG. C-49

Fill



GEOCON
INCORPORATED
GEOTECHNICAL CONSULTANTS
6960 FLANDERS DRIVE - SAN DIEGO, CALIFORNIA 92121-2974
PHONE 858 558-6900 - FAX 858 558-6159

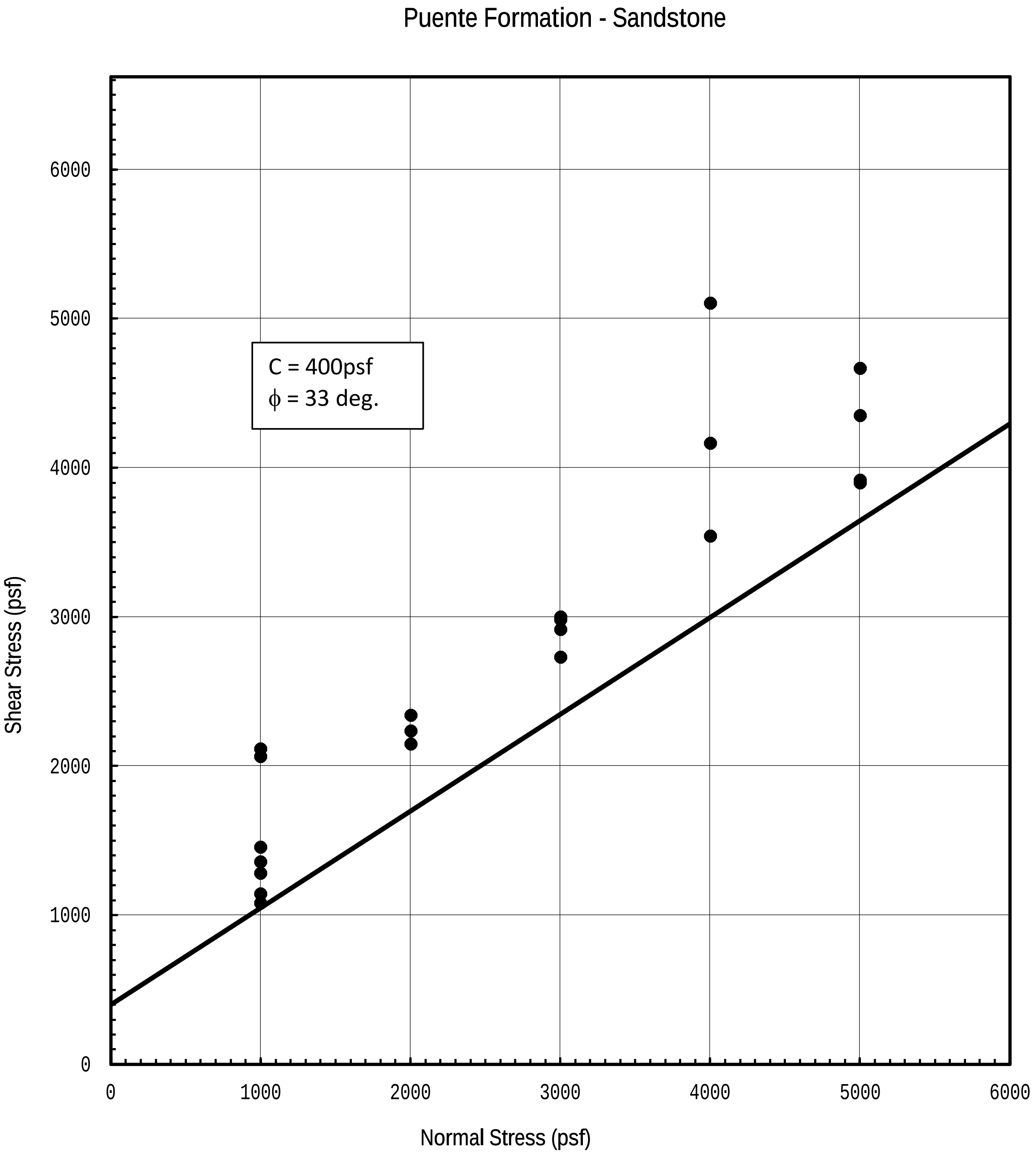
SW/SW

SHEAR STRENGTH TEST RESULTS

PORTOLA CENTER SOUTH
TM #15353
LAKE FOREST, CALIFORNIA

PROJECT NO. G1218-52-01

FIG. C-50



GEOCON
INCORPORATED
GEOTECHNICAL CONSULTANTS
6960 FLANDERS DRIVE - SAN DIEGO, CALIFORNIA 92121-2974
PHONE 858 558-6900 - FAX 858 558-6159

SW/SW

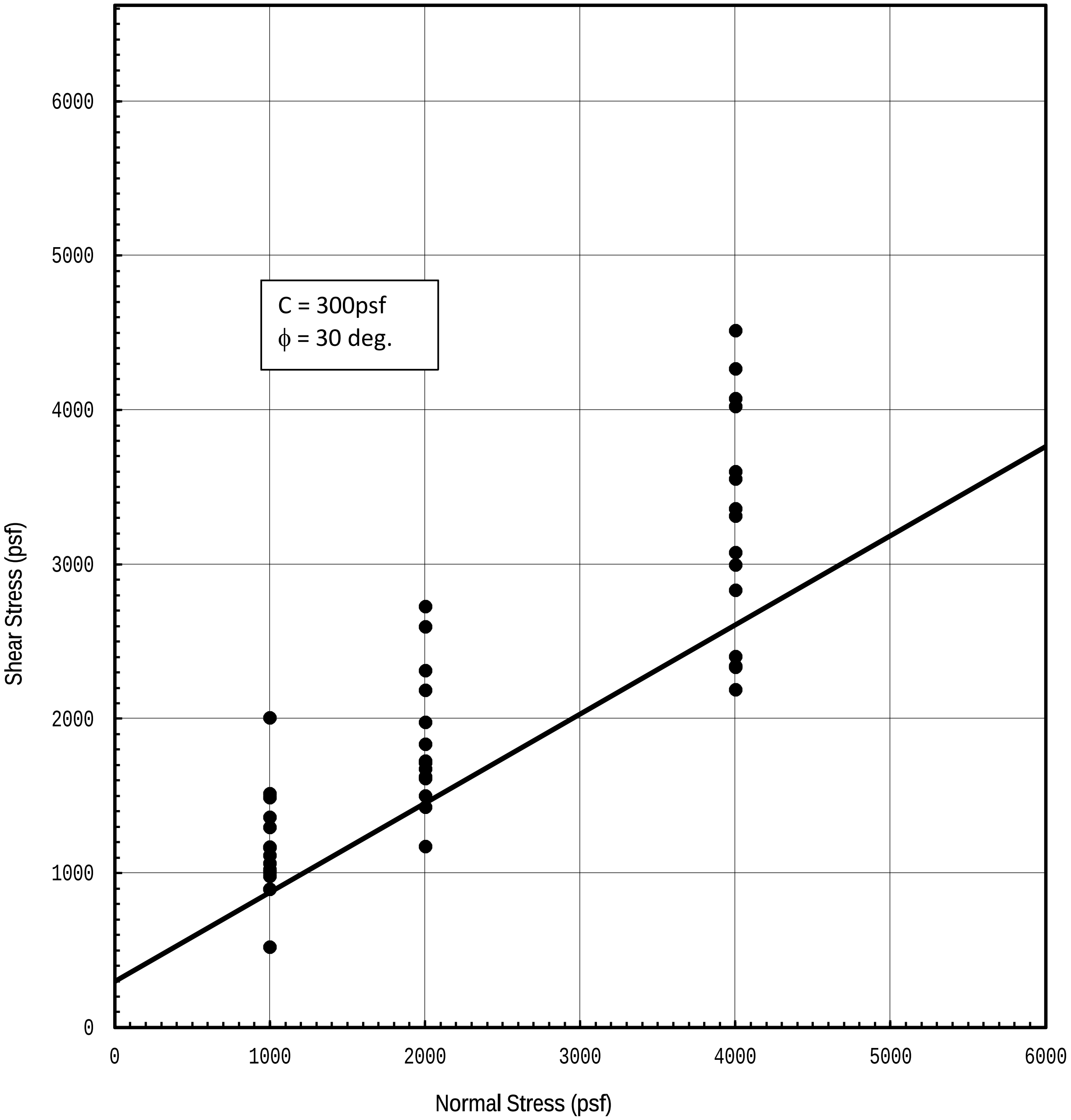
SHEAR STRENGTH TEST RESULTS

PORTOLA CENTER SOUTH
TM #15353
LAKE FOREST, CALIFORNIA

PROJECT NO. G1218-52-01

FIG. C-51

Puente Formation - Siltstone/Claystone
Across Bedding (Average of Inflection and End-Of-Test)



GEOCON
INCORPORATED
GEOTECHNICAL CONSULTANTS
6960 FLANDERS DRIVE - SAN DIEGO, CALIFORNIA 92121-2974
PHONE 858 558-6900 - FAX 858 558-6159

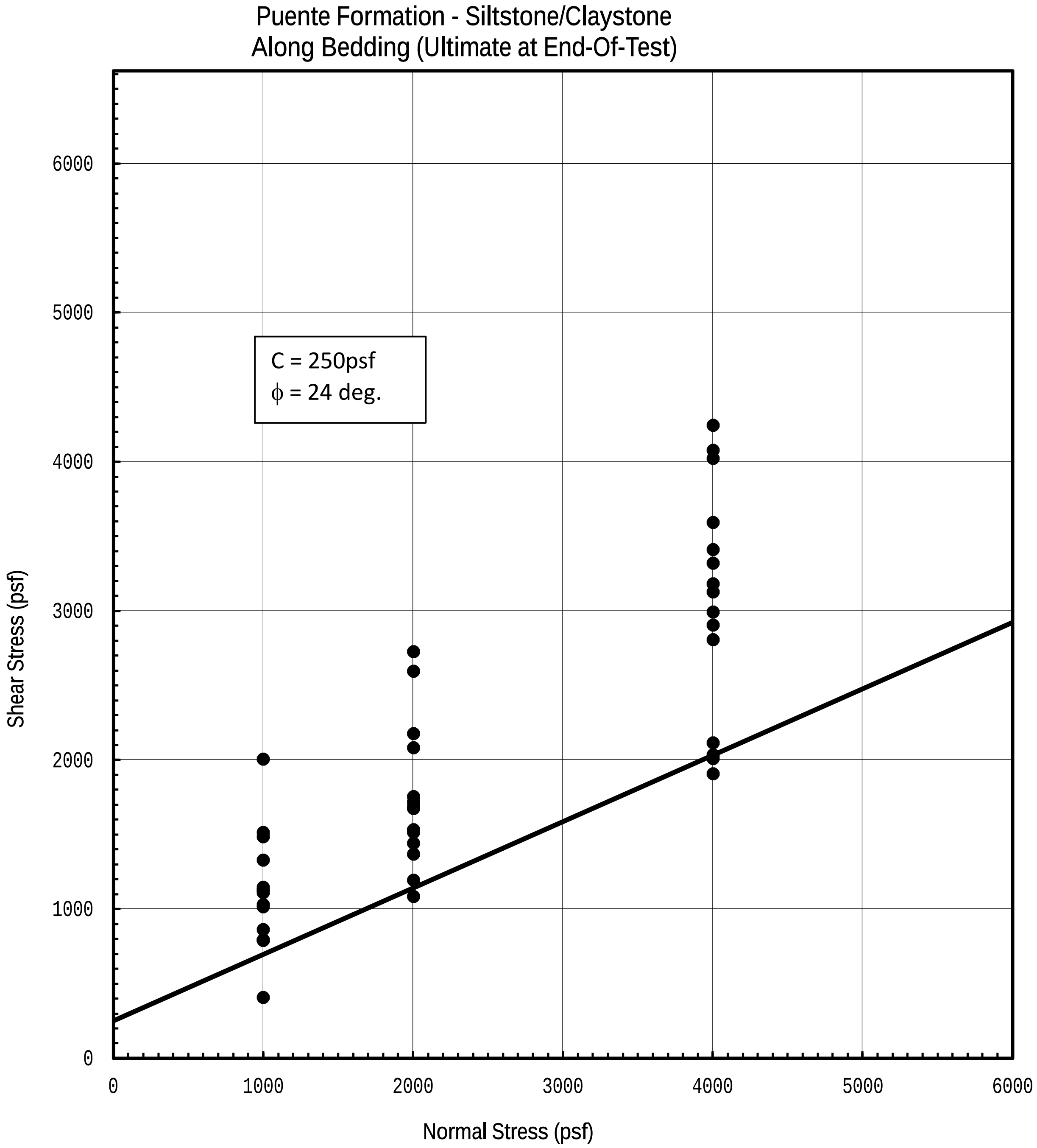
SW/SW

SHEAR STRENGTH TEST RESULTS

PORTOLA CENTER SOUTH
TM #15353
LAKE FOREST, CALIFORNIA

PROJECT NO. G1218-52-01

FIG. C-52



GEOCON
INCORPORATED
GEOTECHNICAL CONSULTANTS
6960 FLANDERS DRIVE - SAN DIEGO, CALIFORNIA 92121-2974
PHONE 858 558-6900 - FAX 858 558-6159

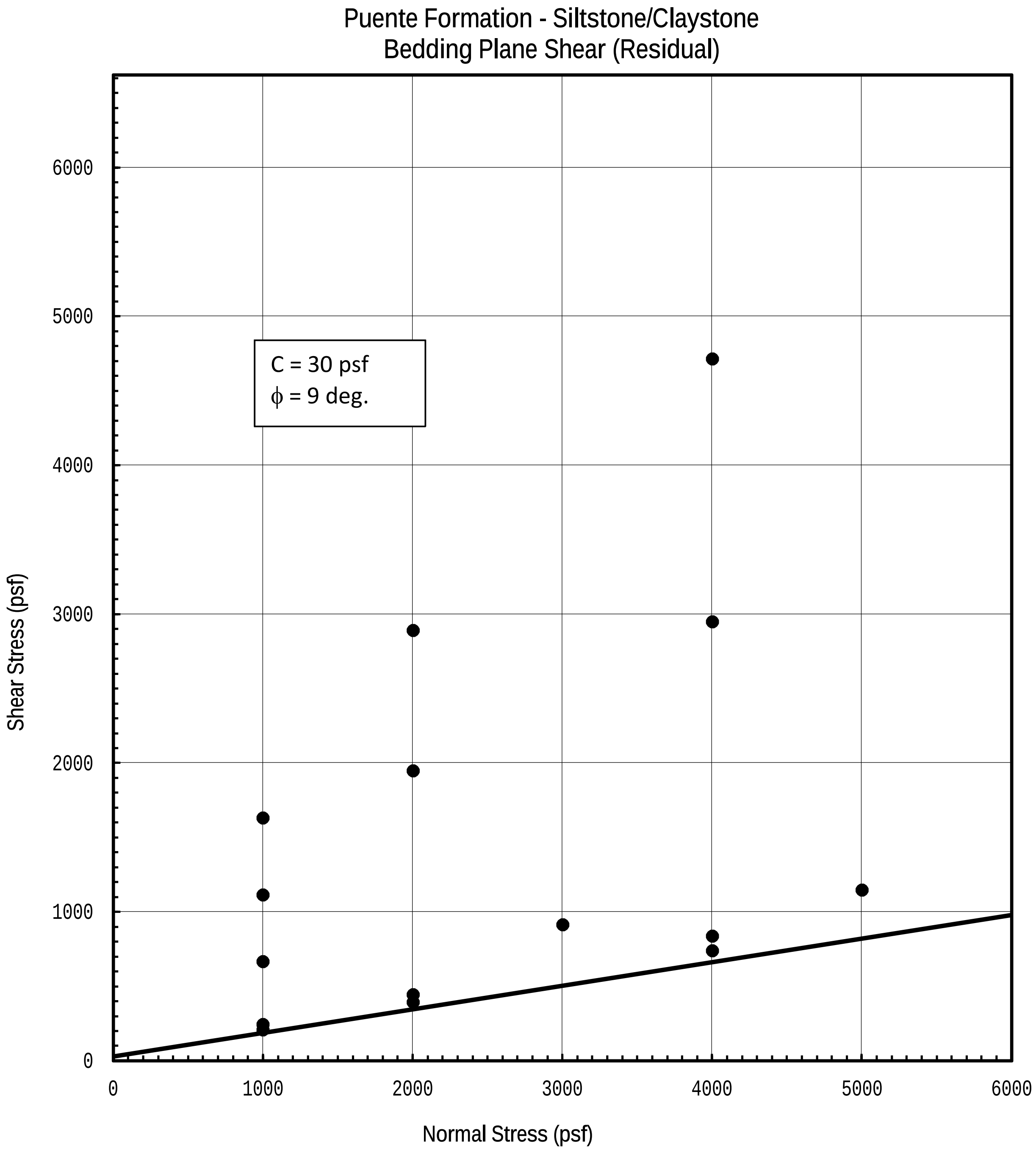
SW/SW

SHEAR STRENGTH TEST RESULTS

PORTOLA CENTER SOUTH
TM #15353
LAKE FOREST, CALIFORNIA

PROJECT NO. G1218-52-01

FIG. C-53



GEOCON
INCORPORATED
GEOTECHNICAL CONSULTANTS
6960 FLANDERS DRIVE - SAN DIEGO, CALIFORNIA 92121-2974
PHONE 858 558-6900 - FAX 858 558-6159

SW/SW

SHEAR STRENGTH TEST RESULTS

PORTOLA CENTER SOUTH
TM #15353
LAKE FOREST, CALIFORNIA

PROJECT NO. G1218-52-01

FIG. C-54

APPENDIX D

APPENDIX D

RECOMMENDED GRADING SPECIFICATIONS

FOR

PORTOLA CENTER SOUTH
TENTATIVE TRACT NO. 15353
LAKE FOREST, CALIFORNIA

PROJECT NO. G1218-52-01A

RECOMMENDED GRADING SPECIFICATIONS

1. GENERAL

1.1 These Recommended Grading Specifications shall be used in conjunction with the Geotechnical Report for the project prepared by Geocon Incorporated. The recommendations contained in the text of the Geotechnical Report are a part of the earthwork and grading specifications and shall supersede the provisions contained hereinafter in the case of conflict.

1.2 Prior to the commencement of grading, a geotechnical consultant (Consultant) shall be employed for the purpose of observing earthwork procedures and testing the fills for substantial conformance with the recommendations of the Geotechnical Report and these specifications. The Consultant should provide adequate testing and observation services so that they may assess whether, in their opinion, the work was performed in substantial conformance with these specifications. It shall be the responsibility of the Contractor to assist the Consultant and keep them apprised of work schedules and changes so that personnel may be scheduled accordingly.

1.3 It shall be the sole responsibility of the Contractor to provide adequate equipment and methods to accomplish the work in accordance with applicable grading codes or agency ordinances, these specifications and the approved grading plans. If, in the opinion of the Consultant, unsatisfactory conditions such as questionable soil materials, poor moisture condition, inadequate compaction, adverse weather, result in a quality of work not in conformance with these specifications, the Consultant will be empowered to reject the work and recommend to the Owner that grading be stopped until the unacceptable conditions are corrected.

2. DEFINITIONS

2.1 **Owner** shall refer to the owner of the property or the entity on whose behalf the grading work is being performed and who has contracted with the Contractor to have grading performed.

2.2 **Contractor** shall refer to the Contractor performing the site grading work.

2.3 **Civil Engineer** or **Engineer of Work** shall refer to the California licensed Civil Engineer or consulting firm responsible for preparation of the grading plans, surveying and verifying as-graded topography.

2.4 **Consultant** shall refer to the soil engineering and engineering geology consulting firm retained to provide geotechnical services for the project.

2.5 **Soil Engineer** shall refer to a California licensed Civil Engineer retained by the Owner, who is experienced in the practice of geotechnical engineering. The Soil Engineer shall be responsible for having qualified representatives on-site to observe and test the Contractor's work for conformance with these specifications.

2.6 **Engineering Geologist** shall refer to a California licensed Engineering Geologist retained by the Owner to provide geologic observations and recommendations during the site grading.

2.7 **Geotechnical Report** shall refer to a soil report (including all addenda) which may include a geologic reconnaissance or geologic investigation that was prepared specifically for the development of the project for which these Recommended Grading Specifications are intended to apply.

3. MATERIALS

3.1 Materials for compacted fill shall consist of any soil excavated from the cut areas or imported to the site that, in the opinion of the Consultant, is suitable for use in construction of fills. In general, fill materials can be classified as *soil* fills, *soil-rock* fills or *rock* fills, as defined below.

3.1.1 **Soil fills** are defined as fills containing no rocks or hard lumps greater than 12 inches in maximum dimension and containing at least 40 percent by weight of material smaller than ¾ inch in size.

3.1.2 **Soil-rock fills** are defined as fills containing no rocks or hard lumps larger than 4 feet in maximum dimension and containing a sufficient matrix of soil fill to allow for proper compaction of soil fill around the rock fragments or hard lumps as specified in Paragraph 6.2. **Oversize rock** is defined as material greater than 12 inches.

3.1.3 **Rock fills** are defined as fills containing no rocks or hard lumps larger than 3 feet in maximum dimension and containing little or no fines. Fines are defined as material smaller than ¾ inch in maximum dimension. The quantity of fines shall be less than approximately 20 percent of the rock fill quantity.

3.2 Material of a perishable, spongy, or otherwise unsuitable nature as determined by the Consultant shall not be used in fills.

3.3 Materials used for fill, either imported or on-site, shall not contain hazardous materials as defined by the California Code of Regulations, Title 22, Division 4, Chapter 30, Articles 9 and 10; 40CFR; and any other applicable local, state or federal laws. The Consultant shall not be responsible for the identification or analysis of the potential presence of hazardous materials. However, if observations, odors or soil discoloration cause Consultant to suspect the presence of hazardous materials, the Consultant may request from the Owner the termination of grading operations within the affected area. Prior to resuming grading operations, the Owner shall provide a written report to the Consultant indicating that the suspected materials are not hazardous as defined by applicable laws and regulations.

3.4 The outer 15 feet of *soil-rock* fill slopes, measured horizontally, should be composed of properly compacted *soil* fill materials approved by the Consultant. *Rock* fill may extend to the slope face, provided that the slope is not steeper than 2:1 (horizontal:vertical) and a soil layer no thicker than 12 inches is track-walked onto the face for landscaping purposes. This procedure may be utilized provided it is acceptable to the governing agency, Owner and Consultant.

3.5 Samples of soil materials to be used for fill should be tested in the laboratory by the Consultant to determine the maximum density, optimum moisture content, and, where appropriate, shear strength, expansion, and gradation characteristics of the soil.

3.6 During grading, soil or groundwater conditions other than those identified in the Geotechnical Report may be encountered by the Contractor. The Consultant shall be notified immediately to evaluate the significance of the unanticipated condition

4. CLEARING AND PREPARING AREAS TO BE FILLED

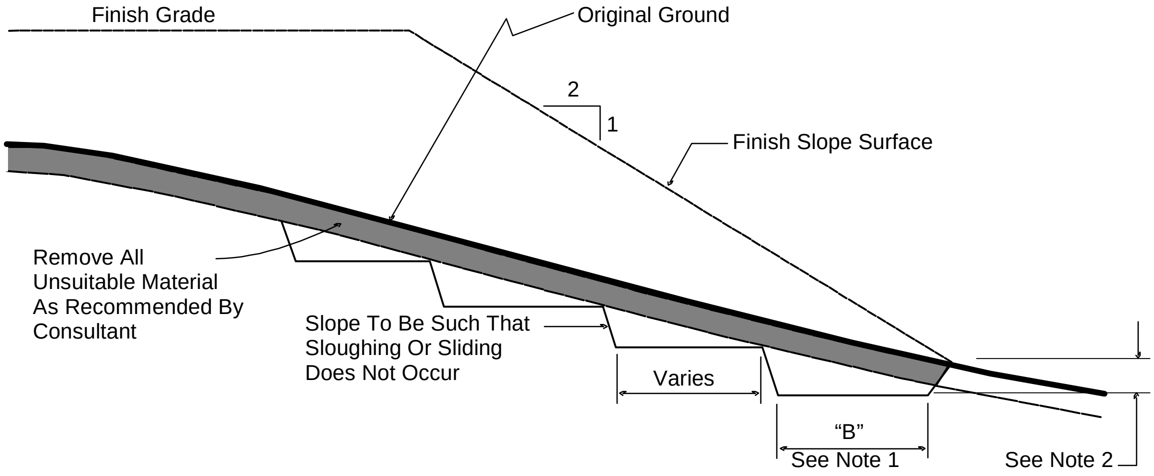
4.1 Areas to be excavated and filled shall be cleared and grubbed. Clearing shall consist of complete removal above the ground surface of trees, stumps, brush, vegetation, man-made structures, and similar debris. Grubbing shall consist of removal of stumps, roots, buried logs and other unsuitable material and shall be performed in areas to be graded. Roots and other projections exceeding 1½ inches in diameter shall be removed to a depth of 3 feet below the surface of the ground. Borrow areas shall be grubbed to the extent necessary to provide suitable fill materials.

4.2 Any asphalt pavement material removed during clearing operations should be properly disposed at an approved off-site facility. Concrete fragments that are free of reinforcing steel may be placed in fills, provided they are placed in accordance with Section 6.2 or 6.3 of this document.

4.3 After clearing and grubbing of organic matter and other unsuitable material, loose or porous soils shall be removed to the depth recommended in the Geotechnical Report. The depth of removal and compaction should be observed and approved by a representative of the Consultant. The exposed surface shall then be plowed or scarified to a minimum depth of 6 inches and until the surface is free from uneven features that would tend to prevent uniform compaction by the equipment to be used.

4.4 Where the slope ratio of the original ground is steeper than 5:1 (horizontal:vertical), or where recommended by the Consultant, the original ground should be benched in accordance with the following illustration.

TYPICAL BENCHING DETAIL



No Scale

DETAIL NOTES: (1) Key width "B" should be a minimum of 10 feet, or sufficiently wide to permit complete coverage with the compaction equipment used. The base of the key should be graded horizontal, or inclined slightly into the natural slope.

(2) The outside of the key should be below the topsoil or unsuitable surficial material and at least 2 feet into dense formational material. Where hard rock is exposed in the bottom of the key, the depth and configuration of the key may be modified as approved by the Consultant.

4.5 After areas to receive fill have been cleared and scarified, the surface should be moisture conditioned to achieve the proper moisture content, and compacted as recommended in Section 6 of these specifications.

5. COMPACTION EQUIPMENT

5.1 Compaction of *soil* or *soil-rock* fill shall be accomplished by sheepsfoot or segmented-steel wheeled rollers, vibratory rollers, multiple-wheel pneumatic-tired rollers, or other types of acceptable compaction equipment. Equipment shall be of such a design that it will be capable of compacting the *soil* or *soil-rock* fill to the specified relative compaction at the specified moisture content.

5.2 Compaction of *rock* fills shall be performed in accordance with Section 6.3.

6. PLACING, SPREADING AND COMPACTION OF FILL MATERIAL

6.1 *Soil* fill, as defined in Paragraph 3.1.1, shall be placed by the Contractor in accordance with the following recommendations:

6.1.1 *Soil* fill shall be placed by the Contractor in layers that, when compacted, should generally not exceed 8 inches. Each layer shall be spread evenly and shall be thoroughly mixed during spreading to obtain uniformity of material and moisture in each layer. The entire fill shall be constructed as a unit in nearly level lifts. Rock materials greater than 12 inches in maximum dimension shall be placed in accordance with Section 6.2 or 6.3 of these specifications.

6.1.2 In general, the *soil* fill shall be compacted at a moisture content at or above the optimum moisture content as determined by ASTM D 1557-02.

6.1.3 When the moisture content of *soil* fill is below that specified by the Consultant, water shall be added by the Contractor until the moisture content is in the range specified.

6.1.4 When the moisture content of the *soil* fill is above the range specified by the Consultant or too wet to achieve proper compaction, the *soil* fill shall be aerated by the Contractor by blading/mixing, or other satisfactory methods until the moisture content is within the range specified.

6.1.5 After each layer has been placed, mixed, and spread evenly, it shall be thoroughly compacted by the Contractor to a relative compaction of at least 90 percent. Relative compaction is defined as the ratio (expressed in percent) of the in-place dry density of the compacted fill to the maximum laboratory dry density as determined in accordance with ASTM D 1557-02. Compaction shall be continuous over the entire area, and compaction equipment shall make sufficient passes so that the specified minimum relative compaction has been achieved throughout the entire fill.

6.1.6 Where practical, soils having an Expansion Index greater than 50 should be placed at least 3 feet below finish pad grade and should be compacted at a moisture content generally 2 to 4 percent greater than the optimum moisture content for the material.

6.1.7 Properly compacted *soil* fill shall extend to the design surface of fill slopes. To achieve proper compaction, it is recommended that fill slopes be over-built by at least 3 feet and then cut to the design grade. This procedure is considered preferable to track-walking of slopes, as described in the following paragraph.

6.1.8 As an alternative to over-building of slopes, slope faces may be back-rolled with a heavy-duty loaded sheepsfoot or vibratory roller at maximum 4-foot fill height intervals. Upon completion, slopes should then be track-walked with a D-8 dozer or similar equipment, such that a dozer track covers all slope surfaces at least twice.

6.2 *Soil-rock* fill, as defined in Paragraph 3.1.2, shall be placed by the Contractor in accordance with the following recommendations:

6.2.1 Rocks larger than 12 inches but less than 4 feet in maximum dimension may be incorporated into the compacted *soil* fill, but shall be limited to the area measured 15 feet minimum horizontally from the slope face and 5 feet below finish grade or 3 feet below the deepest utility, whichever is deeper.

6.2.2 Rocks or rock fragments up to 4 feet in maximum dimension may either be individually placed or placed in windrows. Under certain conditions, rocks or rock fragments up to 10 feet in maximum dimension may be placed using similar methods. The acceptability of placing rock materials greater than 4 feet in maximum dimension shall be evaluated during grading as specific cases arise and shall be approved by the Consultant prior to placement.

6.2.3 For individual placement, sufficient space shall be provided between rocks to allow for passage of compaction equipment.

6.2.4 For windrow placement, the rocks should be placed in trenches excavated in properly compacted *soil* fill. Trenches should be approximately 5 feet wide and 4 feet deep in maximum dimension. The voids around and beneath rocks should be filled with approved granular soil having a Sand Equivalent of 30 or greater and should be compacted by flooding. Windrows may also be placed utilizing an "open-face" method in lieu of the trench procedure, however, this method should first be approved by the Consultant.

6.2.5 Windrows should generally be parallel to each other and may be placed either parallel to or perpendicular to the face of the slope depending on the site geometry. The minimum horizontal spacing for windrows shall be 12 feet center-to-center with a 5-foot stagger or offset from lower courses to next overlying course. The minimum vertical spacing between windrow courses shall be 2 feet from the top of a lower windrow to the bottom of the next higher windrow.

6.2.6 Rock placement, fill placement and flooding of approved granular soil in the windrows should be continuously observed by the Consultant.

6.3 *Rock* fills, as defined in Section 3.1.3, shall be placed by the Contractor in accordance with the following recommendations:

6.3.1 The base of the *rock* fill shall be placed on a sloping surface (minimum slope of 2 percent). The surface shall slope toward suitable subdrainage outlet facilities. The *rock* fills shall be provided with subdrains during construction so that a hydrostatic pressure buildup does not develop. The subdrains shall be permanently connected to controlled drainage facilities to control post-construction infiltration of water.

6.3.2 *Rock* fills shall be placed in lifts not exceeding 3 feet. Placement shall be by rock trucks traversing previously placed lifts and dumping at the edge of the currently placed lift. Spreading of the *rock* fill shall be by dozer to facilitate *seating* of the rock. The *rock* fill shall be watered heavily during placement. Watering shall consist of water trucks traversing in front of the current rock lift face and spraying water continuously during rock placement. Compaction equipment with compactive energy comparable to or greater than that of a 20-ton steel vibratory roller or other compaction equipment providing suitable energy to achieve the required compaction or deflection as recommended in Paragraph 6.3.3 shall be utilized. The number of passes to be made should be determined as described in Paragraph 6.3.3. Once a *rock* fill lift has been covered with *soil* fill, no additional *rock* fill lifts will be permitted over the *soil* fill.

6.3.3 Plate bearing tests, in accordance with ASTM D 1196-93, may be performed in both the compacted *soil* fill and in the *rock* fill to aid in determining the required minimum number of passes of the compaction equipment. If performed, a minimum of three plate bearing tests should be performed in the properly compacted *soil* fill (minimum relative compaction of 90 percent). Plate bearing tests shall then be performed on areas of *rock* fill having two passes, four passes and six passes of the compaction equipment, respectively. The number of passes required for the *rock* fill shall be determined by comparing the results of the plate bearing tests for the *soil* fill and the *rock* fill and by evaluating the deflection variation with number of passes. The required number of passes of the compaction equipment will be performed as necessary until the plate bearing deflections are equal to or less than that determined for the properly compacted *soil* fill. In no case will the required number of passes be less than two.

6.3.4 A representative of the Consultant should be present during *rock* fill operations to observe that the minimum number of “passes” have been obtained, that water is being properly applied and that specified procedures are being followed. The actual number of plate bearing tests will be determined by the Consultant during grading.

6.3.5 Test pits shall be excavated by the Contractor so that the Consultant can state that, in their opinion, sufficient water is present and that voids between large rocks are properly filled with smaller rock material. In-place density testing will not be required in the *rock* fills.

6.3.6 To reduce the potential for “piping” of fines into the *rock* fill from overlying *soil* fill material, a 2-foot layer of graded filter material shall be placed above the uppermost lift of *rock* fill. The need to place graded filter material below the *rock* should be determined by the Consultant prior to commencing grading. The gradation of the graded filter material will be determined at the time the *rock* fill is being excavated. Materials typical of the *rock* fill should be submitted to the Consultant in a timely manner, to allow design of the graded filter prior to the commencement of *rock* fill placement.

6.3.7 *Rock* fill placement should be continuously observed during placement by the Consultant.

7. OBSERVATION AND TESTING

7.1 The Consultant shall be the Owner’s representative to observe and perform tests during clearing, grubbing, filling, and compaction operations. In general, no more than 2 feet in vertical elevation of *soil* or *soil-rock* fill should be placed without at least one field density test being performed within that interval. In addition, a minimum of one field density test should be performed for every 2,000 cubic yards of *soil* or *soil-rock* fill placed and compacted.

7.2 The Consultant should perform a sufficient distribution of field density tests of the compacted *soil* or *soil-rock* fill to provide a basis for expressing an opinion whether the fill material is compacted as specified. Density tests shall be performed in the compacted materials below any disturbed surface. When these tests indicate that the density of any layer of fill or portion thereof is below that specified, the particular layer or areas represented by the test shall be reworked until the specified density has been achieved.

7.3 During placement of *rock* fill, the Consultant should observe that the minimum number of passes have been obtained per the criteria discussed in Section 6.3.3. The Consultant should request the excavation of observation pits and may perform plate bearing tests on the placed *rock* fills. The observation pits will be excavated to provide a basis for expressing an opinion as to whether the *rock* fill is properly seated and sufficient moisture has been applied to the material. When observations indicate that a layer of *rock* fill or any portion thereof is below that specified, the affected layer or area shall be reworked until the *rock* fill has been adequately seated and sufficient moisture applied.

7.4 A settlement monitoring program designed by the Consultant may be conducted in areas of *rock* fill placement. The specific design of the monitoring program shall be as recommended in the Conclusions and Recommendations section of the project Geotechnical Report or in the final report of testing and observation services performed during grading.

7.5 The Consultant should observe the placement of subdrains, to verify that the drainage devices have been placed and constructed in substantial conformance with project specifications.

7.6 Testing procedures shall conform to the following Standards as appropriate:

7.6.1 Soil and Soil-Rock Fills:

7.6.1.1 Field Density Test, ASTM D 1556-02, *Density of Soil In-Place By the Sand-Cone Method.*

7.6.1.2 Field Density Test, Nuclear Method, ASTM D 6938-08A, *Density of Soil and Soil-Aggregate In-Place by Nuclear Methods (Shallow Depth).*

7.6.1.3 Laboratory Compaction Test, ASTM D 1557-02, *Moisture-Density Relations of Soils and Soil-Aggregate Mixtures Using 10-Pound Hammer and 18-Inch Drop*.

7.6.1.4. Expansion Index Test, ASTM D 4829-03, *Expansion Index Test*.

7.6.2 Rock Fills

7.6.2.1 Field Plate Bearing Test, ASTM D 1196-93 (Reapproved 1997) *Standard Method for Nonreparative Static Plate Load Tests of Soils and Flexible Pavement Components, For Use in Evaluation and Design of Airport and Highway Pavements.*

8. PROTECTION OF WORK

8.1 During construction, the Contractor shall properly grade all excavated surfaces to provide positive drainage and prevent ponding of water. Drainage of surface water shall be controlled to avoid damage to adjoining properties or to finished work on the site. The Contractor shall take remedial measures to prevent erosion of freshly graded areas until such time as permanent drainage and erosion control features have been installed. Areas subjected to erosion or sedimentation shall be properly prepared in accordance with the Specifications prior to placing additional fill or structures.

8.2 After completion of grading as observed and tested by the Consultant, no further excavation or filling shall be conducted except in conjunction with the services of the Consultant.

9. CERTIFICATIONS AND FINAL REPORTS

9.1 Upon completion of the work, Contractor shall furnish Owner a certification by the Civil Engineer stating that the lots and/or building pads are graded to within 0.1 foot vertically of elevations shown on the grading plan and that all tops and toes of slopes are within 0.5 foot horizontally of the positions shown on the grading plans. After installation of a section of subdrain, the project Civil Engineer should survey its location and prepare an *as-built* plan of the subdrain location. The project Civil Engineer should verify the proper outlet for the subdrains and the Contractor should ensure that the drain system is free of obstructions.

9.2 The Owner is responsible for furnishing a final as-graded soil and geologic report satisfactory to the appropriate governing or accepting agencies. The as-graded report should be prepared and signed by a California licensed Civil Engineer experienced in geotechnical engineering and by a California Certified Engineering Geologist, indicating that the geotechnical aspects of the grading were performed in substantial conformance with the Specifications or approved changes to the Specifications.

LIST OF REFERENCES

1. Anderson, J. G., 1984, *Synthesis of Seismicity and Geologic Data in California*, U.S. Geological Survey Open File Report 84-424.

2. Boore, D. M. and G. M Atkinson, 2008, *Ground-Motion Prediction for the Average Horizontal Component of PGA, PGV, and 5%-Damped PSA at Spectral Periods Between 0.01 and 10.0 S*, Earthquake Spectra, Volume 24, Issue 1, pages 99-138, February.

3. California Division of Mines and Geology (CDMG), 2000, *Seismic Hazard Evaluation of El Toro 7.5-Minute Quadrangle, Orange County, California,* Open File Report 200-013.

4. California Division of Mines and Geology (CDMG), 2001, *State of California Seismic Hazard Zones, El Toro Quadrangle,* Official Map, released January 17.

5. California Geological Survey (CGS), 2003, *Earthquake Shaking Potential for California*, from USGS/CGS Seismic Hazards Model, CSSC No. 03-02.

6. California Geological Survey, 2002, *Seismic Shaking Hazards in California*, Based on the USGS/CGS Probabilistic Seismic Hazards Assessment (PSHA) Model, revised April 2003, 10% probability of being exceeded in 50 years.
http://redirect.conservation.ca.gov/cgs/rghm/pshamap/pshamain.html

7. Campbell, K. W. and Y. Bozorgnia, 2008 *NGA Ground Motion Model for the Geometric Mean Horizontal Component of PGA, PGV, PGD and 5% Damped Linear Elastic Response Spectra for Periods Ranging from 0.01 to 10 s*, Preprint of version submitted for publication in the NGA Special Volume of Earthquake Spectra, Volume 24, Issue 1, pages 139-171, February.

8. Chiou, Brian S. J. and Robert R. Youngs, 2008, *A NGA Model for the Average Horizontal Component of Peak Ground Motion and Response Spectra*, preprint for article to be published in NGA Special Edition for Earthquake Spectra, Spring.

9. Fife, D. L., 1974, *Geology of the South Half of the El Toro Quadrangle, Orange County, California,* California Dept. of Conservation, Division of Mines and Geology, Special Report 110, map scale 1:12,000.

10. Jennings, Charles W. and William A. Bryant, 2010, *Fault Activity Map of California*, California Division of Mines and Geology Map No. 6.

11. Orange County, 2004, *Safety Element of the General Plan.*

12. Morton, P. K. and R. V. Miller, 1981, *Geologic Map of Orange County, California, Showing Mines and Mineral Deposits*, California Division of Mines and Geology Bulletin 204, Plate 1.

13. Pacific Soils Engineering, Inc., 1998, *Grading Plan Review, 40-Scale Preliminary Grading Plans, Tract 14127, Trabuco Canyon Area, County of Orange, California,* dated June 24, Work Order 102234-V1.

14. Pacific Soils Engineering, Inc., 1998, *Grading Plan Review 40-Scale Preliminary Grading Plan, Tract 14125, Trabuco Canyon Area, County of Orange, California,* dated July 20, Work Order 102234-V2.

LIST OF REFERENCES (Continued)

15. Pacific Soils Engineering, Inc., 1996, *Summary of Completed and Approved Grading Within and Adjacent to Vesting Tentative Tract 15353, Portola Hills, County of Orange, California,* dated October 23, Work Order 102234-A.

16. Pacific Soils Engineering, Inc., 1996, *Preliminary Plan Review, Vesting Tentative Tract No. 15353, Portola Hills, County of Orange, California*, dated November 5, Work Order 102234.

17. Pacific Soils Engineering, Inc., 1991, *Geotechnical Review of Revisions Concerning the Rough Grading Plan, Tentative Tract No. 13491, Phase I, Lots 42 through 48 incl., Portola Hills, County of Orange, California,* dated April 11, Work Order 100874-CW.

18. Pacific Soils Engineering, Inc., 1991, *Interim Soil Engineering and Engineering Geologic Grading Report, for a Portion of Tentative Tract No. 13490, Mass Grading Area North of Glenn Ranch Road, Portola Hills, County of Orange, California,* dated April 30, Work Order 101700-G1.

19. Pacific Soils Engineering, Inc., 1991, *Rough Grading Plan Review, Tentative Tract No. 13490, Commercial Development, Phase I, Portola Hills, County of Orange, California,* dated October 25, Work Order 101700-R1.

20. Pacific Soils Engineering, Inc., 1991, *Interim Soil Engineering and Engineering Geologic Grading Report, for a Portion of Tentative Tract No. 13490, Mass Grading Area North of Glenn Ranch Road, Portola Hills, County of Orange, California,* dated October 25, Work Order 101700-G1.

21. Pacific Soils Engineering, Inc., 1990, *Second Addendum Mass Grading Plan Review, for a Portion of Tentative Tract No. 13491, Portola Hills, County of Orange, California,* dated March 8, Work Order 100874-CS.

22. Risk Engineering Company, *EZ-FRISK,* (Version 7.62) 2011.

23. Shlemon, R. J., 1987, *The Cristianitos Fault and Quaternary Geology, San Onofre State Beach, California*, Geological Society of America Centennial Field Guide – Cordilleran Section: Boulder, Colorado, Geological Society of America, Pages 171 through 174.

24. Wesnousky, S. G., 1986, *Earthquakes, Quaternary Faults and Seismic Hazard in California*, Journal of Geophysical Research, Vol. 91, No. B12, pp. 12,587-12,631.

25. Ziony, J. I. and L. M. Jones, 1989, *Map Showing Late Quaternary Faults and 1978–1984 Seismicity of the Los Angeles Region, California*, U.S. Geological Survey Miscellaneous Field Studies Map MF-1964.