# Appendix E:
# Geotechnical Engineering Reports

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**Earth Systems**
**Southwest**

**Consulting Engineers and Geologists**

GOLDEN PHOENIX PRODUCTS CORPORATION
P. O. BOX 4227
DANA POINT, CALIFORNIA 92629

copy # 7.

# GEOTECHNICAL ENGINEERING REPORT
# MULTI-FAMILY
# RESIDENTIAL DEVELOPMENT
# SOUTH OF VIA CANON AND
# CAMINO CAPISTRANO
# DANA POINT, CALIFORNIA

November 17, 2006

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File No.: 10123-02
06-11-706

**Earth Systems**
Southwest

27126B Paseo Espada, Suite 704
San Juan Capistrano, California 92675
(949) 248-9005
FAX (949) 248-9016

November 17, 2006

File No.: 10123-02
06-11-706

Golden Phoenix Products Corporation
P. O. Box 4227
Dana Point, California 92629

Attention: Mr. Ken Miller

Project: **Multi-Family Residential Development**
South of Via Canon and Camino Capistrano
Dana Point, California

Subject: **Geotechnical Engineering Report**

Dear Mr. Miller:

We take pleasure in presenting this geotechnical engineering report prepared for the proposed residential development of twelve hillside lots to be located along the southerly side at the intersection of Via Canon and Camino Capistrano in the City of Dana Point, California.

This report presents our findings and recommendations for site grading and foundation design, incorporating the information provided to our office. The site may be made suitable for the proposed development, provided the recommendations in this report are followed in design and construction. The site is subject to moderate to strong ground motion from the nearby faults in the area. Highly expansive siltstone bedrock anticipated to be in contact with the foundation systems of the proposed development has a high sulfate content affecting concrete and requires special concrete mixes. In addition, the site soils as tested are very corrosive when in contact with metal. This report should stand as a whole and no part of the report should be excerpted or used to the exclusion of any other part.

This report completes our scope of services in accordance with our agreement, dated July 14, 2006. Other services that may be required, such as additional letters or revisions to the report required by the City reviewer or by design changes, meetings, plan review, and grading observation, are additional services and will be billed according to our Fee Schedule in effect at the time services are provided. Unless requested in writing, the client or his representative is responsible for distributing this report to the appropriate governing agency or other members of the design team.

We appreciate the opportunity to provide our professional services. Please contact our office if there are any questions or comments concerning this report or its recommendations.

Respectfully submitted,
**EARTH SYSTEMS SOUTHWEST**

Carl D. Schrenk
EG 900

Shelton L. Stringer
GE 2266, EG2417

SHELTON L. STRINGER
11/21/06
No. 2266
Exp. 6-30-08

SHELTON L STRINGER
No. 2417
ENGINEERING GEOLOGIST

SER/sls/cds/psh/ajf

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# EXECUTIVE SUMMARY

Earth Systems Southwest has prepared this executive summary solely to provide a general overview of the report. The report itself should be relied upon for information about the findings, conclusions, recommendations, and other concerns.

The site is located along the southerly side of the "T" intersection of Via Canon and Camino Capistrano in the City of Dana Point, California. The proposed development will consist of twelve lots located on hillside terrain that ascends from Via Canon and Camino Capistrano. We understand that the proposed structures will be multi-level consisting of wood-frame and stucco construction supported with perimeter retaining wall foundations and concrete slabs-on-grade. Site access will be afforded by a proposed private roadway to be located along the rear or southerly property line.

The proposed project may be constructed as planned, provided that the recommendations in this report are incorporated in the final design and construction. Site development will include clearing and grubbing of vegetation, site excavations to prepare for building pads, shoring, retaining wall construction, underground utility installation, hardscape, grading for the roadway and roadway paving. In order to minimize retaining wall heights along the roadway compacted fill will be placed in front of the wall that runs along the southerly property line.

We consider the most significant geologic hazards to the project is the expansive and corrosive potential of the underlying bedrock and potential for moderate to severe seismic shaking that is likely to occur during the design life of the proposed structures. The project site is located in the highly seismic Southern California region within the influence of several fault systems that are considered to be active or potentially active. The site is located in Seismic Zone 4 of the 2001 California Building Code (CBC). Structures should be designed in accordance with the values and parameters given within the CBC. The seismic design parameters are presented in the following table and within the report.

## SUMMARY OF RECOMMENDATIONS

| Design Item | Recommended Parameter | Reference Section No. |
|---|---|---|
| **Foundations** | | |
| Allowable Bearing Pressure<br>Continuous wall footings<br>Pad (Column) footings | 2,000 psf<br>3,000 psf | 5.4 |
| Foundation Type-residential | Spread Footing | 5.4 |
| Bearing Materials | Bedrock | |
| Allowable Passive Pressure | 400 psf | 5.4 |
| Active Pressure | 35 pcf-level-granular<br>83 pcf sloping-bedding | 5.6 |
| At-rest Pressure | 55 pcf- granular level | 5.6 |
| Allowable Coefficient of Friction | 0.35 | 5.4 |
| Soil Expansion Potential | Very high<br>bedrock<br>(EI >90 ) | 3.1 |
| **Geologic and Seismic Hazards** | | |
| Liquefaction Potential | Negligible | 3.4.2 |
| Significant Fault and Magnitude | Newport Inglewood | 3.4.3 |
| Fault Type | B | 3.4.3 |
| Seismic Zone | 4 | 3.4.3 |
| Soil Profile Type | $S_c$ | 3.4.3 |
| Near-Source Distance | 5.7 km | 3.4.3 |
| Near Source Factor, $N_A$ | 1.00 | 3.4.3 |
| Near Source Factor, $N_V$ | 1.17 | 3.4.3 |
| **Pavement** | | |
| TI equal to 6.0 (Moderate Traffic) | 3.5" AC / 11.5" AB | 5.8 |
| **Slabs** | | |
| Building Floor Slabs | Bedrock/Granular Fill | 5.5 |
| Modulus of Subgrade Reaction | 75 pci | 5.5 |
| **Existing Site Conditions** | | |
| Existing Fill | 8 +/- | |
| Soil Corrosivity | severe sulfates<br>moderate chlorides | 5.7 |
| Groundwater Depth | N/A | 3.2 |
| Estimated Fill and Cut<br>(includes over-excavation) | 10 feet – fill<br>25 feet – cut (temporary) | 1.1 |

The recommendations contained within this report are subject to the limitations presented in Section 6 of this report. We recommend that all individuals using this report read the limitations.

# GEOTECHNICAL ENGINEERING REPORT
# MULTI-FAMILY
# RESIDENTIAL DEVELOPMENT
# SOUTH OF VIA CANON AND
# CAMINO CAPISTRANO
# DANA POINT, CALIFORNIA

## Section 1
## INTRODUCTION

### 1.1 Project Description

This geotechnical engineering report has been prepared for the proposed development of 12 residential properties to be located along the uphill side, south of Via Canon and Camino Capistrano in the City of Dana Point, California.

The proposed 12-lot development will be multi-level, single-family dwelling units stepped down the hillside, from a roadway. This 30-foot wide road will be graded starting from Camino Capistrano at the westerly end of the proposed development, ascending along the southerly project boundary and terminating near the south-easterly property boundary. Grading along this roadway will necessitate cuts up to 25 feet in vertical height, shoring will be required to support these temporary cut slopes. The shoring will also be used as the permanent retaining wall. This wall will be located along the entire length of the southerly or rear property line.

Fill generated from grading of the cuts will be used to construct a 2:1 fill slope that will be placed along the inside edge of the roadway, ascending to meet the retaining wall along the southerly property boundary. This fill placement will reduce the overall visual height of the wall due to the wall being partially buried by the fill slope. The road will provide access to the individual residences that will be cut into the hillside to provide for several floor levels of living area downslope from the road. The vertical cut areas necessary to create building elevations will be retained. Both landscape and hardscape walls will be constructed elsewhere on the project anticipated not exceeding 8 feet in height.

We understand that the proposed residential structures will be of wood-frame and stucco construction and will be supported by footings/piers placed below the lowest day-lighted bedrock bedding plane measured from the toe of the slope adjacent to Via Canon or Camino Capistrano. In addition, the up slope bedrock behind the residential retaining walls will be trimmed along the lowest exposed bedding plane and the wall will be then backfilled with granular free draining material.

Site development will include clearing and grubbing of vegetation, excavation and site grading, shoring, preparation of the multi-level building pads, retaining wall construction, roadway and flatwork construction, underground utility installation, and driveway placement.

We used maximum column loads of 20 kips and a maximum wall loading of 2.0 kips per linear foot as a basis for the foundation recommendations. All loading is assumed to be dead plus actual live load. If actual structural loading exceeds these assumed values, we would need to re-evaluate the given recommendations.

## 1.2 Site Description

The proposed 12-lot development is to be constructed on hillside terrain, on the property upslope from Camino Capistrano and Via Canon. The site location relative to the general area is shown on Figure 1 in Appendix A.

The project site presently consists of an undeveloped parcel on steep hillside terrain ascending at variable gradients of 1:1 (horizontal to vertical) to 4:1. Single-family residences have been previously built on the lots adjacent to and southerly or above subject property, fronting on Via California. A single-residence is located adjacent to the easterly project boundary and fronts on Via Canon. This residence is stepped into the hillside.

The proposed twelve undeveloped lots are to be created from a +/- 2-acre parcel of land which is irregular in shape. The property has been somewhat been modified by past grading consisting of excavations, old roadway and placement of a limited amount of fill soil. A gentle swale is located near the center of the property. Concrete rubble representing a drainage swale was found to be partially buried in this area. The property also has been modified by erosion and surficial slumping due to a combination of over-steepened road cuts along Camino Capistrano and Via Canon and by concentrated water through burrowing rodent holes. The road cuts are up to 8 to 10 feet in height at a gradient of 1:1, locally steeper. Vegetation mantling the existing terrain consists of seasonal grasses, ice plant, larger shrubs and bushes, with eucalyptus and pine trees bordering the southerly property boundary. Maximum elevation difference across the site is approximately 90 feet. A 30-inch water pipe has been located and traverses the site. The water easement has been marked in the field by the Capistrano Water District. Reportedly this water line is approximately 15 to 20 feet below the existing ground surface. Other utility lines that may also be present on the site including, but are not limited to, electric, sewer, telephone, cable, and irrigation lines.

## 1.3 Purpose and Scope of Work

The purpose for our current services was to evaluate the site soil and geologic conditions and to provide professional opinions and recommendations regarding the proposed development of the site. The scope of work included the following:

- Previous geologic feasibility of the site, including shallow subsurface exploration with a backhoe and bucket auger to depths of 17 feet below existing grade.
- Subsurface exploration by drilling 8 exploratory borings to depths ranging from 26 feet to 37.5 below existing grade.
- Laboratory testing of selected soil samples obtained from the exploratory borings.
- An engineering analysis and evaluation of the acquired data from the exploration and testing programs.
- A summary of our findings and recommendations based upon site development plans in this written report.

This report contains the following:
- Discussions on subsurface soil and groundwater conditions.
- Historic photograph review.
- Discussions on regional and local geologic conditions.

- Discussions on geologic and seismic hazards.
- Graphic and tabulated results of laboratory tests and field studies.
- Recommendations regarding:
    - Site development and grading and excavation criteria.
    - Underground utility installations.
    - Structure foundation type and design.
    - Recommendations for temporary cuts and shoring
    - Allowable foundation bearing capacity and expected total and differential settlements.
    - Concrete slabs-on-grade.
    - Lateral earth pressures and coefficients.
    - Retaining wall design parameters
    - Mitigation of the potential corrosivity of site soils to concrete and steel reinforcement.
    - Seismic design parameters.
    - Preliminary pavement structural sections.

Not Contained in This Report: Although available through Earth Systems Southwest, the current scope of our services does not include:

- A corrosive study to determine cathodic protection of concrete or buried pipes.
- An environmental assessment.
- An investigation for the presence or absence of wetlands, hazardous or toxic materials in the soil, surface water, groundwater, or air on, below, or adjacent to the subject property.

The client did not direct ESSW to provide any service to investigate or detect the presence of moisture, mold, or other biological contaminates in or around any structure, or any service that was designed or intended to prevent or lower the risk or the occurrence of the amplification of the same. Client acknowledges that mold is ubiquitous to the environment, with mold amplification occurring when building materials are impacted by moisture. Client further acknowledges that site conditions are outside of ESSW's control and that mold amplification will likely occur or continue to occur in the presence of moisture. As such, ESSW cannot and shall not be held responsible for the occurrence or recurrence of mold amplification.

## Section 2
## METHODS OF INVESTIGATION

### 2.1 Field Exploration

Seven exploratory test pits were excavated by a track mounted mini excavator and one augered boring drilled by a portable bucket auger, was lifted onto the site by a crane. The test pits and augered boring achieved depths ranging from 8 to 17 feet to determine the depth and nature of surficial soils and shallow bedrock. These test pits and boring was logged during mid May of 2005. In addition eight bucket auger borings were drilled by an all terrain bucket auger to depths of between 26 to 37.5 feet below the ground surface. These bucket auger borings were drilled between August 21 and August 31, 2006 in order to penetrate the bedrock surface and obtain bedrock samples for testing. Down-hole geologic mapping was also conducted to ascertain contacts between stratigraphic and lithologic contacts, measurements of bedding attitudes, joint/fracture patterns and to search for clay seams that may indicate past movement. The down-hole mapping was conducted during the excavation/drilling of both test pits and bucket auger borings. Boring locations are shown on the Boring Location and Geologic Map, Figure 2, in Appendix A. The recent (2006) boring locations have been established from survey data by Toal Engineering, while the 2005 exploratory test pits and boring were made from topographic expressions estimated in the field from topographic expressions. All vertical measurements of the test borings were made from the lowest adjacent grade on the slope face.

Samples were obtained within the most recent test borings using a Standard Penetration (SPT) sampler (ASTM D 1586) and a Modified California (MC) ring sampler (ASTM D 3550 with shoe similar to ASTM D 1586). The SPT sampler has a 2-inch outside diameter and a 1.38-inch inside diameter. The MC sampler has a 3-inch outside diameter and a 2.37-inch inside diameter. The samples were obtained by driving the sampler with a 140-pound hammer, manually activated by rope and cathead, dropping 30 inches in general accordance with ASTM D 1586. Recovered soil samples were sealed in containers and returned to the laboratory. Bulk samples were also obtained from auger cuttings, representing a mixture of soils encountered at the depths noted.

The final logs of the borings and test pits represent our interpretation of the contents of the field logs and the results of laboratory testing performed on the samples obtained during the subsurface exploration. The most recent final logs are included in Appendix A of this report. The previous test pits and boring logs completed in the year of 2005 are included in Appendix C. The stratification lines represent the approximate boundaries between soil types, although the transitions may be gradational.

### 2.2 Laboratory Testing

Samples were reviewed along with field logs to select those that would be analyzed further. Those selected for laboratory testing include soils that would be exposed and used during grading and those deemed to be within the influence of the proposed structure. Test results are presented in graphic and tabular form in Appendix B of this report. The tests were conducted in general accordance with the procedures of the American Society for Testing and Materials (ASTM) or other standardized methods as referenced below. Our testing program consisted of the following:

- Maximum density tests to evaluate the moisture-density relationship of typical soils encountered.

- Direct Shear to evaluate the relative frictional strength of the soils. In-situ and remolded specimens were placed in contact with water before testing and were then sheared under normal loads ranging from 0.5 to 2.0 kips per square foot.
- Expansion index tests to evaluate the expansive nature of the soil. The samples were surcharged under 144 pounds per square foot at moisture content of near 50% saturation. Samples were then submerged in water for 24 hours and the amount of expansion was recorded with a dial indicator.
- Liquid and Plastic Limits tests to evaluate the plasticity and expansive nature of clayey soils.
- Chemical Analyses (Soluble Sulfates and Chlorides, pH, and Electrical Resistivity) to evaluate the potential adverse effects of the soil on concrete and steel.

### 2.3 Historic Aerial Photograph Review

A record of historic aerial photographs was researched for the years 1985, 1971, 1965, 1952 and 1938 to assess if significant alteration of the property or other features had occurred. Prior to 1952 evidence of a former structure was noted with a roadway access cutting diagonally across the property near the southwesterly end of the site. The structure has long since been demolished, however evidence of the roadway still remain. The most significant changes to the property appeared to have occurred during the years from 1952 to 1965. This period of time significantly altered the adjacent terrain, with the construction of the over-crossing for Highway 1 connecting to the Interstate 5 freeway system and residential development along Via California. The area as mapped on Figure 2, Regional Geologic Map, that shows as $Qt_n$ was apparently a broad swale extending upward from the property to Via California, the street above subject property. During the development of the area the swale area was filled to provide for residential building pads, residences were subsequently constructed on this fill that was placed during the early 1960's. No evidence of landslides was noted on the reviewed photographs.

## Section 3
## DISCUSSION

### 3.1 Soil Conditions

The boring logs provided in Appendix A include more detailed descriptions of the soil and bedrock encountered. Expansion tests indicate that the bedrock is classified as very high expansion (EI > 90) category in accordance with Table 18A-I-B of the California Building Codes.

### 3.2 Groundwater

Water seepage was encountered in several test pits and borings near the contact with marine terrace sand and the Capistrano siltstone bedrock. Some seepage was also encountered within the sandier interbedded layers of bedrock. As the bedrock is comprised of compressed silt and clay it is relatively impermeable, allowing for percolation to flow along the more permeable sandier soils. Water seepage, in part is derived from rainfall and landscape irrigation from the upslope terrain.

### 3.3 Geologic Setting

Regional Geology: The Dana Point area comprises a part of the southern Santa Ana Mountains that is within the Peninsular Range Geologic Province. The Dana Point area is characterized by rolling hills that are deeply dissected by gullies and canyons that drain southerly to the ocean. A narrow strip of coastal plain with elevated marine terraces parallels the coastline along the length of the City. Pleistocene marine sand and gravel deposits comprise these terraces as well as later depositions of non marine terrace silts, clays and sands derived from the erosion of the nearby hillsides. The Capistrano Formation of late Miocene to Pliocene Age is widely distributed over the Dana Point area and consists primarily of marine siltstone, interbedded sandstone and mudstone. This Formation directly underlies the terrace soils and typically forms gradual slopes. This Formation is prone to landslides.

Site Geology: Review of the California Division of Mines and Geology Special Report 109, Geology of the Dana Point Quadrangle, 1974, reveals a portion of the central area mapped Qtn on Figure 2 as a landslide. However, based upon our exploration and past development of this "landslide" area no evidence of any landslide or other landslide related instability was noted during our exploration.

Undocumented fill was found in several test pits and borings to depths of 8 feet or less. The undocumented fill may have been placed for a roadway that may have existed previously on the site. Deeper areas of fill may likely exist on the property where not explored. The trench excavated for the water line likely is backfilled with undocumented fill to a depth of 15 feet or greater. A variable mantle of topsoil/slope wash exists on the slope that is in turn underlain by terrace deposits, both marine and non marine and the Capistrano Formation. Both the non marine and marine deposits are highly erodible when exposed to concentrated water runoff. Siltstone bedrock of the Capistrano Formation directly underlies the sandy marine terrace soil and is exposed in road cuts along Via Canon. The weathered bedrock consists of an olive gray to brown siltstone grading to unweathered dark gray siltstone, generally well bedded becoming massive at depth. Bedding measured within the test pits and borings consistently dip from between 20 to 35 degrees in a northerly direction (dip slope condition). No evidence of landslides, other than erosion and surficial slumping on over-steepened road cuts were noted during our exploration.

The test pit and boring logs provided in Appendices A and C include a more detailed description of the surficial soils and bedrock materials encountered.

## 3.4 Geologic Hazards

Geologic hazards that may affect the region include seismic hazards (ground shaking, surface fault rupture, soil liquefaction, and other secondary earthquake-related hazards), slope instability, flooding, ground subsidence, debris flows and erosion. A discussion follows on the specific hazards to this site.

### 3.4.1 Seismic Hazards

Seismic Sources: Several active faults or seismic zones lie within 62 miles (100 kilometers) of the project site as shown on Table 1 in Appendix A. The primary seismic hazard to the site is strong ground shaking from earthquakes along the Newport-Inglewood fault and possibly the San Joaquin Thrust fault. The Maximum Magnitude Earthquake ($M_{max}$) listed is from published geologic information available for each fault (Cao et. al., CGS 2003). The $M_{max}$ corresponds to the maximum earthquake believed to be tectonically possible.

Surface Fault Rupture: The project site does not lie within a currently delineated State of California, *Alquist-Priolo* Earthquake Fault Zone (Hart, 1997). Well-delineated fault lines cross through this region as shown on California Geological Survey (CGS) maps (Jennings, 1994); however, no active faults are mapped in the immediate vicinity of the site. Therefore, active fault rupture is unlikely to occur at the project site. While fault rupture would most likely occur along previously established fault traces, future fault rupture could occur at other locations.

### 3.4.2 Secondary Hazards

Secondary seismic hazards related to ground shaking include soil liquefaction, ground subsidence, tsunamis, and seiches. The site is elevated 80 feet above sea level and approximately 1700 feet inland, so the hazard from tsunamis is remote. At the present time, no water storage reservoirs are located in the immediate vicinity of the site. Therefore, hazards from seiches are considered negligible at this time.

Soil Liquefaction: Liquefaction is the loss of soil strength from sudden shock (usually earthquake shaking), causing the soil to become a fluid mass. In general, for the effects of liquefaction to be manifested at the surface, groundwater levels must be within 50 feet of the ground surface and the soils within the saturated zone must also be susceptible to liquefaction. The potential for liquefaction to occur at this site is considered nil due to the proposed foundations resting entirely into dense bedrock, or compacted fill on bedrock.

Ground Subsidence: The potential for seismically induced ground subsidence is considered to be negligible at the site due to the proposed foundations embedded into bedrock and the onsite soil used at the site will be compacted.

Slope Instability: The site has been mapped as an earthquake induced landslide area. Recommendations provided within this report will substantially mitigate the potential for both landslides and earthquake induced landslides.

Flooding Erosion and Debris Flow: The proposed project development does not lie within a designated FEMA 100-year flood plain. The sandier portion of the site soil is very susceptible to erosion as evidenced by deeply incised erosional features, especially where water is allowed to be directed over or onto the slope face in a concentrated manner. Mitigation erosion and water control measures are provided herein.

### 3.4.3 Site Acceleration and Seismic Coefficients

Site Acceleration: The potential intensity of ground motion may be estimated by the horizontal peak ground acceleration (PGA), measured in "g" forces. Included in Table 1 are deterministic estimates of site acceleration from possible earthquakes at nearby faults. Ground motions are dependent primarily on the earthquake magnitude and distance to the seismogenic (rupture) zone. Accelerations are also dependent upon attenuation by rock and soil deposits, direction of rupture, and type of fault. For these reasons, ground motions may vary considerably in the same general area. This variability can be expressed statistically by a standard deviation about a mean relationship.

The PGA alone is an inconsistent scaling factor to compare to the CBC Z factor and is generally a poor indicator of potential structural damage during an earthquake. Important factors influencing the structural performance are the duration and frequency of strong ground motion, local subsurface conditions, soil-structure interaction, and structural details.

The following table provides the probabilistic estimate of the PGA taken from the 2002 CGS/USGS seismic hazard maps.

**Estimate of PGA from 2002 CGS/USGS**
**Probabilistic Seismic Hazard Maps**

| Risk | Equivalent Return Period (years) | PGA (g) [1] |
|---|---|---|
| 10% exceedance in 50 years | 475 | 0.31 |

Notes:

[1] Based on a soft rock site, $S_{B/C}$.

2001 CBC Seismic Coefficients: The California Building Code (CBC) seismic design criteria are based on a Design Basis Earthquake (DBE) that has an earthquake ground motion with a 10% probability of occurrence in 50 years. The PGA estimate given above is provided for information on the seismic risk inherent in the CBC design. The seismic and site coefficients given in Chapter 16 of the 2001 California Building Code are provided below.

**2001 CBC Seismic Coefficients for Chapter 16 Seismic Provisions**

| | | | Reference |
|---|---|---|---|
| Seismic Zone: | 4 | | Figure 16-2 |
| Seismic Zone Factor, Z: | 0.4 | | Table 16-I |
| Soil Profile Type: | $S_C$ | | Table 16-J |
| Seismic Source Type: | B | | Table 16-U |
| Distance to Known Seismic Source: 5.7 km = 3.5 miles | | | Newport-Inglewood (offshore) |
| Near Source Factor, Na: | 1.00 | | Table 16-S |
| Near Source Factor, Nv: | 1.17 | | Table 16-T |
| Seismic Coefficient, Ca: | 0.40 | = 0.40Na | Table 16-Q |
| Seismic Coefficient, Cv: | 0.66 | = 0.56Nv | Table 16-R |

Seismic Hazard Zones: The site **does not lie** within a liquefaction, zone established by the California Seismic Hazard Mapping Act (Ca. PRC 2690 to 2699).

## Section 4
## CONCLUSIONS

The following is a summary of our conclusions and professional opinions based on the data obtained from a review of selected technical literature and the site evaluation.

General:

- From a geotechnical perspective, the site is suitable for the proposed development, provided the recommendations in this report are followed in the design and construction of this project.

Geotechnical Constraints and Mitigation:

- The primary geologic hazard is severe ground shaking from earthquakes originating on nearby faults, such as the Newport Inglewood Fault. A major earthquake above magnitude 6.5 originating on the local segments of the Newport-Inglewood (fault type B) and the San Joaquin Hills (fault type C) fault zones would be the closest faults that may affect the site within the design life of the proposed development. Engineered design and earthquake-resistant construction increase safety and allow development of seismic areas.
- The project site is in seismic Zone 4, is of soil profile Type $S_C$, and is about 5.7 km from a Type B seismic source as defined in the California Building Code. A qualified professional should design any permanent structure constructed on the site. The *minimum* seismic design should comply with the 2001 edition of the California Building Code (CBC).
- Adherence to the grading and structural recommendations in this report should significantly reduce potential debris flow problems from seismic forces, heavy rainfall or irrigation, and the weight of the intended structures.
- The existing water transmission line traverses the property that will affect the development of several residences. The water line will be required to be removed and relocated. The excavation resulting from the removal of the pipe will be backfilled.
- Bedding planes within the bedrock are adversely oriented with respect to the site. Retaining walls should be designed to resist the additional loading imposed, as an alternate the bedding planes upslope from the walls could be removed along the daylight line. Further the foundations will be embedded below the lowest day lighted bedding plane.
- Because of the adversely oriented bedding and the presence in some areas of un-cemented sand temporary excavations for the retaining walls will require shoring, or trimmed along the bedding at a stable angle.
- Other geologic hazards, including fault rupture, liquefaction, seismically induced flooding are considered low or negligible on this site.
- The surficial native soils were found to be loose to medium dense and are unsuitable in their present condition to support structures, fill, streets, and hardscape. Most of the surficial soils will be removed during excavation, however loose soil if exposed at grade will require moisture conditioning over-excavation and recompaction to improve bearing capacity and reduce the potential for differential settlement from static loading. Site soils and bedrock can be readily excavated by normal grading equipment. Heavy ripping is not anticipated.

## Section 5
## RECOMMENDATIONS

### SITE DEVELOPMENT

### 5.1 Excavation, Shoring and Grading

A representative of Earth Systems Southwest (ESSW) should observe site clearing, shoring installation, excavation, grading, and the bottoms of soil and bedrock removal before placing fill. Local variations in soil conditions may warrant increasing the depth of recompaction and over-excavation.

Clearing and Grubbing: At the start of site grading, existing vegetation, trees, large roots, pavements, foundations, non-engineered fill, construction debris, trash, and abandoned underground utilities should be removed from the area to be developed. The surface should be stripped of organic growth and removed from the construction area. Areas disturbed during demolition and clearing should be properly backfilled and compacted as described below.

Dust control should also be implemented during construction. Site grading should be in strict compliance with the requirements of the South Coast Air Quality Management District (SCAQMD).

Access Road and Shoring Preparation: Temporary cuts along the southerly property line or the upslope portion of the proposed roadway will be excavated to depths of up to 25 feet below the existing grade. Shoring will be required for the temporary cuts necessary to achieve the desired grade within the roadway. Temporary cuts 5 feet or less in height can be trimmed at a slope gradient of 2:1, or along the bedding plane if bedrock is exposed. Because of the anticipated soil and geologic conditions exposed along the proposed roadway excavations for the walls, the earth should be retained by a series of soldier piles and lagging system, prior to excavating the earth materials. Well points positioned upslope may be required if the water seepage is such that it is affecting the excavations, or presents a working hazard. Geologic observations and mapping by Earth Systems Southwest will be required during the excavation phase to search for unanticipated conditions. Steel "H" piles may be installed at regularly spaced intervals not to exceed 8 feet on center. The required minimum embedment depth of the piles is 100% of the retained slope. The piles can be installed using a drill rig to bore slightly oversized holes to the required embedment depth. The steel "H" pile should be set vertically into the boreholes with the flanges of the "H" parallel to the excavation wall. The piles should be anchored by pouring concrete to the proposed finished grade within the boreholes between the annular space and the piles. Reinforcing steel as designed by the structural engineer may then be tied to the soldier piles and either formed with gunite or concrete to provide for a continuous wall. The wall should be provided with a back drain.

Lagging for the earth retention system may consist of wood planking, 4-inches by 8-inches or wider, with the length dependent upon the spacing of the soldier piles. The structural engineer should verify the sizing and specify lagging lumber grades and "H" pile type. The lagging should be designed to have the flexural strength to safely withstand the lateral earth pressures as given in the table below.

The selection of the appropriate steel "H" pile section, spacing, and required embedment depths are based on both geotechnical and structural conditions. The following lateral earth pressures can be used in design, taken as equivalent fluid pressures.

Active earth pressures: 130 pcf – sloping ground
Passive earth pressure: 150 pcf – soil**
500 pcf – bedrock**
Traffic surcharge: 250 psf (equivalent to about 2 feet of soil)*

*Soil should not be stockpiles within 12 feet of the excavation unless the design is modified to adjust for additional surcharges.

** Passive resistance of soldier piles may be taken as twice the borehole diameter times the value cited.

Building Pad Preparation: The existing surface soils within the building pad and foundation areas should be over-excavated to the underlying bedrock (Capistrano formation), trimmed along bedding planes and backfilled with engineered fill to finish pad grade. The over-excavation should extend for 5 feet beyond the outer edge of the exterior footings.

Roadway Subgrade Preparation: In areas to receive pavement that expose bedrock, the bedrock should be removed and recompacted at least three feet below the subgrade and replaced with a non expansive soil compacted to at least 90% relative compaction (ASTM D 1557). Compaction should be verified by testing.

Engineered Fill Soils: The terrace soil is suitable for use as engineered fill for structural backfill support and utility trench backfill, provided it is free of significant organic or deleterious matter. The terrace soil should be placed in maximum 8-inch lifts (loose) and compacted to at least 90% relative compaction (ASTM D 1557) near its optimum moisture content. Compaction should be verified by testing. Rocks larger than 6 inches in greatest dimension should be removed from fill or backfill material. Soil derived from excavation of the bedrock should be hauled from the site or mixed with the terrace soil, due to the highly expansive nature of the bedrock siltstone. Fill slopes should not exceed a 2:1 gradient, unless reinforced.

Imported fill soils (if needed) should be non-expansive, granular soils meeting the USCS classifications of SM, SP-SM, or SW-SM with a maximum rock size of 3 inches and 5 to 35% passing the No. 200 sieve. The geotechnical engineer should evaluate the import fill soils before hauling to the site. However, because of the potential variations within the borrow source, import soil will not be prequalified by ESSW. The imported fill should be placed in lifts no greater than 8 inches in loose thickness and compacted to at least 90% relative compaction (ASTM D 1557) near optimum moisture content.

Auxiliary Structures Subgrade Preparation: Auxiliary structures such as curb, gutter and sidewalk should have the foundation subgrade prepared similar to the roadway subgrade recommendations given above. The lateral extent of the over-excavation needs to extend only 2 feet beyond the face of the curb, gutter and sidewalk, if any.

Site Drainage: Positive drainage should be maintained away from the structures to prevent ponding and subsequent saturation of the foundation soils. Gutters and downspouts should be installed as a means to convey water away from foundations. Drainage should be maintained for paved areas. Water should not pond on or near paved areas.

Utility Trenches: Backfill of utilities within roads or public right-of-ways should be placed in conformance with the requirements of the governing agency (water district, public works department, etc.). Utility trench backfill within private property should be placed in conformance with the provisions of this report. In general, service lines extending inside of property may be backfilled with native soils compacted to a minimum of 90% relative compaction. Backfill operations should be observed and tested to monitor compliance with these recommendations.

### 5.3 Slope Stability

If the proposed development recommendations provided herein are followed during development, the stability of the property should be enhanced. In order to reduce surficial erosion of the exposed slopes within the confines of the property limits, it is recommended that deep-rooted drought-resistant native plants be planted, irrigated and maintained.

## STRUCTURES

In our professional opinion, structure foundations can be supported on shallow foundations bearing on unweathered bedrock. The recommendations that follow are based on very high expansion category soils.

### 5.4 Foundations

Footing design of widths, depths, and reinforcing are the responsibility of the Structural Engineer, considering the structural loading and the geotechnical parameters given in this report. A minimum footing depth of 24 inches below lowest adjacent grade founded either entirely into bedrock or compacted fill should be maintained. A representative of ESSW should observe foundation excavations before placement of reinforcing steel or concrete. Loose soil or construction debris should be removed from footing excavations before placement of concrete.

Conventional Spread Foundations: Allowable soil bearing pressures are given below for foundations bearing entirely on bedrock, or compacted fill. Allowable bearing pressures are net (weight of footing and soil surcharge may be neglected).

- Continuous wall, pad, or shallow pier foundations, 12-inch minimum width and 24 inches below grade:

  1500 psf and 2000 psf for dead plus design live loads for compacted fill and bedrock respectively.

  Allowable increases of 300 psf per each foot of additional footing depth may be used up to a maximum value of 4500 psf and 6000 psf. for fill and bedrock respectively.

A one-third (⅓) increase in the bearing pressure may be used when calculating resistance to wind or seismic loads. The allowable bearing values indicated are based on the anticipated maximum loads stated in Section 1.1 of this report. If the anticipated loads exceed these values, the geotechnical engineer must reevaluate the allowable bearing values and the grading requirements.

Minimum reinforcement for continuous wall footings should be four No.5 steel reinforcing bars, two placed near the top, and two placed near the bottom of the footing. This reinforcing is not intended to supersede any structural requirements provided by the structural engineer.

Expected Settlement: The estimated total static settlement should be less than 1 inch, based on footings founded on firm bedrock or compacted fill, as recommended. Differential settlement between exterior and interior bearing members should be less than ½ inch, expressed in a post-construction angular distortion ratio of 1:480 or less.

Frictional and Lateral Coefficients: Lateral loads may be resisted by soil friction on the base of foundations and by passive resistance of the soils acting on foundation walls. An allowable coefficient of friction of 0.35 of dead load may be used. An allowable passive equivalent fluid pressure of 250 pcf and 400 pcf may also be used for compacted fill and bedrock respectively. These values include a factor of safety of 1.5. Passive resistance and frictional resistance may be used in combination if the friction coefficient is reduced by one-third. A one-third (⅓) increase in the passive pressure may be used when calculating resistance to wind or seismic loads. Lateral passive resistance is based on the assumption that backfill next to foundations is properly compacted.

## 5.5 Slabs-on-Grade

Subgrade: Concrete slabs-on-grade and flatwork should be supported either by firm bedrock, or compacted fill.

Vapor Retarder: In areas of moisture sensitive floor coverings, an appropriate vapor retarder should be installed to reduce moisture transmission from the subgrade soil to the slab. For these areas, an impermeable membrane (15-mil thickness) should underlie the floor slabs. The membrane should be covered with 2 inches of sand to help protect it during construction and to aid in concrete curing. The sand should be lightly moistened just prior to placing the concrete. Low-slump concrete should be used to help reduce the potential for concrete shrinkage. The effectiveness of the membrane is dependent upon its quality, the method of overlapping, its protection during construction, and the successful sealing of the membrane around utility lines.

***The following minimum slab recommendations are intended to address geotechnical concerns such as potential variations of the subgrade and are not to be construed as superseding any structural design. The design engineer and/or project architect should ensure compliance with SB800 with regards to moisture and moisture vapor.***

Slab Thickness and Reinforcement: Slab thickness and reinforcement of slabs-on-grade are contingent on the recommendations of the structural engineer or architect considering the expansion index of the supporting soil. Based upon our findings, a modulus of subgrade reaction of approximately 75 pounds per cubic inch can be used in concrete slab design for the expected very high expansion subgrade (EI > 100). A weighted plasticity index of 36 should be used to design floor slabs against expansive subgrade.

Concrete slabs and flatwork should be a minimum of 5 inches thick (actual, not nominal) and supported with grade beams not exceeding 15 feet spacing. We suggest that the concrete slabs be reinforced with a minimum of No. 4 rebars at 18-inch centers, both horizontal directions, placed at slab mid-height to resist swell forces and cracking. Concrete floor slabs may either be monolithically placed with the foundations or doweled after footing placement. Consideration should also be given to concrete mix having 1-inch diameter rock aggregate. The thickness and reinforcing given are not intended to supersede any structural requirements provided by the structural engineer. The project architect or geotechnical engineer should continually observe all reinforcing steel in slabs during placement of concrete to check for proper location within the slab.

<u>Control Joints</u>: Control joints should be provided in all concrete slabs-on-grade at a maximum spacing of 36 times the slab thickness (12 feet maximum on-center, each way) as recommended by American Concrete Institute (ACI) guidelines. All joints should form approximately square patterns to reduce the potential for randomly oriented contraction cracks. Contraction joints in the slabs should be tooled at the time of the pour or saw cut (¼ of slab depth) within 8 hours of concrete placement. Construction (cold) joints should consist of thickened butt joints with ½-inch dowels at 18-inches on center or a thickened keyed-joint to resist vertical deflection at the joint. All construction joints in exterior flatwork should be sealed to reduce the potential of moisture or foreign material intrusion. These procedures will reduce the potential for randomly oriented cracks, but may not prevent them from occurring.

<u>Curing and Quality Control</u>: The contractor should take precautions to reduce the potential of curling of slabs in this region using proper batching, placement, and curing methods. Curing is highly affected by temperature, wind, and humidity. Quality control procedures *may* be used, including trial batch mix designs, batch plant inspection, and on-site special inspection and testing.

### 5.6 Retaining Walls

The following table presents lateral earth pressures for use in retaining wall design for both residential and landscape/hardscape retaining walls located outside of the building footprint. The values are given as equivalent fluid pressures without surcharge loads or hydrostatic pressure. Surcharged loads due to bedding will be removed along bedding planes within the building footprints and backfilled with granular material.

| Lateral Pressures and Sliding Resistance [1] | Granular Backfill [3] | Native soil |
|---|---|---|
| Passive Pressure | 400 pcf – level ground | 250 pcf |
| Active Pressure (cantilever walls)<br>Use when wall is permitted to rotate 0.1% of wall height | 35 pcf – level ground<br>43 pcf – sloping terrain | 120 pcf<br>130 pcf [4] |
| At-Rest Pressure (restrained walls) | 55 pcf – level ground | 140 pcf |
| Dynamic Lateral Earth Pressure [2]<br>Acting at 0.6H,<br>where H is height of backfill in feet | 34 pcf | 34 pcf |
| Base Lateral Sliding Resistance [1]<br>Dead load x Coefficient of Friction: | 0.45 | 0.30 |

Notes:

[1] These values are ultimate values. A factor of safety of 1.5 should be used in stability analysis except for dynamic earth pressure where a factor of safety of 1.2 is acceptable.

[2] Dynamic pressures are based on the Mononobe-Okabe 1929 method, additive to active earth pressure. Walls retaining less than 6 feet of soil and not supporting inhabitable structures need not consider this increased pressure (reference: CBC Section 1630A.1.1.5).

[3] Granular backfill extending at 1:1 or flatter projection from base of wall.

[4] Additionally, a creep (expansion) force of about 250 pcf should be considered in the upper 4 feet of native soil.

Upward sloping backfill or surcharge loads from nearby footings can create larger lateral pressures. Should any walls be considered for retaining sloped backfill or placed next to foundations, our office should be contacted for recommended design parameters. Surcharge loads should be considered if they exist within a zone between the face of the wall and a plane projected 45 degrees upward from the base of the wall. The increase in lateral earth pressure should be taken as 35% of the surcharge load within this zone. Retaining walls subjected to traffic loads should include a uniform surcharge load equivalent to at least 2 feet of native soil.

Drainage: A backdrain or an equivalent system of backfill drainage should be incorporated into the retaining wall design. Our firm can provide construction details when the specific application is determined. Backfill immediately behind the retaining structure should be a free-draining granular material. Waterproofing should be according to the designer's specifications. Water should not be allowed to pond near the top of the wall. To accomplish this, the final backfill grade should be such that all water is diverted away from the retaining wall.

Backfill and Subgrade Compaction: Compaction on the retained side of the wall within a horizontal distance equal to one wall height should be performed by hand-operated or other lightweight compaction equipment. This is intended to reduce potential locked-in lateral pressures caused by compaction with heavy grading equipment. Foundation subgrade preparation should be as specified in Section 5.1.

### 5.7 Mitigation of Soil Corrosivity on Concrete

Selected chemical analyses for corrosivity were conducted on soil samples from the project site as shown in Appendix B. The native soils were found to have a severe sulfate ion concentration (4742 ppm) and a medium chloride ion concentration (640 ppm). Sulfate ions can attack the cementitious material in concrete, causing weakening of the cement matrix and eventual deterioration by raveling. Chloride ions can cause corrosion of reinforcing steel. The California Building Code (CBC) requires for severe sulfate conditions that Type V Portland Cement be used with a maximum water cement ratio of 0.45 using a 4500-psi concrete mix (CBC Table 19-A-4). Alternately, Type II Portland Cement with 15-20% Type F Flyash replacement may be used instead of Type V. A minimum concrete cover of three (3) inches should be provided around steel reinforcing or embedded components exposed to native soil or landscape water. Additionally, the concrete should be thoroughly vibrated during placement.

Electrical resistivity testing of the soil suggests that the site soils may present a very severe potential for metal loss from electrochemical corrosion processes. Corrosion protection of steel can be achieved by using epoxy corrosion inhibitors, asphalt coatings, cathodic protection, or encapsulating with densely consolidated concrete.

The information provided above should be considered preliminary. These values can potentially change based on several factors, such as importing soil from another job site and the quality of construction water used during grading and subsequent landscape irrigation.

Earth Systems does not practice corrosion engineering. We recommend that a qualified corrosion engineer evaluate the corrosion potential on metal construction materials and concrete at the site to provide mitigation of corrosive effects, if further guidance is desired.

### 5.8 Pavements

Since no traffic loading was provided by the design engineer or owner, we have assumed traffic loading for comparative evaluation. The design engineer or owner should decide the appropriate traffic conditions for the pavements. Maintenance of proper drainage is advised to prolong the service life of the pavements. Water should not pond on or near paved areas. The following table provides our preliminary recommendations for pavement sections. Final pavement sections recommendations should be based on design traffic indices and R-value tests conducted during grading after actual subgrade soils are exposed.

## PRELIMINARY RECOMMENDED PAVEMENTS SECTIONS

R-Value Subgrade Soils - 10 (assumed) Design Method – CALTRANS 1995

| Traffic Index (Assumed) | Pavement Use | Flexible Pavements | | Rigid Pavements | |
|---|---|---|---|---|---|
| | | Asphaltic Concrete Thickness (Inches) | Aggregate Base Thickness (Inches) | Portland Cement Concrete (Inches) | Aggregate Base Thickness (Inches) |
| 6.0 | Residential Street | 3.5 | 11.5 | 4.0 | 10.0 |

Notes:

1. Asphaltic concrete should be Caltrans, Type B, ½-in. or ¾-in. maximum-medium grading and compacted to a minimum of 95% of the 75-blow Marshall density (ASTM D 1559) or equivalent.
2. Aggregate base should be Caltrans Class 2 (¾ in. maximum) and compacted to a minimum of 95% of ASTM D1557 maximum dry density near its optimum moisture.
3. All pavements should be placed on 12 inches of moisture-conditioned subgrade, compacted to a minimum of 90% of ASTM D 1557 maximum dry density near its optimum moisture.
4. Portland cement concrete should have a minimum of 3250 psi compressive strength at 28 days.
5. Equivalent Standard Specifications for Public Works Construction (Greenbook) may be used instead of Caltrans specifications for asphaltic concrete and aggregate base.

## Section 6
## LIMITATIONS AND ADDITIONAL SERVICES

### 6.1 Uniformity of Conditions and Limitations

Our findings and recommendations in this report are based on selected points of field exploration, laboratory testing, and our understanding of the proposed project. Furthermore, our findings and recommendations are based on the assumption that soil conditions do not vary significantly from those found at specific exploratory locations. Variations in soil or groundwater conditions could exist between and beyond the exploration points. The nature and extent of these variations may not become evident until construction. Variations in soil or groundwater may require additional studies, consultation, and possible revisions to our recommendations.

Findings of this report are valid as of the issued date of the report. However, changes in conditions of a property can occur with passage of time, whether they are from natural processes or works of man, on this or adjoining properties. In addition, changes in applicable standards occur, whether they result from legislation or broadening of knowledge. Accordingly, 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 one year.

In the event that any changes in the nature, design, or location of structures are planned, the conclusions and recommendations contained in this report shall not be considered valid unless the changes are reviewed and the conclusions of this report are modified or verified in writing.

This report is issued with the understanding that the owner or the owner's representative has the responsibility to bring the information and recommendations contained herein to the attention of the architect and engineers for the project so that they are incorporated into the plans and specifications for the project. The owner or the owner's representative also has the responsibility to verify that the general contractor and all subcontractors follow such recommendations. It is further understood that the owner or the owner's representative is responsible for submittal of this report to the appropriate governing agencies.

As the Geotechnical Engineer of Record for this project, Earth Systems Southwest (ESSW) has striven to provide our services in accordance with generally accepted geotechnical engineering practices in this locality at this time. No warranty or guarantee is express or implied. This report was prepared for the exclusive use of the Client and the Client's authorized agents.

ESSW should be provided the opportunity for a general review of final design and specifications in order that earthwork and foundation recommendations may be properly interpreted and implemented in the design and specifications. If ESSW is not accorded the privilege of making this recommended review, we can assume no responsibility for misinterpretation of our recommendations.

Although available through ESSW, the current scope of our services does not include an environmental assessment or an investigation for the presence or absence of wetlands, hazardous or toxic materials in the soil, surface water, groundwater, or air on, below, or adjacent to the subject property.

### 6.2 Additional Services

This report is based on the assumption that an adequate program of client consultation, construction monitoring, and testing will be performed during the final design and construction phases to check compliance with these recommendations. Maintaining ESSW as the geotechnical consultant from beginning to end of the project will provide continuity of services. *The geotechnical engineering firm providing tests and observations shall assume the responsibility of Geotechnical Engineer of Record.*

Construction monitoring and testing would be additional services provided by our firm. The costs of these services are not included in our present fee arrangements, but can be obtained from our office. The recommended review, tests, and observations include, but are not necessarily limited to, the following:

- Consultation during the final design stages of the project.
- A review of the building and grading plans to observe that recommendations of our report have been properly implemented into the design.
- Observation and testing during site preparation, grading, and placement of engineered fill as required by CBC Sections 1701 and 3317 or local grading ordinances.
- Consultation as needed during construction.

-o0o-

Appendices as cited are attached and complete this report.

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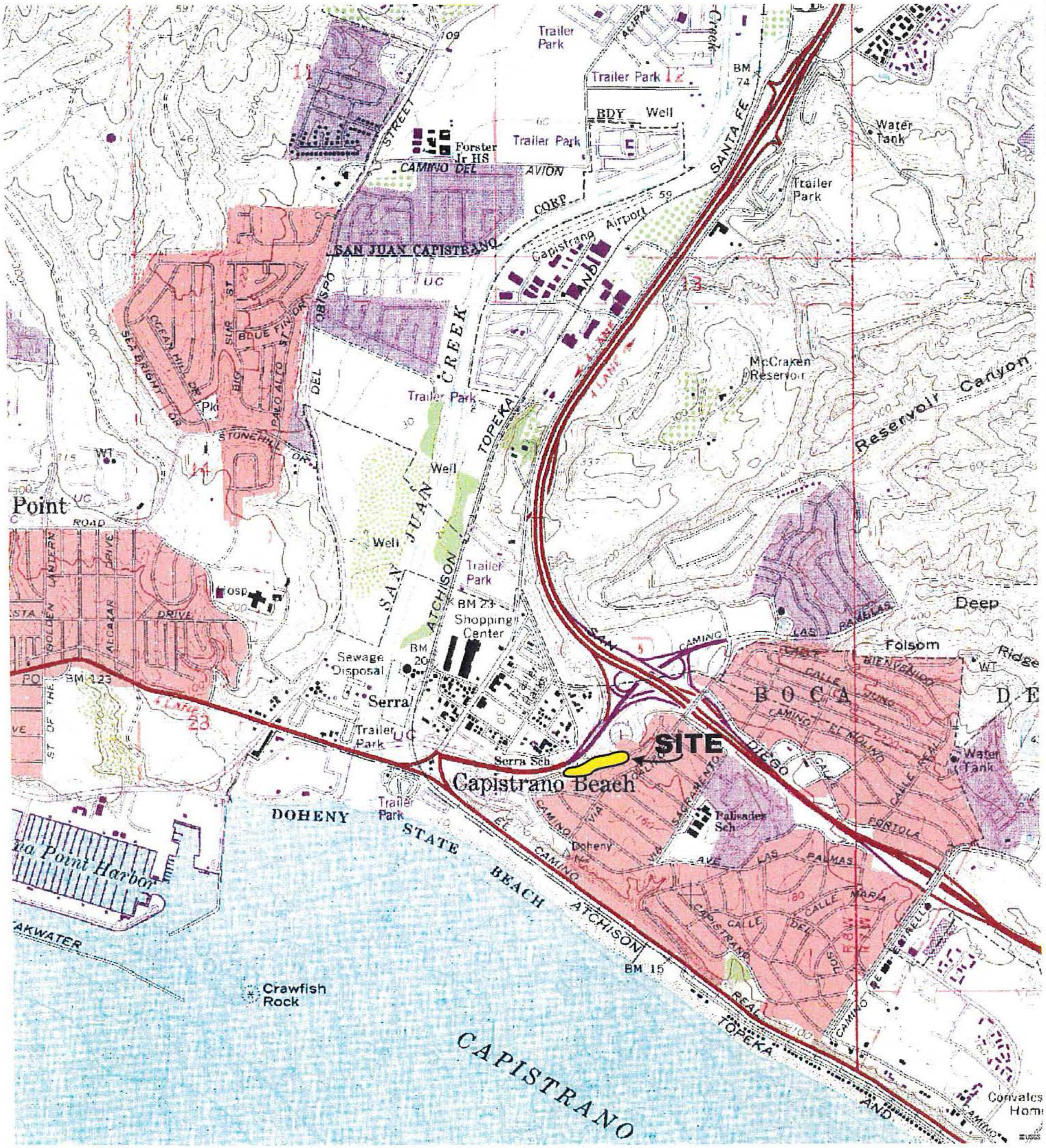
# APPENDIX A



Reference: www.terraserver-usa.com

Scale: 1" = 2,000'

0 2,000' 4,000'

**Figure 1**
**Site Location Map**

South of Via Canon & Camino Capistrano
Dana Point, California

**Earth Systems Southwest**

11/03/06

File No.: 10123-02

# SECTION A-A'

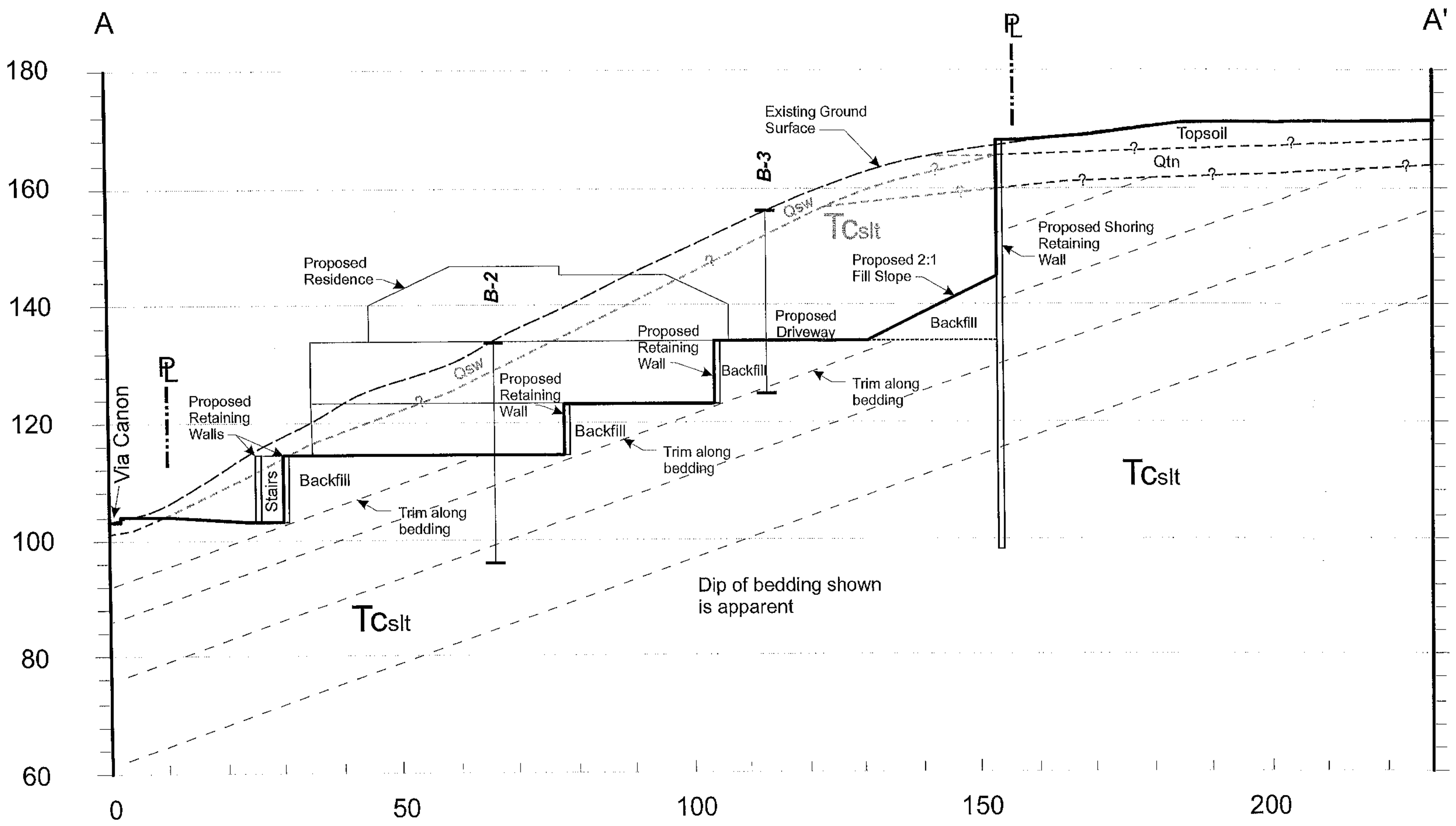


**Figure 3A**
**Geologic Section A-A'**

South of Via Canon & Camino Capistrano
Dana Point, California

**Earth Systems Southwest**

11/03/06
File No.: 10123-02

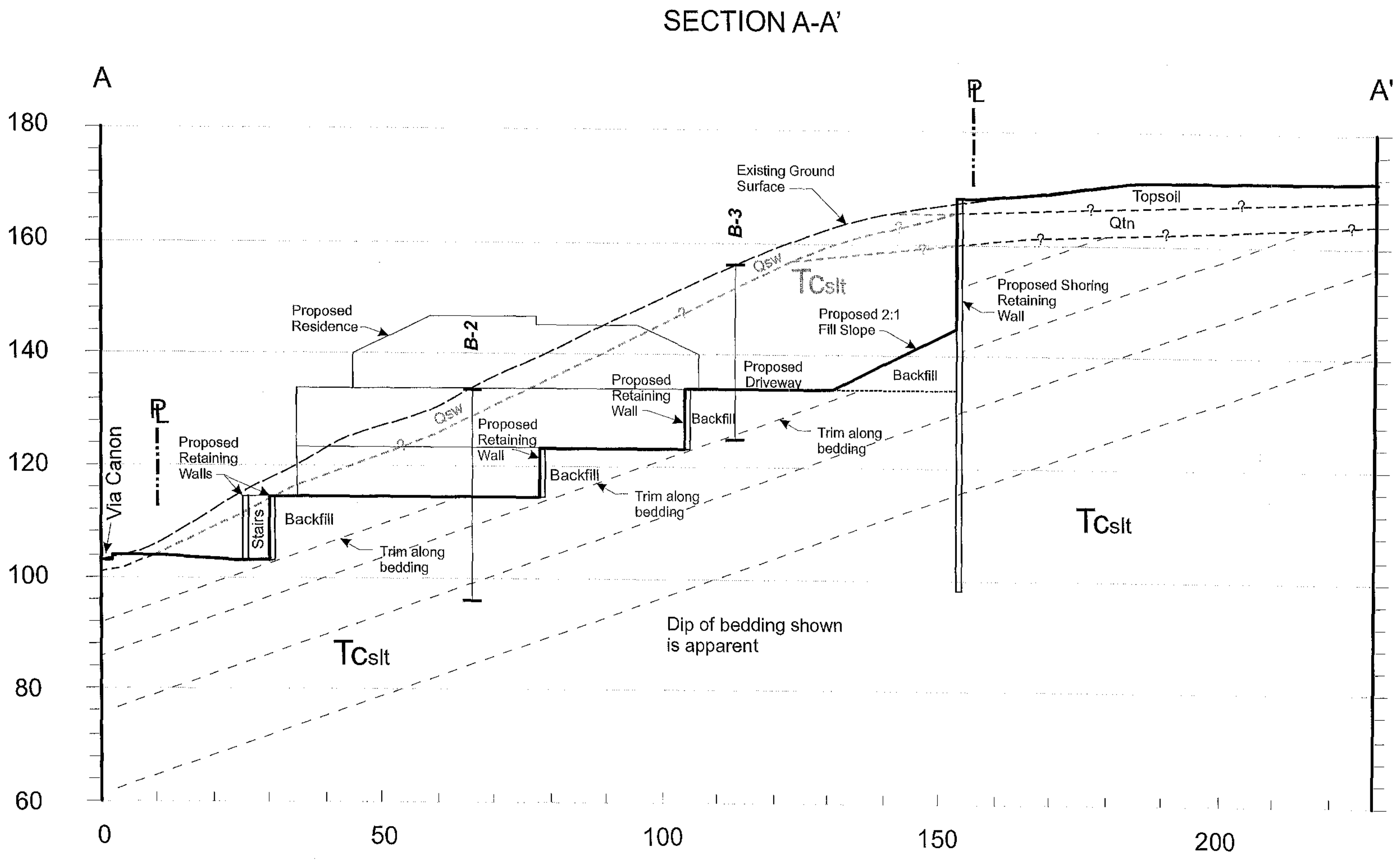


**Figure 3A**
**Geologic Section A-A'**

South of Via Canon & Camino Capistrano
Dana Point, California

**Earth Systems Southwest**

| | |
|---|---|
| 11/03/06 | File No.: 10123-02 |

## SECTION B-B'

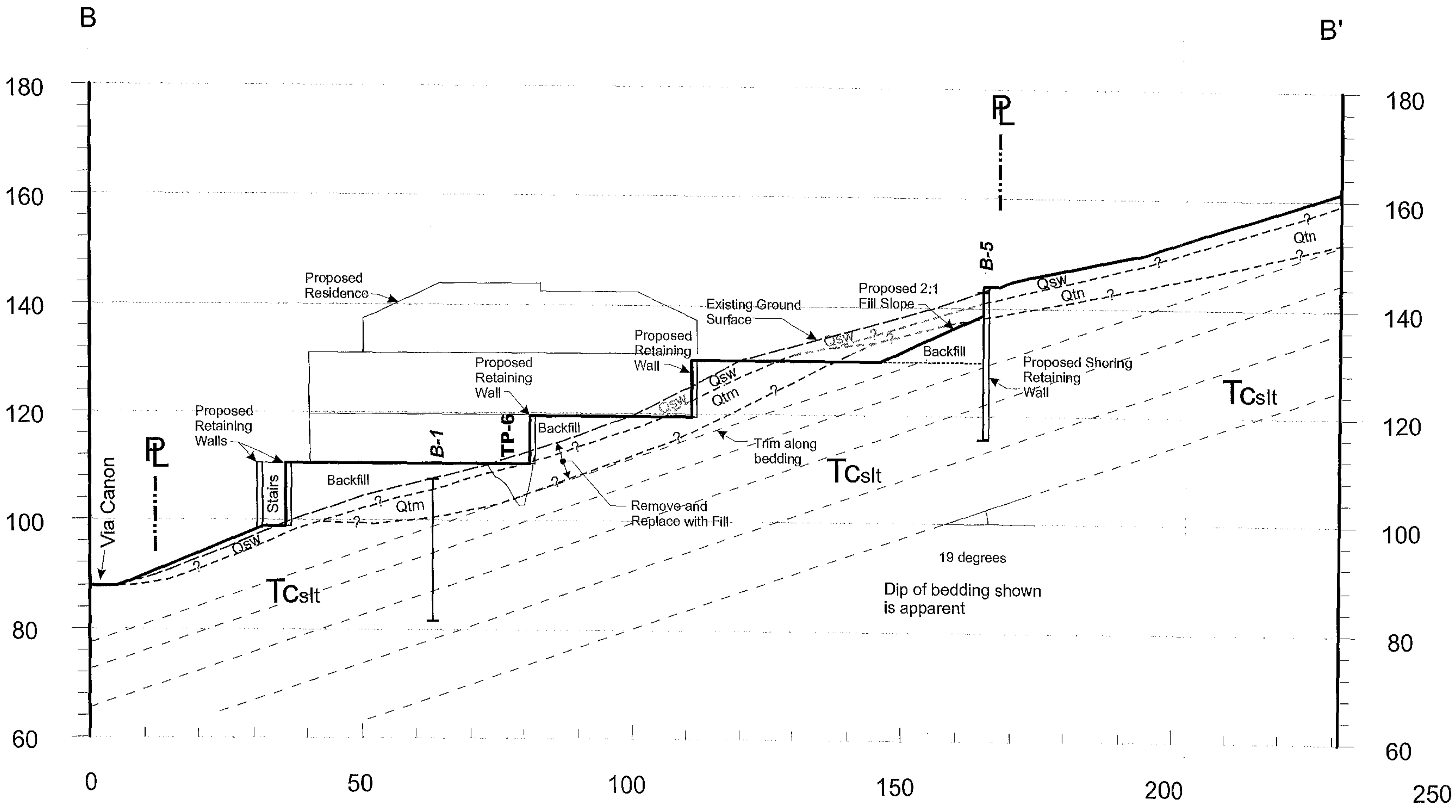


**Figure 3B**
**Geologic Section B-B'**

South of Via Canon & Camino Capistrano
Dana Point, California

**Earth Systems**
**Southwest**

11/03/06 | File No.: 10123-02

## SECTION C-C'

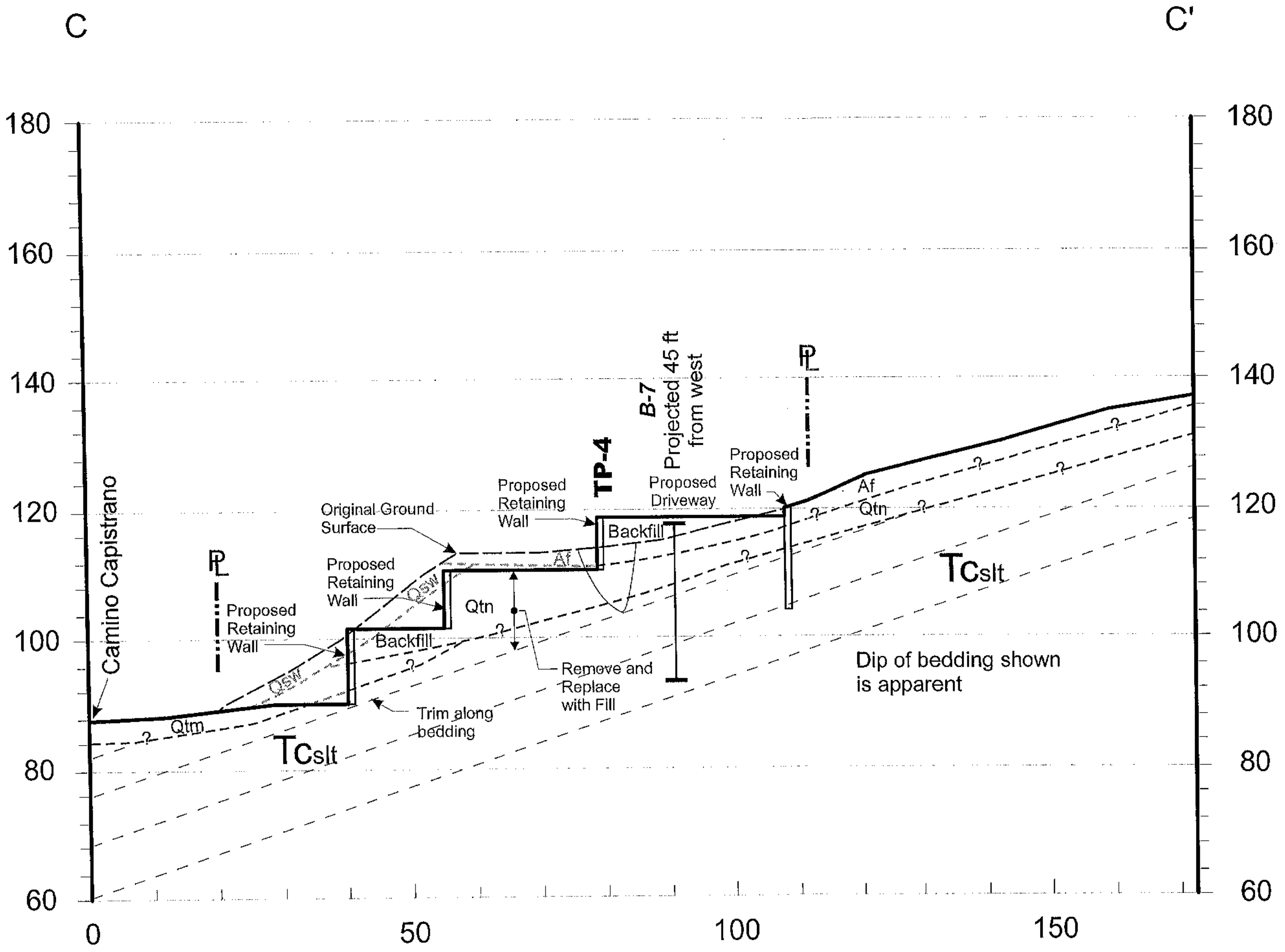


**Figure 3C**
**Geologic Section C-C'**

South of Via Canon & Camino Capistrano
Dana Point, California

**Earth Systems Southwest**

| | |
|---|---|
| 11/03/06 | File No.: 10123-02 |

## SECTION D-D'

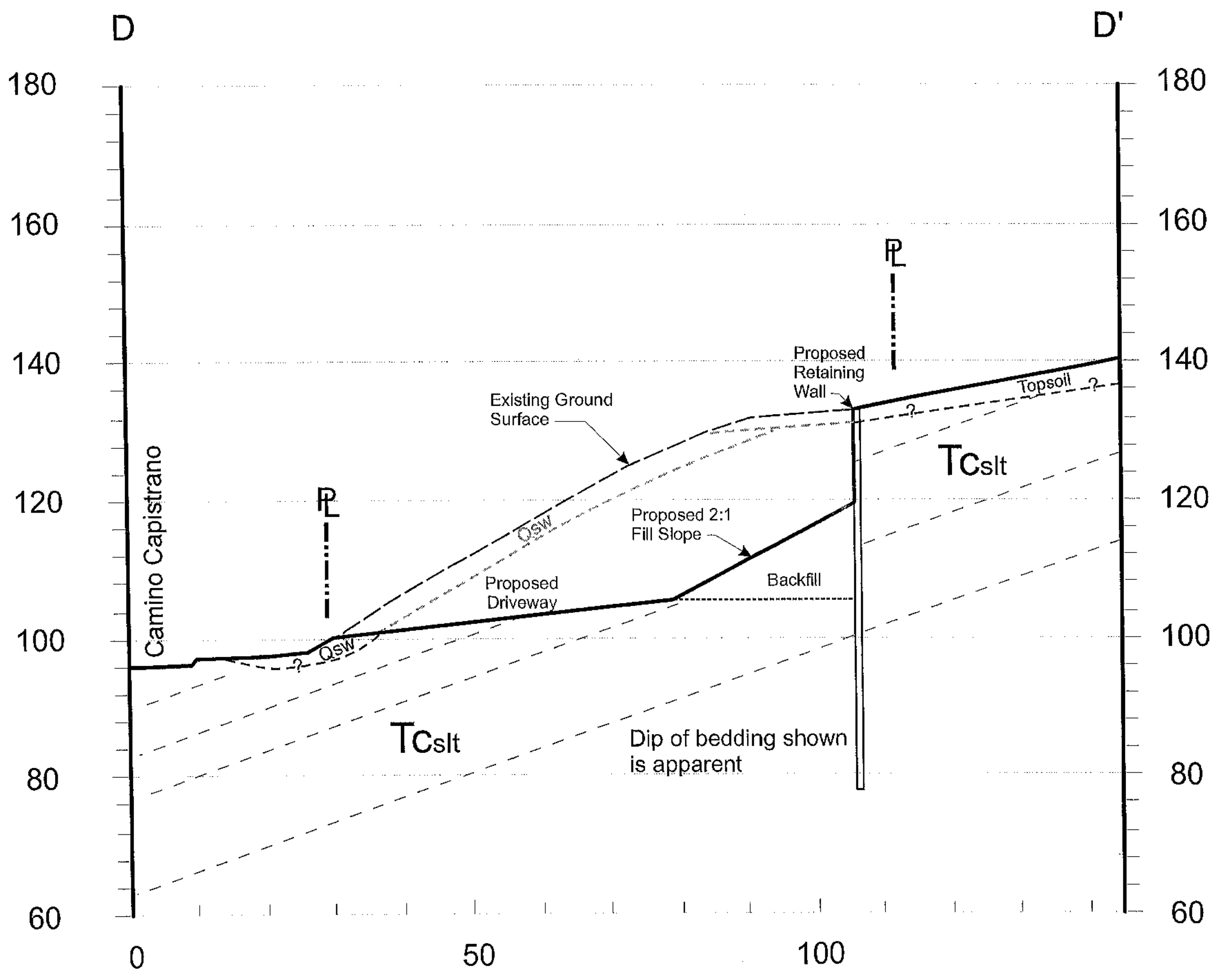


**Figure 3D**
**Geologic Section D-D'**

South of Via Canon & Camino Capistrano
Dana Point, California

**Earth Systems Southwest**

| | |
|---|---|
| 11/03/06 | File No.: 10123-02 |

## Legend

| | | | |
|---|---|---|---|
| **Afu** | Undocumented fill | **TP-7** | Approximate Location of Test Pit Earth Systems Southwest, April, 2005 |
| **$Qt_n$** | Quaternary Nonmarine Terrace circled where buried | **B-1** | Approximate Location of Boring Earth Systems Southwest, June, 2005 |
| **$Qt_m$** | Quaternary Marine Terrace, circled where buried | *B-8* | Approximate Location of Boring Earth Systems Southwest, Sept., 2006 |
| **$T_{Cslt}$** | Tertiary Capistrano Formation Siltstone Member, circled where buried, Queried where uncertain | | Approximate Location of Residential Retaining Walls |
| — —?— — | Approximate Location of Geologic Contact, Queried where uncertain | | Approximate Location of Hardscape/ Landscape Retaining Walls |
| 25 | Strike and Dip of Bedding | | Approximate Location of Property Line Retaining Walls |
| 74 | Strike and Dip of Fracture | (109) | Finish Elevations |
| | Strike of Vertical Fracture | | |
| 74 | Strike and Dip of Fault | | |
| A A' | Location of Section | | |

Figure 2
Boring Location and Geologic Map

South of Via Canon & Camino Capistrano
Dana Point, California

**Earth Systems**
**Southwest**

11/03/06 File No.: 10123-02

## Table 1
## Fault Parameters &
## & Deterministic Estimates of Mean Peak Ground Acceleration (PGA)

| Fault Name or Seismic Zone | Distance from Site (mi) | (km) | Fault Type | | Maximum Magnitude Mmax (Mw) | Avg Slip Rate (mm/yr) | Avg Return Period (yrs) | Fault Length (km) | Mean Site PGA (g) |
|---|---|---|---|---|---|---|---|---|---|
| Reference Notes: (1) | | | (2) | (3) | (4) | (2) | (2) | (2) | (5) |
| San Joaquin Hills Blind Thrust | **2.5** | 4.0 | BT | C | **6.6** | 0.5 | 1400 | 28 | **0.56** |
| Newport-Inglewood (Offshore) | **3.5** | 5.7 | SS | B | **7.1** | 1.5 | 651 | 66 | **0.48** |
| Newport-Inglewood (L.A.Basin) | **17.6** | 28.3 | SS | B | **7.1** | 1 | 1006 | 66 | **0.17** |
| Palos Verdes | **19.8** | 31.9 | SS | B | **7.3** | 3 | 650 | 96 | **0.17** |
| Coronado Bank | **20.3** | 32.6 | SS | B | **7.6** | 3 | 653 | 185 | **0.19** |
| Elsinore-Glen Ivy | **21.9** | 35.3 | SS | B | **6.8** | 5 | 340 | 36 | **0.12** |
| Elsinore-Temecula | **22.4** | 36.0 | SS | B | **6.8** | 5 | 240 | 43 | **0.11** |
| Chino-Central Ave. (Elsinore) | **22.8** | 36.6 | DS | B | **6.7** | 1 | 882 | 28 | **0.12** |
| Rose Canyon | **27.1** | 43.5 | SS | B | **7.2** | 1.5 | 781 | 70 | **0.12** |
| Whittier | **27.1** | 43.6 | SS | B | **6.8** | 2.5 | 641 | 38 | **0.09** |
| Puente Hills Blind Thrust | **34.2** | 55.0 | BT | C | **7.1** | 0.7 | 2800 | 44 | **0.10** |
| Elsinore-Julian | **38.4** | 61.8 | SS | A | **7.1** | 5 | 340 | 76 | **0.08** |
| San Jose | **41.5** | 66.8 | DS | B | **6.4** | 0.5 | 1471 | 20 | **0.06** |
| San Jacinto-San Bernardino | **45.2** | 72.8 | SS | B | **6.7** | 12 | 100 | 36 | **0.05** |
| San Jacinto-San Jacinto Valley | **45.3** | 72.9 | SS | B | **6.9** | 12 | 83 | 43 | **0.06** |
| Sierra Madre | **45.7** | 73.6 | DS | B | **7.2** | 2 | 384 | 57 | **0.08** |
| Cucamonga | **45.8** | 73.8 | DS | A | **6.9** | 5 | 650 | 28 | **0.07** |
| San Jacinto-Anza | **47.4** | 76.3 | SS | A | **7.2** | 12 | 250 | 91 | **0.07** |
| Upper Elysian Park Blind Thrust | **48.6** | 78.2 | BT | C | **6.4** | 1.5 | 440 | 34 | **0.05** |
| San Andreas - Banning Branch | **51.9** | 83.6 | SS | A | **7.2** | 10 | 220 | 98 | **0.06** |
| Raymond | **52.0** | 83.7 | DS | B | **6.5** | 1.5 | 1541 | 23 | **0.05** |
| Clamshell-Sawpit | **52.8** | 85.0 | DS | B | **6.5** | 0.5 | 1461 | 16 | **0.05** |
| Verdugo | **53.8** | 86.6 | DS | B | **6.9** | 0.5 | 1608 | 29 | **0.06** |
| Hollywood | **55.5** | 89.3 | DS | B | **6.4** | 1 | 626 | 17 | **0.04** |
| San Andreas - Southern | **55.6** | 89.5 | SS | A | **7.7** | 24 | 220 | 199 | **0.08** |
| San Andreas - Mill Crk. Branch | **56.5** | 90.9 | SS | A | **7.2** | 25 | 220 | 95 | **0.06** |
| San Andreas - 1857 Rupture | **59.1** | 95.1 | SS | A | **7.8** | 34 | 206 | 348 | **0.08** |
| San Andreas - Mojave | **59.1** | 95.1 | SS | A | **7.4** | 30 | 550 | 103 | **0.06** |
| Cleghorn | **59.1** | 95.1 | SS | B | **6.5** | 3 | 216 | 25 | **0.03** |
| North Frontal Fault Zone (West) | **59.7** | 96.1 | DS | B | **7.2** | 1 | 1314 | 50 | **0.06** |
| Santa Monica | **60.1** | 96.7 | DS | B | **6.6** | 1 | 816 | 28 | **0.04** |

Notes:

1. Jennings (1994) and California Geologic Survey (CGS) (2003)
2. CGS (2003), SS = Strike-Slip, DS = Dip Slip, BT = Blind Thrust
3. 2001 CBC, where Type A faults: Mmax > 7 & slip rate >5 mm/yr & Type C faults: Mmax <6.5 & slip rate < 2 mm/yr
4. CGS (2003)
5. The estimates of the mean Site PGA are based on the following attenuation relationships:
   Average of: (1) 1997 Boore, Joyner & Fumal; (2) 1997 Sadigh et al; (3) 1997 Campbell , (4) 1997 Abrahamson & Silva
   (mean plus sigma values are about 1.5 to 1.6 times higher)
   Based on Site Coordinates: 33.463 N Latitude, 117.672 W Longtude and Site Soil Type D

| MAJOR DIVISIONS | | | GRAPHIC SYMBOL | LETTER SYMBOL | TYPICAL DESCRIPTIONS |
|---|---|---|---|---|---|
| **COARSE GRAINED SOILS**<br>More than 50% of material is larger than No. 200 sieve size | **GRAVEL AND GRAVELLY SOILS**<br>More than 50% of coarse fraction retained on No. 4 sieve | **CLEAN GRAVELS < 5% FINES** | ▨ | **GW** | Well-graded gravels, gravel-sand mixtures, little or no fines |
| | | | ▨ | **GP** | Poorly-graded gravels, gravel-sand mixtures. Little or no fines |
| | | **GRAVELS WITH FINES > 12% FINES** | ▨ | **GM** | Silty gravels, gravel-sand-silt mixtures |
| | | | ▨ | **GC** | Clayey gravels, gravel-sand-clay mixtures |
| | **SAND AND SANDY SOILS**<br>More than 50% of coarse fraction passing No. 4 sieve | **CLEAN SAND (Little or no fines) < 5%** | ▨ | **SW** | Well-graded sands, gravelly sands, little or no fines |
| | | | ▨ | **SP** | Poorly-graded sands, gravelly sands, little or no fines |
| | | **SAND WITH FINES (appreciable amount of fines) > 12%** | ▨ | **SM** | Silty sands, sand-silt mixtures |
| | | | ▨ | **SC** | Clayey sands, sand-clay mixtures |
| **FINE-GRAINED SOILS**<br>50% or more of material is smaller than No. 200 sieve size | **SILTS AND CLAYS** | **LIQUID LIMIT LESS THAN 50** | ▨ | **ML** | Inorganic silts and very fine sands, rock flour, silty low clayey fine sands or clayey silts with slight plasticity |
| | | | ▨ | **CL** | Inorganic clays of low to medium plasticity, gravelly clays, sandy clays, silty clays, lean clays |
| | | | ▨ | **OL** | Organic silts and organic silty clays of low plasticity |
| | | **LIQUID LIMIT GREATER THAN 50** | ▨ | **MH** | Inorganic silty, micaceous, or diatomaceous fine sand or silty soils |
| | | | ▨ | **CH** | Inorganic clays of high plasticity, fat clays |
| | | | ▨ | **OH** | Organic clays of medium to high plasticity, organic silts |
| **HIGHLY ORGANIC SOILS** | | | ▨ | **PT** | Peat, humus, swamp soils with high organic contents |
| **VARIOUS SOILS AND MAN MADE MATERIALS** | | | ▦ | | Fill Materials |
| **MAN MADE MATERIALS** | | | ■ | | Asphalt and concrete |

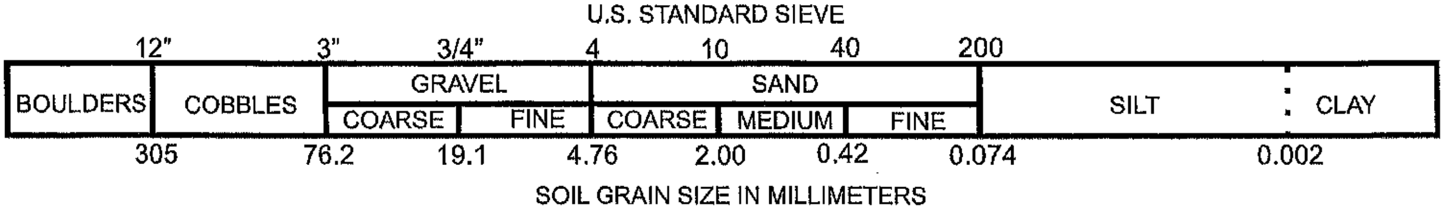
**Soil Classification System**

**Earth Systems**
**Southwest**

## DESCRIPTIVE SOIL CLASSIFICATION

Soil classification is based on ASTM Designations D 2487 and D 2488 (Unified Soil Classification System). Information on each boring log is a compilation of subsurface conditions obtained from the field as well as from laboratory testing of selected samples. The indicated boundaries between strata on the boring logs are approximate only and may be transitional.

## SOIL GRAIN SIZE



## RELATIVE DENSITY OF GRANULAR SOILS (GRAVELS, SANDS, AND NON-PLASTIC SILTS)

| | | | |
|---|---|---|---|
| **Very Loose** | *N=0-4 | RD=0-30 | Easily push a 1/2-inch reinforcing rod by hand |
| **Loose** | N=5-10 | RD=30-50 | Push a 1/2-inch reinforcing rod by hand |
| **Medium Dense** | N=11-30 | RD=50-70 | Easily drive a 1/2-inch reinforcing rod with hammer |
| **Dense** | N=31-50 | RD=70-90 | Drive a 1/2-inch reinforcing rod 1 foot with difficulty by a hammer |
| **Very Dense** | N>50 | RD=90-100 | Drive a 1/2-inch reinforcing rod a few inches with hammer |

*N=Blows per foot in the Standard Penetration Test at 60% theoretical energy. For the 3-inch diameter Modified California sampler, 140-pound weight, multiply the blow count by 0.63 (about 2/3) to estimate N. If automatic hammer is used, multiply a factor of 1.3 to 1.5 to estimate N. RD=Relative Density (%). C=Undrained shear strength (cohesion).

## CONSISTENCY OF COHESIVE SOILS (CLAY OR CLAYEY SOILS)

| | | | |
|---|---|---|---|
| **Very Soft** | *N=0-1 | *C=0-250 psf | Squeezes between fingers |
| **Soft** | N=2-4 | C=250-500 psf | Easily molded by finger pressure |
| **Medium Stiff** | N=5-8 | C=500-1000 psf | Molded by strong finger pressure |
| **Stiff** | N=9-15 | C=1000-2000 psf | Dented by strong finger pressure |
| **Very Stiff** | N=16-30 | C=2000-4000 psf | Dented slightly by finger pressure |
| **Hard** | N>30 | C>4000 | Dented slightly by a pencil point or thumbnail |

## MOISTURE DENSITY

**Moisture Condition:** An observational term; dry, damp, moist, wet, saturated.

**Moisture Content:** The weight of water in a sample divided by the weight of dry soil in the soil sample expressed as a percentage.

**Dry Density:** The pounds of dry soil in a cubic foot.

## MOISTURE CONDITION

Dry....................Absence of moisture, dusty, dry to the touch
Damp................Slight indication of moisture
Moist................Color change with short period of air exposure (granular soil)
Below optimum moisture content (cohesive soil)
Wet....................High degree of saturation by visual and touch (granular soil)
Above optimum moisture content (cohesive soil)
Saturated..........Free surface water

## PLASTICITY

| DESCRIPTION | FIELD TEST |
|---|---|
| Nonplastic | A 1/8 in. (3-mm) thread cannot be rolled at any moisture content. |
| Low | The thread can barely be rolled. |
| Medium | The thread is easy to roll and not much time is required to reach the plastic limit. |
| High | The thread can be rerolled several times after reaching the plastic limit. |

## GROUNDWATER LEVEL

| | |
|---|---|
| ▼ | Water Level (measured or after drilling) |
| ▽ | Water Level (during drilling) |

## RELATIVE PROPORTIONS

Trace.............minor amount (<5%)
with/some......significant amount
modifier/and...sufficient amount to influence material behavior (Typically >30%)

## LOG KEY SYMBOLS

| | |
|---|---|
| ▮ | Bulk, Bag or Grab Sample |
| ▯ | Standard Penetration Split Spoon Sampler (2" outside diameter) |
| ▮ | Modified California Sampler (3" outside diameter) |
| N | No Recovery |

**Terms and Symbols used on Boring Logs**

**Earth Systems**
**Southwest**

# Boring No: B-1

Project Name: South of Via Canon & Camino Capistrano, Dana Point, CA
File Number: 10123-02
Boring Location: See Figure 2

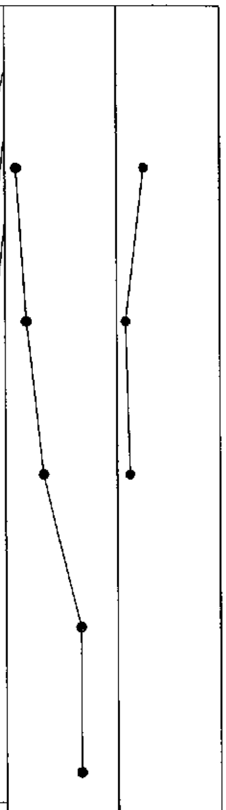
Drilling Date: August 21, 2006
Drilling Method: 24" Bucket Auger
Drill Type: Limited Access Rope & Cathead
Logged By: Clay Stevens

Page 1 of 1

## Description of Units

Note: The stratification lines shown represent the approximate boundary between soil and/or rock types and the transition may be gradational.

| Depth (Ft.) | Sample Type<br>Bulk | SPT | MOD Calif | Penetration Resistance (Blows/6") | Symbol | USCS | Dry Density (pcf) | Moisture Content (%) | Description of Units |
|---|---|---|---|---|---|---|---|---|---|
| 0 | | | | | | SC | | | CLAYEY SAND: dark brown, firm, dry, mottled, some voids pinhole to 1/8-inch diameter, some organics<br>TOPSOIL |
| | | | | | | SM | | | |
| | | | | | | SP | | | SILTY SAND: pale brown, medium dense, moist, some clay, trace rootlets, some organics, few sub-rounded gravel to 3/4" diameter<br>MARINE TERRACE |
| 5 | ■ | | ■ | 6,11,10 | | | 111 | 6 | |
| | | | | | | RX | | | |
| | | | | | | | | | SAND: very pale brown, medium dense, moist, trace sub-rounded cobbles to 8" diameter<br>MARINE TERRACE |
| 10 | | | ■ | 9,18,22 | | | 83 | 37 | |
| | | | | | | | | | SILTSTONE: olive gray, dense, moist, gypsum along bedding and filling fractures, few laminations, mostly massive, trace concretions, weathered bedrock in upper 1 to 2 feet<br>dark orange brown, 2-inch thick coarse grained sand bed with few sub-rounded gravel at 8 feet<br>black, very dense, fissile, slight organic odor, laminated, trace light yellow brown 1-inch thick fine grained sand bed at 12 feet |
| 15 | ■ | | ■ | 17,33,42 | | | 89 | 30 | brown, 3-inch thick clay bed, well bedded, minor groundwater seepage of approximately 1-gallon per hour along bedding at 17 feet |
| 20 | | | ■ | 22,53 | | | | | |
| 25 | | | ■ | 22,50/5" | | | | | CAPISTRANO FORMATION<br>BEDROCK, UNWEATHERED |
| 30 | | | | | | | | | Total Depth 26 feet<br>Minor Groundwater Seepage Encountered at 17 feet |
| 35 | | | | | | | | | |
| 40 | | | | | | | | | |
| 45 | | | | | | | | | |
| 50 | | | | | | | | | |



**Earth Systems**
**Southwest**

27126B Paseo Espada, San Juan Capistrano, CA 92675
Phone (949) 248-9005, Fax (949) 248-9016

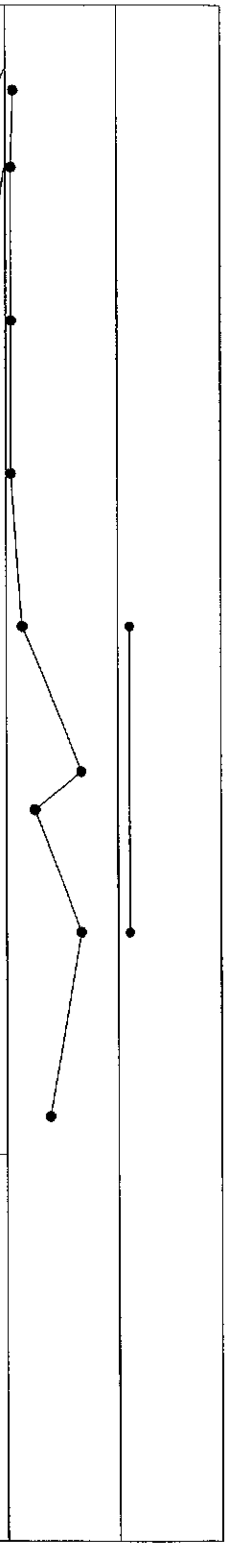
**Boring No: B-2**
Project Name: South of Via Canon & Camino Capistrano, Dana Point, CA
File Number: 10123-02
Boring Location: See Figure 2

Drilling Date: August 22, 2006
Drilling Method: 24" Bucket Auger
Drill Type: Limited Access Rope & Cathead
Logged By: Clay Stevens

Page 1 of 1

| Depth (Ft.) | Sample Type: Bulk | Sample Type: SPT | Sample Type: MOD Calif. | Penetration Resistance (Blows/6") | Symbol | USCS | Dry Density (pcf) | Moisture Content (%) | Description of Units |
|---|---|---|---|---|---|---|---|---|---|
| 0 | ■ |  |  |  |  | ML/CL |  |  | CLAYEY SILT: brown, firm, dry, some voids pinhole to 1/4" diameter<br>TOPSOIL |
|  | ■ |  | ■ | 5,6,9 |  | CL |  |  | SILTY CLAY: dark red brown, firm, damp, mottled with black, voids pinhole to 1/8" diameter, some organics, some rootlets, trace rounded gravel, caliche stringers abundant at 4 feet<br>TOPSOIL |
| 5 |  |  | ■ | 4,5,6 |  | RX |  |  | SILTSTONE: light brown, loose, damp, weathered bedrock, iron oxide stains along bedding and fractures, some rootlets, abundant fissures 1/8" to 1/4" wide, contact is irregular and gradational with topsoil, poorly bedded to massive |
| 10 | ■ |  | ■ | 4,4,6 |  |  |  |  |  |
| 15 |  |  | ■ | 4,4,5 |  |  |  |  |  |
| 20 |  |  | ■ | 6,11,21 |  |  | 87 | 27 |  |
| 25 |  |  | ■ | 17,33,50/5" |  |  |  |  | dark brown to black, very dense, laminated, slightly fissile, gradational interbedded contact with light brown siltstone |
|  |  | □ |  | 6,14,23 |  |  |  |  |  |
| 30 |  |  | ■ | 22,50 |  |  | 87 | 34 |  |
| 35 |  | □ |  | 11,23,34 |  |  |  |  | CAPISTRANO FORMATION<br>BEDROCK, UNWEATHERED |
| 40 |  |  |  |  |  |  |  |  | Total Depth 37.5 feet<br>No Groundwater Encountered |
| 45 |  |  |  |  |  |  |  |  |  |
| 50 |  |  |  |  |  |  |  |  |  |

Note: The stratification lines shown represent the approximate boundary between soil and/or rock types and the transition may be gradational.



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**Southwest**

27126B Paseo Espada, San Juan Capistrano, CA 92675
Phone (949) 248-9005, Fax (949) 248-9016

# Boring No: B-3

Project Name: South of Via Canon & Camino Capistrano, Dana Point, CA
File Number: 10123-02
Boring Location: See Figure 2

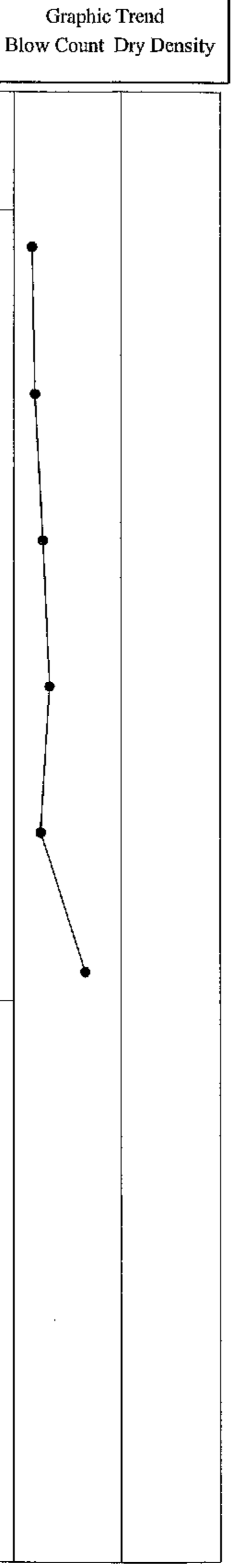
Drilling Date: August 24, 2006
Drilling Method: 24" Bucket Auger
Drill Type: Limited Access Rope & Cathead
Logged By: Clay Stevens

Page 1 of 1

## Description of Units

Note: The stratification lines shown represent the approximate boundary between soil and/or rock types and the transition may be gradational.

| Depth (Ft.) | Sample Type Bulk | Sample Type SPT | Sample Type MOD Calif. | Penetration Resistance (Blows/6") | Symbol | USCS | Dry Density (pcf) | Moisture Content (%) | Description of Units |
|---|---|---|---|---|---|---|---|---|---|
| 0 | | | | | | ML/CL | | | CLAYEY SILT: dark brown, firm to stiff, dry to damp, some pinhole to 1/8" voids, mottled, with roots, with organics<br>TOPSOIL |
| 5 | | | ■ | 6,16,21 | | RX | | | SILTSTONE: light brown, medium dense, damp, weathered near upper 2 to 3 feet, poorly bedded, slightly fractured, several roots, several laminations<br>brown, trace thin beds and laminations, mostly massive, abundant limonite and hematite coated fractures, several gypsum filled fractures |
| 10 | ■ | | ■ | 10,17,27 | | | | | |
| 15 | | | ■ | 10,22,37 | | | | | |
| 20 | ■ | | ■ | 17,31,42 | | | | | black, dense to very dense, laminated, slightly fissile, gradational and interbedded upper contact approximately 2 feet stratigraphically, trace gypsum along bedding and fractures, trace soft sediment deformational structures |
| 25 | | ◧ | | 10,14,23 | | | | | |
| 30 | | | ■ | 17,50 | | | 89 | 31 | CAPISTRANO FORMATION<br>BEDROCK, UNWEATHERED |
| 35 | | | | | | | | | Total Depth 31 feet<br>No Groundwater Encountered |



## Boring No: B-4

Project Name: South of Via Canon & Camino Capistrano, Dana Point, CA
File Number: 10123-02
Boring Location: See Figure 2

Drilling Date: August 24, 2006
Drilling Method: 24" Bucket Auger
Drill Type: Limited Access Rope & Cathead
Logged By: Clay Stevens

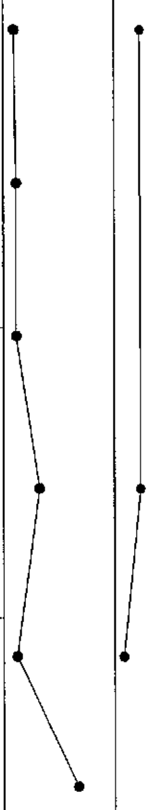
Page 1 of 1

### Description of Units

Note: The stratification lines shown represent the approximate boundary between soil and/or rock types and the transition may be gradational.

| Depth (Ft.) | Sample Type: Bulk | Sample Type: SPT | Sample Type: MOD Calif. | Penetration Resistance (Blows/6") | USCS | Dry Density (pcf) | Moisture Content (%) | Description of Units |
|---|---|---|---|---|---|---|---|---|
| 0 | ■ | | | | ML/CL | | | CLAYEY SILT: light brown, soft, dry, some sand, trace cobbles to 6" diameter, some organics, some roots<br>TOPSOIL |
| 5 | ■ | | ■ | 7,8,13 | SM/ML | 108 | 5 | SILTY SAND TO SANDY SILT: pale brown, medium dense, damp, fine grained, thinly bedded, trace gravel, numerous pinhole to 1/8" voids, trace sub-rounded cobbles to 6" diameter |
| 10 | ■ | | ■ | 7,12,13 | | | | NON-MARINE TERRACE |
| 15 | ■ | | ■ | 5,12,14 | SP | | | SAND: very pale brown, medium dense, damp, medium to coarse grained, several clayey silt interbeds approximately 1" thick |
| 20 | | | ■ | 7,21,50 | | 109 | 2 | dark reddish brown, dense, coarse grained, abundant sub-rounded cobbles up to 8" diameter<br>MARINE TERRACE |
| 25 | | | ■ | 7,11,16 | RX | 83 | 38 | SILTSTONE: olive gray, medium dense to dense, damp, mostly massive to trace thin beds and laminations |
| 30 | | | ■ | 15,50 | | | | CAPISTRANO FORMATION<br>BEDROCK, UNWEATHERED |
| 35 | | | | | | | | Total Depth 31 feet<br>Caving at 19.5 to 22.5 feet<br>No Groundwater Encountered |
| 40 | | | | | | | | |
| 45 | | | | | | | | |
| 50 | | | | | | | | |

Graphic Trend
Blow Count Dry Density



## Boring No: B-5

Project Name: South of Via Canon & Camino Capistrano, Dana Point, CA
File Number: 10123-02
Boring Location: See Figure 2

Drilling Date: August 28, 2006
Drilling Method: 24" Bucket Auger
Drill Type: Limited Access Rope & Cathead
Logged By: Clay Stevens

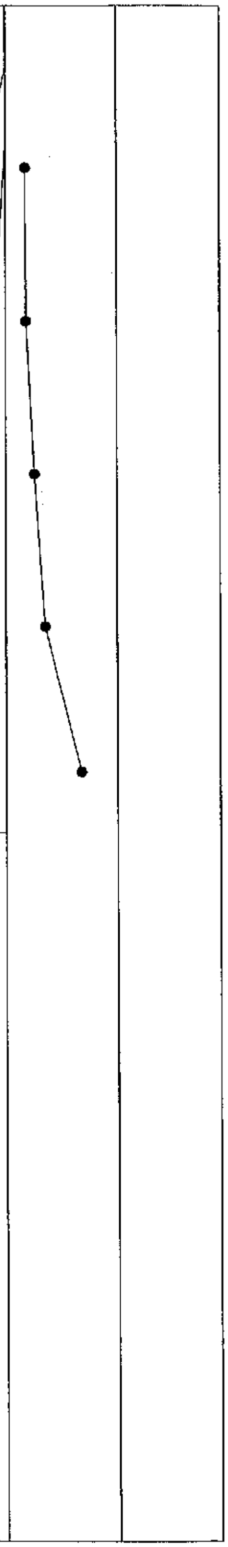
Page 1 of 1

**Description of Units**

Note: The stratification lines shown represent the approximate boundary between soil and/or rock types and the transition may be gradational.

| Depth (Ft.) | Sample Type Bulk | Sample Type SPT | Sample Type MOD Calif. | Penetration Resistance (Blows/6") | Symbol | USCS | Dry Density (pcf) | Moisture Content (%) | Description of Units |
|---|---|---|---|---|---|---|---|---|---|
| 0 | | | | | ▨ | ML/CL | | | CLAYEY SILT: brown, firm, dry to damp, numerous routs, numerous pinhole to 1/8" voids, few 1/4" voids<br>TOPSOIL |
| | | | | | ░ | SP | | | |
| 5 | | | ■ | 7,17,22 | ╳ | RX | 91 | 26 | SAND: very pale brown, loose, dry to damp, medium to coarse grained, numerous sub-rounded gravel, few sub-rounded cobbles to 5" diameter, broken marine shells, heavily oxidized at base, abundant sub-rounded cobbles to 8 " diameter at base<br>MARINE TERRACE |
| 10 | | | ■ | 7,14,24 | ╳ | | | | SILTSTONE: brown, medium dense, damp, laminated, moderately hard, gypsum filling fractures, trace laminations, mostly massive, fracture surfaces oxidized |
| 15 | | | ■ | 10,22,34 | ╳ | | | | |
| 20 | | | ■ | 13,32,45 | ╳ | | | | |
| 25 | | | ■ | 19,48 | ╳ | | | | black, very dense, gradational interbedded upper contact, slightly fissile<br>CAPISTRANO FORMATION<br>REFUSAL: very hard, well cemented bed |
| 30 | | | | | | | | | Total Depth 27 feet<br>Refusal at 27 feet<br>No Groundwater Encountered |
| 35 | | | | | | | | | |
| 40 | | | | | | | | | |
| 45 | | | | | | | | | |
| 50 | | | | | | | | | |

Graphic Trend
Blow Count Dry Density



## Boring No: B-6

Project Name: South of Via Canon & Camino Capistrano, Dana Point, CA
File Number: 10123-02
Boring Location: See Figure 2

Drilling Date: August 29, 2006
Drilling Method: 24" Bucket Auger
Drill Type: Limited Access Rope & Cathead
Logged By: Clay Stevens

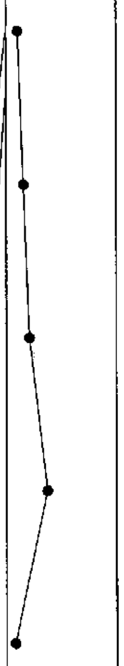
Page 1 of 1

## Description of Units

Note: The stratification lines shown represent the approximate boundary between soil and/or rock types and the transition may be gradational.

| Depth (Ft.) | Sample Type Bulk | Sample Type SPT | Sample Type MOD Calif. | Penetration Resistance (Blows/6") | USCS | Dry Density (pcf) | Moisture Content (%) | Description of Units |
|---|---|---|---|---|---|---|---|---|
| 0 | | | | | ML/CL | | | CLAYEY SILT: dark brown, loose, dry, little sand, few gravel, several roots, numerous rootlets, trace caliche stringers, old beer can, several sub-rounded cobble to 4-inch diameter<br>FILL |
| | | | | | SP | | | |
| 5 | | | ■ | 6,7,8 | ML/CL | 94 | 22 | SAND: very pale brown, loose, damp, numerous sub-rounded cobble to 6-inch diameter, trace sub-rounded cobbles to 12-inch diameter at base<br>MARINE TERRACE |
| | | | | | RX | | | |
| 10 | | | ■ | 8,11,12 | | | | SILTSTONE: brown, loose, damp, heavily weathered, several pinhole voids, several rootlets, trace organics, abundant caliche stringers<br>BEDROCK, WEATHERED |
| 15 | | | ■ | 9,13,18 | | | | SILTSTONE: light orange brown in upper 2 feet, brown from 9 feet, medium dense, damp to moist, trace thin beds and laminations, mostly massive, several gypsum filled fractures, oxidized fracture surfaces, slightly weathered in upper 2 feet, gradational and irregular upper contact |
| 20 | | | ■ | 13,24,31 | | | | |
| 25 | | ■ | | 5,7,11 | | | | CAPISTRANO FORMATION<br>BEDROCK, UNWEATHERED |
| 30 | | | | | | | | Total Depth 26.5 feet<br>No Groundwater Encountered |
| 35 | | | | | | | | |
| 40 | | | | | | | | |
| 45 | | | | | | | | |
| 50 | | | | | | | | |

Graphic Trend
Blow Count Dry Density



**Boring No: B-7**
Project Name: South of Via Canon & Camino Capistrano, Dana Point, CA
File Number: 10123-02
Boring Location: See Figure 2

Drilling Date: August 30, 2006
Drilling Method: 24" Bucket Auger
Drill Type: Limited Access Rope & Cathead
Logged By: Clay Stevens

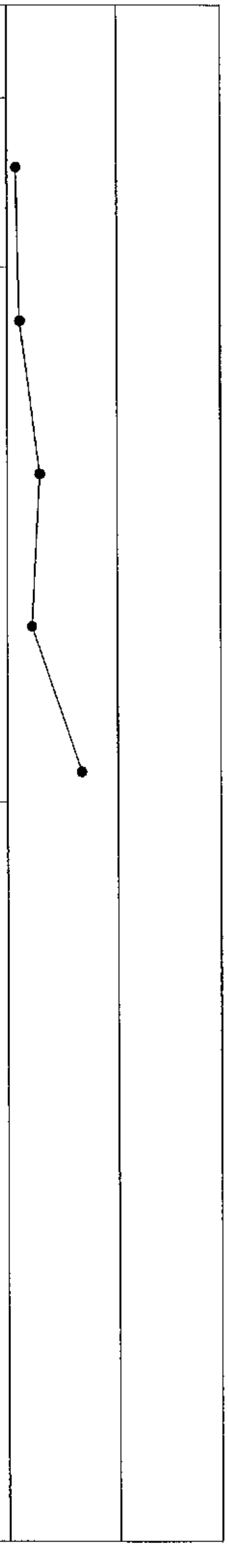
Page 1 of 1

## Description of Units

Note: The stratification lines shown represent the approximate boundary between soil and/or rock types and the transition may be gradational.

| Depth (Ft.) | Sample Type Bulk | Sample Type SPT | Sample Type MOD Calif | Penetration Resistance (Blows/6") | Symbol | USCS | Dry Density (pcf) | Moisture Content (%) | Description of Units |
|---|---|---|---|---|---|---|---|---|---|
| 0 | | | | | | SC | | | CLAYEY SAND: dark brown, firm, dry to damp, several roots<br>TOPSOIL |
| | | | | | | SM/ML | | | SILTY SAND TO SANDY SILT: pale brown, loose, damp, abundant caliche stringers |
| 5 | | | ■ | 6,8,10 | | | 108 | 15 | |
| | | | | | | | | | NON-MARINE TERRACE |
| | | | | | | RX | | | SILTSTONE: olive gray to olive brown, loose, damp, iron oxide along beeding and fracture planes gypsum filling fractures, weathered in upper 1 to 2 feet |
| 10 | | ◧ | | 5,7,10 | | | | | |
| 15 | | | ■ | 11,21,44 | | | | | |
| 20 | | ◧ | | 7,12,21 | | | | | black, medium dense, damp to saturated, discontinous color change along bedding, slightly fissile, trace laminations, mostly massive, several fracures, gypsum filling fractures |
| | ▼ | | | | | | | | very dense, saturated<br>CAPISTRANO FORMATION<br>BEDROCK, UNWEATHERED |
| 25 | | | ■ | 21,50 | | | | | |
| 30 | | | | | | | | | Total Depth 26 feet<br>Groundwater Encountered at 24 feet |
| 35 | | | | | | | | | |
| 40 | | | | | | | | | |
| 45 | | | | | | | | | |
| 50 | | | | | | | | | |

Graphic Trend
Blow Count Dry Density



## Boring No: B-8

Project Name: South of Via Canon & Camino Capistrano, Dana Point, CA
File Number: 10123-02
Boring Location: See Figure 2

Drilling Date: August 31, 2006
Drilling Method: 24" Bucket Auger
Drill Type: Limited Access Rope & Cathead
Logged By: Clay Stevens

Page 1 of 1

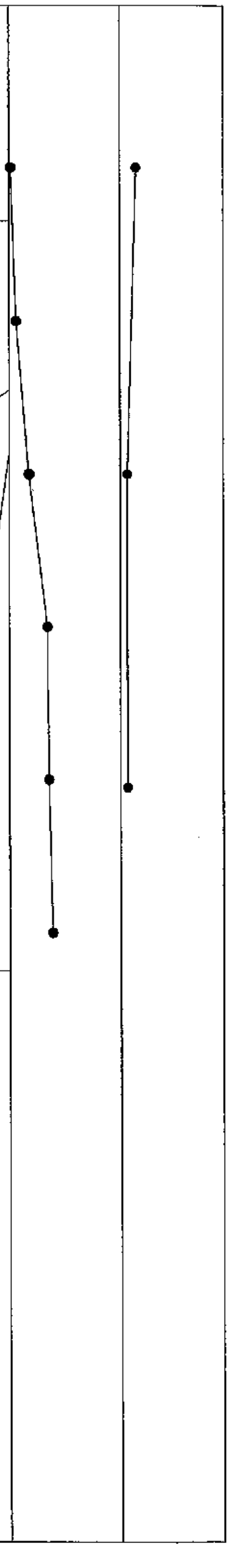
### Description of Units

Note: The stratification lines shown represent the approximate boundary between soil and/or rock types and the transition may be gradational.

| Depth (Ft.) | Sample Type (Bulk / SPT / MOD Calif) | Penetration Resistance (Blows/6") | USCS | Dry Density (pcf) | Moisture Content (%) | Description of Units |
|---|---|---|---|---|---|---|
| 0 | | | SC | | | CLAYEY SAND: light brown to dark brown, very loose, dry to damp, trace organics, trace concrete and asphalt fragments, trace construction wood fragments, mottled |
| 5 | MOD Calif | 1,1,2 | | 93 | 15 | FILL (Backfill From Previous Testpit) |
| 7 | | | SM/ML | | | SANDY SILT TO SILTY SAND: pale brown, medium dense, damp, fine grained, trace sub-rounded gravel, soil development in upper 2 feet, numerous rootlets, numerous caliche stringers, lower contact undulating<br>NON-MARINE TERRACE |
| 10 | SPT | 2,4,5 | | | | |
| 12.5 | | | SP | | | SAND: very pale brown, loose, damp, coarse grained, numerous sub-rounded gravel, several sub-rounded cobbles to 8" diameter, lcontact undulating, abundant sub-rounded gravel and cobbles at base<br>MARINE TERRACE |
| 14.5 | | | RX | | | SILTSTONE: light greenish gray in upper 2 feet, dark brown interbedded with black from 17 feet, medium dense to dense, damp, saturated from 24 feet, iron oxide staining along bedding and fractures, trace small roots along bedding and fractures, trace thin beds and laminations, mostly massive, slightly fissile from 18 feet |
| 15 | MOD Calif | 8,15,24 | | 80 | 39 | |
| 20 | SPT | 12,22,28 | | | | |
| 24 | ▼ | | | | | |
| 25 | MOD Calif | 10,27,50/5" | | 80 | 36 | |
| 30 | SPT | 10,20,37 | | | | CAPISTRANO FORMATION<br>BEDROCK, UNWEATHERED |

Total Depth 31.5 feet
Groundwater Encountered at 24 feet

Graphic Trend
Blow Count Dry Density



# APPENDIX B

Laboratory Test Results

File No.: 10123-02 November 17, 2006

Lab No.: SJC

# UNIT DENSITIES AND MOISTURE CONTENT

ASTM D2937 & D2216

Job Name: South of Via Canon & Camino Capistrano

| Sample Location | Depth (feet) | Unit Dry Density (pcf) | Moisture Content (%) | USCS Group Symbol |
|---|---|---|---|---|
| B-1 | 5 | 111 | 6 | SM |
| B-1 | 10 | 83 | 37 | RX |
| B-1 | 15 | 89 | 30 | RX |
| B-2 | 25 | 87 | 27 | ML/CL |
| B-2 | 30 | 87 | 34 | RX |
| B-3 | 30 | 89 | 31 | RX |
| B-4 | 5 | 108 | 5 | SP |
| B-4 | 20 | 109 | 2 | SP |
| B-4 | 25.5 | 83 | 38 | RX |
| B-5 | 5 | 91 | 26 | RX |
| B-6 | 5 | 94 | 22 | RX |
| B-7 | 5 | 108 | 15 | ML |
| B-8 | 5 | 93 | 15 | ML/CL |
| B-8 | 15 | 80 | 39 | RX |
| B-8 | 25 | 80 | 36 | RX |

File No.: 10123-02 November 17, 2006

Lab No.: SJC

# PARTICLE SIZE ANALYSIS

ASTM D-422

Job Name: South of Via Canon & Camino Capistrano

Sample ID: **B-1 @ 15 ft**

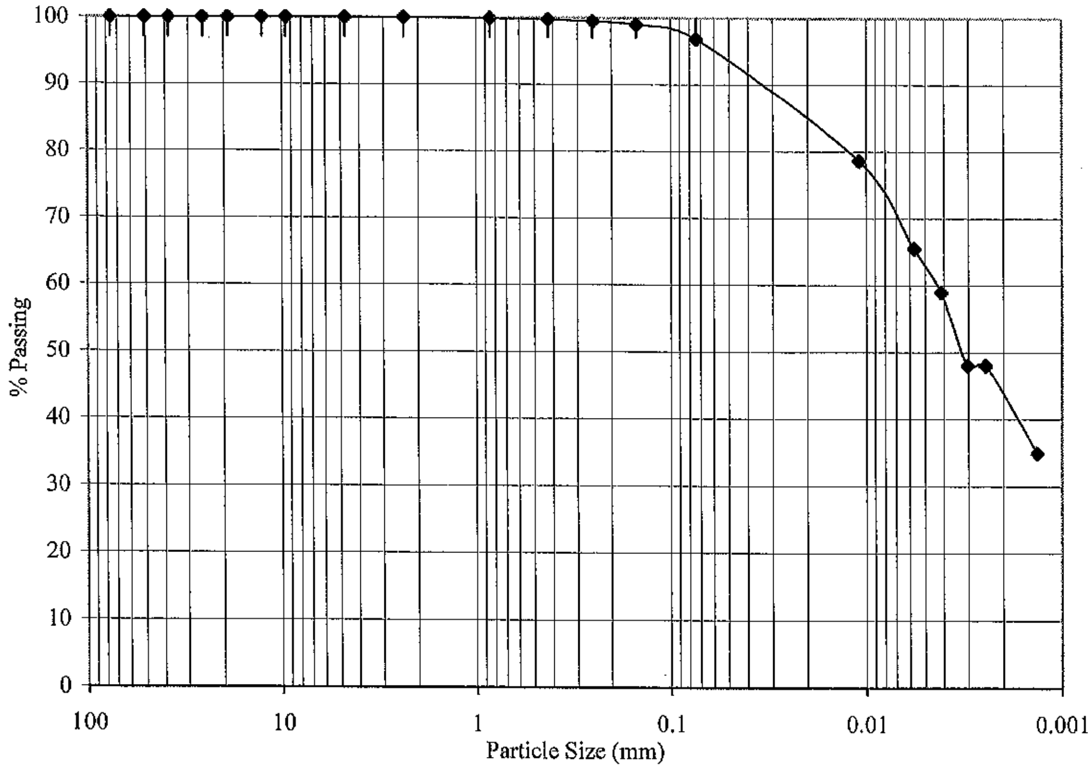
Description: **Black Siltstone**

| Sieve Size | % Passing |
|---|---|
| 3" | 100 |
| 2" | 100 |
| 1-1/2" | 100 |
| 1" | 100 |
| 3/4" | 100 |
| 1/2" | 100 |
| 3/8" | 100 |
| #4 | 100 |
| #8 | 100 |
| #20 | 100 |
| #40 | 100 |
| #60 | 99 |
| #100 | 99 |
| #200 | 97 |

By Hydrometer Method:

| Particle Size | % Passing |
|---|---|
| 47 Micron | 104 |
| 18 Micron | 87 |
| 11 Micron | 79 |
| 6 Micron | 65 |
| 4 Micron | 59 |
| 3.0 Micron | 48 |
| 2.5 Micron | 48 |
| 1.3 Micron | 35 |

| | |
|---|---|
| **% Gravel:** | **0** |
| **% Sand:** | **3** |
| **% Silt:** | **49** |
| **% Clay (2 micron):** | **48** |



File No.: 10123-02
Lab No.: SJC

November 17, 2006

## EXPANSION INDEX

ASTM D-4829, UBC 18-2

Job Name: South of Via Canon & Camino Capistrano
Sample ID: B-1 @ 15 - 20 ft
Soil Description: Black Siltstone

| | |
|---|---|
| Initial Moisture, %: | 17.3 |
| Initial Compacted Dry Density, pcf: | 85.3 |
| Initial Saturation, %: | 48 |
| Final Moisture, %: | -171.9 |
| Volumetric Swell, %: | 16.4 |

**Expansion Index, EI:** **161** **Very High**

*Adjusted to EI at 50 % saturation according to Section 10.1.2 of ASTM D4829*

| EI | UBC Classification |
|---|---|
| 0-20 | Very Low |
| 21-50 | Low |
| 51-90 | Medium |
| 91-130 | High |
| >130 | Very High |

File No.: 10123-02 November 17, 2006

## MAXIMUM DENSITY / OPTIMUM MOISTURE

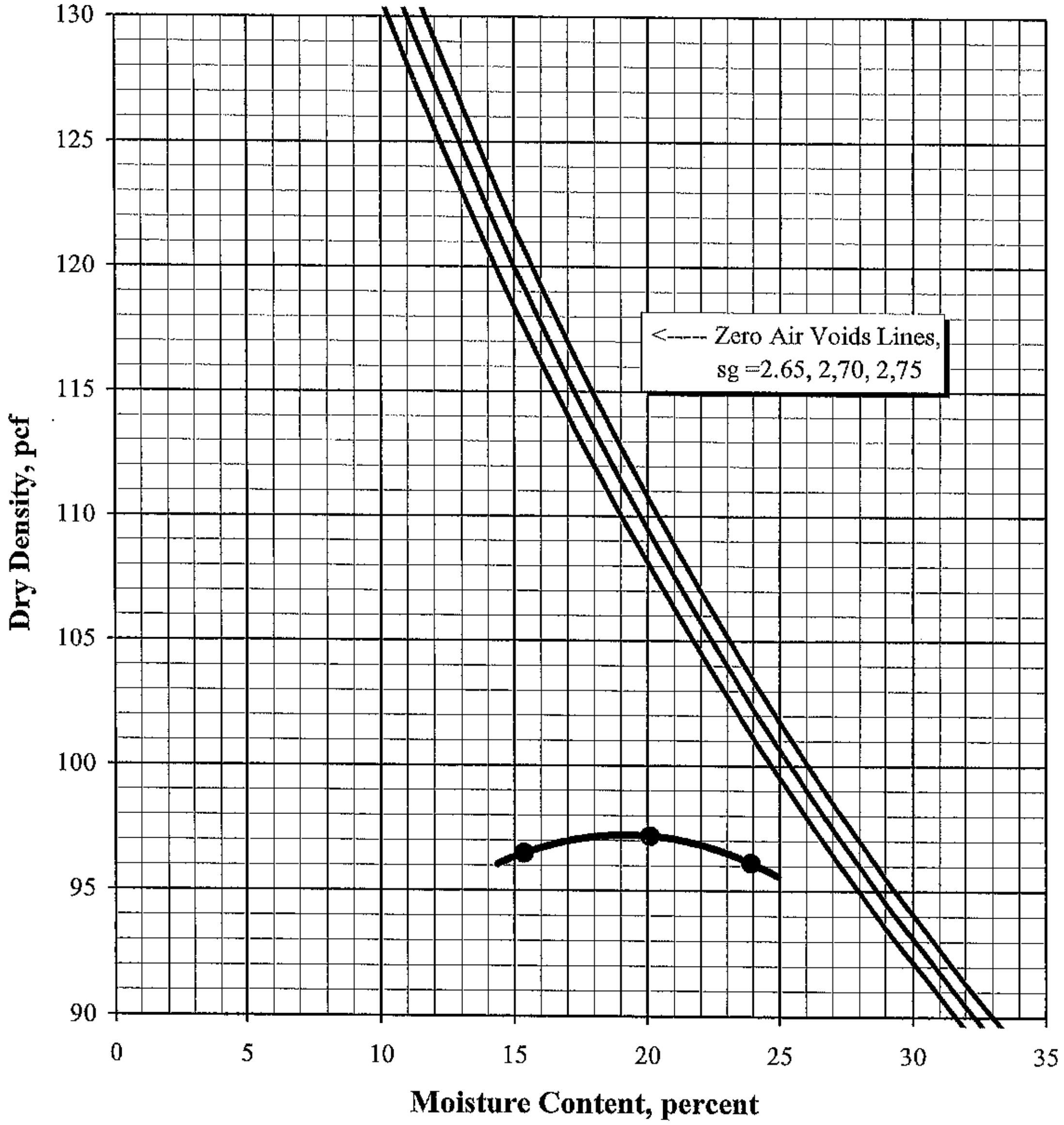
ASTM D 1557-91 (Modified)

Job Name: South of Via Canon & Camino Capistrano
Sample ID: B-1 @ 15-20 ft
Location: Site
Description: Black Siltstone

Procedure Used: A
Preparation Method: Moist
Rammer Type: Hand

**Maximum Density:** 97.5 pcf
**Optimum Moisture:** 18%

| Sieve Size | % Retained |
|---|---|
| 3/4" | 0.0 |
| 3/8" | 0.0 |
| #4 | 0.0 |



File No.: 10123-02 November 17, 2006

## MAXIMUM DENSITY / OPTIMUM MOISTURE

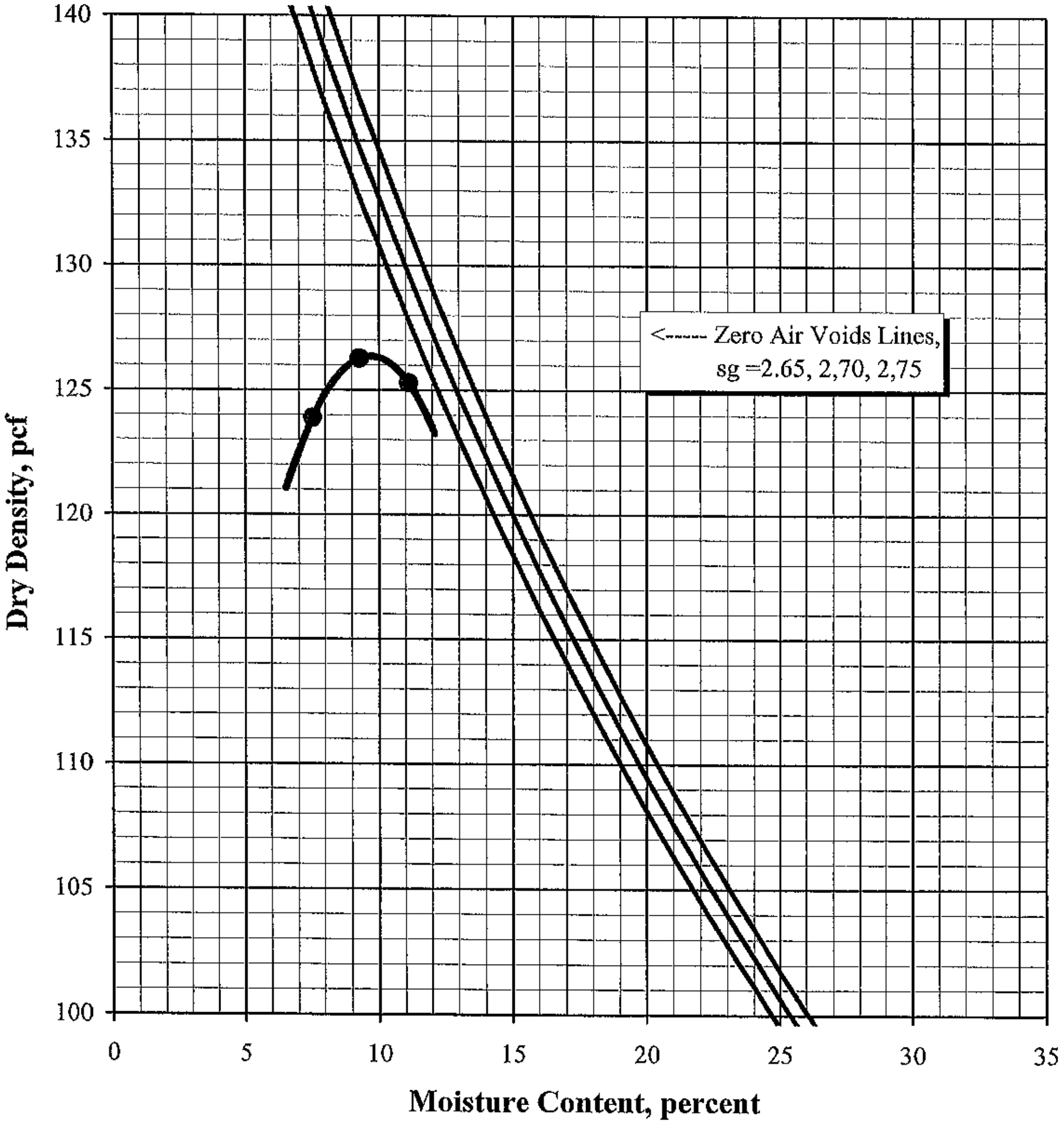
ASTM D 1557-91 (Modified)

Job Name: South of Via Canon & Camino Capistrano
Sample ID: B-1 @ 5-10 ft
Location: Via Canon
Description: Orange Brown, Silty Sand, trace rounded cobbles

Procedure Used: A
Preparation Method: Moist
Rammer Type: Hand

**Maximum Density:** **126 pcf**
**Optimum Moisture:** **9%**

| Sieve Size | % Retained |
|---|---|
| 3/4" | 0.0 |
| 3/8" | 0.0 |
| #4 | 0.0 |



File No.: 10123-02
Lab No.: SJC

November 17, 2006

## SOIL CHEMICAL ANALYSES

Job Name: South of Via Canon & Camino Capistrano
Job No.: 10123-02

| | | DF | RL |
|---|---|---|---|
| Sample ID: | B-1 | | |
| Sample Depth, feet: | 15 to 20 | DF | RL |
| Sulfate, mg/Kg (ppm): | **4,742** | 20 | 20.00 |
| Chloride, mg/Kg (ppm): | **4,327** | 20 | 4.00 |
| pH, (pH Units): | **6.21** | 1 | N/A |
| Resistivity, (ohm-cm): | **203** | N/A | N/A |
| Conductivity, (µmhos-cm): | **4,930** | 1 | 2.00 |

Note: Tests performed by Subcontract Laboratory:
Truesdail Laboratories, Inc.
14201 Franklin Ave
Tustin, California 92780-7008; Tel: (714) 730-6462

DF: Dilution Factor
RL: Reporting Limit

**General Guidelines for Soil Corrosivity**

| Chemical Agent | Amount in Soil | Degree of Corrosivity |
|---|---|---|
| Soluble Sulfates | 0 -1000 mg/Kg (ppm) [ 0-.1%] | Low |
| | 1000 - 2000 mg/Kg (ppm) [0.1-0.2%] | Moderate |
| | 2000 - 20,000 mg/Kg (ppm) [0.2-2.0%] | Severe |
| | > 20,000 mg/Kg (ppm) [>2.0%] | Very Severe |
| Resistivity | 1-1000 ohm-cm | Very Severe |
| | 1000-2000 ohm-cm | Severe |
| | 2000-10,000 ohm-cm | Moderate |
| | 10,000+ ohm-cm | Low |

# APPENDIX C

## 2005 Test Pit Results and Log of Boring

**Boring No: B-1**
Project Name: Via Canon & Camino Capistrano, Dana Point, CA
File Number: 10123-01
Boring Location: See Figure 2

Drilling Date: May 17, 2005
Drilling Method: 24 Dia Bucket Auger
Drill Type: Portable Drill Rig
Logged By: Carl Schrenk

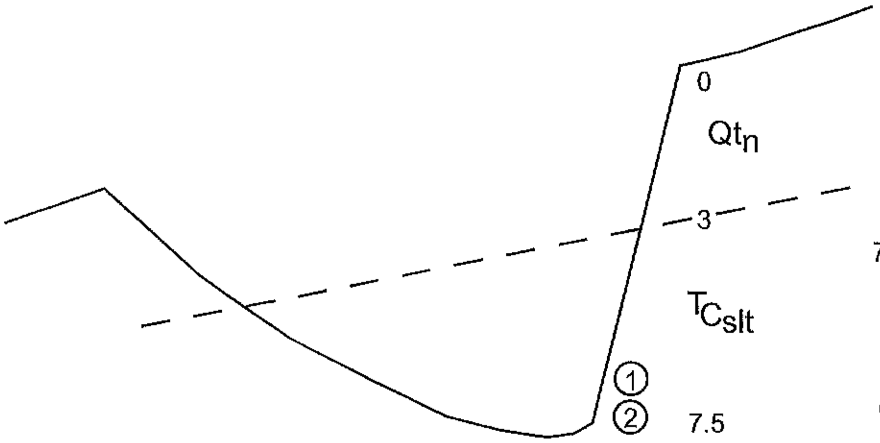
## Description of Units

Page 1 of 1

Note: The stratification lines shown represent the approximate boundary between soil and/or rock types and the transition may be gradational.

| Depth (Ft.) | Sample Type: Bulk | Sample Type: SPT | Sample Type: MOD Calif. | Penetration Resistance (Blows/6") | Symbol | USCS | Dry Density (pcf) | Moisture Content (%) | Description of Units | Graphic Trend Blow Count | Graphic Trend Dry Density |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 0 | | | | | | SC | | | CLAYEY SAND TO SANDY CLAY: mottled brown to dark brown, soft, moist, scattered fragments of asphalt and concrete<br>Fill | | |
| 5 | | | ■ | 8,10 | | SM/ML | | | SILTY SAND TO SANDY SILT: light yellow brown, medium dense, moist, uniform<br>Non Marine Terrace | | |
| 10 | | | ■ | 4,8 | | SP | | | SAND: light yellow, medium dense to dense, very moist to wet, coarse grained, cobbly at 12 feet, interbeds of clay, caving sand | | |
| 15 | | | ■ | 7,16 | | | | | Marine Terrace | | |
| | | | ▨ | 50/3" | | RX | | | SILTSTONE: dark gray, very dense, moist, massive<br>Bedrock | | |
| | | | | | | | | | Refusal<br>Total Depth 16.3 feet<br>Water Seepage at 15.5 feet<br>Subject to Caving 10.5 to 15.5 feet | | |
| 20 | | | | | | | | | | | |
| 25 | | | | | | | | | | | |

## Test Pit 1



Description

0 Cobbly clayey Sand, brown to red brown, loose, moist, occasional roots

3 Non Marine Terrace

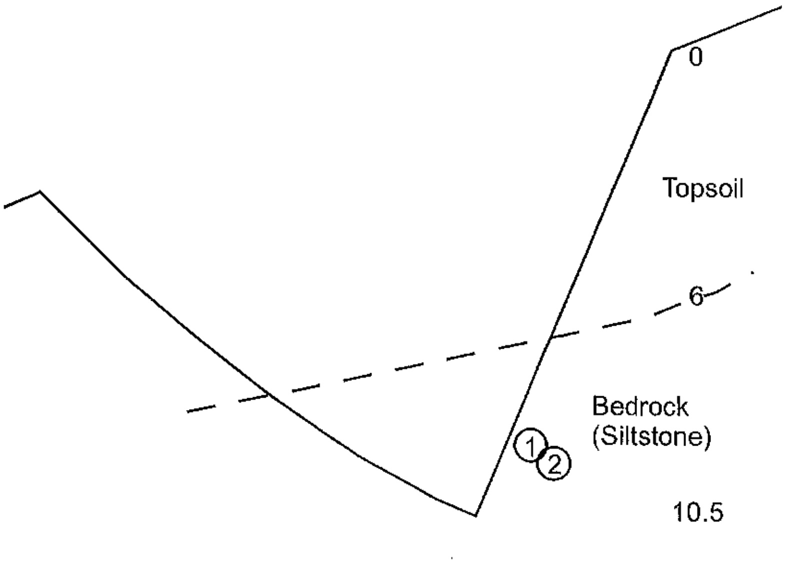
Siltstone, dark gray with reddish brown parting surfaces, very dense, moist, upper 3' highly weathered (silty clay), below massive to poorly bedded

7.5 Capistrano Formation

No Caving
No Free Water

① N80E 20NW bedding @ 7'
② N78E 22NW bedding @ 7.5'

## Test Pit 2



Description

0 Silty Clay, dark brown to gray brown, soft, very moist, rodent holes, creep prone

6 CREEP PRONE TOPSOIL

Siltstone, dark gray, dense to very dense, moist to damp, upper 2 feet weathered below unweathered and well bedded, thin sandstone interbeds

10.5 Capistrano Formation

No Caving
No Free Water

① N63E 30NW bedding @ 9.5'
② N65E 35NW bedding @9.7'

**LEGEND**

N

Not to Scale

**Figure 7**
**Test Pits 1 and 2**

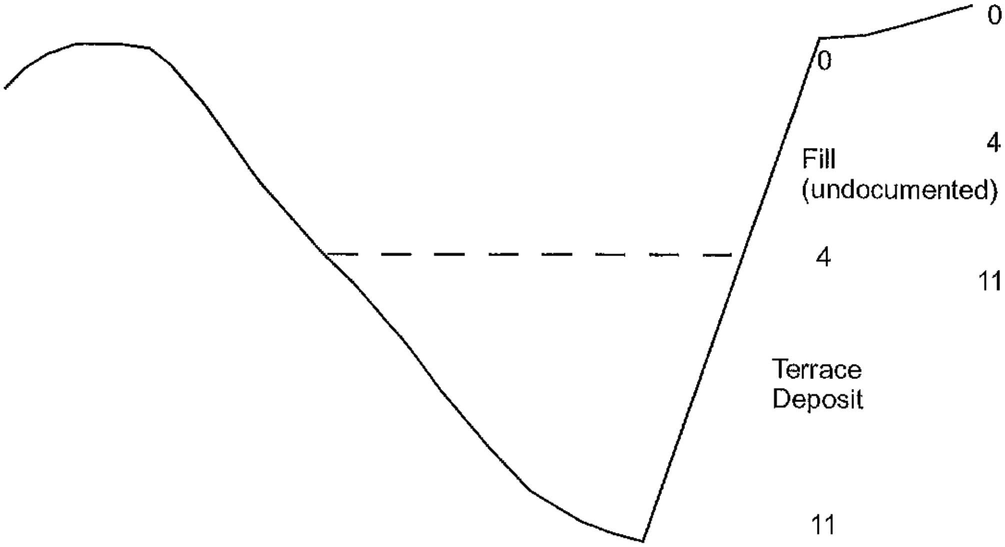
South of Via Canon & Camino Capistrano
Capistrano Beach
Dana Point, California

**Earth Systems**
**Southwest**

06/13/05 | File No.:10123-01

## Test Pit 3

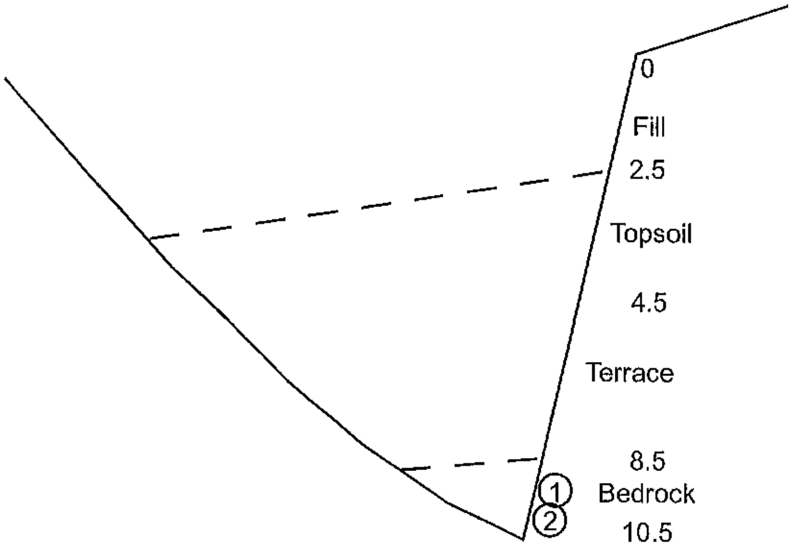
Description



| | |
|---|---|
| 0 | Silty fine Sand to fine sandy Silt, loose, moist, clasts of clay, scattered asphalt and concrete |
| 4 | Fill<br>Silty fine Sand, brown, medium dense, moist, uniform |
| 11 | Terrace |

## Test Pit 4

Description



| | |
|---|---|
| 0 | Silty Clay, mottled brown to red brown, soft, very moist |
| 2.5 | Silty Clay grading to Clayey Sand with depth, dark, black grading to light brown, loose, moist, abundant rodent holes |
| 8.5 | Topsoil/Terrace Undifferentiated |
| | Siltstone (clayey), dark gray to red brown along bedding surfaces, very dense, moist, unweathered |
| 10.5 | Capistrano Formation |

① N83W 20NE bedding @ 9.5'

② E-W 25N bedding @ 10'

**LEGEND**

Not to Scale

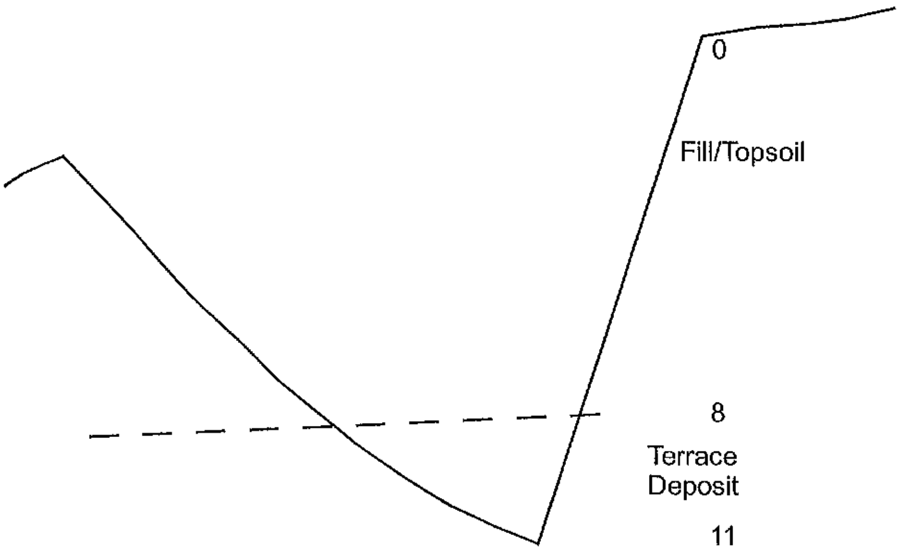
**Figure 8**
**Test Pits 3 and 4**

South of Via Canon & Camino Capistrano
Capistrano Beach
Dana Point, California

**Earth Systems**
**Southwest**

06/13/05
File No.:10123-01

**Test Pit 5**



Description

0 Fill/Topsoil, Sandy Clay to Silty Clay, mottled brown to light brown, soft, very moist, abundant rodent holes

8 Fill/Topsoil (undifferentiated)
Silty fine Sand to fine Sandy Silt, light brown, medium dense, moist, uniform

11 Terrace

**Test Pit 6**

Description

0 Sandy Clay, black, soft, moist, scattered roots

5 Topsoil
Sand, medium dense, wet, fine to medium grained, scattered well-rounded gravel to cobble size clasts, caving

7.5 Terrace
Siltstone, dark gray to red brown along bedding and joint surfaces, . very dense, moist, poorly bedded

10 Capistrano Formation

**LEGEND**

Not to Scale

N

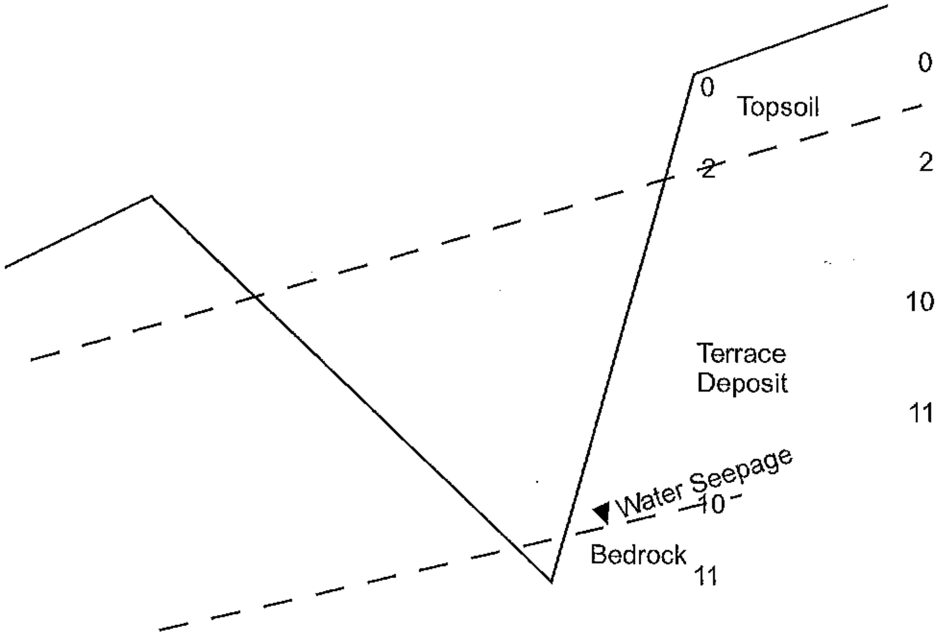
**Figure 9**
**Test Pits 5 and 6**

South of Via Canon & Camino Capistrano
Capistrano Beach
Dana Point, California

**Earth Systems**
**Southwest**

| | |
|---|---|
| 06/13/05 | File No.:10123-01 |

# Test Pit 7



| | Description |
|---|---|
| 0 | Sandy to Silty Clay, black, moist, desiccated on surface |
| 2 | Topsoil<br>Sand, medium dense, wet to saturated, fine to coarse grained, scattered well-rounded gravel to cobble size clasts, caving |
| 10 | Terrace<br>Siltstone, dark gray to red brown, very dense, moist, weathered |
| 11 | Capistrano Formation<br>Subject to Caving |

**LEGEND**

Not to Scale

**Figure 10**
**Test Pit 7**

South of Via Canon & Camino Capistrano
Capistrano Beach
Dana Point, California

**Earth Systems**
**Southwest**

06/13/05
File No.:10123-01

# Earth Systems
## Southwest

RECEIVED

JUN 02 2008

CITY OF DANA POINT
COMMUNITY DEVELOPMENT
DEPARTMENT

**Consulting Engineers and Geologists**

GOLDEN PHOENIX PRODUCTS CORPORATION
P.O. BOX 4227
DANA POINT, CALIFORNIA 92629

RECEIVED

JUN 02 2008

CITY OF DANA POINT
COMMUNITY DEVELOPMENT
DEPARTMENT

# RESPONSE TO CITY OF DANA POINT GEOTECHNICAL REPORT REVIEW CHECKLIST PROPOSED MULTI-FAMILY RESIDENTIAL DEVELOPMENT SOUTH OF VIA CANON AND CAMINO CAPISTRANO DANA POINT, CALIFORNIA

May 28, 2008

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File No.: 10123-02
Doc. No.: 08-05-788

**Earth Systems**
Southwest

27126B Paseo Espada, Suite 704
San Juan Capistrano, California 92675
(949) 248-9005
FAX (949) 248-9016

May 28, 2008

File No.: 10123-02
Doc. No.: 08-05-788

Golden Phoenix Products Corporation
P.O. Box 4227
Dana Point, California 92629

Attention: Mr. Ken Miller

Subject: **Response to City of Dana Point, Geotechnical Report Review Checklist**
March 16, 2007, PN 95101-79

Project: **Proposed Multi-Family Residential Development**
South of Via Canon and Camino Capistrano
Dana Point, California

Reference:

1. Earth Systems Southwest, *Engineering Geology Summary Letter, Proposed 8 Lot Development South of Via Canon and Camino Capistrano, Dana Point, California*, File No.: 10123-01, Doc. No.: 05-05-814, dated May 25, 2005.
2. Earth Systems Southwest, *Engineering Geology Feasibility Report, Proposed 8-Lot, Single-Family Residential Development South of Via Canon and Camino Capistrano, Dana Point, California*, File No.: 10123-01, Doc. No.: 05-06-724, dated June 13, 2005.
3. Earth Systems Southwest, *Geotechnical Engineering Report Multi-Family Residential Development South of Via Canon and Camino Capistrano, Dana Point, California*, File No.: 10123-02, Doc. No.: 06-11-706, dated November 17, 2006.
4. City of Dana Point, *Geotechnical Report Review Checklist*, PN 95101-79, dated March 16, 2007.

As requested, Earth Systems Southwest [ESSW] has reviewed the comments presented in subject Report Review Checklist and are reiterated below. We present the following responses to these comments.

Item # 1 - *Please provide a statement regarding impact of the proposed development on adjacent properties.*

The adjacent properties located to the east, west, and south will not be adversely affected, provided our recommendations are followed.

Item # 2 - *Please provide static and seismic analyses of slope stability in accordance with the City of Dana Point Grading Ordinance. Slope stability analyses should utilize site specific testing for shear strength, and incorporate a worst case groundwater condition.*

Please see attached slope stability calculations and results.

Item # 3 - *The text of the report discusses direct shear testing; however, no results of direct shear testing are included in the report. Please provide site specific shear strength data to justify slope stability analyses and retaining wall and foundation parameters.*

Please see attached direct shear test results.

Item # 4 - *Please provide geotechnical parameters for design of soldier pile and pile supported retaining walls shown on the southern part of the site on the submitted grading plan.*

The values in Section 5.1 of the referenced Geotechnical Engineering Report remain applicable.

Item # 5 - *Please illustrate the location of the landslide found on published maps for the area. Provide a geologic cross section depicting this feature and the area it is illustrated to affect with regards to the subject site.*

Please see attached revised Figure 2 and the geologic cross section D-D'.

Item # 6 - *Borings excavated within the mapped landslide area do not appear to be of sufficient depth to have encountered the base of the landslide in this area. Please discuss and provide additional subsurface data to support the conclusion that the landslide mapped by CGS does not exist.*

We created subsurface structure contours of the basal contact of the Quaternary marine terrace deposit based on data obtained during subsurface exploration and elevation surveys by others. The structure contours of the basal contact of the Quaternary marine terrace deposit indicate that the basal contact is relatively planar with an average strike and dip of N60E, 20NW. We plotted the location of the suspected landslide as mapped by California Geological Survey on Figure 2. We observed that the basal contact of the marine terrace deposit crosses over both lateral edges of the mapped location of the suspected landslide without any change in the general orientation or configuration of the structure contours. Based on the information stated above, it is our opinion that the suspected slide plane of the suspected landslide does not penetrate the basal contact of the Quaternary marine terrace deposit and therefore does not progress through or exist in the bedrock. It is our opinion that the surficial presence of a landslide reflects minor surficial movement of the creep prone topsoil and undocumented previously placed fill in the area. It is our understanding and recommendation that the material above the bedrock is to be removed and recompacted during grading.

Item # 7 - *Figure 2 does not depict all proposed grading as seen on a preliminary grading plan provided by the city for this review. When ready, please provide a complete grading plan review report with updated cross sections to illustrate proposed site improvements.*

We have incorporated the most recent copy of the grading plan that we received from Toal Engineering into a revised Figure 2, which is attached to this response. Five revised cross-sections showing the elevations of the most recent grading plan are also attached to this response.

We sincerely hope that the above information contained in this response addresses the issues in the geotechnical report review check list. When plans become available we will sign and stamp appropriate plans in accordance with the City of Dana Point code requirements, provided that our recommendations are in conformance with the referenced report and associated addendum(s).

We appreciate the opportunity to provide our professional services. Please contact our office if there are any questions or comments concerning this geotechnical review.

Respectfully submitted,
**EARTH SYSTEMS SOUTHWEST**

Carl D. Schrenk

Carl D. Schrenk
EG 900

REGISTERED GEOLOGIST
CARL D. SCHRENK
#CE900
CERTIFIED ENGINEERING GEOLOGIST
STATE OF CALIFORNIA

Reviewed by,

Shelton L Stringer

Shelton L. Stringer
GE 2266, EG 2417

REGISTERED PROFESSIONAL ENGINEER
SHELTON L. STRINGER
5/23/08
No. 2266
Exp. 6-30-08
GEOTECHNICAL
STATE OF CALIFORNIA

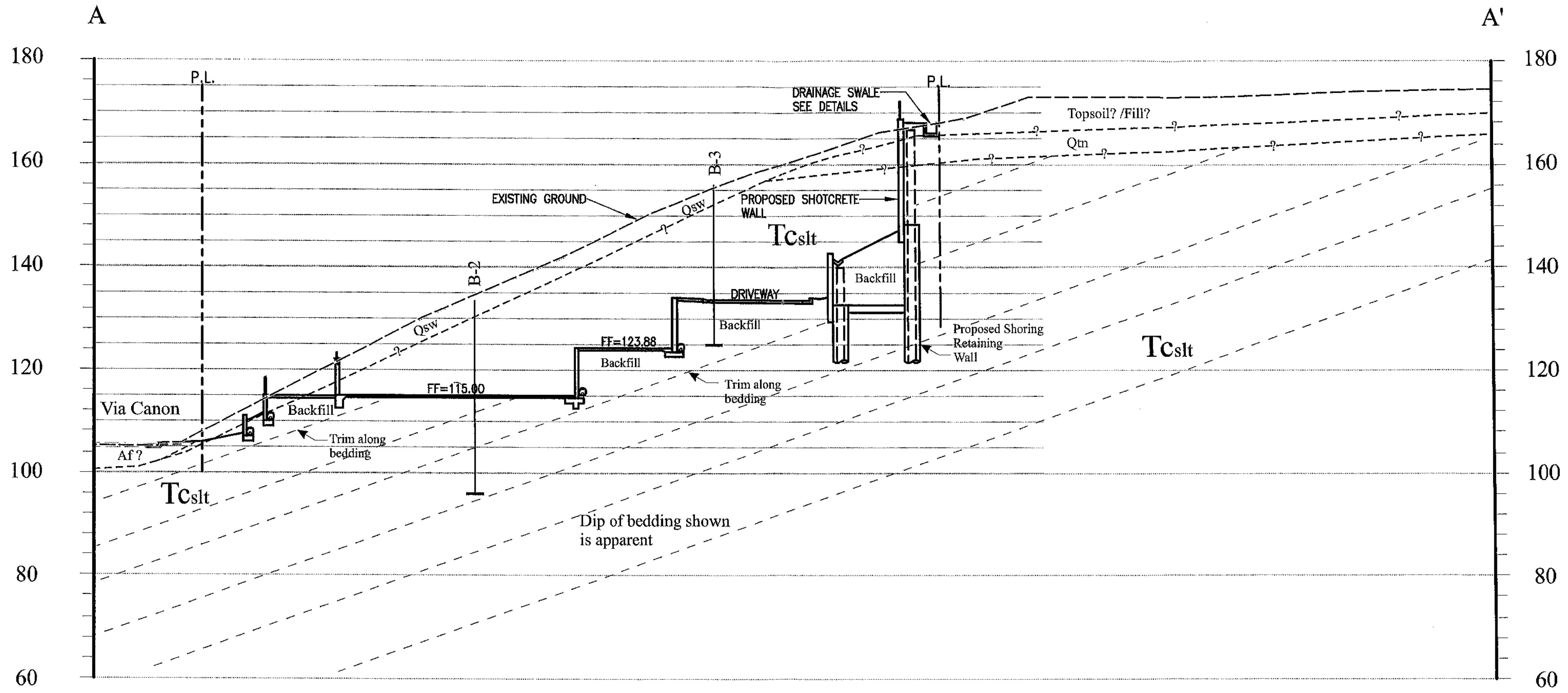
PROFESSIONAL GEOLOGIST
SHELTON L STRINGER
No. 2417
ENGINEERING GEOLOGIST
STATE OF CALIFORNIA

LTR/cds/sls/psh

Attachments: Revised Figure 2
Revised Figure 3A
Revised Figure 3B
Revised Figure 3C
Revised Figure 3D
Revised Figure 3E
Laboratory Test Results
Slope Stability Analysis

Distribution: 6/Golden Phoenix Products Corporation
2/BD File
1/SJC File

Reference: Toal Engineering
Sections, Profiles & Details
Lot 8, Tract 16133
Job 12407
Sheet 3 of 4



HORIZONTAL = VERTICAL
Approximate Scale: 1" = 20'

0 20' 40'

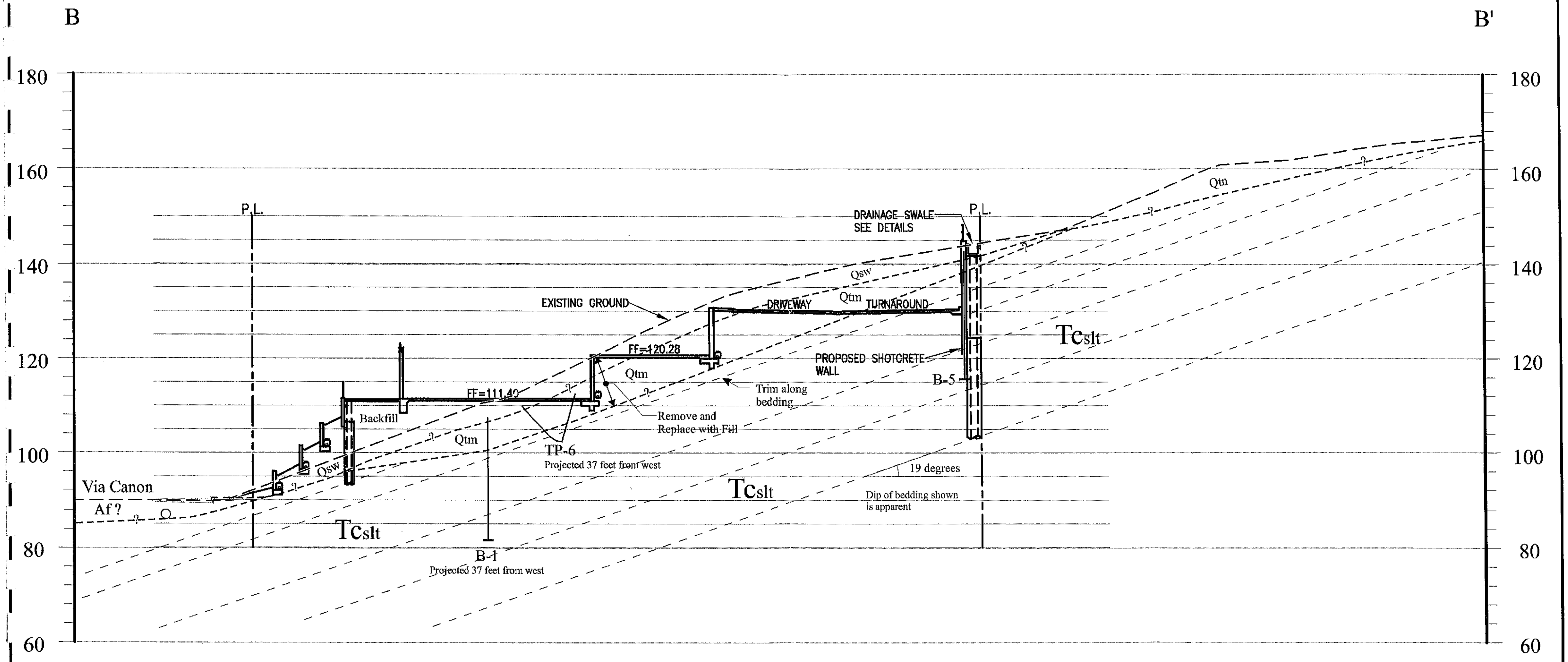
Revised Figure 3A
Geologic Section A-A'

South of Via Canon and Camino Capistrano
Dana Point, California

**Earth Systems**
**Southwest**

| | |
|---|---|
| 05/23/08 | 10123-02 |

Reference: Toal Engineering
Sections, Profiles & Details
Lot 8, Tract 16133
Job 12407
Sheet 3 of 4



HORIZONTAL = VERTICAL
Approximate Scale: 1" = 20'
0 20' 40'

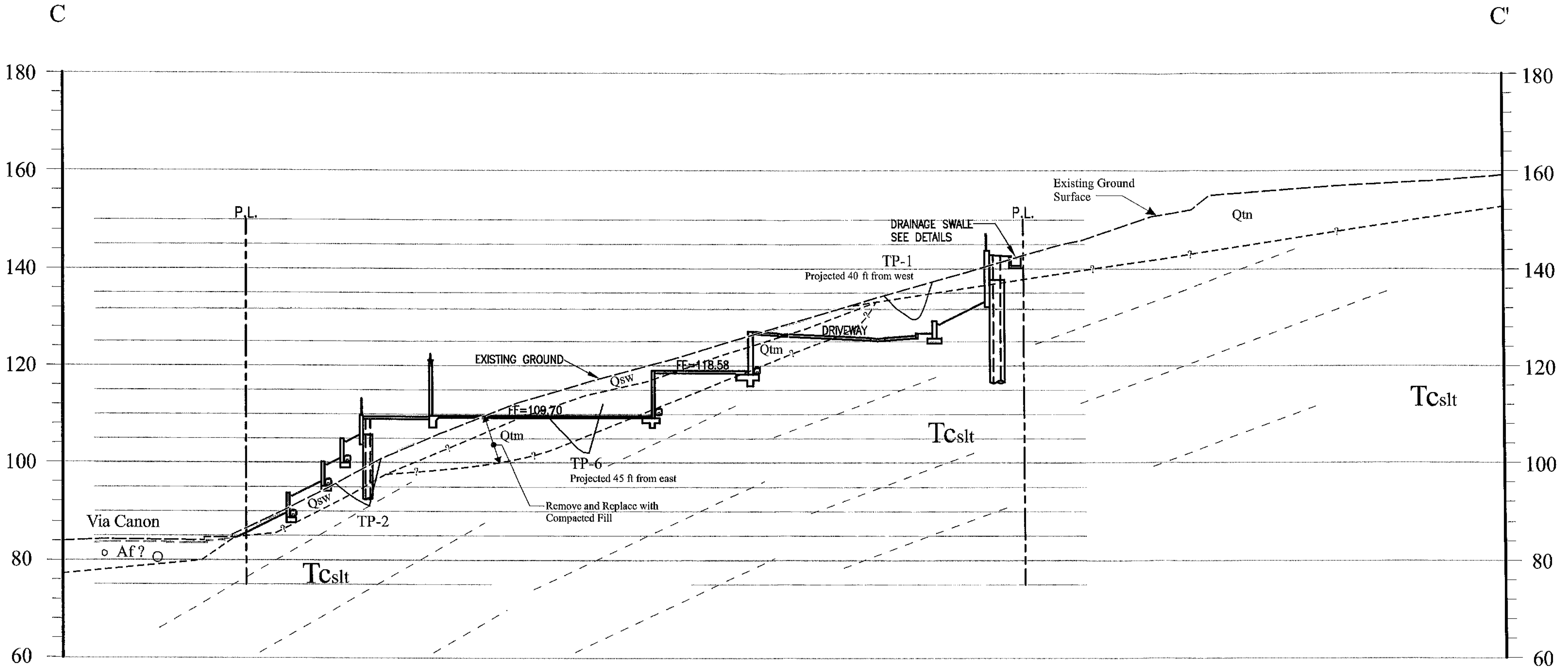
## Revised Figure 3B
## Geologic Section B-B'

South of Via Canon and Camino Capistrano
Dana Point, California

**Earth Systems**
**Southwest**

| | |
|---|---|
| 05/23/08 | 10123-02 |

Reference: Toal Engineering
Sections, Profiles & Details
Lot 8, Tract 16133
Job 12407
Sheet 3 of 4



HORIZONTAL = VERTICAL
Approximate Scale: 1" = 20'
0 20' 40'

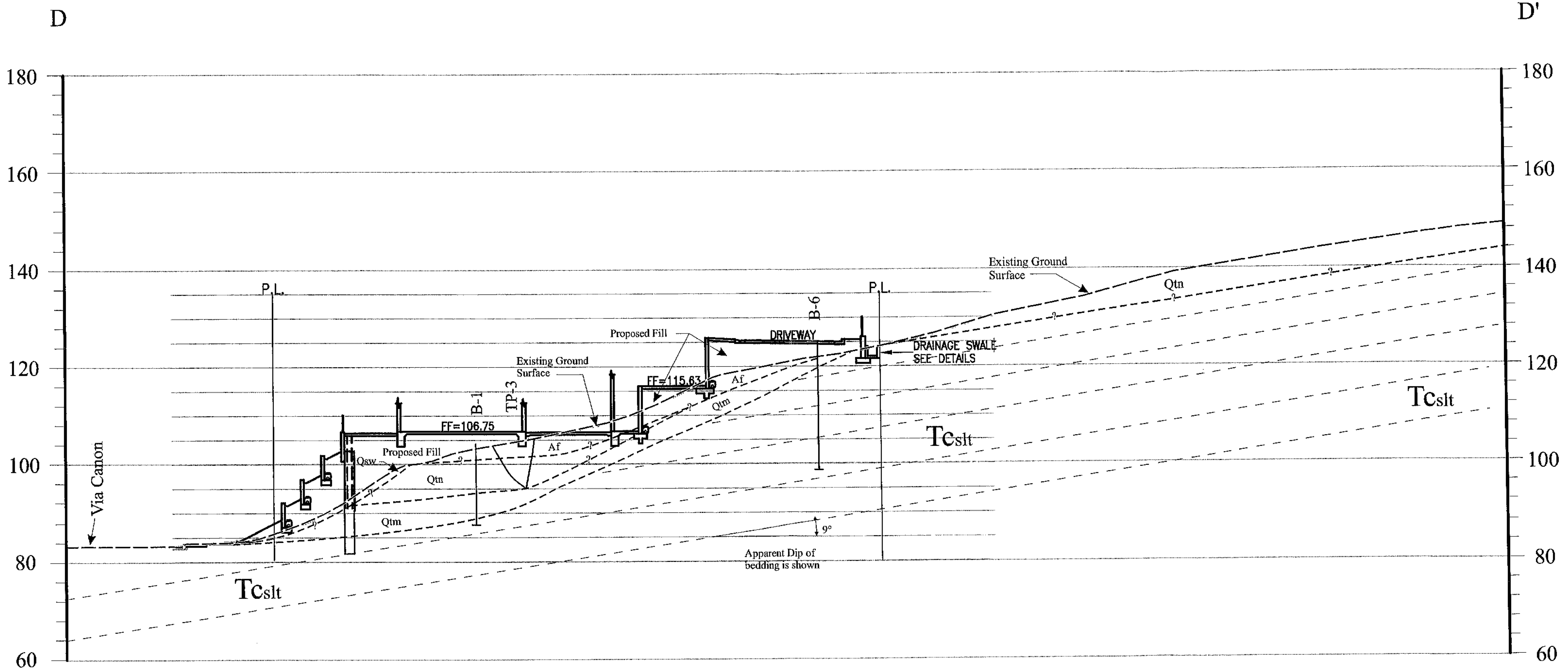
Revised Figure 3C
Geologic Section C-C'

South of Via Canon and Camino Capistrano
Dana Point, California

**Earth Systems**
**Southwest**

05/23/08 10123-02

eference: Toal Engineering
Sections, Profiles & Details
Lot 8, Tract 16133
Job 12407
Sheet 3 of 4



HORIZONTAL = VERTICAL
Approximate Scale: 1" = 20'

0 20' 40'

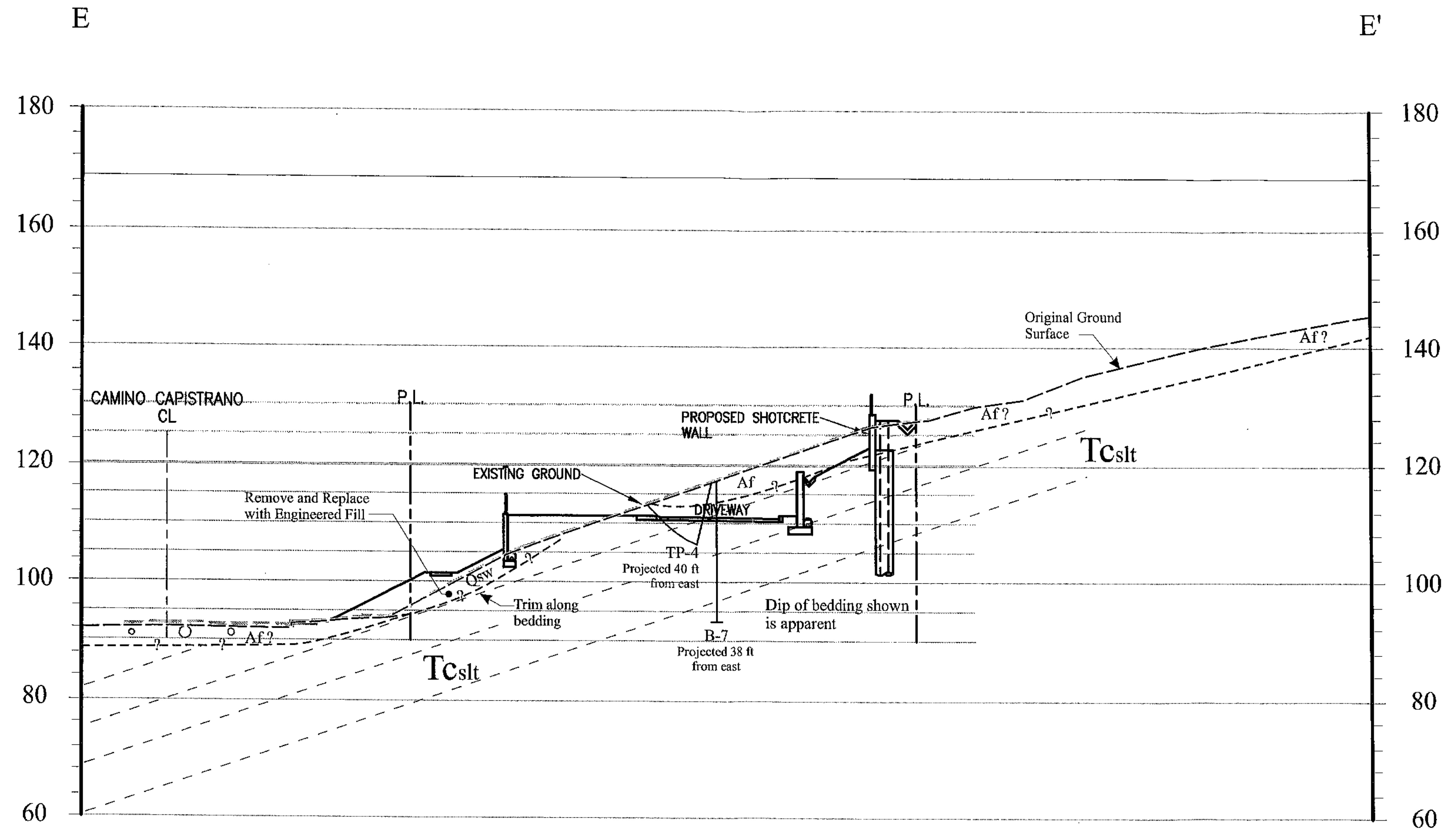
Revised Figure 3D
Geologic Section D-D'

South of Via Canon and Camino Capistrano
Dana Point, California

**Earth Systems**
**Southwest**

| | |
|---|---|
| 05/23/08 | 10123-02 |

Reference: Toal Engineering
Sections, Profiles & Details
Lot 8, Tract 16133
Job 12407
Sheet 3 of 4



HORIZONTAL = VERTICAL
Approximate Scale: 1" = 20'

0 20' 40'

Revised Figure 3E
Geologic Section E-E'

South of Via Canon and Camino Capistrano
Dana Point, California

**Earth Systems**
**Southwest**

05/23/08 10123-02

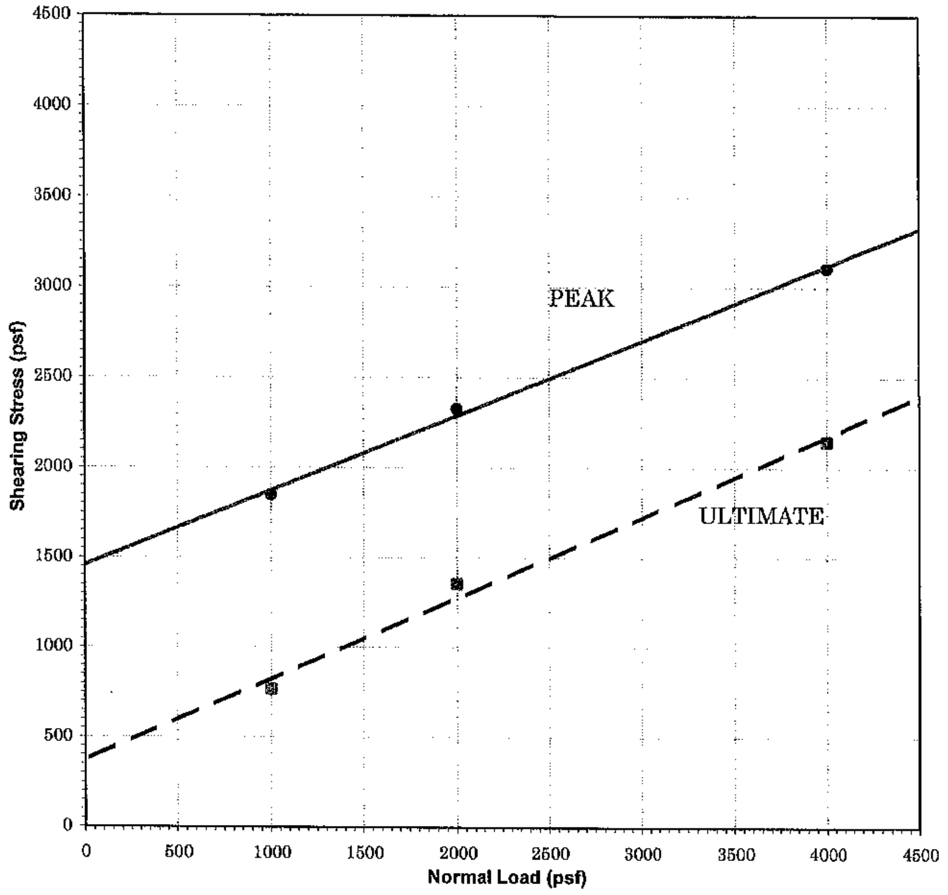
## UNIT DENSITIES AND MOISTURE CONTENT

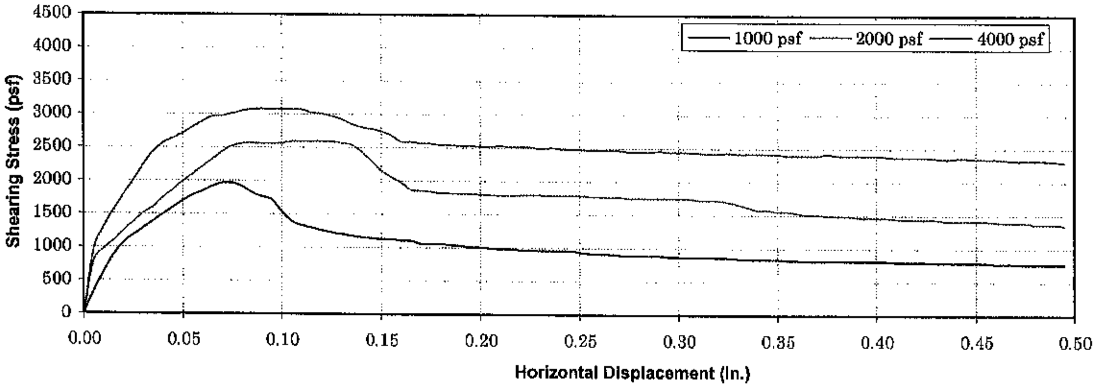
ASTM D2937 & D2216

Job Name: South of Via Canon & Camino Capistrano

| Sample Location | Depth (feet) | Unit Dry Density (pcf) | Moisture Content (%) | USCS Group Symbol |
|---|---|---|---|---|
| B2 | 20 | 82 | 36 | BR* |
| B4 | 15 | 103 | 16 | ML |
| B6 | 10 | 93 | 27 | BR* |
| B6 | 20 | 86 | 33 | BR* |

BR* - Claystone/Siltstone bedrock





## DIRECT SHEAR DATA*

Sample Location: B2 at 20 feet
Material: Claystone Bedrock
Dry Density (pcf): 81.8

| | | |
|---|---|---|
| | Initial | Final |
| Moisture Content (%): | 36.3 | 40.7 |
| Saturation (%): | 93 | 100 |
| | Peak | Ultimate |
| φ Angle of Friction (degrees): | 23 | 24 |
| c Cohesive Strength (psf): | 1450 | 370 |

Test Type: Peak and Ulltimate
Shear Rate (in/min): 0.01

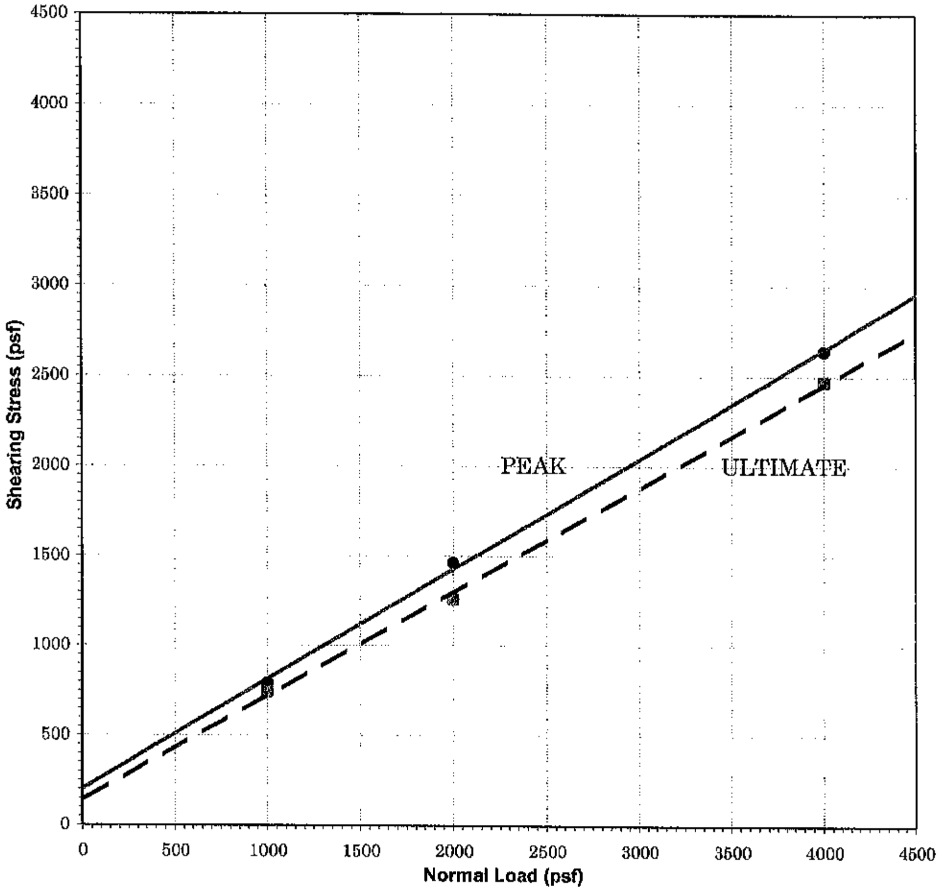
* Test Method: ASTM D-3080

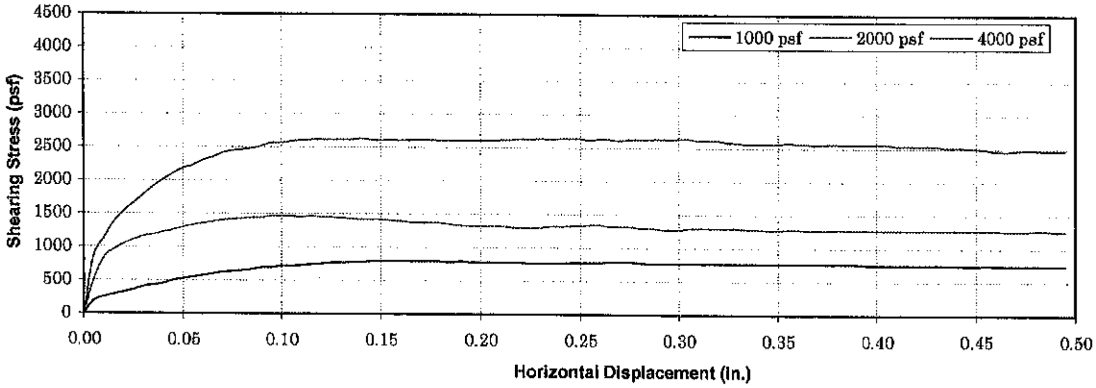
## DIRECT SHEAR TEST

**South of Via Canon & Camino Capistrano**

**Earth Systems**
**Southwest**

5/23/2008 | 10123-02





## DIRECT SHEAR DATA*

Sample Location: B4 at 15 feet

Material: Sandy Silt (ML)

Dry Density (pcf): 103.1

| | Initial | Final |
|---|---|---|
| Moisture Content (%): | 16.3 | 22.0 |
| Saturation (%): | 71 | 100 |
| | Peak | Ultimate |
| ϕ Angle of Friction (degrees): | 31 | 30 |
| c Cohesive Strength (psf): | 200 | 130 |

Test Type: Peak and Ulitimate

Shear Rate (in/min): 0.01

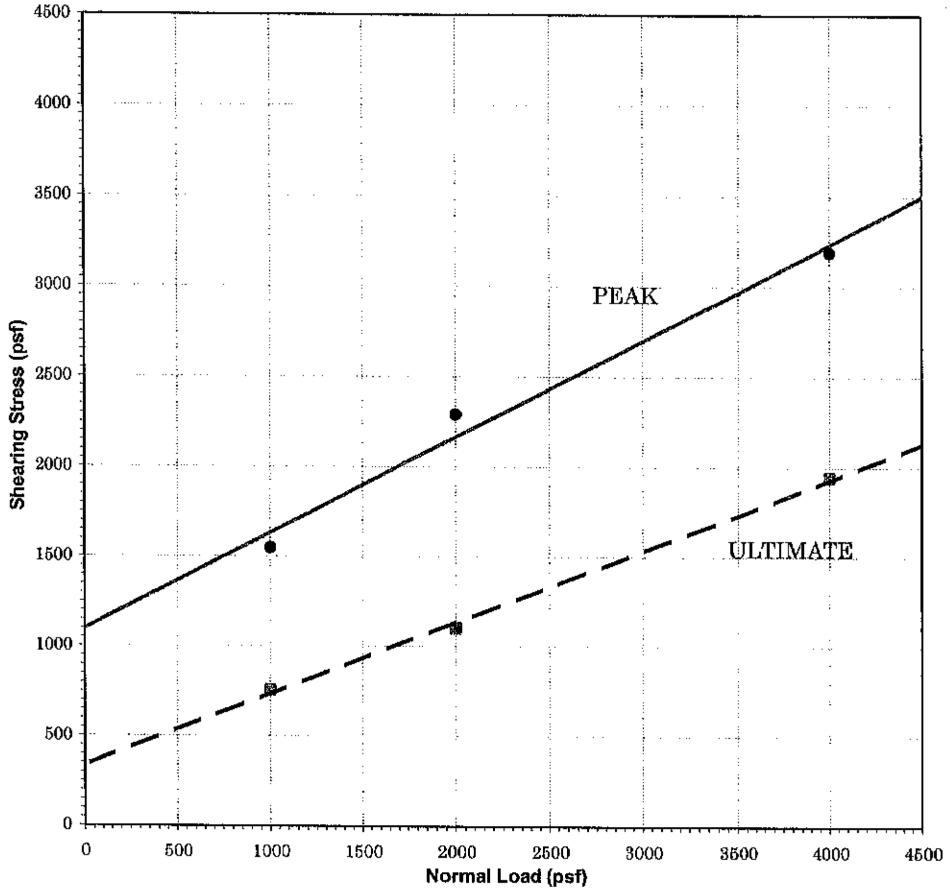
* Test Method: ASTM D-3080

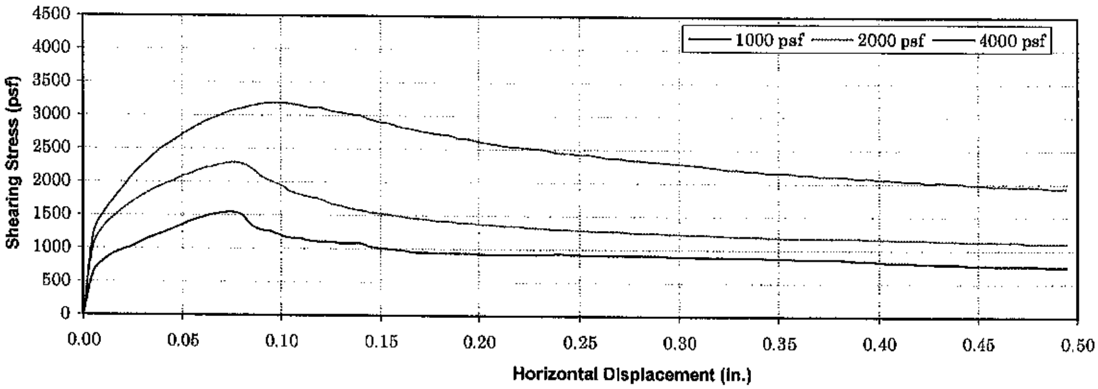
## DIRECT SHEAR TEST

**South of Via Canon & Camino Capistrano**

**Earth Systems**
**Southwest**

| 5/23/2008 | 10123-02 |
|---|---|





## DIRECT SHEAR DATA*

Sample Location: B6 at 10 feet
Material: Claystone/Siltstone Bedrock
Dry Density (pcf): 93.2

| | | |
|---|---|---|
| | Initial | Final |
| Moisture Content (%): | 26.6 | 31.5 |
| Saturation (%): | 90 | 100 |
| | Peak | Ultimate |
| ϕ Angle of Friction (degrees): | 28 | 22 |
| c Cohesive Strength (psf): | 1090 | 330 |

Test Type: Peak and Ulitimate
Shear Rate (in/min): 0.01

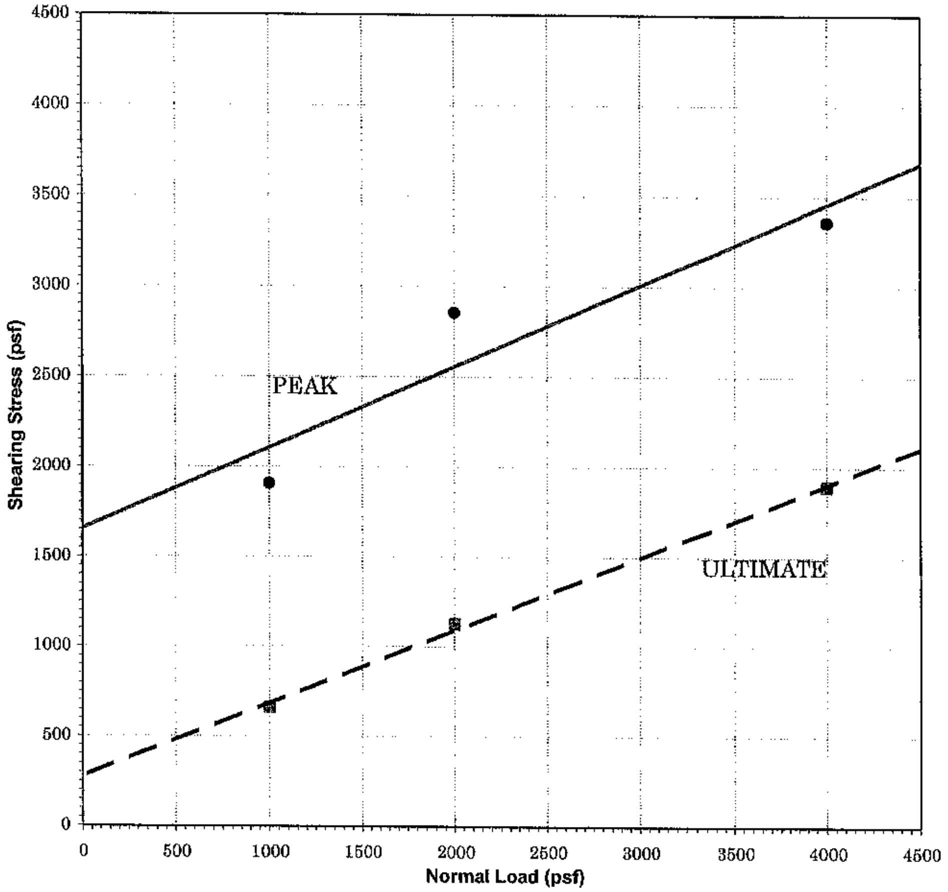
* Test Method: ASTM D-3080

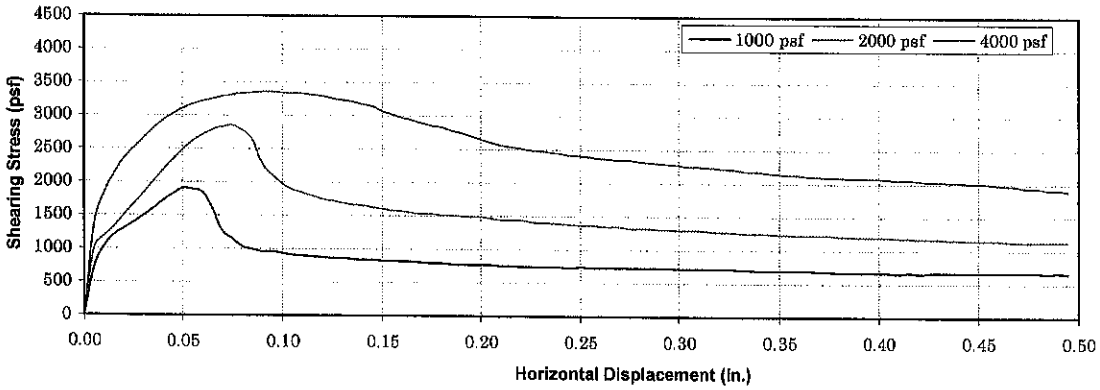
## DIRECT SHEAR TEST

**South of Via Canon & Camino Capistrano**

**Earth Systems**
**Southwest**

| | |
|---|---|
| 5/23/2008 | 10123-02 |





## DIRECT SHEAR DATA*

Sample Location: B6 at 20 feet
Material: Claystone/Siltstone Bedrock
Dry Density (pcf): 85.8

| | Initial | Final |
|---|---|---|
| Moisture Content (%): | 33.2 | 37.4 |
| Saturation (%): | 94 | 100 |
| | Peak | Ultimate |
| ϕ Angle of Friction (degrees): | 24 | 22 |
| c Cohesive Strength (psf): | 1650 | 270 |

Test Type: Peak and Ulitimate
Shear Rate (in/min): 0.01

* Test Method: ASTM D-3080

## DIRECT SHEAR TEST

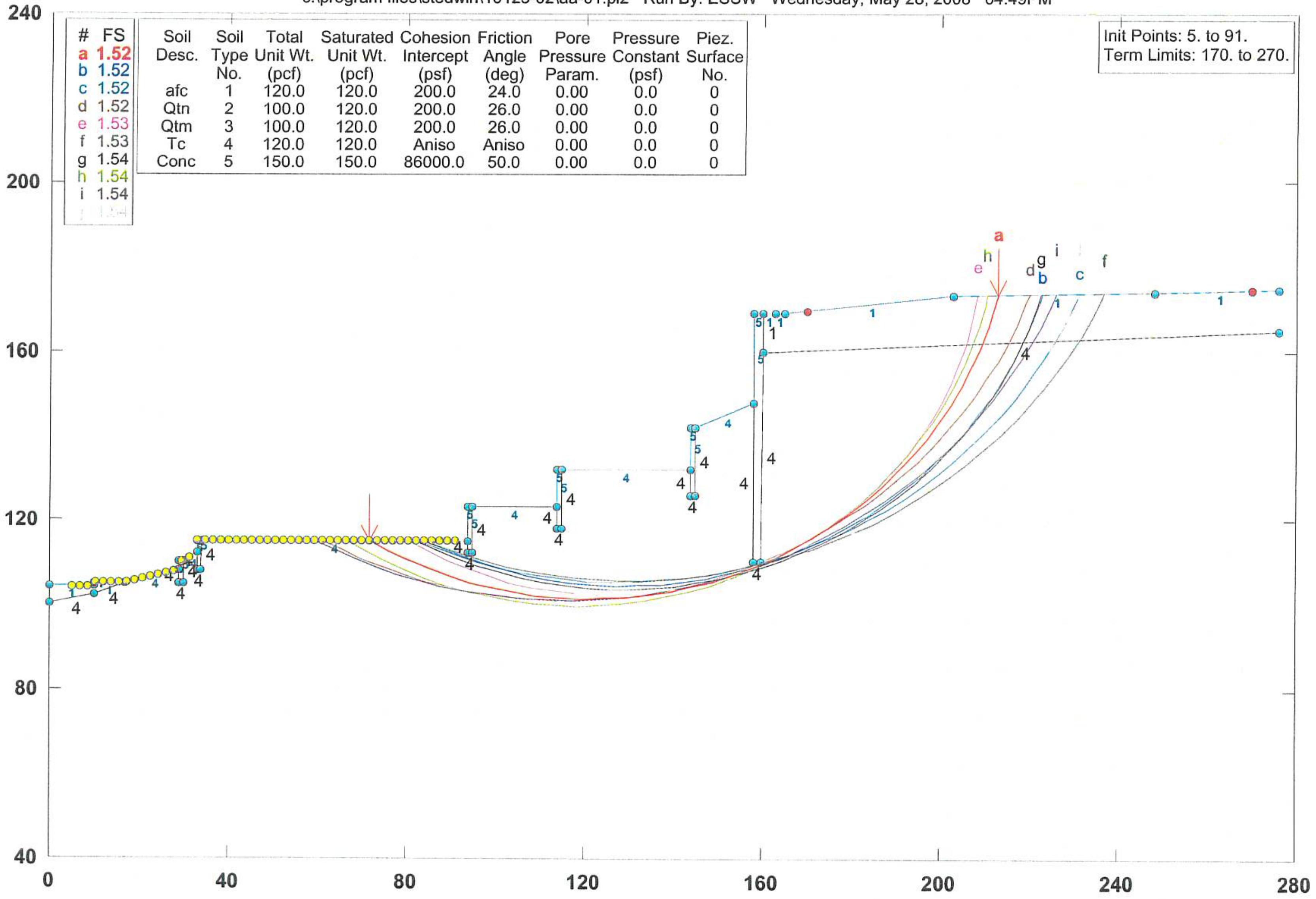
**South of Via Canon & Camino Capistrano**

**Earth Systems**
**Southwest**

5/23/2008 | 10123-02

# 10123-02; Via Canon, Proposed Section AA'; Static

c:\program files\stedwin\10123-02\aa-01.pl2 Run By: ESSW Wednesday, May 28, 2008 04:49PM



| # | FS |
|---|---|
| a | 1.52 |
| b | 1.52 |
| c | 1.52 |
| d | 1.52 |
| e | 1.53 |
| f | 1.53 |
| g | 1.54 |
| h | 1.54 |
| i | 1.54 |
| j | 1.54 |

| Soil Desc. | Soil Type No. | Total Unit Wt. (pcf) | Saturated Unit Wt. (pcf) | Cohesion Intercept (psf) | Friction Angle (deg) | Pore Pressure Param. | Pressure Constant (psf) | Piez. Surface No. |
|---|---|---|---|---|---|---|---|---|
| afc | 1 | 120.0 | 120.0 | 200.0 | 24.0 | 0.00 | 0.0 | 0 |
| Qtn | 2 | 100.0 | 120.0 | 200.0 | 26.0 | 0.00 | 0.0 | 0 |
| Qtm | 3 | 100.0 | 120.0 | 200.0 | 26.0 | 0.00 | 0.0 | 0 |
| Tc | 4 | 120.0 | 120.0 | Aniso | Aniso | 0.00 | 0.0 | 0 |
| Conc | 5 | 150.0 | 150.0 | 86000.0 | 50.0 | 0.00 | 0.0 | 0 |

Init Points: 5. to 91.
Term Limits: 170. to 270.

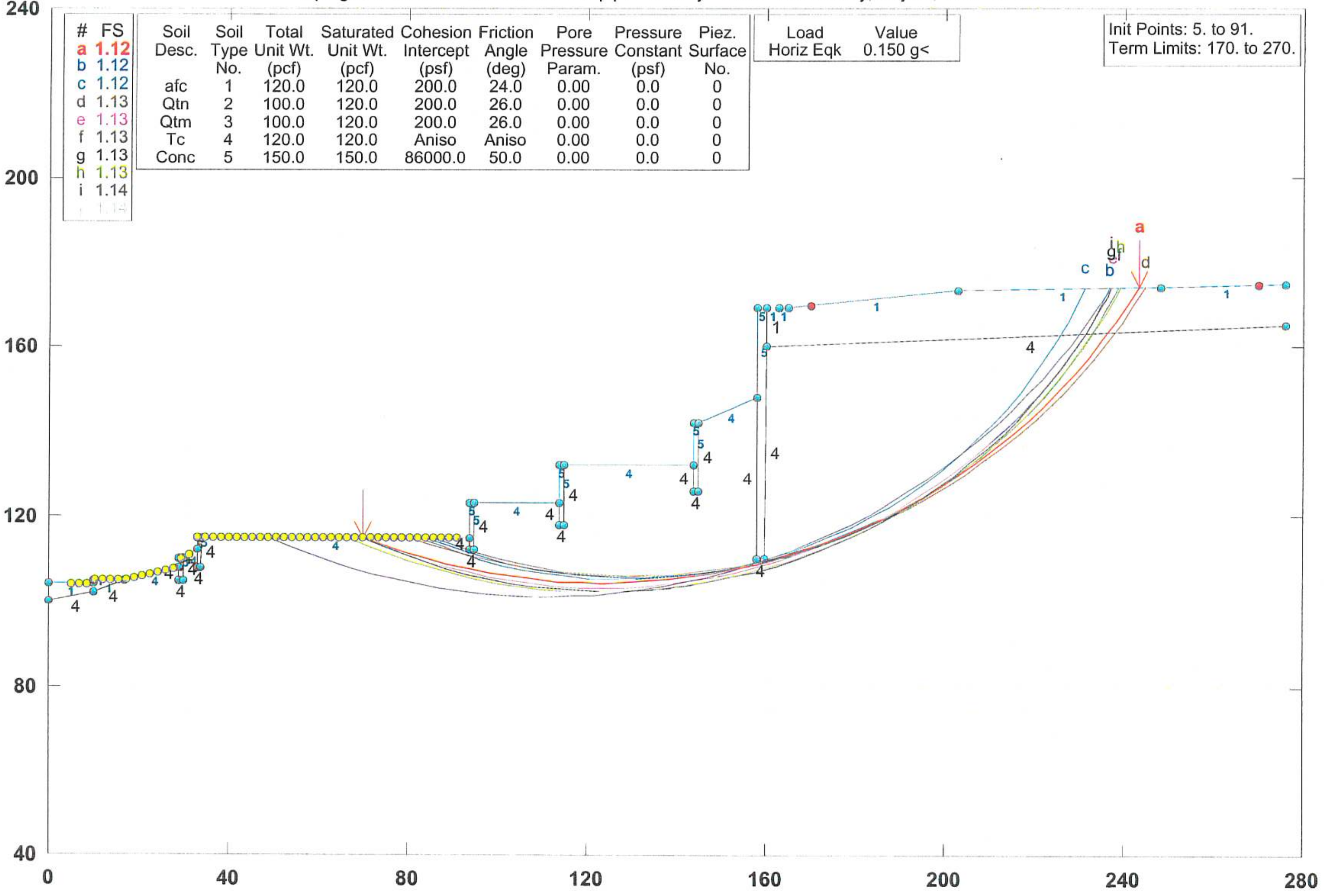
STABL6H FSmin=1.52

Safety Factors Are Calculated By The Modified Bishop Method

**Earth Systems**
**Southwest**

# 10123-02; Via Canon, Proposed Section AA'; Pseudostatic

c:\program files\stedwin\10123-02\aa-01p.pl2  Run By: ESSW  Wednesday, May 28, 2008  04:50PM



| # | FS |
|---|---|
| a | 1.12 |
| b | 1.12 |
| c | 1.12 |
| d | 1.13 |
| e | 1.13 |
| f | 1.13 |
| g | 1.13 |
| h | 1.13 |
| i | 1.14 |
| j | 1.14 |

| Soil Desc. | Soil Type No. | Total Unit Wt. (pcf) | Saturated Unit Wt. (pcf) | Cohesion Intercept (psf) | Friction Angle (deg) | Pore Pressure Param. | Pressure Constant (psf) | Piez. Surface No. |
|---|---|---|---|---|---|---|---|---|
| afc | 1 | 120.0 | 120.0 | 200.0 | 24.0 | 0.00 | 0.0 | 0 |
| Qtn | 2 | 100.0 | 120.0 | 200.0 | 26.0 | 0.00 | 0.0 | 0 |
| Qtm | 3 | 100.0 | 120.0 | 200.0 | 26.0 | 0.00 | 0.0 | 0 |
| Tc | 4 | 120.0 | 120.0 | Aniso | Aniso | 0.00 | 0.0 | 0 |
| Conc | 5 | 150.0 | 150.0 | 86000.0 | 50.0 | 0.00 | 0.0 | 0 |

| Load | Value |
|---|---|
| Horiz Eqk | 0.150 g< |

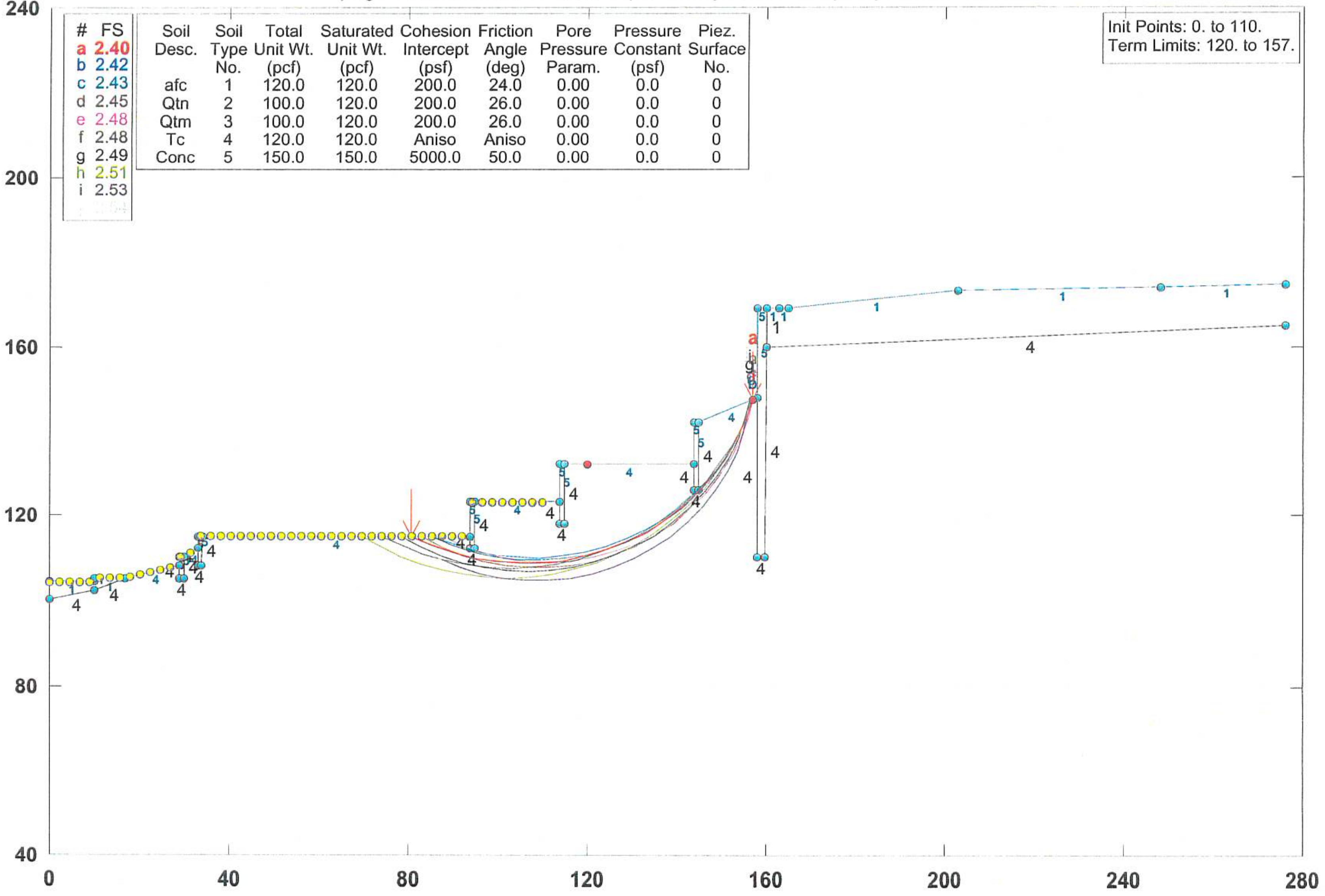
Init Points: 5. to 91.
Term Limits: 170. to 270.

STABL6H FSmin=1.12
Safety Factors Are Calculated By The Modified Bishop Method

**Earth Systems**
**Southwest**

## 10123-02; Via Canon, Proposed Section AA'; Static

c:\program files\stedwin\10123-02\aa-03.pl2 Run By: ESSW Friday, May 09, 2008 11:10AM



| # | FS |
|---|---|
| a | 2.40 |
| b | 2.42 |
| c | 2.43 |
| d | 2.45 |
| e | 2.48 |
| f | 2.48 |
| g | 2.49 |
| h | 2.51 |
| i | 2.53 |

| Soil Desc. | Soil Type No. | Total Unit Wt. (pcf) | Saturated Unit Wt. (pcf) | Cohesion Intercept (psf) | Friction Angle (deg) | Pore Pressure Param. | Pressure Constant (psf) | Piez. Surface No. |
|---|---|---|---|---|---|---|---|---|
| afc | 1 | 120.0 | 120.0 | 200.0 | 24.0 | 0.00 | 0.0 | 0 |
| Qtn | 2 | 100.0 | 120.0 | 200.0 | 26.0 | 0.00 | 0.0 | 0 |
| Qtm | 3 | 100.0 | 120.0 | 200.0 | 26.0 | 0.00 | 0.0 | 0 |
| Tc | 4 | 120.0 | 120.0 | Aniso | Aniso | 0.00 | 0.0 | 0 |
| Conc | 5 | 150.0 | 150.0 | 5000.0 | 50.0 | 0.00 | 0.0 | 0 |

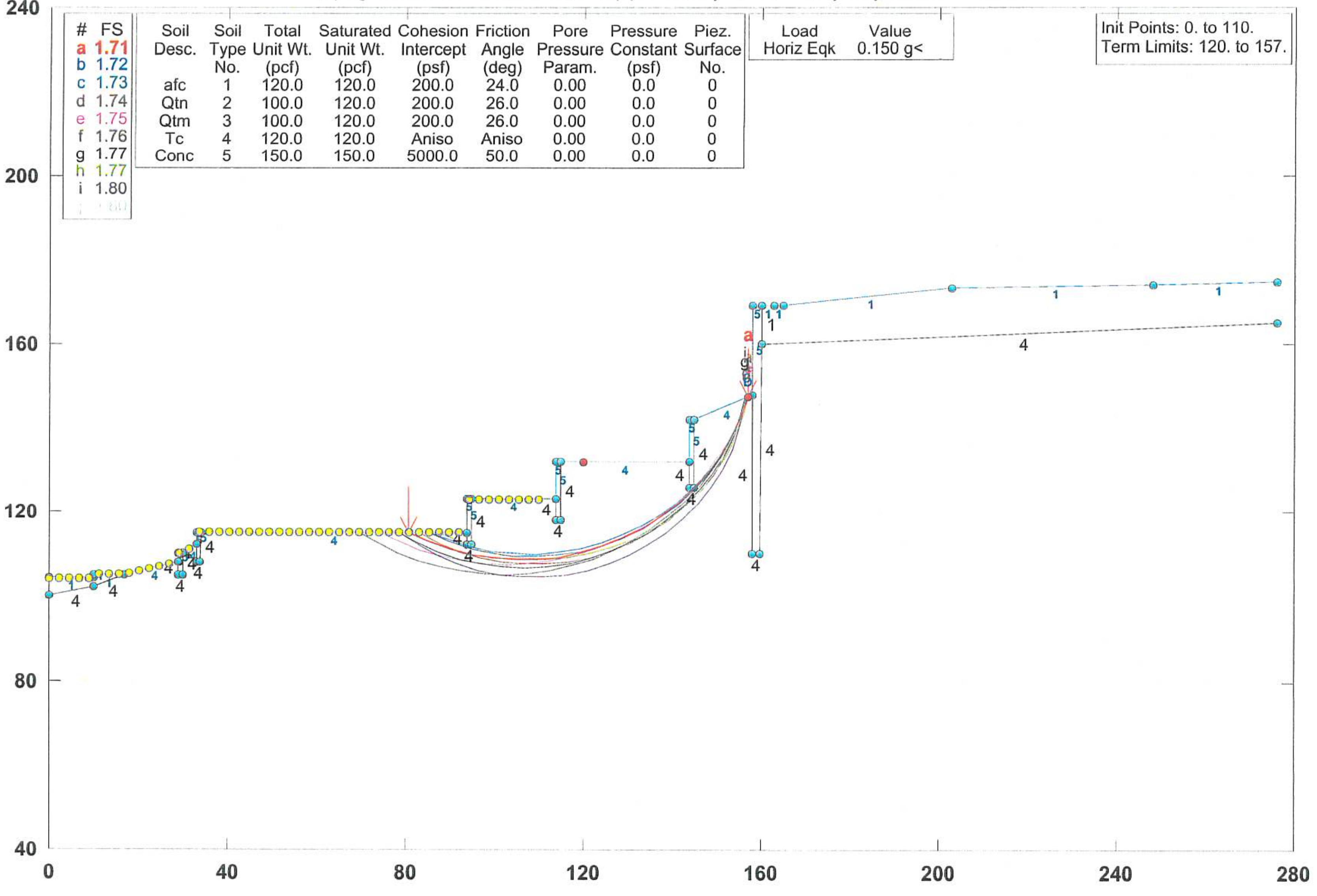
Init Points: 0. to 110.
Term Limits: 120. to 157.

STABL6H FSmin=2.40
Safety Factors Are Calculated By The Modified Bishop Method

**Earth Systems**
**Southwest**

# 10123-02; Via Canon, Proposed Section AA'; Pseudostatic

c:\program files\stedwin\10123-02\aa-03p.pl2  Run By: ESSW  Friday, May 09, 2008  11:09AM



| # | FS |
|---|---|
| a | 1.71 |
| b | 1.72 |
| c | 1.73 |
| d | 1.74 |
| e | 1.75 |
| f | 1.76 |
| g | 1.77 |
| h | 1.77 |
| i | 1.80 |
| j | 1.80 |

| Soil Desc. | Soil Type No. | Total Unit Wt. (pcf) | Saturated Unit Wt. (pcf) | Cohesion Intercept (psf) | Friction Angle (deg) | Pore Pressure Param. | Pressure Constant (psf) | Piez. Surface No. |
|---|---|---|---|---|---|---|---|---|
| afc | 1 | 120.0 | 120.0 | 200.0 | 24.0 | 0.00 | 0.0 | 0 |
| Qtn | 2 | 100.0 | 120.0 | 200.0 | 26.0 | 0.00 | 0.0 | 0 |
| Qtm | 3 | 100.0 | 120.0 | 200.0 | 26.0 | 0.00 | 0.0 | 0 |
| Tc | 4 | 120.0 | 120.0 | Aniso | Aniso | 0.00 | 0.0 | 0 |
| Conc | 5 | 150.0 | 150.0 | 5000.0 | 50.0 | 0.00 | 0.0 | 0 |

| Load | Value |
|---|---|
| Horiz Eqk | 0.150 g< |

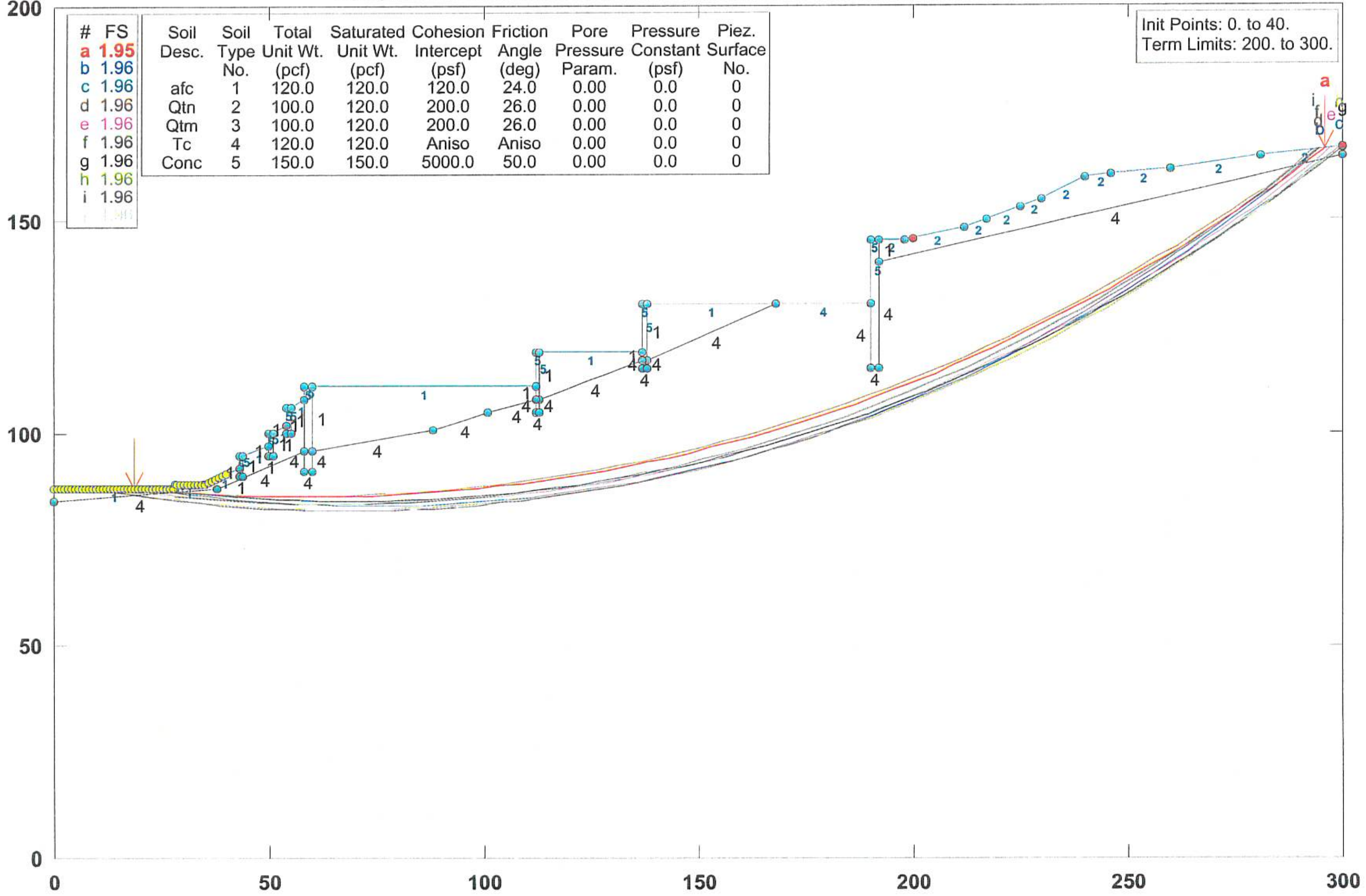
Init Points: 0. to 110.
Term Limits: 120. to 157.

STABL6H  FSmin=1.71
Safety Factors Are Calculated By The Modified Bishop Method

**Earth Systems**
Southwest

## 10123-02; Via Canon, Proposed Section BB; Static

c:\program files\stedwin\10123-02\bb-01.pl2 Run By: ESSW Friday, May 09, 2008 09:52AM



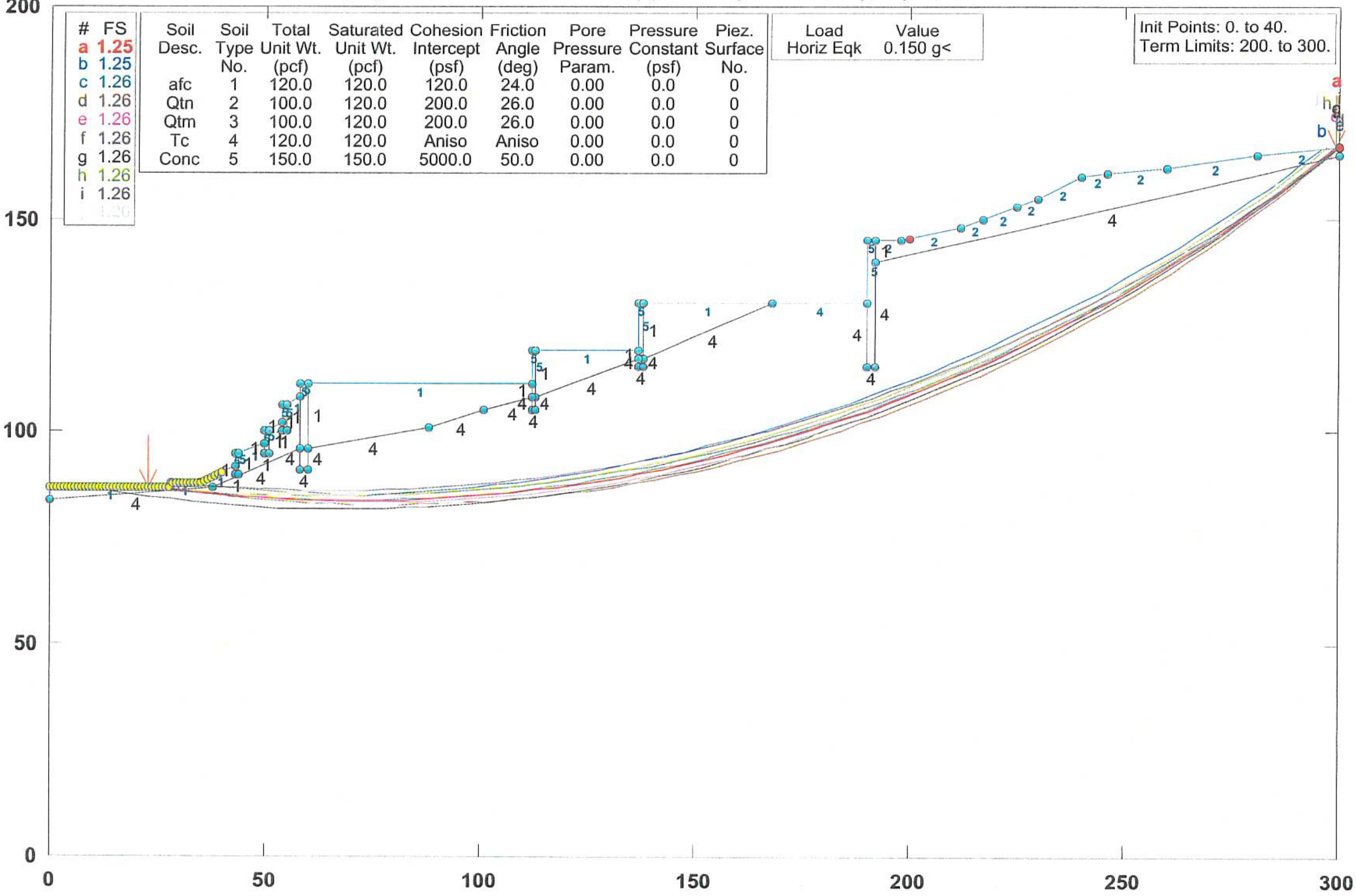
| Soil Desc. | Soil Type No. | Total Unit Wt. (pcf) | Saturated Unit Wt. (pcf) | Cohesion Intercept (psf) | Friction Angle (deg) | Pore Pressure Param. | Pressure Constant (psf) | Piez. Surface No. |
|---|---|---|---|---|---|---|---|---|
| afc | 1 | 120.0 | 120.0 | 120.0 | 24.0 | 0.00 | 0.0 | 0 |
| Qtn | 2 | 100.0 | 120.0 | 200.0 | 26.0 | 0.00 | 0.0 | 0 |
| Qtm | 3 | 100.0 | 120.0 | 200.0 | 26.0 | 0.00 | 0.0 | 0 |
| Tc | 4 | 120.0 | 120.0 | Aniso | Aniso | 0.00 | 0.0 | 0 |
| Conc | 5 | 150.0 | 150.0 | 5000.0 | 50.0 | 0.00 | 0.0 | 0 |

STABL6H FSmin=1.95
Safety Factors Are Calculated By The Modified Bishop Method

**Earth Systems**
**Southwest**

# 10123-02; Via Canon, Proposed Section BB; Pseudostatic

c:\program files\stedwin\10123-02\bb-01p.pl2 Run By: ESSW Friday, May 09, 2008 09:53AM



| # | FS |
|---|---|
| a | 1.25 |
| b | 1.25 |
| c | 1.26 |
| d | 1.26 |
| e | 1.26 |
| f | 1.26 |
| g | 1.26 |
| h | 1.26 |
| i | 1.26 |
| | 1.26 |

| Soil Desc. | Soil Type No. | Total Unit Wt. (pcf) | Saturated Unit Wt. (pcf) | Cohesion Intercept (psf) | Friction Angle (deg) | Pore Pressure Param. | Pressure Constant (psf) | Piez. Surface No. |
|---|---|---|---|---|---|---|---|---|
| afc | 1 | 120.0 | 120.0 | 120.0 | 24.0 | 0.00 | 0.0 | 0 |
| Qtn | 2 | 100.0 | 120.0 | 200.0 | 26.0 | 0.00 | 0.0 | 0 |
| Qtm | 3 | 100.0 | 120.0 | 200.0 | 26.0 | 0.00 | 0.0 | 0 |
| Tc | 4 | 120.0 | 120.0 | Aniso | Aniso | 0.00 | 0.0 | 0 |
| Conc | 5 | 150.0 | 150.0 | 5000.0 | 50.0 | 0.00 | 0.0 | 0 |

| Load | Value |
|---|---|
| Horiz Eqk | 0.150 g< |

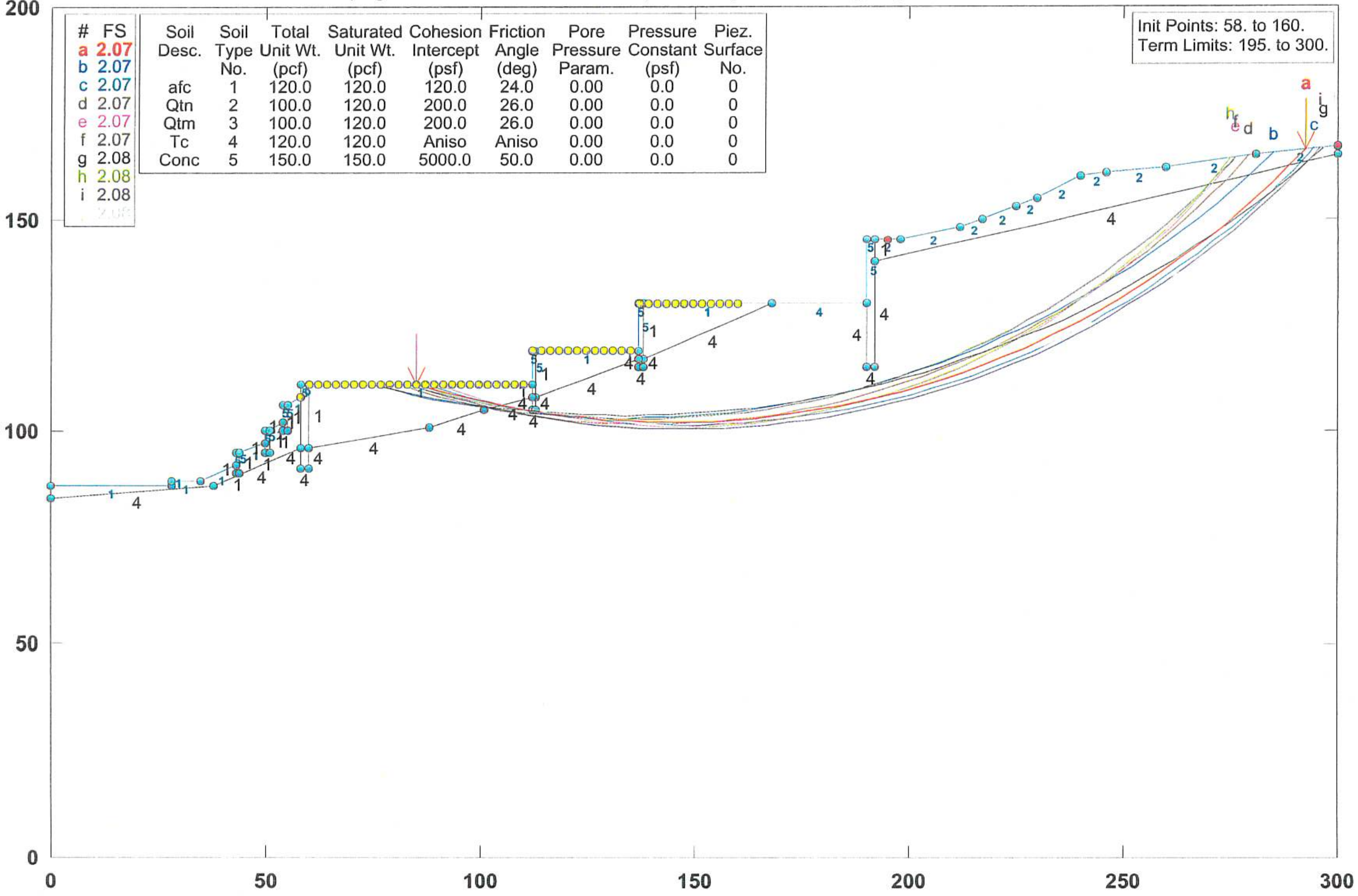
Init Points: 0. to 40.
Term Limits: 200. to 300.

STABL6H FSmin=1.25
Safety Factors Are Calculated By The Modified Bishop Method

**Earth Systems**
**Southwest**

# 10123-02; Via Canon, Proposed Section BB; Static

c:\program files\stedwin\10123-02\bb-02.pl2 Run By: ESSW Friday, May 09, 2008 09:50AM



| # | FS |
|---|---|
| a | 2.07 |
| b | 2.07 |
| c | 2.07 |
| d | 2.07 |
| e | 2.07 |
| f | 2.07 |
| g | 2.08 |
| h | 2.08 |
| i | 2.08 |
|  | 2.08 |

| Soil Desc. | Soil Type No. | Total Unit Wt. (pcf) | Saturated Unit Wt. (pcf) | Cohesion Intercept (psf) | Friction Angle (deg) | Pore Pressure Param. | Pressure Constant (psf) | Piez. Surface No. |
|---|---|---|---|---|---|---|---|---|
| afc | 1 | 120.0 | 120.0 | 120.0 | 24.0 | 0.00 | 0.0 | 0 |
| Qtn | 2 | 100.0 | 120.0 | 200.0 | 26.0 | 0.00 | 0.0 | 0 |
| Qtm | 3 | 100.0 | 120.0 | 200.0 | 26.0 | 0.00 | 0.0 | 0 |
| Tc | 4 | 120.0 | 120.0 | Aniso | Aniso | 0.00 | 0.0 | 0 |
| Conc | 5 | 150.0 | 150.0 | 5000.0 | 50.0 | 0.00 | 0.0 | 0 |

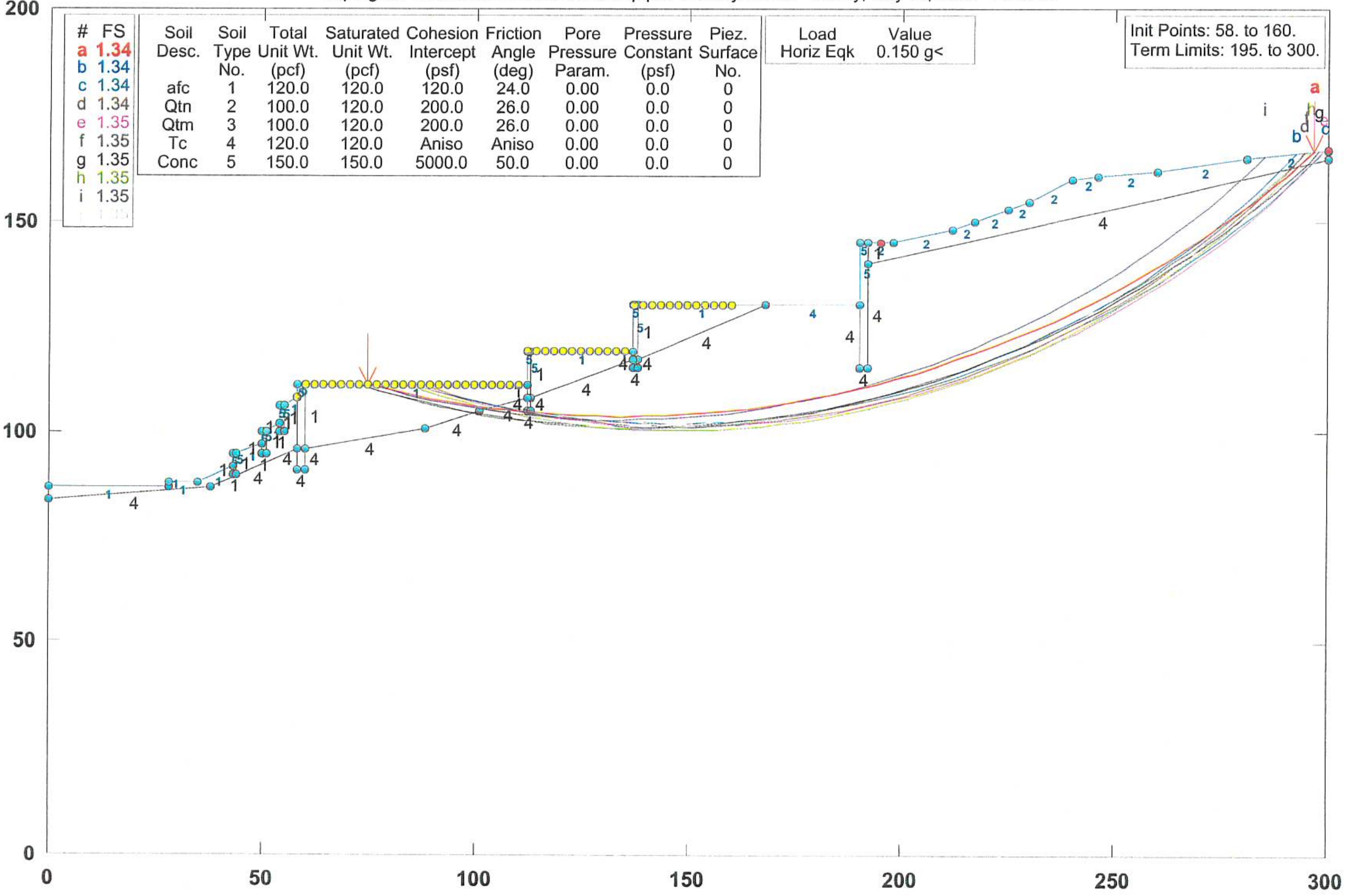
Init Points: 58. to 160.
Term Limits: 195. to 300.

STABL6H FSmin=2.07
Safety Factors Are Calculated By The Modified Bishop Method

**Earth Systems**
**Southwest**

# 10123-02; Via Canon, Proposed Section BB; Pseudostatic

c:\program files\stedwin\10123-02\bb-02p.pl2 Run By: ESSW Friday, May 09, 2008 11:12AM



| # | FS |
|---|---|
| a | 1.34 |
| b | 1.34 |
| c | 1.34 |
| d | 1.34 |
| e | 1.35 |
| f | 1.35 |
| g | 1.35 |
| h | 1.35 |
| i | 1.35 |

| Soil Desc. | Soil Type No. | Total Unit Wt. (pcf) | Saturated Unit Wt. (pcf) | Cohesion Intercept (psf) | Friction Angle (deg) | Pore Pressure Param. | Pressure Constant (psf) | Piez. Surface No. |
|---|---|---|---|---|---|---|---|---|
| afc | 1 | 120.0 | 120.0 | 120.0 | 24.0 | 0.00 | 0.0 | 0 |
| Qtn | 2 | 100.0 | 120.0 | 200.0 | 26.0 | 0.00 | 0.0 | 0 |
| Qtm | 3 | 100.0 | 120.0 | 200.0 | 26.0 | 0.00 | 0.0 | 0 |
| Tc | 4 | 120.0 | 120.0 | Aniso | Aniso | 0.00 | 0.0 | 0 |
| Conc | 5 | 150.0 | 150.0 | 5000.0 | 50.0 | 0.00 | 0.0 | 0 |

| Load | Value |
|---|---|
| Horiz Eqk | 0.150 g< |

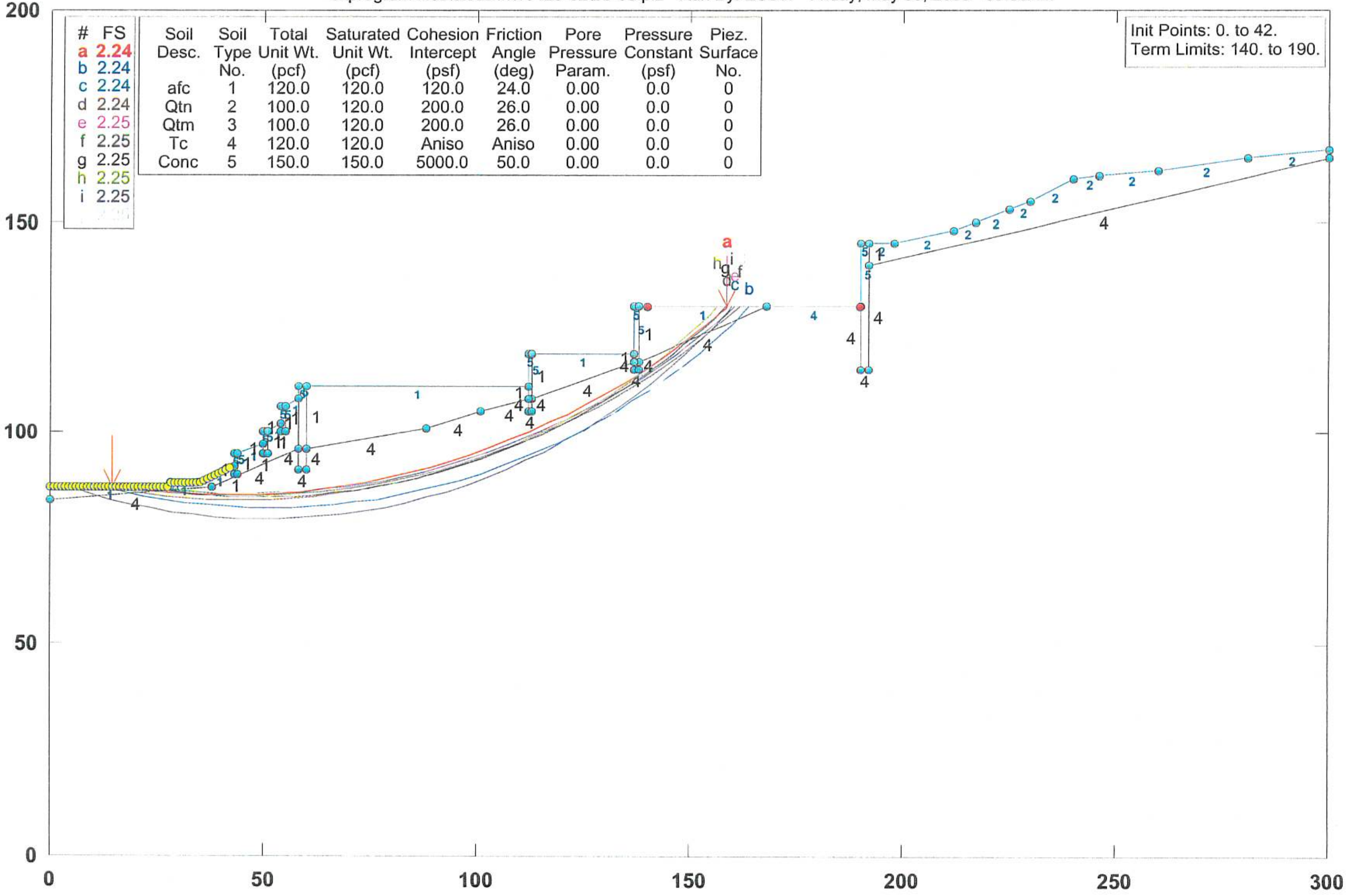
Init Points: 58. to 160.
Term Limits: 195. to 300.

STABL6H FSmin=1.34

Safety Factors Are Calculated By The Modified Bishop Method

## 10123-02; Via Canon, Proposed Section BB; Static

c:\program files\stedwin\10123-02\bb-03.pl2 Run By: ESSW Friday, May 09, 2008 09:56AM



| # | FS |
|---|---|
| a | 2.24 |
| b | 2.24 |
| c | 2.24 |
| d | 2.24 |
| e | 2.25 |
| f | 2.25 |
| g | 2.25 |
| h | 2.25 |
| i | 2.25 |

| Soil Desc. | Soil Type No. | Total Unit Wt. (pcf) | Saturated Unit Wt. (pcf) | Cohesion Intercept (psf) | Friction Angle (deg) | Pore Pressure Param. | Pressure Constant (psf) | Piez. Surface No. |
|---|---|---|---|---|---|---|---|---|
| afc | 1 | 120.0 | 120.0 | 120.0 | 24.0 | 0.00 | 0.0 | 0 |
| Qtn | 2 | 100.0 | 120.0 | 200.0 | 26.0 | 0.00 | 0.0 | 0 |
| Qtm | 3 | 100.0 | 120.0 | 200.0 | 26.0 | 0.00 | 0.0 | 0 |
| Tc | 4 | 120.0 | 120.0 | Aniso | Aniso | 0.00 | 0.0 | 0 |
| Conc | 5 | 150.0 | 150.0 | 5000.0 | 50.0 | 0.00 | 0.0 | 0 |

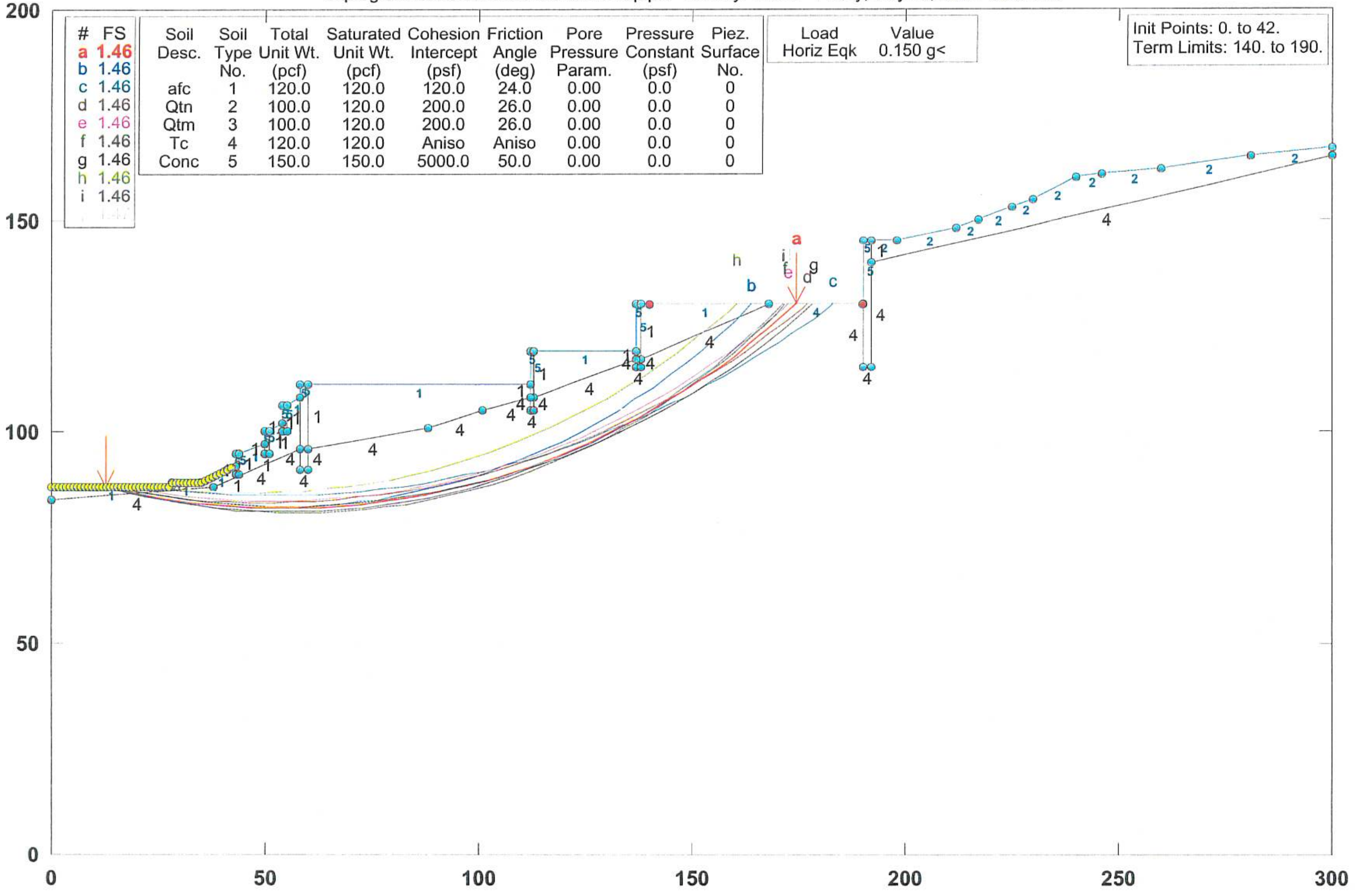
Init Points: 0. to 42.
Term Limits: 140. to 190.

STABL6H FSmin=2.24
Safety Factors Are Calculated By The Modified Bishop Method

**Earth Systems**
**Southwest**

# 10123-02; Via Canon, Proposed Section BB; Pseudostatic

c:\program files\stedwin\10123-02\bb-03p.pl2 Run By: ESSW Friday, May 09, 2008 09:57AM



| # | FS |
|---|---|
| a | 1.46 |
| b | 1.46 |
| c | 1.46 |
| d | 1.46 |
| e | 1.46 |
| f | 1.46 |
| g | 1.46 |
| h | 1.46 |
| i | 1.46 |

| Soil Desc. | Soil Type No. | Total Unit Wt. (pcf) | Saturated Unit Wt. (pcf) | Cohesion Intercept (psf) | Friction Angle (deg) | Pore Pressure Param. | Pressure Constant (psf) | Piez. Surface No. |
|---|---|---|---|---|---|---|---|---|
| afc | 1 | 120.0 | 120.0 | 120.0 | 24.0 | 0.00 | 0.0 | 0 |
| Qtn | 2 | 100.0 | 120.0 | 200.0 | 26.0 | 0.00 | 0.0 | 0 |
| Qtm | 3 | 100.0 | 120.0 | 200.0 | 26.0 | 0.00 | 0.0 | 0 |
| Tc | 4 | 120.0 | 120.0 | Aniso | Aniso | 0.00 | 0.0 | 0 |
| Conc | 5 | 150.0 | 150.0 | 5000.0 | 50.0 | 0.00 | 0.0 | 0 |

| Load | Value |
|---|---|
| Horiz Eqk | 0.150 g< |

Init Points: 0. to 42.
Term Limits: 140. to 190.

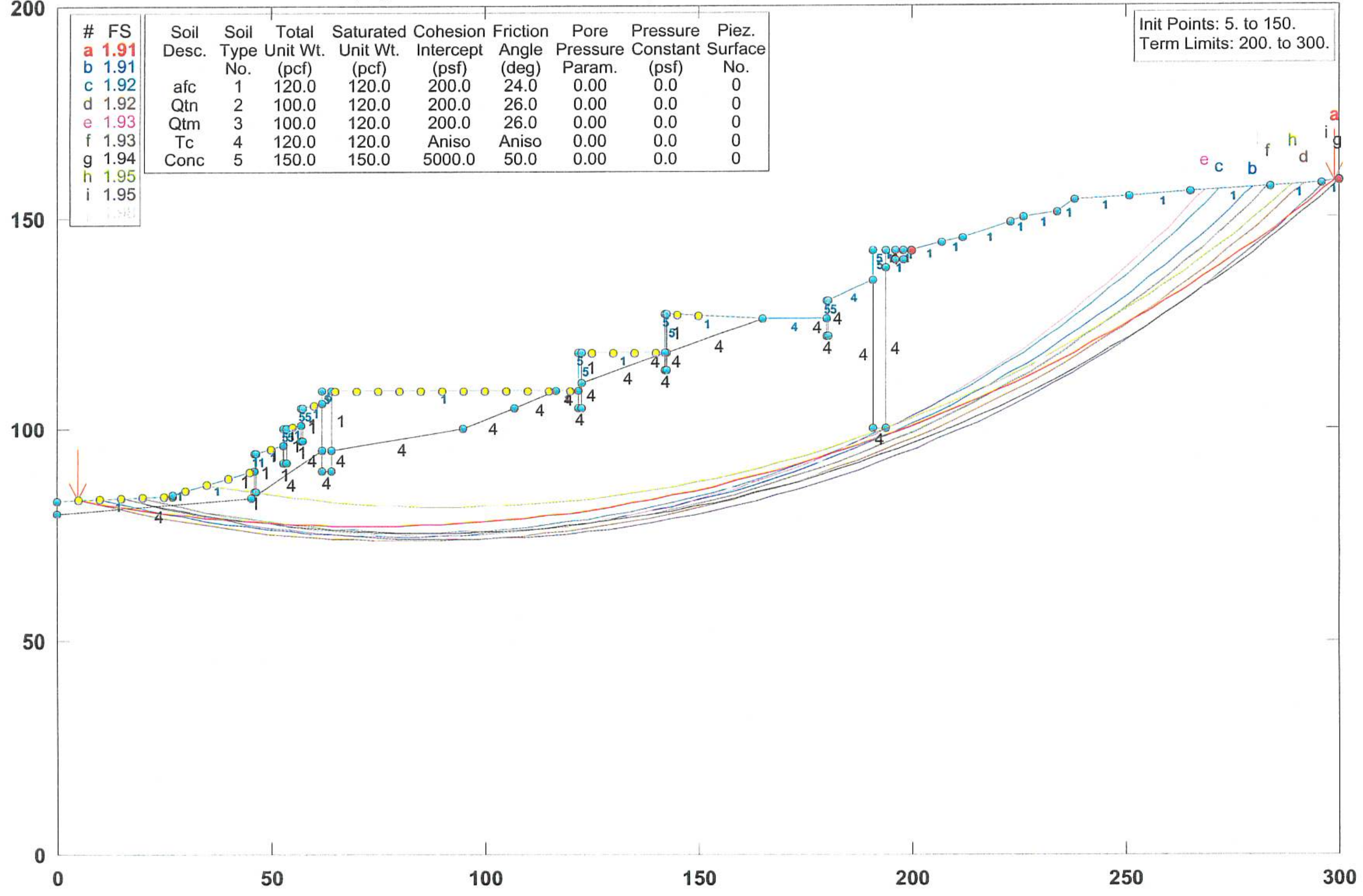
STABL6H FSmin=1.46

Safety Factors Are Calculated By The Modified Bishop Method

**Earth Systems**
**Southwest**

# 10123-02; Via Canon, Proposed Section CC'; Static

c:\program files\stedwin\10123-02\cc-01.pl2 Run By: ESSW Friday, May 09, 2008 10:02AM



| # | FS |
|---|---|
| a | 1.91 |
| b | 1.91 |
| c | 1.92 |
| d | 1.92 |
| e | 1.93 |
| f | 1.93 |
| g | 1.94 |
| h | 1.95 |
| i | 1.95 |

| Soil Desc. | Soil Type No. | Total Unit Wt. (pcf) | Saturated Unit Wt. (pcf) | Cohesion Intercept (psf) | Friction Angle (deg) | Pore Pressure Param. | Pressure Constant (psf) | Piez. Surface No. |
|---|---|---|---|---|---|---|---|---|
| afc | 1 | 120.0 | 120.0 | 200.0 | 24.0 | 0.00 | 0.0 | 0 |
| Qtn | 2 | 100.0 | 120.0 | 200.0 | 26.0 | 0.00 | 0.0 | 0 |
| Qtm | 3 | 100.0 | 120.0 | 200.0 | 26.0 | 0.00 | 0.0 | 0 |
| Tc | 4 | 120.0 | 120.0 | Aniso | Aniso | 0.00 | 0.0 | 0 |
| Conc | 5 | 150.0 | 150.0 | 5000.0 | 50.0 | 0.00 | 0.0 | 0 |

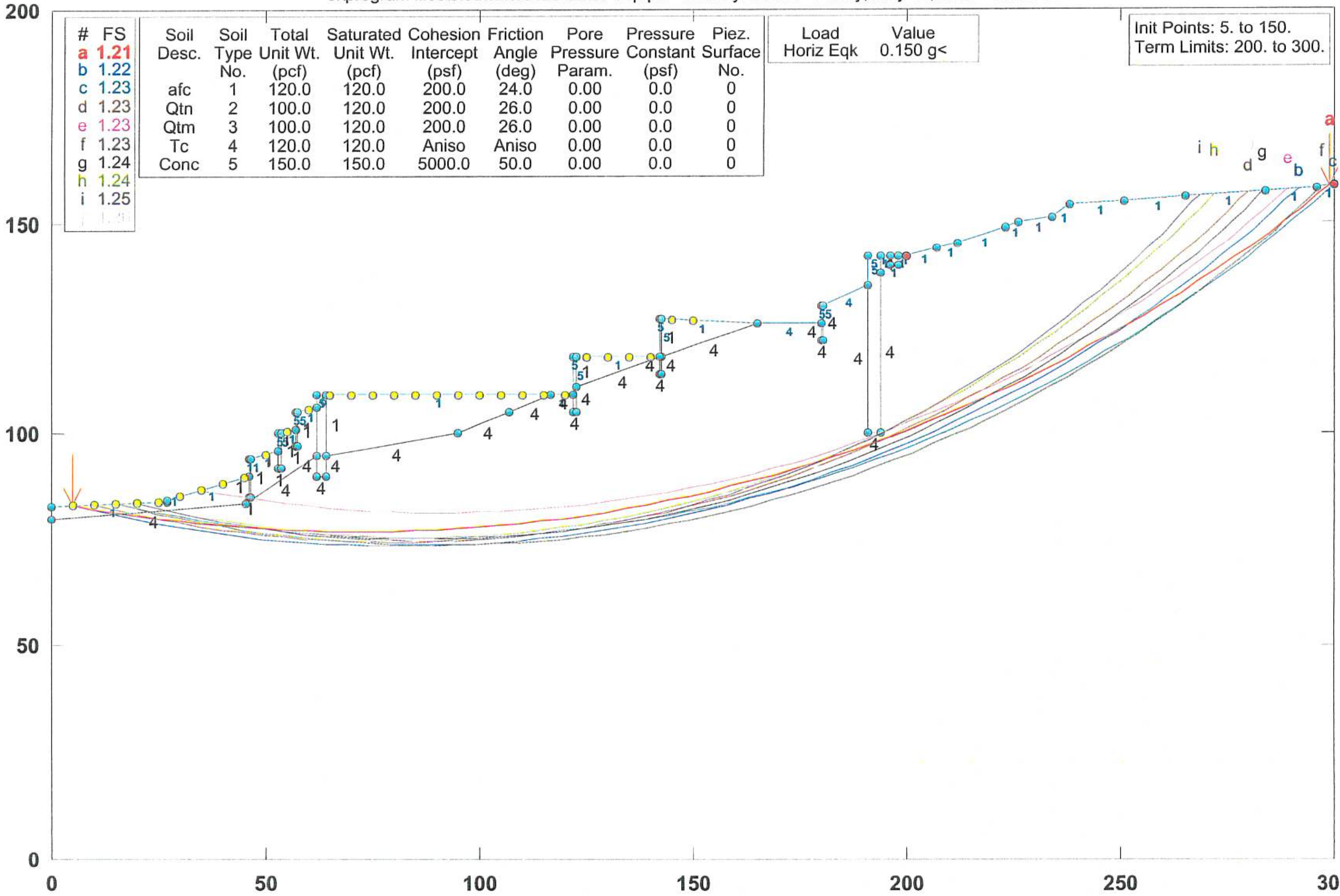
Init Points: 5. to 150.
Term Limits: 200. to 300.

STABL6H FSmin=1.91
Safety Factors Are Calculated By The Modified Bishop Method

**Earth Systems**
**Southwest**

## 10123-02; Via Canon, Proposed Section CC'; Pseudostatic

c:\program files\stedwin\10123-02\cc-01p.pl2 Run By: ESSW Friday, May 09, 2008 10:03AM



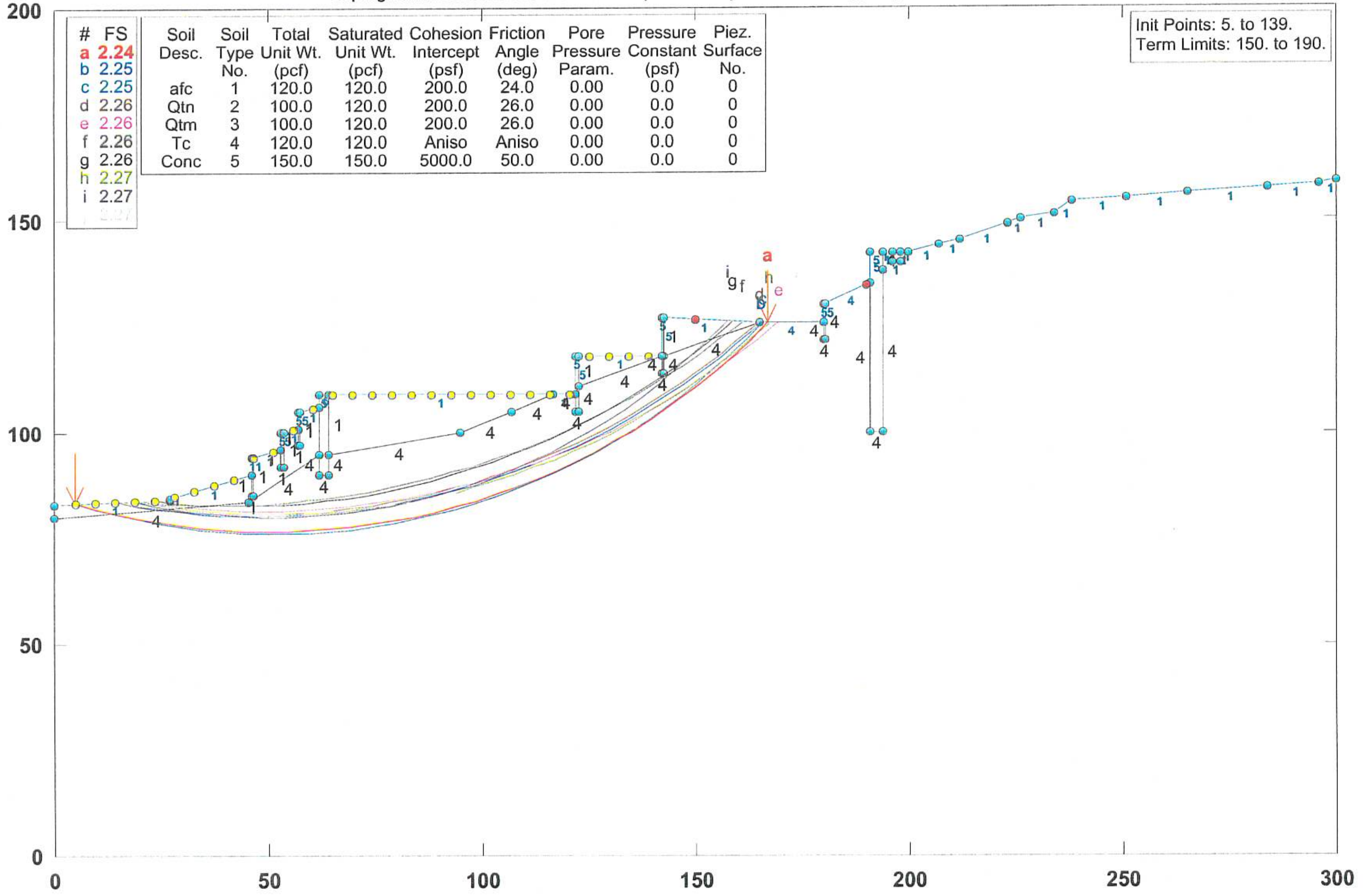
| Soil Desc. | Soil Type No. | Total Unit Wt. (pcf) | Saturated Unit Wt. (pcf) | Cohesion Intercept (psf) | Friction Angle (deg) | Pore Pressure Param. | Pressure Constant (psf) | Piez. Surface No. |
|---|---|---|---|---|---|---|---|---|
| afc | 1 | 120.0 | 120.0 | 200.0 | 24.0 | 0.00 | 0.0 | 0 |
| Qtn | 2 | 100.0 | 120.0 | 200.0 | 26.0 | 0.00 | 0.0 | 0 |
| Qtm | 3 | 100.0 | 120.0 | 200.0 | 26.0 | 0.00 | 0.0 | 0 |
| Tc | 4 | 120.0 | 120.0 | Aniso | Aniso | 0.00 | 0.0 | 0 |
| Conc | 5 | 150.0 | 150.0 | 5000.0 | 50.0 | 0.00 | 0.0 | 0 |

STABL6H FSmin=1.21
Safety Factors Are Calculated By The Modified Bishop Method

**Earth Systems**
**Southwest**

# 10123-02; Via Canon, Proposed Section CC; Static

c:\program files\stedwin\10123-02\cc-02.pl2 Run By: ESSW Friday, May 09, 2008 10:03AM



| # | FS |
|---|---|
| a | 2.24 |
| b | 2.25 |
| c | 2.25 |
| d | 2.26 |
| e | 2.26 |
| f | 2.26 |
| g | 2.26 |
| h | 2.27 |
| i | 2.27 |
| j | 2.27 |

| Soil Desc. | Soil Type No. | Total Unit Wt. (pcf) | Saturated Unit Wt. (pcf) | Cohesion Intercept (psf) | Friction Angle (deg) | Pore Pressure Param. | Pressure Constant (psf) | Piez. Surface No. |
|---|---|---|---|---|---|---|---|---|
| afc | 1 | 120.0 | 120.0 | 200.0 | 24.0 | 0.00 | 0.0 | 0 |
| Qtn | 2 | 100.0 | 120.0 | 200.0 | 26.0 | 0.00 | 0.0 | 0 |
| Qtm | 3 | 100.0 | 120.0 | 200.0 | 26.0 | 0.00 | 0.0 | 0 |
| Tc | 4 | 120.0 | 120.0 | Aniso | Aniso | 0.00 | 0.0 | 0 |
| Conc | 5 | 150.0 | 150.0 | 5000.0 | 50.0 | 0.00 | 0.0 | 0 |

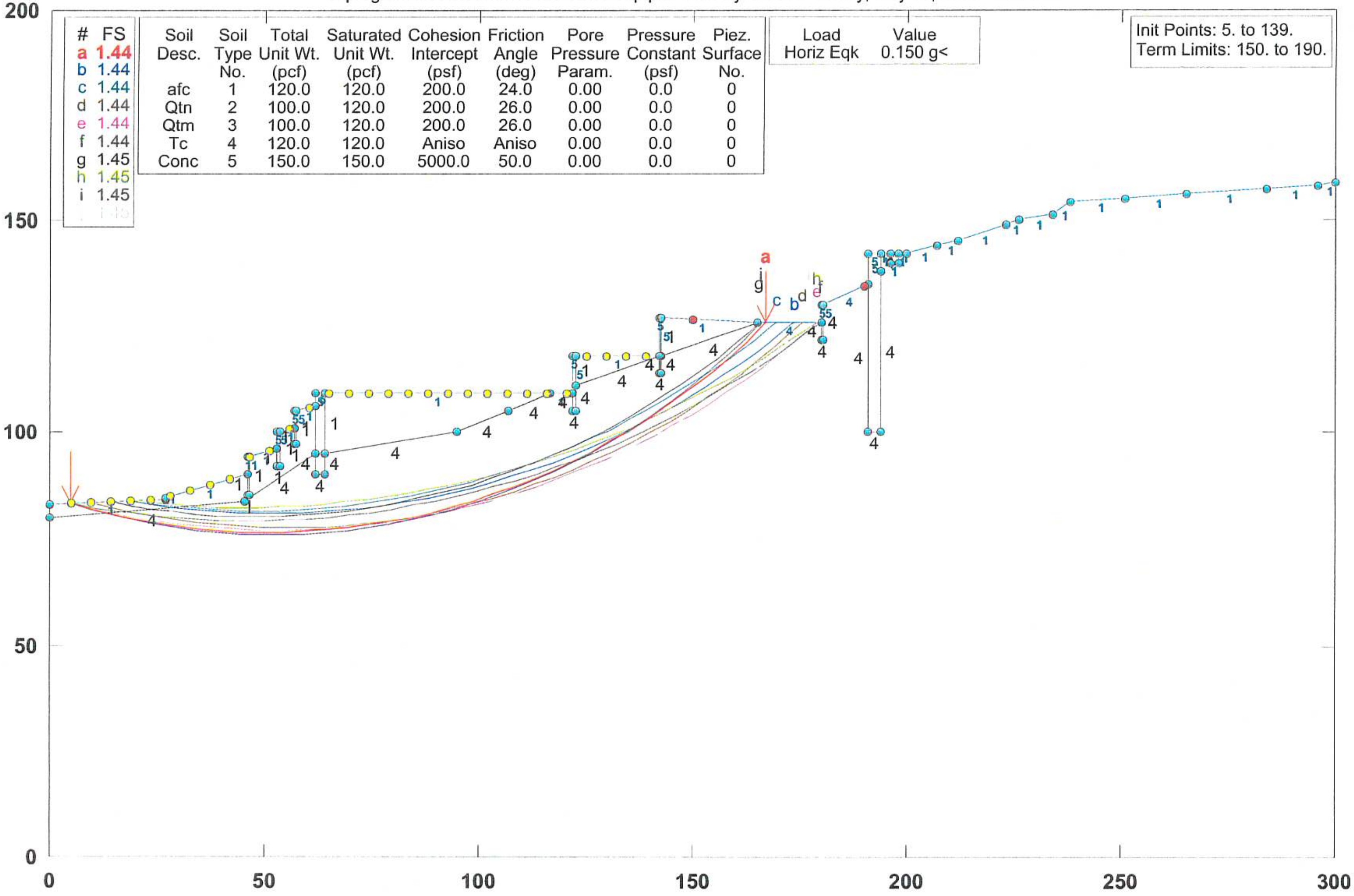
Init Points: 5. to 139.
Term Limits: 150. to 190.

STABL6H FSmin=2.24
Safety Factors Are Calculated By The Modified Bishop Method

**Earth Systems**
**Southwest**

## 10123-02; Via Canon, Proposed Section CC; Pseudostatic

c:\program files\stedwin\10123-02\cc-02p.pl2  Run By: ESSW  Friday, May 09, 2008  10:04AM



| Soil Desc. | Soil Type No. | Total Unit Wt. (pcf) | Saturated Unit Wt. (pcf) | Cohesion Intercept (psf) | Friction Angle (deg) | Pore Pressure Param. | Pressure Constant (psf) | Piez. Surface No. |
|---|---|---|---|---|---|---|---|---|
| afc | 1 | 120.0 | 120.0 | 200.0 | 24.0 | 0.00 | 0.0 | 0 |
| Qtn | 2 | 100.0 | 120.0 | 200.0 | 26.0 | 0.00 | 0.0 | 0 |
| Qtm | 3 | 100.0 | 120.0 | 200.0 | 26.0 | 0.00 | 0.0 | 0 |
| Tc | 4 | 120.0 | 120.0 | Aniso | Aniso | 0.00 | 0.0 | 0 |
| Conc | 5 | 150.0 | 150.0 | 5000.0 | 50.0 | 0.00 | 0.0 | 0 |

| Load | Value |
|---|---|
| Horiz Eqk | 0.150 g< |

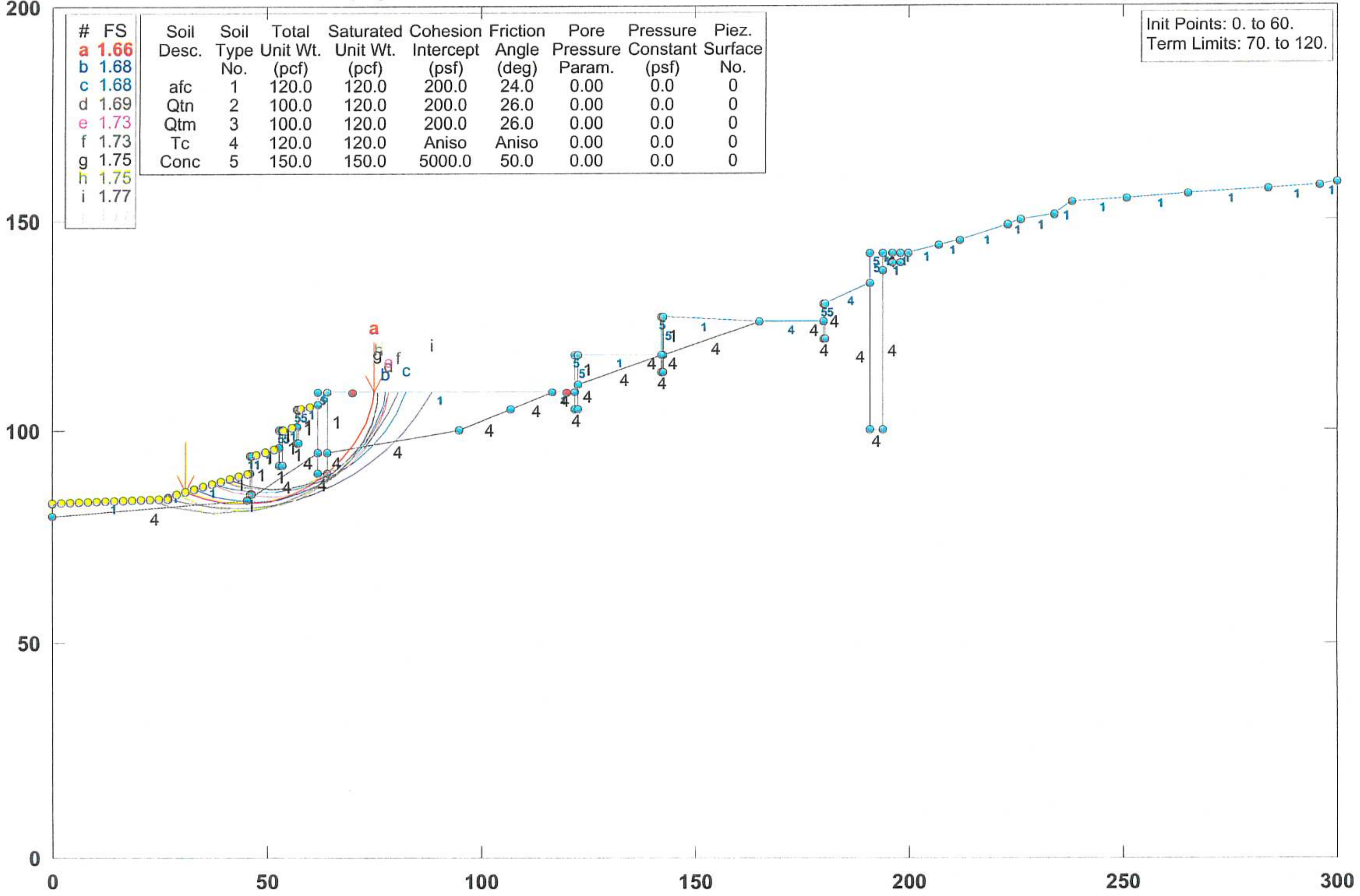
Init Points: 5. to 139.
Term Limits: 150. to 190.

STABL6H FSmin=1.44
Safety Factors Are Calculated By The Modified Bishop Method

**Earth Systems**
Southwest

# 10123-02; Via Canon, Proposed Section CC; Static

c:\program files\stedwin\10123-02\cc-03.pl2 Run By: ESSW Friday, May 09, 2008 10:39AM



| Soil Desc. | Soil Type No. | Total Unit Wt. (pcf) | Saturated Unit Wt. (pcf) | Cohesion Intercept (psf) | Friction Angle (deg) | Pore Pressure Param. | Pressure Constant (psf) | Piez. Surface No. |
|---|---|---|---|---|---|---|---|---|
| afc | 1 | 120.0 | 120.0 | 200.0 | 24.0 | 0.00 | 0.0 | 0 |
| Qtn | 2 | 100.0 | 120.0 | 200.0 | 26.0 | 0.00 | 0.0 | 0 |
| Qtm | 3 | 100.0 | 120.0 | 200.0 | 26.0 | 0.00 | 0.0 | 0 |
| Tc | 4 | 120.0 | 120.0 | Aniso | Aniso | 0.00 | 0.0 | 0 |
| Conc | 5 | 150.0 | 150.0 | 5000.0 | 50.0 | 0.00 | 0.0 | 0 |

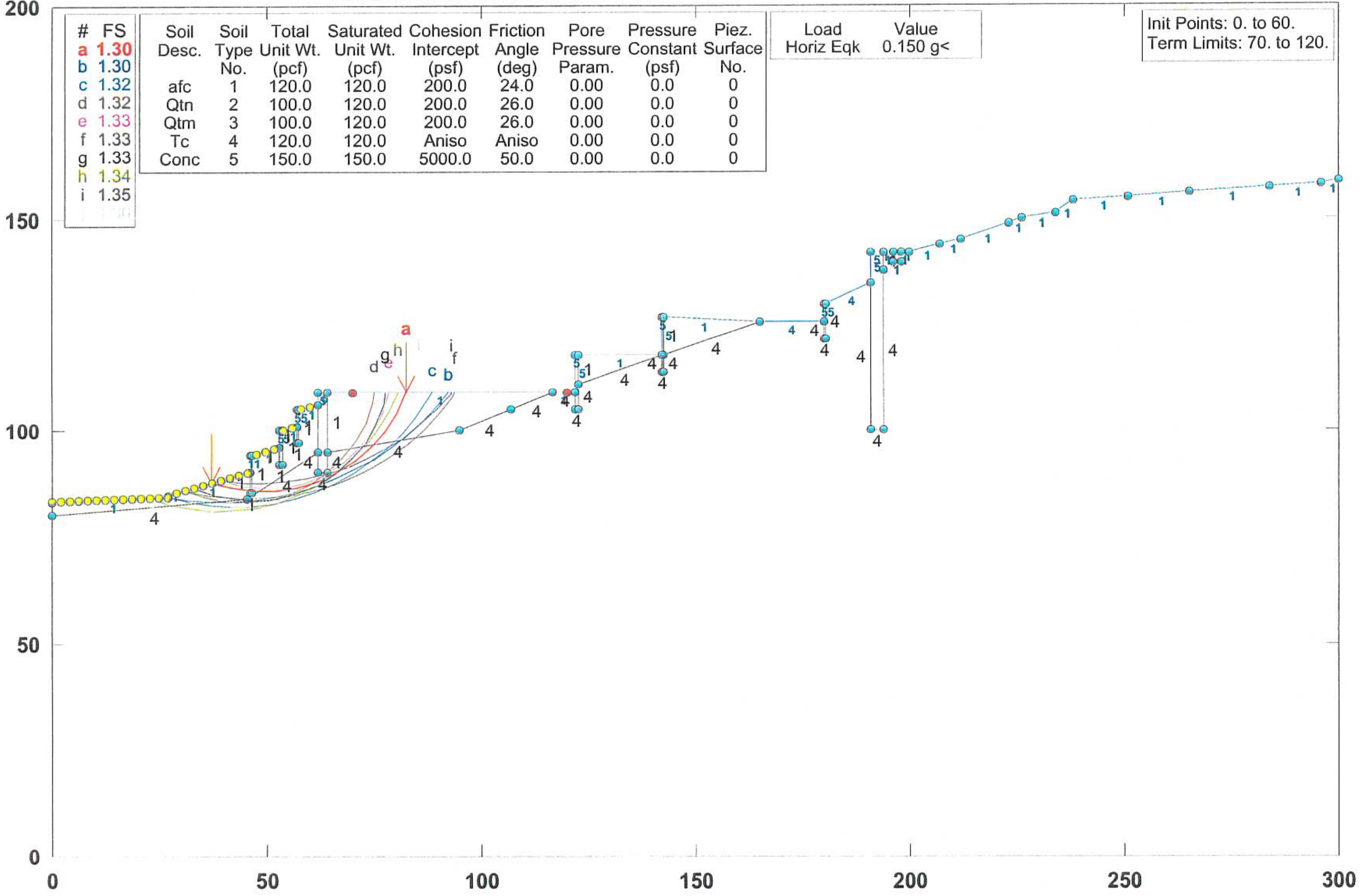
STABL6H FSmin=1.66

Safety Factors Are Calculated By The Modified Bishop Method

**Earth Systems**
**Southwest**

# 10123-02; Via Canon, Proposed Section CC; Pseudostatic

c:\program files\stedwin\10123-02\cc-03p.pl2 Run By: ESSW Friday, May 09, 2008 10:40AM



| # | FS |
|---|---|
| a | 1.30 |
| b | 1.30 |
| c | 1.32 |
| d | 1.32 |
| e | 1.33 |
| f | 1.33 |
| g | 1.33 |
| h | 1.34 |
| i | 1.35 |

| Soil Desc. | Soil Type No. | Total Unit Wt. (pcf) | Saturated Unit Wt. (pcf) | Cohesion Intercept (psf) | Friction Angle (deg) | Pore Pressure Param. | Pressure Constant (psf) | Piez. Surface No. |
|---|---|---|---|---|---|---|---|---|
| afc | 1 | 120.0 | 120.0 | 200.0 | 24.0 | 0.00 | 0.0 | 0 |
| Qtn | 2 | 100.0 | 120.0 | 200.0 | 26.0 | 0.00 | 0.0 | 0 |
| Qtm | 3 | 100.0 | 120.0 | 200.0 | 26.0 | 0.00 | 0.0 | 0 |
| Tc | 4 | 120.0 | 120.0 | Aniso | Aniso | 0.00 | 0.0 | 0 |
| Conc | 5 | 150.0 | 150.0 | 5000.0 | 50.0 | 0.00 | 0.0 | 0 |

| Load | Value |
|---|---|
| Horiz Eqk | 0.150 g< |

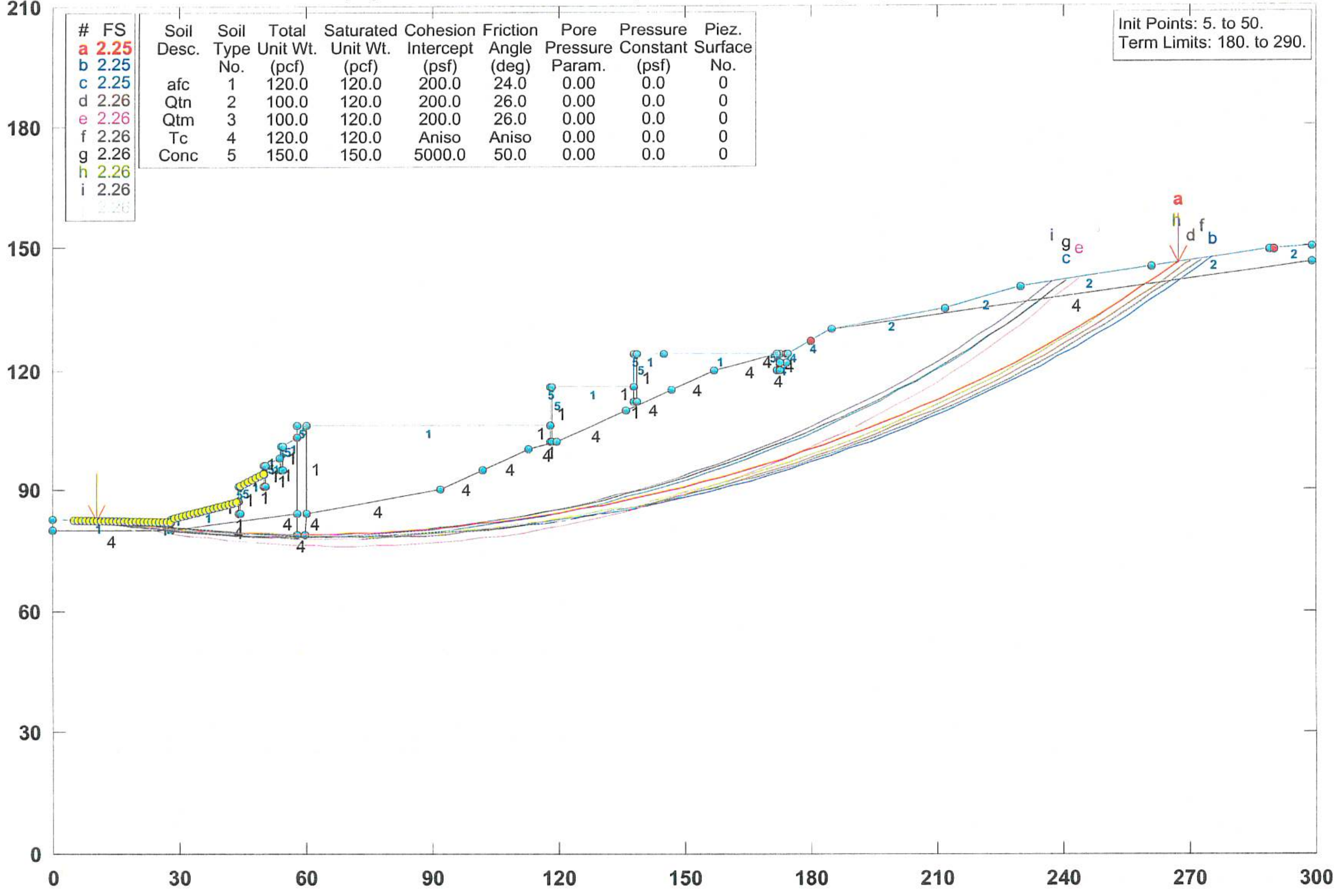
Init Points: 0. to 60.
Term Limits: 70. to 120.

**Earth Systems**
**Southwest**

STABL6H FSmin=1.30
Safety Factors Are Calculated By The Modified Bishop Method

## 10123-02; Via Canon, Proposed Section DD; Static

c:\program files\stedwin\10123-02\dd-01.pl2  Run By: ESSW  Friday, May 09, 2008  09:35AM



| Soil Desc. | Soil Type No. | Total Unit Wt. (pcf) | Saturated Unit Wt. (pcf) | Cohesion Intercept (psf) | Friction Angle (deg) | Pore Pressure Param. | Pressure Constant (psf) | Piez. Surface No. |
|---|---|---|---|---|---|---|---|---|
| afc | 1 | 120.0 | 120.0 | 200.0 | 24.0 | 0.00 | 0.0 | 0 |
| Qtn | 2 | 100.0 | 120.0 | 200.0 | 26.0 | 0.00 | 0.0 | 0 |
| Qtm | 3 | 100.0 | 120.0 | 200.0 | 26.0 | 0.00 | 0.0 | 0 |
| Tc | 4 | 120.0 | 120.0 | Aniso | Aniso | 0.00 | 0.0 | 0 |
| Conc | 5 | 150.0 | 150.0 | 5000.0 | 50.0 | 0.00 | 0.0 | 0 |

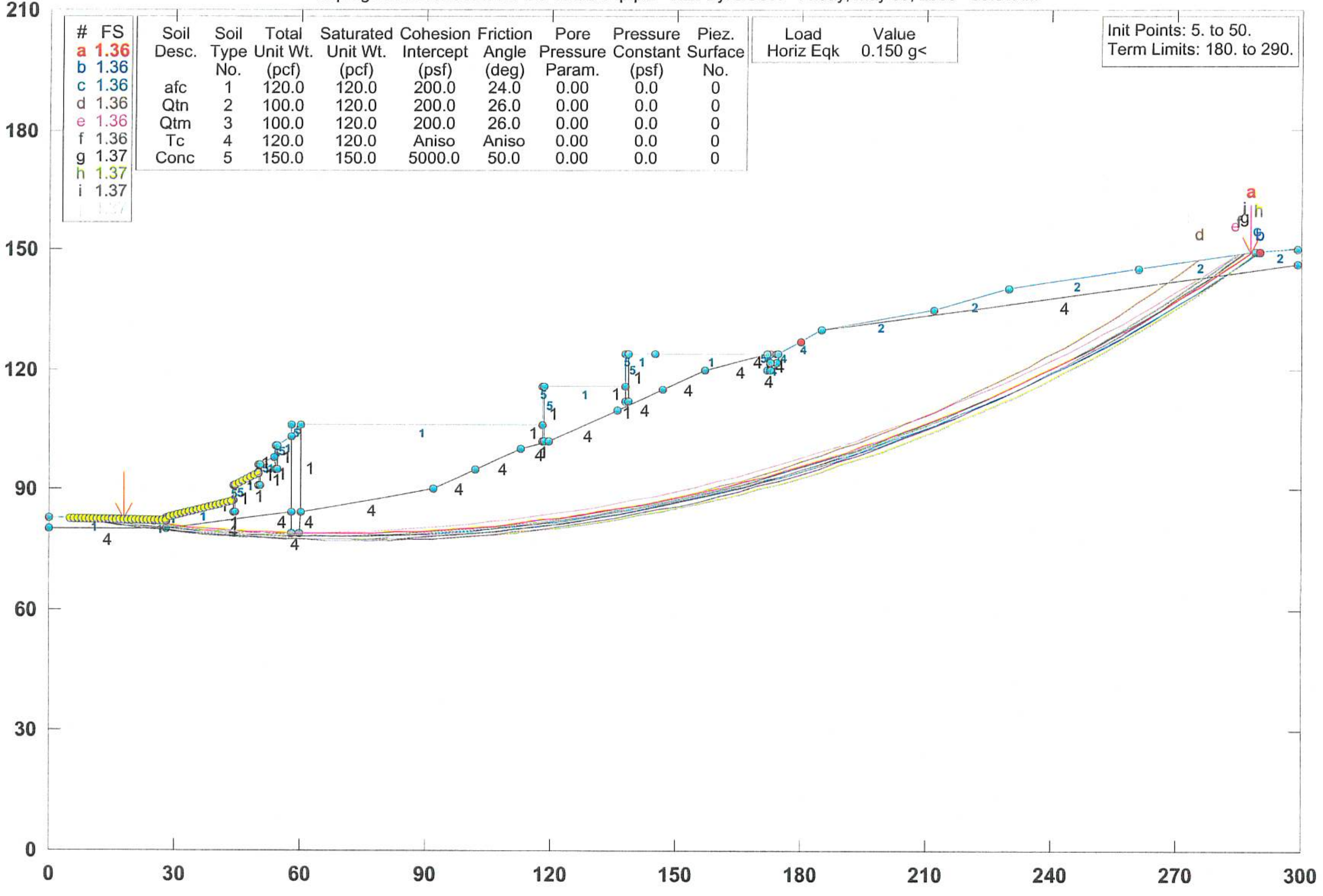
STABL6H  FSmin=2.25

Safety Factors Are Calculated By The Modified Bishop Method

**Earth Systems**
**Southwest**

# 10123-02; Via Canon, Proposed Section DD; Pseudostatic

c:\program files\stedwin\10123-02\dd-01p.pl2  Run By: ESSW  Friday, May 09, 2008  09:37AM



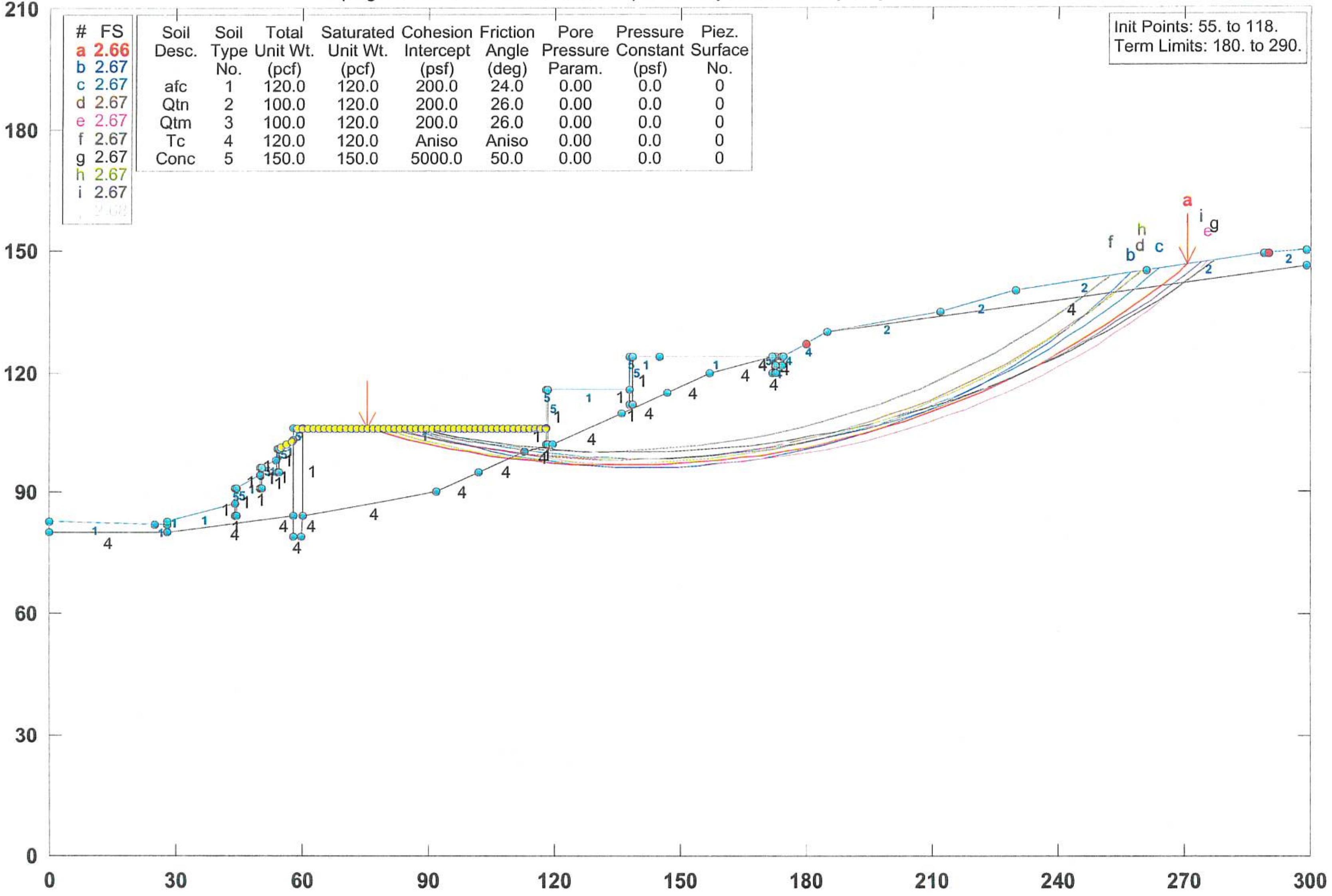
| Soil Desc. | Soil Type No. | Total Unit Wt. (pcf) | Saturated Unit Wt. (pcf) | Cohesion Intercept (psf) | Friction Angle (deg) | Pore Pressure Param. | Pressure Constant (psf) | Piez. Surface No. |
|---|---|---|---|---|---|---|---|---|
| afc | 1 | 120.0 | 120.0 | 200.0 | 24.0 | 0.00 | 0.0 | 0 |
| Qtn | 2 | 100.0 | 120.0 | 200.0 | 26.0 | 0.00 | 0.0 | 0 |
| Qtm | 3 | 100.0 | 120.0 | 200.0 | 26.0 | 0.00 | 0.0 | 0 |
| Tc | 4 | 120.0 | 120.0 | Aniso | Aniso | 0.00 | 0.0 | 0 |
| Conc | 5 | 150.0 | 150.0 | 5000.0 | 50.0 | 0.00 | 0.0 | 0 |

STABL6H FSmin=1.36
Safety Factors Are Calculated By The Modified Bishop Method

**Earth Systems**
**Southwest**

# 10123-02; Via Canon, Proposed Section DD; Static

c:\program files\stedwin\10123-02\dd-02.pl2 Run By: ESSW Friday, May 09, 2008 09:40AM



| Soil Desc. | Soil Type No. | Total Unit Wt. (pcf) | Saturated Unit Wt. (pcf) | Cohesion Intercept (psf) | Friction Angle (deg) | Pore Pressure Param. | Pressure Constant (psf) | Piez. Surface No. |
|---|---|---|---|---|---|---|---|---|
| afc | 1 | 120.0 | 120.0 | 200.0 | 24.0 | 0.00 | 0.0 | 0 |
| Qtn | 2 | 100.0 | 120.0 | 200.0 | 26.0 | 0.00 | 0.0 | 0 |
| Qtm | 3 | 100.0 | 120.0 | 200.0 | 26.0 | 0.00 | 0.0 | 0 |
| Tc | 4 | 120.0 | 120.0 | Aniso | Aniso | 0.00 | 0.0 | 0 |
| Conc | 5 | 150.0 | 150.0 | 5000.0 | 50.0 | 0.00 | 0.0 | 0 |

STABL6H FSmin=2.66

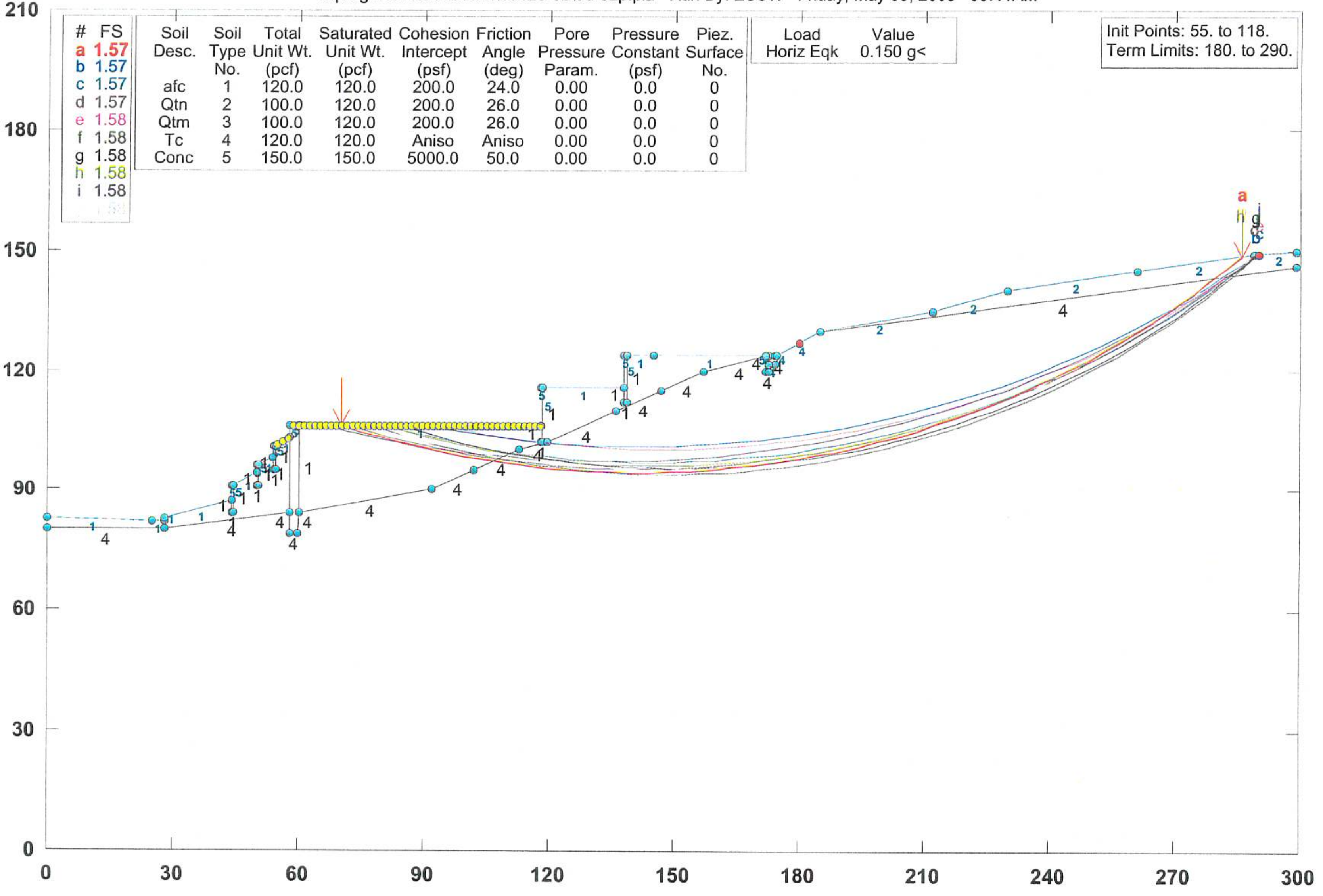
Safety Factors Are Calculated By The Modified Bishop Method

**Earth Systems**

**Southwest**

## 10123-02; Via Canon, Proposed Section DD; Pseudostatic

c:\program files\stedwin\10123-02\dd-02p.pl2 Run By: ESSW Friday, May 09, 2008 09:41AM



| # | FS |
|---|---|
| a | 1.57 |
| b | 1.57 |
| c | 1.57 |
| d | 1.57 |
| e | 1.58 |
| f | 1.58 |
| g | 1.58 |
| h | 1.58 |
| i | 1.58 |
|  | 1.58 |

| Soil Desc. | Soil Type No. | Total Unit Wt. (pcf) | Saturated Unit Wt. (pcf) | Cohesion Intercept (psf) | Friction Angle (deg) | Pore Pressure Param. | Pressure Constant (psf) | Piez. Surface No. |
|---|---|---|---|---|---|---|---|---|
| afc | 1 | 120.0 | 120.0 | 200.0 | 24.0 | 0.00 | 0.0 | 0 |
| Qtn | 2 | 100.0 | 120.0 | 200.0 | 26.0 | 0.00 | 0.0 | 0 |
| Qtm | 3 | 100.0 | 120.0 | 200.0 | 26.0 | 0.00 | 0.0 | 0 |
| Tc | 4 | 120.0 | 120.0 | Aniso | Aniso | 0.00 | 0.0 | 0 |
| Conc | 5 | 150.0 | 150.0 | 5000.0 | 50.0 | 0.00 | 0.0 | 0 |

| Load | Value |
|---|---|
| Horiz Eqk | 0.150 g< |

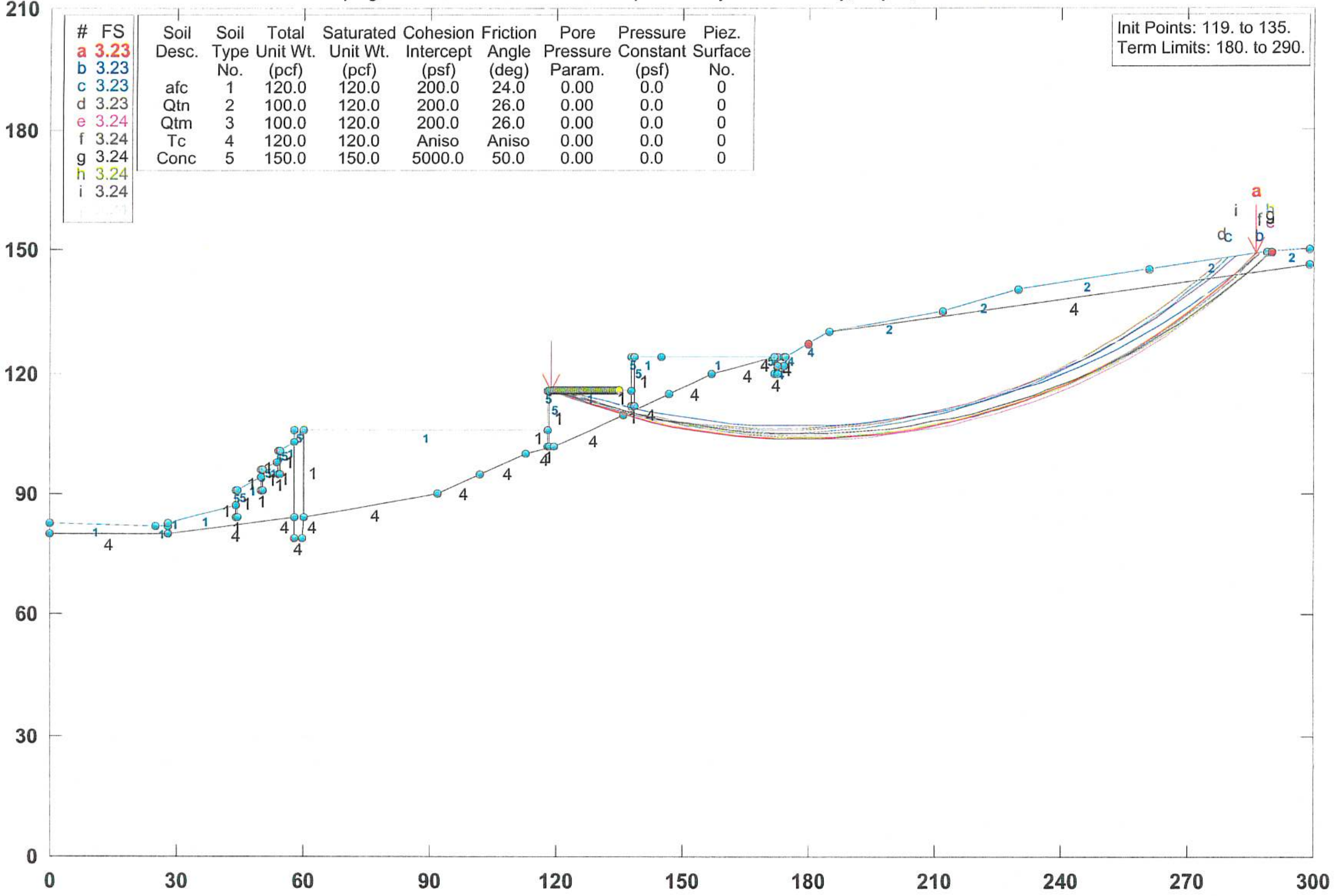
Init Points: 55. to 118.
Term Limits: 180. to 290.

STABL6H FSmin=1.57
Safety Factors Are Calculated By The Modified Bishop Method

**Earth Systems**
**Southwest**

# 10123-02; Via Canon, Proposed Section DD; Static

c:\program files\stedwin\10123-02\dd-03.pl2 Run By: ESSW Friday, May 09, 2008 09:39AM



| # | FS |
|---|---|
| a | 3.23 |
| b | 3.23 |
| c | 3.23 |
| d | 3.23 |
| e | 3.24 |
| f | 3.24 |
| g | 3.24 |
| h | 3.24 |
| i | 3.24 |

| Soil Desc. | Soil Type No. | Total Unit Wt. (pcf) | Saturated Unit Wt. (pcf) | Cohesion Intercept (psf) | Friction Angle (deg) | Pore Pressure Param. | Pressure Constant (psf) | Piez. Surface No. |
|---|---|---|---|---|---|---|---|---|
| afc | 1 | 120.0 | 120.0 | 200.0 | 24.0 | 0.00 | 0.0 | 0 |
| Qtn | 2 | 100.0 | 120.0 | 200.0 | 26.0 | 0.00 | 0.0 | 0 |
| Qtm | 3 | 100.0 | 120.0 | 200.0 | 26.0 | 0.00 | 0.0 | 0 |
| Tc | 4 | 120.0 | 120.0 | Aniso | Aniso | 0.00 | 0.0 | 0 |
| Conc | 5 | 150.0 | 150.0 | 5000.0 | 50.0 | 0.00 | 0.0 | 0 |

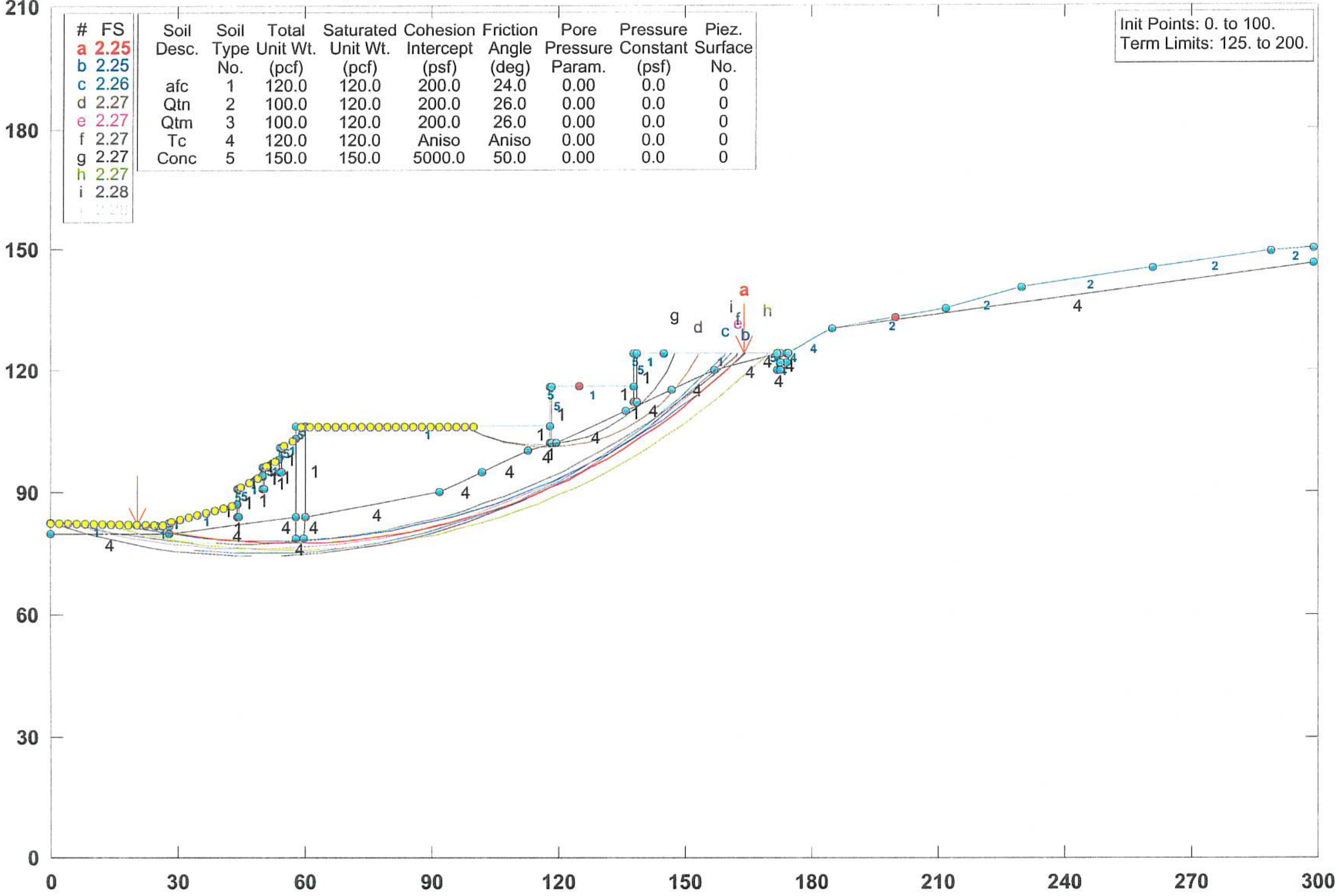
Init Points: 119. to 135.
Term Limits: 180. to 290.

STABL6H FSmin=3.23
Safety Factors Are Calculated By The Modified Bishop Method

**Earth Systems**
**Southwest**

# 10123-02; Via Canon, Proposed Section DD; Static

c:\program files\stedwin\10123-02\dd-04.pl2 Run By: ESSW Friday, May 09, 2008 09:42AM



| # | FS |
|---|---|
| a | 2.25 |
| b | 2.25 |
| c | 2.26 |
| d | 2.27 |
| e | 2.27 |
| f | 2.27 |
| g | 2.27 |
| h | 2.27 |
| i | 2.28 |

| Soil Desc. | Soil Type No. | Total Unit Wt. (pcf) | Saturated Unit Wt. (pcf) | Cohesion Intercept (psf) | Friction Angle (deg) | Pore Pressure Param. | Pressure Constant (psf) | Piez. Surface No. |
|---|---|---|---|---|---|---|---|---|
| afc | 1 | 120.0 | 120.0 | 200.0 | 24.0 | 0.00 | 0.0 | 0 |
| Qtn | 2 | 100.0 | 120.0 | 200.0 | 26.0 | 0.00 | 0.0 | 0 |
| Qtm | 3 | 100.0 | 120.0 | 200.0 | 26.0 | 0.00 | 0.0 | 0 |
| Tc | 4 | 120.0 | 120.0 | Aniso | Aniso | 0.00 | 0.0 | 0 |
| Conc | 5 | 150.0 | 150.0 | 5000.0 | 50.0 | 0.00 | 0.0 | 0 |

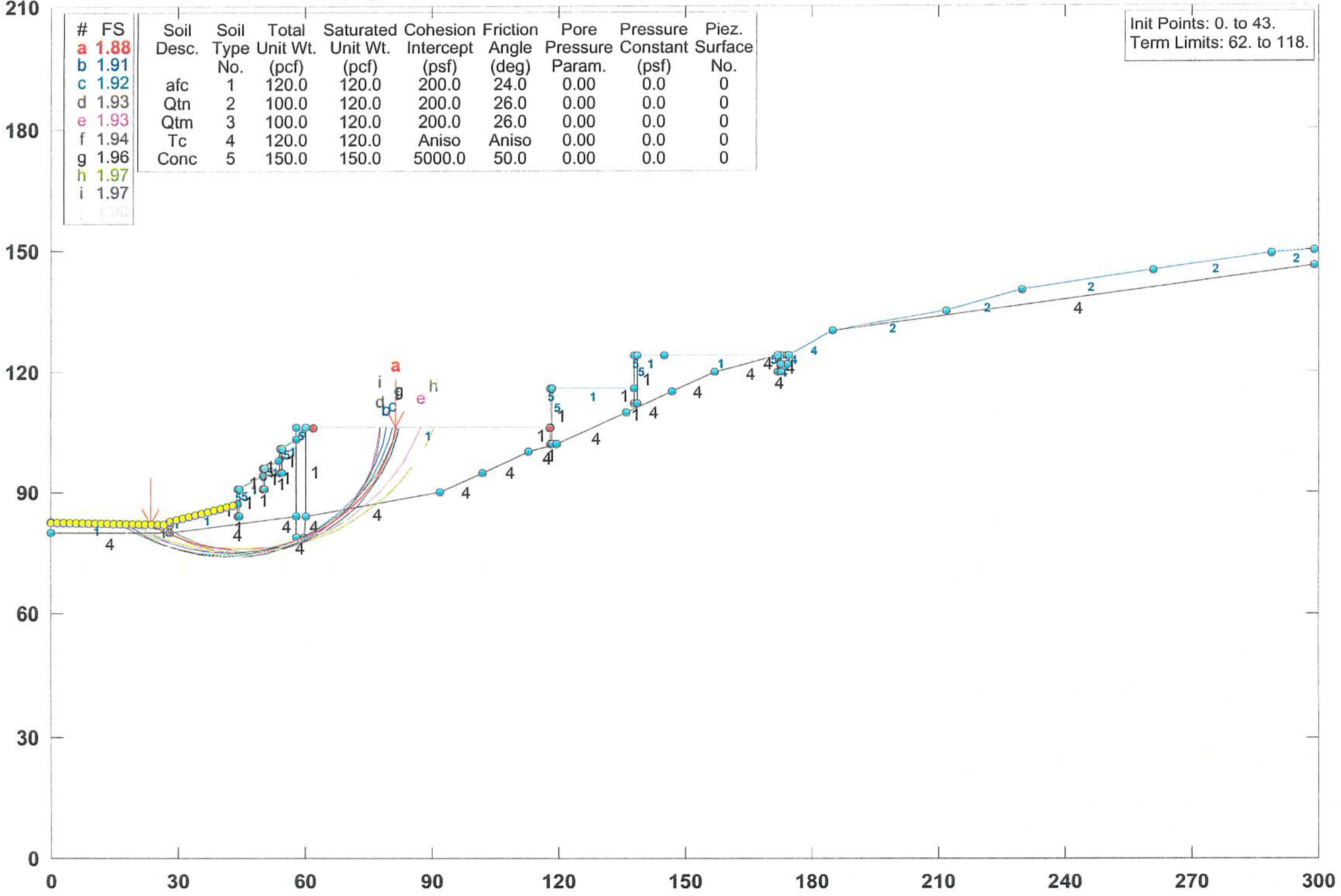
Init Points: 0. to 100.
Term Limits: 125. to 200.

STABL6H FSmin=2.25
Safety Factors Are Calculated By The Modified Bishop Method

**Earth Systems**
**Southwest**

# 10123-02; Via Canon, Proposed Section DD; Static

c:\program files\stedwin\10123-02\dd-05.pl2 Run By: ESSW Friday, May 09, 2008 09:43AM



| Soil Desc. | Soil Type No. | Total Unit Wt. (pcf) | Saturated Unit Wt. (pcf) | Cohesion Intercept (psf) | Friction Angle (deg) | Pore Pressure Param. | Pressure Constant (psf) | Piez. Surface No. |
|---|---|---|---|---|---|---|---|---|
| afc | 1 | 120.0 | 120.0 | 200.0 | 24.0 | 0.00 | 0.0 | 0 |
| Qtn | 2 | 100.0 | 120.0 | 200.0 | 26.0 | 0.00 | 0.0 | 0 |
| Qtm | 3 | 100.0 | 120.0 | 200.0 | 26.0 | 0.00 | 0.0 | 0 |
| Tc | 4 | 120.0 | 120.0 | Aniso | Aniso | 0.00 | 0.0 | 0 |
| Conc | 5 | 150.0 | 150.0 | 5000.0 | 50.0 | 0.00 | 0.0 | 0 |

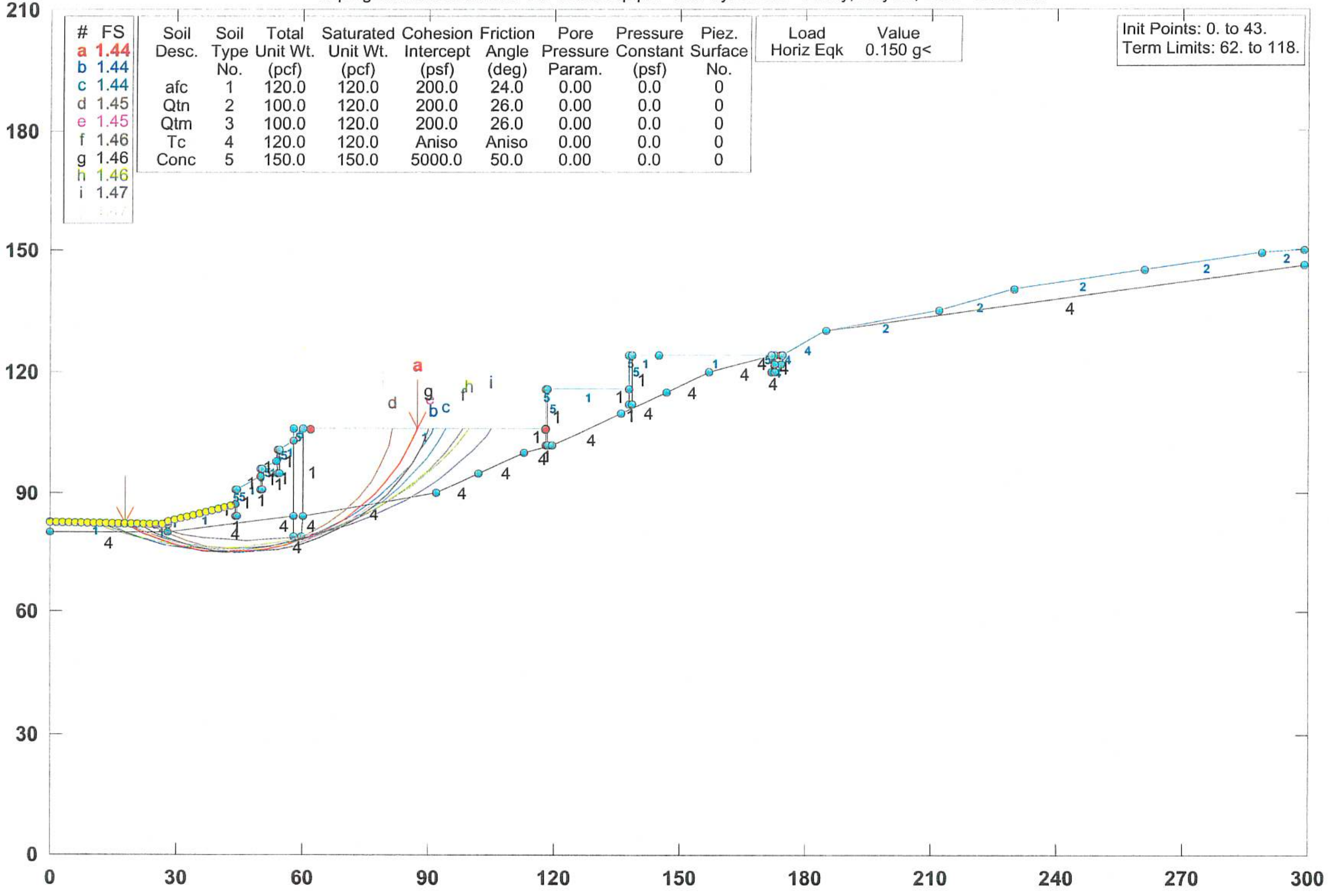
STABL6H FSmin=1.88

Safety Factors Are Calculated By The Modified Bishop Method

**Earth Systems**
**Southwest**

# 10123-02; Via Canon, Proposed Section DD; Pseudostatic

c:\program files\stedwin\10123-02\dd-05p.pl2 Run By: ESSW Friday, May 09, 2008 09:44AM



| # | FS |
|---|---|
| a | 1.44 |
| b | 1.44 |
| c | 1.44 |
| d | 1.45 |
| e | 1.45 |
| f | 1.46 |
| g | 1.46 |
| h | 1.46 |
| i | 1.47 |

| Soil Desc. | Soil Type No. | Total Unit Wt. (pcf) | Saturated Unit Wt. (pcf) | Cohesion Intercept (psf) | Friction Angle (deg) | Pore Pressure Param. | Pressure Constant (psf) | Piez. Surface No. |
|---|---|---|---|---|---|---|---|---|
| afc | 1 | 120.0 | 120.0 | 200.0 | 24.0 | 0.00 | 0.0 | 0 |
| Qtn | 2 | 100.0 | 120.0 | 200.0 | 26.0 | 0.00 | 0.0 | 0 |
| Qtm | 3 | 100.0 | 120.0 | 200.0 | 26.0 | 0.00 | 0.0 | 0 |
| Tc | 4 | 120.0 | 120.0 | Aniso | Aniso | 0.00 | 0.0 | 0 |
| Conc | 5 | 150.0 | 150.0 | 5000.0 | 50.0 | 0.00 | 0.0 | 0 |

| Load | Value |
|---|---|
| Horiz Eqk | 0.150 g< |

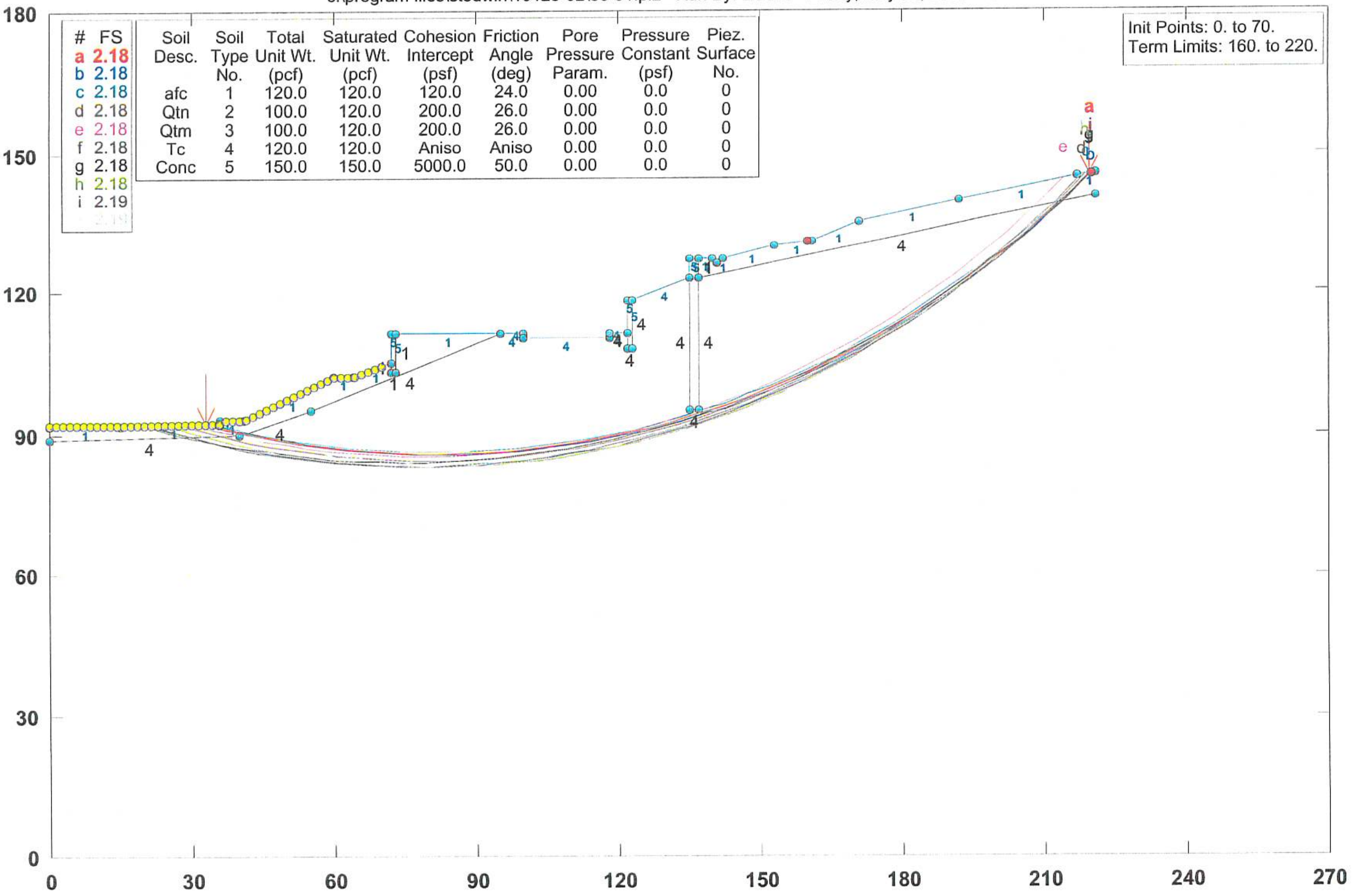
Init Points: 0. to 43.
Term Limits: 62. to 118.

**Earth Systems**
**Southwest**

STABL6H FSmin=1.44
Safety Factors Are Calculated By The Modified Bishop Method

# 10123-02; Via Canon, Proposed Section EE'; Static

c:\program files\stedwin\10123-02\ee-01.pl2 Run By: ESSW Friday, May 09, 2008 10:42AM



| # | FS |
|---|---|
| a | 2.18 |
| b | 2.18 |
| c | 2.18 |
| d | 2.18 |
| e | 2.18 |
| f | 2.18 |
| g | 2.18 |
| h | 2.18 |
| i | 2.19 |

| Soil Desc. | Soil Type No. | Total Unit Wt. (pcf) | Saturated Unit Wt. (pcf) | Cohesion Intercept (psf) | Friction Angle (deg) | Pore Pressure Param. | Pressure Constant (psf) | Piez. Surface No. |
|---|---|---|---|---|---|---|---|---|
| afc | 1 | 120.0 | 120.0 | 120.0 | 24.0 | 0.00 | 0.0 | 0 |
| Qtn | 2 | 100.0 | 120.0 | 200.0 | 26.0 | 0.00 | 0.0 | 0 |
| Qtm | 3 | 100.0 | 120.0 | 200.0 | 26.0 | 0.00 | 0.0 | 0 |
| Tc | 4 | 120.0 | 120.0 | Aniso | Aniso | 0.00 | 0.0 | 0 |
| Conc | 5 | 150.0 | 150.0 | 5000.0 | 50.0 | 0.00 | 0.0 | 0 |

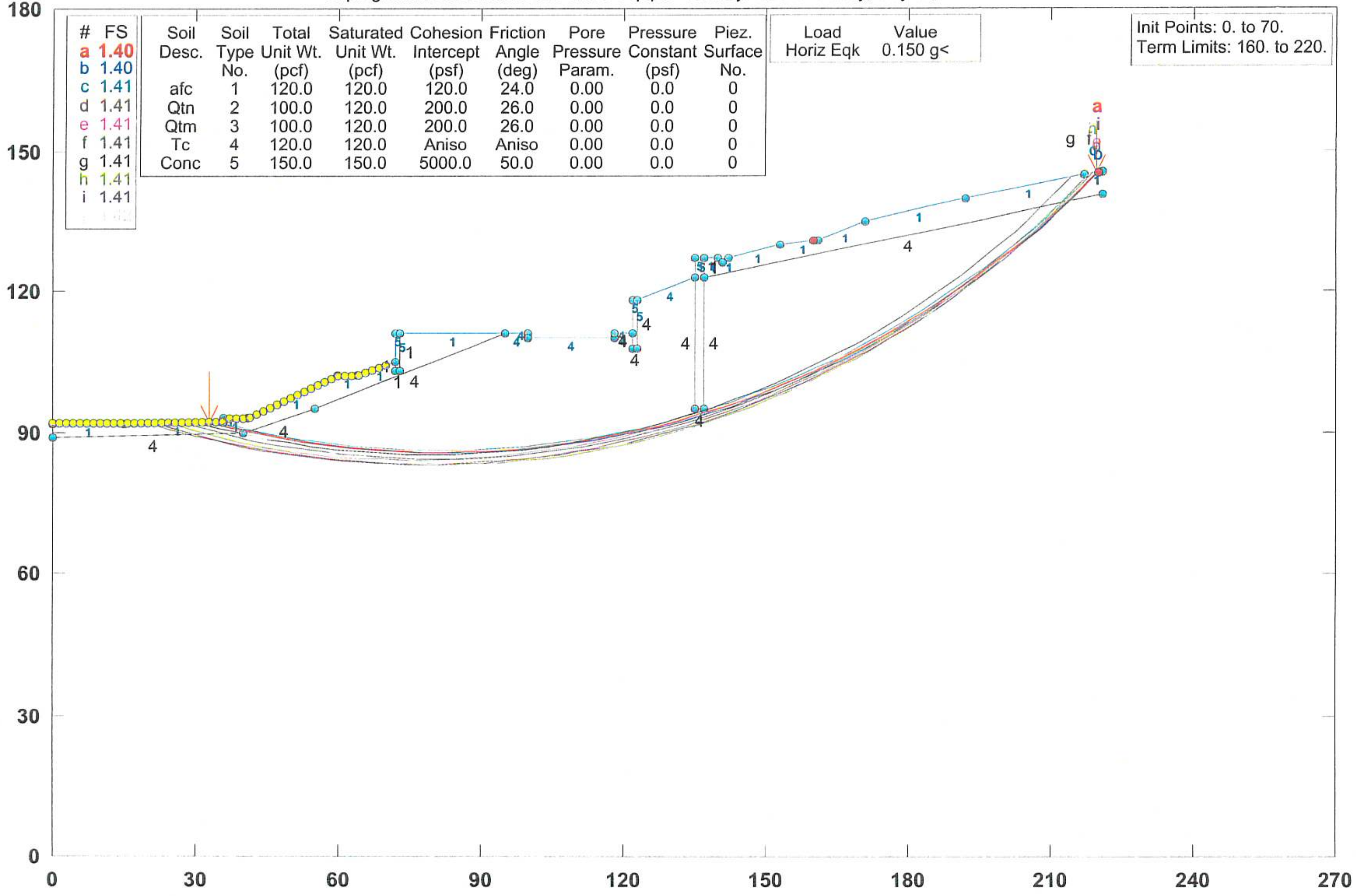
Init Points: 0. to 70.
Term Limits: 160. to 220.

STABL6H FSmin=2.18
Safety Factors Are Calculated By The Modified Bishop Method

**Earth Systems**
**Southwest**

## 10123-02; Via Canon, Proposed Section EE'; Pseudostatic

c:\program files\stedwin\10123-02\ee-01p.pl2 Run By: ESSW Friday, May 09, 2008 10:42AM



| # | FS |
|---|---|
| a | 1.40 |
| b | 1.40 |
| c | 1.41 |
| d | 1.41 |
| e | 1.41 |
| f | 1.41 |
| g | 1.41 |
| h | 1.41 |
| i | 1.41 |

| Soil Desc. | Soil Type No. | Total Unit Wt. (pcf) | Saturated Unit Wt. (pcf) | Cohesion Intercept (psf) | Friction Angle (deg) | Pore Pressure Param. | Pressure Constant (psf) | Piez. Surface No. |
|---|---|---|---|---|---|---|---|---|
| afc | 1 | 120.0 | 120.0 | 120.0 | 24.0 | 0.00 | 0.0 | 0 |
| Qtn | 2 | 100.0 | 120.0 | 200.0 | 26.0 | 0.00 | 0.0 | 0 |
| Qtm | 3 | 100.0 | 120.0 | 200.0 | 26.0 | 0.00 | 0.0 | 0 |
| Tc | 4 | 120.0 | 120.0 | Aniso | Aniso | 0.00 | 0.0 | 0 |
| Conc | 5 | 150.0 | 150.0 | 5000.0 | 50.0 | 0.00 | 0.0 | 0 |

| Load | Value |
|---|---|
| Horiz Eqk | 0.150 g< |

Init Points: 0. to 70.
Term Limits: 160. to 220.

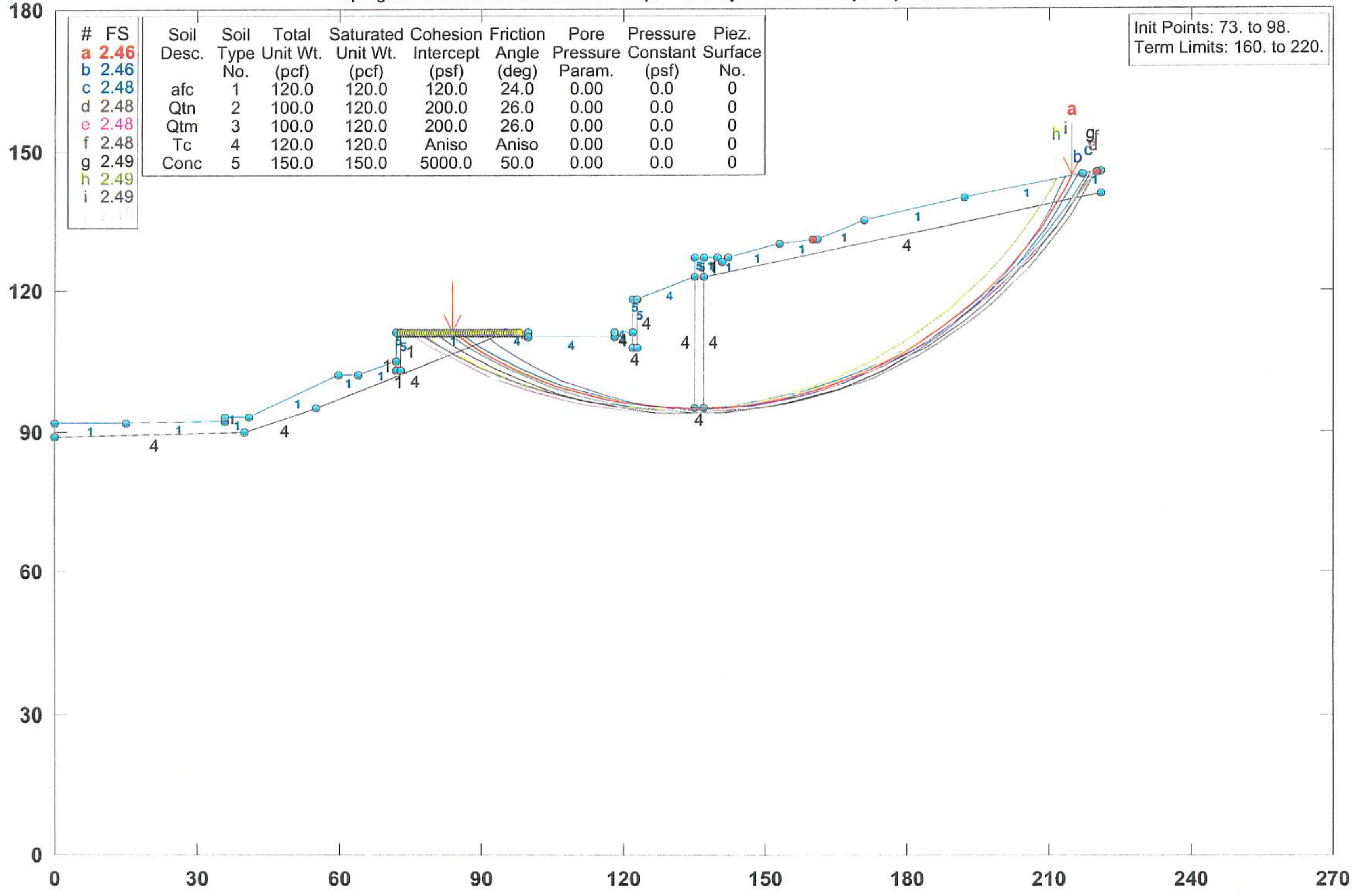
STABL6H FSmin=1.40

Safety Factors Are Calculated By The Modified Bishop Method

**Earth Systems**
**Southwest**

# 10123-02; Via Canon, Proposed Section EE'; Static

c:\program files\stedwin\10123-02\ee-02.pl2 Run By: ESSW Friday, May 09, 2008 10:43AM



| # | FS |
|---|---|
| a | 2.46 |
| b | 2.46 |
| c | 2.48 |
| d | 2.48 |
| e | 2.48 |
| f | 2.48 |
| g | 2.49 |
| h | 2.49 |
| i | 2.49 |

| Soil Desc. | Soil Type No. | Total Unit Wt. (pcf) | Saturated Unit Wt. (pcf) | Cohesion Intercept (psf) | Friction Angle (deg) | Pore Pressure Param. | Pressure Constant (psf) | Piez. Surface No. |
|---|---|---|---|---|---|---|---|---|
| afc | 1 | 120.0 | 120.0 | 120.0 | 24.0 | 0.00 | 0.0 | 0 |
| Qtn | 2 | 100.0 | 120.0 | 200.0 | 26.0 | 0.00 | 0.0 | 0 |
| Qtm | 3 | 100.0 | 120.0 | 200.0 | 26.0 | 0.00 | 0.0 | 0 |
| Tc | 4 | 120.0 | 120.0 | Aniso | Aniso | 0.00 | 0.0 | 0 |
| Conc | 5 | 150.0 | 150.0 | 5000.0 | 50.0 | 0.00 | 0.0 | 0 |

Init Points: 73. to 98.
Term Limits: 160. to 220.

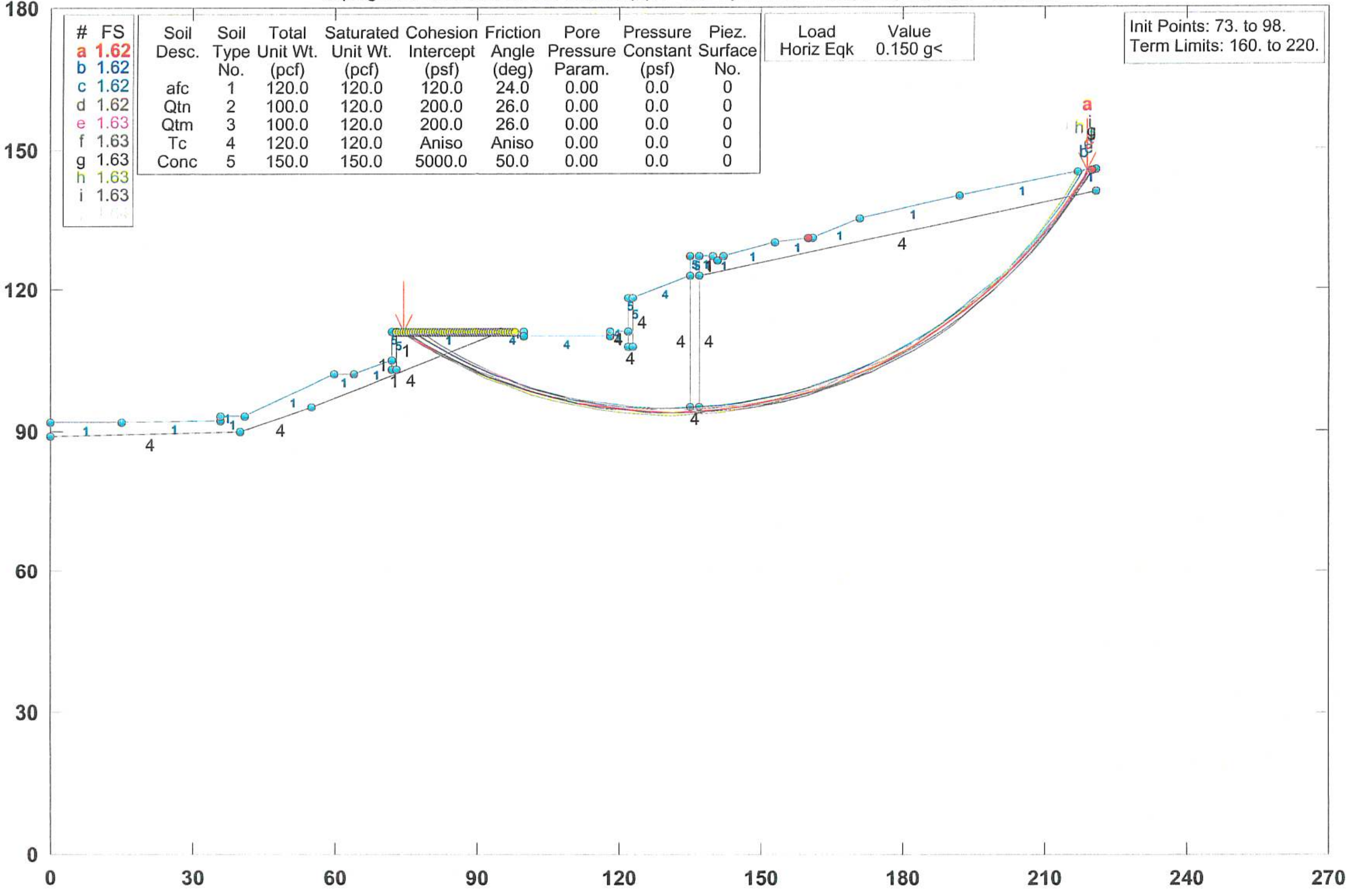
STABL6H FSmin=2.46

Safety Factors Are Calculated By The Modified Bishop Method

**Earth Systems**
**Southwest**

# 10123-02; Via Canon, Proposed Section EE'; Pseudostatic

c:\program files\stedwin\10123-02\ee-02p.pl2 Run By: ESSW Friday, May 09, 2008 10:44AM



| Soil Desc. | Soil Type No. | Total Unit Wt. (pcf) | Saturated Unit Wt. (pcf) | Cohesion Intercept (psf) | Friction Angle (deg) | Pore Pressure Param. | Pressure Constant (psf) | Piez. Surface No. |
|---|---|---|---|---|---|---|---|---|
| afc | 1 | 120.0 | 120.0 | 120.0 | 24.0 | 0.00 | 0.0 | 0 |
| Qtn | 2 | 100.0 | 120.0 | 200.0 | 26.0 | 0.00 | 0.0 | 0 |
| Qtm | 3 | 100.0 | 120.0 | 200.0 | 26.0 | 0.00 | 0.0 | 0 |
| Tc | 4 | 120.0 | 120.0 | Aniso | Aniso | 0.00 | 0.0 | 0 |
| Conc | 5 | 150.0 | 150.0 | 5000.0 | 50.0 | 0.00 | 0.0 | 0 |

STABL6H FSmin=1.62

Safety Factors Are Calculated By The Modified Bishop Method

**Earth Systems**
**Southwest**

## LEGEND

| | | | |
|---|---|---|---|
| 100 | EXISTING CONTOUR | PAD | PROPOSED PAD ELEVATION |
| 100 | PROPOSED CONTOUR | T/SLAB | PROPOSED TOP OF SLAB |
| 100.00 | SPOT ELEVATION | FS | PROPOSED FINISHED SURFACE |
| | PROPOSED CONCRETE PAVING | FG | PROPOSED FINISHED GROUND |
| FM | PROP. FORCE MAIN | TG | TOP OF GRATE |
| 4" | PROPOSED STORM DRAIN | INV | INVERT OF PIPE |
| SUB | PROP. SUBDRAIN | T.C. | TOP OF CURB |
| | DEEPENED FOOTING | P.L. | PROPERTY LINE |
| | PROPOSED BEARING/RETAINING WALL | TW | TOP OF WALL |
| | EXISTING SCREEN WALL | TF | TOP OF FOOTING |
| | PROPOSED SCREEN WALL | W.F. | WATER FEATURE |
| | PROPOSED PLANTER WALL | F.P. | FIRE PIT |
| ● | DOWNSPOUT | P.A. | PLANTER AREA |
| F.F. | PROPOSED FINISHED FLOOR | H.P. | HIGH POINT |

EASEMENT NOTE:
2-12' WIDE EASEMENTS AT FRONT OF PROPERTY AND 4' WIDE UTILITY EASEMENT AT REAR OF PROPERTY ARE IN THE PROCESS OF BEING ABANDONED AND QUITCLAIMED.

## Legend

| | | |
|---|---|---|
| **Afu** | - | Undocumented fill |
| **Qtn** | - | Quaternary Nonmarine Terrace circled where buried |
| **Qtm** | - | Quaternary Marine Terrace, circled where buried |
| **Qls?** | - | California Geologic Survey Suspected Landslide |
| **Tc$_{slt}$** | - | Tertiary Capistrano Formation Siltstone Member, circled where buried, Queried where uncertain |
| ? | - | Approximate Location of Geologic Contact, Queried where uncertain |
| | - | Approximate limits of California Geologic Survey suspected landslide |
| 110 | - | Base of Qtm Elevation Contours |
| 25 | - | Strike and Dip of Bedding |
| 74 | - | Strike and Dip of Fracture |
| | - | Strike of Vertical Fracture |
| 74 | - | Strike and Dip of Fault |
| A A' | - | Location of Section |
| **TP-7** | - | Approximate Location of Test Pit Earth Systems Southwest, April, 2005 |
| **B-1** | - | Approximate Location of Boring Earth Systems Southwest, June, 2005 |
| **B-8** | - | Approximate Location of Boring Earth Systems Southwest, Sept., 2006 |

REVISIONS

| BY | DATE | APVD. | DATE |
|---|---|---|---|

**TOAL ENGINEERING, INC.**
Civil Engineers, Land Planners, Land Surveyors
139 Avenida Navarro, San Clemente, Calif. 92672
Ph: 949-492-8586 Fax: 949-498-8625

| | | | |
|---|---|---|---|
| H. SCALE: | 1"=20' | DATE: | 06/07 |
| V. SCALE: | N/A | DRN.: | A.M.S. |
| DATE OF SURVEY: | – | CHD.: | R.R.T. |
| DR. FILE: | – | APPD.: | R.R.T. |

PRELIMINARY GRADING PLAN
LOT 8, TRACT 16133
DANA POINT, CALIFORNIA
CITY OF DANA POINT

JOB NO.
12407
SHEET 1 OF 4

**Revised Figure 2**
**Boring Location and Geologic Map**
South of Via Canon and Camino Capistrano
Dana Point, California

**Earth Systems Southwest**

05/23/08 File No.: 10123-02

**Earth Systems**
Southwest

27126B Paseo Espada, Suite 704
San Juan Capistrano, California 92675
(949) 248-9005
FAX (949) 248-9016

RECEIVED
SEP [illegible] 2008
CITY OF DANA POINT
COMMUNITY DEVELOPMENT
DEPARTMENT

August 27, 2008

File No.: 10123-02
Doc. No.: 08-08-795

Golden Phoenix Products Corporation
P.O. Box 4227
Dana Point, California 92629

Attention: Mr. Ken Miller

Subject: **Response to City of Dana Point, 2nd Review of Geotechnical Report**

Project: **Proposed Multi-Family Residential Development**
South of Via Cannon and Camino Capistrano
Dana Point, California

References:

1. Earth Systems Southwest, *Engineering Geology Summary Letter, Proposed 8 Lot Development South of Via Cannon and Camino Capistrano, Dana Point, California*, File No.: 10123-01, Doc. No.: 05-05-814, dated May 25, 2005.
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5. Earth Systems Southwest, *Response to City of Dana Point Geotechnical Report Review Checklist, Proposed Multi-Family Residential Development South of Via Cannon and Camino Capistrano, Dana Point, California*, File No.: 10123-02, Doc. No.: 08-05-788, dated May 28, 2008.
6. City of Dana Point, *Site Development Permit No. SDP07-06, Tentative Tract Map TTM13970/TTM07-01, South of Via Canon and Camino Capistrano, 2nd Review of Geotechnical Report*, PN 95101-79, dated June 20, 2008.

As requested, Earth Systems Southwest [ESSW] has reviewed the comments presented in subject Report Review Checklist and are reiterated below. ESSW presents the following responses to these comments.

*Item #1 – The prior report with field investigation is over one year old. Please comment on the current condition of the site. The consultant should confirm that the previous recommendations meet current standard of practice and 2007 CBC. Updates should be provided to applicable recommendations in conformance with the 2007 CBC.*

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The *minimum* seismic design should comply with the 2007 edition of the California Building Code [CBC]. The CBC provisions are generally intended to protect human life safety and prevent structural collapse. They are not necessarily intended to prevent structural damage or preserve functionality after a large earthquake. Therefore, more stringent seismic design should be considered if a particular level of structural performance is desirable after a large earthquake. That design should be based on a site- and project-specific seismicity analysis. The following are the 2007 CBC seismic design values:

**2007 CBC (ASCE 7-05) Seismic Parameters**

| | | Reference |
|---|---|---|
| Seismic Category: | D | Table 1613.5.6 |
| Seismic Class: | C | Table 1613.5.2 |
| **Maximum Considered Earthquake [MCE] Ground Motion** | | |
| Short Period Spectral Response $S_s$: | 1.52 g | Figure 1613.5 |
| 1 second Spectral Response, $S_1$: | 0.55 g | Figure 1613.5 |
| Site Coefficient, $F_a$: | 1.00 | Table 1613.5.3(1) |
| Site Coefficient, $F_v$: | 1.30 | Table 1613.5.3(2) |
| **Design Earthquake Ground Motion** | | |
| Short Period Spectral Response, $S_{DS}$ | 1.01 g | |
| 1 second Spectral Response, $S_{D1}$ | 0.48 | |

*Item #2 – Please clarify whether the proposed development will have any adverse impact on the road to the north of the subject site.*

The proposed development will not adversely impact the road from a geotechnical viewpoint to the north of the subject site, provided that our recommendations are followed.

*Item #3 – A cut slope up to approximately 30 feet high is depicted westerly of Cross Section E-E'. According to information provided, the slope may have the potential to expose adverse bedding. Please address the stability of the proposed slope and provide slope stability analysis.*

Please see attached new Geologic Section F-F' and associated slope stability analysis, and the Revised Southwest Portion of Figure 2, Boring Location and Geologic Map showing the location of cross section F-F'.

As shown on Geologic Section F-F', the cut-slope will be over-excavated to "exposed" bedding planes will be removed and recompacted as engineered fill; thereby eliminating surcharge bedding plane loads along the lower most driveway wall. The upper proposed shotcrete wall under the temporary cut condition would retain up to about 20 feet of soil. This shotcrete wall should be designed to retain this earth load. Moreover, our stability analysis indicates that the shotcrete wall needs to exert up to about 6,500 lbs/lineal feet lateral thrust to maintain a permanent safety factor of 1.5. Assuming an 8-foot soldier pile spacing and effective moment arm at about 7 feet above to potential failure plane, this computes to a moment demand of 364 feet kips. The soldier pile beam should be sized to resist this potential demand. Specifications for recompaction are given below.

Slopes constructed as fill over cut will necessitate specific grading operations to provide bonding of the fill to the bedrock and to mitigate the possibility of creating a weak plane between the fill and cut that could potentially affect slope stability and provide an avenue for seepage. We recommend that the native soil and bedrock of the Capistrano Formation above bedding planes that project down out of the face of the proposed cut slopes should be removed and replaced with compacted fill. Engineered fill should be benched into firm bedrock with subdrains placed against the backside of the bench.

Reducing should start from the top of the cut. The benches should be a minimum of 4 feet wide and should be bottomed into bedrock. The bottoms of benches should be angled 2 to 3 percent back into the slope. Earth materials exposed on the bottoms of benches should be scarified approximately 8 inches; moisture conditioned to a 120% of optimum, and recompacted to a minimum of 90 percent of maximum dry density. A representative of Earth Systems Southwest should observe benching during grading.

Prior to placement fill, geologic observations by the project engineering geologist should be made to check for unanticipated conditions, and if necessary, make appropriate recommendations for corrections.

Subdrains are recommended for fill over cut slope configurations. Lower slope subdrains should be situated within the lowest elevation bench where drainage by gravity to the outlet zone can be achieved. Backdrain outlets should be spaced at maximum intervals of 100 feet horizontally and 15 feet vertically. Solid outlet pipes should slope at 2% gradients towards the front of the slope.

Fill slopes should be overfilled and trimmed back to compacted material. The final surface of the slopes should be track-walked or grid-rolled to improve the slope resistance to erosion.

Proper slope protection and maintenance should help minimize erosion and improve the stability of the project slopes. All project slopes will require protection and maintenance. Recommendations for slope planting should be provided by a qualified landscape architect. We recommend that erosion control measures, such as planting, erosion control blankets or fabrics, sprayed tackifiers, or some combination of these, be used on all slopes within this project.

It is critical to provide periodic maintenance and repair of all slopes and drainage systems. Drainage system inlets, outlets, and spillways should be periodically inspected and cleaned of soil and debris. Slope plantings and irrigation systems should be maintained. We recommend that all project landscaping be provided with automatic sprinkler shutoffs in order to help prevent over-saturation of slope faces and help mitigate surficial slope instability problems. Leaks in the irrigation system should be fixed immediately. All slopes should be periodically inspected for evidence of cracking, erosion, and rodent infestation. Any problems should be repaired immediately.

*Item #4 – Do the earth pressure parameters provided for design of shoring/retaining walls take into account potential surcharge due to adverse bedding? Please provide additional recommendations if warranted.*

The values provided in the previous reports and letters do take into account the surcharge of adverse bedding. We also used anisotropic strength values for the bedrock in our slope stability calculations. Please see the graph of anisotropic strength values attached to this letter.

*Item #5 – The consultant concludes that the landslide identified by the, CGS does not progress through, or exist in the bedrock but is more surficial in nature, if it does exist. The consultant bases this conclusion on contours of the basal contact of the terrace deposits. Please provide the structural contour map with data points (and logs, if not previously submitted).*

The structure contours of the basal contact were shown on the Revised Figure 2, Boring Location, and Geologic Map provided in the referenced *Response to City of Dana Point Geotechnical Report Review Checklist*, dated May 28, 2008.

*Item #6 – The consultant states in the report dated November 17, 2006 that footings should be "founded either entirely into bedrock or compacted fill". The footings depicted in the current cross sections do not illustrate this recommendation. For example, footings depicted in Cross section D-D' are founded in terrace fill and bedrock materials. Please clarify. Update all cross sections to reflect recommendations.*

As stated in the referenced report dated November 17, 2006, the existing surface soils within the building pad and foundation areas should be over-excavated to the underlying bedrock (Capistrano Formation), trimmed along bedding planes and backfilled with engineered fill to finish pad grade. The over excavation should extend for 5 feet beyond the outer edge of the exterior footings. Please see 2nd revision of Figure 3D, Geologic Section D-D' attached to this response letter. The slope stability calculations for section D-D' provided in the referenced *Response to City of Dana Point Geotechnical Report Review Checklist* shows this recommendation.

We sincerely hope that the above information contained in this response addresses the issues in the 2nd review of the geotechnical report. We appreciate the opportunity to provide our professional services. Please contact our office if there are any questions or comments concerning this geotechnical review.

Respectfully submitted,
**EARTH SYSTEMS SOUTHWEST**

CS for

Carl D. Schrenk
EG 900

Reviewed by,

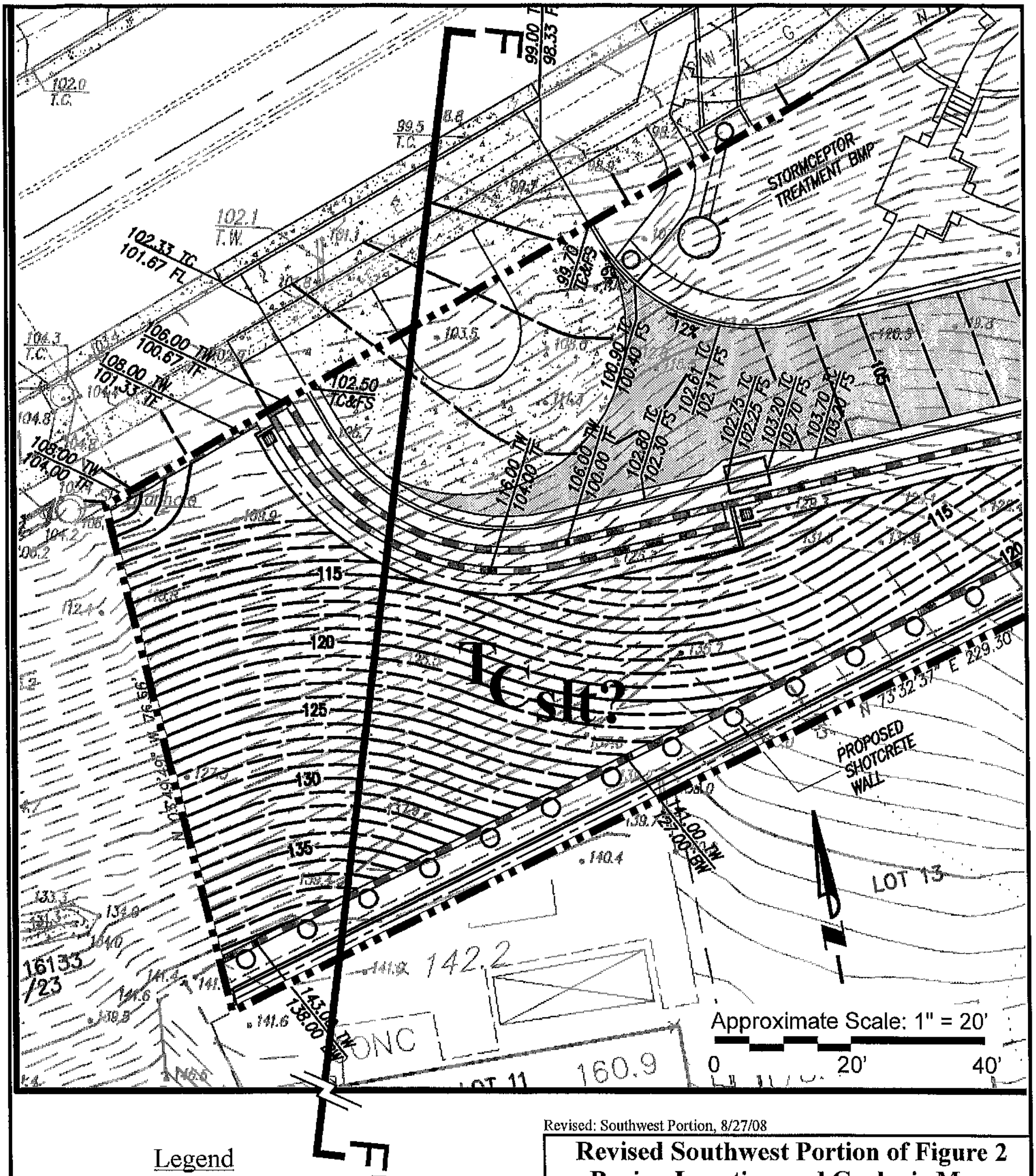
Shelton L. Stringer
GE 2266, EG 2417

Shelton L. Stringer
9/18/08
No. 2266
Exp. 6-30-10

Letter/cms/cds/sls/psh

Distribution: 4/Golden Phoenix Products Corporation
2/BD File
1/SJC File

Attachments: Figure 2 – Boring Location and Geologic Map
Figure 3D – Geologic Section D-D'
Figure 3F – Geologic Section F-F'
Stability Analysis (2)
Anisotropic Strength Graph



Revised: Southwest Portion, 8/27/08

## Revised Southwest Portion of Figure 2 Boring Location and Geologic Map

South of Via Canon & Camino Capistrano
Dana Point, California

**Earth Systems**
**Southwest**

| 11/17/06 | File No.: 10123-02 |
|---|---|

Legend

| | |
|---|---|
| $Tc_{slt}$ | Tertiary Capistrano Formation Siltstone Member, circled where buried, queried where uncertain |
| [ | Location of Section |

# 10123-02; Via Canon, Proposed Section FF'; Static

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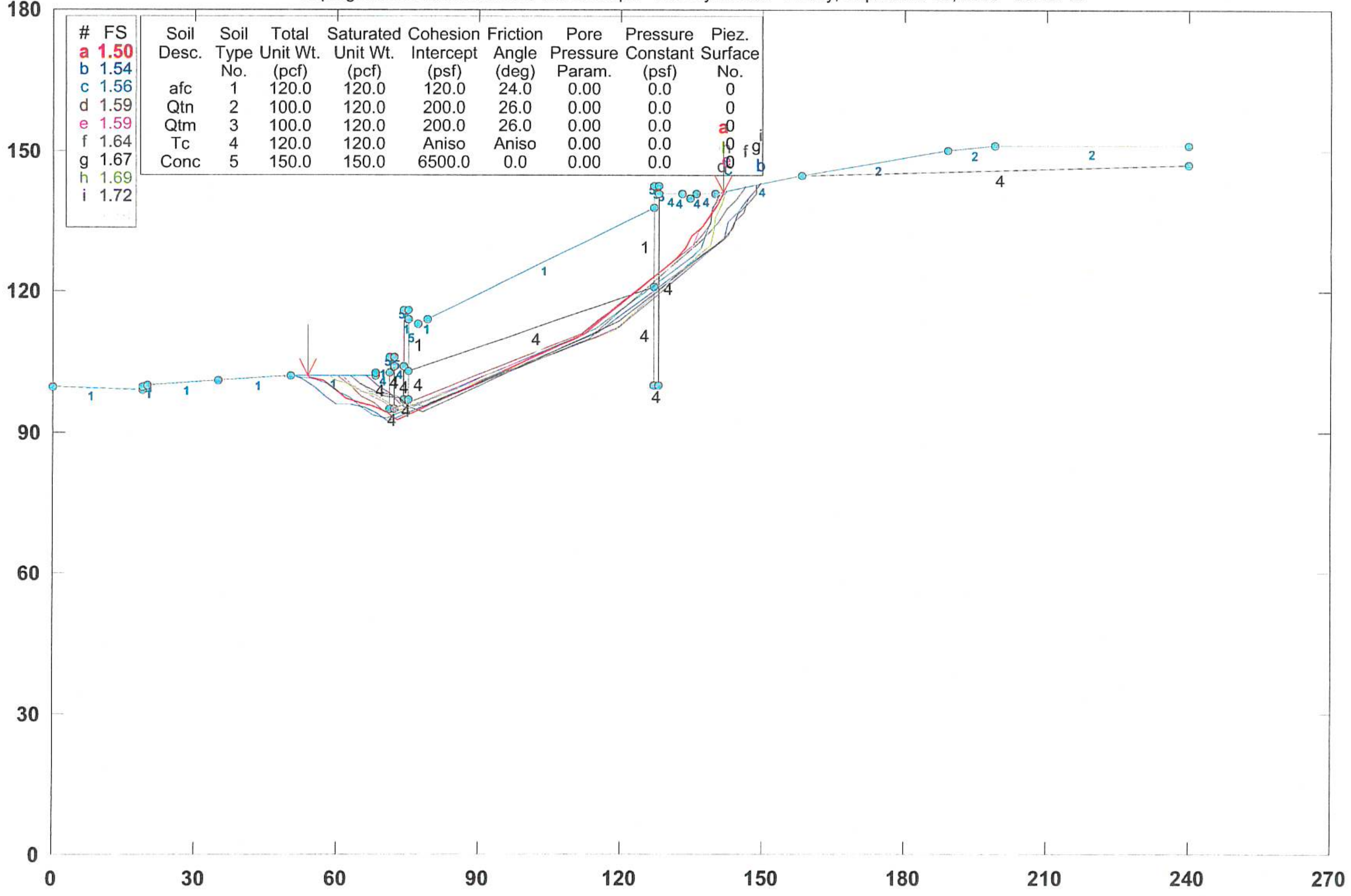

| # | FS |
|---|---|
| a | 1.50 |
| b | 1.54 |
| c | 1.56 |
| d | 1.59 |
| e | 1.59 |
| f | 1.64 |
| g | 1.67 |
| h | 1.69 |
| i | 1.72 |

| Soil Desc. | Soil Type No. | Total Unit Wt. (pcf) | Saturated Unit Wt. (pcf) | Cohesion Intercept (psf) | Friction Angle (deg) | Pore Pressure Param. | Pressure Constant (psf) | Piez. Surface No. |
|---|---|---|---|---|---|---|---|---|
| afc | 1 | 120.0 | 120.0 | 120.0 | 24.0 | 0.00 | 0.0 | 0 |
| Qtn | 2 | 100.0 | 120.0 | 200.0 | 26.0 | 0.00 | 0.0 | 0 |
| Qtm | 3 | 100.0 | 120.0 | 200.0 | 26.0 | 0.00 | 0.0 | 0 |
| Tc | 4 | 120.0 | 120.0 | Aniso | Aniso | 0.00 | 0.0 | 0 |
| Conc | 5 | 150.0 | 150.0 | 6500.0 | 0.0 | 0.00 | 0.0 | 0 |

STABL6H FSmin=1.50

Safety Factors Are Calculated By The Modified Janbu Method

**Earth Systems**
**Southwest**

## 10123-02; Via Canon, Proposed Section FF'; Pseudostatic

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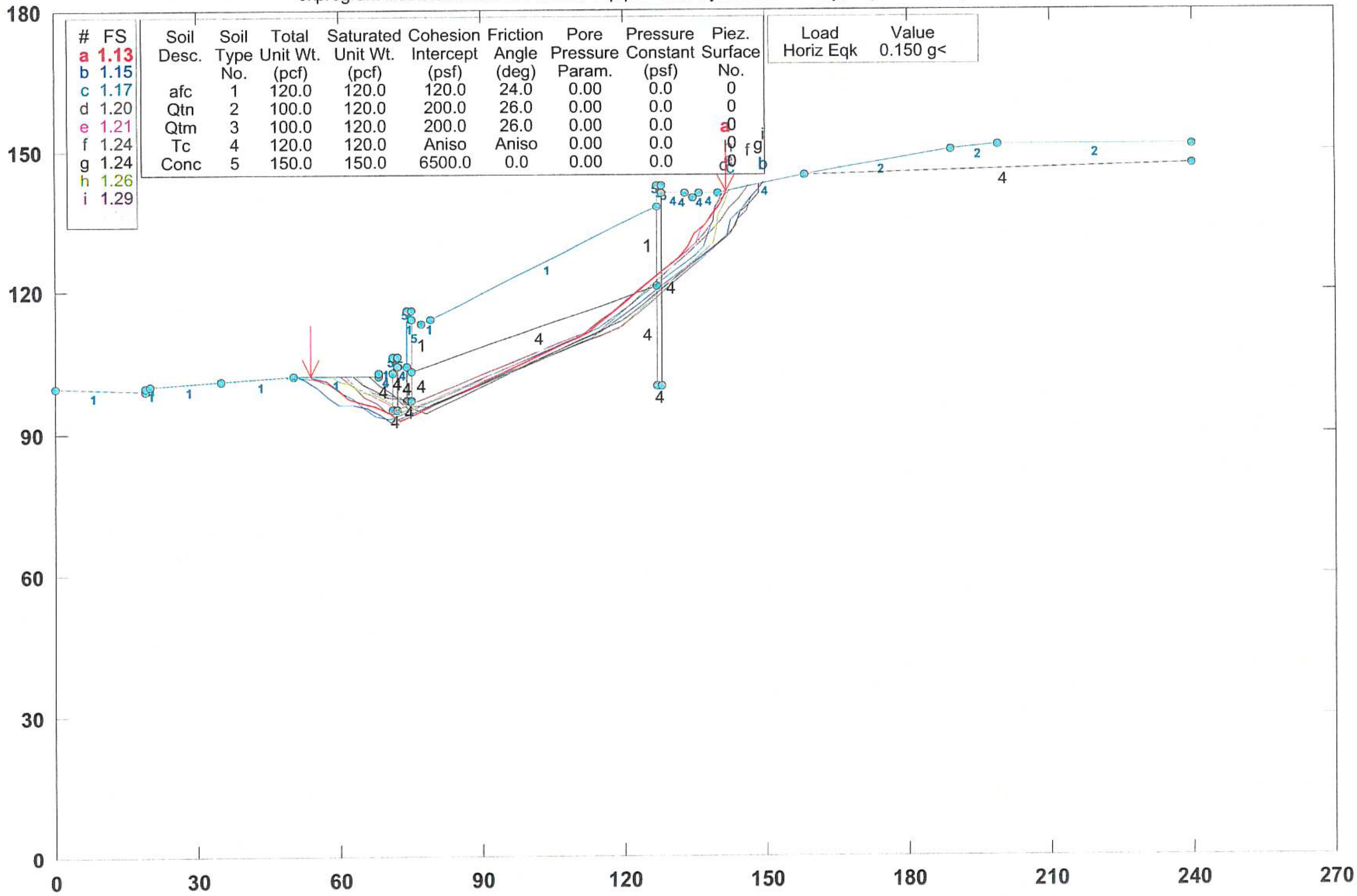


| # | FS |
|---|---|
| a | 1.13 |
| b | 1.15 |
| c | 1.17 |
| d | 1.20 |
| e | 1.21 |
| f | 1.24 |
| g | 1.24 |
| h | 1.26 |
| i | 1.29 |

| Soil Desc. | Soil Type No. | Total Unit Wt. (pcf) | Saturated Unit Wt. (pcf) | Cohesion Intercept (psf) | Friction Angle (deg) | Pore Pressure Param. | Pressure Constant (psf) | Piez. Surface No. |
|---|---|---|---|---|---|---|---|---|
| afc | 1 | 120.0 | 120.0 | 120.0 | 24.0 | 0.00 | 0.0 | 0 |
| Qtn | 2 | 100.0 | 120.0 | 200.0 | 26.0 | 0.00 | 0.0 | 0 |
| Qtm | 3 | 100.0 | 120.0 | 200.0 | 26.0 | 0.00 | 0.0 | 0 |
| Tc | 4 | 120.0 | 120.0 | Aniso | Aniso | 0.00 | 0.0 | 0 |
| Conc | 5 | 150.0 | 150.0 | 6500.0 | 0.0 | 0.00 | 0.0 | 0 |

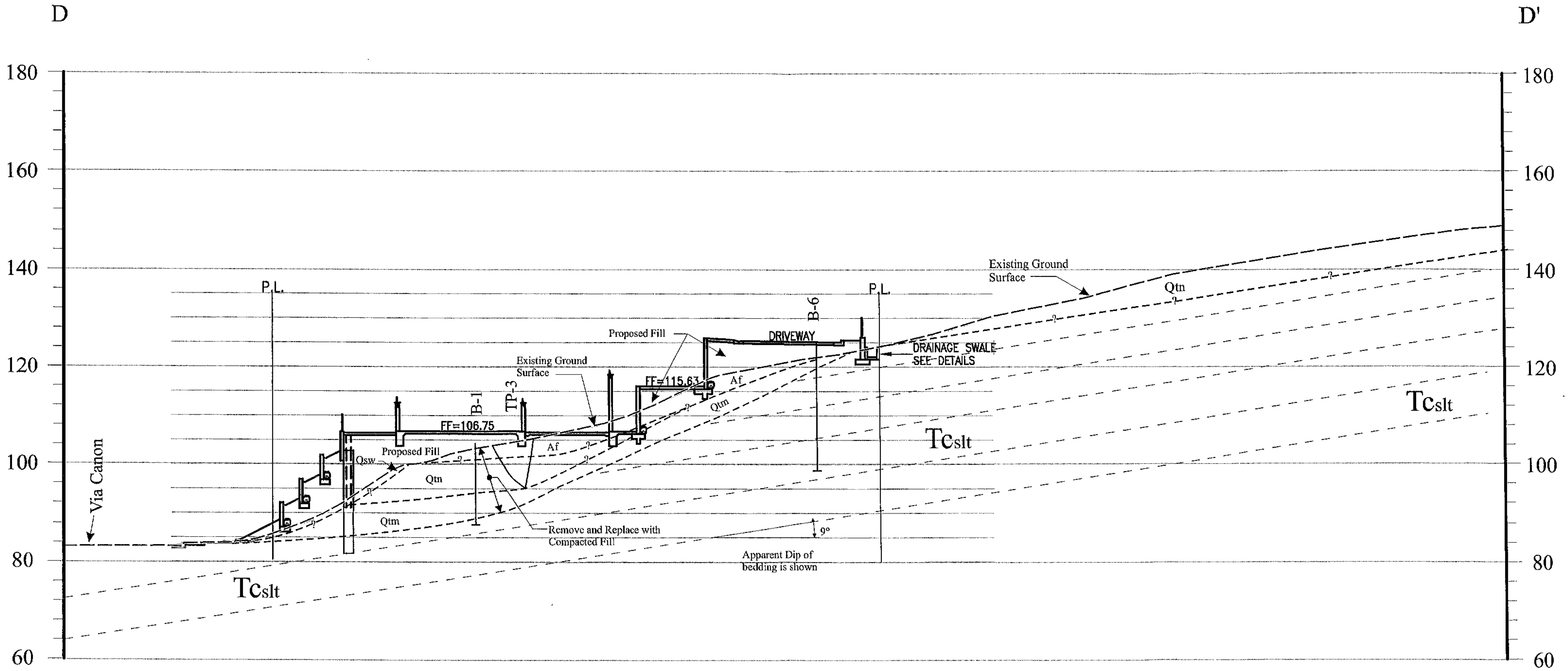
| Load | Value |
|---|---|
| Horiz Eqk | 0.150 g< |

STABL6H FSmin=1.13

Safety Factors Are Calculated By The Modified Janbu Method

**Earth Systems**
Southwest

Reference: Toal Engineering
Sections, Profiles & Details
Lot 8, Tract 16133
Job 12407
Sheet 3 of 4



## Legend

| | |
|---|---|
| Af | Documented fill |
| Afu | Undocumented fill |
| Qtn | Quaternary Nonmarine Terrace |
| Qtm | Quaternary Marine Terrace |
| Qsw | Slopewash |

HORIZONTAL = VERTICAL
Approximate Scale: 1" = 20'
0 20' 40'

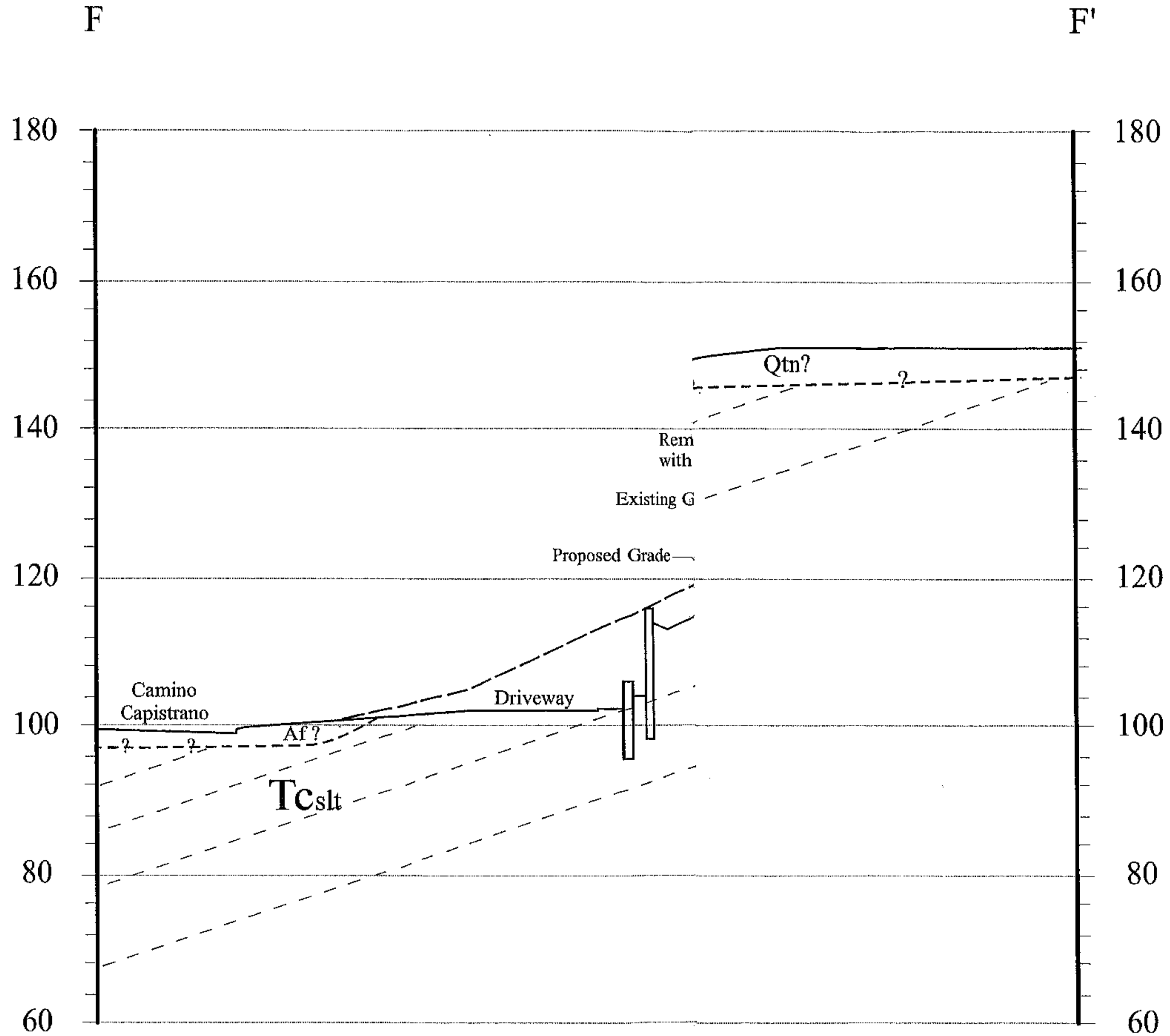
Revised: 8/27/08

**Figure 3D**
**Geologic Section D-D'**

South of Via Canon and Camino Capistrano
Dana Point, California

Earth Systems
Southwest

11/17/06 File No.: 10123-02



Se

HORIZONTAL = VERTICAL
Approximate Scale: 1" = 20'

0 20' 40'

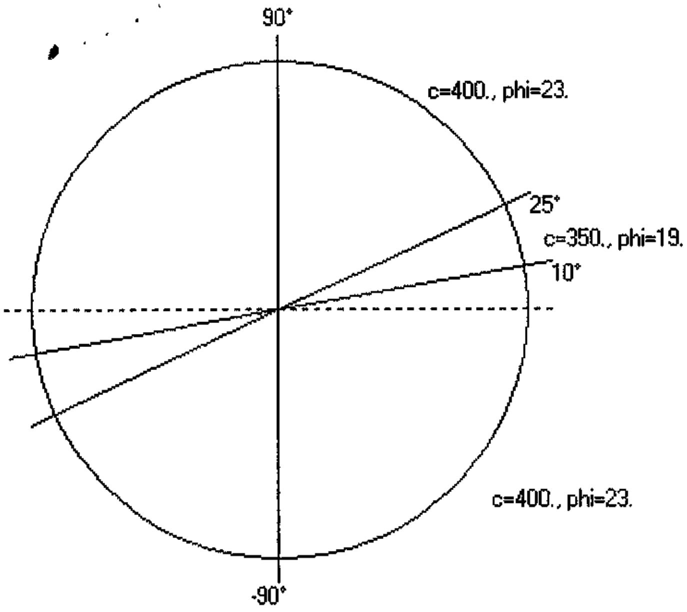
## Figure 3F
## Geologic Section F-F'

South of Via Canon and Camino Capistrano
Dana Point, California

**Earth Systems**
**Southwest**

| | |
|---|---|
| 08/27/08 | File No.: 10123-02 |

# Anisotropic Soil Definition



Soil4

10123-02; Via Canon, Proposed

**Earth Systems**
Southwest

27126B Paseo Espada, Suite 704
San Juan Capistrano, California 92675
(949) 248-9005
FAX (949) 248-9016

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SEP [illegible] 2008
CITY OF DANA POINT
COMMUNITY DEVELOPMENT
DEPARTMENT

August 27, 2008

File No.: 10123-02
Doc. No.: 08-08-795

Golden Phoenix Products Corporation
P.O. Box 4227
Dana Point, California 92629

Attention: Mr. Ken Miller

Subject: **Response to City of Dana Point, 2nd Review of Geotechnical Report**

Project: **Proposed Multi-Family Residential Development**
South of Via Cannon and Camino Capistrano
Dana Point, California

References:

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| | | Reference |
|---|---|---|
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| Seismic Class: | C | Table 1613.5.2 |
| **Maximum Considered Earthquake [MCE] Ground Motion** | | |
| Short Period Spectral Response $S_s$: | 1.52 g | Figure 1613.5 |
| 1 second Spectral Response, $S_1$: | 0.55 g | Figure 1613.5 |
| Site Coefficient, $F_a$: | 1.00 | Table 1613.5.3(1) |
| Site Coefficient, $F_v$: | 1.30 | Table 1613.5.3(2) |
| **Design Earthquake Ground Motion** | | |
| Short Period Spectral Response, $S_{DS}$ | 1.01 g | |
| 1 second Spectral Response, $S_{D1}$ | 0.48 | |

*Item #2 – Please clarify whether the proposed development will have any adverse impact on the road to the north of the subject site.*

The proposed development will not adversely impact the road from a geotechnical viewpoint to the north of the subject site, provided that our recommendations are followed.

*Item #3 – A cut slope up to approximately 30 feet high is depicted westerly of Cross Section E-E'. According to information provided, the slope may have the potential to expose adverse bedding. Please address the stability of the proposed slope and provide slope stability analysis.*

Please see attached new Geologic Section F-F' and associated slope stability analysis, and the Revised Southwest Portion of Figure 2, Boring Location and Geologic Map showing the location of cross section F-F'.

As shown on Geologic Section F-F', the cut-slope will be over-excavated to "exposed" bedding planes will be removed and recompacted as engineered fill; thereby eliminating surcharge bedding plane loads along the lower most driveway wall. The upper proposed shotcrete wall under the temporary cut condition would retain up to about 20 feet of soil. This shotcrete wall should be designed to retain this earth load. Moreover, our stability analysis indicates that the shotcrete wall needs to exert up to about 6,500 lbs/lineal feet lateral thrust to maintain a permanent safety factor of 1.5. Assuming an 8-foot soldier pile spacing and effective moment arm at about 7 feet above to potential failure plane, this computes to a moment demand of 364 feet kips. The soldier pile beam should be sized to resist this potential demand. Specifications for recompaction are given below.

Slopes constructed as fill over cut will necessitate specific grading operations to provide bonding of the fill to the bedrock and to mitigate the possibility of creating a weak plane between the fill and cut that could potentially affect slope stability and provide an avenue for seepage. We recommend that the native soil and bedrock of the Capistrano Formation above bedding planes that project down out of the face of the proposed cut slopes should be removed and replaced with compacted fill. Engineered fill should be benched into firm bedrock with subdrains placed against the backside of the bench.

Reducing should start from the top of the cut. The benches should be a minimum of 4 feet wide and should be bottomed into bedrock. The bottoms of benches should be angled 2 to 3 percent back into the slope. Earth materials exposed on the bottoms of benches should be scarified approximately 8 inches; moisture conditioned to a 120% of optimum, and recompacted to a minimum of 90 percent of maximum dry density. A representative of Earth Systems Southwest should observe benching during grading.

Prior to placement fill, geologic observations by the project engineering geologist should be made to check for unanticipated conditions, and if necessary, make appropriate recommendations for corrections.

Subdrains are recommended for fill over cut slope configurations. Lower slope subdrains should be situated within the lowest elevation bench where drainage by gravity to the outlet zone can be achieved. Backdrain outlets should be spaced at maximum intervals of 100 feet horizontally and 15 feet vertically. Solid outlet pipes should slope at 2% gradients towards the front of the slope.

Fill slopes should be overfilled and trimmed back to compacted material. The final surface of the slopes should be track-walked or grid-rolled to improve the slope resistance to erosion.

Proper slope protection and maintenance should help minimize erosion and improve the stability of the project slopes. All project slopes will require protection and maintenance. Recommendations for slope planting should be provided by a qualified landscape architect. We recommend that erosion control measures, such as planting, erosion control blankets or fabrics, sprayed tackifiers, or some combination of these, be used on all slopes within this project.

It is critical to provide periodic maintenance and repair of all slopes and drainage systems. Drainage system inlets, outlets, and spillways should be periodically inspected and cleaned of soil and debris. Slope plantings and irrigation systems should be maintained. We recommend that all project landscaping be provided with automatic sprinkler shutoffs in order to help prevent over-saturation of slope faces and help mitigate surficial slope instability problems. Leaks in the irrigation system should be fixed immediately. All slopes should be periodically inspected for evidence of cracking, erosion, and rodent infestation. Any problems should be repaired immediately.

*Item #4 – Do the earth pressure parameters provided for design of shoring/retaining walls take into account potential surcharge due to adverse bedding? Please provide additional recommendations if warranted.*

The values provided in the previous reports and letters do take into account the surcharge of adverse bedding. We also used anisotropic strength values for the bedrock in our slope stability calculations. Please see the graph of anisotropic strength values attached to this letter.

*Item #5 – The consultant concludes that the landslide identified by the, CGS does not progress through, or exist in the bedrock but is more surficial in nature, if it does exist. The consultant bases this conclusion on contours of the basal contact of the terrace deposits. Please provide the structural contour map with data points (and logs, if not previously submitted).*

The structure contours of the basal contact were shown on the Revised Figure 2, Boring Location, and Geologic Map provided in the referenced *Response to City of Dana Point Geotechnical Report Review Checklist*, dated May 28, 2008.

*Item #6 – The consultant states in the report dated November 17, 2006 that footings should be "founded either entirely into bedrock or compacted fill". The footings depicted in the current cross sections do not illustrate this recommendation. For example, footings depicted in Cross section D-D' are founded in terrace fill and bedrock materials. Please clarify. Update all cross sections to reflect recommendations.*

As stated in the referenced report dated November 17, 2006, the existing surface soils within the building pad and foundation areas should be over-excavated to the underlying bedrock (Capistrano Formation), trimmed along bedding planes and backfilled with engineered fill to finish pad grade. The over excavation should extend for 5 feet beyond the outer edge of the exterior footings. Please see 2nd revision of Figure 3D, Geologic Section D-D' attached to this response letter. The slope stability calculations for section D-D' provided in the referenced *Response to City of Dana Point Geotechnical Report Review Checklist* shows this recommendation.

We sincerely hope that the above information contained in this response addresses the issues in the 2nd review of the geotechnical report. We appreciate the opportunity to provide our professional services. Please contact our office if there are any questions or comments concerning this geotechnical review.

Respectfully submitted,
**EARTH SYSTEMS SOUTHWEST**

CS for

Carl D. Schrenk
EG 900

Reviewed by,

Shelton L Stringer

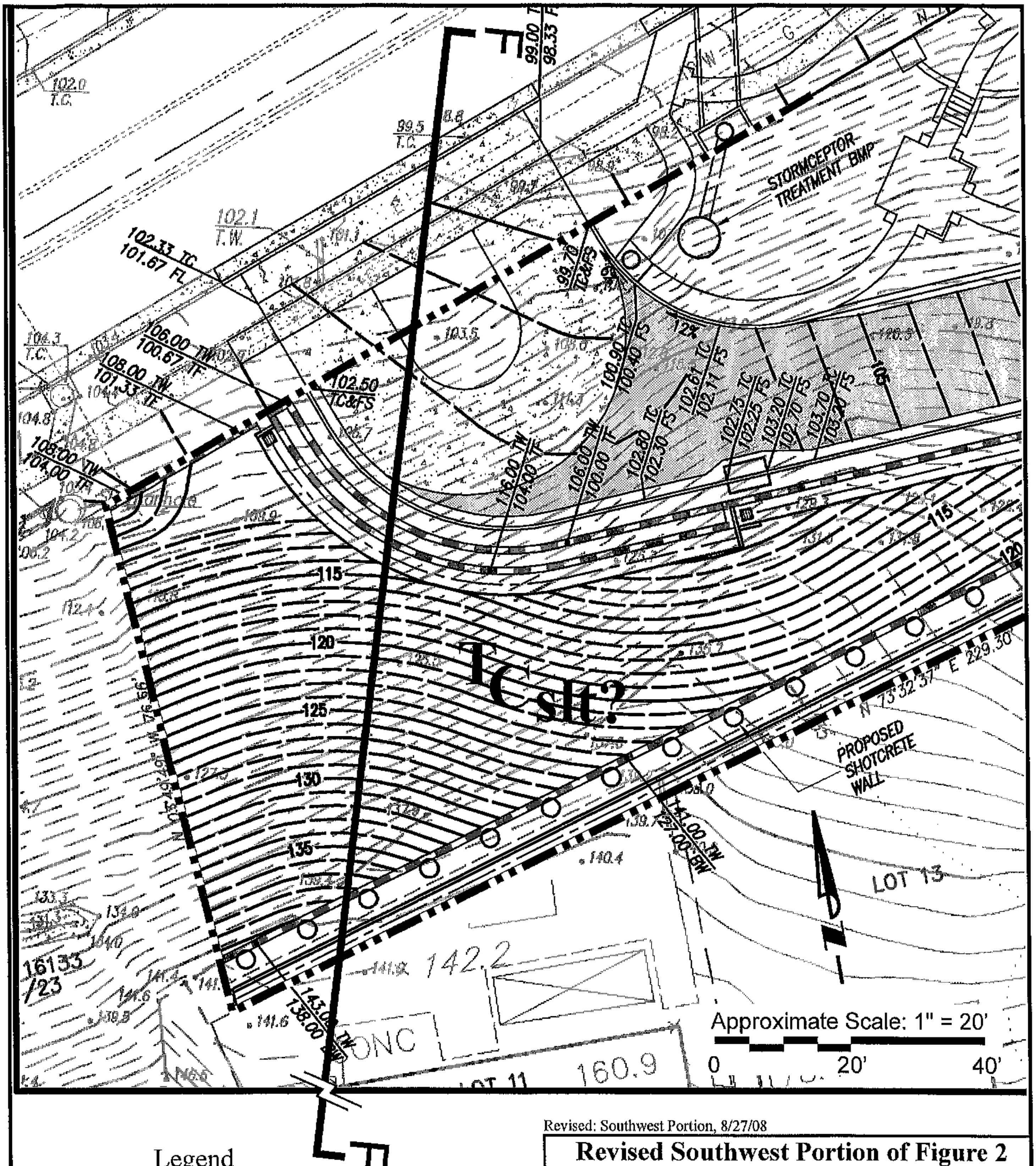
Shelton L. Stringer
GE 2266, EG 2417

Shelton L. Stringer
9/18/08
No. 2266
Exp. 6-30-10

Letter/cms/cds/sls/psh

Distribution: 4/Golden Phoenix Products Corporation
2/BD File
1/SJC File

Attachments: Figure 2 – Boring Location and Geologic Map
Figure 3D – Geologic Section D-D'
Figure 3F – Geologic Section F-F'
Stability Analysis (2)
Anisotropic Strength Graph



## Legend

Tc$_{slt}$ Tertiary Capistrano Formation Siltstone Member, circled where buried, queried where uncertain

Location of Section

Revised: Southwest Portion, 8/27/08

## Revised Southwest Portion of Figure 2
## Boring Location and Geologic Map

South of Via Canon & Camino Capistrano
Dana Point, California

**Earth Systems**
**Southwest**

| | |
|---|---|
| 11/17/06 | File No.: 10123-02 |

# 10123-02; Via Canon, Proposed Section FF'; Static

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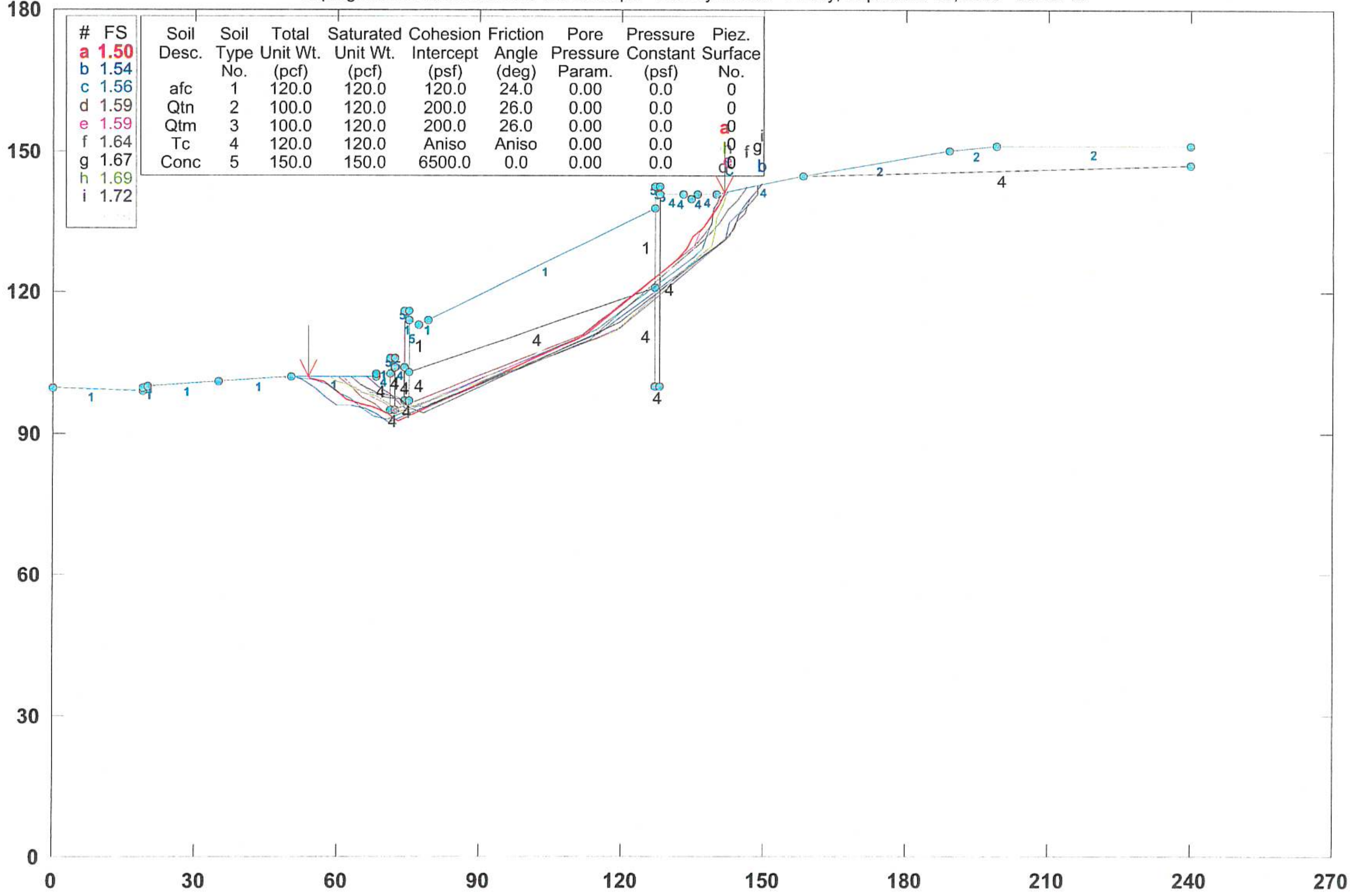

| # | FS |
|---|---|
| a | 1.50 |
| b | 1.54 |
| c | 1.56 |
| d | 1.59 |
| e | 1.59 |
| f | 1.64 |
| g | 1.67 |
| h | 1.69 |
| i | 1.72 |

| Soil Desc. | Soil Type No. | Total Unit Wt. (pcf) | Saturated Unit Wt. (pcf) | Cohesion Intercept (psf) | Friction Angle (deg) | Pore Pressure Param. | Pressure Constant (psf) | Piez. Surface No. |
|---|---|---|---|---|---|---|---|---|
| afc | 1 | 120.0 | 120.0 | 120.0 | 24.0 | 0.00 | 0.0 | 0 |
| Qtn | 2 | 100.0 | 120.0 | 200.0 | 26.0 | 0.00 | 0.0 | 0 |
| Qtm | 3 | 100.0 | 120.0 | 200.0 | 26.0 | 0.00 | 0.0 | 0 |
| Tc | 4 | 120.0 | 120.0 | Aniso | Aniso | 0.00 | 0.0 | 0 |
| Conc | 5 | 150.0 | 150.0 | 6500.0 | 0.0 | 0.00 | 0.0 | 0 |

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Safety Factors Are Calculated By The Modified Janbu Method

**Earth Systems**
**Southwest**

## 10123-02; Via Canon, Proposed Section FF'; Pseudostatic

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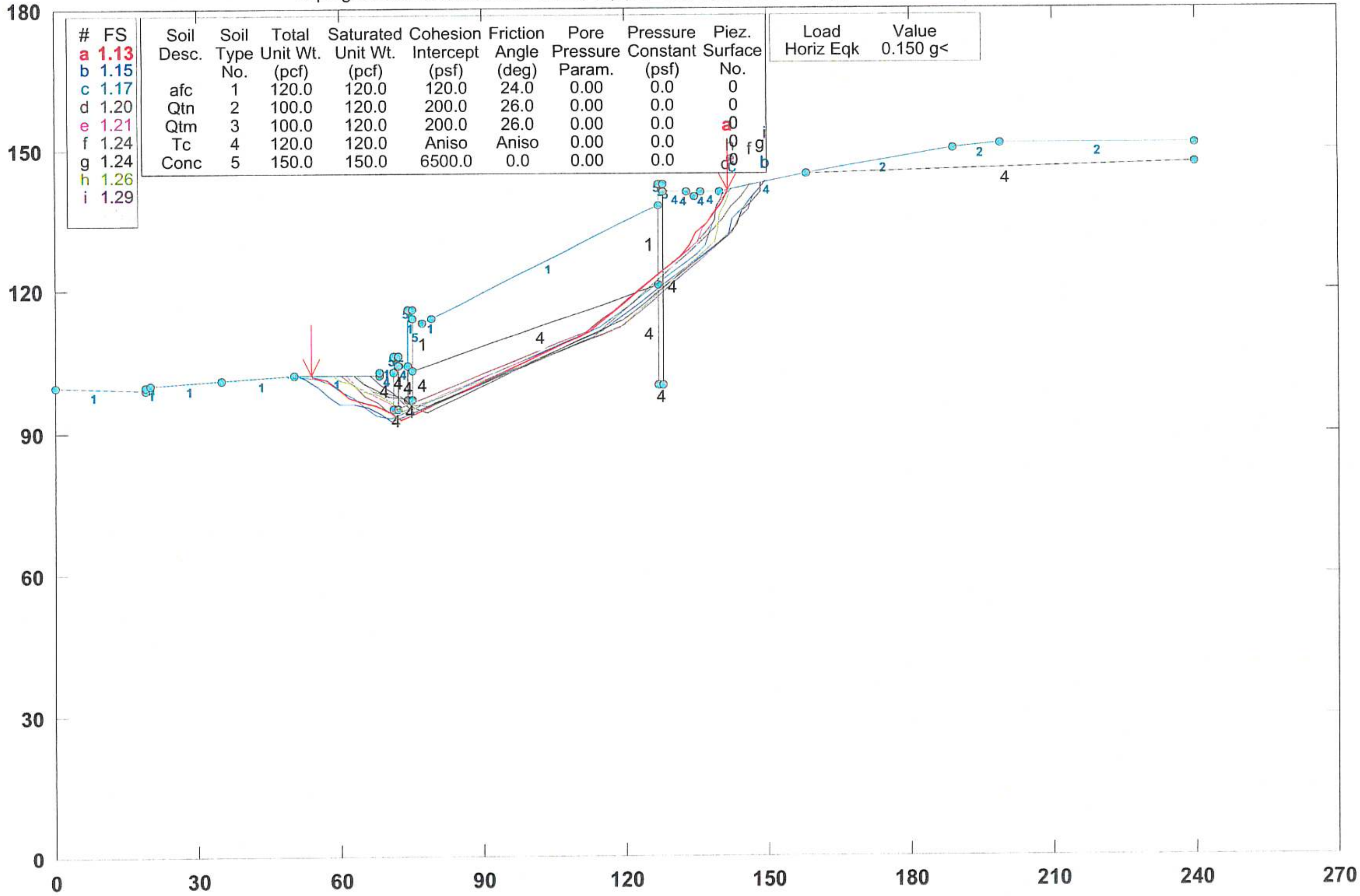


| # | FS |
|---|---|
| a | 1.13 |
| b | 1.15 |
| c | 1.17 |
| d | 1.20 |
| e | 1.21 |
| f | 1.24 |
| g | 1.24 |
| h | 1.26 |
| i | 1.29 |

| Soil Desc. | Soil Type No. | Total Unit Wt. (pcf) | Saturated Unit Wt. (pcf) | Cohesion Intercept (psf) | Friction Angle (deg) | Pore Pressure Param. | Pressure Constant (psf) | Piez. Surface No. |
|---|---|---|---|---|---|---|---|---|
| afc | 1 | 120.0 | 120.0 | 120.0 | 24.0 | 0.00 | 0.0 | 0 |
| Qtn | 2 | 100.0 | 120.0 | 200.0 | 26.0 | 0.00 | 0.0 | 0 |
| Qtm | 3 | 100.0 | 120.0 | 200.0 | 26.0 | 0.00 | 0.0 | 0 |
| Tc | 4 | 120.0 | 120.0 | Aniso | Aniso | 0.00 | 0.0 | 0 |
| Conc | 5 | 150.0 | 150.0 | 6500.0 | 0.0 | 0.00 | 0.0 | 0 |

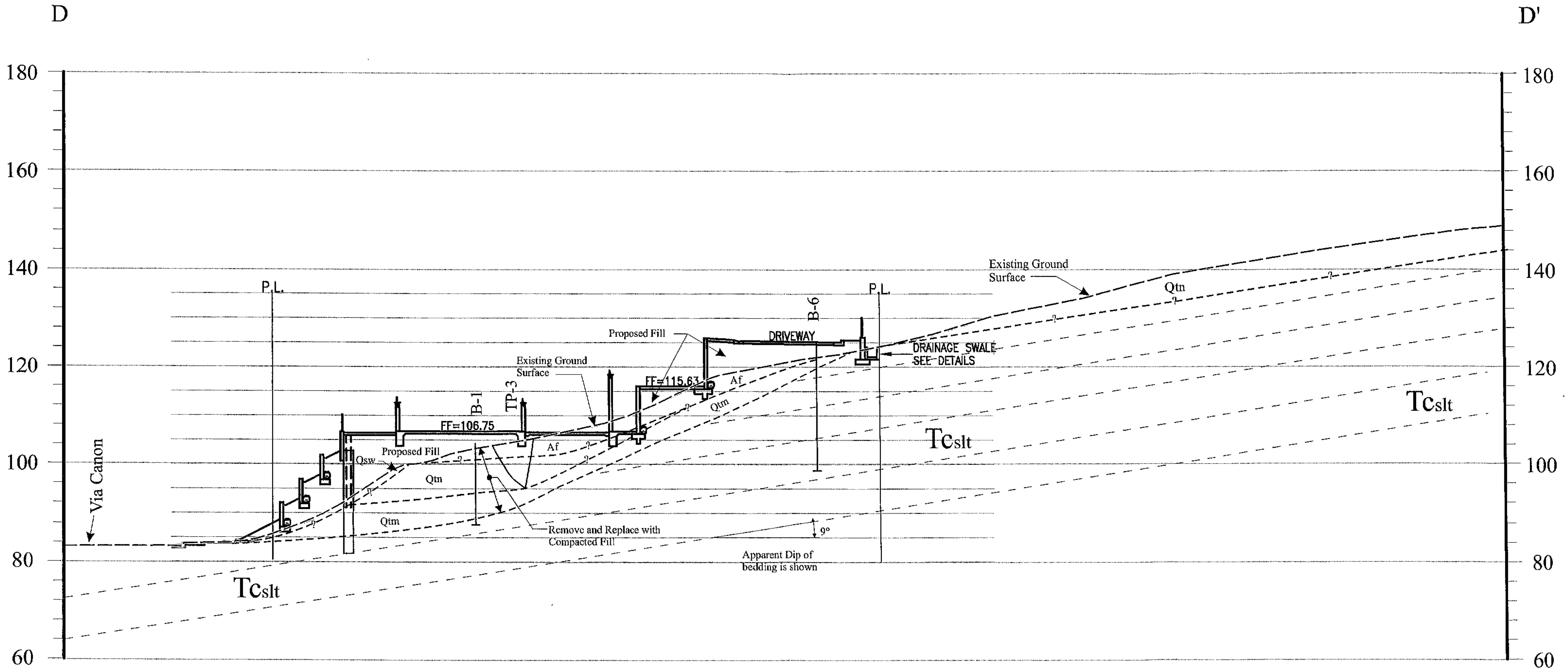
| Load | Value |
|---|---|
| Horiz Eqk | 0.150 g< |

STABL6H FSmin=1.13

Safety Factors Are Calculated By The Modified Janbu Method

Earth Systems
Southwest

Reference: Toal Engineering
Sections, Profiles & Details
Lot 8, Tract 16133
Job 12407
Sheet 3 of 4



## Legend

| | |
|---|---|
| Af | Documented fill |
| Afu | Undocumented fill |
| Qtn | Quaternary Nonmarine Terrace |
| Qtm | Quaternary Marine Terrace |
| Qsw | Slopewash |

HORIZONTAL = VERTICAL
Approximate Scale: 1" = 20'
0 20' 40'

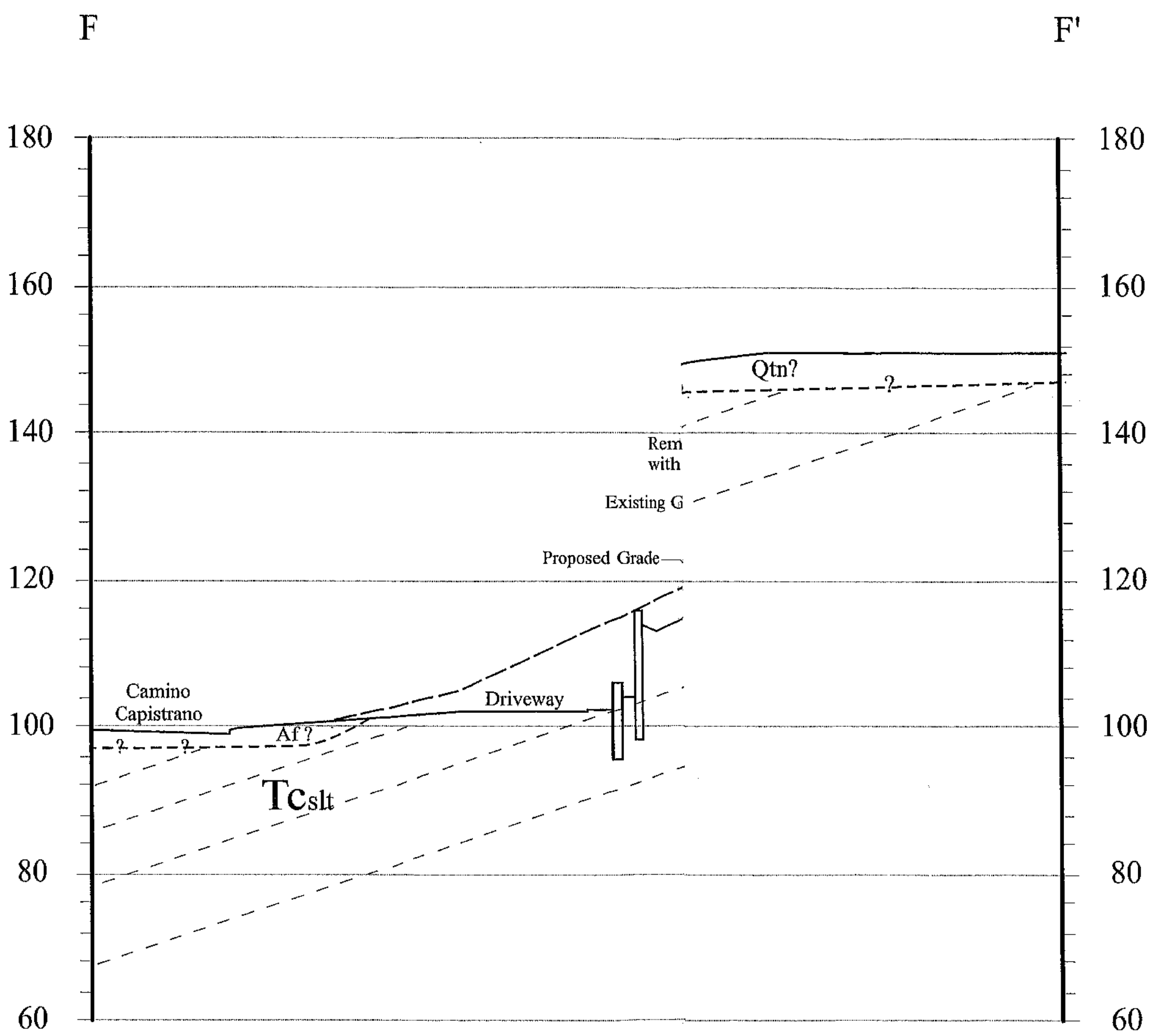
Revised: 8/27/08

**Figure 3D**
**Geologic Section D-D'**

South of Via Canon and Camino Capistrano
Dana Point, California

Earth Systems
Southwest

11/17/06 File No.: 10123-02



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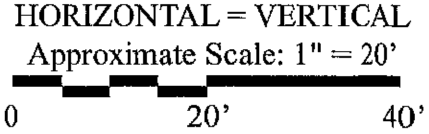


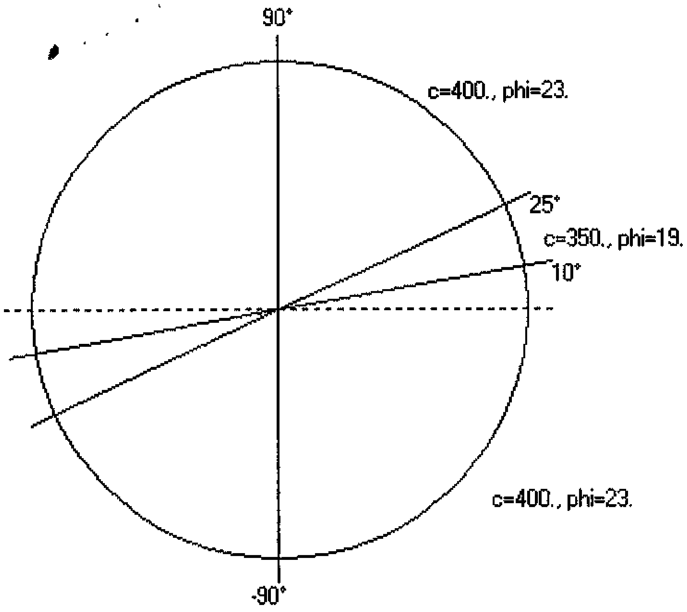
## Figure 3F
## Geologic Section F-F'

South of Via Canon and Camino Capistrano
Dana Point, California

**Earth Systems**
**Southwest**

| | |
|---|---|
| 08/27/08 | File No.: 10123-02 |

# Anisotropic Soil Definition



Soil4

10123-02; Via Canon, Proposed