Appendix D
Geotechnical Investigations & Responses to Comments

STONEY-MILLER CONSULTANTS, INC

GEOTECHNICAL ENGINEERING & ENGINEERING GEOLOGY

FEASIBILITY INVESTIGATION/REVIEW OF 50-SCALE MAP
SUNPOINTE, TENTATIVE TRACT 17433
COLINAS SUR, LAGUNA NIGUEL, CALIFORNIA

VOLUME 1 OF 3
Text, Maps and Appendices A through D

For

Euland Capital Enterprises
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By

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October 9, 2014
(Revised February 17, 2015)

Project No: 13662-05
Report No: 14-13813R

STONEY-MILLER CONSULTANTS, INC

GEOTECHNICAL ENGINEERING & ENGINEERING GEOLOGY

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STONEY-MILLER CONSULTANTS, INC

GEOTECHNICAL ENGINEERING & ENGINEERING GEOLOGY

October 9, 2014
(Revised February 17, 2015)

Euland Capital Enterprises
59 Honeyflower
Irvine, California 92620-3327

Project No: 13662-05
Report No: 14-13813R

Attention: Mr. David Shieh

Subject: **Feasibility Geotechnical Investigation**
Review of 50-Scale Site Layout Plan
SunPointe, Tentative Tract 17433
Colinas Sur, Laguna Niguel, California

Dear Mr. Shieh:

This revised report presents the results of our feasibility geotechnical investigation and review of the 50-scale map for the proposed residential home site development of the previously graded project, Tract 5241, Colinas Sur, located in the City of Laguna Niguel, Orange County, California. The purpose of this feasibility geotechnical investigation was to determine how geologic conditions would affect current site development plans and preparation of grading plans. Specific objectives for this study include reviewing the revised 50-scale Site Study Layout Plan prepared by Hunsaker & Associates, plot dated January 8, 2015, to assess overall gross static and seismic stability of the site for the planned development, and to provide feasibility level recommendations for site grading and drainage, enhancing slope and lot stability, and retaining wall design. Final design of the site grading, drainage, buttress and stabilization fills, concrete piers at top of slope, and Verdura-type walls will be required as final rough grading, precise grading, wall and foundation plans are developed.

SITE DESCRIPTION

The site is located within the low-lying foothills along the eastern side of the San Joaquin Hills in Laguna Niguel, California. The geographic and topographic relationship of the site to the surrounding area is shown on the Site Location Map, Figure 1, and the Aerial Photograph, Figure 2.

Specifically, the project site is an irregular-shaped parcel consisting of 35 previously graded residential lots and street improvements located southwest of Avery Parkway and Interstate 5. The subject tract was originally graded during the 1960's with utilities placed and streets paved. More recently, the regrading of Lots 1-21 and 24-35 was performed during the period between early February, 1982, and the latter part of May, 1982. Previously graded streets located within

the site consist of Avenida del Caballo, Remolino Lejos Road, Calle de Cambio, Mar Bizcocho Road, and Hombre de Guerra Road. The site is situated on an east-facing hillside with moderate relief. Surface elevations onsite range from approximately 250 feet to 455 feet above mean sea level. The site is bounded on the south by a slope descending to Rancho Capistrano; on the north by an existing residential development, through which access to the site is provided by existing street improvements for Avenida del Caballo; on the west by a natural slope which ascends at an approximate slope ratio of 2.2:1 (horizontal:vertical) to the prominent, generally north-south trending ridgeline near the boundary of the adjacent Tract 10726; and on the east by the Mercedes Benz of Laguna Niguel facility.

PROPOSED DEVELOPMENT

The revised 50-scale Site Study Layout Plan for Tentative Tract 17433, plot dated January 8, 2015, prepared by Hunsaker and Associates, Inc., forms the basis of our review and has been utilized as the base map for our Geologic and Geotechnical Maps, Plates 1R and 2R, respectively. The plans are shown at 1-inch equals 40 feet on our revised plans and cross sections (Plates 3R to 6R) to facilitate comparison with previous work.

The plan shows 71 building units separated into six pad areas, with the site configuration accommodated by graded slopes, and mechanically stabilized Verdura earth walls. Earth walls are limited to a maximum height of 26 feet. The finished site is to be achieved using manufactured slopes constructed at ratio of 2:1 (horizontal to vertical) or flatter. It is our understanding that the existing alignment of the streets is to be generally maintained, but that changes have been made to allow for different lot configurations. Plans call for the complete removal of all existing improvements and existing artificial fill soils, and re-grading of the site to facilitate slope stabilization and lot development. Building clusters are shown on the plans, with four different building configurations. Buildings are planned to be two-story constructed on a single pad level. Conventional shallow foundations in combination with conventional or post-tensioned slabs are envisioned for support of the buildings.

The conclusions and recommendations of this report are considered feasibility level in that the primary goal of this work is to demonstrate that the planned site configuration, including pad, wall and slope grades, is grossly stable under static and required seismic load conditions. Gross site stability is achieved with site grading, subdrainage, and planned retaining wall elements to provide local stability and mitigate post-construction deformations. Control and maintenance of groundwater levels beneath the site are also a stipulation for development. Annual monitoring and maintenance of groundwater monitoring wells and in-place groundwater reducing elements will be required to maintain gross stability of the site. It is our opinion that the proposed grading and wall construction is feasible from a geotechnical standpoint, provided development plans take into account the appropriate geotechnical engineering recommendations contained herein. It is essential that future development plans, including rough grading, precise grading, building, foundation, and retaining wall plans be reviewed by our office to assess whether individual lot

improvements are consistent with the onsite geotechnical conditions and the recommendations of this report.

AUTHORIZATION

The scope of work as presented in our Proposal No. S123824C-1, dated April 8, 2014, was authorized by Mr. David Shieh with Euland Capital Enterprises.

SCOPE OF SERVICES

The scope of services provided by Stoney-Miller Consultants, Inc., during the geotechnical investigation and review of the Site Study Layout Plan for tentative tract 17433 included the following:

a. Review of previous geologic, geotechnical engineering and seismological reports and maps pertinent to the subject site (see Appendix A, References).

b. Previously unreported subsurface exploration from 2004, which consisted of the excavation, logging, and sampling of: two 105-feet deep, large-diameter bucket auger borings; two 251-feet deep, small-diameter rotary-wash borings; and five relatively shallow, backhoe-excavated exploratory test pits. The Key to Logs and Logs of the borings and test pits are presented in revised Appendix B, and their approximate locations are shown on the Geologic Map, Plate 1R.

c. Compilation of logs from previous borings and cone penetration testing used in our interpretation of earth materials and groundwater conditions at the subject site are also included in revised Appendix B in approximate reverse chronological order.

d. Observation, monitoring, and testing of five groundwater monitoring wells and four hydraugers over a time period of about two years. The location of the groundwater wells and hydraugers are shown on the Geologic and Geotechnical Maps, Plates 1R and 2R. Monitoring and testing data for these elements are provided in Appendix F.

e. Site reconnaissance of existing site conditions.

f. Laboratory testing of bulk and relatively undisturbed soil samples considered representative of subsurface conditions.

g. Preparation of geotechnical illustrations, including the revised Geologic and Geotechnical Maps, Cross-Sections, and Details, which accompany this report.

h. Geotechnical engineering and geologic analyses of field and laboratory data, including extensive slope stability analyses presented in Appendix E.

i. Preparation of this report presenting our findings, conclusions, and recommendations with respect to the 50-scale Site Study Layout Plans.

EXECUTIVE SUMMARY

Our conclusions and recommendations are based on the information obtained during our review, field exploration, laboratory testing, and observation and monitoring of groundwater conditions, and engineering and geologic analyses. Our work is generally limited to the scope as originally requested, and is specifically addressed to the proposed development, as described herein. In summary, our findings and recommendations are as follows:

a. Based on our recent work, it is our opinion that the site as planned is feasible from a geotechnical standpoint provided that the remedial measures given herein are incorporated into the final design plans and implemented during grading and construction. The final grading plans should be reviewed by the Geotechnical Consultant to assess conformance with the analyses and recommendations of this report, and to develop final designs. Since building, foundation, wall, and pier designs are yet to be completed for the lots, we recommend that supplemental reviews be performed by the Geotechnical Consultant and other design professionals to assess compatibility of the plans with site conditions and geotechnical recommendations.

b. The project site is adjacent to or underlain by older artificial fill, artificial fill, colluvium, alluvium, recent landslide material, ancient block landslide material, and Capistrano Formation bedrock. The distribution of these materials across the site is shown on the Geologic Map, Plate 1R. The majority of the property is underlain by older artificial fill over ancient landslide material, both which require mitigation prior to construction.

c. Grading of the site is to include the removal of all surface improvements, older artificial fill, colluvium, and weathered landslide material. Remedial grading in the form of stabilization fills, daylight shear keys, and fill slope keys with subdrainage will be required to stabilize the perimeter and interior slopes. Feasibility-level remedial grading is shown on the Geotechnical Map, Plate 2R. Verdura retaining walls are planned to achieve finished site grades. The walls are planned to include the use of geogrid and lime-treated onsite soil to improve soil properties and site stability, and reduce import and export of soil from the site. No offsite grading is anticipated during site development. It is believed that the site grading may be accomplished using conventional earth moving equipment.

d. Site grading will include the following order of magnitude heights: excavation of temporary backcuts up to 90 feet, grade increase up to 40 feet above present grades, grade decrease up to 20 feet below present grades, fill slopes up to 65 feet, Verdura walls up to 26 feet, and new engineered fills up to 50 feet.

e. Where proposed structural fills encroach upon deep graben soils and colluvial deposits (see Geologic Map, Plate 1R and upper western key, Plate 2R), removal of graben soils and colluvium to competent block landslide materials and replacement with compacted fill soils is recommended. The scheduled stabilization fill key should be sufficient to remove the majority of the graben and colluvial deposits. However, these deposits may become narrow and extend deeper than feasible for complete removal. As an alternative to complete removal, it may be feasible to leave a remnant of the graben material in-place, and use a rammed-aggregate pier technique or equal to mitigate future settlement of the deposit.

f. Four 800 to 1,000 feet long hydraugers were installed in 2013 between elevation 270 to 280 feet beneath the site to assess groundwater mitigation potential. Additional groundwater mitigation measures are to be constructed along the upper southwestern portion of the site as shown on Plate 2R. A chimney drain is planned along the backcut for a portion of the western key area located south of Avenida del Caballo. This chimney drain and other backdrains and subdrains are to be connected and drained by solid pipes installed within Avenida del Caballo right-of-way. These solid drain pipes are to slope at 0.5 percent or more and ultimately drain to the stormwater mitigation box located adjacent the most easterly key on the site. This system is designed to control groundwater to an elevation of 367 to 375 feet along the southwestern part of the site.

g. Remediation of the eastern and southern border of the site (from Units 1 through 29) will be necessary. These lots border 50 to 100 feet high, descending slopes that are partially offsite and not scheduled for complete grading remediation. Remediation is to be accomplished by first excavating daylight shear keys along the southern and eastern boundaries of the descending slopes (see Plate 2R). Secondly, buried concrete pier walls are to be constructed along the boundaries of the buildable pad area. The buried pier walls are to consist of minimum 2-feet diameter (D), minimum 20- to 35-feet long concrete piers (caissons) spaced as shown on the Geotechnical Map, Plate 2R. Structural design will be needed to provide the final configuration of the concrete piers. Shallow foundations for buildings should be setback at least 5 feet from the piers.

h. Foundations should be setback from descending and ascending slope faces in accordance with the provisions of the California Building Code (CBC). Foundations should be setback a horizontal distance of one-third of the descending slope height, but not less than 10 feet. The actual setback need not exceed 40 feet. This setback does not apply to the southern and eastern lot boundaries proposed for construction of buried concrete pier walls since the planned walls will provide the necessary slope setback for lot improvements.

i. In general, earth materials derived from the Capistrano Formation will be highly expansive and severely corrosive to buried concrete and metals. Building foundations and slabs need to be designed for these conditions or they will not perform. General recommendations are provided herein for concrete materials and metal piping.

j. This feasibility review should be followed by additional plan reviews for rough and precise grading, and possibly additional field investigations to define soil conditions that may affect grading operations. Additional engineering work will be required to develop final designs for site grading, buildings, foundations, retaining wall and concrete piers. Full-time observation and testing of rough and precise grading operations should be performed by the Geotechnical Consultant. This includes full-time observation and testing of retaining (Verdura) wall construction. Concrete pier drill holes should be observed by the Geotechnical Consultant prior to placement of steel and concrete. Observation and testing is needed to assess whether geotechnical recommendations made in this report are implemented, to determine if field conditions are similar to those interpreted from this investigation, and/or to make modifications to designs and recommendations as actual field conditions dictate.

PREVIOUS INVESTIGATION

Previous geotechnical investigations of the property, including subsequent investigations by our firm of the adjacent Mercedes Benz of Laguna Niguel property, were performed by various consultants addressing various levels of design and development of the project. These reports are referenced in Appendix A. Pertinent information presented in our reports, as well as in these consultants' reports were utilized during our geotechnical investigation and in this review of the 50-scale layout plan for tentative tract 17433.

FIELD EXPLORATION PROGRAM

Previously unreported investigative work was performed during 2004. This investigation included the excavation of four borings and five test pits, the location of which are given on the Geologic Map, Plate 1R. Borings No. SMC B-14 and B-15 were excavated using a 30-inch diameter bucket auger to a depth of 105 feet below existing ground. Drilling began on September 7, 2004, and was completed on September 8, 2004. Borings No. SMC RW-1 and RW-2 were drilled using a 5-inch diameter rotary wash drill rig to a maximum depth of about 251 feet below existing grade. Drilling began on October 21 and was completed on October 25, 2004. Test pits 11 through 15 were excavated to a maximum depth of 15.5 feet using a JD310 sampling backhoe. All test pits were excavated on September 15, 2004. Further details of the field exploration program, including the Logs of Borings and Test Pits, are presented in Appendix B. Historic borings and test pits are included in approximate reverse chronological order in Appendix B.

Our most recent site work included observation of the drilling and construction of five site monitoring wells and four hydrauger drains. The wells and drains have been monitored from construction through September 2014. The specifics for the construction of these items and the results of our monitoring are provided in Appendix F.

LABORATORY TESTING PROGRAM

Laboratory tests were performed on bulk and relatively undisturbed samples considered representative of subsurface conditions. Testing included those to define moisture content, dry density, particle size, plasticity, shear strength, compaction properties, expansion, and corrosivity. Specifics regarding test procedures and results are given in Appendix C.

GEOLOGY

Regional Geologic Setting

The project site is located in the eastern foothills of the San Joaquin Hills, one of a number of generally northwest-trending mountain ranges that comprise the Peninsular Range Geomorphic Province of Southern California. A sequence of Tertiary-age sedimentary rocks underlies this area of Orange County and includes, among other units, the Capistrano Formation. Sediments of the Capistrano Formation were deposited in a submarine basin, which was subsequently faulted and downwarped during Miocene-Pliocene time into a north-trending structural trough known as the Capistrano Embayment. Broad, gently folding, north-south faulting, and regional uplift in the last 4 million years have exposed these bedrock units at the surface, where subsequently they have been locally modified by landslides and capped by Quaternary surficial units, including alluvium, colluvium, slope wash, terrace deposits, and man-made fill.

Geologic Units

The results of our field investigation indicate that the project site is underlain by late Miocene, early Pliocene Capistrano Formation, recent and ancient landslide materials, alluvium, colluvium, slopewash, and artificial fill soils. The distribution and engineering characteristics of both bedrock and surficial geologic units are important to the proposed development of the site. A brief description of the geologic units observed onsite from youngest to oldest is presented below. The overall areal distribution of geologic units is shown on the attached Geologic Map, Plate 1R. Our geologic subsurface interpretations are presented on the attached Geotechnical Cross-Sections, Plates 3R through 5R.

a. Fill Soils (Afo, Af, Ef)

Older artificial fill soils (Afo) were encountered over a majority of the site, and were placed as compacted fill in conjunction with previous grading conducted in 1964 and between 1980 and 1982. These fill soils were apparently derived from onsite or nearby sources and typically consist of dark gray to mottled brown, yellow- and gray-brown, clayey silt and silty clay. Fill soils, and the compaction requirements, are discussed in greater detail by other consultants involved in the grading of the site and reported in previous reports listed in Appendix A.

Artificial (Af) and engineered (Ef) fill soil was placed during the grading of the Mercedes Benz of Laguna Niguel facility as reported in the references, Appendix A.

b. Colluvium/Slopewash (Map Symbol – Qcol)

During our subsurface exploration program, colluvium/slopewash (undifferentiated) deposits were encountered along the western-most portion of the site, and generally along the tract boundary and adjacent natural slopes. Colluvium/slopewash deposits generally consist of dark gray-brown to black, soft to stiff, clayey silt and silty clay with abundant caliche stringers and numerous siltstone and concretion fragments. This material was found to be approximately 9 to 32 feet in thickness within the southern half of the western key (see Plates 1R and 2R), and generally less than 3 to 7 feet over the remaining portions of the site. The colluvium/slopewash material is poorly consolidated and considered compressible in its present state, and susceptible to surficial slumping when saturated.

c. Alluvium/Colluvium (Map Symbol – Qac)

Alluvium/colluvium (undifferentiated) is present at the toe of the existing east-facing slope that descends from the tract boundary offsite towards the San Diego Freeway (I-5) located east of the site. Alluvial soils are generally located offsite towards Oso Creek, and have been investigated by us and other consultants during prior studies. Previous consultants' reports have suggested that the alluvium may be in excess of 90 to 100 feet in thickness. These alluvial deposits are likely to have accumulated considerable thickness considering the numerous streams which in prehistoric times drained into the Oso Creek drainage course.

d. Landslide Materials (Map Symbol – Qls)

Ancient block landslide materials, derived from the Capistrano Formation, were encountered below the existing grade and consisted generally of oxidized gray-brown to gray or mottled orange-brown, slightly moist to moist, soft to hard, micaceous, clayey siltstone and silty claystone. Generally, the material becomes dark gray and unoxidized with depth; typically between 20 to 40 feet below the existing ground surface. The material is, in general, moderately to highly fractured and jointed, particularly near shears and landslide rupture surfaces, and generally becomes massive within the unoxidized slide material. Joint and fracture surfaces within the oxidized material typically were stained by iron or manganese-oxide and infilled with gypsum.

e. Capistrano Formation (Map Symbol – Tc)

The bedrock materials of the Capistrano Formation underlying the ancient block landslide complex, and on the west side of the site, consist generally of oxidized, orange-

brown to gray-brown to unoxidized dark gray, slightly moist to moist, moderately hard to hard, massive to poorly bedded, micaceous, clayey siltstone.

Geologic Structure

The apparent geologic structure observed in the ancient block landslide material during our exploratory subsurface investigation is not indicative of regional bedrock bedding dips. Bedding encountered within the landslide material generally strikes northwest to northeast, with gentle to steep dips of 5 to 80 degrees to the west and east.

Regional bedrock generally strikes north-south and dips gently west between 5 to 8 degrees.

Landslide rupture surfaces and/or shears encountered in the landslide material were generally striking between north 10 to 75 degrees northeast, with dips of 24 to 70 degrees to the southeast. Landslide back scarp shears generally trend northeast and dip southeast between 45 and 75 degrees. Moderate to abundant jointing and fracturing were encountered within the oxidized landslide material and near shears and rupture surfaces. Joints and fractures were typically clay-lined, poorly to well developed, closed to very wide, discontinuous, closely spaced, and parallel to subparallel to shears observed within the landslide material. Joints and fractures typically strike between north 85 degrees west and north 55 degrees east, with dips of 2 to 90 degrees to the east.

Mass Movements (Landsliding)

Based on subsurface explorations, aerial photographic analysis, literature reviews, and previous consultants' reports, the entire site is believed underlain by a large landslide complex and moderate to thick deposits of colluvium as illustrated on the Geologic Map, Plate 1R, and on Geotechnical Cross-Sections, Plates 3R through 5R.

Stereographic analysis of paired aerial photographs from the Fairchild Aerial Photography Collection indicate the site to be underlain by ancient landslide materials that have subsequently undergone changes in topographic expression resulting from erosional processes and man-made improvements. Moreover, characteristic topographic expression of a hummocky, subdued landform with a flat upper surface (head) bordered by an abrupt, arcuate-shaped, upslope boundary (back scarp) can be seen in all photographs observed. Additionally, this back scarp region has bench-like platform features which recent studies by geotechnical consulting firms along adjacent properties located south of the subject site have identified as remnants of ancient river terraces underlain by fluvial overbank sediments deposited on a gently sloping, buried terrace base. The development of this geomorphic terrace preceded the mass wasting of the existing slopes, and the majority of the deposits have subsequently been eroded or removed during past grading operations. Previous investigations were directed at exposing and defining the upper, lower, and basal boundaries of the landslide complex by drilling boreholes within the higher, bench-like features and at the toe-of-slope for the postulated landslides. In addition, our own previous borehole data,

as well as data from consultant's reports for studies conducted on the site, as well as within adjacent Tract 10896, were utilized in our interpretation. However, emphasis was placed on utilizing recent data and borings located along or near to constructed cross-section lines.

The results of our subsurface exploration and review, indicates this geomorphic feature is in fact a landslide complex comprised of several deep-seated, block-glide slides with several younger slides having occurred along the forward, east-facing natural slopes, along the flanks, and above the head of the slide infilling the majority of the graben, or "pull-away" zone. The larger deep-seated landslides, which extend to an estimated maximum depth of between 100 to 280 feet below the existing ground profile, likely occurred along several common rupture surfaces with a headward migration as evidenced by the relatively slight internal disturbance within the deeper, unoxidized landslide material.

During the downhole logging of borings completed during our previous subsurface investigation, numerous shears and rupture surfaces (polished, striated, and remolded clay seams) were observed and logged in detail by our field geologist. The observed shears and slip surfaces were typically found to be paper-thin to 1/4-inch in thickness, dark gray to black, moist, stiff, and comprised of remolded, micaceous, silty clay. Due to its depth, the basal shear plane associated with the deep-seated, block-glide slide was never observed.

Surfaces were typically well-polished with poorly to well-developed striations in the down-dip direction, which indicate movement was generally east-southeast. Within the upper 15 to 25 feet of deeply weathered and oxidized landslide material, the landslides were sheared, highly fractured and jointed. However, fracturing and jointing within the dark gray, fresh, unoxidized landslide material was noticeably absent, except immediately above and below the high angle to relatively flat-lying, well-developed rupture surfaces. These disturbed zones were characterized by numerous high angle, open fractures truncated by a flat-lying to curviplanar shear plane(s) with highly polished and striated surfaces. Groundwater was commonly observed to seep from open fractures and shear zones.

Groundwater

Groundwater was encountered during this investigation within our bucket auger excavations SMC B-14 and B-15 as seepage from the boring sidewall. Perched groundwater was seen in nearly all the borings during our subsurface investigation, as well as within those completed previously by other consultants. The depth to groundwater was highly variable from one consultant's findings to another's depending on the location and date of exploration. A relatively static groundwater profile is believed present beneath the Mercedes Benz of Laguna Niguel (MBLN) facility located immediately east of the site.

For initial stability analysis, a conservative long-term groundwater profile was established that consists of first encountered groundwater from site borings. Subsequent to installation of the groundwater wells and hydraugers, the long-term groundwater profile was modified to reflect

current monitoring data, and the planned installation of the chimney drain and subdrains within the western keyway. This surface was used in all stability analyses included herein. Current groundwater levels are depicted on the Groundwater Contour Map, Plate 6R. Future monitoring and maintenance of these groundwater levels will be a requirement for site development.

SEISMIC CONSIDERATIONS

Published Studies

One of the principles of seismic analyses and prediction is the premise that earthquakes are more likely to occur on geologically younger faults, and less likely to occur on older faults. For many years, studies have described faults with Holocene movement (within the last 11,000 years) as "active", and faults with documented Pleistocene movement (within the last 1.6 million years) and with undetermined Holocene movement as "potentially active". Informally, many studies have described faults documented to have no Holocene movement as "inactive". Recent geologic and seismic publications are attempting to clarify the nomenclature describing faults to more accurately represent the potential affects from earthquakes.

Reports by the California Division of Mines and Geology indicate faults with documented Holocene or Historic (within the last 200 years) movement should be considered "active". However, "potentially active" faults are more appropriately characterized in terms of the last period of documented movement. The Fault Activity Map of California (Jennings, C.W.; 1994) defines four categories for onshore "potentially active" faults. The categories are associated with the time of the last displacement evidenced on a given fault and are summarized in Table 1.

Table 1, Definitions of Fault Activity in California

Activity	Category	Recency of Movement
Active	Historic	Within the last 200 years
	Holocene	Within the last 11,000 years
Potentially Active	Late Quaternary	Within the last 700,000 years
	Quaternary	Within the last 1.6 million years
	Late Cenozoic	Possibly within the last 1.6 million years
	Pre-Quaternary	Before the last 1.6 million years

It is important to note these categories embrace all Pre-Holocene faults as "potentially active", and provide no methodology to designate a given fault as "inactive". Although the likelihood of an earthquake or movement to occur on a given fault significantly decreases with inactivity over geologic time, the potential for such events to occur on any fault cannot be eliminated within the current level of understanding.

Local and Regional Faults

The closest published active fault to the site is the San Joaquin Hills Fault, approximately 3.3 miles from the site and the offshore extension of the Newport-Inglewood Fault Zone, approximately 7 miles west of the site (Blake, T.F., 2000, CDMG/2000). Other active faults in the vicinity of the site include the L.A. Basin extension of the Newport-Inglewood Fault Zone, approximately 14.9 miles to the northwest, the Elsinore Fault, approximately 17.9 miles to the northeast, the Whittier Fault, approximately 22.2 miles to the north, and the San Andreas Fault, approximately 49.3 miles to the northeast.

The San Joaquin Hills Fault, which extends approximately 23 miles from Seal Beach to Dana Point, is calculated as the most significant seismic source affecting the site, due to its close proximity to the site and capability of generating a magnitude 7.0 earthquake (USGS, 2008).

Site Classification

For the purposes of determining seismic design parameters provided in the Recommendations portion of this report for use by the structural engineer, the upper 100 and 200 feet of soil underlying the subject site has been classified in accordance with Section 1613.3.2 of the 2013 CBC. The results of our onsite field investigations and review of proposed tentative map indicates the site will generally consist of 5 to 20 feet of engineered fill soil over competent block landslide material. Based on evaluation of materials, the S_{u100} and $S_{u200\ are}$ estimated at 2,030 and 2,888 pounds per square foot (see Appendix D, Figure D.1). For these shear strengths a Site Class of C was assigned for the analysis.

Ground Motion Analyses

The potential ground motions at the site were analyzed using the USGS interactive deaggregation to develop a response spectrum and peak ground acceleration for the site. The response spectrum development for a 475 and 2,475 year return period is provided in Appendix D. The peak ground accelerations for these return periods are estimated at 0.28g and 0.56g, respectively.

Utilizing attenuation relationships (Bozorgnia, et al.; 1999, soft-rock uncorrected), one can estimate the ground motion history of the site. The study indicates the maximum site acceleration from 1800 to 2003 was approximately 0.13g and occurred during a magnitude 6.3 Long Beach Earthquake 17.3 miles from the site on March 11, 1933. While no historic records of fault activity on the San Joaquin Hills Fault exist, a University of California, Irvine study suggests that the fault may have produced an earthquake exceeding a magnitude of 7.0 between 1635 and 1855 AD (Grant, 2002). This earthquake would have likely produced accelerations substantially higher than the 1933 event.

It is noted that the estimation of peak historic ground acceleration presented above is provided for the interest of the client and is required by local (City or County) review agencies. The value derived is not directly utilized in structural design of residential structures. Seismic parameters for use by the structural engineer should be in accordance with the 2013 California Building Code (CBC).

Secondary Seismic Hazards

Potential secondary seismic hazards at the site include landsliding, liquefaction, shallow ground cracking, and settlement.

Analyses have been made to evaluate the gross stability of the site during earthquakes (see Appendix E). With the planned remedial grading and groundwater mitigation, it is our opinion that the potential for future earthquake induced landsliding is a remote possibility.

Review of the Seismic Hazards Zones Map (CDMG, 2004) for the San Juan Capistrano Quadrangle, Figure 3, indicates that the property is not located within a “zone of required investigation" for liquefaction, but is located within an investigation zone for earthquake-induced landsliding. However, the east-facing slope of the property is supported by alluvium that is within a required zone for liquefaction study. The potential for liquefaction within the alluvium was analyzed during the Phase 2 development at the Mercedes Benz facility (see Reference 36) and updated in 2010 during the development of the Sprinter Facility (see Reference 38). It was concluded that the effects of liquefaction would be limited to minor ground settlement from isolated pockets of granular material. Based on the results of this study, it is our opinion that such liquefaction would have an insignificant impact on the subject site.

Other secondary seismic hazards to the site include shallow ground cracking and settlement. The potential for shallow ground cracking to occur during an earthquake is a possibility at any site, but does not pose a significant hazard to site development. The potential for seismically induced settlement to occur is considered remote for engineered fill overlying competent block landslide material.

CONCLUSIONS AND RECOMMENDATIONS

General

Based on the results of our supplemental geotechnical investigation, groundwater studies, and review of the revised 50-scale Site Study Layout Plan prepared by Hunsaker & Associates, plot dated January 8, 2015, it is concluded that the proposed development of the site is geotechnically feasible, provided the recommendations of this report are incorporated into the project plans and specifications, and implemented during construction.

Supplemental site studies should include final design of the site grading, drainage, buttress and stabilization fills, concrete piers at tops of slope, and Verdura-type walls will be required as final rough grading, precise grading, wall and foundation plans are developed prior to grading and construction. Additional work will be required by the project Civil Engineers, Geotechnical Consultant, and Structural Engineers to accomplish the final design. We also recommend supplemental investigative work prior to grading to better define ground conditions near the most easterly key adjoining the Mercedes Benz of Laguna Niguel facility.

The design recommendations in this report should be reviewed during subsequent plan reviews, and during the grading phase when the soil and bedrock conditions in the excavations become exposed. We consider that the anticipated grading will not adversely affect, nor be affected by adjoining property, with due precaution being taken.

General geotechnical considerations applicable to the site grading and recommendations for the design and construction of the proposed development are discussed below.

a. Remedial Grading: The pad areas of the site are overlain with surface improvements, and artificial fill materials (estimated up to 25 feet) that require complete removal and replacement as engineered fill. Similarly, the westernmost lots are underlain with deep graben soil and colluvial deposits that will also need to be removed or remediated in-place if complete removal is not feasible. Remedial grading in the form of stabilization fills, daylight shear keys, and fill slope keys with subdrainage will be required to stabilize the perimeter and interior slopes. Recommended remedial grading is shown on the Geotechnical Map, Plate 2R. No offsite grading is anticipated. It is believed that the majority of the site grading may be accomplished using conventional earth moving equipment. Excavations made for the lowest keyway adjacent the Mercedes Benz of Laguna Niguel property may encounter groundwater seepage and soft, wet soil conditions. It is recommended that a supplemental investigation be made prior to grading to better refine soil and groundwater conditions in this area.

b. Site grading will include the following order of magnitude heights: excavation of temporary backcuts up to 90 feet, grade increase up to 40 feet above present grades, grade decrease up to 20 feet below present grades, fill slopes up to 50 feet, fill slope and Verdura walls up to 70 feet, and new engineered fills up to 50 feet.

c. Groundwater Monitoring and Mitigation: Four 800 to 1,000 feet long hydraugers were previously installed between elevation 270 to 280 feet beneath the site to assess groundwater mitigation potential. Current groundwater levels are depicted on the groundwater map, Plate 6R. The eastern end of the hydraugers are proposed to outlet to the Storm Capture boxes located in the approximate location shown on Plate 2R. Additional groundwater mitigation measures are to be constructed along the upper western portion of the site as shown on Plate 2R. The installation consists of a chimney drain and subdrains within the western key area, outlet to solid pipes located within the

upper northernmost cul-de-sac and within the Avenida del Caballo right-of-way. The solid pipes are to slope at 0.5 percent or more and ultimately drain to the Storm Capture boxes as shown on Plate 2R. This system is designed to control groundwater to an elevation between 361 and 375 feet amsl along the southwestern part of the site. Future monitoring and maintenance of these groundwater levels will be a requirement for site development.

d. Building Setbacks: Foundations should be setback from descending and ascending slope faces in accordance with the provisions of the 2013 CBC. Foundations should be setback a horizontal distance of one-third of the descending slope height, but not less than 10 feet. The actual setback need not exceed 40 feet. This setback does not apply to the southern and eastern border of lots proposed for construction of a buried concrete pier wall that will provide the necessary slope setback for lot improvements. Shallow foundations for buildings should be setback at least 5 feet from the piers.

e. Slope Deformation: After grading, compacted fill slopes designed using customary factors of safety for gross or surficial stability and well-constructed in accordance with design specifications should be expected to undergo some differential vertical heave or settlement in combination with differential lateral movement in the out-of-slope direction. This post-grading slope movement occurs due to downslope creep of the surficial zone of the slope, and by lateral fill slope deformation, which is initiated by deep wetting caused by a combination of precipitation and irrigation. Mitigation measures include compaction and moisture conditioning of fills, buildings setbacks, and proper construction and detailing of flatwork, fences and walls.

f. Expansive Soil: Expansion index testing performed on representative samples of the onsite soils indicates a high expansion potential. Such soils will cause ground supported improvements to experience an annual cyclic rise and fall as the soil heaves as it is wetted, shrinks as it dries, and heaves again upon wetting. As such, lot improvements cannot be precluded from experiencing differential movement and possible damage, although proper design, construction, and maintenance of improvements will serve to mitigate against such movement and damage.

g. Corrosive Soil: Corrosivity tests were performed on representative samples of the onsite soil and landslide materials. The results of this testing and our experience with the Capistrano Formation materials, indicates that the onsite materials are likely to have a significant potential to corrode buried concrete and metal elements. Mitigation measures including specifying concrete resistant to water soluble sulfates (i.e., Type V cement, maximum water/cement ratio of 0.45), and providing corrosion protection to metal elements or substituting non-corrosive materials in place of metal elements.

This report outlines the major geotechnical features of the site based on our review of the data collected in the previous geotechnical investigations and grading of the subject site.

Grading and Earthwork

a. General

All grading and earthwork should be accomplished in accordance with the following recommendations and with the grading codes for the City of Laguna Niguel.

These guidelines present the usual and minimum recommendations for grading operations observed by Stoney-Miller Consultants, Inc., or its designated representative. No deviation from these guidelines will be allowed except where specifically superseded in the geotechnical report signed by a registered geotechnical engineer. The recommendations contained herein and the attached earthwork guidelines (Appendix G) should not be considered to preclude more restrictive requirements of the regulating agencies and/or other consultants.

The placement, spreading, mixing, watering, and compaction of the fill in strict accordance with these guidelines shall be the sole responsibility of the contractor. The construction, excavation, and placement of fill shall be under the direct observation of the geotechnical engineer or any person or persons employed by the licensed geotechnical engineer signing the geotechnical report. Conformance with these guidelines will be discussed in the final report issued by the geotechnical engineer.

b. Clearing and Grubbing

Prior to grading, the site should be cleared of surface obstructions and stripped of brush and vegetation. All debris from the existing improvements should be removed from the site. All debris, stockpiled soil, vegetation, and abandoned residential materials should be removed from the site.

If a cesspool is present (none were encountered during this investigation), it should be pumped free of any liquid and backfilled with clean sand, densified by jetting. The upper 5 feet should be excavated and filled with engineered fill. The location of the cesspool should be plotted on the final as-graded plan, and the geotechnical consultant should be notified to modify foundation recommendations as necessary.

Utility lines encountered during grading should be removed and the resulting excavation backfilled with compacted fill. Any holes or loose material remaining from demolition or other sources should be backfilled with compacted fill.

c. Preparation of Onsite Soils

We recommend that in areas to be graded, all artificial fill, desiccated soil, colluvium, or other unsuitable materials be removed to expose natural ground (competent bedrock and

block landslide material) determined to be satisfactory for the support of fill. The ground should then be scarified to a minimum depth of 6-inches, moisture conditioned to 120 percent of optimum moisture content, and compacted to at least 90 percent of the maximum laboratory density per ASTM D-1557. If existing slopes are steeper than 5:1 (horizontal:vertical) horizontal benches shall be cut into competent soils, block landslide material, or bedrock.

All areas to receive fill, including all removal areas and toe-of-fill benches, shall be observed and approved by the geotechnical engineer or engineering geologist prior to fill placement. Benching details are shown in Appendix G, Standard Grading Guidelines.

d. Overexcavation of Transition Lots

On building pads where proposed buildings and retaining walls will be partly underlain by compacted fill and partly by natural soils (Transition Lots), the cut portion of the lot should be overexcavated a minimum depth of five feet below finished pad grade. The pad should then be brought to grade with engineered fill soil, to provide for more uniform bearing characteristics for building foundations. A Transition Lot Detail is included in Appendix G. Actual depths of overexcavation will be based on geologic field observations made at the time of grading.

e. Compaction and Method of Filling

All fill should be compacted to a minimum relative compaction of 90 percent, based on ASTM Laboratory Test Designation D 1557. Fill should be compacted by mechanical means in uniform horizontal lifts of 6- to 8-inches in thickness. All fills should be placed at a minimum of 120 percent of optimum moisture content.

Fill constructed on natural slopes steeper than 5:1 (horizontal:vertical) should be keyed and benched into competent bedrock or block landslide material. Compaction of slopes can be achieved by overbuilding the slopes laterally and then cutting back to the design line and grade, or backrolling with a sheepsfoot rollers at vertical intervals not greater than 4 feet as the fill is placed, followed by final compaction of the entire slope. Feathering of fill over the tops of slopes should not be permitted.

All fills should be placed and all grading performed in accordance with the City of Laguna Niguel and County of Orange Grading Ordinance.

f. Fill

Onsite soils and block landslide materials are generally suitable for use as fill. This excepts retaining wall backfill where non-expansive sand and gravel materials and mechanically stabilized earth walls where lime-treated onsite soils are envisioned for

design and construction. Fill material should, in general, not contain concretions, rocks, or cobbles greater than 8-inches in largest dimension. Larger rock fragments may be incorporated into the lower portions of fills, provided the method of spacing and compaction is in accordance with accepted construction practices. Refer to Appendix G for recommended rock disposal methods.

g. Shrinkage, Bulking, and Subsidence

It is anticipated that onsite earth materials will undergo some volume change when excavated and recompacted as engineered fill. This volume change is expected to vary with the type of materials and their location within the project area. The landslide, artificial fill, and colluvial material, which will be the predominant material involved in grading, has variable consistency and moisture. Preliminary estimates are presented as follows:

- Removals (colluvium): 5 to 10 percent shrinkage.
- Ancient landslide materials: 0 to 3 percent shrinkage.
- Bedrock material: 0 to 3 percent bulking.
- Artificial fill: 4 to 6 percent shrinkage.

Subsidence due to placement of fill above existing grades may be estimated at about 0.1 foot for each 25 feet of compacted fill, most of which will occur during construction. These estimates are subject to confirmation during grading.

h. Rippability

Excavation of the onsite materials can generally be accomplished with conventional heavy-duty grading equipment. Some excavations may require heavy ripping where cemented beds (concretions) are encountered.

i. Rock Disposal

We estimate that the volume of oversize material generated from the proposed grading will be insignificant. Procedures for placement of oversize rock, if encountered, are presented in Appendix G.

Slope Stability

a. General

Based on our review of the Site Study Layout Plan for tentative tract 17433, the maximum height of existing natural slopes is approximately 155 feet while the maximum height for graded slopes will be 125 feet. Cross sections for a sampling of the proposed slopes are provided in Figures 4R through 7R. All graded slopes should be constructed at a slope ratio of 2:1 (horizontal:vertical) or flatter. The majority of the site slopes are scheduled for stabilization using grading techniques, although mechanical stabilization means are planned for locations with Verdura walls.

b. Bedrock/Soils Characteristics

The stability of slopes is dependent upon the strength characteristics of the bedrock and soils which constitute them. The bulk of the fill soils will be derived from the colluvium, alluvium, and Capistrano Formation and will generally vary from clayey silts to silty or sandy clays. Laboratory tests conducted on representative samples of the onsite materials are shown in Appendix C, Laboratory Test Results. The data indicates that materials found on this site typically exhibit low to moderate shear strengths.

Evaluations of the bedrock's shear strength have been performed for use in stability analysis. Information from laboratory tests performed during this investigation, combined with data collected from previous consultants investigations, have been used to select design shear strength values. These values, plus our stability analyses, are presented in Appendix E.

c. Stability Analysis

Analyses were performed to evaluate the overall stability of slopes within the project area. All analyses were made using GSTABL7 Version 2.004 with STEDwin package developed by Garry Gregory and Harald Van Aller, respectively. A discussion on the procedures used for the slope stability analyses and the results of the analyses, are presented in Appendix E.

d. Existing Ancient Landslides

Both static and pseudostatic stability analyses were performed on the major ancient landslide geometry and selected smaller (worst case) landslide geometries assuming potential failure along a secondary back scarp shear plane as depicted on Geotechnical Cross-Sections A-A', B-B', C-C', D-D' and E-E', Plates 3R through 5R. All of these calculations indicate factors of safety in excess of required engineering minimums.

e. Fill Slopes

The predominant materials anticipated for use in fill slope grading will consist of clayey silts and silty clays. Stability analyses indicate that fill slopes comprised of these materials will have safety factors in excess of generally accepted engineering minimums provided they are constructed in accordance with the recommendations contained herein to unsupported heights not exceeding about 50 feet at a slope ratio of 2:1 (horizontal:vertical) or flatter. Keyways and backdrains for all slopes are shown on the Geotechnical Map, Plate 2R, and Cross Sections 1 through 16, Figures 4R through 7R.

Verdura walls are proposed at several locations throughout the site, at the top, toe or mid-slope, therefore increasing the graded height of slopes to as much as 70 feet. The maximum height of the proposed Verdura walls is 26 feet. Slope stability analyses was performed for one of these slopes using Cross Section D-D' where the height of slope and wall is 67 feet (wall height of 26 feet). The results of these analyses indicated that, in addition to the geogrids and lime-treated onsite soil required for the internal stability of the wall, a lime-treated shear key will be necessary to achieve the required factors of safety. In this case, a lime-treated fill shear key (24 feet wide by 24 feet deep) is needed to achieve stability. The results of the analyses are provided in Figure E-13, Appendix E. The extent of the key and lime-treated zone is shown on Cross Section D-D'.

Lime-treated onsite soils and geogrids are envisioned for the construction of all Verdura walls. The full extent of lime-treated soils for shear keys has not been determined but should be evaluated in future geotechnical studies. The internal stability of all proposed Verdura walls will need to be verified by the wall designer.

f. Cut Slopes

Any cut slopes planned for the site, are recommended for stabilization. Therefore, no cut slopes will remain after the completion of grading.

g. Stabilization Fills

Stabilization fills, keys, and back drainage are required for all existing onsite slopes. All back cuts should be reviewed at the time of cutting by the Geotechnical Consultant to assess actual field conditions. The general recommended criteria for determining key widths of stabilization fills are as follows:

- Slope up to 30 feet in height: minimum 15-feet width.
- Slopes greater than 30 feet in height: minimum H/2 width; where H = vertical slope height in feet.

The minimum recommended fill keys are shown on the Geotechnical Map, Plate 2R, are based on similar-sized slopes comprised of similar soil materials. The size of the stabilization keys to achieve required stability factors of safety has not been determined, but should be evaluated in future geotechnical studies.

h. Natural Slopes

Based on the findings of this investigation, natural slopes outside the subject site appear to be grossly stable. However, localized areas of surficial instability may develop if the soils become saturated.

It is recommended that measures be employed to mitigate the potential impact that mudflows or shallow surficial slumps could have within the westernmost building areas which are located below the current natural slope along the western side of the site. Mitigation measures should include the following:

- Proper drainage behind retaining walls should be provided and runoff should be directed away from building pads/foundations and toward approved receptacles.

- A deflection wall with a minimum 3 feet freeboard above adjacent finished ground should be constructed at the west side of the pad areas below the westernmost slope. The deflection wall should be designed as a free-standing retaining wall for a temporary equivalent fluid pressure of 100 pounds per cubic foot.

It is also recommended that the southern and eastern lots adjacent the natural slopes be mitigated against potential future surficial instabilities that could occur within the descending natural slope that exists south and east of these lots. Mitigation for these lots is recommended by using a buried concrete pier retaining wall adjacent to the lot pad boundary.

i. Daylight Fill Areas/Daylight Shear Keys

The portion of the proposed development area along the southern and eastern descending slopes is recommended for construction of daylight shear keys. The approximate dimensions and elevations of such keys are provided on the Geotechnical Map, Plate 2R. All keys should be constructed at least to the dimensions shown on the plans, although they may be larger depending on conditions encountered during grading. Current sizing is based on similar-sized slopes comprised of similar soil materials. The size of the daylight shear keys to achieve required stability factors of safety should be evaluated in future geotechnical studies. Details of the daylight shear keys are shown in Appendix G.

j. Fill-Over-Cut Slopes

All fill-over-cut slopes should be eliminated by the construction of stabilization blanket fills. Construction of the blanket fills should begin with the excavation of equipment-width keys (minimum) at the toes of the slopes. Details of the stabilization fills and keys are shown in Appendix G.

k. Construction Slopes

Except as noted herein, temporary construction slopes in the Capistrano Formation may be cut at 1:1 (horizontal:vertical) to a maximum height of 30 feet. Above that height, temporary slopes should be cut at 1.5:1 (horizontal:vertical) or flatter subject to conditions encountered during grading. Construction slopes beneath building pads should be laid back to a 1.5 to 1 (horizontal:vertical) slope prior to placing fill.

Our evaluation indicates that property line limitations require a temporary shoring system be constructed within an estimated 150 foot long portion of the buttress key proposed at the west side of the site. The results of slope stability analyses for the temporary backcut shown on Section G-G' are presented in Figures E-20 and E-21. Temporary shoring is envisioned to consist of steel I-beams placed in augered holes that are backfilled with pea gravel. Wood lagging would then be placed between I-beams and supported by the lead flange. After shoring is complete, the I-beams could be vibrated out of the holes and the holes filled with a two-sack cement slurry.

The Geotechnical Consultant, however, makes no warranties as to the stability of temporary slopes. Geologic conditions vary locally and back-cut failures are common. The Contractor should be responsible for the temporary stability of all slopes. The recommendations by the Geotechnical Consultant should be considered on a case-by-case basis.

As is the case in all buttress and shear key cuts, gross stability during construction is low and time dependent. Backslope ratios shown on the stability analyses are the minimum ratios required for stability of the completed buttress or shear key. Flatter ratios may be necessary in order to actually perform required grading. Actual backslope ratios are left to the discretion of the Contractor as long as the minimum design ratio is not exceeded.

l. Surface Runoff and Subsurface Drainage

Care should be exercised in controlling surface runoff into downslope natural areas and areas of landslide removals. It is particularly important to control drainage in offsite natural areas below proposed development to prevent erosion.

Slopes in excess of 30 feet high should have terrace drains to collect surface runoff. These terrace drains should be spaced at vertical intervals of not more than 30 feet; however, when only one drain is required, the terrace should be located at mid-height.

A backdrain at the bottom of buttress and stabilization fills will be required to mitigate the buildup of seepage and hydrostatic pressures. For slopes 30-feet in height or greater, additional backdrains are recommended. Drains should also be placed at contacts between permeable and impermeable formations.

We recommend that a subdrain system be placed to collect subsurface water from below removal areas and canyon fills as well as in other areas identified as potential seepage areas. The specific locations of drains should be determined during grading. The collection drain should be outlet to the Storm Capture boxes planned for the northeast slope area. Details for canyon subdrains are presented in Appendix G. Subdrain installations should be reviewed and approved by the Geotechnical Consultant prior to the placement of compacted fill.

m. Footing Setback from Top-of-Slopes

Analysis of the onsite bedrock materials indicates that fill derived from bedrock units will be generally silts and clays with high expansion potentials. We, therefore, recommend the following footing setback from slope faces:

Setback = 1/3 of Vertical Height of Slope (ft); 10’ Minimum, 40’ Maximum

The intent of this recommendation is to provide for appropriate foundation bearing conditions for residential buildings and other lot improvements where differential vertical and horizontal movement would be objectionable (e.g., a swimming pool, significant flatwork). For mid-slope Verdura walls, it is our opinion that the recommended minimum 10 feet horizontal distance from the bottom of the footing to the slope face may be adopted without increase. Maintenance of this minimum separation generally provides for a foundation embedment below the surface zone susceptible to significant seasonal moisture changes. Foundation designs should be forwarded to the Geotechnical Consultant for review and comment.

This footing setback does not apply to lots where a buried concrete pier retaining wall is constructed. Locations where a pier wall is planned are shown on the Geotechnical Map, Plate 2R. Building footings should be setback at least 5 feet from the buried pier wall.

Retaining Walls

a. Conventional Walls

Retaining walls up to 10 feet high should be designed in accordance with Table 2.

Table 2: Retaining Wall Design Criteria

Earth Pressure Condition	Backfill Profile	Equivalent Fluid Pressure (lb/ft^2/ft depth)
Active	Level	40
(Cantilever Walls)	2:1	60
At-Rest (Basement Walls)	Level	100
Passive	Level	200
Friction Coefficient 0.25		

Retaining walls should be adequately drained to reduce potential hydrostatic pressure on the walls. We recommend placement of select granular backfill for a minimum horizontal distance of 4 feet behind the wall. All retaining walls should be constructed with a backdrain at the base consisting of a 4-inch diameter perforated pipe (PVC Schedule 40 or equal) surrounded with at least 2.0 ft^3/lineal foot of graded filter rock or open graded gravel wrapped in geofabric (Mirafi 140, Supac 5NP, or equal). The backdrain should be tied to a 4-inch diameter non-perforated pipe which outlets to an approved drainage device. Retaining walls should be adequately waterproofed in accordance with their use and surface finish. A waterproofing consultant should be retained to provide recommendations.

Walls subject to surcharge loads should be designed for an additional uniform lateral pressure equal to one-half the anticipated surcharge pressure in the case of restrained walls or one-third the surcharge pressure for unrestrained walls. Backfill should be placed under the observation and testing of the geotechnical consultant. Minimum reinforcement for footings should be as designed by the structural engineer. Minimum footing embedment should be in accordance with the CBC.

b. Buried Concrete Pier Walls

The design of drilled, cast-in-place concrete piers to provide setback for lots along the southern and eastern boundaries of the site should be performed using the soil data given below. The pier lengths shown on the Geotechnical Map, Plate 2R, are minimums and actual pier lengths will need to be determined by the Project Structural Engineer.

Lateral loading of piers will result in active pressure forces derived from adjacent materials. The pier system should be designed to resist 10-feet high active soil pressure loading based on an equivalent fluid pressure of 100 pounds per cubic foot. Pier should have a center to center spacing and minimum depth as shown on Plate 2R. The area of soil between the piers should be treated as a tributary load supported by the buried wall system.

Piers should have a minimum 24-inch diameter. Lateral passive resistance may be computed for bedrock or block landslide materials based on 400 pounds per cubic foot equivalent fluid pressure acting on a tributary area of twice the pier diameter. Lateral passive resistance may be computed for engineered fill based on 300 pounds per cubic foot equivalent fluid pressure acting on a tributary area of twice the pier diameter. Passive resistance should be assumed to begin at a depth of 10 feet below existing grade. Piers should be spaced at least two diameters center to center.

Drilled piers shall be installed by a Contractor experienced in drilled shaft work. All contractors considered for the project should display a track record of successful performance on projects with similar subsurface conditions and project specifications. All contractors should specify the drilling rig they propose to use in their bid. The contractor should agree to perform the work in accordance with the specifications given herein. The contractor should review available geotechnical subsurface information contained herein and in the referenced reports prior to bidding on the work.

Shafts shall be drilled through overburden to the minimum length given above, and to the embedment required to resist loads as designed by the Structural Engineer. Excavation shall be advanced in a manner that will not adversely affect the integrity and performance of completed piers or damage adjacent facilities and property. Shafts should not be excavated within 10 feet of previously completed piers until the concrete has been allowed to cure for at least seven days. If high early strength concrete is utilized, the set time should be defined by the Structural Engineer.

Casing of the hole is not anticipated. Shaft excavations shall be maintained in an essentially dry condition, by pumping if necessary, until just prior to concreting. Significant ground water is not anticipated during drilling.
The piers are to resist lateral earth pressures and not to carry vertical loads. Unless otherwise specified, the bottom surface shall be relatively clean of loose or softened materials, debris or other substances sufficient, in the Geotechnical Engineer's opinion, to affect concrete strength.

Unless otherwise specified, rock is defined as material that cannot be drilled with a heavy-duty auger drill employing a tooth auger designed to excavate hard soil and soft or weathered rock.

The Geotechnical Consultant will provide onsite observation during the duration of the pier excavation. The Contractor shall cooperate with the Consultant during this process and assist in securing the construction documentation specified herein.

The Contractor shall be responsible for the safety of all personnel entering shaft excavations for construction and observation purposes. Safety equipment shall be provided and shall include gas-sensing equipment, protective cage or equivalent provisions, facilities for forced air ventilation of shafts, an air supply, harness support for personnel, hard hats, as well as other equipment or facilities required by local, state, or federal regulations.

Before entry, shafts shall be checked for toxic and explosive gases. If such gases are encountered, forced air shall be circulated in the shaft until safe entry conditions are certified or adequate safety measures are taken to the satisfaction of a health and safety specialist.

The Contractor shall maintain for each shaft complete records of drilling and other operations required herein. These records shall be submitted to the Geotechnical Engineer on a daily basis. For each shaft, the records shall include, but shall not be limited to:

- Detailed description of drilling equipment and tools used.
- Daily production log.
- Shaft locations, alignment, and dimensions.
- Reinforcing steel lengths and cutoff elevations.
- Concrete volume placed.
- Total rock drilling depth and drilling time.

Segmental Retaining Walls

a. General

Verdura walls, a brand of segmental retaining walls, are planned for use at the site. Engineering design for these walls should be provided by a specialty engineer and/or contractor to conform to the NCMA Design Manual for Segmental Retaining Walls (Reference 13). Verdura walls are envisioned to be comprised of lime-treated onsite soils reinforced with geogrid materials.

Suppliers of segmental retaining wall system material components should have demonstrated experience in the supply of similar size and types of segmental retaining walls on previous projects. The Contractor should inspect the materials upon delivery to assure that proper type and grade material has been received, store and handle materials

in accordance with manufacturer's recommendations, and protect the materials from damage. Damaged material shall not be incorporated into the segmental retaining wall.

b. Concrete Segmental Retaining Wall Units

Concrete segmental units shall conform to the requirements of NCMA TEK 2-4 and have a minimum 28 days compressive strength of 3000 psi and a maximum absorption of 10 pcf as determined in accordance with ASTM: C140. All units shall be sound and free of cracks or other defects that would interfere with the proper placing of the unit or significantly impair the strength or permanence of the construction. If pins are used by the retaining wall supplier to interconnect segmental retaining wall units, they shall consist of a nondegrading polymer or galvanized steel and be made for the express use with the segmental retaining wall units supplied.

Cap adhesive shall meet the requirements of the segmental retaining wall unit manufacturer.

c. Geosynthetic Reinforcements

Geosynthetic Reinforcements shall consist of high tenacity geogrids manufactured for soil reinforcement applications. The type, strength and placement location of the reinforcing shall be as shown on the plans prepared by the wall designer. The design properties of the reinforcement shall be determined according to the procedures outlined in this specification and the NCMA Design Manual for Segmental Retaining Walls.

Prior to construction, the Contractor shall submit to the Geotechnical Consultant the Manufacturer's certification that the geosynthetic has been evaluated in full compliance with this specification and is fit for use in long-term critical soil reinforcement applications.

The Contractor's submittal package shall include, but not be limited to, actual tests results for tension/creep, durability/aging, construction damage, pullout and quality control. The Manufacturer shall also provide written certification that all resin used to produce the primary geosynthetic is virgin and classified as high molecular weight polyester or high density polyethylene and is capable of withstanding direct exposure to sunlight for 14 days with no measurable deterioration as per ASTM: D4355.

Approval of the materials by the Geotechnical Engineer will be required prior to delivery of material to the site.

Testing of the geosynthetic reinforcement for tensile strength, ASTM: D4595 and seam strength, ASTM: D4884, shall be performed every 20,000 square yards and test data for each lot of material shall accompany shipments.

d. Drainage Pipe and Aggregate

The drainage collection pipe shall be a perforated or slotted, PVC Schedule 40 pipe with a minimum diameter of 4-inches. The pipe and drainage aggregate should be wrapped with a geotextile that will function as a filter.

Drainage pipe shall be manufactured in accordance with ASTM: D3034 and/or ASTM: D1248. Drainage aggregate should be a clean crushed stone or granular fill meeting the following gradation as determined in accordance with ASTM: D422:

Sieve Size	**Percent Passing**
1 inch	100
3/4 inch	75 – 100
No. 4	0 – 60
No. 40	0 – 50
No. 200	0 – 5

Drainage geotextile should consist of non-woven geofabric (Mirafi 140N or equal) and should meet or exceed the minimum properties or criteria recommended by the Wall Design Engineer.

e. Reinforced Backfill

The reinforced backfill soil should be free of debris and consist of lime-treated onsite soil materials with an equivalent friction angle of 30 degrees or greater. The plasticity index and Expansion Index of the lime-treated soil should be less than 20. The maximum rock size should be limited to ¾-inch for reinforced soil unless specific tests have been performed to evaluate potential strength reduction in the geosynthetic due to installation damage.

f. Foundation Preparation

Following excavation for the leveling pad and the reinforced soil zone, foundation soil shall be observed by the Geotechnical Consultant to assess the actual foundation soil condition. Compacted fill soil placed within 5 feet vertical below the wall base should have a minimum equivalent friction angle of 30 degrees. Soils not meeting the required strength shall be removed and replaced with soil meeting the design criteria. The wall base should be embedded at least 2 feet below finished grade.

A minimum 6-inch thick layer of compacted granular material shall be placed for use as a leveling pad up to the grades and locations shown on the construction drawings. The granular base shall be compacted to provide a firm, level, bearing pad on which to place

the first course of concrete segmental retaining wall units. Compaction should be performed to obtain at least of 90 percent of the maximum dry density (ASTM: D1557).

g. Unit and Geosynthetic Reinforcement Placement

All materials shall be installed at the proper elevation and orientation as shown in the wall details on the construction plans. The concrete segmental wall units and geosynthetic reinforcement shall be installed in general accordance with the manufacturer's recommendations. Broken, chipped, stained or otherwise damaged units shall not be placed in the wall unless they are repaired, and the repair method is approved by the Geotechnical Engineer.

Overlap of the geosynthetic in the design strength direction shall not be permitted. The design strength direction is that length of geosynthetic reinforcement perpendicular to the wall face and shall consist of one continuous piece of material. Adjacent sections of geosynthetic shall be placed in a manner to assure that the horizontal coverage shown on the plans is provided.

Geosynthetic reinforcement should be installed under tension. A nominal tension shall be applied to the reinforcement and maintained by staples, stakes, or hand tensioning until the reinforcement has been covered by at least 6-inches of soil fill.

The Cap block and/or top unit shall be bonded to the segmental retaining wall units below using adhesive recommended by the wall design engineer or manufacturer.

h. Backfill Placement

The reinforced backfill shall be placed as shown in construction plans in maximum compacted lift thickness of 6- to 8-inches and shall be compacted to a minimum 90 percent of the maximum dry density, (ASTM: D1557) at a minimum moisture content of 120 percent of optimum. Backfill shall be placed, spread and compacted in such a manner that eliminates the development of wrinkles or movement of the geosynthetic reinforcement and the wall facing units.

Only hand-operated compaction equipment shall be allowed within 3 feet of the front of the wall face. Soil dry density in this area shall also be a minimum of 90 percent of the maximum dry density (ASTM: D1557).

Tracked construction equipment shall not be operated directly on the geosynthetic reinforcement. A minimum backfill thickness of 6-inches is required prior to operation of tracked vehicles over the geosynthetic reinforcement. Turning of tracked vehicles should be kept to a minimum to prevent displacing the fill and damaging or moving the geosynthetic reinforcement.

Rubber-tired equipment may pass over the geosynthetic reinforcement, if in accordance with the manufacturer's recommendations, at slow speeds less than 10 mph. Sudden braking and sharp turning should be avoided.

The contractor shall not allow surface runoff from adjacent areas to enter the wall construction site.

i. Drainage Aggregate Placement

Drainage aggregate shall be placed to the minimum finished thickness and widths shown on the construction plans prepared by the wall design engineer. As a minimum, the drainage aggregate should have a minimum width of 2 feet measured from the rear of the wall units and extend within 18-inches of the top of the wall. Drainage collection pipes shall be installed to maintain gravity flow of water outside of the reinforced soil zone. The drainage collection pipe should daylight into a storm drain or slope v-ditch at an elevation lower than the lowest point of the pipe within the aggregate drain.

The main collection drain pipe, just behind the block facing, shall be a minimum of 4-inches in diameter. The secondary collection drain pipes should be sloped a minimum of 2 percent to provide gravity flow into the main collection drain pipe. Drainage laterals shall be spaced at a maximum 50 feet spacing along the wall face.

j. Seismic Design

Segmental retaining walls should be designed for seismic loads as specified by the CBC.

Seismic Design

The 2013 California Building Code provides data for use in seismic designs of residential buildings. Based on the geotechnical data and site parameters, the following is provided by the USGS (ASCE 7-10) to satisfy the 2013 CBC design criteria:

Table 3, Site and Seismic Design Criteria For 2013 CBC

Design Parameters	Recommended Values
Site Class	C
Site Longitude (degrees)	-117.6785
Site Latitude (degrees)	33.5431
Ss (g) B	1.396
S1 (g) B	0.518
SMs (g) C	1.396
SM1 (g) C	0.673
SDs (g) C	0.931
SD1 (g) C	0.449
Fa	1.0
Fv	1.3
Seismic Design Category	D

Construction Materials

Our laboratory test results indicate that the onsite soils have soluble sulfate contents up to 0.9 percent. It is recommended that a concrete expert be retained to design an appropriate concrete mix to address water-soluble sulfate content and water vapor transmission as well as the structural requirements. In lieu of retaining a concrete expert, it is preliminarily recommended that the 2013 CBC be utilized for all structural elements, which specifies Type V cement, a maximum water-cement ratio of 0.45, and a minimum compressive strength of 4500 psi.

The results of our laboratory testing indicate that the onsite soils are highly corrosive to buried metals. We recommend that non-corrosive plastic pipe be substituted for metal pipes where possible.

Geotechnical Observation and Testing

All grading and construction should be performed under the observation and testing of a geotechnical engineer and engineering geologist as a minimum as required by the current California Building Code. Geotechnical observation and testing should be provided on a continuous basis during grading, retaining and Verdura wall construction, chimney drain construction, and concrete pier excavation in order to assess design assumptions and conformance with the intent of our recommendations.

Plan Reviews

The Geotechnical Consultant should review the final rough grading, precise grading, improvement, retaining wall, and foundation plans prior to grading and construction, and comment upon their conformance with geotechnical recommendations.

LIMITATIONS

Our services were performed using the degree of care and skill ordinarily exercised, under similar circumstances, by reputable soils engineers and engineering geologists practicing in this or similar localities. No other warranty, expressed or implied, is made as to the conclusions and professional advice included in this report.

Supplemental site studies are required to define the final design of the site grading, drainage, buttress and stabilization fills, concrete piers at tops of slope, and Verdura-type walls as final rough grading, precise grading, wall and foundation plans are developed prior to grading and construction. Additional work will be required by the project Civil Engineers, Geotechnical Consultant, and Structural Engineers to accomplish the final design. We also recommend supplemental investigative work prior to grading to better define ground conditions near the most easterly key adjoining the Mercedes Benz of Laguna Niguel facility.

The samples taken and used for testing, the observations made and the in-place field testing performed are believed representative of the entire project; however, soil and geologic conditions can vary significantly between tested or observed locations. As in most projects, conditions revealed by excavation may be at variance with preliminary findings. If this occurs, the changed conditions must be evaluated by the project soils engineer and engineering geologist and designs adjusted as required or alternate designs recommended. This report is issued with the understanding that it is the responsibility of the owner, or of his representative, to ensure that the information and recommendations contained herein are brought to the attention of the architect and engineer for the project and incorporated into the plans, and the necessary steps are taken to see that the contractor and subcontractors carry out such recommendations in the field.

This firm does not practice or consult in the field of safety engineering. We do not direct the contractor's operations, and we cannot be responsible for other than our own personnel on the site; therefore, the safety of others is the responsibility of the contractor. The contractor should notify the owner if he considers any of the recommended actions presented herein to be unsafe. The findings of this report are valid as of the present date. However, changes in the conditions of a property can occur with the passage of time, whether they are due to natural processes or the works of man on this or adjacent properties. In addition, changes in applicable or appropriate standards may occur, whether they result from legislation or the broadening of knowledge. Accordingly, the findings of this report may be invalidated wholly or partially by changes outside our control. Therefore, this report is subject to review and should not be relied upon after a period of three years.

The opportunity to be of service is appreciated. If you have any questions, please call.

Respectfully submitted,

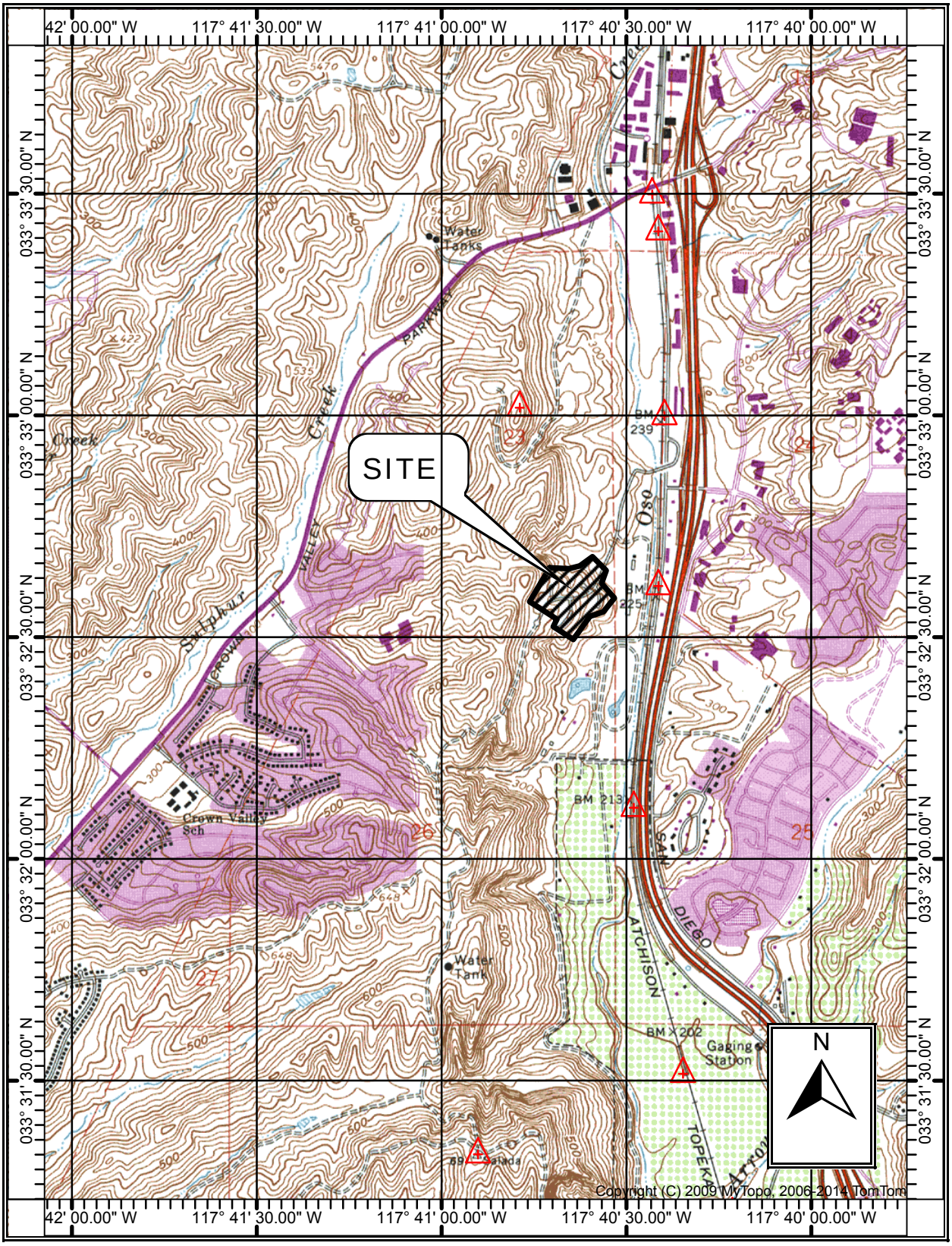
STONEY-MILLER CONSULTANTS, INC.

Russell C. Lamb, G.E. 2207
Chief Geotechnical Engineer
Registration Expires 3-31-15
Date Signed: ___/___/___

John P. Hunt, E.G. 1964
Associate Engineering Geologist
Registration Expires 10-31-15

RCL/JPH:fp

Distribution: (2) Addressee and (2) CDs
(1) Hunsaker and Associates, Attn: Mr. Ted Frattone, and CD
(1) GMU Geotechnical, Attn: Mr. Gary Urban, and CD
(1) City of Laguna Niguel, and CD



SCALE 1:24000

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FEET

SITE LOCATION MAP

PROJECT NO. 13662-05 DATE: OCTOBER 2014 FIGURE NO. 1

NOTE: NO SCALE IS IMPLIED

SMC	**AERIAL PHOTOGRAPH OF SITE (LOOKING WEST)**		
JOB NO.: 13662-05	DATE: OCTOBER 2014	FIGURE NO.: 2	

MAP EXPLANATION

Zones of Required Investigation:

Liquefaction

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

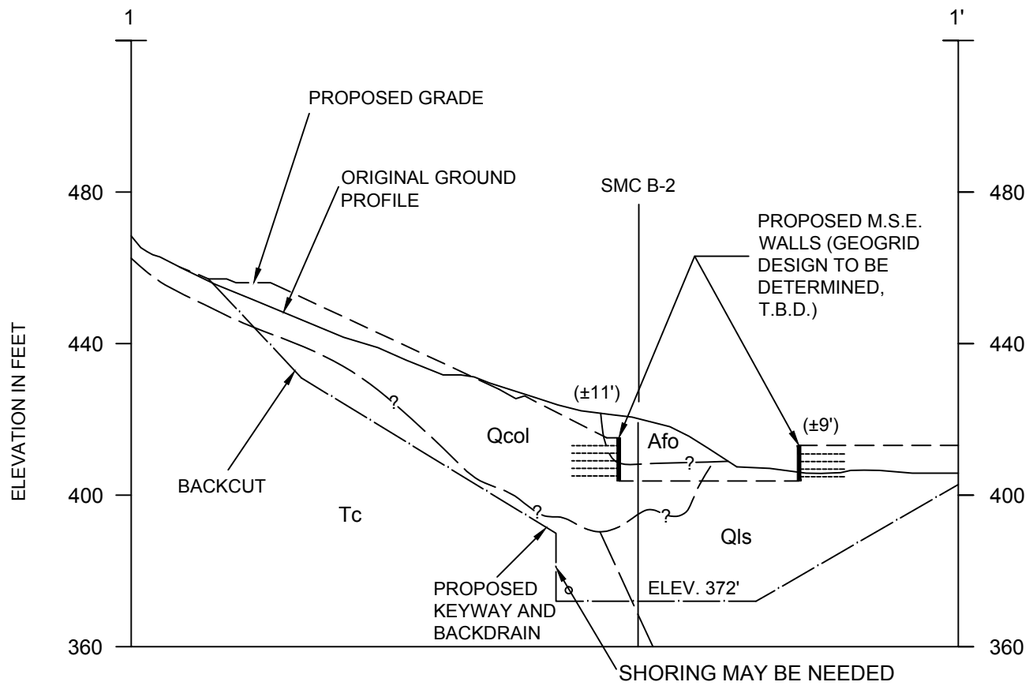
Earthquake-Induced Landslides

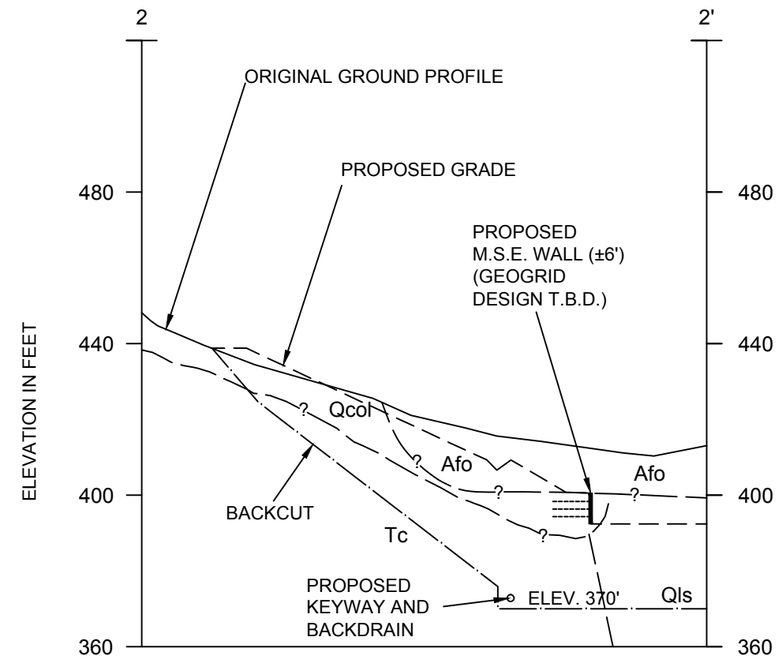
Areas where previous occurrence of landslide movement, or local topographic, geological, geotechnical and subsurface water conditions indicate a potential for permanent ground displacements such that mitigation as defined in Public Resources Code Section 2693(c) would be required.

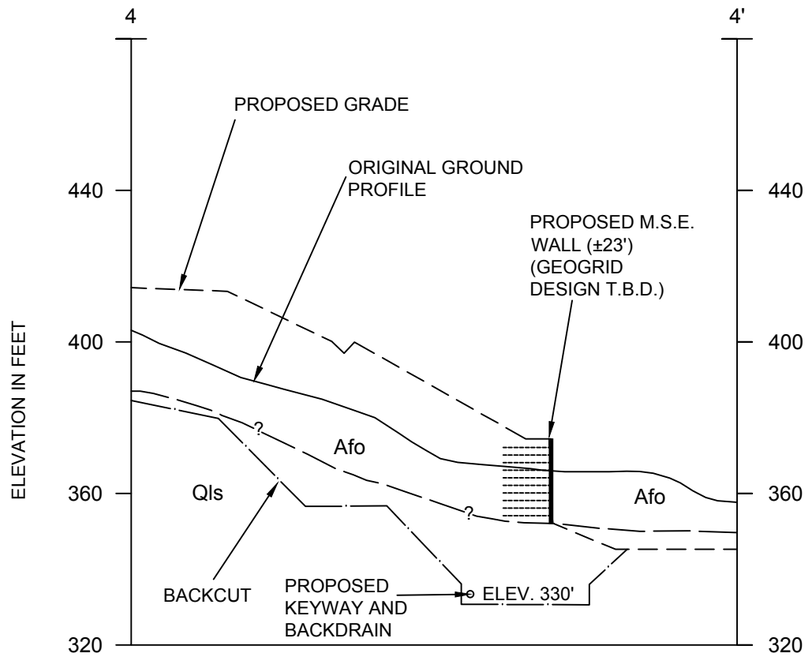
NOTE: Seismic hazard Zones identified on this map may include developed land where delineated hazards have already been mitigated to city or county standards. Check with your local building/planning department for information regarding the location of such mitigated areas.

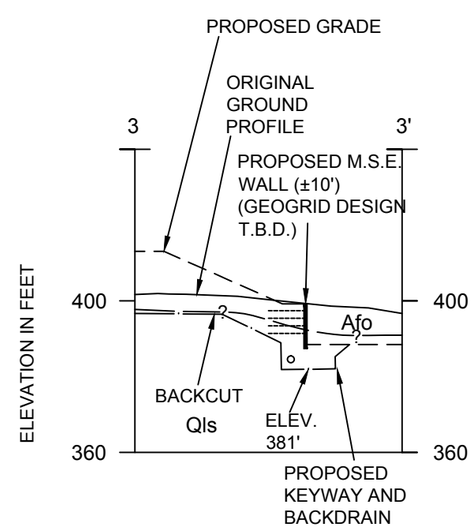
NOTE: NO SCALE IS IMPLIED

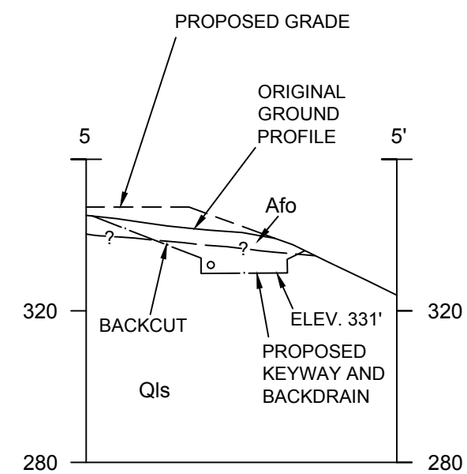
SMC	SEISMIC HAZARD MAP		
	JOB NO.: 13662-05	DATE: OCTOBER 2014	FIGURE NO.: 3

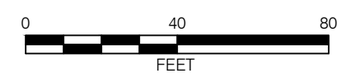






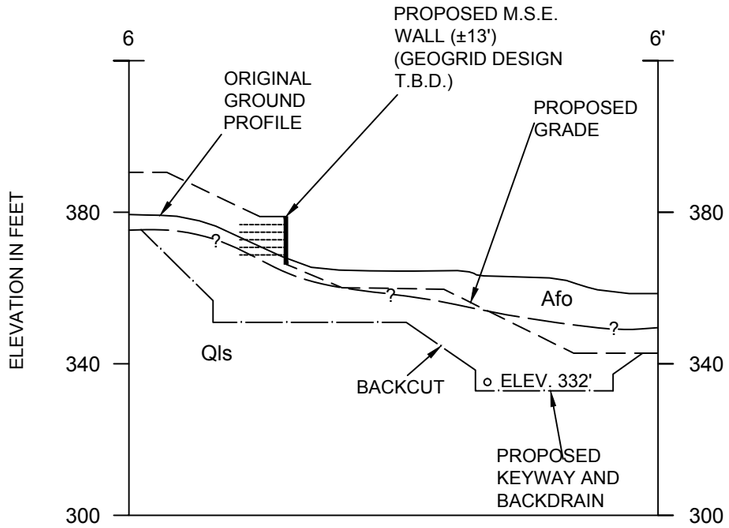


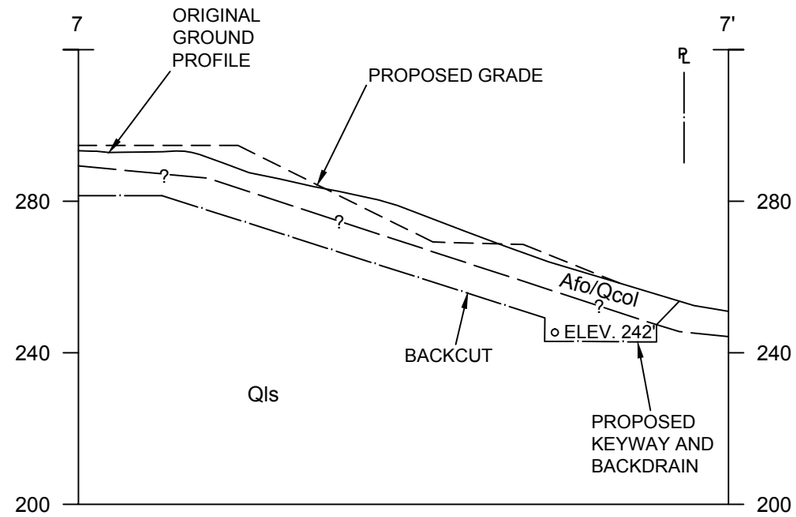


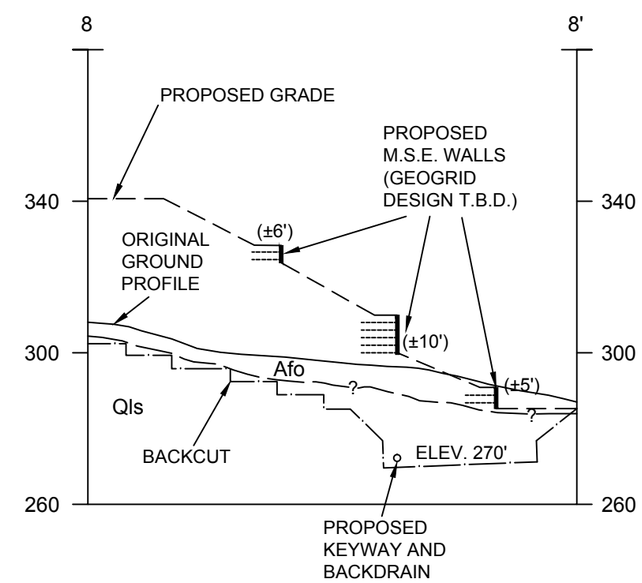


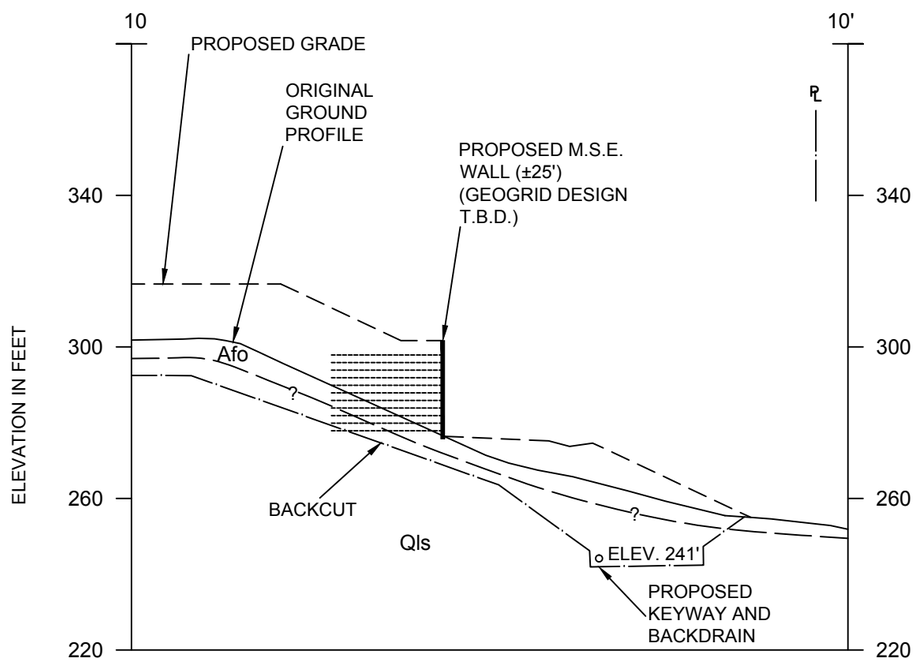
GEOTECHNICAL CROSS SECTIONS 1-5
TENTATIVE TRACT 17433,
LAGUNA NIGUEL, CALIFORNIA

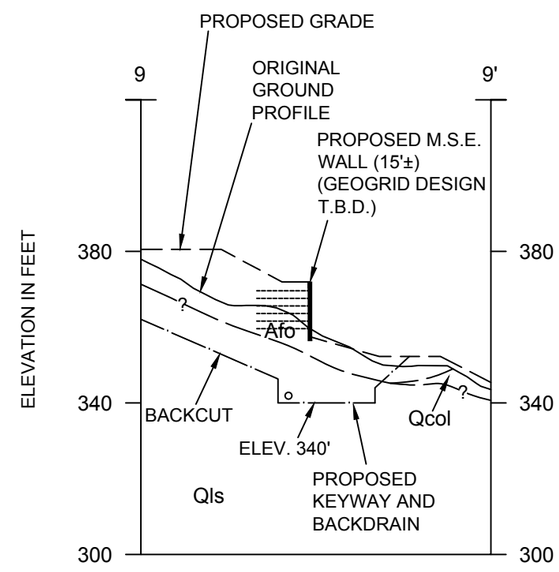
JOB NO.:	DATE:	FIGURE NO.:
13662-05	FEBRUARY 2015	4R

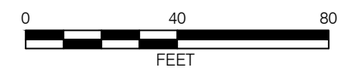












GEOTECHNICAL CROSS SECTIONS 6-10
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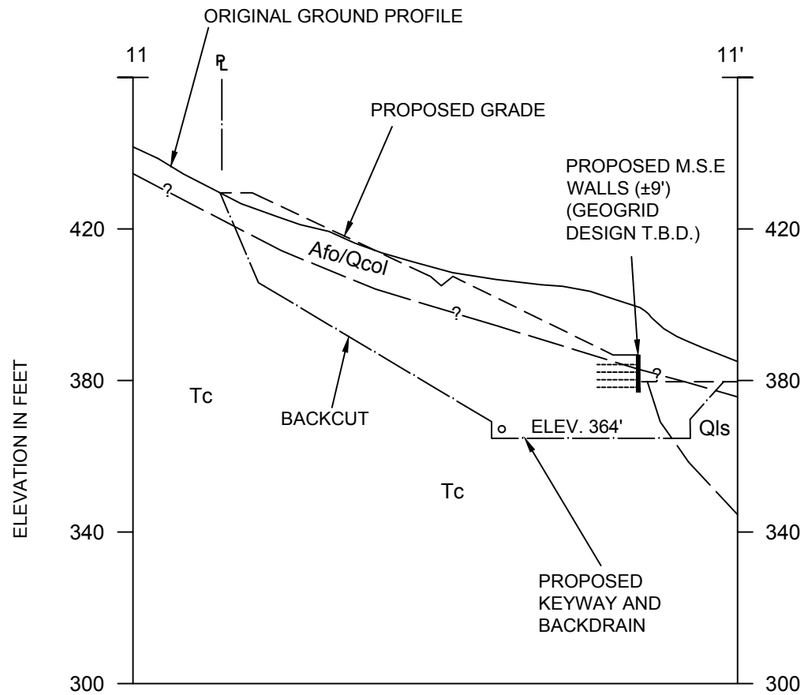
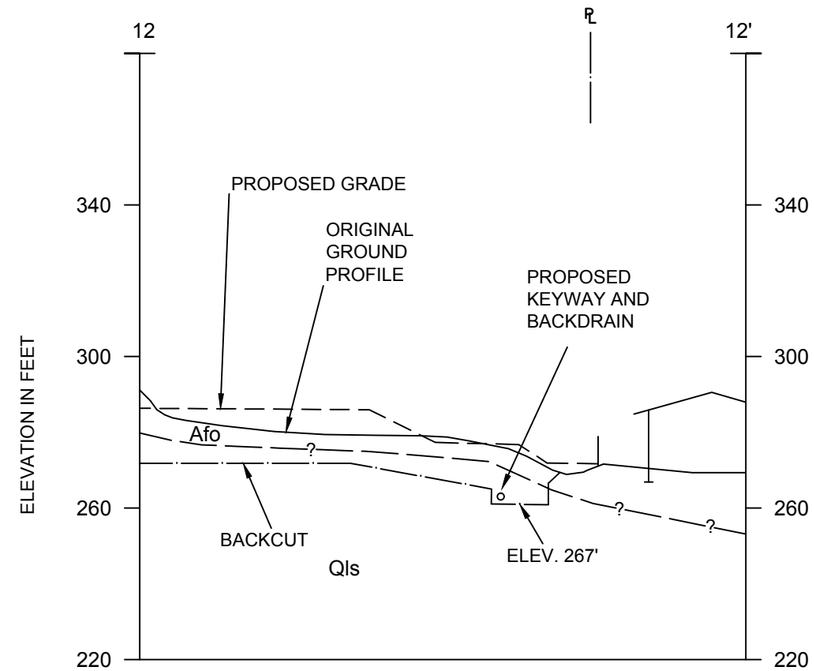
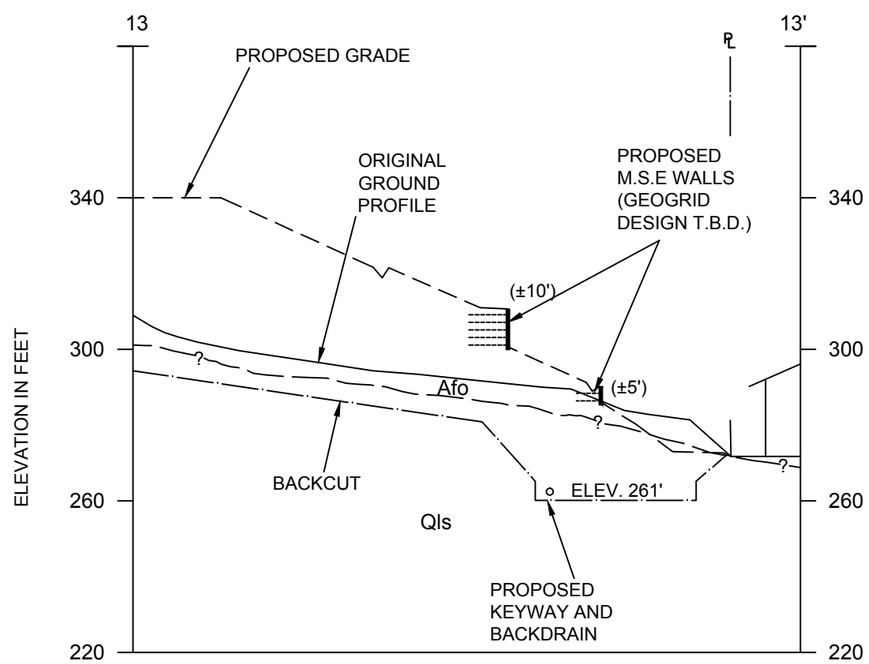
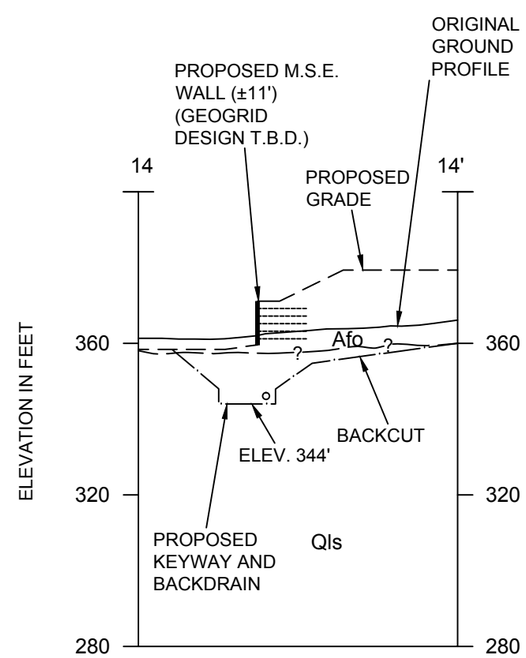
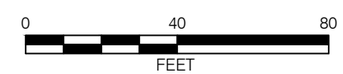
JOB NO.:	DATE:	FIGURE NO.:
13662-05	FEBRUARY 2015	5R





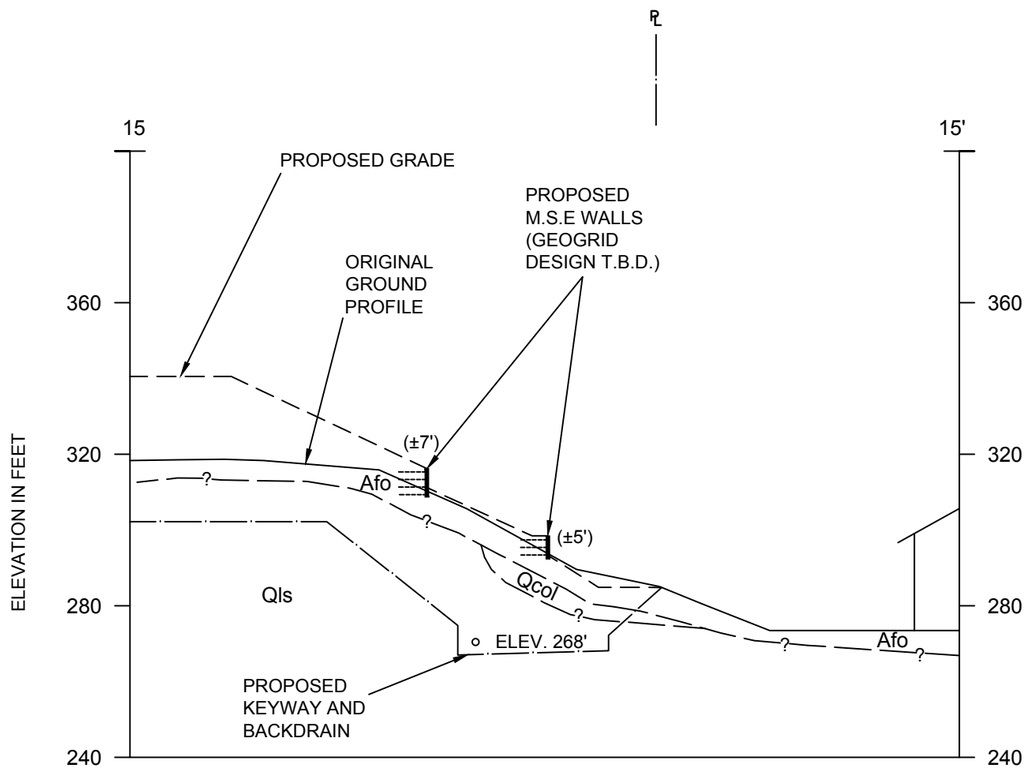


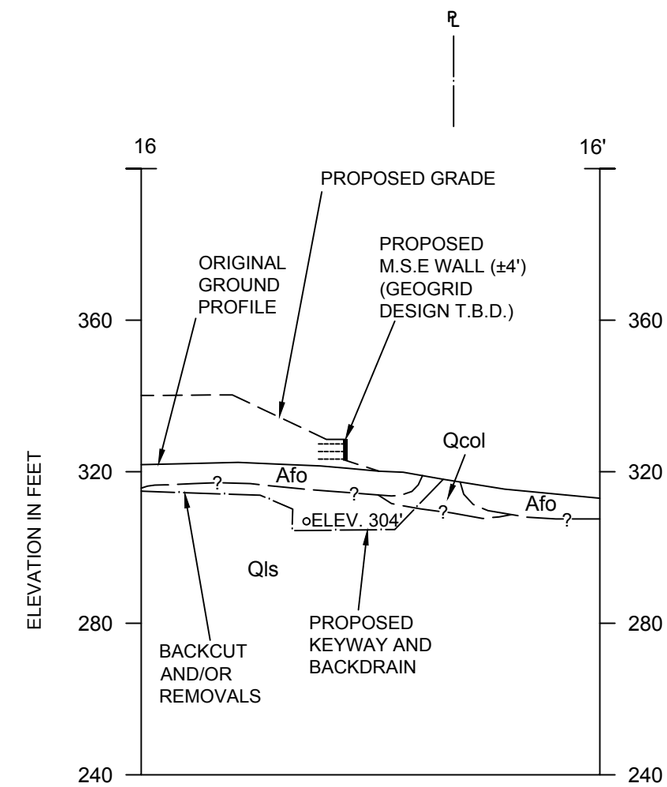




GEOTECHNICAL CROSS SECTIONS 11-14
TENTATIVE TRACT 17433,
LAGUNA NIGUEL, CALIFORNIA

JOB NO.:	DATE:	FIGURE NO.:
13662-05	FEBRUARY 2015	6R





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GEOTECHNICAL CROSS SECTIONS 15-16
TENTATIVE TRACT 17433,
LAGUNA NIGUEL, CALIFORNIA

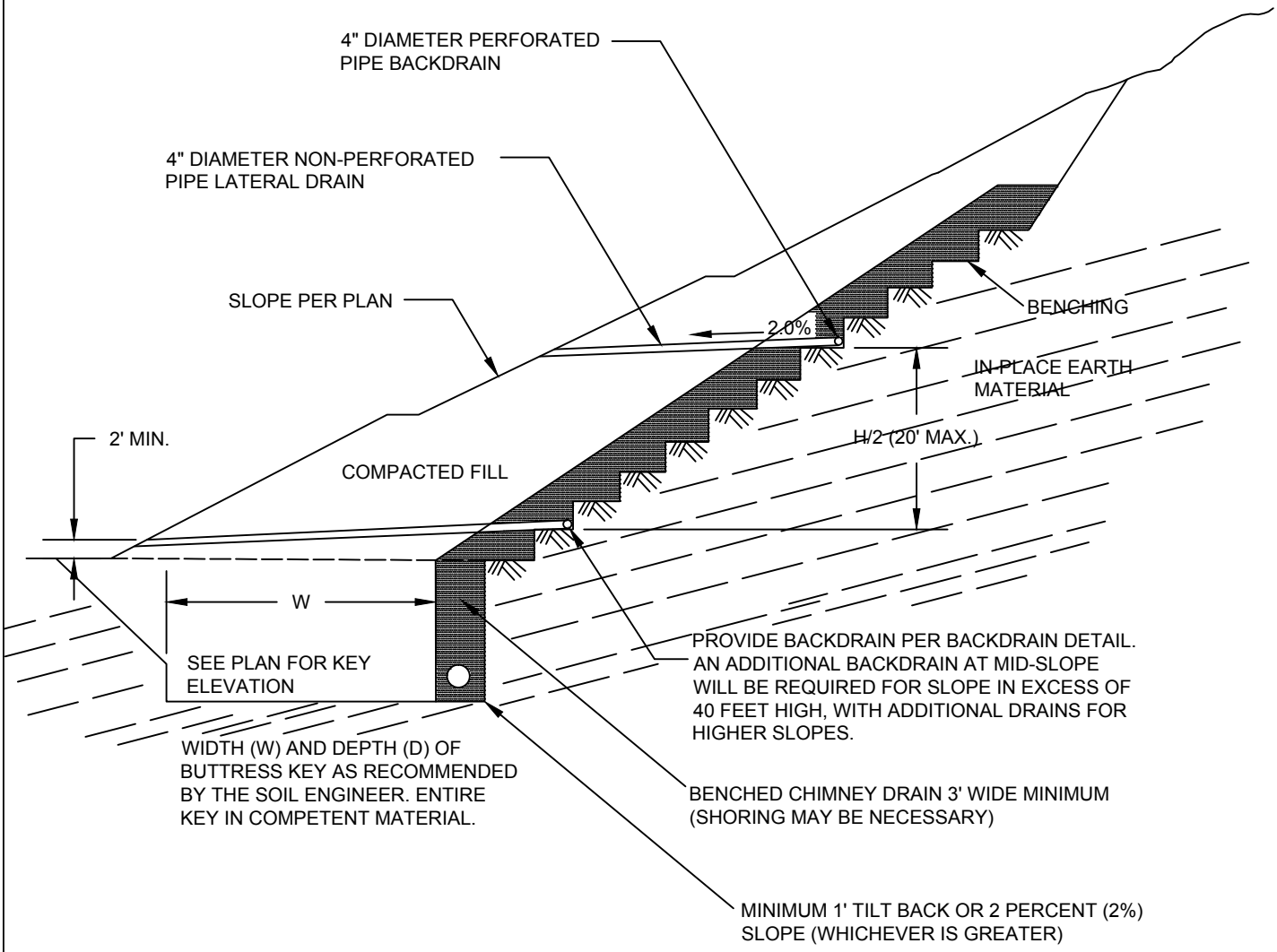
JOB NO.:	DATE:	FIGURE NO.:
13662-05	FEBRUARY 2015	7R

FOR CHIMNEY DRAIN USE CLASS 2 PERMEABLE MATERIAL OR "FILTER MATERIAL" TO MEET THE FOLLOWING SPECIFICATION OR APPROVED EQUIVALENT:

SIEVE SIZE	PERCENTAGE PASSING
1"	100
3/4"	90-100
3/8"	40-100
NO.4	25-40
NO.8	18-33
NO.30	5-15
NO.50	0-7
NO.200	0-3

NOTE:

PIPE SHALL BE A MINIMUM OF 6 INCHES DIAMETER AND RUNS OF 500 FEET OR MORE USE 8-INCH DIAMETER PIPE, OR AS RECOMMENDED BY SOILS ENGINEER.



NOTE: REFER TO STABILIZATION AND BUTTRESS FILL BACKDRAIN DETAIL

NOT TO SCALE

SMC	**TYPICAL BUTTRESS FILL DETAIL WITH CHIMNEY DRAIN**		
JOB NO.: 13662-05	DATE: FEBRUARY 2015	FIGURE NO.: 8R	

APPENDIX A

REFERENCES

APPENDIX A

REFERENCES

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10. Stoney-Miller Consultants, Inc., 1993, "Update of Status of Response to Geotechnical Review by the City of Laguna Niguel, 'Home Depot Site,' Laguna Niguel, California," dated September 8, 1993, Project No: 10507-01, Report No: 3-3171.

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APPENDIX B

BORING AND TEST PIT LOGS

APPENDIX B

BORING AND TEST PIT LOGS

Excavation

Our most recent investigation in 2004 included the excavation of four borings and five test pits. Boring No. SMC B-14 and B-15 were excavated using a 30-inch diameter bucket auger to a depth of 105 feet below existing ground. Drilling began on September 7, 2004 and was completed on September 8, 2004. Borings No. SMC RW-1 and RW-2 were drilled using a 5-inch diameter rotary wash drill rig to a maximum depth of about 251 feet below existing grade. Drilling began on October 21 and was completed on October 25, 2004. Test pits 11 through 15 were excavated to a maximum depth of 15.5 feet using a JD310 backhoe. All test pits were excavated on September 15, 2004. The excavations were observed by our field geologist, who maintained a log of the excavations. The descriptions provided on the logs were obtained from direct examination of the excavation wall and relatively undisturbed drive-ring samples of the underlying materials, and from the excavated cuttings. Once the excavations were completed, the large diameter boreholes and test pits were backfilled with soil cuttings and compacted by tamping. The upper 20 feet of Borings SMC B-14 and B-15 were plugged with cement slurry. Borings RW-1 and RW-2 were backfilled with a cement-bentonite plug.

Our field geologist obtained bulk and relatively undisturbed samples for identification and laboratory testing. The excavation locations for borings are indicated on the Geologic and Geotechnical Maps, Plates 1 and 2. The excavation locations and elevations were estimated from comparing site topography to the base maps provided. Historic borings and test pits are included herein in approximate reverse chronological order.

Sampling and Logging

The following sampling and testing techniques were used to evaluate the subsurface conditions.

a. Relatively undisturbed drive samples were obtained by utilizing a 3-inch outside diameter California Sampler lined with brass rings, each 1-inch long and 2.5-inches inside diameter. The sample was driven for a total length of 12-inches. The numbers of blows per foot driving the final 12-inches were recorded on the boring logs. The hammer utilized for the bucket auger borings was a Kelly bar with a 12-inch drop. The hammer used for the rotary wash borings weighed 400 pounds and was dropped a vertical height of 24-inches. The hammer used for the test pits weighed 140 pounds and was dropped a vertical height of 30-inches. The brass rings were removed from the California Sampler and transferred in a plastic tube and sealed. Samples were also collected using a pitcher barrel.

b. Bulk samples representative of subsurface conditions were collected from the tailings or sidewalls and sealed in plastic bags.

The soils were classified based on field observations and laboratory tests in accordance with the Unified Soil Classification System (Figure B-1). All samples were transported to the laboratory for testing.

Stratification lines on the Logs of Borings represents the approximate boundary between predominant soil types. Layers of differing material types may be contained within the strata and gradual transitions may generally be expected between strata.

DEFINITION OF TERMS

PRIMARY DIVISIONS			SYMBOLS	SECONDARY DIVISIONS
COARSE GRAINED SOILS MORE THAN HALF OF MATERIAL IS LARGER THAN NO. 200 SIEVE SIZE	GRAVELS MORE THAN HALF OF COARSE FRACTION IS LARGER THAN NO. 4 SIEVE	CLEAN GRAVELS (LESS THAN 5% FINES)	**GW**	WELL GRADED GRAVELS, GRAVEL-SAND MIXTURES, LITTLE OR NO FINES
			GP	POORLY GRADED GRAVELS OR GRAVEL-SAND MIXTURES, LITTLE OR NO FINES.
		GRAVEL WITH FINES	**GM**	SILTY GRAVELS, GRAVEL-SAND SILT MIXTURES, NON-PLASTIC FINES.
			GC	CLAYEY GRAVELS, GRAVEL-SAND-CLAY MIXTURES, PLASTIC FINES.
	SANDS MORE THAN HALF OF COARSE FRACTION IS SMALLER THAN NO. 4 SIEVE	CLEAN SANDS (LESS THAN 5% FINES)	**SW**	WELL GRADED SANDS, GRAVELLY SANDS, LITTLE OR NO FINES.
			SP	POORLY GRADED SANDS OR GRAVELLY SANDS, LITTLE OR NO FINES.
		SANDS WITH FINES	**SM**	SILTY SANDS, SAND-SILT MIXTURES, NON-PLASTIC FINES.
			SC	CLAYEY SANDS, SAND-CLAY MIXTURES, PLASTIC FINES.
FINE GRAINED SOILS MORE THAN HALF OF MATERIAL IS SMALLER THAN NO. 200 SIEVE SIZE	SILTS AND CLAYS LIQUID LIMIT IS LESS THAN 50%		**ML**	INORGANIC SILTS AND VERY FINE SANDS, ROCK FLOUR, SILTY OR CLAYEY FINE SANDS OR CLAYEY SILTS WITH SLIGHT PLASTICITY
			CL	INORGANIC CLAYS OF LOW TO MEDIUM PLASTICITY, GRAVELLY CLAYS, SANDY CLAYS, LEAN CLAYS.
			OL	ORGANIC SILTS AND ORGANIC SILTY CLAYS OF LOW PLASTICITY.
	SILTS AND CLAYS LIQUID LIMIT IS LESS THAN 50%		**MH**	INORGANIC SILTS, MICACEOUS OR DIATOMACEOUS FINE SANDY OR SILTY SOILS, ELASTIC SILTS.
			CH	INORGANIC CLAYS OF HIGH PLASTICITY, FAT CLAYS.
			OH	ORGANIC CLAYS OF MEDIUM TO HIGH PLASTICITY, ORGANIC SILTS.
HIGHLY ORGANIC SOILS			**Pt**	PEAT AND OTHER H IGHLY ORGANIC SOILS.

GRAIN SIZES

SILTS AND CLAYS	SAND			GRAVEL		COBBLES	BOULDERS
	FINE	MEDIUM	COARSE	FINE	COARSE		

200 40 10 4 3/4" 3" 12"

U.S. STANDARD SERIES SIEVE CLEAR SQUARE SIEVE OPENINGS

RELATIVE DENSITY

SANDS, GRAVELS AND NON-PLASTIC SILTS	BLOWS/FOOT*
VERY LOOSE	0 – 4
LOOSE	4 – 10
MEDIUM DENSE	10 – 30
DENSE	30 – 50
VERY DENSE	OVER 50

CONSISTENCY

CLAYS AND PLASTIC SILTS	STRENGTH **	BLOWS/FOOT *
VERY SOFT	0 – 1/4	0 – 2
SOFT	1/4 – 1/2	2 – 4
FIRM	1/2 - 1	4 – 8
STIFF	1 – 2	8 – 16
VERY STIFF	2 – 4	16 – 32
HARD	OVER 4	OVER 32

NR NO RECOVERY RING SAMPLE STANDARD PENETRATION TEST BAG SAMPLE

* NUMBER OF BLOWS OF 140 POUND HAMMER FALLING 30-INCHES TO DRIVE A 2-INCH O.D. (1-3/8-INCH I.D.) SPLIT SPOON (ASTM D-1586).

** UNCONFINED COMPRESSIVE STRENGTH IN TONS/SQ. FT. AS DETERMINED BY LABORATORY TESTING OR APPROXIMATED BY THE STANDARD PENETRATION TEST (ASTM D-1586), POCKET PENETROMETER, TORVANE, OR VISUAL OBSERVATION.

KEY TO LOGS

JOB NO: 13662-05	DATE: FEBRUARY 2015	FIGURE: B-1

INDEX TO LOGS

2010 Stoney-Miller Consultants - CPT-3 thru CPT-4

2004 – Stoney-Miller Consultants - RW-1 thru RW-2

2004 - Stoney-Miller Consultants – TP-11 thru TP-15

2004 - Stoney-Miller Consultants – B-14 thru B-15

2001 - Stoney-Miller Consultants – B1 thru B-4

1997 - Stoney-Miller Consultants – B1 thru B-8

1991 - Stoney-Miller Consultants – B-12 thru B-13

1990 – ICG Incorporated – B1 thru B6, BH-1 thru BH-11

1990 - Stoney-Miller Consultants – LCA-1 thru LCA-5

1990 - Stoney-Miller Consultants – B-1 thru B-11

1990 - Stoney-Miller Consultants – CPT-1 thru CPT-2

1989 - Stoney-Miller Consultants – SMB-1 thru SMB-5 and TP-1 thru TP-10

1988 – Petra Geotechnical - P-1 thru P-6 (missing P-7)

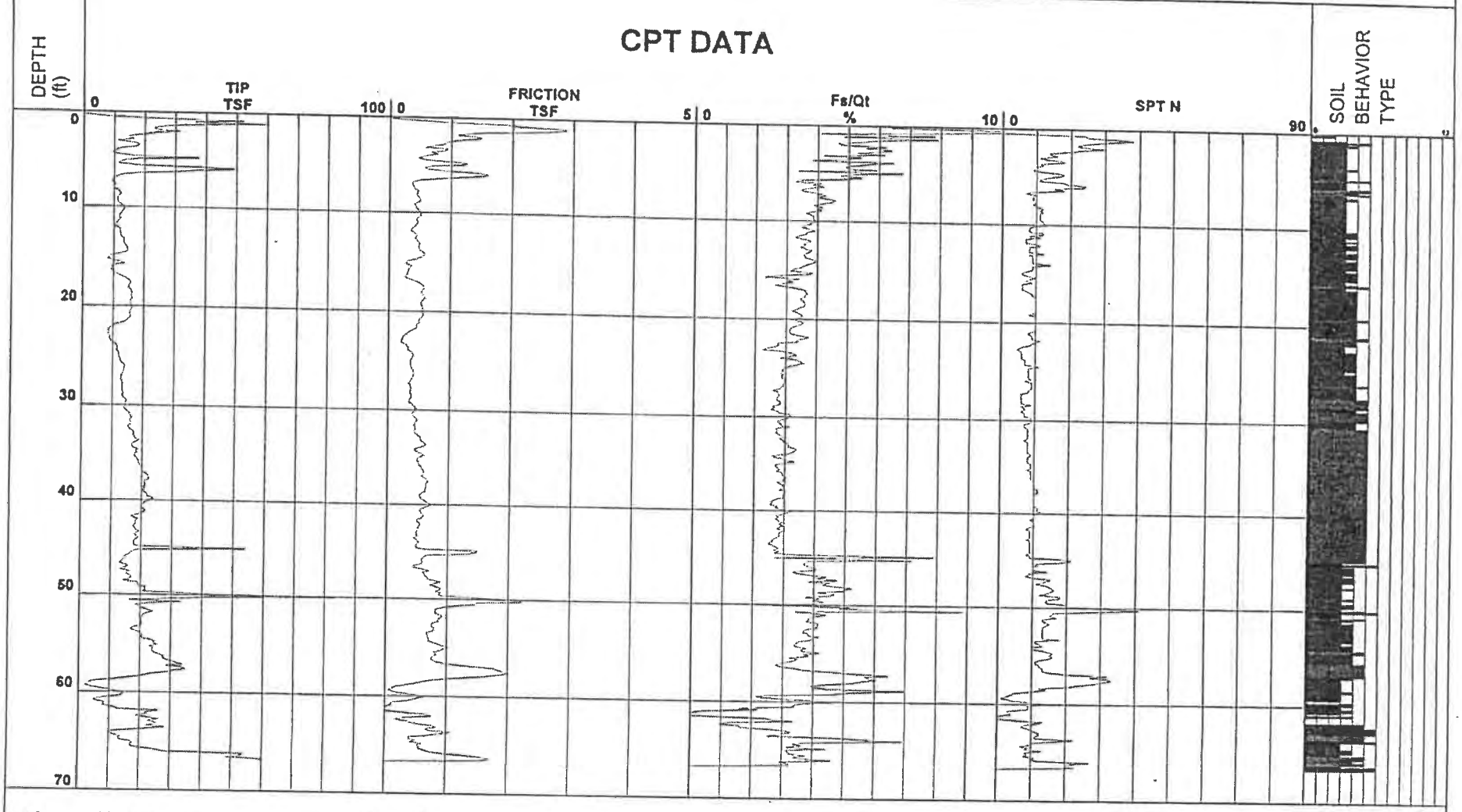
1987 & 1988 – Leighton & Associates – LB-1 thru LB-14

1980 – Medall, Aragon, Worswick & Associates – MB-1A thru MB-10A

Stoney Miller Consultants

Project	Mercedes Benz of Laguna Niguel	Operator	BH-ML	Filename	SDF(403).cpt
Job Number	13372-00	Cone Number	DSG1047	GPS	
Hole Number	CPT-03	Date and Time	1/16/2010 9:14:14 AM	Maximum Depth	66.76 ft
Water Table Depth	9.00 ft				

Net Area Ratio .8



- 1 - sensitive fine grained
- 2 - organic material
- 3 - clay
- 4 - silty clay to clay
- 5 - clayey silt to silty clay
- 6 - sandy silt to clayey silt
- 7 - silty sand to sandy silt
- 8 - sand to silty sand
- 9 - sand
- 10 - gravelly sand to sand
- 11 - very stiff fine grained (*)
- 12 - sand to clayey sand (*)

Cone Size 10cm squared

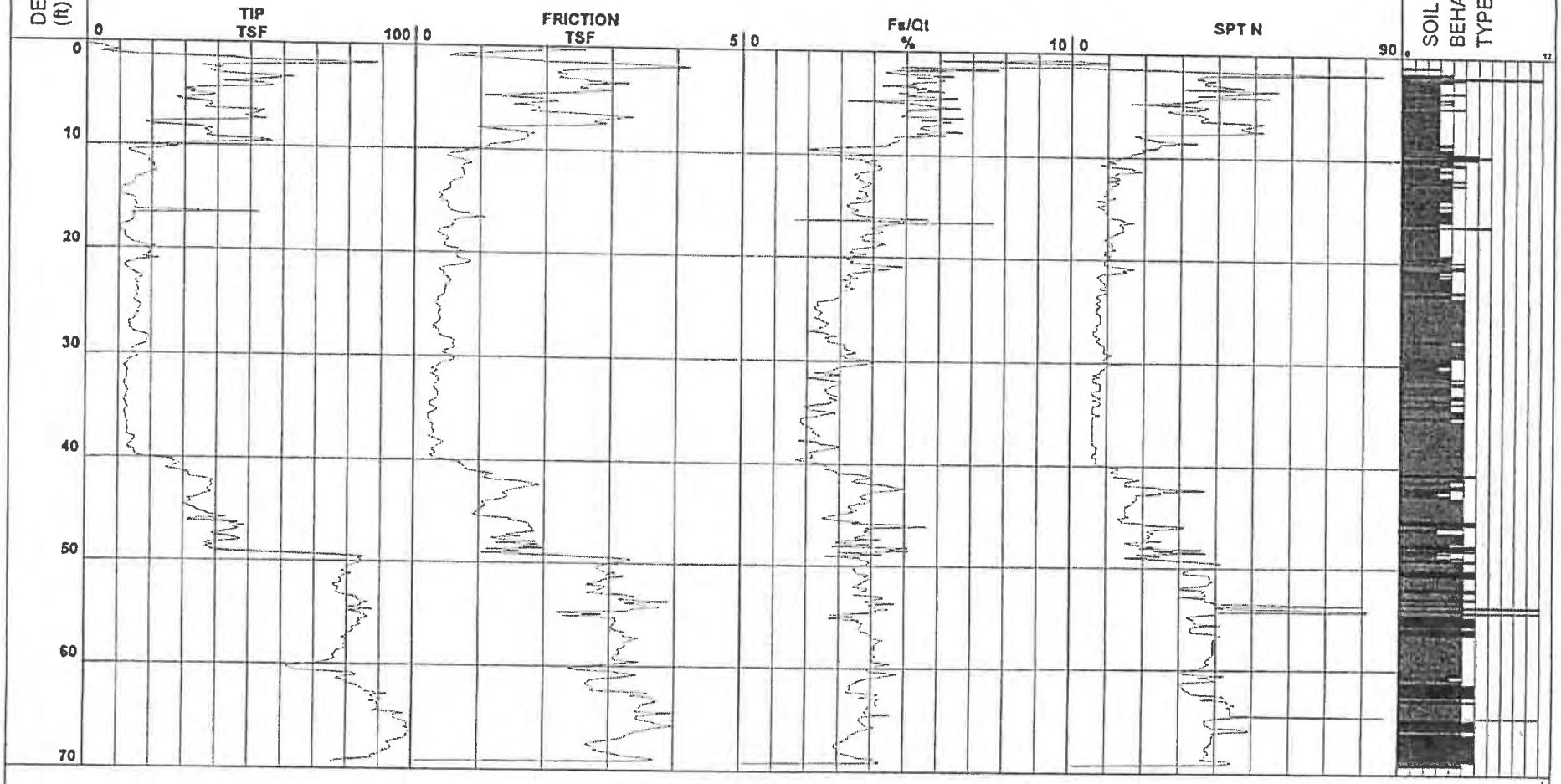
*Soil behavior type and SPT based on data from UBC-1983

Stoney Miller Consultants

Project	Mercedes Benz of Laguna Niguel	Operator	BH-ML	Filename	CPT-02.cpt
Job Number	13372-00	Cone Number	DSG1047	GPS	
Hole Number	CPT-04	Date and Time	1/15/2010 11:03:49 AM	Maximum Depth	69.39 ft
Water Table Depth	9.00 ft				

Net Area Ratio .8

CPT DATA



- 1 - sensitive fine grained
- 2 - organic material
- 3 - clay
- 4 - silty clay to clay
- 5 - clayey silt to silty clay
- 6 - sandy silt to clayey silt
- 7 - silty sand to sandy silt
- 8 - sand to silty sand
- 9 - sand
- 10 - gravelly sand to sand
- 11 - very stiff fine grained (*)
- 12 - sand to clayey sand (*)

Cone Size 10cm squared

*Soil behavior type and SPT based on data from UBC-1983

Date(s) Logged: 10/21/2004
Logged By: JPH

LOCATION: Lot 3, Tract 5241

Ground Elevation: 299.0'

Method of Drilling: 5" Rotary Wash
Drilling Company: A & W Drill
Drop: 24-Inches
Weight(s): 400 lbs.

Depth (feet)	Soil Classification	Blows/ft	Undisturbed Sample	Bulk Sample	Moisture Content (%)	In-place Dry Density (pcf)	BORING NO.: SMC RW-1 Description	Geologic Attitudes	Depth (feet)
0			NO SAMPLES UNTIL 150 FEET				**ENGINEERED FILL** - Clayey SILT/Silty CLAY; medium stiff, damp to moist, olive-gray and mottled by abundant bedrock fragments.		0
1									1
2									2
3									3
4									4
5									5
6									6
7									7
8									8
9									9
10									10
11									11
12									12
13									13
14									14
15									15
16									16
17									17
18									18
19									19
20									20
21									21
22									22
23									23
24									24
25									25
26									26
27									27
28									28
29									29
30									30
31									31
32									32
33									33
34									34
35									35
36									36
37									37
38									38
39									39
40									40

Project No.: 12374-00

LOG OF BORING

Figure No.: B-4.1

Date(s) Logged: 10/21/04
Logged By: JPH

LOCATION: Lot 3, Tract 5241

Ground Elevation: 299.0'

Method of Drilling: 5" Rotary Wash
Drilling Company: A & W Drill
Drop: 24-inches
Weight(s): 400 lbs.

Depth (feet)	Soil Classification	Blows/ft	Undisturbed Sample	Bulk Sample	Moisture Content (%)	In-place Dry Density (pcf)	**BORING NO.: SMC RW-1 Continued** Description	Geologic Attitudes	Depth (feet)
40							**LANDSLIDE DEBRIS** - Clayey SILTSTONE/SILTSTONE; moderately hard, damp to very moist, dark gray to olive-gray, massive to slightly fissile.		40
41									41
42									42
43									43
44									44
45									45
46									46
47									47
48									48
49									49
50									50
51									51
52									52
53									53
54									54
55									55
56									56
57									57
58									58
59									59
60									60
61									61
62									62
63									63
64									64
65									65
66									66
67									67
68									68
69									69
70									70
71									71
72									72
73									73
74									74
75									75
76									76
77									77
78									78
79									79
80									80

Project No.: 12374-00

LOG OF BORING

Figure No.: B-4.2

Date(s) Logged: 10/21/04
Logged By: JPH

LOCATION: Lot 3, Tract 5241

Ground Elevation: 299.0'

Method of Drilling: 5" Rotary Wash
Drilling Company: A & W Drill
Drop: 24-inches
Weight(s): 400 lbs.

Depth (feet)	Soil Classification	Blows/ft	Undisturbed Sample	Bulk Sample	Moisture Content (%)	In-place Dry Density (pcf)	**BORING NO.: SMC RW-1 Continued** Description	Geologic Attitudes	Depth (feet)
80							**LANDSLIDE DEBRIS continued**		80
81									81
82									82
83									83
84									84
85									85
86									86
87									87
88									88
89									89
90									90
91									91
92									92
93									93
94									94
95									95
96									96
97									97
98									98
99									99
100									100
101									101
102									102
103									103
104									104
105									105
106									106
107									107
108									108
109									109
110									110
111									111
112									112
113									113
114									114
115									115
116									116
117									117
118									118
119									119
120									120

Project No.: 12374-00

LOG OF BORING

Figure No.: B-4.3

Date(s) Logged: 10/21/04
Logged By: JPH

LOCATION: Lot 3, Tract 5241

Ground Elevation: 299.0'

Method of Drilling: 5" Rotary Wash
Drilling Company: A & W Drill
Drop: 24-inches
Weight(s): 400 lbs.

BORING NO.: SMC RW-1 Continued

Depth (feet)	Soil Classification	Blows/ft	Undisturbed Sample	Bulk Sample	Moisture Content (%)	In-place Dry Density (pcf)	Description	Geologic Attitudes	Depth (feet)
120							LANDSLIDE DEBRIS continued		120
121									121
122									122
123									123
124									124
125									125
126									126
127									127
128									128
129									129
130									130
131									131
132									132
133									133
134									134
135									135
136									136
137									137
138									138
139									139
140									140
141									141
142									142
143									143
144									144
145									145
146									146
147									147
148									148
149									149
150		75-10"	X	X	31.2	87.6	@150': Clayey SILTSTONE; moderately hard to hard, very moist, dark olive-gray and unoxidized, diatomaceous, slightly to weakly fissile.		150
151									151
152									152
153									153
154									154
155									155
156									156
157									157
158									158
159									159
160									160

Project No.: 12374-00

LOG OF BORING

Figure No.: B-4.4

Date(s) Logged: 10/21/04
Logged By: JPH

LOCATION: Lot 3, Tract 5241

Ground Elevation: 299.0'

Method of Drilling: 5" Rotary Wash
Drilling Company: A & W Drill
Drop: 24-inches
Weight(s): 400 lbs.

Depth (feet)	Soil Classification	Blows/ft	Undisturbed Sample	Bulk Sample	Moisture Content (%)	In-place Dry Density (pcf)	**BORING NO.: SMC RW-1 Continued** Description	Geologic Attitudes	Depth (feet)
240							**BEDROCK: Capistrano Formation continued**		240
241									241
242									242
243									243
244									244
245									245
246									246
247									247
248									248
249									249
250		75-9"	X	X	33.9	85.4	**@250':** Clayey SILTSTONE; hard, moist, dark olive-gray, massive to slightly fissile.		250
251									251
252							**TOTAL DEPTH 250.8'**		252
253							Boring backfilled with cement-bentonite plug.		253
254									254
255									255
256									256
257									257
258									258
259									259
260									260
261									261
262									262
263									263
264									264
265									265
266									266
267									267
268									268
269									269
270									270
271									271
272									272
273									273
274									274
275									275
276									276
277									277
278									278
279									279
280									280

Project No.: 12374-00

LOG OF BORING

Figure No.: B-4.7

Date(s) Logged: 10/25/2004
Logged By: JPH

LOCATION: Lot 10, Tract 5241

Ground Elevation: 355.6'

Method of Drilling: 5" Rotary Wash
Drilling Company: A & W Drill
Drop: 24-inches
Weight(s): 400 lbs.

Depth (feet)	Soil Classification	Blows/ft	Undisturbed Sample	Bulk Sample	Moisture Content (%)	In-place Dry Density (pcf)	**BORING NO.: SMC RW-2** Description	Geologic Attitudes	Depth (feet)
0							**ENGINEERED FILL** - Clayey SILT/Silty CLAY; medium stiff, damp to moist, olive-gray and mottled by abundant bedrock fragments.		0
1									1
2									2
3									3
4									4
5									5
6									6
7									7
8									8
9									9
10									10
11									11
12									12
13									13
14									14
15									15
16									16
17									17
18									18
19									19
20									20
21									21
22									22
23									23
24									24
25									25
26									26
27									27
28									28
29									29
30									30
31									31
32							**@32': Possible CONTACT: LANDSLIDE DEBRIS** - Clayey SILTSTONE; moderately hard, moist, olive-gray, massive.		32
33									33
34									34
35									35
36							**@35.5-38':** Concretionary layer, very hard.		36
37									37
38									38
39									39
40									40

Project No.: 12374-00

LOG OF BORING

Figure No.: B-5.1

Date(s) Logged: 10/25/04
Logged By: JPH

LOCATION: Lot 10, Tract 5241

Ground Elevation: 355.6'

Method of Drilling: 5" Rotary Wash
Drilling Company: A & W Drill
Drop: 24-inches
Weight(s): 400 lbs.

Depth (feet)	Soil Classification	Blows/ft	Undisturbed Sample	Bulk Sample	Moisture Content (%)	In-place Dry Density (pcf)	**BORING NO.: SMC RW-2 Continued** Description	Geologic Attitudes	Depth (feet)
40							**LANDSLIDE DEBRIS**		40
41							**@40-230':** Clayey SILTSTONE; moderately hard, moist, dark olive-gray, unoxidized, massive to slightly fissile.		41
42									42
43									43
44									44
45									45
46									46
47									47
48									48
49									49
50									50
51									51
52									52
53									53
54									54
55									55
56									56
57									57
58									58
59									59
60									60
61									61
62									62
63									63
64									64
65									65
66									66
67									67
68									68
69									69
70									70
71									71
72									72
73									73
74									74
75									75
76									76
77									77
78									78
79									79
80									80

Project No.: 12374-00

LOG OF BORING

Figure No.: B-5.2

Date(s) Logged: 10/25/04
Logged By: JPH

LOCATION: Lot 10, Tract 5241

Ground Elevation: 355.6'

Method of Drilling: 5" Rotary Wash
Drilling Company: A & W Drill
Drop: 24-Inches
Weight(s): 400 lbs.

Depth (feet)	Soil Classification	Blows/ft	Undisturbed Sample	Bulk Sample	Moisture Content (%)	In-place Dry Density (pcf)	**BORING NO.: SMC RW-2 Continued** Description	Geologic Attitudes	Depth (feet)
80							LANDSLIDE DEBRIS continued		80
81									81
82									82
83									83
84									84
85									85
86									86
87									87
88									88
89									89
90									90
91									91
92									92
93									93
94									94
95									95
96									96
97									97
98									98
99									99
100									100
101									101
102									102
103									103
104									104
105									105
106									106
107									107
108									108
109									109
110									110
111									111
112									112
113									113
114									114
115									115
116									116
117									117
118									118
119									119
120									120

Project No.: 12374-00

LOG OF BORING

Figure No.: B-5.3

Date(s) Logged: 10/25/04
Logged By: JPH

LOCATION: Lot 10, Tract 5241

Ground Elevation: 355.6'

Method of Drilling: 5" Rotary Wash
Drilling Company: A & W Drill
Drop: 24-inches
Weight(s): 400 lbs.

Depth (feet)	Soil Classification	Blows/ft	Undisturbed Sample	Bulk Sample	Moisture Content (%)	In-place Dry Density (pcf)	BORING NO.: SMC RW-2 Continued Description	Geologic Attitudes	Depth (feet)
120							**LANDSLIDE DEBRIS continued**		120
121									121
122									122
123									123
124									124
125									125
126									126
127									127
128									128
129									129
130									130
131									131
132									132
133									133
134									134
135									135
136									136
137									137
138									138
139									139
140									140
141									141
142									142
143									143
144									144
145									145
146									146
147									147
148									148
149									149
150									150
151									151
152									152
153									153
154									154
155									155
156									156
157									157
158									158
159									159
160									160

Project No.: 12374-00

LOG OF BORING

Figure No.: B-5.4

Date(s) Logged: 10/25/04
Logged By: JPH

LOCATION: Lot 10, Tract 5241

Ground Elevation: 355.6'

Method of Drilling: 5" Rotary Wash
Drilling Company: A & W Drill
Drop: 24-inches
Weight(s): 400 lbs.

Depth (feet)	Soil Classification	Blows/ft	Undisturbed Sample	Bulk Sample	Moisture Content (%)	In-place Dry Density (pcf)	**BORING NO.: SMC RW-2 Continued** Description	Geologic Attitudes	Depth (feet)
							LANDSLIDE DEBRIS continued		
160		60	X	/	28.4	90.0	**@160':** Clayey SILTSTONE; moderately hard, very moist, dark gray and unoxidized, massive, slightly diatomaceous.		160
161									161
162									162
163									163
164									164
165									165
166									166
167									167
168									168
169									169
170		60	X	/	34.7	82.9	**@170':** Clayey SILTSTONE; moderately hard, moist, dark gray and unoxidized, slightly fissle to massive, slightly diatomaceous, strong petroliferous odor.		170
171									171
172									172
173									173
174									174
175									175
176									176
177									177
178									178
179									179
180		65	X	/	29.0	92.3	**@180':** Clayey SILTSTONE; moderately hard, moist, dark gray, unoxidized, massive to slightly fissile, strong petroliferous odor, slightly diatomaceous.		180
181									181
182									182
183									183
184									184
185									185
186									186
187									187
188									188
189									189
190		67	X	/	26.1	96.7	**@190':** Silty CLAYSTONE/Clayey SILTSTONE; moderately hard, very moist, dark olive-gray, unoxidized, massive.		190
191									191
192									192
193									193
194									194
195									195
196									196
197									197
198									198
199									199
200									200

Project No.: 12374-00

LOG OF BORING

Figure No.: B-5.5

Date(s) Logged: 10/25/04
Logged By: JPH

LOCATION: Lot 10, Tract 5241

Ground Elevation: 355.6'

Method of Drilling: 5" Rotary Wash
Drilling Company: A & W Drill
Drop: 24-inches
Weight(s): 400 lbs.

BORING NO.: SMC RW-2 Continued

Depth (feet)	Soil Classification	Blows/ft	Undisturbed Sample	Bulk Sample	Moisture Content (%)	In-place Dry Density (pcf)	Description	Geologic Attitudes	Depth (feet)
200							**LANDSLIDE DEBRIS continued**		200
201		60	X	/	32.6	87.0	**@200':** Clayey SILTSTONE; moderately hard, moist, dark gray, unoxidized, massive, slightly diatomaceous, moderate petroliferous odor.		201
202									202
203									203
204									204
205									205
206									206
207									207
208									208
209									209
210									210
211		60	X	/	32.2	87.4	**@210':** Clayey SILTSTONE; moderately hard, moist, dark gray, unoxidized, massive, slightly diatomaceous, mild to moderate petroliferous odor.		211
212									212
213									213
214									214
215									215
216									216
217									217
218									218
219									219
220									220
221		65	X	/	27.0	95.7	**@220':** Clayey SILTSTONE; moderately hard, moist, dark olive-gray, massive, strong petroliferous odor.		221
222									222
223									223
224									224
225									225
226									226
227									227
228									228
229									229
230	?					?		?	230
231		70	X	/	25.5	96.7	**@230':** **BEDROCK: Capistrano Formation** - Clayey SILTSTONE; moderately hard, moist, dark olive-gray, slightly fissile to massive, moderate petroliferous odor.		231
232									232
233									233
234									234
235									235
236									236
237									237
238									238
239									239
240									240

Project No.: 12374-00

LOG OF BORING

Figure No.: B-5.6

Date(s) Logged: 10/25/04
Logged By: JPH

LOCATION: Lot 10, Tract 5241

Ground Elevation: 355.6'

Method of Drilling: 5" Rotary Wash
Drilling Company: A & W Drill
Drop: 24-inches
Weight(s): 400 lbs.

Depth (feet)	Soil Classification	Blows/ft	Undisturbed Sample	Bulk Sample	Moisture Content (%)	In-place Dry Density (pcf)	**BORING NO.: SMC RW-2 Continued** Description	Geologic Attitudes	Depth (feet)
240							**BEDROCK: Capistrano Formation continued**		240
241		65	X	X	24.3	99.8	**@240':** Clayey SILTSTONE; moderately hard, moist, dark olive-gray, massive to slightly fissile, trace of fine sand, mild petroliferous odor.		241
242									242
243									243
244									244
245									245
246									246
247									247
248									248
249									249
250		65	X	X	27.0	95.7	**@250':** Clayey SILTSTONE; moderately hard, moist, dark olive-gray, massive, slightly diatomaceous, moderate petroliferous odor.		250
251									251
252									252
253							**TOTAL DEPTH 251'**		253
254							Backfilled with cement-bentonite plug.		254
255									255
256									256
257									257
258									258
259									259
260									260
261									261
262									262
263									263
264									264
265									265
266									266
267									267
268									268
269									269
270									270
271									271
272									272
273									273
274									274
275									275
276									276
277									277
278									278
279									279
280									280

Project No.: 12374-00 **LOG OF BORING** Figure No.: B-5.7

Date(s) Logged: 9/15/2004
Logged By: JPH

LOCATION: Lot 22

Ground Elevation: ±426'

Method of Excav.: JD 310 Backhoe
Company: Al-Roy Drilling
Drop: 30-inches
Weight(s): 140 lbs.

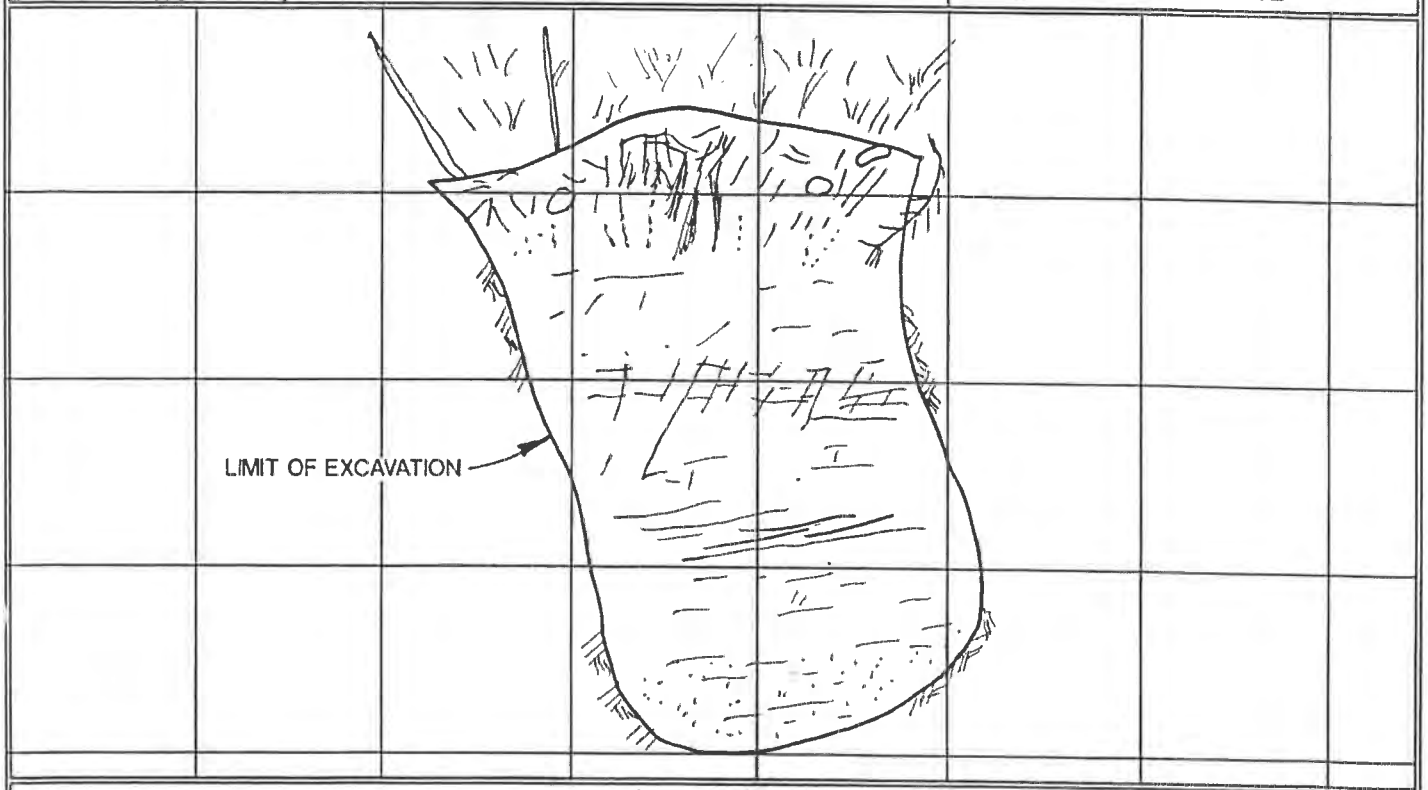
TEST PIT NO.: 11

Depth (feet)	Soil Classification	Blows/ft	Undisturbed Sample	Bulk Sample	Moisture Content (%)	In-place Dry Density (pcf)	Description	Laboratory Test(s)	Depth (feet)
0							**Colluvium/Residual Soil** - Silty CLAY (highly weathered bedrock); medium stiff, dry to damp, dark gray, massive, numerous rodent holes and rootlets, severely desiccated upper 18-24", visible porosity and desiccation cracks 18".		0
1									1
2									2
3							@2-3': Less desiccation, moisture improving to damp, scattered caliche blebs, roots.		3
4							@4': **LANDSLIDE DEBRIS** - Highly weathered Clayey SILTSTONE; soft, medium gray-brown, moist, weakly fissile to massive, soil development, abundant caliche stringers/blebs.		4
5									5
6		5,8	X	X	11.1	99.4	@6': Color change to olive-brown, prismatic soil structure, massive, large white caliche blebs, visible porosity.		6
7									7
8							@8': Shot through with white caliche stringers and pipes turning highly weathered siltstone to light gray.		8
9							@9.5': SILTSTONE; soft, moist, light olive, massive, moderately weathered, moderately oxidized and stained and mottled orange, abundant caliche, fractured.		9
10									10
11		4,5	X	X	12.0	101.5			11
12									12
13							@13': Some orange fine SAND, root filled fractures in siltstone, visible pinhole porosity .		13
14									14
15							**TOTAL DEPTH 15'** - No Groundwater, Pit Backfilled		15

Scale: 1"= 5'

Topography: Hillside

Trench Orientation: NO5E



Project No.: 12374-00

LOG OF TEST PIT

Figure No.: B-6

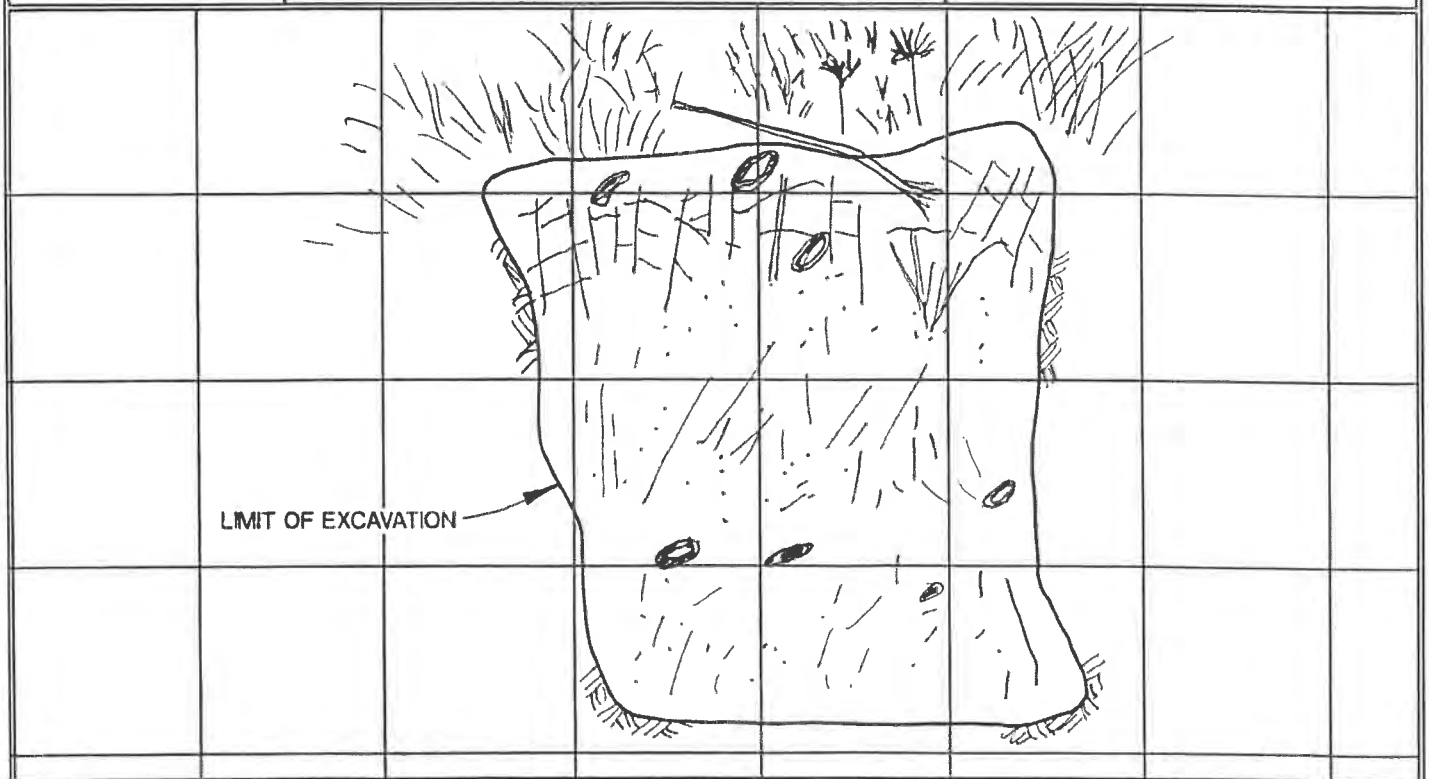
Date(s) Logged: 9/15/2004
Logged By: JPH
LOCATION: Lot 23
Ground Elevation: ±426'

Method of Excav.: JD 310 Backhoe
Company: Al-Roy Drilling
Drop: 30-inches
Weight(s): 140 lbs.

TEST PIT NO.: 12

Depth (feet)	Soil Classification	Blows/ft	Undisturbed Sample	Bulk Sample	Moisture Content (%)	In-place Dry Density (pcf)	Description	Laboratory Test(s)	Depth (feet)
0							**Colluvium/Residual Soil** - Silty CLAY; medium stiff, slightly moist, dark gray to black, massive, prismatic soil structure, rodent burrows and severe desiccation cracks throughout, large roots upper 3', visible porosity.		0
1									1
2				X					2
3				X			@3': Abundant caliche stringers and blebs, fine rootlets.		3
4				X					4
5									5
6									6
7							@7': Color change to olive brown, Clayey SILT (highly weathered), medium stiff, moist, some soil structure, massive, roots, some areas of soft pockets, visible pinhole porosity, caliche stringers, scattered concretionary fragments to 12".		7
8									8
9									9
10							@10': SILT; soft to medium stiff, moist, dark brown, massive, visible pinhole porosity, caliche stringers, some fine roots, soil fractures.		10
11									11
12									12
13									13
14							@14': Medium stiff to stiff Clayey SILT, moist, dark brown, some caliche.		14
15							**TOTAL DEPTH 15'** - No Groundwater, Pit Backfilled		15

Scale: 1"= 5' | Topography: Hillside | Trench Orientation: N273



Project No.: 12374-00

LOG OF TEST PIT

Figure No.: B-7

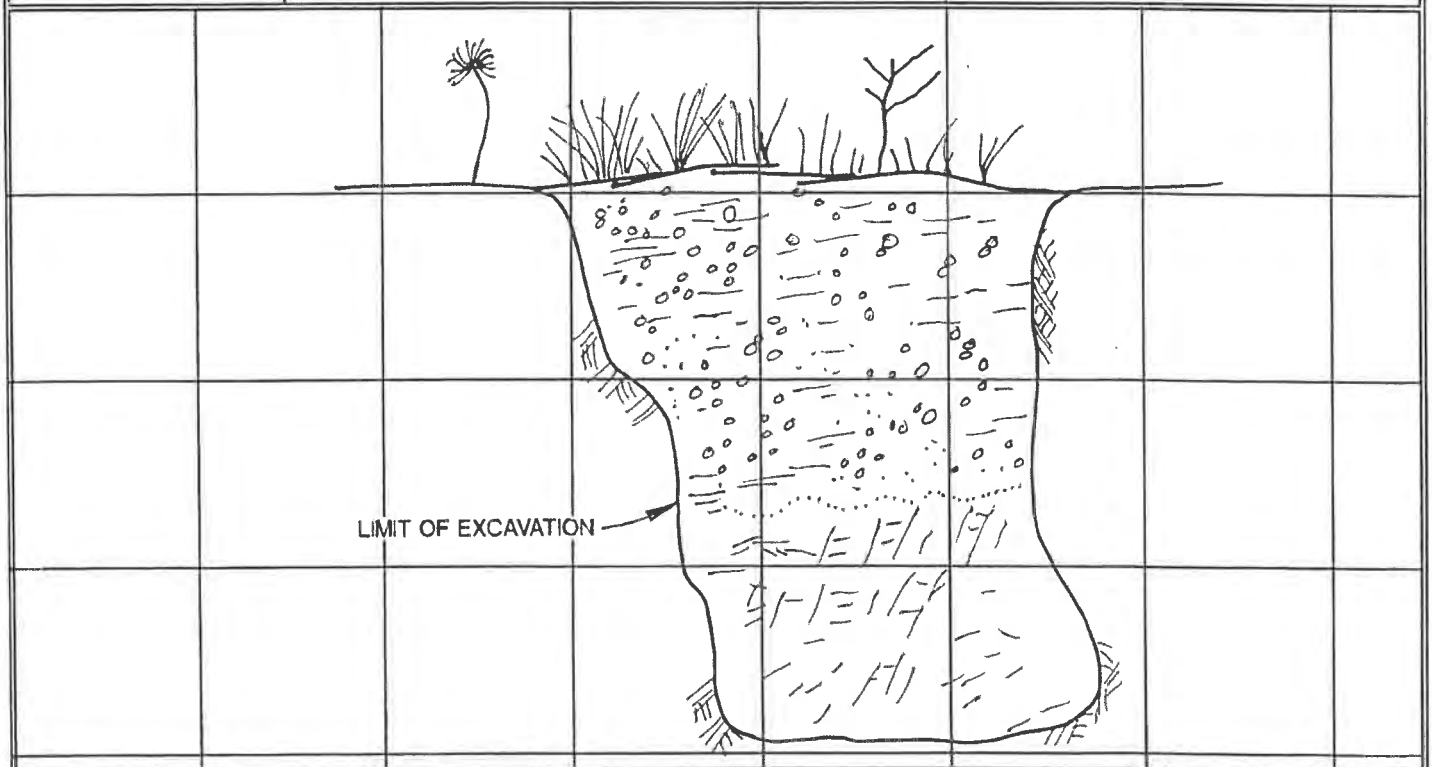
Date(s) Logged: 9/15/2004
Logged By: JPH
LOCATION: Lot 24
Ground Elevation: ±416'

Method of Excav.: JD 310 Backhoe
Company: Al-Roy Drilling
Drop: 30-inches
Weight(s): 140 lbs.

TEST PIT NO.: 13

Depth (feet)	Soil Classification	Blows/ft	Undisturbed Sample	Bulk Sample	Moisture Content (%)	In-place Dry Density (pcf)	Description	Laboratory Test(s)	Depth (feet)
0							**ARTIFICIAL FILL** - Silty CLAY/Clayey SILT; medium stiff, damp, medium brown and mottled, abundant bedrock fragments 30-60%, some roots, desiccation upper 2'.		0
1									1
2									2
3									3
4									4
5									5
6									6
7		4,6	✓		13.3	94.5			7
8							**@8': Residual Soil** - Silty CLAY; soft to medium stiff, moist, olive-brown to dark gray, massive, some caliche, concretionary fragments to 6", roots, prismatic soil structure.		8
9									9
10									10
11							**@11': LANDSLIDE DEBRIS** - SILTSTONE, soft, moist, olive-brown, massive, prismatic soil structure gives blocky appearance, abundant caliche stringers/blebs throughout, fractures, visible pinhole porosity.		11
12									12
13									13
14				X					14
15									15
							TOTAL DEPTH 15.5' - No Groundwater, Pit Backfilled		

Scale: 1"= 5' | Topography: Hillside | Trench Orientation: N15E



Project No.: 12374-00 **LOG OF TEST PIT** Figure No.: B-8

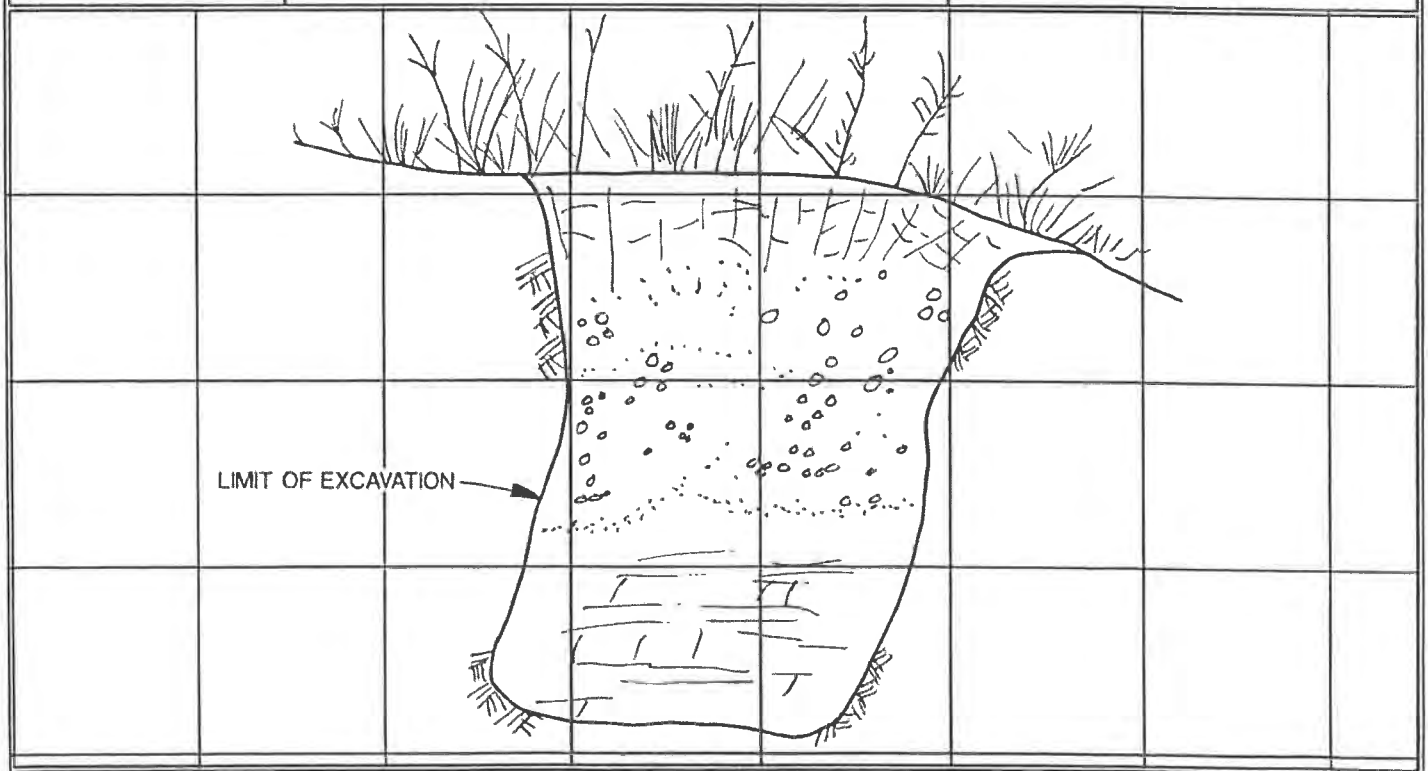
Date(s) Logged: 9/15/2004
Logged By: JPH
LOCATION: Lot 26
Ground Elevation: ±403'

Method of Excav.: JD 310 Backhoe
Company: Al-Roy Drilling
Drop: 30-inches
Weight(s): 140 lbs.

TEST PIT NO.: 14

Depth (feet)	Soil Classification	Blows/ft	Undisturbed Sample	Bulk Sample	Moisture Content (%)	In-place Dry Density (pcf)	Description	Laboratory Test(s)	Depth (feet)
0							**ARTIFICIAL FILL** - Silty CLAY/Clayey SILT with abundant bedrock fragments 30-60%; medium stiff, damp to slightly moist, dark gray-brown and mottled, fill lifts to 4" apparent, severe desiccation upper 2', rodent burrows.		0
1									1
2									2
3									3
4									4
5									5
6									6
7							@7': Some black clay balls and fill mottled black, some roots.		7
8									8
9							@9': **Residual Soil** - Clayey SILT; medium stiff, moist, dark gray, massive, some caliche, visible pinhole porosity.		9
10									10
11									11
12							@12': Color change to dark brown, stiff, moist, highly weathered siltstone, soil fractures, some white concretionary fragments to 6".		12
13									13
14									14
15									15
							TOTAL DEPTH 15.5' - No Groundwater, Pit Backfilled		

Scale: 1"= 5' | Topography: Nearly Level | Trench Orientation:



Project No.: 12374-00

LOG OF TEST PIT

Figure No.: B-9

Stoney-Miller Consultants, Inc.

Date(s) Logged: 9/15/2004
Logged By: JPH

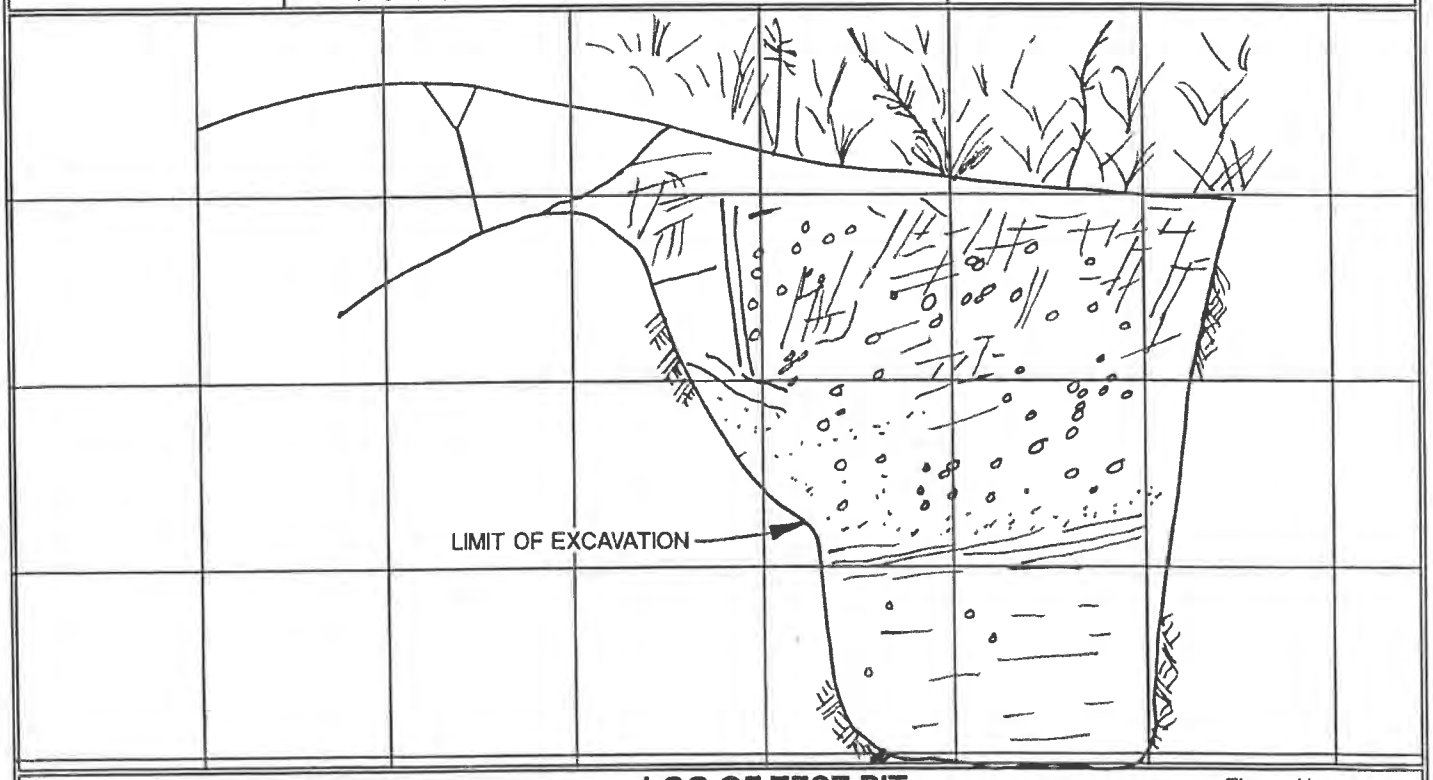
LOCATION: Lot 27

Ground Elevation: ±403'

Method of Excav.: JD 310 Backhoe
Company: Al-Roy Drilling
Drop: 30-inches
Weight(s): 140 lbs.

Depth (feet)	Soil Classification	Blows/ft	Undisturbed Sample	Bulk Sample	Moisture Content (%)	In-place Dry Density (pcf)	**TEST PIT NO.: 15** Description	Laboratory Test(s)	Depth (feet)
0							**ARTIFICIAL FILL** - Clayey SILT/Silty CLAY with abundant scattered bedrock fragments 30-60%; soft to medium stiff, damp, olive-gray and mottled, some roots, scattered concretionary rock fragments to 6", continuous vertical soil crack from 2-6', at 6' truncated by horizontal crack, 1/2" wide, desiccated upper 2'.		0
1									1
2									2
3									3
4									4
5									5
6									6
7		5,9			16.4	96.6			7
8									8
9									9
10							@9.5': **Residual Soil** - Silty fat CLAY; stiff, moist, dark gray, massive, caliche stringers, some white concretionary rock fragments.		10
11							@11': Silty CLAY; stiff, very moist, olive-brown and mottled.		11
12									12
13									13
14									14
15									15
							TOTAL DEPTH 15.5' - No Groundwater, Pit Backfilled		

Scale: 1"= 5' | Topography: Hillside | Trench Orientation: N40E



Project No.: 12374-00

LOG OF TEST PIT

Figure No.: B-10

12374TP11-15.xls 9/21/2004

Stoney-Miller Consultants, Inc.

Date(s) Logged: 9/7/2004
Logged By: JPH

LOCATION: Lot 21

Ground Elevation: ±412'

Method of Drilling: 30" Bucket Auger
Drilling Company: Dave's Drilling
Drop: 12-inch
Weight(s): 0-27' = 4500 lbs., 27-52' = 3500 lbs., 52-80' = 2500 lbs., 80-104' = 1000 lbs.

BORING NO.: SMC B-14

Depth (feet)	Soil Classification	Blows/ft	Undisturbed Sample	Bulk Sample	Moisture Content (%)	In-place Dry Density (pcf)	Description	Geologic Attitudes	Depth (feet)
0							**ARTIFICIAL FILL** - Clayey SILT/Silty CLAY with abundant (30-40%) bedrock fragments; loose, dry to damp, olive-gray, visible porosity and desiccation upper 2', some roots.		0
1				X					1
2				X			**@2':** Desiccation affects diminishing, moisture increasing.		2
3				X					3
4		P/P	X		13.3	95.7			4
5									5
6							**@5':** Fill soil appears compact and homogeneous, medium gray Silty CLAY/Clayey SILT; medium stiff, moist, mottled, bedrock fragments 15-20%, some dark gray clay balls.		6
7		P/1	X		16.9	111.2			7
8									8
9									9
10		P/1	X		18.3	107.3	**@9'3":** **CONTACT** - Sharp, irregular, clean, east dipping.	fr:N12E,68SE	10
11									11
12									12
13		1/1	X		18.0	102.2	**LANDSLIDE DEBRIS** - SILTSTONE; soft, moist, light gray, massive, highly jointed/fractured, fractures high angle, infilled with white caliche, closely spaced, some with orange oxidation halos, paper thin to ±1/2", short to 2'±.		13
14								fr:N08W,78NE	14
15									15
16							**@16':** Closely spaced high angle fractures, slightly open, infilled with caliche, orange oxidation halos, light gray SILTSTONE continues soft, moist.		16
17								fr:N68E,39SE	17
18								fr:N18W,75NE	18
19							**@18'6":** Caliche absent from fractures, oxidized orange.	N27W,73NE	19
20									20
21		P/1	X		16.8	98.7			21
22									22
23							**@22'2"-22'8":** Concretionary lense, cemented, hard, white, nearly continuous, absent on N70W side of boring.		23
24							**@22'8":** Clayey SILTSTONE; moderately hard, medium gray, massive, highly fractured, fractures stained orange and black, closely spaced.	fr:N38W,79NE	24
25									25
26							**@26-27':** Slightly open paper thin fractures, some clean and stained orange, others infilled with gypsum.	fr:N08W,77NE	26
27								N46E,90	27
28							**@28-30':** High angle fractures infilled with gypsum to 3/8", oxidation halos to 1"±.		28
29									29
30		2/3	X		22.0	103.7	**@30'5"-36':** Clayey SILTSTONE; moderately hard, moist, light to medium gray, massive, fractures lengthening and better developed, many infilled with gypsum to 1/2", high to low angle.	fr:N15E,74SE	30
31									31
32									32
33									33
34									34
35									35
36							**@36-36'10":** Concretionary lense, cemented, hard, continuous, nearly horizontal and irregular, blocky.		36
37							**@36'10"-37'9":** Clayey SILTSTONE; moderately hard, moist, medium gray, massive, fractured.	fr:EW,51N	37
38								B:N27E,5NW	38
39							**@37'9"-38'5":** SANDSTONE; soft and friable, damp, pale-brown, massive, fine-grained, micaceous.		39
40									40

Project No.: 12374-00

LOG OF BORING

Figure No.: B-2.1

Date(s) Logged: 9/7/04
Logged By: JPH

LOCATION: Lot 21

Ground Elevation: +412'

Method of Drilling: 30" Bucket Auger
Drilling Company: Dave's Drilling
Drop: 12-inch
Weight(s): 0-27' = 4500 lbs., 27-52' = 3500 lbs., 52-80' = 2500 lbs., 80-104' = 1000 lbs.

BORING NO.: SMC B-14 Continued

Depth (feet)	Soil Classification	Blows/ft	Undisturbed Sample	Bulk Sample	Moisture Content (%)	In-place Dry Density (pcf)	Description	Geologic Attitudes	Depth (feet)
40							**LANDSLIDE DEBRIS continued**		40
41		1/2	✓		24.9	100.2	**@38'5":** Continues SILTSTONE/Clayey SILTSTONE; soft to moderately hard, moist.		41
42							**@42'8"-44'7":** Sand infilled burrow, nearly vertical.		42
43									43
44									44
45									45
46									46
47									47
48									48
49									49
50		1/2	✓		27.5	95.5	**@49'9":** Fractures with gypsum to 1/4".	fr:NS,28E	50
51									51
52									52
53							**@52-53':** Minor seepage (weeping) from high angle, slightly open fractures, some gypsum growth, strongly oxidized orange-brown.	fr:N05W,80NE	53
54									54
55									55
56							**@55'9"-56'6":** Concretionary lense, cemented, hard, light gray, blocky, pinpoint weep at N20W, discontinuous on westerly side.		56
57									57
58									58
59							**@58':** Fractures absent in moderately hard to hard SILTSTONE, moist, medium to dark gray, massive to slightly fissile.		59
60		3/6	✓		26.2	98.2			60
61									61
62									62
63									63
64									64
65							**@64'1"-64'10":** Weeping sidewalls from very fine Sandy SILTSTONE, soft, friable.		65
66									66
67									67
68									68
69									69
70		4/6	✓		23.5	102.3			70
71							**@71'3"-72':** Concretionary pod on S80W sidewall, weeping.		71
72							**@72-85':** SILTSTONE/Clayey SILTSTONE; moderately hard to hard, moist, dark gray, unoxidized, fractures tight.		72
73									73
74									74
75									75
76									76
77									77
78									78
79									79
80									80

Project No.: 12374-00 **LOG OF BORING** Figure No.: B-2.2

Date(s) Logged: 9/7/04
Logged By: JPH

LOCATION: Lot 21

Ground Elevation: +412'

Method of Drilling: 30" Bucket Auger
Drilling Company: Dave's Drilling
Drop: 12-inch
Weight(s): 0-27' = 4500 lbs., 27-52' = 3500 lbs., 52-80' = 2500 lbs., 80-104' = 1000 lbs.

BORING NO.: SMC B-14 Continued

Depth (feet)	Soil Classification	Blows/ft	Undisturbed Sample	Bulk Sample	Moisture Content (%)	In-place Dry Density (pcf)	Description	Geologic Attitudes	Depth (feet)
80		8/10	✓		26.6	96.4			80
81									81
82									82
83									83
84									84
85							**@85':** Minor weeping sidewalls, concoidal fractures.		85
86							**@86'2"-86'7":** Concretionary lense, cemented, hard, discontinuous.		86
87									87
88							**@86'7"-101':** SILTSTONE/Clayey SILTSTONE; moderately hard to hard, dark gray, moist, massive, some spherical to concoidal fracturing.		88
89									89
90		10/15	✓		24.5	97.9			90
91									91
92									92
93									93
94									94
95									95
96									96
97									97
98									98
99									99
100									100
101							**@101':** End of geologic log.		101
102									102
103									103
104									104
105							**TOTAL DEPTH 105'**		105
106							Seepage below 52'.		106
107							Boring backfilled and tamped.		107
108							Upper 20' plugged with cement slurry.		108
109									109
110									110
111									111
112									112
113									113
114									114
115									115
116									116
117									117
118									118
119									119
120									120

Project No.: 12374-00 **LOG OF BORING** Figure No.: B-2.3

Date(s) Logged: 9/8/2004
Logged By: JPH

LOCATION: Lot 13

Ground Elevation: ±358.5'

Method of Drilling: 30" Bucket Auger
Drilling Company: Dave's Drilling
Drop: 12-inches
Weight(s): 0-27' = 4500 lbs., 27-52' = 3500 lbs., 52-80' = 2500 lbs., 80-104' = 1000 lbs.

BORING NO.: SMC B-15

Depth (feet)	Soil Classification	Blows/ft	Undisturbed Sample	Bulk Sample	Moisture Content (%)	In-place Dry Density (pcf)	Description	Geologic Attitudes	Depth (feet)
0							**ARTIFICIAL FILL** - Clayey SILT/Silty CLAY with abundant bedrock fragments (20-40%), soft upper 4', dry to damp, olive-brown, some trash, desiccation upper 2'.		0
1									1
2									2
3		P/P	✓		16.3	109.2			3
4							**@4'6":** Fill soil becoming uniform in appearance, moist and compact, medium stiff.		4
5									5
6		P/P	✓		19.9	102.6			6
7									7
8									8
9		1/1	✓		21.8	103.0	**@9':** Silty CLAY; medium stiff, moist to very moist, medium gray-brown, bedrock fragments 10-30%, some fine sand.		9
10									10
11									11
12		1/1	✓		25.3	95.9	**@12'3"-12'10":** Loose Silty CLAY lift, very soft, moist, bedrock chunks, some roots.		12
13									13
14							**@12'10"-23':** Silty CLAY with bedrock fragments to 30%, medium stiff, moist, medium gray and mottled, trace of organics.		14
15									15
16									16
17									17
18									18
19									19
20		P/P	✓		26.3	94.6			20
21									21
22									22
23							**@23':** Decreasing bedrock fragments to 10%.		23
24							**@24-24'10":** **CONTACT** - Gradational zone of reworked bedrock fragments in a Clayey Silty matrix, irregular.		24
25								fr:N15E,85SE N56E,90	25
26							**LANDSLIDE DEBRIS** - Clayey SILTSTONE; soft, moist, light to medium gray, massive, moderately to highly fractured, fractures high angle, closely spaced, gypsum infilled, stained dark orange to black.		26
27									27
28									28
29							**@26':** Debris incrasing hardness to moderately hard, moist, dark brown and gray, massive, fractured.	fr:N15E,78NW	29
30		1/2	✓		25.1	96.0			30
31									31
32							**@32'4":** Both high and low angle fractures, short to 2'+ and discontinuous, most gypsum filled, some oxidation halos, some bifurcating.		32
33								fr:N22E,26NW	33
34									34
35							**@34-38'2":** Highly fractured, high angle, gypsum filled to 1/4", strongly oxidized orange-brown with halos, fractures pinch out into dark gray SILTSTONE.		35
36								fr:N15E,83SE	36
37									37
38							**@37-38':** Transitioning to dark gray.		38
39							**@38':** Clayey SILTSTONE; moderately hard, moist, dark gray, massive to silightly fissile, slightly micaceous, fractures appear absent.		39
40									40

Project No.: 12374-00

LOG OF BORING

Figure No.: B-3.1

Date(s) Logged: 9/8/04
Logged By: JPH

LOCATION: Lot 13

Ground Elevation: +358.5'

Method of Drilling: 30" Bucket Auger
Drilling Company: Dave's Drilling
Drop: 12-inches
Weight(s): 0-27' = 4500 lbs., 27-52' = 3500 lbs., 52-80' = 2500 lbs., 80-104' = 1000 lbs.

BORING NO.: SMC B-15 Continued

Depth (feet)	Soil Classification	Blows/ft	Undisturbed Sample	Bulk Sample	Moisture Content (%)	In-place Dry Density (pcf)	Description	Geologic Attitudes	Depth (feet)
40		2/3	✓		25.8	94.9			40
41									41
42							**@42':** Trace of sand filled burrow or worm tube.		42
43							**@42-51'6":** Clayey SILTSTONE; moderately hard, very moist, dark gray, massive, micaceous, fractured, fractures widely spaced, high angle, clean, unoxidized.		43
44									44
45									45
46									46
47									47
48									48
49									49
50		1/3	✓		26.3	94.8			50
51							**@51'6"-61':** Clean, unoxidized fractures.	fr:N19E,58SE	51
52									52
53									53
54									54
55								fr:N18E,87NW	55
56									56
57									57
58								fr:N28E,83SE	58
59									59
60		3/5	✓		27.2	94.4		fr:N58E,50SE	60
61							**@61-61'8":** Concretionary lense on westerly half of boring, cemented, hard, light gray, fractures, minor seepage from S48W sidewall at base of concretion.		61
62									62
63									63
64									64
65									65
66									66
67									67
68								fr:N07E,90	68
69									69
70		3/5	✓		26.8	95.2			70
71									71
72									72
73									73
74							**@74':** Minor seepage from short, open fractures at S05W and S83E sidewalls.	fr:N08E,68SE	74
75									75
76									76
77									77
78							**@78-79':** Minor seepage from high angle fracture, clean, slightly open.	fr:N04E,73SE	78
79									79
80									80

Project No.: 12374-00 **LOG OF BORING** Figure No.: B-3.2

Date(s) Logged: 9/8/04
Logged By: JPH

LOCATION: Lot 13

Ground Elevation: +358.5'

Method of Drilling: 30" Bucket Auger
Drilling Company: Dave's Drilling
Drop: 12-inches
Weight(s): 0-27' = 4500 lbs., 27-52' = 3500 lbs., 52-80' = 2500 lbs., 80-104' = 1000 lbs.

BORING NO.: SMC B-15 Continued

Depth (feet)	Soil Classification	Blows/ft	Undisturbed Sample	Bulk Sample	Moisture Content (%)	In-place Dry Density (pcf)	Description	Geologic Attitudes	Depth (feet)
80		5/10	☒		27.6	91.8	**@80-81':** Minor seepage from high angle, open fractures.		80
81									81
82									82
83									83
84									84
85									85
86									86
87									87
88									88
89									89
90		5/15	☒		26.5	93.6	**@90'4"-90'10":** Seepage from concretionary pod on N62E sidewall.		90
91									91
92							**@90'10":** Clayey SILTSTONE; moderately hard, moist to very moist, dark gray, massive to slightly fissile.		92
93									93
94									94
95							**@95':** Weeping from fracture at N43W sidewall.		95
96									96
97									97
98									98
99									99
100									100
101							**@101':** End of geologic log.		101
102									102
103									103
104									104
105							**TOTAL DEPTH 105'**		105
106							Seepage below 61'8".		106
107							Boring backfilled and tamped.		107
108							Upper 20' plugged with cement slurry.		108
109									109
110									110
111									111
112									112
113									113
114									114
115									115
116									116
117									117
118									118
119									119
120									120

Project No.: 12374-00 **LOG OF BORING** Figure No.: B-3.3

Date(s) Logged: 9/24/2001
Logged By: KBM

LOCATION: Mercedes Benz of Laguna Niguel

Ground Elevation: 229'

Method of Drilling: 6" Hollow Stem
Drilling Company: Spectrum
Drop: 30"
Weight(s): 140 lbs.

BORING NO.: B-1

Depth (feet)	Soil Classification	Blows/6"	Undisturbed Sample	Bulk Sample	Moisture Content (%)	In-place Dry Density (pcf)	Description	Geologic Attitudes	Depth (feet)
0							**FILL**		0
1									1
2									2
3		3,5,9	SPT		13.4		**@2.5':** Brown, Sandy CLAY, moist to slightly moist, stiff to very stiff.		3
4									4
5		4,8,9	SPT		12.2		**@5':** Olive-brown, Sandy CLAY, moist to slightly moist, very stiff.		5
6									6
7									7
8									8
9									9
10							**ALLUVIUM/COLLUVIUM**		10
11									11
12									12
13		3,4,7	SPT		16.2		**@12.5':** Olive-gray-brown, Sandy CLAY, moist, slightly porous?, increased plasticity, stiff.		13
14									14
15									15
16									16
17									17
18		2,4,4	SPT		22.6		**@17.5':** Gray, fine to medium Sandy CLAY, moist, caliche/gypsum stringers, firm to stiff.		18
19									19
20									20
21									21
22									22
23		1,1,1	SPT		27.3		**@22.5':** Olive gray/light gray, very fine Clayey SAND, very moist, gypsum stringers, very soft to soft.		23
24									24
25									25
26									26
27									27
28		2,2,3	SPT		27.6		**@27.5':** Gray, very fine Sandy CLAY/Clayey SAND, very moist to wet, caliche stringers, firm. Groundwater at 28'.		28
29									29
30									30
31									31
32									32
33		1,1,1	SPT		24.8		**@32.5':** Olive-gray, very fine Sandy CLAY/Clayey SAND, caliche, very moist to wet, very soft to soft.		33
34									34
35									35
36									36
37									37
38		3,3,3	SPT		26.5		**@37.5':** Olive gray, very fine Sandy CLAY, increased plasticity, very moist to wet, caliche, firm.		38
39									39
40									40

Project No.: 11994-00 **LOG OF BORING** Figure No.: B-1.1

Date(s) Logged: 9/24/01
Logged By: KBM

LOCATION: Mercedes Benz of Laguna Niguel

Ground Elevation: 229'

Method of Drilling: 6" Hollow Stem
Drilling Company: Spectrum
Drop: 30"
Weight(s): 140 lbs.

Depth (feet)	Soil Classification	Blows/6"	Undisturbed Sample	Bulk Sample	Moisture Content (%)	In-place Dry Density (pcf)	BORING NO.: B-1 Continued Description	Geologic Attitudes	Depth (feet)
40									40
41									41
42									42
43		1,1,1	SPT		27.2		**@42.5':** Dark gray, very fine Sandy CLAY, with tan sand lenses, gypsum, increased plasticity, very moist to wet, very soft to soft.		43
44									44
45									45
46									46
47									47
48		1,2,2	SPT		27.1		**@47.5':** Gray Sandy CLAY, very fine, wet, some caliche, soft to firm.		48
49									49
50							**TOTAL DEPTH 49'** Groundwater at 28' Did not encounter bedrock.		50
51									51
52									52
53									53
54									54
55									55
56									56
57									57
58									58
59									59
60									60
61									61
62									62
63									63
64									64
65									65
66									66
67									67
68									68
69									69
70									70
71									71
72									72
73									73
74									74
75									75
76									76
77									77
78									78
79									79
80									80

Project No.: 11994-00 **LOG OF BORING** Figure No.: B-1.2

Date(s) Logged: 9/24/2001
Logged By: KBM

LOCATION: Mercedes Benz of Laguna Niguel

Ground Elevation: 229'

Method of Drilling: 6" Hollow Stem
Drilling Company: Spectrum
Drop: 30"
Weight(s): 140 lb.

BORING NO.: B-2

Depth (feet)	Soil Classification	Blows/6"	Undisturbed Sample	Bulk Sample	Moisture Content (%)	In-place Dry Density (pcf)	Description	Geologic Attitudes	Depth (feet)
0							**FILL**		0
1									1
2							**@2.5':** Brown Sandy CLAY/Clayey SAND, slightly moist.		2
3									3
4									4
5									5
6									6
7									7
8		5,7,11	SPT		13.7		**@7.5':** Black, very fine Sandy CLAY, dry to slightly moist, very		8
9							**ALLUVIUM/COLLUVIUM**		9
10		3,5,6	SPT		21.7		**@10':** Black, very fine Sandy to Silty CLAY, slightly moist, some caliche stringers, increased plasticity, stiff.		10
11									11
12									12
13									13
14									14
15		2,4,4	SPT		26.1		**@15':** Dark gray, fine to medium Sandy CLAY, slightly moist to moist, sand lenses, trace caliche, firm to stiff.		15
16									16
17									17
18									18
19									19
20		3,4,5	SPT		23.9		**@20':** Black, highly plastic, very fine Sandy or Silty CLAY, slightly moist to moist, with caliche stringers, stiff.		20
21									21
22									22
23									23
24									24
25		2,2,2	SPT		30.6		**@25':** Same material as above.		25
26									26
27									27
28							Groundwater??		28
29									29
30		1,1,2	SPT		29.8		**@30':** Dark olive gray/black, highly plastic, very fine Sandy or Silty CLAY, slightly moist to moist, caliche, soft.		30
31									31
32									32
33									33
34									34
35		1,1,1	SPT		29.1		**@35':** Dark olive-gray, very fine Sandy CLAY, moist to very moist, caliche, highly plastic, very soft to soft.		35
36									36
37									37
38									38
39									39
40									40

Project No.: 11994-00

LOG OF BORING

Figure No.: B-2.1

Date(s) Logged: 9/24/01
Logged By: KBM

LOCATION: Mercedes Benz of Laguna Niguel

Ground Elevation: 229'

Method of Drilling: 6" Hollow Stem
Drilling Company: Spectrum
Drop: 30"
Weight(s): 140 lb.

Depth (feet)	Soil Classification	Blows/6"	Undisturbed Sample	Bulk Sample	Moisture Content (%)	In-place Dry Density (pcf)	**BORING NO.: B-2 Continued** Description	Geologic Attitudes	Depth (feet)
40									40
41		4,6,8	SPT		21.1		**@40':** Dark gray, fine to medium Sandy CLAY, wet, trace caliche, stiff.		41
42									42
43									43
44									44
45									45
46		1,2,2	SPT		25.7		**@45':** Dark gray, very moist, fine to medium Sandy CLAY, with caliche, soft to firm.		46
47									47
48									48
49									49
50									50
51		1,2,2	SPT		34.1		**@50':** Same material as above, wet.		51
52									52
53							**TOTAL DEPTH 51'5'**		53
54							Groundwater at 28'		54
55							Did not encounter bedrock.		55
56									56
57									57
58									58
59									59
60									60
61									61
62									62
63									63
64									64
65									65
66									66
67									67
68									68
69									69
70									70
71									71
72									72
73									73
74									74
75									75
76									76
77									77
78									78
79									79
80									80

Project No.: 11994-00 **LOG OF BORING** Figure No.: B-2.2

Date(s) Logged: 9/24/2001
Logged By: KBM

LOCATION: Mercedes Benz of Laguna Niguel

Ground Elevation: 227.5'

Method of Drilling: 6" Hollow Stem
Drilling Company: Spectrum
Drop: 30"
Weight(s): 140 lbs.

BORING NO.: B-3

Depth (feet)	Soil Classification	Blows/6"	Undisturbed Sample	Bulk Sample	Moisture Content (%)	In-place Dry Density (pcf)	Description	Geologic Attitudes	Depth (feet)
0							FILL - Brown, dry to slightly moist, Sandy CLAY/Clayey SAND.		0
1									1
2									2
3									3
4									4
5		4,8,15	X		15.2	116.3	@5': Olive gray, Sandy CLAY, slightly moist, mottled, stiff to very stiff.		5
6									6
7							ALLUVIUM/COLLUVIUM		7
8									8
9									9
10		1,3,5	SPT		20.3		@10': Dark brown, fine to medium Clayey SAND/Sandy CLAY, moist, trace caliche, firm to stiff.		10
11									11
12							Material change seen in cuttings.		12
13									13
14									14
15		4,9,15	X		23.1	102.8	@15': Black, highly plastic, Sandy CLAY, moist, stiff to very stiff.		15
16							Sample tip at 15' was wet.		16
17									17
18									18
19									19
20		1,1,2	SPT		22.2		Groundwater.		20
21							@20': Light brown/olive, coarse SAND with trace CLAY, wet, very loose.		21
22									22
23									23
24									24
25		4,8,10	X		31.3	94.8	@25': Dark gray/brown, Sandy CLAY, highly plastic, slightly porous, very moist, stiff.		25
26									26
27									27
28									28
29									29
30		1,1,1	SPT		29.7		@30': Gray, Sandy CLAY, fine to medium grained, wet to very moist, very soft to soft.		30
31									31
32							TOTAL DEPTH 31.5'		32
33							Groundwater at 20'		33
34							Did not encounter bedrock.		34
35									35
36									36
37									37
38									38
39									39
40									40

Project No.: 11994-00

LOG OF BORING

Figure No.: B-3

Date(s) Logged: 9/24/2001
Logged By: KBM

LOCATION: Mercedes Benz of Laguna Niguel

Ground Elevation: 228.5'

Method of Drilling: 6" Hollow Stem
Drilling Company: Spectrum
Drop: 30"
Weight(s): 140 lbs.

BORING NO.: B-4

Depth (feet)	Soil Classification	Blows/6"	Undisturbed Sample	Bulk Sample	Moisture Content (%)	In-place Dry Density (pcf)	Description	Geologic Attitudes	Depth (feet)
0							FILL -Brown, Sandy CLAY/Clayey SAND, dry to slightly moist.		0
1									1
2									2
3									3
4									4
5		10,25,20	X		12.5	120.4	@5': Gray, olive brown, Sandy CLAY, slightly moist, mottled, very stiff.		5
6									6
7							ALLUVIUM/COLLUVIUM		7
8									8
9									9
10		4,4,5	X		12.0	86.8	@10': Dark brown, fine to medium Sandy CLAY/Clayey SAND, slightly moist to moist, firm.		10
11									11
12							TOTAL DEPTH 11.5'		12
13							No Groundwater		13
14							Did not encounter bedrock		14
15									15
16									16
17									17
18									18
19									19
20									20
21									21
22									22
23									23
24									24
25									25
26									26
27									27
28									28
29									29
30									30
31									31
32									32
33									33
34									34
35									35
36									36
37									37
38									38
39									39
40									40

Project No.: 11994-00

LOG OF BORING

Figure No.: B-4

DATE OBSERVED: 4-16-97

METHOD OF DRILLING: 8" Hollow Stem Auger

LOCATION: Proposed Encore Building

LOGGED BY: KBM

GROUND ELEVATION: 235

DEPTH/FT	CLASSIFICATION	BLOWS/FT	UNDISTURBED	SAMPLE	BULK SAMPLE	MOISTURE CONTENT	INPLACE DRY DENSITY	BORING NO: B-1 DESCRIPTION	LABORATORY TEST	DEPTH/FT
1-								FILL:		1-
2-	SM	43	X			10.4	109.3	@1': Brown, Silty SAND, slightly moist to dry, with trace CLAY, medium dense.		2-
3-										3-
4-										4-
5-								ALLUVIUM: @5': Light grey, fine Sandy SILT, dry to slightly moist, slightly porous.		5-
6-	ML/MH	13	X		X	19.9	95.4	@6': Dark brown, Clayey SILT, moist, firm to stiff.		6-
7-										7-
8-										8-
9-										9-
10-										10-
11-								@11': Dark brown to dark grey, Sandy CLAY, moist to very moist, slightly porous, stiff.		11-
12-	CL	16	X			22.1	99.5			12-
13-										13-
14-										14-
15-										15-
16-								@16': Light brown to light grey, Sandy CLAY, very moist to wet, increased plasticity, slightly porous, gypsum, firm to stiff.		16-
17-		13	X			24.3	95.7			17-
18-										18-
19-										19-
20-										20-
21-								@21': Light brown to tan, Sandy CLAY with pockets of silt and sand, wet to very moist, firm to stiff.		21-
22-		13	X			25.0	101.3			22-
23-								Total Depth 22'		23-
24-								No Bedrock Groundwater @16'		24-
25-								140 lb. Hammer, 30" Drop		25-
26-										26-
27-										27-
28-										28-
29-										29-
30-										30-

JOB NO: 11433-01

LOG OF BORING

FIGURE: B-1

DATE OBSERVED: 4-16-97

METHOD OF DRILLING: 8" Hollow Stem Auger

LOGGED BY: KBM

GROUND ELEVATION: 232.5

LOCATION: Northwest Corner of Proposed Service Building

DEPTH/FT	CLASSIFICATION	BLOWS/FT	UNDISTURBED SAMPLE	BULK SAMPLE	MOISTURE CONTENT	INPLACE DRY DENSITY	BORING NO: B-2 DESCRIPTION	LABORATORY TEST	DEPTH/FT
1-	SM								1-
2-									2-
3-			X				FILL: @3': Brown, Silty SAND, slightly moist, medium dense.		3-
4-									4-
5-		29			14.9	109.2			5-
6-									6-
7-	MH						ALLUVIUM:		7-
8-			X				@8': Dark brown, Clayey SILT, moist, slightly porous, some gypsum, stiff.		8-
9-		15			26.6	94.8		CONSOLI-DATION	9-
10-									10-
11-									11-
12-									12-
13-			X				@13': Same material as above.		13-
14-									14-
15-		21			24.5	98.1		CONSOLI-DATION	15-
16-									16-
17-									17-
18-			X				@18': Same material as above.		18-
19-		14			25.1	97.3		CONSOLI-DATION	19-
20-									20-
21-									21-
22-									22-
23-			X				@23': Brown, Clayey SILT, moist, slightly porous, some gypsum, very stiff.		23-
24-		32			25.0	97.8			24-
25-							Total Depth 24.5'		25-
26-							No Bedrock		26-
27-							Groundwater @13'		27-
28-							140 lb. Hammer, 30" Drop		28-
29-									29-
30-									30-

JOB NO: 11433-01

LOG OF BORING

FIGURE: B-2

1143382

STONEY-MILLER CONSULTANTS, INC.

DATE OBSERVED: 4-16-97

METHOD OF DRILLING: 8" Hollow Stem Auger

LOCATION: East Edge of Proposed Proposed Building

LOGGED BY: KBM

GROUND ELEVATION: 228

DEPTH/FT	CLASSIFICATION	BLOWS/FT	UNDISTURBED	BULK	SAMPLE	MOISTURE CONTENT	INPLACE DRY DENSITY	BORING NO: B-3 DESCRIPTION	LABORATORY TEST	DEPTH/FT
1-	SM							FILL: @0-2': Dark brown, Silty SAND, slightly moist to dry.	MAXIMUM DENSITY DIRECT SHEAR EXPANSION	1-
2-		22	X			12.6	101.7	@2-3': Light grey, Silty-fine SAND, slightly moist to dry, medium dense.		2-
3-										3-
4-										4-
5-										5-
6-								ALLUVIUM:		6-
7-		10	X			16.1	105.5	@7': Dark brown, SAND with SILT and CLAY, moist, firm.		7-
8-										8-
9-										9-
10-										10-
11-										11-
12-	MH	15	X			22.7	99.6	@12': Dark brown, Clayey SILT, moist, slightly porous, some gypsum, stiff.	CONSOLIDATION	12-
13-										13-
14-										14-
15-										15-
16-	CL							@16-17': Light brown, Clayey SAND, very moist to wet, stiff.		16-
17-			X							17-
18-		14				29.6	92.3	@18-22': Dark brown, Clayey SAND, fine-grained, very moist to moist, firm.		18-
19-										19-
20-										20-
21-										21-
22-		10	X			30.2	89.3		CONSOLIDATION	22-
23-										23-
24-								Total Depth 23.5'		24-
25-								No Bedrock Groundwater @17'		25-
26-								140 lb. Hammer, 30" Drop		26-
27-										27-
28-										28-
29-										29-
30-										30-

JOB NO: 11433-01 | LOG OF BORING | FIGURE: B-3

DATE OBSERVED: 4-16-97

METHOD OF DRILLING: 8" Hollow Stem Auger

LOCATION: Southeast Corner of Subject Site

LOGGED BY: KBM

GROUND ELEVATION: 228

DEPTH/FT	CLASSIFICATION	BLOWS/FT	UNDISTURBED	BULK	SAMPLE	MOISTURE CONTENT	INPLACE DRY DENSITY	BORING NO: B-4 DESCRIPTION	LABORATORY TEST	DEPTH/FT
1-	SM							FILL:		1-
2-								@1-4': Dark brown, Silty SAND, slightly moist to dry, medium dense.		2-
3-								ALLUVIUM:		3-
4-		30	X			12.1	111.9	@4-9': Dark brown, Clayey SILT, slightly porous, some gypsum, slightly moist, stiff.		4-
5-				/					MAXIMUM DENSITY	5-
6-	MH									6-
7-										7-
8-										8-
9-			X					@9-14': Same material as above, slightly moist to moist, firm to stiff.		9-
10-		23				10.9	91.7			10-
11-										11-
12-										12-
13-										13-
14-			X					@14-19': Same material as above, moist, increased plasticity, firm.		14-
15-		13				26.1	92.3			15-
16-										16-
17-										17-
18-										18-
19-			X					@19-24': Same material as above.		19-
20-		11				24.1	97.4			20-
21-										21-
22-										22-
23-										23-
24-		8	X			32.5	87.5			24-
25-										25-
26-								Total Depth 25.5'		26-
27-								No Bedrock Groundwater @24' and rising (auger sealed off water)		27-
28-										28-
29-								140 lb. Hammer, 30" Drop		29-
30-										30-

JOB NO: 11433-01 | LOG OF BORING | FIGURE: B-4

DATE OBSERVED: 4-16-97

METHOD OF DRILLING: 8" Hollow Stem Auger

LOCATION: Southeast Corner of Stockpiled Fill

LOGGED BY: KBM

GROUND ELEVATION: 238

DEPTH/FT	CLASSIFICATION	BLOWS/FT	UNDISTURBED	BULK SAMPLE	MOISTURE CONTENT	INPLACE DRY DENSITY	BORING NO: B-5 DESCRIPTION	LABORATORY TEST	DEPTH/FT
1-							FILL:		1-
2-							@1': Brown, Silty SAND, trace cobbles (approx. 1-2" diameter), slightly moist to moist.		2-
3-	SM/ML								3-
4-									4-
5-									5-
6-									6-
7-									7-
8-							@8': Pieces of wood.		8-
9-									9-
10-									10-
11-									11-
12-									12-
13-									13-
14-									14-
15-							@15': Dark grey, fine Sandy SILT, slightly moist to dry, with pieces of red brick in sample, stiff.		15-
16-		23	X		11.8	105.4			16-
17-									17-
18-									18-
19-									19-
20-							@20': No recovery in sampler, concrete dust on sides of sampler tip.		20-
21-	MH	19	X		14.8	108.1	Broke through concrete at 20', hit impermeable object at 24'. Pulled auger, moved forward 10'.		21-
22-							Sampled at 20' in new hole.		22-
23-							ALLUVIUM:		23-
24-							@21': Dark grey, Clayey SILT, slightly moist to moist, some gypsum, slightly porous, stiff.		24-
25-							@25': Same as above, pocket of tan Clayey SAND at 25.5' in sample, less gypsum.		25-
26-		16	X		23.9	97.3			26-
27-									27-
28-									28-
29-									29-
30-		20			18.2	105.3	@30': Dark grey, Clayey SILT, slightly moist		30-

JOB NO: 11433-01

LOG OF BORING

FIGURE: B-5

1143385

STONEY-MILLER CONSULTANTS, INC.

DATE OBSERVED: 4-16-97

METHOD OF DRILLING: 8" Hollow Stem Auger

LOCATION: Southeast Corner of Stockpiled Fill

LOGGED BY: KBM

GROUND ELEVATION: 238

DEPTH/FT	CLASSIFICATION	BLOWS/FT	UNDISTURBED	SAMPLE	BULK SAMPLE	MOISTURE CONTENT	INPLACE DRY DENSITY	BORING NO: B-5 (Continued) DESCRIPTION	LABORATORY TEST	DEPTH/FT
31-			△					@30' cont.: to moist, some gypsum, slightly porous, stiff, Clayey SAND at tip of sample.		31-
32-										32-
33-										33-
34-										34-
35-		13	☒			28.2	93.4	@35': Light brown to tan, fine Sandy SILT, very moist, trace gypsum, slightly porous, firm to stiff.		35-
36-										36-
37-								Total Depth 36.5' No Bedrock Groundwater @35'		37-
38-										38-
39-								140 lb. Hammer, 30" Drop		39-
40-										40-
41-										41-
42-										42-
43-										43-
44-										44-
45-										45-
46-										46-
47-										47-
48-										48-
49-										49-
50-										50-
51-										51-
52-										52-
53-										53-
54-										54-
55-										55-
56-										56-
57-										57-
58-										58-
59-										59-
60-										60-

JOB NO: 11433-01

LOG OF BORING

FIGURE: B-5

DATE OBSERVED: 4-18-97

METHOD OF DRILLING: 8" Hollow Stem Auger

LOCATION: East Edge of Stockpiled Fill

LOGGED BY: KBM

GROUND ELEVATION: 238

DEPTH/FT	CLASSIFICATION	BLOWS/FT	UNDISTURBED	BULK SAMPLE	MOISTURE CONTENT	INPLACE DRY DENSITY	BORING NO: B-6 DESCRIPTION	LABORATORY TEST	DEPTH/FT
1-	ML						FILL: @1': Brown, Sandy SILT, with some CLAY, slightly moist to dry, with rock/concrete fragments.		1-
2-									2-
3-									3-
4-			X						4-
5-		36			15.9	109.5			5-
6-							@6': Dark brown, Clayey SILT, slightly moist, with rock/concrete fragments, very stiff.	CORROSIVITY EXPANSION	6-
7-									7-
8-									8-
9-							@9-10': Concrete lodged in tip.		9-
10-			X				@10': Refusal on rock/concrete. No recovery in sample.		10-
11-		37			15.4	108.5	Sampled again at 10' after moving boring over approx. 8' to south.		11-
12-									12-
13-									13-
14-			X						14-
15-		29			8.7	102.6	@15': Light grey, fine SAND, moist, and dark brown, very fine Sandy SILT, slightly moist (both soil types in sample), medium dense.		15-
16-	MH						ALLUVIUM:		16-
17-							@16': Dark brown to black, Clayey SILT with gypsum, slightly porous, slightly moist to moist, stiff.		17-
18-									18-
19-			X						19-
20-		20			18.7	103.1			20-
21-									21-
22-									22-
23-									23-
24-			X				@24': Same material as above.		24-
25-		23			26.8	95.0			25-
26-									26-
27-									27-
28-									28-
29-			X						29-
30-		10			46.1	80.4	@30': Light brown to tan, Sandy SILT, very		30-

JOB NO: 11433-01 | LOG OF BORING | FIGURE: B-6

DATE OBSERVED: 4-18-97

METHOD OF DRILLING: 8" Hollow Stem Auger

LOCATION: East Edge of Stockpiled Fill

LOGGED BY: KBM

GROUND ELEVATION: 238

DEPTH/FT	CLASSIFICATION	BLOWS/FT	UNDISTURBED	SAMPLE	BULK	SAMPLE	MOISTURE CONTENT	INPLACE DRY DENSITY	BORING NO: B-6 (Continued) DESCRIPTION	LABORATORY TEST	DEPTH/FT
31-									@30' cont.: moist to wet, firm.		31-
32-											32-
33-											33-
34-		15	X				32.4	88.3	@34': Dark brown to black, Clayey SILT with gypsum, slightly porous, moist, stiff.		34-
35-											35-
36-									Total Depth 35.5'		36-
37-									No Bedrock Groundwater @30'		37-
38-									140 lb. Hammer, 30" Drop		38-
39-											39-
40-											40-
41-											41-
42-											42-
43-											43-
44-											44-
45-											45-
46-											46-
47-											47-
48-											48-
49-											49-
50-											50-
51-											51-
52-											52-
53-											53-
54-											54-
55-											55-
56-											56-
57-											57-
58-											58-
59-											59-
60-											60-

JOB NO: 11433-01 | LOG OF BORING | FIGURE: B-6

DATE OBSERVED: 4-18-97

METHOD OF DRILLING: 8" Hollow Stem Auger

LOCATION: West Edge of Stockpiled Fill

LOGGED BY: KBM

GROUND ELEVATION: 238

DEPTH/FT	CLASSIFICATION	BLOWS/FT	UNDISTURBED	SAMPLE	BULK	SAMPLE	MOISTURE CONTENT	INPLACE DRY DENSITY	BORING NO: B-7 DESCRIPTION	LABORATORY TEST	DEPTH/FT
1-	SM								FILL: @1': Light brown, Silty SAND with trace gravel, slightly moist, medium dense.		1-
2-											2-
3-											3-
4-		41	X				10.1	115.9			4-
5-											5-
6-											6-
7-											7-
8-											8-
9-		36	X				8.6	113.9	@9': Same material as above, competent fill, no rubble.		9-
10-										R-VALUE	10-
11-											11-
12-	MH								ALLUVIUM: @12': Dark brown to black, Clayey SILT, trace gypsum, slightly porous, slightly moist, stiff.		12-
13-											13-
14-		21	X				20.6	101.8			14-
15-											15-
16-									@16': Light brown, very fine Sandy SILT, moist, very slightly porous, stiff.		16-
17-											17-
18-											18-
19-		23	X				20.7	103.3			19-
20-											20-
21-											21-
22-											22-
23-									LANDSLIDE DEBRIS: @23': Capistrano Formation - Grey, CLAYSTONE, with highly oxidized, orange weathered (joints), moist, moderately hard.		23-
24-		32	X				38.0	80.9			24-
25-											25-
26-											26-
27-											27-
28-											28-
29-			X								29-
30-		28					39.1	79.7			30-

JOB NO: 11433-01

LOG OF BORING

FIGURE: B-7

DATE OBSERVED: 4-18-97

METHOD OF DRILLING: 8" Hollow Stem Auger

LOCATION: West Edge of Stockpiled Fill

LOGGED BY: KBM

GROUND ELEVATION: 238

DEPTH/FT	CLASSIFICATION	BLOWS/FT	UNDISTURBED	SAMPLE	BULK	SAMPLE	MOISTURE	CONTENT	INPLACE	DRY	DENSITY	BORING NO: B-7 (Continued) DESCRIPTION	LABORATORY TEST	DEPTH/FT
31-														31-
32-												Total Depth 30' No Bedrock Groundwater @27'		32-
33-														33-
34-												140 lb. Hammer, 30" Drop		34-
35-														35-
36-														36-
37-														37-
38-														38-
39-														39-
40-														40-
41-														41-
42-														42-
43-														43-
44-														44-
45-														45-
46-														46-
47-														47-
48-														48-
49-														49-
50-														50-
51-														51-
52-														52-
53-														53-
54-														54-
55-														55-
56-														56-
57-														57-
58-														58-
59-														59-
60-														60-

JOB NO: 11433-01 | LOG OF BORING | FIGURE: B-7

DATE OBSERVED: 4-18-97

METHOD OF DRILLING: 8" Hollow Stem Auger

LOCATION: North Edge of Stockpiled Fill

LOGGED BY: KBM

GROUND ELEVATION: 244

DEPTH/FT	CLASSIFICATION	BLOWS/FT	UNDISTURBED	SAMPLE	BULK SAMPLE	MOISTURE CONTENT	DENSITY	BORING NO: B-8 DESCRIPTION	LABORATORY TEST	DEPTH/FT
1-	ML							FILL:		1-
2-								@1': Brown, Sandy SILT, with some gravel and cobbles (approx. 1/2 to 1" in diameter), dry to slightly moist, very stiff.		2-
3-										3-
4-		38	X			14.4	110.1	Rock in sampler at 4' (still full recovery).		4-
5-			X							5-
6-										6-
7-										7-
8-										8-
9-		29	X			16.8	102.6			9-
10-			X		X				HYDROMETER MAXIMUM DENSITY	10-
11-					X					11-
12-					X					12-
13-										13-
14-		22	X			10.8	109.6			14-
15-			X							15-
16-										16-
17-								ALLUVIUM: @17': Dark brown to grey, very fine Sandy SILT, slightly porous, moist, stiff.		17-
18-	MH									18-
19-										19-
20-		9	X			21.5	89.5		CONSOLIDATION	20-
21-								@21': Dark brown to black, Clayey SILT, slightly porous, moist, no gypsum, firm to stiff.		21-
22-										22-
23-										23-
24-			X							24-
25-		22				23.7	97.1			25-
26-								Total Depth 25.5'		26-
27-								No Groundwater No Bedrock		27-
28-								140 lb. Hammer, 30" Drop		28-
29-										29-
30-										30-

JOB NO: 11433-01 | LOG OF BORING | FIGURE: B-8

DATE OBSERVED: 1/30/91

METHOD OF DRILLING: Rotary Wash, 4-7/8"

LOCATION: See Geotechnical Map

LOGGED BY: JPH

GROUND ELEVATION: 408±

DEPTH/FT	CLASSIFICATION	BLOWS/FT	UNDISTURBED	SAMPLE	BULK	SAMPLE	MOISTURE	CONTENT	INPLACE	DRY	DENSITY	BORING NO: SMC B-12 DESCRIPTION	LABORATORY TEST	DEPTH/FT
1-	ML/CL											FILL: Silty CLAY and Clayey SILT. Stiff, moist, dusky gray-brown to mottled, orange-brown and dark gray-brown.		1-
2-														2-
3-														3-
4-														4-
5-														5-
6-														6-
7-														7-
8-														8-
9-	ML											LANDSLIDE DEBRIS: (Composed of Capistrano Formation Siltstone/Sandstone Bedrock). Moderately hard, moist, light-gray brown to mottled orange-brown, massive to thickly bedded, fine-grained, micaceous.		9-
10-														10-
11-														11-
12-														12-
13-														13-
14-														14-
15-														15-
16-														16-
17-														17-
18-														18-
19-														19-
20-														20-
21-														21-
22-														22-
23-														23-
24-														24-
25-														25-
26-														26-
27-														27-
28-														28-
29-														29-
30-														30-

JOB NO: 10507-00

LOG OF BORING

FIGURE: B-33

DATE OBSERVED: 1/30/91

METHOD OF DRILLING: Rotary Wash, 4-7/8"

LOCATION: See Geotechnical Map

LOGGED BY: JPH

GROUND ELEVATION: 408'±

DEPTH/FT	CLASSIFICATION	BLOWS/FT	UNDISTURBED SAMPLE	BULK SAMPLE	MOISTURE CONTENT	INPLACE DRY DENSITY	BORING NO: SMC B-12 (Cont.) DESCRIPTION	LABORATORY TEST	DEPTH/FT
31-	ML/MH						LANDSLIDE DEBRIS CONTINUED: (Composed of Capistrano Formation Siltstone/Sandstone Bedrock). Moderately hard, moist, light brown to mottled, orange-brown and gray-brown, massive to thickly bedded, fine-grained, micaceous.		31-
32-									32-
33-									33-
34-									34-
35-									35-
36-									36-
37-									37-
38-									38-
39-									39-
40-									40-
41-									41-
42-									42-
43-									43-
44-									44-
45-									45-
46-									46-
47-									47-
48-									48-
49-									49-
50-									50-
51-									51-
52-									52-
53-									53-
54-									54-
55-									55-
56-									56-
57-									57-
58-									58-
59-									59-
60-									60-

JOB NO: 10507-00 | LOG OF BORING | FIGURE: B-34

DATE OBSERVED: 1/30/91

METHOD OF DRILLING: Rotary Wash, 4-7/8"

LOCATION: See Geotechnical Map

LOGGED BY: JPH

GROUND ELEVATION: 408'±

DEPTH/FT	CLASSIFICATION	BLOWS/FT	UNDISTURBED SAMPLE	BULK SAMPLE	MOISTURE CONTENT	INPLACE DRY DENSITY	BORING NO: SMC B-12 (Cont.) DESCRIPTION	LABORATORY TEST	DEPTH/FT
61-	MH						LANDSLIDE DEBRIS CONTINUED: (Composed of Capistrano formation Siltstone/Sandstone Bedrock). Fresh, unoxidized, dark gray to black, moderately hard, moist, massive to thickly bedded; bedding discernable as crude fabric, i.e., imbrication/foliation, jointing/fracturing slight to absent, micaceous, mild petroliferous odor.		61-
62-									62-
63-									63-
64-									64-
65-									65-
66-									66-
67-									67-
68-									68-
69-									69-
70-									70-
71-									71-
72-									72-
73-									73-
74-									74-
75-									75-
76-									76-
77-									77-
78-									78-
79-									79-
80-									80-
81-	MH/ML						@80': Begin Continuous Coring BEDROCK: (Composed of Capistrano Formation Siltstone/Sandstone). Fresh, unoxidized, dark gray to black, moderately hard, moist, massive to thickly bedded; bedding discernable as crude fabric, i.e., imbrication/foliation, jointing/fracturing slight to absent, micaceous, mild petroliferous odor. @83.9-84.8': Very fine-grained, sandy Siltstone. Moderately hard, moist, dark gray. @87.8': Very slight trace of oxidation.		81-
82-									82-
83-									83-
84-									84-
85-									85-
86-									86-
87-								AB;Dip 3°-6°	87-
88-									88-
89-									89-
90-									90-

JOB NO: 10507-00

LOG OF BORING

FIGURE: B-35

10507A34

STONEY-MILLER CONSULTANTS, INC.

DATE OBSERVED: 1/30/91

METHOD OF DRILLING: Rotary Wash, 4-7/8"

LOCATION: See Geotechnical Map

LOGGED BY: JPH

GROUND ELEVATION: 408'±

DEPTH/FT	CLASSIFICATION	BLOWS/FT	UNDISTURBED	SAMPLE	BULK	SAMPLE	MOISTURE	CONTENT	INPLACE	DENSITY	BORING NO: SMC B-12 (Cont.) DESCRIPTION	LABORATORY TEST	DEPTH/FT
91-	MH/ML										BEDROCK CONTINUED: (Composed of Capistrano Formation Siltstone/Sandstone). Fresh, unoxidized, dark gray to black, moderately hard, moist, massive to thickly bedded; bedding discernable as crude fabric, i.e., imbrication/foliation, jointing/ fracturing slight to absent, micaceous, mild petroliferous odor, fossiliferous.		91-
92-													92-
93-													93-
94-													94-
95-											@94.3-95': Trace of light gray, fine-grained sand.	AB;Dip3°-6°	95-
96-											@95.8-98': Traces of light gray, fine-grained sandy silt blebs; 1/4 to 1/2-inch long, irregularly shaped.		96-
97-													97-
98-													98-
99-													99-
100-													100-
101-											@100.8': Appears to contain scattered pelecypods.		101-
102-													102-
103-											@103.3': Trace of carbonized wood fragments and fish scales.		103-
104-													104-
105-											@106.4': Shear; high angle, paper thin, polished, undulatory surface with grooves in down-dip direction.		105-
106-											@106.9: 3-inch long light gray, fine-grained sandy stringer.	S;Dip36°-38°	106-
107-													107-
108-											@109.8': Apparent bedding discernable as crude fabric, i.e., imbrication/ foliation.		108-
109-													109-
110-											@110.9: Carbonized wood fragments and fish scales.	AB;Dip15°-20°	110-
111-													111-
112-													112-
113-													113-
114-											@114.2: Paper thin lense of light gray, fine-grained sand.		114-
115-	MH/SM												115-
116-											@115.9-116': Approximately 3-inch thick, light gray, fine-to medium-grained sandstone bed.	AB;N27E11NW	116-
117-											@116.8-117': Soft zone.		117-
118-											@117.3': Fracture: 1/8-inch thick, high angle, gypsum infilled.	F;N50W72NE	118-
119-											@118': Bedrock becoming hard.		119-
120-													120-

JOB NO: 10507-00 | LOG OF BORING | FIGURE: B-36

DATE OBSERVED: 1/30,31/91 METHOD OF DRILLING: Rotary Wash, 4-7/8"
LOCATION: See Geotechnical Map
LOGGED BY: JPH GROUND ELEVATION: 408'±

DEPTH/FT	CLASSIFICATION	BLOWS/FT	UNDISTURBED	SAMPLE	BULK SAMPLE	MOISTURE	CONTENT	INPLACE DENSITY	BORING NO: SMC B-12 (Cont.) DESCRIPTION	LABORATORY TEST	DEPTH/FT
121-	MH								BEDROCK CONTINUED: (Composed of Capistrano Formation Siltstone/Sandstone). Fresh, unoxidized, dark greenish-gray to dark gray or black, hard, moist, massive to thickly bedded; bedding discernable as crude fabric, i.e., imbrication/foliation, jointing/fracturing very slight to absent, micaceous.		121-
122-											122-
123-											123-
124-											124-
125-									@120.4-121': 8 inch thick concretionary bed (sample broken and shattered-assumed from drilling).		125-
126-											126-
127-									@121-122': Sample not recovered.		127-
128-									@122-124': Scattered pelecypods, fish scales, traces of carbonized wood fragments.		128-
129-									@126-128': Relative density decreasing to moderately hard, slightly sandy.		129-
130-									@128-130.4': Sample not recovered; excessive skin friction.		130-
131-									@130.4': Color change to dark greenish-gray.		131-
132-									@130.2-133.2': Sample not recovered.		132-
133-									@132.7: 2-inch thick concretion. Bedrock above/below appears undisturbed.		133-
134-									@134.4-135.2': Sample not recovered.		134-
135-									@135.2-138': Fresh, unoxidized Siltstone. Hard, moist, massive, joints/fractures absent.		135-
136-											136-
137-											137-
138-									@138-140': As above.		138-
139-											139-
140-									@140-140.8': Sample not recovered.		140-
141-									@140.8-142.8': As above except relative density decreasing to moderately hard.		141-
142-											142-
143-									@142.8-144': Fine-grained, sandy Siltstone.		143-
144-									@144-144.8': As above.		144-
145-									@145.1-147.5': Concretionary bed very hard and difficult to drill. Recovered sample broken and fractured from drilling.		145-
146-											146-
147-											147-
148-									@147.5-150.3': Siltstone. Moderately hard, moist, massive jointing/fracturing absent, dark greenish-gray micaceous.		148-
149-											149-
150-											150-

JOB NO: 10507-00 LOG OF BORING FIGURE: B-37

DATE OBSERVED: 1/30,31/91 METHOD OF DRILLING: Rotary Wash, 4 7/8"
LOCATION: See Geotechnical Map
LOGGED BY: JPH GROUND ELEVATION: 408'±

DEPTH/FT	CLASSIFICATION	BLOWS/FT	UNDISTURBED	SAMPLE	BULK SAMPLE	MOISTURE	CONTENT	INPLACE	DENSITY	BORING NO: SMC B-12 (Cont.) DESCRIPTION	LABORATORY TEST	DEPTH/FT
151-	MH									BEDROCK CONTINUED: (Composed of Capistrano Formation Siltstone/Sandstone). Fresh, unoxidized, dark greenish-gray to dark gray, hard, moist, massive to thickly bedded; bedding discernable as crude fabric, i.e., imbrication/foliation, jointing/ fracturing absent, micaceous, mild petroliferous odor, fossiliferous		151-
152-												152-
153-												153-
154-												154-
155-										@150-151.6': 13-inch (±) thick concretionary bed, only partial recovery, bedrock above/below undisturbed.		155-
156-												156-
157-										@151.6-153.6': Siltstone. Moderately hard, moist, massive.		157-
158-										@153.6-156.1': Same as above; traces of carbonized wood, fish scales.		158-
159-										@156.1-158.1': Same as above.		159-
160-										@158.1-160.6': Traces of carbonized wood. @160.1-160.6': Sample not recovered.		160-
161-										@160.6-161': Same as above. @161-161.5': 6-inch (±) thick concretionary bed.		161-
162-										@161.5-162.6': Siltstone. Hard, moist, massive.		162-
163-										@162.6-163.2': Soft zone.		163-
164-										@163.2-164.6': Same as above.		164-
165-										@164.6-167.1': Same as above; traces of carbonized wood and articulated mollusc shell @166.2 (±).		165-
166-												166-
167-										@167.1-169.6': Same as above; traces of carbonized wood fragments.		167-
168-												168-
169-										@169.6-172.1': Same as above.		169-
170-												170-
171-												171-
172-										@172.6-177.6': Same as above; piece of fine gravel @177.2.		172-
173-												173-
174-												174-
175-												175-
176-												176-
177-												177-
178-										@178.8': Joints; 2 high angle, subparallel, closed, no infilling.	J;N32W/90	178-
179-										@177.6-180.1': Same as above; jointing increasing.	J;N40W/90	179-
180-												180-

JOB NO: 10507-00 LOG OF BORING FIGURE: B-38

DATE OBSERVED: 1/31/91

METHOD OF DRILLING: Rotary Wash 4 7/8"

LOCATION: See Geotechnical Map

LOGGED BY: JPH

GROUND ELEVATION: 408'±

DEPTH/FT	CLASSIFICATION	BLOWS/FT	UNDISTURBED SAMPLE	BULK SAMPLE	MOISTURE CONTENT	INPLACE DRY DENSITY	BORING NO: SMC B-12 (Cont.) DESCRIPTION	LABORATORY TEST	DEPTH/FT
181-	MH						BEDROCK CONTINUED: (Composed of Capistrano Formation Siltstone/Sandstone). Fresh, unoxidized, dark greenish-gray to dark gray, hard, moist, massive to thickly bedded; bedding discernable as fabric, i.e., imbrication/foliation, slightly jointed, micaceous, fossiliferous, mild petroliferous odor.	J;N70E/47NW	181-
182-									182-
183-									183-
184-								J;N48E/90	184-
185-							@180.1-182.6': Same as above; disarticulated mollusc shell.	J;N42W/48NE	185-
186-							@180.4': Traces of carbonized wood, appears bioturbated (worm tubes infilled with light gray silt).		186-
187-							@181.4': Joint; high angle, tight, no infilling.		187-
188-							@182.6-185.5': Same as above except bedrock becoming slightly jointed @184'.	J;N30E/54SE	188-
189-							@185.5-188': Same as above except trace of fine sand.		189-
190-							@188-190': Traces of carbonized shell fragments, fine gravel, jointing/fracturing absent.	J;N85W/78SW	190-
191-							@190-192.5': Same as above.	J;N87E/90	191-
192-							@192.5-195': Slightly jointed; joints are tight, closely spaced, short, discontinuous, no infilling or coatings.		192-
193-							@195-197': Same as above except jointing absent, trace of carbonized wood.		193-
194-							@197-199.5': Same as above; jointing/fracturing absent.		194-
195-									195-
196-									196-
197-							@199.5-202': Same as above; traces of carbonized shell fragments.		197-
198-									198-
199-									199-
200-									200-
201-							@202-204.5': Same as above; jointing/fracturing absent.		201-
202-									202-
203-									203-
204-							@204.5-207': Same as above; joint @206.7' is high angle, short, tight, discontinuous, no infilling.		204-
205-									205-
206-									206-
207-							@207-209.5': Same as above; traces of carbonized shell fragments, fish scales.		207-
208-									208-
209-							@209.5-212': Same as above.		209-
210-									210-

JOB NO: 10507-00 | LOG OF BORING | FIGURE: B-39

DATE OBSERVED: 1/31/91 METHOD OF DRILLING: Rotary Wash, 4 7/8"

LOGGED BY: JPH GROUND ELEVATION: 408'± LOCATION: See Geotechnical Map

DEPTH/FT	CLASSIFICATION	BLOWS/FT	UNDISTURBED SAMPLE	BULK SAMPLE	MOISTURE CONTENT	INPLACE DRY DENSITY	BORING NO: SMC B-12 (Cont.) DESCRIPTION	LABORATORY TEST	DEPTH/FT
211-	MH						BEDROCK CONTINUED: (Composed of Capistrano Fromation Siltstone/Sandstone). Fresh, unoxidized, dark greenish-gray, hard, moist, massive to thickly bedded; bedding discernable as fabric, i.e., imbrication/foliation, jointing slight to absent, micaceous, fossiliferous, mild petroliferous odor.		211-
212-									212-
213-									213-
214-								J;N23W/86SW	214-
215-								J;N19W/71NE	215-
216-							@212.-214.5': Slightly jointed; joints are tight, closely spaced, short, discontinuous, high angle, no infilling or coatings.		216-
217-									217-
218-							@214.5-217': Same as above; jointing/ fracturing absent.		218-
219-							@217-219.5': Same as above, trace of fine sand, high angle joint @219'; short, tight, discontinuous.	J;N59E/90	219-
220-							@219.5-222': Same as above; joints/ fractures absent.		220-
221-									221-
222-							@222-224.5': Same as above, slightly jointed.	J;N61E/86NW	222-
223-									223-
224-									224-
225-							@224.5-227': Same as above; trace of carbonized wood fragments.		225-
226-									226-
227-							@227-229.5': Same as above; joints/fractures absent.		227-
228-									228-
229-									229-
230-							@231.6': Clay Seam; apparent bedding, paper thin, no striations, appears slightly polished.		230-
231-							@229.5-232': Same as above.		231-
232-							@232-234.5': Bedrock same as above except short, parallel joints @232; discontinuous, tight, no infilling or coatings.	CS;N19E/4NW	232-
233-								J;N63E/57NW	233-
234-							@234.5-237': Same as above.		234-
235-							@235.4': Clay seam; apparent bedding, paper thin, striated in down-dip direction surface unpolished.		235-
236-							@236.3: Clay seam; apparent bedding, paper thin, striations in down-dip direction.	CS;N23E/09NW	236-
237-							@237-239.5': Trace of fine-grained sand, slightly jointed; high angle, parallel sets, light, no infilling or surface coatings.	CS;N29E/12NW	237-
238-									238-
239-									239-
240-							@239.5-242.3': Same as above; jointing absent.		240-

JOB NO: 10507-00 LOG OF BORING FIGURE: B-40

DATE OBSERVED: 2/1/91 METHOD OF DRILLING: Rotary Wash, 4 7/8"

LOCATION: See Geotechnical Map

LOGGED BY: JPH GROUND ELEVATION: 408'±

DEPTH/FT	CLASSIFICATION	BLOWS/FT	UNDISTURBED	SAMPLE	BULK	SAMPLE	MOISTURE	CONTENT	INPLACE	DENSITY	BORING NO: SMC B-12 (Cont.) DESCRIPTION	LABORATORY TEST	DEPTH/FT
241-	MH										BEDROCK CONTINUED: (Composed of Capistrano Formation Siltstone/Sandstone). Fresh, unoxidized, dark greenish-gray, hard, moist, massive to thickly bedded; bedding discernable as fabric, i.e., imbrication/foliation, jointing slight to absent, micaceous fossiliferous, mild petroliferous odor.		241-
242-													242-
243-													243-
244-													244-
245-													245-
246-											@242.3-244.8': Same as above; jointing absent, trace of light gray, fine-grained sand.		246-
247-													247-
248-											@244.8-247.6': Same as above.		248-
249-											@247.6-250.4': Same as above.		249-
250-													250-
251-											Total Depth 250.4' Start Continuous Core Sampling @80' Boring Backfilled		251-
252-													252-
253-													253-
254-													254-
255-													255-
256-													256-
257-													257-
258-													258-
259-													259-
260-													260-
261-													261-
262-													262-
263-													263-
264-													264-
265-													265-
266-													266-
267-													267-
268-													268-
269-													269-
270-													270-

JOB NO: 10507-00 LOG OF BORING FIGURE: B-41

DATE OBSERVED: 2/2/91

METHOD OF DRILLING: Rotary Wash, 4 7/8"

LOCATION: See Geotechnical Map

LOGGED BY: JPH

GROUND ELEVATION: 342'±

DEPTH/FT	CLASSIFICATION	BLOWS/FT	UNDISTURBED	SAMPLE	BULK	SAMPLE	MOISTURE	CONTENT	INPLACE	DRY	DENSITY	BORING NO: SMC B-13 DESCRIPTION	LABORATORY TEST	DEPTH/FT
1-	ML											ARTIFICIAL FILL: Mottled orange-brown to gray-brown, clayey SILT. Firm, moist, trace of rootlets and Siltstone bedrock chunks, scattered gypsum.		1-
2-														2-
3-	ML/MH											LANDSLIDE DERBIS: Composed of Capistrano Formation Siltstone/Sandstone Bedrock). Soft to moderately hard, moist, light gray-brown to light gray, massive, moderately to highly jointed/fractured.		3-
4-														4-
5-														5-
6-														6-
7-														7-
8-														8-
9-														9-
10-														10-
11-														11-
12-														12-
13-														13-
14-														14-
15-														15-
16-														16-
17-														17-
18-														18-
19-														19-
20-														20-
21-	MH											@21': Fresh, unoxidized, dark gray to black Siltstone. Moderately hard to hard, moist, massive.		21-
22-														22-
23-														23-
24-														24-
25-														25-
26-														26-
27-														27-
28-														28-
29-														29-
30-														30-

JOB NO: 10507-00

LOG OF BORING

FIGURE: B-42

DATE OBSERVED: 2/2/91 METHOD OF DRILLING: Rotary Wash, 4 7/8"

LOCATION: See Geotechnical Map

LOGGED BY: JPH GROUND ELEVATION: 342'±

DEPTH/FT	CLASSIFICATION	BLOWS/FT	UNDISTURBED	SAMPLE	BULK	SAMPLE	MOISTURE	COINTENT	INPLACE	DRY	DENSITY	BORING NO: SMC B-13 (Cont.) DESCRIPTION	LABORATORY TEST	DEPTH/FT
31-	MH											LANDSLIDE DEBRIS CONTINUED: (Composed of Capistrano Formation Siltstone/Sandstone Bedrock). Fresh, unoxidized, moderately hard, moist, dark greenish-gray, massive to thickly bedded; bedding discernable as fabric, i.e., imbrication/foliation, slight to absent, micaceous.		31-
32-														32-
33-														33-
34-														34-
35-														35-
36-														36-
37-														37-
38-														38-
39-														39-
40-														40-
41-														41-
42-														42-
43-														43-
44-														44-
45-														45-
46-														46-
47-														47-
48-														48-
49-														49-
50-												@50': Begin continuous sampling. @50-52': As above, jointing absent.		50-
51-														51-
52-												@52-54': As above.		52-
53-												@53.2': Clay Seam; apparent bedding, paper thin, no striations or polishing.	CS;Dip 12°	53-
54-												@54-56.5': As above with trace of yellow, fine-grained sand and carbonized wood fragments; fish scales.		54-
55-														55-
56-														56-
57-												@56.5-59': As above.		57-
58-														58-
59-												@59-61': As above.		59-
60-														60-

JOB NO: 10507-00 | LOG OF BORING | FIGURE: B-43

DATE OBSERVED: 2/2/91

METHOD OF DRILLING: Rotary Wash, 4 7/8"

LOCATION: See Geotechnical Map

LOGGED BY: JPH

GROUND ELEVATION: 342'±

DEPTH/FT	CLASSIFICATION	BLOWS/FT	UNDISTURBED	STANDARD PENETRATION	BULK SAMPLE	MOISTURE CONTENT	INPLACE DRY DENSITY	BORING NO: B-13 (Cont.) DESCRIPTION	LABORATORY TEST	DEPTH/FT
61-	MH							LANDSLIDE DEBRIS CONTINUED: (Composed of Capistrano Formation Siltstone/Sandstone Bedrock). Fresh, unoxidized, moderately hard to hard, moist, dark greenish-gray to gray, massive to thickly bedded; bedding discernable as fabric, i.e., imbrication/foliation, jointing/fracturing slight to absent, micaceous, mild petroliferous odor.		61-
62-										62-
63-										63-
64-										64-
65-								@61.8-64.6': As above.		65-
66-								@63.1': Shear; high angle, paper thin, clay lined, tight, polished surface, striated in down dip direction.		66-
67-								@64.6-66.0': As above.		67-
68-								@66.0-67.4': 15-inch thick concretionary bed (broken from drilling) bedrock above/below undisturbed.		68-
69-								@67.4-70.2': As above with trace of yellow, fine-grained sand.		69-
70-								@70.2-73.0': As above.		70-
71-										71-
72-										72-
73-								@73-75.8': As above; dark gray.		73-
74-										74-
75-										75-
76-								@75.8-78.6': Relative density increasing to hard, traces of carbonized shells and wood.		76-
77-										77-
78-										78-
79-								@78.6-81.4': Trace of yellow, fine-grained sand, fossiliferous (scattered pelecypods).		79-
80-										80-
81-								@81.4-84.2': As above; fossiliferous (carbonized wood and shell fragments).		81-
82-										82-
83-										83-
84-										84-
85-										85-
86-									CS;Dip 9°	86-
87-									S;Dip 58°	87-
88-										88-
89-										89-
90-										90-

JOB NO: 10507-00 | LOG OF BORING | FIGURE: B-44

DATE OBSERVED: 2/4/91

METHOD OF DRILLING: Rotary Wash, 4 7/8"

LOCATION: See Geotechnical Map

LOGGED BY: JPH

GROUND ELEVATION: 342'±

DEPTH/FT	CLASSIFICATION	BLOWS/FT	UNDISTURBED	SAMPLE	BULK	SAMPLE	MOISTURE	CONTENT	INPLACE	DRY DENSITY	BORING NO: SMC B-13 (Cont.) DESCRIPTION	LABORATORY TEST	DEPTH/FT
91-	MH										LANDSLIDE DEBRIS CONTINUED: (Composed of Capistrano Formation Siltstone/Sandstone Bedrock). Fresh, unoxidized, moderately hard to hard, moist, dark greenish-gray to gray, massive to thickly bedded; bedding discernable as fabric, i.e., imbrication/foliation, jointing/fracturing slight to absent, micaceous, mild petroliferous odor.		91-
92-													92-
93-													93-
94-													94-
95-											@90.0-90.8': 10-inch thick concretionary bed.		95-
96-											@90.8-92.8': As above.		96-
97-											@92.8-95.6': As above. @95.6-98.4': As above; moderately hard, trace of carbonized wood, fish scales.		97-
98-													98-
99-											@98.4-101.2': As above.		99-
100-													100-
101-											@101.2-103.2': Only partial sample recovery due to chunk of concretion from 90-90.8' disturbing sample tube.		101-
102-													102-
103-											@103.2-105.2': As above; jointing/fracturing absent.		103-
104-													104-
105-											@105.2-106.0': No sample recovered.		105-
106-											@106.0-107.0': Poor sample recovery due to concretionary lense.		106-
107-											@107.0-111': No sample recovered; concretion impeding recovery.		107-
108-													108-
109-													109-
110-													110-
111-											@111-113': As above.		111-
112-											@112.2: Clay Seam; apparent bedding, paper thin, poorly developed striations, surface unpolished.	CS;Dip 12°	112-
113-											@113-115.8': As above (sample recovered, but disturbed by concretionary fragments loosened above).		113-
114-													114-
115-											@115.8-118.6': As above; trace of carbonized wood, jointing absent.		115-
116-													116-
117-													117-
118-											@118.6-121.4': As above.		118-
119-													119-
120-													120-

JOB NO: 10507-00 | LOG OF BORING | FIGURE: B-45

DATE OBSERVED: 2/4/91 METHOD OF DRILLING: Rotary Wash, 4 7/8"

LOGGED BY: JPH GROUND ELEVATION: 342'± LOCATION: See Geotechnical Map

DEPTH/FT	CLASSIFI CATION	BLOWS/FT	UNDISTURBED SAMPLE	BULK SAMPLE	MOISTURE CONTENT	INPLACE DRY DENSITY	BORING NO: SMC B-13 (Cont.) DESCRIPTION	LABORATORY TEST	DEPTH/FT
121-	MH						LANDSLIDE DEBRIS CONTINUED: (Composed of Capistrano Formation Siltstone/Sandstone Bedrock). Fresh, unoxidized, moderately hard, moist, dark greenish-gray to gray, massive to thickly bedded; bedding discernable as crude fabric, i.e., imbrication/foliation, jointing/fracturing slight to absent, micaceous, mild petroliferous odor.		121-
122-									122-
123-									123-
124-									124-
125-							@121.4-124.4': Clayey siltstone; sample disturbed by concretion.		125-
126-							@124.2-127': As above; sample disturbed by concretion.		126-
127-							@127-129.8: As above; hard.		127-
128-									128-
129-									129-
130-									130-
131-							@130.6: Joint; high angle, no clay, poorly developed striations, no infilling.	J;Dip 69°	131-
132-							@129.8-132.6': As above; trace of carbonized wood.		132-
133-							@132.6-137.4': As above.		133-
134-									134-
135-									135-
136-									136-
137-							@137.4-140.2': As above; trace of carbonized wood.		137-
138-									138-
139-									139-
140-							@140.2-141.2': No sample recovered.		140-
141-							@141.2-143.2': Sample disturbed by concretion.		141-
142-									142-
143-							@143.2-144.0': Bedrock hard, shows well-developed fabric.		143-
144-							@143.6': Shear; high angle, paper thin, clay lined, faintly striated, slightly polished.	S;Dip 39°	144-
145-									145-
146-							@144-146.2': As above; bedrock hard.	AB;Dip 6°	146-
147-							@145.3-146.2': Several (4±) paper thin clay seams; apparent bedding, poorly developed striations, surfaces polished.	AB;Dip 4°-6°	147-
148-							@146.2-149': As above; massive, hard, trace of carbonized wood.		148-
149-							@149-151.6': As above; thinly laminated.		149-
150-									150-

JOB NO: 10507-00 LOG OF BORING FIGURE: B-46

DATE OBSERVED: 2/5/91 METHOD OF DRILLING: Rotary Wash, 4 7/8"

LOCATION: See Geotechnical Map

LOGGED BY: JPH GROUND ELEVATION: 342'±

DEPTH/FT	CLASSIFICATION	BLOWS/FT	UNDISTURBED	SAMPLE	BULK SAMPLE	MOISTURE CONTENT	INPLACE DRY DENSITY	BORING NO: SMC B-13 (Cont.) DESCRIPTION	LABORATORY TEST	DEPTH/FT
151-	MH							LANDSLIDE DEBRIS CONTINUED: (Composed of Capistrano Formation Siltstone/Sandstone Bedrock). Fresh, unoxidized, moderately hard to hard, moist, dark greenish-gray to gray, massive to thickly bedded; bedding discernable as crude fabric, i.e., imbrication/foliation, jointing/fracturing slight to absent, micaceous, mild petroliferous odor, fossiliferous.	S;Dip 38°	151-
152-										152-
153-										153-
154-										154-
155-										155-
156-								@151.6-151.8': Shear Plane; possible rupture surface (sample disturbed by dented sampling barrel tip), appears as multiple shears of remolded siltstone, approximately 2 to 3-inches thick, well developed striations in down-dip direction, surfaces highly polished, attitude uncertain.		156-
157-										157-
158-										158-
159-										159-
160-									S;Dip 48°	160-
161-								@151.8-153.8': Clayey siltstone (possibly remolded siltstone) appears thinly laminated (steeply dipping), stiff, moist.		161-
162-										162-
163-								@153.8-156.6': Bedrock becomes hard, fossiliferous.		163-
164-								@156.6-158.9': As above; hard.		164-
165-								@160.5': Shear; high angle, no clay, moderately developed striations, polished surface.		165-
166-								@158.9-161.7': As above; hard.		166-
								@161.7-164.5': As above.		
167-								@164.5-167.3': As above; trace of carbonized fish scales, yellow fine-grained sand.		167-
168-										168-
169-								@167.3-170.1': As above, moderately hard.		169-
170-	ML							@170.5': Shear; high angle, paper thin to 1/32-inch thick, clay-lined, well-developed striations @52° angle from down-dip, slightly polished.	S;Dip 39°	170-
171-								@170.1-172.9': As above; trace of yellow, fine-grained sand, fish scales, moderately hard.		171-
172-										172-
173-								@172.9-175.7': Sandy siltstone bedrock; soft of moderately hard, moist, slight to moderate jointing, blocky, fossiliferous.		173-
174-										174-
175-								@174.1': Fractures; short, irregular joints impart blocky appearance, clean to clay-lined, no infilling.	F;Dip 47°	175-
176-	ML							@175.0': Shear Plane (possible rupture surface); 1-inch thick cemented layer with highly polished and well striated upper contact, clayey, striations and grooves in down-dip direction, bedrock below moderately hard.	S;Dip 36° S;Dip 42°	176-
177-										177-
178-										178-
179-										179-
180-								BEDROCK; CAPISTRANO FORMATION		180-

JOB NO: 10507-00 LOG OF BORING FIGURE: B-47

DATE OBSERVED: 2/5/91 METHOD OF DRILLING: Rotary Wash, 4 7/8"

LOCATION: See Geotechnical Map

LOGGED BY: JPH GROUND ELEVATION: 342'±

DEPTH/FT	CLASSIFI	CATION	BLOWS/FT	UNDISTURBED	STANDARD PENETRATION	BULK	SAMPLE	MOISTURE	CONTENT	INPLACE	DRY DENSITY	BORING NO: SMC B-13 (Cont.) DESCRIPTION	LABORATORY TEST	DEPTH/FT
181-	MH											BEDROCK CONTINUED: (Composed of Siltstone/Sandstone). Fresh, unoxidized, dark greenish-gray, massive to thinly to thickly bedded, jointing slight to absent, micaceous, fossiliferous (carbonized wood and fish scales), mild petroliferous odor.		181-
182-														182-
183-														183-
184-														184-
185-												@175.7-177.7': Fine-grained, yellow, sandy siltstone. Moderately hard, moist, unbedded, planar partings.		185-
186-														186-
187-												@177.4': Shear; high angle, paper thin, no clay, striated, surface polished.		187-
188-												@177.7-180.5': Sandy siltstone continues. @180.-182.1': Sandy siltstone.		188-
189-												@182.1-183.3': Clayey siltstone. Hard, moist, thinly laminated, jointing absent.	S;Dip 6	189-
190-												@183.0-183.3': Siltstone. Hard, moist, massive.		190-
191-												@183.3-186.1': As above; trace of yellow, fine-grained sand, fish scales.		191-
192-												@186.1-188.9': As above; hard.		192-
193-												@188.8': Shear; bedding plane shear, low angle, striated, surface highly polished.		193-
194-												@188.9-191.7': As above.		194-
195-												@191.7-194.5': As above; hard, moist, imbrication/foliation impart well develoed fabric in siltstone.		195-
196-														196-
197-												@194.5-197.3': As above; hard. @197.3-200.1': As above; hard.		197-
198-														198-
199-														199-
200-												@200.1-202.9': As above; hard, massive.		200-
201-														201-
202-														202-
203-												@202.9-205.7': As above, hard, carbonized wood and fish scales.		203-
204-														204-
205-														205-
206-												@205.7-208.2': No sample recovery due to concretionary chunk.		206-
207-														207-
208-												@208.2-211.0': Siltstone; hard, moist massive.		208-
209-														209-
210-														210-

JOB NO: 10507-00 LOG OF BORING FIGURE: B-48

DATE OBSERVED: 2/6/91 METHOD OF DRILLING: Rotary Wash, 4 7/8"

LOGGED BY: JPH GROUND ELEVATION: 342'± LOCATION: See Geotechnical Map

DEPTH/FT	CLASSIFICATION	BLOWS/FT	UNDISTURBED SAMPLE	BULK SAMPLE	MOISTURE CONTENT	INPLACE DRY DENSITY	BORING NO: SMC B-13 (Cont.) DESCRIPTION	LABORATORY TEST	DEPTH/FT
211-	MH						BEDROCK CONTINUED: (Composed of Siltstone/Sandstone). Fresh, unoxidized, dark greenish-gray, massive and thinly to thickly bedded, jointing slight to absent, micaceous, fossiliferous (carbonized wood and fish scales), mild petroliferous odor.	J;Dip 51	211-
212-									212-
213-									213-
214-									214-
215-							@211-213.8': As above. @213.8-216.6': Siltstone; hard, moist, massive, jointing absent.		215-
216-									216-
217-							@216.6-219.4': As above, hard.		217-
218-									218-
219-							@219.4-222.2': As above; hard.		219-
220-									220-
221-									221-
222-							@222.2-225.0': As above; hard, parts along bedding planes.		222-
223-							@225.0-227.8': As above; hard.		223-
224-									224-
225-								B;Dip 6	225-
226-									226-
227-									227-
228-							@227.8-234.0': No sample recovered due to concretionary chunks ruining sampling tubes.		228-
229-									229-
230-									230-
231-									231-
232-									232-
233-									233-
234-							@234.0-236.8': As above; hard, massive, scattered pelecypods.		234-
235-									235-
236-									236-
237-	ML/MH						236.8-239.6': Interbedded yellow-green, fine-grained, sandy siltstone and yellow-green siltstone. Hard, moist, thin to thickly bedded, micaceous, fossiliferous, jointing/fracturing absent.		237-
238-									238-
239-									239-
240-									240-

JOB NO: 10507-00 LOG OF BORING FIGURE: B-49

DATE OBSERVED: 2/6/91 METHOD OF DRILLING: Rotary Wash, 4 7/8"

LOCATION: See Geotechnical Map

LOGGED BY: JPH GROUND ELEVATION: 342'±

DEPTH/FT	CLASSIFICATION	BLOWS/FT	UNDISTURBED SAMPLE	BULK SAMPLE	MOISTURE CONTENT	INPLACE DRY DENSITY	BORING NO: SMC B-13 (Cont.) DESCRIPTION	LABORATORY TEST	DEPTH/FT
241-	ML/MH						BEDROCK CONTINUED: (Composed of Capistrano Formation Siltstone/Sandstone). Fresh, unoxidized, dark greenish-gray, massive to thickly bedded; bedding discernable as poorly to well developed fabric, i.e., foliation/imbrication, jointing/fracturing slight to absent, micaceous, fossiliferous, mild petroliferous odor.		241-
242-									242-
243-									243-
244-									244-
245-									245-
246-							@239.6-242.4': Continued interbedded sandy siltstone and siltstone. Hard, moist.		246-
247-							@242.4-245.2': As above; hard.		247-
248-							@245.2-248.0': As above; hard. @248.0-250.8': As above.		248-
249-									249-
250-									250-
251-							Total Depth 250.8' Easy to Moderate Excavation Boring Backfilled		251-
252-									252-
253-									253-
254-									254-
255-									255-
256-									256-
257-									257-
258-									258-
259-									259-
260-									260-
261-									261-
262-									262-
263-									263-
264-									264-
265-									265-
266-									266-
267-									267-
268-									268-
269-									269-
270-									270-

JOB NO: 10507-00 LOG OF BORING FIGURE: B-50

DATE OBSERVED: 5-29-90 METHOD OF DRILLING: 24" BUCKET AUGER
HOLLOW STEM AUGER

LOGGED BY: JLM GROUND ELEVATION: 235 LOCATION: SEE GEOTECHNICAL MAP

LOG OF BORING NO. B-1

Sheet 1 of 4

DEPTH (FEET)	CLASSIFI-CATION	BLOWS/FOOT	DRIVE ENERGY (FT-KIP/FT)	SAMPLE TYPE	MOISTURE CONTENT (%)	IN PLACE DRY DEN (LB/FT3)	DESCRIPTION	REMARKS
0							**ALLUVIUM: Qal** Silty SAND, SM, yellow brown, fine to medium grained, moist	
5		3	1.19		6.6	98.1	@5' As above, slightly moist, soft, loose	
10		6	2.24				@10' Silty SAND, SM, gray, fine grained, dry, loose	
15		2	0.84		36.6	84.9	**LANDSLIDE DEBRIS:Derived from Capistrano Formation: Qls** Clayey SILTSTONE, (ML), green-gray, moist, soft @15' As above	
20		2	0.84				Clayey SILTSTONE, (ML/CL), gray brown, slightly moist, soft	
25							Clayey SILTSTONE, (ML/CL), black, unoxidized, wet, soft	
30		4	1.54		31.1	89.8	@30' As above, wet	
35								

JOB NO.: 02-7454-004-01-01

ICG Incorporated

FIGURE: B-1.1

DATE OBSERVED: 5-29-90 METHOD OF DRILLING: 24" BUCKET AUGER
HOLLOW STEM AUGER

LOGGED BY: JLM GROUND ELEVATION: 235 LOCATION: SEE GEOTECHNICAL MAP

LOG OF BORING NO. B-1

Sheet 2 of 4

DEPTH (FEET)	CLASSIFICATION	BLOWS/FOOT	DRIVE ENERGY (FT-KIP/FT)	SAMPLE TYPE	MOISTURE CONTENT (%)	IN PLACE DRY DEN (LB/FT3)	DESCRIPTION	REMARKS
40		11	3.99				@40' As above, slightly moist	
45								
50		13	4.69				As above, clayey SILTSTONE, (ML/CL), unoxidized, black, moist	
55								
60		99+	35+				Clayey SILTSTONE, (ML/CL), dusky yellowish brown, dry, moderately hard	
		95	33.4					B: near horizan J: N/S, 70W
		99+	35+					
65		99+	35+				As above	
		100	35.1					B: E/W, 2-5S
		99+	35+				As above, slightly moist, moderately hard, bedding on foram parting	
70		100	35.1					B: N/S, 5W B: E/W, 15W
75								

JOB NO.: 02-7454-004-01-01

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FIGURE: B-1.2

DATE OBSERVED: 5-29-90 METHOD OF DRILLING: 24" BUCKET AUGER
HOLLOW STEM AUGER

LOGGED BY: JLM GROUND ELEVATION: 235 LOCATION: SEE GEOTECHNICAL MAP

LOG OF BORING NO. B-1

Sheet 3 of 4

DEPTH (FEET)	CLASSIFI-CATION	BLOWS/FOOT	DRIVE ENERGY (FT-KIP/FT)	SAMPLE TYPE	MOISTURE CONTENT (%)	IN PLACE DRY DEN (LB/FT3)	DESCRIPTION	REMARKS
80		99+	35+				@80' Clayey SILTSTONE, (ML/CL), dark gray-black, sand partings, partings on forams	B: Near horizontal
85								
90		99+	35+				As above Sand partings near horizontal	
95								
100		99+	35+				@100' As above, thin sand	B: N/W,2-3NW
105								
110		99+	35+				@110' As above, bedding appears very flat, Softer drilling 112-117'	
115								
							Hard drilling at 118', calcareous, SILTSTONE, very hard	

JOB NO.: 02-7454-004-01-01

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FIGURE: B-1.3

DATE OBSERVED: 5-29-90 METHOD OF DRILLING: 24" BUCKET AUGER
HOLLOW STEM AUGER

LOGGED BY: JLM GROUND ELEVATION: 235 LOCATION: SEE GEOTECHNICAL MAP

LOG OF BORING NO. B-1

Sheet 4 of 4

DEPTH (FEET)	CLASSIFI-CATION	BLOWS/FOOT	DRIVE ENERGY (FT-KIP/FT)	SAMPLE TYPE	MOISTURE CONTENT (%)	IN PLACE DRY DEN (LB/FT3)	DESCRIPTION	REMARKS
120							TOTAL DEPTH 118FT NO CAVING H20 AT 20.5FT HOLE BACKFILLED	
125								
130								
135								
140								
145								
150								
155								

JOB NO.: 02-7454-004-01-01

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FIGURE: B-1.4

DATE OBSERVED: 5-30-90 METHOD OF DRILLING: 24 " BUCKET AUGER
HOLLOW STEM AUGER

LOGGED BY: JLM GROUND ELEVATION: 237 LOCATION: SEE GEOTECHNICAL MAP

LOG OF BORING NO. B-2

Sheet 1 of 4

DEPTH (FEET)	CLASSIFI-CATION	BLOWS/FOOT	DRIVE ENERGY (FT-KIP/FT)	SAMPLE TYPE	MOISTURE CONTENT (%)	IN PLACE DRY DEN (LB/FT3)	DESCRIPTION	REMARKS
0							**FILL: AF** Sandy SILT, ML, yellow brown, dry	
							Silty CLAY, CL, gray-brown black, moist, stiff	
5		4	1.54		15.9	103.8	**ALLUVIUM: Qal** Silty CLAY, CL, green gray, caliche streaks, slightly moist, firm	
							SAND, SP, yellow brown, some gravel, fine grained, slightly moist	
10		6	2.24				@10' Clayey GRAVEL, GC, yellow brown with fine to coarse coarse grained sand, moist, medium dense	B: N15E,17NW
								B: N30N,22SW
15		3	1.19		38.1	82.4	**LANDSLIDE: Derived from Capistrano Formation: Qls** Bedding plane shear, slicken sides, down dip	B: N35W,25SW
							@15' Clayey SILTSTONE, (ML/CL), brown, iron mottling, moist, soft Highly fractured, weathered, gypsum along fractures	B: N20W,35W
20		2	0.84				@20' As above	B: N10W,27SW
							Seepage @ 22'	
25							Gradational contact to unoxidized Unoxidized, clayey SILTSTONE, (ML/CL), black, moderately hard, slightly moist	B: N25W,35SW
30					34.6	85.5	@30' As above Clayey shear zone 1 to 2" thick, slicken sides down dip	S: N20E,12NW
35							Numerous near, vertical, tight but well developed fractures	
							6" mashed shear zone	B: N35W,16SW

JOB NO.: 02-7454-004-01-01

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FIGURE: B-2.1

DATE OBSERVED: 5-30-90 METHOD OF DRILLING: 24 " BUCKET AUGER
HOLLOW STEM AUGER

LOGGED BY: JLM GROUND ELEVATION: 237 LOCATION: SEE GEOTECHNICAL MAP

LOG OF BORING NO. B-2

Sheet 2 of 4

DEPTH (FEET)	CLASSIFI-CATION	BLOWS/FOOT	DRIVE ENERGY (FT-KIP/FT)	SAMPLE TYPE	MOISTURE CONTENT (%)	IN PLACE DRY DEN (LB/FT3)	DESCRIPTION	REMARKS
40		11	3.99				@40' As above	
45								
50		20	7.14				Tailings Clayey SILTSTONE, (ML/CL), black, slightly moist	
55								
60							As above	
65								
70							Very wet at 70'	
75								

JOB NO.: 02-7454-004-01-01

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FIGURE: B-2.2

DATE OBSERVED: 5-30-90 METHOD OF DRILLING: 24 " BUCKET AUGER
HOLLOW STEM AUGER

LOGGED BY: JLM GROUND ELEVATION: 237 LOCATION: SEE GEOTECHNICAL MAP

LOG OF BORING NO. B-2

Sheet 3 of 4

DEPTH (FEET)	CLASSIFI-CATION	BLOWS/FOOT	DRIVE ENERGY (FT-KIP/FT)	SAMPLE TYPE	MOISTURE CONTENT (%)	IN PLACE DRY DEN (LB/FT3)	DESCRIPTION	REMARKS
80							Clayey SITLSTONE, (ML/CL), green-gray to black, slightly moist to moist, moderately hard	
85								
90							As above	
95								
100		99+	35+				Clayey SILTSTONE, (ML/CL), black, abundant mica, slight dip to west, slightly moist, moderatley hard	B: N/S 2-4W B: N/S,17W
105								
110		80	28.1				@110' As above Abundant mica, bedding on mica parting, slightly moist, moderately hard	N/S,20W
115								
		99+	35+				@117' As above	
		99+	35+				@119.5' As above	B: N50E,12NW

JOB NO.: 02-7454-004-01-01

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FIGURE: B-2.3

DATE OBSERVED: 5-30-90 METHOD OF DRILLING: 24 " BUCKET AUGER
HOLLOW STEM AUGER

LOGGED BY: JLM GROUND ELEVATION: 237 LOCATION: SEE GEOTECHNICAL MAP

LOG OF BORING NO. B-2

Sheet 4 of 4

DEPTH (FEET)	CLASSIFI-CATION	BLOWS/FOOT	DRIVE ENERGY (FT-KIP/FT)	SAMPLE TYPE	MOISTURE CONTENT (%)	IN PLACE DRY DEN (LB/FT3)	DESCRIPTION	REMARKS
120		100	35.1					
		72	25.3				@121.5' Clayey SILTSTONE, (ML/CL), gray black, calcareous, layer, slightly moist	B: N30E,12NW
125							Alternating, very hard, hard drilling	
130							As above	
135								
							TOTAL DEPTH 135.7 FT NO CAVING H2O @ 21-22 FT HOLE BACKFILLED	
140								
145								
150								
155								

JOB NO.: 02-7454-004-01-01

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FIGURE: B-2.4

DATE OBSERVED: 5-31-90 METHOD OF DRILLING: 24" BUCKET AUGER

LOGGED BY: JLM GROUND ELEVATION: 238 LOCATION: SEE GEOTECHNICAL MAP

LOG OF BORING NO. B-3

Sheet 1 of 2

DEPTH (FEET)	CLASSIFICATION	BLOWS/FOOT	DRIVE ENERGY (FT-KIP/FT)	SAMPLE TYPE	MOISTURE CONTENT (%)	IN PLACE DRY DEN (LB/FT3)	DESCRIPTION	REMARKS
0							**ARTIFICAL FILL: AF** Clayey SILT, ML, brown, dry	
							Silty SAND, SM, fine grained, brown, dry	
5		2	0.84		15.7		@5' Clayey SILT, ML/CL, brown, moist, stiff	
10		2	0.84		22.0	101.0	**ALLUVIUM: Qal** @10' Silty CLAY, CL, black, roots, moist, soft,	
15		2	0.84				∇ Slight caving @15' As above Caliche, soft	
20		2	0.84				@20' As above, saturated, caliche, soft	
25								
30		2 2	0.84 0.84		28.7	95.6	Silty CLAY, CL, brown, caliche, porous, saturated, soft	
35							SQUEEZING GROUND	
							BEDROCK: Capistrano Formation: Tc	

JOB NO.: 02-7454-004-01-01

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FIGURE: B-3.1

DATE OBSERVED: 5-31-90 METHOD OF DRILLING: 24" BUCKET AUGER

LOGGED BY: JLM GROUND ELEVATION: 238 LOCATION: SEE GEOTECHNICAL MAP

LOG OF BORING NO. B-3

Sheet 2 of 2

DEPTH (FEET)	CLASSIFI-CATION	BLOWS/FOOT	DRIVE ENERGY (FT-KIP/FT)	SAMPLE TYPE	MOISTURE CONTENT (%)	IN PLACE DRY DEN (LB/FT3)	DESCRIPTION	REMARKS
40		1	0.49		38.3	82.7	@40' Clayey, SILTSTONE, (ML/CL), green gray, iron mottling, saturated, soft	
45							Heavy seepage @46'	
50		1	0.49				@50' As above, wet	
55							**TOTAL DEPTH 55FT** **CAVING AT 15-20FT** **HOLE BACKFILLED** **SEEPAGE AT 15,46FT**	
60								
65								
70								
75								

JOB NO.: 02-7454-004-01-01

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FIGURE: B-3.2

DATE OBSERVED: 5-31-90 METHOD OF DRILLING: 24" BUCKET AUGER

LOGGED BY: JLM GROUND ELEVATION: 278 LOCATION: SEE GEOTECHNICAL MAP

LOG OF BORING NO. B-4

Sheet 1 of 2

DEPTH (FEET)	CLASSIFI-CATION	BLOWS/FOOT	DRIVE ENERGY (FT-KIP/FT)	SAMPLE TYPE	MOISTURE CONTENT (%)	IN PLACE DRY DEN (LB/FT3)	DESCRIPTION	REMARKS
0							HIGHLY WEATHERED BEDROCK: Silty CLAY, (ML/CL), brown, moist	
							Roots, porous	
5		2	0.84		27.4	80.5	BEDROCK: Capistrano Formation: Tc @5' Clayey SILTSTONE, (ML/CL), light brown, iron staining along fractures, dry, soft, gypsum filled fractures, 6 fractures per 2 ft	J: N17E,85W B: N47E,4-5NW
10		6	2.24		29.9	89.6	@10' Less weathered	
15		5	1.89		32.8	89.7	@15' As above, prominent fractures, infilled with gypsum	B: N60E,11NW
20		5	1.89		32.0	85.9	@20' Clayey SILTSTONE, (ML/CL), black, unoxidized, dry, moderately hard	B: N56E,8NW
							Moisture content increases	
25							Oxidized zone along fractures	
30		8	2.94		26.3	93.9	Thinly bedded, discontinuous @30' Clayey SILTSTONE, (ML/CL), yellow-brown, thinnly bedded, dry, slightly weathered, moderately hard oxidized, unoxidized contact	B: N20W,8SW C: N25E,vert
35							Zone of unoxidized and oxidized SILTSTONE, fracturing diminishes	
							Fracture 38-40'	J: N40E,75SE

JOB NO.: 02-7454-004-01-01

ICG Incorporated

FIGURE: B-4.1

DATE OBSERVED: 5-31-90 METHOD OF DRILLING: 24" BUCKET AUGER

LOGGED BY: JLM GROUND ELEVATION: 278 LOCATION: SEE GEOTECHNICAL MAP

LOG OF BORING NO. B-4

Sheet 2 of 2

DEPTH (FEET)	CLASSIFICATION	BLOWS/FOOT	DRIVE ENERGY (FT-KIP/FT)	SAMPLE TYPE	MOISTURE CONTENT (%)	IN PLACE DRY DEN (LB/FT3)	DESCRIPTION	REMARKS
40		9	3.29		31.4	91.3	@40' As above, gypsum along fractures, dry, moderately hard Unoxidized Fractured 40-46'	
45							Concretion	J: N45E,78SE
50		15	5.39		27.9	94.4	@50' Clayey SILTSTONE, (ML/CL), black, unoxidized, dry, moderately hard, massive	
55							Thin sand bed	B: N10-70W,4SW
60		25	8.89		31.1	90.1	@60' As above	
65								
70		40	14.1		28.5	94.3	@70' As above	
75							TOTAL DEPTH 70FT SAMPLED TO 71FT NO CAVING NO H2O HOLE BACKFILL	

JOB NO.: 02-7454-004-01-01

ICG Incorporated

FIGURE: B-4.2

DATE OBSERVED: 7-9-90 METHOD OF DRILLING: 24" BUCKET AUGER

LOGGED BY: JLM GROUND ELEVATION: 342 LOCATION: SEE GEOTECHNICAL MAP

LOG OF BORING NO. B-5

Sheet 1 of 3

DEPTH (FEET)	CLASSIFI-CATION	BLOWS/FOOT	DRIVE ENERGY (FT-KIP/FT)	SAMPLE TYPE	MOISTURE CONTENT (%)	IN PLACE DRY DEN (LB/FT3)	DESCRIPTION	REMARKS
0							LANDSLIDE Derived from Capistrano Formation: Qls	
							Clayey SILTSTONE, (ML/CL), brown, iron staining, slightly moist, soft	J: N 8SE,64S J: N 67W,52NE
5		5					1/4" Gypsum along fracture contiuous @5' As above	J: N 83E, vert
10		4					@10' As above, vertical joints, gypsum along fracturing, grades unoxidized, oxidized along joints	J: N 30E, vert
15								J: N 40E,60SE
							Seepage along gypsum filled fracture	J: N 40E,vert
20		9					@20' Clayey SILTSTONE, (ML/CL), black, dry, moderately hard	J: N 60E,vert
25							Less fracturing, gypsum along joints @25' Clayey SILTSTONE, (ML/CL), black, unoxidized, abundant forams, dry, moderately hard	J: N 65E,vert B: N 10W,2-4W
30		17						
35								J: N 75E,vert

JOB NO.: 02-7454-004-01-01

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FIGURE: B-5.1

DATE OBSERVED: 7-9-90 METHOD OF DRILLING: 24" BUCKET AUGER

LOGGED BY: JLM GROUND ELEVATION: 342 LOCATION: SEE GEOTECHNICAL MAP

LOG OF BORING NO. B-5

Sheet 2 of 3

DEPTH (FEET)	CLASSIFI-CATION	BLOWS/FOOT	DRIVE ENERGY (FT-KIP/FT)	SAMPLE TYPE	MOISTURE CONTENT (%)	IN PLACE DRY DEN (LB/FT3)	DESCRIPTION	REMARKS
40		20					@40' As above	
45							Seepage at 43' along fractures	J: N 90E,vert J: N 80E,vert
							Seepage at 48'	
50		40/9"					@50' Clayey SILTSTONE, black, unoxidized, dry, moderately hard, concretions at 52' Seepage at 52'- 62', hard drilling	J: N 45E,vert J: N 65W,vert
55							Discontinuous 1/2" white sand bed	B: N 20W,3W
60		40/9"					@60' As above	
65								
70								
75							Discontinuous 1/2' sand bed	B: Horizontal

JOB NO.: 02-7454-004-01-01

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FIGURE: B-5.2

DATE OBSERVED: 7-9-90 METHOD OF DRILLING: 24" BUCKET AUGER

LOGGED BY: JLM GROUND ELEVATION: 342 LOCATION: SEE GEOTECHNICAL MAP

LOG OF BORING NO. B-5

Sheet 3 of 3

DEPTH (FEET)	CLASSIFICATION	BLOWS/FOOT	DRIVE ENERGY (FT-KIP/FT)	SAMPLE TYPE	MOISTURE CONTENT (%)	IN PLACE DRY DEN (LB/FT3)	DESCRIPTION	REMARKS
80		25/9"					@80' As above, dry, moderately hard	
							Hard drilling at 82'- 83'	
85								J: N 60W,45N
90							@90' Clayey SILTSTONE, gray black, dry, moderately hard	
							Hard at 92.5'	B: N 50W,4NE
95							@93' Clayey material possible rupture surface 3-4" sheared (in log B-4) clay with polished surface	
							Massive	B: N 80E,5N
100		25/9"					@100' Clayey SILTSTONE, black, dry, moderately hard	
105								
							TOTAL DEPTH @107.5FT NO CAVING SEEPAGE @ 17',27',43',48',52',62FT HOLE BACKFILLED	
110								
115								

JOB NO.: 02-7454-004-01-01

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FIGURE: B-5.3

DATE OBSERVED: 7-10-90 METHOD OF DRILLING: 24" BUCKET AUGER

LOGGED BY: JLM GROUND ELEVATION: 236 LOCATION: SEE GEOTECHNICAL MAP

LOG OF BORING NO. B-6

Sheet 1 of 3

DEPTH (FEET)	CLASSIFI-CATION	BLOWS/FOOT	DRIVE ENERGY (FT-KIP/FT)	SAMPLE TYPE	MOISTURE CONTENT (%)	IN PLACE DRY DEN (LB/FT3)	DESCRIPTION	REMARKS
0							ALLUVIUM/COLLUVIUM:QAC Silty CLAY, CL, black, porous, dry	
5		6					@5' As above, dry, stiff Caliche string	
10		7					@10' As above	
							LANDSLIDE Derived from Capistrano Formation: Qls Clayey SILTSTONE, (ML/CL), brown, dry to slightly moist, soft	
15								
20							Calcaneous SILTSTONE, highly fractured, massive hard	
		5					@21' As above, dry, soft	
25							Grades unoxidized	
30		15/10"					@30' Clayey SILTSTONE, (ML/CL), black, dry, moderately hard	
35								

JOB NO.: 02-7454-004-01-01

ICG Incorporated

FIGURE: B-6.1

DATE OBSERVED: 7-10-90 METHOD OF DRILLING: 24" BUCKET AUGER

LOGGED BY: JLM GROUND ELEVATION: 236 LOCATION: SEE GEOTECHNICAL MAP

LOG OF BORING NO. B-6

Sheet 2 of 3

DEPTH (FEET)	CLASSIFI-CATION	BLOWS/FOOT	DRIVE ENERGY (FT-KIP/FT)	SAMPLE TYPE	MOISTURE CONTENT (%)	IN PLACE DRY DEN (LB/FT3)	DESCRIPTION	REMARKS
40		15					@40' As above	
45								
50		30/6"					@50' Clayey SILTSTONE, (ML/CL), black, dry, moderately hard	
55								
60		25/9"					As above	
65								
70		30/10"					@70' As above	
75								

JOB NO.: 02-7454-004-01-01

ICG Incorporated

FIGURE: B-6.2

DATE OBSERVED: 7-10-90 METHOD OF DRILLING: 24" BUCKET AUGER

LOGGED BY: JLM GROUND ELEVATION: 236 LOCATION: SEE GEOTECHNICAL MAP

LOG OF BORING NO. B-6

Sheet 3 of 3

DEPTH (FEET)	CLASSIFI-CATION	BLOWS/FOOT	DRIVE ENERGY (FT-KIP/FT)	SAMPLE TYPE	MOISTURE CONTENT (%)	IN PLACE DRY DEN (LB/FT3)	DESCRIPTION	REMARKS
80		35/ 9"					@80' Clayey SILTSTONE, (ML/CL), black, dry, moderately hard	
85							Calcareous layey Well bedded zone 12" sheared clay zone	
90								
95								
		35/ 9"					@97' As above	
100							TOTAL DEPTH 96FT SAMPLED TO 97FT NO CAVING SEEPAGE AT 56FT	
105								
110								
115								

JOB NO.: 02-7454-004-01-01

ICG Incorporated

FIGURE: B-6.3

DATE OBSERVED: 5-23-90 METHOD OF DRILLING: HOLLOW STEM AUGER 140LB HAMMER

LOGGED BY: JLM GROUND ELEVATION: 237 LOCATION: SEE GEOTECHNICAL MAP

LOG OF BORING NO. BH-1

Sheet 1 of 1

DEPTH (FEET)	CLASSIFICATION	BLOWS/FOOT	DRIVE ENERGY (FT-KIP/FT)	SAMPLE TYPE	MOISTURE CONTENT (%)	IN PLACE DRY DEN (LB/FT3)	DESCRIPTION	REMARKS
0							FILL: AF	
		19	6.79		12.6	88.5	@2' Brown clayey SILT, ML, with sand, porous, dry	
5		18	6.44		13.5	91.7	@5' Clayey SILT, ML, black, slightly porous, dry, medium dense	
		17	6.09				@7' Silty CLAY, CL, brown, moist, stiff	
10		23	8.19		29.7	92.9	ALLUVIUM: Qal @10' Silty CLAY, CL, gray, with fine sand moist, stiff	
		14	5.04				@13' As above	
15		13	4.69		29.7	92.3	@15' As above	
20		14	5.04				@20' As above, moist, free water, dark, organic	
25		16	5.74		35.5	85.3	@25' Silty CLAY, CL, gray black, oxidized zones, moist, stiff	
30		11	3.99				@30' As above, black-gray, moist	
35							TOTAL DEPTH 31.5FT H2O @15FT NO CAVING HOLE BACKFILLED	

JOB NO.: 02-7454-004-01-01

ICG Incorporated

FIGURE: BH-1.1

DATE OBSERVED: 5-23-90 METHOD OF DRILLING: HOLLOW STEM AUGER
140LB HAMMER

LOGGED BY: JLM GROUND ELEVATION: 227 LOCATION: SEE GEOTECHNICAL MAP

LOG OF BORING NO. BH-2

Sheet 1 of 1

DEPTH (FEET)	CLASSIFICATION	BLOWS/FOOT	DRIVE ENERGY (FT-KIP/FT)	SAMPLE TYPE	MOISTURE CONTENT (%)	IN PLACE DRY DEN (LB/FT3)	DESCRIPTION	REMARKS
0							ALLUVIUM: Qal Silty SAND, SM, brown, fine grained, dry to slightly moist	
		6	2.24					
5		11	3.99		27.4	96.2	@2' Silty CLAY, CL, black, moist, firm @4' Silty CLAY, CL, black, moist, firm	
		10	3.64				@6.5' As above, caliche stringers, stiff	
10		19	6.79		26.1	99.0	@9' As above	
		22	7.84				@12' As above	
15		13	4.69				@15' Sandy CLAY, CL, brown, fine grained, moist, stiff	
20		15	5.39				@20' As above	
25		13	4.69				@25' As above, moist	
30		9	3.29				Silty CLAY, CL, brown, moist, soft	
							TOTAL DEPTH 31FT H2O @14FT NO CAVING HOLE BACKFILLED	
35								

JOB NO.: 02-7454-004-01-01

ICG Incorporated

FIGURE: BH-2.1

DATE OBSERVED: 5-13-90 METHOD OF DRILLING: HOLLOW STEM AUGER 140LB HAMMER

LOGGED BY: JLM GROUND ELEVATION: 225 LOCATION: SEE GEOTECHNICAL MAP

LOG OF BORING NO. BH-3

Sheet 1 of 2

DEPTH (FEET)	CLASSIFICATION	BLOWS/FOOT	DRIVE ENERGY (FT-KIP/FT)	SAMPLE TYPE	MOISTURE CONTENT (%)	IN PLACE DRY DEN (LB/FT3)	DESCRIPTION	REMARKS
0							ALLUVIUM: Qal Silty SAND, SM, brown, fine grained, dry	
		30	10.6		4.3	124.6	@2' Silty SAND, SM, gray, fine grained, dry, medium dense	
5		24	8.54		9.9	96.0	@5' Silty SAND, SM, brown, fine grained, porous, dry, medium dense	
		15	5.39				@7' Silty SAND, SM, brown, fine grained, dry, loose	
10		24	8.54		21.2	103.8	Clayey SAND, SC, black, slightly moist, medium dense	
		8	2.94				@13' Clayey SAND, SC, dark brown, fine grained, moist, stiff	
15		8	2.94				@15' As above, loose	
20		10	3.64				@20' Sandy CLAY, CL, brown black, fine grained, moist, stiff	
25		9	3.29		28.7	98.1	@25' As above, with silt, soft	
30		13	4.69				@30' Silty CLAY, CL, black, moist, stiff	
35		9	3.29		28.5	95.6	@35' Silty CLAY, CL, brown black, moist, soft	

JOB NO.: 02-7454-004-01-01

ICG Incorporated

FIGURE: BH-3.1

DATE OBSERVED: 5-13-90 METHOD OF DRILLING: HOLLOW STEM AUGER
140LB HAMMER

LOGGED BY: JLM GROUND ELEVATION: 225 LOCATION: SEE GEOTECHNICAL MAP

LOG OF BORING NO. BH-3

Sheet 2 of 2

DEPTH (FEET)	CLASSIFI-CATION	BLOWS/FOOT	DRIVE ENERGY (FT-KIP/FT)	SAMPLE TYPE	MOISTURE CONTENT (%)	IN PLACE DRY DEN (LB/FT3)	DESCRIPTION	REMARKS
40		16	5.74				@40' Clayey SAND, SC, brown, fine grained, saturated, medium dense	
45		9	3.29				@45' Clayey SAND, SC, fine grained, green gray, saturated, medium dense	
50		27	9.59				@50' SAND, SP, green gray, fine to coarse grained with clayey sand, saturated, medium dense	
55							TOTAL DEPTH @51.5FT NO CAVING H20 @ 15FT HOLE BACKFILLED	
60								
65								
70								
75								

JOB NO.: 02-7454-004-01-01

ICG Incorporated

FIGURE: BH-3.2

DATE OBSERVED: 5-23-90 METHOD OF DRILLING: HOLLOW STEM AUGER 140LB HAMMER

LOGGED BY: JLM GROUND ELEVATION: 225 LOCATION: SEE GEOTECHNICAL MAP

LOG OF BORING NO. BH-4

Sheet 1 of 1

DEPTH (FEET)	CLASSIFICATION	BLOWS/FOOT	DRIVE ENERGY (FT-KIP/FT)	SAMPLE TYPE	MOISTURE CONTENT (%)	IN PLACE DRY DEN (LB/FT3)	DESCRIPTION	REMARKS
0							ALLUVIUM: Qal Silty SAND, SM, brown, fine grained, dry	
		16	5.74				@2' Silty SAND, SM, black, fine grained, dry	
5		26	9.24		7.4	92.1	@4' Silty SAND, SM, brown, fine grained, dry, medium dense	
		20	7.14				@6.5' Sandy CLAY, CL, black, fine grained, moist, stiff	
10		20	7.14		19.5	105.7	@9' As above	
		21	7.49		11.2	78.0	@12' Silty CLAY, CL, gray green, moist, stiff	
15		19	6.79				@15' Silty CLAY, CL, green gray, moist, stiff	
20		34	12.0				@20' Silty CLAY, CL, green gray, moist, very stiff	
25		62	21.8				@25' Silty CLAY, CL, black, moist, hard,	
30		59	20.8				@30' As above, hard	
							TOTAL DEPTH 31FT NO H20 ENCOUNTERED NO CAVING HOLE BACKFILLED	
35								

JOB NO.: 02-7454-004-01-01

ICG Incorporated

FIGURE: BH-4.1

DATE OBSERVED: 5-23-90 METHOD OF DRILLING: HOLLOW STEM AUGER 140LB HAMMER

LOGGED BY: JLM GROUND ELEVATION: 225 LOCATION: SEE GEOTECHNICAL MAP

LOG OF BORING NO. BH-5

Sheet 1 of 1

DEPTH (FEET)	CLASSIFI-CATION	BLOWS/FOOT	DRIVE ENERGY (FT-KIP/FT)	SAMPLE TYPE	MOISTURE CONTENT (%)	IN PLACE DRY DEN (LB/FT3)	DESCRIPTION	REMARKS
0							ALLUVIUM: Qal Silty SAND, SM, yellown brown, fine grained	
		27	2.59				@2' Silty SAND, SM, yellow brown, with clay, slightly moist, stiff	
		11	3.99		13.5	95.0	@4' As above	
5								
		13	4.69				@6.5' Clayey SAND, SC, brown, fine grained, slightly moist, stiff	
10		16	5.74		24.5	101.7	@10' As above	
							TOTAL DEPTH 11FT NO H2O ENCOUNTERED NO CAVING HOLE BACKFILLED	
15								
20								
25								
30								
35								

JOB NO.: 02-7454-004-01-01

ICG Incorporated

FIGURE: BH-5.1

DATE OBSERVED: 5-23-90 METHOD OF DRILLING: HOLLOW STEM AUGER 140LB HAMMER

LOGGED BY: JLM GROUND ELEVATION: 225 LOCATION: SEE GEOTECHNICAL MAP

LOG OF BORING NO. BH-6

Sheet 1 of 1

DEPTH (FEET)	CLASSIFICATION	BLOWS/FOOT	DRIVE ENERGY (FT-KIP/FT)	SAMPLE TYPE	MOISTURE CONTENT (%)	IN PLACE DRY DEN (LB/FT3)	DESCRIPTION	REMARKS
0							ALLUVIUM: Qal	
		11	3.99		14.5	79.6	@2' Silty SAND, SM, brown, fine grained, dry, loose	
5		34	12.0		7.1	98.0	@5' Silty SAND, SM, gray brown, fine grained, dry, medium dense	
		13	4.69				@7' Clayey SAND, SC, black, fine grained, slightly moist, stiff	
10		17	6.09		17.9	103.9	@10' As above	
							TOTAL DEPTH 11FT NO H2O ENCOUNTERED NO CAVING HOLE BACKFILLED	
15								
20								
25								
30								
35								

JOB NO.: 02-7454-004-01-01

ICG Incorporated

FIGURE: BH-6.1

DATE OBSERVED: 5-24-90 METHOD OF DRILLING: HOLLOW STEM AUGER 140LB HAMMER

LOGGED BY: JLM GROUND ELEVATION: 222 LOCATION: SEE GEOTECHNICAL MAP

LOG OF BORING NO. BH-7

Sheet 1 of 2

DEPTH (FEET)	CLASSIFICATION	BLOWS/FOOT	DRIVE ENERGY (FT-KIP/FT)	SAMPLE TYPE	MOISTURE CONTENT (%)	IN PLACE DRY DEN (LB/FT3)	DESCRIPTION	REMARKS
0		32	11.3		6.0	107.7	FILL: AF @2' Silty SAND, SM, brown, fine grained, roots, dry	
5		25	8.89		18.6	106.7	ALLUVIUM: Qal @5' Clayey SAND, SC, black, fine grained, caliche stringers, moist, medium dense	
		12	4.34				@7' As above	
10		24	8.54		25.5	96.3	@10' Sitly SAND, SM, yellow brown, porous, dry to slightly moist, medium dense	
		15	5.39				@13' Silty CLAY, CL, black, moist, stiff	
15		12	4.34		25.2	99.3	@15' Sandy CLAY, CL, black, moist, soft	
20		6	2.24				Sandy CLAY, CL, yellow brown, moist, stiff	
25		13	4.69		30.9	91.2	@25' Sandy CLAY, CL, black, moist, stiff	
30		6	2.24				@30' Clayey SAND, SC, yellow brown, fine grained, moist, loose	
35		9	3.29		25.6	99.5	@35' Clayey SAND, SC, yellow brown, moist, loose	

JOB NO.: 02-7454-004-01-01

ICG Incorporated

FIGURE: BH-7.1

DATE OBSERVED: 5-24-90 METHOD OF DRILLING: HOLLOW STEM AUGER
140LB HAMMER

LOGGED BY: JLM GROUND ELEVATION: 222 LOCATION: SEE GEOTECHNICAL MAP

LOG OF BORING NO. BH-7

Sheet 2 of 2

DEPTH (FEET)	CLASSIFI-CATION	BLOWS/FOOT	DRIVE ENERGY (FT-KIP/FT)	SAMPLE TYPE	MOISTURE CONTENT (%)	IN PLACE DRY DEN (LB/FT3)	DESCRIPTION	REMARKS
40		8	2.94				@40' Silty CLAY, black, some fine sand, moist, stiff	
45		9	3.29		29.9	93.2	@45' Clayey SAND, fine grained, green gray, moist, stiff	
50		9	3.29				@50' Clayey SILT, ML, green gray, moist, stiff	
55							TOTAL DEPTH 51.5FT H2O @ 15FT NO CAVING HOLE BACKFILLED	
60								
65								
70								
75								

JOB NO.: 02-7454-004-01-01

ICG Incorporated

FIGURE: BH-7.2

DATE OBSERVED: 5-24-90 METHOD OF DRILLING: HOLLOW STEM AUGER 140LB HAMMER

LOGGED BY: JLM GROUND ELEVATION: 224 LOCATION: SEE GEOTECHNICAL MAP

LOG OF BORING NO. BH-8

Sheet 1 of 2

DEPTH (FEET)	CLASSIFICATION	BLOWS/FOOT	DRIVE ENERGY (FT-KIP/FT)	SAMPLE TYPE	MOISTURE CONTENT (%)	IN PLACE DRY DEN (LB/FT3)	DESCRIPTION	REMARKS
0							ALLUVIUM: Qal Clayey SILT, ML, gray brown, dry to slightly moist	
		12	4.34				@2' Silty SAND, SM, yellow brown, fine grained, dry, medium dense,	
5		22	7.84		15.6	85.4	@4' Silty SAND, SC, black, fine grained, dry , medium dense	
		13	4.69				@6.5' Clayey SAND, SC, black, fine grained, medium dense	
10		17	6.09		19.6	106.8	@9' As above	
		10	3.64				@12' Silty CLAY, CL, black, moist, stiff	
15		7	2.59		23.0		@15' Clayey SAND, SC, yellow brown, fine grained, loose, moist	
20		10	3.64				@20' Silty CLAY, CL, yellow brown, moist, stiff	
25		9	3.29		29.2	94.0	@25' As above	
30		11	3.99				@30' As above	
35		10	3.64		29.7	94.0	@35' Silty CLAY, CL, black, moist, stiff	

LANDSLIDE derived from Capistrano

JOB NO.: 02-7454-004-01-01

ICG Incorporated

FIGURE: BH-8.1

DATE OBSERVED: 5-24-90 METHOD OF DRILLING: HOLLOW STEM AUGER
140LB HAMMER

LOGGED BY: JLM GROUND ELEVATION: 224 LOCATION: SEE GEOTECHNICAL MAP

LOG OF BORING NO. BH-8

Sheet 2 of 2

DEPTH (FEET)	CLASSIFI-CATION	BLOWS/FOOT	DRIVE ENERGY (FT-KIP/FT)	SAMPLE TYPE	MOISTURE CONTENT (%)	IN PLACE DRY DEN (LB/FT3)	DESCRIPTION	REMARKS
40		14	5.04				Formation: Tc @40' Clayey SILTSTONE, (ML/CL), green gray, moist, moderately hard	
45		15	5.39		46.4	74.1	@45' As above	
50		13	4.69				@50' Clayey SILTSTONE, (ML/CL), green gray, moist, stiff	
55							TOTAL DEPTH 51.5FT H20 @ 13FT NO CAVING HOLE BACKFILLED	
60								
65								
70								
75								

JOB NO.: 02-7454-004-01-01

ICG Incorporated

FIGURE: BH-8.2

DATE OBSERVED: 5-24-90 METHOD OF DRILLING: HOLLOW STEM AUGER 140LB HAMMER

LOGGED BY: JLM GROUND ELEVATION: 226 LOCATION: SEE GEOTECHNICAL MAP

LOG OF BORING NO. BH-9

Sheet 1 of 3

DEPTH (FEET)	CLASSIFICATION	BLOWS/FOOT	DRIVE ENERGY (FT-KIP/FT)	SAMPLE TYPE	MOISTURE CONTENT (%)	IN PLACE DRY DEN (LB/FT3)	DESCRIPTION	REMARKS
0							ALLUVIUM: Qal	
		31	11.0		14.3	107.8	@2' Silty CLAY, CL, black, roots, fine sand, dry, stiff, hard	
5		17	6.09		30.2	87.4	LANDSLIDE derived from Capistrano Formation: Qls	
		15	5.39				@5' Clayey SILTSTONE, (ML/CL), yellow brown, moist, soft, iron oxide	
							@7' As above	
10		16	5.74		42.2	76.9	@10' As above	
15		6	2.24				@15' As above, H20	
20		37	13.1		42.9	76.8	@20' As above	
25		16	5.74				@25' Clayey SILTSTONE, (ML/CL), black, unoxidized, moist, soft, micaceous	
30		16	5.74		36.2	32.9	@30' As above, Clayey SILTSTONE, (ML/CL), green gray, bedded, gypsum, stringers, slightly moist, soft	
35		40	14.1				@35' As above, gray black, moderately hard	

JOB NO.: 02-7454-004-01-01

ICG Incorporated

FIGURE: BH-9.1

DATE OBSERVED: 5-24-90 METHOD OF DRILLING: HOLLOW STEM AUGER
140LB HAMMER

LOGGED BY: JLM GROUND ELEVATION: 226 LOCATION: SEE GEOTECHNICAL MAP

LOG OF BORING NO. BH-9

Sheet 2 of 3

DEPTH (FEET)	CLASSIFI-CATION	BLOWS/FOOT	DRIVE ENERGY (FT-KIP/FT)	SAMPLE TYPE	MOISTURE CONTENT (%)	IN PLACE DRY DEN (LB/FT3)	DESCRIPTION	REMARKS
40		35	12.4		34.0	85.7	@40' Clayey SILTSTONE, (ML/CL), green gray, thinly bedded	
45		54	19.0				@45' Clayey SILTSTONE, (ML/CL), gray black, unoxidized, dry, moderately hard	
50		24	8.54		33.0	82.4	@50' As above	
							Seepage @ 53ft	
55		42	14.8				@55' As above	
60		37	13.1		40.9	80.5	@60' As above, dry to slightly moist	
65		44	15.5				@65' Clayey SILTSTONE, (ML/CL), gray black, unoxidized, dry, moderately hard	
70		35	12.4		30.9	91.4	@70' As above, dry, moderately hard	
75		44	15.5				@75' As above	

JOB NO.: 02-7454-004-01-01

ICG Incorporated

FIGURE: BH-9.2

DATE OBSERVED: 5-24-90 METHOD OF DRILLING: HOLLOW STEM AUGER
140LB HAMMER

LOGGED BY: JLM GROUND ELEVATION: 226 LOCATION: SEE GEOTECHNICAL MAP

LOG OF BORING NO. BH-9

Sheet 3 of 3

DEPTH (FEET)	CLASSIFI-CATION	BLOWS/FOOT	DRIVE ENERGY (FT-KIP/FT)	SAMPLE TYPE	MOISTURE CONTENT (%)	IN PLACE DRY DEN (LB/FT3)	DESCRIPTION	REMARKS
80		13	4.69				@80' As above, slightly moist	
85		41	14.5				@85' As above, wet, moderately hard	
90		15	5.39				@90' As above, dry, moderately hard	
95		52	18.3				@95' As above, dry	
100		87	30.6				@100' As above, slightly moist, hard	
							Seepage @103ft	
105		40	14.1				@105' As above, hard, slightly moist, moderately hard	
							Calcareous layer, cemented, thinly bedded, very hard	
110							TOTAL DEPTH 110FT H2O @15FT, 85FT, 103FT NO CAVING HOLE BACKFILLED	
115								

JOB NO.: 02-7454-004-01-01

ICG Incorporated

FIGURE: BH-9.3

DATE OBSERVED: 6-29-90 METHOD OF DRILLING: HOLLOW STEM AUGER
140LB HAMMER

LOGGED BY: JLM GROUND ELEVATION: 222 LOCATION: SEE GEOTECHNICAL MAP

LOG OF BORING NO. BH-10

Sheet 1 of 1

DEPTH (FEET)	CLASSIFI-CATION	BLOWS/FOOT	DRIVE ENERGY (FT-KIP/FT)	SAMPLE TYPE	MOISTURE CONTENT (%)	IN PLACE DRY DEN (LB/FT3)	DESCRIPTION	REMARKS
0								
		24					@2' Silty CLAY, CL, black with sand caliche string, slightly moist, stiff	
5		23					Silty CLAY, CL, black, slightly moist @5' As above	
		6 7 9					@7' As above	
10		15					@10' As above	
							TOTAL DEPTH 11FT NO CAVING NO GROUNDWATER HOLE BACKFILLED	
15								
20								
25								
30								
35								

JOB NO.: 02-7454-004-01-01

ICG Incorporated

FIGURE: BH-10.1

DATE OBSERVED: 6-29-90 METHOD OF DRILLING: HOLLOWSTEM
140LB HAMMER

LOGGED BY: JLM GROUND ELEVATION: 234 LOCATION: SEE GEOTECHNICAL MAP

LOG OF BORING NO. BH-11

Sheet 1 of 1

DEPTH (FEET)	CLASSIFI-CATION	BLOWS/FOOT	DRIVE ENERGY (FT-KIP/FT)	SAMPLE TYPE	MOISTURE CONTENT (%)	IN PLACE DRY DEN (LB/FT3)	DESCRIPTION	REMARKS
0								
		15					@2' Sandy CLAY, CL, black, roots, dry, stiff	
		18					@4' As above, porous	
5								
		27					@6' Silty CLAY, CL, black, slightly moist, stiff	
		19					@9' As above	
10								
		19					@12' As above	
15								
		17					@15' Silty CLAY, CL, black, saturated, stiff	
20								
		12					@20' As above	
25								
		20					@25' Clayey SILT, ML, gray, saturated, stiff,	
							TOTAL DEPTH 26FT NO CAVING GROUNDWATER 14.5FT HOLE BACKFILLED	
30								
35								

JOB NO.: 02-7454-004-01-01

ICG Incorporated

FIGURE: BH-11.1

DATE OBSERVED: 09/25/90

METHOD OF DRILLING: 24" BUCKET A&W

LOCATION: SEE MAP, LOT 7, TT 5241

LOGGED BY: JPH

GROUND ELEVATION: 300±

DEPTH/FT	CLASSIFICATION	BLOWS/FT	UNDISTURBED	BULK	SAMPLE	MOISTURE CONTENT	IN PLACE DRY DENSITY	BORING NO: 1 (LCA-1) DESCRIPTION	LABORATORY TEST	DEPTH/FT
1-	ML/CL							FILL: Mottled gray-brown to orange-brown, clayey SILT with a trace of white to yellow fine sand. Stiff to very stiff, moist, occasional siltstone fragments, rootlet hairs throughout.		1-
2-										2-
3-										3-
4-										4-
5-	ML/MH							LANDSLIDE DEBRIS: Light to medium brown and gray, mottled orange-brown, fine, sandy, clayey SILTSTONE. Moderately hard, moist, massive, micaceous, slightly jointed; joints discontinuous, iron oxide stained, infilled with gypsum, weathered appearance, tiny calcareous blebs and fine sandy stringers.		5-
6-										6-
7-										7-
8-										8-
9-								@9': Sandy stringer.	Str;N38E52NW	9-
10-										10-
11-										11-
12-										12-
13-										13-
14-										14-
15-										15-
16-										16-
17-										17-
18-										18-
19-								@19': Abundant gypsum in-filled joints with iron oxide coating.	J;N71W49NE	19-
20-									J;N18W47NE	20-
21-								@21': Becomes less oxidized; gray to medium dark brown.		21-
22-										22-
23-									J;N25W86SW	23-
24-									J;N60E90	24-
25-								@25': Joints in-filled with gypsum up to 1/4 inch thick, discontinuous.	J;N72E90	25-
26-									J;N25E50SE	26-
27-										27-
28-										28-
29-										29-
30-										30-

JOB NO: 10282-02	LOG OF BORING	FIGURE:

DATE OBSERVED: 09/25/90 METHOD OF DRILLING: 24" BUCKET A&W

LOCATION: SEE MAP, LOT 7, TT 5241

LOGGED BY: JPH GROUND ELEVATION: 300±

DEPTH/FT	CLASSIFICATION	BLOWS/FT	UNDISTURBED SAMPLE	BULK SAMPLE	MOISTURE CONTENT	INPLACE DRY DENSITY	BORING NO: 1 (cont.) (LCA-1) DESCRIPTION	LABORATORY TEST	DEPTH/FT
31-	MH						LANDSLIDE DEBRIS (CONT.) - Dark gray, unoxidized, clayey SILTSTONE.	J;E-W90	31-
32-							Moderately hard, moist, massive, micaceous, slightly jointed; iron oxide staining along joints.	J;N54E79SE	32-
33-							@30'-40': Abundant jointing; joints in-filled with gypsum up to 1/2 inch thick; iron oxide stain along surfaces.	J;N31W55NE	33-
34-									34-
35-									35-
36-									36-
37-									37-
38-									38-
39-									39-
40-							Joints in-filled with gypsum up to 1/2 inch thick; iron oxide staining.		40-
41-							@41'-46': Highly oxidized zone, abundant iron oxide staining along joints/ fractures.	J;N25E55SE	41-
42-									42-
43-									43-
44-								J;N25E45SE	44-
45-									45-
46-									46-
47-							@47': Becomes predominantly unoxidized.		47-
48-									48-
49-									49-
50-							@50': Seepage from joint.	J;N18E60SE	50-
51-									51-
52-									52-
53-									53-
54-									54-
55-							@55': Seepage from joint, iron ozide and gypsum-lined joints terminate.	J;N18E60SE	55-
56-									56-
57-									57-
58-									58-
59-									59-
60-									60-

JOB NO: 10282-02 LOG OF BORING FIGURE:

DATE OBSERVED: 09/25/90 METHOD OF DRILLING: 24" BUCKET A&W

LOCATION: SEE MAP, LOT 7 TT 5241

LOGGED BY: JPH GROUND ELEVATION: 300±

DEPTH/FT	CLASSIFICATION	BLOWS/FT	UNDISTURBED SAMPLE	TIP/PPM	MOISTURE CONTENT	INPLACE DRY DENSITY	BORING NO: 1 (cont.) (LCA-1) DESCRIPTION	LABORATORY TEST	DEPTH/FT
61-	MH								61-
62-									62-
63-									63-
64-									64-
65-									65-
66-							@66': Seepage from joint.	J;N15E86SE	66-
67-									67-
68-									68-
69-									69-
70-									70-
71-									71-
72-									72-
73									73-
74									74-
75-									75-
76									76-
77-									77-
78-									78-
79-									79-
80-							Structure absent. Massive, unoxidized clayey SILTSTONE.		80-
81-									81-
82-								J;N20W/70NE	82-
83-									83-
84-									84-
85									85-
86									86-
87-									87-
88-									88-
89-									89-
90-									90-

JOB NO: 10282-02 LOG OF BORING FIGURE:

DATE OBSERVED: 09/25/90 METHOD OF DRILLING: 24" BUCKET A&W

LOCATION: SEE MAP, LOT 7 TT 5241

LOGGED BY: JPH GROUND ELEVATION: 300±

DEPTH/FT	CLASSIFICATION	BLOWS/FT	UNDISTURBED	SAMPLE	BULK SAMPLE	MOISTURE	CONTENT	INPLACE	DENSITY	BORING NO: 1 (cont.) (LCA-1) DESCRIPTION	LABORATORY TEST	DEPTH/FT
91-										LANDSLIDE DEPOSITS (cont.)		91-
										Dark gray to black, sandy, clayey SILTSTONE.		
92-										Moderately hard, moist, massive, micaceous, unoxidized, slightly jointed.		92-
93-												93-
										Structure Absent		
94-												94-
95-												95-
96-												96-
97-												97-
98-												98-
99-												99-
100-												100-
101-												101-
102-												102-
103-												103-
104-												104-
105-												105-
106-												106-
107-												107-
108-												108-
109-												109-
110-												110-
111-												111-
112-												112-
113-												113-
114-												114-
115-												115-
116-												116-
117-												117-
118-												118-
										@119.6': 6" subrounded concretion with		
119-										abundant gypsum crystals within		119-
										fractured concretion.		
120-												120-

JOB NO: 10282-02	LOG OF BORING	FIGURE:

DATE OBSERVED: 09/25/90 METHOD OF DRILLING: 24" BUCKET A&W
LOCATION: SEE MAP, LOT 7 TT 5241
LOGGED BY: JPH GROUND ELEVATION: 300±

DEPTH/FT	CLASSIFICATION	BLOWS/FT	UNDISTURBED	SAMPLE	TIP/PPM	MOISTURE	CONTENT	INPLACE	DENSITY	BORING NO: 1 (cont.) (LCA-1) DESCRIPTION	LABORATORY TEST	DEPTH/FT
121-										LANDSLIDE DEPOSITS (CONT.) - Dark gray to black, sandy, clayey SILTSTONE.		121-
122-										Moderately hard, moist, massive, micaceous, massive, unoxidized, slightly jointed.	S;N30W62SW	122-
123-										@122': Shear; highly polished surface with broad, shallow grooves; closely spaced striations in dip direction.	S;N57W45SW	123-
124-												124-
125-												125-
126-												126-
127-												127-
128-												128-
129-												129-
130-												130-
131-												131-
132-												132-
133												133-
134												134-
135-												135-
136-												136-
137-												137-
138-												138-
139-												139-
140-												140-
141-												141-
142-										Bedrock same as above. @142': Standing Water		142-
143-												143-
144-												144-
145												145-
146												146-
147-												147-
148-												148-
149-										Total Depth 150 feet Geologically Logged to 140 feet Seepage @ 49' and 54'		149-
150-										No caving		150-

JOB NO: 10282-02 | LOG OF BORING | FIGURE:

DATE OBSERVED: 09/26/90

METHOD OF DRILLING: 24" BUCKET A&W

LOCATION: SEE PLAN, LOT 26, TT 5241

LOGGED BY: JPH

GROUND ELEVATION: 388±

DEPTH/FT	CLASSIFICATION	BLOWS/FT	UNDISTURBED SAMPLE	BULK SAMPLE	MOISTURE CONTENT	INPLACE DRY DENSITY	BORING NO: 2 (LCA-2) DESCRIPTION	LABORATORY TEST	DEPTH/FT
1-	ML/CL						FILL: Gray-brown to dark brown and gray, mottled orange-brown, clayey SILT. Slightly stiff to stiff, moist, disseminated gypsum, abundant iron oxide staining, siltstone and topsoil clasts, traces of rootlets.		1-
2-									2-
3-									3-
4-									4-
5-	ML/MH						LANDSLIDE DEBRIS: Light to medium gray, mottled orange-brown, sandy, clayey SILTSTONE. Moderately hard, moist, massive, micaceous, abundant caliche and yellow sandy stingers.		5-
6-								J;N15E53SE	6-
7-									7-
8-								J;N08E64SE	8-
9-									9-
10-									10-
11-									11-
12-									12-
13-									13-
14-							@14': Shattered concretion (4 to 12 inches wide, 24 inches long) 1/2 inch thick gypsum-in-filled joint along upper contact.	J;N35E46NW	14-
15-									15-
16-									16-
17-									17-
18-							@17.5': Clay Seam; paper thin, polished, smooth surfaces, no apparent striations.	CS;N67W37NE	18-
19-									19-
20-							@20': 1/8 inch thick gypsum in-filled joint, iron oxide staining.	J;N17W55NE	20-
21-									21-
22-							Occasional zones of silty sandstone blebs and stringers.		22-
23-									23-
24-									24-
25-							@25': Gypsum in-filled discontinuous joints (up to 1/4 inch thick).	J;N07E47SE	25-
26-									26-
27-								J;N13E43SE	27-
28-									28-
29-							@28.5': Possible rupture surface; broad, undulating grooves with very faint striations in dip direction; material below similar to above.	RS;N05E47SE	29-
30-								RS;N21E46SE	30-

JOB NO: 10282-02 | LOG OF BORING | FIGURE:

DATE OBSERVED: 09/26/90 METHOD OF DRILLING: 24" BUCKET A&W
LOCATION: SEE PLAN, LOT 26, TT 5241
LOGGED BY: JPH GROUND ELEVATION: 388±

DEPTH/FT	CLASSIFICATION	BLOWS/FT	UNDISTURBED	BULK SAMPLE	MOISTURE CONTENT	INPLACE DRY DENSITY	BORING NO: 2 (cont.) (LCA-2) DESCRIPTION	LABORATORY TEST	DEPTH/FT
31-	ML/MH						LANDSLIDE DEPOSITS (CONT.) Medium gray, clayey SILTSTONE. Moderately hard, moist, massive, micaceous.		31-
32-							@31': Clay seam; paper thin, polished, smooth surface, no apparent striations.		32-
33-							@32': 1/4 inch thick, gypsum in-filled joint. Iron and manganese oxide staining along joints.		33-
34-									34-
35-									35-
36-							@36': Seepage from joints.	J;N68E79SE	36-
37-								J;N05W58NE	37-
38-									38-
39-									39-
40-									40-
41-							@41': Clay seam; 1/8 inch thick with polished, smooth surface, no apparent striations.		41-
42-	MH						@42.5': Dark gray, clayey SILTSTONE. Moderately hard to hard, moist, poorly developed fissile struture to massive, micaceous.		42-
43-									43-
44-									44-
45-									45-
46-									46-
47-									47-
48-							@48': Rupture surface; paper thin to 1/8 inch thick, black clay with broad undulating grooves and well developed striations.	RS;N28E54SE	48-
49-								RS;N32E54SE	49-
50-								STR;N64E30S	50-
51-									51-
52-									52-
53-									53-
54-									54-
55-									55-
56-									56-
57-									57-
58-							@58': Gypsum in-filled, unoxidized joint.	J;N32E65SE	58-
59-									59-
60-									60-

JOB NO: 10282-02 LOG OF BORING FIGURE:

DATE OBSERVED: 09/26/90 METHOD OF DRILLING: 24" BUCKET A&W

LOCATION: SEE PLAN, LOT 26, TT 5241

LOGGED BY: JPH GROUND ELEVATION: 388±

DEPTH/FT	CLASSIFICATION	BLOWS/FT	UNDISTURBED SAMPLE	BULK SAMPLE	MOISTURE CONTENT	INPLACE DRY DENSITY	BORING NO: 2 (cont.) (LCA-2) DESCRIPTION	LABORATORY TEST	DEPTH/FT
61-	MH						LANDSLIDE DEPOSITS (CONT.) Medium gray, clayey SILTSTONE. Moderately hard, moist, massive, micaceous.		61-
62-									62-
63-									63-
64-									64-
65-									65-
66-									66-
67-									67-
68-							@68': Standing water		68-
69-									69-
70-									70-
71-									71-
72-									72-
73-									73-
74-									74-
75-							Total Depth 105 feet		75-
76-							Geologically logged to 65 feet Abundant Seepage @ 36 and 48 feet No caving		76-
77-									77-
78-									78-
79-									79-
80-									80-
81-									81-
82-									82-
83-									83-
84-									84-
85-									85-
86-									86-
87-									87-
88-									88-
89-									89-
90-									90-

JOB NO: 10282-02 LOG OF BORING FIGURE:

DATE OBSERVED: 09/26/90

METHOD OF DRILLING: 24" BUCKET AUGER
LOCATION: LOT 32, TT 5241

LOGGED BY: KAT

GROUND ELEVATION: 317±

DEPTH/FT	CLASSIFICATION	BLOWS/FT	UNDISTURBED	SAMPLE	BULK SAMPLE	MOISTURE CONTENT	INPLACE DRY DENSITY	BORING NO: 3 (LCA-3) DESCRIPTION	LABORATORY TEST	DEPTH/FT
1-	SC/SM							FILL: Clayey to silty SAND; fine to medium grained, dense, moist, gray-brown, blocky.		1-
2-										2-
3-										3-
	ML/MH							@3': ANCIENT LANDSLIDE: (Composed of Capistrano Formation siltstone/ sandstone), very fine grained, soft to medium hard, moist, light gray to light brown, moderately weathered. Colored in bands parallel to joints.		
4-										4-
5-										5-
6-									J;N85E/75SE	6-
7-										7-
8-										8-
9-										9-
10-								Joints; regular, planar, part readily, some gypsum growth.	AB;N20E/29SE	10-
11-										11-
12-										12-
13-								Bedding; difficult to discern crude fabric/imbrication.		13-
14-										14-
15-										15-
16-										16-
17-										17-
18-										18-
19-										19-
20-								@20': (Siltstone); slightly sandy, medium hard, moist, dark gray to black, micaeceous, unoxidized, mild petroliferous odor, fresh.		20-
21-									J;N75W/21NE	21-
22-										22-
23-										23-
24-										24-
25-										25-
26-										26-
27-										27-
28-										28-
29-										29-
30-										30-

JOB NO: 10282-02 | LOG OF BORING | FIGURE:

STONEY-MILLER CONSULTANTS, INC.

DATE OBSERVED: 09/26/90 METHOD OF DRILLING: 24" BUCKET AUGER
LOCATION: LOT 32, TT 5241
LOGGED BY: KAT GROUND ELEVATION: 317+

DEPTH/FT	CLASSIFICATION	BLOWS/FT	UNDISTURBED	BULK SAMPLE	MOISTURE CONTENT	INPLACE DRY DENSITY	BORING NO: 3 (cont.) (LCA-3) DESCRIPTION	LABORATORY TEST	DEPTH/FT
31-	MH								31-
32-									32-
33-								J;N30E/89SE	33-
34-									34-
35-									35-
36-									36-
37-									37-
38-									38-
39-									39-
40-							@40': Very soft, very moist, weathered, along joint sets, gypsum growth in habit within joints.		40-
41-									41-
42-								J;N74E/65NW	42-
43-							@43': Medium hard (siltstone).		43-
44-									44-
45-									45-
46-									46-
47-									47-
48-									48-
49-							@48.5': Soft zone. @49': Shear; very planar, consistent polished surface, very faint stria downdip, ends at joint.		49-
50-									50-
51-									51-
52-									52-
53-								J;N85E/78SE	53-
54-									54-
55-									55-
56-									56-
57-							@58': Very soft, very moist, apparent bedding seepage (emit from unit). Appears as crushed zone -approximately south dipping at high angle apparent bedding, random discontinuous shears, some polished surfaces, unit below is medium hard-no cont. planar shear surface, total thickness ± 2.5.		57-
58-									58-
59-									59-
60-									60-

JOB NO: 10282-02 LOG OF BORING FIGURE:

DATE OBSERVED: 09/26/90

METHOD OF DRILLING: 24" BUCKET AUGER
LOCATION: LOT 32, TT 5241

LOGGED BY: KAT

GROUND ELEVATION: 317±

DEPTH/FT	CLASSIFICATION	BLOWS/FT	UNDISTURBED	SAMPLE	BULK SAMPLE	MOISTURE	CONTENT	INPLACE	DRY DENSITY	BORING NO: 3 (cont.) (LCA-3) DESCRIPTION	LABORATORY TEST	DEPTH/FT
61-	MH									Continued (SILTSTONE); slightly sandy, medium hard to hard, moist, dark gray/black, unox.		61-
62-												62-
63-												63-
64-												64-
65-												65-
66-												66-
67-												67-
68-										Material gradually increasing from medium hard to hard with depth, generally massive.		68-
69-												69-
70-												70-
71-												71-
72-												72-
73-												73-
74-												74-
75-												75-
76-												76-
77-												77-
78-												78-
79-												79-
80-												80-
81-												81-
82-												82-
83-												83-
84-												84-
85-												85-
86-										086': Limit of downhole log.		86-
87-												87-
88-												88-
89-												89-
90-												90-

JOB NO: 10282-02 | LOG OF BORING | FIGURE:

DATE OBSERVED: 09/26/90

METHOD OF DRILLING: 24" BUCKET AUGER
LOCATION: LOT 32, TT 5241

LOGGED BY: KAT

GROUND ELEVATION: 317±

DEPTH/FT	CLASSIFI	CONTACTION	BLOWS/FT	UNDISTURBED	SAMPLE	BULK	SAMPLE	MOISTURE	CONTENT	INPLACE	DRY	DENSITY	BORING NO: 3 (cont.) (LCA-3) DESCRIPTION	LABORATORY TEST	DEPTH/FT
91-	MH												Continued (SILTSTONE); slightly sandy, medium hard to hard, moist, dark gray/black, unoxidized. @91': Water		91-
92-															92-
93-															93-
94-															94-
95-															95-
96-															96-
97-															97-
98-															98-
99-															99-
100-															100-
101-															101-
102-													Total Depth 101 feet Seepage @58 feet No Caving		102-
103-															103-
104-															104-
105-															105-
106-															106-
107-															107-
108-															108-
109-															109-
110-															110-
111-															111-
112-															112-
113-															113-
114-															114-
115-															115-
116-															116-
117-															117-
118-															118-
119-															119-
120-															120-

JOB NO: 10282-02	LOG OF BORING	FIGURE:

DATE OBSERVED: 09/25/90

METHOD OF DRILLING: 24" BUCKET A&W

LOCATION: SEE MAP, LOT 13, TT 5241

LOGGED BY: KAT

GROUND ELEVATION: 358±

DEPTH/FT	CLASSIFICATION	BLOWS/FT	UNDISTURBED	SAMPLE	BULK	MOISTURE	CONTENT	INPLACE	DRY	DENSITY	BORING NO: 4 (LCA-4) DESCRIPTION	LABORATORY TEST	DEPTH/FT
1-	SC/SM										FILL: Clayey to silty SAND; fine to medium grained, dense, moist, gray-brown.		1-
2-													2-
3-													3-
4-													4-
5-													5-
6-													6-
7-													7-
8-													8-
9-													9-
10-													10-
11-													11-
12-													12-
13-													13-
14-											@14': Cobble		14-
15-													15-
16-	ML/MH										@15.5': ANCIENT LANDSLIDE; (composed of Capistrano Formation Siltstone/		16-
17-											Sandstone). Very fine grained, soft to medium hard, moist, light brown to		17-
18-											light gray, moderately weathered in bands subparallel to joints.	J;N28W/62NE	18-
19-												J;N64E/68SE	19-
20-											Joints; regular, planar, part readily, orange stain (Fe?).	W;N60W/25NE	20-
21-											Bedding; visible as crude foliation/fabric., low angle, difficult to discern-superimposed.		21-
22-											weathering, very thickly bedded.		22-
23-													23-
24-													24-
25-													25-
26-													26-
27-													27-
28-													28-
29-													29-
30-													30-

JOB NO: 10282-02	LOG OF BORING	FIGURE:

DATE OBSERVED: 09/26/90

METHOD OF DRILLING: 24" BUCKET A&W

LOCATION: SEE MAP, LOT 13, TT 5241

LOGGED BY: KAT

GROUND ELEVATION: 358±

DEPTH/FT	CLASSIFICATION	BLOWS/FT	UNDISTURBED	TUBE SAMPLE	BULK SAMPLE	MOISTURE CONTENT	INPLACE DENSITY	BORING NO: 4 (cont.) (LCA-4) DESCRIPTION	LABORATORY TEST	DEPTH/FT
31-	ML/MH									31-
32-								@32': Very soft, very moist, slightly weathered, appears as crushed zone ±1' thick, small gypsum growth in habit, apparent bedding shears (discontinuous, no strongly polished surface).		32-
33-										33-
34-										34-
35-										35-
36-										36-
37-								@37': Seepage (north side of hole) emit from joint sets.	J;N87E/89SE	37-
38-	MH							@38': (Silty SANDSTONE) Fine grained, soft to moderately hard, very moist, dark gray, fresh, unoxidized, very strong petroliferous odor.		38-
39-										39-
40-										40-
41-										41-
42-										42-
43-								@43': Seepage - emit from unit, apparent bedding part surfaces, clay lined, no shears or polished surfaces.		43-
44-										44-
45-										45-
46-										46-
47-								@47': Concretion, possibly a disturbed bed (broken?) or lensic, interstices are soft -(Assumed from drilling). - Below concretion (SILTSTONE/ CLAYSTONE) Soft to medium hard, very moist, dark gray/black, unoxidized.	S;N15E/53SE	47-
48-										48-
49-										49-
50-										50-
51-										51-
52-									AB;N21E/37SE	52-
53-									J;N25E/88NEW	53-
54-										54-
55-										55-
56-										56-
57-										57-
58-								@58': Shears, along clay seams/beds, slicks and stria downdip, numerous,		58-
59-								continuous, discreet. (Note: material between shears moderately hard and	S;N30E/28SE	59-
60-								undisturbed) part readily.		60-

JOB NO: 10282-02 | LOG OF BORING | FIGURE:

DATE OBSERVED: 09/26/90 METHOD OF DRILLING: 24" BUCKET A&W

LOCATION: SEE MAP, Lot 13, TT 5241

LOGGED BY: KAT GROUND ELEVATION: 358±

DEPTH/FT	CLASSIFICATION	BLOWS/FT	UNDISTURBED SAMPLE	BULK SAMPLE	MOISTURE	CONTENT	INPLACE DRY DENSITY	BORING NO: 4 (cont.) (LCA-4) DESCRIPTION	LABORATORY TEST	DEPTH/FT
61-	MH									61-
62-										62-
63-										63-
64-										64-
65-										65-
66-										66-
67-										67-
68-										68-
69-										69-
70-								@70': Shears, similar to above, high angle (material between shears moderately hard and unditurbed as above).		70-
71-									S;N44E/67SE	71-
72-										72-
73-										73-
74-										74-
75-										75-
76-										76-
77-										77-
78-										78-
79-										79-
80-										80-
81-										81-
82-								@82': Shear, 1/4"-1/2" thick, polished surface, stria downdip, (material above and below moderately hard, unoxidized, appears undisturbed) continuous around hole.	S;N10W/37NE	82-
83-										83-
84-								- Lower shear, very thin, discontinuous.	S;N24E/54NW	84-
85-										85-
86-										86-
87-										87-
88-										88-
89-										89-
90-										90-

JOB NO: 10282-02 LOG OF BORING FIGURE: -

DATE OBSERVED: 09/26/90 METHOD OF DRILLING: 24" BUCKET A&W

LOCATION: SEE MAP, Lot 13, TT 5241

LOGGED BY: KAT GROUND ELEVATION: 358±

DEPTH/FT	CLASSIFICATION	BLOWS/FT	UNDISTURBED	SAMPLE	BULK SAMPLE	MOISTURE	CONTENT	INPLACE DRY DENSITY	BORING NO: 4 (cont.) (LCA-4) DESCRIPTION	LABORATORY TEST	DEPTH/FT
91-	MH										91-
92-											92-
93-											93-
94-											94-
95-											95-
96-											96-
97-									@97': Shear, very thin, clay seam parts readily, material above and below		97-
98-									undisturbed.	S;N55E/19SE	98-
99-											99-
100-									Material gradually increasing from medium hard to hard, massive (SILTSTONE with a trace of		100-
101-									clay), black, unoxidized.		101-
102-											102-
103-											103-
104-											104-
105-											105-
106-											106-
107-											107-
108-											108-
109-											109-
110-											110-
111-											111-
112-											112-
113-											113-
114-											114-
115-											115-
116-											116-
117-											117-
118-											118-
119-											119-
120-											120-

JOB NO: 10282-02	LOG OF BORING	FIGURE:

DATE OBSERVED: 09/26/90

METHOD OF DRILLING: 24" BUCKET A&W

LOCATION: SEE MAP, Lot 13, TT 5241

LOGGED BY: KAT

GROUND ELEVATION: 358±

DEPTH/FT	CLASSIFICATION	BLOWS/FT	UNDISTURBED SAMPLE	BULK SAMPLE	MOISTURE CONTENT	INPLACE DRY DENSITY	BORING NO: 4 (cont.) (LCA-4) DESCRIPTION	LABORATORY TEST	DEPTH/FT
121-	MH						- Continues massive (SILTSTONE with trace of clay), hard, moist, black, unoxidized to bottom of hole.		121-
122-									122-
123-									123-
124-									124-
125-									125-
126-									126-
127-									127-
128-									128-
129-									129-
130-									130-
131-									131-
132-									132-
133-									133-
134-									134-
135-									135-
136-									136-
137-									137-
138-									138-
139-									139-
140-									140-
141-									141-
142-									142-
143-									143-
144-									144-
145-									145-
146-									146-
147-									147-
148-									148-
149-							Total Depth 150 feet Seepage @ 37' and 47' No Groundwater/No Caving		149-
150-									150-

JOB NO: 10282-02	LOG OF BORING	FIGURE:

DATE OBSERVED: 10/02/90

METHOD OF DRILLING: 24" BUCKET A&W
LOCATION: SEE MAP, LOT 8 TT 5241

LOGGED BY: KAT

GROUND ELEVATION: 350±

DEPTH/FT	CLASSIFICATION	BLOWS/FT	UNDISTURBED SAMPLE	BULK SAMPLE	MOISTURE CONTENT	INPLACE DRY DENSITY	BORING NO: 5 (LCA-5) DESCRIPTION	LABORATORY TEST	DEPTH/FT
1-	ML/SM						FILL: Sandy SILT/ Silty SAND; fine grained, soft, moist, light gray.		1-
2-									2-
3-							- Root material		3-
4-							@4': Silty SAND, fine to medium grained, dense, moist, light gray/brown.		4-
5-									5-
6-									6-
7-									7-
8-									8-
9-									9-
10-									10-
11-	ML/MH						@11': LANDSLIDE DEBRIS; (Composed of Capistrano Formtation SILTSTONE/ SANDSTONE). Fine-grained, moderately hard, slightly moist to moist, light gray with orange staining (mottling).		11-
12-								J;N485E/82E	12-
13-									13-
14-							Joints; Orange stained, rare clays, widely spaced sets are continuous, closely spaced sets discontinuous, small gypsum growths to 1/4"		14-
15-								J;N64E/77NW	15-
16-									16-
17-							Bedding; discernable as a fabric imbrication/foliation, slight northwest dip, will not part readily.	J;N54E/84NW	17-
18-									18-
19-								J;N05W/65NE	19-
20-								N03E/86SE	20-
21-								N85E/71NW	21-
22-									22-
23-									23-
24-							@24': (Sandstone) ± 1' thick, fine grained.	AB;N86W/24NE	24-
25-							@25': (Siltstone/Claystone) medium hard, moist to very moist, light gray/brown to dark gray, locally unoxidized.		25-
26-									26-
27-									27-
28-							@29': Crushed zone: material very soft, very moist between joints, surface planar to undulant, small gypsum, no planar shear continuous around hole, very disturbed.	J;N45E/58SE	28-
29-								N68W/67NE	29-
30-								N37E/74NW	30-

JOB NO: 10282-02	LOG OF BORING	FIGURE:

DATE OBSERVED: 10/02/90

METHOD OF DRILLING: 24" BUCKET A&W
LOCATION: SEE MAP, LOT 8 TT 5241

LOGGED BY: KAT

GROUND ELEVATION: 350±

DEPTH/FT	CLASSIFICATION	BLOWS/FT	UNDISTURBED	BULK	SAMPLE	MOISTURE	INPLACE	DRY DENSITY	BORING NO: 5 (cont.) (LCA-5) DESCRIPTION	LABORATORY TEST	DEPTH/FT
31-	MH										31-
32-											32-
33-											33-
34-											34-
35-											35-
36-									@36': Clay lined joint, parts readily, slightly cemented surface, no slicks, no polishes.	J;N25E/60SE	36-
37-											37-
38-									@38': Seepage (emit from shear)	S;N35E/58SE	38-
39-										N19E/49SE	39-
40-											40-
41-									41': Seepage (emit from shears).		41-
42-									@42': Seepage (emit from shears) Apparent Bedding Shears; polished surface, stria, material appears crushed, very soft, marginally intact, broken concretionary bed at 43' -cont. to 56'.		42-
43-											43-
44-											44-
45-											45-
46-										S;N12E/41SE	46-
47-											47-
48-											48-
49-											49-
50-										S;N12E/46SE	50-
51-											51-
52-											52-
53-											53-
54-											54-
55-											55-
56-									@56': Rupture Surface	RS;N14E/17SE	56-
57-									@56': ANCIENT LANDSLIDE: (Composed of Capistrano Formation Siltstone). Moderately hard, moist, dark gray, unoxidized, generally massive to very thickly bedded.		57-
58-										J;N45E/43NW	58-
59-											59-
60-											60-

JOB NO: 10282-02	LOG OF BORING	FIGURE:

DATE OBSERVED: 10/02/90

METHOD OF DRILLING: 24" BUCKET A&W
LOCATION: SEE MAP, Lot 8 TT 5241

LOGGED BY: KAT

GROUND ELEVATION: 350±

DEPTH/FT	CLASSIFICATION	BLOWS/FT	UNDISTURBED SAMPLE	BULK SAMPLE	MOISTURE CONTENT	INPLACE DRY DENSITY	BORING NO: 5 (cont.) (LCA-5) DESCRIPTION	LABORATORY TEST	DEPTH/FT
61-	MH						Continued (Siltstone), hard, moist, light to dark gray, unoxidized, massive.		61-
62-								J;N40E/42SE	62-
63-								N57E/86NW	63-
64-									64-
65-									65-
66-									66-
67-									67-
68-									68-
69-									69-
70-									70-
71-									71-
72-									72-
73-									73-
74-									74-
75-								J;N50E/78NW	75-
76-									76-
77-									77-
78-									78-
79-									79-
80-									80-
81-									81-
82-									82-
83-									83-
84-									84-
85-									85-
86-									86-
87-									87-
88-									88-
89-									89-
90-									90-

JOB NO: 10282-02	LOG OF BORING	FIGURE:

DATE OBSERVED: 10/02/90

METHOD OF DRILLING: 24" BUCKET A&W

LOCATION: SEE MAP, Lot 8 TT 5241

LOGGED BY: KAT

GROUND ELEVATION: 350±

DEPTH/FT	CLASSIFICATION	BLOWS/FT	UNDISTURBED SAMPLE	BULK SAMPLE	MOISTURE CONTENT	INPLACE DRY DENSITY	BORING NO: 5 (cont.) (LCA-5) DESCRIPTION	LABORATORY TEST	DEPTH/FT
91-	MH						Continued (SILTSTONE), hard, moist, dark gray to black, unoxidized, massive, continuous to the bottom of the hole.	J;N46E/78SE	91-
92-									92-
93-									93-
94-									94-
95-									95-
96-									96-
97-									97-
98-									98-
99-									99-
100-									100-
101-									101-
102-									102-
103-									103-
104-									104-
105-									105-
106-									106-
107-									107-
108-									108-
109-									109-
110-							@110': Seepage (Emit from distcontinuous joint).		110-
111-									111-
112-									112-
113-									113-
114-									114-
115-									115-
116-									116-
117-									117-
118-									118-
119-									119-
120-									120-

JOB NO: 10282-02	LOG OF BORING	FIGURE:

DATE OBSERVED: 10/02/90

METHOD OF DRILLING: 24" BUCKET A&W

LOCATION: SEE MAP, LOT 8 TT 5241

LOGGED BY: JPH

GROUND ELEVATION: 350±

DEPTH/FT	CLASSIFICATION	BLOWS/FT	UNDISTURBED SAMPLE	TIP/PPM	MOISTURE CONTENT	INPLACE DRY DENSITY	BORING NO: 5 (cont.) (LCA-5) DESCRIPTION	LABORATORY TEST	DEPTH/FT
121-							Continued (SILTSTONE), hard, moist, dark gray to black, unoxidized, massive, continuous to the bottom of the hole.		121-
122-									122-
123-									123-
124-									124-
125-									125-
126-									126-
127-									127-
128-									128-
129-									129-
130-									130-
131-									131-
132-									132-
133									133-
134									134-
135-									135-
136-									136-
137-									137-
138-									138-
139-									139-
140-									140-
141-									141-
142-									142-
143-									143-
144-									144-
145									145-
146									146-
147-									147-
148-									148-
149-							Total Depth 150 feet Seepage @38, 41', 42' and 110' No Groundwater No caving		149-
150-									150-

JOB NO: 10282-02 | LOG OF BORING | FIGURE:

DATE OBSERVED: 11/10/90

METHOD OF DRILLING: LARIVE DRILLING COMPANY 24" BUCKET

LOCATION: SEE GEOTECHNICAL MAP

LOGGED BY: JPH & GFS

GROUND ELEVATION: 242' ±

DEPTH/FT	CLASSIFICATION	BLOWS/FT	UNDISTURBED	SAMPLE	BULK SAMPLE	MOISTURE	CONTENT	INPLACE DRY DENSITY	BORING NO: SMC B-1 DESCRIPTION	LABORATORY TEST	DEPTH/FT
1-	ML/MH								LANDSLIDE DEBRIS: (Composed of Capistrano Formation Siltstone/Sandstone Bedrock).		1-
2-									Moderately hard, slightly moist, very fine-grained, light grey to brown with orange stain (mottling), moderately weathered, thin to thickly bedded.	J;N78E/86NW	2-
3-										J;N32W/88NE	3-
4-									Joints; orange-stained, close (2"-1'), planar, narrow to wide tightness, discontinuous, some gypsum growths.	J;N63E/83SE	4-
5-											5-
6-											6-
7-											7-
8-									@8': Apparent Bedding; very fine-grained sandstone bed, yellow.	AB;N38E/24SE	8-
9-										AB;N16E/33SE	9-
10-											10-
11-										J;N29E/21SE	11-
12-											12-
13-									@13': Joint Sets; orange-stained, close, irregular, discontinuous, narrow to wide and infilled with inhabit gypsum growths.	J;N82W/86NE	13-
14-											14-
15-									@15': becoming less weathered and mottled.	J;N16W/37NE	15-
16-	MH								SILTSTONE: Fresh, unoxidized, dark grey to black, moderately hard, Moist, massive to thickly bedded; bedding discernable as a crude fabric, i.e., imbrication/foliation.	AB;N02E/32SE	16-
17-											17-
18-										AB;N12E/24SE	18-
19-											19-
20-											20-
21-											21-
22-											22-
23-											23-
24-											24-
25-											25-
26-									@25.5': Seepage; emit below concretion.		26-
27-											27-
28-									@28': High angle shear; tight, truncated by concretion	S;N15W/70NE	28-
29-											29-
30-											30-

JOB NO: 10507-00 | LOG OF BORING | FIGURE: B-2

DATE OBSERVED: 11/10/90

METHOD OF DRILLING: LARIVE DRILLING COMPANY 24" BUCKET

LOCATION: SEE GEOTECHNICAL MAP

LOGGED BY: JPH & GFS

GROUND ELEVATION: 242' ±

DEPTH/FT	CLASSIFICATION	BLOWS/FT	UNDISTURBED	SAMPLE	BULK	SAMPLE	MOISTURE	CONTENT	INPLACE	DRY DENSITY	BORING NO: SMC B-1 (cont.) DESCRIPTION	LABORATORY TEST	DEPTH/FT
31-	MH										ANCIENT LANDSLIDE DEBRIS CONTINUED: (Composed of Capristrano Formation Siltstone Bedrock) Fresh, unoxidized, dark grey to black, moderately hard, moist, micaceous, massive to thickly bedded; bedding discernable as a crude fabric, i.e., imbrication/foliation. Jointing/fracturing - slight to absent, @31': Slight to moderate petroliferous odor.		31-
32-													32-
33-													33-
34-													34-
35-													35-
36-													36-
37-													37-
38-													38-
39-													39-
40-													40-
41-											@41': Standing water 11/16/90.		41-
42-													42-
43-													43-
44-													44-
45-													45-
46-											@46': Seepage (weep); emit from high angle shear. No polished surfaces or stria.	S;N75W/75SW	46-
47-													47-
48-													48-
49-													49-
50-					X						@50': High angle shear.		50-
51-											@51' to 53': Concretionary lense; discontinuous, broken (presumed from dilling). Below concretion bedrock moderately hard, moist.		51-
52-													52-
53-											@51.5': Seepage; emit from contact between concretion and siltstone bedrock.		53-
54-													54-
55-													55-
56-											@56': Soft zone; soft, moist, massive, no joints/fractures.		56-
57-													57-
58-													58-
59-													59-
60-													60-

JOB NO: 10507-00 | LOG OF BORING | FIGURE: B-3

DATE OBSERVED: 11/10/90 METHOD OF DRILLING: LARIVE DRILLING-COMPANY 24" BUCKET

LOCATION: SEE GEOTECHNICAL MAP

LOGGED BY: JPH & GFS GROUND ELEVATION: 242'±

DEPTH/FT	CLASSIFICATION	BLOWS/FT	UNDISTURBED SAMPLE	BULK SAMPLE	MOISTURE CONTENT	INPLACE DRY DENSITY	BORING NO: SMC B-1 (Cont.) DESCRIPTION	LABORATORY TEST	DEPTH/FT
61-	MH						ANCIENT LANDSLIDE DEBRIS CONTINUED: (Composed of Capistrano Formation Siltstone Bedrock) Fresh, unoxidized, dark grey, moderately hard to hard, moist, micaceous, massive to thickly bedded; bedding discernable as a crude fabric, jointing and fracturing absent, mild petroliferous odor.		61-
62-									62-
63-									63-
64-									64-
65-									65-
66-									66-
67-									67-
68-									68-
69-									69-
70-									70-
71-									71-
72-									72-
73-									73-
74-									74-
75-									75-
76-									76-
77-									77-
78-									78-
79-							@79.5': Standing water as of 11/12/90.		79-
80-									80-
81-									81-
82-									82-
83-									83-
84-									84-
85-									85-
86-									86-
87-									87-
88-									88-
89-									89-
90-									90-

JOB NO: 10507-00 | LOG OF BORING | FIGURE: B-4

DATE OBSERVED: 11/10/90

METHOD OF DRILLING: LARIVE DRILLING COMPANY 24" BUCKET

LOCATION: SEE GEOTECHNICAL MAP

LOGGED BY: JPH & GFS

GROUND ELEVATION: 242'±

DEPTH/FT	CLASSIFICATION	BLOWS/FT	UNDISTURBED	SAMPLE	BULK	SAMPLE	MOISTURE	CONTENT	INPLACE	DRY DENSITY	BORING NO: SMC B-1 (Cont.) DESCRIPTION	LABORATORY TEST	DEPTH/FT
91-	MH										ANCIENT LANDSLIDE DEBRIS CONTINUED: (Composed of Capistrano Formation Siltstone Bedrock) Fresh, unoxidized, dark grey, moderately hard to hard, moist, micaceous, massive to thickly bedded; bedding discernable as a crude fabric, jointing and fracturing absent, mild petroliferous odor.		91-
92-											@92.5: Clay Seam; Apparent bedding, paper thin, continuous around boring, planar, polished, no stria, bedding above and below undisturbed.		92-
93-											@93.5': Seepage; emit from high angle shear, parts readily, no polishes or stria.	CS;N40E/04NW	93-
94-											@95': Soft zone; moderately hard, moist, massive, appears fossiliferous (diatomaceous?).	S;N80W/90	94-
95-											@96': End of geologic log.		95-
96-													96-
97-													97-
98-													98-
99-													99-
100-													100-
101-													101-
102-													102-
103-													103-
104-													104-
105-													105-
106-													106-
107-													107-
108-													108-
109-													109-
110-													110-
111-													111-
112-													112-
113-													113-
114-													114-
115-													115-
116-													116-
117-													117-
118-													118-
119-													119-
120-													120-

JOB NO: 10507-00 | LOG OF BORING | FIGURE: B-5

DATE OBSERVED: 11/12/90

METHOD OF DRILLING: LARIVE DRILLING COMPANY 24" BUCKET

LOCATION: SEE GEOTECHNICAL MAP

LOGGED BY: JPH & GFS

GROUND ELEVATION: 242'±

DEPTH/FT	CLASSIFICATION	BLOWS/FT	UNDISTURBED	SAMPLE	BULK	SAMPLE	MOISTURE	CONTENT	INPLACE	DRY	DENSITY	BORING NO: SMC B-1 (Cont.) DESCRIPTION	LABORATORY TEST	DEPTH/FT
121-	MH											ANCIENT LANDSLIDE DEBRIS CONTINUED: (Composed of Capistrano Formation Siltstone Bedrock) Fresh, unoxidized, dark grey, moderately hard to hard, moist, micaceous, massive to thickly bedded; bedding discernable as a crude fabric, jointing and fracturing absent, mild petroliferous odor.		121-
122-														122-
123-														123-
124-														124-
125-														125-
126-														126-
127-														127-
128-														128-
129-												@129': Seepage; possible slide plane; emits approximately 1 gallon per second.		129-
130-														130-
131-														131-
132-														132-
133-												@133': Bedrock becoming moderately hard to hard. Amount of free water making drilling inefficient and slow.		133-
134-														134-
135-														135-
136-														136-
137-												Total Depth: 134'		137-
138-												Standing Water: @79.5' on 11/12/90 Standing Water: @38.0' on 11/19/90		138-
139-												Seepage: @25.5', 46', 51.5' and 128' Seepage @ 128' measured emitting 1 gallon per second ±. Geologically logged to 96'.		139-
140-														140-
141-														141-
142-														142-
143-														143-
144-														144-
145-														145-
146-														146-
147-														147-
148-														148-
149-														149-
150-														150-

JOB NO: 10507-00 | LOG OF BORING | FIGURE: B-6

DATE OBSERVED: 11/12/90

METHOD OF DRILLING: LARIVE DRILLING COMPANY 24" BUCKET

LOGGED BY: JPH & GFS

GROUND ELEVATION: 252' ±

LOCATION: SEE GEOTECHNICAL MAP

DEPTH/FT	CLASSIFICATION	BLOWS/FT	UNDISTURBED	SAMPLE	BULK	SAMPLE	MOISTURE	CONTENT	INPLACE	DRY	DENSITY	BORING NO: SMC B-2 DESCRIPTION	LABORATORY TEST	DEPTH/FT
1-	CH											COLLUVIUM: Clayey silt, soft, moist, light grey to brown, trace of yellow fine-grained sand, blocky soil structure, abundant caliche stringers.		1-
2-														2-
3-														3-
4-														4-
5-	SM/SP											OLDER ALLUVIUM: Sand and pebbly sand. Loose, slightly moist, light grey, very fine to fine-grained, sands appear cross-bedded; pebbly sands appear massive. Pebbles comprised of subrounded, fine to coarse (1/4" 1-1/2") gravel.		5-
6-														6-
7-														7-
8-	ML/MH											@8': Contact; sharp, irregular, scoured.	C;N62W/12SW	8-
9-												ANCIENT LANDSLIDE DEBRIS: (Composed of Capistrano Formation Siltstone/ Sandstone Bedrock) Very fine-grained, soft, moist, medium-grey to dark brown with orange staining (mottling).		9-
10-														10-
11-														11-
12-												Abundant Jointing; Orange stained, closely spaced sets (2" to 12"), tight to open and infilled with up to 1/4" gypsum growths, planar, discontinuous.	J;N30W/37NE	12-
13-													J;N60E/87NW	13-
14-													J;N18W/N42SW	14-
15-														15-
16-														16-
17-														17-
18-													J;N70W/70NE	18-
19-												@18.5': Joint; curviplanar, closed, no polishes or stria.	J;N35W/03SW	19-
20-													J;N50E/82NW	20-
21-												@21': Seepage; emit from high angle fracture, orange-brown stained, 1/8" gypsum infilling, minor clays.	fr;N28E/78SE	21-
22-													fr;N79E/30SE	22-
23-	MH											@22.6': Seepage; emit from open (1/8") fracture, curviplanar, continuous around hole, oxidized along fracture surface, partial gypsum infilling. No polishes or stria	C;N20E/14SE	23-
24-													CS;N35E/5NW	24-
25-												@22.7': Contact; sharp, roughly planar.		25-
26-												SILTSTONE: Fresh, unoxidized, moderately hard, moist, dark grey to black, micaceous, thickly bedded to masive; bedding discernable as crude fabric, i.e., imbrication/foliation.		26-
27-														27-
28-														28-
29-														29-
30-														30-

JOB NO: 10507-00

LOG OF BORING

FIGURE: B-7

10507A6

STONEY-MILLER CONSULTANTS, INC.

DATE OBSERVED: 11/12/90 METHOD OF DRILLING: LARIVE DRILLING COMPANY 24" BUCKET

LOCATION: SEE GEOTECHNICAL MAP

LOGGED BY: JPH & GFS GROUND ELEVATION: 252' ±

DEPTH/FT	CLASSIFICATION	BLOWS/FT	UNDISTURBED	SAMPLE	BULK	SAMPLE	MOISTURE	CONTENT	INPLACE	DRY	DENSITY	BORING NO: SMC B-2 (cont.) DESCRIPTION	LABORATORY TEST	DEPTH/FT
31-	MH											ANCIENT LANDSLIDE DEBRIS CONTINUED: (Composed of Capristrano Formation Siltstone Bedrock) Fresh, unoxidized, dark grey to black, moderately hard, moist, micaceous, massive to thickly bedded; bedding discernable as a crude fabric, i.e., imbrication/foliation, joints and fractures slight to absent.		31-
32-														32-
33-														33-
34-														34-
35-												@23': Soft zone; siltstone becomes soft and moist.		35-
36-												@23.1': Clay Seam; apparent bedding, paper thin to 1/16 inch, soft, moist, no polishes or stria.		36-
37-														37-
38-														38-
39-														39-
40-														40-
41-														41-
42-														42-
43-														43-
44-														44-
45-														45-
46-														46-
47-														47-
48-														48-
49-														49-
50-														50-
51-														51-
52-														52-
53-														53-
54-														54-
55-														55-
56-														56-
57-														57-
58-														58-
59-														59-
60-														60-

JOB NO: 10507-00 LOG OF BORING FIGURE: B-8

DATE OBSERVED: 11/12/90

METHOD OF DRILLING: LARIVE DRILLING COMPANY 24" BUCKET
LOCATION: SEE GEOTECHNICAL MAP

LOGGED BY: JPH & GFS GROUND ELEVATION: 242'±

DEPTH/FT	CLASSIFICATION	BLOWS/FT	UNDISTURBED	SAMPLE	BULK SAMPLE	MOISTURE CONTENT	INPLACE DRY DENSITY	BORING NO: SMC B-2 (Cont.) DESCRIPTION	LABORATORY TEST	DEPTH/FT
61-	MH							ANCIENT LANDSLIDE DEBRIS CONTINUED: (Composed of Capistrano Formation Siltstone Bedrock) Fresh, unoxidized, dark grey, moderately hard to hard, moist, micaceous, massive to thickly bedded; bedding discernable as a crude fabric, i.e., imbricaiton/foliation, joints and fractures slight to absent.		61-
62-										62-
63-										63-
64-										64-
65-								@65': 6-inch thick cemented zone. @65.5': Seepage; emit from high angle, open (1/4") fracture.	fr;N70W/90	65-
66-										66-
67-										67-
68-										68-
69-										69-
70-										70-
71-										71-
72-										72-
73-										73-
74-										74-
75-										75-
76-										76-
77-										77-
78-										78-
79-										79-
80-								@80': Standing water on 11/12/90.		80-
81-										81-
82-										82-
83-										83-
84-								Total Depth: @84'		84-
85-								Standing Water: @80' on 11/12/90 Standing Water: @21' on 11/16/90		85-
86-								Seepage: @21', 22.6' and 65.5' Geologically Logged to 76'		86-
87-										87-
88-										88-
89-										89-
90-										90-

JOB NO: 10507-00 | LOG OF BORING | FIGURE: B-9

STONEY-MILLER CONSULTANTS, INC.

DATE OBSERVED: 11/13/90

METHOD OF DRILLING: LARIVE DRILLING COMPANY 24" BUCKET
LOCATION: SEE GEOTECHNICAL MAP

LOGGED BY: JPH & KAT GROUND ELEVATION: 228' ±

DEPTH/FT	CLASSIFICATION	BLOWS/FT	UNDISTURBED	SAMPLE	BULK	SAMPLE	MOISTURE	CONTENT	INPLACE	DENSITY	BORING NO: SMC B-3 DESCRIPTION	LABORATORY TEST	DEPTH/FT
1-	ML										COLLUVIUM: Clayey silt with a trace of white, fine-grained sand, soft, moist, rootlets.		1-
2-													2-
3-													3-
4-	ML/MH										@3.5': Contact; irregular, sharp oxidized, orange-brown.		4-
5-											ANCIENT LANDSLIDE DEBRIS: (Composed of Capistrano Formation Siltstone/Sandstone Bedrock) Very fine-grained, soft to moderately hard, grey to dark brown with orange staining (mottling), moderately weathered, thin to thickly bedded. Highly jointed/fractured, orange-stained, closely spaced sets, discontinuous, planar, closed to 1/8" thickness, moderate gypsum infilling.	J;N22W/32NE	5-
6-												J;N40E/90	6-
7-												J;N45E/90	7-
8-												J;N32W/59NE	8-
9-													9-
10-												J;N03W/35NE	10-
11-												J;N10W/57NE	11-
12-												J;N35E/72SE	12-
13-												AB;N15E/18SE	13-
14-											@14': Bedding Plane Shears; orange-stained, continuous around hole, gypsum infilled to 1/4".		14-
15-											@ 15': Black, dark grey and dark brown mottling.	BS;N66E/22SE	15-
16-													16-
17-											@17': Weeping; emit from joints.	J;N73E/39SE	17-
18-											@18': Numerous high angle fractures; closely spaced, gypsum infilled, planar, stained orange-brown.		18-
19-	MH										@18.1': Seepage; emit from open (1/8") fracture.	f;N55E/36SE	19-
20-											@18.9': Contact: gradational, irregular.	C;N72E/36SE	20-
21-											SILTSTONE; Fresh, unoxidized, black to dark grey, micaceous, thickly bedded; bedding discernable as crude fabric. Abundant high angle fractures.		21-
22-													22-
23-													23-
24-													24-
25-													25-
26-													26-
27-													27-
28-													28-
29-											@30': Shear; high angle, healed, planar, bedrock undisturbed above and below, paper thin.		29-
30-													30-

JOB NO: 10507-00 | LOG OF BORING | FIGURE: B-10

DATE OBSERVED: 11/13/90 METHOD OF DRILLING: LARIVE DRILLING COMPANY 24" BUCKET

LOCATION: SEE GEOTECHNICAL MAP

LOGGED BY: JPH & KAT GROUND ELEVATION: 228' ±

DEPTH/FT	CLASSIFICATION	BLOWS/FT	UNDISTURBED	SAMPLE	BULK	SAMPLE	MOISTURE	CONTENT	INPLACE	DRY	DENSITY	BORING NO: SMC B-3 (cont.) DESCRIPTION	LABORATORY TEST	DEPTH/FT
31-	MH											ANCIENT LANDSLIDE DEBRIS CONTINUED: (Composed of Capristrano Formation Siltstone Bedrock) Fresh, unoxidized, dark grey to black, moderately hard, moist, micaceous, massive to thickly bedded, jointing/fracturing slight to absent.	S;N78W/77NE	31-
32-														32-
33-														33-
34-														34-
35-														35-
36-														36-
37-														37-
38-														38-
39-														39-
40-														40-
41-														41-
42-														42-
43-														43-
44-														44-
45-														45-
46-												@46': Bedding discernable as fabric, i.e., imbrication/foliation.	S;N75W/75SW	46-
47-														47-
48-												@48': Fractures; numerous, open (1/4"), high angle fractures. Closely spaced (1/2"), tight, planar, discontinuous.	fr;N80W/60SW	48-
49-												@48': Seepage; emit from fractures.		49-
50-												@50': Fractures; numerous high angle, open (1/8-1/4") fractures, no seepage, discontinuous.		50-
51-														51-
52-														52-
53-														53-
54-														54-
55-														55-
56-														56-
57-														57-
58-														58-
59-														59-
60-														60-

JOB NO: 10507-00 | LOG OF BORING | FIGURE: B-11

DATE OBSERVED: 11/13/90

METHOD OF DRILLING: LARIVE DRILLING COMPANY 24" BUCKET

LOCATION: SEE GEOTECHNICAL MAP

LOGGED BY: JPH

GROUND ELEVATION: 228'±

DEPTH/FT	CLASSIFICATION	BLOWS/FT	UNDISTURBED	TUBE SAMPLE	BULK	SAMPLE	MOISTURE	CONTENT	INPLACE	DRY DENSITY	BORING NO: SMC B-3 (Cont.) DESCRIPTION	LABORATORY TEST	DEPTH/FT
61-	MH										ANCIENT LANDSLIDE DEBRIS CONTINUED: (Composed of Capistrano Formation Siltstone Bedrock) Fresh, unoxidized, dark grey, hard, moist, micaceous, massive to thickly bedded, jointing and fracturing absent.		61-
62-													62-
63-													63-
64-											@64': Fracture; close, planar, discontinuous.	fr;N03W/48NE	64-
65-													65-
66-													66-
67-													67-
68-													68-
69-													69-
70-													70-
71-													71-
72-													72-
73-													73-
74-													74-
75-													75-
76-											@76': Concretionary Bleb; 4" long x 5" high, appears disturbed (by drilling ?).		76-
77-											@77': Clay Seam; 1/8" thick, smooth, planar surface, bedrock above-hard and undisturbed; bedrock-below soft and undisturbed.	CS;N32W/03NE	77-
78-												CS;N50E/03SE	78-
79-											@77.4': Clay Seam; oblique angle, paper thin, no polishes or stria.		79-
80-													80-
81-													81-
82-													82-
83-													83-
84-													84-
85-													85-
86-													86-
87-													87-
88-													88-
89-													89-
90-													90-

JOB NO: 10507-00 | LOG OF BORING | FIGURE: B-12

DATE OBSERVED: 11/13/90

METHOD OF DRILLING: LARIVE DRILLING COMPANY 24" BUCKET

LOCATION: SEE GEOTECHNICAL MAP

LOGGED BY: JPH

GROUND ELEVATION: 228'+

DEPTH/FT	CLASSIFICATION	BLOWS/FT	UNDISTURBED	SAMPLE	BULK	SAMPLE	MOISTURE	CONTENT	INPLACE	DRY DENSITY	BORING NO: SMC B-3 (Cont.) DESCRIPTION	LABORATORY TEST	DEPTH/FT
91-	MH										ANCIENT LANDSLIDE DEBRIS CONTINUED: (Composed of Capistrano Formation Siltstone Bedrock) Fresh, unoxidized, dark grey, hard, moist, micaceous, massive to thickly bedded, jointing and fracturing absent.		91-
92-													92-
93-													93-
94-													94-
95-													95-
96-													96-
97-													97-
98-													98-
99-											@99': End of Geologic Log.		99-
100-													100-
101-											@101': Standing Water		101-
102-													102-
103-													103-
104-													104-
105-													105-
106-													106-
107-													107-
108-													108-
109-													109-
110-													110-
111-													111-
112-													112-
113-											Total Depth: 113'		113-
114-											Standing Water 11/13/90 @101'		114-
115-											Standing Water 11/14/90 @30; 11/16/90 @18' Seepages: @17.0', 18.1', and 48.0'		115-
116-											Geologically Logged to 99'		116-
117-													117-
118-													118-
119-													119-
120-													120-

JOB NO: 10507-00 | LOG OF BORING | FIGURE: B-13

DATE OBSERVED: 11/14/90

METHOD OF DRILLING: LARIVE DRILLING COMPANY 24" BUCKET

LOCATION: SEE GEOTECHNICAL MAP

LOGGED BY: JPH

GROUND ELEVATION: 246' ±

DEPTH/FT	CLASSIFICATION	BLOWS/FT	UNDISTURBED	SAMPLE	BULK	SAMPLE	MOISTURE CONTENT	INPLACE DENSITY	BORING NO: SMC B-4 DESCRIPTION	LABORATORY TEST	DEPTH/FT
1-	ML								ARTIFICIAL FILL: Clayey Silt with fine sand. Loose, moist, rootlets, asphalt and siltstone bedrock chunks.		1-
2-	ML/OL								COLLUVIUM: Clayey silt. Light grey to medium brown, soft, moist, traces of pebbles (maximum 2"), caliche stringers, rootlet casts, visible porosity.		2-
3-											3-
4-											4-
5-											5-
6-									@6': Becoming firm to stiff, increasing moisture.		6-
7-											7-
8-											8-
9-											9-
10-											10-
11-									@11': Contact; Sharp, irregular, stained orange-brown.	C;N04W/53SW	11-
12-	SC								ALLUVIUM: Sandy Clay with gravel. Light yellow-grey, soft to loose, moist, massive to lenticular. Gravel is subrounded to rounded, (2.5" maximum diameter) increasing mottling with depth.		12-
13-											13-
14-											14-
15-									@15.5': Contact; sharp, curviplanar, highly oxidized.		15-
16-	ML/MH								ANCIENT LANDSLIDE DEBRIS: (Composed of Capistrano Formation Siltstone/Sandstone Bedrock) Moderately hard, slightly moist, very fine-grained, light grey to brown with orange stain (mottling), moderately weathered, thin to thickly bedded; bedding discernable as fabric. Micaceous, well jointed/fractured. Joints/fractures; high angle to flat-lying, closely spaced sets (2" to 6"), tight to open (1/8"), surfaces coated with orange staining, open fractures contain minor gypsum infilling, parts readily.	C;N40W/34SW	16-
17-											17-
18-										J;N24E/90	18-
19-										J;N24W/72NE	19-
20-											20-
21-										J;N35W/04NE	21-
22-									@22': Increasing gypsum infilling; bedrock becoming mottled dark brown and dark grey.	J;N56W/76NE	22-
23-										J;N75E/84SE	23-
24-	MH								@23': Seepage; emit from open fractures (1/8"-1/4"), curviplanar, flatlying.	C;N20W/15SW	24-
25-									@23': Contact; gradational, mottled dark brown and dark grey.		25-
26-									SILTSTONE: Fresh, unoxidized, dark grey to black, soft to moderately hard, moist, micaceous, bedding discernable as a crude fabric, i.e., imbrication/foliation. Moderately jointed and fractured. Joints and fractures; closely spaced (2-6"), high angle to flat-lying, stained orange-brown.	J;N55W/42NE	26-
27-										J;N25W/27NE	27-
28-										fr;N40W/84SW	28-
29-									@28': Weeps; emit from open fractures (1/8"), high angle, numerous sets.	fr;N25E/80SE	29-
30-										J;N50E/86SE	30-

JOB NO: 10507-00 | LOG OF BORING | FIGURE: B-14

DATE OBSERVED: 11/14/90 METHOD OF DRILLING: LARIVE DRILLING COMPANY 24" BUCKET

LOCATION: SEE GEOTECHNICAL MAP

LOGGED BY: JPH GROUND ELEVATION: 246' ±

DEPTH/FT	CLASSIFICATION	BLOWS/FT	UNDISTURBED	SAMPLE	BULK	SAMPLE	MOISTURE	CONTENT	INPLACE	DENSITY	BORING NO: SMC B-4 (cont.) DESCRIPTION	LABORATORY TEST	DEPTH/FT
31-	MH										ANCIENT LANDSLIDE DEBRIS CONTINUED: (Composed of Capristrano Formation Siltstone Bedrock) Fresh, unoxidized, dark grey to black, moderately hard, moist, micaceous, bedding discernable as crude fabric, i.e., imbrication/foliation, moderately jointed and fractured. Joints and fractures; closely spaced (2" to 6"), high angle to flat-lying, stained orange-brown.	J;N47E/90	31-
32-											@32': Apparent bedding.	AB;N70W/04W	32-
33-											@33': Seepage; emit from open (1/8") fracture, continuous, high angle, numerous, closely spaced.	fr;N50E/85SE	33-
34-													34-
35-												fr;N48E/90	35-
36-													36-
37-													37-
38-											@38.5': Clay Seam; apparent bedding, flat-lying, 1/4" to 1/2" thick, planar, polished, no stria.	CS;N05W/07SW	38-
39-													39-
40-											@40': Seepage; emit from open (1/4") fracture; minor clay on surface, closely spaced (2" to 1') with other fractures.	fr;N15W/67NE	40-
41-												AB;N20E/12NW	41-
42-											@40.1': Apparent bedding. @40.7'- 42.5': Concretionary Nodule; fractures truncate @ nodule, very spherical, 12" wide.		42-
43-													43-
44-											@44': Increasing fracturing; closely spaced (2" to 6"), open to 1/8", high angle, continuous.		44-
45-													45-
46-													46-
47-													47-
48-												fr;N85E/90	48-
49-													49-
50-											@50': Heavy Seepage; emit from closely spaced, open to 1/2" fractures; high angle, parallel sets, curviplanar.	fr;N86W/87NE	50-
51-												fr;N83W/86NE	51-
52-													52-
53-													53-
54-											@54': High angle, curviplanar fractures converge; becomes less fractured and disturbed.	fr;N60W/68NE	54-
55-													55-
56-											@55': Bedrock becoming moderately hard to hard and decreasing joints/fractures.		56-
57-													57-
58-													58-
59-													59-
60-													60-

JOB NO: 10507-00 LOG OF BORING FIGURE: B-15

DATE OBSERVED: 11/14/90 METHOD OF DRILLING: LARIVE DRILLING COMPANY 24" BUCKET

LOCATION: SEE GEOTECHNICAL MAP

LOGGED BY: JPH GROUND ELEVATION: 246'±

DEPTH/FT	CLASSIFICATION	BLOWS/FT	UNDISTURBED	SAMPLE	BULK	SAMPLE	MOISTURE	CONTENT	INPLACE	DENSITY	BORING NO: SMC B-4 (Cont.) DESCRIPTION	LABORATORY TEST	DEPTH/FT
61-	MH										ANCIENT LANDSLIDE DEBRIS CONTINUED: (Composed of Capistrano Formation Siltstone Bedrock) Fresh, unoxidized, dark grey, hard, moist, micaceous, massive to thickly bedded.		61-
62-													62-
63-											@62': Joint Set; high angle, planar, closely spaced (4").	J;N85W/78SW	63-
64-												J;N87E/90	64-
65-											@65': Fracture; high angle, curviplanar, tight.	fr;N67W/67NE	65-
66-													66-
67-													67-
68-													68-
69-													69-
70-													70-
71-													71-
72-													72-
73-													73-
74-													74-
75-											@75': End of Geologic Log		75-
76-													76-
77-											@77': Standing Water 11/15/90		77-
78-													78-
79-													79-
80-													80-
81-													81-
82-													82-
83-													83-
84-													84-
85-													85-
86-													86-
87-													87-
88-													88-
89-													89-
90-													90-

JOB NO: 10507-00 | LOG OF BORING | FIGURE: B-16

DATE OBSERVED: 11/14/90

METHOD OF DRILLING: LARIVE DRILLING COMPANY 24" BUCKET

LOCATION: SEE GEOTECHNICAL MAP

LOGGED BY: JPH

GROUND ELEVATION: 246'±

DEPTH/FT	CLASSIFICATION	BLOWS/FT	UNDISTURBED	SAMPLE	BULK	SAMPLE	MOISTURE	CONTENT	INPLACE	DRY	DENSITY	BORING NO SMC B-4 (Cont.) DESCRIPTION	LABORATORY TEST	DEPTH/FT
91-	MH											ANCIENT LANDSLIDE DEBRIS CONTINUED: (Composed of Capistrano Formation Siltstone Bedrock) Fresh, unoxidized, dark grey, hard, moist, micaceous, massive to thickly bedded.		91-
92-														92-
93-														93-
94-														94-
95-														95-
96-														96-
97-														97-
98-														98-
99-														99-
100-														100-
101-														101-
102-														102-
103-														103-
104-														104-
105-														105-
106-														106-
107-														107-
108-														108-
109-														109-
110-														110-
111-														111-
112-														112-
113-														113-
114-														114-
115-														115-
116-														116-
117-														117-
118-												@119': Same as above.		118-
119-												Total Depth: @119' Standing Water 11/15/90 @77', 11/16/90 @37' Seepage: @23', 28', 33', 40' and 50' Boring Backfilled		119-
120-														120-

JOB NO: 10507-00 | LOG OF BORING | FIGURE: B-17

DATE OBSERVED: 12/04/90

METHOD OF DRILLING: 8-Inch Flight Auger/H-F Drilling

LOCATION: See Geotechnical Map

LOGGED BY: JPH

GROUND ELEVATION: 228' ±

DEPTH/FT	CLASSIFICATION	BLOWS/FT	UNDISTURBED	BULK	SAMPLE	MOISTURE CONTENT	INPLACE DRY DENSITY	BORING NO: SMC B-5 DESCRIPTION	LABORATORY TEST	DEPTH/FT
1-	ML			X				ARTIFICIAL FILL - Sandy SILT. Loose, dry, very fine-grained, trace of organics and debris.	EXPANSION INDEX	1-
2-				X						2-
3-	CH/SC	5/5/5						ALLUVIUM - Interbedded clay and Clayey SAND. Stiff to very stiff, moist, lensoidal, abundant caliche stringers, some coarse sand.		3-
4-										4-
5-		7/10				11.0	109.0	@2.5' -3.5': Silty SAND. Medium dense, moist fine-grained, some clay, caliche stringers.	CONSOLIDATION	5-
6-										6-
7-									ATTERBERG LIMITS	7-
8-		4/4/4				28.0				8-
9-										9-
10-		8/15				24.0	101.0			10-
11-										11-
12-										12-
13-										13-
14-										14-
15-		3/4/8								15-
16-										16-
17-										17-
18-								@18': Groundwater		18-
19-										19-
20-										20-
21-		3/3/6				28.0				21-
22-										22-
23-										23-
24-										24-
25-	SC	3/4/8				28.0		@25': Increasing grain size to medium to coarse-grained sandy Clay. Stiff, very moist.		25-
26-										26-
27-										27-
28-										28-
29-										29-
30-										30-

JOB NO: 10507-00 | LOG OF BORING | FIGURE: B-18

DATE OBSERVED: 12/04/90 METHOD OF DRILLING: 8-Inch Flight Auger/H-F Drilling

LOGGED BY: JPH GROUND ELEVATION: 228 ± LOCATION: See Geotechnical Map

DEPTH/FT	CLASSIFICATION	BLOWS/FT	UNDISTURBED	SAMPLE	BULK	SAMPLE	MOISTURE	CONTENT	INPLACE	DRY	DENSITY	BORING NO: SMC B-5 (cont.) DESCRIPTION	LABORATORY TEST	DEPTH/FT
31-	CH	5/5/5										ALLUVIUM (Continued) - Clay. Dark gray brown, moist, very stiff, massive to lensoidal, some coarse sand to sandy lenses. @30': Decreasing sand content.		31-
32-														32-
33-														33-
34-														34-
35-														35-
36-														36-
37-														37-
38-														38-
39-														39-
40-	CH/SC													40-
41-														41-
42-														42-
43-														43-
44-														44-
45-														45-
46-														46-
47-														47-
48-														48-
49-														49-
50-		5/13/12												50-
51-							42.0							51-
52-												Total Depth: 51.5' Groundwater @18' No Caving Boring Backfilled		52-
53-														53-
54-														54-
55-														55-
56-														56-
57-														57-
58-														58-
59-														59-
60-														60-

JOB NO: 10507-00 LOG OF BORING FIGURE: B-19

DATE OBSERVED: 12/04/90 METHOD OF DRILLING: 8-Inch Flight Auger/H-F Drilling

LOCATION: See Geotechnical Map

LOGGED BY: JPH GROUND ELEVATION: 232' ±

DEPTH/FT	CLASSIFICATION	BLOWS/FT	UNDISTURBED	SAMPLE	BULK	SAMPLE	MOISTURE CONTENT	INPLACE DRY DENSITY	BORING NO: SMC-6 DESCRIPTION	LABORATORY TEST	DEPTH/FT
1-	ML								COLLUVIUM/ALLUVIUM - Silty SAND. Loose moist, rootlets.		1-
2-											2-
3-		3/3/3					12.0				3-
4-											4-
5-	ML/OL	4/6							@4.5': CLAY. Stiff, moist, dark gray, massive to lensoidal, rootlets, abundant caliche stringers.	HYDROMETER WITH SIEVE ATTERBERG LIMITS MAXIMUM DENSITY	5-
6-		2/4/6									6-
7-											7-
8-		4/7					25.0	97.0			8-
9-											9-
10-											10-
11-		3/5					26.0	98.0			11-
12-											12-
13-											13-
14-											14-
15-											15-
16-		6/8					25.0	100.0	@15': Trace of coarse sand.		16-
17-											17-
18-									@18': Groundwater		18-
19-											19-
20-									@20': Visible porosity (rootlet holes).		20-
21-		3/3/5									21-
22-											22-
23-											23-
24-											24-
25-											25-
26-											26-
27-											27-
28-											28-
29-											29-
30-	ML/OL	3/					25.0				30-

JOB NO: 10507-00 | LOG OF BORING | FIGURE:B-20

DATE OBSERVED: 12/04/90

METHOD OF DRILLING: 8-Inch Flight Auger/H-F-Drilling

LOCATION: See Geotechnical Map

LOGGED BY: JPH

GROUND ELEVATION: 232 ±

DEPTH/FT	CLASSIFICATION	BLOWS/FT	UNDISTURBED	SAMPLE	BULK	SAMPLE	MOISTURE	CONTENT	INPLACE	DRY	DENSITY	BORING NO: SMC B-6 (cont.) DESCRIPTION	LABORATORY TEST	DEPTH/FT
31-	ML/OL	4/6										COLLUVIUM/ALLUVIUM (continued) - Clay. Stiff, moist, dark gray, massive, abundant caliche stringers, traces of oxidation (orange-brown staining/mottling).		31-
32-														32-
33-														33-
34-														34-
35-														35-
36-														36-
37-														37-
38-														38-
39-														39-
40-	ML													40-
41-														41-
42-														42-
43-														43-
44-														44-
45-														45-
46-														46-
47-														47-
48-	ML/MH											LANDSLIDE DEBRIS (Composed of Capistrano Formation Bedrock). SILTSTONE. Soft to moderately hard, moist, appears thickly bedded (apparent fabric), moderately jointed, orange-stain on joint surfaces, micaceous.		48-
49-														49-
50-														50-
51-		10/20/25												51-
52-												Total Depth: 51.5'		52-
53-												Groundwater @18'		53-
54-												Bedrock @47.5'		54-
55-												Boring Backfilled		55-
56-														56-
57-														57-
58-														58-
59-														59-
60-														60-

JOB NO: 10507-00 | LOG OF BORING | FIGURE: B-21

DATE OBSERVED: 12/04/90

METHOD OF DRILLING: 8-Inch Flight Auger/H-F Drilling

LOCATION: See Geotechnical Map

LOGGED BY: JPH

GROUND ELEVATION: 227' ±

DEPTH/FT	CLASSIFICATION	BLOWS/FT	UNDISTURBED	BULK	SAMPLE	MOISTURE CONTENT	INPLACE DRY DENSITY	BORING NO: SMC B-7 DESCRIPTION	LABORATORY TEST	DEPTH/FT
1-	OL							COLLUVIUM/ALLUVIUM - Sandy SILT with some clay. Medium dense, dry to slightly moist, light gray, trace of rootlets.	HYDROMETER WITH SIEVE MAXIMUM DENSITY	
2-		10/15				11.0		@2': Sample disturbed.		2-
3-										3-
4-	CL							@4': CLAY. Stiff, moist, dark gray to black, massive, abundant caliche stringers.	EXPANSION INDEX	4-
5-									CORROSIVITY SERIES R-VALUE	5-
6-		4/6/8								6-
7-										7-
8-										8-
9-										9-
10-		4/10				28.0	97.0			10-
11-										11-
12-										12-
13-										13-
14-										14-
15-										15-
16-		5/5/5								16-
17-										17-
18-										18-
19-						▼		@19': Groundwater		19-
20-								@20': Color change to light to medium gray brown.		20-
21-		5/6/7								21-
22-										22-
23-										23-
24-										24-
25-		3/4/5						@25': Traces of oxidation staining (mottling)		25-
26-						26.0				26-
27-										27-
28-										28-
29-										29-
30-	CL	4/8						@30': Trace of coarse sand.		30-

JOB NO: 10507-00 | LOG OF BORING | FIGURE: B-22

DATE OBSERVED: 12/04/90

METHOD OF DRILLING: 8-Inch Flight Auger/H-F Drilling

LOCATION: See Geotechnical Map

LOGGED BY: JPH

GROUND ELEVATION: 227 ±

DEPTH/FT	CLASSIFICATION	BLOWS/FT	UNDISTURBED SAMPLE	BULK SAMPLE	MOISTURE CONTENT	INPLACE DRY DENSITY	BORING NO: SMC B-7 (cont.) DESCRIPTION	LABORATORY TEST	DEPTH/FT
31-	CL						COLLUVIUM/ALLUVIUM (continued) - Clay. Stiff, moist, dark gray to black, massive, trace of coarse sand.		31-
32-									32-
33-									33-
34-									34-
35-									35-
36-		12/20/15					@36.5': Same as above.		36-
37-									37-
38-									38-
39-							Total Depth: 36.5'		39-
40-							Groundwater @ 19' Standing Water @8' 12/5/90 Boring Backfilled		40-
41-									41-
42-									42-
43-									43-
44-									44-
45-									45-
46-									46-
47-									47-
48-									48-
49-									49-
50-									50-
51-									51-
52-									52-
53-									53-
54-									54-
55-									55-
56-									56-
57-									57-
58-									58-
59-									59-
60-									60-

JOB NO: 10507-00 | LOG OF BORING | FIGURE: B-23

DATE OBSERVED: 12/04/90

METHOD OF DRILLING: 8-Inch Flight Auger/H-F Drilling

LOCATION: See Geotechnical Map

LOGGED BY: JPH

GROUND ELEVATION: 225' ±

DEPTH/FT	CLASSIFICATION	BLOWS/FT	UNDISTURBED	SAMPLE	BULK	MOISTURE CONTENT	INPLACE DRY DENSITY	BORING NO:SMC B-8 DESCRIPTION	LABORATORY TEST	DEPTH/FT
1-	ML							COLLUVIUM/ALLUVIUM - Silty SAND. Medium dense, slightly moist, light gray, lenticular, abundant caliche stringers, fine-grained.		
2-		8/7/7								2-
3-										3-
4-	SM							@3.5': Color change to dark gray, some clay binder, increasing grain size.		4-
5-		5/10				11.0	102.0			5-
6-										6-
7-								@7': Rootlet holes; slight to moderate porosity.	DIRECT SHEAR CONSOLIDATION	7-
8-		6/12				5.0	107.0			8-
9-										9-
10-	CL							@9': CLAY. Firm to stiff, moist, dark gray, massive, trace of coarse sand, trace of rootlet holes.		10-
11-		3/3/3				20.0				11-
12-										12-
13-										13-
14-										14-
15-										15-
16-										16-
17-										17-
18-						▼		@18': Groundwater		18-
19-										19-
20-										20-
21-	SC	3/3/3						@21': 6-inch thick coarse-grained SAND lense with clay.		21-
22-										22-
23-								@23.9': Contact 4-5" ø cobbles.		23-
24-	MH/ML									24-
25-								LANDSLIDE DEBRIS (Composed of Capistrano Formation Bedrock). SILTSTONE. Soft, moist, medium blue to green-gray, bedding discernable as crude fabric, micaceous, moderately jointed; orange-brown staining on joint surfaces, fossiliferous (diatomaceous?).		25-
26-										26-
27-										27-
28-										28-
29-										29-
30-		3/				22.0				30-

JOB NO: 10507-00 | LOG OF BORING | FIGURE: B-24

DATE OBSERVED: 12/04/90

METHOD OF DRILLING: 8-Inch Flight Auger/H-F Drilling

LOCATION: See Geotechnical Map

LOGGED BY: JPH

GROUND ELEVATION: 225 ±

DEPTH/FT	CLASSIFICATION	BLOWS/FT	UNDISTURBED	SAMPLE	BULK	SAMPLE	MOISTURE	CONTENT	INPLACE	DRY	DENSITY	BORING NO: SMC B-8 (cont.) DESCRIPTION	LABORATORY TEST	DEPTH/FT
31-	MH/ML	4/5												31-
32-												Total Depth: 31.5'		32-
33-												Groundwater @18' Standing Water @15' 12/5/90		33-
34-												Bedrock @24' Caving Below 15'		34-
35-														35-
36-														36-
37-														37-
38-														38-
39-														39-
40-														40-
41-														41-
42-														42-
43-														43-
44-														44-
45-														45-
46-														46-
47-														47-
48-														48-
49-														49-
50-														50-
51-														51-
52-														52-
53-														53-
54-														54-
55-														55-
56-														56-
57-														57-
58-														58-
59-														59-
60-														60-

JOB NO: 10507-00 | LOG OF BORING | FIGURE: B-25

DATE OBSERVED: 12/05/90

METHOD OF DRILLING: 8-Inch Flight Auger/H-F Drilling
LOCATION: See Geotechnical Map

LOGGED BY: JPH

GROUND ELEVATION: 222' ±

DEPTH/FT	CLASSIFICATION	BLOWS/FT	UNDISTURBED	BULK SAMPLE	MOISTURE CONTENT	INPLACE DRY DENSITY	BORING NO: SMC B-9 DESCRIPTION	LABORATORY TEST	DEPTH/FT
1-	SM	26/52			15.0	99.0	ALLUVIUM/COLLUVIUM - SAND. Dense, slightly moist, light gray-brown, very fine-grained, slightly micaceous.		1-
2-									2-
3-							@3': Decreasing grain size.		3-
4-									4-
5-	ML	10/17					@4': SILT. Medium dense, slightly moist to moist, dark gray-brown, visible porosity (rootlet holes), caliche stringers.		5-
6-									6-
7-		5/8/9			12.0		@7.5': 4-inch thick very fine-grained sand lense. Medium gray, traces of orange-brown staining/mottling.		7-
8-									8-
9-	CL						@8': CLAY. Very stiff, moist, dark gray, massive, trace of coarse sand, abundant caliche stringers.		9-
10-		5/8/11			22.0				10-
11-									11-
12-									12-
13-									13-
14-	CL/SC						@14'-16': Increasing sand content to sandy clay.		14-
15-		3/4			32.0	92.0		DIRECT SHEAR CONSOLI-DATION	15-
16-							@16'-17': Groundwater		16-
17-					▼				17-
18-									18-
19-									19-
20-							@20': Trace of organics (rootlets) and abundant caliche stringers.		20-
21-		3/5/8			29.0				21-
22-									22-
23-									23-
24-									24-
25-									25-
26-									26-
27-									27-
28-									28-
29-							@30': Increasing sand content. Interlayered clayey sand and sandy clay. Medium dense, moist, no caliche.		29-
30-	CL/SC	3/5/6							30-

JOB NO: 10507-00 | LOG OF BORING | FIGURE: B-26

DATE OBSERVED: 12/05/90

METHOD OF DRILLING: 8-Inch Flight Auger/H-F Drilling

LOCATION: See Geotechnical Map

LOGGED BY: JPH

GROUND ELEVATION: 222±

DEPTH/FT	CLASSIFICATION	BLOWS/FT	UNDISTURBED	SAMPLE	BULK SAMPLE	MOISTURE	CONTENT	INPLACE DRY DENSITY	BORING NO: SMC B-9 (cont.) DESCRIPTION	LABORATORY TEST	DEPTH/FT
31-	CL/SC								ALLUVIUM/COLLUVIUM (Continued) - Interbedded Sandy Clay and Clayey Sand. Stiff, moist to very moist, dark gray, caliche stringers.		31-
32-											32-
33-											33-
34-											34-
35-											35-
36-											36-
37-											37-
38-											38-
39-											39-
40-	CL/SC										40-
41-		3/5/6									41-
42-											42-
43-											43-
44-											44-
45-											45-
46-											46-
47-											47-
48-											48-
49-											49-
50-									@50': Becoming slightly micaceous, no observable caliche, color change to greenish-gray.		50-
51-		5/7/12									51-
52-											52-
53-											53-
54-											54-
55-											55-
56-											56-
57-											57-
58-											58-
59-											59-
60-	CL/SC	5/							@60': Trace of fine gravel and trace of orange-brown mottling (oxidation).		60-

JOB NO: 10507-00 | LOG OF BORING | FIGURE: B-27

DATE OBSERVED: 12/05/90 METHOD OF DRILLING: 8-Inch Flight Auger/H-F Drilling

LOCATION: See Geotechnical Map

LOGGED BY: JPH GROUND ELEVATION: 222 ±

DEPTH/FT	CLASSIFICATION	BLOWS/FT	UNDISTURBED	SAMPLE	BULK	SAMPLE	MOISTURE CONTENT	INPLACE DRY DENSITY	BORING NO: SMC B-9 (cont.) DESCRIPTION	LABORATORY TEST	DEPTH/FT
61-	CL/SC	12/13							ALLUVIUM/COLLUVIUM (Continued) - Interbedded Sandy Clay and Clayey Sand. Stiff, moist to very moist, dark gray, caliche stringers.		61-
62-											62-
63-									@61.3': LANDSLIDE DEBRIS (Composed of Capistrano Formation Bedrock). SILTSTONE. Soft to moderately hard, moist, dark blue-gray, bedding discernable as curde fabric, micaceous, traces of orange-brown staining (mottling).		63-
64-											64-
65-		34/43									65-
66-											66-
67-									Total Depth: 66'		67-
68-									Groundwater @16'		68-
69-									Bedrock @61.3'		69-
70-									Boring Backfilled		70-
71-											71-
72-											72-
73-											73-
74-											74-
75-											75-
76-											76-
77-											77-
78-											78-
79-											79-
80-											80-
81-											81-
82-											82-
83-											83-
84-											84-
85-											85-
86-											86-
87-											87-
88-											88-
89-											89-
90-											90-

JOB NO: 10507-00 | LOG OF BORING | FIGURE: B-28

DATE OBSERVED: 12/05/90 — METHOD OF DRILLING: 8-Inch Flight Auger/H+F Drilling

LOCATION: See Geotechnical Map

LOGGED BY: JPH — GROUND ELEVATION: 223' ±

DEPTH/FT	CLASSIFICATION	BLOWS/FT	UNDISTURBED	BULK	SAMPLE	MOISTURE CONTENT	INPLACE DRY DENSITY	BORING NO: SMC B-10 DESCRIPTION	LABORATORY TEST	DEPTH/FT
1-	ML							COLLUVIUM/ALLUVIUM - Silty SAND. Very dense, moist, medium gray-brown, fine-grained, slightly micaceous, traces of caliche.		
2-		28/61				21.0	92.0		DIRECT SHEAR	2-
3-										3-
4-	CL/SC							@3.5': CLAY. Stiff, moist, dark gray-brown, slightly micaceous, caliche stringers, some interlayered clayey sand.		4-
5-									CORROSIVITY SERIES	5-
6-		2/4/7				22.0				6-
7-										7-
8-		6/14				18.0	107.0		DIRECT SHEAR	8-
9-										9-
10-										10-
11-										11-
12-										12-
13-										13-
14-	SC							@14': Clayey SAND. Medium dense, moist to very moist, medium brown, fine-to-coarse-grained, minor caliche, trace of fine gravel.		14-
15-		4/4/6				22.0				15-
16-										16-
17-										17-
18-										18-
19-						▼		@18'-20': Groundwater		19-
20-	CL							@20': CLAY. Stiff, very moist, medium to dark gray, trace of mica and coarse sand.		20-
21-										21-
22-										22-
23-										23-
24-										24-
25-		4/5/7								25-
26-										26-
27-										27-
28-										28-
29-										29-
30-	CL									30-

JOB NO: 10507-00 — LOG OF BORING — FIGURE: B-29

DATE OBSERVED: 12/05/90

METHOD OF DRILLING: 8-Inch Flight Auger/H-F Drilling
LOCATION: See Geotechnical Map

LOGGED BY: JPH

GROUND ELEVATION: 223 ±

DEPTH/FT	CLASSIFICATION	BLOWS/FT	UNDISTURBED	SAMPLE	BULK SAMPLE	MOISTURE	CONTENT	INPLACE DRY DENSITY	BORING NO: SMC B-10 (cont.) DESCRIPTION	LABORATORY TEST	DEPTH/FT
31-	CL								COLLUVIUM/ALLUVIUM (continued) - Interalyered CLAY and Clayey SAND. Stiff, very moist, medium gray-brown, fine-to-coarse-grained, slightly micaceous.		31-
32-											32-
33-											33-
34-											34-
35-	CL/SC	6/8/12							@35': Interlayered lenses of sandy clay.		35-
36-											36-
37-											37-
38-											38-
39-											39-
40-											40-
41-											41-
42-											42-
43-											43-
44-											44-
45-		12/28/32							@45': Traces of orange-brown stain (mottling) and clean sand lenses.		45-
46-											46-
47-											47-
48-											48-
49-											49-
50-											50-
51-											51-
52-											52-
53-											53-
54-											54-
55-		9/14/17							@55': Abundant caliche stringers.		55-
56-											56-
57-											57-
58-											58-
59-											59-
60-	CL/SC										60-

JOB NO: 10507-00 | LOG OF BORING | FIGURE: B-30

DATE OBSERVED: 12/05/90

METHOD OF DRILLING: 8-Inch Flight Auger/H-F Drilling

LOCATION: See Geotechnical Map

LOGGED BY: JPH

GROUND ELEVATION: 223 ±

DEPTH/FT	CLASSIFICATION	BLOWS/FT	UNDISTURBED SAMPLE	BULK SAMPLE	MOISTURE CONTENT	INPLACE DRY DENSITY	BORING NO: SMC B-10 (cont.) DESCRIPTION	LABORATORY TEST	DEPTH/FT
61-									61-
62-									62-
63-									63-
64-									64-
65-							LANDSLIDE DEBRIS (Composed of Capistrano Formation Bedrock). Clayey SILTSTONE. Moderately hard, moist, dark blue-gray, slightly micaceous, some orange-brown stain (mottling), minor gypsum-infilled joints/fractures.		65-
66-		9/17/22							66-
67-									67-
68-							Total Depth: 66.5' Groundwater @17 -19' Bedrock @64' Boring Backfilled		68-
69-									69-
70-									70-
71-									71-
72-									72-
73-									73-
74-									74-
75-									75-
76-									76-
77-									77-
78-									78-
79-									79-
80-									80-
81-									81-
82-									82-
83-									83-
84-									84-
85-									85-
86-									86-
87-									87-
88-									88-
89-									89-
90-									90-

JOB NO: 10507-00 | LOG OF BORING | FIGURE: B-31

DATE OBSERVED: 12/05/90

METHOD OF DRILLING: 8-Inch Flight Auger/H-F Drilling

LOCATION: See Geotechnical Map

LOGGED BY: JPH

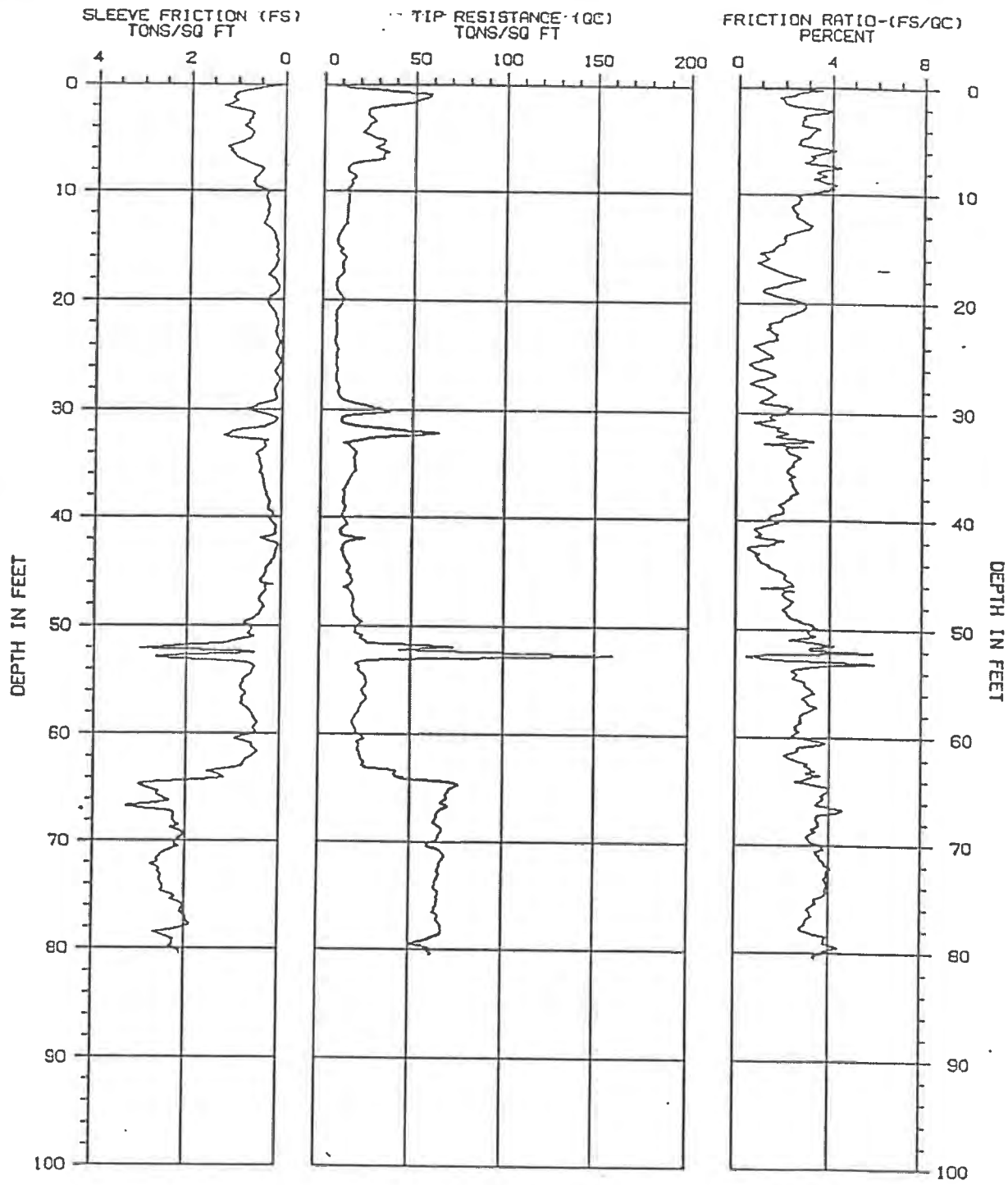
GROUND ELEVATION: 232' ±

DEPTH/FT	CLASSIFICATION	BLOWS/FT	UNDISTURBED	SAMPLE	BULK	MOISTURE CONTENT	INPLACE DRY DENSITY	BORING NO: SMC B-11 DESCRIPTION	LABORATORY TEST	DEPTH/FT
1-	ML				X			ALLUVIUM/COLLUVIUM - SILT. Loose, slightly moist, light gray-brown, with orange-brown mottling.	EXPANSION INDEX	1-
2-					X	14.0	99.0			2-
3-	CL	25/28			X			@2.5': CLAY. Hard, moist, dark gray-brown to black, abundant caliche stringers.		3-
4-										4-
5-		9/15/21				20.0			ATTERBERG LIMITS	5-
6-										6-
7-		12/25				21.0	98.0		DIRECT SHEAR	7-
8-										8-
9-										9-
10-										10-
11-		4/6/11								11-
12-										12-
13-										13-
14-										14-
15-										15-
16-										16-
17-										17-
18-	CL							Same as above.		18-
19-										19-
20-	ML/MH	8/19/20						@19': LANDSLIDE DEBRIS (composed of Capistrano Formation Bedrock). CLAYEY SILTSTONE. Moderately hard, moist, medium gray-brown to mottled orange-brown, appears massive, numerous gypsum-infilled joints/fractures, moderately weathered.		20-
21-										21-
22-										22-
23-										23-
24-								Total Depth: 21.5' No Groundwater Boring Backfilled		24-
25-										25-
26-										26-
27-										27-
28-										28-
29-										29-
30-										30-

JOB NO: 10507-00

LOG OF BORING

FIGURE: B-32



CONE PENETRATION TEST

SOUNDING NUMBER: CPT-1

PROJECT NAME : SM/HOME DEPOT

PROJECT NUMBER : 9110-05302

LOCATION : LAGUNA NIGUEL

DATE : 12-12-1990

THE EARTH TECHNOLOGY CORPORATION

FIGURE B-53

CPT INTERPRETATIONS

SOUNDING : CPT-1
PROJECT : SM/HOME DEPOT
LOCATION : LAGUNA NIGUEL
DATE : 12-12-1990

PROJECT NO : 9110-05302
INSTRUMENT : F15CKE096
SYSTEM : T1/S3
OPERATOR : MS/MR

DEPTH (ft)	NORMALIZED TIP RESISTANCE (tsf)	FRICTION RATIO (%)	SOIL BEHAVIOR TYPE	N1	Dr (%)	Su (tsf)	PHI (Degrees)
.0	.0	.00					
.5	68.6	2.69	SILTY SAND to SANDY SILT	>40	70-80		31-35
1.0	130.3	1.77	SILTY SAND to SANDY SILT	>40	70-80		35-40
1.5	105.4	2.01	SILTY SAND to SANDY SILT	>40	70-80		35-40
2.0	73.3	3.41	SANDY SILT to CLAYEY SILT	>40	90-100		31-35
2.5	45.2	3.23	SANDY SILT to CLAYEY SILT	25-40	70-80		27-31
3.0	43.7	2.86	SANDY SILT to CLAYEY SILT	20-25	60-70		27-31
3.5	48.0	2.66	SANDY SILT to CLAYEY SILT	25-40	60-70		31-35
4.0	40.5	3.33	SANDY SILT to CLAYEY SILT	25-40	70-80		27-31
4.5	34.8	3.04	SANDY SILT to CLAYEY SILT	15-20	60-70		27-31
5.0	43.4	2.58	SANDY SILT to CLAYEY SILT	20-25	60-70		31-35
5.5	49.6	2.99	SANDY SILT to CLAYEY SILT	25-40	70-80		27-31
6.0	42.3	4.00	CLAYEY SILT to SILTY CLAY	25-40	90-100	1.91	
6.5	48.7	3.11	SANDY SILT to CLAYEY SILT	25-40	70-80		27-31
7.0	45.1	2.83	SANDY SILT to CLAYEY SILT	20-25	60-70		27-31
7.5	21.3	4.35	CLAYEY SILT to SILTY CLAY	10-15		1.01	
8.0	18.0	3.38	CLAYEY SILT to SILTY CLAY	5-10		.87	
8.5	21.5	3.30	SANDY SILT to CLAYEY SILT	10-15	60-70		
9.0	19.8	4.15	CLAYEY SILT to SILTY CLAY	10-15		.99	
9.5	19.2	4.03	CLAYEY SILT to SILTY CLAY	10-15		.98	
10.0	15.9	2.76	SANDY SILT to CLAYEY SILT	5-10	40-50		
10.5	17.3	2.67	SANDY SILT to CLAYEY SILT	5-10	40-50		27-31
11.0	17.2	2.34	SANDY SILT to CLAYEY SILT	5-10	40-50		27-31
11.5	16.1	2.43	SANDY SILT to CLAYEY SILT	5-10	40-50		27-31
12.0	15.5	2.48	SANDY SILT to CLAYEY SILT	5-10	40-50		27-31
12.5	15.2	2.83	SANDY SILT to CLAYEY SILT	5-10	40-50		
13.0	15.2	3.09	SANDY SILT to CLAYEY SILT	5-10	40-50		
13.5	12.3	2.41	SANDY SILT to CLAYEY SILT	1-5	30-40		
14.0	10.4	2.03	SANDY SILT to CLAYEY SILT	1-5	20-30		
14.5	9.3	1.90	SANDY SILT to CLAYEY SILT	1-5	20-30		
15.0	9.8	1.52	SANDY SILT to CLAYEY SILT	1-5	10-20		27-31
15.5	10.9	1.09	SILTY SAND to SANDY SILT	1-5	10-20		27-31
16.0	12.7	1.28	SILTY SAND to SANDY SILT	1-5	20-30		27-31
16.5	11.6	1.14	SILTY SAND to SANDY SILT	1-5	10-20		27-31
17.0	11.5	1.65	SANDY SILT to CLAYEY SILT	1-5	20-30		27-31
17.5	11.9	2.40	SANDY SILT to CLAYEY SILT	1-5	30-40		
18.0	8.8	2.41	SANDY SILT to CLAYEY SILT	1-5	20-30		
18.5	8.0	1.38	SANDY SILT to CLAYEY SILT	1-5	10-20		27-31
19.0	8.3	1.24	SANDY SILT to CLAYEY SILT	1-5	10-20		27-31
19.5	9.9	1.99	SANDY SILT to CLAYEY SILT	1-5	20-30		
20.0	11.2	2.83	SANDY SILT to CLAYEY SILT	1-5	30-40		

*INDICATES OVERCONSOLIDATED OR CEMENTED MATERIAL
ASSUMED TOTAL UNIT WT = 115 PCF
ASSUMED DEPTH OF WATER TABLE = 18.0 FT
N1 = OVERBURDEN NORMALIZED EQUIVALENT SPT VALUE
Dr = OVERBURDEN NORMALIZED EQUIVALENT RELATIVE DENSITY
Su = UNDRAINED SHEAR STRENGTH
PHI = OVERBURDEN NORMALIZED EQUIVALENT FRICTION ANGLE

SOUNDING : CPT-1

DEPTH (ft)	NORMALIZED TIP RESISTANCE (tsf)	FRICTION RATIO (%)	SOIL BEHAVIOR TYPE	N1	Dr (%)	Su (tsf)	PHI (Degrees)
20.5	9.9	2.79	SILTY CLAY to CLAY	1-5		.61	
21.0	8.2	2.26	SANDY SILT to CLAYEY SILT	1-5	20-30		
21.5	7.9	1.88	SANDY SILT to CLAYEY SILT	1-5	20-30		
22.0	7.8	1.38	SANDY SILT to CLAYEY SILT	1-5	10-20		27-31
22.5	7.9	1.49	SANDY SILT to CLAYEY SILT	1-5	10-20		
23.0	8.0	1.67	SANDY SILT to CLAYEY SILT	1-5	10-20		
23.5	7.3	1.18	SANDY SILT to CLAYEY SILT	1-5	0-10		27-31
24.0	7.5	.93	SANDY SILT to CLAYEY SILT	1-5	0-10		27-31
24.5	8.6	1.26	SANDY SILT to CLAYEY SILT	1-5	10-20		27-31
25.0	7.5	1.23	SANDY SILT to CLAYEY SILT	1-5	10-20		27-31
25.5	7.7	.60	SILTY SAND to SANDY SILT	1-5	0-10		27-31
26.0	7.8	1.02	SANDY SILT to CLAYEY SILT	1-5	0-10		27-31
26.5	8.1	1.62	SANDY SILT to CLAYEY SILT	1-5	10-20		
27.0	7.7	.88	SANDY SILT to CLAYEY SILT	1-5	0-10		27-31
27.5	7.7	.82	SANDY SILT to CLAYEY SILT	1-5	0-10		27-31
28.0	8.9	1.47	SANDY SILT to CLAYEY SILT	1-5	10-20		27-31
28.5	8.8	1.45	SANDY SILT to CLAYEY SILT	1-5	10-20		27-31
29.0	9.8	.98	SILTY SAND to SANDY SILT	1-5	10-20		27-31
29.5	16.8	2.30	SANDY SILT to CLAYEY SILT	5-10	30-40		27-31
30.0	30.2	2.21	SANDY SILT to CLAYEY SILT	10-15	50-60		27-31
30.5	16.8	1.50	SILTY SAND to SANDY SILT	1-5	20-30		27-31
31.0	10.3	.90	SILTY SAND to SANDY SILT	1-5	10-20		27-31
31.5	14.0	1.74	SANDY SILT to CLAYEY SILT	1-5	20-30		27-31
32.0	42.3	2.04	SILTY SAND to SANDY SILT	15-20	50-60		31-35
32.5	36.1	2.80	SANDY SILT to CLAYEY SILT	15-20	60-70		27-31
33.0	16.4	1.65	SANDY SILT to CLAYEY SILT	1-5	20-30		27-31
33.5	13.7	2.17	SANDY SILT to CLAYEY SILT	1-5	30-40		27-31
34.0	16.3	2.62	SANDY SILT to CLAYEY SILT	5-10	40-50		27-31
34.5	15.6	2.53	SANDY SILT to CLAYEY SILT	5-10	40-50		27-31
35.0	15.7	2.47	SANDY SILT to CLAYEY SILT	5-10	40-50		27-31
35.5	15.9	2.21	SANDY SILT to CLAYEY SILT	5-10	30-40		27-31
36.0	14.7	2.46	SANDY SILT to CLAYEY SILT	5-10	30-40		27-31
36.5	13.2	2.39	SANDY SILT to CLAYEY SILT	1-5	30-40		
37.0	12.3	2.45	SANDY SILT to CLAYEY SILT	1-5	30-40		
37.5	10.7	2.59	SANDY SILT to CLAYEY SILT	1-5	30-40		
38.0	11.0	2.31	SANDY SILT to CLAYEY SILT	1-5	30-40		
38.5	10.5	1.87	SANDY SILT to CLAYEY SILT	1-5	20-30		27-31
39.0	10.9	2.00	SANDY SILT to CLAYEY SILT	1-5	20-30		
39.5	10.3	1.59	SANDY SILT to CLAYEY SILT	1-5	20-30		27-31
40.0	10.5	1.51	SANDY SILT to CLAYEY SILT	1-5	20-30		27-31
40.5	11.5	1.21	SILTY SAND to SANDY SILT	1-5	10-20		27-31
41.0	9.8	.94	SILTY SAND to SANDY SILT	1-5	10-20		27-31
41.5	9.3	.87	SILTY SAND to SANDY SILT	1-5	0-10		27-31
42.0	19.1	1.63	SILTY SAND to SANDY SILT	5-10	30-40		27-31
42.5	10.5	.56	SILTY SAND to SANDY SILT	1-5	0-10		27-31
43.0	9.4	.97	SILTY SAND to SANDY SILT	1-5	10-20		27-31
43.5	10.2	1.01	SILTY SAND to SANDY SILT	1-5	10-20		27-31
44.0	11.2	1.30	SANDY SILT to CLAYEY SILT	1-5	10-20		27-31
44.5	12.4	1.61	SANDY SILT to CLAYEY SILT	1-5	20-30		27-31
45.0	11.3	2.12	SANDY SILT to CLAYEY SILT	1-5	30-40		

*INDICATES OVERCONSOLIDATED OR CEMENTED MATERIAL
ASSUMED TOTAL UNIT WT = 115 PCF
ASSUMED DEPTH OF WATER TABLE = 18.0 FT
N1 = OVERBURDEN NORMALIZED EQUIVALENT SPT VALUE
Dr = OVERBURDEN NORMALIZED EQUIVALENT RELATIVE DENSITY
Su = UNDRAINED SHEAR STRENGTH
PHI = OVERBURDEN NORMALIZED EQUIVALENT FRICTION ANGLE

SOUNDING : CPT-1

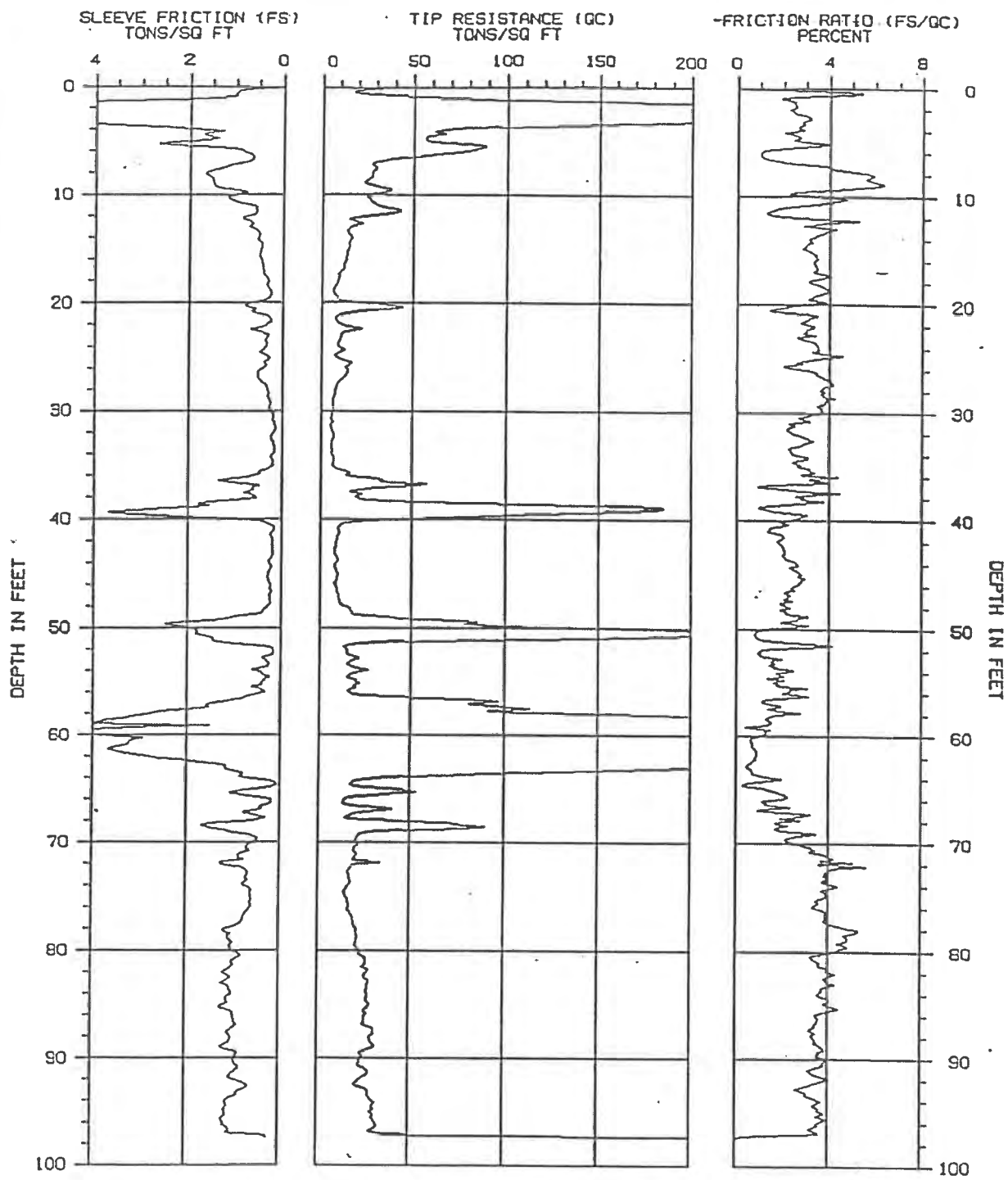
DEPTH (ft)	NORMALIZED TIP RESISTANCE (tsf)	FRICTION RATIO (%)	SOIL BEHAVIOR TYPE	N1	Dr (%)	Su (tsf)	PHI (Degrees)
45.5	12.7	2.19	SANDY SILT to CLAYEY SILT	1-5	30-40	–	27-31
46.0	13.2	2.44	SANDY SILT to CLAYEY SILT	1-5	30-40		
46.5	10.2	2.45	SANDY SILT to CLAYEY SILT	1-5	30-40		
47.0	13.1	2.10	SANDY SILT to CLAYEY SILT	1-5	30-40		27-31
47.5	13.9	2.38	SANDY SILT to CLAYEY SILT	1-5	30-40		27-31
48.0	13.2	2.15	SANDY SILT to CLAYEY SILT	1-5	30-40		27-31
48.5	13.5	2.17	SANDY SILT to CLAYEY SILT	1-5	30-40		27-31
49.0	14.0	2.51	SANDY SILT to CLAYEY SILT	1-5	30-40		
49.5	15.8	3.29	CLAYEY SILT to SILTY CLAY	5-10		1.26	
50.0	15.0	3.19	CLAYEY SILT to SILTY CLAY	5-10		1.18	
50.5	14.3	3.37	CLAYEY SILT to SILTY CLAY	5-10		1.13	
51.0	16.1	2.75	SANDY SILT to CLAYEY SILT	5-10	40-50		
51.5	18.6	4.15	CLAYEY SILT to SILTY CLAY	10-15		1.53	
52.0	42.6	4.47	*SANDY CLAY to SILTY CLAY	25-40		1.89	
52.5	100.2	.78	SAND to SILTY SAND	25-40	40-50		40-42
53.0	27.8	5.55	*SANDY CLAY to SILTY CLAY	25-40		1.21	
53.5	14.8	2.99	SANDY SILT to CLAYEY SILT	5-10	40-50		
54.0	15.5	2.57	SANDY SILT to CLAYEY SILT	5-10	40-50		
54.5	17.8	2.59	SANDY SILT to CLAYEY SILT	5-10	40-50		27-31
55.0	18.3	2.92	SANDY SILT to CLAYEY SILT	5-10	50-60		
55.5	17.7	3.20	SANDY SILT to CLAYEY SILT	5-10	50-60		
56.0	16.8	3.15	SANDY SILT to CLAYEY SILT	5-10	50-60		
56.5	18.2	2.99	SANDY SILT to CLAYEY SILT	5-10	50-60		
57.0	16.7	3.23	SANDY SILT to CLAYEY SILT	5-10	50-60		
57.5	15.6	3.18	SANDY SILT to CLAYEY SILT	5-10	50-60		
58.0	14.7	2.75	SANDY SILT to CLAYEY SILT	5-10	40-50		
58.5	13.1	2.81	SANDY SILT to CLAYEY SILT	5-10	40-50		
59.0	12.8	2.59	SANDY SILT to CLAYEY SILT	1-5	30-40		
59.5	13.8	2.66	SANDY SILT to CLAYEY SILT	5-10	40-50		
60.0	15.0	2.66	SANDY SILT to CLAYEY SILT	5-10	40-50		
60.5	15.5	3.78	CLAYEY SILT to SILTY CLAY	5-10		1.32	
61.0	14.9	2.62	SANDY SILT to CLAYEY SILT	5-10	40-50		
61.5	14.3	2.21	SANDY SILT to CLAYEY SILT	1-5	30-40		27-31
62.0	15.1	2.57	SANDY SILT to CLAYEY SILT	5-10	40-50		
62.5	16.4	2.95	SANDY SILT to CLAYEY SILT	5-10	40-50		
63.0	16.0	3.36	CLAYEY SILT to SILTY CLAY	5-10		1.38	
63.5	27.6	3.62	SANDY SILT to CLAYEY SILT	15-20	70-80		
64.0	29.2	2.60	SANDY SILT to CLAYEY SILT	10-15	50-60		27-31
64.5	47.8	3.80	SANDY SILT to CLAYEY SILT	25-40	90-100		27-31
65.0	46.6	3.91	SANDY SILT to CLAYEY SILT	25-40	90-100		27-31
65.5	44.9	3.72	SANDY SILT to CLAYEY SILT	25-40	80-90		27-31
66.0	44.3	3.52	SANDY SILT to CLAYEY SILT	25-40	80-90		27-31
66.5	44.0	4.10	CLAYEY SILT to SILTY CLAY	25-40		4.36	
67.0	42.3	4.16	CLAYEY SILT to SILTY CLAY	25-40		4.19	
67.5	40.7	3.48	SANDY SILT to CLAYEY SILT	25-40	70-80		27-31
68.0	39.9	3.53	SANDY SILT to CLAYEY SILT	25-40	70-80		27-31
68.5	40.8	3.27	SANDY SILT to CLAYEY SILT	25-40	70-80		27-31
69.0	42.1	3.19	SANDY SILT to CLAYEY SILT	25-40	70-80		27-31
69.5	40.6	3.16	SANDY SILT to CLAYEY SILT	20-25	70-80		27-31
70.0	38.2	3.60	SANDY SILT to CLAYEY SILT	25-40	70-80		27-31

*INDICATES OVERCONSOLIDATED OR CEMENTED MATERIAL
ASSUMED TOTAL UNIT WT = 115 PCF
ASSUMED DEPTH OF WATER TABLE = 18.0 FT
N1 = OVERBURDEN NORMALIZED EQUIVALENT SPT VALUE
Dr = OVERBURDEN NORMALIZED EQUIVALENT RELATIVE DENSITY
Su = UNDRAINED SHEAR STRENGTH
PHI = OVERBURDEN NORMALIZED EQUIVALENT FRICTION ANGLE

SOUNDING : CPT-1

DEPTH (ft)	NORMALIZED TIP RESISTANCE (tsf)	FRICTION RATIO (%)	SOIL BEHAVIOR TYPE	N1	Dr (%)	Su (tsf)	PHI (Degrees)
70.5	36.8	3.59	SANDY SILT to CLAYEY SILT	20-25	70-80		27-31
71.0	41.2	3.59	SANDY SILT to CLAYEY SILT	25-40	80-90	—	27-31
71.5	41.9	3.76	SANDY SILT to CLAYEY SILT	25-40	80-90		27-31
72.0	40.4	3.92	CLAYEY SILT to SILTY CLAY	25-40	80-90	4.14	
72.5	39.9	3.90	SANDY SILT to CLAYEY SILT	25-40	80-90		27-31
73.0	39.8	3.88	SANDY SILT to CLAYEY SILT	25-40	80-90		27-31
73.5	39.1	3.90	CLAYEY SILT to SILTY CLAY	25-40	80-90	4.04	
74.0	38.4	3.88	SANDY SILT to CLAYEY SILT	25-40	80-90		
74.5	38.3	3.85	SANDY SILT to CLAYEY SILT	25-40	80-90		27-31
75.0	39.1	3.48	SANDY SILT to CLAYEY SILT	25-40	70-80		27-31
75.5	38.7	3.41	SANDY SILT to CLAYEY SILT	20-25	70-80		27-31
76.0	38.1	3.12	SANDY SILT to CLAYEY SILT	20-25	70-80		27-31
76.5	37.3	3.26	SANDY SILT to CLAYEY SILT	20-25	70-80		27-31
77.0	38.5	3.03	SANDY SILT to CLAYEY SILT	20-25	60-70		27-31
77.5	38.8	2.89	SANDY SILT to CLAYEY SILT	20-25	60-70		27-31
78.0	39.2	3.00	SANDY SILT to CLAYEY SILT	20-25	60-70		27-31
78.5	39.2	3.91	CLAYEY SILT to SILTY CLAY	25-40	80-90	4.20	
79.0	35.2	3.78	SANDY SILT to CLAYEY SILT	20-25	80-90		
79.5	29.4	4.39	CLAYEY SILT to SILTY CLAY	20-25		3.10	
80.0	33.8	3.83	CLAYEY SILT to SILTY CLAY	20-25		3.62	
80.5	34.9	3.41	SANDY SILT to CLAYEY SILT	20-25	70-80		27-31

*INDICATES OVERCONSOLIDATED OR CEMENTED MATERIAL
ASSUMED TOTAL UNIT WT = 115 PCF
ASSUMED DEPTH OF WATER TABLE = 18.0 FT
N1 = OVERBURDEN NORMALIZED EQUIVALENT SPT VALUE
Dr = OVERBURDEN NORMALIZED EQUIVALENT RELATIVE DENSITY
Su = UNDRAINED SHEAR STRENGTH
PHI = OVERBURDEN NORMALIZED EQUIVALENT FRICTION ANGLE



CONE PENETRATION TEST

SOUNDING NUMBER: CPT-2

PROJECT NAME : SM/HOME DEPOT

PROJECT NUMBER : 9110-05302

LOCATION : LAGUNA NIGUEL

DATE : 12-12-1990

THE EARTH TECHNOLOGY CORPORATION

FIGURE B-61

CPT INTERPRETATIONS

SOUNDING : CPT-2
PROJECT : SM/HOME DEPOT
LOCATION : LAGUNA NIGUEL
DATE : 12-12-1990

PROJECT NO : 9110-05302
INSTRUMENT : F15CKE096
SYSTEM : T1/S3
OPERATOR : MS/MR

DEPTH (ft)	NORMALIZED TIP RESISTANCE (tsf)	FRICTION RATIO (%)	SOIL BEHAVIOR TYPE	N1	Dr (%)	Su (tsf)	PHI (Degrees)
.0	.0	.00					
.5	44.9	5.39	*SANDY CLAY to SILTY CLAY	>40		.59	
1.0	120.3	1.99	SILTY SAND to SANDY SILT	>40	70-80		35-40
1.5	571.1	2.44	*SILTY SAND to CLAYEY SAND	>40			
2.0	758.4	2.38	*SAND to SILTY SAND	>40			
2.5	777.0	2.60	*SILTY SAND to CLAYEY SAND	>40			
3.0	472.9	3.15	*SILTY SAND to CLAYEY SAND	>40			
3.5	258.2	2.74	*SILTY SAND to CLAYEY SAND	>40			
4.0	118.4	2.80	SILTY SAND to SANDY SILT	>40	90-100		35-40
4.5	106.1	2.55	SILTY SAND to SANDY SILT	>40	80-90		35-40
5.0	87.2	2.83	SILTY SAND to SANDY SILT	>40	80-90		31-35
5.5	128.5	2.68	SILTY SAND to SANDY SILT	>40	90-100		35-40
6.0	119.9	1.05	SAND to SILTY SAND	>40	50-60		40-42
6.5	82.7	1.11	SAND to SILTY SAND	25-40	40-50		35-40
7.0	44.0	2.63	SANDY SILT to CLAYEY SILT	20-25	60-70		31-35
7.5	40.7	4.06	CLAYEY SILT to SILTY CLAY	25-40		1.96	
8.0	37.7	5.79	*SANDY CLAY to SILTY CLAY	>40		.92	
8.5	35.5	5.62	*SANDY CLAY to SILTY CLAY	>40		.89	
9.0	31.1	6.14	*SANDY CLAY to SILTY CLAY	25-40		.79	
9.5	44.9	3.36	SANDY SILT to CLAYEY SILT	25-40	70-80		27-31
10.0	34.1	3.39	SANDY SILT to CLAYEY SILT	20-25	70-80		27-31
10.5	31.7	4.38	CLAYEY SILT to SILTY CLAY	25-40		1.69	
11.0	36.1	2.08	SILTY SAND to SANDY SILT	10-15	50-60		31-35
11.5	50.5	1.30	SILTY SAND to SANDY SILT	15-20	40-50		35-40
12.0	33.8	2.64	SANDY SILT to CLAYEY SILT	15-20	50-60		27-31
12.5	20.1	3.89	CLAYEY SILT to SILTY CLAY	10-15		1.12	
13.0	18.2	4.26	CLAYEY SILT to SILTY CLAY	10-15		1.03	
13.5	15.9	3.63	CLAYEY SILT to SILTY CLAY	5-10		.90	
14.0	18.1	3.12	SANDY SILT to CLAYEY SILT	5-10	50-60		
14.5	16.3	2.97	SANDY SILT to CLAYEY SILT	5-10	40-50		
15.0	15.9	3.06	SANDY SILT to CLAYEY SILT	5-10	50-60		
15.5	15.0	3.39	CLAYEY SILT to SILTY CLAY	5-10		.89	
16.0	14.2	3.33	CLAYEY SILT to SILTY CLAY	5-10		.85	
16.5	12.6	3.45	CLAYEY SILT to SILTY CLAY	5-10		.76	
17.0	12.1	3.36	CLAYEY SILT to SILTY CLAY	5-10		.73	
17.5	9.9	3.79	CLAYEY SILT to SILTY CLAY	1-5		.59	
18.0	9.3	3.20	SILTY CLAY to CLAY	1-5		.56	
18.5	8.0	3.85	*SILTY CLAY to CLAY	1-5		.47	
19.0	6.6	3.66	SILTY CLAY to CLAY	1-5		.38	
19.5	8.1	3.11	SILTY CLAY to CLAY	1-5		.48	
20.0	20.0	2.99	SANDY SILT to CLAYEY SILT	5-10	50-60		

*INDICATES OVERCONSOLIDATED OR CEMENTED MATERIAL
ASSUMED TOTAL UNIT WT = 115 PCF
ASSUMED DEPTH OF WATER TABLE = 18.0 FT
N1 = OVERBURDEN NORMALIZED EQUIVALENT SPT VALUE
Dr = OVERBURDEN NORMALIZED EQUIVALENT RELATIVE DENSITY
Su = UNDRAINED SHEAR STRENGTH
PHI = OVERBURDEN NORMALIZED EQUIVALENT FRICTION ANGLE

SOUNDING : CPT-2

DEPTH (ft)	NORMALIZED TIP RESISTANCE (tsf)	FRICTION RATIO (%)	SOIL BEHAVIOR TYPE	N1	Dr (%)	Su (tsf)	PHI (Degrees)
20.5	39.5	1.42	SILTY SAND to SANDY SILT	10-15	40-50	_	31-35
21.0	13.5	3.48	CLAYEY SILT to SILTY CLAY	5-10		.86	
21.5	7.8	2.97	SILTY CLAY to CLAY	1-5		.47	
22.0	9.3	3.36	SILTY CLAY to CLAY	1-5		.57	
22.5	19.5	3.02	SANDY SILT to CLAYEY SILT	5-10	50-60		
23.0	10.5	2.65	SANDY SILT to CLAYEY SILT	1-5	30-40		
23.5	9.8	3.41	SILTY CLAY to CLAY	1-5		.61	
24.0	9.0	3.52	SILTY CLAY to CLAY	1-5		.56	
24.5	11.1	3.83	CLAYEY SILT to SILTY CLAY	5-10		.71	
25.0	7.4	3.41	SILTY CLAY to CLAY	1-5		.45	
25.5	12.2	2.84	SANDY SILT to CLAYEY SILT	1-5	40-50		
26.0	12.3	2.98	SANDY SILT to CLAYEY SILT	1-5	40-50		
26.5	13.1	3.47	CLAYEY SILT to SILTY CLAY	5-10		.87	
27.0	11.2	4.03	CLAYEY SILT to SILTY CLAY	5-10		.73	
27.5	8.6	4.14	SILTY CLAY to CLAY	1-5		.54	
28.0	7.4	3.73	SILTY CLAY to CLAY	1-5		.45	
28.5	6.8	3.72	SILTY CLAY to CLAY	1-5		.40	
29.0	5.9	3.91	SILTY CLAY to CLAY	1-5		.34	
29.5	6.1	3.53	SILTY CLAY to CLAY	1-5		.35	
30.0	5.9	3.66	SILTY CLAY to CLAY	1-5		.34	
30.5	5.5	2.68	SILTY CLAY to CLAY	1-5		.31	
31.0	5.8	2.54	SILTY CLAY to CLAY	1-5		.33	
31.5	5.1	2.24	SILTY CLAY to CLAY	1-5		.28	
32.0	5.9	2.41	SILTY CLAY to CLAY	1-5		.34	
32.5	6.1	3.18	SILTY CLAY to CLAY	1-5		.36	
33.0	5.3	2.90	SILTY CLAY to CLAY	1-5		.29	
33.5	5.5	2.30	SILTY CLAY to CLAY	1-5		.30	
34.0	5.5	2.57	SILTY CLAY to CLAY	1-5		.31	
34.5	6.3	2.71	SILTY CLAY to CLAY	1-5		.37	
35.0	5.8	2.76	SILTY CLAY to CLAY	1-5		.33	
35.5	9.8	3.22	SILTY CLAY to CLAY	1-5		.65	
36.0	11.7	4.35	CLAYEY SILT to SILTY CLAY	5-10		.81	
36.5	27.8	3.94	CLAYEY SILT to SILTY CLAY	15-20		2.13	
37.0	43.1	.93	SAND to SILTY SAND	10-15	30-40		35-40
37.5	13.6	4.47	CLAYEY SILT to SILTY CLAY	5-10		.98	
38.0	15.7	2.88	SANDY SILT to CLAYEY SILT	5-10	40-50		
38.5	44.6	2.74	SANDY SILT to CLAYEY SILT	20-25	60-70		31-35
39.0	145.5	1.06	SAND to SILTY SAND	>40	50-60		40-42
39.5	93.8	3.02	SANDY SILT to CLAYEY SILT	>40	90-100		31-35
40.0	39.1	2.36	SANDY SILT to CLAYEY SILT	15-20	50-60		31-35
40.5	9.9	2.14	SANDY SILT to CLAYEY SILT	1-5	20-30		
41.0	8.2	1.38	SANDY SILT to CLAYEY SILT	1-5	10-20		27-31
41.5	8.0	2.05	SANDY SILT to CLAYEY SILT	1-5	20-30		
42.0	7.3	1.85	SANDY SILT to CLAYEY SILT	1-5	10-20		
42.5	7.1	2.04	SANDY SILT to CLAYEY SILT	1-5	20-30		
43.0	6.7	2.10	SANDY SILT to CLAYEY SILT	1-5	20-30		
43.5	7.4	2.16	SANDY SILT to CLAYEY SILT	1-5	20-30		
44.0	7.2	2.62	SILTY CLAY to CLAY	1-5		.46	
44.5	6.6	2.46	SILTY CLAY to CLAY	1-5		.41	
45.0	7.6	2.68	SILTY CLAY to CLAY	1-5		.49	

*INDICATES OVERCONSOLIDATED OR CEMENTED MATERIAL
ASSUMED TOTAL UNIT WT = 115 PCF
ASSUMED DEPTH OF WATER TABLE = 18.0 FT
N1 = OVERBURDEN NORMALIZED EQUIVALENT SPT VALUE
Dr = OVERBURDEN NORMALIZED EQUIVALENT RELATIVE DENSITY
Su = UNDRAINED SHEAR STRENGTH
PHI = OVERBURDEN NORMALIZED EQUIVALENT FRICTION ANGLE

SOUNDING : CPT-2

DEPTH (ft)	NORMALIZED TIP RESISTANCE (tsf)	FRICTION RATIO (%)	SOIL BEHAVIOR TYPE	N1	Dr (%)	Su (tsf)	PHI (Degrees)
45.5	7.2	2.77	SILTY CLAY to CLAY	1-5		.46	
46.0	6.6	2.56	SILTY CLAY to CLAY	1-5		.41	
46.5	7.1	2.24	SANDY SILT to CLAYEY SILT	1-5	20-30		
47.0	7.9	2.24	SANDY SILT to CLAYEY SILT	1-5	20-30		
47.5	8.5	1.97	SANDY SILT to CLAYEY SILT	1-5	20-30		
48.0	9.4	2.31	SANDY SILT to CLAYEY SILT	1-5	20-30		
48.5	12.9	2.11	SANDY SILT to CLAYEY SILT	1-5	30-40		27-31
49.0	29.4	2.62	SANDY SILT to CLAYEY SILT	10-15	50-60		27-31
49.5	61.8	2.73	SANDY SILT to CLAYEY SILT	25-40	70-80		31-35
50.0	108.4	1.27	SAND to SILTY SAND	>40	50-60		40-42
50.5	153.2	.86	SAND to SILTY SAND	>40	50-60		40-42
51.0	82.4	1.26	SAND to SILTY SAND	25-40	50-60		35-40
51.5	16.5	4.13	CLAYEY SILT to SILTY CLAY	10-15		1.33	
52.0	10.4	1.07	SILTY SAND to SANDY SILT	1-5	10-20		27-31
52.5	11.2	1.23	SANDY SILT to CLAYEY SILT	1-5	10-20		27-31
53.0	14.0	1.54	SANDY SILT to CLAYEY SILT	1-5	20-30		27-31
53.5	11.0	1.73	SANDY SILT to CLAYEY SILT	1-5	20-30		27-31
54.0	18.9	2.09	SANDY SILT to CLAYEY SILT	5-10	30-40		27-31
54.5	11.6	1.41	SANDY SILT to CLAYEY SILT	1-5	20-30		27-31
55.0	14.5	1.76	SANDY SILT to CLAYEY SILT	1-5	20-30		27-31
55.5	13.3	3.09	CLAYEY SILT to SILTY CLAY	5-10		1.06	
56.0	11.3	2.01	SANDY SILT to CLAYEY SILT	1-5	20-30		27-31
56.5	40.5	1.33	SILTY SAND to SANDY SILT	10-15	30-40		31-35
57.0	58.9	1.67	SILTY SAND to SANDY SILT	20-25	50-60		35-40
57.5	77.4	1.53	SILTY SAND to SANDY SILT	25-40	50-60		35-40
58.0	105.9	1.75	SILTY SAND to SANDY SILT	>40	60-70		35-40
58.5	171.0	1.43	SAND to SILTY SAND	>40	70-80		40-42
59.0	219.3	.96	SAND to SILTY SAND	>40	60-70		42-45
59.5	225.7	1.27	SAND to SILTY SAND	>40	70-80		40-42
60.0	288.9	1.02	SAND to SILTY SAND	>40	70-80		42-45
60.5	301.8	.70	SANDY GRAVEL to SAND	>40	70-80		42-45
61.0	295.4	.74	SANDY GRAVEL to SAND	>40	70-80		42-45
61.5	264.7	.89	SAND to SILTY SAND	>40	70-80		42-45
62.0	221.4	.82	SAND to SILTY SAND	>40	60-70		42-45
62.5	180.6	.69	SAND to SILTY SAND	>40	50-60		40-42
63.0	144.4	.52	SAND to SILTY SAND	>40	50-60		40-42
63.5	84.7	.71	SAND to SILTY SAND	20-25	40-50		35-40
64.0	25.0	1.97	SANDY SILT to CLAYEY SILT	5-10	40-50		27-31
64.5	12.3	.42	SILTY SAND to SANDY SILT	1-5	0-10		27-31
65.0	16.8	1.30	SILTY SAND to SANDY SILT	1-5	20-30		27-31
65.5	33.2	2.00	SILTY SAND to SANDY SILT	10-15	40-50		31-35
66.0	9.8	1.49	SANDY SILT to CLAYEY SILT	1-5	10-20		27-31
66.5	8.9	1.51	SANDY SILT to CLAYEY SILT	1-5	10-20		27-31
67.0	25.6	.99	SILTY SAND to SANDY SILT	5-10	20-30		31-35
67.5	12.3	3.04	SILTY CLAY to CLAY	1-5		1.04	
68.0	16.7	2.09	SANDY SILT to CLAYEY SILT	5-10	30-40		27-31
68.5	50.5	2.07	SILTY SAND to SANDY SILT	20-25	50-60		31-35
69.0	28.2	2.50	SANDY SILT to CLAYEY SILT	10-15	50-60		27-31
69.5	13.9	2.33	SANDY SILT to CLAYEY SILT	1-5	30-40		27-31
70.0	13.1	2.54	SANDY SILT to CLAYEY SILT	1-5	30-40		

*INDICATES OVERCONSOLIDATED OR CEMENTED MATERIAL
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SOUNDING : CPT-2

DEPTH (ft)	NORMALIZED TIP RESISTANCE (tsf)	FRICTION RATIO (%)	SOIL BEHAVIOR TYPE	N1	Dr (%)	Su (tsf)	PHI (Degrees)
70.5	13.0	3.31	CLAYEY SILT to SILTY CLAY	5-10		1.13	
71.0	12.4	3.58	CLAYEY SILT to SILTY CLAY	5-10		1.08	
71.5	12.5	4.19	CLAYEY SILT to SILTY CLAY	5-10		1.09	
72.0	20.8	3.66	CLAYEY SILT to SILTY CLAY	10-15		1.99	
72.5	10.9	4.14	CLAYEY SILT to SILTY CLAY	5-10		.92	
73.0	10.4	3.86	CLAYEY SILT to SILTY CLAY	5-10		.86	
73.5	10.7	3.77	CLAYEY SILT to SILTY CLAY	5-10		.90	
74.0	10.4	4.38	CLAYEY SILT to SILTY CLAY	5-10		.87	
74.5	9.3	3.78	SILTY CLAY to CLAY	1-5		.75	
75.0	9.0	3.98	CLAYEY SILT to SILTY CLAY	1-5		.72	
75.5	10.1	3.60	SILTY CLAY to CLAY	1-5		.84	
76.0	10.3	3.42	SILTY CLAY to CLAY	1-5		.87	
76.5	10.2	3.97	CLAYEY SILT to SILTY CLAY	5-10		.86	
77.0	11.4	3.91	CLAYEY SILT to SILTY CLAY	5-10		.99	
77.5	11.8	4.10	CLAYEY SILT to SILTY CLAY	5-10		1.05	
78.0	12.6	5.24	SILTY CLAY to CLAY	5-10		1.14	
78.5	12.7	4.70	CLAYEY SILT to SILTY CLAY	5-10		1.15	
79.0	12.7	4.81	CLAYEY SILT to SILTY CLAY	5-10		1.16	
79.5	12.3	4.86	CLAYEY SILT to SILTY CLAY	5-10		1.12	
80.0	13.5	4.28	CLAYEY SILT to SILTY CLAY	5-10		1.26	
80.5	13.9	3.26	CLAYEY SILT to SILTY CLAY	5-10		1.31	
81.0	15.4	3.66	CLAYEY SILT to SILTY CLAY	5-10		1.49	
81.5	14.4	3.95	CLAYEY SILT to SILTY CLAY	5-10		1.38	
82.0	15.9	4.21	CLAYEY SILT to SILTY CLAY	10-15		1.55	
82.5	14.8	3.85	CLAYEY SILT to SILTY CLAY	5-10		1.43	
83.0	15.9	4.32	CLAYEY SILT to SILTY CLAY	10-15		1.57	
83.5	15.7	3.73	CLAYEY SILT to SILTY CLAY	5-10		1.55	
84.0	15.4	3.58	CLAYEY SILT to SILTY CLAY	5-10		1.52	
84.5	15.3	4.03	CLAYEY SILT to SILTY CLAY	5-10		1.51	
85.0	16.0	4.09	CLAYEY SILT to SILTY CLAY	5-10		1.60	
85.5	14.8	4.04	CLAYEY SILT to SILTY CLAY	5-10		1.46	
86.0	15.0	3.52	CLAYEY SILT to SILTY CLAY	5-10		1.49	
86.5	14.3	3.55	CLAYEY SILT to SILTY CLAY	5-10		1.41	
87.0	14.6	3.44	CLAYEY SILT to SILTY CLAY	5-10		1.45	
87.5	16.8	3.40	CLAYEY SILT to SILTY CLAY	5-10		1.73	
88.0	16.2	3.37	CLAYEY SILT to SILTY CLAY	5-10		1.66	
88.5	16.2	3.44	CLAYEY SILT to SILTY CLAY	5-10		1.66	
89.0	17.1	3.80	CLAYEY SILT to SILTY CLAY	5-10		1.78	
89.5	12.8	3.66	CLAYEY SILT to SILTY CLAY	5-10		1.25	
90.0	12.9	4.01	CLAYEY SILT to SILTY CLAY	5-10		1.27	
90.5	12.6	3.83	CLAYEY SILT to SILTY CLAY	5-10		1.23	
91.0	14.2	3.17	CLAYEY SILT to SILTY CLAY	5-10		1.44	
91.5	14.9	3.51	CLAYEY SILT to SILTY CLAY	5-10		1.54	
92.0	12.9	3.95	CLAYEY SILT to SILTY CLAY	5-10		1.28	
92.5	11.1	3.03	SILTY CLAY to CLAY	1-5		1.05	
93.0	14.6	2.87	SANDY SILT to CLAYEY SILT	5-10	40-50		
93.5	14.7	3.10	SANDY SILT to CLAYEY SILT	5-10	40-50		
94.0	15.5	3.70	CLAYEY SILT to SILTY CLAY	5-10		1.64	
94.5	15.8	3.50	CLAYEY SILT to SILTY CLAY	5-10		1.68	
95.0	15.4	3.77	CLAYEY SILT to SILTY CLAY	5-10		1.63	

*INDICATES OVERCONSOLIDATED OR CEMENTED MATERIAL
ASSUMED TOTAL UNIT WT = 115 PCF
ASSUMED DEPTH OF WATER TABLE = 18.0 FT
N1 = OVERBURDEN NORMALIZED EQUIVALENT SPT VALUE
Dr = OVERBURDEN NORMALIZED EQUIVALENT RELATIVE DENSITY
Su = UNDRAINED SHEAR STRENGTH
PHI = OVERBURDEN NORMALIZED EQUIVALENT FRICTION ANGLE

SOUNDING : CPT-2

DEPTH (ft)	NORMALIZED TIP RESISTANCE (tsf)	FRICTION RATIO (%)	SOIL BEHAVIOR TYPE	N1	Dr (%)	Su (tsf)	PHI (Degrees)
95.5	15.9	3.68	CLAYEY SILT to SILTY CLAY	5-10		1.74	
96.0	16.5	3.57	CLAYEY SILT to SILTY CLAY	5-10		1.78	
96.5	16.9	3.23	SANDY SILT to CLAYEY SILT	5-10	50-60		
97.0	15.5	3.59	CLAYEY SILT to SILTY CLAY	5-10		1.66	
97.5	284.2	.04	SANDY GRAVEL to SAND	>40	50-60		42-45

*INDICATES OVERCONSOLIDATED OR CEMENTED MATERIAL
ASSUMED TOTAL UNIT WT = 115 PCF
ASSUMED DEPTH OF WATER TABLE = 18.0 FT
N1 = OVERBURDEN NORMALIZED EQUIVALENT SPT VALUE
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Su = UNDRAINED SHEAR STRENGTH
PHI = OVERBURDEN NORMALIZED EQUIVALENT FRICTION ANGLE

DATE OBSERVED: 3/24/89 METHOD OF DRILLING: 24" Bucket Auger

LOCATION: See Geotechnical Map

LOGGED BY: J.P.H. GROUND ELEVATION: 412 2500 LB. KELLY BAR

SMC

BORING NO. SMB-1

DEPTH (FEET)	GRAPHIC LOG	CLASSIFICATION	BLOWS/FOOT	UNDISTURBED SAMPLE	BULK SAMPLE	MOISTURE CONTENT (%)	IN PLACE DRY DENSITY (PCF)	DESCRIPTION	LABORATORY TEST Geologic Attitudes	DEPTH (FEET)
0		ML/CL			X			COLLUVIUM/SLOPEWASH (GRABEN INFILL): Dark brown to dark gray-brown, silty CLAY and clayey SILT. Firm, moist, abundant caliche stringers, rootlets and rootlet hairs.	ATTERBERG EXPANSION MAXIMUM DENSITY	0
5			4	X				@2.5', Color change to light gray-brown. @6', Increasing caliche stringers, moderately to deeply weathered, desiccated.		5
10		MH/ML						LANDSLIDE DEBRIS; Qls Mottled light gray-brown, tan, and orange-brown, clayey, micaceous SILT. Firm to stiff, slightly moist, massive to poorly bedded, poorly to moderately jointed; joints typically infilled with disseminated and/or well developed gypsum crystals. Occasional interlayered yellow, fine-grained sand; sands typically stained with iron oxide, silts with manganese oxide.	B: N35E08SE	10
15									F: N15E80SE	15
									F: N18E74SE	
20								@10', 2" yellow, fine-grained, micaceous sand bed. @18', Abundant short, discontinuous subparallel, gypsum infilled fractures.	F: N45W41SW F: N85W90NE F:N70W65NE	20
25								@20-21', ¼" thick gypsum infilled fracture (1' long). Yellow and gray sand inclusions. @21', increased fracturing, paper thin to ¼" thick gypsum infilled.	J: N63W57NE	25
30								@25', Grades to medium gray to gray, micaceous, clayey silt. Stiff to very stiff, moist, massive. Abundant short, discontinuous joints; iron oxide staining along joint surfaces.		30
35		MH							J: N32W80NE J: N55E75SE	35
40								@36', 1/16" thick gypsum-infilled fracture. Iron oxide staining along joint surfaces.		40

JOB NO.: 10282-01 LOG OF BORING FIGURE: B-2

DATE OBSERVED: 3/24/89 METHOD OF DRILLING: 24 Inch Bucket Auger

LOCATION: See Geotechnical Map

LOGGED BY: J.P.H. GROUND ELEVATION: 412

DEPTH (FEET)	GRAPHIC LOG	CLASSIFICATION	BLOWS/FOOT	UNDISTURBED SAMPLE	BULK SAMPLE	MOISTURE CONTENT (%)	IN PLACE DRY DENSITY (PCF)	BORING NO. SMB-1 (Cont) DESCRIPTION	LABORATORY TEST Geologic Attitudes	DEPTH (FEET)
40		MH						LANDSLIDE DEBRIS (Continued): Light gray, micaceous, clayey SILT. Stiff to very stiff, moist, massive to poorly bedded, moderately jointed and fractured, scattered, disseminated gypsum.	F: N65W76NE	40
45								@40, Color change to dark gray, appears diatomaceous. @44-45', 1" thick gypsum-infilled fracture.		45
50								@54', Large, shattered concretionary lense along north and west wall, seepage around concretion.		50
55								TOTAL DEPTH, 54.5' Seepage at 54'. No caving. Boring backfilled.		55
60										60
65										65
70										70
75										75
80										80

JOB NO.: 10282-01

LOG OF BORING

FIGURE: B-3

DATE OBSERVED: 3/24/89 METHOD OF DRILLING: 24 Inch Bucket Auger

LOCATION: See Geotechnical Map

LOGGED BY: J.P.H. GROUND ELEVATION: 414 2500 LB. KELLY BAR

SMC

DEPTH (FEET)	GRAPHIC LOG	CLASSIFICATION	BLOWS/FOOT	UNDISTURBED SAMPLE	BULK SAMPLE	MOISTURE CONTENT (%)	IN PLACE DRY DENSITY (PCF)	BORING NO. SMB-2 DESCRIPTION	LABORATORY TEST Geologic Attitudes	DEPTH (FEET)
0		ML/CL						COLLUVIUM/SLOPEWASH: Qcol/Qsw Dark gray-brown, clayey SILT. Soft to firm, slightly moist, abundant caliche stringers, rootlet hairs, trace of orange fine-grained sand.		0
5			3	X		9.0	94.0	@3', Color change to medium gray-brown.		5
								@8', Increasing porosity, dessication.		
10			6	X		8.0	100.0	@9', Becoming deeply weathered, very stiff.		10
15			6	X		12.0	111.0			15
		SM						@17', Trace of yellow-brown, fine-grained micaceous sand, rootlet holes, carbonized wood fragments.	CONSOLIDATION	
20		MH/ML						@20', Mottled yellow-brown and gray-brown clayey SILT. Soft, moist, rootlet holes, carbonized wood fragments.		20
25			4	X		13.0	102.0			25
								@27', Mottled brown, gray-brown, orange and dark brown, micaceous, clayey SILT with blebs of orange-brown sand. Firm, moist, massive.		
30								@31', Abundant sand blebs and whitesilt stringers (rockflour).		30
		MH/ML						LANDSLIDE DEBRIS; Qls Medium gray, clayey, micaceous SILT. Stiff to very stiff, moist, massive, highly jointed and fractured. Fractures paper thin to ½" thick gypsum-infilled, iron oxide staining along joint and fracture surfaces.	J: N08E70NW J: N17E65NW J: N48E90	
35			7	X		16.0	104.0			35
40										40

JOB NO.: 10282-01 LOG OF BORING FIGURE: B-4

DATE OBSERVED: 3/24/89 METHOD OF DRILLING: 24 Inch Bucket Auger

LOCATION: See Geotechnical Map

LOGGED BY: J.P.H. GROUND ELEVATION: 414

DEPTH (FEET)	GRAPHIC LOG	CLASSIFICATION	BLOWS/FOOT	UNDISTURBED SAMPLE	BULK SAMPLE	MOISTURE CONTENT (%)	IN PLACE DRY DENSITY (PCF)	BORING NO. SMB-2 (Cont) DESCRIPTION	LABORATORY TEST Geologic Attitudes	DEPTH (FEET)
40								LANDSLIDE DEBRIS (Continued)		40
								@39', Increasing iron oxide and manganese oxide staining. Increasing density.	J: N79W39NE J: N10E59SE	
								@44-46', Fractures (paper thin to ¼" thick) infilled with gypsum	F: N16E81SE	
45			6	X		23	101.0		F: N30E68SE	45
								@48', 1" thick concretionary lense, discontinuous round hole.		
50										50
								@55', concretionary lense, seepage.		
55										55
								TOTAL DEPTH, 55.5'. Seepage @ 55'. Boring backfilled.		
60										60
65										65
70										70
75										75
80										80

JOB NO.: 10282-01 LOG OF BORING FIGURE: B-5

DATE OBSERVED: 3/28/89 METHOD OF DRILLING: 24 Inch Bucket Auger

LOCATION: See Geotechnical Map

LOGGED BY: J.P.H. GROUND ELEVATION: 342 2500 LB. KELLY BAR

SMC

BORING NO. SMB-3

DEPTH (FEET)	GRAPHIC LOG	CLASSIFICATION	BLOWS/FOOT	UNDISTURBED SAMPLE	BULK SAMPLE	MOISTURE CONTENT (%)	IN PLACE DRY DENSITY (PCF)	DESCRIPTION	LABORATORY TEST Geologic Attitudes	DEPTH (FEET)
0		ML						ARTIFICIAL FILL; Af Mottled brown, gray-brown, and orange-brown clayey SILT. Firm, moist, traces of rootlet hairs and scattered gypsum.		0
		ML/MH							F: N57E78SE F: N18E82SE	
5			5	X		22.0	91.0	LANDSLIDE DEBRIS; Qls Light gray-brown to light gray, micaceous clayey SILT. Stiff, moist, massive, moderately to highly fractured.	F: N62W02NE	5
		MH/SM						@2.7-5.0', ¼" thick fracture. Infilled with disseminated gypsum, fracture surfaces stained with iron oxide.		
10			3	X		25.0	94.0	@4', 1/8" thick fracture; gypsum-infilled. Color change to gray-brown.		10
15								@7.2', 1/8" thick bedding plane fracture. @9-11, Abundant dissiminated, gypsum-infilled fractures; short, irregular, discontinuous.		15
20								Increasing mica content and trace of yellow to gray, fine-grained sand. @19', increasing iron-oxide staining.	RS: N10E50SE	20
		MH/ML						@22', RUPTURE SURFACE Steeply dipping joint sets along east side of boring; become near vertical, no striations.		
25			5	X				@22.3', Dark gray, unoxidized clayey SILT. Stiff to very stiff, moist, massive, slightly jointed.	J: N02E52NW	25
30								@28', Paper thin joint, iron oxide stained joint surfaces. Increasing mica content. @30.4', Paper thin joint.	J: N08W75SW	30
35										35
40										40

JOB NO.: 10282-01 LOG OF BORING FIGURE: B-6

DATE OBSERVED: 3/28/89 METHOD OF DRILLING: 24 Inch Bucket Auger

LOCATION: See Geotechnical Map

LOGGED BY: J.P.H. GROUND ELEVATION: 342

DEPTH (FEET)	GRAPHIC LOG	CLASSIFICATION	BLOWS/FOOT	UNDISTURBED SAMPLE	BULK SAMPLE	MOISTURE CONTENT (%)	IN PLACE DRY DENSITY (PCF)	BORING NO. SMB-3 (Cont) DESCRIPTION	LABORATORY TEST Geologic Attitudes	DEPTH (FEET)
40		MH/ML	20	X		24.0	96.0	LANDSLIDE DEBRIS (Continued): Dark gray, unoxidized, clayey SILT. Very stiff to hard, moist, massive, slightly jointed and/or fractured. @43', Joint, no staining along surfaces.	J: N08W74SW	40
45										45
50								@50', RUPTURE SURFACE 1/4" clay seam (possibly remolded siltstone), polished; moderately well developed, traced around boring sidewalls, well-developed striations in dip direction. @53-55', Very minor seepage along iron-oxide stained joints.	RS: N25E24SE	50
55										55
60										60
65								@65', Lacks jointings, material same as above.		65
70										70
75								@75', Same as above.		75
80								TOTAL DEPTH, 75'. Rupture surfaces @22' and 50'. Seepage @53-55'. Boring backfilled.		80

JOB NO.: 10282-01 LOG OF BORING FIGURE: B-7

DATE OBSERVED: 3/28/89 METHOD OF DRILLING: 24 Inch Bucket Auger

LOCATION: See Geotechnical Map

LOGGED BY: J.P.H. GROUND ELEVATION: 340 2500 LB. KELLY BAR

SMC

BORING NO. SMB-4

DEPTH (FEET)	GRAPHIC LOG	CLASSIFICATION	BLOWS/FOOT	UNDISTURBED SAMPLE	BULK SAMPLE	MOISTURE CONTENT (%)	IN PLACE DRY DENSITY (PCF)	DESCRIPTION	LABORATORY TEST Geologic Attitudes	DEPTH (FEET)
0		ML/MH						ARTIFICIAL FILL; Af Medium to dark brown or mottled gray-brown and orange-brown clayey SILT to silty CLAY. Firm to stiff, moist, rootlets upper 8 to 12", scattered siltstone, chunks.		0
5		ML/MH	5	X		19.0	93.0	@4.7', Contact clean and sharp.		5
								@4.8', LANDSLIDE DEBRIS; Qls Light to medium gray-brown, micaceous, clayey SILT with trace of yellow, fine-grained sand. Firm to very stiff, moist, massive, moderately to highly jointed and fractured.	J: N79W70SW J: N05E83NW	
10								@8', Abundant gypsum-infilled discontinuous fractures. Joint surfaces, iron oxide stained.	F: N01E73NW J: N15E8NW F: N14E78NW	10
15								@12.8', Minor seepage from short, discontinuous gypsum-infilled fractures; joint surfaces stained with iron and manganese oxide.	J: N50E59SE	15
20								@14', moderate seepage from 1/8" thick, gypsum-infilled fracture. @15', becoming predominantly micaceous, slightly sandy, clayey SILT. Stiff to very stiff, moist massive.	F: N11E80NW	20
25		MH	6	X		25.0	96.0	@17', occasional sandy zones. @22', becoming predominantly clayey silt. @23', moderate seepage from paper thin, near vertical fracture along north side of boring.	ATTERBERG	25
30								@25', Dark gray, unoxidized, micaceous, clayey SILT. Very stiff to hard, moist, massive, to poorly developed fissile structure.		30
35										35
40										40

JOB NO.: 10282-01

LOG OF BORING

FIGURE: B-8

DATE OBSERVED: 3/28/89 METHOD OF DRILLING: 24 Inch Bucket Auger

LOCATION: See Geotechnical Map

LOGGED BY: J.P.H. GROUND ELEVATION: 340

DEPTH (FEET)	GRAPHIC LOG	CLASSIFICATION	BLOWS/FOOT	UNDISTURBED SAMPLE	BULK SAMPLE	MOISTURE CONTENT (%)	IN PLACE DRY DENSITY (PCF)	BORING NO. SMB-4 (Cont) DESCRIPTION	LABORATORY TEST Geologic Attitudes	DEPTH (FEET)
40		MH/ML						LANDSLIDE DEBRIS (Continued) Dark gray, micaceous, clayey SILT. Hard, moist, massive to poorly developed fissile structure. jointing absent.		40
45										45
50								@50', Dark gray, micaceous, clayey SILT. Stiff to hard, moist, massive to poorly developed fissile structure, as above. @51', RUPTURE SURFACE 1/16 to 1/4" thick black clay seam (remolded siltstone); firm, moist, no trace of free water, polished, moderately striated in dip direction. @53', free water along fracture. @55', Dark gray, micaceous, clayey SILT, as above.	RS: N11E70SE	50
55										55
60								TOTAL DEPTH, 55'. Seepage @12.8, 14.0 and 53.0'. No caving. Boring backfilled.		60
65										65
70										70
75										75
80										80

JOB NO.: 10282-01 LOG OF BORING FIGURE: B-9

DATE OBSERVED: 3/29/89 METHOD OF DRILLING: 24 Inch Bucket Auger

LOCATION: See Geotechnical Map

LOGGED BY: J.P.H. GROUND ELEVATION: 277 2500 LB. KELLY BAR

SMC

BORING NO. SMB-5

DEPTH (FEET)	GRAPHIC LOG	CLASSIFICATION	BLOWS/FOOT	UNDISTURBED SAMPLE	BULK SAMPLE	MOISTURE CONTENT (%)	IN PLACE DRY DENSITY (PCF)	DESCRIPTION	LABORATORY TEST Geologic Attitudes	DEPTH (FEET)
0		ML						LANDSLIDE DEBRIS; Qls Light gray to mottled gray-brown and yellow-gray, slightly clayey SILT. Firm to stiff, slightly moist, massive to poorly developed fissile structure, moderately to highly jointed and/or fractured, moderately weathered. @3', 1/16" thick gypsum-infilled joint. @5', Color change to predominately light gray. @7', Becoming very stiff to hard, abundant iron oxide stained joints and fractures. @10', 1/8 to 1/4" thick, gypsum-infilled fracture; manganese oxide stained. @11', increasing yellow, fine-grained sand; becoming micaceous; poorly developed fissile structure. @12.6 to 13.8', Concretionary sandstone lense along east wall. @13.8 to 16', Near vertical, 1/4" thick, gypsum-infilled fracture. @17', 1/4" thick gypsum-infilled shear.	B: N80E08SE J: N48W82SW J: N23E47SE	0
5										5
10		ML/SM							F: N80E64SE F: N50W75SW	10
15		MH/ML								15
		MH/ML							S: N22W09NE F: N70W84NE	
20			7	X		29.0	89.0		F: E-W86S	20
25								@17.1', Black to dark gray, unoxidized, micaceous, clayey SILT. Hard, moist, massive to poorly developed fissile fracture, none to slightly jointed. @17 to 36', 1/16 to 1/4" thick continuous gypsum-infilled fractures; near vertical, closely spaced along east wall, manganese and iron oxide stained. @25 to 36', jointing and fracturing increasing.		25
30									F: N85W77NE	30
35								@36', Iron oxide stained paper thin joint.	J: N74E85NW	35
40										40

JOB NO.: 10282-01 LOG OF BORING FIGURE: B-10

DATE OBSERVED: 3/29/89 METHOD OF DRILLING: 24 Inch Bucket Auger

LOCATION: See Geotechnical Map

LOGGED BY: J.P.H. GROUND ELEVATION: 277

DEPTH (FEET)	GRAPHIC LOG	CLASSIFICATION	BLOWS/FOOT	UNDISTURBED SAMPLE	BULK SAMPLE	MOISTURE CONTENT (%)	IN PLACE DRY DENSITY (PCF)	BORING NO. SMB-5 (Cont) DESCRIPTION	LABORATORY TEST Geologic Attitudes	DEPTH (FEET)
40		MH/ML	15					LANDSLIDE DEBRIS (Continued) Dark gray to black, micaceous, clayey SILT. Hard, moist, massive.	RESIDUAL SHEAR ATTERBERG	40
45										45
50										50
55								@53', Same as above except jointing and fracturing decreasing. @54', RUPTURE SURFACE 1/16" to paper thin black clay seam; highly polished, striations in dip direction, well developed grooves.	RS: N75E46SE	55
60			30 for 6"	☒				@54.6', 6" thick concretion lense on north wall; minor seepage below from fractures. @60', Sample not recovered. @62', Minor seepage from highly fractured concretionary lense along east side of boring.		60
65										65
70								Jointing absent.		70
75										75
80								@80', Same as above.		80

JOB NO.: 10282-01 LOG OF BORING FIGURE: B-11

DATE OBSERVED: 3/29/89 METHOD OF DRILLING: 24 Inch Bucket Auger

LOCATION: See Geotechnical Map

LOGGED BY: J.P.H. GROUND ELEVATION: 277

DEPTH (FEET)	GRAPHIC LOG	CLASSIFICATION	BLOWS/FOOT	UNDISTURBED SAMPLE	BULK SAMPLE	MOISTURE CONTENT (%)	IN PLACE DRY DENSITY (PCF)	BORING NO. SMB-5 (Cont) DESCRIPTION	LABORATORY TEST Geologic Attitudes	DEPTH (FEET)
80								LANDSLIDE DEBRIS (Continued) Dark gray to black, micaceous, clayey SILT. Hard, slightly moist to moist, massive to poorly developed fissile structure, jointing absent.		80
85										85
90			30 for 6"	X				Same as above.		90
95								@96', Minor seepage from paper thin fracture.	F: N86W81SW	95
100								@100', Standing water.		100
105			30 for 6"	X					RESIDUAL SHEAR ATTERBERG	105
110								TOTAL DEPTH, 107' Standing Water @100'. Seepage @54' and 62'. No caving. Geologically logged to 96'. No Caving Boring backfilled.		110
115										115
120										120

JOB NO.: 10282-01 LOG OF BORING FIGURE: B-12

TRENCH NO.: TP-1 PROJECT NAME: H & S DEVELOPMENT

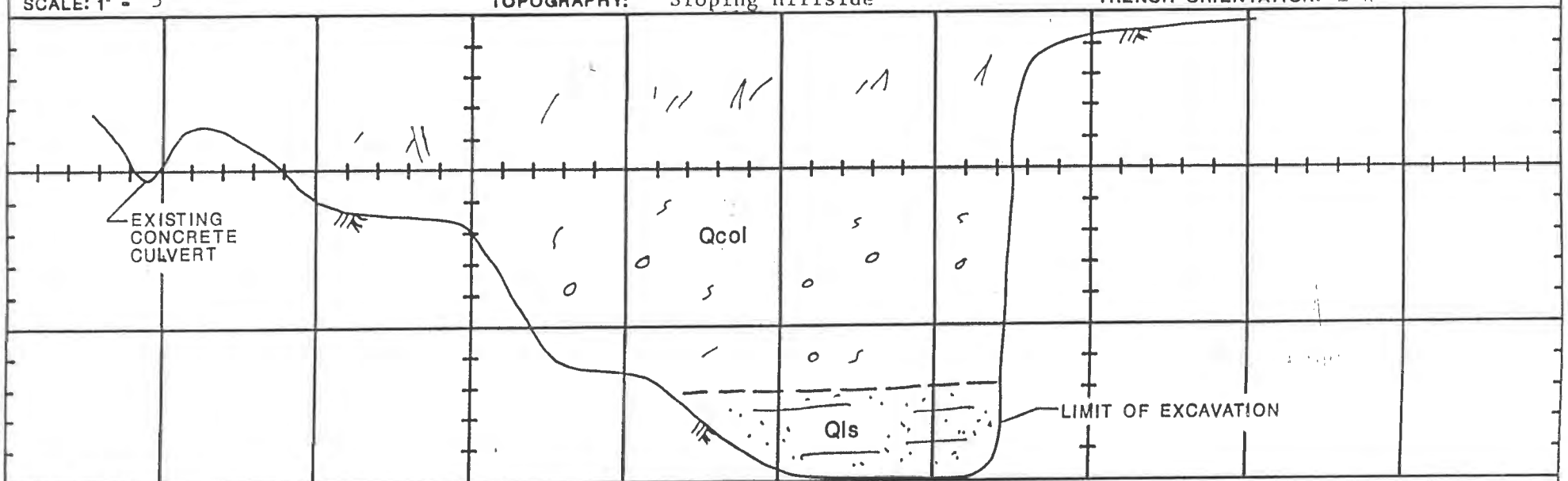
LOCATION: SEE GEOTECHNICAL MAP

DATE: 3/14/89 EQUIPMENT: CASE 580K BACKHOE

ELEVATION: 420 LOGGED BY: JPH

DESCRIPTION	ENGINEERING PROPERTIES: CLASSIFICATION U.S.C.S.	BLOW COUNT (BLOWS/FOOT)	BULK SAMPLE	UNDISTURBED SAMPLE	MOISTURE (%)	DENSITY (PCF)
0-11' Colluvium;Qcol Dark gray-brown to black, silty CLAY. Soft to stiff, moist, massive, rootlets upper 6-12 inches, abundant caliche stringers, occasional yellow siltstone bedrock and concretion fragments.		@2	X			
11-14' Landslide Debris;Qls Mottled yellow and gray, clayey SILTSTONE with trace of fine-grained sand. Moderately hard, moist, massive, trace of oxidation, desiccated, carbonized wood fragments, moderately weathered.						

SCALE: 1" = 5' TOPOGRAPHY: Sloping Hillside TRENCH ORIENTATION: E-W



SMC

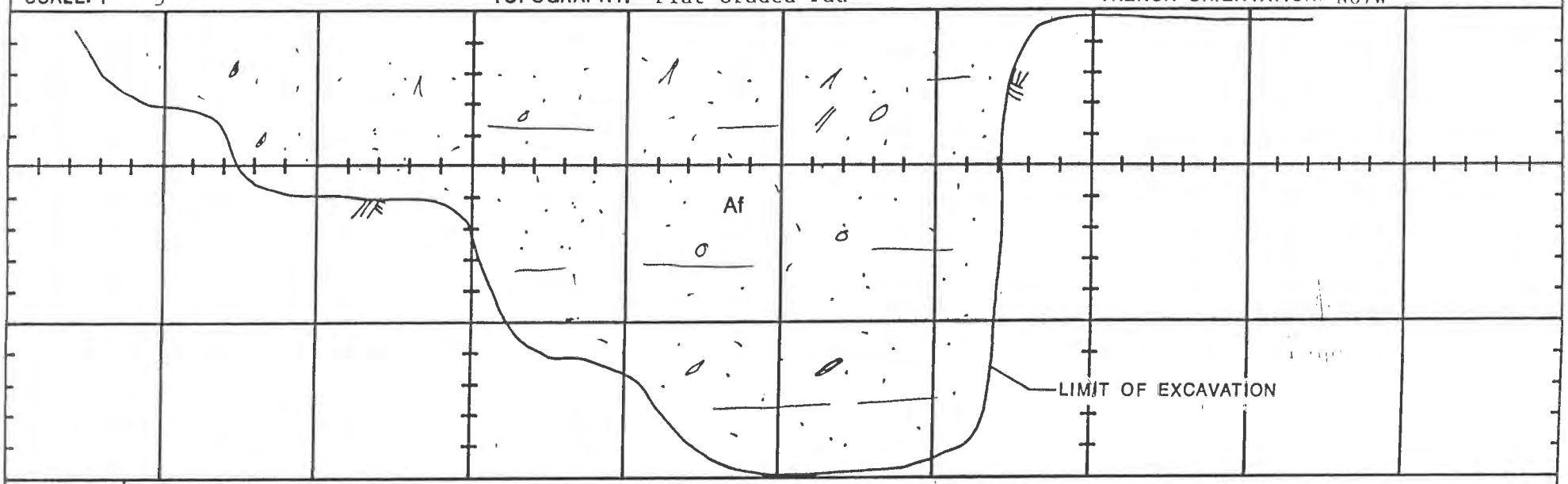
GRAPHIC TEST PIT LOG

JOB NO.: 10282-01 DATE: APRIL 1989 FIGURE NO.: B-13

TRENCH NO.: TP-2	PROJECT NAME: H & S DEVELOPMENT		
LOCATION: SEE GEOTECHNICAL MAP			
DATE: 3-14-89	EQUIPMENT: CASE 580K BACKHOE		
ELEVATION: 405	LOGGED BY: JPH		

DESCRIPTION	ENGINEERING PROPERTIES: CLASSIFICATION U.S.C.S.	BLOW COUNT (BLOWS/FOOT)	BULK SAMPLE	UNDISTURBED SAMPLE	MOISTURE (%)	DENSITY (PCF)
0-14' Artificial Fill;Af Light brown to mottled orange-brown, gray, and yellow, clayey SILT. Firm, slightly moist, laminae, siltstone chunks, wood fragments, concretion fragments, occasional black clayey lense.						

SCALE: 1" = 5' TOPOGRAPHY: Flat Graded Pad TRENCH ORIENTATION: N07W



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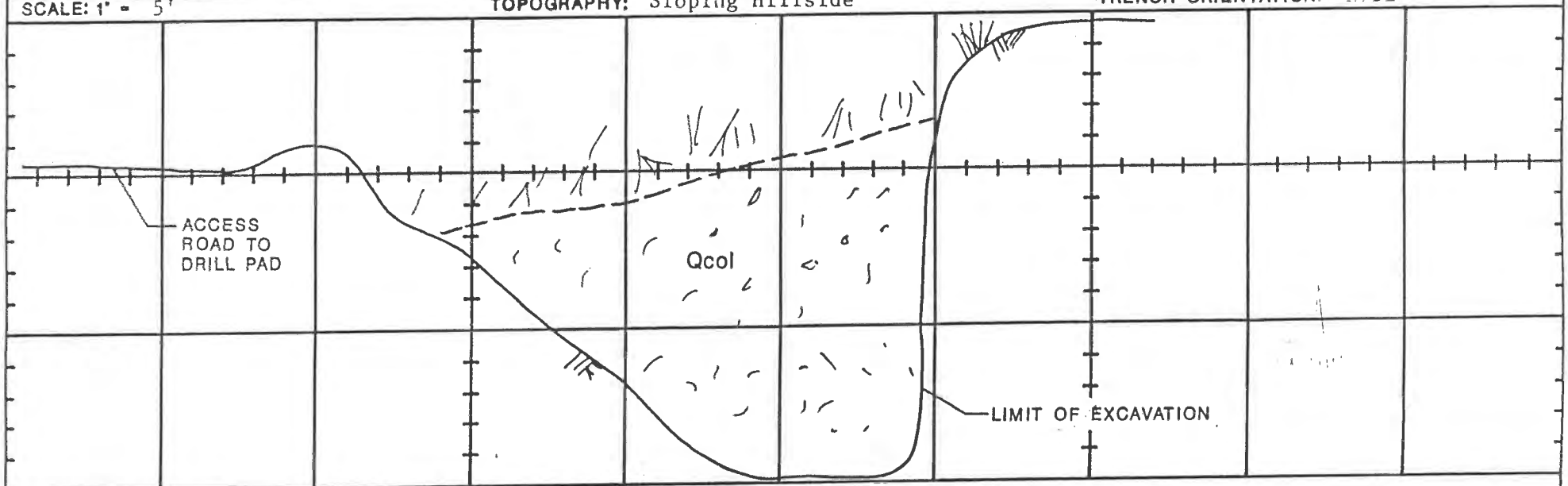
GRAPHIC TEST PIT LOG

JOB NO.: 10282-01	DATE: APRIL 1989	FIGURE NO.: B-14

TRENCH NO.: TP-3	PROJECT NAME: H & S DEVELOPMENT		
LOCATION: SEE GEOTECHNICAL MAP			
DATE: 3-14-89	EQUIPMENT: CASE 580K BACKHOE		
ELEVATION: 425	LOGGED BY: JPH		

DESCRIPTION	ENGINEERING PROPERTIES: CLASSIFICATION U.S.C.S.	BLOW COUNT (BLOWS/FOOT)	BULK SAMPLE	UNDISTURBED SAMPLE	MOISTURE (%)	DENSITY (PCF)
0-2' Topsoil Dark gray-brown to black, silty CLAY. Firm, moist, rootlets, desiccated.						
2-14' Colluvium;Qcol Dusky gray-brown, clayey SILT. Firm, slightly moist to moist, massive, abundant caliche stringers, desiccated.						

SCALE: 1" = 5' TOPOGRAPHY: Sloping Hillside TRENCH ORIENTATION: N75E



SMC

GRAPHIC TEST PIT LOG

JOB NO.: 10282-01	DATE: APRIL 1989	FIGURE NO.: B-15

TRENCH NO.: TP-4 PROJECT NAME: H & S DEVELOPMENT

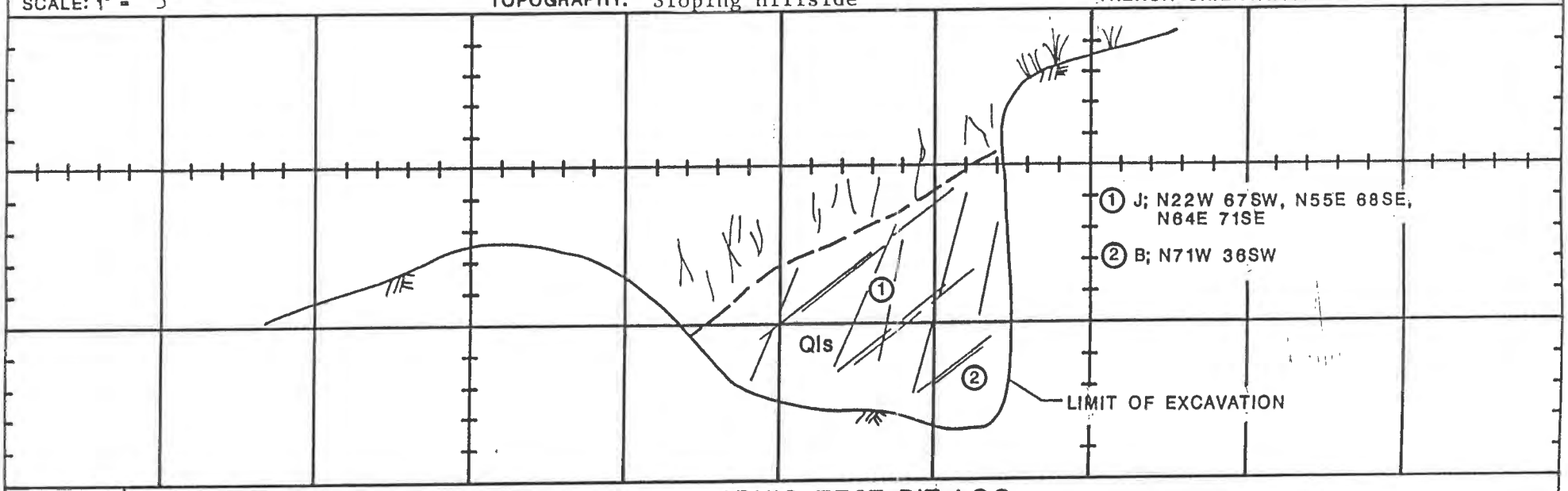
LOCATION: SEE GEOTECHNICAL MAP

DATE: 3-14-89 EQUIPMENT: CASE 580K BACKHOE

ELEVATION: 276 LOGGED BY: JPH

DESCRIPTION	ENGINEERING PROPERTIES: CLASSIFICATION U.S.C.S.	BLOW COUNT (BLOWS/FOOT)	BULK SAMPLE	UNDISTURBED SAMPLE	MOISTURE (%)	DENSITY (PCF)
0-3' Topsoil/Colluvium;Qcol Dark gray-brown to mottled orange-brown, and gray, clayey SILT. Soft to firm, slightly moist, rootlets, desiccated, concretion fragments.						
3-9' Landslide Debris;Qls Light gray SILTSTONE. Moderately hard, slightly moist, poorly bedded to massive, 1/8" - 1/4" gypsum-infilled joints and fractures, oxidized along joint and bedding planes, trace of very fine-grained yellow sand, moderately weathered.		@4	X			

SCALE: 1" = 5' TOPOGRAPHY: Sloping Hillside TRENCH ORIENTATION: N10E



SMC

GRAPHIC TEST PIT LOG

JOB NO.: 10282-01 DATE: APRIL 1989 FIGURE NO.: B-16

TRENCH NO.: TP-5 PROJECT NAME: H & S DEVELOPMENT

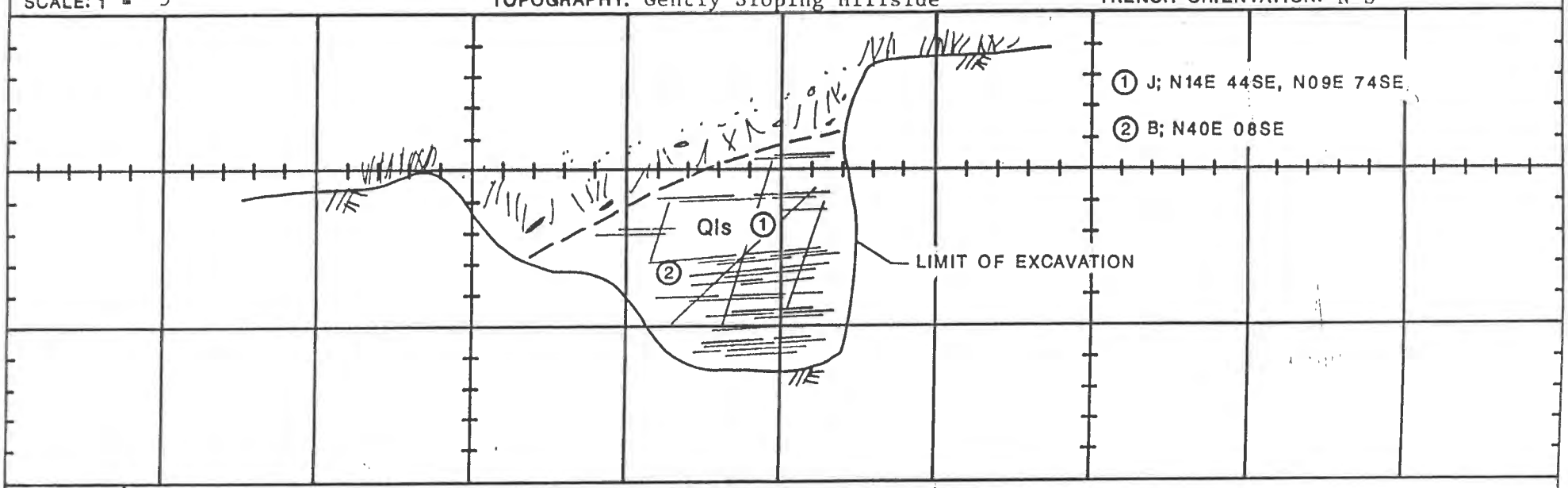
LOCATION: SEE GEOTECHNICAL MAP

DATE: 3-14-89 EQUIPMENT: CASE 580K BACKHOE

ELEVATION: 279 LOGGED BY: JPH

DESCRIPTION	ENGINEERING PROPERTIES: CLASSIFICATION U.S.C.S.	BLOW COUNT (BLOWS/FOOT)	BULK SAMPLE	UNDISTURBED SAMPLE	MOISTURE (%)	DENSITY (PCF)
0-3' Topsoil/Colluvium;Qcol Mottled orange, gray and brown, clayey SILT. Soft, slightly moist to moist, abundant rootlets, siltstone bedrock and concretion fragments.						
3-10' Landslide Debris;Qls Light gray-brown, diatomaceous, clayey SILTSTONE. Very soft to soft, moist, thinly bedded to fissile, moderately jointed and fractured, oxidized along joint planes, traces of caliche.						

SCALE: 1" = 5' TOPOGRAPHY: Gently Sloping Hillside TRENCH ORIENTATION: N-S



SMC

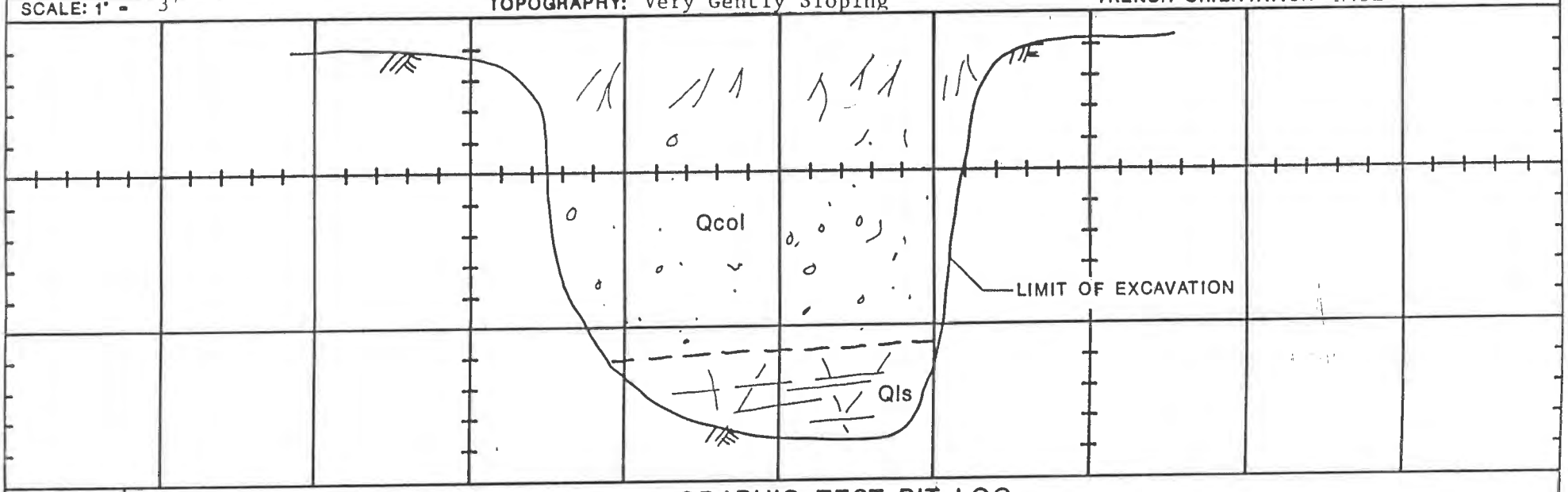
GRAPHIC TEST PIT LOG

JOB NO.: 10282-01 DATE: APRIL 1989 FIGURE NO.: B-17

TRENCH NO.: TP-6	PROJECT NAME: H & S DEVELOPMENT		
LOCATION: SEE GEOTECHNICAL MAP			
DATE: 3-14-89	EQUIPMENT: CASE 580K BACKHOE		
ELEVATION: 275	LOGGED BY: JPH		

DESCRIPTION	ENGINEERING PROPERTIES: CLASSIFICATION U.S.C.S.	BLOW COUNT (BLOWS/FOOT)	BULK SAMPLE	UNDISTURBED SAMPLE	MOISTURE (%)	DENSITY (PCF)
0-7' Topsoil/Colluvium;Qcol Dark brown to black, clayey SILT. Very soft, moist, rootlets upper 18 inches, abundant caliche stringers, deeply weathered.						
7-10' Landslide Debris;Qls Light gray to orange-brown, diatomaceous, clayey SILTSTONE. Soft to moderately hard, moist, poorly bedded, moderately jointed.						

SCALE: 1" = 3' TOPOGRAPHY: Very Gently Sloping TRENCH ORIENTATION: N15E



SMC

GRAPHIC TEST PIT LOG

JOB NO.: 10282-01	DATE: APRIL 1989	FIGURE NO.: B-18

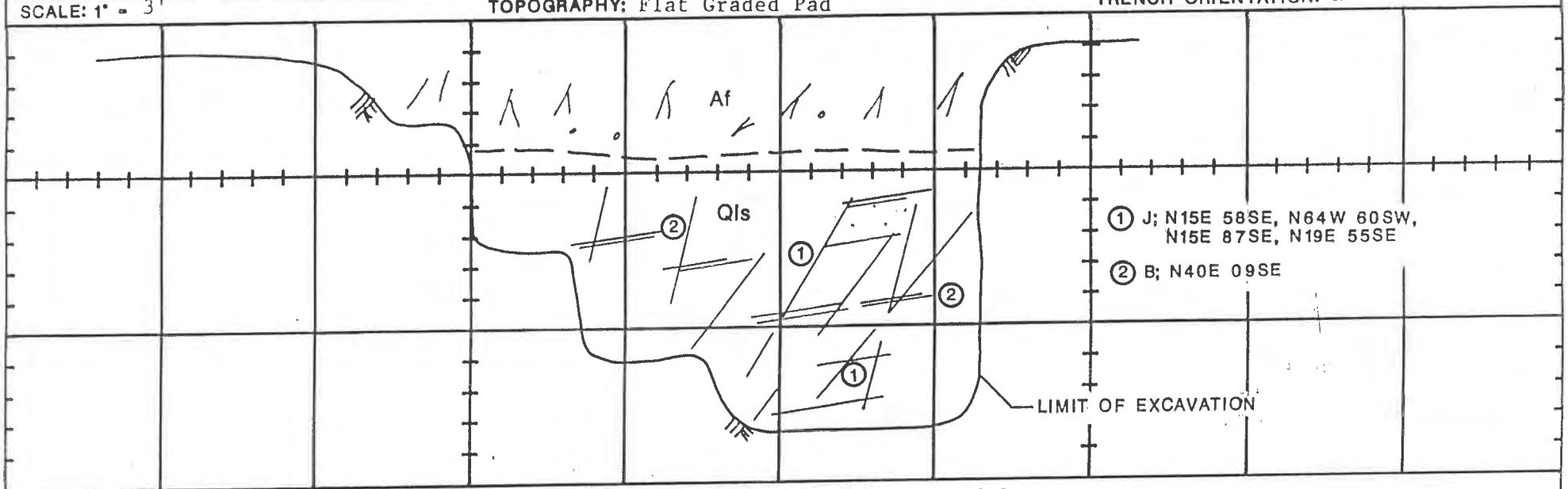
TRENCH NO.: TP-7	PROJECT NAME: H & S DEVELOPMENT		
LOCATION: SEE GEOTECHNICAL MAP			
DATE: 3-14-89	EQUIPMENT: CASE 580K BACKHOE		
ELEVATION: 346	LOGGED BY: JPH		

DESCRIPTION	ENGINEERING PROPERTIES: CLASSIFICATION U.S.C.S.	BLOW COUNT (BLOWS/FOOT)	BULK SAMPLE	UNDISTURBED SAMPLE	MOISTURE (%)	DENSITY (PCF)
0-2' Artificial Fill;Af Dark gray-brown, silty CLAY. Soft, moist, rootlets, some black clay pockets.						
2-8' Landslide Debris;Qls Light gray-brown, clayey SILTSTONE. Moderately hard, moist, thinly to poorly bedded, moderately jointed, minor gypsum infilling, oxidized along joint planes, trace of fine-grained, yellow sand.						

SCALE: 1" = 3'

TOPOGRAPHY: Flat Graded Pad

TRENCH ORIENTATION: N-S



GRAPHIC TEST PIT LOG

JOB NO.: 10282-01	DATE: APRIL 1989	FIGURE NO.: B-19

TRENCH NO.: TP-8 PROJECT NAME: H & S DEVELOPMENT

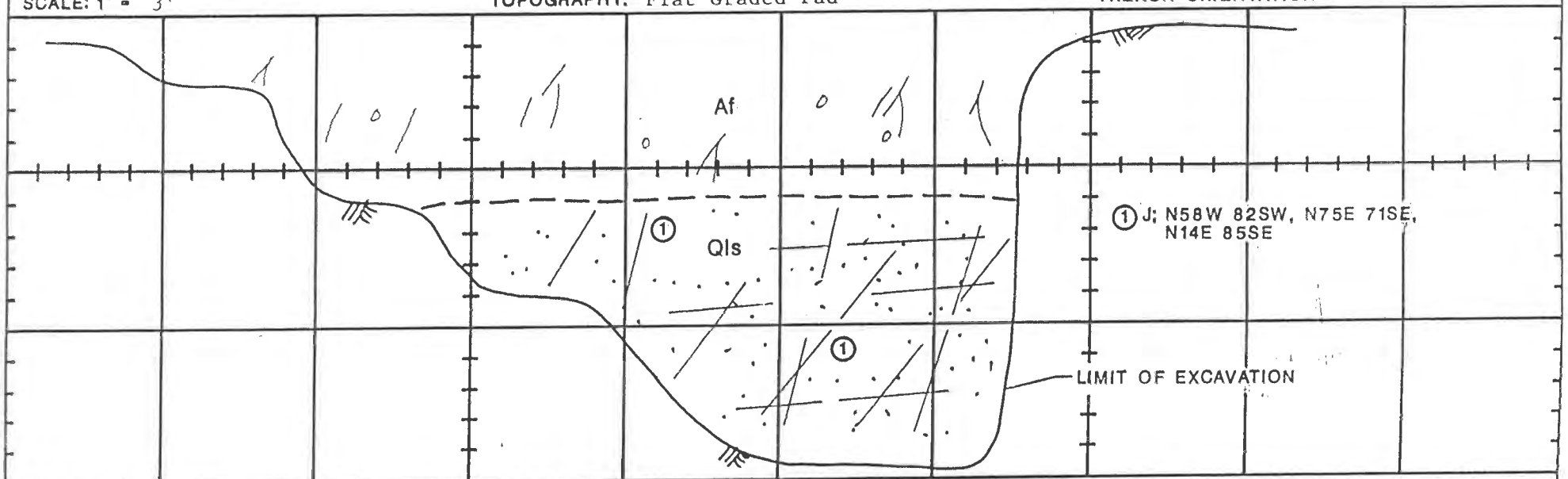
LOCATION: SEE GEOTECHNICAL MAP

DATE: 3-14-89 EQUIPMENT: CASE 580K BACKHOE

ELEVATION: 370 LOGGED BY: JPH

DESCRIPTION	ENGINEERING PROPERTIES: CLASSIFICATION U.S.C.S.	BLOW COUNT (BLOWS/FOOT)	BULK SAMPLE	UNDISTURBED SAMPLE	MOISTURE (%)	DENSITY (PCF)
0-4' Artificial Fill;Af Mottled gray, brown, orange and yellow, clayey SILT. Soft to firm, moist, rootlets, siltstone chunks.						
4-9' Landslide Debris;Qls Light gray to gray-brown, clayey SILTSTONE. Moderately hard, slightly moist, poorly bedded, moderately jointed, trace of gypsum and/or oxidation along joint and bedding planes, trace of yellow, fine-grained sand.						

SCALE: 1" = 3' TOPOGRAPHY: Flat Graded Pad TRENCH ORIENTATION: N75W



SMC

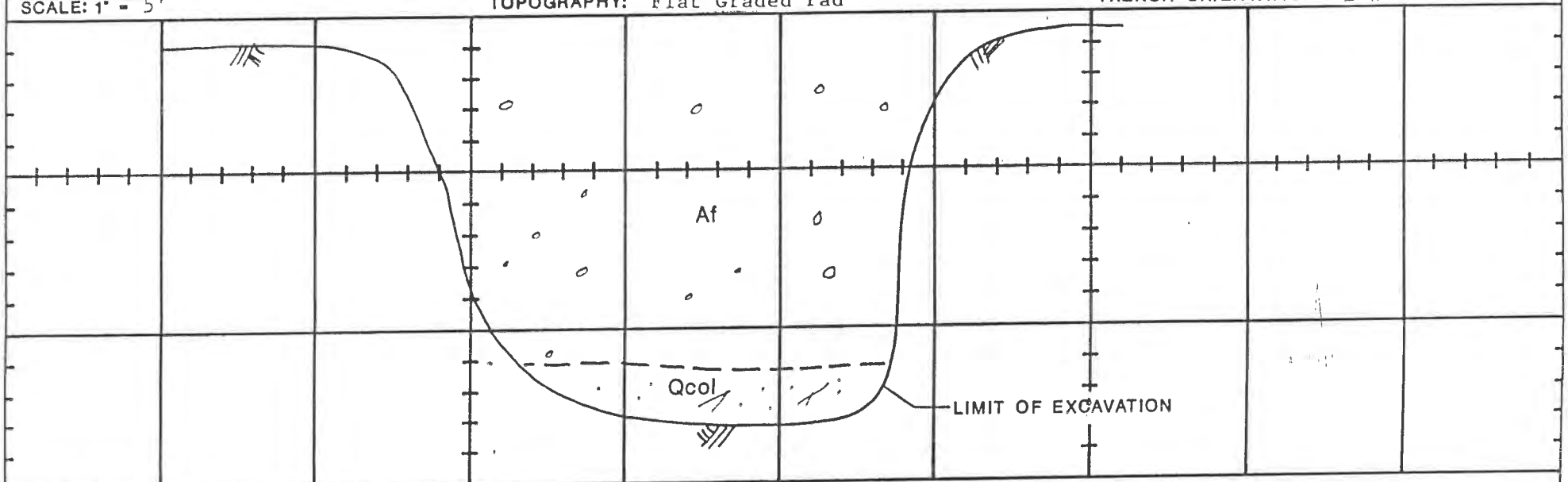
GRAPHIC TEST PIT LOG

JOB NO.: 10282-01 DATE: APRIL 1989 FIGURE NO.: B-20

TRENCH NO.: TP-9	PROJECT NAME: H & S DEVELOPMENT		
LOCATION: SEE GEOTECHNICAL MAP			
DATE: 3-14-89	EQUIPMENT: CASE 580K BACKHOE		
ELEVATION: 404	LOGGED BY: JPH		

DESCRIPTION	ENGINEERING PROPERTIES: CLASSIFICATION U.S.C.S.	BLOW COUNT (BLOWS/FOOT)	BULK SAMPLE	UNDISTURBED SAMPLE	MOISTURE (%)	DENSITY (PCF)
0-12' Artificial Fill;Af Light gray to orange-brown, clayey SILT. Firm, moist, abundant siltstone and concretion fragments.						
12-13' Colluvium;Qcol Dark brown to black, silty CLAY. Stiff, slightly moist, rootlets.						

SCALE: 1" = 5' TOPOGRAPHY: Flat Graded Pad TRENCH ORIENTATION: E-W



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GRAPHIC TEST PIT LOG

JOB NO.: 10282-01	DATE: APRIL 1989	FIGURE NO.: B-21

TRENCH NO.: TP-10 PROJECT NAME: H & S DEVELOPMENT

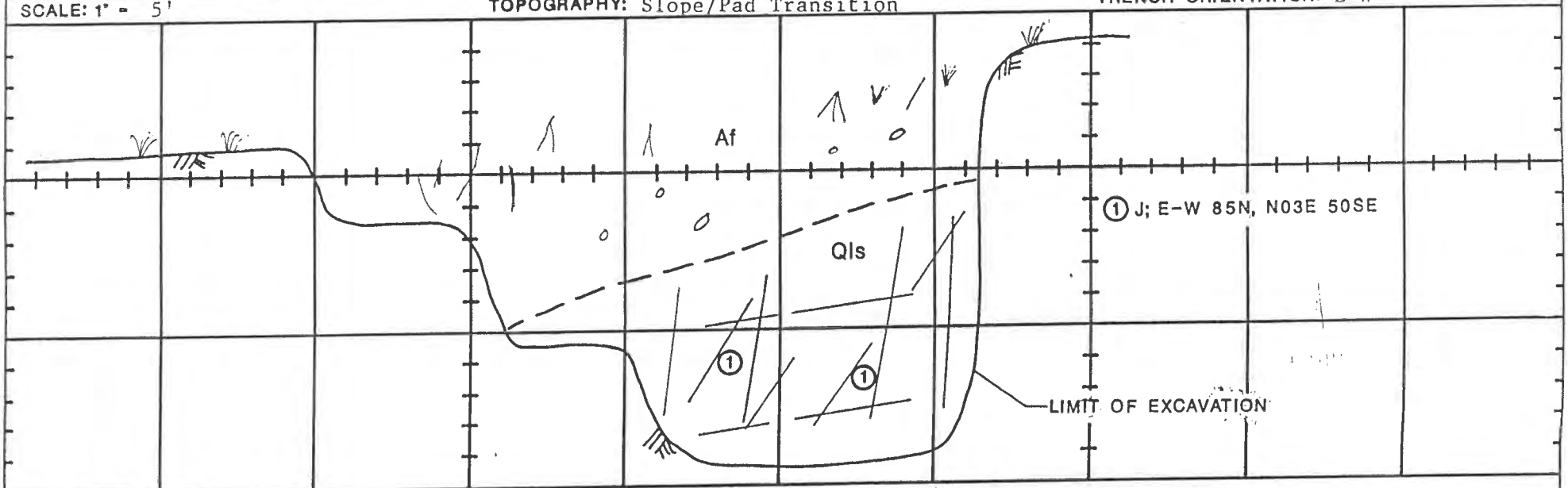
LOCATION: SEE GEOTECHNICAL MAP

DATE: 3-14-89 EQUIPMENT: CASE 580K BACKHOE

ELEVATION: 288 LOGGED BY: JPH

DESCRIPTION	ENGINEERING PROPERTIES: CLASSIFICATION U.S.C.S.	BLOW COUNT (BLOWS/FOOT)	BULK SAMPLE	UNDISTURBED SAMPLE	MOISTURE (%)	DENSITY (PCF)
0-4' Artificial Fill;Af Mottled orange, gray, and yellow-brown clayey SILT. Firm, moist, rootlets upper 18 inches, siltstone fragments.						
4-8' Landslide Debris;Qls Light gray, clayey SILTSTONE. Moderately hard, slightly moist, thinly to poorly bedded, gypsum-infilled joints and fractures, oxidized along bedding and joint planes, trace of yellow, fine-grained sand.						

SCALE: 1" = 5' TOPOGRAPHY: Slope/Pad Transition TRENCH ORIENTATION: E-W



GRAPHIC TEST PIT LOG

SMC

JOB NO.: 10282-01 DATE: APRIL 1989 FIGURE NO.: B-22

BORING LOG

Project: Tract No. 5241 Location: Colinas de Capistrano

Boring No.: 1 Elevation: 417± Drill Date: 11/4/88

Job No.: 237-88 Logged By: AB Driving Weight:

Depth - Ft.	Graphic Log	Description of Materials	Unified Soil Class.	Penetration Blows/Ft.	CORE	BAG	Dry Density Lbs/Cu.Ft.	Moisture %	Relative Comp. - %
		FILL: Silty Clay; mottled dark brown and light brown; damp; stiff.							
5									
		SLIDE DEBRIS: Silty Clay; dark brown; damp to moist; very stiff. (Topsoil)							
10		SILTY SAND: Light brown; fine grained; damp; very dense. (Infill)		11		■	114.0	10.9	
		Rootholes.							
15									
		Caliche; white; not continuous around hole; fragmented.							
20		6" diameter siliceous nodule.		10		■	114.9	13.2	
		Rootholes; occasional caliche pockets.							

BORING LOG

Project: Tract No. 5241 Location: Colinas de Capistrano

Boring No.: 1 Cont'd. Elevation: 417± Drill Date: 11/4/88

Job No.: 237-88 Logged By: AB Driving Weight:

Depth - Ft.	Graphic Log	Description of Materials	Unified Soil Class.	Penetration Blows/Ft.	CORE	BAG	Dry Density Lbs/Cu.Ft.	Moisture %	Relative Comp. - %
		Lighter bands of cleaner sand; 1.0' thick; sand is fine grained; gradational contacts. Attitude of Bedding: N-S 16W.							
30		Below 29.0', becomes more moist and sandy; mottled light brown and white.		10	■		107.6	13.1	
		Sand layers 1.0' thick. Attitude of Bedding: N20E 15NW. Below 32.0 feet; Silty Clayey Sand; brown; moist; massive.							
35									
		Weathered Siltstone; light brown with iron oxide staining; highly weathered and fractured. (Capistrano Formation)							
		SILTY SANDSTONE: Light gray; less weathered; highly fractured; sand is fine grained.							
40				8	■		103.1	20.7	
		Fractures; iron oxide stained. Attitude of Fracture: N20E 60NW.							
		Attitude of Fracture: N20E 60NW.							
45									
		SLIDE PLANE: N15E 65SE.							
		Fracture; gypsum filled; iron oxide stained. Attitude of Fracture: N30E 25NW.							

BORING LOG

Project: Tract No. 5241 Location: Colinas de Capistrano

Boring No.: 1 Cont'd. Elevation: 417± Drill Date: 11/4/88

Job No.: 237-88 Logged By: AB Driving Weight:

Depth - Ft.	Graphic Log	Description of Materials	Unified Soil Class.	Penetration Blows/Ft.	CORE	BAG	Dry Density Lbs/Cu.Ft.	Moisture %	Relative Comp. - %
				9	■		99.0	25.6	
		SLIDE PLANE: Continuous around hole; well developed slickensides and grooves. Attitude of top of Slide Plane at southwest side of hole: N25W 72SE. Attitude of Slide Plane at northwest side of hole: N15E 66SE. (Slide Plane extends to the 59.0 depth on west side.) At 54.0', there is a paper thin Slide Plane. Attitude of Slide at 54.0': N20E 25NW. Below the steep Slide Plane at 51.0' is highly fractured Silty Sandstone; moist; gypsum filled fractures. At 56.0', Slide Plane; cut off by above Slide Planes: N20E 72NW; Slicks downdip. Attitude of continuous steep Slide Plane that started at 51.0': N15E 80NW. Seepage and caving at 59.0' from 1.0' thick sand bed on west side of hole - cut off by Slide Plane.							
55									
60									
		BEDROCK: Siltstone; dark gray; fractured; weathered; gypsum infilled. Siliceous nodule.							
65									
70									
		Siliceous layer; horizontal; highly fractured. Below 74.0': Unoxidized Siltstone; dark gray; dense.							

BORING LOG

Project: Tract No. 5241 Location: Colinas de Capistrano

Boring No.: 1 Cont'd. Elevation: 417± Drill Date: 11/4/88

Job No.: 237-88 Logged By: AB Driving Weight:

Depth - Ft.	Graphic Log	Description of Materials	Unified Soil Class.	Penetration Blows/Ft.	CORE	BAG	Dry Density Lbs/Cu.Ft.	Moisture %	Relative Comp. - %
		BEDROCK - Cont'd.		8	■		100.4	25.4	
		Becomes less fractured.							
80									
85		Water Level. On 11/7/88, unable to log below.							
90									
95									

BORING LOG

Project: Tract No. 5241 Location: Colinas de Capistrano

Boring No.: 1 Cont'd. Elevation: 417± Drill Date: 11/4/88

Job No.: 237-88 Logged By: AB Driving Weight:

Depth - Ft.	Graphic Log	Description of Materials	Unified Soil Class.	Penetration Blows/Ft.	CORE	BAG	Dry Density Lbs/Cu.Ft.	Moisture %	Relative Comp. - %
		BEDROCK - Cont'd.		20	■		99.0	25.4	
105									
110									
115									
120									

BORING LOG

Project: Tract No. 5241 Location: Colinas de Capistrano

Boring No.: 1 Cont'd. Elevation: 417± Drill Date: 11/4/88

Job No.: 237-88 Logged By: AB Driving Weight:

Depth - Ft.	Graphic Log	Description of Materials	Unified Soil Class.	Penetration Blows/Ft.	CORE	BAG	Dry Density Lbs/Cu.Ft.	Moisture %	Relative Comp. - %
		BEDROCK - Cont'd.		39	■		102.2	25.1	
130									
135									
140		Total Depth of Hole - 140.0 feet Heavy seepage @ 59.0 feet. Hole filled with water to 50.0 feet - 11/18/88 Backfilled 11/18/88							
145									

BORING LOG

Project: Tract No. 5241 Location: Colinas de Capistrano

Boring No.: 2 Elevation: 397± Drill Date: 11/7/88

Job No.: 237-88 Logged By: AB Driving Weight:

Depth - Ft.	Graphic Log	Description of Materials	Unified Soil Class.	Penetration Blows/Ft.	CORE	BAG	Dry Density Lbs/Cu.Ft.	Moisture %	Relative Comp. - %
		FILL: Silty Clay; light brown to dark brown; dry; loose to 1.0 foot.							
5		SLIDE DEBRIS: Siltstone; light brown; damp; dense; highly fractured; some fine grained sand layers.							
		Attitude of Bedding: N20E 14NW.							
10		Siliceous nodule layer. Attitude of nodule layer: N-S 20W.							
		One-inch sandstone layer with iron oxide staining. Attitude of Bedding: N20E 14NW.							
15									
20									
		Siliceous nodule layer. Highly fractured with gypsum.							

BORING LOG

Project: Tract No. 5241 Location: Colinas de Capistrano

Boring No.: 2 Cont'd. Elevation: 397± Drill Date: 11/7/88

Job No.: 237-88 Logged By: AB Driving Weight:

Depth - Ft.	Graphic Log	Description of Materials	Unified Soil Class.	Penetration Blows/Ft.	CORE	BAG	Dry Density Lbs/Cu.Ft.	Moisture %	Relative Comp. - %
		Attitude of Bedding: N25E 10NW.							
		1/4" gypsum filled fracture. Attitude of Fracture: N45E 24SE.							
30				6	■		103.2	23.2	
		1.0" gypsum filled fracture. Attitude of Fracture: N20E 32NW.							
		Attitude of Fracture: N25E 64SE.							
35									
		1/4" gypsum filled fracture. Attitude of Fracture: N10E 14SE. At 38.5': Slide Plane: N15W 35NE.							
40		Unoxidized; some light seepage; fractured.							
		Fractures decrease.							
45									

BORING LOG

Project: Tract No. 5241 Location: Colinas de Capistrano

Boring No.: 2 Cont'd. Elevation: 397± Drill Date: 11/7/88

Job No.: 237-88 Logged By: AB Driving Weight:

Depth - Ft.	Graphic Log	Description of Materials	Unified Soil Class.	Penetration Blows/Ft.	CORE	BAG	Dry Density Lbs/Cu.Ft.	Moisture %	Relative Comp. — %
				15	■		98.6	26.5	
		6-inch, fine grained sand layer. Attitude of Bedding: N30E 16NW. SILTSTONE: Dark gray; slightly weathered; stiff.							
55									
60									
65		SILTSTONE: Becomes highly weathered.							
70									

BORING LOG

Project: Tract No. 5241 Location: Colinas de Capistrano

Boring No.: 2 Cont'd. Elevation: 397± Drill Date: 11/7/88

Job No.: 237-88 Logged By: AB Driving Weight:

Depth - Ft.	Graphic Log	Description of Materials	Unified Soil Class.	Penetration Blows/Ft.	CORE	BAG	Dry Density Lbs/Cu.Ft.	Moisture %	Relative Comp. - %
				18	■		99.6	23.8	
		Becoming fractured.							
		Attitude of Fracture: N-S 47E.							
80		Thin sand layer (truncated by above fracture). Attitude of Bedding: N20W 17SW.							
85									
90		Highly fractured and weathered.							
		Slide Plane with slickensides downdip: N30E 47SE.							
95									
		Moderately fractured.							

BORING LOG

Project: Tract No. 5241 Location: Colinas de Capistrano

Boring No.: 2 Cont'd. Elevation: 397± Drill Date: 11/7/88

Job No.: 237-88 Logged By: AB Driving Weight:

Depth - Ft.	Graphic Log	Description of Materials	Unified Soil Class.	Penetration Blows/Ft.	CORE	BAG	Dry Density Lbs/Cu.Ft.	Moisture %	Relative Comp. - %
		SLIDE DEBRIS - Cont'd.		24	■		102.0	23.6	
105									
110									
		SILTSTONE: Massive; dark gray; damp; dense.							
115									
120									
		Small siliceous nodule.							

BORING LOG

Project: Tract No. 5241 Location: Colinas de Capistrano

Boring No.: 2 Cont'd. Elevation: 397± Drill Date: 11/7/88

Job No.: 237-88 Logged By: AB Driving Weight:

Depth - Ft.	Graphic Log	Description of Materials	Unified Soil Class.	Penetration Blows/Ft.	CORE	BAG	Dry Density Lbs/Cu.Ft.	Moisture %	Relative Comp. - %
		SLIDE DEBRIS - Cont'd.		51	■		101.0	24.5	
130									
135		Siliceous fragments.							
		6" by 6" siliceous nodule on east side of hole only.							
140				28	■		93.6	25.3	
145		SLIDE PLANE: Thin, slicks downdip: N38E 37SE. (Below slide plane on west side of hole is a 6" thick siliceous layer truncated by slide plane). SLIDE PLANE: N7W 57NE. SLIDE PLANE: N60E 40SE - Paper thin, slicks downdip.							

BORING LOG

Project: Tract No. 5241 Location: Colinas de Capistrano

Boring No.: 2 Cont'd. Elevation: 397± Drill Date: 11/7/88

Job No.: 237-88 Logged By: AB Driving Weight:

Depth - Ft.	Graphic Log	Description of Materials	Unified Soil Class.	Penetration Blows/Ft.	CORE	BAG	Dry Density Lbs/Cu.Ft.	Moisture %	Relative Comp. — %
		Highly fractured.							
		SLIDE PLANE: N8W 43NE. More dense below this slide plane.							
155									
160				35	■		97.1	26.7	
165									
		Siliceous nodule on east side of hole.							
170									

BORING LOG

Project: Tract No. 5241 Location: Colinas de Capistrano

Boring No.: 2 Cont'd. Elevation: 397± Drill Date: 11/7/88

Job No.: 237-88 Logged By: AB Driving Weight:

Depth - Ft.	Graphic Log	Description of Materials	Unified Soil Class.	Penetration Blows/Ft.	CORE	BAG	Dry Density Lbs/Cu.Ft.	Moisture %	Relative Comp. - %
		SLIDE PLANE: N15E 50SE (Slicks downdip).							
180		SLIDE PLANE: N15E 54SE.							
185									
		SLIDE PLANE: N60E 35SE.							
		SLIDE PLANE: N85E 52SE (Slicks downdip).							
190									
		SLIDE PLANE: N60E 42SE.							
		SLIDE PLANE: N40E 51SE.							
		SLIDE PLANE: N50E 45SE.							
195									
		SLIDE PLANE: N45E 53SE.							
		SLIDE PLANE: N60E 60SE.							

BORING LOG

Project: Tract No. 5241 Location: Colinas de Capistrano

Boring No.: 2 Cont'd. Elevation: 397± Drill Date: 11/7/88

Job No.: 237-88 Logged By: AB Driving Weight:

Depth - Ft.	Graphic Log	Description of Materials	Unified Soil Class.	Penetration Blows/Ft.	CORE	BAG	Dry Density Lbs/Cu.Ft.	Moisture %	Relative Comp. - %
		SLIDE DEBRIS - Cont'd.							
205		Total Depth of Hole - 205.0 feet (11/10/88) Water Level - 204 feet (11/18/88) Backfilled 11/18/88							
210									

BORING LOG

Project: Tract No. 5241 Location: Colinas de Capistrano

Boring No.: 3 Elevation: 353± Drill Date: 11/12/88

Job No.: 237-88 Logged By: AB/TD Driving Weight:

Depth - Ft.	Graphic Log	Description of Materials	Unified Soil Class.	Penetration Blows/Ft.	CORE	BAG	Dry Density Lbs/Cu.Ft.	Moisture %	Relative Comp. - %
		FILL: Silty Clay to Sandy Silt; moist to wet; brown; dense.							
5									
10									
		SLIDE DEBRIS: Sandy Siltstone; brown; damp; dense; gypsum filled fractures; iron staining.							
15									
		Attitude of Bedding: N-S 10W.							
20		Unoxidized Clayey, Sandy Silt; black; moist; dense.							

BORING LOG

Project: Tract No. 5241 Location: Colinas de Capistrano

Boring No.: 3 Cont'd. Elevation: 353± Drill Date: 11/12/88

Job No.: 237-88 Logged By: AB/TD Driving Weight:

Depth - Ft.	Graphic Log	Description of Materials	Unified Soil Class.	Penetration Blows/Ft.	CORE	BAG	Dry Density Lbs/Cu.Ft.	Moisture %	Relative Comp. - %
		SLIDE DEBRIS - Cont'd.		12	■		96.0	27.0	
30									
35									
40		Clay content increases; moisture increases.							
45									

BORING LOG

Project: Tract No. 5241 Location: Colinas de Capistrano

Boring No.: 3 Cont'd. Elevation: 353± Drill Date: 11/12/88

Job No.: 237-88 Logged By: AB/TD Driving Weight:

Depth - Ft.	Graphic Log	Description of Materials	Unified Soil Class.	Penetration Blows/Ft.	CORE	BAG	Dry Density Lbs/Cu.Ft.	Moisture %	Relative Comp. - %
		SLIDE DEBRIS - Cont'd.		16	■		98.6	26.5	
		Attitude of gypsum filled fractures: N72W 88NE							
		6" by 6" siliceous nodule.							
55									
60									
65									
70									

BORING LOG

Project: Tract No. 5241 Location: Colinas de Capistrano

Boring No.: 3 Cont'd. Elevation: 353± Drill Date: 11/12/88

Job No.: 237-88 Logged By: AB/TD Driving Weight:

Depth - Ft.	Graphic Log	Description of Materials	Unified Soil Class.	Penetration Blows/Ft.	CORE	BAG	Dry Density Lbs/Cu.Ft.	Moisture %	Relative Comp. — %
		Seepage on west side of hole only.		12	■		93.0	29.0	
		Slide Plane with slicks downdip: N-S 59E.							
		SLIDE PLANE: N15W 60NE; becoming more dense below slide plane.							
80									
		SLIDE PLANE: N25E 66SE.							
85		SLIDE PLANE: N25E 59SE.							
		Clay content increases.							
		Slide Plane with slicks downdip and a 6" clay gouge zone above slide plane: N12E 48SE. Becoming more dense below slide plane.							
90									
95		Seepage; Slide Plane: N-S 45E.							

BORING LOG

Project: Tract No. 5241 Location: Colinas de Capistrano

Boring No.: 3 Cont'd. Elevation: 353± Drill Date: 11/12/88

Job No.: 237-88 Logged By: AB/TD Driving Weight:

Depth - Ft.	Graphic Log	Description of Materials	Unified Soil Class.	Penetration Blows/Ft.	CORE	BAG	Dry Density Lbs/Cu.Ft.	Moisture %	Relative Comp. - %
				30	■		91.4	29.8	
		SLIDE PLANE: N-S 45E.							
105		Slide Plane with slicks downdip: N20E 33SE.							
110									
115		Slide Plane with slicks downdip: N18E 38SE. SLIDE PLANE: N20E 38SE. SLIDE PLANE: N45E 29SE.							
120		SLIDE PLANE: N10E 28SE. SLIDE PLANE: N25E 38SE. SLIDE PLANE: N25E 38SE.							

BORING LOG

Project: Tract No. 5241 Location: Colinas de Capistrano

Boring No.: 3 Cont'd. Elevation: 353± Drill Date: 11/12/88

Job No.: 237-88 Logged By: AB/TD Driving Weight:

Depth - Ft.	Graphic Log	Description of Materials	Unified Soil Class.	Penetration Blows/Ft.	CORE	BAG	Dry Density Lbs/Cu.Ft.	Moisture %	Relative Comp. - %
				35	■		97.0	25.2	
		SLIDE PLANE: N55E 58SE.							
		SLIDE PLANE: N55E 58SE.							
130									
135									
140									
145									
		Becoming very dense.							

BORING LOG

Project: Tract No. 5241 Location: Colinas de Capistrano

Boring No.: 3 Cont'd. Elevation: 353± Drill Date: 11/12/88

Job No.: 237-88 Logged By: AB/TD Driving Weight:

Depth - Ft.	Graphic Log	Description of Materials	Unified Soil Class.	Penetration Blows/Ft.	CORE	BAG	Dry Density Lbs/Cu.Ft.	Moisture %	Relative Comp. — %
		SLIDE DEBRIS - Cont'd.							
155									
160									
165									
170									

BORING LOG

Project: Tract No. 5241 Location: Colinas de Capistrano

Boring No.: 3 Cont'd. Elevation: 353± Drill Date: 11/12/88

Job No.: 237-88 Logged By: AB/TD Driving Weight:

Depth - Ft.	Graphic Log	Description of Materials	Unified Soil Class.	Penetration Blows/Ft.	CORE	BAG	Dry Density Lbs/Cu.Ft.	Moisture %	Relative Comp. - %
		SLIDE DEBRIS - Cont'd.							
180									
		Slide Plane with slicks downdip and 1/2" clay gouge zone above: N30E 24SE.							
185									
190									
195									

BORING LOG

Project: Tract No. 5241 Location: Colinas de Capistrano

Boring No.: 3 Cont'd. Elevation: 353± Drill Date: 11/12/88

Job No.: 237-88 Logged By: AB/TD Driving Weight:

Depth - Ft.	Graphic Log	Description of Materials	Unified Soil Class.	Penetration Blows/Ft.	CORE	BAG	Dry Density Lbs/Cu.Ft.	Moisture %	Relative Comp. - %
		SLIDE PLANE: N35E 32SE SLIDE PLANE: N55E 17SE SLIDE PLANE: N35E 35SE SLIDE PLANE: N35E 35SE							
205									
		Total Depth of Hole - 207.0 feet No Caving No Groundwater Measured - 11/18/88 Backfilled 11/18/88							
210									

BORING LOG

Project: Tract No. 5241 Location: Colinas de Capistrano

Boring No.: 4 Elevation: 230± Drill Date: 11/15/88

Job No.: 237-88 Logged By: AB Driving Weight:

Depth - Ft.	Graphic Log	Description of Materials	Unified Soil Class.	Penetration Blows/Ft.	CORE	BAG	Dry Density Lbs/Cu.Ft.	Moisture %	Relative Comp. - %
		SLIDE DEBRIS: Clayey Silt; light brown; highly weathered and fractured.							
5									
		Fracture: N70E 80SE.							
10									
		Becoming moist. Becoming unoxidized; dark gray. Approximately horizontal gypsum fill fracture.							
15		1/4" gypsum filled fracture: N30E 24SE. Becoming dense with no fractures.							
20									

BORING LOG

Project: Tract No. 5241 Location: Colinas de Capistrano

Boring No.: 4 Cont'd. Elevation: 230± Drill Date: 11/15/88

Job No.: 237-88 Logged By: AB Driving Weight:

Depth - Ft.	Graphic Log	Description of Materials	Unified Soil Class.	Penetration Blows/Ft.	CORE	BAG	Dry Density Lbs/Cu.Ft.	Moisture %	Relative Comp. - %
		SLIDE DEBRIS - Cont'd.		10	■		92.1	28.9	
30									
		Slight seepage along fracture: N48E 75NW.							
35		Slight seepage along fracture: E-W 65N.							
40		4-inch diameter siliceous nodule. Fracture: E-W 52N.							
45									

BORING LOG

Project: Tract No. 5241 Location: Colinas de Capistrano

Boring No.: 4 Cont'd. Elevation: 230± Drill Date: 11/15/88

Job No.: 237-88 Logged By: AB Driving Weight:

Depth - Ft.	Graphic Log	Description of Materials	Unified Soil Class.	Penetration Blows/Ft.	CORE	BAG	Dry Density Lbs/Cu.Ft.	Moisture %	Relative Comp. - %
		SLIDE DEBRIS - Cont'd.		10	■		95.5	28.6	
		Slightly sandy layer; horizontal; with seepage.							
		1.0' thick, very fine grained sand layer; approximately horizontal.							
55									
60									
65									
70									

BORING LOG

Project: Tract No. 5241 Location: Colinas de Capistrano

Boring No.: 4 Cont'd. Elevation: 230± Drill Date: 11/15/88

Job No.: 237-88 Logged By: AB Driving Weight:

Depth - Ft.	Graphic Log	Description of Materials	Unified Soil Class.	Penetration Blows/Ft.	CORE	BAG	Dry Density Lbs/Cu.Ft.	Moisture %	Relative Comp. - %
				10	■		89.6	31.4	
80		SLIDE PLANE: 6" remolded clay gouge zone above slide plane: N10E 7NW. Dense siltstone below slide plane.							
85									
90									
95		Fracture: N60E 85SE.							
		At 99.5 feet: Slide Plane: N20E 4NW. Very thin plastic clay.							

BORING LOG

Project: Tract No. 5241 Location: Colinas de Capistrano

Boring No.: 4 Cont'd. Elevation: 230± Drill Date: 11/15/88

Job No.: 237-88 Logged By: AB Driving Weight:

Depth - Ft.	Graphic Log	Description of Materials	Unified Soil Class.	Penetration Blows/Ft.	CORE	BAG	Dry Density Lbs/Cu.Ft.	Moisture %	Relative Comp. - %
		BEDROCK: Siltstone; dark gray; massive; dense.		30	■		87.8	33.8	
105									
110									
		Total Depth of Hole - 112.0 feet No Caving No Groundwater		40	■		95.0	28.0	
115									
120									

BORING LOG

Project: Tract No. 5241 Location: Colinas de Capistrano

Boring No.: 5 Elevation: 220± Drill Date: 11/16/88

Job No.: 237-88 Logged By: TD Driving Weight:

Depth: Ft.	Graphic Log	Description of Materials	Unified Soil Class.	Penetration Blows/Ft.	CORE	BAG	Dry Density Lbs/Cu.Ft.	Moisture %	Relative Comp. — %
		ALLUVIUM: Silty Clay; black to brown; wet; soft; scattered gravel.							
5									
10				3		■	89.5	33.4	
15		Groundwater.							
20		Total Depth of Hole - 18.0 feet Groundwater at 15.0 feet Caving below 15.0 feet Backfilled 11/16/88							

BORING LOG

Project: Tract No. 5241 Location: Colinas de Capistrano

Boring No.: 6 Elevation: 230± Drill Date: 11/16/88

Job No.: 237-88 Logged By: AB Driving Weight:

Depth - Ft.	Graphic Log	Description of Materials	Unified Soil Class.	Penetration Blows/Ft.	CORE	BAG	Dry Density Lbs/Cu.Ft.	Moisture %	Relative Comp. - %
		COLLUVIUM: Silty Clay; dark brown; scattered gravel and cobble to 2.0 feet; dry to 1.0 foot; moist below.							
5									
10		Becomes light brown; rootholes.							
15									
		SLIDE DEBRIS: Highly weathered.							
20		Becomes dark brown.							
		SLIDE PLANE: N42E 42SE. Seepage. Unoxidized; fractured.							

BORING LOG

Project: Tract No. 5241 Location: Colinas de Capistrano

Boring No.: 6 Cont'd. Elevation: 230± Drill Date: 11/16/88

Job No.: 237-88 Logged By: AB Driving Weight:

Depth - Ft.	Graphic Log	Description of Materials	Unified Soil Class.	Penetration Blows/Ft.	CORE	BAG	Dry Density Lbs/Cu.Ft.	Moisture %	Relative Comp. - %
		SLIDE PLANE: N25E 32SE.							
		SLIDE PLANE: N30E 49SE. Fractures decrease below 27.0 feet.							
30									
35									
40									
45									

BORING LOG

Project: Tract No. 5241 Location: Colinas de Capistrano

Boring No.: 6 Cont'd. Elevation: 230± Drill Date: 11/16/88

Job No.: 237-88 Logged By: AB Driving Weight:

Depth - Ft.	Graphic Log	Description of Materials	Unified Soil Class.	Penetration Blows/Ft.	CORE	BAG	Dry Density Lbs/Cu.Ft.	Moisture %	Relative Comp. — %
		SLIDE PLANE: N-S 35E.							
		SLIDE PLANE: N-S 35E.							
55		SLIDE PLANE: N-S 35E.							
		SLIDE PLANE: N10E 59SE.							
60									
65									
70									
		SLIDE PLANE: N-S 50E.							

BORING LOG

Project: Tract No. 5241 Location: Colinas de Capistrano

Boring No.: 6 Cont'd. Elevation: 230± Drill Date: 11/16/88

Job No.: 237-88 Logged By: AB Driving Weight:

Depth - Ft.	Graphic Log	Description of Materials	Unified Soil Class.	Penetration Blows/Ft.	CORE	BAG	Dry Density Lbs/Cu.Ft.	Moisture %	Relative Comp. - %
80									
85		Slide Plane with 6" clay gouge zone above: N-S 2W; dark gray siltstone below slide plane.							
90		Total Depth of Hole - 90.0 feet Seepage at 22.0 feet Water Level at 83.0 feet - 11/18/88							
95									

GEOTECHNICAL BORING LOG

DATE 10/21/87 DRILL HOLE NO. LB-1 SHEET 1 OF 1

PROJECT Pacific/Colinas Sur PROJECT NO. 8871452-02

DRILLING CO. Contractor's Drilling Service TYPE OF RIG Bucket Auger

HOLE DIAMETER 24" DRIVE WEIGHT 2,200 # to 5' DROP 12

ELEVATION TOP OF HOLE ±374' REF. OR DATUM See Geotechnical Map

LOGGED BY BJM

SAMPLED BY BJM

Depth Feet	Graphic Log	Attitudes	Tube Sample No.	Blows Per Foot	Dry Density PCF	Moisture Content, %	Soil Class. (U.S.C.S.)	Geotechnical Description
0								
			1	1	98.0	14.1	SM	FILL: Light to medium brown, damp, silty sand; disseminated gypsum
							SC/ML	@ 3' Becomes clayey, silty sand; clast of gray, silty, fine-grained sand to sandy silt
			2	2	95.4	18.2	CL	
5								@ 5' Approximately 3 inches of dark brown, silty clay
10								
15								
20								
25								
30								

Total Depth = 5 Feet
No Ground Water Encountered
No Caving
Backfilled 10/21/87

GEOTECHNICAL BORING LOG

DATE 10/21 - 26/87 DRILL HOLE NO. IB-2 SHEET 1 OF 6

PROJECT Pacific/Colinas Sur PROJECT NO. 8871452-02

DRILLING CO. Contractor's Drilling Service TYPE OF RIG Bucket Auger

HOLE DIAMETER 24" DRIVE WEIGHT 2,220# to 23'/1,450# to 46'/700# to 69'/1,050# to 96'/1,400# to 117'/1,750# to 152'/2,100# to 176' DROP 12

ELEVATION TOP OF HOLE ±360' REF. OR DATUM ~~See Geotechnical Map~~

LOGGED BY RW

SAMPLED BY BJM

Depth Feet	Graphic Log (W–E)	Attitudes	Tube Sample No.	Blows Per Foot	Dry Density PCF	Moisture Content, %	Soil Class. (U.S.C.S.)	Geotechnical Description
0							SM	FILL: Medium brown, damp, silty, fine-grained sand; slightly clayey; massive; no distinct lifts
			1	4	108.7	18.1	ML	@ 3' Becomes mottled medium brown and gray, damp, clayey, silty, fine-grained sand to sandy, clayey silt
5							ML	LANDSLIDE DEPOSITS: Orange-brown, damp, stiff to medium stiff, clayey silt; broken; moderately oxidized
			2	2+push 3"	94.1	25.1		@ 5' Rootlets; scattered organics
								@ 8' Random shears on fracture surfaces; fractures short and discontinuous
10			3	2	95.7	16.5		
							CL/ML	@ 12' Disseminated gypsum
								@ 12.2' Fracture; fracture surface is polished, brown, iron oxide along fracture about 1/2 inch wide; no open structure; becomes micaceous, light gray soft, moist, silty clay to clayey silt below fracture
15		GRS:N44E/ 44°SE						
		GB:N5W/ 3-5°E					SM	@ 14.4'-14.9' (West wall) mashed zone; bottom surface polished paper thin clay with striations; striations in direction of dip; closely spaced
							ML	@ 16' shear truncates a 2-inch thick, light gray, sand bed on west wall
		GRS:N10W/ 64°E					SM	@ 18' Scattered rootlets; slide debris is fractured; numerous, short, discontinuous fractures; randomly oriented; fractures typically near-vertical
							ML	
20			4	2	100.7	21.2		
								@ 21' Abundant disseminated gypsum; numerous polished shear surfaces, randomly oriented; abundant manganese oxide staining on fracture surfaces; moderately clayey
		RS:N44E/ 38°E						
		RS:N3E/ 59°E						@ 22.5' Rupture surface: 1/8-inch thick plastic clay; highly polished; well striated; 2-inch thick, soft mash zone above clay; mashed for about 6 inches below the clay; striations in direction of dip; 6- to 8-inch thick mash zone below clay; abundant, yellow, disseminated clay/caliche stringers; becomes moderately stiff; soft, fractured siltstone slide debris below that; abundant oxidation
25		RS:N3-5W 51°E					ML	
30								@ 27' Soft to moderately stiff; very micaceous

DATE 10/21 - 26/87 DRILL HOLE NO. 1B-2 SHEET 2 OF 6

PROJECT Pacific/Colinas Sur PROJECT NO. 8871452-02

DRILLING CO. Contractor's Drilling Service TYPE OF RIG Bucket Auger

HOLE DIAMETER 24" DRIVE WEIGHT 2,220# to 23'/1,450# to 46'/700# to 69'/1,050# to 96'/1,400# to 117'/1,750# to 152'/2,100# to 176' DROP 12

ELEVATION TOP OF HOLE ±360' REF. OR DATUM ~~See Geotechnical Map~~

LOGGED BY RW

SAMPLED BY BJM

DEPTH FEET	GRAPHIC LOG (W E)	ATTITUDES	TUBE SAMPLE NO.	BLOWS PER FOOT	DRY DENSITY PCF	MOISTURE CONTENT, %	SOIL CLASS. (U.S.C.S.)	GEOTECHNICAL DESCRIPTION
30			5	5	94.0	28.0	ML	LANDSLIDE DEPOSITS (CONTINUED): Light gray, moist, soft to moderately stiff, clayey silt; very micaceous @ 30.5' Disseminated gypsum; moderately fractured with short, discontinuous joints; jointing near-vertical
35		J:N10E/ 74°W J:N19E/ 74°E S:N10E/ 70°E						@ 36' Well developed fractures with 1-inch thick gypsum seams; becomes moderately stiff to stiff @ 37.5' Seepage along fractures; well developed joints; continuous @ 38' Shear; well developed; paper-thin, polished surface; striations in dip direction; remolded, clayey silt to silty clay
40			6	6	95.8	27.8	ML	@ 40' Grades to dark gray, moist, stiff, clayey silt; unoxidized; massive; poorly fractured; micaceous; petroliferous odor
45			4					@ 45' Small concretionary layer approximately 2 inches thick
50			7	50/10"	96.5	26.3		
55								@ 54.5' to 55' Rounded concretion in west wall
60								

DATE 10/21 - 26/87 DRILL HOLE NO. LB-2 SHEET 3 OF 6

PROJECT Pacific/Colinas Sur PROJECT NO. 8871452-02

DRILLING CO. Contractor's Drilling Service TYPE OF RIG Bucket Auger

HOLE DIAMETER 24" DRIVE WEIGHT 2,220# to 23'/1,450# to 46'/700# to 69'/1,050# to 96'/1,400# to 117'/1,750# to 152'/2,100# to 176' DROP 12

ELEVATION TOP OF HOLE ±360' REF. OR DATUM ~~See Geotechnical Map~~

LOGGED BY RW

SAMPLED BY BJM

Depth Feet	Graphic Log (W E)	Attitudes	Tube Sample No.	Blows Per Foot	Dry Density PCF	Moisture Content, %	Soil Class. (U.S.C.S.)	Geotechnical Description
60			8	40	96.9	26.4	ML	LANDSLIDE DEPOSITS (CONTINUED): Dark gray, moist, stiff, clayey silt; unoxidized massive; micaceous; fossiliferous; organic odor
65								@ 64' As above; very hard to hard; massive; scattered pelecypods; slightly to moderately fissile structure; micaceous
70			5					
75								@ 74' As above
								@ 77' Moderate petroliferous odor
80			9	35	98.5	26.2		@ 81' 3-inch thick, 6-inch long concretion
		FR:N14E/ 73°W						@ 82' Fracture; moderately developed; west wall; possible shear; polished surface; no striations
85								@ 84' Concretion
								@ 85' Becomes stiff; short, discontinuous fractures with the same general orientation as the fracture above; softer than above
90								

GEOTECHNICAL BORING LOG

DATE 10/21 - 26/87 DRILL HOLE NO. LB-2 SHEET 4 OF 6

PROJECT Pacific/Colinas Sur PROJECT NO. 8871452-02

DRILLING CO. Contractor's Drilling Service TYPE OF RIG Bucket Auger

HOLE DIAMETER 24" DRIVE WEIGHT 2,220# to 23'/1,450# to 46'/700# to 69'/1,050# to 96'/1,400# to 117'/1,750# to 152'/2,100# to 176' DROP 12

ELEVATION TOP OF HOLE ±360' REF. OR DATUM ~~See Geotechnical Map~~

LOGGED BY RW

SAMPLED BY BJM

Depth Feet	Graphic Log (W–E)	Attitudes	Tube Sample No.	Blows Per Foot	Dry Density PCF	Moisture Content, %	Soil Class. (U.S.C.S.)	Geotechnical Description
90							ML	LANDSLIDE DEPOSITS (CONTINUED): Dark gray, moist, stiff, clayey silt; unoxidized; micaceous; fossiliferous; petroliferous odor
95			9				MH	@ 95' Concretion; free water coming out of the concretion
		SN:N8E/ 67°W	6				ML	@ 95'-95.8' Very plastic clay zone @ 96.5' Well developed shear appears to be a back shear; highly polished surface; striations in direction of dip
		RS:N13E/ 47°W	10					@ 97.5' Caving on west wall along shear; 1 to 1-1/2 feet deep; saturated; severe spalling @ 99' 2 to 3 inches thick, very plastic clay rupture
100		RS:N38E/ 44°E						@ 101.3' Probable rupture; series of shears over a 2-foot thick zone; continuous; oriented about the same as above; highly polished surfaces varying from paper thin to 1/4 inch thick; abundant water along the surfaces; very broken
		RS:N8E/ 33°SE Striations Trend: N42W/11°E						@ 103.8' Well developed rupture; 1/4-inch thick; striate severe caving/spalling from rupture zone; abundant seepage
105								NOT DOWN HOLE LOGGED BELOW 103.8 FEET - HOLE NOT SAFE Material below rupture surface @ 103.8 feet very broken; basal rupture not encountered (below logged depth) @ 105' Becomes clayey silt; tighter than the soft zone above but still not as competent as above the rupture surfaces
110			10	13	91.9	31.6		
115								@ ±115' Becomes more competent
120								

GEOTECHNICAL BORING LOG

DATE 10/21 - 26/87 DRILL HOLE NO. LB-2 SHEET 5 OF 6

PROJECT Pacific/Colinas Sur PROJECT NO. 8871452-02

DRILLING CO. Contractor's Drilling Service TYPE OF RIG Bucket Auger

HOLE DIAMETER 24" DRIVE WEIGHT 2,220# to 23'/1,450# to 46'/700# to 69'/1,050# to 96'/1,400# to 117'/1,750# to 152'/2,100# to 176' DROP 12

ELEVATION TOP OF HOLE ±360' REF. OR DATUM ~~See Geotechnical Map~~

LOGGED BY KW

SAMPLED BY BJM

DEPTH FEET	GRAPHIC LOG (W E)	ATTITUDES	TUBE SAMPLE NO.	BLOWS PER FOOT	DRY DENSITY PCF	MOISTURE CONTENT, %	SOIL CLASS. (U.S.C.S.)	GEOTECHNICAL DESCRIPTION
120							ML	LANDSLIDE DEPOSITS (CONTINUED): Dark gray, slightly moist, clayey silt; unoxidized micaceous; massive; fossiliferous; petroliferous odor
125			7					
130								@ 130' As above
135								
140			11	14	99.7	24.5		@ 140' As above
145								
150								

DATE 10/21 - 26/87 DRILL HOLE NO. LB-2 SHEET 6 OF 6

PROJECT Pacific/Colinas Sur PROJECT NO. 8871452-02

DRILLING CO. Contractor's Drilling Service TYPE OF RIG Bucket Auger

HOLE DIAMETER 24" DRIVE WEIGHT 2,220# to 23'/1,450# to 46'/700# to 69'/1,050# to 96'/1,400# to 117'/1,750# to 152'/2,100# to 176' DROP 12

ELEVATION TOP OF HOLE ±360' REF. OR DATUM See Geotechnical Map

LOGGED BY RW

SAMPLED BY BJM

Depth Feet	Graphic Log (W E)	Attitudes	Tube Sample No.	Blows Per Foot	Dry Density PCF	Moisture Content, %	Soil Class. (U.S.C.S.)	Geotechnical Description
150							ML	LANDSLIDE DEPOSITS (CONTINUED): Dark gray, slightly moist, clayey silt; unoxidized massive; micaceous; fossiliferous; petroliferous odor
155			8					
160								
								@ 162' As above; becomes moist
165								
						▽		@ 165' Becomes very moist
								@ 166' Concretion; standing water
								@ 168' Dark gray, very moist to wet, silty clay; micaceous
170								
175			12	18				
								Total Depth = 176 Feet Geologically Logged to 103.8 Feet - Unsafe Below Seepage Encountered at 37.5 and 95 Feet Standing Water at 166 Feet on 10/26/87 Caving Encountered at 98 Feet Backfilled 10/26/87
180								

GEOTECHNICAL BORING LOG

Date 11/3 - 6/87 Drill Hole No. LB-3 Sheet 1 of 10

Project Pacific/Colinas Sur Job No. 8871452-02

Drilling Co. Pitcher Drilling Type of Rig Rotary Wash

Hole Diameter 4-7/8" Drive Weight N/A Drop N/A in.

Elevation Top of Hole ±360' Ref. or Datum See Geotechnical Map

Depth Feet	Graphic Log	Attitudes	Tube Sample No.	Blows Per Foot	Dry Density pcf	Moisture Content, %	Soil Class. (U.S.C.S.)	GEOTECHNICAL DESCRIPTION Logged by RW/BJM Sampled by RW/BJM
0							ML	FILL: Tan to light brown silt to clayey silt (see Boring LB-2)
5							ML/MH	LANDSLIDE DEPOSITS: Gray mottled orange-brown, moist, stiff, clayey silt; moderately easy drilled (see Boring LB-2)
10								
15								
20								
25								
30								

GEOTECHNICAL BORING LOG

Date 11/3 - 6/87 Drill Hole No. LB-3 Sheet 2 of 10

Project Pacific/Colinas Sur Job No. 8871452-02

Drilling Co. Pitcher Drilling Type of Rig Rotary Wash

Hole Diameter 4-7/8" Drive Weight N/A Drop N/A in.

Elevation Top of Hole ±360' Ref. or Datum See Geotechnical Map

Logged by RW/BJM

Sampled by RW/BJM

Depth Feet	Graphic Log	Attitudes	Tube Sample No.	Blows Per Foot	Dry Density pcf	Moisture Content, %	Soil Class. (U.S.C.S.)	GEOTECHNICAL DESCRIPTION
30							ML/ MH	LANDSLIDE DEPOSITS (CONTINUED): Light gray mottled orange-brown, moist, stiff, clayey silt; micaceous
35								
								@ 42' Becomes dark gray, moist, stiff to very stiff, clayey silt; unoxidized; micaceous
45								@ 44' Small concretion zone
50								
55								
60								

GEOTECHNICAL BORING LOG

Date 11/3 - 6/87 Drill Hole No. LB-3 Sheet 3 of 10

Project Pacific/Colinas Sur Job No. 8871452-02

Drilling Co. Pitcher Drilling Type of Rig Rotary Wash

Hole Diameter 4-7/8" Drive Weight N/A Drop N/A in.

Elevation Top of Hole ±360' Ref. or Datum See Geotechnical Map

Depth Foot	Graphic Log	Attitudes	Tube Sample No.	Blows Per Foot	Dry Density pcf	Moisture Content, %	Soil Class. (U.S.C.S.)	GEOTECHNICAL DESCRIPTION Logged by RW/BJM Sampled by RW/BJM
60								LANDSLIDE DEPOSITS (CONTINUED): Dark gray, moist, stiff, clayey silt; unoxidized; massive; micaceous; fossiliferous
								@ 62' Becomes very stiff; drilling slowed; dark gray, clayey silt
								@ 63' Concretionary or cemented siltstone zone; very slow drilling
65								@ 64' Becomes stiff silt; increased drilling rate
								@ 65' Very difficult drilling; cemented zone; very stiff to hard
								@ 65.5' Becomes stiff to very stiff
70								
75								
80								
								@ 81' Becomes very stiff
85								@ 84' Becomes very clayey
90								

GEOTECHNICAL BORING LOG

Date 11/3 - 6/87 Drill Hole No. LB-3 Sheet 4 of 10

Project Pacific/Colinas Sur Job No. 8871452-02

Drilling Co. Pitcher Drilling Type of Rig Rotary Wash

Hole Diameter 4-7/8" Drive Weight N/A Drop N/A in.

Elevation Top of Hole ±360' Ref. or Datum See Geotechnical Map

Depth Feet	Graphic Log (W I E)	Attitudes	Blows Per Foot	Dry Density pcf	Moisture Content, %	Soil Class. (U.S.C.S.)	GEOTECHNICAL DESCRIPTION Logged by RW/BJM Sampled by RW/BJM
90						ML/MH	LANDSLIDE DEPOSITS (CONTINUED): Dark gray, moist stiff to very stiff, clayey silt; unoxidized; micaceous; fossiliferous; organic odor
95							@ 95' Begin continuous coring
		CS:N60-65E/24W					@ 96' Dark gray, moist, stiff to very stiff, slightly clayey silt; unoxidized; micaceous; fossiliferous; near-vertical, discontinuous fractures
100							@ 96.2' Paper-thin, silty clay shear @ 97.4' Paper-thin, silty clay shear
							@ 103' Tight drilling
105		CS:N79E/29S Str:N86E/12W CS:N8W/3-4W CS:N80E/3NW CS:N37E/6S					@ 104.8' Paper-thin shear; polished; slightly striated @ 105.2' & 105.4' Polished, paper-thin, very plastic shears @ 107.3' to 107.22 Six highly polished, paper-thin, very plastic shears
110		GB:N22E/22SE CS:N14W/25E Grv:NS1W/21S Str:N41E/24NE CS:N64W/34NE Str:N18W/83N GB:N44W/22SW CS:N53W/20NE GCS:N35E/6E					@ 109.2' Paper-thin, silty, clay lamina @ 109.3' Polished, paper-thin to 1/8-inch thick, very plastic shear; grooved in one direction; slightly striated in another @ 109.8' Paper-thin, silty, clay lamina; very slightly striated in direction of dip
115		GB:N27E/40NW CS:N71E/0-1N CS:N42W/10-11SW Str:N41E/8SW GB:N2-4E/6-8NW GB:N34E/25W					@ 111.8' Paper-thin, silty, clay lamina @ 112.4 to 112.9' Nine polished, paper-thin shears; all dipping eastward; plastic to very plastic @ 113.9' Paper-thin, polished shear @ 114.2' Paper-thin, clay to silty clay lamina (not polished)
120							

GEOTECHNICAL BORING LOG

Date 11/3 - 6/87 Drill Hole No. LB-3 Sheet 5 of 10

Project Pacific/Colinas Sur Job No. 8871452-02

Drilling Co. Pitcher Drilling Type of Rig Rotary Wash

Hole Diameter 4-7/8" Drive Weight N/A Drop N/A in.

Elevation Top of Hole ±360' Ref. or Datum See Geotechnical Map

Depth Feet	Graphic Log	Attitudes	Blows Per Foot	Dry Density pcf	Moisture Content, %	Soil Class. (U.S.C.S.)	GEOTECHNICAL DESCRIPTION Logged by RW/BJM Sampled by RW/BJM
120							
		CS:N89W/8S GB:N51W/16SW CS:N41E/7S J:N55W/40S					LANDSLIDE DEPOSITS (CONTINUED): Dark gray, stiff to very stiff, clayey silt; unoxidized; micaceous; fossiliferous; organic odor @ 114.2 to 115.4' More massive; very stiff @ 115.4 to 115.9' Six paper-thin to 1/16-inch thick, polished shears
125		CS:Dip 4-6° GB:Dip 9° GB:Dip 9° CS:Dip 0-1°					@ 116.8' Polished paper-thin shear; striated in direction of dip @ 117' Becomes sandy silt @ 117.2 to 117.7' Ten clayey silt laminae (approximately 1/8 inch thick each); near-horizontal dips @ 119.4' Grades to clayey silt; clasts of sandy silt up to 1 inch long
130		CS:Dip 14° Str:Approx.Dip 9° CS:Dip 6-7° CS:Dip 9° CS:Dip 21-22° Str:Dip 16-17° CS:Dip 8°	Where strike is not provided, dips are assumed to be true dip to southeast along Cross Section A-A'				@ 120.9 to 121.3' Seven paper-thin to 1/16-inch thick polished clay seams; plastic @ 122.1' Paper-thin, silty, clay lamina @ 122.3 to 123.1' Fifteen paper-thin to 1/8-inch thick, polished clayseams @ 124 and 124.3' Joints @ 124.8 to 125.2 Eight paper-thin, moderately polished clay seams dipping approximately 3 degrees @ 125.5' Approximate 1/4 inch clay seam @ 126.6' Approximate 1/2 inch clay seam; sample broken and wet along these very plastic cones
140		J: Dip ±43° J: Dip ±57° GB: Dip 3-4°					@ 127.1 Silty, clay lamina (paper-thin) @ 127.7' Slightly polished, silty, clay lamina @ 127.9 to 128.6' Twelve paper-thin, polished, clay seams with shallow dips @ 128.9' Paper-thin clay seam; slightly polished; slightly striated in direction of dip (5 degree angle with true dip)
145		CS: Dip 47° Str:Approx.Dip 46° GB: Dip 9° CS:N27W/5NE Str:N16E/2-3NE					@ 129.2, 129.7, 130.1, 130.3, 130.5' Paper-thin, slightly polished clay lamina (the clay seam @ 130.3 is more polished than the others @ 132.4 to 132.6' Five Polished clay seams
150							

GEOTECHNICAL BORING LOG

Date 11/3 - 6/87 Drill Hole No. LB-3 Sheet 6 of 10

Project Pacific/Colinas Sur Job No. 8871452-02

Drilling Co. Pitcher Drilling Type of Rig Rotary Wash

Hole Diameter 4-7/8" Drive Weight N/A Drop N/A in.

Elevation Top of Hole ±360' Ref. or Datum See Geotechnical Map

Depth Feet	Graphic Log	Attitudes	Blows Per Foot	Dry Density pcf	Moisture Content, %	Soil Class. (U.S.C.S.)	GEOTECHNICAL DESCRIPTION Logged by RW/BJM Sampled by RW/BJM
150							LANDSLIDE DEPOSITS (CONTINUED):
		GB:Dip 2° CS:Dip 13° CS:Dip 24° Str:Approx.Dip 23°					Dark gray, stiff to very stiff, clayey silt; unoxidized; micaceous; fossiliferous; organic odor @ 133.9' Slightly polished clay seam; low-angle dip
		GB:Dip 2° CS:Dip 27° Str:Approx.Dip 24°					@ 134' Polished clay seam; slightly striated in a direction 27 degrees from true dip
155							
		CS:Dip 20° CS:Dip 27°					@ 134.3 to 134.9' Eight polished clay seams; low-angle dips @ 136.3 to 138.2' Massive
		CS:Dip 6-7° CS:Dip 31° Str:Approx.Dip 30°					@ 138.2' Polished, paper-thin clay seams @ 141.5, 142, 142.3, 142.7 Possible fractures or joints dipping approximately 43 to 57 degrees
160							
		GB:Dip 13° J?:Dip 43° CS:Dip 19-20° Str:Approx.Dip 15°	Where strikes are not provided, dips are considered true dips to southeast along Cross Section A-A'				@ 143.2' Paper-thin, silty, clay lamina @ 144.3, 144.9' Silty lamina @ 146.8' Slightly polished, paper-thin clay seam; striated in direction of dip
		J?:Dip 43° CS:Dip 31° CS:Dip 46° CS:Dip 3° CS?:Dip 41° CS:Dip 2° CS:Dip 5° GB:Dip 14-15°					@ 148.5' Very slightly polished, paper-thin clay seam; slightly striated
165							
							@ 149.9 to 150.6' Six polished to slightly polished, paper-thin clay seams @ 151.6' Polished, paper-thin clay seam @ 152.1' Polished, paper-thin clay seam; slightly striated in direction of dip @ 153.7' Slightly polished clay lamina
170		CS:Dip 2° CS:Dip 24° CS:N44W/1-2NE CS:N31W/9E CS:Dip 10-11° Str:Approx.Dip 9°					@ 154.1' Slightly polished clay seam; striated at a 26 degree angle to true dip @ 155.8' Slightly polished clay lamina @ 156.7, 156.9' Slightly polished, silty clay seams
175		CS:Dip 33-34° CS:Dip 10° Str:Approx.Dip 9° J:Dip 26-27° CS:Dip 22° J:Dip 64° CS:Dip 35° Str:Approx.Dip 32°					@ 157.7' Polished, paper-thin clay seam; slightly striated @ 158.5' Polished, paper-thin clay seam @ 158.8' Slightly polished, paper-thin clay seam; striated in direction of dip @ 160.8' Slightly polished, silty, clay seam; striated at a 30 degree angle from true dip
180							

GEOTECHNICAL BORING LOG

Date 11/3 - 6/87 Drill Hole No. LB-3 Sheet 7 of 10

Project Pacific/Colinas Sur Job No. 8871452-02

illing Co. Pitcher Drilling Type of Rig Rotary Wash

Hole Diameter 4-7/8" Drive Weight N/A Drop N/A in.

Elevation Top of Hole ±360' Ref. or Datum See Geotechnical Map

Depth Feet	Graphic Log	Attitudes	Blows Per Foot	Dry Density pcf	Moisture Content, %	Soil Class. (U.S.C.S.)	GEOTECHNICAL DESCRIPTION Logged by RW/BJM Sampled by RW/BJM
180		GB:Dip 19° GB:Dip 10° J:Dip 43-47° Fr:N1-2W/86-89E CS:N34W/2-3W CS:N17E/5W GB:Dip 5° CS:Dip 3-4° CS:Dip 7-8° CS:Dip 20-21° Str:Approx.Dip 20° J? or CS:Dip 23° CS:Dip 45° CS:Dip 20-21° CS:6° CS:4° GB:Dip 5-6° CS:Dip 7-10° Fr?:Dip 61-62NW J: Dip 40-41° GB:N46W/5-6E GB:N60W/2-3S CS:N44W/7E GB:Dip 12° J: Dip 41° GB: Dip 5-6° GB: Dip 1-2° GB: Dip 0-1°	Where strikes are not provided, dips are considered true dips to southeast along Cross Section A-A'				LANDSLIDE DEPOSITS (CONTINUED): Dark gray, stiff to very stiff, clayey silt; unoxidized; micaceous; fossiliferous; organic odor @ 162.2' Two paper-thin clay seams; both polished and striated; however, striations are at an angle of 58 degrees to each other @ 162.8 Paper-thin, polished clayseam @ 163 to 163.5' Six paper-thin, polished, plastic clay seams @ 164.1' Slightly polished, paper-thin, silty clay seam @ 164.9 to 165.4' Seven paper-thin, polished, plastic clay seams @ 168 to 168.2' Four paper-thin, polished, plastic clay seams @ 168.3' 1/16 inch thick, polished clay seam @ 168.4' 1/8-inch thick, polished clay seam; plastic @ 169.4 to 170' Fourteen paper-thin, polished clay, plastic seams @ 171.3' Becomes very stiff (to hard?) @ 171.8' Slightly polished, slightly striated, silty, clay lamina (paper-thin) @ 172' Two polished, striated, paper-thin clay laminae; striations at 24 degree angle to true dip @ 173' Slightly polished, slightly striated, silty clay seam (striations at approximate 3 degree angle with dip) @ 174.4' Paper-thin, polished clay seam; joint immediately below @ 174.9' Slightly polished, paper-thin, slightly striated, silty clay seam at an angle of 42 degrees to true dip @ 175.2, 175.4, 175.6 Paper-thin, silty clay laminae @ 175.9, 176.2 Slightly polished, paper-thin clay laminae
185							
195							
200							
205							
210							

GEOTECHNICAL BORING LOG

Date 11/3 - 6/87 Drill Hole No. LB-3 Sheet 8 of 10

Project Pacific/Colinas Sur Job No. 8871452-02

Drilling Co. Pitcher Drilling Type of Rig Rotary Wash

Hole Diameter 4-7/8" Drive Weight N/A Drop N/A in.

Elevation Top of Hole ±360' Ref. or Datum See Geotechnical Map

Depth Foot	Graphic Log W E	Attitudes	Blows Per Foot	Dry Density pcf	Moisture Content, %	Soil Class. (U.S.C.S.)	GEOTECHNICAL DESCRIPTION Logged by RW/BJM Sampled by RW/BJM
210		GB:Dip 2° Fr:Dip 14-16° GB:Dip 1-2° GB:Dip 19-20° Fr:Dip 49-50° CS:N19E/10SE Str:N67E/8NE GB:N83E/2NW CS or Fr:N9W/41E GB:N30W/60E	Where strikes are not provided, dips are considered true dips to southeast along Cross Section A-A'				LANDSLIDE DEPOSITS (CONTINUED): Dark gray, stiff to very stiff, clayey silt; micaceous; fossiliferous; organic odor @ 179.6' Top of near-vertical fracture lined with paper-thin, slightly polished, silty clay @ 180.9 to 181.5' Eight paper-thin, very polished clay seams; generally dipping shallowly to the southwest @ 183.1 to 183.8 Eleven very polished, paper-thin clay seams with shallow dips @ 184' Paper-thin, slightly polished, striated, silty clay seam (striations nearly parallel to true dip) @ 185.7' A steeply dipping (45°) paper-thin, striated clay seam truncates a nearly horizontal, very slightly striated, paper-thin clay seam @ 185.7' A steeply dipping (45°) paper-thin, striated clay seam truncates a nearly horizontal, very slightly striated, paper-thin clay seam @ 187.1' Slightly polished, paper-thin clay seam @ 187.6 to 187.9' Four polished, paper-thin clay seams with shallow dips @ 187.1, 189.4, 189.5' Paper-thin, silty, clay laminae @ 189.6 to 190.3 Eleven polished, paper-thin clay seams with shallow dips @ 191.6, 191.9, 192, 192.6, 193, 193.3, and 193.5' Silty clay seams/laminae @ 197.3' Possible fracture @ 199' Grades to dark brown to brown, slightly moist to moist, dense to very dense, silty, very fine-grained @ 200' Interfingers with dark gray, clayey siltstone @ 200.2' 1/16 inch thick, clayey silt lamina
215							
0							

GEOTECHNICAL BORING LOG

Date 11/3 - 6/87 Drill Hole No. LB-3 Sheet 9 of 10

Project Pacific/Colinas Sur Job No. 8871452-02

illing Co. Pitcher Drilling Type of Rig Rotary Wash

Hole Diameter 4-7/8" Drive Weight N/A Drop N/A in.

Elevation Top of Hole ±360' Ref. or Datum See Geotechnical Map

Depth Feet	Graphic Log	Attitudes	Tube Sample No.	Blows Per Foot	Dry Density pcf	Moisture Content, %	Soil Class. (U.S.C.S.)	GEOTECHNICAL DESCRIPTION Logged by RW/BJM Sampled by RW/BJM
								LANDSLIDE DEPOSITS (CONTINUED): Dark gray, stiff to very stiff, clayey siltstone; unoxidized; micaceous; fossiliferous; organic odor @ 200.4' Grades back to clayey siltstone with thin clayseams @ 200.4 to 201' Nine to 10 polished, paper-thin to 1/16 inch thick, silty clay seams @ 201.3 to 206.4 Massive, clayey siltstone @ 206.3' 0.1 inch thick, silty, very fine-grained sandstone lamina; wet, silty clay immediately below @ 206.5 to 207.4' Very laminated; alternating paper-thin to 1/4 inch thick, silty and silty clay lamina (up to 50 silty clay laminae) all with nearly horizontal dips @ 207.4 to 207.8 Less well laminated; however, silty clay laminae are slightly polished to polished @ 207.8 to 208.5 Very laminae @ 210, 210.2, 210.4, 210.6' Very slightly polished, paper-thin clay seams @ 210.4' Fracture; infilled with white carbonate or gypsum @ 212.3' Appears wet @ 212.8 to 212.9' Three paper-thin, silty clay laminae @ 213 to 213.7' Silty, very fine-grained sandstone @ 213.7' Paper-thin, silty clay lamina; nearly horizontal @ 213.9' Steep fracture lined with paper-thin clay; striated in direction of dip @ 213.9' Becomes very stiff, dark gray, clayey siltstone @ 214.8, 215.2, 215.3, 215.4, 215.6, 215.8, 216, 216.4, 216.7, 217.2' Not polished to very slightly polished @ 217.5 to 218.3' Very laminated @ 218.2' Polished clay seam (paper-thin); striated at a 40 degree angle to true dip

GEOTECHNICAL BORING LOG

Date 11/3 - 6/87 Drill Hole No. LB-3 Sheet 10 of 10

Project Pacific/Colinas Sur Job No. 8871452-02

Drilling Co. Pitcher Drilling Type of Rig Rotary Wash

Hole Diameter 4-7/8" Drive Weight N/A Drop N/A in.

Elevation Top of Hole ±360' Ref. or Datum See Geotechnical Map

Depth Feet	Graphic Log	Attitudes	Tube Sample No.	Blows Per Foot	Dry Density pcf	Moisture Content, %	Soil Class. (U.S.C.S.)	GEOTECHNICAL DESCRIPTION Logged by RW/BJM Sampled by RW/BJM
								LANDSLIDE DEPOSITS (CONTINUED): Dark gray, stiff to very stiff, clayey siltstone; unoxidized; micaceous; fossiliferous; organic odor @ 218.6' Paper-thin, silty clay lamina; truncated against a fracture or shear-lined with a polished, paper-thin clay seam @ 219.2 to 219.6' 1 to 2 inch thick, silty, very fine-grained sand bed; steeply dipping eastward Total Depth = 220 Feet Backfilled 11/6/87

DATE November 23, 1987 DRILL HOLE NO. LB-4 SHEET 1 OF 4

PROJECT Pacific/Colinas Sur PROJECT NO. 8871452-03

DRILLING CO. Contractor's Drilling Service TYPE OF RIG Bucket Auger

HOLE DIAMETER ±24" DRIVE WEIGHT 2,200# to 23'; 1,450# to 45'; 700# to 69'; 1,050# to 96'; 1,400# to 117'; 1,750# t DROP 12

ELEVATION TOP OF HOLE ±297' REF. OR DATUM See Geotechnical Map

LOGGED BY RKW

SAMPLED BY RKW

Depth Feet	Graphic Log (W E)	Attitudes	Tube Sample No.	Blows Per Foot	Dry Density PCF	Moisture Content, %	Soil Class. (U.S.C.S.)	Geotechnical Description
0							ML	FILL: Medium brown, moist to stiff, fine-grained, sandy, clayey silt; upper 6 inches loose; scattered topsoil chunks; silt fragments; iron oxide staining; rootlets in upper 8 inches
			①					@ 2' Becomes stiff, occasional subrounded to sub-angular concretions and gravel
5			1	2	93.3	21.9		@ 3' Medium to dark brown, disseminated gypsum throughout; massive; unable to determine lift thickness; irregular lower contact
								LANDSLIDE DEPOSITS: Medium gray mottled orange-brown, slightly moist, stiff, clayey silt; iron oxide stained blebs and disseminated gypsum throughout; micaceous; massive to slightly bedded; weathered and jointed
							MH	@ 9' Irregular, silty, fine-grained sand clasts; iron oxide stained on outer edges
10		B:N14E/6°NW	2	2	94.2	18.2		@ 10' Two to 4-inch thick, very irregular, discontinuous sand bed
		S:N13E/31°SE						@ 11.2' Becomes less weathered than above
								@ 11.5' Slightly sheared below
			②					
		J:N7E/87°SE						
15		B:N24E/16°SE	3	5	98.4	21.5		@ 15' Disseminated gypsum and iron oxide on joints; iron oxide stained possible bedding; 4 to 6 inches apart; gypsum up to 1/4 inch thick
		GB:N32W/16NE						@ 15.5' Manganese oxide staines on joints
								@ 17 to 18' Grades to brown-gray, moist, stiff to very stiff, clayey silt; slightly sandy; massive; micaceous
20		F:N44E/88°SE						
								@ 21.6' Oblong concretion on east wall
								@ 22' Infilled gypsum up to 1/4 inch thick along jointing
		B:N58W/15°NE						@ 22.8 to 24' Abundant joints and fractures; dipping east; gypsum infilled (up to 1/8 inch thick)
25								@ 24' Decrease in jointing
		GF:N30-50E/ 10-18°SE	4 ③	8	88.6	35.3		@ 26' Discontinuous, low-angle joints and/or fractures infilled with gypsum, 2 to 5 inches apart
30								@ 29' Joints and fractures become 6 to 10 inches apart

DATE November 23, 1987 DRILL HOLE NO. LB-4 SHEET 2 OF 4

PROJECT Pacific/Colinas Sur PROJECT NO. 8871452-03

DRILLING CO. Contractor's Drilling Service TYPE OF RIG Bucket Auger

HOLE DIAMETER ±24" DRIVE WEIGHT 2,200# to 23'; 1,450# to 45'; 700# to 69'; 1,050# to 96'; 1,400# to 117'; 1,750# DROP 12

ELEVATION TOP OF HOLE ±297' REF. OR DATUM See Geotechnical Map

LOGGED BY RKW

SAMPLED BY RKW

Depth Feet	Graphic Log (W–E)	Attitudes	Tube Sample No.	Blows Per Foot	Dry Density PCF	Moisture Content, %	Soil Class. (U.S.C.S.)	Geotechnical Description
30							MH	LANDSLIDE DEPOSITS (CONTINUED):
		F:N33W/13°NE						@ 32.5' Six-inch high, 12-inch long concretion on east wall
								@ 33' Brown-gray, moist, stiff to very stiff, fine-grained, sandy silt; massive; micaceous; scattered disseminated gypsum; gradational upper contact; minor oxide stains on beds
35		F:N30W/20°NE	5	14	94.2	28.7		@ 35' Joints and fractures; discontinuous; gypsum-lined
								@ 37.8' Contains unoxidized zones
							MH/CH	@ 38.8' Dark gray, moist, very stiff, fine-grained, sandy, clayey silt to silty clay; massive; micaceous
40								
		J/F:N10W/32E						
								@ 43' Scattered, discontinuous, oxide-stained and gypsum-lined joints; up to 1/8 inch thick gypsum
		J/F:N37W/ 87°SW						@ 43.5' Less jointed below
45			6	20	92.7	29.2		@ 44.2' 3 to 4 inch tall, 12 inch long oxidized siltstone clast
		F:N24E/16°SE						@ 46.4' Discontinuous, gypsum-lined fracture; 3/4 around hole; dips southeast; oxidized 1/2 inch above and below
50								
								@ 50' 4 to 5 inch tall, 2 foot long, silty, fine-grained sandstone concretion; oxide-stained and gypsum-lined along concretion edge; minor seepage along bottom of concretion
								@ 51' Scattered, discontinuous, gypsum-lined fractures dipping 35 to 65 degrees east
55		F:N86E/86°N						
								@ 55.8' Minor jointing below
60								

DATE November 23, 1987 DRILL HOLE NO. LB-4 SHEET 3 OF 4

PROJECT Pacific/Colinas Sur PROJECT NO. 8871452-03

DRILLING CO. Contractor's Drilling Service TYPE OF RIG Bucket Auger

HOLE DIAMETER ±24" DRIVE WEIGHT 2,200# to 23'; 1,450# to 45'; 700# to 69'; 1,050# to 96'; 1,400# to 117'; 1,750# DROP 12

ELEVATION TOP OF HOLE ±297 REF. OR DATUM See Geotechnical Map

LOGGED BY RKW

SAMPLED BY RKW

Depth Feet	Graphic Log (W E)	Attitudes	Tube Sample No.	Blows Per Foot	Dry Density PCF	Moisture Content, %	Soil Class. (U.S.C.S.)	Geotechnical Description
60		J:N72E/77°N					CH	LANDSLIDE DEPOSITS (CONTINUED): Dark gray, moist, dense to very dense, sandy, silty clay; massive; micaceous; unoxidized
65			7	50/11"	90.1	31.4		
70		S:N67E/34°SE						
								@ 73.5' 18-inch long, discontinuous, poorly defined shear
75		S:N88W/58°S						@ 76' North wall - 12-inch by 14-inch concretion; top west side has well developed shear; minor seepage along bottom
								@ 76' Increase in clay content
80								
								@ 83.7' 6-inch thick zone of small pebble-size concretions on northwest wall
85								@ 84.8' 2-inch thick zone of pebble-size sandstone clasts west wall; slightly friable
			8	39	93.6	28.3		
90								

DATE November 23, 1987 DRILL HOLE NO. LB-4 SHEET 4 OF 4

PROJECT Pacific/Colinas Sur PROJECT NO. 8871452-03

DRILLING CO. Contractor's Drilling Service TYPE OF RIG Bucket Auger

HOLE DIAMETER ±24" DRIVE WEIGHT 2,200# to 23'; 1,450# to 45'; 700# to 69'; 1,050# to 96'; 1,400# to 117'; 1,750# DROP 12

ELEVATION TOP OF HOLE ±297' REF. OR DATUM See Geotechnical Map

DEPTH FEET	GRAPHIC LOG (W E)	ATTITUDES	TUBE SAMPLE NO.	BLOWS PER FOOT	DRY DENSITY PCF	MOISTURE CONTENT, %	SOIL CLASS. (U.S.C.S.)	GEOTECHNICAL DESCRIPTION (LOGGED BY RKW; SAMPLED BY RKW)
90							CH	LANDSLIDE DEPOSITS (CONTINUED): Dark gray, moist, very dense, slightly sandy, silty clay; massive; micaceous; unoxidized
95								
100		J:N82W/78°N						@ 100.3' Continuous joint; no gypsum or iron oxide stains
105			9	40	93.5	29.5		
		J:N32W/73°E						
110								@ 109' 18-inch diameter concretion; east wall; minor seepage below
115								
120			10	25	89.6	31.3		Total Depth = 120 Feet Geologically Logged to 117 Feet Minor Seepage Encountered at 50.8, 77, and 109 Feet No Caving; Backfilled 11/23/87

DATE November 24, 1987 DRILL HOLE NO. LB-5 SHEET 1 OF 5

PROJECT Pacific/Colinas Sur PROJECT NO. 8871452-03

DRILLING CO. Contractor's Drilling Service TYPE OF RIG Bucket Auger

HOLE DIAMETER ±24" DRIVE WEIGHT 2,200# to 23'; 1,450# to 45'; 700# to 69'; 1,050# to 96'; 1,400# to 117'; 1,750# t ~~2,100# to 150~~ DROP 12

ELEVATION TOP OF HOLE ±356' REF. OR DATUM See Geotechnical Map

DEPTH FEET	GRAPHIC LOG (W–E)	ATTITUDES	TUBE SAMPLE NO.	BLOWS PER FOOT	DRY DENSITY PCF	MOISTURE CONTENT, %	SOIL CLASS. (U.S.C.S.)	GEOTECHNICAL DESCRIPTION
0							ML/MH	**FILL:** Medium to gray-brown mottled orange-brown, slightly moist to moist, slightly stiff, clayey silt; scattered root hairs; scattered siltstone clasts; occasional dark brown topsoil chunks
			1	2	110.3	18.1		@ 1.6' Becomes stiff @ 1.8 to 2' Asphalt chunk @ 2.2' Contains disseminated gypsum and sandy silt chunks
5			①					@ 4' 6-inch thick, damp, medium stiff, sandy, clayey silt; lift near-horizontal
			2	2	93.0	22.4		@ 4.6' Becomes stiff @ 5.7' to 6.8' Silty, fine-grained sand to sandy silt layer
10			3	2	99.6	22.8		@ 10.2' Becomes moist to very moist; contains occasional dark brown-gray to dark gray, scattered, unoxidized siltstone clasts
15			4	3	99.6	25.9		@ 15.3 to 15.6' Contains minor amounts of organics (not decomposed; appears to be dry grass) in near-horizontal lift @ 15.6' 6-inch by 12-inch broken concretion on west wall; fill appears tight around it
20			5	3	93.2	28.2		@ 18.9' Medium dark brown, moist, stiff, fine-grained, sandy silt; near-horizontal to slightly irregula contact; disseminated gypsum; scattered siltston clasts; iron oxide staining @ 21.4' Becomes clayey silt; slightly sandy
		C:N42-45E/9NW J:N6W/61E	②				ML/MH	**LANDSLIDE DEPOSITS:** Moderate to light red-brown, moist, stiff, sandy, clayey silt; iron oxide stains; massive; micaceous; moderately jointed; joints are iron and manganese oxide stained; joints also infilled with gypsum (up to 1/8 inch thick)
25			6	9	93.3	29.2		@ 24.5' General joint trends N-S to N15°E dipping 20 to 45 degrees south and southeast @ 26.9 to 28.5' Joints infilled with gypsum; 1/4 inch to 1/8 inch; majority of joints are steeply dipping
		J:N9E/63NW						@ 28.5' 10-inch by 18-inch concretion on northwest wall; 3/4 inch zone of disseminated gypsum around concretion
30		RS:N35E/10SE						@ 29.8' Possible rupture surface; poorly developed; discontinuous gypsum-lined; undulating; not polishe majority of joints above terminate on surface; minor joints below

LOGGED BY RKW

SAMPLED BY RKW

DATE November 24, 1987 DRILL HOLE NO. LB-5 SHEET 2 OF 5

PROJECT Pacific/Colinas Sur PROJECT NO. 8871452-03

DRILLING CO. Contractor's Drilling Service TYPE OF RIG Bucket Auger

HOLE DIAMETER ±24" DRIVE WEIGHT 2,200# to 23'; 1,450# to 45'; 700# to 69'; 1,050# to 96'; 1,400# to 117'; 1,750# t DROP 12

ELEVATION TOP OF HOLE ±356' REF. OR DATUM See Geotechnical Map

LOGGED BY RKW

SAMPLED BY RKW

DEPTH FEET	GRAPHIC LOG	ATTITUDES	TUBE SAMPLE NO.	BLOWS PER FOOT	DRY DENSITY PCF	MOISTURE CONTENT, %	SOIL CLASS. (U.S.C.S.)	GEOTECHNICAL DESCRIPTION
30							ML/MH	LANDSLIDE DEPOSITS (CONTINUED):
		RS:N14E/21S Str:N78W/19SE						@ 30.4 to 31.2' Becomes unoxidized @ 31.2' Rupture surface; paper thin to 1/32 inch thick; striated; polished surface; large, undulating grooves; closely spaced striations; slightly stiff, slightly plastic to plastic; moist
		J:N25E/81NW						@ 31.3' Becomes predominantly unoxidized; slightly jointed; iron oxide on joints (up to 2 inches around joints)
		J:N34E/55SE						
35		J:N8E/74NW	7	13	88.1	28.1		@ 34' Becomes predominantly unoxidized @ 34 to 35' Minor jointing below; becomes sandy, clayey silt; stiff to very stiff; massive; unoxidized
			3					@ 39.8' Rupture surface; paper thin; poorly developed; smooth and slightly polished surface; minor joints above terminating at clay seam; no gypsum or iron oxide staining; upper 6 inches above clayseam is less dense
40		RS:N2E/16E						
		RS:N51E/27SE Str:N79W/11SW						@ 40.7' Rupture surface; similar to clay seam at 39.8 feet; material below is tighter
45			8	19	94.9	28.6		
50								@ 49.6' Increase in sand content
								@ 52.5' Becoems fine-grained, sandy silt to silty sand
							ML/SM	@ 53.1' 1-inch by 10-inch long concretion; northeast wall concretion dips 45 degrees northwest
55								
								@ 56.7' Minor seepage on west wall
							CL/CH	@ 57' Becomes sandy, silty clay
60								@ 60 to 61' Occasional 1 to 3 inch diameter concretions on northeast wall

DATE November 24, 1987 DRILL HOLE NO. LB-5 SHEET 3 OF 5

PROJECT Pacific/Colinas Sur PROJECT NO. 8871452-03

DRILLING CO. Contractor's Drilling Service TYPE OF RIG Bucket Auger

HOLE DIAMETER ±24" DRIVE WEIGHT 2,200# to 23'; 1,450# to 45'; 700# to 69'; 1,050# to 96'; 1,400# to 117'; 1,750# DROP 12

ELEVATION TOP OF HOLE ±356' REF. OR DATUM See Geotechnical Map

LOGGED BY RKW

SAMPLED BY RKW

Depth Feet	Graphic Log (W E)	Attitudes	Tube Sample No.	Blows Per Foot	Dry Density PCF	Moisture Content, %	Soil Class. (U.S.C.S.)	Geotechnical Description
60							CL/CH	LANDSLIDE DEPOSITS (CONTINUED): Dark gray, moist, stiff to very stiff, sandy, silty clay; unoxidized; massive
		CS:N8E/40E						@ 62' Minor seepage above upper clay seam on south wal
		CS:N6W/45E Str:N56W/37SE						@ 62.1 and 62.4' Clay seams; paper-thin; 1/32-inch thick; moist; stiff; plastic; polished with broad, shallow grooves; closely spaced striations; between clay seams material is highly disturbed and mashed
65		J:N17E/65NW	9	43	88.3	27.7		@ 65.4' Minor seepage along joint
		S:N18E/67SE						@ 67.3' Material becomes disturbed and mashed
		CS:N5E/44SE						@ 68' Rupture surface; poorly developed; paper-thin; undulating; material above is jointed and sheare; terminates on surface; slight seepage on clay seam at low point
70								
75								
80		J:N7W/68W						
		J:N8E/51SE						
85			10	41	96.9	27.1		
		CS/S:N28E/54SE Str:N85E/51SE						@ 86.8' Clay seam/shear; paper-thin to 1/32 inch thick; moist, slightly stiff, clayey silt; striated; very stiff below; slightly stiff above clayseam @ 86.9' Becomes clayey silt; slightly sandy
90								

DATE November 24, 1987 DRILL HOLE No. LB-5 SHEET 4 OF 5

PROJECT Pacific/Colinas Sur PROJECT No. 8871452-03

DRILLING CO. Contractor's Drilling Service TYPE OF RIG Bucket Auger

HOLE DIAMETER ±24" DRIVE WEIGHT 2,200# to 23'; 1,450# to 45'; 700# to 69'; 1,050# to 96'; 1,400# to 117'; 1,750# DROP 12

ELEVATION TOP OF HOLE ____ REF. OR DATUM See Geotechnical Map

LOGGED BY RKW

SAMPLED BY RKW

DEPTH FEET	GRAPHIC LOG (W E)	ATTITUDES	TUBE SAMPLE No.	BLOWS PER FOOT	DRY DENSITY PCF	MOISTURE CONTENT, %	SOIL CLASS. (U.S.C.S.)	GEOTECHNICAL DESCRIPTION
90							ML/MH	LANDSLIDE DEPOSITS (CONTINUED): Dark gray, moist, very stiff, clayey silt; massive; micaceous; unoxidized
		S:E-W42-47S						@ 93.8' Discontinuous shear on north wall
								@ 94.5' Clay seam/shear surface; paper-thin; well striated; material below is fine-grained, sandy silt
95		CS/S:N2E/21E Str:N55E/20S						
		J:N16E/57NW						@ 97' Becomes slightly sandy, clayey siltstone
100								@ 100' Increase in sand content
		J:N3W/83SW						
		S:N32E/26SE						@ 103' Discontinuous shears dipping to the southeast
105			11	15	87.4	33.9		
		CS/S:N79E/44S Str:N86W/15E						@ 106' Paper-thin, closed-spaced striated, continuous clayseam/shear surface
		S:N36E/47SE						@ 107.6' Shear, smooth, polished shear surface
		Generalized mashed zone: N20E/40SE						@ 107.9' Possible rupture surface; mashed and broken zone; 1/2 to 1 inch thick; appears to be disturbed and mashed siltstone; shears above; massive below
110								@ 110' Gradational change to sandy silt to silty sand
							SM/ML	
							ML/MH	@ 111' Becomes clayey, sandy silt
115								@ 114.5' Gradational change to sandy silt
								@ 115.9' 6-inch dip concretion; minor seepage along base
								@ 118' Minor seepage on joint
120								

DATE November 24, 1987 DRILL HOLE NO. LB-5 SHEET 5 OF 5

PROJECT Pacific/Colinas Sur PROJECT NO. 8871452-03

DRILLING CO. Contractor's Drilling Service TYPE OF RIG Bucket Auger

HOLE DIAMETER ±24" DRIVE WEIGHT 2,200# to 23'; 1,450# to 45'; 700# to 69'; 1,050# to 96'; 1,400# to 117'; 1,750# t DROP 12

ELEVATION TOP OF HOLE ±356' REF. OR DATUM See Geotechnical Map

DEPTH FEET	GRAPHIC LOG (W E)	ATTITUDES	TUBE SAMPLE NO.	BLOWS PER FOOT	DRY DENSITY PCF	MOISTURE CONTENT, %	SOIL CLASS. (U.S.C.S.)	GEOTECHNICAL DESCRIPTION
120		J:N17E/81NW					ML/MH	LANDSLIDE DEPOSITS (CONTINUED): Dark gray, moist, dense to very dense, sandy silt; massive; micaceous; unoxidized @ 121' Minor seepage along joint
125		JN5E/85E	12	18	92.8	28.5		@ 126' Joint; minor seepage
130		J:N25E/76NW						@ 129' Joint; minor seepage @ 130' Jointing and seepage terminate; very massive below
135								
140								
145								
150			13	21	94.5	28.2		Total Depth = 150 Feet Geologically Logged to 146.5 Feet Minor Seepage Encountered at 56, 62, 65, 68, 116, 118, 121, 126, and 129 Feet No Caving Backfilled 11/24/87

LOGGED BY RKW

SAMPLED BY RKW

DATE November 30, 1987 DRILL HOLE NO. LB-6 SHEET 1 OF 4

PROJECT Pacific/Colinas Sur PROJECT NO. 8871452-03

DRILLING CO. Contractor's Drilling Service TYPE OF RIG Bucket Auger

HOLE DIAMETER ±24" DRIVE WEIGHT 2,200# to 23'; 1,450# to 45'; 700# to 69'; 1,050# to 96'; 1,400# to 100' DROP 12

ELEVATION TOP OF HOLE ±314' REF. OR DATUM See Geotechnical Map

LOGGED BY RKW

SAMPLED BY RKW

Depth Feet	Graphic Log (H E)	Attitudes	Tube Sample No.	Blows Per Foot	Dry Density PCF	Moisture Content, %	Soil Class. (U.S.C.S.)	Geotechnical Description
0							ML	**FILL:** Brown-gray, dry to slightly moist, loose, clayey, sandy silt; massive; blocky, abundant root hairs
			1	3	88.7	22.8		@ 0.5' Becomes iron oxide stained, moist
								@ 0.9' 4- to 5-inch thick lift of dark gray-brown, moist, medium stiff to stiff, silty clay; near-horizontal
5			①					@ 1.4' Gray, moist, stiff, slightly sandy, clayey silt; iron oxide stained; disseminated gypsum; scattere root hairs; scattered siltstone clasts
			2	2	106.5	19.0		@ 3.2' 3- to 4-inch thick lift of dark brown, clayey silt
		J:N11E/77E					ML	@ 3.4' Becomes stiff to very stiff
								LANDSLIDE DEPOSITS: Brown and gray, slightly moist to moist, stiff to very stiff, sandy silt; slightly clayey; massive; micaceous; moderately jointed with iron oxide stains and disseminate gypsum on joints
10								@ 10' Contains tiny blebs of gypsum/calcium carbonate(?
		F:N37E/70SE	3	4	94.9	27.6		@ 10.8' Gypsum lined fracture (up to 1/8 inch wide); material below is medium gray, sandy, clayey silt
			②					
15								@ 14' Joints predominantly are steeply dipping to the southeast
		J:N35E/79SE						
		J:N40E/65NW						@ 16' Manganese oxide staining on some joints
								@ 17.7' Brown-medium to dark gray
20								
		J:N16E/72SE	4	4	96.2	27.3	ML/SM	
								@ 21' Grades to silty sand/sandy silt
		J:N13E/65SE						
25								
		J:N39E/85SE						
								@ 27' Disseminated gypsum on joints is thinner than above (approximately 1/16-inch wide)
							CL/CH	@ 28' Contains unoxidized zones; becomes slightly sandy, silty clay
30								

DATE November 30, 1987 DRILL HOLE NO. LB-6 SHEET 2 OF 4

PROJECT Pacific/Colinas Sur PROJECT NO. 8871452-03

DRILLING CO. Contractor's Drilling Service TYPE OF RIG Bucket Auger

HOLE DIAMETER ±24" DRIVE WEIGHT 2,200# to 23'; 1,450# to 45'; 700# to 69'; 1,050# to 96'; 1,400# to 100' DROP 12

ELEVATION TOP OF HOLE ±314' REF. OR DATUM See Geotechnical Map

LOGGED BY RKW

SAMPLED BY RKW

DEPTH FEET	GRAPHIC LOG (W E)	ATTITUDES	TUBE SAMPLE NO.	BLOWS PER FOOT	DRY DENSITY PCF	MOISTURE CONTENT, %	SOIL CLASS. (U.S.C.S.)	GEOTECHNICAL DESCRIPTION
30			5	12	95.3	29.2	CL/CH	LANDSLIDE DEPOSITS (CONTINUED): Brown-medium to dark gray and dark gray, moist, stiff to very stiff, sandy, silty clay; massive; micaceous; slightly unoxidized
		J:N48E/88NW						
35								
		J:N49E/90					ML/MH	@ 37.6' Becomes predominantly unoxidized; fine-grained, sandy silt; slightly clayey
40								@ 39' Majority of jointing terminates
45			6	14	96.9	26.9		
								@ 47' 8- to 10-inch diameter concretion; minor seepage at base, north wall
50								
								@ 53' 11- by 4-inch concretion, east wall
								@ 54' Decrease in sand content
55								
								@ 56' 1- by 4-inch concretion, northwest wall
60								

DATE November 30, 1987 DRILL HOLE NO. LB-6 SHEET 3 OF 4

PROJECT Pacific/Colinas Sur PROJECT NO. 8871452-03

DRILLING CO. Contractor's Drilling Service TYPE OF RIG Bucket Auger

HOLE DIAMETER ±24" DRIVE WEIGHT 2,200# to 23'; 1,450# to 45'; 700# to 69'; 1,050# to 96'; 1,400# to 100' DROP 12

ELEVATION TOP OF HOLE ±314' REF. OR DATUM See Geotechnical Map

LOGGED BY RKW

SAMPLED BY RKW

Depth Feet	Graphic Log (W–E)	Attitudes	Tube Sample No.	Blows Per Foot	Dry Density PCF	Moisture Content, %	Soil Class. (U.S.C.S.)	Geotechnical Description
60							ML/MH	LANDSLIDE DEPOSITS (CONTINUED): Dark gray, moist, very stiff, clayey silt; slightly sandy; massive; micaceous; unoxidized
		J:N8E/78SE						@ 61' Possible bone and scattered concretion
								@ 63' Slight seepage along joint
65			7	32	94.2	29.0		
		J:N68W/67SW						
								@ 67.5' Poorly developed joint (no disseminated gypsum along joint)
70								
		J:N53W/80NE						
75								
		J:N66W/83NE						
								@ 77' Increase in sand content; becomes clayey to sanc silt
80								
		J:N65W/79NE						
								@ 83.6' 5- by 12-inch concretion; northwest wall; seepa at base
85			8	35/11"	93.9	29.4		
								@ 85' Increase in clay content
								@ 87' 4-inch diameter concretion; seepage around it; moderate jointing
		J:N63W/82NE						
90								@ 89' Decrease in jointing

DATE November 30, 1987 DRILL HOLE NO. LB-6 SHEET 4 OF 4

PROJECT Pacific/Colinas Sur PROJECT NO. 8871452-03

DRILLING CO. Contractor's Drilling Service TYPE OF RIG Bucket Auger

HOLE DIAMETER ±24" DRIVE WEIGHT 2,200# to 23'; 1,450# to 45'; 700# to 69'; 1,050# to 96'; 1,400# to 100' DROP 12

ELEVATION TOP OF HOLE ±314' REF. OR DATUM See Geotechnical Map

LOGGED BY RKW

SAMPLED BY RKW

DEPTH FEET	GRAPHIC LOG (W E)	ATTITUDES	TUBE SAMPLE NO.	BLOWS PER FOOT	DRY DENSITY PCF	MOISTURE CONTENT, %	SOIL CLASS. (U.S.C.S.)	GEOTECHNICAL DESCRIPTION
90							ML/MH	LANDSLIDE DEPOSITS (CONTINUED): Dark gray, moist, very stiff, clayey silt; slightly sandy; massive; micaceous; unoxidized
95		J:N69W/48°NE						@ 95' Joint; minor seepage
								@ 97' Slight seepage
100			9	24	93.0	29.3		
								Total Depth = 100 Feet Geologically Logged to 97 Feet Minor Seepage Encountered at 63, 83.6, 87, 95, and 97 Feet No Caving Backfilled 11/30/87
105								
110								
115								
120								

DATE Nov. 30 to Dec. 11 1987 DRILL HOLE NO. LB-7 SHEET 1 OF 4

PROJECT Pacific/Colinas Sur PROJECT NO. 8871452-03

DRILLING CO. Contractor's Drilling Service TYPE OF RIG Bucket Auger

HOLE DIAMETER ±24" DRIVE WEIGHT 2,200# to 23'; 1,450# to 45'; 700# to 69'; 1,050# to 96'; 1,400# to 109' DROP 12

ELEVATION TOP OF HOLE ±386' REF. OR DATUM See Geotechnical Map

LOGGED BY RKW

SAMPLED BY RKW

Depth Feet	Graphic Log (W E)	Attitudes	Tube Sample No.	Blows Per Foot	Dry Density PCF	Moisture Content, %	Soil Class. (U.S.C.S.)	Geotechnical Description
0							ML	**FILL:** Dark brown, mottled orange-brown and light brown, damp to moist, slightly stiff, clayey, sandy silt; abundant root hairs; scattered siltstone fragments
			1 (1)	2	98.4	15.8		@ 1.2' Becomes stiff; contains disseminated gypsum @ 1.3 to 1.8' 6-inch thick lift containing dark brown topsoil @ 1.8' Becomes gray-brown @ 3.4 to 4.2' Zone of abundant topsoil clasts
5			2 (2)	2	89.8	18.3		@ 5.4 to 6.1' Damp, soft, sandy silt; north wall; material below is stiff to very stiff
								LANDSLIDE DEPOSITS: Medium to light gray, slightly moist to moist, stiff, sandy silt; slightly clayey; micaceous; moderately jointed with gypsum, iron oxide staining along joints; tiny blebs of disseminated gypsum throughout
		J:N4E/48SE					ML/MH	
10			3	5	99.8	18.3		
		J:N18E/40SE						
								@ 13' Becomes brown-gray
		J:N6W/42E						
15							SM	@ 15.7' 4- to 5-inch thick sand bed; orange to light brown, slightly moist, dense, silty, fine-grained sand; undulating, slightly irregular contacts; siltstone above is very sandy
		F:N8E/55SE	(3)				ML/MH	@ 16' Medium to brown-gray, moist, stiff, sandy to clayey siltstone; iron oxide staining; blebs; jointing; upper 3 to 9 inches contains sandstone clasts
20			4	4	93.9	27.9		@ 17' Infilled fractures with gypsum; 1/2 to 3/4-incl thick open structure @ 17.4' 6-inch by 3-foot concretion on north and east wall
		J:N26E/76SE						@ 22 to 24' Fracture (1/2 to 1 inch thick) partially in-filled with gypsum; open structure (approximately 12 inches deep into wall)
		F:N18E/78SE						
25								
		J:N25E/57SE						
			(4)					@ 27' Material grades to sandy to very sandy silt
		J:N3E/28SE						
30		J:N24E/50SE						@ 30' Becomes less sandy

DATE Nov. 30 to Dec. 1, 1987 DRILL HOLE NO. LB-7 SHEET 2 OF 4

PROJECT Pacific/Colinas Svr PROJECT NO. 8871452-03

DRILLING CO. Contractor's Drilling Service TYPE OF RIG Bucket Auger

HOLE DIAMETER ±24" DRIVE WEIGHT 2,200# to 23'; 1,450# to 45'; 700# to 69'; 1,050# to 96'; 1,400# to 109' DROP 12

ELEVATION TOP OF HOLE ±386' REF. OR DATUM See Geotechnical Map

DEPTH FEET	GRAPHIC LOG (W–E)	ATTITUDES	TUBE SAMPLE NO.	BLOWS PER FOOT	DRY DENSITY PCF	MOISTURE CONTENT, %	SOIL CLASS. (U.S.C.S.)	GEOTECHNICAL DESCRIPTION (LOGGED BY RKW; SAMPLED BY RKW)
30			5	6	103.9	21.7	ML/MH	LANDSLIDE DEPOSITS (CONTINUED): Medium gray to brown-gray, moist, stiff, clayey silt; slightly sandy; massive; micaceous
								@ 33' Becomes very sandy silt
35		F:N16E/64SE						
		RS(?):N14W/ 38-43NE						@ 38.3' Possible rupture surface/fracture; abundant disseminated gypsum along surface; dark brown t black material along surface; mottled below; less weathered and jointed/fractured; undulatir surface; fractures/jointing short and discontir uous; dip east infilled with gypsum to 1/4 inc
40			6	11	97.1	26.3		@ 38.4' Brown, medium to dark gray, moist, stiff, sand clayey silt; micaceous; iron oxide stained; less jointed than above; massive
								@ 41' Becomes stiff to very stiff
45		J:N4W/59E						
								@ 47' 2-inch diameter concretion; increase in joints
								@ 47.5 to 49' Grades to medium gray, moist, dense, silt fine-grained sand
								@ 49' Grades to sandy, clayey silt
							SM	@ 49.7' Possible rupture surface; paper-thin, orange-brown, iron oxide staining; diseminated gypsum smooth, polished surface with faint, closely spaced striations
							CL/CH	
50		RS:N16E/54SE Str:N51W/54S RS:N34E/30SE Str:N40W/29S	7	28	92.5	27.9	ML/MH	@ 49.8' Dark brown-gray mottled orange-brown, moist, stiff, sandy, silty clay
		J:N13W/43SE						@ 50.8' Rupture surface; paper thin to 1/32 inch thic gray, moist, stiff clay; plastic; tuncates cl seam above; striated; material below clay seam is clayey silt, slightly sandy
								@ 53' Contains unoxidized zones
55		S:N79W/13S						@ 54.4' Discontinuous shear, smooth polished surface, approximately 12 inches long
								@ 54.5' Becoems predominantly unoxidized
								@ 54.6' Short, discontinuous joints/fractures with disseminated gypsum; iron oxide stained
								@ 56.6' Occasional light gray sandstone clasts (appro mately 1/2 inch in diameter)
							SM/ML	@57.5' Grades to very sandy silt; slightly clayey; contains unoxidized joints
							ML/MH	@ 58.5 to 60.2' Becomes silty sand to sandy silt; slig friable
60								

DATE Nov. 30 to Dec. 1, 1987 DRILL HOLE NO. LB-7 SHEET 3 OF 4

PROJECT Pacific/Colinas Sur PROJECT NO. 8871452-03

DRILLING CO. Contractor's Drilling Service TYPE OF RIG Bucket Auger

HOLE DIAMETER ±24" DRIVE WEIGHT 2,200# to 23'; 1,450# to 45'; 700# to 69'; 1,050# to 96'; 1,400# to 109' DROP 12

ELEVATION TOP OF HOLE ±386' REF. OR DATUM See Geotechnical Map

LOGGED BY RKW

SAMPLED BY RKW

DEPTH FEET	GRAPHIC LOG (W–E)	ATTITUDES	TUBE SAMPLE NO.	BLOWS PER FOOT	DRY DENSITY PCF	MOISTURE CONTENT, %	SOIL CLASS. (U.S.C.S.)	GEOTECHNICAL DESCRIPTION
60		J:N29E/37SE					SM/ML / ML	LANDSLIDE DEPOSITS (CONTINUED): Dark gray, moist, stiff to very stiff, silty, fine-grained sand to sandy silt; massive; micaceous; unoxidized @ 60.2' Becomes slightly sandy silt
65								
70			8	18	98.4	26.1	SM/ML	@ 69' Grades to sandy silt to silty sand
								@ 71.5' 2 to 3 inch diameter concretion; seepage zone 71 to 75 feet
		J:N14E/64NW						
75							ML/MH	@ 75' Becomes fine-grained, sandy silt
80								
85		J:N75E/87N						@ 86 to 89' Grades to sandy to very sandy silt; slight seepage
90								@ 89' Becomes less sandy

DATE [illegible] DRILL HOLE NO. [illegible] SHEET 4 OF 4

PROJECT Pacific/Colinas Sur — PROJECT NO. 8871452-03

DRILLING CO. Contractor's Drilling Service — TYPE OF RIG Bucket Auger

HOLE DIAMETER ±24" — DRIVE WEIGHT 2,200# to 23'; 1,450# to 45'; 700# to 69'; 1,050# to 96'; 1,400# to 109' — DROP 12

ELEVATION TOP OF HOLE ±386' — REF. OR DATUM See Geotechnical Map

Depth Feet	Graphic Log (W–E)	Attitudes	Tube Sample No.	Blows Per Foot	Dry Density PCF	Moisture Content, %	Soil Class. (U.S.C.S.)	Geotechnical Description (Logged by RKW; Sampled by RKW)
90			9	30	98.3	26.5	ML/MH	LANDSLIDE DEPOSITS (CONTINUED): Dark gray, moist, very stiff, clayey silt; slightly sandy; massive; micaceous; unoxidized
95								@ 95' Increase in sand content
		J:N73E/81SE						@ 97' Slight seepage @ 97.5' Becomes less sandy
		J:N85W/58SW						@ 98.5' Seepage along joint
100								
105			10	12	95.4	27.4		
110								Total Depth = 109 Feet Geologically Logged to 106 Feet Minor Seepage Encountered at 71 to 75, 86 to 89, 97, and 98.5 Feet No Caving Backfilled 12/1/87
115								
120								

DATE December [illegible] DRILL HOLE NO. LB-8 SHEET 1 OF 4

PROJECT Pacific/Colinas Sur PROJECT NO. 8871452-03

DRILLING CO. Contractor's Drilling Service TYPE OF RIG Bucket Auger

HOLE DIAMETER ±24" DRIVE WEIGHT 2,200# to 23'; 1,450# to 45'; 700# to 69'; 1,050# to 96'; 1,400# to 109' DROP 12

ELEVATION TOP OF HOLE ±305' REF. OR DATUM See Geotechnical Map

LOGGED BY RKW

SAMPLED BY RKW

Depth Feet	Graphic Log (W–E)	Attitudes	Tube Sample No.	Blows Per Foot	Dry Density PCF	Moisture Content, %	Soil Class. (U.S.C.S.)	Geotechnical Description
0			1	Push +2	93.1	18.1	ML	FILL: Medium brown, mottled gray-brown, and orange-brown, moist, slightly stiff to stiff, sandy, clayey silt; root hairs in upper foot; occasional siltstone fragments; disseminated gypsum; upper 1 foot is soft to slightly stiff @ 1' Becomes stiff
5			2	5	98.2	15.3	ML	LANDSLIDE DEPOSITS: Light to medium brown and gray, mottled orange-brown, moist stiff to very stiff, clayey, sandy silt; massive; micaceous; iron oxide stained; tiny blebs and stringers of gypsum/calcium carbonate(?); weathered appearance; subhorizontal, slightly irregular upper contact @ 8' Tiny blebs and stringers stop; becomes less weathered; no apparent jointing
10		J:N17W/66SW	3	6	100.9	17.4		@ 10.9' Abundant disseminated gypsum and iron oxide staining; becomes moderately jointed with gypsum and iron oxide along joints
		J:N29W/59NE						@ 13.5' Joint in-filled with gypsum up to 1/2 inch thick; joints typically infilled with gypsum 1/8 to 1/4 inch thick
15		J:N15W/86NE J:N47E/44SE						@ 14' 1 foot by 1-1/2 foot zone of concretions in northeast wall
20		J:N24E/80SE	4	5	94.1	28.9		@ 21' Becomes less oxidized; gray-medium dark brown @ 22' Contains unoxidized zones
25		J:N54E/87NW						@ 26.5' Grades to sandy to very sandy silt @ 27.5' Becomes predominantly unoxidized; oxidized along jointing; stiff to very stiff; sandy to clayey si
30								

DATE _____ DRILL HOLE NO. LB-8 SHEET 2 OF 4

PROJECT Pacific/Colinas Sur — PROJECT NO. 8871452-03

DRILLING CO. Contractor's Drilling Service — TYPE OF RIG Bucket Auger

HOLE DIAMETER ±24" — DRIVE WEIGHT 2,200# to 23'; 1,450# to 45'; 700# to 69'; 1,050# to 96'; 1,400# to 109' — DROP 12"

ELEVATION TOP OF HOLE ±305' — REF. OR DATUM See Geotechnical Map

LOGGED BY RKW

SAMPLED BY RKW

Depth Feet	Graphic Log (W–E)	Attitudes	Tube Sample No.	Blows Per Foot	Dry Density PCF	Moisture Content, %	Soil Class. (U.S.C.S.)	Geotechnical Description
30		J:N51E/77NW	5	17	91.3	31.1	ML	LANDSLIDE DEPOSITS (CONTINUED): Dark gray, moist, very stiff, sandy, clayey silt; massive; micaceous; unoxidized
		F:N44E/82NW						@ 32.3' Increase in sand content @ 33' Fracture; particllly gypsum in-filled; open structure
35								
40								@ 40.3' 8-inch diameter concretion in north wall @ 41.8' 6-inch discontinuous concretion zone on west side of hole; seepage at base on southwest wall
45		J:N48E/77SE	6	12	88.5	32.8		@ 44.5' Minor seepage along joint @ 46' Iron oxide and disseminated gypsum-lined joints terminate
50								
55								
60								

DATE December 1-2, 1987 DRILL HOLE NO. LB-8 SHEET 3 OF 4

PROJECT Pacific/Colinas Sur PROJECT NO. 8871452-03

DRILLING CO. Contractor's Drilling Service TYPE OF RIG Bucket Auger

HOLE DIAMETER ±24" DRIVE WEIGHT 2,200# to 23'; 1,450# to 45'; 700# to 69'; 1,050# to 96'; 1,400# to 109' DROP 12

ELEVATION TOP OF HOLE ±305' REF. OR DATUM See Geotechnical Map

LOGGED BY RKW

SAMPLED BY RKW

DEPTH FEET	GRAPHIC LOG (W–E)	ATTITUDES	TUBE SAMPLE NO.	BLOWS PER FOOT	DRY DENSITY PCF	MOISTURE CONTENT, %	SOIL CLASS. (U.S.C.S.)	GEOTECHNICAL DESCRIPTION
60							ML	LANDSLIDE DEPOSITS (CONTINUED): Dark gray, moist, very stiff, sandy, clayey silt; massive; micaceous; unoxidized
								@ 62' Becomes less sandy
65		J:N66E/78W	7	46	92.6	29.2		@ 66' Becomes sandy silt to very sandy silt
								@ 67' Seepage along joints in northwest and northeast wall
70		J:N44E/67SE						@ 70' Seepage along joint in southeast wall
								@ 73' Becomes clayey silt, slightly sandy
75								
80								@ 80' Material same as above
85			8	40/11"	91.8	29.9		
90								

DATE December 1 - 23, 1987 DRILL HOLE NO. LB-6 SHEET 4 OF 4

PROJECT Pacific/Colinas Sur PROJECT NO. 8871452-03

DRILLING CO. Contractor's Drilling Service TYPE OF RIG Bucket Auger

HOLE DIAMETER ±24" DRIVE WEIGHT 2,200# to 23'; 1,450# to 45'; 700# to 69'; 1,050# to 96'; 1,400# to 109' DROP 12 "

ELEVATION TOP OF HOLE ±305' REF. OR DATUM See Geotechnical Map

DEPTH FEET	GRAPHIC LOG (W E)	ATTITUDES	TUBE SAMPLE NO.	BLOWS PER FOOT	DRY DENSITY PCF	MOISTURE CONTENT, %	SOIL CLASS. (U.S.C.S.)	GEOTECHNICAL DESCRIPTION (LOGGED BY RKW; SAMPLED BY RKW)
90							ML	LANDSLIDE DEPOSITS (CONTINUED): Dark gray, moist, very stiff, clayey silt; slightly sandy; massive; micaceous; unoxidized
95		J:N32E/54SE						
		CS:N81W/11S						@ 98.3' Clay seam; paper-thin; polished, smooth surface; slightly jointed above; unjointed below; no apparent striations
100								
		CS:N59W/18S						@ 103.3' Clay seam; paper thin; similar to clay seam above
105								@ 105' 4-inch diameter concretion in east wall; minor seepage at base
			9	30	94.8	28.2		
110								Total Depth = 109 Feet Geologically Logged to 107 Feet Minor Seepage Encountered at 41.8, 44.5, 66, 70, and 105 Feet No Caving Backfilled 12/2/87
115								
120								

DATE December 2 - 3, 1987 DRILL HOLE NO. LB-9 SHEET 1 OF 4

PROJECT Pacific/Colinas Sur PROJECT NO. 8871452-03

DRILLING CO. Contractor's Drilling Service TYPE OF RIG Bucket Auger

HOLE DIAMETER ±24" DRIVE WEIGHT 2,200# to 23'; 1,450# to 45'; 700# to 69'; 1,050# to 96'; 1,400# to DROP 12

ELEVATION TOP OF HOLE ±277' REF. OR DATUM See Geotechnical Map

LOGGED BY RKW

SAMPLED BY RKW

DEPTH FEET	GRAPHIC LOG (W – E)	ATTITUDES	TUBE SAMPLE NO.	BLOWS PER FOOT	DRY DENSITY PCF	MOISTURE CONTENT, %	SOIL CLASS. (U.S.C.S.)	GEOTECHNICAL DESCRIPTION
0			1	2	101.3	14.9	ML	FILL: Gray-brown to medium brown, mottled orange-brown, moist, slightly stiff, sandy, clayey silt; root hairs in upper 8 inches; scattered siltstone fragments; disseminated gypsum; iron oxide stains @ 1.2' Becomes stiff to very stiff @ 2' Contains dark brown topsoil clasts @ 3.2 to 4.3' Medium stiff, less compacted than above
5			1 2	3	106.7	16.6	ML/MH	LANDSLIDE DEPOSITS: Light to medium brown, moist, stiff to very stiff, clayey silt; slightly sandy; disseminated gypsum; occasional iron oxide stains; highly weathered @ 7' Becomes less weathered; increase in oxide staining; slightly jointed; medium gray; minor disseminated gypsum along joints
10		J:N6E/73NW	3	3	90.8	25.3	ML/SM	@ 11' Grades to sandy silt/silty sand; generally massive
15		J:N25W/25NE						@ 14' Iron oxide stains on possible bedding/low angle joint(?); discontinuous
20		J:N45W/14NE J:N7E/88W	4	4	90.8	28.7	ML/MH	@ 20.6' Brown-dark gray, moist, stiff to very stiff, clayey, sandy silt; massive; micaceous; disseminated gypsum throughout; undulating upper contac
25		J:N46W/34NE J:N73E/87SE J:N54W/27NE						@ 24' Disseminated gypsum along joints to 1/8 inch wide @ 24.5' Increase in clay content; up to 1/4 inch disseminated gypsum along joints; low-angle jointing dips northeast and high-angle jointing is randomly dipping @ 28' Contains unoxidized zones
30								

GEOTECHNICAL BORING LOG

DATE December 2-3, 1987 DRILL HOLE NO. LB-9 SHEET 2 OF 4

PROJECT Pacific/Colinas Sur PROJECT NO. 8871452-03

DRILLING CO. Contractor's Drilling Service TYPE OF RIG Bucket Auger

HOLE DIAMETER ±24" DRIVE WEIGHT 2,200# to 23'; 1,450# to 45'; 700# to 69'; 1,050# to 96'; 1,400# to 109' DROP 12

ELEVATION TOP OF HOLE ±277' REF. OR DATUM See Geotechnical Map

LOGGED BY RKW

SAMPLED BY RKW

Depth Feet	Graphic Log (W–E)	Attitudes	Tube Sample No.	Blows Per Foot	Dry Density PCF	Moisture Content, %	Soil Class. (U.S.C.S.)	Geotechnical Description
30			5	14	92.7	29.0	ML/MH	LANDSLIDE DEPOSITS (CONTINUED): Brown-dark gray, moist, very stiff, clayey, sandy silt; massive; micaceous
								@ 31' Becomes predominantly unoxidized; contains low-angle joints; disseminated gypsum, oxide stains, oxide 1 to 2 inches on either side of joints
		J:N51E/90						@ 34'. Minor jointing below; becomes clayey silt; slightly sandy
35								
		J:N42W/48NE						@ 39.5' Disseminated gypsum (up to 1/2 inch wide) and iron oxide stains on joints
40								@ 39.6' Minor seepage on joint in south wall
45			6	20	89.9	31.6		
		J:N46E/76NW						
50								@ 50' Minor seepage along joint on northeast wall
55								@ 55' Same material as above
								@ 56' 8- by 6-inch concretion in north wall; minor seepage along base
60								

DATE December 2 - 3, 1987 DRILL HOLE NO. LB-9 SHEET 3 OF 4

PROJECT Pacific/Colinas Sur PROJECT NO. 8871452-03

DRILLING CO. Contractor's Drilling Service TYPE OF RIG Bucket Auger

HOLE DIAMETER ±24" DRIVE WEIGHT 2,200# to 23'; 1,450# to 45'; 700# to 69'; 1,050# to 96'; 1,400# to 109' DROP 12

ELEVATION TOP OF HOLE ±277' REF. OR DATUM See Geotechnical Map

LOGGED BY RKW

SAMPLED BY RKW

Depth Feet	Graphic Log	Attitudes	Tube Sample No.	Blows Per Foot	Dry Density PCF	Moisture Content, %	Soil Class. (U.S.C.S.)	Geotechnical Description
60							ML/MH	LANDSLIDE DEPOSITS (CONTINUED): Dark gray, moist, very stiff, sandy, clayey silt; massive; micaceous; unoxidized
								@ 63.6' 4-inch diameter concretions in north and south walls; seepage at base; water has rotten egg smell; possibly hydrogen sulfide
65			7	47	91.5	28.8		
70								@ 70' Same as above; no apparent structure
75								
80								@ 80' Massive; same as above
85			8	35/9"	90.5	30.9		
90								@ 89' 12-inch by 8-inch concretion in west wall

DATE December 2 - 3, 1987 DRILL HOLE NO. 1B-9 SHEET 4 OF 4

PROJECT Pacific/Colinas Sur PROJECT NO. 8871452-03

DRILLING CO. Contractor's Drilling Service TYPE OF RIG Bucket Auger

HOLE DIAMETER ±24" DRIVE WEIGHT 2,200# to 23'; 1,450# to 45'; 700# to 69'; 1,050# to 96'; 1,400# to 109' DROP 12

ELEVATION TOP OF HOLE ±277' REF. OR DATUM See Geotechnical Map

LOGGED BY RKW

SAMPLED BY RKW

Depth Feet	Graphic Log (W E)	Attitudes	Tube Sample No.	Blows Per Foot	Dry Density PCF	Moisture Content, %	Soil Class. (U.S.C.S.)	Geotechnical Description
90							ML/MH	LANDSLIDE DEPOSITS (CONTINUED): Dark gray, moist, very stiff, sandy, clayey silt; massive; micaceous; unoxidized
95								
100								@ 99.5' Grades to clayey, very sandy silt @ 101' Sand content decreases
105								@ 104.5' Becomes sandy silt; slightly clayey @ 105' Slight seepage; increase in clay content
			9	16	90.3	31.0		
110								Total Depth = 109 Feet Geologically Logged to 107 Feet Minor Seepage Encountered at 39.5, 50, 56, 63.6, and 105 Feet No Caving Backfilled 12/3/87
115								
120								

DATE December 3, 1987 DRILL HOLE NO. LB-10 SHEET 1 OF 3

PROJECT Pacific/Colinas Sur PROJECT NO. 8871452-03

DRILLING CO. Contractor's Drilling Service TYPE OF RIG Bucket Auger

HOLE DIAMETER ±24" DRIVE WEIGHT 2,200# to 23'; 1,450# to 45'; 700# to 62' DROP 12 "

ELEVATION TOP OF HOLE ±402' REF. OR DATUM See Geotechnical Map

LOGGED BY RKW

SAMPLED BY RKW

DEPTH FEET	GRAPHIC LOG (W E)	ATTITUDES	TUBE SAMPLE NO.	BLOWS PER FOOT	DRY DENSITY PCF	MOISTURE CONTENT, %	SOIL CLASS. (U.S.C.S.)	GEOTECHNICAL DESCRIPTION
0							ML/CL	FILL: Gray-brown, dark brown and gray, mottled orange-brown, moist, slightly stiff to stiff, slightly clayey silt to silty clay; disseminated gypsum, iron oxide stains; root hairs in upper 5 to 6 inches; silstone and topsoil clasts
			1	3	98.8	15.1		@ 1' Becomes stiff @ 2' Contains scattered, broken concretionary chunks @ 2.3' Becomes predominantly dark brown (topsoil derived fill)
5			2	3	94.6	15.7		@ 4' Scattered siltstone fragments @ 4.3' Predominantly dark brown; gypsum/calcium carbonate(?) blebs @ 5.6' Becomes dark brown, silty clay with gray-brown, clayey, sandy silt @ 7 to 7.6' Occasional broken concretionary fragments
10			3	3	102.4	18.3	ML/SM	@ 8' Fill lifts 4 to 8 inches thick @ 8.7' Predominantly dark brown, silty clay @ 9.9' 3 to 4 inch zone of gray-brown, sandy silt; lifts are subhorizontal @ 10.7' Dark brown, moist, stiff, clayey, sandy silt to clayey, silty sand; material softer than above; contains blebs of disseminated gypsum/calcium carbonate; generally homogeneous
			4	3	96.0	17.6		@ 13.2' Dark brown and gray-brown fill; stiffer than above
15							ML/MH	@ 15.6' Predominantly dark brown, clayey silt to very sandy silt @ 18.1' 3- to 4-inch lift of gray to light brown, silty sand; near-horizontal @ 18.5 to 19.2' Dark brown, silty clay
							SM	@ 19.2' Light brown, moist, dense, silty sand; slightly silty; massive; iron oxide stained; irregular lower contact; material below appears to have been scarified 6 to 8 inches deep
20			5	4	98.2	11.5	CL/CH	LANDSLIDE DEPOSITS: Light to medium gray, slightly moist to moist, stiff silty clay; micaceous; massive; iron oxide stained; desiccation cracks to 21 feet (1/2 to 1 inch apart); cracks infilled with dark brown material; no apparent jointing @ 22' 10-inch by 14-inch concretion in north wall
25		GC:N13W/12SW					ML/MH	@ 25.5' Medium gray, moist, medium stiff, slightly clayey silt; micaceous; iron oxide staining along sub-horizon; discontinuous bedding
		GB:N3W/5W						@ 28.2 to 28.9' Zone of silty sandstone blebs and string
30		J:N47E/81NW						@ 29' Poorly developed joint

DATE December 3, 1987 DRILL HOLE No. LB-10 SHEET 2 OF 3

PROJECT Pacific/Colinas Sur PROJECT No. 8871452-03

DRILLING CO. Contractor's Drilling Service TYPE OF RIG Bucket Auger

HOLE DIAMETER ±24" DRIVE WEIGHT 2,200# to 23'; 1,450# to 45'; 700# to 82' DROP 12

ELEVATION TOP OF HOLE ±402' REF. OR DATUM See Geotechnical Map

LOGGED BY RKW

SAMPLED BY RKW

Depth Feet	Graphic Log (W E)	Attitudes	Tube Sample No.	Blows Per Foot	Dry Density PCF	Moisture Content, %	Soil Class. (U.S.C.S.)	Geotechnical Description
30		J:N29E/55SE	6	8	96.8	23.9	ML	LANDSLIDE DEPOSITS (CONTINUED): Medium gray, moist, medium stiff, sandy, clayey silt
			3					@ 30.4' Contains short, discontinuous, gypsum infilled fractures; occasionally clay-lined
								@ 31.7' 8-inch diameter concretion in northwest wall; material below is generally medium gray; minor iron oxide stains; gypsum infilled joints; up to 1/2-inch wide; typically 1/8 to 1/4 inch wide; fractures are low-angle and discontinuous
35		J:N9W/47SW						@ 35' Iron and manganese oxide staining along joints
								@ 37.5' Medium to dark gray, moist, stiff, clayey silt; micaceous; massive; scattered iron oxide staining disseminated gypsum; gradational contact over 5 to 6 inches; material is less weathered than above
40								
								@ 41.2' Gypsum infilled, discontinuous joints (gypsum up to 3/4 inch thick)
								@ 41.3' Becomes medium gray
		J:N18E/34SE						
45		J:N18E/63SE						
			7	11	96.5	27.3		
								@ 46.7' Possible rupture surface(?); undulating; slightly iron oxide stained with dark brown, silty clay; striated but very faint; material below similar to above
		RS(?):N11W/31NE						
		Str:N64W/29S						
		J:N21E/47SE						@ 49' Joint; yellow iron oxide staining (limonite) along joints
50		J:N17E/84NW						@ 49.2' Increase in clay content
		GS:N25E/58SE						@ 49.8 Possible shear surface; material on shear very moist; slightly plastic; minor seepage along shear; discontinuous
		J:N16W/18NE						
		J:N34E/84SE						
		J:N39E/77SE						@ 50.5' Joint; disseminated gypsum on low-angle joints only
								@ 52' Becoems brown-dark gray
								@ 53' Contains unoxidized zones
		J:N9E/79SE						@ 54' Minor seepage on joints
55		J:N4E/49SE						@ 56' Dark gray, moist, very stiff, clayey, sandy silt; massive; micaceous; occasional iron oxide stains and gypsum filled joints; unoxidized
		J:N82E/78SE						
60								

DATE December 3, 1987 DRILL HOLE NO. LB-10 SHEET 3 OF 3

PROJECT Pacific/Colinas Sur PROJECT NO. 8871452-03

DRILLING CO. Contractor's Drilling Service TYPE OF RIG Bucket Auger

HOLE DIAMETER ±24" DRIVE WEIGHT 2,200# to 23'; 1,450# to 45'; 700# to 62' DROP 12

ELEVATION TOP OF HOLE ±402' REF. OR DATUM See Geotechnical Map

DEPTH FEET	GRAPHIC LOG (W E)	ATTITUDES	TUBE SAMPLE NO.	BLOWS PER FOOT	DRY DENSITY PCF	MOISTURE CONTENT, %	SOIL CLASS. (U.S.C.S.)	GEOTECHNICAL DESCRIPTION (LOGGED BY RKW; SAMPLED BY RKW)
60							ML/MH	LANDSLIDE DEPOSITS (CONTINUED): Dark gray, moist to very moist, stiff to very stiff, clayey, sandy silt; massive; micaceous; unoxidized @ 62' Drilling stopped on concretion with abundant seepage
65								Total Depth = 62 Feet Geologically Logged to 59 Feet Minor Seepage Encountered at 49.8 and 54 Feet Abundant Seepage Encountered at 62 Feet No Caving Backfilled 12/29/87 Ground Water Encountered at 58 Feet on 12/29/87
70								
75								
80								
85								
90								

GEOTECHNICAL BORING LOG

DATE 12/29-31/87 DRILL HOLE NO. LB-11 SHEET 1 OF 6

PROJECT Pacific/Colinas Sur PROJECT NO. 8871452-03

DRILLING CO. Contractor's Drilling Service TYPE OF RIG Bucket Auger

HOLE DIAMETER ±24" DRIVE WEIGHT 2,200# to 23'; 1,450# to 45'; 700# to 69'; 1,050# to 96'; 1,400# to 117'; 1,750# 138'; 2,100# to 159'; 2,300# to 165' DROP 12

ELEVATION TOP OF HOLE ±409' REF. OR DATUM See Geotechnical Map

LOGGED BY RKW/RW

SAMPLED BY RKW

DEPTH FEET	GRAPHIC LOG (W–E)	ATTITUDES	TUBE SAMPLE NO.	BLOWS PER FOOT	DRY DENSITY PCF	MOISTURE CONTENT, %	SOIL CLASS. (U.S.C.S.)	GEOTECHNICAL DESCRIPTION
0							ML/CL	FILL: Gray-brown, mottled orange-brown and dark brown, moist, stiff, silty clay to clayey silt @ 1.4' Slightly moist, scattered siltstone fragments; topsoil chunks, disseminated gypsum @ 1.6 to 2' 5-inch thick fill lift @ 3.5' Becomes stiff to very stiff, increase topsoil chunks; fill appears well mixed (unable to determine lift thickness) @ 4.2 – 6.7' Two near-horizontal open fractures 1/16 to 1/8 inch wide @ 5.5' Becomes slightly sandy @ 8' Becomes very stiff
5			① 1	3	102.6	13.3		
10		J:N8E/77SE J:N21E/59SE J:N9E/56SE	② 2	6	96.7	10.6	SM/ML	LANDSLIDE DEPOSITS: Light brown-light gray, slightly moist, medium dense to dense, silty, fine-grained sand; micaceous; calcium carbonate stringers; iron oxide stained blebs; highly sheared; shears are infilled with calcium carbonate; 1/8 to 1/2 inch wide, near-vertical, irregular, near-horizontal upper contact; very well developed, steeply dipping to the southeast with no visible striations @ 13.3' Numerous calcium carbonate infilled shears; rodent burrow (2 inches in diameter) in west wall
15		J:N39E/55SE					ML/CL	@ 13.5' Most shears start out vertically then flatten to the southeast @ 14.5' Tan, silty sand bed (1 to 1-1/2 inches thick) @ 14.9' Rust-colored, discontinuous shear in north wall @ 15' Gray mottled yellow-brown, damp, stiff to very stiff, clayey silt to silty clay; iron oxide stained @ 17.4' Becomes micaceous, mottled orange-brown with iron oxide staining; stiff to very stiff @ 17.5' Predominantly orange-brown, massive, stiff to very stiff with scattered pelecypods and foram
20		J:N87W/78S J:N1W/84E S:N17E/59SE J:N27W/88SW	3	3	99.1	19.4		@ 19.5' Becomes slightly fractured, near-vertical; manganese oxide staining along fractures @ 20' Concretion (6 inches wide, 12 inches long) @ 21.5' to 24.6' Series of parallel fractures/shears; 1/16 to 1/4 inch wide; gypsum infilled iron oxide coating polished surfaces @ 23.8' Striations poorly developed on polished surface; striations in dip direction
25			③				ML ML/CL	@ 25' Predominantly gray to medium gray mottled orange-brown silt; gypsum seams parallel to bedding @ 25.6' Becomes predominantly a silty clay @ 26' to 27' Soft zone of silty clay; appears jumbled; no distinct clay seam or rip surface; highly disseminated gypsum within zone @ 27' Becomes stiff below @ 28' Abundant subparallel gypsum stringers (2 to 4 inches apart)
30		J:N31E/72SE F:N88E/87N J:N18W/86NE GB(?):N26E/6NW GB(?):N15E/7NW						

GEOTECHNICAL BORING LOG

DATE 12/29-31/87 DRILL HOLE NO. LB-11 SHEET 2 OF 6

PROJECT Pacific/Colinas Sur PROJECT NO. 8871452-03

DRILLING CO. Contractor's Drilling Service TYPE OF RIG Bucket Auger

HOLE DIAMETER 24" DRIVE WEIGHT 2,200# to 23'/1,450# to 46'/700# to 69'/1,050# to 96'/1,400# to 117'/1,750# to 138'/2,100# to 159/2,300# to 1 DROP 12

ELEVATION TOP OF HOLE ±409' REF. OR DATUM ~~See Geotechnical Map~~

DEPTH FEET	GRAPHIC LOG (W E)	ATTITUDES	TUBE SAMPLE NO.	BLOWS PER FOOT	DRY DENSITY PCF	MOISTURE CONTENT, %	SOIL CLASS. (U.S.C.S.)	GEOTECHNICAL DESCRIPTION
30		B:N19E/5NW					ML/CL	LANDSLIDE DEPOSITS (CONTINUED): Olive-green mottled light gray and orange-brown, moist, stiff to very stiff, silty clay to clayey silt; micaceo massive; iron oxide staining; scattered disseminated gypsum
							ML/MH	@ 30' Gypsum seam up to 1/2 inch wide; well developed gypsum crystals; continues around hold; iron oxic stained; lower surface is polished; numerous 1/4 inch wide gypsum seams truncated by larger se
		F:N10E/66E						@ 31' Sand bed; slightly irregular contact; variable thickness (from 1/4 to 1 inch wide)
35		F:N36E/62SE						@ 31.2' Grades to gray mottled orange-brown, moist, slightly clayey, sandy silt; micaceous; abundar iron oxide throughout and along fractures; disseminated gypsum; poorly bedded to massive; abundant forams
		F:N85E/79S						@ 31.5' to 33.1 Concretion
		F:N18E/74E						@ 33.4' Gypsum infilled fracture; 1/4 inch wide with open structure
40			4	9	98.7	26.5		@ 33.6' Grades to micaceous, clayey silt
								@ 33.3 to 36.5' Abundant gypsum-coated fractures; sub-parallel fractures approximately 18 inches above large fracture
		B:N20E/8NW						@ 35' Becomes gray to medium gray mottled orange-brown, moist, stiff, micaceous silt; slightly clayey; disseminated gypsum and limonite; massive; iron oxidation
45								@ 38.5' Fracture coated with disseminated gypsum (appro imately 3 feet long)
								@ 38.7' 1/2 inch thick fracture (2 feet long) gypsum infilled fractures are 3 to 12 inches apart
								@ 40' Becomes very moist below predominantly gray to medium gray, clayey, micaceous silt
		F:N-2/75E						@ 42' Abundant limonitic stringers parallel to fracture above
								@ 44' Irregular lensoidal sand bed
50								@ 46.3' Predominantly brown to orange-brown mottled gra micaceous silt; slightly clayey; fractured as above; minor manganese oxide staining along fracutures
								@ 48.5' Grades to medium gray to gray, micaceous, claye silt; contains poorly developed, short, discon-tinuous joings; abundant oxide staining along joints; massive; very moist
		S:N25W/72SW						@ 51.6 to 52' Large, shattered concretion in east wall; seepage around concretion; gypsum crystallizati and limonitic coating along concretion
55		F:N45W/30SW						@ 53.2' Becomes very micaceous on west wall
								@ 54' Shear with broad undulations; fractures above (approximately 2 inches apart); begins to become unoxidized, very stiff to hard, dark gra micaceous silt; slightly fissile
								@ 55' Siltstone is fractured (4 to 12 inches apart an approximately 1-1/2 feet long) iron oxide stain no seepage from fractures
60								@ 58' Becomes less fractured below

GEOTECHNICAL BORING LOG

DATE 12/29-31/87 DRILL HOLE NO. LB-11 SHEET 3 OF 6

PROJECT Pacific/Colinas Sur PROJECT NO. 8871452-03

DRILLING CO. Contractor's Drilling Service TYPE OF RIG Bucket Auger

HOLE DIAMETER 24" DRIVE WEIGHT 2,200# to 23'; 1,450# to 45'; 700# to 69'; 1,050# to 96'; 1,400# to 117'; 1,750# 138'; 2,100# to 159'; 2,300# to 165' DROP 12

ELEVATION TOP OF HOLE ±409' REF. OR DATUM See Geotechnical Map

LOGGED BY RKW/RH

SAMPLED BY RKW

Depth Feet	Graphic Log (W–E)	Attitudes	Tube Sample No.	Blows Per Foot	Dry Density PCF	Moisture Content, %	Soil Class. (U.S.C.S.)	Geotechnical Description
60		S:N4E/72SE	5	25	101.5	26.1	ML/MH	LANDSLIDE DEPOSITS (CONTINUED):
		F:N13E/68SE						@ 61' Sand lense (2 inches thick); minor seepage; dark gray, very fine-grained, silty sand; micaceous
								@ 61' Shear truncates sand lense; shear is well developed; 1/8 inch thick, broadly striated, polished; no seepage; remolded silt; very micaceous
								@ 62 to 63' Fracture; wall spalding along fracture; very massive to fissile; structure (appears near-horizontal)
65								@ 65' Becomes micaceous, very stiff silt
								@ 67.7 to 69' Shattered concretion with seepage along concretion; continuous around hole; some spalding of siltstone above concretion
								@ 69' Becomes soft, moderately fractured siltstone below, same as above
70		F:N27E/90 F:N14E/86SE						
75								@ 74' Contains scattered pelecypods
		S:N28E/28E						@ 77.2' Striated shear; well developed; 1/8 inch thick; appears to be remolded silt; closely spaced striations in dip direction
		RS:N70E/52E Str:N56W/35E						@ 78.4' Well developed rupture surface; 1/8 inch thick; remolded, micaceous silt; well developed striations with broad grooves (about 2 inches apart) closely spaced striations between grooves
80		RS:N28E/39SE						
			6	35	97.4	26.5		@ 78.4 to 79.1' Whole series of continuous shears; appear wet but no seepage noted
								@ 79.1' Rupture surface similar to above; striations in dip direction
								@ 79.2' Dark gray, micaceous silt; slightly clayey; abundant forams; fissile structure
								@ 80 to 80.6' Paper thin shears within silt; parallel to lower rupture surface above; shears appear discontinuous
85								@ 80.6' Very stiff to hard, very massive silt
								@ 82' Shattered concretion on north wall (18 inches long, 8 inches wide); some seepage around concretion
								@ 86' Becomes very massive to slightly fissile structure below
90								

GEOTECHNICAL BORING LOG

DATE 12/29-31/87 DRILL HOLE NO. LB-11 SHEET 4 OF 6

PROJECT Pacific/Colinas Sur PROJECT NO. 8871452-03

DRILLING CO. Contractor's Drilling Service TYPE OF RIG Bucket Auger

HOLE DIAMETER 24" DRIVE WEIGHT 2,200# to 23'/1,450# to 46'/700# to 69'/1,050# to 96'/1,400# to 117'/1,750# to 96'/1,400# to 117'/1,750# to 13 2,100# to 159'/2,300# to 165' DROP 12

ELEVATION TOP OF HOLE ±409' REF. OR DATUM ~~See Geotechnical Map~~

LOGGED BY RKW

SAMPLED BY RKW

Depth Feet	Graphic Log (W–E)	Attitudes	Tube Sample No.	Blows Per Foot	Dry Density PCF	Moisture Content, %	Soil Class. (U.S.C.S.)	Geotechnical Description
90							ML/MH	LANDSLIDE DEPOSITS (CONTINUED): Dark gray, moist, very stiff to hard, clayey silt; very massive; unoxidized; micaceous
								@ 92' Becomes slightly sandy, micaceous silt (about 3 inches thick) some weepage
								@ 92.6' Gradational contact to slightly clayey silt; micaceous
95								@ 96' Becomes very micaceous
100								
		S:N64E/46SE						@ 101' Discontinuous shear
		S:N68E/66SE Str:N64W/51E						@ 103' Continuous paper-thin shear, striated; striations are closely spaced
								@ 103.1' Dark gray, moist, very stiff, slightly clayey silt; micaceous
105								
		F:N23E/60NW F:N25E/62NW	7	37	100.9	25.0		@ 108' Fracture; clay-coated; paper-thin; 2 feet long no seepage
								@ 109' Clay-coated fracture (similar to fracture above)
110								@ 109.1' Becomes very stiff, clayey, micaceous silt
							SM/ML	@ 111' Becomes very gradational contact to very fine-grained, micaceous with sand; seepage spalding with sand zone
							ML/MH	@ 112.5' Grades back to micaceous, slightly clayey silt
115								
120								

DATE 12/29-31/87 . DRILL HOLE NO. LB-11 SHEET 5 OF 6

PROJECT Pacific/Colinas Sur PROJECT NO. 8871452-03

DRILLING CO. Contractor's Drilling Service TYPE OF RIG Bucket Auge

HOLE DIAMETER 24" DRIVE WEIGHT 2,200# to 23'/1,450# to 46'/700# to 69'/1,050# to 96'/1,400# to 117'/1,750# to 138'/2,100# to 159'/2,300# to DROP 12

ELEVATION TOP OF HOLE ±409' REF. OR DATUM ~~See Geotechnical Map~~

LOGGED BY RKW

SAMPLED BY RKW

DEPTH FEET	GRAPHIC LOG (W–E)	ATTITUDES	TUBE SAMPLE NO.	BLOWS PER FOOT	DRY DENSITY PCF	MOISTURE CONTENT, %	SOIL CLASS. (U.S.C.S.)	GEOTECHNICAL DESCRIPTION
120		B:N30E/13NW RS:N62E/30SE						LANDSLIDE DEPOSITS (CONTINUED): Dark gray, moist, very stiff to hard, slightly clayey silt; micaceous; massive; unoxidized @ 120.4' Well developed, medium gray sand bed; abundant seepage from sand bed (approximately 1 inch th @ 121' Seepage; piping out sand; flowing approximatel 1 gallon per minute @ 121.2' Well developed rupture surface or shear; 1/4 inch thick remolded silt; open fracture (4 inches deep); seepage on rupture and in sa bed above striations in dip direction; broad, well developed grooves; unsafe below 123 feet @ 123' Concretion
125			8	17	98.4	25.3		
130								
135								
140								@ 140' Similar to above
145			9	11	101.4	23.7		
150								

DATE 12/29-31/87 . DRILL HOLE NO. LB-11 SHEET 6 OF 6

PROJECT Pacific/Colinas Sur PROJECT NO. 8871452-03

DRILLING CO. Contractor's Drilling Service TYPE OF RIG Bucket Auge

HOLE DIAMETER 24" DRIVE WEIGHT 2,200# to 23'/1,450# to 46'/700# to 69'/1,050# to 96'/1,400# to 117'/1,750# to 138'/2,100# to 159'/2,300# to DROP 12

ELEVATION TOP OF HOLE ±409' REF. OR DATUM ~~See Geotechnical Map~~

LOGGED BY RKW

SAMPLED BY RKW

DEPTH FEET	GRAPHIC LOG	ATTITUDES	TUBE SAMPLE NO.	BLOWS PER FOOT	DRY DENSITY PCF	MOISTURE CONTENT, %	SOIL CLASS. (U.S.C.S.)	GEOTECHNICAL DESCRIPTION
150							ML/MH	LANDSLIDE DEPOSITS (CONTINUED): Dark gray, moist, very stiff to hard, slightly clayey silt; massive; micaceous; unoxidized
155								
160								
165			10	14	98.7	25.5		
170								Total Depth = 165 Feet Geologically Logged to Feet (unsafe below) Seepage Encountered at 52, 61, 69, 82, 111, 120.4, and 121 Feet Standing Water @ 128 Feet on 12/31/87 Caving Below 123 Feet Backfilled 12/31/87
175								
180								

GEOTECHNICAL BORING LOG

DATE 1/3-5/88 . DRILL HOLE NO. LB-12 SHEET 1 OF 5

PROJECT Pacific/Colinas Sur PROJECT NO. 8871452-03

DRILLING CO. Contractor's Drilling Service TYPE OF RIG Bucket Auger

HOLE DIAMETER 24" DRIVE WEIGHT 2,200# to 23'/1,450# to 46'/700# to 69'/1,050# to 96'/1,400# to 117'/1,750# to 139' DROP 12

ELEVATION TOP OF HOLE ±338' REF. OR DATUM ~~See Geotechnical Map~~

LOGGED BY RKW

SAMPLED BY RKW

Depth Feet	Graphic Log (W–E)	Attitudes	Tube Sample No.	Blows Per Foot	Dry Density PCF	Moisture Content, %	Soil Class. (U.S.C.S.)	Geotechnical Description
0								**FILL:** Gray-medium brown, mottled orange-brown and dark gray, moist, slightly stiff, sandy, silty clay; root hairs in upper 8 inches; scattered siltstone clasts
							ML/MH	@ 1.1' Becomes stiff to very stiff
		J:N16E/62SE						**LANDSLIDE DEPOSITS:** Brown-medium gray, mottled yellow tan and orange-brown, slightly moist, stiff, sandy, clayey silt; iron oxide stains; disseminated gypsum; massive; micaceous
5		FR:N40E/69SE	1	2	94.6	22.8		@ 3.5' Limonite along joints and fractures
								@ 5' Fractures infilled with limonite and disseminat gypsum
								@ 7.8 to 8.1' Orange-brown, slightly moist, dense, silt fine-grained sand bed
		B:N19E/10NW J:N29E/72SE F:N11E/54SE						@ 8.1' Material similar to silt above
10								@ 9' Fracture infilled with disseminated gypsum; 1/4 inch wide; iron and manganese oxide stains
		FR:N16E/80SE	2	2	88.0	32.4		
								@ 13.5' Contains scattered unoxidized zones
15		J:N9E/87SE						
								@ 15.7 to 16.9' Shattered and broken concretion; 2/3 around hole on west side; disseminated gyps and iron oxide stains around concretion
		J:N41E/50SE N84E/42N						
								@ 18' Becomes brown-dark gray, increase in sand conte
20			3	6	100.2	24.3		
		FR:N64E/81SE						
							ML/MH	@ 22' Becomes unoxidized, dark gray, moist, very stif clayey silt
25		SH:N11W/48SW						
								@ 25' Striated with broad undulating grooves; polishe remolded silt; approximately 1/16 inch wide gyp crystallizatioon along shear
		F:N5W/75W						@ 26' Dark gray mottled orange-brown, very moist, med stiff to stiff, slightly clayey silt; massive; micaceous
								@ 27.7' Gypsum infilled fracture from shear above exits west wall at 29 feet
30								@ 29' Becomes silt; sandy below

GEOTECHNICAL BORING LOG

DATE 1/3-5/88 DRILL HOLE NO. LB-12 SHEET 2 OF 5

PROJECT Pacific/Colinas Sur PROJECT NO. 8871452-03

DRILLING CO. Contractor's Drilling Service TYPE OF RIG Bucket Auge

HOLE DIAMETER 24" DRIVE WEIGHT 2,200# to 23'/1,450# to 46'/700# to 69'/1,050# to 96'/1,400# to 117'/1,750# DROP 12

ELEVATION TOP OF HOLE REF. OR DATUM ~~See Geotechnical Map~~

LOGGED BY RKW

SAMPLED BY RKW

Depth Feet	Graphic Log (W–E)	Attitudes	Tube Sample No.	Blows Per Foot	Dry Density PCF	Moisture Content, %	Soil Class. (U.S.C.S.)	Geotechnical Description
30							ML/MH	LANDSLIDE DEPOSITS (CONTINUED): Dark gray, very moist, medium stiff to stiff, slightly sandy, clayey silt
		S:N14E/33E	4	11	95.4	26.3		@ 31.9' Shear; paper-thin, remolded, micaceous silt; n striations; polished surface
								@ 32.3 to 33.4 Zone of vertical fractures
35		S:N32E/56W						@ 34.5' Shear; broad grooves (approximately 2 inches apart), remolded silt; paper-thin striations i dip direction (probable back shear)
								@ 34.6' Dark gray, stiff, slightly sandy, micaceous si massive; material below fracture as above
		F:N8E/53W						@ 37.8' Shear; moist to very moist, paper-thin, remold silt; slightly polished surface; very poorly developed striations
		S:N24E/28E						@ 37.9' Becomes medium stiff (soft zone)
40		RS:N28E/49E						@ 38.5' Rupture surface; slightly polished; paper-thin to 1/8 inch thick; well developed; 2-inch soft zone above; abundant disseminated gypsum below
		F:N5W/88W						@ 38.6' Becomes dark gray, moist, very stiff, slightly sandy, micaceous silt
		S:N-S/82						@ 40' Very developed fracture; disseminated gypsum along fracture and in silt above and below
								@ 40.1' Becomes massive; slightly fissile
								@ 42' Contains traces of free water along fractures; gypsum infilled and open structure (up to 1/2 inch); soft on each side of fracture for a distance of 1 inch; parallel to fracture at 40 feet
45		S:N-2/64W	5	12	92.8	29.3		@ 43' Minor seepage along fractures
								@ 45.5' Shear
								@ 47' Trace of free water along short, discontinuous fracture
								@ 48' Becomes dark gray, very stiff to hard, micaceou silt; slightly fissile
50		F:N3E/56W						@ 50' Weeping along fracture
		S:N23W/48E						@ 52.6' Shear; remolded; paper-thin; silt very micaceo poorly developed striations in dip direction
55		S:N11E/41E S:N15E/33E						@ 54.2 to 54.6' Shear; moderately developed; remolded silt; paper-thin; poorly striated; short, disc tinuous fractures above (truncated by shear); striations in dip direction; numerous shears 1/2 to 3/4 inches apart; randomly oriented slicks between shears; trace of free water alo shear; well developed striations; shears steep into wall
		S:N16E/38E Str:N43W/31E S:N9W/4E Str:N34W/2E						@ 56.9 to 58.2' Soft zone; numerous shears in zone; slightly plastic; surfaces well striated; silt very micaceous; very moist
60								@ 58.2' Basal shear highly polished; paper-thin; very silty

GEOTECHNICAL BORING LOG

DATE 1/3-5/88 DRILL HOLE NO. LB-12 SHEET 3 OF 5

PROJECT Pacific/Colinas Sur PROJECT NO. 8871452-03

DRILLING CO. Contractor's Drilling Service TYPE OF RIG Bucket Auger

HOLE DIAMETER 24" DRIVE WEIGHT 2,200# to 23'/1,450# to 46'/700# to 69'/1,050# to 96'/1,400# to 117'/1,750# to 139' DROP 12

ELEVATION TOP OF HOLE ±338' REF. OR DATUM ~~See Geotechnical Map~~

LOGGED BY RKW

SAMPLED BY RKW

Depth Feet	Graphic Log (W E)	Attitudes	Tube Sample No.	Blows Per Foot	Dry Density PCF	Moisture Content, %	Soil Class. (U.S.C.S.)	Geotechnical Description
60			6	52	94.5	28.1	ML/MH	LANDSLIDE DEPOSITS (CONTINUED): Dark gray, moist, stiff, clayey silt
								@ 58.3' Clayey silt; very micaceous
								@ 60 to 61' Soft zone; jumbled appearance; very moist, very soft; no evidence of shearing
								@ 64.5' Shear; paper-thin; remolded silt; poorly striat
								@ 64.6' Becomes medium stiff, very massive and very moi
65		S:N28E/30E Str:N50W/27E						
								@ 67' Traces of free water on poorly developed fractu
70		F:N10W/45W						@ 69.4' Abundant fractures; closely spaced (1 to 1-1/2 inches); free water along fractures
								@ 70' Seepage; siltstone varies from very stiff to medium stiff
								@ 70.5' Wall spalding
								@ 72.3' Abundant fractures terminate
								@ 73' Becomes micaceous, clayey silt; medium stiff to stiff; moderately fractured (fractures parallel to fractures at 70 feet; 3 to 6 inches apart
75								@ 75' Ground water sepage
								@ 75 to 79' Abundant spalding seepage along fractures
		F:N6E/62W						
80								@ 79' Becomes stiff to very stiff below
85			7	28	94.8	28.0		
		S:N7E/52E						@ 87.5' Shear; 1/4 inch thick; silty clay; highly polished; well developed striations; striations in dip direction
90								

DATE 1/3-5/88 . DRILL HOLE NO. LB-12 SHEET 4 OF 5

PROJECT Pacific/Colinas Sur PROJECT NO. 8871452-03

DRILLING CO. Contractor's Drilling Service TYPE OF RIG Bucket Auge

HOLE DIAMETER 24" DRIVE WEIGHT 2,200# to 23'/1,450# to 46'/700# to 69'/1,050# to 96'/1,400# to 117'/1,750# to 139' DROP 12

ELEVATION TOP OF HOLE ±338' REF. OR DATUM ~~See Geotechnical Map~~

LOGGED BY RKW

SAMPLED BY RKW

DEPTH FEET	GRAPHIC LOG (W F)	ATTITUDES	TUBE SAMPLE NO.	BLOWS PER FOOT	DRY DENSITY PCF	MOISTURE CONTENT, %	SOIL CLASS. (U.S.C.S.)	GEOTECHNICAL DESCRIPTION
90							ML/MH	LANDSLIDE DEPOSITS (CONTINUED): Dark gray, moist to very moist, stiff to very stiff, slightly clayey silt; massive; micaceous; unoxidized
		S:N23E/21E						@ 90.5' Becomes slightly sandy
								@ 92.2' Shear; remolded silt; polished surface; no visible striations
95		S:N19E/20E						@ 94.8' Shear; paper-thin; remolded silt; polished
								@ 97 to 99.3' Concretion with minor seepage out of fractures at base of concretion
100		F:N32E/88E						
		F:N56E/34E						
105		S:N25E/44E	8	13	93.2	28.5		@ 105.6' Shear; highly polished; paper-thin; remolded silt; no striations
110								
115		S:N12E/44SE						@ 115.5 to 116' Shear zone; 3 to 4 subparallel, well developed, paper-thin shears in broken zone; remolded silt to clay polished to faintly striated (closely spaced striations); micaceou up to 1/8 inch thick; striations in dip direction half way around hold; upper shears truncated by lowest shear
		S:N3W/25NE						
120								

GEOTECHNICAL BORING LOG

DATE 1/3-5/88 . DRILL HOLE NO. LB-12 SHEET 5 OF 5

PROJECT Pacific/Colinas Sur PROJECT NO. 8871452-03

DRILLING CO. Contractor's Drilling Service TYPE OF RIG Bucket Auge

HOLE DIAMETER 24" DRIVE WEIGHT 2,200# to 23'/1,450# to 46'/700# to 69'/1,050# to 96'/1,400# to 117'/1,750# to 139' DROP 12

ELEVATION TOP OF HOLE ±338' REF. OR DATUM ~~See Geotechnical Map~~

LOGGED BY RKW

SAMPLED BY RKW

Depth Feet	Graphic Log	Attitudes	Tube Sample No.	Blows Per Foot	Dry Density PCF	Moisture Content, %	Soil Class. (U.S.C.S.)	Geotechnical Description
120							ML/MH	LANDSLIDE DEPOSITS (CONTINUED): Dark gray, very moist, very stiff to hard, slightly sandy, clayey silt; micaceous; massive; unoxidized
								@ 116.9' Polished, paper-thin to 1/8 inch thick shear; no striations; appears to be remolded silt; saturated; no free water along surfaces
								@ 117' Very stiff to hard, laminated to fissile, dar gray, micaceous, slightly sandy, clayey silt; mica portion near-horizontal; abundant foraminifera; lacks jointing/fractures
125			9	17	97.4	26.5		@ 124' Same as above
		S:N7W/52E Str:N60W/34E						@ 127.8' Shear; highly polished; striated with broad grooves (1 inch apart); closely spaced striations in between; paper-thin; appears to be remolded, clayey silt; slightly micaceous; steepens to the north; exits south side of hole at 129.6
		S:N13W/46E S:N13W/40E						
130		S:N6W/35E						@ 127.8' Paper-thin shear on east wall; at north wall truncated by upper shear; remolded silt; moderately to highly polished; striations are closely spaced; striations in dip directi
		S:N17E/33E Str:N52W/30E						@ 128' Silt is dark gray to gray, massive, very moist, micaceous, slightly clayey silt; sligh fissle; very stiff
135								@ 128.5' Shear; truncated by upper shear; same as shea at 127.8 feet; striations in dip direction
								@ 129' Discontinuous, paper-thin shear
								@ 130.1' Highly polished, paper-thin shear; remolded silt; poorly developed striations; closely spaced striations
			10	25	88.3	27.6		@ 131' Dark gray, very stiff to hard, massive, moist slightly clayey silt; micaceous; abundnat foraminifera; slightly fissile structure; nea horizontal mica partings
140								@ 131.2' Well developed shear; micaceous; slightly clayey silt; highly polished; paper-thin; ran comly oriented shears in 1-inch thick zone above shear
								@ 131.3' Dark gray, very stiff to hard, very moist, slightly clayey silt; micaceous; abundant foraminifera; scattered pelecypods (near-horizontal) massive; slightly fissile; lacks fractures/shears
145								Total Depth = 139 Feet Geologically Logged to 137 Feet Seepage Encountered at 43, 70, 75 to 79, and 97 Feet Minor Caving at 75 to 79 Feet Backfilled 1/5/88
150								

GEOTECHNICAL BORING LOG

DATE 1/5-6/88 DRILL HOLE NO. LB-13 SHEET 1 OF 5

PROJECT Pacific/Colinas Sur PROJECT NO. 8871452-03

DRILLING CO. Contractor's Drilling Service TYPE OF RIG Bucket Auger

HOLE DIAMETER 24" DRIVE WEIGHT 2,200# to 23'/1,450# to 46'/700# to 69'/1,050# to 96'/1,400# to 117'/1,750# to 138' DROP 12

ELEVATION TOP OF HOLE ±339' REF. OR DATUM ~~See Geotechnical Map~~

LOGGED BY RKW

SAMPLED BY RKW

Depth Feet	Graphic Log (W–E)	Attitudes	Tube Sample No.	Blows Per Foot	Dry Density PCF	Moisture Content, %	Soil Class. (U.S.C.S.)	Geotechnical Description
0							ML/MH	FILL: Medium brown, mottled gray-brown, very moist, medium stiff, sandy, clayey silt to silty clay; abundant roots in upper 8 inches; disseminated gypsum @ 1.1' Becomes moist, stiff to very stiff, scattered siltstone fragments @ 3' Becomes medium stiff to stiff, slightly sandy, less dense than above @ 4.2' Soft; some open voids around siltstone fragment
5		J:N88W/76S J:N5E/82NW	1	3	91.4	27.4	ML/MH	LANDSLIDE DEPOSITS: Light to medium gray, slightly moist, stiff to very stiff, clayey, sandy silt; limonite stringers; moderate jointed; massive to slightly fissile
10		J:N8E/80NW GB:N1W/7W S:N52E/21SE J:N74E/82SE	2	4	90.2	30.9	SM ML/MH	@ 8.8' Medium gray, moist, stiff to very stiff, silty sand; tiny blebs of carbon/gypsum; limonite along fractures; discontinuous @ 9.8' Contains short, discontinuous shears; poorly developed; smooth, polished surfaces; truncated by steep dipping joint
		J:N6W/38NE						@ 10.5' Brown to medium gray, moist, very stiff, slight sandy, clayey silt @ 11.5' Contains unoxidized zones @ 12.3' Disseminated gypsum and manganese oxide along joints
15		J:N35W/80SE						@ 14.6 to 15.4' Broken, shattered concretion 18 inches long with size of hole @ 15.5' Predominantly unoxidized, moist, very stiff, micaceous, slightly sandy, clayey silt; iron oxide staining along jointing @ 16' grades to clayey, sandy silt
20		N:38E/87SE	3	10	95.2	27.4	SM/ML ML/MH	@ 20' Grades to silty sand to sandy silt @ 21' Oxidized stain along joint ends; minor jointing below @ 21.8' Becomes clayey silt; very stiff to hard
25								
30								@ 27 to 45' Lacks jointing

DATE 1/5-6/88 DRILL HOLE NO. LB-13 SHEET 2 OF 5

PROJECT Pacific/Colinas Sur PROJECT NO. 8871452-03

DRILLING CO. Contractor's Drilling Service TYPE OF RIG Bucket Auger

HOLE DIAMETER 24" DRIVE WEIGHT 2,200# to 23'/1,450# to 46'/700# to 69'/1,050# to 96'/1,400# to 117'/1,750# to 138' DROP 12

ELEVATION TOP OF HOLE ±339' REF. OR DATUM ~~See Geotechnical Map~~

LOGGED BY RKW

SAMPLED BY RKW

Depth Feet	Graphic Log (W–E)	Attitudes	Tube Sample No.	Blows Per Foot	Dry Density PCF	Moisture Content, %	Soil Class. (U.S.C.S.)	Geotechnical Description
30							ML/MH	LANDSLIDE DEPOSITS (CONTINUED): Light to medium gray, slightly moist, stiff to very stiff, clayey, sandy silt
								@ 30' Dark gray to gray, moist, very stiff to stiff, micaceous, clayey silt; massive; poorly develo fissile structure; very tight
35								
40			4	20	95.3	28.0		@ 40' Same as above
								@ 41' Moderately developed fissile structure, poorly developed; near-horizontal lamination
								@ 43.2 to 44.5 Becomes dark gray, medium to very stiff, massive; moderate to poorly developed fissile structure; increasing mica with depth between shears; very massive; no jointing or fracturin
45								
		S:N13E/69						
50								@ 50' Dark gray, moist, very stiff, micaceous, clayey silt; as above
		S:N14E/74SE						@ 51.7' Highly polished, paper-thin shear; no trace of free water; no striations
								@ 53.6' Shear; paper-thin; dark gray, remolded, clayey silt; broad grooves (2 inches apart) with close spaced striations; very moist; no trace of free water
55		S:N24E/65SE						
		S:N27E/55SE						@ 57' Shear; paper-thin; dark gray, micaceous, remolc clayey silt; highly striated with broad grooves (about 1-1/2 inches apart) with closely spaced striations in dip direction; very moist, no trace of free water
60								

DATE 1/5-6/88 DRILL HOLE NO. LB-13 SHEET 3 OF 5

PROJECT Pacific/Colinas Sur PROJECT NO. 8871452-03

DRILLING CO. Contractor's Drilling Service TYPE OF RIG Bucket Auger

HOLE DIAMETER 24" DRIVE WEIGHT 2,200# to 23'/1,450# to 46'/700# to 69'/1,050# to 96'/1,400# to 117'/1,750# to 138' DROP 12

ELEVATION TOP OF HOLE ±339' REF. OR DATUM ~~See Geotechnical Map~~

DEPTH FEET	GRAPHIC LOG (W–E)	ATTITUDES	TUBE SAMPLE NO.	BLOWS PER FOOT	DRY DENSITY PCF	MOISTURE CONTENT, %	SOIL CLASS. (U.S.C.S.)	GEOTECHNICAL DESCRIPTION
60		S:N27E/47SE	5	27	93.2	28.6	ML/MH	LOGGED BY RKW SAMPLED BY RKW LANDSLIDE DEPOSITS (CONTINUED): Dark gray, moist, very stiff, clayey silt; massive to fissile; unoxidized; micaceous @ 58.9' Shear; paper-thin to 1/8 inch thick; dark gray; micaceous; remolded silt; poorly striated; moderately to highly polished
		B:N10E/15NW						@ 60.8' Slight seepage along converging shears @ 61' Dark gray, moist to very moist, micaceous; slightly clayey silt; massive to poorly develop fissile structure (partings appear to have 2 to 6 degree southeast dip); no free water
65		F:N14E/26NW F:N22W/6NE						@ 63.6' Micaceous, sandy silt bed; laminated (approximately 1/4 inch thick) @ 65.4 to 66.5' Fractured zone; fractures abundant; 18 to 24 inches in length (sub horizontal); paper-thin; discontinuous; polished surfaces
		F:N29E/45NW						@ 69' Discontinuous fracture
70		S:N30E/40W						@ 69.3' Slightly gnarly; poorly developed shear @ 70 to 70.6' Medium stiff, very moist to wet, micaceou zone
		S:N66E/65E						@ 70.6' Shear; traces of free water on shear surface; paper-thin, medium to dark gray, very micaceou moderately polished; poorly striated
		S:N40E/33SE						@ 71.7' Minor seepage within 1-inch thick fracture zone; moderately gnarled; very moist to wet; very micaceous silt
75								@ 73.6' Becomes very clayey @ 75' Dark gray, very moist, very stiff to hard, slightly micaceous, clayey silt to silty clay; very massive; slightly fissile (near-horizonta
							ML/CL	@ 76' Open fractures with active seepage up to 1/8 i wide; micaceous, sandy silt; very tight on wes wall
80			6	40	92.4	29.9	ML/MH	@ 80' Becomes hard, clayey silt below; very massive; scattered foraminifera
		F:N36E/40SE						@ 82' Free water along fracture (polished mica surfa
85								
								@ 89.6' Fracture; slightly polished; micaceous surface no free water; silt is dark gray, hard,
90		F:N38E/35SE						

GEOTECHNICAL BORING LOG

DATE 1/5-6/88 DRILL HOLE NO. LB-13 SHEET 4 OF 5

PROJECT Pacific/Colinas Sur PROJECT NO. 8871452-03

DRILLING CO. Contractor's Drilling Service TYPE OF RIG Bucket Auger

HOLE DIAMETER 24" DRIVE WEIGHT 2,200# to 23'/1,450# to 46'/700# to 69'/1,050# to 96'/1,400# to 117'/1,750# to 138' DROP 12

ELEVATION TOP OF HOLE ±339' REF. OR DATUM ~~See Geotechnical Map~~

LOGGED BY RKW

SAMPLED BY RKW

Depth Feet	Graphic Log (W–E)	Attitudes	Tube Sample No.	Blows Per Foot	Dry Density PCF	Moisture Content, %	Soil Class. (U.S.C.S.)	Geotechnical Description
90								LANDSLIDE DEPOSITS (CONTINUED): Dark gray, moist to very moist, very stiff to hard, clayey silt; micaceous; massive to slightly fissile; unoxidized
								@ 93' Very fine-grained, sandy silt; slightly clayey; micaceous; minor weeping
95								@ 95' Grades to clayey silt (very gradational contact very massive
100								
		S:N16E/35SE						@ 101' Shear: moderately to poorly developed; slightl polished, micaceous, remolded silt; paper-thin traces of free water
105		S:N12E/43SE						@ 105.5' Shear; striated (in dip direction); paper-thin polished; striations very closely spaced; remolded silt; micaceous
110			7	28	96.4	26.8		
								@ 112' Grades to micaceous, clayey silt moderately stiff to stiff
115								
120								@ 118' Grades to dark gray, very moist, hard, clayey silt; very massive; poorly developed, fissile structure; abundant foraminifera; lacks joint and fractures

GEOTECHNICAL BORING LOG

DATE 1/5-6/88 . DRILL HOLE NO. LB-13 SHEET 5 OF 5

PROJECT Pacific/Colinas Sur PROJECT NO. 8871452-03

DRILLING CO. Contractor's Drilling Service TYPE OF RIG Bucket Auger

HOLE DIAMETER 24" DRIVE WEIGHT 2,200# to 23'/1,450# to 46'/700# to 69'/1,050# to 96'/1,400# to 117'/1,750# to 138' DROP 12

ELEVATION TOP OF HOLE ±339' REF. OR DATUM ~~See Geotechnical Map~~

DEPTH FEET	GRAPHIC LOG (W E)	ATTITUDES	TUBE SAMPLE NO.	BLOWS PER FOOT	DRY DENSITY PCF	MOISTURE CONTENT, %	SOIL CLASS. (U.S.C.S.)	GEOTECHNICAL DESCRIPTION
120								LOGGED BY RYW SAMPLED BY RYW LANDSLIDE DEPOSITS (CONTINUED): Dark gray, very moist, hard, clayey silt; poorly developed fissile structure; unoxidized; micaceous
125								
130								@ 130' Same as above
135								Total Depth = 138 Feet Geologically Logged to 135 Feet Seepage Encountered at 60.8, 71.7, and 76 Feet No Caving Backfilled 1/6/88
140								
145								
150								

GEOTECHNICAL BORING LOG

DATE 1/9/88 DRILL HOLE NO. 1B-14 SHEET 1 OF 6

PROJECT Pacific/Colinas Sur PROJECT NO. 8871452-03

DRILLING CO. Contractor's Drilling Service TYPE OF RIG Bucket Auger

HOLE DIAMETER 24" DRIVE WEIGHT 2,200# to 23'/1,450# to 46'/700# to 69'/1,050# to 96'/1,400# to 117'/1,750# to 138'/2,100# to 155' DROP 12

ELEVATION TOP OF HOLE ±406' REF. OR DATUM ~~See Geotechnical Map~~

LOGGED BY RKW

SAMPLED BY RKW

Depth Feet	Graphic Log (H E)	Attitudes	Tube Sample No.	Blows Per Foot	Dry Density PCF	Moisture Content, %	Soil Class. (U.S.C.S.)	Geotechnical Description
0							ML	**FILL:** Gray to light gray mottled dark brown and orange-brown, very moist, medium , slightly sandy, clayey silt; scattered roots and rootlets and siltstone fracments @ 0.7' Becomes stiff and moist; occasional discontinuou open, near-vertical fractures @ 2.1' Near-horizontal lift of topsoil-derived fill; 2 to 4 inches thick @ 2.5' Contains disseminated gypsum; open fractures terminate; iron oxide stringers and blebs
5			1	1	95.0	15.4	ML/CL	@ 3.9' Near-horizontal fill lifts up to 5 inches thick @ 4.8' Becomes predominantly dark brown, sandy, clayey silt to silty clay with scattered zones of gray silt; fill appears to be very tight @ 5.5' Scattered concretions within fill @ 6' Becomes dark brown, silty clay; carbonate blebs occasional silt zones; unable to tell lift thickness
			①					
10			2	3	108.9	13.6	CL	@ 7.9' Broken glass @ 10' Becomes dark brown, sandy clay; minor amounts o carbonate stringers and blebs
			②					
		GC:N38E/7SE J:N12E/90					ML/MH	**TOPSOIL/COLLUVIUM:** Medium to dark brown, slightly moist, very stiff, sligh ly clayey, sandy silt; massive; tiny open pores (pin-hole structure); carbonate blebs and stringers; iron oxide blebs
15							ML/MH	@ 14' Possible joint/fracture
		F:N26E/86NW						**LANDSLIDE DEPOSITS:** Medium brown mottled orange-brown, slightly moist to moist, very stiff to hard, clayey, sandy silt; massive; blocky; carbonate blebs and stringers; appears to be graben material; contains tiny pores; gradational upper contact
20							SM/ML	@ 17.3' Becomes medium to olive-brown, moist, very sti to hard, sandy, silty clay; massive; carbonate stringers @ 18.9' Becomes less stiff
							SM	@ 19.4 to 19.9' Layer of broken concretions
		GB:N16W/6SW B:N62W/7SW	3	4	95.3	25.2	SM/ML	@ 19.7' Irregular contact; light gray mottled orange-brown, slightly moist, medium stiff to stiff, clayey, sandy silt to silty sand; fine-grained massive; slightly micaceous; scattered carbona blebs and stringers; porous; near-vertical stringers of dark brown silt
							SM	
25							ML/MH	@ 21.2' Contains abundant carbonate stringers @ 21.8' Contains orange-brown, fine-grained, silty san clasts @ 22.2' 2-inch thick, irregular sand bed; orange-brown slightly moist, dense, silty, fine-grained san micaceous; iron oxide stained @ 22.4' 4 by 6 inch concretion in east wall @ 22.5' Increase in sand content
30								

GEOTECHNICAL BORING LOG

DATE 1/9/88 DRILL HOLE NO. LB-14 SHEET 2 OF 6

PROJECT Pacific/Colinas Sur PROJECT NO. 8871452-03

DRILLING CO. Contractor's Drilling Service TYPE OF RIG Bucket Auger

HOLE DIAMETER 24" DRIVE WEIGHT 2,200# to 23'/1,450# to 46'/700# to 69'/1,050# to 96'/1,400# to 117'/1,750# to 138'/2,100# to 155' DROP 12

ELEVATION TOP OF HOLE ±406' REF. OR DATUM ~~See Geotechnical Map~~

Depth Feet	Graphic Log (W–E)	Attitudes	Tube Sample No.	Blows Per Foot	Dry Density PCF	Moisture Content, %	Soil Class. (U.S.C.S.)	Geotechnical Description
30							ML/MH	LANDSLIDE DEPOSITS (CONTINUED): Grades to medium gray, moist, stiff, fine-grained, sandy silt; micaceous; massive; slightly clayey, limonite nodules throughout
								@ 23.8' Orange-brown, moist, dense, silty, fine-grained sand; massive to slightly laminated; scattered, small siltstone fragments; friable; ends at 24.5 feet; lower 4 inches has larger grains, less silt, scattered charboal blebs
35								@ 24.5' Medium gray mottled orange-brown, moist, stiff, clayey silt; abundant carbonate stringers and iron oxide stains; micaceous; massive; occasional sand-infilled animal burrows; near-vertical, poorly to moderately fractured; disseminated gypsum; punky texture
		GB:N8W/28E						
								@ 27' Becomes medium stiff to stiff, punky texture; abundant iron oxidzaiton; has disturbed appearan
40								@ 34.6 to 35.5' Subrounded concretion with abundant gypsum and calcite crystals within cracked concretion
		S:N3W/55NE	4	9	94.3	28.8		
		GB:N50-52W/ 4SW						@ 37' Becomes medium stiff to stiff, very micaceous silt
								@ 37 to 37.4' Poorly developed discontinuous sand beds; iron oxide stain along surface
								@ 38' Becomes clayey, micaceous silt
								@ 40.5' Shear; paper-thin, gray, remolded, micaceous, silty clay; polished surface; no striations; parallel, paper-thin shears within 4-inch zone
45								@ 41' Medium gray, medium stiff to stiff, micaceous, clayey silt
								@ 43' Becomes slightly sandy to sandy, very moist; massive
		B:N32W/12NE						@ 47' Minor seepage; traces of free water
								@ 47.1' 2-inch thick silt bed
		F:N16E/50E						@ 47.6' 1-foot thick zone of well developed fractures; iron oxide stained and clay-coated
								@ 48' Gypsum stringer parallel to fractures above
50								
		S(?):N8E/ 66SE						@ 53' Moderately broken silt; well developed fractures gypsum coated; probable shear zone
55								@ 55' Becomes transitional with unoxidized, micaceous, clayey silt; becomes very stiff
		F:N13E/31E						
								@ 56.7' Gypsum-infilled fracture
								@ 57' Becomes predominantly dark gray, unoxidized, clayey silt
60								

LOGGED BY RKW

SAMPLED BY RKW

DATE 1/9/88 DRILL HOLE NO. LB-14 SHEET 3 OF 6

PROJECT Pacific/Colinas Sur PROJECT NO. B871452-03

DRILLING CO. Contractor's Drilling Service TYPE OF RIG Bucket Auger

HOLE DIAMETER 24" DRIVE WEIGHT 2,200# to 23'/1,450# to 46'/700# to 69'/1,050# to 96'/1,400# to 117'/1,750# to 138'/2,100# to 155' DROP 12

ELEVATION TOP OF HOLE ±406' REF. OR DATUM ~~See Geotechnical Map~~

LOGGED BY RKW

SAMPLED BY RKW

Depth Feet	Graphic Log	Attitudes	Tube Sample No.	Blows Per Foot	Dry Density PCF	Moisture Content, %	Soil Class. (U.S.C.S.)	Geotechnical Description
60			5	32	97.3	26.8	ML/MH	LANDSLIDE DEPOSITS (CONTINUED): Dark gray, moist, stiff, clayey silt; micaceous; massive unoxidized
								@ 61' Becomes very micaceous, stiff to medium stiff very moist
								@ 62' Becomes stiff
65								
								@ 68' Becomes micaceous, clayey silt; very stiff; very massive; medium fissile (near-horizontal)
70								
75								@ 75' Same as above
80			6	20	107.9	15.2		
85								@ 84' Lacks fractures and joints; very massive @ 84.6 to 85' Soft to stiff, clayey zone; very gradation upper and lower contacts; no shears or fractures @ 85' Grades to stiff, clayey, micaceous silt; dark gray; massive; fissle (near-horizontal)
90								

GEOTECHNICAL BORING LOG

DATE 1/9/88 DRILL HOLE NO. LB-14 SHEET 4 OF 6

PROJECT Pacific/Colinas Sur PROJECT NO. 8871452-03

DRILLING CO. Contractor's Drilling Service TYPE OF RIG Bucket Auger

HOLE DIAMETER 24" DRIVE WEIGHT 2,200# to 23'/1,450# to 46'/700# to 69'/1,050# to 96'/1,400# to 117'/1,750# to 138'/2,100# to 155 DROP 12

ELEVATION TOP OF HOLE ±406' REF. OR DATUM ~~See Geotechnical Map~~

LOGGED BY RKW

SAMPLED BY RKW

Depth Feet	Graphic Log (W–E)	Attitudes	Tube Sample No.	Blows Per Foot	Dry Density PCF	Moisture Content, %	Soil Class. (U.S.C.S.)	Geotechnical Description
90							ML/MH	LANDSLIDE DEPOSITS (CONTINUED): Dark gray, moist, very stiff, slightly clayey silt; massive; micaceous; unoxidized @ 90.6' Becomes very stiff
								@ 94' Minor seepage; grades to micaceous, fine-graine siltstone; clayey silt
95								@ 96' Grades to dark gray, micaceous, sandy silt
100		S:N8W/42E Str:N86W/37	7	12	93.0	29.2		@ 100' Well developed, remolded shear; dark gray, high polished; striated; 1/8 inch thick to paper-thi
		GB:N30-35E/ 15-18NW						@ 101.4' 2-inch thick, light gray, saturated, dense, co sionless, fine-grained sand bed; micaceous; se @ 101.6' Fine-grained, sandy silt; micaceous; very soft
		F:N23E/72W						@ 103' Fracture 1/2 inch side; infilled with fine-: grained, cohesionless sand; abundnat piping along fracture
105		B:N8E/16NW S:N10E/68NW						@ 103.3 to 103.8' Sand bed; similar to above; piping (2 feet back) on east side of hole
							ML/CL	@ 106' Shear; highly polished surface; 1/4 to 1/2 in thick; remolded clayey silt; micaceous @ 106.5' Dark gray, very stiff, micaceous, clayey silt to silty clay; massive
110		F:N13E/78NW F:N6E/72NW						@ 109 to 114' Numerous fractures and polished surfaces discontinuous; no striations; traces of free water along fractures
							ML	@ 114' Very gradational change to fine-grained, sandy to clayey, micaceous silt; very stiff
115		F:N19W/44NE S:N18W/38NE Str:N78W/30E						@ 118.5' Shear; remolded silt; very micaceous; striat paper-thin @ 119.5, 119.8, and 120' Three parallel shears
120								

DATE 1/9/88 DRILL HOLE NO. LB-14 SHEET 5 OF 6

PROJECT Pacific/Colinas Sur PROJECT NO. 8871452-03

DRILLING CO. Contractor's Drilling Service TYPE OF RIG Bucket Auger

HOLE DIAMETER 24" DRIVE WEIGHT 2,200# to 23'/1,450# to 46'/700# to 69'/1,050# to 96'/1,400# to 117'/1,750# to 138'/2,100# to 155' DROP 12

ELEVATION TOP OF HOLE ±406' REF. OR DATUM ~~See Geotechnical Map~~

DEPTH FEET	GRAPHIC LOG (W E)	ATTITUDES	TUBE SAMPLE NO.	BLOWS PER FOOT	DRY DENSITY PCF	MOISTURE CONTENT, %	SOIL CLASS. (U.S.C.S.)
120							
		J:N38W/40NE					
125		S:N22W/42E	8	12	102.1	24.2	
		F:N50W/73NE S:N60E/44SE					
130							
135							
140							
145							
150							

GEOTECHNICAL DESCRIPTION

LOGGED BY RKW

SAMPLED BY RKW

LANDSLIDE DEPOSITS (CONTINUED):

Dark gray, moist, stiff, slightly clayey silt; massive; unoxidized; micaceous

@ 121' Becomes very micaceous

@ 122.1 to 122.8 Concretion

@ 122.8 to 124.3 Abundant discontinuous joints

@ 124.5' Remolded silt shear; poorly developed striation in dip direction; paper-thin, dark to medium gray; very micaceous

@ 126' Becomes fine-grained, sandy, micaceous silt; medium stiff to soft

@ 129' Becomes soft, micaceous, sandy silt

@ 129 to 130.5' Spalds readily

@ 130' Dark gray, soft to medium stiff, micaceous silt very wet; moderately fractured; spalds readily

@ 130 to 130.4' Very soft, medium plastic zone; no striations; 4 to 6 inches thick; minor seepage very micaceous, silty clay; spalls along zone

@ 130.2' Shear 1/8 inch thick; micaceous, silty clay; moderately plastic; wet

@ 132' Seepage

@ 134' Becomes stiff

@ 135.5' Very stiff, micaceous, clayey silt

@ 136' Concretion (1 foot in diameter)

@ 137' Becomes dark gray, very stiff, micaceous, clay silt; lacks structure; slightly fissle due to mica partings (near-horizontal); moist to very moist

@ 150' Very stiff, micaceous, clayey silt; very mass lacks fractures, joints, shears; very moist t moist

DATE _____ DRILL HOLE NO. LB-14 SHEET 6 OF 6

PROJECT Pacific/Colinas Sur PROJECT NO. 8871452-03

DRILLING CO. Contractor's Drilling Service TYPE OF RIG Bucket Auger

HOLE DIAMETER 24" DRIVE WEIGHT 2,200# to 23'/1,450# to 46'/700# to 69'/1,050# to 96'/1,400# to 117'/1,750# to 138'/2,100# to 155' DROP 12

ELEVATION TOP OF HOLE ±409' REF. OR DATUM ~~See Geotechnical Map~~

DEPTH FEET	GRAPHIC LOG	ATTITUDES	TUBE SAMPLE NO.	BLOWS PER FOOT	DRY DENSITY PCF	MOISTURE CONTENT, %	SOIL CLASS. (U.S.C.S.)	GEOTECHNICAL DESCRIPTION
								LOGGED BY RKW SAMPLED BY RKW
150								LANDSLIDE DEPOSITS (CONTINUED): Dark gray, micaceous, clayey silt; very massive; lacks joints and fractures; very stiff
155								Total Depth = 155 Feet Geologically Logged to 155 Feet Seepage Encountered at 47, 94, 101, 103, 104, and 132 Fe Minor Sloughing/Spalling of Boring Walls Between 100 and 130 Feet Backfilled 1/9/88
160								
165								
170								
175								
180								

BORING LOG

Logged By:	Date Drilled:	Drill Rig:	Boring Diameter:	Boring Number:
PD	9/9/80	BUCKET AUGER	24"	B-1A

This log is a representation of subsurface conditions at the time and place of drilling. With the passage of time or at any other location there may be consequential changes in conditions.

Boring Elevation: 420' topo

SAMPLE BULK	SAMPLE TUBE	DRIVE ENERGY FT. KIPS/FT.	FIELD MOISTURE % DRY WEIGHT	DRY DENSITY LB./CU. FT.	SHEAR RESISTANCE KIPS/SQ. FT.	DEPTH, FEET	SOIL/ROCK TYPE	GEOLOGICAL/ENGINEERING Description and Remarks
								TOPSOIL: CLAYEY SILT Dark brown, (stiff), mod. firm, very porous, sl. mst with roots to ¼" diam. with scattered rock fragm. to 2"
X	X	16	–	–		5		SLOPEWASH: CLAYEY SILT WITH SILT Brn to lt. brn., firm to v. firm, porous, sl. moist, with soil pockets to 6" diam. Carbonate staining
	X	14	15	107		10		OLDER LANDSLIDE (Qlso) - (CAPISTRANO FM.) SILTSTONE W/CLAYEY SILTST. & SANDY SILTST. as irregular lenses/pockets Lt. brn & lt gray, mod. hard, sl porous, Very weathered, mod. fract'd (tight fract's) sl. moist w/scat. carbonate films w/scat sandst. lenses Sandst. lense, m. dense, lt brn
	X	12	–	–		15		mod. weath'd, sl. fract'd, mod hard, sl. mois w/oxide staining Sandst. bed, 6" thk. B-STR N-S Dip 15° W
	X	14	–	–		20		w/alt. sandst (v.f.) beds & lenses to 3" thk

End of boring @ 20'
No caving or groundwater
Hole backfilled and tamped

Medall, Aragon, Worswick & Associates, Inc. *Consulting Engineers and Geologists*	LOS ANGELES SANTA ANA RIVERSIDE	PROJECT NO.: 1753B	FIGURE NO.:

BORING LOG

Logged By:	Date Drilled:	Drill Rig:	Boring Diameter:	Boring Number:
PD	9/9/80	BUCKET AUGER	24"	B-2A

This log is a representation of subsurface conditions at the time and place of drilling. With the passage of time or at any other location there may be consequential changes in conditions.

Boring Elevation: 410' topo

SAMPLE BULK	SAMPLE TUBE	DRIVE ENERGY FT. KIPS/FT.	FIELD MOISTURE % DRY WEIGHT	DRY DENSITY LB./CU. FT.	SHEAR RESISTANCE KIPS/SQ. FT.	DEPTH FEET	SOIL/ROCK TYPE	GEOLOGICAL/ENGINEERING Description and Remarks
								TOPSOIL: SILTY CLAY, merging to CLAYEY SILT Drk. brn. (stiff), mod. firm, por. to v. porous, sl. mst., w/root hairs & scat rock fragm to 1"
	X	14	14	105		5		SLOPEWASH: Mxd CLAYEY SILT & SILTY CLAY Brn,. mod. firm to firm; sl. mst., porous, w/soft soil pockets to 3" daim.
	X	20	—	—		10		OLDER LANDSLIDE (Qlso): (CAPISTRANO FM) Alt. SILTSTONE & CLAYEY SILTSTONE Brn. & lt. brn. w/lt gray, v. weath'd. soft to mod hrd., indist'y bedded, sl. porous w/soil-filled pockets & lenses to 4" diam.
	X	16	12	99		15		Mod. hrd., homogeneous, bedding indistinct, w/oxide staining and scatt'd gypsum filled fract's w/scattered alt. lenses & pockets Sandstone; lt. brn., loose to ± 1" thk.
X	X	14	—	—		20		
								T.D. 21' backfill & tamp

End of boring @ 21 feet.
No caving or groundwater. Hole backfilled & tamped

Medall, Aragon, Worswick & Associates, Inc. *Consulting Engineers and Geologists*	LOS ANGELES SANTA ANA RIVERSIDE	PROJECT NO.: 1753B	FIGURE NO.:

BORING LOG

Logged By:	Date Drilled:	Drill Rig:	Boring Diameter:	Boring Number:
PD	9/9/80	BUCKET AUGER	24"	B-3A

This log is a representation of subsurface conditions at the time and place of drilling. With the passage of time or at any other location there may be consequential changes in conditions.

Boring Elevation: 400' topo

SAMPLE BULK	SAMPLE TUBE	DRIVE ENERGY FT. KIPS/FT.	FIELD MOISTURE % DRY WEIGHT	DRY DENSITY LB./CU. FT.	SHEAR RESISTANCE KIPS/SQ. FT.	DEPTH FEET	SOIL/ROCK TYPE	GEOLOGICAL/ENGINEERING Description and Remarks
								TOPSOIL/SLOPEWASH: CLAYEY SILT Dk. brn. w. brn. firm, v. porous, sl. moist, w/scat. rock frag. to 1" diam.
	X	12	—	—		5		OLDER LANDSLIDE (Qlso) (CAPISTRANO FM): SILTSTONE ALT. W/CLAYEY SILTSTONE mod. hard, v. weath'd, v. fract'd, sl. moist, brn & gry & red-brn (oxides) Indistinct bedding Joint: N-S, dip 70° E Tight, w/ 1/8" gyps seam w/thin oxide stained laminae along fractures and joints.
						10		Fract: (jnt): N30E, 40°SE w/gypsum
	X	10	25	96		15		Bedding v. contorted, discontinuous, w/oxide stained laminae
						20		Joint: N20E, 35°SE w/gypsum filling, continuous
	X	10	—	—				

Medall, Aragon, Worswick & Associates, Inc.
Consulting Engineers and Geologists

LOS ANGELES
SANTA ANA
RIVERSIDE

PROJECT NO.: 1753B

FIGURE NO.:

BORING LOG

Logged By:	Date Drilled:	Drill Rig:	Boring Diameter:	Boring Number:
PD	9/9/80	BUCKET AUGER	24"	B-3A Continued

This log is a representation of subsurface conditions at the time and place of drilling. With the passage of time or at any other location there may be consequential changes in conditions.

Boring Elevation: 400' topo

SAMPLE BULK	SAMPLE TUBE	DRIVE ENERGY FT. KIPS/FT.	FIELD MOISTURE % DRY WEIGHT	DRY DENSITY LB./CU. FT.	SHEAR RESISTANCE KIPS/SQ. FT.	DEPTH, FEET	SOIL/ROCK TYPE	GEOLOGICAL/ENGINEERING Description and Remarks
								SILTSTONE WITH CLAYEY SILTSTONE (CONTINUED)
								Calcareous nodules, 6"-12" thick, intensely fractured, very hard
						25		W/oxide-stained laminae, discontinuous bedding, contorted w/scat'd gypsum healed fract's.
	X	7.8	29	84		30		Joint: N-S 75°E
								Joint: N10W, 80°W
								Joint: N10E, 75°E
						35		
						40		End of boring at 39 feet. No caving or groundwater Hole backfilled & tamped.

BORING LOG

Logged By:	Date Drilled:	Drill Rig:	Boring Diameter:	Boring Number:
PD	9/9/80	BUCKET AUGER	24"	B-4 A

This log is a representation of subsurface conditions at the time and place of drilling. With the passage of time or at any other location there may be consequential changes in conditions.

Boring Elevation: 350' topo

SAMPLE: BULK	SAMPLE: TUBE	DRIVE ENERGY FT. KIPS/FT.	FIELD MOISTURE % DRY WEIGHT	DRY DENSITY LB./CU. FT.	SHEAR RESISTANCE KIPS/SQ. FT.	DEPTH, FEET	SOIL/ROCK TYPE	GEOLOGICAL/ENGINEERING Description and Remarks
								TOPSOIL-SLOPEWASH: CLAYEY SILT & SILTY CLAY Dark brown, m. firm, sl. mst, very porous
	X	8	24	93		5		LANDSLIDE DEBRIS (Qls): SILTSTONE & CLAYEY SILTSTONE Gry w/brn & lt gry, soft to mod. hard, very weathered, int. to v. fract'd, sl. moist; Joint: N40W, vert. w/abundant oxide stains on fract. surfaces & coastings & scat. gypsum veins 1/16"-1/4"; Apparent Bedding (Relict-disrupted): B at: N-S, 28°W 50E, 30°NW
						10		W/scat. pockets & pods, silty sand discontinuous
	X	10	—	—				Joint: NS, 65°E
						15		Joint: N20E, vert. Oxide stained, w/gypsum x'tals.
	X	12	—	—		20		Joint: N20E, 25NW; w/gypsum filling oxide stained ; tight

BORING LOG

Logged By:	Date Drilled:	Drill Rig:	Boring Diameter:	Boring Number:
PD	9/9/80	BUCKET AUGER	24"	B-4A Continued

This log is a representation of subsurface conditions at the time and place of drilling. With the passage of time or at any other location there may be consequential changes in conditions.

Boring Elevation: 350' topo

SAMPLE: BULK	SAMPLE: TUBE	DRIVE ENERGY FT. KIPS/FT.	FIELD MOISTURE % DRY WEIGHT	DRY DENSITY LB./CU. FT.	SHEAR RESISTANCE KIPS/SQ. FT.	DEPTH, FEET	SOIL/ROCK TYPE	GEOLOGICAL/ENGINEERING Description and Remarks
								LANDSLIDE DEBRIS (Qls)
								SILTSTONE ALTERNATING WITH CLAYEY SILTSTONE (CONT.):
								Very to intensely fractured
								Joint: N-S , 45°E Gypsum filled w/oxide staining, tight.
						25		
						SEEP		SOFT, INTENSELY FRACT'D W/GYP. SEAMS; SLIDE ZONE; 1" THICK CLAY SEAM, WET; N-S, 25-30° E
						30		
								OLDER LANDSLIDE (Qlso) (Capistrano FM):
								SILTSTONE
								Dark gray
	X	16	24	95				Hard, slightly weathered, slightly fractured, indistinctly bedded, few fractures, micaceous
						35		
						40		End of boring @ 38 feet. No caving. Slight seep @ 29', not flowing Hole backfilled & tamped

BORING LOG

Logged By:	Date Drilled:	Drill Rig:	Boring Diameter:	Boring Number:
PD	9/10/80	BUCKET AUGER	24"	B-5 A

This log is a representation of subsurface conditions at the time and place of drilling. With the passage of time or at any other location there may be consequential changes in conditions.

Boring Elevation:

SAMPLE BULK	SAMPLE TUBE	DRIVE ENERGY FT. KIPS/FT.	FIELD MOISTURE % DRY WEIGHT	DRY DENSITY LB./CU. FT.	SHEAR RESISTANCE KIPS/SQ. FT.	DEPTH, FEET	SOIL/ROCK TYPE	GEOLOGICAL/ENGINEERING Description and Remarks
								OLDER LANDSLIDE (Qlso)(CAPISTRANO FM): SILTSTONE W/SANDY SILTSTONE Brown w/lt. brn & gry, soft to mod hard, very weathered, intensely fract'd, sl. mst. w/scat. lenses, pods, gypsum fill'g & oxide staining along fract's
	X	10	27	91				V. fract'd w/numerous discontinuous fract's & gypsum fill'g 1/8" - 1/4" thk
						5		Joint: N30W, 45°E w/gyps. 1/8" thk.
						10		Bedding: N60E, 30NW oxide stained
	X	14	26	94				
								Joint: N70E, 65-60°N
						15		
	X	22	—	—		20		Joint: N40E, 65°NW with 1/8" gyps. fill.

BORING LOG

Logged By:	Date Drilled:	Drill Rig:	Boring Diameter:	Boring Number:
PD	9/10/80	BUCKET AUGER	24"	B-5 A Continued

This log is a representation of subsurface conditions at the time and place of drilling. With the passage of time or at any other location there may be consequential changes in conditions.

Boring Elevation:

SAMPLE BULK	SAMPLE TUBE	DRIVE ENERGY FT. KIPS/FT.	FIELD MOISTURE % DRY WEIGHT	DRY DENSITY LB./CU. FT.	SHEAR RESISTANCE KIPS/SQ. FT.	DEPTH, FEET	SOIL/ROCK TYPE	GEOLOGICAL/ENGINEERING Description and Remarks
								SILTSTONE w/CLAYEY SILTSTONE (continued): Brn w/gry & lt. brn, soft to mod. hard, v. weath'd, v. fract'd, sl. moist.
						25		
						30		Joint: NS, 45°E v. tight, gyps. fill'g 1/8"
	X	23	30	89				w/ drk gry siltstone pockets - irregular moderately hard, micaceous
								Joint: NS, 40°E, oxide stain'd & gyp 1/8" thk
						35		SILTSTONE Dark gray, moderately hard, slightly weathered slightly to moderately fractured, slightly moist, micaceous
								w/scat'd alt. oxide-stained seams & laminae, & gypsum fillings to 1/8" thk. discontinuous, random
						40		
	X	21	—	—				
						45		

BORING LOG

Logged By:	Date Drilled:	Drill Rig:	Boring Diameter:	Boring Number:
PD	9/10/80	BUCKET AUGER	24"	B-5A
This log is a representation of subsurface conditions at the time and place of drilling. With the passage of time or at any other location there may be consequential changes in conditions.			Boring Elevation:	Continued

SAMPLE: BULK	SAMPLE: TUBE	DRIVE ENERGY FT. KIPS/FT.	FIELD MOISTURE % DRY WEIGHT	DRY DENSITY LB./CU. FT.	SHEAR RESISTANCE KIPS/SQ. FT.	DEPTH, FEET	SOIL/ROCK TYPE	GEOLOGICAL/ENGINEERING Description and Remarks
						45		SILTSTONE (CONTINUED): Dark gray, moderately hard, slightly weathered
						50		End of boring at 50 feet. No caving, no groundwater Tamped and backfilled.

BORING LOG

Logged By:	Date Drilled:	Drill Rig:	Boring Diameter:	Boring Number:
PD	9/10/80	BUCKET AUGER	24"	B-6A

This log is a representation of subsurface conditions at the time and place of drilling. With the passage of time or at any other location there may be consequential changes in conditions.

Boring Elevation: 297' topo

SAMPLE BULK	SAMPLE TUBE	DRIVE ENERGY FT. KIPS/FT.	FIELD MOISTURE % DRY WEIGHT	DRY DENSITY LB./CU. FT.	SHEAR RESISTANCE KIPS/SQ. FT.	DEPTH FEET	SOIL/ROCK TYPE	GEOLOGICAL/ENGINEERING Description and Remarks
								OLDER LANDSLIDES (Qlso) (CAPISTRANO FM): SILTSTONE W/CLAYEY SILTSTONE AND SANDY SILTSTONE (Irregular Seams & Pockets) Brown with light brown & light gray to red-brn, soft to mod. hard, intens. fract'd, v. weath'd sl. moist, bedding indistinct. W/numerous gypsum filled veins and fract's. & oxide coated fract's. Fract's discontinuous
						5		
X		12	22	98				
								"Relict" bedding (?) E.W, 35°W sand lense, 1"-3" thick, lt. gray
								w/oxide stained laminae ± horizontal
						10		
								"Relict" Bedding - Horiz. oxide stain'd & gypsum filled 1/8" thick
						15		
X		16	32	87				"Relict" Bedding (?) N-S, 10°E with gypsum 1/8" thick & limonite stains ± horiz.
						20		

Medall, Aragon, Worswick & Associates, Inc.
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LOS ANGELES
SANTA ANA
RIVERSIDE

PROJECT NO.: 1753B

FIGURE NO.:

BORING LOG

Logged By:	Date Drilled:	Drill Rig:	Boring Diameter:	Boring Number:
PD	9/10/80	BUCKET AUGER	24"	B-6A Continued

This log is a representation of subsurface conditions at the time and place of drilling. With the passage of time or at any other location there may be consequential changes in conditions.

Boring Elevation: 297' topo

SAMPLE: BULK	SAMPLE: TUBE	DRIVE ENERGY FT. KIPS/FT.	FIELD MOISTURE % DRY WEIGHT	DRY DENSITY LB./CU. FT.	SHEAR RESISTANCE KIPS/SQ. FT.	DEPTH, FEET	SOIL/ROCK TYPE	GEOLOGICAL/ENGINEERING Description and Remarks
								SILTSTONE w/CLAYEY & SANDY SILTSTONE (CONTINUED)
								Very to moderately weathered
								With dark gray zones and irregular pockets - less weathered zones
						25		moderately fractured, sl. to mod. weathered, moderately hard
	X	19						SILTSTONE
								Dark gray, moderately hard, sl. to mod. fract'd sl weath'd, micaceous, sl. moist
								w/thin 1/8"-1/4" gyps. seams & fract. fill'gs oxide stained
						30		
								dark brown alt. w/dark gray zones
						35		"Relict" Bedding(?) Horiz. & gypsum filled laminae
	X	21						
								dark gray, micaceous, bedding indistinct
						40		
								Variable dip to South
								Irregular silty clay seam 1/4-1" thl
								Red-brown, soft, discontinuous, with gypsum

BORING LOG

Logged By:	Date Drilled:	Drill Rig:	Boring Diameter:	Boring Number:
PD	9/10/80	BUCKET AUGER	24"	B-6 A Continued

This log is a representation of subsurface conditions at the time and place of drilling. With the passage of time or at any other location there may be consequential changes in conditions.

Boring Elevation: 297' topo

SAMPLE: BULK	SAMPLE: TUBE	DRIVE ENERGY FT. KIPS/FT.	FIELD MOISTURE % DRY WEIGHT	DRY DENSITY LB./CU. FT.	SHEAR RESISTANCE KIPS/SQ. FT.	DEPTH, FEET	SOIL/ROCK TYPE	GEOLOGICAL/ENGINEERING Description and Remarks
								SILTSTONE (CONTINUED): Dark gray, micaceous, indistinct bedding "Massive", sl. fract'd, sl. weath'd, mod. hard
								No continuous planar surfaces.
						50		
	X	21				55		
								End of boring at 55 feet. No caving or groundwater Hole backfilled and tamped.
						60		

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Consulting Engineers and Geologists

LOS ANGELES
SANTA ANA
RIVERSIDE

PROJECT NO.: 1753B

FIGURE NO.:

BORING LOG

Logged By:	Date Drilled:	Drill Rig:	Boring Diameter:	Boring Number:
AOM	9/10/80	BUCKET AUGER	24"	B-7A
This log is a representation of subsurface conditions at the time and place of drilling. With the passage of time or at any other location there may be consequential changes in conditions.			Boring Elevation: 290'	

SAMPLE: BULK	SAMPLE: TUBE	DRIVE ENERGY FT. KIPS/FT.	FIELD MOISTURE % DRY WEIGHT	DRY DENSITY LB./CU. FT.	SHEAR RESISTANCE KIPS/SQ. FT.	DEPTH FEET	SOIL/ROCK TYPE	GEOLOGICAL/ENGINEERING Description and Remarks
						5		OLDER LANDSLIDE (Qlso) (CAPISTRANO FM): SILTSTONE W/CLAYEY SILTSTONE Gray & light brown to medium brown, soft to moderately hard, intensely fractured, very weathered, indistinct bedding, sl. moist, fractures tight.
								Becomes lighter gray, harder, less fractured, less moist, fractures oxidized, 1/8"-1/4" thick, indistinct planes
	X	14	—	—		10		Joint or Relict Bedding: N10°E 10S - prominent attitude Joints fairly low angle, oxide staining
						15		Joints, oxidized gypsum filled, N75W45N
	X	14	—	—		20		Joint: N56W44N

BORING LOG

Logged By:	Date Drilled:	Drill Rig:	Boring Diameter:	Boring Number:
AOM	9/10/80	BUCKET AUGER	24"	B-7A
This log is a representation of subsurface conditions at the time and place of drilling. With the passage of time or at any other location there may be consequential changes in conditions.			Boring Elevation: 290'	Continued

SAMPLE BULK	SAMPLE TUBE	DRIVE ENERGY FT. KIPS/FT.	FIELD MOISTURE % DRY WEIGHT	DRY DENSITY LB./CU. FT.	SHEAR RESISTANCE KIPS/SQ. FT.	DEPTH, FEET	SOIL/ROCK TYPE	GEOLOGICAL/ENGINEERING Description and Remarks
								SILTSTONE W/CLAYEY SILTSTONE (Continued):
						25		
	X	47						
						30		
								Lenses of black, micaceous siltstone up to 1 foot thick interbedded in gray-brown siltstone.
						35		
	X	46						
						40		Dark gray, moderately hard, slightly to moderately fractured, slightly weathered, micaceous, slightly moist to dry. Few oxidized and gypsum filled fractures. Contact approximately N35W 48°N - undulating.

BORING LOG

Logged By:	Date Drilled:	Drill Rig:	Boring Diameter:	Boring Number:
A OM	9/10/80	BUCKET AUGER	24"	B-7 A
This log is a representation of subsurface conditions at the time and place of drilling. With the passage of time or at any other location there may be consequential changes in conditions.			Boring Elevation: 290'	Continued

SAMPLE BULK	SAMPLE TUBE	DRIVE ENERGY FT. KIPS/FT.	FIELD MOISTURE % DRY WEIGHT	DRY DENSITY LB./CU. FT.	SHEAR RESISTANCE KIPS/SQ. FT.	DEPTH, FEET	SOIL/ROCK TYPE	GEOLOGICAL/ENGINEERING Description and Remarks
								SILTSTONE (CONTINUED) Dark gray, moderately hard.
	X	42				45		
								Fractures tight, gypsum filled, generally oxidized.
						50		
								End of boring at 52.0 feet. No caving or groundwater Hole tamped and backfilled.

BORING LOG

Logged By: AOM	Date Drilled: 9/11/80	Drill Rig: BUCKET AUGER	Boring Diameter: 24"	Boring Number: B-8A
This log is a representation of subsurface conditions at the time and place of drilling. With the passage of time or at any other location there may be consequential changes in conditions.			Boring Elevation: 310'	

SAMPLE BULK	SAMPLE TUBE	DRIVE ENERGY FT. KIPS/FT.	FIELD MOISTURE % DRY WEIGHT	DRY DENSITY LB./CU. FT.	SHEAR RESISTANCE KIPS/SQ. FT.	DEPTH, FEET	SOIL/ROCK TYPE	GEOLOGICAL/ENGINEERING Description and Remarks
								OLDER LANDSLIDE (Qlso) (CAPISTRANO FORMATION): CLAYEY SILTSTONE Soft to moderately hard, gray to bro , slightly moist, yellow mineral stringers, oxidized joints, slightly to moderately weathered, some sandy lenses, joints 1/8-1/4"
								Relic Bedding: (?) - N10W50N
								In some areas joints are zoned, others not slightly to moderately fractured, tight fractures
						5		Joint: N15W 74N
								Zone of oxidation, not laterally continuous
						10		Joint: N30E 63S
	X	14	26	91				Joint: N35E 72S
						15		Joint: N68E 90
	X	6				20		Relic Bedding: (?) N7E 24N

Medall, Aragon, Worswick & Associates, Inc.
Consulting Engineers and Geologists

LOS ANGELES
SANTA ANA
RIVERSIDE

PROJECT NO.: 1753B

FIGURE NO.:

BORING LOG

Logged By:	Date Drilled:	Drill Rig:	Boring Diameter:	Boring Number:
AOM	9/11/80	BUCKET AUGER	24"	B-8A
This log is a representation of subsurface conditions at the time and place of drilling. With the passage of time or at any other location there may be consequential changes in conditions.			Boring Elevation: 310'	Continued

SAMPLE: BULK	TUBE	DRIVE ENERGY FT. KIPS/FT.	FIELD MOISTURE % DRY WEIGHT	DRY DENSITY LB./CU. FT.	SHEAR RESISTANCE KIPS/SQ. FT.	DEPTH, FEET	SOIL/ROCK TYPE	GEOLOGICAL/ENGINEERING Description and Remarks
						25		SILTSTONE (CONTINUED): Soft to moderately hard, gray to brown Joint: N30E64S
						30		Moderately hard, dark gray, micaceous, slightly moist, slightly weathered, moderately fractured, most fractures discontinuous, 1/8-1/4" thick gypsum filled and oxidized, gaseous
						35		
								Lighter gray color
						40		End of boring at 40.0 feet No caving or groundwater Hole backfilled and tamped.

BORING LOG

Logged By:	Date Drilled:	Drill Rig:	Boring Diameter:	Boring Number:
AOM	9/11/80	BUCKET AUGER	24"	B-9A

This log is a representation of subsurface conditions at the time and place of drilling. With the passage of time or at any other location there may be consequential changes in conditions.

Boring Elevation: 326'

SAMPLE BULK	SAMPLE TUBE	DRIVE ENERGY FT. KIPS/FT.	FIELD MOISTURE % DRY WEIGHT	DRY DENSITY LB./CU. FT.	SHEAR RESISTANCE KIPS/SQ. FT.	DEPTH, FEET	SOIL/ROCK TYPE	GEOLOGICAL/ENGINEERING Description and Remarks
						5		ARTIFICIAL FILL (af): SANDY SILT: Firm to stiff, medium brown, dry, clasts of siltstone up to 6" diam., roots
	X	7.6	18	99				CLAYEY SILT - stiff, dark brown, slightly moist
	X	16	23	97		10		firm to stiff, gray to brown to dark brown mottled, trace roots, slightly moist, with lenses of stiff dark brown clayey silt, some clasts of siltstone
	X	12	23	95		15		
	X	5.8	25	93		20		

BORING LOG

Logged By:	Date Drilled:	Drill Rig:	Boring Diameter:	Boring Number:
AOM	9/11/80	BUCKET AUGER	24"	B-9 A Continued

This log is a representation of subsurface conditions at the time and place of drilling. With the passage of time or at any other location there may be consequential changes in conditions.

Boring Elevation: 326'

SAMPLE BULK	SAMPLE TUBE	DRIVE ENERGY FT. KIPS/FT.	FIELD MOISTURE % DRY WEIGHT	DRY DENSITY LB./CU. FT.	SHEAR RESISTANCE KIPS/SQ. FT.	DEPTH, FEET	SOIL/ROCK TYPE	GEOLOGICAL/ENGINEERING Description and Remarks
								CLAYEY SILT (CONTINUED):
	X	7.8	19	99		25		
						30		
	X	16	18	100		35		TOPSOIL (BURIED): CLAYEY SILT Stiff, dark brown, slightly moist, roots, organic (odoriferous), roots, grasses, slightly moist
						40		ALLUVIUM (BURIED): Slight color change to reddish brown, less organic odor
								OLDER LANDSLIDE (Qlso) (CAPISTRANO FM): SILTSTONE Soft to moderatzley hard, gray to brown (Continued)

BORING LOG

Logged By:	Date Drilled:	Drill Rig:	Boring Diameter:	Boring Number:
AOM	9/11/80	BUCKET AUGER	24"	B-9 A Continued
This log is a representation of subsurface conditions at the time and place of drilling. With the passage of time or at any other location there may be consequential changes in conditions.			Boring Elevation: 326'	

SAMPLE: BULK	SAMPLE: TUBE	DRIVE ENERGY FT. KIPS/FT.	FIELD MOISTURE % DRY WEIGHT	DRY DENSITY LB./CU. FT.	SHEAR RESISTANCE KIPS/SQ. FT.	DEPTH, FEET	SOIL/ROCK TYPE	GEOLOGICAL/ENGINEERING Description and Remarks
						45		SILTSTONE (Continued): Slightly moist, oxidized, some gypsum and discontinuous sand lenses.
								End of boring at 46.0 feet. No caving or groundwater Hole backfilled and tamped.

BORING LOG

Logged By:	Date Drilled:	Drill Rig:	Boring Diameter:	Boring Number:
AOM	10/15/80	Bucket Auger	24"	B-10 A
This log is a representation of subsurface conditions at the time and place of drilling. With the passage of time or at any other location there may be consequential changes in conditions.			Boring Elevation: ± 265'	

SAMPLE: BULK	SAMPLE: TUBE	DRIVE ENERGY FT. KIPS/FT.	FIELD MOISTURE % DRY WEIGHT	DRY DENSITY LB./CU. FT.	SHEAR RESISTANCE KIPS/SQ. FT.	DEPTH, FEET	SOIL/ROCK TYPE	GEOLOGICAL/ENGINEERING Description and Remarks
							ML/MH	TOPSOIL CLAYEY SILT - Stiff, dry to slightly moist, roots, desiccation cracks
						5		LANDSLIDE DEBRIS (Qls) CLAYEY SILTSTONE - Soft to moderately hard, slightly moist, medium brownish gray, clay skins on surface, desiccation, cracks or poorly defined joints, very fractured, roots, and slight gypsum in joints, massive
								Increase in oxidation, & gypsum shears in zone N14E42S, N8E 38S @ 7½-8', slick pressure surfaces evident
						10		OLDER LANDSLIDE DEBRIS (Qlso) CLAYEY SILTSTONE Moderately hard, slightly moist, light gray, moderately fractured, joints oxidized, well defined. JOINT: N15W55N @ 9' JOINTS: N6W59N, N30W47S, N65E80S, N29W60N @ 11'
								Magnesium staining on joint surfaces tight with 1" oxidized zones along joint trace
						15		
								JOINT: N25W50N
						20		Secondary joint set N80W 50N darker gray brown, harder siltstone

BORING LOG

Logged By:	Date Drilled:	Drill Rig:	Boring Diameter:	Boring Number:
AOM	10/15/80	Bucket Auger	24"	B-10 A
This log is a representation of subsurface conditions at the time and place of drilling. With the passage of time or at any other location there may be consequential changes in conditions.			Boring Elevation: ± 265'	Continued

SAMPLE: BULK	TUBE	DRIVE ENERGY FT. KIPS/FT.	FIELD MOISTURE % DRY WEIGHT	DRY DENSITY LB./CU. FT.	SHEAR RESISTANCE KIPS/SQ. FT.	DEPTH, FEET	SOIL/ROCK TYPE	GEOLOGICAL/ENGINEERING Description and Remarks
						25		CLAYEY SILTSTONE (Continued) Some gypsum filled joints, direction of joint varies with depth, JOINT:N5E 30S
								interbedded dark gray micaceous siltstone JOINT: N20E 46S
						30		Moderately hard to hard, dark gray, micaceous, massive clayey siltstone, moderately fractured, slightly odor-iferous.
						35		JOINT: N30E 36S
						40		
								Total depth 41' No caving or groundwater, Hole backfilled

APPENDIX C

LABORATORY TEST RESULTS

APPENDIX C

LABORATORY TESTING

1. Moisture and Density Tests

Moisture content and dry density determinations were made for representative samples in accordance with ASTM: D2216 or D2487. Test results are given on the Logs of Borings and Summary of Test Pits, Appendix B.

2. Atterberg Limits

Atterberg Limits tests, consisting of liquid limit and plastic limit in accordance with ASTM: D4318-95, were performed on representative samples of the onsite soils. The test results are summarized in Table C-1.

Table C-1
Grainsize and Atterberg Limits Test Summary

Sample Location @ Depth	Liquid Limit	Plasticity Index	% - No. 200	% - 2 microns
RW-1 @ 160’	67	28	93	4
RW-1 @ 180’	54	27	79	1
RW-1 @ 200’	54	24	78	3
RW-2 @ 160’	72	38	96	6
RW-2 @ 180’	64	23	47	1
RW-2 @ 200’	63	31	65	2
RW-2 @ 210’	66	30	63	1
RW-2 @ 230’	56	30	77	1
SMC B-5 @ 7’	54	35	-	-
SMC B-6 @ @ 5-7’	46	14	-	-
SMC B-11 @ 4’	46	29	-	-

3. Particle Size Analyses

Particle size analyses were performed on representative samples of on-site soils in accordance with ASTM D422. Test results are presented in Figures C-1 and C-2.

4. Direct Shear

Direct shear strength tests were performed in general accordance with ASTM: D3080 on representative samples of the onsite soil. Relative undisturbed samples of the insitu soil and bedrock were selected for testing. To simulate possible adverse field conditions, the samples were soaked prior to shearing. Each sample was sheared at a rate of 0.005 inch per minute. The test results are presented on Figure C-1 through C-11.

5. Corrosivity

Corrosivity tests were performed by M.J. Schiff & Associates on representative samples of onsite materials. The soluble sulfate content was determined by California Test Method 417. The soluble chloride content was determined by California Test Method 417. The corrosivity of soil samples was also tested in terms of pH and resistivity in accordance with the California Test Method 643. The results are summarized in Table C-2.

Table C-2
CORROSIVITY TEST SUMMARY

Sample Location and Depth	Saturated Resistivity (Ohm-cm)	Soluble Chloride (%)	Soluble Sulfate (%)	pH
SMC B-14 @ 9’	580	0.0240	0.0520	7.9
SMC B-14 @ 20’	550	0.0755	0.0321	7.7
SMC B-14 @ 40’	660	0.0200	0.9119	7.7
SMC B-14 @ 60’	420	0.0080	0.5414	7.4
SMC B-15 @ 9’	400	0.0145	0.6547	7.6
SMC B-15 @ 30’	360	0.0255	0.4229	4.5
SMC B-15 @ 50’	350	0.0100	0.5756	7.1
SMC B-15 @ 70’	370	0.0080	0.5343	7.0
TP-11 @ 5’	1200	0.0035	0.0091	8.0
TP-11 @ 10’	770	0.0335	0.0123	7.7
TP-11 @ 14’	350	0.0770	0.0432	7.5
RW-1 @ 150’	340	0.0115	0.5898	7.6
RW-1 @ 160’	460	0.0050	0.3955	8.4
RW-1 @ 170’	380	0.0085	0.5016	7.5
RW-1 @ 180’	360	0.0110	0.4025	6.9
RW-1 @ 190’	390	0.0060	0.4150	6.3
RW-1 @ 200’	450	0.0045	0.3678	7.6
RW-1 @ 210’	430	0.0080	0.4015	8.3
RW-1 @ 220’	500	0.0085	0.3184	8.3
RW-1 @ 230’	540	0.0130	0.4322	7.8
RW-1 @ 250’	350	0.0090	0.5178	7.5
RW-2 @ 160’	400	0.0190	0.4541	8.2
RW-2 @ 170’	370	0.0250	0.5159	7.8
RW-2 @ 180’	350	0.0210	0.4094	8.1
RW-2 @ 190’	410	0.0250	0.3161	8.0
RW-2 @ 200’	310	0.0290	0.5629	7.2
RW-2 @ 210’	320	0.0275	0.4588	7.8
RW-2 @ 220’	370	0.0185	0.4033	7.9
RW-2 @ 230’	310	0.0135	0.4641	6.7
RW-2 @ 240’	350	0.0140	0.4855	6.3
RW-2 @ 250’	340	0.0155	0.4391	5.8

6. Expansion

Expansion tests were performed on representative remolded samples of the anticipated subgrade soils. These tests were performed under a surcharge of 144 pounds per square foot in accordance with ASTM: D 4829-88. The results are summarized in Table C-3.

Table C-3

Sample ID	USCS Classification	UBC Expansion Index	Expansion Potential
TP-11 @ 5’	CH	106	High
TP-11 @ 10’	CH	95	High
TP-12 @ 1-3’	CH	102	High
SMC B-3 @ 1-2’	SM	69	Medium
SMC B-5 @ 1-3’	ML	18	Very Low
SMC B-6 @ 5-7’	SM	43	Low
SMC B-7 @ 0-3’	OL	100	High
SMC B-11 @ 1-3’	ML	105	High

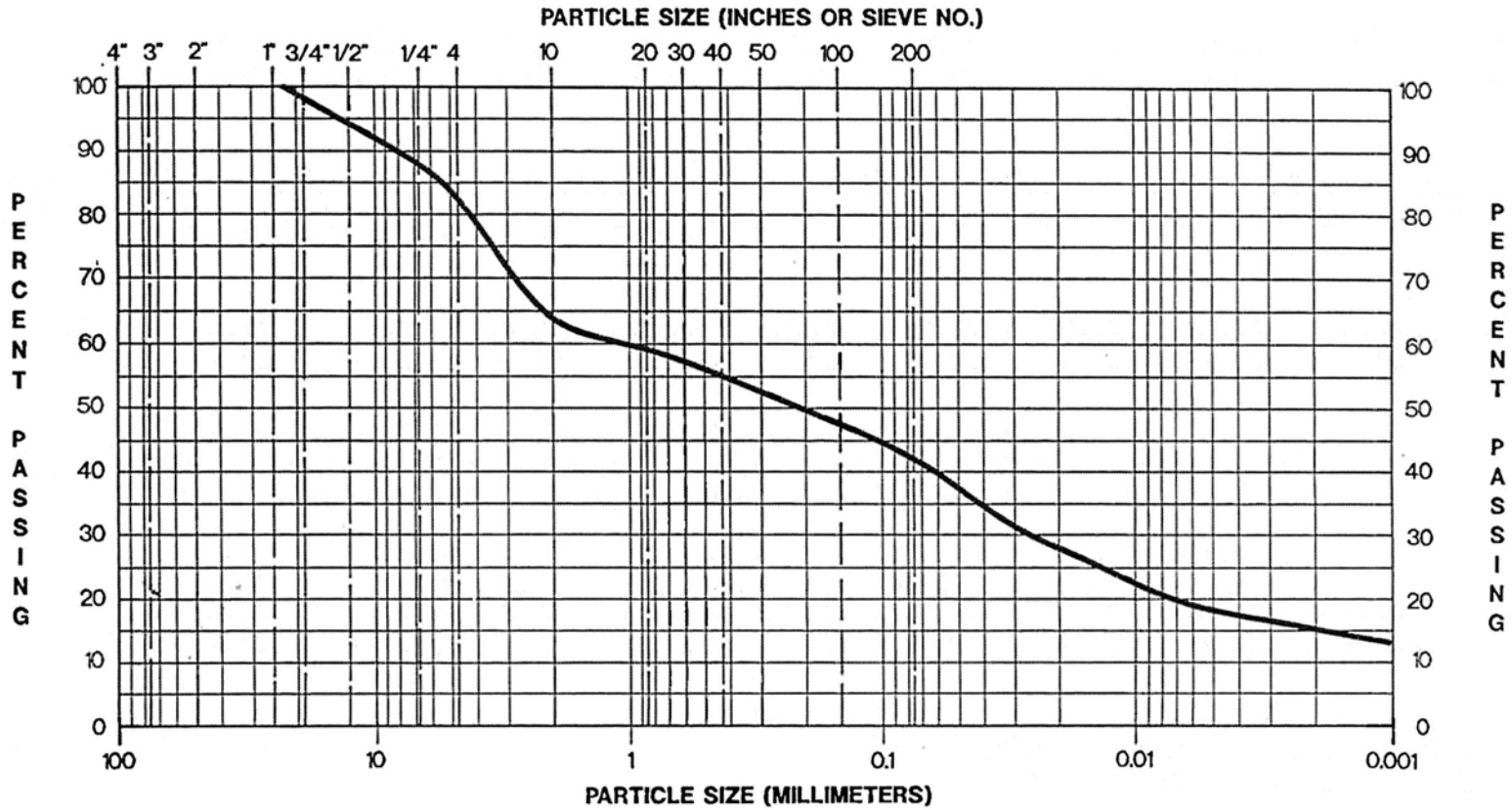
7. Maximum Density and Optimum Moisture Content

Optimum moisture and maximum density test were determined in accordance with ASTM: D 1557. The results are summarized in Table C-4.

Table C-4

Sample ID	Optimum Moisture Content (%)	Maximum Dry Density (pcf)
SMC B-3 @ 1-2’	13	120.0
SMC B-4 @ 5-6’	12	123.0
SMC B-6 @ 5-7’	11	119.0
SMC B-7 @ 0-3’	14	115.0
SMC B-8 @ 10-12’	11	126.0

COBBLES	GRAVEL	SAND			SILT	CLAY
		COARSE	MEDIUM	FINE		

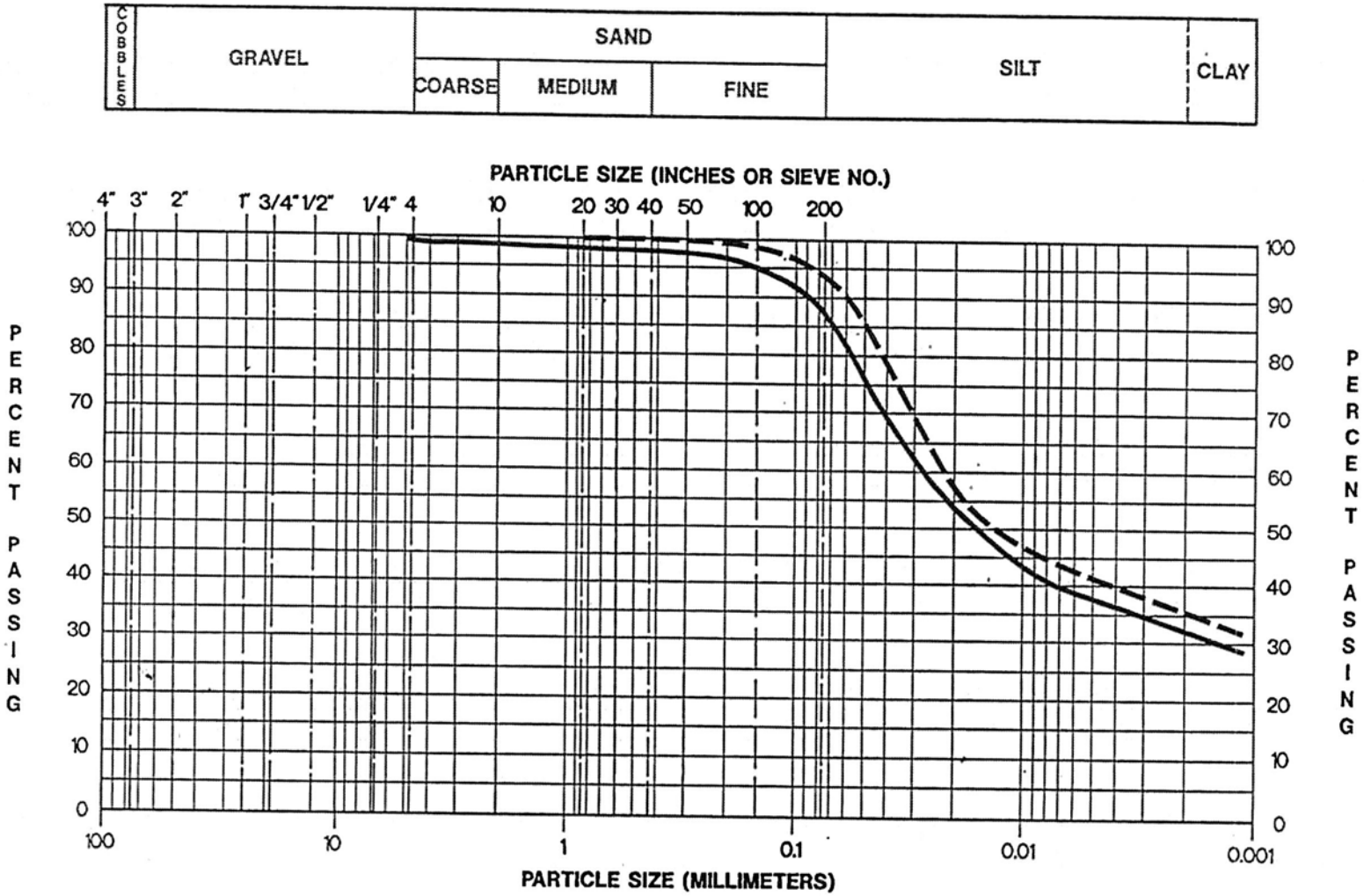


SAMPLE IDENTIFICATION	GRAPH SYMBOL	SOIL DESCRIPTION:
B-8 at 10'-12'	▬▬▬	Silty SAND with gravel (SM)

SMC

PARTICLE SIZE ANALYSIS

JOB NO.:	DATE:	FIGURE NO.:
11433-01	MAY 1997	C-1



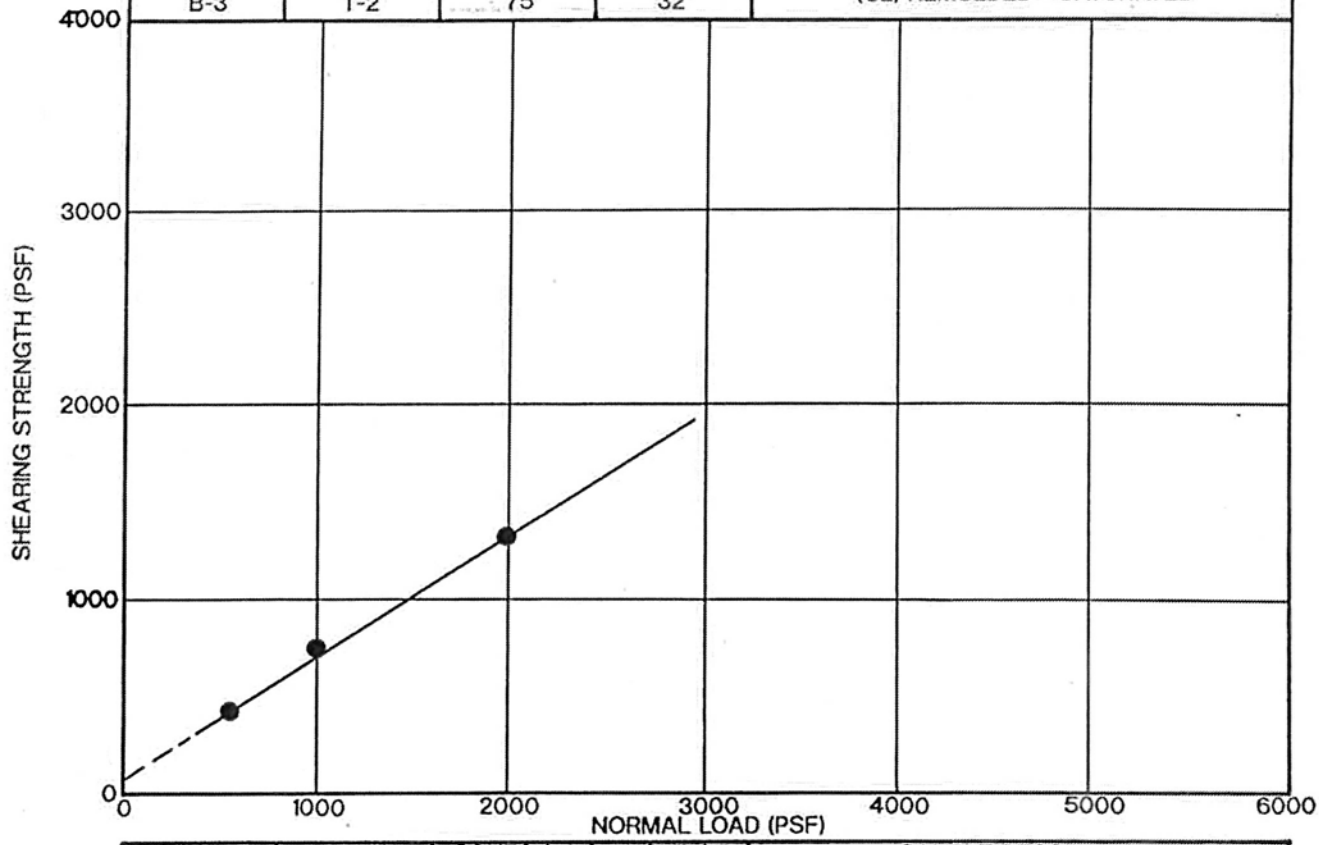
SAMPLE IDENTIFICATION	GRAPH SYMBOL	SOIL DESCRIPTION:
B-6 at 5'-7'	- - -	Elastic SILT
B-7 at 3'	———	Elastic SILT

SMC

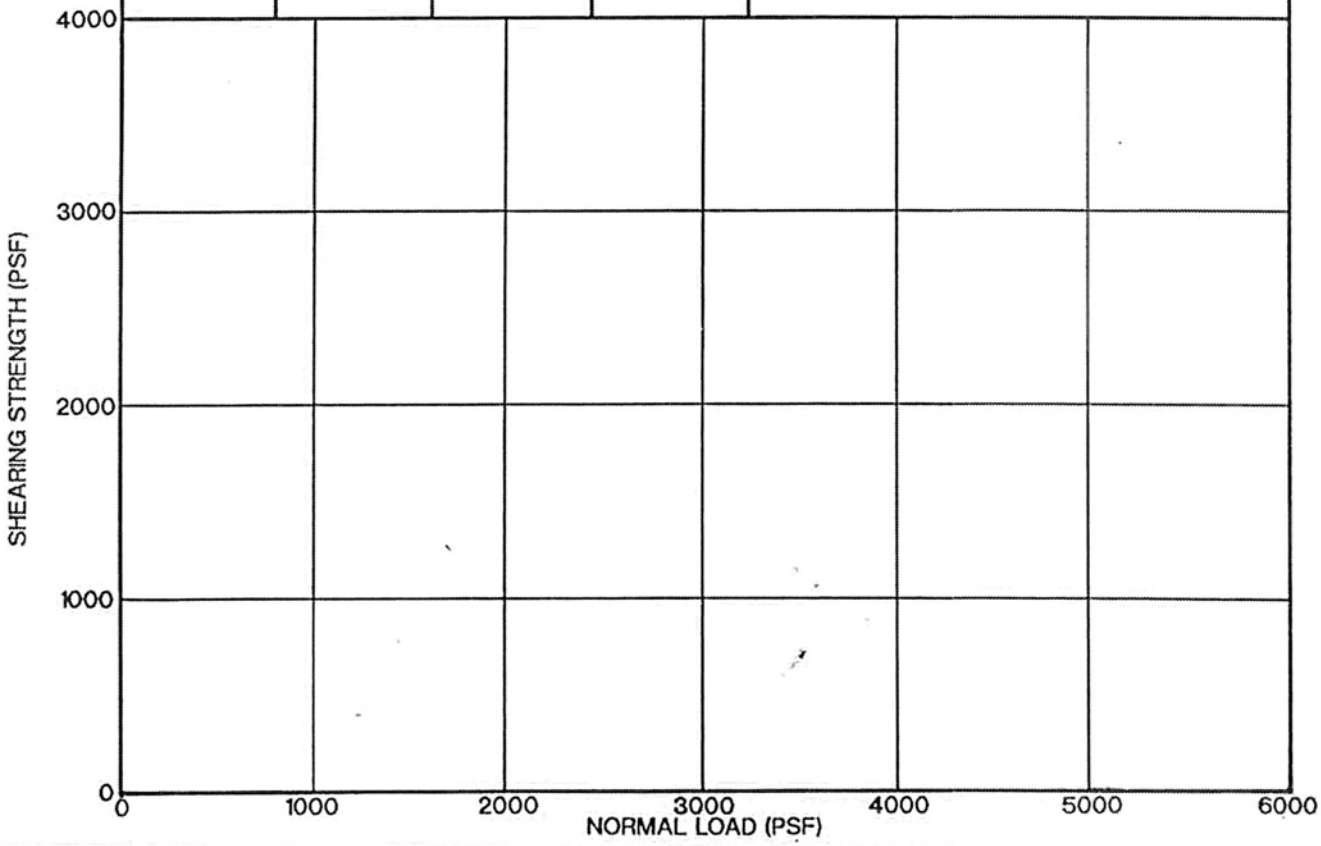
PARTICLE SIZE ANALYSIS

JOB NO.:	DATE:	FIGURE NO.:
10507-00	FEBRUARY 1991	C-2

BORING NO.	DEPTH (FEET)	COHESION (PSF)	ANGLE OF FRICTION (°)	SAMPLE DESCRIPTION
B-3	1'-2'	75	32	(CL) REMOLDED - SATURATED



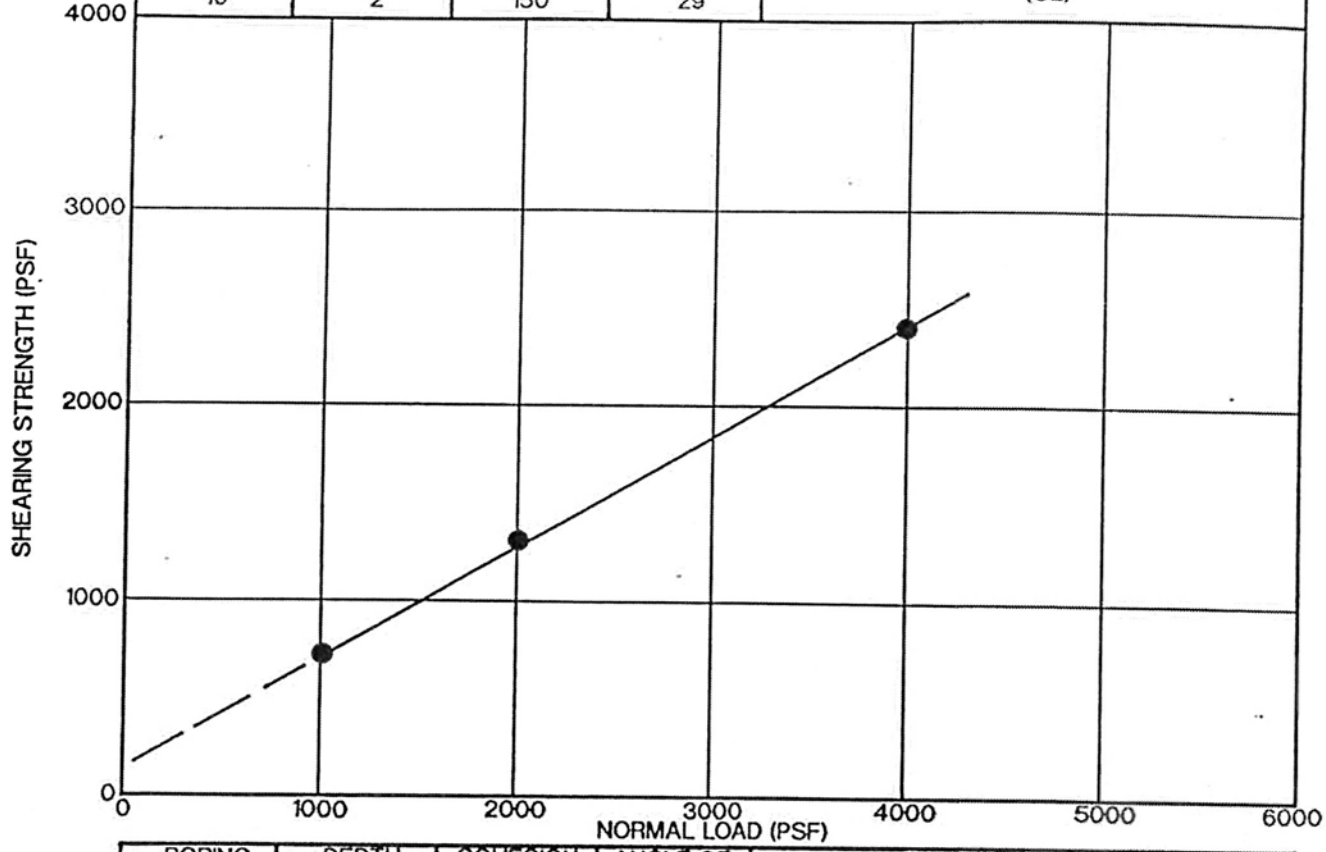
BORING NO.	DEPTH (FEET)	COHESION (PSF)	ANGLE OF FRICTION (°)	SAMPLE DESCRIPTION



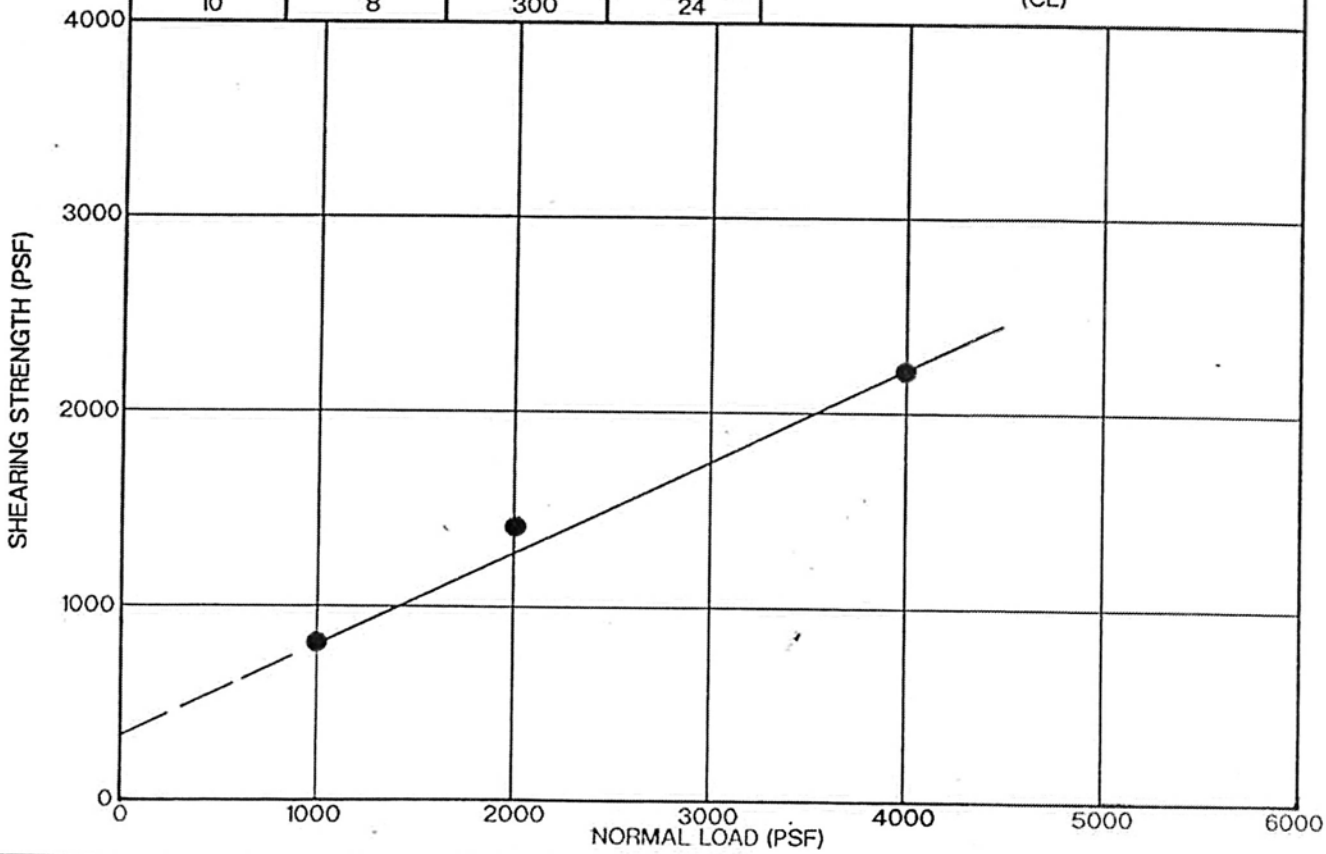
SHEARING STRENGTH TEST

JOB NO.:	DATE:	FIGURE:
11433-01	MAY 1997	C-3

BORING NO.	DEPTH (FEET)	COHESION (PSF)	ANGLE OF FRICTION (°)	SAMPLE DESCRIPTION
10	2	150	29	(CL)



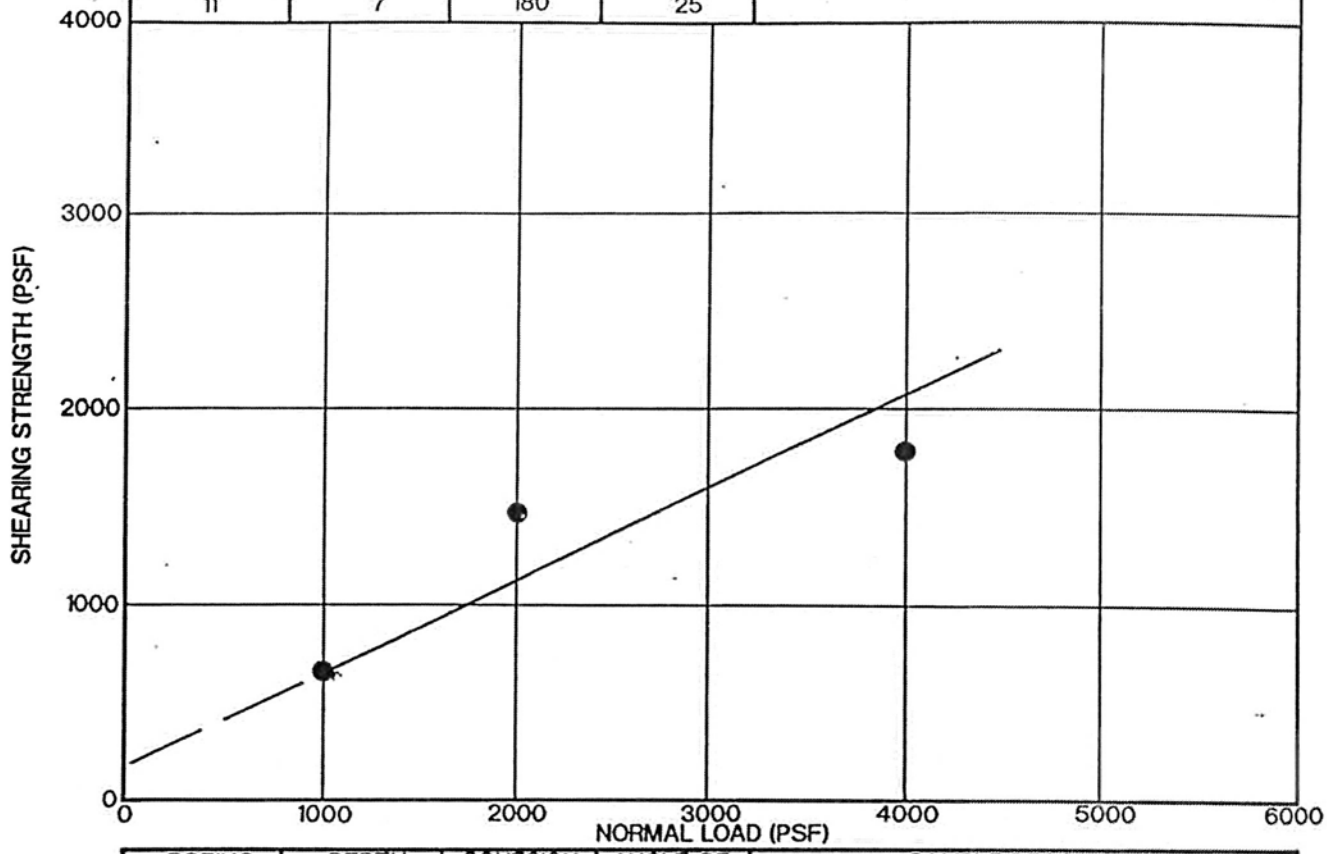
BORING NO.	DEPTH (FEET)	COHESION (PSF)	ANGLE OF FRICTION (°)	SAMPLE DESCRIPTION
10	8	300	24	(CL)



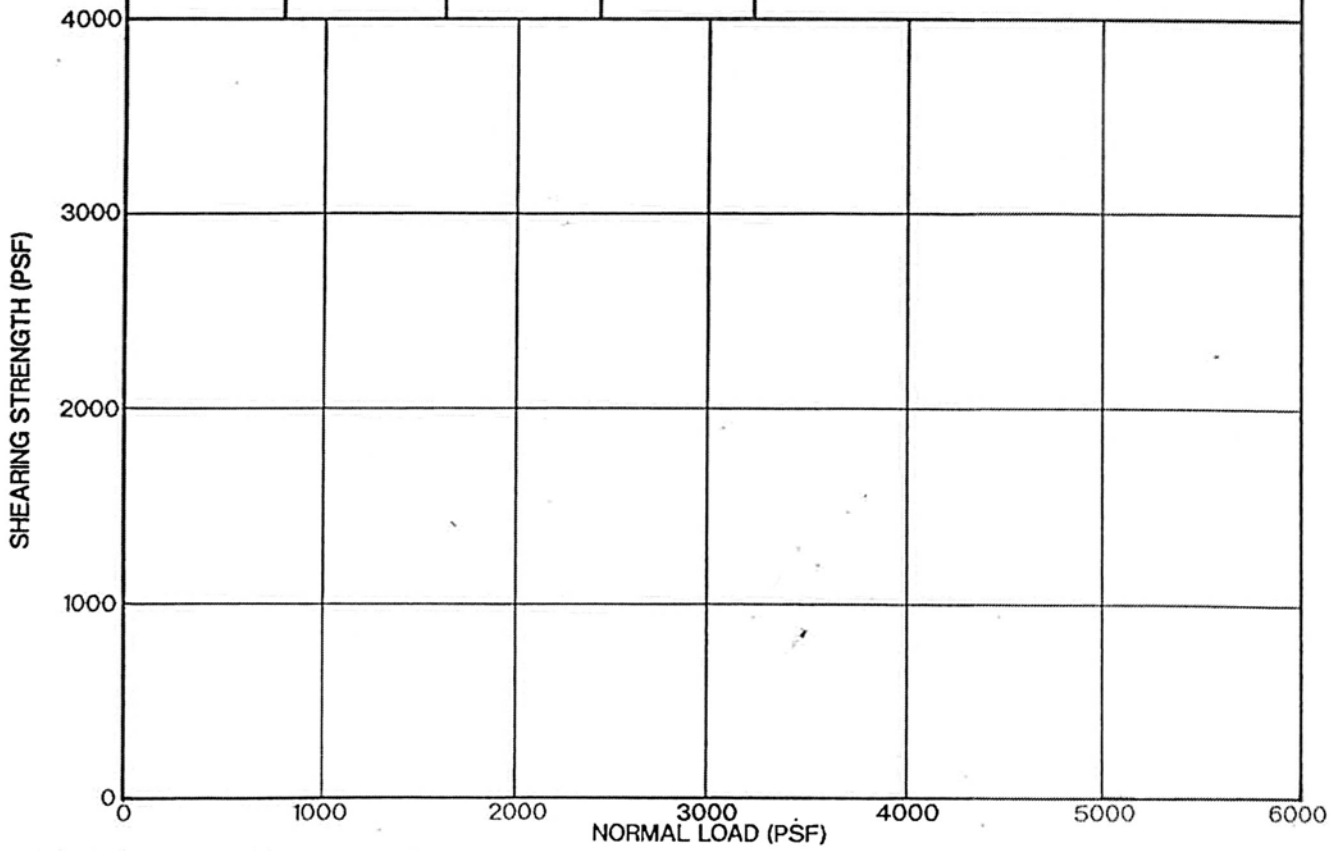
SHEARING STRENGTH TEST

JOB NO.:	DATE:	FIGURE:
10507-00	FEBRUARY 1991	C-4

BORING NO.	DEPTH (FEET)	COHESION (PSF)	ANGLE OF FRICTION (°)	SAMPLE DESCRIPTION
11	7	180	25	



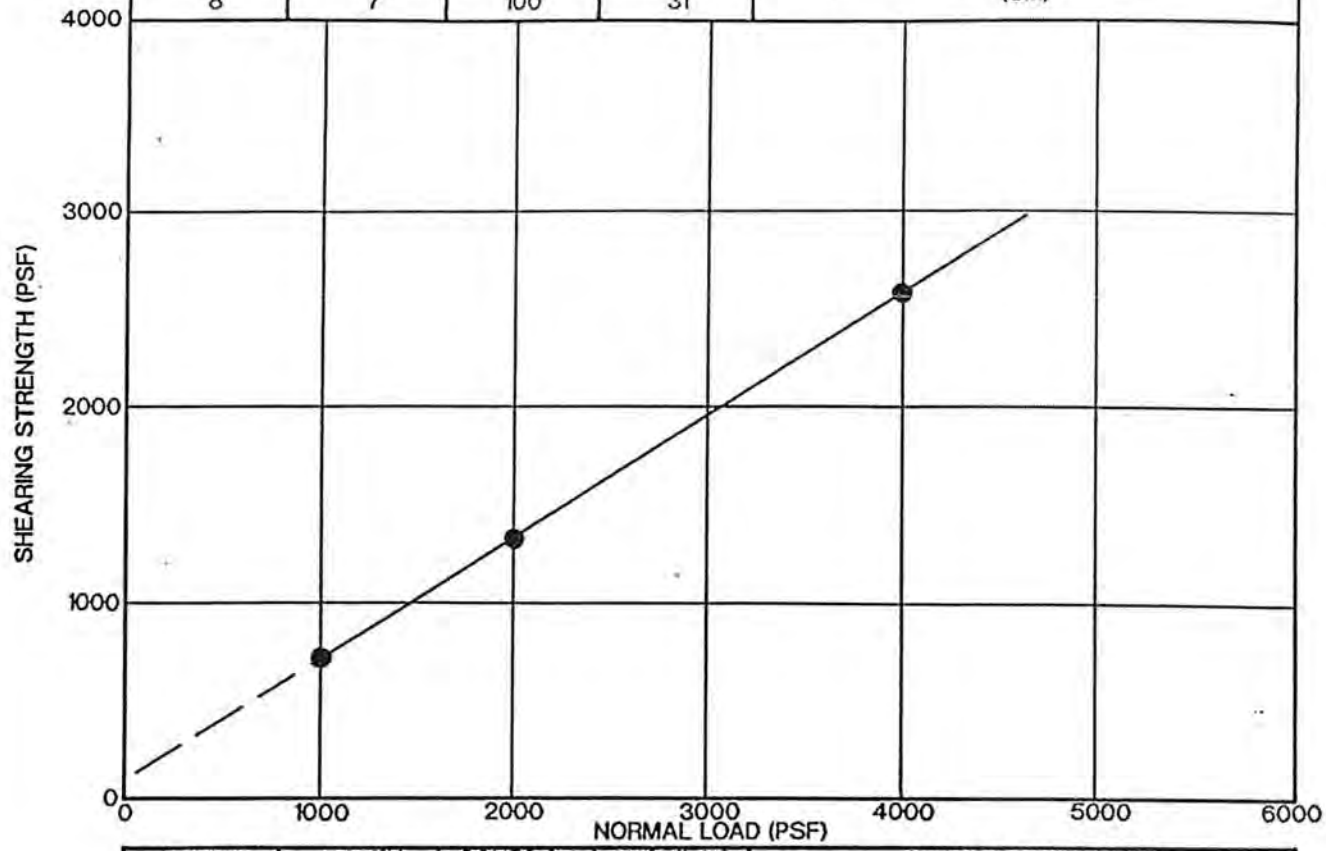
BORING NO.	DEPTH (FEET)	COHESION (PSF)	ANGLE OF FRICTION (°)	SAMPLE DESCRIPTION



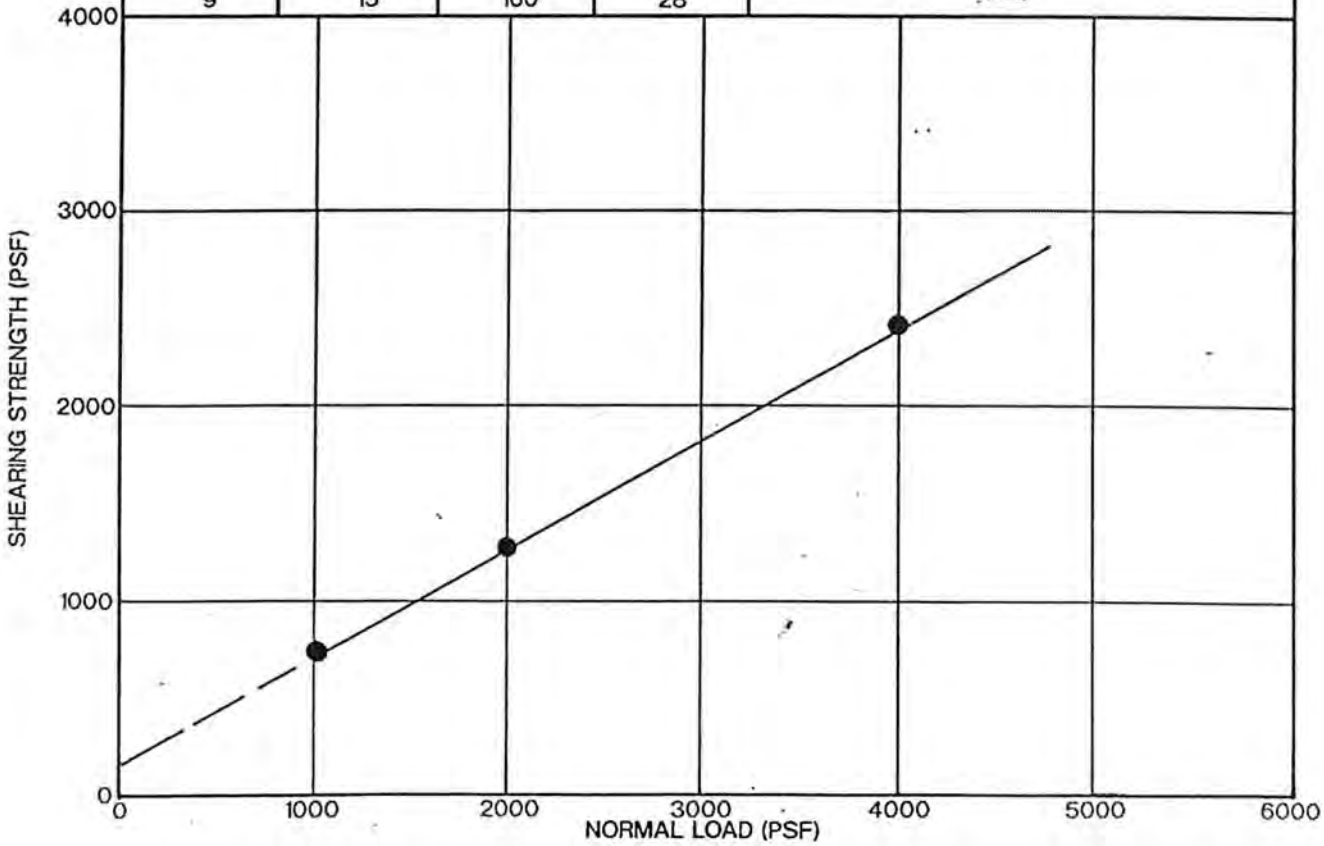
SHEARING STRENGTH TEST

JOB NO.:	DATE:	FIGURE:
10507-00	FEBRUARY 1991	C-5

BORING NO.	DEPTH (FEET)	COHESION (PSF)	ANGLE OF FRICTION (°)	SAMPLE DESCRIPTION
8	7	100	31	(SM)



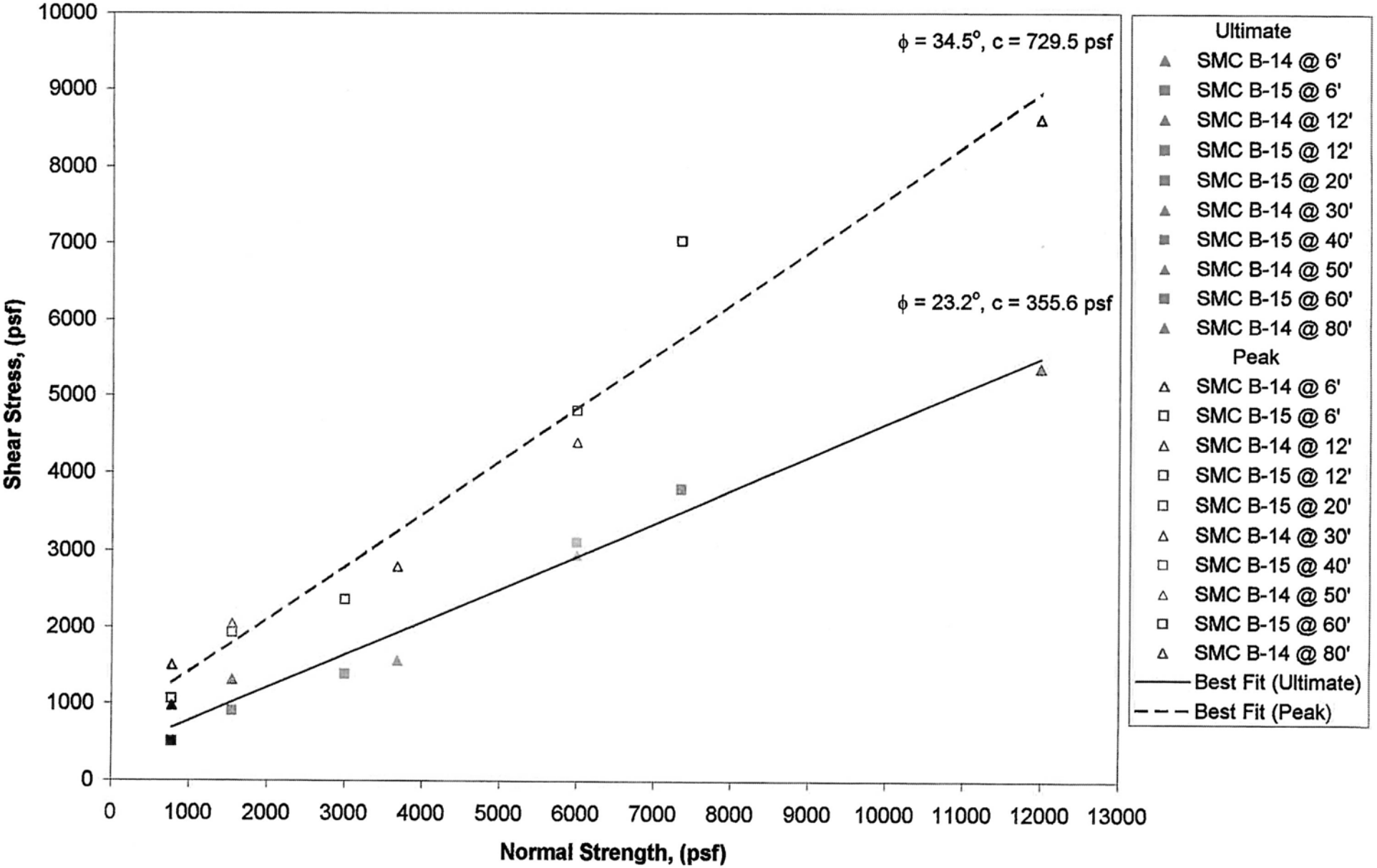
BORING NO.	DEPTH (FEET)	COHESION (PSF)	ANGLE OF FRICTION (°)	SAMPLE DESCRIPTION
9	15	160	28	(CL)



SHEARING STRENGTH TEST

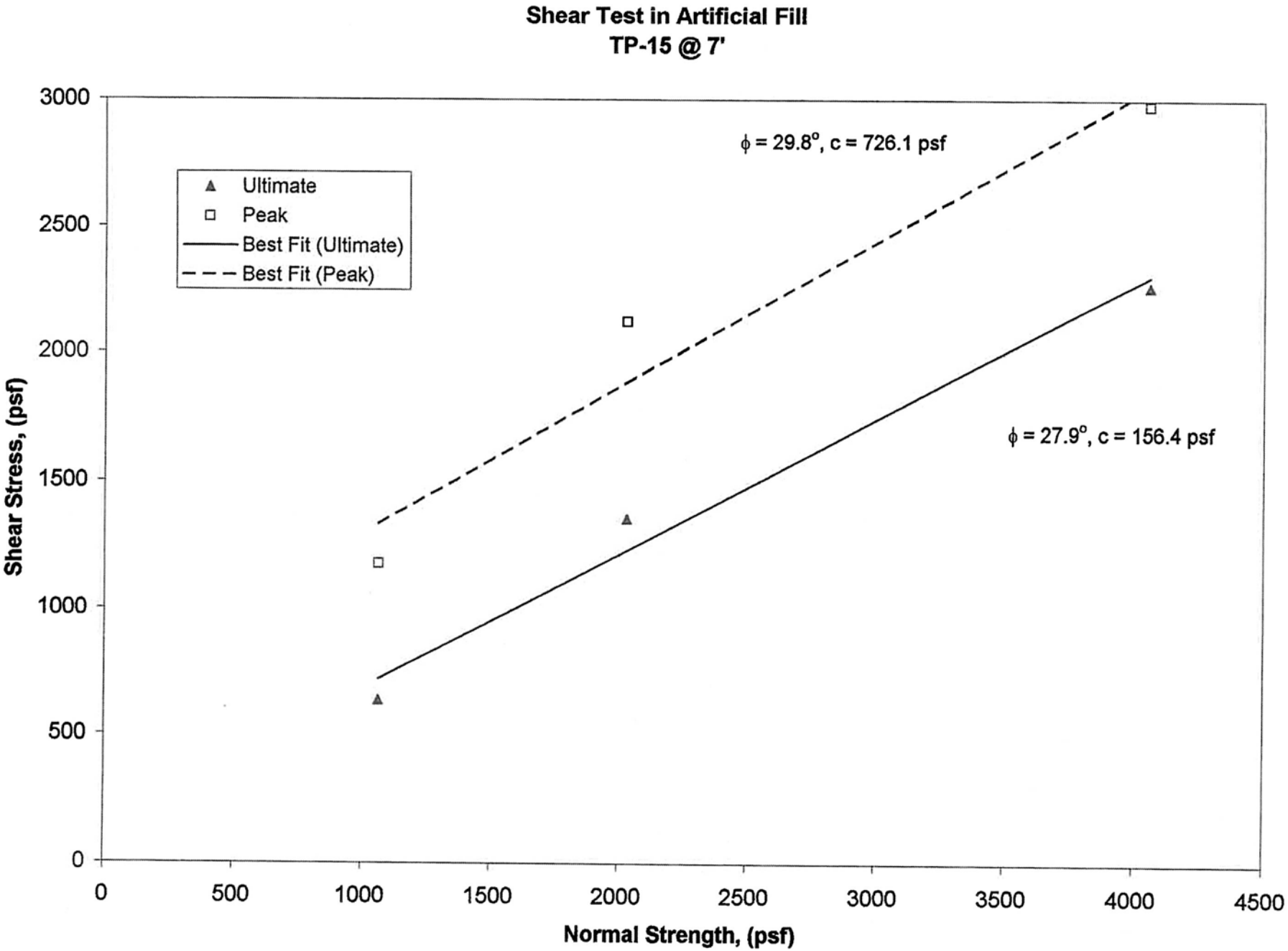
JOB NO.:	DATE:	FIGURE:
10507-00	FEBRUARY 1991	C-6

Shear Tests in Block Landslide Material



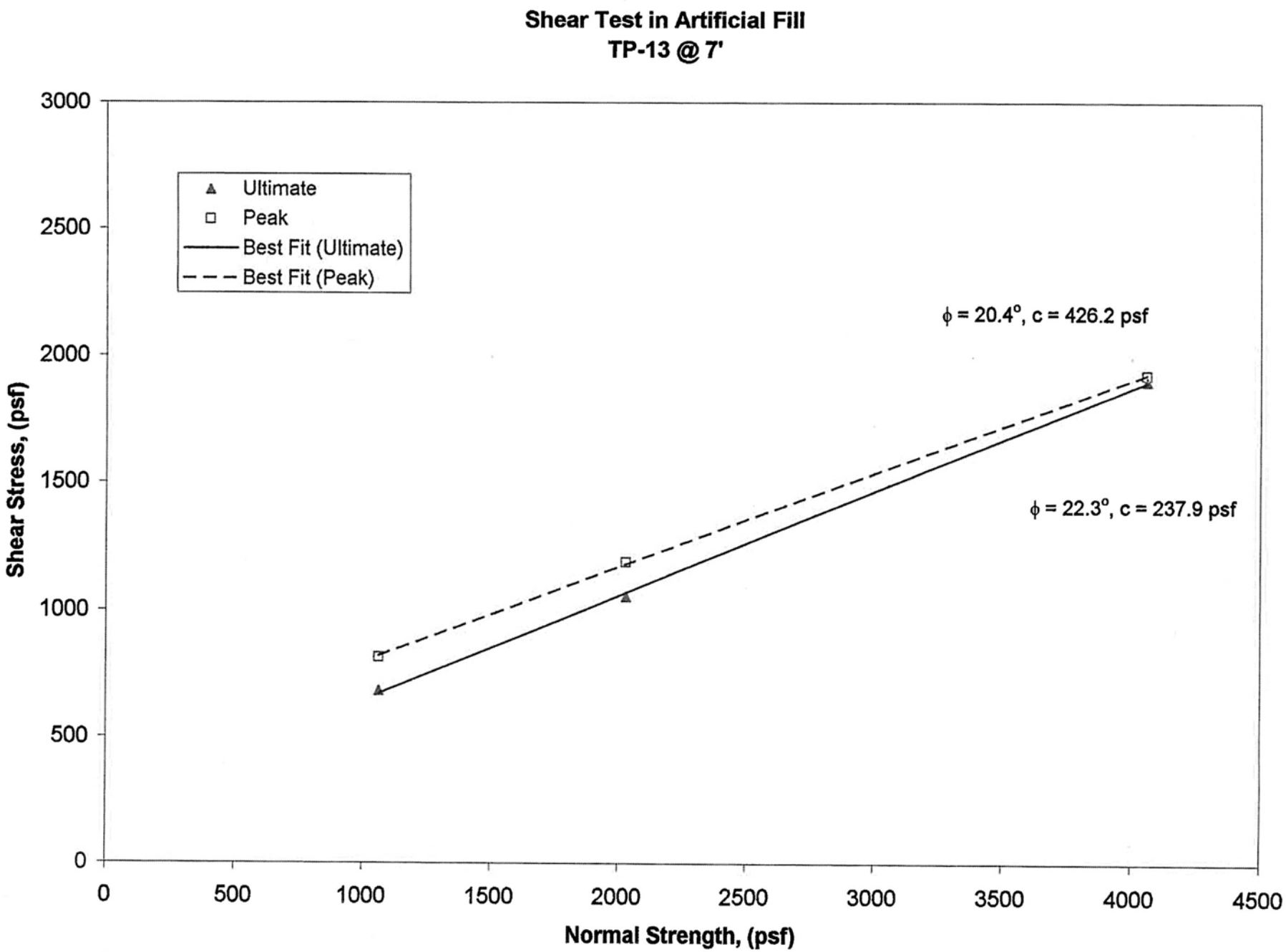
Project No: 12374-00

Figure No. C-7



Project No: 12374-00

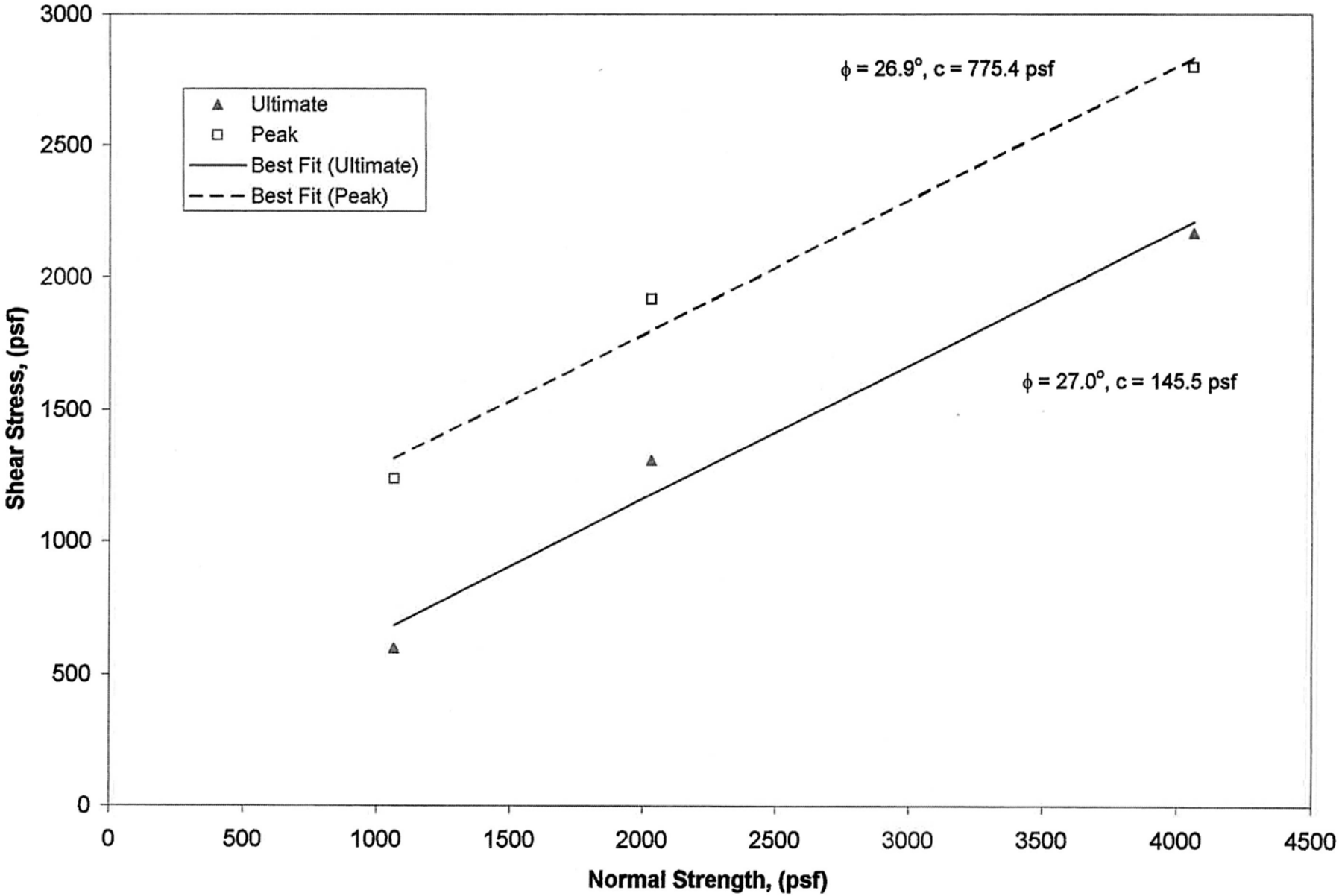
Figure No. C-8



Project No: 12374-00

Figure No. C-9

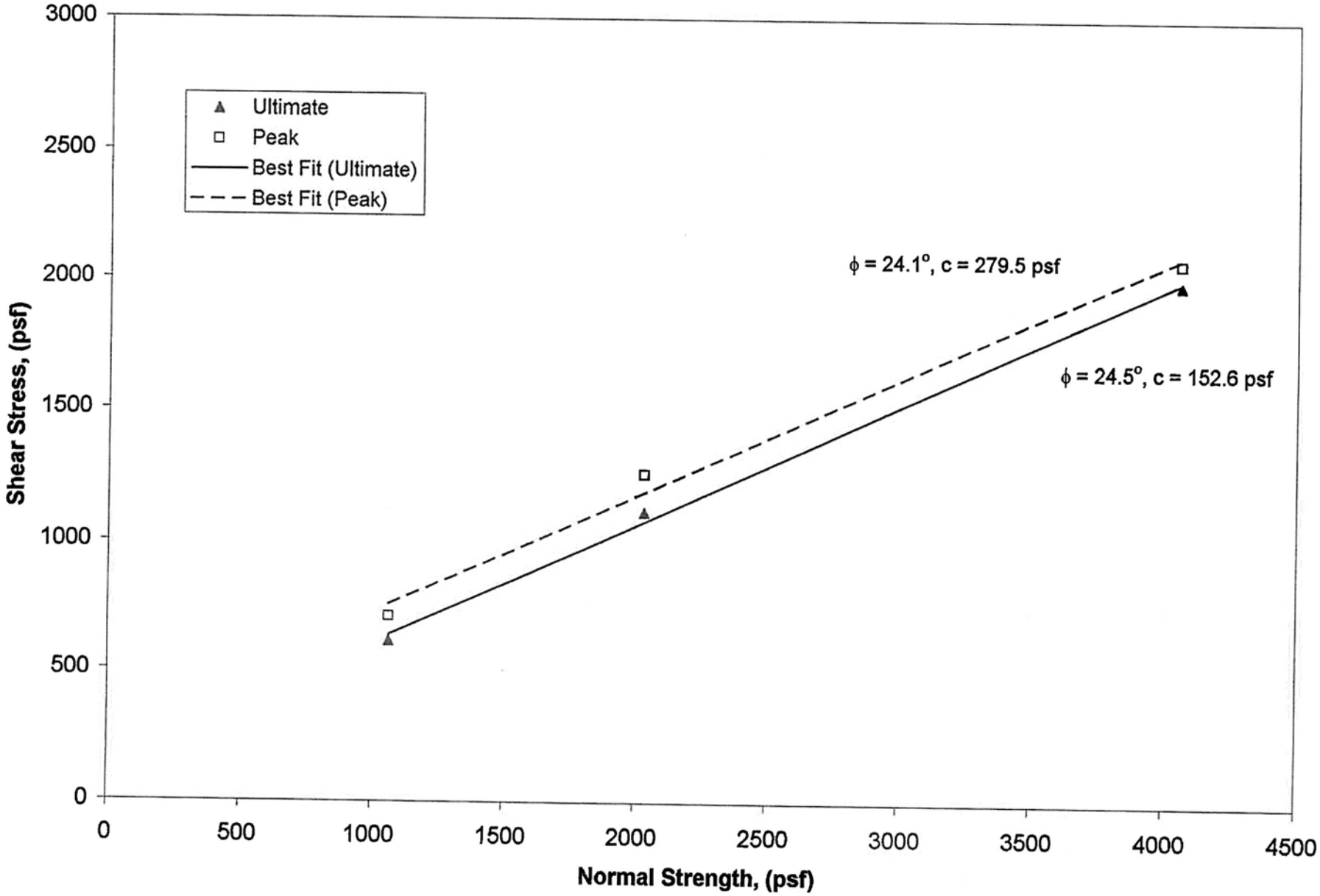
Shear Test in Landslide Material
TP-11 @ 10'



Project No: 12374-00

Figure No. C-10

Shear Test in Landslide Material
TP-11 @ 5'



Project No: 12374-00

Figure No. C-11

APPENDIX D

SEISMICITY EVALUATION

APPENDIX D

SEISMICITY EVALUATION

Our evaluation of site seismicity includes defining the site class using site sampling data (Figure D.1), using the USGS seismic deaggregation tool to define the site response spectrum for a mean return time of 475 years and 2,475 years (Figures D.2 through D.22); estimation of various characteristics of the design earthquake including periods, peak velocity, and duration (Figures D.23 and D.24); and using the USGS Design Maps tool to define the seismic design parameters as required by the California Building Code (Figures D.25 through D.30).

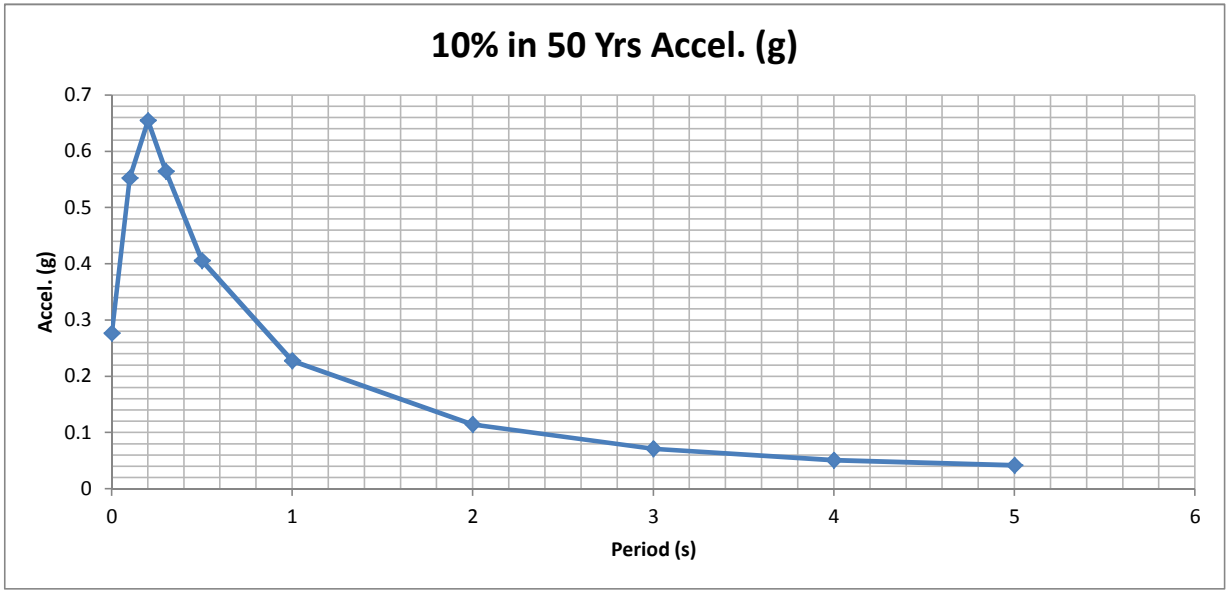
CBC SECTION 1613.3.2 & ASCE 7-10 Chapter 20; SITE CLASS USING UNDRAINED SHEAR STRENGTH

EARTH MATERIAL	Ni CORRECTED BLOW COUNT (1) & (2)	Sui UNDRAINED SHEAR STRENGTH (PSF) (3)	Sui UNDRAINED SHEAR STRENGTH (PSF) (3) **Limited to 5000 psf**	INCREMENT BEGIN (FEET)	END (FEET)	di (FEET)	di/sui	di/sui
Qls	6	800	800	0	10	10	0.01250	0.01250
Qls	6	737	737	10	20	10	0.01356	0.01356
Qls	12	1643	1643	20	30	10	0.00609	0.00609
Qls	19	2549	2549	30	40	10	0.00392	0.00392
Qls	26	3455	3455	40	50	10	0.00289	0.00289
Qls	33	4360	4360	50	60	10	0.00229	0.00229
Qls	39	5266	5000	60	70	10	0.00190	0.00200
Qls	46	6172	5000	70	80	10	0.00162	0.00200
Qls	53	7078	5000	80	90	10	0.00141	0.00200
Qls	60	7983	5000	90	100	10	0.00125	0.00200
Qls	67	8889	5000	100	110	10	0.00112	0.00200
Qls	73	9795	5000	110	120	10	0.00102	0.00200
Qls	80	10701	5000	120	130	10	0.00093	0.00200
Qls	87	11606	5000	130	140	10	0.00086	0.00200
Qls	94	12512	5000	140	150	10	0.00080	0.00200
Qls	100	13333	5000	150	160	10	0.00075	0.00200
Qls	100	13333	5000	160	170	10	0.00075	0.00200
Qls	100	13333	5000	170	180	10	0.00075	0.00200
Qls	100	13333	5000	180	190	10	0.00075	0.00200
Qls	100	13333	5000	190	200	10	0.00075	0.00200
					SUM =	200	0.056	0.069
				Su(200) =	3576	**PSF**		
				Su(200) =	2888	**PSF**		
					SUM =	100	0.047	0.049
				Su(100) =	2108	**PSF**		
				Su(100) =	2030	**PSF**		

NOTES
(1) USE 100 BLOWS FOR REFUSAL CONDITION
(2) USE BURMISTER CORRECTION FROM J. DAVID ROGERS
(3) USE TERZAGHI & PECK FOR SPT N AND UNDRAINED SHEAR STRENGTH; NAVFAC DM 7.1-88

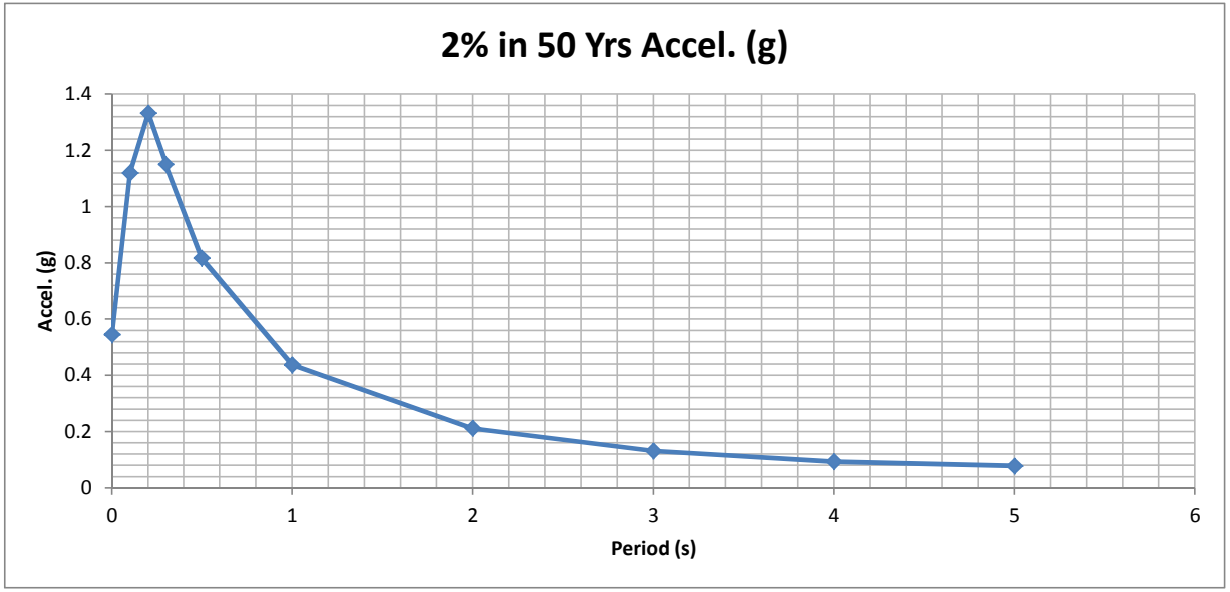
10% in 50 Yrs

Period (s)	Accel. (g)
0	0.2763
0.1	0.5525
0.2	0.6547
0.3	0.5646
0.5	0.4057
1	0.2276
2	0.11424
3	0.07138
4	0.05051
5	0.04144



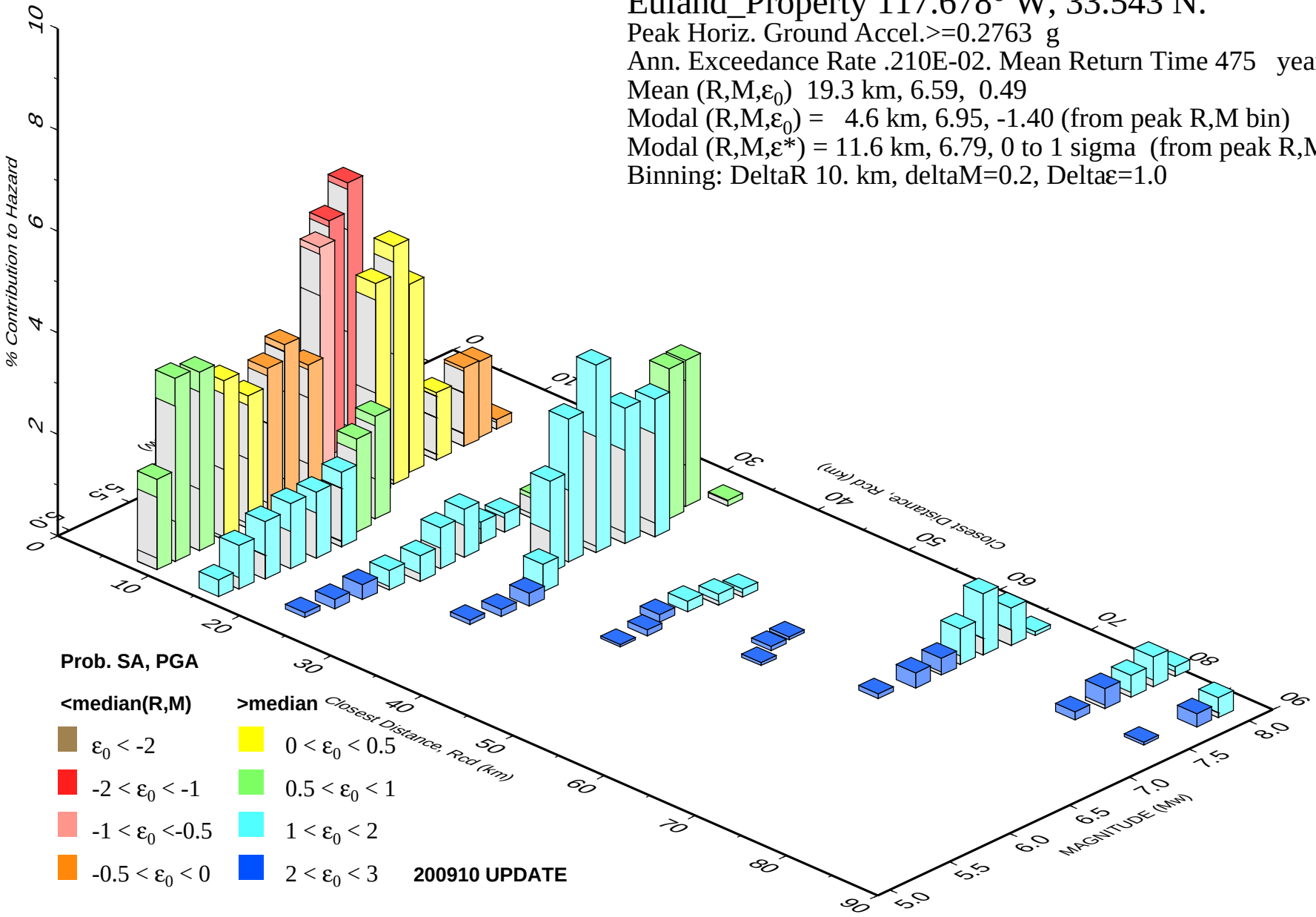
2% in 50 Yrs

Period (s)	Accel. (g)
0	0.5456
0.1	1.1202
0.2	1.3322
0.3	1.1502
0.5	0.817
1	0.4374
2	0.2113
3	0.13151
4	0.09306
5	0.07774



PSH Deaggregation on NEHRP C soil
Euland_Property 117.678º W, 33.543 N.

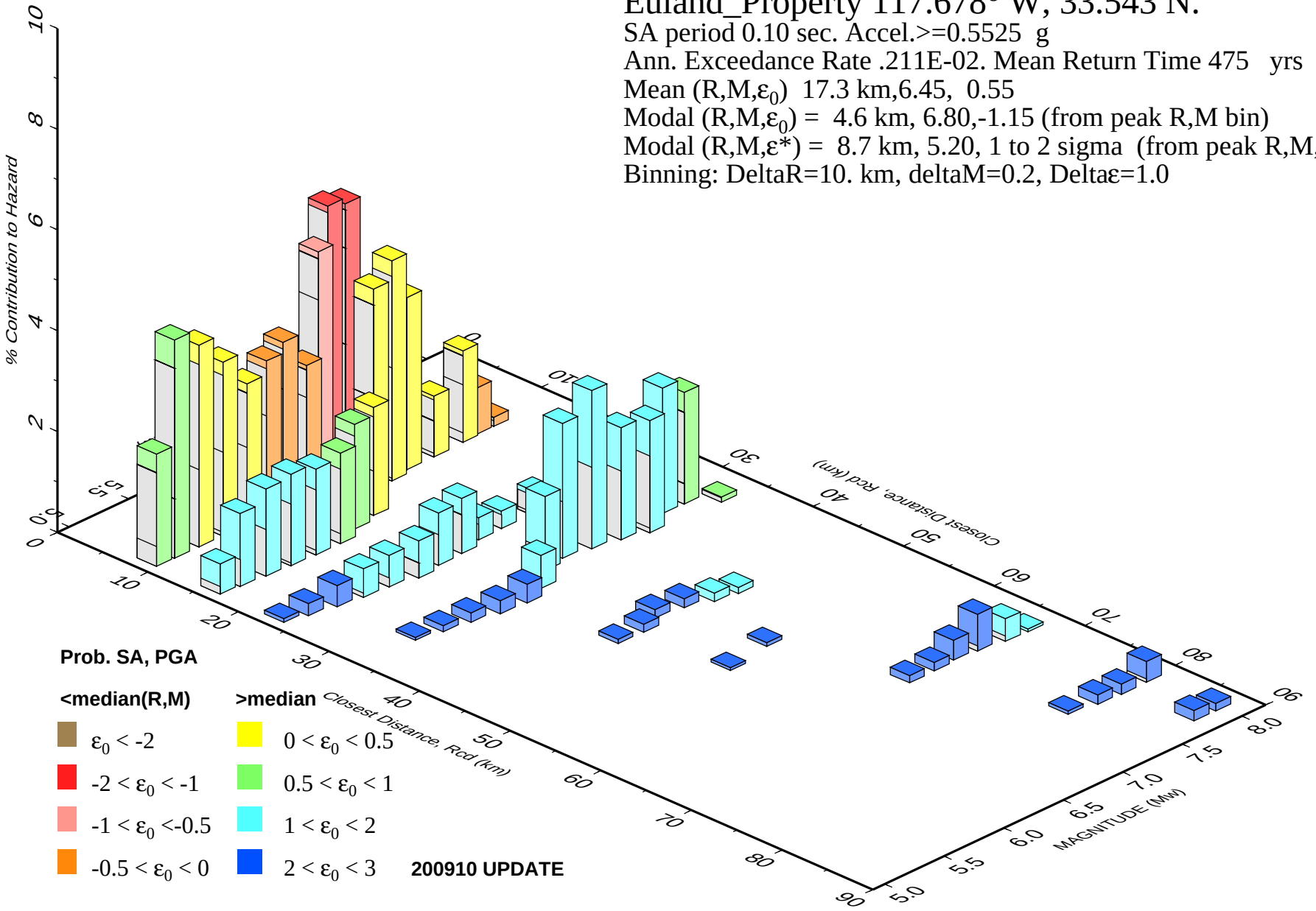
Peak Horiz. Ground Accel.>=0.2763 g
Ann. Exceedance Rate .210E-02. Mean Return Time 475 years
Mean (R,M,ε_0) 19.3 km, 6.59, 0.49
Modal (R,M,ε_0) = 4.6 km, 6.95, -1.40 (from peak R,M bin)
Modal (R,M,ε*) = 11.6 km, 6.79, 0 to 1 sigma (from peak R,M,ε bin)
Binning: DeltaR 10. km, deltaM=0.2, Deltaε=1.0



GMT 2014 Feb 19 23:58:53 **Distance (R), magnitude (M), epsilon (E0,E) deaggregation for a site on soil with average vs= 643. m/s top 30 m. USGS CGHT PSHA2008 UPDATE Bins with lt 0.05% contrib. omitted**

PSH Deaggregation on NEHRP C soil
Euland_Property 117.678º W, 33.543 N.

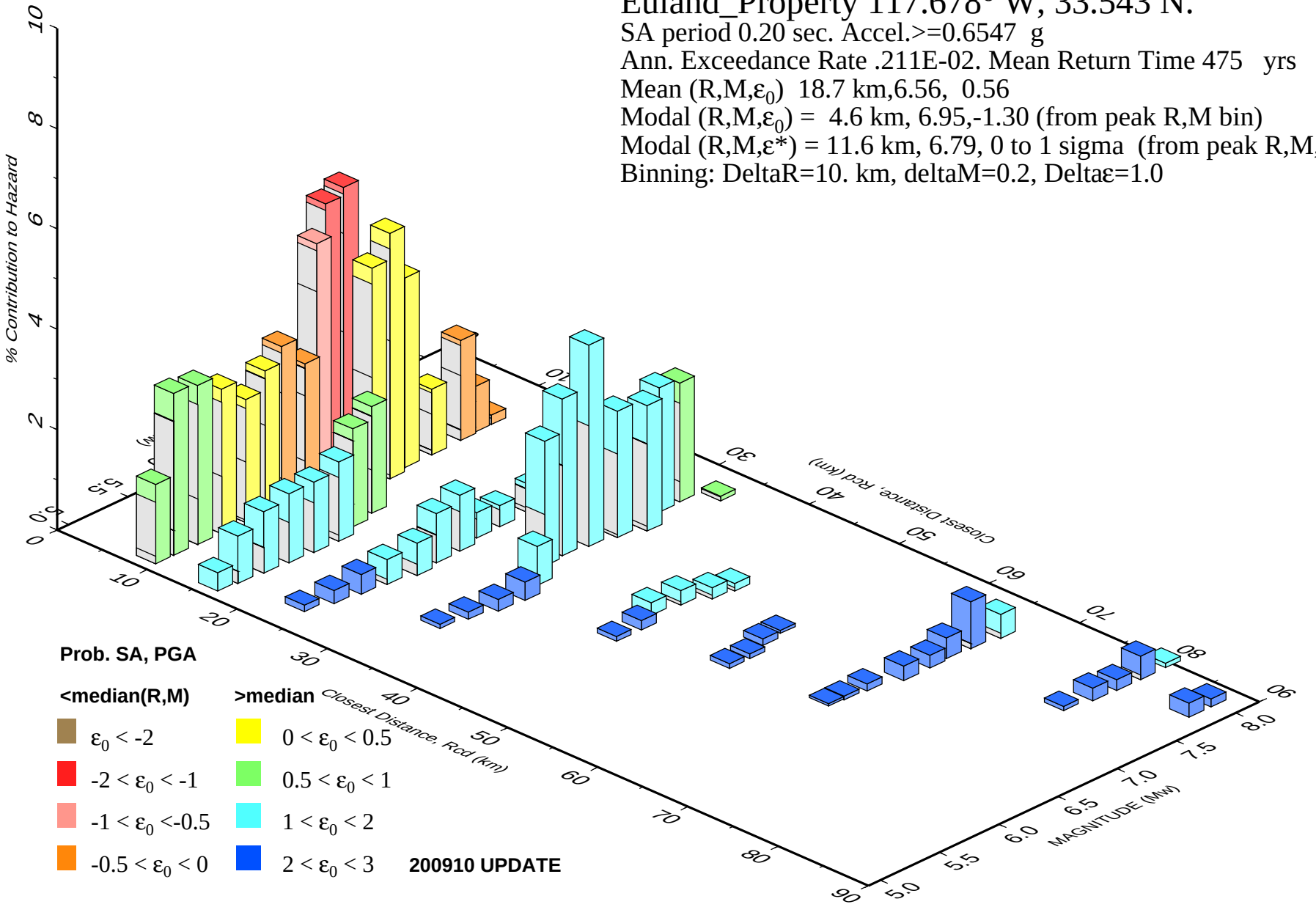
SA period 0.10 sec. Accel.>=0.5525 g
Ann. Exceedance Rate .211E-02. Mean Return Time 475 yrs
Mean (R,M,ε_0) 17.3 km,6.45, 0.55
Modal (R,M,ε_0) = 4.6 km, 6.80,-1.15 (from peak R,M bin)
Modal (R,M,ε*) = 8.7 km, 5.20, 1 to 2 sigma (from peak R,M,ε bin)
Binning: DeltaR=10. km, deltaM=0.2, Deltaε=1.0



GMT 2014 Feb 20 00:23:26 **Distance (R), magnitude (M), epsilon (E0,E) deaggregation for a site on soil with average vs= 643. m/s top 30 m. USGS CGHT PSHA2008 UPDATE Bins with lt 0.05% contrib. omitted**

PSH Deaggregation on NEHRP C soil
Euland_Property 117.678º W, 33.543 N.

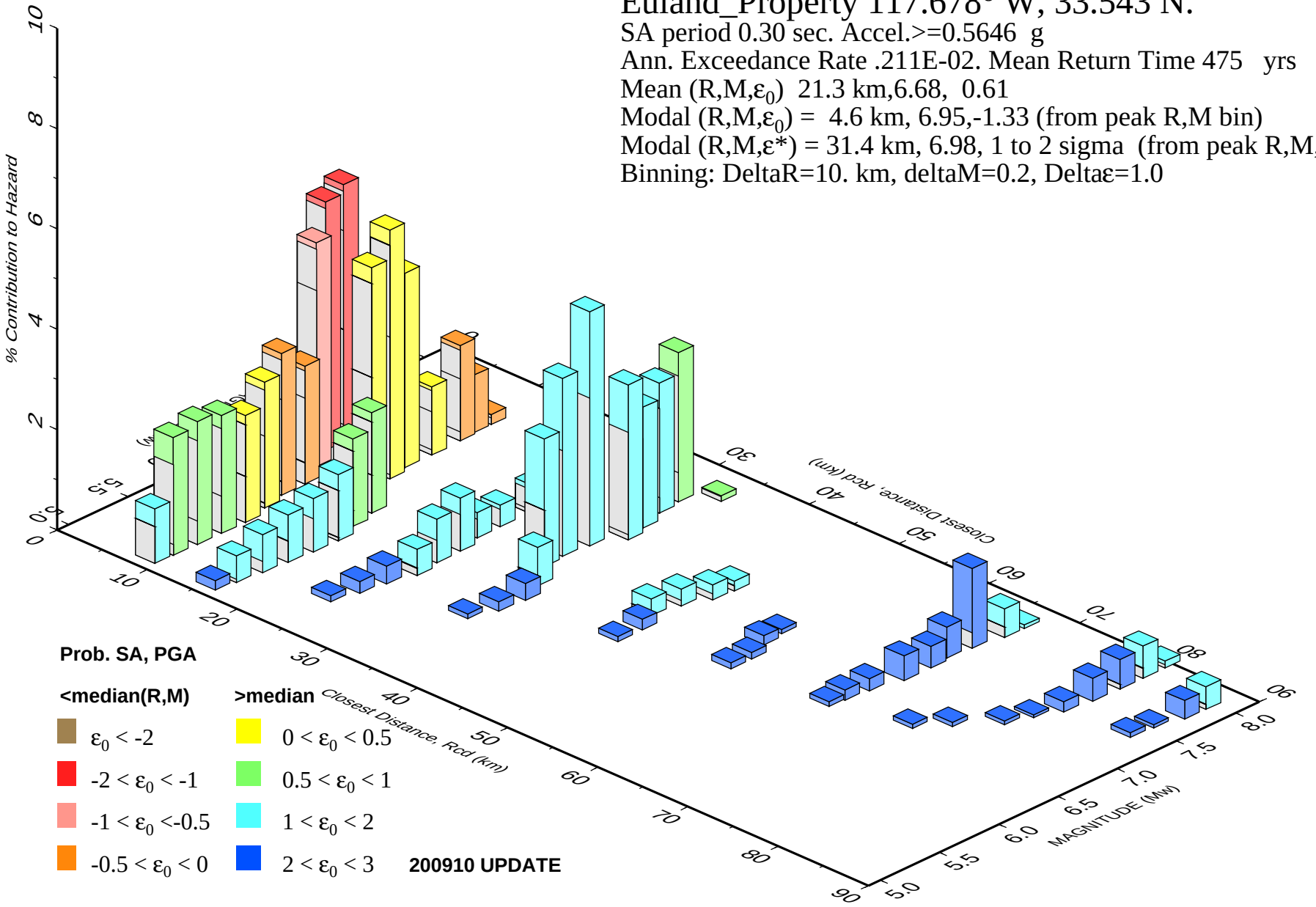
SA period 0.20 sec. Accel.>=0.6547 g
Ann. Exceedance Rate .211E-02. Mean Return Time 475 yrs
Mean (R,M,ε_0) 18.7 km,6.56, 0.56
Modal (R,M,ε_0) = 4.6 km, 6.95,-1.30 (from peak R,M bin)
Modal (R,M,ε*) = 11.6 km, 6.79, 0 to 1 sigma (from peak R,M,ε bin)
Binning: DeltaR=10. km, deltaM=0.2, Deltaε=1.0



GMT 2014 Feb 20 00:24:08 **Distance (R), magnitude (M), epsilon (E0,E) deaggregation for a site on soil with average vs= 643. m/s top 30 m. USGS CGHT PSHA2008 UPDATE Bins with lt 0.05% contrib. omitted**

PSH Deaggregation on NEHRP C soil
Euland_Property 117.678º W, 33.543 N.

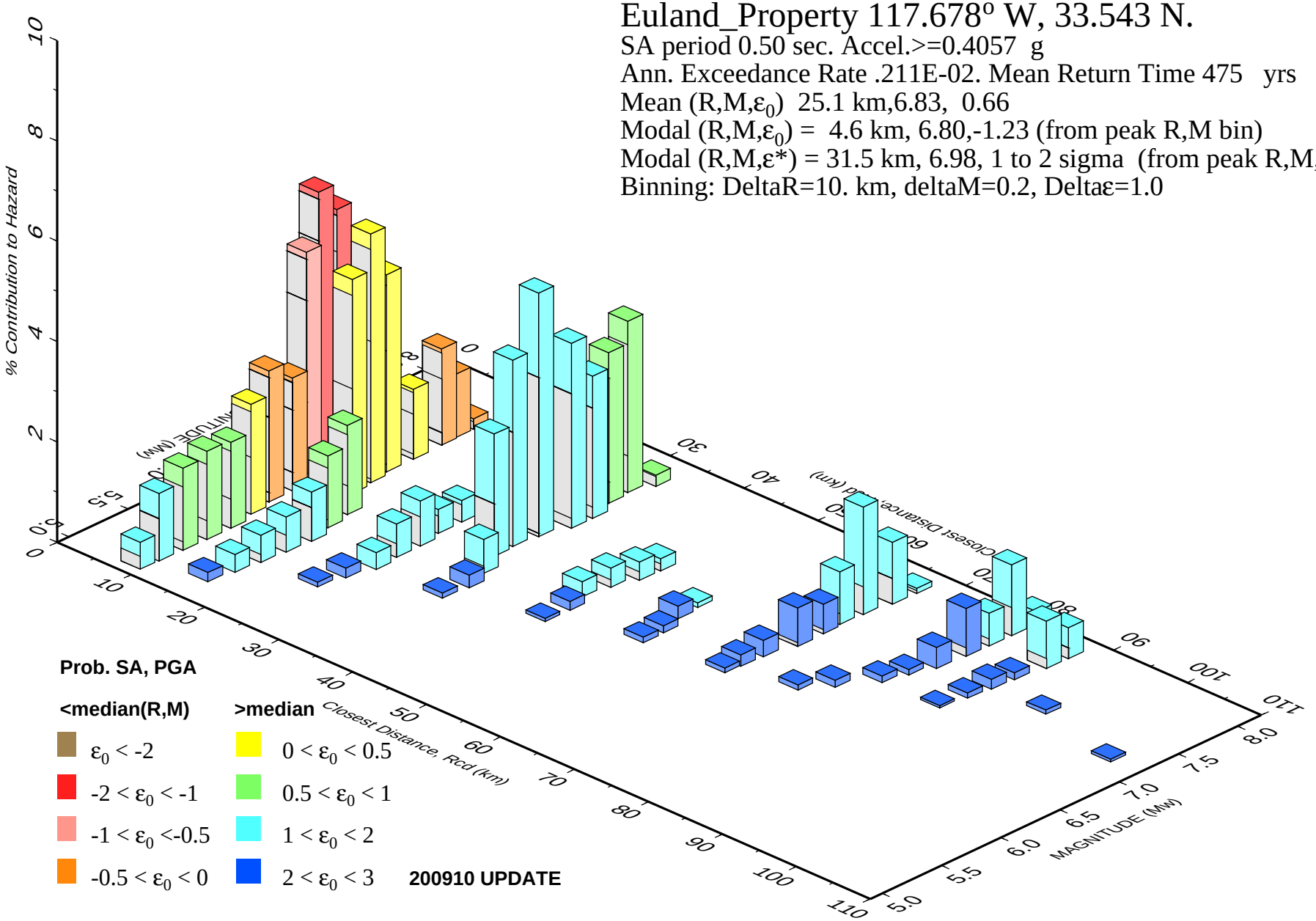
SA period 0.30 sec. Accel.>=0.5646 g
Ann. Exceedance Rate .211E-02. Mean Return Time 475 yrs
Mean (R,M,ε_0) 21.3 km,6.68, 0.61
Modal (R,M,ε_0) = 4.6 km, 6.95,-1.33 (from peak R,M bin)
Modal (R,M,ε*) = 31.4 km, 6.98, 1 to 2 sigma (from peak R,M,ε bin)
Binning: DeltaR=10. km, deltaM=0.2, Deltaε=1.0



GMT 2014 Feb 20 00:44:25 **Distance (R), magnitude (M), epsilon (E0,E) deaggregation for a site on soil with average vs= 643. m/s top 30 m. USGS CGHT PSHA2008 UPDATE Bins with lt 0.05% contrib. omitted**

PSH Deaggregation on NEHRP C soil
Euland_Property 117.678º W, 33.543 N.

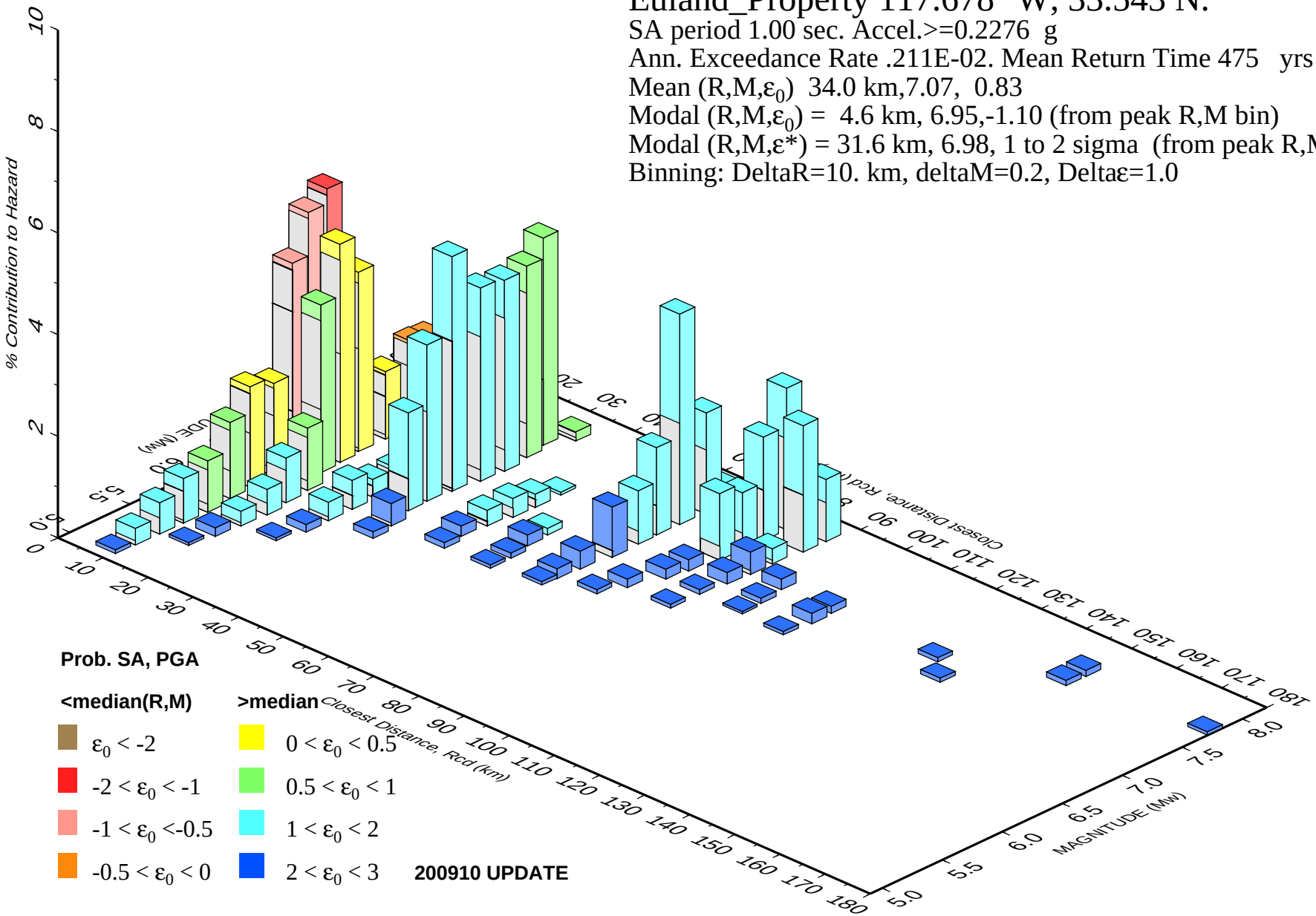
SA period 0.50 sec. Accel.>=0.4057 g
Ann. Exceedance Rate .211E-02. Mean Return Time 475 yrs
Mean (R,M,ε_0) 25.1 km,6.83, 0.66
Modal (R,M,ε_0) = 4.6 km, 6.80,-1.23 (from peak R,M bin)
Modal (R,M,ε*) = 31.5 km, 6.98, 1 to 2 sigma (from peak R,M,ε bin)
Binning: DeltaR=10. km, deltaM=0.2, Deltaε=1.0



GMT 2014 Feb 20 00:44:51 **Distance (R), magnitude (M), epsilon (E0,E) deaggregation for a site on soil with average vs= 643. m/s top 30 m. USGS CGHT PSHA2008 UPDATE Bins with lt 0.05% contrib. omitted**

PSH Deaggregation on NEHRP C soil
Euland_Property 117.678º W, 33.543 N.

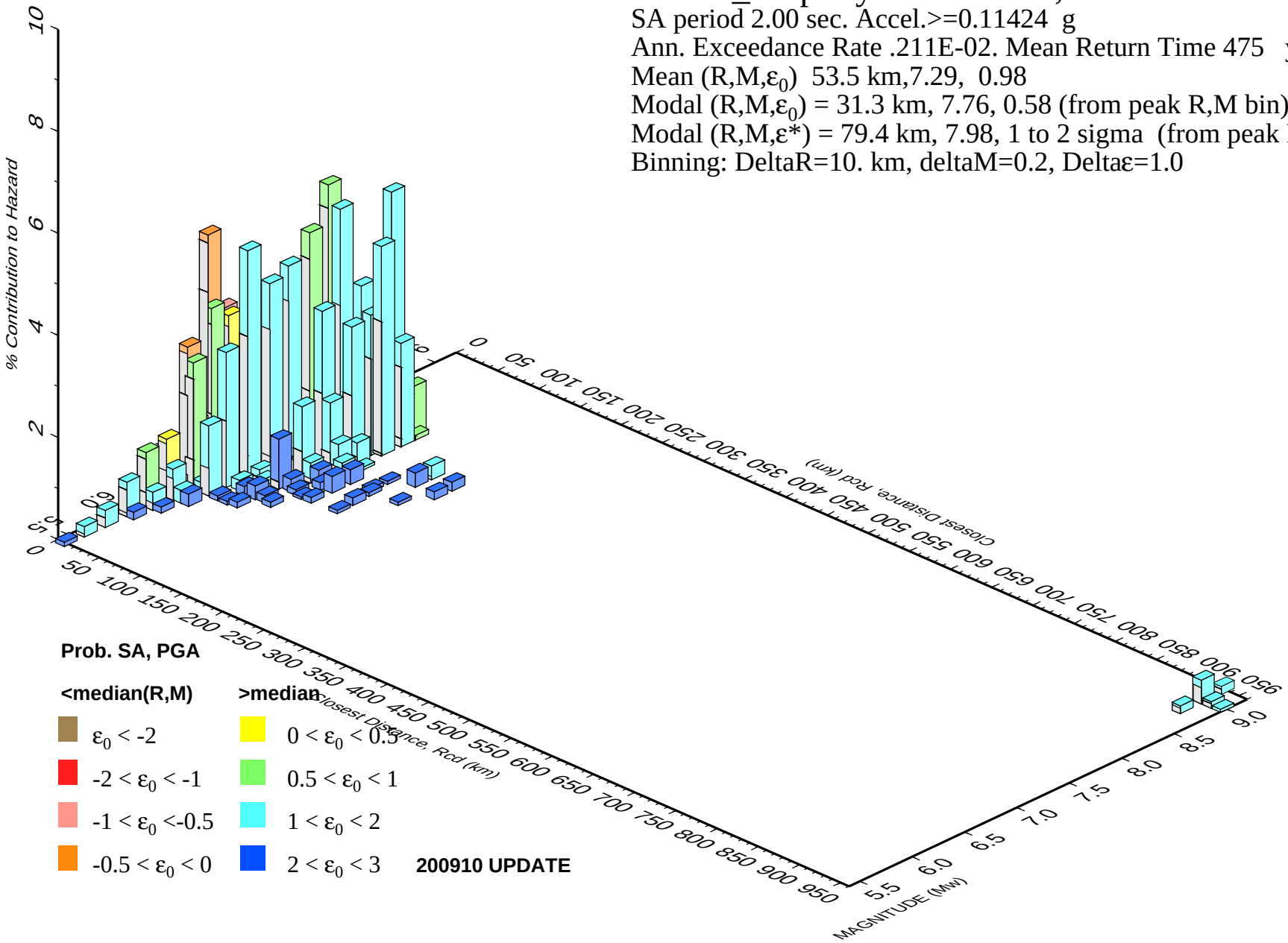
SA period 1.00 sec. Accel.>=0.2276 g
Ann. Exceedance Rate .211E-02. Mean Return Time 475 yrs
Mean (R,M,ε_0) 34.0 km,7.07, 0.83
Modal (R,M,ε_0) = 4.6 km, 6.95,-1.10 (from peak R,M bin)
Modal (R,M,ε*) = 31.6 km, 6.98, 1 to 2 sigma (from peak R,M,ε bin)
Binning: DeltaR=10. km, deltaM=0.2, Deltaε=1.0



GMT 2014 Feb 20 00:45:11 **Distance (R), magnitude (M), epsilon (E0,E) deaggregation for a site on soil with average vs= 643. m/s top 30 m. USGS CGHT PSHA2008 UPDATE Bins with lt 0.05% contrib. omitted**

PSH Deaggregation on NEHRP C soil
Euland_Property 117.678º W, 33.543 N.

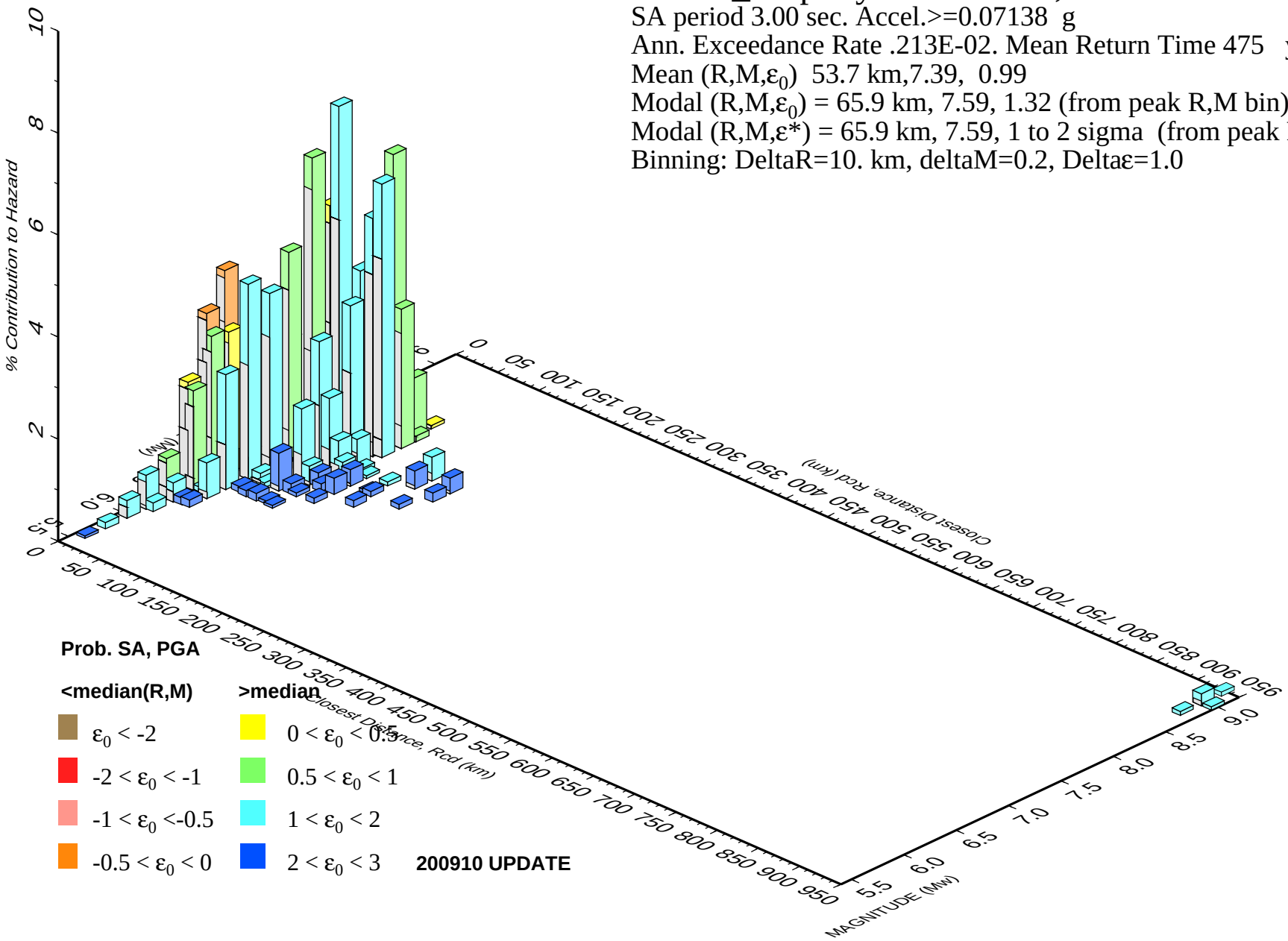
SA period 2.00 sec. Accel.>=0.11424 g
Ann. Exceedance Rate .211E-02. Mean Return Time 475 yrs
Mean (R,M,ε_0) 53.5 km,7.29, 0.98
Modal (R,M,ε_0) = 31.3 km, 7.76, 0.58 (from peak R,M bin)
Modal (R,M,ε*) = 79.4 km, 7.98, 1 to 2 sigma (from peak R,M,ε bin)
Binning: DeltaR=10. km, deltaM=0.2, Deltaε=1.0



GMT 2014 Feb 20 00:45:32 **Distance (R), magnitude (M), epsilon (E0,E) deaggregation for a site on soil with average vs= 643. m/s top 30 m. USGS CGHT PSHA2008 UPDATE Bins with lt 0.05% contrib. omitted**

PSH Deaggregation on NEHRP C soil
Euland_Property 117.678º W, 33.543 N.

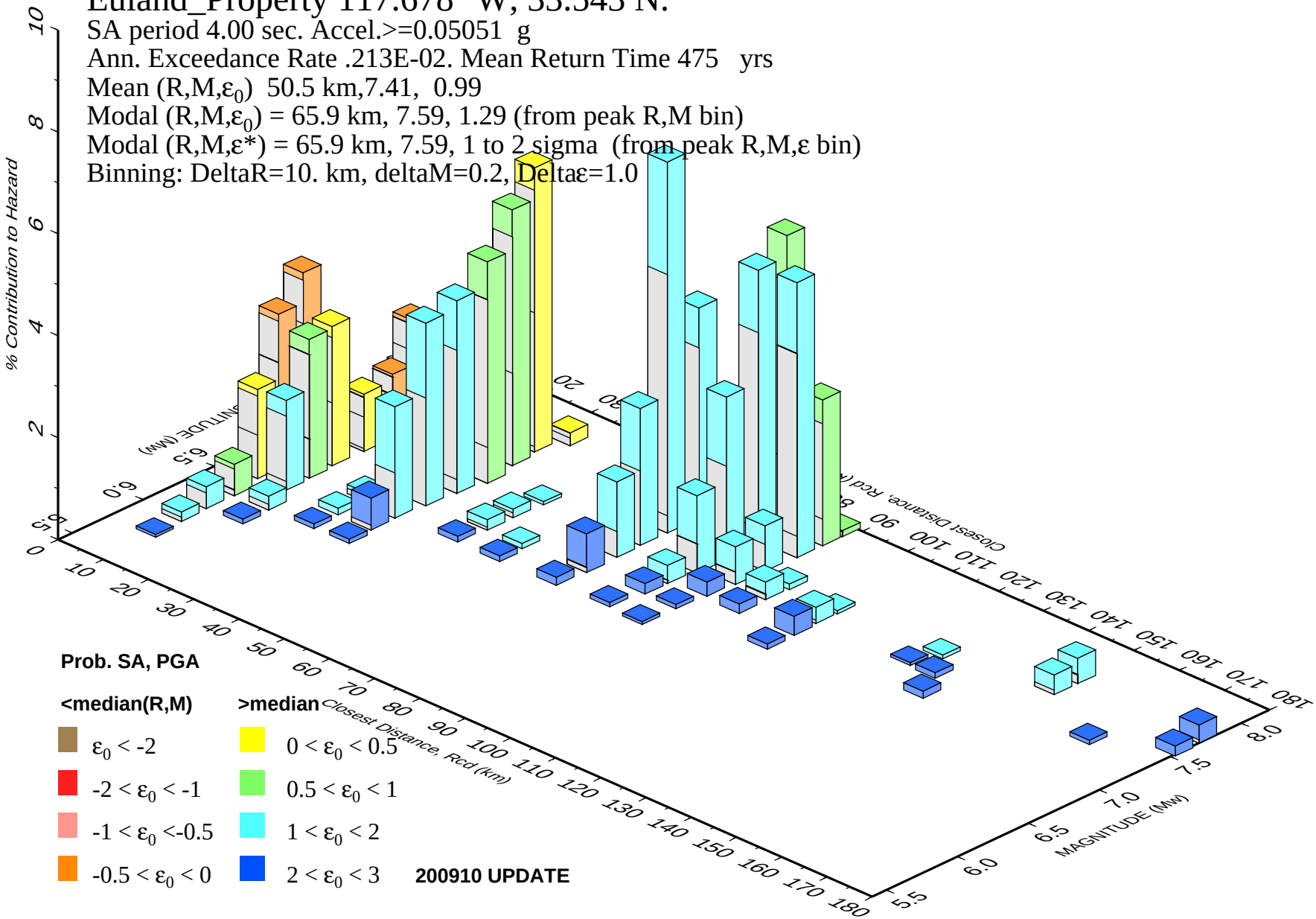
SA period 3.00 sec. Accel.>=0.07138 g
Ann. Exceedance Rate .213E-02. Mean Return Time 475 yrs
Mean (R,M,ε_0) 53.7 km,7.39, 0.99
Modal (R,M,ε_0) = 65.9 km, 7.59, 1.32 (from peak R,M bin)
Modal (R,M,ε*) = 65.9 km, 7.59, 1 to 2 sigma (from peak R,M,ε bin)
Binning: DeltaR=10. km, deltaM=0.2, Deltaε=1.0



GMT 2014 Feb 20 00:45:58 **Distance (R), magnitude (M), epsilon (E0,E) deaggregation for a site on soil with average vs= 643. m/s top 30 m. USGS CGHT PSHA2008 UPDATE Bins with lt 0.05% contrib. omitted**

PSH Deaggregation on NEHRP C soil
Euland_Property 117.678º W, 33.543 N.

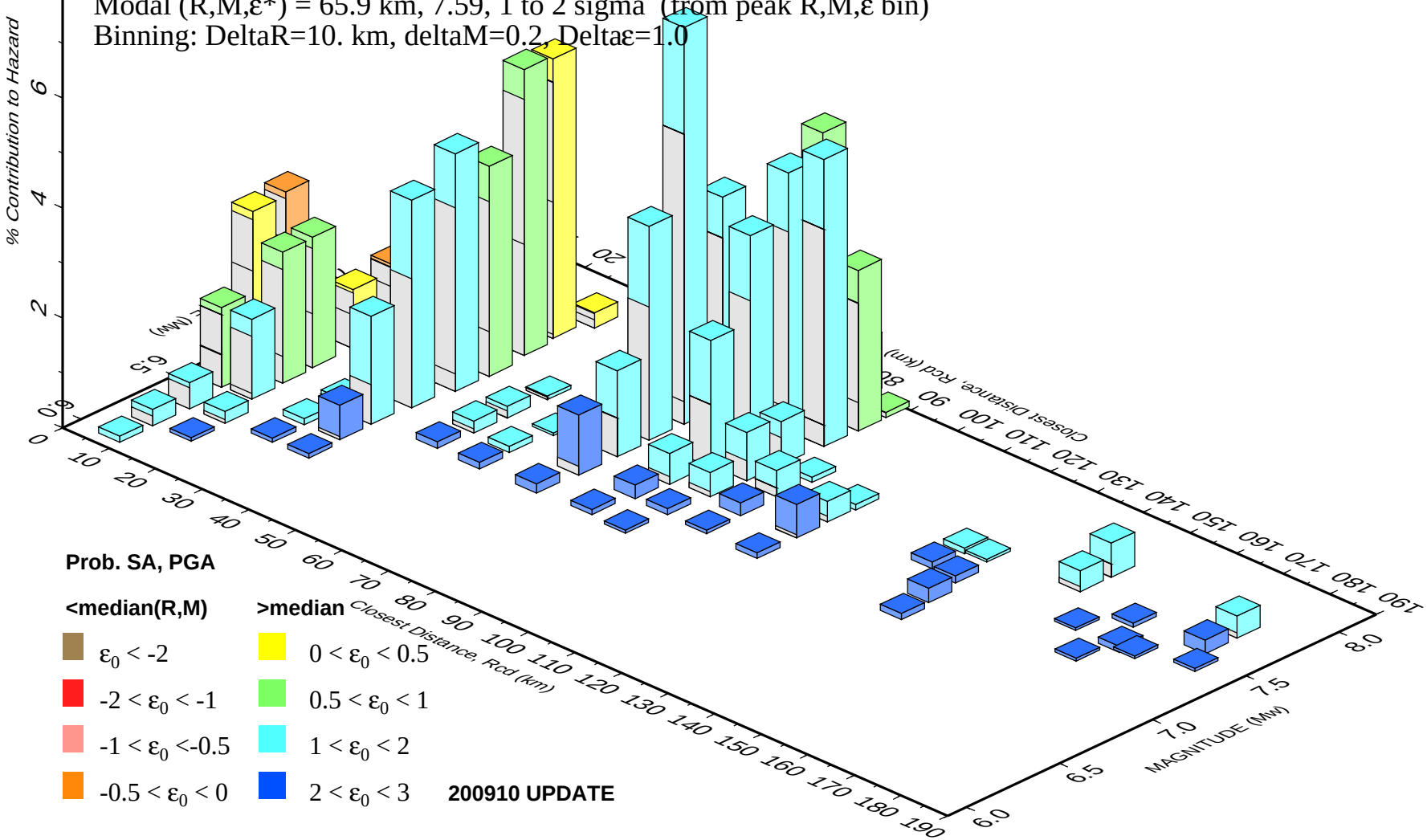
SA period 4.00 sec. Accel.>=0.05051 g
Ann. Exceedance Rate .213E-02. Mean Return Time 475 yrs
Mean (R,M,ε_0) 50.5 km,7.41, 0.99
Modal (R,M,ε_0) = 65.9 km, 7.59, 1.29 (from peak R,M bin)
Modal (R,M,ε*) = 65.9 km, 7.59, 1 to 2 sigma (from peak R,M,ε bin)
Binning: DeltaR=10. km, deltaM=0.2, Deltaε=1.0



GMT 2014 Feb 20 00:46:21 **Distance (R), magnitude (M), epsilon (E0,E) deaggregation for a site on soil with average vs= 643. m/s top 30 m. USGS CGHT PSHA2008 UPDATE Bins with lt 0.05% contrib. omitted**

PSH Deaggregation on NEHRP C soil
Euland_Property 117.678º W, 33.543 N.

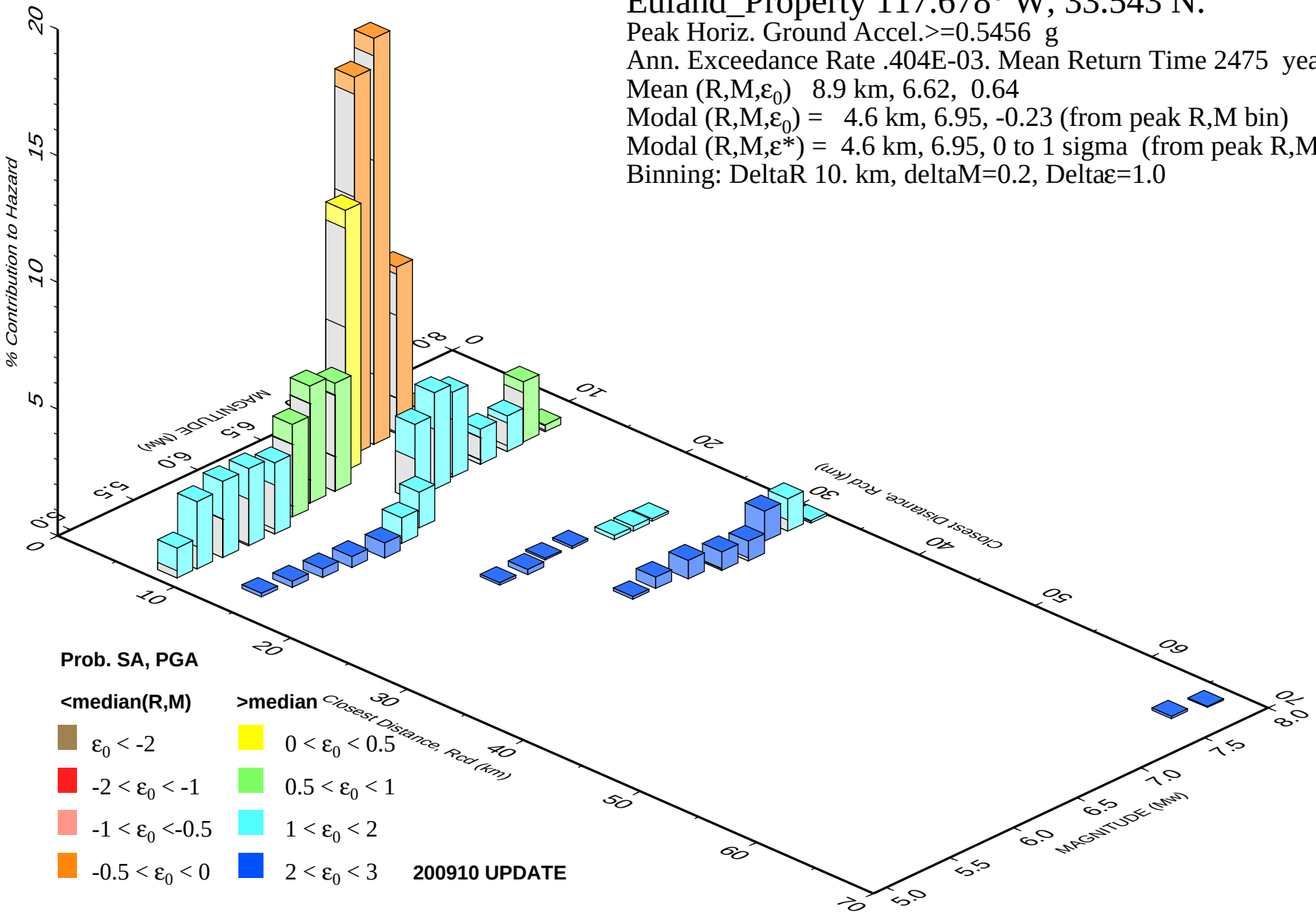
SA period 5.00 sec. Accel.>=0.04144 g
Ann. Exceedance Rate .212E-02. Mean Return Time 475 yrs
Mean (R,M,ε_0) 53.1 km,7.42, 1.04
Modal (R,M,ε_0) = 65.9 km, 7.59, 1.24 (from peak R,M bin)
Modal (R,M,ε*) = 65.9 km, 7.59, 1 to 2 sigma (from peak R,M,ε bin)
Binning: DeltaR=10. km, deltaM=0.2, Deltaε=1.0



GMT 2014 Feb 20 00:46:39 **Distance (R), magnitude (M), epsilon (E0,E) deaggregation for a site on soil with average vs= 643. m/s top 30 m. USGS CGHT PSHA2008 UPDATE Bins with lt 0.05% contrib. omitted**

PSH Deaggregation on NEHRP C soil
Euland_Property 117.678º W, 33.543 N.

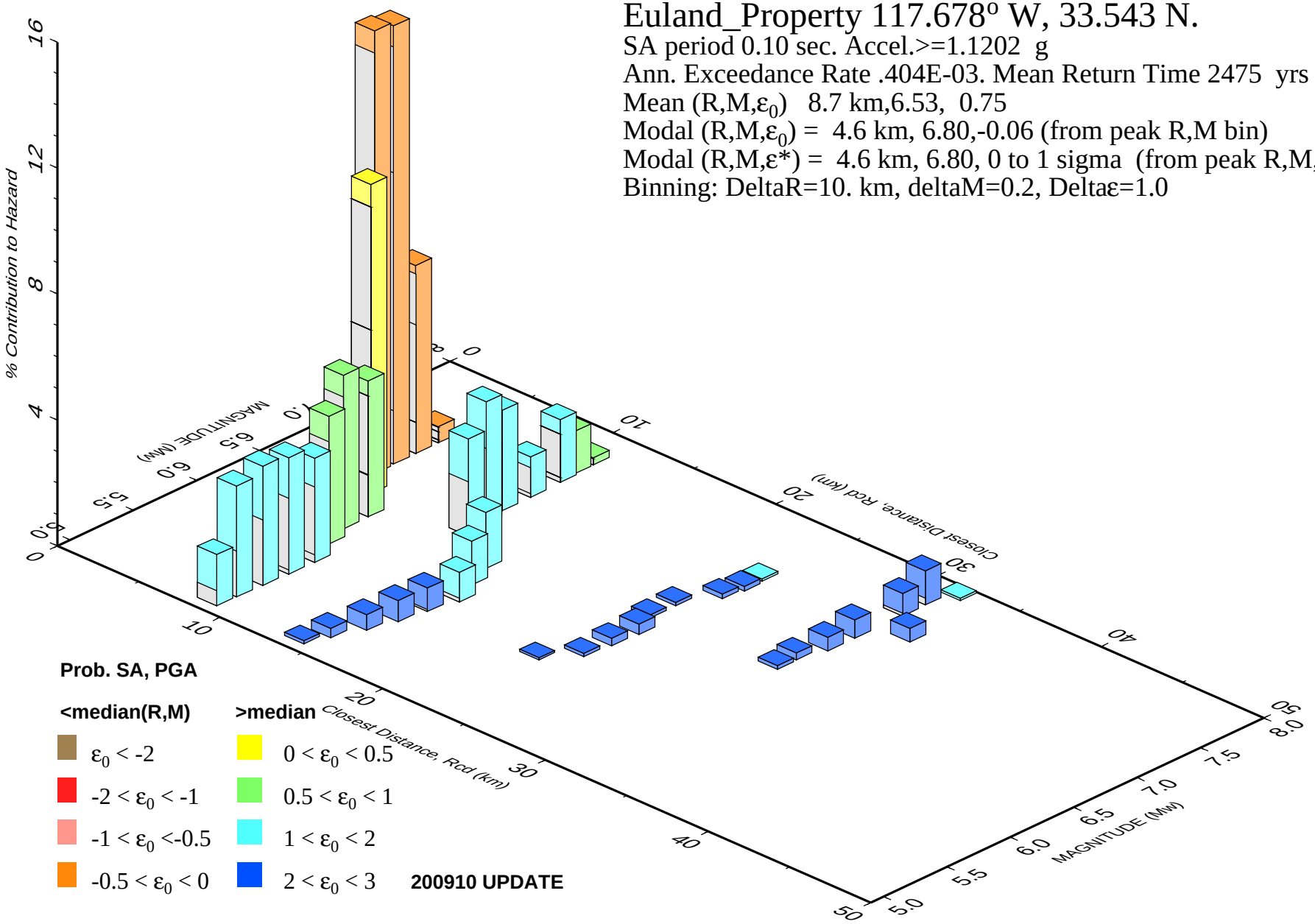
Peak Horiz. Ground Accel.>=0.5456 g
Ann. Exceedance Rate .404E-03. Mean Return Time 2475 years
Mean (R,M,ε_0) 8.9 km, 6.62, 0.64
Modal (R,M,ε_0) = 4.6 km, 6.95, -0.23 (from peak R,M bin)
Modal (R,M,ε*) = 4.6 km, 6.95, 0 to 1 sigma (from peak R,M,ε bin)
Binning: DeltaR 10. km, deltaM=0.2, Deltaε=1.0



GMT 2014 Feb 20 17:14:12 **Distance (R), magnitude (M), epsilon (E0,E) deaggregation for a site on soil with average vs= 643. m/s top 30 m. USGS CGHT PSHA2008 UPDATE Bins with lt 0.05% contrib. omitted**

PSH Deaggregation on NEHRP C soil
Euland_Property 117.678º W, 33.543 N.

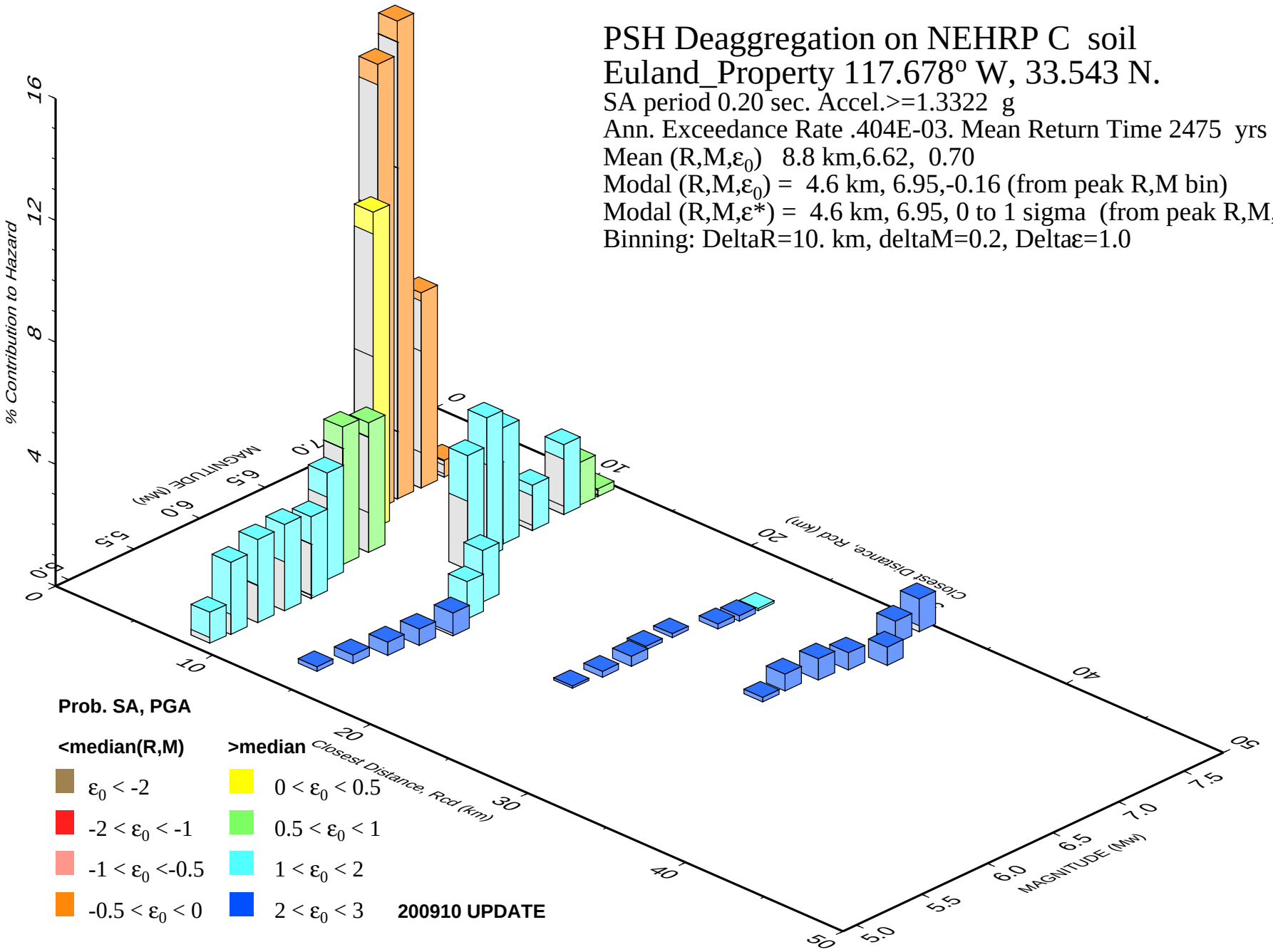
SA period 0.10 sec. Accel.>=1.1202 g
Ann. Exceedance Rate .404E-03. Mean Return Time 2475 yrs
Mean (R,M,ε_0) 8.7 km,6.53, 0.75
Modal (R,M,ε_0) = 4.6 km, 6.80,-0.06 (from peak R,M bin)
Modal (R,M,ε*) = 4.6 km, 6.80, 0 to 1 sigma (from peak R,M,ε bin)
Binning: DeltaR=10. km, deltaM=0.2, Deltaε=1.0



GMT 2014 Feb 20 17:25:49 **Distance (R), magnitude (M), epsilon (E0,E) deaggregation for a site on soil with average vs= 643. m/s top 30 m. USGS CGHT PSHA2008 UPDATE Bins with lt 0.05% contrib. omitted**

PSH Deaggregation on NEHRP C soil
Euland_Property 117.678º W, 33.543 N.

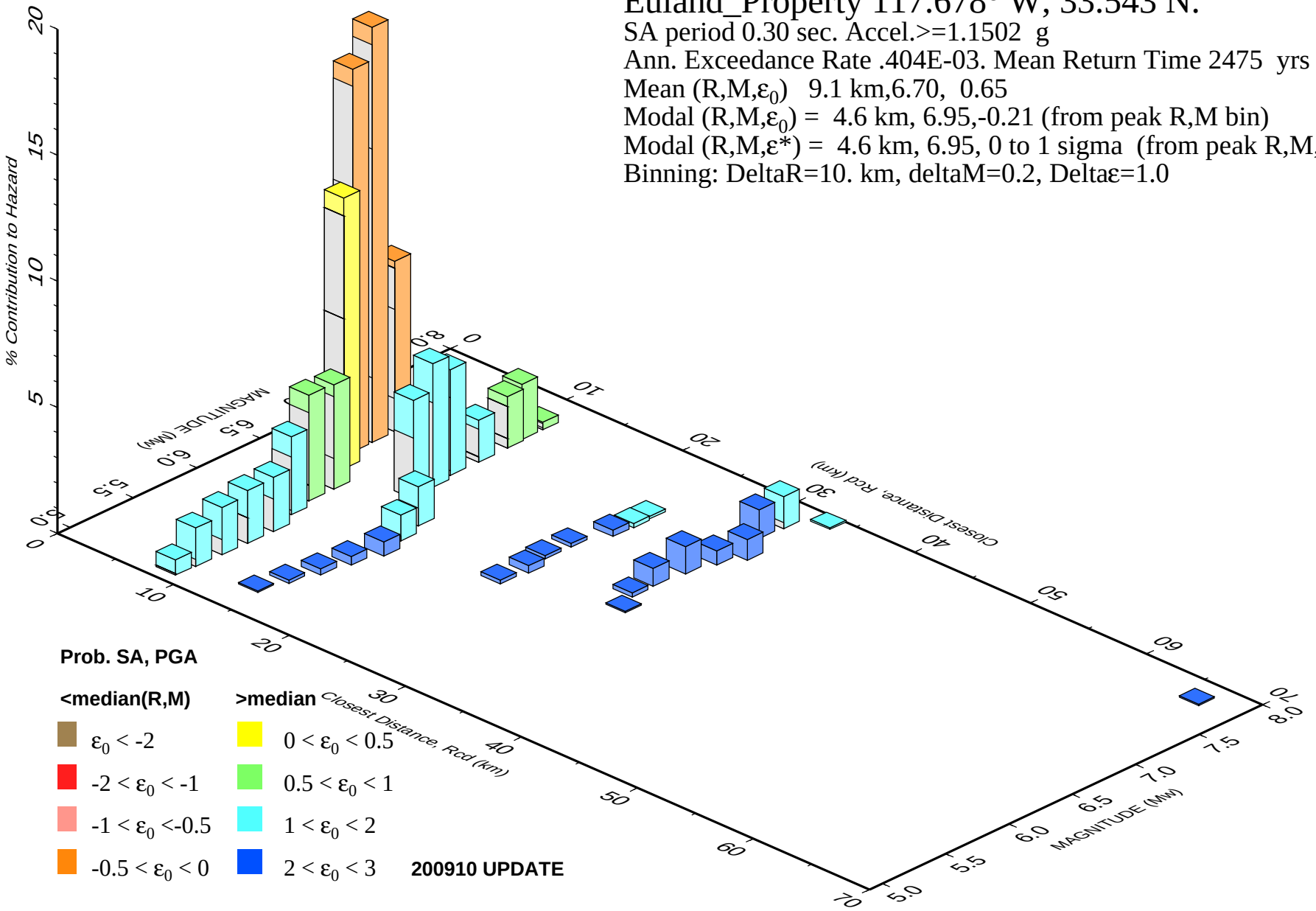
SA period 0.20 sec. Accel.>=1.3322 g
Ann. Exceedance Rate .404E-03. Mean Return Time 2475 yrs
Mean (R,M,ε_0) 8.8 km,6.62, 0.70
Modal (R,M,ε_0) = 4.6 km, 6.95,-0.16 (from peak R,M bin)
Modal (R,M,ε*) = 4.6 km, 6.95, 0 to 1 sigma (from peak R,M,ε bin)
Binning: DeltaR=10. km, deltaM=0.2, Deltaε=1.0



GMT 2014 Feb 20 17:43:26 **Distance (R), magnitude (M), epsilon (E0,E) deaggregation for a site on soil with average vs= 643. m/s top 30 m. USGS CGHT PSHA2008 UPDATE Bins with lt 0.05% contrib. omitted**

PSH Deaggregation on NEHRP C soil
Euland_Property 117.678º W, 33.543 N.

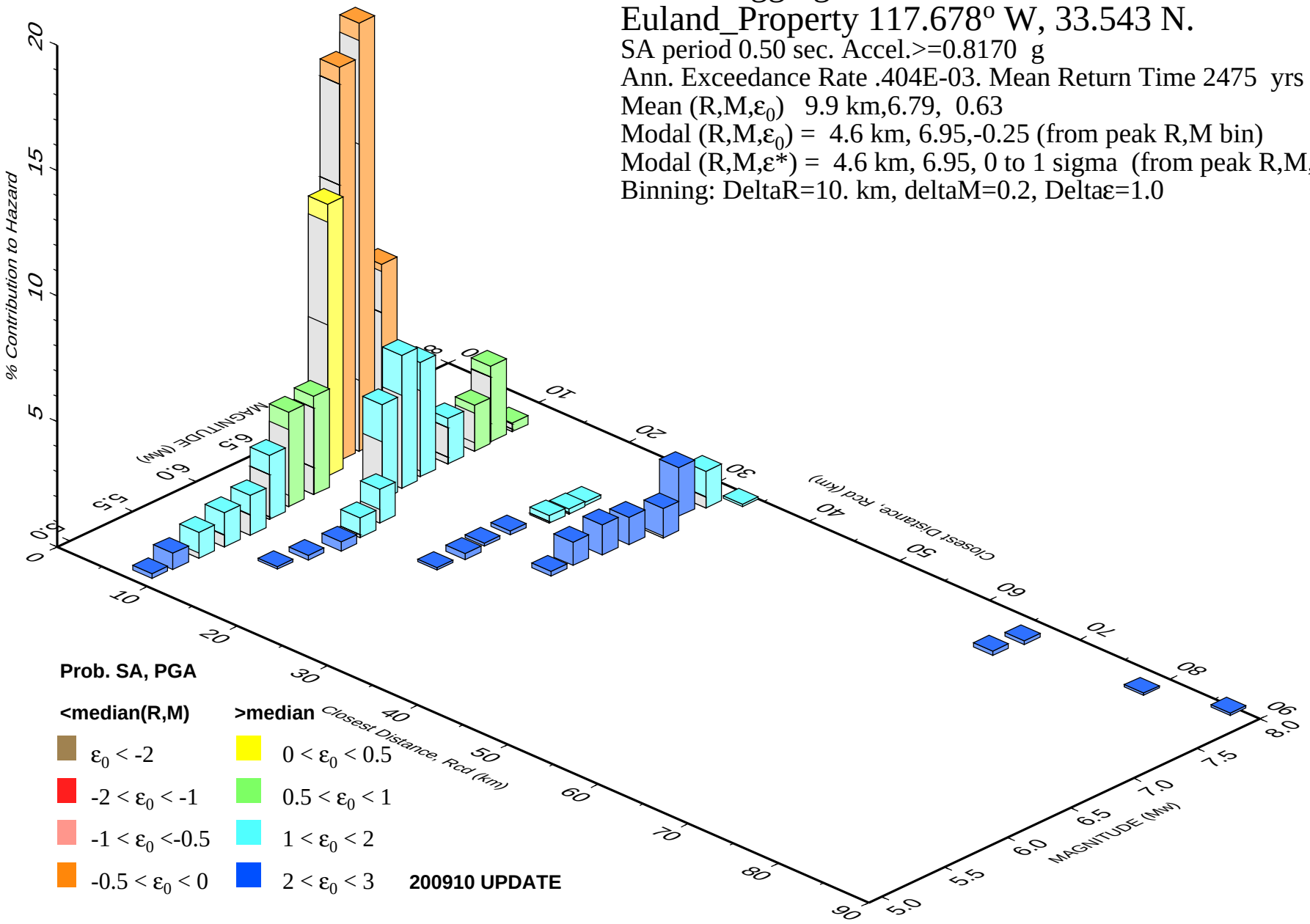
SA period 0.30 sec. Accel.>=1.1502 g
Ann. Exceedance Rate .404E-03. Mean Return Time 2475 yrs
Mean (R,M,ε_0) 9.1 km,6.70, 0.65
Modal (R,M,ε_0) = 4.6 km, 6.95,-0.21 (from peak R,M bin)
Modal (R,M,ε*) = 4.6 km, 6.95, 0 to 1 sigma (from peak R,M,ε bin)
Binning: DeltaR=10. km, deltaM=0.2, Deltaε=1.0



GMT 2014 Feb 20 17:44:35 **Distance (R), magnitude (M), epsilon (E0,E) deaggregation for a site on soil with average vs= 643. m/s top 30 m. USGS CGHT PSHA2008 UPDATE Bins with lt 0.05% contrib. omitted**

PSH Deaggregation on NEHRP C soil
Euland_Property 117.678º W, 33.543 N.

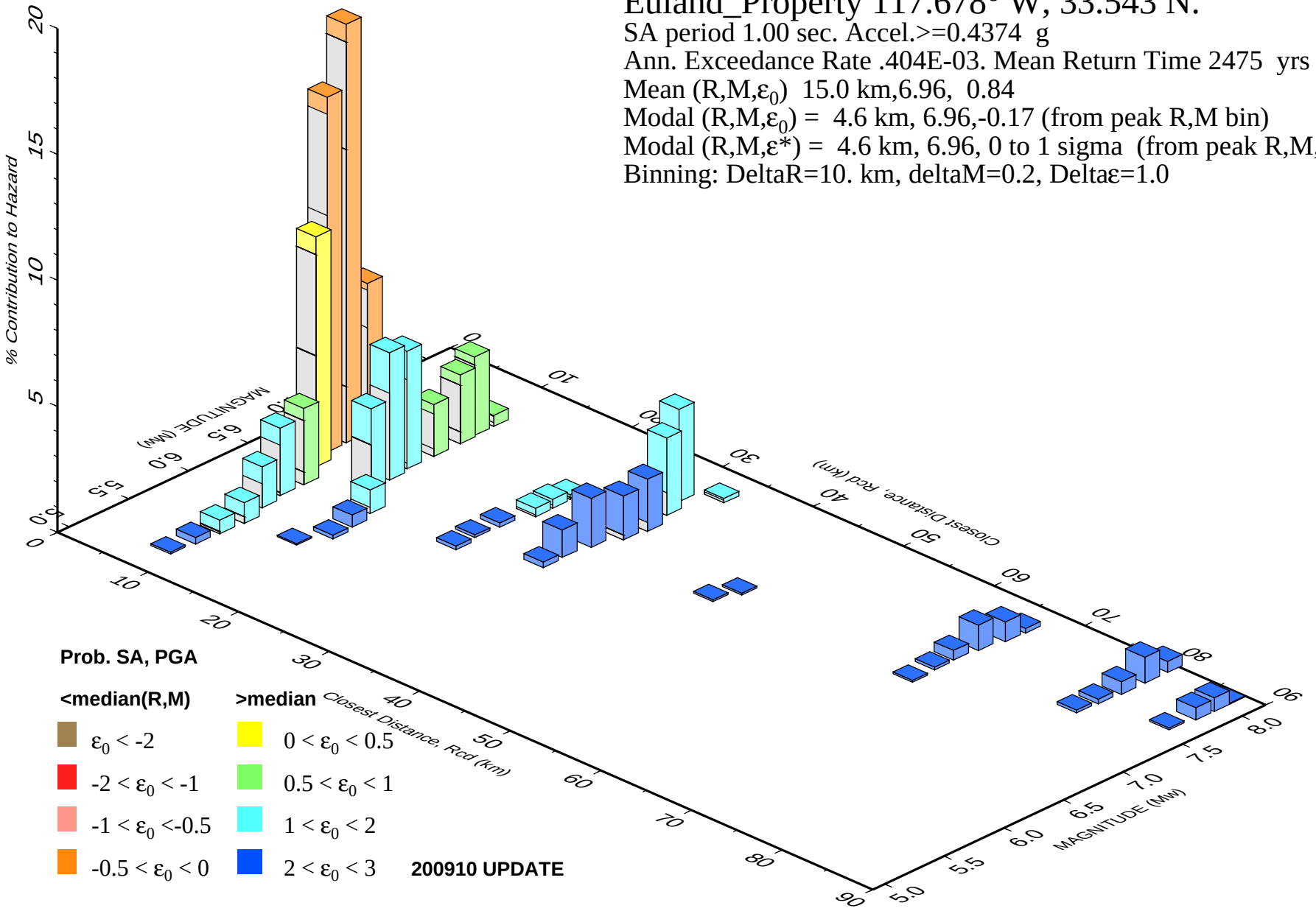
SA period 0.50 sec. Accel.>=0.8170 g
Ann. Exceedance Rate .404E-03. Mean Return Time 2475 yrs
Mean (R,M,ε_0) 9.9 km,6.79, 0.63
Modal (R,M,ε_0) = 4.6 km, 6.95,-0.25 (from peak R,M bin)
Modal (R,M,ε*) = 4.6 km, 6.95, 0 to 1 sigma (from peak R,M,ε bin)
Binning: DeltaR=10. km, deltaM=0.2, Deltaε=1.0



GMT 2014 Feb 20 17:45:25 **Distance (R), magnitude (M), epsilon (E0,E) deaggregation for a site on soil with average vs= 643. m/s top 30 m. USGS CGHT PSHA2008 UPDATE Bins with lt 0.05% contrib. omitted**

PSH Deaggregation on NEHRP C soil
Euland_Property 117.678º W, 33.543 N.

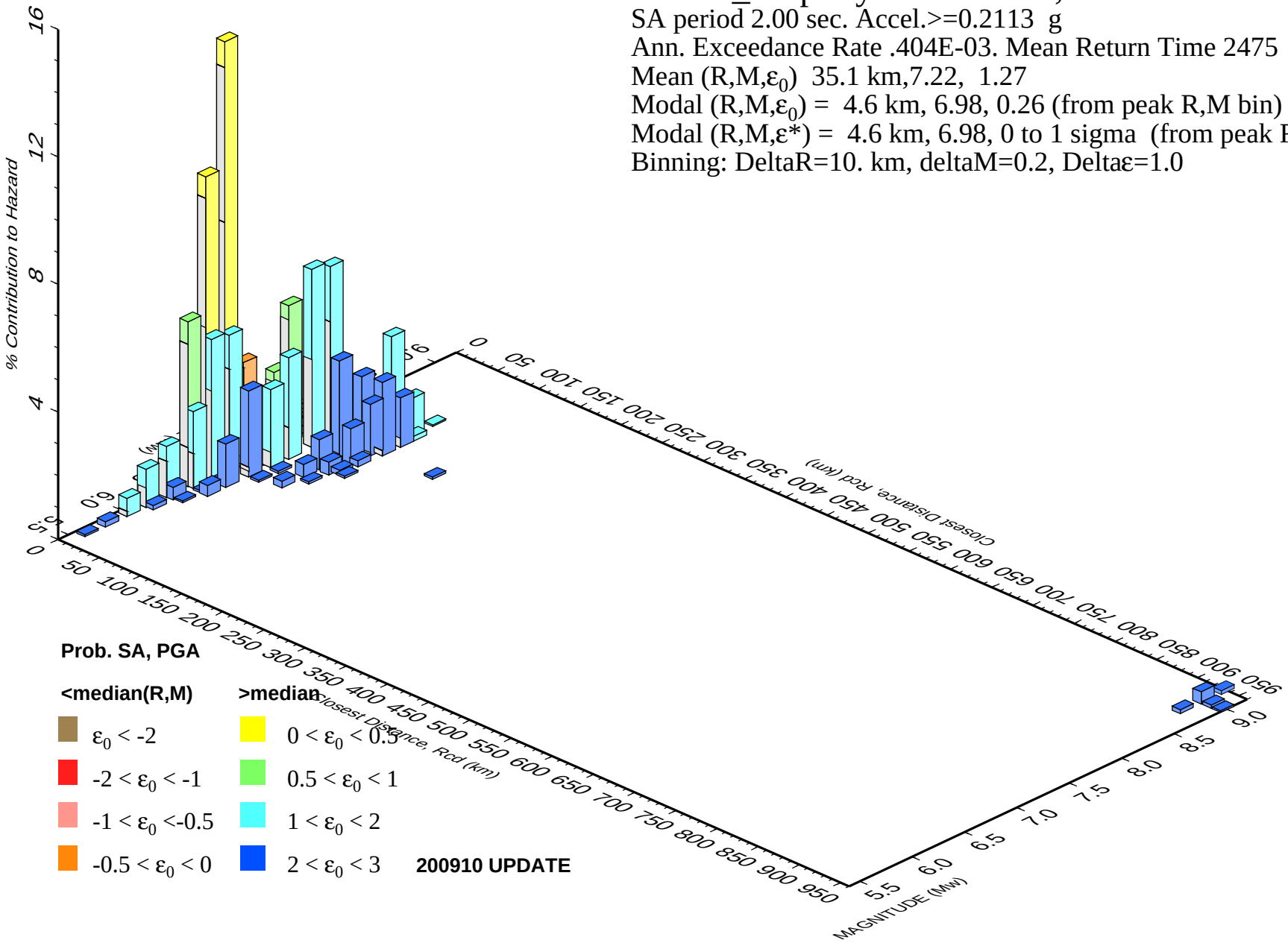
SA period 1.00 sec. Accel.>=0.4374 g
Ann. Exceedance Rate .404E-03. Mean Return Time 2475 yrs
Mean (R,M,ε_0) 15.0 km,6.96, 0.84
Modal (R,M,ε_0) = 4.6 km, 6.96,-0.17 (from peak R,M bin)
Modal (R,M,ε*) = 4.6 km, 6.96, 0 to 1 sigma (from peak R,M,ε bin)
Binning: DeltaR=10. km, deltaM=0.2, Deltaε=1.0



GMT 2014 Feb 20 17:45:42 **Distance (R), magnitude (M), epsilon (E0,E) deaggregation for a site on soil with average vs= 643. m/s top 30 m. USGS CGHT PSHA2008 UPDATE Bins with lt 0.05% contrib. omitted**

PSH Deaggregation on NEHRP C soil
Euland_Property 117.678º W, 33.543 N.

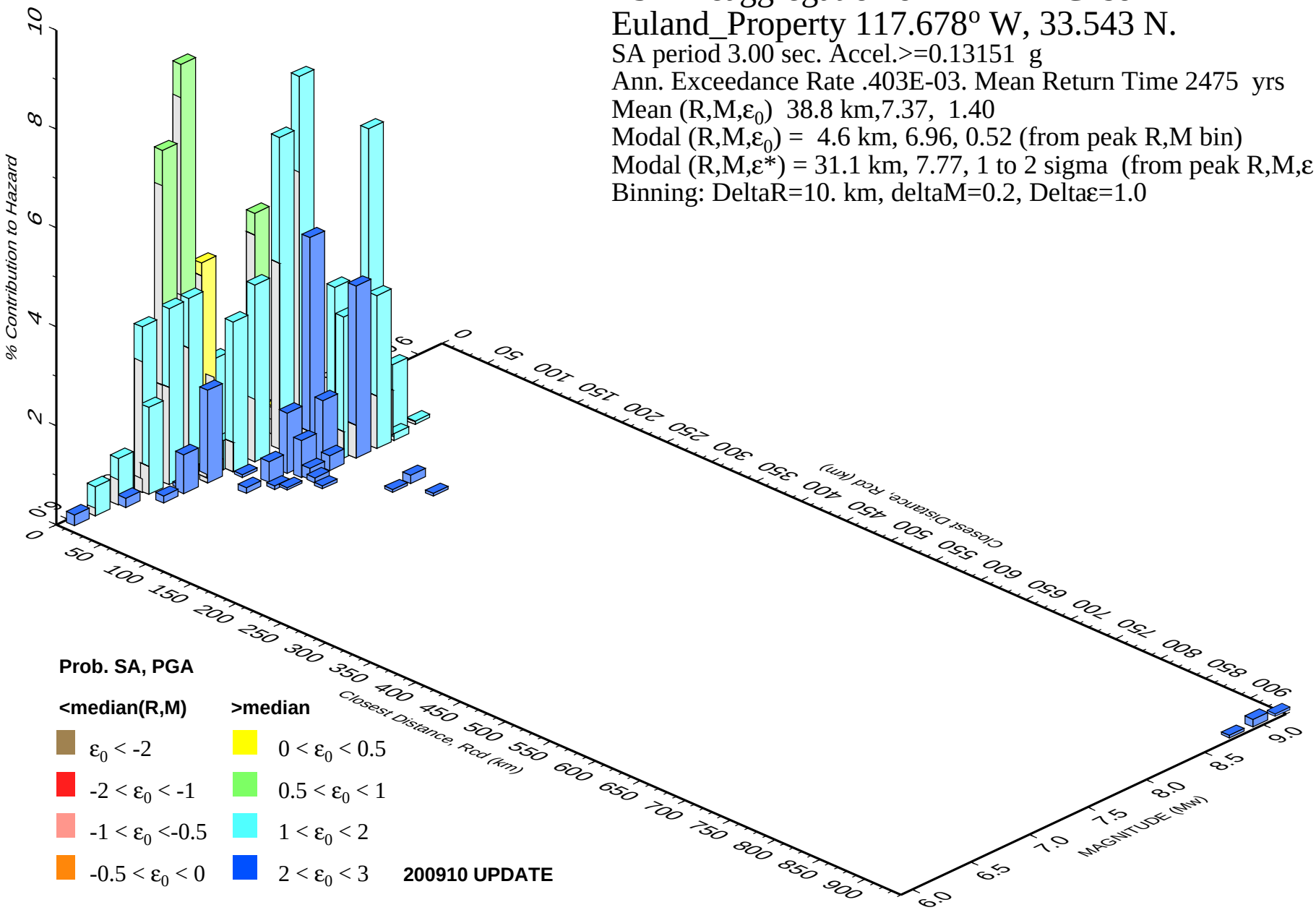
SA period 2.00 sec. Accel.>=0.2113 g
Ann. Exceedance Rate .404E-03. Mean Return Time 2475 yrs
Mean (R,M,ε_0) 35.1 km,7.22, 1.27
Modal (R,M,ε_0) = 4.6 km, 6.98, 0.26 (from peak R,M bin)
Modal (R,M,ε*) = 4.6 km, 6.98, 0 to 1 sigma (from peak R,M,ε bin)
Binning: DeltaR=10. km, deltaM=0.2, Deltaε=1.0



GMT 2014 Feb 20 17:46:05 **Distance (R), magnitude (M), epsilon (E0,E) deaggregation for a site on soil with average vs= 643. m/s top 30 m. USGS CGHT PSHA2008 UPDATE Bins with lt 0.05% contrib. omitted**

PSH Deaggregation on NEHRP C soil
Euland_Property 117.678º W, 33.543 N.

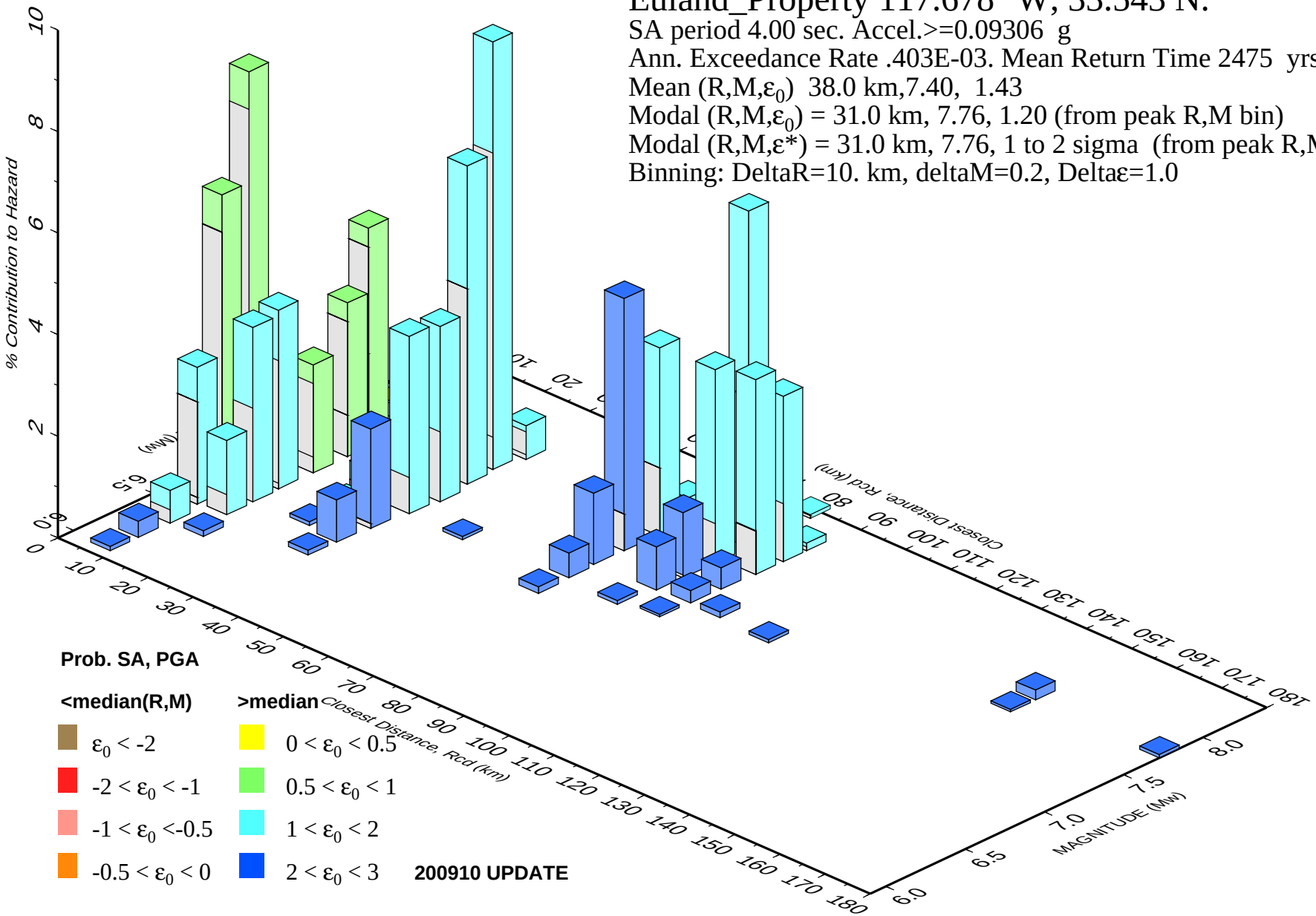
SA period 3.00 sec. Accel.>=0.13151 g
Ann. Exceedance Rate .403E-03. Mean Return Time 2475 yrs
Mean (R,M,ε_0) 38.8 km,7.37, 1.40
Modal (R,M,ε_0) = 4.6 km, 6.96, 0.52 (from peak R,M bin)
Modal (R,M,ε*) = 31.1 km, 7.77, 1 to 2 sigma (from peak R,M,ε bin)
Binning: DeltaR=10. km, deltaM=0.2, Deltaε=1.0



GMT 2014 Feb 20 17:46:22 **Distance (R), magnitude (M), epsilon (E0,E) deaggregation for a site on soil with average vs= 643. m/s top 30 m. USGS CGHT PSHA2008 UPDATE Bins with lt 0.05% contrib. omitted**

PSH Deaggregation on NEHRP C soil
Euland_Property 117.678º W, 33.543 N.

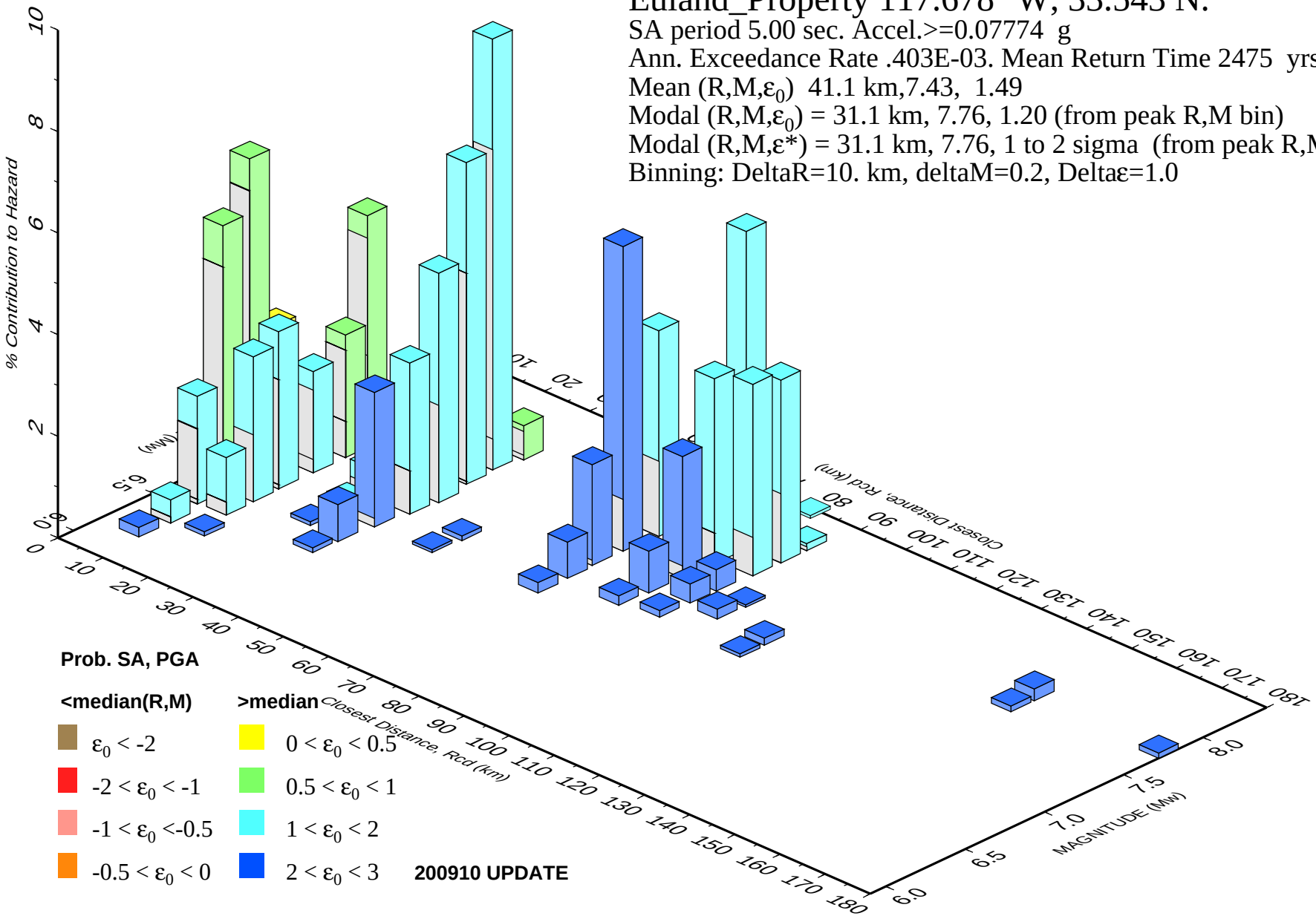
SA period 4.00 sec. Accel.>=0.09306 g
Ann. Exceedance Rate .403E-03. Mean Return Time 2475 yrs
Mean (R,M,ε_0) 38.0 km,7.40, 1.43
Modal (R,M,ε_0) = 31.0 km, 7.76, 1.20 (from peak R,M bin)
Modal (R,M,ε*) = 31.0 km, 7.76, 1 to 2 sigma (from peak R,M,ε bin)
Binning: DeltaR=10. km, deltaM=0.2, Deltaε=1.0



GMT 2014 Feb 20 17:46:52 **Distance (R), magnitude (M), epsilon (E0,E) deaggregation for a site on soil with average vs= 643. m/s top 30 m. USGS CGHT PSHA2008 UPDATE Bins with lt 0.05% contrib. omitted**

PSH Deaggregation on NEHRP C soil
Euland_Property 117.678º W, 33.543 N.

SA period 5.00 sec. Accel.>=0.07774 g
Ann. Exceedance Rate .403E-03. Mean Return Time 2475 yrs
Mean (R,M,ε_0) 41.1 km,7.43, 1.49
Modal (R,M,ε_0) = 31.1 km, 7.76, 1.20 (from peak R,M bin)
Modal (R,M,ε*) = 31.1 km, 7.76, 1 to 2 sigma (from peak R,M,ε bin)
Binning: DeltaR=10. km, deltaM=0.2, Deltaε=1.0



GMT 2014 Feb 20 17:47:17 **Distance (R), magnitude (M), epsilon (E0,E) deaggregation for a site on soil with average vs= 643. m/s top 30 m. USGS CGHT PSHA2008 UPDATE Bins with lt 0.05% contrib. omitted**

Empirical Estimate of Earthquake Peak Ground Velocity

Reference: "Selection of Ground Motion Time Series and Limits on Scaling", Soil Dynamics and Earthquake Engineering, Vol.26, pp.477-482

Input Parameters	
Moment Magnitude (M_w)	6.95
Peak Ground Acceleration (g)	0.28
Spectral Acceleration at 1 sec Period (g)	0.23
Spectral Acceleration at 3 sec Period (g)	0.07
Number of Standard Deviations ε	0.00

Result	
PGV (cm/sec)	23.32
PGV (in/sec)	9.18

Empirical Estimate of Earthquake Duration

Reference: "Empirical Equations for the Prediction of Significant, Bracketed, and Uniform Duration of Earthquake Ground Motion", Bulletin of the Seismological Society of America, Vol.99, No.6, pp. 3217-3233

Table 2

Parameters of the Regression Models for Significant Durations with Relative Thresholds Defined as 5–75% and 5–95% of Arias Intensity

Parameter	$D_{SR}(5–75\%)$	$D_{SR}(5–95\%)$
c_0	-5.6298 ± 0.9325	-2.2393 ± 0.8051
m_1	1.2619 ± 0.1401	0.9368 ± 0.1223
r_1	2.0063 ± 0.1845	1.5686 ± 0.1489
r_2	-0.252 ± 0.027	-0.1953 ± 0.0219
h_1	2.3316 ± -1.5293	2.5*
v_1	-0.29 ± 0.0338	-0.3478 ± 0.0274
z_1	-0.0522 ± 0.0223	-0.0365 ± 0.0202
τ	0.3527 ± 0.0577	0.3252 ± 0.0521
σ	0.4304 ± 0.0116	0.346 ± 0.0107
σ_c	0.1729 ± 0.0049	0.1114 ± 0.0031
$\sigma_{T,ARB}$	0.5564 ± 0.0372	0.4748 ± 0.036
$\sigma_{T,GM}$	0.5289 ± 0.0392	0.4616 ± 0.0371

The plus and minus values define the approximate 95% confidence interval for each parameter.

*Note that the parameter h_1 is fixed for the 5–95% case, for which reason no confidence intervals are reported.

c_0	-2.2393
m_1	0.9368
r_1	1.5686
r_2	-0.1953
h_1	2.5
v_1	-0.3478
z_1	-0.0365

Input Parameters	
Moment Magnitude (M_w)	6.95
Source to Site Distance (km)	10.00
Site Stiffness (m/s)	632.00
z_{HR} Depth to hard rock (km)	0.10

Result		
Da5_95	12.40	sec

Empirical Estimate of Mean Period, Average Spectral Period, and Predominant Period

Reference: "Empirical Relationships for Frequency Content Parameters of Earthquake Ground Motions", Earthquake Spectra, Vol.20, pp.119-144

Input Parameters		
Moment Magnitude (M_W)	6.95	
Closest Distance to Fault Rupture (km)	10.00	
Site Class	C	
Site Class Indicator Sc	1.00	0 OR 1
Site Class Indicator S_D	0.00	0 OR 1
Fault Forward Directivity FD	0.00	
Number of Standard Deviations ε	0.00	

FD=1 for sites with M ≥ 6.0, R ≤ 20.0 km, azimuth angle ≤ 30 deg, and rupture length ratio ≥ 0.5.

FD=0 otherwise.

Tm		Tave		To	
c11	-1.00	c21	-0.89	c31	-1.78
c12	0.18	c22	0.29	c32	0.30
c13	0.0038	c23	0.0030	c33	0.0045
c14	0.078	c24	0.070	c34	0.150
c15	0.27	c25	0.25	c35	0.33
c16	0.40	c26	0.37	c36	0.24
σ1b	0.42	σ2b	0.38	σ3b	0.38
σ1c	0.38	σ2c	0.36	σ3c	0.33
σ1d	0.31	σ2d	0.29	σ3d	0.31
τ1	0.17	τ2	0.13	τ3	0.22

Mean Period	SD =	0.000	lnTm=	-0.659	Tm=	0.517	sec
Average Spectral Period	SD =	0.000	lnTave=	-0.428	Tave=	0.652	sec
Smoothed Spectral Predominant Period	SD =	0.000	lnTo=	-1.210	To=	0.298	sec

Design Maps Detailed Report

ASCE 7-10 Standard (33.5431°N, 117.6785°W)

Site Class C – "Very Dense Soil and Soft Rock", Risk Category I/II/III

Section 11.4.1 — Mapped Acceleration Parameters

Note: Ground motion values provided below are for the direction of maximum horizontal spectral response acceleration. They have been converted from corresponding geometric mean ground motions computed by the USGS by applying factors of 1.1 (to obtain S_S) and 1.3 (to obtain S_1). Maps in the 2010 ASCE-7 Standard are provided for Site Class B. Adjustments for other Site Classes are made, as needed, in Section 11.4.3.

From Figure 22-1[1] S_S = 1.396 g

From Figure 22-2[2] S_1 = 0.518 g

Section 11.4.2 — Site Class

The authority having jurisdiction (not the USGS), site-specific geotechnical data, and/or the default has classified the site as Site Class C, based on the site soil properties in accordance with Chapter 20.

Table 20.3–1 Site Classification

Site Class	$\bar{v}_s$	$\bar{N}$ or $\bar{N}_{ch}$	$\bar{s}_u$
A. Hard Rock	>5,000 ft/s	N/A	N/A
B. Rock	2,500 to 5,000 ft/s	N/A	N/A
C. Very dense soil and soft rock	1,200 to 2,500 ft/s	>50	>2,000 psf
D. Stiff Soil	600 to 1,200 ft/s	15 to 50	1,000 to 2,000 psf
E. Soft clay soil	<600 ft/s	<15	<1,000 psf
	Any profile with more than 10 ft of soil having the characteristics: • Plasticity index PI > 20, • Moisture content w ≥ 40%, and • Undrained shear strength $\bar{s}_u$ < 500 psf		
F. Soils requiring site response analysis in accordance with Section 21.1	See Section 20.3.1		

For SI: 1ft/s = 0.3048 m/s 1lb/ft² = 0.0479 kN/m²

Section 11.4.3 — Site Coefficients and Risk–Targeted Maximum Considered Earthquake (MCE_R) Spectral Response Acceleration Parameters

Table 11.4–1: Site Coefficient F_a

Site Class	Mapped MCE_R Spectral Response Acceleration Parameter at Short Period				
	$S_S \leq 0.25$	$S_S = 0.50$	$S_S = 0.75$	$S_S = 1.00$	$S_S \geq 1.25$
A	0.8	0.8	0.8	0.8	0.8
B	1.0	1.0	1.0	1.0	1.0
C	1.2	1.2	1.1	1.0	1.0
D	1.6	1.4	1.2	1.1	1.0
E	2.5	1.7	1.2	0.9	0.9
F	See Section 11.4.7 of ASCE 7				

Note: Use straight–line interpolation for intermediate values of S_S

For Site Class = C and S_S = 1.396 g, F_a = 1.000

Table 11.4–2: Site Coefficient F_v

Site Class	Mapped MCE_R Spectral Response Acceleration Parameter at 1–s Period				
	$S_1 \leq 0.10$	$S_1 = 0.20$	$S_1 = 0.30$	$S_1 = 0.40$	$S_1 \geq 0.50$
A	0.8	0.8	0.8	0.8	0.8
B	1.0	1.0	1.0	1.0	1.0
C	1.7	1.6	1.5	1.4	1.3
D	2.4	2.0	1.8	1.6	1.5
E	3.5	3.2	2.8	2.4	2.4
F	See Section 11.4.7 of ASCE 7				

Note: Use straight–line interpolation for intermediate values of S_1

For Site Class = C and S_1 = 0.518 g, F_v = 1.300

Equation (11.4–1): $S_{MS} = F_a S_S = 1.000 \times 1.396 = 1.396$ g

Equation (11.4–2): $S_{M1} = F_v S_1 = 1.300 \times 0.518 = 0.673$ g

Section 11.4.4 — Design Spectral Acceleration Parameters

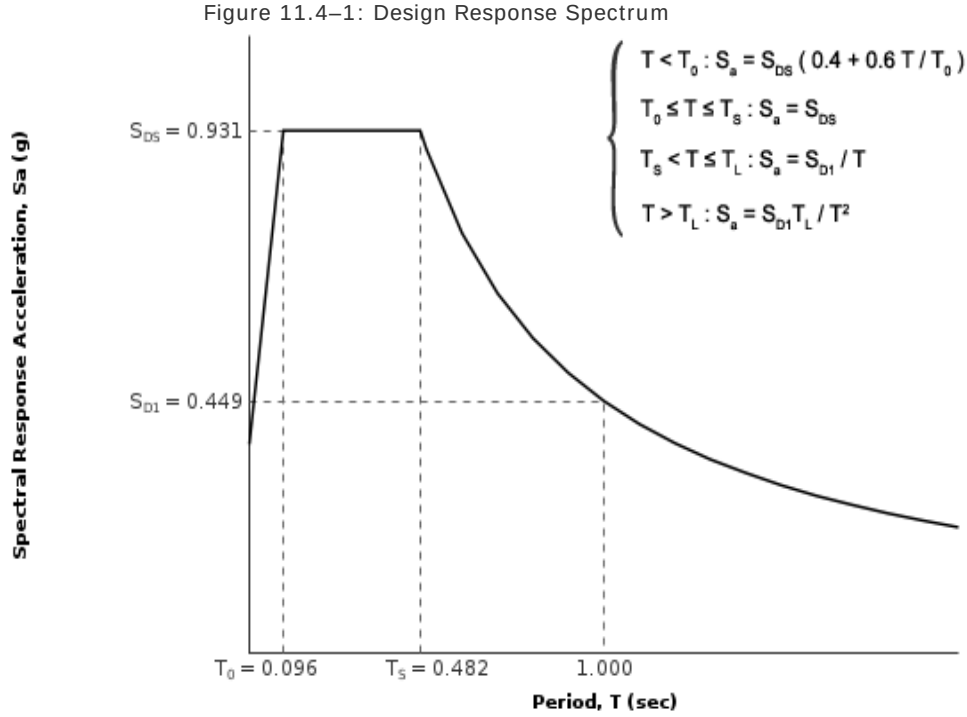
Equation (11.4–3): $S_{DS} = ⅔\ S_{MS} = ⅔ \times 1.396 = 0.931$ g

Equation (11.4–4): $S_{D1} = ⅔\ S_{M1} = ⅔ \times 0.673 = 0.449$ g

Section 11.4.5 — Design Response Spectrum

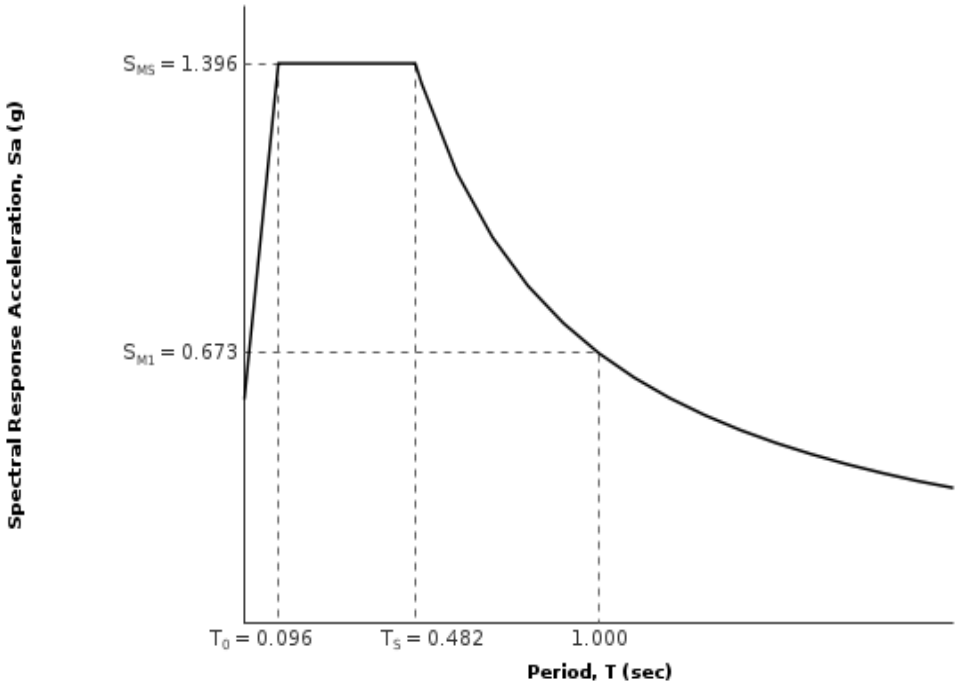
From Figure 22-12[3] $T_L = 8$ seconds

Figure 11.4–1: Design Response Spectrum



Section 11.4.6 — Risk-Targeted Maximum Considered Earthquake (MCE_R) Response Spectrum

The MCE_R Response Spectrum is determined by multiplying the design response spectrum above by 1.5.



Section 11.8.3 — Additional Geotechnical Investigation Report Requirements for Seismic Design Categories D through F

From Figure 22-7[4] PGA = 0.535

Equation (11.8–1): $PGA_M = F_{PGA}PGA = 1.000 \times 0.535 = 0.535$ g

Table 11.8–1: Site Coefficient F_{PGA}

Site Class	Mapped MCE Geometric Mean Peak Ground Acceleration, PGA				
	PGA ≤ 0.10	PGA = 0.20	PGA = 0.30	PGA = 0.40	PGA ≥ 0.50
A	0.8	0.8	0.8	0.8	0.8
B	1.0	1.0	1.0	1.0	1.0
C	1.2	1.2	1.1	1.0	1.0
D	1.6	1.4	1.2	1.1	1.0
E	2.5	1.7	1.2	0.9	0.9
F	See Section 11.4.7 of ASCE 7				

Note: Use straight–line interpolation for intermediate values of PGA

For Site Class = C and PGA = 0.535 g, F_{PGA} = 1.000

Section 21.2.1.1 — Method 1 (from Chapter 21 – Site-Specific Ground Motion Procedures for Seismic Design)

From Figure 22-17[5] C_{RS} = 0.977

From Figure 22-18[6] C_{R1} = 1.022

Section 11.6 — Seismic Design Category

Table 11.6-1 Seismic Design Category Based on Short Period Response Acceleration Parameter

VALUE OF S_{DS}	RISK CATEGORY		
	I or II	III	IV
S_{DS} < 0.167g	A	A	A
0.167g ≤ S_{DS} < 0.33g	B	B	C
0.33g ≤ S_{DS} < 0.50g	C	C	D
0.50g ≤ S_{DS}	D	D	D

For Risk Category = I and S_{DS} = 0.931 g, Seismic Design Category = D

Table 11.6-2 Seismic Design Category Based on 1-S Period Response Acceleration Parameter

VALUE OF S_{D1}	RISK CATEGORY		
	I or II	III	IV
S_{D1} < 0.067g	A	A	A
0.067g ≤ S_{D1} < 0.133g	B	B	C
0.133g ≤ S_{D1} < 0.20g	C	C	D
0.20g ≤ S_{D1}	D	D	D

For Risk Category = I and S_{D1} = 0.449 g, Seismic Design Category = D

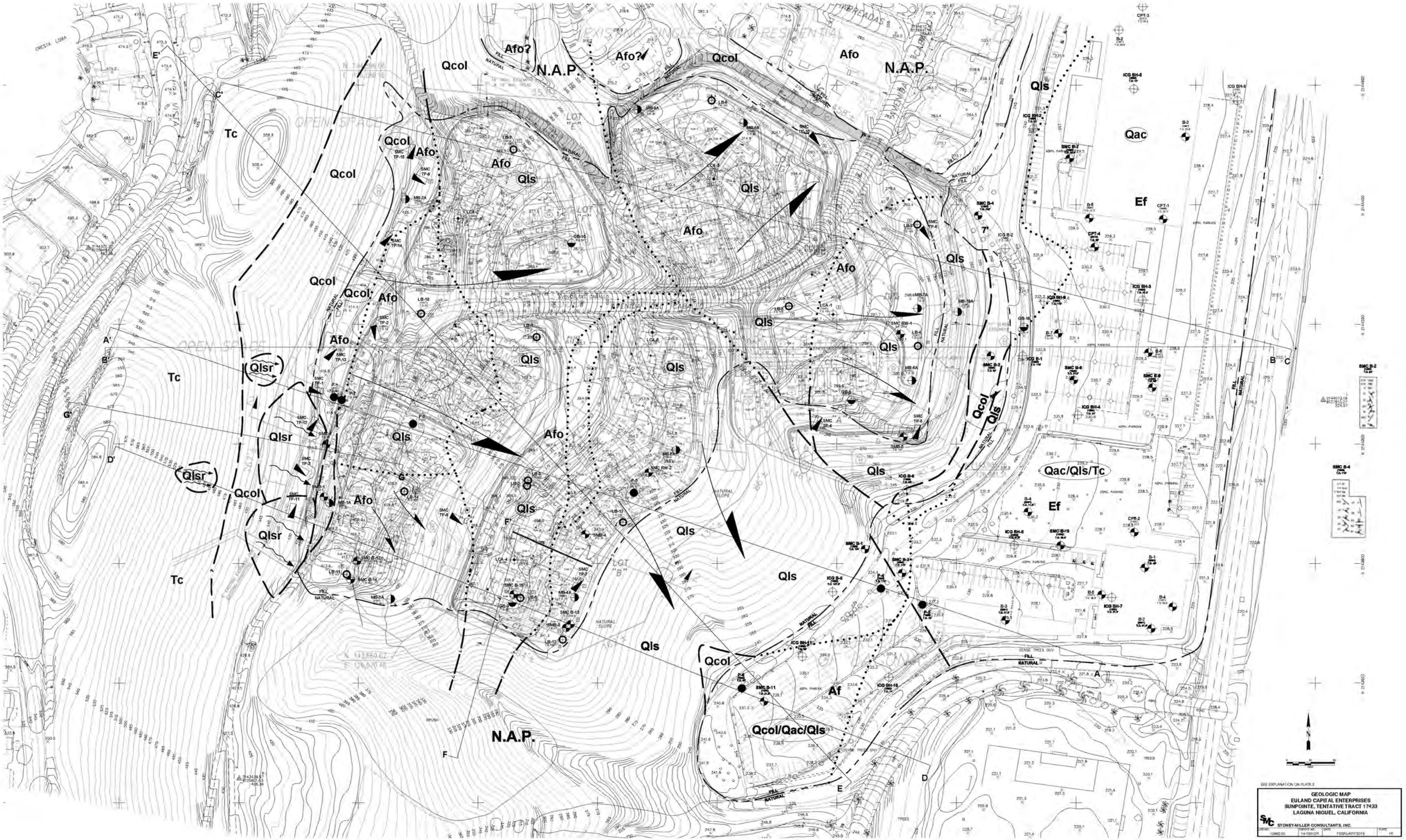
Note: When S_1 is greater than or equal to 0.75g, the Seismic Design Category is **E** for buildings in Risk Categories I, II, and III, and **F** for those in Risk Category IV, irrespective of the above.

Seismic Design Category ≡ "the more severe design category in accordance with Table 11.6-1 or 11.6-2" = D

Note: See Section 11.6 for alternative approaches to calculating Seismic Design Category.

References

1. *Figure 22-1*: http://earthquake.usgs.gov/hazards/designmaps/downloads/pdfs/2010_ASCE-7_Figure_22-1.pdf
2. *Figure 22-2*: http://earthquake.usgs.gov/hazards/designmaps/downloads/pdfs/2010_ASCE-7_Figure_22-2.pdf
3. *Figure 22-12*: http://earthquake.usgs.gov/hazards/designmaps/downloads/pdfs/2010_ASCE-7_Figure_22-12.pdf
4. *Figure 22-7*: http://earthquake.usgs.gov/hazards/designmaps/downloads/pdfs/2010_ASCE-7_Figure_22-7.pdf
5. *Figure 22-17*: http://earthquake.usgs.gov/hazards/designmaps/downloads/pdfs/2010_ASCE-7_Figure_22-17.pdf
6. *Figure 22-18*: http://earthquake.usgs.gov/hazards/designmaps/downloads/pdfs/2010_ASCE-7_Figure_22-18.pdf


Qcol
Afo?
N.A.P.
Afo
Qls
Tc
Qlsr
Qac
Ef
Qac/Qls/Tc
Qcol/Qac/Qls
Af
OPEN SPACE
LOT "B"
A'
B'
C'
D'
E'
F'
G'
A
B
C
D
E
F
G
SEE EXPLANATION ON PLATE 2
GEOLOGIC MAP
EULAND CAPITAL ENTERPRISES
SUNPOINTE, TENTATIVE TRACT 17433
LAGUNA NIGUEL, CALIFORNIA
STONEY-MILLER CONSULTANTS, INC.
JOB NO. 12662-05
REPORT NO. 14-13012TR
DATE FEBRUARY 2015
FIGURE 1R

FINAL DESIGN OF THE SITE GRADING AND OTHER STABILIZATION MEASURES, INCLUDING DRAINAGE, BUTTRESS AND STABILIZATION KEYS, CONCRETE PIERS, AND VERDURA-TYPE WALLS WILL BE REQUIRED AS PLANS FOR ROUGH GRADING, PRECISE GRADING, WALL AND FOUNDATION PLANS ARE DEVELOPED.

EXPLANATION

UNITS

Ef	ENGINEERED FILL (COMPACTED FILL PLACED DURING GRADING PER SUNSCREEN-MINZ OF LAGUNA NIGUEL DEVELOPMENT)
Af	ARTIFICIAL FILL (UNCONTAINED DURING GRADING FOR SUNSCREEN SUNZ OF LAGUNA NIGUEL DEVELOPMENT)
Afo	OLDER ARTIFICIAL FILL (PLACED DURING GRADING FOR TRACT 6241 AND FOR TENTATIVE TRACT 15990)
Qcol	COLLUVIUM (CIRCLED WHERE BURIED BY FILL SOILS)
Qac	ALLUVIUM/COLLUVIUM (UNCONTAINED)
Qls	ANCIENT LANDSLIDE DEBRIS - (CIRCLED WHERE BURIED BY FILL SOILS AND/OR ALLUVIUM OR COLLUVIUM)
Qlsr	RECENT LANDSLIDE DEBRIS
Tc	UNDERCK: CAPISTRANO FORMATION, SILTSTONE, CLAYSTONE AND MINOR SANDSTONE

SYMBOLS

- APPROXIMATE LOCATION OF GEOLOGIC CONTACT, DASHED WHERE APPROXIMATE, QUERIED WHERE UNCERTAIN, DOTTED WHERE BURIED UNDER COLLUVIUM, ALLUVIUM, AND FILL (ON FLATTED DURING PREVIOUS GRADING NOTE: FILL SOILS BLANKET GRADED AREAS OF BSI)
- NATURAL / FILL — CUT — APPROXIMATE LOCATION OF CUT/FILL/NATURAL CONTACT
- 6 / 75 — STRIKE AND DIP OF BEDDING
- STRIKE AND DIP OF JOINT ANCHOR FRACTURE
- STRIKE OF VERTICAL JOINT AND FRACTURE
- 50 / 65 — STRIKE AND DIP OF SHEAR OR LANDSLIDE RUPTURE (DIRECTION AND DIP OF STRIKE)
- Qlsr — APPROXIMATE LIMITS OF SURFICIAL FAILURE
- Qls — APPROXIMATE LIMITS OF ANCIENT LANDSLIDE (QUERIED, LIKELY BOLD; WHERE SECURATOR IS WELL DEFINED, DASHED WHERE APPROXIMATELY LOCATED AND DOTTED WHERE CONCEALED OR BURIED BY FILL SOILS. ARROWS INDICATE DIRECTION OF MOVEMENT
- 8 — APPROXIMATE DEPTH OF EXISTING ENGINEERED FILL (IN FEET)
- C / C' — LOCATION OF GEOLOGIC CROSS SECTION
- N.A.P. — NOT A PART OF PROPOSED DEVELOPMENT
- APPROXIMATE LOCATION OF KEYWAY WITH SACKDRAIN ALL SACKDRAINS TO OUTLET TO A NON-ROCK OUTLET PIPE WHERE POSSIBLE
- EL 331' — APPROXIMATE ELEVATION AT BOTTOM OF KEYWAY (ACTUAL ELEVATION TO BE DETERMINED BY ENGINEERING GEOLOGIST DURING GRADING)
- 15' / 15' — APPROXIMATE LOCATION OF GEOTECHNICAL CROSS SECTION
- EG 6 — APPROXIMATE LOCATION OF GROUNDWATER MONITORING WELL
- APPROXIMATE LOCATION OF DRAIN CAPTURE MODULES
- APPROXIMATE LOCATION OF 36-INCH DIAMETER CONCRETE PIER, 16 FEET DEEP, 10 FOOT ON CENTER
- APPROXIMATE LOCATION OF 36-INCH DIAMETER CONCRETE PIER, 28 FEET DEEP, 10/10 FOOT ON CENTER
- APPROXIMATE LINES OF CHIMNEY DRAIN, SEE FIGURE 8B
- 4"Ø / 4"Ø — APPROXIMATE LOCATION OF 4/6/8/10-INCH DIAMETER OUTLET PIPE (RUN AT MINIMUM 5.0% TO STOUR CATCH BOX)
- FOSSIBLE TEMPORARY SHORING

BORINGS AND TEST PITS

- APPROXIMATE LOCATION OF EXPLORATORY CONE PENETROMETER TEST COMPLETED BY STONEY-MILLER CONSULTANTS, INC. ON 1/1/2014
- TP-10 — APPROXIMATE LOCATION OF EXPLORATORY TEST PIT COMPLETED BY STONEY-MILLER CONSULTANTS, INC. ON 9/1/04
- BHS 3-14 — APPROXIMATE LOCATION OF EXPLORATORY BUCKET AUGER BORING COMPLETED BY STONEY-MILLER CONSULTANTS, INC. FROM 8/1/04 THROUGH 8/8/04
- BSH-2 — APPROXIMATE LOCATION OF EXPLORATORY BORING COMPLETED BY STONEY-MILLER CONSULTANTS, INC. FROM 3/24/99 THROUGH 3/26/99
- B4 — APPROXIMATE LOCATION OF EXPLORATORY HOLLOW STEM AUGER BORING COMPLETED BY STONEY-MILLER CONSULTANTS, INC. ON 8/04/01
- B4 — APPROXIMATE LOCATION OF EXPLORATORY HOLLOW STEM AUGER BORING COMPLETED BY STONEY-MILLER CONSULTANTS, INC. FROM 4/18/97 THROUGH 4/18/97
- RWC B-7 — APPROXIMATE LOCATION OF EXPLORATORY ROTARY WASH BORING COMPLETED BY STONEY-MILLER CONSULTANTS, INC. FROM 1/09/01 THROUGH 2/02/01
- RWC B-11 — APPROXIMATE LOCATION OF EXPLORATORY BUCKET OR HOLLOW STEM AUGER BORING COMPLETED BY STONEY-MILLER CONSULTANTS, INC. FROM 11/14/00 THROUGH 11/16/00
- CPT-9 — APPROXIMATE LOCATION OF EXPLORATORY CONE PENETROMETER TEST COMPLETED BY STONEY-MILLER CONSULTANTS, INC. ON 10/22/04
- TP-13 — APPROXIMATE LOCATION OF EXPLORATORY TEST PIT COMPLETED BY STONEY-MILLER CONSULTANTS, INC. ON 3/14/00
- RWC B-2 — APPROXIMATE LOCATION OF EXPLORATORY ROTARY WASH BORING COMPLETED BY STONEY-MILLER CONSULTANTS, INC. FROM 10/21/04 THROUGH 10/26/04
- LB-4 — APPROXIMATE LOCATION OF EXPLORATORY BORING COMPLETED BY LEIGHTON AND ASSOCIATES, INC. AND LOGGED BY STONEY-MILLER CONSULTANTS, INC. FROM 9/23/90 THROUGH 10/2/90
- KCB B-4 — APPROXIMATE LOCATION OF EXPLORATORY BUCKET AUGER BORING COMPLETED BY BOVIS CONSULTING GROUP FROM 3/23/90 THROUGH 3/26/90
- KCB BH-11 — APPROXIMATE LOCATION OF EXPLORATORY HOLLOW STEM AUGER BORING COMPLETED BY BOVIS CONSULTING GROUP FROM 2/23/90 THROUGH 2/28/90
- APPROXIMATE LOCATION OF EXPLORATORY BORING COMPLETED BY PETRA GEOTECHNICAL, INC. FROM 11/4/99 THROUGH 11/17/99
- LB-10 — APPROXIMATE LOCATION OF EXPLORATORY BORING COMPLETED BY LEIGHTON AND ASSOCIATES, INC. FROM 10/26/87 THROUGH 10/28/87
- MSL-104 — APPROXIMATE LOCATION OF EXPLORATORY BORING COMPLETED BY MCGILL, ARAGON, WORNICK AND ASSOCIATES, INC. FROM 9/9/89 THROUGH 10/10/89
- GTB-10 — APPROXIMATE LOCATION OF EXPLORATORY BORING COMPLETED BY GEOTECHNICAL CONSULTANTS, INC. (LOGS UNAVAILABLE)

T.D. INDICATES TOTAL DEPTH

GEOTECHNICAL MAP
EULAND CAPITAL ENTERPRISES
SUNPOINTE, TENTATIVE TRACT 17433
LAGUNA NIGUEL, CALIFORNIA

STONEY-MILLER CONSULTANTS, INC.

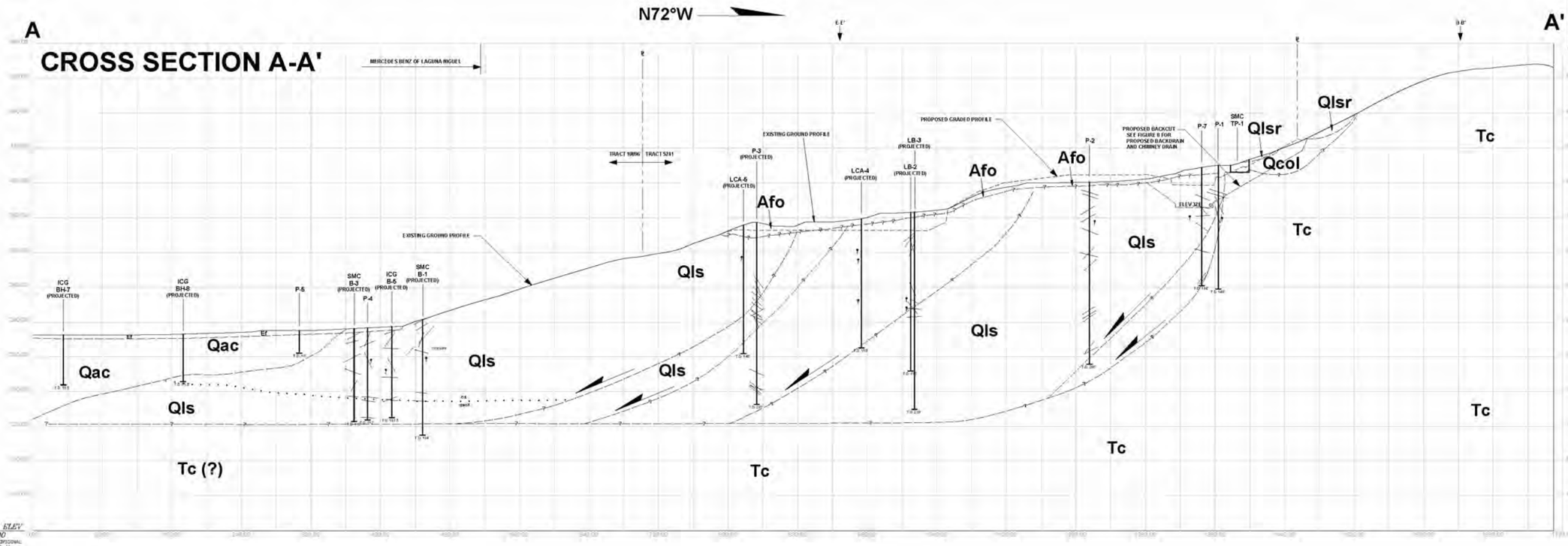
JOB NO.	REPORT NO.	DATE	FIGURE
13962-05	14-13912R	FEBRUARY 2015	8F

GEOTECHNICAL CROSS SECTIONS A-A' & B-B'
EULAND CAPITAL ENTERPRISES
SUNPOINTE, TENTATIVE TRACT 17433
LAGUNA NIGUEL, CALIFORNIA

STONEY-MILLER CONSULTANTS, INC.

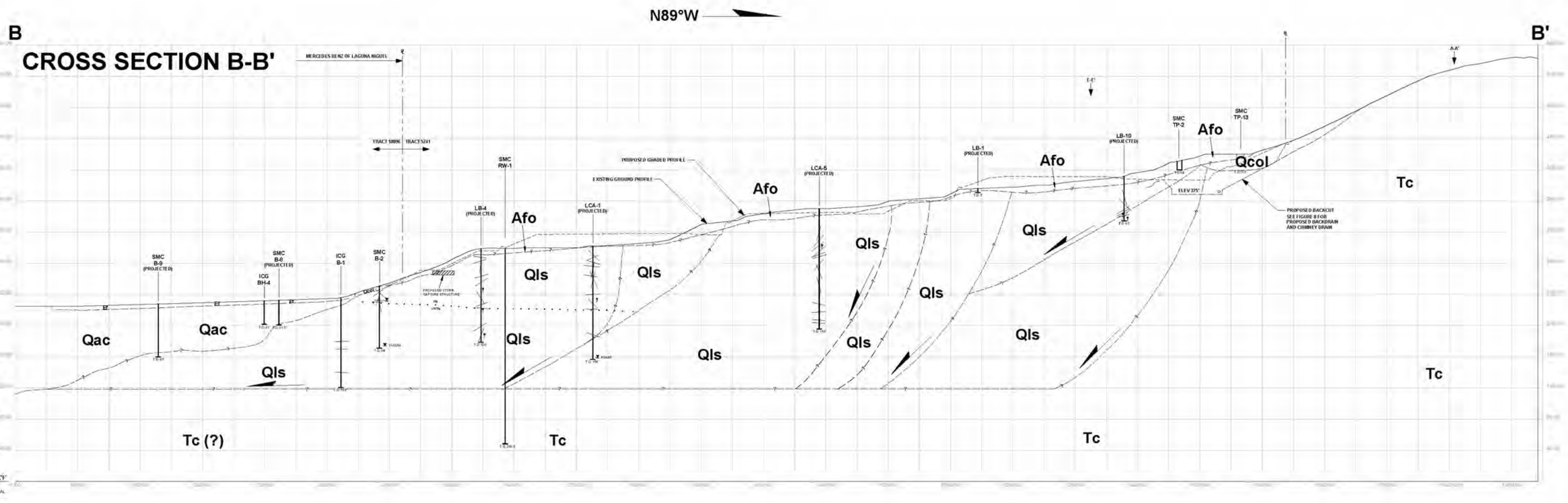
JOB NO.	REPORT NO.	DATE	FIGURE
0862-06	14-13813R	FEBRUARY 2015	3R

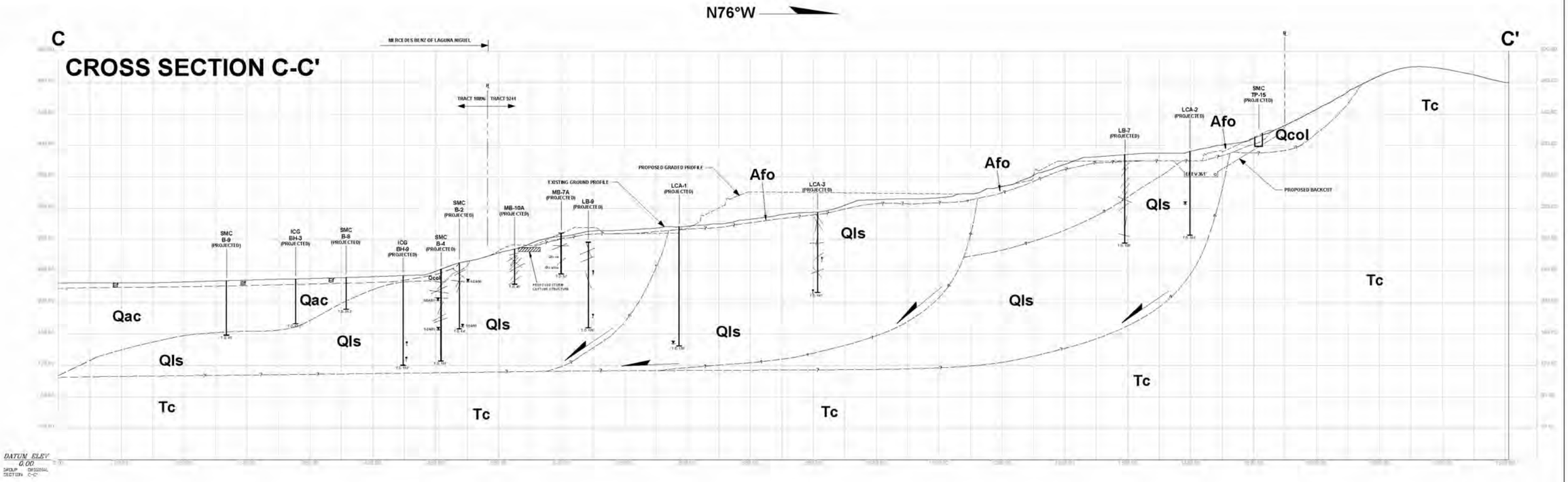
CROSS SECTION A-A'

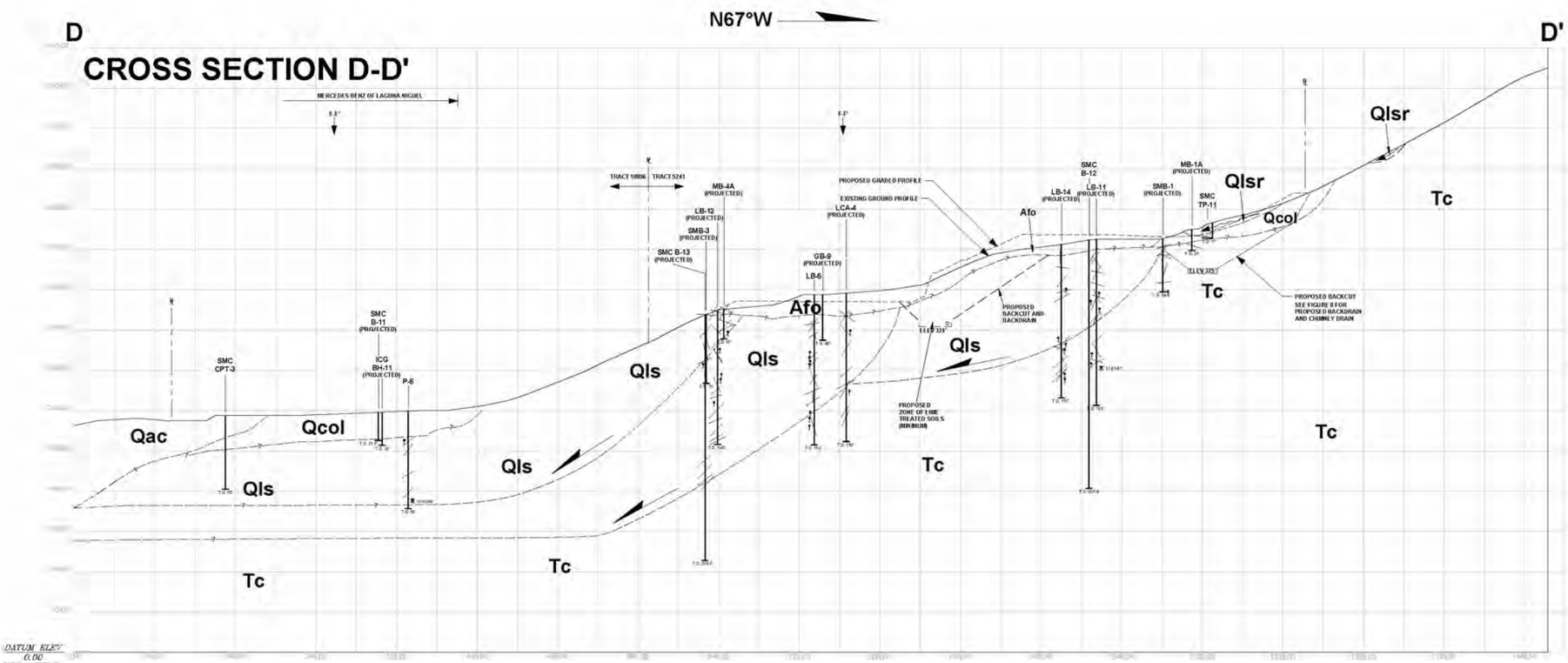


FINAL DESIGN OF THE SITE GRADING AND OTHER STABILIZATION MEASURES, INCLUDING DRAINAGE, BUTTRESS AND STABILIZATION KEYS, CONCRETE PIERS, AND VERDURA-TYPE WALLS WILL BE REQUIRED AS PLANS FOR ROUGH GRADING, PRECISE GRADING, WALL AND FOUNDATION PLANS ARE DEVELOPED.

CROSS SECTION B-B'







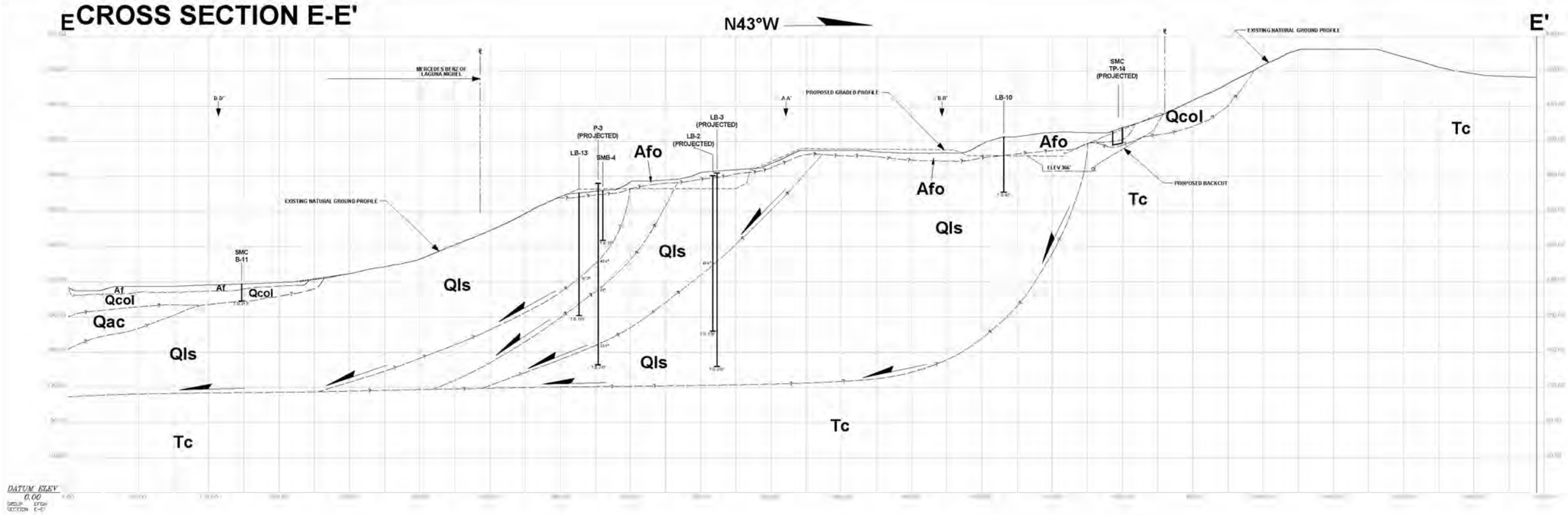
FINAL DESIGN OF THE SITE GRADING AND OTHER STABILIZATION MEASURES, INCLUDING DRAINAGE, BUTTRESS AND STABILIZATION KEYS, CONCRETE PIERS, AND VERDURA-TYPE WALLS WILL BE REQUIRED AS PLANS FOR ROUGH GRADING, PRECISE GRADING, WALL AND FOUNDATION PLANS ARE DEVELOPED.

GEOTECHNICAL CROSS SECTIONS C-C' & D-D'
EULAND CAPITAL ENTERPRISES
SUNPOINTE, TENTATIVE TRACT 17433
LAGUNA NIGUEL, CALIFORNIA

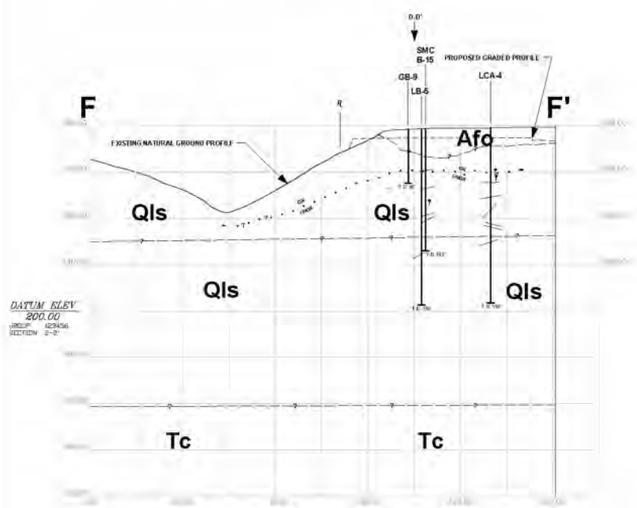
STONEY-MILLER CONSULTANTS, INC.

JOB NO.	REPORT NO.	DATE	PLATE
0988-05	NUMBER	FEBRUARY 2015	4B

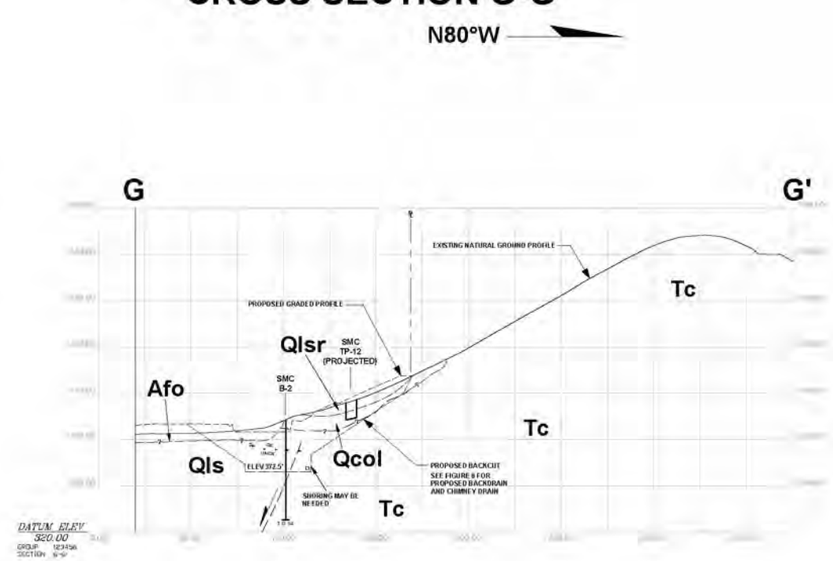
CROSS SECTION E-E'



CROSS SECTION F-F'



CROSS SECTION G-G'



FINAL DESIGN OF THE SITE GRADING AND OTHER STABILIZATION MEASURES, INCLUDING DRAINAGE, BUTTRESS AND STABILIZATION KEYS, CONCRETE PIERS, AND VERDURA-TYPE WALLS WILL BE REQUIRED AS PLANS FOR ROUGH GRADING, PRECISE GRADING, WALL AND FOUNDATION PLANS ARE DEVELOPED.

GEOTECHNICAL CROSS SECTIONS
E-E', F-F', & G-G'
EULAND CAPITAL ENTERPRISES
SUNPOINTE, TENTATIVE TRACT 17433
LAGUNA NIGUEL, CALIFORNIA

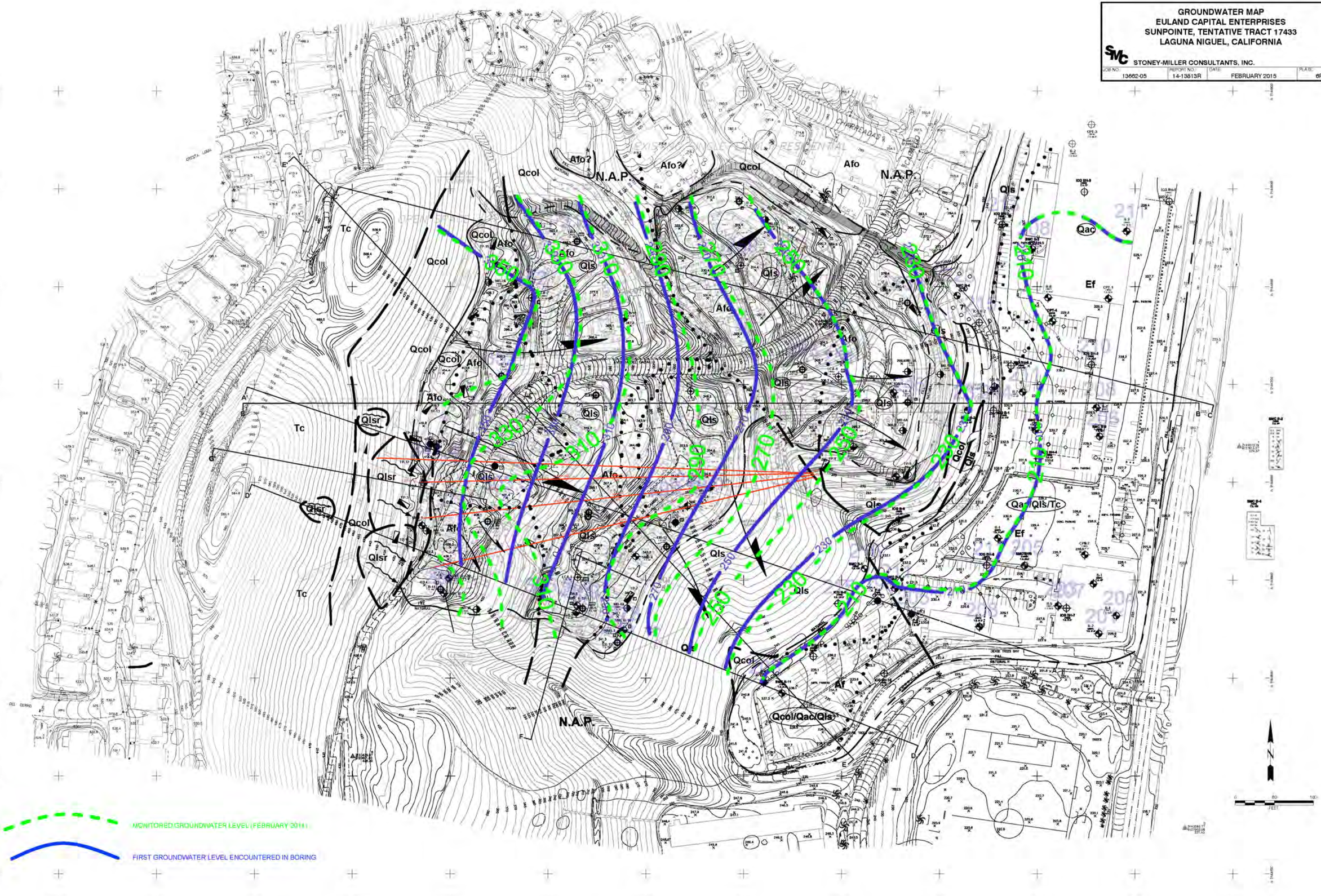
SMC STONEY-MILLER CONSULTANTS, INC.

DATE	REPORT NO.		FOR
130912-05	14-138 GR	FEBRUARY 2015	G2

GROUNDWATER MAP
EULAND CAPITAL ENTERPRISES
SUNPOINTE, TENTATIVE TRACT 17433
LAGUNA NIGUEL, CALIFORNIA

STONEY-MILLER CONSULTANTS, INC.

JOB NO.	REPORT NO.	DATE	PLATE
13662-05	14-13813R	FEBRUARY 2015	6R



STONEY-MILLER CONSULTANTS, INC

GEOTECHNICAL ENGINEERING & ENGINEERING GEOLOGY

FEASIBILITY INVESTIGATION/REVIEW OF 50-SCALE MAP
SUNPOINTE, TENTATIVE TRACT 17433
COLINAS SUR, LAGUNA NIGUEL, CALIFORNIA

VOLUME 2 OF 3
Appendix E, Slope Stability Analyses

For

Euland Capital Enterprises
59 Honeyflower
Irvine, California 92620-3327

By

Stoney-Miller Consultants, Inc.
14 Hughes, Suite B-101
Irvine, California 92618

October 9, 2014
(Revised February 17, 2015)

Project No: 13662-05
Report No: 14-13813R

APPENDIX E

SLOPE STABILITY ANALYSIS

APPENDIX E

SLOPE STABILITY ANALYSIS

GENERAL

Engineering stability analyses were performed during this feasibility investigation to assess the minimum Factors of Safety (FS) against future gross movement of slopes with the revised 50-scale Site Study Layout Plan profiles (Hunsaker & Associates, plot dated January 8, 2015).

The "GSTABL" slope stability program (developed by Garry H. Gregory) in conjunction with the "STEDwin" editor program (developed by Harald W. Van Aller, P.E.) were utilized for the stability analyses of the slopes. The computer program utilizes the limit equilibrium theory for the calculation of the minimum Factor of Safety (FS).

SLOPE STABILITY DESIGN

On-site material shear strength parameters for the analyses were determined from laboratory shear strength tests done by our office and by prior consultants during previous investigations (see list of references), as well as local experience in similar soils and engineering judgment. The on-site material shear strength parameters utilized in our stability analyses are presented in Table E-1. These values are considered reasonable and representative of the on-site materials.

ANALYSES

Slope stability analyses for static and pseudostatic conditions were performed for the design slope profiles. Searches were performed to determine the minimum calculated factors of safety for the critical sections using block and circular modes. The following analyses were performed:

- Analyses of landslides using Cross Sections A-A' through E-E'. Searches were made for potential surfaces throughout the landslide mass as well as within the bedrock material beyond the slide. For potential backscarps, we conservatively used lower shear strengths than for block landslide materials and similar to that of alluvium, while using the shear values listed for Oxidized and Unoxidized zones of the landslide mass for the passive portion of the surfaces.
- Analyses for the natural slope to the south side of the property using Cross section F-F'. We recommend that reinforced concrete piers with a minimum diameter of 2.5 feet and minimum depth of 35 feet, at 10 feet on center be constructed along the south side. The approximate locations of the proposed piers are shown on the Geotechnical Map, Plate 2R. It is recommended that the tops of the piers be placed at least one foot above the base elevation of the Verdura walls where planned along the south side of the site.
- Analyses of the natural slope to the west side of the property using Cross Section G-G' for static, pseudostatic and temporary conditions.
- Analyses for a 26-foot high Verdura wall proposed at the toe of slope. Our analyses indicated that as a minimum the following layers of geogrid will be needed:

1. 14 lower geogrids 26' long, Mirafi 20XT
2. 5 upper geogrids 26' long, Mirafi 8XT.
3. Select lime-treated fill with cohesion of 12,000 psf, minimum.

In addition, a fill shear key (minimum 24 feet wide and deep) consisting of lime-treated onsite soil is required to achieve stability. The approximated extent of the key and lime-treated zone is shown on Cross Section D-D'. The internal stability of the wall should be verified by the wall designer.

- Surficial stability analysis for engineered slope at 2:1 (horizontal:vertical) slope ratio.

The required Factors of Safety were achieved for the cross sections evaluated for the static condition and with the inclusion of the recommended remedial grading, reinforced concrete piers, geogrids, lime-treated fill, as specified. The approximate locations of the proposed keys, concrete piers, Verdura geogrid walls, and lime-treated zone are shown on the Cross Sections 1 through 16 (Figures 4R through 7R), Cross Section A-A' to G-G' (Plate 3R through 5R) and on the Geotechnical Map, Plate 2R. The approximate locations of proposed geogrids for the highest Verdura wall evaluated are shown on Figures E-13.1 and E-13.2. Once grading plans are finalized for the project, all slopes will require final evaluation to determine the specific remedial grading needed to achieve mandatory factors of safety.

When the required factors of safety were not achieved for pseudo-static analyses, slope and ground deformations for seismic loading condition were estimated using the procedure by Rathje and Antonakos (2011). This model uses empirical predictive models for the sliding displacement of rigid slopes, one considering the Peak Ground Acceleration and Magnitude (PGA,M), and the other using the peak ground acceleration and Peak Ground Velocity (PGA,PGV). Rathje and Antonakos recommend use of the PGA,PGV model for deformation estimates due to significant frequency content information provided for the evaluation.

When factors of safety were at or below 1.1, pseudo-static stability analyses were made to determine the yield acceleration (ky) for the various cross sections and surfaces analyzed under static conditions. Consistent with References 10' and 14', the seismicity for slope deformation analyses is characterized by a 475-year return period; a seismic event of magnitude 6.95 with a peak acceleration of 0.2763g. The estimated displacements are provided in Table E-2 for the specific sections analyzed for this study. The results indicate slope deformations ranging from 0.13 to 1.16 inches when using the PGV-model and 0.30 to 2.69 inches with the M-model.

The analyses were performed with the inclusion of such structural elements and remedial grading as was considered necessary, such as buttress fills (site soils or lime-treated soils), soil removals, geogrid, and reinforced concrete piers.

The Factor of Safety (FS) criteria adopted to assess the stability of the landslides and slopes that were analyzed are as follows:

Static Conditions	-	FS≥1.5
Pseudostatic	-	FS≥1.1
Temporary Conditions (Construction)	-	FS≥1.25
Surficial Stability	-	FS≥1.5

Designs should be reviewed during rough and precise grading plan development and should be revised as appropriate; similarly designs should be reviewed for the observed actual site conditions observed in the field and modified as needed. Any revisions to the revised 50-scale Site Study Layout Plan profiles (Hunsaker & Associates, plot dated January 8, 2015) should be reviewed by the Project Geotechnical Consultant and may require additional analyses and revisions to the recommendations presented herein.

TABLE E-1

SUMMARY OF STRENGTH PARAMETERS

Material Type	Bulk Density γ_m (pcf)	Bulk Density γ_s (pcf)	Static Condition		Pseudostatic Condition	
			Cohesion c (psf)	Friction Angle ϕ (deg)	Cohesion c (psf)	Friction Angle ϕ (deg)
Engineered Fill	119	125	300	26	450	28
Rupture Surface	119	125	250	12.5	375	14.5
Capistrano Bedrock – Across Bedding	119	125	750	29	1125	31
Capistrano Bedrock/ Landslide Block – Along Bedding	---	---	300	15	450	17
Landslide Block (Oxidized zone)	119	125	350	23	525	25
Landslide Block (Unoxidized zone)	119	125	500	29	750	31
Alluvium/Colluvium	119	125	300	20	450	22
Lime-treated Fill (for geogrids and specific buttresses)	119	125	12,000	0	12,000	0

TABLE E-2: EULAND - SUMMARY OF STABILITY ANALYSES

Section	Static FOS	Seismic FOS 0.15 g	H_{ave}, ft	k_y, g	Displacement in 10% in 50 Yrs PGA 0.2763 g; M 6.95 Rathje and Antonakos (2011) (Vel)	(M)	Figure No	File Name	Comments
A-A'	1.5	0.9	195	0.1295	0.52	1.16	E-1.1, 1.2	a-33b1-15, a-33b1s-15	Deep Qls. Block mode.
A-A'	1.7	1.1	155				E-2.1, 2.2	a-33b2-15, a-33b2s-15	Deep Qls. Block mode.
A-A'	1.5	0.9	128	0.1202	1.16	2.69	E-3.1, 3.2	a-33b3-15, a-33b3-15s	Shallow Qls. Block mode.
B-B'	1.6	0.9	195	0.1333	0.45	1.00	E-4.1, 4.2	b-35-15, b-35-15s	Deep Qls. Block mode.
B-B'	1.6	0.9	160	0.1259	0.80	1.81	E-5.1, 5.2	b-35a-15, b-35a-15s	Block mode along a band/zone above rupture surface shown on cross section.
B-B'	1.7	1.0	146	0.1574	0.33	0.74	E-6.1, 6.2	b-35b-15, b-35b-15s	Block mode along a band/zone above rupture surface shown on cross section.
C-C'	1.8	1.1					E-7.1, 7.2	c-100-15, c-100-15s	Deep Qls. Block mode.
C-C'	1.8	1.2					E-8.1, 8.2	c-99-15, c-99-15s	Deep Qls. Block mode.
C-C'	1.7	1.0	170	0.1583	0.22	0.50	E-9.1, 9.2	c-101-15, c-101-15s	Block mode along a band/zone above rupture surface shown on cross section.
C-C'	1.8	1.1					E-10.1, 10.2	c-102-15, c-102-15s	Block mode along a band/zone above rupture surface shown on cross section.
D-D'	1.5	1.0	195	0.1588	0.13	0.30	E-11.1, 11.2	d-7ac3-15, d-7ac3s-15	Deep Qls. Block mode.
D-D'	1.7	1.4					E-12.1, 12.2	d-9-15, d-9s-15	Shallower Qls at the back of larger one. Block mode
D-D'	1.5	1.4					E-13.1, 13.2	d-ver3-15s, d-ver3s-15	26' high Verdura Wall mid slope. Circular mode. Recommend a buttress key with lime treated soils as shown on section D-D': 19 geogrids 26 long, Mirafi 8XT (5 upper ones) & Mirafi 20XT (14 lowers ones) for wall internal stability to be verified by wall designer.

TABLE E-2: EULAND - SUMMARY OF STABILITY ANALYSES (CONT.)

Section	Static FOS	Seismic FOS 0.15 g	H_{ave}, ft	k_y, g	Displacement in 10% in 50 Yrs PGA 0.2763 g; M 6.95 Rathje and Antonakos (2011) (Vel)	(M)	Figure No	File Name	Comments
E-E'	1.6	1.0	170	0.1641	0.17	0.38	E-15.1, 15.2	e-b1-15, e--b1-15s	Block mode along a band/zone above rupture surface shown on cross section.
E-E'	1.7	1.0	185	0.1579	0.17	0.39	E-16.1, 16.2	e-a1-15, e-a1-15s	Block mode along a band/zone above rupture surface shown on cross section.
F-F'	1.5	1.4					E-17.1, 17.2	f-5-15, f-15s	Natural slope - south side. Circular mode. Piers 35'L @ 10' o.c., 2.5' diameter below wall. Surfaces exiting at toe.
G-G'	1.6	1.3					E-18.1, 18.2	g-1-15, g-1s-15	Natural Slope - west side. Circular mode. Surfaces exiting at toe. Key at 372.5'
G-G'	1.7	1.4					E-19.1, 19.2	g-1a-15, g-1as-15	Natural Slope - west side. Circular mode. Surfaces exiting at toe. Key at 372.5'
G-G'	1.3	---					E-20	g-3-15	Natural Slope - west side. Circular mode. Temporary condition during key construction. Key at 372.5'. Analysis done with a shoring system providing at least 5 kips/ft minimum.
G-G'	1.4	---					E-21	g-6-15	Natural Slope - west side. Circular mode. Temporary condition during key construction. Key at 372.5'.
NA	2.0	---					E-22		Surficial stability for engineered slope at 2:1 (h:v) slope ratio.

13662-00, Section A-A',- -Static, deep .Qls, 2015 design

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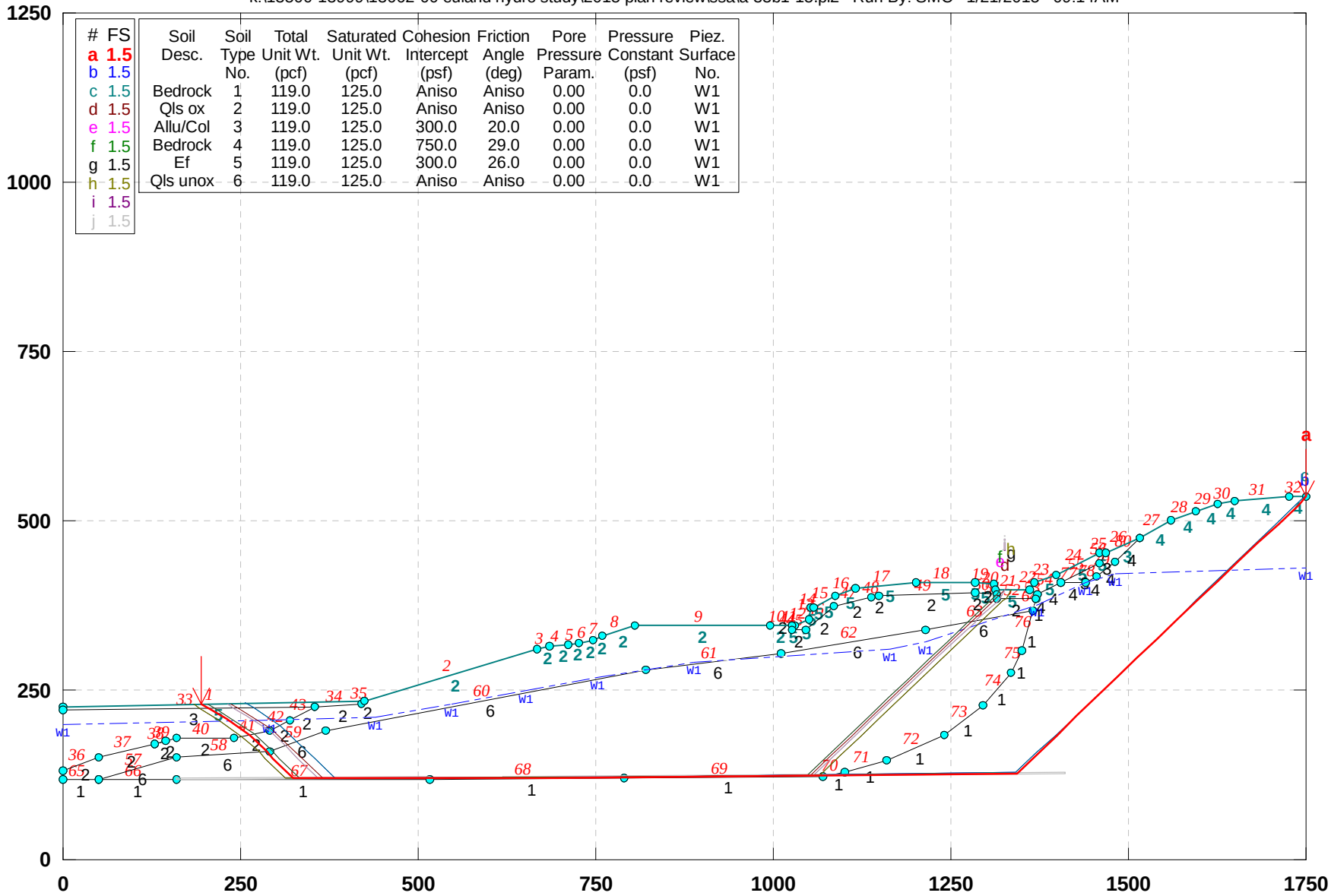

#	FS
a	1.5
b	1.5
c	1.5
d	1.5
e	1.5
f	1.5
g	1.5
h	1.5
i	1.5
j	1.5

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.
Bedrock	1	119.0	125.0	Aniso	Aniso	0.00	0.0	W1
Qls ox	2	119.0	125.0	Aniso	Aniso	0.00	0.0	W1
Allu/Col	3	119.0	125.0	300.0	20.0	0.00	0.0	W1
Bedrock	4	119.0	125.0	750.0	29.0	0.00	0.0	W1
Ef	5	119.0	125.0	300.0	26.0	0.00	0.0	W1
Qls unox	6	119.0	125.0	Aniso	Aniso	0.00	0.0	W1

GSTABL7 v.2 FSmin=1.5

Safety Factors Are Calculated By The Simplified Janbu Method for the case of c & phi both > 0

Figure E-1.1

13662-00, Section A-A',- -Static, deep .Qls, 2015 design

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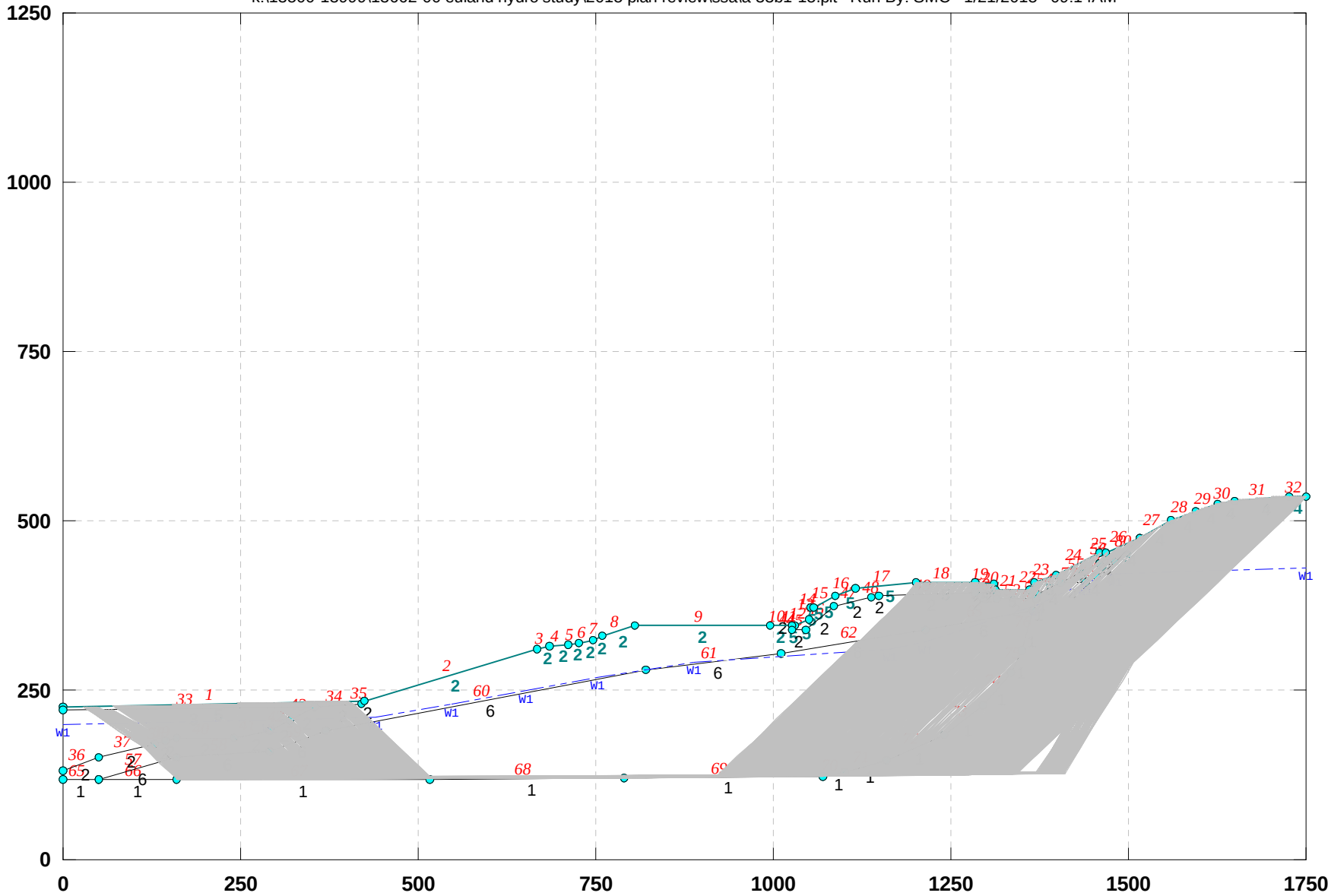

***** GSTABL7 *****

** GSTABL7 by Garry H. Gregory, P.E. **

** Original Version 1.0, January 1996; Current Version 2.005, Sept. 2006 **

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SLOPE STABILITY ANALYSIS SYSTEM

Modified Bishop, Simplified Janbu, or GLE Method of Slices.
(Includes Spencer & Morgenstern-Price Type Analysis)
Including Pier/Pile, Reinforcement, Soil Nail, Tieback,
Nonlinear Undrained Shear Strength, Curved Phi Envelope,
Anisotropic Soil, Fiber-Reinforced Soil, Boundary Loads, Water
Surfaces, Pseudo-Static & Newmark Earthquake, and Applied Forces.

****

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PROBLEM DESCRIPTION: 13662-00, Section A-A',-
-Static, deep .Qls, 2015 design

BOUNDARY COORDINATES
32 Top Boundaries
80 Total Boundaries

Boundary No.	X-Left (ft)	Y-Left (ft)	X-Right (ft)	Y-Right (ft)	Soil Type Below Bnd
1	0.00	225.00	425.00	235.00	5
2	425.00	235.00	667.00	310.00	2
3	667.00	310.00	685.00	314.00	2
4	685.00	314.00	710.00	317.00	2
5	710.00	317.00	727.00	320.00	2
6	727.00	320.00	745.00	324.00	2
7	745.00	324.00	758.00	330.00	2
8	758.00	330.00	805.00	346.00	2
9	805.00	346.00	995.00	346.00	2
10	995.00	346.00	1025.00	346.00	2
11	1025.00	346.00	1030.00	346.00	5
12	1030.00	346.00	1050.00	355.00	5
13	1050.00	355.00	1053.00	372.00	5
14	1053.00	372.00	1056.00	372.00	5
15	1056.00	372.00	1088.00	390.00	5
16	1088.00	390.00	1116.00	400.00	5
17	1116.00	400.00	1200.00	410.00	5
18	1200.00	410.00	1285.00	410.00	5
19	1285.00	410.00	1310.00	406.00	5
20	1310.00	406.00	1313.00	398.00	5
21	1313.00	398.00	1360.00	398.00	5
22	1360.00	398.00	1367.00	408.00	5
23	1367.00	408.00	1397.00	420.00	5
24	1397.00	420.00	1458.00	452.00	5
25	1458.00	452.00	1467.00	452.00	5
26	1467.00	452.00	1515.00	475.00	3
27	1515.00	475.00	1560.00	500.00	4
28	1560.00	500.00	1595.00	515.00	4
29	1595.00	515.00	1625.00	525.00	4
30	1625.00	525.00	1650.00	530.00	4
31	1650.00	530.00	1725.00	537.00	4
32	1725.00	537.00	1750.00	535.00	4
33	0.00	220.00	354.00	226.00	3
34	354.00	226.00	420.00	230.00	2
35	420.00	230.00	425.00	235.00	2
36	0.00	132.00	50.00	150.00	2
37	50.00	150.00	130.00	170.00	2
38	130.00	170.00	145.00	175.00	2
39	130.00	170.00	160.00	180.00	2
40	160.00	180.00	240.00	180.00	2

41	240.00	180.00	290.00	190.00	2
42	290.00	190.00	320.00	205.00	2
43	320.00	205.00	354.00	226.00	2
44	1025.00	346.00	1026.00	340.00	2
45	1026.00	340.00	1045.00	340.00	2
46	1045.00	340.00	1086.00	373.00	2
47	1086.00	373.00	1138.00	388.00	2
48	1138.00	388.00	1148.00	390.00	2
49	1148.00	390.00	1284.00	394.00	2
50	1284.00	394.00	1314.00	391.00	2
51	1314.00	391.00	1315.00	386.00	2
52	1315.00	386.00	1370.00	386.00	2
53	1370.00	386.00	1371.00	391.00	4
54	1371.00	391.00	1405.00	408.00	4
55	1405.00	408.00	1460.00	438.00	3
56	1460.00	438.00	1467.00	452.00	3
57	50.00	118.00	160.00	150.00	6
58	160.00	150.00	290.00	160.00	6
59	290.00	160.00	370.00	190.00	6
60	370.00	190.00	820.00	280.00	6
61	820.00	280.00	1010.00	305.00	6
62	1010.00	305.00	1215.00	340.00	6
63	1215.00	340.00	1364.00	368.00	6
64	1364.00	368.00	1370.00	386.00	1
65	0.00	118.00	50.00	118.00	1
66	50.00	118.00	160.00	118.00	1
67	160.00	118.00	517.00	119.00	1
68	517.00	119.00	790.00	120.00	1
69	790.00	120.00	1070.00	123.00	1
70	1070.00	123.00	1100.00	128.00	1
71	1100.00	128.00	1160.00	146.00	1
72	1160.00	146.00	1240.00	183.00	1
73	1240.00	183.00	1295.00	228.00	1
74	1295.00	228.00	1335.00	276.00	1
75	1335.00	276.00	1350.00	308.00	1
76	1350.00	308.00	1364.00	368.00	1
77	1405.00	408.00	1440.00	410.00	4
78	1440.00	410.00	1455.00	418.00	4
79	1455.00	418.00	1480.00	440.00	4
80	1480.00	440.00	1515.00	475.00	4

Default Y-Origin = 0.00(ft)
Default X-Plus Value = 0.00(ft)
Default Y-Plus Value = 0.00(ft)

ISOTROPIC SOIL PARAMETERS
6 Type(s) of Soil

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.
1	119.0	125.0	0.0	0.0	0.00	0.0	1
2	119.0	125.0	0.0	0.0	0.00	0.0	1
3	119.0	125.0	300.0	20.0	0.00	0.0	1
4	119.0	125.0	750.0	29.0	0.00	0.0	1
5	119.0	125.0	300.0	26.0	0.00	0.0	1
6	119.0	125.0	0.0	0.0	0.00	0.0	1

ANISOTROPIC STRENGTH PARAMETERS
3 soil type(s)

Soil Type 1 Is Anisotropic
Number Of Direction Ranges Specified = 3

Direction Range No.	Counterclockwise Direction Limit (deg)	Cohesion Intercept (psf)	Friction Angle (deg)
1	0.0	750.00	29.00
2	5.0	300.00	15.00
3	90.0	750.00	29.00

Soil Type 2 Is Anisotropic
Number Of Direction Ranges Specified = 3

Direction Range No.	Counterclockwise Direction Limit (deg)	Cohesion Intercept (psf)	Friction Angle (deg)
1	-10.0	350.00	23.00

2	5.0	250.00	12.50
3	90.0	300.00	20.00

Soil Type 6 Is Anisotropic
Number Of Direction Ranges Specified = 3

Direction Range No.	Counterclockwise Direction Limit (deg)	Cohesion Intercept (psf)	Friction Angle (deg)
1	-10.0	500.00	29.00
2	5.0	250.00	12.50
3	90.0	300.00	20.00

ANISOTROPIC SOIL NOTES:
(1) An input value of 0.01 for C and/or Phi will cause Aniso C and/or Phi to be ignored in that range.
(2) An input value of 0.02 for Phi will set both Phi and C equal to zero, with no water weight in the tension crack.
(3) An input value of 0.03 for Phi will set both Phi and C equal to zero, with water weight in the tension crack.

1 PIEZOMETRIC SURFACE(S) SPECIFIED
Unit Weight of Water = 62.40 (pcf)
Piezometric Surface No. 1 Specified by 13 Coordinate Points
Pore Pressure Inclination Factor = 0.50

Point No.	X-Water (ft)	Y-Water (ft)
1	0.00	200.00
2	292.00	205.00
3	440.00	210.00
4	546.00	230.00
5	652.00	250.00
6	752.00	270.00
7	888.00	290.00
8	1164.00	310.00
9	1215.00	321.00
10	1371.00	376.00
11	1440.00	410.00
12	1480.00	422.00
13	1750.00	430.00

Janbus Empirical Coef is being used for the case of c & phi both > 0
A Critical Failure Surface Searching Method, Using A Random Technique For Generating Sliding Block Surfaces, Has Been Specified.
The Active And Passive Portions Of The Sliding Surfaces Are Generated According To The Rankine Theory.
3000 Trial Surfaces Have Been Generated.
3 Boxes Specified For Generation Of Central Block Base
Length Of Line Segments For Active And Passive Portions Of Sliding Block Is 40.0

Box No.	X-Left (ft)	Y-Left (ft)	X-Right (ft)	Y-Right (ft)	Height (ft)
1	160.00	120.00	517.00	121.00	2.00
2	620.00	121.00	920.00	123.00	2.00
3	920.10	123.00	1410.00	128.00	2.00

Following Are Displayed The Ten Most Critical Of The Trial Failure Surfaces Evaluated. They Are Ordered - Most Critical First.
* * Safety Factors Are Calculated By The Simplified Janbu Method * *
Total Number of Trial Surfaces Attempted = 3000
Number of Trial Surfaces With Valid FS = 3000
Statistical Data On All Valid FS Values:
FS Max = 1.772 FS Min = 1.473 FS Ave = 1.375
Standard Deviation = 0.193 Coefficient of Variation = 14.06 %
Failure Surface Specified By 24 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	195.646	229.603
2	205.443	223.482
3	228.656	207.228
4	261.423	184.285
5	286.014	159.693
6	296.161	149.546
7	324.446	121.261

8	694.762	121.021
9	1342.394	127.734
10	1370.678	156.018
11	1398.962	184.302
12	1427.246	212.587
13	1455.531	240.871
14	1483.815	269.155
15	1512.099	297.439
16	1540.384	325.724
17	1568.668	354.008
18	1596.952	382.292
19	1625.237	410.576
20	1653.521	438.861
21	1681.805	467.145
22	1710.089	495.429
23	1738.374	523.714
24	1749.685	535.025

Factor of Safety
*** 1.473 ***

Individual data on the 98 slices

Slice No.	Width (ft)	Weight (lbs)	Water Force Top (lbs)	Water Force Bot (lbs)	Tie Force Norm (lbs)	Tie Force Tan (lbs)	Earthquake Force Hor (lbs)	Earthquake Force Ver (lbs)	Surcharge Load (lbs)
1	9.8	3702.4	0.0	0.0	0.	0.	0.0	0.0	0.0
2	23.2	40752.3	0.0	0.0	0.	0.	0.0	0.0	0.0
3	4.6	13639.8	0.0	0.0	0.	0.	0.0	0.0	0.0
4	28.1	124573.3	0.0	21645.2	0.	0.	0.0	0.0	0.0
5	24.6	178799.5	0.0	70947.3	0.	0.	0.0	0.0	0.0
6	4.0	36269.4	0.0	16612.7	0.	0.	0.0	0.0	0.0
7	2.0	18962.5	0.0	8872.1	0.	0.	0.0	0.0	0.0
8	4.2	41096.1	0.0	19615.4	0.	0.	0.0	0.0	0.0
9	23.8	278132.9	0.0	*******	0.	0.	0.0	0.0	0.0
10	1.6	21542.6	0.0	11585.1	0.	0.	0.0	0.0	0.0
11	2.8	38375.0	0.0	20777.5	0.	0.	0.0	0.0	0.0
12	29.6	408074.7	0.0	*******	0.	0.	0.0	0.0	0.0
13	16.0	222046.1	0.0	85941.2	0.	0.	0.0	0.0	0.0
14	50.0	698982.4	0.0	*******	0.	0.	0.0	0.0	0.0
15	5.0	70322.3	0.0	27506.2	0.	0.	0.0	0.0	0.0
16	15.0	215263.4	0.0	82840.8	0.	0.	0.0	0.0	0.0
17	106.0	1763700.1	0.0	*******	0.	0.	0.0	0.0	0.0
18	106.0	2191498.8	0.0	*******	0.	0.	0.0	0.0	0.0
19	15.0	344653.4	0.0	*******	0.	0.	0.0	0.0	0.0
20	18.0	423220.5	0.0	*******	0.	0.	0.0	0.0	0.0
21	9.8	232699.9	0.0	81580.7	0.	0.	0.0	0.0	0.0
22	15.2	366035.3	0.0	*******	0.	0.	0.0	0.0	0.0
23	17.0	413211.5	0.0	*******	0.	0.	0.0	0.0	0.0
24	18.0	444978.1	0.0	*******	0.	0.	0.0	0.0	0.0
25	7.0	176048.4	0.0	63287.6	0.	0.	0.0	0.0	0.0
26	6.0	153076.7	0.0	55122.6	0.	0.	0.0	0.0	0.0
27	47.0	1251063.5	0.0	*******	0.	0.	0.0	0.0	0.0
28	15.0	413359.3	0.0	*******	0.	0.	0.0	0.0	0.0
29	68.0	1872704.8	0.0	*******	0.	0.	0.0	0.0	0.0
30	17.8	490136.0	0.0	*******	0.	0.	0.0	0.0	0.0
31	89.2	2451005.8	0.0	*******	0.	0.	0.0	0.0	0.0
32	15.0	411521.0	0.0	*******	0.	0.	0.0	0.0	0.0
33	15.0	411327.1	0.0	*******	0.	0.	0.0	0.0	0.0
34	1.0	27414.9	0.0	10924.1	0.	0.	0.0	0.0	0.0
35	4.0	109651.0	0.0	43735.1	0.	0.	0.0	0.0	0.0
36	15.0	417092.9	0.0	*******	0.	0.	0.0	0.0	0.0
37	5.0	141665.4	0.0	55045.7	0.	0.	0.0	0.0	0.0
38	3.0	88425.0	0.0	33073.8	0.	0.	0.0	0.0	0.0
39	3.0	91451.8	0.0	33108.6	0.	0.	0.0	0.0	0.0
40	26.2	822017.8	0.0	*******	0.	0.	0.0	0.0	0.0
41	3.8	122195.1	0.0	42132.0	0.	0.	0.0	0.0	0.0
42	2.0	65061.9	0.0	22323.6	0.	0.	0.0	0.0	0.0
43	12.0	394162.5	0.0	*******	0.	0.	0.0	0.0	0.0
44	16.0	534876.9	0.0	*******	0.	0.	0.0	0.0	0.0
45	22.0	746003.8	0.0	*******	0.	0.	0.0	0.0	0.0
46	10.0	341221.4	0.0	*******	0.	0.	0.0	0.0	0.0

47	12.0	411221.9	0.0	*******	0.	0.	0.0	0.0	0.0
48	4.0	137499.7	0.0	45806.7	0.	0.	0.0	0.0	0.0
49	36.0	1246836.8	0.0	*******	0.	0.	0.0	0.0	0.0
50	15.0	523329.2	0.0	*******	0.	0.	0.0	0.0	0.0
51	25.0	871465.9	0.0	*******	0.	0.	0.0	0.0	0.0
52	44.0	1534852.0	0.0	*******	0.	0.	0.0	0.0	0.0
53	1.0	34898.9	0.0	12873.7	0.	0.	0.0	0.0	0.0
54	10.0	348075.8	0.0	*******	0.	0.	0.0	0.0	0.0
55	15.0	518676.1	0.0	*******	0.	0.	0.0	0.0	0.0
56	3.0	101897.9	0.0	40255.2	0.	0.	0.0	0.0	0.0
57	1.0	33491.4	0.0	13458.7	0.	0.	0.0	0.0	0.0
58	1.0	33492.1	0.0	13478.9	0.	0.	0.0	0.0	0.0
59	15.4	515868.0	0.0	*******	0.	0.	0.0	0.0	0.0
60	4.6	154121.9	0.0	63691.6	0.	0.	0.0	0.0	0.0
61	7.4	247751.8	0.0	*******	0.	0.	0.0	0.0	0.0
62	7.6	251356.8	0.0	*******	0.	0.	0.0	0.0	0.0
63	10.0	319653.4	0.0	*******	0.	0.	0.0	0.0	0.0
64	4.0	125786.6	0.0	75194.1	0.	0.	0.0	0.0	0.0
65	2.1	66012.1	0.0	38938.0	0.	0.	0.0	0.0	0.0
66	0.9	28824.9	0.0	16890.9	0.	0.	0.0	0.0	0.0
67	3.0	94712.1	0.0	55343.1	0.	0.	0.0	0.0	0.0
68	0.7	21306.8	0.0	12437.6	0.	0.	0.0	0.0	0.0
69	0.3	10113.7	0.0	5902.1	0.	0.	0.0	0.0	0.0
70	26.0	789444.3	0.0	*******	0.	0.	0.0	0.0	0.0
71	2.0	57572.0	0.0	32181.3	0.	0.	0.0	0.0	0.0
72	6.0	175724.5	0.0	98051.0	0.	0.	0.0	0.0	0.0
73	22.2	628795.1	0.0	*******	0.	0.	0.0	0.0	0.0
74	12.8	347238.8	0.0	*******	0.	0.	0.0	0.0	0.0
75	15.0	396848.7	0.0	*******	0.	0.	0.0	0.0	0.0
76	0.5	13792.4	0.0	7812.2	0.	0.	0.0	0.0	0.0
77	2.5	63941.2	0.0	36125.0	0.	0.	0.0	0.0	0.0
78	2.0	51394.5	0.0	28995.4	0.	0.	0.0	0.0	0.0
79	7.0	176005.4	0.0	99618.2	0.	0.	0.0	0.0	0.0
80	13.0	315692.1	0.0	*******	0.	0.	0.0	0.0	0.0
81	3.8	90661.3	0.0	52096.3	0.	0.	0.0	0.0	0.0
82	28.3	641371.4	0.0	*******	0.	0.	0.0	0.0	0.0
83	2.9	62708.0	0.0	31753.3	0.	0.	0.0	0.0	0.0
84	25.4	527352.9	0.0	*******	0.	0.	0.0	0.0	0.0
85	19.6	381622.9	0.0	*******	0.	0.	0.0	0.0	0.0
86	8.7	160865.3	0.0	57210.1	0.	0.	0.0	0.0	0.0
87	26.3	454668.6	0.0	*******	0.	0.	0.0	0.0	0.0
88	2.0	31649.7	0.0	7597.8	0.	0.	0.0	0.0	0.0
89	28.0	418876.9	0.0	73144.5	0.	0.	0.0	0.0	0.0
90	0.2	3247.7	0.0	330.6	0.	0.	0.0	0.0	0.0
91	16.2	209035.7	0.0	11241.6	0.	0.	0.0	0.0	0.0
92	8.6	99867.4	0.0	0.0	0.	0.	0.0	0.0	0.0
93	3.5	38992.3	0.0	0.0	0.	0.	0.0	0.0	0.0
94	28.3	264708.2	0.0	0.0	0.	0.	0.0	0.0	0.0
95	28.3	178393.6	0.0	0.0	0.	0.	0.0	0.0	0.0
96	14.9	59298.4	0.0	0.0	0.	0.	0.0	0.0	0.0
97	13.4	30935.8	0.0	0.0	0.	0.	0.0	0.0	0.0
98	11.3	8222.4	0.0	0.0	0.	0.	0.0	0.0	0.0

Failure Surface Specified By 24 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	256.404	231.033
2	266.823	224.522
3	272.476	220.564
4	305.242	197.621
5	328.446	174.417
6	353.860	149.003
7	382.144	120.719
8	704.576	120.781
9	1341.198	128.252
10	1369.482	156.536
11	1397.766	184.820
12	1426.050	213.105
13	1454.335	241.389
14	1482.619	269.673
15	1510.903	297.957

16	1539.188	326.242
17	1567.472	354.526
18	1595.756	382.810
19	1624.041	411.094
20	1652.325	439.379
21	1680.609	467.663
22	1708.893	495.947
23	1737.178	524.232
24	1748.098	535.152

Factor of Safety
*** 1.475 ***

Failure Surface Specified By 24 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	256.404	231.033
2	266.823	224.522
3	272.476	220.564
4	305.242	197.621
5	328.446	174.417
6	353.860	149.003
7	382.144	120.719
8	704.576	120.781
9	1341.198	128.252
10	1369.482	156.536
11	1397.766	184.820
12	1426.050	213.105
13	1454.335	241.389
14	1482.619	269.673
15	1510.903	297.957
16	1539.188	326.242
17	1567.472	354.526
18	1595.756	382.810
19	1624.041	411.094
20	1652.325	439.379
21	1680.609	467.663
22	1708.893	495.947
23	1737.178	524.232
24	1748.098	535.152

Factor of Safety
*** 1.475 ***

Failure Surface Specified By 21 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	237.250	230.582
2	247.473	224.194
3	260.914	214.783
4	293.680	191.840
5	315.832	169.687
6	336.254	149.265
7	364.539	120.981
8	669.860	120.884
9	1052.951	125.106
10	1081.235	153.390
11	1109.519	181.674
12	1137.804	209.959
13	1166.088	238.243
14	1194.372	266.527
15	1222.656	294.811
16	1250.941	323.096
17	1279.225	351.380
18	1280.074	352.229
19	1308.358	380.513
20	1314.807	386.962
21	1325.845	398.000

Factor of Safety
*** 1.476 ***

Failure Surface Specified By 21 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	204.447	229.811

2	214.334	223.633
3	235.740	208.644
4	268.506	185.701
5	293.060	161.147
6	304.529	149.678
7	332.813	121.394
8	833.043	121.427
9	1047.688	124.585
10	1075.972	152.870
11	1104.257	181.154
12	1132.541	209.438
13	1160.825	237.722
14	1189.110	266.007
15	1217.394	294.291
16	1245.678	322.575
17	1273.963	350.859
18	1274.234	351.131
19	1302.519	379.416
20	1314.017	390.914
21	1318.445	398.000

Factor of Safety
*** 1.476 ***

Failure Surface Specified By 21 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	204.447	229.811
2	214.334	223.633
3	235.740	208.644
4	268.506	185.701
5	293.060	161.147
6	304.529	149.678
7	332.813	121.394
8	833.043	121.427
9	1047.688	124.585
10	1075.972	152.870
11	1104.257	181.154
12	1132.541	209.438
13	1160.825	237.722
14	1189.110	266.007
15	1217.394	294.291
16	1245.678	322.575
17	1273.963	350.859
18	1274.234	351.131
19	1302.519	379.416
20	1314.017	390.914
21	1318.445	398.000

Factor of Safety
*** 1.476 ***

Failure Surface Specified By 21 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	183.351	229.314
2	193.021	223.272
3	218.761	205.248
4	251.527	182.305
5	274.987	158.845
6	284.308	149.524
7	312.592	121.240
8	623.864	120.279
9	1065.868	125.111
10	1094.152	153.395
11	1122.437	181.679
12	1150.721	209.963
13	1179.005	238.248
14	1207.289	266.532
15	1235.574	294.816
16	1263.858	323.101
17	1292.142	351.385
18	1295.974	355.217
19	1324.258	383.501

20	1326.758	386.000
21	1334.256	398.000

Factor of Safety
*** 1.478 ***

Failure Surface Specified By 21 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	183.351	229.314
2	193.021	223.272
3	218.761	205.248
4	251.527	182.305
5	274.987	158.845
6	284.308	149.524
7	312.592	121.240
8	623.864	120.279
9	1065.868	125.111
10	1094.152	153.395
11	1122.437	181.679
12	1150.721	209.963
13	1179.005	238.248
14	1207.289	266.532
15	1235.574	294.816
16	1263.858	323.101
17	1292.142	351.385
18	1295.974	355.217
19	1324.258	383.501
20	1326.758	386.000
21	1334.256	398.000

Factor of Safety
*** 1.478 ***

Failure Surface Specified By 21 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	231.077	230.437
2	241.237	224.089
3	257.172	212.931
4	289.938	189.988
5	311.764	168.162
6	331.199	148.727
7	359.483	120.442
8	692.565	120.597
9	1057.496	124.737
10	1085.780	153.021
11	1114.064	181.306
12	1142.349	209.590
13	1170.633	237.874
14	1198.917	266.158
15	1227.201	294.443
16	1255.486	322.727
17	1283.770	351.011
18	1286.124	353.366
19	1314.409	381.650
20	1318.759	386.000
21	1326.257	398.000

Factor of Safety
*** 1.478 ***

Failure Surface Specified By 21 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	231.077	230.437
2	241.237	224.089
3	257.172	212.931
4	289.938	189.988
5	311.764	168.162
6	331.199	148.727
7	359.483	120.442
8	692.565	120.597
9	1057.496	124.737
10	1085.780	153.021
11	1114.064	181.306

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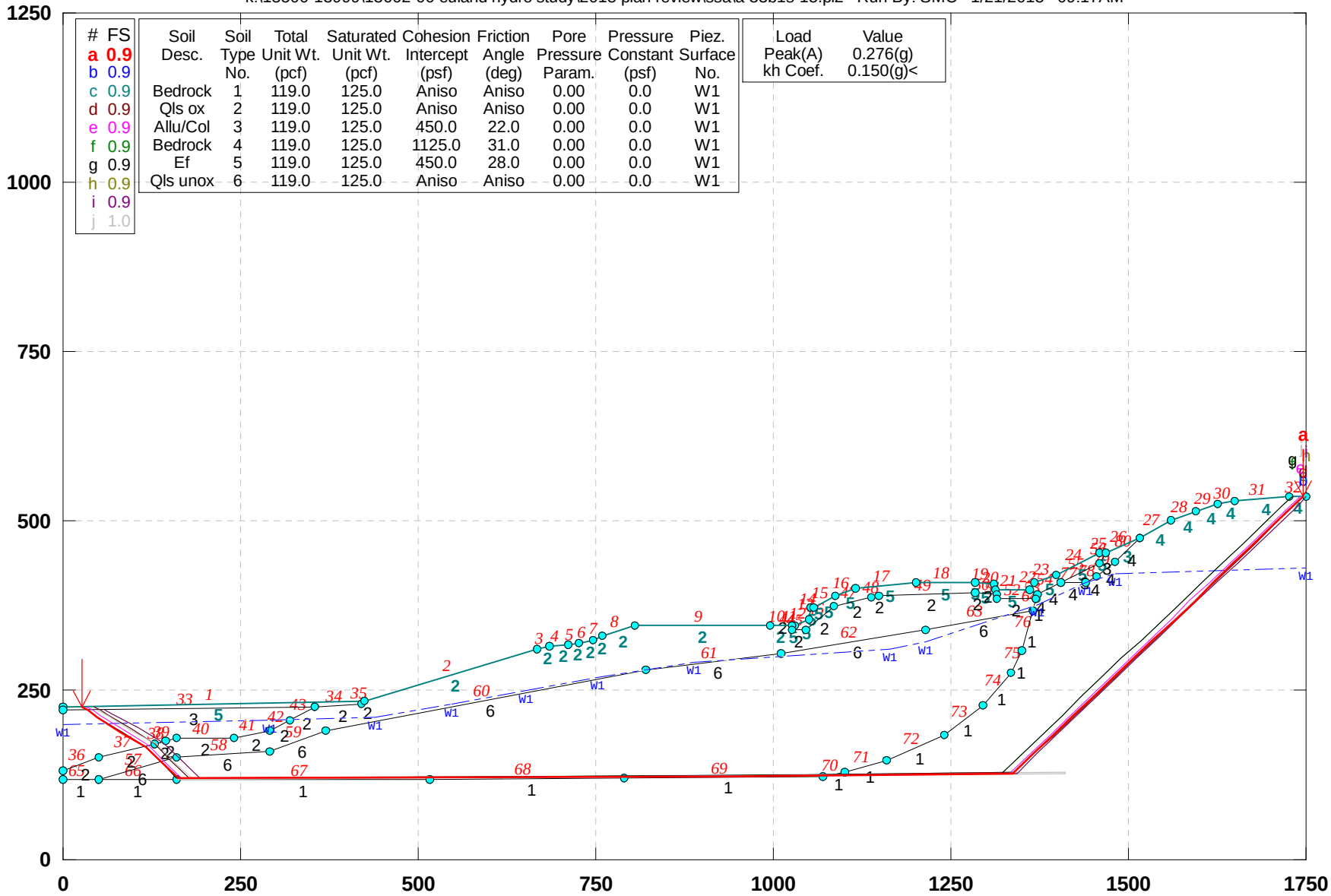
12       1142.349      209.590
13       1170.633      237.874
14       1198.917      266.158
15       1227.201      294.443
16       1255.486      322.727
17       1283.770      351.011
18       1286.124      353.366
19       1314.409      381.650
20       1318.759      386.000
21       1326.257      398.000
    Factor of Safety
   ***    1.478   ***
       **** END OF GSTABL7 OUTPUT ****
```

13662-00, Section A-A',- -Seismic, deep .Qls, 2015 design

k:\13500-13999\13662-00 euland hydro study\2015 plan review\ssa\a-33b1s-15.pl2 Run By: SMC 1/21/2015 09:17AM



#	FS
a	0.9
b	0.9
c	0.9
d	0.9
e	0.9
f	0.9
g	0.9
h	0.9
i	0.9
j	1.0

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.
Bedrock	1	119.0	125.0	Aniso	Aniso	0.00	0.0	W1
Qls ox	2	119.0	125.0	Aniso	Aniso	0.00	0.0	W1
Allu/Col	3	119.0	125.0	450.0	22.0	0.00	0.0	W1
Bedrock	4	119.0	125.0	1125.0	31.0	0.00	0.0	W1
Ef	5	119.0	125.0	450.0	28.0	0.00	0.0	W1
Qls unox	6	119.0	125.0	Aniso	Aniso	0.00	0.0	W1

Load	Value
Peak(A)	0.276(g)
kh Coef.	0.150(g)<

GSTABL7 v.2 FSmin=0.9

Safety Factors Are Calculated By The Simplified Janbu Method for the case of c & phi both > 0

Figure E-1.2

***** GSTABL7 *****

** GSTABL7 by Garry H. Gregory, P.E. **

** Original Version 1.0, January 1996; Current Version 2.005, Sept. 2006 **

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****

SLOPE STABILITY ANALYSIS SYSTEM

Modified Bishop, Simplified Janbu, or GLE Method of Slices.
(Includes Spencer & Morgenstern-Price Type Analysis)
Including Pier/Pile, Reinforcement, Soil Nail, Tieback,
Nonlinear Undrained Shear Strength, Curved Phi Envelope,
Anisotropic Soil, Fiber-Reinforced Soil, Boundary Loads, Water
Surfaces, Pseudo-Static & Newmark Earthquake, and Applied Forces.

****

Analysis Run Date: 1/21/2015
Time of Run: 09:17AM
Run By: SMC
Input Data Filename: K:\13500-13999\13662-00 Euland Hydro Study\2015 Plan Review\SSA\a-33b1s-15.
Output Filename: K:\13500-13999\13662-00 Euland Hydro Study\2015 Plan Review\SSA\a-33b1s-15.OUT
Unit System: English
Plotted Output Filename: K:\13500-13999\13662-00 Euland Hydro Study\2015 Plan Review\SSA\a-33b1s-15.PLT
PROBLEM DESCRIPTION: 13662-00, Section A-A',-
-Seismic, deep .Qls, 2015 design

BOUNDARY COORDINATES
32 Top Boundaries
80 Total Boundaries

Boundary No.	X-Left (ft)	Y-Left (ft)	X-Right (ft)	Y-Right (ft)	Soil Type Below Bnd
1	0.00	225.00	425.00	235.00	5
2	425.00	235.00	667.00	310.00	2
3	667.00	310.00	685.00	314.00	2
4	685.00	314.00	710.00	317.00	2
5	710.00	317.00	727.00	320.00	2
6	727.00	320.00	745.00	324.00	2
7	745.00	324.00	758.00	330.00	2
8	758.00	330.00	805.00	346.00	2
9	805.00	346.00	995.00	346.00	2
10	995.00	346.00	1025.00	346.00	2
11	1025.00	346.00	1030.00	346.00	5
12	1030.00	346.00	1050.00	355.00	5
13	1050.00	355.00	1053.00	372.00	5
14	1053.00	372.00	1056.00	372.00	5
15	1056.00	372.00	1088.00	390.00	5
16	1088.00	390.00	1116.00	400.00	5
17	1116.00	400.00	1200.00	410.00	5
18	1200.00	410.00	1285.00	410.00	5
19	1285.00	410.00	1310.00	406.00	5
20	1310.00	406.00	1313.00	398.00	5
21	1313.00	398.00	1360.00	398.00	5
22	1360.00	398.00	1367.00	408.00	5
23	1367.00	408.00	1397.00	420.00	5
24	1397.00	420.00	1458.00	452.00	5
25	1458.00	452.00	1467.00	452.00	5
26	1467.00	452.00	1515.00	475.00	3
27	1515.00	475.00	1560.00	500.00	4
28	1560.00	500.00	1595.00	515.00	4
29	1595.00	515.00	1625.00	525.00	4
30	1625.00	525.00	1650.00	530.00	4
31	1650.00	530.00	1725.00	537.00	4
32	1725.00	537.00	1750.00	535.00	4
33	0.00	220.00	354.00	226.00	3
34	354.00	226.00	420.00	230.00	2
35	420.00	230.00	425.00	235.00	2
36	0.00	132.00	50.00	150.00	2
37	50.00	150.00	130.00	170.00	2
38	130.00	170.00	145.00	175.00	2
39	130.00	170.00	160.00	180.00	2
40	160.00	180.00	240.00	180.00	2

41	240.00	180.00	290.00	190.00	2
42	290.00	190.00	320.00	205.00	2
43	320.00	205.00	354.00	226.00	2
44	1025.00	346.00	1026.00	340.00	2
45	1026.00	340.00	1045.00	340.00	2
46	1045.00	340.00	1086.00	373.00	2
47	1086.00	373.00	1138.00	388.00	2
48	1138.00	388.00	1148.00	390.00	2
49	1148.00	390.00	1284.00	394.00	2
50	1284.00	394.00	1314.00	391.00	2
51	1314.00	391.00	1315.00	386.00	2
52	1315.00	386.00	1370.00	386.00	2
53	1370.00	386.00	1371.00	391.00	4
54	1371.00	391.00	1405.00	408.00	4
55	1405.00	408.00	1460.00	438.00	3
56	1460.00	438.00	1467.00	452.00	3
57	50.00	118.00	160.00	150.00	6
58	160.00	150.00	290.00	160.00	6
59	290.00	160.00	370.00	190.00	6
60	370.00	190.00	820.00	280.00	6
61	820.00	280.00	1010.00	305.00	6
62	1010.00	305.00	1215.00	340.00	6
63	1215.00	340.00	1364.00	368.00	6
64	1364.00	368.00	1370.00	386.00	1
65	0.00	118.00	50.00	118.00	1
66	50.00	118.00	160.00	118.00	1
67	160.00	118.00	517.00	119.00	1
68	517.00	119.00	790.00	120.00	1
69	790.00	120.00	1070.00	123.00	1
70	1070.00	123.00	1100.00	128.00	1
71	1100.00	128.00	1160.00	146.00	1
72	1160.00	146.00	1240.00	183.00	1
73	1240.00	183.00	1295.00	228.00	1
74	1295.00	228.00	1335.00	276.00	1
75	1335.00	276.00	1350.00	308.00	1
76	1350.00	308.00	1364.00	368.00	1
77	1405.00	408.00	1440.00	410.00	4
78	1440.00	410.00	1455.00	418.00	4
79	1455.00	418.00	1480.00	440.00	4
80	1480.00	440.00	1515.00	475.00	4

Default Y-Origin = 0.00(ft)
Default X-Plus Value = 0.00(ft)
Default Y-Plus Value = 0.00(ft)

ISOTROPIC SOIL PARAMETERS
6 Type(s) of Soil

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.
1	119.0	125.0	0.0	0.0	0.00	0.0	1
2	119.0	125.0	0.0	0.0	0.00	0.0	1
3	119.0	125.0	450.0	22.0	0.00	0.0	1
4	119.0	125.0	1125.0	31.0	0.00	0.0	1
5	119.0	125.0	450.0	28.0	0.00	0.0	1
6	119.0	125.0	0.0	0.0	0.00	0.0	1

ANISOTROPIC STRENGTH PARAMETERS
3 soil type(s)

Soil Type 1 Is Anisotropic
Number Of Direction Ranges Specified = 3

Direction Range No.	Counterclockwise Direction Limit (deg)	Cohesion Intercept (psf)	Friction Angle (deg)
1	0.0	1125.00	31.00
2	5.0	450.00	17.00
3	90.0	1125.00	31.00

Soil Type 2 Is Anisotropic
Number Of Direction Ranges Specified = 3

Direction Range No.	Counterclockwise Direction Limit (deg)	Cohesion Intercept (psf)	Friction Angle (deg)
1	-10.0	525.00	25.00

2	5.0	375.00	14.50
3	90.0	450.00	22.00

Soil Type 6 Is Anisotropic
Number Of Direction Ranges Specified = 3

Direction Range No.	Counterclockwise Direction Limit (deg)	Cohesion Intercept (psf)	Friction Angle (deg)
1	-10.0	750.00	31.00
2	5.0	375.00	14.50
3	90.0	450.00	22.00

ANISOTROPIC SOIL NOTES:
(1) An input value of 0.01 for C and/or Phi will cause Aniso C and/or Phi to be ignored in that range.
(2) An input value of 0.02 for Phi will set both Phi and C equal to zero, with no water weight in the tension crack.
(3) An input value of 0.03 for Phi will set both Phi and C equal to zero, with water weight in the tension crack.
1 PIEZOMETRIC SURFACE(S) SPECIFIED
Unit Weight of Water = 62.40 (pcf)
Piezometric Surface No. 1 Specified by 13 Coordinate Points
Pore Pressure Inclination Factor = 0.50

Point No.	X-Water (ft)	Y-Water (ft)
1	0.00	200.00
2	292.00	205.00
3	440.00	210.00
4	546.00	230.00
5	652.00	250.00
6	752.00	270.00
7	888.00	290.00
8	1164.00	310.00
9	1215.00	321.00
10	1371.00	376.00
11	1440.00	410.00
12	1480.00	422.00
13	1750.00	430.00

Specified Peak Ground Acceleration Coefficient (A) = 0.276(g)
Specified Horizontal Earthquake Coefficient (kh) = 0.150(g)
Specified Vertical Earthquake Coefficient (kv) = 0.000(g)
Specified Seismic Pore-Pressure Factor = 0.000
Janbus Empirical Coef is being used for the case of c & phi both > 0
A Critical Failure Surface Searching Method, Using A Random
Technique For Generating Sliding Block Surfaces, Has Been
Specified.
The Active And Passive Portions Of The Sliding Surfaces
Are Generated According To The Rankine Theory.
3000 Trial Surfaces Have Been Generated.
3 Boxes Specified For Generation Of Central Block Base
Length Of Line Segments For Active And Passive Portions Of
Sliding Block Is 40.0

Box No.	X-Left (ft)	Y-Left (ft)	X-Right (ft)	Y-Right (ft)	Height (ft)
1	160.00	120.00	517.00	121.00	2.00
2	620.00	121.00	920.00	123.00	2.00
3	920.10	123.00	1410.00	128.00	2.00

Following Are Displayed The Ten Most Critical Of The Trial
Failure Surfaces Evaluated. They Are
Ordered - Most Critical First.
* * Safety Factors Are Calculated By The Simplified Janbu Method * *
Total Number of Trial Surfaces Attempted = 3000
Number of Trial Surfaces With Valid FS = 3000
Statistical Data On All Valid FS Values:
FS Max = 1.204 FS Min = 0.942 FS Ave = 0.898
Standard Deviation = 0.130 Coefficient of Variation = 14.44 %
Failure Surface Specified By 24 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	26.262	225.618
2	34.635	220.587
3	48.818	211.021

4	81.979	188.653
5	115.141	166.285
6	137.865	143.561
7	161.460	119.966
8	919.908	122.316
9	1336.892	126.917
10	1365.176	155.201
11	1393.460	183.485
12	1421.745	211.770
13	1450.029	240.054
14	1478.313	268.338
15	1506.598	296.622
16	1534.882	324.907
17	1563.166	353.191
18	1591.450	381.475
19	1619.735	409.760
20	1648.019	438.044
21	1676.303	466.328
22	1704.588	494.612
23	1732.872	522.897
24	1745.348	535.372

Factor of Safety
*** 0.942 ***

Individual data on the 102 slices

Slice No.	Width (ft)	Weight (lbs)	Water Force Top (lbs)	Water Force Bot (lbs)	Tie Force Norm (lbs)	Tie Force Tan (lbs)	Earthquake Force Hor (lbs)	Earthquake Force Ver (lbs)	Surcharge Load (lbs)
1	8.4	2604.5	0.0	0.0	0.	0.	390.7	0.0	0.0
2	14.2	17177.9	0.0	0.0	0.	0.	2576.7	0.0	0.0
3	14.7	35515.7	0.0	0.0	0.	0.	5327.4	0.0	0.0
4	18.4	70561.5	0.0	8845.5	0.	0.	10584.2	0.0	0.0
5	33.2	201537.2	0.0	60440.9	0.	0.	30230.6	0.0	0.0
6	14.9	125915.6	0.0	56696.4	0.	0.	18887.3	0.0	0.0
7	7.9	78076.7	0.0	38029.3	0.	0.	11711.5	0.0	0.0
8	7.1	77673.6	0.0	39301.7	0.	0.	11651.0	0.0	0.0
9	15.0	184528.2	0.0	97523.5	0.	0.	27679.2	0.0	0.0
10	1.5	19496.2	0.0	10569.9	0.	0.	2924.4	0.0	0.0
11	78.5	1063955.2	0.0	*******	0.	0.	*******	0.0	0.0
12	50.0	685415.9	0.0	*******	0.	0.	*******	0.0	0.0
13	2.0	27547.4	0.0	10558.5	0.	0.	4132.1	0.0	0.0
14	28.0	386753.8	0.0	*******	0.	0.	58013.1	0.0	0.0
15	1.6	22441.3	0.0	8640.3	0.	0.	3366.2	0.0	0.0
16	32.4	449944.9	0.0	*******	0.	0.	67491.7	0.0	0.0
17	16.0	223345.5	0.0	86589.9	0.	0.	33501.8	0.0	0.0
18	50.0	702270.0	0.0	*******	0.	0.	*******	0.0	0.0
19	5.0	70586.6	0.0	27638.2	0.	0.	10588.0	0.0	0.0
20	15.0	215986.2	0.0	83201.7	0.	0.	32397.9	0.0	0.0
21	106.0	1765802.0	0.0	*******	0.	0.	*******	0.0	0.0
22	106.0	2188341.5	0.0	*******	0.	0.	*******	0.0	0.0
23	15.0	343781.8	0.0	*******	0.	0.	51567.3	0.0	0.0
24	18.0	422035.7	0.0	*******	0.	0.	63305.4	0.0	0.0
25	25.0	596997.8	0.0	*******	0.	0.	89549.7	0.0	0.0
26	17.0	412309.5	0.0	*******	0.	0.	61846.4	0.0	0.0
27	18.0	444308.9	0.0	*******	0.	0.	66646.3	0.0	0.0
28	7.0	175867.5	0.0	63195.9	0.	0.	26380.1	0.0	0.0
29	6.0	152957.1	0.0	55060.7	0.	0.	22943.6	0.0	0.0
30	47.0	1251257.0	0.0	*******	0.	0.	*******	0.0	0.0
31	15.0	413843.3	0.0	*******	0.	0.	62076.5	0.0	0.0
32	68.0	1877461.0	0.0	*******	0.	0.	*******	0.0	0.0
33	17.8	492075.8	0.0	*******	0.	0.	73811.4	0.0	0.0
34	14.1	389714.4	0.0	*******	0.	0.	58457.2	0.0	0.0
35	75.1	2072545.8	0.0	*******	0.	0.	*******	0.0	0.0
36	15.0	413364.9	0.0	*******	0.	0.	62004.7	0.0	0.0
37	15.0	413152.2	0.0	*******	0.	0.	61972.8	0.0	0.0
38	1.0	27535.9	0.0	10984.4	0.	0.	4130.4	0.0	0.0
39	4.0	110134.2	0.0	43976.0	0.	0.	16520.1	0.0	0.0
40	15.0	418892.9	0.0	*******	0.	0.	62833.9	0.0	0.0
41	5.0	142261.2	0.0	55342.8	0.	0.	21339.2	0.0	0.0
42	3.0	88781.5	0.0	33251.6	0.	0.	13317.2	0.0	0.0

43	3.0	91807.5	0.0	33286.0	0.	0.	13771.1	0.0	0.0
44	20.2	633022.9	0.0	*******	0.	0.	94953.4	0.0	0.0
45	9.8	314705.8	0.0	*******	0.	0.	47205.9	0.0	0.0
46	2.0	65293.7	0.0	22439.2	0.	0.	9794.0	0.0	0.0
47	12.0	395545.8	0.0	*******	0.	0.	59331.9	0.0	0.0
48	16.0	536702.6	0.0	*******	0.	0.	80505.4	0.0	0.0
49	22.0	748479.2	0.0	*******	0.	0.	*******	0.0	0.0
50	10.0	342333.2	0.0	*******	0.	0.	51350.0	0.0	0.0
51	12.0	412545.1	0.0	*******	0.	0.	61881.8	0.0	0.0
52	4.0	137938.1	0.0	46025.4	0.	0.	20690.7	0.0	0.0
53	36.0	1250718.2	0.0	*******	0.	0.	*******	0.0	0.0
54	15.0	524914.6	0.0	*******	0.	0.	78737.2	0.0	0.0
55	25.0	874062.2	0.0	*******	0.	0.	*******	0.0	0.0
56	44.0	1539295.0	0.0	*******	0.	0.	*******	0.0	0.0
57	1.0	34998.0	0.0	12920.7	0.	0.	5249.7	0.0	0.0
58	10.0	349062.2	0.0	*******	0.	0.	52359.3	0.0	0.0
59	15.0	520140.0	0.0	*******	0.	0.	78021.0	0.0	0.0
60	3.0	102188.4	0.0	40392.9	0.	0.	15328.3	0.0	0.0
61	1.0	33588.1	0.0	13504.6	0.	0.	5038.2	0.0	0.0
62	1.0	33588.7	0.0	13524.7	0.	0.	5038.3	0.0	0.0
63	15.4	517345.1	0.0	*******	0.	0.	77601.8	0.0	0.0
64	4.6	154559.2	0.0	63898.9	0.	0.	23183.9	0.0	0.0
65	1.9	63565.8	0.0	26401.8	0.	0.	9534.9	0.0	0.0
66	13.1	429933.5	0.0	*******	0.	0.	64490.0	0.0	0.0
67	10.0	313812.8	0.0	*******	0.	0.	47071.9	0.0	0.0
68	4.0	123450.4	0.0	73631.8	0.	0.	18517.6	0.0	0.0
69	1.2	36439.2	0.0	21483.9	0.	0.	5465.9	0.0	0.0
70	0.9	28352.4	0.0	16637.9	0.	0.	4252.9	0.0	0.0
71	0.9	28293.1	0.0	16535.3	0.	0.	4244.0	0.0	0.0
72	3.0	92959.9	0.0	54171.3	0.	0.	13944.0	0.0	0.0
73	1.0	30836.5	0.0	17949.2	0.	0.	4625.5	0.0	0.0
74	22.5	671824.2	0.0	*******	0.	0.	*******	0.0	0.0
75	3.5	102465.4	0.0	57126.9	0.	0.	15369.8	0.0	0.0
76	8.0	228633.6	0.0	*******	0.	0.	34295.0	0.0	0.0
77	16.7	466258.7	0.0	*******	0.	0.	69938.8	0.0	0.0
78	18.3	489374.9	0.0	*******	0.	0.	73406.2	0.0	0.0
79	10.0	260980.4	0.0	*******	0.	0.	39147.1	0.0	0.0
80	5.0	127101.5	0.0	72008.0	0.	0.	19065.2	0.0	0.0
81	3.0	75980.2	0.0	42748.1	0.	0.	11397.0	0.0	0.0
82	2.0	50225.6	0.0	28202.6	0.	0.	7533.8	0.0	0.0
83	7.0	171914.2	0.0	96843.7	0.	0.	25787.1	0.0	0.0
84	11.3	268748.2	0.0	*******	0.	0.	40312.2	0.0	0.0
85	1.7	39345.8	0.0	21772.1	0.	0.	5901.9	0.0	0.0
86	26.6	595947.4	0.0	*******	0.	0.	89392.1	0.0	0.0
87	8.4	178297.2	0.0	90488.1	0.	0.	26744.6	0.0	0.0
88	19.9	404618.9	0.0	*******	0.	0.	60692.8	0.0	0.0
89	25.1	478004.8	0.0	*******	0.	0.	71700.7	0.0	0.0
90	3.2	57547.9	0.0	20334.2	0.	0.	8632.2	0.0	0.0
91	28.3	481263.9	0.0	*******	0.	0.	72189.6	0.0	0.0
92	3.5	56225.9	0.0	13183.0	0.	0.	8433.9	0.0	0.0
93	24.7	362515.3	0.0	61923.3	0.	0.	54377.3	0.0	0.0
94	5.3	70443.0	0.0	6421.4	0.	0.	10566.4	0.0	0.0
95	11.6	145985.7	0.0	5774.4	0.	0.	21897.9	0.0	0.0
96	11.4	130436.2	0.0	0.0	0.	0.	19565.4	0.0	0.0
97	2.0	21397.0	0.0	0.0	0.	0.	3209.6	0.0	0.0
98	26.3	244307.8	0.0	0.0	0.	0.	36646.2	0.0	0.0
99	28.3	179414.5	0.0	0.0	0.	0.	26912.2	0.0	0.0
100	20.4	75857.2	0.0	0.0	0.	0.	11378.6	0.0	0.0
101	7.9	16603.6	0.0	0.0	0.	0.	2490.5	0.0	0.0
102	12.5	10001.4	0.0	0.0	0.	0.	1500.2	0.0	0.0

Failure Surface Specified By 24 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	26.262	225.618
2	34.635	220.587
3	48.818	211.021
4	81.979	188.653
5	115.141	166.285
6	137.865	143.561
7	161.460	119.966

8	919.908	122.316
9	1336.892	126.917
10	1365.176	155.201
11	1393.460	183.485
12	1421.745	211.770
13	1450.029	240.054
14	1478.313	268.338
15	1506.598	296.622
16	1534.882	324.907
17	1563.166	353.191
18	1591.450	381.475
19	1619.735	409.760
20	1648.019	438.044
21	1676.303	466.328
22	1704.588	494.612
23	1732.872	522.897
24	1745.348	535.372

Factor of Safety
*** 0.942 ***

Failure Surface Specified By 24 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	43.890	226.033
2	52.451	220.889
3	62.143	214.352
4	95.304	191.984
5	128.466	169.616
6	150.768	147.314
7	177.323	120.759
8	838.317	122.044
9	1339.523	128.177
10	1367.807	156.461
11	1396.092	184.746
12	1424.376	213.030
13	1452.660	241.314
14	1480.945	269.598
15	1509.229	297.883
16	1537.513	326.167
17	1565.797	354.451
18	1594.082	382.736
19	1622.366	411.020
20	1650.650	439.304
21	1678.935	467.588
22	1707.219	495.873
23	1735.503	524.157
24	1746.617	535.271

Factor of Safety
*** 0.944 ***

Failure Surface Specified By 24 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	43.890	226.033
2	52.451	220.889
3	62.143	214.352
4	95.304	191.984
5	128.466	169.616
6	150.768	147.314
7	177.323	120.759
8	838.317	122.044
9	1339.523	128.177
10	1367.807	156.461
11	1396.092	184.746
12	1424.376	213.030
13	1452.660	241.314
14	1480.945	269.598
15	1509.229	297.883
16	1537.513	326.167
17	1565.797	354.451
18	1594.082	382.736
19	1622.366	411.020

20	1650.650	439.304
21	1678.935	467.588
22	1707.219	495.873
23	1735.503	524.157
24	1746.617	535.271

Factor of Safety
*** 0.944 ***

Failure Surface Specified By 24 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	32.182	225.757
2	40.618	220.688
3	53.293	212.139
4	86.454	189.772
5	119.616	167.404
6	142.198	144.821
7	166.515	120.504
8	897.203	122.603
9	1332.347	127.285
10	1360.631	155.570
11	1388.915	183.854
12	1417.200	212.138
13	1445.484	240.423
14	1473.768	268.707
15	1502.053	296.991
16	1530.337	325.275
17	1558.621	353.560
18	1586.906	381.844
19	1615.190	410.128
20	1643.474	438.412
21	1671.758	466.697
22	1700.043	494.981
23	1728.327	523.265
24	1740.798	535.736

Factor of Safety
*** 0.945 ***

Failure Surface Specified By 24 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	26.394	225.621
2	34.769	220.589
3	48.918	211.046
4	82.079	188.678
5	115.241	166.310
6	137.962	143.589
7	160.763	120.788
8	633.385	121.448
9	1320.625	126.763
10	1348.910	155.047
11	1377.194	183.331
12	1405.478	211.615
13	1433.763	239.900
14	1462.047	268.184
15	1490.331	296.468
16	1518.616	324.752
17	1546.900	353.037
18	1575.184	381.321
19	1603.469	409.605
20	1631.753	437.889
21	1660.037	466.174
22	1688.321	494.458
23	1716.606	522.742
24	1730.429	536.566

Factor of Safety
*** 0.949 ***

Failure Surface Specified By 24 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	26.394	225.621
2	34.769	220.589

3	48.918	211.046
4	82.079	188.678
5	115.241	166.310
6	137.962	143.589
7	160.763	120.788
8	633.385	121.448
9	1320.625	126.763
10	1348.910	155.047
11	1377.194	183.331
12	1405.478	211.615
13	1433.763	239.900
14	1462.047	268.184
15	1490.331	296.468
16	1518.616	324.752
17	1546.900	353.037
18	1575.184	381.321
19	1603.469	409.605
20	1631.753	437.889
21	1660.037	466.174
22	1688.321	494.458
23	1716.606	522.742
24	1730.429	536.566

Factor of Safety
*** 0.949 ***

Failure Surface Specified By 25 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	59.949	221.016
2	70.980	214.388
3	105.267	193.786
4	139.554	173.185
5	139.554	173.185
6	162.543	150.196
7	164.901	147.837
8	193.185	119.553
9	756.725	121.773
10	1342.154	127.437
11	1370.439	155.722
12	1398.723	184.006
13	1427.007	212.290
14	1455.292	240.574
15	1483.576	268.859
16	1511.860	297.143
17	1540.144	325.427
18	1568.429	353.711
19	1596.713	381.996
20	1624.997	410.280
21	1653.282	438.564
22	1681.566	466.849
23	1709.850	495.133
24	1738.135	523.417
25	1749.738	535.021

Factor of Safety
*** 0.949 ***

Failure Surface Specified By 25 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	59.949	221.016
2	70.980	214.388
3	105.267	193.786
4	139.554	173.185
5	139.554	173.185
6	162.543	150.196
7	164.901	147.837
8	193.185	119.553
9	756.725	121.773
10	1342.154	127.437
11	1370.439	155.722
12	1398.723	184.006
13	1427.007	212.290

14	1455.292	240.574
15	1483.576	268.859
16	1511.860	297.143
17	1540.144	325.427
18	1568.429	353.711
19	1596.713	381.996
20	1624.997	410.280
21	1653.282	438.564
22	1681.566	466.849
23	1709.850	495.133
24	1738.135	523.417
25	1749.738	535.021

Factor of Safety
*** 0.949 ***

Failure Surface Specified By 25 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	47.403	220.803
2	62.683	211.622
3	96.970	191.020
4	131.257	170.419
5	131.257	170.419
6	153.552	148.124
7	154.094	147.582
8	182.378	119.298
9	815.612	122.331
10	1334.978	126.546
11	1363.262	154.830
12	1391.547	183.114
13	1419.831	211.399
14	1448.115	239.683
15	1476.400	267.967
16	1504.684	296.251
17	1532.968	324.536
18	1561.252	352.820
19	1589.537	381.104
20	1617.821	409.388
21	1646.105	437.673
22	1674.390	465.957
23	1702.674	494.241
24	1730.958	522.526
25	1743.919	535.486

Factor of Safety
*** 0.951 ***

**** END OF GSTABL7 OUTPUT ****

***** GSTABL7 *****

** GSTABL7 by Garry H. Gregory, P.E. **

** Original Version 1.0, January 1996; Current Version 2.005, Sept. 2006 **

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SLOPE STABILITY ANALYSIS SYSTEM

Modified Bishop, Simplified Janbu, or GLE Method of Slices.
(Includes Spencer & Morgenstern-Price Type Analysis)
Including Pier/Pile, Reinforcement, Soil Nail, Tieback,
Nonlinear Undrained Shear Strength, Curved Phi Envelope,
Anisotropic Soil, Fiber-Reinforced Soil, Boundary Loads, Water
Surfaces, Pseudo-Static & Newmark Earthquake, and Applied Forces.

****

Analysis Run Date: 1/21/2015
Time of Run: 09:18AM
Run By: SMC
Input Data Filename: K:\13500-13999\13662-00 Euland Hydro Study\2015 Plan Review\SSA\a-33b1s-15 Surface #1.
Output Filename: K:\13500-13999\13662-00 Euland Hydro Study\2015 Plan Review\SSA\a-33b1s-15 Surface #1.OUT
Unit System: English
Plotted Output Filename: K:\13500-13999\13662-00 Euland Hydro Study\2015 Plan Review\SSA\a-33b1s-15 Surface #1.PLT
PROBLEM DESCRIPTION: 13662-00, Section A-A',-
-Seismic, deep .Qls, 2015 design

BOUNDARY COORDINATES
32 Top Boundaries
80 Total Boundaries

Boundary No.	X-Left (ft)	Y-Left (ft)	X-Right (ft)	Y-Right (ft)	Soil Type Below Bnd
1	0.00	225.00	425.00	235.00	5
2	425.00	235.00	667.00	310.00	2
3	667.00	310.00	685.00	314.00	2
4	685.00	314.00	710.00	317.00	2
5	710.00	317.00	727.00	320.00	2
6	727.00	320.00	745.00	324.00	2
7	745.00	324.00	758.00	330.00	2
8	758.00	330.00	805.00	346.00	2
9	805.00	346.00	995.00	346.00	2
10	995.00	346.00	1025.00	346.00	2
11	1025.00	346.00	1030.00	346.00	5
12	1030.00	346.00	1050.00	355.00	5
13	1050.00	355.00	1053.00	372.00	5
14	1053.00	372.00	1056.00	372.00	5
15	1056.00	372.00	1088.00	390.00	5
16	1088.00	390.00	1116.00	400.00	5
17	1116.00	400.00	1200.00	410.00	5
18	1200.00	410.00	1285.00	410.00	5
19	1285.00	410.00	1310.00	406.00	5
20	1310.00	406.00	1313.00	398.00	5
21	1313.00	398.00	1360.00	398.00	5
22	1360.00	398.00	1367.00	408.00	5
23	1367.00	408.00	1397.00	420.00	5
24	1397.00	420.00	1458.00	452.00	5
25	1458.00	452.00	1467.00	452.00	5
26	1467.00	452.00	1515.00	475.00	3
27	1515.00	475.00	1560.00	500.00	4
28	1560.00	500.00	1595.00	515.00	4
29	1595.00	515.00	1625.00	525.00	4
30	1625.00	525.00	1650.00	530.00	4
31	1650.00	530.00	1725.00	537.00	4
32	1725.00	537.00	1750.00	535.00	4
33	0.00	220.00	354.00	226.00	3
34	354.00	226.00	420.00	230.00	2
35	420.00	230.00	425.00	235.00	2
36	0.00	132.00	50.00	150.00	2
37	50.00	150.00	130.00	170.00	2
38	130.00	170.00	145.00	175.00	2
39	130.00	170.00	160.00	180.00	2

40	160.00	180.00	240.00	180.00	2
41	240.00	180.00	290.00	190.00	2
42	290.00	190.00	320.00	205.00	2
43	320.00	205.00	354.00	226.00	2
44	1025.00	346.00	1026.00	340.00	2
45	1026.00	340.00	1045.00	340.00	2
46	1045.00	340.00	1086.00	373.00	2
47	1086.00	373.00	1138.00	388.00	2
48	1138.00	388.00	1148.00	390.00	2
49	1148.00	390.00	1284.00	394.00	2
50	1284.00	394.00	1314.00	391.00	2
51	1314.00	391.00	1315.00	386.00	2
52	1315.00	386.00	1370.00	386.00	2
53	1370.00	386.00	1371.00	391.00	4
54	1371.00	391.00	1405.00	408.00	4
55	1405.00	408.00	1460.00	438.00	3
56	1460.00	438.00	1467.00	452.00	3
57	50.00	118.00	160.00	150.00	6
58	160.00	150.00	290.00	160.00	6
59	290.00	160.00	370.00	190.00	6
60	370.00	190.00	820.00	280.00	6
61	820.00	280.00	1010.00	305.00	6
62	1010.00	305.00	1215.00	340.00	6
63	1215.00	340.00	1364.00	368.00	6
64	1364.00	368.00	1370.00	386.00	1
65	0.00	118.00	50.00	118.00	1
66	50.00	118.00	160.00	118.00	1
67	160.00	118.00	517.00	119.00	1
68	517.00	119.00	790.00	120.00	1
69	790.00	120.00	1070.00	123.00	1
70	1070.00	123.00	1100.00	128.00	1
71	1100.00	128.00	1160.00	146.00	1
72	1160.00	146.00	1240.00	183.00	1
73	1240.00	183.00	1295.00	228.00	1
74	1295.00	228.00	1335.00	276.00	1
75	1335.00	276.00	1350.00	308.00	1
76	1350.00	308.00	1364.00	368.00	1
77	1405.00	408.00	1440.00	410.00	4
78	1440.00	410.00	1455.00	418.00	4
79	1455.00	418.00	1480.00	440.00	4
80	1480.00	440.00	1515.00	475.00	4

Default Y-Origin = 0.00(ft)
Default X-Plus Value = 0.00(ft)
Default Y-Plus Value = 0.00(ft)

ISOTROPIC SOIL PARAMETERS
6 Type(s) of Soil

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.
1	119.0	125.0	0.0	0.0	0.00	0.0	1
2	119.0	125.0	0.0	0.0	0.00	0.0	1
3	119.0	125.0	450.0	22.0	0.00	0.0	1
4	119.0	125.0	1125.0	31.0	0.00	0.0	1
5	119.0	125.0	450.0	28.0	0.00	0.0	1
6	119.0	125.0	0.0	0.0	0.00	0.0	1

ANISOTROPIC STRENGTH PARAMETERS
3 soil type(s)

Soil Type 1 Is Anisotropic
Number Of Direction Ranges Specified = 3

Direction Range No.	Counterclockwise Direction Limit (deg)	Cohesion Intercept (psf)	Friction Angle (deg)
1	0.0	1125.00	31.00
2	5.0	450.00	17.00
3	90.0	1125.00	31.00

Soil Type 2 Is Anisotropic
Number Of Direction Ranges Specified = 3

Direction Range No.	Counterclockwise Direction Limit (deg)	Cohesion Intercept (psf)	Friction Angle (deg)

1	-10.0	525.00	25.00
2	5.0	375.00	14.50
3	90.0	450.00	22.00

Soil Type 6 Is Anisotropic
Number Of Direction Ranges Specified = 3

Direction Range No.	Counterclockwise Direction Limit (deg)	Cohesion Intercept (psf)	Friction Angle (deg)
1	-10.0	750.00	31.00
2	5.0	375.00	14.50
3	90.0	450.00	22.00

ANISOTROPIC SOIL NOTES:
(1) An input value of 0.01 for C and/or Phi will cause Aniso C and/or Phi to be ignored in that range.
(2) An input value of 0.02 for Phi will set both Phi and C equal to zero, with no water weight in the tension crack.
(3) An input value of 0.03 for Phi will set both Phi and C equal to zero, with water weight in the tension crack.

1 PIEZOMETRIC SURFACE(S) SPECIFIED
Unit Weight of Water = 62.40 (pcf)
Piezometric Surface No. 1 Specified by 13 Coordinate Points
Pore Pressure Inclination Factor = 0.50

Point No.	X-Water (ft)	Y-Water (ft)
1	0.00	200.00
2	292.00	205.00
3	440.00	210.00
4	546.00	230.00
5	652.00	250.00
6	752.00	270.00
7	888.00	290.00
8	1164.00	310.00
9	1215.00	321.00
10	1371.00	376.00
11	1440.00	410.00
12	1480.00	422.00
13	1750.00	430.00

Specified Peak Ground Acceleration Coefficient (A) = 0.276(g)
Specified Horizontal Earthquake Coefficient (kh) = 0.150(g)
Specified Vertical Earthquake Coefficient (kv) = 0.000(g)
Specified Seismic Pore-Pressure Factor = 0.000
Janbu's Empirical Coef. is being used for the case of c & phi both > 0
Trial Failure Surface Specified By 24 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	26.262	225.618
2	34.635	220.587
3	48.818	211.021
4	81.979	188.653
5	115.141	166.285
6	137.865	143.561
7	161.460	119.966
8	919.908	122.316
9	1336.892	126.917
10	1365.176	155.201
11	1393.460	183.485
12	1421.745	211.770
13	1450.029	240.054
14	1478.313	268.338
15	1506.598	296.622
16	1534.882	324.907
17	1563.166	353.191
18	1591.450	381.475
19	1619.735	409.760
20	1648.019	438.044
21	1676.303	466.328
22	1704.588	494.612
23	1732.872	522.897
24	1745.348	535.372

Janbu's Empirical Coefficient (fo) = 1.069

* * Factor Of Safety Is Calculated By The Simplified Janbu Method * *
Factor Of Safety For The Preceding Specified Surface = 0.942

Table 1 - Individual Data on the 102 Slices

Slice No.	Width (ft)	Weight (lbs)	Water Force Top (lbs)	Water Force Bot (lbs)	Tie Force Norm (lbs)	Tie Force Tan (lbs)	Earthquake Force Hor (lbs)	Earthquake Force Ver (lbs)	Surcharge Load (lbs)
1	8.4	2604.5	0.0	0.0	0.0	0.0	390.7	0.0	0.0
2	14.2	17177.8	0.0	0.0	0.0	0.0	2576.7	0.0	0.0
3	14.7	35515.8	0.0	0.0	0.0	0.0	5327.4	0.0	0.0
4	18.4	70558.7	0.0	8845.1	0.0	0.0	10583.8	0.0	0.0
5	33.2	201540.3	0.0	60441.8	0.0	0.0	30231.0	0.0	0.0
6	14.9	125912.4	0.0	56694.9	0.0	0.0	18886.9	0.0	0.0
7	7.9	78078.4	0.0	38030.1	0.0	0.0	11711.8	0.0	0.0
8	7.1	77671.5	0.0	39300.6	0.0	0.0	11650.7	0.0	0.0
9	15.0	184527.8	0.0	97523.3	0.0	0.0	27679.2	0.0	0.0
10	1.5	19497.4	0.0	10570.6	0.0	0.0	2924.6	0.0	0.0
11	78.5	1063952.8	0.0	*******	0.0	0.0	*******	0.0	0.0
12	50.0	685415.0	0.0	*******	0.0	0.0	*******	0.0	0.0
13	2.0	27547.4	0.0	10558.5	0.0	0.0	4132.1	0.0	0.0
14	28.0	386753.2	0.0	*******	0.0	0.0	58013.0	0.0	0.0
15	1.6	22441.2	0.0	8640.3	0.0	0.0	3366.2	0.0	0.0
16	32.4	449944.2	0.0	*******	0.0	0.0	67491.6	0.0	0.0
17	16.0	223345.2	0.0	86589.7	0.0	0.0	33501.8	0.0	0.0
18	50.0	702268.9	0.0	*******	0.0	0.0	*******	0.0	0.0
19	5.0	70586.5	0.0	27638.2	0.0	0.0	10588.0	0.0	0.0
20	15.0	215985.8	0.0	83201.6	0.0	0.0	32397.9	0.0	0.0
21	106.0	1765799.2	0.0	*******	0.0	0.0	*******	0.0	0.0
22	106.0	2188338.2	0.0	*******	0.0	0.0	*******	0.0	0.0
23	15.0	343781.4	0.0	*******	0.0	0.0	51567.2	0.0	0.0
24	18.0	422035.1	0.0	*******	0.0	0.0	63305.3	0.0	0.0
25	25.0	596996.9	0.0	*******	0.0	0.0	89549.5	0.0	0.0
26	17.0	412308.9	0.0	*******	0.0	0.0	61846.3	0.0	0.0
27	18.0	444308.2	0.0	*******	0.0	0.0	66646.2	0.0	0.0
28	7.0	175867.3	0.0	63195.8	0.0	0.0	26380.1	0.0	0.0
29	6.0	152956.8	0.0	55060.6	0.0	0.0	22943.5	0.0	0.0
30	47.0	1251255.2	0.0	*******	0.0	0.0	*******	0.0	0.0
31	15.0	413842.8	0.0	*******	0.0	0.0	62076.4	0.0	0.0
32	68.0	1877458.4	0.0	*******	0.0	0.0	*******	0.0	0.0
33	17.8	492075.1	0.0	*******	0.0	0.0	73811.3	0.0	0.0
34	14.1	389702.1	0.0	*******	0.0	0.0	58455.3	0.0	0.0
35	75.1	2072554.5	0.0	*******	0.0	0.0	*******	0.0	0.0
36	15.0	413364.4	0.0	*******	0.0	0.0	62004.7	0.0	0.0
37	15.0	413151.6	0.0	*******	0.0	0.0	61972.7	0.0	0.0
38	1.0	27535.9	0.0	10984.4	0.0	0.0	4130.4	0.0	0.0
39	4.0	110134.1	0.0	43975.9	0.0	0.0	16520.1	0.0	0.0
40	15.0	418892.4	0.0	*******	0.0	0.0	62833.9	0.0	0.0
41	5.0	142261.0	0.0	55342.7	0.0	0.0	21339.2	0.0	0.0
42	3.0	88781.4	0.0	33251.5	0.0	0.0	13317.2	0.0	0.0
43	3.0	91807.4	0.0	33285.9	0.0	0.0	13771.1	0.0	0.0
44	20.2	633080.6	0.0	*******	0.0	0.0	94962.1	0.0	0.0
45	9.8	314647.0	0.0	*******	0.0	0.0	47197.0	0.0	0.0
46	2.0	65293.6	0.0	22439.1	0.0	0.0	9794.0	0.0	0.0
47	12.0	395545.4	0.0	*******	0.0	0.0	59331.8	0.0	0.0
48	16.0	536702.1	0.0	*******	0.0	0.0	80505.3	0.0	0.0
49	22.0	748478.5	0.0	*******	0.0	0.0	*******	0.0	0.0
50	10.0	342332.9	0.0	*******	0.0	0.0	51349.9	0.0	0.0
51	12.0	412544.7	0.0	*******	0.0	0.0	61881.7	0.0	0.0
52	4.0	137938.0	0.0	46025.3	0.0	0.0	20690.7	0.0	0.0
53	36.0	1250717.1	0.0	*******	0.0	0.0	*******	0.0	0.0
54	15.0	524914.1	0.0	*******	0.0	0.0	78737.1	0.0	0.0
55	25.0	874061.6	0.0	*******	0.0	0.0	*******	0.0	0.0
56	44.0	1539293.9	0.0	*******	0.0	0.0	*******	0.0	0.0
57	1.0	34998.0	0.0	12920.6	0.0	0.0	5249.7	0.0	0.0
58	10.0	349061.9	0.0	*******	0.0	0.0	52359.3	0.0	0.0
59	15.0	520139.6	0.0	*******	0.0	0.0	78020.9	0.0	0.0
60	3.0	102188.3	0.0	40392.8	0.0	0.0	15328.3	0.0	0.0
61	1.0	33588.0	0.0	13504.5	0.0	0.0	5038.2	0.0	0.0
62	1.0	33588.6	0.0	13524.7	0.0	0.0	5038.3	0.0	0.0
63	15.4	517344.7	0.0	*******	0.0	0.0	77601.7	0.0	0.0

64	4.6	154559.1	0.0	63898.9	0.0	0.0	23183.9	0.0	0.0
65	1.9	63573.9	0.0	26405.2	0.0	0.0	9536.1	0.0	0.0
66	13.1	429925.2	0.0	*******	0.0	0.0	64488.8	0.0	0.0
67	10.0	313812.8	0.0	*******	0.0	0.0	47071.9	0.0	0.0
68	4.0	123450.4	0.0	73631.9	0.0	0.0	18517.6	0.0	0.0
69	1.2	36435.5	0.0	21481.8	0.0	0.0	5465.3	0.0	0.0
70	0.9	28356.1	0.0	16640.1	0.0	0.0	4253.4	0.0	0.0
71	0.9	28293.1	0.0	16535.2	0.0	0.0	4244.0	0.0	0.0
72	3.0	92959.9	0.0	54171.2	0.0	0.0	13944.0	0.0	0.0
73	1.0	30836.5	0.0	17949.1	0.0	0.0	4625.5	0.0	0.0
74	22.5	671817.4	0.0	*******	0.0	0.0	*******	0.0	0.0
75	3.5	102472.5	0.0	57131.1	0.0	0.0	15370.9	0.0	0.0
76	8.0	228633.6	0.0	*******	0.0	0.0	34295.0	0.0	0.0
77	16.7	466268.8	0.0	*******	0.0	0.0	69940.3	0.0	0.0
78	18.3	489364.8	0.0	*******	0.0	0.0	73404.7	0.0	0.0
79	10.0	260983.5	0.0	*******	0.0	0.0	39147.5	0.0	0.0
80	5.0	127098.4	0.0	72006.1	0.0	0.0	19064.8	0.0	0.0
81	3.0	75980.2	0.0	42748.1	0.0	0.0	11397.0	0.0	0.0
82	2.0	50225.6	0.0	28202.6	0.0	0.0	7533.8	0.0	0.0
83	7.0	171914.3	0.0	96843.7	0.0	0.0	25787.1	0.0	0.0
84	11.3	268745.5	0.0	*******	0.0	0.0	40311.8	0.0	0.0
85	1.7	39348.7	0.0	21773.4	0.0	0.0	5902.3	0.0	0.0
86	26.6	595959.4	0.0	*******	0.0	0.0	89393.9	0.0	0.0
87	8.4	178287.5	0.0	90484.9	0.0	0.0	26743.1	0.0	0.0
88	19.9	404622.0	0.0	*******	0.0	0.0	60693.3	0.0	0.0
89	25.1	478002.0	0.0	*******	0.0	0.0	71700.3	0.0	0.0
90	3.2	57545.6	0.0	20333.3	0.0	0.0	8631.8	0.0	0.0
91	28.3	481259.7	0.0	*******	0.0	0.0	72189.0	0.0	0.0
92	3.5	56231.7	0.0	13184.4	0.0	0.0	8434.8	0.0	0.0
93	24.7	362518.2	0.0	61923.5	0.0	0.0	54377.7	0.0	0.0
94	5.3	70439.5	0.0	6421.0	0.0	0.0	10565.9	0.0	0.0
95	11.6	145982.5	0.0	5774.2	0.0	0.0	21897.4	0.0	0.0
96	11.4	130438.8	0.0	0.0	0.0	0.0	19565.8	0.0	0.0
97	2.0	21397.0	0.0	0.0	0.0	0.0	3209.5	0.0	0.0
98	26.3	244304.9	0.0	0.0	0.0	0.0	36645.7	0.0	0.0
99	28.3	179419.2	0.0	0.0	0.0	0.0	26912.9	0.0	0.0
100	20.4	75856.2	0.0	0.0	0.0	0.0	11378.4	0.0	0.0
101	7.9	16603.3	0.0	0.0	0.0	0.0	2490.5	0.0	0.0
102	12.5	10001.6	0.0	0.0	0.0	0.0	1500.2	0.0	0.0

Table 2 - Base Stress Data on the 102 Slices

Slice No. *	Alpha (deg)	X-Coord. Slice Cntr (ft)	Base Leng. (ft)	Available Shear Strength (psf)	Mobilized Shear Stress (psf)
1	-31.00	30.45	9.77	1086.31	-120.21
2	-34.00	41.73	17.11	1594.11	-526.63
3	-34.00	56.18	17.76	2417.50	-1048.77
4	-34.00	72.76	22.24	3115.41	-1664.33
5	-34.00	98.56	40.00	3894.83	-2642.70
6	-45.00	122.57	21.01	9011.79	-5093.11
7	-45.00	133.93	11.12	9967.85	-5966.56
8	-45.00	141.43	10.09	19329.05	-6543.12
9	-45.00	152.50	21.21	21002.17	-7393.92
10	-45.00	160.73	2.06	22246.34	-8026.60
11	0.18	200.73	78.54	2531.38	2073.96
12	0.18	265.00	50.00	2558.62	2098.71
13	0.18	291.00	2.00	2569.65	2108.72
14	0.18	306.00	28.00	2573.13	2114.68
15	0.18	320.81	1.62	2575.82	2120.61
16	0.18	337.81	32.38	2578.90	2127.42
17	0.18	362.00	16.00	2583.28	2137.10
18	0.18	395.00	50.00	2589.27	2150.32
19	0.18	422.50	5.00	2594.25	2161.33
20	0.18	432.50	15.00	2662.11	2204.46
21	0.18	493.00	106.00	3110.26	2550.38
22	0.18	599.00	106.00	3828.56	3160.66
23	0.18	659.50	15.00	4241.19	3508.81
24	0.18	676.00	18.00	4326.15	3589.59
25	0.18	697.50	25.00	4371.22	3655.95
26	0.18	718.50	17.00	4402.36	3713.15
27	0.18	736.00	18.00	4459.07	3779.03

28	0.18	748.50	7.00	4533.87	3846.41
29	0.18	755.00	6.00	4590.74	3902.89
30	0.18	781.50	47.00	4821.78	4075.84
31	0.18	812.50	15.00	5000.47	4223.89
32	0.18	854.00	68.00	4910.37	4226.98
33	0.18	896.90	17.81	4807.23	4230.80
34	0.18	912.86	14.10	4789.63	4230.91
35	0.63	957.45	75.10	4725.56	4444.30
36	0.63	1002.50	15.00	4670.18	4437.45
37	0.63	1017.50	15.00	4651.73	4435.16
38	0.63	1025.50	1.00	4641.89	4433.94
39	0.63	1028.00	4.00	4638.82	4433.56
40	0.63	1037.50	15.00	4730.70	4496.79
41	0.63	1047.50	5.00	4856.48	4581.49
42	0.63	1051.50	3.00	5146.90	4765.32
43	0.63	1054.50	3.00	5404.03	4927.74
44	0.63	1066.12	20.25	5564.46	5035.08
45	0.63	1081.12	9.75	6865.30	5194.47
46	0.63	1087.00	2.00	6976.62	5256.92
47	0.63	1094.00	12.00	7064.53	5307.70
48	0.63	1108.00	16.00	7225.46	5401.38
49	0.63	1127.00	22.00	7348.92	5478.33
50	0.63	1143.00	10.00	7394.73	5512.39
51	0.63	1154.00	12.00	7426.22	5535.81
52	0.63	1162.00	4.00	7449.13	5552.84
53	0.63	1182.00	36.00	7525.80	5594.33
54	0.63	1207.50	15.00	7505.61	5634.93
55	0.63	1227.50	25.00	7513.51	5629.80
56	0.63	1262.00	44.00	7308.44	5633.26
57	0.63	1284.50	1.00	7174.70	5635.52
58	0.63	1290.00	10.00	7113.01	5620.74
59	0.63	1302.50	15.00	6966.20	5583.67
60	0.63	1311.50	3.00	6724.18	5484.93
61	0.63	1313.50	1.00	6567.27	5408.49
62	0.63	1314.50	1.00	6561.33	5408.59
63	0.63	1322.70	15.40	6512.59	5409.41
64	0.63	1332.70	4.60	6453.15	5410.41
65	0.63	1335.95	1.89	6433.85	5410.74
66	45.00	1343.45	18.54	10867.88	26670.96
67	45.00	1355.00	14.14	10361.31	25518.42
68	45.00	1362.00	5.66	10230.80	25096.64
69	45.00	1364.59	1.66	10345.60	25196.24
70	45.00	1365.63	1.29	10391.94	25236.38
71	45.00	1366.54	1.29	10432.40	25271.48
72	45.00	1368.50	4.24	10423.87	25197.43
73	45.00	1370.50	1.41	10385.58	25075.34
74	45.00	1382.23	31.76	10377.16	24323.25
75	45.00	1395.23	5.01	10069.69	23539.53
76	45.00	1401.00	11.31	9963.99	23239.86
77	45.00	1413.37	23.68	9766.53	22643.04
78	45.00	1430.87	25.82	9487.24	21798.84
79	45.00	1445.01	14.18	8995.82	21160.97
80	45.00	1452.51	7.03	8922.96	20791.38
81	45.00	1456.50	4.24	8884.24	20594.98
82	45.00	1459.00	2.83	8827.57	20421.03
83	45.00	1463.50	9.90	8638.10	19970.84
84	45.00	1472.66	16.00	8419.92	19317.09
85	45.00	1479.16	2.39	8338.52	18968.01
86	45.00	1493.30	37.61	8096.13	18219.87
87	45.00	1510.80	11.88	8030.15	17255.53
88	45.00	1524.94	28.12	8023.65	16549.28
89	45.00	1547.44	35.52	8044.80	15474.86
90	45.00	1561.58	4.48	8045.72	14780.26
91	45.00	1577.31	40.00	7937.24	13836.31
92	45.00	1593.23	5.02	7827.45	12880.87
93	45.00	1607.37	34.98	7657.17	11917.95
94	45.00	1622.37	7.45	7465.50	10879.26
95	45.00	1630.81	16.43	7309.83	10219.89
96	45.00	1642.32	16.13	6906.18	9301.41
97	45.00	1649.01	2.80	6575.62	8783.33

98	45.00	1663.15	37.20	5790.48	7552.79
99	45.00	1690.45	40.00	4262.59	5158.13
100	45.00	1714.79	28.87	2899.60	3022.00
101	45.00	1728.94	11.13	2065.77	1715.14
102	45.00	1739.11	17.64	1387.35	651.86

Sum of the Resisting Forces (including Pier/Pile, Tieback, Reinforcing
Soil Nail, and Applied Forces if applicable) = ********** (lbs)
Average Available Shear Strength (including Tieback, Pier/Pile, Reinforcing,
Soil Nail, and Applied Forces if applicable) = 5722.47(psf)
Sum of the Driving Forces = ********** (lbs)
Average Mobilized Shear Stress = 6495.62(psf)
Total length of the failure surface = 1925.48(ft)
*** SEISMIC SLOPE DISPLACEMENT DATA ***
(Note: kv is set = zero for displacement calculations)
Seismic Yield Coefficient (ky) = 0.1295(g)
Calculated Newmark Seismic Displacement = 0.122(ft)
Non-Symmetrical Sliding Resistance Has Been Specified
for Downhill Sliding.
**** END OF GSTABL7 OUTPUT ****

Sliding displacement models from Rathje and Antonakos (2011)

Prediction of dynamic response and sliding displacement of a sliding mass during earthquake shaking

Cross Section: A-A'

File: a-33b1s-15

Inputs	
PGA (g)	0.2763
PGV (cm/s)	23.32
k_y (g)	0.1295
T_m (s)	0.517
T_s (s)	0.37
M	6.95
T_s/T_m	0.715168

Dynamic Response			
	median	-1σ	+1σ
kmax (g)	0.209	0.163	0.268
k-velmax (cm/s)	25.30	19.70	32.48

Displacement Given Median Dynamic Response					
Displacement Model			Sliding Displacements, D (cm)		
	μ_{lnD}	σ_{lnD}	median	-1σ	+1σ
[kmax, M]	1.08	0.894	2.95	1.21	7.21
[kmax, k-velmax]	0.28	0.576	1.33	0.75	2.36
			Sliding Displacements, D (in)		
	μ_{lnD}	σ_{lnD}	median	-1σ	+1σ
[kmax, M]	1.08	0.894	1.16	0.48	2.84
[kmax, k-velmax]	0.28	0.576	0.52	0.29	0.93

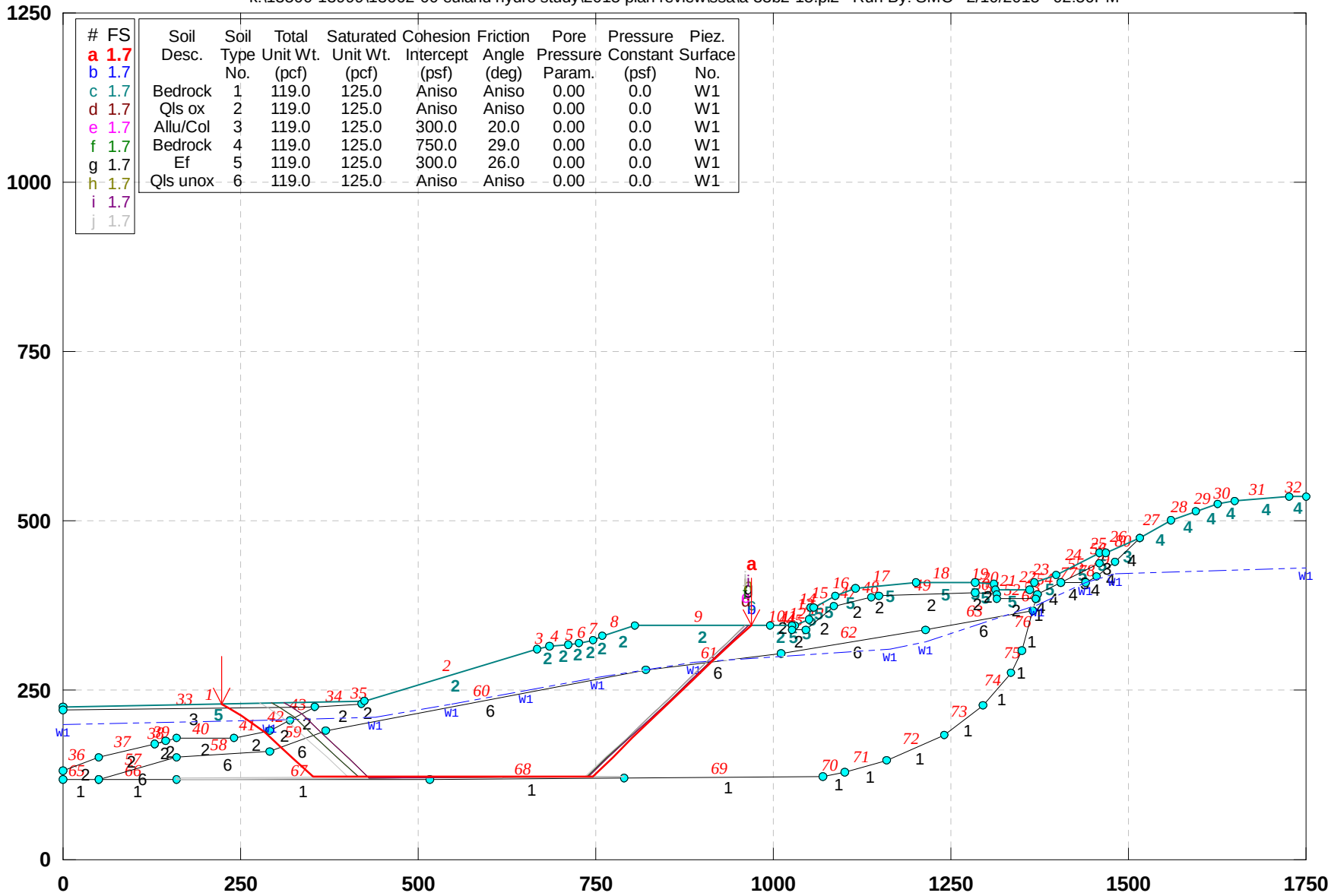
PGA	Peak Ground Acceleration (g)
PGV	Peak Ground Velocity (cm/s)
k_y	Critical or Yield Acceleration (g)
T_m	Mean Period of an Earthquake Motion (s)
T_s	Site Period or the Natural Period of a Sliding Mass (s). For rigid sliding set T_s= 0 s
M	Earthquake Magnitude
kmax	maximum seismic coefficient (g)
k-velmax	the maximum velocity of the seismic coefficient-time history (cm/s)
D	Predicted Sliding Displacment (cm)

H_{avr} =	195	ft
V_s =	2110	ft/s
$T_s = 4\ H_{avr}/V_s$ =	0.37	s

Reference: Rathje, E.M. and Antonakos, G. 2011. "A Unified Model for Predicting Earthquake-Induced Sliding Displacements of Rigid and Flexible Slopes," Engineering Geology, 122, 51-60, doi:10.1016/j.enggeo.2010.12.004.

13662-00, Section A-A',- -Static, deep .Qls, 2015 design

k:\13500-13999\13662-00 euland hydro study\2015 plan review\ssa\a-33b2-15.pl2 Run By: SMC 2/10/2015 02:56PM



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.
Bedrock	1	119.0	125.0	Aniso	Aniso	0.00	0.0	W1
Qls ox	2	119.0	125.0	Aniso	Aniso	0.00	0.0	W1
Allu/Col	3	119.0	125.0	300.0	20.0	0.00	0.0	W1
Bedrock	4	119.0	125.0	750.0	29.0	0.00	0.0	W1
Ef	5	119.0	125.0	300.0	26.0	0.00	0.0	W1
Qls unox	6	119.0	125.0	Aniso	Aniso	0.00	0.0	W1

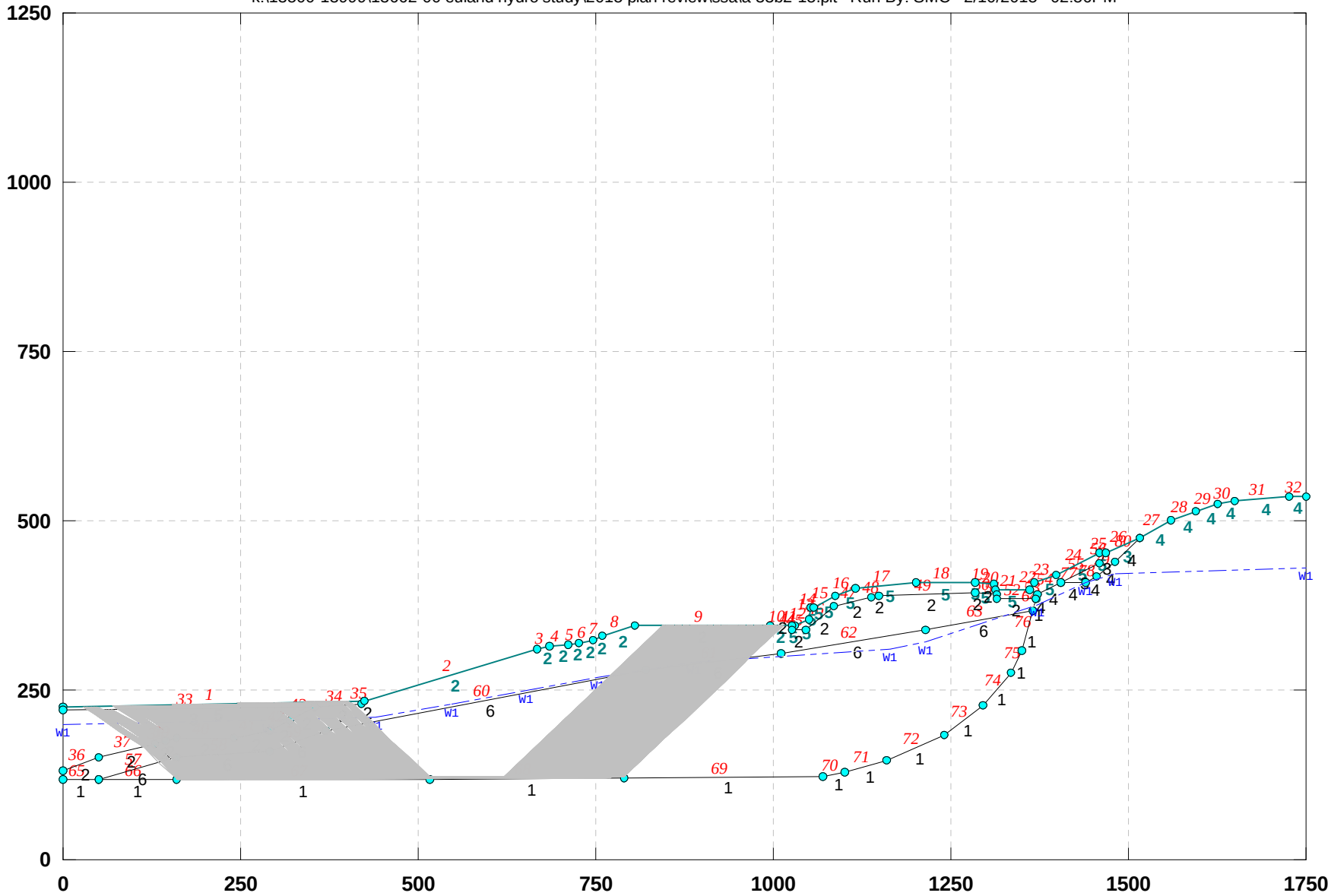
GSTABL7 v.2 FSmin=1.7

Safety Factors Are Calculated By The Simplified Janbu Method for the case of c & phi both > 0

Figure E-2.1

13662-00, Section A-A',- -Static, deep .Qls, 2015 design

k:\13500-13999\13662-00 euland hydro study\2015 plan review\ssa\a-33b2-15.plt Run By: SMC 2/10/2015 02:56PM



***** GSTABL7 *****

** GSTABL7 by Garry H. Gregory, P.E. **

** Original Version 1.0, January 1996; Current Version 2.005, Sept. 2006 **

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SLOPE STABILITY ANALYSIS SYSTEM

Modified Bishop, Simplified Janbu, or GLE Method of Slices.
(Includes Spencer & Morgenstern-Price Type Analysis)
Including Pier/Pile, Reinforcement, Soil Nail, Tieback,
Nonlinear Undrained Shear Strength, Curved Phi Envelope,
Anisotropic Soil, Fiber-Reinforced Soil, Boundary Loads, Water
Surfaces, Pseudo-Static & Newmark Earthquake, and Applied Forces.

****

Analysis Run Date: 2/10/2015
Time of Run: 02:56PM
Run By: SMC
Input Data Filename: K:\13500-13999\13662-00 Euland Hydro Study\2015 Plan Review\SSA\a-33b2-15.
Output Filename: K:\13500-13999\13662-00 Euland Hydro Study\2015 Plan Review\SSA\a-33b2-15.OUT
Unit System: English
Plotted Output Filename: K:\13500-13999\13662-00 Euland Hydro Study\2015 Plan Review\SSA\a-33b2-15.PLT
PROBLEM DESCRIPTION: 13662-00, Section A-A',-
-Static, deep .Qls, 2015 design

BOUNDARY COORDINATES
32 Top Boundaries
80 Total Boundaries

Boundary No.	X-Left (ft)	Y-Left (ft)	X-Right (ft)	Y-Right (ft)	Soil Type Below Bnd
1	0.00	225.00	425.00	235.00	5
2	425.00	235.00	667.00	310.00	2
3	667.00	310.00	685.00	314.00	2
4	685.00	314.00	710.00	317.00	2
5	710.00	317.00	727.00	320.00	2
6	727.00	320.00	745.00	324.00	2
7	745.00	324.00	758.00	330.00	2
8	758.00	330.00	805.00	346.00	2
9	805.00	346.00	995.00	346.00	2
10	995.00	346.00	1025.00	346.00	2
11	1025.00	346.00	1030.00	346.00	5
12	1030.00	346.00	1050.00	355.00	5
13	1050.00	355.00	1053.00	372.00	5
14	1053.00	372.00	1056.00	372.00	5
15	1056.00	372.00	1088.00	390.00	5
16	1088.00	390.00	1116.00	400.00	5
17	1116.00	400.00	1200.00	410.00	5
18	1200.00	410.00	1285.00	410.00	5
19	1285.00	410.00	1310.00	406.00	5
20	1310.00	406.00	1313.00	398.00	5
21	1313.00	398.00	1360.00	398.00	5
22	1360.00	398.00	1367.00	408.00	5
23	1367.00	408.00	1397.00	420.00	5
24	1397.00	420.00	1458.00	452.00	5
25	1458.00	452.00	1467.00	452.00	5
26	1467.00	452.00	1515.00	475.00	3
27	1515.00	475.00	1560.00	500.00	4
28	1560.00	500.00	1595.00	515.00	4
29	1595.00	515.00	1625.00	525.00	4
30	1625.00	525.00	1650.00	530.00	4
31	1650.00	530.00	1725.00	537.00	4
32	1725.00	537.00	1750.00	535.00	4
33	0.00	220.00	354.00	226.00	3
34	354.00	226.00	420.00	230.00	2
35	420.00	230.00	425.00	235.00	2
36	0.00	132.00	50.00	150.00	2
37	50.00	150.00	130.00	170.00	2
38	130.00	170.00	145.00	175.00	2
39	130.00	170.00	160.00	180.00	2
40	160.00	180.00	240.00	180.00	2

41	240.00	180.00	290.00	190.00	2
42	290.00	190.00	320.00	205.00	2
43	320.00	205.00	354.00	226.00	2
44	1025.00	346.00	1026.00	340.00	2
45	1026.00	340.00	1045.00	340.00	2
46	1045.00	340.00	1086.00	373.00	2
47	1086.00	373.00	1138.00	388.00	2
48	1138.00	388.00	1148.00	390.00	2
49	1148.00	390.00	1284.00	394.00	2
50	1284.00	394.00	1314.00	391.00	2
51	1314.00	391.00	1315.00	386.00	2
52	1315.00	386.00	1370.00	386.00	2
53	1370.00	386.00	1371.00	391.00	4
54	1371.00	391.00	1405.00	408.00	4
55	1405.00	408.00	1460.00	438.00	3
56	1460.00	438.00	1467.00	452.00	3
57	50.00	118.00	160.00	150.00	6
58	160.00	150.00	290.00	160.00	6
59	290.00	160.00	370.00	190.00	6
60	370.00	190.00	820.00	280.00	6
61	820.00	280.00	1010.00	305.00	6
62	1010.00	305.00	1215.00	340.00	6
63	1215.00	340.00	1364.00	368.00	6
64	1364.00	368.00	1370.00	386.00	1
65	0.00	118.00	50.00	118.00	1
66	50.00	118.00	160.00	118.00	1
67	160.00	118.00	517.00	119.00	1
68	517.00	119.00	790.00	120.00	1
69	790.00	120.00	1070.00	123.00	1
70	1070.00	123.00	1100.00	128.00	1
71	1100.00	128.00	1160.00	146.00	1
72	1160.00	146.00	1240.00	183.00	1
73	1240.00	183.00	1295.00	228.00	1
74	1295.00	228.00	1335.00	276.00	1
75	1335.00	276.00	1350.00	308.00	1
76	1350.00	308.00	1364.00	368.00	1
77	1405.00	408.00	1440.00	410.00	4
78	1440.00	410.00	1455.00	418.00	4
79	1455.00	418.00	1480.00	440.00	4
80	1480.00	440.00	1515.00	475.00	4

Default Y-Origin = 0.00(ft)
Default X-Plus Value = 0.00(ft)
Default Y-Plus Value = 0.00(ft)

ISOTROPIC SOIL PARAMETERS
6 Type(s) of Soil

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.
1	119.0	125.0	0.0	0.0	0.00	0.0	1
2	119.0	125.0	0.0	0.0	0.00	0.0	1
3	119.0	125.0	300.0	20.0	0.00	0.0	1
4	119.0	125.0	750.0	29.0	0.00	0.0	1
5	119.0	125.0	300.0	26.0	0.00	0.0	1
6	119.0	125.0	0.0	0.0	0.00	0.0	1

ANISOTROPIC STRENGTH PARAMETERS
3 soil type(s)

Soil Type 1 Is Anisotropic
Number Of Direction Ranges Specified = 3

Direction Range No.	Counterclockwise Direction Limit (deg)	Cohesion Intercept (psf)	Friction Angle (deg)
1	0.0	750.00	29.00
2	5.0	300.00	15.00
3	90.0	750.00	29.00

Soil Type 2 Is Anisotropic
Number Of Direction Ranges Specified = 3

Direction Range No.	Counterclockwise Direction Limit (deg)	Cohesion Intercept (psf)	Friction Angle (deg)
1	-10.0	350.00	23.00

2	5.0	250.00	12.50
3	90.0	300.00	20.00

Soil Type 6 Is Anisotropic
Number Of Direction Ranges Specified = 3

Direction Range No.	Counterclockwise Direction Limit (deg)	Cohesion Intercept (psf)	Friction Angle (deg)
1	-10.0	500.00	29.00
2	5.0	250.00	12.50
3	90.0	300.00	20.00

ANISOTROPIC SOIL NOTES:
(1) An input value of 0.01 for C and/or Phi will cause Aniso C and/or Phi to be ignored in that range.
(2) An input value of 0.02 for Phi will set both Phi and C equal to zero, with no water weight in the tension crack.
(3) An input value of 0.03 for Phi will set both Phi and C equal to zero, with water weight in the tension crack.

1 PIEZOMETRIC SURFACE(S) SPECIFIED
Unit Weight of Water = 62.40 (pcf)
Piezometric Surface No. 1 Specified by 13 Coordinate Points
Pore Pressure Inclination Factor = 0.50

Point No.	X-Water (ft)	Y-Water (ft)
1	0.00	200.00
2	292.00	205.00
3	440.00	210.00
4	546.00	230.00
5	652.00	250.00
6	752.00	270.00
7	888.00	290.00
8	1164.00	310.00
9	1215.00	321.00
10	1371.00	376.00
11	1440.00	410.00
12	1480.00	422.00
13	1750.00	430.00

Janbus Empirical Coef is being used for the case of c & phi both > 0
A Critical Failure Surface Searching Method, Using A Random Technique For Generating Sliding Block Surfaces, Has Been Specified.
The Active And Passive Portions Of The Sliding Surfaces Are Generated According To The Rankine Theory.
3000 Trial Surfaces Have Been Generated.
2 Boxes Specified For Generation Of Central Block Base
Length Of Line Segments For Active And Passive Portions Of Sliding Block Is 40.0

Box No.	X-Left (ft)	Y-Left (ft)	X-Right (ft)	Y-Right (ft)	Height (ft)
1	160.00	120.00	517.00	121.00	2.00
2	620.00	121.00	790.00	122.50	2.00

Following Are Displayed The Ten Most Critical Of The Trial Failure Surfaces Evaluated. They Are Ordered - Most Critical First.
* * Safety Factors Are Calculated By The Simplified Janbu Method * *
Total Number of Trial Surfaces Attempted = 3000
Number of Trial Surfaces With Valid FS = 3000
Statistical Data On All Valid FS Values:
FS Max = 1.941 FS Min = 1.657 FS Ave = 1.718
Standard Deviation = 0.048 Coefficient of Variation = 2.79 %
Failure Surface Specified By 17 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	224.217	230.276
2	234.307	223.971
3	251.651	211.827
4	284.417	188.883
5	306.946	166.355
6	323.529	149.772
7	351.813	121.487
8	745.124	122.690

9	773.408	150.974
10	801.692	179.258
11	829.977	207.543
12	858.261	235.827
13	886.545	264.111
14	914.829	292.395
15	914.924	292.490
16	943.208	320.774
17	968.434	346.000

Factor of Safety
*** 1.657 ***

Individual data on the 40 slices

Slice No.	Width (ft)	Weight (lbs)	Water Force Top (lbs)	Water Force Bot (lbs)	Tie Force Norm (lbs)	Tie Force Tan (lbs)	Earthquake Force Hor (lbs)	Earthquake Force Ver (lbs)	Surcharge Load (lbs)
1	10.1	3927.1	0.0	0.0	0.	0.	0.0	0.0	0.0
2	17.3	26456.9	0.0	0.0	0.	0.	0.0	0.0	0.0
3	10.5	28542.0	0.0	0.0	0.	0.	0.0	0.0	0.0
4	22.3	93212.5	0.0	13568.3	0.	0.	0.0	0.0	0.0
5	5.6	30968.2	0.0	9273.3	0.	0.	0.0	0.0	0.0
6	2.0	12064.2	0.0	4002.7	0.	0.	0.0	0.0	0.0
7	14.9	106362.8	0.0	41423.7	0.	0.	0.0	0.0	0.0
8	13.1	116290.8	0.0	52842.8	0.	0.	0.0	0.0	0.0
9	1.6	15954.5	0.0	7642.2	0.	0.	0.0	0.0	0.0
10	1.9	19230.2	0.0	9311.8	0.	0.	0.0	0.0	0.0
11	28.3	339575.4	0.0	*******	0.	0.	0.0	0.0	0.0
12	2.2	30216.1	0.0	11668.4	0.	0.	0.0	0.0	0.0
13	16.0	221482.9	0.0	85660.5	0.	0.	0.0	0.0	0.0
14	50.0	696457.8	0.0	*******	0.	0.	0.0	0.0	0.0
15	5.0	70006.1	0.0	27348.6	0.	0.	0.0	0.0	0.0
16	15.0	214245.3	0.0	82333.2	0.	0.	0.0	0.0	0.0
17	106.0	1753542.9	0.0	*******	0.	0.	0.0	0.0	0.0
18	106.0	2176139.5	0.0	*******	0.	0.	0.0	0.0	0.0
19	15.0	342060.0	0.0	*******	0.	0.	0.0	0.0	0.0
20	18.0	419970.9	0.0	*******	0.	0.	0.0	0.0	0.0
21	25.0	594132.8	0.0	*******	0.	0.	0.0	0.0	0.0
22	17.0	410363.2	0.0	*******	0.	0.	0.0	0.0	0.0
23	18.0	442249.6	0.0	*******	0.	0.	0.0	0.0	0.0
24	0.1	3075.0	0.0	1106.5	0.	0.	0.0	0.0	0.0
25	6.9	169048.9	0.0	85212.8	0.	0.	0.0	0.0	0.0
26	6.0	144890.2	0.0	72229.8	0.	0.	0.0	0.0	0.0
27	15.4	358967.4	0.0	*******	0.	0.	0.0	0.0	0.0
28	28.3	607317.5	0.0	*******	0.	0.	0.0	0.0	0.0
29	3.3	66655.6	0.0	27909.0	0.	0.	0.0	0.0	0.0
30	15.0	286252.3	0.0	*******	0.	0.	0.0	0.0	0.0
31	10.0	174931.6	0.0	68101.0	0.	0.	0.0	0.0	0.0
32	28.3	428810.3	0.0	*******	0.	0.	0.0	0.0	0.0
33	28.3	329559.8	0.0	93195.3	0.	0.	0.0	0.0	0.0
34	1.5	14268.1	0.0	3182.7	0.	0.	0.0	0.0	0.0
35	17.8	153295.0	0.0	25351.8	0.	0.	0.0	0.0	0.0
36	8.5	59484.9	0.0	2974.5	0.	0.	0.0	0.0	0.0
37	0.5	3117.9	0.0	0.0	0.	0.	0.0	0.0	0.0
38	0.1	602.2	0.0	0.0	0.	0.	0.0	0.0	0.0
39	28.3	132505.5	0.0	0.0	0.	0.	0.0	0.0	0.0
40	25.2	37862.0	0.0	0.0	0.	0.	0.0	0.0	0.0

Failure Surface Specified By 17 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	224.217	230.276
2	234.307	223.971
3	251.651	211.827
4	284.417	188.883
5	306.946	166.355
6	323.529	149.772
7	351.813	121.487
8	745.124	122.690
9	773.408	150.974
10	801.692	179.258
11	829.977	207.543

12	858.261	235.827
13	886.545	264.111
14	914.829	292.395
15	914.924	292.490
16	943.208	320.774
17	968.434	346.000

Factor of Safety
*** 1.657 ***

Failure Surface Specified By 17 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	224.217	230.276
2	234.307	223.971
3	251.651	211.827
4	284.417	188.883
5	306.946	166.355
6	323.529	149.772
7	351.813	121.487
8	745.124	122.690
9	773.408	150.974
10	801.692	179.258
11	829.977	207.543
12	858.261	235.827
13	886.545	264.111
14	914.829	292.395
15	914.924	292.490
16	943.208	320.774
17	968.434	346.000

Factor of Safety
*** 1.657 ***

Failure Surface Specified By 16 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	293.277	231.901
2	304.075	225.154
3	326.831	209.219
4	352.582	183.468
5	357.999	178.052
6	386.283	149.768
7	414.567	121.483
8	737.819	122.758
9	766.103	151.042
10	794.388	179.327
11	822.672	207.611
12	850.956	235.895
13	879.240	264.180
14	906.434	291.373
15	934.718	319.657
16	961.061	346.000

Factor of Safety
*** 1.657 ***

Failure Surface Specified By 16 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	293.277	231.901
2	304.075	225.154
3	326.831	209.219
4	352.582	183.468
5	357.999	178.052
6	386.283	149.768
7	414.567	121.483
8	737.819	122.758
9	766.103	151.042
10	794.388	179.327
11	822.672	207.611
12	850.956	235.895
13	879.240	264.180
14	906.434	291.373
15	934.718	319.657
16	961.061	346.000

Factor of Safety
*** 1.657 ***

Failure Surface Specified By 16 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	293.277	231.901
2	304.075	225.154
3	326.831	209.219
4	352.582	183.468
5	357.999	178.052
6	386.283	149.768
7	414.567	121.483
8	737.819	122.758
9	766.103	151.042
10	794.388	179.327
11	822.672	207.611
12	850.956	235.895
13	879.240	264.180
14	906.434	291.373
15	934.718	319.657
16	961.061	346.000

Factor of Safety
*** 1.657 ***

Failure Surface Specified By 17 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	310.425	232.304
2	321.398	225.447
3	336.259	215.042
4	363.673	187.627
5	373.339	177.962
6	401.623	149.678
7	429.907	121.394
8	739.811	121.830
9	768.096	150.115
10	796.380	178.399
11	824.664	206.683
12	852.948	234.968
13	881.233	263.252
14	909.517	291.536
15	909.796	291.815
16	938.080	320.100
17	963.981	346.000

Factor of Safety
*** 1.658 ***

Failure Surface Specified By 17 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	310.425	232.304
2	321.398	225.447
3	336.259	215.042
4	363.673	187.627
5	373.339	177.962
6	401.623	149.678
7	429.907	121.394
8	739.811	121.830
9	768.096	150.115
10	796.380	178.399
11	824.664	206.683
12	852.948	234.968
13	881.233	263.252
14	909.517	291.536
15	909.796	291.815
16	938.080	320.100
17	963.981	346.000

Factor of Safety
*** 1.658 ***

Failure Surface Specified By 17 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)

1	310.425	232.304
2	321.398	225.447
3	336.259	215.042
4	363.673	187.627
5	373.339	177.962
6	401.623	149.678
7	429.907	121.394
8	739.811	121.830
9	768.096	150.115
10	796.380	178.399
11	824.664	206.683
12	852.948	234.968
13	881.233	263.252
14	909.517	291.536
15	909.796	291.815
16	938.080	320.100
17	963.981	346.000

Factor of Safety
*** 1.658 ***

Failure Surface Specified By 16 Coordinate Points

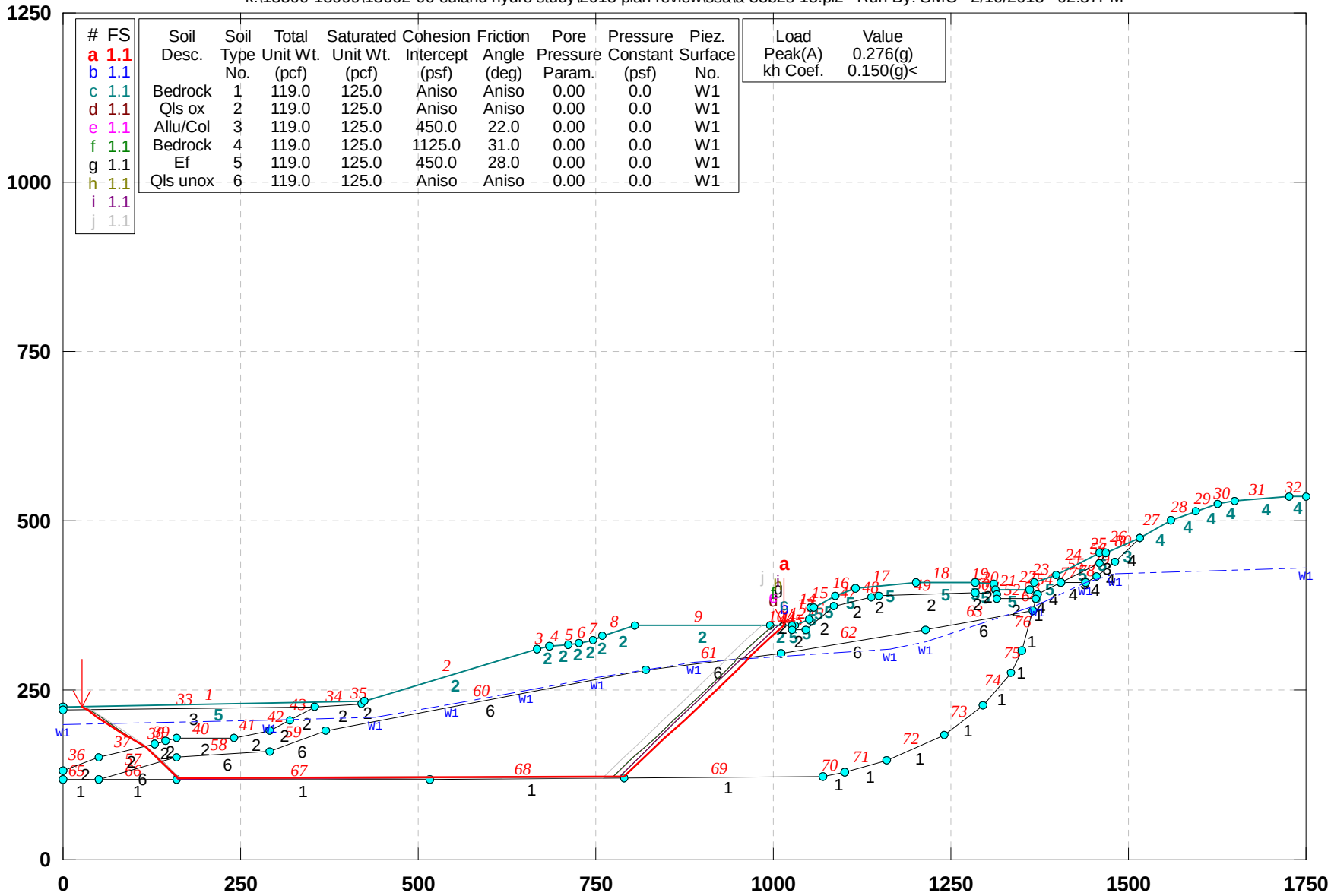
Point No.	X-Surf (ft)	Y-Surf (ft)
1	276.214	231.499
2	286.836	224.862
3	317.201	203.600
4	341.491	179.309
5	342.659	178.142
6	370.943	149.858
7	399.227	121.573
8	735.827	121.686
9	764.111	149.970
10	792.396	178.254
11	820.680	206.539
12	848.964	234.823
13	877.248	263.107
14	905.374	291.233
15	933.659	319.518
16	960.141	346.000

Factor of Safety
*** 1.658 ***

**** END OF GSTABL7 OUTPUT ****

13662-00, Section A-A',- -Seismic, deep .Qls, 2015 design

k:\13500-13999\13662-00 euland hydro study\2015 plan review\ssa\a-33b2s-15.pl2 Run By: SMC 2/10/2015 02:57PM



#	FS
a	1.1
b	1.1
c	1.1
d	1.1
e	1.1
f	1.1
g	1.1
h	1.1
i	1.1
j	1.1

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.
Bedrock	1	119.0	125.0	Aniso	Aniso	0.00	0.0	W1
Qls ox	2	119.0	125.0	Aniso	Aniso	0.00	0.0	W1
Allu/Col	3	119.0	125.0	450.0	22.0	0.00	0.0	W1
Bedrock	4	119.0	125.0	1125.0	31.0	0.00	0.0	W1
Ef	5	119.0	125.0	450.0	28.0	0.00	0.0	W1
Qls unox	6	119.0	125.0	Aniso	Aniso	0.00	0.0	W1

Load	Value
Peak(A)	0.276(g)
kh Coef.	0.150(g)<

GSTABL7 v.2 FSmin=1.1

Safety Factors Are Calculated By The Simplified Janbu Method for the case of c & phi both > 0

Figure E-2.2

***** GSTABL7 *****

** GSTABL7 by Garry H. Gregory, P.E. **

** Original Version 1.0, January 1996; Current Version 2.005, Sept. 2006 **

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SLOPE STABILITY ANALYSIS SYSTEM

Modified Bishop, Simplified Janbu, or GLE Method of Slices.
(Includes Spencer & Morgenstern-Price Type Analysis)
Including Pier/Pile, Reinforcement, Soil Nail, Tieback,
Nonlinear Undrained Shear Strength, Curved Phi Envelope,
Anisotropic Soil, Fiber-Reinforced Soil, Boundary Loads, Water
Surfaces, Pseudo-Static & Newmark Earthquake, and Applied Forces.

****

Analysis Run Date: 2/10/2015
Time of Run: 02:57PM
Run By: SMC
Input Data Filename: K:\13500-13999\13662-00 Euland Hydro Study\2015 Plan Review\SSA\a-33b2s-15.
Output Filename: K:\13500-13999\13662-00 Euland Hydro Study\2015 Plan Review\SSA\a-33b2s-15.OUT
Unit System: English
Plotted Output Filename: K:\13500-13999\13662-00 Euland Hydro Study\2015 Plan Review\SSA\a-33b2s-15.PLT
PROBLEM DESCRIPTION: 13662-00, Section A-A',-
-Seismic, deep .Qls, 2015 design

BOUNDARY COORDINATES
32 Top Boundaries
80 Total Boundaries

Boundary No.	X-Left (ft)	Y-Left (ft)	X-Right (ft)	Y-Right (ft)	Soil Type Below Bnd
1	0.00	225.00	425.00	235.00	5
2	425.00	235.00	667.00	310.00	2
3	667.00	310.00	685.00	314.00	2
4	685.00	314.00	710.00	317.00	2
5	710.00	317.00	727.00	320.00	2
6	727.00	320.00	745.00	324.00	2
7	745.00	324.00	758.00	330.00	2
8	758.00	330.00	805.00	346.00	2
9	805.00	346.00	995.00	346.00	2
10	995.00	346.00	1025.00	346.00	2
11	1025.00	346.00	1030.00	346.00	5
12	1030.00	346.00	1050.00	355.00	5
13	1050.00	355.00	1053.00	372.00	5
14	1053.00	372.00	1056.00	372.00	5
15	1056.00	372.00	1088.00	390.00	5
16	1088.00	390.00	1116.00	400.00	5
17	1116.00	400.00	1200.00	410.00	5
18	1200.00	410.00	1285.00	410.00	5
19	1285.00	410.00	1310.00	406.00	5
20	1310.00	406.00	1313.00	398.00	5
21	1313.00	398.00	1360.00	398.00	5
22	1360.00	398.00	1367.00	408.00	5
23	1367.00	408.00	1397.00	420.00	5
24	1397.00	420.00	1458.00	452.00	5
25	1458.00	452.00	1467.00	452.00	5
26	1467.00	452.00	1515.00	475.00	3
27	1515.00	475.00	1560.00	500.00	4
28	1560.00	500.00	1595.00	515.00	4
29	1595.00	515.00	1625.00	525.00	4
30	1625.00	525.00	1650.00	530.00	4
31	1650.00	530.00	1725.00	537.00	4
32	1725.00	537.00	1750.00	535.00	4
33	0.00	220.00	354.00	226.00	3
34	354.00	226.00	420.00	230.00	2
35	420.00	230.00	425.00	235.00	2
36	0.00	132.00	50.00	150.00	2
37	50.00	150.00	130.00	170.00	2
38	130.00	170.00	145.00	175.00	2
39	130.00	170.00	160.00	180.00	2
40	160.00	180.00	240.00	180.00	2

41	240.00	180.00	290.00	190.00	2
42	290.00	190.00	320.00	205.00	2
43	320.00	205.00	354.00	226.00	2
44	1025.00	346.00	1026.00	340.00	2
45	1026.00	340.00	1045.00	340.00	2
46	1045.00	340.00	1086.00	373.00	2
47	1086.00	373.00	1138.00	388.00	2
48	1138.00	388.00	1148.00	390.00	2
49	1148.00	390.00	1284.00	394.00	2
50	1284.00	394.00	1314.00	391.00	2
51	1314.00	391.00	1315.00	386.00	2
52	1315.00	386.00	1370.00	386.00	2
53	1370.00	386.00	1371.00	391.00	4
54	1371.00	391.00	1405.00	408.00	4
55	1405.00	408.00	1460.00	438.00	3
56	1460.00	438.00	1467.00	452.00	3
57	50.00	118.00	160.00	150.00	6
58	160.00	150.00	290.00	160.00	6
59	290.00	160.00	370.00	190.00	6
60	370.00	190.00	820.00	280.00	6
61	820.00	280.00	1010.00	305.00	6
62	1010.00	305.00	1215.00	340.00	6
63	1215.00	340.00	1364.00	368.00	6
64	1364.00	368.00	1370.00	386.00	1
65	0.00	118.00	50.00	118.00	1
66	50.00	118.00	160.00	118.00	1
67	160.00	118.00	517.00	119.00	1
68	517.00	119.00	790.00	120.00	1
69	790.00	120.00	1070.00	123.00	1
70	1070.00	123.00	1100.00	128.00	1
71	1100.00	128.00	1160.00	146.00	1
72	1160.00	146.00	1240.00	183.00	1
73	1240.00	183.00	1295.00	228.00	1
74	1295.00	228.00	1335.00	276.00	1
75	1335.00	276.00	1350.00	308.00	1
76	1350.00	308.00	1364.00	368.00	1
77	1405.00	408.00	1440.00	410.00	4
78	1440.00	410.00	1455.00	418.00	4
79	1455.00	418.00	1480.00	440.00	4
80	1480.00	440.00	1515.00	475.00	4

Default Y-Origin = 0.00(ft)
Default X-Plus Value = 0.00(ft)
Default Y-Plus Value = 0.00(ft)

ISOTROPIC SOIL PARAMETERS
6 Type(s) of Soil

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.
1	119.0	125.0	0.0	0.0	0.00	0.0	1
2	119.0	125.0	0.0	0.0	0.00	0.0	1
3	119.0	125.0	450.0	22.0	0.00	0.0	1
4	119.0	125.0	1125.0	31.0	0.00	0.0	1
5	119.0	125.0	450.0	28.0	0.00	0.0	1
6	119.0	125.0	0.0	0.0	0.00	0.0	1

ANISOTROPIC STRENGTH PARAMETERS
3 soil type(s)

Soil Type 1 Is Anisotropic
Number Of Direction Ranges Specified = 3

Direction Range No.	Counterclockwise Direction Limit (deg)	Cohesion Intercept (psf)	Friction Angle (deg)
1	0.0	1125.00	31.00
2	5.0	450.00	17.00
3	90.0	1125.00	31.00

Soil Type 2 Is Anisotropic
Number Of Direction Ranges Specified = 3

Direction Range No.	Counterclockwise Direction Limit (deg)	Cohesion Intercept (psf)	Friction Angle (deg)
1	-10.0	525.00	25.00

2	5.0	375.00	14.50
3	90.0	450.00	22.00

Soil Type 6 Is Anisotropic
Number Of Direction Ranges Specified = 3

Direction Range No.	Counterclockwise Direction Limit (deg)	Cohesion Intercept (psf)	Friction Angle (deg)
1	-10.0	750.00	31.00
2	5.0	375.00	14.50
3	90.0	450.00	22.00

ANISOTROPIC SOIL NOTES:
(1) An input value of 0.01 for C and/or Phi will cause Aniso C and/or Phi to be ignored in that range.
(2) An input value of 0.02 for Phi will set both Phi and C equal to zero, with no water weight in the tension crack.
(3) An input value of 0.03 for Phi will set both Phi and C equal to zero, with water weight in the tension crack.

1 PIEZOMETRIC SURFACE(S) SPECIFIED
Unit Weight of Water = 62.40 (pcf)
Piezometric Surface No. 1 Specified by 13 Coordinate Points
Pore Pressure Inclination Factor = 0.50

Point No.	X-Water (ft)	Y-Water (ft)
1	0.00	200.00
2	292.00	205.00
3	440.00	210.00
4	546.00	230.00
5	652.00	250.00
6	752.00	270.00
7	888.00	290.00
8	1164.00	310.00
9	1215.00	321.00
10	1371.00	376.00
11	1440.00	410.00
12	1480.00	422.00
13	1750.00	430.00

Specified Peak Ground Acceleration Coefficient (A) = 0.276(g)
Specified Horizontal Earthquake Coefficient (kh) = 0.150(g)
Specified Vertical Earthquake Coefficient (kv) = 0.000(g)
Specified Seismic Pore-Pressure Factor = 0.000
Janbus Empirical Coef is being used for the case of c & phi both > 0
A Critical Failure Surface Searching Method, Using A Random Technique For Generating Sliding Block Surfaces, Has Been Specified.
The Active And Passive Portions Of The Sliding Surfaces Are Generated According To The Rankine Theory.
3000 Trial Surfaces Have Been Generated.
2 Boxes Specified For Generation Of Central Block Base
Length Of Line Segments For Active And Passive Portions Of Sliding Block Is 40.0

Box No.	X-Left (ft)	Y-Left (ft)	X-Right (ft)	Y-Right (ft)	Height (ft)
1	160.00	120.00	517.00	121.00	2.00
2	620.00	121.00	790.00	122.50	2.00

Following Are Displayed The Ten Most Critical Of The Trial Failure Surfaces Evaluated. They Are Ordered - Most Critical First.
* * Safety Factors Are Calculated By The Simplified Janbu Method * *
Total Number of Trial Surfaces Attempted = 3000
Number of Trial Surfaces With Valid FS = 3000
Statistical Data On All Valid FS Values:
FS Max = 1.525 FS Min = 1.080 FS Ave = 1.214
Standard Deviation = 0.083 Coefficient of Variation = 6.81 %
Failure Surface Specified By 17 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	26.262	225.618
2	34.635	220.587
3	48.818	211.021
4	81.979	188.653

5	115.141	166.285
6	137.865	143.561
7	161.460	119.966
8	789.948	121.816
9	818.232	150.100
10	846.517	178.384
11	874.801	206.669
12	903.085	234.953
13	931.369	263.237
14	959.654	291.521
15	967.546	299.414
16	995.830	327.698
17	1014.132	346.000

Factor of Safety
*** 1.080 ***

Individual data on the 45 slices

Slice No.	Width (ft)	Weight (lbs)	Water Force Top (lbs)	Water Force Bot (lbs)	Tie Force Norm (lbs)	Tie Force Tan (lbs)	Earthquake Force Hor (lbs)	Earthquake Force Ver (lbs)	Surcharge Load (lbs)
1	8.4	2604.5	0.0	0.0	0.	0.	390.7	0.0	0.0
2	14.2	17177.9	0.0	0.0	0.	0.	2576.7	0.0	0.0
3	14.7	35515.7	0.0	0.0	0.	0.	5327.4	0.0	0.0
4	18.4	70561.5	0.0	8845.5	0.	0.	10584.2	0.0	0.0
5	33.2	201537.2	0.0	60440.9	0.	0.	30230.6	0.0	0.0
6	14.9	125915.6	0.0	56696.4	0.	0.	18887.3	0.0	0.0
7	7.9	78076.7	0.0	38029.3	0.	0.	11711.5	0.0	0.0
8	7.1	77673.6	0.0	39301.7	0.	0.	11651.0	0.0	0.0
9	15.0	184528.2	0.0	97523.5	0.	0.	27679.2	0.0	0.0
10	1.5	19496.2	0.0	10569.9	0.	0.	2924.4	0.0	0.0
11	78.5	1064014.9	0.0	*******	0.	0.	*******	0.0	0.0
12	50.0	685516.0	0.0	*******	0.	0.	*******	0.0	0.0
13	2.0	27552.4	0.0	10561.0	0.	0.	4132.9	0.0	0.0
14	28.0	386832.0	0.0	*******	0.	0.	58024.8	0.0	0.0
15	1.6	22446.3	0.0	8642.8	0.	0.	3366.9	0.0	0.0
16	32.4	450055.3	0.0	*******	0.	0.	67508.3	0.0	0.0
17	16.0	223407.6	0.0	86620.8	0.	0.	33511.1	0.0	0.0
18	50.0	702495.8	0.0	*******	0.	0.	*******	0.0	0.0
19	5.0	70611.8	0.0	27650.8	0.	0.	10591.8	0.0	0.0
20	15.0	216064.8	0.0	83240.9	0.	0.	32409.7	0.0	0.0
21	106.0	1766481.0	0.0	*******	0.	0.	*******	0.0	0.0
22	106.0	2189237.2	0.0	*******	0.	0.	*******	0.0	0.0
23	15.0	343926.2	0.0	*******	0.	0.	51588.9	0.0	0.0
24	18.0	422214.6	0.0	*******	0.	0.	63332.2	0.0	0.0
25	25.0	597256.6	0.0	*******	0.	0.	89588.5	0.0	0.0
26	17.0	412492.4	0.0	*******	0.	0.	61873.9	0.0	0.0
27	18.0	444508.6	0.0	*******	0.	0.	66676.3	0.0	0.0
28	7.0	175946.9	0.0	63234.8	0.	0.	26392.0	0.0	0.0
29	6.0	153025.9	0.0	55094.7	0.	0.	22953.9	0.0	0.0
30	31.9	841059.5	0.0	*******	0.	0.	*******	0.0	0.0
31	15.1	396649.6	0.0	*******	0.	0.	59497.4	0.0	0.0
32	13.2	329519.1	0.0	*******	0.	0.	49427.9	0.0	0.0
33	1.8	42373.9	0.0	19892.0	0.	0.	6356.1	0.0	0.0
34	26.5	589133.2	0.0	*******	0.	0.	88370.0	0.0	0.0
35	28.3	532256.6	0.0	*******	0.	0.	79838.5	0.0	0.0
36	13.2	214418.2	0.0	87311.7	0.	0.	32162.7	0.0	0.0
37	15.1	218582.8	0.0	83828.2	0.	0.	32787.4	0.0	0.0
38	2.7	36414.9	0.0	13144.7	0.	0.	5462.2	0.0	0.0
39	25.6	297032.2	0.0	93959.8	0.	0.	44554.8	0.0	0.0
40	28.3	233806.6	0.0	41793.7	0.	0.	35071.0	0.0	0.0
41	4.0	24768.7	0.0	639.3	0.	0.	3715.3	0.0	0.0
42	3.9	22735.2	0.0	0.0	0.	0.	3410.3	0.0	0.0
43	27.5	107351.1	0.0	0.0	0.	0.	16102.7	0.0	0.0
44	0.8	1849.4	0.0	0.0	0.	0.	277.4	0.0	0.0
45	18.3	19929.9	0.0	0.0	0.	0.	2989.5	0.0	0.0

Failure Surface Specified By 17 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	26.262	225.618
2	34.635	220.587

3	48.818	211.021
4	81.979	188.653
5	115.141	166.285
6	137.865	143.561
7	161.460	119.966
8	789.948	121.816
9	818.232	150.100
10	846.517	178.384
11	874.801	206.669
12	903.085	234.953
13	931.369	263.237
14	959.654	291.521
15	967.546	299.414
16	995.830	327.698
17	1014.132	346.000

Factor of Safety
*** 1.080 ***

Failure Surface Specified By 17 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	26.262	225.618
2	34.635	220.587
3	48.818	211.021
4	81.979	188.653
5	115.141	166.285
6	137.865	143.561
7	161.460	119.966
8	789.948	121.816
9	818.232	150.100
10	846.517	178.384
11	874.801	206.669
12	903.085	234.953
13	931.369	263.237
14	959.654	291.521
15	967.546	299.414
16	995.830	327.698
17	1014.132	346.000

Factor of Safety
*** 1.080 ***

Failure Surface Specified By 17 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	28.114	225.662
2	36.507	220.619
3	50.218	211.371
4	83.379	189.003
5	116.541	166.635
6	139.221	143.955
7	162.854	120.321
8	774.675	121.595
9	802.959	149.879
10	831.243	178.164
11	859.527	206.448
12	887.812	234.732
13	916.096	263.016
14	944.380	291.301
15	950.213	297.133
16	978.497	325.418
17	999.079	346.000

Factor of Safety
*** 1.082 ***

Failure Surface Specified By 17 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	28.114	225.662
2	36.507	220.619
3	50.218	211.371
4	83.379	189.003
5	116.541	166.635
6	139.221	143.955

7	162.854	120.321
8	774.675	121.595
9	802.959	149.879
10	831.243	178.164
11	859.527	206.448
12	887.812	234.732
13	916.096	263.016
14	944.380	291.301
15	950.213	297.133
16	978.497	325.418
17	999.079	346.000

Factor of Safety
*** 1.082 ***

Failure Surface Specified By 17 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	28.114	225.662
2	36.507	220.619
3	50.218	211.371
4	83.379	189.003
5	116.541	166.635
6	139.221	143.955
7	162.854	120.321
8	774.675	121.595
9	802.959	149.879
10	831.243	178.164
11	859.527	206.448
12	887.812	234.732
13	916.096	263.016
14	944.380	291.301
15	950.213	297.133
16	978.497	325.418
17	999.079	346.000

Factor of Safety
*** 1.082 ***

Failure Surface Specified By 17 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	26.130	225.615
2	34.501	220.585
3	48.718	210.996
4	81.879	188.628
5	115.041	166.260
6	137.768	143.533
7	162.157	119.144
8	782.311	122.705
9	810.596	150.990
10	838.880	179.274
11	867.164	207.558
12	895.448	235.843
13	923.733	264.127
14	952.017	292.411
15	957.728	298.122
16	986.012	326.406
17	1005.606	346.000

Factor of Safety
*** 1.085 ***

Failure Surface Specified By 17 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	26.130	225.615
2	34.501	220.585
3	48.718	210.996
4	81.879	188.628
5	115.041	166.260
6	137.768	143.533
7	162.157	119.144
8	782.311	122.705
9	810.596	150.990
10	838.880	179.274

11	867.164	207.558
12	895.448	235.843
13	923.733	264.127
14	952.017	292.411
15	957.728	298.122
16	986.012	326.406
17	1005.606	346.000

Factor of Safety
*** 1.085 ***

Failure Surface Specified By 17 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	26.130	225.615
2	34.501	220.585
3	48.718	210.996
4	81.879	188.628
5	115.041	166.260
6	137.768	143.533
7	162.157	119.144
8	782.311	122.705
9	810.596	150.990
10	838.880	179.274
11	867.164	207.558
12	895.448	235.843
13	923.733	264.127
14	952.017	292.411
15	957.728	298.122
16	986.012	326.406
17	1005.606	346.000

Factor of Safety
*** 1.085 ***

Failure Surface Specified By 17 Coordinate Points

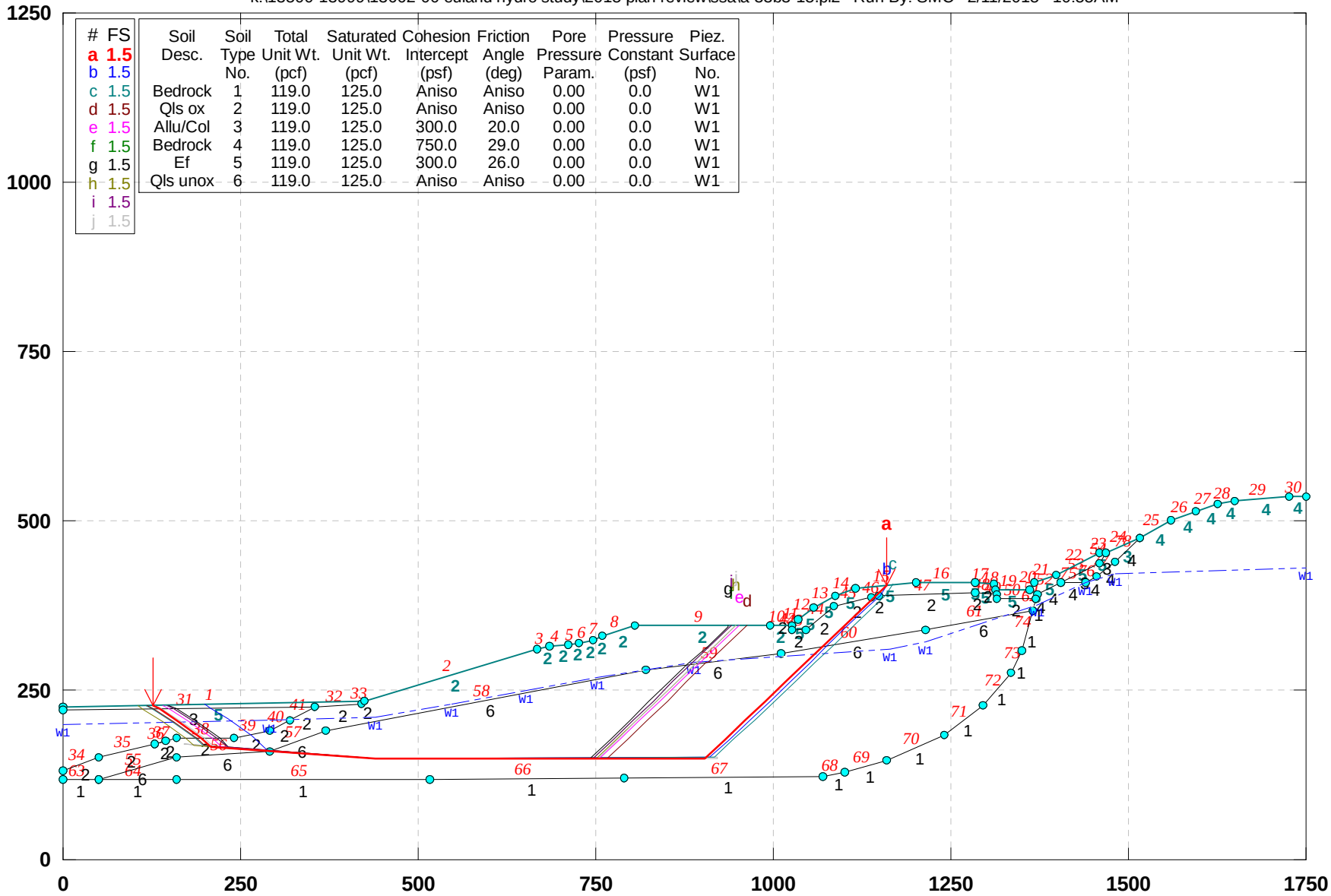
Point No.	X-Surf (ft)	Y-Surf (ft)
1	29.966	225.705
2	38.379	220.650
3	51.618	211.721
4	84.779	189.353
5	117.941	166.985
6	140.576	144.349
7	164.249	120.677
8	759.401	121.374
9	787.685	149.659
10	815.970	177.943
11	844.254	206.227
12	872.538	234.512
13	900.822	262.796
14	929.107	291.080
15	932.879	294.853
16	961.163	323.137
17	984.027	346.000

Factor of Safety
*** 1.085 ***

**** END OF GSTABL7 OUTPUT ****

13662-00, Section A-A',- -Static, shallow Qls, 2015 design

k:\13500-13999\13662-00 euland hydro study\2015 plan review\ssa\a-33b3-15.pl2 Run By: SMC 2/11/2015 10:55AM



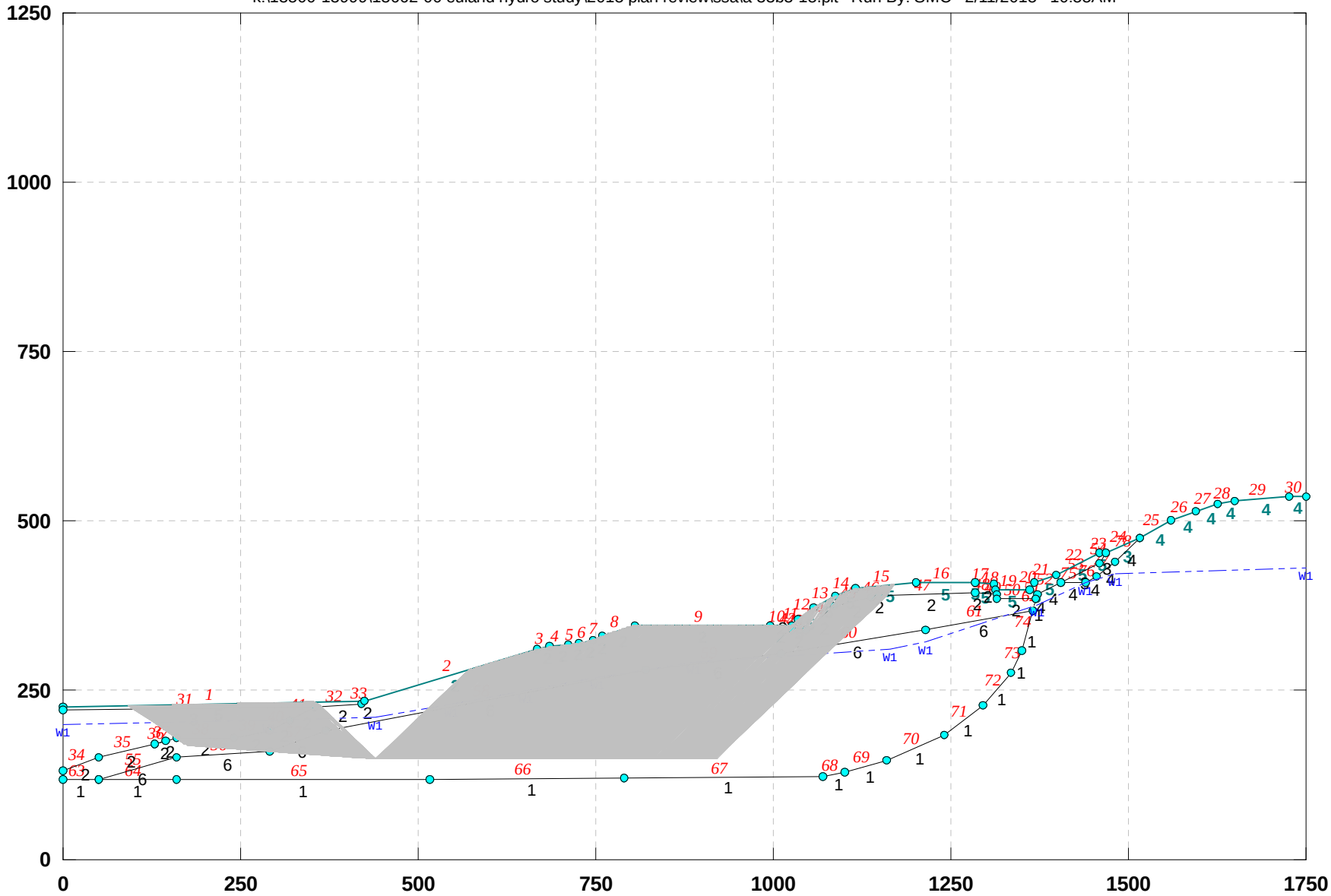
GSTABL7 v.2 FSmin=1.5

Safety Factors Are Calculated By GLE (Spencer`s) Method (0-2)

Figure E-3.1

13662-00, Section A-A',- -Static, shallow Qls, 2015 design

k:\13500-13999\13662-00 euland hydro study\2015 plan review\ssa\a-33b3-15.plt Run By: SMC 2/11/2015 10:55AM



***** GSTABL7 *****

** GSTABL7 by Garry H. Gregory, P.E. **

** Original Version 1.0, January 1996; Current Version 2.005, Sept. 2006 **

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SLOPE STABILITY ANALYSIS SYSTEM

Modified Bishop, Simplified Janbu, or GLE Method of Slices.
(Includes Spencer & Morgenstern-Price Type Analysis)
Including Pier/Pile, Reinforcement, Soil Nail, Tieback,
Nonlinear Undrained Shear Strength, Curved Phi Envelope,
Anisotropic Soil, Fiber-Reinforced Soil, Boundary Loads, Water
Surfaces, Pseudo-Static & Newmark Earthquake, and Applied Forces.

****

Analysis Run Date: 2/11/2015
Time of Run: 10:55AM
Run By: SMC
Input Data Filename: K:\13500-13999\13662-00 Euland Hydro Study\2015 Plan Review\SSA\a-33b3-15.
Output Filename: K:\13500-13999\13662-00 Euland Hydro Study\2015 Plan Review\SSA\a-33b3-15.OUT
Unit System: English
Plotted Output Filename: K:\13500-13999\13662-00 Euland Hydro Study\2015 Plan Review\SSA\a-33b3-15.PLT
PROBLEM DESCRIPTION: 13662-00, Section A-A',-
-Static, shallow Qls, 2015 design

BOUNDARY COORDINATES
30 Top Boundaries
78 Total Boundaries

Boundary No.	X-Left (ft)	Y-Left (ft)	X-Right (ft)	Y-Right (ft)	Soil Type Below Bnd
1	0.00	225.00	425.00	235.00	5
2	425.00	235.00	667.00	310.00	2
3	667.00	310.00	685.00	314.00	2
4	685.00	314.00	710.00	317.00	2
5	710.00	317.00	727.00	320.00	2
6	727.00	320.00	745.00	324.00	2
7	745.00	324.00	758.00	330.00	2
8	758.00	330.00	805.00	346.00	2
9	805.00	346.00	995.00	346.00	2
10	995.00	346.00	1025.00	346.00	2
11	1025.00	346.00	1035.00	355.00	5
12	1035.00	355.00	1056.00	372.00	5
13	1056.00	372.00	1088.00	390.00	5
14	1088.00	390.00	1116.00	400.00	5
15	1116.00	400.00	1200.00	410.00	5
16	1200.00	410.00	1285.00	410.00	5
17	1285.00	410.00	1310.00	406.00	5
18	1310.00	406.00	1313.00	398.00	5
19	1313.00	398.00	1360.00	398.00	5
20	1360.00	398.00	1367.00	408.00	5
21	1367.00	408.00	1397.00	420.00	5
22	1397.00	420.00	1458.00	452.00	5
23	1458.00	452.00	1467.00	452.00	5
24	1467.00	452.00	1515.00	475.00	3
25	1515.00	475.00	1560.00	500.00	4
26	1560.00	500.00	1595.00	515.00	4
27	1595.00	515.00	1625.00	525.00	4
28	1625.00	525.00	1650.00	530.00	4
29	1650.00	530.00	1725.00	537.00	4
30	1725.00	537.00	1750.00	535.00	4
31	0.00	220.00	354.00	226.00	3
32	354.00	226.00	420.00	230.00	2
33	420.00	230.00	425.00	235.00	2
34	0.00	132.00	50.00	150.00	2
35	50.00	150.00	130.00	170.00	2
36	130.00	170.00	145.00	175.00	2
37	130.00	170.00	160.00	180.00	2
38	160.00	180.00	240.00	180.00	2
39	240.00	180.00	290.00	190.00	2
40	290.00	190.00	320.00	205.00	2

41	320.00	205.00	354.00	226.00	2
42	1025.00	346.00	1026.00	340.00	2
43	1026.00	340.00	1045.00	340.00	2
44	1045.00	340.00	1086.00	373.00	2
45	1086.00	373.00	1138.00	388.00	2
46	1138.00	388.00	1148.00	390.00	2
47	1148.00	390.00	1284.00	394.00	2
48	1284.00	394.00	1314.00	391.00	2
49	1314.00	391.00	1315.00	386.00	2
50	1315.00	386.00	1370.00	386.00	2
51	1370.00	386.00	1371.00	391.00	4
52	1371.00	391.00	1405.00	408.00	4
53	1405.00	408.00	1460.00	438.00	3
54	1460.00	438.00	1467.00	452.00	3
55	50.00	118.00	160.00	150.00	6
56	160.00	150.00	290.00	160.00	6
57	290.00	160.00	370.00	190.00	6
58	370.00	190.00	820.00	280.00	6
59	820.00	280.00	1010.00	305.00	6
60	1010.00	305.00	1215.00	340.00	6
61	1215.00	340.00	1364.00	368.00	6
62	1364.00	368.00	1370.00	386.00	1
63	0.00	118.00	50.00	118.00	1
64	50.00	118.00	160.00	118.00	1
65	160.00	118.00	517.00	119.00	1
66	517.00	119.00	790.00	120.00	1
67	790.00	120.00	1070.00	123.00	1
68	1070.00	123.00	1100.00	128.00	1
69	1100.00	128.00	1160.00	146.00	1
70	1160.00	146.00	1240.00	183.00	1
71	1240.00	183.00	1295.00	228.00	1
72	1295.00	228.00	1335.00	276.00	1
73	1335.00	276.00	1350.00	308.00	1
74	1350.00	308.00	1364.00	368.00	1
75	1405.00	408.00	1440.00	410.00	4
76	1440.00	410.00	1455.00	418.00	4
77	1455.00	418.00	1480.00	440.00	4
78	1480.00	440.00	1515.00	475.00	4

Default Y-Origin = 0.00(ft)
Default X-Plus Value = 0.00(ft)
Default Y-Plus Value = 0.00(ft)

ISOTROPIC SOIL PARAMETERS
6 Type(s) of Soil

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.
1	119.0	125.0	0.0	0.0	0.00	0.0	1
2	119.0	125.0	0.0	0.0	0.00	0.0	1
3	119.0	125.0	300.0	20.0	0.00	0.0	1
4	119.0	125.0	750.0	29.0	0.00	0.0	1
5	119.0	125.0	300.0	26.0	0.00	0.0	1
6	119.0	125.0	0.0	0.0	0.00	0.0	1

ANISOTROPIC STRENGTH PARAMETERS
3 soil type(s)

Soil Type 1 Is Anisotropic
Number Of Direction Ranges Specified = 3

Direction Range No.	Counterclockwise Direction Limit (deg)	Cohesion Intercept (psf)	Friction Angle (deg)
1	0.0	750.00	29.00
2	5.0	300.00	15.00
3	90.0	750.00	29.00

Soil Type 2 Is Anisotropic
Number Of Direction Ranges Specified = 3

Direction Range No.	Counterclockwise Direction Limit (deg)	Cohesion Intercept (psf)	Friction Angle (deg)
1	-10.0	350.00	23.00
2	5.0	250.00	12.50
3	90.0	300.00	20.00

Soil Type 6 Is Anisotropic
Number Of Direction Ranges Specified = 3

Direction Range No.	Counterclockwise Direction Limit (deg)	Cohesion Intercept (psf)	Friction Angle (deg)
1	-10.0	500.00	29.00
2	5.0	250.00	12.50
3	90.0	300.00	20.00

ANISOTROPIC SOIL NOTES:
(1) An input value of 0.01 for C and/or Phi will cause Aniso C and/or Phi to be ignored in that range.
(2) An input value of 0.02 for Phi will set both Phi and C equal to zero, with no water weight in the tension crack.
(3) An input value of 0.03 for Phi will set both Phi and C equal to zero, with water weight in the tension crack.

1 PIEZOMETRIC SURFACE(S) SPECIFIED
Unit Weight of Water = 62.40 (pcf)
Piezometric Surface No. 1 Specified by 13 Coordinate Points
Pore Pressure Inclination Factor = 0.50

Point No.	X-Water (ft)	Y-Water (ft)
1	0.00	200.00
2	292.00	205.00
3	440.00	210.00
4	546.00	230.00
5	652.00	250.00
6	752.00	270.00
7	888.00	290.00
8	1164.00	310.00
9	1215.00	321.00
10	1371.00	376.00
11	1440.00	410.00
12	1480.00	422.00
13	1750.00	430.00

Janbus Empirical Coef is being used for the case of c & phi both > 0
A Critical Failure Surface Searching Method, Using A Random Technique For Generating Sliding Block Surfaces, Has Been Specified.
The Active And Passive Portions Of The Sliding Surfaces Are Generated According To The Rankine Theory.
3000 Trial Surfaces Have Been Generated.
3 Boxes Specified For Generation Of Central Block Base Length Of Line Segments For Active And Passive Portions Of Sliding Block Is 40.0

Box No.	X-Left (ft)	Y-Left (ft)	X-Right (ft)	Y-Right (ft)	Height (ft)
1	170.00	170.00	440.00	149.00	0.50
2	440.10	149.00	440.10	149.00	0.50
3	440.20	149.00	920.00	150.00	0.50

Factor Of Safety Calculation By GLE (Spencer`s) Method of Slices
Has Gone Through 20 Iterations

Theta (deg) (ki=1.0)	FOS (Moment) (Equil.)	FOS (Force) (Equil.)	Lambda
5.00	5.081	3.928	0.087
7.50	5.890	4.967	0.132
20.86	11.923	30.024	0.381
8.36	6.210	5.465	0.147
4.86	5.039	3.881	0.085
17.98	11.022	23.997	0.325
6.29	5.478	4.405	0.110
3.58	4.691	3.510	0.063
43.04	14.329	13.186	0.934
89.94	0.000	-0.013	*****
89.94	0.000	-0.013	*****
0.00	0.000	-0.025	0.000
89.94	0.000	-0.013	*****
89.94	0.000	-0.013	*****
0.00	3.881	2.759	0.000
89.94	0.000	-0.013	*****

89.94	0.000	-0.013	*****
0.00	3.881	2.759	0.000
89.94	0.000	-0.013	*****
89.94	0.000	-0.013	*****

The Trial Failure Surface In Question Is Defined
By The Following 14 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	344.63	233.11
2	355.83	226.11
3	360.00	221.94
4	388.28	193.66
5	403.99	177.95
6	432.27	149.67
7	440.10	149.20
8	461.61	149.13
9	489.89	177.42
10	518.18	205.70
11	535.59	223.12
12	563.88	251.40
13	592.16	279.69
14	602.48	290.00

Factor Of Safety Calculation By GLE (Spencer`s) Method of Slices
Has Gone Through 20 Iterations

Theta (deg) (ki=1.0)	FOS (Moment) (Equil.)	FOS (Force) (Equil.)	Lambda
5.00	3.101	2.615	0.087
7.50	3.320	3.034	0.132
12.30	3.735	4.372	0.218
9.49	3.496	3.474	0.167
8.67	3.424	3.279	0.153
9.95	3.537	3.596	0.175
9.45	3.493	3.466	0.167
9.50	3.497	3.477	0.167
2.71	2.907	2.321	0.047
12.08	3.717	4.286	0.214
5.93	3.181	2.757	0.104
7.39	3.310	3.012	0.130
11.97	3.708	4.243	0.212
9.57	3.504	3.497	0.169
8.82	3.437	3.312	0.155
9.89	3.531	3.579	0.174
9.49	3.497	3.476	0.167
9.52	3.499	3.483	0.168
89.94	36.168	-0.004	*****
9.47	3.495	3.471	0.167

The Trial Failure Surface In Question Is Defined
By The Following 15 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	345.97	233.14
2	357.09	226.19
3	361.12	222.16
4	389.40	193.88
5	405.57	177.71
6	433.85	149.43
7	440.10	148.91
8	509.40	149.23
9	537.68	177.51
10	565.97	205.79
11	594.25	234.08
12	595.22	235.04
13	623.50	263.33
14	651.79	291.61
15	671.08	310.91

Factor Of Safety Calculation By GLE (Spencer`s) Method of Slices
Has Gone Through 20 Iterations

Theta (deg)	FOS (Moment)	FOS (Force)

(ki=1.0)	(Equil.)	(Equil.)	Lambda
5.00	5.458	4.246	0.087
7.50	6.343	5.474	0.132
15.92	10.570	24.291	0.285
8.17	6.610	5.931	0.144
6.07	5.816	4.699	0.106
13.21	9.067	15.819	0.235
7.42	6.313	5.426	0.130
6.39	5.928	4.852	0.112
14.22	9.632	20.708	0.253
7.31	6.271	5.360	0.128
5.71	5.693	4.537	0.100
15.82	10.513	23.291	0.283
6.83	6.088	5.081	0.120
4.71	5.367	4.138	0.082
20.36	12.083	29.410	0.371
6.09	5.823	4.708	0.107
2.48	4.732	3.459	0.043
41.31	3.499	0.001	0.879
0.00	-0.252	-0.294	0.000
0.00	-0.252	0.001	0.000

The Trial Failure Surface In Question Is Defined
By The Following 15 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	336.34	232.91
2	347.58	225.89
3	350.50	223.84
4	353.67	220.68
5	381.95	192.39
6	395.81	178.53
7	424.10	150.25
8	440.10	149.24
9	454.58	148.92
10	482.86	177.20
11	511.15	205.48
12	527.08	221.42
13	555.36	249.70
14	583.65	277.98
15	592.61	286.94

Factor Of Safety Calculation By GLE (Spencer`s) Method of Slices
Has Gone Through 20 Iterations

Theta (deg) (ki=1.0)	FOS (Moment) (Equil.)	FOS (Force) (Equil.)	Lambda
5.00	2.803	2.425	0.087
7.50	2.869	2.762	0.132
8.81	2.892	2.981	0.155
8.02	2.879	2.845	0.141
8.05	2.880	2.850	0.141
8.44	-0.048	-0.041	0.148
8.34	-0.051	0.494	0.147
8.47	0.000	0.000	0.149
8.47	0.000	0.000	0.149
8.47	0.000	0.000	0.149
8.47	0.000	0.000	0.149
8.47	0.000	0.000	0.149
8.47	0.000	0.000	0.149
8.47	0.000	0.000	0.149
8.47	0.000	0.000	0.149
8.47	0.000	0.000	0.149
8.47	0.000	0.000	0.149
8.47	0.000	0.000	0.149
8.47	0.000	0.000	0.149

The Trial Failure Surface In Question Is Defined
By The Following 15 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	309.87	232.29

2	320.84	225.44
3	335.95	214.85
4	363.31	187.49
5	370.11	180.70
6	398.39	152.42
7	440.10	148.95
8	517.60	149.31
9	545.88	177.60
10	574.17	205.88
11	602.45	234.17
12	605.36	237.07
13	633.64	265.36
14	661.92	293.64
15	681.51	313.22

Factor Of Safety Calculation By GLE (Spencer`s) Method of Slices
Has Gone Through 20 Iterations

Theta (deg) (ki=1.0)	FOS (Moment) (Equil.)	FOS (Force) (Equil.)	Lambda
5.00	2.046	1.808	0.087
7.50	2.079	1.992	0.132
9.42	2.095	2.162	0.166
8.30	2.087	2.060	0.146
8.36	2.087	2.064	0.147
5.61	-0.016	-0.015	0.098
4.79	-0.015	-0.014	0.084
7.92	-0.016	-0.017	0.139
5.92	-0.016	-0.015	0.104
6.19	-0.016	-0.015	0.108
7.05	-0.016	-0.016	0.124
6.63	-0.016	-0.016	0.116
6.66	-0.016	-0.016	0.117
6.66	-0.016	-0.016	0.117
6.66	-0.016	-0.016	0.117
6.66	-0.016	-0.016	0.117
6.66	-0.016	-0.016	0.117
6.66	-0.016	-0.016	0.117
6.66	-0.016	-0.016	0.117
6.66	-0.016	-0.016	0.117

The Trial Failure Surface In Question Is Defined
By The Following 17 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	337.63	232.94
2	348.88	225.91
3	351.21	224.28
4	354.62	220.87
5	382.91	192.58
6	397.26	178.23
7	425.55	149.94
8	440.10	149.02
9	618.34	149.12
10	646.62	177.41
11	674.91	205.69
12	703.19	233.98
13	731.48	262.26
14	731.52	262.30
15	759.80	290.59
16	788.09	318.87
17	815.21	346.00

Factor Of Safety Calculation By GLE (Spencer`s) Method of Slices
Has Gone Through 20 Iterations

Theta (deg) (ki=1.0)	FOS (Moment) (Equil.)	FOS (Force) (Equil.)	Lambda
5.00	4.062	3.344	0.087
7.50	4.424	4.053	0.132
11.07	4.926	5.796	0.196
8.92	4.630	4.606	0.157
8.28	4.538	4.340	0.146

9.25	4.677	4.756	0.163
8.88	4.624	4.588	0.156
8.91	4.628	4.601	0.157
5.60	-0.119	-0.072	0.098
7.31	4.397	3.990	0.128
5.84	-0.127	-0.214	0.102
4.81	-0.001	0.000	0.084
4.46	-0.001	0.000	0.078
4.35	-0.001	0.000	0.076
4.31	-0.001	0.000	0.075
4.30	-0.001	0.000	0.075
4.30	-0.001	0.000	0.075
4.30	-0.001	0.000	0.075
4.29	-0.001	0.000	0.075
4.29	-0.001	0.000	0.075

The Trial Failure Surface In Question Is Defined
By The Following 15 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	333.10	232.84
2	344.31	225.84
3	348.73	222.74
4	351.27	220.20
5	379.56	191.91
6	392.52	178.95
7	420.80	150.67
8	440.10	148.87
9	474.96	148.85
10	503.25	177.14
11	531.53	205.42
12	552.64	226.53
13	580.92	254.81
14	609.21	283.10
15	622.24	296.13

Factor Of Safety Calculation By GLE (Spencer`s) Method of Slices
Has Gone Through 20 Iterations

Theta (deg) (ki=1.0)	FOS (Moment) (Equil.)	FOS (Force) (Equil.)	Lambda
5.00	2.705	2.354	0.087
7.50	2.790	2.674	0.132
9.15	2.835	2.938	0.161
8.12	2.808	2.766	0.143
8.17	2.809	2.774	0.143
7.24	-0.045	-0.034	0.127
7.21	0.587	0.599	0.126
8.52	2.819	2.831	0.150
89.94	0.000	-0.007	*****
49.58	0.000	-0.007	1.174
0.00	-0.071	-0.060	0.000
24.78	-0.002	-0.001	0.462
29.16	-0.001	-0.001	0.558
27.76	-0.002	-0.001	0.526
28.79	-0.002	-0.001	0.549
11.66	-0.001	0.000	0.206
0.00	-0.001	-0.001	0.000
0.00	-0.001	-0.001	0.000
0.00	-0.001	-0.001	0.000
0.00	-0.001	-0.001	0.000

The Trial Failure Surface In Question Is Defined
By The Following 15 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	318.41	232.49
2	329.46	225.58
3	340.65	217.75
4	368.84	189.56
5	378.28	180.12
6	406.56	151.84
7	440.10	148.91

8	524.63	149.03
9	552.91	177.32
10	581.20	205.60
11	609.48	233.89
12	614.49	238.90
13	642.78	267.18
14	671.06	295.47
15	690.22	314.63

Factor Of Safety Calculation By GLE (Spencer`s) Method of Slices
Has Gone Through 20 Iterations

Theta (deg) (ki=1.0)	FOS (Moment) (Equil.)	FOS (Force) (Equil.)	Lambda
5.00	6.039	4.548	0.087
7.50	7.275	6.001	0.132
27.07	15.761	40.714	0.511
8.77	8.055	7.153	0.154
3.52	-0.222	-0.111	0.061
2.53	5.112	3.665	0.044
3.43	0.000	0.000	0.060
3.42	0.001	0.000	0.060
3.42	0.000	0.000	0.060
3.42	0.000	0.000	0.060
3.42	0.002	0.000	0.060
40.17	0.000	0.000	0.844
36.52	0.000	0.000	0.741
29.02	0.000	0.000	0.555
26.53	0.000	0.000	0.499
25.69	0.000	0.000	0.481
25.41	0.000	0.000	0.475
25.32	0.000	0.000	0.473
25.29	0.000	0.000	0.473
25.28	0.000	0.000	0.472

The Trial Failure Surface In Question Is Defined
By The Following 15 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	340.45	233.01
2	351.73	225.96
3	352.76	225.24
4	356.72	221.28
5	385.00	193.00
6	399.64	178.37
7	427.92	150.08
8	440.10	148.85
9	450.13	149.01
10	478.41	177.29
11	506.70	205.58
12	521.40	220.28
13	549.68	248.56
14	577.97	276.85
15	586.02	284.90

Factor Of Safety Calculation By GLE (Spencer`s) Method of Slices
Has Gone Through 20 Iterations

Theta (deg) (ki=1.0)	FOS (Moment) (Equil.)	FOS (Force) (Equil.)	Lambda
5.00	3.761	3.934	0.087
7.50	3.186	4.517	0.132
4.50	3.876	3.836	0.079
3.62	4.078	3.673	0.063
4.92	3.779	3.919	0.086
4.48	3.882	3.831	0.078
4.48	3.880	3.833	0.078
10.10	0.001	5.343	0.178
4.55	3.865	3.845	0.080
2.73	4.279	3.523	0.048
5.22	3.710	3.980	0.091
4.35	3.911	3.807	0.076
4.38	3.903	3.813	0.077

```
40.95      -0.151     -0.008     0.868
 #################### SOME LINES SKIPPED ####################
     Following Are Displayed The Ten Most Critical Of The Trial
     Failure Surfaces Evaluated. They Are
     Ordered - Most Critical First.
     * * Safety Factors Are Calculated By GLE (Spencer`s) Method (0-2) * *
     Selected ki function = Bi-linear
     Selected Lambda Coefficient =  1.00
     Forces from Reinforcement, Piers/Piles, Soil Nails, and Applied Forces
     (if applicable) have been applied to the slice base(s)
     on which they intersect.
     Specified Tension Crack Water Force Factor =   0.000
     Total Number of Trial Surfaces Attempted =  3000
     WARNING! The Factor of Safety Calculation for one or More Trial Surfaces
     Did Not Converge in 20 Iterations.
     Number of Trial Surfaces with Non-Converged FS =   29
     Number of Trial Surfaces With Valid FS = 2971
     Percentage of Trial Surfaces With Non-Valid FS Solutions
     of the Total Attempted =   1.0 %
     Statistical Data On All Valid FS Values:
        FS Max =   8.514   FS Min =   1.505   FS Ave =   1.924
        Standard Deviation =    0.692   Coefficient of Variation =   35.97 %
                ((Simplified Janbu FS for Critical Surface =  1.447))
     Failure Surface Specified By 17 Coordinate Points
       Point      X-Surf      Y-Surf
        No.        (ft)        (ft)
         1        126.121      227.968
         2        135.204      222.292
         3        162.837      202.943
         4        195.603      180.000
         5        208.677      166.926
         6        440.100      148.751
         7        903.923      149.798
         8        932.207      178.083
         9        960.491      206.367
        10        988.775      234.651
        11       1017.060      262.936
        12       1045.344      291.220
        13       1069.238      315.114
        14       1097.522      343.398
        15       1125.807      371.682
        16       1143.155      389.031
        17       1159.276      405.152
     ***  FOS =     1.505   Theta (ki=1.0) =     3.90  ***
                          Lambda =   0.068
          Individual data on the    53  slices
                     Water  Water     Tie     Tie     Earthquake
                     Force  Force    Force   Force       Force   Surcharge
Slice  Width   Weight    Top    Bot     Norm     Tan     Hor     Ver    Load
 No.    (ft)    (lbs)   (lbs)  (lbs)    (lbs)   (lbs)   (lbs)   (lbs)   (lbs)
  1      9.1    3183.2     0.0     0.0       0.      0.     0.0     0.0      0.0
  2     27.6   52247.6     0.0     0.0       0.      0.     0.0     0.0      0.0
  3      0.2     666.6     0.0     0.0       0.      0.     0.0     0.0      0.0
  4     32.6  148788.7     0.0 28943.9       0.      0.     0.0     0.0      0.0
  5     13.1   89935.6     0.0 34605.8       0.      0.     0.0     0.0      0.0
  6     31.3  247893.0     0.0 74775.3       0.      0.     0.0     0.0      0.0
  7     50.0  421568.5     0.0 *******       0.      0.     0.0     0.0      0.0
  8      1.2   10410.9     0.0  3309.7       0.      0.     0.0     0.0      0.0
  9      0.8    7113.3     0.0  2263.0       0.      0.     0.0     0.0      0.0
 10     28.0  250716.2     0.0 80906.1       0.      0.     0.0     0.0      0.0
 11      1.6   14814.6     0.0  4850.0       0.      0.     0.0     0.0      0.0
 12     32.4  303137.8     0.0 *******       0.      0.     0.0     0.0      0.0
 13     16.0  154752.3     0.0 52527.5       0.      0.     0.0     0.0      0.0
 14     50.0  504752.5     0.0 *******       0.      0.     0.0     0.0      0.0
 15      5.0   52237.9     0.0 18540.3       0.      0.     0.0     0.0      0.0
 16     15.0  162470.5     0.0 56674.8       0.      0.     0.0     0.0      0.0
 17      0.1    1118.0     0.0   376.8       0.      0.     0.0     0.0      0.0
 18    105.9 1395610.8     0.0 *******       0.      0.     0.0     0.0      0.0
 19    106.0 1820447.0     0.0 *******       0.      0.     0.0     0.0      0.0
 20     15.0  291821.7     0.0 93868.9       0.      0.     0.0     0.0      0.0
```

21	18.0	359714.6	0.0	*******	0.	0.	0.0	0.0	0.0
22	25.0	510497.1	0.0	*******	0.	0.	0.0	0.0	0.0
23	17.0	353526.6	0.0	*******	0.	0.	0.0	0.0	0.0
24	18.0	382101.1	0.0	*******	0.	0.	0.0	0.0	0.0
25	7.0	151684.8	0.0	51344.9	0.	0.	0.0	0.0	0.0
26	6.0	132224.5	0.0	44815.2	0.	0.	0.0	0.0	0.0
27	47.0	1088982.8	0.0	*******	0.	0.	0.0	0.0	0.0
28	15.0	362102.4	0.0	*******	0.	0.	0.0	0.0	0.0
29	68.0	1643198.8	0.0	*******	0.	0.	0.0	0.0	0.0
30	15.9	385213.7	0.0	*******	0.	0.	0.0	0.0	0.0
31	1.9	45353.7	0.0	23291.7	0.	0.	0.0	0.0	0.0
32	26.4	589132.0	0.0	*******	0.	0.	0.0	0.0	0.0
33	28.3	534845.2	0.0	*******	0.	0.	0.0	0.0	0.0
34	28.3	435205.0	0.0	*******	0.	0.	0.0	0.0	0.0
35	6.2	82399.2	0.0	32742.8	0.	0.	0.0	0.0	0.0
36	15.0	178740.2	0.0	65908.4	0.	0.	0.0	0.0	0.0
37	7.1	74425.0	0.0	24662.5	0.	0.	0.0	0.0	0.0
38	7.9	76291.3	0.0	22877.1	0.	0.	0.0	0.0	0.0
39	1.0	9104.9	0.0	2516.2	0.	0.	0.0	0.0	0.0
40	9.0	81158.8	0.0	18972.1	0.	0.	0.0	0.0	0.0
41	10.0	87980.3	0.0	13324.5	0.	0.	0.0	0.0	0.0
42	0.3	2976.3	0.0	313.1	0.	0.	0.0	0.0	0.0
43	10.7	90543.0	0.0	4914.6	0.	0.	0.0	0.0	0.0
44	0.3	2678.7	0.0	4.2	0.	0.	0.0	0.0	0.0
45	12.9	103227.2	0.0	0.0	0.	0.	0.0	0.0	0.0
46	16.8	121009.5	0.0	0.0	0.	0.	0.0	0.0	0.0
47	2.0	13461.7	0.0	0.0	0.	0.	0.0	0.0	0.0
48	9.5	60128.5	0.0	0.0	0.	0.	0.0	0.0	0.0
49	18.5	96889.2	0.0	0.0	0.	0.	0.0	0.0	0.0
50	9.8	39449.1	0.0	0.0	0.	0.	0.0	0.0	0.0
51	12.2	34990.2	0.0	0.0	0.	0.	0.0	0.0	0.0
52	5.2	10105.5	0.0	0.0	0.	0.	0.0	0.0	0.0
53	16.1	13622.2	0.0	0.0	0.	0.	0.0	0.0	0.0

Failure Surface Specified By 17 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	198.978	229.682
2	208.808	223.539
3	231.338	207.764
4	264.104	184.821
5	288.306	160.618
6	440.100	148.879
7	910.482	149.870
8	938.767	178.154
9	967.051	206.438
10	995.335	234.723
11	1023.619	263.007
12	1051.904	291.291
13	1077.062	316.450
14	1105.347	344.734
15	1133.631	373.018
16	1150.692	390.079
17	1160.177	405.259

*** FOS = 1.510 Theta (ki=1.0) = 4.57 ***
Lambda = 0.080

Failure Surface Specified By 17 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	116.001	227.729
2	124.981	222.118
3	152.366	202.943
4	185.132	180.000
5	197.208	167.925
6	440.100	148.922
7	917.277	150.015
8	945.561	178.299
9	973.845	206.584
10	1002.129	234.868
11	1030.414	263.152
12	1058.698	291.436

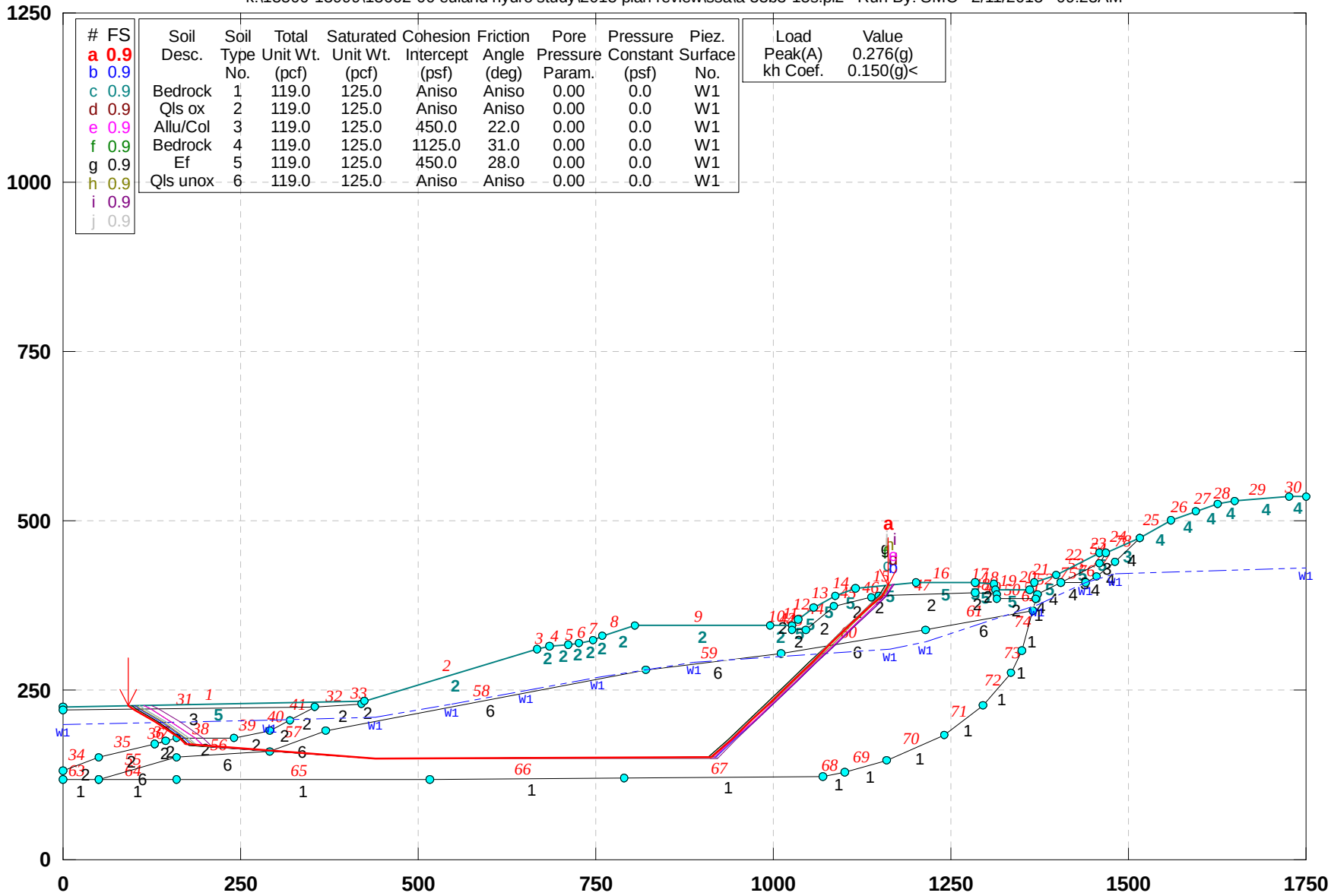
```
      13       1085.080      317.819
      14       1113.364      346.103
      15       1141.649      374.387
      16       1157.542      390.281
      17       1167.442      406.124
***  FOS =     1.520   Theta (ki=1.0) =     5.23  ***
                     Lambda =   0.091
Failure Surface Specified By 15 Coordinate Points
  Point      X-Surf      Y-Surf
   No.        (ft)        (ft)
    1        118.699      227.793
    2        127.707      222.165
    3        155.158      202.943
    4        187.924      180.000
    5        200.108      167.816
    6        440.100      148.988
    7        764.996      149.432
    8        793.281      177.716
    9        821.565      206.000
   10        849.849      234.284
   11        878.133      262.569
   12        906.417      290.853
   13        907.014      291.449
   14        935.298      319.733
   15        961.565      346.000
***  FOS =     1.535   Theta (ki=1.0) =     6.19  ***
                     Lambda =   0.109
Failure Surface Specified By 14 Coordinate Points
  Point      X-Surf      Y-Surf
   No.        (ft)        (ft)
    1        139.693      228.287
    2        148.915      222.524
    3        176.880      202.943
    4        209.646      180.000
    5        223.575      166.071
    6        440.100      148.885
    7        754.219      149.529
    8        782.504      177.813
    9        810.788      206.097
   10        839.072      234.382
   11        867.356      262.666
   12        894.492      289.802
   13        922.776      318.086
   14        950.691      346.000
***  FOS =     1.535   Theta (ki=1.0) =     6.54  ***
                     Lambda =   0.115
Failure Surface Specified By 15 Coordinate Points
  Point      X-Surf      Y-Surf
   No.        (ft)        (ft)
    1        146.278      228.442
    2        155.568      222.637
    3        183.694      202.943
    4        216.460      180.000
    5        231.221      165.239
    6        440.100      149.104
    7        745.317      149.718
    8        773.601      178.002
    9        801.885      206.286
   10        830.170      234.570
   11        858.454      262.855
   12        884.023      288.424
   13        912.307      316.708
   14        940.592      344.993
   15        941.599      346.000
***  FOS =     1.536   Theta (ki=1.0) =     6.61  ***
                     Lambda =   0.116
Failure Surface Specified By 15 Coordinate Points
  Point      X-Surf      Y-Surf
   No.        (ft)        (ft)
    1        149.812      228.525
```

```
        2        159.139      222.697
        3        187.351      202.943
        4        220.117      180.000
        5        235.045      165.072
        6        440.100      149.214
        7        740.866      149.812
        8        769.150      178.096
        9        797.434      206.381
       10        825.718      234.665
       11        854.003      262.949
       12        878.789      287.735
       13        907.073      316.020
       14        935.357      344.304
       15        937.053      346.000
***  FOS =     1.537   Theta (ki=1.0) =     6.70  ***
                     Lambda =   0.117
Failure Surface Specified By 15 Coordinate Points
  Point      X-Surf      Y-Surf
   No.        (ft)        (ft)
        1        104.020      227.448
        2        112.877      221.913
        3        139.969      202.943
        4        172.735      180.000
        5        183.760      168.975
        6        440.100      149.071
        7        750.940      149.493
        8        779.224      177.777
        9        807.508      206.062
       10        835.792      234.346
       11        864.077      262.630
       12        890.756      289.310
       13        919.041      317.594
       14        947.325      345.879
       15        947.446      346.000
***  FOS =     1.537   Theta (ki=1.0) =     6.45  ***
                     Lambda =   0.113
Failure Surface Specified By 15 Coordinate Points
  Point      X-Surf      Y-Surf
   No.        (ft)        (ft)
        1        146.278      228.442
        2        155.568      222.637
        3        183.694      202.943
        4        216.460      180.000
        5        231.221      165.239
        6        440.100      149.104
        7        745.317      149.718
        8        773.601      178.002
        9        801.885      206.286
       10        830.170      234.570
       11        858.454      262.855
       12        884.023      288.424
       13        912.307      316.708
       14        940.592      344.993
       15        941.599      346.000
***  FOS =     1.537   Theta (ki=1.0) =     6.66  ***
                     Lambda =   0.117
Failure Surface Specified By 15 Coordinate Points
  Point      X-Surf      Y-Surf
   No.        (ft)        (ft)
        1        128.819      228.031
        2        137.930      222.338
        3        165.629      202.943
        4        198.395      180.000
        5        211.578      166.817
        6        440.100      148.817
        7        751.642      149.715
        8        779.927      177.999
        9        808.211      206.284
       10        836.495      234.568
       11        864.779      262.852
```

```
        12        891.310      289.383
        13        919.594      317.667
        14        947.879      345.951
        15        947.927      346.000
    ***  FOS =     1.538   Theta (ki=1.0) =     6.62  ***
                       Lambda =   0.116
              **** END OF GSTABL7 OUTPUT ****
```

13662-00, Section A-A',- -Seismic, shallow Qls, 2015 design

k:\13500-13999\13662-00 euland hydro study\2015 plan review\ssa\a-33b3-15s.pl2 Run By: SMC 2/11/2015 09:23AM



#	FS
a	0.9
b	0.9
c	0.9
d	0.9
e	0.9
f	0.9
g	0.9
h	0.9
i	0.9
j	0.9

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.
Bedrock	1	119.0	125.0	Aniso	Aniso	0.00	0.0	W1
Qls ox	2	119.0	125.0	Aniso	Aniso	0.00	0.0	W1
Allu/Col	3	119.0	125.0	450.0	22.0	0.00	0.0	W1
Bedrock	4	119.0	125.0	1125.0	31.0	0.00	0.0	W1
Ef	5	119.0	125.0	450.0	28.0	0.00	0.0	W1
Qls unox	6	119.0	125.0	Aniso	Aniso	0.00	0.0	W1

Load	Value
Peak(A)	0.276(g)
kh Coef.	0.150(g)<

GSTABL7 v.2 FSmin=0.9

Safety Factors Are Calculated By GLE (Spencer`s) Method (0-2)

Figure E-3.2

***** GSTABL7 *****

** GSTABL7 by Garry H. Gregory, P.E. **

** Original Version 1.0, January 1996; Current Version 2.005, Sept. 2006 **

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****

SLOPE STABILITY ANALYSIS SYSTEM

Modified Bishop, Simplified Janbu, or GLE Method of Slices.
(Includes Spencer & Morgenstern-Price Type Analysis)
Including Pier/Pile, Reinforcement, Soil Nail, Tieback,
Nonlinear Undrained Shear Strength, Curved Phi Envelope,
Anisotropic Soil, Fiber-Reinforced Soil, Boundary Loads, Water
Surfaces, Pseudo-Static & Newmark Earthquake, and Applied Forces.

****

Analysis Run Date: 2/11/2015
Time of Run: 09:23AM
Run By: SMC
Input Data Filename: K:\13500-13999\13662-00 Euland Hydro Study\2015 Plan Review\SSA\a-33b3-15s.
Output Filename: K:\13500-13999\13662-00 Euland Hydro Study\2015 Plan Review\SSA\a-33b3-15s.OUT
Unit System: English
Plotted Output Filename: K:\13500-13999\13662-00 Euland Hydro Study\2015 Plan Review\SSA\a-33b3-15s.PLT
PROBLEM DESCRIPTION: 13662-00, Section A-A',-
-Seismic, shallow Qls, 2015 design

BOUNDARY COORDINATES
30 Top Boundaries
78 Total Boundaries

Boundary No.	X-Left (ft)	Y-Left (ft)	X-Right (ft)	Y-Right (ft)	Soil Type Below Bnd
1	0.00	225.00	425.00	235.00	5
2	425.00	235.00	667.00	310.00	2
3	667.00	310.00	685.00	314.00	2
4	685.00	314.00	710.00	317.00	2
5	710.00	317.00	727.00	320.00	2
6	727.00	320.00	745.00	324.00	2
7	745.00	324.00	758.00	330.00	2
8	758.00	330.00	805.00	346.00	2
9	805.00	346.00	995.00	346.00	2
10	995.00	346.00	1025.00	346.00	2
11	1025.00	346.00	1035.00	355.00	5
12	1035.00	355.00	1056.00	372.00	5
13	1056.00	372.00	1088.00	390.00	5
14	1088.00	390.00	1116.00	400.00	5
15	1116.00	400.00	1200.00	410.00	5
16	1200.00	410.00	1285.00	410.00	5
17	1285.00	410.00	1310.00	406.00	5
18	1310.00	406.00	1313.00	398.00	5
19	1313.00	398.00	1360.00	398.00	5
20	1360.00	398.00	1367.00	408.00	5
21	1367.00	408.00	1397.00	420.00	5
22	1397.00	420.00	1458.00	452.00	5
23	1458.00	452.00	1467.00	452.00	5
24	1467.00	452.00	1515.00	475.00	3
25	1515.00	475.00	1560.00	500.00	4
26	1560.00	500.00	1595.00	515.00	4
27	1595.00	515.00	1625.00	525.00	4
28	1625.00	525.00	1650.00	530.00	4
29	1650.00	530.00	1725.00	537.00	4
30	1725.00	537.00	1750.00	535.00	4
31	0.00	220.00	354.00	226.00	3
32	354.00	226.00	420.00	230.00	2
33	420.00	230.00	425.00	235.00	2
34	0.00	132.00	50.00	150.00	2
35	50.00	150.00	130.00	170.00	2
36	130.00	170.00	145.00	175.00	2
37	130.00	170.00	160.00	180.00	2
38	160.00	180.00	240.00	180.00	2
39	240.00	180.00	290.00	190.00	2
40	290.00	190.00	320.00	205.00	2

41	320.00	205.00	354.00	226.00	2
42	1025.00	346.00	1026.00	340.00	2
43	1026.00	340.00	1045.00	340.00	2
44	1045.00	340.00	1086.00	373.00	2
45	1086.00	373.00	1138.00	388.00	2
46	1138.00	388.00	1148.00	390.00	2
47	1148.00	390.00	1284.00	394.00	2
48	1284.00	394.00	1314.00	391.00	2
49	1314.00	391.00	1315.00	386.00	2
50	1315.00	386.00	1370.00	386.00	2
51	1370.00	386.00	1371.00	391.00	4
52	1371.00	391.00	1405.00	408.00	4
53	1405.00	408.00	1460.00	438.00	3
54	1460.00	438.00	1467.00	452.00	3
55	50.00	118.00	160.00	150.00	6
56	160.00	150.00	290.00	160.00	6
57	290.00	160.00	370.00	190.00	6
58	370.00	190.00	820.00	280.00	6
59	820.00	280.00	1010.00	305.00	6
60	1010.00	305.00	1215.00	340.00	6
61	1215.00	340.00	1364.00	368.00	6
62	1364.00	368.00	1370.00	386.00	1
63	0.00	118.00	50.00	118.00	1
64	50.00	118.00	160.00	118.00	1
65	160.00	118.00	517.00	119.00	1
66	517.00	119.00	790.00	120.00	1
67	790.00	120.00	1070.00	123.00	1
68	1070.00	123.00	1100.00	128.00	1
69	1100.00	128.00	1160.00	146.00	1
70	1160.00	146.00	1240.00	183.00	1
71	1240.00	183.00	1295.00	228.00	1
72	1295.00	228.00	1335.00	276.00	1
73	1335.00	276.00	1350.00	308.00	1
74	1350.00	308.00	1364.00	368.00	1
75	1405.00	408.00	1440.00	410.00	4
76	1440.00	410.00	1455.00	418.00	4
77	1455.00	418.00	1480.00	440.00	4
78	1480.00	440.00	1515.00	475.00	4

Default Y-Origin = 0.00(ft)
Default X-Plus Value = 0.00(ft)
Default Y-Plus Value = 0.00(ft)

ISOTROPIC SOIL PARAMETERS
6 Type(s) of Soil

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.
1	119.0	125.0	0.0	0.0	0.00	0.0	1
2	119.0	125.0	0.0	0.0	0.00	0.0	1
3	119.0	125.0	450.0	22.0	0.00	0.0	1
4	119.0	125.0	1125.0	31.0	0.00	0.0	1
5	119.0	125.0	450.0	28.0	0.00	0.0	1
6	119.0	125.0	0.0	0.0	0.00	0.0	1

ANISOTROPIC STRENGTH PARAMETERS
3 soil type(s)

Soil Type 1 Is Anisotropic
Number Of Direction Ranges Specified = 3

Direction Range No.	Counterclockwise Direction Limit (deg)	Cohesion Intercept (psf)	Friction Angle (deg)
1	0.0	1125.00	31.00
2	5.0	450.00	17.00
3	90.0	1125.00	31.00

Soil Type 2 Is Anisotropic
Number Of Direction Ranges Specified = 3

Direction Range No.	Counterclockwise Direction Limit (deg)	Cohesion Intercept (psf)	Friction Angle (deg)
1	-10.0	525.00	25.00
2	5.0	375.00	14.50
3	90.0	450.00	22.00

Soil Type 6 Is Anisotropic
Number Of Direction Ranges Specified = 3

Direction Range No.	Counterclockwise Direction Limit (deg)	Cohesion Intercept (psf)	Friction Angle (deg)
1	-10.0	750.00	31.00
2	5.0	375.00	14.50
3	90.0	450.00	22.00

ANISOTROPIC SOIL NOTES:
(1) An input value of 0.01 for C and/or Phi will cause Aniso C and/or Phi to be ignored in that range.
(2) An input value of 0.02 for Phi will set both Phi and C equal to zero, with no water weight in the tension crack.
(3) An input value of 0.03 for Phi will set both Phi and C equal to zero, with water weight in the tension crack.

1 PIEZOMETRIC SURFACE(S) SPECIFIED
Unit Weight of Water = 62.40 (pcf)
Piezometric Surface No. 1 Specified by 13 Coordinate Points
Pore Pressure Inclination Factor = 0.50

Point No.	X-Water (ft)	Y-Water (ft)
1	0.00	200.00
2	292.00	205.00
3	440.00	210.00
4	546.00	230.00
5	652.00	250.00
6	752.00	270.00
7	888.00	290.00
8	1164.00	310.00
9	1215.00	321.00
10	1371.00	376.00
11	1440.00	410.00
12	1480.00	422.00
13	1750.00	430.00

Specified Peak Ground Acceleration Coefficient (A) = 0.276(g)
Specified Horizontal Earthquake Coefficient (kh) = 0.150(g)
Specified Vertical Earthquake Coefficient (kv) = 0.000(g)
Specified Seismic Pore-Pressure Factor = 0.000
Janbus Empirical Coef is being used for the case of c & phi both > 0
A Critical Failure Surface Searching Method, Using A Random Technique For Generating Sliding Block Surfaces, Has Been Specified.
The Active And Passive Portions Of The Sliding Surfaces Are Generated According To The Rankine Theory.
3000 Trial Surfaces Have Been Generated.
3 Boxes Specified For Generation Of Central Block Base
Length Of Line Segments For Active And Passive Portions Of Sliding Block Is 40.0

Box No.	X-Left (ft)	Y-Left (ft)	X-Right (ft)	Y-Right (ft)	Height (ft)
1	170.00	170.00	440.00	149.00	0.50
2	440.10	149.00	440.10	149.00	0.50
3	440.20	149.00	920.00	150.00	0.50

Factor Of Safety Calculation By GLE (Spencer`s) Method of Slices
Has Gone Through 20 Iterations

Theta (deg) (ki=1.0)	FOS (Moment) (Equil.)	FOS (Force) (Equil.)	Lambda
5.00	3.263	2.900	0.087
7.50	3.632	3.385	0.132
14.63	5.101	6.368	0.261
9.05	3.894	3.774	0.159
7.84	3.687	3.463	0.138
11.35	4.337	4.539	0.201
9.13	3.908	3.795	0.161
9.45	3.967	3.888	0.166
10.43	4.151	4.199	0.184
9.94	4.057	4.037	0.175
9.97	4.063	4.047	0.176
0.00	0.002	-0.012	0.000

0.00	0.002	-0.012	0.000
5.81	3.376	3.043	0.102
0.00	0.002	0.001	0.000
0.00	0.002	0.001	0.000
0.00	1.517	1.254	0.000
9.85	4.040	4.008	0.174
11.64	4.398	4.659	0.206
10.11	4.089	4.091	0.178

The Trial Failure Surface In Question Is Defined
By The Following 14 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	351.00	233.26
2	362.25	226.50
3	365.68	223.08
4	393.96	194.79
5	411.63	177.12
6	439.92	148.84
7	440.10	148.92
8	452.70	148.82
9	480.99	177.11
10	509.27	205.39
11	524.85	220.97
12	553.14	249.25
13	581.42	277.54
14	590.03	286.14

Factor Of Safety Calculation By GLE (Spencer`s) Method of Slices
Has Gone Through 20 Iterations

Theta (deg) (ki=1.0)	FOS (Moment) (Equil.)	FOS (Force) (Equil.)	Lambda
5.00	3.737	3.261	0.087
7.50	4.242	3.878	0.132
18.36	8.483	19.689	0.332
7.96	4.346	4.016	0.140
4.88	3.716	3.237	0.085
18.11	8.324	18.015	0.327
5.71	3.871	3.417	0.100
2.32	3.296	2.781	0.041
40.50	8.163	45.095	0.854
3.02	3.403	2.893	0.053
0.00	2.979	2.463	0.000
89.94	0.000	-0.025	*****
89.94	0.000	-0.025	*****
0.00	2.979	2.463	0.000
89.94	0.000	-0.025	*****
89.94	0.000	-0.025	*****
0.00	-0.031	0.000	0.000
36.44	-0.027	0.000	0.738
89.94	0.000	-0.025	*****
55.29	0.000	-0.002	1.444

The Trial Failure Surface In Question Is Defined
By The Following 14 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	347.07	233.17
2	358.54	226.28
3	362.40	222.42
4	390.68	194.14
5	407.28	177.53
6	435.57	149.25
7	440.10	149.07
8	441.22	149.20
9	469.51	177.48
10	497.79	205.77
11	510.03	218.01
12	538.32	246.29
13	566.60	274.58
14	572.85	280.82

Factor Of Safety Calculation By GLE (Spencer`s) Method of Slices

Has Gone Through 20 Iterations

Theta (deg) (ki=1.0)	FOS (Moment) (Equil.)	FOS (Force) (Equil.)	Lambda
5.00	3.367	3.028	0.087
7.50	3.745	3.553	0.132
11.82	4.559	5.047	0.209
9.12	4.024	4.000	0.161
8.39	3.895	3.787	0.148
9.64	4.121	4.168	0.170
9.14	4.027	4.005	0.161
9.19	4.036	4.020	0.162
6.61	3.603	3.347	0.116
10.27	4.241	4.390	0.181
8.48	3.910	3.811	0.149
8.84	3.974	3.915	0.156
9.54	4.101	4.133	0.168
9.21	4.040	4.028	0.162
9.23	4.043	4.033	0.162
89.94	0.000	-0.005	*****
89.94	-0.031	-0.005	*****
36.44	0.003	0.001	0.738
22.48	5.272	0.000	0.414
41.09	-0.037	-0.001	0.872

The Trial Failure Surface In Question Is Defined
By The Following 14 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	343.42	233.08
2	355.09	226.07
3	359.35	221.81
4	387.63	193.53
5	403.46	177.70
6	431.74	149.42
7	440.10	148.96
8	445.68	149.10
9	473.96	177.39
10	502.24	205.67
11	515.72	219.14
12	544.00	247.43
13	572.28	275.71
14	579.43	282.86

Following Are Displayed The Ten Most Critical Of The Trial
Failure Surfaces Evaluated. They Are
Ordered - Most Critical First.
* * Safety Factors Are Calculated By GLE (Spencer`s) Method (0-2) * *
Selected ki function = Bi-linear
Selected Lambda Coefficient = 1.00
Forces from Reinforcement, Piers/Piles, Soil Nails, and Applied Forces
(if applicable) have been applied to the slice base(s)
on which they intersect.
Specified Tension Crack Water Force Factor = 0.000
Total Number of Trial Surfaces Attempted = 3000
WARNING! The Factor of Safety Calculation for one or More Trial Surfaces
Did Not Converge in 20 Iterations.
Number of Trial Surfaces with Non-Converged FS = 3
Number of Trial Surfaces With Valid FS = 2997
Percentage of Trial Surfaces With Non-Valid FS Solutions
of the Total Attempted = 0.1 %
Statistical Data On All Valid FS Values:
FS Max = 3.491 FS Min = 0.898 FS Ave = 1.152
Standard Deviation = 0.326 Coefficient of Variation = 28.34 %
((Simplified Janbu FS for Critical Surface = 0.910))
Failure Surface Specified By 17 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	92.207	227.170
2	101.282	221.717
3	129.968	202.368
4	163.130	180.000

5	173.214	169.916
6	440.100	148.786
7	912.122	149.888
8	940.407	178.172
9	968.691	206.456
10	996.975	234.740
11	1025.259	263.025
12	1053.544	291.309
13	1079.018	316.784
14	1107.303	345.068
15	1135.587	373.352
16	1152.363	390.128
17	1161.553	405.423

*** FOS = 0.898 Theta (ki=1.0) = 5.28 ***

Lambda = 0.092

Individual data on the 54 slices

Slice No.	Width (ft)	Weight (lbs)	Water Force Top (lbs)	Water Force Bot (lbs)	Tie Force Norm (lbs)	Tie Force Tan (lbs)	Earthquake Force Hor (lbs)	Earthquake Force Ver (lbs)	Surcharge Load (lbs)
1	9.1	3059.8	0.0	0.0	0.	0.	459.0	0.0	0.0
2	28.7	53520.3	0.0	0.0	0.	0.	8028.0	0.0	0.0
3	0.2	630.5	0.0	0.0	0.	0.	94.6	0.0	0.0
4	33.0	148676.0	0.0	28265.5	0.	0.	22301.4	0.0	0.0
5	10.1	66485.6	0.0	24842.5	0.	0.	9972.8	0.0	0.0
6	66.8	511961.1	0.0	*******	0.	0.	76794.2	0.0	0.0
7	50.0	420651.4	0.0	*******	0.	0.	63097.7	0.0	0.0
8	1.5	12896.2	0.0	4096.1	0.	0.	1934.4	0.0	0.0
9	0.5	4595.4	0.0	1460.6	0.	0.	689.3	0.0	0.0
10	28.0	250294.2	0.0	80699.0	0.	0.	37544.1	0.0	0.0
11	1.6	14792.1	0.0	4839.0	0.	0.	2218.8	0.0	0.0
12	32.4	302732.1	0.0	*******	0.	0.	45409.8	0.0	0.0
13	16.0	154582.8	0.0	52445.3	0.	0.	23187.4	0.0	0.0
14	50.0	504354.3	0.0	*******	0.	0.	75653.1	0.0	0.0
15	5.0	52209.0	0.0	18526.8	0.	0.	7831.4	0.0	0.0
16	15.0	162396.0	0.0	56640.3	0.	0.	24359.4	0.0	0.0
17	0.1	1117.6	0.0	376.6	0.	0.	167.6	0.0	0.0
18	105.9	1395096.0	0.0	*******	0.	0.	*******	0.0	0.0
19	106.0	1819825.8	0.0	*******	0.	0.	*******	0.0	0.0
20	15.0	291725.2	0.0	93821.6	0.	0.	43758.8	0.0	0.0
21	18.0	359596.0	0.0	*******	0.	0.	53939.4	0.0	0.0
22	25.0	510327.4	0.0	*******	0.	0.	76549.1	0.0	0.0
23	17.0	353407.7	0.0	*******	0.	0.	53011.2	0.0	0.0
24	18.0	381972.3	0.0	*******	0.	0.	57295.9	0.0	0.0
25	7.0	151633.9	0.0	51320.0	0.	0.	22745.1	0.0	0.0
26	6.0	132180.5	0.0	44793.5	0.	0.	19827.1	0.0	0.0
27	47.0	1088626.2	0.0	*******	0.	0.	*******	0.0	0.0
28	15.0	361984.2	0.0	*******	0.	0.	54297.6	0.0	0.0
29	68.0	1642636.2	0.0	*******	0.	0.	*******	0.0	0.0
30	17.8	430634.1	0.0	*******	0.	0.	64595.1	0.0	0.0
31	6.3	152757.4	0.0	55676.7	0.	0.	22913.6	0.0	0.0
32	28.3	634271.4	0.0	*******	0.	0.	95140.7	0.0	0.0
33	28.3	534630.8	0.0	*******	0.	0.	80194.6	0.0	0.0
34	26.3	407850.1	0.0	*******	0.	0.	61177.5	0.0	0.0
35	2.0	27140.4	0.0	11138.8	0.	0.	4071.1	0.0	0.0
36	13.0	166805.4	0.0	65477.7	0.	0.	25020.8	0.0	0.0
37	15.0	165921.8	0.0	58247.7	0.	0.	24888.3	0.0	0.0
38	0.3	2626.4	0.0	845.7	0.	0.	394.0	0.0	0.0
39	0.7	7492.2	0.0	2384.4	0.	0.	1123.8	0.0	0.0
40	9.0	90282.1	0.0	25396.9	0.	0.	13542.3	0.0	0.0
41	10.0	98117.3	0.0	20463.1	0.	0.	14717.6	0.0	0.0
42	8.5	81593.2	0.0	11016.0	0.	0.	12239.0	0.0	0.0
43	2.5	23076.7	0.0	2064.2	0.	0.	3461.5	0.0	0.0
44	9.1	82488.5	0.0	3354.8	0.	0.	12373.3	0.0	0.0
45	14.0	118247.2	0.0	0.0	0.	0.	17737.1	0.0	0.0
46	7.0	55362.4	0.0	0.0	0.	0.	8304.4	0.0	0.0
47	2.0	15392.0	0.0	0.0	0.	0.	2308.8	0.0	0.0
48	19.3	133297.3	0.0	0.0	0.	0.	19994.6	0.0	0.0
49	8.7	50745.2	0.0	0.0	0.	0.	7611.8	0.0	0.0
50	19.6	87657.2	0.0	0.0	0.	0.	13148.6	0.0	0.0

51	2.4	8016.1	0.0	0.0	0.	0.	1202.4	0.0	0.0
52	10.0	26714.5	0.0	0.0	0.	0.	4007.2	0.0	0.0
53	4.4	8371.0	0.0	0.0	0.	0.	1255.7	0.0	0.0
54	9.2	7764.9	0.0	0.0	0.	0.	1164.7	0.0	0.0

Failure Surface Specified By 17 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	99.537	227.342
2	108.690	221.842
3	137.563	202.368
4	170.724	180.000
5	181.387	169.337
6	440.100	149.245
7	919.151	150.107
8	947.435	178.391
9	975.719	206.675
10	1004.003	234.960
11	1032.288	263.244
12	1060.572	291.528
13	1087.229	318.185
14	1115.514	346.470
15	1143.798	374.754
16	1159.379	390.335
17	1168.976	406.307

*** FOS = 0.898 Theta (ki=1.0) = 5.42 ***
Lambda = 0.095

Failure Surface Specified By 17 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	106.114	227.497
2	115.337	221.955
3	144.376	202.368
4	177.538	180.000
5	189.034	168.504
6	440.100	148.964
7	910.248	149.796
8	938.532	178.080
9	966.817	206.364
10	995.101	234.649
11	1023.385	262.933
12	1051.669	291.217
13	1076.869	316.417
14	1105.153	344.701
15	1133.438	372.985
16	1150.527	390.074
17	1159.610	405.192

*** FOS = 0.898 Theta (ki=1.0) = 4.73 ***
Lambda = 0.083

Failure Surface Specified By 17 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	113.444	227.669
2	122.745	222.080
3	151.971	202.368
4	185.132	180.000
5	197.208	167.925
6	440.100	148.922
7	917.277	150.015
8	945.561	178.299
9	973.845	206.584
10	1002.129	234.868
11	1030.414	263.152
12	1058.698	291.436
13	1085.080	317.819
14	1113.364	346.103
15	1141.649	374.387
16	1157.542	390.281
17	1167.033	406.075

*** FOS = 0.900 Theta (ki=1.0) = 5.23 ***
Lambda = 0.092

```
Failure Surface Specified By 17 Coordinate Points
  Point      X-Surf      Y-Surf
   No.        (ft)        (ft)
    1        113.444      227.669
    2        122.745      222.080
    3        151.971      202.368
    4        185.132      180.000
    5        197.208      167.925
    6        440.100      148.922
    7        917.277      150.015
    8        945.561      178.299
    9        973.845      206.584
   10       1002.129      234.868
   11       1030.414      263.152
   12       1058.698      291.436
   13       1085.080      317.819
   14       1113.364      346.103
   15       1141.649      374.387
   16       1157.542      390.281
   17       1167.033      406.075
***  FOS =     0.901   Theta (ki=1.0) =     5.27  ***
                     Lambda =   0.092
Failure Surface Specified By 17 Coordinate Points
  Point      X-Surf      Y-Surf
   No.        (ft)        (ft)
    1         95.254      227.241
    2        104.362      221.769
    3        133.125      202.368
    4        166.287      180.000
    5        177.037      169.250
    6        440.100      148.896
    7        907.671      149.982
    8        935.955      178.266
    9        964.240      206.551
   10        992.524      234.835
   11       1020.808      263.119
   12       1049.092      291.403
   13       1073.537      315.848
   14       1101.821      344.132
   15       1130.105      372.416
   16       1147.611      389.922
   17       1156.569      404.830
***  FOS =     0.902   Theta (ki=1.0) =     5.23  ***
                     Lambda =   0.091
Failure Surface Specified By 17 Coordinate Points
  Point      X-Surf      Y-Surf
   No.        (ft)        (ft)
    1         95.254      227.241
    2        104.362      221.769
    3        133.125      202.368
    4        166.287      180.000
    5        177.037      169.250
    6        440.100      148.896
    7        907.671      149.982
    8        935.955      178.266
    9        964.240      206.551
   10        992.524      234.835
   11       1020.808      263.119
   12       1049.092      291.403
   13       1073.537      315.848
   14       1101.821      344.132
   15       1130.105      372.416
   16       1147.611      389.922
   17       1156.569      404.830
***  FOS =     0.903   Theta (ki=1.0) =     5.24  ***
                     Lambda =   0.092
Failure Surface Specified By 17 Coordinate Points
  Point      X-Surf      Y-Surf
   No.        (ft)        (ft)
    1        102.584      227.414
```

```
      2        111.770      221.894
      3        140.720      202.368
      4        173.881      180.000
      5        185.211      168.670
      6        440.100      148.854
      7        914.699      150.201
      8        942.984      178.486
      9        971.268      206.770
     10        999.552      235.054
     11       1027.836      263.338
     12       1056.121      291.623
     13       1081.748      317.250
     14       1110.032      345.534
     15       1138.316      373.818
     16       1154.695      390.197
     17       1164.020      405.717
***  FOS =     0.903   Theta (ki=1.0) =     5.47  ***
                     Lambda =   0.096
Failure Surface Specified By 17 Coordinate Points
  Point      X-Surf      Y-Surf
   No.        (ft)        (ft)
      1        124.304      227.925
      2        133.721      222.266
      3        163.222      202.368
      4        196.383      180.000
      5        209.205      167.179
      6        440.100      148.990
      7        919.854      149.829
      8        948.138      178.113
      9        976.422      206.397
     10       1004.706      234.682
     11       1032.991      262.966
     12       1061.275      291.250
     13       1088.412      318.387
     14       1116.697      346.672
     15       1144.981      374.956
     16       1160.389      390.364
     17       1170.045      406.434
***  FOS =     0.903   Theta (ki=1.0) =     5.38  ***
                     Lambda =   0.094
Failure Surface Specified By 17 Coordinate Points
  Point      X-Surf      Y-Surf
   No.        (ft)        (ft)
      1        106.114      227.497
      2        115.337      221.955
      3        144.376      202.368
      4        177.538      180.000
      5        189.034      168.504
      6        440.100      148.964
      7        910.248      149.796
      8        938.532      178.080
      9        966.817      206.364
     10        995.101      234.649
     11       1023.385      262.933
     12       1051.669      291.217
     13       1076.869      316.417
     14       1105.153      344.701
     15       1133.438      372.985
     16       1150.527      390.074
     17       1159.610      405.192
***  FOS =     0.904   Theta (ki=1.0) =     5.29  ***
                     Lambda =   0.093
           **** END OF GSTABL7 OUTPUT ****
```

***** GSTABL7 *****

** GSTABL7 by Garry H. Gregory, P.E. **

** Original Version 1.0, January 1996; Current Version 2.005, Sept. 2006 **

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SLOPE STABILITY ANALYSIS SYSTEM

Modified Bishop, Simplified Janbu, or GLE Method of Slices.
(Includes Spencer & Morgenstern-Price Type Analysis)
Including Pier/Pile, Reinforcement, Soil Nail, Tieback,
Nonlinear Undrained Shear Strength, Curved Phi Envelope,
Anisotropic Soil, Fiber-Reinforced Soil, Boundary Loads, Water
Surfaces, Pseudo-Static & Newmark Earthquake, and Applied Forces.

****

Analysis Run Date: 2/11/2015
Time of Run: 10:59AM
Run By: SMC
Input Data Filename: K:\13500-13999\13662-00 Euland Hydro Study\2015 Plan Review\SSA\a-33b3-15s Surface #1.
Output Filename: K:\13500-13999\13662-00 Euland Hydro Study\2015 Plan Review\SSA\a-33b3-15s Surface #1.OUT
Unit System: English
Plotted Output Filename: K:\13500-13999\13662-00 Euland Hydro Study\2015 Plan Review\SSA\a-33b3-15s Surface #1.PLT
PROBLEM DESCRIPTION: 13662-00, Section A-A',-
-Seismic, shallow Qls, 2015 design

BOUNDARY COORDINATES
30 Top Boundaries
78 Total Boundaries

Boundary No.	X-Left (ft)	Y-Left (ft)	X-Right (ft)	Y-Right (ft)	Soil Type Below Bnd
1	0.00	225.00	425.00	235.00	5
2	425.00	235.00	667.00	310.00	2
3	667.00	310.00	685.00	314.00	2
4	685.00	314.00	710.00	317.00	2
5	710.00	317.00	727.00	320.00	2
6	727.00	320.00	745.00	324.00	2
7	745.00	324.00	758.00	330.00	2
8	758.00	330.00	805.00	346.00	2
9	805.00	346.00	995.00	346.00	2
10	995.00	346.00	1025.00	346.00	2
11	1025.00	346.00	1035.00	355.00	5
12	1035.00	355.00	1056.00	372.00	5
13	1056.00	372.00	1088.00	390.00	5
14	1088.00	390.00	1116.00	400.00	5
15	1116.00	400.00	1200.00	410.00	5
16	1200.00	410.00	1285.00	410.00	5
17	1285.00	410.00	1310.00	406.00	5
18	1310.00	406.00	1313.00	398.00	5
19	1313.00	398.00	1360.00	398.00	5
20	1360.00	398.00	1367.00	408.00	5
21	1367.00	408.00	1397.00	420.00	5
22	1397.00	420.00	1458.00	452.00	5
23	1458.00	452.00	1467.00	452.00	5
24	1467.00	452.00	1515.00	475.00	3
25	1515.00	475.00	1560.00	500.00	4
26	1560.00	500.00	1595.00	515.00	4
27	1595.00	515.00	1625.00	525.00	4
28	1625.00	525.00	1650.00	530.00	4
29	1650.00	530.00	1725.00	537.00	4
30	1725.00	537.00	1750.00	535.00	4
31	0.00	220.00	354.00	226.00	3
32	354.00	226.00	420.00	230.00	2
33	420.00	230.00	425.00	235.00	2
34	0.00	132.00	50.00	150.00	2
35	50.00	150.00	130.00	170.00	2
36	130.00	170.00	145.00	175.00	2
37	130.00	170.00	160.00	180.00	2
38	160.00	180.00	240.00	180.00	2
39	240.00	180.00	290.00	190.00	2

40	290.00	190.00	320.00	205.00	2
41	320.00	205.00	354.00	226.00	2
42	1025.00	346.00	1026.00	340.00	2
43	1026.00	340.00	1045.00	340.00	2
44	1045.00	340.00	1086.00	373.00	2
45	1086.00	373.00	1138.00	388.00	2
46	1138.00	388.00	1148.00	390.00	2
47	1148.00	390.00	1284.00	394.00	2
48	1284.00	394.00	1314.00	391.00	2
49	1314.00	391.00	1315.00	386.00	2
50	1315.00	386.00	1370.00	386.00	2
51	1370.00	386.00	1371.00	391.00	4
52	1371.00	391.00	1405.00	408.00	4
53	1405.00	408.00	1460.00	438.00	3
54	1460.00	438.00	1467.00	452.00	3
55	50.00	118.00	160.00	150.00	6
56	160.00	150.00	290.00	160.00	6
57	290.00	160.00	370.00	190.00	6
58	370.00	190.00	820.00	280.00	6
59	820.00	280.00	1010.00	305.00	6
60	1010.00	305.00	1215.00	340.00	6
61	1215.00	340.00	1364.00	368.00	6
62	1364.00	368.00	1370.00	386.00	1
63	0.00	118.00	50.00	118.00	1
64	50.00	118.00	160.00	118.00	1
65	160.00	118.00	517.00	119.00	1
66	517.00	119.00	790.00	120.00	1
67	790.00	120.00	1070.00	123.00	1
68	1070.00	123.00	1100.00	128.00	1
69	1100.00	128.00	1160.00	146.00	1
70	1160.00	146.00	1240.00	183.00	1
71	1240.00	183.00	1295.00	228.00	1
72	1295.00	228.00	1335.00	276.00	1
73	1335.00	276.00	1350.00	308.00	1
74	1350.00	308.00	1364.00	368.00	1
75	1405.00	408.00	1440.00	410.00	4
76	1440.00	410.00	1455.00	418.00	4
77	1455.00	418.00	1480.00	440.00	4
78	1480.00	440.00	1515.00	475.00	4

Default Y-Origin = 0.00(ft)
Default X-Plus Value = 0.00(ft)
Default Y-Plus Value = 0.00(ft)

ISOTROPIC SOIL PARAMETERS
6 Type(s) of Soil

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.
1	119.0	125.0	0.0	0.0	0.00	0.0	1
2	119.0	125.0	0.0	0.0	0.00	0.0	1
3	119.0	125.0	450.0	22.0	0.00	0.0	1
4	119.0	125.0	1125.0	31.0	0.00	0.0	1
5	119.0	125.0	450.0	28.0	0.00	0.0	1
6	119.0	125.0	0.0	0.0	0.00	0.0	1

ANISOTROPIC STRENGTH PARAMETERS
3 soil type(s)

Soil Type 1 Is Anisotropic
Number Of Direction Ranges Specified = 3

Direction Range No.	Counterclockwise Direction Limit (deg)	Cohesion Intercept (psf)	Friction Angle (deg)
1	0.0	1125.00	31.00
2	5.0	450.00	17.00
3	90.0	1125.00	31.00

Soil Type 2 Is Anisotropic
Number Of Direction Ranges Specified = 3

Direction Range No.	Counterclockwise Direction Limit (deg)	Cohesion Intercept (psf)	Friction Angle (deg)
1	-10.0	525.00	25.00
2	5.0	375.00	14.50

```
    3              90.0             450.00         22.00
Soil Type  6 Is Anisotropic
Number Of Direction Ranges Specified =  3
Direction    Counterclockwise     Cohesion     Friction
  Range       Direction Limit    Intercept       Angle
   No.            (deg)            (psf)         (deg)
    1            -10.0             750.00         31.00
    2              5.0             375.00         14.50
    3             90.0             450.00         22.00
ANISOTROPIC SOIL NOTES:
   (1) An input value of 0.01 for C and/or Phi will cause Aniso
       C and/or Phi to be ignored in that range.
   (2) An input value of 0.02 for Phi will set both Phi and
       C equal to zero, with no water weight in the tension crack.
   (3) An input value of 0.03 for Phi will set both Phi and
       C equal to zero, with water weight in the tension crack.
1 PIEZOMETRIC SURFACE(S) SPECIFIED
Unit Weight of Water =  62.40 (pcf)
Piezometric Surface No.  1 Specified by 13 Coordinate Points
Pore Pressure Inclination Factor =  0.50
  Point      X-Water     Y-Water
   No.         (ft)        (ft)
    1          0.00      200.00
    2        292.00      205.00
    3        440.00      210.00
    4        546.00      230.00
    5        652.00      250.00
    6        752.00      270.00
    7        888.00      290.00
    8       1164.00      310.00
    9       1215.00      321.00
   10       1371.00      376.00
   11       1440.00      410.00
   12       1480.00      422.00
   13       1750.00      430.00
Specified Peak Ground Acceleration Coefficient (A) =   0.276(g)
Specified Horizontal Earthquake Coefficient (kh) =   0.150(g)
Specified Vertical Earthquake Coefficient (kv) =   0.000(g)
Specified Seismic Pore-Pressure Factor =   0.000
Trial Failure Surface Specified By 17 Coordinate Points
  Point      X-Surf      Y-Surf
   No.        (ft)        (ft)
    1         92.207      227.170
    2        101.282      221.717
    3        129.968      202.368
    4        163.130      180.000
    5        173.214      169.916
    6        440.100      148.786
    7        912.122      149.888
    8        940.407      178.172
    9        968.691      206.456
   10        996.975      234.740
   11       1025.259      263.025
   12       1053.544      291.309
   13       1079.018      316.784
   14       1107.303      345.068
   15       1135.587      373.352
   16       1152.363      390.128
   17       1161.553      405.423
 Theta        FOS        FOS
 (deg)      (Moment)   (Force)
(ki=1.0)    (Equil.)   (Equil.)   Lambda
  5.00       0.901      0.896     0.087
  7.50       0.871      0.922     0.132
  5.32       0.898      0.899     0.093
  5.27       0.898      0.898     0.092
         ((Simplified Janbu FS for Specified Surface =  0.913))
Factor Of Safety For The Preceding Specified Surface =  0.898
Theta (ki = 1.0) =   5.27 Deg    Lambda =   0.092
Factor Of Safety Is Calculated By GLE (Spencer`s) Method (0-2)
```

Forces from Reinforcement, Piers/Piles, Applied Forces, and Soil Nails
(if applicable) have been applied to the slice base(s)
on which they intersect.
Selected ki function = Bi-linear
Selected Lambda Coefficient = 1.00
Tension Crack Water Force = 0.00(lbs)
Specified Tension Crack Water Force Factor = 0.000
Depth of Tension Crack (zo) at Center of Last Slice = 7.100(ft)

*** Line of Thrust and Slice Force Data ***

Slice No.	X Coord.	Y Coord.	L/H	Side Force (lbs)	ki	Force Angle (Deg)	Vert. Shear Force(lbs)
1	101.28	224.86	0.555	17934.	1.000	5.27	1653.8
2	129.97	215.10	0.496	145790.	1.000	5.27	13444.2
3	130.17	215.01	0.495	147136.	1.000	5.27	13568.3
4	163.13	201.56	0.442	418653.	1.000	5.27	38606.5
5	173.21	192.01	0.374	683167.	1.000	5.27	62998.9
6	240.00	194.51	0.453	786607.	1.000	5.27	72537.8
7	290.00	195.94	0.496	867411.	1.000	5.27	79989.2
8	291.47	195.98	0.497	869838.	1.000	5.27	80213.0
9	292.00	195.99	0.497	870703.	1.000	5.27	80292.8
10	320.00	196.65	0.517	917169.	1.000	5.27	84577.6
11	321.62	196.69	0.518	919878.	1.000	5.27	84827.4
12	354.00	197.36	0.537	974492.	1.000	5.27	89863.8
13	370.00	197.66	0.546	1001810.	1.000	5.27	92382.9
14	420.00	198.48	0.569	1088590.	1.000	5.27	100385.4
15	425.00	198.55	0.571	1097386.	1.000	5.27	101196.5
16	440.00	198.72	0.549	1124801.	1.000	5.27	103724.6
17	440.10	198.72	0.549	1124992.	1.000	5.27	103742.3
18	546.00	203.88	0.444	1228344.	1.000	5.27	113272.9
19	652.00	208.17	0.377	1352832.	1.000	5.27	124752.7
20	667.00	208.71	0.370	1372181.	1.000	5.27	126537.0
21	685.00	209.36	0.364	1395664.	1.000	5.27	128702.6
22	710.00	210.29	0.363	1427871.	1.000	5.27	131672.5
23	727.00	210.94	0.361	1449382.	1.000	5.27	133656.2
24	745.00	211.64	0.356	1472112.	1.000	5.27	135752.3
25	752.00	211.91	0.351	1481070.	1.000	5.27	136578.3
26	758.00	212.13	0.347	1488816.	1.000	5.27	137292.7
27	805.00	213.77	0.327	1553630.	1.000	5.27	143269.5
28	820.00	214.27	0.329	1575113.	1.000	5.27	145250.7
29	888.00	216.88	0.342	1665253.	1.000	5.27	153563.0
30	905.81	217.65	0.346	1686747.	1.000	5.27	155545.0
31	912.12	217.93	0.347	1694273.	1.000	5.27	156239.1
32	940.41	240.11	0.369	1250930.	1.000	5.27	115355.8
33	968.69	262.54	0.402	888838.	0.902	4.75	66653.9
34	995.00	283.38	0.447	622220.	0.779	4.11	34798.4
35	996.98	284.94	0.451	604912.	0.770	4.06	33032.8
36	1010.00	295.04	0.481	500273.	0.709	3.74	23165.8
37	1025.00	306.01	0.520	400303.	0.638	3.37	15048.8
38	1025.26	306.19	0.519	398769.	0.637	3.36	14934.3
39	1026.00	306.71	0.517	394395.	0.634	3.35	14610.3
40	1035.00	312.99	0.489	343146.	0.592	3.12	11079.9
41	1045.00	319.93	0.463	290545.	0.545	2.88	7957.4
42	1053.54	325.79	0.438	249447.	0.505	2.67	5866.9
43	1056.00	327.46	0.431	238290.	0.494	2.61	5352.5
44	1065.07	333.43	0.412	200283.	0.451	2.38	3759.2
45	1079.02	342.32	0.375	148391.	0.386	2.04	2037.9
46	1086.00	346.84	0.354	124340.	0.353	1.87	1430.9
47	1088.00	348.15	0.349	117686.	0.344	1.82	1283.6
48	1107.30	360.69	0.301	61277.	0.254	1.34	363.6
49	1116.00	366.64	0.279	40651.	0.213	1.13	170.1
50	1135.59	380.25	0.238	8035.	0.121	0.64	10.9
51	1138.00	382.95	0.268	5470.	0.110	0.58	6.1
52	1148.00	373.76	-0.665	-1739.	0.063	0.33	-0.6
53	1152.36	380.14	-0.703	-3155.	0.043	0.23	-0.5
54	1161.55	648.38	0.000	222.	0.000	0.00	0.0

Table 1 - Individual data on the 54 slices

Slice No.	Width (ft)	Weight (lbs)	Water Force Top (lbs)	Water Force Bot (lbs)	Tie Force Norm (lbs)	Tie Force Tan (lbs)	Earthquake Force Hor (lbs)	Earthquake Force Ver (lbs)	Surcharge Load (lbs)

1	9.1	3059.9	0.0	0.0	0.0	0.0	459.0	0.0	0.0
2	28.7	53518.8	0.0	0.0	0.0	0.0	8027.8	0.0	0.0
3	0.2	631.7	0.0	0.0	0.0	0.0	94.8	0.0	0.0
4	33.0	148676.5	0.0	28265.6	0.0	0.0	22301.5	0.0	0.0
5	10.1	66487.6	0.0	24843.3	0.0	0.0	9973.1	0.0	0.0
6	66.8	511959.6	0.0	*******	0.0	0.0	76793.9	0.0	0.0
7	50.0	420652.7	0.0	*******	0.0	0.0	63097.9	0.0	0.0
8	1.5	12892.5	0.0	4094.9	0.0	0.0	1933.9	0.0	0.0
9	0.5	4599.1	0.0	1461.8	0.0	0.0	689.9	0.0	0.0
10	28.0	250294.9	0.0	80699.3	0.0	0.0	37544.2	0.0	0.0
11	1.6	14792.2	0.0	4839.0	0.0	0.0	2218.8	0.0	0.0
12	32.4	302732.8	0.0	*******	0.0	0.0	45409.9	0.0	0.0
13	16.0	154583.1	0.0	52445.5	0.0	0.0	23187.5	0.0	0.0
14	50.0	504355.1	0.0	*******	0.0	0.0	75653.3	0.0	0.0
15	5.0	52209.1	0.0	18526.8	0.0	0.0	7831.4	0.0	0.0
16	15.0	162396.2	0.0	56640.4	0.0	0.0	24359.4	0.0	0.0
17	0.1	1117.6	0.0	376.6	0.0	0.0	167.6	0.0	0.0
18	105.9	1395096.5	0.0	*******	0.0	0.0	*******	0.0	0.0
19	106.0	1819825.0	0.0	*******	0.0	0.0	*******	0.0	0.0
20	15.0	291724.9	0.0	93821.5	0.0	0.0	43758.7	0.0	0.0
21	18.0	359595.7	0.0	*******	0.0	0.0	53939.4	0.0	0.0
22	25.0	510326.9	0.0	*******	0.0	0.0	76549.0	0.0	0.0
23	17.0	353407.3	0.0	*******	0.0	0.0	53011.1	0.0	0.0
24	18.0	381971.9	0.0	*******	0.0	0.0	57295.8	0.0	0.0
25	7.0	151633.7	0.0	51319.9	0.0	0.0	22745.1	0.0	0.0
26	6.0	132180.3	0.0	44793.4	0.0	0.0	19827.0	0.0	0.0
27	47.0	1088624.6	0.0	*******	0.0	0.0	*******	0.0	0.0
28	15.0	361983.8	0.0	*******	0.0	0.0	54297.6	0.0	0.0
29	68.0	1642633.4	0.0	*******	0.0	0.0	*******	0.0	0.0
30	17.8	430633.3	0.0	*******	0.0	0.0	64595.0	0.0	0.0
31	6.3	152746.8	0.0	55672.7	0.0	0.0	22912.0	0.0	0.0
32	28.3	634288.2	0.0	*******	0.0	0.0	95143.2	0.0	0.0
33	28.3	534625.2	0.0	*******	0.0	0.0	80193.8	0.0	0.0
34	26.3	407850.0	0.0	*******	0.0	0.0	61177.5	0.0	0.0
35	2.0	27138.8	0.0	11138.1	0.0	0.0	4070.8	0.0	0.0
36	13.0	166807.1	0.0	65479.5	0.0	0.0	25021.1	0.0	0.0
37	15.0	165921.0	0.0	58248.2	0.0	0.0	24888.2	0.0	0.0
38	0.3	2622.7	0.0	844.5	0.0	0.0	393.4	0.0	0.0
39	0.7	7495.8	0.0	2385.5	0.0	0.0	1124.4	0.0	0.0
40	9.0	90281.5	0.0	25396.0	0.0	0.0	13542.2	0.0	0.0
41	10.0	98117.1	0.0	20462.6	0.0	0.0	14717.6	0.0	0.0
42	8.5	81596.9	0.0	11016.4	0.0	0.0	12239.5	0.0	0.0
43	2.5	23073.3	0.0	2064.0	0.0	0.0	3461.0	0.0	0.0
44	9.1	82487.4	0.0	3354.8	0.0	0.0	12373.1	0.0	0.0
45	14.0	118244.6	0.0	0.0	0.0	0.0	17736.7	0.0	0.0
46	7.0	55364.9	0.0	0.0	0.0	0.0	8304.7	0.0	0.0
47	2.0	15391.9	0.0	0.0	0.0	0.0	2308.8	0.0	0.0
48	19.3	133299.2	0.0	0.0	0.0	0.0	19994.9	0.0	0.0
49	8.7	50743.1	0.0	0.0	0.0	0.0	7611.5	0.0	0.0
50	19.6	87657.0	0.0	0.0	0.0	0.0	13148.5	0.0	0.0
51	2.4	8016.5	0.0	0.0	0.0	0.0	1202.5	0.0	0.0
52	10.0	26714.7	0.0	0.0	0.0	0.0	4007.2	0.0	0.0
53	4.4	8371.8	0.0	0.0	0.0	0.0	1255.8	0.0	0.0
54	9.2	7764.6	0.0	0.0	0.0	0.0	1164.7	0.0	0.0

- TABLE 2 - Base Stress Data on the 54 Slices -

Slice No. *	Alpha (deg)	X-Coord. Slice Cntr (ft)	Base Leng. (ft)	Total Normal Stress (psf)	Total Vert. Stress (psf)	Mobilized Shear Stress (psf)
1	-31.00	96.74	10.59	1272.04	289.00	1253.97
2	-34.00	115.63	34.60	3750.95	1546.75	2188.17
3	-34.00	130.07	0.25	5746.70	2541.56	3085.87
4	-34.00	146.65	39.75	7737.67	3740.10	3661.58
5	-45.00	168.17	14.26	18055.65	4662.22	9053.54
6	-4.53	206.61	67.00	7971.07	7641.76	2061.05
7	-4.53	265.00	50.16	8734.03	8386.81	2179.71
8	-4.53	290.74	1.48	9070.31	8715.20	2232.02
9	-4.53	291.74	0.53	9083.37	8727.96	2234.05
10	-4.53	306.00	28.09	9270.37	8911.22	2259.38
11	-4.53	320.81	1.63	9464.62	9101.66	2285.27
12	-4.53	337.81	32.48	9687.58	9320.25	2314.98

13	-4.53	362.00	16.05	10004.85	9631.30	2357.27
14	-4.53	395.00	50.16	10437.67	10055.63	2414.95
15	-4.53	422.50	5.02	10798.36	10409.25	2463.03
16	-4.53	432.50	15.05	11196.72	10792.64	2557.44
17	-4.53	440.05	0.10	11561.60	11140.18	2665.32
18	0.13	493.05	105.90	13256.38	13173.68	2978.82
19	0.13	599.00	106.00	17267.17	17168.11	3784.99
20	0.13	659.50	15.00	19556.87	19448.28	4247.42
21	0.13	676.00	18.00	20087.20	19977.48	4342.65
22	0.13	697.50	25.00	20521.12	20413.02	4392.69
23	0.13	718.50	17.00	20894.52	20788.61	4427.06
24	0.13	736.00	18.00	21326.14	21220.60	4490.38
25	0.13	748.50	7.00	21768.78	21661.90	4574.29
26	0.13	755.00	6.00	22137.78	22029.99	4641.91
27	0.13	781.50	47.00	23277.41	23162.16	4901.85
28	0.13	812.50	15.00	24251.86	24132.18	5102.66
29	0.13	854.00	68.00	24266.42	24156.31	5000.09
30	0.13	896.90	17.81	24283.54	24184.04	4886.29
31	0.13	908.96	6.32	24283.87	24185.75	4871.23
32	45.00	926.26	40.00	16615.24	15857.06	4370.49
33	45.00	954.55	40.00	13666.54	13365.78	3778.57
34	45.00	981.85	37.21	11074.94	10961.78	3321.64
35	45.00	995.99	2.79	9757.86	9716.28	3096.42
36	45.00	1003.49	18.42	9050.67	9055.56	2973.08
37	45.00	1017.50	21.21	7717.73	7821.45	2737.38
38	45.00	1025.13	0.37	6995.17	7159.31	2610.48
39	45.00	1025.63	1.05	6982.95	7153.40	2617.97
40	45.00	1030.50	12.73	6861.90	7093.32	2689.98
41	45.00	1040.00	14.14	6587.32	6938.06	2813.14
42	45.00	1049.27	12.08	6284.12	6753.08	2917.50
43	45.00	1054.77	3.47	6102.45	6643.10	2978.60
44	45.00	1060.53	12.82	5820.79	6433.92	3001.49
45	45.00	1072.04	19.73	5349.13	5992.41	2907.04
46	45.00	1082.51	9.87	5002.63	5607.28	2751.18
47	45.00	1087.00	2.83	4853.13	5441.96	2683.94
48	45.00	1097.65	27.30	4335.53	4883.07	2451.12
49	45.00	1111.65	12.30	3628.53	4125.69	2133.11
50	45.00	1125.79	27.70	2716.32	3164.49	1722.79
51	45.00	1136.79	3.41	1936.05	2349.10	1371.83
52	45.00	1143.00	14.14	1492.57	1889.03	1172.35
53	45.00	1150.18	6.17	977.43	1356.66	940.64
54	59.00	1156.96	17.84	6.29	435.17	504.71

*** SEISMIC SLOPE DISPLACEMENT DATA ***
(Note: kv is set = zero for displacement calculations)
Seismic Yield Coefficient (ky) = 0.1202(g)
Calculated Newmark Seismic Displacement = 0.142(ft)
Non-Symmetrical Sliding Resistance Has Been Specified
for Downhill Sliding.

**** END OF GSTABL7 OUTPUT ****

Sliding displacement models from Rathje and Antonakos (2011)

Prediction of dynamic response and sliding displacement of a sliding mass during earthquake shaking

Cross Section: A-A'

File: a-33b3-15s

Inputs	
PGA (g)	0.2763
PGV (cm/s)	23.32
k_y (g)	0.1202
T_m (s)	0.517
T_s (s)	0.24
M	6.95
T_s/T_m	0.469444

Dynamic Response			
	median	-1σ	+1σ
kmax (g)	0.254	0.198	0.326
k-velmax (cm/s)	25.88	20.15	33.23

Displacement Given Median Dynamic Response					
Displacement Model			Sliding Displacements, D (cm)		
	μ_{lnD}	σ_{lnD}	median	-1σ	+1σ
[kmax, M]	1.92	0.847	6.82	2.93	15.91
[kmax, k-velmax]	1.08	0.535	2.95	1.73	5.03
			Sliding Displacements, D (in)		
	μ_{lnD}	σ_{lnD}	median	-1σ	+1σ
[kmax, M]	1.92	0.847	2.69	1.15	6.26
[kmax, k-velmax]	1.08	0.535	1.16	0.68	1.98

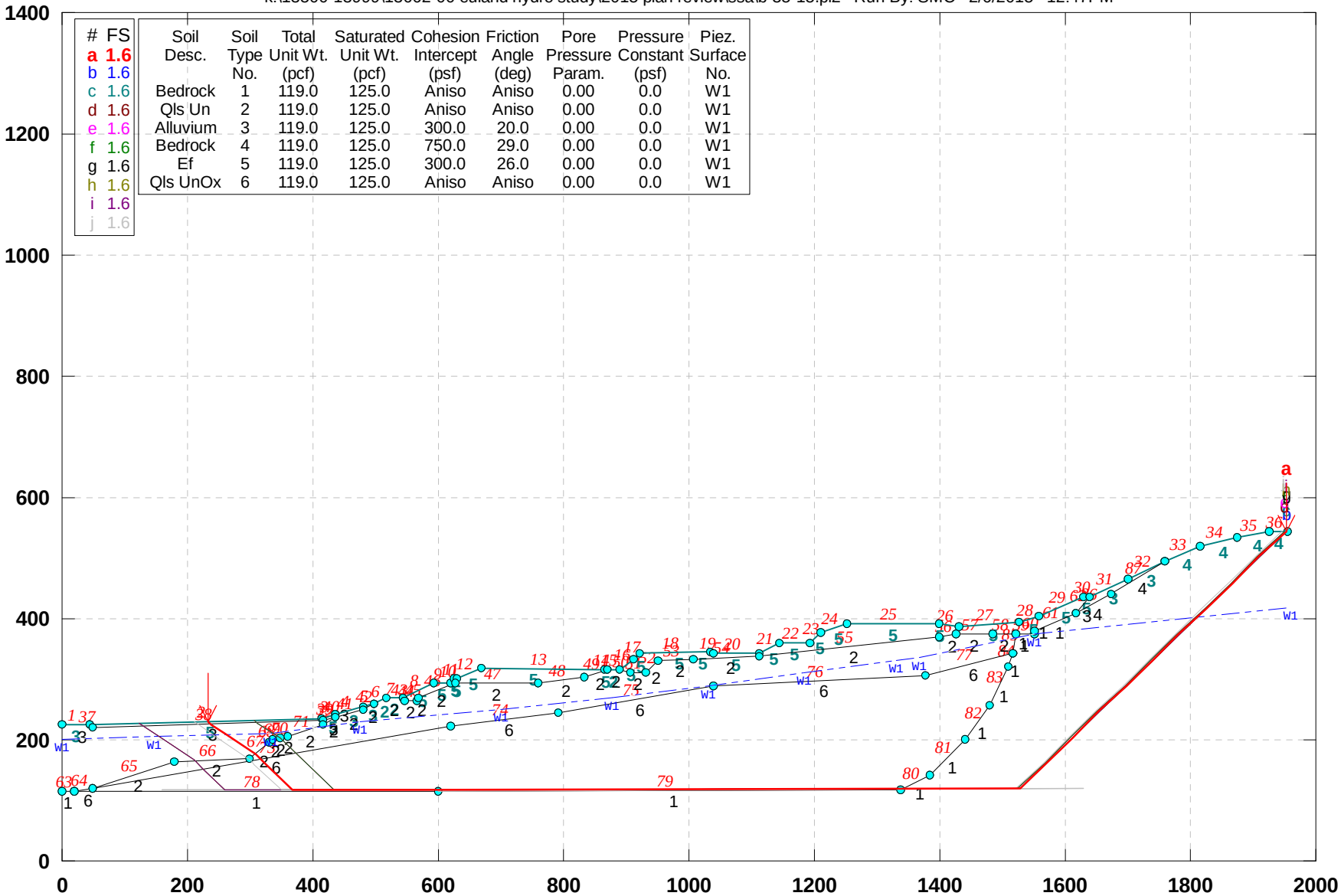
PGA	Peak Ground Acceleration (g)	
PGV	Peak Ground Velocity (cm/s)	
k_y	Critical or Yield Acceleration (g)	
T_m	Mean Period of an Earthquake Motion (s)	
T_s	Site Period or the Natural Period of a Sliding Mass (s). For rigid sliding set T_s= 0 s	
M	Earthquake Magnitude	
kmax	maximum seismic coefficient (g)	
k-velmax	the maximum velocity of the seismic coefficient-time history (cm/s)	
D	Predicted Sliding Displacment (cm)	

H_{avr} =	128	ft
V_s =	2110	ft/s
$T_s = 4\ H_{avr}/V_s$ =	0.24	s

Reference: Rathje, E.M. and Antonakos, G. 2011. "A Unified Model for Predicting Earthquake-Induced Sliding Displacements of Rigid and Flexible Slopes," Engineering Geology, 122, 51-60, doi:10.1016/j.enggeo.2010.12.004.

13662-00, Euland Capital , B-B', , , Static, 2015 design

k:\13500-13999\13662-00 euland hydro study\2015 plan review\ssa\b-35-15.pl2 Run By: SMC 2/6/2015 12:47PM



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.
Bedrock	1	119.0	125.0	Aniso	Aniso	0.00	0.0	W1
Qls Un	2	119.0	125.0	Aniso	Aniso	0.00	0.0	W1
Alluvium	3	119.0	125.0	300.0	20.0	0.00	0.0	W1
Bedrock	4	119.0	125.0	750.0	29.0	0.00	0.0	W1
Ef	5	119.0	125.0	300.0	26.0	0.00	0.0	W1
Qls UnOx	6	119.0	125.0	Aniso	Aniso	0.00	0.0	W1

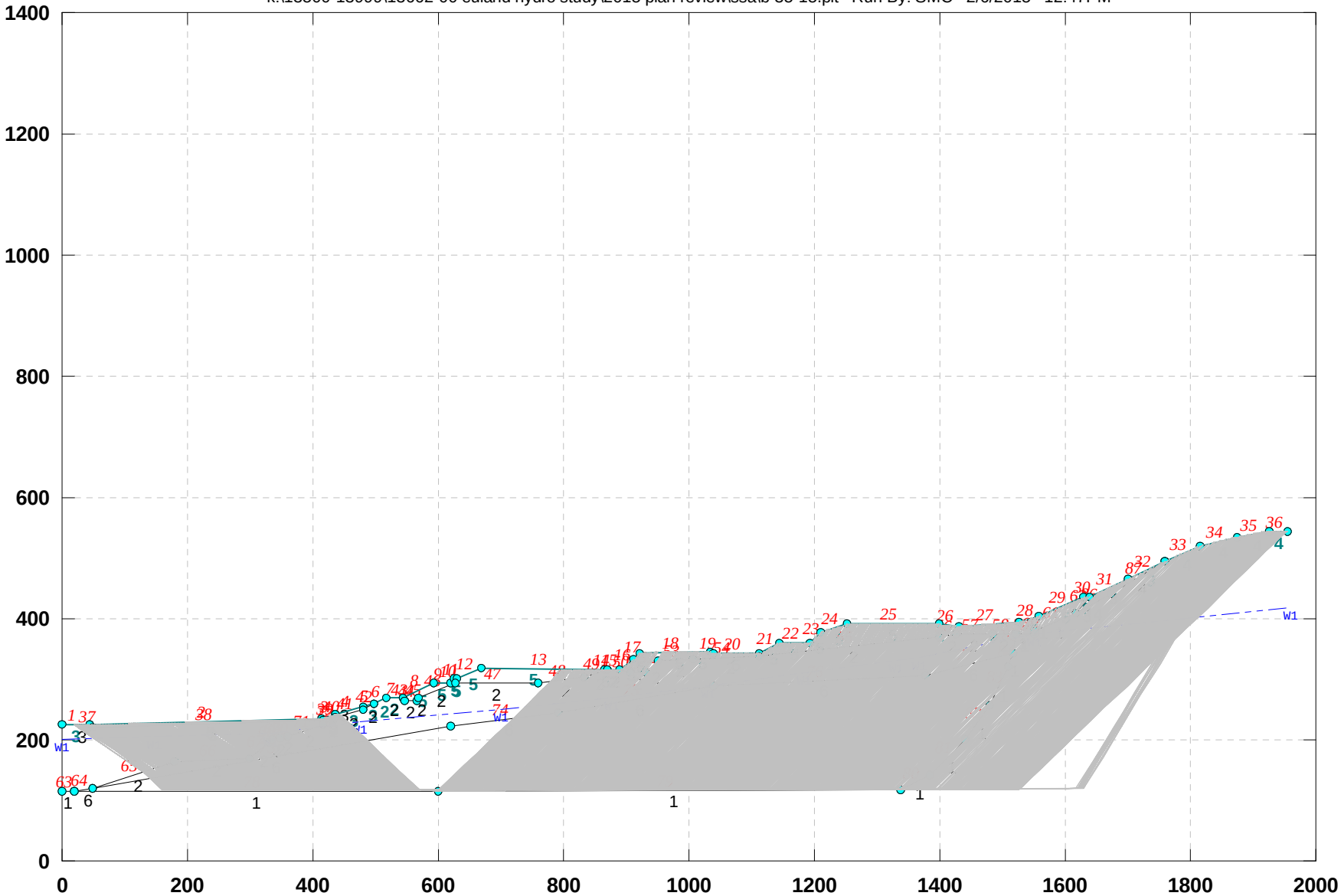
GSTABL7 v.2 FSmin=1.6

Safety Factors Are Calculated By The Simplified Janbu Method for the case of c & phi both > 0

Figure E-4.1

13662-00, Euland Capital , B-B', , , Static, 2015 design

k:\13500-13999\13662-00 euland hydro study\2015 plan review\ssa\b-35-15.plt Run By: SMC 2/6/2015 12:47PM



***** GSTABL7 *****

** GSTABL7 by Garry H. Gregory, P.E. **

** Original Version 1.0, January 1996; Current Version 2.005, Sept. 2006 **

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****

SLOPE STABILITY ANALYSIS SYSTEM

Modified Bishop, Simplified Janbu, or GLE Method of Slices.
(Includes Spencer & Morgenstern-Price Type Analysis)
Including Pier/Pile, Reinforcement, Soil Nail, Tieback,
Nonlinear Undrained Shear Strength, Curved Phi Envelope,
Anisotropic Soil, Fiber-Reinforced Soil, Boundary Loads, Water
Surfaces, Pseudo-Static & Newmark Earthquake, and Applied Forces.

****

Analysis Run Date: 2/6/2015
Time of Run: 12:47PM
Run By: SMC
Input Data Filename: K:\13500-13999\13662-00 Euland Hydro Study\2015 Plan Review\SSA\b-35-15.
Output Filename: K:\13500-13999\13662-00 Euland Hydro Study\2015 Plan Review\SSA\b-35-15.OUT
Unit System: English
Plotted Output Filename: K:\13500-13999\13662-00 Euland Hydro Study\2015 Plan Review\SSA\b-35-15.PLT
PROBLEM DESCRIPTION: 13662-00, Euland Capital , B-B',
, , Static, 2015 design

BOUNDARY COORDINATES
36 Top Boundaries
87 Total Boundaries

Boundary No.	X-Left (ft)	Y-Left (ft)	X-Right (ft)	Y-Right (ft)	Soil Type Below Bnd
1	0.00	225.00	45.00	225.00	3
2	45.00	225.00	413.00	235.00	5
3	413.00	235.00	437.00	242.00	5
4	437.00	242.00	480.00	254.00	3
5	480.00	254.00	497.00	260.00	3
6	497.00	260.00	518.00	270.00	2
7	518.00	270.00	545.00	270.00	2
8	545.00	270.00	593.00	295.00	5
9	593.00	295.00	620.00	295.00	5
10	620.00	295.00	624.00	302.00	5
11	624.00	302.00	630.00	302.00	5
12	630.00	302.00	669.00	318.00	5
13	669.00	318.00	865.00	316.00	5
14	865.00	316.00	870.00	315.00	5
15	870.00	315.00	890.00	315.00	2
16	890.00	315.00	912.00	333.00	5
17	912.00	333.00	920.00	344.00	5
18	920.00	344.00	1033.00	345.00	5
19	1033.00	345.00	1038.00	342.00	5
20	1038.00	342.00	1113.00	342.00	5
21	1113.00	342.00	1144.00	360.00	5
22	1144.00	360.00	1193.00	360.00	5
23	1193.00	360.00	1210.00	378.00	5
24	1210.00	378.00	1253.00	391.00	5
25	1253.00	391.00	1400.00	391.00	5
26	1400.00	391.00	1430.00	388.00	5
27	1430.00	388.00	1527.00	395.00	5
28	1527.00	395.00	1557.00	404.00	5
29	1557.00	404.00	1630.00	435.00	5
30	1630.00	435.00	1640.00	437.00	5
31	1640.00	437.00	1700.00	465.00	3
32	1700.00	465.00	1760.00	495.00	3
33	1760.00	495.00	1815.00	520.00	4
34	1815.00	520.00	1875.00	535.00	4
35	1875.00	535.00	1925.00	545.00	4
36	1925.00	545.00	1955.00	545.00	4
37	45.00	225.00	50.00	220.00	3
38	50.00	220.00	417.00	232.00	3
39	417.00	232.00	435.00	237.00	3
40	435.00	237.00	437.00	242.00	3

41	435.00	237.00	480.00	249.00	2
42	480.00	249.00	497.00	260.00	2
43	545.00	270.00	546.00	265.00	2
44	546.00	265.00	567.00	265.00	2
45	567.00	265.00	568.00	270.00	2
46	568.00	270.00	627.00	293.00	2
47	627.00	293.00	760.00	295.00	2
48	760.00	295.00	832.00	305.00	2
49	832.00	305.00	870.00	315.00	2
50	890.00	315.00	906.00	310.00	2
51	906.00	310.00	931.00	310.00	2
52	931.00	310.00	950.00	330.00	2
53	950.00	330.00	1006.00	333.00	2
54	1006.00	333.00	1113.00	337.00	2
55	1113.00	337.00	1400.00	370.00	2
56	1400.00	370.00	1427.00	374.00	2
57	1427.00	374.00	1485.00	375.00	2
58	1485.00	375.00	1522.00	375.00	2
59	1522.00	375.00	1550.00	375.00	1
60	1550.00	375.00	1551.00	380.00	1
61	1551.00	380.00	1618.00	410.00	1
62	1618.00	410.00	1640.00	437.00	3
63	0.00	115.00	20.00	115.00	1
64	20.00	115.00	50.00	120.00	6
65	50.00	120.00	180.00	165.00	2
66	180.00	165.00	300.00	170.00	2
67	300.00	170.00	330.00	195.00	2
68	330.00	195.00	335.00	200.00	2
69	335.00	200.00	347.00	203.00	2
70	347.00	203.00	360.00	207.00	2
71	360.00	207.00	417.00	225.00	2
72	417.00	225.00	435.00	237.00	2
73	50.00	120.00	620.00	223.00	6
74	620.00	223.00	792.00	245.00	6
75	792.00	245.00	1040.00	290.00	6
76	1040.00	290.00	1378.00	307.00	6
77	1378.00	307.00	1516.00	342.00	6
78	20.00	115.00	600.00	115.00	1
79	600.00	115.00	1338.00	118.00	1
80	1338.00	118.00	1385.00	143.00	1
81	1385.00	143.00	1440.00	200.00	1
82	1440.00	200.00	1480.00	258.00	1
83	1480.00	258.00	1510.00	320.00	1
84	1510.00	320.00	1516.00	342.00	1
85	1516.00	342.00	1522.00	375.00	1
86	1618.00	410.00	1673.00	440.00	4
87	1673.00	440.00	1760.00	495.00	4

Default Y-Origin = 0.00(ft)
Default X-Plus Value = 0.00(ft)
Default Y-Plus Value = 0.00(ft)

ISOTROPIC SOIL PARAMETERS
6 Type(s) of Soil

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.
1	119.0	125.0	0.0	0.0	0.00	0.0	1
2	119.0	125.0	0.0	0.0	0.00	0.0	1
3	119.0	125.0	300.0	20.0	0.00	0.0	1
4	119.0	125.0	750.0	29.0	0.00	0.0	1
5	119.0	125.0	300.0	26.0	0.00	0.0	1
6	119.0	125.0	0.0	0.0	0.00	0.0	1

ANISOTROPIC STRENGTH PARAMETERS
3 soil type(s)
Soil Type 1 Is Anisotropic
Number Of Direction Ranges Specified = 3

Direction Range No.	Counterclockwise Direction Limit (deg)	Cohesion Intercept (psf)	Friction Angle (deg)
1	0.0	750.00	29.00
2	5.0	300.00	15.00

```
    3              90.0             750.00         29.00
Soil Type  2 Is Anisotropic
Number Of Direction Ranges Specified =  3
Direction    Counterclockwise     Cohesion     Friction
  Range       Direction Limit    Intercept       Angle
   No.            (deg)            (psf)         (deg)
    1              0.0             350.00         23.00
    2             15.0             250.00         12.50
    3             90.0             300.00         20.00
Soil Type  6 Is Anisotropic
Number Of Direction Ranges Specified =  3
Direction    Counterclockwise     Cohesion     Friction
  Range       Direction Limit    Intercept       Angle
   No.            (deg)            (psf)         (deg)
    1              0.0             500.00         29.00
    2             15.0             250.00         12.50
    3             90.0             300.00         20.00
ANISOTROPIC SOIL NOTES:
   (1) An input value of 0.01 for C and/or Phi will cause Aniso
       C and/or Phi to be ignored in that range.
   (2) An input value of 0.02 for Phi will set both Phi and
       C equal to zero, with no water weight in the tension crack.
   (3) An input value of 0.03 for Phi will set both Phi and
       C equal to zero, with water weight in the tension crack.
1 PIEZOMETRIC SURFACE(S) SPECIFIED
Unit Weight of Water =  62.40 (pcf)
Piezometric Surface No.  1 Specified by 12 Coordinate Points
Pore Pressure Inclination Factor =  0.50
  Point      X-Water     Y-Water
   No.         (ft)        (ft)
    1          0.00      201.00
    2        147.00      205.00
    3        333.00      210.00
    4        476.00      230.00
    5        700.00      250.00
    6        878.00      270.00
    7       1031.00      290.00
    8       1183.00      310.00
    9       1330.00      330.00
   10       1368.00      336.00
   11       1550.00      375.00
   12       1960.00      420.00
Janbus Empirical Coef is being used for the case of  c & phi both > 0
A Critical Failure Surface Searching Method, Using A Random
Technique For Generating Sliding Block Surfaces, Has Been
Specified.
The Active And Passive Portions Of The Sliding Surfaces
Are Generated According To The Rankine Theory.
5000 Trial Surfaces Have Been Generated.
3 Boxes Specified For Generation Of Central Block Base
Length Of Line Segments For Active And Passive Portions Of
Sliding Block Is  60.0
Box        X-Left     Y-Left    X-Right    Y-Right      Height
No.         (ft)       (ft)       (ft)       (ft)        (ft)
 1         160.00     117.00     570.00     117.00       1.00
 2         571.00     117.00     571.00     117.00       1.00
 3         600.00     117.00    1630.00     120.00       2.00
Following Are Displayed The Ten Most Critical Of The Trial
      Failure Surfaces Evaluated. They Are
      Ordered - Most Critical First.
      * * Safety Factors Are Calculated By The Simplified Janbu Method * *
      Total Number of Trial Surfaces Attempted =  5000
      Number of Trial Surfaces With Valid FS = 5000
      Statistical Data On All Valid FS Values:
         FS Max =   3.375   FS Min =   1.614   FS Ave =   1.718
         Standard Deviation =    0.454   Coefficient of Variation =   26.45 %
      Failure Surface Specified By 20 Coordinate Points
        Point      X-Surf      Y-Surf
         No.        (ft)        (ft)
          1        231.735     230.074
```

2	238.019	226.148
3	259.164	211.342
4	308.313	176.928
5	316.994	168.246
6	325.451	159.789
7	367.878	117.363
8	571.000	117.376
9	1527.591	119.347
10	1570.017	161.774
11	1612.444	204.200
12	1654.870	246.626
13	1697.297	289.053
14	1739.723	331.479
15	1782.149	373.906
16	1824.576	416.332
17	1867.002	458.758
18	1909.428	501.185
19	1951.855	543.611
20	1953.244	545.000

Factor of Safety
*** 1.614 ***

Individual data on the 0 slices

Slice No.	Width (ft)	Weight (lbs)	Water Force Top (lbs)	Water Force Bot (lbs)	Tie Force Norm (lbs)	Tie Force Tan (lbs)	Earthquake Force Hor (lbs)	Earthquake Force Ver (lbs)	Surcharge Load (lbs)

Failure Surface Specified By 20 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	231.735	230.074
2	238.019	226.148
3	259.164	211.342
4	308.313	176.928
5	316.994	168.246
6	325.451	159.789
7	367.878	117.363
8	571.000	117.376
9	1527.591	119.347
10	1570.017	161.774
11	1612.444	204.200
12	1654.870	246.626
13	1697.297	289.053
14	1739.723	331.479
15	1782.149	373.906
16	1824.576	416.332
17	1867.002	458.758
18	1909.428	501.185
19	1951.855	543.611
20	1953.244	545.000

Factor of Safety
*** 1.614 ***

Failure Surface Specified By 20 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	231.735	230.074
2	238.019	226.148
3	259.164	211.342
4	308.313	176.928
5	316.994	168.246
6	325.451	159.789
7	367.878	117.363
8	571.000	117.376
9	1527.591	119.347
10	1570.017	161.774
11	1612.444	204.200
12	1654.870	246.626
13	1697.297	289.053
14	1739.723	331.479
15	1782.149	373.906
16	1824.576	416.332

17	1867.002	458.758
18	1909.428	501.185
19	1951.855	543.611
20	1953.244	545.000

Factor of Safety
*** 1.614 ***

Failure Surface Specified By 19 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	306.108	232.095
2	311.767	228.559
3	347.882	203.271
4	372.819	178.334
5	391.716	159.437
6	434.142	117.011
7	571.000	117.223
8	1525.076	119.870
9	1567.503	162.296
10	1609.929	204.723
11	1652.355	247.149
12	1694.782	289.576
13	1737.208	332.002
14	1779.635	374.428
15	1822.061	416.855
16	1864.487	459.281
17	1906.914	501.708
18	1949.340	544.134
19	1950.206	545.000

Factor of Safety
*** 1.616 ***

Failure Surface Specified By 19 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	306.108	232.095
2	311.767	228.559
3	347.882	203.271
4	372.819	178.334
5	391.716	159.437
6	434.142	117.011
7	571.000	117.223
8	1525.076	119.870
9	1567.503	162.296
10	1609.929	204.723
11	1652.355	247.149
12	1694.782	289.576
13	1737.208	332.002
14	1779.635	374.428
15	1822.061	416.855
16	1864.487	459.281
17	1906.914	501.708
18	1949.340	544.134
19	1950.206	545.000

Factor of Safety
*** 1.616 ***

Failure Surface Specified By 19 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	306.108	232.095
2	311.767	228.559
3	347.882	203.271
4	372.819	178.334
5	391.716	159.437
6	434.142	117.011
7	571.000	117.223
8	1525.076	119.870
9	1567.503	162.296
10	1609.929	204.723
11	1652.355	247.149
12	1694.782	289.576
13	1737.208	332.002

14	1779.635	374.428
15	1822.061	416.855
16	1864.487	459.281
17	1906.914	501.708
18	1949.340	544.134
19	1950.206	545.000

Factor of Safety
*** 1.616 ***

Failure Surface Specified By 19 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	122.150	227.096
2	129.354	222.595
3	160.683	200.658
4	209.832	166.243
5	224.536	151.539
6	259.372	116.704
7	571.000	117.037
8	1528.597	119.938
9	1571.023	162.364
10	1613.450	204.791
11	1655.876	247.217
12	1698.302	289.644
13	1740.729	332.070
14	1783.155	374.496
15	1825.582	416.923
16	1868.008	459.349
17	1910.434	501.776
18	1952.861	544.202
19	1953.659	545.000

Factor of Safety
*** 1.620 ***

Failure Surface Specified By 19 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	122.150	227.096
2	129.354	222.595
3	160.683	200.658
4	209.832	166.243
5	224.536	151.539
6	259.372	116.704
7	571.000	117.037
8	1528.597	119.938
9	1571.023	162.364
10	1613.450	204.791
11	1655.876	247.217
12	1698.302	289.644
13	1740.729	332.070
14	1783.155	374.496
15	1825.582	416.923
16	1868.008	459.349
17	1910.434	501.776
18	1952.861	544.202
19	1953.659	545.000

Factor of Safety
*** 1.620 ***

Failure Surface Specified By 19 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	122.150	227.096
2	129.354	222.595
3	160.683	200.658
4	209.832	166.243
5	224.536	151.539
6	259.372	116.704
7	571.000	117.037
8	1528.597	119.938
9	1571.023	162.364
10	1613.450	204.791
11	1655.876	247.217

12	1698.302	289.644
13	1740.729	332.070
14	1783.155	374.496
15	1825.582	416.923
16	1868.008	459.349
17	1910.434	501.776
18	1952.861	544.202
19	1953.659	545.000

Factor of Safety
*** 1.620 ***

Failure Surface Specified By 20 Coordinate Points

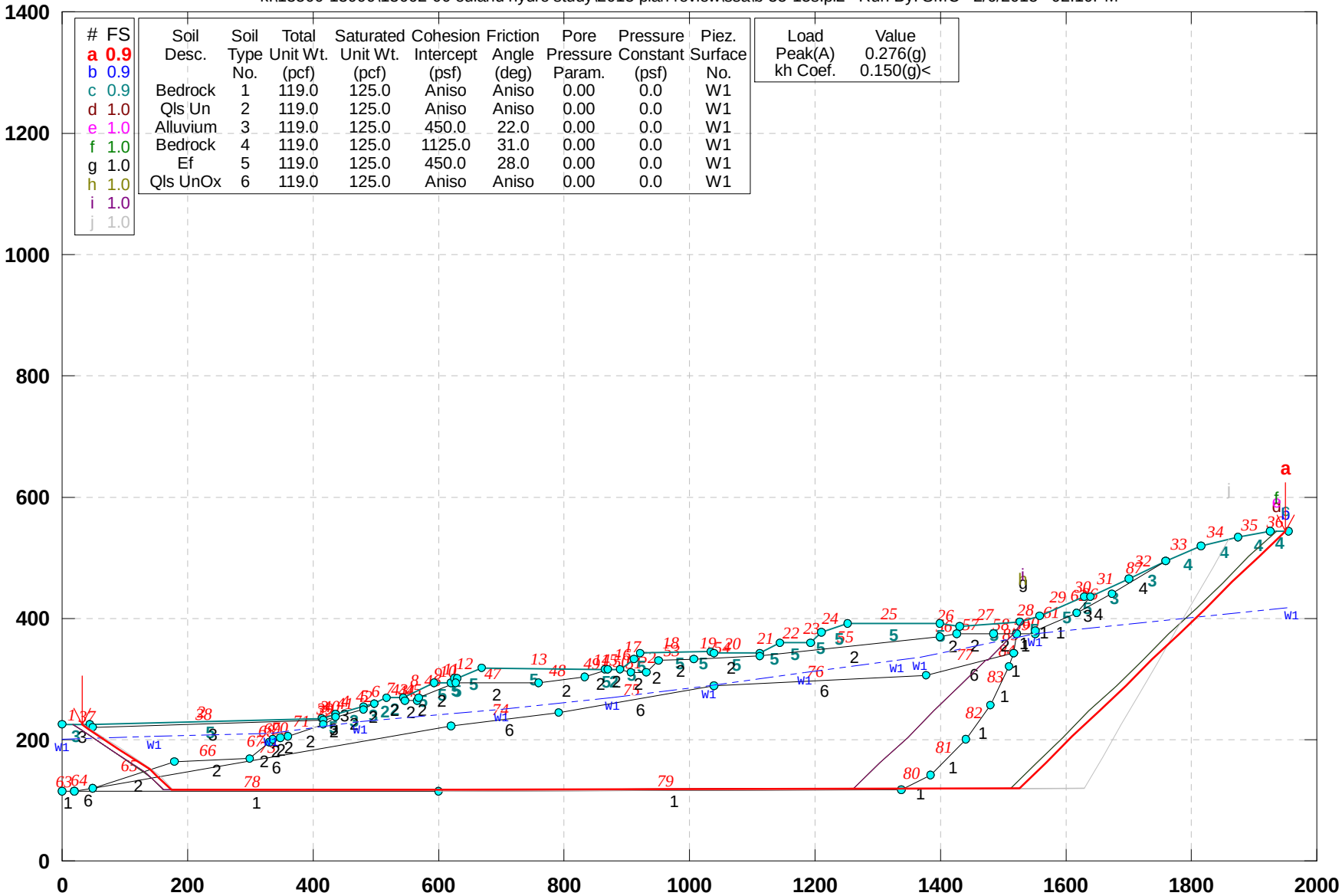
Point No.	X-Surf (ft)	Y-Surf (ft)
1	210.909	229.508
2	217.368	225.473
3	247.633	204.281
4	296.782	169.866
5	301.247	165.401
6	307.234	159.415
7	349.660	116.988
8	571.000	117.240
9	1522.059	120.098
10	1564.485	162.524
11	1606.911	204.950
12	1649.338	247.377
13	1691.764	289.803
14	1734.191	332.230
15	1776.617	374.656
16	1819.043	417.082
17	1861.470	459.509
18	1903.896	501.935
19	1946.323	544.362
20	1946.961	545.000

Factor of Safety
*** 1.623 ***

**** END OF GSTABL7 OUTPUT ****

13662-00, Euland Capital , B-B', , , seismic, 2015 design

k:\13500-13999\13662-00 euland hydro study\2015 plan review\ssa\b-35-15s.pl2 Run By: SMC 2/6/2015 02:10PM



GSTABL7 v.2 FSmin=0.9

Safety Factors Are Calculated By The Simplified Janbu Method for the case of c & phi both > 0

Figure E-4.2

***** GSTABL7 *****

** GSTABL7 by Garry H. Gregory, P.E. **

** Original Version 1.0, January 1996; Current Version 2.005, Sept. 2006 **

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****

SLOPE STABILITY ANALYSIS SYSTEM

Modified Bishop, Simplified Janbu, or GLE Method of Slices.
(Includes Spencer & Morgenstern-Price Type Analysis)
Including Pier/Pile, Reinforcement, Soil Nail, Tieback,
Nonlinear Undrained Shear Strength, Curved Phi Envelope,
Anisotropic Soil, Fiber-Reinforced Soil, Boundary Loads, Water
Surfaces, Pseudo-Static & Newmark Earthquake, and Applied Forces.

****

Analysis Run Date: 2/6/2015
Time of Run: 02:10PM
Run By: SMC
Input Data Filename: K:\13500-13999\13662-00 Euland Hydro Study\2015 Plan Review\SSA\b-35-15s.
Output Filename: K:\13500-13999\13662-00 Euland Hydro Study\2015 Plan Review\SSA\b-35-15s.OUT
Unit System: English
Plotted Output Filename: K:\13500-13999\13662-00 Euland Hydro Study\2015 Plan Review\SSA\b-35-15s.PLT
PROBLEM DESCRIPTION: 13662-00, Euland Capital , B-B',
, , seismic, 2015 design

BOUNDARY COORDINATES
36 Top Boundaries
87 Total Boundaries

Boundary No.	X-Left (ft)	Y-Left (ft)	X-Right (ft)	Y-Right (ft)	Soil Type Below Bnd
1	0.00	225.00	45.00	225.00	3
2	45.00	225.00	413.00	235.00	5
3	413.00	235.00	437.00	242.00	5
4	437.00	242.00	480.00	254.00	3
5	480.00	254.00	497.00	260.00	3
6	497.00	260.00	518.00	270.00	2
7	518.00	270.00	545.00	270.00	2
8	545.00	270.00	593.00	295.00	5
9	593.00	295.00	620.00	295.00	5
10	620.00	295.00	624.00	302.00	5
11	624.00	302.00	630.00	302.00	5
12	630.00	302.00	669.00	318.00	5
13	669.00	318.00	865.00	316.00	5
14	865.00	316.00	870.00	315.00	5
15	870.00	315.00	890.00	315.00	2
16	890.00	315.00	912.00	333.00	5
17	912.00	333.00	920.00	344.00	5
18	920.00	344.00	1033.00	345.00	5
19	1033.00	345.00	1038.00	342.00	5
20	1038.00	342.00	1113.00	342.00	5
21	1113.00	342.00	1144.00	360.00	5
22	1144.00	360.00	1193.00	360.00	5
23	1193.00	360.00	1210.00	378.00	5
24	1210.00	378.00	1253.00	391.00	5
25	1253.00	391.00	1400.00	391.00	5
26	1400.00	391.00	1430.00	388.00	5
27	1430.00	388.00	1527.00	395.00	5
28	1527.00	395.00	1557.00	404.00	5
29	1557.00	404.00	1630.00	435.00	5
30	1630.00	435.00	1640.00	437.00	5
31	1640.00	437.00	1700.00	465.00	3
32	1700.00	465.00	1760.00	495.00	3
33	1760.00	495.00	1815.00	520.00	4
34	1815.00	520.00	1875.00	535.00	4
35	1875.00	535.00	1925.00	545.00	4
36	1925.00	545.00	1955.00	545.00	4
37	45.00	225.00	50.00	220.00	3
38	50.00	220.00	417.00	232.00	3
39	417.00	232.00	435.00	237.00	3
40	435.00	237.00	437.00	242.00	3

41	435.00	237.00	480.00	249.00	2
42	480.00	249.00	497.00	260.00	2
43	545.00	270.00	546.00	265.00	2
44	546.00	265.00	567.00	265.00	2
45	567.00	265.00	568.00	270.00	2
46	568.00	270.00	627.00	293.00	2
47	627.00	293.00	760.00	295.00	2
48	760.00	295.00	832.00	305.00	2
49	832.00	305.00	870.00	315.00	2
50	890.00	315.00	906.00	310.00	2
51	906.00	310.00	931.00	310.00	2
52	931.00	310.00	950.00	330.00	2
53	950.00	330.00	1006.00	333.00	2
54	1006.00	333.00	1113.00	337.00	2
55	1113.00	337.00	1400.00	370.00	2
56	1400.00	370.00	1427.00	374.00	2
57	1427.00	374.00	1485.00	375.00	2
58	1485.00	375.00	1522.00	375.00	2
59	1522.00	375.00	1550.00	375.00	1
60	1550.00	375.00	1551.00	380.00	1
61	1551.00	380.00	1618.00	410.00	1
62	1618.00	410.00	1640.00	437.00	3
63	0.00	115.00	20.00	115.00	1
64	20.00	115.00	50.00	120.00	6
65	50.00	120.00	180.00	165.00	2
66	180.00	165.00	300.00	170.00	2
67	300.00	170.00	330.00	195.00	2
68	330.00	195.00	335.00	200.00	2
69	335.00	200.00	347.00	203.00	2
70	347.00	203.00	360.00	207.00	2
71	360.00	207.00	417.00	225.00	2
72	417.00	225.00	435.00	237.00	2
73	50.00	120.00	620.00	223.00	6
74	620.00	223.00	792.00	245.00	6
75	792.00	245.00	1040.00	290.00	6
76	1040.00	290.00	1378.00	307.00	6
77	1378.00	307.00	1516.00	342.00	6
78	20.00	115.00	600.00	115.00	1
79	600.00	115.00	1338.00	118.00	1
80	1338.00	118.00	1385.00	143.00	1
81	1385.00	143.00	1440.00	200.00	1
82	1440.00	200.00	1480.00	258.00	1
83	1480.00	258.00	1510.00	320.00	1
84	1510.00	320.00	1516.00	342.00	1
85	1516.00	342.00	1522.00	375.00	1
86	1618.00	410.00	1673.00	440.00	4
87	1673.00	440.00	1760.00	495.00	4

Default Y-Origin = 0.00(ft)
Default X-Plus Value = 0.00(ft)
Default Y-Plus Value = 0.00(ft)

ISOTROPIC SOIL PARAMETERS
6 Type(s) of Soil

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.
1	119.0	125.0	0.0	0.0	0.00	0.0	1
2	119.0	125.0	0.0	0.0	0.00	0.0	1
3	119.0	125.0	450.0	22.0	0.00	0.0	1
4	119.0	125.0	1125.0	31.0	0.00	0.0	1
5	119.0	125.0	450.0	28.0	0.00	0.0	1
6	119.0	125.0	0.0	0.0	0.00	0.0	1

ANISOTROPIC STRENGTH PARAMETERS
3 soil type(s)
Soil Type 1 Is Anisotropic
Number Of Direction Ranges Specified = 3

Direction Range No.	Counterclockwise Direction Limit (deg)	Cohesion Intercept (psf)	Friction Angle (deg)
1	0.0	1125.00	31.00
2	5.0	450.00	17.00

3	90.0	1125.00	31.00

Soil Type 2 Is Anisotropic
Number Of Direction Ranges Specified = 3

Direction Range No.	Counterclockwise Direction Limit (deg)	Cohesion Intercept (psf)	Friction Angle (deg)
1	0.0	525.00	25.00
2	15.0	375.00	14.50
3	90.0	450.00	22.00

Soil Type 6 Is Anisotropic
Number Of Direction Ranges Specified = 3

Direction Range No.	Counterclockwise Direction Limit (deg)	Cohesion Intercept (psf)	Friction Angle (deg)
1	0.0	750.00	31.00
2	15.0	375.00	14.50
3	90.0	450.00	22.00

ANISOTROPIC SOIL NOTES:
(1) An input value of 0.01 for C and/or Phi will cause Aniso C and/or Phi to be ignored in that range.
(2) An input value of 0.02 for Phi will set both Phi and C equal to zero, with no water weight in the tension crack.
(3) An input value of 0.03 for Phi will set both Phi and C equal to zero, with water weight in the tension crack.

1 PIEZOMETRIC SURFACE(S) SPECIFIED
Unit Weight of Water = 62.40 (pcf)
Piezometric Surface No. 1 Specified by 12 Coordinate Points
Pore Pressure Inclination Factor = 0.50

Point No.	X-Water (ft)	Y-Water (ft)
1	0.00	201.00
2	147.00	205.00
3	333.00	210.00
4	476.00	230.00
5	700.00	250.00
6	878.00	270.00
7	1031.00	290.00
8	1183.00	310.00
9	1330.00	330.00
10	1368.00	336.00
11	1550.00	375.00
12	1960.00	420.00

Specified Peak Ground Acceleration Coefficient (A) = 0.276(g)
Specified Horizontal Earthquake Coefficient (kh) = 0.150(g)
Specified Vertical Earthquake Coefficient (kv) = 0.000(g)
Specified Seismic Pore-Pressure Factor = 0.000
Janbus Empirical Coef is being used for the case of c & phi both > 0
A Critical Failure Surface Searching Method, Using A Random Technique For Generating Sliding Block Surfaces, Has Been Specified.
The Active And Passive Portions Of The Sliding Surfaces Are Generated According To The Rankine Theory.
5000 Trial Surfaces Have Been Generated.
3 Boxes Specified For Generation Of Central Block Base Length Of Line Segments For Active And Passive Portions Of Sliding Block Is 60.0

Box No.	X-Left (ft)	Y-Left (ft)	X-Right (ft)	Y-Right (ft)	Height (ft)
1	160.00	117.00	570.00	117.00	1.00
2	571.00	117.00	571.00	117.00	1.00
3	600.00	117.00	1630.00	120.00	2.00

Following Are Displayed The Ten Most Critical Of The Trial Failure Surfaces Evaluated. They Are Ordered - Most Critical First.
* * Safety Factors Are Calculated By The Simplified Janbu Method * *
Total Number of Trial Surfaces Attempted = 5000
Number of Trial Surfaces With Valid FS = 5000
Statistical Data On All Valid FS Values:
FS Max = 2.097 FS Min = 0.946 FS Ave = 1.035
Standard Deviation = 0.275 Coefficient of Variation = 26.59 %

Failure Surface Specified By 19 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	30.987	225.000
2	40.825	218.364
3	90.567	184.813
4	140.310	151.261
5	152.965	138.606
6	174.890	116.681
7	571.000	117.054
8	1525.579	120.165
9	1568.006	162.592
10	1610.432	205.018
11	1652.858	247.445
12	1695.285	289.871
13	1737.711	332.297
14	1780.138	374.724
15	1822.564	417.150
16	1864.990	459.577
17	1907.417	502.003
18	1949.843	544.429
19	1950.414	545.000

Factor of Safety
*** 0.946 ***

Individual data on the 101 slices

Slice No.	Width (ft)	Weight (lbs)	Water Force Top (lbs)	Water Force Bot (lbs)	Tie Force Norm (lbs)	Tie Force Tan (lbs)	Earthquake Force Hor (lbs)	Earthquake Force Ver (lbs)	Surcharge Load (lbs)
1	9.8	3884.4	0.0	0.0	0.	0.	582.7	0.0	0.0
2	4.2	3996.3	0.0	0.0	0.	0.	599.4	0.0	0.0
3	5.0	6667.6	0.0	0.0	0.	0.	1000.1	0.0	0.0
4	14.0	29740.0	0.0	0.0	0.	0.	4461.0	0.0	0.0
5	26.6	103021.1	0.0	18650.9	0.	0.	15453.2	0.0	0.0
6	49.7	359285.5	0.0	*******	0.	0.	53892.8	0.0	0.0
7	6.7	65792.5	0.0	33636.7	0.	0.	9868.9	0.0	0.0
8	6.0	63502.0	0.0	33408.0	0.	0.	9525.3	0.0	0.0
9	21.9	272672.4	0.0	*******	0.	0.	40900.9	0.0	0.0
10	5.1	70793.2	0.0	28414.3	0.	0.	10619.0	0.0	0.0
11	120.0	1686910.0	0.0	*******	0.	0.	*******	0.0	0.0
12	30.0	429101.5	0.0	*******	0.	0.	64365.2	0.0	0.0
13	3.0	43072.4	0.0	17427.9	0.	0.	6460.9	0.0	0.0
14	2.0	28722.3	0.0	11533.3	0.	0.	4308.3	0.0	0.0
15	12.0	172665.5	0.0	69920.8	0.	0.	25899.8	0.0	0.0
16	13.0	187695.8	0.0	77142.7	0.	0.	28154.4	0.0	0.0
17	38.5	560025.9	0.0	*******	0.	0.	84003.9	0.0	0.0
18	14.5	212099.1	0.0	92442.6	0.	0.	31814.9	0.0	0.0
19	4.0	58975.4	0.0	25848.2	0.	0.	8846.3	0.0	0.0
20	18.0	272402.8	0.0	*******	0.	0.	40860.4	0.0	0.0
21	2.0	30975.4	0.0	13284.7	0.	0.	4646.3	0.0	0.0
22	39.0	631200.3	0.0	*******	0.	0.	94680.0	0.0	0.0
23	4.0	67668.8	0.0	28146.1	0.	0.	10150.3	0.0	0.0
24	17.0	294864.7	0.0	*******	0.	0.	44229.7	0.0	0.0
25	21.0	384402.6	0.0	*******	0.	0.	57660.4	0.0	0.0
26	27.0	510566.6	0.0	*******	0.	0.	76585.0	0.0	0.0
27	1.0	18946.7	0.0	7407.2	0.	0.	2842.0	0.0	0.0
28	21.0	412293.8	0.0	*******	0.	0.	61844.1	0.0	0.0
29	1.0	20319.4	0.0	7528.0	0.	0.	3047.9	0.0	0.0
30	3.0	61332.5	0.0	22616.8	0.	0.	9199.9	0.0	0.0
31	22.0	466860.3	0.0	*******	0.	0.	70029.0	0.0	0.0
32	27.0	591456.2	0.0	*******	0.	0.	88718.4	0.0	0.0
33	4.0	89297.0	0.0	31279.6	0.	0.	13394.5	0.0	0.0
34	3.0	68223.5	0.0	23515.8	0.	0.	10233.5	0.0	0.0
35	3.0	68224.7	0.0	23564.0	0.	0.	10233.7	0.0	0.0
36	39.0	924152.2	0.0	*******	0.	0.	*******	0.0	0.0
37	31.0	763648.0	0.0	*******	0.	0.	*******	0.0	0.0
38	60.0	1475194.8	0.0	*******	0.	0.	*******	0.0	0.0
39	32.0	785369.6	0.0	*******	0.	0.	*******	0.0	0.0
40	40.0	980341.5	0.0	*******	0.	0.	*******	0.0	0.0
41	33.0	807635.4	0.0	*******	0.	0.	*******	0.0	0.0

42	5.0	121996.3	0.0	46756.6	0.	0.	18299.4	0.0	0.0
43	8.0	194731.7	0.0	75162.3	0.	0.	29209.8	0.0	0.0
44	12.0	292113.1	0.0	*******	0.	0.	43817.0	0.0	0.0
45	16.0	402029.7	0.0	*******	0.	0.	60304.5	0.0	0.0
46	6.0	157211.6	0.0	57877.8	0.	0.	23581.7	0.0	0.0
47	8.0	217208.9	0.0	77612.0	0.	0.	32581.3	0.0	0.0
48	11.0	305964.2	0.0	*******	0.	0.	45894.6	0.0	0.0
49	19.0	528889.2	0.0	*******	0.	0.	79333.4	0.0	0.0
50	56.0	1561820.8	0.0	*******	0.	0.	*******	0.0	0.0
51	25.0	698682.7	0.0	*******	0.	0.	*******	0.0	0.0
52	2.0	55932.8	0.0	21230.5	0.	0.	8389.9	0.0	0.0
53	5.0	138951.4	0.0	53215.1	0.	0.	20842.7	0.0	0.0
54	2.0	55226.2	0.0	21341.6	0.	0.	8283.9	0.0	0.0
55	73.0	2016784.0	0.0	*******	0.	0.	*******	0.0	0.0
56	31.0	890248.8	0.0	*******	0.	0.	*******	0.0	0.0
57	39.0	1162271.9	0.0	*******	0.	0.	*******	0.0	0.0
58	10.0	298105.1	0.0	*******	0.	0.	44715.8	0.0	0.0
59	17.0	525077.8	0.0	*******	0.	0.	78761.7	0.0	0.0
60	43.0	1407969.6	0.0	*******	0.	0.	*******	0.0	0.0
61	77.0	2582662.8	0.0	*******	0.	0.	*******	0.0	0.0
62	10.9	367079.3	0.0	*******	0.	0.	55061.9	0.0	0.0
63	27.1	908303.2	0.0	*******	0.	0.	*******	0.0	0.0
64	10.0	335642.9	0.0	*******	0.	0.	50346.4	0.0	0.0
65	7.0	235000.6	0.0	93644.1	0.	0.	35250.1	0.0	0.0
66	15.0	503713.0	0.0	*******	0.	0.	75557.0	0.0	0.0
67	27.0	902828.1	0.0	*******	0.	0.	*******	0.0	0.0
68	3.0	99817.0	0.0	41949.1	0.	0.	14972.6	0.0	0.0
69	10.0	333029.5	0.0	*******	0.	0.	49954.4	0.0	0.0
70	40.0	1341556.0	0.0	*******	0.	0.	*******	0.0	0.0
71	5.0	168756.3	0.0	73392.5	0.	0.	25313.4	0.0	0.0
72	25.0	847320.7	0.0	*******	0.	0.	*******	0.0	0.0
73	6.0	204234.7	0.0	90427.9	0.	0.	30635.2	0.0	0.0
74	4.9	165845.3	0.0	73660.3	0.	0.	24876.8	0.0	0.0
75	1.1	38729.2	0.0	17231.2	0.	0.	5809.4	0.0	0.0
76	3.6	122198.1	0.0	54441.0	0.	0.	18329.7	0.0	0.0
77	1.4	48414.6	0.0	30539.4	0.	0.	7262.2	0.0	0.0
78	23.0	758619.3	0.0	*******	0.	0.	*******	0.0	0.0
79	1.0	31950.3	0.0	20173.2	0.	0.	4792.5	0.0	0.0
80	6.0	189840.9	0.0	*******	0.	0.	28476.1	0.0	0.0
81	11.0	340825.8	0.0	*******	0.	0.	51123.9	0.0	0.0
82	42.4	1230253.9	0.0	*******	0.	0.	*******	0.0	0.0
83	7.6	205495.1	0.0	*******	0.	0.	30824.3	0.0	0.0
84	12.0	317176.4	0.0	*******	0.	0.	47576.5	0.0	0.0
85	10.0	254861.6	0.0	*******	0.	0.	38229.2	0.0	0.0
86	12.9	315563.6	0.0	*******	0.	0.	47334.5	0.0	0.0
87	20.1	471446.9	0.0	*******	0.	0.	70717.0	0.0	0.0
88	22.3	489099.1	0.0	*******	0.	0.	73364.9	0.0	0.0
89	4.7	99109.9	0.0	40939.1	0.	0.	14866.5	0.0	0.0
90	37.7	740459.4	0.0	*******	0.	0.	*******	0.0	0.0
91	22.3	394305.2	0.0	*******	0.	0.	59145.8	0.0	0.0
92	20.1	327465.8	0.0	60942.1	0.	0.	49119.9	0.0	0.0
93	28.7	417267.1	0.0	32125.1	0.	0.	62590.1	0.0	0.0
94	6.2	82427.5	0.0	0.0	0.	0.	12364.1	0.0	0.0
95	7.6	96831.5	0.0	0.0	0.	0.	14524.7	0.0	0.0
96	42.4	448484.0	0.0	0.0	0.	0.	67272.6	0.0	0.0
97	10.0	82388.5	0.0	0.0	0.	0.	12358.3	0.0	0.0
98	32.4	202319.3	0.0	0.0	0.	0.	30347.9	0.0	0.0
99	17.6	67892.4	0.0	0.0	0.	0.	10183.9	0.0	0.0
100	24.8	38408.9	0.0	0.0	0.	0.	5761.3	0.0	0.0
101	0.6	19.4	0.0	0.0	0.	0.	2.9	0.0	0.0

Failure Surface Specified By 19 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	30.987	225.000
2	40.825	218.364
3	90.567	184.813
4	140.310	151.261
5	152.965	138.606
6	174.890	116.681
7	571.000	117.054

8	1525.579	120.165
9	1568.006	162.592
10	1610.432	205.018
11	1652.858	247.445
12	1695.285	289.871
13	1737.711	332.297
14	1780.138	374.724
15	1822.564	417.150
16	1864.990	459.577
17	1907.417	502.003
18	1949.843	544.429
19	1950.414	545.000

Factor of Safety
*** 0.946 ***

Failure Surface Specified By 19 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	30.987	225.000
2	40.825	218.364
3	90.567	184.813
4	140.310	151.261
5	152.965	138.606
6	174.890	116.681
7	571.000	117.054
8	1525.579	120.165
9	1568.006	162.592
10	1610.432	205.018
11	1652.858	247.445
12	1695.285	289.871
13	1737.711	332.297
14	1780.138	374.724
15	1822.564	417.150
16	1864.990	459.577
17	1907.417	502.003
18	1949.843	544.429
19	1950.414	545.000

Factor of Safety
*** 0.946 ***

Failure Surface Specified By 19 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	16.909	225.000
2	31.521	215.144
3	81.263	181.592
4	131.006	148.040
5	142.357	136.689
6	162.477	116.569
7	571.000	117.137
8	1510.491	119.303
9	1552.918	161.730
10	1595.344	204.156
11	1637.771	246.582
12	1680.197	289.009
13	1722.623	331.435
14	1765.050	373.862
15	1807.476	416.288
16	1849.902	458.714
17	1892.329	501.141
18	1934.755	543.567
19	1936.188	545.000

Factor of Safety
*** 0.950 ***

Failure Surface Specified By 19 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	16.909	225.000
2	31.521	215.144
3	81.263	181.592
4	131.006	148.040
5	142.357	136.689

6	162.477	116.569
7	571.000	117.137
8	1510.491	119.303
9	1552.918	161.730
10	1595.344	204.156
11	1637.771	246.582
12	1680.197	289.009
13	1722.623	331.435
14	1765.050	373.862
15	1807.476	416.288
16	1849.902	458.714
17	1892.329	501.141
18	1934.755	543.567
19	1936.188	545.000

Factor of Safety
*** 0.950 ***

Failure Surface Specified By 19 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	16.909	225.000
2	31.521	215.144
3	81.263	181.592
4	131.006	148.040
5	142.357	136.689
6	162.477	116.569
7	571.000	117.137
8	1510.491	119.303
9	1552.918	161.730
10	1595.344	204.156
11	1637.771	246.582
12	1680.197	289.009
13	1722.623	331.435
14	1765.050	373.862
15	1807.476	416.288
16	1849.902	458.714
17	1892.329	501.141
18	1934.755	543.567
19	1936.188	545.000

Factor of Safety
*** 0.950 ***

Failure Surface Specified By 17 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	17.299	225.000
2	31.779	215.233
3	81.521	181.681
4	131.264	148.130
5	142.651	136.742
6	162.678	116.716
7	571.000	117.006
8	1261.541	119.075
9	1303.968	161.502
10	1346.394	203.928
11	1388.820	246.354
12	1431.247	288.781
13	1473.673	331.207
14	1473.750	331.285
15	1516.177	373.711
16	1517.466	375.000
17	1530.029	395.909

Factor of Safety
*** 0.951 ***

Failure Surface Specified By 17 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	17.299	225.000
2	31.779	215.233
3	81.521	181.681
4	131.264	148.130
5	142.651	136.742

6	162.678	116.716
7	571.000	117.006
8	1261.541	119.075
9	1303.968	161.502
10	1346.394	203.928
11	1388.820	246.354
12	1431.247	288.781
13	1473.673	331.207
14	1473.750	331.285
15	1516.177	373.711
16	1517.466	375.000
17	1530.029	395.909

Factor of Safety
*** 0.951 ***

Failure Surface Specified By 17 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	17.299	225.000
2	31.779	215.233
3	81.521	181.681
4	131.264	148.130
5	142.651	136.742
6	162.678	116.716
7	571.000	117.006
8	1261.541	119.075
9	1303.968	161.502
10	1346.394	203.928
11	1388.820	246.354
12	1431.247	288.781
13	1473.673	331.207
14	1473.750	331.285
15	1516.177	373.711
16	1517.466	375.000
17	1530.029	395.909

Factor of Safety
*** 0.951 ***

Failure Surface Specified By 16 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	34.546	225.000
2	43.177	219.178
3	92.919	185.627
4	142.661	152.075
5	155.646	139.090
6	177.292	117.445
7	571.000	117.489
8	1628.177	120.429
9	1657.722	172.650
10	1687.268	224.872
11	1716.813	277.093
12	1746.359	329.315
13	1775.904	381.536
14	1805.449	433.757
15	1834.995	485.979
16	1860.708	531.427

Factor of Safety
*** 0.951 ***

**** END OF GSTABL7 OUTPUT ****

***** GSTABL7 *****

** GSTABL7 by Garry H. Gregory, P.E. **

** Original Version 1.0, January 1996; Current Version 2.005, Sept. 2006 **

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****

SLOPE STABILITY ANALYSIS SYSTEM

Modified Bishop, Simplified Janbu, or GLE Method of Slices.
(Includes Spencer & Morgenstern-Price Type Analysis)
Including Pier/Pile, Reinforcement, Soil Nail, Tieback,
Nonlinear Undrained Shear Strength, Curved Phi Envelope,
Anisotropic Soil, Fiber-Reinforced Soil, Boundary Loads, Water
Surfaces, Pseudo-Static & Newmark Earthquake, and Applied Forces.

****

Analysis Run Date: 2/6/2015
Time of Run: 02:11PM
Run By: SMC
Input Data Filename: K:\13500-13999\13662-00 Euland Hydro Study\2015 Plan Review\SSA\b-35-15s Surface #1.
Output Filename: K:\13500-13999\13662-00 Euland Hydro Study\2015 Plan Review\SSA\b-35-15s Surface #1.OUT
Unit System: English
Plotted Output Filename: K:\13500-13999\13662-00 Euland Hydro Study\2015 Plan Review\SSA\b-35-15s Surface #1.PLT
PROBLEM DESCRIPTION: 13662-00, Euland Capital , B-B',
, , seismic, 2015 design

BOUNDARY COORDINATES
36 Top Boundaries
87 Total Boundaries

Boundary No.	X-Left (ft)	Y-Left (ft)	X-Right (ft)	Y-Right (ft)	Soil Type Below Bnd
1	0.00	225.00	45.00	225.00	3
2	45.00	225.00	413.00	235.00	5
3	413.00	235.00	437.00	242.00	5
4	437.00	242.00	480.00	254.00	3
5	480.00	254.00	497.00	260.00	3
6	497.00	260.00	518.00	270.00	2
7	518.00	270.00	545.00	270.00	2
8	545.00	270.00	593.00	295.00	5
9	593.00	295.00	620.00	295.00	5
10	620.00	295.00	624.00	302.00	5
11	624.00	302.00	630.00	302.00	5
12	630.00	302.00	669.00	318.00	5
13	669.00	318.00	865.00	316.00	5
14	865.00	316.00	870.00	315.00	5
15	870.00	315.00	890.00	315.00	2
16	890.00	315.00	912.00	333.00	5
17	912.00	333.00	920.00	344.00	5
18	920.00	344.00	1033.00	345.00	5
19	1033.00	345.00	1038.00	342.00	5
20	1038.00	342.00	1113.00	342.00	5
21	1113.00	342.00	1144.00	360.00	5
22	1144.00	360.00	1193.00	360.00	5
23	1193.00	360.00	1210.00	378.00	5
24	1210.00	378.00	1253.00	391.00	5
25	1253.00	391.00	1400.00	391.00	5
26	1400.00	391.00	1430.00	388.00	5
27	1430.00	388.00	1527.00	395.00	5
28	1527.00	395.00	1557.00	404.00	5
29	1557.00	404.00	1630.00	435.00	5
30	1630.00	435.00	1640.00	437.00	5
31	1640.00	437.00	1700.00	465.00	3
32	1700.00	465.00	1760.00	495.00	3
33	1760.00	495.00	1815.00	520.00	4
34	1815.00	520.00	1875.00	535.00	4
35	1875.00	535.00	1925.00	545.00	4
36	1925.00	545.00	1955.00	545.00	4
37	45.00	225.00	50.00	220.00	3
38	50.00	220.00	417.00	232.00	3
39	417.00	232.00	435.00	237.00	3

40	435.00	237.00	437.00	242.00	3
41	435.00	237.00	480.00	249.00	2
42	480.00	249.00	497.00	260.00	2
43	545.00	270.00	546.00	265.00	2
44	546.00	265.00	567.00	265.00	2
45	567.00	265.00	568.00	270.00	2
46	568.00	270.00	627.00	293.00	2
47	627.00	293.00	760.00	295.00	2
48	760.00	295.00	832.00	305.00	2
49	832.00	305.00	870.00	315.00	2
50	890.00	315.00	906.00	310.00	2
51	906.00	310.00	931.00	310.00	2
52	931.00	310.00	950.00	330.00	2
53	950.00	330.00	1006.00	333.00	2
54	1006.00	333.00	1113.00	337.00	2
55	1113.00	337.00	1400.00	370.00	2
56	1400.00	370.00	1427.00	374.00	2
57	1427.00	374.00	1485.00	375.00	2
58	1485.00	375.00	1522.00	375.00	2
59	1522.00	375.00	1550.00	375.00	1
60	1550.00	375.00	1551.00	380.00	1
61	1551.00	380.00	1618.00	410.00	1
62	1618.00	410.00	1640.00	437.00	3
63	0.00	115.00	20.00	115.00	1
64	20.00	115.00	50.00	120.00	6
65	50.00	120.00	180.00	165.00	2
66	180.00	165.00	300.00	170.00	2
67	300.00	170.00	330.00	195.00	2
68	330.00	195.00	335.00	200.00	2
69	335.00	200.00	347.00	203.00	2
70	347.00	203.00	360.00	207.00	2
71	360.00	207.00	417.00	225.00	2
72	417.00	225.00	435.00	237.00	2
73	50.00	120.00	620.00	223.00	6
74	620.00	223.00	792.00	245.00	6
75	792.00	245.00	1040.00	290.00	6
76	1040.00	290.00	1378.00	307.00	6
77	1378.00	307.00	1516.00	342.00	6
78	20.00	115.00	600.00	115.00	1
79	600.00	115.00	1338.00	118.00	1
80	1338.00	118.00	1385.00	143.00	1
81	1385.00	143.00	1440.00	200.00	1
82	1440.00	200.00	1480.00	258.00	1
83	1480.00	258.00	1510.00	320.00	1
84	1510.00	320.00	1516.00	342.00	1
85	1516.00	342.00	1522.00	375.00	1
86	1618.00	410.00	1673.00	440.00	4
87	1673.00	440.00	1760.00	495.00	4

Default Y-Origin = 0.00(ft)
Default X-Plus Value = 0.00(ft)
Default Y-Plus Value = 0.00(ft)

ISOTROPIC SOIL PARAMETERS
6 Type(s) of Soil

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.
1	119.0	125.0	0.0	0.0	0.00	0.0	1
2	119.0	125.0	0.0	0.0	0.00	0.0	1
3	119.0	125.0	450.0	22.0	0.00	0.0	1
4	119.0	125.0	1125.0	31.0	0.00	0.0	1
5	119.0	125.0	450.0	28.0	0.00	0.0	1
6	119.0	125.0	0.0	0.0	0.00	0.0	1

ANISOTROPIC STRENGTH PARAMETERS
3 soil type(s)
Soil Type 1 Is Anisotropic
Number Of Direction Ranges Specified = 3

Direction Range No.	Counterclockwise Direction Limit (deg)	Cohesion Intercept (psf)	Friction Angle (deg)
1	0.0	1125.00	31.00

2	5.0	450.00	17.00
3	90.0	1125.00	31.00

Soil Type 2 Is Anisotropic
Number Of Direction Ranges Specified = 3

Direction Range No.	Counterclockwise Direction Limit (deg)	Cohesion Intercept (psf)	Friction Angle (deg)
1	0.0	525.00	25.00
2	15.0	375.00	14.50
3	90.0	450.00	22.00

Soil Type 6 Is Anisotropic
Number Of Direction Ranges Specified = 3

Direction Range No.	Counterclockwise Direction Limit (deg)	Cohesion Intercept (psf)	Friction Angle (deg)
1	0.0	750.00	31.00
2	15.0	375.00	14.50
3	90.0	450.00	22.00

ANISOTROPIC SOIL NOTES:
(1) An input value of 0.01 for C and/or Phi will cause Aniso C and/or Phi to be ignored in that range.
(2) An input value of 0.02 for Phi will set both Phi and C equal to zero, with no water weight in the tension crack.
(3) An input value of 0.03 for Phi will set both Phi and C equal to zero, with water weight in the tension crack.

1 PIEZOMETRIC SURFACE(S) SPECIFIED
Unit Weight of Water = 62.40 (pcf)
Piezometric Surface No. 1 Specified by 12 Coordinate Points
Pore Pressure Inclination Factor = 0.50

Point No.	X-Water (ft)	Y-Water (ft)
1	0.00	201.00
2	147.00	205.00
3	333.00	210.00
4	476.00	230.00
5	700.00	250.00
6	878.00	270.00
7	1031.00	290.00
8	1183.00	310.00
9	1330.00	330.00
10	1368.00	336.00
11	1550.00	375.00
12	1960.00	420.00

Specified Peak Ground Acceleration Coefficient (A) = 0.276(g)
Specified Horizontal Earthquake Coefficient (kh) = 0.150(g)
Specified Vertical Earthquake Coefficient (kv) = 0.000(g)
Specified Seismic Pore-Pressure Factor = 0.000
Janbu's Empirical Coef. is being used for the case of c & phi both > 0
Trial Failure Surface Specified By 19 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	30.987	225.000
2	40.825	218.364
3	90.567	184.813
4	140.310	151.261
5	152.965	138.606
6	174.890	116.681
7	571.000	117.054
8	1525.579	120.165
9	1568.006	162.592
10	1610.432	205.018
11	1652.858	247.445
12	1695.285	289.871
13	1737.711	332.297
14	1780.138	374.724
15	1822.564	417.150
16	1864.990	459.577
17	1907.417	502.003
18	1949.843	544.429
19	1950.414	545.000

Janbu's Empirical Coefficient (fo) = 1.067
* * Factor Of Safety Is Calculated By The Simplified Janbu Method * *
Factor Of Safety For The Preceding Specified Surface = 0.946

Table 1 - Individual Data on the 101 Slices

Slice No.	Width (ft)	Weight (lbs)	Water Force Top (lbs)	Water Force Bot (lbs)	Tie Force Norm (lbs)	Tie Force Tan (lbs)	Earthquake Force Hor (lbs)	Earthquake Force Ver (lbs)	Surcharge Load (lbs)
1	9.8	3884.4	0.0	0.0	0.0	0.0	582.7	0.0	0.0
2	4.2	3996.5	0.0	0.0	0.0	0.0	599.5	0.0	0.0
3	5.0	6667.7	0.0	0.0	0.0	0.0	1000.2	0.0	0.0
4	14.0	29740.0	0.0	0.0	0.0	0.0	4461.0	0.0	0.0
5	26.6	103019.2	0.0	18650.2	0.0	0.0	15452.9	0.0	0.0
6	49.7	359289.6	0.0	*******	0.0	0.0	53893.4	0.0	0.0
7	6.7	65788.5	0.0	33634.6	0.0	0.0	9868.3	0.0	0.0
8	6.0	63505.4	0.0	33409.7	0.0	0.0	9525.8	0.0	0.0
9	21.9	272674.2	0.0	*******	0.0	0.0	40901.1	0.0	0.0
10	5.1	70786.7	0.0	28411.7	0.0	0.0	10618.0	0.0	0.0
11	120.0	1686910.2	0.0	*******	0.0	0.0	*******	0.0	0.0
12	30.0	429101.3	0.0	*******	0.0	0.0	64365.2	0.0	0.0
13	3.0	43072.4	0.0	17427.9	0.0	0.0	6460.9	0.0	0.0
14	2.0	28722.3	0.0	11533.3	0.0	0.0	4308.3	0.0	0.0
15	12.0	172665.4	0.0	69920.8	0.0	0.0	25899.8	0.0	0.0
16	13.0	187695.6	0.0	77142.6	0.0	0.0	28154.3	0.0	0.0
17	38.5	560025.3	0.0	*******	0.0	0.0	84003.8	0.0	0.0
18	14.5	212098.8	0.0	92442.5	0.0	0.0	31814.8	0.0	0.0
19	4.0	58975.3	0.0	25848.2	0.0	0.0	8846.3	0.0	0.0
20	18.0	272402.3	0.0	*******	0.0	0.0	40860.3	0.0	0.0
21	2.0	30975.4	0.0	13284.7	0.0	0.0	4646.3	0.0	0.0
22	39.0	631199.2	0.0	*******	0.0	0.0	94679.9	0.0	0.0
23	4.0	67668.7	0.0	28146.0	0.0	0.0	10150.3	0.0	0.0
24	17.0	294864.1	0.0	*******	0.0	0.0	44229.6	0.0	0.0
25	21.0	384401.9	0.0	*******	0.0	0.0	57660.3	0.0	0.0
26	27.0	510565.5	0.0	*******	0.0	0.0	76584.8	0.0	0.0
27	1.0	18946.6	0.0	7407.1	0.0	0.0	2842.0	0.0	0.0
28	21.0	412292.8	0.0	*******	0.0	0.0	61843.9	0.0	0.0
29	1.0	20319.3	0.0	7527.9	0.0	0.0	3047.9	0.0	0.0
30	3.0	61332.4	0.0	22616.8	0.0	0.0	9199.9	0.0	0.0
31	22.0	466859.4	0.0	*******	0.0	0.0	70028.9	0.0	0.0
32	27.0	591455.1	0.0	*******	0.0	0.0	88718.3	0.0	0.0
33	4.0	89296.8	0.0	31279.5	0.0	0.0	13394.5	0.0	0.0
34	3.0	68223.4	0.0	23515.8	0.0	0.0	10233.5	0.0	0.0
35	3.0	68224.6	0.0	23563.9	0.0	0.0	10233.7	0.0	0.0
36	39.0	924150.9	0.0	*******	0.0	0.0	*******	0.0	0.0
37	31.0	763647.0	0.0	*******	0.0	0.0	*******	0.0	0.0
38	60.0	1475193.2	0.0	*******	0.0	0.0	*******	0.0	0.0
39	32.0	785368.9	0.0	*******	0.0	0.0	*******	0.0	0.0
40	40.0	980340.8	0.0	*******	0.0	0.0	*******	0.0	0.0
41	33.0	807635.0	0.0	*******	0.0	0.0	*******	0.0	0.0
42	5.0	121996.2	0.0	46756.5	0.0	0.0	18299.4	0.0	0.0
43	8.0	194731.6	0.0	75162.3	0.0	0.0	29209.7	0.0	0.0
44	12.0	292113.0	0.0	*******	0.0	0.0	43817.0	0.0	0.0
45	16.0	402029.5	0.0	*******	0.0	0.0	60304.4	0.0	0.0
46	6.0	157211.5	0.0	57877.7	0.0	0.0	23581.7	0.0	0.0
47	8.0	217208.8	0.0	77612.0	0.0	0.0	32581.3	0.0	0.0
48	11.0	305964.1	0.0	*******	0.0	0.0	45894.6	0.0	0.0
49	19.0	528889.2	0.0	*******	0.0	0.0	79333.4	0.0	0.0
50	56.0	1561820.8	0.0	*******	0.0	0.0	*******	0.0	0.0
51	25.0	698682.8	0.0	*******	0.0	0.0	*******	0.0	0.0
52	2.0	55932.8	0.0	21230.5	0.0	0.0	8389.9	0.0	0.0
53	5.0	138951.5	0.0	53215.2	0.0	0.0	20842.7	0.0	0.0
54	2.0	55226.2	0.0	21341.6	0.0	0.0	8283.9	0.0	0.0
55	73.0	2016784.8	0.0	*******	0.0	0.0	*******	0.0	0.0
56	31.0	890249.3	0.0	*******	0.0	0.0	*******	0.0	0.0
57	39.0	1162272.6	0.0	*******	0.0	0.0	*******	0.0	0.0
58	10.0	298105.3	0.0	*******	0.0	0.0	44715.8	0.0	0.0
59	17.0	525078.2	0.0	*******	0.0	0.0	78761.7	0.0	0.0
60	43.0	1407970.8	0.0	*******	0.0	0.0	*******	0.0	0.0
61	77.0	2582665.5	0.0	*******	0.0	0.0	*******	0.0	0.0
62	10.9	367063.3	0.0	*******	0.0	0.0	55059.5	0.0	0.0

63	27.1	908320.6	0.0	*******	0.0	0.0	*******	0.0	0.0
64	10.0	335643.3	0.0	*******	0.0	0.0	50346.5	0.0	0.0
65	7.0	235000.9	0.0	93644.2	0.0	0.0	35250.1	0.0	0.0
66	15.0	503713.7	0.0	*******	0.0	0.0	75557.1	0.0	0.0
67	27.0	902829.4	0.0	*******	0.0	0.0	*******	0.0	0.0
68	3.0	99817.1	0.0	41949.2	0.0	0.0	14972.6	0.0	0.0
69	10.0	333030.0	0.0	*******	0.0	0.0	49954.5	0.0	0.0
70	40.0	1341558.1	0.0	*******	0.0	0.0	*******	0.0	0.0
71	5.0	168756.6	0.0	73392.6	0.0	0.0	25313.5	0.0	0.0
72	25.0	847322.1	0.0	*******	0.0	0.0	*******	0.0	0.0
73	6.0	204235.1	0.0	90428.1	0.0	0.0	30635.3	0.0	0.0
74	4.9	165845.5	0.0	73660.5	0.0	0.0	24876.8	0.0	0.0
75	1.1	38729.3	0.0	17231.2	0.0	0.0	5809.4	0.0	0.0
76	3.6	122190.0	0.0	54437.4	0.0	0.0	18328.5	0.0	0.0
77	1.4	48422.9	0.0	30544.7	0.0	0.0	7263.4	0.0	0.0
78	23.0	758620.0	0.0	*******	0.0	0.0	*******	0.0	0.0
79	1.0	31950.3	0.0	20173.3	0.0	0.0	4792.5	0.0	0.0
80	6.0	189841.1	0.0	*******	0.0	0.0	28476.2	0.0	0.0
81	11.0	340837.3	0.0	*******	0.0	0.0	51125.6	0.0	0.0
82	42.4	1230243.8	0.0	*******	0.0	0.0	*******	0.0	0.0
83	7.6	205495.3	0.0	*******	0.0	0.0	30824.3	0.0	0.0
84	12.0	317176.4	0.0	*******	0.0	0.0	47576.5	0.0	0.0
85	10.0	254861.4	0.0	*******	0.0	0.0	38229.2	0.0	0.0
86	12.9	315557.0	0.0	*******	0.0	0.0	47333.6	0.0	0.0
87	20.1	471451.9	0.0	*******	0.0	0.0	70717.8	0.0	0.0
88	22.3	489101.7	0.0	*******	0.0	0.0	73365.3	0.0	0.0
89	4.7	99107.4	0.0	40938.1	0.0	0.0	14866.1	0.0	0.0
90	37.7	740456.1	0.0	*******	0.0	0.0	*******	0.0	0.0
91	22.3	394310.5	0.0	*******	0.0	0.0	59146.6	0.0	0.0
92	20.1	327474.2	0.0	60943.7	0.0	0.0	49121.1	0.0	0.0
93	28.7	417265.6	0.0	32124.7	0.0	0.0	62589.8	0.0	0.0
94	6.2	82422.8	0.0	0.0	0.0	0.0	12363.4	0.0	0.0
95	7.6	96833.4	0.0	0.0	0.0	0.0	14525.0	0.0	0.0
96	42.4	448478.1	0.0	0.0	0.0	0.0	67271.7	0.0	0.0
97	10.0	82391.0	0.0	0.0	0.0	0.0	12358.7	0.0	0.0
98	32.4	202320.0	0.0	0.0	0.0	0.0	30348.0	0.0	0.0
99	17.6	67891.9	0.0	0.0	0.0	0.0	10183.8	0.0	0.0
100	24.8	38410.0	0.0	0.0	0.0	0.0	5761.5	0.0	0.0
101	0.6	19.4	0.0	0.0	0.0	0.0	2.9	0.0	0.0

Table 2 - Base Stress Data on the 101 Slices

Slice No. *	Alpha (deg)	X-Coord. Slice Cntr (ft)	Base Leng. (ft)	Available Shear Strength (psf)	Mobilized Shear Stress (psf)
1	-34.00	35.91	11.87	1032.59	-171.70
2	-34.00	42.91	5.04	1417.49	-416.24
3	-34.00	47.50	6.03	1675.05	-579.87
4	-34.00	56.99	16.87	2217.60	-924.56
5	-34.00	77.28	32.06	3016.94	-1685.34
6	-34.00	115.44	60.00	4164.59	-3140.79
7	-45.00	143.65	9.46	9626.52	-5910.54
8	-45.00	149.98	8.44	10155.66	-6398.84
9	-45.00	163.93	31.01	20555.75	-7474.96
10	0.05	177.45	5.11	2518.95	2090.93
11	0.05	240.00	120.00	2545.79	2121.87
12	0.05	315.00	30.00	2577.96	2158.97
13	0.05	331.50	3.00	2585.04	2167.14
14	0.05	334.00	2.00	2597.03	2167.70
15	0.05	341.00	12.00	2588.63	2171.87
16	0.05	353.50	13.00	2573.64	2179.31
17	0.05	379.26	38.52	2542.75	2194.66
18	0.05	405.76	14.48	2510.97	2210.45
19	0.05	415.00	4.00	2516.17	2225.46
20	0.05	426.00	18.00	2592.49	2284.27
21	0.05	436.00	2.00	2661.88	2337.73
22	0.05	456.50	39.00	2796.56	2442.93
23	0.05	478.00	4.00	2929.56	2553.50
24	0.05	488.50	17.00	3025.26	2618.07
25	0.05	507.50	21.00	3246.47	2762.96
26	0.05	531.50	27.00	3368.81	2854.28
27	0.05	545.50	1.00	3358.46	2859.84

28	0.05	556.50	21.00	3520.30	2963.44
29	0.05	567.50	1.00	3682.14	3067.03
30	0.05	569.50	3.00	3711.56	3085.87
31	0.19	582.00	22.00	3892.61	3252.27
32	0.19	606.50	27.00	4035.72	3357.24
33	0.19	622.00	4.00	4122.43	3421.37
34	0.19	625.50	3.00	4225.33	3485.27
35	0.19	628.50	3.00	4221.28	3485.33
36	0.19	649.50	39.00	4438.94	3631.63
37	0.19	684.50	31.00	4632.85	3775.33
38	0.19	730.00	60.00	4551.66	3768.09
39	0.19	776.00	32.00	4459.94	3761.38
40	0.19	812.00	40.00	4388.16	3756.13
41	0.19	848.50	33.00	4315.38	3750.81
42	0.19	867.50	5.00	4262.90	3739.38
43	0.19	874.00	8.00	4236.60	3730.53
44	0.19	884.00	12.00	4223.03	3730.73
45	0.19	898.00	16.00	4397.10	3850.89
46	0.19	909.00	6.00	4652.47	4015.66
47	0.19	916.00	8.00	4883.46	4161.13
48	0.19	925.50	11.00	5035.63	4262.87
49	0.19	940.50	19.00	5010.58	4266.14
50	0.19	978.00	56.00	4947.95	4274.32
51	0.19	1018.50	25.00	4880.32	4283.15
52	0.19	1032.00	2.00	4858.03	4286.08
53	0.19	1035.50	5.00	4805.34	4259.09
54	0.19	1039.00	2.00	4752.38	4231.94
55	0.19	1076.50	73.00	4679.09	4234.09
56	0.19	1128.50	31.00	4854.20	4401.23
57	0.19	1163.50	39.00	5062.54	4567.38
58	0.19	1188.00	10.00	5015.95	4568.71
59	0.19	1201.50	17.00	5265.44	4733.68
60	0.19	1231.50	43.00	5681.50	5018.21
61	0.19	1291.50	77.00	5760.29	5140.45
62	0.19	1335.47	10.94	5679.31	5142.67
63	0.19	1354.47	27.06	6667.28	5144.21
64	0.19	1373.00	10.00	6648.19	5144.01
65	0.19	1381.50	7.00	6616.96	5145.12
66	0.19	1392.50	15.00	6576.55	5146.55
67	0.19	1413.50	27.00	6450.34	5124.67
68	0.19	1428.50	3.00	6340.72	5099.27
69	0.19	1435.00	10.00	6324.50	5103.96
70	0.19	1460.00	40.00	6298.23	5140.12
71	0.19	1482.50	5.00	6274.58	5172.67
72	0.19	1497.50	25.00	6258.82	5194.36
73	0.19	1513.00	6.00	6242.53	5216.78
74	0.19	1518.43	4.86	6236.83	5224.64
75	0.19	1521.43	1.14	6233.67	5228.98
76	0.19	1523.79	3.58	6231.20	5232.39
77	45.00	1526.29	2.01	10784.32	27709.81
78	45.00	1538.50	32.53	10520.72	26821.27
79	45.00	1550.50	1.41	10165.14	25981.13
80	45.00	1554.00	8.49	10104.41	25728.94
81	45.00	1562.50	15.56	9999.27	25182.63
82	45.00	1589.22	60.00	9741.63	23579.88
83	45.00	1614.22	10.70	9500.59	22080.41
84	45.00	1624.00	16.97	9406.23	21493.43
85	45.00	1635.00	14.14	9230.66	20724.79
86	45.00	1646.43	18.18	9067.66	19956.54
87	45.00	1662.93	28.48	8951.38	19033.48
88	45.00	1684.14	31.52	8801.93	17847.12
89	45.00	1697.64	6.67	8706.84	17092.24
90	45.00	1718.86	53.33	8596.26	15966.68
91	45.00	1748.86	31.52	8446.74	14385.63
92	45.00	1770.07	28.48	8312.71	13223.36
93	45.00	1794.48	40.56	8122.42	11829.53
94	45.00	1811.91	8.74	7906.41	10847.56
95	45.00	1818.78	10.70	7626.75	10410.02
96	45.00	1843.78	60.00	6467.28	8596.01
97	45.00	1869.99	14.16	5251.05	6693.05

98	45.00	1891.21	45.84	4216.92	5075.11
99	45.00	1916.21	24.87	2979.97	3139.84
100	45.00	1937.42	35.13	1776.70	1257.24
101	45.00	1950.13	0.81	990.79	27.62

Sum of the Resisting Forces (including Pier/Pile, Tieback, Reinforcing
Soil Nail, and Applied Forces if applicable) = ********** (lbs)
Average Available Shear Strength (including Tieback, Pier/Pile, Reinforcing,
Soil Nail, and Applied Forces if applicable) = 5527.10(psf)
Sum of the Driving Forces = ********** (lbs)
Average Mobilized Shear Stress = 6232.87(psf)
Total length of the failure surface = 2132.27(ft)
*** SEISMIC SLOPE DISPLACEMENT DATA ***
(Note: kv is set = zero for displacement calculations)
Seismic Yield Coefficient (ky) = 0.1333(g)
Calculated Newmark Seismic Displacement = 0.115(ft)
Non-Symmetrical Sliding Resistance Has Been Specified
for Downhill Sliding.
**** END OF GSTABL7 OUTPUT ****

Sliding displacement models from Rathje and Antonakos (2011)

Prediction of dynamic response and sliding displacement of a sliding mass during earthquake shaking

Cross Section: B-B'

File: b-35-15s

Inputs	
PGA (g)	0.2763
PGV (cm/s)	23.32
k_y (g)	0.1333
T_m (s)	0.517
T_s (s)	0.37
M	6.95
T_s/T_m	0.715168

Dynamic Response			
	median	-1σ	+1σ
kmax (g)	0.209	0.163	0.268
k-velmax (cm/s)	25.30	19.70	32.48

Displacement Given Median Dynamic Response					
Displacement Model			Sliding Displacements, D (cm)		
	μ_{lnD}	σ_{lnD}	median	-1σ	+1σ
[kmax, M]	0.93	0.899	2.55	1.04	6.26
[kmax, k-velmax]	0.14	0.581	1.15	0.64	2.05
			Sliding Displacements, D (in)		
	μ_{lnD}	σ_{lnD}	median	-1σ	+1σ
[kmax, M]	0.93	0.899	1.00	0.41	2.47
[kmax, k-velmax]	0.14	0.581	0.45	0.25	0.81

PGA Peak Ground Acceleration (g)
PGV Peak Ground Velocity (cm/s)
k_y Critical or Yield Acceleration (g)
T_m Mean Period of an Earthquake Motion (s)
T_s Site Period or the Natural Period of a Sliding Mass (s). For rigid sliding set T_s= 0 s
M Earthquake Magnitude
kmax maximum seismic coefficient (g)
k-velmax the maximum velocity of the seismic coefficient-time history (cm/s)
D Predicted Sliding Displacment (cm)

H_{avr} = 195 ft

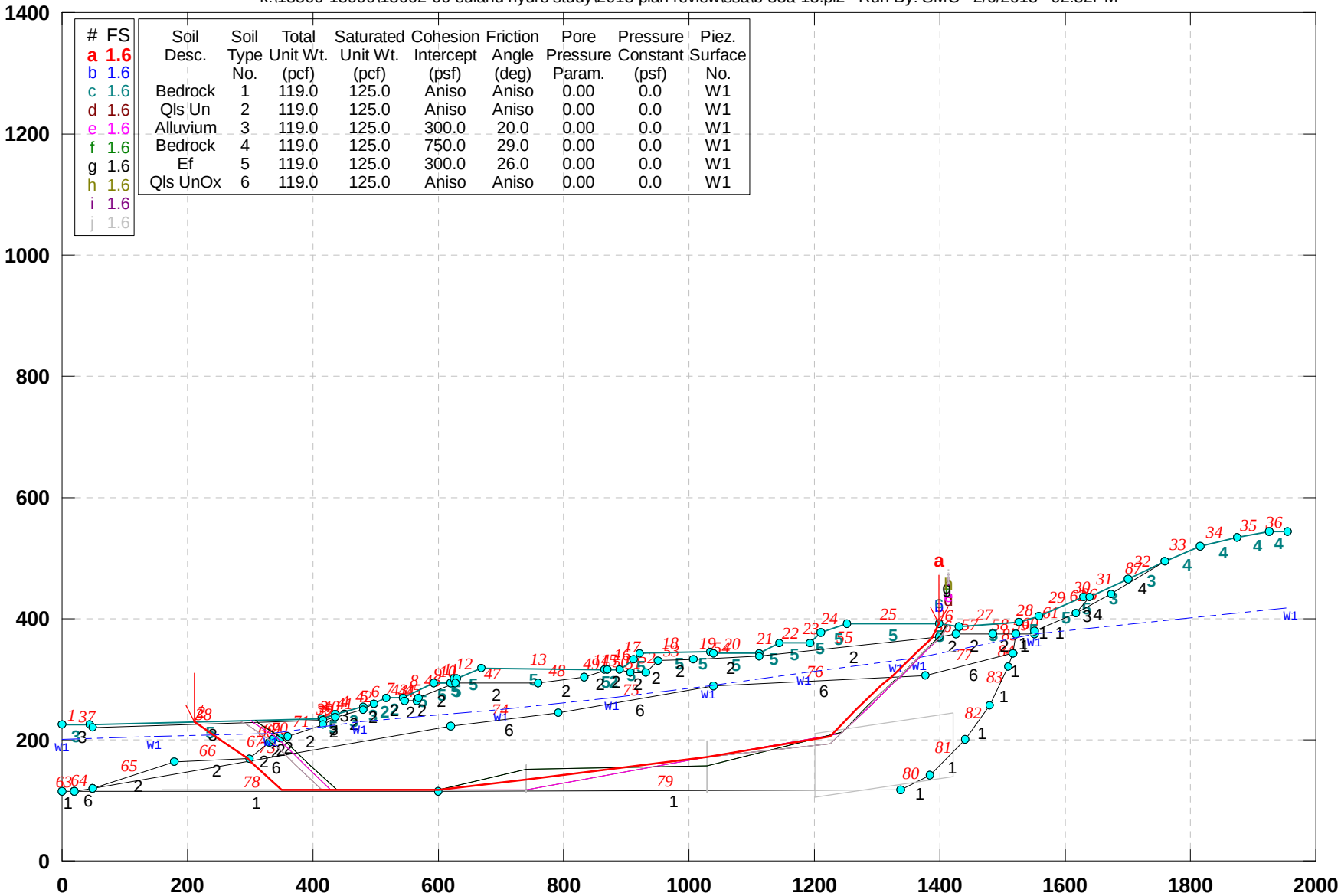
V_s = 2110 ft/s

$T_s = 4\ H_{avr}/V_s$ = 0.37 s

Reference: Rathje, E.M. and Antonakos, G. 2011. "A Unified Model for Predicting Earthquake-Induced Sliding Displacements of Rigid and Flexible Slopes," Engineering Geology, 122, 51-60, doi:10.1016/j.enggeo.2010.12.004.

13662-00, Euland Capital , B-B', , , Static, 2015 design

k:\13500-13999\13662-00 euland hydro study\2015 plan review\ssa\b-35a-15.pl2 Run By: SMC 2/6/2015 02:32PM



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.
Bedrock	1	119.0	125.0	Aniso	Aniso	0.00	0.0	W1
Qls Un	2	119.0	125.0	Aniso	Aniso	0.00	0.0	W1
Alluvium	3	119.0	125.0	300.0	20.0	0.00	0.0	W1
Bedrock	4	119.0	125.0	750.0	29.0	0.00	0.0	W1
Ef	5	119.0	125.0	300.0	26.0	0.00	0.0	W1
Qls UnOx	6	119.0	125.0	Aniso	Aniso	0.00	0.0	W1

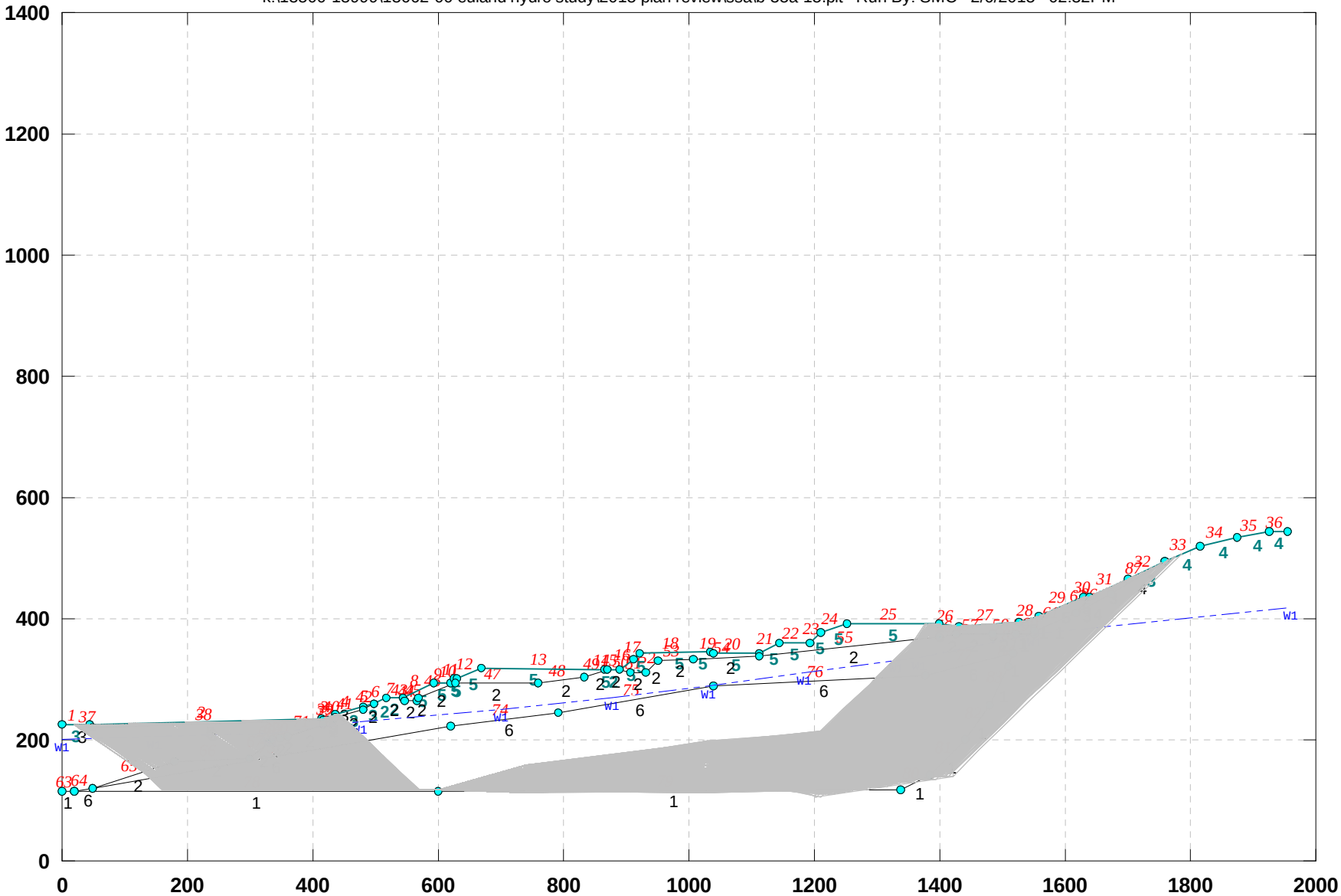
GSTABL7 v.2 FSmin=1.6

Safety Factors Are Calculated By The Simplified Janbu Method for the case of c & phi both > 0

Figure E-5.1

13662-00, Euland Capital , B-B', , , Static, 2015 design

k:\13500-13999\13662-00 euland hydro study\2015 plan review\ssa\b-35a-15.plt Run By: SMC 2/6/2015 02:32PM



***** GSTABL7 *****

** GSTABL7 by Garry H. Gregory, P.E. **

** Original Version 1.0, January 1996; Current Version 2.005, Sept. 2006 **

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SLOPE STABILITY ANALYSIS SYSTEM

Modified Bishop, Simplified Janbu, or GLE Method of Slices.
(Includes Spencer & Morgenstern-Price Type Analysis)
Including Pier/Pile, Reinforcement, Soil Nail, Tieback,
Nonlinear Undrained Shear Strength, Curved Phi Envelope,
Anisotropic Soil, Fiber-Reinforced Soil, Boundary Loads, Water
Surfaces, Pseudo-Static & Newmark Earthquake, and Applied Forces.

****

Analysis Run Date: 2/6/2015
Time of Run: 02:32PM
Run By: SMC
Input Data Filename: K:\13500-13999\13662-00 Euland Hydro Study\2015 Plan Review\SSA\b-35a-15.
Output Filename: K:\13500-13999\13662-00 Euland Hydro Study\2015 Plan Review\SSA\b-35a-15.OUT
Unit System: English
Plotted Output Filename: K:\13500-13999\13662-00 Euland Hydro Study\2015 Plan Review\SSA\b-35a-15.PLT
PROBLEM DESCRIPTION: 13662-00, Euland Capital , B-B',
, , Static, 2015 design

BOUNDARY COORDINATES
36 Top Boundaries
87 Total Boundaries

Boundary No.	X-Left (ft)	Y-Left (ft)	X-Right (ft)	Y-Right (ft)	Soil Type Below Bnd
1	0.00	225.00	45.00	225.00	3
2	45.00	225.00	413.00	235.00	5
3	413.00	235.00	437.00	242.00	5
4	437.00	242.00	480.00	254.00	3
5	480.00	254.00	497.00	260.00	3
6	497.00	260.00	518.00	270.00	2
7	518.00	270.00	545.00	270.00	2
8	545.00	270.00	593.00	295.00	5
9	593.00	295.00	620.00	295.00	5
10	620.00	295.00	624.00	302.00	5
11	624.00	302.00	630.00	302.00	5
12	630.00	302.00	669.00	318.00	5
13	669.00	318.00	865.00	316.00	5
14	865.00	316.00	870.00	315.00	5
15	870.00	315.00	890.00	315.00	2
16	890.00	315.00	912.00	333.00	5
17	912.00	333.00	920.00	344.00	5
18	920.00	344.00	1033.00	345.00	5
19	1033.00	345.00	1038.00	342.00	5
20	1038.00	342.00	1113.00	342.00	5
21	1113.00	342.00	1144.00	360.00	5
22	1144.00	360.00	1193.00	360.00	5
23	1193.00	360.00	1210.00	378.00	5
24	1210.00	378.00	1253.00	391.00	5
25	1253.00	391.00	1400.00	391.00	5
26	1400.00	391.00	1430.00	388.00	5
27	1430.00	388.00	1527.00	395.00	5
28	1527.00	395.00	1557.00	404.00	5
29	1557.00	404.00	1630.00	435.00	5
30	1630.00	435.00	1640.00	437.00	5
31	1640.00	437.00	1700.00	465.00	3
32	1700.00	465.00	1760.00	495.00	3
33	1760.00	495.00	1815.00	520.00	4
34	1815.00	520.00	1875.00	535.00	4
35	1875.00	535.00	1925.00	545.00	4
36	1925.00	545.00	1955.00	545.00	4
37	45.00	225.00	50.00	220.00	3
38	50.00	220.00	417.00	232.00	3
39	417.00	232.00	435.00	237.00	3
40	435.00	237.00	437.00	242.00	3

41	435.00	237.00	480.00	249.00	2
42	480.00	249.00	497.00	260.00	2
43	545.00	270.00	546.00	265.00	2
44	546.00	265.00	567.00	265.00	2
45	567.00	265.00	568.00	270.00	2
46	568.00	270.00	627.00	293.00	2
47	627.00	293.00	760.00	295.00	2
48	760.00	295.00	832.00	305.00	2
49	832.00	305.00	870.00	315.00	2
50	890.00	315.00	906.00	310.00	2
51	906.00	310.00	931.00	310.00	2
52	931.00	310.00	950.00	330.00	2
53	950.00	330.00	1006.00	333.00	2
54	1006.00	333.00	1113.00	337.00	2
55	1113.00	337.00	1400.00	370.00	2
56	1400.00	370.00	1427.00	374.00	2
57	1427.00	374.00	1485.00	375.00	2
58	1485.00	375.00	1522.00	375.00	2
59	1522.00	375.00	1550.00	375.00	1
60	1550.00	375.00	1551.00	380.00	1
61	1551.00	380.00	1618.00	410.00	1
62	1618.00	410.00	1640.00	437.00	3
63	0.00	115.00	20.00	115.00	1
64	20.00	115.00	50.00	120.00	6
65	50.00	120.00	180.00	165.00	2
66	180.00	165.00	300.00	170.00	2
67	300.00	170.00	330.00	195.00	2
68	330.00	195.00	335.00	200.00	2
69	335.00	200.00	347.00	203.00	2
70	347.00	203.00	360.00	207.00	2
71	360.00	207.00	417.00	225.00	2
72	417.00	225.00	435.00	237.00	2
73	50.00	120.00	620.00	223.00	6
74	620.00	223.00	792.00	245.00	6
75	792.00	245.00	1040.00	290.00	6
76	1040.00	290.00	1378.00	307.00	6
77	1378.00	307.00	1516.00	342.00	6
78	20.00	115.00	600.00	115.00	1
79	600.00	115.00	1338.00	118.00	1
80	1338.00	118.00	1385.00	143.00	1
81	1385.00	143.00	1440.00	200.00	1
82	1440.00	200.00	1480.00	258.00	1
83	1480.00	258.00	1510.00	320.00	1
84	1510.00	320.00	1516.00	342.00	1
85	1516.00	342.00	1522.00	375.00	1
86	1618.00	410.00	1673.00	440.00	4
87	1673.00	440.00	1760.00	495.00	4

Default Y-Origin = 0.00(ft)
Default X-Plus Value = 0.00(ft)
Default Y-Plus Value = 0.00(ft)

ISOTROPIC SOIL PARAMETERS
6 Type(s) of Soil

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.
1	119.0	125.0	0.0	0.0	0.00	0.0	1
2	119.0	125.0	0.0	0.0	0.00	0.0	1
3	119.0	125.0	300.0	20.0	0.00	0.0	1
4	119.0	125.0	750.0	29.0	0.00	0.0	1
5	119.0	125.0	300.0	26.0	0.00	0.0	1
6	119.0	125.0	0.0	0.0	0.00	0.0	1

ANISOTROPIC STRENGTH PARAMETERS
3 soil type(s)
Soil Type 1 Is Anisotropic
Number Of Direction Ranges Specified = 3

Direction Range No.	Counterclockwise Direction Limit (deg)	Cohesion Intercept (psf)	Friction Angle (deg)
1	0.0	750.00	29.00
2	5.0	300.00	15.00

```
    3              90.0             750.00         29.00
Soil Type  2 Is Anisotropic
Number Of Direction Ranges Specified =  3
Direction    Counterclockwise     Cohesion     Friction
  Range       Direction Limit    Intercept       Angle
   No.            (deg)            (psf)         (deg)
    1              0.0             350.00         23.00
    2             15.0             250.00         12.50
    3             90.0             300.00         20.00
Soil Type  6 Is Anisotropic
Number Of Direction Ranges Specified =  3
Direction    Counterclockwise     Cohesion     Friction
  Range       Direction Limit    Intercept       Angle
   No.            (deg)            (psf)         (deg)
    1              0.0             500.00         29.00
    2             15.0             250.00         12.50
    3             90.0             300.00         20.00
ANISOTROPIC SOIL NOTES:
   (1) An input value of 0.01 for C and/or Phi will cause Aniso
       C and/or Phi to be ignored in that range.
   (2) An input value of 0.02 for Phi will set both Phi and
       C equal to zero, with no water weight in the tension crack.
   (3) An input value of 0.03 for Phi will set both Phi and
       C equal to zero, with water weight in the tension crack.
1 PIEZOMETRIC SURFACE(S) SPECIFIED
Unit Weight of Water =  62.40 (pcf)
Piezometric Surface No.  1 Specified by 12 Coordinate Points
Pore Pressure Inclination Factor =  0.50
  Point      X-Water     Y-Water
   No.         (ft)        (ft)
    1          0.00      201.00
    2        147.00      205.00
    3        333.00      210.00
    4        476.00      230.00
    5        700.00      250.00
    6        878.00      270.00
    7       1031.00      290.00
    8       1183.00      310.00
    9       1330.00      330.00
   10       1368.00      336.00
   11       1550.00      375.00
   12       1960.00      420.00
Janbus Empirical Coef is being used for the case of  c & phi both > 0
A Critical Failure Surface Searching Method, Using A Random
Technique For Generating Sliding Block Surfaces, Has Been
Specified.
The Active And Passive Portions Of The Sliding Surfaces
Are Generated According To The Rankine Theory.
5000 Trial Surfaces Have Been Generated.
5 Boxes Specified For Generation Of Central Block Base
Length Of Line Segments For Active And Passive Portions Of
Sliding Block Is  60.0
Box        X-Left     Y-Left    X-Right    Y-Right      Height
No.         (ft)       (ft)       (ft)       (ft)        (ft)
 1         160.00     117.00     570.00     117.00       1.00
 2         600.00     117.00     600.00     117.00       1.00
 3         740.00     136.00     740.00     136.00      47.00
 4        1030.00     155.00    1030.00     155.00      85.00
 5        1200.00     157.00    1420.00     192.00     105.00
Following Are Displayed The Ten Most Critical Of The Trial
      Failure Surfaces Evaluated. They Are
      Ordered - Most Critical First.
      * * Safety Factors Are Calculated By The Simplified Janbu Method * *
      Total Number of Trial Surfaces Attempted =  5000
      Number of Trial Surfaces With Valid FS = 5000
      Statistical Data On All Valid FS Values:
         FS Max =   3.252   FS Min =   1.580   FS Ave =   1.961
         Standard Deviation =    0.391   Coefficient of Variation =   19.96 %
      Failure Surface Specified By 17 Coordinate Points
        Point      X-Surf      Y-Surf
```

No.	(ft)	(ft)
1	210.569	229.499
2	217.031	225.461
3	247.300	204.267
4	296.449	169.852
5	300.953	165.348
6	307.033	159.268
7	349.460	116.841
8	600.000	117.370
9	740.000	134.001
10	1030.000	171.762
11	1223.888	206.270
12	1266.314	248.696
13	1308.741	291.123
14	1321.791	304.173
15	1364.217	346.599
16	1386.009	368.391
17	1400.129	390.987

Factor of Safety
*** 1.580 ***

Individual data on the 69 slices

Slice No.	Width (ft)	Weight (lbs)	Water Force Top (lbs)	Water Force Bot (lbs)	Tie Force Norm (lbs)	Tie Force Tan (lbs)	Earthquake Force Hor (lbs)	Earthquake Force Ver (lbs)	Surcharge Load (lbs)
1	6.5	1619.9	0.0	0.0	0.	0.	0.0	0.0	0.0
2	25.6	41069.7	0.0	0.0	0.	0.	0.0	0.0	0.0
3	4.7	13809.1	0.0	615.9	0.	0.	0.0	0.0	0.0
4	49.1	264241.4	0.0	79709.0	0.	0.	0.0	0.0	0.0
5	3.6	27834.3	0.0	12839.5	0.	0.	0.0	0.0	0.0
6	1.0	7749.0	0.0	3641.8	0.	0.	0.0	0.0	0.0
7	6.1	52162.3	0.0	25161.7	0.	0.	0.0	0.0	0.0
8	23.0	239861.6	0.0	*******	0.	0.	0.0	0.0	0.0
9	3.0	36332.7	0.0	19890.4	0.	0.	0.0	0.0	0.0
10	2.0	24856.5	0.0	13606.3	0.	0.	0.0	0.0	0.0
11	12.0	159975.7	0.0	90006.1	0.	0.	0.0	0.0	0.0
12	2.5	35087.2	0.0	20221.8	0.	0.	0.0	0.0	0.0
13	10.5	152228.7	0.0	62655.9	0.	0.	0.0	0.0	0.0
14	38.5	559877.6	0.0	*******	0.	0.	0.0	0.0	0.0
15	14.5	211987.2	0.0	92387.4	0.	0.	0.0	0.0	0.0
16	4.0	58939.1	0.0	25830.3	0.	0.	0.0	0.0	0.0
17	18.0	272210.4	0.0	*******	0.	0.	0.0	0.0	0.0
18	2.0	30951.1	0.0	13272.7	0.	0.	0.0	0.0	0.0
19	39.0	630609.6	0.0	*******	0.	0.	0.0	0.0	0.0
20	4.0	67595.6	0.0	28109.7	0.	0.	0.0	0.0	0.0
21	17.0	294527.6	0.0	*******	0.	0.	0.0	0.0	0.0
22	21.0	383927.9	0.0	*******	0.	0.	0.0	0.0	0.0
23	27.0	509861.4	0.0	*******	0.	0.	0.0	0.0	0.0
24	1.0	18918.5	0.0	7393.2	0.	0.	0.0	0.0	0.0
25	21.0	411668.5	0.0	*******	0.	0.	0.0	0.0	0.0
26	1.0	20288.0	0.0	7512.4	0.	0.	0.0	0.0	0.0
27	25.0	527430.9	0.0	*******	0.	0.	0.0	0.0	0.0
28	7.0	153134.0	0.0	53686.5	0.	0.	0.0	0.0	0.0
29	20.0	434682.3	0.0	*******	0.	0.	0.0	0.0	0.0
30	4.0	87915.5	0.0	30807.5	0.	0.	0.0	0.0	0.0
31	3.0	67035.8	0.0	23086.2	0.	0.	0.0	0.0	0.0
32	3.0	66907.0	0.0	23069.6	0.	0.	0.0	0.0	0.0
33	39.0	895197.5	0.0	*******	0.	0.	0.0	0.0	0.0
34	31.0	724966.9	0.0	*******	0.	0.	0.0	0.0	0.0
35	40.0	913437.9	0.0	*******	0.	0.	0.0	0.0	0.0
36	20.0	447200.2	0.0	*******	0.	0.	0.0	0.0	0.0
37	32.0	701529.5	0.0	*******	0.	0.	0.0	0.0	0.0
38	40.0	852696.6	0.0	*******	0.	0.	0.0	0.0	0.0
39	33.0	683219.7	0.0	*******	0.	0.	0.0	0.0	0.0
40	5.0	101638.3	0.0	36963.4	0.	0.	0.0	0.0	0.0
41	8.0	161334.0	0.0	59083.3	0.	0.	0.0	0.0	0.0
42	12.0	240118.2	0.0	88380.6	0.	0.	0.0	0.0	0.0
43	16.0	329149.8	0.0	*******	0.	0.	0.0	0.0	0.0
44	6.0	128834.7	0.0	44195.0	0.	0.	0.0	0.0	0.0
45	8.0	178484.8	0.0	58928.5	0.	0.	0.0	0.0	0.0

46	11.0	251060.8	0.0	81029.9	0.	0.	0.0	0.0	0.0
47	19.0	429535.3	0.0	*******	0.	0.	0.0	0.0	0.0
48	56.0	1235676.2	0.0	*******	0.	0.	0.0	0.0	0.0
49	24.0	515713.8	0.0	*******	0.	0.	0.0	0.0	0.0
50	1.0	21304.6	0.0	7421.3	0.	0.	0.0	0.0	0.0
51	2.0	42547.8	0.0	14832.2	0.	0.	0.0	0.0	0.0
52	5.0	105106.9	0.0	37029.5	0.	0.	0.0	0.0	0.0
53	2.0	41535.6	0.0	14791.4	0.	0.	0.0	0.0	0.0
54	73.0	1457314.2	0.0	*******	0.	0.	0.0	0.0	0.0
55	31.0	617474.6	0.0	*******	0.	0.	0.0	0.0	0.0
56	39.0	789305.4	0.0	*******	0.	0.	0.0	0.0	0.0
57	10.0	197126.9	0.0	69586.0	0.	0.	0.0	0.0	0.0
58	17.0	348404.9	0.0	*******	0.	0.	0.0	0.0	0.0
59	13.9	298372.5	0.0	95582.2	0.	0.	0.0	0.0	0.0
60	29.1	591034.6	0.0	*******	0.	0.	0.0	0.0	0.0
61	13.3	242219.5	0.0	91267.6	0.	0.	0.0	0.0	0.0
62	42.4	625053.4	0.0	*******	0.	0.	0.0	0.0	0.0
63	13.1	147326.3	0.0	34631.4	0.	0.	0.0	0.0	0.0
64	8.2	81844.4	0.0	15192.7	0.	0.	0.0	0.0	0.0
65	20.9	170778.5	0.0	16065.4	0.	0.	0.0	0.0	0.0
66	13.3	80769.8	0.0	0.0	0.	0.	0.0	0.0	0.0
67	21.8	86886.0	0.0	0.0	0.	0.	0.0	0.0	0.0
68	14.0	19002.7	0.0	0.0	0.	0.	0.0	0.0	0.0
69	0.1	1.7	0.0	0.0	0.	0.	0.0	0.0	0.0

Failure Surface Specified By 17 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	210.569	229.499
2	217.031	225.461
3	247.300	204.267
4	296.449	169.852
5	300.953	165.348
6	307.033	159.268
7	349.460	116.841
8	600.000	117.370
9	740.000	134.001
10	1030.000	171.762
11	1223.888	206.270
12	1266.314	248.696
13	1308.741	291.123
14	1321.791	304.173
15	1364.217	346.599
16	1386.009	368.391
17	1400.129	390.987

Factor of Safety
*** 1.580 ***

Failure Surface Specified By 17 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	210.569	229.499
2	217.031	225.461
3	247.300	204.267
4	296.449	169.852
5	300.953	165.348
6	307.033	159.268
7	349.460	116.841
8	600.000	117.370
9	740.000	134.001
10	1030.000	171.762
11	1223.888	206.270
12	1266.314	248.696
13	1308.741	291.123
14	1321.791	304.173
15	1364.217	346.599
16	1386.009	368.391
17	1400.129	390.987

Factor of Safety
*** 1.580 ***

Failure Surface Specified By 16 Coordinate Points

Point X-Surf Y-Surf

No.	(ft)	(ft)
1	301.240	231.963
2	306.940	228.401
3	344.212	202.303
4	368.891	177.624
5	387.312	159.204
6	429.738	116.777
7	600.000	117.091
8	740.000	118.143
9	1030.000	172.634
10	1242.902	210.782
11	1285.328	253.208
12	1327.754	295.635
13	1337.061	304.941
14	1379.487	347.367
15	1402.489	370.369
16	1414.476	389.552

Factor of Safety
*** 1.582 ***

Failure Surface Specified By 16 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	301.240	231.963
2	306.940	228.401
3	344.212	202.303
4	368.891	177.624
5	387.312	159.204
6	429.738	116.777
7	600.000	117.091
8	740.000	118.143
9	1030.000	172.634
10	1242.902	210.782
11	1285.328	253.208
12	1327.754	295.635
13	1337.061	304.941
14	1379.487	347.367
15	1402.489	370.369
16	1414.476	389.552

Factor of Safety
*** 1.582 ***

Failure Surface Specified By 16 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	309.186	232.179
2	314.819	228.659
3	350.101	203.954
4	375.277	178.778
5	395.119	158.936
6	437.546	116.509
7	600.000	117.007
8	740.000	150.708
9	1030.000	156.821
10	1243.654	213.926
11	1286.080	256.353
12	1328.506	298.779
13	1334.542	304.814
14	1376.968	347.241
15	1399.692	369.965
16	1412.081	389.792

Factor of Safety
*** 1.582 ***

Failure Surface Specified By 16 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	309.186	232.179
2	314.819	228.659
3	350.101	203.954
4	375.277	178.778
5	395.119	158.936
6	437.546	116.509

7	600.000	117.007
8	740.000	150.708
9	1030.000	156.821
10	1243.654	213.926
11	1286.080	256.353
12	1328.506	298.779
13	1334.542	304.814
14	1376.968	347.241
15	1399.692	369.965
16	1412.081	389.792

Factor of Safety
*** 1.582 ***

Failure Surface Specified By 16 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	285.075	231.524
2	290.911	227.877
3	333.239	198.239
4	356.155	175.323
5	372.297	159.181
6	414.724	116.754
7	600.000	116.869
8	740.000	135.056
9	1030.000	170.351
10	1224.532	193.965
11	1266.959	236.392
12	1309.385	278.818
13	1335.426	304.859
14	1377.852	347.285
15	1400.666	370.099
16	1412.919	389.708

Factor of Safety
*** 1.585 ***

Failure Surface Specified By 16 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	285.075	231.524
2	290.911	227.877
3	333.239	198.239
4	356.155	175.323
5	372.297	159.181
6	414.724	116.754
7	600.000	116.869
8	740.000	135.056
9	1030.000	170.351
10	1224.532	193.965
11	1266.959	236.392
12	1309.385	278.818
13	1335.426	304.859
14	1377.852	347.285
15	1400.666	370.099
16	1412.919	389.708

Factor of Safety
*** 1.585 ***

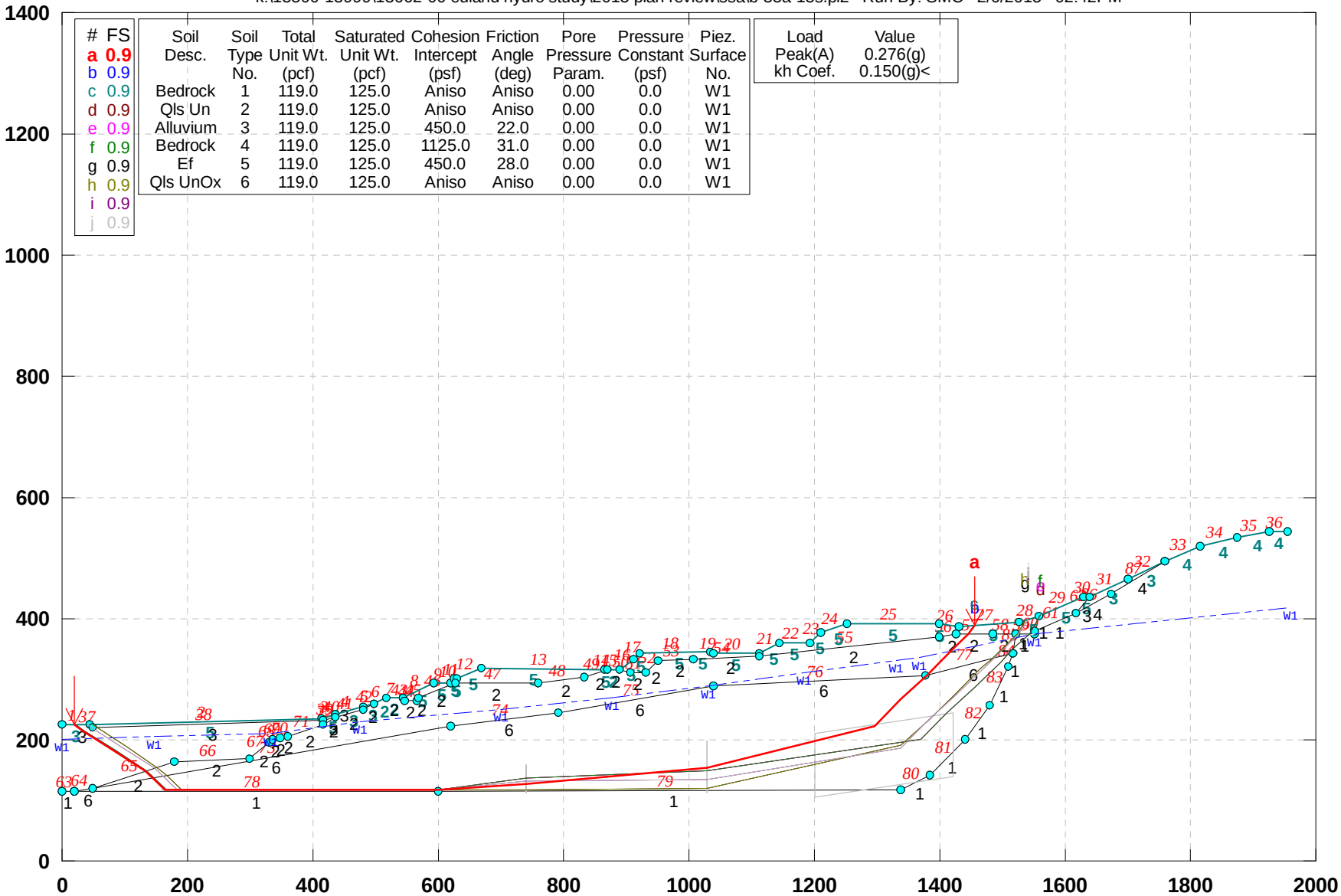
Failure Surface Specified By 16 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	285.075	231.524
2	290.911	227.877
3	333.239	198.239
4	356.155	175.323
5	372.297	159.181
6	414.724	116.754
7	600.000	116.869
8	740.000	135.056
9	1030.000	170.351
10	1224.532	193.965
11	1266.959	236.392
12	1309.385	278.818
13	1335.426	304.859

```
      14       1377.852      347.285
      15       1400.666      370.099
      16       1412.919      389.708
          Factor of Safety
         ***    1.585   ***
             **** END OF GSTABL7 OUTPUT ****
```

13662-00, Euland Capital , B-B', , , seismic, 2015 design

k:\13500-13999\13662-00 euland hydro study\2015 plan review\ssa\b-35a-15s.pl2 Run By: SMC 2/6/2015 02:42PM



GSTABL7 v.2 FSmin=0.9

Safety Factors Are Calculated By The Simplified Janbu Method for the case of c & phi both > 0

Figure E-5.2

***** GSTABL7 *****

** GSTABL7 by Garry H. Gregory, P.E. **

** Original Version 1.0, January 1996; Current Version 2.005, Sept. 2006 **

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****

SLOPE STABILITY ANALYSIS SYSTEM

Modified Bishop, Simplified Janbu, or GLE Method of Slices.
(Includes Spencer & Morgenstern-Price Type Analysis)
Including Pier/Pile, Reinforcement, Soil Nail, Tieback,
Nonlinear Undrained Shear Strength, Curved Phi Envelope,
Anisotropic Soil, Fiber-Reinforced Soil, Boundary Loads, Water
Surfaces, Pseudo-Static & Newmark Earthquake, and Applied Forces.

****

Analysis Run Date: 2/6/2015
Time of Run: 02:42PM
Run By: SMC
Input Data Filename: K:\13500-13999\13662-00 Euland Hydro Study\2015 Plan Review\SSA\b-35a-15s.
Output Filename: K:\13500-13999\13662-00 Euland Hydro Study\2015 Plan Review\SSA\b-35a-15s.OUT
Unit System: English
Plotted Output Filename: K:\13500-13999\13662-00 Euland Hydro Study\2015 Plan Review\SSA\b-35a-15s.PLT
PROBLEM DESCRIPTION: 13662-00, Euland Capital , B-B',
, , seismic, 2015 design

BOUNDARY COORDINATES
36 Top Boundaries
87 Total Boundaries

Boundary No.	X-Left (ft)	Y-Left (ft)	X-Right (ft)	Y-Right (ft)	Soil Type Below Bnd
1	0.00	225.00	45.00	225.00	3
2	45.00	225.00	413.00	235.00	5
3	413.00	235.00	437.00	242.00	5
4	437.00	242.00	480.00	254.00	3
5	480.00	254.00	497.00	260.00	3
6	497.00	260.00	518.00	270.00	2
7	518.00	270.00	545.00	270.00	2
8	545.00	270.00	593.00	295.00	5
9	593.00	295.00	620.00	295.00	5
10	620.00	295.00	624.00	302.00	5
11	624.00	302.00	630.00	302.00	5
12	630.00	302.00	669.00	318.00	5
13	669.00	318.00	865.00	316.00	5
14	865.00	316.00	870.00	315.00	5
15	870.00	315.00	890.00	315.00	2
16	890.00	315.00	912.00	333.00	5
17	912.00	333.00	920.00	344.00	5
18	920.00	344.00	1033.00	345.00	5
19	1033.00	345.00	1038.00	342.00	5
20	1038.00	342.00	1113.00	342.00	5
21	1113.00	342.00	1144.00	360.00	5
22	1144.00	360.00	1193.00	360.00	5
23	1193.00	360.00	1210.00	378.00	5
24	1210.00	378.00	1253.00	391.00	5
25	1253.00	391.00	1400.00	391.00	5
26	1400.00	391.00	1430.00	388.00	5
27	1430.00	388.00	1527.00	395.00	5
28	1527.00	395.00	1557.00	404.00	5
29	1557.00	404.00	1630.00	435.00	5
30	1630.00	435.00	1640.00	437.00	5
31	1640.00	437.00	1700.00	465.00	3
32	1700.00	465.00	1760.00	495.00	3
33	1760.00	495.00	1815.00	520.00	4
34	1815.00	520.00	1875.00	535.00	4
35	1875.00	535.00	1925.00	545.00	4
36	1925.00	545.00	1955.00	545.00	4
37	45.00	225.00	50.00	220.00	3
38	50.00	220.00	417.00	232.00	3
39	417.00	232.00	435.00	237.00	3
40	435.00	237.00	437.00	242.00	3

41	435.00	237.00	480.00	249.00	2
42	480.00	249.00	497.00	260.00	2
43	545.00	270.00	546.00	265.00	2
44	546.00	265.00	567.00	265.00	2
45	567.00	265.00	568.00	270.00	2
46	568.00	270.00	627.00	293.00	2
47	627.00	293.00	760.00	295.00	2
48	760.00	295.00	832.00	305.00	2
49	832.00	305.00	870.00	315.00	2
50	890.00	315.00	906.00	310.00	2
51	906.00	310.00	931.00	310.00	2
52	931.00	310.00	950.00	330.00	2
53	950.00	330.00	1006.00	333.00	2
54	1006.00	333.00	1113.00	337.00	2
55	1113.00	337.00	1400.00	370.00	2
56	1400.00	370.00	1427.00	374.00	2
57	1427.00	374.00	1485.00	375.00	2
58	1485.00	375.00	1522.00	375.00	2
59	1522.00	375.00	1550.00	375.00	1
60	1550.00	375.00	1551.00	380.00	1
61	1551.00	380.00	1618.00	410.00	1
62	1618.00	410.00	1640.00	437.00	3
63	0.00	115.00	20.00	115.00	1
64	20.00	115.00	50.00	120.00	6
65	50.00	120.00	180.00	165.00	2
66	180.00	165.00	300.00	170.00	2
67	300.00	170.00	330.00	195.00	2
68	330.00	195.00	335.00	200.00	2
69	335.00	200.00	347.00	203.00	2
70	347.00	203.00	360.00	207.00	2
71	360.00	207.00	417.00	225.00	2
72	417.00	225.00	435.00	237.00	2
73	50.00	120.00	620.00	223.00	6
74	620.00	223.00	792.00	245.00	6
75	792.00	245.00	1040.00	290.00	6
76	1040.00	290.00	1378.00	307.00	6
77	1378.00	307.00	1516.00	342.00	6
78	20.00	115.00	600.00	115.00	1
79	600.00	115.00	1338.00	118.00	1
80	1338.00	118.00	1385.00	143.00	1
81	1385.00	143.00	1440.00	200.00	1
82	1440.00	200.00	1480.00	258.00	1
83	1480.00	258.00	1510.00	320.00	1
84	1510.00	320.00	1516.00	342.00	1
85	1516.00	342.00	1522.00	375.00	1
86	1618.00	410.00	1673.00	440.00	4
87	1673.00	440.00	1760.00	495.00	4

Default Y-Origin = 0.00(ft)
Default X-Plus Value = 0.00(ft)
Default Y-Plus Value = 0.00(ft)

ISOTROPIC SOIL PARAMETERS
6 Type(s) of Soil

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.
1	119.0	125.0	0.0	0.0	0.00	0.0	1
2	119.0	125.0	0.0	0.0	0.00	0.0	1
3	119.0	125.0	450.0	22.0	0.00	0.0	1
4	119.0	125.0	1125.0	31.0	0.00	0.0	1
5	119.0	125.0	450.0	28.0	0.00	0.0	1
6	119.0	125.0	0.0	0.0	0.00	0.0	1

ANISOTROPIC STRENGTH PARAMETERS
3 soil type(s)
Soil Type 1 Is Anisotropic
Number Of Direction Ranges Specified = 3

Direction Range No.	Counterclockwise Direction Limit (deg)	Cohesion Intercept (psf)	Friction Angle (deg)
1	0.0	1125.00	31.00
2	5.0	450.00	17.00

3	90.0	1125.00	31.00

Soil Type 2 Is Anisotropic
Number Of Direction Ranges Specified = 3

Direction Range No.	Counterclockwise Direction Limit (deg)	Cohesion Intercept (psf)	Friction Angle (deg)
1	0.0	525.00	25.00
2	15.0	375.00	14.50
3	90.0	450.00	22.00

Soil Type 6 Is Anisotropic
Number Of Direction Ranges Specified = 3

Direction Range No.	Counterclockwise Direction Limit (deg)	Cohesion Intercept (psf)	Friction Angle (deg)
1	0.0	750.00	31.00
2	15.0	375.00	14.50
3	90.0	450.00	22.00

ANISOTROPIC SOIL NOTES:
(1) An input value of 0.01 for C and/or Phi will cause Aniso C and/or Phi to be ignored in that range.
(2) An input value of 0.02 for Phi will set both Phi and C equal to zero, with no water weight in the tension crack.
(3) An input value of 0.03 for Phi will set both Phi and C equal to zero, with water weight in the tension crack.

1 PIEZOMETRIC SURFACE(S) SPECIFIED
Unit Weight of Water = 62.40 (pcf)
Piezometric Surface No. 1 Specified by 12 Coordinate Points
Pore Pressure Inclination Factor = 0.50

Point No.	X-Water (ft)	Y-Water (ft)
1	0.00	201.00
2	147.00	205.00
3	333.00	210.00
4	476.00	230.00
5	700.00	250.00
6	878.00	270.00
7	1031.00	290.00
8	1183.00	310.00
9	1330.00	330.00
10	1368.00	336.00
11	1550.00	375.00
12	1960.00	420.00

Specified Peak Ground Acceleration Coefficient (A) = 0.276(g)
Specified Horizontal Earthquake Coefficient (kh) = 0.150(g)
Specified Vertical Earthquake Coefficient (kv) = 0.000(g)
Specified Seismic Pore-Pressure Factor = 0.000
Janbus Empirical Coef is being used for the case of c & phi both > 0
A Critical Failure Surface Searching Method, Using A Random Technique For Generating Sliding Block Surfaces, Has Been Specified.
The Active And Passive Portions Of The Sliding Surfaces Are Generated According To The Rankine Theory.
5000 Trial Surfaces Have Been Generated.
5 Boxes Specified For Generation Of Central Block Base Length Of Line Segments For Active And Passive Portions Of Sliding Block Is 60.0

Box No.	X-Left (ft)	Y-Left (ft)	X-Right (ft)	Y-Right (ft)	Height (ft)
1	160.00	117.00	570.00	117.00	1.00
2	600.00	117.00	600.00	117.00	1.00
3	740.00	136.00	740.00	136.00	47.00
4	1030.00	155.00	1030.00	155.00	85.00
5	1200.00	157.00	1420.00	192.00	105.00

Following Are Displayed The Ten Most Critical Of The Trial Failure Surfaces Evaluated. They Are Ordered - Most Critical First.
* * Safety Factors Are Calculated By The Simplified Janbu Method * *
Total Number of Trial Surfaces Attempted = 5000
Number of Trial Surfaces With Valid FS = 5000
Statistical Data On All Valid FS Values:

FS Max = 1.728 FS Min = 0.928 FS Ave = 1.113
Standard Deviation = 0.200 Coefficient of Variation = 17.98 %

Failure Surface Specified By 15 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	18.906	225.000
2	32.842	215.601
3	82.584	182.049
4	132.326	148.497
5	143.862	136.961
6	164.079	116.745
7	600.000	117.094
8	740.000	127.253
9	1030.000	154.912
10	1296.290	224.043
11	1338.717	266.470
12	1379.671	307.424
13	1422.097	349.850
14	1446.584	374.338
15	1455.917	389.870

Factor of Safety
*** 0.928 ***

Individual data on the 75 slices

Slice No.	Width (ft)	Weight (lbs)	Water Force Top (lbs)	Water Force Bot (lbs)	Tie Force Norm (lbs)	Tie Force Tan (lbs)	Earthquake Force Hor (lbs)	Earthquake Force Ver (lbs)	Surcharge Load (lbs)
1	13.9	7793.4	0.0	0.0	0.	0.	1169.0	0.0	0.0
2	12.2	19532.3	0.0	0.0	0.	0.	2929.8	0.0	0.0
3	5.0	11516.0	0.0	0.0	0.	0.	1727.4	0.0	0.0
4	2.4	6201.3	0.0	0.0	0.	0.	930.2	0.0	0.0
5	30.2	121894.0	0.0	24090.7	0.	0.	18284.1	0.0	0.0
6	49.7	375119.2	0.0	*******	0.	0.	56267.9	0.0	0.0
7	11.5	120708.4	0.0	63124.6	0.	0.	18106.3	0.0	0.0
8	3.1	35784.8	0.0	19254.0	0.	0.	5367.7	0.0	0.0
9	17.1	216956.8	0.0	*******	0.	0.	32543.5	0.0	0.0
10	15.9	220120.6	0.0	88309.8	0.	0.	33018.1	0.0	0.0
11	120.0	1685964.5	0.0	*******	0.	0.	*******	0.0	0.0
12	30.0	428904.4	0.0	*******	0.	0.	64335.7	0.0	0.0
13	3.0	43053.5	0.0	17418.5	0.	0.	6458.0	0.0	0.0
14	2.0	28709.9	0.0	11527.1	0.	0.	4306.5	0.0	0.0
15	12.0	172592.2	0.0	69884.5	0.	0.	25888.8	0.0	0.0
16	13.0	187619.1	0.0	77104.8	0.	0.	28142.9	0.0	0.0
17	38.5	559816.2	0.0	*******	0.	0.	83972.4	0.0	0.0
18	14.5	212026.9	0.0	92406.9	0.	0.	31804.0	0.0	0.0
19	4.0	58956.1	0.0	25838.7	0.	0.	8843.4	0.0	0.0
20	18.0	272319.4	0.0	*******	0.	0.	40847.9	0.0	0.0
21	2.0	30966.5	0.0	13280.3	0.	0.	4645.0	0.0	0.0
22	39.0	631040.5	0.0	*******	0.	0.	94656.1	0.0	0.0
23	4.0	67653.9	0.0	28138.7	0.	0.	10148.1	0.0	0.0
24	17.0	294804.5	0.0	*******	0.	0.	44220.7	0.0	0.0
25	21.0	384335.2	0.0	*******	0.	0.	57650.3	0.0	0.0
26	27.0	510491.2	0.0	*******	0.	0.	76573.7	0.0	0.0
27	1.0	18944.1	0.0	7405.9	0.	0.	2841.6	0.0	0.0
28	21.0	412244.3	0.0	*******	0.	0.	61836.6	0.0	0.0
29	1.0	20317.2	0.0	7526.9	0.	0.	3047.6	0.0	0.0
30	25.0	528214.6	0.0	*******	0.	0.	79232.2	0.0	0.0
31	7.0	153371.8	0.0	53804.6	0.	0.	23005.8	0.0	0.0
32	20.0	436528.3	0.0	*******	0.	0.	65479.2	0.0	0.0
33	4.0	88561.9	0.0	30995.2	0.	0.	13284.3	0.0	0.0
34	3.0	67581.3	0.0	23257.3	0.	0.	10137.2	0.0	0.0
35	3.0	67504.5	0.0	23266.7	0.	0.	10125.7	0.0	0.0
36	39.0	907695.7	0.0	*******	0.	0.	*******	0.0	0.0
37	31.0	741168.8	0.0	*******	0.	0.	*******	0.0	0.0
38	40.0	942542.6	0.0	*******	0.	0.	*******	0.0	0.0
39	20.0	464933.7	0.0	*******	0.	0.	69740.1	0.0	0.0
40	32.0	733525.1	0.0	*******	0.	0.	*******	0.0	0.0
41	40.0	898960.4	0.0	*******	0.	0.	*******	0.0	0.0
42	33.0	726631.4	0.0	*******	0.	0.	*******	0.0	0.0
43	5.0	108629.4	0.0	40305.3	0.	0.	16294.4	0.0	0.0

44	8.0	172746.1	0.0	64543.4	0.	0.	25911.9	0.0	0.0
45	12.0	257757.1	0.0	96812.9	0.	0.	38663.6	0.0	0.0
46	16.0	353643.4	0.0	*******	0.	0.	53046.5	0.0	0.0
47	6.0	138307.1	0.0	48736.0	0.	0.	20746.1	0.0	0.0
48	8.0	191358.4	0.0	65104.4	0.	0.	28703.8	0.0	0.0
49	11.0	269217.0	0.0	89748.1	0.	0.	40382.6	0.0	0.0
50	19.0	462136.7	0.0	*******	0.	0.	69320.5	0.0	0.0
51	56.0	1340906.2	0.0	*******	0.	0.	*******	0.0	0.0
52	24.0	564991.5	0.0	*******	0.	0.	84748.7	0.0	0.0
53	1.0	23405.0	0.0	8623.3	0.	0.	3510.7	0.0	0.0
54	2.0	46718.0	0.0	17220.1	0.	0.	7007.7	0.0	0.0
55	5.0	115353.7	0.0	42907.0	0.	0.	17303.1	0.0	0.0
56	2.0	45562.9	0.0	17105.5	0.	0.	6834.4	0.0	0.0
57	73.0	1576389.4	0.0	*******	0.	0.	*******	0.0	0.0
58	31.0	651598.4	0.0	*******	0.	0.	97739.8	0.0	0.0
59	39.0	818312.4	0.0	*******	0.	0.	*******	0.0	0.0
60	10.0	202065.5	0.0	73305.4	0.	0.	30309.8	0.0	0.0
61	17.0	354459.7	0.0	*******	0.	0.	53169.0	0.0	0.0
62	43.0	935087.5	0.0	*******	0.	0.	*******	0.0	0.0
63	43.3	915811.1	0.0	*******	0.	0.	*******	0.0	0.0
64	33.7	619524.5	0.0	*******	0.	0.	92928.7	0.0	0.0
65	8.7	137236.9	0.0	52108.9	0.	0.	20585.5	0.0	0.0
66	29.3	392055.3	0.0	*******	0.	0.	58808.3	0.0	0.0
67	10.0	109525.0	0.0	31346.2	0.	0.	16428.8	0.0	0.0
68	1.7	17091.6	0.0	4575.4	0.	0.	2563.7	0.0	0.0
69	20.3	180352.7	0.0	40515.6	0.	0.	27052.9	0.0	0.0
70	19.2	121347.6	0.0	12530.1	0.	0.	18202.1	0.0	0.0
71	2.9	13856.7	0.0	0.0	0.	0.	2078.5	0.0	0.0
72	4.9	21146.9	0.0	0.0	0.	0.	3172.0	0.0	0.0
73	3.0	11387.2	0.0	0.0	0.	0.	1708.1	0.0	0.0
74	16.6	44509.5	0.0	0.0	0.	0.	6676.4	0.0	0.0
75	9.3	8251.5	0.0	0.0	0.	0.	1237.7	0.0	0.0

Failure Surface Specified By 15 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	18.906	225.000
2	32.842	215.601
3	82.584	182.049
4	132.326	148.497
5	143.862	136.961
6	164.079	116.745
7	600.000	117.094
8	740.000	127.253
9	1030.000	154.912
10	1296.290	224.043
11	1338.717	266.470
12	1379.671	307.424
13	1422.097	349.850
14	1446.584	374.338
15	1455.917	389.870

Factor of Safety
*** 0.928 ***

Failure Surface Specified By 15 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	18.906	225.000
2	32.842	215.601
3	82.584	182.049
4	132.326	148.497
5	143.862	136.961
6	164.079	116.745
7	600.000	117.094
8	740.000	127.253
9	1030.000	154.912
10	1296.290	224.043
11	1338.717	266.470
12	1379.671	307.424
13	1422.097	349.850
14	1446.584	374.338
15	1455.917	389.870

Factor of Safety
*** 0.928 ***
Failure Surface Specified By 16 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	21.731	225.000
2	34.708	216.247
3	84.451	182.695
4	134.193	149.144
5	145.991	137.346
6	166.682	116.655
7	600.000	117.399
8	740.000	138.108
9	1030.000	149.641
10	1369.874	201.758
11	1412.301	244.185
12	1454.727	286.611
13	1497.153	329.038
14	1517.308	349.192
15	1543.116	375.000
16	1561.754	406.019

Factor of Safety
*** 0.932 ***
Failure Surface Specified By 16 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	21.731	225.000
2	34.708	216.247
3	84.451	182.695
4	134.193	149.144
5	145.991	137.346
6	166.682	116.655
7	600.000	117.399
8	740.000	138.108
9	1030.000	149.641
10	1369.874	201.758
11	1412.301	244.185
12	1454.727	286.611
13	1497.153	329.038
14	1517.308	349.192
15	1543.116	375.000
16	1561.754	406.019

Factor of Safety
*** 0.932 ***
Failure Surface Specified By 16 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	21.731	225.000
2	34.708	216.247
3	84.451	182.695
4	134.193	149.144
5	145.991	137.346
6	166.682	116.655
7	600.000	117.399
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9	1030.000	149.641
10	1369.874	201.758
11	1412.301	244.185
12	1454.727	286.611
13	1497.153	329.038
14	1517.308	349.192
15	1543.116	375.000
16	1561.754	406.019

Factor of Safety
*** 0.932 ***
Failure Surface Specified By 16 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	48.472	225.094
2	56.592	220.216

3	102.801	189.047
4	152.543	155.496
5	166.912	141.126
6	191.306	116.733
7	600.000	117.363
8	740.000	117.890
9	1030.000	119.384
10	1338.400	190.137
11	1380.826	232.564
12	1423.252	274.990
13	1465.679	317.416
14	1481.517	333.254
15	1523.262	375.000
16	1537.100	398.030

Factor of Safety
*** 0.934 ***

Failure Surface Specified By 16 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	48.472	225.094
2	56.592	220.216
3	102.801	189.047
4	152.543	155.496
5	166.912	141.126
6	191.306	116.733
7	600.000	117.363
8	740.000	117.890
9	1030.000	119.384
10	1338.400	190.137
11	1380.826	232.564
12	1423.252	274.990
13	1465.679	317.416
14	1481.517	333.254
15	1523.262	375.000
16	1537.100	398.030

Factor of Safety
*** 0.934 ***

Failure Surface Specified By 16 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	41.023	225.000
2	47.457	220.660
3	97.200	187.108
4	146.942	153.557
5	160.527	139.972
6	183.498	117.001
7	600.000	117.448
8	740.000	132.325
9	1030.000	135.197
10	1337.648	186.993
11	1380.074	229.419
12	1422.500	271.845
13	1464.927	314.272
14	1484.722	334.067
15	1525.655	375.000
16	1540.019	398.906

Factor of Safety
*** 0.937 ***

Failure Surface Specified By 16 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	41.023	225.000
2	47.457	220.660
3	97.200	187.108
4	146.942	153.557
5	160.527	139.972
6	183.498	117.001
7	600.000	117.448
8	740.000	132.325
9	1030.000	135.197

```
10       1337.648      186.993
11       1380.074      229.419
12       1422.500      271.845
13       1464.927      314.272
14       1484.722      334.067
15       1525.655      375.000
16       1540.019      398.906
    Factor of Safety
   ***    0.937   ***
       **** END OF GSTABL7 OUTPUT ****
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***** GSTABL7 *****

** GSTABL7 by Garry H. Gregory, P.E. **

** Original Version 1.0, January 1996; Current Version 2.005, Sept. 2006 **

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SLOPE STABILITY ANALYSIS SYSTEM

Modified Bishop, Simplified Janbu, or GLE Method of Slices.
(Includes Spencer & Morgenstern-Price Type Analysis)
Including Pier/Pile, Reinforcement, Soil Nail, Tieback,
Nonlinear Undrained Shear Strength, Curved Phi Envelope,
Anisotropic Soil, Fiber-Reinforced Soil, Boundary Loads, Water
Surfaces, Pseudo-Static & Newmark Earthquake, and Applied Forces.

****

Analysis Run Date: 2/6/2015
Time of Run: 02:42PM
Run By: SMC
Input Data Filename: K:\13500-13999\13662-00 Euland Hydro Study\2015 Plan Review\SSA\b-35a-15s Surface #1.
Output Filename: K:\13500-13999\13662-00 Euland Hydro Study\2015 Plan Review\SSA\b-35a-15s Surface #1.OUT
Unit System: English
Plotted Output Filename: K:\13500-13999\13662-00 Euland Hydro Study\2015 Plan Review\SSA\b-35a-15s Surface #1.PLT
PROBLEM DESCRIPTION: 13662-00, Euland Capital , B-B',
, , seismic, 2015 design

BOUNDARY COORDINATES
36 Top Boundaries
87 Total Boundaries

Boundary No.	X-Left (ft)	Y-Left (ft)	X-Right (ft)	Y-Right (ft)	Soil Type Below Bnd
1	0.00	225.00	45.00	225.00	3
2	45.00	225.00	413.00	235.00	5
3	413.00	235.00	437.00	242.00	5
4	437.00	242.00	480.00	254.00	3
5	480.00	254.00	497.00	260.00	3
6	497.00	260.00	518.00	270.00	2
7	518.00	270.00	545.00	270.00	2
8	545.00	270.00	593.00	295.00	5
9	593.00	295.00	620.00	295.00	5
10	620.00	295.00	624.00	302.00	5
11	624.00	302.00	630.00	302.00	5
12	630.00	302.00	669.00	318.00	5
13	669.00	318.00	865.00	316.00	5
14	865.00	316.00	870.00	315.00	5
15	870.00	315.00	890.00	315.00	2
16	890.00	315.00	912.00	333.00	5
17	912.00	333.00	920.00	344.00	5
18	920.00	344.00	1033.00	345.00	5
19	1033.00	345.00	1038.00	342.00	5
20	1038.00	342.00	1113.00	342.00	5
21	1113.00	342.00	1144.00	360.00	5
22	1144.00	360.00	1193.00	360.00	5
23	1193.00	360.00	1210.00	378.00	5
24	1210.00	378.00	1253.00	391.00	5
25	1253.00	391.00	1400.00	391.00	5
26	1400.00	391.00	1430.00	388.00	5
27	1430.00	388.00	1527.00	395.00	5
28	1527.00	395.00	1557.00	404.00	5
29	1557.00	404.00	1630.00	435.00	5
30	1630.00	435.00	1640.00	437.00	5
31	1640.00	437.00	1700.00	465.00	3
32	1700.00	465.00	1760.00	495.00	3
33	1760.00	495.00	1815.00	520.00	4
34	1815.00	520.00	1875.00	535.00	4
35	1875.00	535.00	1925.00	545.00	4
36	1925.00	545.00	1955.00	545.00	4
37	45.00	225.00	50.00	220.00	3
38	50.00	220.00	417.00	232.00	3
39	417.00	232.00	435.00	237.00	3

40	435.00	237.00	437.00	242.00	3
41	435.00	237.00	480.00	249.00	2
42	480.00	249.00	497.00	260.00	2
43	545.00	270.00	546.00	265.00	2
44	546.00	265.00	567.00	265.00	2
45	567.00	265.00	568.00	270.00	2
46	568.00	270.00	627.00	293.00	2
47	627.00	293.00	760.00	295.00	2
48	760.00	295.00	832.00	305.00	2
49	832.00	305.00	870.00	315.00	2
50	890.00	315.00	906.00	310.00	2
51	906.00	310.00	931.00	310.00	2
52	931.00	310.00	950.00	330.00	2
53	950.00	330.00	1006.00	333.00	2
54	1006.00	333.00	1113.00	337.00	2
55	1113.00	337.00	1400.00	370.00	2
56	1400.00	370.00	1427.00	374.00	2
57	1427.00	374.00	1485.00	375.00	2
58	1485.00	375.00	1522.00	375.00	2
59	1522.00	375.00	1550.00	375.00	1
60	1550.00	375.00	1551.00	380.00	1
61	1551.00	380.00	1618.00	410.00	1
62	1618.00	410.00	1640.00	437.00	3
63	0.00	115.00	20.00	115.00	1
64	20.00	115.00	50.00	120.00	6
65	50.00	120.00	180.00	165.00	2
66	180.00	165.00	300.00	170.00	2
67	300.00	170.00	330.00	195.00	2
68	330.00	195.00	335.00	200.00	2
69	335.00	200.00	347.00	203.00	2
70	347.00	203.00	360.00	207.00	2
71	360.00	207.00	417.00	225.00	2
72	417.00	225.00	435.00	237.00	2
73	50.00	120.00	620.00	223.00	6
74	620.00	223.00	792.00	245.00	6
75	792.00	245.00	1040.00	290.00	6
76	1040.00	290.00	1378.00	307.00	6
77	1378.00	307.00	1516.00	342.00	6
78	20.00	115.00	600.00	115.00	1
79	600.00	115.00	1338.00	118.00	1
80	1338.00	118.00	1385.00	143.00	1
81	1385.00	143.00	1440.00	200.00	1
82	1440.00	200.00	1480.00	258.00	1
83	1480.00	258.00	1510.00	320.00	1
84	1510.00	320.00	1516.00	342.00	1
85	1516.00	342.00	1522.00	375.00	1
86	1618.00	410.00	1673.00	440.00	4
87	1673.00	440.00	1760.00	495.00	4

Default Y-Origin = 0.00(ft)
Default X-Plus Value = 0.00(ft)
Default Y-Plus Value = 0.00(ft)

ISOTROPIC SOIL PARAMETERS
6 Type(s) of Soil

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.
1	119.0	125.0	0.0	0.0	0.00	0.0	1
2	119.0	125.0	0.0	0.0	0.00	0.0	1
3	119.0	125.0	450.0	22.0	0.00	0.0	1
4	119.0	125.0	1125.0	31.0	0.00	0.0	1
5	119.0	125.0	450.0	28.0	0.00	0.0	1
6	119.0	125.0	0.0	0.0	0.00	0.0	1

ANISOTROPIC STRENGTH PARAMETERS
3 soil type(s)
Soil Type 1 Is Anisotropic
Number Of Direction Ranges Specified = 3

Direction Range No.	Counterclockwise Direction Limit (deg)	Cohesion Intercept (psf)	Friction Angle (deg)
1	0.0	1125.00	31.00

2	5.0	450.00	17.00
3	90.0	1125.00	31.00

Soil Type 2 Is Anisotropic
Number Of Direction Ranges Specified = 3

Direction Range No.	Counterclockwise Direction Limit (deg)	Cohesion Intercept (psf)	Friction Angle (deg)
1	0.0	525.00	25.00
2	15.0	375.00	14.50
3	90.0	450.00	22.00

Soil Type 6 Is Anisotropic
Number Of Direction Ranges Specified = 3

Direction Range No.	Counterclockwise Direction Limit (deg)	Cohesion Intercept (psf)	Friction Angle (deg)
1	0.0	750.00	31.00
2	15.0	375.00	14.50
3	90.0	450.00	22.00

ANISOTROPIC SOIL NOTES:
(1) An input value of 0.01 for C and/or Phi will cause Aniso C and/or Phi to be ignored in that range.
(2) An input value of 0.02 for Phi will set both Phi and C equal to zero, with no water weight in the tension crack.
(3) An input value of 0.03 for Phi will set both Phi and C equal to zero, with water weight in the tension crack.

1 PIEZOMETRIC SURFACE(S) SPECIFIED
Unit Weight of Water = 62.40 (pcf)
Piezometric Surface No. 1 Specified by 12 Coordinate Points
Pore Pressure Inclination Factor = 0.50

Point No.	X-Water (ft)	Y-Water (ft)
1	0.00	201.00
2	147.00	205.00
3	333.00	210.00
4	476.00	230.00
5	700.00	250.00
6	878.00	270.00
7	1031.00	290.00
8	1183.00	310.00
9	1330.00	330.00
10	1368.00	336.00
11	1550.00	375.00
12	1960.00	420.00

Specified Peak Ground Acceleration Coefficient (A) = 0.276(g)
Specified Horizontal Earthquake Coefficient (kh) = 0.150(g)
Specified Vertical Earthquake Coefficient (kv) = 0.000(g)
Specified Seismic Pore-Pressure Factor = 0.000
Janbu's Empirical Coef. is being used for the case of c & phi both > 0
Trial Failure Surface Specified By 15 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	18.906	225.000
2	32.842	215.601
3	82.584	182.049
4	132.326	148.497
5	143.862	136.961
6	164.079	116.745
7	600.000	117.094
8	740.000	127.253
9	1030.000	154.912
10	1296.290	224.043
11	1338.717	266.470
12	1379.671	307.424
13	1422.097	349.850
14	1446.584	374.338
15	1455.917	389.870

Janbu's Empirical Coefficient (fo) = 1.052
* * Factor Of Safety Is Calculated By The Simplified Janbu Method * *
Factor Of Safety For The Preceding Specified Surface = 0.928
Table 1 - Individual Data on the 75 Slices

Slice No.	Width (ft)	Weight (lbs)	Water Force Top (lbs)	Water Force Bot (lbs)	Tie Force Norm (lbs)	Tie Force Tan (lbs)	Earthquake Force Hor (lbs)	Earthquake Force Ver (lbs)	Surcharge Load (lbs)
1	13.9	7793.6	0.0	0.0	0.0	0.0	1169.0	0.0	0.0
2	12.2	19531.0	0.0	0.0	0.0	0.0	2929.6	0.0	0.0
3	5.0	11515.7	0.0	0.0	0.0	0.0	1727.3	0.0	0.0
4	2.4	6202.9	0.0	0.0	0.0	0.0	930.4	0.0	0.0
5	30.2	121892.4	0.0	24090.6	0.0	0.0	18283.9	0.0	0.0
6	49.7	375119.1	0.0	*******	0.0	0.0	56267.9	0.0	0.0
7	11.5	120704.8	0.0	63122.8	0.0	0.0	18105.7	0.0	0.0
8	3.1	35790.0	0.0	19256.3	0.0	0.0	5368.5	0.0	0.0
9	17.1	216957.1	0.0	*******	0.0	0.0	32543.6	0.0	0.0
10	15.9	220119.4	0.0	88309.2	0.0	0.0	33017.9	0.0	0.0
11	120.0	1685958.4	0.0	*******	0.0	0.0	*******	0.0	0.0
12	30.0	428903.0	0.0	*******	0.0	0.0	64335.5	0.0	0.0
13	3.0	43053.4	0.0	17418.4	0.0	0.0	6458.0	0.0	0.0
14	2.0	28709.8	0.0	11527.1	0.0	0.0	4306.5	0.0	0.0
15	12.0	172591.6	0.0	69884.3	0.0	0.0	25888.7	0.0	0.0
16	13.0	187618.5	0.0	77104.5	0.0	0.0	28142.8	0.0	0.0
17	38.5	559814.4	0.0	*******	0.0	0.0	83972.2	0.0	0.0
18	14.5	212026.3	0.0	92406.6	0.0	0.0	31803.9	0.0	0.0
19	4.0	58955.9	0.0	25838.6	0.0	0.0	8843.4	0.0	0.0
20	18.0	272318.6	0.0	*******	0.0	0.0	40847.8	0.0	0.0
21	2.0	30966.4	0.0	13280.3	0.0	0.0	4645.0	0.0	0.0
22	39.0	631038.8	0.0	*******	0.0	0.0	94655.8	0.0	0.0
23	4.0	67653.7	0.0	28138.6	0.0	0.0	10148.1	0.0	0.0
24	17.0	294803.8	0.0	*******	0.0	0.0	44220.6	0.0	0.0
25	21.0	384334.3	0.0	*******	0.0	0.0	57650.2	0.0	0.0
26	27.0	510490.1	0.0	*******	0.0	0.0	76573.5	0.0	0.0
27	1.0	18944.1	0.0	7405.9	0.0	0.0	2841.6	0.0	0.0
28	21.0	412243.4	0.0	*******	0.0	0.0	61836.5	0.0	0.0
29	1.0	20317.2	0.0	7526.9	0.0	0.0	3047.6	0.0	0.0
30	25.0	528213.6	0.0	*******	0.0	0.0	79232.0	0.0	0.0
31	7.0	153371.5	0.0	53804.5	0.0	0.0	23005.7	0.0	0.0
32	20.0	436527.7	0.0	*******	0.0	0.0	65479.2	0.0	0.0
33	4.0	88561.9	0.0	30995.1	0.0	0.0	13284.3	0.0	0.0
34	3.0	67581.3	0.0	23257.3	0.0	0.0	10137.2	0.0	0.0
35	3.0	67504.5	0.0	23266.7	0.0	0.0	10125.7	0.0	0.0
36	39.0	907695.5	0.0	*******	0.0	0.0	*******	0.0	0.0
37	31.0	741169.4	0.0	*******	0.0	0.0	*******	0.0	0.0
38	40.0	942544.4	0.0	*******	0.0	0.0	*******	0.0	0.0
39	20.0	464934.8	0.0	*******	0.0	0.0	69740.2	0.0	0.0
40	32.0	733526.8	0.0	*******	0.0	0.0	*******	0.0	0.0
41	40.0	898962.0	0.0	*******	0.0	0.0	*******	0.0	0.0
42	33.0	726632.3	0.0	*******	0.0	0.0	*******	0.0	0.0
43	5.0	108629.5	0.0	40305.3	0.0	0.0	16294.4	0.0	0.0
44	8.0	172746.3	0.0	64543.5	0.0	0.0	25911.9	0.0	0.0
45	12.0	257757.3	0.0	96813.1	0.0	0.0	38663.6	0.0	0.0
46	16.0	353643.7	0.0	*******	0.0	0.0	53046.6	0.0	0.0
47	6.0	138307.2	0.0	48736.1	0.0	0.0	20746.1	0.0	0.0
48	8.0	191358.5	0.0	65104.4	0.0	0.0	28703.8	0.0	0.0
49	11.0	269217.1	0.0	89748.1	0.0	0.0	40382.6	0.0	0.0
50	19.0	462136.7	0.0	*******	0.0	0.0	69320.5	0.0	0.0
51	56.0	1340905.9	0.0	*******	0.0	0.0	*******	0.0	0.0
52	24.0	564991.0	0.0	*******	0.0	0.0	84748.7	0.0	0.0
53	1.0	23405.0	0.0	8623.3	0.0	0.0	3510.7	0.0	0.0
54	2.0	46717.9	0.0	17220.1	0.0	0.0	7007.7	0.0	0.0
55	5.0	115353.6	0.0	42907.0	0.0	0.0	17303.0	0.0	0.0
56	2.0	45562.9	0.0	17105.5	0.0	0.0	6834.4	0.0	0.0
57	73.0	1576388.5	0.0	*******	0.0	0.0	*******	0.0	0.0
58	31.0	651598.4	0.0	*******	0.0	0.0	97739.8	0.0	0.0
59	39.0	818312.8	0.0	*******	0.0	0.0	*******	0.0	0.0
60	10.0	202065.7	0.0	73305.5	0.0	0.0	30309.8	0.0	0.0
61	17.0	354460.0	0.0	*******	0.0	0.0	53169.0	0.0	0.0
62	43.0	935088.9	0.0	*******	0.0	0.0	*******	0.0	0.0
63	43.3	915805.2	0.0	*******	0.0	0.0	*******	0.0	0.0
64	33.7	619532.2	0.0	*******	0.0	0.0	92929.8	0.0	0.0
65	8.7	137240.8	0.0	52110.4	0.0	0.0	20586.1	0.0	0.0
66	29.3	392052.3	0.0	*******	0.0	0.0	58807.9	0.0	0.0

67	10.0	109525.1	0.0	31346.3	0.0	0.0	16428.8	0.0	0.0
68	1.7	17095.3	0.0	4576.4	0.0	0.0	2564.3	0.0	0.0
69	20.3	180348.9	0.0	40514.6	0.0	0.0	27052.3	0.0	0.0
70	19.2	121348.3	0.0	12530.1	0.0	0.0	18202.2	0.0	0.0
71	2.9	13856.1	0.0	0.0	0.0	0.0	2078.4	0.0	0.0
72	4.9	21146.9	0.0	0.0	0.0	0.0	3172.0	0.0	0.0
73	3.0	11387.1	0.0	0.0	0.0	0.0	1708.1	0.0	0.0
74	16.6	44507.6	0.0	0.0	0.0	0.0	6676.1	0.0	0.0
75	9.3	8251.3	0.0	0.0	0.0	0.0	1237.7	0.0	0.0

Table 2 - Base Stress Data on the 75 Slices

Slice No. *	Alpha (deg)	X-Coord. Slice Cntr (ft)	Base Leng. (ft)	Available Shear Strength (psf)	Mobilized Shear Stress (psf)
1	-34.00	25.87	16.81	1154.02	-243.15
2	-34.00	38.92	14.67	1876.51	-698.55
3	-34.00	47.50	6.03	2357.13	-1001.51
4	-34.00	51.19	2.87	2569.55	-1135.41
5	-34.00	67.48	36.44	3095.79	-1754.62
6	-34.00	107.46	60.00	4307.46	-3279.29
7	-45.00	138.09	16.31	10228.32	-6288.88
8	-45.00	145.43	4.44	20022.55	-6854.85
9	-45.00	155.54	24.15	21588.54	-7634.85
10	0.05	172.04	15.92	2515.54	2084.93
11	0.05	240.00	120.00	2544.85	2118.70
12	0.05	315.00	30.00	2577.19	2155.96
13	0.05	331.50	3.00	2584.31	2164.16
14	0.05	334.00	2.00	2596.30	2164.72
15	0.05	341.00	12.00	2587.92	2168.91
16	0.05	353.50	13.00	2572.96	2176.38
17	0.05	379.26	38.52	2542.12	2191.78
18	0.05	405.76	14.48	2510.41	2207.63
19	0.05	415.00	4.00	2515.62	2222.65
20	0.05	426.00	18.00	2591.97	2281.43
21	0.05	436.00	2.00	2661.38	2334.88
22	0.05	456.50	39.00	2796.12	2440.03
23	0.05	478.00	4.00	2929.17	2550.55
24	0.05	488.50	17.00	3024.90	2615.09
25	0.05	507.50	21.00	3246.16	2759.90
26	0.05	531.50	27.00	3368.57	2851.19
27	0.05	545.50	1.00	3358.24	2856.78
28	0.05	556.50	21.00	3520.11	2960.31
29	0.05	567.50	1.00	3681.98	3063.84
30	0.05	580.50	25.00	3873.28	3186.20
31	0.05	596.50	7.00	4052.64	3304.07
32	4.15	610.00	20.05	3954.84	4845.04
33	4.15	622.00	4.01	4031.49	4914.75
34	4.15	625.50	3.01	4128.83	5000.58
35	4.15	628.50	3.01	4121.53	4994.89
36	4.15	649.50	39.10	4312.39	5166.43
37	4.15	684.50	31.08	4464.40	5307.27
38	4.15	720.00	40.11	4364.59	5230.67
39	5.45	750.00	20.09	4250.49	5678.42
40	5.45	776.00	32.15	4161.56	5599.27
41	5.45	812.00	40.18	4038.42	5489.68
42	5.45	848.50	33.15	3913.58	5378.56
43	5.45	867.50	5.02	3834.30	5306.93
44	5.45	874.00	8.04	3799.01	5274.54
45	5.45	884.00	12.05	3770.33	5246.81
46	5.45	898.00	16.07	3920.23	5398.98
47	5.45	909.00	6.03	4154.17	5630.66
48	5.45	916.00	8.04	4370.11	5842.83
49	5.45	925.50	11.05	4505.17	5978.27
50	5.45	940.50	19.09	4458.58	5941.31
51	5.45	978.00	56.25	4342.11	5848.92
52	5.45	1018.00	24.11	4217.87	5750.37
53	14.55	1030.50	1.03	4113.41	9279.26
54	14.55	1032.00	2.07	4105.15	9261.03
55	14.55	1035.50	5.17	4040.23	9146.75
56	14.55	1039.00	2.07	3975.06	9032.05
57	14.55	1076.50	75.42	3753.29	8561.42

58	14.55	1128.50	32.03	3712.63	8333.43
59	14.55	1163.50	40.29	3772.51	8318.79
60	14.55	1188.00	10.33	3628.24	8011.21
61	14.55	1201.50	17.56	3814.42	8266.54
62	14.55	1231.50	44.43	4094.70	8621.64
63	14.55	1274.65	44.72	4029.55	8387.30
64	45.00	1313.15	47.67	5623.27	14944.69
65	45.00	1334.36	12.33	5028.65	12802.75
66	45.00	1353.36	41.41	4483.39	10887.05
67	45.00	1373.00	14.14	3921.44	8906.28
68	45.00	1378.84	2.36	3745.67	8319.72
69	45.00	1389.84	28.75	3414.33	7214.03
70	45.00	1409.61	27.19	2773.10	5133.18
71	45.00	1420.66	4.06	2363.17	3921.10
72	45.00	1424.55	6.93	2160.55	3507.25
73	45.00	1428.50	4.24	1954.61	3086.61
74	45.00	1438.29	23.45	1511.91	2182.40
75	59.00	1451.25	18.12	914.64	826.12

Sum of the Resisting Forces (including Pier/Pile, Tieback, Reinforcing
Soil Nail, and Applied Forces if applicable) = 6234570.00 (lbs)
Average Available Shear Strength (including Tieback, Pier/Pile, Reinforcing,
Soil Nail, and Applied Forces if applicable) = 4009.10(psf)
Sum of the Driving Forces = 7067628.00 (lbs)
Average Mobilized Shear Stress = 4544.79(psf)
Total length of the failure surface = 1555.11(ft)

*** SEISMIC SLOPE DISPLACEMENT DATA ***

(Note: kv is set = zero for displacement calculations)
Seismic Yield Coefficient (ky) = 0.1259(g)
Calculated Newmark Seismic Displacement = 0.129(ft)
Non-Symmetrical Sliding Resistance Has Been Specified
for Downhill Sliding.

**** END OF GSTABL7 OUTPUT ****

Sliding displacement models from Rathje and Antonakos (2011)

Prediction of dynamic response and sliding displacement of a sliding mass during earthquake shaking

Cross Section: B-B'

File: b-35a-15s

Inputs	
PGA (g)	0.2763
PGV (cm/s)	23.32
k_y (g)	0.1259
T_m (s)	0.517
T_s (s)	0.30
M	6.95
T_s/T_m	0.586804

Dynamic Response			
	median	-1σ	+1σ
kmax (g)	0.231	0.180	0.297
k-velmax (cm/s)	25.73	20.03	33.03

Displacement Given Median Dynamic Response					
Displacement Model			Sliding Displacements, D (cm)		
	μ_{lnD}	σ_{lnD}	median	-1σ	+1σ
[kmax, M]	1.52	0.870	4.59	1.93	10.96
[kmax, k-velmax]	0.71	0.555	2.03	1.17	3.54
			Sliding Displacements, D (in)		
	μ_{lnD}	σ_{lnD}	median	-1σ	+1σ
[kmax, M]	1.52	0.870	1.81	0.76	4.31
[kmax, k-velmax]	0.71	0.555	0.80	0.46	1.39

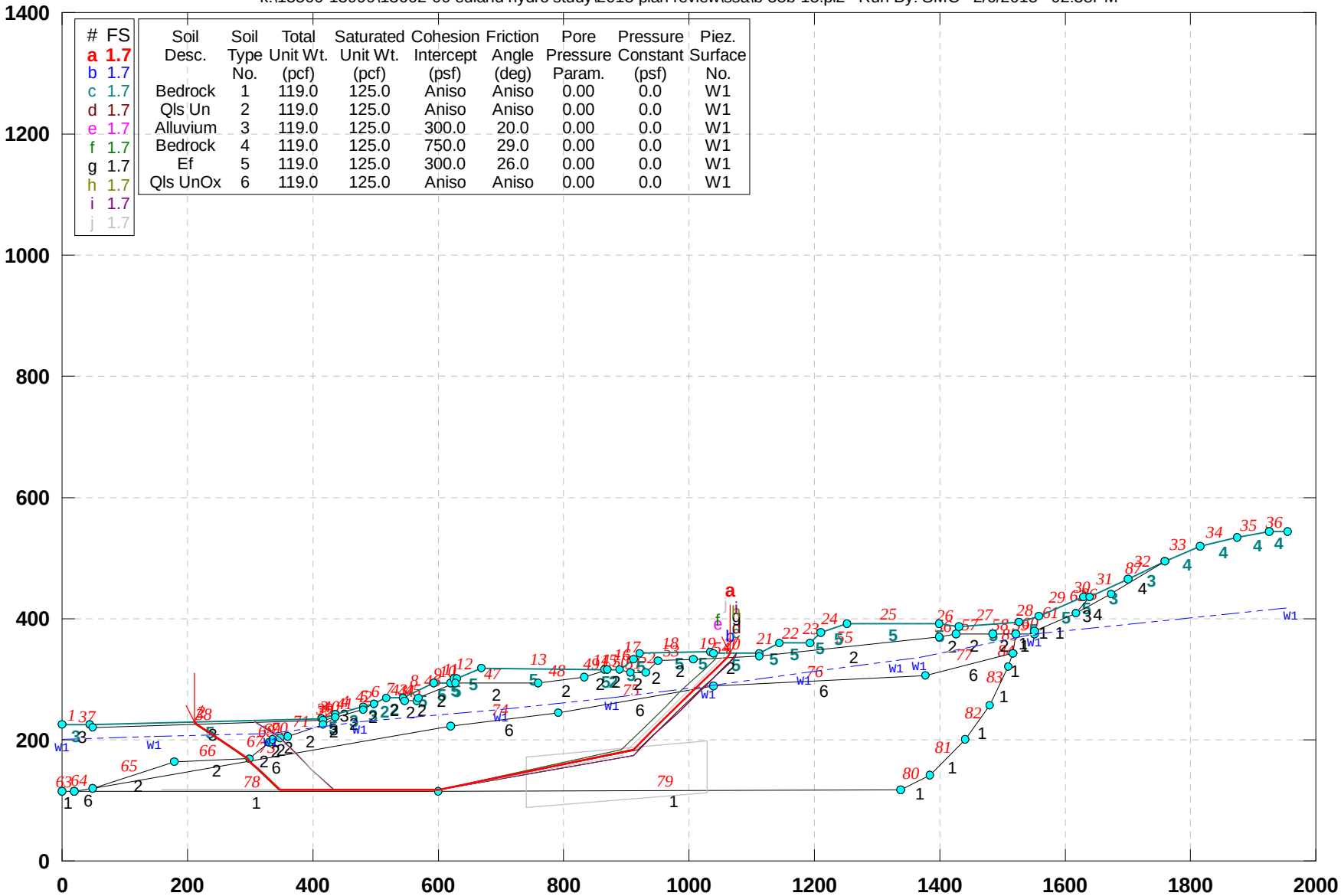
PGA	Peak Ground Acceleration (g)	
PGV	Peak Ground Velocity (cm/s)	
k_y	Critical or Yield Acceleration (g)	
T_m	Mean Period of an Earthquake Motion (s)	
T_s	Site Period or the Natural Period of a Sliding Mass (s). For rigid sliding set T_s= 0 s	
M	Earthquake Magnitude	
kmax	maximum seismic coefficient (g)	
k-velmax	the maximum velocity of the seismic coefficient-time history (cm/s)	
D	Predicted Sliding Displacment (cm)	

H_{avr} =	160	ft
V_s =	2110	ft/s
$T_s = 4\ H_{avr}/V_s$ =	0.30	s

Reference: Rathje, E.M. and Antonakos, G. 2011. "A Unified Model for Predicting Earthquake-Induced Sliding Displacements of Rigid and Flexible Slopes," Engineering Geology, 122, 51-60, doi:10.1016/j.enggeo.2010.12.004.

13662-00, Euland Capital , B-B', , , Static, 2015 design

k:\13500-13999\13662-00 euland hydro study\2015 plan review\ssa\b-35b-15.pl2 Run By: SMC 2/6/2015 02:38PM



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.
Bedrock	1	119.0	125.0	Aniso	Aniso	0.00	0.0	W1
Qls Un	2	119.0	125.0	Aniso	Aniso	0.00	0.0	W1
Alluvium	3	119.0	125.0	300.0	20.0	0.00	0.0	W1
Bedrock	4	119.0	125.0	750.0	29.0	0.00	0.0	W1
Ef	5	119.0	125.0	300.0	26.0	0.00	0.0	W1
Qls UnOx	6	119.0	125.0	Aniso	Aniso	0.00	0.0	W1

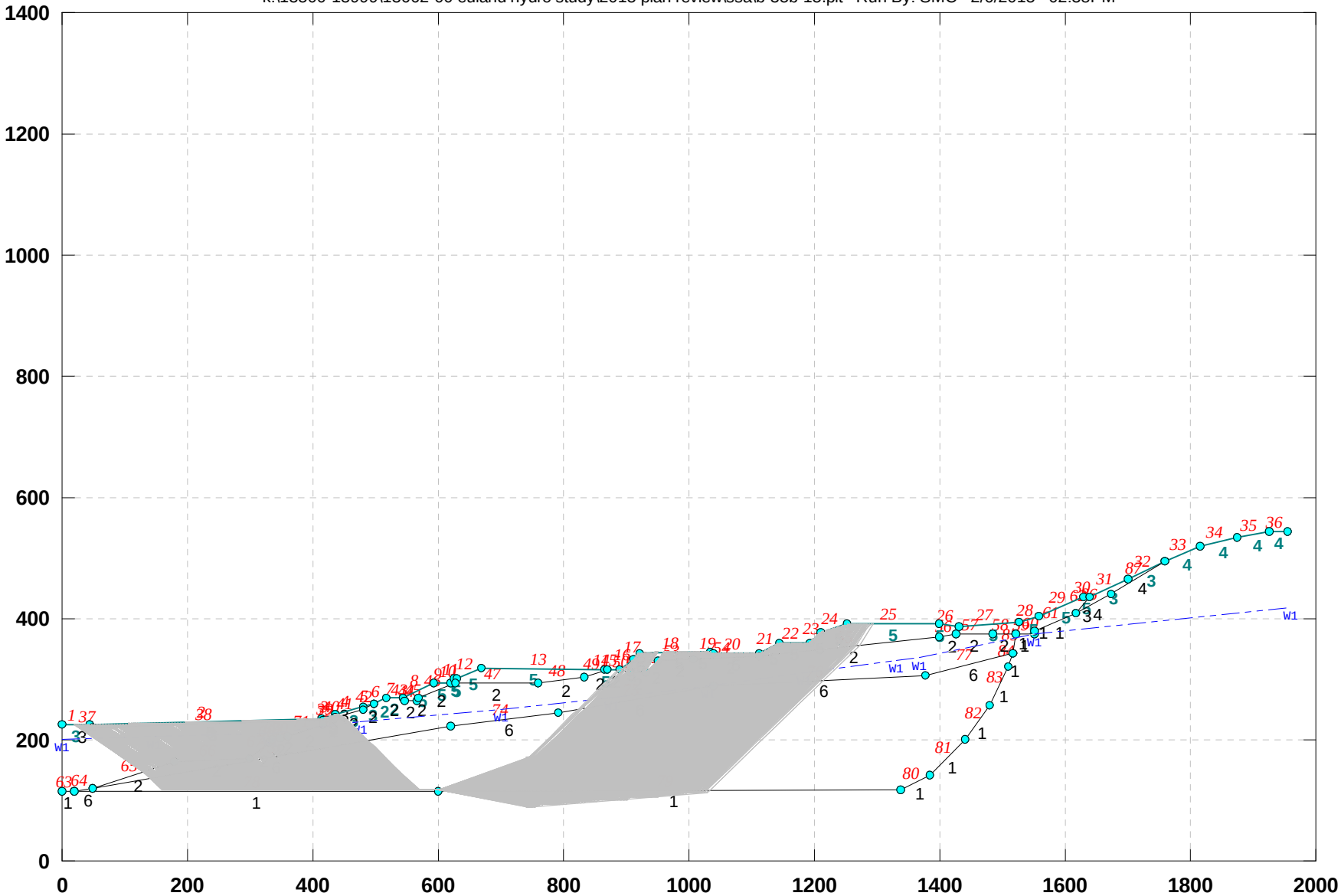
GSTABL7 v.2 FSmin=1.7

Safety Factors Are Calculated By The Simplified Janbu Method for the case of c & phi both > 0

Figure E-6.1

13662-00, Euland Capital , B-B', , , Static, 2015 design

k:\13500-13999\13662-00 euland hydro study\2015 plan review\ssa\b-35b-15.plt Run By: SMC 2/6/2015 02:38PM



***** GSTABL7 *****

** GSTABL7 by Garry H. Gregory, P.E. **

** Original Version 1.0, January 1996; Current Version 2.005, Sept. 2006 **

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SLOPE STABILITY ANALYSIS SYSTEM

Modified Bishop, Simplified Janbu, or GLE Method of Slices.
(Includes Spencer & Morgenstern-Price Type Analysis)
Including Pier/Pile, Reinforcement, Soil Nail, Tieback,
Nonlinear Undrained Shear Strength, Curved Phi Envelope,
Anisotropic Soil, Fiber-Reinforced Soil, Boundary Loads, Water
Surfaces, Pseudo-Static & Newmark Earthquake, and Applied Forces.

****

Analysis Run Date: 2/6/2015
Time of Run: 02:38PM
Run By: SMC
Input Data Filename: K:\13500-13999\13662-00 Euland Hydro Study\2015 Plan Review\SSA\b-35b-15.
Output Filename: K:\13500-13999\13662-00 Euland Hydro Study\2015 Plan Review\SSA\b-35b-15.OUT
Unit System: English
Plotted Output Filename: K:\13500-13999\13662-00 Euland Hydro Study\2015 Plan Review\SSA\b-35b-15.PLT
PROBLEM DESCRIPTION: 13662-00, Euland Capital , B-B',
, , Static, 2015 design

BOUNDARY COORDINATES
36 Top Boundaries
87 Total Boundaries

Boundary No.	X-Left (ft)	Y-Left (ft)	X-Right (ft)	Y-Right (ft)	Soil Type Below Bnd
1	0.00	225.00	45.00	225.00	3
2	45.00	225.00	413.00	235.00	5
3	413.00	235.00	437.00	242.00	5
4	437.00	242.00	480.00	254.00	3
5	480.00	254.00	497.00	260.00	3
6	497.00	260.00	518.00	270.00	2
7	518.00	270.00	545.00	270.00	2
8	545.00	270.00	593.00	295.00	5
9	593.00	295.00	620.00	295.00	5
10	620.00	295.00	624.00	302.00	5
11	624.00	302.00	630.00	302.00	5
12	630.00	302.00	669.00	318.00	5
13	669.00	318.00	865.00	316.00	5
14	865.00	316.00	870.00	315.00	5
15	870.00	315.00	890.00	315.00	2
16	890.00	315.00	912.00	333.00	5
17	912.00	333.00	920.00	344.00	5
18	920.00	344.00	1033.00	345.00	5
19	1033.00	345.00	1038.00	342.00	5
20	1038.00	342.00	1113.00	342.00	5
21	1113.00	342.00	1144.00	360.00	5
22	1144.00	360.00	1193.00	360.00	5
23	1193.00	360.00	1210.00	378.00	5
24	1210.00	378.00	1253.00	391.00	5
25	1253.00	391.00	1400.00	391.00	5
26	1400.00	391.00	1430.00	388.00	5
27	1430.00	388.00	1527.00	395.00	5
28	1527.00	395.00	1557.00	404.00	5
29	1557.00	404.00	1630.00	435.00	5
30	1630.00	435.00	1640.00	437.00	5
31	1640.00	437.00	1700.00	465.00	3
32	1700.00	465.00	1760.00	495.00	3
33	1760.00	495.00	1815.00	520.00	4
34	1815.00	520.00	1875.00	535.00	4
35	1875.00	535.00	1925.00	545.00	4
36	1925.00	545.00	1955.00	545.00	4
37	45.00	225.00	50.00	220.00	3
38	50.00	220.00	417.00	232.00	3
39	417.00	232.00	435.00	237.00	3
40	435.00	237.00	437.00	242.00	3

41	435.00	237.00	480.00	249.00	2
42	480.00	249.00	497.00	260.00	2
43	545.00	270.00	546.00	265.00	2
44	546.00	265.00	567.00	265.00	2
45	567.00	265.00	568.00	270.00	2
46	568.00	270.00	627.00	293.00	2
47	627.00	293.00	760.00	295.00	2
48	760.00	295.00	832.00	305.00	2
49	832.00	305.00	870.00	315.00	2
50	890.00	315.00	906.00	310.00	2
51	906.00	310.00	931.00	310.00	2
52	931.00	310.00	950.00	330.00	2
53	950.00	330.00	1006.00	333.00	2
54	1006.00	333.00	1113.00	337.00	2
55	1113.00	337.00	1400.00	370.00	2
56	1400.00	370.00	1427.00	374.00	2
57	1427.00	374.00	1485.00	375.00	2
58	1485.00	375.00	1522.00	375.00	2
59	1522.00	375.00	1550.00	375.00	1
60	1550.00	375.00	1551.00	380.00	1
61	1551.00	380.00	1618.00	410.00	1
62	1618.00	410.00	1640.00	437.00	3
63	0.00	115.00	20.00	115.00	1
64	20.00	115.00	50.00	120.00	6
65	50.00	120.00	180.00	165.00	2
66	180.00	165.00	300.00	170.00	2
67	300.00	170.00	330.00	195.00	2
68	330.00	195.00	335.00	200.00	2
69	335.00	200.00	347.00	203.00	2
70	347.00	203.00	360.00	207.00	2
71	360.00	207.00	417.00	225.00	2
72	417.00	225.00	435.00	237.00	2
73	50.00	120.00	620.00	223.00	6
74	620.00	223.00	792.00	245.00	6
75	792.00	245.00	1040.00	290.00	6
76	1040.00	290.00	1378.00	307.00	6
77	1378.00	307.00	1516.00	342.00	6
78	20.00	115.00	600.00	115.00	1
79	600.00	115.00	1338.00	118.00	1
80	1338.00	118.00	1385.00	143.00	1
81	1385.00	143.00	1440.00	200.00	1
82	1440.00	200.00	1480.00	258.00	1
83	1480.00	258.00	1510.00	320.00	1
84	1510.00	320.00	1516.00	342.00	1
85	1516.00	342.00	1522.00	375.00	1
86	1618.00	410.00	1673.00	440.00	4
87	1673.00	440.00	1760.00	495.00	4

Default Y-Origin = 0.00(ft)
Default X-Plus Value = 0.00(ft)
Default Y-Plus Value = 0.00(ft)

ISOTROPIC SOIL PARAMETERS
6 Type(s) of Soil

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.
1	119.0	125.0	0.0	0.0	0.00	0.0	1
2	119.0	125.0	0.0	0.0	0.00	0.0	1
3	119.0	125.0	300.0	20.0	0.00	0.0	1
4	119.0	125.0	750.0	29.0	0.00	0.0	1
5	119.0	125.0	300.0	26.0	0.00	0.0	1
6	119.0	125.0	0.0	0.0	0.00	0.0	1

ANISOTROPIC STRENGTH PARAMETERS
3 soil type(s)
Soil Type 1 Is Anisotropic
Number Of Direction Ranges Specified = 3

Direction Range No.	Counterclockwise Direction Limit (deg)	Cohesion Intercept (psf)	Friction Angle (deg)
1	0.0	750.00	29.00
2	5.0	300.00	15.00

```
    3              90.0             750.00         29.00
Soil Type  2 Is Anisotropic
Number Of Direction Ranges Specified =  3
Direction    Counterclockwise     Cohesion     Friction
  Range       Direction Limit    Intercept       Angle
   No.            (deg)            (psf)         (deg)
    1              0.0             350.00         23.00
    2             15.0             250.00         12.50
    3             90.0             300.00         20.00
Soil Type  6 Is Anisotropic
Number Of Direction Ranges Specified =  3
Direction    Counterclockwise     Cohesion     Friction
  Range       Direction Limit    Intercept       Angle
   No.            (deg)            (psf)         (deg)
    1              0.0             500.00         29.00
    2             15.0             250.00         12.50
    3             90.0             300.00         20.00
ANISOTROPIC SOIL NOTES:
   (1) An input value of 0.01 for C and/or Phi will cause Aniso
       C and/or Phi to be ignored in that range.
   (2) An input value of 0.02 for Phi will set both Phi and
       C equal to zero, with no water weight in the tension crack.
   (3) An input value of 0.03 for Phi will set both Phi and
       C equal to zero, with water weight in the tension crack.
1 PIEZOMETRIC SURFACE(S) SPECIFIED
Unit Weight of Water =  62.40 (pcf)
Piezometric Surface No.  1 Specified by 12 Coordinate Points
Pore Pressure Inclination Factor =  0.50
  Point      X-Water     Y-Water
   No.         (ft)        (ft)
    1          0.00      201.00
    2        147.00      205.00
    3        333.00      210.00
    4        476.00      230.00
    5        700.00      250.00
    6        878.00      270.00
    7       1031.00      290.00
    8       1183.00      310.00
    9       1330.00      330.00
   10       1368.00      336.00
   11       1550.00      375.00
   12       1960.00      420.00
Janbus Empirical Coef is being used for the case of  c & phi both > 0
A Critical Failure Surface Searching Method, Using A Random
Technique For Generating Sliding Block Surfaces, Has Been
Specified.
The Active And Passive Portions Of The Sliding Surfaces
Are Generated According To The Rankine Theory.
5000 Trial Surfaces Have Been Generated.
3 Boxes Specified For Generation Of Central Block Base
Length Of Line Segments For Active And Passive Portions Of
Sliding Block Is  50.0
Box        X-Left     Y-Left    X-Right    Y-Right      Height
No.         (ft)       (ft)       (ft)       (ft)        (ft)
 1         160.00     117.00     570.00     117.00       1.00
 2         600.00     117.00     600.00     117.00       1.00
 3         740.00     130.00    1030.00     155.00      85.00
Following Are Displayed The Ten Most Critical Of The Trial
      Failure Surfaces Evaluated. They Are
      Ordered - Most Critical First.
      * * Safety Factors Are Calculated By The Simplified Janbu Method * *
      Total Number of Trial Surfaces Attempted =  5000
      Number of Trial Surfaces With Valid FS = 5000
      Statistical Data On All Valid FS Values:
         FS Max =   3.567   FS Min =   1.728   FS Ave =   2.218
         Standard Deviation =    0.445   Coefficient of Variation =   20.06 %
      Failure Surface Specified By 15 Coordinate Points
        Point      X-Surf      Y-Surf
         No.        (ft)        (ft)
          1        209.508     229.470
```

2	215.978	225.427
3	254.452	198.488
4	295.409	169.809
5	300.036	165.182
6	312.903	152.315
7	348.259	116.959
8	600.000	117.152
9	910.258	184.308
10	945.614	219.664
11	980.969	255.019
12	1010.618	284.669
13	1045.974	320.024
14	1061.006	335.056
15	1065.345	342.000

Factor of Safety
*** 1.728 ***

Individual data on the 0 slices

Slice No.	Width (ft)	Weight (lbs)	Water Force Top (lbs)	Water Force Bot (lbs)	Tie Force Norm (lbs)	Tie Force Tan (lbs)	Earthquake Force Hor (lbs)	Earthquake Force Ver (lbs)	Surcharge Load (lbs)

Failure Surface Specified By 15 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	209.508	229.470
2	215.978	225.427
3	254.452	198.488
4	295.409	169.809
5	300.036	165.182
6	312.903	152.315
7	348.259	116.959
8	600.000	117.152
9	910.258	184.308
10	945.614	219.664
11	980.969	255.019
12	1010.618	284.669
13	1045.974	320.024
14	1061.006	335.056
15	1065.345	342.000

Factor of Safety
*** 1.728 ***

Failure Surface Specified By 15 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	209.888	229.481
2	216.356	225.439
3	254.825	198.503
4	295.782	169.824
5	300.365	165.241
6	313.704	151.903
7	349.059	116.547
8	600.000	116.631
9	919.887	184.641
10	955.242	219.996
11	990.598	255.351
12	1021.976	286.730
13	1057.331	322.085
14	1070.664	335.417
15	1074.777	342.000

Factor of Safety
*** 1.734 ***

Failure Surface Specified By 15 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	209.888	229.481
2	216.356	225.439
3	254.825	198.503
4	295.782	169.824
5	300.365	165.241
6	313.704	151.903

7	349.059	116.547
8	600.000	116.631
9	919.887	184.641
10	955.242	219.996
11	990.598	255.351
12	1021.976	286.730
13	1057.331	322.085
14	1070.664	335.417
15	1074.777	342.000

Factor of Safety
*** 1.734 ***

Failure Surface Specified By 15 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	207.766	229.423
2	214.251	225.371
3	252.745	198.416
4	293.703	169.738
5	298.531	164.910
6	311.302	152.139
7	346.657	116.784
8	600.000	117.195
9	891.000	183.644
10	926.356	219.000
11	961.711	254.355
12	987.903	280.547
13	1023.258	315.902
14	1041.690	334.334
15	1046.480	342.000

Factor of Safety
*** 1.734 ***

Failure Surface Specified By 15 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	207.766	229.423
2	214.251	225.371
3	252.745	198.416
4	293.703	169.738
5	298.531	164.910
6	311.302	152.139
7	346.657	116.784
8	600.000	117.195
9	891.000	183.644
10	926.356	219.000
11	961.711	254.355
12	987.903	280.547
13	1023.258	315.902
14	1041.690	334.334
15	1046.480	342.000

Factor of Safety
*** 1.734 ***

Failure Surface Specified By 15 Coordinate Points

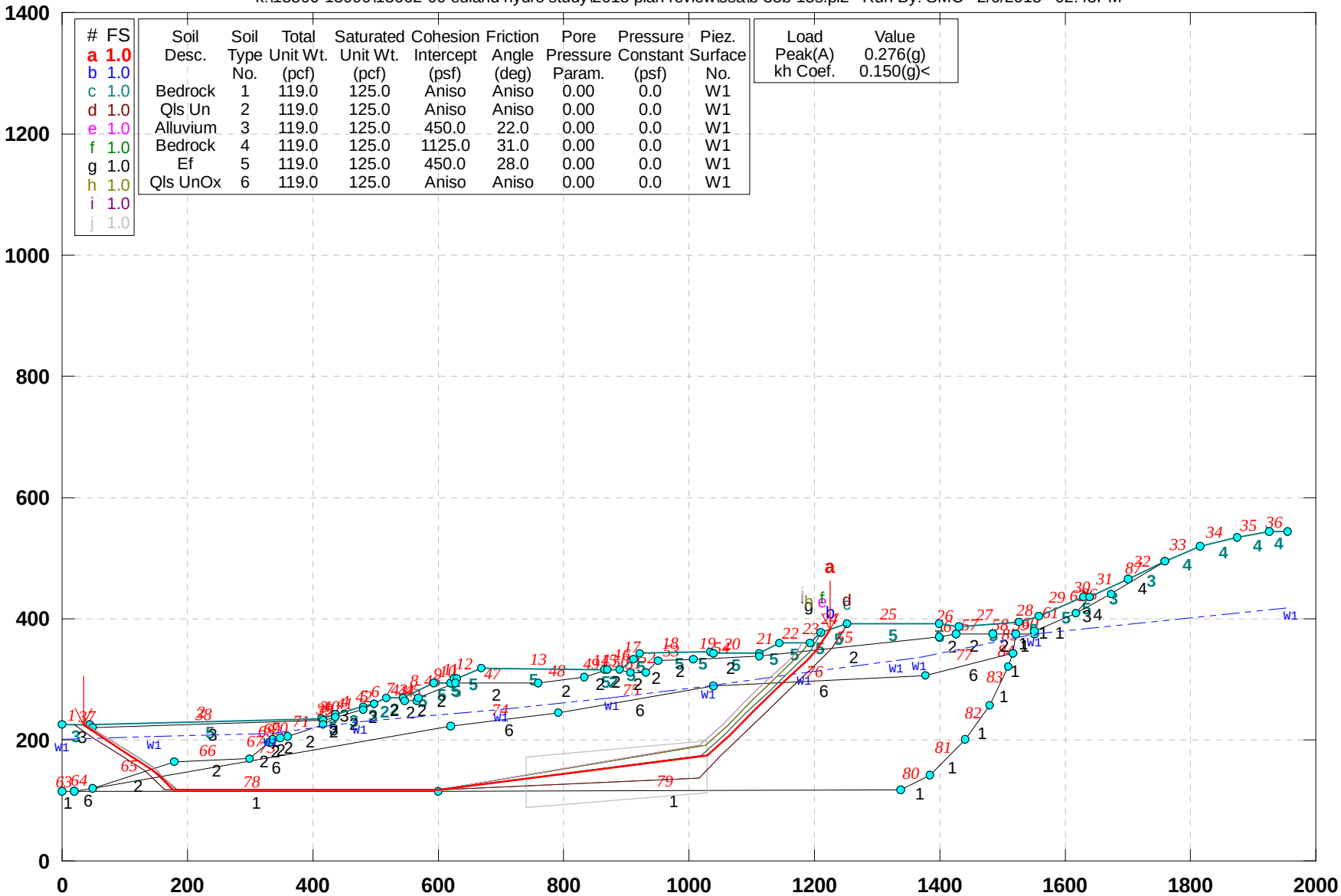
Point No.	X-Surf (ft)	Y-Surf (ft)
1	304.595	232.054
2	310.267	228.510
3	346.778	202.945
4	371.608	178.115
5	397.386	152.337
6	432.741	116.982
7	600.000	117.136
8	911.108	174.338
9	946.463	209.693
10	981.818	245.048
11	1017.174	280.404
12	1023.837	287.067
13	1059.193	322.423
14	1072.247	335.477
15	1076.323	342.000

Factor of Safety

```
        ***    1.736   ***
   Failure Surface Specified By 15 Coordinate Points
     Point      X-Surf      Y-Surf
      No.        (ft)        (ft)
       1        304.595      232.054
       2        310.267      228.510
       3        346.778      202.945
       4        371.608      178.115
       5        397.386      152.337
       6        432.741      116.982
       7        600.000      117.136
       8        911.108      174.338
       9        946.463      209.693
      10        981.818      245.048
      11       1017.174      280.404
      12       1023.837      287.067
      13       1059.193      322.423
      14       1072.247      335.477
      15       1076.323      342.000
          Factor of Safety
        ***    1.736   ***
   Failure Surface Specified By 15 Coordinate Points
     Point      X-Surf      Y-Surf
      No.        (ft)        (ft)
       1        304.595      232.054
       2        310.267      228.510
       3        346.778      202.945
       4        371.608      178.115
       5        397.386      152.337
       6        432.741      116.982
       7        600.000      117.136
       8        911.108      174.338
       9        946.463      209.693
      10        981.818      245.048
      11       1017.174      280.404
      12       1023.837      287.067
      13       1059.193      322.423
      14       1072.247      335.477
      15       1076.323      342.000
          Factor of Safety
        ***    1.736   ***
   Failure Surface Specified By 15 Coordinate Points
     Point      X-Surf      Y-Surf
      No.        (ft)        (ft)
       1        302.736      232.004
       2        308.424      228.450
       3        345.356      202.589
       4        370.103      177.843
       5        395.784      152.161
       6        431.140      116.806
       7        600.000      117.179
       8        891.850      173.674
       9        927.205      209.029
      10        962.561      244.384
      11        997.916      279.740
      12       1001.122      282.945
      13       1036.477      318.301
      14       1052.931      334.754
      15       1057.458      342.000
          Factor of Safety
        ***    1.739   ***
            **** END OF GSTABL7 OUTPUT ****
```

13662-00, Euland Capital , B-B', , , seismic, 2015 design

k:\13500-13999\13662-00 euland hydro study\2015 plan review\ssa\b-35b-15s.pl2 Run By: SMC 2/6/2015 02:43PM



GSTABL7 v.2 FSmin=1.0

Safety Factors Are Calculated By The Simplified Janbu Method for the case of c & phi both > 0

Figure E-6.2

***** GSTABL7 *****

** GSTABL7 by Garry H. Gregory, P.E. **

** Original Version 1.0, January 1996; Current Version 2.005, Sept. 2006 **

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****

SLOPE STABILITY ANALYSIS SYSTEM

Modified Bishop, Simplified Janbu, or GLE Method of Slices.
(Includes Spencer & Morgenstern-Price Type Analysis)
Including Pier/Pile, Reinforcement, Soil Nail, Tieback,
Nonlinear Undrained Shear Strength, Curved Phi Envelope,
Anisotropic Soil, Fiber-Reinforced Soil, Boundary Loads, Water
Surfaces, Pseudo-Static & Newmark Earthquake, and Applied Forces.

****

Analysis Run Date: 2/6/2015
Time of Run: 02:43PM
Run By: SMC
Input Data Filename: K:\13500-13999\13662-00 Euland Hydro Study\2015 Plan Review\SSA\b-35b-15s.
Output Filename: K:\13500-13999\13662-00 Euland Hydro Study\2015 Plan Review\SSA\b-35b-15s.OUT
Unit System: English
Plotted Output Filename: K:\13500-13999\13662-00 Euland Hydro Study\2015 Plan Review\SSA\b-35b-15s.PLT
PROBLEM DESCRIPTION: 13662-00, Euland Capital , B-B',
, , seismic, 2015 design

BOUNDARY COORDINATES
36 Top Boundaries
87 Total Boundaries

Boundary No.	X-Left (ft)	Y-Left (ft)	X-Right (ft)	Y-Right (ft)	Soil Type Below Bnd
1	0.00	225.00	45.00	225.00	3
2	45.00	225.00	413.00	235.00	5
3	413.00	235.00	437.00	242.00	5
4	437.00	242.00	480.00	254.00	3
5	480.00	254.00	497.00	260.00	3
6	497.00	260.00	518.00	270.00	2
7	518.00	270.00	545.00	270.00	2
8	545.00	270.00	593.00	295.00	5
9	593.00	295.00	620.00	295.00	5
10	620.00	295.00	624.00	302.00	5
11	624.00	302.00	630.00	302.00	5
12	630.00	302.00	669.00	318.00	5
13	669.00	318.00	865.00	316.00	5
14	865.00	316.00	870.00	315.00	5
15	870.00	315.00	890.00	315.00	2
16	890.00	315.00	912.00	333.00	5
17	912.00	333.00	920.00	344.00	5
18	920.00	344.00	1033.00	345.00	5
19	1033.00	345.00	1038.00	342.00	5
20	1038.00	342.00	1113.00	342.00	5
21	1113.00	342.00	1144.00	360.00	5
22	1144.00	360.00	1193.00	360.00	5
23	1193.00	360.00	1210.00	378.00	5
24	1210.00	378.00	1253.00	391.00	5
25	1253.00	391.00	1400.00	391.00	5
26	1400.00	391.00	1430.00	388.00	5
27	1430.00	388.00	1527.00	395.00	5
28	1527.00	395.00	1557.00	404.00	5
29	1557.00	404.00	1630.00	435.00	5
30	1630.00	435.00	1640.00	437.00	5
31	1640.00	437.00	1700.00	465.00	3
32	1700.00	465.00	1760.00	495.00	3
33	1760.00	495.00	1815.00	520.00	4
34	1815.00	520.00	1875.00	535.00	4
35	1875.00	535.00	1925.00	545.00	4
36	1925.00	545.00	1955.00	545.00	4
37	45.00	225.00	50.00	220.00	3
38	50.00	220.00	417.00	232.00	3
39	417.00	232.00	435.00	237.00	3
40	435.00	237.00	437.00	242.00	3

41	435.00	237.00	480.00	249.00	2
42	480.00	249.00	497.00	260.00	2
43	545.00	270.00	546.00	265.00	2
44	546.00	265.00	567.00	265.00	2
45	567.00	265.00	568.00	270.00	2
46	568.00	270.00	627.00	293.00	2
47	627.00	293.00	760.00	295.00	2
48	760.00	295.00	832.00	305.00	2
49	832.00	305.00	870.00	315.00	2
50	890.00	315.00	906.00	310.00	2
51	906.00	310.00	931.00	310.00	2
52	931.00	310.00	950.00	330.00	2
53	950.00	330.00	1006.00	333.00	2
54	1006.00	333.00	1113.00	337.00	2
55	1113.00	337.00	1400.00	370.00	2
56	1400.00	370.00	1427.00	374.00	2
57	1427.00	374.00	1485.00	375.00	2
58	1485.00	375.00	1522.00	375.00	2
59	1522.00	375.00	1550.00	375.00	1
60	1550.00	375.00	1551.00	380.00	1
61	1551.00	380.00	1618.00	410.00	1
62	1618.00	410.00	1640.00	437.00	3
63	0.00	115.00	20.00	115.00	1
64	20.00	115.00	50.00	120.00	6
65	50.00	120.00	180.00	165.00	2
66	180.00	165.00	300.00	170.00	2
67	300.00	170.00	330.00	195.00	2
68	330.00	195.00	335.00	200.00	2
69	335.00	200.00	347.00	203.00	2
70	347.00	203.00	360.00	207.00	2
71	360.00	207.00	417.00	225.00	2
72	417.00	225.00	435.00	237.00	2
73	50.00	120.00	620.00	223.00	6
74	620.00	223.00	792.00	245.00	6
75	792.00	245.00	1040.00	290.00	6
76	1040.00	290.00	1378.00	307.00	6
77	1378.00	307.00	1516.00	342.00	6
78	20.00	115.00	600.00	115.00	1
79	600.00	115.00	1338.00	118.00	1
80	1338.00	118.00	1385.00	143.00	1
81	1385.00	143.00	1440.00	200.00	1
82	1440.00	200.00	1480.00	258.00	1
83	1480.00	258.00	1510.00	320.00	1
84	1510.00	320.00	1516.00	342.00	1
85	1516.00	342.00	1522.00	375.00	1
86	1618.00	410.00	1673.00	440.00	4
87	1673.00	440.00	1760.00	495.00	4

Default Y-Origin = 0.00(ft)
Default X-Plus Value = 0.00(ft)
Default Y-Plus Value = 0.00(ft)

ISOTROPIC SOIL PARAMETERS
6 Type(s) of Soil

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.
1	119.0	125.0	0.0	0.0	0.00	0.0	1
2	119.0	125.0	0.0	0.0	0.00	0.0	1
3	119.0	125.0	450.0	22.0	0.00	0.0	1
4	119.0	125.0	1125.0	31.0	0.00	0.0	1
5	119.0	125.0	450.0	28.0	0.00	0.0	1
6	119.0	125.0	0.0	0.0	0.00	0.0	1

ANISOTROPIC STRENGTH PARAMETERS
3 soil type(s)
Soil Type 1 Is Anisotropic
Number Of Direction Ranges Specified = 3

Direction Range No.	Counterclockwise Direction Limit (deg)	Cohesion Intercept (psf)	Friction Angle (deg)
1	0.0	1125.00	31.00
2	5.0	450.00	17.00

3	90.0	1125.00	31.00

Soil Type 2 Is Anisotropic
Number Of Direction Ranges Specified = 3

Direction Range No.	Counterclockwise Direction Limit (deg)	Cohesion Intercept (psf)	Friction Angle (deg)
1	0.0	525.00	25.00
2	15.0	375.00	14.50
3	90.0	450.00	22.00

Soil Type 6 Is Anisotropic
Number Of Direction Ranges Specified = 3

Direction Range No.	Counterclockwise Direction Limit (deg)	Cohesion Intercept (psf)	Friction Angle (deg)
1	0.0	750.00	31.00
2	15.0	375.00	14.50
3	90.0	450.00	22.00

ANISOTROPIC SOIL NOTES:
(1) An input value of 0.01 for C and/or Phi will cause Aniso C and/or Phi to be ignored in that range.
(2) An input value of 0.02 for Phi will set both Phi and C equal to zero, with no water weight in the tension crack.
(3) An input value of 0.03 for Phi will set both Phi and C equal to zero, with water weight in the tension crack.

1 PIEZOMETRIC SURFACE(S) SPECIFIED
Unit Weight of Water = 62.40 (pcf)
Piezometric Surface No. 1 Specified by 12 Coordinate Points
Pore Pressure Inclination Factor = 0.50

Point No.	X-Water (ft)	Y-Water (ft)
1	0.00	201.00
2	147.00	205.00
3	333.00	210.00
4	476.00	230.00
5	700.00	250.00
6	878.00	270.00
7	1031.00	290.00
8	1183.00	310.00
9	1330.00	330.00
10	1368.00	336.00
11	1550.00	375.00
12	1960.00	420.00

Specified Peak Ground Acceleration Coefficient (A) = 0.276(g)
Specified Horizontal Earthquake Coefficient (kh) = 0.150(g)
Specified Vertical Earthquake Coefficient (kv) = 0.000(g)
Specified Seismic Pore-Pressure Factor = 0.000
Janbus Empirical Coef is being used for the case of c & phi both > 0
A Critical Failure Surface Searching Method, Using A Random Technique For Generating Sliding Block Surfaces, Has Been Specified.
The Active And Passive Portions Of The Sliding Surfaces Are Generated According To The Rankine Theory.
5000 Trial Surfaces Have Been Generated.
3 Boxes Specified For Generation Of Central Block Base Length Of Line Segments For Active And Passive Portions Of Sliding Block Is 50.0

Box No.	X-Left (ft)	Y-Left (ft)	X-Right (ft)	Y-Right (ft)	Height (ft)
1	160.00	117.00	570.00	117.00	1.00
2	600.00	117.00	600.00	117.00	1.00
3	740.00	130.00	1030.00	155.00	85.00

Following Are Displayed The Ten Most Critical Of The Trial Failure Surfaces Evaluated. They Are Ordered - Most Critical First.
* * Safety Factors Are Calculated By The Simplified Janbu Method * *
Total Number of Trial Surfaces Attempted = 5000
Number of Trial Surfaces With Valid FS = 5000
Statistical Data On All Valid FS Values:
FS Max = 2.129 FS Min = 1.023 FS Ave = 1.315
Standard Deviation = 0.228 Coefficient of Variation = 17.30 %

Failure Surface Specified By 15 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	34.546	225.000
2	59.758	207.994
3	101.210	180.035
4	142.661	152.075
5	155.646	139.090
6	177.292	117.445
7	600.000	117.489
8	1029.487	173.420
9	1064.842	208.775
10	1100.197	244.130
11	1135.553	279.486
12	1151.684	295.617
13	1187.040	330.973
14	1203.469	347.402
15	1224.486	382.379

Factor of Safety
*** 1.023 ***

Individual data on the 0 slices

Slice No.	Width (ft)	Weight (lbs)	Water Force Top (lbs)	Water Force Bot (lbs)	Tie Force Norm (lbs)	Tie Force Tan (lbs)	Earthquake Force Hor (lbs)	Earthquake Force Ver (lbs)	Surcharge Load (lbs)

Failure Surface Specified By 15 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	34.546	225.000
2	59.758	207.994
3	101.210	180.035
4	142.661	152.075
5	155.646	139.090
6	177.292	117.445
7	600.000	117.489
8	1029.487	173.420
9	1064.842	208.775
10	1100.197	244.130
11	1135.553	279.486
12	1151.684	295.617
13	1187.040	330.973
14	1203.469	347.402
15	1224.486	382.379

Factor of Safety
*** 1.023 ***

Failure Surface Specified By 16 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	18.906	225.000
2	49.422	204.417
3	90.874	176.457
4	132.326	148.497
5	143.862	136.961
6	164.079	116.745
7	600.000	117.094
8	1015.610	137.941
9	1050.965	173.297
10	1086.320	208.652
11	1121.676	244.007
12	1157.031	279.363
13	1174.430	296.761
14	1209.785	332.117
15	1227.877	350.209
16	1252.251	390.774

Factor of Safety
*** 1.027 ***

Failure Surface Specified By 16 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	18.906	225.000

2	49.422	204.417
3	90.874	176.457
4	132.326	148.497
5	143.862	136.961
6	164.079	116.745
7	600.000	117.094
8	1015.610	137.941
9	1050.965	173.297
10	1086.320	208.652
11	1121.676	244.007
12	1157.031	279.363
13	1174.430	296.761
14	1209.785	332.117
15	1227.877	350.209
16	1252.251	390.774

Factor of Safety
*** 1.027 ***

Failure Surface Specified By 15 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	32.985	225.000
2	58.726	207.637
3	100.178	179.678
4	141.630	151.718
5	154.470	138.878
6	176.491	116.857
7	600.000	117.011
8	1019.858	173.088
9	1055.213	208.443
10	1090.568	243.798
11	1125.924	279.154
12	1141.895	295.125
13	1177.250	330.480
14	1192.964	346.195
15	1212.536	378.767

Factor of Safety
*** 1.028 ***

Failure Surface Specified By 15 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	32.985	225.000
2	58.726	207.637
3	100.178	179.678
4	141.630	151.718
5	154.470	138.878
6	176.491	116.857
7	600.000	117.011
8	1019.858	173.088
9	1055.213	208.443
10	1090.568	243.798
11	1125.924	279.154
12	1141.895	295.125
13	1177.250	330.480
14	1192.964	346.195
15	1212.536	378.767

Factor of Safety
*** 1.028 ***

Failure Surface Specified By 14 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	40.243	225.000
2	63.522	209.298
3	104.974	181.338
4	146.426	153.378
5	159.938	139.866
6	183.098	116.707
7	600.000	116.708
8	1026.796	190.827
9	1062.152	226.182
10	1097.507	261.538

```
      11       1130.522      294.553
      12       1165.878      329.908
      13       1180.761      344.791
      14       1189.899      360.000
          Factor of Safety
         ***    1.028   ***
   Failure Surface Specified By 14 Coordinate Points
     Point      X-Surf      Y-Surf
      No.        (ft)        (ft)
       1         40.243      225.000
       2         63.522      209.298
       3        104.974      181.338
       4        146.426      153.378
       5        159.938      139.866
       6        183.098      116.707
       7        600.000      116.708
       8       1026.796      190.827
       9       1062.152      226.182
      10       1097.507      261.538
      11       1130.522      294.553
      12       1165.878      329.908
      13       1180.761      344.791
      14       1189.899      360.000
          Factor of Safety
         ***    1.028   ***
   Failure Surface Specified By 14 Coordinate Points
     Point      X-Surf      Y-Surf
      No.        (ft)        (ft)
       1         39.806      225.000
       2         63.234      209.198
       3        104.686      181.238
       4        146.137      153.278
       5        159.609      139.807
       6        182.297      117.119
       7        600.000      117.230
       8       1017.167      190.495
       9       1052.523      225.850
      10       1087.878      261.206
      11       1120.733      294.061
      12       1156.088      329.416
      13       1170.256      343.583
      14       1180.120      360.000
          Factor of Safety
         ***    1.030   ***
   Failure Surface Specified By 14 Coordinate Points
     Point      X-Surf      Y-Surf
      No.        (ft)        (ft)
       1         39.806      225.000
       2         63.234      209.198
       3        104.686      181.238
       4        146.137      153.278
       5        159.609      139.807
       6        182.297      117.119
       7        600.000      117.230
       8       1017.167      190.495
       9       1052.523      225.850
      10       1087.878      261.206
      11       1120.733      294.061
      12       1156.088      329.416
      13       1170.256      343.583
      14       1180.120      360.000
          Factor of Safety
         ***    1.030   ***
             **** END OF GSTABL7 OUTPUT ****
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***** GSTABL7 *****

** GSTABL7 by Garry H. Gregory, P.E. **

** Original Version 1.0, January 1996; Current Version 2.005, Sept. 2006 **

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SLOPE STABILITY ANALYSIS SYSTEM

Modified Bishop, Simplified Janbu, or GLE Method of Slices.
(Includes Spencer & Morgenstern-Price Type Analysis)
Including Pier/Pile, Reinforcement, Soil Nail, Tieback,
Nonlinear Undrained Shear Strength, Curved Phi Envelope,
Anisotropic Soil, Fiber-Reinforced Soil, Boundary Loads, Water
Surfaces, Pseudo-Static & Newmark Earthquake, and Applied Forces.

****

Analysis Run Date: 2/6/2015
Time of Run: 02:46PM
Run By: SMC
Input Data Filename: K:\13500-13999\13662-00 Euland Hydro Study\2015 Plan Review\SSA\b-35b-15s Surface #1.
Output Filename: K:\13500-13999\13662-00 Euland Hydro Study\2015 Plan Review\SSA\b-35b-15s Surface #1.OUT
Unit System: English
Plotted Output Filename: K:\13500-13999\13662-00 Euland Hydro Study\2015 Plan Review\SSA\b-35b-15s Surface #1.PLT
PROBLEM DESCRIPTION: 13662-00, Euland Capital , B-B',
, , seismic, 2015 design

BOUNDARY COORDINATES
36 Top Boundaries
87 Total Boundaries

Boundary No.	X-Left (ft)	Y-Left (ft)	X-Right (ft)	Y-Right (ft)	Soil Type Below Bnd
1	0.00	225.00	45.00	225.00	3
2	45.00	225.00	413.00	235.00	5
3	413.00	235.00	437.00	242.00	5
4	437.00	242.00	480.00	254.00	3
5	480.00	254.00	497.00	260.00	3
6	497.00	260.00	518.00	270.00	2
7	518.00	270.00	545.00	270.00	2
8	545.00	270.00	593.00	295.00	5
9	593.00	295.00	620.00	295.00	5
10	620.00	295.00	624.00	302.00	5
11	624.00	302.00	630.00	302.00	5
12	630.00	302.00	669.00	318.00	5
13	669.00	318.00	865.00	316.00	5
14	865.00	316.00	870.00	315.00	5
15	870.00	315.00	890.00	315.00	2
16	890.00	315.00	912.00	333.00	5
17	912.00	333.00	920.00	344.00	5
18	920.00	344.00	1033.00	345.00	5
19	1033.00	345.00	1038.00	342.00	5
20	1038.00	342.00	1113.00	342.00	5
21	1113.00	342.00	1144.00	360.00	5
22	1144.00	360.00	1193.00	360.00	5
23	1193.00	360.00	1210.00	378.00	5
24	1210.00	378.00	1253.00	391.00	5
25	1253.00	391.00	1400.00	391.00	5
26	1400.00	391.00	1430.00	388.00	5
27	1430.00	388.00	1527.00	395.00	5
28	1527.00	395.00	1557.00	404.00	5
29	1557.00	404.00	1630.00	435.00	5
30	1630.00	435.00	1640.00	437.00	5
31	1640.00	437.00	1700.00	465.00	3
32	1700.00	465.00	1760.00	495.00	3
33	1760.00	495.00	1815.00	520.00	4
34	1815.00	520.00	1875.00	535.00	4
35	1875.00	535.00	1925.00	545.00	4
36	1925.00	545.00	1955.00	545.00	4
37	45.00	225.00	50.00	220.00	3
38	50.00	220.00	417.00	232.00	3
39	417.00	232.00	435.00	237.00	3

40	435.00	237.00	437.00	242.00	3
41	435.00	237.00	480.00	249.00	2
42	480.00	249.00	497.00	260.00	2
43	545.00	270.00	546.00	265.00	2
44	546.00	265.00	567.00	265.00	2
45	567.00	265.00	568.00	270.00	2
46	568.00	270.00	627.00	293.00	2
47	627.00	293.00	760.00	295.00	2
48	760.00	295.00	832.00	305.00	2
49	832.00	305.00	870.00	315.00	2
50	890.00	315.00	906.00	310.00	2
51	906.00	310.00	931.00	310.00	2
52	931.00	310.00	950.00	330.00	2
53	950.00	330.00	1006.00	333.00	2
54	1006.00	333.00	1113.00	337.00	2
55	1113.00	337.00	1400.00	370.00	2
56	1400.00	370.00	1427.00	374.00	2
57	1427.00	374.00	1485.00	375.00	2
58	1485.00	375.00	1522.00	375.00	2
59	1522.00	375.00	1550.00	375.00	1
60	1550.00	375.00	1551.00	380.00	1
61	1551.00	380.00	1618.00	410.00	1
62	1618.00	410.00	1640.00	437.00	3
63	0.00	115.00	20.00	115.00	1
64	20.00	115.00	50.00	120.00	6
65	50.00	120.00	180.00	165.00	2
66	180.00	165.00	300.00	170.00	2
67	300.00	170.00	330.00	195.00	2
68	330.00	195.00	335.00	200.00	2
69	335.00	200.00	347.00	203.00	2
70	347.00	203.00	360.00	207.00	2
71	360.00	207.00	417.00	225.00	2
72	417.00	225.00	435.00	237.00	2
73	50.00	120.00	620.00	223.00	6
74	620.00	223.00	792.00	245.00	6
75	792.00	245.00	1040.00	290.00	6
76	1040.00	290.00	1378.00	307.00	6
77	1378.00	307.00	1516.00	342.00	6
78	20.00	115.00	600.00	115.00	1
79	600.00	115.00	1338.00	118.00	1
80	1338.00	118.00	1385.00	143.00	1
81	1385.00	143.00	1440.00	200.00	1
82	1440.00	200.00	1480.00	258.00	1
83	1480.00	258.00	1510.00	320.00	1
84	1510.00	320.00	1516.00	342.00	1
85	1516.00	342.00	1522.00	375.00	1
86	1618.00	410.00	1673.00	440.00	4
87	1673.00	440.00	1760.00	495.00	4

Default Y-Origin = 0.00(ft)
Default X-Plus Value = 0.00(ft)
Default Y-Plus Value = 0.00(ft)

ISOTROPIC SOIL PARAMETERS
6 Type(s) of Soil

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.
1	119.0	125.0	0.0	0.0	0.00	0.0	1
2	119.0	125.0	0.0	0.0	0.00	0.0	1
3	119.0	125.0	450.0	22.0	0.00	0.0	1
4	119.0	125.0	1125.0	31.0	0.00	0.0	1
5	119.0	125.0	450.0	28.0	0.00	0.0	1
6	119.0	125.0	0.0	0.0	0.00	0.0	1

ANISOTROPIC STRENGTH PARAMETERS
3 soil type(s)
Soil Type 1 Is Anisotropic
Number Of Direction Ranges Specified = 3

Direction Range No.	Counterclockwise Direction Limit (deg)	Cohesion Intercept (psf)	Friction Angle (deg)
1	0.0	1125.00	31.00

2	5.0	450.00	17.00
3	90.0	1125.00	31.00

Soil Type 2 Is Anisotropic
Number Of Direction Ranges Specified = 3

Direction Range No.	Counterclockwise Direction Limit (deg)	Cohesion Intercept (psf)	Friction Angle (deg)
1	0.0	525.00	25.00
2	15.0	375.00	14.50
3	90.0	450.00	22.00

Soil Type 6 Is Anisotropic
Number Of Direction Ranges Specified = 3

Direction Range No.	Counterclockwise Direction Limit (deg)	Cohesion Intercept (psf)	Friction Angle (deg)
1	0.0	750.00	31.00
2	15.0	375.00	14.50
3	90.0	450.00	22.00

ANISOTROPIC SOIL NOTES:
(1) An input value of 0.01 for C and/or Phi will cause Aniso C and/or Phi to be ignored in that range.
(2) An input value of 0.02 for Phi will set both Phi and C equal to zero, with no water weight in the tension crack.
(3) An input value of 0.03 for Phi will set both Phi and C equal to zero, with water weight in the tension crack.

1 PIEZOMETRIC SURFACE(S) SPECIFIED
Unit Weight of Water = 62.40 (pcf)
Piezometric Surface No. 1 Specified by 12 Coordinate Points
Pore Pressure Inclination Factor = 0.50

Point No.	X-Water (ft)	Y-Water (ft)
1	0.00	201.00
2	147.00	205.00
3	333.00	210.00
4	476.00	230.00
5	700.00	250.00
6	878.00	270.00
7	1031.00	290.00
8	1183.00	310.00
9	1330.00	330.00
10	1368.00	336.00
11	1550.00	375.00
12	1960.00	420.00

Specified Peak Ground Acceleration Coefficient (A) = 0.276(g)
Specified Horizontal Earthquake Coefficient (kh) = 0.150(g)
Specified Vertical Earthquake Coefficient (kv) = 0.000(g)
Specified Seismic Pore-Pressure Factor = 0.000
Janbu's Empirical Coef. is being used for the case of c & phi both > 0
Trial Failure Surface Specified By 15 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	34.546	225.000
2	59.758	207.994
3	101.210	180.035
4	142.661	152.075
5	155.646	139.090
6	177.292	117.445
7	600.000	117.489
8	1029.487	173.420
9	1064.842	208.775
10	1100.197	244.130
11	1135.553	279.486
12	1151.684	295.617
13	1187.040	330.973
14	1203.469	347.402
15	1224.486	382.379

Janbu's Empirical Coefficient (fo) = 1.060
* * Factor Of Safety Is Calculated By The Simplified Janbu Method * *
Factor Of Safety For The Preceding Specified Surface = 1.023
Table 1 - Individual Data on the 67 Slices

Slice No.	Width (ft)	Weight (lbs)	Water Force Top (lbs)	Water Force Bot (lbs)	Tie Force Norm (lbs)	Tie Force Tan (lbs)	Earthquake Force Hor (lbs)	Earthquake Force Ver (lbs)	Surcharge Load (lbs)
1	10.5	4386.1	0.0	0.0	0.0	0.0	657.9	0.0	0.0
2	5.0	5239.4	0.0	0.0	0.0	0.0	785.9	0.0	0.0
3	9.8	16237.6	0.0	0.0	0.0	0.0	2435.6	0.0	0.0
4	7.6	18289.4	0.0	0.0	0.0	0.0	2743.4	0.0	0.0
5	33.8	141716.3	0.0	30161.8	0.0	0.0	21257.4	0.0	0.0
6	41.5	310581.8	0.0	*******	0.0	0.0	46587.3	0.0	0.0
7	4.3	41606.8	0.0	21065.2	0.0	0.0	6241.0	0.0	0.0
8	8.6	90115.1	0.0	47061.5	0.0	0.0	13517.3	0.0	0.0
9	21.6	267703.1	0.0	*******	0.0	0.0	40155.5	0.0	0.0
10	2.7	37266.1	0.0	14933.3	0.0	0.0	5589.9	0.0	0.0
11	120.0	1676272.2	0.0	*******	0.0	0.0	*******	0.0	0.0
12	30.0	426677.4	0.0	*******	0.0	0.0	64001.6	0.0	0.0
13	3.0	42835.1	0.0	17309.5	0.0	0.0	6425.3	0.0	0.0
14	2.0	28564.8	0.0	11455.3	0.0	0.0	4284.7	0.0	0.0
15	12.0	171728.9	0.0	69457.5	0.0	0.0	25759.3	0.0	0.0
16	13.0	186698.0	0.0	76649.1	0.0	0.0	28004.7	0.0	0.0
17	38.5	557173.6	0.0	*******	0.0	0.0	83576.0	0.0	0.0
18	14.5	211066.7	0.0	91931.9	0.0	0.0	31660.0	0.0	0.0
19	4.0	58694.1	0.0	25709.1	0.0	0.0	8804.1	0.0	0.0
20	18.0	271157.7	0.0	*******	0.0	0.0	40673.7	0.0	0.0
21	2.0	30839.2	0.0	13217.3	0.0	0.0	4625.9	0.0	0.0
22	39.0	628626.9	0.0	*******	0.0	0.0	94294.0	0.0	0.0
23	4.0	67413.8	0.0	28019.2	0.0	0.0	10112.1	0.0	0.0
24	17.0	293799.5	0.0	*******	0.0	0.0	44069.9	0.0	0.0
25	21.0	383128.6	0.0	*******	0.0	0.0	57469.3	0.0	0.0
26	27.0	508996.2	0.0	*******	0.0	0.0	76349.4	0.0	0.0
27	1.0	18890.0	0.0	7379.0	0.0	0.0	2833.5	0.0	0.0
28	21.0	411127.2	0.0	*******	0.0	0.0	61669.1	0.0	0.0
29	1.0	20265.0	0.0	7500.9	0.0	0.0	3039.7	0.0	0.0
30	25.0	526937.0	0.0	*******	0.0	0.0	79040.6	0.0	0.0
31	7.0	153023.8	0.0	53631.5	0.0	0.0	22953.6	0.0	0.0
32	20.0	434099.1	0.0	*******	0.0	0.0	65114.9	0.0	0.0
33	4.0	87730.2	0.0	30757.8	0.0	0.0	13159.5	0.0	0.0
34	3.0	66881.9	0.0	23041.4	0.0	0.0	10032.3	0.0	0.0
35	3.0	66740.2	0.0	23018.3	0.0	0.0	10011.0	0.0	0.0
36	39.0	891858.0	0.0	*******	0.0	0.0	*******	0.0	0.0
37	31.0	720761.5	0.0	*******	0.0	0.0	*******	0.0	0.0
38	60.0	1348883.0	0.0	*******	0.0	0.0	*******	0.0	0.0
39	32.0	694648.3	0.0	*******	0.0	0.0	*******	0.0	0.0
40	40.0	844092.5	0.0	*******	0.0	0.0	*******	0.0	0.0
41	33.0	676119.2	0.0	*******	0.0	0.0	*******	0.0	0.0
42	5.0	100562.3	0.0	36425.0	0.0	0.0	15084.3	0.0	0.0
43	8.0	159612.3	0.0	58221.9	0.0	0.0	23941.8	0.0	0.0
44	12.0	237535.7	0.0	87091.1	0.0	0.0	35630.4	0.0	0.0
45	16.0	325706.1	0.0	*******	0.0	0.0	48855.9	0.0	0.0
46	6.0	127543.2	0.0	43550.1	0.0	0.0	19131.5	0.0	0.0
47	8.0	176762.7	0.0	58068.6	0.0	0.0	26514.4	0.0	0.0
48	11.0	248692.7	0.0	79847.5	0.0	0.0	37303.9	0.0	0.0
49	19.0	425444.5	0.0	*******	0.0	0.0	63816.7	0.0	0.0
50	56.0	1223615.4	0.0	*******	0.0	0.0	*******	0.0	0.0
51	23.5	499716.0	0.0	*******	0.0	0.0	74957.4	0.0	0.0
52	1.5	31794.9	0.0	15322.1	0.0	0.0	4769.2	0.0	0.0
53	2.0	41594.5	0.0	19983.8	0.0	0.0	6239.2	0.0	0.0
54	5.0	100926.2	0.0	48629.8	0.0	0.0	15138.9	0.0	0.0
55	2.0	39144.3	0.0	18920.0	0.0	0.0	5871.7	0.0	0.0
56	24.8	444815.0	0.0	*******	0.0	0.0	66722.2	0.0	0.0
57	35.4	500925.7	0.0	*******	0.0	0.0	75138.9	0.0	0.0
58	12.8	143122.4	0.0	55356.3	0.0	0.0	21468.4	0.0	0.0
59	22.6	220183.2	0.0	67217.8	0.0	0.0	33027.5	0.0	0.0
60	8.4	75256.0	0.0	15227.3	0.0	0.0	11288.4	0.0	0.0
61	7.7	63007.9	0.0	9143.1	0.0	0.0	9451.2	0.0	0.0
62	11.8	82589.5	0.0	5305.4	0.0	0.0	12388.4	0.0	0.0
63	23.5	114274.6	0.0	0.0	0.0	0.0	17141.2	0.0	0.0
64	6.0	18473.5	0.0	0.0	0.0	0.0	2771.0	0.0	0.0
65	10.5	29122.2	0.0	0.0	0.0	0.0	4368.3	0.0	0.0
66	6.5	16868.3	0.0	0.0	0.0	0.0	2530.2	0.0	0.0

67	14.5	17004.8	0.0	0.0	0.0	0.0	2550.7	0.0	0.0

Table 2 - Base Stress Data on the 67 Slices

Slice No. *	Alpha (deg)	X-Coord. Slice Cntr (ft)	Base Leng. (ft)	Available Shear Strength (psf)	Mobilized Shear Stress (psf)
1	-34.00	39.77	12.61	1018.80	-182.44
2	-34.00	47.50	6.03	1436.26	-455.66
3	-34.00	54.88	11.77	1845.65	-723.60
4	-34.00	63.58	9.23	2328.47	-1039.59
5	-34.00	84.31	40.77	3034.04	-1823.02
6	-34.00	121.94	50.00	4132.63	-3258.23
7	-45.00	144.83	6.14	8828.03	-5763.48
8	-45.00	151.32	12.23	9334.34	-6264.51
9	-45.00	166.47	30.61	18123.86	-7433.04
10	0.01	178.65	2.71	2507.73	2065.65
11	0.01	240.00	120.00	2534.89	2096.79
12	0.01	315.00	30.00	2568.09	2134.87
13	0.01	331.50	3.00	2575.39	2143.24
14	0.01	334.00	2.00	2587.33	2143.84
15	0.01	341.00	12.00	2579.03	2148.10
16	0.01	353.50	13.00	2564.21	2155.70
17	0.01	379.26	38.52	2533.66	2171.37
18	0.01	405.76	14.48	2502.24	2187.49
19	0.01	415.00	4.00	2507.56	2202.56
20	0.01	426.00	18.00	2584.05	2261.22
21	0.01	436.00	2.00	2653.59	2314.54
22	0.01	456.50	39.00	2788.59	2419.47
23	0.01	478.00	4.00	2921.95	2529.77
24	0.01	488.50	17.00	3017.81	2594.15
25	0.01	507.50	21.00	3239.33	2738.53
26	0.01	531.50	27.00	3362.04	2829.72
27	0.01	545.50	1.00	3351.87	2835.46
28	0.01	556.50	21.00	3513.89	2938.66
29	0.01	567.50	1.00	3675.92	3041.86
30	0.01	580.50	25.00	3867.40	3163.82
31	0.01	596.50	7.00	4046.98	3281.36
32	7.42	610.00	20.17	3913.36	6031.40
33	7.42	622.00	4.03	3978.54	6094.64
34	7.42	625.50	3.03	4072.04	6195.07
35	7.42	628.50	3.03	4062.04	6181.95
36	7.42	649.50	39.33	4232.43	6354.63
37	7.42	684.50	31.26	4351.43	6460.84
38	7.42	730.00	60.51	4179.91	6247.15
39	7.42	776.00	32.27	3997.45	6032.17
40	7.42	812.00	40.34	3854.65	5863.93
41	7.42	848.50	33.28	3709.88	5693.36
42	7.42	867.50	5.04	3620.26	5588.87
43	7.42	874.00	8.07	3581.44	5544.15
44	7.42	884.00	12.10	3546.87	5500.56
45	7.42	898.00	16.14	3688.66	5656.72
46	7.42	909.00	6.05	3915.96	5906.97
47	7.42	916.00	8.07	4127.52	6139.87
48	7.42	925.50	11.09	4257.00	6282.45
49	7.42	940.50	19.16	4202.19	6222.26
50	7.42	978.00	56.47	4065.17	6071.78
51	7.42	1017.74	23.69	3919.95	5912.29
52	45.00	1030.24	2.14	6129.77	17087.68
53	45.00	1032.00	2.83	6080.16	16911.76
54	45.00	1035.50	7.07	5906.52	16414.08
55	45.00	1039.00	2.83	5732.45	15915.54
56	45.00	1052.42	35.13	5345.27	14560.44
57	45.00	1082.52	50.00	4476.99	11521.46
58	45.00	1106.60	18.11	3782.34	9090.22
59	45.00	1124.28	31.89	3591.48	7938.89
60	45.00	1139.78	11.95	3582.98	7244.83
61	45.00	1147.84	10.87	3469.82	6667.77
62	45.00	1157.59	16.71	3188.52	5683.22
63	45.00	1175.27	33.29	2444.46	3947.75
64	45.00	1190.02	8.43	1725.62	2520.50
65	45.00	1198.23	14.81	1595.39	2261.94

```
66      59.00     1206.73       12.68           1897.89              2413.60
67      59.00     1217.24       28.13           1118.04              1096.90
   Sum of the Resisting Forces (including Pier/Pile, Tieback, Reinforcing
   Soil Nail, and Applied Forces if applicable) = 5097257.00 (lbs)
   Average Available Shear Strength (including Tieback, Pier/Pile, Reinforcing,
   Soil Nail, and Applied Forces if applicable) =   3855.54(psf)
   Sum of the Driving Forces =  5282037.00 (lbs)
   Average Mobilized Shear Stress =    3995.31(psf)
   Total length of the failure surface =    1322.06(ft)
          *** SEISMIC SLOPE DISPLACEMENT DATA ***
   (Note: kv is set = zero for displacement calculations)
   Seismic Yield Coefficient (ky) =  0.1574(g)
   Calculated Newmark Seismic Displacement =   0.083(ft)
   Non-Symmetrical Sliding Resistance Has Been Specified
   for Downhill Sliding.
                 **** END OF GSTABL7 OUTPUT ****
```

Sliding displacement models from Rathje and Antonakos (2011)

Prediction of dynamic response and sliding displacement of a sliding mass during earthquake shaking

Cross Section: B-B'

File: b-35b-15s

Inputs	
PGA (g)	0.2763
PGV (cm/s)	23.32
k_y (g)	0.1574
T_m (s)	0.517
T_s (s)	0.28
M	6.95
T_s/T_m	0.535459

Dynamic Response			
	median	-1σ	+1σ
kmax (g)	0.241	0.187	0.309
k-velmax (cm/s)	25.83	20.12	33.17

Displacement Given Median Dynamic Response					
Displacement Model			Sliding Displacements, D (cm)		
	μ_{lnD}	σ_{lnD}	median	-1σ	+1σ
[kmax, M]	0.63	0.905	1.89	0.76	4.66
[kmax, k-velmax]	-0.19	0.586	0.83	0.46	1.49
			Sliding Displacements, D (in)		
	μ_{lnD}	σ_{lnD}	median	-1σ	+1σ
[kmax, M]	0.63	0.905	0.74	0.30	1.84
[kmax, k-velmax]	-0.19	0.586	0.33	0.18	0.59

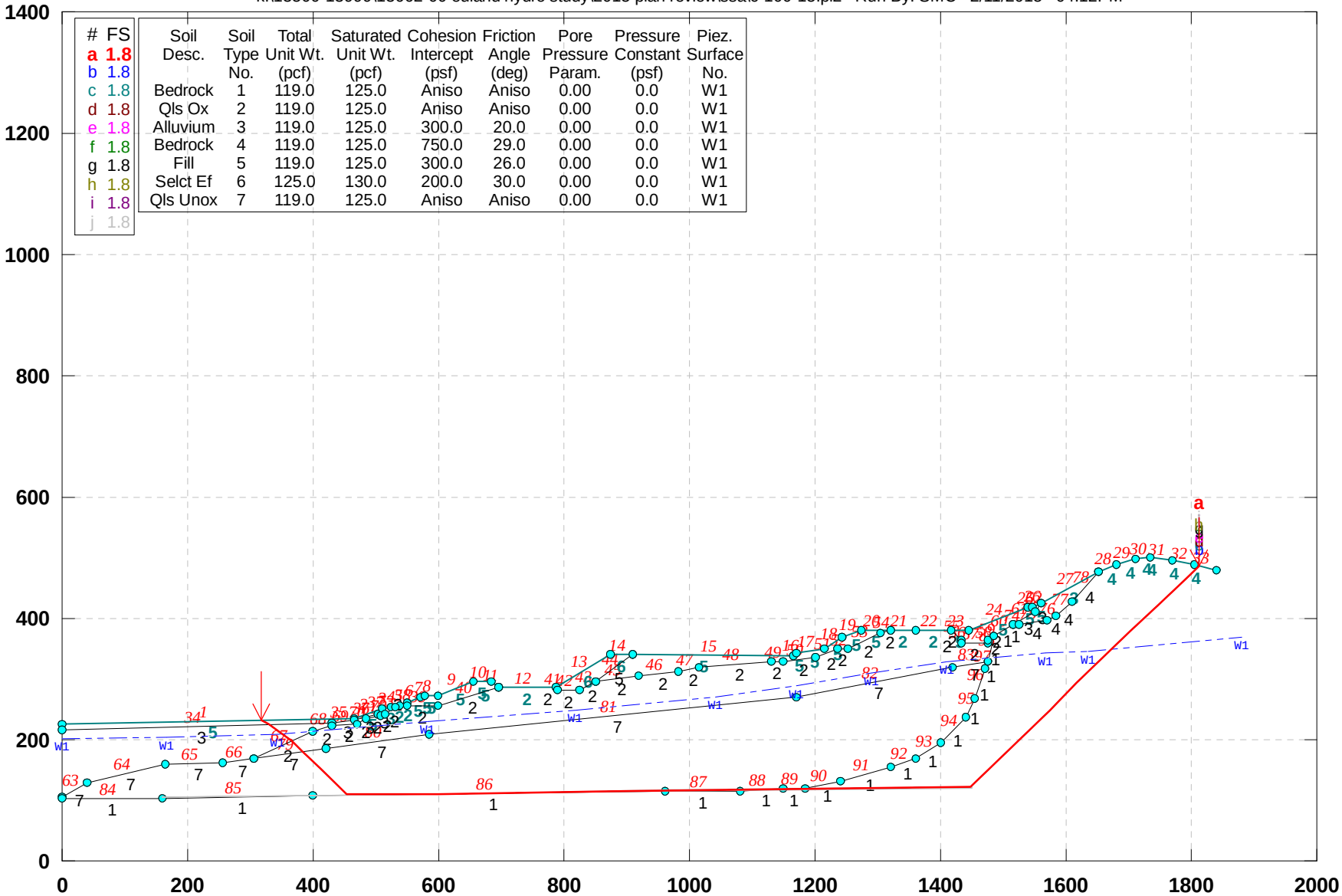
PGA	Peak Ground Acceleration (g)
PGV	Peak Ground Velocity (cm/s)
k_y	Critical or Yield Acceleration (g)
T_m	Mean Period of an Earthquake Motion (s)
T_s	Site Period or the Natural Period of a Sliding Mass (s). For rigid sliding set T_s= 0 s
M	Earthquake Magnitude
kmax	maximum seismic coefficient (g)
k-velmax	the maximum velocity of the seismic coefficient-time history (cm/s)
D	Predicted Sliding Displacment (cm)

H_{avr} =	146	ft
V_s =	2110	ft/s
$T_s = 4\ H_{avr}/V_s$ =	0.28	s

Reference: Rathje, E.M. and Antonakos, G. 2011. "A Unified Model for Predicting Earthquake-Induced Sliding Displacements of Rigid and Flexible Slopes," Engineering Geology, 122, 51-60, doi:10.1016/j.enggeo.2010.12.004.

13662-00, Euland Capital, C-C', - - Static-

k:\13500-13999\13662-00 euland hydro study\2015 plan review\ssa\c-100-15.pl2 Run By: SMC 2/11/2015 04:12PM



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.
Bedrock	1	119.0	125.0	Aniso	Aniso	0.00	0.0	W1
Qls Ox	2	119.0	125.0	Aniso	Aniso	0.00	0.0	W1
Alluvium	3	119.0	125.0	300.0	20.0	0.00	0.0	W1
Bedrock	4	119.0	125.0	750.0	29.0	0.00	0.0	W1
Fill	5	119.0	125.0	300.0	26.0	0.00	0.0	W1
Selct Ef	6	125.0	130.0	200.0	30.0	0.00	0.0	W1
Qls Unox	7	119.0	125.0	Aniso	Aniso	0.00	0.0	W1

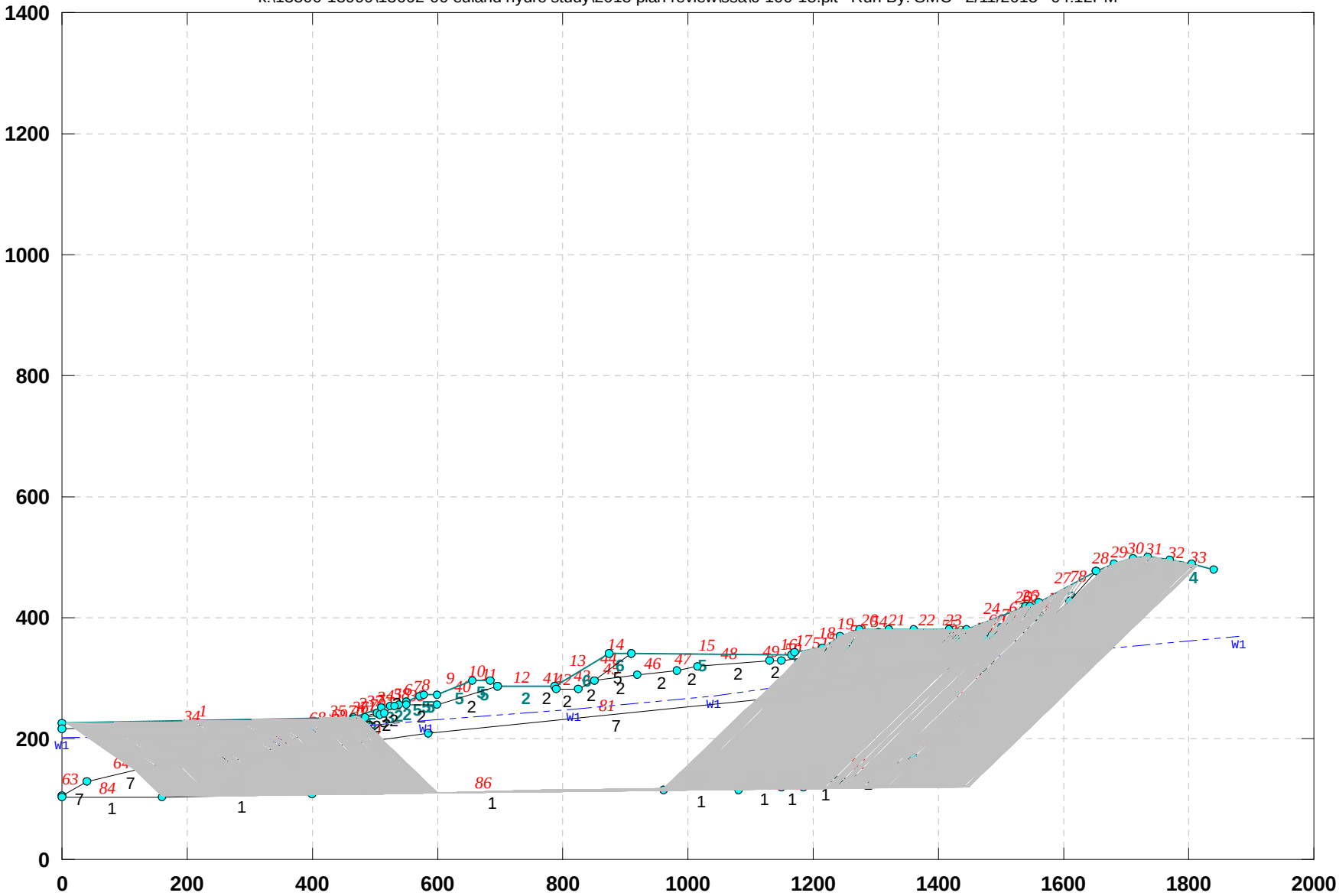
GSTABL7 v.2 FSmin=1.8

Safety Factors Are Calculated By The Simplified Janbu Method for the case of c & phi both > 0

Figure E-7.1

13662-00, Euland Capital, C-C', - - Static-

k:\13500-13999\13662-00 euland hydro study\2015 plan review\ssa\c-100-15.plt Run By: SMC 2/11/2015 04:12PM



***** GSTABL7 *****

** GSTABL7 by Garry H. Gregory, P.E. **

** Original Version 1.0, January 1996; Current Version 2.005, Sept. 2006 **

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SLOPE STABILITY ANALYSIS SYSTEM

Modified Bishop, Simplified Janbu, or GLE Method of Slices.
(Includes Spencer & Morgenstern-Price Type Analysis)
Including Pier/Pile, Reinforcement, Soil Nail, Tieback,
Nonlinear Undrained Shear Strength, Curved Phi Envelope,
Anisotropic Soil, Fiber-Reinforced Soil, Boundary Loads, Water
Surfaces, Pseudo-Static & Newmark Earthquake, and Applied Forces.

****

Analysis Run Date: 2/11/2015
Time of Run: 04:12PM
Run By: SMC
Input Data Filename: K:\13500-13999\13662-00 Euland Hydro Study\2015 Plan Review\SSA\c-100-15.
Output Filename: K:\13500-13999\13662-00 Euland Hydro Study\2015 Plan Review\SSA\c-100-15.OUT
Unit System: English
Plotted Output Filename: K:\13500-13999\13662-00 Euland Hydro Study\2015 Plan Review\SSA\c-100-15.PLT
PROBLEM DESCRIPTION: 13662-00, Euland Capital, C-C',
- - Static-

BOUNDARY COORDINATES
33 Top Boundaries
98 Total Boundaries

Boundary No.	X-Left (ft)	Y-Left (ft)	X-Right (ft)	Y-Right (ft)	Soil Type Below Bnd
1	0.00	225.00	465.00	235.00	5
2	465.00	235.00	510.00	252.00	5
3	510.00	252.00	523.00	253.00	3
4	523.00	253.00	537.00	255.00	2
5	537.00	255.00	550.00	260.00	2
6	550.00	260.00	570.00	270.00	5
7	570.00	270.00	578.00	272.00	5
8	578.00	272.00	600.00	273.00	5
9	600.00	273.00	656.00	295.00	5
10	656.00	295.00	685.00	295.00	5
11	685.00	295.00	696.00	287.00	5
12	696.00	287.00	788.00	287.00	2
13	788.00	287.00	875.00	341.00	6
14	875.00	341.00	910.00	341.00	6
15	910.00	341.00	1165.00	338.00	5
16	1165.00	338.00	1170.00	342.00	5
17	1170.00	342.00	1215.00	351.00	5
18	1215.00	351.00	1244.00	370.00	5
19	1244.00	370.00	1273.00	380.00	5
20	1273.00	380.00	1320.00	380.00	5
21	1320.00	380.00	1360.00	380.00	2
22	1360.00	380.00	1418.00	380.00	2
23	1418.00	380.00	1445.00	380.00	5
24	1445.00	380.00	1540.00	418.00	5
25	1540.00	418.00	1547.00	418.00	5
26	1547.00	418.00	1560.00	425.00	5
27	1560.00	425.00	1653.00	476.00	3
28	1653.00	476.00	1680.00	489.00	4
29	1680.00	489.00	1710.00	498.00	4
30	1710.00	498.00	1735.00	500.00	4
31	1735.00	500.00	1770.00	495.00	4
32	1770.00	495.00	1805.00	488.00	4
33	1805.00	488.00	1840.00	480.00	4
34	0.00	217.00	430.00	227.00	3
35	430.00	227.00	465.00	232.00	3
36	465.00	232.00	502.00	243.00	3
37	502.00	243.00	510.00	252.00	3
38	550.00	260.00	551.00	255.00	2
39	551.00	255.00	600.00	255.00	2
40	600.00	255.00	696.00	287.00	2

41	788.00	287.00	789.00	281.00	2
42	789.00	281.00	825.00	281.00	2
43	825.00	281.00	850.00	295.00	2
44	850.00	295.00	910.00	341.00	5
45	850.00	295.00	920.00	305.00	2
46	920.00	305.00	983.00	312.00	2
47	983.00	312.00	1015.00	320.00	2
48	1015.00	320.00	1131.00	328.00	2
49	1131.00	328.00	1148.00	330.00	2
50	1148.00	330.00	1200.00	337.00	2
51	1200.00	337.00	1237.00	350.00	2
52	1237.00	350.00	1252.00	350.00	2
53	1252.00	350.00	1305.00	375.00	2
54	1305.00	375.00	1320.00	380.00	2
55	1418.00	380.00	1433.00	365.00	2
56	1433.00	365.00	1434.00	360.00	2
57	1434.00	360.00	1475.00	360.00	2
58	1475.00	360.00	1476.00	365.00	2
59	1476.00	365.00	1485.00	372.00	2
60	1485.00	372.00	1515.00	390.00	1
61	1515.00	390.00	1550.00	412.00	3
62	1550.00	412.00	1560.00	425.00	3
63	0.00	105.00	40.00	130.00	7
64	40.00	130.00	165.00	160.00	7
65	165.00	160.00	255.00	162.00	7
66	255.00	162.00	305.00	169.00	7
67	305.00	169.00	400.00	215.00	2
68	400.00	215.00	430.00	224.00	2
69	430.00	224.00	470.00	225.00	2
70	470.00	225.00	483.00	235.00	2
71	483.00	235.00	508.00	240.00	2
72	508.00	240.00	515.00	243.00	2
73	515.00	243.00	532.00	253.00	2
74	1515.00	390.00	1525.00	390.00	1
75	1525.00	390.00	1570.00	397.00	4
76	1570.00	397.00	1585.00	404.00	4
77	1585.00	404.00	1610.00	427.00	4
78	1610.00	427.00	1653.00	476.00	4
79	305.00	169.00	420.00	185.00	7
80	420.00	185.00	586.00	210.00	7
81	586.00	210.00	1170.00	270.00	7
82	1170.00	270.00	1420.00	320.00	7
83	1420.00	320.00	1476.00	330.00	7
84	0.00	103.00	160.00	104.00	1
85	160.00	104.00	400.00	107.00	1
86	400.00	107.00	960.00	114.00	1
87	960.00	114.00	1080.00	115.00	1
88	1080.00	115.00	1150.00	119.00	1
89	1150.00	119.00	1185.00	121.00	1
90	1185.00	121.00	1240.00	131.00	1
91	1240.00	131.00	1320.00	154.00	1
92	1320.00	154.00	1360.00	170.00	1
93	1360.00	170.00	1400.00	194.00	1
94	1400.00	194.00	1440.00	238.00	1
95	1440.00	238.00	1455.00	268.00	1
96	1455.00	268.00	1470.00	318.00	1
97	1470.00	318.00	1476.00	330.00	1
98	1476.00	330.00	1485.00	372.00	1

Default Y-Origin = 0.00(ft)
Default X-Plus Value = 0.00(ft)
Default Y-Plus Value = 0.00(ft)

ISOTROPIC SOIL PARAMETERS
7 Type(s) of Soil

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.
1	119.0	125.0	0.0	0.0	0.00	0.0	1
2	119.0	125.0	0.0	0.0	0.00	0.0	1
3	119.0	125.0	300.0	20.0	0.00	0.0	1
4	119.0	125.0	750.0	29.0	0.00	0.0	1

5	119.0	125.0	300.0	26.0	0.00	0.0	1
6	125.0	130.0	200.0	30.0	0.00	0.0	1
7	119.0	125.0	0.0	0.0	0.00	0.0	1

ANISOTROPIC STRENGTH PARAMETERS
3 soil type(s)

Soil Type 1 Is Anisotropic
Number Of Direction Ranges Specified = 3

Direction Range No.	Counterclockwise Direction Limit (deg)	Cohesion Intercept (psf)	Friction Angle (deg)
1	0.0	750.00	29.00
2	5.0	300.00	15.00
3	90.0	750.00	29.00

Soil Type 2 Is Anisotropic
Number Of Direction Ranges Specified = 3

Direction Range No.	Counterclockwise Direction Limit (deg)	Cohesion Intercept (psf)	Friction Angle (deg)
1	0.0	350.00	23.00
2	15.0	250.00	12.50
3	90.0	300.00	20.00

Soil Type 7 Is Anisotropic
Number Of Direction Ranges Specified = 3

Direction Range No.	Counterclockwise Direction Limit (deg)	Cohesion Intercept (psf)	Friction Angle (deg)
1	0.0	500.00	29.00
2	15.0	250.00	12.50
3	90.0	300.00	20.00

ANISOTROPIC SOIL NOTES:
(1) An input value of 0.01 for C and/or Phi will cause Aniso C and/or Phi to be ignored in that range.
(2) An input value of 0.02 for Phi will set both Phi and C equal to zero, with no water weight in the tension crack.
(3) An input value of 0.03 for Phi will set both Phi and C equal to zero, with water weight in the tension crack.

1 PIEZOMETRIC SURFACE(S) SPECIFIED
Unit Weight of Water = 62.40 (pcf)
Piezometric Surface No. 1 Specified by 12 Coordinate Points
Pore Pressure Inclination Factor = 0.50

Point No.	X-Water (ft)	Y-Water (ft)
1	0.00	202.00
2	168.00	205.00
3	343.00	210.00
4	583.00	230.00
5	818.00	250.00
6	1042.00	270.00
7	1170.00	290.00
8	1289.00	310.00
9	1410.00	330.00
10	1568.00	343.00
11	1636.00	345.00
12	1880.00	370.00

Janbus Empirical Coef is being used for the case of c & phi both > 0
A Critical Failure Surface Searching Method, Using A Random Technique For Generating Sliding Block Surfaces, Has Been Specified.
The Active And Passive Portions Of The Sliding Surfaces Are Generated According To The Rankine Theory.
5000 Trial Surfaces Have Been Generated.
4 Boxes Specified For Generation Of Central Block Base Length Of Line Segments For Active And Passive Portions Of Sliding Block Is 60.0

Box No.	X-Left (ft)	Y-Left (ft)	X-Right (ft)	Y-Right (ft)	Height (ft)
1	160.00	106.00	600.00	111.00	1.00
2	600.10	111.00	600.10	111.00	1.00
3	730.00	113.00	960.00	116.00	1.00
4	960.10	116.00	1450.00	122.00	2.00

Following Are Displayed The Ten Most Critical Of The Trial
Failure Surfaces Evaluated. They Are
Ordered - Most Critical First.
* * Safety Factors Are Calculated By The Simplified Janbu Method * *
Total Number of Trial Surfaces Attempted = 5000
Number of Trial Surfaces With Valid FS = 5000
Statistical Data On All Valid FS Values:
FS Max = 2.689 FS Min = 1.751 FS Ave = 1.815
Standard Deviation = 0.185 Coefficient of Variation = 10.22 %
Failure Surface Specified By 18 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	316.545	231.807
2	328.034	224.629
3	365.584	198.336
4	383.937	179.983
5	411.990	151.930
6	454.417	109.503
7	600.100	111.093
8	880.980	115.306
9	1447.937	122.939
10	1490.363	165.366
11	1532.790	207.792
12	1575.216	250.219
13	1617.642	292.645
14	1660.069	335.071
15	1702.495	377.498
16	1744.922	419.924
17	1787.348	462.351
18	1811.509	486.512

Factor of Safety
*** 1.751 ***

Individual data on the 103 slices

Slice No.	Width (ft)	Weight (lbs)	Water Force Top (lbs)	Water Force Bot (lbs)	Tie Force Norm (lbs)	Tie Force Tan (lbs)	Earthquake Force Hor (lbs)	Earthquake Force Ver (lbs)	Surcharge Load (lbs)
1	11.5	5075.9	0.0	0.0	0.	0.	0.0	0.0	0.0
2	20.3	35533.9	0.0	0.0	0.	0.	0.0	0.0	0.0
3	17.3	58898.3	0.0	8889.5	0.	0.	0.0	0.0	0.0
4	18.4	98455.9	0.0	37909.3	0.	0.	0.0	0.0	0.0
5	15.4	116224.0	0.0	56743.0	0.	0.	0.0	0.0	0.0
6	0.6	5335.9	0.0	2769.2	0.	0.	0.0	0.0	0.0
7	12.0	112272.0	0.0	60445.7	0.	0.	0.0	0.0	0.0
8	8.0	85257.9	0.0	48011.3	0.	0.	0.0	0.0	0.0
9	10.0	117970.5	0.0	68519.2	0.	0.	0.0	0.0	0.0
10	24.4	341839.2	0.0	*******	0.	0.	0.0	0.0	0.0
11	10.6	164810.5	0.0	72507.3	0.	0.	0.0	0.0	0.0
12	5.0	78458.0	0.0	34430.4	0.	0.	0.0	0.0	0.0
13	13.0	209149.3	0.0	90045.9	0.	0.	0.0	0.0	0.0
14	19.0	319083.1	0.0	*******	0.	0.	0.0	0.0	0.0
15	6.0	104069.9	0.0	42329.8	0.	0.	0.0	0.0	0.0
16	2.0	35042.7	0.0	14146.0	0.	0.	0.0	0.0	0.0
17	5.0	87930.8	0.0	35443.7	0.	0.	0.0	0.0	0.0
18	8.0	141120.2	0.0	56944.2	0.	0.	0.0	0.0	0.0
19	9.0	159712.1	0.0	64406.7	0.	0.	0.0	0.0	0.0
20	5.0	89293.7	0.0	35939.2	0.	0.	0.0	0.0	0.0
21	13.0	236482.3	0.0	93968.8	0.	0.	0.0	0.0	0.0
22	1.0	18512.1	0.0	7259.9	0.	0.	0.0	0.0	0.0
23	19.0	362871.2	0.0	*******	0.	0.	0.0	0.0	0.0
24	8.0	158168.4	0.0	58925.9	0.	0.	0.0	0.0	0.0
25	5.0	99489.8	0.0	36975.1	0.	0.	0.0	0.0	0.0
26	3.0	59748.1	0.0	22236.3	0.	0.	0.0	0.0	0.0
27	14.0	279366.5	0.0	*******	0.	0.	0.0	0.0	0.0
28	0.1	1998.4	0.0	748.2	0.	0.	0.0	0.0	0.0
29	55.9	1188418.4	0.0	*******	0.	0.	0.0	0.0	0.0
30	29.0	652743.5	0.0	*******	0.	0.	0.0	0.0	0.0
31	11.0	242055.9	0.0	86664.1	0.	0.	0.0	0.0	0.0
32	92.0	1974204.5	0.0	*******	0.	0.	0.0	0.0	0.0
33	1.0	21452.0	0.0	8305.8	0.	0.	0.0	0.0	0.0

34	29.0	655786.8	0.0	*******	0.	0.	0.0	0.0	0.0
35	7.0	167895.7	0.0	59132.6	0.	0.	0.0	0.0	0.0
36	25.0	629075.6	0.0	*******	0.	0.	0.0	0.0	0.0
37	25.0	674241.4	0.0	*******	0.	0.	0.0	0.0	0.0
38	6.0	166517.1	0.0	52072.7	0.	0.	0.0	0.0	0.0
39	29.0	805207.6	0.0	*******	0.	0.	0.0	0.0	0.0
40	10.0	276501.1	0.0	88823.2	0.	0.	0.0	0.0	0.0
41	63.0	1736095.1	0.0	*******	0.	0.	0.0	0.0	0.0
42	32.0	877951.4	0.0	*******	0.	0.	0.0	0.0	0.0
43	27.0	738741.1	0.0	*******	0.	0.	0.0	0.0	0.0
44	89.0	2422860.2	0.0	*******	0.	0.	0.0	0.0	0.0
45	17.0	460851.1	0.0	*******	0.	0.	0.0	0.0	0.0
46	0.3	9454.5	0.0	3608.6	0.	0.	0.0	0.0	0.0
47	1.7	44722.4	0.0	17085.7	0.	0.	0.0	0.0	0.0
48	15.0	406051.3	0.0	*******	0.	0.	0.0	0.0	0.0
49	5.0	136450.1	0.0	52550.2	0.	0.	0.0	0.0	0.0
50	15.0	415464.3	0.0	*******	0.	0.	0.0	0.0	0.0
51	15.0	420664.7	0.0	*******	0.	0.	0.0	0.0	0.0
52	15.0	425865.0	0.0	*******	0.	0.	0.0	0.0	0.0
53	22.0	647116.9	0.0	*******	0.	0.	0.0	0.0	0.0
54	3.0	91141.1	0.0	33493.4	0.	0.	0.0	0.0	0.0
55	4.0	122603.4	0.0	44791.1	0.	0.	0.0	0.0	0.0
56	8.0	247734.4	0.0	90039.0	0.	0.	0.0	0.0	0.0
57	21.0	662588.4	0.0	*******	0.	0.	0.0	0.0	0.0
58	16.0	511519.6	0.0	*******	0.	0.	0.0	0.0	0.0
59	16.0	511349.5	0.0	*******	0.	0.	0.0	0.0	0.0
60	15.0	479226.7	0.0	*******	0.	0.	0.0	0.0	0.0
61	40.0	1277164.0	0.0	*******	0.	0.	0.0	0.0	0.0
62	40.0	1276038.4	0.0	*******	0.	0.	0.0	0.0	0.0
63	10.0	318833.8	0.0	*******	0.	0.	0.0	0.0	0.0
64	8.0	255099.7	0.0	*******	0.	0.	0.0	0.0	0.0
65	2.0	63763.0	0.0	25897.2	0.	0.	0.0	0.0	0.0
66	13.0	414343.6	0.0	*******	0.	0.	0.0	0.0	0.0
67	1.0	31864.2	0.0	13010.7	0.	0.	0.0	0.0	0.0
68	6.0	191160.5	0.0	78153.8	0.	0.	0.0	0.0	0.0
69	5.0	159267.7	0.0	65245.9	0.	0.	0.0	0.0	0.0
70	2.9	93737.8	0.0	38372.3	0.	0.	0.0	0.0	0.0
71	7.1	224012.6	0.0	*******	0.	0.	0.0	0.0	0.0
72	15.0	463006.7	0.0	*******	0.	0.	0.0	0.0	0.0
73	5.0	150491.2	0.0	82514.8	0.	0.	0.0	0.0	0.0
74	1.0	29867.6	0.0	16260.8	0.	0.	0.0	0.0	0.0
75	1.2	35280.8	0.0	19157.6	0.	0.	0.0	0.0	0.0
76	7.8	230067.4	0.0	*******	0.	0.	0.0	0.0	0.0
77	5.4	155161.3	0.0	81936.2	0.	0.	0.0	0.0	0.0
78	24.6	684353.1	0.0	*******	0.	0.	0.0	0.0	0.0
79	10.0	264460.6	0.0	*******	0.	0.	0.0	0.0	0.0
80	7.8	200675.7	0.0	93093.8	0.	0.	0.0	0.0	0.0
81	7.2	181598.8	0.0	81808.1	0.	0.	0.0	0.0	0.0
82	7.0	171308.2	0.0	75405.9	0.	0.	0.0	0.0	0.0
83	3.0	71838.8	0.0	31106.1	0.	0.	0.0	0.0	0.0
84	10.0	235536.0	0.0	98440.7	0.	0.	0.0	0.0	0.0
85	8.0	184117.0	0.0	72941.1	0.	0.	0.0	0.0	0.0
86	2.0	45439.8	0.0	17470.1	0.	0.	0.0	0.0	0.0
87	5.2	117384.8	0.0	43950.2	0.	0.	0.0	0.0	0.0
88	9.8	215819.5	0.0	76159.4	0.	0.	0.0	0.0	0.0
89	25.0	525558.9	0.0	*******	0.	0.	0.0	0.0	0.0
90	7.6	153230.5	0.0	37429.8	0.	0.	0.0	0.0	0.0
91	18.4	353860.5	0.0	69478.2	0.	0.	0.0	0.0	0.0
92	17.0	309839.8	0.0	39352.0	0.	0.	0.0	0.0	0.0
93	7.1	123607.3	0.0	9660.0	0.	0.	0.0	0.0	0.0
94	13.8	231811.7	0.0	7513.1	0.	0.	0.0	0.0	0.0
95	6.1	98772.9	0.0	0.0	0.	0.	0.0	0.0	0.0
96	22.5	337623.6	0.0	0.0	0.	0.	0.0	0.0	0.0
97	7.5	103261.6	0.0	0.0	0.	0.	0.0	0.0	0.0
98	25.0	301954.3	0.0	0.0	0.	0.	0.0	0.0	0.0
99	9.9	99562.5	0.0	0.0	0.	0.	0.0	0.0	0.0
100	25.1	191976.3	0.0	0.0	0.	0.	0.0	0.0	0.0
101	17.3	81726.5	0.0	0.0	0.	0.	0.0	0.0	0.0
102	17.7	39047.0	0.0	0.0	0.	0.	0.0	0.0	0.0
103	6.5	3097.5	0.0	0.0	0.	0.	0.0	0.0	0.0

Failure Surface Specified By 18 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	316.545	231.807
2	328.034	224.629
3	365.584	198.336
4	383.937	179.983
5	411.990	151.930
6	454.417	109.503
7	600.100	111.093
8	880.980	115.306
9	1447.937	122.939
10	1490.363	165.366
11	1532.790	207.792
12	1575.216	250.219
13	1617.642	292.645
14	1660.069	335.071
15	1702.495	377.498
16	1744.922	419.924
17	1787.348	462.351
18	1811.509	486.512

Factor of Safety
*** 1.751 ***

Failure Surface Specified By 18 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	316.545	231.807
2	328.034	224.629
3	365.584	198.336
4	383.937	179.983
5	411.990	151.930
6	454.417	109.503
7	600.100	111.093
8	880.980	115.306
9	1447.937	122.939
10	1490.363	165.366
11	1532.790	207.792
12	1575.216	250.219
13	1617.642	292.645
14	1660.069	335.071
15	1702.495	377.498
16	1744.922	419.924
17	1787.348	462.351
18	1811.509	486.512

Factor of Safety
*** 1.751 ***

Failure Surface Specified By 18 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
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2	328.034	224.629
3	365.584	198.336
4	383.937	179.983
5	411.990	151.930
6	454.417	109.503
7	600.100	111.093
8	880.980	115.306
9	1447.937	122.939
10	1490.363	165.366
11	1532.790	207.792
12	1575.216	250.219
13	1617.642	292.645
14	1660.069	335.071
15	1702.495	377.498
16	1744.922	419.924
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*** 1.751 ***

Failure Surface Specified By 18 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	316.545	231.807
2	328.034	224.629
3	365.584	198.336
4	383.937	179.983
5	411.990	151.930
6	454.417	109.503
7	600.100	111.093
8	880.980	115.306
9	1447.937	122.939
10	1490.363	165.366
11	1532.790	207.792
12	1575.216	250.219
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Factor of Safety
*** 1.751 ***

Failure Surface Specified By 18 Coordinate Points

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1	316.545	231.807
2	328.034	224.629
3	365.584	198.336
4	383.937	179.983
5	411.990	151.930
6	454.417	109.503
7	600.100	111.093
8	880.980	115.306
9	1447.937	122.939
10	1490.363	165.366
11	1532.790	207.792
12	1575.216	250.219
13	1617.642	292.645
14	1660.069	335.071
15	1702.495	377.498
16	1744.922	419.924
17	1787.348	462.351
18	1811.509	486.512

Factor of Safety
*** 1.751 ***

Failure Surface Specified By 18 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	316.545	231.807
2	328.034	224.629
3	365.584	198.336
4	383.937	179.983
5	411.990	151.930
6	454.417	109.503
7	600.100	111.093
8	880.980	115.306
9	1447.937	122.939
10	1490.363	165.366
11	1532.790	207.792
12	1575.216	250.219
13	1617.642	292.645
14	1660.069	335.071
15	1702.495	377.498
16	1744.922	419.924
17	1787.348	462.351
18	1811.509	486.512

Factor of Safety
*** 1.751 ***

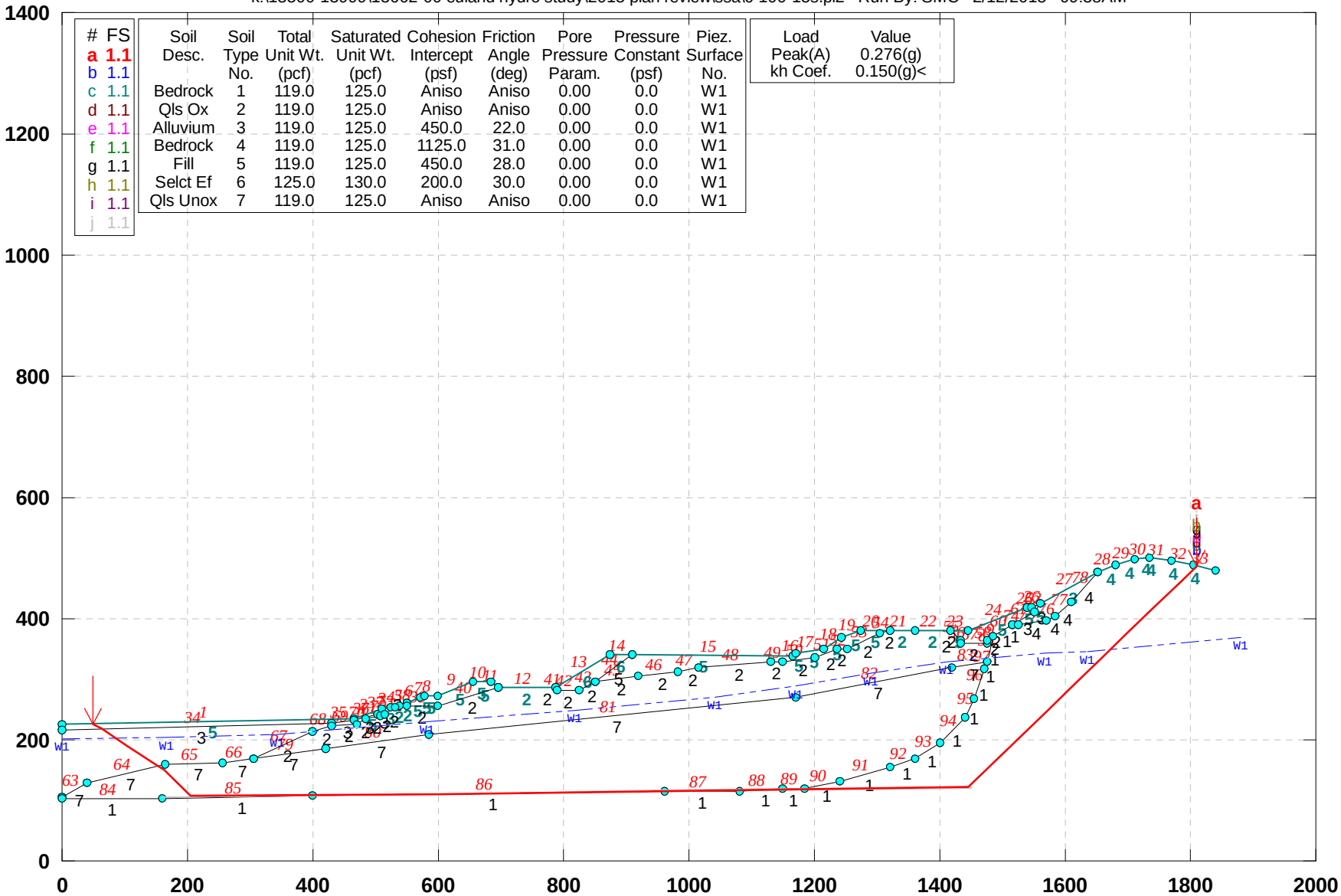
Failure Surface Specified By 18 Coordinate Points

Point X-Surf Y-Surf

```
      No.        (ft)        (ft)
       1        316.545      231.807
       2        328.034      224.629
       3        365.584      198.336
       4        383.937      179.983
       5        411.990      151.930
       6        454.417      109.503
       7        600.100      111.093
       8        880.980      115.306
       9       1447.937      122.939
      10       1490.363      165.366
      11       1532.790      207.792
      12       1575.216      250.219
      13       1617.642      292.645
      14       1660.069      335.071
      15       1702.495      377.498
      16       1744.922      419.924
      17       1787.348      462.351
      18       1811.509      486.512
          Factor of Safety
         ***    1.751   ***
   Failure Surface Specified By 18 Coordinate Points
     Point      X-Surf      Y-Surf
      No.        (ft)        (ft)
       1        316.545      231.807
       2        328.034      224.629
       3        365.584      198.336
       4        383.937      179.983
       5        411.990      151.930
       6        454.417      109.503
       7        600.100      111.093
       8        880.980      115.306
       9       1447.937      122.939
      10       1490.363      165.366
      11       1532.790      207.792
      12       1575.216      250.219
      13       1617.642      292.645
      14       1660.069      335.071
      15       1702.495      377.498
      16       1744.922      419.924
      17       1787.348      462.351
      18       1811.509      486.512
          Factor of Safety
         ***    1.751   ***
   Failure Surface Specified By 18 Coordinate Points
     Point      X-Surf      Y-Surf
      No.        (ft)        (ft)
       1        316.545      231.807
       2        328.034      224.629
       3        365.584      198.336
       4        383.937      179.983
       5        411.990      151.930
       6        454.417      109.503
       7        600.100      111.093
       8        880.980      115.306
       9       1447.937      122.939
      10       1490.363      165.366
      11       1532.790      207.792
      12       1575.216      250.219
      13       1617.642      292.645
      14       1660.069      335.071
      15       1702.495      377.498
      16       1744.922      419.924
      17       1787.348      462.351
      18       1811.509      486.512
          Factor of Safety
         ***    1.751   ***
             **** END OF GSTABL7 OUTPUT ****
```

13662-00, Euland Capital, C-C', - - Seismic

k:\13500-13999\13662-00 euland hydro study\2015 plan review\ssa\c-100-15s.pl2 Run By: SMC 2/12/2015 09:38AM



#	FS
a	1.1
b	1.1
c	1.1
d	1.1
e	1.1
f	1.1
g	1.1
h	1.1
i	1.1
j	1.1

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.
Bedrock	1	119.0	125.0	Aniso	Aniso	0.00	0.0	W1
Qls Ox	2	119.0	125.0	Aniso	Aniso	0.00	0.0	W1
Alluvium	3	119.0	125.0	450.0	22.0	0.00	0.0	W1
Bedrock	4	119.0	125.0	1125.0	31.0	0.00	0.0	W1
Fill	5	119.0	125.0	450.0	28.0	0.00	0.0	W1
Selct Ef	6	125.0	130.0	200.0	30.0	0.00	0.0	W1
Qls Unox	7	119.0	125.0	Aniso	Aniso	0.00	0.0	W1

Load	Value
Peak(A)	0.276(g)
kh Coef.	0.150(g)<

GSTABL7 v.2 FSmin=1.1

Safety Factors Are Calculated By The Simplified Janbu Method for the case of c & phi both > 0

Figure E-7.2

***** GSTABL7 *****

** GSTABL7 by Garry H. Gregory, P.E. **

** Original Version 1.0, January 1996; Current Version 2.005, Sept. 2006 **

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****

SLOPE STABILITY ANALYSIS SYSTEM

Modified Bishop, Simplified Janbu, or GLE Method of Slices.
(Includes Spencer & Morgenstern-Price Type Analysis)
Including Pier/Pile, Reinforcement, Soil Nail, Tieback,
Nonlinear Undrained Shear Strength, Curved Phi Envelope,
Anisotropic Soil, Fiber-Reinforced Soil, Boundary Loads, Water
Surfaces, Pseudo-Static & Newmark Earthquake, and Applied Forces.

****

Analysis Run Date: 2/12/2015
Time of Run: 09:38AM
Run By: SMC
Input Data Filename: K:\13500-13999\13662-00 Euland Hydro Study\2015 Plan Review\SSA\c-100-15s.
Output Filename: K:\13500-13999\13662-00 Euland Hydro Study\2015 Plan Review\SSA\c-100-15s.OUT
Unit System: English
Plotted Output Filename: K:\13500-13999\13662-00 Euland Hydro Study\2015 Plan Review\SSA\c-100-15s.PLT
PROBLEM DESCRIPTION: 13662-00, Euland Capital, C-C',
- - Seismic

BOUNDARY COORDINATES
33 Top Boundaries
98 Total Boundaries

Boundary No.	X-Left (ft)	Y-Left (ft)	X-Right (ft)	Y-Right (ft)	Soil Type Below Bnd
1	0.00	225.00	465.00	235.00	5
2	465.00	235.00	510.00	252.00	5
3	510.00	252.00	523.00	253.00	3
4	523.00	253.00	537.00	255.00	2
5	537.00	255.00	550.00	260.00	2
6	550.00	260.00	570.00	270.00	5
7	570.00	270.00	578.00	272.00	5
8	578.00	272.00	600.00	273.00	5
9	600.00	273.00	656.00	295.00	5
10	656.00	295.00	685.00	295.00	5
11	685.00	295.00	696.00	287.00	5
12	696.00	287.00	788.00	287.00	2
13	788.00	287.00	875.00	341.00	6
14	875.00	341.00	910.00	341.00	6
15	910.00	341.00	1165.00	338.00	5
16	1165.00	338.00	1170.00	342.00	5
17	1170.00	342.00	1215.00	351.00	5
18	1215.00	351.00	1244.00	370.00	5
19	1244.00	370.00	1273.00	380.00	5
20	1273.00	380.00	1320.00	380.00	5
21	1320.00	380.00	1360.00	380.00	2
22	1360.00	380.00	1418.00	380.00	2
23	1418.00	380.00	1445.00	380.00	5
24	1445.00	380.00	1540.00	418.00	5
25	1540.00	418.00	1547.00	418.00	5
26	1547.00	418.00	1560.00	425.00	5
27	1560.00	425.00	1653.00	476.00	3
28	1653.00	476.00	1680.00	489.00	4
29	1680.00	489.00	1710.00	498.00	4
30	1710.00	498.00	1735.00	500.00	4
31	1735.00	500.00	1770.00	495.00	4
32	1770.00	495.00	1805.00	488.00	4
33	1805.00	488.00	1840.00	480.00	4
34	0.00	217.00	430.00	227.00	3
35	430.00	227.00	465.00	232.00	3
36	465.00	232.00	502.00	243.00	3
37	502.00	243.00	510.00	252.00	3
38	550.00	260.00	551.00	255.00	2
39	551.00	255.00	600.00	255.00	2
40	600.00	255.00	696.00	287.00	2

41	788.00	287.00	789.00	281.00	2
42	789.00	281.00	825.00	281.00	2
43	825.00	281.00	850.00	295.00	2
44	850.00	295.00	910.00	341.00	5
45	850.00	295.00	920.00	305.00	2
46	920.00	305.00	983.00	312.00	2
47	983.00	312.00	1015.00	320.00	2
48	1015.00	320.00	1131.00	328.00	2
49	1131.00	328.00	1148.00	330.00	2
50	1148.00	330.00	1200.00	337.00	2
51	1200.00	337.00	1237.00	350.00	2
52	1237.00	350.00	1252.00	350.00	2
53	1252.00	350.00	1305.00	375.00	2
54	1305.00	375.00	1320.00	380.00	2
55	1418.00	380.00	1433.00	365.00	2
56	1433.00	365.00	1434.00	360.00	2
57	1434.00	360.00	1475.00	360.00	2
58	1475.00	360.00	1476.00	365.00	2
59	1476.00	365.00	1485.00	372.00	2
60	1485.00	372.00	1515.00	390.00	1
61	1515.00	390.00	1550.00	412.00	3
62	1550.00	412.00	1560.00	425.00	3
63	0.00	105.00	40.00	130.00	7
64	40.00	130.00	165.00	160.00	7
65	165.00	160.00	255.00	162.00	7
66	255.00	162.00	305.00	169.00	7
67	305.00	169.00	400.00	215.00	2
68	400.00	215.00	430.00	224.00	2
69	430.00	224.00	470.00	225.00	2
70	470.00	225.00	483.00	235.00	2
71	483.00	235.00	508.00	240.00	2
72	508.00	240.00	515.00	243.00	2
73	515.00	243.00	532.00	253.00	2
74	1515.00	390.00	1525.00	390.00	1
75	1525.00	390.00	1570.00	397.00	4
76	1570.00	397.00	1585.00	404.00	4
77	1585.00	404.00	1610.00	427.00	4
78	1610.00	427.00	1653.00	476.00	4
79	305.00	169.00	420.00	185.00	7
80	420.00	185.00	586.00	210.00	7
81	586.00	210.00	1170.00	270.00	7
82	1170.00	270.00	1420.00	320.00	7
83	1420.00	320.00	1476.00	330.00	7
84	0.00	103.00	160.00	104.00	1
85	160.00	104.00	400.00	107.00	1
86	400.00	107.00	960.00	114.00	1
87	960.00	114.00	1080.00	115.00	1
88	1080.00	115.00	1150.00	119.00	1
89	1150.00	119.00	1185.00	121.00	1
90	1185.00	121.00	1240.00	131.00	1
91	1240.00	131.00	1320.00	154.00	1
92	1320.00	154.00	1360.00	170.00	1
93	1360.00	170.00	1400.00	194.00	1
94	1400.00	194.00	1440.00	238.00	1
95	1440.00	238.00	1455.00	268.00	1
96	1455.00	268.00	1470.00	318.00	1
97	1470.00	318.00	1476.00	330.00	1
98	1476.00	330.00	1485.00	372.00	1

Default Y-Origin = 0.00(ft)
Default X-Plus Value = 0.00(ft)
Default Y-Plus Value = 0.00(ft)

ISOTROPIC SOIL PARAMETERS
7 Type(s) of Soil

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.
1	119.0	125.0	0.0	0.0	0.00	0.0	1
2	119.0	125.0	0.0	0.0	0.00	0.0	1
3	119.0	125.0	450.0	22.0	0.00	0.0	1
4	119.0	125.0	1125.0	31.0	0.00	0.0	1

```
   5   119.0    125.0     450.0     28.0    0.00       0.0      1
   6   125.0    130.0     200.0     30.0    0.00       0.0      1
   7   119.0    125.0       0.0      0.0    0.00       0.0      1
ANISOTROPIC STRENGTH PARAMETERS
     3 soil type(s)
 Soil Type  1 Is Anisotropic
 Number Of Direction Ranges Specified =  3
 Direction    Counterclockwise     Cohesion     Friction
   Range       Direction Limit    Intercept       Angle
    No.            (deg)            (psf)         (deg)
     1              0.0            1125.00         31.00
     2              5.0             450.00         17.00
     3             90.0            1125.00         31.00
 Soil Type  2 Is Anisotropic
 Number Of Direction Ranges Specified =  3
 Direction    Counterclockwise     Cohesion     Friction
   Range       Direction Limit    Intercept       Angle
    No.            (deg)            (psf)         (deg)
     1              0.0             525.00         25.00
     2             15.0             375.00         14.50
     3             90.0             450.00         22.00
 Soil Type  7 Is Anisotropic
 Number Of Direction Ranges Specified =  3
 Direction    Counterclockwise     Cohesion     Friction
   Range       Direction Limit    Intercept       Angle
    No.            (deg)            (psf)         (deg)
     1              0.0             750.00         31.00
     2             15.0             375.00         14.50
     3             90.0             450.00         22.00
 ANISOTROPIC SOIL NOTES:
    (1) An input value of 0.01 for C and/or Phi will cause Aniso
        C and/or Phi to be ignored in that range.
    (2) An input value of 0.02 for Phi will set both Phi and
        C equal to zero, with no water weight in the tension crack.
    (3) An input value of 0.03 for Phi will set both Phi and
        C equal to zero, with water weight in the tension crack.
 1 PIEZOMETRIC SURFACE(S) SPECIFIED
 Unit Weight of Water =  62.40 (pcf)
 Piezometric Surface No.  1 Specified by 12 Coordinate Points
 Pore Pressure Inclination Factor =  0.50
   Point      X-Water     Y-Water
    No.         (ft)        (ft)
     1          0.00      202.00
     2        168.00      205.00
     3        343.00      210.00
     4        583.00      230.00
     5        818.00      250.00
     6       1042.00      270.00
     7       1170.00      290.00
     8       1289.00      310.00
     9       1410.00      330.00
    10       1568.00      343.00
    11       1636.00      345.00
    12       1880.00      370.00
 Specified Peak Ground Acceleration Coefficient (A) =   0.276(g)
 Specified Horizontal Earthquake Coefficient (kh) =   0.150(g)
 Specified Vertical Earthquake Coefficient (kv) =   0.000(g)
 Specified Seismic Pore-Pressure Factor =   0.000
 Janbus Empirical Coef is being used for the case of  c & phi both > 0
 A Critical Failure Surface Searching Method, Using A Random
 Technique For Generating Sliding Block Surfaces, Has Been
 Specified.
 The Active And Passive Portions Of The Sliding Surfaces
 Are Generated According To The Rankine Theory.
 5000 Trial Surfaces Have Been Generated.
 4 Boxes Specified For Generation Of Central Block Base
 Length Of Line Segments For Active And Passive Portions Of
 Sliding Block Is  60.0
 Box        X-Left     Y-Left    X-Right    Y-Right      Height
 No.         (ft)       (ft)       (ft)       (ft)        (ft)
```

1	160.00	106.00	600.00	111.00	1.00
2	600.10	111.00	600.10	111.00	1.00
3	730.00	113.00	960.00	116.00	1.00
4	960.10	116.00	1450.00	122.00	2.00

Following Are Displayed The Ten Most Critical Of The Trial
Failure Surfaces Evaluated. They Are
Ordered - Most Critical First.
* * Safety Factors Are Calculated By The Simplified Janbu Method * *
Total Number of Trial Surfaces Attempted = 5000
Number of Trial Surfaces With Valid FS = 5000
Statistical Data On All Valid FS Values:
FS Max = 1.464 FS Min = 1.058 FS Ave = 1.046
Standard Deviation = 0.119 Coefficient of Variation = 11.38 %
Failure Surface Specified By 18 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	49.772	226.070
2	62.450	218.452
3	103.537	190.739
4	153.280	157.187
5	161.053	149.414
6	203.479	106.988
7	600.100	111.366
8	951.058	115.931
9	1444.109	122.189
10	1486.536	164.616
11	1528.962	207.042
12	1571.389	249.469
13	1613.815	291.895
14	1656.241	334.321
15	1698.668	376.748
16	1741.094	419.174
17	1783.521	461.601
18	1809.005	487.085

Factor of Safety
*** 1.058 ***

Individual data on the 108 slices

Slice No.	Width (ft)	Weight (lbs)	Water Force Top (lbs)	Water Force Bot (lbs)	Tie Force Norm (lbs)	Tie Force Tan (lbs)	Earthquake Force Hor (lbs)	Earthquake Force Ver (lbs)	Surcharge Load (lbs)
1	12.7	5952.5	0.0	0.0	0.	0.	892.9	0.0	0.0
2	22.2	41121.7	0.0	0.0	0.	0.	6168.3	0.0	0.0
3	18.9	68114.7	0.0	9341.0	0.	0.	10217.2	0.0	0.0
4	49.7	327502.2	0.0	*******	0.	0.	49125.3	0.0	0.0
5	7.8	71849.4	0.0	35324.6	0.	0.	10777.4	0.0	0.0
6	3.9	39440.8	0.0	20016.5	0.	0.	5916.1	0.0	0.0
7	3.0	31305.1	0.0	16148.3	0.	0.	4695.8	0.0	0.0
8	35.5	457405.3	0.0	*******	0.	0.	68610.8	0.0	0.0
9	51.5	782753.6	0.0	*******	0.	0.	*******	0.0	0.0
10	50.0	763073.0	0.0	*******	0.	0.	*******	0.0	0.0
11	38.0	582193.8	0.0	*******	0.	0.	87329.1	0.0	0.0
12	56.4	867744.5	0.0	*******	0.	0.	*******	0.0	0.0
13	0.6	9628.7	0.0	4094.3	0.	0.	1444.3	0.0	0.0
14	20.0	309142.1	0.0	*******	0.	0.	46371.3	0.0	0.0
15	10.0	154822.7	0.0	66790.7	0.	0.	23223.4	0.0	0.0
16	35.0	543200.6	0.0	*******	0.	0.	81480.1	0.0	0.0
17	5.0	78297.8	0.0	34350.7	0.	0.	11744.7	0.0	0.0
18	13.0	208731.0	0.0	89837.9	0.	0.	31309.7	0.0	0.0
19	19.0	318466.9	0.0	*******	0.	0.	47770.0	0.0	0.0
20	6.0	103874.1	0.0	42232.4	0.	0.	15581.1	0.0	0.0
21	2.0	34977.3	0.0	14113.4	0.	0.	5246.6	0.0	0.0
22	5.0	87767.0	0.0	35362.3	0.	0.	13165.0	0.0	0.0
23	8.0	140857.3	0.0	56813.4	0.	0.	21128.6	0.0	0.0
24	9.0	159415.1	0.0	64259.1	0.	0.	23912.3	0.0	0.0
25	5.0	89128.1	0.0	35856.8	0.	0.	13369.2	0.0	0.0
26	13.0	236049.9	0.0	93753.8	0.	0.	35407.5	0.0	0.0
27	1.0	18478.8	0.0	7243.3	0.	0.	2771.8	0.0	0.0
28	19.0	362234.1	0.0	*******	0.	0.	54335.1	0.0	0.0
29	8.0	157898.4	0.0	58791.6	0.	0.	23684.8	0.0	0.0

30	5.0	99320.5	0.0	36890.9	0.	0.	14898.1	0.0	0.0
31	3.0	59646.4	0.0	22185.7	0.	0.	8947.0	0.0	0.0
32	14.0	278889.7	0.0	*******	0.	0.	41833.5	0.0	0.0
33	0.1	1995.0	0.0	746.5	0.	0.	299.2	0.0	0.0
34	55.9	1186897.2	0.0	*******	0.	0.	*******	0.0	0.0
35	29.0	652261.1	0.0	*******	0.	0.	97839.2	0.0	0.0
36	11.0	241927.7	0.0	86598.0	0.	0.	36289.2	0.0	0.0
37	92.0	1974312.5	0.0	*******	0.	0.	*******	0.0	0.0
38	1.0	21464.8	0.0	8311.9	0.	0.	3219.7	0.0	0.0
39	29.0	656265.2	0.0	*******	0.	0.	98439.8	0.0	0.0
40	7.0	168042.5	0.0	59204.0	0.	0.	25206.4	0.0	0.0
41	25.0	629699.8	0.0	*******	0.	0.	94455.0	0.0	0.0
42	25.0	675021.2	0.0	*******	0.	0.	*******	0.0	0.0
43	35.0	972997.2	0.0	*******	0.	0.	*******	0.0	0.0
44	10.0	276878.5	0.0	89010.4	0.	0.	41531.8	0.0	0.0
45	31.1	858333.4	0.0	*******	0.	0.	*******	0.0	0.0
46	31.9	880291.3	0.0	*******	0.	0.	*******	0.0	0.0
47	32.0	879373.0	0.0	*******	0.	0.	*******	0.0	0.0
48	27.0	740017.4	0.0	*******	0.	0.	*******	0.0	0.0
49	89.0	2427562.5	0.0	*******	0.	0.	*******	0.0	0.0
50	6.8	183772.4	0.0	69287.8	0.	0.	27565.9	0.0	0.0
51	10.2	278063.7	0.0	*******	0.	0.	41709.6	0.0	0.0
52	2.0	54294.5	0.0	20752.2	0.	0.	8144.2	0.0	0.0
53	15.0	406946.3	0.0	*******	0.	0.	61042.0	0.0	0.0
54	5.0	136753.3	0.0	52699.3	0.	0.	20513.0	0.0	0.0
55	15.0	416388.2	0.0	*******	0.	0.	62458.2	0.0	0.0
56	15.0	421610.2	0.0	*******	0.	0.	63241.5	0.0	0.0
57	15.0	426832.2	0.0	*******	0.	0.	64024.8	0.0	0.0
58	22.0	648574.6	0.0	*******	0.	0.	97286.2	0.0	0.0
59	3.0	91343.5	0.0	33592.8	0.	0.	13701.5	0.0	0.0
60	4.0	122874.6	0.0	44924.3	0.	0.	18431.2	0.0	0.0
61	8.0	248281.4	0.0	90307.6	0.	0.	37242.2	0.0	0.0
62	21.0	664053.6	0.0	*******	0.	0.	99608.0	0.0	0.0
63	16.0	512664.4	0.0	*******	0.	0.	76899.7	0.0	0.0
64	16.0	512519.0	0.0	*******	0.	0.	76877.9	0.0	0.0
65	15.0	480345.4	0.0	*******	0.	0.	72051.8	0.0	0.0
66	40.0	1280253.1	0.0	*******	0.	0.	*******	0.0	0.0
67	40.0	1279281.8	0.0	*******	0.	0.	*******	0.0	0.0
68	10.0	319668.6	0.0	*******	0.	0.	47950.3	0.0	0.0
69	8.0	255774.9	0.0	*******	0.	0.	38366.2	0.0	0.0
70	2.0	63932.8	0.0	25981.4	0.	0.	9589.9	0.0	0.0
71	13.0	415456.4	0.0	*******	0.	0.	62318.5	0.0	0.0
72	1.0	31950.5	0.0	13053.5	0.	0.	4792.6	0.0	0.0
73	6.0	191680.1	0.0	78411.6	0.	0.	28752.0	0.0	0.0
74	4.1	131262.1	0.0	53795.3	0.	0.	19689.3	0.0	0.0
75	0.9	28392.3	0.0	16463.5	0.	0.	4258.9	0.0	0.0
76	10.0	314436.1	0.0	*******	0.	0.	47165.4	0.0	0.0
77	15.0	457237.8	0.0	*******	0.	0.	68585.7	0.0	0.0
78	5.0	148568.2	0.0	81161.6	0.	0.	22285.2	0.0	0.0
79	1.0	29483.0	0.0	15990.2	0.	0.	4422.4	0.0	0.0
80	1.2	34825.2	0.0	18837.0	0.	0.	5223.8	0.0	0.0
81	7.8	227061.6	0.0	*******	0.	0.	34059.2	0.0	0.0
82	1.5	44070.0	0.0	23286.2	0.	0.	6610.5	0.0	0.0
83	28.5	783906.6	0.0	*******	0.	0.	*******	0.0	0.0
84	10.0	260614.6	0.0	*******	0.	0.	39092.2	0.0	0.0
85	4.0	101136.0	0.0	46893.3	0.	0.	15170.4	0.0	0.0
86	11.0	275369.4	0.0	*******	0.	0.	41305.4	0.0	0.0
87	7.0	168616.0	0.0	73511.4	0.	0.	25292.4	0.0	0.0
88	3.0	70685.0	0.0	30294.2	0.	0.	10602.8	0.0	0.0
89	10.0	231690.0	0.0	95734.2	0.	0.	34753.5	0.0	0.0
90	8.0	181040.2	0.0	70776.0	0.	0.	27156.0	0.0	0.0
91	2.0	44670.5	0.0	16927.2	0.	0.	6700.6	0.0	0.0
92	1.4	30876.2	0.0	11551.7	0.	0.	4631.4	0.0	0.0
93	13.6	296558.2	0.0	*******	0.	0.	44483.7	0.0	0.0
94	25.0	515942.6	0.0	*******	0.	0.	77391.4	0.0	0.0
95	3.8	75460.2	0.0	18274.5	0.	0.	11319.0	0.0	0.0
96	22.2	421629.9	0.0	81576.1	0.	0.	63244.5	0.0	0.0
97	17.0	303302.2	0.0	34759.5	0.	0.	45495.3	0.0	0.0
98	3.2	55851.2	0.0	4042.8	0.	0.	8377.7	0.0	0.0
99	14.2	236498.8	0.0	7953.2	0.	0.	35474.8	0.0	0.0

100	9.6	151602.5	0.0	0.0	0.	0.	22740.4	0.0	0.0
101	18.7	276320.7	0.0	0.0	0.	0.	41448.1	0.0	0.0
102	11.3	153578.5	0.0	0.0	0.	0.	23036.8	0.0	0.0
103	25.0	292799.4	0.0	0.0	0.	0.	43919.9	0.0	0.0
104	6.1	60510.1	0.0	0.0	0.	0.	9076.5	0.0	0.0
105	28.9	218211.6	0.0	0.0	0.	0.	32731.7	0.0	0.0
106	13.5	62439.8	0.0	0.0	0.	0.	9366.0	0.0	0.0
107	21.5	45517.2	0.0	0.0	0.	0.	6827.6	0.0	0.0
108	4.0	1172.3	0.0	0.0	0.	0.	175.8	0.0	0.0

Failure Surface Specified By 18 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	49.772	226.070
2	62.450	218.452
3	103.537	190.739
4	153.280	157.187
5	161.053	149.414
6	203.479	106.988
7	600.100	111.366
8	951.058	115.931
9	1444.109	122.189
10	1486.536	164.616
11	1528.962	207.042
12	1571.389	249.469
13	1613.815	291.895
14	1656.241	334.321
15	1698.668	376.748
16	1741.094	419.174
17	1783.521	461.601
18	1809.005	487.085

Factor of Safety
*** 1.058 ***

Failure Surface Specified By 18 Coordinate Points

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5	161.053	149.414
6	203.479	106.988
7	600.100	111.366
8	951.058	115.931
9	1444.109	122.189
10	1486.536	164.616
11	1528.962	207.042
12	1571.389	249.469

13	1613.815	291.895
14	1656.241	334.321
15	1698.668	376.748
16	1741.094	419.174
17	1783.521	461.601
18	1809.005	487.085

Factor of Safety
*** 1.058 ***

Failure Surface Specified By 18 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	49.772	226.070
2	62.450	218.452
3	103.537	190.739
4	153.280	157.187
5	161.053	149.414
6	203.479	106.988
7	600.100	111.366
8	951.058	115.931
9	1444.109	122.189
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*** 1.058 ***

Failure Surface Specified By 18 Coordinate Points

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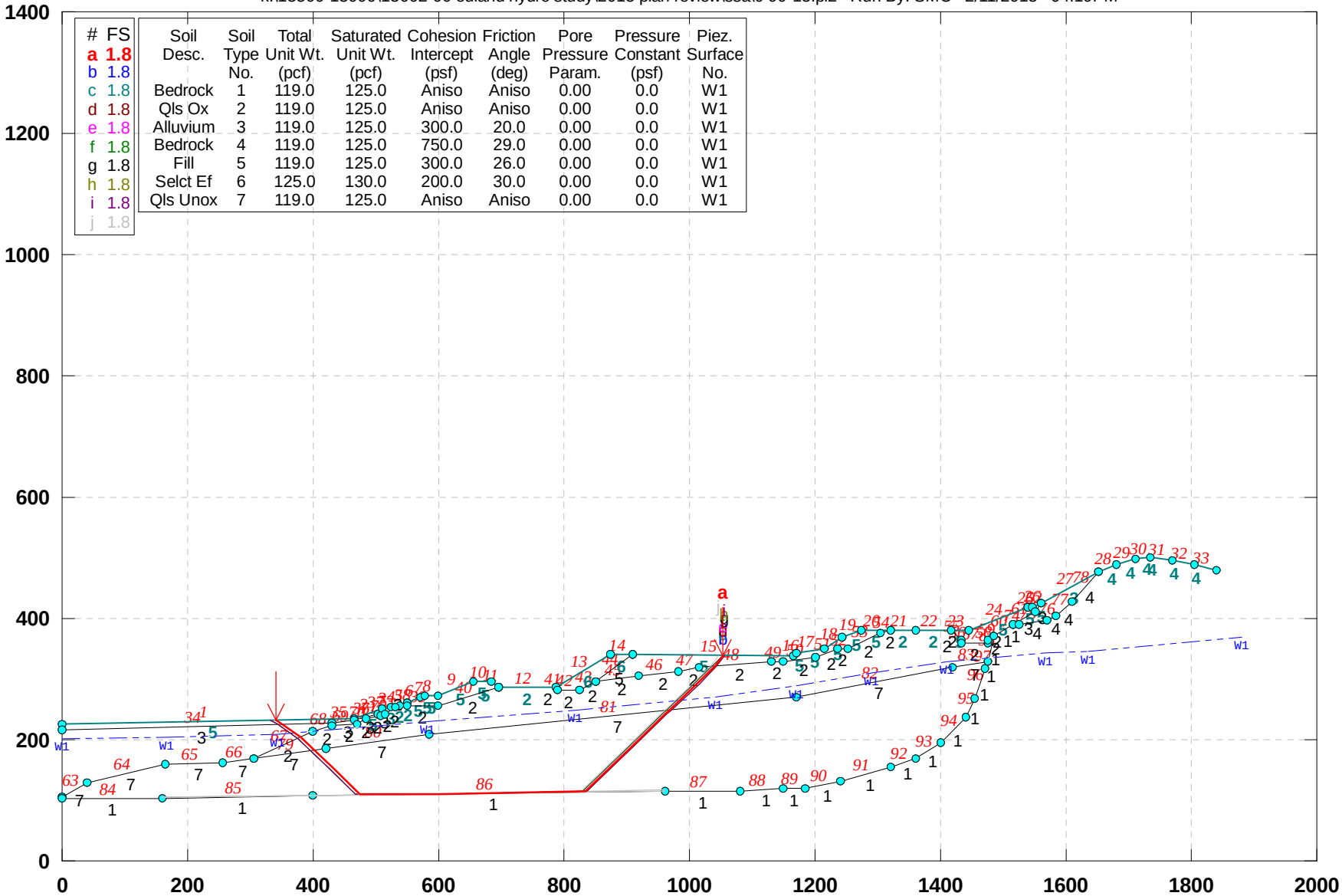
11	1528.962	207.042
12	1571.389	249.469
13	1613.815	291.895
14	1656.241	334.321

```
15       1698.668      376.748
16       1741.094      419.174
17       1783.521      461.601
18       1809.005      487.085
    Factor of Safety
   ***    1.058   ***
       **** END OF GSTABL7 OUTPUT ****
```

13662-00, Euland Capital, C-C', - - Static-

k:\13500-13999\13662-00 euland hydro study\2015 plan review\ssa\c-99-15.pl2 Run By: SMC 2/11/2015 04:19PM



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.
Bedrock	1	119.0	125.0	Aniso	Aniso	0.00	0.0	W1
Qls Ox	2	119.0	125.0	Aniso	Aniso	0.00	0.0	W1
Alluvium	3	119.0	125.0	300.0	20.0	0.00	0.0	W1
Bedrock	4	119.0	125.0	750.0	29.0	0.00	0.0	W1
Fill	5	119.0	125.0	300.0	26.0	0.00	0.0	W1
Selct Ef	6	125.0	130.0	200.0	30.0	0.00	0.0	W1
Qls Unox	7	119.0	125.0	Aniso	Aniso	0.00	0.0	W1

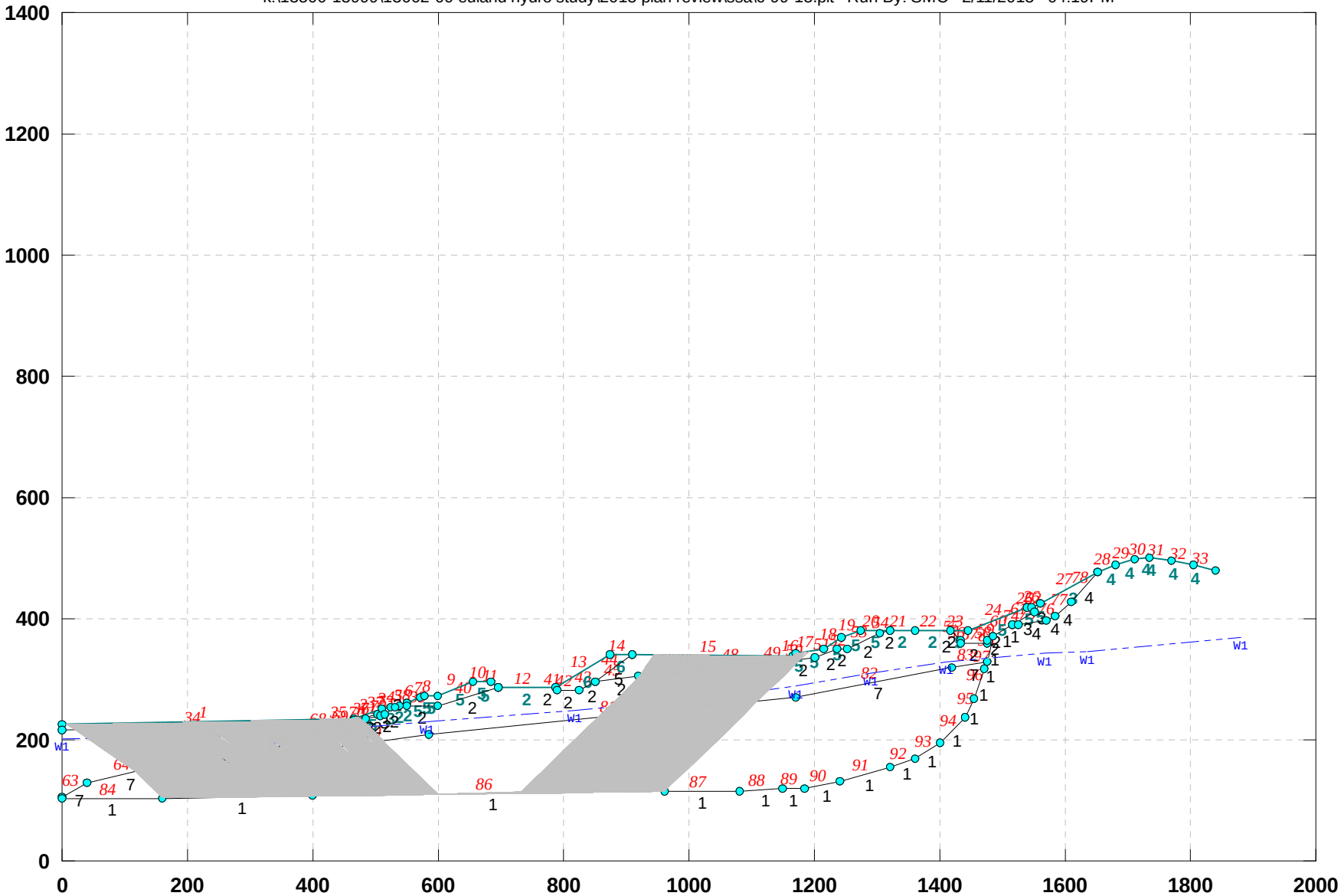
GSTABL7 v.2 FSmin=1.8

Safety Factors Are Calculated By The Simplified Janbu Method for the case of c & phi both > 0

Figure E-8.1

13662-00, Euland Capital, C-C', - - Static-

k:\13500-13999\13662-00 euland hydro study\2015 plan review\ssa\c-99-15.plt Run By: SMC 2/11/2015 04:19PM



***** GSTABL7 *****

** GSTABL7 by Garry H. Gregory, P.E. **

** Original Version 1.0, January 1996; Current Version 2.005, Sept. 2006 **

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****

SLOPE STABILITY ANALYSIS SYSTEM

Modified Bishop, Simplified Janbu, or GLE Method of Slices.
(Includes Spencer & Morgenstern-Price Type Analysis)
Including Pier/Pile, Reinforcement, Soil Nail, Tieback,
Nonlinear Undrained Shear Strength, Curved Phi Envelope,
Anisotropic Soil, Fiber-Reinforced Soil, Boundary Loads, Water
Surfaces, Pseudo-Static & Newmark Earthquake, and Applied Forces.

****

Analysis Run Date: 2/11/2015
Time of Run: 04:19PM
Run By: SMC
Input Data Filename: K:\13500-13999\13662-00 Euland Hydro Study\2015 Plan Review\SSA\c-99-15.
Output Filename: K:\13500-13999\13662-00 Euland Hydro Study\2015 Plan Review\SSA\c-99-15.OUT
Unit System: English
Plotted Output Filename: K:\13500-13999\13662-00 Euland Hydro Study\2015 Plan Review\SSA\c-99-15.PLT
PROBLEM DESCRIPTION: 13662-00, Euland Capital, C-C',
- - Static-

BOUNDARY COORDINATES
33 Top Boundaries
98 Total Boundaries

Boundary No.	X-Left (ft)	Y-Left (ft)	X-Right (ft)	Y-Right (ft)	Soil Type Below Bnd
1	0.00	225.00	465.00	235.00	5
2	465.00	235.00	510.00	252.00	5
3	510.00	252.00	523.00	253.00	3
4	523.00	253.00	537.00	255.00	2
5	537.00	255.00	550.00	260.00	2
6	550.00	260.00	570.00	270.00	5
7	570.00	270.00	578.00	272.00	5
8	578.00	272.00	600.00	273.00	5
9	600.00	273.00	656.00	295.00	5
10	656.00	295.00	685.00	295.00	5
11	685.00	295.00	696.00	287.00	5
12	696.00	287.00	788.00	287.00	2
13	788.00	287.00	875.00	341.00	6
14	875.00	341.00	910.00	341.00	6
15	910.00	341.00	1165.00	338.00	5
16	1165.00	338.00	1170.00	342.00	5
17	1170.00	342.00	1215.00	351.00	5
18	1215.00	351.00	1244.00	370.00	5
19	1244.00	370.00	1273.00	380.00	5
20	1273.00	380.00	1320.00	380.00	5
21	1320.00	380.00	1360.00	380.00	2
22	1360.00	380.00	1418.00	380.00	2
23	1418.00	380.00	1445.00	380.00	5
24	1445.00	380.00	1540.00	418.00	5
25	1540.00	418.00	1547.00	418.00	5
26	1547.00	418.00	1560.00	425.00	5
27	1560.00	425.00	1653.00	476.00	3
28	1653.00	476.00	1680.00	489.00	4
29	1680.00	489.00	1710.00	498.00	4
30	1710.00	498.00	1735.00	500.00	4
31	1735.00	500.00	1770.00	495.00	4
32	1770.00	495.00	1805.00	488.00	4
33	1805.00	488.00	1840.00	480.00	4
34	0.00	217.00	430.00	227.00	3
35	430.00	227.00	465.00	232.00	3
36	465.00	232.00	502.00	243.00	3
37	502.00	243.00	510.00	252.00	3
38	550.00	260.00	551.00	255.00	2
39	551.00	255.00	600.00	255.00	2
40	600.00	255.00	696.00	287.00	2

41	788.00	287.00	789.00	281.00	2
42	789.00	281.00	825.00	281.00	2
43	825.00	281.00	850.00	295.00	2
44	850.00	295.00	910.00	341.00	5
45	850.00	295.00	920.00	305.00	2
46	920.00	305.00	983.00	312.00	2
47	983.00	312.00	1015.00	320.00	2
48	1015.00	320.00	1131.00	328.00	2
49	1131.00	328.00	1148.00	330.00	2
50	1148.00	330.00	1200.00	337.00	2
51	1200.00	337.00	1237.00	350.00	2
52	1237.00	350.00	1252.00	350.00	2
53	1252.00	350.00	1305.00	375.00	2
54	1305.00	375.00	1320.00	380.00	2
55	1418.00	380.00	1433.00	365.00	2
56	1433.00	365.00	1434.00	360.00	2
57	1434.00	360.00	1475.00	360.00	2
58	1475.00	360.00	1476.00	365.00	2
59	1476.00	365.00	1485.00	372.00	2
60	1485.00	372.00	1515.00	390.00	1
61	1515.00	390.00	1550.00	412.00	3
62	1550.00	412.00	1560.00	425.00	3
63	0.00	105.00	40.00	130.00	7
64	40.00	130.00	165.00	160.00	7
65	165.00	160.00	255.00	162.00	7
66	255.00	162.00	305.00	169.00	7
67	305.00	169.00	400.00	215.00	2
68	400.00	215.00	430.00	224.00	2
69	430.00	224.00	470.00	225.00	2
70	470.00	225.00	483.00	235.00	2
71	483.00	235.00	508.00	240.00	2
72	508.00	240.00	515.00	243.00	2
73	515.00	243.00	532.00	253.00	2
74	1515.00	390.00	1525.00	390.00	1
75	1525.00	390.00	1570.00	397.00	4
76	1570.00	397.00	1585.00	404.00	4
77	1585.00	404.00	1610.00	427.00	4
78	1610.00	427.00	1653.00	476.00	4
79	305.00	169.00	420.00	185.00	7
80	420.00	185.00	586.00	210.00	7
81	586.00	210.00	1170.00	270.00	7
82	1170.00	270.00	1420.00	320.00	7
83	1420.00	320.00	1476.00	330.00	7
84	0.00	103.00	160.00	104.00	1
85	160.00	104.00	400.00	107.00	1
86	400.00	107.00	960.00	114.00	1
87	960.00	114.00	1080.00	115.00	1
88	1080.00	115.00	1150.00	119.00	1
89	1150.00	119.00	1185.00	121.00	1
90	1185.00	121.00	1240.00	131.00	1
91	1240.00	131.00	1320.00	154.00	1
92	1320.00	154.00	1360.00	170.00	1
93	1360.00	170.00	1400.00	194.00	1
94	1400.00	194.00	1440.00	238.00	1
95	1440.00	238.00	1455.00	268.00	1
96	1455.00	268.00	1470.00	318.00	1
97	1470.00	318.00	1476.00	330.00	1
98	1476.00	330.00	1485.00	372.00	1

Default Y-Origin = 0.00(ft)
Default X-Plus Value = 0.00(ft)
Default Y-Plus Value = 0.00(ft)

ISOTROPIC SOIL PARAMETERS
7 Type(s) of Soil

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.
1	119.0	125.0	0.0	0.0	0.00	0.0	1
2	119.0	125.0	0.0	0.0	0.00	0.0	1
3	119.0	125.0	300.0	20.0	0.00	0.0	1
4	119.0	125.0	750.0	29.0	0.00	0.0	1

5	119.0	125.0	300.0	26.0	0.00	0.0	1
6	125.0	130.0	200.0	30.0	0.00	0.0	1
7	119.0	125.0	0.0	0.0	0.00	0.0	1

ANISOTROPIC STRENGTH PARAMETERS
3 soil type(s)
Soil Type 1 Is Anisotropic
Number Of Direction Ranges Specified = 3

Direction Range No.	Counterclockwise Direction Limit (deg)	Cohesion Intercept (psf)	Friction Angle (deg)
1	0.0	750.00	29.00
2	5.0	300.00	15.00
3	90.0	750.00	29.00

Soil Type 2 Is Anisotropic
Number Of Direction Ranges Specified = 3

Direction Range No.	Counterclockwise Direction Limit (deg)	Cohesion Intercept (psf)	Friction Angle (deg)
1	0.0	350.00	23.00
2	15.0	250.00	12.50
3	90.0	300.00	20.00

Soil Type 7 Is Anisotropic
Number Of Direction Ranges Specified = 3

Direction Range No.	Counterclockwise Direction Limit (deg)	Cohesion Intercept (psf)	Friction Angle (deg)
1	0.0	500.00	29.00
2	15.0	250.00	12.50
3	90.0	300.00	20.00

ANISOTROPIC SOIL NOTES:
(1) An input value of 0.01 for C and/or Phi will cause Aniso C and/or Phi to be ignored in that range.
(2) An input value of 0.02 for Phi will set both Phi and C equal to zero, with no water weight in the tension crack.
(3) An input value of 0.03 for Phi will set both Phi and C equal to zero, with water weight in the tension crack.
1 PIEZOMETRIC SURFACE(S) SPECIFIED
Unit Weight of Water = 62.40 (pcf)
Piezometric Surface No. 1 Specified by 12 Coordinate Points
Pore Pressure Inclination Factor = 0.50

Point No.	X-Water (ft)	Y-Water (ft)
1	0.00	202.00
2	168.00	205.00
3	343.00	210.00
4	583.00	230.00
5	818.00	250.00
6	1042.00	270.00
7	1170.00	290.00
8	1289.00	310.00
9	1410.00	330.00
10	1568.00	343.00
11	1636.00	345.00
12	1880.00	370.00

Janbus Empirical Coef is being used for the case of c & phi both > 0
A Critical Failure Surface Searching Method, Using A Random Technique For Generating Sliding Block Surfaces, Has Been Specified.
The Active And Passive Portions Of The Sliding Surfaces Are Generated According To The Rankine Theory.
5000 Trial Surfaces Have Been Generated.
3 Boxes Specified For Generation Of Central Block Base Length Of Line Segments For Active And Passive Portions Of Sliding Block Is 60.0

Box No.	X-Left (ft)	Y-Left (ft)	X-Right (ft)	Y-Right (ft)	Height (ft)
1	160.00	106.00	600.00	111.00	1.00
2	600.10	111.00	600.10	111.00	1.00
3	730.00	113.00	960.00	116.00	1.00

Following Are Displayed The Ten Most Critical Of The Trial

Failure Surfaces Evaluated. They Are
Ordered - Most Critical First.
* * Safety Factors Are Calculated By The Simplified Janbu Method * *
Total Number of Trial Surfaces Attempted = 5000
Number of Trial Surfaces With Valid FS = 5000
Statistical Data On All Valid FS Values:
FS Max = 2.685 FS Min = 1.842 FS Ave = 1.997
Standard Deviation = 0.122 Coefficient of Variation = 6.11 %

Failure Surface Specified By 15 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	339.737	232.306
2	351.163	225.167
3	379.712	205.176
4	402.345	182.544
5	432.615	152.273
6	475.042	109.847
7	600.100	110.577
8	834.261	114.556
9	876.687	156.982
10	919.114	199.408
11	961.540	241.835
12	969.061	249.356
13	1011.487	291.782
14	1041.535	321.830
15	1052.467	339.324

Factor of Safety
*** 1.842 ***

Individual data on the 0 slices

Slice No.	Width (ft)	Weight (lbs)	Water Force Top (lbs)	Water Force Bot (lbs)	Tie Force Norm (lbs)	Tie Force Tan (lbs)	Earthquake Force Hor (lbs)	Earthquake Force Ver (lbs)	Surcharge Load (lbs)

Failure Surface Specified By 15 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	339.737	232.306
2	351.163	225.167
3	379.712	205.176
4	402.345	182.544
5	432.615	152.273
6	475.042	109.847
7	600.100	110.577
8	834.261	114.556
9	876.687	156.982
10	919.114	199.408
11	961.540	241.835
12	969.061	249.356
13	1011.487	291.782
14	1041.535	321.830
15	1052.467	339.324

Factor of Safety
*** 1.842 ***

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4	402.345	182.544
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6	475.042	109.847
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9	876.687	156.982
10	919.114	199.408
11	961.540	241.835
12	969.061	249.356
13	1011.487	291.782
14	1041.535	321.830

```
    15       1052.467      339.324
        Factor of Safety
       ***    1.842   ***
  Failure Surface Specified By 15 Coordinate Points
    Point      X-Surf      Y-Surf
     No.        (ft)        (ft)
      1        331.973      232.139
      2        343.419      224.986
      3        374.982      202.886
      4        396.182      181.686
      5        425.525      152.343
      6        467.952      109.916
      7        600.100      110.879
      8        828.758      114.282
      9        871.184      156.709
     10        913.611      199.135
     11        956.037      241.561
     12        963.232      248.757
     13       1005.659      291.183
     14       1035.918      321.443
     15       1053.784      339.308
        Factor of Safety
       ***    1.843   ***
  Failure Surface Specified By 15 Coordinate Points
    Point      X-Surf      Y-Surf
     No.        (ft)        (ft)
      1        331.973      232.139
      2        343.419      224.986
      3        374.982      202.886
      4        396.182      181.686
      5        425.525      152.343
      6        467.952      109.916
      7        600.100      110.879
      8        828.758      114.282
      9        871.184      156.709
     10        913.611      199.135
     11        956.037      241.561
     12        963.232      248.757
     13       1005.659      291.183
     14       1035.918      321.443
     15       1053.784      339.308
        Factor of Safety
       ***    1.843   ***
  Failure Surface Specified By 15 Coordinate Points
    Point      X-Surf      Y-Surf
     No.        (ft)        (ft)
      1        331.973      232.139
      2        343.419      224.986
      3        374.982      202.886
      4        396.182      181.686
      5        425.525      152.343
      6        467.952      109.916
      7        600.100      110.879
      8        828.758      114.282
      9        871.184      156.709
     10        913.611      199.135
     11        956.037      241.561
     12        963.232      248.757
     13       1005.659      291.183
     14       1035.918      321.443
     15       1053.784      339.308
        Factor of Safety
       ***    1.843   ***
  Failure Surface Specified By 15 Coordinate Points
    Point      X-Surf      Y-Surf
     No.        (ft)        (ft)
      1        332.478      232.150
      2        343.923      224.998
      3        375.290      203.035
      4        396.583      181.742
```

5	426.385	151.940
6	468.811	109.514
7	600.100	111.358
8	836.395	114.376
9	878.821	156.802
10	921.247	199.229
11	963.674	241.655
12	971.639	249.620
13	1014.065	292.047
14	1044.020	322.001
15	1054.827	339.296

Factor of Safety
*** 1.846 ***

Failure Surface Specified By 15 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	332.478	232.150
2	343.923	224.998
3	375.290	203.035
4	396.583	181.742
5	426.385	151.940
6	468.811	109.514
7	600.100	111.358
8	836.395	114.376
9	878.821	156.802
10	921.247	199.229
11	963.674	241.655
12	971.639	249.620
13	1014.065	292.047
14	1044.020	322.001
15	1054.827	339.296

Factor of Safety
*** 1.846 ***

Failure Surface Specified By 15 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	332.478	232.150
2	343.923	224.998
3	375.290	203.035
4	396.583	181.742
5	426.385	151.940
6	468.811	109.514
7	600.100	111.358
8	836.395	114.376
9	878.821	156.802
10	921.247	199.229
11	963.674	241.655
12	971.639	249.620
13	1014.065	292.047
14	1044.020	322.001
15	1054.827	339.296

Factor of Safety
*** 1.846 ***

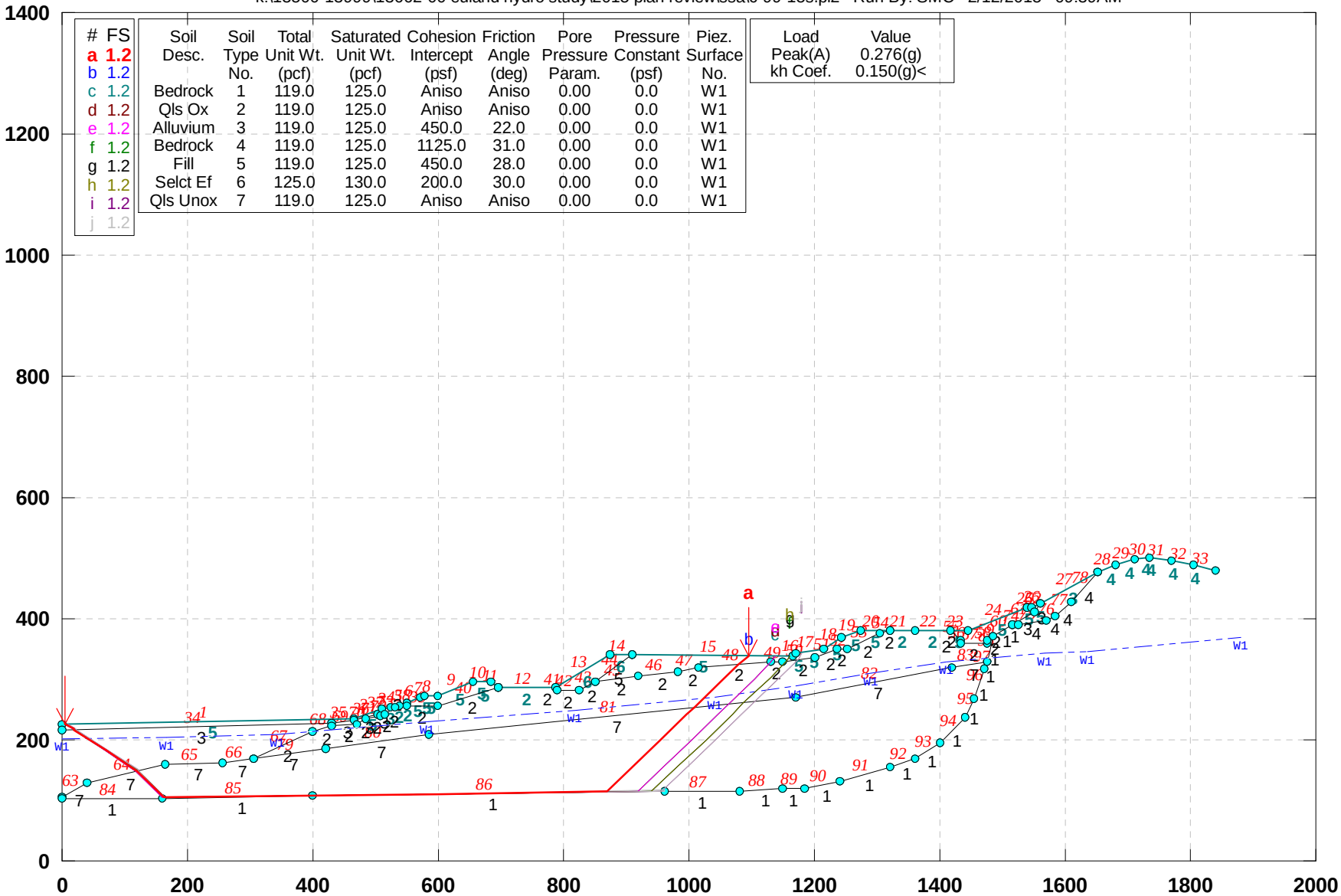
Failure Surface Specified By 15 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	338.126	232.272
2	349.556	225.129
3	378.730	204.701
4	401.066	182.366
5	431.756	151.676
6	474.182	109.249
7	600.100	111.099
8	826.624	114.462
9	869.051	156.888
10	911.477	199.315
11	953.903	241.741
12	960.654	248.492
13	1003.080	290.918
14	1033.433	321.271

```
     15       1044.771      339.414
         Factor of Safety
        ***    1.847   ***
            **** END OF GSTABL7 OUTPUT ****
```

13662-00, Euland Capital, C-C', - - Seismic

k:\13500-13999\13662-00 euland hydro study\2015 plan review\ssa\c-99-15s.pl2 Run By: SMC 2/12/2015 09:39AM



#	FS
a	1.2
b	1.2
c	1.2
d	1.2
e	1.2
f	1.2
g	1.2
h	1.2
i	1.2
j	1.2

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.
Bedrock	1	119.0	125.0	Aniso	Aniso	0.00	0.0	W1
Qls Ox	2	119.0	125.0	Aniso	Aniso	0.00	0.0	W1
Alluvium	3	119.0	125.0	450.0	22.0	0.00	0.0	W1
Bedrock	4	119.0	125.0	1125.0	31.0	0.00	0.0	W1
Fill	5	119.0	125.0	450.0	28.0	0.00	0.0	W1
Selct Ef	6	125.0	130.0	200.0	30.0	0.00	0.0	W1
Qls Unox	7	119.0	125.0	Aniso	Aniso	0.00	0.0	W1

Load	Value
Peak(A)	0.276(g)
kh Coef.	0.150(g)<

GSTABL7 v.2 FSmin=1.2

Safety Factors Are Calculated By The Simplified Janbu Method for the case of c & phi both > 0

Figure E-8.2

***** GSTABL7 *****

** GSTABL7 by Garry H. Gregory, P.E. **

** Original Version 1.0, January 1996; Current Version 2.005, Sept. 2006 **

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****

SLOPE STABILITY ANALYSIS SYSTEM

Modified Bishop, Simplified Janbu, or GLE Method of Slices.
(Includes Spencer & Morgenstern-Price Type Analysis)
Including Pier/Pile, Reinforcement, Soil Nail, Tieback,
Nonlinear Undrained Shear Strength, Curved Phi Envelope,
Anisotropic Soil, Fiber-Reinforced Soil, Boundary Loads, Water
Surfaces, Pseudo-Static & Newmark Earthquake, and Applied Forces.

****

Analysis Run Date: 2/12/2015
Time of Run: 09:39AM
Run By: SMC
Input Data Filename: K:\13500-13999\13662-00 Euland Hydro Study\2015 Plan Review\SSA\c-99-15s.
Output Filename: K:\13500-13999\13662-00 Euland Hydro Study\2015 Plan Review\SSA\c-99-15s.OUT
Unit System: English
Plotted Output Filename: K:\13500-13999\13662-00 Euland Hydro Study\2015 Plan Review\SSA\c-99-15s.PLT
PROBLEM DESCRIPTION: 13662-00, Euland Capital, C-C',
- - Seismic

BOUNDARY COORDINATES
33 Top Boundaries
98 Total Boundaries

Boundary No.	X-Left (ft)	Y-Left (ft)	X-Right (ft)	Y-Right (ft)	Soil Type Below Bnd
1	0.00	225.00	465.00	235.00	5
2	465.00	235.00	510.00	252.00	5
3	510.00	252.00	523.00	253.00	3
4	523.00	253.00	537.00	255.00	2
5	537.00	255.00	550.00	260.00	2
6	550.00	260.00	570.00	270.00	5
7	570.00	270.00	578.00	272.00	5
8	578.00	272.00	600.00	273.00	5
9	600.00	273.00	656.00	295.00	5
10	656.00	295.00	685.00	295.00	5
11	685.00	295.00	696.00	287.00	5
12	696.00	287.00	788.00	287.00	2
13	788.00	287.00	875.00	341.00	6
14	875.00	341.00	910.00	341.00	6
15	910.00	341.00	1165.00	338.00	5
16	1165.00	338.00	1170.00	342.00	5
17	1170.00	342.00	1215.00	351.00	5
18	1215.00	351.00	1244.00	370.00	5
19	1244.00	370.00	1273.00	380.00	5
20	1273.00	380.00	1320.00	380.00	5
21	1320.00	380.00	1360.00	380.00	2
22	1360.00	380.00	1418.00	380.00	2
23	1418.00	380.00	1445.00	380.00	5
24	1445.00	380.00	1540.00	418.00	5
25	1540.00	418.00	1547.00	418.00	5
26	1547.00	418.00	1560.00	425.00	5
27	1560.00	425.00	1653.00	476.00	3
28	1653.00	476.00	1680.00	489.00	4
29	1680.00	489.00	1710.00	498.00	4
30	1710.00	498.00	1735.00	500.00	4
31	1735.00	500.00	1770.00	495.00	4
32	1770.00	495.00	1805.00	488.00	4
33	1805.00	488.00	1840.00	480.00	4
34	0.00	217.00	430.00	227.00	3
35	430.00	227.00	465.00	232.00	3
36	465.00	232.00	502.00	243.00	3
37	502.00	243.00	510.00	252.00	3
38	550.00	260.00	551.00	255.00	2
39	551.00	255.00	600.00	255.00	2
40	600.00	255.00	696.00	287.00	2

41	788.00	287.00	789.00	281.00	2
42	789.00	281.00	825.00	281.00	2
43	825.00	281.00	850.00	295.00	2
44	850.00	295.00	910.00	341.00	5
45	850.00	295.00	920.00	305.00	2
46	920.00	305.00	983.00	312.00	2
47	983.00	312.00	1015.00	320.00	2
48	1015.00	320.00	1131.00	328.00	2
49	1131.00	328.00	1148.00	330.00	2
50	1148.00	330.00	1200.00	337.00	2
51	1200.00	337.00	1237.00	350.00	2
52	1237.00	350.00	1252.00	350.00	2
53	1252.00	350.00	1305.00	375.00	2
54	1305.00	375.00	1320.00	380.00	2
55	1418.00	380.00	1433.00	365.00	2
56	1433.00	365.00	1434.00	360.00	2
57	1434.00	360.00	1475.00	360.00	2
58	1475.00	360.00	1476.00	365.00	2
59	1476.00	365.00	1485.00	372.00	2
60	1485.00	372.00	1515.00	390.00	1
61	1515.00	390.00	1550.00	412.00	3
62	1550.00	412.00	1560.00	425.00	3
63	0.00	105.00	40.00	130.00	7
64	40.00	130.00	165.00	160.00	7
65	165.00	160.00	255.00	162.00	7
66	255.00	162.00	305.00	169.00	7
67	305.00	169.00	400.00	215.00	2
68	400.00	215.00	430.00	224.00	2
69	430.00	224.00	470.00	225.00	2
70	470.00	225.00	483.00	235.00	2
71	483.00	235.00	508.00	240.00	2
72	508.00	240.00	515.00	243.00	2
73	515.00	243.00	532.00	253.00	2
74	1515.00	390.00	1525.00	390.00	1
75	1525.00	390.00	1570.00	397.00	4
76	1570.00	397.00	1585.00	404.00	4
77	1585.00	404.00	1610.00	427.00	4
78	1610.00	427.00	1653.00	476.00	4
79	305.00	169.00	420.00	185.00	7
80	420.00	185.00	586.00	210.00	7
81	586.00	210.00	1170.00	270.00	7
82	1170.00	270.00	1420.00	320.00	7
83	1420.00	320.00	1476.00	330.00	7
84	0.00	103.00	160.00	104.00	1
85	160.00	104.00	400.00	107.00	1
86	400.00	107.00	960.00	114.00	1
87	960.00	114.00	1080.00	115.00	1
88	1080.00	115.00	1150.00	119.00	1
89	1150.00	119.00	1185.00	121.00	1
90	1185.00	121.00	1240.00	131.00	1
91	1240.00	131.00	1320.00	154.00	1
92	1320.00	154.00	1360.00	170.00	1
93	1360.00	170.00	1400.00	194.00	1
94	1400.00	194.00	1440.00	238.00	1
95	1440.00	238.00	1455.00	268.00	1
96	1455.00	268.00	1470.00	318.00	1
97	1470.00	318.00	1476.00	330.00	1
98	1476.00	330.00	1485.00	372.00	1

Default Y-Origin = 0.00(ft)
Default X-Plus Value = 0.00(ft)
Default Y-Plus Value = 0.00(ft)

ISOTROPIC SOIL PARAMETERS
7 Type(s) of Soil

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.
1	119.0	125.0	0.0	0.0	0.00	0.0	1
2	119.0	125.0	0.0	0.0	0.00	0.0	1
3	119.0	125.0	450.0	22.0	0.00	0.0	1
4	119.0	125.0	1125.0	31.0	0.00	0.0	1

```
   5   119.0    125.0     450.0     28.0    0.00       0.0      1
   6   125.0    130.0     200.0     30.0    0.00       0.0      1
   7   119.0    125.0       0.0      0.0    0.00       0.0      1
ANISOTROPIC STRENGTH PARAMETERS
     3 soil type(s)
 Soil Type  1 Is Anisotropic
 Number Of Direction Ranges Specified =  3
 Direction    Counterclockwise     Cohesion     Friction
   Range       Direction Limit    Intercept       Angle
    No.            (deg)            (psf)         (deg)
     1              0.0            1125.00         31.00
     2              5.0             450.00         17.00
     3             90.0            1125.00         31.00
 Soil Type  2 Is Anisotropic
 Number Of Direction Ranges Specified =  3
 Direction    Counterclockwise     Cohesion     Friction
   Range       Direction Limit    Intercept       Angle
    No.            (deg)            (psf)         (deg)
     1              0.0             525.00         25.00
     2             15.0             375.00         14.50
     3             90.0             450.00         22.00
 Soil Type  7 Is Anisotropic
 Number Of Direction Ranges Specified =  3
 Direction    Counterclockwise     Cohesion     Friction
   Range       Direction Limit    Intercept       Angle
    No.            (deg)            (psf)         (deg)
     1              0.0             750.00         31.00
     2             15.0             375.00         14.50
     3             90.0             450.00         22.00
 ANISOTROPIC SOIL NOTES:
    (1) An input value of 0.01 for C and/or Phi will cause Aniso
        C and/or Phi to be ignored in that range.
    (2) An input value of 0.02 for Phi will set both Phi and
        C equal to zero, with no water weight in the tension crack.
    (3) An input value of 0.03 for Phi will set both Phi and
        C equal to zero, with water weight in the tension crack.
 1 PIEZOMETRIC SURFACE(S) SPECIFIED
 Unit Weight of Water =  62.40 (pcf)
 Piezometric Surface No.  1 Specified by 12 Coordinate Points
 Pore Pressure Inclination Factor =  0.50
   Point      X-Water     Y-Water
    No.         (ft)        (ft)
     1          0.00      202.00
     2        168.00      205.00
     3        343.00      210.00
     4        583.00      230.00
     5        818.00      250.00
     6       1042.00      270.00
     7       1170.00      290.00
     8       1289.00      310.00
     9       1410.00      330.00
    10       1568.00      343.00
    11       1636.00      345.00
    12       1880.00      370.00
 Specified Peak Ground Acceleration Coefficient (A) =   0.276(g)
 Specified Horizontal Earthquake Coefficient (kh) =   0.150(g)
 Specified Vertical Earthquake Coefficient (kv) =   0.000(g)
 Specified Seismic Pore-Pressure Factor =   0.000
 Janbus Empirical Coef is being used for the case of  c & phi both > 0
 A Critical Failure Surface Searching Method, Using A Random
 Technique For Generating Sliding Block Surfaces, Has Been
 Specified.
 The Active And Passive Portions Of The Sliding Surfaces
 Are Generated According To The Rankine Theory.
 5000 Trial Surfaces Have Been Generated.
 3 Boxes Specified For Generation Of Central Block Base
 Length Of Line Segments For Active And Passive Portions Of
 Sliding Block Is  60.0
 Box        X-Left     Y-Left    X-Right    Y-Right      Height
 No.         (ft)       (ft)       (ft)       (ft)        (ft)
```

1	160.00	106.00	600.00	111.00	1.00
2	600.10	111.00	600.10	111.00	1.00
3	730.00	113.00	960.00	116.00	1.00

Following Are Displayed The Ten Most Critical Of The Trial
Failure Surfaces Evaluated. They Are
Ordered - Most Critical First.
* * Safety Factors Are Calculated By The Simplified Janbu Method * *
Total Number of Trial Surfaces Attempted = 5000
Number of Trial Surfaces With Valid FS = 5000
Statistical Data On All Valid FS Values:
FS Max = 1.812 FS Min = 1.156 FS Ave = 1.267
Standard Deviation = 0.106 Coefficient of Variation = 8.39 %
Failure Surface Specified By 16 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	4.935	225.106
2	17.739	217.413
3	19.681	216.103
4	69.423	182.551
5	119.165	149.000
6	119.588	148.577
7	162.014	106.151
8	600.100	110.528
9	870.086	114.907
10	912.512	157.334
11	954.939	199.760
12	997.365	242.186
13	1008.596	253.417
14	1051.023	295.844
15	1079.636	324.458
16	1094.014	338.835

Factor of Safety
*** 1.156 ***
Individual data on the 0 slices

Slice No.	Width (ft)	Weight (lbs)	Water Force Top (lbs)	Water Force Bot (lbs)	Tie Force Norm (lbs)	Tie Force Tan (lbs)	Earthquake Force Hor (lbs)	Earthquake Force Ver (lbs)	Surcharge Load (lbs)

Failure Surface Specified By 16 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	4.935	225.106
2	17.739	217.413
3	19.681	216.103
4	69.423	182.551
5	119.165	149.000
6	119.588	148.577
7	162.014	106.151
8	600.100	110.528
9	870.086	114.907
10	912.512	157.334
11	954.939	199.760
12	997.365	242.186
13	1008.596	253.417
14	1051.023	295.844
15	1079.636	324.458
16	1094.014	338.835

Factor of Safety
*** 1.156 ***
Failure Surface Specified By 16 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	4.064	225.087
2	16.871	217.392
3	19.018	215.944
4	68.761	182.392
5	118.503	148.841
6	118.514	148.830
7	160.940	106.404
8	600.100	111.180

9	918.040	115.290
10	960.467	157.716
11	1002.893	200.143
12	1045.319	242.569
13	1061.615	258.865
14	1104.041	301.291
15	1130.732	327.981
16	1136.950	338.330

Factor of Safety
*** 1.156 ***

Failure Surface Specified By 16 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	4.064	225.087
2	16.871	217.392
3	19.018	215.944
4	68.761	182.392
5	118.503	148.841
6	118.514	148.830
7	160.940	106.404
8	600.100	111.180
9	918.040	115.290
10	960.467	157.716
11	1002.893	200.143
12	1045.319	242.569
13	1061.615	258.865
14	1104.041	301.291
15	1130.732	327.981
16	1136.950	338.330

Factor of Safety
*** 1.156 ***

Failure Surface Specified By 16 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	4.064	225.087
2	16.871	217.392
3	19.018	215.944
4	68.761	182.392
5	118.503	148.841
6	118.514	148.830
7	160.940	106.404
8	600.100	111.180
9	918.040	115.290
10	960.467	157.716
11	1002.893	200.143
12	1045.319	242.569
13	1061.615	258.865
14	1104.041	301.291
15	1130.732	327.981
16	1136.950	338.330

Factor of Safety
*** 1.156 ***

Failure Surface Specified By 16 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	6.577	225.141
2	19.377	217.451
3	20.931	216.403
4	70.673	182.851
5	120.415	149.300
6	121.092	148.623
7	163.518	106.197
8	600.100	110.615
9	940.950	115.571
10	983.377	157.998
11	1025.803	200.424
12	1068.229	242.851
13	1086.835	261.456
14	1129.261	303.882
15	1156.527	331.148

16	1160.675	338.051

Factor of Safety
*** 1.156 ***

Failure Surface Specified By 16 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	6.577	225.141
2	19.377	217.451
3	20.931	216.403
4	70.673	182.851
5	120.415	149.300
6	121.092	148.623
7	163.518	106.197
8	600.100	110.615
9	940.950	115.571
10	983.377	157.998
11	1025.803	200.424
12	1068.229	242.851
13	1086.835	261.456
14	1129.261	303.882
15	1156.527	331.148
16	1160.675	338.051

Factor of Safety
*** 1.156 ***

Failure Surface Specified By 16 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	6.577	225.141
2	19.377	217.451
3	20.931	216.403
4	70.673	182.851
5	120.415	149.300
6	121.092	148.623
7	163.518	106.197
8	600.100	110.615
9	940.950	115.571
10	983.377	157.998
11	1025.803	200.424
12	1068.229	242.851
13	1086.835	261.456
14	1129.261	303.882
15	1156.527	331.148
16	1160.675	338.051

Factor of Safety
*** 1.156 ***

Failure Surface Specified By 16 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	8.606	225.185
2	21.400	217.498
3	22.474	216.773
4	72.216	183.222
5	121.959	149.670
6	122.810	148.818
7	165.237	106.392
8	600.100	110.572
9	956.224	115.759
10	998.650	158.185
11	1041.077	200.612
12	1083.503	243.038
13	1103.648	263.183
14	1146.074	305.609
15	1173.959	333.495
16	1180.309	344.062

Factor of Safety
*** 1.157 ***

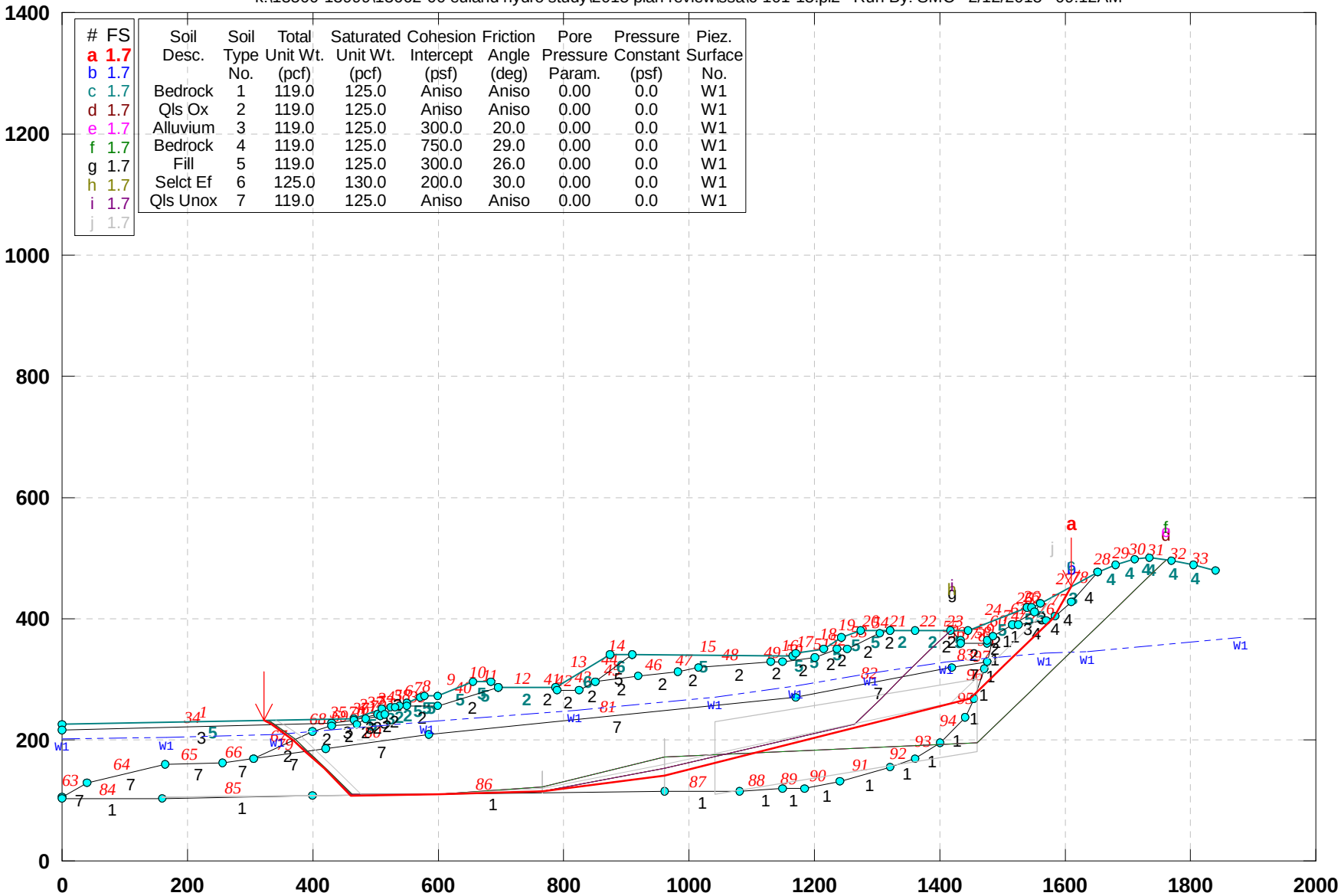
Failure Surface Specified By 16 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	8.606	225.185

```
       2         21.400      217.498
       3         22.474      216.773
       4         72.216      183.222
       5        121.959      149.670
       6        122.810      148.818
       7        165.237      106.392
       8        600.100      110.572
       9        956.224      115.759
      10        998.650      158.185
      11       1041.077      200.612
      12       1083.503      243.038
      13       1103.648      263.183
      14       1146.074      305.609
      15       1173.959      333.495
      16       1180.309      344.062
          Factor of Safety
         ***    1.157   ***
             **** END OF GSTABL7 OUTPUT ****
```

13662-00, Euland Capital, C-C', - - Static-

k:\13500-13999\13662-00 euland hydro study\2015 plan review\ssa\c-101-15.pl2 Run By: SMC 2/12/2015 09:12AM



#	FS
a	1.7
b	1.7
c	1.7
d	1.7
e	1.7
f	1.7
g	1.7
h	1.7
i	1.7
j	1.7

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.
Bedrock	1	119.0	125.0	Aniso	Aniso	0.00	0.0	W1
Qls Ox	2	119.0	125.0	Aniso	Aniso	0.00	0.0	W1
Alluvium	3	119.0	125.0	300.0	20.0	0.00	0.0	W1
Bedrock	4	119.0	125.0	750.0	29.0	0.00	0.0	W1
Fill	5	119.0	125.0	300.0	26.0	0.00	0.0	W1
Selct Ef	6	125.0	130.0	200.0	30.0	0.00	0.0	W1
Qls Unox	7	119.0	125.0	Aniso	Aniso	0.00	0.0	W1

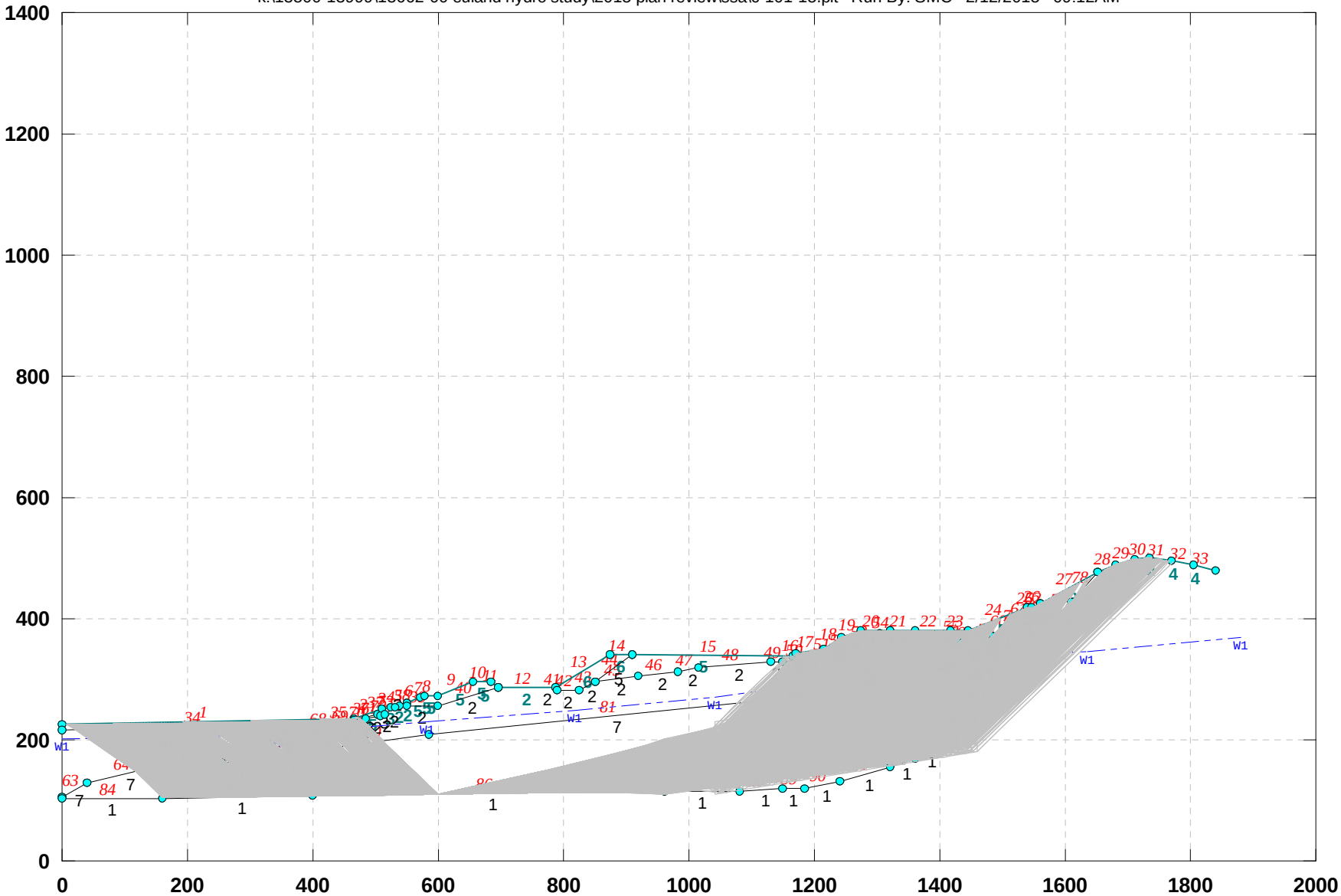
GSTABL7 v.2 FSmin=1.7

Safety Factors Are Calculated By The Simplified Janbu Method for the case of c & phi both > 0

Figure E-9.1

13662-00, Euland Capital, C-C', - - Static-

k:\13500-13999\13662-00 euland hydro study\2015 plan review\ssa\c-101-15.plt Run By: SMC 2/12/2015 09:12AM



***** GSTABL7 *****

** GSTABL7 by Garry H. Gregory, P.E. **

** Original Version 1.0, January 1996; Current Version 2.005, Sept. 2006 **

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SLOPE STABILITY ANALYSIS SYSTEM

Modified Bishop, Simplified Janbu, or GLE Method of Slices.
(Includes Spencer & Morgenstern-Price Type Analysis)
Including Pier/Pile, Reinforcement, Soil Nail, Tieback,
Nonlinear Undrained Shear Strength, Curved Phi Envelope,
Anisotropic Soil, Fiber-Reinforced Soil, Boundary Loads, Water
Surfaces, Pseudo-Static & Newmark Earthquake, and Applied Forces.

****

Analysis Run Date: 2/12/2015
Time of Run: 09:12AM
Run By: SMC
Input Data Filename: K:\13500-13999\13662-00 Euland Hydro Study\2015 Plan Review\SSA\c-101-15.
Output Filename: K:\13500-13999\13662-00 Euland Hydro Study\2015 Plan Review\SSA\c-101-15.OUT
Unit System: English
Plotted Output Filename: K:\13500-13999\13662-00 Euland Hydro Study\2015 Plan Review\SSA\c-101-15.PLT
PROBLEM DESCRIPTION: 13662-00, Euland Capital, C-C',
- - Static-

BOUNDARY COORDINATES
33 Top Boundaries
98 Total Boundaries

Boundary No.	X-Left (ft)	Y-Left (ft)	X-Right (ft)	Y-Right (ft)	Soil Type Below Bnd
1	0.00	225.00	465.00	235.00	5
2	465.00	235.00	510.00	252.00	5
3	510.00	252.00	523.00	253.00	3
4	523.00	253.00	537.00	255.00	2
5	537.00	255.00	550.00	260.00	2
6	550.00	260.00	570.00	270.00	5
7	570.00	270.00	578.00	272.00	5
8	578.00	272.00	600.00	273.00	5
9	600.00	273.00	656.00	295.00	5
10	656.00	295.00	685.00	295.00	5
11	685.00	295.00	696.00	287.00	5
12	696.00	287.00	788.00	287.00	2
13	788.00	287.00	875.00	341.00	6
14	875.00	341.00	910.00	341.00	6
15	910.00	341.00	1165.00	338.00	5
16	1165.00	338.00	1170.00	342.00	5
17	1170.00	342.00	1215.00	351.00	5
18	1215.00	351.00	1244.00	370.00	5
19	1244.00	370.00	1273.00	380.00	5
20	1273.00	380.00	1320.00	380.00	5
21	1320.00	380.00	1360.00	380.00	2
22	1360.00	380.00	1418.00	380.00	2
23	1418.00	380.00	1445.00	380.00	5
24	1445.00	380.00	1540.00	418.00	5
25	1540.00	418.00	1547.00	418.00	5
26	1547.00	418.00	1560.00	425.00	5
27	1560.00	425.00	1653.00	476.00	3
28	1653.00	476.00	1680.00	489.00	4
29	1680.00	489.00	1710.00	498.00	4
30	1710.00	498.00	1735.00	500.00	4
31	1735.00	500.00	1770.00	495.00	4
32	1770.00	495.00	1805.00	488.00	4
33	1805.00	488.00	1840.00	480.00	4
34	0.00	217.00	430.00	227.00	3
35	430.00	227.00	465.00	232.00	3
36	465.00	232.00	502.00	243.00	3
37	502.00	243.00	510.00	252.00	3
38	550.00	260.00	551.00	255.00	2
39	551.00	255.00	600.00	255.00	2
40	600.00	255.00	696.00	287.00	2

41	788.00	287.00	789.00	281.00	2
42	789.00	281.00	825.00	281.00	2
43	825.00	281.00	850.00	295.00	2
44	850.00	295.00	910.00	341.00	5
45	850.00	295.00	920.00	305.00	2
46	920.00	305.00	983.00	312.00	2
47	983.00	312.00	1015.00	320.00	2
48	1015.00	320.00	1131.00	328.00	2
49	1131.00	328.00	1148.00	330.00	2
50	1148.00	330.00	1200.00	337.00	2
51	1200.00	337.00	1237.00	350.00	2
52	1237.00	350.00	1252.00	350.00	2
53	1252.00	350.00	1305.00	375.00	2
54	1305.00	375.00	1320.00	380.00	2
55	1418.00	380.00	1433.00	365.00	2
56	1433.00	365.00	1434.00	360.00	2
57	1434.00	360.00	1475.00	360.00	2
58	1475.00	360.00	1476.00	365.00	2
59	1476.00	365.00	1485.00	372.00	2
60	1485.00	372.00	1515.00	390.00	1
61	1515.00	390.00	1550.00	412.00	3
62	1550.00	412.00	1560.00	425.00	3
63	0.00	105.00	40.00	130.00	7
64	40.00	130.00	165.00	160.00	7
65	165.00	160.00	255.00	162.00	7
66	255.00	162.00	305.00	169.00	7
67	305.00	169.00	400.00	215.00	2
68	400.00	215.00	430.00	224.00	2
69	430.00	224.00	470.00	225.00	2
70	470.00	225.00	483.00	235.00	2
71	483.00	235.00	508.00	240.00	2
72	508.00	240.00	515.00	243.00	2
73	515.00	243.00	532.00	253.00	2
74	1515.00	390.00	1525.00	390.00	1
75	1525.00	390.00	1570.00	397.00	4
76	1570.00	397.00	1585.00	404.00	4
77	1585.00	404.00	1610.00	427.00	4
78	1610.00	427.00	1653.00	476.00	4
79	305.00	169.00	420.00	185.00	7
80	420.00	185.00	586.00	210.00	7
81	586.00	210.00	1170.00	270.00	7
82	1170.00	270.00	1420.00	320.00	7
83	1420.00	320.00	1476.00	330.00	7
84	0.00	103.00	160.00	104.00	1
85	160.00	104.00	400.00	107.00	1
86	400.00	107.00	960.00	114.00	1
87	960.00	114.00	1080.00	115.00	1
88	1080.00	115.00	1150.00	119.00	1
89	1150.00	119.00	1185.00	121.00	1
90	1185.00	121.00	1240.00	131.00	1
91	1240.00	131.00	1320.00	154.00	1
92	1320.00	154.00	1360.00	170.00	1
93	1360.00	170.00	1400.00	194.00	1
94	1400.00	194.00	1440.00	238.00	1
95	1440.00	238.00	1455.00	268.00	1
96	1455.00	268.00	1470.00	318.00	1
97	1470.00	318.00	1476.00	330.00	1
98	1476.00	330.00	1485.00	372.00	1

Default Y-Origin = 0.00(ft)
Default X-Plus Value = 0.00(ft)
Default Y-Plus Value = 0.00(ft)

ISOTROPIC SOIL PARAMETERS
7 Type(s) of Soil

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.
1	119.0	125.0	0.0	0.0	0.00	0.0	1
2	119.0	125.0	0.0	0.0	0.00	0.0	1
3	119.0	125.0	300.0	20.0	0.00	0.0	1
4	119.0	125.0	750.0	29.0	0.00	0.0	1

5	119.0	125.0	300.0	26.0	0.00	0.0	1
6	125.0	130.0	200.0	30.0	0.00	0.0	1
7	119.0	125.0	0.0	0.0	0.00	0.0	1

ANISOTROPIC STRENGTH PARAMETERS
3 soil type(s)

Soil Type 1 Is Anisotropic
Number Of Direction Ranges Specified = 3

Direction Range No.	Counterclockwise Direction Limit (deg)	Cohesion Intercept (psf)	Friction Angle (deg)
1	0.0	750.00	29.00
2	5.0	300.00	15.00
3	90.0	750.00	29.00

Soil Type 2 Is Anisotropic
Number Of Direction Ranges Specified = 3

Direction Range No.	Counterclockwise Direction Limit (deg)	Cohesion Intercept (psf)	Friction Angle (deg)
1	0.0	350.00	23.00
2	15.0	250.00	12.50
3	90.0	300.00	20.00

Soil Type 7 Is Anisotropic
Number Of Direction Ranges Specified = 3

Direction Range No.	Counterclockwise Direction Limit (deg)	Cohesion Intercept (psf)	Friction Angle (deg)
1	0.0	500.00	29.00
2	15.0	250.00	12.50
3	90.0	300.00	20.00

ANISOTROPIC SOIL NOTES:
(1) An input value of 0.01 for C and/or Phi will cause Aniso C and/or Phi to be ignored in that range.
(2) An input value of 0.02 for Phi will set both Phi and C equal to zero, with no water weight in the tension crack.
(3) An input value of 0.03 for Phi will set both Phi and C equal to zero, with water weight in the tension crack.

1 PIEZOMETRIC SURFACE(S) SPECIFIED
Unit Weight of Water = 62.40 (pcf)
Piezometric Surface No. 1 Specified by 12 Coordinate Points
Pore Pressure Inclination Factor = 0.50

Point No.	X-Water (ft)	Y-Water (ft)
1	0.00	202.00
2	168.00	205.00
3	343.00	210.00
4	583.00	230.00
5	818.00	250.00
6	1042.00	270.00
7	1170.00	290.00
8	1289.00	310.00
9	1410.00	330.00
10	1568.00	343.00
11	1636.00	345.00
12	1880.00	370.00

Janbus Empirical Coef is being used for the case of c & phi both > 0
A Critical Failure Surface Searching Method, Using A Random Technique For Generating Sliding Block Surfaces, Has Been Specified.
The Active And Passive Portions Of The Sliding Surfaces Are Generated According To The Rankine Theory.
5000 Trial Surfaces Have Been Generated.
5 Boxes Specified For Generation Of Central Block Base Length Of Line Segments For Active And Passive Portions Of Sliding Block Is 60.0

Box No.	X-Left (ft)	Y-Left (ft)	X-Right (ft)	Y-Right (ft)	Height (ft)
1	160.00	106.00	600.00	111.00	1.00
2	600.10	111.00	600.10	111.00	1.00
3	765.00	130.00	765.00	130.00	35.00
4	960.00	156.00	960.00	156.00	90.00

```
 5        1040.00     170.00    1460.00     240.00     120.00
****  ERROR - BK12  ****
```

>>Points on active or passive wedges are outside defined ground surface

```
Following Are Displayed The Ten Most Critical Of The Trial
      Failure Surfaces Evaluated. They Are
      Ordered - Most Critical First.
      * * Safety Factors Are Calculated By The Simplified Janbu Method * *
      Total Number of Trial Surfaces Attempted =  5000
      Number of Trial Surfaces With Valid FS = 5000
      Statistical Data On All Valid FS Values:
         FS Max =   3.194   FS Min =   1.654   FS Ave =   1.887
         Standard Deviation =    0.353   Coefficient of Variation =   18.73 %
      Failure Surface Specified By 15 Coordinate Points
        Point      X-Surf      Y-Surf
         No.        (ft)        (ft)
          1        322.193      231.929
          2        333.666      224.760
          3        369.025      200.001
          4        388.420      180.606
          5        417.361      151.665
          6        459.788      109.239
          7        600.100      110.833
          8        765.000      114.241
          9        960.000      140.218
         10       1446.747      268.018
         11       1458.545      279.816
         12       1500.971      322.243
         13       1543.398      364.669
         14       1580.741      402.013
         15       1610.640      452.770
             Factor of Safety
            ***    1.654   ***
          Individual data on the    83  slices
                     Water  Water     Tie     Tie     Earthquake
                     Force  Force    Force   Force       Force   Surcharge
 Slice  Width   Weight    Top    Bot     Norm     Tan     Hor     Ver    Load
  No.    (ft)    (lbs)   (lbs)  (lbs)    (lbs)   (lbs)   (lbs)   (lbs)   (lbs)
   1     11.5    5062.5     0.0     0.0       0.      0.     0.0     0.0     0.0
   2     19.8   34385.5     0.0     0.0       0.      0.     0.0     0.0     0.0
   3     15.5   51069.7     0.0  7171.6       0.      0.     0.0     0.0     0.0
   4     19.4  101507.0     0.0 38672.6       0.      0.     0.0     0.0     0.0
   5     11.0   78630.2     0.0 37687.0       0.      0.     0.0     0.0     0.0
   6      0.6    4937.9     0.0  2489.1       0.      0.     0.0     0.0     0.0
   7     17.4  157455.1     0.0 84168.5       0.      0.     0.0     0.0     0.0
   8      2.6   27310.8     0.0 15307.1       0.      0.     0.0     0.0     0.0
   9     10.0  111588.5     0.0 64028.5       0.      0.     0.0     0.0     0.0
  10     29.8  408268.3     0.0 *******       0.      0.     0.0     0.0     0.0
  11      5.2   81403.1     0.0 35877.7       0.      0.     0.0     0.0     0.0
  12      5.0   78657.8     0.0 34530.0       0.      0.     0.0     0.0     0.0
  13     13.0  209662.1     0.0 90301.5       0.      0.     0.0     0.0     0.0
  14     19.0  319815.3     0.0 *******       0.      0.     0.0     0.0     0.0
  15      6.0  104296.8     0.0 42442.9       0.      0.     0.0     0.0     0.0
  16      2.0   35117.9     0.0 14183.5       0.      0.     0.0     0.0     0.0
  17      5.0   88117.7     0.0 35537.0       0.      0.     0.0     0.0     0.0
  18      8.0  141416.4     0.0 57091.9       0.      0.     0.0     0.0     0.0
  19      9.0  160041.0     0.0 64570.7       0.      0.     0.0     0.0     0.0
  20      5.0   89474.4     0.0 36029.3       0.      0.     0.0     0.0     0.0
  21     13.0  236945.5     0.0 94199.7       0.      0.     0.0     0.0     0.0
  22      1.0   18547.4     0.0  7277.5       0.      0.     0.0     0.0     0.0
  23     19.0  363529.8     0.0 *******       0.      0.     0.0     0.0     0.0
  24      8.0  158439.6     0.0 59061.1       0.      0.     0.0     0.0     0.0
  25      5.0   99657.4     0.0 37058.6       0.      0.     0.0     0.0     0.0
  26      3.0   59848.0     0.0 22286.1       0.      0.     0.0     0.0     0.0
  27     14.0  279825.8     0.0 *******       0.      0.     0.0     0.0     0.0
  28      0.1    2001.6     0.0   749.8       0.      0.     0.0     0.0     0.0
  29     55.9 1189123.5     0.0 *******       0.      0.     0.0     0.0     0.0
  30     29.0  652237.6     0.0 *******       0.      0.     0.0     0.0     0.0
  31     11.0  241708.2     0.0 86499.9       0.      0.     0.0     0.0     0.0
  32     69.0 1477602.1     0.0 *******       0.      0.     0.0     0.0     0.0
  33     23.0  486619.3     0.0 *******       0.      0.     0.0     0.0     0.0
```

34	1.0	21020.5	0.0	8161.6	0.	0.	0.0	0.0	0.0
35	29.0	636844.7	0.0	*******	0.	0.	0.0	0.0	0.0
36	7.0	161462.0	0.0	56420.4	0.	0.	0.0	0.0	0.0
37	25.0	600188.4	0.0	*******	0.	0.	0.0	0.0	0.0
38	25.0	636120.2	0.0	*******	0.	0.	0.0	0.0	0.0
39	35.0	902761.2	0.0	*******	0.	0.	0.0	0.0	0.0
40	10.0	253430.8	0.0	78025.1	0.	0.	0.0	0.0	0.0
41	40.0	996208.1	0.0	*******	0.	0.	0.0	0.0	0.0
42	23.0	555854.2	0.0	*******	0.	0.	0.0	0.0	0.0
43	32.0	743724.0	0.0	*******	0.	0.	0.0	0.0	0.0
44	27.0	600690.9	0.0	*******	0.	0.	0.0	0.0	0.0
45	89.0	1807343.0	0.0	*******	0.	0.	0.0	0.0	0.0
46	17.0	315242.2	0.0	*******	0.	0.	0.0	0.0	0.0
47	17.0	305625.8	0.0	*******	0.	0.	0.0	0.0	0.0
48	5.0	89267.3	0.0	30250.8	0.	0.	0.0	0.0	0.0
49	30.0	536720.6	0.0	*******	0.	0.	0.0	0.0	0.0
50	15.0	265659.0	0.0	86949.7	0.	0.	0.0	0.0	0.0
51	22.0	399483.8	0.0	*******	0.	0.	0.0	0.0	0.0
52	7.0	131793.9	0.0	39187.6	0.	0.	0.0	0.0	0.0
53	8.0	152209.5	0.0	44425.2	0.	0.	0.0	0.0	0.0
54	21.0	402360.7	0.0	*******	0.	0.	0.0	0.0	0.0
55	16.0	304040.4	0.0	85675.7	0.	0.	0.0	0.0	0.0
56	16.0	295900.0	0.0	84151.3	0.	0.	0.0	0.0	0.0
57	15.0	270008.0	0.0	77452.2	0.	0.	0.0	0.0	0.0
58	40.0	685018.9	0.0	*******	0.	0.	0.0	0.0	0.0
59	50.0	784677.6	0.0	*******	0.	0.	0.0	0.0	0.0
60	8.0	118184.2	0.0	36474.5	0.	0.	0.0	0.0	0.0
61	2.0	29222.8	0.0	9002.7	0.	0.	0.0	0.0	0.0
62	13.0	186796.8	0.0	57387.4	0.	0.	0.0	0.0	0.0
63	1.0	14142.7	0.0	4333.3	0.	0.	0.0	0.0	0.0
64	11.0	153436.7	0.0	46900.9	0.	0.	0.0	0.0	0.0
65	1.7	24078.9	0.0	7318.9	0.	0.	0.0	0.0	0.0
66	11.8	157435.5	0.0	61834.8	0.	0.	0.0	0.0	0.0
67	11.5	142618.1	0.0	49287.5	0.	0.	0.0	0.0	0.0
68	5.0	59088.0	0.0	18193.0	0.	0.	0.0	0.0	0.0
69	1.0	11586.9	0.0	3396.5	0.	0.	0.0	0.0	0.0
70	1.2	13626.1	0.0	3918.9	0.	0.	0.0	0.0	0.0
71	7.8	87196.5	0.0	23017.1	0.	0.	0.0	0.0	0.0
72	16.0	163586.4	0.0	31705.1	0.	0.	0.0	0.0	0.0
73	14.0	127509.5	0.0	10864.1	0.	0.	0.0	0.0	0.0
74	2.6	21804.5	0.0	268.7	0.	0.	0.0	0.0	0.0
75	7.4	60001.0	0.0	0.0	0.	0.	0.0	0.0	0.0
76	15.0	109293.2	0.0	0.0	0.	0.	0.0	0.0	0.0
77	3.4	22250.0	0.0	0.0	0.	0.	0.0	0.0	0.0
78	3.6	22089.5	0.0	0.0	0.	0.	0.0	0.0	0.0
79	3.0	17506.0	0.0	0.0	0.	0.	0.0	0.0	0.0
80	10.0	54783.3	0.0	0.0	0.	0.	0.0	0.0	0.0
81	10.0	49350.1	0.0	0.0	0.	0.	0.0	0.0	0.0
82	10.7	47022.0	0.0	0.0	0.	0.	0.0	0.0	0.0
83	29.9	61127.9	0.0	0.0	0.	0.	0.0	0.0	0.0

Failure Surface Specified By 15 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	322.193	231.929
2	333.666	224.760
3	369.025	200.001
4	388.420	180.606
5	417.361	151.665
6	459.788	109.239
7	600.100	110.833
8	765.000	114.241
9	960.000	140.218
10	1446.747	268.018
11	1458.545	279.816
12	1500.971	322.243
13	1543.398	364.669
14	1580.741	402.013
15	1610.640	452.770

Factor of Safety

*** 1.654 ***

Failure Surface Specified By 15 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	322.193	231.929
2	333.666	224.760
3	369.025	200.001
4	388.420	180.606
5	417.361	151.665
6	459.788	109.239
7	600.100	110.833
8	765.000	114.241
9	960.000	140.218
10	1446.747	268.018
11	1458.545	279.816
12	1500.971	322.243
13	1543.398	364.669
14	1580.741	402.013
15	1610.640	452.770

Factor of Safety
*** 1.654 ***

Failure Surface Specified By 18 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	327.841	232.050
2	339.299	224.891
3	372.465	201.667
4	392.903	181.230
5	422.732	151.400
6	465.159	108.974
7	600.100	110.574
8	765.000	121.709
9	960.000	171.024
10	1458.436	195.259
11	1500.863	237.686
12	1543.289	280.112
13	1585.715	322.539
14	1628.142	364.965
15	1670.568	407.391
16	1712.995	449.818
17	1755.421	492.244
18	1759.655	496.478

Factor of Safety
*** 1.673 ***

Failure Surface Specified By 18 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	327.841	232.050
2	339.299	224.891
3	372.465	201.667
4	392.903	181.230
5	422.732	151.400
6	465.159	108.974
7	600.100	110.574
8	765.000	121.709
9	960.000	171.024
10	1458.436	195.259
11	1500.863	237.686
12	1543.289	280.112
13	1585.715	322.539
14	1628.142	364.965
15	1670.568	407.391
16	1712.995	449.818
17	1755.421	492.244
18	1759.655	496.478

Factor of Safety
*** 1.673 ***

Failure Surface Specified By 18 Coordinate Points

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1	327.841	232.050

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8	765.000	121.709
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13	1585.715	322.539
14	1628.142	364.965
15	1670.568	407.391
16	1712.995	449.818
17	1755.421	492.244
18	1759.655	496.478

Factor of Safety
*** 1.673 ***

Failure Surface Specified By 15 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	323.805	231.964
2	335.274	224.797
3	370.007	200.477
4	389.699	180.784
5	418.221	152.263
6	460.647	109.836
7	600.100	111.312
8	765.000	114.036
9	960.000	152.347
10	1263.817	225.577
11	1306.244	268.003
12	1342.800	304.560
13	1385.227	346.986
14	1418.120	379.880
15	1418.240	380.000

Factor of Safety
*** 1.673 ***

Failure Surface Specified By 15 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	323.805	231.964
2	335.274	224.797
3	370.007	200.477
4	389.699	180.784
5	418.221	152.263
6	460.647	109.836
7	600.100	111.312
8	765.000	114.036
9	960.000	152.347
10	1263.817	225.577
11	1306.244	268.003
12	1342.800	304.560
13	1385.227	346.986
14	1418.120	379.880
15	1418.240	380.000

Factor of Safety
*** 1.673 ***

Failure Surface Specified By 15 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	323.805	231.964
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3	370.007	200.477
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7	600.100	111.312
8	765.000	114.036

9	960.000	152.347
10	1263.817	225.577
11	1306.244	268.003
12	1342.800	304.560
13	1385.227	346.986
14	1418.120	379.880
15	1418.240	380.000

Factor of Safety
*** 1.673 ***

Failure Surface Specified By 15 Coordinate Points

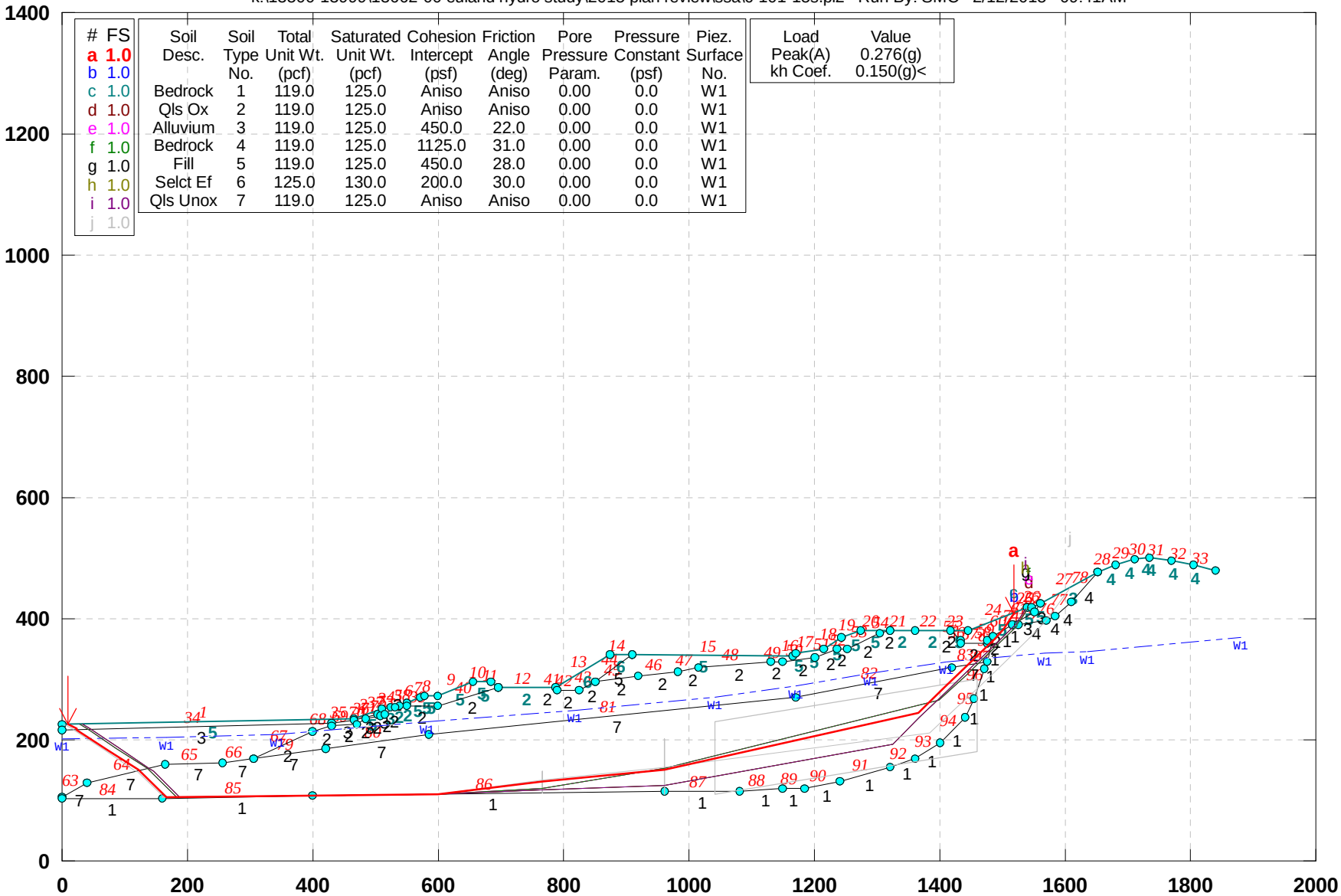
Point No.	X-Surf (ft)	Y-Surf (ft)
1	341.554	232.345
2	352.975	225.209
3	380.819	205.712
4	403.787	182.744
5	434.764	151.768
6	477.190	109.341
7	600.100	111.273
8	765.000	118.838
9	960.000	160.828
10	1417.421	261.080
11	1459.847	303.506
12	1468.140	311.799
13	1510.566	354.225
14	1550.272	393.931
15	1579.523	435.706

Factor of Safety
*** 1.675 ***

**** END OF GSTABL7 OUTPUT ****

13662-00, Euland Capital, C-C', - - Seismic

k:\13500-13999\13662-00 euland hydro study\2015 plan review\ssa\c-101-15s.pl2 Run By: SMC 2/12/2015 09:41AM



#	FS
a	1.0
b	1.0
c	1.0
d	1.0
e	1.0
f	1.0
g	1.0
h	1.0
i	1.0
j	1.0

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.
Bedrock	1	119.0	125.0	Aniso	Aniso	0.00	0.0	W1
Qls Ox	2	119.0	125.0	Aniso	Aniso	0.00	0.0	W1
Alluvium	3	119.0	125.0	450.0	22.0	0.00	0.0	W1
Bedrock	4	119.0	125.0	1125.0	31.0	0.00	0.0	W1
Fill	5	119.0	125.0	450.0	28.0	0.00	0.0	W1
Selct Ef	6	125.0	130.0	200.0	30.0	0.00	0.0	W1
Qls Unox	7	119.0	125.0	Aniso	Aniso	0.00	0.0	W1

Load	Value
Peak(A)	0.276(g)
kh Coef.	0.150(g)<

GSTABL7 v.2 FSmin=1.0

Safety Factors Are Calculated By The Simplified Janbu Method for the case of c & phi both > 0

Figure E-9.2

***** GSTABL7 *****

** GSTABL7 by Garry H. Gregory, P.E. **

** Original Version 1.0, January 1996; Current Version 2.005, Sept. 2006 **

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****

SLOPE STABILITY ANALYSIS SYSTEM

Modified Bishop, Simplified Janbu, or GLE Method of Slices.
(Includes Spencer & Morgenstern-Price Type Analysis)
Including Pier/Pile, Reinforcement, Soil Nail, Tieback,
Nonlinear Undrained Shear Strength, Curved Phi Envelope,
Anisotropic Soil, Fiber-Reinforced Soil, Boundary Loads, Water
Surfaces, Pseudo-Static & Newmark Earthquake, and Applied Forces.

****

Analysis Run Date: 2/12/2015
Time of Run: 09:41AM
Run By: SMC
Input Data Filename: K:\13500-13999\13662-00 Euland Hydro Study\2015 Plan Review\SSA\c-101-15s.
Output Filename: K:\13500-13999\13662-00 Euland Hydro Study\2015 Plan Review\SSA\c-101-15s.OUT
Unit System: English
Plotted Output Filename: K:\13500-13999\13662-00 Euland Hydro Study\2015 Plan Review\SSA\c-101-15s.PLT
PROBLEM DESCRIPTION: 13662-00, Euland Capital, C-C',
- - Seismic

BOUNDARY COORDINATES
33 Top Boundaries
98 Total Boundaries

Boundary No.	X-Left (ft)	Y-Left (ft)	X-Right (ft)	Y-Right (ft)	Soil Type Below Bnd
1	0.00	225.00	465.00	235.00	5
2	465.00	235.00	510.00	252.00	5
3	510.00	252.00	523.00	253.00	3
4	523.00	253.00	537.00	255.00	2
5	537.00	255.00	550.00	260.00	2
6	550.00	260.00	570.00	270.00	5
7	570.00	270.00	578.00	272.00	5
8	578.00	272.00	600.00	273.00	5
9	600.00	273.00	656.00	295.00	5
10	656.00	295.00	685.00	295.00	5
11	685.00	295.00	696.00	287.00	5
12	696.00	287.00	788.00	287.00	2
13	788.00	287.00	875.00	341.00	6
14	875.00	341.00	910.00	341.00	6
15	910.00	341.00	1165.00	338.00	5
16	1165.00	338.00	1170.00	342.00	5
17	1170.00	342.00	1215.00	351.00	5
18	1215.00	351.00	1244.00	370.00	5
19	1244.00	370.00	1273.00	380.00	5
20	1273.00	380.00	1320.00	380.00	5
21	1320.00	380.00	1360.00	380.00	2
22	1360.00	380.00	1418.00	380.00	2
23	1418.00	380.00	1445.00	380.00	5
24	1445.00	380.00	1540.00	418.00	5
25	1540.00	418.00	1547.00	418.00	5
26	1547.00	418.00	1560.00	425.00	5
27	1560.00	425.00	1653.00	476.00	3
28	1653.00	476.00	1680.00	489.00	4
29	1680.00	489.00	1710.00	498.00	4
30	1710.00	498.00	1735.00	500.00	4
31	1735.00	500.00	1770.00	495.00	4
32	1770.00	495.00	1805.00	488.00	4
33	1805.00	488.00	1840.00	480.00	4
34	0.00	217.00	430.00	227.00	3
35	430.00	227.00	465.00	232.00	3
36	465.00	232.00	502.00	243.00	3
37	502.00	243.00	510.00	252.00	3
38	550.00	260.00	551.00	255.00	2
39	551.00	255.00	600.00	255.00	2
40	600.00	255.00	696.00	287.00	2

41	788.00	287.00	789.00	281.00	2
42	789.00	281.00	825.00	281.00	2
43	825.00	281.00	850.00	295.00	2
44	850.00	295.00	910.00	341.00	5
45	850.00	295.00	920.00	305.00	2
46	920.00	305.00	983.00	312.00	2
47	983.00	312.00	1015.00	320.00	2
48	1015.00	320.00	1131.00	328.00	2
49	1131.00	328.00	1148.00	330.00	2
50	1148.00	330.00	1200.00	337.00	2
51	1200.00	337.00	1237.00	350.00	2
52	1237.00	350.00	1252.00	350.00	2
53	1252.00	350.00	1305.00	375.00	2
54	1305.00	375.00	1320.00	380.00	2
55	1418.00	380.00	1433.00	365.00	2
56	1433.00	365.00	1434.00	360.00	2
57	1434.00	360.00	1475.00	360.00	2
58	1475.00	360.00	1476.00	365.00	2
59	1476.00	365.00	1485.00	372.00	2
60	1485.00	372.00	1515.00	390.00	1
61	1515.00	390.00	1550.00	412.00	3
62	1550.00	412.00	1560.00	425.00	3
63	0.00	105.00	40.00	130.00	7
64	40.00	130.00	165.00	160.00	7
65	165.00	160.00	255.00	162.00	7
66	255.00	162.00	305.00	169.00	7
67	305.00	169.00	400.00	215.00	2
68	400.00	215.00	430.00	224.00	2
69	430.00	224.00	470.00	225.00	2
70	470.00	225.00	483.00	235.00	2
71	483.00	235.00	508.00	240.00	2
72	508.00	240.00	515.00	243.00	2
73	515.00	243.00	532.00	253.00	2
74	1515.00	390.00	1525.00	390.00	1
75	1525.00	390.00	1570.00	397.00	4
76	1570.00	397.00	1585.00	404.00	4
77	1585.00	404.00	1610.00	427.00	4
78	1610.00	427.00	1653.00	476.00	4
79	305.00	169.00	420.00	185.00	7
80	420.00	185.00	586.00	210.00	7
81	586.00	210.00	1170.00	270.00	7
82	1170.00	270.00	1420.00	320.00	7
83	1420.00	320.00	1476.00	330.00	7
84	0.00	103.00	160.00	104.00	1
85	160.00	104.00	400.00	107.00	1
86	400.00	107.00	960.00	114.00	1
87	960.00	114.00	1080.00	115.00	1
88	1080.00	115.00	1150.00	119.00	1
89	1150.00	119.00	1185.00	121.00	1
90	1185.00	121.00	1240.00	131.00	1
91	1240.00	131.00	1320.00	154.00	1
92	1320.00	154.00	1360.00	170.00	1
93	1360.00	170.00	1400.00	194.00	1
94	1400.00	194.00	1440.00	238.00	1
95	1440.00	238.00	1455.00	268.00	1
96	1455.00	268.00	1470.00	318.00	1
97	1470.00	318.00	1476.00	330.00	1
98	1476.00	330.00	1485.00	372.00	1

Default Y-Origin = 0.00(ft)
Default X-Plus Value = 0.00(ft)
Default Y-Plus Value = 0.00(ft)

ISOTROPIC SOIL PARAMETERS
7 Type(s) of Soil

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.
1	119.0	125.0	0.0	0.0	0.00	0.0	1
2	119.0	125.0	0.0	0.0	0.00	0.0	1
3	119.0	125.0	450.0	22.0	0.00	0.0	1
4	119.0	125.0	1125.0	31.0	0.00	0.0	1

5	119.0	125.0	450.0	28.0	0.00	0.0	1
6	125.0	130.0	200.0	30.0	0.00	0.0	1
7	119.0	125.0	0.0	0.0	0.00	0.0	1

ANISOTROPIC STRENGTH PARAMETERS
3 soil type(s)

Soil Type 1 Is Anisotropic
Number Of Direction Ranges Specified = 3

Direction Range No.	Counterclockwise Direction Limit (deg)	Cohesion Intercept (psf)	Friction Angle (deg)
1	0.0	1125.00	31.00
2	5.0	450.00	17.00
3	90.0	1125.00	31.00

Soil Type 2 Is Anisotropic
Number Of Direction Ranges Specified = 3

Direction Range No.	Counterclockwise Direction Limit (deg)	Cohesion Intercept (psf)	Friction Angle (deg)
1	0.0	525.00	25.00
2	15.0	375.00	14.50
3	90.0	450.00	22.00

Soil Type 7 Is Anisotropic
Number Of Direction Ranges Specified = 3

Direction Range No.	Counterclockwise Direction Limit (deg)	Cohesion Intercept (psf)	Friction Angle (deg)
1	0.0	750.00	31.00
2	15.0	375.00	14.50
3	90.0	450.00	22.00

ANISOTROPIC SOIL NOTES:
(1) An input value of 0.01 for C and/or Phi will cause Aniso C and/or Phi to be ignored in that range.
(2) An input value of 0.02 for Phi will set both Phi and C equal to zero, with no water weight in the tension crack.
(3) An input value of 0.03 for Phi will set both Phi and C equal to zero, with water weight in the tension crack.

1 PIEZOMETRIC SURFACE(S) SPECIFIED
Unit Weight of Water = 62.40 (pcf)
Piezometric Surface No. 1 Specified by 12 Coordinate Points
Pore Pressure Inclination Factor = 0.50

Point No.	X-Water (ft)	Y-Water (ft)
1	0.00	202.00
2	168.00	205.00
3	343.00	210.00
4	583.00	230.00
5	818.00	250.00
6	1042.00	270.00
7	1170.00	290.00
8	1289.00	310.00
9	1410.00	330.00
10	1568.00	343.00
11	1636.00	345.00
12	1880.00	370.00

Specified Peak Ground Acceleration Coefficient (A) = 0.276(g)
Specified Horizontal Earthquake Coefficient (kh) = 0.150(g)
Specified Vertical Earthquake Coefficient (kv) = 0.000(g)
Specified Seismic Pore-Pressure Factor = 0.000
Janbus Empirical Coef is being used for the case of c & phi both > 0
A Critical Failure Surface Searching Method, Using A Random Technique For Generating Sliding Block Surfaces, Has Been Specified.
The Active And Passive Portions Of The Sliding Surfaces Are Generated According To The Rankine Theory.
5000 Trial Surfaces Have Been Generated.
5 Boxes Specified For Generation Of Central Block Base
Length Of Line Segments For Active And Passive Portions Of Sliding Block Is 60.0

Box No.	X-Left (ft)	Y-Left (ft)	X-Right (ft)	Y-Right (ft)	Height (ft)

```
  1         160.00     106.00     600.00     111.00       1.00
  2         600.10     111.00     600.10     111.00       1.00
  3         765.00     130.00     765.00     130.00      35.00
  4         960.00     156.00     960.00     156.00      90.00
  5        1040.00     170.00    1460.00     240.00     120.00
 Following Are Displayed The Ten Most Critical Of The Trial
       Failure Surfaces Evaluated. They Are
       Ordered - Most Critical First.
       * * Safety Factors Are Calculated By The Simplified Janbu Method * *
       Total Number of Trial Surfaces Attempted =  5000
       Number of Trial Surfaces With Valid FS = 5000
       Statistical Data On All Valid FS Values:
          FS Max =   1.871   FS Min =   1.023   FS Ave =   1.105
          Standard Deviation =    0.188   Coefficient of Variation =   16.99 %
       Failure Surface Specified By 16 Coordinate Points
         Point      X-Surf      Y-Surf
          No.        (ft)        (ft)
           1          9.961      225.214
           2         22.751      217.529
           3         23.505      217.021
           4         73.247      183.469
           5        122.990      149.918
           6        124.744      148.163
           7        167.170      105.737
           8        600.100      111.399
           9        765.000      131.570
          10        960.000      150.326
          11       1364.305      244.317
          12       1406.732      286.743
          13       1444.334      324.345
          14       1486.760      366.772
          15       1502.471      382.483
          16       1518.690      409.476
              Factor of Safety
             ***    1.023   ***
            Individual data on the     0  slices
                      Water  Water     Tie     Tie     Earthquake
                      Force  Force    Force   Force       Force   Surcharge
Slice  Width   Weight    Top    Bot     Norm     Tan     Hor     Ver    Load
 No.    (ft)    (lbs)   (lbs)  (lbs)    (lbs)   (lbs)   (lbs)   (lbs)   (lbs)
       Failure Surface Specified By 16 Coordinate Points
         Point      X-Surf      Y-Surf
          No.        (ft)        (ft)
           1          9.961      225.214
           2         22.751      217.529
           3         23.505      217.021
           4         73.247      183.469
           5        122.990      149.918
           6        124.744      148.163
           7        167.170      105.737
           8        600.100      111.399
           9        765.000      131.570
          10        960.000      150.326
          11       1364.305      244.317
          12       1406.732      286.743
          13       1444.334      324.345
          14       1486.760      366.772
          15       1502.471      382.483
          16       1518.690      409.476
              Factor of Safety
             ***    1.023   ***
       Failure Surface Specified By 16 Coordinate Points
         Point      X-Surf      Y-Surf
          No.        (ft)        (ft)
           1          9.961      225.214
           2         22.751      217.529
           3         23.505      217.021
           4         73.247      183.469
           5        122.990      149.918
           6        124.744      148.163
```

7	167.170	105.737
8	600.100	111.399
9	765.000	131.570
10	960.000	150.326
11	1364.305	244.317
12	1406.732	286.743
13	1444.334	324.345
14	1486.760	366.772
15	1502.471	382.483
16	1518.690	409.476

Factor of Safety
*** 1.023 ***

Failure Surface Specified By 16 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	27.258	225.586
2	40.000	217.930
3	86.408	186.628
4	136.150	153.076
5	140.857	148.369
6	183.284	105.943
7	600.100	110.621
8	765.000	118.975
9	960.000	152.743
10	1399.374	266.041
11	1441.800	308.467
12	1479.455	346.121
13	1521.881	388.548
14	1523.333	390.000
15	1529.467	399.093
16	1542.219	418.000

Factor of Safety
*** 1.023 ***

Failure Surface Specified By 16 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	27.258	225.586
2	40.000	217.930
3	86.408	186.628
4	136.150	153.076
5	140.857	148.369
6	183.284	105.943
7	600.100	110.621
8	765.000	118.975
9	960.000	152.743
10	1399.374	266.041
11	1441.800	308.467
12	1479.455	346.121
13	1521.881	388.548
14	1523.333	390.000
15	1529.467	399.093
16	1542.219	418.000

Factor of Safety
*** 1.023 ***

Failure Surface Specified By 16 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	27.258	225.586
2	40.000	217.930
3	86.408	186.628
4	136.150	153.076
5	140.857	148.369
6	183.284	105.943
7	600.100	110.621
8	765.000	118.975
9	960.000	152.743
10	1399.374	266.041
11	1441.800	308.467
12	1479.455	346.121
13	1521.881	388.548

14	1523.333	390.000
15	1529.467	399.093
16	1542.219	418.000

Factor of Safety
*** 1.023 ***

Failure Surface Specified By 17 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	31.800	225.684
2	44.529	218.036
3	89.864	187.457
4	139.606	153.905
5	145.154	148.357
6	187.581	105.931
7	600.100	111.014
8	765.000	117.950
9	960.000	123.387
10	1324.725	193.834
11	1367.152	236.260
12	1409.578	278.686
13	1452.005	321.113
14	1480.120	349.229
15	1520.892	390.000
16	1525.228	396.429
17	1537.616	417.047

Factor of Safety
*** 1.026 ***

Failure Surface Specified By 17 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	31.800	225.684
2	44.529	218.036
3	89.864	187.457
4	139.606	153.905
5	145.154	148.357
6	187.581	105.931
7	600.100	111.014
8	765.000	117.950
9	960.000	123.387
10	1324.725	193.834
11	1367.152	236.260
12	1409.578	278.686
13	1452.005	321.113
14	1480.120	349.229
15	1520.892	390.000
16	1525.228	396.429
17	1537.616	417.047

Factor of Safety
*** 1.026 ***

Failure Surface Specified By 17 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	31.800	225.684
2	44.529	218.036
3	89.864	187.457
4	139.606	153.905
5	145.154	148.357
6	187.581	105.931
7	600.100	111.014
8	765.000	117.950
9	960.000	123.387
10	1324.725	193.834
11	1367.152	236.260
12	1409.578	278.686
13	1452.005	321.113
14	1480.120	349.229
15	1520.892	390.000
16	1525.228	396.429
17	1537.616	417.047

Factor of Safety

```
          ***    1.026   ***
    Failure Surface Specified By 18 Coordinate Points
      Point      X-Surf      Y-Surf
       No.        (ft)        (ft)
        1          3.390      225.073
        2         16.199      217.377
        3         18.506      215.821
        4         68.248      182.269
        5        117.990      148.718
        6        118.728      147.980
        7        161.155      105.553
        8        600.100      111.049
        9        765.000      133.006
       10        960.000      155.423
       11       1384.813      211.407
       12       1427.240      253.833
       13       1460.826      287.419
       14       1503.252      329.846
       15       1545.679      372.272
       16       1570.762      397.356
       17       1604.313      447.098
       18       1606.672      450.594
           Factor of Safety
          ***    1.031   ***
              **** END OF GSTABL7 OUTPUT ****
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***** GSTABL7 *****

** GSTABL7 by Garry H. Gregory, P.E. **

** Original Version 1.0, January 1996; Current Version 2.005, Sept. 2006 **

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SLOPE STABILITY ANALYSIS SYSTEM

Modified Bishop, Simplified Janbu, or GLE Method of Slices.
(Includes Spencer & Morgenstern-Price Type Analysis)
Including Pier/Pile, Reinforcement, Soil Nail, Tieback,
Nonlinear Undrained Shear Strength, Curved Phi Envelope,
Anisotropic Soil, Fiber-Reinforced Soil, Boundary Loads, Water
Surfaces, Pseudo-Static & Newmark Earthquake, and Applied Forces.

****

Analysis Run Date: 2/12/2015
Time of Run: 09:42AM
Run By: SMC
Input Data Filename: K:\13500-13999\13662-00 Euland Hydro Study\2015 Plan Review\SSA\c-101-15s Surface #1.
Output Filename: K:\13500-13999\13662-00 Euland Hydro Study\2015 Plan Review\SSA\c-101-15s Surface #1.OUT
Unit System: English
Plotted Output Filename: K:\13500-13999\13662-00 Euland Hydro Study\2015 Plan Review\SSA\c-101-15s Surface #1.PLT
PROBLEM DESCRIPTION: 13662-00, Euland Capital, C-C',
- - Seismic

BOUNDARY COORDINATES
33 Top Boundaries
98 Total Boundaries

Boundary No.	X-Left (ft)	Y-Left (ft)	X-Right (ft)	Y-Right (ft)	Soil Type Below Bnd
1	0.00	225.00	465.00	235.00	5
2	465.00	235.00	510.00	252.00	5
3	510.00	252.00	523.00	253.00	3
4	523.00	253.00	537.00	255.00	2
5	537.00	255.00	550.00	260.00	2
6	550.00	260.00	570.00	270.00	5
7	570.00	270.00	578.00	272.00	5
8	578.00	272.00	600.00	273.00	5
9	600.00	273.00	656.00	295.00	5
10	656.00	295.00	685.00	295.00	5
11	685.00	295.00	696.00	287.00	5
12	696.00	287.00	788.00	287.00	2
13	788.00	287.00	875.00	341.00	6
14	875.00	341.00	910.00	341.00	6
15	910.00	341.00	1165.00	338.00	5
16	1165.00	338.00	1170.00	342.00	5
17	1170.00	342.00	1215.00	351.00	5
18	1215.00	351.00	1244.00	370.00	5
19	1244.00	370.00	1273.00	380.00	5
20	1273.00	380.00	1320.00	380.00	5
21	1320.00	380.00	1360.00	380.00	2
22	1360.00	380.00	1418.00	380.00	2
23	1418.00	380.00	1445.00	380.00	5
24	1445.00	380.00	1540.00	418.00	5
25	1540.00	418.00	1547.00	418.00	5
26	1547.00	418.00	1560.00	425.00	5
27	1560.00	425.00	1653.00	476.00	3
28	1653.00	476.00	1680.00	489.00	4
29	1680.00	489.00	1710.00	498.00	4
30	1710.00	498.00	1735.00	500.00	4
31	1735.00	500.00	1770.00	495.00	4
32	1770.00	495.00	1805.00	488.00	4
33	1805.00	488.00	1840.00	480.00	4
34	0.00	217.00	430.00	227.00	3
35	430.00	227.00	465.00	232.00	3
36	465.00	232.00	502.00	243.00	3
37	502.00	243.00	510.00	252.00	3
38	550.00	260.00	551.00	255.00	2
39	551.00	255.00	600.00	255.00	2

40	600.00	255.00	696.00	287.00	2
41	788.00	287.00	789.00	281.00	2
42	789.00	281.00	825.00	281.00	2
43	825.00	281.00	850.00	295.00	2
44	850.00	295.00	910.00	341.00	5
45	850.00	295.00	920.00	305.00	2
46	920.00	305.00	983.00	312.00	2
47	983.00	312.00	1015.00	320.00	2
48	1015.00	320.00	1131.00	328.00	2
49	1131.00	328.00	1148.00	330.00	2
50	1148.00	330.00	1200.00	337.00	2
51	1200.00	337.00	1237.00	350.00	2
52	1237.00	350.00	1252.00	350.00	2
53	1252.00	350.00	1305.00	375.00	2
54	1305.00	375.00	1320.00	380.00	2
55	1418.00	380.00	1433.00	365.00	2
56	1433.00	365.00	1434.00	360.00	2
57	1434.00	360.00	1475.00	360.00	2
58	1475.00	360.00	1476.00	365.00	2
59	1476.00	365.00	1485.00	372.00	2
60	1485.00	372.00	1515.00	390.00	1
61	1515.00	390.00	1550.00	412.00	3
62	1550.00	412.00	1560.00	425.00	3
63	0.00	105.00	40.00	130.00	7
64	40.00	130.00	165.00	160.00	7
65	165.00	160.00	255.00	162.00	7
66	255.00	162.00	305.00	169.00	7
67	305.00	169.00	400.00	215.00	2
68	400.00	215.00	430.00	224.00	2
69	430.00	224.00	470.00	225.00	2
70	470.00	225.00	483.00	235.00	2
71	483.00	235.00	508.00	240.00	2
72	508.00	240.00	515.00	243.00	2
73	515.00	243.00	532.00	253.00	2
74	1515.00	390.00	1525.00	390.00	1
75	1525.00	390.00	1570.00	397.00	4
76	1570.00	397.00	1585.00	404.00	4
77	1585.00	404.00	1610.00	427.00	4
78	1610.00	427.00	1653.00	476.00	4
79	305.00	169.00	420.00	185.00	7
80	420.00	185.00	586.00	210.00	7
81	586.00	210.00	1170.00	270.00	7
82	1170.00	270.00	1420.00	320.00	7
83	1420.00	320.00	1476.00	330.00	7
84	0.00	103.00	160.00	104.00	1
85	160.00	104.00	400.00	107.00	1
86	400.00	107.00	960.00	114.00	1
87	960.00	114.00	1080.00	115.00	1
88	1080.00	115.00	1150.00	119.00	1
89	1150.00	119.00	1185.00	121.00	1
90	1185.00	121.00	1240.00	131.00	1
91	1240.00	131.00	1320.00	154.00	1
92	1320.00	154.00	1360.00	170.00	1
93	1360.00	170.00	1400.00	194.00	1
94	1400.00	194.00	1440.00	238.00	1
95	1440.00	238.00	1455.00	268.00	1
96	1455.00	268.00	1470.00	318.00	1
97	1470.00	318.00	1476.00	330.00	1
98	1476.00	330.00	1485.00	372.00	1

Default Y-Origin = 0.00(ft)
Default X-Plus Value = 0.00(ft)
Default Y-Plus Value = 0.00(ft)

ISOTROPIC SOIL PARAMETERS

7 Type(s) of Soil

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.
1	119.0	125.0	0.0	0.0	0.00	0.0	1
2	119.0	125.0	0.0	0.0	0.00	0.0	1
3	119.0	125.0	450.0	22.0	0.00	0.0	1

4	119.0	125.0	1125.0	31.0	0.00	0.0	1
5	119.0	125.0	450.0	28.0	0.00	0.0	1
6	125.0	130.0	200.0	30.0	0.00	0.0	1
7	119.0	125.0	0.0	0.0	0.00	0.0	1

ANISOTROPIC STRENGTH PARAMETERS
3 soil type(s)

Soil Type 1 Is Anisotropic
Number Of Direction Ranges Specified = 3

Direction Range No.	Counterclockwise Direction Limit (deg)	Cohesion Intercept (psf)	Friction Angle (deg)
1	0.0	1125.00	31.00
2	5.0	450.00	17.00
3	90.0	1125.00	31.00

Soil Type 2 Is Anisotropic
Number Of Direction Ranges Specified = 3

Direction Range No.	Counterclockwise Direction Limit (deg)	Cohesion Intercept (psf)	Friction Angle (deg)
1	0.0	525.00	25.00
2	15.0	375.00	14.50
3	90.0	450.00	22.00

Soil Type 7 Is Anisotropic
Number Of Direction Ranges Specified = 3

Direction Range No.	Counterclockwise Direction Limit (deg)	Cohesion Intercept (psf)	Friction Angle (deg)
1	0.0	750.00	31.00
2	15.0	375.00	14.50
3	90.0	450.00	22.00

ANISOTROPIC SOIL NOTES:
(1) An input value of 0.01 for C and/or Phi will cause Aniso C and/or Phi to be ignored in that range.
(2) An input value of 0.02 for Phi will set both Phi and C equal to zero, with no water weight in the tension crack.
(3) An input value of 0.03 for Phi will set both Phi and C equal to zero, with water weight in the tension crack.

1 PIEZOMETRIC SURFACE(S) SPECIFIED
Unit Weight of Water = 62.40 (pcf)
Piezometric Surface No. 1 Specified by 12 Coordinate Points
Pore Pressure Inclination Factor = 0.50

Point No.	X-Water (ft)	Y-Water (ft)
1	0.00	202.00
2	168.00	205.00
3	343.00	210.00
4	583.00	230.00
5	818.00	250.00
6	1042.00	270.00
7	1170.00	290.00
8	1289.00	310.00
9	1410.00	330.00
10	1568.00	343.00
11	1636.00	345.00
12	1880.00	370.00

Specified Peak Ground Acceleration Coefficient (A) = 0.276(g)
Specified Horizontal Earthquake Coefficient (kh) = 0.150(g)
Specified Vertical Earthquake Coefficient (kv) = 0.000(g)
Specified Seismic Pore-Pressure Factor = 0.000
Janbu's Empirical Coef. is being used for the case of c & phi both > 0
Trial Failure Surface Specified By 16 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	9.961	225.214
2	22.751	217.529
3	23.505	217.021
4	73.247	183.469
5	122.990	149.918
6	124.744	148.163
7	167.170	105.737

8	600.100	111.399
9	765.000	131.570
10	960.000	150.326
11	1364.305	244.317
12	1406.732	286.743
13	1444.334	324.345
14	1486.760	366.772
15	1502.471	382.483
16	1518.690	409.476

Janbu's Empirical Coefficient (fo) = 1.051

* * Factor Of Safety Is Calculated By The Simplified Janbu Method * *

Factor Of Safety For The Preceding Specified Surface = 1.023

Table 1 - Individual Data on the 81 Slices

Slice No.	Width (ft)	Weight (lbs)	Water Force Top (lbs)	Water Force Bot (lbs)	Tie Force Norm (lbs)	Tie Force Tan (lbs)	Earthquake Force Hor (lbs)	Earthquake Force Ver (lbs)	Surcharge Load (lbs)
1	12.8	6057.8	0.0	0.0	0.0	0.0	908.7	0.0	0.0
2	0.8	737.8	0.0	0.0	0.0	0.0	110.7	0.0	0.0
3	21.1	39709.9	0.0	0.0	0.0	0.0	5956.5	0.0	0.0
4	28.7	114685.5	0.0	21389.9	0.0	0.0	17202.8	0.0	0.0
5	49.7	368693.6	0.0	*******	0.0	0.0	55304.0	0.0	0.0
6	1.8	16987.2	0.0	8538.7	0.0	0.0	2548.1	0.0	0.0
7	40.3	497919.2	0.0	*******	0.0	0.0	74687.9	0.0	0.0
8	2.2	32717.3	0.0	18791.2	0.0	0.0	4907.6	0.0	0.0
9	0.8	12629.0	0.0	5139.9	0.0	0.0	1894.4	0.0	0.0
10	87.0	1327957.1	0.0	*******	0.0	0.0	*******	0.0	0.0
11	50.0	766946.6	0.0	*******	0.0	0.0	*******	0.0	0.0
12	38.0	584711.6	0.0	*******	0.0	0.0	87706.8	0.0	0.0
13	56.4	870801.5	0.0	*******	0.0	0.0	*******	0.0	0.0
14	0.6	9658.0	0.0	4109.0	0.0	0.0	1448.7	0.0	0.0
15	20.0	310028.8	0.0	*******	0.0	0.0	46504.3	0.0	0.0
16	10.0	155227.8	0.0	66993.9	0.0	0.0	23284.2	0.0	0.0
17	35.0	544417.9	0.0	*******	0.0	0.0	81662.7	0.0	0.0
18	5.0	78446.2	0.0	34425.4	0.0	0.0	11766.9	0.0	0.0
19	13.0	209087.1	0.0	90017.3	0.0	0.0	31363.1	0.0	0.0
20	19.0	318909.8	0.0	*******	0.0	0.0	47836.5	0.0	0.0
21	6.0	103994.8	0.0	42293.6	0.0	0.0	15599.2	0.0	0.0
22	2.0	35015.5	0.0	14132.8	0.0	0.0	5252.3	0.0	0.0
23	5.0	87858.0	0.0	35408.5	0.0	0.0	13178.7	0.0	0.0
24	8.0	140989.8	0.0	56880.8	0.0	0.0	21148.5	0.0	0.0
25	9.0	159544.6	0.0	64325.1	0.0	0.0	23931.7	0.0	0.0
26	5.0	89191.1	0.0	35889.1	0.0	0.0	13378.7	0.0	0.0
27	13.0	236184.0	0.0	93822.8	0.0	0.0	35427.6	0.0	0.0
28	1.0	18487.3	0.0	7247.7	0.0	0.0	2773.1	0.0	0.0
29	19.0	362347.8	0.0	*******	0.0	0.0	54352.2	0.0	0.0
30	8.0	157918.8	0.0	58803.2	0.0	0.0	23687.8	0.0	0.0
31	5.0	99324.9	0.0	36894.0	0.0	0.0	14898.7	0.0	0.0
32	3.0	59646.0	0.0	22186.0	0.0	0.0	8946.9	0.0	0.0
33	14.0	278857.6	0.0	*******	0.0	0.0	41828.6	0.0	0.0
34	0.1	1994.6	0.0	746.3	0.0	0.0	299.2	0.0	0.0
35	55.9	1165321.8	0.0	*******	0.0	0.0	*******	0.0	0.0
36	29.0	624249.1	0.0	*******	0.0	0.0	93637.4	0.0	0.0
37	11.0	228296.8	0.0	80404.2	0.0	0.0	34244.5	0.0	0.0
38	69.0	1358409.9	0.0	*******	0.0	0.0	*******	0.0	0.0
39	23.0	438031.2	0.0	*******	0.0	0.0	65704.7	0.0	0.0
40	1.0	18963.5	0.0	7099.4	0.0	0.0	2844.5	0.0	0.0
41	29.0	579205.2	0.0	*******	0.0	0.0	86880.8	0.0	0.0
42	7.0	148132.4	0.0	49524.8	0.0	0.0	22219.9	0.0	0.0
43	25.0	554433.9	0.0	*******	0.0	0.0	83165.1	0.0	0.0
44	25.0	593258.2	0.0	*******	0.0	0.0	88988.7	0.0	0.0
45	35.0	847613.9	0.0	*******	0.0	0.0	*******	0.0	0.0
46	10.0	238715.8	0.0	70346.9	0.0	0.0	35807.4	0.0	0.0
47	40.0	941976.0	0.0	*******	0.0	0.0	*******	0.0	0.0
48	23.0	527794.1	0.0	*******	0.0	0.0	79169.1	0.0	0.0
49	32.0	707992.4	0.0	*******	0.0	0.0	*******	0.0	0.0
50	27.0	573537.1	0.0	*******	0.0	0.0	86030.6	0.0	0.0
51	89.0	1737271.0	0.0	*******	0.0	0.0	*******	0.0	0.0
52	17.0	305243.9	0.0	*******	0.0	0.0	45786.6	0.0	0.0
53	17.0	296713.7	0.0	98876.5	0.0	0.0	44507.1	0.0	0.0

54	5.0	86852.8	0.0	28815.9	0.0	0.0	13027.9	0.0	0.0
55	30.0	524207.9	0.0	*******	0.0	0.0	78631.2	0.0	0.0
56	15.0	260671.0	0.0	83818.9	0.0	0.0	39100.7	0.0	0.0
57	22.0	393697.6	0.0	*******	0.0	0.0	59054.6	0.0	0.0
58	7.0	130334.3	0.0	38175.4	0.0	0.0	19550.1	0.0	0.0
59	8.0	150766.8	0.0	43384.9	0.0	0.0	22615.0	0.0	0.0
60	21.0	399718.0	0.0	*******	0.0	0.0	59957.7	0.0	0.0
61	16.0	303139.3	0.0	84621.0	0.0	0.0	45470.9	0.0	0.0
62	16.0	295961.0	0.0	83593.9	0.0	0.0	44394.2	0.0	0.0
63	15.0	270938.9	0.0	77381.8	0.0	0.0	40640.8	0.0	0.0
64	40.0	691635.2	0.0	*******	0.0	0.0	*******	0.0	0.0
65	4.3	71761.9	0.0	21301.0	0.0	0.0	10764.3	0.0	0.0
66	42.4	593112.6	0.0	*******	0.0	0.0	88966.9	0.0	0.0
67	3.3	36432.2	0.0	11767.4	0.0	0.0	5464.8	0.0	0.0
68	8.0	83598.9	0.0	25553.4	0.0	0.0	12539.8	0.0	0.0
69	2.0	19654.9	0.0	5581.2	0.0	0.0	2948.2	0.0	0.0
70	13.0	115619.0	0.0	28408.4	0.0	0.0	17342.9	0.0	0.0
71	1.0	8022.4	0.0	1620.3	0.0	0.0	1203.4	0.0	0.0
72	10.3	75616.8	0.0	12017.5	0.0	0.0	11342.5	0.0	0.0
73	0.7	4413.1	0.0	478.4	0.0	0.0	662.0	0.0	0.0
74	8.6	53683.4	0.0	2966.9	0.0	0.0	8052.5	0.0	0.0
75	21.4	110697.8	0.0	0.0	0.0	0.0	16604.7	0.0	0.0
76	1.0	4365.9	0.0	0.0	0.0	0.0	654.9	0.0	0.0
77	7.1	28922.2	0.0	0.0	0.0	0.0	4338.3	0.0	0.0
78	1.9	7157.8	0.0	0.0	0.0	0.0	1073.7	0.0	0.0
79	1.8	6379.6	0.0	0.0	0.0	0.0	956.9	0.0	0.0
80	15.7	47148.9	0.0	0.0	0.0	0.0	7072.3	0.0	0.0
81	16.2	19788.3	0.0	0.0	0.0	0.0	2968.2	0.0	0.0

Table 2 - Base Stress Data on the 81 Slices

Slice No. *	Alpha (deg)	X-Coord. Slice Cntr (ft)	Base Leng. (ft)	Available Shear Strength (psf)	Mobilized Shear Stress (psf)
1	-31.00	16.36	14.92	1190.62	-183.05
2	-33.97	23.13	0.91	1388.81	-425.00
3	-34.00	34.05	25.44	1990.80	-818.82
4	-34.00	58.92	34.56	2987.68	-1740.47
5	-34.00	98.12	60.00	4127.62	-3222.87
6	-45.02	123.87	2.48	15446.14	-5824.58
7	-45.00	144.87	56.93	18204.74	-7434.16
8	-45.00	166.09	3.07	21007.33	-9061.88
9	0.75	167.59	0.83	2699.99	2481.18
10	0.75	211.50	87.01	2701.88	2488.99
11	0.75	280.00	50.00	2704.17	2501.23
12	0.75	324.00	38.00	2705.63	2509.10
13	0.75	371.19	56.38	2689.37	2518.73
14	0.75	399.69	0.62	2667.72	2525.34
15	0.75	410.00	20.00	2659.89	2527.73
16	0.75	425.00	10.00	2648.50	2531.21
17	0.75	447.50	35.00	2631.42	2536.43
18	0.75	467.50	5.00	2643.55	2558.36
19	0.75	476.50	13.00	2735.08	2622.67
20	0.75	492.50	19.00	2897.80	2736.99
21	0.75	505.00	6.00	3024.92	2826.31
22	0.75	509.00	2.00	3065.60	2854.89
23	0.75	512.50	5.00	3078.12	2865.30
24	0.75	519.00	8.00	3084.24	2873.80
25	0.75	527.50	9.00	3101.33	2890.67
26	0.75	534.50	5.00	3122.07	2908.78
27	0.75	543.50	13.00	3196.95	2962.55
28	0.75	550.50	1.00	3271.38	3014.62
29	0.75	560.50	19.00	3410.57	3109.79
30	0.75	574.00	8.00	3567.80	3218.87
31	0.75	580.50	5.00	3592.74	3239.27
32	0.75	584.50	3.00	3592.86	3242.04
33	0.75	593.00	14.00	3592.43	3247.98
34	0.75	600.05	0.10	3592.61	3253.24
35	6.97	628.05	56.32	3764.83	5634.98
36	6.97	670.50	29.22	3961.34	5818.60
37	6.97	690.50	11.08	3778.03	5610.04
38	6.97	730.50	69.51	3531.72	5321.58

39	5.49	776.50	23.11	3403.84	4667.01
40	5.49	788.50	1.00	3385.30	4647.07
41	5.49	803.50	29.13	3643.88	4894.36
42	5.49	821.50	7.03	3949.06	5185.77
43	5.49	837.50	25.12	4208.40	5434.64
44	5.49	862.50	25.12	4605.02	5815.20
45	5.49	892.50	35.16	4731.86	5934.60
46	5.49	915.00	10.05	4646.56	5849.82
47	5.49	940.00	40.18	4567.56	5770.87
48	13.09	971.50	23.61	4392.81	8548.91
49	13.09	999.00	32.85	4247.85	8242.38
50	13.09	1028.50	27.72	4092.34	7913.56
51	13.09	1086.50	91.37	3755.56	7271.96
52	13.09	1139.50	17.45	3425.72	6689.17
53	13.09	1156.50	17.45	3319.92	6502.24
54	13.09	1167.50	5.13	3312.03	6471.25
55	13.09	1185.00	30.80	3358.31	6509.63
56	13.09	1207.50	15.40	3356.72	6474.04
57	13.09	1226.00	22.59	3504.83	6666.75
58	13.09	1240.50	7.19	3700.76	6936.41
59	13.09	1248.00	8.21	3765.06	7020.85
60	13.09	1262.50	21.56	3826.71	7091.02
61	13.09	1281.00	16.43	3823.03	7058.24
62	13.09	1297.00	16.43	3726.20	6891.10
63	13.09	1312.50	15.40	3633.20	6729.06
64	13.09	1340.00	41.07	3468.20	6441.56
65	13.09	1362.15	4.42	3335.29	6209.97
66	45.00	1385.52	60.00	4658.56	11367.78
67	45.00	1408.37	4.62	3979.64	9065.19
68	45.00	1414.00	11.31	3811.45	8497.53
69	45.00	1419.00	2.83	3673.38	7991.38
70	45.00	1426.50	18.38	3466.27	7232.16
71	45.00	1433.50	1.41	3272.98	6523.55
72	45.00	1439.17	14.62	3116.49	5949.86
73	45.00	1444.67	0.94	2964.63	5393.16
74	45.00	1449.29	12.13	2920.64	5091.42
75	45.00	1464.29	30.30	2572.51	4201.33
76	45.00	1475.50	1.41	2244.56	3550.27
77	45.00	1479.55	10.03	2126.19	3315.28
78	45.00	1484.05	2.70	3012.81	3053.99
79	45.00	1485.88	2.49	2942.75	2947.57
80	45.00	1494.62	22.22	2608.84	2440.35
81	59.00	1510.58	31.49	1143.86	1140.06

Sum of the Resisting Forces (including Pier/Pile, Tieback, Reinforcing
Soil Nail, and Applied Forces if applicable) = 6577817.00 (lbs)
Average Available Shear Strength (including Tieback, Pier/Pile, Reinforcing,
Soil Nail, and Applied Forces if applicable) = 4022.44(psf)
Sum of the Driving Forces = 6760559.50 (lbs)
Average Mobilized Shear Stress = 4134.19(psf)
Total length of the failure surface = 1635.28(ft)

*** SEISMIC SLOPE DISPLACEMENT DATA ***

(Note: kv is set = zero for displacement calculations)
Seismic Yield Coefficient (ky) = 0.1583(g)
Calculated Newmark Seismic Displacement = 0.082(ft)
Non-Symmetrical Sliding Resistance Has Been Specified
for Downhill Sliding.

**** END OF GSTABL7 OUTPUT ****

Sliding displacement models from Rathje and Antonakos (2011)

Prediction of dynamic response and sliding displacement of a sliding mass during earthquake shaking

Cross Section: C-C'

File: c-101-15s

Inputs	
PGA (g)	0.2763
PGV (cm/s)	23.32
k_y (g)	0.1583
T_m (s)	0.517
T_s (s)	0.32
M	6.95
T_s/T_m	0.62348

Dynamic Response			
	median	-1σ	+1σ
kmax (g)	0.224	0.175	0.288
k-velmax (cm/s)	25.62	19.95	32.90

Displacement Given Median Dynamic Response					
Displacement Model			Sliding Displacements, D (cm)		
	μ_{lnD}	σ_{lnD}	median	-1σ	+1σ
[kmax, M]	0.25	0.921	1.28	0.51	3.21
[kmax, k-velmax]	-0.57	0.600	0.57	0.31	1.04
			Sliding Displacements, D (in)		
	μ_{lnD}	σ_{lnD}	median	-1σ	+1σ
[kmax, M]	0.25	0.921	0.50	0.20	1.26
[kmax, k-velmax]	-0.57	0.600	0.22	0.12	0.41

H_{avr} =	170	ft
V_s =	2110	ft/s
$T_s = 4\ H_{avr}/V_s$ =	0.32	s

PGA Peak Ground Acceleration (g)
PGV Peak Ground Velocity (cm/s)
k_y Critical or Yield Acceleration (g)
T_m Mean Period of an Earthquake Motion (s)
T_s Site Period or the Natural Period of a Sliding Mass (s). For rigid sliding set T_s= 0 s
M Earthquake Magnitude
kmax maximum seismic coefficient (g)
k-velmax the maximum velocity of the seismic coefficient-time history (cm/s)
D Predicted Sliding Displacment (cm)

Reference: Rathje, E.M. and Antonakos, G. 2011. "A Unified Model for Predicting Earthquake-Induced Sliding Displacements of Rigid and Flexible Slopes," Engineering Geology, 122, 51-60, doi:10.1016/j.enggeo.2010.12.004.

13662-00, Euland Capital, C-C', - - Static-

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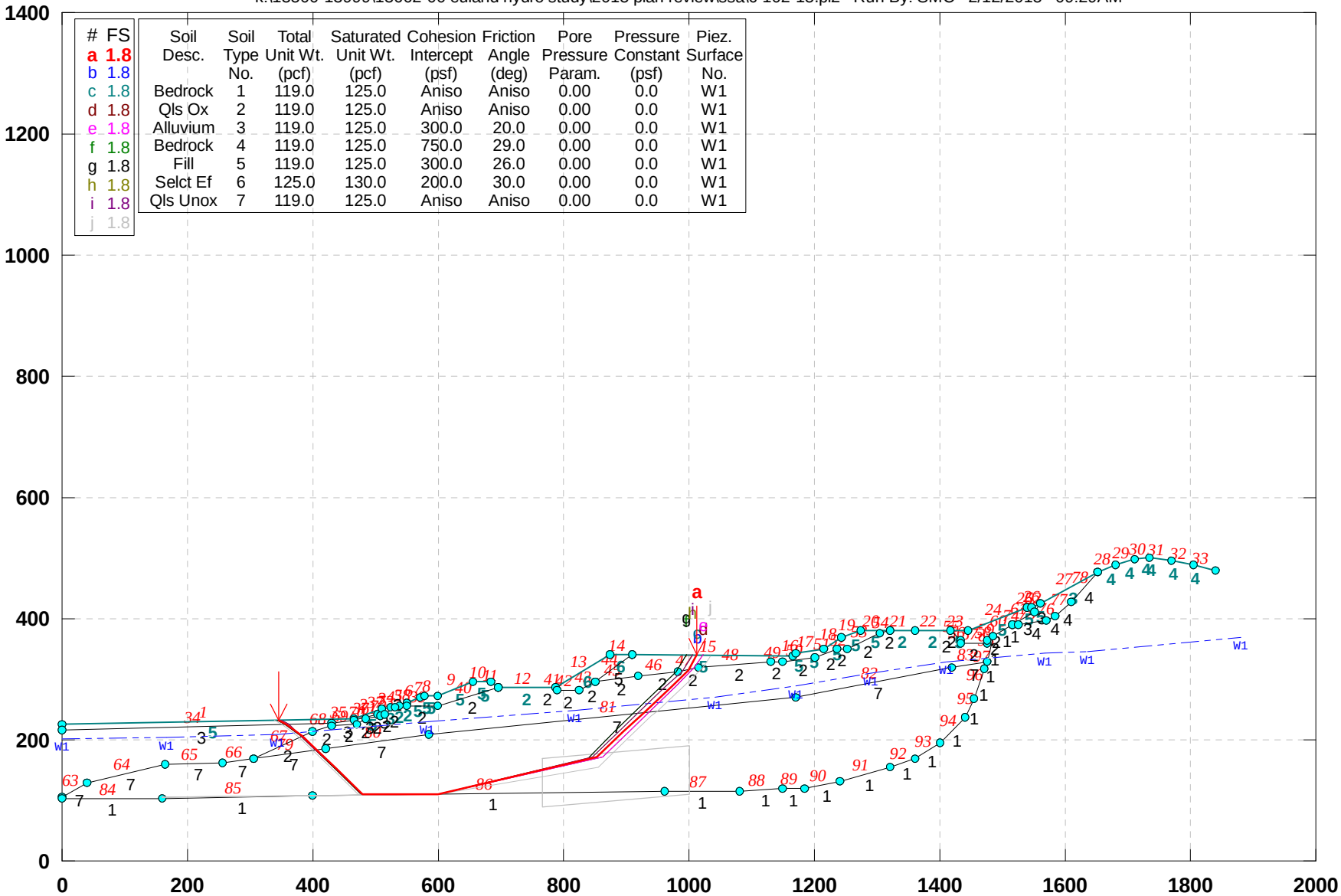

#	FS
a	1.8
b	1.8
c	1.8
d	1.8
e	1.8
f	1.8
g	1.8
h	1.8
i	1.8
j	1.8

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.
Bedrock	1	119.0	125.0	Aniso	Aniso	0.00	0.0	W1
Qls Ox	2	119.0	125.0	Aniso	Aniso	0.00	0.0	W1
Alluvium	3	119.0	125.0	300.0	20.0	0.00	0.0	W1
Bedrock	4	119.0	125.0	750.0	29.0	0.00	0.0	W1
Fill	5	119.0	125.0	300.0	26.0	0.00	0.0	W1
Selct Ef	6	125.0	130.0	200.0	30.0	0.00	0.0	W1
Qls Unox	7	119.0	125.0	Aniso	Aniso	0.00	0.0	W1

GSTABL7 v.2 FSmin=1.8

Safety Factors Are Calculated By The Simplified Janbu Method for the case of c & phi both > 0

Figure E-10.1

13662-00, Euland Capital, C-C', - - Static-

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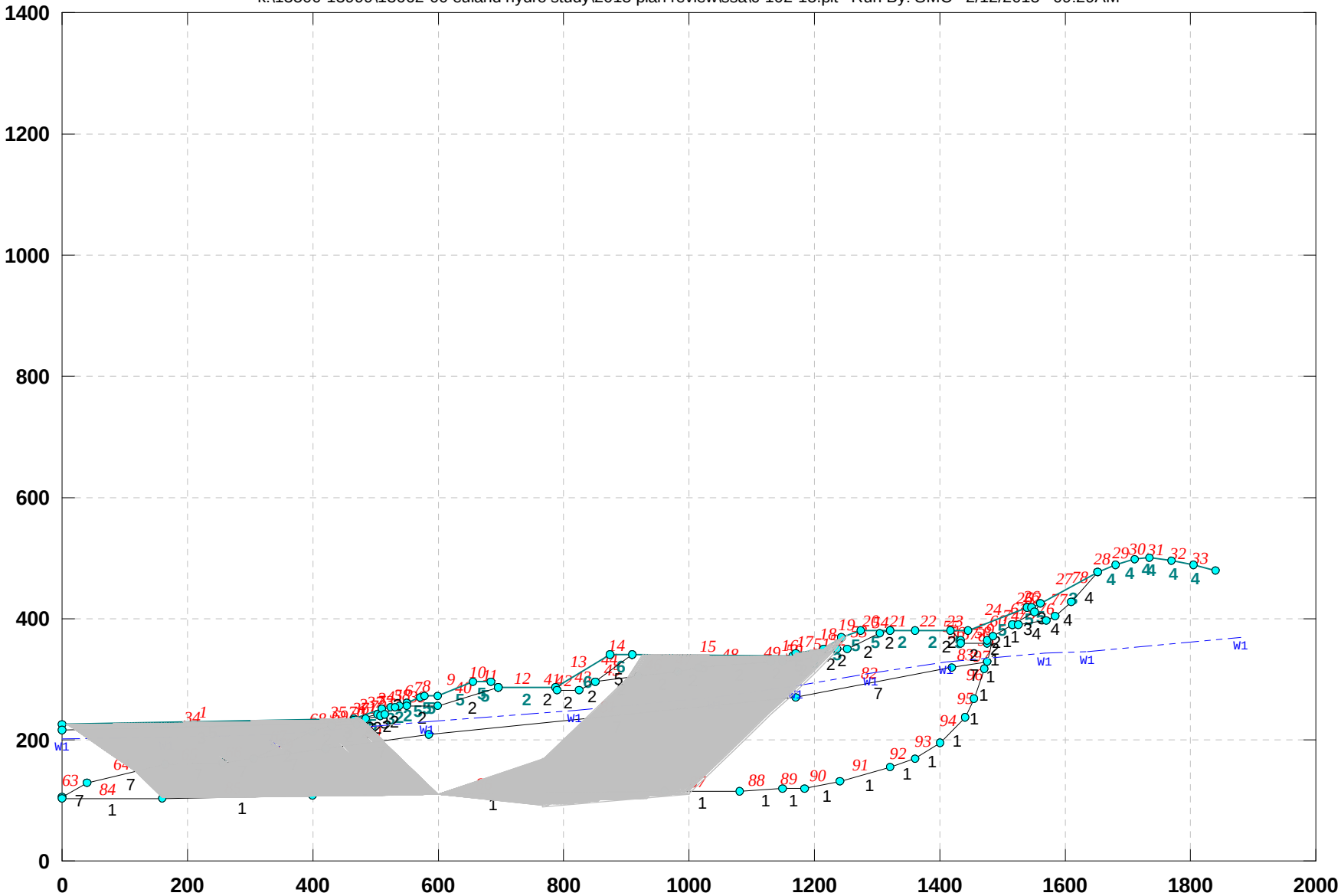

***** GSTABL7 *****

** GSTABL7 by Garry H. Gregory, P.E. **

** Original Version 1.0, January 1996; Current Version 2.005, Sept. 2006 **

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SLOPE STABILITY ANALYSIS SYSTEM

Modified Bishop, Simplified Janbu, or GLE Method of Slices.
(Includes Spencer & Morgenstern-Price Type Analysis)
Including Pier/Pile, Reinforcement, Soil Nail, Tieback,
Nonlinear Undrained Shear Strength, Curved Phi Envelope,
Anisotropic Soil, Fiber-Reinforced Soil, Boundary Loads, Water
Surfaces, Pseudo-Static & Newmark Earthquake, and Applied Forces.

****

Analysis Run Date: 2/12/2015
Time of Run: 09:29AM
Run By: SMC
Input Data Filename: K:\13500-13999\13662-00 Euland Hydro Study\2015 Plan Review\SSA\c-102-15.
Output Filename: K:\13500-13999\13662-00 Euland Hydro Study\2015 Plan Review\SSA\c-102-15.OUT
Unit System: English
Plotted Output Filename: K:\13500-13999\13662-00 Euland Hydro Study\2015 Plan Review\SSA\c-102-15.PLT
PROBLEM DESCRIPTION: 13662-00, Euland Capital, C-C',
- - Static-

BOUNDARY COORDINATES
33 Top Boundaries
98 Total Boundaries

Boundary No.	X-Left (ft)	Y-Left (ft)	X-Right (ft)	Y-Right (ft)	Soil Type Below Bnd
1	0.00	225.00	465.00	235.00	5
2	465.00	235.00	510.00	252.00	5
3	510.00	252.00	523.00	253.00	3
4	523.00	253.00	537.00	255.00	2
5	537.00	255.00	550.00	260.00	2
6	550.00	260.00	570.00	270.00	5
7	570.00	270.00	578.00	272.00	5
8	578.00	272.00	600.00	273.00	5
9	600.00	273.00	656.00	295.00	5
10	656.00	295.00	685.00	295.00	5
11	685.00	295.00	696.00	287.00	5
12	696.00	287.00	788.00	287.00	2
13	788.00	287.00	875.00	341.00	6
14	875.00	341.00	910.00	341.00	6
15	910.00	341.00	1165.00	338.00	5
16	1165.00	338.00	1170.00	342.00	5
17	1170.00	342.00	1215.00	351.00	5
18	1215.00	351.00	1244.00	370.00	5
19	1244.00	370.00	1273.00	380.00	5
20	1273.00	380.00	1320.00	380.00	5
21	1320.00	380.00	1360.00	380.00	2
22	1360.00	380.00	1418.00	380.00	2
23	1418.00	380.00	1445.00	380.00	5
24	1445.00	380.00	1540.00	418.00	5
25	1540.00	418.00	1547.00	418.00	5
26	1547.00	418.00	1560.00	425.00	5
27	1560.00	425.00	1653.00	476.00	3
28	1653.00	476.00	1680.00	489.00	4
29	1680.00	489.00	1710.00	498.00	4
30	1710.00	498.00	1735.00	500.00	4
31	1735.00	500.00	1770.00	495.00	4
32	1770.00	495.00	1805.00	488.00	4
33	1805.00	488.00	1840.00	480.00	4
34	0.00	217.00	430.00	227.00	3
35	430.00	227.00	465.00	232.00	3
36	465.00	232.00	502.00	243.00	3
37	502.00	243.00	510.00	252.00	3
38	550.00	260.00	551.00	255.00	2
39	551.00	255.00	600.00	255.00	2
40	600.00	255.00	696.00	287.00	2

41	788.00	287.00	789.00	281.00	2
42	789.00	281.00	825.00	281.00	2
43	825.00	281.00	850.00	295.00	2
44	850.00	295.00	910.00	341.00	5
45	850.00	295.00	920.00	305.00	2
46	920.00	305.00	983.00	312.00	2
47	983.00	312.00	1015.00	320.00	2
48	1015.00	320.00	1131.00	328.00	2
49	1131.00	328.00	1148.00	330.00	2
50	1148.00	330.00	1200.00	337.00	2
51	1200.00	337.00	1237.00	350.00	2
52	1237.00	350.00	1252.00	350.00	2
53	1252.00	350.00	1305.00	375.00	2
54	1305.00	375.00	1320.00	380.00	2
55	1418.00	380.00	1433.00	365.00	2
56	1433.00	365.00	1434.00	360.00	2
57	1434.00	360.00	1475.00	360.00	2
58	1475.00	360.00	1476.00	365.00	2
59	1476.00	365.00	1485.00	372.00	2
60	1485.00	372.00	1515.00	390.00	1
61	1515.00	390.00	1550.00	412.00	3
62	1550.00	412.00	1560.00	425.00	3
63	0.00	105.00	40.00	130.00	7
64	40.00	130.00	165.00	160.00	7
65	165.00	160.00	255.00	162.00	7
66	255.00	162.00	305.00	169.00	7
67	305.00	169.00	400.00	215.00	2
68	400.00	215.00	430.00	224.00	2
69	430.00	224.00	470.00	225.00	2
70	470.00	225.00	483.00	235.00	2
71	483.00	235.00	508.00	240.00	2
72	508.00	240.00	515.00	243.00	2
73	515.00	243.00	532.00	253.00	2
74	1515.00	390.00	1525.00	390.00	1
75	1525.00	390.00	1570.00	397.00	4
76	1570.00	397.00	1585.00	404.00	4
77	1585.00	404.00	1610.00	427.00	4
78	1610.00	427.00	1653.00	476.00	4
79	305.00	169.00	420.00	185.00	7
80	420.00	185.00	586.00	210.00	7
81	586.00	210.00	1170.00	270.00	7
82	1170.00	270.00	1420.00	320.00	7
83	1420.00	320.00	1476.00	330.00	7
84	0.00	103.00	160.00	104.00	1
85	160.00	104.00	400.00	107.00	1
86	400.00	107.00	960.00	114.00	1
87	960.00	114.00	1080.00	115.00	1
88	1080.00	115.00	1150.00	119.00	1
89	1150.00	119.00	1185.00	121.00	1
90	1185.00	121.00	1240.00	131.00	1
91	1240.00	131.00	1320.00	154.00	1
92	1320.00	154.00	1360.00	170.00	1
93	1360.00	170.00	1400.00	194.00	1
94	1400.00	194.00	1440.00	238.00	1
95	1440.00	238.00	1455.00	268.00	1
96	1455.00	268.00	1470.00	318.00	1
97	1470.00	318.00	1476.00	330.00	1
98	1476.00	330.00	1485.00	372.00	1

Default Y-Origin = 0.00(ft)
Default X-Plus Value = 0.00(ft)
Default Y-Plus Value = 0.00(ft)

ISOTROPIC SOIL PARAMETERS
7 Type(s) of Soil

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.
1	119.0	125.0	0.0	0.0	0.00	0.0	1
2	119.0	125.0	0.0	0.0	0.00	0.0	1
3	119.0	125.0	300.0	20.0	0.00	0.0	1
4	119.0	125.0	750.0	29.0	0.00	0.0	1

5	119.0	125.0	300.0	26.0	0.00	0.0	1
6	125.0	130.0	200.0	30.0	0.00	0.0	1
7	119.0	125.0	0.0	0.0	0.00	0.0	1

ANISOTROPIC STRENGTH PARAMETERS
3 soil type(s)
Soil Type 1 Is Anisotropic
Number Of Direction Ranges Specified = 3

Direction Range No.	Counterclockwise Direction Limit (deg)	Cohesion Intercept (psf)	Friction Angle (deg)
1	0.0	750.00	29.00
2	5.0	300.00	15.00
3	90.0	750.00	29.00

Soil Type 2 Is Anisotropic
Number Of Direction Ranges Specified = 3

Direction Range No.	Counterclockwise Direction Limit (deg)	Cohesion Intercept (psf)	Friction Angle (deg)
1	0.0	350.00	23.00
2	15.0	250.00	12.50
3	90.0	300.00	20.00

Soil Type 7 Is Anisotropic
Number Of Direction Ranges Specified = 3

Direction Range No.	Counterclockwise Direction Limit (deg)	Cohesion Intercept (psf)	Friction Angle (deg)
1	0.0	500.00	29.00
2	15.0	250.00	12.50
3	90.0	300.00	20.00

ANISOTROPIC SOIL NOTES:
(1) An input value of 0.01 for C and/or Phi will cause Aniso C and/or Phi to be ignored in that range.
(2) An input value of 0.02 for Phi will set both Phi and C equal to zero, with no water weight in the tension crack.
(3) An input value of 0.03 for Phi will set both Phi and C equal to zero, with water weight in the tension crack.
1 PIEZOMETRIC SURFACE(S) SPECIFIED
Unit Weight of Water = 62.40 (pcf)
Piezometric Surface No. 1 Specified by 12 Coordinate Points
Pore Pressure Inclination Factor = 0.50

Point No.	X-Water (ft)	Y-Water (ft)
1	0.00	202.00
2	168.00	205.00
3	343.00	210.00
4	583.00	230.00
5	818.00	250.00
6	1042.00	270.00
7	1170.00	290.00
8	1289.00	310.00
9	1410.00	330.00
10	1568.00	343.00
11	1636.00	345.00
12	1880.00	370.00

Janbus Empirical Coef is being used for the case of c & phi both > 0
A Critical Failure Surface Searching Method, Using A Random Technique For Generating Sliding Block Surfaces, Has Been Specified.
The Active And Passive Portions Of The Sliding Surfaces Are Generated According To The Rankine Theory.
5000 Trial Surfaces Have Been Generated.
3 Boxes Specified For Generation Of Central Block Base Length Of Line Segments For Active And Passive Portions Of Sliding Block Is 60.0

Box No.	X-Left (ft)	Y-Left (ft)	X-Right (ft)	Y-Right (ft)	Height (ft)
1	160.00	106.00	600.00	111.00	1.00
2	600.10	111.00	600.10	111.00	1.00
3	765.00	130.00	1000.00	150.00	80.00

Following Are Displayed The Ten Most Critical Of The Trial

```
   Failure Surfaces Evaluated. They Are
   Ordered - Most Critical First.
   * * Safety Factors Are Calculated By The Simplified Janbu Method * *
   Total Number of Trial Surfaces Attempted =  5000
   Number of Trial Surfaces With Valid FS = 5000
   Statistical Data On All Valid FS Values:
      FS Max =   3.158   FS Min =   1.785   FS Ave =   2.044
      Standard Deviation =    0.268   Coefficient of Variation =   13.13 %
   Failure Surface Specified By 13 Coordinate Points
     Point      X-Surf      Y-Surf
      No.        (ft)        (ft)
       1        344.880      232.417
       2        356.292      225.286
       3        382.845      206.693
       4        406.426      183.112
       5        437.127      152.411
       6        479.553      109.985
       7        600.100      110.839
       8        853.742      170.751
       9        896.168      213.177
      10        928.143      245.152
      11        970.569      287.578
      12        998.988      315.997
      13       1013.848      339.778
          Factor of Safety
         ***    1.785   ***
        Individual data on the     0  slices
                  Water  Water     Tie     Tie     Earthquake
                  Force  Force    Force   Force       Force   Surcharge
Slice  Width   Weight    Top    Bot     Norm     Tan     Hor     Ver    Load
 No.    (ft)    (lbs)   (lbs)  (lbs)    (lbs)   (lbs)   (lbs)   (lbs)   (lbs)
   Failure Surface Specified By 13 Coordinate Points
     Point      X-Surf      Y-Surf
      No.        (ft)        (ft)
       1        344.880      232.417
       2        356.292      225.286
       3        382.845      206.693
       4        406.426      183.112
       5        437.127      152.411
       6        479.553      109.985
       7        600.100      110.839
       8        853.742      170.751
       9        896.168      213.177
      10        928.143      245.152
      11        970.569      287.578
      12        998.988      315.997
      13       1013.848      339.778
          Factor of Safety
         ***    1.785   ***
   Failure Surface Specified By 13 Coordinate Points
     Point      X-Surf      Y-Surf
      No.        (ft)        (ft)
       1        344.880      232.417
       2        356.292      225.286
       3        382.845      206.693
       4        406.426      183.112
       5        437.127      152.411
       6        479.553      109.985
       7        600.100      110.839
       8        853.742      170.751
       9        896.168      213.177
      10        928.143      245.152
      11        970.569      287.578
      12        998.988      315.997
      13       1013.848      339.778
          Factor of Safety
         ***    1.785   ***
   Failure Surface Specified By 13 Coordinate Points
     Point      X-Surf      Y-Surf
      No.        (ft)        (ft)
```

1	345.385	232.428
2	356.796	225.298
3	383.153	206.842
4	406.828	183.167
5	437.986	152.009
6	480.413	109.582
7	600.100	111.318
8	861.544	170.946
9	903.971	213.372
10	936.621	246.023
11	979.048	288.449
12	1009.131	318.533
13	1022.344	339.678

Factor of Safety
*** 1.789 ***

Failure Surface Specified By 13 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	345.385	232.428
2	356.796	225.298
3	383.153	206.842
4	406.828	183.167
5	437.986	152.009
6	480.413	109.582
7	600.100	111.318
8	861.544	170.946
9	903.971	213.372
10	936.621	246.023
11	979.048	288.449
12	1009.131	318.533
13	1022.344	339.678

Factor of Safety
*** 1.789 ***

Failure Surface Specified By 13 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	342.763	232.371
2	354.180	225.237
3	381.555	206.069
4	404.746	182.878
5	435.408	152.216
6	477.834	109.789
7	600.100	110.882
8	838.136	170.360
9	880.563	212.787
10	911.186	243.409
11	953.612	285.836
12	979.373	311.597
13	997.106	339.975

Factor of Safety
*** 1.791 ***

Failure Surface Specified By 13 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	342.763	232.371
2	354.180	225.237
3	381.555	206.069
4	404.746	182.878
5	435.408	152.216
6	477.834	109.789
7	600.100	110.882
8	838.136	170.360
9	880.563	212.787
10	911.186	243.409
11	953.612	285.836
12	979.373	311.597
13	997.106	339.975

Factor of Safety
*** 1.791 ***

Failure Surface Specified By 13 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	351.253	232.554
2	362.647	225.434
3	381.863	206.218
4	405.147	182.934
5	436.267	151.813
6	478.694	109.387
7	600.100	111.361
8	845.939	170.555
9	888.365	212.982
10	919.664	244.281
11	962.091	286.707
12	988.845	313.461
13	1005.352	339.878

Factor of Safety
*** 1.791 ***

Failure Surface Specified By 13 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	351.253	232.554
2	362.647	225.434
3	381.863	206.218
4	405.147	182.934
5	436.267	151.813
6	478.694	109.387
7	600.100	111.361
8	845.939	170.555
9	888.365	212.982
10	919.664	244.281
11	962.091	286.707
12	988.845	313.461
13	1005.352	339.878

Factor of Safety
*** 1.791 ***

Failure Surface Specified By 14 Coordinate Points

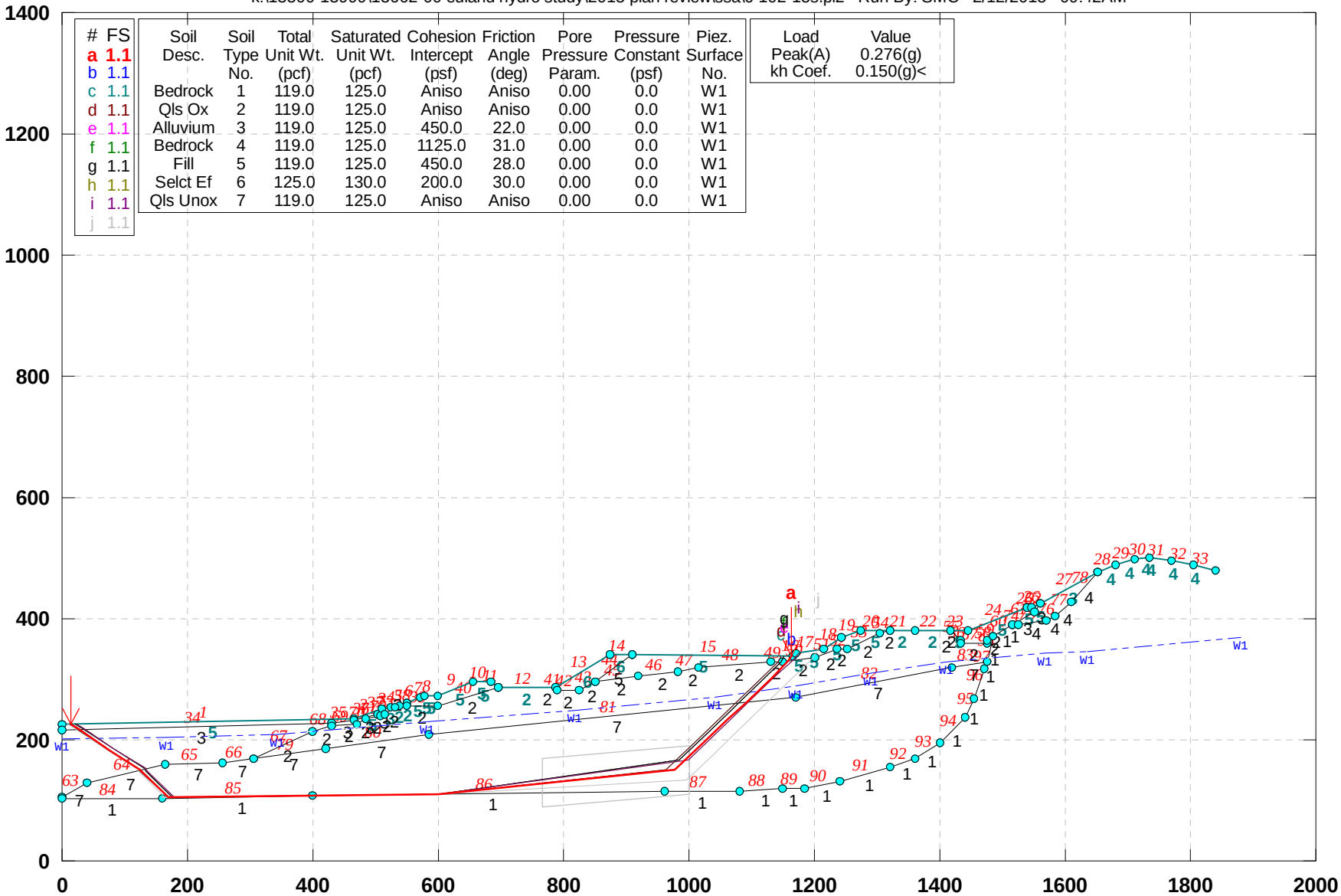
Point No.	X-Surf (ft)	Y-Surf (ft)
1	337.620	232.261
2	349.052	225.117
3	378.423	204.552
4	400.665	182.310
5	430.896	152.078
6	473.323	109.652
7	600.100	110.620
8	855.922	154.335
9	898.348	196.761
10	940.775	239.188
11	948.868	247.281
12	991.295	289.707
13	1022.075	320.488
14	1033.981	339.541

Factor of Safety
*** 1.794 ***

**** END OF GSTABL7 OUTPUT ****

13662-00, Euland Capital, C-C', - - Seismic

k:\13500-13999\13662-00 euland hydro study\2015 plan review\ssa\c-102-15s.pl2 Run By: SMC 2/12/2015 09:42AM



#	FS
a	1.1
b	1.1
c	1.1
d	1.1
e	1.1
f	1.1
g	1.1
h	1.1
i	1.1
j	1.1

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.
Bedrock	1	119.0	125.0	Aniso	Aniso	0.00	0.0	W1
Qls Ox	2	119.0	125.0	Aniso	Aniso	0.00	0.0	W1
Alluvium	3	119.0	125.0	450.0	22.0	0.00	0.0	W1
Bedrock	4	119.0	125.0	1125.0	31.0	0.00	0.0	W1
Fill	5	119.0	125.0	450.0	28.0	0.00	0.0	W1
Selct Ef	6	125.0	130.0	200.0	30.0	0.00	0.0	W1
Qls Unox	7	119.0	125.0	Aniso	Aniso	0.00	0.0	W1

Load	Value
Peak(A)	0.276(g)
kh Coef.	0.150(g)<

GSTABL7 v.2 FSmin=1.1

Safety Factors Are Calculated By The Simplified Janbu Method for the case of c & phi both > 0

Figure E-10.2

***** GSTABL7 *****

** GSTABL7 by Garry H. Gregory, P.E. **

** Original Version 1.0, January 1996; Current Version 2.005, Sept. 2006 **

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****

SLOPE STABILITY ANALYSIS SYSTEM

Modified Bishop, Simplified Janbu, or GLE Method of Slices.
(Includes Spencer & Morgenstern-Price Type Analysis)
Including Pier/Pile, Reinforcement, Soil Nail, Tieback,
Nonlinear Undrained Shear Strength, Curved Phi Envelope,
Anisotropic Soil, Fiber-Reinforced Soil, Boundary Loads, Water
Surfaces, Pseudo-Static & Newmark Earthquake, and Applied Forces.

****

Analysis Run Date: 2/12/2015
Time of Run: 09:42AM
Run By: SMC
Input Data Filename: K:\13500-13999\13662-00 Euland Hydro Study\2015 Plan Review\SSA\c-102-15s.
Output Filename: K:\13500-13999\13662-00 Euland Hydro Study\2015 Plan Review\SSA\c-102-15s.OUT
Unit System: English
Plotted Output Filename: K:\13500-13999\13662-00 Euland Hydro Study\2015 Plan Review\SSA\c-102-15s.PLT
PROBLEM DESCRIPTION: 13662-00, Euland Capital, C-C',
- - Seismic

BOUNDARY COORDINATES
33 Top Boundaries
98 Total Boundaries

Boundary No.	X-Left (ft)	Y-Left (ft)	X-Right (ft)	Y-Right (ft)	Soil Type Below Bnd
1	0.00	225.00	465.00	235.00	5
2	465.00	235.00	510.00	252.00	5
3	510.00	252.00	523.00	253.00	3
4	523.00	253.00	537.00	255.00	2
5	537.00	255.00	550.00	260.00	2
6	550.00	260.00	570.00	270.00	5
7	570.00	270.00	578.00	272.00	5
8	578.00	272.00	600.00	273.00	5
9	600.00	273.00	656.00	295.00	5
10	656.00	295.00	685.00	295.00	5
11	685.00	295.00	696.00	287.00	5
12	696.00	287.00	788.00	287.00	2
13	788.00	287.00	875.00	341.00	6
14	875.00	341.00	910.00	341.00	6
15	910.00	341.00	1165.00	338.00	5
16	1165.00	338.00	1170.00	342.00	5
17	1170.00	342.00	1215.00	351.00	5
18	1215.00	351.00	1244.00	370.00	5
19	1244.00	370.00	1273.00	380.00	5
20	1273.00	380.00	1320.00	380.00	5
21	1320.00	380.00	1360.00	380.00	2
22	1360.00	380.00	1418.00	380.00	2
23	1418.00	380.00	1445.00	380.00	5
24	1445.00	380.00	1540.00	418.00	5
25	1540.00	418.00	1547.00	418.00	5
26	1547.00	418.00	1560.00	425.00	5
27	1560.00	425.00	1653.00	476.00	3
28	1653.00	476.00	1680.00	489.00	4
29	1680.00	489.00	1710.00	498.00	4
30	1710.00	498.00	1735.00	500.00	4
31	1735.00	500.00	1770.00	495.00	4
32	1770.00	495.00	1805.00	488.00	4
33	1805.00	488.00	1840.00	480.00	4
34	0.00	217.00	430.00	227.00	3
35	430.00	227.00	465.00	232.00	3
36	465.00	232.00	502.00	243.00	3
37	502.00	243.00	510.00	252.00	3
38	550.00	260.00	551.00	255.00	2
39	551.00	255.00	600.00	255.00	2
40	600.00	255.00	696.00	287.00	2

41	788.00	287.00	789.00	281.00	2
42	789.00	281.00	825.00	281.00	2
43	825.00	281.00	850.00	295.00	2
44	850.00	295.00	910.00	341.00	5
45	850.00	295.00	920.00	305.00	2
46	920.00	305.00	983.00	312.00	2
47	983.00	312.00	1015.00	320.00	2
48	1015.00	320.00	1131.00	328.00	2
49	1131.00	328.00	1148.00	330.00	2
50	1148.00	330.00	1200.00	337.00	2
51	1200.00	337.00	1237.00	350.00	2
52	1237.00	350.00	1252.00	350.00	2
53	1252.00	350.00	1305.00	375.00	2
54	1305.00	375.00	1320.00	380.00	2
55	1418.00	380.00	1433.00	365.00	2
56	1433.00	365.00	1434.00	360.00	2
57	1434.00	360.00	1475.00	360.00	2
58	1475.00	360.00	1476.00	365.00	2
59	1476.00	365.00	1485.00	372.00	2
60	1485.00	372.00	1515.00	390.00	1
61	1515.00	390.00	1550.00	412.00	3
62	1550.00	412.00	1560.00	425.00	3
63	0.00	105.00	40.00	130.00	7
64	40.00	130.00	165.00	160.00	7
65	165.00	160.00	255.00	162.00	7
66	255.00	162.00	305.00	169.00	7
67	305.00	169.00	400.00	215.00	2
68	400.00	215.00	430.00	224.00	2
69	430.00	224.00	470.00	225.00	2
70	470.00	225.00	483.00	235.00	2
71	483.00	235.00	508.00	240.00	2
72	508.00	240.00	515.00	243.00	2
73	515.00	243.00	532.00	253.00	2
74	1515.00	390.00	1525.00	390.00	1
75	1525.00	390.00	1570.00	397.00	4
76	1570.00	397.00	1585.00	404.00	4
77	1585.00	404.00	1610.00	427.00	4
78	1610.00	427.00	1653.00	476.00	4
79	305.00	169.00	420.00	185.00	7
80	420.00	185.00	586.00	210.00	7
81	586.00	210.00	1170.00	270.00	7
82	1170.00	270.00	1420.00	320.00	7
83	1420.00	320.00	1476.00	330.00	7
84	0.00	103.00	160.00	104.00	1
85	160.00	104.00	400.00	107.00	1
86	400.00	107.00	960.00	114.00	1
87	960.00	114.00	1080.00	115.00	1
88	1080.00	115.00	1150.00	119.00	1
89	1150.00	119.00	1185.00	121.00	1
90	1185.00	121.00	1240.00	131.00	1
91	1240.00	131.00	1320.00	154.00	1
92	1320.00	154.00	1360.00	170.00	1
93	1360.00	170.00	1400.00	194.00	1
94	1400.00	194.00	1440.00	238.00	1
95	1440.00	238.00	1455.00	268.00	1
96	1455.00	268.00	1470.00	318.00	1
97	1470.00	318.00	1476.00	330.00	1
98	1476.00	330.00	1485.00	372.00	1

Default Y-Origin = 0.00(ft)
Default X-Plus Value = 0.00(ft)
Default Y-Plus Value = 0.00(ft)

ISOTROPIC SOIL PARAMETERS
7 Type(s) of Soil

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.
1	119.0	125.0	0.0	0.0	0.00	0.0	1
2	119.0	125.0	0.0	0.0	0.00	0.0	1
3	119.0	125.0	450.0	22.0	0.00	0.0	1
4	119.0	125.0	1125.0	31.0	0.00	0.0	1

5	119.0	125.0	450.0	28.0	0.00	0.0	1
6	125.0	130.0	200.0	30.0	0.00	0.0	1
7	119.0	125.0	0.0	0.0	0.00	0.0	1

ANISOTROPIC STRENGTH PARAMETERS
3 soil type(s)

Soil Type 1 Is Anisotropic
Number Of Direction Ranges Specified = 3

Direction Range No.	Counterclockwise Direction Limit (deg)	Cohesion Intercept (psf)	Friction Angle (deg)
1	0.0	1125.00	31.00
2	5.0	450.00	17.00
3	90.0	1125.00	31.00

Soil Type 2 Is Anisotropic
Number Of Direction Ranges Specified = 3

Direction Range No.	Counterclockwise Direction Limit (deg)	Cohesion Intercept (psf)	Friction Angle (deg)
1	0.0	525.00	25.00
2	15.0	375.00	14.50
3	90.0	450.00	22.00

Soil Type 7 Is Anisotropic
Number Of Direction Ranges Specified = 3

Direction Range No.	Counterclockwise Direction Limit (deg)	Cohesion Intercept (psf)	Friction Angle (deg)
1	0.0	750.00	31.00
2	15.0	375.00	14.50
3	90.0	450.00	22.00

ANISOTROPIC SOIL NOTES:
(1) An input value of 0.01 for C and/or Phi will cause Aniso C and/or Phi to be ignored in that range.
(2) An input value of 0.02 for Phi will set both Phi and C equal to zero, with no water weight in the tension crack.
(3) An input value of 0.03 for Phi will set both Phi and C equal to zero, with water weight in the tension crack.

1 PIEZOMETRIC SURFACE(S) SPECIFIED
Unit Weight of Water = 62.40 (pcf)
Piezometric Surface No. 1 Specified by 12 Coordinate Points
Pore Pressure Inclination Factor = 0.50

Point No.	X-Water (ft)	Y-Water (ft)
1	0.00	202.00
2	168.00	205.00
3	343.00	210.00
4	583.00	230.00
5	818.00	250.00
6	1042.00	270.00
7	1170.00	290.00
8	1289.00	310.00
9	1410.00	330.00
10	1568.00	343.00
11	1636.00	345.00
12	1880.00	370.00

Specified Peak Ground Acceleration Coefficient (A) = 0.276(g)
Specified Horizontal Earthquake Coefficient (kh) = 0.150(g)
Specified Vertical Earthquake Coefficient (kv) = 0.000(g)
Specified Seismic Pore-Pressure Factor = 0.000
Janbus Empirical Coef is being used for the case of c & phi both > 0
A Critical Failure Surface Searching Method, Using A Random Technique For Generating Sliding Block Surfaces, Has Been Specified.
The Active And Passive Portions Of The Sliding Surfaces Are Generated According To The Rankine Theory.
5000 Trial Surfaces Have Been Generated.
3 Boxes Specified For Generation Of Central Block Base Length Of Line Segments For Active And Passive Portions Of Sliding Block Is 60.0

Box No.	X-Left (ft)	Y-Left (ft)	X-Right (ft)	Y-Right (ft)	Height (ft)

1	160.00	106.00	600.00	111.00	1.00
2	600.10	111.00	600.10	111.00	1.00
3	765.00	130.00	1000.00	150.00	80.00

Following Are Displayed The Ten Most Critical Of The Trial
Failure Surfaces Evaluated. They Are
Ordered - Most Critical First.
* * Safety Factors Are Calculated By The Simplified Janbu Method * *
Total Number of Trial Surfaces Attempted = 5000
Number of Trial Surfaces With Valid FS = 5000
Statistical Data On All Valid FS Values:
FS Max = 2.025 FS Min = 1.142 FS Ave = 1.286
Standard Deviation = 0.154 Coefficient of Variation = 11.97 %
Failure Surface Specified By 14 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	13.534	225.291
2	26.314	217.612
3	75.966	184.122
4	125.708	150.570
5	127.322	148.956
6	169.749	106.530
7	600.100	110.834
8	978.356	150.341
9	1020.782	192.767
10	1063.209	235.193
11	1089.773	261.758
12	1132.199	304.184
13	1159.573	331.558
14	1163.455	338.018

Factor of Safety
*** 1.142 ***
Individual data on the 0 slices

Slice No.	Width (ft)	Weight (lbs)	Water Force Top (lbs)	Water Force Bot (lbs)	Tie Force Norm (lbs)	Tie Force Tan (lbs)	Earthquake Force Hor (lbs)	Earthquake Force Ver (lbs)	Surcharge Load (lbs)

Failure Surface Specified By 14 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	13.534	225.291
2	26.314	217.612
3	75.966	184.122
4	125.708	150.570
5	127.322	148.956
6	169.749	106.530
7	600.100	110.834
8	978.356	150.341
9	1020.782	192.767
10	1063.209	235.193
11	1089.773	261.758
12	1132.199	304.184
13	1159.573	331.558
14	1163.455	338.018

Factor of Safety
*** 1.142 ***
Failure Surface Specified By 15 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	11.505	225.247
2	24.291	217.565
3	24.680	217.303
4	74.422	183.751
5	124.165	150.200
6	125.603	148.761
7	168.030	106.334
8	600.100	110.877
9	962.751	149.950
10	1005.177	192.376
11	1047.603	234.803
12	1072.816	260.015

13	1115.242	302.442
14	1142.107	329.307
15	1147.455	338.206

Factor of Safety
*** 1.143 ***

Failure Surface Specified By 15 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	11.505	225.247
2	24.291	217.565
3	24.680	217.303
4	74.422	183.751
5	124.165	150.200
6	125.603	148.761
7	168.030	106.334
8	600.100	110.877
9	962.751	149.950
10	1005.177	192.376
11	1047.603	234.803
12	1072.816	260.015
13	1115.242	302.442
14	1142.107	329.307
15	1147.455	338.206

Factor of Safety
*** 1.143 ***

Failure Surface Specified By 14 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	20.975	225.451
2	33.735	217.785
3	81.628	185.480
4	131.370	151.929
5	134.412	148.887
6	176.838	106.460
7	600.100	110.532
8	983.979	166.952
9	1026.405	209.378
10	1068.831	251.805
11	1077.526	260.499
12	1119.952	302.926
13	1146.897	329.870
14	1151.875	338.154

Factor of Safety
*** 1.143 ***

Failure Surface Specified By 14 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	20.975	225.451
2	33.735	217.785
3	81.628	185.480
4	131.370	151.929
5	134.412	148.887
6	176.838	106.460
7	600.100	110.532
8	983.979	166.952
9	1026.405	209.378
10	1068.831	251.805
11	1077.526	260.499
12	1119.952	302.926
13	1146.897	329.870
14	1151.875	338.154

Factor of Safety
*** 1.143 ***

Failure Surface Specified By 14 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	20.975	225.451
2	33.735	217.785
3	81.628	185.480
4	131.370	151.929

5	134.412	148.887
6	176.838	106.460
7	600.100	110.532
8	983.979	166.952
9	1026.405	209.378
10	1068.831	251.805
11	1077.526	260.499
12	1119.952	302.926
13	1146.897	329.870
14	1151.875	338.154

Factor of Safety
*** 1.143 ***

Failure Surface Specified By 14 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	23.004	225.495
2	35.758	217.832
3	83.171	185.851
4	132.914	152.299
5	136.131	149.082
6	178.557	106.656
7	600.100	111.489
8	999.584	167.343
9	1042.010	209.769
10	1084.437	252.195
11	1094.483	262.241
12	1136.909	304.668
13	1164.457	332.215
14	1175.302	343.060

Factor of Safety
*** 1.143 ***

Failure Surface Specified By 14 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	23.004	225.495
2	35.758	217.832
3	83.171	185.851
4	132.914	152.299
5	136.131	149.082
6	178.557	106.656
7	600.100	111.489
8	999.584	167.343
9	1042.010	209.769
10	1084.437	252.195
11	1094.483	262.241
12	1136.909	304.668
13	1164.457	332.215
14	1175.302	343.060

Factor of Safety
*** 1.143 ***

Failure Surface Specified By 16 Coordinate Points

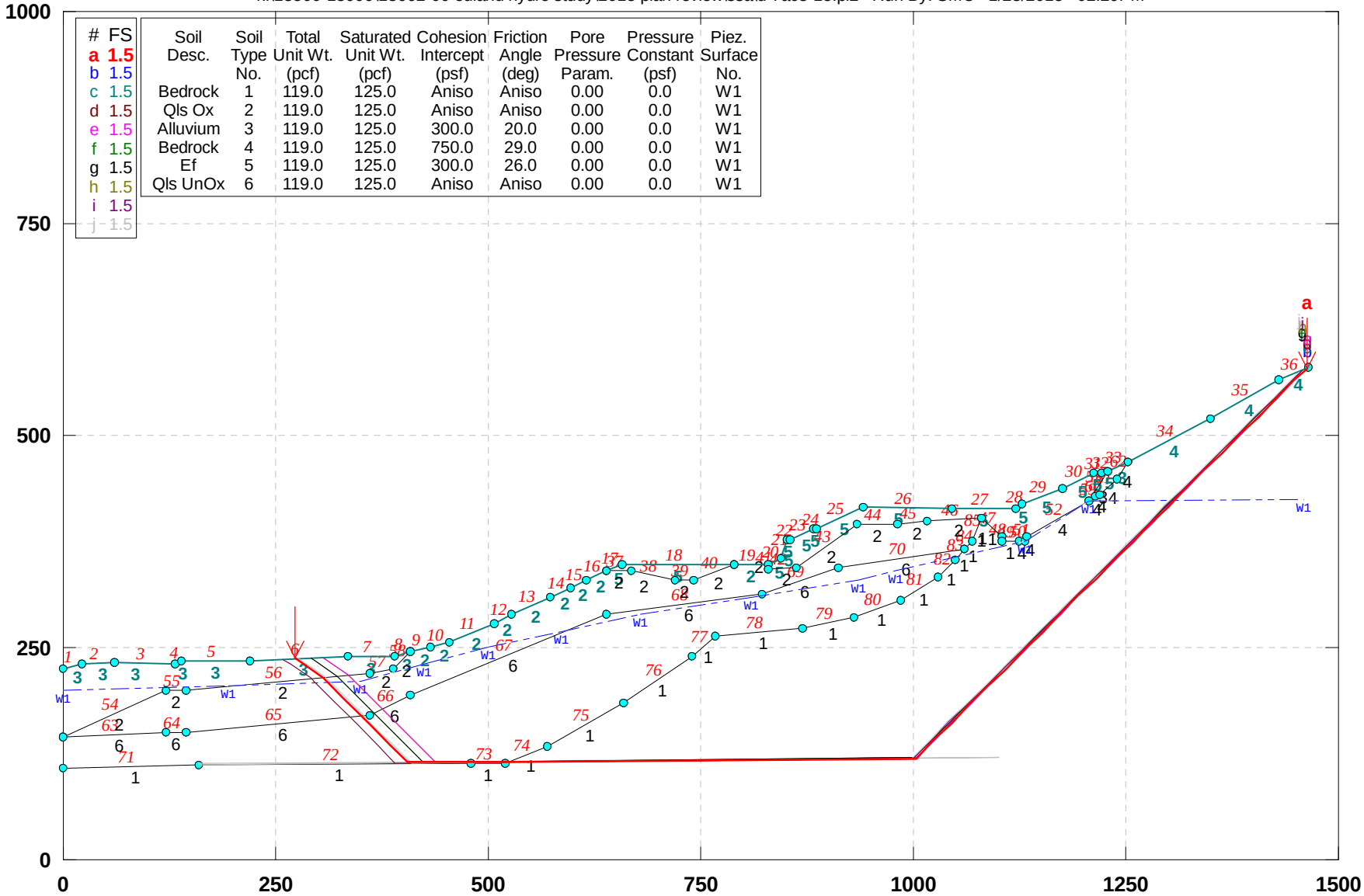
Point No.	X-Surf (ft)	Y-Surf (ft)
1	8.606	225.185
2	21.400	217.498
3	22.474	216.773
4	72.216	183.222
5	121.959	149.670
6	122.810	148.818
7	165.237	106.392
8	600.100	110.572
9	996.142	134.315
10	1038.568	176.742
11	1080.995	219.168
12	1123.421	261.594
13	1127.455	265.629
14	1169.882	308.055
15	1198.644	336.817
16	1206.096	349.219

Factor of Safety

```
***    1.143   ***
    **** END OF GSTABL7 OUTPUT ****
```

13662-00, Euland, Section D-D', - , static, 2015 design

k:\13500-13999\13662-00 euland hydro study\2015 plan review\ssa\d-7ac3-15.pl2 Run By: SMC 1/23/2015 02:29PM



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.
Bedrock	1	119.0	125.0	Aniso	Aniso	0.00	0.0	W1
Qls Ox	2	119.0	125.0	Aniso	Aniso	0.00	0.0	W1
Alluvium	3	119.0	125.0	300.0	20.0	0.00	0.0	W1
Bedrock	4	119.0	125.0	750.0	29.0	0.00	0.0	W1
Ef	5	119.0	125.0	300.0	26.0	0.00	0.0	W1
Qls UnOx	6	119.0	125.0	Aniso	Aniso	0.00	0.0	W1

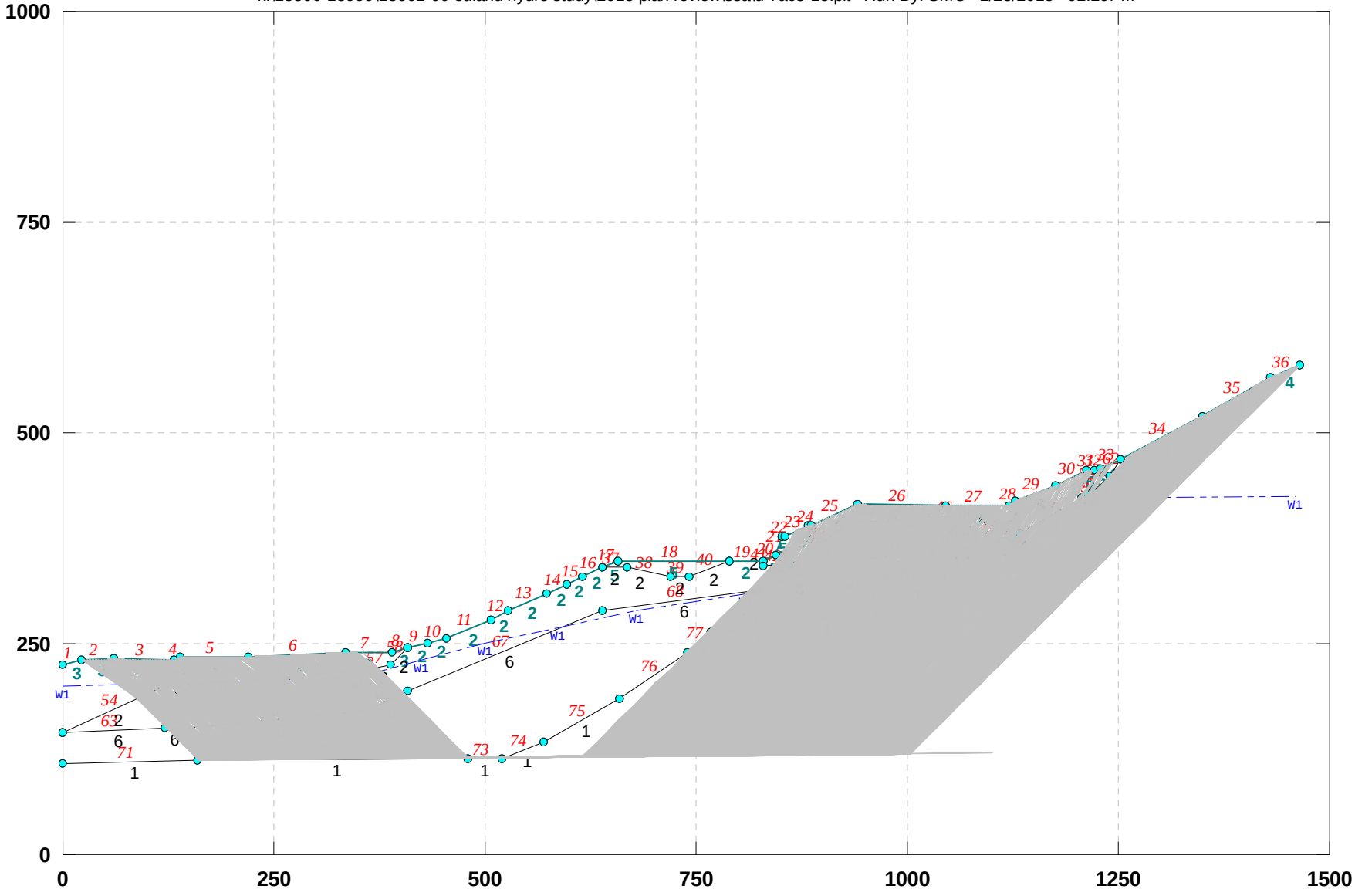
GSTABL7 v.2 FSmin=1.5

Safety Factors Are Calculated By The Simplified Janbu Method for the case of c & phi both > 0

Figure E-11.1

13662-00, Euland, Section D-D', - , static, 2015 design

k:\13500-13999\13662-00 euland hydro study\2015 plan review\ssa\d-7ac3-15.plt Run By: SMC 1/23/2015 02:29PM



***** GSTABL7 *****

** GSTABL7 by Garry H. Gregory, P.E. **

** Original Version 1.0, January 1996; Current Version 2.005, Sept. 2006 **

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****

SLOPE STABILITY ANALYSIS SYSTEM

Modified Bishop, Simplified Janbu, or GLE Method of Slices.
(Includes Spencer & Morgenstern-Price Type Analysis)
Including Pier/Pile, Reinforcement, Soil Nail, Tieback,
Nonlinear Undrained Shear Strength, Curved Phi Envelope,
Anisotropic Soil, Fiber-Reinforced Soil, Boundary Loads, Water
Surfaces, Pseudo-Static & Newmark Earthquake, and Applied Forces.

****

Analysis Run Date: 1/23/2015
Time of Run: 02:29PM
Run By: SMC
Input Data Filename: K:\13500-13999\13662-00 Euland Hydro Study\2015 Plan Review\SSA\d-7ac3-15.
Output Filename: K:\13500-13999\13662-00 Euland Hydro Study\2015 Plan Review\SSA\d-7ac3-15.OUT
Unit System: English
Plotted Output Filename: K:\13500-13999\13662-00 Euland Hydro Study\2015 Plan Review\SSA\d-7ac3-15.PLT
PROBLEM DESCRIPTION: 13662-00, Euland, Section D-D',
- , static, 2015 design

BOUNDARY COORDINATES
36 Top Boundaries
85 Total Boundaries

Boundary No.	X-Left (ft)	Y-Left (ft)	X-Right (ft)	Y-Right (ft)	Soil Type Below Bnd
1	0.00	225.00	22.00	230.00	3
2	22.00	230.00	60.00	232.00	3
3	60.00	232.00	131.00	230.00	3
4	131.00	230.00	140.00	235.00	3
5	140.00	235.00	220.00	235.00	3
6	220.00	235.00	335.00	240.00	3
7	335.00	240.00	390.00	240.00	3
8	390.00	240.00	408.00	245.00	3
9	408.00	245.00	432.00	250.00	2
10	432.00	250.00	454.00	256.00	2
11	454.00	256.00	508.00	279.00	2
12	508.00	279.00	527.00	289.00	2
13	527.00	289.00	574.00	310.00	2
14	574.00	310.00	597.00	320.00	2
15	597.00	320.00	616.00	330.00	2
16	616.00	330.00	640.00	340.00	2
17	640.00	340.00	658.00	348.00	5
18	658.00	348.00	790.00	348.00	5
19	790.00	348.00	830.00	348.00	2
20	830.00	348.00	845.00	355.00	5
21	845.00	355.00	851.00	378.00	5
22	851.00	378.00	855.00	378.00	5
23	855.00	378.00	882.00	390.00	5
24	882.00	390.00	886.00	390.00	5
25	886.00	390.00	941.00	415.00	5
26	941.00	415.00	1046.00	413.00	5
27	1046.00	413.00	1120.00	414.00	5
28	1120.00	414.00	1128.00	420.00	5
29	1128.00	420.00	1175.00	437.00	5
30	1175.00	437.00	1212.00	456.00	5
31	1212.00	456.00	1221.00	456.00	5
32	1221.00	456.00	1228.00	458.00	5
33	1228.00	458.00	1252.00	468.00	3
34	1252.00	468.00	1350.00	520.00	4
35	1350.00	520.00	1430.00	566.00	4
36	1430.00	566.00	1465.00	580.00	4
37	640.00	340.00	669.00	340.00	2
38	669.00	340.00	720.00	330.00	2
39	720.00	330.00	742.00	330.00	2

40	742.00	330.00	790.00	348.00	2
41	830.00	348.00	830.10	343.00	2
42	830.10	343.00	863.00	344.00	2
43	863.00	344.00	934.00	395.00	2
44	934.00	395.00	982.00	396.00	2
45	982.00	396.00	1016.00	400.00	2
46	1016.00	400.00	1080.00	403.00	2
47	1080.00	403.00	1104.00	380.00	1
48	1104.00	380.00	1105.00	375.00	1
49	1105.00	375.00	1125.00	375.00	1
50	1125.00	375.00	1132.00	375.00	4
51	1132.00	375.00	1133.00	380.00	4
52	1133.00	380.00	1207.00	423.00	4
53	1207.00	423.00	1228.00	458.00	3
54	0.00	145.00	120.00	200.00	2
55	120.00	200.00	145.00	200.00	2
56	145.00	200.00	360.00	220.00	2
57	360.00	220.00	388.00	226.00	2
58	388.00	226.00	408.00	245.00	2
59	1207.00	423.00	1215.00	428.00	4
60	1215.00	428.00	1220.00	430.00	4
61	1220.00	430.00	1240.00	449.00	4
62	1240.00	449.00	1252.00	468.00	4
63	0.00	145.00	120.00	150.00	6
64	120.00	150.00	145.00	150.00	6
65	145.00	150.00	360.00	170.00	6
66	360.00	170.00	408.00	195.00	6
67	408.00	195.00	640.00	290.00	6
68	640.00	290.00	823.00	313.00	6
69	823.00	313.00	912.00	345.00	6
70	912.00	345.00	1061.00	366.00	6
71	0.00	108.00	160.00	111.00	1
72	160.00	111.00	480.00	113.00	1
73	480.00	113.00	520.00	113.00	1
74	520.00	113.00	570.00	133.00	1
75	570.00	133.00	660.00	185.00	1
76	660.00	185.00	740.00	240.00	1
77	740.00	240.00	767.00	263.00	1
78	767.00	263.00	870.00	273.00	1
79	870.00	273.00	930.00	286.00	1
80	930.00	286.00	985.00	305.00	1
81	985.00	305.00	1030.00	333.00	1
82	1030.00	333.00	1050.00	353.00	1
83	1050.00	353.00	1061.00	366.00	1
84	1061.00	366.00	1070.00	376.00	1
85	1070.00	376.00	1080.00	403.00	1

Default Y-Origin = 0.00(ft)
Default X-Plus Value = 0.00(ft)
Default Y-Plus Value = 0.00(ft)

ISOTROPIC SOIL PARAMETERS
6 Type(s) of Soil

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.
1	119.0	125.0	0.0	0.0	0.00	0.0	1
2	119.0	125.0	0.0	0.0	0.00	0.0	1
3	119.0	125.0	300.0	20.0	0.00	0.0	1
4	119.0	125.0	750.0	29.0	0.00	0.0	1
5	119.0	125.0	300.0	26.0	0.00	0.0	1
6	119.0	125.0	0.0	0.0	0.00	0.0	1

ANISOTROPIC STRENGTH PARAMETERS
3 soil type(s)
Soil Type 1 Is Anisotropic
Number Of Direction Ranges Specified = 3

Direction Range No.	Counterclockwise Direction Limit (deg)	Cohesion Intercept (psf)	Friction Angle (deg)
1	-3.0	750.00	29.00
2	10.0	300.00	15.00
3	90.0	750.00	29.00

Soil Type 2 Is Anisotropic
Number Of Direction Ranges Specified = 3

Direction Range No.	Counterclockwise Direction Limit (deg)	Cohesion Intercept (psf)	Friction Angle (deg)
1	-3.0	350.00	23.00
2	10.0	250.00	12.50
3	90.0	300.00	20.00

Soil Type 6 Is Anisotropic
Number Of Direction Ranges Specified = 3

Direction Range No.	Counterclockwise Direction Limit (deg)	Cohesion Intercept (psf)	Friction Angle (deg)
1	-3.0	500.00	29.00
2	10.0	250.00	12.50
3	90.0	300.00	20.00

ANISOTROPIC SOIL NOTES:
(1) An input value of 0.01 for C and/or Phi will cause Aniso C and/or Phi to be ignored in that range.
(2) An input value of 0.02 for Phi will set both Phi and C equal to zero, with no water weight in the tension crack.
(3) An input value of 0.03 for Phi will set both Phi and C equal to zero, with water weight in the tension crack.

1 PIEZOMETRIC SURFACE(S) SPECIFIED
Unit Weight of Water = 62.40 (pcf)
Piezometric Surface No. 1 Specified by 13 Coordinate Points
Pore Pressure Inclination Factor = 0.50

Point No.	X-Water (ft)	Y-Water (ft)
1	0.00	200.00
2	195.00	205.00
3	349.00	210.00
4	425.00	230.00
5	500.00	250.00
6	586.00	270.00
7	680.00	290.00
8	810.00	310.00
9	936.00	330.00
10	980.00	340.00
11	1132.00	375.00
12	1207.00	423.00
13	1460.00	425.00

Janbus Empirical Coef is being used for the case of c & phi both > 0
A Critical Failure Surface Searching Method, Using A Random Technique For Generating Sliding Block Surfaces, Has Been Specified.
The Active And Passive Portions Of The Sliding Surfaces Are Generated According To The Rankine Theory.
3000 Trial Surfaces Have Been Generated.
3 Boxes Specified For Generation Of Central Block Base Length Of Line Segments For Active And Passive Portions Of Sliding Block Is 30.0

Box No.	X-Left (ft)	Y-Left (ft)	X-Right (ft)	Y-Right (ft)	Height (ft)
1	160.00	113.00	480.00	115.00	1.00
2	480.10	115.00	615.00	116.00	1.00
3	615.10	116.00	1100.00	121.00	1.00

Following Are Displayed The Ten Most Critical Of The Trial Failure Surfaces Evaluated. They Are Ordered - Most Critical First.
* * Safety Factors Are Calculated By The Simplified Janbu Method * *
Total Number of Trial Surfaces Attempted = 3000
Number of Trial Surfaces With Valid FS = 3000
Statistical Data On All Valid FS Values:
FS Max = 1.848 FS Min = 1.465 FS Ave = 1.174
Standard Deviation = 0.388 Coefficient of Variation = 33.05 %
Failure Surface Specified By 33 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	272.947	237.302

2	280.393	232.088
3	304.968	214.881
4	308.286	211.562
5	329.499	190.349
6	350.712	169.136
7	362.632	157.216
8	383.845	136.003
9	405.059	114.790
10	544.874	115.759
11	1003.014	119.546
12	1024.227	140.759
13	1045.441	161.973
14	1066.654	183.186
15	1087.867	204.399
16	1109.080	225.612
17	1130.294	246.825
18	1151.507	268.039
19	1172.720	289.252
20	1193.933	310.465
21	1215.147	331.678
22	1236.360	352.891
23	1257.573	374.105
24	1278.786	395.318
25	1300.000	416.531
26	1321.213	437.744
27	1342.426	458.957
28	1363.639	480.171
29	1384.853	501.384
30	1406.066	522.597
31	1427.279	543.810
32	1448.492	565.023
33	1462.448	578.979

Factor of Safety
*** 1.465 ***

Individual data on the 108 slices

Slice No.	Width (ft)	Weight (lbs)	Water Force Top (lbs)	Water Force Bot (lbs)	Tie Force Norm (lbs)	Tie Force Tan (lbs)	Earthquake Force Hor (lbs)	Earthquake Force Ver (lbs)	Surcharge Load (lbs)
1	7.4	2453.6	0.0	0.0	0.	0.	0.0	0.0	0.0
2	24.6	42917.0	0.0	0.0	0.	0.	0.0	0.0	0.0
3	3.3	10087.1	0.0	0.0	0.	0.	0.0	0.0	0.0
4	2.8	9552.2	0.0	0.0	0.	0.	0.0	0.0	0.0
5	18.4	88292.3	0.0	15448.2	0.	0.	0.0	0.0	0.0
6	5.5	34944.2	0.0	10604.6	0.	0.	0.0	0.0	0.0
7	14.0	106224.7	0.0	39420.3	0.	0.	0.0	0.0	0.0
8	1.7	14665.9	0.0	5882.9	0.	0.	0.0	0.0	0.0
9	9.3	85997.0	0.0	37416.9	0.	0.	0.0	0.0	0.0
10	2.6	26354.3	0.0	12296.4	0.	0.	0.0	0.0	0.0
11	21.2	244344.4	0.0	*******	0.	0.	0.0	0.0	0.0
12	4.2	54512.2	0.0	30435.0	0.	0.	0.0	0.0	0.0
13	2.0	27019.4	0.0	15315.0	0.	0.	0.0	0.0	0.0
14	15.1	223410.8	0.0	*******	0.	0.	0.0	0.0	0.0
15	2.9	47314.8	0.0	19596.7	0.	0.	0.0	0.0	0.0
16	17.0	277979.3	0.0	*******	0.	0.	0.0	0.0	0.0
17	7.0	116596.7	0.0	48980.0	0.	0.	0.0	0.0	0.0
18	22.0	376427.2	0.0	*******	0.	0.	0.0	0.0	0.0
19	46.0	858187.9	0.0	*******	0.	0.	0.0	0.0	0.0
20	8.0	160388.0	0.0	65885.6	0.	0.	0.0	0.0	0.0
21	18.6	387229.7	0.0	*******	0.	0.	0.0	0.0	0.0
22	0.4	8975.4	0.0	3578.7	0.	0.	0.0	0.0	0.0
23	17.9	392017.8	0.0	*******	0.	0.	0.0	0.0	0.0
24	25.1	580003.6	0.0	*******	0.	0.	0.0	0.0	0.0
25	4.0	95451.9	0.0	36665.7	0.	0.	0.0	0.0	0.0
26	12.0	291388.4	0.0	*******	0.	0.	0.0	0.0	0.0
27	10.7	267097.7	0.0	*******	0.	0.	0.0	0.0	0.0
28	0.3	6628.7	0.0	2510.8	0.	0.	0.0	0.0	0.0
29	19.0	489573.6	0.0	*******	0.	0.	0.0	0.0	0.0
30	24.0	647080.6	0.0	*******	0.	0.	0.0	0.0	0.0
31	18.0	504670.4	0.0	*******	0.	0.	0.0	0.0	0.0

32	2.0	57030.8	0.0	20614.3	0.	0.	0.0	0.0	0.0
33	9.0	256649.5	0.0	93382.5	0.	0.	0.0	0.0	0.0
34	11.0	313706.5	0.0	*******	0.	0.	0.0	0.0	0.0
35	40.0	1141121.9	0.0	*******	0.	0.	0.0	0.0	0.0
36	20.0	570488.8	0.0	*******	0.	0.	0.0	0.0	0.0
37	2.0	57046.2	0.0	22452.3	0.	0.	0.0	0.0	0.0
38	25.0	713037.4	0.0	*******	0.	0.	0.0	0.0	0.0
39	23.0	655928.0	0.0	*******	0.	0.	0.0	0.0	0.0
40	20.0	570320.5	0.0	*******	0.	0.	0.0	0.0	0.0
41	13.0	370674.0	0.0	*******	0.	0.	0.0	0.0	0.0
42	7.0	199587.3	0.0	83930.2	0.	0.	0.0	0.0	0.0
43	0.1	2850.8	0.0	1202.0	0.	0.	0.0	0.0	0.0
44	14.9	431068.5	0.0	*******	0.	0.	0.0	0.0	0.0
45	6.0	184271.9	0.0	73136.5	0.	0.	0.0	0.0	0.0
46	4.0	128320.1	0.0	48943.2	0.	0.	0.0	0.0	0.0
47	8.0	258328.3	0.0	98331.5	0.	0.	0.0	0.0	0.0
48	7.0	228809.1	0.0	86526.9	0.	0.	0.0	0.0	0.0
49	12.0	398263.0	0.0	*******	0.	0.	0.0	0.0	0.0
50	4.0	134020.7	0.0	50093.1	0.	0.	0.0	0.0	0.0
51	26.0	889381.6	0.0	*******	0.	0.	0.0	0.0	0.0
52	18.0	637109.3	0.0	*******	0.	0.	0.0	0.0	0.0
53	4.0	143955.8	0.0	51873.7	0.	0.	0.0	0.0	0.0
54	2.0	72301.9	0.0	25992.5	0.	0.	0.0	0.0	0.0
55	5.0	181626.9	0.0	64386.5	0.	0.	0.0	0.0	0.0
56	39.0	1420495.8	0.0	*******	0.	0.	0.0	0.0	0.0
57	2.0	72763.6	0.0	26871.0	0.	0.	0.0	0.0	0.0
58	3.0	109130.8	0.0	40407.8	0.	0.	0.0	0.0	0.0
59	18.0	654928.3	0.0	*******	0.	0.	0.0	0.0	0.0
60	13.0	461288.2	0.0	*******	0.	0.	0.0	0.0	0.0
61	8.2	281276.9	0.0	*******	0.	0.	0.0	0.0	0.0
62	5.8	192276.5	0.0	*******	0.	0.	0.0	0.0	0.0
63	15.4	493694.8	0.0	*******	0.	0.	0.0	0.0	0.0
64	0.6	17324.9	0.0	9282.7	0.	0.	0.0	0.0	0.0
65	4.0	122755.1	0.0	65766.5	0.	0.	0.0	0.0	0.0
66	3.3	99120.4	0.0	53093.2	0.	0.	0.0	0.0	0.0
67	7.7	228399.9	0.0	*******	0.	0.	0.0	0.0	0.0
68	5.7	162601.2	0.0	87032.6	0.	0.	0.0	0.0	0.0
69	3.3	94399.6	0.0	50512.9	0.	0.	0.0	0.0	0.0
70	10.0	273976.5	0.0	*******	0.	0.	0.0	0.0	0.0
71	7.9	206972.3	0.0	*******	0.	0.	0.0	0.0	0.0
72	16.1	400838.5	0.0	*******	0.	0.	0.0	0.0	0.0
73	1.0	23801.8	0.0	12700.4	0.	0.	0.0	0.0	0.0
74	4.1	95855.6	0.0	51135.4	0.	0.	0.0	0.0	0.0
75	10.9	246544.0	0.0	*******	0.	0.	0.0	0.0	0.0
76	5.0	109134.0	0.0	57542.5	0.	0.	0.0	0.0	0.0
77	3.0	65069.4	0.0	33730.9	0.	0.	0.0	0.0	0.0
78	2.3	49417.8	0.0	25386.2	0.	0.	0.0	0.0	0.0
79	1.7	36492.2	0.0	18661.3	0.	0.	0.0	0.0	0.0
80	1.0	21186.5	0.0	9525.3	0.	0.	0.0	0.0	0.0
81	18.5	378051.9	0.0	*******	0.	0.	0.0	0.0	0.0
82	21.2	400559.5	0.0	*******	0.	0.	0.0	0.0	0.0
83	2.3	40966.7	0.0	19156.5	0.	0.	0.0	0.0	0.0
84	18.9	327819.3	0.0	*******	0.	0.	0.0	0.0	0.0
85	13.1	213751.9	0.0	*******	0.	0.	0.0	0.0	0.0
86	5.0	79476.9	0.0	42793.1	0.	0.	0.0	0.0	0.0
87	3.0	46645.0	0.0	24625.3	0.	0.	0.0	0.0	0.0
88	0.1	2250.7	0.0	1183.2	0.	0.	0.0	0.0	0.0
89	4.9	72992.0	0.0	38108.1	0.	0.	0.0	0.0	0.0
90	1.0	14673.7	0.0	7595.6	0.	0.	0.0	0.0	0.0
91	7.0	100050.1	0.0	50718.0	0.	0.	0.0	0.0	0.0
92	8.4	114191.5	0.0	54950.1	0.	0.	0.0	0.0	0.0
93	3.6	48076.3	0.0	22014.8	0.	0.	0.0	0.0	0.0
94	12.0	151414.8	0.0	64358.3	0.	0.	0.0	0.0	0.0
95	5.6	66840.9	0.0	25602.7	0.	0.	0.0	0.0	0.0
96	21.2	236859.4	0.0	72579.9	0.	0.	0.0	0.0	0.0
97	21.2	209045.0	0.0	33183.7	0.	0.	0.0	0.0	0.0
98	7.3	65168.9	0.0	2308.2	0.	0.	0.0	0.0	0.0
99	14.0	116641.3	0.0	0.0	0.	0.	0.0	0.0	0.0
100	21.2	156517.4	0.0	0.0	0.	0.	0.0	0.0	0.0
101	7.6	49792.8	0.0	0.0	0.	0.	0.0	0.0	0.0

102	13.6	82080.3	0.0	0.0	0.	0.	0.0	0.0	0.0
103	21.2	108962.9	0.0	0.0	0.	0.	0.0	0.0	0.0
104	21.2	86204.2	0.0	0.0	0.	0.	0.0	0.0	0.0
105	21.2	63445.5	0.0	0.0	0.	0.	0.0	0.0	0.0
106	2.7	6490.8	0.0	0.0	0.	0.	0.0	0.0	0.0
107	18.5	30635.3	0.0	0.0	0.	0.	0.0	0.0	0.0
108	14.0	6953.4	0.0	0.0	0.	0.	0.0	0.0	0.0

Failure Surface Specified By 33 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	272.947	237.302
2	280.393	232.088
3	304.968	214.881
4	308.286	211.562
5	329.499	190.349
6	350.712	169.136
7	362.632	157.216
8	383.845	136.003
9	405.059	114.790
10	544.874	115.759
11	1003.014	119.546
12	1024.227	140.759
13	1045.441	161.973
14	1066.654	183.186
15	1087.867	204.399
16	1109.080	225.612
17	1130.294	246.825
18	1151.507	268.039
19	1172.720	289.252
20	1193.933	310.465
21	1215.147	331.678
22	1236.360	352.891
23	1257.573	374.105
24	1278.786	395.318
25	1300.000	416.531
26	1321.213	437.744
27	1342.426	458.957
28	1363.639	480.171
29	1384.853	501.384
30	1406.066	522.597
31	1427.279	543.810
32	1448.492	565.023
33	1462.448	578.979

Factor of Safety
*** 1.465 ***

Failure Surface Specified By 33 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	272.947	237.302
2	280.393	232.088
3	304.968	214.881
4	308.286	211.562
5	329.499	190.349
6	350.712	169.136
7	362.632	157.216
8	383.845	136.003
9	405.059	114.790
10	544.874	115.759
11	1003.014	119.546
12	1024.227	140.759
13	1045.441	161.973
14	1066.654	183.186
15	1087.867	204.399
16	1109.080	225.612
17	1130.294	246.825
18	1151.507	268.039
19	1172.720	289.252
20	1193.933	310.465
21	1215.147	331.678
22	1236.360	352.891

23	1257.573	374.105
24	1278.786	395.318
25	1300.000	416.531
26	1321.213	437.744
27	1342.426	458.957
28	1363.639	480.171
29	1384.853	501.384
30	1406.066	522.597
31	1427.279	543.810
32	1448.492	565.023
33	1462.448	578.979

Factor of Safety
*** 1.465 ***

Failure Surface Specified By 32 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	305.331	238.710
2	310.755	234.912
3	335.329	217.705
4	353.933	199.102
5	375.146	177.889
6	395.601	157.434
7	416.814	136.220
8	438.027	115.007
9	596.186	115.631
10	1003.724	119.995
11	1024.938	141.208
12	1046.151	162.421
13	1067.364	183.634
14	1088.577	204.847
15	1109.791	226.060
16	1131.004	247.274
17	1152.217	268.487
18	1173.430	289.700
19	1194.644	310.913
20	1215.857	332.126
21	1237.070	353.340
22	1258.283	374.553
23	1279.497	395.766
24	1300.710	416.979
25	1321.923	438.192
26	1343.136	459.406
27	1364.350	480.619
28	1385.563	501.832
29	1406.776	523.045
30	1427.990	544.258
31	1449.203	565.472
32	1462.885	579.154

Factor of Safety
*** 1.467 ***

Failure Surface Specified By 32 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	305.331	238.710
2	310.755	234.912
3	335.329	217.705
4	353.933	199.102
5	375.146	177.889
6	395.601	157.434
7	416.814	136.220
8	438.027	115.007
9	596.186	115.631
10	1003.724	119.995
11	1024.938	141.208
12	1046.151	162.421
13	1067.364	183.634
14	1088.577	204.847
15	1109.791	226.060
16	1131.004	247.274
17	1152.217	268.487

18	1173.430	289.700
19	1194.644	310.913
20	1215.857	332.126
21	1237.070	353.340
22	1258.283	374.553
23	1279.497	395.766
24	1300.710	416.979
25	1321.923	438.192
26	1343.136	459.406
27	1364.350	480.619
28	1385.563	501.832
29	1406.776	523.045
30	1427.990	544.258
31	1449.203	565.472
32	1462.885	579.154

Factor of Safety
*** 1.467 ***

Failure Surface Specified By 33 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	291.004	238.087
2	297.322	233.663
3	321.897	216.456
4	323.066	215.287
5	344.279	194.074
6	365.492	172.860
7	381.382	156.970
8	402.595	135.757
9	423.809	114.544
10	497.975	114.767
11	1001.120	120.351
12	1022.333	141.564
13	1043.546	162.777
14	1064.760	183.991
15	1085.973	205.204
16	1107.186	226.417
17	1128.399	247.630
18	1149.613	268.843
19	1170.826	290.057
20	1192.039	311.270
21	1213.252	332.483
22	1234.466	353.696
23	1255.679	374.909
24	1276.892	396.122
25	1298.105	417.336
26	1319.319	438.549
27	1340.532	459.762
28	1361.745	480.975
29	1382.958	502.188
30	1404.172	523.402
31	1425.385	544.615
32	1446.598	565.828
33	1457.950	577.180

Factor of Safety
*** 1.468 ***

Failure Surface Specified By 33 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	291.004	238.087
2	297.322	233.663
3	321.897	216.456
4	323.066	215.287
5	344.279	194.074
6	365.492	172.860
7	381.382	156.970
8	402.595	135.757
9	423.809	114.544
10	497.975	114.767
11	1001.120	120.351
12	1022.333	141.564

13	1043.546	162.777
14	1064.760	183.991
15	1085.973	205.204
16	1107.186	226.417
17	1128.399	247.630
18	1149.613	268.843
19	1170.826	290.057
20	1192.039	311.270
21	1213.252	332.483
22	1234.466	353.696
23	1255.679	374.909
24	1276.892	396.122
25	1298.105	417.336
26	1319.319	438.549
27	1340.532	459.762
28	1361.745	480.975
29	1382.958	502.188
30	1404.172	523.402
31	1425.385	544.615
32	1446.598	565.828
33	1457.950	577.180

Factor of Safety
*** 1.468 ***

Failure Surface Specified By 33 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	258.619	236.679
2	266.961	230.838
3	291.535	213.631
4	294.853	210.313
5	316.067	189.100
6	337.280	167.886
7	348.413	156.753
8	369.627	135.540
9	390.840	114.326
10	581.563	115.895
11	1000.410	119.903
12	1021.623	141.116
13	1042.836	162.329
14	1064.049	183.542
15	1085.263	204.755
16	1106.476	225.969
17	1127.689	247.182
18	1148.902	268.395
19	1170.116	289.608
20	1191.329	310.821
21	1212.542	332.035
22	1233.755	353.248
23	1254.969	374.461
24	1276.182	395.674
25	1297.395	416.887
26	1318.608	438.101
27	1339.822	459.314
28	1361.035	480.527
29	1382.248	501.740
30	1403.461	522.953
31	1424.675	544.167
32	1445.888	565.380
33	1457.514	577.005

Factor of Safety
*** 1.473 ***

Failure Surface Specified By 33 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	258.619	236.679
2	266.961	230.838
3	291.535	213.631
4	294.853	210.313
5	316.067	189.100
6	337.280	167.886

7	348.413	156.753
8	369.627	135.540
9	390.840	114.326
10	581.563	115.895
11	1000.410	119.903
12	1021.623	141.116
13	1042.836	162.329
14	1064.049	183.542
15	1085.263	204.755
16	1106.476	225.969
17	1127.689	247.182
18	1148.902	268.395
19	1170.116	289.608
20	1191.329	310.821
21	1212.542	332.035
22	1233.755	353.248
23	1254.969	374.461
24	1276.182	395.674
25	1297.395	416.887
26	1318.608	438.101
27	1339.822	459.314
28	1361.035	480.527
29	1382.248	501.740
30	1403.461	522.953
31	1424.675	544.167
32	1445.888	565.380
33	1457.514	577.005

Factor of Safety
*** 1.473 ***

Failure Surface Specified By 33 Coordinate Points

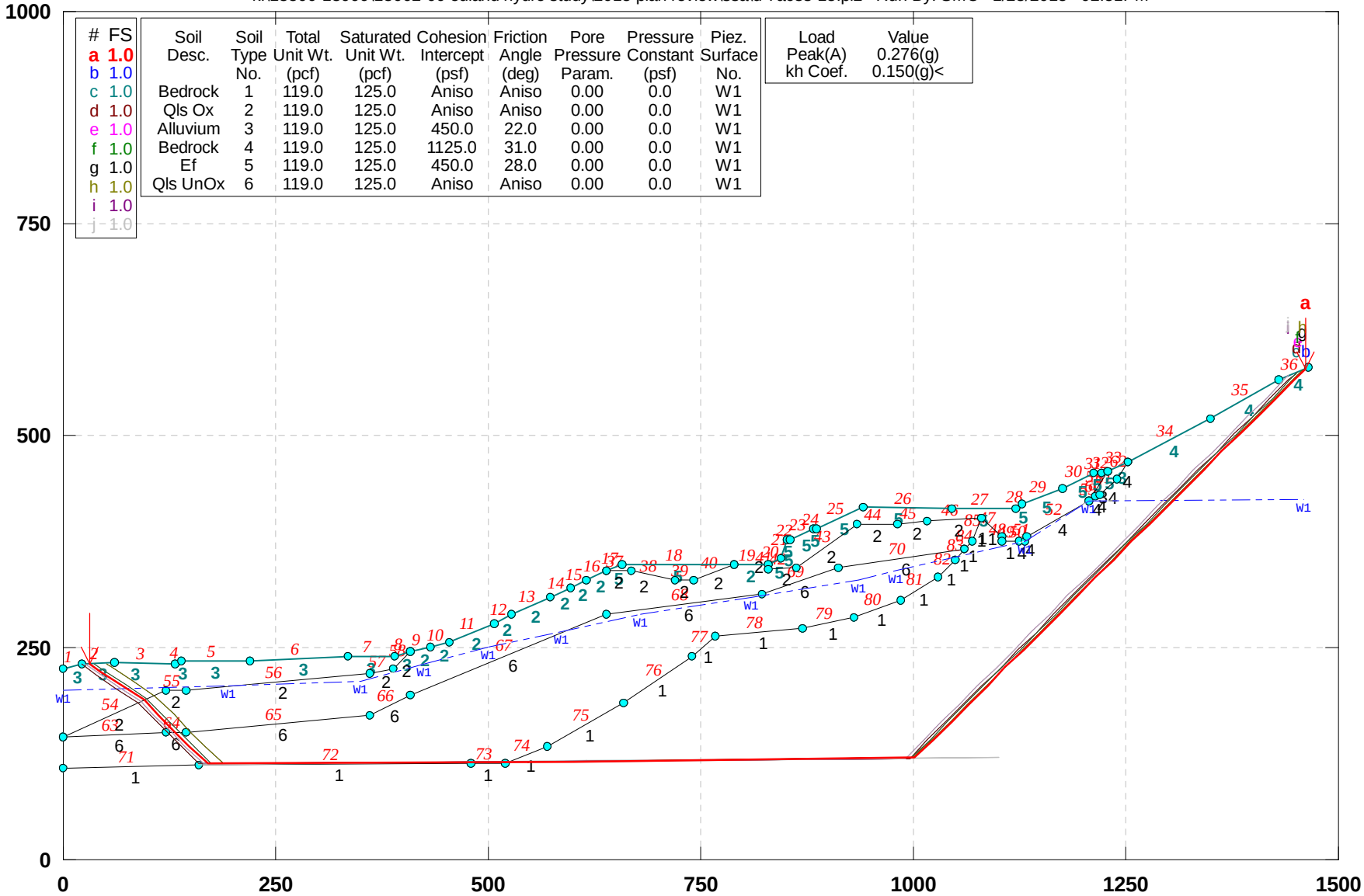
Point No.	X-Surf (ft)	Y-Surf (ft)
1	276.676	237.464
2	283.890	232.413
3	308.464	215.206
4	311.783	211.888
5	332.996	190.674
6	354.209	169.461
7	367.163	156.507
8	388.377	135.294
9	409.590	114.080
10	534.664	115.903
11	998.516	119.707
12	1019.729	140.921
13	1040.942	162.134
14	1062.155	183.347
15	1083.368	204.560
16	1104.582	225.773
17	1125.795	246.987
18	1147.008	268.200
19	1168.221	289.413
20	1189.435	310.626
21	1210.648	331.839
22	1231.861	353.053
23	1253.074	374.266
24	1274.288	395.479
25	1295.501	416.692
26	1316.714	437.905
27	1337.927	459.119
28	1359.141	480.332
29	1380.354	501.545
30	1401.567	522.758
31	1422.781	543.971
32	1443.994	565.185
33	1454.682	575.873

Factor of Safety
*** 1.473 ***

**** END OF GSTABL7 OUTPUT ****

13662-00, Euland, Section D-D', - , seismic, 2015 design

k:\13500-13999\13662-00 euland hydro study\2015 plan review\ssa\d-7ac3s-15.pl2 Run By: SMC 1/23/2015 02:51PM



GSTABL7 v.2 FSmin=1.0

Safety Factors Are Calculated By The Simplified Janbu Method for the case of c & phi both > 0

Figure E-11.2

***** GSTABL7 *****

** GSTABL7 by Garry H. Gregory, P.E. **

** Original Version 1.0, January 1996; Current Version 2.005, Sept. 2006 **

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****

SLOPE STABILITY ANALYSIS SYSTEM

Modified Bishop, Simplified Janbu, or GLE Method of Slices.
(Includes Spencer & Morgenstern-Price Type Analysis)
Including Pier/Pile, Reinforcement, Soil Nail, Tieback,
Nonlinear Undrained Shear Strength, Curved Phi Envelope,
Anisotropic Soil, Fiber-Reinforced Soil, Boundary Loads, Water
Surfaces, Pseudo-Static & Newmark Earthquake, and Applied Forces.

****

Analysis Run Date: 1/23/2015
Time of Run: 02:51PM
Run By: SMC
Input Data Filename: K:\13500-13999\13662-00 Euland Hydro Study\2015 Plan Review\SSA\d-7ac3s-15.
Output Filename: K:\13500-13999\13662-00 Euland Hydro Study\2015 Plan Review\SSA\d-7ac3s-15.OUT
Unit System: English
Plotted Output Filename: K:\13500-13999\13662-00 Euland Hydro Study\2015 Plan Review\SSA\d-7ac3s-15.PLT
PROBLEM DESCRIPTION: 13662-00, Euland, Section D-D',
- , seismic, 2015 design

BOUNDARY COORDINATES
36 Top Boundaries
85 Total Boundaries

Boundary No.	X-Left (ft)	Y-Left (ft)	X-Right (ft)	Y-Right (ft)	Soil Type Below Bnd
1	0.00	225.00	22.00	230.00	3
2	22.00	230.00	60.00	232.00	3
3	60.00	232.00	131.00	230.00	3
4	131.00	230.00	140.00	235.00	3
5	140.00	235.00	220.00	235.00	3
6	220.00	235.00	335.00	240.00	3
7	335.00	240.00	390.00	240.00	3
8	390.00	240.00	408.00	245.00	3
9	408.00	245.00	432.00	250.00	2
10	432.00	250.00	454.00	256.00	2
11	454.00	256.00	508.00	279.00	2
12	508.00	279.00	527.00	289.00	2
13	527.00	289.00	574.00	310.00	2
14	574.00	310.00	597.00	320.00	2
15	597.00	320.00	616.00	330.00	2
16	616.00	330.00	640.00	340.00	2
17	640.00	340.00	658.00	348.00	5
18	658.00	348.00	790.00	348.00	5
19	790.00	348.00	830.00	348.00	2
20	830.00	348.00	845.00	355.00	5
21	845.00	355.00	851.00	378.00	5
22	851.00	378.00	855.00	378.00	5
23	855.00	378.00	882.00	390.00	5
24	882.00	390.00	886.00	390.00	5
25	886.00	390.00	941.00	415.00	5
26	941.00	415.00	1046.00	413.00	5
27	1046.00	413.00	1120.00	414.00	5
28	1120.00	414.00	1128.00	420.00	5
29	1128.00	420.00	1175.00	437.00	5
30	1175.00	437.00	1212.00	456.00	5
31	1212.00	456.00	1221.00	456.00	5
32	1221.00	456.00	1228.00	458.00	5
33	1228.00	458.00	1252.00	468.00	3
34	1252.00	468.00	1350.00	520.00	4
35	1350.00	520.00	1430.00	566.00	4
36	1430.00	566.00	1465.00	580.00	4
37	640.00	340.00	669.00	340.00	2
38	669.00	340.00	720.00	330.00	2
39	720.00	330.00	742.00	330.00	2

40	742.00	330.00	790.00	348.00	2
41	830.00	348.00	830.10	343.00	2
42	830.10	343.00	863.00	344.00	2
43	863.00	344.00	934.00	395.00	2
44	934.00	395.00	982.00	396.00	2
45	982.00	396.00	1016.00	400.00	2
46	1016.00	400.00	1080.00	403.00	2
47	1080.00	403.00	1104.00	380.00	1
48	1104.00	380.00	1105.00	375.00	1
49	1105.00	375.00	1125.00	375.00	1
50	1125.00	375.00	1132.00	375.00	4
51	1132.00	375.00	1133.00	380.00	4
52	1133.00	380.00	1207.00	423.00	4
53	1207.00	423.00	1228.00	458.00	3
54	0.00	145.00	120.00	200.00	2
55	120.00	200.00	145.00	200.00	2
56	145.00	200.00	360.00	220.00	2
57	360.00	220.00	388.00	226.00	2
58	388.00	226.00	408.00	245.00	2
59	1207.00	423.00	1215.00	428.00	4
60	1215.00	428.00	1220.00	430.00	4
61	1220.00	430.00	1240.00	449.00	4
62	1240.00	449.00	1252.00	468.00	4
63	0.00	145.00	120.00	150.00	6
64	120.00	150.00	145.00	150.00	6
65	145.00	150.00	360.00	170.00	6
66	360.00	170.00	408.00	195.00	6
67	408.00	195.00	640.00	290.00	6
68	640.00	290.00	823.00	313.00	6
69	823.00	313.00	912.00	345.00	6
70	912.00	345.00	1061.00	366.00	6
71	0.00	108.00	160.00	111.00	1
72	160.00	111.00	480.00	113.00	1
73	480.00	113.00	520.00	113.00	1
74	520.00	113.00	570.00	133.00	1
75	570.00	133.00	660.00	185.00	1
76	660.00	185.00	740.00	240.00	1
77	740.00	240.00	767.00	263.00	1
78	767.00	263.00	870.00	273.00	1
79	870.00	273.00	930.00	286.00	1
80	930.00	286.00	985.00	305.00	1
81	985.00	305.00	1030.00	333.00	1
82	1030.00	333.00	1050.00	353.00	1
83	1050.00	353.00	1061.00	366.00	1
84	1061.00	366.00	1070.00	376.00	1
85	1070.00	376.00	1080.00	403.00	1

Default Y-Origin = 0.00(ft)
Default X-Plus Value = 0.00(ft)
Default Y-Plus Value = 0.00(ft)

ISOTROPIC SOIL PARAMETERS
6 Type(s) of Soil

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.
1	119.0	125.0	0.0	0.0	0.00	0.0	1
2	119.0	125.0	0.0	0.0	0.00	0.0	1
3	119.0	125.0	450.0	22.0	0.00	0.0	1
4	119.0	125.0	1125.0	31.0	0.00	0.0	1
5	119.0	125.0	450.0	28.0	0.00	0.0	1
6	119.0	125.0	0.0	0.0	0.00	0.0	1

ANISOTROPIC STRENGTH PARAMETERS
3 soil type(s)
Soil Type 1 Is Anisotropic
Number Of Direction Ranges Specified = 3

Direction Range No.	Counterclockwise Direction Limit (deg)	Cohesion Intercept (psf)	Friction Angle (deg)
1	-3.0	1125.00	31.00
2	10.0	450.00	17.00
3	90.0	1125.00	31.00

Soil Type 2 Is Anisotropic
Number Of Direction Ranges Specified = 3

Direction Range No.	Counterclockwise Direction Limit (deg)	Cohesion Intercept (psf)	Friction Angle (deg)
1	-3.0	525.00	25.00
2	10.0	375.00	14.50
3	90.0	450.00	22.00

Soil Type 6 Is Anisotropic
Number Of Direction Ranges Specified = 3

Direction Range No.	Counterclockwise Direction Limit (deg)	Cohesion Intercept (psf)	Friction Angle (deg)
1	-3.0	750.00	31.00
2	10.0	375.00	14.50
3	90.0	450.00	22.00

ANISOTROPIC SOIL NOTES:
(1) An input value of 0.01 for C and/or Phi will cause Aniso C and/or Phi to be ignored in that range.
(2) An input value of 0.02 for Phi will set both Phi and C equal to zero, with no water weight in the tension crack.
(3) An input value of 0.03 for Phi will set both Phi and C equal to zero, with water weight in the tension crack.

1 PIEZOMETRIC SURFACE(S) SPECIFIED
Unit Weight of Water = 62.40 (pcf)
Piezometric Surface No. 1 Specified by 13 Coordinate Points
Pore Pressure Inclination Factor = 0.50

Point No.	X-Water (ft)	Y-Water (ft)
1	0.00	200.00
2	195.00	205.00
3	349.00	210.00
4	425.00	230.00
5	500.00	250.00
6	586.00	270.00
7	680.00	290.00
8	810.00	310.00
9	936.00	330.00
10	980.00	340.00
11	1132.00	375.00
12	1207.00	423.00
13	1460.00	425.00

Specified Peak Ground Acceleration Coefficient (A) = 0.276(g)
Specified Horizontal Earthquake Coefficient (kh) = 0.150(g)
Specified Vertical Earthquake Coefficient (kv) = 0.000(g)
Specified Seismic Pore-Pressure Factor = 0.000
Janbus Empirical Coef is being used for the case of c & phi both > 0
A Critical Failure Surface Searching Method, Using A Random Technique For Generating Sliding Block Surfaces, Has Been Specified.
The Active And Passive Portions Of The Sliding Surfaces Are Generated According To The Rankine Theory.
3000 Trial Surfaces Have Been Generated.
3 Boxes Specified For Generation Of Central Block Base Length Of Line Segments For Active And Passive Portions Of Sliding Block Is 30.0

Box No.	X-Left (ft)	Y-Left (ft)	X-Right (ft)	Y-Right (ft)	Height (ft)
1	160.00	113.00	480.00	115.00	1.00
2	480.10	115.00	615.00	116.00	1.00
3	615.10	116.00	1100.00	121.00	1.00

Following Are Displayed The Ten Most Critical Of The Trial Failure Surfaces Evaluated. They Are Ordered - Most Critical First.
* * Safety Factors Are Calculated By The Simplified Janbu Method * *
Total Number of Trial Surfaces Attempted = 3000
Number of Trial Surfaces With Valid FS = 3000
Statistical Data On All Valid FS Values:
FS Max = 1.428 FS Min = 1.022 FS Ave = 0.835
Standard Deviation = 0.280 Coefficient of Variation = 33.48 %

Failure Surface Specified By 32 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	31.827	230.517
2	44.697	221.836
3	69.568	205.061
4	94.440	188.285
5	111.511	171.213
6	132.724	150.000
7	148.533	134.192
8	169.746	112.978
9	600.599	115.511
10	1002.541	120.247
11	1023.754	141.461
12	1044.967	162.674
13	1066.180	183.887
14	1087.393	205.100
15	1108.607	226.313
16	1129.820	247.527
17	1151.033	268.740
18	1172.246	289.953
19	1193.460	311.166
20	1214.673	332.379
21	1235.886	353.593
22	1257.099	374.806
23	1278.313	396.019
24	1299.526	417.232
25	1320.739	438.445
26	1341.953	459.659
27	1363.166	480.872
28	1384.379	502.085
29	1405.592	523.298
30	1426.806	544.511
31	1448.019	565.725
32	1460.490	578.196

Factor of Safety
*** 1.022 ***

Individual data on the 115 slices

Slice No.	Width (ft)	Weight (lbs)	Water Force Top (lbs)	Water Force Bot (lbs)	Tie Force Norm (lbs)	Tie Force Tan (lbs)	Earthquake Force Hor (lbs)	Earthquake Force Ver (lbs)	Surcharge Load (lbs)
1	12.9	7166.1	0.0	0.0	0.	0.	1074.9	0.0	0.0
2	15.3	27172.8	0.0	0.0	0.	0.	4075.9	0.0	0.0
3	9.6	26846.6	0.0	0.0	0.	0.	4027.0	0.0	0.0
4	4.7	15695.8	0.0	0.0	0.	0.	2354.4	0.0	0.0
5	20.2	87882.7	0.0	10738.5	0.	0.	13182.4	0.0	0.0
6	17.1	106033.8	0.0	34475.0	0.	0.	15905.1	0.0	0.0
7	8.5	65938.6	0.0	26958.5	0.	0.	9890.8	0.0	0.0
8	11.0	98500.6	0.0	44632.0	0.	0.	14775.1	0.0	0.0
9	1.7	16881.1	0.0	7989.4	0.	0.	2532.2	0.0	0.0
10	7.3	77485.5	0.0	36670.8	0.	0.	11622.8	0.0	0.0
11	5.0	58293.7	0.0	27978.1	0.	0.	8744.1	0.0	0.0
12	3.5	43075.6	0.0	21132.5	0.	0.	6461.3	0.0	0.0
13	21.2	291494.9	0.0	*******	0.	0.	43724.2	0.0	0.0
14	25.3	380356.8	0.0	*******	0.	0.	57053.5	0.0	0.0
15	5.8	86710.4	0.0	33035.6	0.	0.	13006.6	0.0	0.0
16	19.2	289467.3	0.0	*******	0.	0.	43420.1	0.0	0.0
17	115.0	1760281.5	0.0	*******	0.	0.	*******	0.0	0.0
18	14.0	217972.4	0.0	83632.3	0.	0.	32695.9	0.0	0.0
19	11.0	171068.7	0.0	64680.1	0.	0.	25660.3	0.0	0.0
20	28.0	435881.1	0.0	*******	0.	0.	65382.2	0.0	0.0
21	2.0	31158.2	0.0	12831.9	0.	0.	4673.7	0.0	0.0
22	18.0	285921.6	0.0	*******	0.	0.	42888.2	0.0	0.0
23	17.0	278913.2	0.0	*******	0.	0.	41837.0	0.0	0.0
24	7.0	116992.4	0.0	49170.9	0.	0.	17548.9	0.0	0.0
25	22.0	377712.6	0.0	*******	0.	0.	56656.9	0.0	0.0
26	46.0	861081.5	0.0	*******	0.	0.	*******	0.0	0.0
27	8.0	160919.8	0.0	66144.2	0.	0.	24138.0	0.0	0.0
28	17.2	358217.0	0.0	*******	0.	0.	53732.6	0.0	0.0

29	1.8	39285.1	0.0	15689.7	0.	0.	5892.8	0.0	0.0
30	43.0	975184.9	0.0	*******	0.	0.	*******	0.0	0.0
31	4.0	95771.7	0.0	36820.9	0.	0.	14365.8	0.0	0.0
32	12.0	292376.4	0.0	*******	0.	0.	43856.5	0.0	0.0
33	10.7	268018.2	0.0	*******	0.	0.	40202.7	0.0	0.0
34	0.3	6651.7	0.0	2522.1	0.	0.	997.8	0.0	0.0
35	3.6	91319.6	0.0	34548.2	0.	0.	13697.9	0.0	0.0
36	15.4	399881.3	0.0	*******	0.	0.	59982.2	0.0	0.0
37	24.0	648915.6	0.0	*******	0.	0.	97337.3	0.0	0.0
38	18.0	505880.6	0.0	*******	0.	0.	75882.1	0.0	0.0
39	2.0	57156.5	0.0	20676.5	0.	0.	8573.5	0.0	0.0
40	9.0	257193.3	0.0	93651.7	0.	0.	38579.0	0.0	0.0
41	11.0	314322.9	0.0	*******	0.	0.	47148.4	0.0	0.0
42	40.0	1142916.0	0.0	*******	0.	0.	*******	0.0	0.0
43	20.0	571122.2	0.0	*******	0.	0.	85668.3	0.0	0.0
44	2.0	57099.9	0.0	22479.6	0.	0.	8565.0	0.0	0.0
45	25.0	713560.0	0.0	*******	0.	0.	*******	0.0	0.0
46	23.0	656166.3	0.0	*******	0.	0.	98425.0	0.0	0.0
47	20.0	570338.8	0.0	*******	0.	0.	85550.8	0.0	0.0
48	13.0	370591.6	0.0	*******	0.	0.	55588.7	0.0	0.0
49	7.0	199512.1	0.0	83896.1	0.	0.	29926.8	0.0	0.0
50	0.1	2849.6	0.0	1201.4	0.	0.	427.4	0.0	0.0
51	14.9	430836.3	0.0	*******	0.	0.	64625.4	0.0	0.0
52	6.0	184150.9	0.0	73079.4	0.	0.	27622.6	0.0	0.0
53	4.0	128230.6	0.0	48900.7	0.	0.	19234.6	0.0	0.0
54	8.0	258128.2	0.0	98236.2	0.	0.	38719.2	0.0	0.0
55	7.0	228610.9	0.0	86432.2	0.	0.	34291.6	0.0	0.0
56	12.0	397873.2	0.0	*******	0.	0.	59681.0	0.0	0.0
57	4.0	133876.7	0.0	50023.9	0.	0.	20081.5	0.0	0.0
58	26.0	888274.2	0.0	*******	0.	0.	*******	0.0	0.0
59	18.0	636168.8	0.0	*******	0.	0.	95425.3	0.0	0.0
60	4.0	143727.5	0.0	51762.9	0.	0.	21559.1	0.0	0.0
61	2.0	72185.1	0.0	25935.8	0.	0.	10827.8	0.0	0.0
62	5.0	181327.4	0.0	64242.7	0.	0.	27199.1	0.0	0.0
63	39.0	1417782.6	0.0	*******	0.	0.	*******	0.0	0.0
64	2.0	72606.5	0.0	26795.4	0.	0.	10891.0	0.0	0.0
65	3.0	108891.8	0.0	40292.8	0.	0.	16333.8	0.0	0.0
66	17.5	636242.5	0.0	*******	0.	0.	95436.4	0.0	0.0
67	13.5	476537.3	0.0	*******	0.	0.	71480.6	0.0	0.0
68	7.8	264180.0	0.0	*******	0.	0.	39627.0	0.0	0.0
69	6.2	207320.1	0.0	*******	0.	0.	31098.0	0.0	0.0
70	15.0	476801.4	0.0	*******	0.	0.	71520.2	0.0	0.0
71	1.0	31871.4	0.0	17053.3	0.	0.	4780.7	0.0	0.0
72	4.0	122168.4	0.0	65362.2	0.	0.	18325.3	0.0	0.0
73	3.3	98639.7	0.0	52762.0	0.	0.	14796.0	0.0	0.0
74	7.7	227267.2	0.0	*******	0.	0.	34090.1	0.0	0.0
75	5.2	148369.4	0.0	79299.4	0.	0.	22255.4	0.0	0.0
76	3.8	107311.3	0.0	57336.6	0.	0.	16096.7	0.0	0.0
77	10.0	272509.8	0.0	*******	0.	0.	40876.5	0.0	0.0
78	7.4	193640.6	0.0	*******	0.	0.	29046.1	0.0	0.0
79	16.6	410650.1	0.0	*******	0.	0.	61597.5	0.0	0.0
80	1.0	23655.1	0.0	12599.3	0.	0.	3548.3	0.0	0.0
81	3.6	84304.0	0.0	44891.8	0.	0.	12645.6	0.0	0.0
82	11.4	255895.4	0.0	*******	0.	0.	38384.3	0.0	0.0
83	5.0	108400.7	0.0	57037.2	0.	0.	16260.1	0.0	0.0
84	3.0	64629.4	0.0	33427.7	0.	0.	9694.4	0.0	0.0
85	1.8	38980.6	0.0	19988.4	0.	0.	5847.1	0.0	0.0
86	2.2	46342.8	0.0	23654.8	0.	0.	6951.4	0.0	0.0
87	1.0	21040.7	0.0	9436.7	0.	0.	3156.1	0.0	0.0
88	18.0	366079.2	0.0	*******	0.	0.	54911.9	0.0	0.0
89	21.2	398247.8	0.0	*******	0.	0.	59737.2	0.0	0.0
90	2.8	49126.4	0.0	22909.8	0.	0.	7369.0	0.0	0.0
91	18.5	317187.8	0.0	*******	0.	0.	47578.2	0.0	0.0
92	13.5	219716.8	0.0	*******	0.	0.	32957.5	0.0	0.0
93	5.0	78742.6	0.0	42274.8	0.	0.	11811.4	0.0	0.0
94	2.7	41222.4	0.0	21702.1	0.	0.	6183.4	0.0	0.0
95	0.3	4982.1	0.0	2612.2	0.	0.	747.3	0.0	0.0
96	5.0	74508.4	0.0	38772.9	0.	0.	11176.3	0.0	0.0
97	1.0	14526.8	0.0	7491.9	0.	0.	2179.0	0.0	0.0
98	7.0	99022.1	0.0	49992.3	0.	0.	14853.3	0.0	0.0

99	7.9	106704.6	0.0	51182.8	0.	0.	16005.7	0.0	0.0
100	4.1	53801.0	0.0	24538.1	0.	0.	8070.2	0.0	0.0
101	12.0	149652.6	0.0	63114.2	0.	0.	22447.9	0.0	0.0
102	5.1	60486.2	0.0	23003.9	0.	0.	9072.9	0.0	0.0
103	21.2	234365.3	0.0	71260.3	0.	0.	35154.8	0.0	0.0
104	21.2	206550.8	0.0	31864.1	0.	0.	30982.6	0.0	0.0
105	6.6	58165.5	0.0	1878.6	0.	0.	8724.8	0.0	0.0
106	14.7	121211.0	0.0	0.0	0.	0.	18181.6	0.0	0.0
107	21.2	154113.0	0.0	0.0	0.	0.	23116.9	0.0	0.0
108	8.0	51888.0	0.0	0.0	0.	0.	7783.2	0.0	0.0
109	13.2	77547.1	0.0	0.0	0.	0.	11632.1	0.0	0.0
110	21.2	106505.4	0.0	0.0	0.	0.	15975.8	0.0	0.0
111	21.2	83746.7	0.0	0.0	0.	0.	12562.0	0.0	0.0
112	21.2	60988.0	0.0	0.0	0.	0.	9148.2	0.0	0.0
113	3.2	7212.4	0.0	0.0	0.	0.	1081.9	0.0	0.0
114	18.0	27636.2	0.0	0.0	0.	0.	4145.4	0.0	0.0
115	12.5	5552.9	0.0	0.0	0.	0.	832.9	0.0	0.0

Failure Surface Specified By 32 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	31.827	230.517
2	44.697	221.836
3	69.568	205.061
4	94.440	188.285
5	111.511	171.213
6	132.724	150.000
7	148.533	134.192
8	169.746	112.978
9	600.599	115.511
10	1002.541	120.247
11	1023.754	141.461
12	1044.967	162.674
13	1066.180	183.887
14	1087.393	205.100
15	1108.607	226.313
16	1129.820	247.527
17	1151.033	268.740
18	1172.246	289.953
19	1193.460	311.166
20	1214.673	332.379
21	1235.886	353.593
22	1257.099	374.806
23	1278.313	396.019
24	1299.526	417.232
25	1320.739	438.445
26	1341.953	459.659
27	1363.166	480.872
28	1384.379	502.085
29	1405.592	523.298
30	1426.806	544.511
31	1448.019	565.725
32	1460.490	578.196

Factor of Safety
*** 1.022 ***

Failure Surface Specified By 32 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	21.430	229.871
2	37.936	218.737
3	62.807	201.962
4	87.678	185.186
5	101.651	171.213
6	122.864	150.000
7	138.845	134.019
8	160.059	112.805
9	492.179	114.791
10	995.438	119.765
11	1016.651	140.978
12	1037.864	162.191
13	1059.077	183.405

14	1080.290	204.618
15	1101.504	225.831
16	1122.717	247.044
17	1143.930	268.257
18	1165.143	289.471
19	1186.357	310.684
20	1207.570	331.897
21	1228.783	353.110
22	1249.996	374.323
23	1271.210	395.537
24	1292.423	416.750
25	1313.636	437.963
26	1334.849	459.176
27	1356.063	480.389
28	1377.276	501.603
29	1398.489	522.816
30	1419.703	544.029
31	1440.916	565.242
32	1449.456	573.782

Factor of Safety
*** 1.025 ***

Failure Surface Specified By 32 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	21.430	229.871
2	37.936	218.737
3	62.807	201.962
4	87.678	185.186
5	101.651	171.213
6	122.864	150.000
7	138.845	134.019
8	160.059	112.805
9	492.179	114.791
10	995.438	119.765
11	1016.651	140.978
12	1037.864	162.191
13	1059.077	183.405
14	1080.290	204.618
15	1101.504	225.831
16	1122.717	247.044
17	1143.930	268.257
18	1165.143	289.471
19	1186.357	310.684
20	1207.570	331.897
21	1228.783	353.110
22	1249.996	374.323
23	1271.210	395.537
24	1292.423	416.750
25	1313.636	437.963
26	1334.849	459.176
27	1356.063	480.389
28	1377.276	501.603
29	1398.489	522.816
30	1419.703	544.029
31	1440.916	565.242
32	1449.456	573.782

Factor of Safety
*** 1.025 ***

Failure Surface Specified By 32 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	36.979	230.788
2	48.004	223.352
3	72.875	206.576
4	97.746	189.800
5	116.333	171.213
6	137.546	150.000
7	153.064	134.482
8	174.277	113.269
9	590.390	115.655

10	998.042	120.409
11	1019.255	141.622
12	1040.468	162.835
13	1061.682	184.048
14	1082.895	205.261
15	1104.108	226.475
16	1125.321	247.688
17	1146.535	268.901
18	1167.748	290.114
19	1188.961	311.327
20	1210.174	332.541
21	1231.388	353.754
22	1252.601	374.967
23	1273.814	396.180
24	1295.027	417.393
25	1316.241	438.607
26	1337.454	459.820
27	1358.667	481.033
28	1379.880	502.246
29	1401.094	523.459
30	1422.307	544.672
31	1443.520	565.886
32	1452.724	575.090

Factor of Safety
*** 1.025 ***

Failure Surface Specified By 32 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	36.979	230.788
2	48.004	223.352
3	72.875	206.576
4	97.746	189.800
5	116.333	171.213
6	137.546	150.000
7	153.064	134.482
8	174.277	113.269
9	590.390	115.655
10	998.042	120.409
11	1019.255	141.622
12	1040.468	162.835
13	1061.682	184.048
14	1082.895	205.261
15	1104.108	226.475
16	1125.321	247.688
17	1146.535	268.901
18	1167.748	290.114
19	1188.961	311.327
20	1210.174	332.541
21	1231.388	353.754
22	1252.601	374.967
23	1273.814	396.180
24	1295.027	417.393
25	1316.241	438.607
26	1337.454	459.820
27	1358.667	481.033
28	1379.880	502.246
29	1401.094	523.459
30	1422.307	544.672
31	1443.520	565.886
32	1452.724	575.090

Factor of Safety
*** 1.025 ***

Failure Surface Specified By 33 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	51.595	231.558
2	57.386	227.652
3	82.257	210.876
4	107.128	194.100
5	108.272	192.956

6	129.485	171.743
7	150.698	150.530
8	167.283	133.945
9	188.496	112.732
10	553.701	115.519
11	1000.646	120.052
12	1021.860	141.265
13	1043.073	162.479
14	1064.286	183.692
15	1085.499	204.905
16	1106.713	226.118
17	1127.926	247.331
18	1149.139	268.544
19	1170.352	289.758
20	1191.566	310.971
21	1212.779	332.184
22	1233.992	353.397
23	1255.205	374.610
24	1276.419	395.824
25	1297.632	417.037
26	1318.845	438.250
27	1340.058	459.463
28	1361.272	480.676
29	1382.485	501.890
30	1403.698	523.103
31	1424.911	544.316
32	1446.125	565.529
33	1457.659	577.064

Factor of Safety
*** 1.028 ***

Failure Surface Specified By 33 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	51.595	231.558
2	57.386	227.652
3	82.257	210.876
4	107.128	194.100
5	108.272	192.956
6	129.485	171.743
7	150.698	150.530
8	167.283	133.945
9	188.496	112.732
10	553.701	115.519
11	1000.646	120.052
12	1021.860	141.265
13	1043.073	162.479
14	1064.286	183.692
15	1085.499	204.905
16	1106.713	226.118
17	1127.926	247.331
18	1149.139	268.544
19	1170.352	289.758
20	1191.566	310.971
21	1212.779	332.184
22	1233.992	353.397
23	1255.205	374.610
24	1276.419	395.824
25	1297.632	417.037
26	1318.845	438.250
27	1340.058	459.463
28	1361.272	480.676
29	1382.485	501.890
30	1403.698	523.103
31	1424.911	544.316
32	1446.125	565.529
33	1457.659	577.064

Factor of Safety
*** 1.028 ***

Failure Surface Specified By 32 Coordinate Points

Point	X-Surf	Y-Surf

No.	(ft)	(ft)
1	26.445	230.234
2	41.242	220.253
3	66.113	203.477
4	90.985	186.701
5	106.473	171.213
6	127.686	150.000
7	143.377	134.309
8	164.590	113.096
9	481.969	114.934
10	990.939	119.926
11	1012.152	141.139
12	1033.365	162.353
13	1054.579	183.566
14	1075.792	204.779
15	1097.005	225.992
16	1118.218	247.205
17	1139.432	268.419
18	1160.645	289.632
19	1181.858	310.845
20	1203.071	332.058
21	1224.285	353.271
22	1245.498	374.484
23	1266.711	395.698
24	1287.924	416.911
25	1309.138	438.124
26	1330.351	459.337
27	1351.564	480.550
28	1372.777	501.764
29	1393.991	522.977
30	1415.204	544.190
31	1436.417	565.403
32	1441.690	570.676

Factor of Safety
*** 1.028 ***

Failure Surface Specified By 32 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	26.445	230.234
2	41.242	220.253
3	66.113	203.477
4	90.985	186.701
5	106.473	171.213
6	127.686	150.000
7	143.377	134.309
8	164.590	113.096
9	481.969	114.934
10	990.939	119.926
11	1012.152	141.139
12	1033.365	162.353
13	1054.579	183.566
14	1075.792	204.779
15	1097.005	225.992
16	1118.218	247.205
17	1139.432	268.419
18	1160.645	289.632
19	1181.858	310.845
20	1203.071	332.058
21	1224.285	353.271
22	1245.498	374.484
23	1266.711	395.698
24	1287.924	416.911
25	1309.138	438.124
26	1330.351	459.337
27	1351.564	480.550
28	1372.777	501.764
29	1393.991	522.977
30	1415.204	544.190
31	1436.417	565.403
32	1441.690	570.676

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 Factor of Safety
***    1.028   ***
    **** END OF GSTABL7 OUTPUT ****
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***** GSTABL7 *****

** GSTABL7 by Garry H. Gregory, P.E. **

** Original Version 1.0, January 1996; Current Version 2.005, Sept. 2006 **

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SLOPE STABILITY ANALYSIS SYSTEM

Modified Bishop, Simplified Janbu, or GLE Method of Slices.
(Includes Spencer & Morgenstern-Price Type Analysis)
Including Pier/Pile, Reinforcement, Soil Nail, Tieback,
Nonlinear Undrained Shear Strength, Curved Phi Envelope,
Anisotropic Soil, Fiber-Reinforced Soil, Boundary Loads, Water
Surfaces, Pseudo-Static & Newmark Earthquake, and Applied Forces.

****

Analysis Run Date: 1/23/2015
Time of Run: 02:52PM
Run By: SMC
Input Data Filename: K:\13500-13999\13662-00 Euland Hydro Study\2015 Plan Review\SSA\d-7ac3s-15 Surface #1.
Output Filename: K:\13500-13999\13662-00 Euland Hydro Study\2015 Plan Review\SSA\d-7ac3s-15 Surface #1.OUT
Unit System: English
Plotted Output Filename: K:\13500-13999\13662-00 Euland Hydro Study\2015 Plan Review\SSA\d-7ac3s-15 Surface #1.PLT
PROBLEM DESCRIPTION: 13662-00, Euland, Section D-D',
- , seismic, 2015 design

BOUNDARY COORDINATES
36 Top Boundaries
85 Total Boundaries

Boundary No.	X-Left (ft)	Y-Left (ft)	X-Right (ft)	Y-Right (ft)	Soil Type Below Bnd
1	0.00	225.00	22.00	230.00	3
2	22.00	230.00	60.00	232.00	3
3	60.00	232.00	131.00	230.00	3
4	131.00	230.00	140.00	235.00	3
5	140.00	235.00	220.00	235.00	3
6	220.00	235.00	335.00	240.00	3
7	335.00	240.00	390.00	240.00	3
8	390.00	240.00	408.00	245.00	3
9	408.00	245.00	432.00	250.00	2
10	432.00	250.00	454.00	256.00	2
11	454.00	256.00	508.00	279.00	2
12	508.00	279.00	527.00	289.00	2
13	527.00	289.00	574.00	310.00	2
14	574.00	310.00	597.00	320.00	2
15	597.00	320.00	616.00	330.00	2
16	616.00	330.00	640.00	340.00	2
17	640.00	340.00	658.00	348.00	5
18	658.00	348.00	790.00	348.00	5
19	790.00	348.00	830.00	348.00	2
20	830.00	348.00	845.00	355.00	5
21	845.00	355.00	851.00	378.00	5
22	851.00	378.00	855.00	378.00	5
23	855.00	378.00	882.00	390.00	5
24	882.00	390.00	886.00	390.00	5
25	886.00	390.00	941.00	415.00	5
26	941.00	415.00	1046.00	413.00	5
27	1046.00	413.00	1120.00	414.00	5
28	1120.00	414.00	1128.00	420.00	5
29	1128.00	420.00	1175.00	437.00	5
30	1175.00	437.00	1212.00	456.00	5
31	1212.00	456.00	1221.00	456.00	5
32	1221.00	456.00	1228.00	458.00	5
33	1228.00	458.00	1252.00	468.00	3
34	1252.00	468.00	1350.00	520.00	4
35	1350.00	520.00	1430.00	566.00	4
36	1430.00	566.00	1465.00	580.00	4
37	640.00	340.00	669.00	340.00	2
38	669.00	340.00	720.00	330.00	2
39	720.00	330.00	742.00	330.00	2

40	742.00	330.00	790.00	348.00	2
41	830.00	348.00	830.10	343.00	2
42	830.10	343.00	863.00	344.00	2
43	863.00	344.00	934.00	395.00	2
44	934.00	395.00	982.00	396.00	2
45	982.00	396.00	1016.00	400.00	2
46	1016.00	400.00	1080.00	403.00	2
47	1080.00	403.00	1104.00	380.00	1
48	1104.00	380.00	1105.00	375.00	1
49	1105.00	375.00	1125.00	375.00	1
50	1125.00	375.00	1132.00	375.00	4
51	1132.00	375.00	1133.00	380.00	4
52	1133.00	380.00	1207.00	423.00	4
53	1207.00	423.00	1228.00	458.00	3
54	0.00	145.00	120.00	200.00	2
55	120.00	200.00	145.00	200.00	2
56	145.00	200.00	360.00	220.00	2
57	360.00	220.00	388.00	226.00	2
58	388.00	226.00	408.00	245.00	2
59	1207.00	423.00	1215.00	428.00	4
60	1215.00	428.00	1220.00	430.00	4
61	1220.00	430.00	1240.00	449.00	4
62	1240.00	449.00	1252.00	468.00	4
63	0.00	145.00	120.00	150.00	6
64	120.00	150.00	145.00	150.00	6
65	145.00	150.00	360.00	170.00	6
66	360.00	170.00	408.00	195.00	6
67	408.00	195.00	640.00	290.00	6
68	640.00	290.00	823.00	313.00	6
69	823.00	313.00	912.00	345.00	6
70	912.00	345.00	1061.00	366.00	6
71	0.00	108.00	160.00	111.00	1
72	160.00	111.00	480.00	113.00	1
73	480.00	113.00	520.00	113.00	1
74	520.00	113.00	570.00	133.00	1
75	570.00	133.00	660.00	185.00	1
76	660.00	185.00	740.00	240.00	1
77	740.00	240.00	767.00	263.00	1
78	767.00	263.00	870.00	273.00	1
79	870.00	273.00	930.00	286.00	1
80	930.00	286.00	985.00	305.00	1
81	985.00	305.00	1030.00	333.00	1
82	1030.00	333.00	1050.00	353.00	1
83	1050.00	353.00	1061.00	366.00	1
84	1061.00	366.00	1070.00	376.00	1
85	1070.00	376.00	1080.00	403.00	1

Default Y-Origin = 0.00(ft)
Default X-Plus Value = 0.00(ft)
Default Y-Plus Value = 0.00(ft)

ISOTROPIC SOIL PARAMETERS
6 Type(s) of Soil

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.
1	119.0	125.0	0.0	0.0	0.00	0.0	1
2	119.0	125.0	0.0	0.0	0.00	0.0	1
3	119.0	125.0	450.0	22.0	0.00	0.0	1
4	119.0	125.0	1125.0	31.0	0.00	0.0	1
5	119.0	125.0	450.0	28.0	0.00	0.0	1
6	119.0	125.0	0.0	0.0	0.00	0.0	1

ANISOTROPIC STRENGTH PARAMETERS
3 soil type(s)
Soil Type 1 Is Anisotropic
Number Of Direction Ranges Specified = 3

Direction Range No.	Counterclockwise Direction Limit (deg)	Cohesion Intercept (psf)	Friction Angle (deg)
1	-3.0	1125.00	31.00
2	10.0	450.00	17.00
3	90.0	1125.00	31.00

Soil Type 2 Is Anisotropic
Number Of Direction Ranges Specified = 3

Direction Range No.	Counterclockwise Direction Limit (deg)	Cohesion Intercept (psf)	Friction Angle (deg)
1	-3.0	525.00	25.00
2	10.0	375.00	14.50
3	90.0	450.00	22.00

Soil Type 6 Is Anisotropic
Number Of Direction Ranges Specified = 3

Direction Range No.	Counterclockwise Direction Limit (deg)	Cohesion Intercept (psf)	Friction Angle (deg)
1	-3.0	750.00	31.00
2	10.0	375.00	14.50
3	90.0	450.00	22.00

ANISOTROPIC SOIL NOTES:
(1) An input value of 0.01 for C and/or Phi will cause Aniso C and/or Phi to be ignored in that range.
(2) An input value of 0.02 for Phi will set both Phi and C equal to zero, with no water weight in the tension crack.
(3) An input value of 0.03 for Phi will set both Phi and C equal to zero, with water weight in the tension crack.

1 PIEZOMETRIC SURFACE(S) SPECIFIED
Unit Weight of Water = 62.40 (pcf)
Piezometric Surface No. 1 Specified by 13 Coordinate Points
Pore Pressure Inclination Factor = 0.50

Point No.	X-Water (ft)	Y-Water (ft)
1	0.00	200.00
2	195.00	205.00
3	349.00	210.00
4	425.00	230.00
5	500.00	250.00
6	586.00	270.00
7	680.00	290.00
8	810.00	310.00
9	936.00	330.00
10	980.00	340.00
11	1132.00	375.00
12	1207.00	423.00
13	1460.00	425.00

Specified Peak Ground Acceleration Coefficient (A) = 0.276(g)
Specified Horizontal Earthquake Coefficient (kh) = 0.150(g)
Specified Vertical Earthquake Coefficient (kv) = 0.000(g)
Specified Seismic Pore-Pressure Factor = 0.000
Janbu's Empirical Coef. is being used for the case of c & phi both > 0
Trial Failure Surface Specified By 32 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	31.827	230.517
2	44.697	221.836
3	69.568	205.061
4	94.440	188.285
5	111.511	171.213
6	132.724	150.000
7	148.533	134.192
8	169.746	112.978
9	600.599	115.511
10	1002.541	120.247
11	1023.754	141.461
12	1044.967	162.674
13	1066.180	183.887
14	1087.393	205.100
15	1108.607	226.313
16	1129.820	247.527
17	1151.033	268.740
18	1172.246	289.953
19	1193.460	311.166
20	1214.673	332.379

21	1235.886	353.593
22	1257.099	374.806
23	1278.313	396.019
24	1299.526	417.232
25	1320.739	438.445
26	1341.953	459.659
27	1363.166	480.872
28	1384.379	502.085
29	1405.592	523.298
30	1426.806	544.511
31	1448.019	565.725
32	1460.490	578.196

Janbu's Empirical Coefficient (fo) = 1.078
* * Factor Of Safety Is Calculated By The Simplified Janbu Method * *
Factor Of Safety For The Preceding Specified Surface = 1.022

Table 1 - Individual Data on the 115 Slices

Slice No.	Width (ft)	Weight (lbs)	Water Force Top (lbs)	Water Force Bot (lbs)	Tie Force Norm (lbs)	Tie Force Tan (lbs)	Earthquake Force Hor (lbs)	Earthquake Force Ver (lbs)	Surcharge Load (lbs)
1	12.9	7166.5	0.0	0.0	0.0	0.0	1075.0	0.0	0.0
2	15.3	27173.9	0.0	0.0	0.0	0.0	4076.1	0.0	0.0
3	9.6	26845.2	0.0	0.0	0.0	0.0	4026.8	0.0	0.0
4	4.7	15698.0	0.0	0.0	0.0	0.0	2354.7	0.0	0.0
5	20.2	87883.2	0.0	10738.4	0.0	0.0	13182.5	0.0	0.0
6	17.1	106029.9	0.0	34474.7	0.0	0.0	15904.5	0.0	0.0
7	8.5	65940.6	0.0	26959.4	0.0	0.0	9891.1	0.0	0.0
8	11.0	98501.2	0.0	44632.4	0.0	0.0	14775.2	0.0	0.0
9	1.7	16877.0	0.0	7987.5	0.0	0.0	2531.5	0.0	0.0
10	7.3	77490.0	0.0	36671.8	0.0	0.0	11623.5	0.0	0.0
11	5.0	58293.6	0.0	27977.1	0.0	0.0	8744.0	0.0	0.0
12	3.5	43076.7	0.0	21132.4	0.0	0.0	6461.5	0.0	0.0
13	21.2	291491.8	0.0	*******	0.0	0.0	43723.8	0.0	0.0
14	25.3	380359.5	0.0	*******	0.0	0.0	57053.9	0.0	0.0
15	5.8	86710.6	0.0	33035.7	0.0	0.0	13006.6	0.0	0.0
16	19.2	289468.1	0.0	*******	0.0	0.0	43420.2	0.0	0.0
17	115.0	1760286.2	0.0	*******	0.0	0.0	*******	0.0	0.0
18	14.0	217973.0	0.0	83632.6	0.0	0.0	32695.9	0.0	0.0
19	11.0	171069.1	0.0	64680.3	0.0	0.0	25660.4	0.0	0.0
20	28.0	435882.3	0.0	*******	0.0	0.0	65382.3	0.0	0.0
21	2.0	31158.3	0.0	12831.9	0.0	0.0	4673.7	0.0	0.0
22	18.0	285922.4	0.0	*******	0.0	0.0	42888.4	0.0	0.0
23	17.0	278913.9	0.0	*******	0.0	0.0	41837.1	0.0	0.0
24	7.0	116992.6	0.0	49171.0	0.0	0.0	17548.9	0.0	0.0
25	22.0	377713.6	0.0	*******	0.0	0.0	56657.0	0.0	0.0
26	46.0	861083.4	0.0	*******	0.0	0.0	*******	0.0	0.0
27	8.0	160920.2	0.0	66144.4	0.0	0.0	24138.0	0.0	0.0
28	17.2	358199.5	0.0	*******	0.0	0.0	53729.9	0.0	0.0
29	1.8	39303.5	0.0	15697.1	0.0	0.0	5895.5	0.0	0.0
30	43.0	975186.8	0.0	*******	0.0	0.0	*******	0.0	0.0
31	4.0	95771.9	0.0	36820.9	0.0	0.0	14365.8	0.0	0.0
32	12.0	292376.9	0.0	*******	0.0	0.0	43856.5	0.0	0.0
33	10.7	268018.7	0.0	*******	0.0	0.0	40202.8	0.0	0.0
34	0.3	6651.7	0.0	2522.1	0.0	0.0	997.8	0.0	0.0
35	3.6	91310.4	0.0	34544.7	0.0	0.0	13696.6	0.0	0.0
36	15.4	399891.3	0.0	*******	0.0	0.0	59983.7	0.0	0.0
37	24.0	648916.6	0.0	*******	0.0	0.0	97337.5	0.0	0.0
38	18.0	505881.4	0.0	*******	0.0	0.0	75882.2	0.0	0.0
39	2.0	57156.6	0.0	20676.6	0.0	0.0	8573.5	0.0	0.0
40	9.0	257193.7	0.0	93651.9	0.0	0.0	38579.1	0.0	0.0
41	11.0	314323.4	0.0	*******	0.0	0.0	47148.5	0.0	0.0
42	40.0	1142917.9	0.0	*******	0.0	0.0	*******	0.0	0.0
43	20.0	571123.2	0.0	*******	0.0	0.0	85668.5	0.0	0.0
44	2.0	57100.0	0.0	22479.6	0.0	0.0	8565.0	0.0	0.0
45	25.0	713561.2	0.0	*******	0.0	0.0	*******	0.0	0.0
46	23.0	656167.4	0.0	*******	0.0	0.0	98425.1	0.0	0.0
47	20.0	570339.8	0.0	*******	0.0	0.0	85551.0	0.0	0.0
48	13.0	370592.3	0.0	*******	0.0	0.0	55588.8	0.0	0.0
49	7.0	199512.5	0.0	83896.3	0.0	0.0	29926.9	0.0	0.0
50	0.1	2849.6	0.0	1201.4	0.0	0.0	427.4	0.0	0.0

51	14.9	430837.0	0.0	*******	0.0	0.0	64625.6	0.0	0.0
52	6.0	184151.2	0.0	73079.5	0.0	0.0	27622.7	0.0	0.0
53	4.0	128230.8	0.0	48900.8	0.0	0.0	19234.6	0.0	0.0
54	8.0	258128.6	0.0	98236.4	0.0	0.0	38719.3	0.0	0.0
55	7.0	228611.3	0.0	86432.4	0.0	0.0	34291.7	0.0	0.0
56	12.0	397873.8	0.0	*******	0.0	0.0	59681.1	0.0	0.0
57	4.0	133876.9	0.0	50024.0	0.0	0.0	20081.5	0.0	0.0
58	26.0	888275.6	0.0	*******	0.0	0.0	*******	0.0	0.0
59	18.0	636169.6	0.0	*******	0.0	0.0	95425.4	0.0	0.0
60	4.0	143727.7	0.0	51763.0	0.0	0.0	21559.1	0.0	0.0
61	2.0	72185.2	0.0	25935.8	0.0	0.0	10827.8	0.0	0.0
62	5.0	181327.6	0.0	64242.8	0.0	0.0	27199.1	0.0	0.0
63	39.0	1417784.8	0.0	*******	0.0	0.0	*******	0.0	0.0
64	2.0	72606.6	0.0	26795.5	0.0	0.0	10891.0	0.0	0.0
65	3.0	108892.0	0.0	40292.9	0.0	0.0	16333.8	0.0	0.0
66	17.5	636258.9	0.0	*******	0.0	0.0	95438.8	0.0	0.0
67	13.5	476522.8	0.0	*******	0.0	0.0	71478.4	0.0	0.0
68	7.8	264190.3	0.0	*******	0.0	0.0	39628.6	0.0	0.0
69	6.2	207309.9	0.0	*******	0.0	0.0	31096.5	0.0	0.0
70	15.0	476805.0	0.0	*******	0.0	0.0	71520.8	0.0	0.0
71	1.0	31867.7	0.0	17051.3	0.0	0.0	4780.1	0.0	0.0
72	4.0	122168.4	0.0	65362.5	0.0	0.0	18325.3	0.0	0.0
73	3.3	98639.7	0.0	52762.2	0.0	0.0	14796.0	0.0	0.0
74	7.7	227267.0	0.0	*******	0.0	0.0	34090.1	0.0	0.0
75	5.2	148362.4	0.0	79295.9	0.0	0.0	22254.4	0.0	0.0
76	3.8	107318.1	0.0	57340.1	0.0	0.0	16097.7	0.0	0.0
77	10.0	272509.6	0.0	*******	0.0	0.0	40876.4	0.0	0.0
78	7.4	193631.1	0.0	*******	0.0	0.0	29044.7	0.0	0.0
79	16.6	410659.9	0.0	*******	0.0	0.0	61599.0	0.0	0.0
80	1.0	23655.2	0.0	12599.1	0.0	0.0	3548.3	0.0	0.0
81	3.6	84309.9	0.0	44894.1	0.0	0.0	12646.5	0.0	0.0
82	11.4	255890.4	0.0	*******	0.0	0.0	38383.6	0.0	0.0
83	5.0	108400.7	0.0	57038.4	0.0	0.0	16260.1	0.0	0.0
84	3.0	64629.3	0.0	33428.4	0.0	0.0	9694.4	0.0	0.0
85	1.8	38983.1	0.0	19990.2	0.0	0.0	5847.5	0.0	0.0
86	2.2	46340.1	0.0	23653.4	0.0	0.0	6951.0	0.0	0.0
87	1.0	21040.7	0.0	9436.7	0.0	0.0	3156.1	0.0	0.0
88	18.0	366076.1	0.0	*******	0.0	0.0	54911.4	0.0	0.0
89	21.2	398240.5	0.0	*******	0.0	0.0	59736.1	0.0	0.0
90	2.8	49135.1	0.0	22913.2	0.0	0.0	7370.3	0.0	0.0
91	18.5	317194.2	0.0	*******	0.0	0.0	47579.1	0.0	0.0
92	13.5	219711.6	0.0	*******	0.0	0.0	32956.7	0.0	0.0
93	5.0	78742.9	0.0	42275.1	0.0	0.0	11811.4	0.0	0.0
94	2.7	41222.5	0.0	21702.3	0.0	0.0	6183.4	0.0	0.0
95	0.3	4982.1	0.0	2612.3	0.0	0.0	747.3	0.0	0.0
96	5.0	74508.6	0.0	38774.0	0.0	0.0	11176.3	0.0	0.0
97	1.0	14526.8	0.0	7492.1	0.0	0.0	2179.0	0.0	0.0
98	7.0	99022.0	0.0	49993.5	0.0	0.0	14853.3	0.0	0.0
99	7.9	106700.9	0.0	51182.2	0.0	0.0	16005.1	0.0	0.0
100	4.1	53803.9	0.0	24539.4	0.0	0.0	8070.6	0.0	0.0
101	12.0	149651.6	0.0	63113.6	0.0	0.0	22447.7	0.0	0.0
102	5.1	60480.0	0.0	23001.5	0.0	0.0	9072.0	0.0	0.0
103	21.2	234374.2	0.0	71261.1	0.0	0.0	35156.1	0.0	0.0
104	21.2	206547.8	0.0	31864.0	0.0	0.0	30982.2	0.0	0.0
105	6.6	58166.7	0.0	1878.7	0.0	0.0	8725.0	0.0	0.0
106	14.7	121208.3	0.0	0.0	0.0	0.0	18181.2	0.0	0.0
107	21.2	154119.4	0.0	0.0	0.0	0.0	23117.9	0.0	0.0
108	8.0	51884.1	0.0	0.0	0.0	0.0	7782.6	0.0	0.0
109	13.2	77548.5	0.0	0.0	0.0	0.0	11632.3	0.0	0.0
110	21.2	106504.1	0.0	0.0	0.0	0.0	15975.6	0.0	0.0
111	21.2	83745.1	0.0	0.0	0.0	0.0	12561.8	0.0	0.0
112	21.2	60991.0	0.0	0.0	0.0	0.0	9148.7	0.0	0.0
113	3.2	7211.6	0.0	0.0	0.0	0.0	1081.7	0.0	0.0
114	18.0	27636.9	0.0	0.0	0.0	0.0	4145.5	0.0	0.0
115	12.5	5552.2	0.0	0.0	0.0	0.0	832.8	0.0	0.0

Table 2 - Base Stress Data on the 115 Slices

Slice No. *	Alpha (deg)	X-Coord. Slice Cntr (ft)	Base Leng. (ft)	Available Shear Strength (psf)	Mobilized Shear Stress (psf)
1	-34.00	38.26	15.52	1110.43	-242.14

2	-34.00	52.35	18.46	1920.50	-772.12
3	-34.00	64.78	11.54	2605.08	-1219.98
4	-34.00	71.91	5.65	2969.32	-1458.27
5	-34.00	84.34	24.35	3340.17	-1892.61
6	-45.00	102.98	24.14	7170.19	-3733.28
7	-45.00	115.76	12.01	8066.25	-4668.75
8	-45.00	125.50	15.56	8749.88	-5382.11
9	-45.00	131.86	2.44	9268.87	-5883.84
10	-45.00	136.36	10.29	17196.03	-6400.85
11	-45.00	142.50	7.07	18466.95	-7007.06
12	-45.00	146.77	5.00	19005.43	-7327.96
13	-45.00	159.14	30.00	20571.59	-8259.29
14	0.34	182.37	25.25	2787.91	2347.71
15	0.34	197.88	5.76	2780.62	2346.30
16	0.34	210.38	19.24	2773.53	2345.25
17	0.34	277.50	115.00	2812.25	2385.97
18	0.34	342.00	14.00	2852.46	2426.92
19	0.34	354.50	11.00	2872.08	2424.15
20	0.34	374.00	28.00	2797.85	2426.56
21	0.34	389.00	2.00	2740.75	2428.42
22	0.34	399.00	18.00	2779.51	2476.03
23	0.34	416.50	17.00	2844.14	2557.42
24	0.34	428.50	7.00	2876.49	2605.20
25	0.34	443.00	22.00	2935.23	2676.21
26	0.34	477.00	46.00	3197.46	2917.88
27	0.34	504.00	8.00	3433.82	3135.46
28	0.34	516.58	17.17	3582.27	3252.09
29	0.34	526.08	1.83	4383.83	3345.77
30	0.34	548.50	43.00	4660.22	3535.08
31	0.34	572.00	4.00	4947.20	3732.14
32	0.34	580.00	12.00	5042.28	3797.89
33	0.34	591.37	10.74	5167.21	3891.16
34	0.34	596.87	0.26	5233.72	3935.96
35	0.34	598.80	3.60	5263.06	3954.75
36	0.68	608.30	15.40	5399.40	4200.44
37	0.68	628.00	24.00	5652.65	4374.01
38	0.68	649.00	18.00	5899.03	4546.51
39	0.68	659.00	2.00	6005.99	4623.16
40	0.68	664.50	9.00	5985.06	4622.96
41	0.68	674.50	11.00	5947.00	4622.60
42	0.68	700.00	40.00	5839.16	4622.29
43	0.68	730.00	20.00	5753.95	4619.57
44	0.68	741.00	2.00	5722.71	4618.58
45	0.68	754.50	25.00	5684.37	4617.36
46	0.68	778.50	23.00	5616.21	4615.18
47	0.68	800.00	20.00	5555.14	4613.24
48	0.68	816.50	13.00	5510.15	4611.64
49	0.68	826.50	7.00	5480.94	4610.78
50	0.68	830.05	0.10	5471.41	4610.92
51	0.68	837.55	14.90	5576.40	4677.66
52	0.68	848.00	6.00	6088.88	4965.07
53	0.68	853.00	4.00	6491.22	5186.03
54	0.68	859.00	8.00	6538.15	5219.73
55	0.68	866.50	7.00	6637.10	5283.26
56	0.68	876.00	12.00	6762.43	5363.72
57	0.68	884.00	4.00	6835.74	5414.37
58	0.68	899.00	26.00	7006.17	5526.84
59	0.68	921.00	18.00	7304.46	5717.45
60	0.68	932.00	4.00	7453.61	5812.76
61	0.68	935.00	2.00	7494.29	5838.76
62	0.68	938.50	5.00	7583.34	5866.73
63	0.68	960.50	39.00	7522.21	5880.96
64	0.68	981.00	2.00	7427.54	5872.84
65	0.68	983.50	3.00	7415.60	5871.88
66	0.68	993.77	17.54	7366.53	5867.90
67	45.00	1009.27	19.03	12792.57	28791.16
68	45.00	1019.88	10.97	12344.54	27706.36
69	45.00	1026.88	8.83	12048.80	26989.99
70	45.00	1037.48	21.17	11600.79	25905.24
71	45.00	1045.48	1.46	11262.88	25087.11

72	45.00	1048.00	5.66	11160.73	24836.05
73	45.00	1051.64	4.63	11014.58	24475.38
74	45.00	1057.14	10.92	10793.67	23930.21
75	45.00	1063.59	7.33	10534.55	23290.74
76	45.00	1068.09	5.40	10353.79	22844.61
77	45.00	1075.00	14.14	10076.24	22159.68
78	45.00	1083.70	10.46	9726.94	21297.68
79	45.00	1095.70	23.49	9244.92	20108.01
80	45.00	1104.50	1.41	8891.33	19235.46
81	45.00	1106.80	5.10	8798.82	19007.14
82	45.00	1114.30	16.11	8497.66	18264.29
83	45.00	1122.50	7.07	8285.66	17629.97
84	45.00	1126.50	4.24	8312.55	17518.54
85	45.00	1128.91	2.57	8306.26	17417.20
86	45.00	1130.91	3.08	8270.22	17286.08
87	45.00	1132.50	1.41	8689.05	17109.71
88	45.00	1142.02	25.50	8390.66	16507.61
89	45.00	1161.64	30.00	7775.39	15266.13
90	45.00	1173.62	3.89	7399.60	14507.67
91	45.00	1184.23	26.11	7156.26	13972.25
92	45.00	1200.23	19.15	6809.30	13195.34
93	45.00	1209.50	7.07	6229.02	12806.34
94	45.00	1213.34	3.78	6181.35	12540.75
95	45.00	1214.84	0.46	6130.78	12388.53
96	45.00	1217.50	7.07	6040.92	12117.87
97	45.00	1220.50	1.41	5939.72	11813.03
98	45.00	1224.50	9.90	5868.45	11503.34
99	45.00	1231.94	11.15	5785.64	11002.78
100	45.00	1237.94	5.82	5742.38	10634.85
101	45.00	1246.00	16.97	5684.34	10141.05
102	45.00	1254.55	7.21	5641.24	9645.17
103	45.00	1267.71	30.00	5641.90	8983.79
104	45.00	1288.92	30.00	5643.04	7917.80
105	45.00	1302.80	9.26	5643.74	7220.04
106	45.00	1313.41	20.73	5424.82	6722.42
107	45.00	1331.35	30.00	4888.73	5907.65
108	45.00	1345.98	11.38	4451.50	5243.13
109	45.00	1356.58	18.62	4153.13	4789.64
110	45.00	1373.77	30.00	3687.99	4082.69
111	45.00	1394.99	30.00	3113.98	3210.28
112	45.00	1416.20	30.00	2539.96	2337.84
113	45.00	1428.40	4.52	2209.80	1836.07
114	45.00	1439.01	25.48	1822.37	1247.23
115	45.00	1454.25	17.64	1239.95	362.03

Sum of the Resisting Forces (including Pier/Pile, Tieback, Reinforcing
Soil Nail, and Applied Forces if applicable) = 9858540.00 (lbs)
Average Available Shear Strength (including Tieback, Pier/Pile, Reinforcing,
Soil Nail, and Applied Forces if applicable) = 5929.98(psf)
Sum of the Driving Forces = ********** (lbs)
Average Mobilized Shear Stress = 6256.70(psf)
Total length of the failure surface = 1662.49(ft)

*** SEISMIC SLOPE DISPLACEMENT DATA ***

(Note: kv is set = zero for displacement calculations)
Seismic Yield Coefficient (ky) = 0.1588(g)
Calculated Newmark Seismic Displacement = 0.081(ft)
Non-Symmetrical Sliding Resistance Has Been Specified
for Downhill Sliding.

**** END OF GSTABL7 OUTPUT ****

Sliding displacement models from Rathje and Antonakos (2011)

Prediction of dynamic response and sliding displacement of a sliding mass during earthquake shaking

Cross Section: D-D'

File: d-7ac3s-15

Inputs	
PGA (g)	0.2763
PGV (cm/s)	23.32
k_y (g)	0.1588
T_m (s)	0.517
T_s (s)	0.37
M	6.95
T_s/T_m	0.715168

Dynamic Response			
	median	-1σ	+1σ
kmax (g)	0.209	0.163	0.268
k-velmax (cm/s)	25.30	19.70	32.48

Displacement Given Median Dynamic Response					
Displacement Model			Sliding Displacements, D (cm)		
	μ_{lnD}	σ_{lnD}	median	-1σ	+1σ
[kmax, M]	-0.27	0.939	0.76	0.30	1.95
[kmax, k-velmax]	-1.08	0.616	0.34	0.18	0.63
			Sliding Displacements, D (in)		
	μ_{lnD}	σ_{lnD}	median	-1σ	+1σ
[kmax, M]	-0.27	0.939	0.30	0.12	0.77
[kmax, k-velmax]	-1.08	0.616	0.13	0.07	0.25

PGA Peak Ground Acceleration (g)
PGV Peak Ground Velocity (cm/s)
k_y Critical or Yield Acceleration (g)
T_m Mean Period of an Earthquake Motion (s)
T_s Site Period or the Natural Period of a Sliding Mass (s). For rigid sliding set T_s= 0 s
M Earthquake Magnitude
kmax maximum seismic coefficient (g)
k-velmax the maximum velocity of the seismic coefficient-time history (cm/s)
D Predicted Sliding Displacment (cm)

H_{avr} = 195 ft

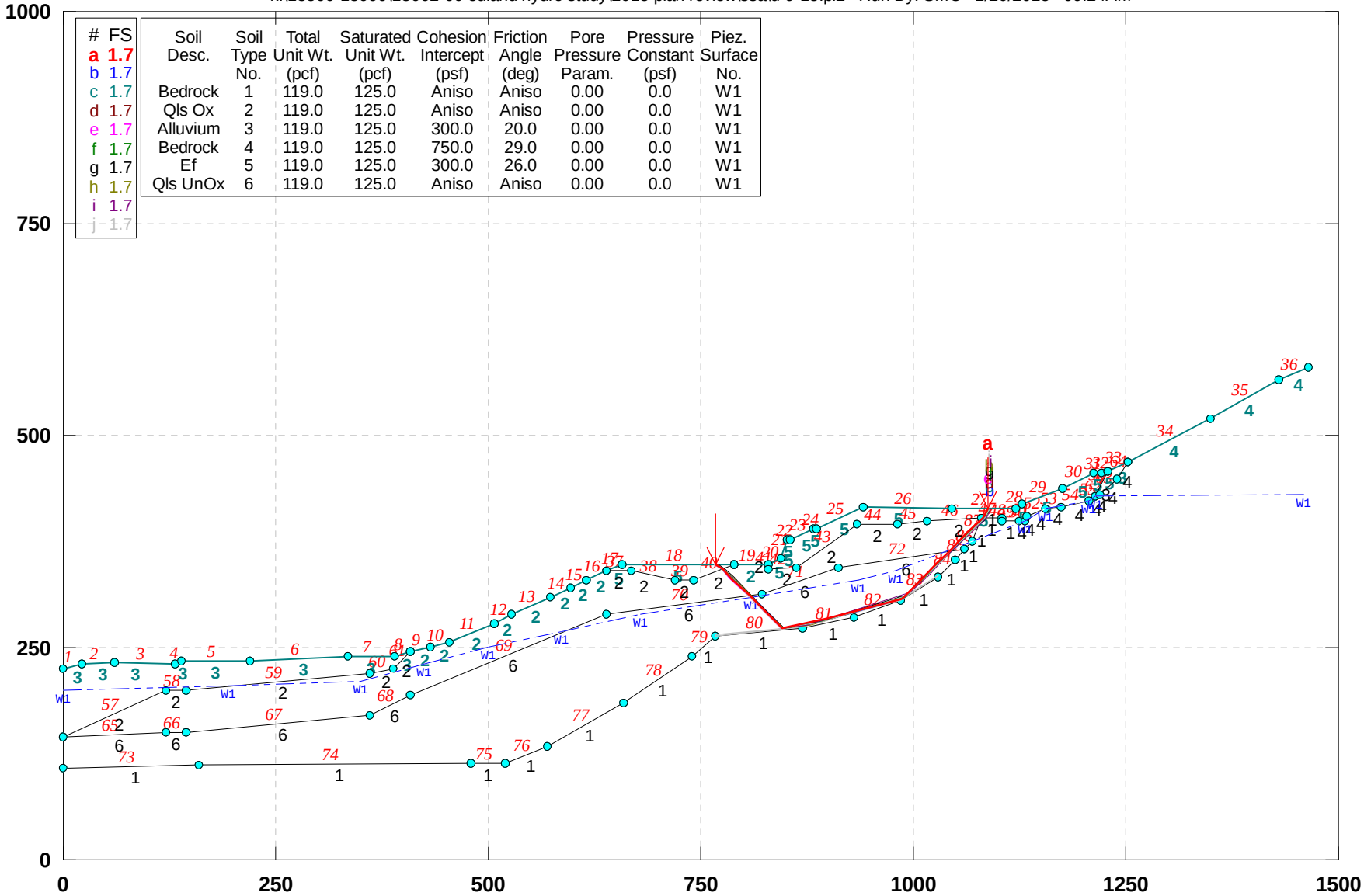
V_s = 2110 ft/s

$T_s = 4\ H_{avr}/V_s$ = 0.37 s

Reference: Rathje, E.M. and Antonakos, G. 2011. "A Unified Model for Predicting Earthquake-Induced Sliding Displacements of Rigid and Flexible Slopes," Engineering Geology, 122, 51-60, doi:10.1016/j.enggeo.2010.12.004.

13662-00, Euland, Section D-D', - , static, 2015 design

k:\13500-13999\13662-00 euland hydro study\2015 plan review\ssa\d-9-15.pl2 Run By: SMC 1/20/2015 09:24AM



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.
Bedrock	1	119.0	125.0	Aniso	Aniso	0.00	0.0	W1
Qls Ox	2	119.0	125.0	Aniso	Aniso	0.00	0.0	W1
Alluvium	3	119.0	125.0	300.0	20.0	0.00	0.0	W1
Bedrock	4	119.0	125.0	750.0	29.0	0.00	0.0	W1
Ef	5	119.0	125.0	300.0	26.0	0.00	0.0	W1
Qls UnOx	6	119.0	125.0	Aniso	Aniso	0.00	0.0	W1

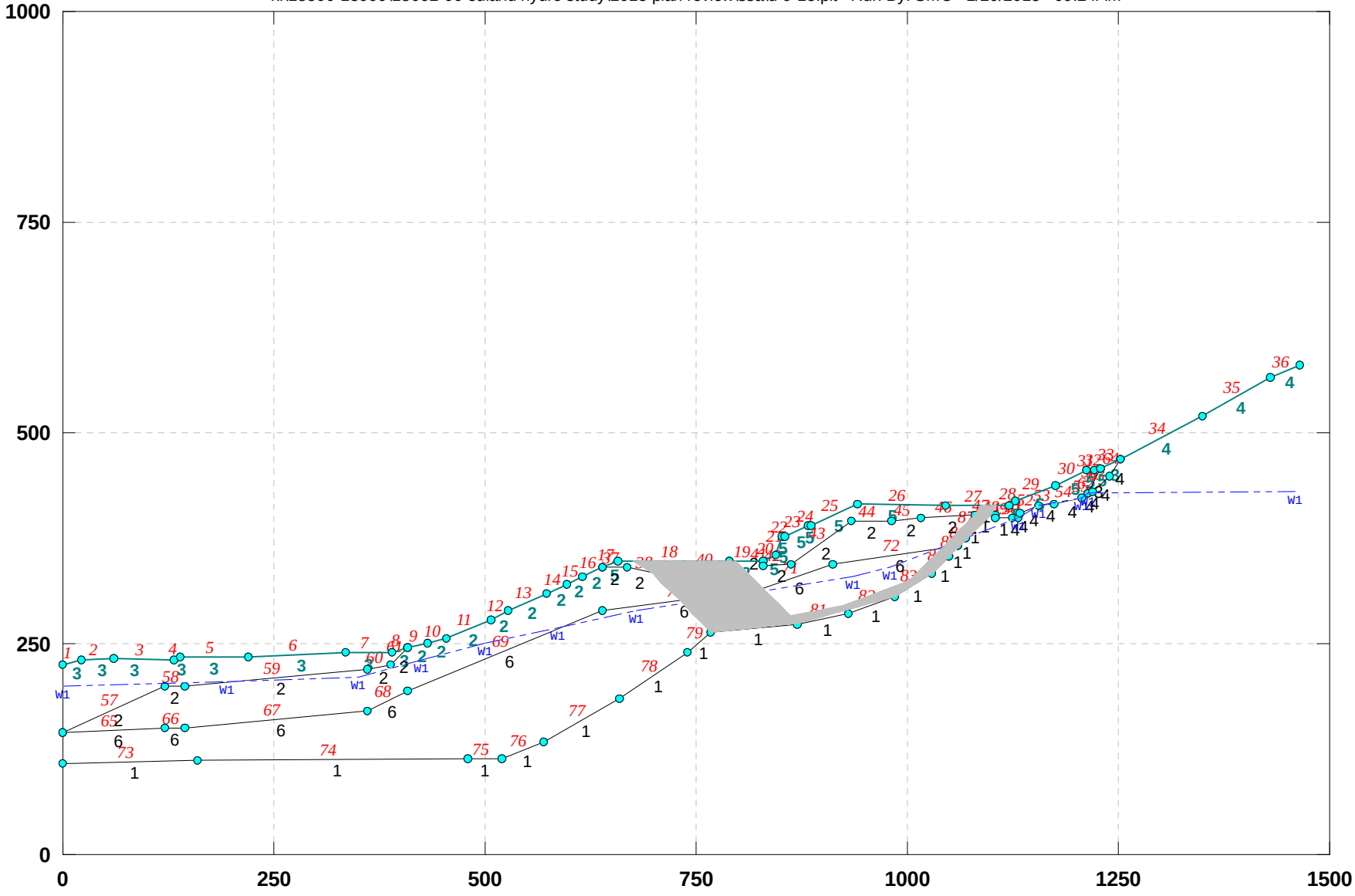
GSTABL7 v.2 FSmin=1.7

Safety Factors Are Calculated By The Simplified Janbu Method for the case of c & phi both > 0

Figure E-12.1

13662-00, Euland, Section D-D', - , static, 2015 design

k:\13500-13999\13662-00 euland hydro study\2015 plan review\ssa\d-9-15.plt Run By: SMC 1/20/2015 09:24AM



***** GSTABL7 *****

** GSTABL7 by Garry H. Gregory, P.E. **

** Original Version 1.0, January 1996; Current Version 2.005, Sept. 2006 **

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SLOPE STABILITY ANALYSIS SYSTEM

Modified Bishop, Simplified Janbu, or GLE Method of Slices.
(Includes Spencer & Morgenstern-Price Type Analysis)
Including Pier/Pile, Reinforcement, Soil Nail, Tieback,
Nonlinear Undrained Shear Strength, Curved Phi Envelope,
Anisotropic Soil, Fiber-Reinforced Soil, Boundary Loads, Water
Surfaces, Pseudo-Static & Newmark Earthquake, and Applied Forces.

****

Analysis Run Date: 1/20/2015
Time of Run: 09:24AM
Run By: SMC
Input Data Filename: K:\13500-13999\13662-00 Euland Hydro Study\2015 Plan Review\SSA\d-9-15.
Output Filename: K:\13500-13999\13662-00 Euland Hydro Study\2015 Plan Review\SSA\d-9-15.OUT
Unit System: English
Plotted Output Filename: K:\13500-13999\13662-00 Euland Hydro Study\2015 Plan Review\SSA\d-9-15.PLT
PROBLEM DESCRIPTION: 13662-00, Euland, Section D-D',
- , static, 2015 design

BOUNDARY COORDINATES
36 Top Boundaries
87 Total Boundaries

Boundary No.	X-Left (ft)	Y-Left (ft)	X-Right (ft)	Y-Right (ft)	Soil Type Below Bnd
1	0.00	225.00	22.00	230.00	3
2	22.00	230.00	60.00	232.00	3
3	60.00	232.00	131.00	230.00	3
4	131.00	230.00	140.00	235.00	3
5	140.00	235.00	220.00	235.00	3
6	220.00	235.00	335.00	240.00	3
7	335.00	240.00	390.00	240.00	3
8	390.00	240.00	408.00	245.00	3
9	408.00	245.00	432.00	250.00	2
10	432.00	250.00	454.00	256.00	2
11	454.00	256.00	508.00	279.00	2
12	508.00	279.00	527.00	289.00	2
13	527.00	289.00	574.00	310.00	2
14	574.00	310.00	597.00	320.00	2
15	597.00	320.00	616.00	330.00	2
16	616.00	330.00	640.00	340.00	2
17	640.00	340.00	658.00	348.00	5
18	658.00	348.00	790.00	348.00	5
19	790.00	348.00	830.00	348.00	2
20	830.00	348.00	845.00	355.00	5
21	845.00	355.00	851.00	378.00	5
22	851.00	378.00	855.00	378.00	5
23	855.00	378.00	882.00	390.00	5
24	882.00	390.00	886.00	390.00	5
25	886.00	390.00	941.00	415.00	5
26	941.00	415.00	1046.00	413.00	5
27	1046.00	413.00	1120.00	414.00	5
28	1120.00	414.00	1128.00	420.00	5
29	1128.00	420.00	1175.00	437.00	5
30	1175.00	437.00	1212.00	456.00	5
31	1212.00	456.00	1221.00	456.00	5
32	1221.00	456.00	1228.00	458.00	5
33	1228.00	458.00	1252.00	468.00	3
34	1252.00	468.00	1350.00	520.00	4
35	1350.00	520.00	1430.00	566.00	4
36	1430.00	566.00	1465.00	580.00	4
37	640.00	340.00	669.00	340.00	2
38	669.00	340.00	720.00	330.00	2
39	720.00	330.00	742.00	330.00	2

40	742.00	330.00	790.00	348.00	2
41	830.00	348.00	830.10	343.00	2
42	830.10	343.00	863.00	344.00	2
43	863.00	344.00	934.00	395.00	2
44	934.00	395.00	982.00	396.00	2
45	982.00	396.00	1016.00	400.00	2
46	1016.00	400.00	1080.00	403.00	2
47	1080.00	403.00	1104.00	403.00	1
48	1104.00	403.00	1105.00	400.00	1
49	1105.00	400.00	1125.00	400.00	1
50	1125.00	400.00	1132.00	400.00	4
51	1132.00	400.00	1133.00	405.00	4
52	1133.00	405.00	1155.00	413.00	4
53	1155.00	413.00	1173.00	415.00	4
54	1173.00	415.00	1207.00	423.00	4
55	1207.00	423.00	1215.00	428.00	4
56	1215.00	428.00	1228.00	458.00	3
57	0.00	145.00	120.00	200.00	2
58	120.00	200.00	145.00	200.00	2
59	145.00	200.00	360.00	220.00	2
60	360.00	220.00	388.00	226.00	2
61	388.00	226.00	408.00	245.00	2
62	1215.00	428.00	1220.00	430.00	4
63	1220.00	430.00	1240.00	449.00	4
64	1240.00	449.00	1252.00	468.00	4
65	0.00	145.00	120.00	150.00	6
66	120.00	150.00	145.00	150.00	6
67	145.00	150.00	360.00	170.00	6
68	360.00	170.00	408.00	195.00	6
69	408.00	195.00	640.00	290.00	6
70	640.00	290.00	823.00	313.00	6
71	823.00	313.00	912.00	345.00	6
72	912.00	345.00	1061.00	366.00	6
73	0.00	108.00	160.00	111.00	1
74	160.00	111.00	480.00	113.00	1
75	480.00	113.00	520.00	113.00	1
76	520.00	113.00	570.00	133.00	1
77	570.00	133.00	660.00	185.00	1
78	660.00	185.00	740.00	240.00	1
79	740.00	240.00	767.00	263.00	1
80	767.00	263.00	870.00	273.00	1
81	870.00	273.00	930.00	286.00	1
82	930.00	286.00	985.00	305.00	1
83	985.00	305.00	1030.00	333.00	1
84	1030.00	333.00	1050.00	353.00	1
85	1050.00	353.00	1061.00	366.00	1
86	1061.00	366.00	1070.00	376.00	1
87	1070.00	376.00	1080.00	403.00	1

Default Y-Origin = 0.00(ft)
Default X-Plus Value = 0.00(ft)
Default Y-Plus Value = 0.00(ft)

ISOTROPIC SOIL PARAMETERS
6 Type(s) of Soil

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.
1	119.0	125.0	0.0	0.0	0.00	0.0	1
2	119.0	125.0	0.0	0.0	0.00	0.0	1
3	119.0	125.0	300.0	20.0	0.00	0.0	1
4	119.0	125.0	750.0	29.0	0.00	0.0	1
5	119.0	125.0	300.0	26.0	0.00	0.0	1
6	119.0	125.0	0.0	0.0	0.00	0.0	1

ANISOTROPIC STRENGTH PARAMETERS
3 soil type(s)
Soil Type 1 Is Anisotropic
Number Of Direction Ranges Specified = 3

Direction Range No.	Counterclockwise Direction Limit (deg)	Cohesion Intercept (psf)	Friction Angle (deg)
1	-3.0	750.00	29.00

2	10.0	300.00	15.00
3	90.0	750.00	29.00

Soil Type 2 Is Anisotropic
Number Of Direction Ranges Specified = 3

Direction Range No.	Counterclockwise Direction Limit (deg)	Cohesion Intercept (psf)	Friction Angle (deg)
1	-3.0	350.00	23.00
2	60.0	250.00	12.50
3	90.0	300.00	20.00

Soil Type 6 Is Anisotropic
Number Of Direction Ranges Specified = 3

Direction Range No.	Counterclockwise Direction Limit (deg)	Cohesion Intercept (psf)	Friction Angle (deg)
1	-3.0	500.00	29.00
2	60.0	250.00	12.50
3	90.0	300.00	20.00

ANISOTROPIC SOIL NOTES:
(1) An input value of 0.01 for C and/or Phi will cause Aniso C and/or Phi to be ignored in that range.
(2) An input value of 0.02 for Phi will set both Phi and C equal to zero, with no water weight in the tension crack.
(3) An input value of 0.03 for Phi will set both Phi and C equal to zero, with water weight in the tension crack.

1 PIEZOMETRIC SURFACE(S) SPECIFIED
Unit Weight of Water = 62.40 (pcf)
Piezometric Surface No. 1 Specified by 15 Coordinate Points
Pore Pressure Inclination Factor = 0.50

Point No.	X-Water (ft)	Y-Water (ft)
1	0.00	200.00
2	195.00	205.00
3	349.00	210.00
4	425.00	230.00
5	500.00	250.00
6	586.00	270.00
7	680.00	290.00
8	810.00	310.00
9	936.00	330.00
10	980.00	340.00
11	1132.00	400.00
12	1155.00	413.00
13	1207.00	423.00
14	1215.00	428.00
15	1460.00	431.00

Janbus Empirical Coef is being used for the case of c & phi both > 0
A Critical Failure Surface Searching Method, Using A Random Technique For Generating Sliding Block Surfaces, Has Been Specified.
The Active And Passive Portions Of The Sliding Surfaces Are Generated According To The Rankine Theory.
1000 Trial Surfaces Have Been Generated.
3 Boxes Specified For Generation Of Central Block Base Length Of Line Segments For Active And Passive Portions Of Sliding Block Is 30.0

Box No.	X-Left (ft)	Y-Left (ft)	X-Right (ft)	Y-Right (ft)	Height (ft)
1	767.00	265.00	870.00	275.00	1.00
2	870.10	275.00	985.00	307.00	1.00
3	985.10	307.00	1030.00	335.00	1.00

Following Are Displayed The Ten Most Critical Of The Trial Failure Surfaces Evaluated. They Are Ordered - Most Critical First.
* * Safety Factors Are Calculated By The Simplified Janbu Method * *
Total Number of Trial Surfaces Attempted = 1000
Number of Trial Surfaces With Valid FS = 1000
Statistical Data On All Valid FS Values:
FS Max = 2.132 FS Min = 1.696 FS Ave = 1.848
Standard Deviation = 0.097 Coefficient of Variation = 5.23 %

Failure Surface Specified By 14 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	767.415	348.000
2	775.885	342.707
3	786.323	332.270
4	807.536	311.056
5	824.615	293.978
6	845.828	272.764
7	897.836	283.134
8	986.972	308.465
9	1008.185	329.678
10	1029.398	350.891
11	1041.801	363.294
12	1063.014	384.507
13	1081.507	403.000
14	1088.111	413.569

Factor of Safety
*** 1.696 ***

Individual data on the 37 slices

Slice No.	Width (ft)	Weight (lbs)	Water Force Top (lbs)	Water Force Bot (lbs)	Tie Force Norm (lbs)	Tie Force Tan (lbs)	Earthquake Force Hor (lbs)	Earthquake Force Ver (lbs)	Surcharge Load (lbs)
1	8.5	2667.7	0.0	0.0	0.	0.	0.0	0.0	0.0
2	10.4	13056.0	0.0	0.0	0.	0.	0.0	0.0	0.0
3	3.7	7688.1	0.0	0.0	0.	0.	0.0	0.0	0.0
4	17.5	58796.2	0.0	0.0	0.	0.	0.0	0.0	0.0
5	1.2	5561.7	0.0	0.0	0.	0.	0.0	0.0	0.0
6	1.2	5637.3	0.0	74.9	0.	0.	0.0	0.0	0.0
7	13.0	71707.7	0.0	10129.3	0.	0.	0.0	0.0	0.0
8	1.6	10392.1	0.0	2449.9	0.	0.	0.0	0.0	0.0
9	5.4	37030.5	0.0	10074.2	0.	0.	0.0	0.0	0.0
10	0.1	722.2	0.0	214.7	0.	0.	0.0	0.0	0.0
11	14.9	127913.0	0.0	43287.2	0.	0.	0.0	0.0	0.0
12	0.8	8426.1	0.0	3062.9	0.	0.	0.0	0.0	0.0
13	5.2	59663.5	0.0	13917.6	0.	0.	0.0	0.0	0.0
14	4.0	50422.0	0.0	10716.8	0.	0.	0.0	0.0	0.0
15	8.0	101386.0	0.0	21310.9	0.	0.	0.0	0.0	0.0
16	19.0	248209.9	0.0	49958.1	0.	0.	0.0	0.0	0.0
17	4.0	53162.0	0.0	10400.0	0.	0.	0.0	0.0	0.0
18	11.8	158851.3	0.0	30534.5	0.	0.	0.0	0.0	0.0
19	14.2	194574.1	0.0	36228.1	0.	0.	0.0	0.0	0.0
20	22.0	309991.8	0.0	53073.9	0.	0.	0.0	0.0	0.0
21	2.0	28649.8	0.0	4632.0	0.	0.	0.0	0.0	0.0
22	5.0	71958.1	0.0	11351.4	0.	0.	0.0	0.0	0.0
23	39.0	535521.9	0.0	85451.0	0.	0.	0.0	0.0	0.0
24	2.0	25954.2	0.0	4068.7	0.	0.	0.0	0.0	0.0
25	5.0	63904.2	0.0	10230.2	0.	0.	0.0	0.0	0.0
26	21.2	242746.0	0.0	48651.0	0.	0.	0.0	0.0	0.0
27	7.8	75289.8	0.0	12273.1	0.	0.	0.0	0.0	0.0
28	13.4	111362.8	0.0	13962.4	0.	0.	0.0	0.0	0.0
29	8.1	56243.0	0.0	4093.2	0.	0.	0.0	0.0	0.0
30	4.3	26901.1	0.0	861.8	0.	0.	0.0	0.0	0.0
31	1.8	10582.2	0.0	82.4	0.	0.	0.0	0.0	0.0
32	2.4	13231.9	0.0	0.0	0.	0.	0.0	0.0	0.0
33	17.0	75145.6	0.0	0.0	0.	0.	0.0	0.0	0.0
34	16.1	39814.2	0.0	0.0	0.	0.	0.0	0.0	0.0
35	0.9	1308.5	0.0	0.0	0.	0.	0.0	0.0	0.0
36	1.5	2012.6	0.0	0.0	0.	0.	0.0	0.0	0.0
37	6.6	4118.1	0.0	0.0	0.	0.	0.0	0.0	0.0

Failure Surface Specified By 14 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	769.582	348.000
2	777.240	343.215
3	787.977	332.478
4	809.190	311.264
5	826.073	294.381
6	847.286	273.168

7	889.140	279.932
8	986.555	307.413
9	1007.768	328.626
10	1028.982	349.839
11	1042.541	363.398
12	1063.754	384.612
13	1082.142	403.000
14	1088.752	413.578

Factor of Safety
*** 1.697 ***

Failure Surface Specified By 14 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	768.133	348.000
2	776.334	342.875
3	786.871	332.339
4	808.084	311.125
5	825.017	294.193
6	846.230	272.979
7	887.513	280.216
8	989.953	310.313
9	1011.167	331.526
10	1032.380	352.739
11	1043.121	363.480
12	1064.334	384.693
13	1082.641	403.000
14	1089.255	413.585

Factor of Safety
*** 1.698 ***

Failure Surface Specified By 14 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	767.192	348.000
2	775.746	342.655
3	786.153	332.248
4	807.366	311.035
5	824.816	293.585
6	846.029	272.372
7	892.675	281.175
8	988.463	309.389
9	1009.676	330.602
10	1030.889	351.815
11	1042.461	363.387
12	1063.674	384.600
13	1082.074	403.000
14	1088.683	413.577

Factor of Safety
*** 1.699 ***

Failure Surface Specified By 14 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	765.248	348.000
2	774.531	342.199
3	784.668	332.062
4	805.882	310.849
5	823.156	293.574
6	844.369	272.361
7	906.532	285.337
8	987.388	308.517
9	1008.602	329.730
10	1029.815	350.944
11	1042.225	363.354
12	1063.438	384.567
13	1081.871	403.000
14	1088.479	413.574

Factor of Safety
*** 1.701 ***

Failure Surface Specified By 14 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)

1	766.684	348.000
2	775.429	342.536
3	785.765	332.200
4	806.978	310.986
5	823.961	294.004
6	845.174	272.790
7	885.886	279.501
8	993.352	312.213
9	1014.565	333.426
10	1035.778	354.639
11	1044.865	363.726
12	1066.078	384.939
13	1084.139	403.000
14	1090.766	413.605

Factor of Safety
*** 1.702 ***

Failure Surface Specified By 14 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	770.078	348.000
2	777.549	343.331
3	788.355	332.525
4	809.569	311.312
5	826.677	294.204
6	847.890	272.991
7	873.656	276.055
8	991.028	311.184
9	1012.241	332.397
10	1033.454	353.611
11	1043.357	363.513
12	1064.570	384.727
13	1082.844	403.000
14	1089.459	413.587

Factor of Safety
*** 1.702 ***

Failure Surface Specified By 14 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	769.137	348.000
2	776.961	343.111
3	787.637	332.435
4	808.850	311.222
5	826.476	293.596
6	847.689	272.383
7	878.817	277.014
8	989.537	310.260
9	1010.750	331.474
10	1031.963	352.687
11	1042.697	363.420
12	1063.910	384.634
13	1082.276	403.000
14	1088.887	413.580

Factor of Safety
*** 1.703 ***

Failure Surface Specified By 14 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	767.402	348.000
2	775.878	342.704
3	786.313	332.268
4	807.526	311.055
5	824.363	294.218
6	845.576	273.005
7	875.563	276.583
8	996.333	314.060
9	1017.546	335.273
10	1038.760	356.487
11	1046.185	363.912
12	1067.398	385.125
13	1085.273	403.000

```
    14       1091.910      413.620
        Factor of Safety
       ***    1.704   ***
 Failure Surface Specified By 14 Coordinate Points
   Point      X-Surf      Y-Surf
    No.        (ft)        (ft)
     1        765.743      348.000
     2        774.841      342.315
     3        785.047      332.109
     4        806.260      310.896
     5        823.760      293.396
     6        844.973      272.183
     7        891.048      280.460
     8        991.861      311.289
     9       1013.074      332.502
    10       1034.287      353.715
    11       1044.205      363.633
    12       1065.418      384.846
    13       1083.572      403.000
    14       1090.194      413.597
        Factor of Safety
       ***    1.704   ***
           **** END OF GSTABL7 OUTPUT ****
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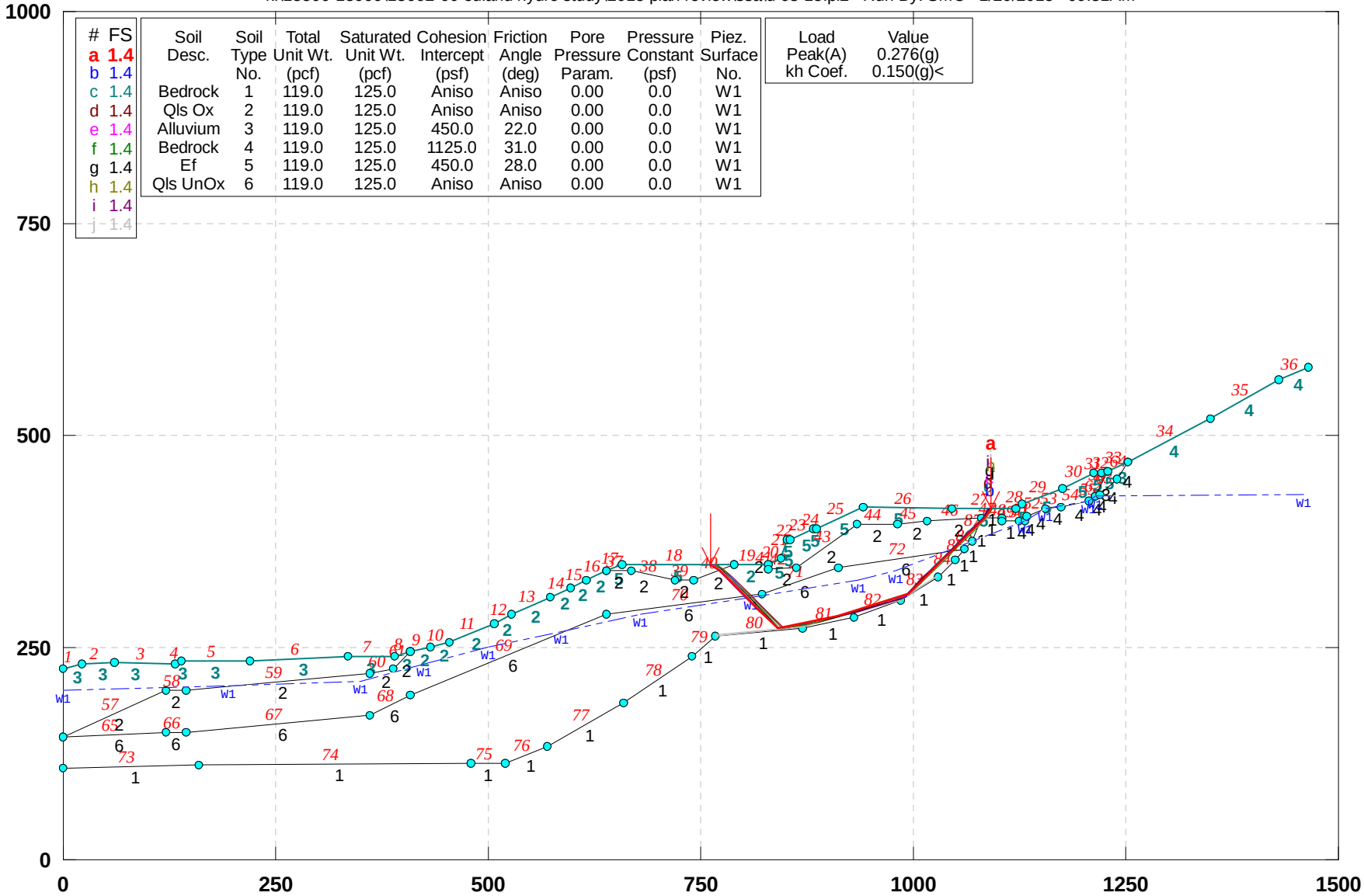
13662-00, Euland, Section D-D', - , seismic 2015 design

k:\13500-13999\13662-00 euland hydro study\2015 plan review\ssa\d-9s-15.pl2 Run By: SMC 1/20/2015 09:31AM



#	FS
a	1.4
b	1.4
c	1.4
d	1.4
e	1.4
f	1.4
g	1.4
h	1.4
i	1.4
j	1.4

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.
Bedrock	1	119.0	125.0	Aniso	Aniso	0.00	0.0	W1
Qls Ox	2	119.0	125.0	Aniso	Aniso	0.00	0.0	W1
Alluvium	3	119.0	125.0	450.0	22.0	0.00	0.0	W1
Bedrock	4	119.0	125.0	1125.0	31.0	0.00	0.0	W1
Ef	5	119.0	125.0	450.0	28.0	0.00	0.0	W1
Qls UnOx	6	119.0	125.0	Aniso	Aniso	0.00	0.0	W1

Load	Value
Peak(A)	0.276(g)
kh Coef.	0.150(g)<

GSTABL7 v.2 FSmin=1.4

Safety Factors Are Calculated By The Simplified Janbu Method for the case of c & phi both > 0

Figure E-12.2

***** GSTABL7 *****

** GSTABL7 by Garry H. Gregory, P.E. **

** Original Version 1.0, January 1996; Current Version 2.005, Sept. 2006 **

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SLOPE STABILITY ANALYSIS SYSTEM

Modified Bishop, Simplified Janbu, or GLE Method of Slices.
(Includes Spencer & Morgenstern-Price Type Analysis)
Including Pier/Pile, Reinforcement, Soil Nail, Tieback,
Nonlinear Undrained Shear Strength, Curved Phi Envelope,
Anisotropic Soil, Fiber-Reinforced Soil, Boundary Loads, Water
Surfaces, Pseudo-Static & Newmark Earthquake, and Applied Forces.

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Analysis Run Date: 1/20/2015
Time of Run: 09:31AM
Run By: SMC
Input Data Filename: K:\13500-13999\13662-00 Euland Hydro Study\2015 Plan Review\SSA\d-9s-15.
Output Filename: K:\13500-13999\13662-00 Euland Hydro Study\2015 Plan Review\SSA\d-9s-15.OUT
Unit System: English
Plotted Output Filename: K:\13500-13999\13662-00 Euland Hydro Study\2015 Plan Review\SSA\d-9s-15.PLT
PROBLEM DESCRIPTION: 13662-00, Euland, Section D-D',
- , seismic 2015 design

BOUNDARY COORDINATES
36 Top Boundaries
87 Total Boundaries

Boundary No.	X-Left (ft)	Y-Left (ft)	X-Right (ft)	Y-Right (ft)	Soil Type Below Bnd
1	0.00	225.00	22.00	230.00	3
2	22.00	230.00	60.00	232.00	3
3	60.00	232.00	131.00	230.00	3
4	131.00	230.00	140.00	235.00	3
5	140.00	235.00	220.00	235.00	3
6	220.00	235.00	335.00	240.00	3
7	335.00	240.00	390.00	240.00	3
8	390.00	240.00	408.00	245.00	3
9	408.00	245.00	432.00	250.00	2
10	432.00	250.00	454.00	256.00	2
11	454.00	256.00	508.00	279.00	2
12	508.00	279.00	527.00	289.00	2
13	527.00	289.00	574.00	310.00	2
14	574.00	310.00	597.00	320.00	2
15	597.00	320.00	616.00	330.00	2
16	616.00	330.00	640.00	340.00	2
17	640.00	340.00	658.00	348.00	5
18	658.00	348.00	790.00	348.00	5
19	790.00	348.00	830.00	348.00	2
20	830.00	348.00	845.00	355.00	5
21	845.00	355.00	851.00	378.00	5
22	851.00	378.00	855.00	378.00	5
23	855.00	378.00	882.00	390.00	5
24	882.00	390.00	886.00	390.00	5
25	886.00	390.00	941.00	415.00	5
26	941.00	415.00	1046.00	413.00	5
27	1046.00	413.00	1120.00	414.00	5
28	1120.00	414.00	1128.00	420.00	5
29	1128.00	420.00	1175.00	437.00	5
30	1175.00	437.00	1212.00	456.00	5
31	1212.00	456.00	1221.00	456.00	5
32	1221.00	456.00	1228.00	458.00	5
33	1228.00	458.00	1252.00	468.00	3
34	1252.00	468.00	1350.00	520.00	4
35	1350.00	520.00	1430.00	566.00	4
36	1430.00	566.00	1465.00	580.00	4
37	640.00	340.00	669.00	340.00	2
38	669.00	340.00	720.00	330.00	2
39	720.00	330.00	742.00	330.00	2

40	742.00	330.00	790.00	348.00	2
41	830.00	348.00	830.10	343.00	2
42	830.10	343.00	863.00	344.00	2
43	863.00	344.00	934.00	395.00	2
44	934.00	395.00	982.00	396.00	2
45	982.00	396.00	1016.00	400.00	2
46	1016.00	400.00	1080.00	403.00	2
47	1080.00	403.00	1104.00	403.00	1
48	1104.00	403.00	1105.00	400.00	1
49	1105.00	400.00	1125.00	400.00	1
50	1125.00	400.00	1132.00	400.00	4
51	1132.00	400.00	1133.00	405.00	4
52	1133.00	405.00	1155.00	413.00	4
53	1155.00	413.00	1173.00	415.00	4
54	1173.00	415.00	1207.00	423.00	4
55	1207.00	423.00	1215.00	428.00	4
56	1215.00	428.00	1228.00	458.00	3
57	0.00	145.00	120.00	200.00	2
58	120.00	200.00	145.00	200.00	2
59	145.00	200.00	360.00	220.00	2
60	360.00	220.00	388.00	226.00	2
61	388.00	226.00	408.00	245.00	2
62	1215.00	428.00	1220.00	430.00	4
63	1220.00	430.00	1240.00	449.00	4
64	1240.00	449.00	1252.00	468.00	4
65	0.00	145.00	120.00	150.00	6
66	120.00	150.00	145.00	150.00	6
67	145.00	150.00	360.00	170.00	6
68	360.00	170.00	408.00	195.00	6
69	408.00	195.00	640.00	290.00	6
70	640.00	290.00	823.00	313.00	6
71	823.00	313.00	912.00	345.00	6
72	912.00	345.00	1061.00	366.00	6
73	0.00	108.00	160.00	111.00	1
74	160.00	111.00	480.00	113.00	1
75	480.00	113.00	520.00	113.00	1
76	520.00	113.00	570.00	133.00	1
77	570.00	133.00	660.00	185.00	1
78	660.00	185.00	740.00	240.00	1
79	740.00	240.00	767.00	263.00	1
80	767.00	263.00	870.00	273.00	1
81	870.00	273.00	930.00	286.00	1
82	930.00	286.00	985.00	305.00	1
83	985.00	305.00	1030.00	333.00	1
84	1030.00	333.00	1050.00	353.00	1
85	1050.00	353.00	1061.00	366.00	1
86	1061.00	366.00	1070.00	376.00	1
87	1070.00	376.00	1080.00	403.00	1

Default Y-Origin = 0.00(ft)
Default X-Plus Value = 0.00(ft)
Default Y-Plus Value = 0.00(ft)

ISOTROPIC SOIL PARAMETERS
6 Type(s) of Soil

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.
1	119.0	125.0	0.0	0.0	0.00	0.0	1
2	119.0	125.0	0.0	0.0	0.00	0.0	1
3	119.0	125.0	450.0	22.0	0.00	0.0	1
4	119.0	125.0	1125.0	31.0	0.00	0.0	1
5	119.0	125.0	450.0	28.0	0.00	0.0	1
6	119.0	125.0	0.0	0.0	0.00	0.0	1

ANISOTROPIC STRENGTH PARAMETERS
3 soil type(s)
Soil Type 1 Is Anisotropic
Number Of Direction Ranges Specified = 3

Direction Range No.	Counterclockwise Direction Limit (deg)	Cohesion Intercept (psf)	Friction Angle (deg)
1	-3.0	1125.00	31.00

2	10.0	450.00	17.00
3	90.0	1125.00	31.00

Soil Type 2 Is Anisotropic
Number Of Direction Ranges Specified = 3

Direction Range No.	Counterclockwise Direction Limit (deg)	Cohesion Intercept (psf)	Friction Angle (deg)
1	-3.0	525.00	25.00
2	60.0	375.00	14.50
3	90.0	450.00	22.00

Soil Type 6 Is Anisotropic
Number Of Direction Ranges Specified = 3

Direction Range No.	Counterclockwise Direction Limit (deg)	Cohesion Intercept (psf)	Friction Angle (deg)
1	-3.0	750.00	31.00
2	60.0	375.00	14.50
3	90.0	450.00	22.00

ANISOTROPIC SOIL NOTES:
(1) An input value of 0.01 for C and/or Phi will cause Aniso C and/or Phi to be ignored in that range.
(2) An input value of 0.02 for Phi will set both Phi and C equal to zero, with no water weight in the tension crack.
(3) An input value of 0.03 for Phi will set both Phi and C equal to zero, with water weight in the tension crack.

1 PIEZOMETRIC SURFACE(S) SPECIFIED
Unit Weight of Water = 62.40 (pcf)
Piezometric Surface No. 1 Specified by 15 Coordinate Points
Pore Pressure Inclination Factor = 0.50

Point No.	X-Water (ft)	Y-Water (ft)
1	0.00	200.00
2	195.00	205.00
3	349.00	210.00
4	425.00	230.00
5	500.00	250.00
6	586.00	270.00
7	680.00	290.00
8	810.00	310.00
9	936.00	330.00
10	980.00	340.00
11	1132.00	400.00
12	1155.00	413.00
13	1207.00	423.00
14	1215.00	428.00
15	1460.00	431.00

Specified Peak Ground Acceleration Coefficient (A) = 0.276(g)
Specified Horizontal Earthquake Coefficient (kh) = 0.150(g)
Specified Vertical Earthquake Coefficient (kv) = 0.000(g)
Specified Seismic Pore-Pressure Factor = 0.000
Janbus Empirical Coef is being used for the case of c & phi both > 0
A Critical Failure Surface Searching Method, Using A Random
Technique For Generating Sliding Block Surfaces, Has Been
Specified.
The Active And Passive Portions Of The Sliding Surfaces
Are Generated According To The Rankine Theory.
1000 Trial Surfaces Have Been Generated.
3 Boxes Specified For Generation Of Central Block Base
Length Of Line Segments For Active And Passive Portions Of
Sliding Block Is 30.0

Box No.	X-Left (ft)	Y-Left (ft)	X-Right (ft)	Y-Right (ft)	Height (ft)
1	767.00	265.00	870.00	275.00	1.00
2	870.10	275.00	985.00	307.00	1.00
3	985.10	307.00	1030.00	335.00	1.00

Following Are Displayed The Ten Most Critical Of The Trial
Failure Surfaces Evaluated. They Are
Ordered - Most Critical First.
* * Safety Factors Are Calculated By The Simplified Janbu Method * *
Total Number of Trial Surfaces Attempted = 1000

Number of Trial Surfaces With Valid FS = 1000
Statistical Data On All Valid FS Values:
FS Max = 1.585 FS Min = 1.387 FS Ave = 1.439
Standard Deviation = 0.042 Coefficient of Variation = 2.94 %
Failure Surface Specified By 14 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	760.917	348.000
2	772.093	341.285
3	781.690	331.687
4	802.903	310.474
5	819.585	293.792
6	840.799	272.579
7	911.974	287.109
8	994.601	313.369
9	1015.814	334.583
10	1037.028	355.796
11	1044.973	363.741
12	1066.186	384.954
13	1084.232	403.000
14	1090.603	413.603

Factor of Safety
*** 1.387 ***

Individual data on the 37 slices

Slice No.	Width (ft)	Weight (lbs)	Water Force Top (lbs)	Water Force Bot (lbs)	Tie Force Norm (lbs)	Tie Force Tan (lbs)	Earthquake Force Hor (lbs)	Earthquake Force Ver (lbs)	Surcharge Load (lbs)
1	11.2	4465.4	0.0	0.0	0.	0.	669.8	0.0	0.0
2	9.6	13150.0	0.0	0.0	0.	0.	1972.5	0.0	0.0
3	8.3	20239.7	0.0	0.0	0.	0.	3036.0	0.0	0.0
4	12.9	47714.3	0.0	0.0	0.	0.	7157.2	0.0	0.0
5	1.4	6170.2	0.0	0.0	0.	0.	925.5	0.0	0.0
6	5.7	28629.5	0.0	1657.7	0.	0.	4294.4	0.0	0.0
7	9.6	57058.0	0.0	10172.9	0.	0.	8558.7	0.0	0.0
8	3.4	23118.9	0.0	5865.4	0.	0.	3467.8	0.0	0.0
9	7.0	51982.8	0.0	15705.9	0.	0.	7797.4	0.0	0.0
10	0.1	787.4	0.0	260.2	0.	0.	118.1	0.0	0.0
11	10.7	94738.5	0.0	33674.7	0.	0.	14210.8	0.0	0.0
12	4.2	41553.9	0.0	11156.6	0.	0.	6233.1	0.0	0.0
13	6.0	67502.8	0.0	15845.4	0.	0.	10125.4	0.0	0.0
14	4.0	49984.6	0.0	10506.5	0.	0.	7497.7	0.0	0.0
15	8.0	100482.7	0.0	20875.8	0.	0.	15072.4	0.0	0.0
16	19.0	245912.4	0.0	48847.3	0.	0.	36886.9	0.0	0.0
17	4.0	52651.0	0.0	10152.2	0.	0.	7897.6	0.0	0.0
18	26.0	350577.2	0.0	64812.2	0.	0.	52586.6	0.0	0.0
19	0.0	357.5	0.0	65.1	0.	0.	53.6	0.0	0.0
20	22.0	309091.2	0.0	53102.5	0.	0.	46363.7	0.0	0.0
21	2.0	28467.1	0.0	4580.6	0.	0.	4270.1	0.0	0.0
22	5.0	71428.1	0.0	11186.1	0.	0.	10714.2	0.0	0.0
23	39.0	527784.3	0.0	82289.7	0.	0.	79167.6	0.0	0.0
24	2.0	25386.4	0.0	3828.4	0.	0.	3808.0	0.0	0.0
25	12.6	156301.2	0.0	24553.1	0.	0.	23445.2	0.0	0.0
26	21.2	229774.4	0.0	45346.8	0.	0.	34466.2	0.0	0.0
27	0.2	1762.9	0.0	297.8	0.	0.	264.4	0.0	0.0
28	21.0	171917.4	0.0	22633.4	0.	0.	25787.6	0.0	0.0
29	0.4	2975.8	0.0	235.8	0.	0.	446.4	0.0	0.0
30	7.5	47636.7	0.0	2582.9	0.	0.	7145.5	0.0	0.0
31	1.0	5967.5	0.0	134.8	0.	0.	895.1	0.0	0.0
32	2.1	11923.8	0.0	112.2	0.	0.	1788.6	0.0	0.0
33	18.1	80026.9	0.0	0.0	0.	0.	12004.0	0.0	0.0
34	11.3	30634.7	0.0	0.0	0.	0.	4595.2	0.0	0.0
35	2.5	4715.8	0.0	0.0	0.	0.	707.4	0.0	0.0
36	4.2	6347.4	0.0	0.0	0.	0.	952.1	0.0	0.0
37	6.4	3986.5	0.0	0.0	0.	0.	598.0	0.0	0.0

Failure Surface Specified By 14 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	767.805	348.000
2	776.334	342.875

3	786.871	332.339
4	808.084	311.125
5	825.017	294.193
6	846.230	272.979
7	887.513	280.216
8	989.953	310.313
9	1011.167	331.526
10	1032.380	352.739
11	1043.121	363.480
12	1064.334	384.693
13	1082.641	403.000
14	1088.999	413.581

Factor of Safety
*** 1.387 ***

Failure Surface Specified By 14 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	767.076	348.000
2	775.885	342.707
3	786.323	332.270
4	807.536	311.056
5	824.615	293.978
6	845.828	272.764
7	897.836	283.134
8	986.972	308.465
9	1008.185	329.678
10	1029.398	350.891
11	1041.801	363.294
12	1063.014	384.507
13	1081.507	403.000
14	1087.855	413.566

Factor of Safety
*** 1.387 ***

Failure Surface Specified By 14 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	769.276	348.000
2	777.240	343.215
3	787.977	332.478
4	809.190	311.264
5	826.073	294.381
6	847.286	273.168
7	889.140	279.932
8	986.555	307.413
9	1007.768	328.626
10	1028.982	349.839
11	1042.541	363.398
12	1063.754	384.612
13	1082.142	403.000
14	1088.496	413.574

Factor of Safety
*** 1.388 ***

Failure Surface Specified By 14 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	766.335	348.000
2	775.429	342.536
3	785.765	332.200
4	806.978	310.986
5	823.961	294.004
6	845.174	272.790
7	885.886	279.501
8	993.352	312.213
9	1014.565	333.426
10	1035.778	354.639
11	1044.865	363.726
12	1066.078	384.939
13	1084.139	403.000
14	1090.509	413.601

Factor of Safety

```
       ***    1.388   ***
  Failure Surface Specified By 14 Coordinate Points
    Point      X-Surf      Y-Surf
     No.        (ft)        (ft)
      1        763.619      348.000
      2        773.757      341.909
      3        783.723      331.943
      4        804.936      310.730
      5        821.647      294.018
      6        842.861      272.805
      7        887.794      280.029
      8        998.657      315.089
      9       1019.870      336.302
     10       1041.083      357.515
     11       1047.693      364.125
     12       1068.906      385.338
     13       1086.569      403.000
     14       1092.959      413.635
        Factor of Safety
       ***    1.388   ***
  Failure Surface Specified By 14 Coordinate Points
    Point      X-Surf      Y-Surf
     No.        (ft)        (ft)
      1        763.632      348.000
      2        773.765      341.912
      3        783.732      331.944
      4        804.946      310.731
      5        821.899      293.777
      6        843.112      272.564
      7        910.067      286.581
      8        989.296      309.493
      9       1010.509      330.707
     10       1031.722      351.920
     11       1043.309      363.507
     12       1064.522      384.720
     13       1082.802      403.000
     14       1089.162      413.583
        Factor of Safety
       ***    1.388   ***
  Failure Surface Specified By 14 Coordinate Points
    Point      X-Surf      Y-Surf
     No.        (ft)        (ft)
      1        767.064      348.000
      2        775.878      342.704
      3        786.313      332.268
      4        807.526      311.055
      5        824.363      294.218
      6        845.576      273.005
      7        875.563      276.583
      8        996.333      314.060
      9       1017.546      335.273
     10       1038.760      356.487
     11       1046.185      363.912
     12       1067.398      385.125
     13       1085.273      403.000
     14       1091.652      413.617
        Factor of Safety
       ***    1.388   ***
  Failure Surface Specified By 14 Coordinate Points
    Point      X-Surf      Y-Surf
     No.        (ft)        (ft)
      1        759.459      348.000
      2        771.195      340.948
      3        780.594      331.550
      4        801.807      310.336
      5        818.781      293.362
      6        839.994      272.149
      7        932.620      291.945
      8        988.638      309.674
      9       1009.851      330.887
```

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    10       1031.064      352.100
    11       1042.333      363.369
    12       1063.546      384.582
    13       1081.964      403.000
    14       1088.316      413.572
        Factor of Safety
       ***    1.388   ***
 Failure Surface Specified By 14 Coordinate Points
   Point      X-Surf      Y-Surf
    No.        (ft)        (ft)
     1        762.890      348.000
     2        773.308      341.740
     3        783.174      331.874
     4        804.388      310.661
     5        821.245      293.803
     6        842.458      272.590
     7        898.117      282.947
     8        995.675      313.241
     9       1016.889      334.454
    10       1038.102      355.667
    11       1046.373      363.939
    12       1067.586      385.152
    13       1085.435      403.000
    14       1091.815      413.619
        Factor of Safety
       ***    1.388   ***
           **** END OF GSTABL7 OUTPUT ****
```

13662-00, Euland, Section D-D', - , static, 2015 design, 26' H MSE wall

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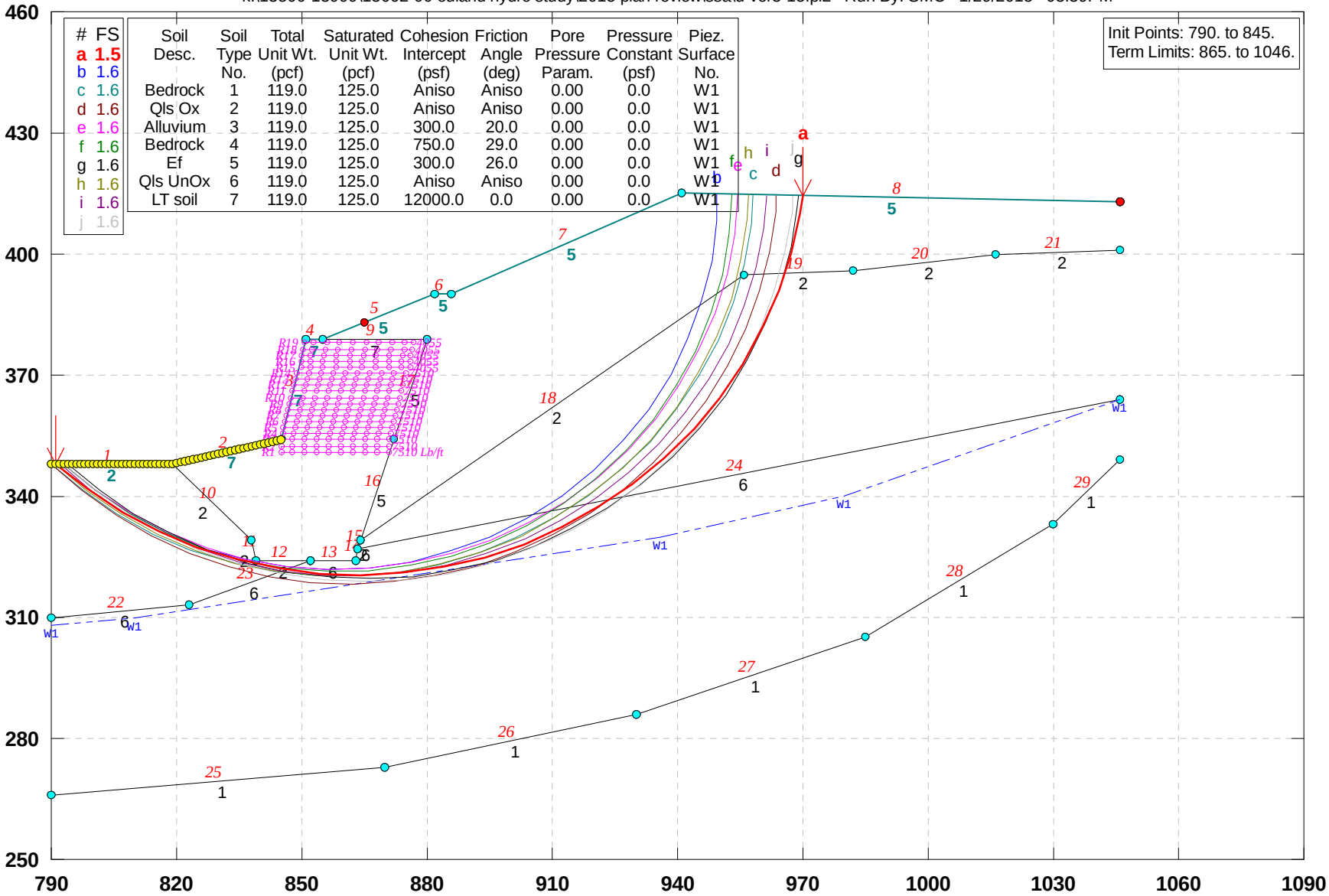


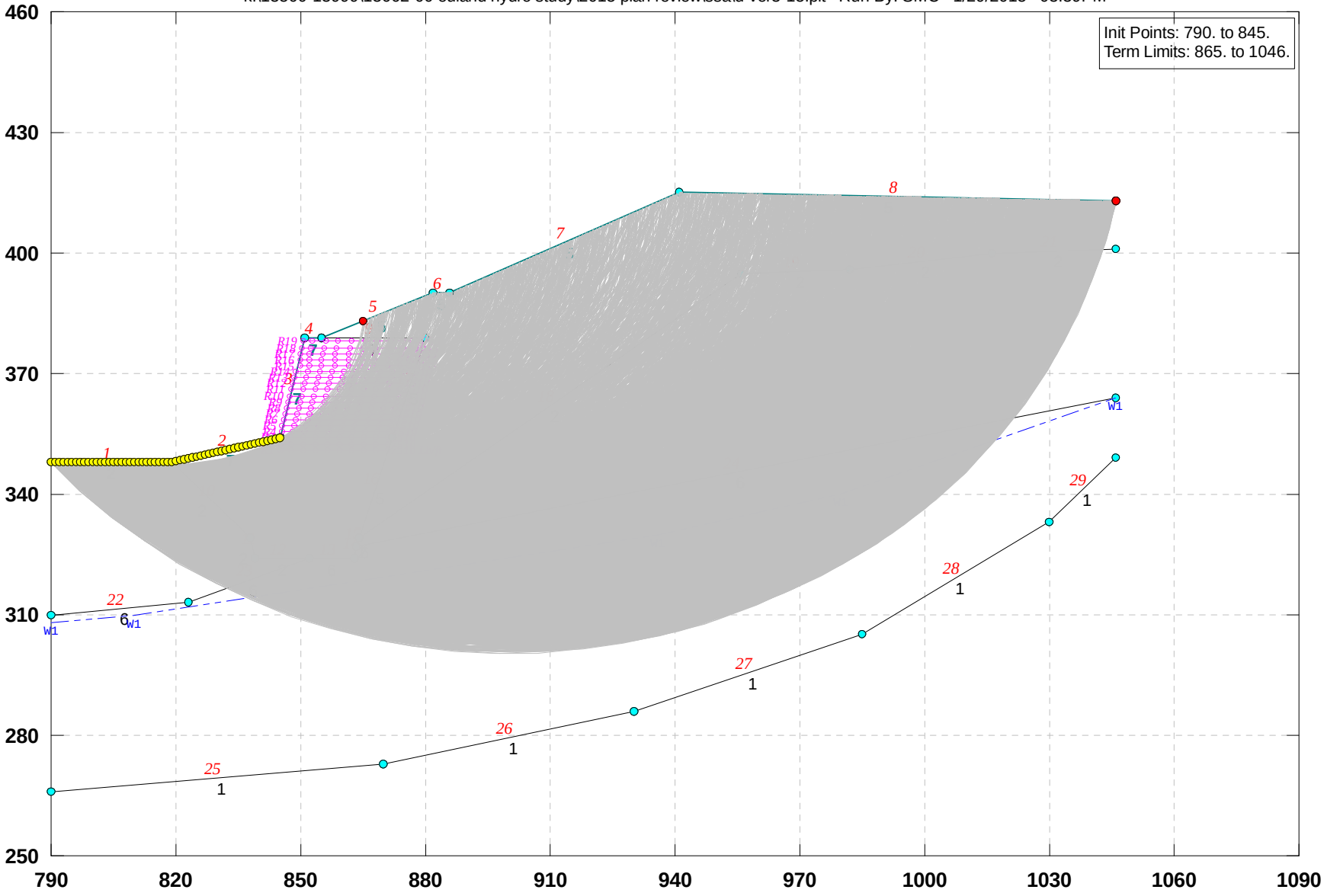
GSTABL7 v.2 FSmin=1.5

Safety Factors Are Calculated By The Modified Bishop Method

Figure E-13.1

13662-00, Euland, Section D-D', - , static, 2015 design, 26' H MSE wall

k:\13500-13999\13662-00 euland hydro study\2015 plan review\ssa\d-ver3-15.plt Run By: SMC 1/29/2015 03:39PM



***** GSTABL7 *****

** GSTABL7 by Garry H. Gregory, P.E. **

** Original Version 1.0, January 1996; Current Version 2.005, Sept. 2006 **

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SLOPE STABILITY ANALYSIS SYSTEM

Modified Bishop, Simplified Janbu, or GLE Method of Slices.
(Includes Spencer & Morgenstern-Price Type Analysis)
Including Pier/Pile, Reinforcement, Soil Nail, Tieback,
Nonlinear Undrained Shear Strength, Curved Phi Envelope,
Anisotropic Soil, Fiber-Reinforced Soil, Boundary Loads, Water
Surfaces, Pseudo-Static & Newmark Earthquake, and Applied Forces.

****

Analysis Run Date: 1/29/2015
Time of Run: 03:39PM
Run By: SMC
Input Data Filename: K:\13500-13999\13662-00 Euland Hydro Study\2015 Plan Review\SSA\d-ver3-15.
Output Filename: K:\13500-13999\13662-00 Euland Hydro Study\2015 Plan Review\SSA\d-ver3-15.OUT
Unit System: English
Plotted Output Filename: K:\13500-13999\13662-00 Euland Hydro Study\2015 Plan Review\SSA\d-ver3-15.PLT
PROBLEM DESCRIPTION: 13662-00, Euland, Section D-D',
- , static, 2015 design, 26' H MSE wall

BOUNDARY COORDINATES
8 Top Boundaries
29 Total Boundaries

Boundary No.	X-Left (ft)	Y-Left (ft)	X-Right (ft)	Y-Right (ft)	Soil Type Below Bnd
1	790.00	348.00	819.00	348.00	2
2	819.00	348.00	845.00	354.00	7
3	845.00	354.00	851.00	379.00	7
4	851.00	379.00	855.00	379.00	7
5	855.00	379.00	882.00	390.00	5
6	882.00	390.00	886.00	390.00	5
7	886.00	390.00	941.00	415.00	5
8	941.00	415.00	1046.00	413.00	5
9	855.00	379.00	880.00	379.00	7
10	819.00	348.00	838.00	329.00	2
11	838.00	329.00	839.00	324.00	2
12	839.00	324.00	852.00	324.00	2
13	852.00	324.00	863.00	324.00	6
14	863.00	324.00	863.50	327.00	6
15	863.50	327.00	864.00	329.00	2
16	864.00	329.00	872.00	354.00	5
17	872.00	354.00	880.00	379.00	5
18	864.00	329.00	956.00	395.00	2
19	956.00	395.00	982.00	396.00	2
20	982.00	396.00	1016.00	400.00	2
21	1016.00	400.00	1046.00	401.00	2
22	790.00	310.00	823.00	313.00	6
23	823.00	313.00	852.00	324.00	6
24	863.50	327.00	1046.00	364.00	6
25	790.00	266.00	870.00	273.00	1
26	870.00	273.00	930.00	286.00	1
27	930.00	286.00	985.00	305.00	1
28	985.00	305.00	1030.00	333.00	1
29	1030.00	333.00	1046.00	349.00	1

User Specified Y-Origin = 250.00(ft)
Default X-Plus Value = 0.00(ft)
Default Y-Plus Value = 0.00(ft)

ISOTROPIC SOIL PARAMETERS
7 Type(s) of Soil

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.
1	119.0	125.0	0.0	0.0	0.00	0.0	1
2	119.0	125.0	0.0	0.0	0.00	0.0	1
3	119.0	125.0	300.0	20.0	0.00	0.0	1

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   4   119.0    125.0     750.0     29.0    0.00       0.0      1
   5   119.0    125.0     300.0     26.0    0.00       0.0      1
   6   119.0    125.0       0.0      0.0    0.00       0.0      1
   7   119.0    125.0   12000.0      0.0    0.00       0.0      1
ANISOTROPIC STRENGTH PARAMETERS
     3 soil type(s)
 Soil Type  1 Is Anisotropic
 Number Of Direction Ranges Specified =  3
 Direction    Counterclockwise     Cohesion     Friction
   Range       Direction Limit    Intercept       Angle
    No.            (deg)            (psf)         (deg)
     1              -3.0             750.00         29.00
     2              10.0             300.00         15.00
     3              90.0             750.00         29.00
 Soil Type  2 Is Anisotropic
 Number Of Direction Ranges Specified =  3
 Direction    Counterclockwise     Cohesion     Friction
   Range       Direction Limit    Intercept       Angle
    No.            (deg)            (psf)         (deg)
     1              -3.0             350.00         23.00
     2              10.0             250.00         12.50
     3              90.0             300.00         20.00
 Soil Type  6 Is Anisotropic
 Number Of Direction Ranges Specified =  3
 Direction    Counterclockwise     Cohesion     Friction
   Range       Direction Limit    Intercept       Angle
    No.            (deg)            (psf)         (deg)
     1              -3.0             500.00         29.00
     2              10.0             250.00         12.50
     3              90.0             300.00         20.00
 ANISOTROPIC SOIL NOTES:
    (1) An input value of 0.01 for C and/or Phi will cause Aniso
        C and/or Phi to be ignored in that range.
    (2) An input value of 0.02 for Phi will set both Phi and
        C equal to zero, with no water weight in the tension crack.
    (3) An input value of 0.03 for Phi will set both Phi and
        C equal to zero, with water weight in the tension crack.
 1 PIEZOMETRIC SURFACE(S) SPECIFIED
 Unit Weight of Water =  62.40 (pcf)
 Piezometric Surface No.  1 Specified by  5 Coordinate Points
 Pore Pressure Inclination Factor =  0.50
   Point      X-Water     Y-Water
    No.         (ft)        (ft)
     1        790.00      308.00
     2        810.00      310.00
     3        936.00      330.00
     4        980.00      340.00
     5       1046.00      364.00
REINFORCING LAYER(S)
    19 REINFORCING LAYER(S) SPECIFIED
 REINFORCING LAYER NO.   1
  10 POINTS DEFINE THIS LAYER
      POINT     X-COORD   Y-COORD   FORCE   INCLINATION
       NO.                                    FACTOR
        1       845.00    351.00   7510.00     1.000
        2       847.89    351.00   7510.00     1.000
        3       850.78    351.00   7510.00     1.000
        4       853.67    351.00   7510.00     1.000
        5       856.56    351.00   7510.00     1.000
        6       859.44    351.00   7510.00     1.000
        7       862.33    351.00   7510.00     1.000
        8       865.22    351.00   7510.00     1.000
        9       868.11    351.00   7510.00     1.000
       10       871.00    351.00   7510.00     1.000
 REINFORCING LAYER NO.   2
  10 POINTS DEFINE THIS LAYER
      POINT     X-COORD   Y-COORD   FORCE   INCLINATION
       NO.                                    FACTOR
        1       845.00    352.50   7510.00     1.000
        2       847.89    352.50   7510.00     1.000
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3	850.78	352.50	7510.00	1.000
4	853.67	352.50	7510.00	1.000
5	856.56	352.50	7510.00	1.000
6	859.44	352.50	7510.00	1.000
7	862.33	352.50	7510.00	1.000
8	865.22	352.50	7510.00	1.000
9	868.11	352.50	7510.00	1.000
10	871.00	352.50	7510.00	1.000

REINFORCING LAYER NO. 3
10 POINTS DEFINE THIS LAYER

POINT NO.	X-COORD	Y-COORD	FORCE	INCLINATION FACTOR
1	845.00	354.00	7510.00	1.000
2	847.89	354.00	7510.00	1.000
3	850.78	354.00	7510.00	1.000
4	853.67	354.00	7510.00	1.000
5	856.56	354.00	7510.00	1.000
6	859.44	354.00	7510.00	1.000
7	862.33	354.00	7510.00	1.000
8	865.22	354.00	7510.00	1.000
9	868.11	354.00	7510.00	1.000
10	871.00	354.00	7510.00	1.000

REINFORCING LAYER NO. 4
10 POINTS DEFINE THIS LAYER

POINT NO.	X-COORD	Y-COORD	FORCE	INCLINATION FACTOR
1	845.36	355.50	7510.00	1.000
2	848.25	355.50	7510.00	1.000
3	851.14	355.50	7510.00	1.000
4	854.03	355.50	7510.00	1.000
5	856.92	355.50	7510.00	1.000
6	859.80	355.50	7510.00	1.000
7	862.69	355.50	7510.00	1.000
8	865.58	355.50	7510.00	1.000
9	868.47	355.50	7510.00	1.000
10	871.36	355.50	7510.00	1.000

REINFORCING LAYER NO. 5
10 POINTS DEFINE THIS LAYER

POINT NO.	X-COORD	Y-COORD	FORCE	INCLINATION FACTOR
1	845.72	357.00	7510.00	1.000
2	848.61	357.00	7510.00	1.000
3	851.50	357.00	7510.00	1.000
4	854.39	357.00	7510.00	1.000
5	857.28	357.00	7510.00	1.000
6	860.16	357.00	7510.00	1.000
7	863.05	357.00	7510.00	1.000
8	865.94	357.00	7510.00	1.000
9	868.83	357.00	7510.00	1.000
10	871.72	357.00	7510.00	1.000

REINFORCING LAYER NO. 6
10 POINTS DEFINE THIS LAYER

POINT NO.	X-COORD	Y-COORD	FORCE	INCLINATION FACTOR
1	846.08	358.50	7510.00	1.000
2	848.97	358.50	7510.00	1.000
3	851.86	358.50	7510.00	1.000
4	854.75	358.50	7510.00	1.000
5	857.64	358.50	7510.00	1.000
6	860.52	358.50	7510.00	1.000
7	863.41	358.50	7510.00	1.000
8	866.30	358.50	7510.00	1.000
9	869.19	358.50	7510.00	1.000
10	872.08	358.50	7510.00	1.000

REINFORCING LAYER NO. 7
10 POINTS DEFINE THIS LAYER

POINT NO.	X-COORD	Y-COORD	FORCE	INCLINATION FACTOR
1	846.44	360.00	7510.00	1.000
2	849.33	360.00	7510.00	1.000

3	852.22	360.00	7510.00	1.000
4	855.11	360.00	7510.00	1.000
5	858.00	360.00	7510.00	1.000
6	860.88	360.00	7510.00	1.000
7	863.77	360.00	7510.00	1.000
8	866.66	360.00	7510.00	1.000
9	869.55	360.00	7510.00	1.000
10	872.44	360.00	7510.00	1.000

REINFORCING LAYER NO. 8
10 POINTS DEFINE THIS LAYER

POINT NO.	X-COORD	Y-COORD	FORCE	INCLINATION FACTOR
1	846.80	361.50	7510.00	1.000
2	849.69	361.50	7510.00	1.000
3	852.58	361.50	7510.00	1.000
4	855.47	361.50	7510.00	1.000
5	858.36	361.50	7510.00	1.000
6	861.24	361.50	7510.00	1.000
7	864.13	361.50	7510.00	1.000
8	867.02	361.50	7510.00	1.000
9	869.91	361.50	7510.00	1.000
10	872.80	361.50	7510.00	1.000

REINFORCING LAYER NO. 9
10 POINTS DEFINE THIS LAYER

POINT NO.	X-COORD	Y-COORD	FORCE	INCLINATION FACTOR
1	847.16	363.00	7510.00	1.000
2	850.05	363.00	7510.00	1.000
3	852.94	363.00	7510.00	1.000
4	855.83	363.00	7510.00	1.000
5	858.72	363.00	7510.00	1.000
6	861.60	363.00	7510.00	1.000
7	864.49	363.00	7510.00	1.000
8	867.38	363.00	7510.00	1.000
9	870.27	363.00	7510.00	1.000
10	873.16	363.00	7510.00	1.000

REINFORCING LAYER NO. 10
10 POINTS DEFINE THIS LAYER

POINT NO.	X-COORD	Y-COORD	FORCE	INCLINATION FACTOR
1	847.52	364.50	7510.00	1.000
2	850.41	364.50	7510.00	1.000
3	853.30	364.50	7510.00	1.000
4	856.19	364.50	7510.00	1.000
5	859.08	364.50	7510.00	1.000
6	861.96	364.50	7510.00	1.000
7	864.85	364.50	7510.00	1.000
8	867.74	364.50	7510.00	1.000
9	870.63	364.50	7510.00	1.000
10	873.52	364.50	7510.00	1.000

REINFORCING LAYER NO. 11
10 POINTS DEFINE THIS LAYER

POINT NO.	X-COORD	Y-COORD	FORCE	INCLINATION FACTOR
1	847.88	366.00	7510.00	1.000
2	850.77	366.00	7510.00	1.000
3	853.66	366.00	7510.00	1.000
4	856.55	366.00	7510.00	1.000
5	859.44	366.00	7510.00	1.000
6	862.32	366.00	7510.00	1.000
7	865.21	366.00	7510.00	1.000
8	868.10	366.00	7510.00	1.000
9	870.99	366.00	7510.00	1.000
10	873.88	366.00	7510.00	1.000

REINFORCING LAYER NO. 12
10 POINTS DEFINE THIS LAYER

POINT NO.	X-COORD	Y-COORD	FORCE	INCLINATION FACTOR
1	848.24	367.50	7510.00	1.000
2	851.13	367.50	7510.00	1.000

3	854.02	367.50	7510.00	1.000
4	856.91	367.50	7510.00	1.000
5	859.80	367.50	7510.00	1.000
6	862.68	367.50	7510.00	1.000
7	865.57	367.50	7510.00	1.000
8	868.46	367.50	7510.00	1.000
9	871.35	367.50	7510.00	1.000
10	874.24	367.50	7510.00	1.000

REINFORCING LAYER NO. 13
10 POINTS DEFINE THIS LAYER

POINT NO.	X-COORD	Y-COORD	FORCE	INCLINATION FACTOR
1	848.60	369.00	7510.00	1.000
2	851.49	369.00	7510.00	1.000
3	854.38	369.00	7510.00	1.000
4	857.27	369.00	7510.00	1.000
5	860.16	369.00	7510.00	1.000
6	863.04	369.00	7510.00	1.000
7	865.93	369.00	7510.00	1.000
8	868.82	369.00	7510.00	1.000
9	871.71	369.00	7510.00	1.000
10	874.60	369.00	7510.00	1.000

REINFORCING LAYER NO. 14
10 POINTS DEFINE THIS LAYER

POINT NO.	X-COORD	Y-COORD	FORCE	INCLINATION FACTOR
1	848.96	370.50	7510.00	1.000
2	851.85	370.50	7510.00	1.000
3	854.74	370.50	7510.00	1.000
4	857.63	370.50	7510.00	1.000
5	860.52	370.50	7510.00	1.000
6	863.40	370.50	7510.00	1.000
7	866.29	370.50	7510.00	1.000
8	869.18	370.50	7510.00	1.000
9	872.07	370.50	7510.00	1.000
10	874.96	370.50	7510.00	1.000

REINFORCING LAYER NO. 15
10 POINTS DEFINE THIS LAYER

POINT NO.	X-COORD	Y-COORD	FORCE	INCLINATION FACTOR
1	850.00	372.00	0.00	1.000
2	852.00	372.00	4055.00	1.000
3	855.14	372.00	4055.00	1.000
4	858.29	372.00	4055.00	1.000
5	861.43	372.00	4055.00	1.000
6	864.57	372.00	4055.00	1.000
7	867.71	372.00	4055.00	1.000
8	870.86	372.00	4055.00	1.000
9	874.00	372.00	4055.00	1.000
10	876.00	372.00	0.00	1.000

REINFORCING LAYER NO. 16
10 POINTS DEFINE THIS LAYER

POINT NO.	X-COORD	Y-COORD	FORCE	INCLINATION FACTOR
1	850.00	373.50	0.00	1.000
2	852.00	373.50	4055.00	1.000
3	855.14	373.50	4055.00	1.000
4	858.29	373.50	4055.00	1.000
5	861.43	373.50	4055.00	1.000
6	864.57	373.50	4055.00	1.000
7	867.71	373.50	4055.00	1.000
8	870.86	373.50	4055.00	1.000
9	874.00	373.50	4055.00	1.000
10	876.00	373.50	0.00	1.000

REINFORCING LAYER NO. 17
10 POINTS DEFINE THIS LAYER

POINT NO.	X-COORD	Y-COORD	FORCE	INCLINATION FACTOR
1	850.04	375.00	0.00	1.000
2	852.04	375.00	4055.00	1.000

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       3       855.18    375.00   4055.00     1.000
       4       858.33    375.00   4055.00     1.000
       5       861.47    375.00   4055.00     1.000
       6       864.61    375.00   4055.00     1.000
       7       867.75    375.00   4055.00     1.000
       8       870.90    375.00   4055.00     1.000
       9       874.04    375.00   4055.00     1.000
      10       876.04    375.00      0.00     1.000
 REINFORCING LAYER NO.  18
  10 POINTS DEFINE THIS LAYER
      POINT     X-COORD   Y-COORD   FORCE   INCLINATION
       NO.                                    FACTOR
       1       850.40    376.50      0.00     1.000
       2       852.40    376.50   4055.00     1.000
       3       855.54    376.50   4055.00     1.000
       4       858.69    376.50   4055.00     1.000
       5       861.83    376.50   4055.00     1.000
       6       864.97    376.50   4055.00     1.000
       7       868.11    376.50   4055.00     1.000
       8       871.26    376.50   4055.00     1.000
       9       874.40    376.50   4055.00     1.000
      10       876.40    376.50      0.00     1.000
 REINFORCING LAYER NO.  19
  10 POINTS DEFINE THIS LAYER
      POINT     X-COORD   Y-COORD   FORCE   INCLINATION
       NO.                                    FACTOR
       1       850.76    378.00      0.00     1.000
       2       852.76    378.00   4055.00     1.000
       3       855.90    378.00   4055.00     1.000
       4       859.05    378.00   4055.00     1.000
       5       862.19    378.00   4055.00     1.000
       6       865.33    378.00   4055.00     1.000
       7       868.47    378.00   4055.00     1.000
       8       871.62    378.00   4055.00     1.000
       9       874.76    378.00   4055.00     1.000
      10       876.76    378.00      0.00     1.000
 A Critical Failure Surface Searching Method, Using A Random
 Technique For Generating Circular Surfaces, Has Been Specified.
11200 Trial Surfaces Have Been Generated.
  200 Surface(s) Initiate(s) From Each Of    56 Points Equally Spaced
 Along The Ground Surface Between  X = 790.00(ft)
                              and  X = 845.00(ft)
 Each Surface Terminates Between   X = 865.00(ft)
                             and   X =1046.00(ft)
 Unless Further Limitations Were Imposed, The Minimum Elevation
 At Which A Surface Extends Is  Y =    270.00(ft)
 10.00(ft) Line Segments Define Each Trial Failure Surface.
 Following Are Displayed The Ten Most Critical Of The Trial
       Failure Surfaces Evaluated. They Are
       Ordered - Most Critical First.
       * * Safety Factors Are Calculated By The Modified Bishop Method * *
       Total Number of Trial Surfaces Attempted =     0
       Number of Trial Surfaces With Valid FS =    0
       Statistical Data On All Valid FS Values:
          FS Max =   0.000   FS Min = 500.000   FS Ave =  NaN
          Standard Deviation =    0.000   Coefficient of Variation =  NaN    %
       Failure Surface Specified By 25 Coordinate Points
         Point      X-Surf      Y-Surf
          No.        (ft)        (ft)
           1        791.000      348.000
           2        798.746      341.676
           3        807.045      336.096
           4        815.824      331.308
           5        825.009      327.353
           6        834.520      324.266
           7        844.277      322.072
           8        854.194      320.791
           9        864.188      320.434
          10        874.172      321.003
          11        884.060      322.494
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12	893.768	324.894
13	903.211	328.182
14	912.310	332.330
15	920.986	337.303
16	929.165	343.058
17	936.775	349.545
18	943.752	356.708
19	950.037	364.487
20	955.574	372.814
21	960.316	381.618
22	964.223	390.823
23	967.261	400.350
24	969.405	410.118
25	969.941	414.449

Circle Center At X = 863.044 ; Y = 428.337 ; and Radius = 107.909

Factor of Safety

*** 1.543 ***

Individual data on the 0 slices

Slice No.	Width (ft)	Weight (lbs)	Water Force Top (lbs)	Water Force Bot (lbs)	Tie Force Norm (lbs)	Tie Force Tan (lbs)	Earthquake Force Hor (lbs)	Earthquake Force Ver (lbs)	Surcharge Load (lbs)

Failure Surface Specified By 23 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	793.000	348.000
2	800.541	341.432
3	808.749	335.720
4	817.527	330.929
5	826.771	327.117
6	836.375	324.328
7	846.223	322.595
8	856.202	321.938
9	866.193	322.365
10	876.078	323.870
11	885.743	326.438
12	895.074	330.036
13	903.959	334.623
14	912.297	340.145
15	919.987	346.537
16	926.940	353.724
17	933.075	361.621
18	938.318	370.136
19	942.609	379.169
20	945.897	388.613
21	948.144	398.357
22	949.322	408.288
23	949.386	414.840

Circle Center At X = 857.264 ; Y = 414.178 ; and Radius = 92.246

Factor of Safety

*** 1.576 ***

Failure Surface Specified By 24 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	790.000	348.000
2	797.547	341.440
3	805.715	335.670
4	814.421	330.750
5	823.577	326.729
6	833.090	323.647
7	842.865	321.536
8	852.802	320.417
9	862.801	320.301
10	872.762	321.189
11	882.583	323.073
12	892.165	325.933
13	901.411	329.741
14	910.229	334.458
15	918.529	340.037
16	926.226	346.420

17	933.244	353.544
18	939.511	361.337
19	944.964	369.719
20	949.548	378.606
21	953.217	387.909
22	955.933	397.533
23	957.670	407.381
24	958.210	414.672

Circle Center At X = 858.933 ; Y = 419.613 ; and Radius = 99.400

Factor of Safety

*** 1.581 ***

Failure Surface Specified By 25 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	790.000	348.000
2	797.425	341.301
3	805.470	335.362
4	814.059	330.240
5	823.108	325.985
6	832.531	322.637
7	842.237	320.228
8	852.132	318.782
9	862.121	318.313
10	872.107	318.826
11	881.996	320.314
12	891.691	322.765
13	901.099	326.154
14	910.130	330.448
15	918.697	335.607
16	926.716	341.581
17	934.112	348.312
18	940.812	355.735
19	946.753	363.780
20	951.876	372.368
21	956.133	381.416
22	959.483	390.838
23	961.893	400.544
24	963.341	410.438
25	963.536	414.571

Circle Center At X = 861.900 ; Y = 420.225 ; and Radius = 101.912

Factor of Safety

*** 1.584 ***

Failure Surface Specified By 23 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	793.000	348.000
2	800.627	341.533
3	808.887	335.895
4	817.688	331.148
5	826.936	327.344
6	836.530	324.524
7	846.366	322.718
8	856.336	321.946
9	866.332	322.217
10	876.246	323.528
11	885.969	325.864
12	895.396	329.201
13	904.425	333.500
14	912.956	338.717
15	920.898	344.794
16	928.163	351.665
17	934.674	359.256
18	940.358	367.483
19	945.155	376.258
20	949.011	385.484
21	951.886	395.062
22	953.747	404.887
23	954.566	414.742

Circle Center At X = 858.739 ; Y = 417.798 ; and Radius = 95.882

Factor of Safety

```
        ***    1.584   ***
Failure Surface Specified By 23 Coordinate Points
  Point      X-Surf      Y-Surf
   No.        (ft)        (ft)
    1        793.000      348.000
    2        800.529      341.418
    3        808.712      335.670
    4        817.457      330.822
    5        826.668      326.926
    6        836.238      324.028
    7        846.062      322.159
    8        856.029      321.342
    9        866.026      321.584
   10        875.941      322.884
   11        885.663      325.226
   12        895.082      328.584
   13        904.093      332.921
   14        912.593      338.188
   15        920.488      344.326
   16        927.689      351.265
   17        934.115      358.927
   18        939.693      367.227
   19        944.360      376.071
   20        948.065      385.359
   21        950.766      394.987
   22        952.432      404.848
   23        953.040      414.771
Circle Center At X =   858.745 ; Y =   415.604 ; and Radius =    94.302
       Factor of Safety
        ***    1.588   ***
Failure Surface Specified By 25 Coordinate Points
  Point      X-Surf      Y-Surf
   No.        (ft)        (ft)
    1        794.000      348.000
    2        801.582      341.480
    3        809.756      335.719
    4        818.446      330.771
    5        827.572      326.682
    6        837.048      323.490
    7        846.788      321.223
    8        856.701      319.905
    9        866.695      319.546
   10        876.676      320.149
   11        886.554      321.710
   12        896.235      324.214
   13        905.631      327.638
   14        914.654      331.949
   15        923.220      337.108
   16        931.250      343.068
   17        938.670      349.772
   18        945.411      357.158
   19        951.410      365.159
   20        956.612      373.700
   21        960.968      382.701
   22        964.438      392.080
   23        966.990      401.749
   24        968.600      411.618
   25        968.786      414.471
Circle Center At X =   865.423 ; Y =   423.383 ; and Radius =   103.845
       Factor of Safety
        ***    1.594   ***
Failure Surface Specified By 24 Coordinate Points
  Point      X-Surf      Y-Surf
   No.        (ft)        (ft)
    1        791.000      348.000
    2        798.500      341.386
    3        806.637      335.572
    4        815.324      330.620
    5        824.472      326.580
    6        833.984      323.496
```

7	843.762	321.398
8	853.703	320.310
9	863.702	320.242
10	873.657	321.196
11	883.462	323.161
12	893.015	326.117
13	902.217	330.032
14	910.970	334.867
15	919.185	340.570
16	926.774	347.082
17	933.659	354.334
18	939.767	362.252
19	945.035	370.752
20	949.407	379.745
21	952.839	389.138
22	955.294	398.832
23	956.746	408.726
24	957.006	414.695

Circle Center At X = 859.338 ; Y = 417.849 ; and Radius = 97.719

Factor of Safety

*** 1.594 ***

Failure Surface Specified By 24 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	792.000	348.000
2	799.567	341.462
3	807.746	335.710
4	816.458	330.799
5	825.615	326.781
6	835.126	323.693
7	844.898	321.567
8	854.832	320.425
9	864.831	320.276
10	874.795	321.123
11	884.626	322.958
12	894.224	325.761
13	903.497	329.506
14	912.350	334.155
15	920.697	339.662
16	928.455	345.973
17	935.546	353.023
18	941.901	360.745
19	947.455	369.061
20	952.154	377.888
21	955.952	387.138
22	958.810	396.721
23	960.700	406.541
24	961.433	414.611

Circle Center At X = 861.305 ; Y = 420.507 ; and Radius = 100.301

Factor of Safety

*** 1.599 ***

Failure Surface Specified By 25 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	793.000	348.000
2	800.509	341.396
3	808.622	335.550
4	817.263	330.517
5	826.351	326.344
6	835.800	323.070
7	845.522	320.727
8	855.424	319.335
9	865.415	318.909
10	875.401	319.452
11	885.286	320.959
12	894.980	323.415
13	904.390	326.799
14	913.428	331.078
15	922.010	336.211
16	930.055	342.151

17	937.486	348.842
18	944.235	356.222
19	950.238	364.219
20	955.439	372.760
21	959.789	381.765
22	963.246	391.148
23	965.779	400.822
24	967.363	410.696
25	967.599	414.493

Circle Center At X = 864.814 ; Y = 422.087 ; and Radius = 103.180

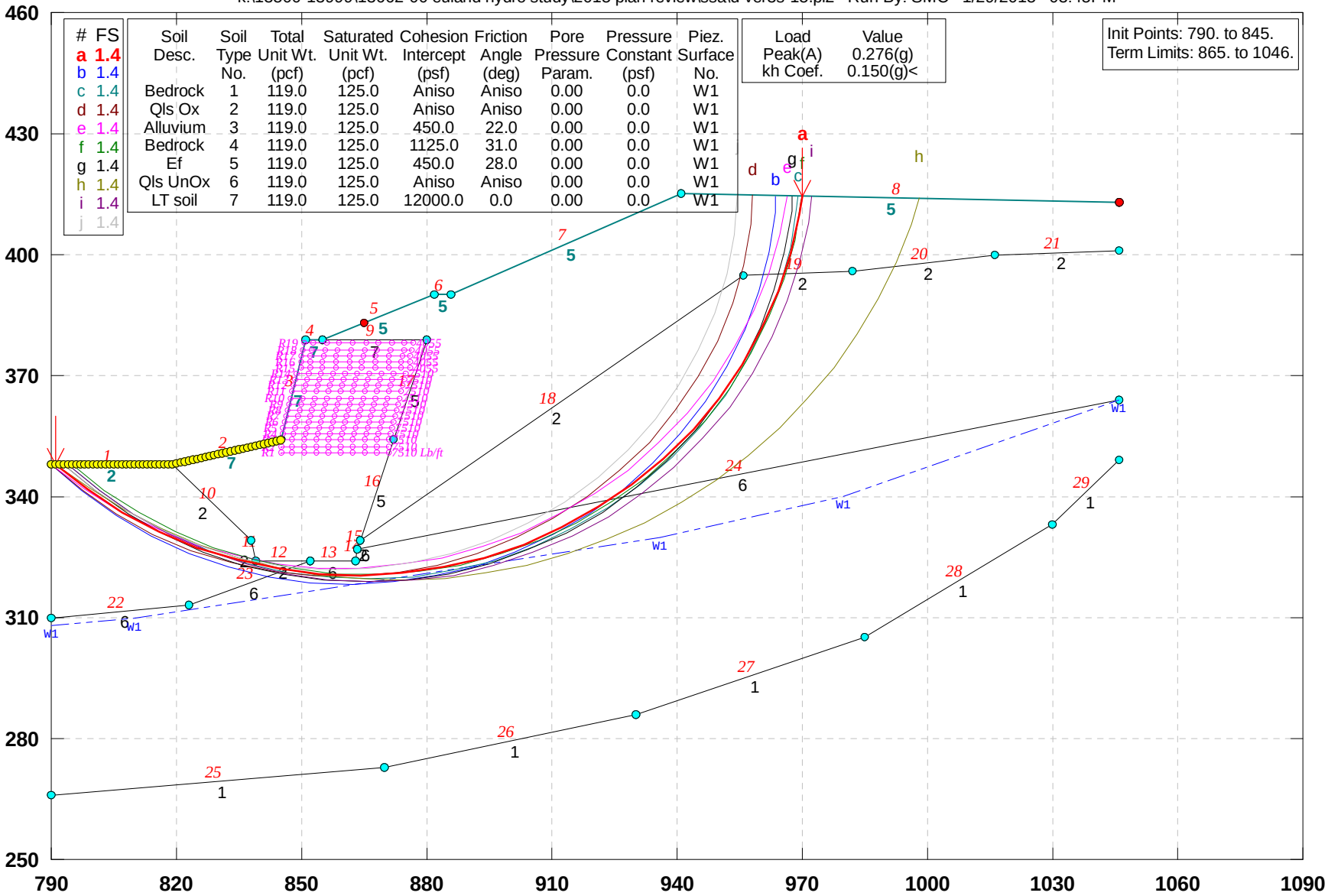
Factor of Safety

*** 1.599 ***

**** END OF GSTABL7 OUTPUT ****

13662-00, Euland, Section D-D', - , seismic, 2015 design, 26' H MSE wall

k:\13500-13999\13662-00 euland hydro study\2015 plan review\ssa\d-ver3s-15.pl2 Run By: SMC 1/29/2015 03:45PM



GSTABL7 v.2 FSmin=1.4

Safety Factors Are Calculated By The Modified Bishop Method

Figure E-13.2

***** GSTABL7 *****

** GSTABL7 by Garry H. Gregory, P.E. **

** Original Version 1.0, January 1996; Current Version 2.005, Sept. 2006 **

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****

SLOPE STABILITY ANALYSIS SYSTEM

Modified Bishop, Simplified Janbu, or GLE Method of Slices.
(Includes Spencer & Morgenstern-Price Type Analysis)
Including Pier/Pile, Reinforcement, Soil Nail, Tieback,
Nonlinear Undrained Shear Strength, Curved Phi Envelope,
Anisotropic Soil, Fiber-Reinforced Soil, Boundary Loads, Water
Surfaces, Pseudo-Static & Newmark Earthquake, and Applied Forces.

****

Analysis Run Date: 1/29/2015
Time of Run: 03:45PM
Run By: SMC
Input Data Filename: K:\13500-13999\13662-00 Euland Hydro Study\2015 Plan Review\SSA\d-ver3s-15.
Output Filename: K:\13500-13999\13662-00 Euland Hydro Study\2015 Plan Review\SSA\d-ver3s-15.OUT
Unit System: English
Plotted Output Filename: K:\13500-13999\13662-00 Euland Hydro Study\2015 Plan Review\SSA\d-ver3s-15.PLT
PROBLEM DESCRIPTION: 13662-00, Euland, Section D-D',
- , seismic, 2015 design, 26' H MSE wall

BOUNDARY COORDINATES
8 Top Boundaries
29 Total Boundaries

Boundary No.	X-Left (ft)	Y-Left (ft)	X-Right (ft)	Y-Right (ft)	Soil Type Below Bnd
1	790.00	348.00	819.00	348.00	2
2	819.00	348.00	845.00	354.00	7
3	845.00	354.00	851.00	379.00	7
4	851.00	379.00	855.00	379.00	7
5	855.00	379.00	882.00	390.00	5
6	882.00	390.00	886.00	390.00	5
7	886.00	390.00	941.00	415.00	5
8	941.00	415.00	1046.00	413.00	5
9	855.00	379.00	880.00	379.00	7
10	819.00	348.00	838.00	329.00	2
11	838.00	329.00	839.00	324.00	2
12	839.00	324.00	852.00	324.00	2
13	852.00	324.00	863.00	324.00	6
14	863.00	324.00	863.50	327.00	6
15	863.50	327.00	864.00	329.00	2
16	864.00	329.00	872.00	354.00	5
17	872.00	354.00	880.00	379.00	5
18	864.00	329.00	956.00	395.00	2
19	956.00	395.00	982.00	396.00	2
20	982.00	396.00	1016.00	400.00	2
21	1016.00	400.00	1046.00	401.00	2
22	790.00	310.00	823.00	313.00	6
23	823.00	313.00	852.00	324.00	6
24	863.50	327.00	1046.00	364.00	6
25	790.00	266.00	870.00	273.00	1
26	870.00	273.00	930.00	286.00	1
27	930.00	286.00	985.00	305.00	1
28	985.00	305.00	1030.00	333.00	1
29	1030.00	333.00	1046.00	349.00	1

User Specified Y-Origin = 250.00(ft)
Default X-Plus Value = 0.00(ft)
Default Y-Plus Value = 0.00(ft)

ISOTROPIC SOIL PARAMETERS
7 Type(s) of Soil

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.
1	119.0	125.0	0.0	0.0	0.00	0.0	1
2	119.0	125.0	0.0	0.0	0.00	0.0	1
3	119.0	125.0	450.0	22.0	0.00	0.0	1

```
   4   119.0    125.0    1125.0     31.0    0.00       0.0      1
   5   119.0    125.0     450.0     28.0    0.00       0.0      1
   6   119.0    125.0       0.0      0.0    0.00       0.0      1
   7   119.0    125.0   12000.0      0.0    0.00       0.0      1
ANISOTROPIC STRENGTH PARAMETERS
     3 soil type(s)
 Soil Type  1 Is Anisotropic
 Number Of Direction Ranges Specified =  3
 Direction    Counterclockwise     Cohesion     Friction
   Range       Direction Limit    Intercept       Angle
    No.            (deg)            (psf)         (deg)
     1              -3.0            1125.00         31.00
     2              10.0             450.00         17.00
     3              90.0            1125.00         31.00
 Soil Type  2 Is Anisotropic
 Number Of Direction Ranges Specified =  3
 Direction    Counterclockwise     Cohesion     Friction
   Range       Direction Limit    Intercept       Angle
    No.            (deg)            (psf)         (deg)
     1              -3.0             525.00         25.00
     2              10.0             375.00         14.50
     3              90.0             450.00         22.00
 Soil Type  6 Is Anisotropic
 Number Of Direction Ranges Specified =  3
 Direction    Counterclockwise     Cohesion     Friction
   Range       Direction Limit    Intercept       Angle
    No.            (deg)            (psf)         (deg)
     1              -3.0             750.00         31.00
     2              10.0             375.00         14.50
     3              90.0             450.00         22.00
 ANISOTROPIC SOIL NOTES:
    (1) An input value of 0.01 for C and/or Phi will cause Aniso
        C and/or Phi to be ignored in that range.
    (2) An input value of 0.02 for Phi will set both Phi and
        C equal to zero, with no water weight in the tension crack.
    (3) An input value of 0.03 for Phi will set both Phi and
        C equal to zero, with water weight in the tension crack.
 1 PIEZOMETRIC SURFACE(S) SPECIFIED
 Unit Weight of Water =  62.40 (pcf)
 Piezometric Surface No.  1 Specified by  5 Coordinate Points
 Pore Pressure Inclination Factor =  0.50
   Point      X-Water     Y-Water
    No.         (ft)        (ft)
     1        790.00      308.00
     2        810.00      310.00
     3        936.00      330.00
     4        980.00      340.00
     5       1046.00      364.00
 Specified Peak Ground Acceleration Coefficient (A) =   0.276(g)
 Specified Horizontal Earthquake Coefficient (kh) =   0.150(g)
 Specified Vertical Earthquake Coefficient (kv) =   0.000(g)
 Specified Seismic Pore-Pressure Factor =   0.000
REINFORCING LAYER(S)
    19 REINFORCING LAYER(S) SPECIFIED
 REINFORCING LAYER NO.   1
  10 POINTS DEFINE THIS LAYER
      POINT     X-COORD   Y-COORD   FORCE   INCLINATION
       NO.                                    FACTOR
        1       845.00    351.00   7510.00     1.000
        2       847.89    351.00   7510.00     1.000
        3       850.78    351.00   7510.00     1.000
        4       853.67    351.00   7510.00     1.000
        5       856.56    351.00   7510.00     1.000
        6       859.44    351.00   7510.00     1.000
        7       862.33    351.00   7510.00     1.000
        8       865.22    351.00   7510.00     1.000
        9       868.11    351.00   7510.00     1.000
       10       871.00    351.00   7510.00     1.000
 REINFORCING LAYER NO.   2
  10 POINTS DEFINE THIS LAYER
```

POINT NO.	X-COORD	Y-COORD	FORCE	INCLINATION FACTOR
1	845.00	352.50	7510.00	1.000
2	847.89	352.50	7510.00	1.000
3	850.78	352.50	7510.00	1.000
4	853.67	352.50	7510.00	1.000
5	856.56	352.50	7510.00	1.000
6	859.44	352.50	7510.00	1.000
7	862.33	352.50	7510.00	1.000
8	865.22	352.50	7510.00	1.000
9	868.11	352.50	7510.00	1.000
10	871.00	352.50	7510.00	1.000

REINFORCING LAYER NO. 3
10 POINTS DEFINE THIS LAYER

POINT NO.	X-COORD	Y-COORD	FORCE	INCLINATION FACTOR
1	845.00	354.00	7510.00	1.000
2	847.89	354.00	7510.00	1.000
3	850.78	354.00	7510.00	1.000
4	853.67	354.00	7510.00	1.000
5	856.56	354.00	7510.00	1.000
6	859.44	354.00	7510.00	1.000
7	862.33	354.00	7510.00	1.000
8	865.22	354.00	7510.00	1.000
9	868.11	354.00	7510.00	1.000
10	871.00	354.00	7510.00	1.000

REINFORCING LAYER NO. 4
10 POINTS DEFINE THIS LAYER

POINT NO.	X-COORD	Y-COORD	FORCE	INCLINATION FACTOR
1	845.36	355.50	7510.00	1.000
2	848.25	355.50	7510.00	1.000
3	851.14	355.50	7510.00	1.000
4	854.03	355.50	7510.00	1.000
5	856.92	355.50	7510.00	1.000
6	859.80	355.50	7510.00	1.000
7	862.69	355.50	7510.00	1.000
8	865.58	355.50	7510.00	1.000
9	868.47	355.50	7510.00	1.000
10	871.36	355.50	7510.00	1.000

REINFORCING LAYER NO. 5
10 POINTS DEFINE THIS LAYER

POINT NO.	X-COORD	Y-COORD	FORCE	INCLINATION FACTOR
1	845.72	357.00	7510.00	1.000
2	848.61	357.00	7510.00	1.000
3	851.50	357.00	7510.00	1.000
4	854.39	357.00	7510.00	1.000
5	857.28	357.00	7510.00	1.000
6	860.16	357.00	7510.00	1.000
7	863.05	357.00	7510.00	1.000
8	865.94	357.00	7510.00	1.000
9	868.83	357.00	7510.00	1.000
10	871.72	357.00	7510.00	1.000

REINFORCING LAYER NO. 6
10 POINTS DEFINE THIS LAYER

POINT NO.	X-COORD	Y-COORD	FORCE	INCLINATION FACTOR
1	846.08	358.50	7510.00	1.000
2	848.97	358.50	7510.00	1.000
3	851.86	358.50	7510.00	1.000
4	854.75	358.50	7510.00	1.000
5	857.64	358.50	7510.00	1.000
6	860.52	358.50	7510.00	1.000
7	863.41	358.50	7510.00	1.000
8	866.30	358.50	7510.00	1.000
9	869.19	358.50	7510.00	1.000
10	872.08	358.50	7510.00	1.000

REINFORCING LAYER NO. 7
10 POINTS DEFINE THIS LAYER

POINT NO.	X-COORD	Y-COORD	FORCE	INCLINATION FACTOR
1	846.44	360.00	7510.00	1.000
2	849.33	360.00	7510.00	1.000
3	852.22	360.00	7510.00	1.000
4	855.11	360.00	7510.00	1.000
5	858.00	360.00	7510.00	1.000
6	860.88	360.00	7510.00	1.000
7	863.77	360.00	7510.00	1.000
8	866.66	360.00	7510.00	1.000
9	869.55	360.00	7510.00	1.000
10	872.44	360.00	7510.00	1.000

REINFORCING LAYER NO. 8
10 POINTS DEFINE THIS LAYER

POINT NO.	X-COORD	Y-COORD	FORCE	INCLINATION FACTOR
1	846.80	361.50	7510.00	1.000
2	849.69	361.50	7510.00	1.000
3	852.58	361.50	7510.00	1.000
4	855.47	361.50	7510.00	1.000
5	858.36	361.50	7510.00	1.000
6	861.24	361.50	7510.00	1.000
7	864.13	361.50	7510.00	1.000
8	867.02	361.50	7510.00	1.000
9	869.91	361.50	7510.00	1.000
10	872.80	361.50	7510.00	1.000

REINFORCING LAYER NO. 9
10 POINTS DEFINE THIS LAYER

POINT NO.	X-COORD	Y-COORD	FORCE	INCLINATION FACTOR
1	847.16	363.00	7510.00	1.000
2	850.05	363.00	7510.00	1.000
3	852.94	363.00	7510.00	1.000
4	855.83	363.00	7510.00	1.000
5	858.72	363.00	7510.00	1.000
6	861.60	363.00	7510.00	1.000
7	864.49	363.00	7510.00	1.000
8	867.38	363.00	7510.00	1.000
9	870.27	363.00	7510.00	1.000
10	873.16	363.00	7510.00	1.000

REINFORCING LAYER NO. 10
10 POINTS DEFINE THIS LAYER

POINT NO.	X-COORD	Y-COORD	FORCE	INCLINATION FACTOR
1	847.52	364.50	7510.00	1.000
2	850.41	364.50	7510.00	1.000
3	853.30	364.50	7510.00	1.000
4	856.19	364.50	7510.00	1.000
5	859.08	364.50	7510.00	1.000
6	861.96	364.50	7510.00	1.000
7	864.85	364.50	7510.00	1.000
8	867.74	364.50	7510.00	1.000
9	870.63	364.50	7510.00	1.000
10	873.52	364.50	7510.00	1.000

REINFORCING LAYER NO. 11
10 POINTS DEFINE THIS LAYER

POINT NO.	X-COORD	Y-COORD	FORCE	INCLINATION FACTOR
1	847.88	366.00	7510.00	1.000
2	850.77	366.00	7510.00	1.000
3	853.66	366.00	7510.00	1.000
4	856.55	366.00	7510.00	1.000
5	859.44	366.00	7510.00	1.000
6	862.32	366.00	7510.00	1.000
7	865.21	366.00	7510.00	1.000
8	868.10	366.00	7510.00	1.000
9	870.99	366.00	7510.00	1.000
10	873.88	366.00	7510.00	1.000

REINFORCING LAYER NO. 12
10 POINTS DEFINE THIS LAYER

POINT NO.	X-COORD	Y-COORD	FORCE	INCLINATION FACTOR
1	848.24	367.50	7510.00	1.000
2	851.13	367.50	7510.00	1.000
3	854.02	367.50	7510.00	1.000
4	856.91	367.50	7510.00	1.000
5	859.80	367.50	7510.00	1.000
6	862.68	367.50	7510.00	1.000
7	865.57	367.50	7510.00	1.000
8	868.46	367.50	7510.00	1.000
9	871.35	367.50	7510.00	1.000
10	874.24	367.50	7510.00	1.000

REINFORCING LAYER NO. 13
10 POINTS DEFINE THIS LAYER

POINT NO.	X-COORD	Y-COORD	FORCE	INCLINATION FACTOR
1	848.60	369.00	7510.00	1.000
2	851.49	369.00	7510.00	1.000
3	854.38	369.00	7510.00	1.000
4	857.27	369.00	7510.00	1.000
5	860.16	369.00	7510.00	1.000
6	863.04	369.00	7510.00	1.000
7	865.93	369.00	7510.00	1.000
8	868.82	369.00	7510.00	1.000
9	871.71	369.00	7510.00	1.000
10	874.60	369.00	7510.00	1.000

REINFORCING LAYER NO. 14
10 POINTS DEFINE THIS LAYER

POINT NO.	X-COORD	Y-COORD	FORCE	INCLINATION FACTOR
1	848.96	370.50	7510.00	1.000
2	851.85	370.50	7510.00	1.000
3	854.74	370.50	7510.00	1.000
4	857.63	370.50	7510.00	1.000
5	860.52	370.50	7510.00	1.000
6	863.40	370.50	7510.00	1.000
7	866.29	370.50	7510.00	1.000
8	869.18	370.50	7510.00	1.000
9	872.07	370.50	7510.00	1.000
10	874.96	370.50	7510.00	1.000

REINFORCING LAYER NO. 15
10 POINTS DEFINE THIS LAYER

POINT NO.	X-COORD	Y-COORD	FORCE	INCLINATION FACTOR
1	850.00	372.00	0.00	1.000
2	852.00	372.00	4055.00	1.000
3	855.14	372.00	4055.00	1.000
4	858.29	372.00	4055.00	1.000
5	861.43	372.00	4055.00	1.000
6	864.57	372.00	4055.00	1.000
7	867.71	372.00	4055.00	1.000
8	870.86	372.00	4055.00	1.000
9	874.00	372.00	4055.00	1.000
10	876.00	372.00	0.00	1.000

REINFORCING LAYER NO. 16
10 POINTS DEFINE THIS LAYER

POINT NO.	X-COORD	Y-COORD	FORCE	INCLINATION FACTOR
1	850.00	373.50	0.00	1.000
2	852.00	373.50	4055.00	1.000
3	855.14	373.50	4055.00	1.000
4	858.29	373.50	4055.00	1.000
5	861.43	373.50	4055.00	1.000
6	864.57	373.50	4055.00	1.000
7	867.71	373.50	4055.00	1.000
8	870.86	373.50	4055.00	1.000
9	874.00	373.50	4055.00	1.000
10	876.00	373.50	0.00	1.000

REINFORCING LAYER NO. 17
10 POINTS DEFINE THIS LAYER

POINT NO.	X-COORD	Y-COORD	FORCE	INCLINATION FACTOR
1	850.04	375.00	0.00	1.000
2	852.04	375.00	4055.00	1.000
3	855.18	375.00	4055.00	1.000
4	858.33	375.00	4055.00	1.000
5	861.47	375.00	4055.00	1.000
6	864.61	375.00	4055.00	1.000
7	867.75	375.00	4055.00	1.000
8	870.90	375.00	4055.00	1.000
9	874.04	375.00	4055.00	1.000
10	876.04	375.00	0.00	1.000

REINFORCING LAYER NO. 18
10 POINTS DEFINE THIS LAYER

POINT NO.	X-COORD	Y-COORD	FORCE	INCLINATION FACTOR
1	850.40	376.50	0.00	1.000
2	852.40	376.50	4055.00	1.000
3	855.54	376.50	4055.00	1.000
4	858.69	376.50	4055.00	1.000
5	861.83	376.50	4055.00	1.000
6	864.97	376.50	4055.00	1.000
7	868.11	376.50	4055.00	1.000
8	871.26	376.50	4055.00	1.000
9	874.40	376.50	4055.00	1.000
10	876.40	376.50	0.00	1.000

REINFORCING LAYER NO. 19
10 POINTS DEFINE THIS LAYER

POINT NO.	X-COORD	Y-COORD	FORCE	INCLINATION FACTOR
1	850.76	378.00	0.00	1.000
2	852.76	378.00	4055.00	1.000
3	855.90	378.00	4055.00	1.000
4	859.05	378.00	4055.00	1.000
5	862.19	378.00	4055.00	1.000
6	865.33	378.00	4055.00	1.000
7	868.47	378.00	4055.00	1.000
8	871.62	378.00	4055.00	1.000
9	874.76	378.00	4055.00	1.000
10	876.76	378.00	0.00	1.000

A Critical Failure Surface Searching Method, Using A Random
Technique For Generating Circular Surfaces, Has Been Specified.
11200 Trial Surfaces Have Been Generated.
200 Surface(s) Initiate(s) From Each Of 56 Points Equally Spaced
Along The Ground Surface Between X = 790.00(ft)
and X = 845.00(ft)
Each Surface Terminates Between X = 865.00(ft)
and X =1046.00(ft)
Unless Further Limitations Were Imposed, The Minimum Elevation
At Which A Surface Extends Is Y = 270.00(ft)
10.00(ft) Line Segments Define Each Trial Failure Surface.
Following Are Displayed The Ten Most Critical Of The Trial
Failure Surfaces Evaluated. They Are
Ordered - Most Critical First.
* * Safety Factors Are Calculated By The Modified Bishop Method * *
Total Number of Trial Surfaces Attempted = 0
Number of Trial Surfaces With Valid FS = 0
Statistical Data On All Valid FS Values:
FS Max = 0.000 FS Min = 500.000 FS Ave = NaN
Standard Deviation = 0.000 Coefficient of Variation = NaN %
Failure Surface Specified By 25 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	791.000	348.000
2	798.746	341.676
3	807.045	336.096
4	815.824	331.308
5	825.009	327.353
6	834.520	324.266
7	844.277	322.072

8	854.194	320.791
9	864.188	320.434
10	874.172	321.003
11	884.060	322.494
12	893.768	324.894
13	903.211	328.182
14	912.310	332.330
15	920.986	337.303
16	929.165	343.058
17	936.775	349.545
18	943.752	356.708
19	950.037	364.487
20	955.574	372.814
21	960.316	381.618
22	964.223	390.823
23	967.261	400.350
24	969.405	410.118
25	969.941	414.449

Circle Center At X = 863.044 ; Y = 428.337 ; and Radius = 107.909

Factor of Safety

*** 1.357 ***

Individual data on the 0 slices

Slice No.	Width (ft)	Weight (lbs)	Water Force Top (lbs)	Water Force Bot (lbs)	Tie Force Norm (lbs)	Tie Force Tan (lbs)	Earthquake Force Hor (lbs)	Earthquake Force Ver (lbs)	Surcharge Load (lbs)

Failure Surface Specified By 25 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	790.000	348.000
2	797.425	341.301
3	805.470	335.362
4	814.059	330.240
5	823.108	325.985
6	832.531	322.637
7	842.237	320.228
8	852.132	318.782
9	862.121	318.313
10	872.107	318.826
11	881.996	320.314
12	891.691	322.765
13	901.099	326.154
14	910.130	330.448
15	918.697	335.607
16	926.716	341.581
17	934.112	348.312
18	940.812	355.735
19	946.753	363.780
20	951.876	372.368
21	956.133	381.416
22	959.483	390.838
23	961.893	400.544
24	963.341	410.438
25	963.536	414.571

Circle Center At X = 861.900 ; Y = 420.225 ; and Radius = 101.912

Factor of Safety

*** 1.404 ***

Failure Surface Specified By 25 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	794.000	348.000
2	801.582	341.480
3	809.756	335.719
4	818.446	330.771
5	827.572	326.682
6	837.048	323.490
7	846.788	321.223
8	856.701	319.905
9	866.695	319.546
10	876.676	320.149

11	886.554	321.710
12	896.235	324.214
13	905.631	327.638
14	914.654	331.949
15	923.220	337.108
16	931.250	343.068
17	938.670	349.772
18	945.411	357.158
19	951.410	365.159
20	956.612	373.700
21	960.968	382.701
22	964.438	392.080
23	966.990	401.749
24	968.600	411.618
25	968.786	414.471

Circle Center At X = 865.423 ; Y = 423.383 ; and Radius = 103.845

Factor of Safety

*** 1.405 ***

Failure Surface Specified By 24 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	790.000	348.000
2	797.547	341.440
3	805.715	335.670
4	814.421	330.750
5	823.577	326.729
6	833.090	323.647
7	842.865	321.536
8	852.802	320.417
9	862.801	320.301
10	872.762	321.189
11	882.583	323.073
12	892.165	325.933
13	901.411	329.741
14	910.229	334.458
15	918.529	340.037
16	926.226	346.420
17	933.244	353.544
18	939.511	361.337
19	944.964	369.719
20	949.548	378.606
21	953.217	387.909
22	955.933	397.533
23	957.670	407.381
24	958.210	414.672

Circle Center At X = 858.933 ; Y = 419.613 ; and Radius = 99.400

Factor of Safety

*** 1.407 ***

Failure Surface Specified By 24 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	790.000	348.000
2	797.901	341.871
3	806.337	336.501
4	815.235	331.937
5	824.518	328.217
6	834.105	325.375
7	843.915	323.434
8	853.862	322.411
9	863.862	322.315
10	873.827	323.147
11	883.672	324.900
12	893.313	327.558
13	902.665	331.099
14	911.648	335.492
15	920.185	340.699
16	928.203	346.676
17	935.632	353.370
18	942.407	360.725
19	948.472	368.676

20	953.773	377.156
21	958.264	386.090
22	961.908	395.403
23	964.672	405.013
24	966.471	414.515

Circle Center At X = 859.890 ; Y = 429.931 ; and Radius = 107.691

Factor of Safety

*** 1.408 ***

Failure Surface Specified By 25 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	795.000	348.000
2	802.711	341.633
3	810.994	336.029
4	819.772	331.239
5	828.966	327.306
6	838.492	324.266
7	848.265	322.146
8	858.195	320.965
9	868.193	320.736
10	878.166	321.458
11	888.026	323.127
12	897.682	325.726
13	907.048	329.232
14	916.036	333.614
15	924.568	338.832
16	932.563	344.837
17	939.951	351.576
18	946.664	358.988
19	952.642	367.005
20	957.829	375.555
21	962.179	384.559
22	965.652	393.936
23	968.217	403.602
24	969.851	413.467
25	969.919	414.449

Circle Center At X = 865.604 ; Y = 425.662 ; and Radius = 104.958

Factor of Safety

*** 1.409 ***

Failure Surface Specified By 25 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	793.000	348.000
2	800.509	341.396
3	808.622	335.550
4	817.263	330.517
5	826.351	326.344
6	835.800	323.070
7	845.522	320.727
8	855.424	319.335
9	865.415	318.909
10	875.401	319.452
11	885.286	320.959
12	894.980	323.415
13	904.390	326.799
14	913.428	331.078
15	922.010	336.211
16	930.055	342.151
17	937.486	348.842
18	944.235	356.222
19	950.238	364.219
20	955.439	372.760
21	959.789	381.765
22	963.246	391.148
23	965.779	400.822
24	967.363	410.696
25	967.599	414.493

Circle Center At X = 864.814 ; Y = 422.087 ; and Radius = 103.180

Factor of Safety

*** 1.411 ***

Failure Surface Specified By 27 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	791.000	348.000
2	799.030	342.040
3	807.493	336.713
4	816.339	332.050
5	825.517	328.079
6	834.972	324.824
7	844.649	322.302
8	854.491	320.530
9	864.440	319.517
10	874.436	319.270
11	884.423	319.790
12	894.340	321.074
13	904.130	323.115
14	913.734	325.899
15	923.097	329.412
16	932.163	333.632
17	940.879	338.535
18	949.193	344.091
19	957.057	350.268
20	964.425	357.030
21	971.252	364.336
22	977.499	372.145
23	983.130	380.409
24	988.110	389.081
25	992.411	398.108
26	996.007	407.439
27	997.948	413.915

Circle Center At X = 872.656 ; Y = 449.623 ; and Radius = 130.365

Factor of Safety

*** 1.415 ***

Failure Surface Specified By 25 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	794.000	348.000
2	801.560	341.455
3	809.704	335.652
4	818.360	330.643
5	827.449	326.473
6	836.891	323.180
7	846.602	320.792
8	856.494	319.331
9	866.481	318.810
10	876.472	319.234
11	886.378	320.598
12	896.112	322.891
13	905.586	326.092
14	914.715	330.173
15	923.419	335.097
16	931.619	340.820
17	939.243	347.291
18	946.222	354.453
19	952.495	362.241
20	958.004	370.587
21	962.702	379.415
22	966.545	388.646
23	969.501	398.200
24	971.541	407.989
25	972.257	414.405

Circle Center At X = 866.998 ; Y = 424.676 ; and Radius = 105.867

Factor of Safety

*** 1.415 ***

Failure Surface Specified By 23 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	793.000	348.000
2	800.627	341.533
3	808.887	335.895

4	817.688	331.148
5	826.936	327.344
6	836.530	324.524
7	846.366	322.718
8	856.336	321.946
9	866.332	322.217
10	876.246	323.528
11	885.969	325.864
12	895.396	329.201
13	904.425	333.500
14	912.956	338.717
15	920.898	344.794
16	928.163	351.665
17	934.674	359.256
18	940.358	367.483
19	945.155	376.258
20	949.011	385.484
21	951.886	395.062
22	953.747	404.887
23	954.566	414.742

Circle Center At X = 858.739 ; Y = 417.798 ; and Radius = 95.882

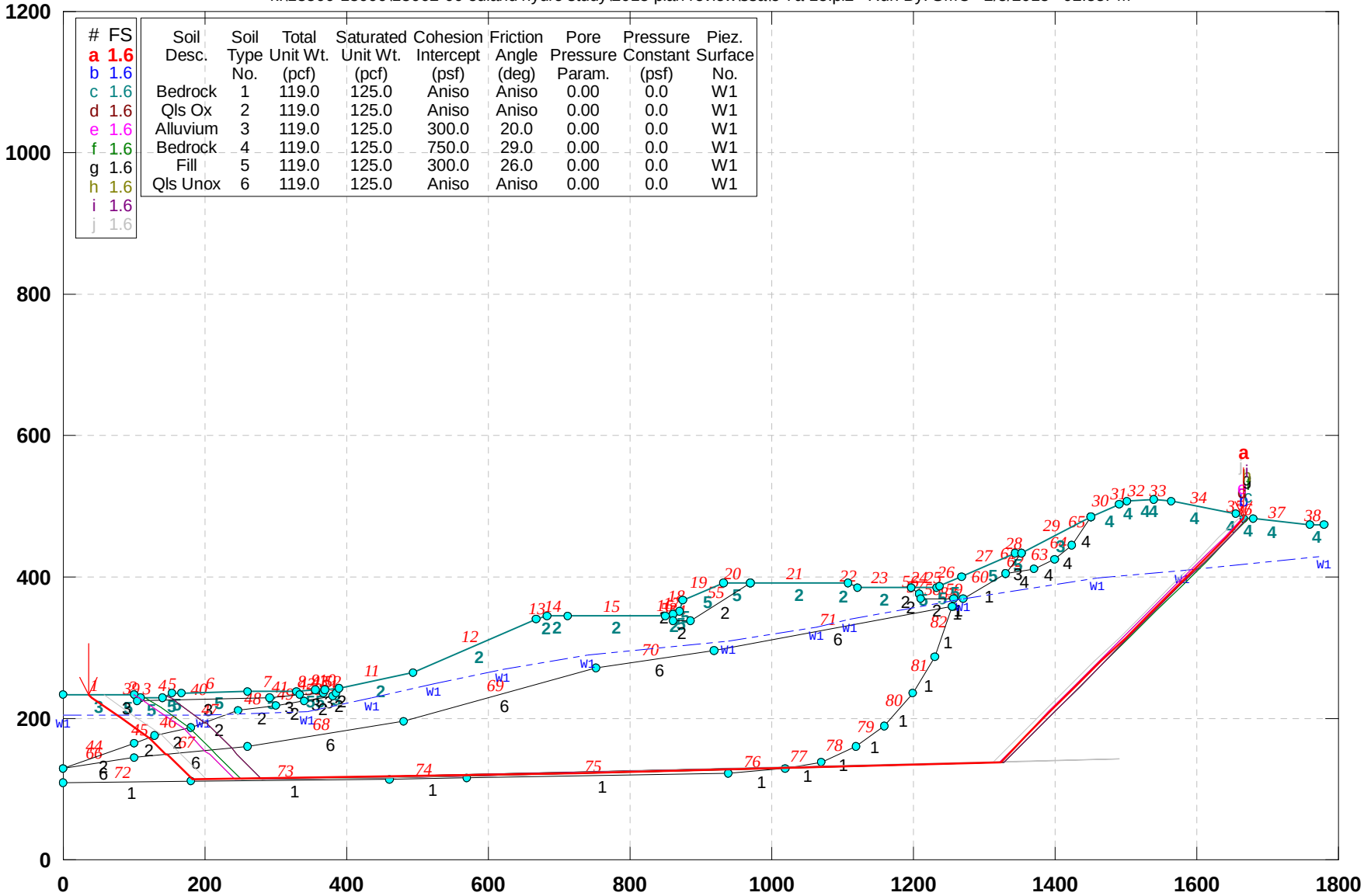
Factor of Safety

*** 1.416 ***

**** END OF GSTABL7 OUTPUT ****

13662-00, Euland, Section E-E', Static

k:\13500-13999\13662-00 euland hydro study\2015 plan review\ssa\e-7a-15.pl2 Run By: SMC 2/5/2015 02:55PM



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.
Bedrock	1	119.0	125.0	Aniso	Aniso	0.00	0.0	W1
Qls Ox	2	119.0	125.0	Aniso	Aniso	0.00	0.0	W1
Alluvium	3	119.0	125.0	300.0	20.0	0.00	0.0	W1
Bedrock	4	119.0	125.0	750.0	29.0	0.00	0.0	W1
Fill	5	119.0	125.0	300.0	26.0	0.00	0.0	W1
Qls Unox	6	119.0	125.0	Aniso	Aniso	0.00	0.0	W1

GSTABL7 v.2 FSmin=1.6

Safety Factors Are Calculated By GLE (Spencer`s) Method (0-2)

Figure E-14.1

13662-00, Euland, Section E-E', Static

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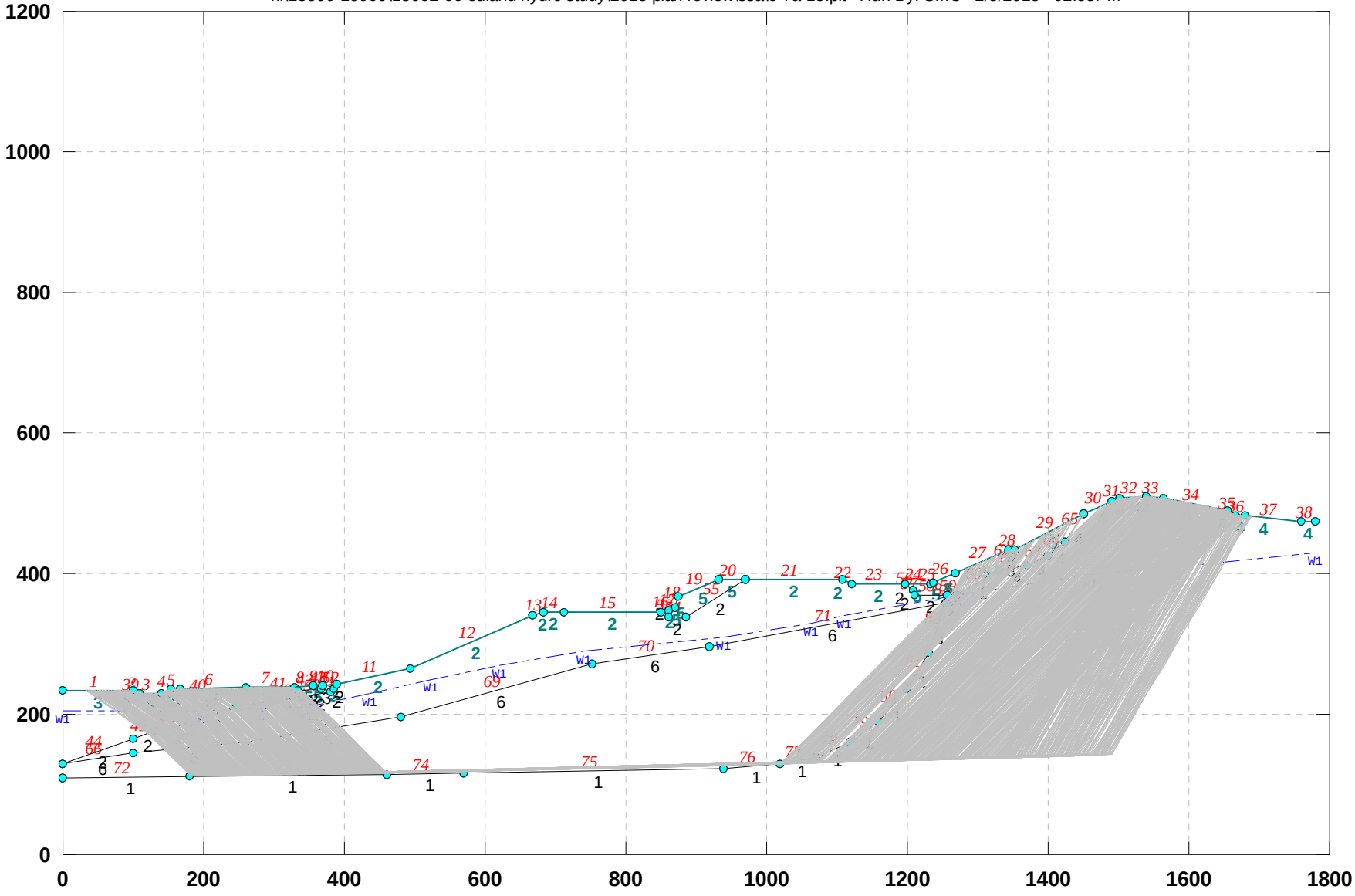

***** GSTABL7 *****

** GSTABL7 by Garry H. Gregory, P.E. **

** Original Version 1.0, January 1996; Current Version 2.005, Sept. 2006 **

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SLOPE STABILITY ANALYSIS SYSTEM

Modified Bishop, Simplified Janbu, or GLE Method of Slices.
(Includes Spencer & Morgenstern-Price Type Analysis)
Including Pier/Pile, Reinforcement, Soil Nail, Tieback,
Nonlinear Undrained Shear Strength, Curved Phi Envelope,
Anisotropic Soil, Fiber-Reinforced Soil, Boundary Loads, Water
Surfaces, Pseudo-Static & Newmark Earthquake, and Applied Forces.

****

Analysis Run Date: 2/5/2015
Time of Run: 02:55PM
Run By: SMC
Input Data Filename: K:\13500-13999\13662-00 Euland Hydro Study\2015 Plan Review\SSA\e-7a-15.
Output Filename: K:\13500-13999\13662-00 Euland Hydro Study\2015 Plan Review\SSA\e-7a-15.OUT
Unit System: English
Plotted Output Filename: K:\13500-13999\13662-00 Euland Hydro Study\2015 Plan Review\SSA\e-7a-15.PLT
PROBLEM DESCRIPTION: 13662-00, Euland, Section E-E',
Static

BOUNDARY COORDINATES
38 Top Boundaries
83 Total Boundaries

Boundary No.	X-Left (ft)	Y-Left (ft)	X-Right (ft)	Y-Right (ft)	Soil Type Below Bnd
1	0.00	233.00	100.00	233.00	3
2	100.00	233.00	110.00	230.00	5
3	110.00	230.00	140.00	230.00	5
4	140.00	230.00	153.00	235.00	5
5	153.00	235.00	166.00	235.00	5
6	166.00	235.00	260.00	237.00	5
7	260.00	237.00	330.00	239.00	5
8	330.00	239.00	355.00	240.00	5
9	355.00	240.00	370.00	240.00	5
10	370.00	240.00	390.00	243.00	3
11	390.00	243.00	495.00	265.00	2
12	495.00	265.00	667.00	340.00	2
13	667.00	340.00	682.00	345.00	2
14	682.00	345.00	712.00	345.00	2
15	712.00	345.00	850.00	345.00	2
16	850.00	345.00	860.00	346.00	2
17	860.00	346.00	871.00	352.00	5
18	871.00	352.00	875.00	367.00	5
19	875.00	367.00	933.00	391.00	5
20	933.00	391.00	970.00	391.00	5
21	970.00	391.00	1107.00	391.00	2
22	1107.00	391.00	1122.00	384.00	2
23	1122.00	384.00	1197.00	384.00	2
24	1197.00	384.00	1233.00	384.00	5
25	1233.00	384.00	1236.00	387.00	5
26	1236.00	387.00	1268.00	400.00	5
27	1268.00	400.00	1343.00	433.00	5
28	1343.00	433.00	1353.00	433.00	5
29	1353.00	433.00	1450.00	485.00	3
30	1450.00	485.00	1490.00	502.00	4
31	1490.00	502.00	1502.00	507.00	4
32	1502.00	507.00	1540.00	510.00	4
33	1540.00	510.00	1565.00	507.00	4
34	1565.00	507.00	1656.00	490.00	4
35	1656.00	490.00	1666.00	482.00	4
36	1666.00	482.00	1680.00	482.00	4
37	1680.00	482.00	1760.00	473.00	4
38	1760.00	473.00	1780.00	473.00	4
39	100.00	233.00	105.00	225.00	3

40	105.00	225.00	292.00	230.00	3
41	292.00	230.00	333.00	233.00	3
42	333.00	233.00	368.00	235.00	3
43	368.00	235.00	370.00	240.00	3
44	0.00	128.00	100.00	164.00	2
45	100.00	164.00	130.00	175.00	2
46	130.00	175.00	180.00	187.00	2
47	180.00	187.00	248.00	212.00	2
48	248.00	212.00	300.00	219.00	2
49	300.00	219.00	340.00	224.00	2
50	340.00	224.00	380.00	231.00	2
51	380.00	231.00	385.00	235.00	2
52	385.00	235.00	390.00	243.00	2
53	860.00	346.00	861.00	338.00	2
54	861.00	338.00	885.00	338.00	2
55	885.00	338.00	970.00	391.00	2
56	1197.00	384.00	1209.00	375.00	2
57	1209.00	375.00	1210.00	370.00	2
58	1210.00	370.00	1257.00	370.00	2
59	1257.00	370.00	1270.00	370.00	1
60	1270.00	370.00	1330.00	406.00	1
61	1330.00	406.00	1353.00	433.00	3
62	1330.00	406.00	1370.00	412.00	4
63	1370.00	412.00	1400.00	425.00	4
64	1400.00	425.00	1425.00	445.00	4
65	1425.00	445.00	1450.00	485.00	4
66	0.00	128.00	100.00	145.00	6
67	100.00	145.00	260.00	160.00	6
68	260.00	160.00	480.00	195.00	6
69	480.00	195.00	752.00	272.00	6
70	752.00	272.00	920.00	295.00	6
71	920.00	295.00	1255.00	358.00	6
72	0.00	109.00	180.00	111.00	1
73	180.00	111.00	460.00	114.50	1
74	460.00	114.50	570.00	116.00	1
75	570.00	116.00	940.00	123.00	1
76	940.00	123.00	1020.00	128.00	1
77	1020.00	128.00	1070.00	138.00	1
78	1070.00	138.00	1120.00	161.00	1
79	1120.00	161.00	1160.00	190.00	1
80	1160.00	190.00	1200.00	236.00	1
81	1200.00	236.00	1230.00	288.00	1
82	1230.00	288.00	1255.00	358.00	1
83	1255.00	358.00	1257.00	370.00	1

Default Y-Origin = 0.00(ft)
Default X-Plus Value = 0.00(ft)
Default Y-Plus Value = 0.00(ft)

ISOTROPIC SOIL PARAMETERS
6 Type(s) of Soil

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.
1	119.0	125.0	0.0	0.0	0.00	0.0	1
2	119.0	125.0	0.0	0.0	0.00	0.0	1
3	119.0	125.0	300.0	20.0	0.00	0.0	1
4	119.0	125.0	750.0	29.0	0.00	0.0	1
5	119.0	125.0	300.0	26.0	0.00	0.0	1
6	119.0	125.0	0.0	0.0	0.00	0.0	1

ANISOTROPIC STRENGTH PARAMETERS
3 soil type(s)

Soil Type 1 Is Anisotropic
Number Of Direction Ranges Specified = 3

Direction Range No.	Counterclockwise Direction Limit (deg)	Cohesion Intercept (psf)	Friction Angle (deg)
1	0.0	750.00	29.00
2	5.0	300.00	15.00
3	90.0	750.00	29.00

Soil Type 2 Is Anisotropic
Number Of Direction Ranges Specified = 3

Direction Range No.	Counterclockwise Direction Limit (deg)	Cohesion Intercept (psf)	Friction Angle (deg)
1	0.0	350.00	23.00
2	10.0	250.00	12.50
3	90.0	300.00	20.00

Soil Type 6 Is Anisotropic
Number Of Direction Ranges Specified = 3

Direction Range No.	Counterclockwise Direction Limit (deg)	Cohesion Intercept (psf)	Friction Angle (deg)
1	0.0	500.00	29.00
2	10.0	250.00	12.50
3	90.0	300.00	20.00

ANISOTROPIC SOIL NOTES:
(1) An input value of 0.01 for C and/or Phi will cause Aniso C and/or Phi to be ignored in that range.
(2) An input value of 0.02 for Phi will set both Phi and C equal to zero, with no water weight in the tension crack.
(3) An input value of 0.03 for Phi will set both Phi and C equal to zero, with water weight in the tension crack.

1 PIEZOMETRIC SURFACE(S) SPECIFIED
Unit Weight of Water = 62.40 (pcf)
Piezometric Surface No. 1 Specified by 14 Coordinate Points
Pore Pressure Inclination Factor = 0.50

Point No.	X-Water (ft)	Y-Water (ft)
1	0.00	204.00
2	198.00	205.00
3	345.00	210.00
4	436.00	230.00
5	523.00	250.00
6	621.00	270.00
7	742.00	290.00
8	940.00	310.00
9	1063.00	330.00
10	1110.00	340.00
11	1270.00	370.00
12	1460.00	398.00
13	1580.00	410.00
14	1780.00	430.00

Janbus Empirical Coef is being used for the case of c & phi both > 0
A Critical Failure Surface Searching Method, Using A Random Technique For Generating Sliding Block Surfaces, Has Been Specified.
The Active And Passive Portions Of The Sliding Surfaces Are Generated According To The Rankine Theory.
1000 Trial Surfaces Have Been Generated.
4 Boxes Specified For Generation Of Central Block Base Length Of Line Segments For Active And Passive Portions Of Sliding Block Is 50.0

Box No.	X-Left (ft)	Y-Left (ft)	X-Right (ft)	Y-Right (ft)	Height (ft)
1	180.00	113.00	460.00	116.50	1.00
2	460.10	116.50	460.10	116.50	1.00
3	550.00	119.00	1020.00	130.00	1.00
4	1020.10	130.00	1490.00	143.00	1.00

Following Are Displayed The Ten Most Critical Of The Trial Failure Surfaces Evaluated. They Are Ordered - Most Critical First.
* * Safety Factors Are Calculated By GLE (Spencer`s) Method (0-2) * *
Selected ki function = Bi-linear
Selected Lambda Coefficient = 1.00
Forces from Reinforcement, Piers/Piles, Soil Nails, and Applied Forces (if applicable) have been applied to the slice base(s) on which they intersect.
Specified Tension Crack Water Force Factor = 0.000
Total Number of Trial Surfaces Attempted = 1000
Number of Trial Surfaces With Valid FS = 1000
Statistical Data On All Valid FS Values:

FS Max = 1.972 FS Min = 1.590 FS Ave = 1.529
Standard Deviation = 0.226 Coefficient of Variation = 14.80 %
((Simplified Janbu FS for Critical Surface = 1.486))

Failure Surface Specified By 20 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	35.697	233.000
2	40.556	229.597
3	81.514	200.918
4	122.471	172.240
5	145.450	149.261
6	146.063	148.648
7	181.418	113.293
8	460.100	116.897
9	722.664	123.370
10	1322.822	138.037
11	1358.177	173.392
12	1393.532	208.748
13	1428.888	244.103
14	1464.243	279.458
15	1499.599	314.814
16	1534.954	350.169
17	1570.309	385.524
18	1605.665	420.880
19	1641.020	456.235
20	1666.785	482.000

*** FOS = 1.590 Theta (ki=1.0) = 7.38 ***
Lambda = 0.129

Individual data on the 100 slices

Slice No.	Width (ft)	Weight (lbs)	Water Force Top (lbs)	Water Force Bot (lbs)	Tie Force Norm (lbs)	Tie Force Tan (lbs)	Earthquake Force Hor (lbs)	Earthquake Force Ver (lbs)	Surcharge Load (lbs)
1	4.9	983.9	0.0	0.0	0.	0.	0.0	0.0	0.0
2	36.0	68586.9	0.0	0.0	0.	0.	0.0	0.0	0.0
3	5.0	17939.8	0.0	659.0	0.	0.	0.0	0.0	0.0
4	18.5	85922.8	0.0	14098.9	0.	0.	0.0	0.0	0.0
5	5.0	27934.4	0.0	6967.7	0.	0.	0.0	0.0	0.0
6	5.0	29230.8	0.0	8310.8	0.	0.	0.0	0.0	0.0
7	12.5	81336.4	0.0	26582.7	0.	0.	0.0	0.0	0.0
8	7.5	56753.0	0.0	24024.8	0.	0.	0.0	0.0	0.0
9	10.0	86342.1	0.0	39684.8	0.	0.	0.0	0.0	0.0
10	5.5	53001.0	0.0	25362.7	0.	0.	0.0	0.0	0.0
11	0.6	6279.1	0.0	3017.7	0.	0.	0.0	0.0	0.0
12	6.9	75524.1	0.0	36469.3	0.	0.	0.0	0.0	0.0
13	13.0	159801.8	0.0	79838.5	0.	0.	0.0	0.0	0.0
14	14.0	195973.1	0.0	*******	0.	0.	0.0	0.0	0.0
15	1.4	21250.6	0.0	11379.6	0.	0.	0.0	0.0	0.0
16	16.6	250046.3	0.0	94741.0	0.	0.	0.0	0.0	0.0
17	34.1	515375.6	0.0	*******	0.	0.	0.0	0.0	0.0
18	15.9	240389.3	0.0	91515.7	0.	0.	0.0	0.0	0.0
19	12.0	181799.8	0.0	69359.5	0.	0.	0.0	0.0	0.0
20	32.0	486031.8	0.0	*******	0.	0.	0.0	0.0	0.0
21	8.0	121825.9	0.0	46681.4	0.	0.	0.0	0.0	0.0
22	30.0	457979.8	0.0	*******	0.	0.	0.0	0.0	0.0
23	3.0	45902.5	0.0	17645.5	0.	0.	0.0	0.0	0.0
24	7.0	107222.9	0.0	41218.9	0.	0.	0.0	0.0	0.0
25	5.0	76688.2	0.0	29481.5	0.	0.	0.0	0.0	0.0
26	10.0	153554.2	0.0	58300.6	0.	0.	0.0	0.0	0.0
27	13.0	199881.0	0.0	77676.0	0.	0.	0.0	0.0	0.0
28	2.0	30746.0	0.0	12139.3	0.	0.	0.0	0.0	0.0
29	10.0	154603.0	0.0	61453.3	0.	0.	0.0	0.0	0.0
30	5.0	77958.6	0.0	31199.5	0.	0.	0.0	0.0	0.0
31	5.0	78396.7	0.0	31514.8	0.	0.	0.0	0.0	0.0
32	46.0	749298.5	0.0	*******	0.	0.	0.0	0.0	0.0
33	24.1	413335.3	0.0	*******	0.	0.	0.0	0.0	0.0
34	19.9	351809.4	0.0	*******	0.	0.	0.0	0.0	0.0
35	15.0	271255.8	0.0	*******	0.	0.	0.0	0.0	0.0
36	28.0	530877.7	0.0	*******	0.	0.	0.0	0.0	0.0
37	98.0	2167436.0	0.0	*******	0.	0.	0.0	0.0	0.0

38	46.0	1183045.1	0.0	*******	0.	0.	0.0	0.0	0.0
39	15.0	407178.9	0.0	*******	0.	0.	0.0	0.0	0.0
40	30.0	821864.9	0.0	*******	0.	0.	0.0	0.0	0.0
41	10.7	291695.1	0.0	*******	0.	0.	0.0	0.0	0.0
42	19.3	528284.0	0.0	*******	0.	0.	0.0	0.0	0.0
43	10.0	272974.4	0.0	*******	0.	0.	0.0	0.0	0.0
44	98.0	2662177.5	0.0	*******	0.	0.	0.0	0.0	0.0
45	10.0	270922.1	0.0	*******	0.	0.	0.0	0.0	0.0
46	1.0	27170.7	0.0	10882.5	0.	0.	0.0	0.0	0.0
47	10.0	275142.1	0.0	*******	0.	0.	0.0	0.0	0.0
48	4.0	114856.4	0.0	43767.7	0.	0.	0.0	0.0	0.0
49	10.0	298356.4	0.0	*******	0.	0.	0.0	0.0	0.0
50	35.0	1081094.6	0.0	*******	0.	0.	0.0	0.0	0.0
51	13.0	416148.0	0.0	*******	0.	0.	0.0	0.0	0.0
52	7.0	226148.6	0.0	78707.1	0.	0.	0.0	0.0	0.0
53	30.0	967754.9	0.0	*******	0.	0.	0.0	0.0	0.0
54	65.0	2090870.5	0.0	*******	0.	0.	0.0	0.0	0.0
55	28.0	897216.1	0.0	*******	0.	0.	0.0	0.0	0.0
56	7.0	224112.2	0.0	85054.4	0.	0.	0.0	0.0	0.0
57	37.0	1183125.6	0.0	*******	0.	0.	0.0	0.0	0.0
58	3.0	95571.0	0.0	37900.9	0.	0.	0.0	0.0	0.0
59	10.0	314894.2	0.0	*******	0.	0.	0.0	0.0	0.0
60	2.0	62289.1	0.0	25642.8	0.	0.	0.0	0.0	0.0
61	38.0	1179902.9	0.0	*******	0.	0.	0.0	0.0	0.0
62	37.0	1146152.0	0.0	*******	0.	0.	0.0	0.0	0.0
63	3.0	92814.5	0.0	40790.4	0.	0.	0.0	0.0	0.0
64	9.0	278338.2	0.0	*******	0.	0.	0.0	0.0	0.0
65	1.0	30916.7	0.0	13706.8	0.	0.	0.0	0.0	0.0
66	20.0	617926.0	0.0	*******	0.	0.	0.0	0.0	0.0
67	3.0	92621.8	0.0	41780.9	0.	0.	0.0	0.0	0.0
68	3.0	93139.7	0.0	41870.9	0.	0.	0.0	0.0	0.0
69	19.0	601595.7	0.0	*******	0.	0.	0.0	0.0	0.0
70	1.6	50803.9	0.0	22398.3	0.	0.	0.0	0.0	0.0
71	0.4	13496.3	0.0	5945.8	0.	0.	0.0	0.0	0.0
72	11.0	356968.5	0.0	*******	0.	0.	0.0	0.0	0.0
73	2.0	65514.6	0.0	28604.3	0.	0.	0.0	0.0	0.0
74	52.8	1803437.1	0.0	*******	0.	0.	0.0	0.0	0.0
75	7.2	252744.6	0.0	*******	0.	0.	0.0	0.0	0.0
76	13.0	448324.7	0.0	*******	0.	0.	0.0	0.0	0.0
77	10.0	334001.5	0.0	*******	0.	0.	0.0	0.0	0.0
78	5.2	168897.6	0.0	95739.8	0.	0.	0.0	0.0	0.0
79	11.8	379651.0	0.0	*******	0.	0.	0.0	0.0	0.0
80	23.5	730593.1	0.0	*******	0.	0.	0.0	0.0	0.0
81	6.5	194945.3	0.0	99777.8	0.	0.	0.0	0.0	0.0
82	25.0	729848.1	0.0	*******	0.	0.	0.0	0.0	0.0
83	3.9	110116.3	0.0	51245.3	0.	0.	0.0	0.0	0.0
84	21.1	582064.6	0.0	*******	0.	0.	0.0	0.0	0.0
85	10.0	265664.6	0.0	*******	0.	0.	0.0	0.0	0.0
86	4.2	110520.2	0.0	45037.3	0.	0.	0.0	0.0	0.0
87	25.8	642366.9	0.0	*******	0.	0.	0.0	0.0	0.0
88	9.6	226815.9	0.0	77091.3	0.	0.	0.0	0.0	0.0
89	2.4	55670.3	0.0	18149.0	0.	0.	0.0	0.0	0.0
90	33.0	698532.4	0.0	*******	0.	0.	0.0	0.0	0.0
91	5.0	95940.8	0.0	23509.1	0.	0.	0.0	0.0	0.0
92	25.0	424735.8	0.0	86789.0	0.	0.	0.0	0.0	0.0
93	5.3	78932.5	0.0	12072.6	0.	0.	0.0	0.0	0.0
94	9.7	133418.7	0.0	16292.1	0.	0.	0.0	0.0	0.0
95	16.4	194716.8	0.0	10663.6	0.	0.	0.0	0.0	0.0
96	9.2	92337.7	0.0	0.0	0.	0.	0.0	0.0	0.0
97	35.4	242101.8	0.0	0.0	0.	0.	0.0	0.0	0.0
98	15.0	49332.7	0.0	0.0	0.	0.	0.0	0.0	0.0
99	10.0	11644.0	0.0	0.0	0.	0.	0.0	0.0	0.0
100	0.8	36.7	0.0	0.0	0.	0.	0.0	0.0	0.0

Failure Surface Specified By 20 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	35.697	233.000
2	40.556	229.597
3	81.514	200.918
4	122.471	172.240

```
     5        145.450      149.261
     6        146.063      148.648
     7        181.418      113.293
     8        460.100      116.897
     9        722.664      123.370
    10       1322.822      138.037
    11       1358.177      173.392
    12       1393.532      208.748
    13       1428.888      244.103
    14       1464.243      279.458
    15       1499.599      314.814
    16       1534.954      350.169
    17       1570.309      385.524
    18       1605.665      420.880
    19       1641.020      456.235
    20       1666.785      482.000
***  FOS =     1.594   Theta (ki=1.0) =     7.49  ***
                     Lambda =   0.131
Failure Surface Specified By 20 Coordinate Points
  Point      X-Surf      Y-Surf
   No.        (ft)        (ft)
     1        115.313      230.000
     2        122.563      225.470
     3        137.183      215.233
     4        178.141      186.554
     5        209.435      155.260
     6        215.516      149.178
     7        250.872      113.823
     8        460.100      116.669
     9        824.559      125.010
    10       1329.246      138.330
    11       1364.602      173.685
    12       1399.957      209.041
    13       1435.312      244.396
    14       1470.668      279.751
    15       1506.023      315.107
    16       1541.378      350.462
    17       1576.734      385.817
    18       1612.089      421.173
    19       1647.444      456.528
    20       1672.916      482.000
***  FOS =     1.594   Theta (ki=1.0) =     7.50  ***
                     Lambda =   0.132
Failure Surface Specified By 20 Coordinate Points
  Point      X-Surf      Y-Surf
   No.        (ft)        (ft)
     1        100.538      232.838
     2        112.751      225.207
     3        129.597      213.412
     4        170.554      184.733
     5        200.834      154.453
     6        206.219      149.068
     7        241.575      113.712
     8        460.100      116.534
     9        559.266      118.901
    10       1320.986      138.810
    11       1356.342      174.166
    12       1391.697      209.521
    13       1427.052      244.876
    14       1462.408      280.232
    15       1497.763      315.587
    16       1533.118      350.942
    17       1568.474      386.298
    18       1603.829      421.653
    19       1639.184      457.008
    20       1664.987      482.811
***  FOS =     1.595   Theta (ki=1.0) =     7.51  ***
                     Lambda =   0.132
Failure Surface Specified By 20 Coordinate Points
  Point      X-Surf      Y-Surf
```

```
    No.        (ft)        (ft)
     1        100.538      232.838
     2        112.751      225.207
     3        129.597      213.412
     4        170.554      184.733
     5        200.834      154.453
     6        206.219      149.068
     7        241.575      113.712
     8        460.100      116.534
     9        559.266      118.901
    10       1320.986      138.810
    11       1356.342      174.166
    12       1391.697      209.521
    13       1427.052      244.876
    14       1462.408      280.232
    15       1497.763      315.587
    16       1533.118      350.942
    17       1568.474      386.298
    18       1603.829      421.653
    19       1639.184      457.008
    20       1664.987      482.811
 ***  FOS =     1.596   Theta (ki=1.0) =     7.53  ***
                     Lambda =   0.132
 Failure Surface Specified By 20 Coordinate Points
   Point      X-Surf      Y-Surf
    No.        (ft)        (ft)
     1        115.313      230.000
     2        122.563      225.470
     3        137.183      215.233
     4        178.141      186.554
     5        209.435      155.260
     6        215.516      149.178
     7        250.872      113.823
     8        460.100      116.669
     9        824.559      125.010
    10       1329.246      138.330
    11       1364.602      173.685
    12       1399.957      209.041
    13       1435.312      244.396
    14       1470.668      279.751
    15       1506.023      315.107
    16       1541.378      350.462
    17       1576.734      385.817
    18       1612.089      421.173
    19       1647.444      456.528
    20       1672.916      482.000
 ***  FOS =     1.597   Theta (ki=1.0) =     7.58  ***
                     Lambda =   0.133
 Failure Surface Specified By 21 Coordinate Points
   Point      X-Surf      Y-Surf
    No.        (ft)        (ft)
     1        146.018      232.315
     2        155.560      226.352
     3        159.868      223.335
     4        200.826      194.657
     5        202.229      193.254
     6        237.584      157.898
     7        245.594      149.888
     8        280.950      114.533
     9        460.100      116.987
    10        742.859      123.776
    11       1328.328      138.717
    12       1363.684      174.072
    13       1399.039      209.427
    14       1434.395      244.783
    15       1469.750      280.138
    16       1505.105      315.493
    17       1540.461      350.849
    18       1575.816      386.204
    19       1611.171      421.559
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    20       1646.527      456.915
    21       1671.612      482.000
***  FOS =     1.597   Theta (ki=1.0) =     7.49  ***
                     Lambda =   0.132
Failure Surface Specified By 21 Coordinate Points
  Point      X-Surf      Y-Surf
   No.        (ft)        (ft)
    1        146.018      232.315
    2        155.560      226.352
    3        159.868      223.335
    4        200.826      194.657
    5        202.229      193.254
    6        237.584      157.898
    7        245.594      149.888
    8        280.950      114.533
    9        460.100      116.987
   10        742.859      123.776
   11       1328.328      138.717
   12       1363.684      174.072
   13       1399.039      209.427
   14       1434.395      244.783
   15       1469.750      280.138
   16       1505.105      315.493
   17       1540.461      350.849
   18       1575.816      386.204
   19       1611.171      421.559
   20       1646.527      456.915
   21       1671.612      482.000
***  FOS =     1.597   Theta (ki=1.0) =     7.49  ***
                     Lambda =   0.132
Failure Surface Specified By 21 Coordinate Points
  Point      X-Surf      Y-Surf
   No.        (ft)        (ft)
    1        146.018      232.315
    2        155.560      226.352
    3        159.868      223.335
    4        200.826      194.657
    5        202.229      193.254
    6        237.584      157.898
    7        245.594      149.888
    8        280.950      114.533
    9        460.100      116.987
   10        742.859      123.776
   11       1328.328      138.717
   12       1363.684      174.072
   13       1399.039      209.427
   14       1434.395      244.783
   15       1469.750      280.138
   16       1505.105      315.493
   17       1540.461      350.849
   18       1575.816      386.204
   19       1611.171      421.559
   20       1646.527      456.915
   21       1671.612      482.000
***  FOS =     1.597   Theta (ki=1.0) =     7.49  ***
                     Lambda =   0.132
Failure Surface Specified By 19 Coordinate Points
  Point      X-Surf      Y-Surf
   No.        (ft)        (ft)
    1         58.096      233.000
    2         97.181      205.632
    3        138.139      176.953
    4        164.084      151.008
    5        166.844      148.248
    6        202.200      112.892
    7        460.100      116.081
    8        845.672      126.026
    9       1313.644      137.904
   10       1348.999      173.260
   11       1384.355      208.615
```
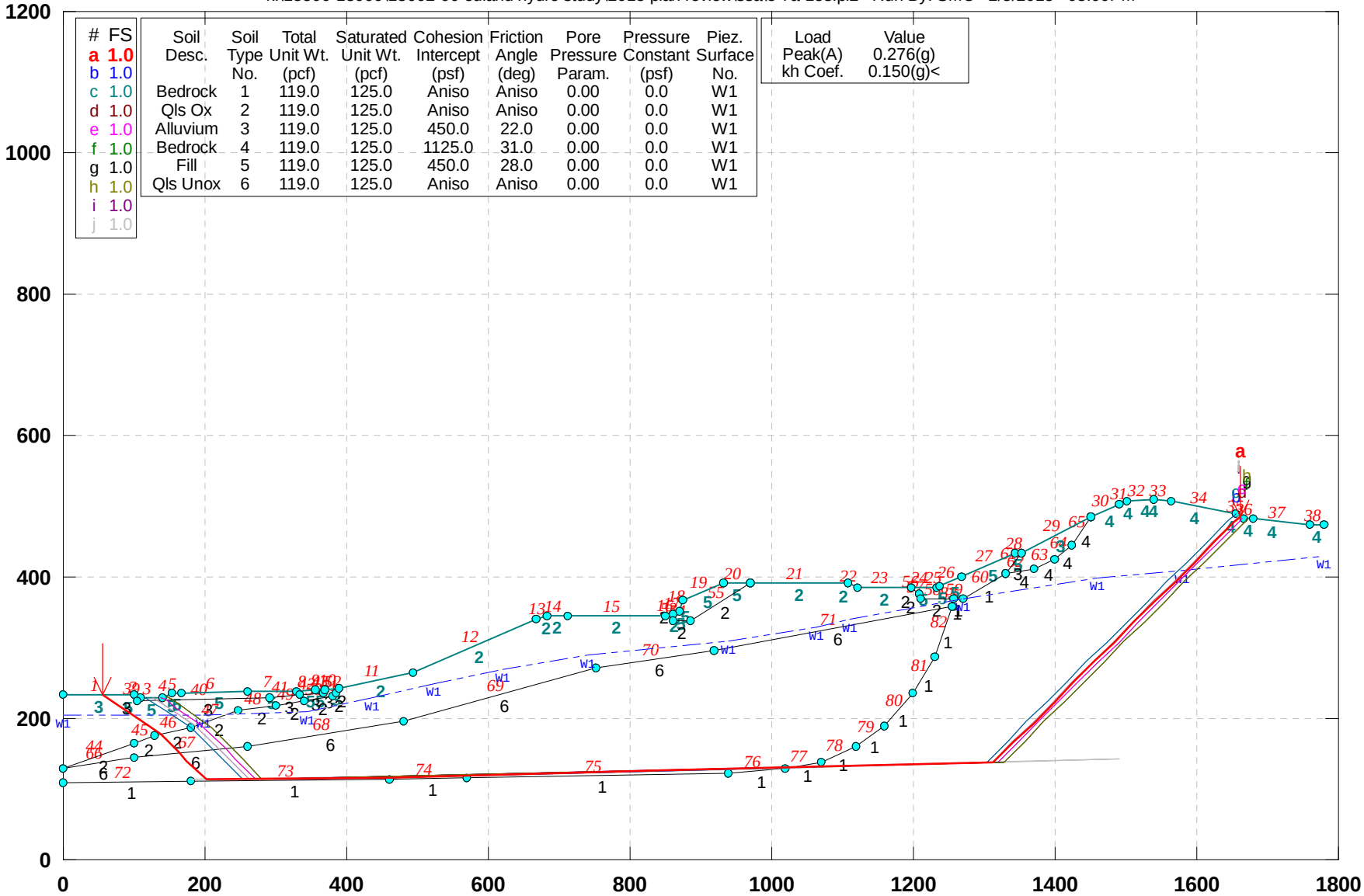

```
    12       1419.710      243.970
    13       1455.065      279.326
    14       1490.421      314.681
    15       1525.776      350.036
    16       1561.131      385.392
    17       1596.487      420.747
    18       1631.842      456.102
    19       1661.411      485.671
 ***  FOS =     1.598   Theta (ki=1.0) =     7.45  ***
                     Lambda =   0.131
           **** END OF GSTABL7 OUTPUT ****
```

13662-00, Euland, Section E-E', Seismic

k:\13500-13999\13662-00 euland hydro study\2015 plan review\ssa\e-7a-15s.pl2 Run By: SMC 2/5/2015 03:00PM



#	FS
a	1.0
b	1.0
c	1.0
d	1.0
e	1.0
f	1.0
g	1.0
h	1.0
i	1.0
j	1.0

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.
Bedrock	1	119.0	125.0	Aniso	Aniso	0.00	0.0	W1
Qls Ox	2	119.0	125.0	Aniso	Aniso	0.00	0.0	W1
Alluvium	3	119.0	125.0	450.0	22.0	0.00	0.0	W1
Bedrock	4	119.0	125.0	1125.0	31.0	0.00	0.0	W1
Fill	5	119.0	125.0	450.0	28.0	0.00	0.0	W1
Qls Unox	6	119.0	125.0	Aniso	Aniso	0.00	0.0	W1

Load	Value
Peak(A)	0.276(g)
kh Coef.	0.150(g)<

GSTABL7 v.2 FSmin=1.0

Safety Factors Are Calculated By GLE (Spencer`s) Method (0-2)

Figure E-14.2

***** GSTABL7 *****

** GSTABL7 by Garry H. Gregory, P.E. **

** Original Version 1.0, January 1996; Current Version 2.005, Sept. 2006 **

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****

SLOPE STABILITY ANALYSIS SYSTEM

Modified Bishop, Simplified Janbu, or GLE Method of Slices.
(Includes Spencer & Morgenstern-Price Type Analysis)
Including Pier/Pile, Reinforcement, Soil Nail, Tieback,
Nonlinear Undrained Shear Strength, Curved Phi Envelope,
Anisotropic Soil, Fiber-Reinforced Soil, Boundary Loads, Water
Surfaces, Pseudo-Static & Newmark Earthquake, and Applied Forces.

****

Analysis Run Date: 2/5/2015
Time of Run: 03:00PM
Run By: SMC
Input Data Filename: K:\13500-13999\13662-00 Euland Hydro Study\2015 Plan Review\SSA\e-7a-15s.
Output Filename: K:\13500-13999\13662-00 Euland Hydro Study\2015 Plan Review\SSA\e-7a-15s.OUT
Unit System: English
Plotted Output Filename: K:\13500-13999\13662-00 Euland Hydro Study\2015 Plan Review\SSA\e-7a-15s.PLT
PROBLEM DESCRIPTION: 13662-00, Euland, Section E-E',
Seismic

BOUNDARY COORDINATES
38 Top Boundaries
83 Total Boundaries

Boundary No.	X-Left (ft)	Y-Left (ft)	X-Right (ft)	Y-Right (ft)	Soil Type Below Bnd
1	0.00	233.00	100.00	233.00	3
2	100.00	233.00	110.00	230.00	5
3	110.00	230.00	140.00	230.00	5
4	140.00	230.00	153.00	235.00	5
5	153.00	235.00	166.00	235.00	5
6	166.00	235.00	260.00	237.00	5
7	260.00	237.00	330.00	239.00	5
8	330.00	239.00	355.00	240.00	5
9	355.00	240.00	370.00	240.00	5
10	370.00	240.00	390.00	243.00	3
11	390.00	243.00	495.00	265.00	2
12	495.00	265.00	667.00	340.00	2
13	667.00	340.00	682.00	345.00	2
14	682.00	345.00	712.00	345.00	2
15	712.00	345.00	850.00	345.00	2
16	850.00	345.00	860.00	346.00	2
17	860.00	346.00	871.00	352.00	5
18	871.00	352.00	875.00	367.00	5
19	875.00	367.00	933.00	391.00	5
20	933.00	391.00	970.00	391.00	5
21	970.00	391.00	1107.00	391.00	2
22	1107.00	391.00	1122.00	384.00	2
23	1122.00	384.00	1197.00	384.00	2
24	1197.00	384.00	1233.00	384.00	5
25	1233.00	384.00	1236.00	387.00	5
26	1236.00	387.00	1268.00	400.00	5
27	1268.00	400.00	1343.00	433.00	5
28	1343.00	433.00	1353.00	433.00	5
29	1353.00	433.00	1450.00	485.00	3
30	1450.00	485.00	1490.00	502.00	4
31	1490.00	502.00	1502.00	507.00	4
32	1502.00	507.00	1540.00	510.00	4
33	1540.00	510.00	1565.00	507.00	4
34	1565.00	507.00	1656.00	490.00	4
35	1656.00	490.00	1666.00	482.00	4
36	1666.00	482.00	1680.00	482.00	4
37	1680.00	482.00	1760.00	473.00	4
38	1760.00	473.00	1780.00	473.00	4
39	100.00	233.00	105.00	225.00	3

40	105.00	225.00	292.00	230.00	3
41	292.00	230.00	333.00	233.00	3
42	333.00	233.00	368.00	235.00	3
43	368.00	235.00	370.00	240.00	3
44	0.00	128.00	100.00	164.00	2
45	100.00	164.00	130.00	175.00	2
46	130.00	175.00	180.00	187.00	2
47	180.00	187.00	248.00	212.00	2
48	248.00	212.00	300.00	219.00	2
49	300.00	219.00	340.00	224.00	2
50	340.00	224.00	380.00	231.00	2
51	380.00	231.00	385.00	235.00	2
52	385.00	235.00	390.00	243.00	2
53	860.00	346.00	861.00	338.00	2
54	861.00	338.00	885.00	338.00	2
55	885.00	338.00	970.00	391.00	2
56	1197.00	384.00	1209.00	375.00	2
57	1209.00	375.00	1210.00	370.00	2
58	1210.00	370.00	1257.00	370.00	2
59	1257.00	370.00	1270.00	370.00	1
60	1270.00	370.00	1330.00	406.00	1
61	1330.00	406.00	1353.00	433.00	3
62	1330.00	406.00	1370.00	412.00	4
63	1370.00	412.00	1400.00	425.00	4
64	1400.00	425.00	1425.00	445.00	4
65	1425.00	445.00	1450.00	485.00	4
66	0.00	128.00	100.00	145.00	6
67	100.00	145.00	260.00	160.00	6
68	260.00	160.00	480.00	195.00	6
69	480.00	195.00	752.00	272.00	6
70	752.00	272.00	920.00	295.00	6
71	920.00	295.00	1255.00	358.00	6
72	0.00	109.00	180.00	111.00	1
73	180.00	111.00	460.00	114.50	1
74	460.00	114.50	570.00	116.00	1
75	570.00	116.00	940.00	123.00	1
76	940.00	123.00	1020.00	128.00	1
77	1020.00	128.00	1070.00	138.00	1
78	1070.00	138.00	1120.00	161.00	1
79	1120.00	161.00	1160.00	190.00	1
80	1160.00	190.00	1200.00	236.00	1
81	1200.00	236.00	1230.00	288.00	1
82	1230.00	288.00	1255.00	358.00	1
83	1255.00	358.00	1257.00	370.00	1

Default Y-Origin = 0.00(ft)
Default X-Plus Value = 0.00(ft)
Default Y-Plus Value = 0.00(ft)

ISOTROPIC SOIL PARAMETERS
6 Type(s) of Soil

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.
1	119.0	125.0	0.0	0.0	0.00	0.0	1
2	119.0	125.0	0.0	0.0	0.00	0.0	1
3	119.0	125.0	450.0	22.0	0.00	0.0	1
4	119.0	125.0	1125.0	31.0	0.00	0.0	1
5	119.0	125.0	450.0	28.0	0.00	0.0	1
6	119.0	125.0	0.0	0.0	0.00	0.0	1

ANISOTROPIC STRENGTH PARAMETERS
3 soil type(s)
Soil Type 1 Is Anisotropic
Number Of Direction Ranges Specified = 3

Direction Range No.	Counterclockwise Direction Limit (deg)	Cohesion Intercept (psf)	Friction Angle (deg)
1	0.0	1125.00	31.00
2	5.0	450.00	17.00
3	90.0	1125.00	31.00

Soil Type 2 Is Anisotropic
Number Of Direction Ranges Specified = 3

Direction Range No.	Counterclockwise Direction Limit (deg)	Cohesion Intercept (psf)	Friction Angle (deg)
1	0.0	525.00	25.00
2	10.0	375.00	14.50
3	90.0	450.00	22.00

Soil Type 6 Is Anisotropic
Number Of Direction Ranges Specified = 3

Direction Range No.	Counterclockwise Direction Limit (deg)	Cohesion Intercept (psf)	Friction Angle (deg)
1	0.0	750.00	31.00
2	10.0	375.00	14.50
3	90.0	450.00	22.00

ANISOTROPIC SOIL NOTES:
(1) An input value of 0.01 for C and/or Phi will cause Aniso C and/or Phi to be ignored in that range.
(2) An input value of 0.02 for Phi will set both Phi and C equal to zero, with no water weight in the tension crack.
(3) An input value of 0.03 for Phi will set both Phi and C equal to zero, with water weight in the tension crack.

1 PIEZOMETRIC SURFACE(S) SPECIFIED
Unit Weight of Water = 62.40 (pcf)
Piezometric Surface No. 1 Specified by 14 Coordinate Points
Pore Pressure Inclination Factor = 0.50

Point No.	X-Water (ft)	Y-Water (ft)
1	0.00	204.00
2	198.00	205.00
3	345.00	210.00
4	436.00	230.00
5	523.00	250.00
6	621.00	270.00
7	742.00	290.00
8	940.00	310.00
9	1063.00	330.00
10	1110.00	340.00
11	1270.00	370.00
12	1460.00	398.00
13	1580.00	410.00
14	1780.00	430.00

Specified Peak Ground Acceleration Coefficient (A) = 0.276(g)
Specified Horizontal Earthquake Coefficient (kh) = 0.150(g)
Specified Vertical Earthquake Coefficient (kv) = 0.000(g)
Specified Seismic Pore-Pressure Factor = 0.000
Janbus Empirical Coef is being used for the case of c & phi both > 0
A Critical Failure Surface Searching Method, Using A Random Technique For Generating Sliding Block Surfaces, Has Been Specified.
The Active And Passive Portions Of The Sliding Surfaces Are Generated According To The Rankine Theory.
1000 Trial Surfaces Have Been Generated.
4 Boxes Specified For Generation Of Central Block Base Length Of Line Segments For Active And Passive Portions Of Sliding Block Is 40.0

Box No.	X-Left (ft)	Y-Left (ft)	X-Right (ft)	Y-Right (ft)	Height (ft)
1	180.00	113.00	460.00	116.50	1.00
2	460.10	116.50	460.10	116.50	1.00
3	550.00	119.00	1020.00	130.00	1.00
4	1020.10	130.00	1490.00	143.00	1.00

Factor Of Safety Calculation By GLE (Spencer`s) Method of Slices
Has Gone Through 20 Iterations

Theta (deg) (ki=1.0)	FOS (Moment) (Equil.)	FOS (Force) (Equil.)	Lambda
8.50	10.633	1.072	0.149
12.75	0.931	0.939	0.226
12.74	0.930	0.944	0.226
1.82	5.205	0.929	0.032

12.70	20.000	1.207	0.225
0.00	4.643	0.901	0.000
0.00	4.643	0.901	0.000
6.43	7.872	1.020	0.113
0.00	4.643	0.901	0.000
0.00	4.643	0.901	0.000
0.00	1.350	-0.084	0.000
0.00	1.350	-0.084	0.000
0.00	1.350	-0.084	0.000
0.00	1.350	-0.084	0.000
0.00	1.350	-0.084	0.000
0.00	1.350	-0.084	0.000
0.00	1.350	-0.084	0.000
0.00	1.350	-0.084	0.000
0.00	1.350	-0.084	0.000
0.00	1.350	-0.084	0.000

The Trial Failure Surface In Question Is Defined
By The Following 23 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	65.33	233.00
2	79.40	223.51
3	112.56	201.14
4	145.73	178.77
5	172.68	151.81
6	183.21	141.29
7	211.50	113.00
8	460.10	116.22
9	640.96	121.14
10	1321.90	138.42
11	1350.19	166.71
12	1378.47	194.99
13	1406.76	223.28
14	1435.04	251.56
15	1463.33	279.85
16	1491.61	308.13
17	1519.89	336.41
18	1548.18	364.70
19	1576.46	392.98
20	1604.75	421.27
21	1633.03	449.55
22	1661.32	477.83
23	1665.71	482.23

Factor Of Safety Calculation By GLE (Spencer`s) Method of Slices
Has Gone Through 20 Iterations

Theta (deg) (ki=1.0)	FOS (Moment) (Equil.)	FOS (Force) (Equil.)	Lambda
8.50	25.301	1.122	0.149
12.75	33.946	1.264	0.226
0.00	7.627	0.941	0.000
0.00	7.627	0.941	0.000
6.72	23.606	1.074	0.118
0.00	7.627	0.941	0.000
0.00	7.627	0.941	0.000
6.66	23.466	1.073	0.117
0.00	7.627	0.941	0.000
0.00	7.627	0.941	0.000
0.00	2.381	-0.104	0.000
0.00	2.381	-0.104	0.000
0.00	2.381	-0.104	0.000
0.00	2.381	-0.104	0.000
0.00	2.381	-0.104	0.000
0.00	2.381	-0.104	0.000
0.00	2.381	-0.104	0.000
0.00	2.381	-0.104	0.000
0.00	2.381	-0.104	0.000
0.00	2.381	-0.104	0.000

The Trial Failure Surface In Question Is Defined
By The Following 26 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	97.41	233.00
2	101.56	230.51
3	110.48	225.15
4	137.28	207.07
5	170.44	184.71
6	172.42	182.73
7	200.70	154.44
8	212.74	142.40
9	241.03	114.12
10	460.10	116.06
11	1013.66	129.54
12	1209.94	135.60
13	1238.22	163.89
14	1266.50	192.17
15	1294.79	220.46
16	1323.07	248.74
17	1351.36	277.02
18	1379.64	305.31
19	1407.93	333.59
20	1436.21	361.88
21	1464.49	390.16
22	1492.78	418.45
23	1521.06	446.73
24	1549.35	475.01
25	1577.63	503.30
26	1578.76	504.43

Factor Of Safety Calculation By GLE (Spencer`s) Method of Slices
Has Gone Through 20 Iterations

Theta (deg) (ki=1.0)	FOS (Moment) (Equil.)	FOS (Force) (Equil.)	Lambda
8.50	25.406	1.079	0.149
12.75	20.000	0.966	0.226
33.12	5.120	0.000	0.653
43.12	-1.443	0.000	0.936
40.19	-1.693	0.000	0.845
66.67	-0.198	0.000	2.318
71.35	-0.090	0.000	2.963
76.53	-0.005	0.000	4.175
76.96	0.185	0.000	4.319
76.55	-0.004	0.000	4.181
76.42	-0.012	0.000	4.141
76.69	0.000	0.000	4.226
76.69	0.000	0.000	4.227
76.69	0.000	0.000	4.227
76.69	0.000	0.000	4.227
76.69	0.000	0.000	4.227
76.69	0.000	0.000	4.227
76.69	0.000	0.000	4.227
76.69	0.000	0.000	4.227
76.69	0.000	0.000	4.227

The Trial Failure Surface In Question Is Defined
By The Following 23 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	47.57	233.00
2	66.30	220.36
3	99.46	198.00
4	132.62	175.63
5	157.83	150.42
6	166.81	141.45
7	195.09	113.16
8	460.10	116.86
9	642.80	121.35
10	1279.69	137.21
11	1307.97	165.50
12	1336.26	193.78
13	1364.54	222.07

14	1392.82	250.35
15	1421.11	278.63
16	1449.39	306.92
17	1477.68	335.20
18	1505.96	363.49
19	1534.25	391.77
20	1562.53	420.06
21	1590.81	448.34
22	1619.10	476.62
23	1636.18	493.70

Factor Of Safety Calculation By GLE (Spencer`s) Method of Slices
Has Gone Through 20 Iterations

Theta (deg) (ki=1.0)	FOS (Moment) (Equil.)	FOS (Force) (Equil.)	Lambda
8.50	16.924	1.079	0.149
12.75	0.947	0.954	0.226
12.75	0.932	0.800	0.226
3.27	7.032	0.959	0.057
16.19	139.639	0.620	0.290
2.48	6.517	0.944	0.043
0.00	5.343	0.904	0.000
0.00	5.343	0.904	0.000
89.94	1.427	0.450	*****
89.94	1.427	0.450	*****
72.10	-0.220	0.455	3.095
75.86	-1.012	0.329	3.971
67.01	0.612	0.640	2.357
63.80	-2.446	0.002	2.032
68.13	0.678	0.675	2.492
68.12	0.695	0.676	2.491
79.54	0.378	0.623	5.419
69.22	0.732	0.712	2.635
66.84	28.007	0.000	2.338
70.01	0.762	0.418	2.749

The Trial Failure Surface In Question Is Defined
By The Following 24 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	112.90	230.00
2	120.53	225.42
3	144.98	208.92
4	178.14	186.55
5	181.15	183.54
6	209.43	155.26
7	222.59	142.11
8	250.87	113.82
9	460.10	116.67
10	824.56	125.01
11	1329.25	138.33
12	1357.53	166.61
13	1385.81	194.90
14	1414.10	223.18
15	1442.38	251.47
16	1470.67	279.75
17	1498.95	308.04
18	1527.24	336.32
19	1555.52	364.60
20	1583.80	392.89
21	1612.09	421.17
22	1640.37	449.46
23	1668.66	477.74
24	1672.92	482.00

Factor Of Safety Calculation By GLE (Spencer`s) Method of Slices
Has Gone Through 20 Iterations

Theta (deg) (ki=1.0)	FOS (Moment) (Equil.)	FOS (Force) (Equil.)	Lambda
8.50	3.540	1.078	0.149
12.75	0.919	0.956	0.226

12.67	0.915	0.798	0.225
12.72	0.918	0.799	0.226
3.17	2.955	0.957	0.055
16.71	1.010	0.631	0.300
20.94	1.010	0.000	0.383
13.33	4.446	1.239	0.237
28.14	6.462	0.001	0.535
0.00	1.427	-0.098	0.000
0.00	0.857	-0.098	0.000
89.94	1.387	0.451	*****
89.94	20.584	20.701	*****
59.11	-0.550	0.000	1.671
89.94	20.584	20.701	*****
89.94	20.584	20.701	*****
72.27	219.998	-0.001	3.128
89.93	21.051	21.286	*****
89.91	22.076	22.606	*****
62.31	-0.209	-0.017	1.906

The Trial Failure Surface In Question Is Defined
By The Following 25 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	97.57	233.00
2	101.46	230.66
3	110.63	225.15
4	137.39	207.10
5	170.55	184.73
6	172.55	182.74
7	200.83	154.45
8	213.29	142.00
9	241.57	113.71
10	460.10	116.53
11	559.27	118.90
12	1320.99	138.81
13	1349.27	167.09
14	1377.55	195.38
15	1405.84	223.66
16	1434.12	251.95
17	1462.41	280.23
18	1490.69	308.52
19	1518.98	336.80
20	1547.26	365.08
21	1575.55	393.37
22	1603.83	421.65
23	1632.11	449.94
24	1660.40	478.22
25	1664.99	482.81

Factor Of Safety Calculation By GLE (Spencer`s) Method of Slices
Has Gone Through 20 Iterations

Theta (deg) (ki=1.0)	FOS (Moment) (Equil.)	FOS (Force) (Equil.)	Lambda
8.50	4.504	1.105	0.149
12.75	6.090	1.242	0.226
0.00	3.146	0.933	0.000
0.00	3.146	0.933	0.000
7.65	4.299	1.083	0.134
0.00	3.146	0.933	0.000
0.00	3.146	0.933	0.000
5.24	3.827	1.026	0.092
0.00	0.562	0.533	0.000
0.00	0.561	0.533	0.000
0.00	0.150	-0.040	0.000
89.94	0.134	0.459	*****
44.28	0.140	0.111	0.975
34.03	0.129	0.029	0.675
53.26	0.153	0.194	1.340
45.77	0.142	0.124	1.027
46.28	0.142	0.129	1.046
48.65	0.145	0.150	1.136

47.90	0.144	0.143	1.107
47.89	0.144	0.143	1.106

The Trial Failure Surface In Question Is Defined
By The Following 24 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	31.10	233.00
2	55.31	216.67
3	88.47	194.30
4	121.64	171.93
5	144.41	149.16
6	152.59	140.98
7	180.87	112.70
8	460.10	116.42
9	707.06	123.01
10	1211.77	134.83
11	1240.06	163.11
12	1268.34	191.40
13	1296.62	219.68
14	1324.91	247.97
15	1353.19	276.25
16	1381.48	304.54
17	1409.76	332.82
18	1438.05	361.10
19	1466.33	389.39
20	1494.61	417.67
21	1522.90	445.96
22	1551.18	474.24
23	1579.47	502.53
24	1580.96	504.02

Factor Of Safety Calculation By GLE (Spencer`s) Method of Slices
Has Gone Through 20 Iterations

Theta (deg) (ki=1.0)	FOS (Moment) (Equil.)	FOS (Force) (Equil.)	Lambda
8.50	21.263	1.086	0.149
12.75	38.082	1.224	0.226
1.65	9.405	0.937	0.029
0.00	7.638	0.911	0.000
0.00	7.638	0.911	0.000
5.61	21.358	1.014	0.098
0.00	7.638	0.911	0.000
0.00	7.638	0.911	0.000
0.00	0.566	0.533	0.000
0.00	0.566	0.533	0.000
0.00	0.150	-0.039	0.000
89.94	1.438	0.453	*****
0.00	2.358	-0.019	0.000
89.94	1.438	0.453	*****
89.94	1.438	0.453	*****
33.54	0.132	0.029	0.663
6.03	10.213	0.005	0.106
43.08	-1.431	0.000	0.935
37.01	14.800	0.000	0.754
42.37	0.144	0.000	0.912

The Trial Failure Surface In Question Is Defined
By The Following 24 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	81.23	233.00
2	91.13	226.32
3	124.29	203.96
4	157.45	181.59
5	157.69	181.34
6	185.98	153.06
7	196.88	142.15
8	225.17	113.87
9	460.10	116.18
10	561.10	119.12
11	1278.77	137.60

```
   12       1307.05      165.88
   13       1335.34      194.17
   14       1363.62      222.45
   15       1391.91      250.74
   16       1420.19      279.02
   17       1448.47      307.31
   18       1476.76      335.59
   19       1505.04      363.87
   20       1533.33      392.16
   21       1561.61      420.44
   22       1589.90      448.73
   23       1618.18      477.01
   24       1635.08      493.91
The Factor Of Safety For The Trial Failure Surface Defined
By The Coordinates Listed Below Is Misleading.
Failure Surface Defined By 23 Coordinate Points
  #################### SOME LINES SKIPPED ####################
      Following Are Displayed The Ten Most Critical Of The Trial
      Failure Surfaces Evaluated. They Are
      Ordered - Most Critical First.
      * * Safety Factors Are Calculated By GLE (Spencer`s) Method (0-2) * *
      Selected ki function = Bi-linear
      Selected Lambda Coefficient =  1.00
      Forces from Reinforcement, Piers/Piles, Soil Nails, and Applied Forces
      (if applicable) have been applied to the slice base(s)
      on which they intersect.
      Specified Tension Crack Water Force Factor =   0.000
      Total Number of Trial Surfaces Attempted =  1000
      WARNING! The Factor of Safety Calculation for one or More Trial Surfaces
      Did Not Converge in 20 Iterations.
      Number of Trial Surfaces with Non-Converged FS =   30
      Number of Trial Surfaces with Misleading FS =    3
      Number of Trial Surfaces With Valid FS =  967
      Percentage of Trial Surfaces With Non-Valid FS Solutions
      of the Total Attempted =   3.3 %
      Statistical Data On All Valid FS Values:
         FS Max =   1.153   FS Min =   0.962   FS Ave =   0.925
         Standard Deviation =    0.130   Coefficient of Variation =   14.05 %
                ((Simplified Janbu FS for Critical Surface =  0.954))
      Failure Surface Specified By 23 Coordinate Points
        Point      X-Surf      Y-Surf
         No.        (ft)        (ft)
          1         55.046      233.000
          2         71.816      221.689
          3        104.977      199.321
          4        138.139      176.953
          5        164.084      151.008
          6        173.915      141.176
          7        202.200      112.892
          8        460.100      116.081
          9        845.672      126.026
         10       1313.644      137.904
         11       1341.928      166.188
         12       1370.213      194.473
         13       1398.497      222.757
         14       1426.781      251.041
         15       1455.066      279.326
         16       1483.350      307.610
         17       1511.634      335.894
         18       1539.918      364.178
         19       1568.203      392.463
         20       1596.487      420.747
         21       1624.771      449.031
         22       1653.056      477.315
         23       1661.411      485.671
      ***  FOS =     0.962   Theta (ki=1.0) =    12.68  ***
                         Lambda =   0.225
           Individual data on the   101  slices
                     Water  Water     Tie     Tie     Earthquake
                     Force  Force    Force   Force       Force   Surcharge
```

Slice No.	Width (ft)	Weight (lbs)	Top (lbs)	Bot (lbs)	Norm (lbs)	Tan (lbs)	Hor (lbs)	Ver (lbs)	Load (lbs)
1	16.8	11286.3	0.0	0.0	0.	0.	1693.0	0.0	0.0
2	25.5	60407.0	0.0	0.0	0.	0.	9061.0	0.0	0.0
3	2.7	9425.4	0.0	184.8	0.	0.	1413.8	0.0	0.0
4	5.0	18616.1	0.0	1317.9	0.	0.	2792.4	0.0	0.0
5	0.0	88.3	0.0	9.0	0.	0.	13.3	0.0	0.0
6	5.0	19920.5	0.0	2605.6	0.	0.	2988.1	0.0	0.0
7	28.1	148919.9	0.0	38511.0	0.	0.	22338.0	0.0	0.0
8	1.9	12276.5	0.0	4710.9	0.	0.	1841.5	0.0	0.0
9	13.0	101685.4	0.0	41468.8	0.	0.	15252.8	0.0	0.0
10	11.1	106684.4	0.0	47195.0	0.	0.	16002.7	0.0	0.0
11	1.9	19998.6	0.0	9262.7	0.	0.	2999.8	0.0	0.0
12	7.9	87563.7	0.0	41717.6	0.	0.	13134.6	0.0	0.0
13	6.1	72743.0	0.0	35845.7	0.	0.	10911.4	0.0	0.0
14	18.0	242846.4	0.0	*******	0.	0.	36427.0	0.0	0.0
15	4.2	62606.9	0.0	33365.1	0.	0.	9391.0	0.0	0.0
16	29.9	454537.8	0.0	*******	0.	0.	68180.7	0.0	0.0
17	15.9	241760.8	0.0	92199.4	0.	0.	36264.1	0.0	0.0
18	12.0	182848.0	0.0	69882.0	0.	0.	27427.2	0.0	0.0
19	32.0	488877.0	0.0	*******	0.	0.	73331.6	0.0	0.0
20	8.0	122548.6	0.0	47041.7	0.	0.	18382.3	0.0	0.0
21	30.0	460730.6	0.0	*******	0.	0.	69109.6	0.0	0.0
22	3.0	46181.1	0.0	17784.4	0.	0.	6927.2	0.0	0.0
23	7.0	107875.5	0.0	41544.2	0.	0.	16181.3	0.0	0.0
24	5.0	77156.5	0.0	29715.0	0.	0.	11573.5	0.0	0.0
25	10.0	154495.1	0.0	58759.6	0.	0.	23174.3	0.0	0.0
26	13.0	201114.9	0.0	78277.9	0.	0.	30167.2	0.0	0.0
27	2.0	30936.9	0.0	12232.4	0.	0.	4640.5	0.0	0.0
28	10.0	155561.8	0.0	61921.0	0.	0.	23334.3	0.0	0.0
29	5.0	78440.7	0.0	31434.7	0.	0.	11766.1	0.0	0.0
30	5.0	78880.5	0.0	31750.8	0.	0.	11832.1	0.0	0.0
31	46.0	753833.2	0.0	*******	0.	0.	*******	0.0	0.0
32	24.1	415771.1	0.0	*******	0.	0.	62365.7	0.0	0.0
33	19.9	353809.6	0.0	*******	0.	0.	53071.4	0.0	0.0
34	15.0	272726.1	0.0	*******	0.	0.	40908.9	0.0	0.0
35	28.0	533536.4	0.0	*******	0.	0.	80030.5	0.0	0.0
36	98.0	2175862.8	0.0	*******	0.	0.	*******	0.0	0.0
37	46.0	1186529.2	0.0	*******	0.	0.	*******	0.0	0.0
38	15.0	408249.8	0.0	*******	0.	0.	61237.5	0.0	0.0
39	30.0	823910.1	0.0	*******	0.	0.	*******	0.0	0.0
40	30.0	821891.0	0.0	*******	0.	0.	*******	0.0	0.0
41	10.0	273578.6	0.0	*******	0.	0.	41036.8	0.0	0.0
42	93.7	2549942.5	0.0	*******	0.	0.	*******	0.0	0.0
43	4.3	117261.8	0.0	46933.4	0.	0.	17589.3	0.0	0.0
44	10.0	271348.5	0.0	*******	0.	0.	40702.3	0.0	0.0
45	1.0	27212.7	0.0	10903.6	0.	0.	4081.9	0.0	0.0
46	10.0	275555.4	0.0	*******	0.	0.	41333.3	0.0	0.0
47	4.0	115018.4	0.0	43849.2	0.	0.	17252.8	0.0	0.0
48	10.0	298753.3	0.0	*******	0.	0.	44813.0	0.0	0.0
49	35.0	1082390.9	0.0	*******	0.	0.	*******	0.0	0.0
50	13.0	416592.7	0.0	*******	0.	0.	62488.9	0.0	0.0
51	7.0	226379.8	0.0	78823.9	0.	0.	33957.0	0.0	0.0
52	30.0	968679.9	0.0	*******	0.	0.	*******	0.0	0.0
53	64.0	2061001.2	0.0	*******	0.	0.	*******	0.0	0.0
54	29.0	929279.0	0.0	*******	0.	0.	*******	0.0	0.0
55	7.0	224236.0	0.0	85116.9	0.	0.	33635.4	0.0	0.0
56	37.0	1183684.2	0.0	*******	0.	0.	*******	0.0	0.0
57	3.0	95609.3	0.0	37920.5	0.	0.	14341.4	0.0	0.0
58	10.0	315014.0	0.0	*******	0.	0.	47252.1	0.0	0.0
59	2.0	62311.6	0.0	25654.4	0.	0.	9346.7	0.0	0.0
60	38.0	1180241.8	0.0	*******	0.	0.	*******	0.0	0.0
61	37.0	1146318.4	0.0	*******	0.	0.	*******	0.0	0.0
62	3.0	92820.9	0.0	40794.5	0.	0.	13923.1	0.0	0.0
63	9.0	278351.2	0.0	*******	0.	0.	41752.7	0.0	0.0
64	1.0	30917.6	0.0	13707.6	0.	0.	4637.6	0.0	0.0
65	20.0	617918.1	0.0	*******	0.	0.	92687.7	0.0	0.0
66	3.0	92616.5	0.0	41779.3	0.	0.	13892.5	0.0	0.0
67	3.0	93133.4	0.0	41868.8	0.	0.	13970.0	0.0	0.0
68	19.0	601531.1	0.0	*******	0.	0.	90229.7	0.0	0.0

69	1.6	50796.6	0.0	22395.3	0.	0.	7619.5	0.0	0.0
70	0.4	13494.3	0.0	5945.0	0.	0.	2024.1	0.0	0.0
71	11.0	356909.1	0.0	*******	0.	0.	53536.4	0.0	0.0
72	2.0	65502.2	0.0	28598.9	0.	0.	9825.3	0.0	0.0
73	43.6	1479654.9	0.0	*******	0.	0.	*******	0.0	0.0
74	16.4	562790.7	0.0	*******	0.	0.	84418.6	0.0	0.0
75	11.9	398345.9	0.0	*******	0.	0.	59751.9	0.0	0.0
76	1.1	35288.4	0.0	20018.7	0.	0.	5293.3	0.0	0.0
77	10.0	322701.1	0.0	*******	0.	0.	48405.2	0.0	0.0
78	17.0	529338.1	0.0	*******	0.	0.	79400.7	0.0	0.0
79	0.2	6511.0	0.0	3534.7	0.	0.	976.6	0.0	0.0
80	28.3	841744.6	0.0	*******	0.	0.	*******	0.0	0.0
81	1.5	43381.9	0.0	21723.6	0.	0.	6507.3	0.0	0.0
82	25.0	701597.4	0.0	*******	0.	0.	*******	0.0	0.0
83	1.8	48551.3	0.0	22211.7	0.	0.	7282.7	0.0	0.0
84	23.2	615378.9	0.0	*******	0.	0.	92306.8	0.0	0.0
85	5.1	129768.0	0.0	53119.5	0.	0.	19465.2	0.0	0.0
86	4.9	124596.4	0.0	49908.0	0.	0.	18689.5	0.0	0.0
87	23.3	565330.1	0.0	*******	0.	0.	84799.5	0.0	0.0
88	6.7	153647.1	0.0	52399.3	0.	0.	23047.1	0.0	0.0
89	12.0	268922.3	0.0	85709.6	0.	0.	40338.3	0.0	0.0
90	9.6	206244.0	0.0	60575.8	0.	0.	30936.6	0.0	0.0
91	28.3	543841.7	0.0	*******	0.	0.	81576.3	0.0	0.0
92	0.1	1434.9	0.0	299.1	0.	0.	215.2	0.0	0.0
93	25.0	396477.7	0.0	66933.4	0.	0.	59471.7	0.0	0.0
94	3.2	44490.1	0.0	5005.7	0.	0.	6673.5	0.0	0.0
95	11.8	150906.2	0.0	11445.8	0.	0.	22635.9	0.0	0.0
96	6.4	73087.1	0.0	1607.4	0.	0.	10963.1	0.0	0.0
97	10.1	103901.6	0.0	0.0	0.	0.	15585.2	0.0	0.0
98	28.3	214022.8	0.0	0.0	0.	0.	32103.4	0.0	0.0
99	28.3	101037.6	0.0	0.0	0.	0.	15155.6	0.0	0.0
100	2.9	4024.9	0.0	0.0	0.	0.	603.7	0.0	0.0
101	5.4	3136.1	0.0	0.0	0.	0.	470.4	0.0	0.0

Failure Surface Specified By 24 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	115.725	230.000
2	123.235	225.488
3	147.029	209.438
4	180.191	187.070
5	183.497	183.764
6	211.781	155.480
7	224.775	142.486
8	253.059	114.202
9	460.100	116.583
10	886.981	126.448
11	1303.549	138.158
12	1331.833	166.442
13	1360.117	194.727
14	1388.401	223.011
15	1416.686	251.295
16	1444.970	279.579
17	1473.254	307.864
18	1501.539	336.148
19	1529.823	364.432
20	1558.107	392.717
21	1586.392	421.001
22	1614.676	449.285
23	1642.960	477.569
24	1655.487	490.096

*** FOS = 0.967 Theta (ki=1.0) = 12.75 ***
Lambda = 0.226

Failure Surface Specified By 24 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	115.725	230.000
2	123.235	225.488
3	147.029	209.438
4	180.191	187.070
5	183.497	183.764

6	211.781	155.480
7	224.775	142.486
8	253.059	114.202
9	460.100	116.583
10	886.981	126.448
11	1303.549	138.158
12	1331.833	166.442
13	1360.117	194.727
14	1388.401	223.011
15	1416.686	251.295
16	1444.970	279.579
17	1473.254	307.864
18	1501.539	336.148
19	1529.823	364.432
20	1558.107	392.717
21	1586.392	421.001
22	1614.676	449.285
23	1642.960	477.569
24	1655.487	490.096

*** FOS = 0.967 Theta (ki=1.0) = 12.75 ***
Lambda = 0.226

Failure Surface Specified By 24 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	137.079	230.000
2	143.679	226.034
3	160.786	214.495
4	193.948	192.128
5	200.699	185.376
6	228.983	157.092
7	243.369	142.707
8	271.653	114.422
9	460.100	116.852
10	947.567	128.667
11	1320.068	138.197
12	1348.353	166.481
13	1376.637	194.766
14	1404.921	223.050
15	1433.206	251.334
16	1461.490	279.618
17	1489.774	307.903
18	1518.059	336.187
19	1546.343	364.471
20	1574.627	392.756
21	1602.911	421.040
22	1631.196	449.324
23	1659.480	477.608
24	1664.818	482.946

*** FOS = 0.967 Theta (ki=1.0) = 12.75 ***
Lambda = 0.226

Failure Surface Specified By 24 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	137.079	230.000
2	143.679	226.034
3	160.786	214.495
4	193.948	192.128
5	200.699	185.376
6	228.983	157.092
7	243.369	142.707
8	271.653	114.422
9	460.100	116.852
10	947.567	128.667
11	1320.068	138.197
12	1348.353	166.481
13	1376.637	194.766
14	1404.921	223.050
15	1433.206	251.334
16	1461.490	279.618
17	1489.774	307.903

18	1518.059	336.187
19	1546.343	364.471
20	1574.627	392.756
21	1602.911	421.040
22	1631.196	449.324
23	1659.480	477.608
24	1664.818	482.946

*** FOS = 0.967 Theta (ki=1.0) = 12.75 ***
Lambda = 0.226
Failure Surface Specified By 24 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	144.729	231.819
2	153.901	226.308
3	167.664	217.024
4	200.826	194.657
5	209.300	186.183
6	237.584	157.898
7	252.665	142.817
8	280.950	114.533
9	460.100	116.987
10	742.859	123.776
11	1328.328	138.717
12	1356.613	167.001
13	1384.897	195.285
14	1413.181	223.569
15	1441.466	251.854
16	1469.750	280.138
17	1498.034	308.422
18	1526.319	336.707
19	1554.603	364.991
20	1582.887	393.275
21	1611.172	421.559
22	1639.456	449.844
23	1667.740	478.128
24	1671.612	482.000

*** FOS = 0.968 Theta (ki=1.0) = 12.75 ***
Lambda = 0.226
Failure Surface Specified By 24 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	144.729	231.819
2	153.901	226.308
3	167.664	217.024
4	200.826	194.657
5	209.300	186.183
6	237.584	157.898
7	252.665	142.817
8	280.950	114.533
9	460.100	116.987
10	742.859	123.776
11	1328.328	138.717
12	1356.613	167.001
13	1384.897	195.285
14	1413.181	223.569
15	1441.466	251.854
16	1469.750	280.138
17	1498.034	308.422
18	1526.319	336.707
19	1554.603	364.991
20	1582.887	393.275
21	1611.172	421.559
22	1639.456	449.844
23	1667.740	478.128
24	1671.612	482.000

*** FOS = 0.968 Theta (ki=1.0) = 12.75 ***
Lambda = 0.226
Failure Surface Specified By 24 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)

1	144.729	231.819
2	153.901	226.308
3	167.664	217.024
4	200.826	194.657
5	209.300	186.183
6	237.584	157.898
7	252.665	142.817
8	280.950	114.533
9	460.100	116.987
10	742.859	123.776
11	1328.328	138.717
12	1356.613	167.001
13	1384.897	195.285
14	1413.181	223.569
15	1441.466	251.854
16	1469.750	280.138
17	1498.034	308.422
18	1526.319	336.707
19	1554.603	364.991
20	1582.887	393.275
21	1611.172	421.559
22	1639.456	449.844
23	1667.740	478.128
24	1671.612	482.000

*** FOS = 0.968 Theta (ki=1.0) = 12.75 ***
Lambda = 0.226

Failure Surface Specified By 24 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	126.402	230.000
2	133.457	225.761
3	153.908	211.967
4	187.069	189.599
5	192.098	184.570
6	220.382	156.286
7	234.072	142.596
8	262.356	114.312
9	460.100	116.718
10	682.274	122.557
11	1311.809	137.678
12	1340.093	165.962
13	1368.377	194.246
14	1396.661	222.530
15	1424.946	250.815
16	1453.230	279.099
17	1481.514	307.383
18	1509.799	335.668
19	1538.083	363.952
20	1566.367	392.236
21	1594.652	420.520
22	1622.936	448.805
23	1651.220	477.089
24	1660.517	486.386

*** FOS = 0.969 Theta (ki=1.0) = 12.75 ***
Lambda = 0.226

Failure Surface Specified By 24 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	126.402	230.000
2	133.457	225.761
3	153.908	211.967
4	187.069	189.599
5	192.098	184.570
6	220.382	156.286
7	234.072	142.596
8	262.356	114.312
9	460.100	116.718
10	682.274	122.557
11	1311.809	137.678
12	1340.093	165.962

```
      13       1368.377      194.246
      14       1396.661      222.530
      15       1424.946      250.815
      16       1453.230      279.099
      17       1481.514      307.383
      18       1509.799      335.668
      19       1538.083      363.952
      20       1566.367      392.236
      21       1594.652      420.520
      22       1622.936      448.805
      23       1651.220      477.089
      24       1660.517      486.386
   ***  FOS =     0.969   Theta (ki=1.0) =    12.75  ***
                      Lambda =   0.226
             **** END OF GSTABL7 OUTPUT ****
```

***** GSTABL7 *****

** GSTABL7 by Garry H. Gregory, P.E. **

** Original Version 1.0, January 1996; Current Version 2.005, Sept. 2006 **

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SLOPE STABILITY ANALYSIS SYSTEM

Modified Bishop, Simplified Janbu, or GLE Method of Slices.
(Includes Spencer & Morgenstern-Price Type Analysis)
Including Pier/Pile, Reinforcement, Soil Nail, Tieback,
Nonlinear Undrained Shear Strength, Curved Phi Envelope,
Anisotropic Soil, Fiber-Reinforced Soil, Boundary Loads, Water
Surfaces, Pseudo-Static & Newmark Earthquake, and Applied Forces.

****

Analysis Run Date: 2/5/2015
Time of Run: 03:08PM
Run By: SMC
Input Data Filename: K:\13500-13999\13662-00 Euland Hydro Study\2015 Plan Review\SSA\e-7a-15s Surface #1.
Output Filename: K:\13500-13999\13662-00 Euland Hydro Study\2015 Plan Review\SSA\e-7a-15s Surface #1.OUT
Unit System: English
Plotted Output Filename: K:\13500-13999\13662-00 Euland Hydro Study\2015 Plan Review\SSA\e-7a-15s Surface #1.PLT
PROBLEM DESCRIPTION: 13662-00, Euland, Section E-E',
Seismic

BOUNDARY COORDINATES
38 Top Boundaries
83 Total Boundaries

Boundary No.	X-Left (ft)	Y-Left (ft)	X-Right (ft)	Y-Right (ft)	Soil Type Below Bnd
1	0.00	233.00	100.00	233.00	3
2	100.00	233.00	110.00	230.00	5
3	110.00	230.00	140.00	230.00	5
4	140.00	230.00	153.00	235.00	5
5	153.00	235.00	166.00	235.00	5
6	166.00	235.00	260.00	237.00	5
7	260.00	237.00	330.00	239.00	5
8	330.00	239.00	355.00	240.00	5
9	355.00	240.00	370.00	240.00	5
10	370.00	240.00	390.00	243.00	3
11	390.00	243.00	495.00	265.00	2
12	495.00	265.00	667.00	340.00	2
13	667.00	340.00	682.00	345.00	2
14	682.00	345.00	712.00	345.00	2
15	712.00	345.00	850.00	345.00	2
16	850.00	345.00	860.00	346.00	2
17	860.00	346.00	871.00	352.00	5
18	871.00	352.00	875.00	367.00	5
19	875.00	367.00	933.00	391.00	5
20	933.00	391.00	970.00	391.00	5
21	970.00	391.00	1107.00	391.00	2
22	1107.00	391.00	1122.00	384.00	2
23	1122.00	384.00	1197.00	384.00	2
24	1197.00	384.00	1233.00	384.00	5
25	1233.00	384.00	1236.00	387.00	5
26	1236.00	387.00	1268.00	400.00	5
27	1268.00	400.00	1343.00	433.00	5
28	1343.00	433.00	1353.00	433.00	5
29	1353.00	433.00	1450.00	485.00	3
30	1450.00	485.00	1490.00	502.00	4
31	1490.00	502.00	1502.00	507.00	4
32	1502.00	507.00	1540.00	510.00	4
33	1540.00	510.00	1565.00	507.00	4
34	1565.00	507.00	1656.00	490.00	4
35	1656.00	490.00	1666.00	482.00	4
36	1666.00	482.00	1680.00	482.00	4
37	1680.00	482.00	1760.00	473.00	4
38	1760.00	473.00	1780.00	473.00	4
39	100.00	233.00	105.00	225.00	3

40	105.00	225.00	292.00	230.00	3
41	292.00	230.00	333.00	233.00	3
42	333.00	233.00	368.00	235.00	3
43	368.00	235.00	370.00	240.00	3
44	0.00	128.00	100.00	164.00	2
45	100.00	164.00	130.00	175.00	2
46	130.00	175.00	180.00	187.00	2
47	180.00	187.00	248.00	212.00	2
48	248.00	212.00	300.00	219.00	2
49	300.00	219.00	340.00	224.00	2
50	340.00	224.00	380.00	231.00	2
51	380.00	231.00	385.00	235.00	2
52	385.00	235.00	390.00	243.00	2
53	860.00	346.00	861.00	338.00	2
54	861.00	338.00	885.00	338.00	2
55	885.00	338.00	970.00	391.00	2
56	1197.00	384.00	1209.00	375.00	2
57	1209.00	375.00	1210.00	370.00	2
58	1210.00	370.00	1257.00	370.00	2
59	1257.00	370.00	1270.00	370.00	1
60	1270.00	370.00	1330.00	406.00	1
61	1330.00	406.00	1353.00	433.00	3
62	1330.00	406.00	1370.00	412.00	4
63	1370.00	412.00	1400.00	425.00	4
64	1400.00	425.00	1425.00	445.00	4
65	1425.00	445.00	1450.00	485.00	4
66	0.00	128.00	100.00	145.00	6
67	100.00	145.00	260.00	160.00	6
68	260.00	160.00	480.00	195.00	6
69	480.00	195.00	752.00	272.00	6
70	752.00	272.00	920.00	295.00	6
71	920.00	295.00	1255.00	358.00	6
72	0.00	109.00	180.00	111.00	1
73	180.00	111.00	460.00	114.50	1
74	460.00	114.50	570.00	116.00	1
75	570.00	116.00	940.00	123.00	1
76	940.00	123.00	1020.00	128.00	1
77	1020.00	128.00	1070.00	138.00	1
78	1070.00	138.00	1120.00	161.00	1
79	1120.00	161.00	1160.00	190.00	1
80	1160.00	190.00	1200.00	236.00	1
81	1200.00	236.00	1230.00	288.00	1
82	1230.00	288.00	1255.00	358.00	1
83	1255.00	358.00	1257.00	370.00	1

Default Y-Origin = 0.00(ft)
Default X-Plus Value = 0.00(ft)
Default Y-Plus Value = 0.00(ft)

ISOTROPIC SOIL PARAMETERS
6 Type(s) of Soil

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.
1	119.0	125.0	0.0	0.0	0.00	0.0	1
2	119.0	125.0	0.0	0.0	0.00	0.0	1
3	119.0	125.0	450.0	22.0	0.00	0.0	1
4	119.0	125.0	1125.0	31.0	0.00	0.0	1
5	119.0	125.0	450.0	28.0	0.00	0.0	1
6	119.0	125.0	0.0	0.0	0.00	0.0	1

ANISOTROPIC STRENGTH PARAMETERS
3 soil type(s)

Soil Type 1 Is Anisotropic
Number Of Direction Ranges Specified = 3

Direction Range No.	Counterclockwise Direction Limit (deg)	Cohesion Intercept (psf)	Friction Angle (deg)
1	0.0	1125.00	31.00
2	5.0	450.00	17.00
3	90.0	1125.00	31.00

Soil Type 2 Is Anisotropic
Number Of Direction Ranges Specified = 3

Direction Range No.	Counterclockwise Direction Limit (deg)	Cohesion Intercept (psf)	Friction Angle (deg)
1	0.0	525.00	25.00
2	10.0	375.00	14.50
3	90.0	450.00	22.00

Soil Type 6 Is Anisotropic
Number Of Direction Ranges Specified = 3

Direction Range No.	Counterclockwise Direction Limit (deg)	Cohesion Intercept (psf)	Friction Angle (deg)
1	0.0	750.00	31.00
2	10.0	375.00	14.50
3	90.0	450.00	22.00

ANISOTROPIC SOIL NOTES:
(1) An input value of 0.01 for C and/or Phi will cause Aniso C and/or Phi to be ignored in that range.
(2) An input value of 0.02 for Phi will set both Phi and C equal to zero, with no water weight in the tension crack.
(3) An input value of 0.03 for Phi will set both Phi and C equal to zero, with water weight in the tension crack.

1 PIEZOMETRIC SURFACE(S) SPECIFIED
Unit Weight of Water = 62.40 (pcf)
Piezometric Surface No. 1 Specified by 14 Coordinate Points
Pore Pressure Inclination Factor = 0.50

Point No.	X-Water (ft)	Y-Water (ft)
1	0.00	204.00
2	198.00	205.00
3	345.00	210.00
4	436.00	230.00
5	523.00	250.00
6	621.00	270.00
7	742.00	290.00
8	940.00	310.00
9	1063.00	330.00
10	1110.00	340.00
11	1270.00	370.00
12	1460.00	398.00
13	1580.00	410.00
14	1780.00	430.00

Specified Peak Ground Acceleration Coefficient (A) = 0.276(g)
Specified Horizontal Earthquake Coefficient (kh) = 0.150(g)
Specified Vertical Earthquake Coefficient (kv) = 0.000(g)
Specified Seismic Pore-Pressure Factor = 0.000
Trial Failure Surface Specified By 23 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	55.046	233.000
2	71.816	221.689
3	104.977	199.321
4	138.139	176.953
5	164.084	151.008
6	173.915	141.176
7	202.200	112.892
8	460.100	116.081
9	845.672	126.026
10	1313.644	137.904
11	1341.928	166.188
12	1370.213	194.473
13	1398.497	222.757
14	1426.781	251.041
15	1455.066	279.326
16	1483.350	307.610
17	1511.634	335.894
18	1539.918	364.178
19	1568.203	392.463
20	1596.487	420.747
21	1624.771	449.031
22	1653.056	477.315

23	1661.411	485.671	
Theta (deg) (ki=1.0)	FOS (Moment) (Equil.)	FOS (Force) (Equil.)	Lambda
8.50	0.989	1.071	0.149
12.75	0.943	0.941	0.226
12.57	1.012	1.201	0.223
12.75	1.014	1.207	0.226
2.97	0.985	0.949	0.052
1.75	0.985	0.928	0.031
6.19	0.986	1.014	0.108
4.21	0.985	0.972	0.074
4.36	0.985	0.975	0.076
4.86	0.985	0.985	0.085

((Simplified Janbu FS for Specified Surface = 0.962))
Factor Of Safety For The Preceding Specified Surface = 0.985
Theta (ki = 1.0) = 4.86 Deg Lambda = 0.085
Factor Of Safety Is Calculated By GLE (Spencer`s) Method (0-2)
Forces from Reinforcement, Piers/Piles, Applied Forces, and Soil Nails
(if applicable) have been applied to the slice base(s)
on which they intersect.
Selected ki function = Bi-linear
Selected Lambda Coefficient = 1.00
Tension Crack Water Force = 0.00(lbs)
Specified Tension Crack Water Force Factor = 0.000
Depth of Tension Crack (zo) at Center of Last Slice = 4.870(ft)

*** Line of Thrust and Slice Force Data ***

Slice No.	X Coord.	Y Coord.	L/H	Side Force (lbs)	ki	Force Angle (Deg)	Vert. Shear Force(lbs)
1	71.82	228.06	0.563	35254.	1.000	4.86	2998.8
2	97.31	217.80	0.467	156007.	1.000	4.86	13270.4
3	100.00	216.60	0.459	173339.	1.000	4.86	14744.6
4	104.98	214.48	0.471	206469.	1.000	4.86	17562.8
5	105.00	214.47	0.471	206624.	1.000	4.86	17576.0
6	110.00	212.48	0.486	240790.	1.000	4.86	20482.3
7	138.14	201.55	0.464	471463.	1.000	4.86	40103.9
8	140.00	199.71	0.448	511355.	1.000	4.86	43497.2
9	153.00	188.63	0.364	831293.	1.000	4.86	70711.9
10	164.08	180.47	0.351	1153970.	1.000	4.86	98159.7
11	166.00	178.13	0.338	1256988.	1.000	4.86	106922.6
12	173.91	170.10	0.308	1701211.	1.000	4.86	144709.4
13	180.00	164.97	0.298	2063086.	1.000	4.86	175491.4
14	198.00	152.11	0.295	3237945.	1.000	4.86	275427.9
15	202.20	149.34	0.297	3534520.	1.000	4.86	300655.3
16	232.12	151.76	0.313	3546139.	1.000	4.86	301643.6
17	248.00	153.05	0.321	3552220.	1.000	4.86	302160.9
18	260.00	154.02	0.327	3556774.	1.000	4.86	302548.2
19	292.00	156.60	0.344	3568792.	1.000	4.86	303570.6
20	300.00	157.24	0.348	3571773.	1.000	4.86	303824.1
21	330.00	159.66	0.363	3582862.	1.000	4.86	304767.3
22	333.00	159.90	0.364	3583964.	1.000	4.86	304861.1
23	340.00	160.46	0.368	3586535.	1.000	4.86	305079.8
24	345.00	160.86	0.370	3588371.	1.000	4.86	305236.0
25	355.00	161.66	0.374	3592241.	1.000	4.86	305565.2
26	368.00	162.71	0.382	3596793.	1.000	4.86	305952.4
27	370.00	162.87	0.383	3597442.	1.000	4.86	306007.6
28	380.00	163.68	0.384	3600572.	1.000	4.86	306273.9
29	385.00	164.09	0.385	3602078.	1.000	4.86	306401.9
30	390.00	164.49	0.386	3603543.	1.000	4.86	306526.6
31	436.00	168.23	0.383	3615909.	1.000	4.86	307578.5
32	460.10	170.19	0.382	3621694.	1.000	4.86	308070.5
33	480.00	171.90	0.381	3620968.	1.000	4.86	308008.8
34	495.00	173.19	0.380	3620080.	1.000	4.86	307933.2
35	523.00	175.59	0.363	3618557.	1.000	4.86	307803.7
36	621.00	183.90	0.319	3620494.	1.000	4.86	307968.4
37	667.00	187.71	0.303	3626052.	1.000	4.86	308441.2
38	682.00	188.94	0.301	3628676.	1.000	4.86	308664.4
39	712.00	191.41	0.309	3633022.	1.000	4.86	309034.1
40	742.00	193.92	0.318	3635125.	1.000	4.86	309213.0
41	752.00	194.77	0.321	3635156.	1.000	4.86	309215.7

42	845.67	202.88	0.351	3628280.	1.000	4.86	308630.7
43	850.00	203.26	0.352	3627700.	1.000	4.86	308581.4
44	860.00	204.14	0.354	3626306.	1.000	4.86	308462.8
45	861.00	204.23	0.353	3626166.	1.000	4.86	308451.0
46	871.00	205.10	0.348	3625004.	1.000	4.86	308352.1
47	875.00	205.44	0.327	3624924.	1.000	4.86	308345.3
48	885.00	206.28	0.325	3625620.	1.000	4.86	308404.5
49	920.00	209.15	0.315	3630292.	1.000	4.86	308801.9
50	933.00	210.20	0.312	3632913.	1.000	4.86	309024.8
51	940.00	210.76	0.314	3634417.	1.000	4.86	309152.8
52	970.00	213.18	0.321	3640293.	1.000	4.86	309652.6
53	1034.04	218.51	0.337	3645448.	1.000	4.86	310091.2
54	1063.00	220.26	0.342	3674790.	1.000	4.86	312587.1
55	1070.00	220.69	0.343	3681716.	1.000	4.86	313176.1
56	1107.00	223.03	0.350	3715153.	1.000	4.86	316020.4
57	1110.00	223.22	0.352	3717597.	1.000	4.86	316228.3
58	1120.00	223.90	0.361	3724836.	1.000	4.86	316844.1
59	1122.00	224.03	0.363	3726152.	1.000	4.86	316956.0
60	1160.00	226.72	0.371	3748251.	1.000	4.86	318835.8
61	1197.00	229.45	0.379	3765004.	1.000	4.86	320260.8
62	1200.00	229.68	0.380	3766156.	1.000	4.86	320358.9
63	1209.00	230.36	0.382	3769428.	1.000	4.86	320637.2
64	1210.00	230.44	0.383	3769775.	1.000	4.86	320666.7
65	1230.00	231.98	0.388	3775980.	1.000	4.86	321194.5
66	1233.00	232.22	0.388	3776793.	1.000	4.86	321263.7
67	1236.00	232.45	0.384	3777648.	1.000	4.86	321336.3
68	1255.00	233.90	0.377	3783998.	1.000	4.86	321876.5
69	1256.58	234.02	0.377	3784578.	1.000	4.86	321925.8
70	1257.00	234.06	0.377	3784733.	1.000	4.86	321939.0
71	1268.00	234.88	0.373	3789002.	1.000	4.86	322302.2
72	1270.00	235.03	0.372	3789820.	1.000	4.86	322371.8
73	1313.64	238.19	0.355	3810857.	1.000	4.86	324161.2
74	1330.00	249.52	0.349	3442403.	1.000	4.86	292819.6
75	1341.93	257.78	0.344	3185208.	0.994	4.84	267931.0
76	1343.00	258.51	0.343	3162677.	0.991	4.82	264253.8
77	1353.00	265.35	0.344	2957110.	0.960	4.67	231802.1
78	1370.00	276.87	0.333	2623748.	0.907	4.41	183621.8
79	1370.21	277.01	0.333	2619684.	0.906	4.41	183069.6
80	1398.50	296.05	0.312	2104562.	0.818	3.98	119889.1
81	1400.00	297.06	0.311	2078557.	0.814	3.96	117057.7
82	1425.00	313.80	0.290	1666322.	0.736	3.58	76751.1
83	1426.78	315.00	0.289	1638418.	0.730	3.55	74333.2
84	1450.00	330.55	0.267	1292435.	0.658	3.20	47605.2
85	1455.07	333.96	0.263	1221416.	0.642	3.13	42859.0
86	1460.00	337.28	0.259	1153892.	0.627	3.05	38576.4
87	1483.35	353.02	0.237	856324.	0.554	2.70	22375.1
88	1490.00	357.55	0.231	778498.	0.534	2.60	18850.6
89	1502.00	365.78	0.219	645860.	0.496	2.42	13525.9
90	1511.63	372.45	0.213	547388.	0.466	2.27	10119.9
91	1539.92	391.82	0.190	304270.	0.378	1.84	3701.3
92	1540.00	391.87	0.189	303666.	0.378	1.84	3689.0
93	1565.00	408.67	0.165	149121.	0.300	1.46	1142.3
94	1568.20	410.81	0.161	133650.	0.290	1.41	956.9
95	1580.00	418.20	0.139	85409.	0.253	1.23	466.5
96	1586.38	421.72	0.120	65062.	0.234	1.14	301.9
97	1596.49	426.05	0.066	38804.	0.202	0.98	134.8
98	1624.77	504.15	1.178	-4827.	0.114	0.56	-5.3
99	1653.06	509.09	2.401	-4325.	0.026	0.13	-0.2
100	1656.00	554.66	7.638	-1728.	0.017	0.08	0.0
101	1661.41	456.72	0.000	4720.	0.000	0.00	0.0

Table 1 - Individual data on the 101 slices

Slice No.	Width (ft)	Weight (lbs)	Water Force Top (lbs)	Water Force Bot (lbs)	Tie Force Norm (lbs)	Tie Force Tan (lbs)	Earthquake Force Hor (lbs)	Earthquake Force Ver (lbs)	Surcharge Load (lbs)
1	16.8	11286.3	0.0	0.0	0.0	0.0	1692.9	0.0	0.0
2	25.5	60406.0	0.0	0.0	0.0	0.0	9060.9	0.0	0.0
3	2.7	9424.9	0.0	184.8	0.0	0.0	1413.7	0.0	0.0
4	5.0	18615.6	0.0	1317.9	0.0	0.0	2792.3	0.0	0.0
5	0.0	88.8	0.0	9.0	0.0	0.0	13.3	0.0	0.0

6	5.0	19920.5	0.0	2605.6	0.0	0.0	2988.1	0.0	0.0
7	28.1	148922.5	0.0	38511.8	0.0	0.0	22338.4	0.0	0.0
8	1.9	12274.0	0.0	4709.9	0.0	0.0	1841.1	0.0	0.0
9	13.0	101685.2	0.0	41468.7	0.0	0.0	15252.8	0.0	0.0
10	11.1	106685.2	0.0	47195.4	0.0	0.0	16002.8	0.0	0.0
11	1.9	19997.6	0.0	9262.7	0.0	0.0	2999.6	0.0	0.0
12	7.9	87559.0	0.0	41717.5	0.0	0.0	13133.9	0.0	0.0
13	6.1	72748.7	0.0	35848.0	0.0	0.0	10912.3	0.0	0.0
14	18.0	242847.2	0.0	*******	0.0	0.0	36427.1	0.0	0.0
15	4.2	62611.3	0.0	33366.9	0.0	0.0	9391.7	0.0	0.0
16	29.9	454534.0	0.0	*******	0.0	0.0	68180.1	0.0	0.0
17	15.9	241761.2	0.0	92199.6	0.0	0.0	36264.2	0.0	0.0
18	12.0	182848.2	0.0	69882.1	0.0	0.0	27427.2	0.0	0.0
19	32.0	488877.5	0.0	*******	0.0	0.0	73331.6	0.0	0.0
20	8.0	122548.7	0.0	47041.7	0.0	0.0	18382.3	0.0	0.0
21	30.0	460730.9	0.0	*******	0.0	0.0	69109.6	0.0	0.0
22	3.0	46181.1	0.0	17784.4	0.0	0.0	6927.2	0.0	0.0
23	7.0	107875.6	0.0	41544.3	0.0	0.0	16181.3	0.0	0.0
24	5.0	77156.5	0.0	29715.0	0.0	0.0	11573.5	0.0	0.0
25	10.0	154495.2	0.0	58759.6	0.0	0.0	23174.3	0.0	0.0
26	13.0	201115.0	0.0	78278.0	0.0	0.0	30167.2	0.0	0.0
27	2.0	30936.9	0.0	12232.5	0.0	0.0	4640.5	0.0	0.0
28	10.0	155561.8	0.0	61921.0	0.0	0.0	23334.3	0.0	0.0
29	5.0	78440.7	0.0	31434.7	0.0	0.0	11766.1	0.0	0.0
30	5.0	78880.6	0.0	31750.8	0.0	0.0	11832.1	0.0	0.0
31	46.0	753833.4	0.0	*******	0.0	0.0	*******	0.0	0.0
32	24.1	415771.1	0.0	*******	0.0	0.0	62365.7	0.0	0.0
33	19.9	353809.5	0.0	*******	0.0	0.0	53071.4	0.0	0.0
34	15.0	272726.1	0.0	*******	0.0	0.0	40908.9	0.0	0.0
35	28.0	533536.2	0.0	*******	0.0	0.0	80030.4	0.0	0.0
36	98.0	2175862.2	0.0	*******	0.0	0.0	*******	0.0	0.0
37	46.0	1186528.9	0.0	*******	0.0	0.0	*******	0.0	0.0
38	15.0	408249.6	0.0	*******	0.0	0.0	61237.4	0.0	0.0
39	30.0	823909.9	0.0	*******	0.0	0.0	*******	0.0	0.0
40	30.0	821890.8	0.0	*******	0.0	0.0	*******	0.0	0.0
41	10.0	273578.5	0.0	*******	0.0	0.0	41036.8	0.0	0.0
42	93.7	2549941.2	0.0	*******	0.0	0.0	*******	0.0	0.0
43	4.3	117261.8	0.0	46933.3	0.0	0.0	17589.3	0.0	0.0
44	10.0	271348.3	0.0	*******	0.0	0.0	40702.2	0.0	0.0
45	1.0	27212.7	0.0	10903.6	0.0	0.0	4081.9	0.0	0.0
46	10.0	275555.3	0.0	*******	0.0	0.0	41333.3	0.0	0.0
47	4.0	115018.4	0.0	43849.2	0.0	0.0	17252.8	0.0	0.0
48	10.0	298753.2	0.0	*******	0.0	0.0	44813.0	0.0	0.0
49	35.0	1082390.6	0.0	*******	0.0	0.0	*******	0.0	0.0
50	13.0	416592.6	0.0	*******	0.0	0.0	62488.9	0.0	0.0
51	7.0	226379.8	0.0	78823.9	0.0	0.0	33957.0	0.0	0.0
52	30.0	968679.8	0.0	*******	0.0	0.0	*******	0.0	0.0
53	64.0	2061001.1	0.0	*******	0.0	0.0	*******	0.0	0.0
54	29.0	929279.1	0.0	*******	0.0	0.0	*******	0.0	0.0
55	7.0	224236.1	0.0	85116.9	0.0	0.0	33635.4	0.0	0.0
56	37.0	1183684.4	0.0	*******	0.0	0.0	*******	0.0	0.0
57	3.0	95609.3	0.0	37920.5	0.0	0.0	14341.4	0.0	0.0
58	10.0	315014.1	0.0	*******	0.0	0.0	47252.1	0.0	0.0
59	2.0	62311.6	0.0	25654.4	0.0	0.0	9346.7	0.0	0.0
60	38.0	1180242.0	0.0	*******	0.0	0.0	*******	0.0	0.0
61	37.0	1146318.9	0.0	*******	0.0	0.0	*******	0.0	0.0
62	3.0	92820.9	0.0	40794.5	0.0	0.0	13923.1	0.0	0.0
63	9.0	278351.3	0.0	*******	0.0	0.0	41752.7	0.0	0.0
64	1.0	30917.6	0.0	13707.6	0.0	0.0	4637.6	0.0	0.0
65	20.0	617918.5	0.0	*******	0.0	0.0	92687.8	0.0	0.0
66	3.0	92616.5	0.0	41779.3	0.0	0.0	13892.5	0.0	0.0
67	3.0	93133.5	0.0	41868.8	0.0	0.0	13970.0	0.0	0.0
68	19.0	601531.5	0.0	*******	0.0	0.0	90229.7	0.0	0.0
69	1.6	50796.7	0.0	22395.3	0.0	0.0	7619.5	0.0	0.0
70	0.4	13494.3	0.0	5945.0	0.0	0.0	2024.1	0.0	0.0
71	11.0	356909.3	0.0	*******	0.0	0.0	53536.4	0.0	0.0
72	2.0	65502.3	0.0	28598.9	0.0	0.0	9825.3	0.0	0.0
73	43.6	1479655.8	0.0	*******	0.0	0.0	*******	0.0	0.0
74	16.4	562791.1	0.0	*******	0.0	0.0	84418.7	0.0	0.0
75	11.9	398338.0	0.0	*******	0.0	0.0	59750.7	0.0	0.0

76	1.1	35296.4	0.0	20023.3	0.0	0.0	5294.5	0.0	0.0
77	10.0	322701.4	0.0	*******	0.0	0.0	48405.2	0.0	0.0
78	17.0	529338.3	0.0	*******	0.0	0.0	79400.8	0.0	0.0
79	0.2	6522.2	0.0	3540.8	0.0	0.0	978.3	0.0	0.0
80	28.3	841733.6	0.0	*******	0.0	0.0	*******	0.0	0.0
81	1.5	43381.9	0.0	21723.7	0.0	0.0	6507.3	0.0	0.0
82	25.0	701597.1	0.0	*******	0.0	0.0	*******	0.0	0.0
83	1.8	48541.3	0.0	22207.2	0.0	0.0	7281.2	0.0	0.0
84	23.2	615388.8	0.0	*******	0.0	0.0	92308.3	0.0	0.0
85	5.1	129780.4	0.0	53124.4	0.0	0.0	19467.1	0.0	0.0
86	4.9	124584.0	0.0	49903.0	0.0	0.0	18687.6	0.0	0.0
87	23.4	565335.8	0.0	*******	0.0	0.0	84800.4	0.0	0.0
88	6.6	153641.4	0.0	52397.4	0.0	0.0	23046.2	0.0	0.0
89	12.0	268922.3	0.0	85709.8	0.0	0.0	40338.4	0.0	0.0
90	9.6	206241.5	0.0	60575.1	0.0	0.0	30936.2	0.0	0.0
91	28.3	543837.8	0.0	*******	0.0	0.0	81575.7	0.0	0.0
92	0.1	1441.4	0.0	300.5	0.0	0.0	216.2	0.0	0.0
93	25.0	396477.5	0.0	66933.4	0.0	0.0	59471.6	0.0	0.0
94	3.2	44493.3	0.0	5006.0	0.0	0.0	6674.0	0.0	0.0
95	11.8	150902.5	0.0	11445.2	0.0	0.0	22635.4	0.0	0.0
96	6.4	73084.2	0.0	1607.3	0.0	0.0	10962.6	0.0	0.0
97	10.1	103902.8	0.0	0.0	0.0	0.0	15585.4	0.0	0.0
98	28.3	214020.1	0.0	0.0	0.0	0.0	32103.0	0.0	0.0
99	28.3	101041.9	0.0	0.0	0.0	0.0	15156.3	0.0	0.0
100	2.9	4024.5	0.0	0.0	0.0	0.0	603.7	0.0	0.0
101	5.4	3136.0	0.0	0.0	0.0	0.0	470.4	0.0	0.0

- TABLE 2 - Base Stress Data on the 101 Slices -

Slice No. *	Alpha (deg)	X-Coord. Slice Cntr (ft)	Base Leng. (ft)	Total Normal Stress (psf)	Total Vert. Stress (psf)	Mobilized Shear Stress (psf)
1	-34.00	63.43	20.23	1602.86	557.95	1114.47
2	-34.00	84.56	30.75	4256.82	1964.19	2203.23
3	-34.00	98.66	3.24	6006.98	2906.49	2897.82
4	-34.00	102.49	6.00	6293.49	3100.84	2948.69
5	-34.00	104.99	0.03	6431.43	3201.69	2961.79
6	-34.00	107.50	6.03	6569.85	3302.97	2974.88
7	-34.00	124.07	33.94	8269.71	4387.59	3383.99
8	-45.00	139.07	2.63	15380.05	4663.65	6967.83
9	-45.00	146.50	18.38	17801.58	5530.94	7893.73
10	-45.00	158.54	15.68	21271.60	6805.94	9179.13
11	-45.00	165.04	2.71	35068.08	7380.24	20070.91
12	-45.00	169.96	11.19	36699.68	7821.92	20878.25
13	-45.00	176.96	8.61	39022.86	8453.89	22027.78
14	-45.00	189.00	25.46	43041.52	9540.11	24018.81
15	-45.00	200.10	5.94	46744.20	10541.35	25852.73
16	0.71	217.16	29.92	15191.13	15192.34	2853.82
17	0.71	240.06	15.88	15217.93	15219.59	2852.74
18	0.71	254.00	12.00	15234.25	15236.18	2852.08
19	0.71	276.00	32.00	15273.96	15276.26	2854.71
20	0.71	296.00	8.00	15314.82	15317.42	2858.35
21	0.71	315.00	30.00	15353.64	15356.52	2861.81
22	0.71	331.50	3.00	15389.41	15392.52	2865.35
23	0.71	336.50	7.00	15406.46	15409.62	2868.06
24	0.71	342.50	5.00	15426.92	15430.12	2871.30
25	0.71	350.00	10.00	15446.54	15448.34	2894.06
26	0.71	361.50	13.00	15464.69	15469.20	2860.64
27	0.71	369.00	2.00	15460.92	15467.28	2834.75
28	0.71	375.00	10.00	15547.63	15554.99	2837.59
29	0.71	382.50	5.00	15678.45	15686.94	2847.04
30	0.71	387.50	5.00	15765.67	15774.90	2853.34
31	0.71	413.00	46.00	16374.26	16386.43	2928.49
32	0.71	448.05	24.10	17234.66	17250.59	3040.03
33	1.48	470.05	19.91	17696.67	17773.47	3087.04
34	1.48	487.50	15.00	18095.86	18175.69	3134.98
35	1.48	509.00	28.01	18965.32	19048.53	3293.19
36	1.48	572.00	98.03	22103.24	22195.29	3920.19
37	1.48	644.00	46.02	25684.36	25785.53	4651.98
38	1.48	674.50	15.00	27103.64	27207.59	4955.89
39	1.48	697.00	30.01	27347.77	27454.53	4969.25
40	1.48	727.00	30.01	27276.36	27387.25	4882.83

41	1.48	747.00	10.00	27234.07	27348.76	4809.25
42	1.48	798.84	93.70	27094.34	27212.97	4708.99
43	1.45	847.84	4.33	26965.25	27085.01	4614.99
44	1.45	855.00	10.00	27005.84	27126.10	4616.82
45	1.45	860.50	1.00	27083.31	27203.90	4630.38
46	1.45	866.00	10.00	27426.04	27546.66	4713.59
47	1.45	873.00	4.00	28625.49	28745.33	5019.93
48	1.45	880.00	10.00	29746.55	29865.70	5305.69
49	1.45	902.50	35.01	30795.80	30915.49	5553.47
50	1.45	926.50	13.00	31915.00	32035.27	5817.77
51	1.45	936.50	7.00	32208.86	32329.55	5882.61
52	1.45	955.00	30.01	32157.32	32278.93	5854.76
53	1.45	1002.02	64.06	32047.12	32175.16	5721.47
54	1.45	1048.52	28.97	32000.34	32072.54	6634.02
55	1.45	1066.50	7.00	31950.01	32023.41	6601.70
56	1.45	1088.50	37.01	31902.86	31981.17	6508.94
57	1.45	1108.50	3.00	31776.39	31859.50	6398.66
58	1.45	1115.00	10.00	31404.29	31491.26	6243.62
59	1.45	1121.00	2.00	31056.31	31145.79	6117.07
60	1.45	1141.00	38.01	30955.39	31049.00	6024.00
61	1.45	1178.50	37.01	30870.67	30971.62	5881.94
62	1.45	1198.50	3.00	30825.49	30930.34	5806.17
63	1.45	1204.50	9.00	30811.94	30917.96	5783.45
64	1.45	1209.50	1.00	30800.64	30907.64	5764.50
65	1.45	1220.00	20.01	30776.92	30885.98	5724.73
66	1.45	1231.50	3.00	30750.94	30862.24	5681.16
67	1.45	1234.50	3.00	30923.32	31034.50	5725.41
68	1.45	1245.50	19.01	31538.57	31649.36	5882.45
69	1.45	1255.79	1.58	32014.62	32125.43	5998.46
70	1.45	1256.79	0.42	32060.88	32171.70	6009.73
71	1.45	1262.50	11.00	32325.02	32435.85	6074.10
72	1.45	1269.00	2.00	32629.76	32740.59	6148.64
73	1.45	1291.82	43.66	33780.63	33891.89	6423.10
74	45.00	1321.82	23.13	24892.24	24330.81	7607.37
75	45.00	1335.96	16.87	23953.43	23613.80	7488.77
76	45.00	1342.46	1.52	23132.27	23284.19	7196.53
77	45.00	1348.00	14.14	22673.73	22818.40	7094.56
78	45.00	1361.50	24.04	21836.25	22017.54	7017.17
79	45.00	1370.11	0.30	21422.22	21650.77	7040.97
80	45.00	1384.35	40.00	20730.68	21043.57	7076.65
81	45.00	1399.25	2.13	20003.32	20408.86	7111.19
82	45.00	1412.50	35.36	19349.26	19844.14	7137.72
83	45.00	1425.89	2.52	18684.54	19273.50	7162.20
84	45.00	1438.39	32.84	18057.93	18740.89	7181.34
85	45.00	1452.53	7.16	17324.40	18114.53	7188.00
86	45.00	1457.53	6.98	17030.36	17854.67	7169.18
87	45.00	1471.68	33.02	16194.74	17119.97	7112.06
88	45.00	1486.68	9.40	15281.45	16337.20	7066.26
89	45.00	1496.00	16.97	14705.66	15846.39	7032.90
90	45.00	1506.82	13.62	13913.57	15137.45	6918.43
91	45.00	1525.78	40.00	12254.25	13596.05	6552.47
92	45.00	1539.96	0.12	11005.32	12442.93	6274.04
93	45.00	1552.50	35.36	9709.82	11214.07	5911.22
94	45.00	1566.60	4.53	8238.29	9822.51	5494.22
95	45.00	1574.10	16.68	7418.40	9045.01	5249.71
96	45.00	1583.19	9.02	6421.85	8102.98	4951.53
97	45.00	1591.43	14.30	5635.57	7267.62	4580.55
98	45.00	1610.63	40.00	3974.48	5350.56	3567.12
99	45.00	1638.91	40.00	1510.07	2526.02	2063.59
100	45.00	1654.53	4.16	140.97	966.57	1228.30
101	45.00	1658.71	7.65	0.00	409.77	929.18

*** SEISMIC SLOPE DISPLACEMENT DATA ***
(Note: kv is set = zero for displacement calculations)
Seismic Yield Coefficient (ky) = 0.1439(g)
Calculated Newmark Seismic Displacement = 0.099(ft)
Non-Symmetrical Sliding Resistance Has Been Specified
for Downhill Sliding.

**** END OF GSTABL7 OUTPUT ****

Sliding displacement models from Rathje and Antonakos (2011)

Prediction of dynamic response and sliding displacement of a sliding mass during earthquake shaking

Cross Section: E-E'

File: e-7as-15

Inputs	
PGA (g)	0.2763
PGV (cm/s)	23.32
k_y (g)	0.1439
T_m (s)	0.517
T_s (s)	0.39
M	6.95
T_s/T_m	0.762846

Dynamic Response			
	median	-1σ	+1σ
kmax (g)	0.201	0.157	0.259
k-velmax (cm/s)	25.10	19.55	32.23

Displacement Given Median Dynamic Response					
Displacement Model			Sliding Displacements, D (cm)		
	μ_{lnD}	σ_{lnD}	median	-1σ	+1σ
[kmax, M]	0.28	0.924	1.32	0.53	3.34
[kmax, k-velmax]	-0.52	0.603	0.60	0.33	1.09
			Sliding Displacements, D (in)		
	μ_{lnD}	σ_{lnD}	median	-1σ	+1σ
[kmax, M]	0.28	0.924	0.52	0.21	1.31
[kmax, k-velmax]	-0.52	0.603	0.24	0.13	0.43

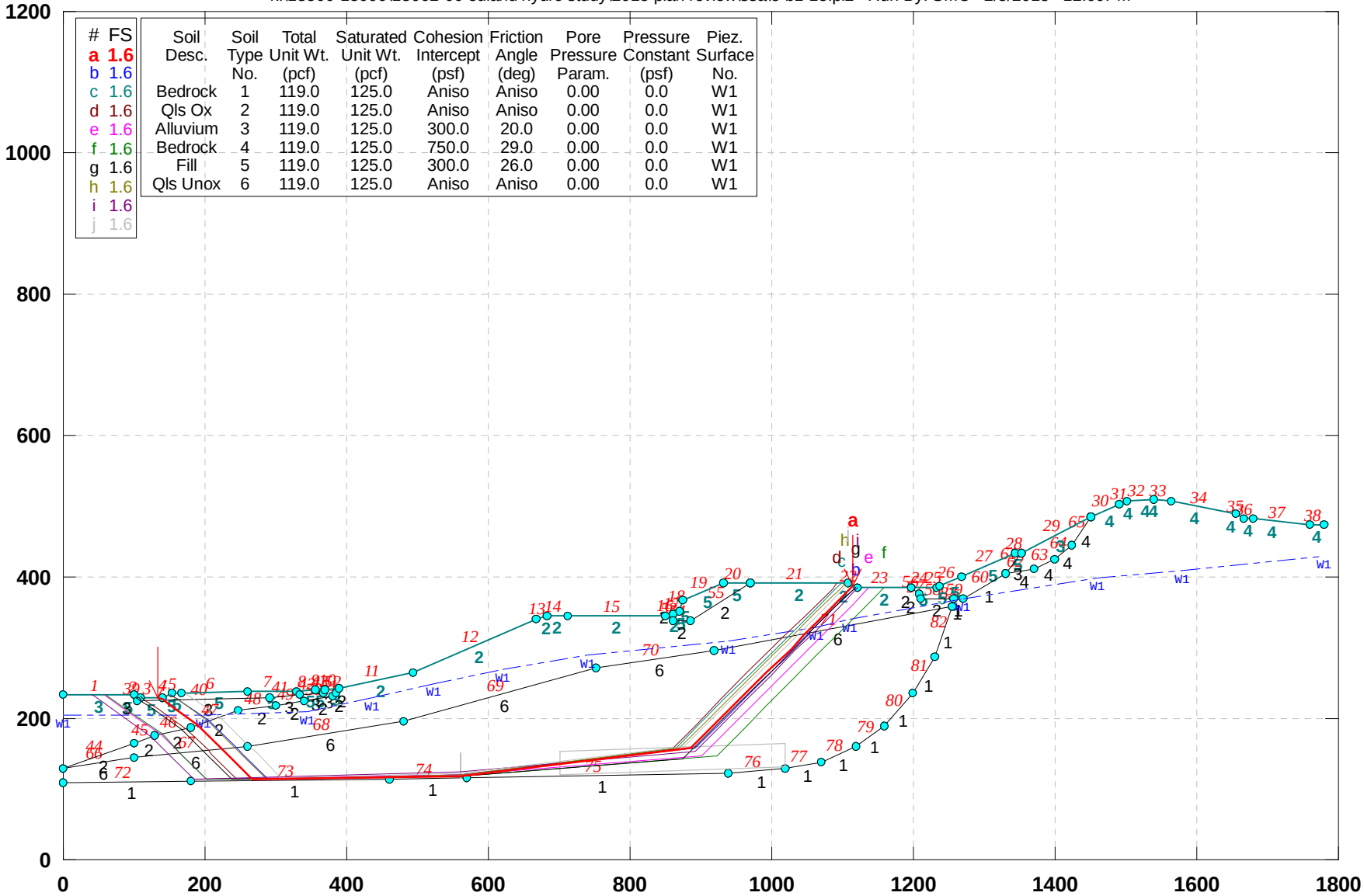
PGA Peak Ground Acceleration (g)
PGV Peak Ground Velocity (cm/s)
k_y Critical or Yield Acceleration (g)
T_m Mean Period of an Earthquake Motion (s)
T_s Site Period or the Natural Period of a Sliding Mass (s). For rigid sliding set T_s= 0 s
M Earthquake Magnitude
kmax maximum seismic coefficient (g)
k-velmax the maximum velocity of the seismic coefficient-time history (cm/s)
D Predicted Sliding Displacment (cm)

H_{avr} = 208 ft
V_s = 2110 ft/s
$T_s = 4\ H_{avr}/V_s$ = 0.39 s

Reference: Rathje, E.M. and Antonakos, G. 2011. "A Unified Model for Predicting Earthquake-Induced Sliding Displacements of Rigid and Flexible Slopes," Engineering Geology, 122, 51-60, doi:10.1016/j.enggeo.2010.12.004.

13662-00, Euland, Section E-E', Static

k:\13500-13999\13662-00 euland hydro study\2015 plan review\ssa\e-b1-15.pl2 Run By: SMC 2/5/2015 12:09PM



#	FS
a	1.6
b	1.6
c	1.6
d	1.6
e	1.6
f	1.6
g	1.6
h	1.6
i	1.6
j	1.6

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.
Bedrock	1	119.0	125.0	Aniso	Aniso	0.00	0.0	W1
Qls Ox	2	119.0	125.0	Aniso	Aniso	0.00	0.0	W1
Alluvium	3	119.0	125.0	300.0	20.0	0.00	0.0	W1
Bedrock	4	119.0	125.0	750.0	29.0	0.00	0.0	W1
Fill	5	119.0	125.0	300.0	26.0	0.00	0.0	W1
Qls Unox	6	119.0	125.0	Aniso	Aniso	0.00	0.0	W1

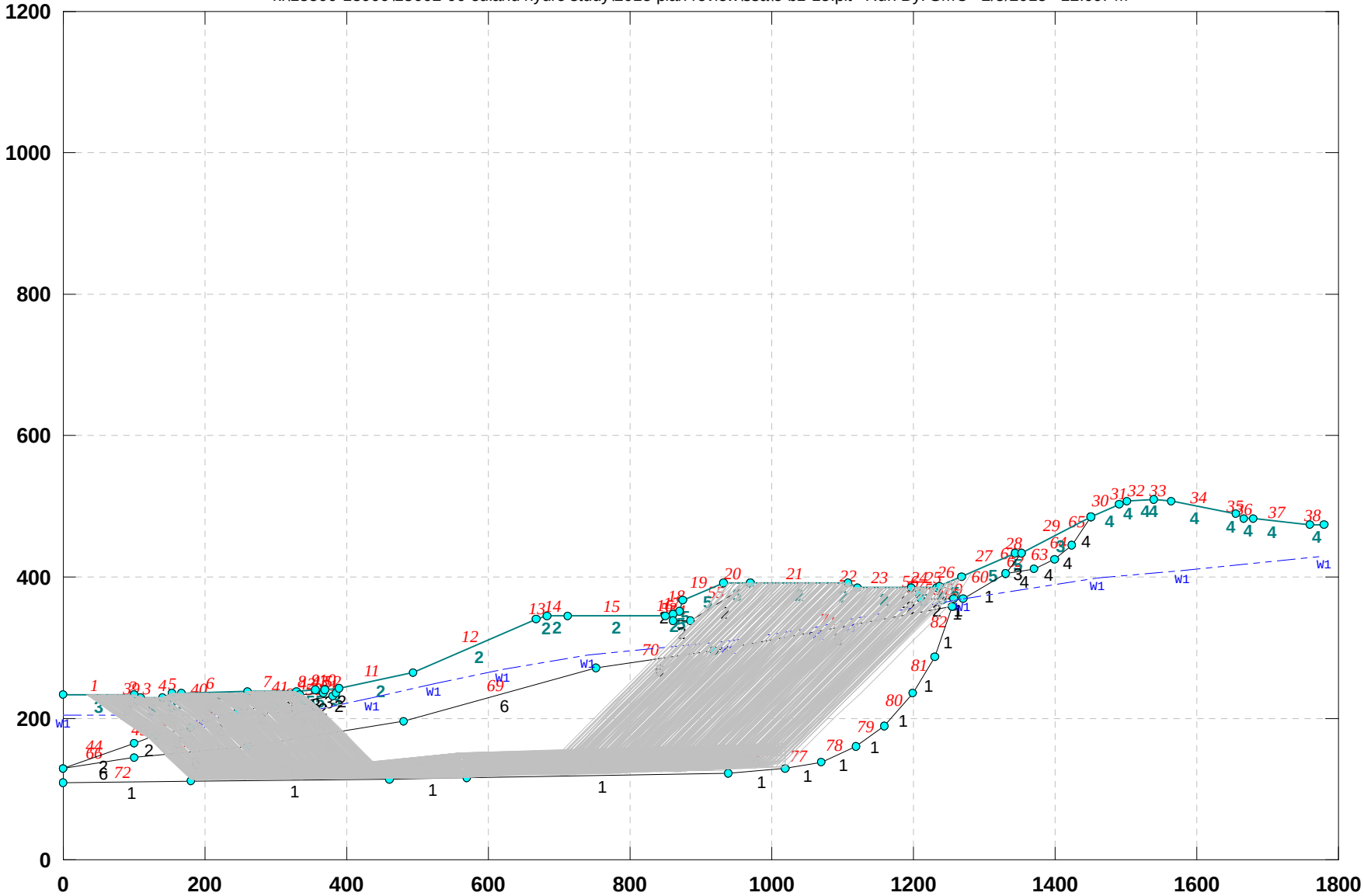
GSTABL7 v.2 FSmin=1.6

Safety Factors Are Calculated By GLE (Spencer`s) Method (0-2)

Figure E-15.1

13662-00, Euland, Section E-E', Static

k:\13500-13999\13662-00 euland hydro study\2015 plan review\ssa\e-b1-15.plt Run By: SMC 2/5/2015 12:09PM



***** GSTABL7 *****

** GSTABL7 by Garry H. Gregory, P.E. **

** Original Version 1.0, January 1996; Current Version 2.005, Sept. 2006 **

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SLOPE STABILITY ANALYSIS SYSTEM

Modified Bishop, Simplified Janbu, or GLE Method of Slices.
(Includes Spencer & Morgenstern-Price Type Analysis)
Including Pier/Pile, Reinforcement, Soil Nail, Tieback,
Nonlinear Undrained Shear Strength, Curved Phi Envelope,
Anisotropic Soil, Fiber-Reinforced Soil, Boundary Loads, Water
Surfaces, Pseudo-Static & Newmark Earthquake, and Applied Forces.

****

Analysis Run Date: 2/5/2015
Time of Run: 12:09PM
Run By: SMC
Input Data Filename: K:\13500-13999\13662-00 Euland Hydro Study\2015 Plan Review\SSA\e-b1-15.
Output Filename: K:\13500-13999\13662-00 Euland Hydro Study\2015 Plan Review\SSA\e-b1-15.OUT
Unit System: English
Plotted Output Filename: K:\13500-13999\13662-00 Euland Hydro Study\2015 Plan Review\SSA\e-b1-15.PLT
PROBLEM DESCRIPTION: 13662-00, Euland, Section E-E',
Static

BOUNDARY COORDINATES
38 Top Boundaries
83 Total Boundaries

Boundary No.	X-Left (ft)	Y-Left (ft)	X-Right (ft)	Y-Right (ft)	Soil Type Below Bnd
1	0.00	233.00	100.00	233.00	3
2	100.00	233.00	110.00	230.00	5
3	110.00	230.00	140.00	230.00	5
4	140.00	230.00	153.00	235.00	5
5	153.00	235.00	166.00	235.00	5
6	166.00	235.00	260.00	237.00	5
7	260.00	237.00	330.00	239.00	5
8	330.00	239.00	355.00	240.00	5
9	355.00	240.00	370.00	240.00	5
10	370.00	240.00	390.00	243.00	3
11	390.00	243.00	495.00	265.00	2
12	495.00	265.00	667.00	340.00	2
13	667.00	340.00	682.00	345.00	2
14	682.00	345.00	712.00	345.00	2
15	712.00	345.00	850.00	345.00	2
16	850.00	345.00	860.00	346.00	2
17	860.00	346.00	871.00	352.00	5
18	871.00	352.00	875.00	367.00	5
19	875.00	367.00	933.00	391.00	5
20	933.00	391.00	970.00	391.00	5
21	970.00	391.00	1107.00	391.00	2
22	1107.00	391.00	1122.00	384.00	2
23	1122.00	384.00	1197.00	384.00	2
24	1197.00	384.00	1233.00	384.00	5
25	1233.00	384.00	1236.00	387.00	5
26	1236.00	387.00	1268.00	400.00	5
27	1268.00	400.00	1343.00	433.00	5
28	1343.00	433.00	1353.00	433.00	5
29	1353.00	433.00	1450.00	485.00	3
30	1450.00	485.00	1490.00	502.00	4
31	1490.00	502.00	1502.00	507.00	4
32	1502.00	507.00	1540.00	510.00	4
33	1540.00	510.00	1565.00	507.00	4
34	1565.00	507.00	1656.00	490.00	4
35	1656.00	490.00	1666.00	482.00	4
36	1666.00	482.00	1680.00	482.00	4
37	1680.00	482.00	1760.00	473.00	4
38	1760.00	473.00	1780.00	473.00	4
39	100.00	233.00	105.00	225.00	3

40	105.00	225.00	292.00	230.00	3
41	292.00	230.00	333.00	233.00	3
42	333.00	233.00	368.00	235.00	3
43	368.00	235.00	370.00	240.00	3
44	0.00	128.00	100.00	164.00	2
45	100.00	164.00	130.00	175.00	2
46	130.00	175.00	180.00	187.00	2
47	180.00	187.00	248.00	212.00	2
48	248.00	212.00	300.00	219.00	2
49	300.00	219.00	340.00	224.00	2
50	340.00	224.00	380.00	231.00	2
51	380.00	231.00	385.00	235.00	2
52	385.00	235.00	390.00	243.00	2
53	860.00	346.00	861.00	338.00	2
54	861.00	338.00	885.00	338.00	2
55	885.00	338.00	970.00	391.00	2
56	1197.00	384.00	1209.00	375.00	2
57	1209.00	375.00	1210.00	370.00	2
58	1210.00	370.00	1257.00	370.00	2
59	1257.00	370.00	1270.00	370.00	1
60	1270.00	370.00	1330.00	406.00	1
61	1330.00	406.00	1353.00	433.00	3
62	1330.00	406.00	1370.00	412.00	4
63	1370.00	412.00	1400.00	425.00	4
64	1400.00	425.00	1425.00	445.00	4
65	1425.00	445.00	1450.00	485.00	4
66	0.00	128.00	100.00	145.00	6
67	100.00	145.00	260.00	160.00	6
68	260.00	160.00	480.00	195.00	6
69	480.00	195.00	752.00	272.00	6
70	752.00	272.00	920.00	295.00	6
71	920.00	295.00	1255.00	358.00	6
72	0.00	109.00	180.00	111.00	1
73	180.00	111.00	460.00	114.50	1
74	460.00	114.50	570.00	116.00	1
75	570.00	116.00	940.00	123.00	1
76	940.00	123.00	1020.00	128.00	1
77	1020.00	128.00	1070.00	138.00	1
78	1070.00	138.00	1120.00	161.00	1
79	1120.00	161.00	1160.00	190.00	1
80	1160.00	190.00	1200.00	236.00	1
81	1200.00	236.00	1230.00	288.00	1
82	1230.00	288.00	1255.00	358.00	1
83	1255.00	358.00	1257.00	370.00	1

Default Y-Origin = 0.00(ft)
Default X-Plus Value = 0.00(ft)
Default Y-Plus Value = 0.00(ft)

ISOTROPIC SOIL PARAMETERS
6 Type(s) of Soil

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.
1	119.0	125.0	0.0	0.0	0.00	0.0	1
2	119.0	125.0	0.0	0.0	0.00	0.0	1
3	119.0	125.0	300.0	20.0	0.00	0.0	1
4	119.0	125.0	750.0	29.0	0.00	0.0	1
5	119.0	125.0	300.0	26.0	0.00	0.0	1
6	119.0	125.0	0.0	0.0	0.00	0.0	1

ANISOTROPIC STRENGTH PARAMETERS
3 soil type(s)

Soil Type 1 Is Anisotropic
Number Of Direction Ranges Specified = 3

Direction Range No.	Counterclockwise Direction Limit (deg)	Cohesion Intercept (psf)	Friction Angle (deg)
1	0.0	750.00	29.00
2	5.0	300.00	15.00
3	90.0	750.00	29.00

Soil Type 2 Is Anisotropic
Number Of Direction Ranges Specified = 3

Direction Range No.	Counterclockwise Direction Limit (deg)	Cohesion Intercept (psf)	Friction Angle (deg)
1	0.0	350.00	23.00
2	10.0	250.00	12.50
3	90.0	300.00	20.00

Soil Type 6 Is Anisotropic
Number Of Direction Ranges Specified = 3

Direction Range No.	Counterclockwise Direction Limit (deg)	Cohesion Intercept (psf)	Friction Angle (deg)
1	0.0	500.00	29.00
2	10.0	250.00	12.50
3	90.0	300.00	20.00

ANISOTROPIC SOIL NOTES:
(1) An input value of 0.01 for C and/or Phi will cause Aniso C and/or Phi to be ignored in that range.
(2) An input value of 0.02 for Phi will set both Phi and C equal to zero, with no water weight in the tension crack.
(3) An input value of 0.03 for Phi will set both Phi and C equal to zero, with water weight in the tension crack.

1 PIEZOMETRIC SURFACE(S) SPECIFIED
Unit Weight of Water = 62.40 (pcf)
Piezometric Surface No. 1 Specified by 14 Coordinate Points
Pore Pressure Inclination Factor = 0.50

Point No.	X-Water (ft)	Y-Water (ft)
1	0.00	204.00
2	198.00	205.00
3	345.00	210.00
4	436.00	230.00
5	523.00	250.00
6	621.00	270.00
7	742.00	290.00
8	940.00	310.00
9	1063.00	330.00
10	1110.00	340.00
11	1270.00	370.00
12	1460.00	398.00
13	1580.00	410.00
14	1780.00	430.00

Janbus Empirical Coef is being used for the case of c & phi both > 0
A Critical Failure Surface Searching Method, Using A Random Technique For Generating Sliding Block Surfaces, Has Been Specified.
The Active And Passive Portions Of The Sliding Surfaces Are Generated According To The Rankine Theory.
1000 Trial Surfaces Have Been Generated.
3 Boxes Specified For Generation Of Central Block Base
Length Of Line Segments For Active And Passive Portions Of Sliding Block Is 50.0

Box No.	X-Left (ft)	Y-Left (ft)	X-Right (ft)	Y-Right (ft)	Height (ft)
1	180.00	113.00	460.00	116.50	1.00
2	560.00	134.00	560.00	134.00	35.00
3	700.00	137.00	1020.00	148.00	35.00

Following Are Displayed The Ten Most Critical Of The Trial Failure Surfaces Evaluated. They Are Ordered - Most Critical First.
* * Safety Factors Are Calculated By GLE (Spencer`s) Method (0-2) * *
Selected ki function = Bi-linear
Selected Lambda Coefficient = 1.00
Forces from Reinforcement, Piers/Piles, Soil Nails, and Applied Forces (if applicable) have been applied to the slice base(s) on which they intersect.
Specified Tension Crack Water Force Factor = 0.000
Total Number of Trial Surfaces Attempted = 1000
Number of Trial Surfaces With Valid FS = 1000
Statistical Data On All Valid FS Values:
FS Max = 3.248 FS Min = 1.620 FS Ave = 1.998

Standard Deviation = 0.425 Coefficient of Variation = 21.28 %
((Simplified Janbu FS for Critical Surface = 1.442))

Failure Surface Specified By 16 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	133.437	230.000
2	139.943	225.934
3	149.237	219.427
4	190.195	190.748
5	224.290	156.652
6	231.923	149.020
7	267.278	113.665
8	560.000	117.352
9	885.684	157.685
10	921.039	193.040
11	956.394	228.396
12	991.750	263.751
13	1027.105	299.106
14	1046.855	318.856
15	1082.210	354.212
16	1115.181	387.182

*** FOS = 1.620 Theta (ki=1.0) = 6.69 ***
Lambda = 0.117

Individual data on the 57 slices

Slice No.	Width (ft)	Weight (lbs)	Water Force Top (lbs)	Water Force Bot (lbs)	Tie Force Norm (lbs)	Tie Force Tan (lbs)	Earthquake Force Hor (lbs)	Earthquake Force Ver (lbs)	Surcharge Load (lbs)
1	6.5	1574.0	0.0	0.0	0.	0.	0.0	0.0	0.0
2	0.1	27.6	0.0	0.0	0.	0.	0.0	0.0	0.0
3	9.2	10019.9	0.0	0.0	0.	0.	0.0	0.0	0.0
4	3.8	7239.7	0.0	0.0	0.	0.	0.0	0.0	0.0
5	13.0	35209.0	0.0	0.0	0.	0.	0.0	0.0	0.0
6	4.0	13838.4	0.0	0.0	0.	0.	0.0	0.0	0.0
7	20.2	90781.9	0.0	10909.0	0.	0.	0.0	0.0	0.0
8	7.8	46133.4	0.0	12491.5	0.	0.	0.0	0.0	0.0
9	26.3	212614.6	0.0	82661.0	0.	0.	0.0	0.0	0.0
10	7.6	78258.6	0.0	35802.5	0.	0.	0.0	0.0	0.0
11	0.2	2084.5	0.0	978.5	0.	0.	0.0	0.0	0.0
12	15.9	187114.6	0.0	91822.0	0.	0.	0.0	0.0	0.0
13	12.0	162733.8	0.0	84628.2	0.	0.	0.0	0.0	0.0
14	7.3	107679.2	0.0	57723.2	0.	0.	0.0	0.0	0.0
15	24.7	377966.4	0.0	*******	0.	0.	0.0	0.0	0.0
16	8.0	122574.1	0.0	47054.5	0.	0.	0.0	0.0	0.0
17	30.0	460809.6	0.0	*******	0.	0.	0.0	0.0	0.0
18	3.0	46187.5	0.0	17787.7	0.	0.	0.0	0.0	0.0
19	7.0	107889.5	0.0	41551.4	0.	0.	0.0	0.0	0.0
20	5.0	77165.6	0.0	29719.6	0.	0.	0.0	0.0	0.0
21	10.0	154511.2	0.0	58767.6	0.	0.	0.0	0.0	0.0
22	13.0	201131.4	0.0	78286.3	0.	0.	0.0	0.0	0.0
23	2.0	30939.0	0.0	12233.5	0.	0.	0.0	0.0	0.0
24	10.0	155570.5	0.0	61925.4	0.	0.	0.0	0.0	0.0
25	5.0	78444.0	0.0	31436.4	0.	0.	0.0	0.0	0.0
26	5.0	78883.1	0.0	31752.2	0.	0.	0.0	0.0	0.0
27	46.0	753822.8	0.0	*******	0.	0.	0.0	0.0	0.0
28	44.0	769844.9	0.0	*******	0.	0.	0.0	0.0	0.0
29	15.0	273379.1	0.0	*******	0.	0.	0.0	0.0	0.0
30	28.0	535747.1	0.0	*******	0.	0.	0.0	0.0	0.0
31	37.0	770125.9	0.0	*******	0.	0.	0.0	0.0	0.0
32	61.0	1397803.5	0.0	*******	0.	0.	0.0	0.0	0.0
33	46.0	1146703.4	0.0	*******	0.	0.	0.0	0.0	0.0
34	15.0	389659.6	0.0	*******	0.	0.	0.0	0.0	0.0
35	30.0	778462.4	0.0	*******	0.	0.	0.0	0.0	0.0
36	30.0	765419.9	0.0	*******	0.	0.	0.0	0.0	0.0
37	10.0	252296.9	0.0	93835.4	0.	0.	0.0	0.0	0.0
38	98.0	2393800.2	0.0	*******	0.	0.	0.0	0.0	0.0
39	10.0	236828.8	0.0	92292.9	0.	0.	0.0	0.0	0.0
40	1.0	23693.0	0.0	9221.4	0.	0.	0.0	0.0	0.0
41	10.0	239682.3	0.0	92135.8	0.	0.	0.0	0.0	0.0
42	4.0	100324.6	0.0	36814.3	0.	0.	0.0	0.0	0.0

43	10.0	261157.6	0.0	91935.9	0.	0.	0.0	0.0	0.0
44	0.7	17978.1	0.0	6279.5	0.	0.	0.0	0.0	0.0
45	34.3	858667.8	0.0	*******	0.	0.	0.0	0.0	0.0
46	1.0	24616.7	0.0	10537.0	0.	0.	0.0	0.0	0.0
47	12.0	277565.0	0.0	*******	0.	0.	0.0	0.0	0.0
48	7.0	156248.0	0.0	62164.7	0.	0.	0.0	0.0	0.0
49	16.4	342069.2	0.0	*******	0.	0.	0.0	0.0	0.0
50	13.6	258586.8	0.0	93125.1	0.	0.	0.0	0.0	0.0
51	21.7	365707.8	0.0	*******	0.	0.	0.0	0.0	0.0
52	35.4	469344.9	0.0	*******	0.	0.	0.0	0.0	0.0
53	19.8	194728.1	0.0	28882.2	0.	0.	0.0	0.0	0.0
54	10.2	81431.4	0.0	3774.3	0.	0.	0.0	0.0	0.0
55	25.2	147979.3	0.0	0.0	0.	0.	0.0	0.0	0.0
56	24.8	71959.9	0.0	0.0	0.	0.	0.0	0.0	0.0
57	8.2	5840.5	0.0	0.0	0.	0.	0.0	0.0	0.0

Failure Surface Specified By 17 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	150.959	234.215
2	163.214	226.557
3	165.079	225.251
4	206.036	196.572
5	208.744	193.865
6	244.099	158.509
7	252.840	149.768
8	288.196	114.413
9	560.000	119.215
10	892.090	158.811
11	927.445	194.166
12	962.801	229.522
13	998.156	264.877
14	1033.511	300.232
15	1053.358	320.079
16	1088.714	355.435
17	1118.781	385.502

*** FOS = 1.623 Theta (ki=1.0) = 6.64 ***
Lambda = 0.116

Failure Surface Specified By 17 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	133.120	230.000
2	139.639	225.926
3	149.030	219.351
4	189.987	190.672
5	224.031	156.628
6	230.829	149.831
7	266.184	114.475
8	560.000	118.856
9	864.434	157.365
10	899.789	192.720
11	935.144	228.075
12	970.500	263.431
13	1005.855	298.786
14	1021.078	314.009
15	1056.433	349.364
16	1091.788	384.719
17	1098.069	391.000

*** FOS = 1.629 Theta (ki=1.0) = 6.79 ***
Lambda = 0.119

Failure Surface Specified By 17 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	108.291	230.513
2	116.616	225.311
3	132.585	214.129
4	173.543	185.450
5	204.222	154.771
6	209.911	149.082
7	245.266	113.727
8	560.000	116.993

9	858.027	156.239
10	893.383	191.594
11	928.738	226.949
12	964.093	262.305
13	999.449	297.660
14	1014.574	312.786
15	1049.930	348.141
16	1085.285	383.496
17	1092.789	391.000

*** FOS = 1.630 Theta (ki=1.0) = 6.80 ***
Lambda = 0.119

Failure Surface Specified By 16 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	58.096	233.000
2	97.181	205.632
3	138.139	176.953
4	164.084	151.008
5	166.844	148.248
6	202.200	112.892
7	560.000	119.335
8	901.309	147.626
9	936.664	182.982
10	972.019	218.337
11	1007.375	253.692
12	1042.730	289.048
13	1078.085	324.403
14	1078.487	324.805
15	1113.843	360.160
16	1137.682	384.000

*** FOS = 1.632 Theta (ki=1.0) = 6.33 ***
Lambda = 0.111

Failure Surface Specified By 16 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	59.485	233.000
2	98.216	205.880
3	139.173	177.202
4	165.257	151.118
5	167.938	148.437
6	203.293	113.082
7	560.000	117.831
8	922.559	147.947
9	957.914	183.302
10	993.269	218.657
11	1028.625	254.013
12	1063.980	289.368
13	1099.335	324.723
14	1104.265	329.653
15	1139.620	365.008
16	1158.612	384.000

*** FOS = 1.633 Theta (ki=1.0) = 6.17 ***
Lambda = 0.108

Failure Surface Specified By 17 Coordinate Points

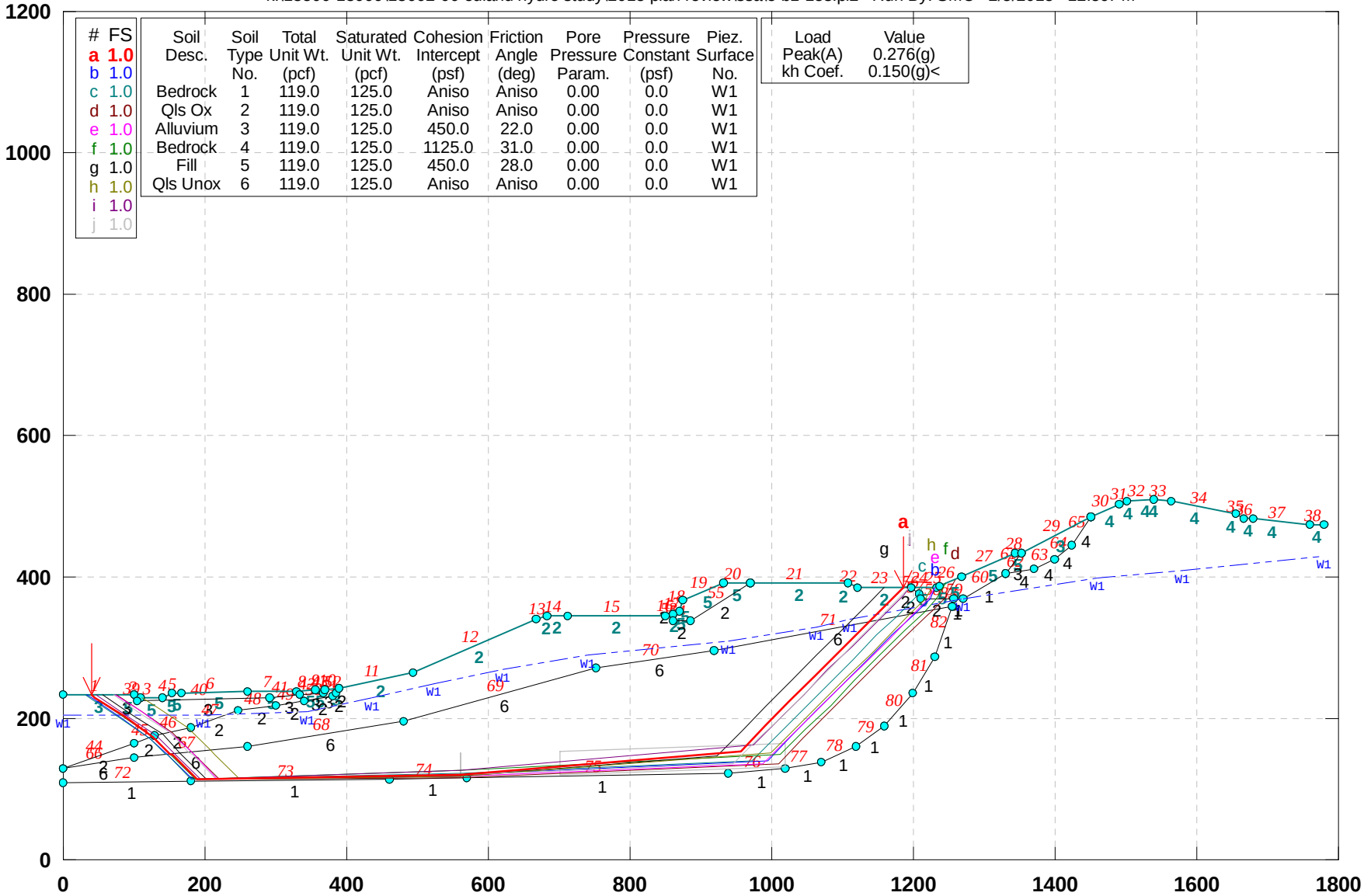
Point No.	X-Surf (ft)	Y-Surf (ft)
1	102.403	229.154
2	108.886	225.104
3	126.608	212.695
4	167.566	184.016
5	197.446	154.136
6	202.528	149.053
7	237.883	113.698
8	560.000	118.395
9	874.590	142.077
10	909.945	177.432
11	945.301	212.787
12	980.656	248.143
13	1016.011	283.498
14	1051.367	318.853

```
    15       1052.415      319.902
    16       1087.771      355.257
    17       1118.259      385.746
***  FOS =     1.635   Theta (ki=1.0) =     6.60  ***
                     Lambda =   0.116
Failure Surface Specified By 18 Coordinate Points
  Point      X-Surf      Y-Surf
   No.        (ft)        (ft)
     1        150.069      233.873
     2        161.836      226.520
     3        164.141      224.906
     4        205.098      196.227
     5        207.571      193.755
     6        242.926      158.399
     7        251.747      149.579
     8        287.102      114.223
     9        560.000      120.719
    10        870.840      158.491
    11        906.195      193.846
    12        941.551      229.201
    13        976.906      264.557
    14       1012.261      299.912
    15       1027.581      315.232
    16       1062.936      350.587
    17       1098.292      385.942
    18       1103.349      391.000
***  FOS =     1.636   Theta (ki=1.0) =     6.77  ***
                     Lambda =   0.119
Failure Surface Specified By 16 Coordinate Points
  Point      X-Surf      Y-Surf
   No.        (ft)        (ft)
     1         40.146      233.000
     2         43.477      230.668
     3         84.434      201.989
     4        125.392      173.310
     5        149.099      149.603
     6        149.891      148.811
     7        185.247      113.456
     8        560.000      125.145
     9        891.934      153.661
    10        927.289      189.017
    11        962.644      224.372
    12        998.000      259.728
    13       1033.355      295.083
    14       1059.508      321.236
    15       1094.863      356.591
    16       1122.272      384.000
***  FOS =     1.636   Theta (ki=1.0) =     6.46  ***
                     Lambda =   0.113
Failure Surface Specified By 17 Coordinate Points
  Point      X-Surf      Y-Surf
   No.        (ft)        (ft)
     1        172.317      235.134
     2        185.107      227.142
     3        220.940      202.052
     4        227.226      195.766
     5        262.581      160.411
     6        272.665      150.327
     7        308.020      114.972
     8        560.000      122.582
     9        877.246      159.617
    10        912.601      194.972
    11        947.957      230.327
    12        983.312      265.683
    13       1018.667      301.038
    14       1034.084      316.455
    15       1069.440      351.810
    16       1104.795      387.165
    17       1108.111      390.482
***  FOS =     1.639   Theta (ki=1.0) =     6.87  ***
```

```
                    Lambda =   0.120
          **** END OF GSTABL7 OUTPUT ****
```

13662-00, Euland, Section E-E', Seismic

k:\13500-13999\13662-00 euland hydro study\2015 plan review\ssa\e-b1-15s.pl2 Run By: SMC 2/5/2015 12:59PM



#	FS
a	1.0
b	1.0
c	1.0
d	1.0
e	1.0
f	1.0
g	1.0
h	1.0
i	1.0
j	1.0

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.
Bedrock	1	119.0	125.0	Aniso	Aniso	0.00	0.0	W1
Qls Ox	2	119.0	125.0	Aniso	Aniso	0.00	0.0	W1
Alluvium	3	119.0	125.0	450.0	22.0	0.00	0.0	W1
Bedrock	4	119.0	125.0	1125.0	31.0	0.00	0.0	W1
Fill	5	119.0	125.0	450.0	28.0	0.00	0.0	W1
Qls Unox	6	119.0	125.0	Aniso	Aniso	0.00	0.0	W1

Load	Value
Peak(A)	0.276(g)
kh Coef.	0.150(g)<

GSTABL7 v.2 FSmin=1.0

Safety Factors Are Calculated By GLE (Spencer`s) Method (0-2)

Figure E-15.2

***** GSTABL7 *****

** GSTABL7 by Garry H. Gregory, P.E. **

** Original Version 1.0, January 1996; Current Version 2.005, Sept. 2006 **

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****

SLOPE STABILITY ANALYSIS SYSTEM

Modified Bishop, Simplified Janbu, or GLE Method of Slices.
(Includes Spencer & Morgenstern-Price Type Analysis)
Including Pier/Pile, Reinforcement, Soil Nail, Tieback,
Nonlinear Undrained Shear Strength, Curved Phi Envelope,
Anisotropic Soil, Fiber-Reinforced Soil, Boundary Loads, Water
Surfaces, Pseudo-Static & Newmark Earthquake, and Applied Forces.

****

Analysis Run Date: 2/5/2015
Time of Run: 12:59PM
Run By: SMC
Input Data Filename: K:\13500-13999\13662-00 Euland Hydro Study\2015 Plan Review\SSA\e-b1-15s.
Output Filename: K:\13500-13999\13662-00 Euland Hydro Study\2015 Plan Review\SSA\e-b1-15s.OUT
Unit System: English
Plotted Output Filename: K:\13500-13999\13662-00 Euland Hydro Study\2015 Plan Review\SSA\e-b1-15s.PLT
PROBLEM DESCRIPTION: 13662-00, Euland, Section E-E',
Seismic

BOUNDARY COORDINATES
38 Top Boundaries
83 Total Boundaries

Boundary No.	X-Left (ft)	Y-Left (ft)	X-Right (ft)	Y-Right (ft)	Soil Type Below Bnd
1	0.00	233.00	100.00	233.00	3
2	100.00	233.00	110.00	230.00	5
3	110.00	230.00	140.00	230.00	5
4	140.00	230.00	153.00	235.00	5
5	153.00	235.00	166.00	235.00	5
6	166.00	235.00	260.00	237.00	5
7	260.00	237.00	330.00	239.00	5
8	330.00	239.00	355.00	240.00	5
9	355.00	240.00	370.00	240.00	5
10	370.00	240.00	390.00	243.00	3
11	390.00	243.00	495.00	265.00	2
12	495.00	265.00	667.00	340.00	2
13	667.00	340.00	682.00	345.00	2
14	682.00	345.00	712.00	345.00	2
15	712.00	345.00	850.00	345.00	2
16	850.00	345.00	860.00	346.00	2
17	860.00	346.00	871.00	352.00	5
18	871.00	352.00	875.00	367.00	5
19	875.00	367.00	933.00	391.00	5
20	933.00	391.00	970.00	391.00	5
21	970.00	391.00	1107.00	391.00	2
22	1107.00	391.00	1122.00	384.00	2
23	1122.00	384.00	1197.00	384.00	2
24	1197.00	384.00	1233.00	384.00	5
25	1233.00	384.00	1236.00	387.00	5
26	1236.00	387.00	1268.00	400.00	5
27	1268.00	400.00	1343.00	433.00	5
28	1343.00	433.00	1353.00	433.00	5
29	1353.00	433.00	1450.00	485.00	3
30	1450.00	485.00	1490.00	502.00	4
31	1490.00	502.00	1502.00	507.00	4
32	1502.00	507.00	1540.00	510.00	4
33	1540.00	510.00	1565.00	507.00	4
34	1565.00	507.00	1656.00	490.00	4
35	1656.00	490.00	1666.00	482.00	4
36	1666.00	482.00	1680.00	482.00	4
37	1680.00	482.00	1760.00	473.00	4
38	1760.00	473.00	1780.00	473.00	4
39	100.00	233.00	105.00	225.00	3

40	105.00	225.00	292.00	230.00	3
41	292.00	230.00	333.00	233.00	3
42	333.00	233.00	368.00	235.00	3
43	368.00	235.00	370.00	240.00	3
44	0.00	128.00	100.00	164.00	2
45	100.00	164.00	130.00	175.00	2
46	130.00	175.00	180.00	187.00	2
47	180.00	187.00	248.00	212.00	2
48	248.00	212.00	300.00	219.00	2
49	300.00	219.00	340.00	224.00	2
50	340.00	224.00	380.00	231.00	2
51	380.00	231.00	385.00	235.00	2
52	385.00	235.00	390.00	243.00	2
53	860.00	346.00	861.00	338.00	2
54	861.00	338.00	885.00	338.00	2
55	885.00	338.00	970.00	391.00	2
56	1197.00	384.00	1209.00	375.00	2
57	1209.00	375.00	1210.00	370.00	2
58	1210.00	370.00	1257.00	370.00	2
59	1257.00	370.00	1270.00	370.00	1
60	1270.00	370.00	1330.00	406.00	1
61	1330.00	406.00	1353.00	433.00	3
62	1330.00	406.00	1370.00	412.00	4
63	1370.00	412.00	1400.00	425.00	4
64	1400.00	425.00	1425.00	445.00	4
65	1425.00	445.00	1450.00	485.00	4
66	0.00	128.00	100.00	145.00	6
67	100.00	145.00	260.00	160.00	6
68	260.00	160.00	480.00	195.00	6
69	480.00	195.00	752.00	272.00	6
70	752.00	272.00	920.00	295.00	6
71	920.00	295.00	1255.00	358.00	6
72	0.00	109.00	180.00	111.00	1
73	180.00	111.00	460.00	114.50	1
74	460.00	114.50	570.00	116.00	1
75	570.00	116.00	940.00	123.00	1
76	940.00	123.00	1020.00	128.00	1
77	1020.00	128.00	1070.00	138.00	1
78	1070.00	138.00	1120.00	161.00	1
79	1120.00	161.00	1160.00	190.00	1
80	1160.00	190.00	1200.00	236.00	1
81	1200.00	236.00	1230.00	288.00	1
82	1230.00	288.00	1255.00	358.00	1
83	1255.00	358.00	1257.00	370.00	1

Default Y-Origin = 0.00(ft)
Default X-Plus Value = 0.00(ft)
Default Y-Plus Value = 0.00(ft)

ISOTROPIC SOIL PARAMETERS
6 Type(s) of Soil

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.
1	119.0	125.0	0.0	0.0	0.00	0.0	1
2	119.0	125.0	0.0	0.0	0.00	0.0	1
3	119.0	125.0	450.0	22.0	0.00	0.0	1
4	119.0	125.0	1125.0	31.0	0.00	0.0	1
5	119.0	125.0	450.0	28.0	0.00	0.0	1
6	119.0	125.0	0.0	0.0	0.00	0.0	1

ANISOTROPIC STRENGTH PARAMETERS
3 soil type(s)

Soil Type 1 Is Anisotropic
Number Of Direction Ranges Specified = 3

Direction Range No.	Counterclockwise Direction Limit (deg)	Cohesion Intercept (psf)	Friction Angle (deg)
1	0.0	1125.00	31.00
2	5.0	450.00	17.00
3	90.0	1125.00	31.00

Soil Type 2 Is Anisotropic
Number Of Direction Ranges Specified = 3

Direction Range No.	Counterclockwise Direction Limit (deg)	Cohesion Intercept (psf)	Friction Angle (deg)
1	0.0	525.00	25.00
2	10.0	375.00	14.50
3	90.0	450.00	22.00

Soil Type 6 Is Anisotropic
Number Of Direction Ranges Specified = 3

Direction Range No.	Counterclockwise Direction Limit (deg)	Cohesion Intercept (psf)	Friction Angle (deg)
1	0.0	750.00	31.00
2	10.0	375.00	14.50
3	90.0	450.00	22.00

ANISOTROPIC SOIL NOTES:
(1) An input value of 0.01 for C and/or Phi will cause Aniso C and/or Phi to be ignored in that range.
(2) An input value of 0.02 for Phi will set both Phi and C equal to zero, with no water weight in the tension crack.
(3) An input value of 0.03 for Phi will set both Phi and C equal to zero, with water weight in the tension crack.

1 PIEZOMETRIC SURFACE(S) SPECIFIED
Unit Weight of Water = 62.40 (pcf)
Piezometric Surface No. 1 Specified by 14 Coordinate Points
Pore Pressure Inclination Factor = 0.50

Point No.	X-Water (ft)	Y-Water (ft)
1	0.00	204.00
2	198.00	205.00
3	345.00	210.00
4	436.00	230.00
5	523.00	250.00
6	621.00	270.00
7	742.00	290.00
8	940.00	310.00
9	1063.00	330.00
10	1110.00	340.00
11	1270.00	370.00
12	1460.00	398.00
13	1580.00	410.00
14	1780.00	430.00

Specified Peak Ground Acceleration Coefficient (A) = 0.276(g)
Specified Horizontal Earthquake Coefficient (kh) = 0.150(g)
Specified Vertical Earthquake Coefficient (kv) = 0.000(g)
Specified Seismic Pore-Pressure Factor = 0.000
Janbus Empirical Coef is being used for the case of c & phi both > 0
A Critical Failure Surface Searching Method, Using A Random Technique For Generating Sliding Block Surfaces, Has Been Specified.
The Active And Passive Portions Of The Sliding Surfaces Are Generated According To The Rankine Theory.
1000 Trial Surfaces Have Been Generated.
3 Boxes Specified For Generation Of Central Block Base Length Of Line Segments For Active And Passive Portions Of Sliding Block Is 50.0

Box No.	X-Left (ft)	Y-Left (ft)	X-Right (ft)	Y-Right (ft)	Height (ft)
1	180.00	113.00	460.00	116.50	1.00
2	560.00	134.00	560.00	134.00	35.00
3	700.00	137.00	1020.00	148.00	35.00

Factor Of Safety Calculation By GLE (Spencer`s) Method of Slices
Has Gone Through 20 Iterations

Theta (deg) (ki=1.0)	FOS (Moment) (Equil.)	FOS (Force) (Equil.)	Lambda
9.00	1.783	1.165	0.158
13.50	1.580	1.343	0.240
17.25	1.510	1.543	0.310
16.63	0.812	1.506	0.299
17.50	0.818	1.559	0.315

0.00	1.797	0.936	0.000
6.72	1.813	1.094	0.118
51.72	-0.557	0.000	1.267
25.53	1.464	0.003	0.478
42.09	0.100	0.000	0.903
43.71	0.100	0.000	0.956
89.94	0.005	0.698	*****
51.46	0.100	0.000	1.255
45.13	0.099	0.096	1.004
42.71	0.100	0.080	0.923
46.63	0.099	0.106	1.058
45.36	0.099	0.097	1.013
45.34	0.099	0.097	1.012
0.00	0.020	-0.009	0.000
64.76	0.077	0.000	2.121

The Trial Failure Surface In Question Is Defined
By The Following 17 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	34.64	233.00
2	41.03	228.69
3	82.48	200.73
4	123.93	172.77
5	147.27	149.43
6	147.98	148.73
7	183.33	113.37
8	560.00	119.03
9	1014.75	141.10
10	1050.10	176.46
11	1085.46	211.81
12	1120.81	247.17
13	1156.17	282.52
14	1191.52	317.88
15	1226.24	352.59
16	1243.65	370.00
17	1259.63	396.60

Factor Of Safety Calculation By GLE (Spencer`s) Method of Slices
Has Gone Through 20 Iterations

Theta (deg) (ki=1.0)	FOS (Moment) (Equil.)	FOS (Force) (Equil.)	Lambda
9.00	1.012	1.167	0.158
13.50	0.987	0.982	0.240
13.31	1.029	1.338	0.237
13.50	0.001	0.819	0.240
13.16	0.002	1.331	0.234
14.32	0.001	0.000	0.255
14.32	0.001	0.000	0.255
14.32	0.001	0.001	0.255
14.32	0.001	0.000	0.255
14.32	0.001	0.000	0.255
14.32	0.001	0.000	0.255
14.32	0.001	0.000	0.255
14.32	0.001	0.000	0.255
14.32	0.001	0.000	0.255
14.32	0.001	0.000	0.255
14.32	0.001	0.000	0.255
14.32	0.001	0.000	0.255
14.32	0.001	0.000	0.255
14.32	0.001	0.000	0.255

The Trial Failure Surface In Question Is Defined
By The Following 17 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	43.02	233.00
2	46.45	230.68
3	87.90	202.72
4	129.35	174.76
5	154.05	150.07

6	155.36	148.76
7	190.72	113.40
8	560.00	117.63
9	998.18	155.26
10	1033.54	190.62
11	1068.89	225.97
12	1104.25	261.33
13	1139.60	296.68
14	1174.96	332.04
15	1188.39	345.47
16	1212.92	370.00
17	1221.33	384.00

Following Are Displayed The Ten Most Critical Of The Trial
Failure Surfaces Evaluated. They Are
Ordered - Most Critical First.
* * Safety Factors Are Calculated By GLE (Spencer`s) Method (0-2) * *
Selected ki function = Bi-linear
Selected Lambda Coefficient = 1.00
Forces from Reinforcement, Piers/Piles, Soil Nails, and Applied Forces
(if applicable) have been applied to the slice base(s)
on which they intersect.
Specified Tension Crack Water Force Factor = 0.000
Total Number of Trial Surfaces Attempted = 1000
WARNING! The Factor of Safety Calculation for one or More Trial Surfaces
Did Not Converge in 20 Iterations.
Number of Trial Surfaces with Non-Converged FS = 2
Number of Trial Surfaces With Valid FS = 998
Percentage of Trial Surfaces With Non-Valid FS Solutions
of the Total Attempted = 0.2 %
Statistical Data On All Valid FS Values:
FS Max = 1.903 FS Min = 1.000 FS Ave = 1.250
Standard Deviation = 0.203 Coefficient of Variation = 16.22 %
((Simplified Janbu FS for Critical Surface = 0.993))
Failure Surface Specified By 17 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	40.117	233.000
2	44.573	229.994
3	86.025	202.035
4	127.477	174.075
5	151.705	149.847
6	153.173	148.379
7	188.528	113.024
8	560.000	120.634
9	955.684	154.622
10	991.039	189.978
11	1026.394	225.333
12	1061.750	260.688
13	1097.105	296.044
14	1132.460	331.399
15	1136.840	335.779
16	1172.195	371.134
17	1185.061	384.000

*** FOS = 0.998 Theta (ki=1.0) = 13.50 ***
Lambda = 0.240
Individual data on the 66 slices

Slice No.	Width (ft)	Weight (lbs)	Water Force Top (lbs)	Water Force Bot (lbs)	Tie Force Norm (lbs)	Tie Force Tan (lbs)	Earthquake Force Hor (lbs)	Earthquake Force Ver (lbs)	Surcharge Load (lbs)
1	4.5	797.0	0.0	0.0	0.	0.	119.5	0.0	0.0
2	37.9	71273.3	0.0	0.0	0.	0.	10691.0	0.0	0.0
3	3.5	12538.5	0.0	319.0	0.	0.	1880.8	0.0	0.0
4	14.0	59933.4	0.0	7519.0	0.	0.	8990.0	0.0	0.0
5	5.0	24998.0	0.0	5116.5	0.	0.	3749.7	0.0	0.0
6	5.0	26214.1	0.0	6395.2	0.	0.	3932.1	0.0	0.0
7	17.5	106635.1	0.0	32400.1	0.	0.	15995.3	0.0	0.0
8	2.5	17651.7	0.0	7088.4	0.	0.	2647.8	0.0	0.0
9	10.0	77791.1	0.0	33648.1	0.	0.	11668.7	0.0	0.0
10	11.7	110067.4	0.0	50649.2	0.	0.	16510.1	0.0	0.0

11	1.3	13620.4	0.0	6352.7	0.	0.	2043.1	0.0	0.0
12	0.2	1834.6	0.0	857.1	0.	0.	275.2	0.0	0.0
13	12.8	146850.9	0.0	71133.6	0.	0.	22027.6	0.0	0.0
14	14.0	184001.7	0.0	94291.2	0.	0.	27600.3	0.0	0.0
15	8.5	124334.3	0.0	65955.1	0.	0.	18650.2	0.0	0.0
16	9.5	143254.7	0.0	54302.8	0.	0.	21488.2	0.0	0.0
17	34.1	516058.8	0.0	*******	0.	0.	77408.8	0.0	0.0
18	15.9	240332.7	0.0	91499.0	0.	0.	36049.9	0.0	0.0
19	12.0	181599.2	0.0	69268.1	0.	0.	27239.9	0.0	0.0
20	32.0	484832.4	0.0	*******	0.	0.	72724.9	0.0	0.0
21	8.0	121375.0	0.0	46462.3	0.	0.	18206.3	0.0	0.0
22	30.0	455751.1	0.0	*******	0.	0.	68362.7	0.0	0.0
23	3.0	45632.9	0.0	17513.2	0.	0.	6844.9	0.0	0.0
24	7.0	106560.8	0.0	40893.7	0.	0.	15984.1	0.0	0.0
25	5.0	76187.0	0.0	29235.1	0.	0.	11428.0	0.0	0.0
26	10.0	152482.2	0.0	57784.4	0.	0.	22872.3	0.0	0.0
27	13.0	198346.5	0.0	76936.5	0.	0.	29752.0	0.0	0.0
28	2.0	30495.8	0.0	12018.7	0.	0.	4574.4	0.0	0.0
29	10.0	153295.4	0.0	60822.4	0.	0.	22994.3	0.0	0.0
30	5.0	77269.5	0.0	30866.9	0.	0.	11590.4	0.0	0.0
31	5.0	77684.0	0.0	31170.7	0.	0.	11652.6	0.0	0.0
32	46.0	741635.5	0.0	*******	0.	0.	*******	0.0	0.0
33	44.0	756238.9	0.0	*******	0.	0.	*******	0.0	0.0
34	15.0	268305.0	0.0	*******	0.	0.	40245.8	0.0	0.0
35	28.0	525682.6	0.0	*******	0.	0.	78852.4	0.0	0.0
36	37.0	755638.8	0.0	*******	0.	0.	*******	0.0	0.0
37	61.0	1381623.0	0.0	*******	0.	0.	*******	0.0	0.0
38	46.0	1146162.0	0.0	*******	0.	0.	*******	0.0	0.0
39	15.0	391651.3	0.0	*******	0.	0.	58747.7	0.0	0.0
40	30.0	785645.1	0.0	*******	0.	0.	*******	0.0	0.0
41	30.0	776868.4	0.0	*******	0.	0.	*******	0.0	0.0
42	10.0	257062.8	0.0	95843.4	0.	0.	38559.4	0.0	0.0
43	98.0	2465598.0	0.0	*******	0.	0.	*******	0.0	0.0
44	10.0	246715.5	0.0	96860.3	0.	0.	37007.3	0.0	0.0
45	1.0	24707.8	0.0	9691.2	0.	0.	3706.2	0.0	0.0
46	10.0	250090.6	0.0	96963.9	0.	0.	37513.6	0.0	0.0
47	4.0	104620.7	0.0	38811.9	0.	0.	15693.1	0.0	0.0
48	10.0	272229.6	0.0	97095.7	0.	0.	40834.4	0.0	0.0
49	35.0	983602.4	0.0	*******	0.	0.	*******	0.0	0.0
50	13.0	377540.2	0.0	*******	0.	0.	56631.0	0.0	0.0
51	7.0	204822.2	0.0	68339.4	0.	0.	30723.3	0.0	0.0
52	15.7	457033.8	0.0	*******	0.	0.	68555.1	0.0	0.0
53	14.3	403392.9	0.0	*******	0.	0.	60508.9	0.0	0.0
54	21.0	546710.5	0.0	*******	0.	0.	82006.6	0.0	0.0
55	35.4	795153.8	0.0	*******	0.	0.	*******	0.0	0.0
56	35.4	640203.9	0.0	*******	0.	0.	96030.6	0.0	0.0
57	1.3	19804.4	0.0	7470.2	0.	0.	2970.7	0.0	0.0
58	34.1	465524.7	0.0	*******	0.	0.	69828.7	0.0	0.0
59	9.9	108153.5	0.0	31880.4	0.	0.	16223.0	0.0	0.0
60	3.0	30149.2	0.0	8350.9	0.	0.	4522.4	0.0	0.0
61	12.0	104471.1	0.0	27259.3	0.	0.	15670.7	0.0	0.0
62	10.5	73039.4	0.0	15482.0	0.	0.	10955.9	0.0	0.0
63	4.4	26558.8	0.0	4191.8	0.	0.	3983.8	0.0	0.0
64	11.4	57947.5	0.0	4571.2	0.	0.	8692.1	0.0	0.0
65	24.0	70868.2	0.0	0.0	0.	0.	10630.2	0.0	0.0
66	12.9	9848.9	0.0	0.0	0.	0.	1477.3	0.0	0.0

Failure Surface Specified By 17 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	33.195	233.000
2	40.089	228.350
3	81.541	200.390
4	122.993	172.431
5	146.101	149.322
6	146.883	148.540
7	182.239	113.185
8	560.000	120.531
9	993.496	140.781
10	1028.851	176.136
11	1064.207	211.491

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     12       1099.562      246.847
     13       1134.917      282.202
     14       1170.273      317.557
     15       1200.458      347.743
     16       1222.716      370.000
     17       1231.128      384.000
***  FOS =     1.000   Theta (ki=1.0) =    13.50  ***
                     Lambda =   0.240
Failure Surface Specified By 17 Coordinate Points
  Point      X-Surf      Y-Surf
   No.        (ft)        (ft)
     1         31.746      233.000
     2         39.150      228.006
     3         80.602      200.046
     4        122.054      172.086
     5        144.928      149.212
     6        145.790      148.351
     7        181.145      112.995
     8        560.000      122.035
     9        972.246      140.460
    10       1007.601      175.816
    11       1042.957      211.171
    12       1078.312      246.526
    13       1113.667      281.882
    14       1149.023      317.237
    15       1174.681      342.895
    16       1207.735      375.949
    17       1212.572      384.000
***  FOS =     1.032   Theta (ki=1.0) =     4.10  ***
                     Lambda =   0.072
Failure Surface Specified By 17 Coordinate Points
  Point      X-Surf      Y-Surf
   No.        (ft)        (ft)
     1         75.151      233.000
     2        111.515      208.472
     3        152.967      180.512
     4        180.895      152.584
     5        184.755      148.725
     6        220.110      113.369
     7        560.000      116.583
     8       1009.277      135.871
     9       1044.633      171.227
    10       1079.988      206.582
    11       1115.343      241.937
    12       1150.699      277.293
    13       1186.054      312.648
    14       1221.409      348.003
    15       1225.941      352.535
    16       1243.406      370.000
    17       1259.311      396.470
***  FOS =     1.032   Theta (ki=1.0) =     3.96  ***
                     Lambda =   0.069
Failure Surface Specified By 17 Coordinate Points
  Point      X-Surf      Y-Surf
   No.        (ft)        (ft)
     1         73.748      233.000
     2        110.480      208.223
     3        151.932      180.264
     4        179.722      152.474
     5        183.661      148.535
     6        219.016      113.180
     7        560.000      118.087
     8        988.027      135.551
     9       1023.383      170.906
    10       1058.738      206.262
    11       1094.093      241.617
    12       1129.449      276.972
    13       1164.804      312.328
    14       1200.159      347.683
    15       1200.164      347.688
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     16       1222.476      370.000
     17       1230.888      384.000
***  FOS =     1.036   Theta (ki=1.0) =     3.94  ***
                     Lambda =   0.069
Failure Surface Specified By 17 Coordinate Points
  Point      X-Surf      Y-Surf
   No.        (ft)        (ft)
     1         38.345      233.000
     2         43.425      229.573
     3         84.877      201.614
     4        126.329      173.654
     5        150.270      149.713
     6        151.942      148.041
     7        187.297      112.686
     8        560.000      126.701
     9       1011.777      148.262
    10       1047.133      183.617
    11       1082.488      218.973
    12       1117.843      254.328
    13       1153.199      289.683
    14       1188.554      325.039
    15       1213.760      350.244
    16       1233.515      370.000
    17       1246.226      391.154
***  FOS =     1.040   Theta (ki=1.0) =     4.14  ***
                     Lambda =   0.072
Failure Surface Specified By 16 Coordinate Points
  Point      X-Surf      Y-Surf
   No.        (ft)        (ft)
     1         56.449      233.000
     2         97.722      205.161
     3        139.173      177.202
     4        165.257      151.118
     5        167.938      148.437
     6        203.293      113.082
     7        560.000      117.831
     8        922.559      147.947
     9        957.914      183.302
    10        993.269      218.657
    11       1028.625      254.013
    12       1063.980      289.368
    13       1099.335      324.723
    14       1104.265      329.653
    15       1139.620      365.008
    16       1158.612      384.000
***  FOS =     1.041   Theta (ki=1.0) =     4.27  ***
                     Lambda =   0.075
Failure Surface Specified By 17 Coordinate Points
  Point      X-Surf      Y-Surf
   No.        (ft)        (ft)
     1        110.548      230.000
     2        118.279      225.355
     3        134.965      214.100
     4        176.417      186.140
     5        207.481      155.076
     6        213.055      149.502
     7        248.411      114.147
     8        560.000      117.045
     9        999.121      151.160
    10       1034.476      186.515
    11       1069.832      221.870
    12       1105.187      257.226
    13       1140.542      292.581
    14       1175.898      327.936
    15       1194.603      346.642
    16       1217.962      370.000
    17       1226.374      384.000
***  FOS =     1.041   Theta (ki=1.0) =     4.14  ***
                     Lambda =   0.072
Failure Surface Specified By 16 Coordinate Points
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    Point      X-Surf      Y-Surf
     No.        (ft)        (ft)
      1         46.320      233.000
      2         48.799      231.328
      3         90.251      203.368
      4        131.703      175.409
      5        156.788      150.324
      6        158.231      148.881
      7        193.586      113.525
      8        560.000      126.803
      9        973.965      162.104
     10       1009.320      197.459
     11       1044.676      232.815
     12       1080.031      268.170
     13       1115.386      303.525
     14       1150.141      338.280
     15       1185.497      373.636
     16       1195.861      384.000
  ***  FOS =     1.041   Theta (ki=1.0) =     4.23  ***
                     Lambda =   0.074
  Failure Surface Specified By 16 Coordinate Points
    Point      X-Surf      Y-Surf
     No.        (ft)        (ft)
      1         72.035      233.000
      2        109.217      207.920
      3        150.669      179.961
      4        178.290      152.340
      5        181.473      149.156
      6        216.829      113.801
      7        560.000      121.095
      8        945.527      134.911
      9        980.883      170.266
     10       1016.238      205.621
     11       1051.593      240.977
     12       1086.949      276.332
     13       1122.304      311.687
     14       1148.609      337.992
     15       1183.964      373.348
     16       1194.617      384.000
  ***  FOS =     1.046   Theta (ki=1.0) =     4.16  ***
                     Lambda =   0.073
           **** END OF GSTABL7 OUTPUT ****
```

***** GSTABL7 *****

** GSTABL7 by Garry H. Gregory, P.E. **

** Original Version 1.0, January 1996; Current Version 2.005, Sept. 2006 **

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SLOPE STABILITY ANALYSIS SYSTEM

Modified Bishop, Simplified Janbu, or GLE Method of Slices.
(Includes Spencer & Morgenstern-Price Type Analysis)
Including Pier/Pile, Reinforcement, Soil Nail, Tieback,
Nonlinear Undrained Shear Strength, Curved Phi Envelope,
Anisotropic Soil, Fiber-Reinforced Soil, Boundary Loads, Water
Surfaces, Pseudo-Static & Newmark Earthquake, and Applied Forces.

****

Analysis Run Date: 2/5/2015
Time of Run: 01:03PM
Run By: SMC
Input Data Filename: K:\13500-13999\13662-00 Euland Hydro Study\2015 Plan Review\SSA\e-b1-15s Surface #1.
Output Filename: K:\13500-13999\13662-00 Euland Hydro Study\2015 Plan Review\SSA\e-b1-15s Surface #1.OUT
Unit System: English
Plotted Output Filename: K:\13500-13999\13662-00 Euland Hydro Study\2015 Plan Review\SSA\e-b1-15s Surface #1.PLT
PROBLEM DESCRIPTION: 13662-00, Euland, Section E-E',
Seismic

BOUNDARY COORDINATES
38 Top Boundaries
83 Total Boundaries

Boundary No.	X-Left (ft)	Y-Left (ft)	X-Right (ft)	Y-Right (ft)	Soil Type Below Bnd
1	0.00	233.00	100.00	233.00	3
2	100.00	233.00	110.00	230.00	5
3	110.00	230.00	140.00	230.00	5
4	140.00	230.00	153.00	235.00	5
5	153.00	235.00	166.00	235.00	5
6	166.00	235.00	260.00	237.00	5
7	260.00	237.00	330.00	239.00	5
8	330.00	239.00	355.00	240.00	5
9	355.00	240.00	370.00	240.00	5
10	370.00	240.00	390.00	243.00	3
11	390.00	243.00	495.00	265.00	2
12	495.00	265.00	667.00	340.00	2
13	667.00	340.00	682.00	345.00	2
14	682.00	345.00	712.00	345.00	2
15	712.00	345.00	850.00	345.00	2
16	850.00	345.00	860.00	346.00	2
17	860.00	346.00	871.00	352.00	5
18	871.00	352.00	875.00	367.00	5
19	875.00	367.00	933.00	391.00	5
20	933.00	391.00	970.00	391.00	5
21	970.00	391.00	1107.00	391.00	2
22	1107.00	391.00	1122.00	384.00	2
23	1122.00	384.00	1197.00	384.00	2
24	1197.00	384.00	1233.00	384.00	5
25	1233.00	384.00	1236.00	387.00	5
26	1236.00	387.00	1268.00	400.00	5
27	1268.00	400.00	1343.00	433.00	5
28	1343.00	433.00	1353.00	433.00	5
29	1353.00	433.00	1450.00	485.00	3
30	1450.00	485.00	1490.00	502.00	4
31	1490.00	502.00	1502.00	507.00	4
32	1502.00	507.00	1540.00	510.00	4
33	1540.00	510.00	1565.00	507.00	4
34	1565.00	507.00	1656.00	490.00	4
35	1656.00	490.00	1666.00	482.00	4
36	1666.00	482.00	1680.00	482.00	4
37	1680.00	482.00	1760.00	473.00	4
38	1760.00	473.00	1780.00	473.00	4
39	100.00	233.00	105.00	225.00	3

40	105.00	225.00	292.00	230.00	3
41	292.00	230.00	333.00	233.00	3
42	333.00	233.00	368.00	235.00	3
43	368.00	235.00	370.00	240.00	3
44	0.00	128.00	100.00	164.00	2
45	100.00	164.00	130.00	175.00	2
46	130.00	175.00	180.00	187.00	2
47	180.00	187.00	248.00	212.00	2
48	248.00	212.00	300.00	219.00	2
49	300.00	219.00	340.00	224.00	2
50	340.00	224.00	380.00	231.00	2
51	380.00	231.00	385.00	235.00	2
52	385.00	235.00	390.00	243.00	2
53	860.00	346.00	861.00	338.00	2
54	861.00	338.00	885.00	338.00	2
55	885.00	338.00	970.00	391.00	2
56	1197.00	384.00	1209.00	375.00	2
57	1209.00	375.00	1210.00	370.00	2
58	1210.00	370.00	1257.00	370.00	2
59	1257.00	370.00	1270.00	370.00	1
60	1270.00	370.00	1330.00	406.00	1
61	1330.00	406.00	1353.00	433.00	3
62	1330.00	406.00	1370.00	412.00	4
63	1370.00	412.00	1400.00	425.00	4
64	1400.00	425.00	1425.00	445.00	4
65	1425.00	445.00	1450.00	485.00	4
66	0.00	128.00	100.00	145.00	6
67	100.00	145.00	260.00	160.00	6
68	260.00	160.00	480.00	195.00	6
69	480.00	195.00	752.00	272.00	6
70	752.00	272.00	920.00	295.00	6
71	920.00	295.00	1255.00	358.00	6
72	0.00	109.00	180.00	111.00	1
73	180.00	111.00	460.00	114.50	1
74	460.00	114.50	570.00	116.00	1
75	570.00	116.00	940.00	123.00	1
76	940.00	123.00	1020.00	128.00	1
77	1020.00	128.00	1070.00	138.00	1
78	1070.00	138.00	1120.00	161.00	1
79	1120.00	161.00	1160.00	190.00	1
80	1160.00	190.00	1200.00	236.00	1
81	1200.00	236.00	1230.00	288.00	1
82	1230.00	288.00	1255.00	358.00	1
83	1255.00	358.00	1257.00	370.00	1

Default Y-Origin = 0.00(ft)
Default X-Plus Value = 0.00(ft)
Default Y-Plus Value = 0.00(ft)

ISOTROPIC SOIL PARAMETERS
6 Type(s) of Soil

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.
1	119.0	125.0	0.0	0.0	0.00	0.0	1
2	119.0	125.0	0.0	0.0	0.00	0.0	1
3	119.0	125.0	450.0	22.0	0.00	0.0	1
4	119.0	125.0	1125.0	31.0	0.00	0.0	1
5	119.0	125.0	450.0	28.0	0.00	0.0	1
6	119.0	125.0	0.0	0.0	0.00	0.0	1

ANISOTROPIC STRENGTH PARAMETERS
3 soil type(s)

Soil Type 1 Is Anisotropic
Number Of Direction Ranges Specified = 3

Direction Range No.	Counterclockwise Direction Limit (deg)	Cohesion Intercept (psf)	Friction Angle (deg)
1	0.0	1125.00	31.00
2	5.0	450.00	17.00
3	90.0	1125.00	31.00

Soil Type 2 Is Anisotropic
Number Of Direction Ranges Specified = 3

Direction Range No.	Counterclockwise Direction Limit (deg)	Cohesion Intercept (psf)	Friction Angle (deg)
1	0.0	525.00	25.00
2	10.0	375.00	14.50
3	90.0	450.00	22.00

Soil Type 6 Is Anisotropic
Number Of Direction Ranges Specified = 3

Direction Range No.	Counterclockwise Direction Limit (deg)	Cohesion Intercept (psf)	Friction Angle (deg)
1	0.0	750.00	31.00
2	10.0	375.00	14.50
3	90.0	450.00	22.00

ANISOTROPIC SOIL NOTES:
(1) An input value of 0.01 for C and/or Phi will cause Aniso C and/or Phi to be ignored in that range.
(2) An input value of 0.02 for Phi will set both Phi and C equal to zero, with no water weight in the tension crack.
(3) An input value of 0.03 for Phi will set both Phi and C equal to zero, with water weight in the tension crack.

1 PIEZOMETRIC SURFACE(S) SPECIFIED
Unit Weight of Water = 62.40 (pcf)
Piezometric Surface No. 1 Specified by 14 Coordinate Points
Pore Pressure Inclination Factor = 0.50

Point No.	X-Water (ft)	Y-Water (ft)
1	0.00	204.00
2	198.00	205.00
3	345.00	210.00
4	436.00	230.00
5	523.00	250.00
6	621.00	270.00
7	742.00	290.00
8	940.00	310.00
9	1063.00	330.00
10	1110.00	340.00
11	1270.00	370.00
12	1460.00	398.00
13	1580.00	410.00
14	1780.00	430.00

Specified Peak Ground Acceleration Coefficient (A) = 0.276(g)
Specified Horizontal Earthquake Coefficient (kh) = 0.150(g)
Specified Vertical Earthquake Coefficient (kv) = 0.000(g)
Specified Seismic Pore-Pressure Factor = 0.000
Trial Failure Surface Specified By 17 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	40.117	233.000
2	44.573	229.994
3	86.025	202.035
4	127.477	174.075
5	151.705	149.847
6	153.173	148.379
7	188.528	113.024
8	560.000	120.634
9	955.684	154.622
10	991.039	189.978
11	1026.394	225.333
12	1061.750	260.688
13	1097.105	296.044
14	1132.460	331.399
15	1136.840	335.779
16	1172.195	371.134
17	1185.061	384.000

Theta (deg) (ki=1.0)	FOS (Moment) (Equil.)	FOS (Force) (Equil.)	Lambda
9.00	1.033	1.178	0.158
13.50	0.998	0.998	0.240

((Simplified Janbu FS for Specified Surface = 1.000))
Factor Of Safety For The Preceding Specified Surface = 0.998
Theta (ki = 1.0) = 13.50 Deg Lambda = 0.240
Factor Of Safety Is Calculated By GLE (Spencer`s) Method (0-2)
Forces from Reinforcement, Piers/Piles, Applied Forces, and Soil Nails
(if applicable) have been applied to the slice base(s)
on which they intersect.
Selected ki function = Bi-linear
Selected Lambda Coefficient = 1.00
Tension Crack Water Force = 0.00(lbs)
Specified Tension Crack Water Force Factor = 0.000
Depth of Tension Crack (zo) at Center of Last Slice = 6.433(ft)

*** Line of Thrust and Slice Force Data ***

Slice No.	X Coord.	Y Coord.	L/H	Side Force (lbs)	ki	Force Angle (Deg)	Vert. Shear Force(lbs)
1	44.57	232.03	0.678	8129.	1.000	13.50	1951.5
2	82.49	222.49	0.632	214852.	1.000	13.50	51581.5
3	86.02	220.82	0.607	246343.	1.000	13.50	59141.7
4	100.00	215.06	0.556	386275.	1.000	13.50	92736.5
5	105.00	213.17	0.566	441319.	1.000	13.50	105951.2
6	110.00	211.41	0.579	497583.	1.000	13.50	119459.2
7	127.48	205.39	0.560	715479.	1.000	13.50	171771.4
8	130.00	201.01	0.504	843442.	1.000	13.50	202492.6
9	140.00	189.36	0.406	1391626.	1.000	13.50	334099.8
10	151.71	179.90	0.355	2141187.	1.000	13.50	514053.6
11	153.00	168.25	0.228	3495716.	1.000	13.50	839247.3
12	153.17	167.31	0.219	3678472.	1.000	13.50	883123.0
13	166.00	149.00	0.135	18001078.	1.000	13.50	4321677.0
14	180.00	141.50	0.175	35367036.	1.000	13.50	8490875.0
15	188.53	137.36	0.199	46846136.	1.000	13.50	11246763.0
16	198.00	139.63	0.216	46848384.	1.000	13.50	11247303.0
17	232.12	147.82	0.277	46856424.	1.000	13.50	11249233.0
18	248.00	151.63	0.305	46860080.	1.000	13.50	11250111.0
19	260.00	154.51	0.327	46862804.	1.000	13.50	11250765.0
20	292.00	162.18	0.383	46869960.	1.000	13.50	11252483.0
21	300.00	164.10	0.397	46871728.	1.000	13.50	11252907.0
22	330.00	171.30	0.450	46878276.	1.000	13.50	11254479.0
23	333.00	172.02	0.455	46878924.	1.000	13.50	11254635.0
24	340.00	173.70	0.467	46880436.	1.000	13.50	11254998.0
25	345.00	174.89	0.476	46881516.	1.000	13.50	11255257.0
26	355.00	177.29	0.493	46883880.	1.000	13.50	11255825.0
27	368.00	180.41	0.517	46886452.	1.000	13.50	11256442.0
28	370.00	180.89	0.520	46886796.	1.000	13.50	11256525.0
29	380.00	183.29	0.533	46888384.	1.000	13.50	11256906.0
30	385.00	184.49	0.539	46889108.	1.000	13.50	11257080.0
31	390.00	185.69	0.545	46889788.	1.000	13.50	11257243.0
32	436.00	196.72	0.584	46894592.	1.000	13.50	11258397.0
33	480.00	207.28	0.618	46896904.	1.000	13.50	11258952.0
34	495.00	210.88	0.629	46897108.	1.000	13.50	11259001.0
35	523.00	217.60	0.621	46897700.	1.000	13.50	11259143.0
36	560.00	226.48	0.613	46899844.	1.000	13.50	11259657.0
37	621.00	241.34	0.595	46809396.	1.000	13.50	11237943.0
38	667.00	252.57	0.584	46738416.	1.000	13.50	11220902.0
39	682.00	256.23	0.585	46715032.	1.000	13.50	11215288.0
40	712.00	263.56	0.615	46667412.	1.000	13.50	11203855.0
41	742.00	270.90	0.645	46618404.	1.000	13.50	11192090.0
42	752.00	273.35	0.655	46601600.	1.000	13.50	11188055.0
43	850.00	297.40	0.761	46434420.	1.000	13.50	11147919.0
44	860.00	299.85	0.769	46417120.	1.000	13.50	11143766.0
45	861.00	300.10	0.768	46415392.	1.000	13.50	11143351.0
46	871.00	302.56	0.758	46398136.	1.000	13.50	11139208.0
47	875.00	303.54	0.711	46391324.	1.000	13.50	11137573.0
48	885.00	306.00	0.707	46374492.	1.000	13.50	11133532.0
49	920.00	314.60	0.697	46316024.	1.000	13.50	11119495.0
50	933.00	317.80	0.693	46294484.	1.000	13.50	11114323.0
51	940.00	319.52	0.699	46282900.	1.000	13.50	11111542.0
52	955.68	323.38	0.714	46257060.	1.000	13.50	11105339.0
53	970.00	326.79	0.711	46088344.	0.939	12.71	9759772.0
54	991.04	331.24	0.703	45896948.	0.847	11.50	7910622.5
55	1026.39	337.44	0.677	45717352.	0.693	9.44	5269618.5

56	1061.75	342.14	0.625	45719876.	0.539	7.37	3182979.2
57	1063.00	342.28	0.622	45723364.	0.533	7.29	3119013.0
58	1097.10	345.51	0.521	45909632.	0.384	5.27	1626145.5
59	1107.00	346.25	0.474	45996744.	0.341	4.68	1283274.6
60	1110.00	346.46	0.465	46026284.	0.328	4.50	1187295.8
61	1122.00	347.20	0.416	46161268.	0.275	3.78	840472.5
62	1132.46	347.76	0.311	46299516.	0.230	3.16	586528.3
63	1136.84	347.97	0.253	46362624.	0.211	2.89	493585.7
64	1148.23	348.45	0.035	46541264.	0.161	2.21	289076.0
65	1172.19	349.17	-1.707	46977992.	0.056	0.77	35605.2
66	1185.06	349.42	0.000	47244764.	0.000	0.00	0.0

Table 1 - Individual data on the 66 slices

Slice No.	Width (ft)	Weight (lbs)	Water Force Top (lbs)	Water Force Bot (lbs)	Tie Force Norm (lbs)	Tie Force Tan (lbs)	Earthquake Force Hor (lbs)	Earthquake Force Ver (lbs)	Surcharge Load (lbs)
1	4.5	797.0	0.0	0.0	0.0	0.0	119.5	0.0	0.0
2	37.9	71275.1	0.0	0.0	0.0	0.0	10691.3	0.0	0.0
3	3.5	12536.2	0.0	318.8	0.0	0.0	1880.4	0.0	0.0
4	14.0	59933.1	0.0	7518.6	0.0	0.0	8990.0	0.0	0.0
5	5.0	24997.8	0.0	5116.4	0.0	0.0	3749.7	0.0	0.0
6	5.0	26213.9	0.0	6395.1	0.0	0.0	3932.1	0.0	0.0
7	17.5	106635.6	0.0	32400.3	0.0	0.0	15995.3	0.0	0.0
8	2.5	17650.7	0.0	7087.9	0.0	0.0	2647.6	0.0	0.0
9	10.0	77790.9	0.0	33648.0	0.0	0.0	11668.6	0.0	0.0
10	11.7	110072.0	0.0	50651.3	0.0	0.0	16510.8	0.0	0.0
11	1.3	13615.7	0.0	6350.4	0.0	0.0	2042.3	0.0	0.0
12	0.2	1840.1	0.0	859.7	0.0	0.0	276.0	0.0	0.0
13	12.8	146845.1	0.0	71130.9	0.0	0.0	22026.8	0.0	0.0
14	14.0	184001.4	0.0	94291.0	0.0	0.0	27600.2	0.0	0.0
15	8.5	124336.7	0.0	65956.4	0.0	0.0	18650.5	0.0	0.0
16	9.5	143252.2	0.0	54301.9	0.0	0.0	21487.8	0.0	0.0
17	34.1	516058.8	0.0	*******	0.0	0.0	77408.8	0.0	0.0
18	15.9	240332.6	0.0	91499.0	0.0	0.0	36049.9	0.0	0.0
19	12.0	181599.1	0.0	69268.1	0.0	0.0	27239.9	0.0	0.0
20	32.0	484832.1	0.0	*******	0.0	0.0	72724.8	0.0	0.0
21	8.0	121374.9	0.0	46462.2	0.0	0.0	18206.2	0.0	0.0
22	30.0	455750.7	0.0	*******	0.0	0.0	68362.6	0.0	0.0
23	3.0	45632.8	0.0	17513.2	0.0	0.0	6844.9	0.0	0.0
24	7.0	106560.7	0.0	40893.7	0.0	0.0	15984.1	0.0	0.0
25	5.0	76186.9	0.0	29235.1	0.0	0.0	11428.0	0.0	0.0
26	10.0	152482.0	0.0	57784.3	0.0	0.0	22872.3	0.0	0.0
27	13.0	198346.2	0.0	76936.4	0.0	0.0	29751.9	0.0	0.0
28	2.0	30495.8	0.0	12018.6	0.0	0.0	4574.4	0.0	0.0
29	10.0	153295.1	0.0	60822.3	0.0	0.0	22994.3	0.0	0.0
30	5.0	77269.3	0.0	30866.9	0.0	0.0	11590.4	0.0	0.0
31	5.0	77683.8	0.0	31170.7	0.0	0.0	11652.6	0.0	0.0
32	46.0	741634.2	0.0	*******	0.0	0.0	*******	0.0	0.0
33	44.0	756237.4	0.0	*******	0.0	0.0	*******	0.0	0.0
34	15.0	268304.4	0.0	*******	0.0	0.0	40245.7	0.0	0.0
35	28.0	525681.5	0.0	*******	0.0	0.0	78852.2	0.0	0.0
36	37.0	755637.1	0.0	*******	0.0	0.0	*******	0.0	0.0
37	61.0	1381620.5	0.0	*******	0.0	0.0	*******	0.0	0.0
38	46.0	1146160.8	0.0	*******	0.0	0.0	*******	0.0	0.0
39	15.0	391651.1	0.0	*******	0.0	0.0	58747.7	0.0	0.0
40	30.0	785644.8	0.0	*******	0.0	0.0	*******	0.0	0.0
41	30.0	776868.2	0.0	*******	0.0	0.0	*******	0.0	0.0
42	10.0	257062.8	0.0	95843.4	0.0	0.0	38559.4	0.0	0.0
43	98.0	2465599.5	0.0	*******	0.0	0.0	*******	0.0	0.0
44	10.0	246715.8	0.0	96860.5	0.0	0.0	37007.4	0.0	0.0
45	1.0	24707.8	0.0	9691.2	0.0	0.0	3706.2	0.0	0.0
46	10.0	250090.9	0.0	96964.1	0.0	0.0	37513.6	0.0	0.0
47	4.0	104620.9	0.0	38812.0	0.0	0.0	15693.1	0.0	0.0
48	10.0	272230.0	0.0	97095.9	0.0	0.0	40834.5	0.0	0.0
49	35.0	983603.9	0.0	*******	0.0	0.0	*******	0.0	0.0
50	13.0	377540.9	0.0	*******	0.0	0.0	56631.1	0.0	0.0
51	7.0	204822.5	0.0	68339.6	0.0	0.0	30723.4	0.0	0.0
52	15.7	457047.1	0.0	*******	0.0	0.0	68557.1	0.0	0.0
53	14.3	403381.6	0.0	*******	0.0	0.0	60507.2	0.0	0.0
54	21.0	546712.2	0.0	*******	0.0	0.0	82006.8	0.0	0.0

55	35.4	795146.4	0.0	*******	0.0	0.0	*******	0.0	0.0
56	35.4	640216.4	0.0	*******	0.0	0.0	96032.5	0.0	0.0
57	1.2	19798.7	0.0	7468.2	0.0	0.0	2969.8	0.0	0.0
58	34.1	465525.9	0.0	*******	0.0	0.0	69828.9	0.0	0.0
59	9.9	108153.3	0.0	31880.2	0.0	0.0	16223.0	0.0	0.0
60	3.0	30149.2	0.0	8350.9	0.0	0.0	4522.4	0.0	0.0
61	12.0	104470.9	0.0	27259.1	0.0	0.0	15670.6	0.0	0.0
62	10.5	73037.9	0.0	15481.7	0.0	0.0	10955.7	0.0	0.0
63	4.4	26560.2	0.0	4192.0	0.0	0.0	3984.0	0.0	0.0
64	11.4	57946.1	0.0	4571.1	0.0	0.0	8691.9	0.0	0.0
65	24.0	70868.2	0.0	0.0	0.0	0.0	10630.2	0.0	0.0
66	12.9	9849.4	0.0	0.0	0.0	0.0	1477.4	0.0	0.0

- TABLE 2 - Base Stress Data on the 66 Slices -

Slice No. *	Alpha (deg)	X-Coord. Slice Cntr (ft)	Base Leng. (ft)	Total Normal Stress (psf)	Total Vert. Stress (psf)	Mobilized Shear Stress (psf)
1	-34.00	42.34	5.38	1250.38	148.27	957.12
2	-34.00	63.53	45.74	4754.63	1558.25	2375.79
3	-34.00	84.26	4.26	8138.20	2943.38	3715.30
4	-34.00	93.01	16.86	9366.05	3555.39	4062.12
5	-34.00	102.50	6.03	10512.71	4144.81	4363.47
6	-34.00	107.50	6.03	10846.10	4346.45	4412.60
7	-34.00	118.74	21.08	12238.34	5058.31	4783.31
8	-45.00	128.74	3.57	34602.82	4947.07	15766.03
9	-45.00	135.00	14.14	37523.34	5500.64	16947.16
10	-45.00	145.85	16.55	44016.04	6649.52	19662.87
11	-45.00	152.35	1.83	636671.38	7434.62	381988.41
12	-45.00	153.09	0.24	642952.19	7520.47	385742.22
13	-45.00	159.59	18.14	679789.19	8095.05	407675.47
14	-45.00	173.00	19.80	755419.06	9293.47	452703.94
15	-45.00	184.26	12.06	819926.06	10309.48	491116.72
16	1.17	193.26	9.47	15121.60	15120.58	2809.07
17	1.17	215.06	34.12	15123.92	15123.27	2807.96
18	1.17	240.06	15.89	15127.12	15127.64	2803.33
19	1.17	254.00	12.00	15128.84	15130.09	2800.72
20	1.17	276.00	32.01	15145.83	15147.83	2800.32
21	1.17	296.00	8.00	15166.12	15168.68	2801.20
22	1.17	315.00	30.01	15185.23	15188.50	2802.00
23	1.17	331.50	3.00	15204.02	15207.75	2803.26
24	1.17	336.50	7.00	15215.98	15219.77	2805.27
25	1.17	342.50	5.00	15230.27	15234.18	2807.66
26	1.17	350.00	10.00	15245.45	15245.00	2829.36
27	1.17	361.50	13.00	15246.38	15254.20	2793.40
28	1.17	369.00	2.00	15231.22	15244.68	2765.85
29	1.17	375.00	10.00	15309.86	15326.30	2767.34
30	1.17	382.50	5.00	15430.85	15450.62	2775.08
31	1.17	387.50	5.00	15511.55	15533.51	2780.25
32	1.17	413.00	46.01	16088.50	16119.10	2849.48
33	1.17	458.00	44.01	17138.42	17183.61	2980.25
34	1.17	487.50	15.00	17827.44	17883.21	3061.42
35	1.17	509.00	28.01	18713.31	18770.40	3220.01
36	1.17	541.50	37.01	20363.70	20418.34	3536.91
37	4.91	590.50	61.22	21973.26	22566.42	3843.06
38	4.91	644.00	46.17	24185.72	24825.12	4314.54
39	4.91	674.50	15.06	25352.88	26014.28	4578.37
40	4.91	697.00	30.11	25425.17	26092.08	4568.60
41	4.91	727.00	30.11	25131.62	25800.60	4454.52
42	4.91	747.00	10.04	24939.15	25611.97	4363.93
43	4.91	801.00	98.36	24399.24	25066.87	4210.88
44	4.91	855.00	10.04	23917.84	24581.06	4073.00
45	4.91	860.50	1.00	23953.54	24617.16	4080.92
46	4.91	866.00	10.04	24249.23	24917.34	4156.21
47	4.91	873.00	4.01	25375.66	26059.25	4446.41
48	4.91	880.00	10.04	26424.95	27123.12	4716.62
49	4.91	902.50	35.13	27289.09	27999.86	4935.08
50	4.91	926.50	13.05	28210.87	28935.06	5168.12
51	4.91	936.50	7.03	28425.52	29153.01	5221.31
52	4.91	947.84	15.74	28309.61	29034.03	5200.66
53	45.00	962.84	20.25	0.00	19923.87	0.00
54	45.00	980.52	29.75	0.00	18374.37	0.00

55	45.00	1008.72	50.00	0.00	15903.07	0.00
56	45.00	1044.07	50.00	0.00	12804.28	0.00
57	45.00	1062.38	1.77	0.00	11199.67	0.00
58	45.00	1080.05	48.23	0.00	9651.72	0.00
59	45.00	1102.05	13.99	0.00	7728.74	0.00
60	45.00	1108.50	4.24	0.00	7106.24	0.00
61	45.00	1116.00	16.97	0.00	6156.02	0.00
62	45.00	1127.23	14.79	0.00	4937.40	0.00
63	45.00	1134.65	6.19	0.00	4287.86	0.00
64	45.00	1142.53	16.11	0.00	3597.71	0.00
65	45.00	1160.21	33.89	0.00	2090.94	0.00
66	45.00	1178.63	18.20	0.00	541.31	0.00

*** SEISMIC SLOPE DISPLACEMENT DATA ***
(Note: kv is set = zero for displacement calculations)
Seismic Yield Coefficient (ky) = 0.1641(g)
Calculated Newmark Seismic Displacement = 0.076(ft)
Non-Symmetrical Sliding Resistance Has Been Specified
for Downhill Sliding.

**** END OF GSTABL7 OUTPUT ****

Sliding displacement models from Rathje and Antonakos (2011)

Prediction of dynamic response and sliding displacement of a sliding mass during earthquake shaking

Cross Section: E-E'

File: e-b1-15s

Inputs	
PGA (g)	0.2763
PGV (cm/s)	23.32
k_y (g)	0.1641
T_m (s)	0.517
T_s (s)	0.32
M	6.95
T_s/T_m	0.62348

Dynamic Response			
	median	-1σ	+1σ
kmax (g)	0.224	0.175	0.288
k-velmax (cm/s)	25.62	19.95	32.90

Displacement Given Median Dynamic Response					
Displacement Model			Sliding Displacements, D (cm)		
	μ_{lnD}	σ_{lnD}	median	-1σ	+1σ
[kmax, M]	-0.02	0.930	0.98	0.39	2.47
[kmax, k-velmax]	-0.84	0.608	0.43	0.24	0.80
			Sliding Displacements, D (in)		
	μ_{lnD}	σ_{lnD}	median	-1σ	+1σ
[kmax, M]	-0.02	0.930	0.38	0.15	0.97
[kmax, k-velmax]	-0.84	0.608	0.17	0.09	0.31

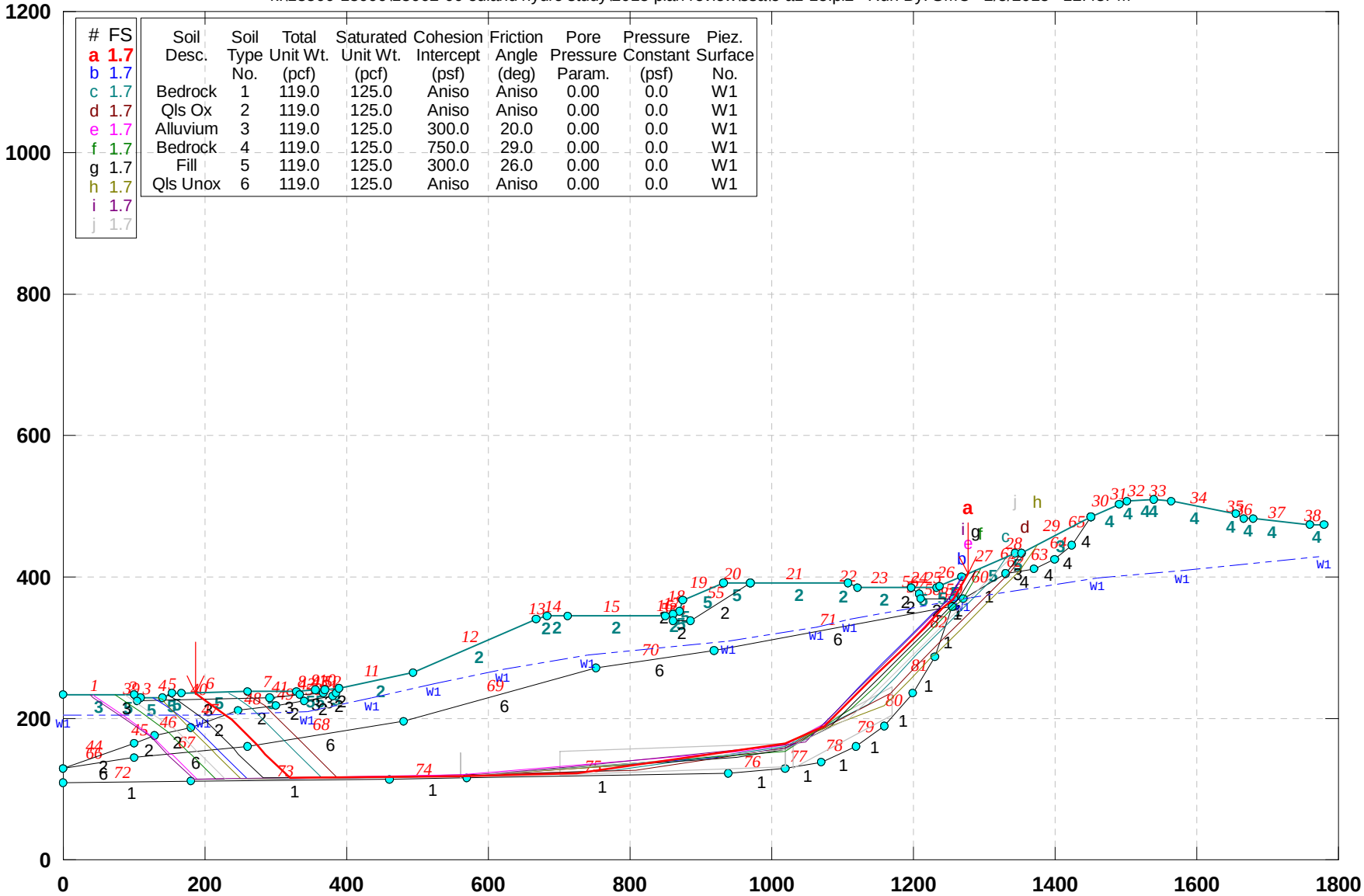
H_{avr} =	170	ft
V_s =	2110	ft/s
$T_s = 4\ H_{avr}/V_s$ =	0.32	s

PGA Peak Ground Acceleration (g)
PGV Peak Ground Velocity (cm/s)
k_y Critical or Yield Acceleration (g)
T_m Mean Period of an Earthquake Motion (s)
T_s Site Period or the Natural Period of a Sliding Mass (s). For rigid sliding set T_s= 0 s
M Earthquake Magnitude
kmax maximum seismic coefficient (g)
k-velmax the maximum velocity of the seismic coefficient-time history (cm/s)
D Predicted Sliding Displacment (cm)

Reference: Rathje, E.M. and Antonakos, G. 2011. "A Unified Model for Predicting Earthquake-Induced Sliding Displacements of Rigid and Flexible Slopes," Engineering Geology, 122, 51-60, doi:10.1016/j.enggeo.2010.12.004.

13662-00, Euland, Section E-E', Static

k:\13500-13999\13662-00 euland hydro study\2015 plan review\ssa\e-a1-15.pl2 Run By: SMC 2/5/2015 12:43PM



#	FS
a	1.7
b	1.7
c	1.7
d	1.7
e	1.7
f	1.7
g	1.7
h	1.7
i	1.7
j	1.7

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.
Bedrock	1	119.0	125.0	Aniso	Aniso	0.00	0.0	W1
Qls Ox	2	119.0	125.0	Aniso	Aniso	0.00	0.0	W1
Alluvium	3	119.0	125.0	300.0	20.0	0.00	0.0	W1
Bedrock	4	119.0	125.0	750.0	29.0	0.00	0.0	W1
Fill	5	119.0	125.0	300.0	26.0	0.00	0.0	W1
Qls Unox	6	119.0	125.0	Aniso	Aniso	0.00	0.0	W1

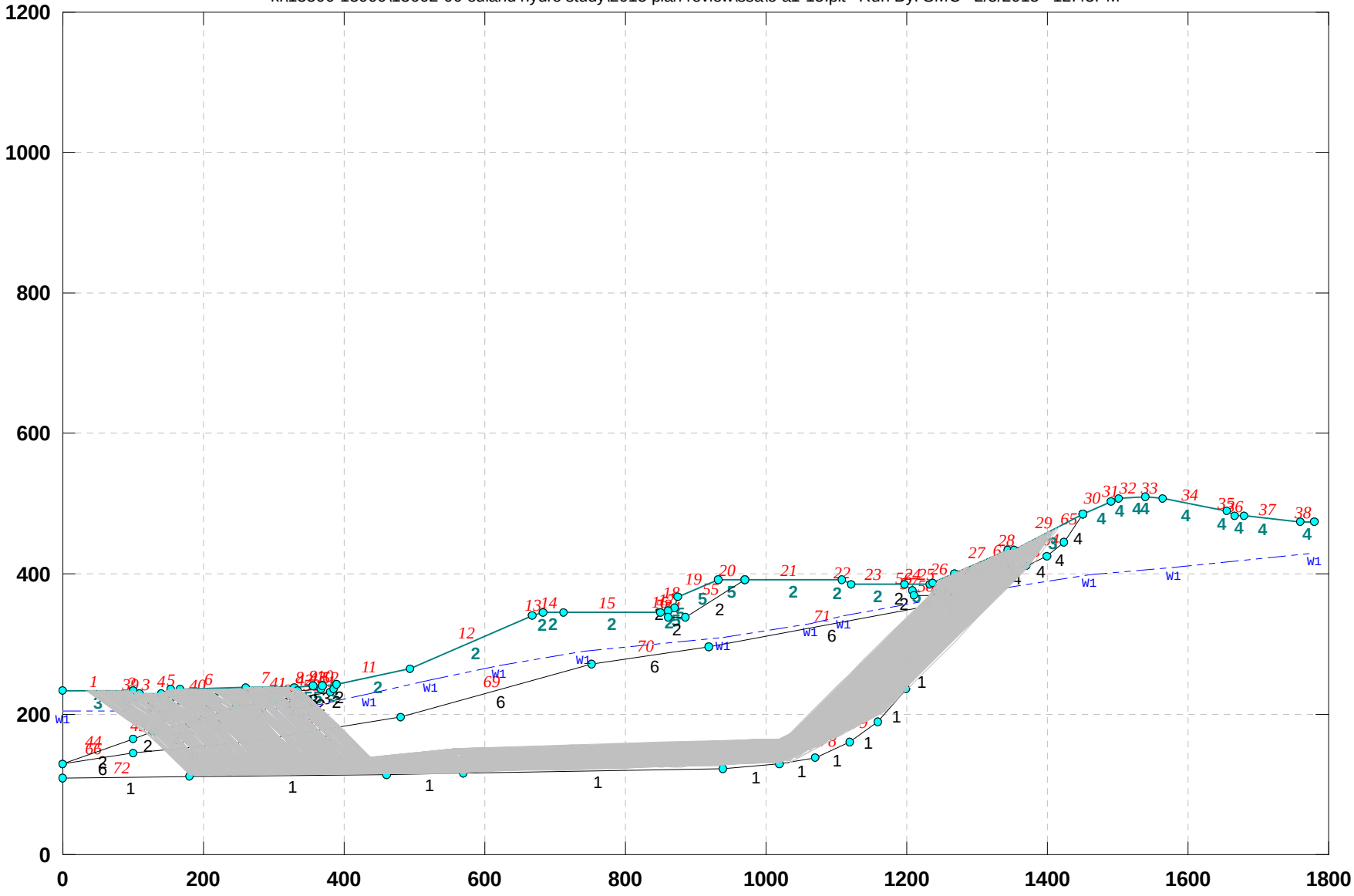
GSTABL7 v.2 FSmin=1.7

Safety Factors Are Calculated By GLE (Spencer`s) Method (0-2)

Figure E-16.1

13662-00, Euland, Section E-E', Static

k:\13500-13999\13662-00 euland hydro study\2015 plan review\ssa\e-a1-15.plt Run By: SMC 2/5/2015 12:43PM



***** GSTABL7 *****

** GSTABL7 by Garry H. Gregory, P.E. **

** Original Version 1.0, January 1996; Current Version 2.005, Sept. 2006 **

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SLOPE STABILITY ANALYSIS SYSTEM

Modified Bishop, Simplified Janbu, or GLE Method of Slices.
(Includes Spencer & Morgenstern-Price Type Analysis)
Including Pier/Pile, Reinforcement, Soil Nail, Tieback,
Nonlinear Undrained Shear Strength, Curved Phi Envelope,
Anisotropic Soil, Fiber-Reinforced Soil, Boundary Loads, Water
Surfaces, Pseudo-Static & Newmark Earthquake, and Applied Forces.

****

Analysis Run Date: 2/5/2015
Time of Run: 12:43PM
Run By: SMC
Input Data Filename: K:\13500-13999\13662-00 Euland Hydro Study\2015 Plan Review\SSA\e-a1-15.
Output Filename: K:\13500-13999\13662-00 Euland Hydro Study\2015 Plan Review\SSA\e-a1-15.OUT
Unit System: English
Plotted Output Filename: K:\13500-13999\13662-00 Euland Hydro Study\2015 Plan Review\SSA\e-a1-15.PLT
PROBLEM DESCRIPTION: 13662-00, Euland, Section E-E',
Static

BOUNDARY COORDINATES
38 Top Boundaries
83 Total Boundaries

Boundary No.	X-Left (ft)	Y-Left (ft)	X-Right (ft)	Y-Right (ft)	Soil Type Below Bnd
1	0.00	233.00	100.00	233.00	3
2	100.00	233.00	110.00	230.00	5
3	110.00	230.00	140.00	230.00	5
4	140.00	230.00	153.00	235.00	5
5	153.00	235.00	166.00	235.00	5
6	166.00	235.00	260.00	237.00	5
7	260.00	237.00	330.00	239.00	5
8	330.00	239.00	355.00	240.00	5
9	355.00	240.00	370.00	240.00	5
10	370.00	240.00	390.00	243.00	3
11	390.00	243.00	495.00	265.00	2
12	495.00	265.00	667.00	340.00	2
13	667.00	340.00	682.00	345.00	2
14	682.00	345.00	712.00	345.00	2
15	712.00	345.00	850.00	345.00	2
16	850.00	345.00	860.00	346.00	2
17	860.00	346.00	871.00	352.00	5
18	871.00	352.00	875.00	367.00	5
19	875.00	367.00	933.00	391.00	5
20	933.00	391.00	970.00	391.00	5
21	970.00	391.00	1107.00	391.00	2
22	1107.00	391.00	1122.00	384.00	2
23	1122.00	384.00	1197.00	384.00	2
24	1197.00	384.00	1233.00	384.00	5
25	1233.00	384.00	1236.00	387.00	5
26	1236.00	387.00	1268.00	400.00	5
27	1268.00	400.00	1343.00	433.00	5
28	1343.00	433.00	1353.00	433.00	5
29	1353.00	433.00	1450.00	485.00	3
30	1450.00	485.00	1490.00	502.00	4
31	1490.00	502.00	1502.00	507.00	4
32	1502.00	507.00	1540.00	510.00	4
33	1540.00	510.00	1565.00	507.00	4
34	1565.00	507.00	1656.00	490.00	4
35	1656.00	490.00	1666.00	482.00	4
36	1666.00	482.00	1680.00	482.00	4
37	1680.00	482.00	1760.00	473.00	4
38	1760.00	473.00	1780.00	473.00	4
39	100.00	233.00	105.00	225.00	3

40	105.00	225.00	292.00	230.00	3
41	292.00	230.00	333.00	233.00	3
42	333.00	233.00	368.00	235.00	3
43	368.00	235.00	370.00	240.00	3
44	0.00	128.00	100.00	164.00	2
45	100.00	164.00	130.00	175.00	2
46	130.00	175.00	180.00	187.00	2
47	180.00	187.00	248.00	212.00	2
48	248.00	212.00	300.00	219.00	2
49	300.00	219.00	340.00	224.00	2
50	340.00	224.00	380.00	231.00	2
51	380.00	231.00	385.00	235.00	2
52	385.00	235.00	390.00	243.00	2
53	860.00	346.00	861.00	338.00	2
54	861.00	338.00	885.00	338.00	2
55	885.00	338.00	970.00	391.00	2
56	1197.00	384.00	1209.00	375.00	2
57	1209.00	375.00	1210.00	370.00	2
58	1210.00	370.00	1257.00	370.00	2
59	1257.00	370.00	1270.00	370.00	1
60	1270.00	370.00	1330.00	406.00	1
61	1330.00	406.00	1353.00	433.00	3
62	1330.00	406.00	1370.00	412.00	4
63	1370.00	412.00	1400.00	425.00	4
64	1400.00	425.00	1425.00	445.00	4
65	1425.00	445.00	1450.00	485.00	4
66	0.00	128.00	100.00	145.00	6
67	100.00	145.00	260.00	160.00	6
68	260.00	160.00	480.00	195.00	6
69	480.00	195.00	752.00	272.00	6
70	752.00	272.00	920.00	295.00	6
71	920.00	295.00	1255.00	358.00	6
72	0.00	109.00	180.00	111.00	1
73	180.00	111.00	460.00	114.50	1
74	460.00	114.50	570.00	116.00	1
75	570.00	116.00	940.00	123.00	1
76	940.00	123.00	1020.00	128.00	1
77	1020.00	128.00	1070.00	138.00	1
78	1070.00	138.00	1120.00	161.00	1
79	1120.00	161.00	1160.00	190.00	1
80	1160.00	190.00	1200.00	236.00	1
81	1200.00	236.00	1230.00	288.00	1
82	1230.00	288.00	1255.00	358.00	1
83	1255.00	358.00	1257.00	370.00	1

Default Y-Origin = 0.00(ft)
Default X-Plus Value = 0.00(ft)
Default Y-Plus Value = 0.00(ft)

ISOTROPIC SOIL PARAMETERS
6 Type(s) of Soil

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.
1	119.0	125.0	0.0	0.0	0.00	0.0	1
2	119.0	125.0	0.0	0.0	0.00	0.0	1
3	119.0	125.0	300.0	20.0	0.00	0.0	1
4	119.0	125.0	750.0	29.0	0.00	0.0	1
5	119.0	125.0	300.0	26.0	0.00	0.0	1
6	119.0	125.0	0.0	0.0	0.00	0.0	1

ANISOTROPIC STRENGTH PARAMETERS
3 soil type(s)

Soil Type 1 Is Anisotropic
Number Of Direction Ranges Specified = 3

Direction Range No.	Counterclockwise Direction Limit (deg)	Cohesion Intercept (psf)	Friction Angle (deg)
1	0.0	750.00	29.00
2	5.0	300.00	15.00
3	90.0	750.00	29.00

Soil Type 2 Is Anisotropic
Number Of Direction Ranges Specified = 3

Direction Range No.	Counterclockwise Direction Limit (deg)	Cohesion Intercept (psf)	Friction Angle (deg)
1	0.0	350.00	23.00
2	10.0	250.00	12.50
3	90.0	300.00	20.00

Soil Type 6 Is Anisotropic
Number Of Direction Ranges Specified = 3

Direction Range No.	Counterclockwise Direction Limit (deg)	Cohesion Intercept (psf)	Friction Angle (deg)
1	0.0	500.00	29.00
2	10.0	250.00	12.50
3	90.0	300.00	20.00

ANISOTROPIC SOIL NOTES:
(1) An input value of 0.01 for C and/or Phi will cause Aniso C and/or Phi to be ignored in that range.
(2) An input value of 0.02 for Phi will set both Phi and C equal to zero, with no water weight in the tension crack.
(3) An input value of 0.03 for Phi will set both Phi and C equal to zero, with water weight in the tension crack.

1 PIEZOMETRIC SURFACE(S) SPECIFIED
Unit Weight of Water = 62.40 (pcf)
Piezometric Surface No. 1 Specified by 14 Coordinate Points
Pore Pressure Inclination Factor = 0.50

Point No.	X-Water (ft)	Y-Water (ft)
1	0.00	204.00
2	198.00	205.00
3	345.00	210.00
4	436.00	230.00
5	523.00	250.00
6	621.00	270.00
7	742.00	290.00
8	940.00	310.00
9	1063.00	330.00
10	1110.00	340.00
11	1270.00	370.00
12	1460.00	398.00
13	1580.00	410.00
14	1780.00	430.00

Janbus Empirical Coef is being used for the case of c & phi both > 0
A Critical Failure Surface Searching Method, Using A Random Technique For Generating Sliding Block Surfaces, Has Been Specified.
The Active And Passive Portions Of The Sliding Surfaces Are Generated According To The Rankine Theory.
1000 Trial Surfaces Have Been Generated.
5 Boxes Specified For Generation Of Central Block Base
Length Of Line Segments For Active And Passive Portions Of Sliding Block Is 50.0

Box No.	X-Left (ft)	Y-Left (ft)	X-Right (ft)	Y-Right (ft)	Height (ft)
1	180.00	113.00	460.00	116.50	1.00
2	560.00	134.00	560.00	134.00	35.00
3	700.00	137.00	1020.00	148.00	35.00
4	1020.10	148.00	1020.10	148.00	35.00
5	1030.00	150.00	1170.00	225.00	40.00

**** ERROR - BK12 ****
>>Points on active or passive wedges are outside defined ground surface
The Factor Of Safety For The Trial Failure Surface Defined By The Coordinates Listed Below Is Misleading.
Failure Surface Defined By 20 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	102.90	228.36
2	108.14	225.08
3	126.03	212.56
4	166.99	183.88
5	196.79	154.07

6	201.71	149.16
7	237.06	113.81
8	560.00	145.77
9	1018.65	164.84
10	1020.10	143.61
11	1164.35	206.23
12	1199.71	241.58
13	1208.02	249.89
14	1243.37	285.25
15	1278.73	320.60
16	1314.08	355.96
17	1349.44	391.31
18	1370.22	412.09
19	1398.89	453.05
20	1404.00	460.34

Factor Of Safety For The Preceding Specified Surface = 1.613
Theta (ki = 1.0) = 5.94 Deg Lambda =
The Factor Of Safety For The Trial Failure Surface Defined
By The Coordinates Listed Below Is Misleading.
Failure Surface Defined By 19 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	313.65	238.53
2	323.60	232.31
3	336.16	223.52
4	345.15	214.53
5	380.51	179.17
6	407.61	152.08
7	442.96	116.72
8	560.00	133.91
9	1018.96	140.14
10	1020.10	134.48
11	1096.68	189.86
12	1132.03	225.21
13	1167.39	260.57
14	1202.74	295.92
15	1238.10	331.28
16	1249.55	342.73
17	1284.90	378.08
18	1287.05	380.23
19	1311.31	419.06

Factor Of Safety For The Preceding Specified Surface = 1.720
Theta (ki = 1.0) = 6.33 Deg Lambda =
WARNING! The factor of safety calculation did not converge in 20 iterations.
The Trial Failure Surface In Question Is Defined
By The Following 18 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	69.83	233.00
2	105.92	207.73
3	146.88	179.05
4	173.99	151.94
5	176.82	149.10
6	212.18	113.75
7	560.00	136.24
8	1015.21	156.55
9	1020.10	138.99
10	1068.79	176.32
11	1104.14	211.68
12	1139.50	247.03
13	1174.85	282.39
14	1210.21	317.74
15	1245.56	353.10
16	1255.91	363.44
17	1262.46	370.00
18	1286.22	408.02

Factor of Safety for the Preceding Surface is Between 1.351 and 1.072
The Factor Of Safety For The Trial Failure Surface Defined
By The Coordinates Listed Below Is Misleading.
Failure Surface Defined By 18 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	69.83	233.00
2	105.92	207.73
3	146.88	179.05
4	173.99	151.94
5	176.82	149.10
6	212.18	113.75
7	560.00	136.24
8	1015.21	156.55
9	1020.10	138.99
10	1068.79	176.32
11	1104.14	211.68
12	1139.50	247.03
13	1174.85	282.39
14	1210.21	317.74
15	1245.56	353.10
16	1255.91	363.44
17	1262.46	370.00
18	1286.22	408.02

Factor Of Safety For The Preceding Specified Surface = 0.485
Theta (ki = 1.0) = 3.74 Deg Lambda =
Factor Of Safety Calculation By GLE (Spencer`s) Method of Slices
Has Gone Through 20 Iterations

Theta (deg) (ki=1.0)	FOS (Moment) (Equil.)	FOS (Force) (Equil.)	Lambda
9.00	173.051	1.908	0.158
13.50	169.815	2.218	0.240
89.94	169.815	2.481	*****
89.94	43.570	42.107	*****
0.00	169.815	-0.468	0.000
89.94	43.570	42.107	*****
89.94	43.570	42.107	*****
0.00	169.815	-0.468	0.000
89.94	43.570	42.107	*****
89.94	43.570	42.107	*****
0.00	169.815	-0.468	0.000
89.94	43.570	42.107	*****
89.94	43.570	42.107	*****
0.00	169.815	-0.468	0.000
89.94	43.570	42.107	*****
89.94	43.570	42.107	*****
0.00	169.815	-0.468	0.000

The Trial Failure Surface In Question Is Defined
By The Following 19 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	90.97	233.00
2	121.67	211.51
3	162.62	182.83
4	191.84	153.61
5	196.24	149.21
6	231.59	113.86
7	560.00	118.29
8	912.40	128.23
9	1020.10	131.44
10	1074.12	157.73
11	1109.47	193.09
12	1144.83	228.44
13	1180.18	263.80
14	1215.54	299.15
15	1244.23	327.85
16	1279.59	363.20
17	1310.96	394.58
18	1346.32	429.93
19	1349.38	433.00

Factor Of Safety Calculation By GLE (Spencer`s) Method of Slices
Has Gone Through 20 Iterations

Theta (deg) (ki=1.0)	FOS (Moment) (Equil.)	FOS (Force) (Equil.)	Lambda
9.00	-2.807	1.940	0.158
13.50	-2.632	2.252	0.240
0.00	-3.153	-0.071	0.000
0.00	-3.153	-0.071	0.000
8.29	-2.806	1.901	0.146
0.00	-3.153	-0.067	0.000
0.00	-3.153	-0.067	0.000
0.00	-3.153	-0.067	0.000
89.94	258.371	815.697	*****
0.00	-3.153	-0.075	0.000
0.00	-3.153	-0.075	0.000
89.94	258.371	815.697	*****
0.00	-3.153	-0.075	0.000
0.00	-3.153	-0.075	0.000
89.94	258.371	815.697	*****
0.00	-3.153	-0.075	0.000
0.00	-3.153	-0.075	0.000
89.94	258.371	815.697	*****
0.00	-3.153	-0.075	0.000
0.00	-3.153	-0.075	0.000

The Trial Failure Surface In Question Is Defined
By The Following 20 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	47.76	233.00
2	48.52	232.46
3	89.48	203.78
4	130.44	175.11
5	155.35	150.19
6	157.00	148.54
7	192.36	113.19
8	560.00	132.87
9	710.06	144.74
10	1020.10	160.51
11	1074.19	163.65
12	1109.54	199.00
13	1144.90	234.36
14	1180.25	269.71
15	1215.61	305.07
16	1247.48	336.94
17	1282.83	372.30
18	1296.34	385.81
19	1331.70	421.16
20	1343.54	433.00

Factor Of Safety Calculation By GLE (Spencer`s) Method of Slices
Has Gone Through 20 Iterations

Theta (deg) (ki=1.0)	FOS (Moment) (Equil.)	FOS (Force) (Equil.)	Lambda
9.00	-3.162	2.331	0.158
13.50	-2.970	2.720	0.240
0.00	-3.403	-0.076	0.000
0.00	-3.403	-0.076	0.000
10.95	-3.131	2.483	0.193
0.00	-3.403	-0.075	0.000
0.00	-3.403	-0.075	0.000
0.00	-3.403	-0.075	0.000
89.94	298.034	1937.370	*****
0.00	-3.403	-0.080	0.000
0.00	-3.403	-0.080	0.000
89.94	298.034	1937.370	*****
0.00	-3.403	-0.080	0.000
0.00	-3.403	-0.080	0.000
89.94	298.034	1937.370	*****
0.00	-3.403	-0.080	0.000

0.00	-3.403	-0.080	0.000
89.94	298.034	1937.370	*****
0.00	-3.403	-0.080	0.000
0.00	-3.403	-0.080	0.000

The Trial Failure Surface In Question Is Defined
By The Following 19 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	46.66	233.00
2	47.75	232.24
3	88.71	203.56
4	129.67	174.88
5	154.44	150.10
6	156.04	148.50
7	191.40	113.15
8	560.00	129.81
9	931.46	161.46
10	1020.10	134.75
11	1145.89	209.04
12	1181.25	244.39
13	1216.61	279.75
14	1232.86	296.00
15	1268.21	331.35
16	1303.57	366.71
17	1338.92	402.07
18	1345.13	408.27
19	1368.12	441.10

Factor Of Safety Calculation By GLE (Spencer`s) Method of Slices
Has Gone Through 20 Iterations

Theta (deg) (ki=1.0)	FOS (Moment) (Equil.)	FOS (Force) (Equil.)	Lambda
9.00	-3.821	2.363	0.158
13.50	-3.661	2.705	0.240
0.00	-4.105	-0.069	0.000
0.00	-4.105	-0.069	0.000
9.90	-3.814	2.422	0.174
0.00	-4.105	-0.065	0.000
0.00	-4.105	-0.065	0.000
0.00	-4.105	-0.065	0.000
89.94	43.057	0.251	*****
10.34	-23.836	0.027	0.182
21.80	-21.022	-0.001	0.400
89.94	-0.150	0.251	*****
89.94	1.016	0.251	*****
0.00	-3.229	0.000	0.000
66.97	-0.010	0.213	2.353
73.61	-3.403	0.288	3.400
66.40	2.034	0.208	2.289
67.18	-0.371	0.215	2.377
66.93	-3.403	0.213	2.348
67.33	-2.044	0.217	2.394

The Trial Failure Surface In Question Is Defined
By The Following 18 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	59.95	233.00
2	98.56	205.96
3	139.52	177.28
4	165.65	151.15
5	168.62	148.18
6	203.98	112.83
7	560.00	130.02
8	855.84	154.15
9	1020.10	138.24
10	1143.43	196.08
11	1178.79	231.43
12	1214.14	266.79
13	1222.70	275.34
14	1258.05	310.70

15	1293.41	346.05
16	1328.76	381.41
17	1357.48	410.12
18	1385.81	450.59

Factor Of Safety Calculation By GLE (Spencer`s) Method of Slices
Has Gone Through 20 Iterations

Theta (deg) (ki=1.0)	FOS (Moment) (Equil.)	FOS (Force) (Equil.)	Lambda
9.00	-0.124	2.241	0.158
13.50	-21.095	2.558	0.240
8.33	-21.136	2.202	0.146
0.00	-22.365	-0.067	0.000
0.00	-22.365	-0.067	0.000
7.89	1.106	2.178	0.139
8.42	-2.151	2.207	0.148
7.66	-2.155	2.165	0.134
0.00	-2.432	-0.066	0.000
0.00	-2.432	-0.066	0.000
51.78	0.735	0.113	1.270
37.41	0.075	0.020	0.765
30.75	-0.109	0.000	0.595
34.41	-0.006	0.014	0.685
35.56	-0.006	0.018	0.715
26.38	-0.178	0.070	0.496
39.97	0.200	0.000	0.838
31.89	-0.124	0.001	0.622
33.35	-0.006	0.000	0.658
33.46	-0.002	0.000	0.661

The Trial Failure Surface In Question Is Defined
By The Following 20 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	103.30	227.72
2	107.55	225.07
3	125.57	212.45
4	166.53	183.77
5	196.27	154.03
6	201.43	148.86
7	236.79	113.51
8	560.00	119.90
9	853.34	141.76
10	1020.10	141.25
11	1124.84	187.05
12	1160.20	222.41
13	1195.55	257.77
14	1230.91	293.12
15	1232.34	294.56
16	1267.70	329.91
17	1303.05	365.27
18	1338.41	400.62
19	1346.22	408.43
20	1369.68	441.94

Factor Of Safety Calculation By GLE (Spencer`s) Method of Slices
Has Gone Through 20 Iterations

Theta (deg) (ki=1.0)	FOS (Moment) (Equil.)	FOS (Force) (Equil.)	Lambda
9.00	-3.050	2.017	0.158
13.50	-2.823	2.322	0.240
0.00	-3.263	-0.042	0.000
0.00	-3.263	-0.042	0.000
8.99	-3.050	2.017	0.158
0.00	-3.263	-0.040	0.000

```
  #################### SOME LINES SKIPPED ####################
      Following Are Displayed The Ten Most Critical Of The Trial
      Failure Surfaces Evaluated. They Are
      Ordered - Most Critical First.
      * * Safety Factors Are Calculated By GLE (Spencer`s) Method (0-2) * *
      Selected ki function = Bi-linear
```

Selected Lambda Coefficient = 1.00
Forces from Reinforcement, Piers/Piles, Soil Nails, and Applied Forces
(if applicable) have been applied to the slice base(s)
on which they intersect.
Specified Tension Crack Water Force Factor = 0.000
Total Number of Trial Surfaces Attempted = 1000
WARNING! The Factor of Safety Calculation for one or More Trial Surfaces
Did Not Converge in 20 Iterations.
Number of Trial Surfaces with Non-Converged FS = 14
Number of Trial Surfaces with Misleading FS = 8
Number of Trial Surfaces With Valid FS = 978
Percentage of Trial Surfaces With Non-Valid FS Solutions
of the Total Attempted = 2.2 %
Statistical Data On All Valid FS Values:
FS Max = 28.311 FS Min = 1.678 FS Ave = 1.789
Standard Deviation = 0.977 Coefficient of Variation = 54.59 %
((Simplified Janbu FS for Critical Surface = 1.367))
Failure Surface Specified By 18 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	185.902	235.423
2	198.579	227.502
3	230.111	205.423
4	238.047	197.487
5	273.402	162.132
6	285.380	150.154
7	320.735	114.799
8	560.000	118.224
9	724.277	123.340
10	1020.100	165.276
11	1074.938	188.720
12	1110.293	224.075
13	1145.648	259.430
14	1181.004	294.786
15	1216.359	330.141
16	1241.721	355.503
17	1256.218	370.000
18	1277.605	404.226

*** FOS = 1.678 Theta (ki=1.0) = 6.07 ***
Lambda = 0.106
Individual data on the 64 slices

Slice No.	Width (ft)	Weight (lbs)	Water Force Top (lbs)	Water Force Bot (lbs)	Tie Force Norm (lbs)	Tie Force Tan (lbs)	Earthquake Force Hor (lbs)	Earthquake Force Ver (lbs)	Surcharge Load (lbs)
1	12.7	6178.3	0.0	0.0	0.	0.	0.0	0.0	0.0
2	30.6	70098.1	0.0	0.0	0.	0.	0.0	0.0	0.0
3	0.9	3321.5	0.0	23.2	0.	0.	0.0	0.0	0.0
4	2.0	7649.0	0.0	301.7	0.	0.	0.0	0.0	0.0
5	5.9	25623.7	0.0	3038.1	0.	0.	0.0	0.0	0.0
6	10.0	53104.8	0.0	12308.1	0.	0.	0.0	0.0	0.0
7	12.0	80848.8	0.0	26851.2	0.	0.	0.0	0.0	0.0
8	13.4	112113.9	0.0	45511.0	0.	0.	0.0	0.0	0.0
9	12.0	119745.7	0.0	54535.6	0.	0.	0.0	0.0	0.0
10	6.6	74105.1	0.0	35758.3	0.	0.	0.0	0.0	0.0
11	8.0	97067.3	0.0	48542.6	0.	0.	0.0	0.0	0.0
12	20.7	289895.5	0.0	*******	0.	0.	0.0	0.0	0.0
13	9.3	141967.2	0.0	54589.5	0.	0.	0.0	0.0	0.0
14	3.0	46007.7	0.0	17698.4	0.	0.	0.0	0.0	0.0
15	7.0	107462.4	0.0	41339.2	0.	0.	0.0	0.0	0.0
16	5.0	76854.1	0.0	29564.9	0.	0.	0.0	0.0	0.0
17	10.0	153872.8	0.0	58457.2	0.	0.	0.0	0.0	0.0
18	13.0	200269.5	0.0	77867.2	0.	0.	0.0	0.0	0.0
19	2.0	30803.2	0.0	12167.5	0.	0.	0.0	0.0	0.0
20	10.0	154878.6	0.0	61589.0	0.	0.	0.0	0.0	0.0
21	5.0	78090.0	0.0	31264.3	0.	0.	0.0	0.0	0.0
22	5.0	78523.7	0.0	31577.4	0.	0.	0.0	0.0	0.0
23	46.0	750265.4	0.0	*******	0.	0.	0.0	0.0	0.0
24	44.0	766018.2	0.0	*******	0.	0.	0.0	0.0	0.0
25	15.0	271979.8	0.0	*******	0.	0.	0.0	0.0	0.0

26	28.0	533006.1	0.0	*******	0.	0.	0.0	0.0	0.0
27	37.0	766245.2	0.0	*******	0.	0.	0.0	0.0	0.0
28	61.0	1412700.9	0.0	*******	0.	0.	0.0	0.0	0.0
29	46.0	1186438.5	0.0	*******	0.	0.	0.0	0.0	0.0
30	15.0	407914.2	0.0	*******	0.	0.	0.0	0.0	0.0
31	30.0	822788.0	0.0	*******	0.	0.	0.0	0.0	0.0
32	12.3	335966.0	0.0	*******	0.	0.	0.0	0.0	0.0
33	17.7	482031.2	0.0	*******	0.	0.	0.0	0.0	0.0
34	10.0	269728.9	0.0	*******	0.	0.	0.0	0.0	0.0
35	98.0	2552784.0	0.0	*******	0.	0.	0.0	0.0	0.0
36	10.0	251842.4	0.0	*******	0.	0.	0.0	0.0	0.0
37	1.0	25182.1	0.0	9990.2	0.	0.	0.0	0.0	0.0
38	10.0	254449.6	0.0	99761.2	0.	0.	0.0	0.0	0.0
39	4.0	106168.8	0.0	39832.9	0.	0.	0.0	0.0	0.0
40	10.0	275611.3	0.0	99403.5	0.	0.	0.0	0.0	0.0
41	35.0	989940.9	0.0	*******	0.	0.	0.0	0.0	0.0
42	13.0	377716.6	0.0	*******	0.	0.	0.0	0.0	0.0
43	7.0	204428.5	0.0	68571.9	0.	0.	0.0	0.0	0.0
44	30.0	866569.5	0.0	*******	0.	0.	0.0	0.0	0.0
45	50.1	1413569.8	0.0	*******	0.	0.	0.0	0.0	0.0
46	42.9	1144168.4	0.0	*******	0.	0.	0.0	0.0	0.0
47	11.9	301150.7	0.0	*******	0.	0.	0.0	0.0	0.0
48	32.1	735309.2	0.0	*******	0.	0.	0.0	0.0	0.0
49	3.0	62049.8	0.0	30407.2	0.	0.	0.0	0.0	0.0
50	0.3	5976.6	0.0	2951.8	0.	0.	0.0	0.0	0.0
51	11.7	226125.8	0.0	*******	0.	0.	0.0	0.0	0.0
52	23.6	397344.7	0.0	*******	0.	0.	0.0	0.0	0.0
53	35.4	464924.3	0.0	*******	0.	0.	0.0	0.0	0.0
54	16.0	159507.6	0.0	72197.7	0.	0.	0.0	0.0	0.0
55	12.0	98864.8	0.0	42321.6	0.	0.	0.0	0.0	0.0
56	1.0	7434.1	0.0	3068.7	0.	0.	0.0	0.0	0.0
57	6.4	44377.7	0.0	17864.8	0.	0.	0.0	0.0	0.0
58	16.6	92439.5	0.0	33261.0	0.	0.	0.0	0.0	0.0
59	3.0	13553.3	0.0	3919.7	0.	0.	0.0	0.0	0.0
60	5.7	24569.2	0.0	5716.4	0.	0.	0.0	0.0	0.0
61	11.3	41329.9	0.0	4513.4	0.	0.	0.0	0.0	0.0
62	3.2	9899.9	0.0	0.0	0.	0.	0.0	0.0	0.0
63	11.8	25488.3	0.0	0.0	0.	0.	0.0	0.0	0.0
64	9.6	6369.1	0.0	0.0	0.	0.	0.0	0.0	0.0

Failure Surface Specified By 19 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	126.573	230.000
2	133.361	225.758
3	144.756	217.779
4	185.714	189.101
5	218.687	156.127
6	225.633	149.181
7	260.989	113.825
8	560.000	117.250
9	923.496	143.843
10	1020.100	157.466
11	1051.627	171.525
12	1086.983	206.880
13	1122.338	242.236
14	1157.693	277.591
15	1193.049	312.946
16	1228.404	348.302
17	1234.188	354.086
18	1250.102	370.000
19	1269.170	400.515

*** FOS = 1.684 Theta (ki=1.0) = 5.92 ***
Lambda = 0.104

Failure Surface Specified By 18 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	233.258	236.431
2	245.538	228.758
3	266.009	214.424
4	276.783	203.650

5	312.138	168.295
6	329.403	151.030
7	364.758	115.675
8	560.000	118.942
9	779.590	126.233
10	1020.100	159.978
11	1136.324	220.863
12	1171.680	256.219
13	1207.035	291.574
14	1242.391	326.929
15	1244.744	329.283
16	1280.099	364.638
17	1308.653	393.192
18	1329.936	427.252

*** FOS = 1.684 Theta (ki=1.0) = 6.21 ***
Lambda = 0.109

Failure Surface Specified By 17 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	255.662	236.908
2	267.754	229.352
3	285.354	217.028
4	295.720	206.663
5	331.075	171.307
6	351.415	150.968
7	386.770	115.612
8	560.000	119.301
9	807.246	127.679
10	1020.100	157.329
11	1167.018	236.935
12	1202.373	272.290
13	1236.621	306.538
14	1271.976	341.893
15	1307.331	377.249
16	1337.156	407.073
17	1356.698	434.983

*** FOS = 1.685 Theta (ki=1.0) = 6.33 ***
Lambda = 0.111

Failure Surface Specified By 18 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	43.323	233.000
2	45.562	231.433
3	86.519	202.754
4	127.477	174.075
5	151.705	149.847
6	153.173	148.379
7	188.528	113.024
8	560.000	120.634
9	955.684	154.622
10	1020.100	162.490
11	1081.022	195.202
12	1116.377	230.557
13	1151.732	265.912
14	1187.088	301.268
15	1222.443	336.623
16	1241.231	355.411
17	1255.820	370.000
18	1277.056	403.985

*** FOS = 1.688 Theta (ki=1.0) = 5.88 ***
Lambda = 0.103

Failure Surface Specified By 16 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	73.841	233.000
2	108.907	208.446
3	149.864	179.767
4	177.378	152.254
5	180.516	149.116
6	215.872	113.760

7	560.000	118.036
8	846.934	140.630
9	1020.100	153.330
10	1112.194	212.682
11	1147.549	248.038
12	1182.904	283.393
13	1218.260	318.748
14	1253.605	354.093
15	1269.511	370.000
16	1295.939	412.293

*** FOS = 1.692 Theta (ki=1.0) = 5.92 ***
Lambda = 0.104

Failure Surface Specified By 19 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	147.599	232.923
2	158.010	226.417
3	161.536	223.949
4	202.494	195.270
5	204.314	193.449
6	239.670	158.094
7	247.645	150.118
8	283.000	114.763
9	560.000	117.609
10	951.152	145.289
11	1020.100	154.817
12	1082.321	187.597
13	1117.676	222.952
14	1153.031	258.307
15	1188.387	293.663
16	1223.742	329.018
17	1255.455	360.731
18	1264.724	370.000
19	1289.336	409.388

*** FOS = 1.692 Theta (ki=1.0) = 6.00 ***
Lambda = 0.105

Failure Surface Specified By 19 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	132.669	230.000
2	139.207	225.915
3	143.130	221.992
4	178.485	186.636
5	209.825	155.296
6	216.200	148.922
7	251.555	113.566
8	560.000	117.096
9	820.215	135.080
10	1020.100	163.601
11	1158.473	217.494
12	1193.828	252.850
13	1229.184	288.205
14	1230.567	289.589
15	1265.923	324.944
16	1301.278	360.299
17	1336.633	395.655
18	1349.975	408.996
19	1375.065	444.829

*** FOS = 1.694 Theta (ki=1.0) = 6.05 ***
Lambda = 0.106

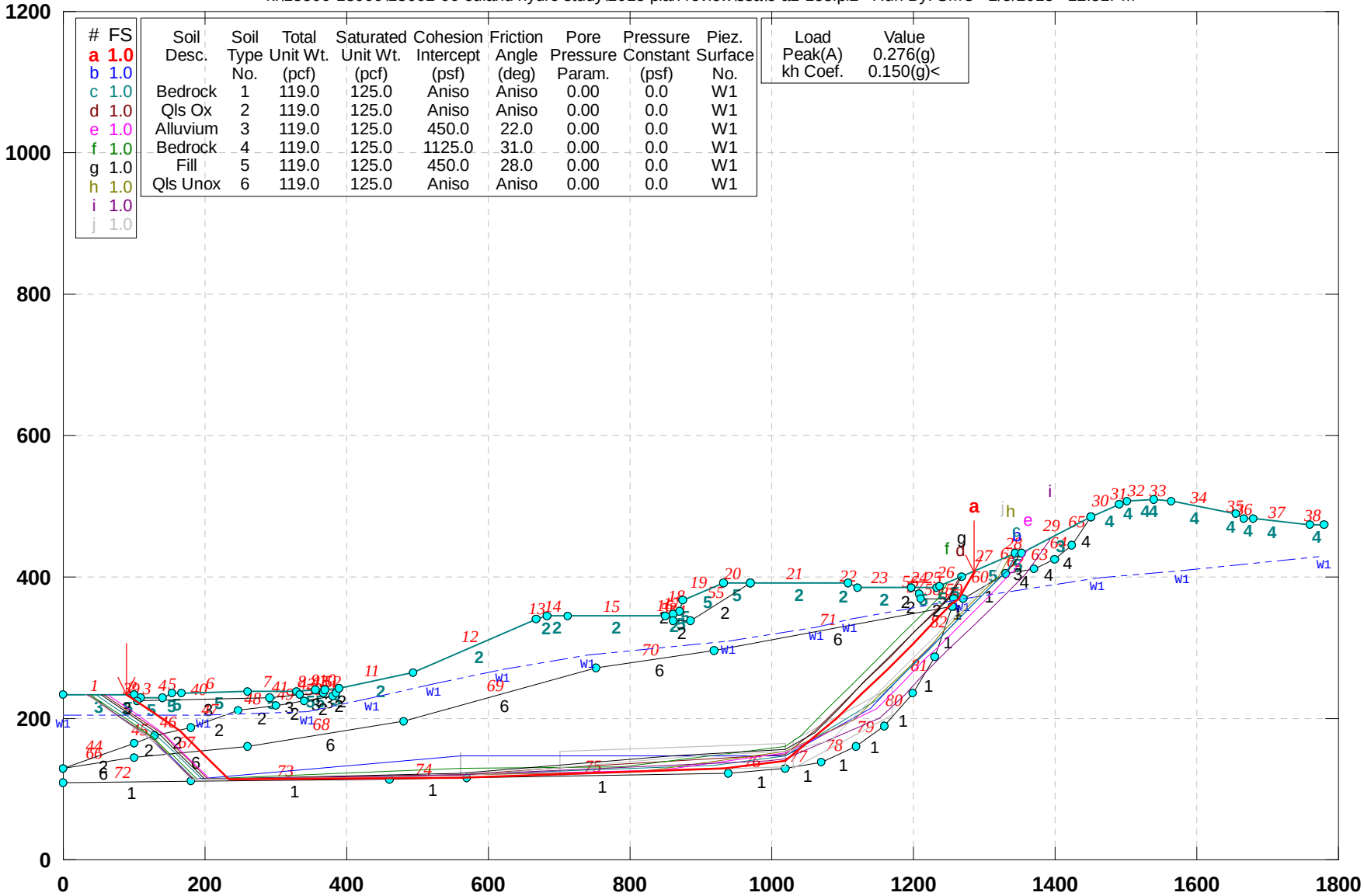
Failure Surface Specified By 19 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	38.237	233.000
2	42.224	230.209
3	83.181	201.530
4	124.139	172.851
5	147.534	149.456
6	149.071	147.919
7	184.426	112.564

```
      8        560.000      117.523
      9        715.996      130.421
     10       1020.100      162.114
     11       1048.346      167.580
     12       1083.701      202.935
     13       1119.057      238.290
     14       1154.412      273.646
     15       1189.767      309.001
     16       1225.123      344.356
     17       1235.006      354.240
     18       1250.766      370.000
     19       1270.086      400.918
***  FOS =     1.695   Theta (ki=1.0) =     5.85  ***
                     Lambda =   0.102
Failure Surface Specified By 18 Coordinate Points
  Point      X-Surf      Y-Surf
   No.        (ft)        (ft)
     1        87.113      233.000
     2       118.791      210.819
     3       159.749      182.140
     4       188.584      153.305
     5       193.094      148.794
     6       228.450      113.439
     7       560.000      118.241
     8       771.309      133.314
     9      1020.100      156.816
    10      1109.733      199.723
    11      1145.088      235.079
    12      1180.443      270.434
    13      1215.799      305.789
    14      1247.772      337.763
    15      1283.128      373.118
    16      1295.024      385.014
    17      1330.379      420.370
    18      1343.010      433.000
***  FOS =     1.696   Theta (ki=1.0) =     5.93  ***
                     Lambda =   0.104
          **** END OF GSTABL7 OUTPUT ****
```

13662-00, Euland, Section E-E', Seismic

k:\13500-13999\13662-00 euland hydro study\2015 plan review\ssa\e-a1-15s.pl2 Run By: SMC 2/5/2015 12:51PM



#	FS
a	1.0
b	1.0
c	1.0
d	1.0
e	1.0
f	1.0
g	1.0
h	1.0
i	1.0
j	1.0

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.
Bedrock	1	119.0	125.0	Aniso	Aniso	0.00	0.0	W1
Qls Ox	2	119.0	125.0	Aniso	Aniso	0.00	0.0	W1
Alluvium	3	119.0	125.0	450.0	22.0	0.00	0.0	W1
Bedrock	4	119.0	125.0	1125.0	31.0	0.00	0.0	W1
Fill	5	119.0	125.0	450.0	28.0	0.00	0.0	W1
Qls Unox	6	119.0	125.0	Aniso	Aniso	0.00	0.0	W1

Load	Value
Peak(A)	0.276(g)
kh Coef.	0.150(g)<

GSTABL7 v.2 FSmin=1.0

Safety Factors Are Calculated By GLE (Spencer`s) Method (0-2)

Figure E-16.2

***** GSTABL7 *****

** GSTABL7 by Garry H. Gregory, P.E. **

** Original Version 1.0, January 1996; Current Version 2.005, Sept. 2006 **

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****

SLOPE STABILITY ANALYSIS SYSTEM

Modified Bishop, Simplified Janbu, or GLE Method of Slices.
(Includes Spencer & Morgenstern-Price Type Analysis)
Including Pier/Pile, Reinforcement, Soil Nail, Tieback,
Nonlinear Undrained Shear Strength, Curved Phi Envelope,
Anisotropic Soil, Fiber-Reinforced Soil, Boundary Loads, Water
Surfaces, Pseudo-Static & Newmark Earthquake, and Applied Forces.

****

Analysis Run Date: 2/5/2015
Time of Run: 12:51PM
Run By: SMC
Input Data Filename: K:\13500-13999\13662-00 Euland Hydro Study\2015 Plan Review\SSA\e-a1-15s.
Output Filename: K:\13500-13999\13662-00 Euland Hydro Study\2015 Plan Review\SSA\e-a1-15s.OUT
Unit System: English
Plotted Output Filename: K:\13500-13999\13662-00 Euland Hydro Study\2015 Plan Review\SSA\e-a1-15s.PLT
PROBLEM DESCRIPTION: 13662-00, Euland, Section E-E',
Seismic

BOUNDARY COORDINATES
38 Top Boundaries
83 Total Boundaries

Boundary No.	X-Left (ft)	Y-Left (ft)	X-Right (ft)	Y-Right (ft)	Soil Type Below Bnd
1	0.00	233.00	100.00	233.00	3
2	100.00	233.00	110.00	230.00	5
3	110.00	230.00	140.00	230.00	5
4	140.00	230.00	153.00	235.00	5
5	153.00	235.00	166.00	235.00	5
6	166.00	235.00	260.00	237.00	5
7	260.00	237.00	330.00	239.00	5
8	330.00	239.00	355.00	240.00	5
9	355.00	240.00	370.00	240.00	5
10	370.00	240.00	390.00	243.00	3
11	390.00	243.00	495.00	265.00	2
12	495.00	265.00	667.00	340.00	2
13	667.00	340.00	682.00	345.00	2
14	682.00	345.00	712.00	345.00	2
15	712.00	345.00	850.00	345.00	2
16	850.00	345.00	860.00	346.00	2
17	860.00	346.00	871.00	352.00	5
18	871.00	352.00	875.00	367.00	5
19	875.00	367.00	933.00	391.00	5
20	933.00	391.00	970.00	391.00	5
21	970.00	391.00	1107.00	391.00	2
22	1107.00	391.00	1122.00	384.00	2
23	1122.00	384.00	1197.00	384.00	2
24	1197.00	384.00	1233.00	384.00	5
25	1233.00	384.00	1236.00	387.00	5
26	1236.00	387.00	1268.00	400.00	5
27	1268.00	400.00	1343.00	433.00	5
28	1343.00	433.00	1353.00	433.00	5
29	1353.00	433.00	1450.00	485.00	3
30	1450.00	485.00	1490.00	502.00	4
31	1490.00	502.00	1502.00	507.00	4
32	1502.00	507.00	1540.00	510.00	4
33	1540.00	510.00	1565.00	507.00	4
34	1565.00	507.00	1656.00	490.00	4
35	1656.00	490.00	1666.00	482.00	4
36	1666.00	482.00	1680.00	482.00	4
37	1680.00	482.00	1760.00	473.00	4
38	1760.00	473.00	1780.00	473.00	4
39	100.00	233.00	105.00	225.00	3

40	105.00	225.00	292.00	230.00	3
41	292.00	230.00	333.00	233.00	3
42	333.00	233.00	368.00	235.00	3
43	368.00	235.00	370.00	240.00	3
44	0.00	128.00	100.00	164.00	2
45	100.00	164.00	130.00	175.00	2
46	130.00	175.00	180.00	187.00	2
47	180.00	187.00	248.00	212.00	2
48	248.00	212.00	300.00	219.00	2
49	300.00	219.00	340.00	224.00	2
50	340.00	224.00	380.00	231.00	2
51	380.00	231.00	385.00	235.00	2
52	385.00	235.00	390.00	243.00	2
53	860.00	346.00	861.00	338.00	2
54	861.00	338.00	885.00	338.00	2
55	885.00	338.00	970.00	391.00	2
56	1197.00	384.00	1209.00	375.00	2
57	1209.00	375.00	1210.00	370.00	2
58	1210.00	370.00	1257.00	370.00	2
59	1257.00	370.00	1270.00	370.00	1
60	1270.00	370.00	1330.00	406.00	1
61	1330.00	406.00	1353.00	433.00	3
62	1330.00	406.00	1370.00	412.00	4
63	1370.00	412.00	1400.00	425.00	4
64	1400.00	425.00	1425.00	445.00	4
65	1425.00	445.00	1450.00	485.00	4
66	0.00	128.00	100.00	145.00	6
67	100.00	145.00	260.00	160.00	6
68	260.00	160.00	480.00	195.00	6
69	480.00	195.00	752.00	272.00	6
70	752.00	272.00	920.00	295.00	6
71	920.00	295.00	1255.00	358.00	6
72	0.00	109.00	180.00	111.00	1
73	180.00	111.00	460.00	114.50	1
74	460.00	114.50	570.00	116.00	1
75	570.00	116.00	940.00	123.00	1
76	940.00	123.00	1020.00	128.00	1
77	1020.00	128.00	1070.00	138.00	1
78	1070.00	138.00	1120.00	161.00	1
79	1120.00	161.00	1160.00	190.00	1
80	1160.00	190.00	1200.00	236.00	1
81	1200.00	236.00	1230.00	288.00	1
82	1230.00	288.00	1255.00	358.00	1
83	1255.00	358.00	1257.00	370.00	1

Default Y-Origin = 0.00(ft)
Default X-Plus Value = 0.00(ft)
Default Y-Plus Value = 0.00(ft)

ISOTROPIC SOIL PARAMETERS
6 Type(s) of Soil

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.
1	119.0	125.0	0.0	0.0	0.00	0.0	1
2	119.0	125.0	0.0	0.0	0.00	0.0	1
3	119.0	125.0	450.0	22.0	0.00	0.0	1
4	119.0	125.0	1125.0	31.0	0.00	0.0	1
5	119.0	125.0	450.0	28.0	0.00	0.0	1
6	119.0	125.0	0.0	0.0	0.00	0.0	1

ANISOTROPIC STRENGTH PARAMETERS
3 soil type(s)
Soil Type 1 Is Anisotropic
Number Of Direction Ranges Specified = 3

Direction Range No.	Counterclockwise Direction Limit (deg)	Cohesion Intercept (psf)	Friction Angle (deg)
1	0.0	1125.00	31.00
2	5.0	450.00	17.00
3	90.0	1125.00	31.00

Soil Type 2 Is Anisotropic
Number Of Direction Ranges Specified = 3

Direction Range No.	Counterclockwise Direction Limit (deg)	Cohesion Intercept (psf)	Friction Angle (deg)
1	0.0	525.00	25.00
2	10.0	375.00	14.50
3	90.0	450.00	22.00

Soil Type 6 Is Anisotropic
Number Of Direction Ranges Specified = 3

Direction Range No.	Counterclockwise Direction Limit (deg)	Cohesion Intercept (psf)	Friction Angle (deg)
1	0.0	750.00	31.00
2	10.0	375.00	14.50
3	90.0	450.00	22.00

ANISOTROPIC SOIL NOTES:
(1) An input value of 0.01 for C and/or Phi will cause Aniso C and/or Phi to be ignored in that range.
(2) An input value of 0.02 for Phi will set both Phi and C equal to zero, with no water weight in the tension crack.
(3) An input value of 0.03 for Phi will set both Phi and C equal to zero, with water weight in the tension crack.

1 PIEZOMETRIC SURFACE(S) SPECIFIED
Unit Weight of Water = 62.40 (pcf)
Piezometric Surface No. 1 Specified by 14 Coordinate Points
Pore Pressure Inclination Factor = 0.50

Point No.	X-Water (ft)	Y-Water (ft)
1	0.00	204.00
2	198.00	205.00
3	345.00	210.00
4	436.00	230.00
5	523.00	250.00
6	621.00	270.00
7	742.00	290.00
8	940.00	310.00
9	1063.00	330.00
10	1110.00	340.00
11	1270.00	370.00
12	1460.00	398.00
13	1580.00	410.00
14	1780.00	430.00

Specified Peak Ground Acceleration Coefficient (A) = 0.276(g)
Specified Horizontal Earthquake Coefficient (kh) = 0.150(g)
Specified Vertical Earthquake Coefficient (kv) = 0.000(g)
Specified Seismic Pore-Pressure Factor = 0.000
Janbus Empirical Coef is being used for the case of c & phi both > 0
A Critical Failure Surface Searching Method, Using A Random Technique For Generating Sliding Block Surfaces, Has Been Specified.
The Active And Passive Portions Of The Sliding Surfaces Are Generated According To The Rankine Theory.
1000 Trial Surfaces Have Been Generated.
5 Boxes Specified For Generation Of Central Block Base Length Of Line Segments For Active And Passive Portions Of Sliding Block Is 50.0

Box No.	X-Left (ft)	Y-Left (ft)	X-Right (ft)	Y-Right (ft)	Height (ft)
1	180.00	113.00	460.00	116.50	1.00
2	560.00	134.00	560.00	134.00	35.00
3	700.00	137.00	1020.00	148.00	35.00
4	1020.10	148.00	1020.10	148.00	35.00
5	1030.00	150.00	1170.00	225.00	40.00

The Factor Of Safety For The Trial Failure Surface Defined By The Coordinates Listed Below Is Misleading.
Failure Surface Defined By 20 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	104.38	225.99
2	105.99	225.03
3	125.54	211.84

4	166.99	183.88
5	196.79	154.07
6	201.71	149.16
7	237.06	113.81
8	560.00	145.77
9	1018.65	164.84
10	1020.10	143.61
11	1164.35	206.23
12	1199.71	241.58
13	1208.02	249.89
14	1243.37	285.25
15	1278.73	320.60
16	1314.08	355.96
17	1349.44	391.31
18	1370.22	412.09
19	1398.18	453.55
20	1402.06	459.30

Factor Of Safety For The Preceding Specified Surface = 1.038
Theta (ki = 1.0) = 4.25 Deg Lambda =
The Factor Of Safety For The Trial Failure Surface Defined
By The Coordinates Listed Below Is Misleading.
Failure Surface Defined By 19 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	312.81	238.51
2	323.17	232.28
3	336.16	223.52
4	345.15	214.53
5	380.51	179.17
6	407.61	152.08
7	442.96	116.72
8	560.00	133.91
9	1018.96	140.14
10	1020.10	134.48
11	1096.68	189.86
12	1132.03	225.21
13	1167.39	260.57
14	1202.74	295.92
15	1238.10	331.28
16	1249.55	342.73
17	1284.90	378.08
18	1287.05	380.23
19	1310.04	418.50

Factor Of Safety For The Preceding Specified Surface = 1.110
Theta (ki = 1.0) = 4.32 Deg Lambda =
WARNING! The factor of safety calculation did not converge in 20 iterations.
The Trial Failure Surface In Question Is Defined
By The Following 19 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	87.62	233.00
2	120.71	210.68
3	162.16	182.72
4	191.32	153.56
5	195.97	148.92
6	231.32	113.56
7	560.00	127.42
8	747.09	140.15
9	1020.10	164.08
10	1034.61	138.56
11	1069.96	173.91
12	1105.32	209.27
13	1140.67	244.62
14	1176.03	279.98
15	1211.38	315.34
16	1246.74	350.69
17	1255.19	359.14
18	1266.05	370.00
19	1289.85	409.61

Factor of Safety for the Preceding Surface is Between-5.115 and 1.039

Factor Of Safety Calculation By GLE (Spencer`s) Method of Slices
Has Gone Through 20 Iterations

Theta (deg) (ki=1.0)	FOS (Moment) (Equil.)	FOS (Force) (Equil.)	Lambda
9.00	30.275	37.710	0.158
13.50	41.463	0.000	0.240
9.91	36.559	57.596	0.175
10.33	39.573	74.339	0.182
9.07	30.709	38.730	0.160
8.14	25.024	27.583	0.143
7.26	20.360	20.771	0.127
6.74	0.000	0.001	0.118
6.56	0.000	-0.026	0.115
6.73	0.000	-0.002	0.118
6.75	0.000	0.000	0.118
6.75	0.000	0.000	0.118
6.75	0.000	0.000	0.118
6.75	0.000	0.000	0.118
6.75	0.000	0.000	0.118
6.75	0.000	0.000	0.118
6.75	0.000	0.000	0.118
6.75	0.000	0.000	0.118
6.75	0.000	0.000	0.118

The Trial Failure Surface In Question Is Defined
By The Following 19 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	87.62	233.00
2	120.71	210.68
3	162.16	182.72
4	191.32	153.56
5	195.97	148.92
6	231.32	113.56
7	560.00	127.42
8	747.09	140.15
9	1020.10	164.08
10	1034.61	138.56
11	1069.96	173.91
12	1105.32	209.27
13	1140.67	244.62
14	1176.03	279.98
15	1211.38	315.34
16	1246.74	350.69
17	1255.19	359.14
18	1266.05	370.00
19	1289.85	409.61

Factor Of Safety Calculation By GLE (Spencer`s) Method of Slices
Has Gone Through 20 Iterations

Theta (deg) (ki=1.0)	FOS (Moment) (Equil.)	FOS (Force) (Equil.)	Lambda
9.00	1.139	1.322	0.158
13.50	1.116	1.498	0.240
3.47	1.135	1.166	0.061
0.00	1.124	1.091	0.000
1.23	1.129	1.116	0.021
2.21	1.132	1.138	0.039
1.80	1.131	1.129	0.031
1.81	1.131	1.129	0.032
8.38	-0.111	0.001	0.147
1.96	1.131	1.132	0.034
0.00	1.124	1.091	0.000
1.90	1.131	1.131	0.033
1.92	1.131	1.131	0.034
1.92	1.131	1.131	0.034
1.92	1.131	1.131	0.034
1.92	1.131	1.131	0.034
1.92	1.131	1.131	0.034

1.92	1.131	1.131	0.034
1.92	1.131	1.131	0.034
1.92	1.131	1.131	0.034

The Trial Failure Surface In Question Is Defined
By The Following 19 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	43.50	233.00
2	46.76	230.80
3	88.22	202.84
4	129.67	174.88
5	154.44	150.10
6	156.04	148.50
7	191.40	113.15
8	560.00	129.81
9	931.46	161.46
10	1020.10	134.75
11	1145.89	209.04
12	1181.25	244.39
13	1216.61	279.75
14	1232.86	296.00
15	1268.21	331.35
16	1303.57	366.71
17	1338.92	402.07
18	1345.13	408.27
19	1366.80	440.40

Factor Of Safety Calculation By GLE (Spencer`s) Method of Slices
Has Gone Through 20 Iterations

Theta (deg) (ki=1.0)	FOS (Moment) (Equil.)	FOS (Force) (Equil.)	Lambda
9.00	1.023	1.175	0.158
13.50	1.062	1.350	0.240
2.30	1.000	0.996	0.040
0.00	0.995	0.951	0.000
3.32	1.002	1.019	0.058
2.11	0.999	0.992	0.037
2.18	0.999	0.994	0.038
2.58	1.000	1.002	0.045
2.44	1.000	0.999	0.043
2.44	1.000	0.999	0.043
2.44	1.000	0.999	0.043
2.44	1.000	0.999	0.043
2.44	1.000	0.999	0.043
2.44	1.000	0.999	0.043
2.44	1.000	0.999	0.043
2.44	1.000	0.999	0.043
2.44	1.000	0.999	0.043
2.44	1.000	0.999	0.043
2.44	1.000	0.999	0.043

The Trial Failure Surface In Question Is Defined
By The Following 17 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	84.03	233.00
2	118.07	210.04
3	159.52	182.08
4	188.32	153.28
5	192.96	148.65
6	228.31	113.29
7	560.00	122.80
8	848.65	127.27
9	1020.10	138.14
10	1159.98	227.64
11	1195.33	262.99
12	1230.69	298.35
13	1235.37	303.03
14	1270.72	338.38
15	1306.08	373.74

16	1339.81	407.47
17	1359.32	436.39

Factor Of Safety Calculation By GLE (Spencer`s) Method of Slices
Has Gone Through 20 Iterations

Theta (deg) (ki=1.0)	FOS (Moment) (Equil.)	FOS (Force) (Equil.)	Lambda
9.00	1.414	1.466	0.158
13.50	1.038	1.138	0.240
2.32	-0.195	-0.151	0.041
0.00	0.001	-0.001	0.000
0.00	0.001	-0.001	0.000
7.43	1.362	1.387	0.130
0.78	-0.093	-0.074	0.014
0.00	-0.075	-0.060	0.000
0.00	-0.075	-0.060	0.000
3.30	1.256	1.215	0.058
1.21	-0.107	-0.060	0.021
2.01	0.544	0.548	0.035
2.12	0.546	0.550	0.037
19.50	0.025	0.593	0.354
1.95	0.543	0.547	0.034
0.00	0.511	0.513	0.000
0.00	-0.001	-0.623	0.000
3.26	1.255	1.214	0.057
3.56	1.261	1.225	0.062
6.93	1.347	1.363	0.122

The Trial Failure Surface In Question Is Defined
By The Following 20 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	153.83	235.00
2	167.68	226.68
3	168.65	226.03
4	210.10	198.07
5	213.83	194.34
6	249.18	158.99
7	258.86	149.31
8	294.21	113.95
9	560.00	128.44
10	1008.96	160.57
11	1020.10	146.51
12	1162.30	228.76
13	1197.66	264.12
14	1233.01	299.47
15	1234.70	301.16
16	1270.06	336.52
17	1305.41	371.87
18	1340.77	407.23
19	1341.22	407.68
20	1361.30	437.45

Factor Of Safety Calculation By GLE (Spencer`s) Method of Slices
Has Gone Through 20 Iterations

Theta (deg) (ki=1.0)	FOS (Moment) (Equil.)	FOS (Force) (Equil.)	Lambda
9.00	-0.739	1.283	0.158
13.50	-0.795	1.458	0.240
0.00	-0.779	-0.056	0.000
0.00	-0.779	-0.056	0.000
6.54	-0.623	1.208	0.115
0.00	-0.779	-0.053	0.000
0.00	-0.779	-0.053	0.000
20.62	-0.071	1.901	0.376
0.00	-0.779	-0.071	0.000
0.00	-0.779	-0.071	0.000
1.21	0.287	0.287	0.021
1.21	0.287	0.285	0.021
2.39	0.556	0.577	0.042
1.30	-0.779	-1.634	0.023

```
  2.36       0.556      0.576     0.041
  2.33       0.555      0.576     0.041
  0.00       0.417      0.432     0.000
  0.00      -0.147     -0.011     0.000
  4.65      -0.294      1.158     0.081
  0.00      -0.257     -0.050     0.000
The Trial Failure Surface In Question Is Defined
By The Following 19 Coordinate Points
  Point      X-Surf      Y-Surf
   No.        (ft)        (ft)
    1         37.22      233.00
    2         42.70      229.31
    3         84.15      201.35
    4        125.60      173.39
    5        149.36      149.63
    6        150.99      148.00
    7        186.34      112.65
    8        560.00      123.64
    9        913.18      153.98
   10       1020.10      143.62
   11       1044.93      151.80
   12       1080.28      187.16
   13       1115.64      222.51
   14       1150.99      257.87
   15       1186.35      293.22
   16       1221.70      328.58
   17       1255.78      362.65
   18       1263.12      370.00
   19       1285.88      407.87
Factor Of Safety Calculation By GLE (Spencer`s) Method of Slices
Has Gone Through 20 Iterations
 Theta        FOS        FOS
 (deg)      (Moment)   (Force)
(ki=1.0)    (Equil.)   (Equil.)   Lambda
  9.00      -0.711      1.213     0.158
 13.50      -0.765      1.386     0.240
  0.00      -1.325     -0.369     0.000
  0.00      -1.325     -0.369     0.000
  6.54      -0.656      1.140     0.115
  0.00       0.641     -0.369     0.000
  0.96      -0.351      0.003     0.017
  0.63      -0.071      1.901     0.011
  1.17      -0.400      0.005     0.020
  1.35      -0.433      0.002     0.024
  0.00      -0.100     -0.003     0.000
  0.00      -0.100     -0.003     0.000
  2.80       0.558      0.578     0.049
  3.78       0.879      1.071     0.066
  2.64       0.555      0.575     0.046
  2.08       0.546      0.565     0.036
  0.00       0.395      0.415     0.000
 41.09       2.239      0.003     0.872
  0.50       0.400      0.421     0.009
  0.00       0.395      0.415     0.000
The Trial Failure Surface In Question Is Defined
By The Following 17 Coordinate Points
  Point      X-Surf      Y-Surf
   No.        (ft)        (ft)
    1         75.00      233.00
    2        111.40      208.44
    3        152.85      180.48
    4        180.77      152.57
    5        184.21      149.13
    6        219.56      113.77
    7        560.00      134.84
    8        998.65      135.71
    9       1020.10      132.67
   10       1155.60      209.04
   11       1190.96      244.40
  #################### SOME LINES SKIPPED ####################
```

Following Are Displayed The Ten Most Critical Of The Trial
Failure Surfaces Evaluated. They Are
Ordered - Most Critical First.
* * Safety Factors Are Calculated By GLE (Spencer`s) Method (0-2) * *
Selected ki function = Bi-linear
Selected Lambda Coefficient = 1.00
Forces from Reinforcement, Piers/Piles, Soil Nails, and Applied Forces
(if applicable) have been applied to the slice base(s)
on which they intersect.
Specified Tension Crack Water Force Factor = 0.000
Total Number of Trial Surfaces Attempted = 1000
WARNING! The Factor of Safety Calculation for one or More Trial Surfaces
Did Not Converge in 20 Iterations.
Number of Trial Surfaces with Non-Converged FS = 72
Number of Trial Surfaces with Misleading FS = 11
Number of Trial Surfaces With Valid FS = 917
Percentage of Trial Surfaces With Non-Valid FS Solutions
of the Total Attempted = 8.3 %
Statistical Data On All Valid FS Values:
FS Max = 3.641 FS Min = 0.998 FS Ave = 0.967
Standard Deviation = 0.298 Coefficient of Variation = 30.85 %
((Simplified Janbu FS for Critical Surface = 0.992))
Failure Surface Specified By 17 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	89.646	233.000
2	122.206	211.038
3	163.658	183.078
4	193.016	153.720
5	197.333	149.404
6	232.688	114.048
7	560.000	116.788
8	933.652	128.555
9	1020.100	140.871
10	1092.164	199.433
11	1127.520	234.788
12	1162.875	270.143
13	1198.230	305.499
14	1233.586	340.854
15	1255.854	363.122
16	1262.732	370.000
17	1285.343	407.631

*** FOS = 0.998 Theta (ki=1.0) = 13.50 ***
Lambda = 0.240
Individual data on the 74 slices

Slice No.	Width (ft)	Weight (lbs)	Water Force Top (lbs)	Water Force Bot (lbs)	Tie Force Norm (lbs)	Tie Force Tan (lbs)	Earthquake Force Hor (lbs)	Earthquake Force Ver (lbs)	Surcharge Load (lbs)
1	10.4	4302.7	0.0	0.0	0.	0.	645.4	0.0	0.0
2	5.0	4712.6	0.0	0.0	0.	0.	706.9	0.0	0.0
3	5.0	5826.7	0.0	0.0	0.	0.	874.0	0.0	0.0
4	12.2	21564.2	0.0	0.0	0.	0.	3234.6	0.0	0.0
5	9.4	24901.8	0.0	0.0	0.	0.	3735.3	0.0	0.0
6	8.3	28098.8	0.0	1781.3	0.	0.	4214.8	0.0	0.0
7	13.0	59338.8	0.0	9871.4	0.	0.	8900.8	0.0	0.0
8	10.7	62454.2	0.0	14541.8	0.	0.	9368.1	0.0	0.0
9	2.3	15117.7	0.0	4737.6	0.	0.	2267.7	0.0	0.0
10	14.0	104929.2	0.0	38468.6	0.	0.	15739.4	0.0	0.0
11	13.0	119981.5	0.0	51358.3	0.	0.	17997.2	0.0	0.0
12	4.3	44563.9	0.0	20350.9	0.	0.	6684.6	0.0	0.0
13	0.7	7101.5	0.0	3293.6	0.	0.	1065.2	0.0	0.0
14	34.1	438827.9	0.0	*******	0.	0.	65824.2	0.0	0.0
15	0.6	8619.2	0.0	4630.0	0.	0.	1292.9	0.0	0.0
16	15.3	231632.8	0.0	88168.7	0.	0.	34744.9	0.0	0.0
17	12.0	181807.1	0.0	69359.7	0.	0.	27271.1	0.0	0.0
18	32.0	486452.7	0.0	*******	0.	0.	72967.9	0.0	0.0
19	8.0	122022.4	0.0	46777.1	0.	0.	18303.4	0.0	0.0
20	30.0	459041.7	0.0	*******	0.	0.	68856.3	0.0	0.0
21	3.0	46036.9	0.0	17711.7	0.	0.	6905.5	0.0	0.0

22	7.0	107556.5	0.0	41383.4	0.	0.	16133.5	0.0	0.0
23	5.0	76943.6	0.0	29607.5	0.	0.	11541.5	0.0	0.0
24	10.0	154107.3	0.0	58567.8	0.	0.	23116.1	0.0	0.0
25	13.0	200685.2	0.0	78064.9	0.	0.	30102.8	0.0	0.0
26	2.0	30878.3	0.0	12203.3	0.	0.	4631.7	0.0	0.0
27	10.0	155298.5	0.0	61789.9	0.	0.	23294.8	0.0	0.0
28	5.0	78327.7	0.0	31378.2	0.	0.	11749.2	0.0	0.0
29	5.0	78780.1	0.0	31700.5	0.	0.	11817.0	0.0	0.0
30	46.0	753493.8	0.0	*******	0.	0.	*******	0.0	0.0
31	44.0	770574.9	0.0	*******	0.	0.	*******	0.0	0.0
32	15.0	273861.5	0.0	*******	0.	0.	41079.2	0.0	0.0
33	28.0	536965.1	0.0	*******	0.	0.	80544.8	0.0	0.0
34	37.0	772370.4	0.0	*******	0.	0.	*******	0.0	0.0
35	61.0	1423555.8	0.0	*******	0.	0.	*******	0.0	0.0
36	46.0	1194520.1	0.0	*******	0.	0.	*******	0.0	0.0
37	15.0	410529.8	0.0	*******	0.	0.	61579.5	0.0	0.0
38	30.0	827989.8	0.0	*******	0.	0.	*******	0.0	0.0
39	30.0	825330.0	0.0	*******	0.	0.	*******	0.0	0.0
40	10.0	274583.0	0.0	*******	0.	0.	41187.4	0.0	0.0
41	98.0	2673277.8	0.0	*******	0.	0.	*******	0.0	0.0
42	10.0	271578.9	0.0	*******	0.	0.	40736.8	0.0	0.0
43	1.0	27231.5	0.0	10914.9	0.	0.	4084.7	0.0	0.0
44	10.0	275701.9	0.0	*******	0.	0.	41355.3	0.0	0.0
45	4.0	115055.6	0.0	43875.3	0.	0.	17258.3	0.0	0.0
46	10.0	298792.9	0.0	*******	0.	0.	44818.9	0.0	0.0
47	35.0	1081928.5	0.0	*******	0.	0.	*******	0.0	0.0
48	13.0	416182.8	0.0	*******	0.	0.	62427.4	0.0	0.0
49	0.7	21078.1	0.0	7325.4	0.	0.	3161.7	0.0	0.0
50	6.3	204748.1	0.0	71920.7	0.	0.	30712.2	0.0	0.0
51	30.0	958202.9	0.0	*******	0.	0.	*******	0.0	0.0
52	50.1	1566418.8	0.0	*******	0.	0.	*******	0.0	0.0
53	42.9	1230685.5	0.0	*******	0.	0.	*******	0.0	0.0
54	29.2	730882.4	0.0	*******	0.	0.	*******	0.0	0.0
55	14.8	336508.8	0.0	*******	0.	0.	50476.3	0.0	0.0
56	3.0	64489.9	0.0	32094.3	0.	0.	9673.5	0.0	0.0
57	12.0	241864.8	0.0	*******	0.	0.	36279.7	0.0	0.0
58	5.5	103426.2	0.0	53024.3	0.	0.	15513.9	0.0	0.0
59	35.4	573032.5	0.0	*******	0.	0.	85954.9	0.0	0.0
60	34.1	406334.4	0.0	*******	0.	0.	60950.2	0.0	0.0
61	1.2	11957.6	0.0	5501.4	0.	0.	1793.6	0.0	0.0
62	10.8	96669.6	0.0	43600.8	0.	0.	14500.4	0.0	0.0
63	1.0	8247.6	0.0	3633.7	0.	0.	1237.1	0.0	0.0
64	23.0	155528.8	0.0	64122.0	0.	0.	23329.3	0.0	0.0
65	0.6	3125.9	0.0	1146.0	0.	0.	468.9	0.0	0.0
66	2.4	12868.1	0.0	4468.9	0.	0.	1930.2	0.0	0.0
67	13.7	66044.7	0.0	17612.8	0.	0.	9906.7	0.0	0.0
68	6.1	24789.0	0.0	3555.8	0.	0.	3718.3	0.0	0.0
69	0.7	2761.9	0.0	247.9	0.	0.	414.3	0.0	0.0
70	0.4	1574.7	0.0	126.0	0.	0.	236.2	0.0	0.0
71	4.1	14541.9	0.0	579.3	0.	0.	2181.3	0.0	0.0
72	1.7	5660.4	0.0	0.0	0.	0.	849.1	0.0	0.0
73	5.3	15388.5	0.0	0.0	0.	0.	2308.3	0.0	0.0
74	17.3	21908.9	0.0	0.0	0.	0.	3286.3	0.0	0.0

Failure Surface Specified By 18 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	35.287	233.000
2	41.444	228.847
3	82.896	200.887
4	124.348	172.928
5	147.795	149.481
6	149.208	148.068
7	184.563	112.712
8	560.000	147.960
9	958.652	147.461
10	1020.100	145.793
11	1138.102	214.667
12	1173.457	250.022
13	1208.812	285.378
14	1240.314	316.879

```
      15       1275.669      352.235
      16       1311.025      387.590
      17       1333.250      409.815
      18       1347.181      433.000
   ***  FOS =     0.998   Theta (ki=1.0) =    13.41  ***
                      Lambda =   0.238
   Failure Surface Specified By 18 Coordinate Points
     Point      X-Surf      Y-Surf
      No.        (ft)        (ft)
       1         46.942      233.000
       2         49.258      231.438
       3         90.710      203.478
       4        132.161      175.519
       5        157.308      150.373
       6        159.462      148.219
       7        194.817      112.863
       8        560.000      120.736
       9        917.871      133.464
      10       1020.100      146.733
      11       1149.791      226.222
      12       1185.147      261.578
      13       1220.502      296.933
      14       1240.239      316.670
      15       1275.595      352.026
      16       1310.950      387.381
      17       1332.478      408.909
      18       1346.953      433.000
   ***  FOS =     1.002   Theta (ki=1.0) =    13.50  ***
                      Lambda =   0.240
   Failure Surface Specified By 17 Coordinate Points
     Point      X-Surf      Y-Surf
      No.        (ft)        (ft)
       1         58.943      233.000
       2         99.561      205.603
       3        141.013      177.643
       4        167.343      151.313
       5        169.989      148.667
       6        205.344      113.312
       7        560.000      119.386
       8        722.402      131.547
       9       1020.100      150.032
      10       1060.992      181.952
      11       1096.348      217.308
      12       1131.703      252.663
      13       1167.058      288.018
      14       1202.414      323.374
      15       1232.880      353.840
      16       1249.040      370.000
      17       1266.765      399.498
   ***  FOS =     1.003   Theta (ki=1.0) =    13.50  ***
                      Lambda =   0.240
   Failure Surface Specified By 18 Coordinate Points
     Point      X-Surf      Y-Surf
      No.        (ft)        (ft)
       1         61.437      233.000
       2        101.401      206.044
       3        142.853      178.085
       4        169.428      151.509
       5        172.040      148.897
       6        207.395      113.542
       7        560.000      120.941
       8        842.246      126.148
       9       1020.100      150.220
      10       1147.330      213.263
      11       1182.686      248.619
      12       1218.041      283.974
      13       1234.407      300.340
      14       1269.762      335.695
      15       1305.118      371.051
      16       1340.473      406.406
```

```
      17       1341.844      407.777
      18       1362.174      437.918
   ***  FOS =     1.005   Theta (ki=1.0) =    13.50  ***
                     Lambda =   0.240
   Failure Surface Specified By 18 Coordinate Points
     Point      X-Surf      Y-Surf
      No.        (ft)        (ft)
       1         39.472      233.000
       2         44.156      229.841
       3         85.607      201.881
       4        127.059      173.922
       5        151.183      149.798
       6        152.899      148.082
       7        188.254      112.727
       8        560.000      129.760
       9        790.371      131.542
      10       1020.100      160.132
      11       1041.510      176.027
      12       1076.865      211.382
      13       1112.221      246.738
      14       1147.576      282.093
      15       1182.931      317.448
      16       1216.183      350.700
      17       1235.483      370.000
      18       1248.829      392.212
   ***  FOS =     1.005   Theta (ki=1.0) =    13.55  ***
                     Lambda =   0.241
   Failure Surface Specified By 18 Coordinate Points
     Point      X-Surf      Y-Surf
      No.        (ft)        (ft)
       1         53.333      233.000
       2         53.972      232.569
       3         95.424      204.610
       4        136.875      176.650
       5        162.652      150.874
       6        164.657      148.869
       7        200.012      113.513
       8        560.000      122.343
       9        858.809      146.986
      10       1020.100      156.543
      11       1060.514      180.544
      12       1095.869      215.899
      13       1131.225      251.254
      14       1166.580      286.610
      15       1201.935      321.965
      16       1234.026      354.056
      17       1249.970      370.000
      18       1267.995      399.998
   ***  FOS =     1.005   Theta (ki=1.0) =    13.55  ***
                     Lambda =   0.241
   Failure Surface Specified By 19 Coordinate Points
     Point      X-Surf      Y-Surf
      No.        (ft)        (ft)
       1         36.091      233.000
       2         41.965      229.038
       3         83.417      201.078
       4        124.869      173.119
       5        148.446      149.542
       6        150.028      147.960
       7        185.383      112.604
       8        560.000      120.582
       9        814.590      124.702
      10       1020.100      152.868
      11       1116.637      197.191
      12       1151.992      232.547
      13       1187.348      267.902
      14       1222.703      303.257
      15       1242.530      323.085
      16       1277.886      358.440
      17       1313.241      393.795
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      18       1318.614      399.168
      19       1337.484      430.573
   ***  FOS =     1.013   Theta (ki=1.0) =     3.84  ***
                     Lambda =   0.067
   Failure Surface Specified By 20 Coordinate Points
     Point      X-Surf      Y-Surf
      No.        (ft)        (ft)
       1         33.195      233.000
       2         40.089      228.350
       3         81.541      200.390
       4        122.993      172.431
       5        146.101      149.322
       6        146.883      148.540
       7        182.239      113.185
       8        560.000      120.531
       9        993.496      140.781
      10       1020.100      143.247
      11       1152.252      199.181
      12       1187.608      234.537
      13       1214.903      261.832
      14       1250.259      297.188
      15       1285.614      332.543
      16       1320.969      367.898
      17       1356.325      403.254
      18       1364.201      411.130
      19       1392.161      452.582
      20       1393.652      454.793
   ***  FOS =     1.021   Theta (ki=1.0) =     3.95  ***
                     Lambda =   0.069
   Failure Surface Specified By 19 Coordinate Points
     Point      X-Surf      Y-Surf
      No.        (ft)        (ft)
       1         32.068      233.000
       2         39.359      228.082
       3         80.811      200.123
       4        122.263      172.163
       5        145.189      149.236
       6        145.926      148.499
       7        181.282      113.144
       8        560.000      117.472
       9        894.902      146.500
      10       1020.100      152.492
      11       1083.961      169.569
      12       1119.317      204.925
      13       1154.672      240.280
      14       1190.027      275.635
      15       1225.383      310.991
      16       1245.338      330.946
      17       1280.693      366.301
      18       1305.979      391.588
      19       1326.500      425.740
   ***  FOS =     1.022   Theta (ki=1.0) =     3.94  ***
                     Lambda =   0.069
            **** END OF GSTABL7 OUTPUT ****
```

***** GSTABL7 *****

** GSTABL7 by Garry H. Gregory, P.E. **

** Original Version 1.0, January 1996; Current Version 2.005, Sept. 2006 **

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SLOPE STABILITY ANALYSIS SYSTEM

Modified Bishop, Simplified Janbu, or GLE Method of Slices.
(Includes Spencer & Morgenstern-Price Type Analysis)
Including Pier/Pile, Reinforcement, Soil Nail, Tieback,
Nonlinear Undrained Shear Strength, Curved Phi Envelope,
Anisotropic Soil, Fiber-Reinforced Soil, Boundary Loads, Water
Surfaces, Pseudo-Static & Newmark Earthquake, and Applied Forces.

****

Analysis Run Date: 2/5/2015
Time of Run: 12:57PM
Run By: SMC
Input Data Filename: K:\13500-13999\13662-00 Euland Hydro Study\2015 Plan Review\SSA\e-a1-15s Surface #1.
Output Filename: K:\13500-13999\13662-00 Euland Hydro Study\2015 Plan Review\SSA\e-a1-15s Surface #1.OUT
Unit System: English
Plotted Output Filename: K:\13500-13999\13662-00 Euland Hydro Study\2015 Plan Review\SSA\e-a1-15s Surface #1.PLT
PROBLEM DESCRIPTION: 13662-00, Euland, Section E-E',
Seismic

BOUNDARY COORDINATES
38 Top Boundaries
83 Total Boundaries

Boundary No.	X-Left (ft)	Y-Left (ft)	X-Right (ft)	Y-Right (ft)	Soil Type Below Bnd
1	0.00	233.00	100.00	233.00	3
2	100.00	233.00	110.00	230.00	5
3	110.00	230.00	140.00	230.00	5
4	140.00	230.00	153.00	235.00	5
5	153.00	235.00	166.00	235.00	5
6	166.00	235.00	260.00	237.00	5
7	260.00	237.00	330.00	239.00	5
8	330.00	239.00	355.00	240.00	5
9	355.00	240.00	370.00	240.00	5
10	370.00	240.00	390.00	243.00	3
11	390.00	243.00	495.00	265.00	2
12	495.00	265.00	667.00	340.00	2
13	667.00	340.00	682.00	345.00	2
14	682.00	345.00	712.00	345.00	2
15	712.00	345.00	850.00	345.00	2
16	850.00	345.00	860.00	346.00	2
17	860.00	346.00	871.00	352.00	5
18	871.00	352.00	875.00	367.00	5
19	875.00	367.00	933.00	391.00	5
20	933.00	391.00	970.00	391.00	5
21	970.00	391.00	1107.00	391.00	2
22	1107.00	391.00	1122.00	384.00	2
23	1122.00	384.00	1197.00	384.00	2
24	1197.00	384.00	1233.00	384.00	5
25	1233.00	384.00	1236.00	387.00	5
26	1236.00	387.00	1268.00	400.00	5
27	1268.00	400.00	1343.00	433.00	5
28	1343.00	433.00	1353.00	433.00	5
29	1353.00	433.00	1450.00	485.00	3
30	1450.00	485.00	1490.00	502.00	4
31	1490.00	502.00	1502.00	507.00	4
32	1502.00	507.00	1540.00	510.00	4
33	1540.00	510.00	1565.00	507.00	4
34	1565.00	507.00	1656.00	490.00	4
35	1656.00	490.00	1666.00	482.00	4
36	1666.00	482.00	1680.00	482.00	4
37	1680.00	482.00	1760.00	473.00	4
38	1760.00	473.00	1780.00	473.00	4
39	100.00	233.00	105.00	225.00	3

40	105.00	225.00	292.00	230.00	3
41	292.00	230.00	333.00	233.00	3
42	333.00	233.00	368.00	235.00	3
43	368.00	235.00	370.00	240.00	3
44	0.00	128.00	100.00	164.00	2
45	100.00	164.00	130.00	175.00	2
46	130.00	175.00	180.00	187.00	2
47	180.00	187.00	248.00	212.00	2
48	248.00	212.00	300.00	219.00	2
49	300.00	219.00	340.00	224.00	2
50	340.00	224.00	380.00	231.00	2
51	380.00	231.00	385.00	235.00	2
52	385.00	235.00	390.00	243.00	2
53	860.00	346.00	861.00	338.00	2
54	861.00	338.00	885.00	338.00	2
55	885.00	338.00	970.00	391.00	2
56	1197.00	384.00	1209.00	375.00	2
57	1209.00	375.00	1210.00	370.00	2
58	1210.00	370.00	1257.00	370.00	2
59	1257.00	370.00	1270.00	370.00	1
60	1270.00	370.00	1330.00	406.00	1
61	1330.00	406.00	1353.00	433.00	3
62	1330.00	406.00	1370.00	412.00	4
63	1370.00	412.00	1400.00	425.00	4
64	1400.00	425.00	1425.00	445.00	4
65	1425.00	445.00	1450.00	485.00	4
66	0.00	128.00	100.00	145.00	6
67	100.00	145.00	260.00	160.00	6
68	260.00	160.00	480.00	195.00	6
69	480.00	195.00	752.00	272.00	6
70	752.00	272.00	920.00	295.00	6
71	920.00	295.00	1255.00	358.00	6
72	0.00	109.00	180.00	111.00	1
73	180.00	111.00	460.00	114.50	1
74	460.00	114.50	570.00	116.00	1
75	570.00	116.00	940.00	123.00	1
76	940.00	123.00	1020.00	128.00	1
77	1020.00	128.00	1070.00	138.00	1
78	1070.00	138.00	1120.00	161.00	1
79	1120.00	161.00	1160.00	190.00	1
80	1160.00	190.00	1200.00	236.00	1
81	1200.00	236.00	1230.00	288.00	1
82	1230.00	288.00	1255.00	358.00	1
83	1255.00	358.00	1257.00	370.00	1

Default Y-Origin = 0.00(ft)
Default X-Plus Value = 0.00(ft)
Default Y-Plus Value = 0.00(ft)

ISOTROPIC SOIL PARAMETERS
6 Type(s) of Soil

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.
1	119.0	125.0	0.0	0.0	0.00	0.0	1
2	119.0	125.0	0.0	0.0	0.00	0.0	1
3	119.0	125.0	450.0	22.0	0.00	0.0	1
4	119.0	125.0	1125.0	31.0	0.00	0.0	1
5	119.0	125.0	450.0	28.0	0.00	0.0	1
6	119.0	125.0	0.0	0.0	0.00	0.0	1

ANISOTROPIC STRENGTH PARAMETERS
3 soil type(s)

Soil Type 1 Is Anisotropic
Number Of Direction Ranges Specified = 3

Direction Range No.	Counterclockwise Direction Limit (deg)	Cohesion Intercept (psf)	Friction Angle (deg)
1	0.0	1125.00	31.00
2	5.0	450.00	17.00
3	90.0	1125.00	31.00

Soil Type 2 Is Anisotropic
Number Of Direction Ranges Specified = 3

Direction Range No.	Counterclockwise Direction Limit (deg)	Cohesion Intercept (psf)	Friction Angle (deg)
1	0.0	525.00	25.00
2	10.0	375.00	14.50
3	90.0	450.00	22.00

Soil Type 6 Is Anisotropic
Number Of Direction Ranges Specified = 3

Direction Range No.	Counterclockwise Direction Limit (deg)	Cohesion Intercept (psf)	Friction Angle (deg)
1	0.0	750.00	31.00
2	10.0	375.00	14.50
3	90.0	450.00	22.00

ANISOTROPIC SOIL NOTES:
(1) An input value of 0.01 for C and/or Phi will cause Aniso C and/or Phi to be ignored in that range.
(2) An input value of 0.02 for Phi will set both Phi and C equal to zero, with no water weight in the tension crack.
(3) An input value of 0.03 for Phi will set both Phi and C equal to zero, with water weight in the tension crack.

1 PIEZOMETRIC SURFACE(S) SPECIFIED
Unit Weight of Water = 62.40 (pcf)
Piezometric Surface No. 1 Specified by 14 Coordinate Points
Pore Pressure Inclination Factor = 0.50

Point No.	X-Water (ft)	Y-Water (ft)
1	0.00	204.00
2	198.00	205.00
3	345.00	210.00
4	436.00	230.00
5	523.00	250.00
6	621.00	270.00
7	742.00	290.00
8	940.00	310.00
9	1063.00	330.00
10	1110.00	340.00
11	1270.00	370.00
12	1460.00	398.00
13	1580.00	410.00
14	1780.00	430.00

Specified Peak Ground Acceleration Coefficient (A) = 0.276(g)
Specified Horizontal Earthquake Coefficient (kh) = 0.150(g)
Specified Vertical Earthquake Coefficient (kv) = 0.000(g)
Specified Seismic Pore-Pressure Factor = 0.000
Trial Failure Surface Specified By 17 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	89.646	233.000
2	122.206	211.038
3	163.658	183.078
4	193.016	153.720
5	197.333	149.404
6	232.688	114.048
7	560.000	116.788
8	933.652	128.555
9	1020.100	140.871
10	1092.164	199.433
11	1127.520	234.788
12	1162.875	270.143
13	1198.230	305.499
14	1233.586	340.854
15	1255.854	363.122
16	1262.732	370.000
17	1285.343	407.631

Theta (deg) (ki=1.0)	FOS (Moment) (Equil.)	FOS (Force) (Equil.)	Lambda
9.00	1.021	1.170	0.158
13.50	0.998	0.998	0.240

((Simplified Janbu FS for Specified Surface = 1.000))
Factor Of Safety For The Preceding Specified Surface = 0.998
Theta (ki = 1.0) = 13.50 Deg Lambda = 0.240
Factor Of Safety Is Calculated By GLE (Spencer`s) Method (0-2)
Forces from Reinforcement, Piers/Piles, Applied Forces, and Soil Nails
(if applicable) have been applied to the slice base(s)
on which they intersect.
Selected ki function = Bi-linear
Selected Lambda Coefficient = 1.00
Tension Crack Water Force = 0.00(lbs)
Specified Tension Crack Water Force Factor = 0.000
Depth of Tension Crack (zo) at Center of Last Slice = 10.616(ft)

*** Line of Thrust and Slice Force Data ***

Slice No.	X Coord.	Y Coord.	L/H	Side Force (lbs)	ki	Force Angle (Deg)	Vert. Shear Force(lbs)
1	100.00	230.75	0.678	24107.	1.000	13.50	5787.5
2	105.00	229.02	0.720	41367.	1.000	13.50	9931.4
3	110.00	227.43	0.761	61005.	1.000	13.50	14645.9
4	122.21	223.35	0.649	124596.	1.000	13.50	29912.8
5	131.65	219.82	0.598	191335.	1.000	13.50	45935.4
6	140.00	216.74	0.572	261387.	1.000	13.50	62753.4
7	153.00	211.82	0.482	396098.	1.000	13.50	95094.8
8	163.66	207.73	0.475	529064.	1.000	13.50	127017.0
9	166.00	203.61	0.422	644724.	1.000	13.50	154784.5
10	180.00	189.82	0.337	1412934.	1.000	13.50	339215.5
11	193.02	181.39	0.338	2245680.	1.000	13.50	539140.1
12	197.33	162.36	0.150	6627850.	1.000	13.50	1591206.1
13	198.00	161.24	0.144	7331716.	1.000	13.50	1760189.6
14	232.12	140.83	0.215	48789404.	1.000	13.50	11713301.0
15	232.69	140.55	0.217	49575400.	1.000	13.50	11902002.0
16	248.00	144.22	0.245	49582132.	1.000	13.50	11903618.0
17	260.00	147.10	0.267	49587364.	1.000	13.50	11904874.0
18	292.00	154.77	0.326	49601176.	1.000	13.50	11908190.0
19	300.00	156.69	0.341	49604600.	1.000	13.50	11909012.0
20	330.00	163.88	0.395	49617348.	1.000	13.50	11912072.0
21	333.00	164.60	0.400	49618612.	1.000	13.50	11912376.0
22	340.00	166.27	0.412	49621568.	1.000	13.50	11913086.0
23	345.00	167.47	0.421	49623676.	1.000	13.50	11913592.0
24	355.00	169.87	0.439	49628104.	1.000	13.50	11914655.0
25	368.00	172.98	0.463	49633352.	1.000	13.50	11915915.0
26	370.00	173.46	0.467	49634104.	1.000	13.50	11916095.0
27	380.00	175.86	0.480	49637748.	1.000	13.50	11916970.0
28	385.00	177.06	0.486	49639508.	1.000	13.50	11917393.0
29	390.00	178.26	0.493	49641228.	1.000	13.50	11917806.0
30	436.00	189.28	0.537	49655920.	1.000	13.50	11921333.0
31	480.00	199.82	0.574	49668240.	1.000	13.50	11924291.0
32	495.00	203.42	0.586	49671976.	1.000	13.50	11925187.0
33	523.00	210.13	0.583	49679480.	1.000	13.50	11926989.0
34	560.00	218.99	0.579	49691544.	1.000	13.50	11929885.0
35	621.00	233.65	0.571	49681200.	1.000	13.50	11927402.0
36	667.00	244.71	0.567	49675976.	1.000	13.50	11926148.0
37	682.00	248.31	0.569	49674952.	1.000	13.50	11925902.0
38	712.00	255.52	0.600	49671916.	1.000	13.50	11925173.0
39	742.00	262.74	0.630	49666588.	1.000	13.50	11923894.0
40	752.00	265.15	0.641	49664120.	1.000	13.50	11923301.0
41	850.00	288.77	0.743	49632100.	1.000	13.50	11915614.0
42	860.00	291.19	0.751	49628080.	1.000	13.50	11914649.0
43	861.00	291.43	0.750	49627676.	1.000	13.50	11914552.0
44	871.00	293.84	0.742	49623864.	1.000	13.50	11913637.0
45	875.00	294.81	0.700	49622700.	1.000	13.50	11913357.0
46	885.00	297.22	0.697	49620620.	1.000	13.50	11912858.0
47	920.00	305.64	0.689	49615376.	1.000	13.50	11911599.0
48	933.00	308.76	0.687	49614232.	1.000	13.50	11911324.0
49	933.65	308.92	0.687	49614184.	1.000	13.50	11911313.0
50	940.00	310.53	0.692	49589360.	1.000	13.50	11905353.0
51	970.00	318.16	0.717	49473040.	1.000	13.50	11877427.0
52	1020.10	330.93	0.760	49279456.	1.000	13.50	11830952.0
53	1063.00	342.67	0.775	48603320.	0.930	12.58	10087074.0
54	1092.16	348.82	0.780	48298320.	0.808	10.98	7566657.0
55	1107.00	351.46	0.776	48213552.	0.746	10.15	6437745.0

56	1110.00	351.96	0.782	48200292.	0.733	9.98	6221272.0
57	1122.00	353.84	0.805	48162484.	0.683	9.31	5394641.5
58	1127.52	354.65	0.803	48153000.	0.660	9.00	5035198.0
59	1162.88	359.01	0.781	48197028.	0.512	7.01	3034720.0
60	1197.00	362.03	0.724	48415172.	0.369	5.07	1586279.1
61	1198.23	362.12	0.721	48426328.	0.364	5.00	1542771.4
62	1209.00	362.84	0.688	48533932.	0.319	4.38	1187512.4
63	1210.00	362.90	0.684	48544832.	0.315	4.33	1156866.1
64	1233.00	364.12	0.545	48838692.	0.219	3.01	561741.9
65	1233.59	364.14	0.533	48847256.	0.216	2.97	549332.2
66	1236.00	364.25	0.480	48882880.	0.206	2.84	499647.6
67	1249.74	364.76	0.218	49099792.	0.149	2.05	261229.0
68	1255.85	364.95	0.057	49204360.	0.123	1.70	179630.0
69	1256.58	364.97	0.036	49211964.	0.120	1.65	170913.9
70	1257.00	364.98	0.023	49216380.	0.119	1.63	165981.9
71	1261.05	365.09	-0.112	49260164.	0.102	1.40	121997.6
72	1262.73	365.13	-0.175	49278808.	0.095	1.30	105770.3
73	1268.00	365.26	-0.636	49421544.	0.073	1.00	62406.4
74	1285.34	365.70	0.000	49929284.	0.000	0.00	0.0

Table 1 - Individual data on the 74 slices

Slice No.	Width (ft)	Weight (lbs)	Water Force Top (lbs)	Water Force Bot (lbs)	Tie Force Norm (lbs)	Tie Force Tan (lbs)	Earthquake Force Hor (lbs)	Earthquake Force Ver (lbs)	Surcharge Load (lbs)
1	10.4	4302.5	0.0	0.0	0.0	0.0	645.4	0.0	0.0
2	5.0	4712.5	0.0	0.0	0.0	0.0	706.9	0.0	0.0
3	5.0	5826.6	0.0	0.0	0.0	0.0	874.0	0.0	0.0
4	12.2	21563.2	0.0	0.0	0.0	0.0	3234.5	0.0	0.0
5	9.4	24902.9	0.0	0.0	0.0	0.0	3735.4	0.0	0.0
6	8.3	28098.3	0.0	1781.2	0.0	0.0	4214.7	0.0	0.0
7	13.0	59338.8	0.0	9871.4	0.0	0.0	8900.8	0.0	0.0
8	10.7	62453.6	0.0	14541.7	0.0	0.0	9368.0	0.0	0.0
9	2.3	15118.4	0.0	4737.9	0.0	0.0	2267.8	0.0	0.0
10	14.0	104929.5	0.0	38468.8	0.0	0.0	15739.4	0.0	0.0
11	13.0	119982.4	0.0	51358.8	0.0	0.0	17997.4	0.0	0.0
12	4.3	44566.8	0.0	20349.9	0.0	0.0	6685.0	0.0	0.0
13	0.7	7097.7	0.0	3291.9	0.0	0.0	1064.7	0.0	0.0
14	34.1	438826.5	0.0	*******	0.0	0.0	65824.0	0.0	0.0
15	0.6	8619.5	0.0	4630.2	0.0	0.0	1292.9	0.0	0.0
16	15.3	231632.9	0.0	88168.8	0.0	0.0	34744.9	0.0	0.0
17	12.0	181807.4	0.0	69359.9	0.0	0.0	27271.1	0.0	0.0
18	32.0	486453.5	0.0	*******	0.0	0.0	72968.0	0.0	0.0
19	8.0	122022.6	0.0	46777.3	0.0	0.0	18303.4	0.0	0.0
20	30.0	459042.6	0.0	*******	0.0	0.0	68856.4	0.0	0.0
21	3.0	46037.0	0.0	17711.8	0.0	0.0	6905.5	0.0	0.0
22	7.0	107556.7	0.0	41383.5	0.0	0.0	16133.5	0.0	0.0
23	5.0	76943.8	0.0	29607.6	0.0	0.0	11541.6	0.0	0.0
24	10.0	154107.6	0.0	58567.9	0.0	0.0	23116.1	0.0	0.0
25	13.0	200685.6	0.0	78065.1	0.0	0.0	30102.8	0.0	0.0
26	2.0	30878.4	0.0	12203.3	0.0	0.0	4631.8	0.0	0.0
27	10.0	155298.8	0.0	61790.0	0.0	0.0	23294.8	0.0	0.0
28	5.0	78327.9	0.0	31378.3	0.0	0.0	11749.2	0.0	0.0
29	5.0	78780.2	0.0	31700.5	0.0	0.0	11817.0	0.0	0.0
30	46.0	753495.5	0.0	*******	0.0	0.0	*******	0.0	0.0
31	44.0	770576.7	0.0	*******	0.0	0.0	*******	0.0	0.0
32	15.0	273862.1	0.0	*******	0.0	0.0	41079.3	0.0	0.0
33	28.0	536966.3	0.0	*******	0.0	0.0	80545.0	0.0	0.0
34	37.0	772372.2	0.0	*******	0.0	0.0	*******	0.0	0.0
35	61.0	1423558.5	0.0	*******	0.0	0.0	*******	0.0	0.0
36	46.0	1194522.0	0.0	*******	0.0	0.0	*******	0.0	0.0
37	15.0	410530.3	0.0	*******	0.0	0.0	61579.6	0.0	0.0
38	30.0	827990.8	0.0	*******	0.0	0.0	*******	0.0	0.0
39	30.0	825330.8	0.0	*******	0.0	0.0	*******	0.0	0.0
40	10.0	274583.2	0.0	*******	0.0	0.0	41187.5	0.0	0.0
41	98.0	2673279.8	0.0	*******	0.0	0.0	*******	0.0	0.0
42	10.0	271579.1	0.0	*******	0.0	0.0	40736.9	0.0	0.0
43	1.0	27231.5	0.0	10914.9	0.0	0.0	4084.7	0.0	0.0
44	10.0	275702.1	0.0	*******	0.0	0.0	41355.3	0.0	0.0
45	4.0	115055.7	0.0	43875.4	0.0	0.0	17258.4	0.0	0.0
46	10.0	298793.0	0.0	*******	0.0	0.0	44819.0	0.0	0.0

47	35.0	1081928.8	0.0	*******	0.0	0.0	*******	0.0	0.0
48	13.0	416182.8	0.0	*******	0.0	0.0	62427.4	0.0	0.0
49	0.7	21066.3	0.0	7321.3	0.0	0.0	3159.9	0.0	0.0
50	6.3	204759.9	0.0	71924.8	0.0	0.0	30714.0	0.0	0.0
51	30.0	958203.2	0.0	*******	0.0	0.0	*******	0.0	0.0
52	50.1	1566420.5	0.0	*******	0.0	0.0	*******	0.0	0.0
53	42.9	1230686.1	0.0	*******	0.0	0.0	*******	0.0	0.0
54	29.2	730875.4	0.0	*******	0.0	0.0	*******	0.0	0.0
55	14.8	336513.8	0.0	*******	0.0	0.0	50477.1	0.0	0.0
56	3.0	64489.9	0.0	32093.9	0.0	0.0	9673.5	0.0	0.0
57	12.0	241864.8	0.0	*******	0.0	0.0	36279.7	0.0	0.0
58	5.5	103433.1	0.0	53027.2	0.0	0.0	15515.0	0.0	0.0
59	35.4	573027.1	0.0	*******	0.0	0.0	85954.1	0.0	0.0
60	34.1	406333.8	0.0	*******	0.0	0.0	60950.1	0.0	0.0
61	1.2	11954.0	0.0	5499.7	0.0	0.0	1793.1	0.0	0.0
62	10.8	96672.6	0.0	43601.4	0.0	0.0	14500.9	0.0	0.0
63	1.0	8247.6	0.0	3633.6	0.0	0.0	1237.1	0.0	0.0
64	23.0	155528.7	0.0	64121.0	0.0	0.0	23329.3	0.0	0.0
65	0.6	3127.2	0.0	1146.5	0.0	0.0	469.1	0.0	0.0
66	2.4	12866.8	0.0	4468.4	0.0	0.0	1930.0	0.0	0.0
67	13.7	66047.4	0.0	17613.5	0.0	0.0	9907.1	0.0	0.0
68	6.1	24789.1	0.0	3555.8	0.0	0.0	3718.4	0.0	0.0
69	0.7	2760.1	0.0	247.7	0.0	0.0	414.0	0.0	0.0
70	0.4	1574.8	0.0	126.0	0.0	0.0	236.2	0.0	0.0
71	4.1	14543.4	0.0	579.4	0.0	0.0	2181.5	0.0	0.0
72	1.7	5660.0	0.0	0.0	0.0	0.0	849.0	0.0	0.0
73	5.3	15388.0	0.0	0.0	0.0	0.0	2308.2	0.0	0.0
74	17.3	21910.1	0.0	0.0	0.0	0.0	3286.5	0.0	0.0

- TABLE 2 - Base Stress Data on the 74 Slices -

Slice No. *	Alpha (deg)	X-Coord. Slice Cntr (ft)	Base Leng. (ft)	Total Normal Stress (psf)	Total Vert. Stress (psf)	Mobilized Shear Stress (psf)
1	-34.00	94.82	12.49	1737.59	344.50	1154.23
2	-34.00	102.50	6.03	2823.38	781.36	1593.75
3	-34.00	107.50	6.03	3282.53	966.10	1779.61
4	-34.00	116.10	14.72	4521.46	1464.59	2281.12
5	-34.00	126.93	11.40	6312.22	2185.07	3006.01
6	-34.00	135.83	10.07	7678.74	2791.22	3487.55
7	-34.00	146.50	15.68	9788.45	3784.15	4158.35
8	-34.00	158.33	12.86	12060.31	4857.93	4874.94
9	-45.00	164.83	3.31	33487.82	4564.81	15503.01
10	-45.00	173.00	19.80	37392.45	5299.74	17087.82
11	-45.00	186.51	18.41	43873.62	6518.16	19720.01
12	-44.99	195.17	6.10	617971.75	7300.69	370766.16
13	-45.00	197.67	0.94	642354.50	7524.47	385350.62
14	-45.00	215.06	48.25	740036.44	9095.14	443481.94
15	-45.00	232.40	0.81	837630.12	10661.67	501560.41
16	0.48	240.34	15.31	15206.53	15127.01	2823.93
17	0.48	254.00	12.00	15228.76	15150.08	2824.04
18	0.48	276.00	32.00	15278.77	15201.14	2827.88
19	0.48	296.00	8.00	15329.01	15252.29	2832.61
20	0.48	315.00	30.00	15376.86	15300.88	2837.13
21	0.48	331.50	3.00	15420.23	15345.12	2841.53
22	0.48	336.50	7.00	15440.01	15364.71	2844.59
23	0.48	342.50	5.00	15463.35	15388.21	2848.15
24	0.48	350.00	10.00	15490.13	15410.22	2871.86
25	0.48	361.50	13.00	15507.84	15436.81	2838.05
26	0.48	369.00	2.00	15503.25	15438.63	2811.81
27	0.48	375.00	10.00	15591.36	15529.34	2814.60
28	0.48	382.50	5.00	15724.15	15665.03	2823.96
29	0.48	387.50	5.00	15812.59	15755.50	2830.18
30	0.48	413.00	46.00	16430.57	16379.76	2905.15
31	0.48	458.00	44.00	17552.97	17512.49	3046.16
32	0.48	487.50	15.00	18289.40	18256.84	3133.97
33	0.48	509.00	28.00	19212.31	19176.70	3298.03
34	0.48	541.50	37.00	20920.70	20874.19	3623.42
35	1.80	590.50	61.03	23169.41	23325.46	4065.31
36	1.80	644.00	46.02	25796.59	25955.00	4597.15
37	1.80	674.50	15.01	27198.56	27355.13	4895.31
38	1.80	697.00	30.01	27421.60	27586.02	4905.08

39	1.80	727.00	30.01	27317.96	27497.40	4814.19
40	1.80	747.00	10.00	27251.48	27444.72	4737.02
41	1.80	801.00	98.05	27056.40	27264.85	4626.09
42	1.80	855.00	10.00	26921.35	27144.45	4530.70
43	1.80	860.50	1.00	26993.75	27218.04	4543.31
44	1.80	866.00	10.00	27335.58	27556.55	4625.73
45	1.80	873.00	4.00	28540.80	28749.67	4930.19
46	1.80	880.00	10.00	29666.55	29864.50	5214.05
47	1.80	902.50	35.02	30705.39	30896.94	5458.06
48	1.80	926.50	13.01	31813.43	31998.20	5718.33
49	1.80	933.33	0.65	32111.52	32295.37	5787.93
50	8.11	936.83	6.41	30574.65	31933.26	5391.47
51	8.11	955.00	30.30	30275.04	31620.82	5333.99
52	8.11	995.05	50.61	29629.60	30953.34	5153.88
53	39.10	1041.55	55.28	7815.99	22263.12	0.00
54	39.10	1077.58	37.58	0.00	19448.75	0.00
55	45.00	1099.58	20.98	0.00	16039.06	0.00
56	45.00	1108.50	4.24	0.00	15200.61	0.00
57	45.00	1116.00	16.97	0.00	14252.22	0.00
58	45.00	1124.76	7.81	0.00	13249.81	0.00
59	45.00	1145.20	50.00	0.00	11460.65	0.00
60	45.00	1179.94	48.26	0.00	8419.55	0.00
61	45.00	1197.61	1.74	0.00	6872.14	0.00
62	45.00	1203.61	15.23	0.00	6347.14	0.00
63	45.00	1209.50	1.41	0.00	5832.00	0.00
64	45.00	1221.50	32.53	0.00	4781.60	0.00
65	45.00	1233.29	0.83	0.00	3773.98	0.00
66	45.00	1234.79	3.41	0.00	3768.86	0.00
67	45.00	1242.87	19.44	0.00	3398.16	0.00
68	45.00	1252.80	8.64	0.00	2868.56	0.00
69	45.00	1256.22	1.03	0.00	2686.13	0.00
70	45.00	1256.79	0.59	0.00	2655.57	0.00
71	45.00	1259.03	5.73	0.00	2536.22	0.00
72	45.00	1261.89	2.37	0.00	2386.16	0.00
73	59.00	1265.37	10.23	0.00	1504.44	0.00
74	59.00	1276.67	33.67	0.00	650.67	0.00

*** SEISMIC SLOPE DISPLACEMENT DATA ***
(Note: kv is set = zero for displacement calculations)
Seismic Yield Coefficient (ky) = 0.1579(g)
Calculated Newmark Seismic Displacement = 0.082(ft)
Non-Symmetrical Sliding Resistance Has Been Specified
for Downhill Sliding.

**** END OF GSTABL7 OUTPUT ****

Sliding displacement models from Rathje and Antonakos (2011)

Prediction of dynamic response and sliding displacement of a sliding mass during earthquake shaking

Cross Section: E-E'

File: e-a1-15s

Inputs	
PGA (g)	0.2763
PGV (cm/s)	23.32
k_y (g)	0.1579
T_m (s)	0.517
T_s (s)	0.35
M	6.95
T_s/T_m	0.678493

Dynamic Response			
	median	-1σ	+1σ
kmax (g)	0.215	0.167	0.276
k-velmax (cm/s)	25.44	19.81	32.66

Displacement Given Median Dynamic Response					
Displacement Model			Sliding Displacements, D (cm)		
	μ_{lnD}	σ_{lnD}	median	-1σ	+1σ
[kmax, M]	-0.01	0.931	0.99	0.39	2.51
[kmax, k-velmax]	-0.82	0.609	0.44	0.24	0.81
			Sliding Displacements, D (in)		
	μ_{lnD}	σ_{lnD}	median	-1σ	+1σ
[kmax, M]	-0.01	0.931	0.39	0.15	0.99
[kmax, k-velmax]	-0.82	0.609	0.17	0.09	0.32

PGA Peak Ground Acceleration (g)
PGV Peak Ground Velocity (cm/s)
k_y Critical or Yield Acceleration (g)
T_m Mean Period of an Earthquake Motion (s)
T_s Site Period or the Natural Period of a Sliding Mass (s). For rigid sliding set T_s= 0 s
M Earthquake Magnitude
kmax maximum seismic coefficient (g)
k-velmax the maximum velocity of the seismic coefficient-time history (cm/s)
D Predicted Sliding Displacment (cm)

H_{avr} = 185 ft

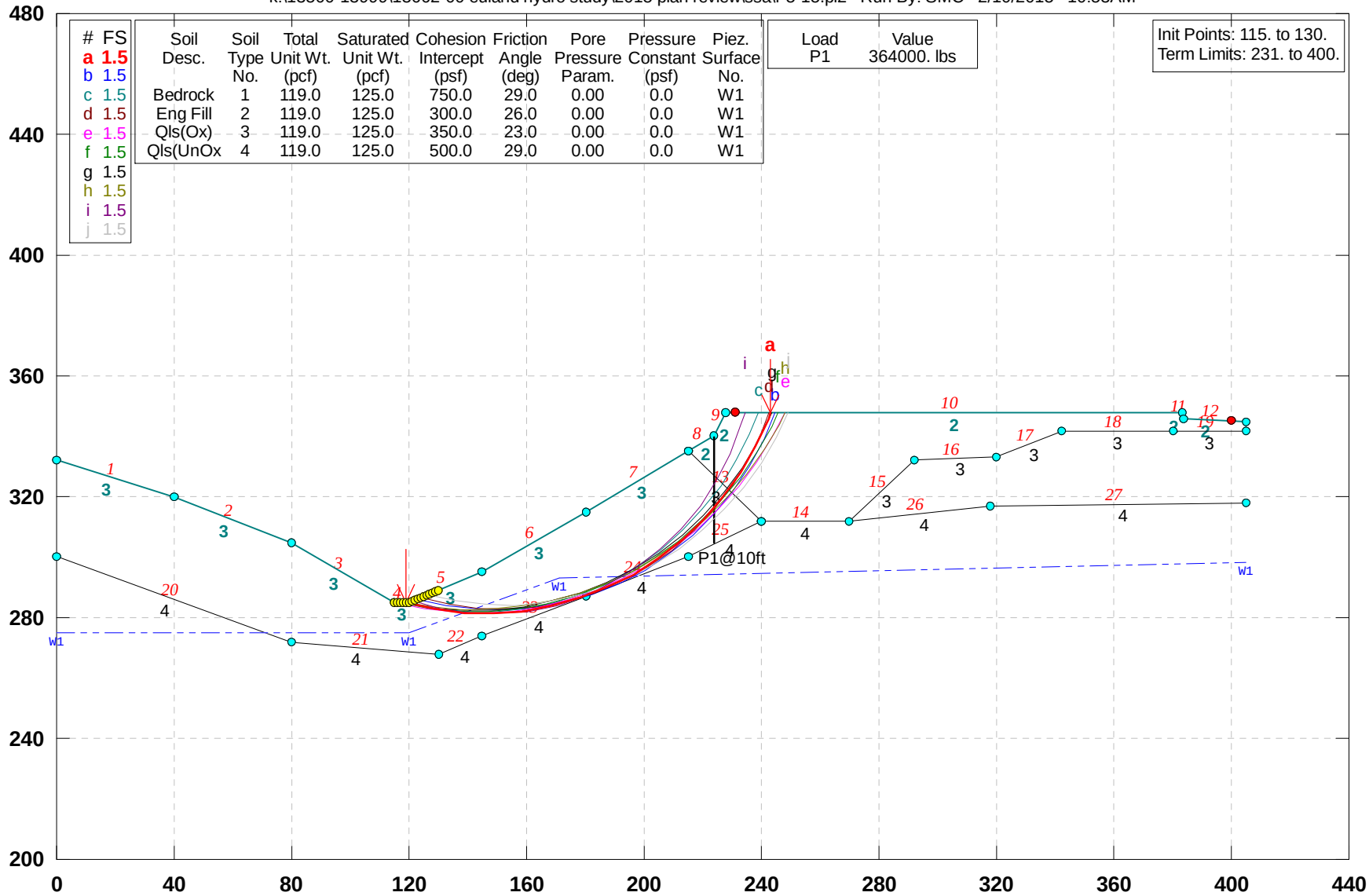
V_s = 2110 ft/s

$T_s = 4\ H_{avr}/V_s$ = 0.35 s

Reference: Rathje, E.M. and Antonakos, G. 2011. "A Unified Model for Predicting Earthquake-Induced Sliding Displacements of Rigid and Flexible Slopes," Engineering Geology, 122, 51-60, doi:10.1016/j.enggeo.2010.12.004.

Euland - Section F-F', --with conc. piers, -Static

k:\13500-13999\13662-00 euland hydro study\2015 plan review\ssa\f-5-15.pl2 Run By: SMC 2/10/2015 10:53AM



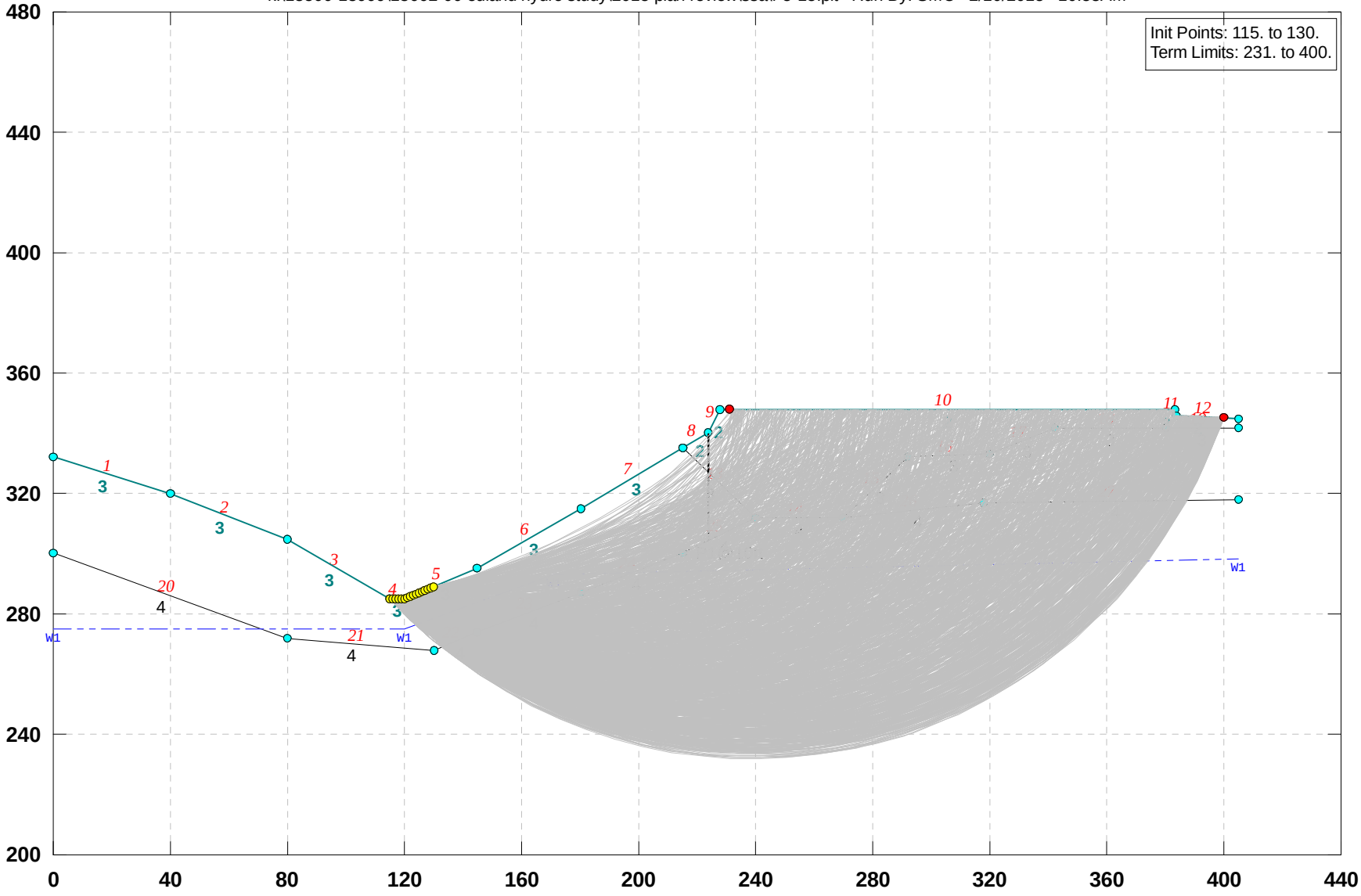
GSTABL7 v.2 FSmin=1.5

Safety Factors Are Calculated By The Simplified Janbu Method for the case of c & phi both > 0

Figure E-17.1

Euland - Section F-F', --with conc. piers, -Static

k:\13500-13999\13662-00 euland hydro study\2015 plan review\ssa\f-5-15.plt Run By: SMC 2/10/2015 10:53AM



***** GSTABL7 *****

** GSTABL7 by Garry H. Gregory, P.E. **

** Original Version 1.0, January 1996; Current Version 2.005, Sept. 2006 **

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SLOPE STABILITY ANALYSIS SYSTEM

Modified Bishop, Simplified Janbu, or GLE Method of Slices.
(Includes Spencer & Morgenstern-Price Type Analysis)
Including Pier/Pile, Reinforcement, Soil Nail, Tieback,
Nonlinear Undrained Shear Strength, Curved Phi Envelope,
Anisotropic Soil, Fiber-Reinforced Soil, Boundary Loads, Water
Surfaces, Pseudo-Static & Newmark Earthquake, and Applied Forces.

****

Analysis Run Date: 2/10/2015
Time of Run: 10:53AM
Run By: SMC
Input Data Filename: K:\13500-13999\13662-00 Euland Hydro Study\2015 Plan Review\SSA\f-5-15.
Output Filename: K:\13500-13999\13662-00 Euland Hydro Study\2015 Plan Review\SSA\f-5-15.OUT
Unit System: English
Plotted Output Filename: K:\13500-13999\13662-00 Euland Hydro Study\2015 Plan Review\SSA\f-5-15.PLT
PROBLEM DESCRIPTION: Euland - Section F-F',
--with conc. piers, -Static

BOUNDARY COORDINATES
12 Top Boundaries
27 Total Boundaries

Boundary No.	X-Left (ft)	Y-Left (ft)	X-Right (ft)	Y-Right (ft)	Soil Type Below Bnd
1	0.00	332.00	40.00	320.00	3
2	40.00	320.00	80.00	305.00	3
3	80.00	305.00	115.00	285.00	3
4	115.00	285.00	120.00	285.00	3
5	120.00	285.00	145.00	295.00	3
6	145.00	295.00	180.00	315.00	3
7	180.00	315.00	215.00	335.00	3
8	215.00	335.00	224.00	340.00	2
9	224.00	340.00	228.00	348.00	2
10	228.00	348.00	383.00	348.00	2
11	383.00	348.00	383.50	346.00	2
12	383.50	346.00	405.00	345.00	2
13	215.00	335.00	240.00	312.00	3
14	240.00	312.00	270.00	312.00	4
15	270.00	312.00	292.00	332.00	3
16	292.00	332.00	320.00	333.00	3
17	320.00	333.00	342.00	342.00	3
18	342.00	342.00	380.00	342.00	3
19	380.00	342.00	405.00	342.00	3
20	0.00	300.00	80.00	272.00	4
21	80.00	272.00	130.00	268.00	4
22	130.00	268.00	145.00	274.00	4
23	145.00	274.00	180.00	287.00	4
24	180.00	287.00	215.00	300.00	4
25	215.00	300.00	240.00	312.00	4
26	270.00	312.00	318.00	317.00	4
27	318.00	317.00	405.00	318.00	4

User Specified Y-Origin = 200.00(ft)
Default X-Plus Value = 0.00(ft)
Default Y-Plus Value = 0.00(ft)

ISOTROPIC SOIL PARAMETERS
4 Type(s) of Soil

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.
1	119.0	125.0	750.0	29.0	0.00	0.0	1
2	119.0	125.0	300.0	26.0	0.00	0.0	1
3	119.0	125.0	350.0	23.0	0.00	0.0	1
4	119.0	125.0	500.0	29.0	0.00	0.0	1

1 PIEZOMETRIC SURFACE(S) SPECIFIED

Unit Weight of Water = 62.40 (pcf)
Piezometric Surface No. 1 Specified by 4 Coordinate Points
Pore Pressure Inclination Factor = 0.50

Point No.	X-Water (ft)	Y-Water (ft)
1	0.00	275.00
2	120.00	275.00
3	171.00	293.00
4	405.00	298.00

PIER/PILE LOAD(S)
1 Pier/Pile Load(s) Specified

Pier/Pile No.	X-Pos (ft)	Y-Pos (ft)	Load (lbs)	Spacing (ft)	Inclination (deg)	Length (ft)
1	223.90	339.94	364000.0	10.0	90.00	35.0

NOTE - An Equivalent Line Load Is Calculated For Each Row Of Piers/Piles
Assuming A Uniform Distribution Of Load Horizontally Between
Individual Piers/Piles.
A Critical Failure Surface Searching Method, Using A Random
Technique For Generating Circular Surfaces, Has Been Specified.
Janbus Empirical Coef. is being used for the case of c & phi both > 0
1600 Trial Surfaces Have Been Generated.
100 Surface(s) Initiate(s) From Each Of 16 Points Equally Spaced
Along The Ground Surface Between X = 115.00(ft)
and X = 130.00(ft)
Each Surface Terminates Between X = 231.00(ft)
and X = 400.00(ft)
Unless Further Limitations Were Imposed, The Minimum Elevation
At Which A Surface Extends Is Y = 200.00(ft)
10.00(ft) Line Segments Define Each Trial Failure Surface.
Following Are Displayed The Ten Most Critical Of The Trial
Failure Surfaces Evaluated. They Are
Ordered - Most Critical First.
* * Safety Factors Are Calculated By The Simplified Janbu Method * *
Total Number of Trial Surfaces Attempted = 1600
Number of Trial Surfaces With Valid FS = 1600
Statistical Data On All Valid FS Values:
FS Max = 3.599 FS Min = 1.495 FS Ave = 2.478
Standard Deviation = 0.552 Coefficient of Variation = 22.27 %
Failure Surface Specified By 17 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	119.000	285.000
2	128.766	282.850
3	138.694	281.648
4	148.691	281.406
5	158.665	282.126
6	168.523	283.802
7	178.175	286.418
8	187.531	289.949
9	196.504	294.363
10	205.011	299.620
11	212.973	305.669
12	220.317	312.456
13	226.975	319.918
14	232.885	327.985
15	237.991	336.583
16	242.248	345.632
17	243.095	348.000

Factor of Safety
*** 1.495 ***
Individual data on the 26 slices

Slice No.	Width (ft)	Weight (lbs)	Water Force Top (lbs)	Water Force Bot (lbs)	Tie Force Norm (lbs)	Tie Force Tan (lbs)	Earthquake Force Hor (lbs)	Earthquake Force Ver (lbs)	Surcharge Load (lbs)
1	1.0	13.1	0.0	0.0	0.	0.	0.0	0.0	0.0
2	8.8	3065.3	0.0	0.0	0.	0.	0.0	0.0	0.0
3	9.9	9738.3	0.0	0.0	0.	0.	0.0	0.0	0.0
4	0.1	172.0	0.0	0.0	0.	0.	0.0	0.0	0.0
5	6.2	8999.6	0.0	423.7	0.	0.	0.0	0.0	0.0

6	3.7	6477.0	0.0	658.1	0.	0.	0.0	0.0	0.0
7	10.0	21882.2	0.0	3017.9	0.	0.	0.0	0.0	0.0
8	9.9	26999.8	0.0	4374.7	0.	0.	0.0	0.0	0.0
9	2.5	7490.0	0.0	1274.3	0.	0.	0.0	0.0	0.0
10	7.2	22922.6	0.0	3539.1	0.	0.	0.0	0.0	0.0
11	1.8	6089.0	0.0	780.1	0.	0.	0.0	0.0	0.0
12	7.5	25866.6	0.0	2382.9	0.	0.	0.0	0.0	0.0
13	7.2	25591.4	0.0	856.1	0.	0.	0.0	0.0	0.0
14	1.7	6207.4	0.0	0.0	0.	0.	0.0	0.0	0.0
15	8.5	30238.8	0.0	0.0	0.	0.	0.0	0.0	0.0
16	8.0	27405.0	0.0	0.0	0.	0.	0.0	0.0	0.0
17	2.0	6707.9	0.0	0.0	0.	0.	0.0	0.0	0.0
18	5.3	16754.6	0.0	0.0	0.	0.	0.0	0.0	0.0
19	3.7	10717.5	0.0	0.0	0.	0.	0.0	0.0	0.0
20	3.0	8753.3	0.0	0.0	0.	0.	0.0	0.0	0.0
21	1.0	3214.6	0.0	0.0	0.	0.	0.0	0.0	0.0
22	0.8	2347.9	0.0	0.0	0.	0.	0.0	0.0	0.0
23	4.1	11224.2	0.0	0.0	0.	0.	0.0	0.0	0.0
24	5.1	9550.6	0.0	0.0	0.	0.	0.0	0.0	0.0
25	4.3	3491.4	0.0	0.0	0.	0.	0.0	0.0	0.0
26	0.8	119.3	0.0	0.0	0.	0.	0.0	0.0	0.0

Failure Surface Specified By 16 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	123.000	286.200
2	132.756	284.004
3	142.681	282.781
4	152.678	282.544
5	162.650	283.294
6	172.499	285.025
7	182.129	287.719
8	191.446	291.351
9	200.360	295.884
10	208.782	301.275
11	216.632	307.470
12	223.831	314.410
13	230.311	322.027
14	236.007	330.246
15	240.865	338.987
16	244.765	348.000

Factor of Safety
*** 1.510 ***

Failure Surface Specified By 16 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	120.000	285.000
2	129.800	283.010
3	139.750	282.008
4	149.750	282.003
5	159.700	282.995
6	169.502	284.975
7	179.058	287.923
8	188.272	291.808
9	197.053	296.594
10	205.313	302.231
11	212.969	308.663
12	219.946	315.828
13	226.173	323.652
14	231.589	332.058
15	236.140	340.963
16	238.890	348.000

Factor of Safety
*** 1.515 ***

Failure Surface Specified By 16 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	124.000	286.600
2	133.733	284.304
3	143.651	283.025
4	153.648	282.777

5	163.617	283.562
6	173.452	285.373
7	183.047	288.189
8	192.300	291.981
9	201.112	296.708
10	209.389	302.319
11	217.043	308.756
12	223.991	315.947
13	230.160	323.818
14	235.482	332.284
15	239.903	341.254
16	242.399	348.000

Factor of Safety
*** 1.516 ***

Failure Surface Specified By 17 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	115.000	285.000
2	124.801	283.013
3	134.736	281.877
4	144.732	281.600
5	154.715	282.184
6	164.611	283.624
7	174.346	285.911
8	183.848	289.026
9	193.047	292.947
10	201.875	297.646
11	210.266	303.086
12	218.157	309.228
13	225.491	316.026
14	232.213	323.429
15	238.273	331.384
16	243.626	339.830
17	247.867	348.000

Factor of Safety
*** 1.519 ***

Failure Surface Specified By 17 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	117.000	285.000
2	126.825	283.140
3	136.777	282.154
4	146.776	282.050
5	156.746	282.830
6	166.608	284.486
7	176.285	287.007
8	185.701	290.372
9	194.784	294.555
10	203.463	299.524
11	211.669	305.239
12	219.338	311.657
13	226.411	318.726
14	232.832	326.392
15	238.551	334.595
16	243.524	343.271
17	245.705	348.000

Factor of Safety
*** 1.519 ***

Failure Surface Specified By 17 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	119.000	285.000
2	128.849	283.268
3	138.814	282.435
4	148.814	282.508
5	158.766	283.488
6	168.588	285.365
7	178.200	288.125
8	187.522	291.745
9	196.477	296.194

10	204.993	301.436
11	212.998	307.429
12	220.428	314.122
13	227.220	321.462
14	233.320	329.386
15	238.676	337.831
16	243.245	346.726
17	243.759	348.000

Factor of Safety
*** 1.520 ***

Failure Surface Specified By 17 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	119.000	285.000
2	128.877	283.439
3	138.851	282.716
4	148.850	282.837
5	158.804	283.801
6	168.641	285.602
7	178.290	288.225
8	187.684	291.653
9	196.756	295.862
10	205.440	300.820
11	213.675	306.493
12	221.402	312.841
13	228.566	319.818
14	235.116	327.374
15	241.005	335.456
16	246.192	344.005
17	248.176	348.000

Factor of Safety
*** 1.524 ***

Failure Surface Specified By 16 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	121.000	285.400
2	130.697	282.958
3	140.606	281.612
4	150.604	281.377
5	160.565	282.257
6	170.366	284.242
7	179.885	287.305
8	189.004	291.409
9	197.609	296.504
10	205.593	302.525
11	212.857	309.397
12	219.311	317.036
13	224.873	325.346
14	229.476	334.224
15	233.061	343.559
16	234.219	348.000

Factor of Safety
*** 1.525 ***

Failure Surface Specified By 16 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	126.000	287.400
2	135.799	285.407
3	145.743	284.348
4	155.743	284.235
5	165.708	285.067
6	175.550	286.837
7	185.181	289.529
8	194.514	293.120
9	203.466	297.577
10	211.956	302.860
11	219.910	308.922
12	227.254	315.708
13	233.925	323.158
14	239.861	331.206

```
    15        245.010      339.778
    16        248.944      348.000
        Factor of Safety
       ***    1.531   ***
           **** END OF GSTABL7 OUTPUT ****
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Euland - Section F-F', --with conc. piers, -Seismic

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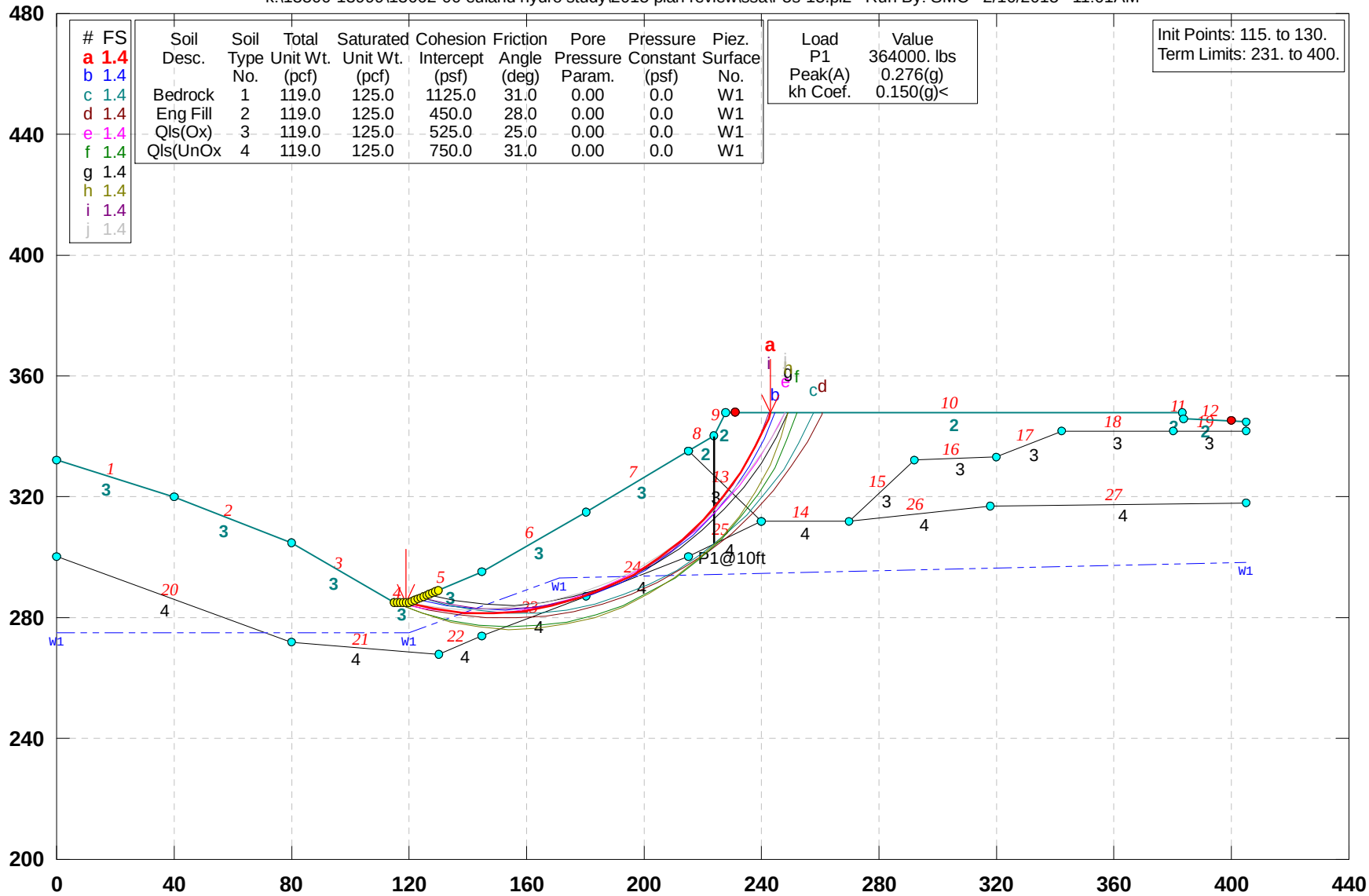

GSTABL7 v.2 FSmin=1.4

Safety Factors Are Calculated By The Simplified Janbu Method for the case of c & phi both > 0

Figure E-17.2

***** GSTABL7 *****

** GSTABL7 by Garry H. Gregory, P.E. **

** Original Version 1.0, January 1996; Current Version 2.005, Sept. 2006 **

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****

SLOPE STABILITY ANALYSIS SYSTEM

Modified Bishop, Simplified Janbu, or GLE Method of Slices.
(Includes Spencer & Morgenstern-Price Type Analysis)
Including Pier/Pile, Reinforcement, Soil Nail, Tieback,
Nonlinear Undrained Shear Strength, Curved Phi Envelope,
Anisotropic Soil, Fiber-Reinforced Soil, Boundary Loads, Water
Surfaces, Pseudo-Static & Newmark Earthquake, and Applied Forces.

****

Analysis Run Date: 2/10/2015
Time of Run: 11:01AM
Run By: SMC
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Output Filename: K:\13500-13999\13662-00 Euland Hydro Study\2015 Plan Review\SSA\f-5s-15.OUT
Unit System: English
Plotted Output Filename: K:\13500-13999\13662-00 Euland Hydro Study\2015 Plan Review\SSA\f-5s-15.PLT
PROBLEM DESCRIPTION: Euland - Section F-F',
--with conc. piers, -Seismic

BOUNDARY COORDINATES
12 Top Boundaries
27 Total Boundaries

Boundary No.	X-Left (ft)	Y-Left (ft)	X-Right (ft)	Y-Right (ft)	Soil Type Below Bnd
1	0.00	332.00	40.00	320.00	3
2	40.00	320.00	80.00	305.00	3
3	80.00	305.00	115.00	285.00	3
4	115.00	285.00	120.00	285.00	3
5	120.00	285.00	145.00	295.00	3
6	145.00	295.00	180.00	315.00	3
7	180.00	315.00	215.00	335.00	3
8	215.00	335.00	224.00	340.00	2
9	224.00	340.00	228.00	348.00	2
10	228.00	348.00	383.00	348.00	2
11	383.00	348.00	383.50	346.00	2
12	383.50	346.00	405.00	345.00	2
13	215.00	335.00	240.00	312.00	3
14	240.00	312.00	270.00	312.00	4
15	270.00	312.00	292.00	332.00	3
16	292.00	332.00	320.00	333.00	3
17	320.00	333.00	342.00	342.00	3
18	342.00	342.00	380.00	342.00	3
19	380.00	342.00	405.00	342.00	3
20	0.00	300.00	80.00	272.00	4
21	80.00	272.00	130.00	268.00	4
22	130.00	268.00	145.00	274.00	4
23	145.00	274.00	180.00	287.00	4
24	180.00	287.00	215.00	300.00	4
25	215.00	300.00	240.00	312.00	4
26	270.00	312.00	318.00	317.00	4
27	318.00	317.00	405.00	318.00	4

User Specified Y-Origin = 200.00(ft)
Default X-Plus Value = 0.00(ft)
Default Y-Plus Value = 0.00(ft)

ISOTROPIC SOIL PARAMETERS
4 Type(s) of Soil

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.
1	119.0	125.0	1125.0	31.0	0.00	0.0	1
2	119.0	125.0	450.0	28.0	0.00	0.0	1
3	119.0	125.0	525.0	25.0	0.00	0.0	1
4	119.0	125.0	750.0	31.0	0.00	0.0	1

1 PIEZOMETRIC SURFACE(S) SPECIFIED

Unit Weight of Water = 62.40 (pcf)
Piezometric Surface No. 1 Specified by 4 Coordinate Points
Pore Pressure Inclination Factor = 0.50

Point No.	X-Water (ft)	Y-Water (ft)
1	0.00	275.00
2	120.00	275.00
3	171.00	293.00
4	405.00	298.00

Specified Peak Ground Acceleration Coefficient (A) = 0.276(g)
Specified Horizontal Earthquake Coefficient (kh) = 0.150(g)
Specified Vertical Earthquake Coefficient (kv) = 0.000(g)
Specified Seismic Pore-Pressure Factor = 0.000
PIER/PILE LOAD(S)
1 Pier/Pile Load(s) Specified

Pier/Pile No.	X-Pos (ft)	Y-Pos (ft)	Load (lbs)	Spacing (ft)	Inclination (deg)	Length (ft)
1	223.90	339.94	364000.0	10.0	90.00	35.0

NOTE - An Equivalent Line Load Is Calculated For Each Row Of Piers/Piles
Assuming A Uniform Distribution Of Load Horizontally Between
Individual Piers/Piles.
A Critical Failure Surface Searching Method, Using A Random
Technique For Generating Circular Surfaces, Has Been Specified.
Janbus Empirical Coef. is being used for the case of c & phi both > 0
1600 Trial Surfaces Have Been Generated.
100 Surface(s) Initiate(s) From Each Of 16 Points Equally Spaced
Along The Ground Surface Between X = 115.00(ft)
and X = 130.00(ft)
Each Surface Terminates Between X = 231.00(ft)
and X = 400.00(ft)
Unless Further Limitations Were Imposed, The Minimum Elevation
At Which A Surface Extends Is Y = 200.00(ft)
10.00(ft) Line Segments Define Each Trial Failure Surface.
Following Are Displayed The Ten Most Critical Of The Trial
Failure Surfaces Evaluated. They Are
Ordered - Most Critical First.
* * Safety Factors Are Calculated By The Simplified Janbu Method * *
Total Number of Trial Surfaces Attempted = 1600
Number of Trial Surfaces With Valid FS = 1600
Statistical Data On All Valid FS Values:
FS Max = 3.057 FS Min = 1.350 FS Ave = 1.794
Standard Deviation = 0.222 Coefficient of Variation = 12.40 %
Failure Surface Specified By 17 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	119.000	285.000
2	128.766	282.850
3	138.694	281.648
4	148.691	281.406
5	158.665	282.126
6	168.523	283.802
7	178.175	286.418
8	187.531	289.949
9	196.504	294.363
10	205.011	299.620
11	212.973	305.669
12	220.317	312.456
13	226.975	319.918
14	232.885	327.985
15	237.991	336.583
16	242.248	345.632
17	243.095	348.000

Factor of Safety
*** 1.350 ***
Individual data on the 26 slices

Slice No.	Width (ft)	Weight (lbs)	Water Force Top (lbs)	Water Force Bot (lbs)	Tie Force Norm (lbs)	Tie Force Tan (lbs)	Earthquake Force Hor (lbs)	Earthquake Force Ver (lbs)	Surcharge Load (lbs)
1	1.0	13.1	0.0	0.0	0.	0.	2.0	0.0	0.0

2	8.8	3065.3	0.0	0.0	0.	0.	459.8	0.0	0.0
3	9.9	9738.3	0.0	0.0	0.	0.	1460.7	0.0	0.0
4	0.1	172.0	0.0	0.0	0.	0.	25.8	0.0	0.0
5	6.2	8999.6	0.0	423.7	0.	0.	1349.9	0.0	0.0
6	3.7	6477.0	0.0	658.1	0.	0.	971.6	0.0	0.0
7	10.0	21882.2	0.0	3017.9	0.	0.	3282.3	0.0	0.0
8	9.9	26999.8	0.0	4374.7	0.	0.	4050.0	0.0	0.0
9	2.5	7490.0	0.0	1274.3	0.	0.	1123.5	0.0	0.0
10	7.2	22922.6	0.0	3539.1	0.	0.	3438.4	0.0	0.0
11	1.8	6089.0	0.0	780.1	0.	0.	913.3	0.0	0.0
12	7.5	25866.6	0.0	2382.9	0.	0.	3880.0	0.0	0.0
13	7.2	25591.4	0.0	856.1	0.	0.	3838.7	0.0	0.0
14	1.7	6207.4	0.0	0.0	0.	0.	931.1	0.0	0.0
15	8.5	30238.8	0.0	0.0	0.	0.	4535.8	0.0	0.0
16	8.0	27405.0	0.0	0.0	0.	0.	4110.8	0.0	0.0
17	2.0	6707.9	0.0	0.0	0.	0.	1006.2	0.0	0.0
18	5.3	16754.6	0.0	0.0	0.	0.	2513.2	0.0	0.0
19	3.7	10717.5	0.0	0.0	0.	0.	1607.6	0.0	0.0
20	3.0	8753.3	0.0	0.0	0.	0.	1313.0	0.0	0.0
21	1.0	3214.6	0.0	0.0	0.	0.	482.2	0.0	0.0
22	0.8	2347.9	0.0	0.0	0.	0.	352.2	0.0	0.0
23	4.1	11224.2	0.0	0.0	0.	0.	1683.6	0.0	0.0
24	5.1	9550.6	0.0	0.0	0.	0.	1432.6	0.0	0.0
25	4.3	3491.4	0.0	0.0	0.	0.	523.7	0.0	0.0
26	0.8	119.3	0.0	0.0	0.	0.	17.9	0.0	0.0

Failure Surface Specified By 16 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	123.000	286.200
2	132.756	284.004
3	142.681	282.781
4	152.678	282.544
5	162.650	283.294
6	172.499	285.025
7	182.129	287.719
8	191.446	291.351
9	200.360	295.884
10	208.782	301.275
11	216.632	307.470
12	223.831	314.410
13	230.311	322.027
14	236.007	330.246
15	240.865	338.987
16	244.765	348.000

Factor of Safety
*** 1.359 ***

Failure Surface Specified By 18 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	124.000	286.600
2	133.657	284.005
3	143.512	282.304
4	153.480	281.512
5	163.479	281.636
6	173.425	282.675
7	183.235	284.620
8	192.825	287.454
9	202.115	291.154
10	211.028	295.688
11	219.488	301.020
12	227.425	307.103
13	234.772	313.887
14	241.467	321.315
15	247.454	329.324
16	252.683	337.848
17	257.110	346.815
18	257.565	348.000

Factor of Safety
*** 1.359 ***

Failure Surface Specified By 19 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	117.000	285.000
2	126.679	282.485
3	136.532	280.779
4	146.493	279.894
5	156.493	279.837
6	166.463	280.606
7	176.335	282.198
8	186.042	284.601
9	195.517	287.799
10	204.695	291.770
11	213.513	296.487
12	221.910	301.917
13	229.830	308.023
14	237.217	314.763
15	244.021	322.091
16	250.196	329.957
17	255.699	338.307
18	260.492	347.083
19	260.898	348.000

Factor of Safety
*** 1.364 ***

Failure Surface Specified By 17 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	115.000	285.000
2	124.801	283.013
3	134.736	281.877
4	144.732	281.600
5	154.715	282.184
6	164.611	283.624
7	174.346	285.911
8	183.848	289.026
9	193.047	292.947
10	201.875	297.646
11	210.266	303.086
12	218.157	309.228
13	225.491	316.026
14	232.213	323.429
15	238.273	331.384
16	243.626	339.830
17	247.867	348.000

Factor of Safety
*** 1.364 ***

Failure Surface Specified By 18 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	115.000	285.000
2	124.380	281.533
3	134.054	279.002
4	143.930	277.430
5	153.912	276.834
6	163.905	277.217
7	173.812	278.578
8	183.538	280.903
9	192.990	284.168
10	202.076	288.344
11	210.710	293.390
12	218.807	299.257
13	226.292	305.889
14	233.091	313.222
15	239.139	321.186
16	244.377	329.704
17	248.757	338.694
18	252.208	348.000

Factor of Safety
*** 1.366 ***

Failure Surface Specified By 16 Coordinate Points

Point	X-Surf	Y-Surf

No.	(ft)	(ft)
1	126.000	287.400
2	135.799	285.407
3	145.743	284.348
4	155.743	284.235
5	165.708	285.067
6	175.550	286.837
7	185.181	289.529
8	194.514	293.120
9	203.466	297.577
10	211.956	302.860
11	219.910	308.922
12	227.254	315.708
13	233.925	323.158
14	239.861	331.206
15	245.010	339.778
16	248.944	348.000

Factor of Safety
*** 1.367 ***

Failure Surface Specified By 18 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	115.000	285.000
2	124.290	281.299
3	133.911	278.573
4	143.762	276.850
5	153.737	276.148
6	163.732	276.476
7	173.640	277.829
8	183.356	280.193
9	192.778	283.544
10	201.806	287.845
11	210.344	293.051
12	218.301	299.107
13	225.594	305.949
14	232.145	313.504
15	237.885	321.693
16	242.753	330.428
17	246.697	339.618
18	249.313	348.000

Factor of Safety
*** 1.368 ***

Failure Surface Specified By 16 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	124.000	286.600
2	133.733	284.304
3	143.651	283.025
4	153.648	282.777
5	163.617	283.562
6	173.452	285.373
7	183.047	288.189
8	192.300	291.981
9	201.112	296.708
10	209.389	302.319
11	217.043	308.756
12	223.991	315.947
13	230.160	323.818
14	235.482	332.284
15	239.903	341.254
16	242.399	348.000

Factor of Safety
*** 1.369 ***

Failure Surface Specified By 17 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	119.000	285.000
2	128.877	283.439
3	138.851	282.716
4	148.850	282.837

```
      5        158.804      283.801
      6        168.641      285.602
      7        178.290      288.225
      8        187.684      291.653
      9        196.756      295.862
     10        205.440      300.820
     11        213.675      306.493
     12        221.402      312.841
     13        228.566      319.818
     14        235.116      327.374
     15        241.005      335.456
     16        246.192      344.005
     17        248.176      348.000
         Factor of Safety
        ***    1.369   ***
            **** END OF GSTABL7 OUTPUT ****
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Euland - Section G-G', Static, --2015 design

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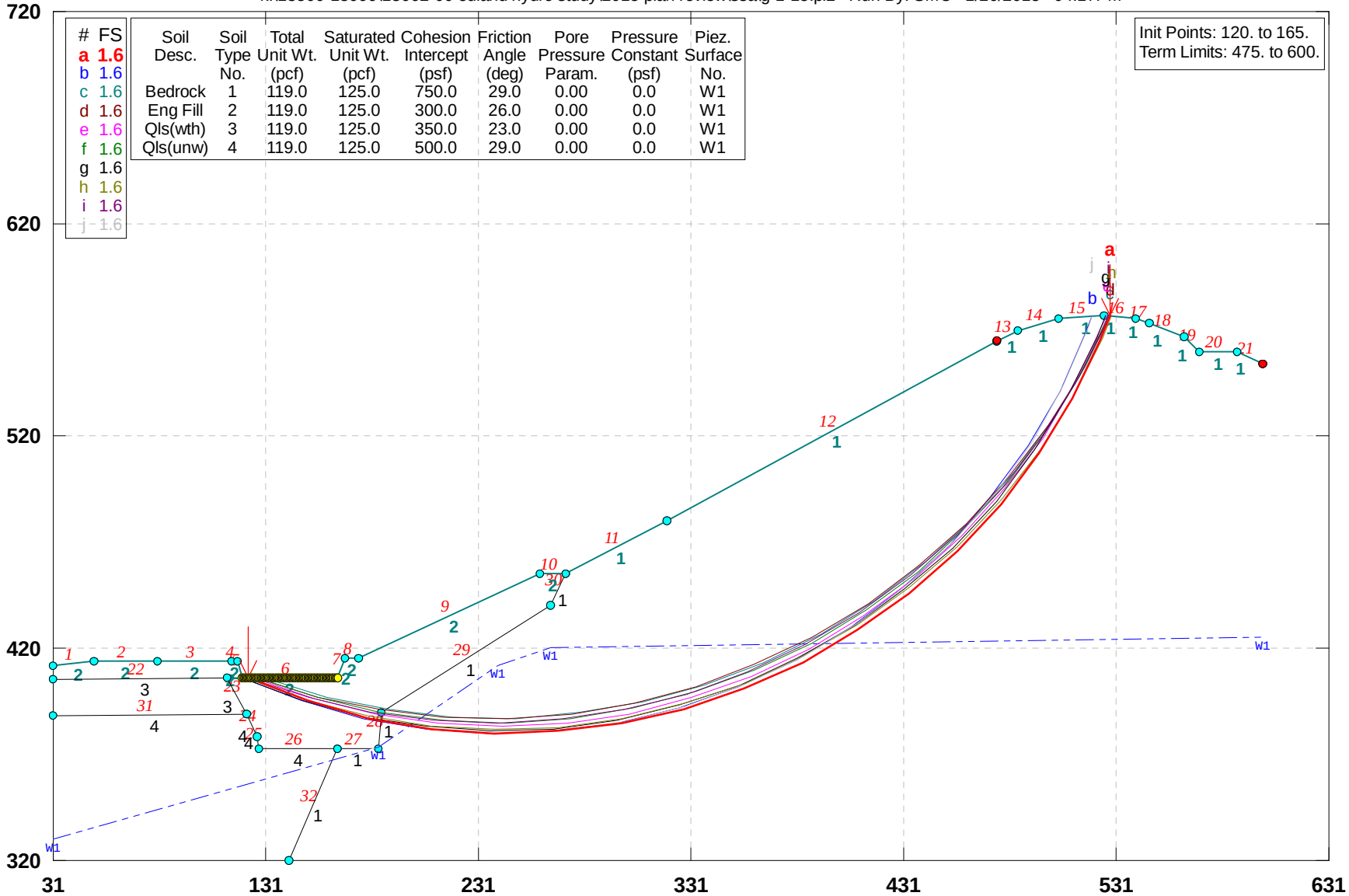

GSTABL7 v.2 FSmin=1.6

Safety Factors Are Calculated By The Simplified Janbu Method for the case of c & phi both > 0

Figure E-18.1

Euland - Section G-G', Static, --2015 design

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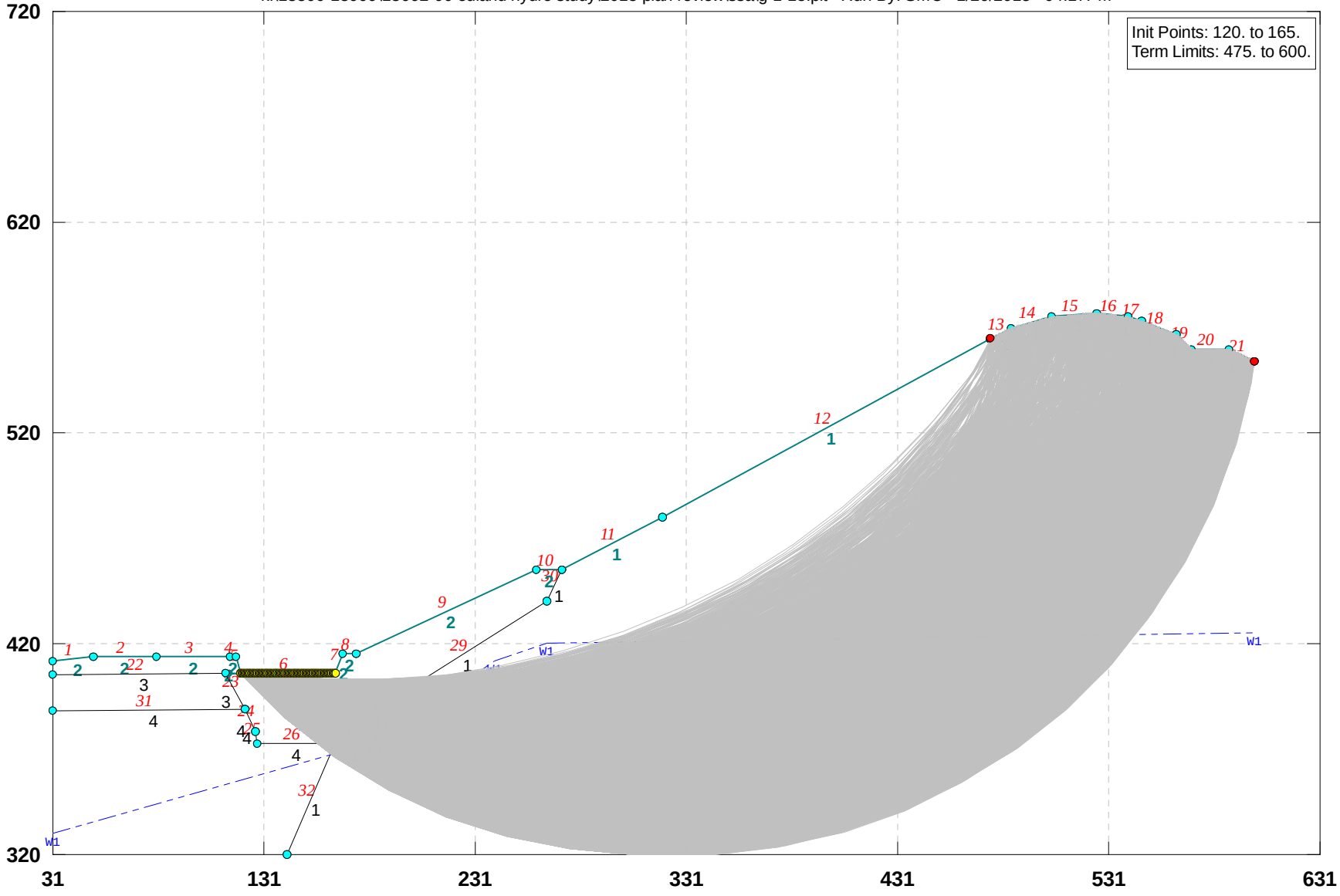

***** GSTABL7 *****

** GSTABL7 by Garry H. Gregory, P.E. **

** Original Version 1.0, January 1996; Current Version 2.005, Sept. 2006 **

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****

SLOPE STABILITY ANALYSIS SYSTEM

Modified Bishop, Simplified Janbu, or GLE Method of Slices.
(Includes Spencer & Morgenstern-Price Type Analysis)
Including Pier/Pile, Reinforcement, Soil Nail, Tieback,
Nonlinear Undrained Shear Strength, Curved Phi Envelope,
Anisotropic Soil, Fiber-Reinforced Soil, Boundary Loads, Water
Surfaces, Pseudo-Static & Newmark Earthquake, and Applied Forces.

****

Analysis Run Date: 1/26/2015
Time of Run: 04:17PM
Run By: SMC
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Output Filename: K:\13500-13999\13662-00 Euland Hydro Study\2015 Plan Review\SSA\g-1-15.OUT
Unit System: English
Plotted Output Filename: K:\13500-13999\13662-00 Euland Hydro Study\2015 Plan Review\SSA\g-1-15.PLT
PROBLEM DESCRIPTION: Euland - Section G-G', Static,
--2015 design

BOUNDARY COORDINATES
21 Top Boundaries
32 Total Boundaries

Boundary No.	X-Left (ft)	Y-Left (ft)	X-Right (ft)	Y-Right (ft)	Soil Type Below Bnd
1	31.00	412.00	50.00	414.00	2
2	50.00	414.00	80.00	414.00	2
3	80.00	414.00	115.00	414.00	2
4	115.00	414.00	118.00	414.00	2
5	118.00	414.00	120.00	406.00	2
6	120.00	406.00	165.00	406.00	2
7	165.00	406.00	168.00	415.00	2
8	168.00	415.00	175.00	415.00	2
9	175.00	415.00	260.00	455.00	2
10	260.00	455.00	272.00	455.00	2
11	272.00	455.00	320.00	480.00	1
12	320.00	480.00	475.00	565.00	1
13	475.00	565.00	485.00	570.00	1
14	485.00	570.00	504.00	575.00	1
15	504.00	575.00	525.00	577.00	1
16	525.00	577.00	540.00	575.00	1
17	540.00	575.00	547.00	573.00	1
18	547.00	573.00	563.00	567.00	1
19	563.00	567.00	570.00	560.00	1
20	570.00	560.00	588.00	560.00	1
21	588.00	560.00	600.00	554.00	1
22	31.00	405.00	113.00	406.00	3
23	113.00	406.00	122.00	389.00	3
24	122.00	389.00	127.00	378.00	4
25	127.00	378.00	128.00	372.50	4
26	128.00	372.50	165.00	372.50	4
27	165.00	372.50	184.00	372.50	1
28	184.00	372.50	185.00	390.00	1
29	185.00	390.00	265.00	440.00	1
30	265.00	440.00	272.00	455.00	1
31	31.00	388.00	122.00	389.00	4
32	142.00	320.00	165.00	372.50	1

User Specified Y-Origin = 320.00(ft)
Default X-Plus Value = 0.00(ft)
Default Y-Plus Value = 0.00(ft)

ISOTROPIC SOIL PARAMETERS
4 Type(s) of Soil

Soil Type	Total Unit Wt.	Saturated Unit Wt.	Cohesion Intercept	Friction Angle	Pore Pressure	Pressure Constant	Piez. Surface

```
 No.  (pcf)    (pcf)     (psf)     (deg)    Param.   (psf)     No.
  1   119.0    125.0     750.0     29.0    0.00       0.0      1
  2   119.0    125.0     300.0     26.0    0.00       0.0      1
  3   119.0    125.0     350.0     23.0    0.00       0.0      1
  4   119.0    125.0     500.0     29.0    0.00       0.0      1
1 PIEZOMETRIC SURFACE(S) SPECIFIED
Unit Weight of Water =  62.40 (pcf)
Piezometric Surface No.  1 Specified by  5 Coordinate Points
Pore Pressure Inclination Factor =  0.50
  Point      X-Water     Y-Water
   No.         (ft)        (ft)
    1         31.00      330.00
    2        184.00      373.00
    3        240.00      412.00
    4        265.00      420.00
    5        600.00      425.00
A Critical Failure Surface Searching Method, Using A Random
Technique For Generating Circular Surfaces, Has Been Specified.
Janbus Empirical Coef. is being used for the case of  c & phi both > 0
18400 Trial Surfaces Have Been Generated.
 200 Surface(s) Initiate(s) From Each Of    92 Points Equally Spaced
Along The Ground Surface Between  X = 120.00(ft)
                                and  X = 165.00(ft)
Each Surface Terminates Between   X = 475.00(ft)
                              and   X = 600.00(ft)
Unless Further Limitations Were Imposed, The Minimum Elevation
At Which A Surface Extends Is  Y =    320.00(ft)
30.00(ft) Line Segments Define Each Trial Failure Surface.
Following Are Displayed The Ten Most Critical Of The Trial
      Failure Surfaces Evaluated. They Are
      Ordered - Most Critical First.
      * * Safety Factors Are Calculated By The Simplified Janbu Method * *
      Total Number of Trial Surfaces Attempted =     0
      Number of Trial Surfaces With Valid FS =    0
      Statistical Data On All Valid FS Values:
         FS Max =   0.000   FS Min = 500.000   FS Ave =  NaN
         Standard Deviation =    0.000   Coefficient of Variation =  NaN    %
      Failure Surface Specified By 18 Coordinate Points
        Point      X-Surf      Y-Surf
         No.        (ft)        (ft)
          1        122.473      406.000
          2        150.454      395.183
          3        179.371      387.195
          4        208.938      382.116
          5        238.864      379.997
          6        268.851      380.857
          7        298.605      384.689
          8        327.833      391.454
          9        356.244      401.086
         10        383.560      413.489
         11        409.510      428.542
         12        433.839      446.096
         13        456.305      465.977
         14        476.688      487.990
         15        494.786      511.916
         16        510.420      537.520
         17        523.437      564.549
         18        527.836      576.622
             Factor of Safety
            ***    1.607   ***
           Individual data on the     0  slices
                     Water  Water     Tie     Tie     Earthquake
                     Force  Force    Force   Force       Force   Surcharge
Slice  Width   Weight    Top    Bot     Norm     Tan     Hor     Ver    Load
 No.    (ft)    (lbs)   (lbs)  (lbs)    (lbs)   (lbs)   (lbs)   (lbs)   (lbs)
      Failure Surface Specified By 18 Coordinate Points
        Point      X-Surf      Y-Surf
         No.        (ft)        (ft)
          1        120.000      406.000
          2        147.945      395.087
```

3	176.852	387.064
4	206.424	382.013
5	236.355	379.986
6	266.338	381.004
7	296.063	385.058
8	325.223	392.104
9	353.520	402.070
10	380.659	414.855
11	406.363	430.325
12	430.365	448.321
13	452.420	468.659
14	472.298	491.127
15	489.796	515.496
16	504.733	541.513
17	516.955	568.910
18	519.445	576.471

Factor of Safety
*** 1.607 ***

Failure Surface Specified By 17 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	130.879	406.000
2	159.522	397.080
3	188.884	390.923
4	218.698	387.585
5	248.694	387.095
6	278.600	389.459
7	308.147	394.654
8	337.066	402.634
9	365.096	413.327
10	391.983	426.635
11	417.483	442.438
12	441.366	460.593
13	463.415	480.936
14	483.430	503.283
15	501.232	527.431
16	516.657	553.161
17	527.842	576.621

Factor of Safety
*** 1.607 ***

Failure Surface Specified By 17 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	126.923	406.000
2	155.566	397.080
3	184.920	390.886
4	214.725	387.472
5	244.719	386.867
6	274.637	389.078
7	304.217	394.085
8	333.196	401.843
9	361.320	412.285
10	388.341	425.318
11	414.021	440.827
12	438.134	458.676
13	460.466	478.708
14	480.822	500.745
15	499.021	524.595
16	514.904	550.045
17	528.181	576.576

Factor of Safety
*** 1.607 ***

Failure Surface Specified By 18 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	125.440	406.000
2	153.725	396.004
3	182.852	388.820
4	212.542	384.516
5	242.510	383.135

6	272.470	384.689
7	302.135	389.163
8	331.220	396.514
9	359.448	406.672
10	386.548	419.541
11	412.260	434.996
12	436.340	452.889
13	458.555	473.050
14	478.694	495.286
15	496.564	519.383
16	511.994	545.111
17	524.835	572.224
18	526.478	576.803

Factor of Safety
*** 1.607 ***

Failure Surface Specified By 18 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	126.923	406.000
2	155.391	396.535
3	184.636	389.847
4	214.388	385.999
5	244.372	385.025
6	274.311	386.936
7	303.929	391.712
8	332.951	399.310
9	361.109	409.660
10	388.143	422.666
11	413.803	438.208
12	437.852	456.142
13	460.068	476.303
14	480.245	498.504
15	498.197	522.540
16	513.758	548.188
17	526.785	575.213
18	527.329	576.690

Factor of Safety
*** 1.607 ***

Failure Surface Specified By 18 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	120.000	406.000
2	148.098	395.487
3	177.091	387.781
4	206.700	382.955
5	236.640	381.056
6	266.622	382.102
7	296.356	386.084
8	325.557	392.963
9	353.943	402.672
10	381.239	415.118
11	407.183	430.182
12	431.525	447.717
13	454.030	467.554
14	474.480	489.503
15	492.680	513.352
16	508.453	538.871
17	521.647	565.814
18	525.782	576.896

Factor of Safety
*** 1.607 ***

Failure Surface Specified By 18 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	121.978	406.000
2	150.151	395.691
3	179.191	388.164
4	208.825	383.491
5	238.773	381.716
6	268.751	382.856

7	298.477	386.899
8	327.671	393.808
9	356.056	403.518
10	383.365	415.936
11	409.340	430.946
12	433.736	448.406
13	456.322	468.151
14	476.886	489.995
15	495.232	513.731
16	511.189	539.135
17	524.605	565.968
18	528.651	576.513

Factor of Safety
*** 1.607 ***

Failure Surface Specified By 18 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	122.967	406.000
2	151.435	396.535
3	180.671	389.810
4	210.414	385.887
5	240.394	384.800
6	270.342	386.559
7	299.989	391.148
8	329.068	398.526
9	357.316	408.627
10	384.480	421.359
11	410.316	436.609
12	434.589	454.238
13	457.083	474.088
14	477.594	495.981
15	495.938	519.719
16	511.950	545.089
17	525.486	571.862
18	527.374	576.683

Factor of Safety
*** 1.607 ***

Failure Surface Specified By 18 Coordinate Points

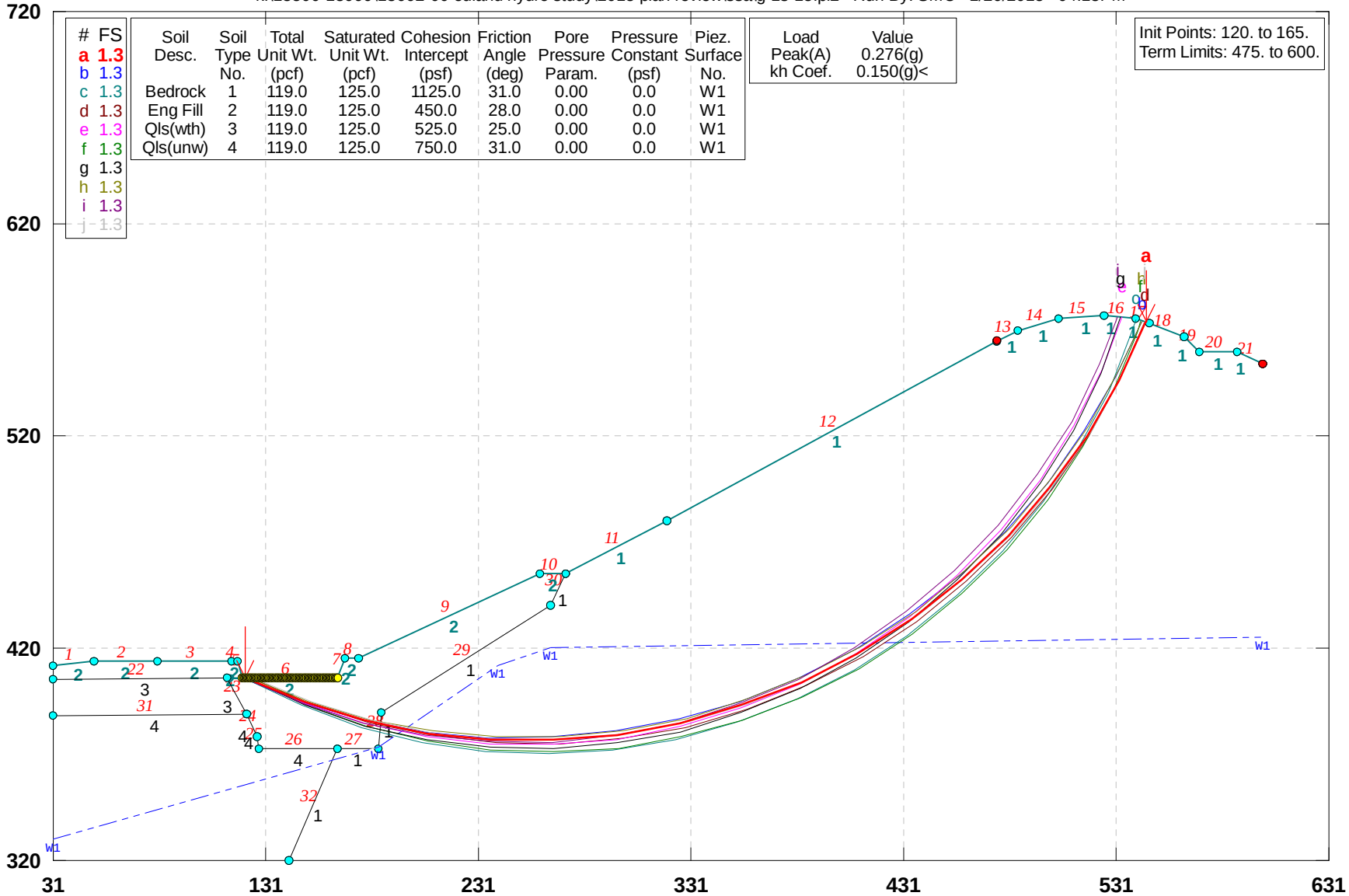
Point No.	X-Surf (ft)	Y-Surf (ft)
1	123.462	406.000
2	151.406	395.087
3	180.323	387.097
4	209.906	382.114
5	239.844	380.190
6	269.822	381.346
7	299.523	385.569
8	328.635	392.816
9	356.850	403.009
10	383.871	416.042
11	409.414	431.776
12	433.209	450.047
13	455.005	470.660
14	474.572	493.400
15	491.705	518.027
16	506.223	544.280
17	517.972	571.884
18	519.388	576.466

Factor of Safety
*** 1.607 ***

**** END OF GSTABL7 OUTPUT ****

Euland - Section G-G', Seismic --2015 design

k:\13500-13999\13662-00 euland hydro study\2015 plan review\ssa\g-1s-15.pl2 Run By: SMC 1/26/2015 04:18PM



GSTABL7 v.2 FSmin=1.3

Safety Factors Are Calculated By The Simplified Janbu Method for the case of c & phi both > 0

Figure E-18.2

***** GSTABL7 *****

** GSTABL7 by Garry H. Gregory, P.E. **

** Original Version 1.0, January 1996; Current Version 2.005, Sept. 2006 **

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****

SLOPE STABILITY ANALYSIS SYSTEM

Modified Bishop, Simplified Janbu, or GLE Method of Slices.
(Includes Spencer & Morgenstern-Price Type Analysis)
Including Pier/Pile, Reinforcement, Soil Nail, Tieback,
Nonlinear Undrained Shear Strength, Curved Phi Envelope,
Anisotropic Soil, Fiber-Reinforced Soil, Boundary Loads, Water
Surfaces, Pseudo-Static & Newmark Earthquake, and Applied Forces.

****

Analysis Run Date: 1/26/2015
Time of Run: 04:18PM
Run By: SMC
Input Data Filename: K:\13500-13999\13662-00 Euland Hydro Study\2015 Plan Review\SSA\g-1s-15.
Output Filename: K:\13500-13999\13662-00 Euland Hydro Study\2015 Plan Review\SSA\g-1s-15.OUT
Unit System: English
Plotted Output Filename: K:\13500-13999\13662-00 Euland Hydro Study\2015 Plan Review\SSA\g-1s-15.PLT
PROBLEM DESCRIPTION: Euland - Section G-G', Seismic
--2015 design

BOUNDARY COORDINATES
21 Top Boundaries
32 Total Boundaries

Boundary No.	X-Left (ft)	Y-Left (ft)	X-Right (ft)	Y-Right (ft)	Soil Type Below Bnd
1	31.00	412.00	50.00	414.00	2
2	50.00	414.00	80.00	414.00	2
3	80.00	414.00	115.00	414.00	2
4	115.00	414.00	118.00	414.00	2
5	118.00	414.00	120.00	406.00	2
6	120.00	406.00	165.00	406.00	2
7	165.00	406.00	168.00	415.00	2
8	168.00	415.00	175.00	415.00	2
9	175.00	415.00	260.00	455.00	2
10	260.00	455.00	272.00	455.00	2
11	272.00	455.00	320.00	480.00	1
12	320.00	480.00	475.00	565.00	1
13	475.00	565.00	485.00	570.00	1
14	485.00	570.00	504.00	575.00	1
15	504.00	575.00	525.00	577.00	1
16	525.00	577.00	540.00	575.00	1
17	540.00	575.00	547.00	573.00	1
18	547.00	573.00	563.00	567.00	1
19	563.00	567.00	570.00	560.00	1
20	570.00	560.00	588.00	560.00	1
21	588.00	560.00	600.00	554.00	1
22	31.00	405.00	113.00	406.00	3
23	113.00	406.00	122.00	389.00	3
24	122.00	389.00	127.00	378.00	4
25	127.00	378.00	128.00	372.50	4
26	128.00	372.50	165.00	372.50	4
27	165.00	372.50	184.00	372.50	1
28	184.00	372.50	185.00	390.00	1
29	185.00	390.00	265.00	440.00	1
30	265.00	440.00	272.00	455.00	1
31	31.00	388.00	122.00	389.00	4
32	142.00	320.00	165.00	372.50	1

User Specified Y-Origin = 320.00(ft)
Default X-Plus Value = 0.00(ft)
Default Y-Plus Value = 0.00(ft)

ISOTROPIC SOIL PARAMETERS
4 Type(s) of Soil

Soil Type	Total Unit Wt.	Saturated Unit Wt.	Cohesion Intercept	Friction Angle	Pore Pressure	Pressure Constant	Piez. Surface

No.	(pcf)	(pcf)	(psf)	(deg)	Param.	(psf)	No.
1	119.0	125.0	1125.0	31.0	0.00	0.0	1
2	119.0	125.0	450.0	28.0	0.00	0.0	1
3	119.0	125.0	525.0	25.0	0.00	0.0	1
4	119.0	125.0	750.0	31.0	0.00	0.0	1

1 PIEZOMETRIC SURFACE(S) SPECIFIED
Unit Weight of Water = 62.40 (pcf)
Piezometric Surface No. 1 Specified by 5 Coordinate Points
Pore Pressure Inclination Factor = 0.50

Point No.	X-Water (ft)	Y-Water (ft)
1	31.00	330.00
2	184.00	373.00
3	240.00	412.00
4	265.00	420.00
5	600.00	425.00

Specified Peak Ground Acceleration Coefficient (A) = 0.276(g)
Specified Horizontal Earthquake Coefficient (kh) = 0.150(g)
Specified Vertical Earthquake Coefficient (kv) = 0.000(g)
Specified Seismic Pore-Pressure Factor = 0.000
A Critical Failure Surface Searching Method, Using A Random
Technique For Generating Circular Surfaces, Has Been Specified.
Janbus Empirical Coef. is being used for the case of c & phi both > 0
18400 Trial Surfaces Have Been Generated.
200 Surface(s) Initiate(s) From Each Of 92 Points Equally Spaced
Along The Ground Surface Between X = 120.00(ft)
and X = 165.00(ft)
Each Surface Terminates Between X = 475.00(ft)
and X = 600.00(ft)
Unless Further Limitations Were Imposed, The Minimum Elevation
At Which A Surface Extends Is Y = 320.00(ft)
30.00(ft) Line Segments Define Each Trial Failure Surface.
Following Are Displayed The Ten Most Critical Of The Trial
Failure Surfaces Evaluated. They Are
Ordered - Most Critical First.
* * Safety Factors Are Calculated By The Simplified Janbu Method * *
Total Number of Trial Surfaces Attempted = 0
Number of Trial Surfaces With Valid FS = 0
Statistical Data On All Valid FS Values:
FS Max = 0.000 FS Min = 500.000 FS Ave = NaN
Standard Deviation = 0.000 Coefficient of Variation = NaN %
Failure Surface Specified By 19 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	120.989	406.000
2	148.731	394.582
3	177.438	385.869
4	206.847	379.942
5	236.687	376.854
6	266.687	376.635
7	296.569	379.286
8	326.061	384.782
9	354.893	393.075
10	382.799	404.086
11	409.523	417.716
12	434.822	433.840
13	458.463	452.309
14	480.229	472.955
15	499.921	495.587
16	517.357	520.000
17	532.379	545.968
18	544.849	573.253
19	544.963	573.582

Factor of Safety
*** 1.333 ***

Individual data on the 0 slices

Slice No.	Width (ft)	Weight (lbs)	Water Force Top (lbs)	Water Force Bot (lbs)	Tie Force Norm (lbs)	Tie Force Tan (lbs)	Earthquake Force Hor (lbs)	Earthquake Force Ver (lbs)	Surcharge Load (lbs)

Failure Surface Specified By 18 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	120.000	406.000
2	147.861	394.876
3	176.653	386.447
4	206.115	380.791
5	235.981	377.958
6	265.981	377.973
7	295.844	380.837
8	325.300	386.524
9	354.083	394.982
10	381.933	406.135
11	408.598	419.882
12	433.837	436.099
13	457.422	454.639
14	479.140	475.335
15	498.795	498.000
16	516.209	522.428
17	531.225	548.400
18	543.003	574.142

Factor of Safety
*** 1.333 ***

Failure Surface Specified By 19 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	120.495	406.000
2	147.541	393.020
3	175.772	382.869
4	204.891	375.656
5	234.596	371.454
6	264.574	370.308
7	294.512	372.230
8	324.098	377.200
9	353.021	385.166
10	380.979	396.044
11	407.680	409.721
12	432.845	426.053
13	456.210	444.870
14	477.530	465.975
15	496.584	489.148
16	513.171	514.145
17	527.118	540.706
18	538.279	568.553
19	540.116	574.967

Factor of Safety
*** 1.334 ***

Failure Surface Specified By 18 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	123.956	406.000
2	151.497	394.105
3	180.074	384.976
4	209.411	378.701
5	239.222	375.341
6	269.219	374.930
7	299.112	377.469
8	328.609	382.936
9	357.426	391.277
10	385.284	402.412
11	411.911	416.231
12	437.050	432.602
13	460.458	451.366
14	481.907	472.341
15	501.190	495.323
16	518.120	520.089
17	532.531	546.401
18	544.200	573.800

Factor of Safety
*** 1.334 ***

Failure Surface Specified By 18 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	121.484	406.000
2	148.905	393.831
3	177.421	384.515
4	206.738	378.148
5	236.550	374.796
6	266.549	374.494
7	296.422	377.246
8	325.861	383.022
9	354.559	391.763
10	382.220	403.377
11	408.555	417.746
12	433.292	434.718
13	456.175	454.119
14	476.965	475.748
15	495.447	499.378
16	511.429	524.767
17	524.746	551.649
18	533.793	575.828

Factor of Safety
*** 1.334 ***

Failure Surface Specified By 19 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	122.473	406.000
2	149.602	393.194
3	177.889	383.202
4	207.043	376.129
5	236.764	372.046
6	266.746	370.995
7	296.680	372.987
8	326.257	378.003
9	355.175	385.989
10	383.134	396.865
11	409.847	410.517
12	435.040	426.806
13	458.452	445.564
14	479.844	466.598
15	498.994	489.691
16	515.705	514.605
17	529.806	541.085
18	541.152	568.857
19	542.731	574.220

Factor of Safety
*** 1.334 ***

Failure Surface Specified By 18 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	121.978	406.000
2	149.193	393.377
3	177.570	383.642
4	206.802	376.899
5	236.576	373.221
6	266.570	372.649
7	296.463	375.187
8	325.931	380.809
9	354.659	389.454
10	382.336	401.029
11	408.664	415.409
12	433.361	432.440
13	456.161	451.939
14	476.817	473.694
15	495.108	497.473
16	510.837	523.019
17	523.834	550.058
18	533.107	575.919

Factor of Safety
*** 1.335 ***

Failure Surface Specified By 18 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	123.462	406.000
2	151.323	394.876
3	180.123	386.477
4	209.597	380.881
5	239.471	378.139
6	269.471	378.278
7	299.319	381.295
8	328.739	387.162
9	357.461	395.827
10	385.218	407.207
11	411.756	421.200
12	436.827	437.674
13	460.202	456.479
14	481.664	477.440
15	501.016	500.364
16	518.078	525.040
17	532.693	551.239
18	542.752	574.214

Factor of Safety
*** 1.335 ***

Failure Surface Specified By 18 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	120.495	406.000
2	148.039	394.112
3	176.644	385.071
4	206.017	378.969
5	235.856	375.870
6	265.856	375.805
7	295.709	378.775
8	325.108	384.749
9	353.752	393.666
10	381.347	405.435
11	407.611	419.934
12	432.273	437.016
13	455.081	456.504
14	475.801	478.200
15	494.220	501.880
16	510.149	527.301
17	523.425	554.203
18	531.602	576.120

Factor of Safety
*** 1.335 ***

Failure Surface Specified By 18 Coordinate Points

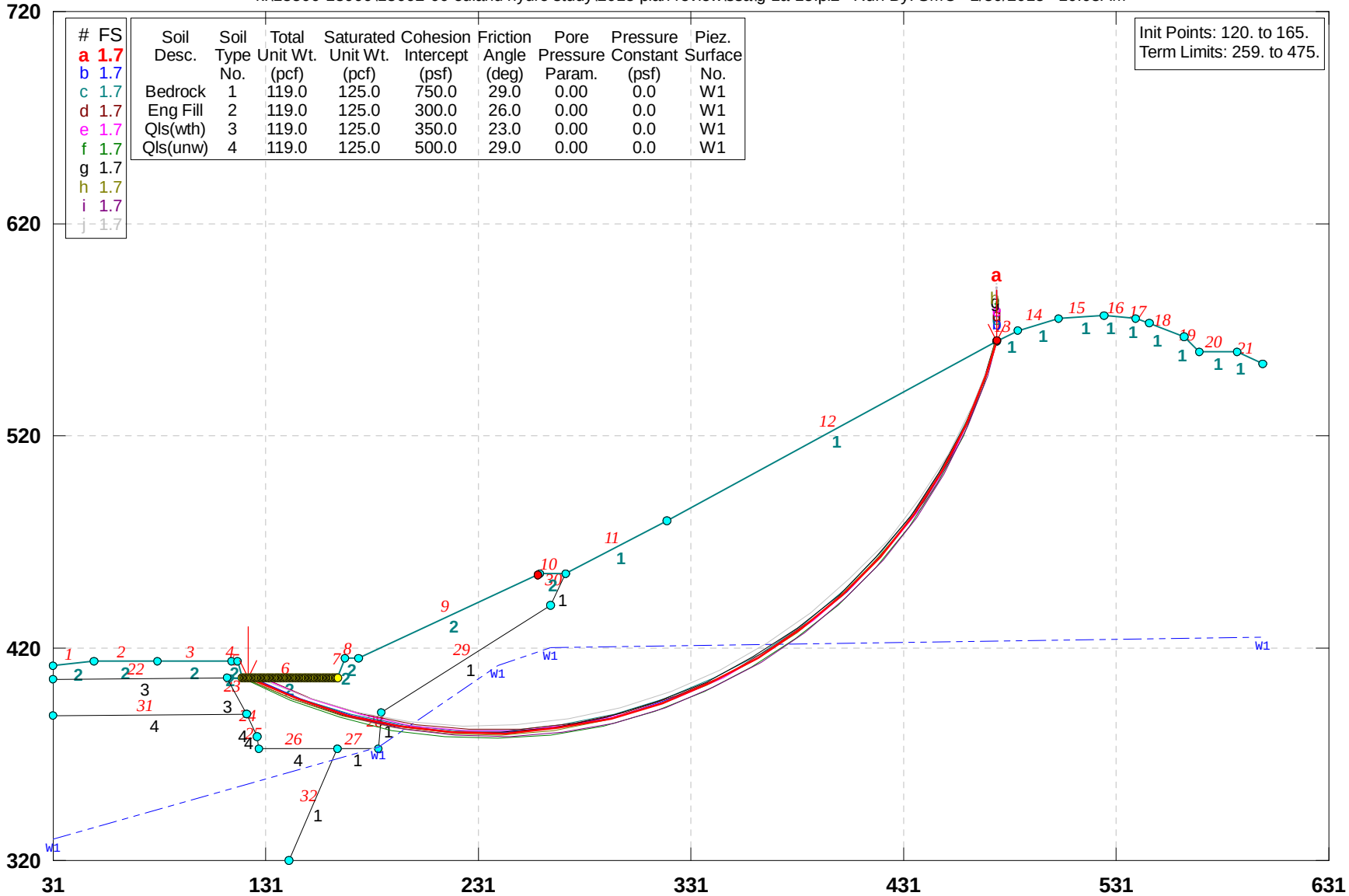
Point No.	X-Surf (ft)	Y-Surf (ft)
1	124.945	406.000
2	152.687	394.582
3	181.404	385.902
4	210.827	380.044
5	240.678	377.061
6	270.678	376.982
7	300.545	379.808
8	329.997	385.512
9	358.760	394.040
10	386.561	405.312
11	413.141	419.223
12	438.250	435.641
13	461.651	454.413
14	483.125	475.362
15	502.470	498.292
16	519.505	522.987
17	534.069	549.214
18	544.692	573.660

Factor of Safety
*** 1.335 ***

**** END OF GSTABL7 OUTPUT ****

Euland - Section G-G', Static, --2015 design

k:\13500-13999\13662-00 euland hydro study\2015 plan review\ssa\g-1a-15.pl2 Run By: SMC 1/30/2015 10:08AM



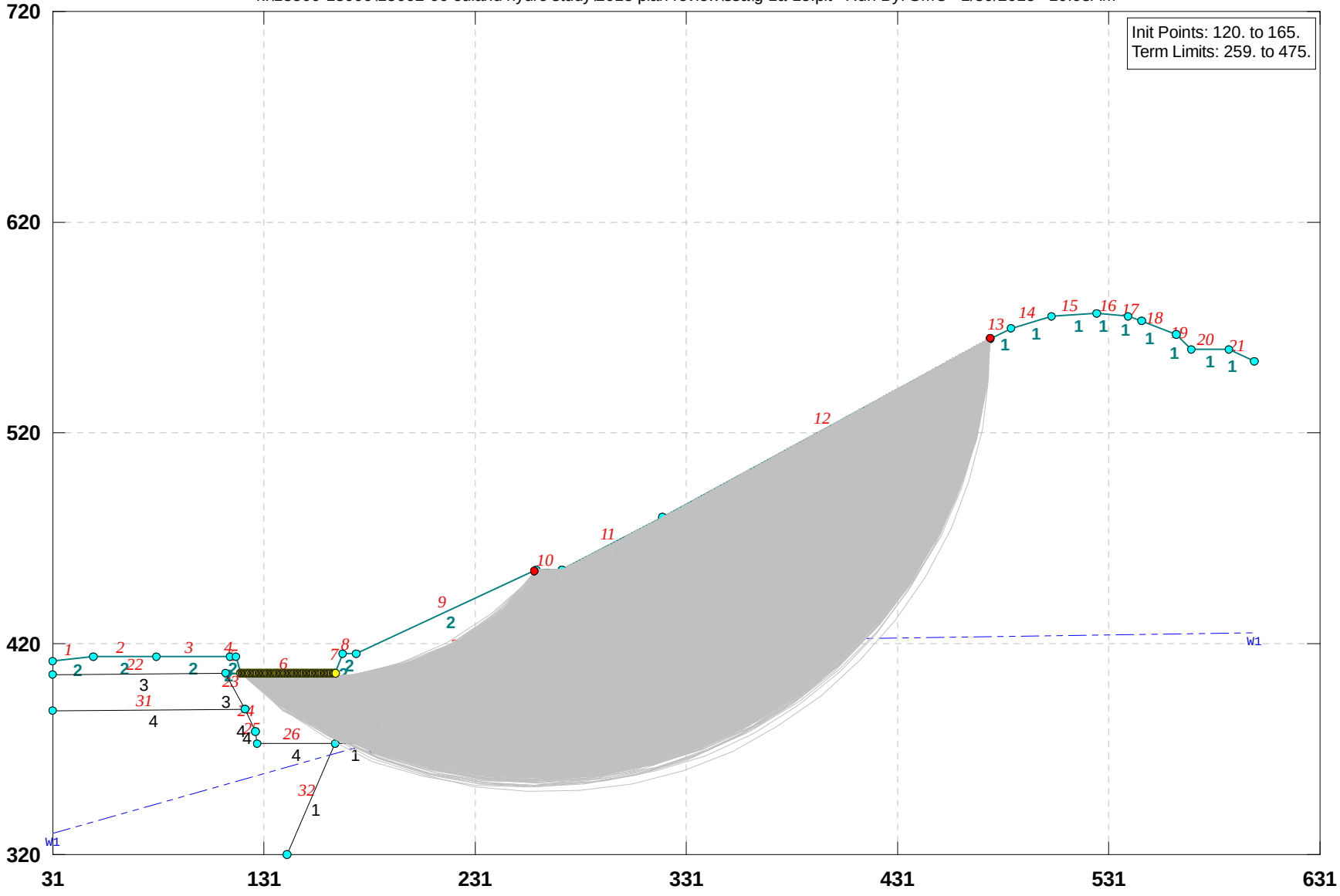
GSTABL7 v.2 FSmin=1.7

Safety Factors Are Calculated By The Simplified Janbu Method for the case of c & phi both > 0

Figure E-19.1

Euland - Section G-G', Static, --2015 design

k:\13500-13999\13662-00 euland hydro study\2015 plan review\ssa\g-1a-15.plt Run By: SMC 1/30/2015 10:08AM



***** GSTABL7 *****

** GSTABL7 by Garry H. Gregory, P.E. **

** Original Version 1.0, January 1996; Current Version 2.005, Sept. 2006 **

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****

SLOPE STABILITY ANALYSIS SYSTEM

Modified Bishop, Simplified Janbu, or GLE Method of Slices.
(Includes Spencer & Morgenstern-Price Type Analysis)
Including Pier/Pile, Reinforcement, Soil Nail, Tieback,
Nonlinear Undrained Shear Strength, Curved Phi Envelope,
Anisotropic Soil, Fiber-Reinforced Soil, Boundary Loads, Water
Surfaces, Pseudo-Static & Newmark Earthquake, and Applied Forces.

****

Analysis Run Date: 1/30/2015
Time of Run: 10:08AM
Run By: SMC
Input Data Filename: K:\13500-13999\13662-00 Euland Hydro Study\2015 Plan Review\SSA\g-1a-15.
Output Filename: K:\13500-13999\13662-00 Euland Hydro Study\2015 Plan Review\SSA\g-1a-15.OUT
Unit System: English
Plotted Output Filename: K:\13500-13999\13662-00 Euland Hydro Study\2015 Plan Review\SSA\g-1a-15.PLT
PROBLEM DESCRIPTION: Euland - Section G-G', Static,
--2015 design

BOUNDARY COORDINATES
21 Top Boundaries
32 Total Boundaries

Boundary No.	X-Left (ft)	Y-Left (ft)	X-Right (ft)	Y-Right (ft)	Soil Type Below Bnd
1	31.00	412.00	50.00	414.00	2
2	50.00	414.00	80.00	414.00	2
3	80.00	414.00	115.00	414.00	2
4	115.00	414.00	118.00	414.00	2
5	118.00	414.00	120.00	406.00	2
6	120.00	406.00	165.00	406.00	2
7	165.00	406.00	168.00	415.00	2
8	168.00	415.00	175.00	415.00	2
9	175.00	415.00	260.00	455.00	2
10	260.00	455.00	272.00	455.00	2
11	272.00	455.00	320.00	480.00	1
12	320.00	480.00	475.00	565.00	1
13	475.00	565.00	485.00	570.00	1
14	485.00	570.00	504.00	575.00	1
15	504.00	575.00	525.00	577.00	1
16	525.00	577.00	540.00	575.00	1
17	540.00	575.00	547.00	573.00	1
18	547.00	573.00	563.00	567.00	1
19	563.00	567.00	570.00	560.00	1
20	570.00	560.00	588.00	560.00	1
21	588.00	560.00	600.00	554.00	1
22	31.00	405.00	113.00	406.00	3
23	113.00	406.00	122.00	389.00	3
24	122.00	389.00	127.00	378.00	4
25	127.00	378.00	128.00	372.50	4
26	128.00	372.50	165.00	372.50	4
27	165.00	372.50	184.00	372.50	1
28	184.00	372.50	185.00	390.00	1
29	185.00	390.00	265.00	440.00	1
30	265.00	440.00	272.00	455.00	1
31	31.00	388.00	122.00	389.00	4
32	142.00	320.00	165.00	372.50	1

User Specified Y-Origin = 320.00(ft)
Default X-Plus Value = 0.00(ft)
Default Y-Plus Value = 0.00(ft)

ISOTROPIC SOIL PARAMETERS
4 Type(s) of Soil

Soil Type	Total Unit Wt.	Saturated Unit Wt.	Cohesion Intercept	Friction Angle	Pore Pressure	Pressure Constant	Piez. Surface

```
  No.  (pcf)    (pcf)     (psf)     (deg)    Param.   (psf)     No.
   1   119.0    125.0     750.0     29.0    0.00       0.0      1
   2   119.0    125.0     300.0     26.0    0.00       0.0      1
   3   119.0    125.0     350.0     23.0    0.00       0.0      1
   4   119.0    125.0     500.0     29.0    0.00       0.0      1
 1 PIEZOMETRIC SURFACE(S) SPECIFIED
 Unit Weight of Water =  62.40 (pcf)
 Piezometric Surface No.  1 Specified by  5 Coordinate Points
 Pore Pressure Inclination Factor =  0.50
   Point      X-Water     Y-Water
    No.         (ft)        (ft)
     1         31.00      330.00
     2        184.00      373.00
     3        240.00      412.00
     4        265.00      420.00
     5        600.00      425.00
 A Critical Failure Surface Searching Method, Using A Random
 Technique For Generating Circular Surfaces, Has Been Specified.
 Janbus Empirical Coef. is being used for the case of  c & phi both > 0
18400 Trial Surfaces Have Been Generated.
  200 Surface(s) Initiate(s) From Each Of    92 Points Equally Spaced
 Along The Ground Surface Between  X = 120.00(ft)
                                 and  X = 165.00(ft)
 Each Surface Terminates Between   X = 259.00(ft)
                                and   X = 475.00(ft)
 Unless Further Limitations Were Imposed, The Minimum Elevation
 At Which A Surface Extends Is  Y =    320.00(ft)
 25.00(ft) Line Segments Define Each Trial Failure Surface.
 Following Are Displayed The Ten Most Critical Of The Trial
       Failure Surfaces Evaluated. They Are
       Ordered - Most Critical First.
       * * Safety Factors Are Calculated By The Simplified Janbu Method * *
       Total Number of Trial Surfaces Attempted =     0
       Number of Trial Surfaces With Valid FS =    0
       Statistical Data On All Valid FS Values:
          FS Max =   0.000   FS Min = 500.000   FS Ave =  NaN
          Standard Deviation =    0.000   Coefficient of Variation =  NaN    %
       Failure Surface Specified By 19 Coordinate Points
         Point      X-Surf      Y-Surf
          No.        (ft)        (ft)
           1       122.967      406.000
           2       145.871      395.980
           3       169.664      388.306
           4       194.107      383.055
           5       218.952      380.279
           6       243.951      380.007
           7       268.851      382.241
           8       293.401      386.958
           9       317.356      394.112
          10       340.473      403.631
          11       362.520      415.417
          12       383.275      429.354
          13       402.529      445.300
          14       420.089      463.095
          15       435.777      482.560
          16       449.435      503.499
          17       460.927      525.702
          18       470.136      548.944
          19       474.644      564.805
              Factor of Safety
             ***    1.664   ***
            Individual data on the     0  slices
                      Water  Water     Tie     Tie     Earthquake
                      Force  Force    Force   Force       Force   Surcharge
Slice  Width   Weight    Top    Bot     Norm     Tan     Hor     Ver    Load
 No.    (ft)    (lbs)   (lbs)  (lbs)    (lbs)   (lbs)   (lbs)   (lbs)   (lbs)
       Failure Surface Specified By 19 Coordinate Points
         Point      X-Surf      Y-Surf
          No.        (ft)        (ft)
           1       124.945      406.000
```

2	147.890	396.074
3	171.716	388.504
4	196.183	383.368
5	221.042	380.717
6	246.042	380.579
7	270.929	382.954
8	295.451	387.819
9	319.360	395.124
10	342.413	404.795
11	364.378	416.734
12	385.031	430.821
13	404.164	446.913
14	421.582	464.847
15	437.109	484.440
16	450.588	505.495
17	461.883	527.798
18	470.878	551.124
19	474.623	564.793

Factor of Safety
*** 1.664 ***

Failure Surface Specified By 19 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	123.956	406.000
2	146.983	396.266
3	170.865	388.871
4	195.363	383.889
5	220.236	381.369
6	245.236	381.335
7	270.115	383.789
8	294.627	388.706
9	318.528	396.037
10	341.581	405.710
11	363.557	417.627
12	384.239	431.673
13	403.421	447.706
14	420.912	465.567
15	436.540	485.081
16	450.149	506.052
17	461.605	528.273
18	470.792	551.523
19	474.549	564.753

Factor of Safety
*** 1.664 ***

Failure Surface Specified By 19 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	129.890	406.000
2	152.930	396.296
3	176.835	388.978
4	201.359	384.121
5	226.248	381.776
6	251.248	381.966
7	276.099	384.690
8	300.546	389.920
9	324.337	397.601
10	347.226	407.654
11	368.978	419.976
12	389.369	434.440
13	408.189	450.897
14	425.243	469.177
15	440.355	489.092
16	453.371	510.437
17	464.156	532.991
18	472.598	556.522
19	474.652	564.809

Factor of Safety
*** 1.664 ***

Failure Surface Specified By 19 Coordinate Points

Point	X-Surf	Y-Surf

No.	(ft)	(ft)
1	128.901	406.000
2	151.874	396.138
3	175.730	388.663
4	200.223	383.651
5	225.098	381.156
6	250.098	381.202
7	274.963	383.789
8	299.437	388.890
9	323.266	396.454
10	346.202	406.400
11	368.008	418.626
12	388.459	433.006
13	407.341	449.391
14	424.461	467.610
15	439.639	487.475
16	452.719	508.780
17	463.566	531.304
18	472.067	554.815
19	474.553	564.755

Factor of Safety
*** 1.664 ***

Failure Surface Specified By 19 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	120.000	406.000
2	142.662	395.445
3	166.277	387.239
4	190.602	381.466
5	215.386	378.186
6	240.374	377.433
7	265.311	379.214
8	289.939	383.511
9	314.005	390.280
10	337.262	399.451
11	359.471	410.929
12	380.403	424.598
13	399.844	440.316
14	417.593	457.922
15	433.468	477.235
16	447.306	498.056
17	458.964	520.172
18	468.323	543.354
19	474.525	564.740

Factor of Safety
*** 1.665 ***

Failure Surface Specified By 19 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	120.495	406.000
2	143.469	396.142
3	167.306	388.605
4	191.771	383.462
5	216.625	380.764
6	241.624	380.537
7	266.523	382.783
8	291.077	387.481
9	315.047	394.584
10	338.197	404.023
11	360.299	415.705
12	381.138	429.516
13	400.510	445.320
14	418.223	462.962
15	434.104	482.269
16	447.998	503.053
17	459.769	525.108
18	469.301	548.220
19	474.218	564.571

Factor of Safety
*** 1.665 ***

Failure Surface Specified By 19 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	120.495	406.000
2	143.350	395.870
3	167.103	388.074
4	191.517	382.691
5	216.346	379.775
6	241.343	379.355
7	266.256	381.435
8	290.837	385.995
9	314.839	392.988
10	338.022	402.345
11	360.154	413.972
12	381.013	427.752
13	400.390	443.548
14	418.092	461.202
15	433.941	480.536
16	447.778	501.358
17	459.465	523.458
18	468.885	546.615
19	474.161	564.540

Factor of Safety
*** 1.665 ***

Failure Surface Specified By 19 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	124.945	406.000
2	147.666	395.572
3	171.336	387.525
4	195.705	381.943
5	220.517	378.886
6	245.512	378.385
7	270.427	380.446
8	295.000	385.047
9	318.973	392.139
10	342.093	401.649
11	364.119	413.476
12	384.818	427.496
13	403.972	443.561
14	421.382	461.504
15	436.862	481.134
16	450.252	502.246
17	461.410	524.618
18	470.218	548.015
19	474.639	564.802

Factor of Safety
*** 1.665 ***

Failure Surface Specified By 19 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	126.923	406.000
2	150.172	396.809
3	174.213	389.951
4	198.813	385.492
5	223.731	383.476
6	248.727	383.922
7	273.558	386.825
8	297.982	392.159
9	321.764	399.870
10	344.670	409.884
11	366.480	422.103
12	386.982	436.410
13	405.976	452.665
14	423.278	470.710
15	438.721	490.371
16	452.153	511.456
17	463.445	533.760
18	472.488	557.067
19	474.642	564.803

```
 Factor of Safety
***    1.665   ***
    **** END OF GSTABL7 OUTPUT ****
```

Euland - Section G-G', Seismic --2015 design

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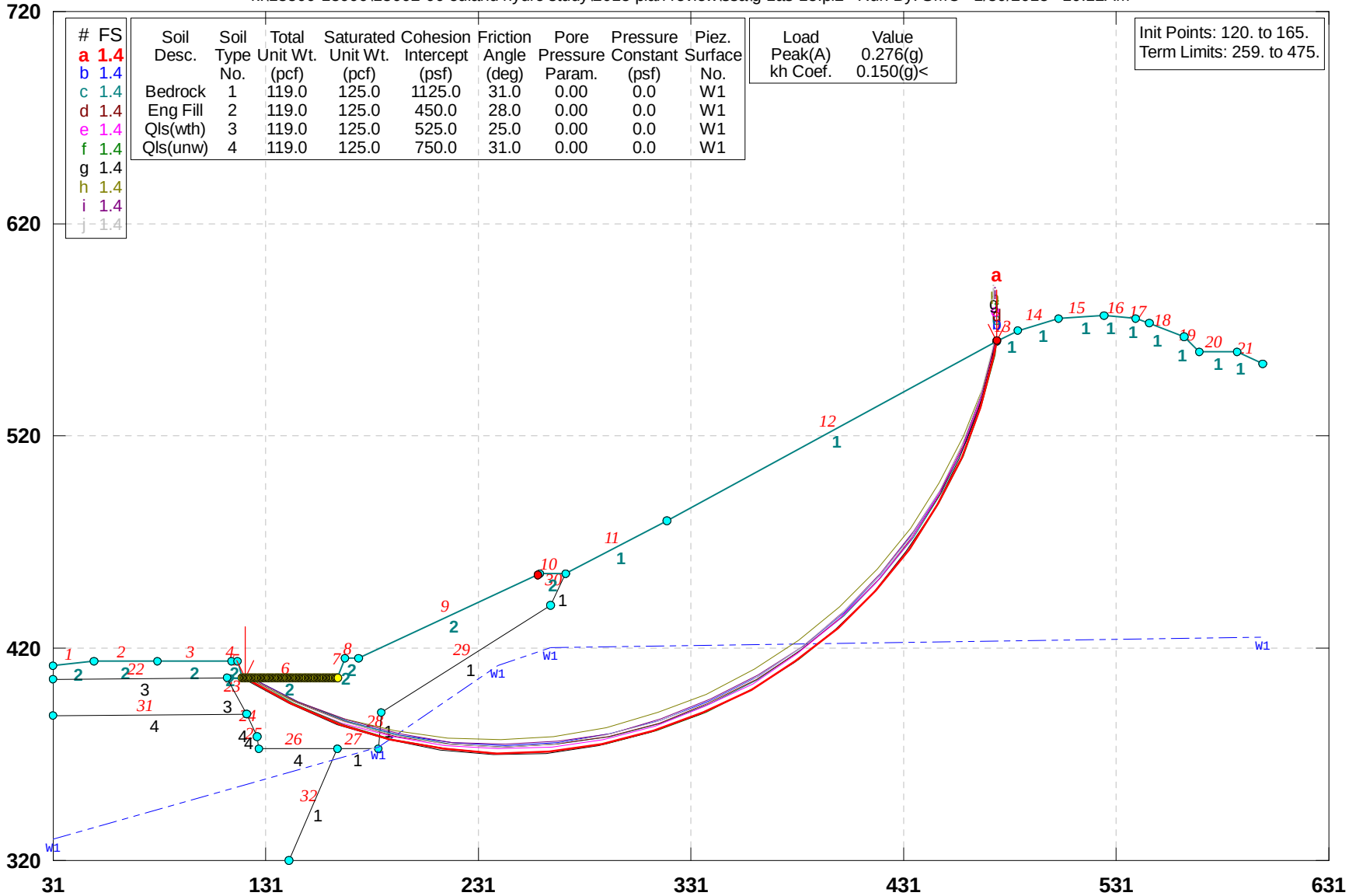

GSTABL7 v.2 FSmin=1.4

Safety Factors Are Calculated By The Simplified Janbu Method for the case of c & phi both > 0

Figure E-19.2

***** GSTABL7 *****

** GSTABL7 by Garry H. Gregory, P.E. **

** Original Version 1.0, January 1996; Current Version 2.005, Sept. 2006 **

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SLOPE STABILITY ANALYSIS SYSTEM

Modified Bishop, Simplified Janbu, or GLE Method of Slices.
(Includes Spencer & Morgenstern-Price Type Analysis)
Including Pier/Pile, Reinforcement, Soil Nail, Tieback,
Nonlinear Undrained Shear Strength, Curved Phi Envelope,
Anisotropic Soil, Fiber-Reinforced Soil, Boundary Loads, Water
Surfaces, Pseudo-Static & Newmark Earthquake, and Applied Forces.

****

Analysis Run Date: 1/30/2015
Time of Run: 10:12AM
Run By: SMC
Input Data Filename: K:\13500-13999\13662-00 Euland Hydro Study\2015 Plan Review\SSA\g-1as-15.
Output Filename: K:\13500-13999\13662-00 Euland Hydro Study\2015 Plan Review\SSA\g-1as-15.OUT
Unit System: English
Plotted Output Filename: K:\13500-13999\13662-00 Euland Hydro Study\2015 Plan Review\SSA\g-1as-15.PLT
PROBLEM DESCRIPTION: Euland - Section G-G', Seismic
--2015 design

BOUNDARY COORDINATES
21 Top Boundaries
32 Total Boundaries

Boundary No.	X-Left (ft)	Y-Left (ft)	X-Right (ft)	Y-Right (ft)	Soil Type Below Bnd
1	31.00	412.00	50.00	414.00	2
2	50.00	414.00	80.00	414.00	2
3	80.00	414.00	115.00	414.00	2
4	115.00	414.00	118.00	414.00	2
5	118.00	414.00	120.00	406.00	2
6	120.00	406.00	165.00	406.00	2
7	165.00	406.00	168.00	415.00	2
8	168.00	415.00	175.00	415.00	2
9	175.00	415.00	260.00	455.00	2
10	260.00	455.00	272.00	455.00	2
11	272.00	455.00	320.00	480.00	1
12	320.00	480.00	475.00	565.00	1
13	475.00	565.00	485.00	570.00	1
14	485.00	570.00	504.00	575.00	1
15	504.00	575.00	525.00	577.00	1
16	525.00	577.00	540.00	575.00	1
17	540.00	575.00	547.00	573.00	1
18	547.00	573.00	563.00	567.00	1
19	563.00	567.00	570.00	560.00	1
20	570.00	560.00	588.00	560.00	1
21	588.00	560.00	600.00	554.00	1
22	31.00	405.00	113.00	406.00	3
23	113.00	406.00	122.00	389.00	3
24	122.00	389.00	127.00	378.00	4
25	127.00	378.00	128.00	372.50	4
26	128.00	372.50	165.00	372.50	4
27	165.00	372.50	184.00	372.50	1
28	184.00	372.50	185.00	390.00	1
29	185.00	390.00	265.00	440.00	1
30	265.00	440.00	272.00	455.00	1
31	31.00	388.00	122.00	389.00	4
32	142.00	320.00	165.00	372.50	1

User Specified Y-Origin = 320.00(ft)
Default X-Plus Value = 0.00(ft)
Default Y-Plus Value = 0.00(ft)

ISOTROPIC SOIL PARAMETERS
4 Type(s) of Soil

Soil Type	Total Unit Wt.	Saturated Unit Wt.	Cohesion Intercept	Friction Angle	Pore Pressure	Pressure Constant	Piez. Surface

No.	(pcf)	(pcf)	(psf)	(deg)	Param.	(psf)	No.
1	119.0	125.0	1125.0	31.0	0.00	0.0	1
2	119.0	125.0	450.0	28.0	0.00	0.0	1
3	119.0	125.0	525.0	25.0	0.00	0.0	1
4	119.0	125.0	750.0	31.0	0.00	0.0	1

1 PIEZOMETRIC SURFACE(S) SPECIFIED
Unit Weight of Water = 62.40 (pcf)
Piezometric Surface No. 1 Specified by 5 Coordinate Points
Pore Pressure Inclination Factor = 0.50

Point No.	X-Water (ft)	Y-Water (ft)
1	31.00	330.00
2	184.00	373.00
3	240.00	412.00
4	265.00	420.00
5	600.00	425.00

Specified Peak Ground Acceleration Coefficient (A) = 0.276(g)
Specified Horizontal Earthquake Coefficient (kh) = 0.150(g)
Specified Vertical Earthquake Coefficient (kv) = 0.000(g)
Specified Seismic Pore-Pressure Factor = 0.000
A Critical Failure Surface Searching Method, Using A Random
Technique For Generating Circular Surfaces, Has Been Specified.
Janbus Empirical Coef. is being used for the case of c & phi both > 0
18400 Trial Surfaces Have Been Generated.
200 Surface(s) Initiate(s) From Each Of 92 Points Equally Spaced
Along The Ground Surface Between X = 120.00(ft)
and X = 165.00(ft)
Each Surface Terminates Between X = 259.00(ft)
and X = 475.00(ft)
Unless Further Limitations Were Imposed, The Minimum Elevation
At Which A Surface Extends Is Y = 320.00(ft)
25.00(ft) Line Segments Define Each Trial Failure Surface.
Following Are Displayed The Ten Most Critical Of The Trial
Failure Surfaces Evaluated. They Are
Ordered - Most Critical First.
* * Safety Factors Are Calculated By The Simplified Janbu Method * *
Total Number of Trial Surfaces Attempted = 0
Number of Trial Surfaces With Valid FS = 0
Statistical Data On All Valid FS Values:
FS Max = 0.000 FS Min = 500.000 FS Ave = NaN
Standard Deviation = 0.000 Coefficient of Variation = NaN %
Failure Surface Specified By 20 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	120.989	406.000
2	142.870	393.907
3	165.918	384.224
4	189.870	377.061
5	214.450	372.499
6	239.378	370.593
7	264.366	371.363
8	289.128	374.800
9	313.381	380.866
10	336.847	389.490
11	359.255	400.574
12	380.350	413.991
13	399.889	429.586
14	417.649	447.182
15	433.425	466.575
16	447.037	487.545
17	458.329	509.849
18	467.171	533.234
19	473.461	557.429
20	474.547	564.752

Factor of Safety
*** 1.402 ***
Individual data on the 0 slices

Slice	Width	Weight	Water Force Top	Water Force Bot	Tie Force Norm	Tie Force Tan	Earthquake Force Hor	Earthquake Force Ver	Surcharge Load

No. (ft) (lbs) (lbs) (lbs) (lbs) (lbs) (lbs) (lbs) (lbs)

Failure Surface Specified By 19 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	123.956	406.000
2	146.238	394.664
3	169.590	385.737
4	193.752	379.318
5	218.455	375.479
6	243.426	374.262
7	268.385	375.681
8	293.057	379.721
9	317.166	386.335
10	340.444	395.452
11	362.634	406.968
12	383.487	420.757
13	402.773	436.666
14	420.276	454.516
15	435.803	474.110
16	449.180	495.230
17	460.259	517.641
18	468.917	541.094
19	474.970	564.984

Factor of Safety
*** 1.402 ***

Failure Surface Specified By 20 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	123.956	406.000
2	146.128	394.451
3	169.401	385.318
4	193.510	378.704
5	218.185	374.685
6	243.147	373.304
7	268.114	374.579
8	292.806	378.493
9	316.943	385.004
10	340.254	394.038
11	362.475	405.493
12	383.356	419.239
13	402.662	435.122
14	420.175	452.963
15	435.698	472.561
16	449.054	493.694
17	460.094	516.124
18	468.694	539.598
19	474.756	563.852
20	474.909	564.950

Factor of Safety
*** 1.402 ***

Failure Surface Specified By 20 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	122.967	406.000
2	145.135	394.442
3	168.402	385.296
4	192.506	378.663
5	217.177	374.619
6	242.137	373.209
7	267.106	374.449
8	291.804	378.325
9	315.953	384.792
10	339.282	393.780
11	361.528	405.186
12	382.442	418.882
13	401.789	434.716
14	419.352	452.508
15	434.932	472.059
16	448.356	493.149
17	459.473	515.542

18	468.156	538.985
19	474.310	563.216
20	474.529	564.742

Factor of Safety
*** 1.402 ***

Failure Surface Specified By 20 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	121.484	406.000
2	143.557	394.262
3	166.751	384.933
4	190.804	378.118
5	215.444	373.893
6	240.394	372.306
7	265.371	373.376
8	290.094	377.090
9	314.283	383.406
10	337.665	392.253
11	359.976	403.531
12	380.965	417.113
13	400.395	432.845
14	418.045	450.550
15	433.717	470.028
16	447.234	491.059
17	458.443	513.405
18	467.218	536.814
19	473.459	561.023
20	473.960	564.430

Factor of Safety
*** 1.402 ***

Failure Surface Specified By 20 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	122.473	406.000
2	144.347	393.896
3	167.395	384.212
4	191.351	377.062
5	215.936	372.527
6	240.866	370.660
7	265.853	371.483
8	290.606	374.987
9	314.840	381.130
10	338.273	389.841
11	360.634	401.021
12	381.664	414.538
13	401.120	430.237
14	418.777	447.936
15	434.429	467.430
16	447.896	488.493
17	459.021	510.881
18	467.676	534.335
19	473.761	558.583
20	474.624	564.794

Factor of Safety
*** 1.403 ***

Failure Surface Specified By 20 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	120.000	406.000
2	141.820	393.798
3	164.822	384.006
4	188.742	376.737
5	213.304	372.074
6	238.223	370.072
7	263.214	370.754
8	287.988	374.112
9	312.258	380.106
10	335.746	388.669
11	358.181	399.701
12	379.303	413.074

13	398.869	428.636
14	416.654	446.205
15	432.452	465.581
16	446.082	486.539
17	457.386	508.837
18	466.234	532.219
19	472.523	556.415
20	473.687	564.280

Factor of Safety
*** 1.403 ***

Failure Surface Specified By 19 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	121.484	406.000
2	144.046	395.232
3	167.593	386.835
4	191.878	380.897
5	216.643	377.480
6	241.629	376.622
7	266.570	378.330
8	291.205	382.587
9	315.273	389.348
10	338.521	398.542
11	360.704	410.072
12	381.588	423.815
13	400.951	439.628
14	418.591	457.343
15	434.322	476.774
16	447.976	497.715
17	459.411	519.947
18	468.506	543.234
19	474.435	564.690

Factor of Safety
*** 1.403 ***

Failure Surface Specified By 19 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	123.956	406.000
2	146.261	394.708
3	169.631	385.829
4	193.806	379.460
5	218.517	375.673
6	243.490	374.510
7	268.447	375.983
8	293.109	380.077
9	317.204	386.745
10	340.462	395.914
11	362.625	407.481
12	383.446	421.319
13	402.694	437.272
14	420.155	455.164
15	435.634	474.796
16	448.959	495.948
17	459.983	518.387
18	468.582	541.861
19	474.284	564.607

Factor of Safety
*** 1.403 ***

Failure Surface Specified By 20 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	121.978	406.000
2	144.181	394.510
3	167.474	385.429
4	191.594	378.857
5	216.274	374.868
6	241.237	373.507
7	266.204	374.789
8	290.896	378.699
9	315.038	385.194

```
      10        338.359      394.202
      11        360.599      405.621
      12        381.509      419.324
      13        400.855      435.157
      14        418.422      452.945
      15        434.013      472.488
      16        447.454      493.568
      17        458.594      515.948
      18        467.310      539.380
      19        473.503      563.601
      20        473.594      564.229
          Factor of Safety
         ***    1.403   ***
             **** END OF GSTABL7 OUTPUT ****
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Euland - Section G-G', Temp, --2015 design

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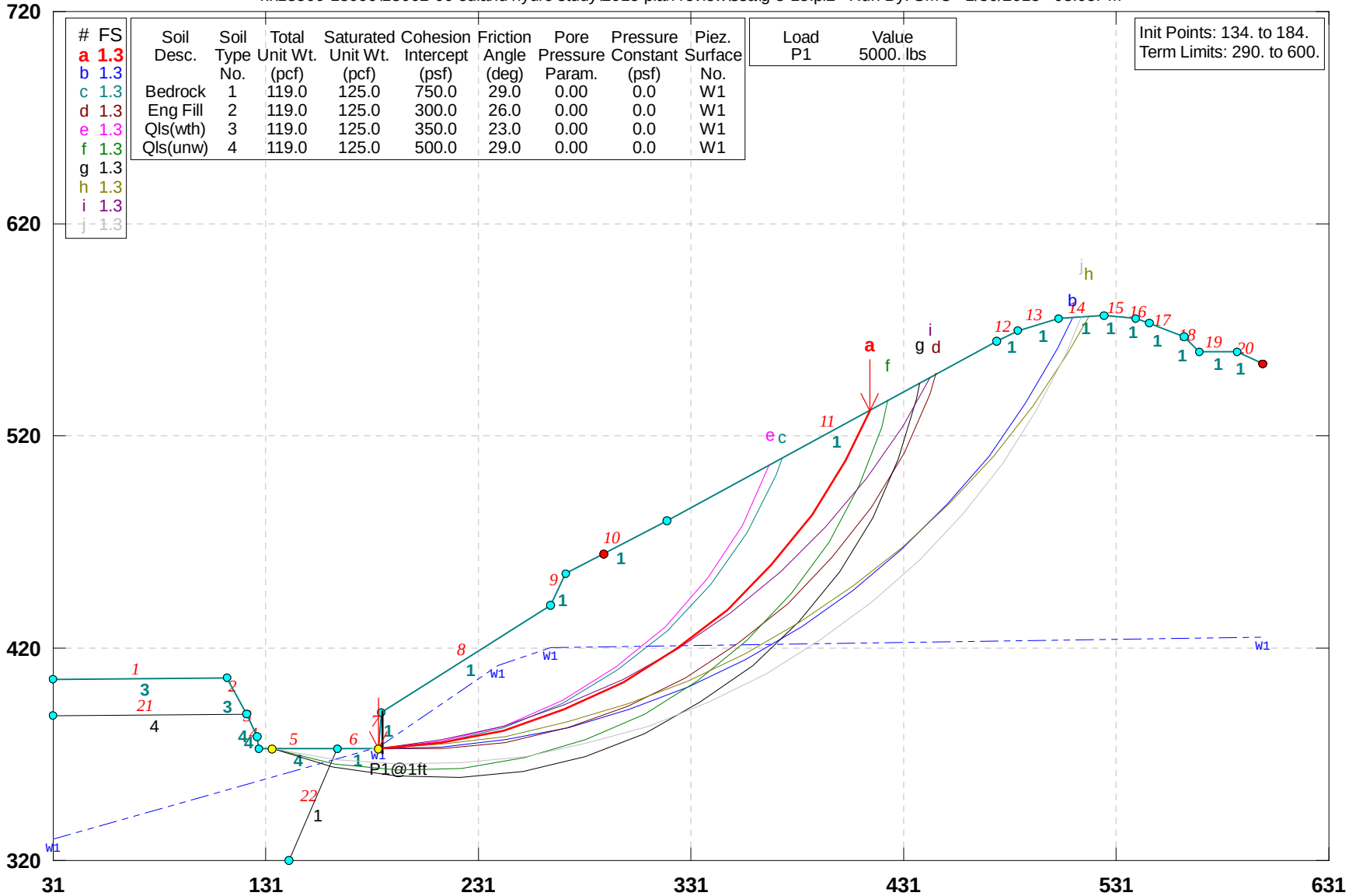

GSTABL7 v.2 FSmin=1.3

Safety Factors Are Calculated By The Simplified Janbu Method for the case of c & phi both > 0

Figure E-20

Euland - Section G-G', Temp, --2015 design

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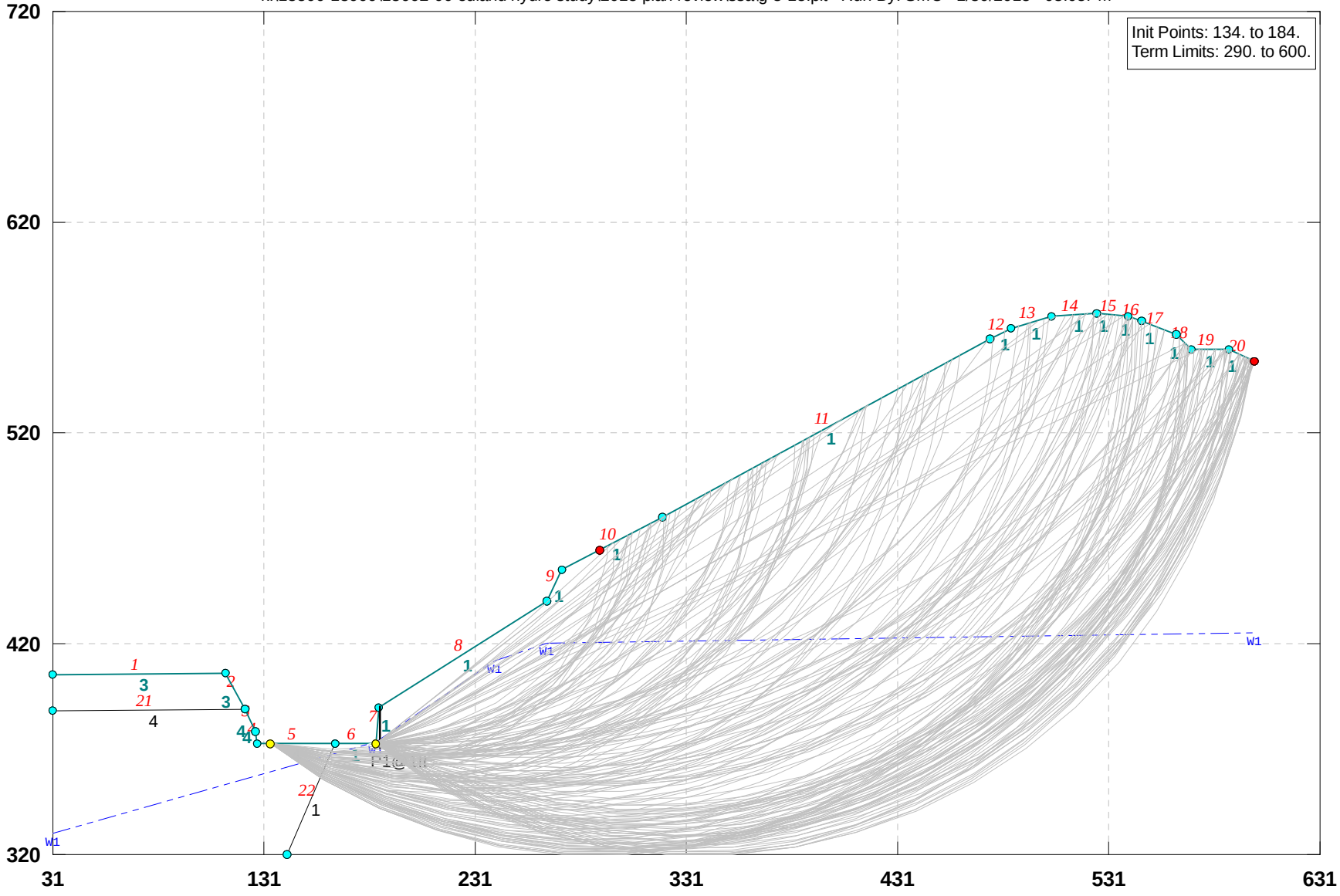

***** GSTABL7 *****

** GSTABL7 by Garry H. Gregory, P.E. **

** Original Version 1.0, January 1996; Current Version 2.005, Sept. 2006 **

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****

SLOPE STABILITY ANALYSIS SYSTEM

Modified Bishop, Simplified Janbu, or GLE Method of Slices.
(Includes Spencer & Morgenstern-Price Type Analysis)
Including Pier/Pile, Reinforcement, Soil Nail, Tieback,
Nonlinear Undrained Shear Strength, Curved Phi Envelope,
Anisotropic Soil, Fiber-Reinforced Soil, Boundary Loads, Water
Surfaces, Pseudo-Static & Newmark Earthquake, and Applied Forces.

****

Analysis Run Date: 1/30/2015
Time of Run: 03:05PM
Run By: SMC
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Output Filename: K:\13500-13999\13662-00 Euland Hydro Study\2015 Plan Review\SSA\g-3-15.OUT
Unit System: English
Plotted Output Filename: K:\13500-13999\13662-00 Euland Hydro Study\2015 Plan Review\SSA\g-3-15.PLT
PROBLEM DESCRIPTION: Euland - Section G-G', Temp,
--2015 design

BOUNDARY COORDINATES
20 Top Boundaries
22 Total Boundaries

Boundary No.	X-Left (ft)	Y-Left (ft)	X-Right (ft)	Y-Right (ft)	Soil Type Below Bnd
1	31.00	405.00	113.00	406.00	3
2	113.00	406.00	122.00	389.00	3
3	122.00	389.00	127.00	378.00	4
4	127.00	378.00	128.00	372.50	4
5	128.00	372.50	165.00	372.50	4
6	165.00	372.50	184.00	372.50	1
7	184.00	372.50	185.00	390.00	1
8	185.00	390.00	265.00	440.00	1
9	265.00	440.00	272.00	455.00	1
10	272.00	455.00	320.00	480.00	1
11	320.00	480.00	475.00	565.00	1
12	475.00	565.00	485.00	570.00	1
13	485.00	570.00	504.00	575.00	1
14	504.00	575.00	525.00	577.00	1
15	525.00	577.00	540.00	575.00	1
16	540.00	575.00	547.00	573.00	1
17	547.00	573.00	563.00	567.00	1
18	563.00	567.00	570.00	560.00	1
19	570.00	560.00	588.00	560.00	1
20	588.00	560.00	600.00	554.00	1
21	31.00	388.00	122.00	389.00	4
22	142.00	320.00	165.00	372.50	1

User Specified Y-Origin = 320.00(ft)
Default X-Plus Value = 0.00(ft)
Default Y-Plus Value = 0.00(ft)

ISOTROPIC SOIL PARAMETERS
4 Type(s) of Soil

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.
1	119.0	125.0	750.0	29.0	0.00	0.0	1
2	119.0	125.0	300.0	26.0	0.00	0.0	1
3	119.0	125.0	350.0	23.0	0.00	0.0	1
4	119.0	125.0	500.0	29.0	0.00	0.0	1

1 PIEZOMETRIC SURFACE(S) SPECIFIED
Unit Weight of Water = 62.40 (pcf)
Piezometric Surface No. 1 Specified by 5 Coordinate Points
Pore Pressure Inclination Factor = 0.50

Point	X-Water	Y-Water

No.	(ft)	(ft)
1	31.00	330.00
2	184.00	373.00
3	240.00	412.00
4	265.00	420.00
5	600.00	425.00

PIER/PILE LOAD(S)
1 Pier/Pile Load(s) Specified

Pier/Pile No.	X-Pos (ft)	Y-Pos (ft)	Load (lbs)	Spacing (ft)	Inclination (deg)	Length (ft)
1	186.00	390.62	5000.0	1.0	90.00	20.0

NOTE - An Equivalent Line Load Is Calculated For Each Row Of Piers/Piles
Assuming A Uniform Distribution Of Load Horizontally Between
Individual Piers/Piles.
A Critical Failure Surface Searching Method, Using A Random
Technique For Generating Circular Surfaces, Has Been Specified.
Janbus Empirical Coef. is being used for the case of c & phi both > 0
200 Trial Surfaces Have Been Generated.
100 Surface(s) Initiate(s) From Each Of 2 Points Equally Spaced
Along The Ground Surface Between X = 134.00(ft)
and X = 184.00(ft)
Each Surface Terminates Between X = 290.00(ft)
and X = 600.00(ft)
Unless Further Limitations Were Imposed, The Minimum Elevation
At Which A Surface Extends Is Y = 320.00(ft)
30.00(ft) Line Segments Define Each Trial Failure Surface.
Following Are Displayed The Ten Most Critical Of The Trial
Failure Surfaces Evaluated. They Are
Ordered - Most Critical First.
* * Safety Factors Are Calculated By The Simplified Janbu Method * *
Total Number of Trial Surfaces Attempted = 200
Number of Trial Surfaces With Valid FS = 200
Statistical Data On All Valid FS Values:
FS Max = 2.415 FS Min = 1.256 FS Ave = 1.447
Standard Deviation = 0.189 Coefficient of Variation = 13.06 %
Failure Surface Specified By 11 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	184.000	372.500
2	213.871	375.281
3	243.224	381.476
4	271.671	391.005
5	298.834	403.740
6	324.353	419.512
7	347.890	438.113
8	369.133	459.296
9	387.801	482.781
10	403.646	508.255
11	414.874	532.027

Factor of Safety
*** 1.256 ***
Individual data on the 16 slices

Slice No.	Width (ft)	Weight (lbs)	Water Force Top (lbs)	Water Force Bot (lbs)	Tie Force Norm (lbs)	Tie Force Tan (lbs)	Earthquake Force Hor (lbs)	Earthquake Force Ver (lbs)	Surcharge Load (lbs)
1	1.0	1039.7	0.0	42.0	0.	0.	0.0	0.0	0.0
2	28.9	87605.8	0.0	14855.1	0.	0.	0.0	0.0	0.0
3	26.1	121950.2	0.0	34665.7	0.	0.	0.0	0.0	0.0
4	3.2	17554.9	0.0	6152.6	0.	0.	0.0	0.0	0.0
5	21.8	128480.7	0.0	42896.6	0.	0.	0.0	0.0	0.0
6	6.7	46660.9	0.0	13239.3	0.	0.	0.0	0.0	0.0
7	0.3	2547.9	0.0	658.4	0.	0.	0.0	0.0	0.0
8	26.8	209764.5	0.0	42262.0	0.	0.	0.0	0.0	0.0
9	21.2	163043.3	0.0	16118.7	0.	0.	0.0	0.0	0.0
10	4.4	32717.5	0.0	857.7	0.	0.	0.0	0.0	0.0
11	1.8	13219.6	0.0	96.8	0.	0.	0.0	0.0	0.0
12	21.8	154922.8	0.0	0.0	0.	0.	0.0	0.0	0.0
13	21.2	132501.9	0.0	0.0	0.	0.	0.0	0.0	0.0
14	18.7	91134.0	0.0	0.0	0.	0.	0.0	0.0	0.0

15	15.8	49039.1	0.0	0.0	0.	0.	0.0	0.0	0.0
16	11.2	11768.1	0.0	0.0	0.	0.	0.0	0.0	0.0

Failure Surface Specified By 15 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	184.000	372.500
2	213.986	373.413
3	243.791	376.832
4	273.205	382.733
5	302.021	391.075
6	330.039	401.799
7	357.061	414.830
8	382.897	430.078
9	407.367	447.433
10	430.299	466.776
11	451.532	487.970
12	470.916	510.866
13	488.316	535.305
14	503.610	561.113
15	510.645	575.633

Factor of Safety
*** 1.257 ***

Failure Surface Specified By 10 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	184.000	372.500
2	213.849	375.504
3	242.960	382.752
4	270.734	394.094
5	296.597	409.296
6	320.017	428.045
7	340.510	449.955
8	357.655	474.573
9	371.097	501.392
10	373.792	509.499

Factor of Safety
*** 1.257 ***

Failure Surface Specified By 13 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	184.000	372.500
2	214.000	372.418
3	243.811	375.777
4	273.041	382.534
5	301.302	392.598
6	328.223	405.837
7	353.448	422.076
8	376.644	441.101
9	397.504	462.661
10	415.755	486.471
11	431.154	512.217
12	443.499	539.559
13	446.660	549.459

Factor of Safety
*** 1.258 ***

Failure Surface Specified By 10 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	184.000	372.500
2	213.813	375.842
3	242.814	383.519
4	270.377	395.363
5	295.906	411.121
6	318.848	430.451
7	338.709	452.935
8	355.060	478.087
9	367.547	505.365
10	367.791	506.208

Factor of Safety
*** 1.259 ***

Failure Surface Specified By 14 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	134.000	372.500
2	163.191	365.580
3	193.035	362.529
4	223.023	363.400
5	252.640	368.177
6	281.380	376.779
7	308.752	389.058
8	334.287	404.804
9	357.549	423.749
10	378.139	445.568
11	395.705	469.888
12	409.946	496.292
13	420.620	524.329
14	423.578	536.801

Factor of Safety
*** 1.259 ***

Failure Surface Specified By 15 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	134.000	372.500
2	162.809	364.130
3	192.461	359.573
4	222.453	358.907
5	252.278	362.141
6	281.431	369.222
7	309.417	380.029
8	335.762	394.380
9	360.019	412.031
10	381.779	432.683
11	400.672	455.987
12	416.378	481.547
13	428.631	508.930
14	437.224	537.674
15	438.396	544.927

Factor of Safety
*** 1.260 ***

Failure Surface Specified By 15 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	184.000	372.500
2	213.936	374.453
3	243.638	378.677
4	272.932	385.147
5	301.649	393.826
6	329.623	404.664
7	356.691	417.598
8	382.698	432.552
9	407.492	449.442
10	430.930	468.167
11	452.877	488.621
12	473.204	510.685
13	491.794	534.231
14	508.540	559.122
15	518.323	576.364

Factor of Safety
*** 1.260 ***

Failure Surface Specified By 12 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	184.000	372.500
2	213.705	376.699
3	242.901	383.596
4	271.344	393.135
5	298.796	405.234
6	325.026	419.794
7	349.815	436.691
8	372.955	455.784

9	394.252	476.913
10	413.527	499.902
11	430.620	524.556
12	443.820	547.901

Factor of Safety
*** 1.262 ***

Failure Surface Specified By 17 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	134.000	372.500
2	163.616	367.713
3	193.539	365.576
4	223.535	366.106
5	253.364	369.300
6	282.792	375.131
7	311.585	383.554
8	339.516	394.502
9	366.364	407.888
10	391.917	423.607
11	415.971	441.534
12	438.338	461.527
13	458.840	483.429
14	477.314	507.065
15	493.616	532.250
16	507.615	558.783
17	514.837	576.032

Factor of Safety
*** 1.262 ***

**** END OF GSTABL7 OUTPUT ****

Euland - Section G-G', Temp, --2015 design

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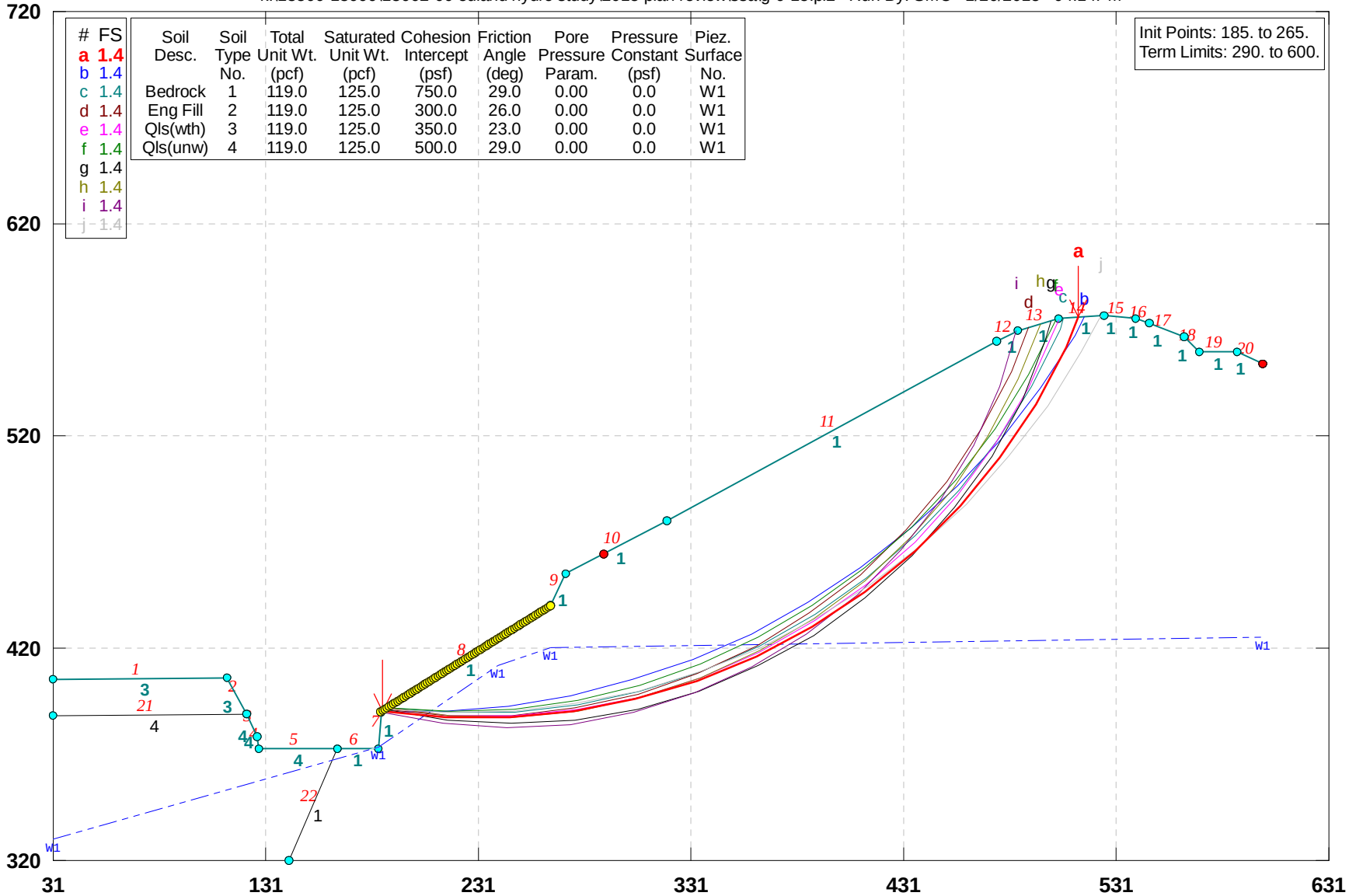

GSTABL7 v.2 FSmin=1.4

Safety Factors Are Calculated By The Simplified Janbu Method for the case of c & phi both > 0

Figure E-21

Euland - Section G-G', Temp, --2015 design

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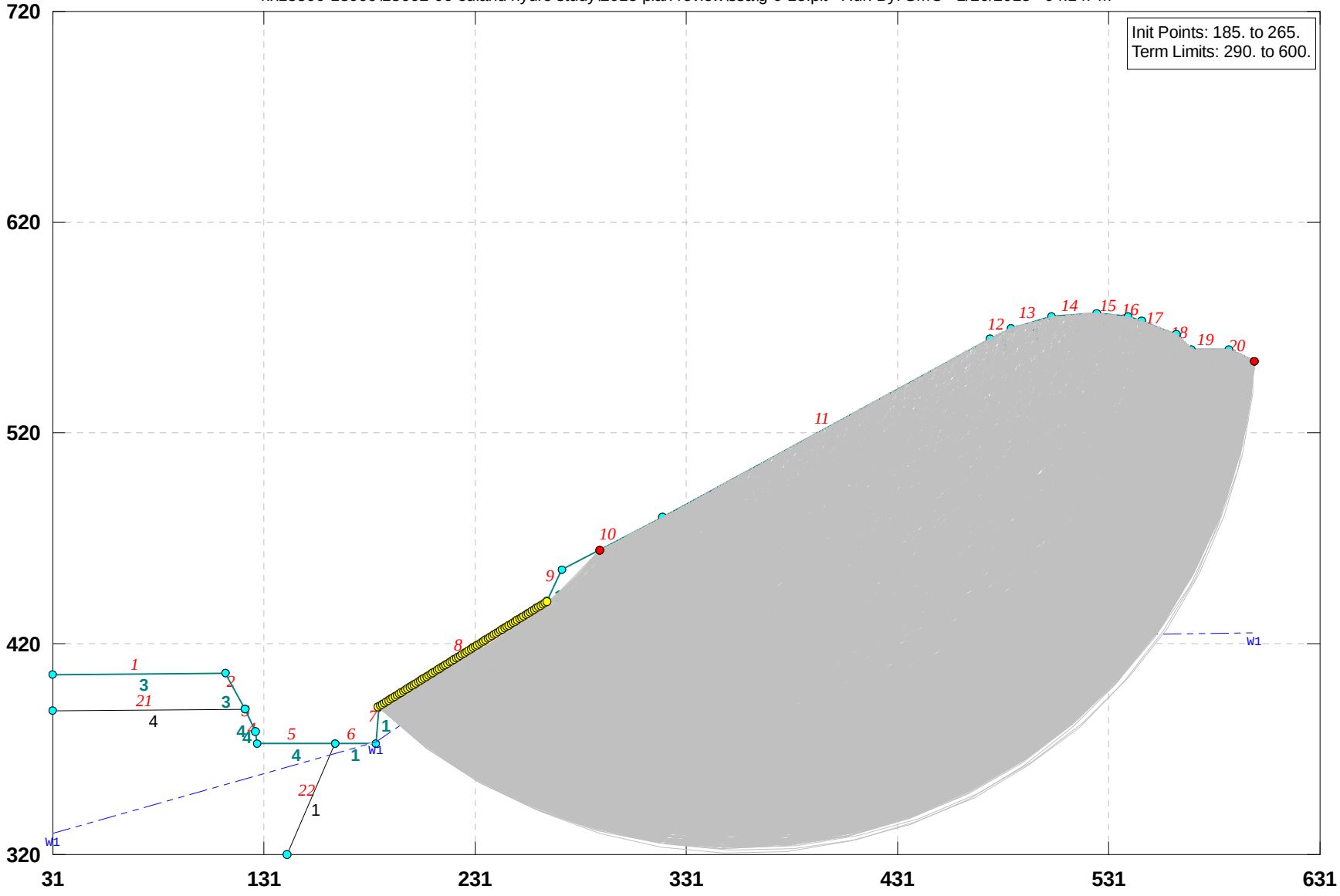

***** GSTABL7 *****

** GSTABL7 by Garry H. Gregory, P.E. **

** Original Version 1.0, January 1996; Current Version 2.005, Sept. 2006 **

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****

SLOPE STABILITY ANALYSIS SYSTEM

Modified Bishop, Simplified Janbu, or GLE Method of Slices.
(Includes Spencer & Morgenstern-Price Type Analysis)
Including Pier/Pile, Reinforcement, Soil Nail, Tieback,
Nonlinear Undrained Shear Strength, Curved Phi Envelope,
Anisotropic Soil, Fiber-Reinforced Soil, Boundary Loads, Water
Surfaces, Pseudo-Static & Newmark Earthquake, and Applied Forces.

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Time of Run: 04:14PM
Run By: SMC
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Unit System: English
Plotted Output Filename: K:\13500-13999\13662-00 Euland Hydro Study\2015 Plan Review\SSA\g-6-15.PLT
PROBLEM DESCRIPTION: Euland - Section G-G', Temp,
--2015 design

BOUNDARY COORDINATES
20 Top Boundaries
22 Total Boundaries

Boundary No.	X-Left (ft)	Y-Left (ft)	X-Right (ft)	Y-Right (ft)	Soil Type Below Bnd
1	31.00	405.00	113.00	406.00	3
2	113.00	406.00	122.00	389.00	3
3	122.00	389.00	127.00	378.00	4
4	127.00	378.00	128.00	372.50	4
5	128.00	372.50	165.00	372.50	4
6	165.00	372.50	184.00	372.50	1
7	184.00	372.50	185.00	390.00	1
8	185.00	390.00	265.00	440.00	1
9	265.00	440.00	272.00	455.00	1
10	272.00	455.00	320.00	480.00	1
11	320.00	480.00	475.00	565.00	1
12	475.00	565.00	485.00	570.00	1
13	485.00	570.00	504.00	575.00	1
14	504.00	575.00	525.00	577.00	1
15	525.00	577.00	540.00	575.00	1
16	540.00	575.00	547.00	573.00	1
17	547.00	573.00	563.00	567.00	1
18	563.00	567.00	570.00	560.00	1
19	570.00	560.00	588.00	560.00	1
20	588.00	560.00	600.00	554.00	1
21	31.00	388.00	122.00	389.00	4
22	142.00	320.00	165.00	372.50	1

User Specified Y-Origin = 320.00(ft)
Default X-Plus Value = 0.00(ft)
Default Y-Plus Value = 0.00(ft)

ISOTROPIC SOIL PARAMETERS
4 Type(s) of Soil

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.
1	119.0	125.0	750.0	29.0	0.00	0.0	1
2	119.0	125.0	300.0	26.0	0.00	0.0	1
3	119.0	125.0	350.0	23.0	0.00	0.0	1
4	119.0	125.0	500.0	29.0	0.00	0.0	1

1 PIEZOMETRIC SURFACE(S) SPECIFIED
Unit Weight of Water = 62.40 (pcf)
Piezometric Surface No. 1 Specified by 5 Coordinate Points
Pore Pressure Inclination Factor = 0.50

Point	X-Water	Y-Water

No.	(ft)	(ft)
1	31.00	330.00
2	184.00	373.00
3	240.00	412.00
4	265.00	420.00
5	600.00	425.00

A Critical Failure Surface Searching Method, Using A Random
Technique For Generating Circular Surfaces, Has Been Specified.
Janbus Empirical Coef. is being used for the case of c & phi both > 0
16200 Trial Surfaces Have Been Generated.
200 Surface(s) Initiate(s) From Each Of 81 Points Equally Spaced
Along The Ground Surface Between X = 185.00(ft)
and X = 265.00(ft)
Each Surface Terminates Between X = 290.00(ft)
and X = 600.00(ft)
Unless Further Limitations Were Imposed, The Minimum Elevation
At Which A Surface Extends Is Y = 320.00(ft)
30.00(ft) Line Segments Define Each Trial Failure Surface.
Following Are Displayed The Ten Most Critical Of The Trial
Failure Surfaces Evaluated. They Are
Ordered - Most Critical First.
* * Safety Factors Are Calculated By The Simplified Janbu Method * *
Total Number of Trial Surfaces Attempted = 0
Number of Trial Surfaces With Valid FS = 0
Statistical Data On All Valid FS Values:
FS Max = 0.000 FS Min = 500.000 FS Ave = NaN
Standard Deviation = 0.000 Coefficient of Variation = NaN %

Failure Surface Specified By 15 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	186.000	390.625
2	215.843	387.557
3	245.842	387.441
4	275.708	390.277
5	305.150	396.038
6	333.882	404.668
7	361.625	416.084
8	388.110	430.174
9	413.080	446.802
10	436.293	465.807
11	457.523	487.003
12	476.564	510.186
13	493.232	535.129
14	507.364	561.592
15	513.271	575.883

Factor of Safety
*** 1.374 ***

Individual data on the 0 slices

Slice No.	Width (ft)	Weight (lbs)	Water Force Top (lbs)	Water Force Bot (lbs)	Tie Force Norm (lbs)	Tie Force Tan (lbs)	Earthquake Force Hor (lbs)	Earthquake Force Ver (lbs)	Surcharge Load (lbs)

Failure Surface Specified By 15 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	185.000	390.000
2	215.000	390.088
3	244.891	392.647
4	274.469	397.659
5	303.534	405.090
6	331.888	414.889
7	359.339	426.991
8	385.701	441.312
9	410.793	457.755
10	434.445	476.210
11	456.497	496.549
12	476.800	518.636
13	495.214	542.319
14	511.615	567.439
15	516.342	576.175

Factor of Safety
*** 1.378 ***
Failure Surface Specified By 15 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	188.000	391.875
2	217.893	389.349
3	247.890	389.810
4	277.692	393.252
5	307.003	399.642
6	335.534	408.915
7	363.001	420.981
8	389.131	435.720
9	413.665	452.984
10	436.360	472.604
11	456.991	494.384
12	475.353	518.108
13	491.264	543.541
14	504.566	570.431
15	506.369	575.226

Factor of Safety
*** 1.379 ***
Failure Surface Specified By 14 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	187.000	391.250
2	216.831	388.071
3	246.831	388.167
4	276.641	391.538
5	305.905	398.143
6	334.273	407.902
7	361.406	420.701
8	386.980	436.384
9	410.689	454.766
10	432.250	475.626
11	451.404	498.715
12	467.924	523.757
13	481.611	550.452
14	489.521	571.190

Factor of Safety
*** 1.379 ***
Failure Surface Specified By 15 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	188.000	391.875
2	217.810	388.508
3	247.809	388.270
4	277.669	391.165
5	307.064	397.161
6	335.672	406.193
7	363.182	418.161
8	389.292	432.935
9	413.717	450.354
10	436.190	470.227
11	456.467	492.337
12	474.325	516.443
13	489.569	542.281
14	502.033	569.570
15	503.842	574.958

Factor of Safety
*** 1.380 ***
Failure Surface Specified By 14 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	188.000	391.875
2	217.954	390.217
3	247.928	391.473
4	277.638	395.633
5	306.804	402.656
6	335.151	412.477

7	362.411	425.002
8	388.327	440.114
9	412.654	457.670
10	435.162	477.504
11	455.639	499.429
12	473.892	523.237
13	489.747	548.705
14	502.579	574.626

Factor of Safety
*** 1.381 ***

Failure Surface Specified By 15 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	187.000	391.250
2	216.580	386.250
3	246.536	384.613
4	276.485	386.358
5	306.047	391.464
6	334.847	399.866
7	362.517	411.457
8	388.706	426.090
9	413.082	443.578
10	435.334	463.699
11	455.179	486.197
12	472.364	510.787
13	486.672	537.155
14	497.920	564.967
15	500.454	574.067

Factor of Safety
*** 1.381 ***

Failure Surface Specified By 14 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	188.000	391.875
2	217.773	388.195
3	247.771	387.797
4	277.632	390.684
5	306.997	396.823
6	335.513	406.140
7	362.838	418.523
8	388.644	433.822
9	412.620	451.855
10	434.477	472.404
11	453.954	495.222
12	470.816	520.035
13	484.860	546.544
14	495.227	572.691

Factor of Safety
*** 1.381 ***

Failure Surface Specified By 14 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	185.000	390.000
2	214.485	384.466
3	244.424	382.557
4	274.374	384.301
5	303.889	389.673
6	332.532	398.593
7	359.879	410.929
8	385.523	426.497
9	409.085	445.067
10	430.215	466.363
11	448.599	490.069
12	463.966	515.835
13	476.087	543.277
14	484.033	569.517

Factor of Safety
*** 1.381 ***

Failure Surface Specified By 15 Coordinate Points

Point	X-Surf	Y-Surf

```
No.        (ft)        (ft)
 1        187.000      391.250
 2        216.943      389.406
 3        246.932      390.241
 4        276.726      393.747
 5        306.089      399.898
 6        334.786      408.643
 7        362.588      419.914
 8        389.275      433.619
 9        414.632      449.651
10        438.458      467.881
11        460.563      488.163
12        480.770      510.336
13        498.919      534.224
14        514.864      559.636
15        523.642      576.871
    Factor of Safety
   ***    1.383   ***
       **** END OF GSTABL7 OUTPUT ****
```

SURFICIAL SLOPE STABILITY ANALYSIS

ADAPTED FROM: U.S. Geological Survey
Prof. Paper 851
Campbell, 1975

SOIL TYPE: Engineered Fill

SLOPE RATIO: 2:1 (Horizontal:vertical)

DATA:

C	= Cohesion =	300	PSF
ϕ	= Angle of Interior Friction =	26	degrees
γ	= Density =	125	PCF
i	= Slope of Angle =	26.57	degrees
D_s	= Depth of Saturation =	4	feet
γ_B	= Buoyant Density (γ - 62.4) =	62.6	PCF

$$\text{STATIC SAFETY FACTOR} = \frac{C + (\gamma_B) * D_s * COS^2\, i * TAN\, \phi}{\gamma * D_s * SIN\, i * COS\, i}$$

STATIC FACTOR OF SAFETY: 2.0

SMC	SURFICIAL SLOPE STABILITY ANALYSIS		
	JOB NO: 13662-00	DATE: FEBRUARY 2015	FIGURE: E-22

STONEY-MILLER CONSULTANTS, INC

GEOTECHNICAL ENGINEERING & ENGINEERING GEOLOGY

FEASIBILITY INVESTIGATION/REVIEW OF 50-SCALE MAP
SUNPOINTE, TENTATIVE TRACT 17433
COLINAS SUR, LAGUNA NIGUEL, CALIFORNIA

VOLUME 3 OF 3
Appendix F, Groundwater Study and Mitigation
Appendix G, Standard Grading Guidelines

For

Euland Capital Enterprises
59 Honeyflower
Irvine, California 92620-3327

By

Stoney-Miller Consultants, Inc.
14 Hughes, Suite B-101
Irvine, California 92618

October 9, 2014
(Revised February 17, 2015)

Project No: 13662-05
Report No: 14-13813R

APPENDIX F

GROUNDWATER STUDY AND MITIGATION

APPENDIX F

GROUNDWATER STUDY AND MITIGATION

General

Our groundwater study and mitigation effort has consisted of both office and field work from June 2012 until August 2014. Efforts include groundwater well monitoring, hydrauger monitoring, and groundwater sampling and testing. Our initial office effort consisted of reviewing all of the past onsite and adjacent offsite borings to determine the occurrence of first water in the boring. This "first water" information was placed on the geologic map and with the elevation data contoured to create our first estimate of groundwater elevation levels across the site as shown on the Groundwater Map, Plate 6. The solid blue line defines the estimate of "first water" below the property.

Five groundwater wells were installed during our work to better define hydrostatic groundwater levels across the southern half of the property. The location of each well is shown on the Geologic Map, Plate 1. Data regarding placement and reading of each of the wells is given in Table F-1 below. Groundwater has been monitored aperiodically since installation using both hand sounding equipment and pressure transducers.

Table F-1; Groundwater Well Completion Summary

Well No.	First Reading	Boring Diameter	Well Diameter	Top Elevation of Well	Total Depth of Well	Screen Length	Top of Screen	Bottom Elevation of Well
-	date	inch	inch	feet msl	feet bgs	feet	feet msl	feet msl
EC-1	7/9/2012	10	4	355.0	162.2	80	272.8	192.8
EC-2	7/9/2012	10	4	355.0	161.5	80	273.5	193.5
EC-3	8/20/2012	10	4	401.5	201.0	100	300.5	200.5
EC-4	10/2/2013	10	4	422.0	201.0	150	371.0	221.0
EC-5	4/24/2014	12	4	360.0	165.0	80	275.0	195.0

Notes:
1) Elevation for wells based on surveys by others.
2) Feet msl denotes elevation in feet relative to mean sea level
3) Feet bgs denotes depth measured in feet below reference point (top of casing).

Four hydraugers were drilled laterally 800 to 1,000 feet into the hillside to intercept and reduce groundwater levels beneath the site. The approximate location of hydraugers D-1 through D-4 are shown on the Geologic Map, Plate 1. Installation dates are May 2013 for D-1

through D-3 and November 2013 for D-4. The slotted hydraugers are approximately two-inch diameter and were drilled at an upslope gradient of about one percent. Beginning elevations on the east are about 270 feet above mean sea level (amsl) and ending elevations on the west end are about 280 feet. Initial flowrates from the hydraugers varied from 100 to 600 gallons per day. Total flowrates from all hydraugers are currently about 300 gallons per day.

Groundwater levels existing in February 2014 were used to define an updated definition of groundwater levels beneath the property. This “monitored water” groundwater information was then overlayed on the geologic map and the new water elevation data contoured to create our second estimate of groundwater elevation levels across the site as shown on the Groundwater Map, Plate 6. The dashed green line defines the estimate of “monitored water” below the property. The installation of the hydraugers has had a noticeable effect on the groundwater levels at the property as can be seen in Plate 6. These monitored water elevations were used to perform stability evaluation given in Appendix E.

Groundwater sampling and testing has been performed to assess water quality. The results of this work is documented in our September 4, 2014 report which is included in Appendix F for convenience.

STONEY-MILLER CONSULTANTS, INC

GEOTECHNICAL ENGINEERING & ENGINEERING GEOLOGY

TECHNICAL MEMO

Date: September 4, 2014

To: Euland Capital
25076 Whitespring
Mission Viejo, CA 92692

c/o Charlie Mallon / David Shieh

From: Ian K. Goltz, PG, CHg

Subject: **Summary of Water Quality Testing**
Tract 5241, Avenida del Caballo, Laguna Niguel, California

Summarized below are the results from two groundwater water sampling events that have occurred as part of recent dewatering activities conducted at Tract 5241 near Avenida del Caballo, Laguna Niguel, California (the Site). Representative groundwater samples collected during both events were submitted to an analytical laboratory licensed by the State of California for the analysis of hazardous materials. The collection methods and summaries of the results are provided below along with copies of the laboratory reports and chain of custody documentation . A figure showing the location of the wells and drains is also attached.

Groundwater Monitoring Well EC-1

SMC collected representative groundwater samples from Monitoring Well EC-1 on November 11, 2012 and submitted them for the following types of analyses:

- Volatile organic compounds (VOCs) using U.S. EPA Method 8260B;
- Chloride, fluoride; nitrite (as NO2) and nitrate (as NO3) using USEPA Method 300;
- Priority pollutants (metals) using U.S. EPA Method 6010B; and
- Specific conductance (EC) and total dissolved solids (TDS) using ASTM Methods.

Prior to collecting the sample, the well was purged three times using a decontaminated electric submersible pump. Following purging, the samples were collected in new disposable bailers lowered on decontaminated nylon line. Water from the bailers was decanted into laboratory supplied bottles appropriate for the types of analyses performed. In addition to groundwater samples, quality assurance and quality control (QA/QC) samples including an equipment and trip

blank were collected and held at the analytical laboratory in the event that any VOCs were detected above laboratory reporting values.

The laboratory report for groundwater samples collected from Well EC-1 is attached. As indicated in the laboratory report, no VOCs were detected over the laboratory reporting limits. No priority pollutant metals were detected over the laboratory reporting limits with the except of the metals listed below:

- Potassium at 79,000 ug/L (micrograms per liter);
- Magnesium at 110,000 ug/L; and
- Calcium at 180,000 ug/L.

The concentration of potassium, magnesium and calcium reported for Well EC-1 is believed to be typical of local groundwater in the Capistrano Formation and reflects the mineral content of the marine clay.

Nitrate (as NO2) and nitrate (as NO3) were not detected above laboratory reporting limits. As indicated by the specific conductance and total dissolved solids (TDS) concentrations (11.1 micromhos per centimeter (umhos/cm) and 8,200 milligrams per liter (mg/L) respectively), groundwater from this formation is brackish in nature. Chloride was detected at 1,340 mg/L.

This water exceeds the secondary maximum contaminant level (MCL) for drinking water in California for TDS which is set at 1,000 mg/L. TDS comprise inorganic salts (principally calcium, magnesium, potassium, sodium, bicarbonates, chlorides and sulfates) and some small amounts of organic matter that are dissolved in water. In California, secondary MCLs are non-enforceable standards based on aesthetics rather than a health hazard. An elevated TDS concentration is not a health hazard and may cause the water to appear cloudy or colored, or to taste or smell bad.

Hydra Auger Drains Samples

On August 14, 2014, representative groundwater samples from the three active hydra-auger drains HA-1, HA-2, and HA-3 (identified as D1, D2, and D3 on the attached figure) located at the Site were sampled and submitted for the following types of analyses:

- VOCs using U.S. EPA Method 8260B;
- Total petroleum hydrocarbons by USEPA Method 8105C;
- Chloride and fluoride using USEPA Method 300; and
- Priority pollutants (metals) using U.S. EPA Method 6010B.

The samples were labeled EWN1 for the north drain HA-3(D3), EWM1 for the middle drain HA-2(D2), and EWS1 for the south drain HA-1(D1). Water from each drain was collected and

decanted directly into the laboratory supplied bottles appropriate for the types of analyses performed. The laboratory report for these samples is attached.

No VOCs or petroleum hydrocarbons were detected in any of the samples submitted. For metals, only copper was detected above the laboratory reporting limit at concentrations ranging from 62 ug/L to 69 ug/L. The California public health goals (PHGs) for copper in drinking water is 300 ug/L.

No fluoride was detected above the laboratory reporting limits. Chloride was detected in all three samples submitted at concentrations ranging from 1,050 mg/L to 1,150 mg/L. These concentrations are comparable to chloride concentrations detected in samples from Well EC-1. These chloride concentrations reflect the clayey marine origin of the Capistrano Formation.

Thank you for the opportunity to be of service. If you have any questions, please call our office.

Respectfully submitted,

STONEY-MILLER CONSULTANTS, INC.

Ian K. Goltz, P.G. 7446, C.Hg. 785
Associate Hydrogeologist

Attachments: Laboratory Reports
Figure (Auger Lines

SunStar Laboratories, Inc.
PROVIDING QUALITY ANALYTICAL SERVICES NATIONWIDE

25712 Commercentre Drive
Lake Forest, California 92630
949.297.5020 Phone
949.297.5027 Fax

26 December 2012

Ian Goltz
Stoney-Miller Consultants
14 Hughes B101
Irvine, CA 92618

RE: Euland

Enclosed are the results of analyses for samples received by the laboratory on 11/29/12 11:30. If you have any questions concerning this report, please feel free to contact me.

Sincerely,

Katherine Shields

Katherine Shields For Daniel Chavez
Project Manager

SunStar Laboratories, Inc.
PROVIDING QUALITY ANALYTICAL SERVICES NATIONWIDE

25712 Commercentre Drive
Lake Forest, California 92630
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949.297.5027 Fax

Stoney-Miller Consultants	Project: Euland	
14 Hughes B101	Project Number: 13662-04	**Reported:**
Irvine CA, 92618	Project Manager: Ian Goltz	12/26/12 16:36

ANALYTICAL REPORT FOR SAMPLES

Sample ID	Laboratory ID	Matrix	Date Sampled	Date Received
EC1	T122208-03	Water	11/29/12 09:00	11/29/12 11:30
EC1	T122208-04	Water	11/29/12 09:00	11/29/12 11:30

SunStar Laboratories, Inc.

The results in this report apply to the samples analyzed in accordance with the chain of custody document. This analytical report must be reproduced in its entirety.

Katherine Shields

Katherine Shields For Daniel Chavez, Project Manager

SunStar Laboratories, Inc.
Providing Quality Analytical Services Nationwide

25712 Commercentre Drive
Lake Forest, California 92630
949.297.5020 Phone
949.297.5027 Fax

Stoney-Miller Consultants	Project: Euland	
14 Hughes B101	Project Number: 13662-04	**Reported:**
Irvine CA, 92618	Project Manager: Ian Goltz	12/26/12 16:36

EC1

T122208-03 (Water)

SunStar Laboratories, Inc.

Volatile Organic Compounds by EPA Method 8260B

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
Bromobenzene	ND	1.0	ug/l	1	2112911	11/29/12	11/29/12	EPA 8260B	
Bromochloromethane	ND	1.0	"	"	"	"	"	"	
Bromodichloromethane	ND	1.0	"	"	"	"	"	"	
Bromoform	ND	1.0	"	"	"	"	"	"	
Bromomethane	ND	1.0	"	"	"	"	"	"	
n-Butylbenzene	ND	1.0	"	"	"	"	"	"	
sec-Butylbenzene	ND	1.0	"	"	"	"	"	"	
tert-Butylbenzene	ND	1.0	"	"	"	"	"	"	
Carbon tetrachloride	ND	0.50	"	"	"	"	"	"	
Chlorobenzene	ND	1.0	"	"	"	"	"	"	
Chloroethane	ND	1.0	"	"	"	"	"	"	
Chloroform	ND	1.0	"	"	"	"	"	"	
Chloromethane	ND	1.0	"	"	"	"	"	"	
2-Chlorotoluene	ND	1.0	"	"	"	"	"	"	
4-Chlorotoluene	ND	1.0	"	"	"	"	"	"	
Dibromochloromethane	ND	1.0	"	"	"	"	"	"	
1,2-Dibromo-3-chloropropane	ND	1.0	"	"	"	"	"	"	
1,2-Dibromoethane (EDB)	ND	1.0	"	"	"	"	"	"	
Dibromomethane	ND	1.0	"	"	"	"	"	"	
1,2-Dichlorobenzene	ND	1.0	"	"	"	"	"	"	
1,3-Dichlorobenzene	ND	1.0	"	"	"	"	"	"	
1,4-Dichlorobenzene	ND	1.0	"	"	"	"	"	"	
Dichlorodifluoromethane	ND	0.50	"	"	"	"	"	"	
1,1-Dichloroethane	ND	1.0	"	"	"	"	"	"	
1,2-Dichloroethane	ND	0.50	"	"	"	"	"	"	
1,1-Dichloroethene	ND	1.0	"	"	"	"	"	"	
cis-1,2-Dichloroethene	ND	1.0	"	"	"	"	"	"	
trans-1,2-Dichloroethene	ND	1.0	"	"	"	"	"	"	
1,2-Dichloropropane	ND	1.0	"	"	"	"	"	"	
1,3-Dichloropropane	ND	1.0	"	"	"	"	"	"	
2,2-Dichloropropane	ND	1.0	"	"	"	"	"	"	
1,1-Dichloropropene	ND	1.0	"	"	"	"	"	"	

SunStar Laboratories, Inc.

The results in this report apply to the samples analyzed in accordance with the chain of custody document. This analytical report must be reproduced in its entirety.

Katherine Shields

Katherine Shields For Daniel Chavez, Project Manager

SunStar Laboratories, Inc.
Providing Quality Analytical Services Nationwide

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949.297.5020 Phone
949.297.5027 Fax

Stoney-Miller Consultants	Project: Euland	
14 Hughes B101	Project Number: 13662-04	**Reported:**
Irvine CA, 92618	Project Manager: Ian Goltz	12/26/12 16:36

EC1

T122208-03 (Water)

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
SunStar Laboratories, Inc.									
Volatile Organic Compounds by EPA Method 8260B									
cis-1,3-Dichloropropene	ND	0.50	ug/l	1	2112911	11/29/12	11/29/12	EPA 8260B	
trans-1,3-Dichloropropene	ND	0.50	"	"	"	"	"	"	
Hexachlorobutadiene	ND	1.0	"	"	"	"	"	"	
Isopropylbenzene	ND	1.0	"	"	"	"	"	"	
p-Isopropyltoluene	ND	1.0	"	"	"	"	"	"	
Methylene chloride	ND	1.0	"	"	"	"	"	"	
Naphthalene	ND	1.0	"	"	"	"	"	"	
n-Propylbenzene	ND	1.0	"	"	"	"	"	"	
Styrene	ND	1.0	"	"	"	"	"	"	
1,1,2,2-Tetrachloroethane	ND	1.0	"	"	"	"	"	"	
1,1,1,2-Tetrachloroethane	ND	1.0	"	"	"	"	"	"	
Tetrachloroethene	ND	1.0	"	"	"	"	"	"	
1,2,3-Trichlorobenzene	ND	1.0	"	"	"	"	"	"	
1,2,4-Trichlorobenzene	ND	1.0	"	"	"	"	"	"	
1,1,2-Trichloroethane	ND	1.0	"	"	"	"	"	"	
1,1,1-Trichloroethane	ND	1.0	"	"	"	"	"	"	
Trichloroethene	ND	1.0	"	"	"	"	"	"	
Trichlorofluoromethane	ND	1.0	"	"	"	"	"	"	
1,2,3-Trichloropropane	ND	1.0	"	"	"	"	"	"	
1,3,5-Trimethylbenzene	ND	1.0	"	"	"	"	"	"	
1,2,4-Trimethylbenzene	ND	1.0	"	"	"	"	"	"	
Vinyl chloride	ND	1.0	"	"	"	"	"	"	
Benzene	ND	0.50	"	"	"	"	"	"	
Toluene	ND	0.50	"	"	"	"	"	"	
Ethylbenzene	ND	0.50	"	"	"	"	"	"	
m,p-Xylene	ND	1.0	"	"	"	"	"	"	
o-Xylene	ND	0.50	"	"	"	"	"	"	
Tert-amyl methyl ether	ND	2.0	"	"	"	"	"	"	
Tert-butyl alcohol	ND	10	"	"	"	"	"	"	
Di-isopropyl ether	ND	2.0	"	"	"	"	"	"	
Ethyl tert-butyl ether	ND	2.0	"	"	"	"	"	"	
Methyl tert-butyl ether	ND	1.0	"	"	"	"	"	"	

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Katherine Shields For Daniel Chavez, Project Manager

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Stoney-Miller Consultants	Project: Euland	
14 Hughes B101	Project Number: 13662-04	**Reported:**
Irvine CA, 92618	Project Manager: Ian Goltz	12/26/12 16:36

EC1

T122208-03 (Water)

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
SunStar Laboratories, Inc.									
Volatile Organic Compounds by EPA Method 8260B									
Surrogate: 4-Bromofluorobenzene		*90.1 %*		*83.5-119*	*2112911*	*11/29/12*	*11/29/12*	*EPA 8260B*	
Surrogate: Dibromofluoromethane		*84.8 %*		*81-136*	*"*	*"*	*"*	*"*	
Surrogate: Toluene-d8		*109 %*		*88.8-117*	*"*	*"*	*"*	*"*	

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Stoney-Miller Consultants	Project: Euland	
14 Hughes B101	Project Number: 13662-04	**Reported:**
Irvine CA, 92618	Project Manager: Ian Goltz	12/26/12 16:36

EC1

T122208-04 (Water)

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
SunStar Laboratories, Inc.									
Metals by EPA 6010B									
Potassium	**79000**	500	ug/l	1	2112915	11/29/12	12/03/12	EPA 6010B	
Magnesium	**110000**	500	"	"	"	"	"	"	
Sodium	ND	500	"	"	"	"	"	"	
Calcium	**180000**	500	"	"	"	"	"	"	
Antimony	ND	50	"	"	"	"	"	"	
Silver	ND	50	"	"	"	"	"	"	
Arsenic	ND	50	"	"	"	"	"	"	
Beryllium	ND	50	"	"	"	"	12/03/12	"	
Cadmium	ND	50	"	"	"	"	12/03/12	"	
Chromium	ND	50	"	"	"	"	"	"	
Copper	ND	50	"	"	"	"	"	"	
Lead	ND	50	"	"	"	"	"	"	
Nickel	ND	50	"	"	"	"	"	"	
Selenium	ND	50	"	"	"	"	"	"	
Thallium	ND	50	"	"	"	"	12/05/12	"	
Zinc	ND	50	"	"	"	"	12/03/12	"	
Cold Vapor Extraction EPA 7470/7471									
Mercury	ND	0.50	ug/l	1	2112916	11/29/12	11/30/12	EPA 7470A Water	
Conventional Chemistry Parameters by APHA/EPA/ASTM Methods									
Specific Conductance (EC)	**11.1**	10.0	umhos/cm	1	2120423	12/04/12	12/04/12	SM2510b mod.	
Total Dissolved Solids	**8200**	55	mg/l	"	2112925	11/29/12	12/05/12	EPA 160.1	
Anions by EPA Method 300.0									
Fluoride	ND	0.500	mg/l	1	2112912	11/29/12	11/29/12	EPA 300.0	
Chloride	**1340**	50.0	"	100	"	"	12/03/12	"	
Nitrite as NO2	ND	0.500	"	1	"	"	11/29/12	"	
Nitrate as NO3	ND	0.500	"	"	"	"	"	"	

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14 Hughes B101	Project Number: 13662-04	**Reported:**
Irvine CA, 92618	Project Manager: Ian Goltz	12/26/12 16:36

Metals by EPA 6010B - Quality Control

SunStar Laboratories, Inc.

Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Batch 2112915 - EPA 3010A										
Blank (2112915-BLK1)				Prepared: 11/29/12	Analyzed: 12/03/12					
Antimony	ND	50	ug/l							
Silver	ND	50	"							
Arsenic	ND	50	"							
Beryllium	ND	50	"							
Cadmium	ND	50	"							
Chromium	ND	50	"							
Copper	ND	50	"							
Lead	ND	50	"							
Nickel	ND	50	"							
Selenium	ND	50	"							
Thallium	ND	50	"							
Zinc	ND	50	"							
LCS (2112915-BS1)				Prepared: 11/29/12	Analyzed: 12/03/12					
Arsenic	540	50	ug/l	500		108	75-125			
Cadmium	550	50	"	500		110	75-125			
Chromium	560	50	"	500		112	75-125			
Lead	591	50	"	500		118	75-125			
Matrix Spike (2112915-MS1)		**Source: T122206-01**		Prepared: 11/29/12	Analyzed: 12/03/12					
Arsenic	522	50	ug/l	500	ND	104	75-125			
Cadmium	495	50	"	500	ND	99.0	75-125			
Chromium	497	50	"	500	ND	99.4	75-125			
Lead	505	50	"	500	ND	101	75-125			
Matrix Spike Dup (2112915-MSD1)		**Source: T122206-01**		Prepared: 11/29/12	Analyzed: 12/03/12					
Arsenic	504	50	ug/l	500	ND	101	75-125	3.58	20	
Cadmium	473	50	"	500	ND	94.6	75-125	4.51	20	
Chromium	474	50	"	500	ND	94.8	75-125	4.72	20	
Lead	491	50	"	500	ND	98.2	75-125	2.89	20	

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14 Hughes B101	Project Number: 13662-04	**Reported:**
Irvine CA, 92618	Project Manager: Ian Goltz	12/26/12 16:36

Cold Vapor Extraction EPA 7470/7471 - Quality Control

SunStar Laboratories, Inc.

Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Batch 2112916 - EPA 7470A Water										
Blank (2112916-BLK1)				Prepared: 11/29/12		Analyzed: 11/30/12				
Mercury	ND	0.50	ug/l							
LCS (2112916-BS1)				Prepared: 11/29/12		Analyzed: 11/30/12				
Mercury	4.36	0.50	ug/l	5.00		87.2	75-125			
Matrix Spike (2112916-MS1)		**Source: T122207-02**		Prepared: 11/29/12		Analyzed: 11/30/12				
Mercury	5.16	0.50	ug/l	5.00	ND	103	75-125			
Matrix Spike Dup (2112916-MSD1)		**Source: T122207-02**		Prepared: 11/29/12		Analyzed: 11/30/12				
Mercury	5.65	0.50	ug/l	5.00	ND	113	75-125	9.04	20	

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Stoney-Miller Consultants	Project: Euland	
14 Hughes B101	Project Number: 13662-04	**Reported:**
Irvine CA, 92618	Project Manager: Ian Goltz	12/26/12 16:36

Volatile Organic Compounds by EPA Method 8260B - Quality Control

SunStar Laboratories, Inc.

Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Batch 2112911 - EPA 5030 GCMS										
Blank (2112911-BLK1)				Prepared & Analyzed: 11/29/12						
Bromobenzene	ND	1.0	ug/l							
Bromochloromethane	ND	1.0	"							
Bromodichloromethane	ND	1.0	"							
Bromoform	ND	1.0	"							
Bromomethane	ND	1.0	"							
n-Butylbenzene	ND	1.0	"							
sec-Butylbenzene	ND	1.0	"							
tert-Butylbenzene	ND	1.0	"							
Carbon tetrachloride	ND	0.50	"							
Chlorobenzene	ND	1.0	"							
Chloroethane	ND	1.0	"							
Chloroform	ND	1.0	"							
Chloromethane	ND	1.0	"							
2-Chlorotoluene	ND	1.0	"							
4-Chlorotoluene	ND	1.0	"							
Dibromochloromethane	ND	1.0	"							
1,2-Dibromo-3-chloropropane	ND	1.0	"							
1,2-Dibromoethane (EDB)	ND	1.0	"							
Dibromomethane	ND	1.0	"							
1,2-Dichlorobenzene	ND	1.0	"							
1,3-Dichlorobenzene	ND	1.0	"							
1,4-Dichlorobenzene	ND	1.0	"							
Dichlorodifluoromethane	ND	0.50	"							
1,1-Dichloroethane	ND	1.0	"							
1,2-Dichloroethane	ND	0.50	"							
1,1-Dichloroethene	ND	1.0	"							
cis-1,2-Dichloroethene	ND	1.0	"							
trans-1,2-Dichloroethene	ND	1.0	"							
1,2-Dichloropropane	ND	1.0	"							
1,3-Dichloropropane	ND	1.0	"							
2,2-Dichloropropane	ND	1.0	"							
1,1-Dichloropropene	ND	1.0	"							
cis-1,3-Dichloropropene	ND	0.50	"							
trans-1,3-Dichloropropene	ND	0.50	"							
Hexachlorobutadiene	ND	1.0	"							
Isopropylbenzene	ND	1.0	"							

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Stoney-Miller Consultants	Project: Euland	
14 Hughes B101	Project Number: 13662-04	**Reported:**
Irvine CA, 92618	Project Manager: Ian Goltz	12/26/12 16:36

Volatile Organic Compounds by EPA Method 8260B - Quality Control

SunStar Laboratories, Inc.

Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Batch 2112911 - EPA 5030 GCMS										
Blank (2112911-BLK1)				Prepared & Analyzed: 11/29/12						
p-Isopropyltoluene	ND	1.0	ug/l							
Methylene chloride	ND	1.0	"							
Naphthalene	ND	1.0	"							
n-Propylbenzene	ND	1.0	"							
Styrene	ND	1.0	"							
1,1,2,2-Tetrachloroethane	ND	1.0	"							
1,1,1,2-Tetrachloroethane	ND	1.0	"							
Tetrachloroethene	ND	1.0	"							
1,2,3-Trichlorobenzene	ND	1.0	"							
1,2,4-Trichlorobenzene	ND	1.0	"							
1,1,2-Trichloroethane	ND	1.0	"							
1,1,1-Trichloroethane	ND	1.0	"							
Trichloroethene	ND	1.0	"							
Trichlorofluoromethane	ND	1.0	"							
1,2,3-Trichloropropane	ND	1.0	"							
1,3,5-Trimethylbenzene	ND	1.0	"							
1,2,4-Trimethylbenzene	ND	1.0	"							
Vinyl chloride	ND	1.0	"							
Benzene	ND	0.50	"							
Toluene	ND	0.50	"							
Ethylbenzene	ND	0.50	"							
m,p-Xylene	ND	1.0	"							
o-Xylene	ND	0.50	"							
Tert-amyl methyl ether	ND	2.0	"							
Tert-butyl alcohol	ND	10	"							
Di-isopropyl ether	ND	2.0	"							
Ethyl tert-butyl ether	ND	2.0	"							
Methyl tert-butyl ether	ND	1.0	"							
Surrogate: 4-Bromofluorobenzene	*7.11*		*"*	*8.00*		*88.9*	*83.5-119*			
Surrogate: Dibromofluoromethane	*6.51*		*"*	*8.00*		*81.4*	*81-136*			
Surrogate: Toluene-d8	*8.80*		*"*	*8.00*		*110*	*88.8-117*			

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14 Hughes B101	Project Number: 13662-04	**Reported:**
Irvine CA, 92618	Project Manager: Ian Goltz	12/26/12 16:36

Volatile Organic Compounds by EPA Method 8260B - Quality Control

SunStar Laboratories, Inc.

Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Batch 2112911 - EPA 5030 GCMS										
LCS (2112911-BS1)				Prepared & Analyzed: 11/29/12						
Chlorobenzene	21.8	1.0	ug/l	20.0		109	75-125			
1,1-Dichloroethene	22.4	1.0	"	20.0		112	75-125			
Trichloroethene	19.2	1.0	"	20.0		95.9	75-125			
Benzene	22.0	0.50	"	20.0		110	75-125			
Toluene	21.2	0.50	"	20.0		106	75-125			
Surrogate: 4-Bromofluorobenzene	*8.07*		*"*	*8.00*		*101*	*83.5-119*			
Surrogate: Dibromofluoromethane	*7.15*		*"*	*8.00*		*89.4*	*81-136*			
Surrogate: Toluene-d8	*7.94*		*"*	*8.00*		*99.2*	*88.8-117*			
Matrix Spike (2112911-MS1)		**Source: T122209-01**		Prepared & Analyzed: 11/29/12						
Chlorobenzene	22.1	1.0	ug/l	20.0	ND	110	75-125			
1,1-Dichloroethene	23.9	1.0	"	20.0	ND	119	75-125			
Trichloroethene	17.9	1.0	"	20.0	ND	89.4	75-125			
Benzene	22.0	0.50	"	20.0	0.900	105	75-125			
Toluene	20.8	0.50	"	20.0	0.370	102	75-125			
Surrogate: 4-Bromofluorobenzene	*8.28*		*"*	*8.00*		*104*	*83.5-119*			
Surrogate: Dibromofluoromethane	*6.88*		*"*	*8.00*		*86.0*	*81-136*			
Surrogate: Toluene-d8	*7.70*		*"*	*8.00*		*96.2*	*88.8-117*			
Matrix Spike Dup (2112911-MSD1)		**Source: T122209-01**		Prepared & Analyzed: 11/29/12						
Chlorobenzene	21.4	1.0	ug/l	20.0	ND	107	75-125	3.08	20	
1,1-Dichloroethene	26.6	1.0	"	20.0	ND	133	75-125	10.5	20	QM-07
Trichloroethene	17.9	1.0	"	20.0	ND	89.7	75-125	0.279	20	
Benzene	22.1	0.50	"	20.0	0.900	106	75-125	0.408	20	
Toluene	20.0	0.50	"	20.0	0.370	98.2	75-125	3.78	20	
Surrogate: 4-Bromofluorobenzene	*7.16*		*"*	*8.00*		*89.5*	*83.5-119*			
Surrogate: Dibromofluoromethane	*7.25*		*"*	*8.00*		*90.6*	*81-136*			
Surrogate: Toluene-d8	*7.69*		*"*	*8.00*		*96.1*	*88.8-117*			

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14 Hughes B101	Project Number: 13662-04	**Reported:**
Irvine CA, 92618	Project Manager: Ian Goltz	12/26/12 16:36

Conventional Chemistry Parameters by APHA/EPA/ASTM Methods - Quality Control

SunStar Laboratories, Inc.

Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Batch 2112925 - General Preparation										
Blank (2112925-BLK1)				Prepared: 11/29/12 Analyzed: 12/05/12						
Total Dissolved Solids	ND	55	mg/l							
Duplicate (2112925-DUP1)		**Source: T122206-04**		Prepared: 11/29/12 Analyzed: 12/05/12						
Total Dissolved Solids	2240	55	mg/l		2320			3.78	5	
Batch 2120423 - General Preparation										
Duplicate (2120423-DUP1)		**Source: T122208-04**		Prepared & Analyzed: 12/04/12						
Specific Conductance (EC)	11.1	10.0	umhos/cm		11.1			0.180	15	

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14 Hughes B101	Project Number: 13662-04	**Reported:**
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Anions by EPA Method 300.0 - Quality Control

SunStar Laboratories, Inc.

Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Batch 2112912 - General Preparation										
Blank (2112912-BLK1)				Prepared & Analyzed: 11/29/12						
Nitrate as N	ND	0.500	mg/l							
Chloride	ND	0.500	"							
Nitrite as NO2	ND	0.500	"							
Sulfate as SO4	ND	0.500	"							
LCS (2112912-BS1)				Prepared & Analyzed: 11/29/12						
Chloride	2.33	0.500	mg/l	2.00		116	75-125			
Sulfate as SO4	2.48	0.500	"	2.00		124	75-125			
Nitrate as NO3	0.0980	0.500	"	0.100		98.0	75-125			
Matrix Spike (2112912-MS1)		**Source: T122206-01**		Prepared & Analyzed: 11/29/12						
Chloride	128	0.500	mg/l	2.00	107	NR	75-125			QM-4X
Sulfate as SO4	698	0.500	"	2.00	742	NR	75-125			QM-4X
Nitrate as NO3	0.265	0.500	"	0.100	ND	265	75-125			QM-05
Matrix Spike Dup (2112912-MSD1)		**Source: T122206-01**		Prepared & Analyzed: 11/29/12						
Chloride	128	0.500	mg/l	2.00	107	NR	75-125	0.0600	20	QM-4X
Sulfate as SO4	699	0.500	"	2.00	742	NR	75-125	0.111	20	QM-4X
Nitrate as NO3	0.256	0.500	"	0.100	ND	256	75-125	3.45	20	QM-05

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Stoney-Miller Consultants	Project: Euland	
14 Hughes B101	Project Number: 13662-04	**Reported:**
Irvine CA, 92618	Project Manager: Ian Goltz	12/26/12 16:36

Notes and Definitions

QM-4X	The spike recovery was outside of QC acceptance limits for the MS and/or MSD due to analyte concentration at 4 times or greater the spike concentration. The QC batch was accepted based on LCS and/or LCSD recoveries within the acceptance limits.
QM-07	The spike recovery and or RPD was outside acceptance limits for the MS and/or MSD. The batch was accepted based on acceptable LCS recovery.
QM-05	The spike recovery was outside acceptance limits for the MS and/or MSD due to possible matrix interference. The LCS was within acceptance criteria. The data is acceptable as no negative impact on data is expected.
DET	Analyte DETECTED
ND	Analyte NOT DETECTED at or above the reporting limit
NR	Not Reported
dry	Sample results reported on a dry weight basis
RPD	Relative Percent Difference

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Chain of Custody Record

Client: Stoney-Miller, Inc
Address:
Phone: 949-275-6975 Fax:
Project Manager: IAN GOLTZ

Date: 11/29/2012 Page: 1 Of 1
Project Name: EULAND
Collector: GOLTZ Client Project #: 13662-04
Batch #: T122208 EDF #:

Sample ID	Date Sampled	Time	Sample Type	Container Type	8260	8260 + OXY	8260 BTEX, OXY only	8270	8021 BTEX	8015M (gasoline)	8015M (diesel)	8015M Ext./Carbon Chain	6010/7000 Title 22 Metals		CHLORIDE	PRIORITY POLLUT.	FLUORIDE	Laboratory ID #	Comments/Preservative	Total # of containers
TRIP 1	—	—	2W	VOA														01	HOLD	
EQUIP 1	11/29	8:00	3W	VOA														02	HOLD	
EC1	11/29	9:00	8W	VOA			X											03	VOC, BTEX, OXYS.	
EC1	11/29	9:00	4W	poly											X	X	X	04		
			17																	

Relinquished by: (signature)	Date / Time	Received by: (signature)	Date / Time
	11/29		11-29-12 11:30
Relinquished by: (signature)	Date / Time	Received by: (signature)	Date / Time
Relinquished by: (signature)	Date / Time	Received by: (signature)	Date / Time

Total # of containers
Chain of Custody seals Y/N/NA
Seals intact? Y/N/NA
Received good condition/cold 4.2

Turn around time: STD

Notes

Sample disposal Instructions: Disposal @ $2.00 each ____ Return to client ____ Pickup ____

COC 110742

SunStar Laboratories, Inc.
PROVIDING QUALITY ANALYTICAL SERVICES NATIONWIDE

SAMPLE RECEIVING REVIEW SHEET

BATCH # T122208

Client Name: STONEY - MILLER Project: EULAND

Received by: SUNNY Date/Time Received: 11.29.12 / 11:30

Delivered by : ☒ Client ☐ SunStar Courier ☐ GSO ☐ FedEx ☐ Other _____

Total number of coolers received 1 **Temp criteria = 6°C > 0°C (no frozen containers)**

Temperature: cooler #1 4.4 °C +/- the CF (- 0.2°C) = 4.2 °C corrected temperature

cooler #2 _____ °C +/- the CF (- 0.2°C) = _____ °C corrected temperature

cooler #3 _____ °C +/- the CF (- 0.2°C) = _____ °C corrected temperature

Samples outside temp. but received on ice, w/in 6 hours of final sampling.	☒ Yes	☐ No*	☐ N/A
Custody Seals Intact on Cooler/Sample	☐ Yes	☐ No*	☒ N/A
Sample Containers Intact	☒ Yes	☐ No*	
Sample labels match COC ID's	☒ Yes	☐ No*	
Total number of containers received match COC	☒ Yes	☐ No*	
Proper containers received for analyses requested on COC	☒ Yes	☐ No*	
Proper preservative indicated on COC/containers for analyses requested	☒ Yes	☐ No*	☐ N/A

Complete shipment received in good condition with correct temperatures, containers, labels, volumes preservatives and within method specified holding times. ☒ **Yes** ☐ **No***

* Complete Non-Conformance Receiving Sheet if checked Cooler/Sample Review - Initials and date SZ 11.29.12

Comments:

SunStar Laboratories, Inc.
PROVIDING QUALITY ANALYTICAL SERVICES NATIONWIDE

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21 August 2014

Ian Goltz
Stoney-Miller Consultants
14 Hughes B101
Irvine, CA 92618

RE: Euland

Enclosed are the results of analyses for samples received by the laboratory on 08/14/14 14:57. If you have any questions concerning this report, please feel free to contact me.

Sincerely,

Katherine RunningCrane

Katherine RunningCrane
Project Manager

SunStar Laboratories, Inc.
PROVIDING QUALITY ANALYTICAL SERVICES NATIONWIDE

25712 Commercentre Drive
Lake Forest, California 92630
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Stoney-Miller Consultants	Project: Euland	
14 Hughes B101	Project Number: 13662	**Reported:**
Irvine CA, 92618	Project Manager: Ian Goltz	08/21/14 16:45

ANALYTICAL REPORT FOR SAMPLES

Sample ID	Laboratory ID	Matrix	Date Sampled	Date Received
EWN1	T141671-01	Water	08/14/14 05:00	08/14/14 14:57
EWN2	T141671-02	Water	08/14/14 05:06	08/14/14 14:57
EWN3	T141671-03	Water	08/14/14 05:39	08/14/14 14:57
EWN4	T141671-04	Water	08/14/14 05:39	08/14/14 14:57
EWM1	T141671-05	Water	08/14/14 05:12	08/14/14 14:57
EWM2	T141671-06	Water	08/14/14 05:18	08/14/14 14:57
EWM3	T141671-07	Water	08/14/14 05:47	08/14/14 14:57
EWM4	T141671-08	Water	08/14/14 05:50	08/14/14 14:57
EWS1	T141671-09	Water	08/14/14 05:24	08/14/14 14:57
EWS2	T141671-10	Water	08/14/14 05:30	08/14/14 14:57
EWS3	T141671-11	Water	08/14/14 05:53	08/14/14 14:57
EWS4	T141671-12	Water	08/14/14 05:56	08/14/14 14:57

DETECTIONS SUMMARY

Sample ID: EWN1 **Laboratory ID:** T141671-01

No Results Detected

Sample ID: EWN2 **Laboratory ID:** T141671-02

No Results Detected

SunStar Laboratories, Inc.

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Katherine RunningCrane

Katherine RunningCrane, Project Manager

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Stoney-Miller Consultants	Project: Euland	
14 Hughes B101	Project Number: 13662	**Reported:**
Irvine CA, 92618	Project Manager: Ian Goltz	08/21/14 16:45

Sample ID: EWN3 **Laboratory ID:** T141671-03

Analyte	Result	Reporting Limit	Units	Method	Notes
Chloride	**1050**	100	mg/l	EPA 300.0	

Sample ID: EWN4 **Laboratory ID:** T141671-04

Analyte	Result	Reporting Limit	Units	Method	Notes
Copper	**69**	50	ug/l	EPA 6010B	

Sample ID: EWM1 **Laboratory ID:** T141671-05

No Results Detected

Sample ID: EWM2 **Laboratory ID:** T141671-06

No Results Detected

Sample ID: EWM3 **Laboratory ID:** T141671-07

Analyte	Result	Reporting Limit	Units	Method	Notes
Chloride	**1100**	100	mg/l	EPA 300.0	

Sample ID: EWM4 **Laboratory ID:** T141671-08

Analyte	Result	Reporting Limit	Units	Method	Notes
Copper	**64**	50	ug/l	EPA 6010B	

Sample ID: EWS1 **Laboratory ID:** T141671-09

No Results Detected

SunStar Laboratories, Inc.

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Katherine RunningCrane

Katherine RunningCrane, Project Manager

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Stoney-Miller Consultants	Project: Euland	
14 Hughes B101	Project Number: 13662	**Reported:**
Irvine CA, 92618	Project Manager: Ian Goltz	08/21/14 16:45

Sample ID: EWS2 **Laboratory ID:** T141671-10

No Results Detected

Sample ID: EWS3 **Laboratory ID:** T141671-11

Analyte	Result	Reporting Limit	Units	Method	Notes
Chloride	**1150**	100	mg/l	EPA 300.0	

Sample ID: EWS4 **Laboratory ID:** T141671-12

Analyte	Result	Reporting Limit	Units	Method	Notes
Copper	**62**	50	ug/l	EPA 6010B	

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Stoney-Miller Consultants	Project: Euland	
14 Hughes B101	Project Number: 13662	**Reported:**
Irvine CA, 92618	Project Manager: Ian Goltz	08/21/14 16:45

EWN1

T141671-01 (Water)

SunStar Laboratories, Inc.

Volatile Organic Compounds by EPA Method 8260B

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
Bromobenzene	ND	1.0	ug/l	1	4081530	08/15/14	08/16/14	EPA 8260B	
Bromochloromethane	ND	1.0	"	"	"	"	"	"	
Bromodichloromethane	ND	1.0	"	"	"	"	"	"	
Bromoform	ND	1.0	"	"	"	"	"	"	
Bromomethane	ND	1.0	"	"	"	"	"	"	
n-Butylbenzene	ND	1.0	"	"	"	"	"	"	
sec-Butylbenzene	ND	1.0	"	"	"	"	"	"	
tert-Butylbenzene	ND	1.0	"	"	"	"	"	"	
Carbon tetrachloride	ND	0.50	"	"	"	"	"	"	
Chlorobenzene	ND	1.0	"	"	"	"	"	"	
Chloroethane	ND	1.0	"	"	"	"	"	"	
Chloroform	ND	1.0	"	"	"	"	"	"	
Chloromethane	ND	1.0	"	"	"	"	"	"	
2-Chlorotoluene	ND	1.0	"	"	"	"	"	"	
4-Chlorotoluene	ND	1.0	"	"	"	"	"	"	
Dibromochloromethane	ND	1.0	"	"	"	"	"	"	
1,2-Dibromo-3-chloropropane	ND	5.0	"	"	"	"	"	"	
1,2-Dibromoethane (EDB)	ND	1.0	"	"	"	"	"	"	
Dibromomethane	ND	1.0	"	"	"	"	"	"	
1,2-Dichlorobenzene	ND	1.0	"	"	"	"	"	"	
1,3-Dichlorobenzene	ND	1.0	"	"	"	"	"	"	
1,4-Dichlorobenzene	ND	1.0	"	"	"	"	"	"	
Dichlorodifluoromethane	ND	0.50	"	"	"	"	"	"	
1,1-Dichloroethane	ND	1.0	"	"	"	"	"	"	
1,2-Dichloroethane	ND	0.50	"	"	"	"	"	"	
1,1-Dichloroethene	ND	1.0	"	"	"	"	"	"	
cis-1,2-Dichloroethene	ND	1.0	"	"	"	"	"	"	
trans-1,2-Dichloroethene	ND	1.0	"	"	"	"	"	"	
1,2-Dichloropropane	ND	1.0	"	"	"	"	"	"	
1,3-Dichloropropane	ND	1.0	"	"	"	"	"	"	
2,2-Dichloropropane	ND	1.0	"	"	"	"	"	"	
1,1-Dichloropropene	ND	1.0	"	"	"	"	"	"	

SunStar Laboratories, Inc.

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Katherine RunningCrane

Katherine RunningCrane, Project Manager

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Stoney-Miller Consultants	Project: Euland	
14 Hughes B101	Project Number: 13662	**Reported:**
Irvine CA, 92618	Project Manager: Ian Goltz	08/21/14 16:45

EWN1

T141671-01 (Water)

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
SunStar Laboratories, Inc.									
Volatile Organic Compounds by EPA Method 8260B									
cis-1,3-Dichloropropene	ND	0.50	ug/l	1	4081530	08/15/14	08/16/14	EPA 8260B	
trans-1,3-Dichloropropene	ND	0.50	"	"	"	"	"	"	
Hexachlorobutadiene	ND	1.0	"	"	"	"	"	"	
Isopropylbenzene	ND	1.0	"	"	"	"	"	"	
p-Isopropyltoluene	ND	1.0	"	"	"	"	"	"	
Methylene chloride	ND	1.0	"	"	"	"	"	"	
Naphthalene	ND	1.0	"	"	"	"	"	"	
n-Propylbenzene	ND	1.0	"	"	"	"	"	"	
Styrene	ND	1.0	"	"	"	"	"	"	
1,1,2,2-Tetrachloroethane	ND	1.0	"	"	"	"	"	"	
1,1,1,2-Tetrachloroethane	ND	1.0	"	"	"	"	"	"	
Tetrachloroethene	ND	1.0	"	"	"	"	"	"	
1,2,3-Trichlorobenzene	ND	1.0	"	"	"	"	"	"	
1,2,4-Trichlorobenzene	ND	1.0	"	"	"	"	"	"	
1,1,2-Trichloroethane	ND	1.0	"	"	"	"	"	"	
1,1,1-Trichloroethane	ND	1.0	"	"	"	"	"	"	
Trichloroethene	ND	1.0	"	"	"	"	"	"	
Trichlorofluoromethane	ND	1.0	"	"	"	"	"	"	
1,2,3-Trichloropropane	ND	1.0	"	"	"	"	"	"	
1,3,5-Trimethylbenzene	ND	1.0	"	"	"	"	"	"	
1,2,4-Trimethylbenzene	ND	1.0	"	"	"	"	"	"	
Vinyl chloride	ND	1.0	"	"	"	"	"	"	
Benzene	ND	0.50	"	"	"	"	"	"	
Toluene	ND	0.50	"	"	"	"	"	"	
Ethylbenzene	ND	0.50	"	"	"	"	"	"	
m,p-Xylene	ND	1.0	"	"	"	"	"	"	
o-Xylene	ND	0.50	"	"	"	"	"	"	
Surrogate: 4-Bromofluorobenzene		*95.4 %*	*83.5-119*		"	"	"	"	
Surrogate: Dibromofluoromethane		*103 %*	*81-136*		"	"	"	"	
Surrogate: Toluene-d8		*87.2 %*	*88.8-117*		"	"	"	"	*S-GC*

SunStar Laboratories, Inc.

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Katherine RunningCrane

Katherine RunningCrane, Project Manager

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Stoney-Miller Consultants	Project: Euland	
14 Hughes B101	Project Number: 13662	**Reported:**
Irvine CA, 92618	Project Manager: Ian Goltz	08/21/14 16:45

EWN2

T141671-02 (Water)

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
SunStar Laboratories, Inc.									
Extractable Petroleum Hydrocarbons by 8015C									
C6-C12 (GRO)	ND	0.50	mg/l	1	4081509	08/15/14	08/19/14	EPA 8015C	
C13-C28 (DRO)	ND	0.50	"	"	"	"	"	"	
C29-C40 (MORO)	ND	0.50	"	"	"	"	"	"	
Surrogate: p-Terphenyl		*90.8 %*	*65-135*		"	"	"	"	

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Stoney-Miller Consultants	Project: Euland	
14 Hughes B101	Project Number: 13662	**Reported:**
Irvine CA, 92618	Project Manager: Ian Goltz	08/21/14 16:45

EWN3

T141671-03 (Water)

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
SunStar Laboratories, Inc.									
Anions by EPA Method 300.0									
Fluoride	ND	0.500	mg/l	1	4081501	08/15/14	08/16/14	EPA 300.0	
Chloride	**1050**	100	"	20	"	"	08/18/14	"	

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Stoney-Miller Consultants	Project: Euland	
14 Hughes B101	Project Number: 13662	**Reported:**
Irvine CA, 92618	Project Manager: Ian Goltz	08/21/14 16:45

EWN4

T141671-04 (Water)

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
SunStar Laboratories, Inc.									
Metals by EPA 6010B									
Antimony	ND	50	ug/l	1	4081505	08/15/14	08/15/14	EPA 6010B	
Silver	ND	50	"	"	"	"	"	"	
Arsenic	ND	50	"	"	"	"	"	"	
Barium	ND	50	"	"	"	"	"	"	
Beryllium	ND	50	"	"	"	"	08/15/14	"	
Cadmium	ND	50	"	"	"	"	08/15/14	"	
Chromium	ND	50	"	"	"	"	"	"	
Cobalt	ND	50	"	"	"	"	"	"	
Copper	**69**	50	"	"	"	"	"	"	
Lead	ND	50	"	"	"	"	"	"	
Molybdenum	ND	50	"	"	"	"	"	"	
Nickel	ND	50	"	"	"	"	"	"	
Selenium	ND	50	"	"	"	"	"	"	
Thallium	ND	50	"	"	"	"	"	"	
Vanadium	ND	50	"	"	"	"	"	"	
Zinc	ND	50	"	"	"	"	"	"	
Cold Vapor Extraction EPA 7470/7471									
Mercury	ND	0.50	ug/l	1	4081506	08/15/14	08/18/14	EPA 7470A Water	

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Stoney-Miller Consultants	Project: Euland	
14 Hughes B101	Project Number: 13662	**Reported:**
Irvine CA, 92618	Project Manager: Ian Goltz	08/21/14 16:45

EWM1

T141671-05 (Water)

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
SunStar Laboratories, Inc.									
Volatile Organic Compounds by EPA Method 8260B									
Bromobenzene	ND	1.0	ug/l	1	4081530	08/15/14	08/16/14	EPA 8260B	
Bromochloromethane	ND	1.0	"	"	"	"	"	"	
Bromodichloromethane	ND	1.0	"	"	"	"	"	"	
Bromoform	ND	1.0	"	"	"	"	"	"	
Bromomethane	ND	1.0	"	"	"	"	"	"	
n-Butylbenzene	ND	1.0	"	"	"	"	"	"	
sec-Butylbenzene	ND	1.0	"	"	"	"	"	"	
tert-Butylbenzene	ND	1.0	"	"	"	"	"	"	
Carbon tetrachloride	ND	0.50	"	"	"	"	"	"	
Chlorobenzene	ND	1.0	"	"	"	"	"	"	
Chloroethane	ND	1.0	"	"	"	"	"	"	
Chloroform	ND	1.0	"	"	"	"	"	"	
Chloromethane	ND	1.0	"	"	"	"	"	"	
2-Chlorotoluene	ND	1.0	"	"	"	"	"	"	
4-Chlorotoluene	ND	1.0	"	"	"	"	"	"	
Dibromochloromethane	ND	1.0	"	"	"	"	"	"	
1,2-Dibromo-3-chloropropane	ND	5.0	"	"	"	"	"	"	
1,2-Dibromoethane (EDB)	ND	1.0	"	"	"	"	"	"	
Dibromomethane	ND	1.0	"	"	"	"	"	"	
1,2-Dichlorobenzene	ND	1.0	"	"	"	"	"	"	
1,3-Dichlorobenzene	ND	1.0	"	"	"	"	"	"	
1,4-Dichlorobenzene	ND	1.0	"	"	"	"	"	"	
Dichlorodifluoromethane	ND	0.50	"	"	"	"	"	"	
1,1-Dichloroethane	ND	1.0	"	"	"	"	"	"	
1,2-Dichloroethane	ND	0.50	"	"	"	"	"	"	
1,1-Dichloroethene	ND	1.0	"	"	"	"	"	"	
cis-1,2-Dichloroethene	ND	1.0	"	"	"	"	"	"	
trans-1,2-Dichloroethene	ND	1.0	"	"	"	"	"	"	
1,2-Dichloropropane	ND	1.0	"	"	"	"	"	"	
1,3-Dichloropropane	ND	1.0	"	"	"	"	"	"	
2,2-Dichloropropane	ND	1.0	"	"	"	"	"	"	
1,1-Dichloropropene	ND	1.0	"	"	"	"	"	"	

SunStar Laboratories, Inc.

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Katherine RunningCrane

Katherine RunningCrane, Project Manager

SunStar Laboratories, Inc.
PROVIDING QUALITY ANALYTICAL SERVICES NATIONWIDE

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Stoney-Miller Consultants	Project: Euland	
14 Hughes B101	Project Number: 13662	**Reported:**
Irvine CA, 92618	Project Manager: Ian Goltz	08/21/14 16:45

EWM1

T141671-05 (Water)

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
SunStar Laboratories, Inc.									
Volatile Organic Compounds by EPA Method 8260B									
cis-1,3-Dichloropropene	ND	0.50	ug/l	1	4081530	08/15/14	08/16/14	EPA 8260B	
trans-1,3-Dichloropropene	ND	0.50	"	"	"	"	"	"	
Hexachlorobutadiene	ND	1.0	"	"	"	"	"	"	
Isopropylbenzene	ND	1.0	"	"	"	"	"	"	
p-Isopropyltoluene	ND	1.0	"	"	"	"	"	"	
Methylene chloride	ND	1.0	"	"	"	"	"	"	
Naphthalene	ND	1.0	"	"	"	"	"	"	
n-Propylbenzene	ND	1.0	"	"	"	"	"	"	
Styrene	ND	1.0	"	"	"	"	"	"	
1,1,2,2-Tetrachloroethane	ND	1.0	"	"	"	"	"	"	
1,1,1,2-Tetrachloroethane	ND	1.0	"	"	"	"	"	"	
Tetrachloroethene	ND	1.0	"	"	"	"	"	"	
1,2,3-Trichlorobenzene	ND	1.0	"	"	"	"	"	"	
1,2,4-Trichlorobenzene	ND	1.0	"	"	"	"	"	"	
1,1,2-Trichloroethane	ND	1.0	"	"	"	"	"	"	
1,1,1-Trichloroethane	ND	1.0	"	"	"	"	"	"	
Trichloroethene	ND	1.0	"	"	"	"	"	"	
Trichlorofluoromethane	ND	1.0	"	"	"	"	"	"	
1,2,3-Trichloropropane	ND	1.0	"	"	"	"	"	"	
1,3,5-Trimethylbenzene	ND	1.0	"	"	"	"	"	"	
1,2,4-Trimethylbenzene	ND	1.0	"	"	"	"	"	"	
Vinyl chloride	ND	1.0	"	"	"	"	"	"	
Benzene	ND	0.50	"	"	"	"	"	"	
Toluene	ND	0.50	"	"	"	"	"	"	
Ethylbenzene	ND	0.50	"	"	"	"	"	"	
m,p-Xylene	ND	1.0	"	"	"	"	"	"	
o-Xylene	ND	0.50	"	"	"	"	"	"	
Surrogate: 4-Bromofluorobenzene		*94.8 %*	*83.5-119*		"	"	"	"	
Surrogate: Dibromofluoromethane		*104 %*	*81-136*		"	"	"	"	
Surrogate: Toluene-d8		*86.1 %*	*88.8-117*		"	"	"	"	*S-GC*

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Katherine RunningCrane

Katherine RunningCrane, Project Manager

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14 Hughes B101	Project Number: 13662	**Reported:**
Irvine CA, 92618	Project Manager: Ian Goltz	08/21/14 16:45

EWM2

T141671-06 (Water)

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
SunStar Laboratories, Inc.									
Extractable Petroleum Hydrocarbons by 8015C									
C6-C12 (GRO)	ND	0.50	mg/l	1	4081509	08/15/14	08/19/14	EPA 8015C	
C13-C28 (DRO)	ND	0.50	"	"	"	"	"	"	
C29-C40 (MORO)	ND	0.50	"	"	"	"	"	"	
Surrogate: p-Terphenyl		*95.3 %*	*65-135*		"	"	"	"	

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14 Hughes B101	Project Number: 13662	**Reported:**
Irvine CA, 92618	Project Manager: Ian Goltz	08/21/14 16:45

EWM3

T141671-07 (Water)

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
SunStar Laboratories, Inc.									
Anions by EPA Method 300.0									
Fluoride	ND	0.500	mg/l	1	4081501	08/15/14	08/18/14	EPA 300.0	
Chloride	**1100**	100	"	20	"	"	"	"	

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14 Hughes B101	Project Number: 13662	**Reported:**
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EWM4

T141671-08 (Water)

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
SunStar Laboratories, Inc.									
Metals by EPA 6010B									
Antimony	ND	50	ug/l	1	4081505	08/15/14	08/15/14	EPA 6010B	
Silver	ND	50	"	"	"	"	"	"	
Arsenic	ND	50	"	"	"	"	"	"	
Barium	ND	50	"	"	"	"	"	"	
Beryllium	ND	50	"	"	"	"	"	"	
Cadmium	ND	50	"	"	"	"	"	"	
Chromium	ND	50	"	"	"	"	"	"	
Cobalt	ND	50	"	"	"	"	"	"	
Copper	**64**	50	"	"	"	"	"	"	
Lead	ND	50	"	"	"	"	"	"	
Molybdenum	ND	50	"	"	"	"	"	"	
Nickel	ND	50	"	"	"	"	"	"	
Selenium	ND	50	"	"	"	"	"	"	
Thallium	ND	50	"	"	"	"	"	"	
Vanadium	ND	50	"	"	"	"	"	"	
Zinc	ND	50	"	"	"	"	"	"	
Cold Vapor Extraction EPA 7470/7471									
Mercury	ND	0.50	ug/l	1	4081506	08/15/14	08/18/14	EPA 7470A Water	

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14 Hughes B101	Project Number: 13662	**Reported:**
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EWS1

T141671-09 (Water)

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
SunStar Laboratories, Inc.									
Volatile Organic Compounds by EPA Method 8260B									
Bromobenzene	ND	1.0	ug/l	1	4081530	08/15/14	08/16/14	EPA 8260B	
Bromochloromethane	ND	1.0	"	"	"	"	"	"	
Bromodichloromethane	ND	1.0	"	"	"	"	"	"	
Bromoform	ND	1.0	"	"	"	"	"	"	
Bromomethane	ND	1.0	"	"	"	"	"	"	
n-Butylbenzene	ND	1.0	"	"	"	"	"	"	
sec-Butylbenzene	ND	1.0	"	"	"	"	"	"	
tert-Butylbenzene	ND	1.0	"	"	"	"	"	"	
Carbon tetrachloride	ND	0.50	"	"	"	"	"	"	
Chlorobenzene	ND	1.0	"	"	"	"	"	"	
Chloroethane	ND	1.0	"	"	"	"	"	"	
Chloroform	ND	1.0	"	"	"	"	"	"	
Chloromethane	ND	1.0	"	"	"	"	"	"	
2-Chlorotoluene	ND	1.0	"	"	"	"	"	"	
4-Chlorotoluene	ND	1.0	"	"	"	"	"	"	
Dibromochloromethane	ND	1.0	"	"	"	"	"	"	
1,2-Dibromo-3-chloropropane	ND	5.0	"	"	"	"	"	"	
1,2-Dibromoethane (EDB)	ND	1.0	"	"	"	"	"	"	
Dibromomethane	ND	1.0	"	"	"	"	"	"	
1,2-Dichlorobenzene	ND	1.0	"	"	"	"	"	"	
1,3-Dichlorobenzene	ND	1.0	"	"	"	"	"	"	
1,4-Dichlorobenzene	ND	1.0	"	"	"	"	"	"	
Dichlorodifluoromethane	ND	0.50	"	"	"	"	"	"	
1,1-Dichloroethane	ND	1.0	"	"	"	"	"	"	
1,2-Dichloroethane	ND	0.50	"	"	"	"	"	"	
1,1-Dichloroethene	ND	1.0	"	"	"	"	"	"	
cis-1,2-Dichloroethene	ND	1.0	"	"	"	"	"	"	
trans-1,2-Dichloroethene	ND	1.0	"	"	"	"	"	"	
1,2-Dichloropropane	ND	1.0	"	"	"	"	"	"	
1,3-Dichloropropane	ND	1.0	"	"	"	"	"	"	
2,2-Dichloropropane	ND	1.0	"	"	"	"	"	"	
1,1-Dichloropropene	ND	1.0	"	"	"	"	"	"	

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14 Hughes B101	Project Number: 13662	**Reported:**
Irvine CA, 92618	Project Manager: Ian Goltz	08/21/14 16:45

EWS1

T141671-09 (Water)

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
SunStar Laboratories, Inc.									
Volatile Organic Compounds by EPA Method 8260B									
cis-1,3-Dichloropropene	ND	0.50	ug/l	1	4081530	08/15/14	08/16/14	EPA 8260B	
trans-1,3-Dichloropropene	ND	0.50	"	"	"	"	"	"	
Hexachlorobutadiene	ND	1.0	"	"	"	"	"	"	
Isopropylbenzene	ND	1.0	"	"	"	"	"	"	
p-Isopropyltoluene	ND	1.0	"	"	"	"	"	"	
Methylene chloride	ND	1.0	"	"	"	"	"	"	
Naphthalene	ND	1.0	"	"	"	"	"	"	
n-Propylbenzene	ND	1.0	"	"	"	"	"	"	
Styrene	ND	1.0	"	"	"	"	"	"	
1,1,2,2-Tetrachloroethane	ND	1.0	"	"	"	"	"	"	
1,1,1,2-Tetrachloroethane	ND	1.0	"	"	"	"	"	"	
Tetrachloroethene	ND	1.0	"	"	"	"	"	"	
1,2,3-Trichlorobenzene	ND	1.0	"	"	"	"	"	"	
1,2,4-Trichlorobenzene	ND	1.0	"	"	"	"	"	"	
1,1,2-Trichloroethane	ND	1.0	"	"	"	"	"	"	
1,1,1-Trichloroethane	ND	1.0	"	"	"	"	"	"	
Trichloroethene	ND	1.0	"	"	"	"	"	"	
Trichlorofluoromethane	ND	1.0	"	"	"	"	"	"	
1,2,3-Trichloropropane	ND	1.0	"	"	"	"	"	"	
1,3,5-Trimethylbenzene	ND	1.0	"	"	"	"	"	"	
1,2,4-Trimethylbenzene	ND	1.0	"	"	"	"	"	"	
Vinyl chloride	ND	1.0	"	"	"	"	"	"	
Benzene	ND	0.50	"	"	"	"	"	"	
Toluene	ND	0.50	"	"	"	"	"	"	
Ethylbenzene	ND	0.50	"	"	"	"	"	"	
m,p-Xylene	ND	1.0	"	"	"	"	"	"	
o-Xylene	ND	0.50	"	"	"	"	"	"	
Surrogate: 4-Bromofluorobenzene		*92.5 %*	*83.5-119*		"	"	"	"	
Surrogate: Dibromofluoromethane		*101 %*	*81-136*		"	"	"	"	
Surrogate: Toluene-d8		*86.5 %*	*88.8-117*		"	"	"	"	*S-GC*

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EWS2

T141671-10 (Water)

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
SunStar Laboratories, Inc.									
Extractable Petroleum Hydrocarbons by 8015C									
C6-C12 (GRO)	ND	0.50	mg/l	1	4081509	08/15/14	08/19/14	EPA 8015C	
C13-C28 (DRO)	ND	0.50	"	"	"	"	"	"	
C29-C40 (MORO)	ND	0.50	"	"	"	"	"	"	
Surrogate: p-Terphenyl		*93.2 %*	*65-135*		"	"	"	"	

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14 Hughes B101	Project Number: 13662	**Reported:**
Irvine CA, 92618	Project Manager: Ian Goltz	08/21/14 16:45

EWS3

T141671-11 (Water)

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
SunStar Laboratories, Inc.									
Anions by EPA Method 300.0									
Fluoride	ND	0.500	mg/l	1	4081501	08/15/14	08/18/14	EPA 300.0	
Chloride	**1150**	100	"	20	"	"	"	"	

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EWS4

T141671-12 (Water)

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
SunStar Laboratories, Inc.									
Metals by EPA 6010B									
Antimony	ND	50	ug/l	1	4081505	08/15/14	08/15/14	EPA 6010B	
Silver	ND	50	"	"	"	"	"	"	
Arsenic	ND	50	"	"	"	"	"	"	
Barium	ND	50	"	"	"	"	"	"	
Beryllium	ND	50	"	"	"	"	08/15/14	"	
Cadmium	ND	50	"	"	"	"	08/15/14	"	
Chromium	ND	50	"	"	"	"	"	"	
Cobalt	ND	50	"	"	"	"	"	"	
Copper	**62**	50	"	"	"	"	"	"	
Lead	ND	50	"	"	"	"	"	"	
Molybdenum	ND	50	"	"	"	"	"	"	
Nickel	ND	50	"	"	"	"	"	"	
Selenium	ND	50	"	"	"	"	"	"	
Thallium	ND	50	"	"	"	"	"	"	
Vanadium	ND	50	"	"	"	"	"	"	
Zinc	ND	50	"	"	"	"	"	"	
Cold Vapor Extraction EPA 7470/7471									
Mercury	ND	0.50	ug/l	1	4081506	08/15/14	08/18/14	EPA 7470A Water	

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14 Hughes B101	Project Number: 13662	**Reported:**
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Extractable Petroleum Hydrocarbons by 8015C - Quality Control

SunStar Laboratories, Inc.

Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Batch 4081509 - EPA 3510C GC										
Blank (4081509-BLK1)				Prepared: 08/15/14	Analyzed: 08/19/14					
C6-C12 (GRO)	ND	0.50	mg/l							
C13-C28 (DRO)	ND	0.50	"							
C29-C40 (MORO)	ND	0.50	"							
Surrogate: p-Terphenyl	*2.99*		*"*	*4.00*		*74.7*	*65-135*			
LCS (4081509-BS1)				Prepared: 08/15/14	Analyzed: 08/19/14					
C13-C28 (DRO)	18.3	0.50	mg/l	20.0		91.5	75-125			
Surrogate: p-Terphenyl	*3.50*		*"*	*4.00*		*87.5*	*65-135*			
LCS Dup (4081509-BSD1)				Prepared: 08/15/14	Analyzed: 08/19/14					
C13-C28 (DRO)	18.2	0.50	mg/l	20.0		91.0	75-125	0.630	20	
Surrogate: p-Terphenyl	*3.83*		*"*	*4.00*		*95.6*	*65-135*			

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14 Hughes B101	Project Number: 13662	**Reported:**
Irvine CA, 92618	Project Manager: Ian Goltz	08/21/14 16:45

Metals by EPA 6010B - Quality Control

SunStar Laboratories, Inc.

Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Batch 4081505 - EPA 3010A										
Blank (4081505-BLK1)				Prepared & Analyzed: 08/15/14						
Antimony	ND	50	ug/l							
Silver	ND	50	"							
Arsenic	ND	50	"							
Barium	ND	50	"							
Beryllium	ND	50	"							
Cadmium	ND	50	"							
Chromium	ND	50	"							
Cobalt	ND	50	"							
Copper	ND	50	"							
Lead	ND	50	"							
Molybdenum	ND	50	"							
Nickel	ND	50	"							
Selenium	ND	50	"							
Thallium	ND	50	"							
Vanadium	ND	50	"							
Zinc	ND	50	"							
LCS (4081505-BS1)				Prepared & Analyzed: 08/15/14						
Arsenic	494	50	ug/l	500		98.8	75-125			
Barium	520	50	"	500		104	75-125			
Cadmium	517	50	"	500		103	75-125			
Chromium	518	50	"	500		104	75-125			
Lead	508	50	"	500		102	75-125			
Matrix Spike (4081505-MS1)		**Source: T141650-02**		Prepared & Analyzed: 08/15/14						
Arsenic	489	50	ug/l	500	ND	97.8	75-125			
Barium	465	50	"	500	31.1	86.7	75-125			
Cadmium	458	50	"	500	ND	91.6	75-125			
Chromium	433	50	"	500	ND	86.6	75-125			
Lead	422	50	"	500	ND	84.4	75-125			

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Irvine CA, 92618	Project Manager: Ian Goltz	08/21/14 16:45

Metals by EPA 6010B - Quality Control

SunStar Laboratories, Inc.

Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Batch 4081505 - EPA 3010A										
Matrix Spike Dup (4081505-MSD1)		**Source: T141650-02**		Prepared & Analyzed: 08/15/14						
Arsenic	483	50	ug/l	500	ND	96.6	75-125	1.20	20	
Barium	471	50	"	500	31.1	88.0	75-125	1.38	20	
Cadmium	464	50	"	500	ND	92.7	75-125	1.26	20	
Chromium	437	50	"	500	ND	87.5	75-125	1.02	20	
Lead	422	50	"	500	ND	84.4	75-125	0.0674	20	

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Irvine CA, 92618	Project Manager: Ian Goltz	08/21/14 16:45

Cold Vapor Extraction EPA 7470/7471 - Quality Control

SunStar Laboratories, Inc.

Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Batch 4081506 - EPA 7470A Water										
Blank (4081506-BLK1)				Prepared: 08/15/14	Analyzed: 08/18/14					
Mercury	ND	0.50	ug/l							
LCS (4081506-BS1)				Prepared: 08/15/14	Analyzed: 08/18/14					
Mercury	5.16	0.50	ug/l	5.00		103	75-125			
Matrix Spike (4081506-MS1)		**Source: T141671-08**		Prepared: 08/15/14	Analyzed: 08/18/14					
Mercury	4.76	0.50	ug/l	5.00	ND	95.2	75-125			
Matrix Spike Dup (4081506-MSD1)		**Source: T141671-08**		Prepared: 08/15/14	Analyzed: 08/18/14					
Mercury	4.56	0.50	ug/l	5.00	ND	91.3	75-125	4.23	20	

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Volatile Organic Compounds by EPA Method 8260B - Quality Control

SunStar Laboratories, Inc.

Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Batch 4081530 - EPA 5030 GCMS										
Blank (4081530-BLK1)				Prepared: 08/15/14 Analyzed: 08/16/14						
Bromobenzene	ND	1.0	ug/l							
Bromochloromethane	ND	1.0	"							
Bromodichloromethane	ND	1.0	"							
Bromoform	ND	1.0	"							
Bromomethane	ND	1.0	"							
n-Butylbenzene	ND	1.0	"							
sec-Butylbenzene	ND	1.0	"							
tert-Butylbenzene	ND	1.0	"							
Carbon tetrachloride	ND	0.50	"							
Chlorobenzene	ND	1.0	"							
Chloroethane	ND	1.0	"							
Chloroform	ND	1.0	"							
Chloromethane	ND	1.0	"							
2-Chlorotoluene	ND	1.0	"							
4-Chlorotoluene	ND	1.0	"							
Dibromochloromethane	ND	1.0	"							
1,2-Dibromo-3-chloropropane	ND	5.0	"							
1,2-Dibromoethane (EDB)	ND	1.0	"							
Dibromomethane	ND	1.0	"							
1,2-Dichlorobenzene	ND	1.0	"							
1,3-Dichlorobenzene	ND	1.0	"							
1,4-Dichlorobenzene	ND	1.0	"							
Dichlorodifluoromethane	ND	0.50	"							
1,1-Dichloroethane	ND	1.0	"							
1,2-Dichloroethane	ND	0.50	"							
1,1-Dichloroethene	ND	1.0	"							
cis-1,2-Dichloroethene	ND	1.0	"							
trans-1,2-Dichloroethene	ND	1.0	"							
1,2-Dichloropropane	ND	1.0	"							
1,3-Dichloropropane	ND	1.0	"							
2,2-Dichloropropane	ND	1.0	"							
1,1-Dichloropropene	ND	1.0	"							
cis-1,3-Dichloropropene	ND	0.50	"							
trans-1,3-Dichloropropene	ND	0.50	"							
Hexachlorobutadiene	ND	1.0	"							
Isopropylbenzene	ND	1.0	"							

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Volatile Organic Compounds by EPA Method 8260B - Quality Control

SunStar Laboratories, Inc.

Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Batch 4081530 - EPA 5030 GCMS										
Blank (4081530-BLK1)				Prepared: 08/15/14 Analyzed: 08/16/14						
p-Isopropyltoluene	ND	1.0	ug/l							
Methylene chloride	ND	1.0	"							
Naphthalene	ND	1.0	"							
n-Propylbenzene	ND	1.0	"							
Styrene	ND	1.0	"							
1,1,2,2-Tetrachloroethane	ND	1.0	"							
1,1,1,2-Tetrachloroethane	ND	1.0	"							
Tetrachloroethene	ND	1.0	"							
1,2,3-Trichlorobenzene	ND	1.0	"							
1,2,4-Trichlorobenzene	ND	1.0	"							
1,1,2-Trichloroethane	ND	1.0	"							
1,1,1-Trichloroethane	ND	1.0	"							
Trichloroethene	ND	1.0	"							
Trichlorofluoromethane	ND	1.0	"							
1,2,3-Trichloropropane	ND	1.0	"							
1,3,5-Trimethylbenzene	ND	1.0	"							
1,2,4-Trimethylbenzene	ND	1.0	"							
Vinyl chloride	ND	1.0	"							
Benzene	ND	0.50	"							
Toluene	ND	0.50	"							
Ethylbenzene	ND	0.50	"							
m,p-Xylene	ND	1.0	"							
o-Xylene	ND	0.50	"							
Surrogate: 4-Bromofluorobenzene	*6.81*		*"*	*8.00*		*85.1*	*83.5-119*			
Surrogate: Dibromofluoromethane	*7.49*		*"*	*8.00*		*93.6*	*81-136*			
Surrogate: Toluene-d8	*7.24*		*"*	*8.00*		*90.5*	*88.8-117*			
LCS (4081530-BS1)				Prepared: 08/15/14 Analyzed: 08/16/14						
Chlorobenzene	16.2	1.0	ug/l	20.0		81.0	75-125			
1,1-Dichloroethene	16.4	1.0	"	20.0		82.2	75-125			
Trichloroethene	17.2	1.0	"	20.0		85.9	75-125			
Benzene	16.3	0.50	"	20.0		81.5	75-125			
Toluene	16.4	0.50	"	20.0		82.2	75-125			
Surrogate: 4-Bromofluorobenzene	*7.79*		*"*	*8.00*		*97.4*	*83.5-119*			
Surrogate: Dibromofluoromethane	*9.27*		*"*	*8.00*		*116*	*81-136*			
Surrogate: Toluene-d8	*7.22*		*"*	*8.00*		*90.2*	*88.8-117*			

SunStar Laboratories, Inc.

The results in this report apply to the samples analyzed in accordance with the chain of custody document. This analytical report must be reproduced in its entirety.

Katherine RunningCrane

Katherine RunningCrane, Project Manager

SunStar Laboratories, Inc.
PROVIDING QUALITY ANALYTICAL SERVICES NATIONWIDE

25712 Commercentre Drive
Lake Forest, California 92630
949.297.5020 Phone
949.297.5027 Fax

Stoney-Miller Consultants	Project: Euland	
14 Hughes B101	Project Number: 13662	**Reported:**
Irvine CA, 92618	Project Manager: Ian Goltz	08/21/14 16:45

Volatile Organic Compounds by EPA Method 8260B - Quality Control

SunStar Laboratories, Inc.

Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Batch 4081530 - EPA 5030 GCMS										
Matrix Spike (4081530-MS1)		**Source: T141673-01**		Prepared: 08/15/14	Analyzed: 08/16/14					
Chlorobenzene	18.1	1.0	ug/l	20.0	ND	90.7	75-125			
1,1-Dichloroethene	20.8	1.0	"	20.0	4.64	80.8	75-125			
Trichloroethene	631	1.0	"	20.0	423	NR	75-125			QM-4X
Benzene	17.5	0.50	"	20.0	ND	87.4	75-125			
Toluene	19.2	0.50	"	20.0	0.240	95.0	75-125			
Surrogate: 4-Bromofluorobenzene	*8.03*		*"*	*8.00*		*100*	*83.5-119*			
Surrogate: Dibromofluoromethane	*9.84*		*"*	*8.00*		*123*	*81-136*			
Surrogate: Toluene-d8	*7.20*		*"*	*8.00*		*90.0*	*88.8-117*			
Matrix Spike Dup (4081530-MSD1)		**Source: T141673-01**		Prepared: 08/15/14	Analyzed: 08/16/14					
Chlorobenzene	17.2	1.0	ug/l	20.0	ND	86.2	75-125	5.03	20	
1,1-Dichloroethene	21.0	1.0	"	20.0	4.64	82.0	75-125	1.15	20	
Trichloroethene	630	1.0	"	20.0	423	NR	75-125	0.182	20	QM-4X
Benzene	16.4	0.50	"	20.0	ND	82.0	75-125	6.26	20	
Toluene	18.2	0.50	"	20.0	0.240	89.8	75-125	5.66	20	
Surrogate: 4-Bromofluorobenzene	*8.02*		*"*	*8.00*		*100*	*83.5-119*			
Surrogate: Dibromofluoromethane	*9.78*		*"*	*8.00*		*122*	*81-136*			
Surrogate: Toluene-d8	*7.20*		*"*	*8.00*		*90.0*	*88.8-117*			

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Stoney-Miller Consultants	Project: Euland	
14 Hughes B101	Project Number: 13662	**Reported:**
Irvine CA, 92618	Project Manager: Ian Goltz	08/21/14 16:45

Anions by EPA Method 300.0 - Quality Control

SunStar Laboratories, Inc.

Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Batch 4081501 - General Preparation										
Blank (4081501-BLK1)				Prepared & Analyzed: 08/15/14						
Fluoride	ND	0.500	mg/l							
Chloride	ND	5.00	"							
Sulfate as SO4	ND	5.00	"							
Bromide	ND	1.25	"							
LCS (4081501-BS1)				Prepared & Analyzed: 08/15/14						
Chloride	10.4	5.00	mg/l	10.0		104	75-125			
Sulfate as SO4	10.5	5.00	"	10.0		105	75-125			
LCS Dup (4081501-BSD1)				Prepared & Analyzed: 08/15/14						
Chloride	10.4	5.00	mg/l	10.0		104	75-125	0.316	20	
Sulfate as SO4	10.4	5.00	"	10.0		104	75-125	0.725	20	
Matrix Spike (4081501-MS1)		**Source: T141671-03**		Prepared: 08/15/14 Analyzed: 08/16/14						
Chloride	ND	5.00	mg/l	10.0	1050	NR	75-125			QM-4X
Sulfate as SO4	ND	5.00	"	10.0	ND		75-125			QM-4X
Matrix Spike Dup (4081501-MSD1)		**Source: T141671-03**		Prepared: 08/15/14 Analyzed: 08/16/14						
Chloride	ND	5.00	mg/l	10.0	1050	NR	75-125		20	QM-4X
Sulfate as SO4	ND	5.00	"	10.0	ND		75-125		20	QM-4X

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Stoney-Miller Consultants	Project: Euland	
14 Hughes B101	Project Number: 13662	**Reported:**
Irvine CA, 92618	Project Manager: Ian Goltz	08/21/14 16:45

Notes and Definitions

S-GC	Surrogate recovery outside of established control limits. The data was accepted based on valid recovery of the remaining surrogate(s).
QM-4X	The spike recovery was outside of QC acceptance limits for the MS and/or MSD due to analyte concentration at 4 times or greater the spike concentration. The QC batch was accepted based on LCS and/or LCSD recoveries within the acceptance limits.
DET	Analyte DETECTED
ND	Analyte NOT DETECTED at or above the reporting limit
NR	Not Reported
dry	Sample results reported on a dry weight basis
RPD	Relative Percent Difference

SunStar Laboratories, Inc.
25712 Commercentre Dr
Lake Forest, CA 92630
949-297-5020

Chain of Custody Record

Client: Taylor Kennedy
Address: 14 Hughes, Suite B-101
Phone: (949) 380-9886 Fax: (949) 455-9371
Project Manager: Ian Goltz

Date: 8/14/14 Page: 1 Of 1
Project Name: England Hydro Study
Collector: Taylor Kennedy Client Project #: 13662
Batch #: 7141671 EDF #:

Sample ID	Date Sampled	Time	Sample Type	Container Type	8260	8260 + OXY	8260 BTEX, OXY only	8270	8021 BTEX	8015M (gasoline)	8015M (diesel)	8015M Ext./Carbon Chain	6010/7000 Title 22 Metals	Chloride & Fluoride				Laboratory ID #	Comments/Preservative	Total # of containers
EWN 1	8/14/14	05:00		VOA	✓													01		3
EWN 2		05:06		VOA								✓						02		3
EWN 3		05:39		250ml Poly										✓				03		1
EWN 4		05:44		250ml Poly									✓					04		1
EWM 1		05:12		VOA	✓													05		3
EWM 2		05:18		VOA								✓						06		3
EWM 3		05:47		250ml Poly										✓				07		1
EWM 4		05:50		250ml Poly									✓					08		1
EWS 1		05:27		VOA	✓													09		3
EWS 2		05:30		VOA								✓						10		3
EWS 3		05:53		250ml Poly										✓				11		1
EWS 4		05:56		250ml Poly									✓					12		1

Relinquished by: (signature)	Date / Time	Received by: (signature)	Date / Time
[signature]	8/14/14 2:57	[signature]	8-14-14 14:57
Relinquished by: (signature)	Date / Time	Received by: (signature)	Date / Time
Relinquished by: (signature)	Date / Time	Received by: (signature)	Date / Time

Total # of containers 24
Chain of Custody seals Y/N/NA
Seals intact? Y/N/NA
Received good condition/cold 5.1

Turn around time: STD

Notes

Sample disposal Instructions: Disposal @ $2.00 each ____ Return to client ____ Pickup ____

COC 134566

SunStar Laboratories, Inc.
PROVIDING QUALITY ANALYTICAL SERVICES NATIONWIDE

SAMPLE RECEIVING REVIEW SHEET

BATCH # T141671

Client Name: STONEY - MILLER CON. Project: EULAND

Received by: SUNNY Date/Time Received: 8.14.14 / 14:57

Delivered by : ☒ Client ☐ SunStar Courier ☐ GSO ☐ FedEx ☐ Other _____

Total number of coolers received 0 **Temp criteria = 6°C > 0°C (no frozen containers)**

Temperature: cooler #1 5.3 °C +/- the CF (- 0.2°C) = 5.1 °C corrected temperature

cooler #2 _____ °C +/- the CF (- 0.2°C) = _____ °C corrected temperature

cooler #3 _____ °C +/- the CF (- 0.2°C) = _____ °C corrected temperature

Samples outside temp. but received on ice, w/in 6 hours of final sampling.	☒ Yes	☐ No*	☐ N/A
Custody Seals Intact on Cooler/Sample	☐ Yes	☐ No*	☒ N/A
Sample Containers Intact	☒ Yes	☐ No*	
Sample labels match COC ID's	☒ Yes	☐ No*	
Total number of containers received match COC	☒ Yes	☐ No*	
Proper containers received for analyses requested on COC	☒ Yes	☐ No*	
Proper preservative indicated on COC/containers for analyses requested	☒ Yes	☐ No*	☐ N/A

Complete shipment received in good condition with correct temperatures, containers, labels, volumes preservatives and within method specified holding times. ☒ **Yes** ☐ **No***

* Complete Non-Conformance Receiving Sheet if checked Cooler/Sample Review - Initials and date SL 8.14.14

Comments:

Desc:	AUGER LINES	Prepared by:	JON CRISP	Project:	5241
W.O. No:	2950-3X	Path:	Topo	Party Chief:	JON CRISP
Tracts:	5241	Plot Date:	05-03-13	Survey Date:	5-03-13

Sheet 1 of 1

APPENDIX G

STANDARD GRADING GUIDELINES

APPENDIX G

STANDARD GRADING GUIDELINES

GENERAL

These Guidelines present the usual and minimum requirements for grading operations observed by Stoney-Miller Consultants, Inc., or its designated representative. No deviation from these guidelines will be allowed, except where specifically superseded in the geotechnical report signed by a registered geotechnical engineer.

The placement, spreading, mixing, watering and compaction of the fills in strict accordance with these guidelines shall be the sole responsibility of the contractor. The construction, excavation, and placement of fill shall be under the direct observation of the geotechnical engineer or any person or persons employed by the licensed geotechnical engineer signing the soils report. If unsatisfactory soil-related conditions exist, the geotechnical engineer shall have the authority to reject the compacted fill ground and, if necessary, excavation equipment will be shut down to permit completion of compaction. Conformance with these specifications will be discussed in the final report issued by the geotechnical engineer.

SITE PREPARATION

All brush, vegetation and other deleterious material such as rubbish shall be collected, piled and removed from the site prior to placing fill, leaving the site clear and free from objectionable material.

Soil, alluvium, or rock materials determined by the geotechnical engineer as being unsuitable for placement in compacted fills shall be removed from the site. Any material incorporated as part of a compacted fill must be approved by the geotechnical engineer.

The surface shall then be plowed or scarified to a minimum depth of 6 inches until the surface is free from uneven features that would tend to prevent uniform compaction by the equipment used. After the area to receive fill has been cleared and scarified, it shall be disced or bladed by the contractor until it is uniform and free from large clods, brought to the proper moisture content and compacted to minimum requirements. If the scarified zone is greater than 12 inches in depth, the excess shall be removed and placed in lifts restricted to 6 inches.

Any underground structures such as cesspools, cisterns, mining shafts, tunnels, septic tanks, wells, pipe lines or others not located prior to grading are to be removed or treated in a manner prescribed by the geotechnical engineer.

MATERIALS

Materials for compacted fill shall consist of materials approved by the geotechnical engineer. These materials may be excavated from the cut area or imported from other approved sources, and soils from one or more sources may be blended. Fill soils shall be free from organic vegetable matter and other unsuitable substances. Normally, the material shall contain no rocks or hard lumps greater than 6 inches in size and shall contain at least 50 percent of material smaller than 1/4-inch in size. Materials greater than 4 inches in size shall be placed so that they are completely surrounded by compacted fines; no nesting of rocks shall be permitted. No material of a perishable, spongy, or otherwise of an unsuitable nature shall be used in the fill soils.

Representative samples of materials to be utilized as compacted fill shall be analyzed in the laboratory by the geotechnical engineer to determine their physical properties. If any material other than that previously tested is encountered during grading, the appropriate analysis of this material shall be conducted by the geotechnical engineer as soon as possible.

PLACING, SPREADING, AND COMPACTING FILL MATERIAL

The material used in the compacting process shall be evenly spread, watered, processed and compacted in thin lifts not to exceed 6 inches in thickness to obtain a uniformly dense layer.

When the moisture content of the fill material is below that specified by the geotechnical engineer, water shall be added by the contractor until the moisture content is near optimum as specified.

When the moisture content of the fill material is above that specified by the geotechnical engineer, the fill material shall be aerated by the contractor by blading, mixing, or other satisfactory methods until the moisture content is near optimum as specified.

After each layer has been placed, mixed, and spread evenly, it shall be thoroughly compacted to 90 percent of the maximum laboratory density in compliance with ASTM D: 1557-70 (five layers). Compaction shall be accomplished by sheepsfoot rollers, vibratory rollers, multiple-wheel pneumatic-tired rollers, or other types of acceptable compacting equipment. Equipment shall be of such design that it will be able to compact the fill to the specified density. Compaction shall be continuous over the entire area and the equipment shall make sufficient passes to obtain the desired density uniformly.

A minimum relative compaction of 90 percent out to the finished slope face of all fill slopes will be required. Compacting of the slopes shall be accomplished by backrolling the slopes in increments of 2 to 5 feet in elevation gain or by overbuilding and cutting back to the compacted inner core, or by any other procedure which produces the required compaction.

GRADING OBSERVATIONS

The geotechnical engineer shall observe the placement of fill during the grading process and will file a written report upon completion of grading stating his observations as to compliance with these specifications.

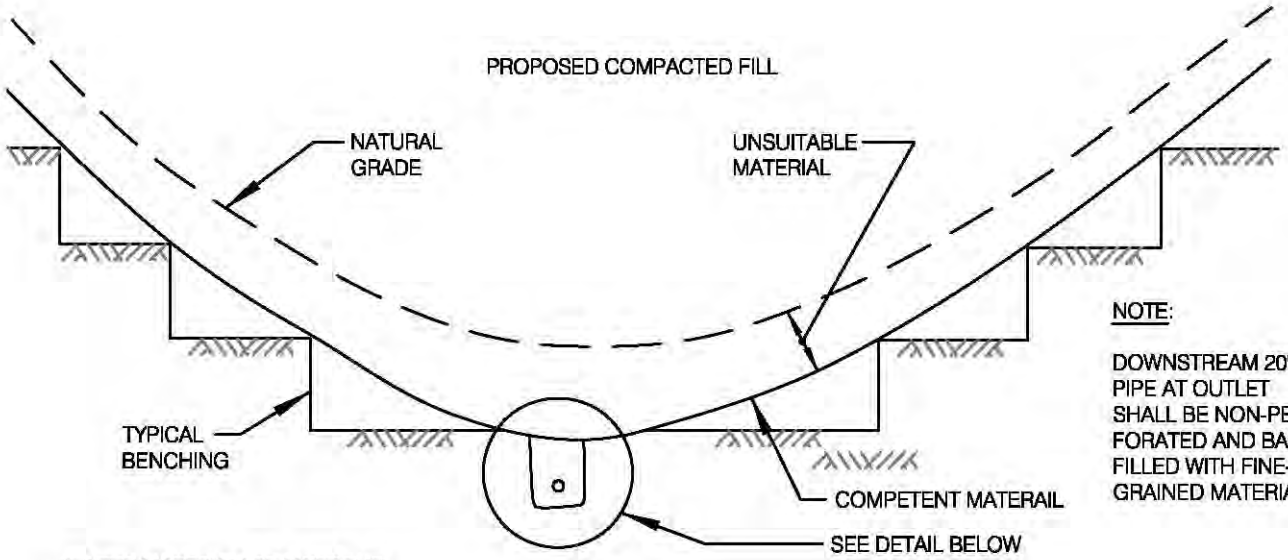
One density test shall be required for each 2 vertical feet of fill placed, or one for each 1,000 cubic yards of fill, whichever requires the greater number of tests.

Any cleanouts and processed ground to receive fill must be observed by the geotechnical engineer and/or engineering geologist prior to any fill placement. The contractor shall notify the geotechnical engineer when these areas are ready for observation.

PROTECTION OF WORK

During the grading process and prior to the complete construction of permanent drainage controls, it shall be the responsibility of the contractor to provide good drainage and prevent ponding of water and damage to adjoining properties or to finished work on the site.

After the geotechnical engineer has terminated his observations of the completed grading, no further excavations and/or filling shall be performed without the approval of the geotechnical engineer, if it is to be subject to the recommendations of this report.



NOTE:

DOWNSTREAM 20' OF PIPE AT OUTLET SHALL BE NON-PERFORATED AND BACK-FILLED WITH FINE-GRAINED MATERIAL

"FILTER MATERIAL" TO MEET THE FOLLOWING SPECIFICATION OR APPROVED EQUIVALENT:

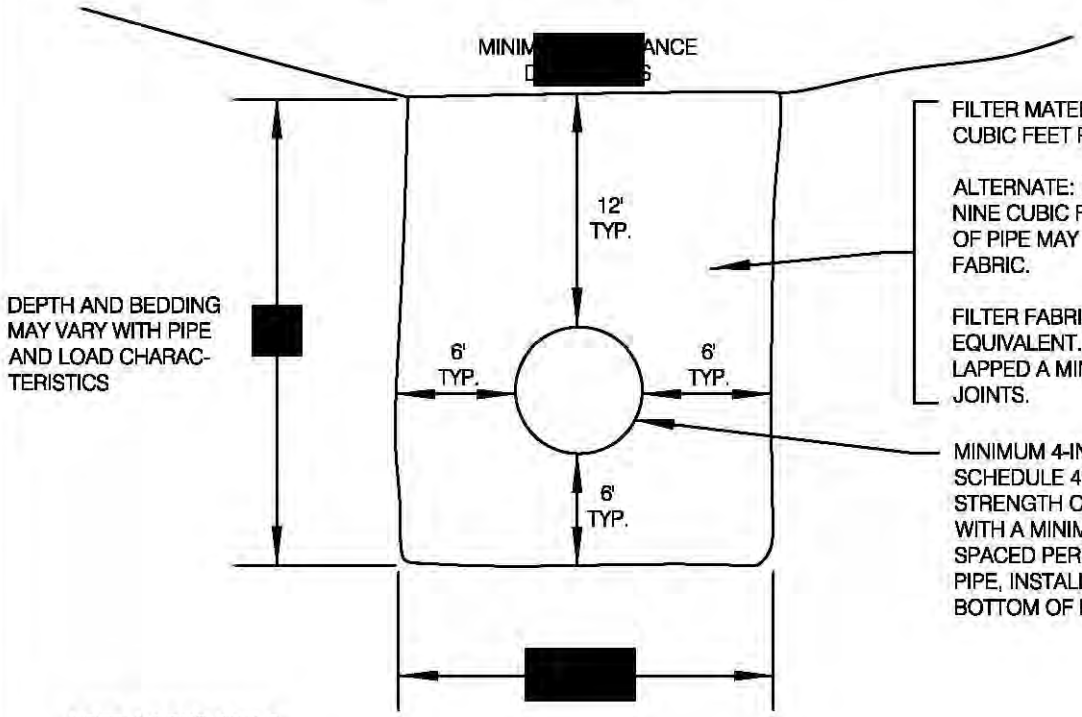
SIEVE SIZE	PERCENTAGE PASSING
1"	100
3/4"	90-100
3/8"	40-100
NO. 4	25-40
NO. 8	18-33
NO. 30	5-15
NO. 50	0-7
NO. 200	0-3

"GRAVEL" TO MEET THE FOLLOWING SPECIFICATION OR APPROVED EQUIVALENT:

SIEVE SIZE	PERCENTAGE PASSING
1 1/2"	88-100
1"	5-40
3/4"	0-17
3/8"	0-7
NO. 200	0-3

NOTE:

PIPE SHALL BE A MINIMUM OF 4 INCHES DIAMETER AND RUNS OF 500 FEET OR MORE USE 6-INCH DIAMETER PIPE AND OVER 1500 FEET USE 8-INCH PIPE, OR AS RECOMMENDED BY SOILS ENGINEER.



FILTER MATERIAL - MINIMUM OF NINE CUBIC FEET PER FOOT OF PIPE

ALTERNATE: IN LIEU OF FILTER MATERIAL, NINE CUBIC FEET OF GRAVEL PER FOOT OF PIPE MAY BE ENCASED IN FILTER FABRIC.

FILTER FABRIC SHALL BE MIRAFI 140N OR EQUIVALENT. FILTER FABRIC SHALL BE LAPPED A MINIMUM OF 12 INCHES ON ALL JOINTS.

MINIMUM 4-INCH DIAMETER PVC SCHEDULE 40 WITH A CRUSHING STRENGTH OF AT LEAST 1000 POUNDS, WITH A MINIMUM OF 8 UNIFORMLY SPACED PERFORATIONS PER FOOT OF PIPE, INSTALLED WITH PERFORATIONS ON BOTTOM OF PIPE.

NOTE: NOT TO SCALE

SMC	TYPICAL CANYON SUBDRAIN		
	JOB NO.: 13662-05	DATE: OCTOBER 2014	FIGURE NO.: G-1

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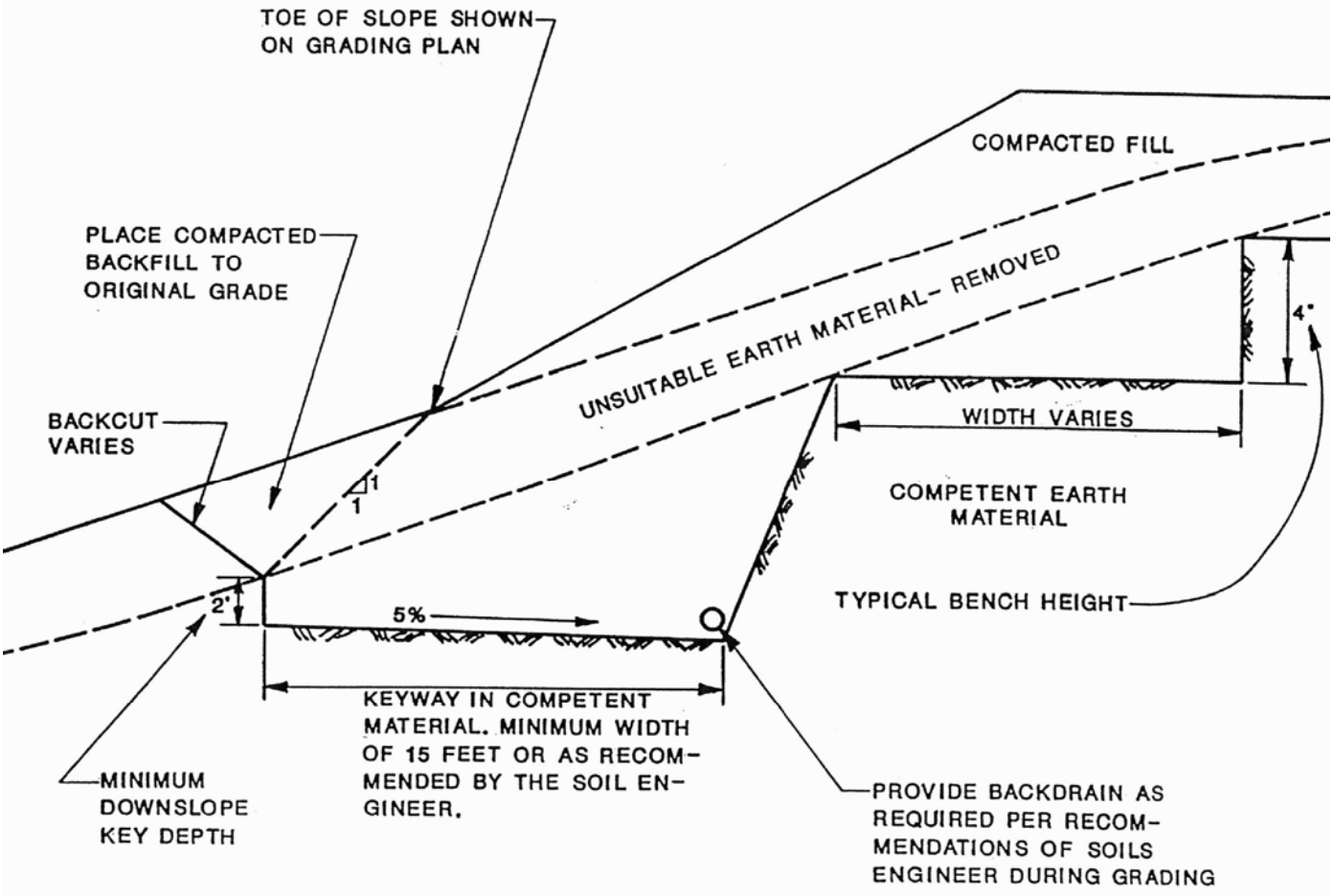
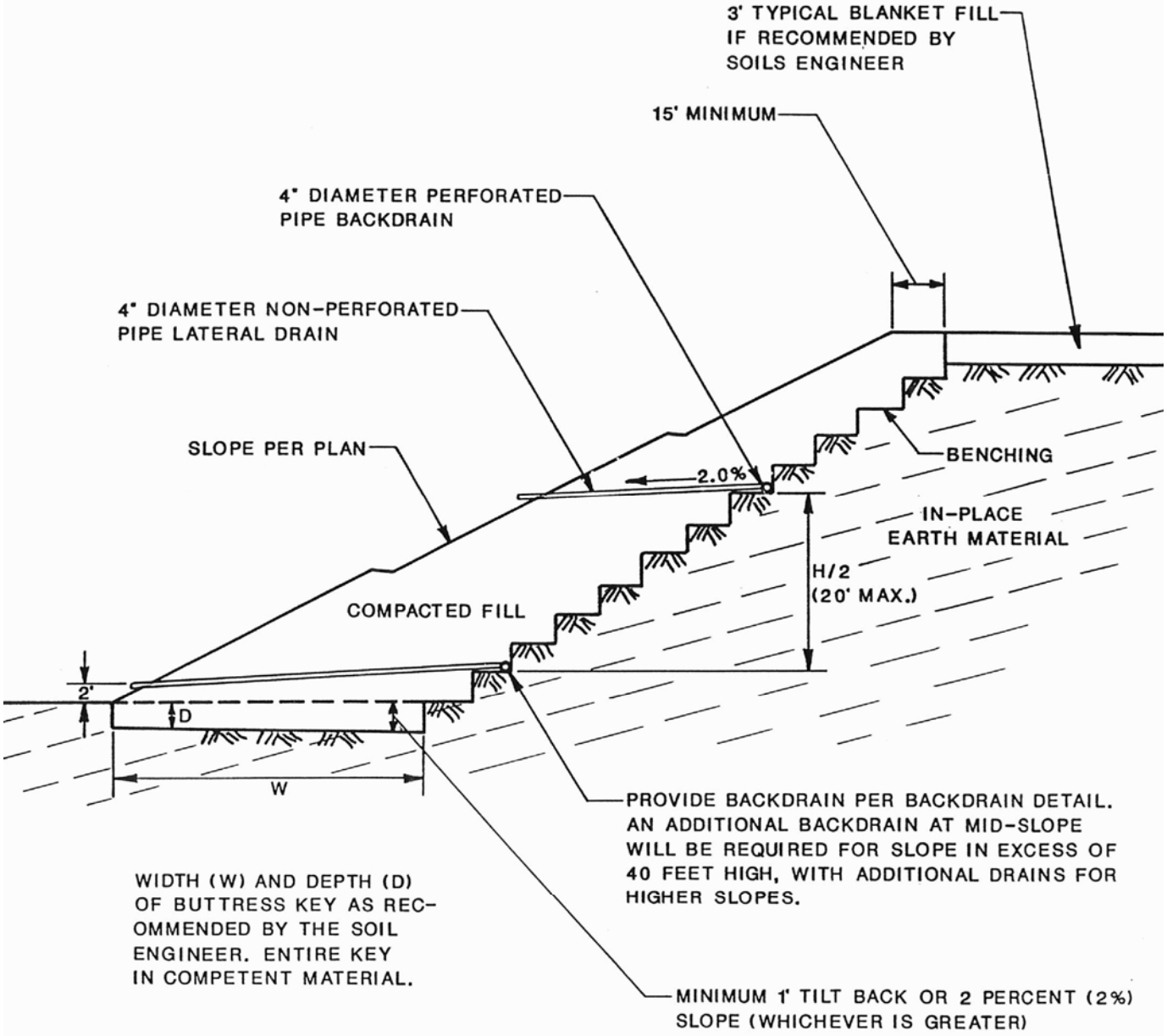


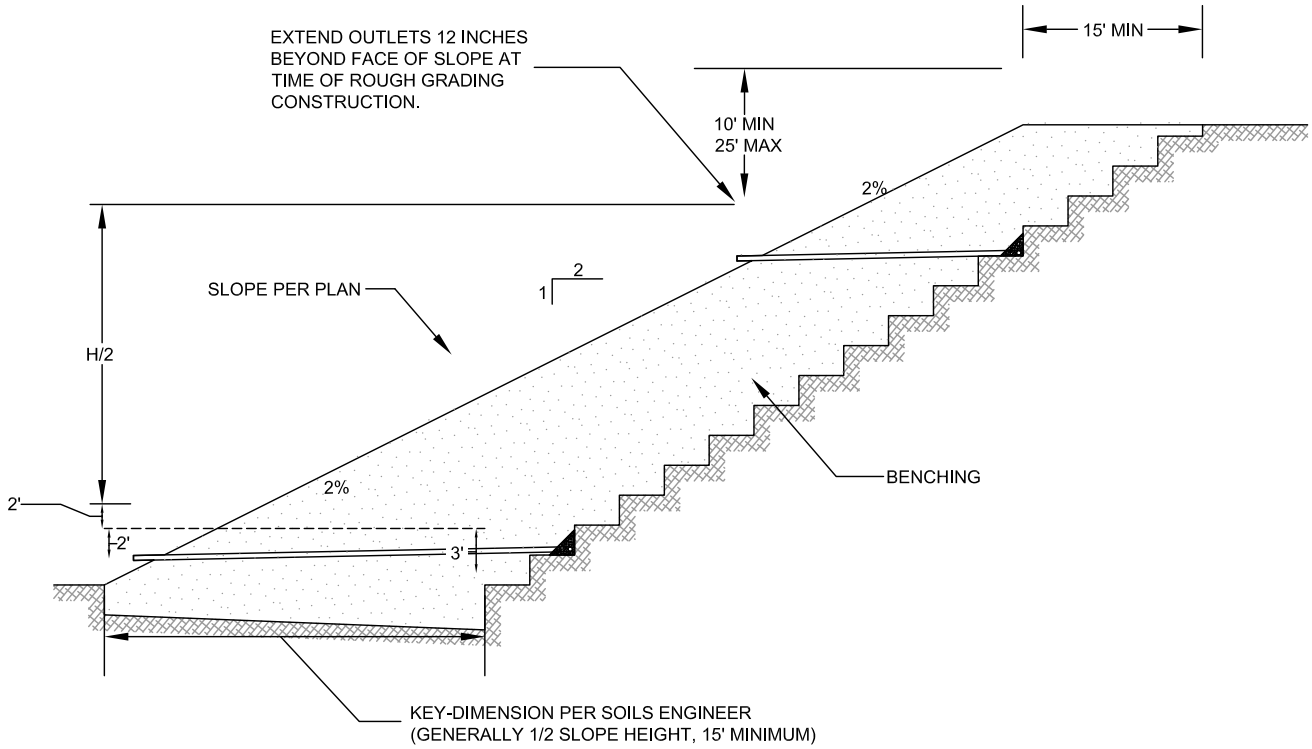
WHERE NATURAL SLOPE GRADIENT IS 5:1 OR LESS, BENCHING IS NOT NECESSARY. HOWEVER, FILL IS NOT TO BE PLACED ON COMPRESSIBLE OR UNSUITABLE MATERIAL.

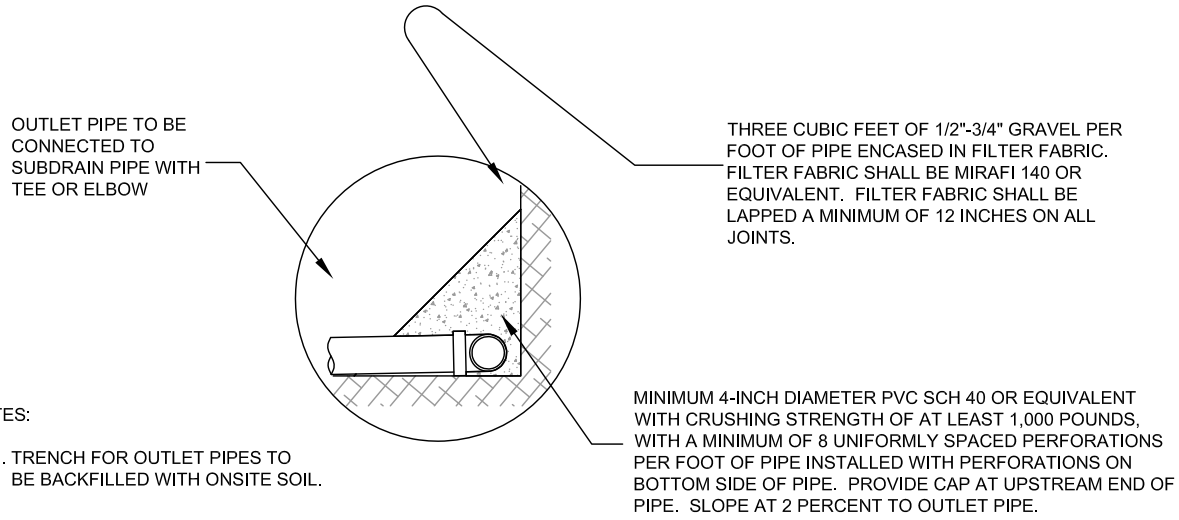
SMC	FILL SLOPE ABOVE NATURAL GROUND DETAIL		
	JOB NO.: 13662-05	DATE: OCTOBER 2014	FIGURE NO.: G-2



NOTE: REFER TO STABILIZATION AND BUTTRESS FILL BACKDRAIN DETAIL

SMC	TYPICAL BUTTRESS FILL DETAIL				
	JOB NO.:	13662-05	DATE:	OCTOBER 2014	FIGURE NO.: G-3





NOTES:

1. TRENCH FOR OUTLET PIPES TO BE BACKFILLED WITH ONSITE SOIL.

TYPICAL STABILIZATION FILL DETAIL

JOB NO.:	13662-05	DATE:	October 2014	FIGURE NO.:	G-4

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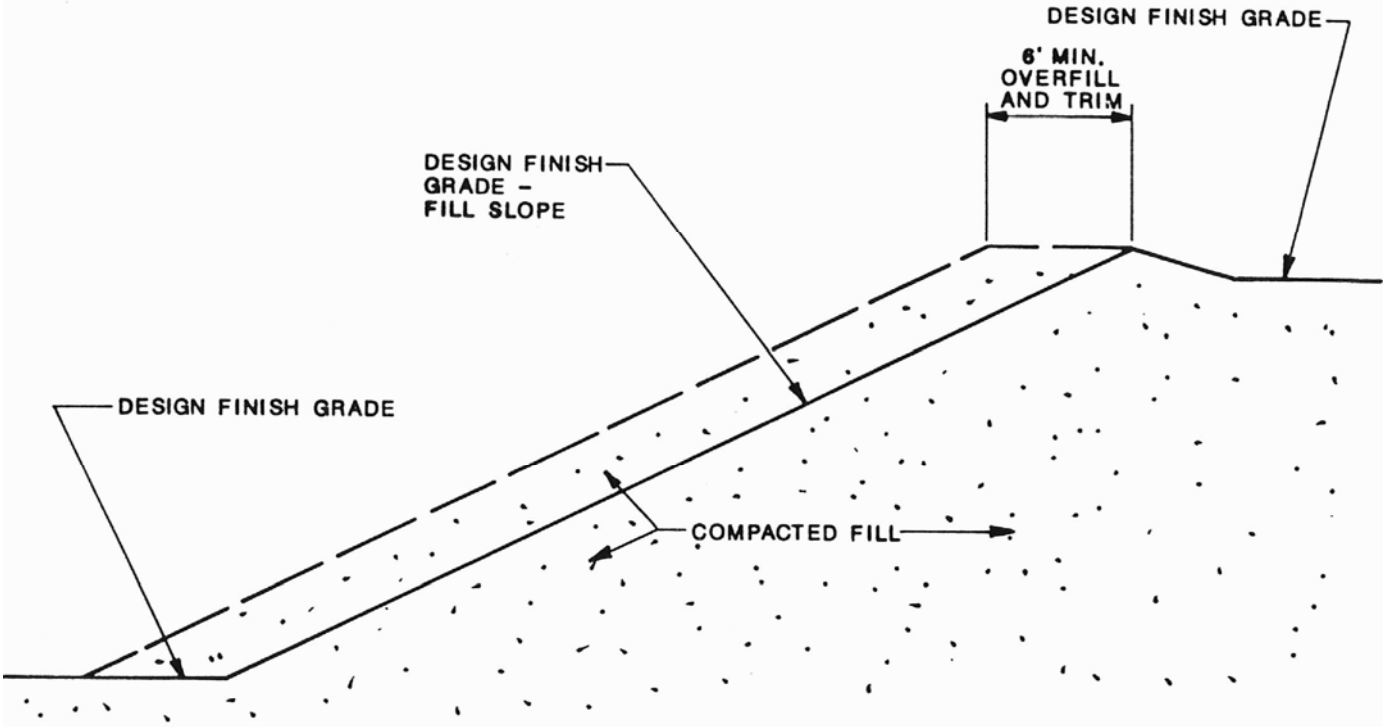
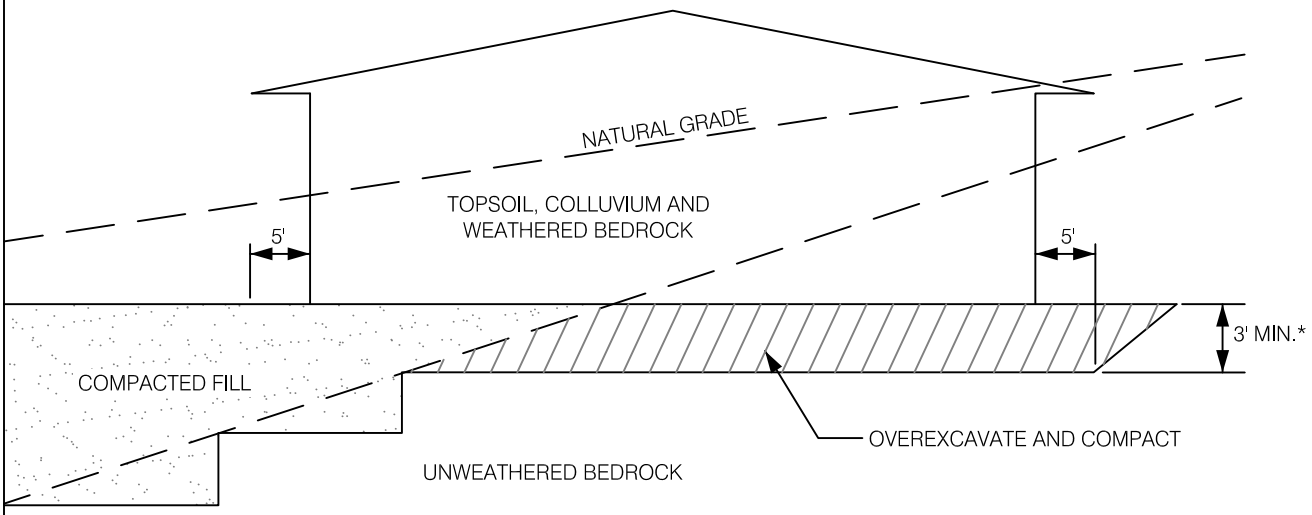


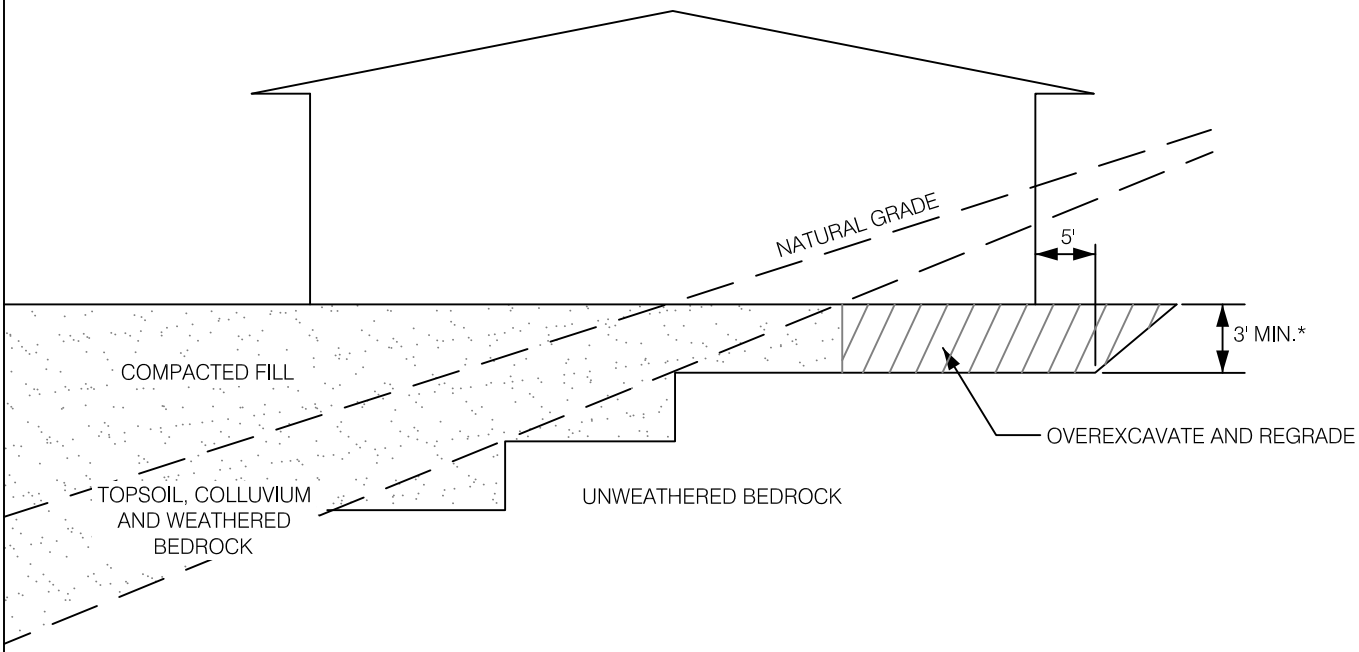
SMC	**FILL SLOPE ABOVE NATURAL GROUND DETAIL**		
JOB NO.: 13662-05	DATE: OCTOBER 2014	FIGURE NO.: G-5	

GENERAL GRADING RECOMMENDATIONS

CUT LOT



CUT/FILL LOT (TRANSISTION)



*DEEPER OVEREXCAVATION MAY BE RECOMMENDED
BY THE SOIL ENGINEER IN STEEP TRANSISTIONS

NOTE: NOT TO SCALE

SMC	**TRANSISTION LOT OVEREXCAVATION DETAIL**		
	JOB NO.: 13662-05	DATE: October 2014	FIGURE NO.: G-6

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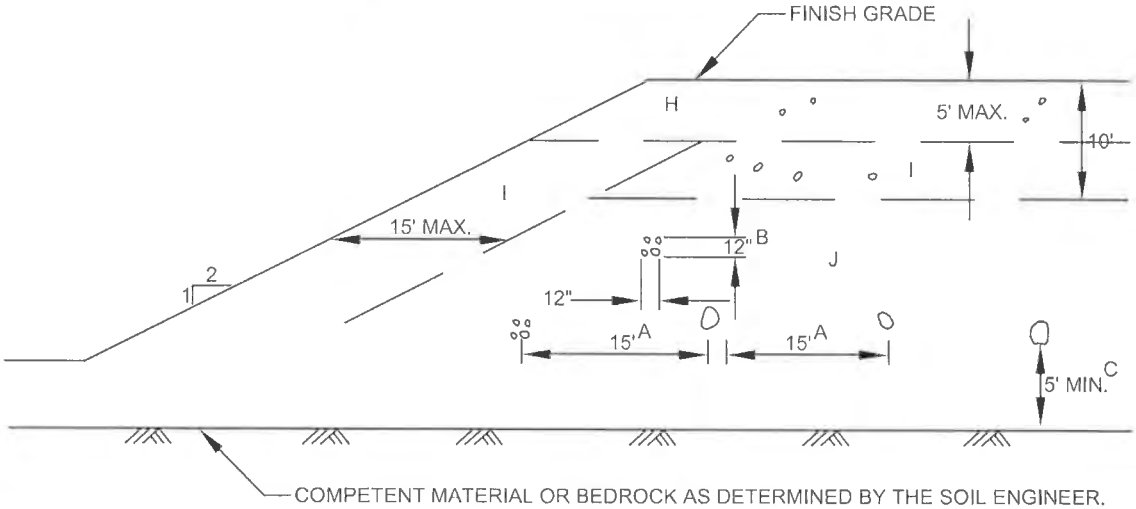
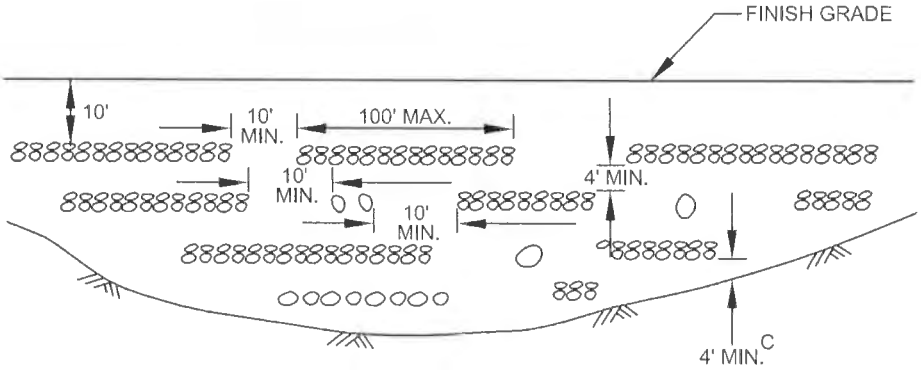
VIEW NORMAL TO SLOPE FACE



NOTE:

ORIENTATION OF WINDROWS MAY VARY BUT SHALL BE AS RECOMMENDED BY SOIL ENGINEER.
STAGGERING OF WINDROWS IS NOT NECESSARY UNLESS RECOMMENDED BY SOIL ENGINEER.

VIEW PARALLEL TO SLOPE FACE



NOTES:

A. ONE EQUIPMENT WIDTH OR A MINIMUM OF 15 FEET.

B. HEIGHT AND WIDTH MAY VARY DEPENDING ON ROCK SIZE AND TYPE OF EQUIPMENT.

C. IF APPROVED BY THE SOIL ENGINEER, WINDROWS MAY BE PLACED DIRECTLY ON COMPETENT MATERIALS OR BEDROCK PROVIDING ADEQUATE SPACE IS AVAILABLE FOR COMPACTION.

D. VOIDS IN WINDROW TO BE FILLED BY FLOODING GRANULAR SOIL INTO PLACE. GRANULAR SOIL SHALL MEAN ANY SOIL WHICH HAS A UNIFIED SOIL CLASSIFICATION SYSTEM (UBC 29-1) DESIGNATION OF SM, SP, SW, GM, GP, OR GW.

E. AFTER FILL BETWEEN WINDROWS IS PLACED AND COMPACTED WITH THE LIFT OF FILL COVERING WINDROW, WINDROW SHALL BE PROOF-ROLLED WITH D-9 DOZER OR EQUIVALENT.

F. OVERSIZED ROCK IS DEFINED AS LARGER THAN 6 INCHES IN SIZE.

G. ROCKS EXCEEDING 12 INCHES SHALL NOT BE USED AT THE SITE.

H. ROCKS NOT EXCEEDING 3 INCHES MAY BE USED WITHIN THIS ZONE.

I. ROCKS NOT EXCEEDING 6 INCHES MAY BE USED WITHIN THIS ZONE.

J. ROCKS NOT EXCEEDING 12 INCHES MAY BE USED WITHIN THIS ZONE.

SMC	TYPICAL OVERSIZE ROCK DISPOSAL		
JOB NO.: 13662-05	DATE: OCTOBER 2014	FIGURE NO.: G-7	

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