GEOTECHNICAL REPORT FOR

TENTATIVE TRACT MAP NO. 69164

CANYON COUNTRY, CALIFORNIA

VOLUME I OF II

FOR

VISTA CANYON RANCH, LLC

NOVEMBER 14, 2008

JOB NO. 2005-052-01

RTF&A
GEOTECHNICAL ENGINEERING & ENGINEERING GEOLOGY

RT&A
GEOTECHNICAL ENGINEERING & ENGINEERING GEOLOGY

November 14, 2008

Vista Canyon, LLC
27441 Tourney Road, Suite 260
Valencia, California 91355

Job No. 2005-052-01

Attention: Mr. Glenn Adamick

We are pleased to submit this Geotechnical Report for Tentative Tract Map No. 69164 in Canyon Country, California. The scope of work for this investigation was planned with Mr. Glenn Adamick of Vista Canyon Ranch, LLC and outlined in our proposal (P066R-2008-01) dated July 18, 2008,.

Alliance Land Planning & Engineering, Inc. provided us with a Tentative Tract Map for the site. The map was prepared at a scale of 1 inch equals 100 feet.

Proposed grading will include excavation into ridges and upland areas resulting in low angle cut slopes, and placement and compaction of engineered fill. Natural alluvium and uncertified fill will require removal and recompaction. Based on this investigation, the site is suitable for the proposed development as envisioned at this tentative tract stage. Assuming grading operations are performed in accordance with the recommendations in this report, the site will be safe from hazards of landslide, settlement, or slippage, and will not adversely affect adjacent properties.

For planning purposes, shallow footings are expected to be suitable for support of typical one- or two-story residential/industrial/commercial buildings. Perimeter footings should be continuous and extend beneath windows and doors. Floor slabs may be supported on grade. Both the footings and the floor slabs should be reinforced. Foundations for tall, especially heavy, or settlement sensitive buildings should be evaluated by site-specific investigations.

Should you have any questions regarding the information presented in this report, please contact our office.

Respectfully submitted,

R. T. FRANKIAN & ASSOCIATES

by: Douglas S. Santo
Principal Engineering Geologist

and: Dharmesh P. Amin
Principal Geotechnical Engineer

DSS/DPA/sjc

Distribution: (6) Vista Canyon, LLC
Attn: Mr. Glenn Adamick
(4) Alliance Land Planning & Engineering, Inc.
1- Attn: Mr. Craig Whittaker
(3 wet-signed copies for submittal to the City of Santa Clarita)

RTF&A
GEOTECHNICAL ENGINEERING & ENGINEERING GEOLOGY

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INTRODUCTION

This report presents our 100-Scale Plan Review of Tentative Tract Map 69164 (TTM 69164) in Canyon Country, California. The site is southeast of the Antelope Valley Freeway (I-14), southwest of Sand Canyon and generally northwest of the Metro Rail railroad tracks in Canyon Country, California. The site is shown on Figure 1.1.

The purpose of this investigation was to characterize surface and subsurface geologic conditions, identify geologic hazards and liquefaction potential, and develop recommendations for bulk grading, mitigation of geologic hazards, and preliminary building and utility design. The ultimate goal was to determine if the site is suitable for the proposed development as envisioned at the tentative tract map stage. Environmental conditions including the presence or absence of contaminants in the soil and groundwater were not investigated as part of this work.

Recommendations herein are based on review of previous work completed on site, and the results of our current field exploration, laboratory testing, and

engineering and geologic analyses. Logs of exploratory borings and laboratory test sheets are included in the appendices of this report.

This work was performed in accordance with generally accepted professional engineering geology and geotechnical engineering principles and practice in southern California at the present time. We make no other warranty either express or implied. This report was prepared for Vista Canyon Ranch, LLC and its design consultants to be used solely in design and filing of a tentative tract map for the site. The report was not prepared for use by other parties, and may not contain sufficient information for other purposes at other times. Additional studies will be required to develop recommendations for final grading plans.

SCOPE OF WORK

The scope of work for this investigation included:

- Research and review of published and unpublished technical reports and documents including data available from the California Geological Survey (CGS), California Division of Oil, Gas, and Geothermal Resources (DOGGR), US Geological Survey (USGS), and private consultants;

- Review and analysis of stereo-paired aerial photographs to identify geomorphic features suggestive of landslide or fault hazards (see References);

- Compilation of previous field exploration and laboratory testing completed on site by R. T. Frankian & Associates (RTF&A);

- Reconnaissance geologic mapping to verify results of our literature review and imagery analysis, identification of the type and areal

distribution of geologic units, and collection of structural information for bedrock formations;

- Preparation of geologic maps and cross sections;
- Subsurface exploration that included drilling, sampling, and geologic logging of exploratory borings using truck-mounted hollow-stem auger and bucket-auger drill rigs;
- Geotechnical laboratory testing of representative samples of earth materials;
- Engineering and geologic analyses to develop recommendations for design and construction of the project appropriate for the tentative tract phase of development, and
- Preparation of this report and accompanying illustrations.

PROPOSED DEVELOPMENT

Alliance Land Planning & Engineering, Inc. (Alliance) prepared a Tentative Tract Map for the site. The plan is dated October 10, 2008. The plan shows the site boundaries, proposed lots, roadways, cut and fill slopes and pad elevations. The plan was used as the base for the attached Geotechnical Map, Figures 1.1 through 1.3.

The site covers a total area of about 185 acres that is divided into four planning areas. The Tentative Tract Map includes about 162 lots and 1,117 residential units. Earthwork will involve about 590,000 yards of cut, 830,000 yards of fill, and 1.5 million yards of overexcavation. It is anticipated the project will require about 450,000 yards of imported clean soil.

The Tentative Tract Map includes the following:

- Planning Area 1 includes 10 multi-family residential lots covering 8.3 acres, 1 private drive and 3 landscape open space lots totaling 4.1 acres;

- Planning Area 2 includes 8 lots of multi-story residential units over parking covering 5.4 acres, 2 lots of multi-story retail units over parking covering 0.8 acres, 6 lots of multi-story office and retail units covering 5.6 acres, 4 lots of parking structures covering 5.2 acres, 1 lot for a theatre covering 0.7 acres, 2 lots for a hotel covering 1.6 acres, and 12 lots of private drives, parks and open space areas covering 10.6 acres;

- Planning Area 3 includes 49 lots of 2-story attached and detached residential units covering 24.9 acres, and 21 lots of private drives and open space areas covering 14.9 acres;

- Planning Area 4 includes 7 lots of 1- to 2-story commercial units covering 6.2 acres and 6 landscape and open space areas covering 4.4 acres;

- there are 9 lots of riverbank protection and 3 lots that encompass the Santa Clara River;

- the project will include an 650-foot long bridge spanning the Santa Clara River for the proposed extension of Vista Canyon Ranch Road;

- the project will include about 2,850 lineal feet of bank protection on the north bank of the Santa Clara River and about 4,400 feet on the south bank; and

- the development will include an extension to Lost Canyon Road and construction of numerous interior streets and associated utilities.

PREVIOUS INVESTIGATIONS

RTF&A has completed four previous investigations at the subject site that are relevant to the current investigation. RTF&A investigated Planning Areas 1 through 3 and presented results in a geotechnical constraints report dated February 10, 2006 (RTF&A, 2006). RTF&A completed a Phase I environmental site assessment for Planning Area 1 and presented results in our report dated June 18, 2007 (RTF&A, 2007c). An erodibility index analysis for Planning Area 4 was completed and our results presented in our report dated December 21, 2007 (RTF&A, 2007a). RTF&A completed a limited hydrogeologic analysis of groundwater resources available on site and presented results in our report dated May 20, 2008 (RTF&A, 2008).

Field exploration, laboratory testing, and portions of the engineering and geologic analyses from reports listed above are incorporated in this report and form a part of the basis of the findings and recommendations presented herein. A list references used in this work are presented at the end of the text.

SITE CONDITIONS

The site is an irregularly-shaped parcel that borders the Santa Clara River on the north and south. The bulk of the site is south of the river. A majority of the site is relatively flat lying with a low surface gradient to the northwest. Isolated bedrock ridges are located along the southeast property line. Bedrock is also exposed on the north bank of the river where it forms a resistant promontory. The site has numerous oak trees and small bushes and includes a sparse cover of non-native grasses. Fill and construction debris are located at the northeast corner of the site. The site is located in Township 4 north, Range 15 west and occupies portions of Sections 22 and 23. A

major water pipeline crosses the west portion of the site. Abandoned irrigation lines may be encountered locally. Shallow water lines servicing water wells may be located in the Santa Clara River Channel.

ABANDONED OIL WELLS

Review of the California Division of Oil, Gas, and Geothermal Resources (DOGGR) Regional Wildcat Map W1-2 (June 19, 1986) shows no oil wells on or immediately adjacent to the site. One plugged and abandoned dry hole is offsite located south of the railroad tracks in Section 22.

SUBSURFACE EXPLORATION

Subsurface exploration for this investigation was performed in August and September, 2008 and consisted of excavation, sampling, and logging six bucket-auger borings and 20 hollow-stem auger borings. Relatively undisturbed samples and bulk samples of soil and rock were obtained from the borings for laboratory testing. Exploratory boring information is summarized in Table A-1, in Appendix A. Summary boring logs are in Appendix A. Boring locations are shown on the Geotechnical Map, Figure 1.3.

Previous subsurface exploration included eight bucket-auger borings, four hollow-stem auger borings, and 13 Cone Penetration Test (CPTs) soundings. Previous exploration is included in Appendix B and summarized in Table A-1.

LABORATORY TESTS

Laboratory tests were performed on samples obtained from the borings to aid in the classification of the soils and to determine their pertinent engineering properties. Results of the laboratory tests we performed as part of the current investigation are presented in Appendix B. Complete laboratory testing from the previous investigations and reports are also presented in Appendix B.

SOIL CORROSIVITY

Schiff Associates (Schiff) performed soil corrosivity testing on samples of on-site soils that we provided to them during our investigations. Three samples of on-site soils were tested recently. One sample was tested during our past investigation dated December 21, 2007 (RTF & A, 2007a). Copies of the corrosion test results both past and current are attached in Appendix B. Tests indicate that on-site soils are mildly to severely corrosive to ferrous metals. Sulfate attack on portland cement concrete is moderate to negligible.

The corrosion potential of site soils exposed at rough grade should be tested again after site grading is complete and the final foundation design should be based on those test results.

GEOLOGY

REGIONAL GEOLOGY

TTM 69164 is located in the Soledad Basin within the Transverse Ranges geomorphic province of California. The Soledad Basin is a narrow elongate sedimentary trough that generally coincides with the Santa Clara River Valley. The

Soledad basin includes a thick section of fluvial and lacustrine beds overlain by marine strata. The oldest beds correlate with the Oligocene Vasquez Formation which rest unconformably on Precambrian gabbro-anorthosite rock. The youngest rock northeast of the San Gabriel Fault is the Plio-Pleistocene Saugus Formation (Saul and Wootton, 1983).

SITE GEOLOGY

Geologic Materials: Soil and bedrock materials encountered on site consist of artificial fill, alluvium, slopewash/colluvium, terrace deposits, and bedrock assigned to the Mint Canyon Formation. The areal extent of the various geologic units is depicted on the Geotechnical Maps, Figures 1.1 through 1.3. Interpreted subsurface conditions are shown on the Geotechnical Cross Sections (Figure 2). Following is a brief description of the earth materials with emphasis on their engineering geologic characteristics.

Mint Canyon Formation Deltaic Facies (Tmc): Mint Canyon Formation underlies the site at depth and is exposed at ground surface in Planning Areas 2, 3, and 4. This unit consists of fine to coarse grained arkosic sandstone interbedded with conglomerate and siltstone. The rock is hard when struck with a rock pick and difficult to excavate with standard drill rigs. Beds are several inches to several feet thick and have diffuse planar contacts. The color is light gray to brown. The rock mass shows few widely spaced joints. Joint spacing is in excess of 20 feet. Joints are tight with no separation and continuous over 3 feet to 10 feet. Joint surfaces are rough and irregular and may show no coating or a coating of disseminated carbonate

or oxide. Joint attitudes measured in outcrop show one primary joint set with scatter. The primary joint set has a north strike with a west dip around 80°.

Two mudstone beds are located in Planning Area 4 where they are exposed in the south facing slope. The beds are 12 to 18 inches thick with sharp contacts. The beds are weathered and oxidized in outcrop. No evidence was observed of shear surfaces or large lateral deformation. The beds are separated stratigraphically by 12 to 15 feet. The lower bed was encountered in Boring B-8. The upper bed is eroded and no longer present at the location of Boring B-8. Mudstone beds may be subject to expansion when exposed to repeated cycles of wetting. Where mudstone beds are isolated between non-expansive, coarse-grained horizons differential expansion may occur. Differential expansion can be detrimental to structures. Recommendations to mitigate such conditions are presented in subsequent sections of this report.

Terrace Deposits (Qt): Pleistocene age terrace deposits cap the Mint Canyon Formation in some areas. Terrace deposits consist of massive to poorly bedded sand, gravel and silt. Cobbles and boulders are common. The unit is loose and poorly consolidated. The color is yellowish brown to brown.

Alluvium (Qal): Holocene age alluvial deposits blanket much of the site. Alluvial deposits consist of loose to dense mixtures of sand, silty sand, and gravelly sand. Cobbles and boulders are common. Silt layers were identified in some areas. Coarse grain materials are generally found in proximity to the active channel of the Santa Clara River. Fine grain materials are generally found near the southeast margin of the site. Fine grain materials are generally stiff to hard.

Artificial Fill (af): Masses of artificial fill are located south of the site and were placed for railroad bed construction. Isolated areas of fill and construction debris are located in Planning Area 3.

Artificial fill of unknown origin blankets the south half of Planning Area 1. Fill materials were not properly compacted under the observation of a geotechnical engineer. Fill soils mainly consist of loose, clast supported mixtures of angular concrete blocks with a silty sand matrix. These materials are four to eight feet thick.

Slopewash (Qsw): Slopewash blankets slopes in Planning Areas 2, 3, and 4. Slopewash deposits are generally less than five feet thick. The material consists of loose sand, gravel, and silt.

Geologic Structure: The Mint Canyon Formation has been warped into a north striking homoclinal structure with northwest dips between 20° to 40°.

Bedding: Bedding planes within the Mint Canyon Formation vary from diffuse and gradational to sharp and planar. A daylighted bedding condition may be present in west and northwest facing slopes.

Faults: Faults in southern California are classified active, potentially active, and inactive, based on their most recent activity. Fault activity is defined by California law and interpreted by the CGS (Hart, 1999) for the Alquist-Priolo Earthquake Fault Zone program. A fault can be considered active if it has demonstrated movement within the Holocene epoch, or approximately the last 11,000 years. Faults that have demonstrated Quaternary movement (last 1.6 million years), but lacking strong evidence of Holocene movement, are classified as potentially active. Faults that have not moved since the beginning of the Quaternary period are deemed inactive.

San Gabriel Fault Zone: The active San Gabriel fault zone, located approximately 1.5 miles southwest of the site, consists of a northwest-trending zone of imbricate steeply north-dipping faults. The fault has strong geomorphic expression characterized by displaced geologic units, deflected drainages, strike valleys, notched ridges, subparallel faulting, fracturing and folding (Oakeshott, 1958; Wentworth and Yerkes, 1971). According to Oakeshott (1958), the zone of faulting ranges in width from a single plane with no more than a few inches of gouge, to a half-mile wide area of several fault planes, zones of brecciation, and complex steep-limbed folds.

No known active faults project into or cross the site. The site is not located in a State of California Alquist-Priolo Earthquake Fault Zone.

Faults confined to the Mint Canyon formation are mapped adjacent to the site on the east and southeast. These faults are part of the informally named Sulphur Springs fault. The Sulphur Springs fault is not considered active.

Landslides: No known landslides are located on site based on regional geologic maps. Reconnaissance level geologic mapping completed as part of this investigation indicates no deep-seated landslides are present. A shallow surficial failure is located on a bedrock ridge off-site to the southeast. Minor surficial erosion was noted on bedrock ridges within the project boundaries. The site is located within a State of California Seismic Hazard Zone for Earthquake Induced Landsliding.

GROUNDWATER

Groundwater was encountered in six borings at the subject site. This data is summarized in Table 1. No surface water or seeps were observed.

Table 1.

Boring	Depth to Groundwater	Date
HS-1	44'	5/31/07
B-1	17'	12/7/05
B-3	12'	12/7/05
B-4	15'	12/7/05
B-5	34'	12/7/05
B-6	52'	12/12/05

The Los Angeles County Department of Public Works (LACDPW) has water level records for two wells located in the channel of the Santa Clara River adjacent to the site. The wells are 7178B and 7168C. Well records are in Appendix E. Well locations are shown on the Geotechnical Maps, Figures 1.1 through 1.3. Water level records are generally collected twice a year, with one reading in April or May and the second reading in October or November. Readings date back to 1948 for one of the wells. Records indicate wide variation in the elevation of the water table. Historic high water is between 9 to 17 feet below ground surface. Historic low water is between 96 to 99 feet below ground surface. Groundwater well data is presented in Appendix E. There is usually a strong correlation between time of year and water table elevation. High water table elevation coincides with winter months, and low water table elevation coincides with summer months. Sometimes a high or low water table will persist year-round depending on rainfall.

DEBRIS FLOW HAZARD

Debris flows, consisting of a moving mass of heterogeneous debris lubricated by water, are generated by shallow soil slips in response to heavy rainfall. Debris flows "occur during, and only during, heavy rainfall" (Campbell, 1975). Landslides depend on deep percolation of groundwater and may not respond to the effects of heavy rainfall until long after a storm according to Campbell (1975), damage from debris flows is due chiefly to inundation by or high-velocity impact of the debris mass. Campbell identifies three conditions for debris flow potential:

- a mantle of colluvial soil or a wedge of colluvial ravine soil;
- a slope angle ranging from 27 to 56 degrees (slopes steeper than 56 degrees generally do not have a continuous mantle of colluvium and are most commonly bare bedrock); and
- soil moisture equal to or greater than the colluvial soil's liquid limit.

Debris flows are not considered a significant hazard at the subject site due to the absence of tall slopes combined with proposed site grading.

SLOPE STABILITY ANALYSES

GENERAL

Five major cut slopes and modified natural slopes are proposed on site. These are numbered CS-1 through CS-5 on the Geotechnical Map. Engineering geologic conditions for each slope are summarized in Table 2. Cut slope heights will be 40 feet

or less. Slope ratios will be 2:1 (horizontal:vertical) or less. Geologic sections were completed through the largest cut and natural slopes.

Table 2. Cut Slope Summary.

Slope No	Max Height	Length of Cut	Slope Ratio (horz:vert)	Geologic Material	Geologic Comments
CS-1	~20'	~500'	2:1	Mint Canyon	North to northwest facing cut that will expose Mint Canyon Formation and terrace deposits along its entire length and height. Bedrock in this area is sandstone and conglomerate. Bedding dips steeper than the proposed cut and bedding plane failures are unlikely given the nature of the materials present and the dip of bedding. Cut is geologically stable.
CS-2	~15'	~250'	3:1	Mint Canyon	North to northwest facing cut that will expose Mint Canyon Formation along its entire length and height. Bedrock in this area is sandstone. Bedding dips steeper than the proposed cut. Bedding plane failures are unlikely given the nature of the materials present and the dip of bedding. Cut is geologically stable.
CS-3	~40'	~300'	2:1	Mint Canyon	North to northwest facing natural slope over cut that will expose Mint Canyon Formation for most of its length and height. Bedrock in this area is sandstone and conglomerate. Bedding dips steeper than the proposed cut, but components of bedding may dip at roughly the same angle as the cut depending on orientation. Bedding plane failures are unlikely given the nature of the materials present and the dip of bedding. Cut is geologically stable.
CS-4	~30'	~200'	0.5:1	Mint Canyon	East facing natural slope that will expose Mint Canyon Formation along its entire length and height. Some terrace deposits will also be exposed. Bedrock in this area is sandstone and conglomerate. The rock is hard and difficult to excavate with conventional drill rigs. Bedding dips into slope. Failures are unlikely given the nature of the materials present and the dip of bedding. Cut is geologically stable.
CS-5	~30'	~300'	2:1	Mint Canyon	South to southeast facing cut that will expose Mint Canyon Formation along its entire length and height. Bedrock in this area is sandstone and conglomerate. Locally the slope will be fill over cut. Bedding dips into slope. Bedding plane failures are unlikely given the nature of the materials present and the dip of bedding. Cut is geologically stable.

STABILITY ANALYSES

Two-dimensional limit equilibrium analyses were performed using the computer program GSTABL7 Version 2.004 (June 2003) of "GSTABLE7 with STEwin"(tm), a software package supplied by Gregory Geotechnical Software. Potential failure planes (both circular and along bedding) were analyzed using The Modified Bishop's Method (circular) and The Simplified Janbu's Method (bedding), and the analyses accounted for both static and seismic conditions. Our slope stability analyses are presented in Appendix D. Slope stability calculations were performed for a typical compacted fill slope up to 50 feet high, and for critical Geologic Cross Sections D-D', E-E' and F-F'. The analyzed cut-slopes, proposed grades, and compacted fill slopes comply with the City of Santa Clarita building code minimum requirements for gross stability under static and pseudostatic (seismic coefficient of 0.15g) loading conditions (static factors of safety in excess of 1.5, and seismic factors of safety in excess of 1.1), provided our recommendations are followed and incorporated into project construction.

SHEAR STRENGTH PARAMETERS

Shear strength parameters used for slope stability analyses were based on laboratory testing performed for the Geotechnical Constraints Investigation report dated February 10, 2006 (RTF&A, 2006), the Erodibility Index Analyses report dated December 21, 2007 (RTF&A, 2007b), and additional tests performed by our office as part of the current investigation.

Presented in Table 3 below are the recommended shear strengths for use at the subject site. The shear test results are considered to be effective values; that is, they

require hydrostatic pressures be considered in a stability analysis. A description of the testing procedures is included in Appendix B and the direct shear test results for the current and past investigations are presented in Appendix B.

Table 3
Summary of Shear Strength Parameters

MATERIAL	Cohesion (psf)	Angle of Internal Friction (degrees)
Mint Canyon Cross-Bedding	600	29
Mint Canyon Along Bedding (static)	250	22
Mint Canyon Along Bedding (Pseudostatic)	400	29
Compacted Fill	300	35
Terrace Deposits	300	28
Alluvium	450	35

LIQUEFACTION POTENTIAL

General: Liquefaction may occur when saturated, loose to medium dense, cohesionless soils are densified by ground vibrations. The densification results in increased pore water pressures if the soils are not sufficiently permeable to dissipate these pressures during and immediately following an earthquake. When the pore water pressure is equal to or exceeds the overburden pressure, liquefaction of the affected soil layers occurs. For liquefaction to occur, three conditions are required:

- Ground shaking of sufficient magnitude and duration;
- A ground water level at or above the level of the susceptible soils during the ground shaking; and

- Soils that are susceptible to liquefaction.

Even if some soil layers do liquefy, the affects of the liquefaction will not be observed on the ground surface if a sufficient thickness of non-liquefiable soils overlies the liquefiable soils.

Ground settlement may occur during seismic shaking of an area. The settlement can be caused by liquefaction of loose granular soils and by consolidation of soft, but not necessarily liquefiable, soils. Lateral spreading can occur when a site is sloped or is adjacent to a free face.

The Seismic Hazard Zone Map for the Mint Canyon Quadrangle (1999) indicates that the alluvial areas along the Santa Clara River are within areas that are classified as being potentially susceptible to liquefaction.

Alluvial Areas: Alluvial areas are within zones mapped by CDMG as having potentially liquefiable soils. The density and shear strength of the on-site soils in those areas were measured using Standard Penetration Tests (SPT) supplemented with CPT soundings.

Hillside Areas: Bedrock materials of the Plio-Pleistocene age Mint Canyon Formation are exposed at or near the ground surface over the north and south margins of the site. These materials are not susceptible to liquefaction.

Analyses: For the computation of liquefaction potential, ground acceleration of 0.53g was used, based on the Seismic Hazard Zone Report for the Mint Canyon 7.5-Minute Quadrangle. We assumed the groundwater level would rise to within nine to 15 feet of the existing ground surface based on Wells 7178b and 7168c, and on borings performed for this investigation. Liquefaction analyses were performed on

the CPT data using the methodology presented by Robertson and Fear (1996). Seismically induced settlements were estimated using the procedure developed by Tokimatsu and Seed (1987). The results of our liquefaction analyses are presented in Appendix C.

Conclusions: Based on the results of our analyses using the CPT data, some sandy soil layers beneath the site may liquefy in the event of a large earthquake on a nearby fault that produces the design-level ground motions. However, due to the proposed increase in the existing site grades shown on the attached Geotechnical Maps, the potentially liquefiable soil layers will be overlain by sufficient thicknesses of non-liquefiable soils so that surface expression of liquefaction (such as sand boils or ground cracks) are not expected to occur. The recommended grading of the site includes removal of the upper soils, and their replacement with properly compacted fill. The recommended removals and the proposed site grades will mitigate the potential for surface expression of liquefaction.

Lateral Spreading: Lateral spreading can occur when a site is sloped or is adjacent to a free face. The site is essentially level, currently sloping at 30:1 or flatter towards the Santa Clara River. Except at the eastern end of the site, where the potential for liquefaction of the underlying soils occurring is low, the bank of the river does not currently present a free face to the site. Development of the site will result in an approximately 25-foot high slope inclined at 4:1 along the river. The proposed slope will consist entirely of compacted fill and soil cement bank protection will be buried within the slope. If the site is graded as recommended, soils that could potentially liquefy and result in lateral spreading will be removed and replaced with

compacted fill. Lateral spreading will be further evaluated during the geotechnical investigation of the proposed bank protection.

CONCLUSIONS

GEOLOGIC CONSIDERATIONS

Erosion Potential: Friable sandstone beds are common within the Mint Canyon Formation and are present at the site. If exposed in graded slopes, these beds could be subject to erosion and rilling due to the lack of cementation. Under most circumstances, the erosion can be controlled by adhering to the provisions of the grading code and establishing vegetative cover upon completion of grading. The presence of erosion-susceptible beds should be determined during rough grading. Extensive or thick deposits of the friable beds may warrant the construction of stabilization fills during rough grading.

Rippability: Grading operations can be performed using conventional grading equipment. Heavy ripping may be needed when excavating well-cemented sandstone or conglomerate beds.

Sewage Disposal: Sewage disposal is expected to be by sewers.

RESTRICTED USE AREAS

No geologic restricted use areas have been designated on site.

RECOMMENDATIONS

GRADING

General: The following sections present recommendations for treatment of cut and fill slopes, and grading. The applicability of the preliminary recommendations given in the following sections for foundation and retaining wall design should be confirmed at the completion of grading. Paving studies and soil corrosivity tests should be performed at the completion of rough grading to develop detailed recommendations for protection of utilities, structures, and for construction of the proposed roads.

Site Preparation: Prior to performing earthwork, the existing vegetation and any deleterious debris should be removed from the site. Existing utility lines should be relocated or properly protected in-place. All unsuitable soils, uncertified fills, artificial fills, slopewash, upper loose terrace deposits, and upper loose alluvial soils in the areas of grading receiving new fill should be removed to competent earth materials and replaced with engineered fill. The depth of removal and recompaction of unsuitable soils is noted on the Geotechnical Map. Any fill required to raise the site grades should be properly compacted.

Removal Depths: The required depth of removal and recompaction of the existing compacted fill or natural soils are indicated on the Geotechnical Map. Deeper removals will be required if disturbed or unsuitable soils are encountered during project grading as directed by the Project Geotechnical Consultant. After excavation of the upper natural soils on hillsides and in canyons, further excavation should be performed, if necessary and as directed by the Project Geotechnical Consultant, to remove slopewash or other unsuitable soils. Additional removals will

also be required for transition lots and where expansive bedrock occurs as directed by the Project Geotechnical Consultant.

The Project Geotechnical Consultant may require that additional shallow excavations be made periodically in the exposed bottom to determine that sufficient removals have been made prior to recompacting the soil in-place. Deeper removals may be recommended by the Project Geotechnical Consultant based on observed field conditions during grading. During grading operations, the removal depths should be observed by a representative of the Project Geotechnical Consultant and surveyed by the Project Civil Engineer for conformance with the recommended removal depths shown on the grading plan.

Material for Fill: The on-site soils, less any debris or organic matter, may be used in the required fills. Any expansive clays should be mixed with non-expansive soils to result in a mixture having an expansion index less than 30 if they are to be placed within the upper 8 feet of the proposed rough grades.

Rocks or hard fragments larger than 8 inches may not be placed in the fill without special treatment. Rocks or hard fragments larger than 4 inches shall not be clustered or compose more than 25% by weight of any portion of the fill or a lift. Soils containing more than 25% rock or hard fragments larger than 4 inches must be removed or crushed with successive passes (e.g., with a sheepsfoot roller) until rock or hard fragments larger than 4 inches constitute less than 25% of the fill or lift.

Oversized Material: Rock or material greater than 8 inches in diameter, but not exceeding 4 feet in largest dimension shall be considered oversize rock. The oversize rocks can be incorporated into deep fills where designated by the Project Geotechnical Consultant. Rocks should be placed in the lower portions of the fill and

should not be placed within the upper 15 feet of compacted fill, or nearer than 15 feet to the surface of any fill slope. Rocks between 8 inches and 4 feet in diameter shall be placed in windrows or shallow trenches located so that equipment can build up and compact fill on both sides. The width of the windrows shall not exceed 4 feet. The windrows should be staggered vertically so that one windrow is not placed directly above the windrow immediately below. Rocks greater than 1 foot in diameter shall not exceed 30% of the volume of the windrows. Granular fill shall be placed on the windrow, and enough water should be applied so that soil can be flooded into the voids. Fill should be placed along the sides of the windrows and compacted as thoroughly as possible. After the fill has been brought to the top of the rock windrow, additional granular fill should be placed and flooded into the voids. Flooding is not permitted in fill soils placed more than 1 foot above the top of the windrowed rocks.

Where utility lines or pipelines are to be located at depths greater than 15 feet, rock shall be excluded in that area. Excess rock that cannot be included in the fill, or that exceeds 4 feet in diameter, should be stockpiled for export or used for landscaping purposes.

Import Material: Import material should consist of relatively non-expansive soils with an expansion index less than 30. The imported materials should contain sufficient fines (binder material) so as to be relatively impermeable and result in a stable subgrade when compacted. The import material should be free of organic materials, debris, and rocks larger than 8 inches. A bulk sample of potential import material, weighing at least 25 pounds, should be submitted to the Project Geotechnical Consultant at least 48 hours in advance of fill operations. All proposed

import materials should be approved by the Geotechnical Consultant prior to being placed at the site.

Compaction: After the site is cleared and excavated as recommended, the exposed soils should be carefully observed for the removal of all unsuitable material. Next, the exposed subgrade soils should be scarified to a depth of at least 6 inches, brought to above optimum moisture content, and rolled with heavy compaction equipment. The upper 6 inches of exposed soils should be compacted to at least 90% of the maximum dry density obtainable by the ASTM D 1557-02 Method of Compaction.

After compacting the exposed subgrade soils, all required fills should be placed in loose lifts, not more than 8 inches in thickness, and compacted to at least 90% of their maximum density. For fills placed at depths greater than 40 feet below proposed finish grade a minimum compaction of 93% of the maximum dry density is required. The moisture content of the fill soils at the time of compaction should be above the optimum moisture content. Compacted fill should not be allowed to dry out before subsequent lifts are placed.

Rough grades should be sloped so as not to direct water flow over slope faces. Finished exterior grades should be sloped to drain away from building areas to prevent ponding of water adjacent to foundations.

Shrinkage and Bulking: In computing fill quantities, about 10 to 15% shrinkage of the upper 5 feet is estimated for on-site natural alluvial soils, slopewash, and unsuitable soils. That is, it will require approximately 1.15 cubic yards of excavated alluvium to make 1 cubic yard of fill compacted to 90% of the maximum dry density. About 10% shrinkage of the alluvium between depths of about 5 to

10 feet is estimated, as well as 5% shrinkage below a depth of about 10 feet. Additional loss of material may be due to stripping, clearing, and grubbing.

A bulking value of about 5 to 10% is anticipated for materials generated from the bedrock when placed as compacted fill. The removal of oversize material generated by excavation of the bedrock may affect volume losses.

Temporary Slopes: For purposes of construction, the soils encountered at the site should not be expected to stand vertically for any significant length of time in cuts 4 feet or higher. Where the necessary space is available, temporary unsurcharged embankments may be sloped back at a 1:1 gradient without shoring, up to a height of 45 feet in competent bedrock with favorable bedding. Where any cut slope exceeds a height of 50 feet within competent bedrock, a bench at least 10 feet wide should be located at mid-height. Within alluvial or compacted fill material, temporary excavations may be made at a 1¼:1 cut to a height of 25 feet. If the temporary construction embankments are to be maintained during the rainy season, berms are recommended along the tops of the slopes where necessary to prevent runoff water from entering the excavation and eroding the slope faces.

Where sloped embankments are used, the tops of the slopes should be barricaded to prevent vehicles and storage loads within five feet of the tops of the slopes. A greater setback may be necessary when considering heavy vehicles, such as concrete trucks and cranes; the Project Geotechnical Consultant of Record should be advised of such heavy vehicle loads so that specific setback requirements can be established.

All applicable safety requirements and regulations, including OSHA regulations, should be met.

Permanent Slopes: Permanent cut and fill slopes may be inclined at 2:1 or flatter. The current bulk grading plan indicates that the steepest slope to be constructed at the site during grading will be 2:1.

Proposed Cut Slopes: Cut slopes proposed for the rough grading of the subject site have been designated as shown on the Geotechnical Map. Each cut slope is discussed with specific recommendations presented in the "Slope Stability Analyses" section of this report. All grading should conform to the minimum recommendations presented in this report. If these slopes are modified from those that are discussed in this report, the modifications should be reviewed by the Project Geotechnical Consultant to ascertain the applicability of our recommendations.

Fill Slopes: Where the toe of a fill slope terminates on natural, fill, or cut, a keyway is required at the toe of the fill slope. The keyway should be a minimum width of 12 feet, be founded within competent material, and should extend a horizontal distance beyond the toe of the fill to the depth of the keyway. The keyway should be sloped back at a minimum gradient of 2% into the slope. The width of fill slopes shall be no less than 8 feet and under no circumstances should the fill widths be less than what the compaction equipment being used can fully compact. Benches should be cut into the existing slope to bind the fill to the slope. Benches should be step-like in profile, with each bench not less than 4 feet in height and established in competent material. Compressible or other unsuitable soils should be removed from the slope prior to benching. Competent material is defined as being essentially free of loose soil, heavy fracturing, or erosion-prone material and is established by the Geotechnical Consultant during grading.

Where the top or toe of a fill slope terminates on a natural or cut slope and the natural or cut slope is steeper than a gradient of 3:1, a drainage terrace with a width of at least 6 feet is recommended along the contact. As an alternative, the natural or cut portion of the slope can be excavated and replaced as a stability fill to provide an all-fill slope condition.

When constructing fill slopes, the grading contractor shall avoid spillage of loose material down the face of the slope during the dumping and rolling operations. Preferably, the incoming load shall be dumped behind the face of the slope and bladed into place. After a maximum of four feet of compacted fill has been placed, the contractor shall backroll the outer face of the slope by backing the tamping roller over the top of the slope and thoroughly covering all of the slope surface with overlapping passes of the roller. The foregoing should be repeated after the placement of each four-foot thickness of fill. As an alternative, the fill slope can be over built and the slope cut back to expose a compacted core. If the required compaction is not obtained on the fill slope, additional rolling will be required prior to placement of additional fill, or the slope shall be overbuilt and cut back to expose the compacted core.

Slope Planting: In order to reduce the potential for erosion, all cut and fill slopes should be seeded or planted with proper ground cover as soon as possible following grading operations in accordance with applicable sections of the City of Santa Clarita Municipal Code. The ground cover should consist of drought-resistant, deep-rooting vegetation. A landscape architect should be consulted for ground cover recommendations, plant selection, installation procedures, and plant care requirements.

DRAINAGE

Subdrains: Canyon subdrains are recommended to intercept and remove groundwater within canyon fill areas. All subdrains should extend up-canyon, with the drain inlet carried to within 15 feet of final pad grade. Specific subdrain locations and recommendations should be provided as part of the future rough grading plan review.

BEDROCK OVEREXCAVATION

Bedrock should be over-excavated to a minimum depth of five feet below lots and streets. Bedrock should be overexcavated to a depth of at least three feet below proposed soil subgrade areas receiving pavement or hardscape improvements.

EXPANSIVE BEDROCK

Mint Canyon Formation bedrock materials exposed at pad grade may contain expansive claystone beds that could cause differential expansion. Therefore, within building areas at locations where expansive Mint Canyon Formation units are exposed at pad grade, it is recommended that the bedrock be removed and recompacted to a depth of at least eight feet below the proposed final pad elevations or five feet below the bottom of proposed footings, whichever is greater. The soils generated by these over-excavations should be mixed with non-expansive soils to yield a relatively non-expansive mixture. Should the resulting fill soil still be expansive, special construction techniques such as pad subgrade saturation or post-tensioned slabs may be required at the discretion of the Project Geotechnical Consultant to reduce the potential for expansive soil related distress.

TRANSITION LOTS

Proposed building pads located in a cut and fill transition zone may experience cracking and movement of the footings and slab due to differing compressibility of the fill, as compared to the bedrock material. To reduce the potential for cracking and differential settlement, the portion of the lot in bedrock should be over-excavated to a depth of at least five feet below the proposed finished pad elevation; or three feet below the bottom of proposed footings, whichever is greater. The over-excavation should extend at least five feet laterally beyond the building limits. Where removal and recompaction for potentially expansive soils or bedrock is also required, it is recommended that the eight-foot removals be performed as described in the "Expansive Bedrock" section of this report.

Foundation and floor slabs for structures located within a transition zone should also contain special reinforcement as designed by the Project Structural Engineer. Continuous footings located across the transition zone and 20 feet on either side of the contact should incorporate a minimum of two No. 4 bars, one at the top and one at the bottom.

Floor slabs located across the transition zone and 20 feet on either side of the contact should have a minimum slab thickness of at least 4 inches and should contain as a minimum No. 4 bars spaced a maximum of 18 inches on center. As an alternative, post-tensioned floor slabs may be used.

FOUNDATIONS

General: Residential and commercial buildings up to three stories in height may be supported on continuous or individual spread footings established in properly

compacted fill. The following recommendations should be considered preliminary since fill will be used in some lots to raise the site grade and the final design values will depend upon the engineering characteristics of the fill soil. The preliminary design values are based upon this investigation, our experience with the soils in the area, and with the site preparation and grading recommendations for this project.

Bearing Capacity: It is assumed that the proposed buildings will be founded at approximately final planned grades, with column loads less than 100 kips, and have normal floor loads with no special requirements. Individual column pads or wall footings for buildings should have a width of at least 12 inches and be placed at a depth of at least 18 inches below the lowest final adjacent grade.

Structures may be placed on spread footings designed using a bearing value of 2,000 pounds per square foot (psf). The recommended bearing value is a net value, and the weight of concrete in the footings may be taken as 50 pounds per cubic foot (pcf). The weight of soil backfill may be neglected when determining the downward loads from the footings. A one-third increase in the bearing value may be used when considering wind or seismic loads.

While the actual bearing value of the fill placed at the site will depend on the materials used and the compaction methods employed, the quoted bearing value will be applicable if acceptable soils are used and are compacted as recommended. The bearing value of the fill should be confirmed during grading.

Lateral Resistance: Lateral loads may be resisted by soil friction and by the passive resistance of the soils. A coefficient of friction of 0.4 applied to the dead loads may be used between the footings, floor slabs, and the supporting soils. The passive resistance of properly compacted fill soils may be assumed to be equal to the pressure

developed by a fluid with a density of 250 pcf. The frictional resistance and the passive resistance of the soils may be combined without reduction in determining the total lateral resistance.

Settlement: Provided that conventional residential and commercial structures are founded in compacted fill soils as recommended, we estimate that the maximum settlement will be less than one inch, and that differential settlements will be less than ¾ inch within a horizontal distance of 30 feet.

Foundation Observations: To verify the presence of satisfactory soils at foundation design elevations, the excavations should be observed by the Project Geotechnical Consultant. Excavations should be deepened as necessary to extend into satisfactory soils. Where the foundation excavations are deeper than four feet, the sides of the excavations should be sloped back at ¾:1 or shored for safety.

Inspection of foundation excavations may also be required by the appropriate reviewing governmental agencies. The contractor should be familiar with the inspection requirements of the reviewing agencies.

CALIFORNIA BUILDING CODE SEISMIC DESIGN

The following coefficients and factors apply to seismic force design of structures at the subject site based on the 2007 California Building Code. The parameters were determined using the Ground Motion Parameter Calculator (Version 5.0.9) available at the United States Geologic Survey (USGS) Earthquake Hazards website.

Latitude	34.41599
Longitude	-118.4342
Site Class	D
Ss	1.810
S1	0.673
SMs	1.810
SM1	1.009
SDs	1.207
SD1	0.673

RETAINING WALLS

General: Backfill placed behind retaining walls should be compacted to a minimum of 90% of the maximum dry density as determined by ASTM D 1557. When backfilling behind walls, it is recommended the walls be braced and heavy compaction equipment not be used closer to the back of the wall than the height of the wall.

Lateral Earth Pressures: For design of non-building retaining walls, where the surface of the backfill is level and the retained height of soils is less than 15 feet, it may be assumed that drained, non-expansive soils will exert a lateral pressure equal to that developed by a fluid with a density of 35 pcf. Where the surface of the backfill is inclined at 2:1, it may be assumed that drained soils will exert a lateral pressure equal to that developed by a fluid with a density of 47 pcf.

In addition to the recommended earth pressures, the walls should be designed to resist any applicable surcharges due to any nearby foundations, walls, storage or traffic loads. A drainage system, such as weepholes or a perforated pipe should be

provided behind the walls to prevent the development of hydrostatic pressure. Recommendations for wall drains are presented as follows.

If a drainage system is not installed, the walls should be designed to resist an additional hydrostatic pressure equal to that developed by a fluid with a density of 60 pcf against the full height of the wall. In addition to the recommended earth and hydrostatic pressures, the upper 10 feet of walls adjacent to vehicular traffic areas should be designed to resist a uniform lateral pressure of 100 psf. This pressure is based on an assumed 300 psf surcharge behind the walls due to normal traffic. If the traffic is kept back at least 10 feet from the walls, the traffic surcharge is not required.

Wall Drainage: A drainage system should be provided behind all retaining walls or the walls should be designed to resist hydrostatic pressures. Retaining wall backfill may be drained by a perforated pipe installed at the base and back side of the wall. The perforated pipe should be at least four inches in diameter, placed with the perforations down, and be surrounded on all sides by at least six inches of gravel. The pipe should be installed to drain at a gradient of between 0.5 to 1% and should be connected to an outlet device. A filter fabric such as Mirafi 140 or equivalent should be placed on top of gravel followed by a minimum two feet thick compacted soil layer. Alternatively, the filter fabric and gravel is not required when using a continuous slotted pipe and graded sand which conforms to Los Angeles County Flood Control District (LACFCD) "F1 " Designated Filter Material.

The backside of the wall should be waterproofed. A 6-inch vertical gravel chimney drain, Miradrain, or equivalent, should be placed behind retaining walls and extend to within 18 inches below the top of the wall backfill to provide a drainage

path to the perforated pipe. The top of the vertical drain should be capped with 18 inches of onsite soils.

The drainage system should be observed by the Geotechnical Consultant prior to backfilling the retaining wall. Inspection of the drainage system may also be required by the reviewing governmental agencies.

CHANNEL LINING

General: The proposed development includes a proposed soil cement channel liner. Detailed construction plans for the soil cement channel liner are not yet available and will be geotechnically reviewed in a future report. The following preliminary recommendations can be used in the planning of the proposed bank protection. The grading recommendations presented in the preceding sections are also applicable to the proposed channel lining. Overexcavation of the natural soils is not expected to be required for the lining, though existing fill soils should be excavated and replaced with compacted fill. The backcut for the channel lining may be sloped back at 1¼:1. Concrete lined and soil-cement channel liners may be inclined at 1½:1 or flatter. Grouted and ungrouted rip-rap liners may be inclined at 2:1 or flatter.

Soil Cement: It is expected that portions of the on-site alluvial soils will be suitable for use in soil-cement. For estimating purposes, a cement content of 8 to 12%, by weight, may be used. To determine the actual required cement content, the granular soils that are to be used in a soil-cement channel lining should be stockpiled. Representative samples of the stockpiled material should be mixed with varying amounts of cement, compacted, and cured for different time intervals. Based on the

results of unconfined compression tests on the samples of the soil-cement mixtures, the actual cement content to be used during construction can be determined. This testing should take place when soil intended for soil cement manufacture has been stockpiled on site.

The soil-cement should be placed in layers not more than 8 inches in thickness and should be compacted to at least 95% of the maximum dry density at a moisture content of no more than 2% over optimum for the soils. The placement of the soil-cement should be performed under the observation of the Geotechnical Consultant, who should perform sieve analyses, compaction, unconfined compression, and moisture-density tests.

VISTA CANYON RANCH BRIDGE

It is proposed to construct the Vista Canyon Ranch Bridge to extend the existing Lost Canyon Road across the Santa Clara River. The bridge will be two lanes with a striped median and Class 1 Trail. The width of the bridge will be about 50 feet and the length about 650 feet. Construction plans for the bridge are not currently available. Construction plans for the bridge will be geotechnically reviewed in a future report. It is anticipated the bridge will be founded on driven or cast-in-drilled-hole piles at bents and abutments.

GEOTECHNICAL OBSERVATION

Grading operations should be observed by the Project Geotechnical Consultant. The Project Geotechnical Consultant's representative shall, at a minimum, have the following duties:

- Observe the excavation so that any necessary modifications based on variations in the soil/rock conditions encountered can be made;

- Observe the exposed subgrade in areas to receive fill and in areas where excavation has resulted in the desired finished subgrade. The representative should also observe proof-rolling and delineation of areas requiring overexcavation;

- Evaluate the suitability of on-site and import soils for fill placement; collect and submit soil samples for required or recommended laboratory testing where necessary;

- Observe the fill and backfill for uniformity during placement;

- Test fill for field density and compaction to determine the percentage of compaction achieved during fill placement;

- Geologic observation of all cut slopes, keyways, backcuts and geologic exposures during grading to ascertain that conditions conform to those anticipated in the report; and

- Observe benching operations; observe canyon cleanouts for subdrains, and subdrain installation.

The governmental agencies having jurisdiction over the project should be notified prior to commencement of grading so that the necessary grading permits can be obtained and arrangements can be made for required inspection(s). The contractor should be familiar with the inspection requirements of the reviewing agencies.

CITY OF SANTA CLARITA MUNICIPAL CODE SECTION 18.12.210 SUBSECTION 116.6

Based on the findings of this report and assuming the recommendations of this report are incorporated in the design and construction of the project, it is our professional opinion that building sites for proposed structures will be safe from hazards of landslide, settlement or slippage, and proposed grading at the site will not adversely affect the geologic stability of the site or adjacent properties.

GEOTECHNICAL CONSULTANT OF RECORD

This report has been prepared assuming that RTF&A will perform all geologic and geotechnically-related field observations and testing. If the recommendations presented in this report are to be utilized, but observation of the grading activities is performed by others, the parties performing the work must review this report and assume responsibility for recommendations contained herein or provide their own recommendations. That party would then assume the title "Project Geotechnical Consultant of Record" for the project.

A representative of the Project Geotechnical Consultant of Record should be present to observe all grading operations as well as test compacted fills. A report presenting the results of these observations and related testing should be issued upon completion of these operations. All footing excavations should be observed by a representative of the Geotechnical Consultant of Record, prior to placing steel or pouring concrete into the excavations.

-oOo-

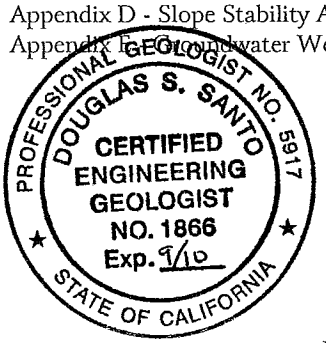
The following are attached and complete this report:

Volume I

- References
- Geotechnical Maps – Figures 1.1 through 1.3 (in pocket)
- Geotechnical Cross Sections - Figure 2 (in pocket)

Volume II

- Appendix A - Explorations
  - Table A-1, Exploration Summary
  - RTF&A Current Borings Logs, B-9 through B-14, & HS-3 through HS-22 (40 pages)
  - RTF&A Boring Logs dated December 21, 2007, B-8 and HS-1- HS-2 (5 pages)
  - RTF&A Boring Logs dated February 10, 2005, B-1 through B-7 (10 pages)
  - Kehoe Testing Cone Penetrometer Test Soundings dated December 1-2, 2005, CPT-1 through CPT-11 (38 pages)
  - RTF&A Boring Logs dated June 22, 2007, HS-1 & HS-2 (4 pages),
  - Kehoe Testing Cone Penetrometer Test Soundings dated May 30, 2007, CPT-1* & CPT-2* (21 pages)
- Appendix B - Laboratory Tests
  - Schiff and Associates Corrosion Test Data dated September 24, 2008 (2 pages)
  - RTF&A Laboratory Tests Data dated December 21, 2007 (5 pages)
  - RTF&A Consolidation Test Data dated June 22, 2007 (1 page)
  - RTF&A Laboratory Test Data dated February 10, 2006 (6 pages)
- Appendix C - Liquefaction Analyses
- Appendix D - Slope Stability Analyses
- Appendix E - Groundwater Well Data



Respectfully submitted,

R. T. FRANKIAN & ASSOCIATES

by: Douglas S. Santo
Principal Engineering Geologist

and: Dharmesh P. Amin
Principal Geotechnical Engineer

RTF&A
GEOTECHNICAL ENGINEERING & ENGINEERING GEOLOGY

REFERENCES

Bailey, T. L., and Jahns, R. H., 1954, "Geology of the Transverse Range Province, Southern California", in Geology of Southern California, California Division of Mines Bull 170, Vol. 1, pp. 83-106.

California Division of Mines and Geology, 1996, "Probabilistic Seismic Hazard Assessment for the State of California", Open-File Report 96-08.

California Division of Mines and Geology, 1997, "Guidelines for Evaluating and Mitigating Seismic Hazards in California", Special Publication 117.

California Division of Mines and Geology, 1977, "Fault Evaluation Report FER-59, Holser Fault".

California Division of Oil, Gas, and Geothermal Resources, 1996, "Regional Wildcat Map W1-2".

California Division of Oil, Gas, and Geothermal Resources, undated, "Division of Oil, Gas, and Geothermal Resources Construction Project Site Review and Well Abandonment Procedure", California Department of Conservation.

Dibblee, T. W., Jr., 1993, "Geologic Map of the Newhall Quadrangle, Los Angeles County, California", Dibblee Geological Foundation Map DF-56.

Dibblee, T. W., Jr., 1996, "Geologic Map of the Mint Canyon Quadrangle, Los Angeles County, California", Dibblee Geological Foundation Map DF-57.

Frankian, R. T. & Associates, 2006, "Final Report, Geotechnical Constraints Investigation, Vista Canyon Ranch Project, Santa Clarita, California", for Vista Canyon, LLC, dated February 10, 2006, Project No. 2005-052-02,.

Frankian, R. T. & Associates, 2007a, "Erodibility Index Analysis Vista Canyon Ranch North Parcel, Santa Clarita, California," for Vista Canyon, LLC, dated December 21, 2007, Project No. 2005-052-01

Frankian, R. T. & Associates, 2007b, "Geotechnical Constraints Investigation, Waldron Property, 27556 Woodfall Road, APN 2840-004-021, Santa Clarita, California," for Vista Canyon, LLC, dated June 22, 2007, Project No. 2007-019-01.

Frankian, R. T. & Associates, 2007c, "Phase I Environmental Site Assessment, Vista Canyon Ranch (Waldron Property), 27556 Woodfall Road, Los Angeles County Assessor's Parcel No. 2840-004-021 Santa Clarita, Los Angeles County, California," for Vista Canyon, LLC, dated June 18, 2007, Project No. 2007-019-51.

Frankian, R. T. & Associates, 2008, "Limited Hydrogeologic Report, Analysis of Groundwater Resource, Vista Canyon Ranch Project, Santa Clarita, California," for Vista Canyon, LLC, dated May 20, 2008, Project No. 2005-052-60.

Hart, E. W., 1999, "Fault-Rupture Hazard Zones in California," California Division of Mines and Geology, Special Publication 42.

Ishihara, Kenji, 1985, "Stability of Natural Deposits During Earthquakes," *Procedures of the 11th International Conference of Soil Mechanics and Foundation Engineering*, A. A. Balkema, Rotterdam, The Netherlands, Vol. I, pp. 321-376.

Kew, W. S. W., 1924, "Geology and Oil Resources of a Part of Los Angeles and Ventura Counties, California", U.S. Geological Survey Bulletin 753, 202p.

Los Angeles County Department of Public Works, Land Development Division, 2006, "Manual for Preparation of Geotechnical Reports".

Robertson, Peter K. and Wride (Fear), Catherine E., 1997, "Cyclic Liquefaction and Its Evaluation Based on SPT and CPT," *Evaluation and Mitigation of Earthquake Induced Liquefaction Hazards - Proceedings*, San Francisco, California, March 13-14.

Saul, R.B., and Wooten, T.M., 1983, "Geology of the South Half of the Mint Canyon Quadrangle, Los Angeles County, California," CDMG Open File Report 83-24LA.

State of California, 1995, "Mint Canyon Quadrangle Earthquake Fault Zones, Revised Official Map", June 1, 1995.

Weber, F. H., Jr., 1979, "Geologic and Geomorphic Investigation of the San Gabriel Fault Zone, Los Angeles and Ventura Counties, California", California Division of Mines and Geology Open-File Report 79-17, 78p.

Wentworth, C. M., and Yerkes, R. F., 1971, "Geologic Setting and Activity of Faults in the San Fernando Area, California", U.S. Geological Survey Professional Paper 733, pp. 6-16.

Winterer, E. L. and Durham, D. L., 1962, "Geology of the Southeastern Ventura Basin", U.S. Geological Survey Professional Paper 334-H, pp. 275-366.

Weber, F.H., Jr., 1982, Geology and Geomorphology Along the San Gabriel Fault Zone, Los Angeles and Ventura Counties, California, CDMG Open File Report 82-2.

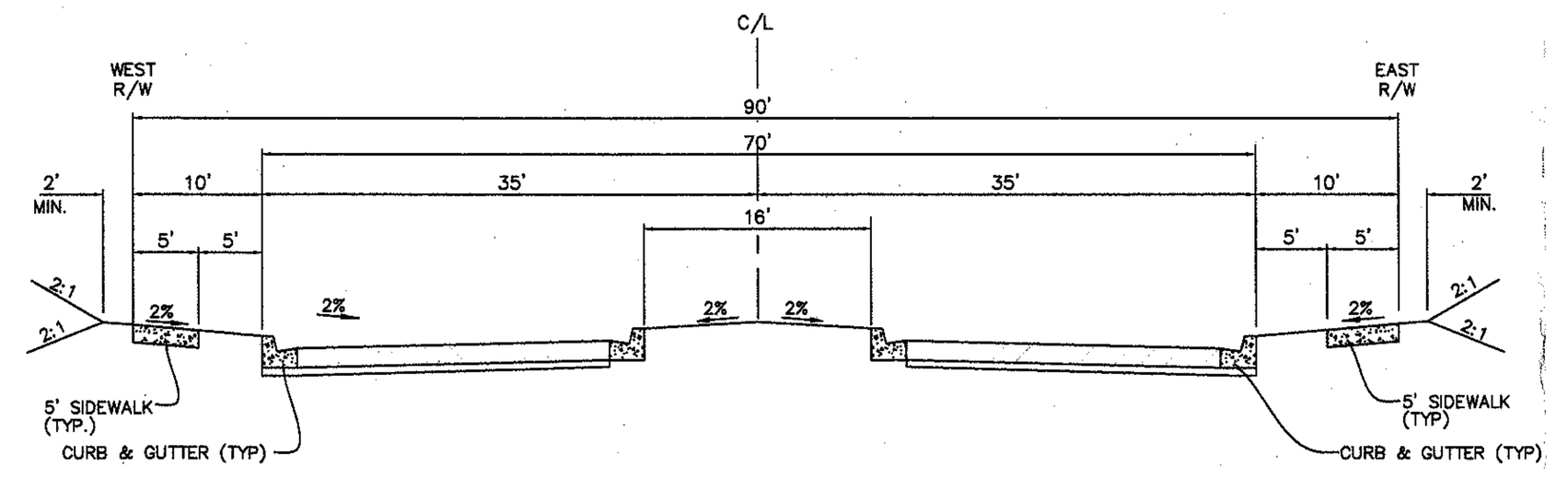
Winterer, E.L., and Durham, D.L., 1962, Geology of Southeastern Ventura Basin, Los Angeles County, California, USGS Professional Paper 334-H.

Aerial Photos Reviewed

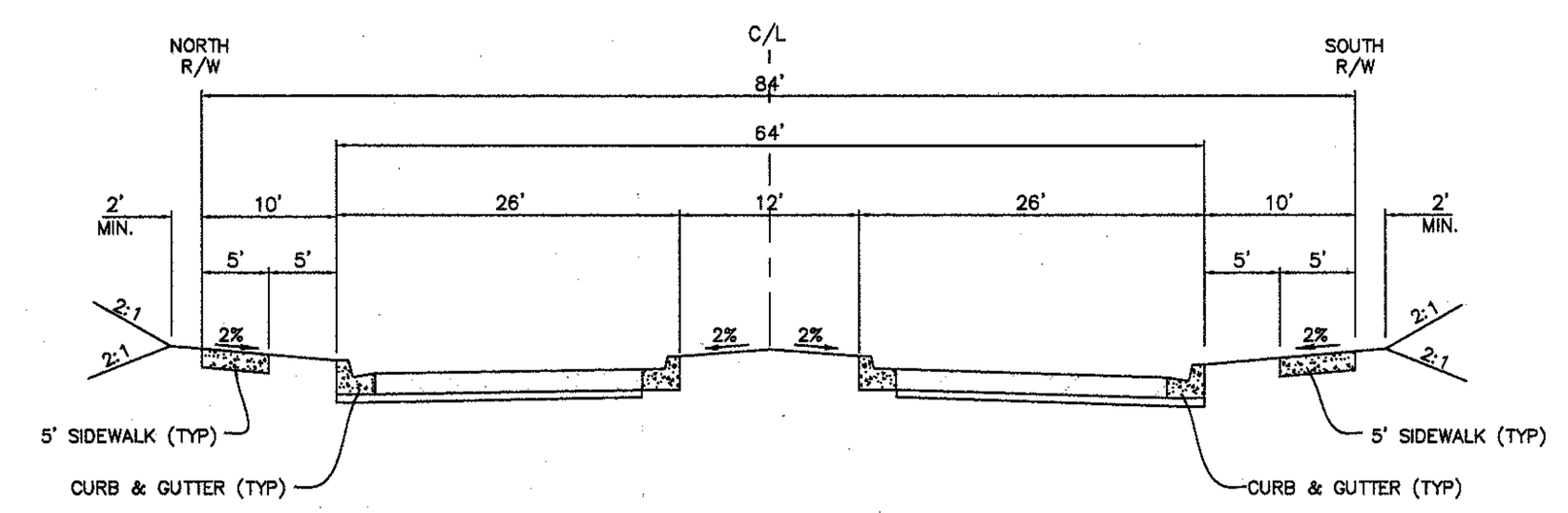
Year	Flight	Frame	Scale	Source
1952	AXJ-14K	150-152	1: 20,000	USGS
1952	AXJ-4K	45 - 47	1: 20,000	USGS
1994	NAPPW	119, 151	1:40,000	USGS
1989	NAPP	42, 43	1:40,000	USGS

VISTA CANYON RANCH

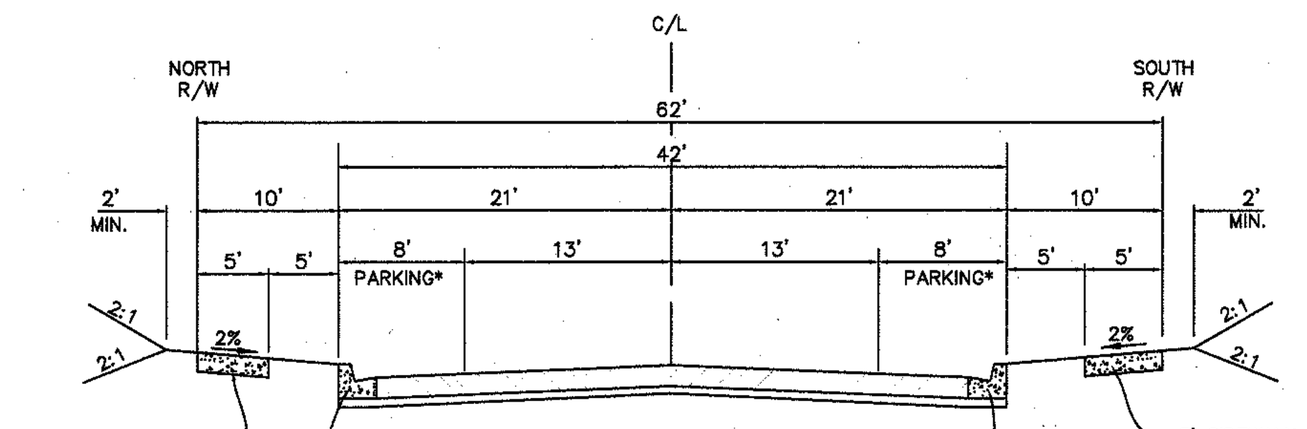
TENTATIVE TRACT MAP 69164
SITE DEVELOPMENT PLAN



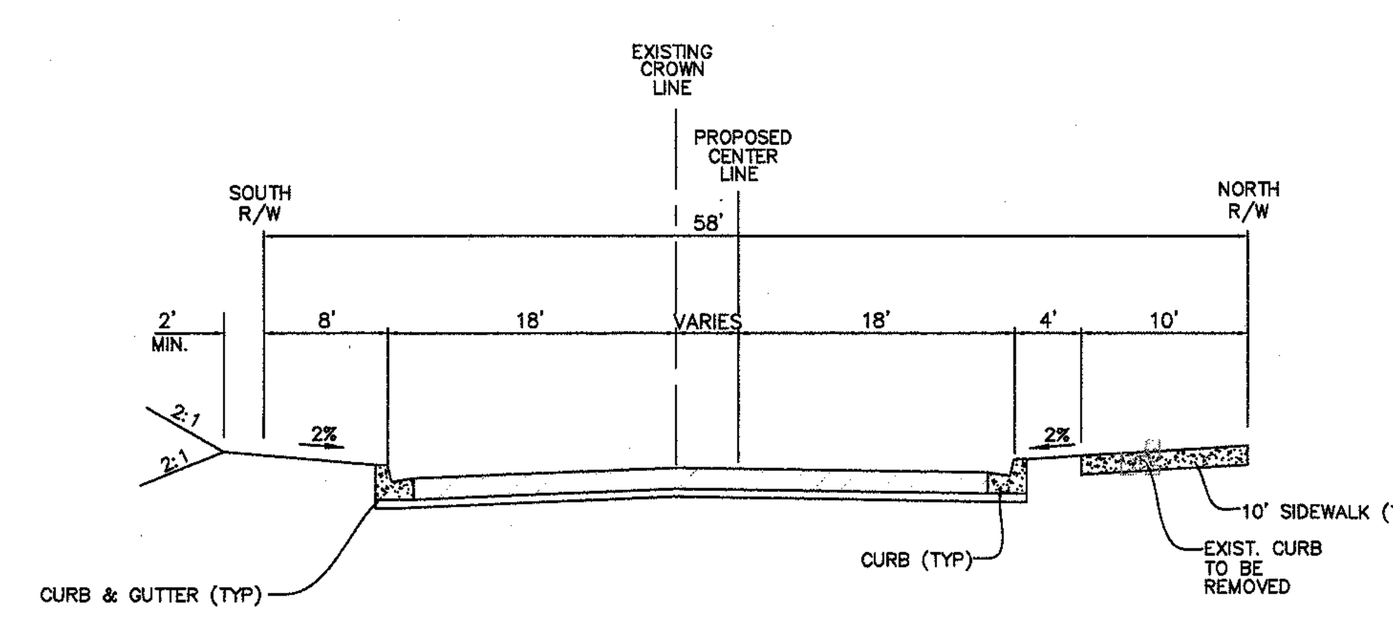
LOST CANYON RANCH ROAD (PUBLIC)
SOUTH OF JAKES WAY
NOT TO SCALE



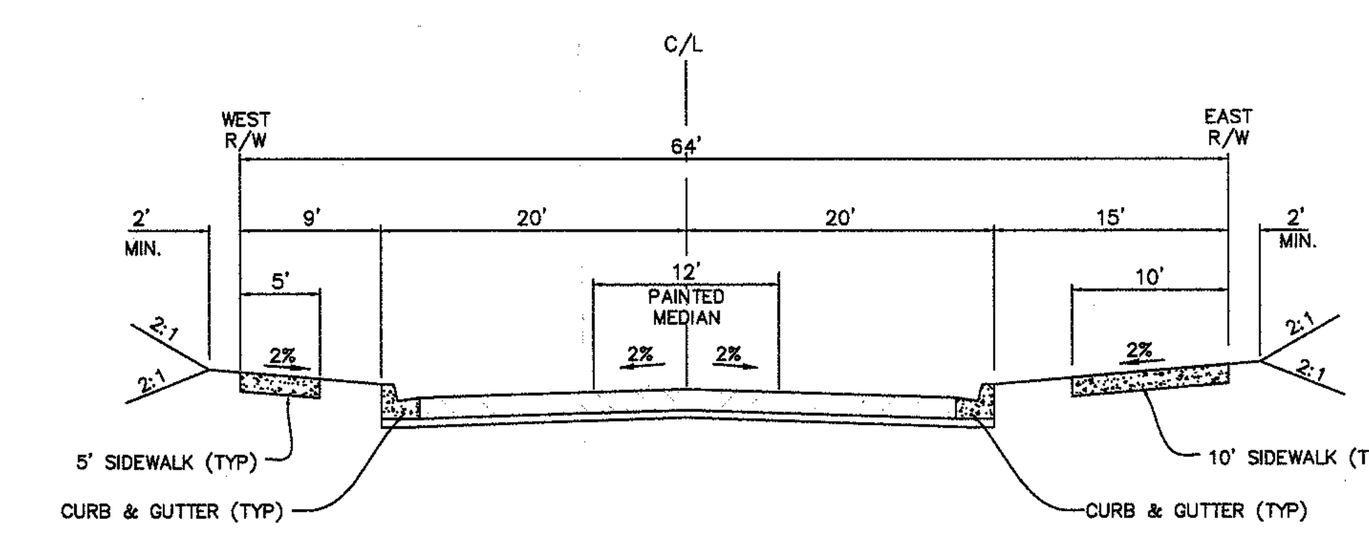
LOST CANYON RANCH ROAD (PUBLIC)
JAKES WAY TO VCR ROAD
NOT TO SCALE



LOST CANYON ROAD (PUBLIC)
VCR TO LA VEDA AVE.
NO SCALE
* SEE PLAN FOR PARKING LOCATIONS.



LOST CANYON ROAD (PUBLIC)
EAST OF LA VEDA AVE.
NOT TO SCALE



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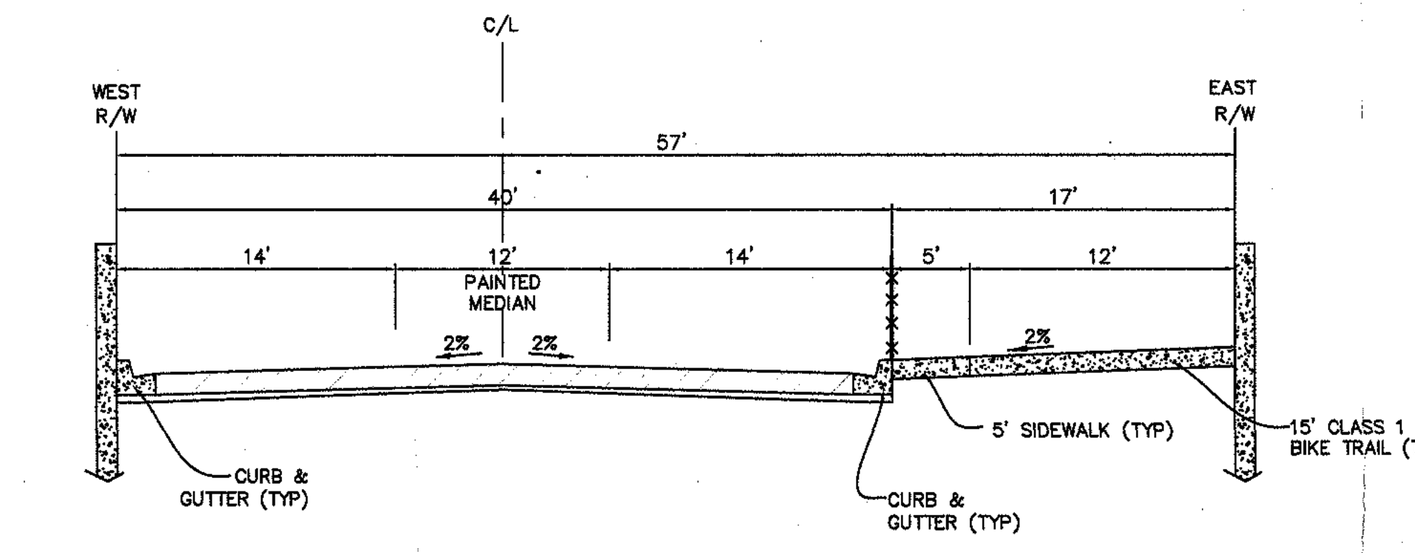
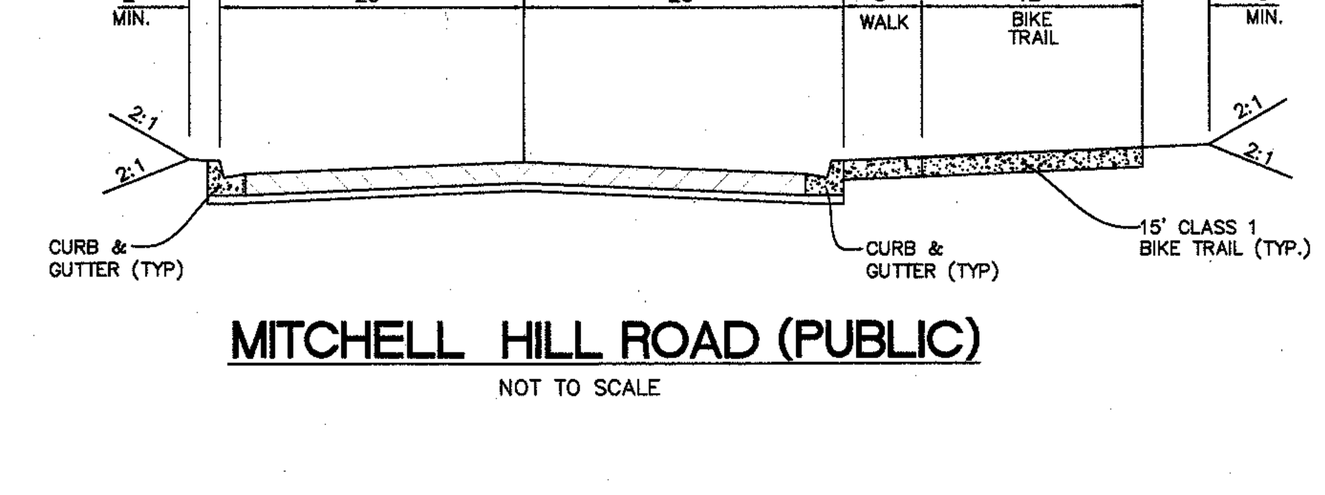
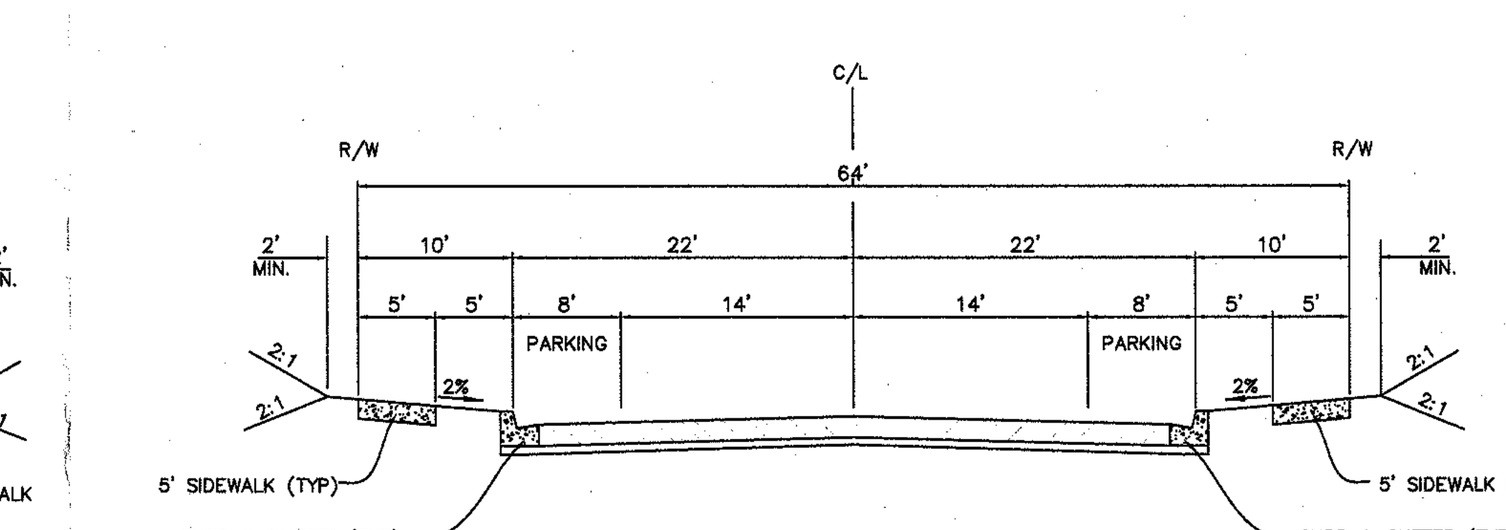
NOT TO SCALE



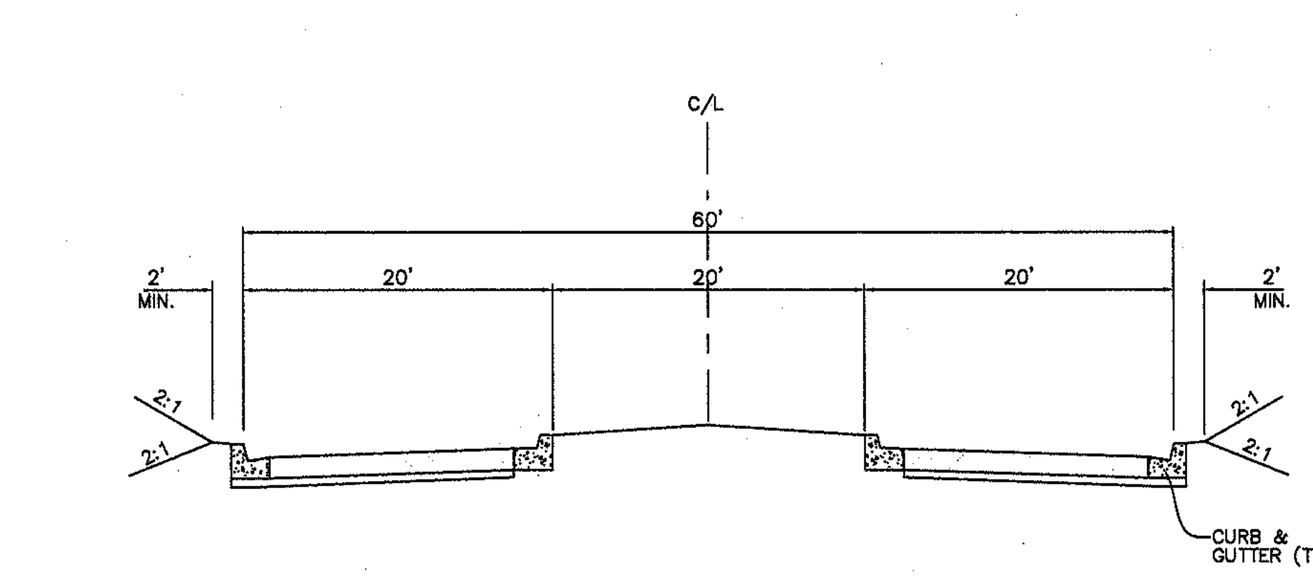
VISTA CANYON RANCH ROAD-BRIDGE (PUBLIC)
NOT TO SCALE



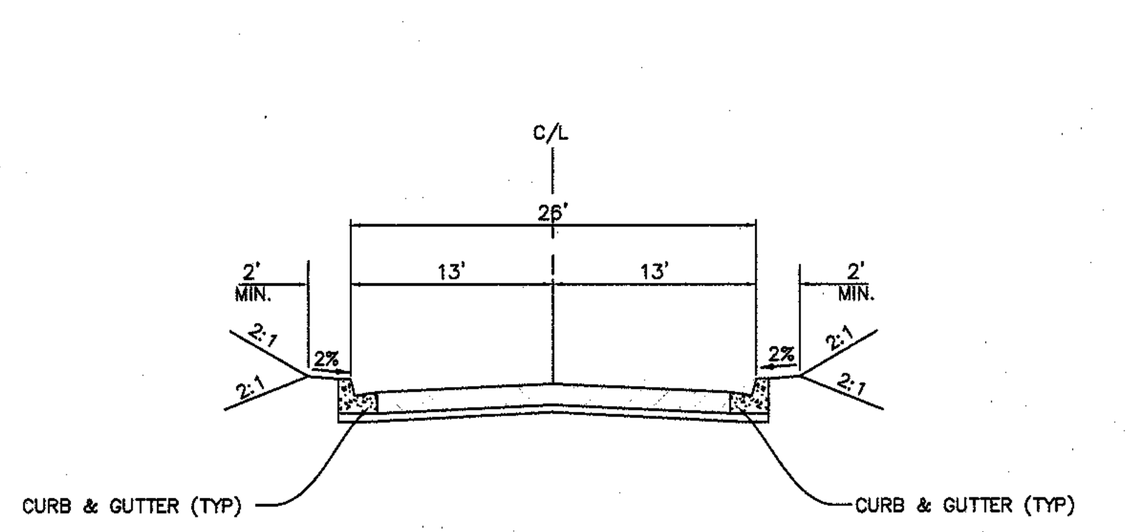
MITCHELL HILL ROAD (PUBLIC)
NOT TO SCALE



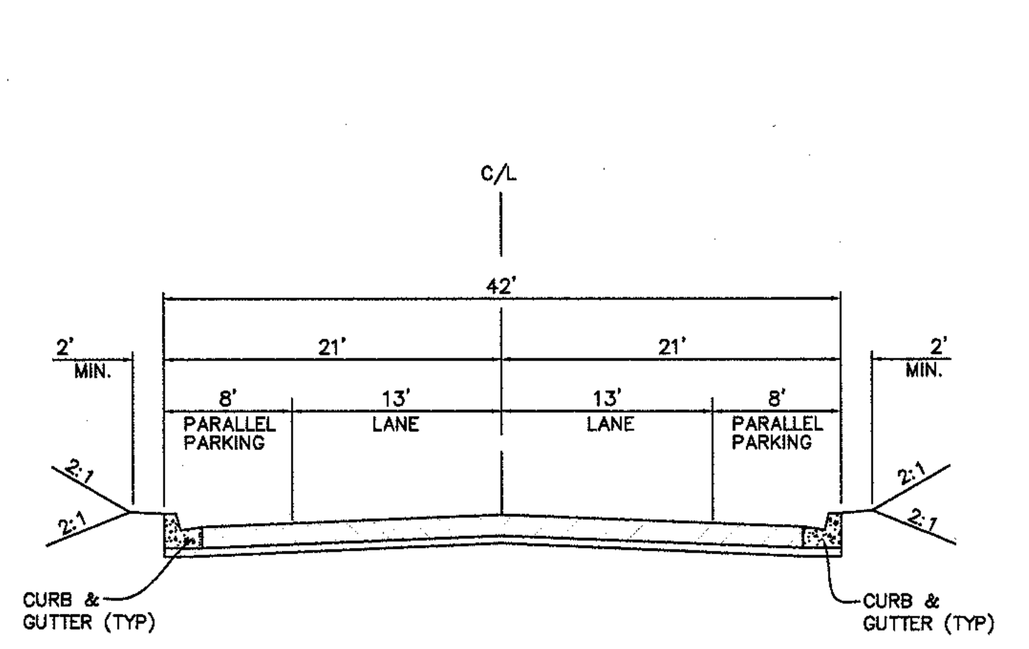
'A', 'B', 'C' DRIVES (PRIVATE)
NOT TO SCALE



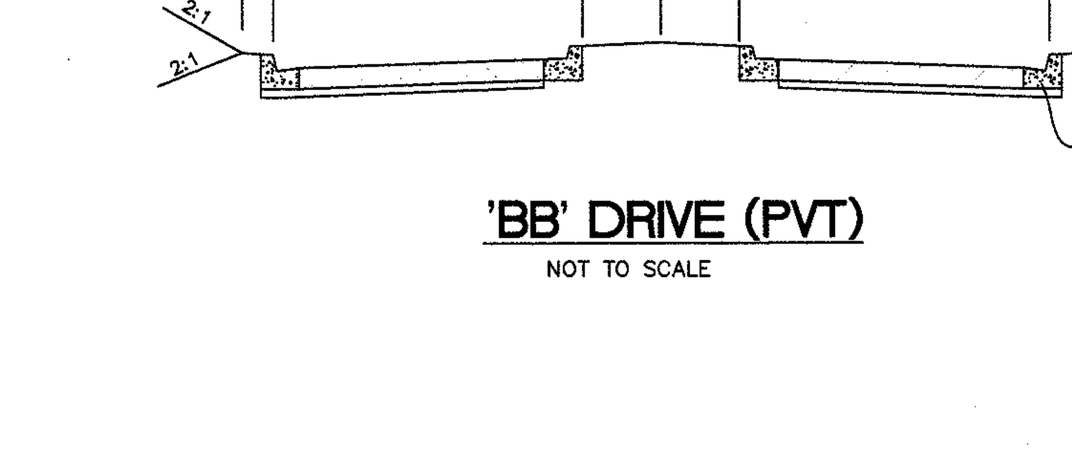
'D', 'I' DRIVES (PVT)
NOT TO SCALE



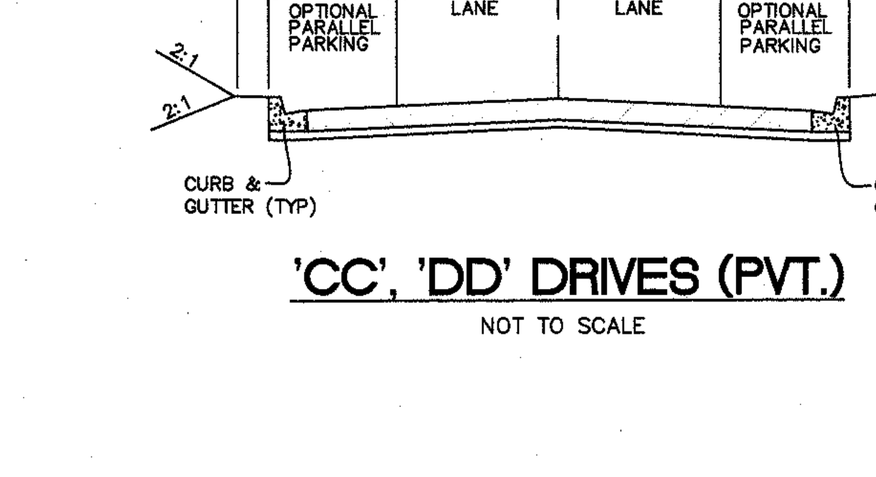
'E', 'F', 'G', 'H', 'J', 'K', 'L', 'M', 'O', 'P', 'Q',
'S', 'T', 'U', 'V', 'Y', 'Z', 'AA' DRIVES (PVT.)
NOT TO SCALE



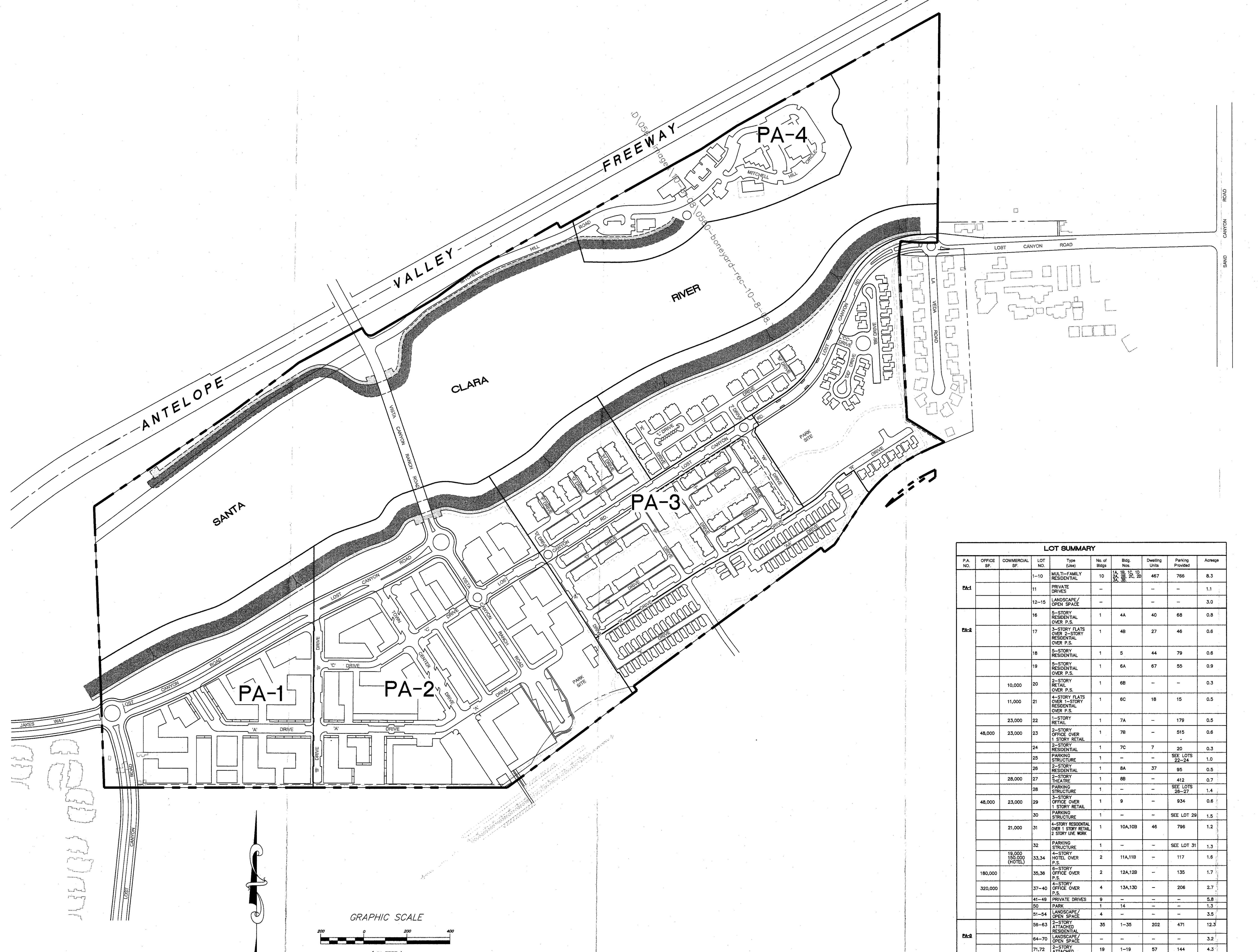
'N', 'R', 'W', 'X', DRIVES (PVT.)
NOT TO SCALE



'BB' DRIVE (PVT)
NOT TO SCALE



'CC', 'DD' DRIVES (PVT.)
NOT TO SCALE



GENERAL NOTES

1. LOT LINES CAN BE ADJUSTED PROVIDED NO ADDITIONAL LOTS ARE CREATED TO THE SATISFACTION OF THE CITY OF SANTA CLARITA PLANNING DEPARTMENT.
2. ALIGNMENT AND GEOMETRICS OF STREETS AND TRAILS ARE APPROXIMATE. ADJUSTMENTS TO TRAILS CAN BE MADE WITH APPROVAL BY THE CITY OF SANTA CLARITA PLANNING DEPARTMENT AND THE PARKS AND RECREATION DEPARTMENT.
3. BUILDING FOOTPRINTS THAT ARE SHOWN ON THIS TENTATIVE MAP FOR ILLUSTRATIVE PURPOSES. ACTUAL BUILDING LOCATIONS AND FOOTPRINTS MAY VARY. REVISIONS MAY BE ALLOWED DURING FUTURE SITE PLAN REVIEW, PROVIDED THE PROPOSED BUILDINGS SATISFY ALL EXISTING CODES AND ORDINANCES.
4. GRADES SHOWN ON THIS TENTATIVE MAP ARE APPROXIMATE. GRADES MAY DEVIATE UP TO FIVE FEET WITH APPROVAL OF CITY PLANNING AND ENGINEERING DEPARTMENTS.
5. PERMISSION IS REQUESTED FOR UNIT PHASING.
6. PERMISSION IS REQUESTED TO COMBINE LOTS.
7. PERMISSION IS REQUESTED TO FILE ADDITIONAL LARGE LOT PARCEL MAPS
8. PERMISSION IS REQUESTED TO RECORD ADDITIONAL OPEN SPACE LOTS.
9. PERMISSION IS REQUESTED TO RECORD ADDITIONAL UTILITY LOTS AND PROVIDE MAINTENANCE EASEMENTS TO THE SATISFACTION OF THE CITY OF SANTA CLARITA PLANNING AND ENGINEERING DEPARTMENTS.
10. THE LOCATIONS OF APPURTENANT STRUCTURES (E.G., PASEOS, PEDESTRIAN BRIDGES, TRANSIT SHELTERS, WATER QUALITY BASINS, ETC.) MAY BE RELOCATED TO THE SATISFACTION OF THE CITY OF SANTA CLARITA PLANNING AND ENGINEERING DEPARTMENTS.
11. PERMISSION IS REQUESTED TO MASS GRADE.
12. PROPOSED GRADING IS APPROXIMATE ONLY AND SUBJECT TO ADJUSTMENTS PENDING DETERMINATION OF FINAL DEVELOPMENT LAYOUT AND PLANS.
13. MODIFIED STREET CROSS-SECTIONS AS SHOWN ON THIS TENTATIVE MAP ARE REQUESTED.
14. ALL DIMENSIONS SHOWN ARE APPROXIMATE.
15. PERMISSION IS REQUESTED TO ALLOW OFFICE & RETAIL SPACE TO BE INTERCHANGEABLE PROVIDED THE REQUIRED PARKING IS SATISFIED.

FLOOD ZONE

FLOOD INSURANCE RATE MAPS COMMUNITY PANEL NUMBERS
065043 0365 B AND 065043 0480 B
ZONE A, ZONE AO (DEPTH 2) AND ZONE C

BENCHMARK:

L 1668 DATUM NAVD 88(1995 ADJUSTMENT) ELEVATION 1586.011

DESCRIPTION: CS MON IN WELL 250MM DN @ PI 600MM EAST OF CENTERLINE SAND CANYON ROAD AND 161M NORTH OF LIVE OAK SPRINGS CANYON ROAD 8.2M NORTHEAST OF POWER POLE #1155006E MKD (PI 24)

TOPOGRAPHY:

CONTOURS ARE BASED ON AN AERIAL PHOTOGRAMETRIC SURVEY PERFORMED BY HOVEL LAND PILARSKI ENGINEERING, INC. AND C AND C AERIAL MAPPING CORPORATION ON DECEMBER 2005.

ASSESSOR'S PARCEL NUMBERS:

2840-002-270, 2840-002-271, 2840-002-272, 2840-002-273,
2840-002-274, 2840-002-901, 2840-004-012, 2840-005-057,
2840-005-058, 2840-004-021, 2840-004-017, 2840-004-036,
2840-006-007, 2840-006-270

PROJECT SUMMARY:

GROSS AREA: 185.12 Acres
TOTAL LOTS: 162
TOTAL D.U.: 1,117 DU

PROPOSED ZONING: PER VCR SPECIFIC PLAN
GENERAL PLAN LAND USE: PER VCR SPECIFIC PLAN
PROPOSED LAND USE: PER VCR SPECIFIC PLAN
OAK TREES TO BE REMOVED: 9
OAK TREES TO BE IMPACTED: 22
OAK TREES TO REMAIN: 3
(NOT IMPACTED)
TOTAL OAK TREES: 34

EARTHWORK SUMARY

CUT: 590,000 cy
FILL: 830,000 cy
OVEREXCAVATION: 1,500,000 cy
SHRINKAGE (15%): 210,000 cy
IMPORT: 450,000 cy

OWNERS:

APN 2840-002-270 THE CITY OF SANTA CLARITA, AN INCORPORATED CITY
APN 2840-002-271 THE CITY OF SANTA CLARITA
APN 2840-002-272 THE CITY OF SANTA CLARITA
APN 2840-002-273 THE CITY OF SANTA CLARITA
APN 2840-002-274 THE CITY OF SANTA CLARITA
APN 2840-002-901 CASTAIC LAKE WATER AGENCY, A CALIFORNIA SPECIAL DISTRICT
APN 2840-004-017 VISTA CANYON RANCH, LLC
APN 2840-004-021 ROBERT L. WALDRON
PAUL SMOR
ALAN SPIEGEL
MORRIS GORDON
ESTHER WILSON
WOODFALL INVESTMENT GROUP
JAMES G. MCGALL, JR.
ROBERT L. & CHERILYN E. WALDRON
JOSEPH R. & JANE F. WITALIS
ROY C. WALDRON TRUST
WILLIAM B. EASTER
RCW FAMILY LIMITED PARTNERSHIP
JOYCE E. EASTER
APN 2840-004-036 JBS DEVELOPMENT DOLOROSA HOMES
APN 2840-005-057 & VISTA CANYON RANCH, LLC
APN 2840-005-058
APN 2840-006-007 VISTA CANYON RANCH, LLC
APN 2840-006-270 THE CITY OF SANTA CLARITA, A MUNICIPAL CORPORATION

BASIS OF BEARING

THE ASSUMED BEARING OF N89°54'38"W SHOWN AS N89°52'42"W ON THE CENTER OF SECTION LINE OF SECTION 22, T4N, R15W, S.B.M. AS SHOWN ON THE MAP OF TRACT NO. 45023-02, FILED IN BOOK 1272, PAGES 14 THROUGH 22 OF MAPS, WAS USED AS THE BASIS OF BEARINGS FOR THIS SURVEY.

PUBLIC UTILITIES:

CABLE TV: TIME WARNER
22620 MARKET STREET
SANTA CLARITA, CA. 91321
MIKE NELSON (818) 674-9197

ELECTRIC: SOUTHERN CALIFORNIA EDISION CO.
3589 FOOTHILL DRIVE
THOUSAND OAKS, CA 91361
(818) 999-1800

GAS: SOUTHERN CA. GAS COMPANY
9400 OAKDALE AVENUE
CHATSWORTH, CA. 91313
P.J. MARTIN (818) 701-7516

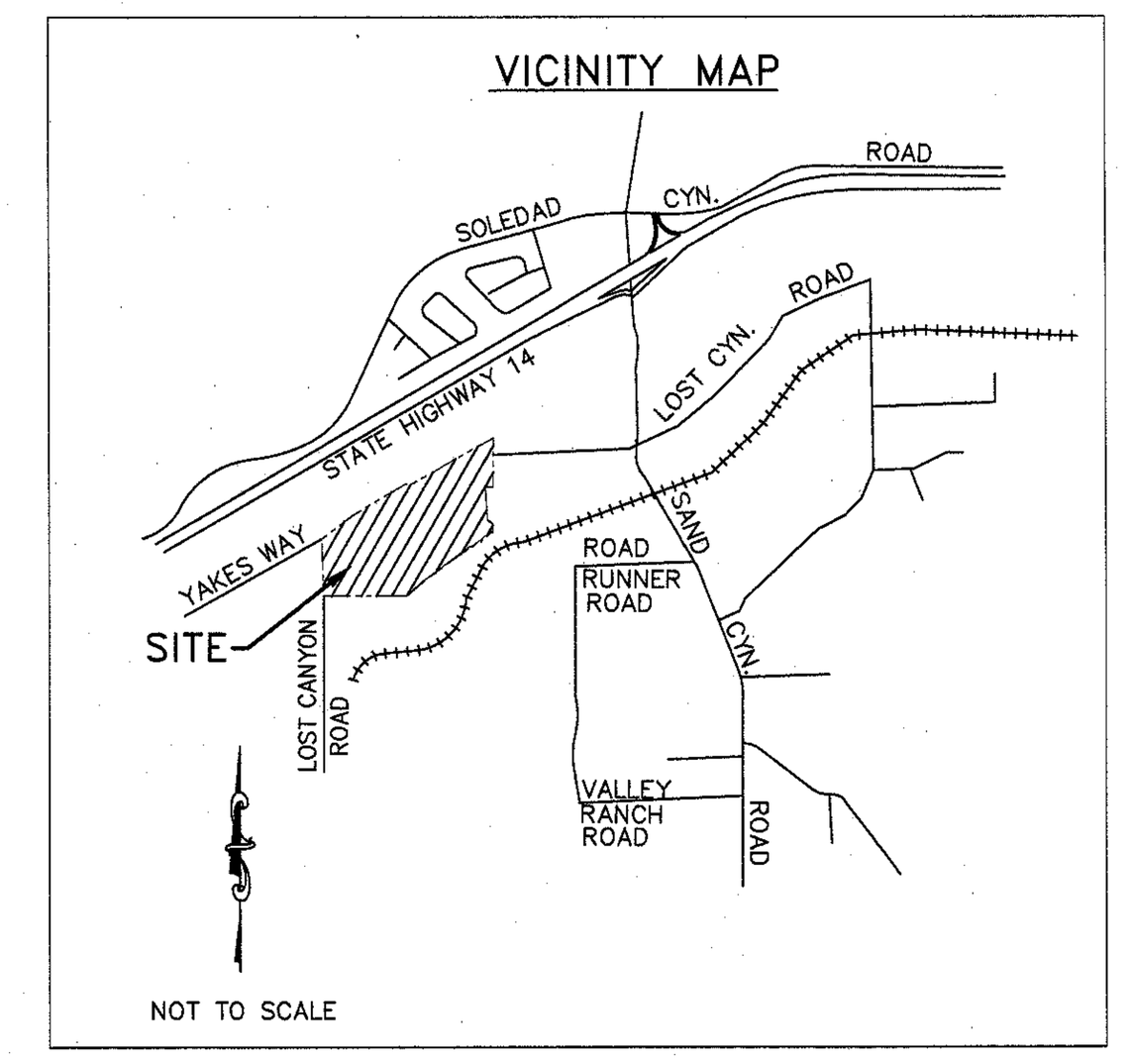
SEWER: LOS ANGELES COUNTY
SEWER MAINTENANCE DEPARTMENT
45712 NORTH DIVISION
LANCASTER, CA. 93535
MARISA MORALES (626) 300-3370

TELEPHONE: AT&T
26971 N. FURNIVALL AVENUE
SANTA CLARITA, CA 91351
CARLOS CAZAN (661) 251-8799

WATER: SANTA CLARITA WATER DISTRICT
22772 SOLEDAD CANYON RD.
SANTA CLARITA, CA. 91350
(661) 259-2737

LOT SUMMARY

P.A. NO.	OFFICE SF.	COMMERCIAL SF.	LOT NO.	Type (Use)	No. of Bldgs	Bldg. Nos.	Dwelling Units	Parking Provided	Acreage
PA-1			1–10	MULTI-FAMILY RESIDENTIAL	10	1A, 1B, 1C, 1D 2A, 2B, 2C, 2D 3A, 3B	467	766	8.3
			11	PRIVATE DRIVES	–		–	–	1.1
			12–15	LANDSCAPE/ OPEN SPACE	–		–	–	3.0
PA-2			16	5-STORY RESIDENTIAL OVER P.S.	1	4A	40	68	0.8
			17	3-STORY FLATS OVER 2-STORY RESIDENTIAL OVER P.S.	1	4B	27	46	0.6
			18	5-STORY RESIDENTIAL	1	5	44	79	0.6
			19	5-STORY RESIDENTIAL OVER P.S.	1	6A	67	55	0.9
		10,000	20	2-STORY RETAIL OVER P.S.	1	6B	–	–	0.3
		11,000	21	4-STORY FLATS OVER 1-STORY RESIDENTIAL OVER P.S.	1	6C	18	15	0.5
		23,000	22	1-STORY RETAIL	1	7A	–	179	0.5
	48,000	23,000	23	2-STORY OFFICE OVER 1 STORY RETAIL	1	7B	–	515	0.6
			24	2-STORY RESIDENTIAL	1	7C	7	20	0.3
			25	PARKING STRUCTURE	1	–	–	SEE LOTS 22–24	1.0
			26	2-STORY RESIDENTIAL	1	8A	37	95	0.5
		28,000	27	2-STORY THEATRE	1	8B	–	412	0.7
			28	PARKING STRUCTURE	1	–	–	SEE LOTS 26–27	1.4
	48,000	23,000	29	3-STORY OFFICE OVER 1 STORY RETAIL	1	9	–	934	0.6
			30	PARKING STRUCTURE	1	–	–	SEE LOT 29	1.5
		21,000	31	4-STORY RESIDENTIAL OVER 1 STORY RETAIL, 2 STORY LIVE WORK	1	10A,10B	46	796	1.2
			32	PARKING STRUCTURE	1	–	–	SEE LOT 31	1.3
		19,000 150,000 (HOTEL)	33,34	4-STORY HOTEL OVER P.S.	2	11A,11B	–	117	1.6
	180,000		35,36	6-STORY OFFICE OVER P.S.	2	12A,12B	–	135	1.7
	320,000		37–40	4-STORY OFFICE OVER P.S.	4	13A,13D	–	206	2.7
			41–49	PRIVATE DRIVES	9	–	–	–	5.8
			50	PARK	1	14	–	–	1.3
			51–54	LANDSCAPE/ OPEN SPACE	4	–	–	–	3.5
PA-3			56–63	2-STORY ATTACHED RESIDENTIAL	35	1–35	202	471	12.3
			64–70	LANDSCAPE/ OPEN SPACE	–	–	–	–	3.2
			71,72	2-STORY ATTACHED RESIDENTIAL	19	1–19	57	144	4.3
			73–75	LANDSCAPE/ OPEN SPACE	–	–	–	–	2.3
			76–81	2-STORY DETACHED RESIDENTIAL	69	1–69	69	155	5.6
			82–85	LANDSCAPE/ OPEN SPACE	–	–	–	–	2.1
			86–121	2-STORY DETACHED RESIDENTIAL	36	1–36	36	72	2.7
			122–124	PRIVATE DRIVES	–	–	–	–	0.9
			125–131	LANDSCAPE/ OPEN SPACE	–	–	–	–	1.4
			132,133	PARK	–	–	–	–	5.0
PA-4		46,000	134–141	1-STORY COMMERCIAL	8	1–8	–	243	6.2
			142–148	LANSCAPE/ OPEN SPACE	–	–	–	–	4.4
			149–158	RIVER BANK PROTECTION	–	–	–	–	22.9
			159–162	SANTA CLARA RIVER	–	–	–	–	56.7
			PUBLIC STREETS	PUBLIC STREETS	–	–	–	–	12.8
TOTAL	596.000	354,000					1117	5,523	185.1



LEGEND:

PROJECT BOUNDARY
PROPOSED ROAD RIGHT OF WAY
PROPOSED UTILITY EASEMENT
EXISTING EASEMENT
FUTURE RIGHT OF WAY
1000 PROPOSED CONTOUR
1000 EXISTING CONTOUR
DAYLIGHT LINE
SD STORM DRAIN
SS SANITARY SEWER
W WATER
STORM DRAIN INLET/OUTLET
S.D. CATCH BASIN
S EXISTING SEWER LINE
W EXISTING WATER LINE
O EXISTING OIL LINE
G EXISTING GAS LINE
OE EXISTING OVERHEAD POWER LINE
EXISTING POWER POLE
▨ BURIED BANK STABILIZATION
OAK NO. XX OAK TREE

ABBREVIATIONS:

AC	ACRES
APWA	AMERICAN PUBLIC WORKS ASSOCIATION
BVC	BEGINING VERTICAL CURB
EVC	END VERTICAL CURB
EX	EXISTING
FF	FINISH FLOOR
FM	FORCE MAIN
FS	FINISHED SURFACE
FW	FIRE WATER
GB	GRADE BREAK
HP	HIGH POINT
L	LENGTH
MIN	MINIMUM
P.C.C.	PORTLAND CEMENT CONCRETE
PI	POINT OF INTERSECTION
PROP	PROPOSED
R	RADIUS
R/W	RIGHT OF WAY
SF	SQUARE FOOT
SD	STORM DRAIN
SS	SANITARY SEWER
STD	STANDARD
TBI	TO BE IMPACTED
TBR	TO BE REMOVED
TR	TO REMAIN
W	WATER

CONDOMINUIM NOTE:

ALL RESIDENTIAL, COMMERCIAL AND OFFICE LOTS WITHIN THIS TENTATIVE MAP MAY BE FURTHER AIRSPACE SUBDIVIDED FOR CONDOMINIUM PURPOSES.

TITLE REPORTS:

Ⓐ PRELIMINARY REPORT PREPARED BY FIRST AMERICAN TITLE COMPANY
EFFECTIVE DATE: MAY 2, 2008
ORDER NO.: 2784276 (58)
TITLE OFFICER: MIKE EINSTEIN
EFFECTS: APNs 2840-002-270, 2840-002-271, 2840-002-272, 2840-002-273, 2840-002-274 & 2840-002-901

Ⓑ PRELIMINARY REPORT PREPARED BY FIRST AMERICAN TITLE COMPANY
EFFECTIVE DATE: JUNE 6, 2008
ORDER NO.: 2784278 (51)
TITLE OFFICER: MIKE EINSTEIN
EFFECTS: APNs 2840-004-009, 2840-004-010, 2840-004-012 & 2840-004-021

Ⓒ PRELIMINARY REPORT PREPARED BY FIRST AMERICAN TITLE COMPANY
EFFECTIVE DATE: MAY 3, 2007
ORDER NO.: 2784279 (51)
TITLE OFFICER: MIKE EINSTEIN
EFFECTS: APNs 2840-006-007 & 2840-006-270

Ⓓ PRELIMINARY REPORT PREPARED BY FIRST AMERICAN TITLE COMPANY
EFFECTIVE DATE: JUNE 23, 2007
ORDER NO.: 3098262 (51)
TITLE OFFICER: MIKE EINSTEIN
EFFECTS: APNs 2840-004-017 & 2840-004-0360 & 2840-005-057 & 2840-005-0058

Geotechnical Map

PREPARED FOR: Vista Canyon Ranch, LLC

Project Location: Tentative Tract Map No. 69164
Canyon Country, California

SCALE	DRAWN BY	CHECKED BY
1" = 100'	MN	DS/DA
DATE 11-14-08	Figure 1.1	JOB NO. 2005-052-01

1329 SCOTT ROAD
BURBANK, CA, 91504
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RTFA
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ALLIANCE
LAND PLANNING & ENGINEERING INC.
2248 FARADAY AVE.
CARLSBAD, CA 92008
TEL: (760) 431-9896
FAX: (760) 431-8802
CIVIL ENGINEERING • LAND PLANNING • HILLSIDE DESIGN • SURVEYING

PLAN PREPARED FOR:
VISTA CANYON RANCH, LLC
27451 Tourney Road, Suite 100
VALENCIA, CA 91355
Phone: 661-255-3275
Fax: 661-255-1137

PLANS PREPARED BY:
ALLIANCE LAND PLANNING & ENGINEERING INC.
2248 FARADAY AVE.
(760) 431-9896
PLANS PREPARED UNDER THE DIRECTION OF:

CRAIG M. WHITTEKER R.C.E. 51929 DATE

REGISTERED PROFESSIONAL ENGINEER
CRAIG M. WHITTEKER
NO. 51929
EXP 6-30-10
CIVIL
STATE OF CALIFORNIA

NO.	DATE	REVISIONS	BY	APPR

SHEET 1 | CITY OF SANTA CLARITA | SHEET 3

VISTA CANYON RANCH
TENTATIVE TRACT MAP 69164
SITE DEVELOPMENT PLAN

VISTA CANYON RANCH - TPM 69164

DATE 10-3-08

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C:\Documents and Settings\Mohammed\My Documents\DRAFTING\Jobs\2005\2005-052\10-29-08WIP\0560-TENTATIVE-MAP-SHEET-01.dwg, PostScript Custom Page Size

EXPLANATION

- af — Artificial Fill
- Qal — Alluvium
- Qsw — Slopewash
- Qc — Colluvium
- Qt — Terrace Deposits
- Tmc — Mint Canyon Formation
- Geologic Contact, dashed where approximate, dotted where concealed
- Fault, dashed where approximate, dotted where concealed
- Approximate Boundary between Removal Areas
- 50 — Strike and Dip of Bedding
- HS-22 — Hollow Stem Auger Boring (Current) HS-1 and HS-2 were previously done for (Job No. 2005-052-01 Report Dated 12-21-07)
- HS-2 — Hollow Stem Auger Boring (Job No. 2007-019-01 Report Dated 6-22-07)
- B-14 — Bucket Auger Boring (B-9 through B-14 Current)
- B-8 — Bucket Auger Boring (B-1 through B-8 (Job No. 2005-052-01 Report Dated 12-21-07)
- CPT-11 — Cone Penetration Test (Job No. 2005-052-01 Report Dated 12-21-07)
- CPT-2* — Cone Penetration Test (Job No. 2007-019-01 Report Dated 6-22-07)

SECTION A–A
TYPICAL SECTION–BANK STABILIZATION
NOT TO SCALE

SECTION B–B

SECTION C–C

SECTION D–D

SECTION E–E

Geotechnical Map

Vista Canyon Ranch, LLC

Tentative Tract Map No. 69164
Canyon Country, California

SCALE	DRAWN BY	CHECKED BY
1" = 100'	MN	DS/DA
DATE	Figure 1.2	JOB NO.
11-14-08		2005-052-01

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2246 FARADAY AVE.
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FAX: (760) 431-0860

PLAN PREPARED FOR:
JSB Development/
James S. Backer
27451 Tourney Road, Suite 100
VALENCIA, CA 91355
Phone: 661-255-3275
Fax: 661-255-1137

PLANS PREPARED BY:
ALLIANCE LAND PLANNING & ENGINEERING INC.
2246 FARADAY AVE.
(760) 431-9696
PLANS PREPARED UNDER THE DIRECTION OF:

CRAIG M. WHITTAKER R.C.E. 51929 DATE

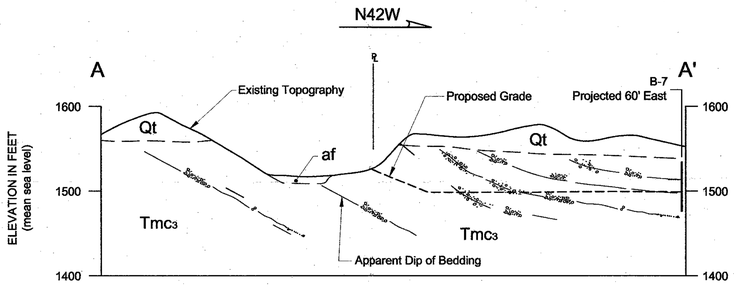
REGISTERED PROFESSIONAL ENGINEER
CRAIG M. WHITTAKER
No. 51929
EXP. 6-30-10
CIVIL
STATE OF CALIFORNIA

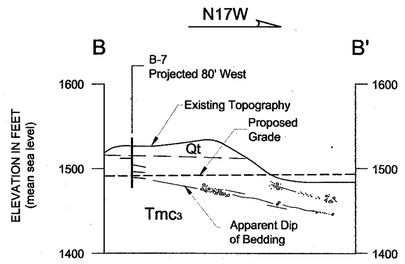
NO.	DATE	REVISIONS	BY	APPR

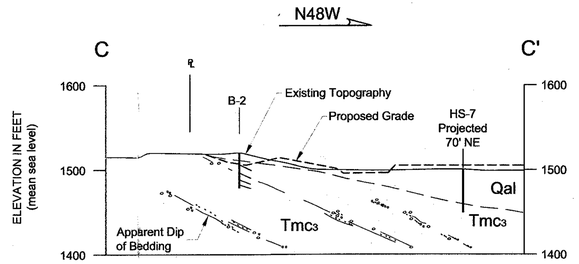
SHEET 2 | CITY OF SANTA CLARITA | SHEET 2

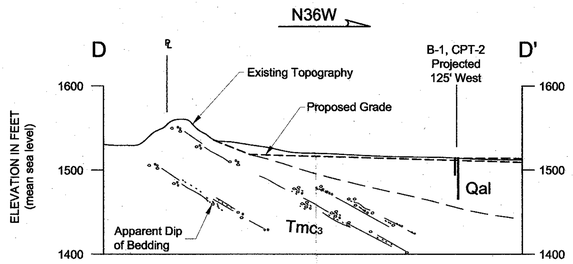
VISTA CANYON RANCH
TENTATIVE TRACT MAP 69164
SITE DEVELOPMENT PLAN

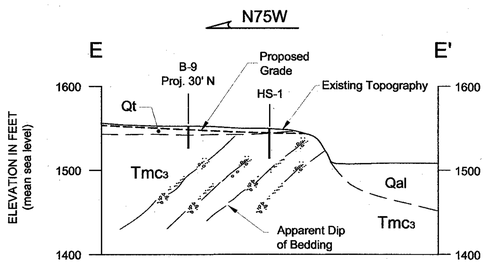
I:\CAD\5560\TENTATIVE-MAP\5560-TENTATIVE-MAP-SHEET-02.dwg

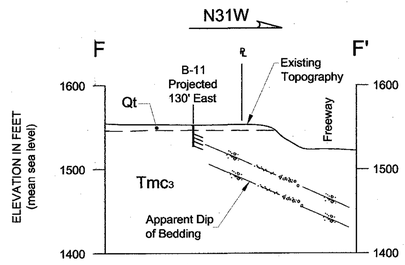


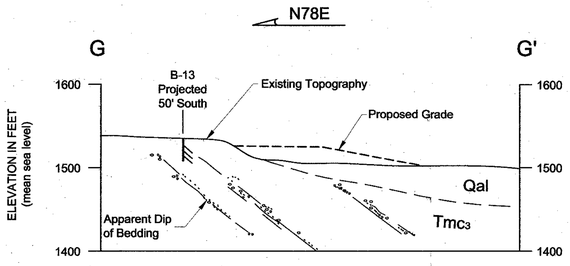


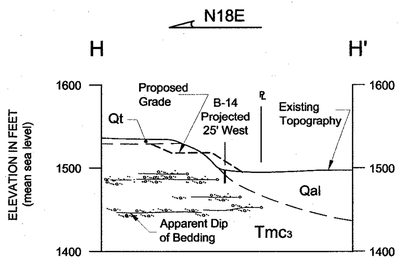


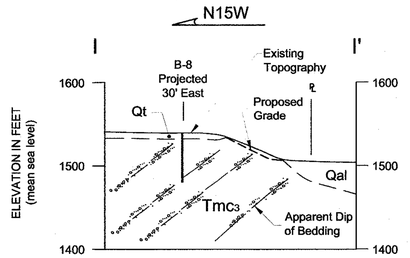












Geologic Sections

PREPARED FOR
Vista Canyon Ranch, LLC

Project Location
Tentative Tract Map No. 69164
Canyon Country, California

SCALE	DRAWN BY	CHECKED BY
1" = 100'	MN	DS/DA
DATE	Figure 2	JOB NO.
11-14-08		2005-052-01

1329 SCOTT ROAD
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TEL: (818) 531-1501
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RTF&A
GEOTECHNICAL ENGINEERING & ENGINEERING GEOLOGY

VISTA CANYON RANCH

TENTATIVE TRACT MAP 69164

EASEMENTS:

PRELIMINARY REPORT NO. 2784276 (58):

(3A) AN EASEMENT FOR PUBLIC ROAD AND HIGHWAY AND INCIDENTAL PURPOSES PER DOCUMENT RECORDED IN BOOK 7300, PAGE 172 OF OFFICIAL RECORDS.
PART(S) OF DOCUMENT ILLEGIBLE
OWNER: COUNTY OF LOS ANGELES
DISPOSITION: TO BE QUITCLAIMED

(5A) AN EASEMENT FOR PUBLIC UTILITIES AND INCIDENTAL PURPOSES PER DOCUMENT RECORDED IN BOOK 20996, PAGE 388 OF OFFICIAL RECORDS.
REFERENCED DEEDS ILLEGIBLE, NOT PLOTTED.
OWNER: SOUTHERN CALIFORNIA EDISON COMPANY
DISPOSITION: TO BE QUITCLAIMED

(6A) AN EASEMENT FOR PUBLIC UTILITIES AND INCIDENTAL PURPOSES PER DOCUMENT RECORDED SEPTEMBER 29, 1956 AS INSTRUMENT NO. 4758 IN BOOK 52435, PAGE 416 OF OFFICIAL RECORDS.
OWNER: SOUTHERN CALIFORNIA EDISON COMPANY
DISPOSITION: TO BE QUITCLAIMED

(10A) AN EASEMENT FOR POLE LINES AND INCIDENTAL PURPOSES PER DOCUMENT RECORDED OCTOBER 28, 2004 AS INSTRUMENT NO. 04-2794793 OF OFFICIAL RECORDS.
DOCUMENT STATES EASEMENT IS FOR TEMPORARY CONSTRUCTION
OWNER: CASTAIC LAKE WATER AGENCY
DISPOSITION: TO BE QUITCLAIMED

(14A) AN EASEMENT FOR POLES AND INCIDENTAL PURPOSES PER DOCUMENT RECORDED IN BOOK 37548, PAGE 233 OF OFFICIAL RECORDS.
DOCUMENT ILLEGIBLE, NOT PLOTTED.
DISPOSITION: TO BE QUITCLAIMED

(17A) AN EASEMENT FOR TEMPORARY CONSTRUCTION AND INCIDENTAL PURPOSES PER DOCUMENT RECORDED OCTOBER 28, 2004 AS INSTRUMENT NO. 04-2794792 OF OFFICIAL RECORDS.
OWNER: CASTAIC LAKE WATER AGENCY
DISPOSITION: TO BE QUITCLAIMED

(18A) AN EASEMENT FOR TEMPORARY CONSTRUCTION AND INCIDENTAL PURPOSES PER DOCUMENT RECORDED OCTOBER 28, 2004 AS INSTRUMENT NO. 04-2794793 OF OFFICIAL RECORDS.
OWNER: CASTAIC LAKE WATER AGENCY
DISPOSITION: TO BE QUITCLAIMED

(20A) AN EASEMENT FOR POLES AND INCIDENTAL PURPOSES PER DOCUMENT RECORDED JULY 13, 1951 IN BOOK 36754, PAGE 83 OF OFFICIAL RECORDS.
DOCUMENT ILLEGIBLE, NOT PLOTTED.
OWNER: SOUTHERN CALIFORNIA EDISON COMPANY
DISPOSITION: TO BE QUITCLAIMED

(22A) AN EASEMENT FOR TEMPORARY CONSTRUCTION AND INCIDENTAL PURPOSES PER DOCUMENT RECORDED OCTOBER 28, 2004 AS INSTRUMENT NO. 04-2794794 OF OFFICIAL RECORDS.
OWNER: CASTAIC LAKE WATER AGENCY
DISPOSITION: TO BE QUITCLAIMED

PRELIMINARY REPORT NO. 2784278 (51):

(6B) AN EASEMENT FOR POLE LINES AND INCIDENTAL PURPOSES PER DOCUMENT RECORDED IN BOOK 20996, PAGE 385 OF OFFICIAL RECORDS.
DISPOSITION: TO BE QUITCLAIMED

(12B) AN EASEMENT FOR POLES AND INCIDENTAL PURPOSES PER DOCUMENT RECORDED FEBRUARY 5, 1968 AS INSTRUMENT NO. 38 IN BOOK D-3904, PAGE 164 OF OFFICIAL RECORDS.
OWNER: PACIFIC TELEPHONE AND TELEGRAPH COMPANY
DISPOSITION: TO BE QUITCLAIMED

(14B) AN EASEMENT FOR CONDUITS AND INCIDENTAL PURPOSES PER DOCUMENT RECORDED APRIL 23, 1980 AS INSTRUMENT NO. 80-406767 OF OFFICIAL RECORDS.
OWNER: PACIFIC TELEPHONE AND TELEGRAPH COMPANY
DISPOSITION: TO BE QUITCLAIMED

(15B) AN EASEMENT FOR CONSTRUCTION AND INCIDENTAL PURPOSES PER DOCUMENT RECORDED MAY 16, 2000 AS INSTRUMENT NO. 00-0751199 OF OFFICIAL RECORDS.
OWNER: SAUGUS COLONY LTD.
DISPOSITION: TO BE QUITCLAIMED

(16B) AN EASEMENT FOR FLOOD CONTROL PURPOSES AND INCIDENTAL PURPOSES PER DOCUMENT RECORDED JUNE 17, 2002 AS INSTRUMENT NO. 02-1371786 OF OFFICIAL RECORDS.
LOS ANGELES COUNTY FLOOD CONTROL DISTRICT
DISPOSITION: TO BE QUITCLAIMED

(20B) AN EASEMENT FOR UTILITIES AND INCIDENTAL PURPOSES PER DOCUMENT RECORDED IN BOOK 20996, PAGE 385 OFFICIAL RECORDS.
DISPOSITION: TO BE QUITCLAIMED

(21B) AN EASEMENT FOR UTILITIES AND INCIDENTAL PURPOSES PER DOCUMENT RECORDED MARCH 21, 1968 AS INSTRUMENT NO. 2863 IN BOOK D3946, PAGE 960 OFFICIAL RECORDS.
PART(S) OF DOCUMENT ILLEGIBLE
OWNER: PACIFIC TELEPHONE AND TELEGRAPH COMPANY
DISPOSITION: TO BE QUITCLAIMED

PRELIMINARY REPORT NO. 2784279 (51):

(5C) AN EASEMENT FOR PUBLIC HIGHWAY AND INCIDENTAL PURPOSES PER DOCUMENT RECORDED JULY 22, 1924 IN BOOK 3447, PAGE 74 AND IN BOOK 3400, PAGE 314 OF OFFICIAL RECORDS.
OWNER: COUNTY OF LOS ANGELES
DISPOSITION: TO BE QUITCLAIMED

(6C) AN EASEMENT FOR PUBLIC UTILITIES AND INCIDENTAL PURPOSES PER DOCUMENT RECORDED MARCH 28, 1930 IN BOOK 9892, PAGE 16 OF OFFICIAL RECORDS.
OWNER: PACIFIC BELL
DISPOSITION: TO BE QUITCLAIMED

(7C) AN EASEMENT FOR WATER MAIN AND INCIDENTAL PURPOSES PER DOCUMENT RECORDED APRIL 19, 1961 AS INSTRUMENT NO. 3538 OF OFFICIAL RECORDS.
OWNER: SOLEMINT WATER COMPANY
DISPOSITION: TO BE QUITCLAIMED

(9C) AN EASEMENT FOR SANITARY SEWER AND INCIDENTAL PURPOSES PER DOCUMENT RECORDED FEBRUARY 20, 1969 AS INSTRUMENT NO. 3318 OF OFFICIAL RECORDS.
OWNER: NEWHALL COUNTY WATER DISTRICT
DISPOSITION: TO BE QUITCLAIMED

(10C) AN EASEMENT FOR RIGHT TO CONSTRUCT, MAINTAIN, OPERATE, USE OF SANITARY SEWER AND INCIDENTAL PURPOSES PER DOCUMENT RECORDED JULY 1, 1977 AS AS INSTRUMENT NO. 77-710960 OF OFFICIAL RECORDS.
OWNER: COUNTY OF LOS ANGELES
DISPOSITION: TO BE QUITCLAIMED

(14C) AN EASEMENT FOR PUBLIC HIGHWAY AND INCIDENTAL PURPOSES PER DOCUMENT RECORDED JULY 22, 1924 IN BOOK 3447, PAGE 74 AND IN BOOK 3400, PAGE 314 OF OFFICIAL RECORDS.
DISPOSITION: TO BE QUITCLAIMED

(15C) AN EASEMENT FOR POLE LINES AND INCIDENTAL PURPOSES PER DOCUMENT RECORDED MARCH 28, 1930 IN BOOK 9892, PAGE 16 OF OFFICIAL RECORDS.
OWNER: PACIFIC TELEPHONE AND TELEGRAPH COMPANY
DISPOSITION: TO BE QUITCLAIMED

(16C) AN EASEMENT FOR PUBLIC ROAD AND HIGHWAY AND INCIDENTAL PURPOSES PER DOCUMENT RECORDED OCTOBER 15, 1934 IN BOOK 13031, PAGE 164 OF OFFICIAL RECORDS.
DISPOSITION: TO BE QUITCLAIMED

PRELIMINARY REPORT NO. 3098262 (51)

(5D) AN EASEMENT FOR RIGHT OF WAY TO CONSTRUCT AND MAINTAIN A LINE FOR THE PURPOSE OF CONVEYING WATER FOR IRRIGATION PURPOSES AND INCIDENTAL PURPOSES, RECORDED IN BOOK 7427, PAGE 328 OF DEEDS.
OWNER: JOHN W. MITCHELL
DISPOSITION: TO BE QUITCLAIMED

(6D) AN EASEMENT FOR PUBLIC HIGHWAY PURPOSES AND INCIDENTAL PURPOSES, RECORDED JULY 22, 1924 IN BOOK 3447, PAGE 74 AND IN BOOK 3400, PAGE 314 OF OFFICIAL RECORDS.
OWNER: COUNTY OF LOS ANGELES
DISPOSITION: TO BE QUITCLAIMED

(10D) A NON-EXCLUSIVE EASEMENT FOR ROAD PURPOSES AND OTHER PROVISIONS CONTAINED IN THE DOCUMENT ENTITLED "EASEMENT AGREEMENT" RECORDED JULY 17, 1964 AS INSTUMENT NO. 5149 OFFICIAL RECORDS.

(11D) SEE ITEM 10C

(13D) AN EASEMENT FOR PUBLIC UTILTIES AND INCIDENTAL PURPOSES RECORDED SEPTEMBER 20, 1965 AS INSTRUMENT NO. 3730 OFFICIAL RECORDS.
OWNER: SOUTHERN CALIFORNIA EDISON COMPANY, A CORPORATION
DISPOSITION: TO BE QUITCLAIMED

(13D) AN EASEMENT FOR PUBLIC UTILTIES AND INCIDENTAL PURPOSES RECORDED SEPTEMBER 20, 1965 AS INSTRUMENT NO. 3730 OFFICIAL RECORDS.
OWNER: SOUTHERN CALIFORNIA EDISON COMPANY, A CORPORATION
DISPOSITION: TO BE QUITCLAIMED

(14D) AN EASEMENT FOR PIPE LINE AND TEMPORARY CONSTRUCTION AND INCIDENTAL PURPOSES RECORDED NOVEMBER 30, 2004 AS INSTRUMENT NO. 04-3088053 OFFICIAL RECORDS.
OWNER: CASTAIC LAKE WATER AGENCY
DISPOSITION: TO BE QUITCLAIMED

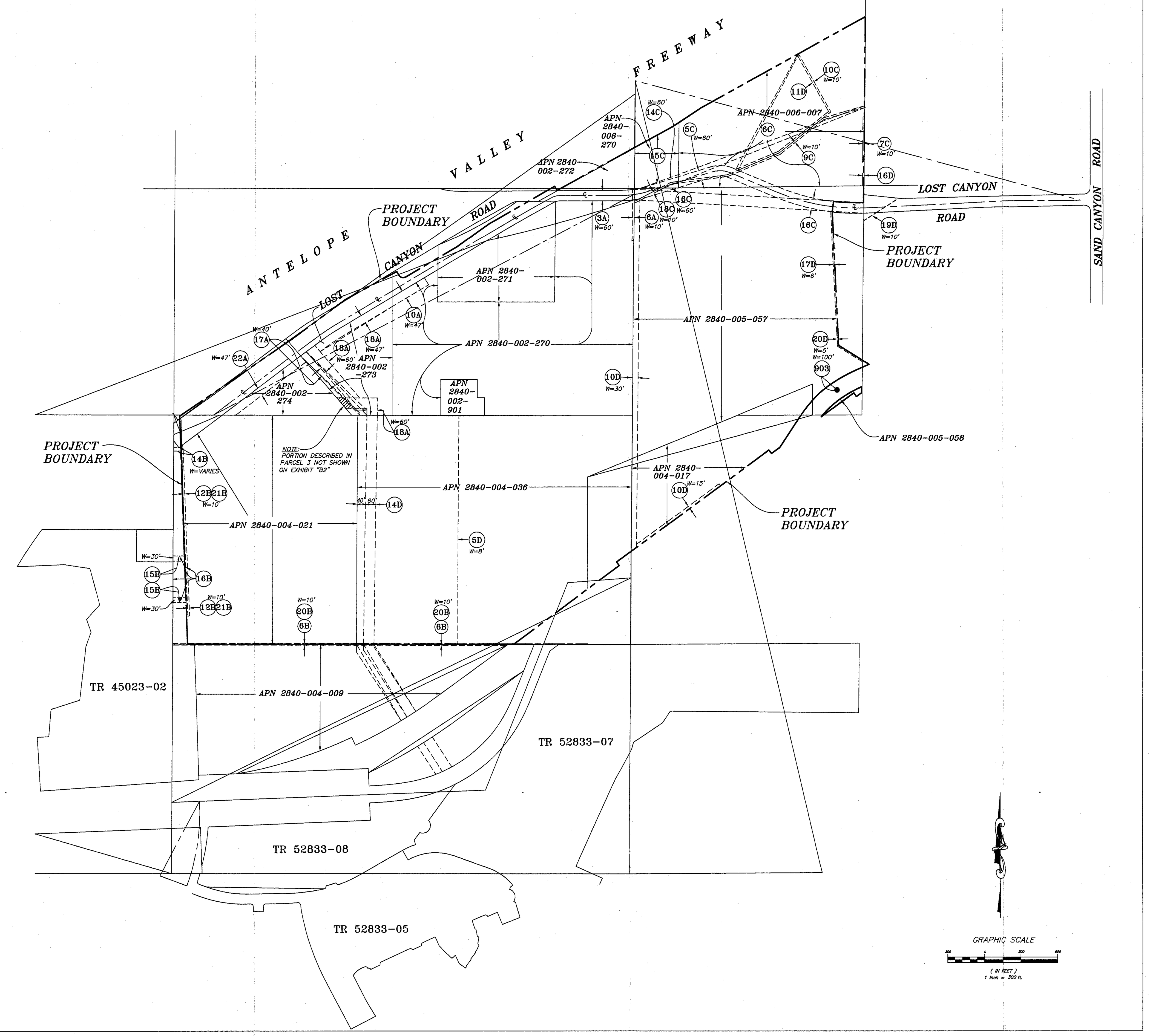
(16D) AN EASEMENT FOR WATER MAIN PURPOSES AND INCIDENTAL PURPOSES, RECORDED APRIL 19, 1961 AS INSTRUMENT NO. 3539 OFFICIAL RECORDS.
OWNER: SOLEMINT WATER COMPANY
DISPOSITION: TO BE QUITCLAIMED

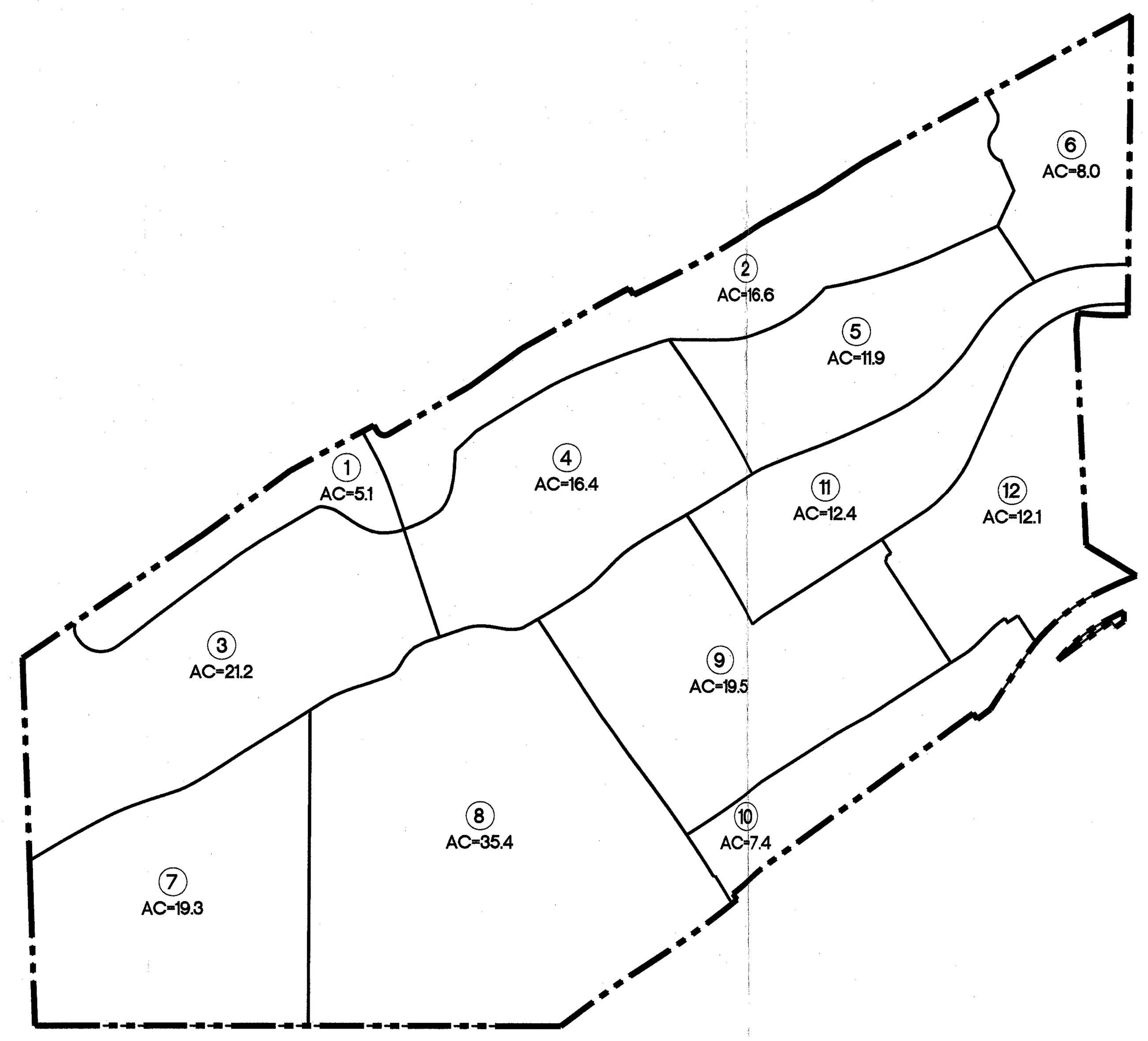
(17D) AN EASEMENT FOR ELECTRIC LINE PURPOSES AND INCIDENTAL PURPOSES, RECORDED DECEMBER 27, 1963 AS INSTRUMENT NO. 4841 OFFICIAL RECORDS.
OWNER: SOUTHERN CALIFORNIA EDISON COMPANY, A CORPORATION
DISPOSITION: TO BE QUITCLAIMED

(18D) AN EASEMENT FOR SANITARY SEWER PURPOSES AND INCIDENTAL PURPOSES, RECORDED FEBRUARY 20, 1969 AS INSTRUMENT NO. 3317 OFFICIAL RECORDS.
OWNER: NEWHALL COUNTY WATER DISTRICT
DISPOSITION: TO BE QUITCLAIMED

(20D) AN EASEMENT FOR ELECTRICAL SUPPLY SYSTEMS AND COMMUNICATION SYSTEMS AND INCIDENTAL PURPOSES RECORDED MAY 6, 1977 AS INSTRUMENT NO. 77-472930 OFFICIAL RECORDS.
OWNER: SOUTHERN CALIFORNIA EDISON COMPANY, A CORPORATION
DISPOSITION: TO BE QUITCLAIMED

EASEMENT DISPOSITION MAP





PROPOSED LARGE LOT PARCEL MAP

GRAPHIC SCALE
(IN FEET)
1 inch = 300 ft.

Geotechnical Map		
PREPARED FOR: Vista Canyon Ranch, LLC		
Project Location: Tentative Tract Map No. 69164, Canyon Country, California		
SCALE 1" = 100'	DRAWN BY MN	CHECKED BY DS/DA
DATE 11-14-08	Figure 1.3	JOB NO. 2005-052-01
1329 SCOTT ROAD, BURBANK, CA, 91504, TEL: (818) 531-1501, FAX: (818) 531-1511, www.rtfrankian.com	RTFA GEOTECHNICAL ENGINEERING & ENGINEERING GEOLOGY	

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PLAN PREPARED FOR:
VISTA CANYON RANCH, LLC
27451 TOURNEY ROAD, SUITE 100
VALENCIA, CA 91355
TEL: (661) 255-3275
TEL: (661) 255-1137

PLANS PREPARED BY:
ALLIANCE LAND PLANNING & ENGINEERING INC.
2248 FARADAY AVE.
(760) 431-9896
PLANS PREPARED UNDER THE DIRECTION OF:
CRAIG M. WHITTEKER R.C.E. 51929 DATE

REGISTERED PROFESSIONAL ENGINEER CRAIG M. WHITTEKER NO. 51929 EXP 6-30-10 CIVIL STATE OF CALIFORNIA

NO.	DATE	REVISIONS	BY	APPR

SHEET 3	CITY OF SANTA CLARITA	SHEET 3
VISTA CANYON RANCH TENTATIVE TRACT MAP 69164 EASEMENT DISPOSITION		

VISTA CANYON RANCH - TM 69164

DATE 10-3-08

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GEOTECHNICAL REPORT FOR

TENTATIVE TRACT MAP NO. 69164

VALENCIA, CALIFORNIA

VOLUME II OF II

FOR

VISTA CANYON, LLC

NOVEMBER 14, 2008

JOB NO. 2005-052-01

RTF&A

GEOTECHNICAL ENGINEERING & ENGINEERING GEOLOGY

Vista Canyon Ranch, LLC
November 14, 2008
2005-052-01

APPENDIX A

EXPLORATIONS

RTF&A
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APPENDIX A

EXPLORATIONS

The soil and bedrock conditions within the site were explored by drilling 24 hollow-stem auger and 14 bucket auger borings and 13 Cone Penetrometer Test (CPT) soundings at the location shown on Geotechnical Map. The borings were drilled using 18- and 24-inch-diameter bucket-auger drilling equipment and 8-inch-diameter hollow-stem auger drilling equipment. Details of the explorations are summarized in Table A-1, Exploration Summary. The soils encountered were classified in the accordance with the Unified Soil Classification System. Results of the borings are presented in this Appendix.

In 2005 RTF&A drilled Borings B-1 through B-7 to depths of 12 to 60.5 feet below the existing grade by Roy Brothers, Inc. using 24-inch-diameter bucket drilling equipment. The soils and bedrock encountered were logged by our field representative and staff geologist. Downhole geologic logging was performed for selected borings by a Certified Engineering Geologist to directly observe subsurface geologic structure and lithology.

In 2007 RTF&A drilled Borings B-8 and HS-1 and HS-2 were drilled as part of Erodibility Index Analyses to depths of 36 to 60.5 feet below the existing grade using 24-inch-diameter bucket drilling equipment and 8-inch-diameter hollow stem auger drilling equipment. The soils and bedrock encountered were logged by our field representative and staff geologist. Downhole geologic logging was performed for boring B-8 by a Certified Engineering Geologist to directly observe subsurface geologic structure and lithology.

Borings B-9 through B-14 were drilled in 2008 to depths of 12 to 26 feet below the existing grade by Tri-Valley Drilling Service, Inc. using 24-inch-diameter bucket drilling equipment. The soils and bedrock encountered were logged by our field representative and staff geologist. Downhole geologic logging was performed for selected borings by a Certified Engineering Geologist to directly observe subsurface geologic structure and lithology.

RTF& A drilled Borings HS-3 through HS-22 in 2008 to depths of 28 to 52.5 feet below the existing grade using 8-inch-diameter hollow stem auger drilling equipment. The soils and bedrock encountered were logged by our field representative and staff geologist.

Our field representative obtained relatively undisturbed and bulk samples for laboratory observation and testing. The undisturbed samples were collected with a 3¼-inch outside diameter lined-barrel sampler containing an 8-inch long, 2.625-inch inside diameter sampling sleeve. The number of blows of the kelly or hammer needed to drive the sampler 12 inches was recorded as an indication of the density or consistency of the earth materials. Except as indicated, a drop of 12 inches was used. The depths at which undisturbed samples were obtained and the number of blows required to drive the lined-barrel sampler 12 inches are indicated to the left of the boring logs.

In addition to obtaining undisturbed samples, Standard Penetration Tests (SPT) were performed in hollow stem borings. The results of the tests are indicated on the boring logs. The standard penetration tests were performed in accordance with the ASTM D1586 Test Method.

The kelly and hammer weights for various depths and drilling equipment are summarized in the following tables.

KELLY WEIGHTS
(Borings B-1 through B-7)

Depth in Feet	Weight in pounds
0 to 25	4,901
25 to 50	3,396
50 to 75	2,213
75 to 100	1,190

KELLY WEIGHTS
(Boring B-8)

Depth in Feet	Weight in pounds
0 to 25	4,900
25 to 50	3,400
50 to 75	2,200
75 to 100	1,200

KELLY WEIGHTS
(Borings B-9 through B-14)

Depth in Feet	Weight in pounds
0 to 24	3,160
24 to 47	2,040
47 to 72	1,120

HAMMER WEIGHTS
(Borings HS-1 through HS-22 and HS-1(*) and HS-2(*))

Depth in Feet	Weight in pounds
Undisturbed (30-inch drop)	140
SPT (30-inch drop)	140

CONE PENETROMETER TEST SOUNDINGS

Cone Penetrometer Test (CPT) soundings were performed for us at 13 locations by Kehoe Testing & Engineering in 2005 and 2007. Our 2005 CPT soundings were performed for us at 11 locations by Kehoe Testing & Engineering. The CPT 2005 soundings are identified as CPT-1 through CPT-11. Our 2007 CPT soundings were also performed for us at two locations by Kehoe Testing & Engineering. The CPT 2007 soundings are identified as CPT-1(*) and CPT-2(*). The soundings extended to depths of approximately 30 to 50 feet; the soundings were

all taken to 50 feet or refusal. The locations of the soundings are shown on Geotechnical Map. The results of the soundings and the methodology of performing the soundings are presented in the Kehoe Testing & Engineering report in this appendix.

EXPLORATION SUMMARY TABLE A-1

Exploration	Date	Total Depth in ft.	Groundwater in ft.	Existing grade in ft.	Prposed grade in ft.	Historic High Water in ft.	Removal depth in ft.
B-1	12/7/2005	19	17	1519	1519	15	30
B-2	12/8/2005	40.5	-	1520.8	1511	50	CUT
B-3	12/7/2005	12	12	1506	1512	9	10
B-4	12/7/2005	15.5	15	1494	1500	9	5
B-5	12/7/2005	35.5	34	1482	1492	15	10-15
B-6	12/12/2005	54	52	1492	1492	50	5
B-7	12/9/2005	60.5	-	1505	1500	50	CUT
B-8	11/12/2007	61	-	1540	1542	50	5
B-9	8/14/2008	24	-	1550	1548	50	5
B-10	8/14/2008	12	-	1558	1550	50	CUT
B-11	8/14/2008	24	-	1552	1548	50	CUT
B-12	8/14/2008	26	-	1542	1548	50	5
B-13	8/14/2008	24	-	1538	1539	50	5
B-14	8/14/2008	14	-	1510	1520	50	5
HS-1	11/8/2007	53	-	1550	1545	50	CUT
HS-2	11/8/2007	36		1540	1542	50	5
HS-3	9/2/2008	28	-	1515	1518	15	15
HS-4	9/2/2008	52.5	-	1506	1513	9	5
HS-5	9/3/2008	52.5	-	1503	1514	15	15
HS-6	9/3/2008	51.5	-	1500	1506	9	5
HS-7	9/3/2008	49.5	-	1496	1510	9	15
HS-8	9/4/2008	31	-	1494	1505	15	15
HS-9	9/4/2008	52	-	1493	1504	9	5
HS-10	9/4/2008	42	-	1493	1503	9	10
HS-11	9/5/2008	52.5	-	1488	1498	9	5
HS-12	9/5/2008	33	-	1484	1494	9	5
HS-13	9/5/2008	51.5	-	1483	1490	15	10
HS-14	9/5/2008	46.5	-	1479	1496	9	5
HS-15	9/5/2008	50.5	-	1488	1490	15	15
HS-16	9/8/2008	52.5	-	1486	1494	15	15
HS-17	9/8/2008	49	-	1490	1496	15	15
HS-18	9/8/2008	39.5	-	1487	1498	15	15
HS-19	9/8/2008	19.5	-	1498	1502	15	10
HS-20	9/9/2008	49.5	-	1485	1486	15	15
HS-21	9/9/2008	32	-	1472	1482	9	10
HS-22	9/9/2008	52.5	-	1474	1485	15	15
CPT 1	12/1/2005	50		1515	1517	9	5
CPT 2	12/1/2005	50		1515	1519	15	30
CPT-3	12/1/2005	50		1508	1515	9	15
CPT 4	12/1/2005	36	17	1501	1510	9	10
CPT 5	12/1/2005	47	14	1498	1506	9	14
CPT-6	12/1/2005	39	13	1492	1501	9	5
CPT 7	12/2/2005	50		1505	1513	9	5
CPT 8	12/2/2005	36		1484	1494	9	5
CPT 9	12/2/2005	50		1502	1502	9	10
CPT 10	12/2/2005	50	29	1490	1490	15	15
CPT 11	12/2/2005	50		1483	1490	15	5
Waldron Property (2007-019-01)							
HS-1	5/31/2007	51	44	1480	1484	9	8
HS-2	5/30/2007	51	-	1484	1488	9	8
CPT 1*	5/30/2007	50		1482	1484	9	8
CPT 2*	5/30/2007	30		1477	1482	9	10

BORING B-9

JOB NUMBER: 2005-052-01
DATE DRILLED: 8/14/08
EQUIPMENT USED: Bucket Auger with Kelly Weight of 3160 lbs.
ELEVATION: 1550'
LOGGED BY: KGF
BORING DEPTH: 0-24'

BLOWS PER FOOT	MOISTURE CONTENT (%)	DRY UNIT WEIGHT (LBS. PER CU. FT.)	N-VALUE	DEPTH (FEET)	SOIL TYPE	
			-	0	SP	**TERRACE DEPOSITS** GRAVELLY SAND: fine to medium, with cobbles, medium dense, damp to dry, light brown
				5		abundant cobbles, using core bucket
						difficult drilling, boulders/cobbles
				10		caving from 9-12' abundant boulders, difficult drilling
17/6"	4.8	117	-	15		**BEDROCK** CONGLOMERATE: medium to coarse, with gravel, moderately sorted, hard
22/6"	6.4	124	-	20		SANDSTONE: fine to medium, very hard, light gray using coring bucket, drilling very slowly
				25		Bottom of Boring at 24 feet. Boring ended due to difficult drilling. No groundwater. Minor caving from 9-13' in cobble layer. Reduced bucket size to 18" below 13'. Boring backfilled.
				30		
				35		
				40		

Note: The log of subsurface conditions shown hereon is approximate and applies only at the specific location and date indicated. It is not warranted to be representative of subsurface conditions at other locations or times.

BOREHOLE LOG 2005-052-01 HS-3.GPJ FRANKIAN.GDT 11/17/08

LOG OF BORING

BORING B-10

JOB NUMBER: 2005-052-01
DATE DRILLED: 8/14/08
EQUIPMENT USED: Bucket Auger with Kelly Weight of 3160 lbs.
ELEVATION: 1558'
LOGGED BY: KGF
BORING DEPTH: 0-12'

BLOWS PER FOOT	MOISTURE CONTENT (%)	DRY UNIT WEIGHT (LBS. PER CU. FT.)	N-VALUE	SOIL TYPE	
				SM	**TOPSOIL** SILTY SAND: fine to medium, slightly porous, loose, dry, brown
7	5.9	116	-	SP	**TERRACE DEPOSITS** GRAVELLY SAND: fine to coarse, poorly sorted, slightly silty, light brown to reddish brown, with gravel and cobbles boulders very difficult drilling due to cobbles and boulders using coring and rock bucket 2 feet of progress in 2 hours
					Bottom of Boring at 12 feet. Boring ended due to difficult drilling. No groundwater. No caving. Boring backfilled with cuttings.

DEPTH (FEET): 5, 10, 15, 20, 25, 30, 35, 40

SAMPLE LOCATION / GRAPHIC LOG

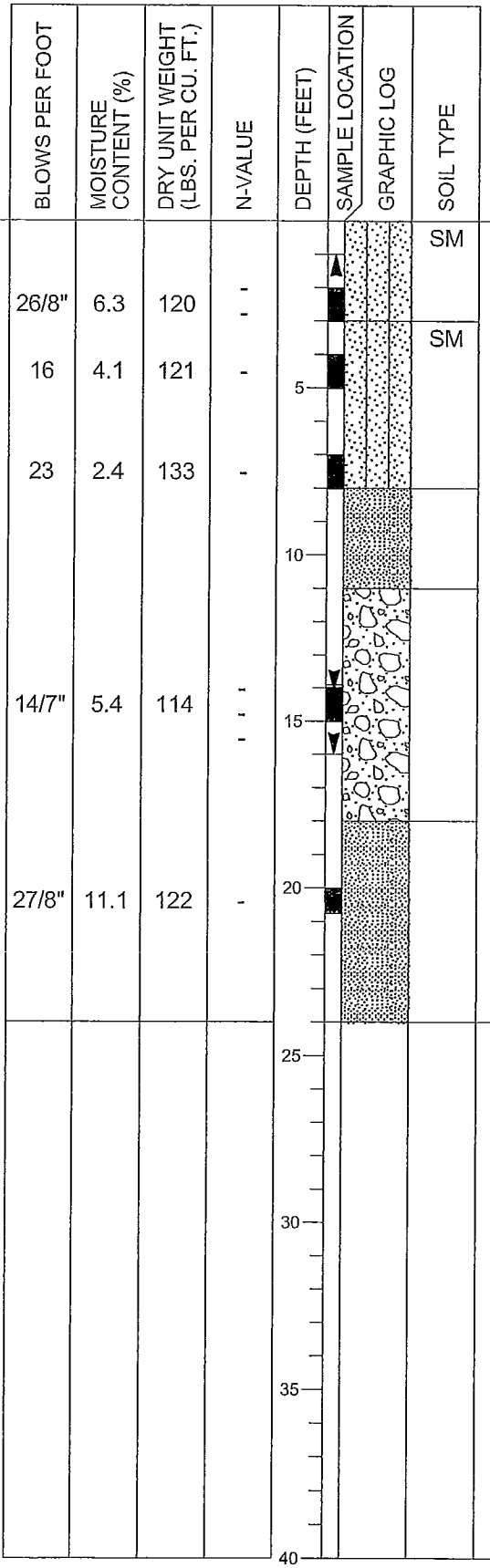
Note: The log of subsurface conditions shown hereon is approximate and applies only at the specific location and date indicated. It is not warranted to be representative of subsurface conditions at other locations or times.

BOREHOLE LOG 2005-052-01 HS-3.GPJ FRANKIAN.GDT 11/17/08

LOG OF BORING

BORING B-11

JOB NUMBER: 2005-052-01
DATE DRILLED: 8/14/08
EQUIPMENT USED: Bucket Auger with Kelly Weight of 3160 lbs.
ELEVATION: 1552'
LOGGED BY: KGF
BORING DEPTH: 0-24'



TOPSOIL
SILTY SAND: fine, well graded, loose, dry, brown

TERRACE DEPOSITS
SILTY SAND: with gravel and cobbles, very dense

BEDROCK
SANDSTONE: fine to medium, poorly laminated, hard, light gray

CONGLOMERATE

@12' Cobble Layer: N10E, 38W

N5W, 48W

N2W, 49

@18' N2E, 45W

SANDSTONE: fine to medium, hard, greenish gray

Bottom of Boring at 24 feet.
No groundwater. No caving. Boring backfilled with cuttings.

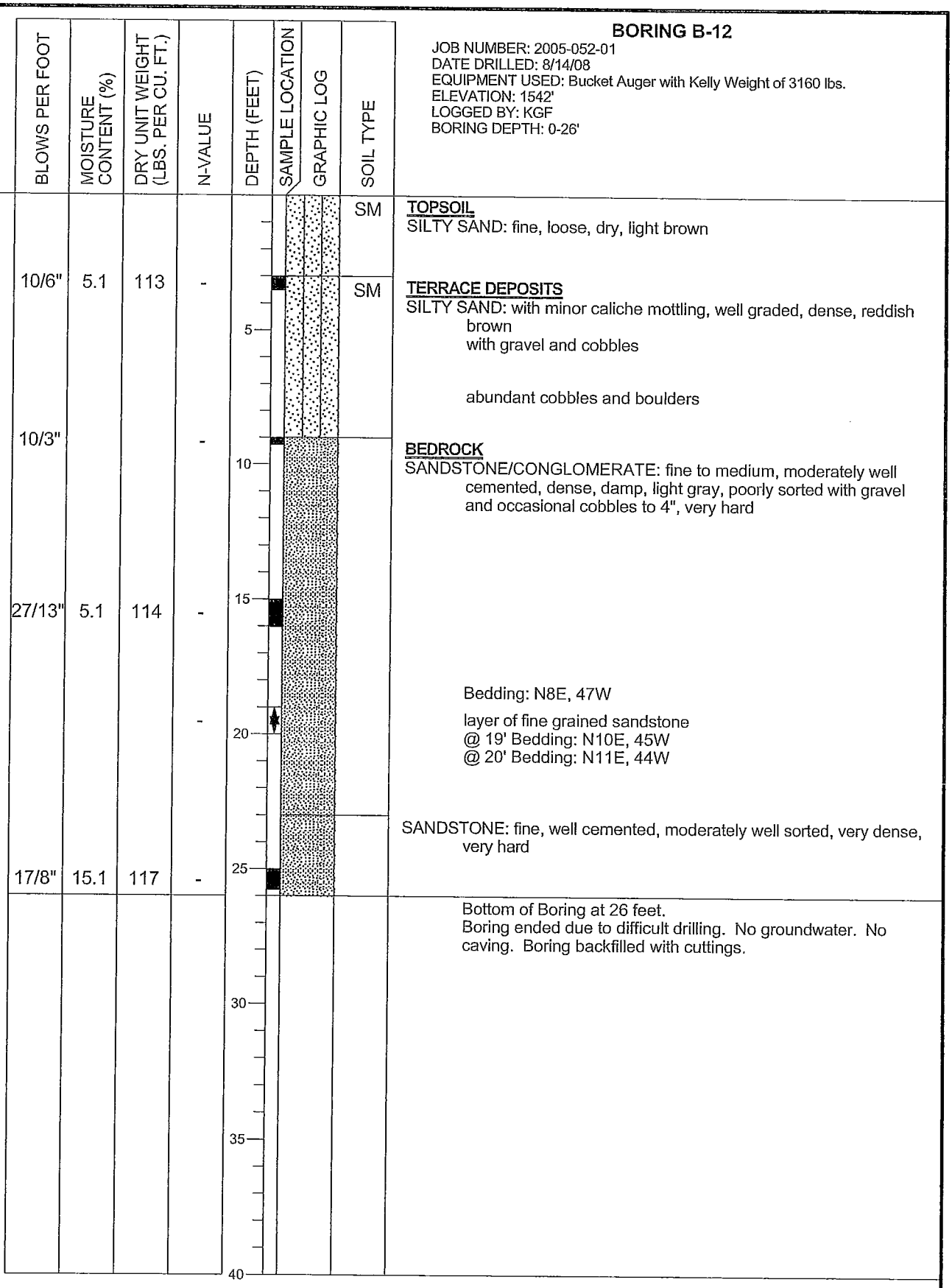
Note: The log of subsurface conditions shown hereon is approximate and applies only at the specific location and date indicated. It is not warranted to be representative of subsurface conditions at other locations or times.

BOREHOLE LOG 2005-052-01 HS-3.GPJ FRANKIAN.GDT 11/17/08

LOG OF BORING

BORING B-12

JOB NUMBER: 2005-052-01
DATE DRILLED: 8/14/08
EQUIPMENT USED: Bucket Auger with Kelly Weight of 3160 lbs.
ELEVATION: 1542'
LOGGED BY: KGF
BORING DEPTH: 0-26'



BLOWS PER FOOT	MOISTURE CONTENT (%)	DRY UNIT WEIGHT (LBS. PER CU. FT.)	N-VALUE	SOIL TYPE	
				SM	**TOPSOIL** SILTY SAND: fine, loose, dry, light brown
10/6"	5.1	113	-	SM	**TERRACE DEPOSITS** SILTY SAND: with minor caliche mottling, well graded, dense, reddish brown with gravel and cobbles
10/3"			-		abundant cobbles and boulders **BEDROCK** SANDSTONE/CONGLOMERATE: fine to medium, moderately well cemented, dense, damp, light gray, poorly sorted with gravel and occasional cobbles to 4", very hard
27/13"	5.1	114	-		Bedding: N8E, 47W
			-		layer of fine grained sandstone @ 19' Bedding: N10E, 45W @ 20' Bedding: N11E, 44W
17/8"	15.1	117	-		SANDSTONE: fine, well cemented, moderately well sorted, very dense, very hard
					Bottom of Boring at 26 feet. Boring ended due to difficult drilling. No groundwater. No caving. Boring backfilled with cuttings.

DEPTH (FEET): 5, 10, 15, 20, 25, 30, 35, 40

SAMPLE LOCATION

GRAPHIC LOG

Note: The log of subsurface conditions shown hereon is approximate and applies only at the specific location and date indicated. It is not warranted to be representative of subsurface conditions at other locations or times.

BOREHOLE LOG 2005-052-01 HS-3.GPJ FRANKIAN.GDT 11/17/08

LOG OF BORING

BORING B-13

JOB NUMBER: 2005-052-01
DATE DRILLED: 8/14/08
EQUIPMENT USED: Bucket Auger with Kelly Weight of 3160 lbs.
ELEVATION: 1538'
LOGGED BY: KGF
BORING DEPTH: 0-24'

BLOWS PER FOOT	MOISTURE CONTENT (%)	DRY UNIT WEIGHT (LBS. PER CU. FT.)	N-VALUE	DEPTH (FEET)	SAMPLE LOCATION	GRAPHIC LOG	SOIL TYPE	
				0			SM	**TERRACE DEPOSITS** SILTY SAND: fine to medium, with gravel and cobbles, well graded, dense, dry, brown
				5				increasing cobbles
12/8"	4.8	116	-	10				**BEDROCK** CONGLOMERATE/SANDSTONE: coarse, with gravel and minor cobbles, moderately well cemented, dense, light greenish tan to gray, very hard
								drills very slowly, requires coring @ 10-12'
13	3.9	134	-	15				coarse sandstone bed Bedding: N20E, 45NW
				20				Bedding: N28E, 50NW
								Bedding: N15E, 47W
				25				Bottom of Boring at 24 feet. No groundwater. No caving. Boring backfilled with cuttings.
				30				
				35				
				40				

Note: The log of subsurface conditions shown hereon is approximate and applies only at the specific location and date indicated. It is not warranted to be representative of subsurface conditions at other locations or times.

BOREHOLE LOG 2005-052-01 HS-3.GPJ FRANKIAN.GDT 11/17/08

LOG OF BORING

BORING B-14

JOB NUMBER: 2005-052-01
DATE DRILLED: 8/14/08
EQUIPMENT USED: Bucket Auger with Kelly Weight of 3160 lbs.
ELEVATION: 1510'
LOGGED BY: KGF
BORING DEPTH: 0-14'

BLOWS PER FOOT	MOISTURE CONTENT (%)	DRY UNIT WEIGHT (LBS. PER CU. FT.)	N-VALUE	DEPTH (FEET)	SAMPLE LOCATION	GRAPHIC LOG	SOIL TYPE	
							SP	**ALLUVIUM** SAND: fine, loose, dry, tan
							SP	GRAVELLY SAND: medium, with gravel and cobbles, dense, damp, tan to light brown
3	3.2	123	-	5				
4	2.5	119	-					increasing cobbles and some boulders
13	8.1	120	-	10				**BEDROCK** SANDSTONE: fine to medium, well cemented, hard, damp, greenish gray
23	4.8	117	-					
				15				Bottom of Boring at 14 feet. Boring ended due to difficult drilling. No groundwater. No caving. Boring backfilled with cuttings.
				20				
				25				
				30				
				35				
				40				

Note: The log of subsurface conditions shown hereon is approximate and applies only at the specific location and date indicated. It is not warranted to be representative of subsurface conditions at other locations or times.

BOREHOLE LOG 2005-052-01 HS-3.GPJ FRANKIAN.GDT 11/17/08

LOG OF BORING

R.T. FRANKIAN & ASSOCIATES

BORING HS-3

JOB NUMBER: 2005-052-01
DATE DRILLED: 9/2/08
EQUIPMENT USED: Hollow Stem Auger with Frankian Heavy Duty Sampler and SPT Sampler
ELEVATION: 1515'
DRILLING CO.: ACE
LOGGED BY: KGF
BORING DEPTH: 0-28'

BLOWS PER FOOT	MOISTURE CONTENT (%)	DRY UNIT WEIGHT (LBS. PER CU. FT.)	N-VALUE	DEPTH (FEET)	SOIL TYPE	
					SM	**ALLUVIUM** SILTY SAND: fine to medium, well graded with minor gravel, loose, slightly moist, light brown
20			-	5		dry, (sample distubed, partially fell out of sleeve)
-			7	10		well graded, slightly moist to moist, brown, slightly plastic with slight caliche mottling (46.7% passing no. 200 sieve)
33	15.5	117	-	15		with gravel, very dense, moist, tan
-			35			(22.8% passing no. 200 sieve)
75/3"			-	20		increasing gravel, difficult drilling
-			50/5"	25		**BEDROCK** SANDSTONE: fine to medium, with minor gravel, hard
-			50/6"			
				30		Bottom of Boring at 28 feet. No groundwater. Boring backfilled with cuttings.
				35		
				40		

Note: The log of subsurface conditions shown hereon is approximate and applies only at the specific location and date indicated. It is not warranted to be representative of subsurface conditions at other locations or times.

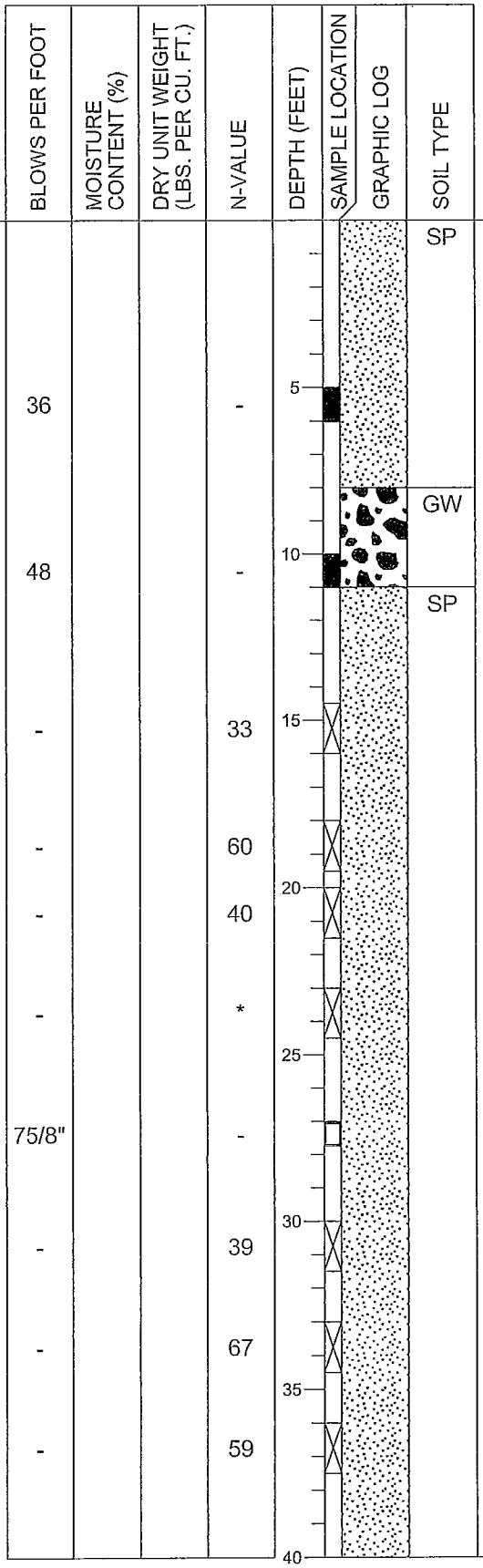
BOREHOLE LOG 2005-052-01 HS-3.GPJ FRANKIAN.GDT 11/17/08

LOG OF BORING

R.T. FRANKIAN & ASSOCIATES

BORING HS-4

JOB NUMBER: 2005-052-01
DATE DRILLED: 9/2/08
EQUIPMENT USED: Hollow Stem Auger with Frankian Heavy Duty Sampler and SPT Sampler
ELEVATION: 1506'
DRILLING CO.: ACE
LOGGED BY: KGF
BORING DEPTH: 0-52.5'



ALLUVIUM
SAND: fine to medium, loose to medium dense, dry, light gray to tan

medium to coarse, dense, damp, gray

SANDY GRAVEL: medium to coarse, very dense, slightly moist, dark gray, (rig chattering)

SAND: coarse, medium dense, slightly moist, light brown to gray

(6.7% passing no. 200 sieve)

medium to coarse, with gravel

* Sampler bouncing on rock

coarse, (sample fell out)

Note: The log of subsurface conditions shown hereon is approximate and applies only at the specific location and date indicated. It is not warranted to be representative of subsurface conditions at other locations or times.

(CONTINUED ON THE FOLLOWING FIGURE)

BOREHOLE LOG 2005-052-01 HS-3.GPJ FRANKIAN.GDT 11/17/08

LOG OF BORING

R.T. FRANKIAN & ASSOCIATES

BORING HS-4 (CONTINUED)

JOB NUMBER: 2005-052-01
DATE DRILLED: 9/2/08
EQUIPMENT USED: Hollow Stem Auger with Frankian Heavy Duty Sampler and SPT Sampler
ELEVATION: 1506'
DRILLING CO.: ACE
LOGGED BY: KGF
BORING DEPTH: 0-52.5'

BLOWS PER FOOT	MOISTURE CONTENT (%)	DRY UNIT WEIGHT (LBS. PER CU. FT.)	N-VALUE	DEPTH (FEET)	SAMPLE LOCATION	GRAPHIC LOG	SOIL TYPE
-			61	45			SP
-			79				
-			49				
-			57	50			
-			49				

Bottom of Boring at 52.5 feet.
No groundwater. Boring backfilled with cuttings.

Note: The log of subsurface conditions shown hereon is approximate and applies only at the specific location and date indicated. It is not warranted to be representative of subsurface conditions at other locations or times.

BOREHOLE LOG 2005-052-01 HS-3.GPJ FRANKIAN.GDT 11/17/08

LOG OF BORING

R.T. FRANKIAN & ASSOCIATES

BORING HS-5

JOB NUMBER: 2005-052-01
DATE DRILLED: 9/3/08
EQUIPMENT USED: Hollow Stem Auger with Frankian Heavy Duty Sampler and SPT Sampler
ELEVATION: 1503'
DRILLING CO.: ACE
LOGGED BY: KGF
BORING DEPTH: 0-52.5'

BLOWS PER FOOT	MOISTURE CONTENT (%)	DRY UNIT WEIGHT (LBS. PER CU. FT.)	N-VALUE	DEPTH (FEET)	SOIL TYPE	
					SM	**ALLUVIUM** SILTY SAND: fine, well graded, loose, damp, brown
15	9.7	90	-	5		decreasing fines with depth
			-			moderately to poorly graded, loose to medium dense, damp to slightly moist, yellowish brown
					ML	SANDY SILT: stiff, moist, yellowish brown
-			21	10		(52.2% passing no. 200 sieve)
28	11.5	116	-	15		(8" recovery) slightly plastic, moist, brown
				20		(68.5% passing no. 200 sieve)
18	14.9	101	-			slightly yellowish brown
-			14	25		brown, (53.5% passing no. 200 sieve)
-			15			increasing fine sand, (50.6% passing no. 200 sieve)
-			15	30		fine, light brown to yellowish brown
-			18		SM	SILTY SAND: fine, no visable porosity, dense, moist, green with tan to tan, (45.1% passing no. 200 sieve)
-			18	35		with minor small gravel, slightly moist, yellowish brown
-			14	40		

Note: The log of subsurface conditions shown hereon is approximate and applies only at the specific location and date indicated. It is not warranted to be representative of subsurface conditions at other locations or times.

(CONTINUED ON THE FOLLOWING FIGURE)

BORING HS-5 (CONTINUED)

JOB NUMBER: 2005-052-01
DATE DRILLED: 9/3/08
EQUIPMENT USED: Hollow Stem Auger with Frankian Heavy Duty Sampler and SPT Sampler
ELEVATION: 1503'
DRILLING CO.: ACE
LOGGED BY: KGF
BORING DEPTH: 0-52.5'

BLOWS PER FOOT	MOISTURE CONTENT (%)	DRY UNIT WEIGHT (LBS. PER CU. FT.)	N-VALUE	DEPTH (FEET)	SAMPLE LOCATION	GRAPHIC LOG	SOIL TYPE	
-							SM	
-			20					fine to medium, well graded with minor granules, small gravel, moist, greenish tan to light brown
-			19	45				medium to coarse, small gravel, (38.4% passing no. 200 sieve)
-			10					
-			23	50				
								Bottom of Boring at 52.5 feet. No groundwater. Boring backfilled with cuttings.
				55				
				60				
				65				
				70				
				75				
				80				

Note: The log of subsurface conditions shown hereon is approximate and applies only at the specific location and date indicated. It is not warranted to be representative of subsurface conditions at other locations or times.

BOREHOLE LOG 2005-052-01 HS-3.GPJ FRANKIAN.GDT 11/17/08

LOG OF BORING

R.T. FRANKIAN & ASSOCIATES

BORING HS-6

JOB NUMBER: 2005-052-01
DATE DRILLED: 9/3/08
EQUIPMENT USED: Hollow Stem Auger with Frankian Heavy Duty Sampler and SPT Sampler
ELEVATION: 1500'
DRILLING CO.: ACE
LOGGED BY: KGF
BORING DEPTH: 0-51.5'

Note: The log of subsurface conditions shown hereon is approximate and applies only at the specific location and date indicated. It is not warranted to be representative of subsurface conditions at other locations or times.

BLOWS PER FOOT	MOISTURE CONTENT (%)	DRY UNIT WEIGHT (LBS. PER CU. FT.)	N-VALUE	DEPTH (FEET)	SOIL TYPE	
					SM	**ALLUVIUM** SILTY SAND: well graded, loose to medium dense, damp, brown
50	6.5	96	-	5		very dense minor gravel and cobbles to 3"
75			-	10		
35			-			fine, moderately graded with silt, dense, slightly moist, brown to light brown (45.8% passing no. 200 sieve)
-			15	15		
-			17			(38.6% passing no. 200 sieve) medium, poorly graded, dense, damp, light brown
-			46	20		
				25		
75			-			with minor gravel, well graded, dark brown to dark gray
-			34	30	SP	SAND: coarse, moderately to poorly graded, brown to light brown, (8.8% passing no. 200 sieve)
-			27			(7% passing no. 200 sieve)
				35		damp to slightly moist
-			70			very dense
-			59	40		

(CONTINUED ON THE FOLLOWING FIGURE)

LOG OF BORING

R.T. FRANKIAN & ASSOCIATES

BORING HS-6 (CONTINUED)

JOB NUMBER: 2005-052-01
DATE DRILLED: 9/3/08
EQUIPMENT USED: Hollow Stem Auger with Frankian Heavy Duty Sampler and SPT Sampler
ELEVATION: 1500'
DRILLING CO.: ACE
LOGGED BY: KGF
BORING DEPTH: 0-51.5'

BLOWS PER FOOT	MOISTURE CONTENT (%)	DRY UNIT WEIGHT (LBS. PER CU. FT.)	N-VALUE	DEPTH (FEET)	SAMPLE LOCATION	GRAPHIC LOG	SOIL TYPE
-			53	45			SP
-			60				
50/3"			-	50			
-			61				

Bottom of Boring at 51.5 feet.
No groundwater. Boring backfilled with cuttings.

Note: The log of subsurface conditions shown hereon is approximate and applies only at the specific location and date indicated. It is not warranted to be representative of subsurface conditions at other locations or times.

BOREHOLE LOG 2005-052-01 HS-3.GPJ FRANKIAN.GDT 11/17/08

LOG OF BORING

R.T. FRANKIAN & ASSOCIATES

BORING HS-7

JOB NUMBER: 2005-052-01
DATE DRILLED: 9/3/08
EQUIPMENT USED: Hollow Stem Auger with Frankian Heavy Duty Sampler and SPT Sampler
ELEVATION: 1496'
DRILLING CO.: ACE
LOGGED BY: KGF
BORING DEPTH: 0-49.5'

BLOWS PER FOOT	MOISTURE CONTENT (%)	DRY UNIT WEIGHT (LBS. PER CU. FT.)	N-VALUE	DEPTH (FEET)	SOIL TYPE	
					SM	SILTY SAND: loose, damp to slightly moist, dark brown to dark gray
20	15.6	99	-	5		dark gray
					SP	SAND: medium, moderately grained, medium dense, damp
-			10	10		
						fine, poorly graded, light brown to yellowish brown
18	10.1	103	-	15		
-			38			fine to medium, with minor gravel layer, (8% passing no. 200 sieve)
75/6"			-	20		gravel and cobbles
-			26			with minor gravel, (5.3% passing no. 200 sieve)
75/6"			-	25		gravel & minor cobbles
-			48	30		medium to coarse, with minor gravel, dense
-			41			
-			43	35		
45			-	40		

Note: The log of subsurface conditions shown hereon is approximate and applies only at the specific location and date indicated. It is not warranted to be representative of subsurface conditions at other locations or times.

(CONTINUED ON THE FOLLOWING FIGURE)

BOREHOLE LOG 2005-052-01 HS-3.GPJ FRANKIAN.GDT 11/17/08

LOG OF BORING

BORING HS-7 (CONTINUED)

JOB NUMBER: 2005-052-01
DATE DRILLED: 9/3/08
EQUIPMENT USED: Hollow Stem Auger with Frankian Heavy Duty Sampler and SPT Sampler
ELEVATION: 1496'
DRILLING CO.: ACE
LOGGED BY: KGF
BORING DEPTH: 0-49.5'

BLOWS PER FOOT	MOISTURE CONTENT (%)	DRY UNIT WEIGHT (LBS. PER CU. FT.)	N-VALUE	DEPTH (FEET)	SAMPLE LOCATION	GRAPHIC LOG	SOIL TYPE	
'			*				SP	
'								**BEDROCK**
'			*	45				SANDSTONE: coarse, with gravel, (* 50 blows for the first 4")
								(* 50 blows for the first 5")
'			*					(* 50 blows for the first 4")
				50				Bottom of Boring at 49.5 feet.
								No groundwater. Boring backfilled with cuttings.
				55				
				60				
				65				
				70				
				75				
				80				

Note: The log of subsurface conditions shown hereon is approximate and applies only at the specific location and date indicated. It is not warranted to be representative of subsurface conditions at other locations or times.

BOREHOLE LOG 2005-052-01 HS-3.GPJ FRANKIAN.GDT 11/17/08

LOG OF BORING

R.T. FRANKIAN & ASSOCIATES

BORING HS-8

JOB NUMBER: 2005-052-01
DATE DRILLED: 9/4/08
EQUIPMENT USED: Hollow Stem Auger with Frankian Heavy Duty Sampler and SPT Sampler
ELEVATION: 1494'
DRILLING CO.: ACE
LOGGED BY: KGF
BORING DEPTH: 0-31'

BLOWS PER FOOT	MOISTURE CONTENT (%)	DRY UNIT WEIGHT (LBS. PER CU. FT.)	N-VALUE	DEPTH (FEET)	SAMPLE LOCATION	GRAPHIC LOG	SOIL TYPE	
30	14	111	-	5			ML	**ALLUVIUM** SILT: slightly clayey, soft to firm, damp, dark brown to black becomes firmer and darker with depth & slightly plastic, moist, black silt with white caliche mottling
- 15			9 -	10			ML	SANDY SILT: slightly plastic, firm, gray to greenish gray gray, (62.8% passing no. 200 sieve) stiff
- 13	15.1	108	16 -	15				
-			19	20				greenish gray, (60.4% passing no. 200 sieve)
21	15.2	107	-					moist, greenish tan, (56.5% passing no. 200 sieve)
-			50/1"	25				**BEDROCK** SANDSTONE: fine to medium, cemented, with minor gravel, dense, slightly moist, light gray to white
-			50/5"	30				
				35				Bottom of Boring at 31 feet. No groundwater. Upper 2' caved. Boring backfilled with cuttings.
				40				

Note: The log of subsurface conditions shown hereon is approximate and applies only at the specific location and date indicated. It is not warranted to be representative of subsurface conditions at other locations or times.

BOREHOLE LOG 2005-052-01 HS-3.GPJ FRANKIAN.GDT 11/17/08

LOG OF BORING

BORING HS-9

JOB NUMBER: 2005-052-01
DATE DRILLED: 9/4/08
EQUIPMENT USED: Hollow Stem Auger with Frankian Heavy Duty Sampler and SPT Sampler
ELEVATION: 1493'
DRILLING CO.: ACE
LOGGED BY: KGF
BORING DEPTH: 0-52'

BLOWS PER FOOT	MOISTURE CONTENT (%)	DRY UNIT WEIGHT (LBS. PER CU. FT.)	N-VALUE	DEPTH (FEET)	SOIL TYPE	
					SM	**ALLUVIUM** SILTY SAND: very dense, damp, brown to greenish brown
46	6.7	105	-	5		white caliche mottling below 4'
20	12.8	106	-	10		
					ML	SANDY SILT: fine to medium, stiff, moist, brown, (60.7% passing no. 200 sieve)
-			10	15		
-			19		SM	SILTY SAND: medium to coarse, dense, slightly moist, light brown to tan, (21.2% passing no. 200 sieve)
-			35	20		with minor gravel, "river sand"
-			40			very moist
50/6"			-	25		
-			38			coarse, increasing gravel, dense
-			51	30		
-			32			
-			37	35		
				40		

Note: The log of subsurface conditions shown hereon is approximate and applies only at the specific location and date indicated. It is not warranted to be representative of subsurface conditions at other locations or times.

(CONTINUED ON THE FOLLOWING FIGURE)

LOG OF BORING

BORING HS-9 (CONTINUED)

JOB NUMBER: 2005-052-01
DATE DRILLED: 9/4/08
EQUIPMENT USED: Hollow Stem Auger with Frankian Heavy Duty Sampler and SPT Sampler
ELEVATION: 1493'
DRILLING CO.: ACE
LOGGED BY: KGF
BORING DEPTH: 0-52'

BLOWS PER FOOT	MOISTURE CONTENT (%)	DRY UNIT WEIGHT (LBS. PER CU. FT.)	N-VALUE	DEPTH (FEET)	SAMPLE LOCATION	GRAPHIC LOG	SOIL TYPE	
-			55	45			SM	
-			41					
60/3"			-					**BEDROCK** SANDSTONE: fine to medium, with minor gravel, dense, damp, white
-			50/3"	50				
								Bottom of Boring at 52 feet. No groundwater. Boring backfilled with cuttings.
				55				
				60				
				65				
				70				
				75				
				80				

Note: The log of subsurface conditions shown hereon is approximate and applies only at the specific location and date indicated. It is not warranted to be representative of subsurface conditions at other locations or times.

BOREHOLE LOG 2005-052-01 HS-3.GPJ FRANKIAN.GDT 11/17/08

LOG OF BORING

R.T. FRANKIAN & ASSOCIATES

BORING HS-10

JOB NUMBER: 2005-052-01
DATE DRILLED: 9/4/08
EQUIPMENT USED: Hollow Stem Auger with Frankian Heavy Duty Sampler and SPT Sampler
ELEVATION: 1493'
DRILLING CO.: ACE
LOGGED BY: KGF
BORING DEPTH: 0-42'

Note: The log of subsurface conditions shown hereon is approximate and applies only at the specific location and date indicated. It is not warranted to be representative of subsurface conditions at other locations or times.

BLOWS PER FOOT	MOISTURE CONTENT (%)	DRY UNIT WEIGHT (LBS. PER CU. FT.)	N-VALUE	DEPTH (FEET)	SAMPLE LOCATION	GRAPHIC LOG	SOIL TYPE	
							SM	ALLUVIUM SILTY SAND: fine, medium dense, dry, light brown to tan
28			-	5				(disturbed sample)
							SP	SAND: fine to medium, dense, slightly moist, tan
-			24	10				Note* sand has generally angular sand grains, appears alluvial, typical "river sand" with gravel (5.6% passing no. 200 sieve) coarse, with gravel
41	2.2	113	-	15				angular with gravel, very dense
-			36					medium to coarse, with gravel
50/1"			-	20				(no recovery, sampler bouncing on gravel?)
-			21	25				(8.4% passing no. 200 sieve)
50/6"			-					(no recovery)
-			23	30				coarse, yellowish brown, (5.3% passing no. 200 sieve)
-			63	35				
-			102					light brown to yellowish brown
75/1"			-	40				

(CONTINUED ON THE FOLLOWING FIGURE)

BOREHOLE LOG 2005-052-01 HS-3.GPJ FRANKIAN.GDT 11/17/08

BORING HS-10 (CONTINUED)

JOB NUMBER: 2005-052-01
DATE DRILLED: 9/4/08
EQUIPMENT USED: Hollow Stem Auger with Frankian Heavy Duty Sampler and SPT Sampler
ELEVATION: 1493'
DRILLING CO.: ACE
LOGGED BY: KGF
BORING DEPTH: 0-42'

BLOWS PER FOOT	MOISTURE CONTENT (%)	DRY UNIT WEIGHT (LBS. PER CU. FT.)	N-VALUE	DEPTH (FEET)	SAMPLE LOCATION	GRAPHIC LOG	SOIL TYPE	
75/2"							SP	
								Bottom of Boring at 42 feet. No groundwater. Boring backfilled with cuttings.

45
50
55
60
65
70
75
80

Note: The log of subsurface conditions shown hereon is approximate and applies only at the specific location and date indicated. It is not warranted to be representative of subsurface conditions at other locations or times.

BOREHOLE LOG 2005-052-01 HS-3.GPJ FRANKIAN.GDT 11/17/08

LOG OF BORING

BORING HS-11

JOB NUMBER: 2005-052-01
DATE DRILLED: 9/5/08
EQUIPMENT USED: Hollow Stem Auger with Frankian Heavy Duty Sampler and SPT Sampler
ELEVATION: 1488'
DRILLING CO.: ACE
LOGGED BY: KGF
BORING DEPTH: 0-52.5'

BLOWS PER FOOT	MOISTURE CONTENT (%)	DRY UNIT WEIGHT (LBS. PER CU. FT.)	N-VALUE	DEPTH (FEET)	SAMPLE LOCATION	GRAPHIC LOG	SOIL TYPE	
							SP	**ALLUVIUM** SAND: fine to medium, poorly graded, loose, dry, light gray
							SP	SAND: medium to coarse, no gravel, dense, damp to slightly moist, tan, (sample fell out of rings)
55			-	5				
								poorly graded, no fines
50			-	10				(sample fell out of rings)
							SP	SAND: medium to coarse, poorly graded with gravel, slightly moist, gray, (some rig chattering on cobbles)
-	-		45	15				
	-		34					
	-		33	20				
	-		27					
	-		65	25				appears as "washed" river sand but with angular to sub angular grains
	-		65	30				with gravel
	-		58					
	-		39	35				coarse
-			36	40				

Note: The log of subsurface conditions shown hereon is approximate and applies only at the specific location and date indicated. It is not warranted to be representative of subsurface conditions at other locations or times.

(CONTINUED ON THE FOLLOWING FIGURE)

BOREHOLE LOG 2005-052-01 HS-3.GPJ FRANKIAN.GDT 11/17/08

LOG OF BORING

R.T. FRANKIAN & ASSOCIATES

BORING HS-11 (CONTINUED)

JOB NUMBER: 2005-052-01
DATE DRILLED: 9/5/08
EQUIPMENT USED: Hollow Stem Auger with Frankian Heavy Duty Sampler and SPT Sampler
ELEVATION: 1488'
DRILLING CO.: ACE
LOGGED BY: KGF
BORING DEPTH: 0-52.5'

BLOWS PER FOOT	MOISTURE CONTENT (%)	DRY UNIT WEIGHT (LBS. PER CU. FT.)	N-VALUE	DEPTH (FEET)	SAMPLE LOCATION	GRAPHIC LOG	SOIL TYPE
-			45	45			SP
-			50				
-			70	50			
-			60				

Bottom of Boring at 52.5 feet.
No groundwater. Boring backfilled with cuttings.

Note: The log of subsurface conditions shown hereon is approximate and applies only at the specific location and date indicated. It is not warranted to be representative of subsurface conditions at other locations or times.

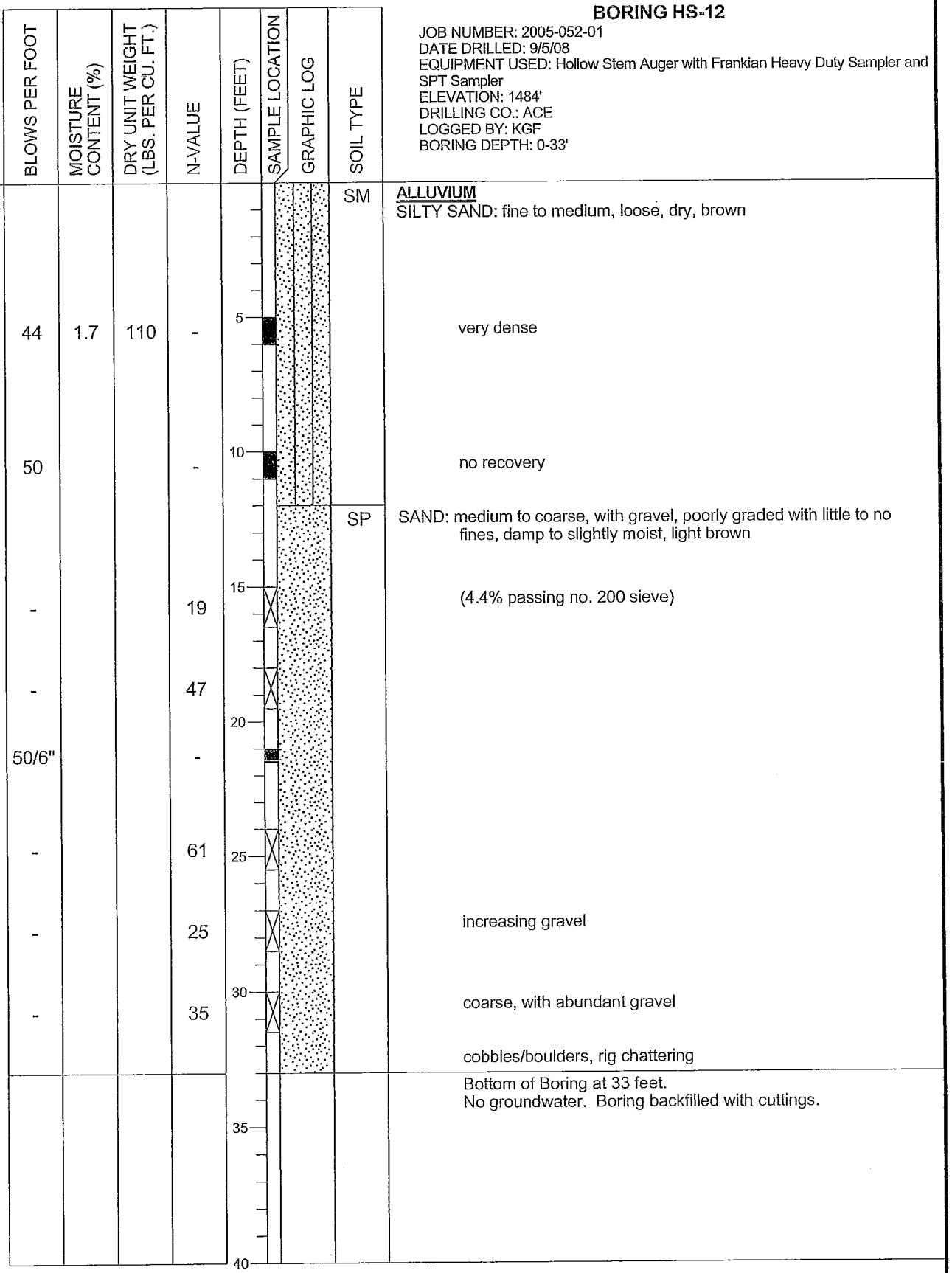
BOREHOLE LOG 2005-052-01 HS-3.GPJ FRANKIAN.GDT 11/17/08

LOG OF BORING

R.T. FRANKIAN & ASSOCIATES

BORING HS-12

JOB NUMBER: 2005-052-01
DATE DRILLED: 9/5/08
EQUIPMENT USED: Hollow Stem Auger with Frankian Heavy Duty Sampler and SPT Sampler
ELEVATION: 1484'
DRILLING CO.: ACE
LOGGED BY: KGF
BORING DEPTH: 0-33'



ALLUVIUM
SILTY SAND: fine to medium, loose, dry, brown

very dense

no recovery

SAND: medium to coarse, with gravel, poorly graded with little to no fines, damp to slightly moist, light brown

(4.4% passing no. 200 sieve)

increasing gravel

coarse, with abundant gravel

cobbles/boulders, rig chattering

Bottom of Boring at 33 feet.
No groundwater. Boring backfilled with cuttings.

Note: The log of subsurface conditions shown hereon is approximate and applies only at the specific location and date indicated. It is not warranted to be representative of subsurface conditions at other locations or times.

BOREHOLE LOG 2005-052-01 HS-3.GPJ FRANKIAN.GDT 11/17/08

LOG OF BORING

R.T. FRANKIAN & ASSOCIATES

BORING HS-13

JOB NUMBER: 2005-052-01
DATE DRILLED: 9/5/08
EQUIPMENT USED: Hollow Stem Auger with Frankian Heavy Duty Sampler and SPT Sampler
ELEVATION: 1483'
DRILLING CO.: ACE
LOGGED BY: KGF
BORING DEPTH: 0-51.5'

BLOWS PER FOOT	MOISTURE CONTENT (%)	DRY UNIT WEIGHT (LBS. PER CU. FT.)	N-VALUE	DEPTH (FEET)	SAMPLE LOCATION	GRAPHIC LOG	SOIL TYPE	
							ML	ALLUVIUM SILT: with minor fine sand, stiff, slightly moist, greenish brown
17	6.1	102	-	5				increase in moisture with occasional caliche mottling
32	12	100	-	10				
-			9	15				increase in clay, slightly plastic (79.2% passing no. 200 sieve)
-			11					(62.2% passing no. 200 sieve)
-			8	20				moist (52.2% passing no. 200 sieve)
18	15.3	108	-					well graded, greenish gray
-			7	25				with occasional caliche mottling, slightly plastic, moist, greenish brown, with minor fine sand (67.1% passing no. 200 sieve)
-			13	30				(67.1% passing no. 200 sieve)
11	12.2	109	-				SM	SILTY SAND: fine, slightly clayey, slightly plastic, moist, light brown to greenish brown
-			16	35				fine to coarse, increased sand, dense, (hard drilling) (47.3% passing no. 200 sieve)
-			17	40			ML	SANDY SILT: stiff, light brown, (55.7% passing no. 200 sieve)

Note: The log of subsurface conditions shown hereon is approximate and applies only at the specific location and date indicated. It is not warranted to be representative of subsurface conditions at other locations or times.

(CONTINUED ON THE FOLLOWING FIGURE)

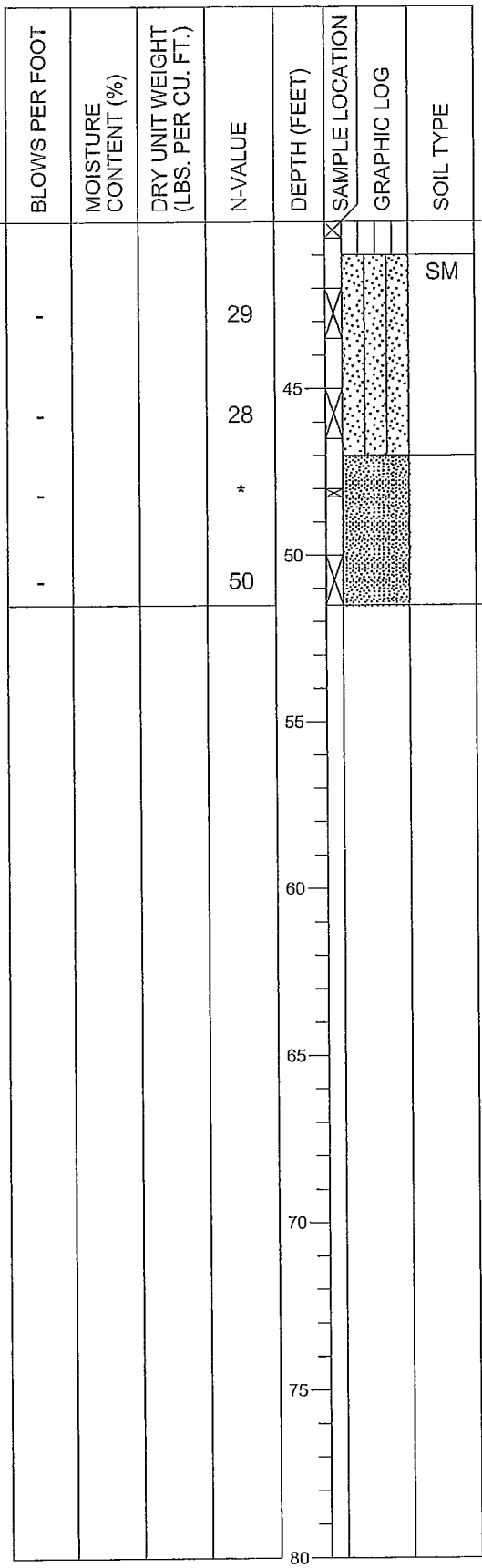
BOREHOLE LOG 2005-052-01 HS-3.GPJ FRANKIAN.GDT 11/17/08

LOG OF BORING

R.T. FRANKIAN & ASSOCIATES

BORING HS-13 (CONTINUED)

JOB NUMBER: 2005-052-01
DATE DRILLED: 9/5/08
EQUIPMENT USED: Hollow Stem Auger with Frankian Heavy Duty Sampler and SPT Sampler
ELEVATION: 1483'
DRILLING CO.: ACE
LOGGED BY: KGF
BORING DEPTH: 0-51.5'



SILTY SAND: fine, dense, slightly moist, greenish gray

(23% passing no. 200 sieve)

some gravel

BEDROCK

SANDSTONE: fine to medium, with gravel, slightly moist, white to tan

Bottom of Boring at 51.5 feet.
No groundwater. Boring backfilled with cuttings.

Note: The log of subsurface conditions shown hereon is approximate and applies only at the specific location and date indicated. It is not warranted to be representative of subsurface conditions at other locations or times.

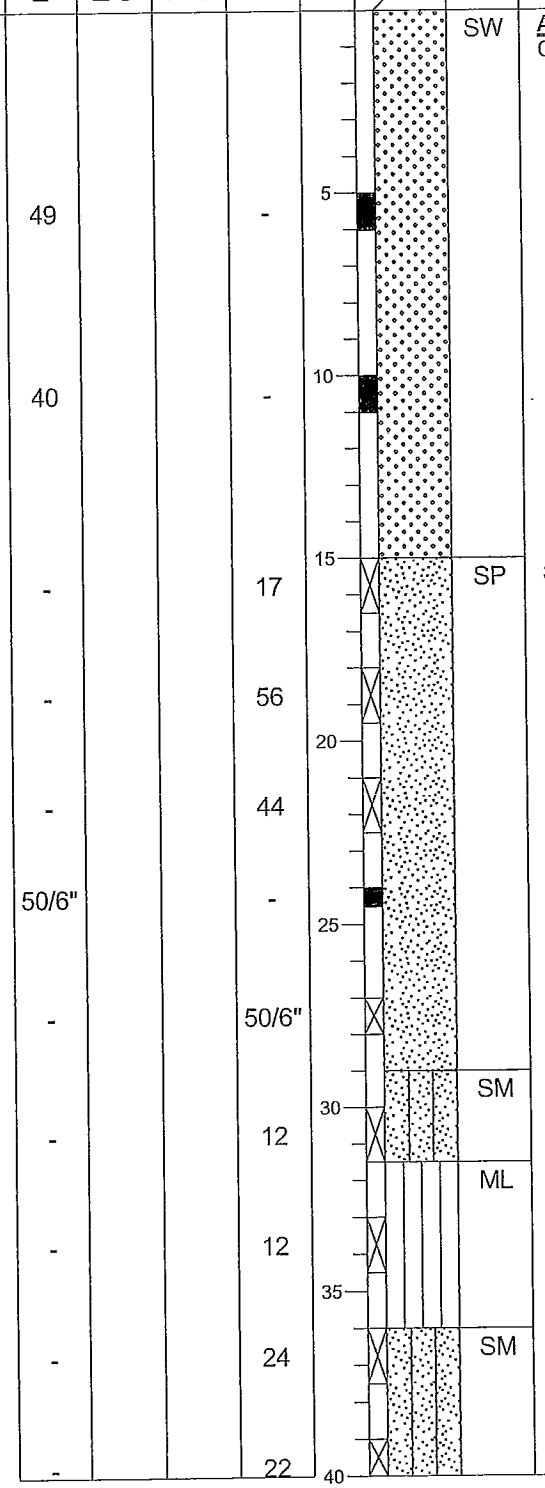
BOREHOLE LOG 2005-052-01 HS-3.GPJ FRANKIAN.GDT 11/17/08

LOG OF BORING

R.T. FRANKIAN & ASSOCIATES

BORING HS-14

JOB NUMBER: 2005-052-01
DATE DRILLED: 9/5/08
EQUIPMENT USED: Hollow Stem Auger with Frankian Heavy Duty Sampler and SPT Sampler
ELEVATION: 1479'
DRILLING CO.: ACE
LOGGED BY: KGF
BORING DEPTH: 0-46.5'



BLOWS PER FOOT	N-VALUE	SOIL TYPE	
49	-	SW	**ALLUVIUM** GRAVELLY SAND: medium to coarse, dense, dry to damp, gray (sample fell out)
40	-		(no recovery)
-	17	SP	SAND: fine to coarse, occasional gravel, medium dense, dry to slightly moist, grayish brown, (4.7% passing no. 200 sieve)
-	56		
-	44		
50/6"	-		(no recovery)
-	50/6"		broken cobbles, very dense, light brown, chatter, cobbles/boulders
-	12	SM	SILTY SAND: fine to medium, medium dense, slightly moist, dark brown, (rock in tip, possibly slough) (37.3% passing no. 200 sieve)
-	12	ML	SANDY SILT: olive gray, slight plasticity (60.8% passing no. 200 sieve)
-	24	SM	SILTY SAND: fine to medium, medium dense, slightly moist, olive gray to light gray, (40.4% passing no. 200 sieve)
-	22		(49.1% passing no. 200 sieve)

Note: The log of subsurface conditions shown hereon is approximate and applies only at the specific location and date indicated. It is not warranted to be representative of subsurface conditions at other locations or times.

(CONTINUED ON THE FOLLOWING FIGURE)

BOREHOLE LOG 2005-052-01 HS-3.GPJ FRANKIAN.GDT 11/17/08

LOG OF BORING

R.T. FRANKIAN & ASSOCIATES

BORING HS-14 (CONTINUED)

JOB NUMBER: 2005-052-01
DATE DRILLED: 9/5/08
EQUIPMENT USED: Hollow Stem Auger with Frankian Heavy Duty Sampler and SPT Sampler
ELEVATION: 1479'
DRILLING CO.: ACE
LOGGED BY: KGF
BORING DEPTH: 0-46.5'

BLOWS PER FOOT	MOISTURE CONTENT (%)	DRY UNIT WEIGHT (LBS. PER CU. FT.)	N-VALUE	DEPTH (FEET)	SAMPLE LOCATION	GRAPHIC LOG	SOIL TYPE	
-			28	45			SM	(46.3% passing no. 200 sieve)
-			26					(48.7% passing no. 200 sieve)
								Bottom of Boring at 46.5 feet. No groundwater. Boring backfilled with cuttings.

50
55
60
65
70
75
80

Note: The log of subsurface conditions shown hereon is approximate and applies only at the specific location and date indicated. It is not warranted to be representative of subsurface conditions at other locations or times.

BOREHOLE LOG 2005-052-01 HS-3.GPJ FRANKIAN.GDT 11/17/08

LOG OF BORING

R.T. FRANKIAN & ASSOCIATES

BORING HS-15

JOB NUMBER: 2005-052-01
DATE DRILLED: 9/5/08
EQUIPMENT USED: Hollow Stem Auger with Frankian Heavy Duty Sampler and SPT Sampler
ELEVATION: 1488'
DRILLING CO.: ACE
LOGGED BY: KGF
BORING DEPTH: 0-50.5'

BLOWS PER FOOT	MOISTURE CONTENT (%)	DRY UNIT WEIGHT (LBS. PER CU. FT.)	N-VALUE	DEPTH (FEET)	SOIL TYPE	
					SM	**ALLUVIUM** SILTY SAND: fine, loose, dry, light brown to yellowish brown
25	3.4	110	-	5		
					ML	SANDY SILT: with minor caliche motlling, soft, moist, greenish brown
24	9	101	-	10		
-			12	15		stiff, (70.7% passing no. 200 sieve)
-			14			(74.4% passing no. 200 sieve)
-			16	20		slightly clayey, (75% passing no. 200 sieve)
13	14.3	110	-	25		
-			17			(53% passing no. 200 sieve)
-			14	30		with caliche mottling, drilling difficult, hole "squeezing" (78.5% passing no. 200 sieve)
-			14			(67.2% passing no. 200 sieve)
-			11	35		(63.8% passing no. 200 sieve)
-			21	40		fine to coarse, with occasional gravel, moist, greenish brown, (55.7% passing no. 200 sieve)

Note: The log of subsurface conditions shown hereon is approximate and applies only at the specific location and date indicated. It is not warranted to be representative of subsurface conditions at other locations or times.

(CONTINUED ON THE FOLLOWING FIGURE)

BOREHOLE LOG 2005-052-01 HS-3.GPJ FRANKIAN.GDT 11/17/08

LOG OF BORING

R.T. FRANKIAN & ASSOCIATES

BORING HS-15 (CONTINUED)

JOB NUMBER: 2005-052-01
DATE DRILLED: 9/5/08
EQUIPMENT USED: Hollow Stem Auger with Frankian Heavy Duty Sampler and SPT Sampler
ELEVATION: 1488'
DRILLING CO.: ACE
LOGGED BY: KGF
BORING DEPTH: 0-50.5'

BLOWS PER FOOT	MOISTURE CONTENT (%)	DRY UNIT WEIGHT (LBS. PER CU. FT.)	N-VALUE	DEPTH (FEET)	SAMPLE LOCATION	GRAPHIC LOG	SOIL TYPE	
-			15	45			ML	fine, with minor coarse sand, greenish gray (50.1% passing no. 200 sieve)
-			29					(54.1% passing no. 200 sieve)
-			21	50				(55.1% passing no. 200 sieve)
								Bottom of Boring at 50.5 feet. No groundwater. Boring backfilled with cuttings.
				55				
				60				
				65				
				70				
				75				
				80				

Note: The log of subsurface conditions shown hereon is approximate and applies only at the specific location and date indicated. It is not warranted to be representative of subsurface conditions at other locations or times.

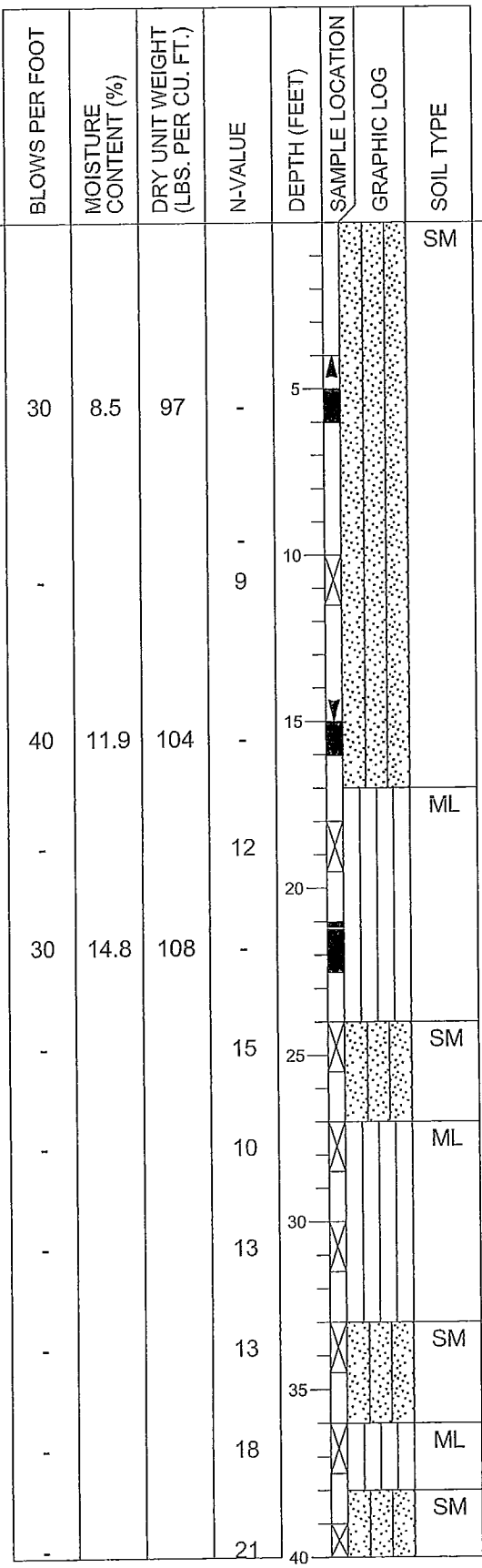
BOREHOLE LOG 2005-052-01 HS-3.GPJ FRANKIAN.GDT 11/17/08

LOG OF BORING

R.T. FRANKIAN & ASSOCIATES

BORING HS-16

JOB NUMBER: 2005-052-01
DATE DRILLED: 9/8/08
EQUIPMENT USED: Hollow Stem Auger with Frankian Heavy Duty Sampler and SPT Sampler
ELEVATION: 1486'
DRILLING CO.: ACE
LOGGED BY: AMB
BORING DEPTH: 0-52.5'



BLOWS PER FOOT	MOISTURE CONTENT (%)	DRY UNIT WEIGHT (LBS. PER CU. FT.)	N-VALUE	SOIL TYPE	
				SM	**ALLUVIUM** SILTY SAND: fine, dense, dry, gray
30	8.5	97	-		
-			9		
40	11.9	104	-		
-			12	ML	SANDY SILT: stiff, moist, gray, (76.2% passing no. 200 sieve)
30	14.8	108	-		
-			15	SM	SILTY SAND: fine to medium, occasional coarse sand and gravel, dense, (30.5% passing no. 200 sieve)
-			10	ML	SANDY SILT: stiff, moist, grayish brown, (53.9% passing no. 200 sieve)
-			13		(53% passing no. 200 sieve)
-			13	SM	SILTY SAND: dense, moist, grayishbrown, (39.6% passing no. 200 sieve)
-			18	ML	SANDY SILT: stiff, moist, gray, (52% passing no. 200 sieve)
-			21	SM	SILTY SAND: fine, dense, moist, gray, (36.8% passing no. 200 sieve)

Note: The log of subsurface conditions shown hereon is approximate and applies only at the specific location and date indicated. It is not warranted to be representative of subsurface conditions at other locations or times.

(CONTINUED ON THE FOLLOWING FIGURE)

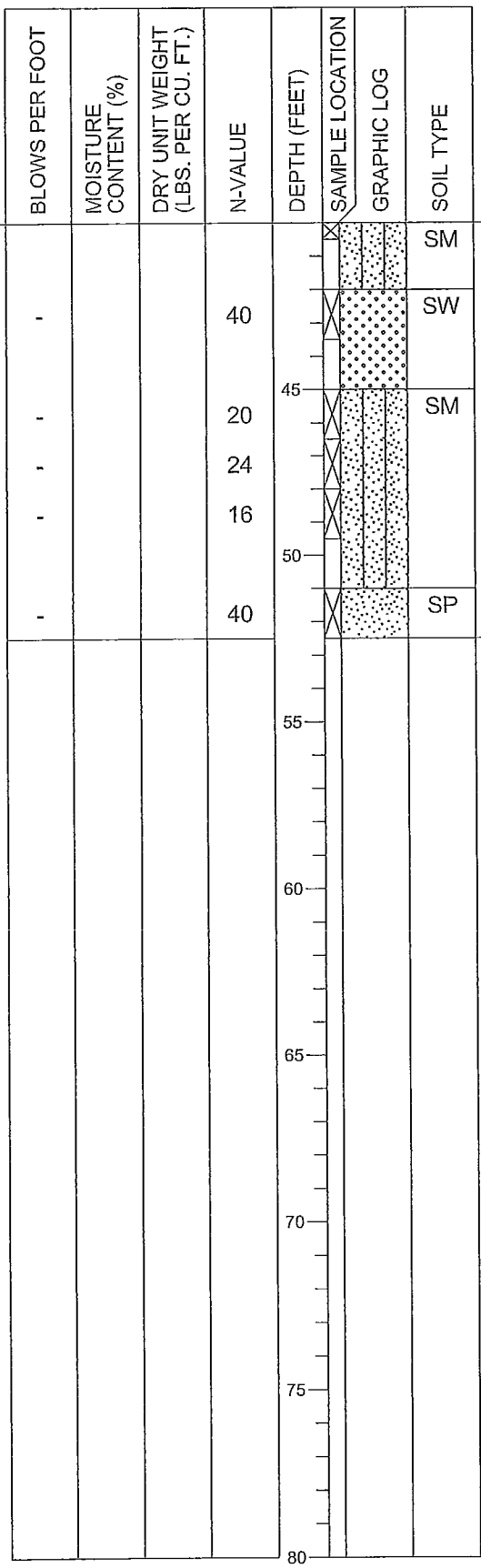
BOREHOLE LOG 2005-052-01 HS-3.GPJ FRANKIAN.GDT 11/17/08

LOG OF BORING

R.T. FRANKIAN & ASSOCIATES

BORING HS-16 (CONTINUED)

JOB NUMBER: 2005-052-01
DATE DRILLED: 9/8/08
EQUIPMENT USED: Hollow Stem Auger with Frankian Heavy Duty Sampler and SPT Sampler
ELEVATION: 1486'
DRILLING CO.: ACE
LOGGED BY: AMB
BORING DEPTH: 0-52.5'



GRAVELLY SAND: fine to coarse, dense, dry, gray

SILTY SAND: fine to medium, medium dense, dry, gray

(36.1% passing no. 200 sieve)

SAND: fine to coarse, with trace gravel, dense, dry, gray

Bottom of Boring at 52.5 feet.
No groundwater. Boring backfilled with cuttings.

Note: The log of subsurface conditions shown hereon is approximate and applies only at the specific location and date indicated. It is not warranted to be representative of subsurface conditions at other locations or times.

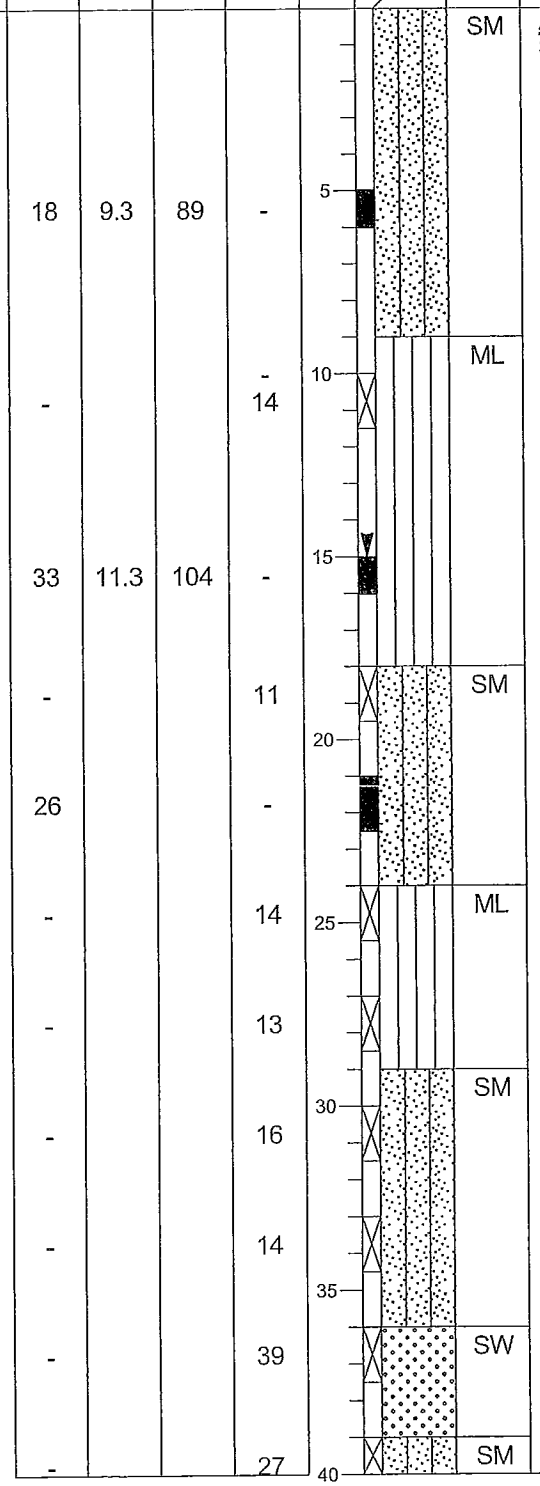
BOREHOLE LOG 2005-052-01 HS-3.GPJ FRANKIAN.GDT 11/17/08

LOG OF BORING

R.T. FRANKIAN & ASSOCIATES

BORING HS-17

JOB NUMBER: 2005-052-01
DATE DRILLED: 9/8/08
EQUIPMENT USED: Hollow Stem Auger with Frankian Heavy Duty Sampler and SPT Sampler
ELEVATION: 1490'
DRILLING CO.: ACE
LOGGED BY: AMB
BORING DEPTH: 0-49'



BLOWS PER FOOT	MOISTURE CONTENT (%)	DRY UNIT WEIGHT (LBS. PER CU. FT.)	N-VALUE	DEPTH (FEET)	SOIL TYPE	
18	9.3	89	-	5	SM	**ALLUVIUM** SILTY SAND: fine, dry, gray
-			14	10	ML	SANDY SILT: stiff, moist, gray, (71.5% passing no. 200 sieve)
33	11.3	104	-	15		occasional coarse sand, medium dense, grayish brown
-			11	20	SM	SILTY SAND: fine to medium, occasional coarse sand and gravel, moist, (38.2% passing no. 200 sieve)
26			-			
-			14	25	ML	SANDY SILT: stiff, moist, gray, (54.7% passing no. 200 sieve)
-			13			(59.1% passing no. 200 sieve)
-			16	30	SM	SILTY SAND: medium dense to dense, moist, grayish brown, (46.3% passing no. 200 sieve)
-			14			(43.6% passing no. 200 sieve)
-			39	35	SW	(water added to boring) GRAVELLY SAND: fine to coarse, dense, dry, gray
-			27	40	SM	SILTY SAND: fine to medium, occasional coarse sand an gravel,

Note: The log of subsurface conditions shown hereon is approximate and applies only at the specific location and date indicated. It is not warranted to be representative of subsurface conditions at other locations or times.

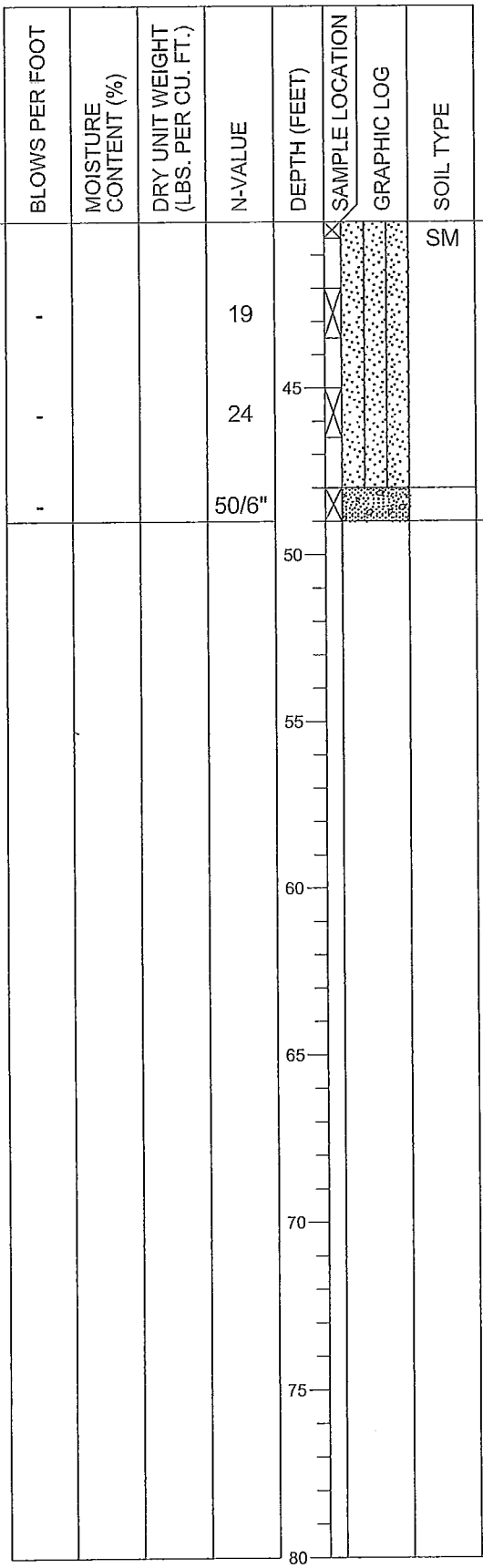
(CONTINUED ON THE FOLLOWING FIGURE)

LOG OF BORING

R.T. FRANKIAN & ASSOCIATES

BORING HS-17 (CONTINUED)

JOB NUMBER: 2005-052-01
DATE DRILLED: 9/8/08
EQUIPMENT USED: Hollow Stem Auger with Frankian Heavy Duty Sampler and SPT Sampler
ELEVATION: 1490'
DRILLING CO.: ACE
LOGGED BY: AMB
BORING DEPTH: 0-49'



medium dense, dry, gray

(27.7% passing no. 200 sieve)

(24.7% passing no. 200 sieve)

MINT CANYON FORMATION

GRAVELLY SANDSTONE: medium to coarse, very dense, very dry, gray

Bottom of Boring at 49 feet.
No groundwater. Boring backfilled with cuttings.

Note: The log of subsurface conditions shown hereon is approximate and applies only at the specific location and date indicated. It is not warranted to be representative of subsurface conditions at other locations or times.

BOREHOLE LOG 2005-052-01 HS-3.GPJ FRANKIAN.GDT 11/17/08

LOG OF BORING

R.T. FRANKIAN & ASSOCIATES

BORING HS-18

JOB NUMBER: 2005-052-01
DATE DRILLED: 9/8/08
EQUIPMENT USED: Hollow Stem Auger with Frankian Heavy Duty Sampler and SPT Sampler
ELEVATION: 1487'
DRILLING CO.: ACE
LOGGED BY: AMB
BORING DEPTH: 0-39.5'

BLOWS PER FOOT	MOISTURE CONTENT (%)	DRY UNIT WEIGHT (LBS. PER CU. FT.)	N-VALUE	DEPTH (FEET)	SAMPLE LOCATION	GRAPHIC LOG	SOIL TYPE	
				0			SM	**ALLUVIUM** SILTY SAND: fine, occasional roots, few pinhole voids, dry, gray
35	5.8	99	-	5				dense
24	8.1	98	-	10				
							ML	SANDY SILT: stiff, moist, gray, (59.5% passing no. 200 sieve)
-			16	15				
25	9.8	106	-					occasional coarse sand and gravel
				20				
-			14					very stiff
25	10.2	109	-	25				
							SM	SILTY SAND: dense to very dense, moist, gray
-			22	30				
								MINT CANYON FORMATION SANDSTONE: fine to coarse, occasional gravel, dense, dry, light gray
-			35					
-			43	35				
-			*					very dense, (* 50 blows for the first 6")
-			*					(* 60 blows for the first 4")
				40				Bottom of Boring at 39.5 feet. No groundwater. Boring backfilled with cuttings.

Note: The log of subsurface conditions shown hereon is approximate and applies only at the specific location and date indicated. It is not warranted to be representative of subsurface conditions at other locations or times.

BOREHOLE LOG 2005-052-01 HS-3.GPJ FRANKIAN.GDT 11/17/08

LOG OF BORING

R.T. FRANKIAN & ASSOCIATES

BORING HS-19

JOB NUMBER: 2005-052-01
DATE DRILLED: 9/8/08
EQUIPMENT USED: Hollow Stem Auger with Frankian Heavy Duty Sampler and SPT Sampler
ELEVATION: 1498'
DRILLING CO.: ACE
LOGGED BY: AMB
BORING DEPTH: 0-19.5'

BLOWS PER FOOT	MOISTURE CONTENT (%)	DRY UNIT WEIGHT (LBS. PER CU. FT.)	N-VALUE	DEPTH (FEET)	SAMPLE LOCATION	GRAPHIC LOG	SOIL TYPE	
				0			CL	**ALLUVIUM** SILTY CLAY: few pinhole voids, few small roots, dry, gray, with sand
15	5.8	90	-	5				
			-					
39	6.5	98	-	10				
			-					
-			34	15				
-			70					**MINT CANYON FORMATION** SANDSTONE: fine to coarse, very dense, dry, light gray
				20				Bottom of Boring at 19.5 feet. No groundwater. Boring backfilled with cuttings.
				25				
				30				
				35				
				40				

Note: The log of subsurface conditions shown hereon is approximate and applies only at the specific location and date indicated. It is not warranted to be representative of subsurface conditions at other locations or times.

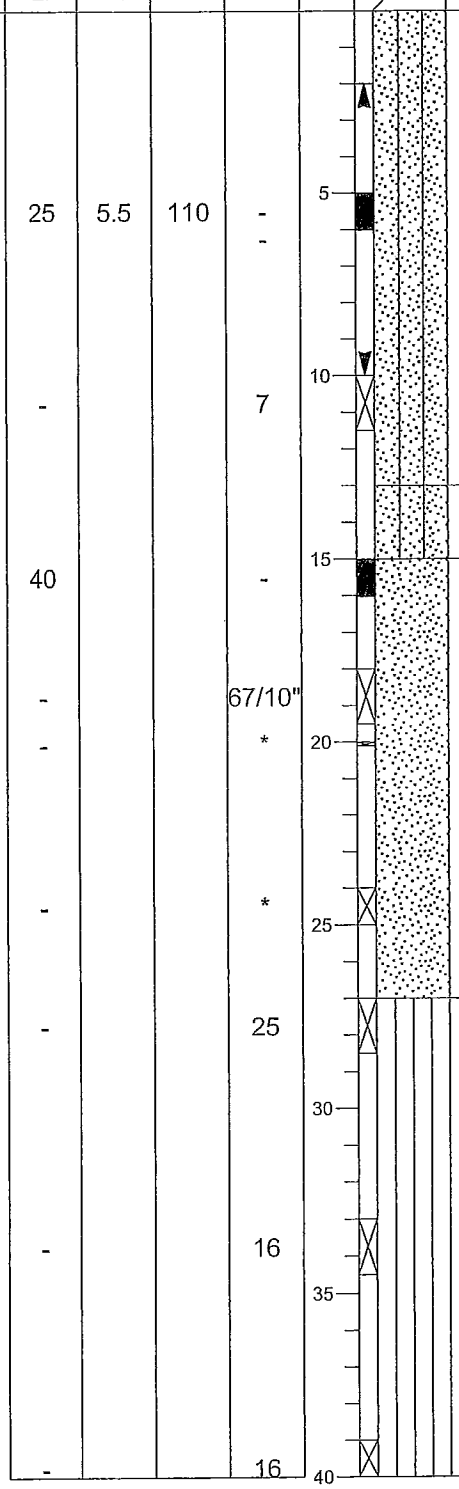
BOREHOLE LOG 2005-052-01 HS-3.GPJ FRANKIAN.GDT 11/17/08

LOG OF BORING

R.T. FRANKIAN & ASSOCIATES

BORING HS-20

JOB NUMBER: 2005-052-01
DATE DRILLED: 9/9/08
EQUIPMENT USED: Hollow Stem Auger with Frankian Heavy Duty Sampler and SPT Sampler
ELEVATION: 1485'
DRILLING CO.: ACE
LOGGED BY: AMB
BORING DEPTH: 0-49.5'



ARTIFICIAL FILL
SILTY SAND: fine to coarse, with cobbles and gravel, medium dense, dry, brown

(rock in tip)

(32.9% passing no. 200 sieve)

ALLUVIUM
SILTY SAND: fine to medium, dark brownish gray

SAND: fine to coarse, occasional gravel, dense, dry, gray, (sample loose, colllected in bag)

cobbles

few cobbles, very dense

(9.6% passing no. 200 sieve)

SANDY SILT: stiff, moist, gray

(79% passing no. 200 sieve)

(58.2% passing no. 200 sieve)

Note: The log of subsurface conditions shown hereon is approximate and applies only at the specific location and date indicated. It is not warranted to be representative of subsurface conditions at other locations or times.

(CONTINUED ON THE FOLLOWING FIGURE)

BOREHOLE LOG 2005-052-01 HS-3.GPJ FRANKIAN.GDT 11/17/08

LOG OF BORING

R.T. FRANKIAN & ASSOCIATES

BORING HS-20 (CONTINUED)

JOB NUMBER: 2005-052-01
DATE DRILLED: 9/9/08
EQUIPMENT USED: Hollow Stem Auger with Frankian Heavy Duty Sampler and SPT Sampler
ELEVATION: 1485'
DRILLING CO.: ACE
LOGGED BY: AMB
BORING DEPTH: 0-49.5'

BLOWS PER FOOT	MOISTURE CONTENT (%)	DRY UNIT WEIGHT (LBS. PER CU. FT.)	N-VALUE	DEPTH (FEET)	SAMPLE LOCATION	GRAPHIC LOG	SOIL TYPE	
				45			ML	
-			20					(77.2% passing no. 200 sieve)
				50				Bottom of Boring at 49.5 feet. No groundwater. Boring backfilled with cuttings.
				55				
				60				
				65				
				70				
				75				
				80				

Note: The log of subsurface conditions shown hereon is approximate and applies only at the specific location and date indicated. It is not warranted to be representative of subsurface conditions at other locations or times.

BOREHOLE LOG 2005-052-01 HS-3.GPJ FRANKIAN.GDT 11/17/08

LOG OF BORING

R.T. FRANKIAN & ASSOCIATES

BORING HS-21

JOB NUMBER: 2005-052-01
DATE DRILLED: 9/9/08
EQUIPMENT USED: Hollow Stem Auger with Frankian Heavy Duty Sampler and SPT Sampler
ELEVATION: 1472'
DRILLING CO.: ACE
LOGGED BY: AMB
BORING DEPTH: 0-32'

BLOWS PER FOOT	MOISTURE CONTENT (%)	DRY UNIT WEIGHT (LBS. PER CU. FT.)	N-VALUE	DEPTH (FEET)	SAMPLE LOCATION	GRAPHIC LOG	SOIL TYPE	
			-				SP	**ARTIFICIAL FILL** SAND: fine to coarse, dry, grayish brown to dark gray
50			-	5				
							SP	**ALLUVIUM** SAND: fine to coarse, medium dense, dry, brownish gray
-			24	10				
35	11.3	117	-	15				
-			28					
31			-	20				(No recovery)
-			44	25				
-			50/6"					
-			*	30				(* 50 blows for the first 6") chatter, cobbles/boulders Refusal
				35				Bottom of Boring at 32 feet. No groundwater. Boring backfilled with cuttings.
				40				

Note: The log of subsurface conditions shown hereon is approximate and applies only at the specific location and date indicated. It is not warranted to be representative of subsurface conditions at other locations or times.

BOREHOLE LOG 2005-052-01 HS-3.GPJ FRANKIAN.GDT 11/17/08

LOG OF BORING

R.T. FRANKIAN & ASSOCIATES

BORING HS-22

JOB NUMBER: 2005-052-01
DATE DRILLED: 9/9/08
EQUIPMENT USED: Hollow Stem Auger with Frankian Heavy Duty Sampler and SPT Sampler
ELEVATION: 1474'
DRILLING CO.: ACE
LOGGED BY: AMB
BORING DEPTH: 0-52.5'

BLOWS PER FOOT	MOISTURE CONTENT (%)	DRY UNIT WEIGHT (LBS. PER CU. FT.)	N-VALUE	DEPTH (FEET)	SOIL TYPE	
					SP	ARTIFICIAL FILL GRAVELLY SAND: fine to coarse, dry, light gray
17			-	5	SM	ALLUVIUM SILTY SAND: fine, medium dense, slightly moist, grayish brown
-			14	10	SP	GRAVELLY SAND: fine to coarse, medium dense, slightly moist, gray
50/10"			-	15		few cobbles, very dense
-			37	20		
50/2"			-			no recovery
-			12	25	ML	SANDY SILT: with gravel, stiff, slightly moist, brownish gray
-			14			(71.5% passing no. 200 sieve)
-			22	30	SM	SILTY SAND: trace coarse sand and gravel, dense, moist, gray, (48.9% passing no. 200 sieve)
					ML	SANDY SILT: slight plasticity, stiff, gray
-			14	35		(67.3% passing no. 200 sieve)
-			13	40		(60.5% passing no. 200 sieve)

Note: The log of subsurface conditions shown hereon is approximate and applies only at the specific location and date indicated. It is not warranted to be representative of subsurface conditions at other locations or times.

(CONTINUED ON THE FOLLOWING FIGURE)

BOREHOLE LOG 2005-052-01 HS-3.GPJ FRANKIAN.GDT 11/17/08

LOG OF BORING

BORING HS-22 (CONTINUED)

JOB NUMBER: 2005-052-01
DATE DRILLED: 9/9/08
EQUIPMENT USED: Hollow Stem Auger with Frankian Heavy Duty Sampler and SPT Sampler
ELEVATION: 1474'
DRILLING CO.: ACE
LOGGED BY: AMB
BORING DEPTH: 0-52.5'

BLOWS PER FOOT	MOISTURE CONTENT (%)	DRY UNIT WEIGHT (LBS. PER CU. FT.)	N-VALUE	DEPTH (FEET)	SAMPLE LOCATION	GRAPHIC LOG	SOIL TYPE	
				45			ML	slight plasticity, stiff
-			11					very moist, (62.2% passing no. 200 sieve)
-			15	50				slightly moist, (70.2% passing no. 200 sieve)
				55				Bottom of Boring at 52.5 feet. No groundwater. Boring backfilled with cuttings.
				60				
				65				
				70				
				75				
				80				

Note: The log of subsurface conditions shown hereon is approximate and applies only at the specific location and date indicated. It is not warranted to be representative of subsurface conditions at other locations or times.

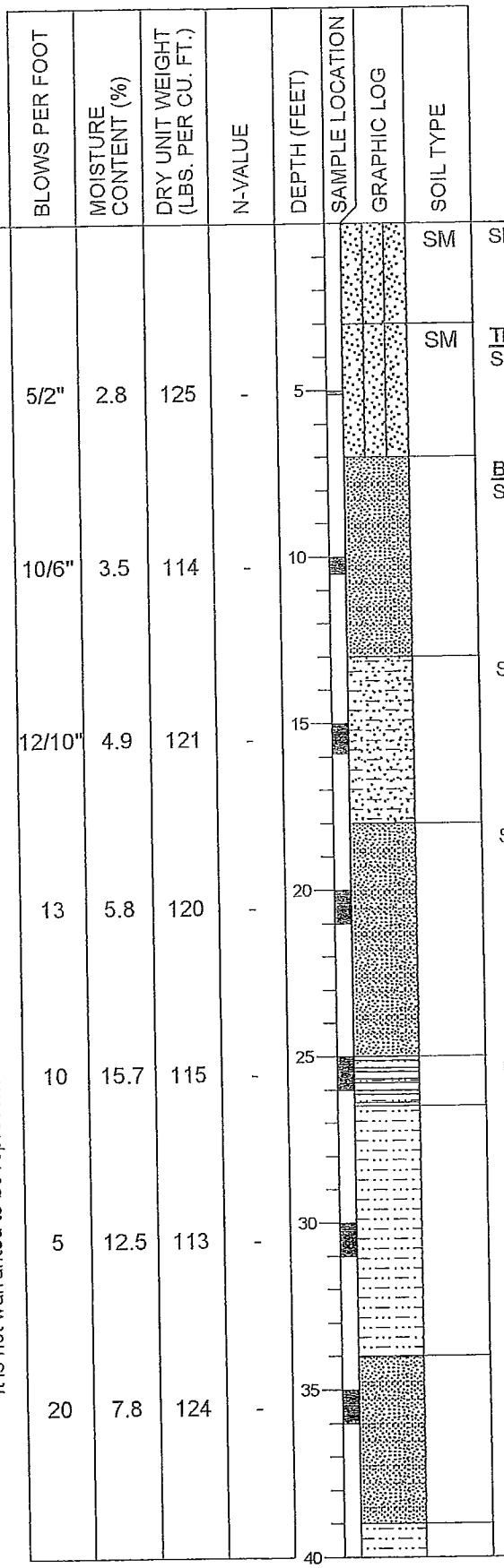
BOREHOLE LOG 2005-052-01 HS-3.GPJ FRANKIAN.GDT 11/17/08

LOG OF BORING

R.T. FRANKIAN & ASSOCIATES

BORING B-8

JOB NUMBER: 2005-052-01
DATE DRILLED: 11/12/07
EQUIPMENT USED: 24" Bucket Auger with Frankian Sampler using driving weights of 4900 lbs. to 25', 3400 lbs. to 50', and 2200 lbs. to 61'.
ELEVATION: 1540'
LOGGED BY: AMB
BORING DEPTH: 0-61'
SURFACE CONDITIONS: Level pad cleared with sagebrush



SILTY SAND: fine to coarse, minor cobbles, dry, brown (10YR 5/3)

TERRACE DEPOSITS (Qt)
SILTY SAND: fine to coarse, cobbly, dry, pale brown (10YR 6/3)

BEDROCK: MINT CANYON FORMATION (Tmc)
SANDSTONE: fine to coarse, trace gravel, dry, light gray (2/5Y 7/2)

SANDY SILTSTONE: fine, dry, light gray (2.5Y 7/2)

SANDSTONE: fine to medium, dry, light gray (2.5Y 7/2)

MUDSTONE: dry, pale olive (5Y 6/3), (LL=62%, PL=27%, PI=35) (84% passing no. 200 sieve)

SILTSTONE: dry, gray (5Y 6/1)

fine to medium, dry, light gray (2/5Y 7/2)

dry, gray (5Y 6/1)

Note: The log of subsurface conditions shown hereon is approximate and applies only at the specific location and date indicated. It is not warranted to be representative of subsurface conditions at other locations or times.

(CONTINUED ON THE FOLLOWING FIGURE)

BOREHOLE LOG 2005-052-01.GPJ FRANKIAN.GDT 12/20/07

LOG OF BORING

R.T. FRANKIAN & ASSOCIATES

BORING B-3 (CONTINUED)

JOB NUMBER: 2005-052-01
DATE DRILLED: 11/12/07
EQUIPMENT USED: 24" Bucket Auger with Frankian Sampler using driving weights of 4900 lbs. to 25', 3400 lbs. to 50', and 2200 lbs. to 61'.
ELEVATION: 1540'
LOGGED BY: AMB
BORING DEPTH: 0-61'
SURFACE CONDITIONS: Level pad cleared with sagebrush

BLOWS PER FOOT	MOISTURE CONTENT (%)	DRY UNIT WEIGHT (LBS. PER CU. FT.)	N-VALUE	DEPTH (FEET)	SAMPLE LOCATION	GRAPHIC LOG	SOIL TYPE
20			-				(inner tube got bent, could not retrieve out of sampling tube)
12	8.2	108	-	45			SANDSTONE: fine to coarse, trace gravel, dry, light gray (2/5Y 7/2)
20	7.7	116	-	50			
20	8.9	115	-	55			
16	10.5	117	-	60			Bottom of Boring at 61 feet. No groundwater. No caving. Boring backfilled with cuttings after drilling.
				65			
				70			
				75			
				80			

Note: The log of subsurface conditions shown hereon is approximate and applies only at the specific location and date indicated. It is not warranted to be representative of subsurface conditions at other locations or times.

BOREHOLE LOG 2005-052-01.GPJ FRANKIAN.GDT 12/20/07

LOG OF BORING

R.T. FRANKIAN & ASSOCIATES

BORING HS-1

JOB NUMBER: 2005-052-01
DATE DRILLED: 11/8/07
EQUIPMENT USED: 6" Hollow Stem Auger with Frankian Sampler
ELEVATION: 1550'
LOGGED BY: AMB
BORING DEPTH: 0-53'
SURFACE CONDITIONS: Level Terrace with moderate sage brush vegetation and light grass

BLOWS PER FOOT	MOISTURE CONTENT (%)	DRY UNIT WEIGHT (LBS. PER CU. FT.)	N-VALUE	DEPTH (FEET)	SAMPLE LOCATION	GRAPHIC LOG	SOIL TYPE	
							SM	SILTY SAND: loose, dry
							ML	TERRACE DEPOSITS (Qf) GRAVELLY SANDY SILT: medium to fine, few cobbles, dry, light gray
55	1.7	108	-	5				BEDROCK: MINT CANYON FORMATION (Tmc) SILTSTONE: dry, light gray (2.5Y 7/2)
50/5"	4.7	116	-	10				
50/5"	9.8	99	-	15				
50/6"	7.7	108	-	20				SANDSTONE: medium to fine, dry, light gray (2.5Y 7/2)
50/5"			-	25				coarse to fine
50/4"			-	30				SANDY SILTSTONE: medium to fine, dry
50/2"			-	35				(Chatter of drill stem. Added H20 to cool) GRAVELLY SANDSTONE: coarse to fine, with clay balls, dry, pale brown (10YR 6/3)
				40				

Note: The log of subsurface conditions shown hereon is approximate and applies only at the specific location and date indicated. It is not warranted to be representative of subsurface conditions at other locations or times.

(CONTINUED ON THE FOLLOWING FIGURE)

BOREHOLE LOG 2005-052-01.GPJ FRANKIAN.GDT 12/11/07

LOG OF BORING

R.T. FRANKIAN & ASSOCIATES

BORING HS-1 (CONTINUED)

JOB NUMBER: 2005-052-01
DATE DRILLED: 11/8/07
EQUIPMENT USED: 6" Hollow Stem Auger with Frankian Sampler
ELEVATION: 1550'
LOGGED BY: AMB
BORING DEPTH: 0-53'
SURFACE CONDITIONS: Level Terrace with moderate sage brush vegetation and light grass

BLOWS PER FOOT	MOISTURE CONTENT (%)	DRY UNIT WEIGHT (LBS. PER CU. FT.)	N-VALUE	DEPTH (FEET)	SAMPLE LOCATION	GRAPHIC LOG	SOIL TYPE	
65/7"	7.8	113	-					SANDSTONE: medium to fine, light gray (2.5Y 7/2), with interbedded light olive brown (2.5Y 5/3) siltstone
50/5"	9.6	100	-	45				with interbedded very dark brown (10YR 2/2) siltstone
50/5"			-	50				coarse to fine, trace gravels, light gray (2.5Y 7/2)
								(chatter of drill stem)
								Bottom of Boring at 53 feet. No groundwater. No caving. Boring backfilled with cuttings after drilling.

55
60
65
70
75
80

Note: The log of subsurface conditions shown hereon is approximate and applies only at the specific location and date indicated. It is not warranted to be representative of subsurface conditions at other locations or times.

BOREHOLE LOG 2005-052-01.GPJ FRANKIAN.GDT 12/11/07

LOG OF BORING

R.T. FRANKIAN & ASSOCIATES

BORING HS-2

JOB NUMBER: 2005-052-01
DATE DRILLED: 11/8/07
EQUIPMENT USED: 6" Hollow Stem Auger with Frankian Sampler
ELEVATION: 1540'
LOGGED BY: AMB
BORING DEPTH: 0-36'
SURFACE CONDITIONS: Level pad with sagebrush and minor grasses

BLOWS PER FOOT	MOISTURE CONTENT (%)	DRY UNIT WEIGHT (LBS. PER CU. FT.)	N-VALUE	DEPTH (FEET)	SAMPLE LOCATION	GRAPHIC LOG	SOIL TYPE	
				0			SM	SILTY SAND: loose, dry
							SM	TERRACE DEPOSITS (Qt) GRAVELLY SILTY SAND: fine to coarse, clay, light yellowish brown (10Y 6/4)
50/5"	5.1	102	-	5				BEDROCK: MINT CANYON FORMATION (Tmc) SANDSTONE: fine to coarse, trace gravel, dry, light gray (2.5Y 7/2)
50/5"	3.2	108	-	10				
50/3"			-	15				
			-	20				
50/6"	6.1	117	-					SILTSTONE: light olive brown (2/5Y 5/3) to light gray (2/5Y 7/2) with interbedded medium to fine light gray (2/5Y 7/2) sandstone
50/6"			-	25				
50/4"	6.6	103	-	30				(LL=37%, PL=22%, PI=15.1%)
200/5"			-					
50/4"	11.2	100	-	35				SANDSTONE: fine to coarse, light gray (2.5Y 7/2)
				40				Bottom of Boring at 36 feet. No groundwater. No caving. Boring backfilled after drilling. Drill Rig broke down.

Note: The log of subsurface conditions shown hereon is approximate and applies only at the specific location and date indicated. It is not warranted to be representative of subsurface conditions at other locations or times.

BOREHOLE LOG 2005-052-01.GPJ FRANKIAN.GDT 12/20/07

LOG OF BORING

R.T. FRANKIAN & ASSOCIATES

BORING B-1

JOB NUMBER: 2005-052-02
DATE DRILLED: 12/7/05
EQUIPMENT USED: 24" Bucket Auger with Drive Tube. Weights 0-25' 4901 lbs. 25-50' 3396 lbs. 50-75' 2213 lbs. 75-100' 1190 lbs.
ELEVATION: 1519'
LOGGED BY: DMT
BORING DEPTH: 0-19'

BLOWS PER FOOT	MOISTURE CONTENT (%)	DRY UNIT WEIGHT (LBS. PER CU. FT.)	N-VALUE	DEPTH (FEET)	SAMPLE LOCATION	GRAPHIC LOG	SOIL TYPE	
				0			SM	ALLUVIUM (Qal) SILTY SAND: fine, few gravel, scattered rounded fine gravel, dense, moist, gray
12	1.4	122	-					(6.6% passing no. 200 sieve)
			-	5				
20	7.5	118	-					fine to medium, coarse gravel, very dense, dark brown, (40.3% passing no. 200 sieve)
20	15.8	102	-	10				silty, moist, (48.5% passing no. 200 sieve)
20	13.7	115	-					(46.9% passing no. 200 sieve)
				15			ML	SANDY SILT: some clay, stiff, very moist, dark brown lost sample ▽ (51.2% passing no. 200 sieve) groundwater at 17 feet 12/7/05 heavy caving
20	19.6	105	-					
				20				Bottom of Boring at 19 feet. Boring terminated due to caving at bottom. Groundwater @ 17'. Boring backfilled with native soil.
				25				
				30				
				35				
				40				

Note: The log of subsurface conditions shown hereon is approximate and applies only at the specific location and date indicated. It is not warranted to be representative of subsurface conditions at other locations or times.

BOREHOLE LOG 2005-052-02.GPJ FRANKIAN.GDT 2/6/06

LOG OF BORING — R.T. FRANKIAN & ASSOCIATES

For use with report dated 11/14/2008; RTF Job No. 2005-052-01

BORING B-2

JOB NUMBER: 2005-052-02
DATE DRILLED: 12/8/05
EQUIPMENT USED: 24" Track Mount Auger with Drive Tube. Weights 0-15' 1767 lbs. 15-30' 1182 lbs. 30-45' 757 lbs. 45-60' 489 lbs.
ELEVATION: 1520.8'
DRILLING CO.: Roy Brothers
LOGGED BY: DMT
BORING DEPTH: 0-40.5'

BLOWS PER FOOT	MOISTURE CONTENT (%)	DRY UNIT WEIGHT (LBS. PER CU. FT.)	N-VALUE	DEPTH (FEET)	SAMPLE LOCATION	GRAPHIC LOG	SOIL TYPE
17	3.4	106	-	5			MINT CANYON FM (Tmc) WEATHERED BEDROCK: fine to coarse, arkosic sandstone, interbedded gravelly sandstone, and silty fine grained sandstone, tan to olive, several roots SANDSTONE: silty to gravelly, very poorly bedded, oxidized, slighlty weathered, tan to light gray
20	6	110	-	10			6" GRAVEL LENS SANDSTONE: fine to medium
20	6.1	112	-	15			CONTACT: (weak), very approximate NS strike 32 N dip SILTY SANDSTONE: very fine, greenish olive brown SANDSTONE: fine, coarser with depth, some silty interbeds very weakly laminated with silty beds few fine gravel, coarse sand beds
22	5.9	125	-	20			VERY SILTY SANDSTONE: fine SANDSTONE: fine, poorly bedded
20	5.7	108	-	25			CONTACT: approximately N20E 25NW fine to coarse, poorly bedded, slightly cemented SANDSTONE: fine, 6" thick SANDSTONE: fine to coarse, poorly bedded, scattered coarse sandstone
22	7.5	120	-	30			SILTY SANDSTONE BED: very fine, olive yellow, N10W 28W (40.1% passing no. 200 sieve, LL=30, PL=20 and PI=10) SANDSTONE: fine, poorly laminated, yellowish brown CONTACT: approximately N5 35W SANDSTONE: fine to coarse, poorly bedded, with fine subrounded to subangular gravel interbeds
				35			(37-40' covered by soil cuttings)
				40			

Note: The log of subsurface conditions shown hereon is approximate and applies only at the specific location and date indicated. It is not warranted to be representative of subsurface conditions at other locations or times.

(CONTINUED ON THE FOLLOWING FIGURE)

BOREHOLE LOG 2005-052-02.GPJ FRANKIAN.GDT 2/8/06

LOG OF BORING — R.T. FRANKIAN & ASSOCIATES

BORING B-2 (CONTINUED)

JOB NUMBER: 2005-052-02
DATE DRILLED: 12/8/05
EQUIPMENT USED: 24" Track Mount Auger with Drive Tube. Weights 0-15' 1767 lbs. 15-30' 1182 lbs. 30-45' 757 lbs. 45-60' 489 lbs.
ELEVATION: 1520.8'
DRILLING CO.: Roy Brothers
LOGGED BY: DMT
BORING DEPTH: 0-40.5'

BLOWS PER FOOT	MOISTURE CONTENT (%)	DRY UNIT WEIGHT (LBS. PER CU. FT.)	N-VALUE	DEPTH (FEET)	SAMPLE LOCATION	GRAPHIC LOG	SOIL TYPE
23	8.9	113					

Bottom of Boring at 40.5 feet.
No groundwater. No caving. Clean sidewalls. Boring backfilled with native soil & tamped with auger.

45
50
55
60
65
70
75
80

Note: The log of subsurface conditions shown hereon is approximate and applies only at the specific location and date indicated. It is not warranted to be representative of subsurface conditions at other locations or times.

BOREHOLE LOG 2005-052-02.GPJ FRANKIAN.GDT 2/8/06

LOG OF BORING

R.T. FRANKIAN & ASSOCIATES

BORING B-3

JOB NUMBER: 2005-052-02
DATE DRILLED: 12/7/05
EQUIPMENT USED: 24" Bucket Auger with Drive Tube. Weights 0-25' 4901 lbs. 25-50' 3396 lbs. 50-75' 2213 lbs. 75-100' 1190 lbs.
ELEVATION: 1506'
LOGGED BY: DMT
BORING DEPTH: 0-12.5'

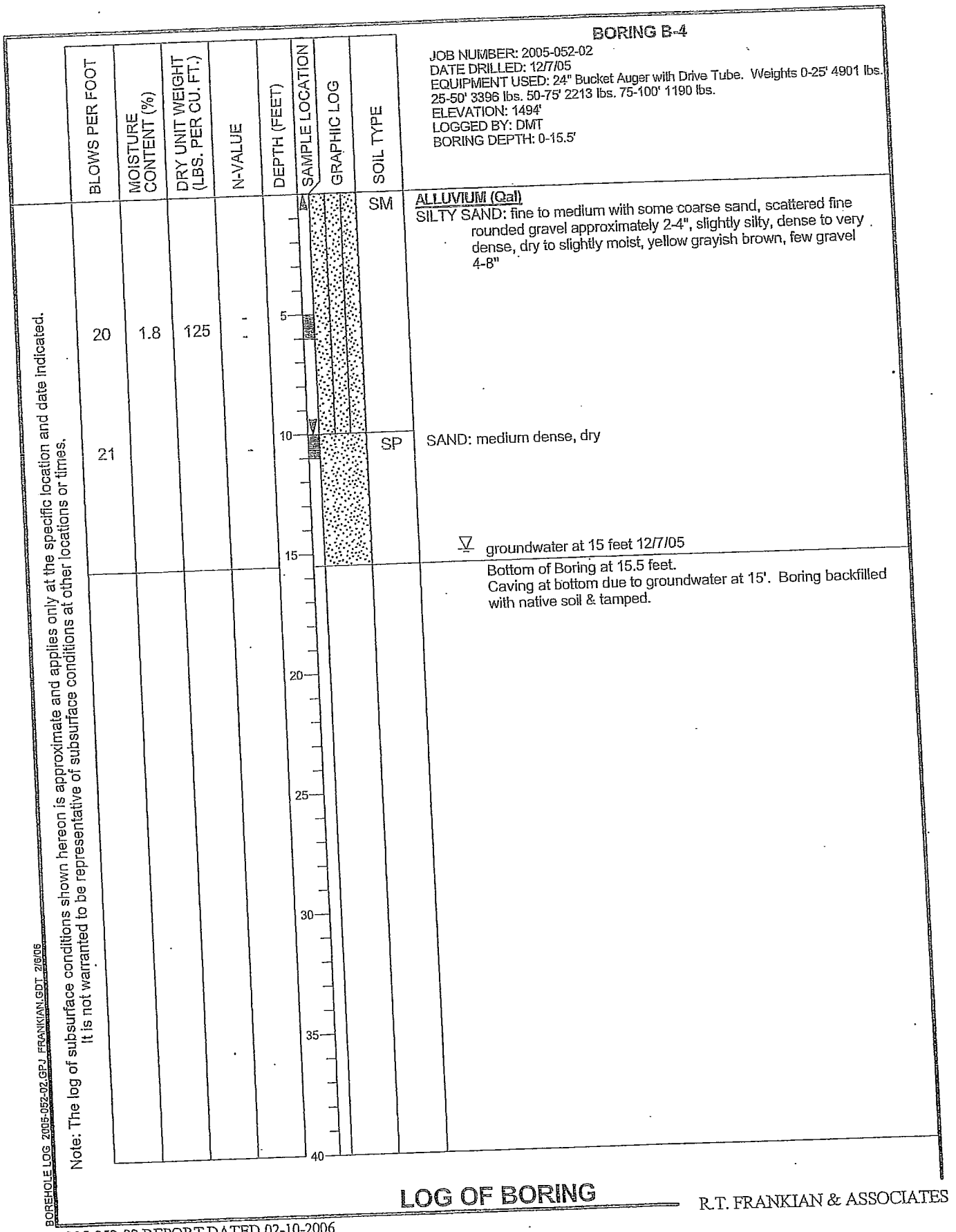
BLOWS PER FOOT	MOISTURE CONTENT (%)	DRY UNIT WEIGHT (LBS. PER CU. FT.)	N-VALUE	DEPTH (FEET)	SAMPLE LOCATION	GRAPHIC LOG	SOIL TYPE	
20	7.8	114	-	0			SM	ALLUVIUM (Qal) SILTY SAND: fine with some medium grained, trace coarse to fine rounded gravel, dense to very dense, moist, brown to grayish brown (16.5% passing no. 200 sieve)
20	2.6	132	-	5				fine to coarse, scattered fine rounded (1"-3") gravel, slightly moist to moist
20	5.4	117	-	10				moist ▽ groundwater at 12 feet 12/7/05
				15				Bottom of Boring at 12.5 feet. Caving at bottom due to groundwater at 12'. Boring backfilled with native soil & tamped.
				20				
				25				
				30				
				35				
				40				

Note: The log of subsurface conditions shown hereon is approximate and applies only at the specific location and date indicated. It is not warranted to be representative of subsurface conditions at other locations or times.

BOREHOLE LOG 2005-052-02.GPJ FRANKIAN.GDT 2/6/06

LOG OF BORING — R.T. FRANKIAN & ASSOCIATES

.For use with report dated 11/14/2008; RTF Job No. 2005-052-01



For use with report dated 11/14/2008; RTF Job No. 2005-052-01

BORING B-5

JOB NUMBER: 2005-052-02
DATE DRILLED: 12/7/05
EQUIPMENT USED: 24" Bucket Auger with Drive Tube. Weights 0-25' 4901 lbs. 25-50' 3396 lbs. 50-75' 2213 lbs. 75-100' 1190 lbs.
ELEVATION: 1482'
LOGGED BY: DMT
BORING DEPTH: 0-35.5'

BLOWS PER FOOT	MOISTURE CONTENT (%)	DRY UNIT WEIGHT (LBS. PER CU. FT.)	N-VALUE	DEPTH (FEET)	SAMPLE LOCATION	GRAPHIC LOG	SOIL TYPE	
				0			SM	ALLUVIUM (Qal) SILTY SAND: very fine, dense, slightly moist, yellowish brown
16	5.9	112	-	5			ML	SILT: moist, yellowish brown (64.6% passing no. 200 sieve)
16	6.3	109	-	10				(57.4% passing no. 200 sieve)
17	14.9	109	-	15				(74.5% passing no. 200 sieve)
22	13.3	115	-	20				sandy, slightly clayey, with very fine sand, moist, yellowish brown, (50.5% passing no. 200 sieve)
22	12.3	92	-	25				
21	18.3	111	-	30				trace clay, very moist to moist
	21.6	101	-	35				▽ groundwater at 34 feet 12/7/05 CL SILTY CLAY: stiff, very moist, yellow greenish brown
				40				Bottom of Boring at 35.5 feet. Caving to 34' due to groundwater. Boring backfilled with native soil and tamped.

Note: The log of subsurface conditions shown hereon is approximate and applies only at the specific location and date indicated. It is not warranted to be representative of subsurface conditions at other locations or times.

BOREHOLE LOG 2005-052-02.GPJ FRANKIAN.GDT 2/6/06

LOG OF BORING

R.T. FRANKIAN & ASSOCIATES

BORING B-6

JOB NUMBER: 2005-052-02
DATE DRILLED: 12/12/05
EQUIPMENT USED: 24" Track Mount Auger with Drive Tube. Weights 0-15' 1767 lbs. 15-30' 1182 lbs. 30-45' 757 lbs. 45-60' 489 lbs.
ELEVATION: 1492'
DRILLING CO.: Roy Brothers
LOGGED BY: DMT
BORING DEPTH: 0-54'
HAMMER WEIGHT: 140lbs; DROP: 30"

BLOWS PER FOOT	MOISTURE CONTENT (%)	DRY UNIT WEIGHT (LBS. PER CU. FT.)	N-VALUE	DEPTH (FEET)	SAMPLE LOCATION	GRAPHIC LOG	SOIL TYPE	
				0				TERRACE DEPOSIT/OLDER GRAVEL (Qog) (remnant of alluvial channel deposit of Santa Clara River)
				5			GP	SILTY GRAVELLY SAND: fine to coarse, poorly bedded, few sub-horizontal lenses of gravel and sand, sub angular to subrounded rock fragments, occasional cobbles 4-6", light brown to yellowish brown
20	6	118	-	10				
				15				boring belled to 42" (moderate caving in loose sand)
				20				MINT CANYON FORMATION (Tmc) SANDSTONE AND CONGLOMERATE SANDSTONE: fine to medium grained sand, with alternate coarse sand, fine gravel lenses, poorly bedded, arkosic, light gray to olive gray, clean sidewalls, hard
20				25				
				30				NS, 35E, fine to medium grained sand bedding, 6" lens poorly bedded, diffuse faint boundary
		4.4	107	- 35				
				40				

Note: The log of subsurface conditions shown hereon is approximate and applies only at the specific location and date indicated. It is not warranted to be representative of subsurface conditions at other locations or times.

(CONTINUED ON THE FOLLOWING FIGURE)

BOREHOLE LOG 2005-052-02.GPJ FRANKIAN.GDT 2/6/06

LOG OF BORING — R.T. FRANKIAN & ASSOCIATES

For use with report dated 11/14/2008; RTF Job No. 2005-052-01

BORING B-6 (CONTINUED)

JOB NUMBER: 2005-052-02
DATE DRILLED: 12/12/05
EQUIPMENT USED: 24" Track Mount Auger with Drive Tube. Weights 0-15' 1767 lbs. 15-30' 1182 lbs. 30-45' 757 lbs. 45-60' 489 lbs.
ELEVATION: 1492'
DRILLING CO.: Roy Brothers
LOGGED BY: DMT
BORING DEPTH: 0-54'
HAMMER WEIGHT: 140lbs; DROP: 30"

BLOWS PER FOOT	MOISTURE CONTENT (%)	DRY UNIT WEIGHT (LBS. PER CU. FT.)	N-VALUE	DEPTH (FEET)	SAMPLE LOCATION	GRAPHIC LOG	SOIL TYPE	
25	4.7	122	-	45				N10W, 30E, fine to medium grained sand bed, poorly bedded, diffuse, faint contacts
23	9.5	112	-	50				moist sidewalls ▽ groundwater at 52 feet 12/12/05
				55				Bottom of Boring at 54 feet. Groundwater at 52'. Boring backfilled with native soil and tamped with auger.
				60				
				65				
				70				
				75				
				80				

Note: The log of subsurface conditions shown hereon is approximate and applies only at the specific location and date indicated. It is not warranted to be representative of subsurface conditions at other locations or times..

BOREHOLE LOG 2005-052-02.GPJ FRANKIAN.GDT 2/6/06

LOG OF BORING — R.T. FRANKIAN & ASSOCIATES

For use with report dated 11/14/2008; RTF Job No. 2005-052-01

BORING B-7

JOB NUMBER: 2005-052-02
DATE DRILLED: 12/9/05
EQUIPMENT USED: 24" Track Mount Auger with Drive Tube. Weighis 0-15' 1767 lbs. 15-30' 1182 lbs. 30-45' 757 lbs. 45-60' 489 lbs.
ELEVATION: 1505'
DRILLING CO.: Roy Brothers
LOGGED BY: DMT
BORING DEPTH: 0-60.5'
HAMMER WEIGHT: 140lbs; DROP: 30"

BLOWS PER FOOT	MOISTURE CONTENT (%)	DRY UNIT WEIGHT (LBS. PER CU. FT.)	N-VALUE	DEPTH (FEET)	SAMPLE LOCATION	GRAPHIC LOG	SOIL TYPE	
								TERRACE DEPOSIT/OLDER GRAVEL (Qog)
							GP	GRAVELLY SAND: fine to coarse, silty, poorly bedded, few sub-horizontal lenses of fine gravel-coarse sand, sub angular to subrounded crystalline bedrock cobbles 4-6" diameter, light brown to yellowish brown
20	5	114	-	5				
20	5.7	120	-	10				COBBLE LENS/ GRAVELLY SAND: 4-6" rounded cobbles, slight caving
								6" medium to coarse sand lens (horizontally bedded)
				15				6" medium to coarse sand lens (horizontally bedded)
				20				CONTACT: N5W, 5E: (erosion surface on bedrock)
								MINT CANYON FORMATION (Tmc)
								SANDSTONE: fine to medium, cross-bedded, cemented hard, light gray
				25				EROSIONAL CONGLOMERATE SANDSTONE: fine to coarse, orkosic, light yellowish orange, subangular to subrounded fine to coarse gravel and few subangular cobbles to 4-5", poorly sorted, some silty sand zones, orkosic
23	4.1	121	-	30				SANDSTONE: fine, very silty, fine grained SANDY SILTSTONE, light gray and greenish gray, very poorly bedded to massive, few faint think sandy laminations, dense, clean sidewalls
				35				N50E, 12NW: laminations in very fine grained silty sand
				40				

Note: The log of subsurface conditions shown hereon is approximate and applies only at the specific location and date indicated. It is not warranted to be representative of subsurface conditions at other locations or times.

(CONTINUED ON THE FOLLOWING FIGURE)

LOG OF BORING

R.T. FRANKIAN & ASSOCIATES

BOREHOLE LOG 2005-052-02.GPJ FRANKIAN.GDT 2/6/06

BORING B-7 (CONTINUED)

JOB NUMBER: 2005-052-02
DATE DRILLED: 12/9/05
EQUIPMENT USED: 24" Track Mount Auger with Drive Tube. Weights 0-15' 1767 lbs. 15-30' 1182 lbs. 30-45' 757 lbs. 45-60' 489 lbs.
ELEVATION: 1505'
DRILLING CO.: Roy Brothers
LOGGED BY: DMT
BORING DEPTH: 0-60.5'
HAMMER WEIGHT: 140lbs; DROP: 30"

BLOWS PER FOOT	MOISTURE CONTENT (%)	DRY UNIT WEIGHT (LBS. PER CU. FT.)	N-VALUE	DEPTH (FEET)	SAMPLE LOCATION	GRAPHIC LOG	SOIL TYPE
20	6.7	108	-	45			N80E, 8NW: discontinuous think fine whitish gray CaCO3-coated fine sand lenses
							N65E, 10NW: thin, discontinuous CaCO3 cemented fine sand layers less than 2mm thick
20	8.2	109	-	50			
				55			SLOUGH: (Boring downhole log ends at 57')
	7.6	106		60			Bottom of Boring at 60.5 feet. Boring backfilled with native soil and tamped with auger.
				65			
				70			
				75			
				80			

Note: The log of subsurface conditions shown hereon is approximate and applies only at the specific location and date indicated. It is not warranted to be representative of subsurface conditions at other locations or times.

BOREHOLE LOG 2005-052-02.GPJ FRANKIAN.GDT 2/6/06

LOG OF BORING

R.T. FRANKIAN & ASSOCIATES

For use with report dated 11/14/2008; RTF Job No. 2005-052-01

PRESENTATION

OF

CONE PENETRATION TEST DATA

Project:

Lost Canyon Road
Santa Clarita, CA
December 1-2, 2005

Prepared for:

Mr. Dharmesh Amin
R.T. Frankian
1329 Scott Road
Burbank, CA 91504
Office (818) 531-1501 / Fax (818) 531-1511

Prepared by:

KEHOE TESTING & ENGINEERING
15571 Industry Lane
Huntington Beach, CA 92649-1534
Office (714) 901-7270 / Fax (714) 901-7289

TABLE OF CONTENTS

PRESENTATION
OF
CONE PENETRATION TEST DATA

1. INTRODUCTION

This report presents the results of a Cone Penetration Test (CPT) program carried out for the project located off Lost Canyon Road in Santa Clarita, California. The work was performed by Kehoe Testing & Engineering (KTE) on December 1-2, 2005. The scope of work was performed as directed by R.T. Frankian personnel.

2. SUMMARY OF FIELD WORK

The fieldwork consisted of performing CPT soundings at 11 locations to determine the soil lithology. The groundwater measurements were taken in the open CPT hole approximately 10 minutes after completion of CPT. The following TABLE 2.1 summarizes the CPT soundings performed:

LOCATION	DEPTH OF CPT (ft)	COMMENTS/NOTES:
CPT-1	50	Hole open to 10 ft (dry)
CPT-2	50	Hole open to 11 ft (dry)
CPT-3	50	Hole open to 13 ft (dry)
CPT-4	36	Groundwater @ 17 ft
CPT-5	47	Groundwater @ 14 ft
CPT-6	39	Groundwater @ 13 ft
CPT-7	50	Hole open to 12 ft (dry)
CPT-8	36	Hole open to 5 ft (dry)
CPT-9	50	Hole open to 4 ft (dry)
CPT-10	50	Groundwater @ 29 ft
CPT-11	50	Hole open to 10 ft (dry)

TABLE 2.1 - Summary of CPT Soundings

3. FIELD EQUIPMENT & PROCEDURES

The CPT soundings were carried out by KTE using an integrated electronic cone system manufactured by Vertek. The CPT soundings were performed in accordance with ASTM standards (D5778). The cone penetrometers were pushed using a 30-ton CPT rig. The cone used during the program was a 15 cm^2 cone and recorded the following parameters at approximately 2.5 cm depth intervals:

- Cone Resistance (qc)
- Sleeve Friction (fs)
- Dynamic Pore Pressure (u)
- Inclination
- Penetration Speed
- Pore Pressure Dissipation (at selected depths)

The above parameters were recorded and viewed in real time using a portable computer and stored on a diskette for future analysis and reference. A complete set of baseline readings was taken prior to each sounding to determine temperature shifts and any zero load offsets. Monitoring base line readings ensures that the cone electronics are operating properly.

4. CONE PENETRATION TEST DATA & INTERPRETATION

The Cone Penetration Test data is presented in graphical form in the attached Appendix. Penetration depths are referenced to ground surface. The soil classification on the CPT plots is derived from the CPT Classification Chart (Robertson, 1986) and presents major soil lithologic changes. The stratigraphic interpretation is based on relationships between cone resistance (qc), sleeve friction (fs), and penetration pore pressure (u). The friction ratio (Rf), which is sleeve friction divided by cone resistance, is a calculated parameter that is used to infer soil behavior type. Generally, cohesive soils (clays) have high friction ratios, low cone resistance and generate excess pore water pressures. Cohesionless soils (sands) have lower friction ratios, high cone bearing and generate little (or negative) excess pore water pressures.

Output from the interpretation program CPTINT provides averaged CPT data over one-foot intervals. The CPTINT output includes Soil Classification Zones, SPT N Values and Undrained Shear Strength (Su). A summary of the equations used for the tabulated parameters is provided in the CPTINT Correlation Table in the Appendix.

The interpretation of soils encountered on this project was carried out using correlations developed by Robertson et al, 1986. It should be noted that it is not always possible to clearly identify a soil type based on qc, fs and u. In these situations, experience, judgment and an assessment of the pore pressure data should be used to infer the soil behavior type.

If you have any questions regarding this information, please do not hesitate to call our office at (714) 901-7270.

Sincerely,

KEHOE TESTING & ENGINEERING

Steven P. Kehoe, P.E.
President

12/06/05-ca-12

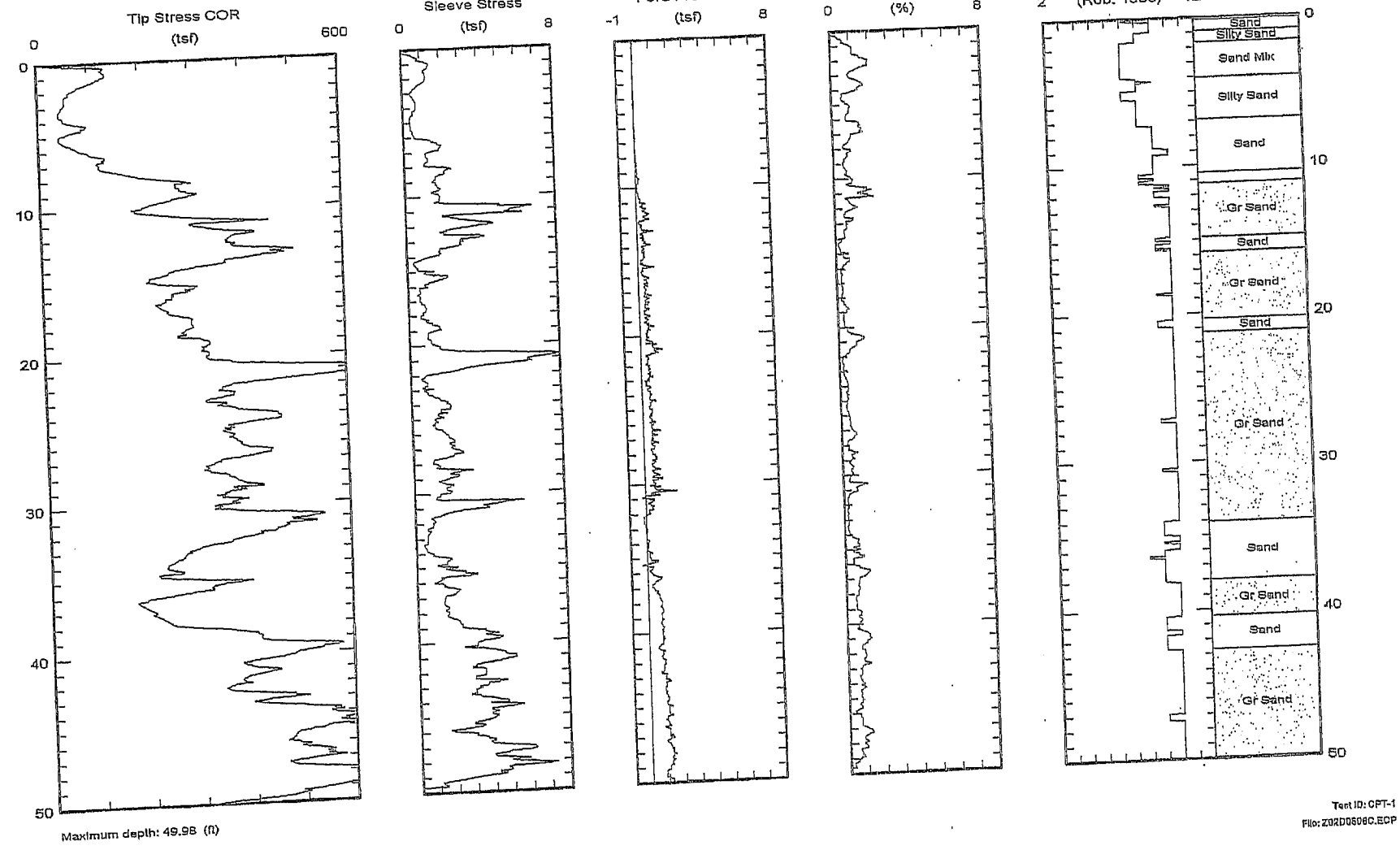
APPENDIX

Kehoe Testing & Engineering
Office: (714) 901-7270
Fax: (714) 901-7289
skehoe@msn.com

CPT Data
30 ton rig

Date: 02/Dec/2005
Test ID: CPT-1
Project: SantaClarita

Client: R.T. Frankian
Job Site: Lost Canyon Rd



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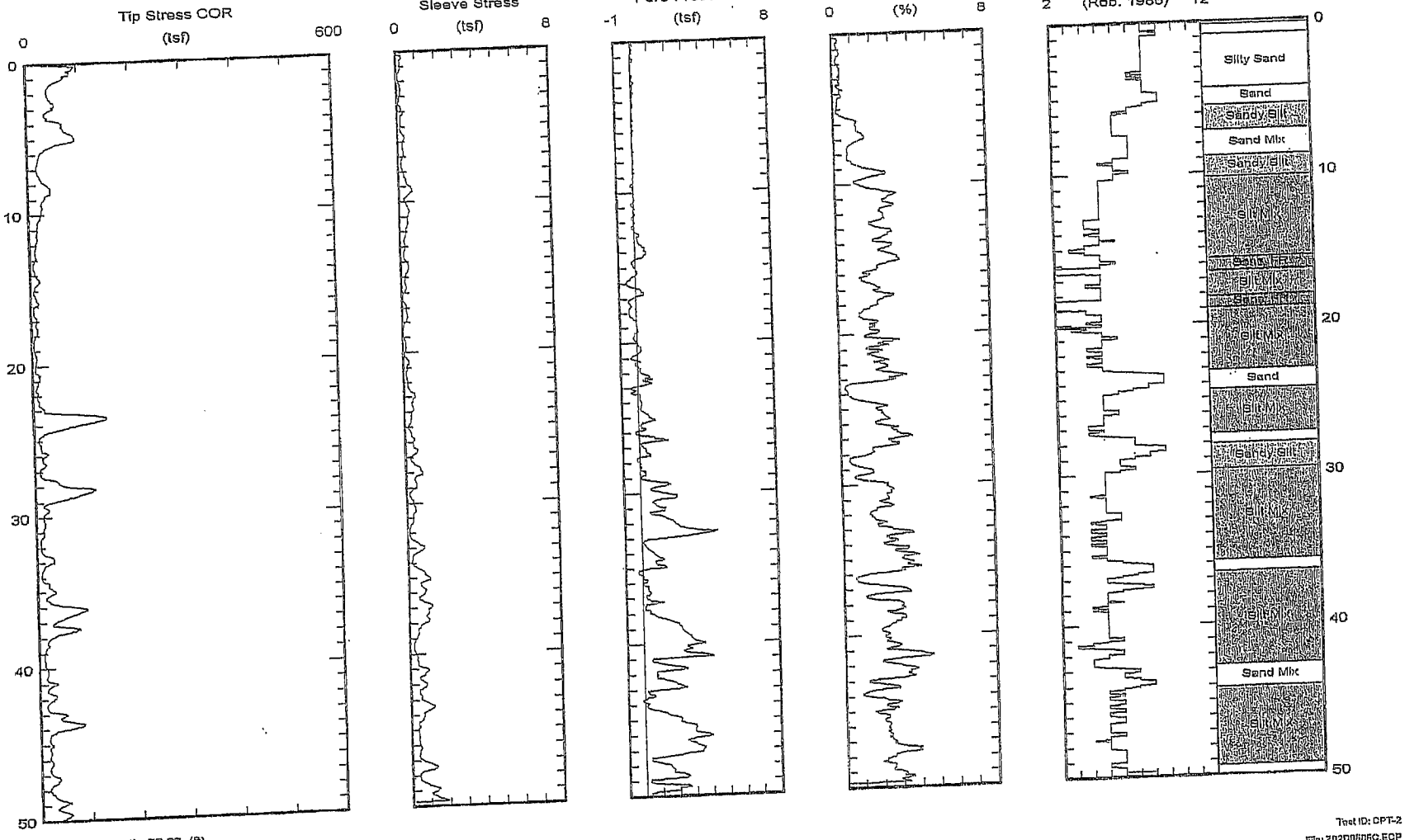
CPT Data
30 ton rig

Date: 02/Dec/2005
Test ID: CPT-2
Project: SantaClarita

Client: R.T. Frankian
Job Site: Lost Canyon Rd



Maximum depth: 50.03 (ft)

Test ID: CPT-2
File: 202D0505C.ECP

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Office: (714) 901-7270
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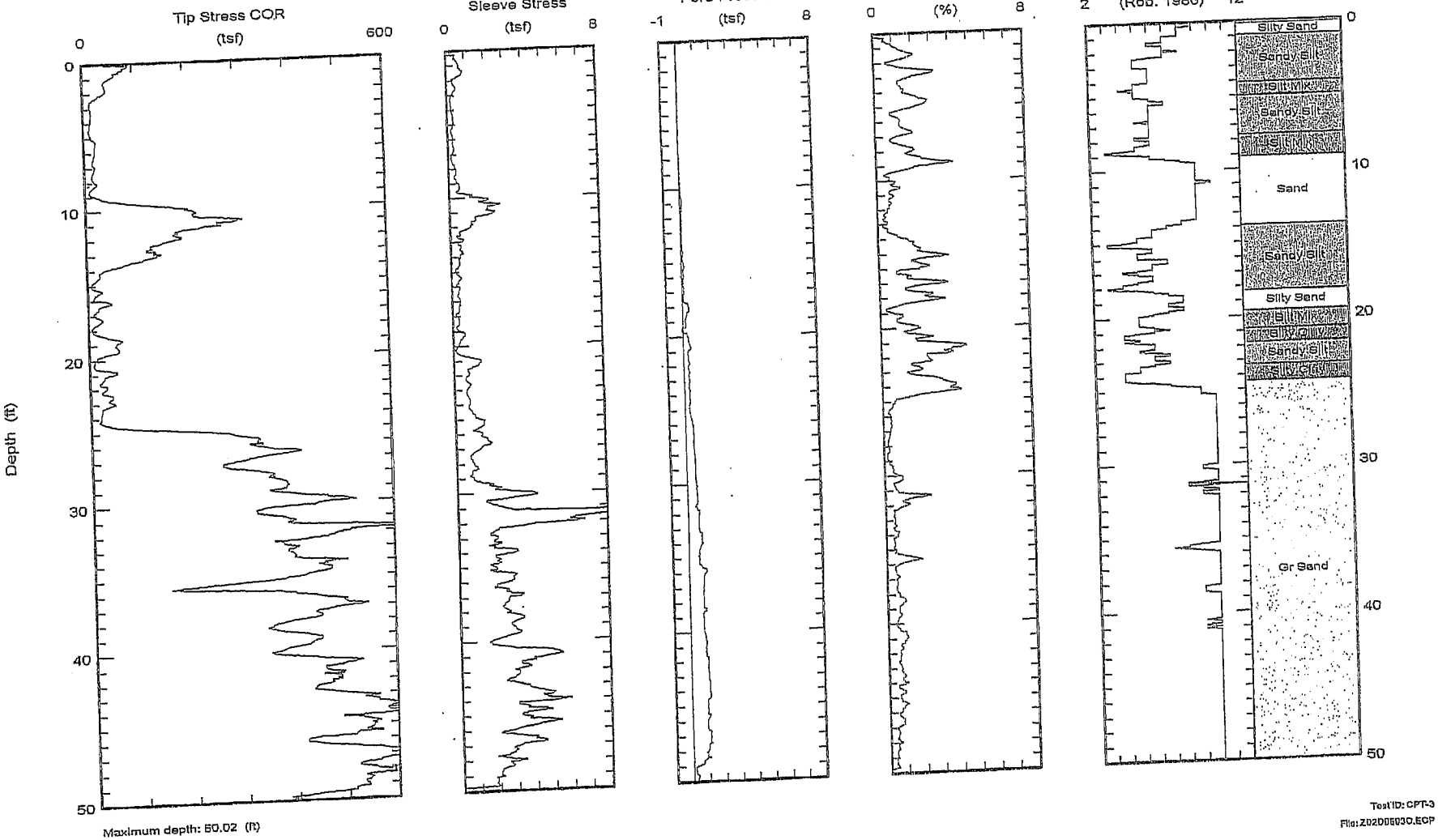
skehoe@msn.com

CPT Data
30 ton rig

Date: 02/Dec/2005
Test ID: CPT-3
Project: SantaClarita

Client: R.T. Frankian
Job Site: Lost Canyon Rd



Maximum depth: 50.02 (ft)

Test ID: CPT-3
File: Z02D05030.ECP

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Office: (714) 901-7270
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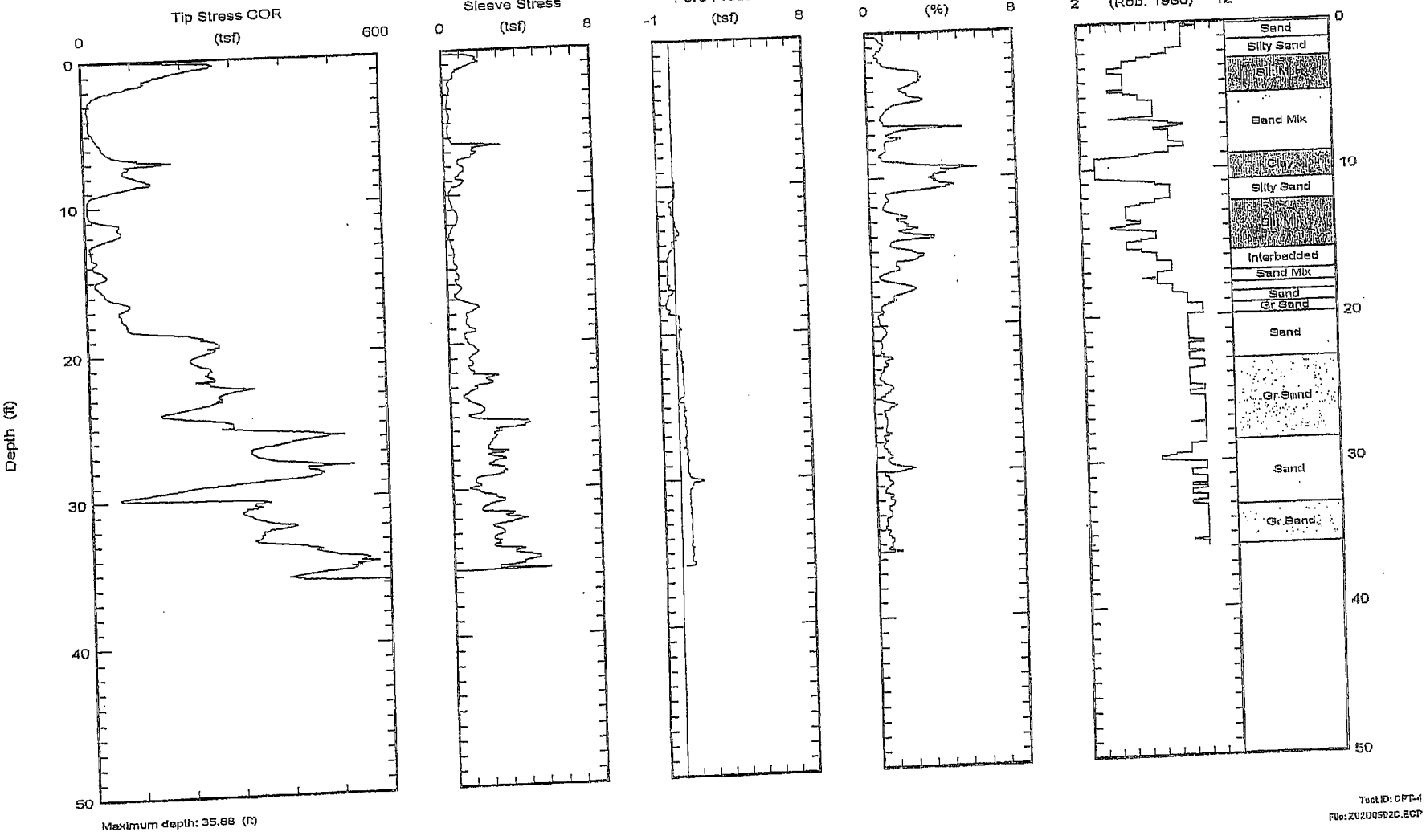
skehoe@msn.com

CPT Data
30 ton rig

Date: 02/Dec/2005
Test ID: CPT-4
Project: SantaClarita

Client: R.T. Frankian
Job Site: Lost Canyon Rd



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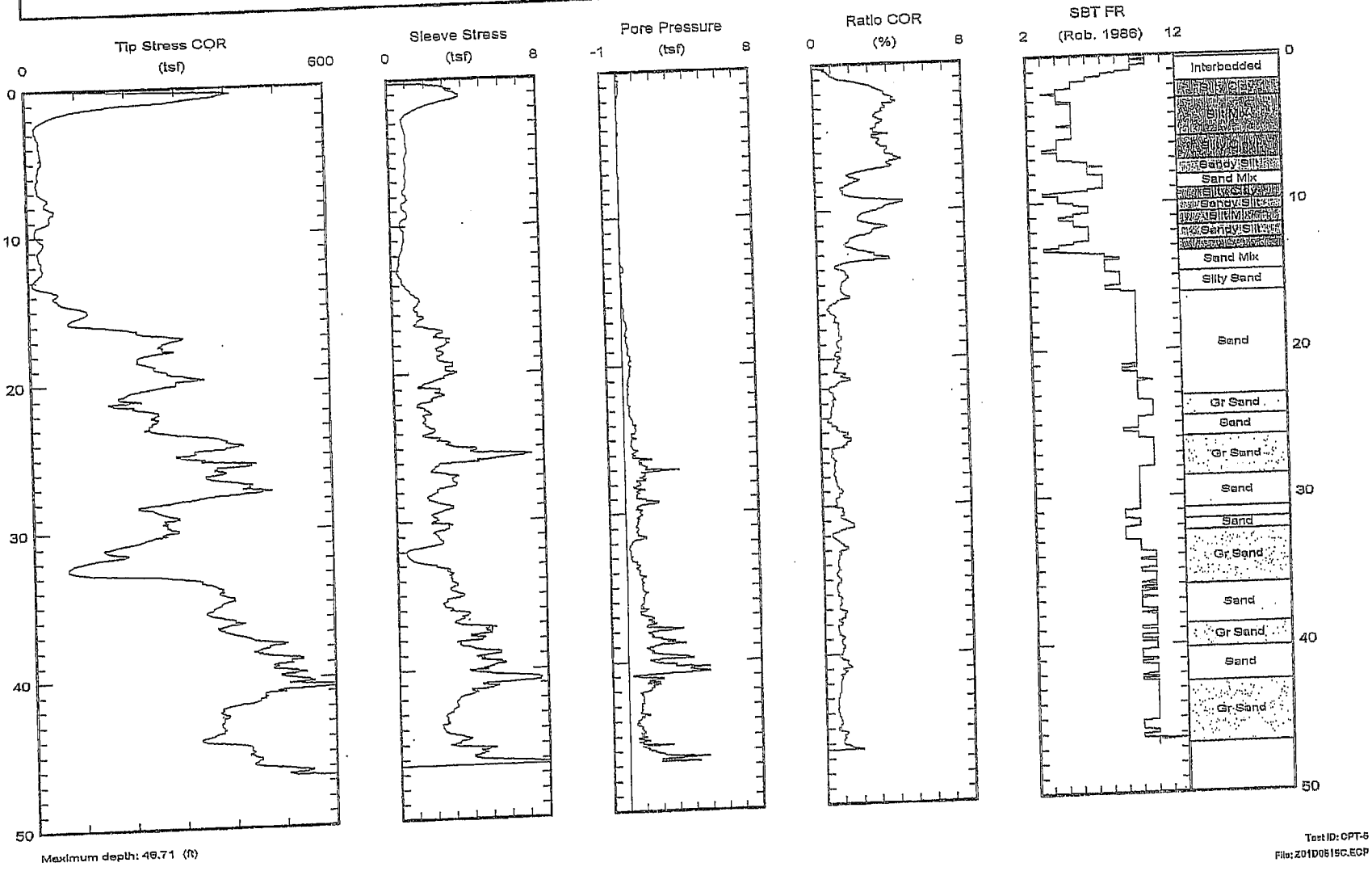
CPT Data
30 ton rig

Date: 01/Dec/2005
Test ID: CPT-5
Project: SantaClarita

Client: R.T. Frankian
Job Site: Lost Canyon Rd



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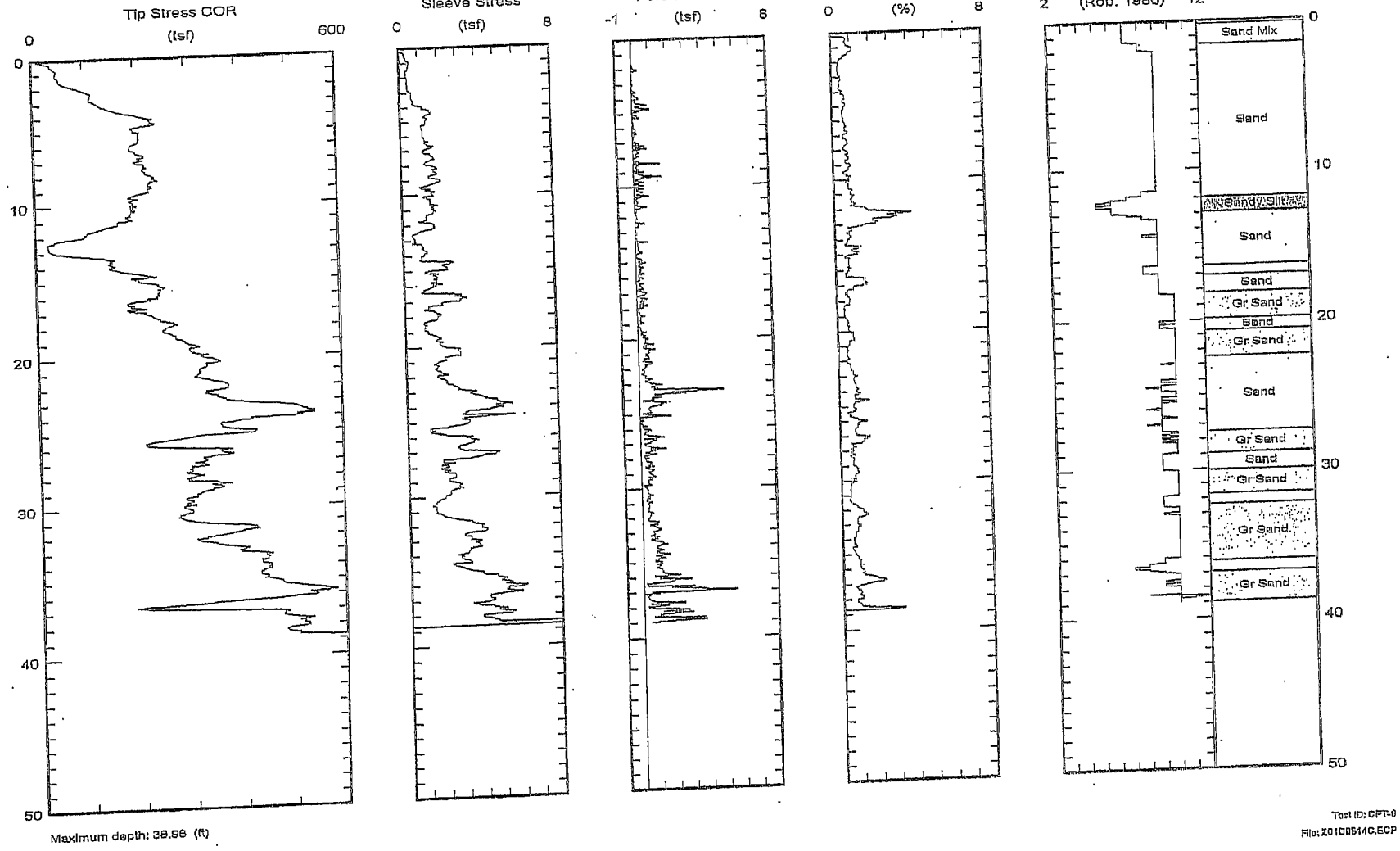
CPT Data
30 ton rig

Date: 01/Dec/2005
Test ID: CPT-6
Project: SantaClarita

Client: R.T. Frankian
Job Site: Lost Canyon Rd



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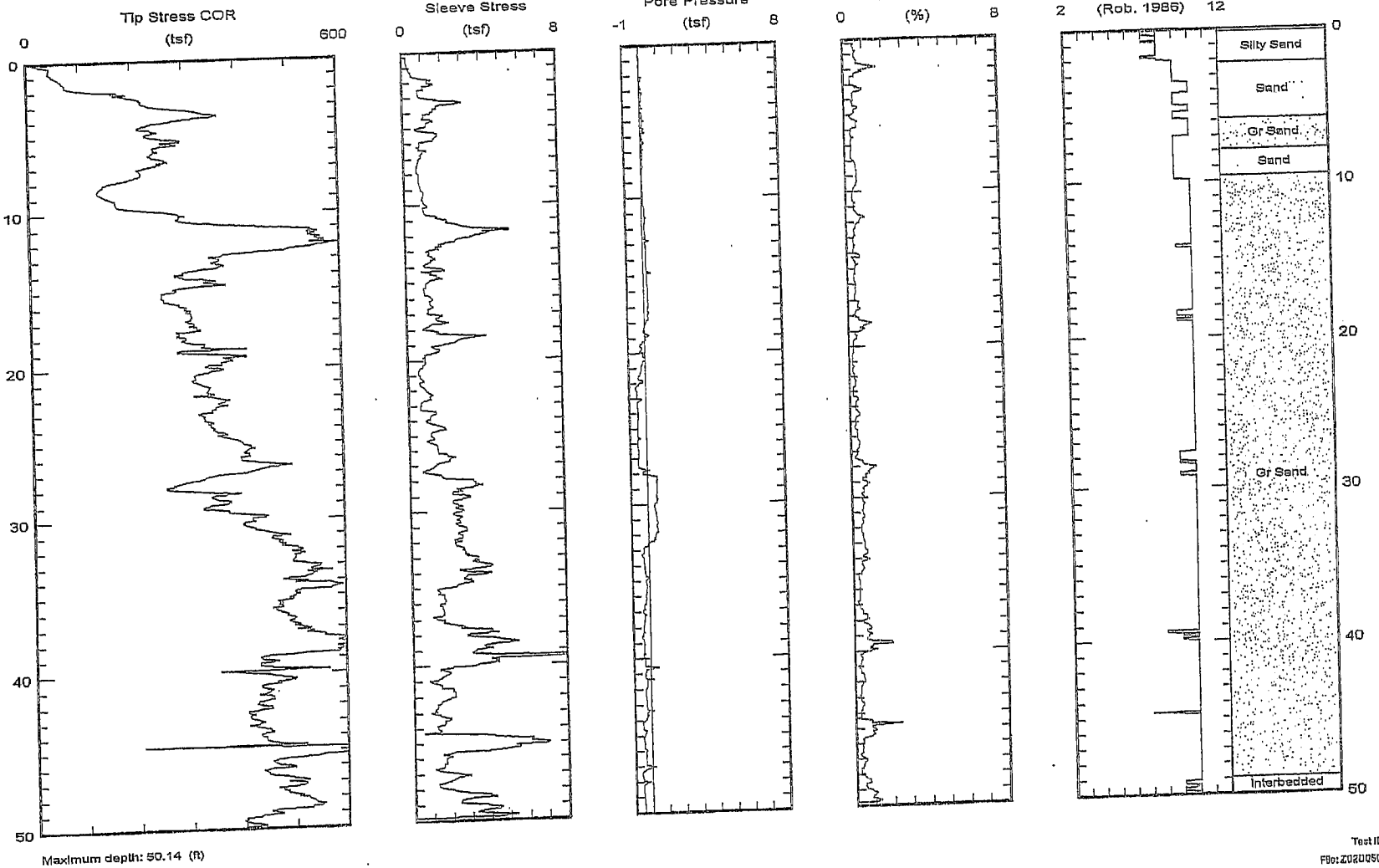
CPT Data
30 ton rig

Date: 02/Dec/2005
Test ID: CPT-7
Project: SantaClarita

Client: R.T. Frankian
Job Site: Lost Canyon Rd



Maximum depth: 50.14 (ft)

Test ID: CPT-7
File: Z02005010.ECP

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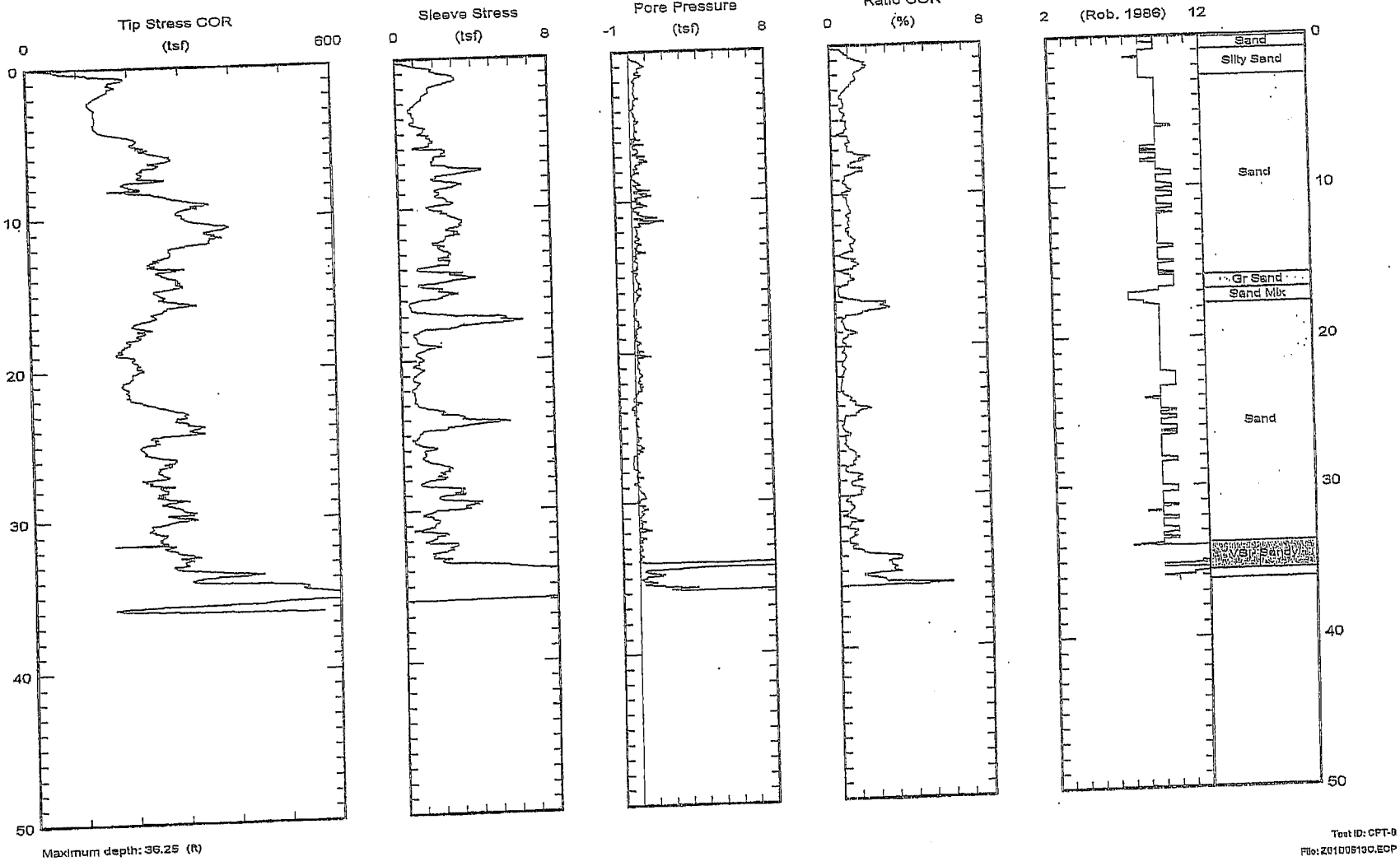
CPT Data
30 ton rig

Date: 01/Dec/2005
Test ID: CPT-8
Project: SantaClarita

Client: R.T. Frankian
Job Site: Lost Canyon Rd



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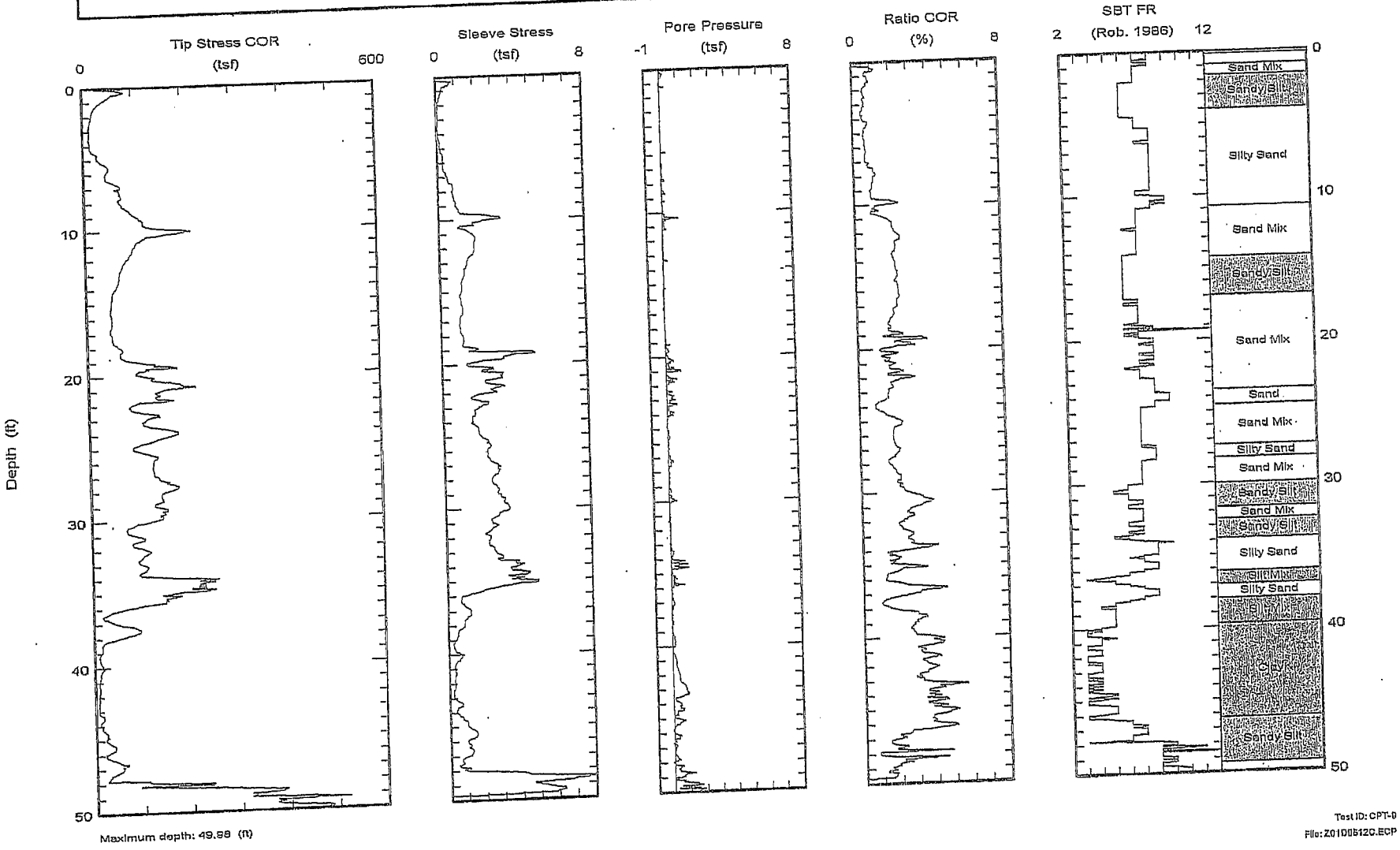
CPT Data
30 ton rig

Date: 01/Dec/2005
Test ID: CPT-9
Project: SantaClarita

Client: R.T. Frankian
Job Site: Lost Canyon Rd



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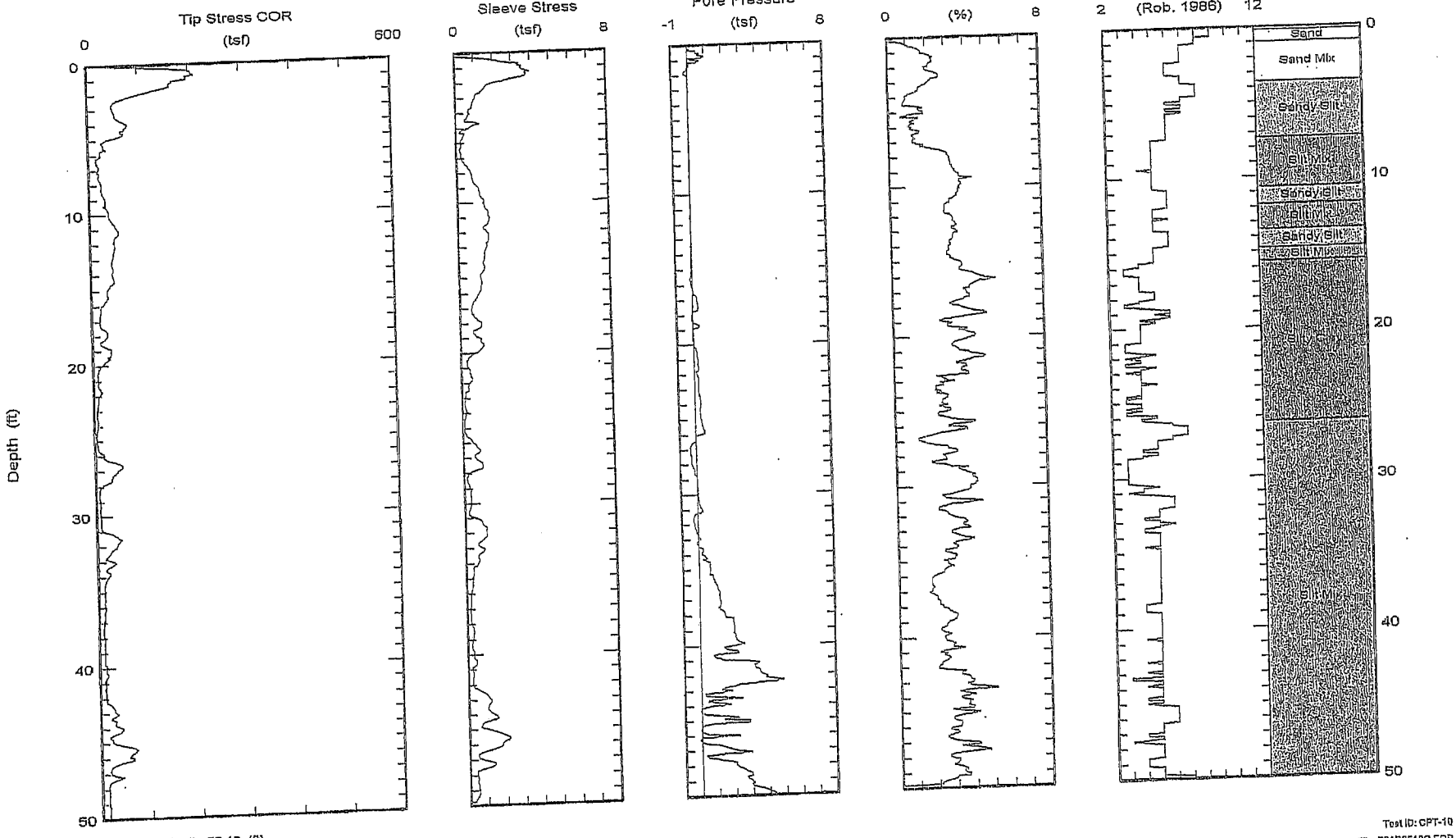
CPT Data
30 ton rig

Date: 01/Dec/2005
Test ID: CPT-10
Project: SantaClarita

Client: R.T. Frankian
Job Site: Lost Canyon Rd



Maximum depth: 50.13 (ft)

Test ID: CPT-10
File: Z01D0510C.ECP

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Office: (714) 901-7270
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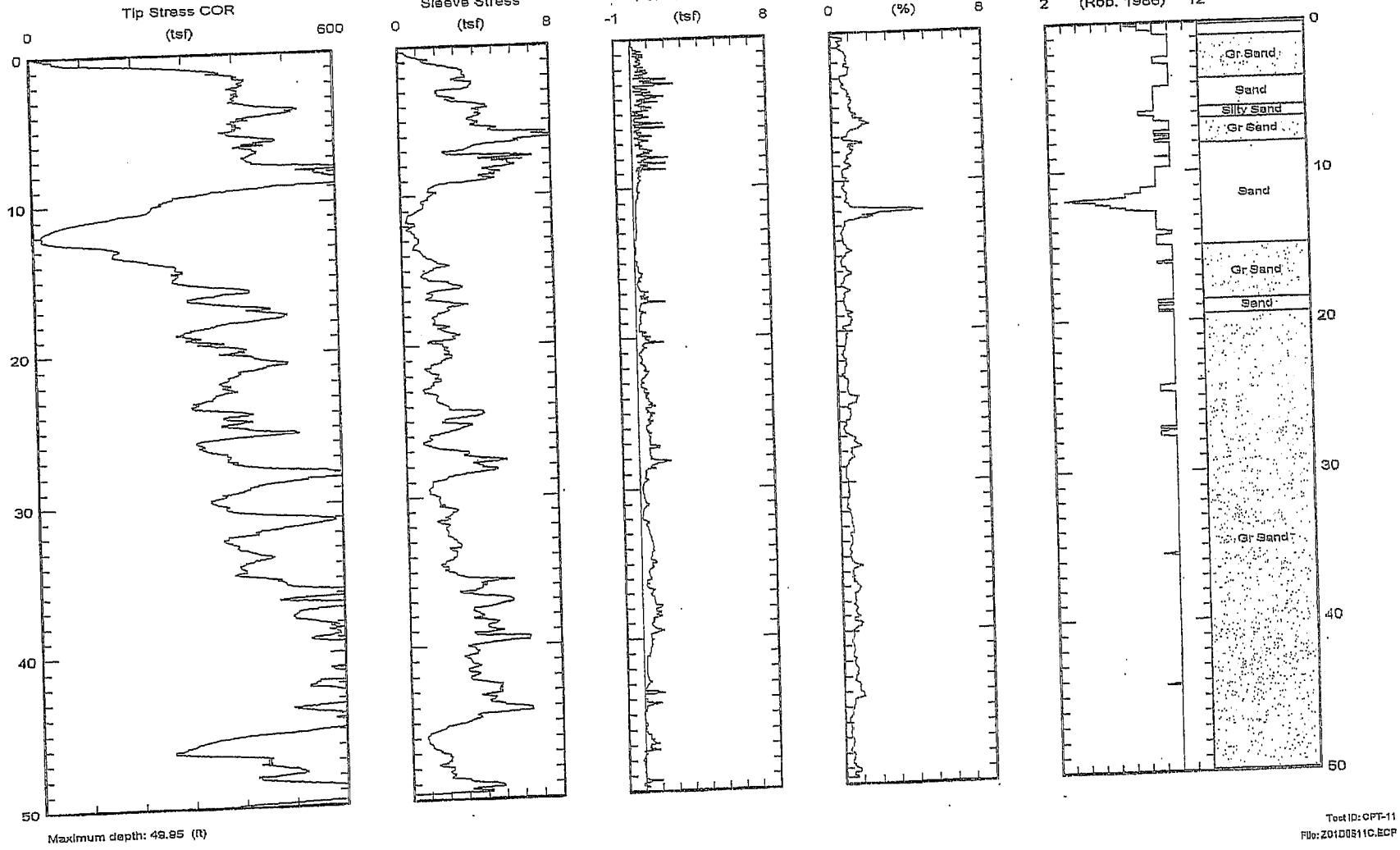
skehoe@msn.com

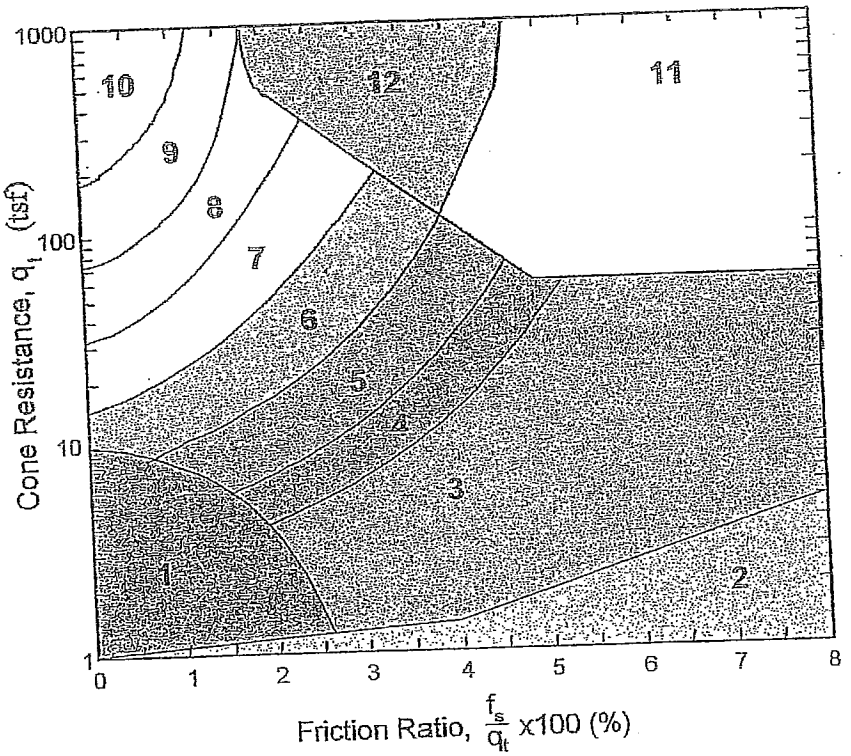
CPT Data
30 ton rig

Date: 01/Dec/2005
Test ID: CPT-11
Project: SantaClarita

Client: R.T. Frankian
Job Site: Lost Canyon Rd



CPT Soil Behavior Type Legend
(Robertson et al. 1986)



Zone	Soil Behavior Type
1	Sensitive, Fine Grained
2	Organic Material
3	Clay
4	Silty Clay to Clay
5	Clayey Silt to Silty Clay (Silt Mix)
6	Sandy Silt to Clayey Silt
7	Silty Sand to Sandy Silt (Sand Mix)
8	Sand to Silty Sand
9	Sand
10	Gravelly Sand to Sand
11	Very Stiff Fine Grained*
12	Sand to Clayey Sand*

*Overconsolidated or cemented

INPUT FILE: C:\TEMP\CPT-1.CSV

Depth (feet)	Qc(avg) (TSF)	Fs(avg) (TSF)	Rf (%)	Rf Zone (zone #)	Spt N (blow/ft)	Spt N1 (blow/ft)	Su (TSF)
0.500	108.814	0.669	0.614	9	21	32	UNDF
1.500	96.707	1.292	1.336	8	23	35	UNDF
2.500	55.427	0.827	1.493	7	18	27	UNDF
3.500	45.431	0.626	1.378	7	15	23	UNDF
4.500	72.315	0.504	0.697	8	17	26	UNDF
5.500	55.762	0.472	0.847	8	13	20	UNDF
6.500	114.057	1.551	1.360	8	27	41	UNDF
7.500	155.207	1.185	0.763	9	30	45	UNDF
8.500	273.807	1.940	0.708	9	52	78	UNDF
9.500	253.264	1.694	0.669	9	49	74	UNDF
10.500	276.779	3.673	1.327	9	53	74	UNDF
11.500	354.836	3.829	1.079	9	68	88	UNDF
12.500	404.287	2.861	0.708	10	65	79	UNDF
13.500	384.671	2.103	0.547	10	61	70	UNDF
14.500	238.408	0.645	0.270	10	38	42	UNDF
15.500	271.571	1.395	0.514	10	43	47	UNDF
16.500	238.927	0.671	0.281	10	38	40	UNDF
17.500	284.243	0.841	0.296	10	45	46	UNDF
18.500	289.393	1.231	0.425	10	46	46	UNDF
19.500	322.308	1.093	0.339	10	51	50	UNDF
20.500	445.423	4.263	0.957	9	85	81	UNDF
21.500	535.371	3.789	0.708	10	85	79	UNDF
22.500	353.207	0.791	0.224	10	56	51	UNDF
23.500	383.564	1.349	0.352	10	61	54	UNDF
24.500	411.293	1.678	0.408	10	66	57	UNDF
25.500	369.821	1.364	0.369	10	59	50	UNDF
26.500	411.514	2.054	0.499	10	66	55	UNDF
27.500	326.964	1.869	0.571	10	52	42	UNDF
28.500	384.260	2.001	0.521	10	61	49	UNDF
29.500	362.015	1.763	0.487	10	58	46	UNDF
30.500	419.293	2.896	0.690	10	67	52	UNDF
31.500	473.007	1.693	0.358	10	76	57	UNDF
32.500	345.007	0.763	0.221	10	55	41	UNDF
33.500	258.471	0.602	0.233	10	41	30	UNDF
34.500	239.679	1.511	0.631	9	46	33	UNDF
35.500	325.536	1.943	0.597	10	52	37	UNDF
36.500	191.213	1.739	0.909	9	37	26	UNDF
37.500	220.121	1.544	0.701	9	42	29	UNDF
38.500	367.321	2.053	0.559	10	59	40	UNDF
39.500	508.429	3.771	0.741	10	81	54	UNDF
40.500	426.187	3.905	0.916	9	82	54	UNDF
41.499	404.450	3.776	0.933	9	78	50	UNDF
42.499	395.564	3.561	0.900	9	76	48	UNDF
43.499	481.938	3.438	0.713	10	77	48	UNDF
44.499	585.900	4.304	0.734	10	94	58	UNDF
45.499	490.671	2.970	0.605	10	78	48	UNDF
46.499	530.862	3.811	0.718	10	85	51	UNDF
47.499	531.443	5.069	0.953	10	85	51	UNDF
48.499	694.850	5.056	0.727	10	111	65	UNDF
49.499	455.608	1.100	0.241	10	73	42	UNDF

INPUT FILE: C:\TEMP\CPT-2.CSV

Depth (feet)	Qc(avg) (TSF)	Fs(avg) (TSF)	Rf (%)	Rf Zone (zone #)	Spt N (blow/ft)	Spt N1 (blow/ft)	Su (TSF)
0.500	80.158	0.205	0.256	8	19	29	UNDF
1.500	50.233	0.155	0.309	8	12	18	UNDF
2.500	48.555	0.189	0.389	8	12	18	UNDF
3.500	45.473	0.160	0.352	8	11	17	UNDF
4.500	77.918	0.225	0.289	8	19	29	UNDF
5.500	54.692	0.267	0.488	8	13	20	UNDF
6.500	21.069	0.287	1.362	6	8	12	UNDF
7.500	23.915	0.202	0.843	7	8	12	UNDF
8.500	40.031	0.381	0.951	7	13	20	UNDF
9.500	27.177	0.508	1.871	6	10	15	UNDF
10.500	20.454	0.456	2.230	6	8	11	UNDF
11.500	16.085	0.418	2.599	5	8	10	1.024
12.500	12.462	0.277	2.222	5	6	7	0.779
13.500	9.015	0.231	2.540	4	6	7	0.550
14.500	13.492	0.364	2.691	5	6	7	0.842
15.500	11.123	0.234	2.110	5	5	6	0.676
16.500	8.023	0.144	1.791	5	4	4	0.468
17.500	12.000	0.276	2.315	5	6	6	0.724
18.500	6.277	0.091	1.451	1	3	3	0.342
19.500	8.114	0.151	1.869	5	4	4	0.461
20.500	10.631	0.218	2.051	5	5	5	0.625
21.500	9.708	0.200	2.060	5	5	5	0.560
22.500	13.646	0.375	2.731	5	7	7	0.823
23.500	98.546	0.492	0.499	9	19	18	UNDF
24.500	37.108	0.342	0.919	7	12	11	UNDF
25.500	16.264	0.354	2.164	5	8	7	0.986
26.500	16.577	0.498	2.977	5	8	7	1.007
27.500	29.154	0.558	1.912	6	11	9	UNDF
28.500	86.108	0.601	0.698	8	21	18	UNDF
29.500	20.623	0.286	1.376	6	8	7	UNDF
30.500	16.271	0.414	2.501	5	8	6	0.979
31.500	10.931	0.228	2.041	5	5	4	0.616
32.500	19.962	0.432	2.106	6	8	6	UNDF
33.500	13.833	0.404	2.909	5	7	5	0.791
34.500	21.600	0.697	3.197	5	10	8	1.314
35.500	29.525	0.842	2.850	5	14	10	1.825
36.500	70.083	0.858	1.223	8	17	13	UNDF
37.500	49.492	1.015	2.049	6	19	14	UNDF
38.500	17.992	0.536	2.931	5	9	6	1.063
39.500	11.600	0.285	2.356	5	6	4	0.647
40.500	19.823	0.504	2.474	5	10	7	1.194
41.499	24.350	0.754	3.066	5	12	8	1.472
42.499	20.758	0.612	2.910	5	10	7	1.231
43.499	60.877	0.944	1.549	7	19	13	UNDF
44.499	23.662	0.522	2.188	6	9	6	UNDF
45.499	18.992	0.418	2.140	6	7	5	UNDF
46.499	19.392	0.467	2.333	5	10	6	1.145
47.499	27.369	0.865	3.128	5	13	8	1.652
48.499	33.150	0.820	2.447	6	13	8	UNDF
49.499	43.662	0.925	2.108	6	17	10	UNDF

INPUT FILE: C:\TEMP\CPT-3.CSV

Depth (feet)	Qc(avg) (TSF)	Fs(avg) (TSF)	Rf (%)	Rf Zone (zone #)	Spt N (blow/ft)	Spt N1 (blow/ft)	Su (TSF)
0.500	68.450	0.415	0.606	8	16	24	UNDF
1.500	44.946	0.659	1.467	7	14	21	UNDF
2.500	20.992	0.395	1.882	6	8	12	UNDF
3.500	15.875	0.226	1.423	6	6	9	UNDF
4.500	13.071	0.305	2.333	5	6	9	0.853
5.500	22.254	0.261	1.171	6	9	14	UNDF
6.500	19.500	0.289	1.483	6	7	11	UNDF
7.500	17.800	0.238	1.335	6	7	11	UNDF
8.500	16.146	0.388	2.405	5	8	12	1.042
9.500	95.864	0.741	0.773	8	23	35	UNDF
10.500	244.585	2.145	0.877	9	47	66	UNDF
11.500	209.885	1.494	0.712	9	40	52	UNDF
12.500	140.700	0.624	0.444	9	27	33	UNDF
13.500	94.138	0.535	0.569	8	23	27	UNDF
14.500	20.600	0.408	1.981	6	8	9	UNDF
15.500	16.669	0.388	2.324	5	8	9	1.049
16.500	26.667	0.401	1.501	6	10	11	UNDF
17.500	18.375	0.366	1.990	6	7	7	UNDF
18.500	37.133	0.316	0.850	7	12	12	UNDF
19.500	42.008	0.475	1.129	7	13	13	UNDF
20.500	25.133	0.563	2.232	6	10	10	UNDF
21.500	28.958	1.031	3.554	5	14	13	1.846
22.500	36.392	0.741	2.032	6	14	13	UNDF
23.500	28.077	0.751	2.667	6	11	10	UNDF
24.500	74.000	0.957	1.292	8	18	16	UNDF
25.500	302.408	1.369	0.453	10	48	42	UNDF
26.500	363.508	1.594	0.438	10	58	50	UNDF
27.500	298.992	0.938	0.314	10	48	40	UNDF
28.500	375.250	0.931	0.248	10	60	50	UNDF
29.500	436.192	2.135	0.489	10	70	57	UNDF
30.500	364.083	2.600	0.714	10	58	46	UNDF
31.500	493.669	6.608	1.338	9	95	74	UNDF
32.500	429.958	2.643	0.614	10	69	53	UNDF
33.500	411.682	2.263	0.549	10	66	50	UNDF
34.500	454.473	2.142	0.471	10	73	54	UNDF
35.500	283.382	2.556	0.902	9	54	39	UNDF
36.500	476.009	2.559	0.537	10	76	54	UNDF
37.500	448.118	2.515	0.561	10	72	51	UNDF
38.500	376.755	3.000	0.796	10	60	41	UNDF
39.500	423.600	2.690	0.635	10	68	46	UNDF
40.500	441.192	3.580	0.811	10	70	47	UNDF
41.499	475.364	3.546	0.746	10	76	50	UNDF
42.499	460.036	2.974	0.646	10	73	47	UNDF
43.499	572.155	4.544	0.794	10	91	58	UNDF
44.499	562.391	3.774	0.671	10	90	57	UNDF
45.499	521.209	3.925	0.753	10	83	52	UNDF
46.499	527.875	3.410	0.646	10	84	52	UNDF
47.499	573.791	2.677	0.466	10	92	56	UNDF
48.499	556.345	2.375	0.427	10	89	53	UNDF
49.499	468.964	1.363	0.291	10	75	44	UNDF

INPUT FILE: C:\TEMP\CPT-4.CSV

Depth (feet)	Qc(avg) (TSF)	Fs(avg) (TSF)	Rf (%)	Rf Zone (zone #)	Spt N (blow/ft)	Spt N1 (blow/ft)	Su (TSF)
0.500	199.992	1.288	0.644	9	38	57	UNDF
1.500	118.531	0.792	0.668	9	23	35	UNDF
2.500	25.008	0.362	1.446	6	10	15	UNDF
3.500	11.600	0.278	2.395	5	6	9	0.759
4.500	14.033	0.319	2.274	5	7	11	0.917
5.500	28.909	0.265	0.915	7	9	14	UNDF
6.500	71.108	1.247	1.753	7	23	35	UNDF
7.500	96.883	1.093	1.128	8	23	35	UNDF
8.500	104.591	0.860	0.822	8	25	38	UNDF
9.500	16.258	0.553	3.403	4	10	15	1.045
10.500	9.283	0.312	3.351	3	9	13	0.577
11.500	65.292	0.627	0.960	8	16	21	UNDF
12.500	26.783	0.279	1.042	7	9	11	UNDF
13.500	15.583	0.324	2.077	5	7	8	0.986
14.500	29.608	0.466	1.577	6	11	13	UNDF
15.500	26.408	0.538	2.042	6	10	11	UNDF
16.500	68.483	0.585	0.855	8	16	17	UNDF
17.500	70.267	1.271	1.811	7	22	23	UNDF
18.500	142.023	1.052	0.741	9	27	28	UNDF
19.500	251.492	1.070	0.425	10	40	40	UNDF
20.500	216.985	1.353	0.624	9	42	41	UNDF
21.500	242.871	1.193	0.491	9	47	45	UNDF
22.500	278.123	1.997	0.718	9	53	49	UNDF
23.500	226.138	1.035	0.457	9	43	39	UNDF
24.500	224.354	1.548	0.690	9	43	38	UNDF
25.500	393.246	3.119	0.793	10	63	55	UNDF
26.500	367.146	2.342	0.638	10	59	51	UNDF
27.500	398.164	2.376	0.597	10	64	54	UNDF
28.500	422.292	2.562	0.606	10	67	55	UNDF
29.500	143.593	1.398	0.973	9	28	23	UNDF
30.500	317.046	2.175	0.686	10	51	40	UNDF
31.500	347.754	2.345	0.674	10	56	43	UNDF
32.500	349.707	2.817	0.805	10	56	43	UNDF
33.500	442.546	2.368	0.535	10	71	53	UNDF
34.500	543.329	3.999	0.736	10	87	64	UNDF
35.500	488.270	1.732	0.355	10	78	56	UNDF

INPUT FILE: C:\TEMP\CPT-5.CSV

Depth (feet)	Qc(avg) (TSF)	Fs(avg) (TSF)	Rf (%)	Rf Zone (zone #)	Spt N (blow/ft)	Spt N1 (blow/ft)	Su (TSF)
0.500	309.017	2.534	0.820	9	59	89	UNDF
1.500	108.608	2.856	2.629	7	35	53	UNDF
2.500	24.125	0.978	4.054	4	15	23	1.599
3.500	25.000	0.877	3.507	5	12	18	1.652
4.500	29.375	0.977	3.325	5	14	21	1.940
5.500	25.550	0.913	3.575	5	12	18	1.681
6.500	21.660	0.890	4.109	4	14	21	1.417
7.500	35.164	0.815	2.317	6	13	20	UNDF
8.500	48.007	0.784	1.633	7	15	23	UNDF
9.500	21.723	0.754	3.468	5	10	15	1.410
10.500	26.831	0.684	2.549	6	10	14	UNDF
11.500	23.336	0.633	2.711	5	11	14	1.509
12.500	22.331	0.435	1.950	6	9	11	UNDF
13.500	31.431	0.465	1.480	6	12	14	UNDF
14.500	71.557	1.051	1.468	7	23	26	UNDF
15.500	97.677	1.342	1.373	8	23	25	UNDF
16.500	217.515	1.527	0.702	9	42	45	UNDF
17.500	271.343	2.697	0.994	9	52	54	UNDF
18.500	226.708	2.515	1.109	9	43	44	UNDF
19.500	290.550	2.982	1.026	9	56	55	UNDF
20.500	224.315	2.155	0.960	9	43	42	UNDF
21.500	204.614	2.189	1.070	9	39	37	UNDF
22.500	245.500	1.642	0.668	9	47	43	UNDF
23.500	305.171	1.842	0.603	10	49	44	UNDF
24.500	364.623	2.465	0.676	10	58	51	UNDF
25.500	372.443	5.121	1.374	9	71	61	UNDF
26.500	381.308	2.432	0.638	10	61	52	UNDF
27.500	405.107	2.859	0.705	10	65	54	UNDF
28.500	245.346	2.119	0.863	9	47	38	UNDF
29.500	274.064	2.339	0.853	9	53	42	UNDF
30.500	233.400	2.462	1.054	9	45	35	UNDF
31.500	150.186	1.775	1.181	8	36	28	UNDF
32.500	93.169	0.959	1.029	8	22	17	UNDF
33.500	323.100	2.756	0.853	9	62	46	UNDF
34.500	382.714	3.111	0.813	10	61	45	UNDF
35.500	358.177	2.778	0.775	10	57	41	UNDF
36.500	387.714	3.406	0.878	9	74	53	UNDF
37.500	448.615	4.632	1.032	9	86	60	UNDF
38.500	480.879	4.083	0.848	10	77	53	UNDF
39.500	500.536	4.934	0.985	9	96	65	UNDF
40.500	547.093	5.959	1.088	9	105	70	UNDF
41.499	437.679	4.161	0.950	9	84	55	UNDF
42.499	375.829	2.991	0.795	10	60	39	UNDF
43.499	367.392	2.472	0.672	10	59	38	UNDF
44.499	392.607	3.078	0.784	10	63	40	UNDF
45.499	443.386	4.226	0.953	9	85	53	UNDF
46.499	569.340	3.919	0.688	10	91	56	UNDF

INPUT FILE: C:\TEMP\CPT-6.CSV

Depth (feet)	Qc(avg) (TSF)	Fs(avg) (TSF)	Rf (%)	Rf Zone (zone #)	Spt N (blow/ft)	Spt N1 (blow/ft)	Su (TSF)
0.500	37.683	0.301	0.798	7	12	18	UNDF
1.500	59.408	0.445	0.750	8	14	21	UNDF
2.500	112.300	0.449	0.399	9	22	33	UNDF
3.500	162.392	0.726	0.447	9	31	47	UNDF
4.500	218.064	1.399	0.641	9	42	63	UNDF
5.500	204.893	1.206	0.588	9	39	59	UNDF
6.500	202.286	1.373	0.679	9	39	59	UNDF
7.500	215.331	1.454	0.675	9	41	62	UNDF
8.500	231.079	1.719	0.744	9	44	66	UNDF
9.500	199.693	1.549	0.776	9	38	57	UNDF
10.500	190.121	1.526	0.803	9	36	50	UNDF
11.500	131.200	1.419	1.081	8	31	40	UNDF
12.500	37.457	0.958	2.555	6	14	17	UNDF
13.500	122.664	0.993	0.809	8	29	33	UNDF
14.500	188.536	1.774	0.940	9	36	40	UNDF
15.500	239.400	1.624	0.678	9	46	50	UNDF
16.500	199.086	2.174	1.091	9	38	40	UNDF.
17.500	244.686	1.636	0.668	9	47	49	UNDF
18.500	265.386	1.218	0.459	10	42	42	UNDF
19.500	307.929	1.697	0.551	10	49	48	UNDF
20.500	336.207	2.496	0.742	10	54	52	UNDF
21.500	337.457	1.716	0.508	10	54	51	UNDF
22.500	355.493	2.433	0.684	10	57	52	UNDF
23.500	498.207	4.364	0.875	10	80	72	UNDF
24.500	392.771	3.782	0.963	9	75	66	UNDF
25.500	275.236	2.126	0.772	9	53	45	UNDF
26.500	343.664	3.189	0.928	9	66	56	UNDF
27.500	306.860	3.031	0.988	9	59	49	UNDF
28.500	334.864	2.224	0.664	10	53	43	UNDF
29.500	296.593	2.409	0.812	9	57	45	UNDF
30.500	286.143	1.486	0.519	10	46	36	UNDF
31.500	381.114	2.587	0.679	10	61	47	UNDF
32.500	351.214	3.505	0.998	9	67	50	UNDF
33.500	436.671	3.324	0.761	10	70	52	UNDF
34.500	441.764	2.768	0.626	10	71	52	UNDF
35.500	516.907	4.558	0.881	10	83	59	UNDF
36.500	357.000	5.014	1.403	9	68	48	UNDF
37.500	498.507	4.467	0.896	10	80	55	UNDF
38.500	562.036	4.729	0.841	10	90	61	UNDF

INPUT FILE: C:\TEMP\CPT-7.CSV

Depth (feet)	Qc (avg) (TSF)	Fs (avg) (TSF)	Rf (%)	Rf Zone (zone #)	Spt N (blow/ft)	Spt N1 (blow/ft)	Su (TSF)
0.500	38.238	0.202	0.527	7	12	18	UNDF
1.500	76.250	0.729	0.957	8	18	27	UNDF
2.500	203.121	1.038	0.511	9	39	59	UNDF
3.500	311.514	1.910	0.613	10	50	75	UNDF
4.500	235.021	1.205	0.513	9	45	68	UNDF
5.500	259.700	1.312	0.505	9	50	75	UNDF
6.500	247.964	0.902	0.364	10	40	60	UNDF
7.500	206.507	0.723	0.350	9	40	60	UNDF
8.500	141.160	0.799	0.566	9	27	41	UNDF
9.500	189.943	0.982	0.517	9	36	54	UNDF
10.500	326.254	1.312	0.402	10	52	72	UNDF
11.500	546.231	3.496	0.640	10	87	111	UNDF
12.500	480.725	2.258	0.470	10	77	92	UNDF
13.500	339.923	1.222	0.359	10	54	62	UNDF
14.500	317.475	1.466	0.462	10	51	56	UNDF
15.500	263.792	1.026	0.389	10	42	45	UNDF
16.500	305.250	1.224	0.401	10	49	51	UNDF
17.500	303.962	1.465	0.482	10	49	50	UNDF
18.500	318.892	2.421	0.759	9	61	60	UNDF
19.500	367.508	1.255	0.341	10	59	57	UNDF
20.500	328.817	0.733	0.223	10	52	49	UNDF
21.500	339.115	0.735	0.217	10	54	50	UNDF
22.500	359.793	0.979	0.272	10	57	51	UNDF
23.500	336.862	1.044	0.310	10	54	48	UNDF
24.500	374.493	1.379	0.368	10	60	52	UNDF
25.500	415.092	1.285	0.310	10	66	56	UNDF
26.500	438.564	1.834	0.418	10	70	58	UNDF
27.500	305.650	1.512	0.495	10	49	40	UNDF
28.500	355.479	2.927	0.823	9	68	54	UNDF
29.500	383.462	2.540	0.662	10	61	48	UNDF
30.500	424.336	2.452	0.578	10	68	52	UNDF
31.500	479.657	2.647	0.552	10	77	58	UNDF
32.500	509.157	2.690	0.528	10	81	60	UNDF
33.500	532.686	3.458	0.649	10	85	62	UNDF
34.500	538.600	2.894	0.537	10	86	61	UNDF
35.500	479.379	1.574	0.328	10	77	54	UNDF
36.500	494.114	1.506	0.305	10	79	55	UNDF
37.500	555.214	2.815	0.507	10	89	61	UNDF
38.500	560.871	4.039	0.720	10	90	60	UNDF
39.500	447.143	4.541	1.016	9	86	57	UNDF
40.500	460.747	1.724	0.374	10	74	48	UNDF
41.499	444.143	1.775	0.400	10	71	45	UNDF
42.499	423.429	1.375	0.325	10	68	43	UNDF
43.499	436.414	1.494	0.342	10	70	44	UNDF
44.499	501.214	3.596	0.718	10	80	49	UNDF
45.499	520.545	3.745	0.720	10	83	50	UNDF
46.499	473.125	1.547	0.327	10	76	45	UNDF
47.499	494.085	1.869	0.378	10	79	47	UNDF
48.499	516.283	3.019	0.585	10	82	48	UNDF
49.499	418.875	3.107	0.742	10	67	38	UNDF

INPUT FILE: C:\TEMP\CPT-8.CSV

Depth (feet)	Qc(avg) (TSF)	Fs(avg) (TSF)	Rf (%)	Rf Zone (zone #)	Spt N (blow/ft)	Spt N1 (blow/ft)	Su (TSF)
0.500	122.123	1.036	0.848	8	29	44	UNDF
1.500	157.393	2.630	1.670	8	38	57	UNDF
2.500	127.467	1.459	1.144	8	31	47	UNDF
3.500	132.736	0.827	0.623	9	25	38	UNDF
4.500	174.800	1.120	0.640	9	33	50	UNDF
5.500	230.487	1.567	0.680	9	44	66	UNDF
6.500	251.921	2.186	0.868	9	48	72	UNDF
7.500	216.371	2.973	1.373	8	52	78	UNDF
8.500	239.023	2.452	1.026	9	46	69	UNDF
9.500	315.538	2.263	0.717	9	60	90	UNDF
10.500	347.967	2.700	0.776	10	56	77	UNDF
11.500	348.167	2.873	0.825	9	67	86	UNDF
12.500	266.058	2.259	0.849	9	51	62	UNDF
13.500	257.336	2.223	0.864	9	49	56	UNDF
14.500	277.892	2.471	0.889	9	53	59	UNDF
15.500	276.817	2.033	0.734	9	53	58	UNDF
16.500	235.442	1.026	0.436	9	45	48	UNDF
17.500	213.875	4.137	1.934	8	51	53	UNDF
18.500	181.983	0.957	0.526	9	35	35	UNDF
19.500	204.567	1.201	0.587	9	39	38	UNDF
20.500	197.792	0.938	0.474	9	38	36	UNDF
21.500	188.308	0.745	0.395	9	36	34	UNDF
22.500	247.285	0.722	0.292	10	39	36	UNDF
23.500	304.550	2.184	0.717	9	58	52	UNDF
24.500	273.807	2.845	1.039	9	52	46	UNDF
25.500	227.900	0.975	0.428	9	44	38	UNDF
26.500	259.846	1.280	0.493	9	50	42	UNDF
27.500	245.271	2.198	0.896	9	47	39	UNDF
28.500	262.425	2.032	0.774	9	50	41	UNDF
29.500	289.131	3.036	1.050	9	55	44	UNDF
30.500	251.060	1.524	0.607	9	48	38	UNDF
31.500	249.293	1.546	0.620	9	48	37	UNDF
32.500	295.293	2.025	0.686	9	57	43	UNDF
33.500	341.243	4.304	1.261	9	65	48	UNDF
34.500	476.657	13.719	2.870	12	229	168	UNDF
35.500	481.715	10.725	2.222	12	231	166	UNDF
36.500	387.675	0.000	0.000	10	UNDF	UNDF	UNDF

INPUT FILE: C:\TEMP\CPT-9.CSV

Depth (feet)	Qc (avg) (TSF)	Fs (avg) (TSF)	Rf (%)	Rf Zone (zone #)	Spt N (blow/ft)	Spt N1 (blow/ft)	Su (TSF)
0.500	56.182	0.405	0.720	8	13	20	UNDF
1.500	26.229	0.206	0.787	7	8	12	UNDF
2.500	15.957	0.096	0.600	6	6	9	UNDF
3.500	14.114	0.075	0.531	6	5	8	UNDF
4.500	21.750	0.144	0.663	7	7	11	UNDF
5.500	44.707	0.277	0.620	7	14	21	UNDF
6.500	56.029	0.373	0.666	8	13	20	UNDF
7.500	72.258	0.711	0.984	8	17	26	UNDF
8.500	88.273	0.885	1.002	8	21	32	UNDF
9.500	128.838	1.848	1.434	8	31	47	UNDF
10.500	143.075	1.674	1.170	8	34	48	UNDF
11.500	94.838	1.934	2.039	7	30	39	UNDF
12.500	75.367	1.736	2.303	7	24	29	UNDF
13.500	66.585	1.395	2.095	7	21	25	UNDF
14.500	54.150	1.200	2.216	6	21	24	UNDF
15.500	50.700	1.135	2.239	6	19	21	UNDF
16.500	50.642	1.148	2.268	6	19	20	UNDF
17.500	55.046	1.083	1.968	7	18	19	UNDF
18.500	72.317	1.381	1.909	7	23	24	UNDF
19.500	123.938	2.984	2.407	7	40	40	UNDF
20.500	164.317	2.745	1.670	8	39	38	UNDF
21.500	135.454	2.786	2.056	7	43	41	UNDF
22.500	109.592	2.005	1.829	7	35	33	UNDF
23.500	137.769	1.711	1.241	8	33	30	UNDF
24.500	130.425	1.862	1.428	8	31	28	UNDF
25.500	120.323	2.403	1.997	7	38	34	UNDF
26.500	130.569	2.545	1.949	7	42	36	UNDF
27.500	162.242	2.888	1.780	8	39	33	UNDF
28.500	144.115	2.802	1.944	7	46	38	UNDF
29.500	146.346	3.311	2.262	7	47	39	UNDF
30.500	84.283	2.889	3.428	6	32	26	UNDF
31.500	96.462	2.516	2.608	6	37	29	UNDF
32.500	105.192	2.499	2.376	7	34	26	UNDF
33.500	114.883	3.378	2.940	6	44	34	UNDF
34.500	227.400	3.959	1.741	8	54	41	UNDF
35.500	138.800	2.688	1.936	7	44	33	UNDF
36.500	33.042	0.911	2.755	6	13	9	UNDF
37.500	78.092	1.080	1.383	7	25	18	UNDF
38.500	21.342	0.610	2.858	5	10	7	1.266
39.500	12.962	0.386	2.974	4	8	6	0.704
40.500	13.708	0.516	3.756	4	9	6	0.750
41.499	9.831	0.351	3.546	3	9	6	0.490
42.499	8.546	0.292	3.381	3	8	5	0.403
43.499	12.450	0.509	4.063	3	12	8	0.658
44.499	18.538	0.752	4.039	4	12	8	1.059
45.499	31.108	1.275	4.092	4	20	13	1.891
46.499	44.331	1.120	2.526	6	17	11	UNDF
47.499	48.433	0.692	1.427	7	15	9	UNDF
48.499	282.931	5.174	1.828	8	68	42	UNDF
49.499	425.554	3.608	0.847	10	68	42	UNDF

INPUT FILE: C:\TEMP\CPT-10.CSV

Depth (feet)	Qc(avg) (TSF)	Fs(avg) (TSF)	Rf (%)	Rf Zone (zone #)	Spt N (blow/ft)	Spt N1 (blow/ft)	Su (TSF)
0.500	167.673	1.965	1.172	8	40	60	UNDF
1.500	151.792	3.332	2.195	7	48	72	UNDF
2.500	60.550	1.399	2.311	6	23	35	UNDF
3.500	59.136	0.857	1.450	7	19	29	UNDF
4.500	66.850	0.762	1.139	8	16	24	UNDF
5.500	28.567	0.355	1.243	7	9	14	UNDF
6.500	18.700	0.252	1.346	6	7	11	UNDF
7.500	20.883	0.525	2.515	5	10	15	1.361
8.500	26.709	0.876	3.282	5	13	20	1.745
9.500	33.625	1.251	3.721	5	16	24	2.202
10.500	43.983	1.519	3.454	5	21	29	2.889
11.500	51.925	1.529	2.946	6	20	26	UNDF
12.500	47.275	1.577	3.337	5	23	28	3.100
13.500	43.208	1.397	3.235	5	21	24	2.825
14.500	41.125	1.272	3.096	5	20	23	2.679
15.500	29.700	1.157	3.899	4	19	21	1.915
16.500	18.391	0.803	4.354	3	18	19	1.161
17.500	22.960	0.808	3.510	5	11	11	1.463
18.500	25.382	0.909	3.580	5	12	12	1.616
19.500	31.000	1.098	3.545	5	15	15	1.985
20.500	11.910	0.417	3.495	4	8	8	0.711
21.500	12.667	0.508	4.000	3	12	11	0.759
22.500	9.136	0.305	3.314	3	9	8	0.520
23.500	7.575	0.188	2.473	4	5	5	0.411
24.500	5.858	0.158	2.665	3	6	5	0.295
25.500	9.220	0.291	3.122	4	6	5	0.517
26.500	39.090	0.743	1.902	6	15	13	UNDF
27.500	31.667	0.838	2.652	6	12	10	UNDF
28.500	8.350	0.230	2.761	4	5	4	0.438
29.500	8.810	0.359	4.075	3	8	7	0.466
30.500	9.560	0.322	3.365	3	9	7	0.513
31.500	38.950	1.003	2.577	6	15	12	UNDF
32.500	26.810	0.914	3.410	5	13	10	1.653
33.500	24.022	0.770	3.207	5	11	8	1.463
34.500	15.480	0.445	2.856	5	7	5	0.897
35.500	13.309	0.330	2.456	5	6	4	0.750
36.500	13.156	0.240	1.794	5	6	4	0.742
37.500	10.600	0.218	2.006	5	5	4	0.571
38.500	11.620	0.339	2.825	4	8	6	0.642
39.500	11.630	0.292	2.425	5	6	4	0.641
40.500	13.710	0.383	2.738	5	7	5	0.767
41.499	11.270	0.284	2.383	5	6	4	0.625
42.499	21.510	0.769	3.476	5	11	7	1.301
43.499	30.630	1.134	3.678	5	15	10	1.878
44.499	28.700	1.034	3.583	5	14	9	1.742
45.499	59.300	1.831	3.083	6	23	15	UNDF
46.499	35.050	0.978	2.779	6	13	8	UNDF
47.499	23.120	0.862	3.681	4	15	9	1.367
48.499	14.060	0.455	3.123	4	9	6	0.773
49.499	15.030	0.354	2.252	5	8	5	0.845

INPUT FILE: C:\TEMP\CPT-11.CSV

Depth (feet)	Qc(avg) (TSF)	Fs(avg) (TSF)	Rf (%)	Rf Zone (zone #)	Spt N (blow/ft)	Spt N1 (blow/ft)	Su (TSF)
0.500	127.382	0.580	0.455	9	24	36	UNDF
1.500	388.129	2.832	0.730	10	62	93	UNDF
2.500	404.980	3.295	0.813	10	65	98	UNDF
3.500	459.100	3.077	0.670	10	73	110	UNDF
4.500	421.771	4.086	0.969	9	81	122	UNDF
5.500	423.121	5.359	1.266	9	81	122	UNDF
6.500	430.807	5.408	1.255	9	83	125	UNDF
7.500	505.669	4.881	0.965	9	97	146	UNDF
8.500	592.347	4.837	0.816	10	95	143	UNDF
9.500	320.485	2.049	0.639	10	51	75	UNDF
10.500	209.543	1.246	0.595	9	40	55	UNDF
11.500	53.454	0.505	0.945	7	17	22	UNDF
12.500	73.179	0.637	0.870	8	18	22	UNDF
13.500	187.183	0.874	0.467	9	36	41	UNDF
14.500	280.408	1.781	0.635	9	54	60	UNDF
15.500	345.893	1.686	0.488	10	55	59	UNDF
16.500	349.438	1.817	0.520	10	56	59	UNDF
17.500	457.257	2.406	0.526	10	73	74	UNDF
18.500	319.538	1.802	0.564	10	51	51	UNDF
19.500	362.886	2.271	0.626	10	58	56	UNDF
20.500	447.492	2.311	0.516	10	71	67	UNDF
21.500	402.300	1.542	0.383	10	64	59	UNDF
22.500	368.971	1.519	0.412	10	59	53	UNDF
23.500	338.800	1.699	0.501	10	54	48	UNDF
24.500	393.429	3.078	0.782	10	63	54	UNDF
25.500	405.979	2.436	0.600	10	65	55	UNDF
26.500	347.231	1.420	0.409	10	55	46	UNDF
27.500	453.250	3.854	0.850	10	72	58	UNDF
28.500	528.623	3.156	0.597	10	84	67	UNDF
29.500	364.477	1.346	0.369	10	58	45	UNDF
30.500	423.064	2.008	0.475	10	68	52	UNDF
31.500	506.721	2.063	0.407	10	81	61	UNDF
32.500	383.892	2.208	0.575	10	61	45	UNDF
33.500	429.367	2.578	0.600	10	69	50	UNDF
34.500	404.242	2.079	0.514	10	65	46	UNDF
35.500	535.546	3.572	0.667	10	86	60	UNDF
36.500	585.554	3.998	0.683	10	93	64	UNDF
37.500	517.625	4.079	0.788	10	83	56	UNDF
38.500	576.992	4.256	0.737	10	92	62	UNDF
39.500	604.577	4.691	0.776	10	97	64	UNDF
40.500	625.285	3.278	0.524	10	100	65	UNDF
41.499	595.069	3.368	0.566	10	95	61	UNDF
42.499	619.623	4.248	0.685	10	99	62	UNDF
43.499	588.523	4.554	0.774	10	94	58	UNDF
44.499	612.577	4.468	0.729	10	98	60	UNDF
45.499	383.450	1.471	0.384	10	61	37	UNDF
46.499	339.673	1.165	0.343	10	54	32	UNDF
47.499	480.814	1.909	0.397	10	77	45	UNDF
48.499	528.620	2.590	0.490	10	84	49	UNDF
49.499	581.121	2.372	0.408	10	93	53	UNDF

CPTCP.TBL - CPTINT Correlation and Parameters Table File
with NOTES & References at end

Program: CPTINT - CPT Cone Interpretation Program
Version: 5.2
Table File by: Dr. R. G. (DICK) Campanella, P.Eng.
Rev. Dated: April 3, 2002

Parameter	Methods	Refer. Number	Valid Soil Type	Valid Zone
Depth average see NOTE #1	Depth averaged over specified range (see menu)		All	All
Parameter Averaging	Averaged over range specified for depth. If no values exist, your choice is zero's or no value		All	All
Qc, Tip Stress	measured tip force/area	#6,#8	All	All
Qt corrtd for U2 see NOTE #2	Qt = Qc + (1 - a) x U2 and a = tip area ratio. Defaults to U2 if given or uses U1 or U3 times Const. [Note: Input value from input file is used if defined, not calculated]	#6,#8	All	All
Q (Qt Normalized)	$Q = \frac{Qt - sv}{sv'}$	#9 & 13	All	All
Fs	measured sleeve force/area	#6,#8	All	All
Rf Friction Ratio (if Rf>8, Rf=8)	$Rf = \frac{Fs}{Qt} \times 100\%$	#6,#8	All	All
F (Rf Normalized)	$F = \frac{Fs}{(Qt - sv)} \times 100\%$	#9 & 13	All	All
Gamma Total Unit Weight (Soil + Water) see NOTE #3	Based on Rf or Bq Classif. Zone		All	All

Zone #	Gamma = kN/m^3	
1	Qt<4bar	15.70
1	Qt=4bar	17.30
2	Rf<5%	13.36
2	Rf=5%	11.80
2	Bq Zone	12.58
3	Qt<10bar	18.86
3	Qt=10bar	19.65
4, 5 & 6	Qt<20bar	18.86
4, 5 & 6	Qt=20bar	19.65
7		18.86
8 & 9		19.65
10		20.44
11 & 12		21.22

Parameter	Methods	Refer. Number	Valid Soil Type	Valid Zone
U Penetration Pore Pressure see NOTE #4	U1, measured on Face of tip U2, measured Behind Tip at shoulder (std location) U3, measured Behind Friction Sleeve		All	All
Water Table	Depth below ground surface to where pore pressure = 0 Make negative if water level is above ground		All	All
Uo Hydrostatic Pore Pressure see NOTE #4	Uo = water depth, Hw x unit weight water, Gamma or Uo=Hw=depth-depth to water table if depth<water table, Uo = 0		All	All
dU Excess Pore Pressure	dU = U2 − Uo Defaults to U2 if given or uses U1 or U3 x const.		All	All
DPPR (Differential Pore Pressure Ratio)	$DPPR = \frac{dU}{Qt} = \frac{U - Uo}{Qt}$ Defaults to U2 if given or uses U1 or U3 x const.	#6, #8	All	All
Bq	$Bq = \frac{dU}{Qt - sv}$	# 4 # 8 # 13	All	All
OS (Overburden Stress)	OS = sv = S (Gamma x Depth)		All	All
EOS (Effective Overburden Stress)	EOS = sv' = OS − Uo = sv − Uo		All	All
Rf Zone Soil Behavior Type see NOTE #5	Classification chart for Qc and Rf Zone # = Soil Behavior Type 1=sensitive fine grained 2=organic material 3=clay 4=silty clay 5=clayey silt 6=sandy silt 7=silty sand 8=fine sand 9=sand 10=gravelly sand 11=very stiff fine grained ¥ 12=sand to clayey sand ¥ ¥ overconsolidated or cemented	#6 #8, Fig4.3	All	1<Qt<1000bar 0<Rf<8%

Parameter	Methods	Refer. Number	Valid Soil Type	Valid Zone
Bq Zone Soil Behavior Type	Classification chart for Qc and Bq (same zone #'s as Rf above)	#8 Fig 4.3	All	0<Qt<1000bar -0.1<Bq<1.4
Spt N(60) Standard Penetration Test (Blows/foot) at 60% Energy After R&C(1983) see NOTE #6	Qt/N ratio per zone Zone # Qt/N Zone # Qt/N 1 2 7 3 2 1 8 4 3 1 9 5 4 1.5 10 6 5 2 11 1 6 2.5 12 2	# 7 # 8 Fig 4.2	All	All
Spt N1(60) Normalized for Overburden str	Spt N1(60) = Cn x Spt N(60) where Cn = (sv')^(-0.77)	# 8	All	0.5<Cn<1.5
Dr Relative Density see NOTE #7	Specific Sands: $Dr = \frac{100}{C2} * \ln\left(\frac{Qc}{C1 + C0\ sv'}\right)$ where: All are NC & UNAGED Sand | C0 | C1 | C2 Ticino | 17.37 | .558 | 2.58 Schmertmann | 15.32 | .520 | 2.75	# 8 # 1 # 1	/ Sand— \	7 to 10 0<Qt<500bar 0<sv'<5bar
Compressibility moderate high all	ALL SANDS: NC, OC, ALL TESTS $Dr = C3 + C4 \log_{10}\left(\frac{\frac{Qc}{C1}}{sv' + C2}\right) + C0$ where: C0 | C1 | C2 | C3 | C4 0.100 | 0.0981 | 0.5 | -98 | 66	# 5	Sand	7 to 10 (6 possible)
Phi Friction Angle	Methods: 1) Robertson & Campanella 2) Durgunoglu & Mitchell 3) Janbu beta = +15 degree 4) Janbu beta = 0 degree 5) Janbu beta = -15 degree	#6, #8 # 2 #6, #8 #6, #8 #6, #8	/ Sand— \	7 to 10 & 6 0<Qt<500bar 0<sv'<4bar 29<phi<49

Parameter	Methods	Refer. Number	Valid Soil Type	Valid Zone
Gmax Maximum Shear Modulus at very small strains	Clay: Gmax = alpha x Qt Sand: Digitized figure of Qc vs Gmax with interpolation between sv' curves, R&C method	# 8 Fig4.18 # 6 # 8 Fig4.13	Clay Sand	1 to 6 (6 possible) 7 to 10 .25<sv'<8bar
CSR(Qc), t/s LEVEL ground Liquefaction SAND Resistance see NOTE #8	Seed's CSR vs N1(60) graph for specified equake Magnitude. Can include silty sand corr. for Zone 7. N1(60) from CPT correlations.	# 11 # 12	Sand	7 to 10 (6 possible)
CSR(Eq), t/s Cyclic Stress Ratio applied by design quake	$CSR(Eq) = 0.65 \frac{Amax}{g} \frac{sv}{svo'} rd$ Amax=max surface acceleratn including Amplification	# 12 # 3	Sand	7 to 10 (6 possible)
[Note: Input value from input file is used if defined, & not calculated]				
rd Reduction Factor to find CSR(Eq)	Digitized graph to use for depth vs rd: 1) Seed's mean 2) Fraser Delta	# 12 # 3	Sand	(6 possible) 7 to 10 0<depth<30m
FL, Safety Factor against Liquefaction	FL = CSR(Qc)/CSR(Eq)	# 3	Sand	7 to 10 (6 possible)
Qcr Critical Bearng required to resist Liquefctn	Qcr backcalculated from CSR(Eq) for a specified FL. Qcr is only for the given GWT, EOS, OS, Amax/g & Eq.Mag	# 12	Sand	7 to 10 (6 possible)
Su, Undrained Shear Strength of CLAY METHODS: see NOTE #9	Nk: $Su = \frac{Qc - st}{Nk}$ Nke: $Su = \frac{Qt - U2}{Nke}$ Nkt: $Su = \frac{Qt - sv}{Nkt}$ Nc: $Su = \frac{Qt}{Nc}$ NdU: $Su = \frac{dU2 \text{ (dU1 or dU3)}}{NdU}$	# 8	Clay Clay Clay Clay Clay	1 to 6 1 to 6 1 to 6 1 to 6 1 to 6

Parameter	Methods	Refer. Number	Valid Soil Type	Valid Zone
Su/EOS	$Su/EOS = \frac{Su}{sv'}$	# 8	Clay	1 to 6
Ko (NC) Normally Consolidated	$(Ko)NC = 1 - \sin(f)$ see NOTE #10	# 8	Sand	7 to 10 (6 possible)
Ko (OC) Over Consolidated	$(Ko)OC = (Ko)NC \times OCR^{0.42}$	# 8	Sand	7 to 10 (6 possible)
E25 Youngs Modulus	E25 = alpha x Qt where user input alpha	# 8 4.11&12	Sand	(6) 7 to 10 0<Qt<500bar
M Constrained Modulus	CLAY: M = alpha x Qt where user input alpha SAND: Methods: Qt: M = alpha x Qt Baldi: $\frac{M}{Qt} = C0 \times pa \left\{ \frac{sv' + C1}{pa} \right\}^{C2} \times OCR^{C3\,Dr}$	# 8 Tab14.3 # 8 Fig4.10	Clay Sand Sand	1 to 6 7 to 10 (6 possible) 7 to 10
OCR (Clay) Over-Consolidation Ratio see NOTE #11	$OCR = \left\{ \frac{\frac{Su}{svo'}}{\frac{Su}{svo'} + NC} \right\}^{1.25}$	# 6 # 8 Fig4.19	Clay	1 to 6
Ic Material Index After J&D(1993) see NOTE #18	$Ic = \left\{ \left\{ 3 - \log_{10}(Q(1-Bq)) \right\}^2 + \left\{ 1.5 + 1.3 \log_{10} F \right\}^{2+0.5} \right\}$	# 13 # 17	All	All
Spt N(60) Standard Penetration Test (Blows/foot) at 60% Energy After J&D(1993) see NOTE #16	Qc/N = 8.5(1-(Ic/4.75)) where Qc in bars	# 13	All	All

Parameter	Methods	Refer. Number	Valid Soil Type	Valid Zone
State Parameter State, (e-units) Current Void Ratio minus Critical Void Ratio	$State = \frac{\ln\left[\frac{3M + 8.5M/F}{Q(1-Bq)}\right] + +}{11.9 - 1.33F}$ $M = \frac{6 \sin fcv}{3 - \sin fcv}$ fcv = const. vol. Phi angle	# 14	All	All
Fines Content FC(%) Percent less than #200 Sieve After Davies, 99	FC(%) = 42.4179(Ic) - 54.8574 FC(%) = 0% if Ic < 1.2933 FC(%) = 100% if Ic > 3.6508	# 15	All	All
OCR (Clay) Overcons. Ratio by Pore Press. U1 & U2 or U1 & U3 see NOTE #17	OCR = 0.5 + 1.50(PPD) PPD = (U1 - U2)/Uo or PPD = (U1 - U3)/Uo and default 0.5 & 1.5 are settable	# 16	Clay	1 to 6

1. Depth averaging may be in 0.5, 1, 2.5 or 5 ft. intervals or 0.1, 0.25, 0.5 or 1.0 m intervals, or no depth averaging if zero is selected. The average is the mean value of the readings in the interval. The depth value is the mid-depth of the averaged interval. It is convenient to start at half the depth averaging interval. For example, if you want "even" depths and the depth averaging is set at 0.50 m then start at 0.25 to get values of depth of 0.5, 1.0, 1.5, etc.

2. Basic input CPTU data columns are for Depth, Qc, Fs, U1, U2, U3, INC and TEMP may be selected. In addition the following parameters may also be specified as an INPUT data column: Qt, Gamma, Uo, Spt N, Rf Zone, Bq Zone and CSR(EQ). These values will be used where required to obtain other interpreted parameters. If they are not specified the program will estimate them when they are required. For example, you can create an OUTPUT data file of any of the above parameters and then edit some or all of the values to suite your measurements or your desires to specify their values. You can do that with "Gamma" values to input your measurements of unit weight, or with "Uo" if you want to input values of pore water pressure other than hydrostatic, or with any of the other input parameters. You would use your edited file of adjusted data as your new INPUT data file. Thus, you can specify these parameters if you want to override the Program's values.

You can also use the designated value of "9E9" to denote an unknown value.

You can use the "OTHER" designation to input other data that exists on your input file and identify its units. This allows you to output it, without operating on it, if you choose.

It is best NOT to use depth averaging when using input data that is not continuous at regular depth intervals. Always use DEPTH AVERAGING with extreme caution since the program averages ALL INPUT parameters over the interval chosen irregardless of soil type. Careful use of start and end depth choises can make depth averaging very effective.

3. Since there is no data in the file within the initial depth interval, a default Gamma (unit weight) must be specified from the surface to the starting depth. This is done in the "Param" Menu in units of kN/m^3 (1kN/m^3=6.36pcf). Also, you can specify the values of Gamma to be used by the program as in NOTE #2 above.

4. If pore pressures are not measured by the cone then the program will take Qc as being equal to Qt for all interpretations requiring Qt. Also, Uo may be specified in the input file as a column of Uo vs depth values, if the water pressures are not hydrostatic. See NOTE #2 for more info on customizing input data.

5. You can choose to use either the Rf classif. Zone or the Bq classif. Zone to divide soil into Undrained Parameters (Zones 1 to 6) and Drained Parameters (Zones 7 to 10) in the "Param" Menu. (However, in order to use the Bq Zone you must have Pore Pressure, UZ, data.) Also, you may choose to switch Zone 6 to a Drained Zone from its Undrained Zone status. This is done if you feel that the soil identified as Zone 6 (sandy silt) is really coaser (using other sources of information) and/or you want it analyzed as a Drained rather than Undrained soil. Finally, the soil behavior names in each zone were shortened in version 5.0 for simplicity. For example, Zone 6 was named "sandy silt to clayey silt" but was shortened to "sandy silt".

6. Spt N is the same as Spt N(60) for 60% transferred energy. This value is calculated from the Qt/N ratios given for each Soil Zone (you can specify either Rf or Bq Zone) and these values are used in the Level Ground Liquefaction analysis. Values of Spt N may be specified in the Input File, if indepedently measured values are to be used. We suggest that you not use depth averaging if you only have selected Spt N values at a few depths. You may use "9E9" for missing data.

7. If Dr values are negative then soil is very loose or likely more of an undrained soil like a silty sand rather than a drained soil for which the Dr correlations were developed. Use Dr interpretations very cautiously since they also assume the soil is free draining, uncemented, unaged and has the same compressibility of grains as the soil used for the correlations in chamber calibration tests.

8. The simplified sand liquefaction analysis for level ground according to Seed et al requires Spt N1(60) and earthquake magnitude to obtain the cyclic stress ratio to cause liquefaction, CSR(Qc). The design maximum ground acceleration, the depth-reduction factor, Rd, and overburden total and effective stresses are required to calculate the cyclic stress ratio applied by the design earthquake, CSR(EQ). The program estimates the N1(60) values from the cone stresses, the operator identifies the earthquake magnitude and Seed et al chart is used to get CSR(Qc). The program also calculates CSR(EQ) from the user specified maximum ground acceleration including any amplification factors, the calculated overburden stresses and either Seed's mean or the Fraser Delta Rd factor. The Fraser Delta is used only when amplification factors of the order of 2 or more are used. See Reference Nos. 3, 6, 11 and 12 for more information. The user can INPUT specific values for Spt N, CSR(EQ), Soil Zones, Gamma's, etc. in order to customize the analysis for the existing data base of information. It is recommended that you do not use depth averaging when using specific input data but make calculations at specific depths where external input data exists. The calculated value of Qcr is the minimum value of cone bearing stress required at a given depth such that the factor of safety against liquefaction, or the ratio FL = CSR(Qc)/CSR(EQ) have the specified value for a given earthquake magnitude, max. ground acceleration, depth reduction factor, and calculated overburden stresses. This value of Qcr is useful to identify the required minimum level of soil improvement for a given design condition.

9. The NdU method to calculate undrained shear strength has been extended to allow the user to choose either dU1, or dU2 or dU3 provided such pore pressure measurements exist.

10. The Overconsolidation Ratio, OCR, for the sand must be estimated by the user in the "Param" menu if you want to estimate Ko in the sand layers. For the typical normally consolidated sand, OCR = 1.0.

11. It is currently only possible to estimate the OCR for a clay, which makes use of the correlations obtained from extensive laboratory tests.

12. An improved calculation and print routine was added to version 5.0 which uses swap routines to reduce memory requirements, but slows down the calculations.

13. The classification charts for Rf has been extended at all boundaries such that values of Rf>8 and values of Qc<1.00 are possible. The Bq classification chart which requires dU2 and can now accept values of Bq>1.2 and Qt<1. Unfortunately, this feature does not work.

14. Version 5.1ppd added several enhancements to the program. You may input an average vertical flow gradient, which is applied over the entire profile depth to be analysed so adjust the depth of interest accordingly. Zero gives hydrostatic and no flow, a negative gradient is upward flow which increases pore pressure and reduces vertical effective stress. A positive gradient gives downward flow.

15. A State Parameter or current void ratio minus critical void ratio is calculated according to the paper by Ref. 14, Plewes, Davies and Jefferies, 1994.

16. An alternate method to estimate SPT from CPT is provided according to Ref. 13, Jefferies and Davies, 1993 in ASTM.

17. An alternate method to estimate OCR in clays is provided which uses the measured pore pressure difference, ppd, so both U1 and U2 or U1 and U3 must be measured at the same time. (see Ref. 16)

18. Version 5.2 added the value Ic (Material Index) according to Jefferies & Davies, 1993, 1991 (Ref. 13 & 17) which combines all Normalized parameters Q, F and Bq.
(Note: QtN was changed to Q and RfN to F.)

18A. In Version 5.2, if at any depth the value of Bq>1 (in very sensitive saturated soil) then Bq is made equal to 0.99. Also, if Rf>8 it is made 7.99. These changes have a negligable effect on the results.

19. FC(%) or percent of dry weight less than #200 sieve (.074mm) was also added according to Davies, 1999 Ref.#15)

REFERENCES:

1) Bellotti, R., Crippa, V., Pedroni, S., Baldi, G., Fretti, C., Ostricati, D., Ghionna, V., Jamiolkowski, M., Pasqalini, E., 1985, "Laboratory Validation Of In-Situ Tests", Italian Geotechnical Society Jubilee Volume for the XI ICSMFE, S.F., Cal.

2) Durgunoglu, H.T. and Mitchell, J.K., 1975, "Static Penetration Resistance of Soils: I-Analysis", Proceedings of the ASCE Specialty Conference on In-Situ Measurement of Soil Properties, Raleigh, NC

3) "Earthquake Design in the Fraser Delta - Geotechnical Aspects" Task Force Report, May 1991 - Co-chair: Dr. P. M. Byrne, Univ. of British Columbia, Dept. of Civil Engineering, Vancouver, B.C., V6T 1Z4.

4) Janbu, N. and Senneset, K., 1974. "Effective Stress Interpretation of In Situ Static Penetratuion Tests", Proceedings of the European Symposium on Penetration Testing, Stockholm Sweden, Vol. 2.2

5) Jamiolkowski, M., Ladd, C.C., Germaine, J.T., Lancellotta, R., 1985, "New Developments in Field and Laboratory Testing of Soils", State of the Art Address for XIth ICSMFE, San Francisco.

6) Robertson, P.K. and Campanella, R.G., 1983, "Interpretation of Cone Penetration Tests - PART I (SAND) and PART II (CLAY)", Canadian Geotechnical Journal, Vol. 20, No. 4.

7) Robertson, P.K., Campanella, R.G., and Wightman, A., 1983, "SPT - CPT Correlations", Journal of the Geotechnical Division, ASCE, Vol. 109, Nov.

8) Robertson, P.K. and Campanella, R.G., 1989 "Guidelines for Geotechnical Design using CPT and CPTU", Soil Mechanics Series NO. 120, Civil Eng. Dept., Univ. of B.C., Vancouver, B.C., V6T 1Z4, Sept 1989.

9) Robertson, P.K., 1990, Soil Classification using the CPT, Canadian Geot. Journal, V.27, No.1, Feb, p151-158.

10) Schmertmann, J.H., 1976, "An updated Correlation between Relative Density, Dr and Fugro-type Electric Cone Bearing, qc" Department of Civil Engineering Report, University of Florida, July.

11) Seed, H.B., Idriss, I.M. and Arango, I., 1983, "Evaluation of Liquefaction Potential Using Field Performance Data", Journal of Geot. Engrg. Div., ASCE, Vol. 109, No. 3, March 1983, pp. 458-482.

12) Seed, H.B. and Idriss, I.M., 1971, "Simplified procedure for Evaluation Soil Liquefaction Potential", Journal of Soil Mechanics and Foundations, ASCE, SM9, Vol. 97, Sept.

13) Jefferies, M.G. and Davies, M.P., 1993, "Use of CPTu to Estimate Equivalent SPT N60", ASTM, Geotechnical Testing Journal, V.16:4, 458-468.

14) Plewes, H.D., Davies, M.P. and Jefferies, M.G., 1994, "CPT based Screening Procedure for Evaluating Liquefaction Susceptibility", Proc. Canadian Geot. Conference, Halifax

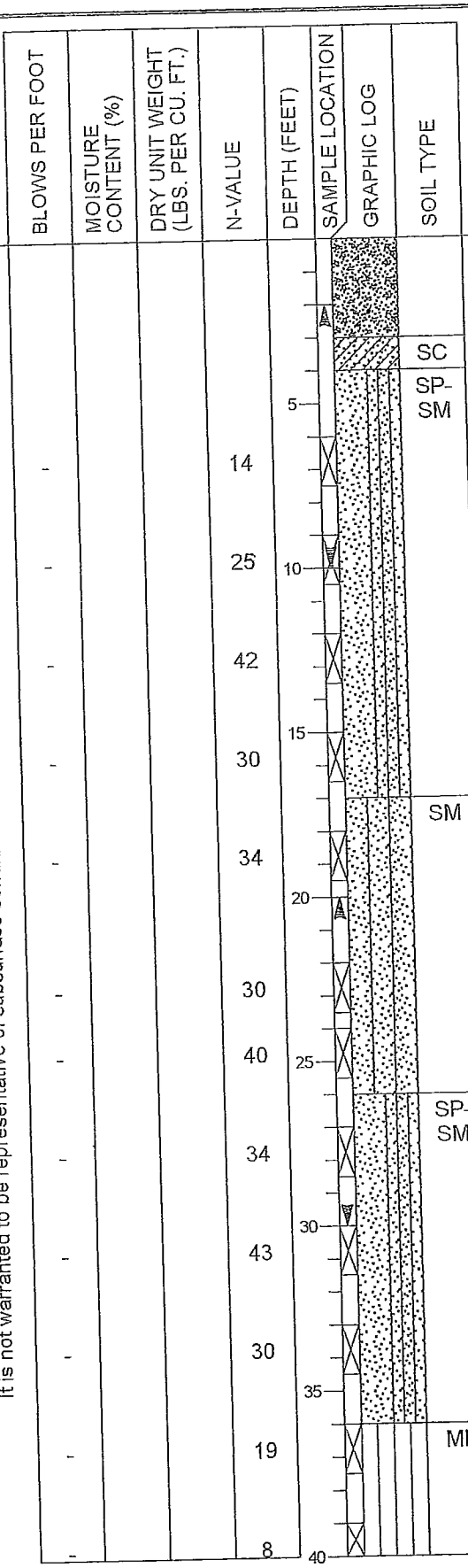
15) Davies, M.P., 1999, "Piezocone Technology for the Geoenvironmental Characterization of Mine Tailings", PhD Thesis, Univ. of British Columbia, Civil Eng. Dept, Vancouver, BC, V6T 1Z4, Canada.

16) Sully, J.P., Campanella, R.G. and Robertson, P.K., 1988, "Overconsolidation Ratio of Clays from Penetration Pore Pressures", ASCE Journal of Geotechnical Engineering, Vol. 114, No. 2, February, pp. 209-216.

17) Jefferies, M.G. and Davies, M.P., 1991, "Soil Classification by the CPT":Discussion.Canadian Geot. Jour., V28(1),173-6

BORING HS-1

JOB NUMBER: 2007-019-01
DATE DRILLED: 5/31/07
EQUIPMENT USED: Hollow stem rig with spt sampler
LOGGED BY: AMB
BORING DEPTH: 0-51'
HAMMER WEIGHT: 140lbs
SURFACE CONDITIONS: Gravelly pad



ARTIFICIAL FILL (af)
concrete rubble, clast supported mixtures of angular concrete blocks within silty sand matrix, loose, slightly moist, brown

CLAYEY SAND: brown

RIVER ALLUVIUM (Qar)
SAND: medium dense to dense, moist, brown

dense

(7.2% passing no. 200 sieve)

SILTY SAND: fine to coarse, with coarse gravels, dense, dry, dark yellowish brown (10YR 4/2), (12.4% passing no. 200 sieve)

lightly olive gray 5Y 5/2

(24.2% passing no. 200 sieve)

SAND: dense, moist, lightly olive gray 5Y 5/2

(7.6% passing no. 200 sieve)

CLAYEY SILT: very stiff, damp, olive gray 5Y 3/2, (72% passing no. 200 sieve)

Note: The log of subsurface conditions shown hereon is approximate and applies only at the specific location and date indicated. It is not warranted to be representative of subsurface conditions at other locations or times.

(CONTINUED ON THE FOLLOWING FIGURE)

BOREHOLE LOG 2007-019.GPJ FRANKIAN.GDT 6/26/07

LOG OF BORING

R.T. FRANKIAN & ASSOCIATES

BORING HS-1 (CONTINUED)

JOB NUMBER: 2007-019-01
DATE DRILLED: 5/31/07
EQUIPMENT USED: Hollow stem rig with spt sampler
LOGGED BY: AMB
BORING DEPTH: 0-51'
HAMMER WEIGHT: 140lbs
SURFACE CONDITIONS: Gravelly pad

BLOWS PER FOOT	MOISTURE CONTENT (%)	DRY UNIT WEIGHT (LBS. PER CU. FT.)	N-VALUE	DEPTH (FEET)	SAMPLE LOCATION	GRAPHIC LOG	SOIL TYPE	
-			14	45			ML	(86.7% passing no. 200 sieve)
-			9					▽ groundwater at 44 feet 5/31/07
-			13	50				(90.2% passing no. 200 sieve)
-			20	55				Bottom of Boring at 51 feet. Groundwater @ 44'. Boring backfilled with cuttings.
				60				
				65				
				70				
				75				
				80				

Note: The log of subsurface conditions shown hereon is approximate and applies only at the specific location and date indicated. It is not warranted to be representative of subsurface conditions at other locations or times.

BOREHOLE LOG 2007-019.GPJ FRANKIAN.GDT 6/26/07

LOG OF BORING

R.T. FRANKIAN & ASSOCIATES

BORING HS-2

JOB NUMBER: 2007-019-01
DATE DRILLED: 5/30/07
EQUIPMENT USED: Hollow stem rig with spt & cylinder samplers
LOGGED BY: AMB
BORING DEPTH: 0-51'
SURFACE CONDITIONS: Gravel

BLOWS PER FOOT	MOISTURE CONTENT (%)	DRY UNIT WEIGHT (LBS. PER CU. FT.)	N-VALUE	DEPTH (FEET)	SAMPLE LOCATION	GRAPHIC LOG	SOIL TYPE	
				0				**ARTIFICIAL FILL (af)** concrete rubble, clast supported mixtures of angular concrete block with silty sand, loose, slightly moist, brown
-			27	5			SC	CLAYEY SAND: loose
41	11.7	107					SP-SM	**RIVER ALLUVIUM (Qar)** SAND: fine to coarse, dense, dry, moderate yellowish brown 10YR 5/4
-			43	10				light olive gray, (7.7% passing no. 200 sieve)
40				15			SM	SILTY SAND: fine to coarse, very dense, light olive gray, (12.4% passing no. 200 sieve)
-			50/3"				SP-SM	SAND: fine to coarse, poorly graded, with silt, dense
40				20				cobbles
-			46	25				(9.4% passing no. 200 sieve)
*				30				
-			60	35				(8.7% passing no. 200 sieve)
				40				

Note: The log of subsurface conditions shown hereon is approximate and applies only at the specific location and date indicated. It is not warranted to be representative of subsurface conditions at other locations or times.

(CONTINUED ON THE FOLLOWING FIGURE)

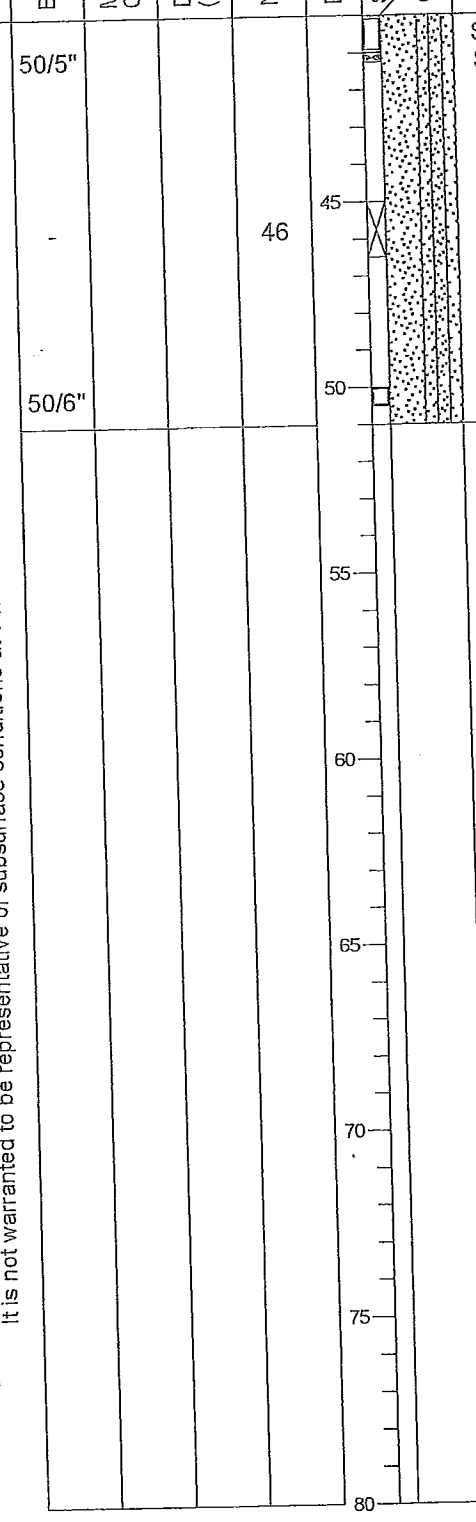
BOREHOLE LOG 2007-019.GPJ FRANKIAN.GDT 6/26/07

LOG OF BORING

R.T. FRANKIAN & ASSOCIATES

BORING HS-2 (CONTINUED)

JOB NUMBER: 2007-019-01
DATE DRILLED: 5/30/07
EQUIPMENT USED: Hollow stem rig with spt & cylinder samplers
LOGGED BY: AMB
BORING DEPTH: 0-51'
SURFACE CONDITIONS: Gravel



(8.4% passing no. 200 sieve)

Bottom of Boring at 51 feet.
No groundwater. Boring backfilled with cuttings.

Note: The log of subsurface conditions shown hereon is approximate and applies only at the specific location and date indicated. It is not warranted to be representative of subsurface conditions at other locations or times.

BOREHOLE LOG 2007-019.GPJ FRANKIAN.GDT 6/26/07

LOG OF BORING

R.T. FRANKIAN & ASSOCIATES

SUMMARY

OF

CONE PENETRATION TEST DATA

Project:

Vista Canyon
End of Lost Canyon Road
Santa Clarita, CA
May 30, 2007

Prepared for:

Mr. Dharmesh Amin
R.T. Frankian & Associates
1329 Scott Road
Burbank, CA 91504
Office (818) 531-1501 / Fax (818) 531-1511

Prepared by:

KEHOE TESTING & ENGINEERING
5415 Industrial Drive
Huntington Beach, CA 92649-1518
Office (714) 901-7270 / Fax (714) 901-7289

For use with report dated 06/22/2007; RTF job number 2007-019-01
For use with report dated 11/14/2008; RTF Job No. 2005-052-01

TABLE OF CONTENTS

SUMMARY
OF
CONE PENETRATION TEST DATA

1. INTRODUCTION

This report presents the results of a Cone Penetration Test (CPT) program carried out for the Vista Canyon project located at the End of Lost Canyon Road in Santa Clarita, California. The work was performed by Kehoe Testing & Engineering (KTE) on May 30, 2007. The scope of work was performed as directed by R.T. Frankian & Associates personnel.

2. SUMMARY OF FIELD WORK

The fieldwork consisted of performing CPT soundings at six locations to determine the soil lithology. The groundwater measurements were taken in the open CPT hole approximately 10 minutes after completion of CPT. The following TABLE 2.1 summarizes the CPT soundings performed:

LOCATION	DEPTH OF CPT (ft)	COMMENTS/NOTES:
CPT-1	50	Hole open to 5 ft (dry)
CPT-2	30	Refusal, hole open to 15 ft (dry)
CPT-3	50	Hole open to 50 ft (dry)
CPT-4	50	Hole open to 15 ft (dry)
CPT-5	50	Hole open to 50 ft (dry)
CPT-6	50	Hole open to 3 ft (dry)

TABLE 2.1 - Summary of CPT Soundings

3. FIELD EQUIPMENT & PROCEDURES

The CPT soundings were carried out by KTE using an integrated electronic cone system manufactured by Vertek. The CPT soundings were performed in accordance with ASTM standards (D5778). The cone penetrometers were pushed using a 30-ton CPT rig. The cone used during the program was a 15 cm^2 cone and recorded the following parameters at approximately 2.5 cm depth intervals:

- Cone Resistance (qc)
- Sleeve Friction (fs)
- Dynamic Pore Pressure (u)
- Inclination
- Penetration Speed
- Pore Pressure Dissipation (at selected depths)

At locations CPT-1 & CPT4, shear wave measurements were obtained at approximately 5-foot intervals. The shear wave is generated using an air-actuated hammer, which is located inside the front jack of the CPT rig. The cone has a triaxial geophone, which recorded the shear wave signal generated by the air hammer.

The above parameters were recorded and viewed in real time using a portable computer and stored on a diskette for future analysis and reference. A complete set of baseline readings was taken prior to each sounding to determine temperature shifts and any zero load offsets. Monitoring base line readings ensures that the cone electronics are operating properly.

4. CONE PENETRATION TEST DATA & INTERPRETATION

The Cone Penetration Test data is presented in graphical form in the attached Appendix. Penetration depths are referenced to ground surface. The soil classification on the CPT plots is derived from the CPT Classification Chart (Robertson, 1986) and presents major soil lithologic changes. The stratigraphic interpretation is based on relationships between cone resistance (qc), sleeve friction (fs), and penetration pore pressure (u). The friction ratio (Rf), which is sleeve friction divided by cone resistance, is a calculated parameter that is used to infer soil behavior type. Generally, cohesive soils (clays) have high friction ratios, low cone resistance and generate excess pore water pressures. Cohesionless soils (sands) have lower friction ratios, high cone bearing and generate little (or negative) excess pore water pressures.

Output from the interpretation program CPTINT provides averaged CPT data over one-foot intervals. The CPTINT output includes Soil Classification Zones, SPT N Values and Undrained Shear Strength (Su). A summary of the equations used for the tabulated parameters is provided in the CPTINT Correlation Table in the Appendix.

The interpretation of soils encountered on this project was carried out using correlations developed by Robertson et al, 1986. It should be noted that it is not always possible to clearly identify a soil type based on qc, fs and u. In these situations, experience, judgment and an assessment of the pore pressure data should be used to infer the soil behavior type.

If you have any questions regarding this information, please do not hesitate to call our office at (714) 901-7270.

Sincerely,

KEHOE TESTING & ENGINEERING

Steven P. Kehoe
President

06/20/07-ae-25-7358

APPENDIX

Kehoe Testing & Engineering
Office: (714) 901-7270
Fax: (714) 901-7289
skehoe@msn.com

CPT Data
30 ton rig

Date: 30/May/2007
Test ID: CPT-1
Project: SantaClarita

Customer: R.T . Frankian & Associates
Job Site: Vista Canyon

Maximum depth: 50.25 (ft)

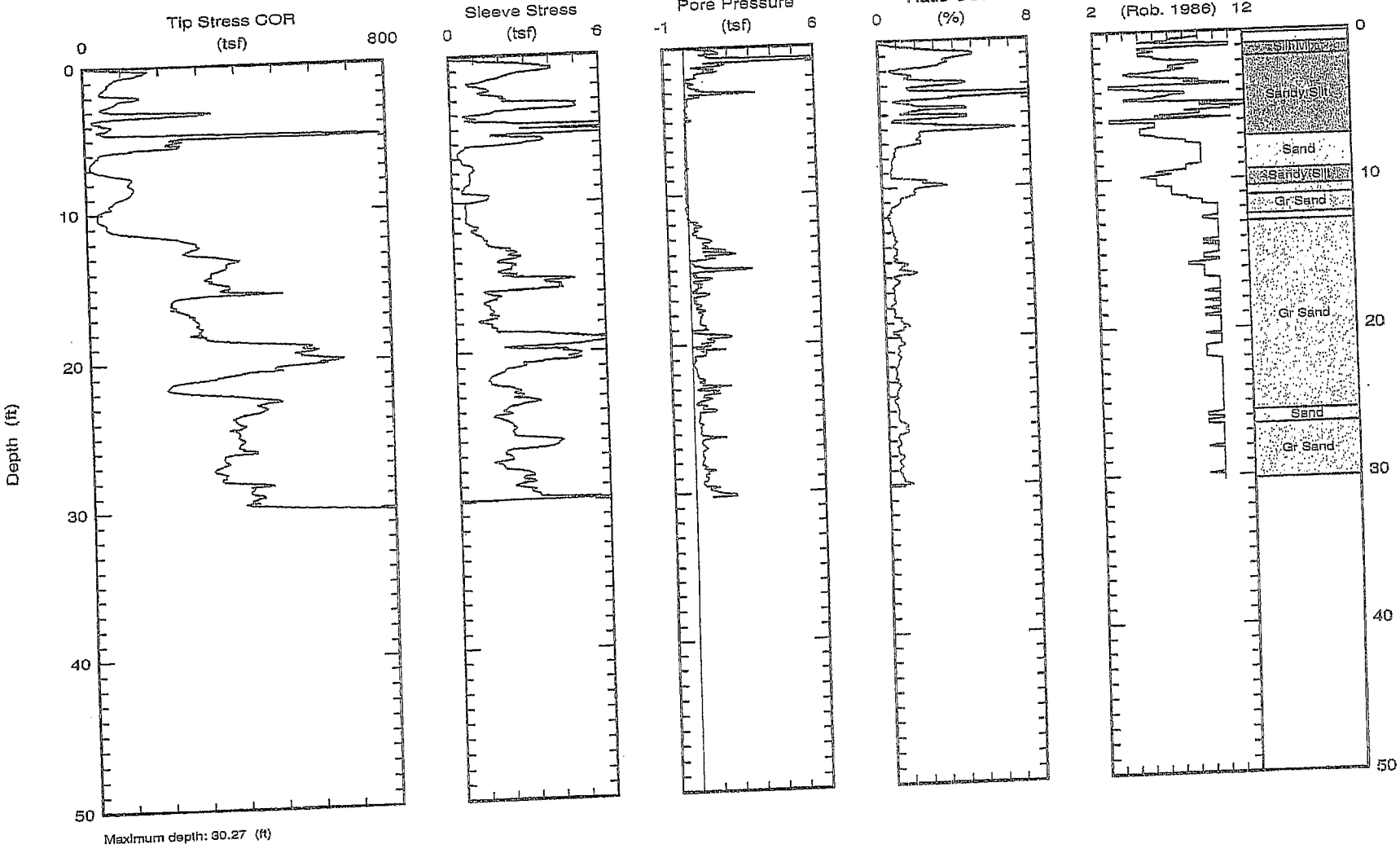
For use with report dated 06/22/2007; RTF job number 2007-019-01
For use with report dated 11/14/2008; RTF Job No. 2005-052-01

Kehoe Testing & Engineering
Office: (714) 901-7270
Fax: (714) 901-7289
skehoe@msn.com

CPT Data
30 ton rig

Date: 30/May/2007
Test ID: CPT-2
Project: SantaClarita

Customer: R.T . Frankian & Associates
Job Site: Vista Canyon

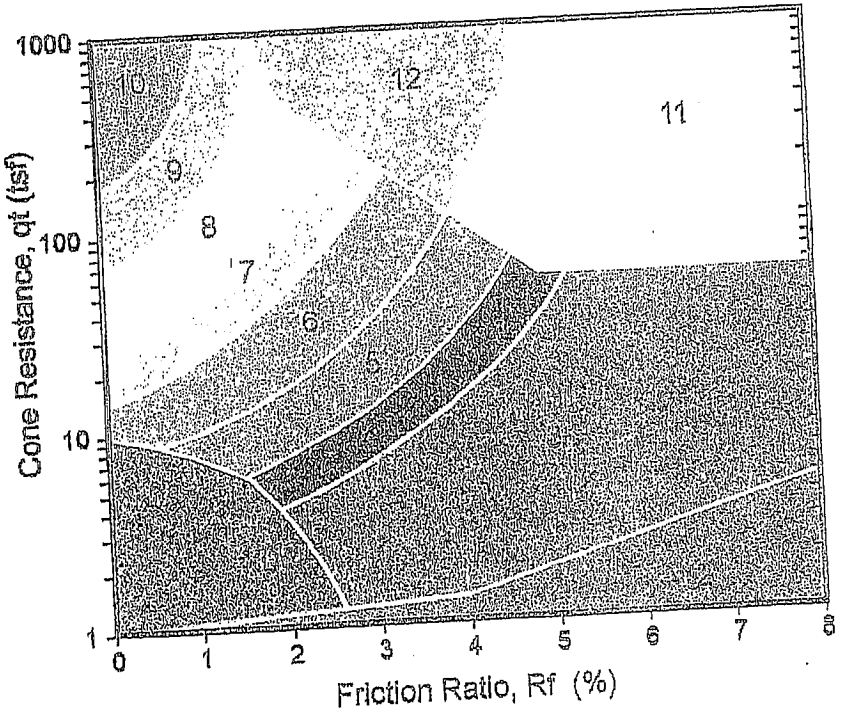


Maximum depth: 30.27 (ft)

KEHOE TESTING & ENGINEERING

CPT Classification Chart

(after Robertson and Campanella, 1988)



Zone	q_t / N	Soil Behavior Type	UCSCS
1	2	sensitive fine grained	OL-OH
2	1	organic material	Pt-OH
3	1	clay	CH
4	1.5	silty clay to clay	CL-CH
5	2	clayey silt to silty clay	ML-CL
6	2.5	sandy silt to clayey silt	MH-ML
7	3	silty sand to sandy silt	SM-ML
8	4	sand to silty sand	SP-SM
9	5	sand	SP
10	6	gravelly sand to sand	SW-SP
11	1	very stiff fine grained *	CL-MH
12	2	sand to clayey sand *	SP-SC

* overconsolidated or cemented

PUT FILE: c:\temp\CPT-1.CSV

Depth (feet)	Qc(avg) (TSF)	Fs(avg) (TSF)	Rf (%)	Rf Zone (zone #)	Spt N (blow/ft)	Spt N1 (blow/ft)	Su (TSF)
0.500	16.175	0.099	0.611	6	6	9	9E9
1.500	18.087	0.174	0.960	6	7	11	9E9
2.500	7.967	0.061	0.766	1	4	6	0.522
3.500	6.487	0.045	0.694	1	3	5	0.419
4.500	4.425	0.029	0.646	1	2	3	0.279
5.500	22.910	0.146	0.637	7	7	11	9E9
6.500	116.040	0.512	0.441	9	22	33	9E9
7.500	193.090	0.834	0.432	9	37	56	9E9
8.500	235.956	0.931	0.395	9	45	68	9E9
9.500	321.775	1.777	0.552	10	51	77	9E9
10.500	251.173	1.441	0.574	9	48	69	9E9
11.500	307.717	1.839	0.598	10	49	65	9E9
12.500	250.821	0.986	0.393	10	40	50	9E9
13.500	274.214	1.682	0.613	9	53	62	9E9
14.500	189.557	1.441	0.760	9	36	40	9E9
15.500	179.070	1.954	1.091	9	34	35	9E9
16.500	141.744	1.420	1.001	9	27	27	9E9
17.500	277.825	1.894	0.682	9	53	50	9E9
18.500	316.129	1.614	0.511	10	50	45	9E9
19.500	317.420	1.207	0.380	10	51	44	9E9
20.500	398.408	2.120	0.532	10	64	53	9E9
21.500	265.608	1.316	0.495	10	42	34	9E9
22.500	79.390	0.593	0.747	8	19	15	9E9
23.500	167.100	1.070	0.640	9	32	24	9E9
24.500	428.800	2.345	0.547	10	68	49	9E9
25.500	377.450	1.824	0.483	10	60	42	9E9
26.500	436.527	2.166	0.496	10	70	48	9E9
27.500	394.958	2.112	0.535	10	63	42	9E9
28.500	419.780	2.452	0.584	10	67	43	9E9
29.500	334.900	2.351	0.702	10	53	33	9E9
30.500	410.308	2.476	0.603	10	66	40	9E9
31.500	400.260	2.675	0.668	10	64	38	9E9
32.500	277.700	1.271	0.458	10	44	25	9E9
33.500	27.067	0.749	2.769	5	13	7	1.663
34.500	17.389	0.430	2.474	5	8	4	1.014
35.500	23.883	0.673	2.821	5	11	6	1.443
36.500	15.662	0.430	2.736	5	8	4	0.895
37.500	12.354	0.333	2.678	5	6	3	0.673
38.500	11.731	0.356	3.001	4	8	4	0.631
39.500	14.315	0.405	2.780	5	7	4	0.806
40.500	15.823	0.547	3.343	4	10	5	0.922
41.499	10.638	0.497	4.449	3	11	6	0.572
42.499	9.554	0.435	4.294	3	10	5	0.499
43.499	11.554	0.482	3.916	3	12	6	0.640
44.499	21.217	0.719	3.280	5	11	6	1.277
45.499	12.731	0.537	3.973	3	13	7	0.712
46.499	12.642	0.526	3.874	4	9	5	0.712
47.499	11.185	0.464	3.785	3	12	6	0.620
48.499	13.569	0.470	3.194	4	9	5	0.780
49.499	28.446	0.817	2.830	5	14	7	1.719

OUT FILE: c:\temp\CPT-2.CSV

Depth (feet)	Qc(avg) (TSF)	Fs(avg) (TSF)	Rf (%)	Rf Zone (zone #)	Spt N (blow/ft)	Spt N1 (blow/ft)	Su (TSF)
0.500	115.109	2.339	2.024	7	37	56	9E9
1.500	63.855	1.906	2.977	6	25	38	9E9
2.500	83.580	1.609	1.924	7	27	41	9E9
3.500	136.667	3.681	2.691	7	44	66	9E9
4.500	239.414	4.254	1.777	8	57	86	9E9
5.500	182.843	5.071	2.773	7	58	87	9E9
6.500	21.117	0.567	2.686	5	10	15	1.380
7.500	84.982	0.679	0.799	8	20	30	9E9
8.500	118.520	0.691	0.583	9	23	35	9E9
9.500	65.733	0.938	1.427	7	21	32	9E9
10.500	37.767	0.544	1.442	7	12	17	9E9
11.500	169.140	0.733	0.433	9	32	42	9E9
12.500	282.200	1.178	0.417	10	45	55	9E9
13.500	370.318	2.265	0.611	10	59	68	9E9
14.500	330.818	2.208	0.667	10	53	58	9E9
15.500	327.933	3.693	1.126	9	63	65	9E9
16.500	239.658	1.462	0.610	9	46	45	9E9
17.500	288.300	1.436	0.498	10	46	43	9E9
18.500	377.373	2.558	0.678	10	60	54	9E9
19.500	592.108	4.817	0.813	10	95	82	9E9
20.500	502.831	3.958	0.787	10	80	66	9E9
21.500	249.755	1.662	0.665	9	48	38	9E9
22.500	427.245	2.210	0.517	10	68	52	9E9
23.500	426.300	2.505	0.588	10	68	50	9E9
24.500	389.536	1.906	0.489	10	62	44	9E9
25.500	394.910	2.821	0.714	10	63	44	9E9
26.500	370.000	2.933	0.792	10	59	40	9E9
27.500	339.720	1.927	0.567	10	54	35	9E9
28.500	421.546	2.715	0.644	10	67	43	9E9
29.500	455.008	3.136	0.689	10	73	45	9E9
30.500	841.100	0.000	0.000	10	9E9	9E9	9E9

Vista Canyon
Santa Clarita, CA

CPT Shear Wave Measurements

CPT-1

Depth (ft)	Travel Distance (ft)	S-Wave Arrival (msec)	S-Wave Velocity from Surface (ft/sec)	Interval S-Wave Velocity (ft/sec)
5.62	7.52	8.92	843.30	
10.19	11.35	14.42	787.14	696.06
15.51	16.30	20.16	808.33	861.57
20.39	20.99	25.34	828.50	906.97
25.17	25.66	29.58	867.54	1100.68
30.39	30.80	34.40	895.31	1065.72
35.17	35.52	39.06	909.46	1013.96
40.74	41.05	48.62	844.21	577.62
45.92	46.19	56.47	817.98	655.51
50.26	50.51	63.02	801.46	659.04

CPT-4

Depth (ft)	Travel Distance (ft)	S-Wave Arrival (msec)	S-Wave Velocity from Surface (ft/sec)	Interval S-Wave Velocity (ft/sec)
5.96	7.78	9.20	845.60	
10.18	11.34	14.30	793.12	698.44
15.36	16.15	19.95	809.69	851.63
20.23	20.84	25.62	813.38	826.35
25.26	25.75	32.97	781.02	668.21
30.82	31.22	39.54	789.65	833.01
35.21	35.56	45.93	774.29	679.23
40.04	40.35	52.72	765.38	705.12
45.24	45.52	58.98	771.71	825.00
50.16	50.41	63.80	790.10	1015.17

Shear Wave Source Offset = 5 ft

S-Wave Velocity from Surface = Travel Distance/S-Wave Arrival
Interval S-Wave Velocity = (Travel Dist2-Travel Dist1)/(Time2-Time1)

CPTCP.TBL - CPTINT Correlation and Parameters Table File
----------with NOTES & References at end----------

Program: CPTINT - CPT Cone Interpretation Program
Version: 5.2
Table File by: Dr. R. G. (DICK) Campanella, P.Eng.
Rev. Dated: April 3, 2002

Parameter	Methods	Refer. Number	Valid Soil Type	Valid Zone
Depth average see NOTE #1	Depth averaged over specified range (see menu)		All	All
Parameter Averaging	Averaged over range specified for depth. If no values exist, your choice is zero's or no value		All	All
Qc, Tip Stress	measured tip force/area	#6,#8	All	All
Qt corrtd for U2 see NOTE #2	Qt = Qc + (1 - a) x U2 and a = tip area ratio. Defaults to U2 if given or uses U1 or U3 times Const. [Note: Input value from input file is used if defined, not calculated]	#6,#8	All	All
Q (Qt Normalized)	$Q = \frac{Qt - sv}{sv'}$	#9 & 13	All	All
Fs	measured sleeve force/area	#6,#8	All	All
Rf Friction Ratio (if Rf>8, Rf=8)	$Rf = \frac{Fs}{Qt} \times 100\%$	#6,#8	All	All
F (Rf Normalized)	$F = \frac{Fs}{(Qt - sv)} \times 100\%$	#9 & 13	All	All
Gamma Total Unit Weight (Soil + Water) see NOTE #3	Based on Rf or Bq Classif. Zone		All	All

Zone #	Gamma = kN/m^3	
1	Qt<4bar	15.70
1	Qt=4bar	17.30
2	Rf<5%	13.36
2	Rf=5%	11.80
2	Bq Zone	12.58
3	Qt<10bar	18.86
3	Qt=10bar	19.65
4, 5 & 6	Qt<20bar	18.86
4, 5 & 6	Qt=20bar	19.65
7		18.86
8 & 9		19.65
10		20.44
11 & 12		21.22

Parameter	Methods	Refer. Number	Valid Soil Type	Valid Zone
U Penetration Pore Pressure see NOTE #4	U1, measured on Face of tip U2, measured Behind Tip at shoulder (std location) U3, measured Behind Friction Sleeve		All	All
Water Table	Depth below ground surface to where pore pressure = 0 Make negative if water level is above ground		All	All
Uo Hydrostatic Pore Pressure see NOTE #4	Uo = water depth, Hw x unit weight water, Gamma or Uo=Hw=depth-depth to water table if depth<water table, Uo = 0		All	All
dU Excess Pore Pressure	dU = U2 - Uo Defaults to U2 if given or uses U1 or U3 x const.		All	All
DPPR (Differential Pore Pressure Ratio)	$DPPR = \frac{dU}{Qt} = \frac{U - Uo}{Qt}$ Defaults to U2 if given or uses U1 or U3 x const.	#6, #8	All	All
Bq	$Bq = \frac{dU}{Qt - sv}$	# 4 # 8 # 13	All	All
OS (Overburden Stress)	OS = sv = S (Gamma x Depth)		All	All
EOS (Effective Overburden Stress)	EOS = sv' = OS - Uo = sv - Uo		All	All
Rf Zone Soil Behavior Type see NOTE #5	Classification chart for Qc and Rf Zone # = Soil Behavior Type 1=sensitive fine grained 2=organic material 3=clay 4=silty clay 5=clayey silt 6=sandy silt 7=silty sand 8=fine sand 9=sand 10=gravelly sand 11=very stiff fine grained ¥ 12=sand to clayey sand ¥ ¥ overconsolidated or cemented	#6 #8, Fig4.3	All	1<Qt<1000bar 0<Rf<8%

Parameter	Methods	Refer. Number	Valid Soil Type	Valid Zone
Bq Zone Soil Behavior Type	Classification chart for Qc and Bq (same zone #'s as Rf above)	#8 Fig 4.3	All	0<Qt<1000bar -0.1<Bq<1.4
Spt N(60) Standard Penetration Test (Blows/foot) at 60% Energy After R&C(1983) see NOTE #6	Qt/N ratio per zone Zone # Qt/N Zone # Qt/N 1 2 7 3 2 1 8 4 3 1 9 5 4 1.5 10 6 5 2 11 1 6 2.5 12 2	# 7 # 8 Fig 4.2	All	All
Spt N1(60) Normalized for Overburden str	Spt N1(60) = Cn x Spt N(60) where Cn = (sv')^(-0.77)	# 8	All	0.5<Cn<1.5
Dr Relative Density see NOTE #7	Specific Sands: $Dr = \frac{100}{C2} * \ln \left(\frac{Qc}{C1} \cdot \frac{1}{C0\ sv'} \right)$ where: All are NC & UNAGED Sand | C0 | C1 | C2 Ticino | 17.37 | .558 | 2.58 Schmertmann | 15.32 | .520 | 2.75	# 8 # 1 # 1	/ Sand-- \	7 to 10 0<Qt<500bar 0<sv'<5bar
Compressibility moderate high all	ALL SANDS: NC, OC, ALL TESTS $Dr = C3 + C4 \log_{10} \left(\frac{Qc}{C1} \cdot \frac{1}{sv' + C2} \cdot \frac{1}{C0} \right)$ where: C0 | C1 | C2 | C3 | C4 0.100 | 0.0981 | 0.5 | -98 | 66	# 5	Sand	7 to 10 (6 possible)
Phi Friction Angle	Methods: 1) Robertson & Campanella 2) Durgunoglu & Mitchell 3) Janbu beta = +15 degree 4) Janbu beta = 0 degree 5) Janbu beta = -15 degree	#6, #8 # 2 #6, #8 #6, #8 #6, #8	/ Sand-- \	7 to 10 & 6 0<Qt<500bar 0<sv'<4bar 29<phi<49

Parameter	Methods	Refer. Number	Valid Soil Type	Valid Zone
Gmax Maximum Shear Modulus at very small strains	Clay: Gmax = alpha x Qt Sand: Digitized figure of Qc vs Gmax with interpolation between sv'curves,R&C method	# 8 Fig4.18 # 6 # 8 Fig4.13	Clay Sand	1 to 6 (6 possible) 7 to 10 .25<sv'<8bar
CSR(Qc), t/s LEVEL ground Liquefaction SAND Resistance see NOTE #8	Seed's CSR vs N1(60) graph for specified equake Magnitude.Can include silty sand corr. for Zone 7. N1(60) from CPT correlations.	# 11 # 12	Sand	7 to 10 (6 possible)
CSR(Eq), t/s Cyclic Stress Ratio applied by design quake	$CSR(Eq) = 0.65 \frac{Amax}{g} \frac{sv}{svo'} rd$ Amax=max surface acceleratn including Amplification	# 12 # 3	Sand	7 to 10 (6 possible)
[Note: Input value from input file is used if defined, & not calculated]				
rd Reduction Factor to find CSR(Eq)	Digitized graph to use for depth vs rd: 1) Seed's mean 2) Fraser Delta	# 12 # 3	Sand	(6 possible) 7 to 10 0<depth<30m
FL,Safety Factor against Liquefaction	FL = CSR(Qc)/CSR(Eq)	# 3	Sand	7 to 10 (6 possible)
Qcr Critical Bearng required to resist Liquefctn	Qcr backcalculated from CSR(Eq) for a specified FL. Qcr is only for the given GWT,EOS,OS,Amax/g & Eq.Mag	# 12	Sand	7 to 10 (6 possible)
Su, Undrained Shear Strength of CLAY METHODS: see NOTE #9	Nk: $Su = \frac{Qc - st}{Nk}$ Nke: $Su = \frac{Qt - U2}{Nke}$ Nkt: $Su = \frac{Qt - sv}{Nkt}$ Nc: $Su = \frac{Qt}{Nc}$ NdU: $Su = \frac{dU2 \text{ (dU1 or dU3)}}{NdU}$	# 8	Clay Clay Clay Clay Clay	1 to 6 1 to 6 1 to 6 1 to 6 1 to 6

Parameter	Methods	Refer. Number	Valid Soil Type	Valid Zone
Su/EOS	$Su/EOS = \frac{Su}{sv'}$	# 8	Clay	1 to 6
Ko (NC) Normally Consolidated	$(Ko)NC = 1 - \sin(f)$ see NOTE #10	# 8	Sand	7 to 10 (6 possible)
Ko (OC) Over Consolidated	$(Ko)OC = (Ko)NC \times OCR^{0.42}$	# 8	Sand	7 to 10 (6 possible)
E25 Youngs Modulus	E25 = alpha x Qt where user input alpha	# 8 4.11&12	Sand	(6) 7 to 10 0<Qt<500bar
M Constrained Modulus	CLAY: M = alpha x Qt where user input alpha	# 8 Tabl4.3	Clay	1 to 6
	SAND: Methods: Qt: M = alpha x Qt		Sand	7 to 10 (6 possible)
	Baldi: $\frac{M}{Qt} = C0 \times pa \left(\frac{sv' + C1 \times pa}{pa}\right)^{C2} OCR^{C3} \exp(Dr)$	# 8 Fig4.10	Sand	7 to 10
OCR (Clay) Over-Consolidation Ratio see NOTE #11	$OCR = \left(\frac{\frac{Su}{svo'}}{\frac{Su}{svo'} + NC}\right)^{1.25}$	# 6 # 8. Fig4.19	Clay	1 to 6
Ic Material Index After J&D(1993) see NOTE #18	$Ic = \left[(3 - \log_{10}(Q(1-Bq)))^2 + (1.5 + 1.3\log_{10} F)^{2+0.5}\right]^{0.5}$	# 13 # 17	All	All
Spt N(60) Standard Penetration Test (Blows/foot) at 60% Energy After J&D(1993) see NOTE #16	$Qc/N = 8.5(1-(Ic/4.75))$ where Qc in bars	# 13	All	All

Parameter	Methods	Refer. Number	Valid Soil Type	Valid Zone
State Parameter State, (e-units) Current Void Void Ratio minus Critical Void Ratio	$State = \ln\left[\frac{3M + 8.5M/F}{+ Q(1-Bq) +}\right] \div (11.9 - 1.33F)$ $M = \frac{6 \sin fcv}{3 - \sin fcv}$ fcv = const. vol. Phi angle	# 14	All	All
Fines Content FC(%) Percent less than #200 Sieve After Davies, 99	FC(%) = 42.4179(Ic) - 54.8574 FC(%) = 0% if Ic < 1.2933 FC(%) = 100% if Ic > 3.6508	# 15	All	All
OCR (Clay) Overcons. Ratio by Pore Press. U1 & U2 or U1 & U3 see NOTE #17	OCR = 0.5 + 1.50(PPD) PPD = (U1 - U2)/Uo or PPD = (U1 - U3)/Uo and default 0.5 & 1.5 are settable	# 16	Clay	1 to 6

1. Depth averaging may be in 0.5, 1, 2.5 or 5 ft. intervals or 0.1, 0.25, 0.5 or 1.0 m intervals, or no depth averaging if zero is selected. The average is the mean value of the readings in the interval. The depth value is the mid-depth of the averaged interval. It is convenient to start at half the depth averaging interval. For example, if you want "even" depths and the depth averaging is set at 0.50 m then start at 0.25 to get values of depth of 0.5, 1.0, 1.5, etc.

2. Basic input CPTU data columns are for Depth, Qc, Fs, U1, U2, U3, INC and TEMP may be selected. In addition the following parameters may also be specified as an INPUT data column: Qt, Gamma, Uo, Spt N, Rf Zone, Bq Zone and CSR(EQ). These values will be used where required to obtain other interpreted parameters. If they are not specified the program will estimate them when they are required. For example, you can create an OUTPUT data file of any of the above parameters and then edit some or all of the values to suite your measurements or your desires to specify their values. You can do that with "Gamma" values to input your measurements of unit weight, or with "Uo" if you want to input values of pore water pressure other than hydrostatic, or with any of the other input parameters. You would use your edited file of adjusted data as your new INPUT data file. Thus, you can specify these parameters if you want to override the Program's values.

You can also use the designated value of "9E9" to denote an unknown value.

You can use the "OTHER" designation to input other data that exists on your input file and identify its units. This allows you to output it, without operating on it, if you choose.

It is best NOT to use depth averaging when using input data that is not continuous at regular depth intervals. Always use DEPTH AVERAGING with extreme caution since the program averages ALL INPUT parameters over the interval chosen irregardless of soil type. Careful use of start and end depth choises can make depth averaging very effective.

3. Since there is no data in the file within the initial depth interval, a default Gamma (unit weight) must be specified from the surface to the starting depth. This is done in the "Param" Menu in units of kN/m^3 (1kN/m^3=6.36pcf). Also, you can specify the values of Gamma to be used by the program as in NOTE #2 above.

4. If pore pressures are not measured by the cone then the program will take Qc as being equal to Qt for all interpretations requiring Qt. Also, Uo may be specified in the input file as a column of Uo vs depth values, if the water pressures are not hydrostatic. See NOTE #2 for more info on customizing input data.

5. You can choose to use either the Rf classif. Zone or the Bq classif. Zone to divide soil into Undrained Parameters (Zones 1 to 6) and Drained Parameters (Zones 7 to 10) in the "Param" Menu. (However, in order to use the Bq Zone you must have Pore Pressure, U2, data.) Also, you may choose to switch Zone 6 to a Drained Zone from its Undrained Zone status. This is done if you feel that the soil identified as Zone 6 (sandy silt) is really coaser (using other sources of information) and/or you want it analyzed as a Drained rather than Undrained soil. Finally, the soil behavior names in each zone were shortened in version 5.0 for simplicity. For example, Zone 6 was named "sandy silt to clayey silt" but was shortened to "sandy silt".

6. Spt N is the same as Spt N(60) for 60% transferred energy. This value is calculated from the Qt/N ratios given for each Soil Zone (you can specify either Rf or Bq Zone) and these values are used in the Level Ground Liquefaction analysis. Values of Spt N may be specified in the Input File, if indepedently measured values are to be used. We suggest that you not use depth averaging if you only have selected Spt N values at a few depths. You may use "9E9" for missing data.

7. If Dr values are negative then soil is very loose or likely more of an undrained soil like a silty sand rather than a drained soil for which the Dr correlations were developed. Use Dr interpretations very cautiously since they also assume the soil is free draining, uncemented, unaged and has the same compressibility of grains as the soil used for the correlations in chamber calibration tests.

8. The simplified sand liquefaction analysis for level ground according to Seed et al requires Spt N1(60) and earthquake magnitude to obtain the cyclic stress ratio to cause liquefaction, CSR(Qc). The design maximum ground acceleration, the depth-reduction factor, Rd, and overburden total and effective stresses are required to calculate the cyclic stress ratio applied by the design earthquake, CSR(EQ). The program estimates the N1(60) values from the cone stresses, the operator identifies the earthquake magnitude and Seed et al chart is used to get CSR(Qc). The program also calculates CSR(EQ) from the user specified maximum ground acceleration including any amplification factors, the calculated overburden stresses and either Seed's mean or the Fraser Delta Rd factor. The Fraser Delta is used only when amplification factors of the order of 2 or more are used. See Reference Nos. 3, 6, 11 and 12 for more information. The user can INPUT specific values for Spt N, CSR(EQ), Soil Zones, Gamma's, etc. in order to customize the analysis for the existing data base of information. It is recommended that you do not use depth averaging when using specific input data but make calculations at specific depths where external input data exists. The calculated value of Qcr is the minimum value of cone bearing stress required at a given depth such that the factor of safety against liquefaction, or the ratio FL = CSR(Qc)/CSR(EQ) have the specified value for a given earthquake magnitude, max. ground acceleration, depth reduction factor, and calculated overburden stresses. This value of Qcr is useful to identify the required minimum level of soil improvement for a given design condition.

9. The NdU method to calculate undrained shear strength has been extended to allow the user to choose either dU1, or dU2 or dU3 provided such pore pressure measurements exist.

10. The Overconsolidation Ratio, OCR, for the sand must be estimated by the user in the "Param" menu if you want to estimate Ko in the sand layers. For the typical normally consolidated sand, OCR = 1.0.

11. It is currently only possible to estimate the OCR for a clay, which makes use of the correlations obtained from extensive laboratory tests.

12. An improved calculation and print routine was added to version 5.0 which uses swap routines to reduce memory requirements, but slows down the calculations.

13. The classification charts for Rf has been extended at all boundaries such that values of Rf>8 and values of Qc<1.00 are possible. The Bq classification chart which requires dU2 and can now accept values of Bq>1.2 and Qt<1. Unfortunately, this feature does not work.

14. Version 5.1ppd added several enhancements to the program. You may input an average vertical flow gradient, which is applied over the entire profile depth to be analysed so adjust the depth of interest accordingly. Zero gives hydrostatic and no flow, a negative gradient is upward flow which increases pore pressure and reduces vertical effective stress. A positive gradient gives downward flow.

15. A State Parameter or current void ratio minus critical void ratio is calculated according to the paper by Ref. 14, Plewes, Davies and Jefferies, 1994.

16. An alternate method to estimate SPT from CPT is provided according to Ref. 13, Jefferies and Davies, 1993 in ASTM.

17. An alternate method to estimate OCR in clays is provided which uses the measured pore pressure difference, ppd, so both U1 and U2 or U1 and U3 must be measured at the same time. (see Ref. 16)

18. Version 5.2 added the value Ic (Material Index) according to Jefferies & Davies, 1993, 1991 (Ref. 13 & 17) which combines all Normalized parameters Q, F and Bq.
(Note: QtN was changed to Q and RfN to F.)

18A. In Version 5.2, if at any depth the value of Bq>1 (in very sensitive saturated soil)then Bq is made equal to 0.99. Also, if Rf>8 it is made 7.99. These changes have a negligable effect on the results.

19. FC(%) or percent of dry weight less than #200 sieve (.074mm) was also added according to Davies, 1999 Ref.#15)

REFERENCES:

1) Bellotti, R., Crippa, V., Pedroni, S., Baldi, G., Fretti, C., Ostricati, D., Ghionna, V., Jamiolkowski, M., Pasqalini, E., 1985, "Laboratory Validation Of In-Situ Tests", Italian Geotechnical Society Jubilee Volume for the XI ICSMFE, S.F., Cal.

2) Durgunoglu, H.T. and Mitchell, J.K., 1975, "Static Penetration Resistance of Soils: I-Analysis", Proceedings of the ASCE Specialty Conference on In-Situ Measurement of Soil Properties, Raleigh, NC

3) "Earthquake Design in the Fraser Delta - Geotechnical Aspects" Task Force Report, May 1991 - Co-chair: Dr. P. M. Byrne, Univ. of British Columbia, Dept. of Civil Engineering, Vancouver, B.C., V6T 1Z4.

4) Janbu, N. and Senneset, K., 1974,. "Effective Stress Interpretation of In Situ Static Penetratuion Tests", Proceedings of the European Symposium on Penetration Testing,Stockholm Sweden, Vol. 2.2

5) Jamiolkowski, M., Ladd, C.C., Germaine, J.T., Lancellotta, R., 1985, "New Developments in Field and Laboratory Testing of Soils", State of the Art Address for XIth ICSMFE, San Francisco.

6) Robertson, P.K. and Campanella, R.G., 1983, "Interpretation of Cone Penetration Tests - PART I (SAND) and PART II (CLAY)", Canadian Geotechnical Journal, Vol. 20, No. 4.

7) Robertson, P.K., Campanella, R.G., and Wightman, A., 1983, "SPT - CPT Correlations", Journal of the Geotechnical Division, ASCE, Vol. 109, Nov.

8) Robertson, P.K. and Campanella, R.G., 1989 "Guidelines for Geotechnical Design using CPT and CPTU", Soil Mechanics Series NO. 120, Civil Eng. Dept., Univ. of B.C., Vancouver, B.C., V6T 1Z4, Sept 1989.

9) Robertson, P.K., 1990, Soil Classification using the CPT, Canadian Geot. Journal, V.27,No.1, Feb, p151-158.

10) Schmertmann, J.H., 1976, "An updated Correlation between Relative Density, Dr and Fugro-type Electric Cone Bearing, qc" Department of Civil Engineering Report, University of Florida, July.

11) Seed, H.B., Idriss, I.M. and Arango, I., 1983, "Evaluation of Liquefaction Potential Using Field Performance Data", Journal of Geot. Engrg. Div., ASCE, Vol. 109, No. 3, March 1983, pp. 458-482.

12) Seed, H.B. and Idriss, I.M., 1971, "Simplified procedure for Evaluation Soil Liquefaction Potential", Journal of Soil Mechanics and Foundations, ASCE, SM9, Vol. 97, Sept.

13) Jefferies, M.G. and Davies, M.P., 1993, "Use of CPTu to Estimate Equivalent SPT N60", ASTM, Geotechnical Testing Journal, V.16:4, 458-468.

14) Plewes, H.D., Davies, M.P. and Jefferies, M.G., 1994, "CPT based Screening Procedure for Evaluating Liquefaction Susceptibility", Proc. Canadian Geot. Conference, Halifax

15) Davies, M.P., 1999, "Piezocone Technology for the Geoenvironmental Characterization of Mine Tailings", PhD Thesis, Univ. of British Columbia, Civil Eng. Dept, Vancouver, BC, V6T 1Z4, Canada.

16) Sully, J.P., Campanella, R.G. and Robertson, P.K., 1988, "Overconsolidation Ratio of Clays from Penetration Pore Pressures", ASCE Journal of Geotechnical Engineering, Vol. 114, No. 2, February, pp. 209-216.

17) Jefferies, M.G. and Davies, M.P.,1991,"Soil Classification by the CPT":Discussion.Canadian Geot. Jour.,V28(1),173-6

Vista Canyon Ranch, LLC
November 14, 2008
2005-052-01

APPENDIX B

LABORATORY TESTS

RTF&A
GEOTECHNICAL ENGINEERING & ENGINEERING GEOLOGY

APPENDIX B

LABORATORY TESTS

Laboratory tests were performed on selected samples obtained from the test borings to aid in the classification of the soils, and to determine their engineering properties.

Moisture and Density Tests: Moisture content and unit dry density tests were performed on samples of undisturbed soil obtained in the borings. Dry density and field moisture information is useful in correlating field and laboratory data, and in providing a gross picture of the variations of soil characteristics. The results of the tests are presented on the boring logs in Appendix A.

Direct Shear Tests: Direct shear tests were performed on selected undisturbed samples to determine the strength and supporting capacities of the soils. The method of performing these tests is to contain the sample in testing rings, to apply a normal load, and to then allow sufficient time to elapse to dissipate any excess hydrostatic pressure which may have developed in applying the normal pressure.

The sample is then subjected to strain-controlled, double-plane shear tests. The method of applying the normal and shearing load is such as to allow the sample to change in volume during shear without producing an associated change in the normal stress. The shearing stress is measured at a constant rate of strain of approximately 0.02 inch per minute.

Selected samples of the soil were tested at confining pressures similar to those of the materials in-situ. Additional specimens, from the same sample, were also tested at increased normal pressures in order to determine the increase in shear strengths associated with increased intergranular pressures. Specimens were soaked for testing.

To evaluate the effect of sustaining a shearing stress on a soil for a long period of time, where such might be the case in the field, the direct shear tests are run until the ultimate portion of the stress-strain curve is reached and then held until the soil has "relaxed" to an equilibrium shearing resistance. The ultimate portion of the stress-strain curve represents the shearing resistance available under large deflections, usually greater than 0.1 inch for direct shear tests, or four percent axial strain for unconfined compression tests. Allowing the soil to "relax" removed the majority of the shearing resistance due to the viscous component of the shear strength, such as would be involved in creep or plastic flow. Unless otherwise stated, these are the values which are shown on the graphic "Summary of Shear Test Data."

Atterberg limits: Atterberg limits (liquid and plastic limit) tests were conducted on selected samples to aid in classifying the soils in accordance with USCS (by evaluating soil plasticity). Test results are presented on the boring log in Appendix A.

Consolidation Tests: Confined consolidation tests were performed on selected undisturbed samples and remolded samples compacted to 90%. Water was added to the samples during the tests to illustrate the effect of moisture on the compressibility. The results of the tests are presented in this appendix.

Grain Size Analyses: To estimate the particle size distribution of the soils and to aid in classifying the soils, grain size analyses were performed on samples obtained from the borings. The percentage of "fines" (percent passing the No. 200 sieve) of various samples is presented on the boring logs in Appendix A; the complete results of the grain size analyses (i.e., sieve and hydrometer tests) are presented in this appendix.

Expansion Index Tests: Expansion Index tests provided an index to the expansion potential of soils when inundated with water. This test method controls variables that influence the expansive characteristics of soils. The tests were performed in accordance with the ASTM D 4829 method, and the results of the tests are presented below:

Sample(feet)	Soil Description and Classification	Expansion Index	Expansion Potential
HS-19 @ 2-8'	Silty Clay with Sand	4	Very Low

Compaction Tests: The optimum moisture content and maximum dry density of the site materials were determined by performing four compaction tests on selected bulk samples. The tests were performed in accordance with the ASTM D 1557 method of compaction. The specific test methods and results are presented in the following table.

Sample (feet)	Soil Description	Optimum Moisture Content (%)	Maximum Dry Density (pcf)
HS-5 at 4 to 8	Silty Sand	8.5	134
HS-19 at 2 to 8	Silty Clay with Sand	9.0	129
HS-20 at 24	Sandy Silt with gravel	9.0	130
HS-22 at 5 to 10	Silty Sand	12.0	124

Corrosivity Tests: Soil chemical testing was performed recently for us on three samples of the on-site soils by M. J. Schiff and Associates. Also one sample of on site soils was tested during our past investigation dated December 21, 2007 (RTF & A, 2007a). Test results are presented in this Appendix.

SCHIFF ASSOCIATES

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TRANSMITTAL LETTER

DATE: September 24, 2008

ATTENTION: **Dharmesh Amin**

TO: R.T. Frankian & Associates
1329 Scott Rd
Burbank , CA 91504

SUBJECT: Laboratory Test Data
Vista Gym
Your #2005-052-01, SA #08-1115LAB

COMMENTS: Enclosed are the results for the subject project.

Julie L.S. Bell, Ph.D.
Laboratory Manager

431 West Baseline Road · Claremont, CA 91711
Phone: 909.626.0967 · Fax: 909.626.3316

Table 1 - Laboratory Tests on Soil Samples

R.T. Frankian & Associates
Vista Gym
Your #2005-052-01, SA #08-1115LAB
15-Sep-08

Sample ID			B-11 @ 14-16' TmC3	HS-16 @ 5-15' Qal	HS-19 @ 18' TmC3
Resistivity		**Units**			
as-received		ohm-cm	14,800	60,000	156,000
minimum		ohm-cm	3,840	960	5,200
pH			7.2	7.7	8.2
Electrical Conductivity		mS/cm	0.04	0.66	0.15
Chemical Analyses					
Cations					
calcium	Ca^{2+}	mg/kg	23	551	92
magnesium	Mg^{2+}	mg/kg	3.2	45	7.3
sodium	Na^{1+}	mg/kg	47	157	61
potassium	K^{1+}	mg/kg	4.4	48	13
Anions					
carbonate	CO_3^{2-}	mg/kg	ND	ND	ND
bicarbonate	HCO_3^{1-}	mg/kg	82	485	354
flouride	F^{1-}	mg/kg	5.1	1.5	3.5
chloride	Cl^{1-}	mg/kg	13	31	2.1
sulfate	SO_4^{2-}	mg/kg	6.5	1,150	14
phosphate	PO_4^{3-}	mg/kg	7.9	ND	1.0
Other Tests					
ammonium	NH_4^{1+}	mg/kg	ND	ND	ND
nitrate	NO_3^{1-}	mg/kg	ND	56	ND
sulfide	S^{2-}	qual	na	na	na
Redox		mV	na	na	na

Minimum resistivity per CTM 643

Electrical conductivity in millisiemens/cm and chemical analysis were made on a 1:5 soil-to-water extract.
mg/kg = milligrams per kilogram (parts per million) of dry soil.
Redox = oxidation-reduction potential in millivolts
ND = not detected
na = not analyzed

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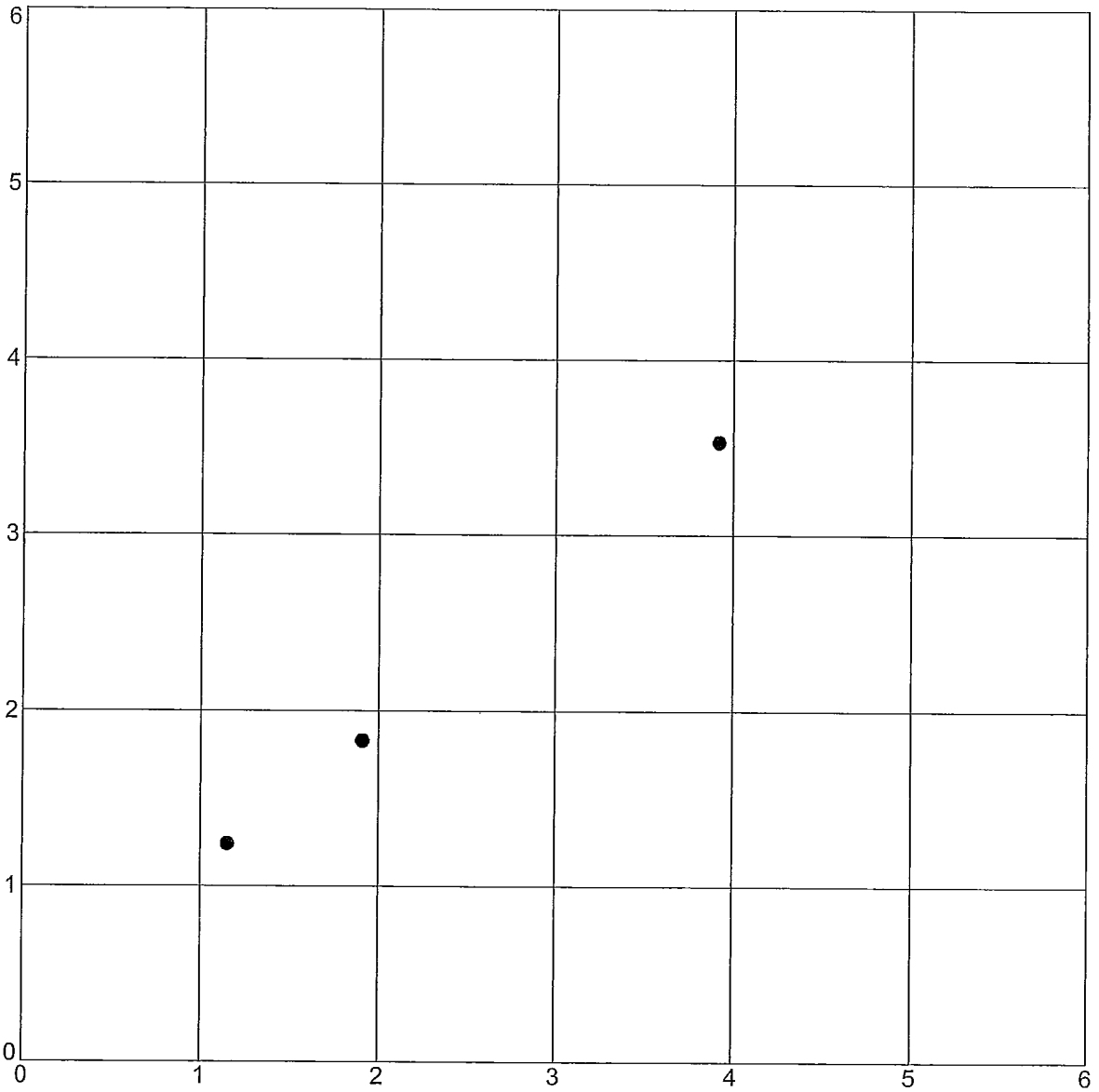


Specimen Identification		Classification
●	HS-22 6-10'	Certified Compacted Fill (cef)
		Remolded to 90% Compaction
		Residual

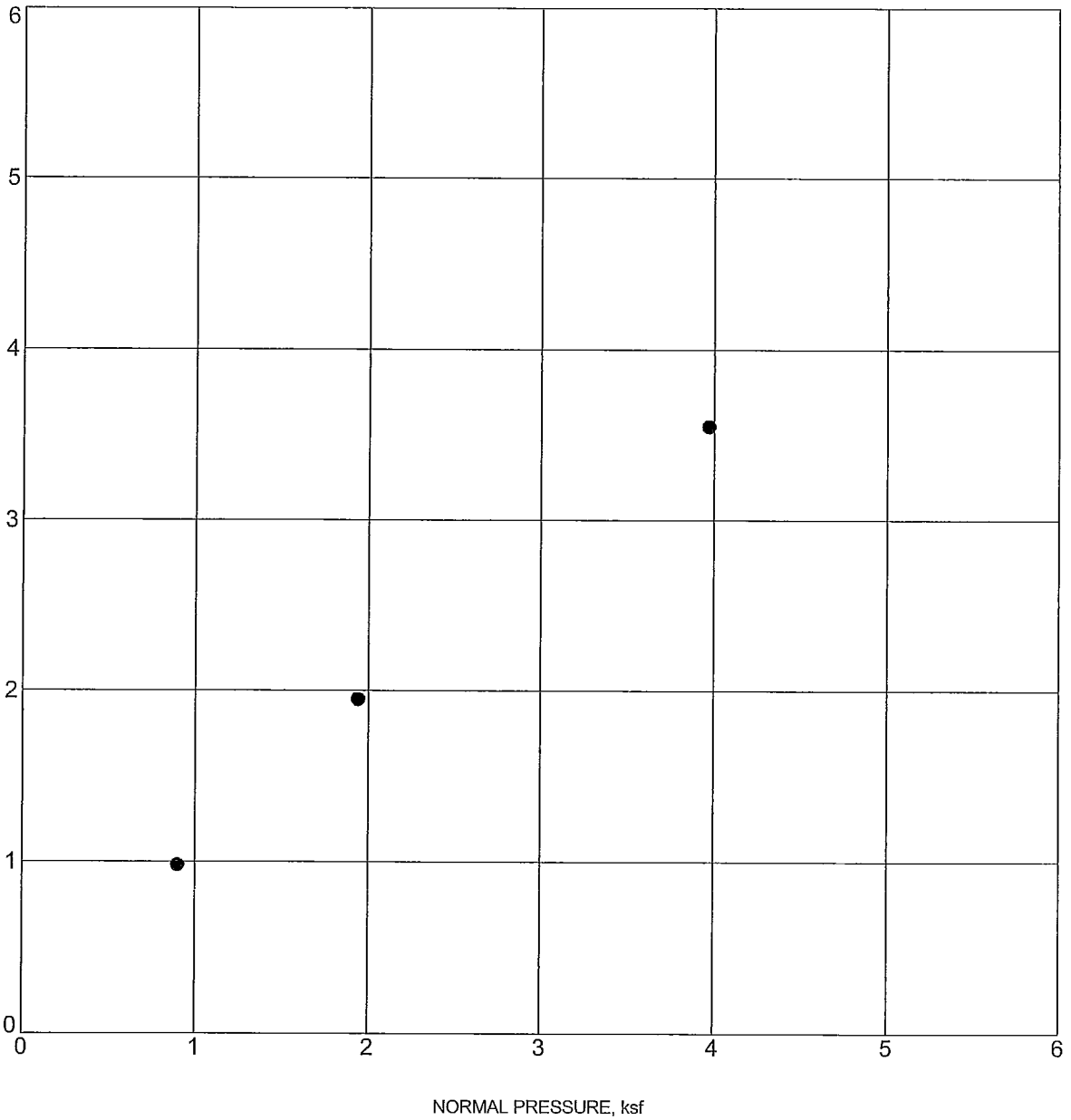
R. T. Frankian & Associates
1329 Scott Road
Burbank, Ca 91504
Telephone: (818) 531-1501
Fax: (818) 531-1511

DIRECT SHEAR TEST

JOB NUMBER: 2005-052-01

REPORT DATED: 11-14-2008

US DIRECT SHEAR 2005-052-01 HS-3.GPJ FRANKIAN.GDT 11/17/08



Specimen Identification		Classification
● HS-5	4-8'	Certified Compacted Fill (cef)
		Remolded to 90% Compaction
		Residual

R. T. Frankian & Associates
1329 Scott Road
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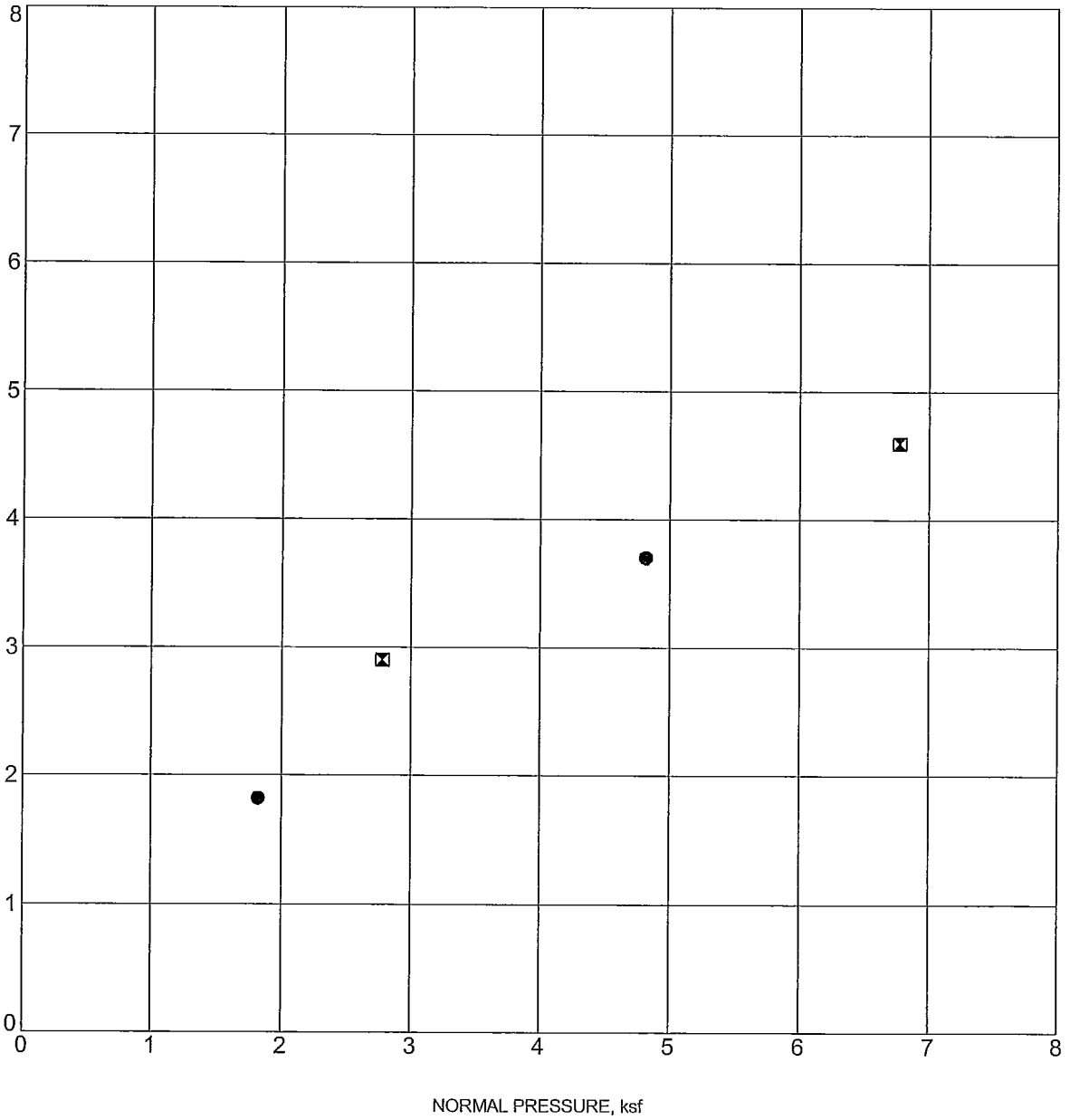
Fax: (818) 531-1511

DIRECT SHEAR TEST

JOB NUMBER: 2005-052-01

REPORT DATED: 11-14-2008

US DIRECT SHEAR 2005-052-01 HS-3.GPJ FRANKIAN.GDT 11/17/08



Specimen Identification			Classification
●	B-12	15.0'	**Bedrock (Repeat Shear)**
⊠	B-12	25.0'	**Bedrock (Repeat Shear)**

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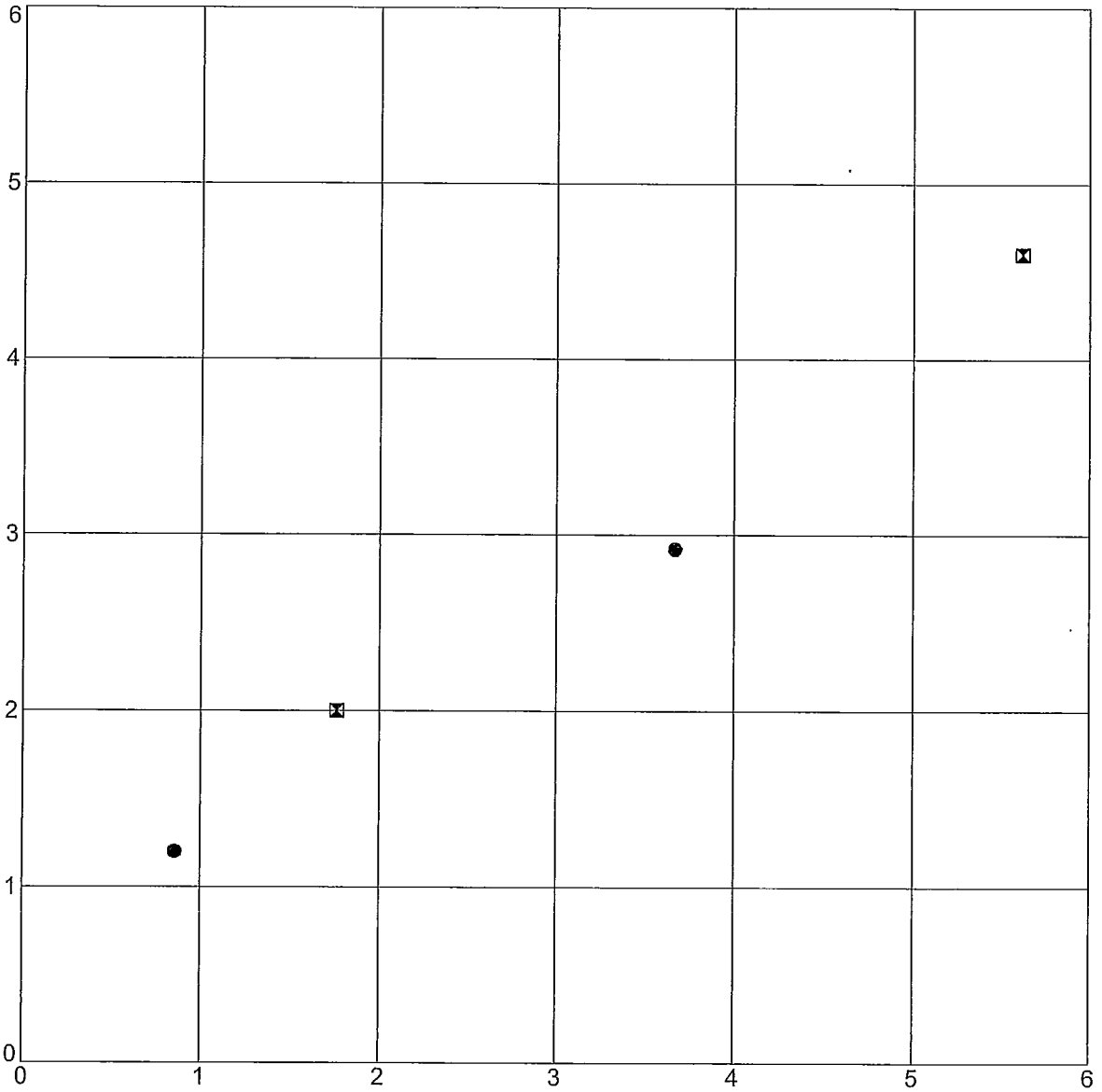
DIRECT SHEAR TEST

JOB NUMBER: 2005-052-01

REPORT DATED: 11-14-2008

US DIRECT SHEAR 2005-052-01 HS-3.GPJ FRANKIAN.GDT 11/17/08



Specimen Identification		Classification
● B-13	8.0'	**Bedrock - (Repeat Shear)**
⊠ B-13	14.0'	**Bedrock - (Repeat Shear)**

R. T. Frankian & Associates
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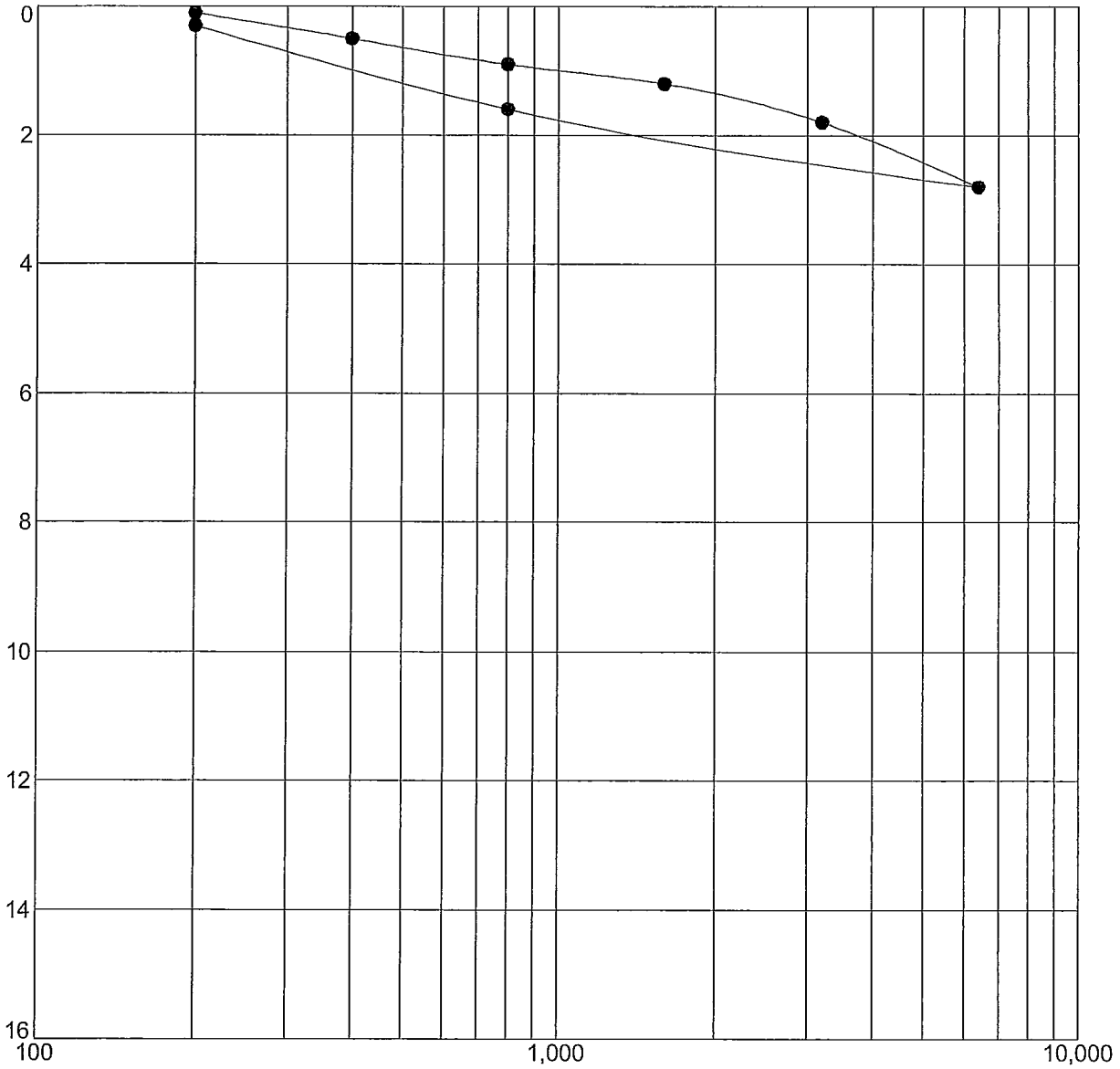
DIRECT SHEAR TEST

JOB NUMBER: 2005-052-01

REPORT DATED: 11-14-2008

US DIRECT SHEAR 2005-052-01 HS-3.GPJ FRANKIAN.GDT 11/17/08



Water added at 1600 psf

	Specimen Identification		Classification
●	HS-16	15.0'	Silty Sand (SM)

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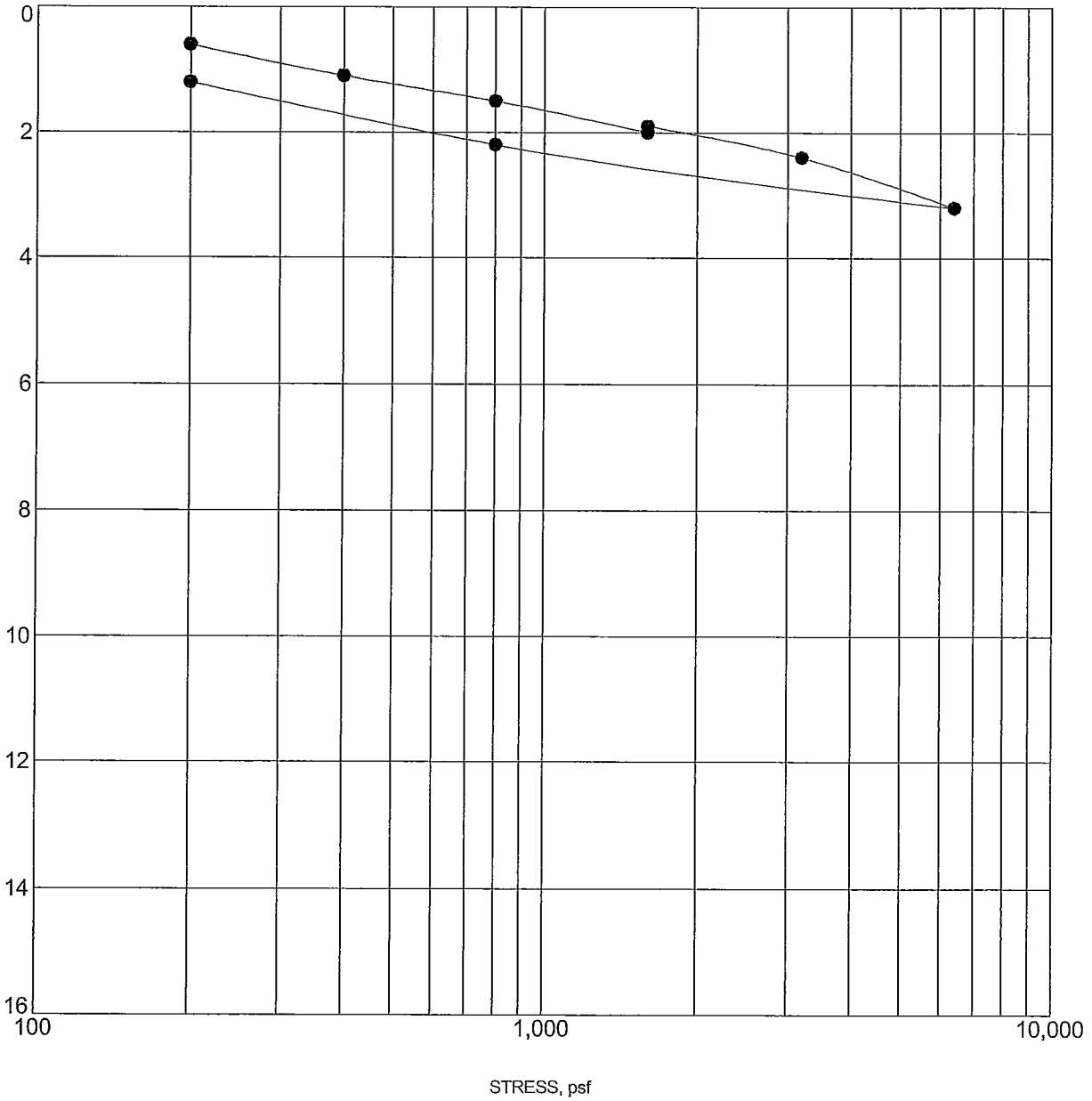
CONSOLIDATION TEST

JOB NUMBER: 2005-052-01

REPORT DATED: 11-14-2008

US CONSOL STRAIN 2005-052-01 HS-3.GPJ FRANKIAN.GDT 11/17/08



Water added at 1600 psf

Specimen Identification		Classification
● HS-5 4.0'		Silty Sand (SM) (Remolded to 90% dry density)

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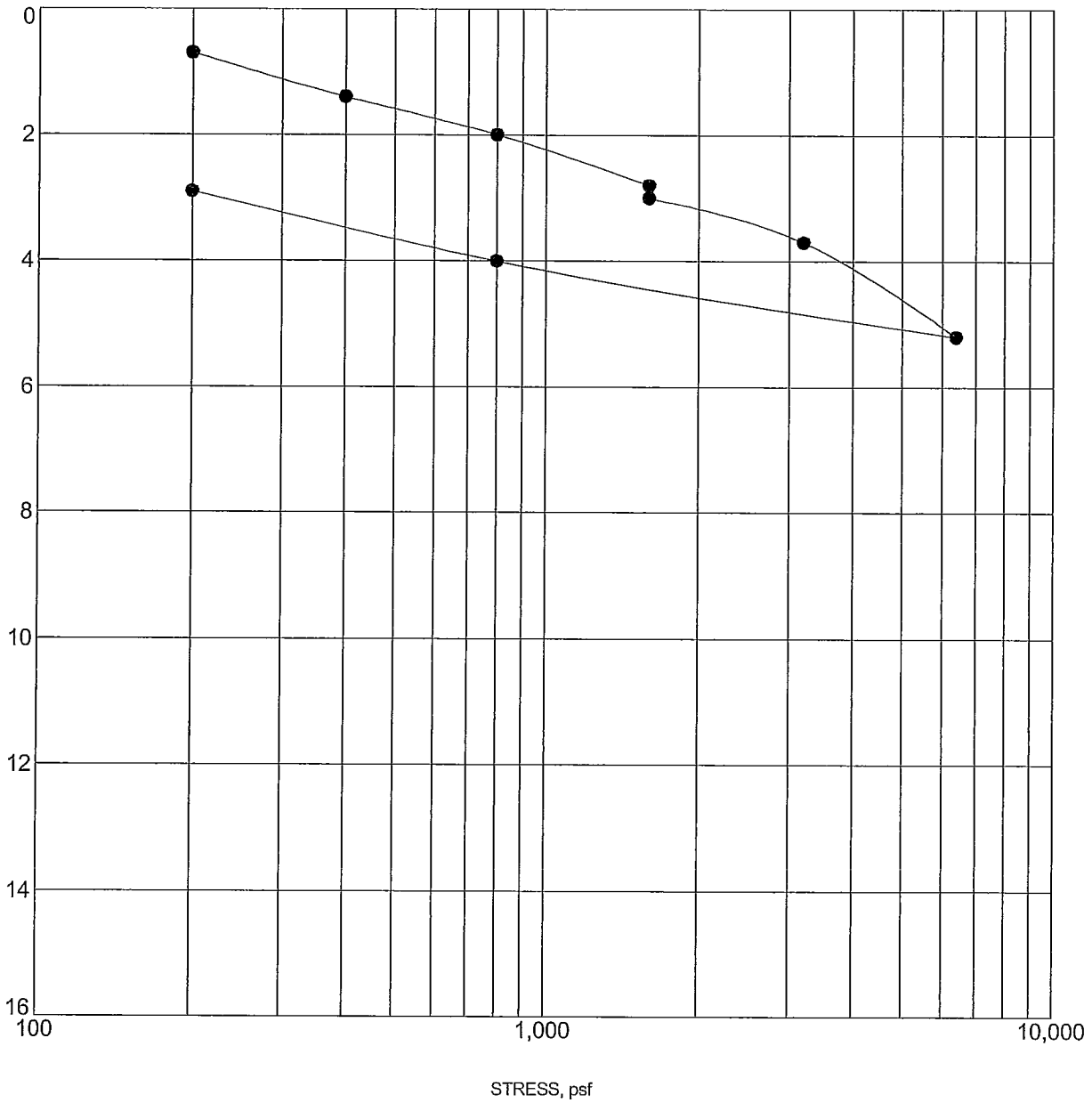
CONSOLIDATION TEST

JOB NUMBER: 2005-052-01

REPORT DATED: 11-14-2008

US CONSOL STRAIN 2005-052-01 HS-3.GPJ FRANKIAN.GDT 11/17/08



Water added at 1600 psf

Specimen Identification		Classification
● HS-5 21.0'		Sandy Silt (ML)

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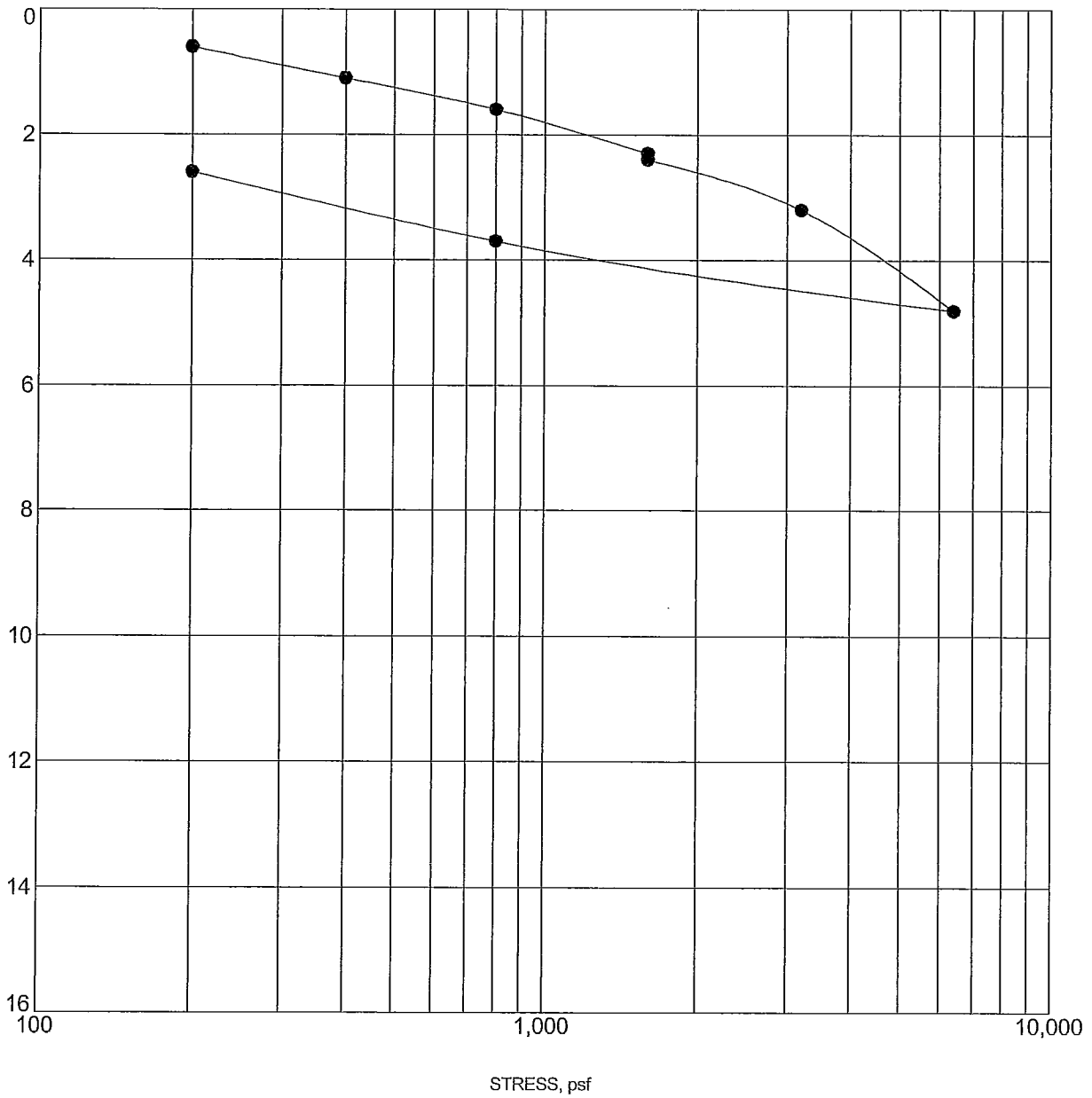
CONSOLIDATION TEST

JOB NUMBER: 2005-052-01

REPORT DATED: 11-14-2008

US CONSOL STRAIN 2005-052-01 HS-3.GPJ FRANKIAN.GDT 11/17/08



Water added at 1600 psf

Specimen Identification		Classification
● HS-7 15.0'		Sand (SP)

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CONSOLIDATION TEST

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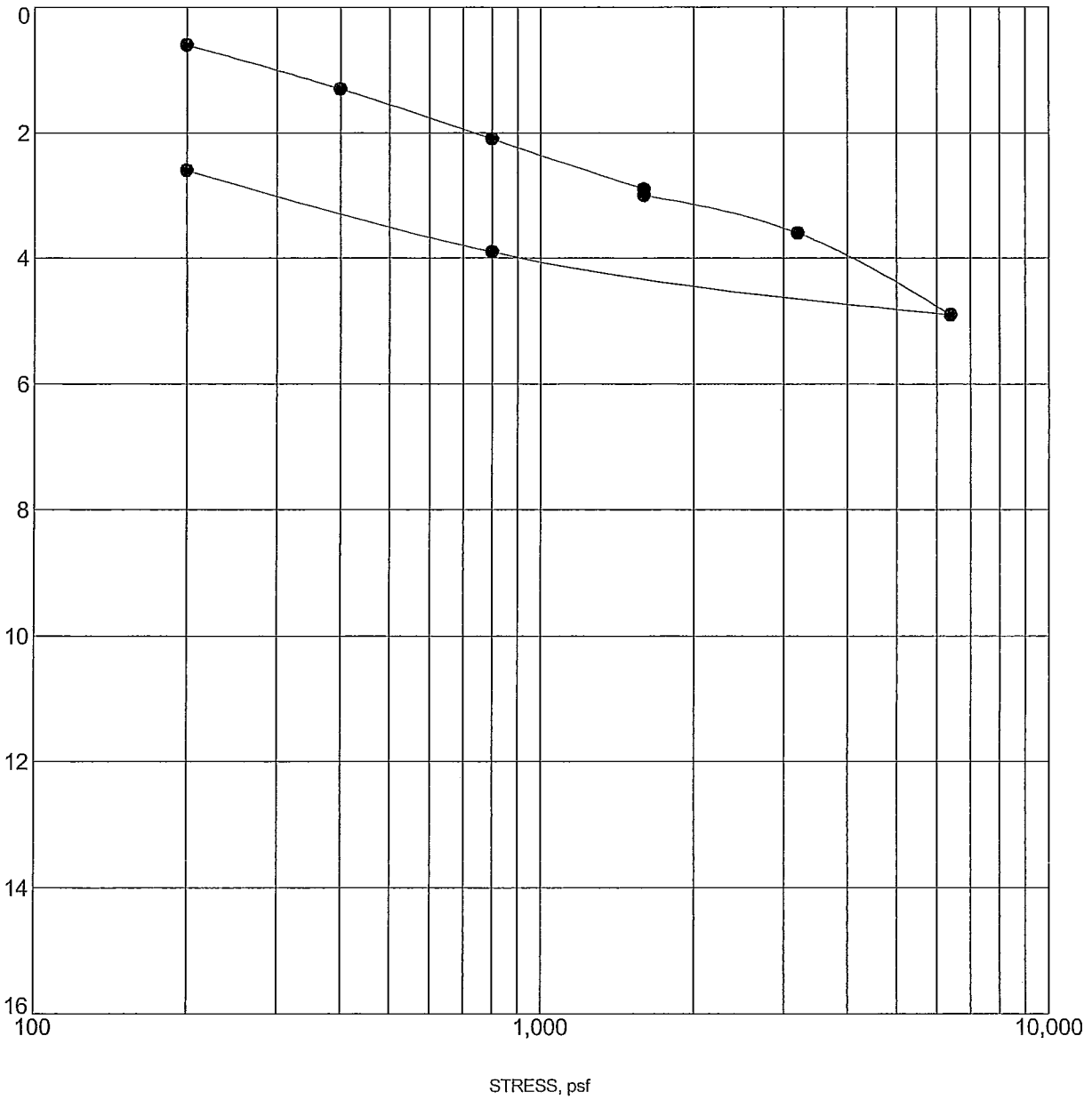
REPORT DATED: 11-14-2008

US CONSOL STRAIN 2005-052-01 HS-3.GPJ FRANKIAN.GDT 11/17/08



Water added at 1600 psf

Specimen Identification		Classification
● HS-8 21.0'		Sandy Silt (ML)

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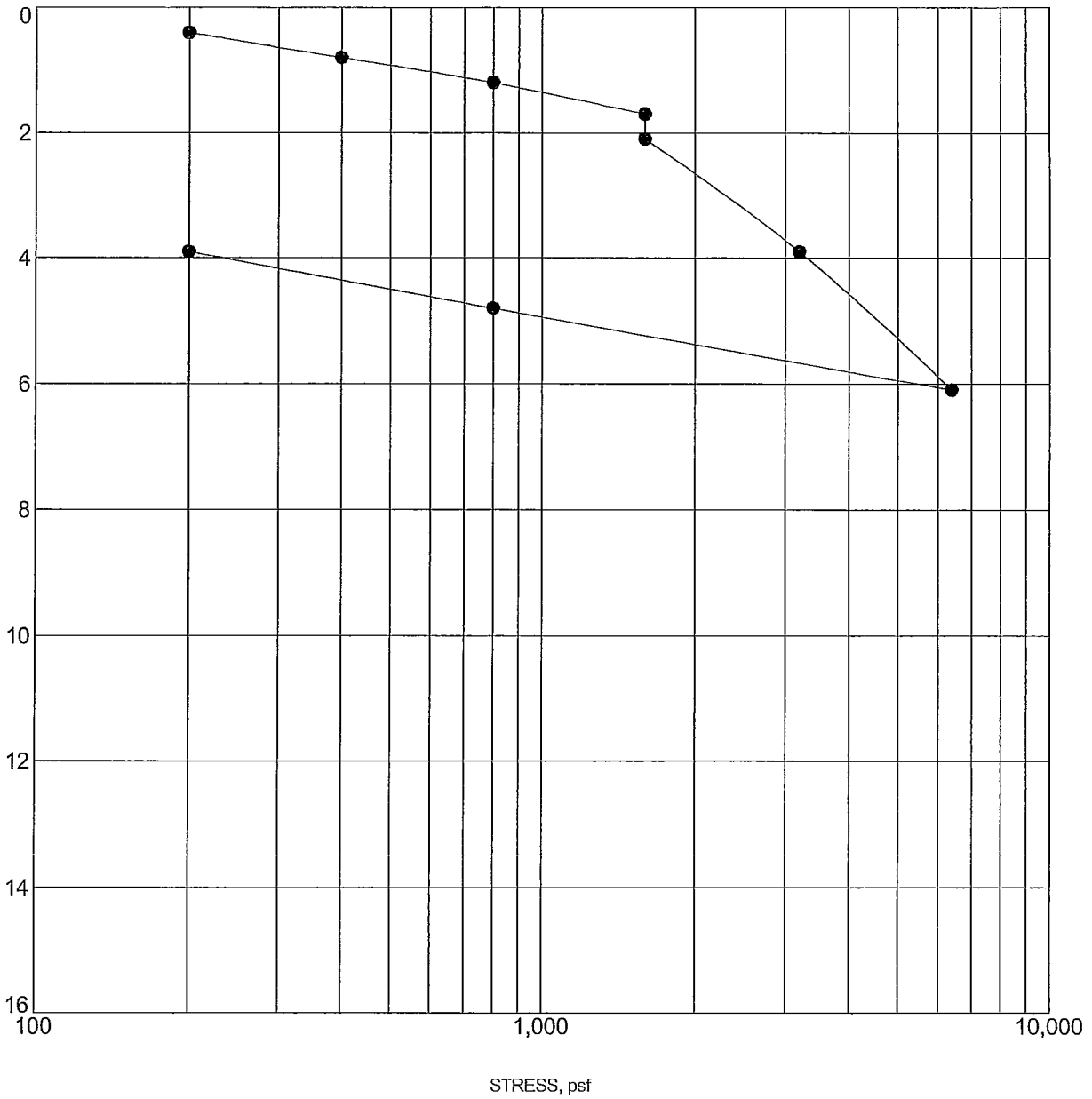
CONSOLIDATION TEST

JOB NUMBER: 2005-052-01

REPORT DATED: 11-14-2008



Water added at 1600 psf

Specimen Identification		Classification
● HS-9 5.0'		Silty Sand (SM)

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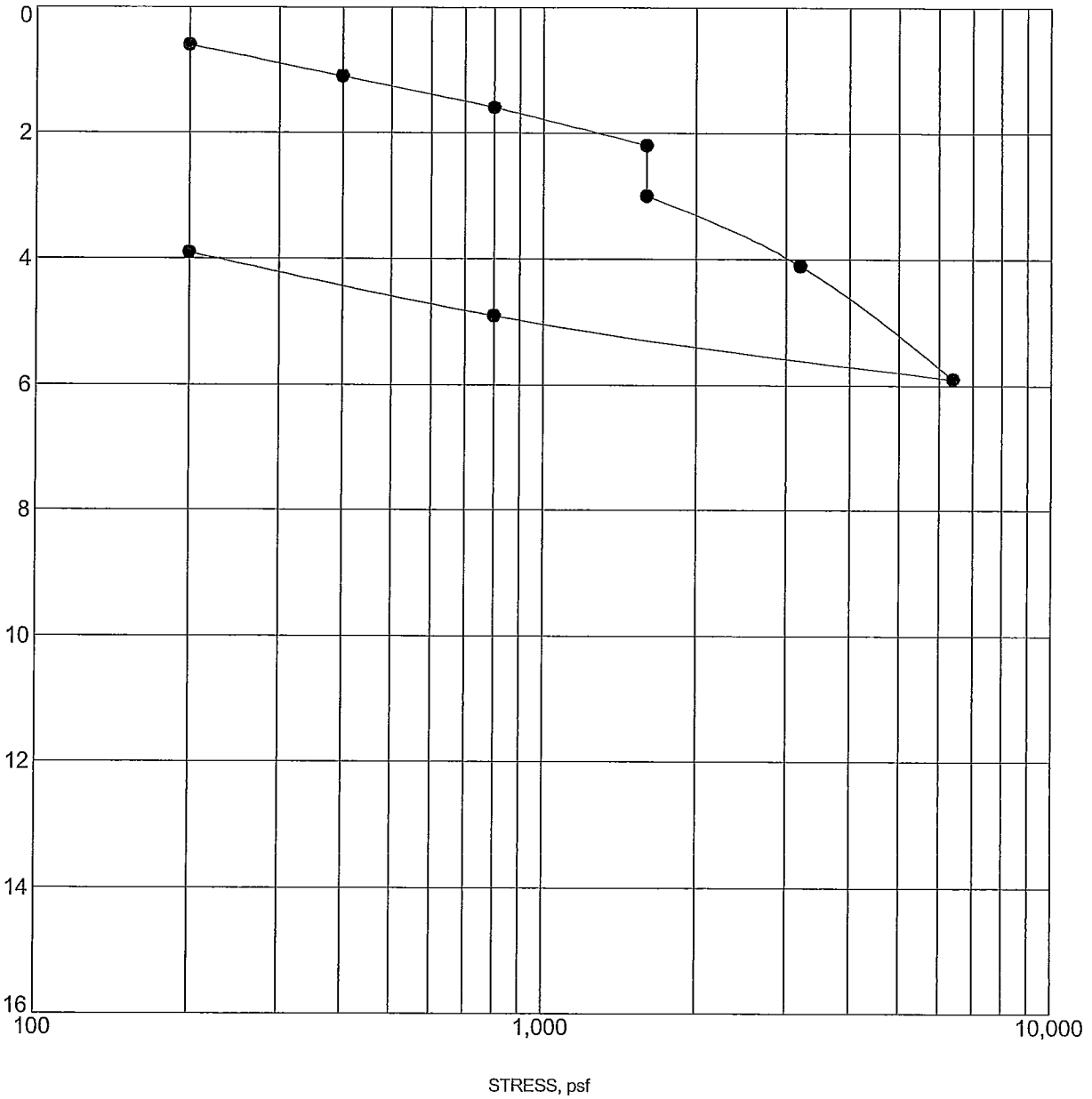
JOB NUMBER: 2005-052-01

REPORT DATED: 11-14-2008

US CONSOL STRAIN 2005-052-01 HS-3.GPJ FRANKIAN.GDT 11/17/08



Water added at 1600 psf

Specimen Identification		Classification
● HS-9 10.0'		**Silty Sand (SM)**

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CONSOLIDATION TEST

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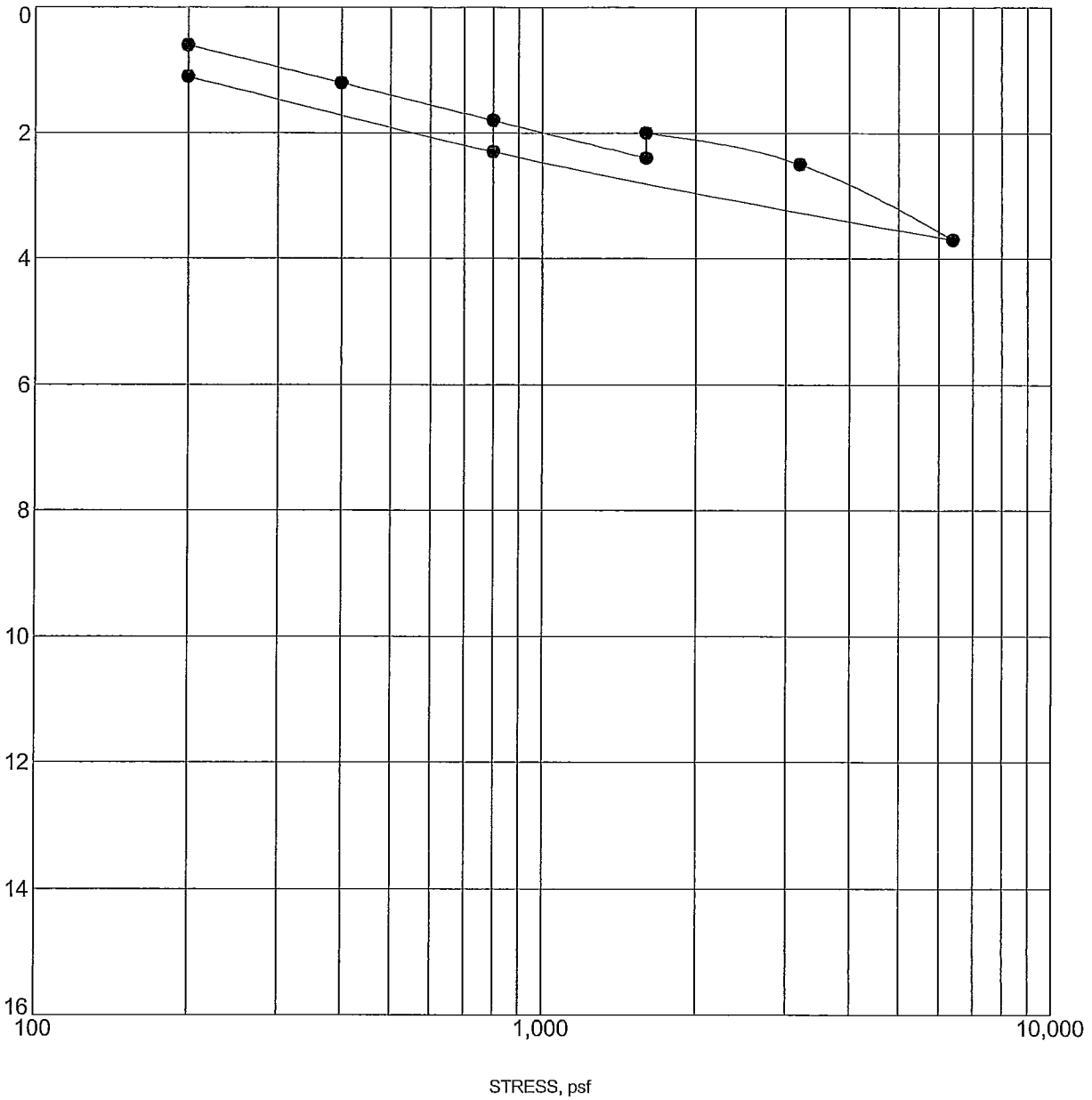
US CONSOL STRAIN 2005-052-01 HS-3.GPJ FRANKIAN.GDT 11/17/08



Water added at 1600 psf

Specimen Identification		Classification
● HS-13 10.0'		Silt with sand (ML)

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CONSOLIDATION TEST

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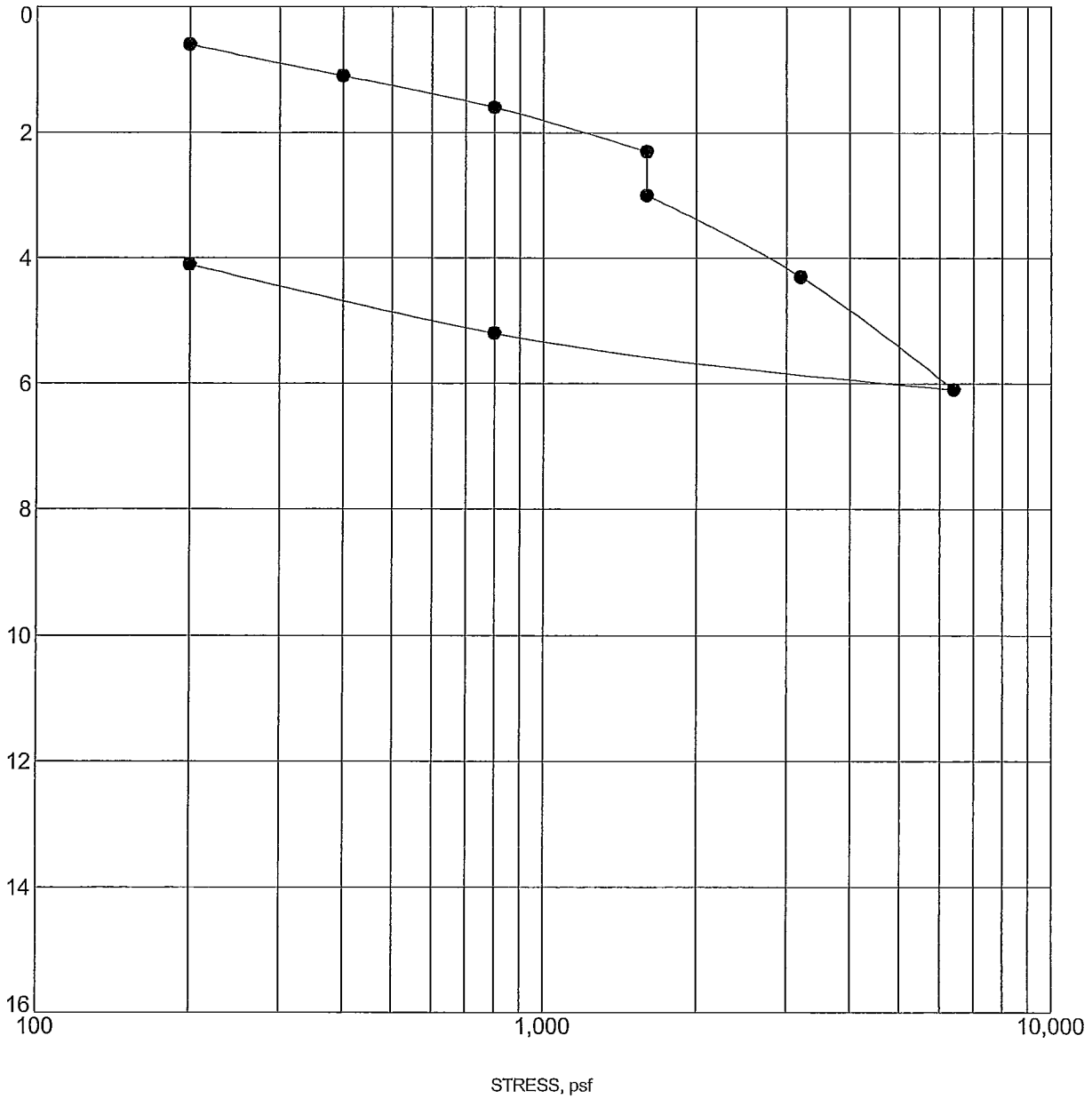
REPORT DATED: 11-14-2008

US CONSOL_STRAIN 2005-052-01 HS-3.GPJ FRANKIAN.GDT 11/17/08



Water added at 1600 psf

Specimen Identification		Classification
● HS-15 10.0'		Sandy Silt (ML)

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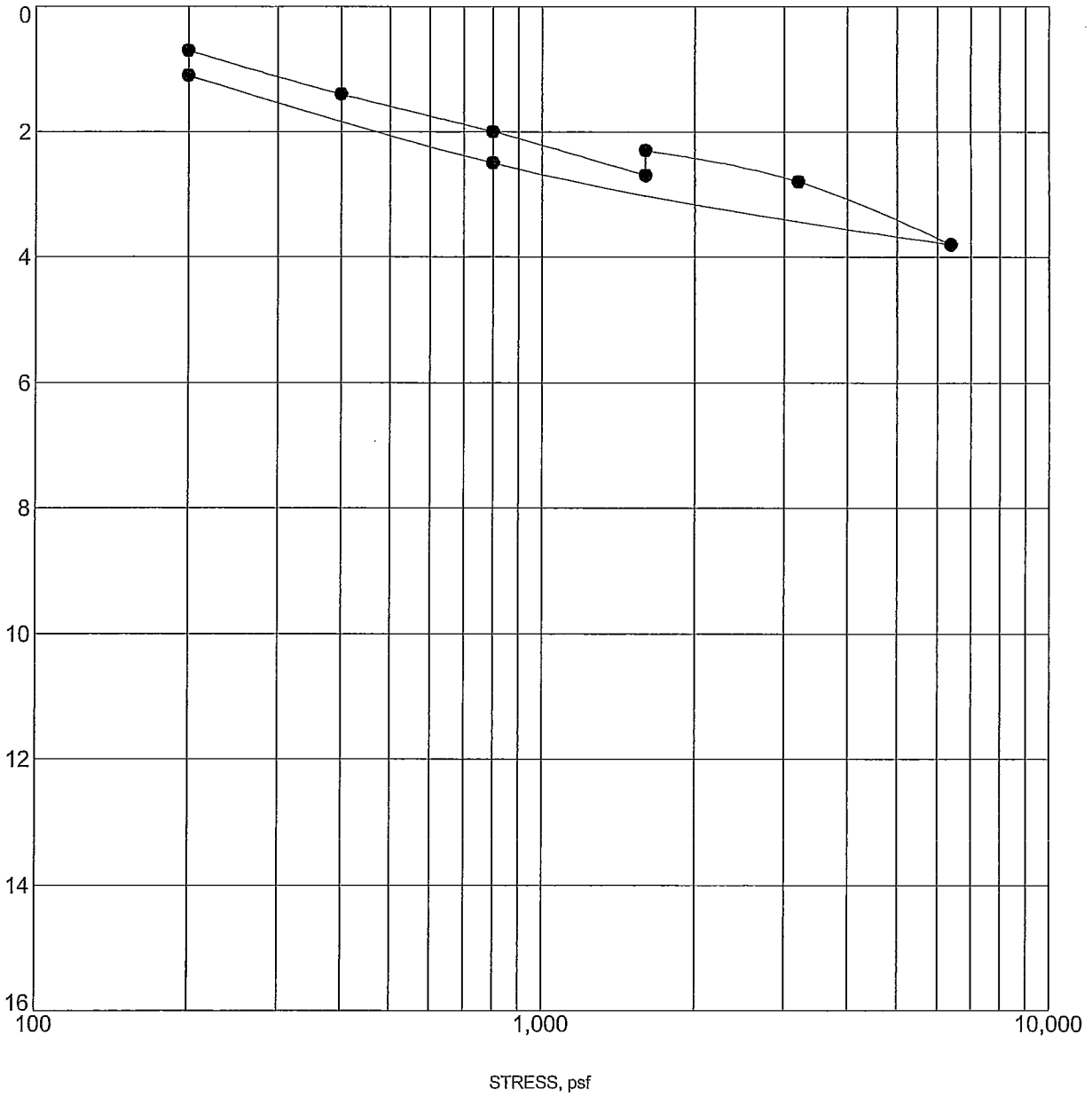
REPORT DATED: 11-14-2008

US CONSOL STRAIN 2005-052-01 HS-3.GPJ FRANKIAN.GDT 11/17/08



Water added at 1600 psf

Specimen Identification		Classification
● HS-17 15.0'		Sand Silt (ML)

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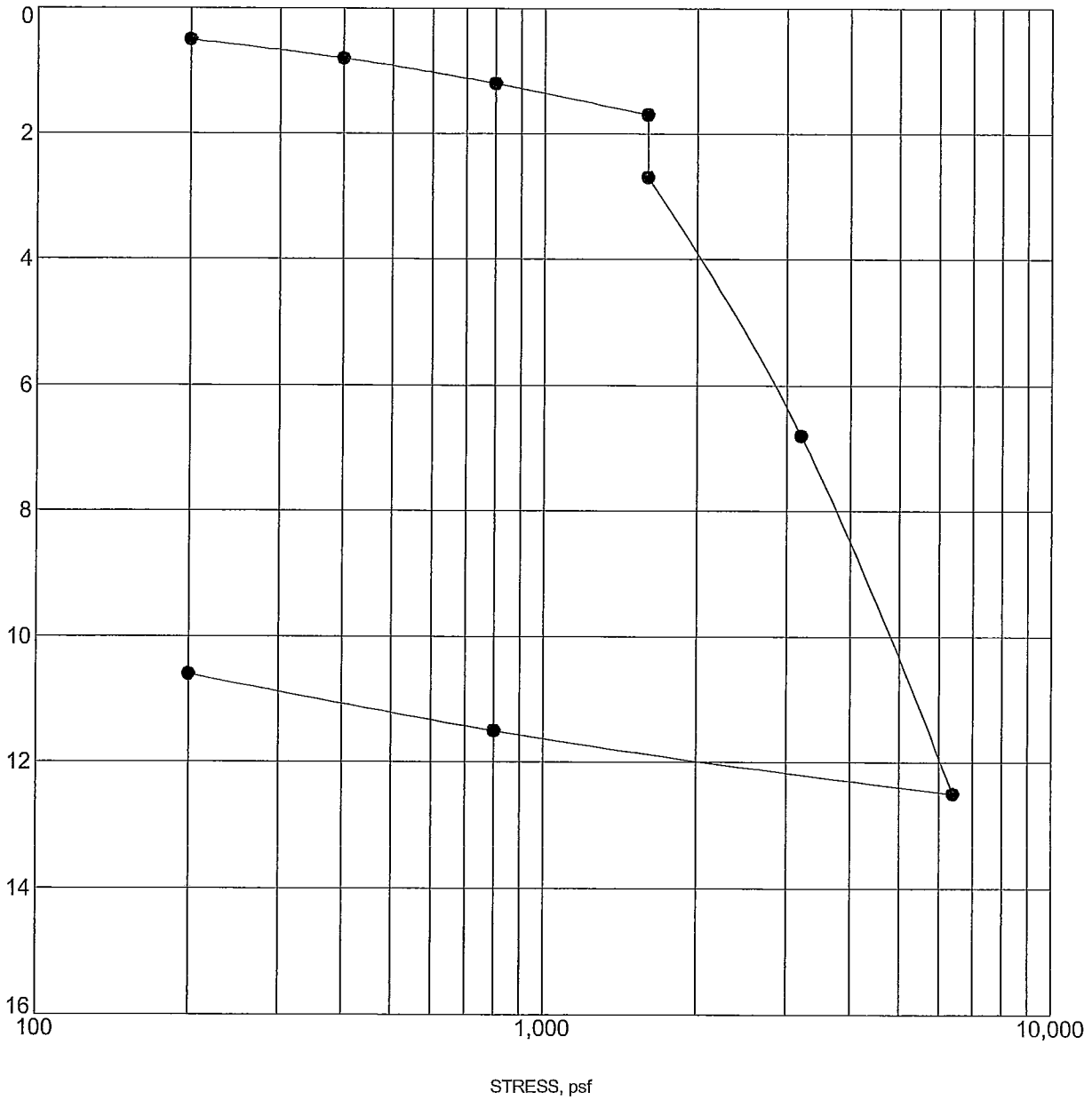
US CONSOL STRAIN 2005-052-01 HS-3.GPJ FRANKIAN.GDT 11/17/08



Water added at 1600 psf

Specimen Identification	Classification
● HS-18 10.0'	Silty Sand (SM)

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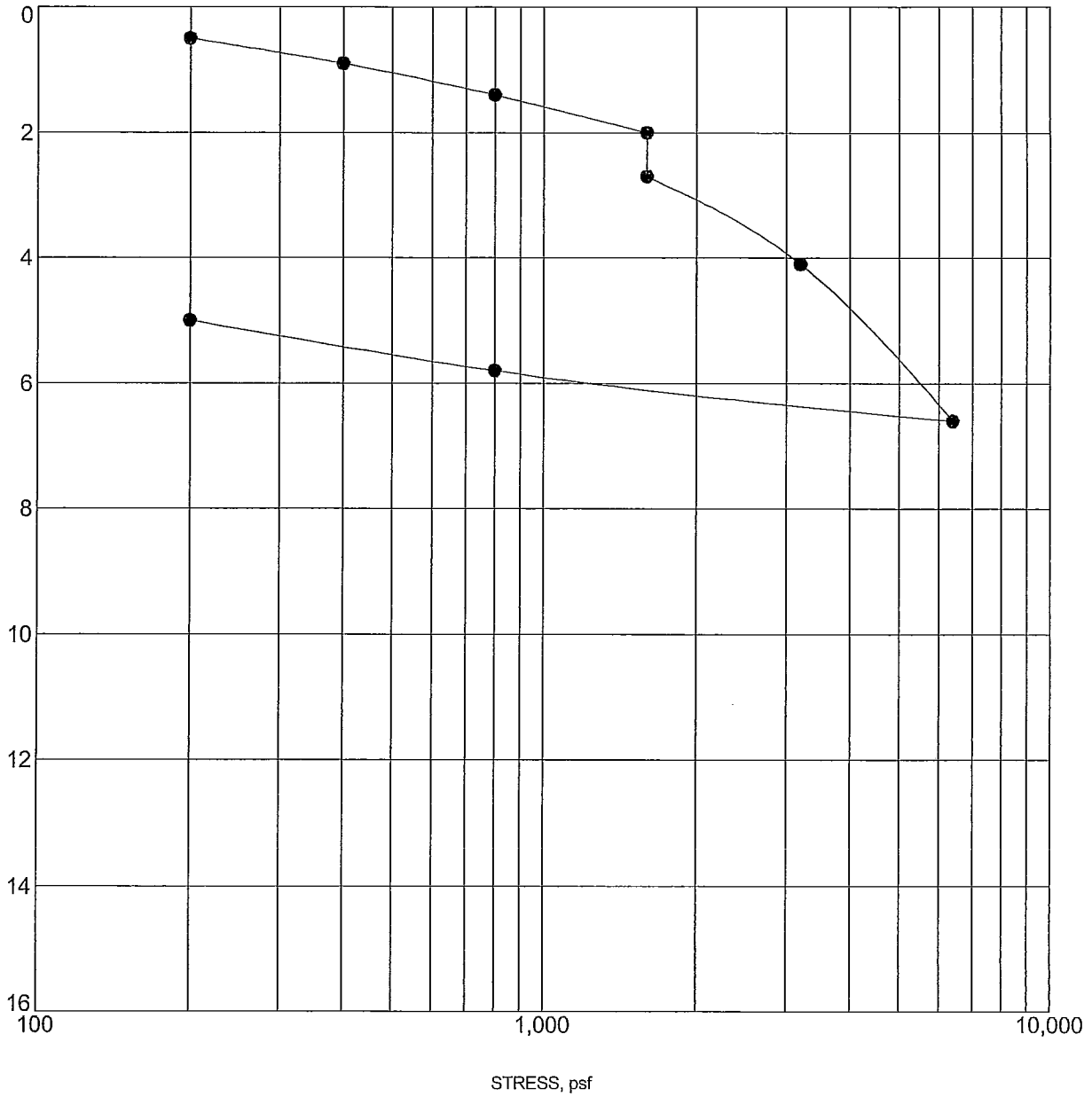
CONSOLIDATION TEST

JOB NUMBER: 2005-052-01

REPORT DATED: 11-14-2008

US CONSOL STRAIN 2005-052-01 HS-3.GPJ FRANKIAN.GDT 11/17/08



Water added at 1600 psf

Specimen Identification		Classification
● HS-18 18.0'		Sandy Silt (ML)

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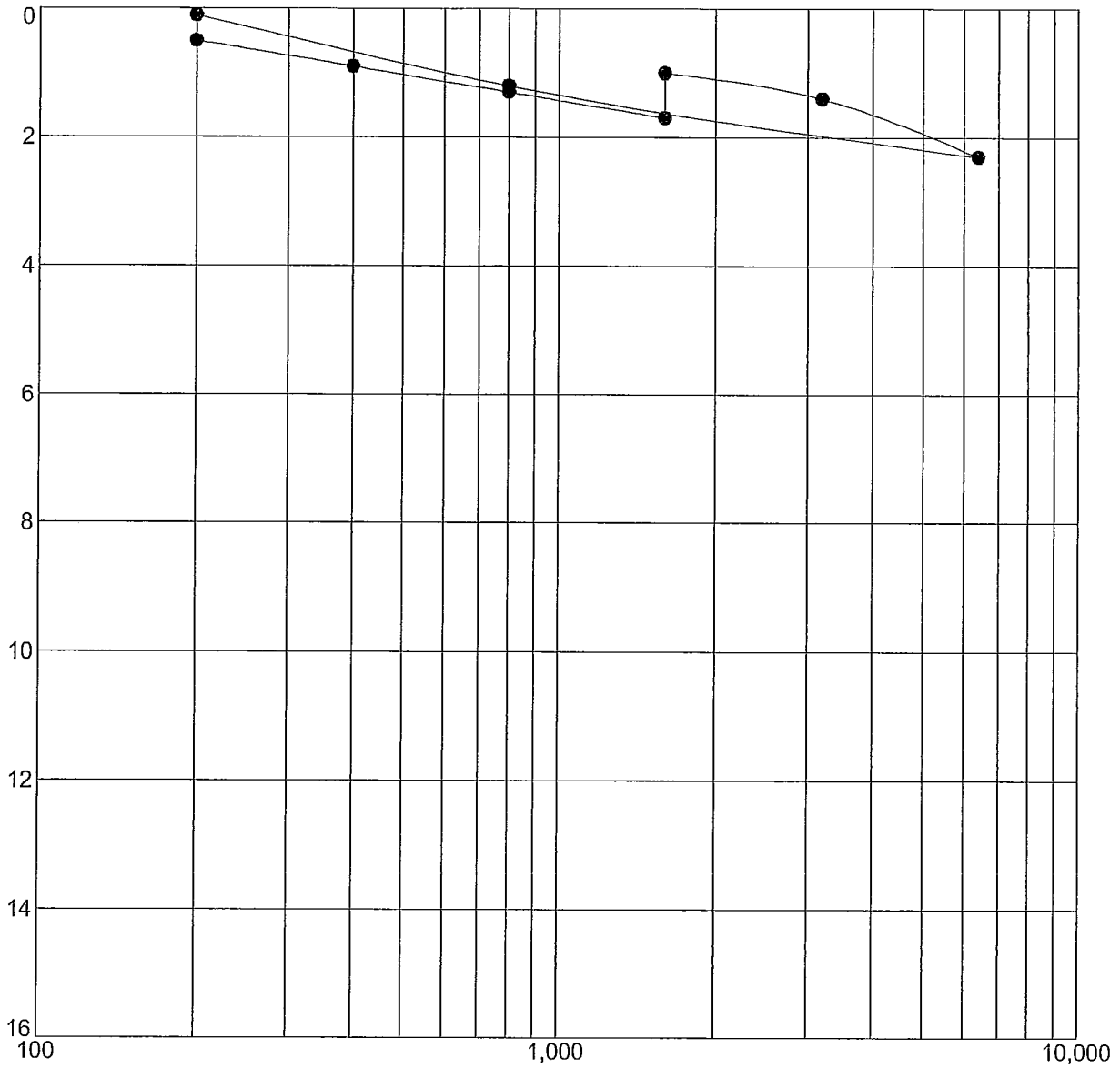
CONSOLIDATION TEST

JOB NUMBER: 2005-052-01

REPORT DATED: 11-14-2008

US CONSOL STRAIN 2005-052-01 HS-3.GPJ FRANKIAN.GDT 11/17/08



Water added at 1600 psf

Specimen Identification		Classification
● HS-19 2.0'		Silty Clay (CL) (Remolded to 90% dry density)

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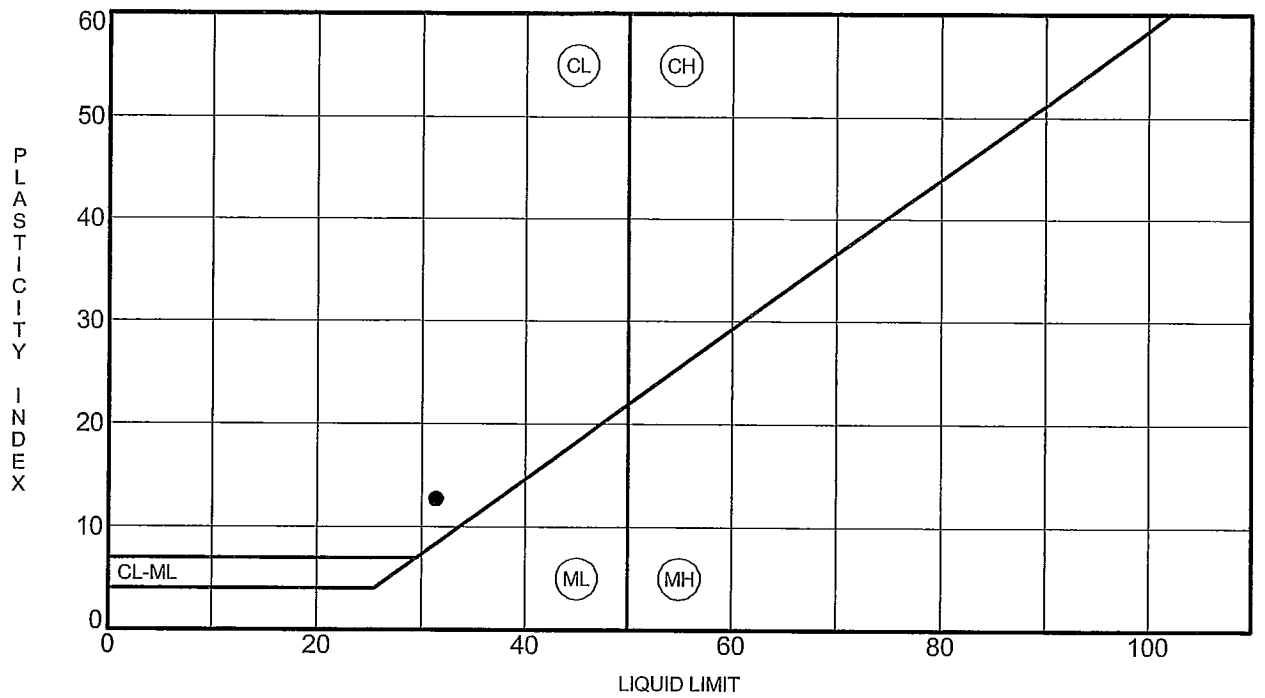
CONSOLIDATION TEST

JOB NUMBER: 2005-052-01

REPORT DATED: 11-14-2008

US CONSOL STRAIN 2005-052-01 HS-3.GPJ FRANKIAN.GDT 11/17/08



	Specimen Identification		LL	PL	PI	Fines	Classification
●	**HS-19**	**2.0**	**31**	**19**	**12**		**Silty Clay (CL) (Remolded to 90% dry density)**

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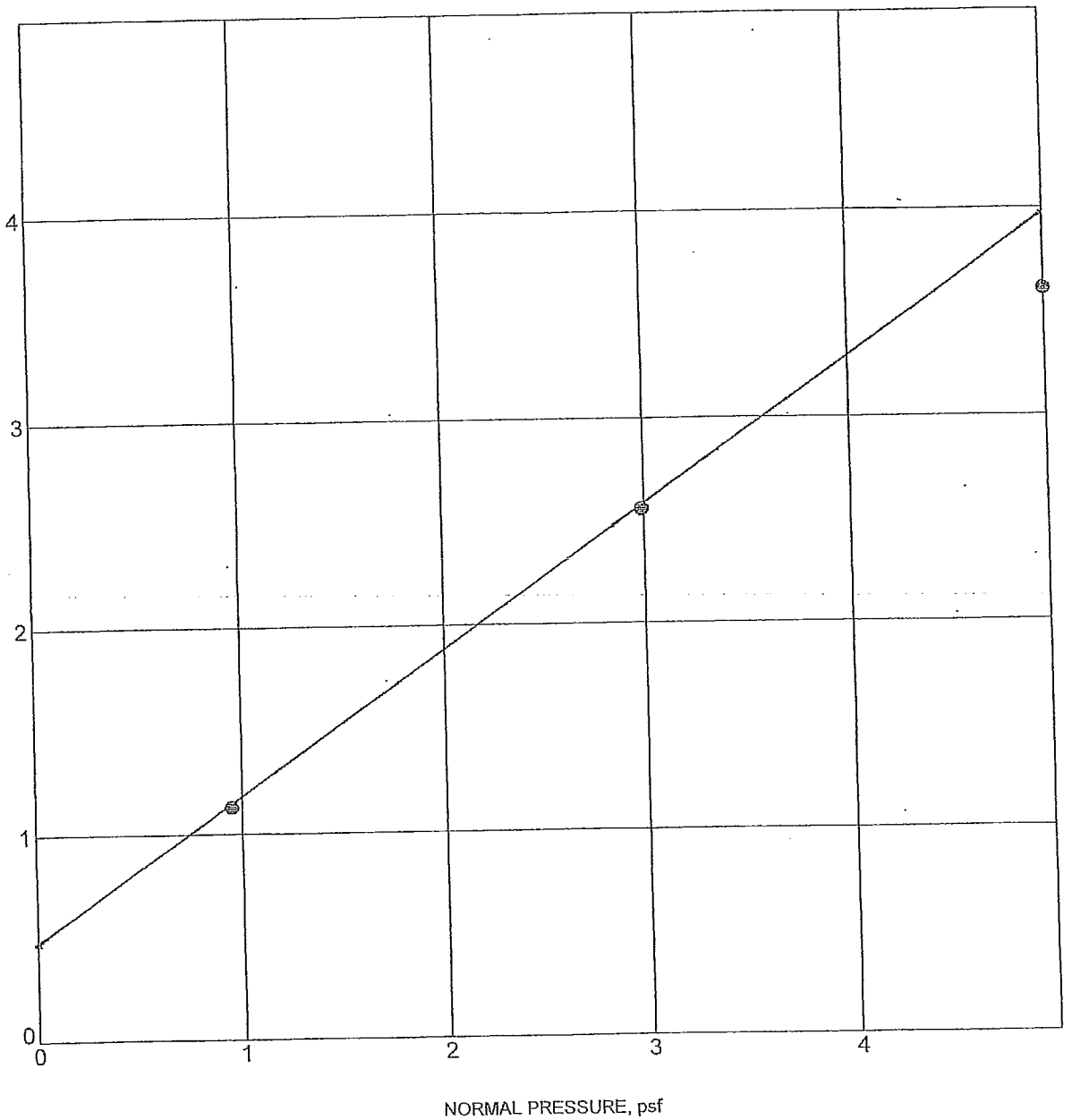
ATTERBERG LIMITS' RESULTS

JOB NUMBER: 2005-052-01

REPORT DATED: 11-14-2008



Specimen Identification		Classification			c psf	ϕ °
⊕ B-1	10.0'	ALLUVIUM (Qal) SILTY SAND (SM)			450	35

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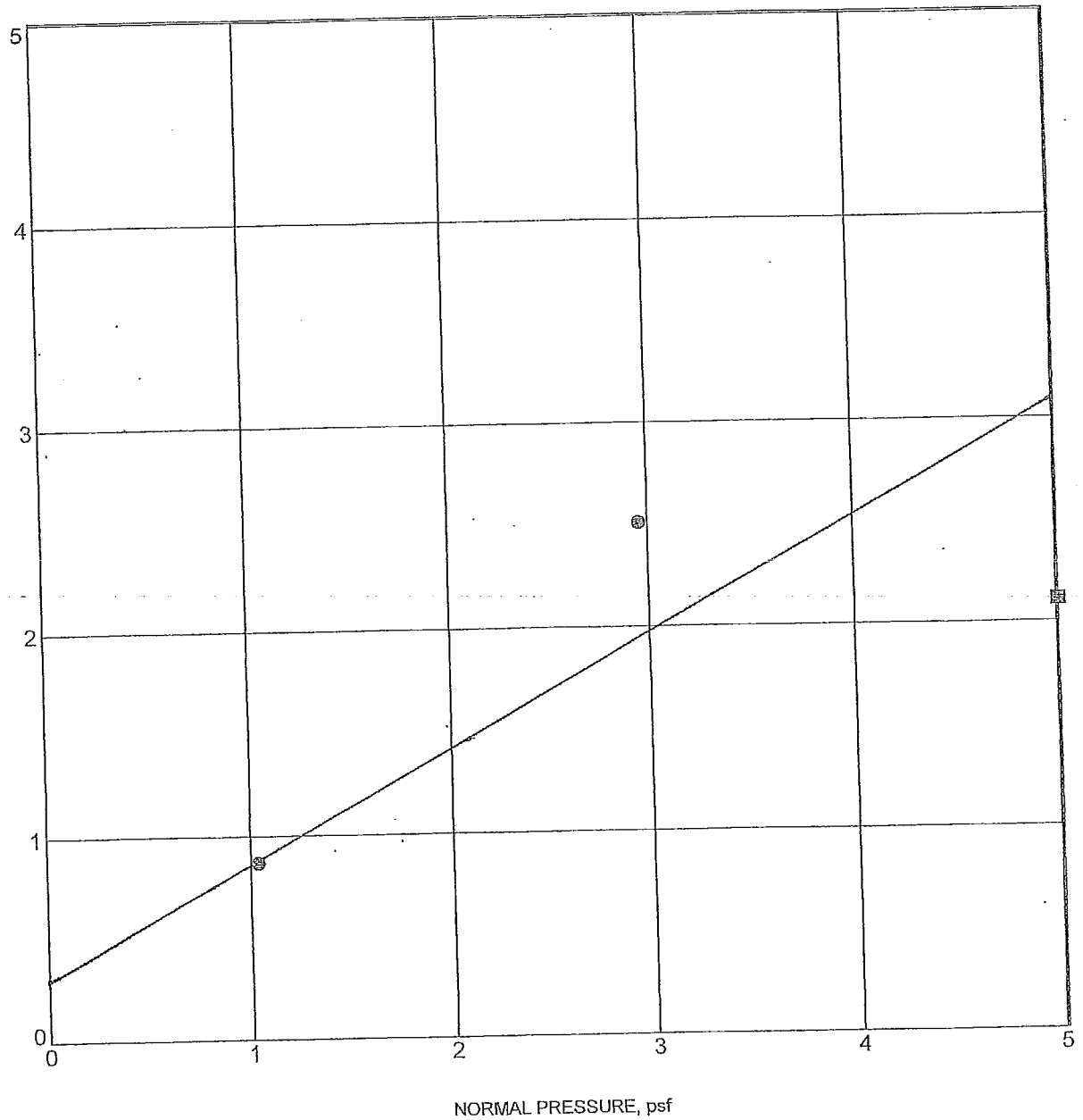
DIRECT SHEAR TEST

JOB NUMBER: 2005-052-02

REPORT DATED: 02-10-2006

US DIRECT SHEAR 2005-052-02.GPJ FRANKIAN.GDT 2/8/06



Specimen Identification			Classification			c, psf	ϕ °
●	B-7	5.0'	TERRACE DEPOSIT (Qog), GRAVELLY SAND			300	28
■	B-7	10.0'	TERRACE DEPOSIT (Qog), GRAVELLY SAND			300	28

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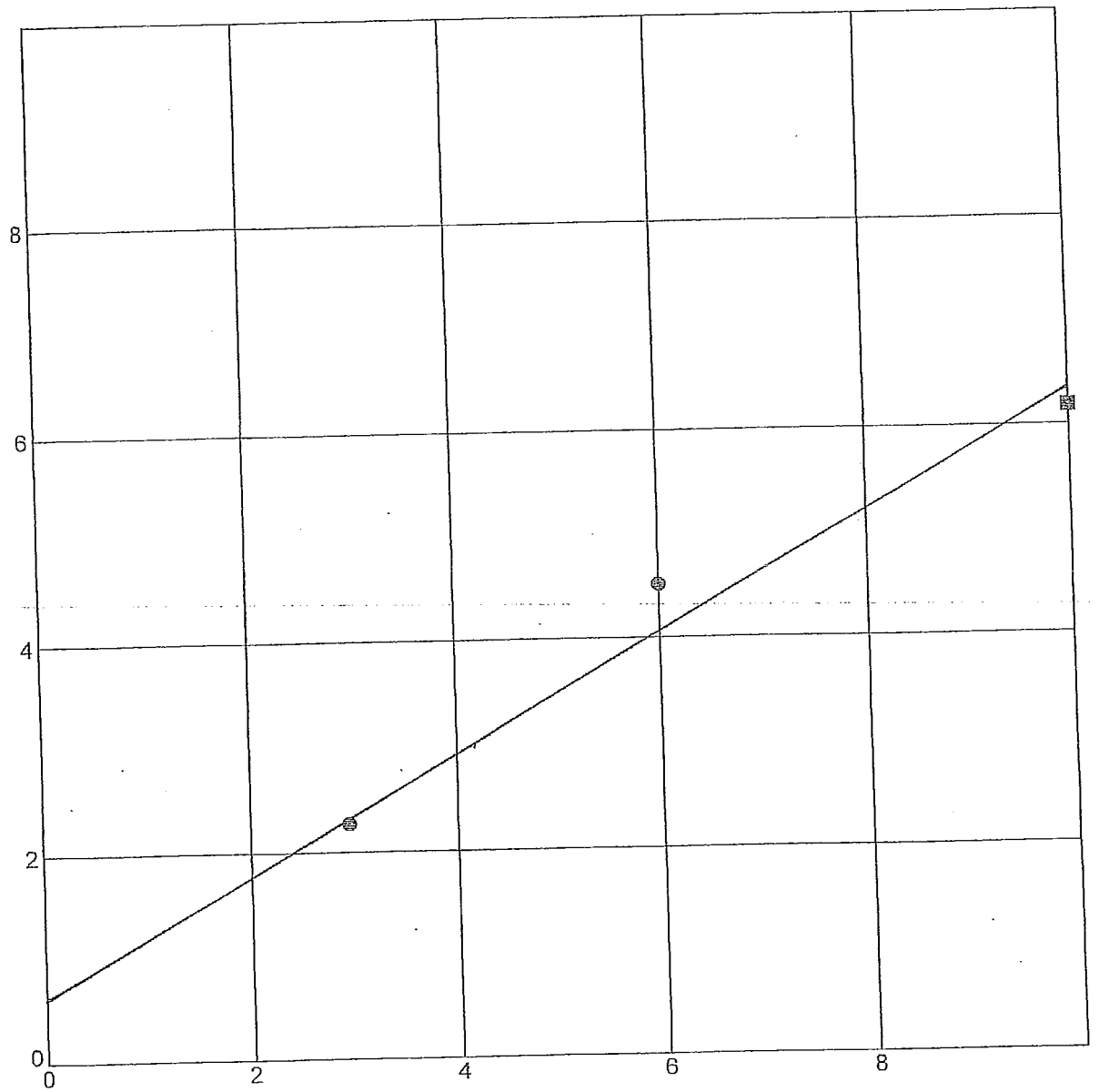
DIRECT SHEAR TEST

JOB NUMBER: 2005-052-02

REPORT DATED: 02-10-2006

US DIRECT SHEAR 2005-052-02.GPJ FRANKIAN.GDT 2/8/06



Specimen Identification			Classification			c psf	ϕ °
⊗	B-7	50.0'	MINT CANYON FORMATION (Tmc) SANDSTONE			600	29
▨	B-7	60.0'	MINT CANYON FORMATION (Tmc) SANDSTONE			600	29

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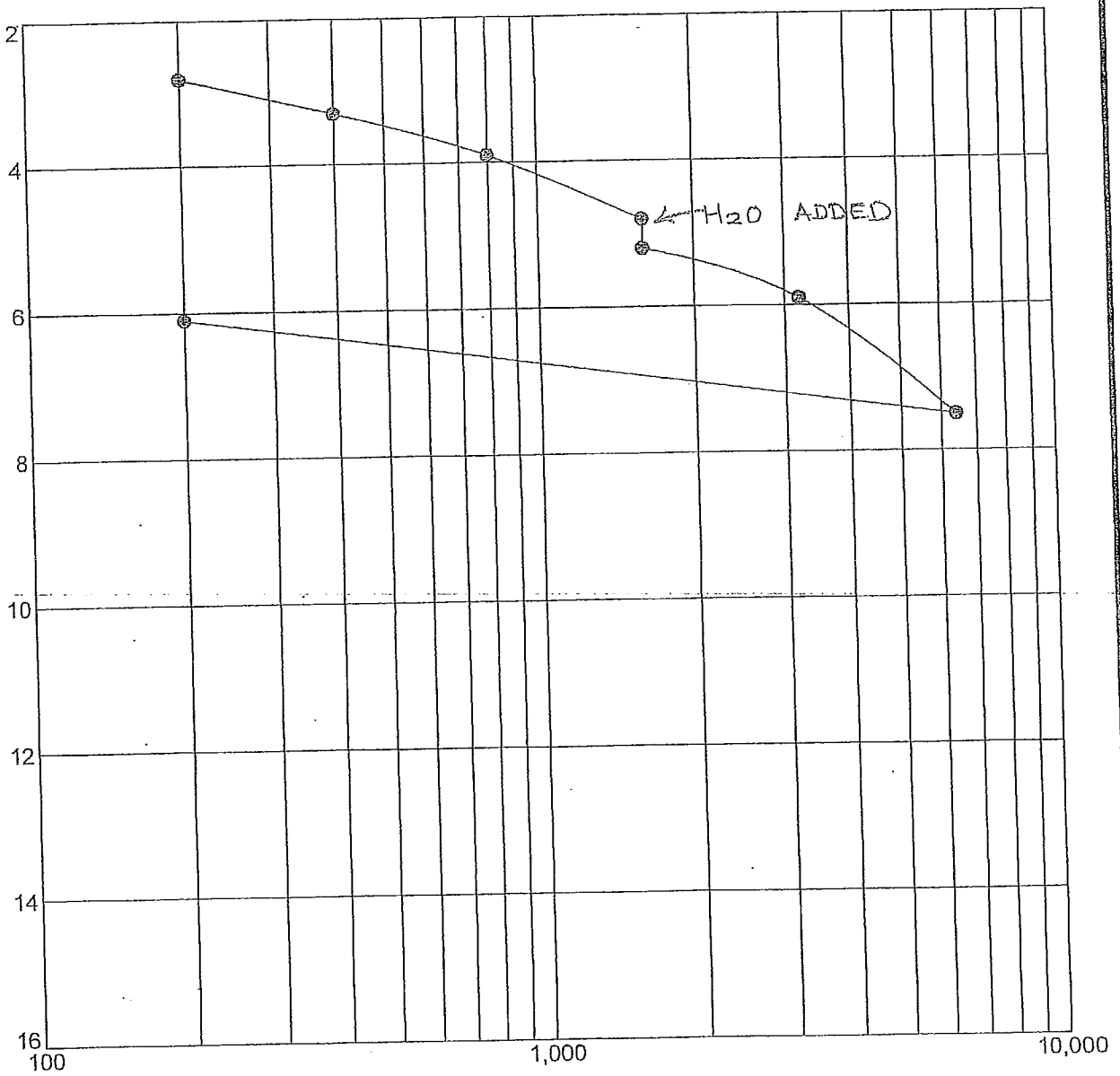
DIRECT SHEAR TEST

JOB NUMBER: 2005-052-02

REPORT DATED: 02-10-2006

US DIRECT SHEAR 2005-052-02.GPJ FRANKIAN.GDT 2/8/06



Specimen Identification		Classification
⊕ B-1	9.0'	ALLUVIUM (Qal) SILTY SAND (SM)

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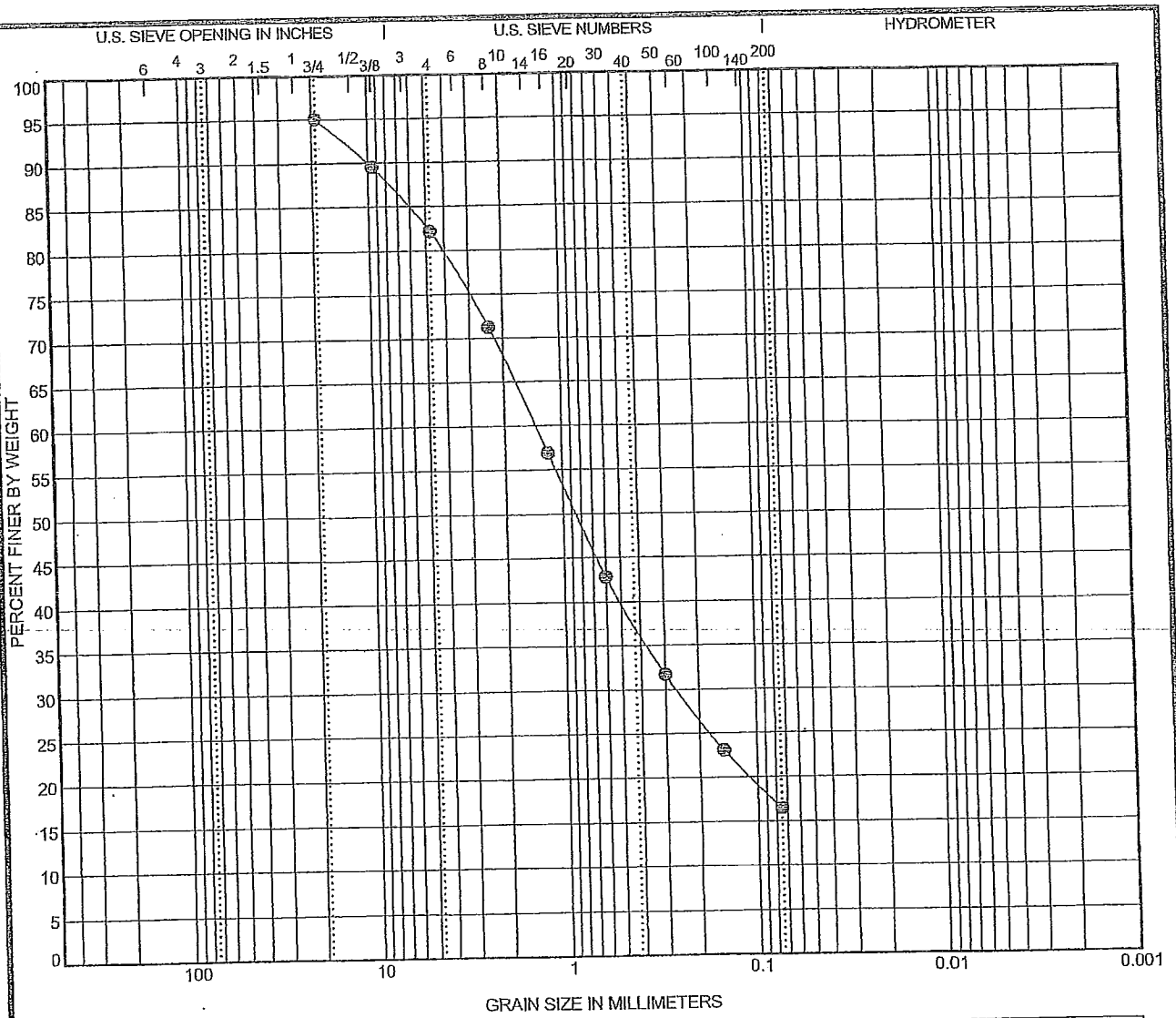
CONSOLIDATION TEST

JOB NUMBER: 2005-052-02

REPORT DATED: 02-10-2006

US CONSOL STRAIN 2005-052-02.GPJ FRANKIAN.GDT 2/13/06



COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

	Specimen Identification		Classification	LL	PL	PI	Cc	Cu
⊗	B-3	10.0'	ALLUVIUM (Qal) SILTY SAND (SM-SC)					

	Specimen Identification		D100	D60	D30	D10	%Gravel	%Sand	%Silt	%Clay
⊗	B-3	10.0'	19	1.368	0.26		12.9	65.8	16.5	

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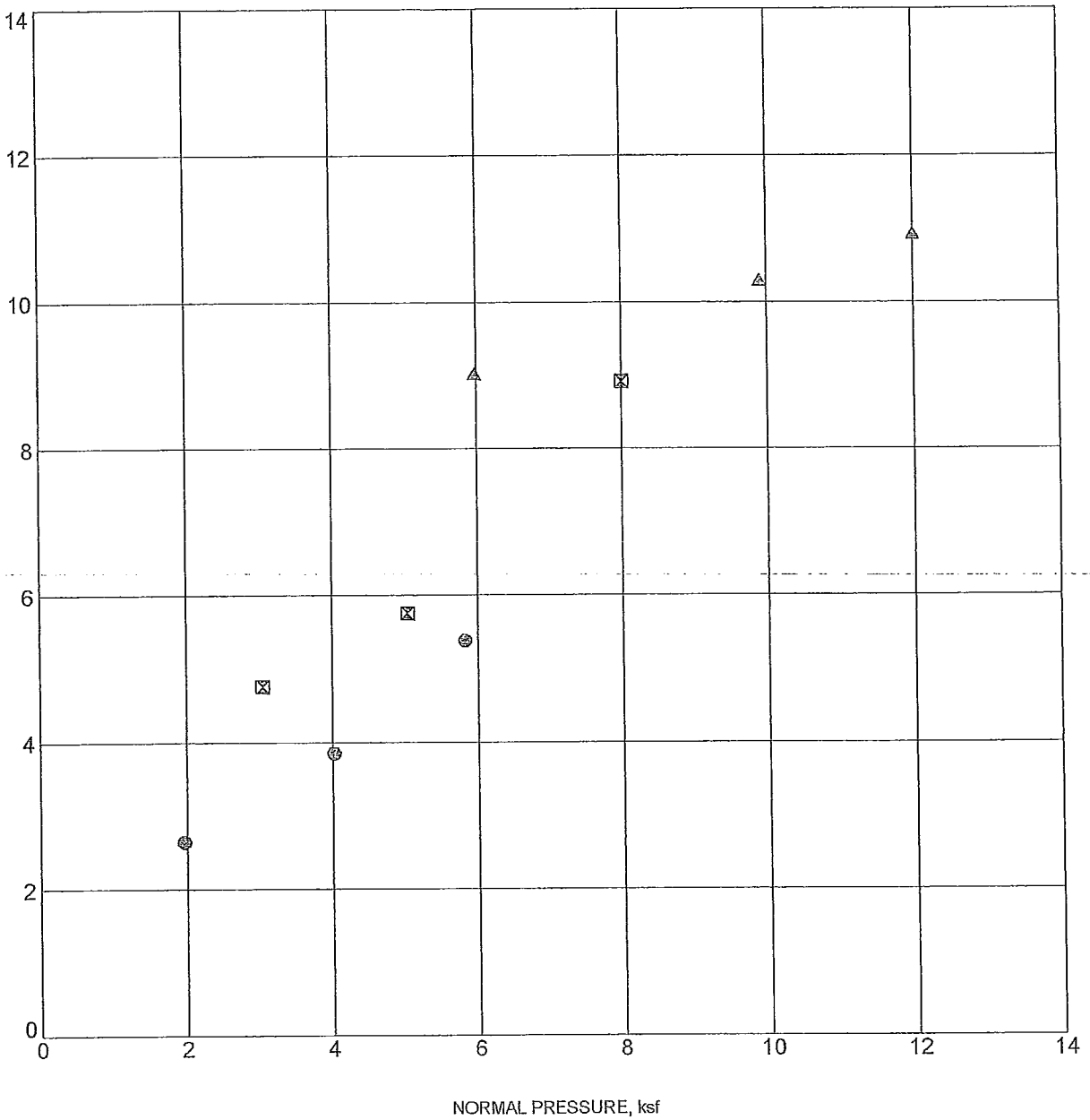
GRAIN SIZE DISTRIBUTION

JOB NUMBER: 2005-052-02

REPORT DATED: 02-10-2006

US GRAIN SIZE 2005-052-02.GPJ FRANKIAN.GDT 2/7/06



Specimen Identification			Classification
⊛	B-8	15.0'	SANDY SILTSTONE (Tmc)
⊠	B-8	25.0'	MUDSTONE (Tmc)
▲	B-8	55.0'	SANDSTONE (Tmc)

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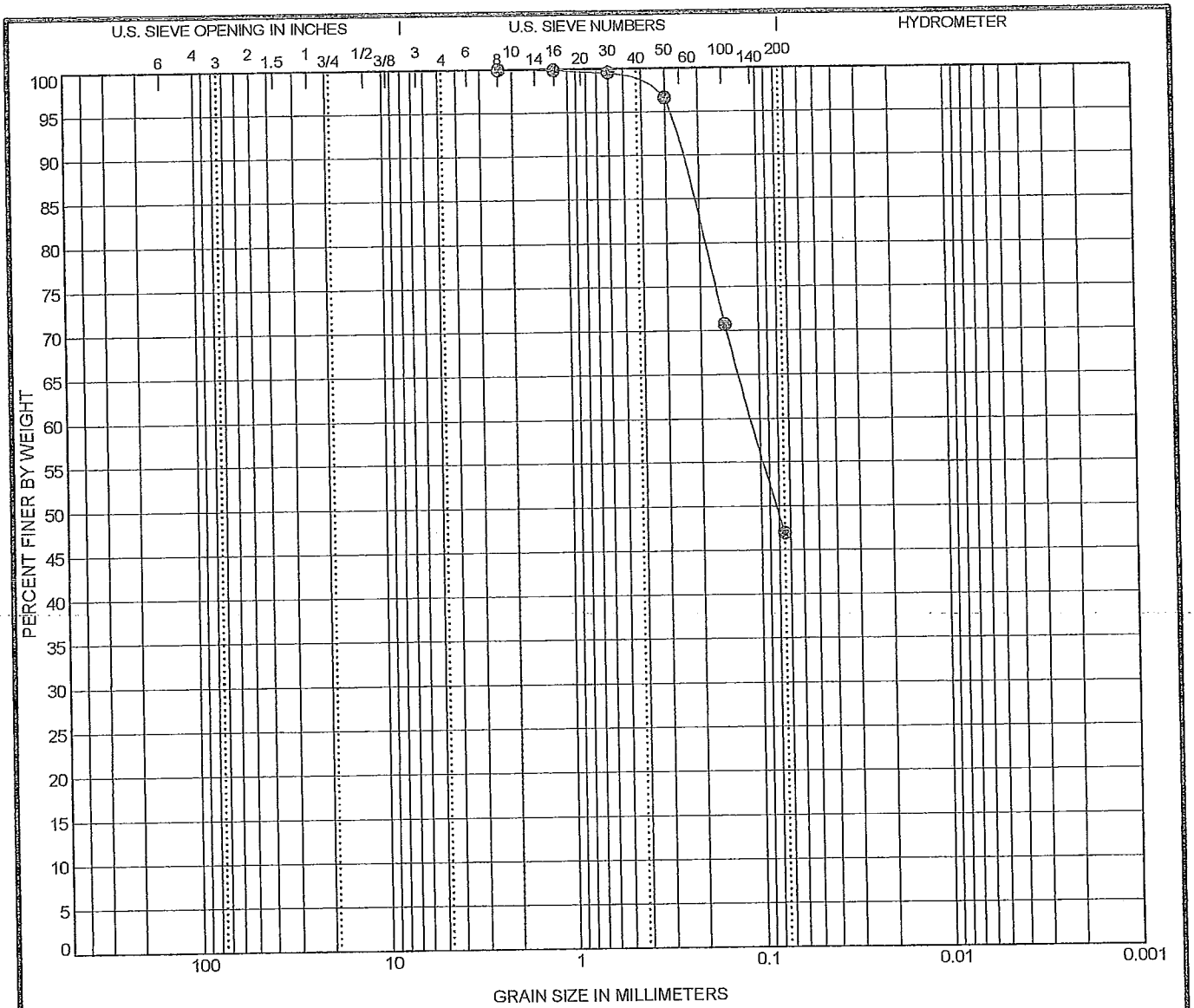
DIRECT SHEAR TEST

JOB NUMBER: 2005-052-01

REPORT DATED: 12-21-2007

US DIRECT SHEAR 2005-052-01.GPJ FRANKIAN.GDT 12/11/07



COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

Specimen Identification		Classification	LL	PL	PI	Cc	Cu
B-8	15.0	SANDY SILTSTONE (Tmc)					

Specimen Identification		D100	D60	D30	D10	%Gravel	%Sand	%Silt	%Clay
B-8	15.0	2.36	0.11				53.0	47.0	

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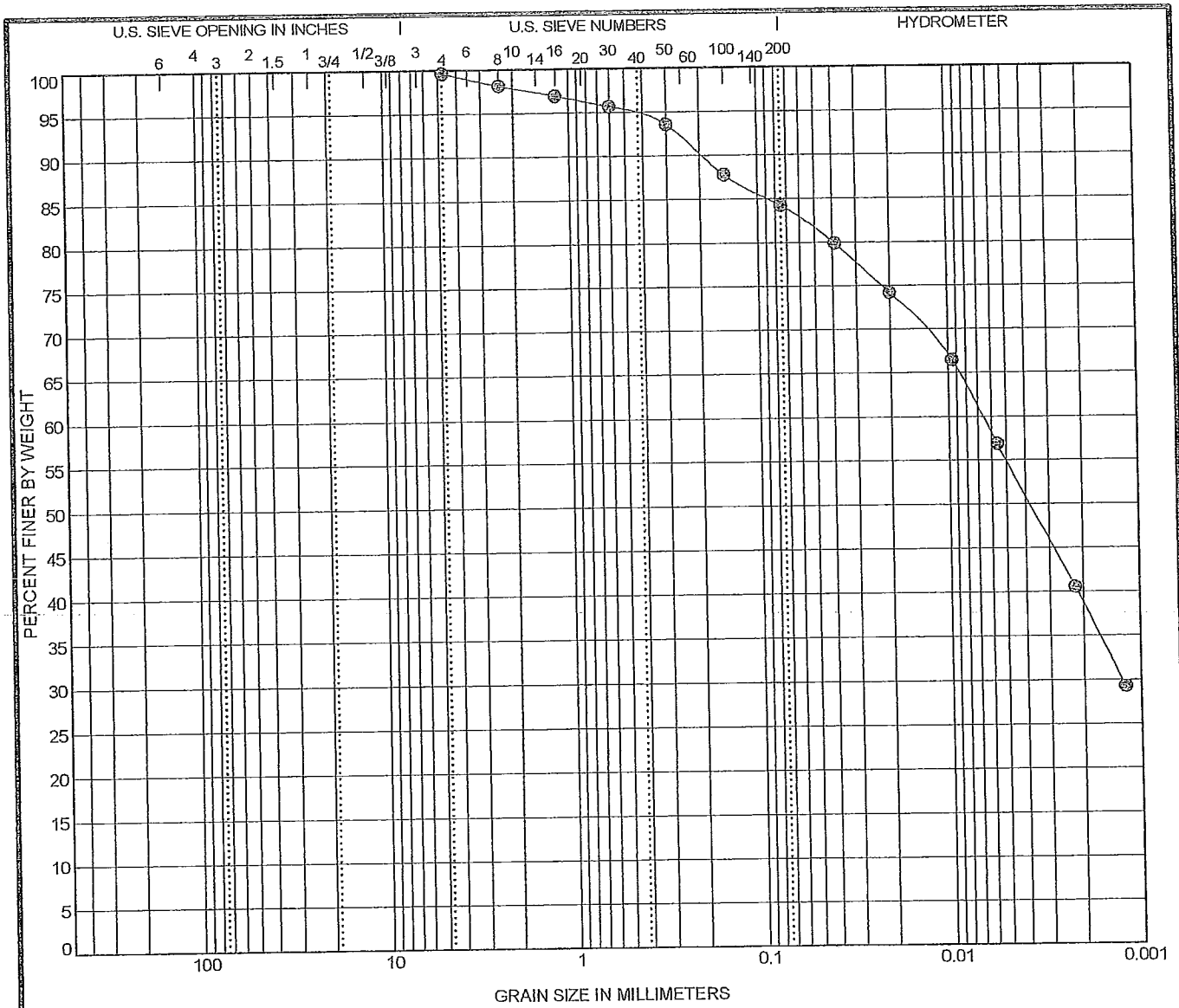
GRAIN SIZE DISTRIBUTION

JOB NUMBER: 2005-052-01

REPORT DATED: 12-21-2007

US GRAIN SIZE 2005-052-01.GPJ FRANKIAN.GDT 12/11/07



COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

Specimen Identification		Classification	LL	PL	PI	Cc	Cu
B-8	25.0	MUDSTONE (Tmc)	62	27	35		

Specimen Identification		D100	D60	D30	D10	%Gravel	%Sand	%Silt	%Clay
B-8	25.0	4.75	0.007	0.001			15.3	29.4	54.9

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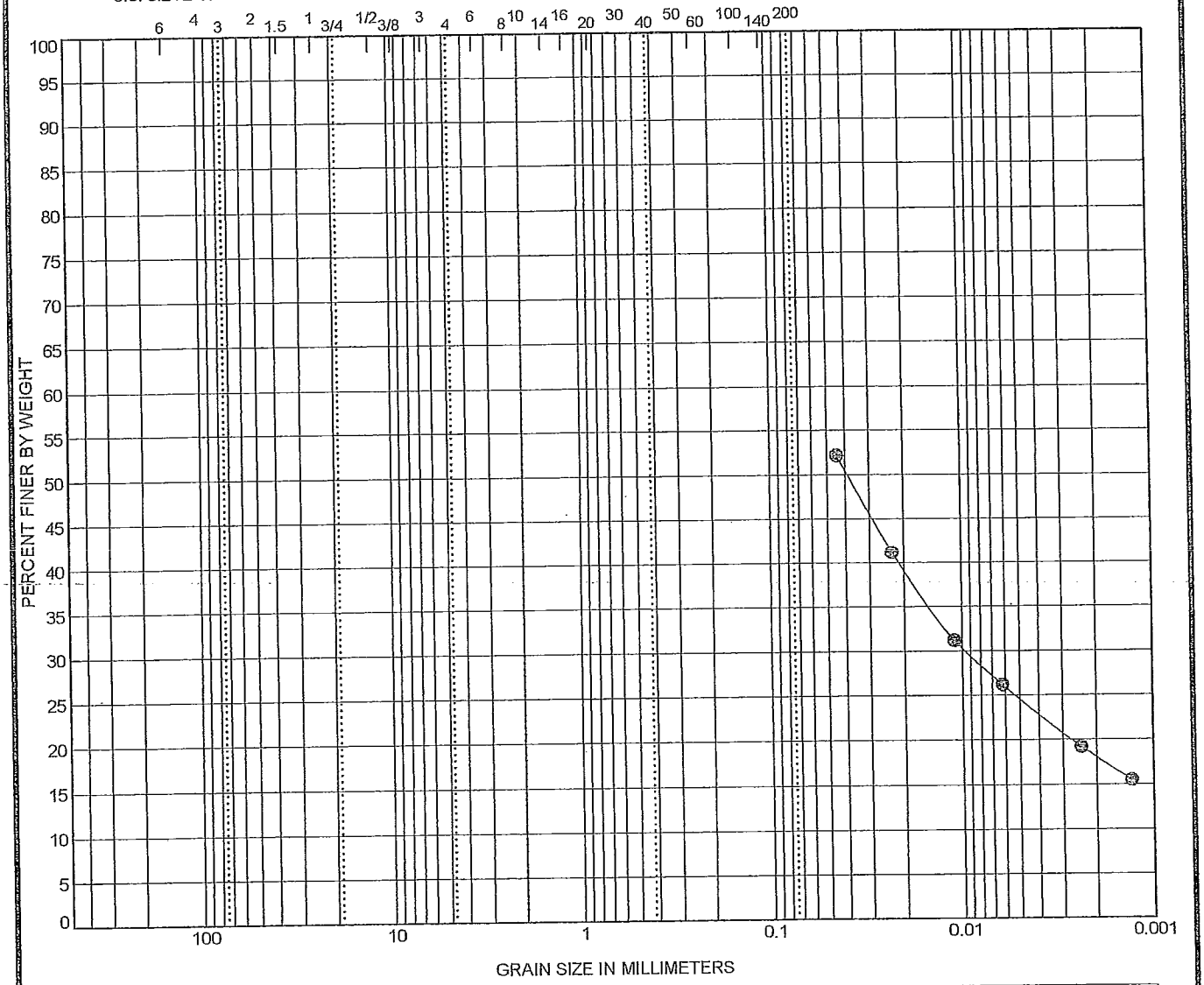
GRAIN SIZE DISTRIBUTION

JOB NUMBER: 2005-052-01

REPORT DATED: 12-21-2007

US GRAIN SIZE 2005-052-01.GPJ FRANKIAN.GDT 12/20/07



COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

	Specimen Identification		Classification	LL	PL	PI	Cc	Cu
●	HS-2	30.0	SILTSTONE (Tmc)	37	22	15		

	Specimen Identification		D100	D60	D30	D10	%Gravel	%Sand	%Silt	%Clay
●	HS-2	30.0			0.01					24.6

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GRAIN SIZE DISTRIBUTION

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REPORT DATED: 12-21-2007

US GRAIN SIZE 2005-052-01.GPJ FRANKIAN.GDT 12/20/07

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Table 1 - Laboratory Tests on Soil Samples

R.T. Frankian & Assoc.
J.S.B.
Your #2007-037-01, SA #07-1537LAB
16-Nov-07

Sample ID			B3 @ 10' SP / SM
Resistivity		**Units**	
as-received		ohm-cm	80,000
minimum		ohm-cm	11,600
pH			8.0
Electrical Conductivity		mS/cm	0.04
Chemical Analyses			
Cations			
calcium	Ca^{2+}	mg/kg	11
magnesium	Mg^{2+}	mg/kg	3.0
sodium	Na^{1+}	mg/kg	46
potassium	K^{1+}	mg/kg	1.0
Anions			
carbonate	CO_3^{2-}	mg/kg	ND
bicarbonate	HCO_3^{1-}	mg/kg	95
flouride	F^{1-}	mg/kg	2.0
chloride	Cl^{1-}	mg/kg	1.0
sulfate	SO_4^{2-}	mg/kg	3.0
phosphate	PO_4^{3-}	mg/kg	3.0
Other Tests			
ammonium	NH_4^{1+}	mg/kg	ND
nitrate	NO_3^{1-}	mg/kg	0.6
sulfide	S^{2-}	qual	na
Redox		mV	na

Minimum resistivity per CTM 643

Electrical conductivity in millisiemens/cm and chemical analysis were made on a 1:5 soil-to-water extract.
mg/kg = milligrams per kilogram (parts per million) of dry soil.
Redox = oxidation-reduction potential in millivolts
ND = not detected
na = not analyzed

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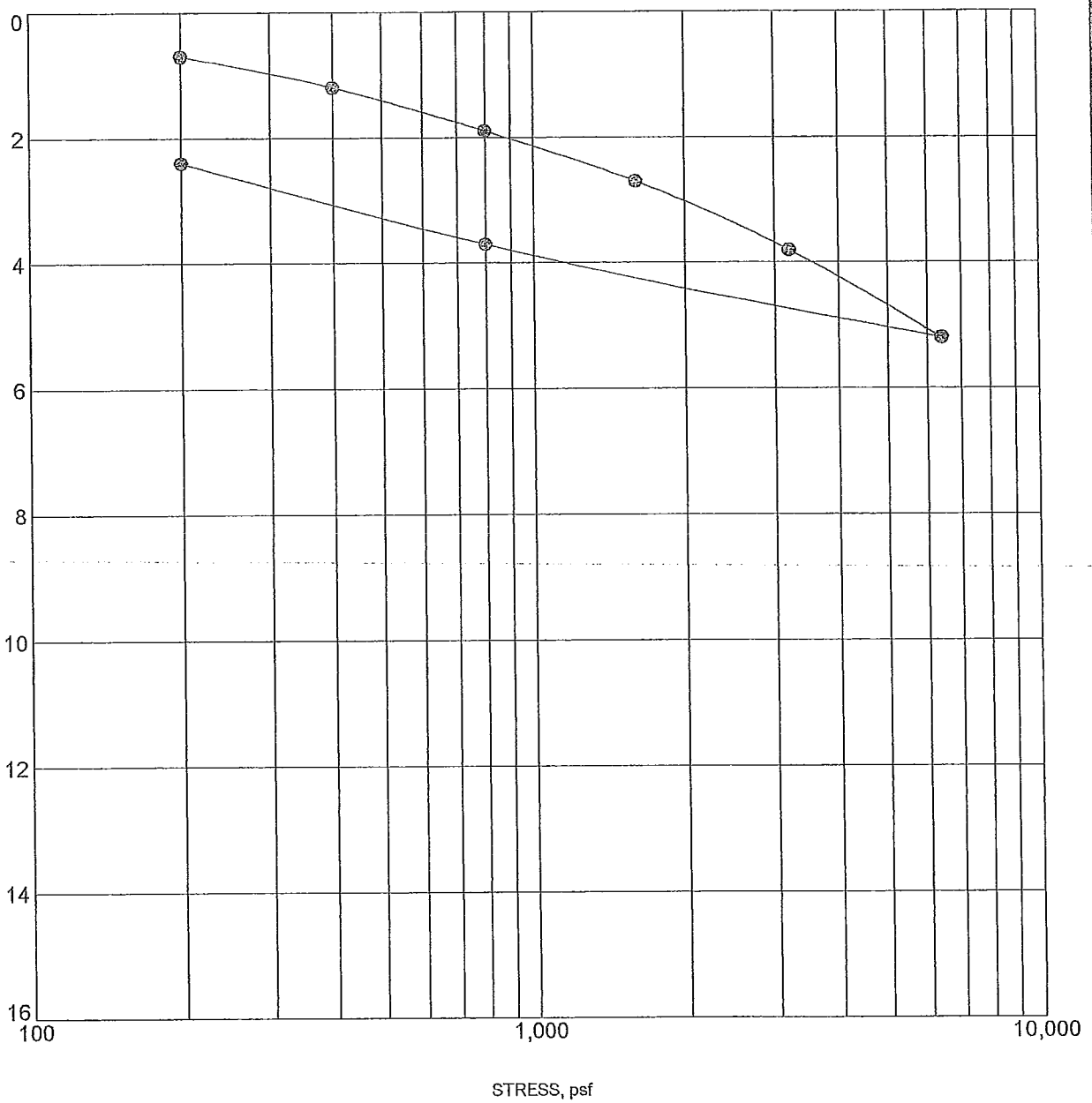
For use with report dated 12/21/2007; RTF Job No. 2005-052-01

For use with report dated 11/14/2008; RTF Job No. 2005-052-01



Water added at 1600 psf

Specimen Identification		Classification
⊜ HS-2 8.0'		SAND (SP-SM)

US CONSOL STRAIN 2007-019.GPJ FRANKIAN.GDT 6/26/07

R. T. Frankian & Associates
1329 Scott Road
Burbank, Ca 91504
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CONSOLIDATION TEST

JOB NUMBER: 2007-019-01

REPORT DATED: 06-22-2007

Vista Canyon Ranch, LLC
November 14, 2008
2005-052-01

APPENDIX C

LIQUEFACTION ANALYSES

RTF&A
GEOTECHNICAL ENGINEERING & ENGINEERING GEOLOGY

APPENDIX C

LIQUEFACTION CALCULATIONS

Liquefaction analyses were performed on both 2005 and 2007 CPT data. The symbols, method and N values used in the liquefaction analyses including detail computations for typical CPT-1 are presented in this Appendix. The general liquefaction analyses including computations for all CPT data are also presented in this Appendix. Please note that the there is a discrepancy between the raw CPT data presented in Kehoe Testing and Engineering (depth interval = 12 inches) and in our liquefaction spread sheet analyses (depth interval = 2 inches) due to the difference in depth interval readings.

Sheet Ind 1

SPREADSHEET TO CALCULATE CYCLIC RESISTANCE RATIO USING CPT DATA

RTF Job: 2005-052-01
PROJECT :
CPT: CPT-1 CPT DATE: 12/2/05 KTE
DATE : 11/10/2008
amax = 0.53 g
M = 6.60
MSF = 1.5

Ic = (((3.47-LOG(Q))^2)+(LOG(F%)+1.22)^2)^0.5
dqc1N = IF(FC>=35,60,IF(FC<=5,0,2*(FC-5)))
CRR = IF(qc1Ncs<50,(0.833*(qc1Ncs/1000)+0.05),(93*(qc1Ncs/1000)^3+0.08))
MSF = 10^2.24/M^2.56
CSR = 0.65(amax/g)(sigv/sigv')rd = Seed's Equation
Z = IF(Ic<1.31,7,IF(Ic<2.05,6,IF(Ic<2.6,5,IF(Ic<2.95,4,IF(Ic<3.6,3,2)))))
Q = [(qc-St)/Pa]*[(Pa/S')^n] Kc = IF(Ic<=1.64,1,(-0.403*Ic^4+5.581*Ic^3-21.63*Ic^2+33.75*Ic-17.88))

Liquefiable Soil (Type 5+ or 6+) = 2.4
Seismic Settlement Soil (Type) = 6
Actual Water = 30 feet
Design Water = 9 feet
Gamma = 120 pcf
rd = 2

Added Fill = 2 feet
Fill Density = 125 pcf
Pa = 1.04427 tsf = 100 kPa
Threshold FS = 1.10

FS = CRR*MSF/CSR

FS = Thresho
NL = Above
Z
3
4
5
6
7

Depth (m)	Depth (ft)	Tip Resist qc (tsf)	Sleeve Fric fs (tsf)	Total Stress (tsf) 0.00	Water Pressure (tsf) Sw	Effective Stress (tsf) S' = St - Sw	Norm. Fr. Ratio F (%) = fs/(qc-St)	Norm. Pen. Res. Q for n=1 (qc-St)/S'	Soil Index Ic for n=1	Norm. Pen. Res. Q for n= 0.5	Soil Index Ic for n=0.5	Norm. Pen. Res. Q for n= 0.7	Soil Index Ic for n=0.7	Soil Index Ic	Cq exp n	Overburden Correction Cq = 1.7 > (Pa/S')^n	Norm. Cone Res. qc1N = qc*Cq/Pa	Grain Char. Corr. Kc	Equivalent Clean Sand Cone Res. (qc1N)cs = Kc*qc1N	Cyclic Resistance Ratio CRR	rd	Design Effective Stress (tsf) S' = St - Sw	Cyclic Stress Ratio CSR	Depth (ft) Depth	Soil Behavior Type Z	Factor of Safety FS	Liquefiable Layers
0.00	0.00	0.00	0.00	0.00	0.00	0.00																					
0.05	0.16	28.20	1.00	0.010	0.000	0.010	3.55	2864	1.77	278	2.05	707	1.88	2.05	0.50	1.70	46	1.4	62.6	0.103	1.000	0.010	0.344	0.16	6 S	NL	0
0.10	0.33	98.40	0.33	0.020	0.000	0.020	0.34	4997	0.78	686	0.98	1518	0.80	0.98	0.50	1.70	160	1.0	160.2	0.462	0.999	0.020	0.344	0.33	7 S	NL	0
0.15	0.49	133.80	0.55	0.030	0.000	0.030	0.41	4530	0.85	762	1.02	1554	0.88	1.02	0.50	1.70	218	1.0	217.8	1.041	0.999	0.030	0.344	0.49	7 S	NL	0
0.20	0.66	129.40	0.90	0.039	0.000	0.039	0.70	3286	1.06	638	1.25	1229	1.13	1.25	0.50	1.70	211	1.0	210.7	0.949	0.998	0.039	0.344	0.66	7 S	NL	0
0.25	0.82	135.00	1.00	0.049	0.000	0.049	0.74	2742	1.09	595	1.29	1097	1.17	1.29	0.50	1.70	220	1.0	219.8	1.067	0.998	0.049	0.344	0.82	7 S	NL	0
0.30	0.98	134.90	1.43	0.059	0.000	0.059	1.06	2283	1.25	543	1.45	964	1.34	1.45	0.50	1.70	220	1.0	219.6	1.065	0.998	0.059	0.344	0.98	7 S	NL	0
0.35	1.15	125.00	1.45	0.069	0.000	0.069	1.16	1813	1.30	466	1.51	802	1.40	1.51	0.50	1.70	203	1.0	203.5	0.864	0.997	0.069	0.344	1.15	7 S	NL	0
0.40	1.31	115.90	1.38	0.079	0.000	0.079	1.19	1471	1.33	404	1.56	677	1.45	1.56	0.50	1.70	189	1.0	188.7	0.705	0.997	0.079	0.343	1.31	6 S	NL	0
0.45	1.48	104.80	1.23	0.089	0.000	0.089	1.17	1182	1.35	344	1.59	564	1.48	1.59	0.50	1.70	171	1.0	170.6	0.542	0.997	0.089	0.343	1.48	6 S	NL	0
0.50	1.64	86.50	1.23	0.098	0.000	0.098	1.42	878	1.47	269	1.72	432	1.61	1.72	0.50	1.70	141	1.1	148.3	0.383	0.996	0.098	0.343	1.64	6 S	NL	0
0.55	1.80	78.60	1.23	0.108	0.000	0.108	1.57	725	1.54	233	1.79	367	1.68	1.79	0.50	1.70	128	1.1	141.0	0.341	0.996	0.108	0.343	1.80	6 S	NL	0
0.60	1.97	65.40	1.30	0.118	0.000	0.118	1.99	553	1.68	186	1.94	287	1.83	1.94	0.50	1.70	106	1.2	130.4	0.286	0.995	0.118	0.343	1.97	6 S	NL	0
0.65	2.13	62.40	1.24	0.128	0.000	0.128	1.99	487	1.71	170	1.96	259	1.85	1.96	0.50	1.70	102	1.3	127.1	0.271	0.995	0.128	0.343	2.13	6 S	NL	0
0.70	2.30	57.00	1.13	0.138	0.000	0.138	1.99	413	1.74	150	2.00	225	1.89	2.00	0.50	1.70	93	1.3	120.0	0.241	0.995	0.138	0.343	2.30	6 S	NL	0
0.75	2.46	54.10	0.85	0.148	0.000	0.148	1.58	365	1.68	137	1.95	203	1.83	1.95	0.50	1.70	88	1.2	108.7	0.200	0.994	0.148	0.343	2.46	6 S	NL	0
0.80	2.62	54.50	0.72	0.157	0.000	0.157	1.32	345	1.63	134	1.90	196	1.79	1.90	0.50	1.70	89	1.2	105.4	0.189	0.994	0.157	0.342	2.62	6 S	NL	0
0.85	2.79	55.70	0.56	0.167	0.000	0.167	1.01	332	1.55	133	1.82	192	1.71	1.82	0.50	1.70	91	1.1	101.7	0.178	0.993	0.167	0.342	2.79	6 S	NL	0
0.90	2.95	50.20	0.46	0.177	0.000	0.177	0.92	282	1.56	116	1.84	166	1.72	1.84	0.50	1.70	82	1.1	92.7	0.154	0.993	0.177	0.342	2.95	6 S	NL	0
0.95	3.12	47.00	0.46	0.187	0.000	0.187	0.98	250	1.62	106	1.89	149	1.77	1.89	0.50	1.70	77	1.2	90.0	0.148	0.993	0.187	0.342	3.12	6 S	NL	0
1.00	3.28	43.70	0.54	0.197	0.000	0.197	1.24	221	1.73	96	1.99	134	1.88	1.99	0.50	1.70	71	1.3	91.1	0.150	0.992	0.197	0.342	3.28	6 S	NL	0
1.05	3.45	42.40	0.63	0.207	0.000	0.207	1.49	204	1.81	91	2.06	126	1.96	2.06	0.50	1.70	69	1.4	95.3	0.161	0.992	0.207	0.342	3.45	6 S	NL	0
1.10	3.61	41.50	0.70	0.217	0.000	0.217	1.70	191	1.88	87	2.11	119	2.01	2.11	0.50	1.70	68	1.5	99.3	0.171	0.992	0.217	0.342	3.61	6 S	NL	0
1.15	3.77	46.40	0.74	0.226	0.000	0.226	1.60	204	1.84	95	2.06	129	1.97	2.06	0.50	1.70	76	1.4	105.2	0.188	0.991	0.226	0.341	3.77	6 S	NL	0
1.20	3.94	50.10	0.71	0.236	0.000	0.236	1.42	211	1.79	100	2.01	135	1.92	2.01	0.50	1.70	82	1.3	107.2	0.194	0.991	0.236	0.341	3.94	6 S	NL	0
1.25	4.10	55.30	0.72	0.246	0.000	0.246	1.31	224	1.74	109	1.96	145	1.87	1.96	0.50	1.70	90	1.3	112.7	0.213	0.990	0.246	0.341	4.10	6 S	NL	0
1.30	4.27	90.20	0.55	0.256	0.000	0.256	0.61	351	1.37	174	1.59	230	1.50	1.59	0.50	1.70	147	1.0	146.8	0.374	0.990	0.256	0.341	4.27	6 S	NL	0
1.35	4.43	93.30	0.56	0.266	0.000	0.266	0.60	350	1.36	177	1.58	232	1.49	1.58	0.50	1.70	152	1.0	151.9	0.406	0.990	0.266	0.341	4.43	6 S	NL	0
1.40	4.59	86.60	0.45	0.276	0.000	0.276	0.52	313	1.35	161	1.57	210	1.48	1.57	0.50	1.70	141	1.0	141.0	0.341	0.989	0.276	0.341	4.59	6 S	NL	0
1.45	4.76	65.00	0.39	0.285	0.000	0.285	0.60	227	1.50	119	1.72	154	1.63	1.72	0.50	1.70	106	1.0	111.1	0.207	0.989	0.285	0.341	4.76	6 S	NL	0
1.50	4.92	52.70	0.39	0.295	0.000	0.295	0.74	177	1.64	94	1.85	121	1.76	1.85	0.50	1.70	86	1.1	98.3	0.168	0.989	0.295	0.341	4.92	6 S	NL	0
1.55	5.09	41.50	0.39	0.305	0.000	0.305	0.95	135	1.80	73	2.00	93	1.92	2.00	0.50	1.70	68	1.3	88.1	0.144	0.988	0.305	0.340	5.09	6 S	NL	0
1.60	5.25	40.00	0.39	0.315	0.000	0.315	0.98	126	1.83	69	2.03	88	1.95	2.03	0.50	1.70	65	1.3	87.5	0.142	0.988	0.315	0.340	5.25	6 S	NL	0
1.65	5.41	44.70	0.41	0.325	0.000	0.325	0.92	137	1.79	76	1.98	96	1.90	1.98	0.50	1.70	73	1.3	92.9	0.155	0.987	0.325	0.340	5.41	6 S	NL	0
1.70	5.58	51.30	0.47	0.335	0.000	0.335	0.92	152	1.75	86	1.94	108	1.86	1.94	0.50	1.70	84	1.2	102.5	0.180	0.987	0.335	0.340	5.58	6 S	NL	0
1.75	5.74	68.00	0.51	0.345	0.000	0.345	0.75	196	1.61	113	1.79	141	1.72	1.79	0.50	1.70	111	1.1	121.9	0.249	0.987	0.345	0.340	5.74	6 S	NL	0
1.80	5.91	76.90	0.58	0.354	0.000	0.354	0.76	216	1.58	126	1.76	156	1.68	1.76	0.50	1.70	125	1.1	134.7	0.307	0.986	0.354	0.340	5.91	6 S	NL	0
1.85	6.07	85.90	0.63	0.364	0.000	0.364	0.74	235	1.55	139	1.72	171	1.65	1.72	0.50	1.69	139	1.0	146.1	0.370	0.986	0.364	0.340	6.07	6 S	NL	0
1.90	6.23	100.10	1.46	0.374	0.000	0.374	1.46	267	1.73	160	1.88	196	1.82	1.88	0.50	1.67	160	1.2	187.1	0.690	0.985	0.374	0.339	6.23	6 S	NL	0
1.95	6.40	117.20	1.75	0.384	0.000	0.384	1.50	304	1.71	185	1.84	225	1.79	1.84	0.50	1.65	185	1.1	210.9	0.953	0.985	0.384	0.339	6.40	6 S	NL	0
2.00	6.56	129.80	1.80	0.394	0.000	0.394	1.39	329	1.66	202	1.79	245	1.74	1.79	0.50	1.63	202	1.1	223.0	1.112	0.985	0.394	0.339	6.56	6 S	NL	0
2.05	6.73	125.20	1.98	0.404	0.000	0.404	1.59	309	1.73	192	1.85	232	1.80	1.85	0.50	1.61	193	1.1	220.9	1.083	0.984	0.404	0.339	6.73	6 S	NL	0
2.10	6.89	114.50	1.63	0.413	0.000	0.413	1.43	276	1.72	174	1.85	209	1.79	1.85	0.50	1.59	174	1.1	198.9	0.811	0.984	0.413	0.339	6.89	6 S	NL	0
2.15	7.05	119.40	1.21	0.423	0.000	0.423	1.02	281	1.60	179	1.73	214	1.67	1.73	0.50	1.57	180	1.1	189.9	0.716	0.984	0.423	0.339	7.05	6 S	NL	0
2.20	7.22	119.60	1.18	0.433	0.000	0.433	0.99	275	1.59	177	1.72	211	1.67	1.72	0.50	1.55	178	1.1	187.4	0.692	0.983	0.433	0.339	7.22	6 S	NL	0
2.25	7.38	125.90	1.17	0.443	0.000	0.443	0.93	283	1.57	184	1.69	219	1.64	1.69	0.50	1.54	185	1.0	191.2	0.730	0.983	0.443	0.339	7.38	6 S	NL	0
2.30	7.55	154.70	1.28	0.453	0.000	0.453	0.83	341	1.48	224	1.60	265	1.55	1.60	0.50	1.52	225	1.0	225.0	1.139	0.982	0.453	0.338	7.55	6 S	NL	0
2.35	7.71	175.50	1.18	0.463	0.000	0.463	0.67	378	1.38	252	1.50	296	1.45	1.50	0.50	1.50	252	1.0	252.5	1.577	0.982	0.463	0.338	7.71	6 S	NL	0

old Factor of Safety
e water or Soil Behavior Type is not liquefiable

RTF Job: 2005-052-01
PROJECT :
CPT: CPT-1 CPT DATE: 12/2/05 KTE
DATE : 11/10/2008
amax = 0.53 g
M = 6.60

Soil
Clay to Silty Clay
Claycy Silt to Silty Clay
Silty Sand to Sandy Silt
Clean Sand to Silty Sand
Gravelly Sand to Sand

Sum of Liquefiable Thickness (m)	Sum of Non-Liq Thickness (m)	Ratio of Non-Liq to Liquefiable 110.00	Liq. 0.03 in. Settlement (in) Settlement	N-Value Conversion (tsf) qc	qc/N	N-Value	Liquefaction Settlement 0.03 in. CSR	H_Index	V_Index	Strain%	Settlement	Cumulative Settlement	Dry Settlement Cyc Shear	Avg Stress	Gmax	Acoeff	Bcoeff	Cyc Strain	Eps15	Nc	EpsNc	Settlement
												0										
0.00	0.05	---	0.1641	28.20	6	4.7	0.3444	8	14	4.50E-02	0.00E+00	0.00	0.050	0.000	0.00E+00	0.1240	0.0	#DIV/0!	#DIV/0!	7.95	#DIV/0!	#DIV/0!
0.00	0.10	---	0.3281	98.40	8	12.3	0.3442	21	14	2.30E-02	0.00E+00	0.00	0.100	0.000	0.00E+00	0.1240	0.0	#DIV/0!	#DIV/0!	7.95	#DIV/0!	#DIV/0!
0.00	0.15	---	0.4922	133.80	8	16.7	0.3441	26	14	1.80E-02	0.00E+00	0.00	0.150	0.000	0.00E+00	0.1240	0.0	#DIV/0!	#DIV/0!	7.95	#DIV/0!	#DIV/0!
0.00	0.20	---	0.6562	129.40	8	16.2	0.3440	25	14	1.90E-02	0.00E+00	0.00	0.200	0.000	0.00E+00	0.1240	0.0	#DIV/0!	#DIV/0!	7.95	#DIV/0!	#DIV/0!
0.00	0.25	---	0.8203	135.00	8	16.9	0.3438	26	14	1.80E-02	0.00E+00	0.00	0.250	0.000	0.00E+00	0.1240	0.0	#DIV/0!	#DIV/0!	7.95	#DIV/0!	#DIV/0!
0.00	0.30	---	0.9843	134.90	8	16.9	0.3437	26	14	1.80E-02	0.00E+00	0.00	0.300	0.000	0.00E+00	0.1240	0.0	#DIV/0!	#DIV/0!	7.95	#DIV/0!	#DIV/0!
0.00	0.35	---	1.1484	125.00	8	15.6	0.3436	25	14	1.90E-02	0.00E+00	0.00	0.350	0.000	0.00E+00	0.1240	0.0	#DIV/0!	#DIV/0!	7.95	#DIV/0!	#DIV/0!
0.00	0.40	---	1.3124	115.90	6	19.3	0.3434	28	14	1.60E-02	0.00E+00	0.00	0.400	0.000	0.00E+00	0.1240	0.0	#DIV/0!	#DIV/0!	7.95	#DIV/0!	#DIV/0!
0.00	0.45	---	1.4765	104.80	6	17.5	0.3433	27	14	1.70E-02	0.00E+00	0.00	0.450	0.000	0.00E+00	0.1240	0.0	#DIV/0!	#DIV/0!	7.95	#DIV/0!	#DIV/0!
0.00	0.50	---	1.6405	86.50	6	14.4	0.3432	24	14	2.00E-02	0.00E+00	0.00	0.500	0.000	0.00E+00	0.1240	0.0	#DIV/0!	#DIV/0!	7.95	#DIV/0!	#DIV/0!
0.00	0.55	---	1.8046	78.60	6	13.1	0.3431	22	14	2.20E-02	0.00E+00	0.00	0.550	0.000	0.00E+00	0.1240	0.0	#DIV/0!	#DIV/0!	7.95	#DIV/0!	#DIV/0!
0.00	0.60	---	1.9686	65.40	6	10.9	0.3429	20	14	2.40E-02	0.00E+00	0.00	0.600	0.000	0.00E+00	0.1240	0.0	#DIV/0!	#DIV/0!	7.95	#DIV/0!	#DIV/0!
0.00	0.65	---	2.1327	62.40	6	10.4	0.3428	19	14	2.50E-02	0.00E+00	0.00	0.650	0.000	0.00E+00	0.1240	0.0	#DIV/0!	#DIV/0!	7.95	#DIV/0!	#DIV/0!
0.00	0.70	---	2.2967	57.00	6	9.5	0.3427	17	14	2.70E-02	0.00E+00	0.00	0.700	0.000	0.00E+00	0.1240	0.0	#DIV/0!	#DIV/0!	7.95	#DIV/0!	#DIV/0!
0.00	0.75	---	2.4608	54.10	6	9.0	0.3425	17	14	2.70E-02	0.00E+00	0.00	0.750	0.000	0.00E+00	0.1240	0.0	#DIV/0!	#DIV/0!	7.95	#DIV/0!	#DIV/0!
0.00	0.80	---	2.6248	54.50	6	9.1	0.3424	17	14	2.70E-02	0.00E+00	0.00	0.800	0.000	0.00E+00	0.1240	0.0	#DIV/0!	#DIV/0!	7.95	#DIV/0!	#DIV/0!
0.00	0.85	---	2.7889	55.70	6	9.3	0.3423	17	14	2.70E-02	0.00E+00	0.00	0.850	0.000	0.00E+00	0.1240	0.0	#DIV/0!	#DIV/0!	7.95	#DIV/0!	#DIV/0!
0.00	0.90	---	2.9529	50.20	6	8.4	0.3421	15	14	2.90E-02	0.00E+00	0.00	0.900	0.000	0.00E+00	0.1240	0.0	#DIV/0!	#DIV/0!	7.95	#DIV/0!	#DIV/0!
0.00	0.95	---	3.1170	47.00	6	7.8	0.3420	14	14	3.00E-02	0.00E+00	0.00	0.950	0.000	0.00E+00	0.1240	0.0	#DIV/0!	#DIV/0!	7.95	#DIV/0!	#DIV/0!
0.00	1.00	---	3.2810	43.70	6	7.3	0.3419	13	14	3.20E-02	0.00E+00	0.00	1.000	0.000	0.00E+00	0.1240	0.0	#DIV/0!	#DIV/0!	7.95	#DIV/0!	#DIV/0!
0.00	1.05	---	3.4451	42.40	6	7.1	0.3417	13	14	3.20E-02	0.00E+00	0.00	1.050	0.000	0.00E+00	0.1240	0.0	#DIV/0!	#DIV/0!	7.95	#DIV/0!	#DIV/0!
0.00	1.10	---	3.6091	41.50	6	6.9	0.3416	13	14	3.20E-02	0.00E+00	0.00	1.100	0.000	0.00E+00	0.1240	0.0	#DIV/0!	#DIV/0!	7.95	#DIV/0!	#DIV/0!
0.00	1.15	---	3.7732	46.40	6	7.7	0.3415	14	14	3.00E-02	0.00E+00	0.00	1.150	0.000	0.00E+00	0.1240	0.0	#DIV/0!	#DIV/0!	7.95	#DIV/0!	#DIV/0!
0.00	1.20	---	3.9372	50.10	6	8.4	0.3413	15	14	2.90E-02	0.00E+00	0.00	1.200	0.000	0.00E+00	0.1240	0.0	#DIV/0!	#DIV/0!	7.95	#DIV/0!	#DIV/0!
0.00	1.25	---	4.1013	55.30	6	9.2	0.3412	17	14	2.70E-02	0.00E+00	0.00	1.250	0.000	0.00E+00	0.1240	0.0	#DIV/0!	#DIV/0!	7.95	#DIV/0!	#DIV/0!
0.00	1.30	---	4.2653	90.20	6	15.0	0.3411	24	14	2.00E-02	0.00E+00	0.00	1.300	0.000	0.00E+00	0.1240	0.0	#DIV/0!	#DIV/0!	7.95	#DIV/0!	#DIV/0!
0.00	1.35	---	4.4294	93.30	6	15.6	0.3409	25	14	1.90E-02	0.00E+00	0.00	1.350	0.000	0.00E+00	0.1240	0.0	#DIV/0!	#DIV/0!	7.95	#DIV/0!	#DIV/0!
0.00	1.40	---	4.5934	86.60	6	14.4	0.3408	24	14	2.00E-02	0.00E+00	0.00	1.400	0.000	0.00E+00	0.1240	0.0	#DIV/0!	#DIV/0!	7.95	#DIV/0!	#DIV/0!
0.00	1.45	---	4.7575	65.00	6	10.8	0.3407	19	14	2.50E-02	0.00E+00	0.00	1.450	0.000	0.00E+00	0.1240	0.0	#DIV/0!	#DIV/0!	7.95	#DIV/0!	#DIV/0!
0.00	1.50	---	4.9215	52.70	6	8.8	0.3405	16	14	2.80E-02	0.00E+00	0.00	1.500	0.000	0.00E+00	0.1240	0.0	#DIV/0!	#DIV/0!	7.95	#DIV/0!	#DIV/0!
0.00	1.55	---	5.0856	41.50	6	6.9	0.3404	13	14	3.20E-02	0.00E+00	0.00	1.550	0.000	0.00E+00	0.1240	0.0	#DIV/0!	#DIV/0!	7.95	#DIV/0!	#DIV/0!
0.00	1.60	---	5.2496	40.00	6	6.7	0.3403	12	14	3.40E-02	0.00E+00	0.00	1.600	0.000	0.00E+00	0.1240	0.0	#DIV/0!	#DIV/0!	7.95	#DIV/0!	#DIV/0!
0.00	1.65	---	5.4137	44.70	6	7.5	0.3402	13	14	3.20E-02	0.00E+00	0.00	1.650	0.000	0.00E+00	0.1240	0.0	#DIV/0!	#DIV/0!	7.95	#DIV/0!	#DIV/0!
0.00	1.70	---	5.5777	51.30	6	8.6	0.3400	16	14	2.80E-02	0.00E+00	0.00	1.700	0.000	0.00E+00	0.1240	0.0	#DIV/0!	#DIV/0!	7.95	#DIV/0!	#DIV/0!
0.00	1.75	---	5.7418	68.00	6	11.3	0.3399	20	13	2.40E-02	0.00E+00	0.00	1.750	0.000	0.00E+00	0.1240	0.0	#DIV/0!	#DIV/0!	7.95	#DIV/0!	#DIV/0!
0.00	1.80	---	5.9058	76.90	6	12.8	0.3398	22	13	2.20E-02	0.00E+00	0.00	1.800	0.000	0.00E+00	0.1240	0.0	#DIV/0!	#DIV/0!	7.95	#DIV/0!	#DIV/0!
0.00	1.85	---	6.0699	85.90	6	14.3	0.3396	24	13	2.00E-02	0.00E+00	0.00	1.850	0.000	0.00E+00	0.1240	0.0	#DIV/0!	#DIV/0!	7.95	#DIV/0!	#DIV/0!
0.00	1.90	---	6.2339	100.10	6	16.7	0.3395	26	13	1.80E-02	0.00E+00	0.00	1.900	0.000	0.00E+00	0.1240	0.0	#DIV/0!	#DIV/0!	7.95	#DIV/0!	#DIV/0!
0.00	1.95	---	6.3980	117.20	6	19.5	0.3394	28	13	1.60E-02	0.00E+00	0.00	1.950	0.000	0.00E+00	0.1240	0.0	#DIV/0!	#DIV/0!	7.95	#DIV/0!	#DIV/0!
0.00	2.00	---	6.5620	129.80	6	21.6	0.3392	30	13	1.40E-02	0.00E+00	0.00	2.000	0.000	0.00E+00	0.1240	0.0	#DIV/0!	#DIV/0!	7.95	#DIV/0!	#DIV/0!
0.00	2.05	---	6.7261	125.20	6	20.9	0.3391	29	13	1.50E-02	0.00E+00	0.00	2.050	0.000	0.00E+00	0.1240	0.0	#DIV/0!	#DIV/0!	7.95	#DIV/0!	#DIV/0!
0.00	2.10	---	6.8901	114.50	6	19.1	0.3390	28	13	1.60E-02	0.00E+00	0.00	2.100	0.000	0.00E+00	0.1240	0.0	#DIV/0!	#DIV/0!	7.95	#DIV/0!	#DIV/0!
0.00	2.15	---	7.0542	119.40	6	19.9	0.3388	28	13	1.60E-02	0.00E+00	0.00	2.150	0.000	0.00E+00	0.1240	0.0	#DIV/0!	#DIV/0!	7.95	#DIV/0!	#DIV/0!
0.00	2.20	---	7.2182	119.60	6	19.9	0.3387	28	13	1.60E-02	0.00E+00	0.00	2.200	0.000	0.00E+00	0.1240	0.0	#DIV/0!	#DIV/0!	7.95	#DIV/0!	#DIV/0!
0.00	2.25	---	7.3823	125.90	6	21.0	0.3386	29	13	1.50E-02	0.00E+00	0.00	2.250	0.000	0.00E+00	0.1240	0.0	#DIV/0!	#DIV/0!	7.95	#DIV/0!	#DIV/0!
0.00	2.30	---	7.5463	154.70	6	25.8	0.3384	32	13	1.05E-02	0.00E+00	0.00	2.300	0.000	0.00E+00	0.1240	0.0	#DIV/0!	#DIV/0!	7.95	#DIV/0!	#DIV/0!
0.00	2.35	---	7.7104	175.50	6	29.3	0.3383	35	13	2.00E-03	0.00E+00	0.00	2.350	0.000	0.00E+00	0.1240	0.0	#DIV/0!	#DIV/0!	7.95	#DIV/0!	#DIV/0!

SPREADSHEET TO CALCULATE CYCLIC RESISTANCE RATIO USING CPT DATA

RTF Job: 2005-052-01
PROJECT :
CPT: CPT-1 CPT DATE: 12/2/05 KTE
DATE : 11/10/2008
amax = 0.53 g
M = 6.60
MSF = 1.5

Ic = (((3.47-LOG(Q))^2)+(LOG(F%)+1.22)^2)^0.5
dqc1N = IF(FC>=35,60,IF(FC<=5,0,2*(FC-5)))
CRR = IF(qc1Ncs<50,(0.833*(qc1Ncs/1000)+0.05),(93*(qc1Ncs/1000)^3+0.08))
MSF = 10^2.24/M^2.56
CSR = 0.65(amax/g)(sigv/sigv')rd = Seed's Equation
Z = IF(Ic<1.31,7,IF(Ic<2.05,6,IF(Ic<2.6,5,IF(Ic<2.95,4,IF(Ic<3.6,3,2)))))
Q = [(qc-St)/Pa]*[(Pa/S')^n] Kc = IF(Ic<=1.64,1,(-0.403*Ic^4+5.581*Ic^3-21.63*Ic^2+33.75*Ic-17.88))

Liquefiable Soil (Type 5+ or 6+) = 2.4
Seismic Settlement Soil (Type) = 6
Actual Water = 30 feet
Design Water = 9 feet
Gamma = 120 pcf
rd = 2

Added Fill = 2 feet
Fill Density = 125 pcf
Pa = 1.04427 tsf = 100 kPa
Threshold FS = 1.10

FS = CRR*MSF/CSR

FS = Threshc
NL = Above
Z
3
4
5
6
7

Depth (m)	Depth (ft)	Tip Resist qc (tsf)	Sleeve Fric fs (tsf)	Total Stress (tsf) 0.00	Water Pressure (tsf) Sw	Effective Stress (tsf) S' = St - Sw	Norm. Fr. Ratio F (%) = fs/(qc-St)	Norm. Pen. Res. Q for n=1 (qc-St)/S'	Soil Index Ic for n=1	Norm. Pen. Res. Q for n= 0.5	Soil Index Ic for n=0.5	Norm. Pen. Res. Q for n= 0.7	Soil Index Ic for n=0.7	Soil Index Ic	Cq exp n	Overburden Correction Cq = 1.7 > (Pa/S')^n	Norm. Cone Res. qc1N = qc*Cq/Pa	Grain Char. Corr. Kc	Equivalent Clean Sand Cone Res. (qc1N)cs = Kc*qc1N	Cyclic Resistance Ratio CRR	rd	Design Effective Stress (tsf) S' = St - Sw	Cyclic Stress Ratio CSR	Depth (ft) Depth	Soil Behavior Type Z	Factor of Safety FS	Liquefiable Layers
2.40	7.87	191.50	1.10	0.472	0.000	0.472	0.58	404	1.31	272	1.43	319	1.38	1.43	0.50	1.49	273	1.0	272.6	1.965	0.982	0.472	0.338	7.87	7 S	NL	0
2.45	8.04	230.90	2.12	0.482	0.000	0.482	0.92	478	1.42	325	1.52	379	1.48	1.52	0.50	1.47	325	1.0	325.4	3.283	0.981	0.482	0.338	8.04	6 S	NL	0
2.50	8.20	269.70	2.22	0.492	0.000	0.492	0.82	547	1.35	376	1.45	436	1.41	1.45	0.50	1.46	376	1.0	376.2	5.032	0.981	0.492	0.338	8.20	6 S	NL	0
2.55	8.37	299.00	2.13	0.502	0.000	0.502	0.71	595	1.28	412	1.37	477	1.33	1.37	0.50	1.44	413	1.0	413.0	6.630	0.980	0.502	0.338	8.37	7 S	NL	0
2.60	8.53	268.30	2.18	0.512	0.000	0.512	0.81	523	1.36	366	1.45	422	1.41	1.45	0.50	1.43	367	1.0	367.0	4.677	0.980	0.512	0.338	8.53	6 S	NL	0
2.65	8.69	272.70	1.67	0.522	0.000	0.522	0.61	522	1.26	369	1.35	424	1.31	1.35	0.50	1.41	369	1.0	369.5	4.770	0.980	0.522	0.338	8.69	7 S	NL	0
2.70	8.86	275.60	1.66	0.532	0.000	0.532	0.60	518	1.25	369	1.35	423	1.31	1.35	0.50	1.40	370	1.0	369.9	4.788	0.979	0.532	0.337	8.86	7 S	NL	0
2.75	9.02	293.30	1.49	0.541	0.000	0.541	0.51	541	1.18	389	1.28	444	1.24	1.28	0.50	1.39	390	1.0	390.1	5.600	0.979	0.541	0.338	9.02	7 S	24.88	0
2.80	9.19	308.80	1.67	0.551	0.000	0.551	0.54	559	1.20	406	1.29	462	1.25	1.29	0.50	1.38	407	1.0	407.0	6.351	0.979	0.545	0.340	9.19	7 S	28.01	0
2.85	9.35	275.90	1.72	0.561	0.000	0.561	0.62	491	1.28	360	1.37	407	1.33	1.37	0.50	1.36	360	1.0	360.4	4.435	0.978	0.550	0.342	9.35	7 S	19.43	0
2.90	9.51	258.00	1.91	0.571	0.000	0.571	0.74	451	1.36	333	1.44	376	1.41	1.44	0.50	1.35	334	1.0	334.1	3.550	0.978	0.555	0.345	9.51	6 S	15.44	0
2.95	9.68	235.00	1.69	0.581	0.000	0.581	0.72	404	1.38	301	1.46	339	1.43	1.46	0.50	1.34	302	1.0	301.8	2.636	0.977	0.560	0.347	9.68	6 S	11.39	0
3.00	9.84	211.00	1.65	0.591	0.000	0.591	0.78	356	1.44	268	1.53	300	1.49	1.53	0.50	1.33	269	1.0	268.7	1.884	0.977	0.564	0.349	9.84	6 S	8.09	0
3.05	10.01	199.50	1.83	0.600	0.000	0.600	0.92	331	1.52	251	1.60	281	1.56	1.60	0.50	1.32	252	1.0	251.9	1.567	0.977	0.569	0.352	10.01	6 S	6.68	0
3.10	10.17	187.60	1.85	0.610	0.000	0.610	0.99	306	1.56	234	1.64	261	1.61	1.64	0.50	1.31	235	1.0	235.0	1.287	0.976	0.574	0.354	10.17	6 S	5.45	0
3.15	10.34	208.10	1.76	0.620	0.000	0.620	0.85	335	1.49	258	1.56	286	1.53	1.56	0.50	1.30	259	1.0	258.6	1.688	0.976	0.578	0.356	10.34	6 S	7.11	0
3.20	10.50	249.80	2.32	0.630	0.000	0.630	0.93	396	1.47	307	1.54	340	1.51	1.54	0.50	1.29	308	1.0	308.0	2.797	0.976	0.583	0.358	10.50	6 S	11.71	0
3.25	10.66	285.70	5.02	0.640	0.000	0.640	1.76	446	1.68	349	1.73	385	1.71	1.73	0.50	1.28	350	1.1	370.9	4.825	0.975	0.588	0.360	10.66	6 S	20.08	0
3.30	10.83	373.40	6.39	0.650	0.000	0.650	1.71	574	1.62	453	1.67	498	1.65	1.67	0.50	1.27	453	1.0	460.1	9.141	0.975	0.593	0.362	10.83	6 S	37.83	0
3.35	10.99	453.10	5.60	0.659	0.000	0.659	1.24	686	1.46	545	1.50	598	1.48	1.50	0.50	1.26	546	1.0	546.0	15.217	0.974	0.597	0.365	10.99	6 S	62.61	0
3.40	11.16	295.70	5.27	0.669	0.000	0.669	1.79	441	1.69	353	1.74	386	1.72	1.74	0.50	1.25	354	1.1	375.9	5.020	0.974	0.602	0.367	11.16	6 S	20.54	0
3.45	11.32	308.80	2.44	0.679	0.000	0.679	0.79	454	1.38	366	1.44	399	1.42	1.44	0.50	1.24	367	1.0	366.7	4.665	0.974	0.607	0.369	11.32	6 S	18.98	0
3.50	11.48	339.90	2.60	0.689	0.000	0.689	0.77	492	1.35	400	1.40	435	1.38	1.40	0.50	1.23	401	1.0	400.7	6.064	0.973	0.612	0.371	11.48	6 S	24.55	0
3.55	11.65	390.50	3.32	0.699	0.000	0.699	0.85	558	1.36	456	1.41	494	1.39	1.41	0.50	1.22	457	1.0	457.1	8.963	0.973	0.616	0.372	11.65	6 S	36.09	0
3.60	11.81	424.60	4.13	0.709	0.000	0.709	0.97	598	1.39	493	1.44	532	1.42	1.44	0.50	1.21	494	1.0	493.6	11.262	0.972	0.621	0.374	11.81	6 S	45.12	0
3.65	11.98	378.70	4.08	0.719	0.000	0.719	1.08	526	1.46	436	1.50	470	1.49	1.50	0.50	1.21	437	1.0	437.2	7.851	0.972	0.626	0.376	11.98	6 S	31.30	0
3.70	12.14	371.70	3.23	0.728	0.000	0.728	0.87	509	1.39	425	1.43	457	1.41	1.43	0.50	1.20	426	1.0	426.2	7.280	0.972	0.630	0.378	12.14	6 S	28.87	0
3.75	12.30	366.20	2.14	0.738	0.000	0.738	0.59	495	1.26	416	1.30	446	1.28	1.30	0.50	1.19	417	1.0	417.1	6.827	0.971	0.635	0.380	12.30	7 S	26.95	0
3.80	12.47	384.20	2.05	0.748	0.000	0.748	0.53	513	1.22	434	1.26	464	1.24	1.26	0.50	1.18	435	1.0	434.7	7.719	0.971	0.640	0.382	12.47	7 S	30.33	0
3.85	12.63	379.00	2.33	0.758	0.000	0.758	0.62	499	1.27	425	1.31	453	1.30	1.31	0.50	1.17	426	1.0	426.0	7.270	0.971	0.645	0.384	12.63	7 S	28.43	0
3.90	12.80	451.00	3.77	0.768	0.000	0.768	0.84	586	1.34	503	1.38	535	1.36	1.38	0.50	1.17	504	1.0	503.7	11.964	0.970	0.649	0.385	12.80	6 S	46.57	0
3.95	12.96	501.30	2.86	0.778	0.000	0.778	0.57	644	1.18	555	1.22	589	1.20	1.22	0.50	1.16	556	1.0	556.3	16.091	0.970	0.654	0.387	12.96	7 S	62.36	0
4.00	13.12	474.80	2.92	0.787	0.000	0.787	0.62	602	1.22	523	1.26	553	1.24	1.26	0.50	1.15	524	1.0	523.6	13.430	0.969	0.659	0.389	13.12	7 S	51.81	0
4.05	13.29	430.20	2.78	0.797	0.000	0.797	0.65	539	1.27	471	1.30	497	1.29	1.30	0.50	1.14	471	1.0	471.5	9.827	0.969	0.663	0.390	13.29	7 S	37.75	0
4.10	13.45	393.40	2.15	0.807	0.000	0.807	0.55	486	1.24	428	1.27	450	1.26	1.27	0.50	1.14	429	1.0	428.5	7.397	0.969	0.668	0.392	13.45	7 S	28.30	0
4.15	13.62	363.90	1.79	0.817	0.000	0.817	0.49	444	1.23	393	1.26	413	1.25	1.26	0.50	1.13	394	1.0	394.0	5.767	0.968	0.673	0.394	13.62	7 S	21.97	0
4.20	13.78	349.10	1.82	0.827	0.000	0.827	0.52	421	1.26	375	1.30	393	1.28	1.30	0.50	1.12	376	1.0	375.7	5.012	0.968	0.678	0.395	13.78	7 S	19.01	0
4.25	13.94	304.00	1.57	0.837	0.000	0.837	0.52	362	1.30	324	1.34	339	1.33	1.34	0.50	1.12	325	1.0	325.2	3.279	0.967	0.682	0.397	13.94	7 S	12.39	0
4.30	14.11	284.40	1.02	0.846	0.000	0.846	0.36	335	1.22	302	1.26	315	1.24	1.26	0.50	1.11	302	1.0	302.5	2.654	0.967	0.687	0.399	14.11	7 S	9.99	0
4.35	14.27	252.80	0.56	0.856	0.000	0.856	0.22	294	1.15	266	1.19	277	1.17	1.19	0.50	1.10	267	1.0	267.3	1.857	0.967	0.692	0.400	14.27	7 S	6.96	0
4.40	14.44	249.50	0.37	0.866	0.000	0.866	0.15	287	1.09	261	1.12	271	1.11	1.12	0.50	1.10	262	1.0	262.3	1.759	0.966	0.697	0.402	14.44	7 S	6.57	0
4.45	14.60	231.10	0.44	0.876	0.000	0.876	0.19	263	1.16	241	1.20	249	1.18	1.20	0.50	1.09	242	1.0	241.6	1.392	0.966	0.701	0.403	14.60	7 S	5.18	0
4.50	14.76	214.40	0.57	0.886	0.000	0.886	0.27	241	1.27	222	1.30	229	1.28	1.30	0.50	1.09	223	1.0	222.9	1.110	0.966	0.706	0.405	14.76	7 S	4.12	0
4.55	14.93	206.80	0.63	0.896	0.000	0.896	0.31	230	1.31	213	1.34	220	1.33	1.34	0.50	1.08	214	1.0	213.8	0.989	0.965	0.711	0.406	14.93	6 S	3.65	0
4.60	15.09	242.90	0.89	0.906	0.000	0.906	0.37	267	1.31	249	1.33	256	1.32	1.33	0.50	1.07	250	1.0	249.8	1.529	0.965	0.715	0.408	15.09	7 S	5.63	0
4.65	15.26	306.30	1.35	0.915	0.000	0.915	0.44	334	1.28	312	1.30	321	1.30	1.30	0.50	1.07	313	1.0	313.3	2.939	0.964	0.720	0.409	15.26	7 S	10.78	0
4.70	15.42	298.50	2.17	0.925	0.000	0.925	0.73	322	1.45	303	1.47	310	1.46	1.47	0.50	1.06	304	1.0	303.7	2.684	0.964	0.725	0.410	15.42	6 S	9.81	0
4.75	15.58	284.60	1.61	0.935	0.000	0.935	0.57	303	1.39	287	1.40	293	1.40	1.40	0.50	1.06	288	1.0	288.0	2.302	0.964	0.730	0.412	15.58	6 S	8.38	0
4.80	15.75	256.10	1.14	0.945	0.000	0.945	0.45	270	1.35	257	1.37	262	1.36	1.37	0.50	1.05	258	1.0	257.8	1.674	0.963	0.734	0.413	15.75	6 S	6.08	0
4.85	15.91	259.40	0.89	0.955	0.000	0.955	0.34	271	1.28	259	1.30	264	1.29	1.30	0.50	1.05	260	1.0	259.8	1.711	0.963	0.739	0.415	15.91	7 S	6.19	0
4.90	16.08	243.60	0.64	0.965	0.000	0.965	0.26	252	1.25	242	1.26	246	1.26	1.26	0.50	1.04	243	1.0	242.7	1.410	0.963	0.744	0.416	16.08	7 S	5.08	0
4.95	16.24	244.80	0.63	0.974	0.000	0.974	0.26	250	1.24	242	1.26	245	1.25	1.26	0.50	1.04	243	1.0	242.7	1.409	0.962	0.749	0.417	16.24	7 S	5.07	0

old Factor of Safety
e water or Soil Behavior Type is not liquefiable

Soil
Clay to Silty Clay
Clayey Silt to Silty Clay
Silty Sand to Sandy Silt
Clean Sand to Silty Sand
Gravelly Sand to Sand

RTF Job: 2005-052-01
PROJECT :
CPT: CPT-1 CPT DATE: 12/2/05 KTE
DATE : 11/10/2008
amax = 0.53 g
M = 6.60

Sum of Liquefiable Thickness (m)	Sum of Non-Liq Thickness (m)	Ratio of Non-Liq to Liquefiable 110.00	Liq. 0.03 in. Settlement (in) Settlement	N-Value Conversion (tsf) qc	qc/N	N-Value	Liquefaction Settlement CSR	H_Index	V_Index	Strain%	Settlement	0.03 in. Cumulative Settlement	Dry Settlement Cyc Shear Avg Stress	Gmax	Acoeff	Bcoeff	Cyc Strain	Eps15	Nc	EpsNc	Settlement
0.00	2.40	---	7.8744	191.50	8	23.9	0.3382	31	13	1.30E-02	0.00E+00	0.00	2.400	0.000	0.00E+00	0.1240	0.0	#DIV/0!	#DIV/0!	7.95	#DIV/0!	#DIV/0!
0.00	2.45	---	8.0385	230.90	6	38.5	0.3380	42	13	0.00E+00	0.00E+00	0.00	2.450	0.000	0.00E+00	0.1240	0.0	#DIV/0!	#DIV/0!	7.95	#DIV/0!	#DIV/0!
0.00	2.50	---	8.2025	269.70	6	45.0	0.3379	42	13	0.00E+00	0.00E+00	0.00	2.500	0.000	0.00E+00	0.1240	0.0	#DIV/0!	#DIV/0!	7.95	#DIV/0!	#DIV/0!
0.00	2.55	---	8.3666	299.00	8	37.4	0.3378	42	13	0.00E+00	0.00E+00	0.00	2.550	0.000	0.00E+00	0.1240	0.0	#DIV/0!	#DIV/0!	7.95	#DIV/0!	#DIV/0!
0.00	2.60	---	8.5306	268.30	6	44.7	0.3376	42	13	0.00E+00	0.00E+00	0.00	2.600	0.000	0.00E+00	0.1240	0.0	#DIV/0!	#DIV/0!	7.95	#DIV/0!	#DIV/0!
0.00	2.65	---	8.6947	272.70	8	34.1	0.3375	41	13	0.00E+00	0.00E+00	0.00	2.650	0.000	0.00E+00	0.1240	0.0	#DIV/0!	#DIV/0!	7.95	#DIV/0!	#DIV/0!
0.00	2.70	---	8.8587	275.60	8	34.5	0.3374	41	13	0.00E+00	0.00E+00	0.00	2.700	0.000	0.00E+00	0.1240	0.0	#DIV/0!	#DIV/0!	7.95	#DIV/0!	#DIV/0!
0.00	2.75	---	9.0228	293.30	8	36.7	0.3376	42	13	0.00E+00	0.00E+00	0.00	2.750	0.000	0.00E+00	0.1240	0.0	#DIV/0!	#DIV/0!	7.95	#DIV/0!	#DIV/0!
0.00	2.80	---	9.1868	308.80	8	38.6	0.3401	42	14	0.00E+00	0.00E+00	0.00	2.800	0.000	0.00E+00	0.1240	0.0	#DIV/0!	#DIV/0!	7.95	#DIV/0!	#DIV/0!
0.00	2.85	---	9.3509	275.90	8	34.5	0.3425	41	14	0.00E+00	0.00E+00	0.00	2.850	0.000	0.00E+00	0.1240	0.0	#DIV/0!	#DIV/0!	7.95	#DIV/0!	#DIV/0!
0.00	2.90	---	9.5149	258.00	6	43.0	0.3448	42	14	0.00E+00	0.00E+00	0.00	2.900	0.000	0.00E+00	0.1240	0.0	#DIV/0!	#DIV/0!	7.95	#DIV/0!	#DIV/0!
0.00	2.95	---	9.6790	235.00	6	39.2	0.3471	42	14	0.00E+00	0.00E+00	0.00	2.950	0.000	0.00E+00	0.1240	0.0	#DIV/0!	#DIV/0!	7.95	#DIV/0!	#DIV/0!
0.00	3.00	---	9.8430	211.00	6	35.2	0.3494	42	14	0.00E+00	0.00E+00	0.00	3.000	0.000	0.00E+00	0.1240	0.0	#DIV/0!	#DIV/0!	7.95	#DIV/0!	#DIV/0!
0.00	3.05	---	10.0071	199.50	6	33.3	0.3517	39	14	1.00E-04	0.00E+00	0.00	3.050	0.000	0.00E+00	0.1240	0.0	#DIV/0!	#DIV/0!	7.95	#DIV/0!	#DIV/0!
0.00	3.10	---	10.1711	187.60	6	31.3	0.3539	37	14	2.00E-03	0.00E+00	0.00	3.100	0.000	0.00E+00	0.1240	0.0	#DIV/0!	#DIV/0!	7.95	#DIV/0!	#DIV/0!
0.00	3.15	---	10.3352	208.10	6	34.7	0.3561	41	14	0.00E+00	0.00E+00	0.00	3.150	0.000	0.00E+00	0.1240	0.0	#DIV/0!	#DIV/0!	7.95	#DIV/0!	#DIV/0!
0.00	3.20	---	10.4992	249.80	6	41.6	0.3583	42	14	0.00E+00	0.00E+00	0.00	3.200	0.000	0.00E+00	0.1240	0.0	#DIV/0!	#DIV/0!	7.95	#DIV/0!	#DIV/0!
0.00	3.25	---	10.6633	285.70	6	47.6	0.3604	42	14	0.00E+00	0.00E+00	0.00	3.250	0.000	0.00E+00	0.1240	0.0	#DIV/0!	#DIV/0!	7.95	#DIV/0!	#DIV/0!
0.00	3.30	---	10.8273	373.40	6	62.2	0.3625	42	14	0.00E+00	0.00E+00	0.00	3.300	0.000	0.00E+00	0.1240	0.0	#DIV/0!	#DIV/0!	7.95	#DIV/0!	#DIV/0!
0.00	3.35	---	10.9914	453.10	6	75.5	0.3645	42	14	0.00E+00	0.00E+00	0.00	3.350	0.000	0.00E+00	0.1240	0.0	#DIV/0!	#DIV/0!	7.95	#DIV/0!	#DIV/0!
0.00	3.40	---	11.1554	295.70	6	49.3	0.3666	42	14	0.00E+00	0.00E+00	0.00	3.400	0.000	0.00E+00	0.1240	0.0	#DIV/0!	#DIV/0!	7.95	#DIV/0!	#DIV/0!
0.00	3.45	---	11.3195	308.80	6	51.5	0.3686	42	14	0.00E+00	0.00E+00	0.00	3.450	0.000	0.00E+00	0.1240	0.0	#DIV/0!	#DIV/0!	7.95	#DIV/0!	#DIV/0!
0.00	3.50	---	11.4835	339.90	6	56.7	0.3705	42	14	0.00E+00	0.00E+00	0.00	3.500	0.000	0.00E+00	0.1240	0.0	#DIV/0!	#DIV/0!	7.95	#DIV/0!	#DIV/0!
0.00	3.55	---	11.6476	390.50	6	65.1	0.3725	42	14	0.00E+00	0.00E+00	0.00	3.550	0.000	0.00E+00	0.1240	0.0	#DIV/0!	#DIV/0!	7.95	#DIV/0!	#DIV/0!
0.00	3.60	---	11.8116	424.60	6	70.8	0.3744	42	14	0.00E+00	0.00E+00	0.00	3.600	0.000	0.00E+00	0.1240	0.0	#DIV/0!	#DIV/0!	7.95	#DIV/0!	#DIV/0!
0.00	3.65	---	11.9757	378.70	6	63.1	0.3763	42	15	0.00E+00	0.00E+00	0.00	3.650	0.000	0.00E+00	0.1240	0.0	#DIV/0!	#DIV/0!	7.95	#DIV/0!	#DIV/0!
0.00	3.70	---	12.1397	371.70	6	62.0	0.3782	42	15	0.00E+00	0.00E+00	0.00	3.700	0.000	0.00E+00	0.1240	0.0	#DIV/0!	#DIV/0!	7.95	#DIV/0!	#DIV/0!
0.00	3.75	---	12.3038	366.20	8	45.8	0.3800	42	15	0.00E+00	0.00E+00	0.00	3.750	0.000	0.00E+00	0.1240	0.0	#DIV/0!	#DIV/0!	7.95	#DIV/0!	#DIV/0!
0.00	3.80	---	12.4678	384.20	8	48.0	0.3818	42	15	0.00E+00	0.00E+00	0.00	3.800	0.000	0.00E+00	0.1240	0.0	#DIV/0!	#DIV/0!	7.95	#DIV/0!	#DIV/0!
0.00	3.85	---	12.6319	379.00	8	47.4	0.3836	42	15	0.00E+00	0.00E+00	0.00	3.850	0.000	0.00E+00	0.1240	0.0	#DIV/0!	#DIV/0!	7.95	#DIV/0!	#DIV/0!
0.00	3.90	---	12.7959	451.00	6	75.2	0.3853	42	15	0.00E+00	0.00E+00	0.00	3.900	0.000	0.00E+00	0.1240	0.0	#DIV/0!	#DIV/0!	7.95	#DIV/0!	#DIV/0!
0.00	3.95	---	12.9600	501.30	8	62.7	0.3871	42	15	0.00E+00	0.00E+00	0.00	3.950	0.000	0.00E+00	0.1240	0.0	#DIV/0!	#DIV/0!	7.95	#DIV/0!	#DIV/0!
0.00	4.00	---	13.1240	474.80	8	59.4	0.3888	42	15	0.00E+00	0.00E+00	0.00	4.000	0.000	0.00E+00	0.1240	0.0	#DIV/0!	#DIV/0!	7.95	#DIV/0!	#DIV/0!
0.00	4.05	---	13.2881	430.20	8	53.8	0.3905	42	15	0.00E+00	0.00E+00	0.00	4.050	0.000	0.00E+00	0.1240	0.0	#DIV/0!	#DIV/0!	7.95	#DIV/0!	#DIV/0!
0.00	4.10	---	13.4521	393.40	8	49.2	0.3921	42	15	0.00E+00	0.00E+00	0.00	4.100	0.000	0.00E+00	0.1240	0.0	#DIV/0!	#DIV/0!	7.95	#DIV/0!	#DIV/0!
0.00	4.15	---	13.6162	363.90	8	45.5	0.3938	42	15	0.00E+00	0.00E+00	0.00	4.150	0.000	0.00E+00	0.1240	0.0	#DIV/0!	#DIV/0!	7.95	#DIV/0!	#DIV/0!
0.00	4.20	---	13.7802	349.10	8	43.6	0.3954	42	15	0.00E+00	0.00E+00	0.00	4.200	0.000	0.00E+00	0.1240	0.0	#DIV/0!	#DIV/0!	7.95	#DIV/0!	#DIV/0!
0.00	4.25	---	13.9443	304.00	8	38.0	0.3970	42	15	0.00E+00	0.00E+00	0.00	4.250	0.000	0.00E+00	0.1240	0.0	#DIV/0!	#DIV/0!	7.95	#DIV/0!	#DIV/0!
0.00	4.30	---	14.1083	284.40	8	35.6	0.3986	42	15	0.00E+00	0.00E+00	0.00	4.300	0.000	0.00E+00	0.1240	0.0	#DIV/0!	#DIV/0!	7.95	#DIV/0!	#DIV/0!
0.00	4.35	---	14.2724	252.80	8	31.6	0.4001	37	16	5.00E-03	0.00E+00	0.00	4.350	0.000	0.00E+00	0.1240	0.0	#DIV/0!	#DIV/0!	7.95	#DIV/0!	#DIV/0!
0.00	4.40	---	14.4364	249.50	8	31.2	0.4016	37	16	5.00E-03	0.00E+00	0.00	4.400	0.000	0.00E+00	0.1240	0.0	#DIV/0!	#DIV/0!	7.95	#DIV/0!	#DIV/0!
0.00	4.45	---	14.6005	231.10	8	28.9	0.4031	34	16	9.00E-03	0.00E+00	0.00	4.450	0.000	0.00E+00	0.1240	0.0	#DIV/0!	#DIV/0!	7.95	#DIV/0!	#DIV/0!
0.00	4.50	---	14.7645	214.40	8	26.8	0.4046	33	16	1.00E-02	0.00E+00	0.00	4.500	0.000	0.00E+00	0.1240	0.0	#DIV/0!	#DIV/0!	7.95	#DIV/0!	#DIV/0!
0.00	4.55	---	14.9286	206.80	6	34.5	0.4061	41	16	0.00E+00	0.00E+00	0.00	4.550	0.000	0.00E+00	0.1240	0.0	#DIV/0!	#DIV/0!	7.95	#DIV/0!	#DIV/0!
0.00	4.60	---	15.0926	242.90	8	30.4	0.4076	36	16	7.00E-03	0.00E+00	0.00	4.600	0.000	0.00E+00	0.1240	0.0	#DIV/0!	#DIV/0!	7.95	#DIV/0!	#DIV/0!
0.00	4.65	---	15.2567	306.30	8	38.3	0.4090	42	16	0.00E+00	0.00E+00	0.00	4.650	0.000	0.00E+00	0.1240	0.0	#DIV/0!	#DIV/0!	7.95	#DIV/0!	#DIV/0!
0.00	4.70	---	15.4207	298.50	6	49.8	0.4104	42	16	0.00E+00	0.00E+00	0.00	4.700	0.000	0.00E+00	0.1240	0.0	#DIV/0!	#DIV/0!	7.95	#DIV/0!	#DIV/0!
0.00	4.75	---	15.5848	284.60	6	47.4	0.4118	42	16	0.00E+00	0.00E+00	0.00	4.750	0.000	0.00E+00	0.1240	0.0	#DIV/0!	#DIV/0!	7.95	#DIV/0!	#DIV/0!
0.00	4.80	---	15.7488	256.10	6	42.7	0.4132	42	16	0.00E+00	0.00E+00	0.00	4.800	0.000	0.00E+00	0.1240	0.0	#DIV/0!	#DIV/0!	7.95	#DIV/0!	#DIV/0!
0.00	4.85	---	15.9129	259.40	8	32.4	0.4145	38	16	3.00E-03	0.00E+00	0.00	4.850	0.000	0.00E+00	0.1240	0.0	#DIV/0!	#DIV/0!	7.95	#DIV/0!	#DIV/0!
0.00	4.90	---	16.0769	243.60	8	30.5	0.4159	36	16	7.00E-03	0.00E+00	0.00	4.900	0.000	0.00E+00	0.1240	0.0	#DIV/0!	#DIV/0!	7.95	#DIV/0!	#DIV/0!
0.00	4.95	---	16.2410	244.80	8	30.6	0.4172	36	16	7.00E-03	0.00E+00	0.00	4.950	0.000	0.00E+00	0.1240	0.0	#DIV/0!	#DIV/0!	7.95	#DIV/0!	#DIV/0!

SPREADSHEET TO CALCULATE CYCLIC RESISTANCE RATIO USING CPT DATA

RTF Job: 2005-052-01
PROJECT :
CPT: CPT-1 CPT DATE: 12/2/05 KTE
DATE : 11/10/2008
amax = 0.53 g
M = 6.60
MSF = 1.5

Ic = (((3.47-LOG(Q))^2)+(LOG(F%)+1.22)^2)^0.5
dqc1N = IF(FC>=35,60,IF(FC<=5,0,2*(FC-5)))
CRR = IF(qc1Ncs<50,(0.833*(qc1Ncs/1000)+0.05),(93*(qc1Ncs/1000)^3+0.08))
MSF = 10^2.24/M^2.56
CSR = 0.65(amax/g)(sigv/sigv')rd = Seed's Equation
Z = IF(Ic<1.31,7,IF(Ic<2.05,6,IF(Ic<2.6,5,IF(Ic<2.95,4,IF(Ic<3.6,3,2)))))
Q = [(qc-St)/Pa]*[(Pa/S')^n] Kc = IF(Ic<=1.64,1,(-0.403*Ic^4+5.581*Ic^3-21.63*Ic^2+33.75*Ic-17.88))

Liquefiable Soil (Type 5+ or 6+) = 2.4
Seismic Settlement Soil (Type) = 6
Actual Water = 30 feet
Design Water = 9 feet
Gamma = 120 pcf
rd = 2

Added Fill = 2 feet
Fill Density = 125 pcf
Pa = 1.04427 tsf = 100 kPa
Threshold FS = 1.10

FS = CRR*MSF/CSR

FS = Thresh
NL = Above
Z
3
4
5
6
7

Depth (m)	Depth (ft)	Tip Resist qc (tsf)	Sleeve Fric fs (tsf)	Total Stress (tsf) 0.00	Water Pressure (tsf) Sw	Effective Stress (tsf) S' = St - Sw	Norm. Fr. Ratio F (%) = fs/(qc-St)	Norm. Pen. Res. Q for n=1 (qc-St)/S'	Soil Index Ic for n=1	Norm. Pen. Res. Q for n= 0.5	Soil Index Ic for n=0.5	Norm. Pen. Res. Q for n= 0.7	Soil Index Ic for n=0.7	Soil Index Ic	Cq exp n	Overburden Correction Cq = 1.7 > (Pa/S')^n	Norm. Cone Res. qc1N = qc*Cq/Pa	Grain Char. Corr. Kc	Equivalent Clean Sand Cone Res. (qc1N)cs = Kc*qc1N	Cyclic Resistance Ratio CRR	rd	Design Effective Stress (tsf) S' = St - Sw	Cyclic Stress Ratio CSR	Depth (ft) Depth	Soil Behavior Type Z	Factor of Safety FS	Liquefiable Layers
5.00	16.41	235.30	0.65	0.984	0.000	0.984	0.28	238	1.28	231	1.29	234	1.29	1.29	0.50	1.03	232	1.0	232.1	1.243	0.962	0.753	0.418	16.41	7 S	4.45	0
5.05	16.57	229.90	0.52	0.994	0.000	0.994	0.23	230	1.25	225	1.26	227	1.25	1.26	0.50	1.02	226	1.0	225.6	1.148	0.961	0.758	0.420	16.57	7 S	4.10	0
5.10	16.73	235.00	0.69	1.004	0.000	1.004	0.29	233	1.30	229	1.31	230	1.30	1.31	0.50	1.02	230	1.0	229.5	1.204	0.961	0.763	0.421	16.73	7 S	4.29	0
5.15	16.90	244.90	0.65	1.014	0.000	1.014	0.27	241	1.27	237	1.27	238	1.27	1.27	0.50	1.01	238	1.0	238.0	1.334	0.961	0.767	0.422	16.90	7 S	4.74	0
5.20	17.06	244.50	0.66	1.024	0.000	1.024	0.27	238	1.27	235	1.28	236	1.28	1.28	0.50	1.01	236	1.0	236.5	1.310	0.960	0.772	0.424	17.06	7 S	4.64	0
5.25	17.23	267.60	0.83	1.034	0.000	1.034	0.31	258	1.28	257	1.28	257	1.28	1.28	0.50	1.01	258	1.0	257.6	1.669	0.960	0.777	0.425	17.23	7 S	5.90	0
5.30	17.39	286.30	0.90	1.043	0.000	1.043	0.32	273	1.26	273	1.26	273	1.26	1.26	0.50	1.00	274	1.0	274.3	1.999	0.959	0.782	0.426	17.39	7 S	7.04	0
5.35	17.55	296.10	0.96	1.053	0.000	1.053	0.33	280	1.26	281	1.26	281	1.26	1.26	0.50	1.00	282	1.0	282.3	2.173	0.959	0.786	0.427	17.55	7 S	7.63	0
5.40	17.72	292.00	0.87	1.063	0.000	1.063	0.30	274	1.25	276	1.24	275	1.24	1.24	0.50	0.99	277	1.0	277.1	2.060	0.959	0.791	0.428	17.72	7 S	7.21	0
5.45	17.88	294.80	0.80	1.073	0.000	1.073	0.27	274	1.22	277	1.22	276	1.22	1.22	0.50	0.99	279	1.0	278.5	2.089	0.958	0.796	0.429	17.88	7 S	7.30	0
5.50	18.05	297.50	0.68	1.083	0.000	1.083	0.23	274	1.18	279	1.18	277	1.18	1.18	0.50	0.98	280	1.0	279.8	2.117	0.958	0.801	0.431	18.05	7 S	7.37	0
5.55	18.21	283.00	0.66	1.093	0.000	1.093	0.23	258	1.21	264	1.20	262	1.21	1.20	0.50	0.98	265	1.0	264.9	1.810	0.958	0.805	0.432	18.21	7 S	6.29	0
5.60	18.37	273.50	0.91	1.102	0.000	1.102	0.33	247	1.31	254	1.30	251	1.30	1.30	0.50	0.97	255	1.0	254.9	1.620	0.957	0.810	0.433	18.37	7 S	5.61	0
5.65	18.54	282.30	1.23	1.112	0.000	1.112	0.44	253	1.37	261	1.36	258	1.36	1.36	0.50	0.97	262	1.0	261.9	1.751	0.957	0.815	0.434	18.54	6 S	6.05	0
5.70	18.70	264.30	1.50	1.122	0.000	1.122	0.57	235	1.47	243	1.46	240	1.46	1.46	0.50	0.96	244	1.0	244.2	1.434	0.956	0.819	0.435	18.70	6 S	4.94	0
5.75	18.87	313.70	1.67	1.132	0.000	1.132	0.53	276	1.40	287	1.39	283	1.39	1.39	0.50	0.96	289	1.0	288.5	2.314	0.956	0.824	0.436	18.87	6 S	7.96	0
5.80	19.03	327.50	1.42	1.142	0.000	1.142	0.44	286	1.33	299	1.31	294	1.32	1.31	0.50	0.96	300	1.0	299.9	2.589	0.956	0.829	0.437	19.03	6 S	8.88	0
5.85	19.19	330.50	1.06	1.152	0.000	1.152	0.32	286	1.25	300	1.23	295	1.24	1.23	0.50	0.95	301	1.0	301.4	2.626	0.955	0.834	0.438	19.19	7 S	8.99	0
5.90	19.36	321.90	1.04	1.161	0.000	1.161	0.32	276	1.26	291	1.24	285	1.25	1.24	0.50	0.95	292	1.0	292.3	2.402	0.955	0.838	0.439	19.36	7 S	8.20	0
5.95	19.52	317.90	0.98	1.171	0.000	1.171	0.31	270	1.26	286	1.24	280	1.25	1.24	0.50	0.94	287	1.0	287.4	2.289	0.954	0.843	0.440	19.52	7 S	7.80	0
6.00	19.69	312.10	1.10	1.181	0.000	1.181	0.35	263	1.30	280	1.28	273	1.29	1.28	0.50	0.94	281	1.0	281.0	2.144	0.954	0.848	0.441	19.69	7 S	7.29	0
6.05	19.85	327.30	1.14	1.191	0.000	1.191	0.35	274	1.28	292	1.26	285	1.27	1.26	0.50	0.94	293	1.0	293.5	2.431	0.954	0.852	0.442	19.85	7 S	8.24	0
6.10	20.01	320.50	1.45	1.201	0.000	1.201	0.45	266	1.36	285	1.34	277	1.35	1.34	0.50	0.93	286	1.0	286.2	2.260	0.953	0.857	0.443	20.01	6 S	7.65	0
6.15	20.18	326.90	1.59	1.211	0.000	1.211	0.49	269	1.38	290	1.36	281	1.37	1.36	0.50	0.93	291	1.0	290.7	2.365	0.953	0.862	0.444	20.18	6 S	7.99	0
6.20	20.34	367.70	2.05	1.221	0.000	1.221	0.56	300	1.39	325	1.36	315	1.37	1.36	0.50	0.92	326	1.0	325.7	3.293	0.953	0.867	0.445	20.34	6 S	11.09	0
6.25	20.51	392.50	3.45	1.230	0.000	1.230	0.88	318	1.51	345	1.49	334	1.50	1.49	0.50	0.92	346	1.0	346.3	3.941	0.952	0.871	0.446	20.51	6 S	13.25	0
6.30	20.67	479.70	6.18	1.240	0.000	1.240	1.29	386	1.60	420	1.58	406	1.59	1.58	0.50	0.92	422	1.0	421.5	7.045	0.952	0.876	0.447	20.67	6 S	23.63	0
6.35	20.83	591.80	7.95	1.250	0.000	1.250	1.35	472	1.57	517	1.55	499	1.55	1.55	0.50	0.91	518	1.0	518.0	13.004	0.951	0.881	0.448	20.83	6 S	43.53	0
6.40	21.00	671.80	6.91	1.260	0.000	1.260	1.03	532	1.44	585	1.42	563	1.43	1.42	0.50	0.91	586	1.0	585.7	18.764	0.951	0.886	0.449	21.00	6 S	62.69	0
6.45	21.16	701.10	6.25	1.270	0.000	1.270	0.89	551	1.38	608	1.36	584	1.37	1.36	0.50	0.91	609	1.0	608.9	21.071	0.951	0.890	0.450	21.16	6 S	70.25	0
6.50	21.33	606.60	5.07	1.280	0.000	1.280	0.84	473	1.39	524	1.37	503	1.38	1.37	0.50	0.90	525	1.0	524.8	13.519	0.950	0.895	0.451	21.33	6 S	44.98	0
6.55	21.49	557.90	3.68	1.289	0.000	1.289	0.66	432	1.33	480	1.31	460	1.32	1.31	0.50	0.90	481	1.0	480.8	10.416	0.950	0.900	0.452	21.49	6 S	34.59	0
6.60	21.65	492.70	2.89	1.299	0.000	1.299	0.59	378	1.33	422	1.30	404	1.31	1.30	0.50	0.90	423	1.0	423.0	7.118	0.950	0.904	0.453	21.65	6 S	23.59	0
6.65	21.82	402.00	1.69	1.309	0.000	1.309	0.42	306	1.30	343	1.26	328	1.28	1.26	0.50	0.89	344	1.0	343.8	3.860	0.949	0.909	0.453	21.82	7 S	12.77	0
6.70	21.98	370.70	0.93	1.319	0.000	1.319	0.25	280	1.20	315	1.15	300	1.17	1.15	0.50	0.89	316	1.0	315.9	3.011	0.949	0.914	0.454	21.98	7 S	9.94	0
6.75	22.15	352.20	0.77	1.329	0.000	1.329	0.22	264	1.19	298	1.14	284	1.16	1.14	0.50	0.89	299	1.0	299.0	2.566	0.948	0.919	0.455	22.15	7 S	8.46	0
6.80	22.31	348.90	0.60	1.339	0.000	1.339	0.17	260	1.15	294	1.10	280	1.12	1.10	0.50	0.88	295	1.0	295.1	2.470	0.948	0.923	0.456	22.31	7 S	8.13	0
6.85	22.47	376.00	0.75	1.348	0.000	1.348	0.20	278	1.15	316	1.10	300	1.12	1.10	0.50	0.88	317	1.0	316.9	3.038	0.948	0.928	0.457	22.47	7 S	9.98	0
6.90	22.64	373.30	0.92	1.358	0.000	1.358	0.25	274	1.20	312	1.15	296	1.17	1.15	0.50	0.88	313	1.0	313.4	2.944	0.947	0.933	0.458	22.64	7 S	9.65	0
6.95	22.80	349.80	0.74	1.368	0.000	1.368	0.21	255	1.20	292	1.14	276	1.17	1.14	0.50	0.87	293	1.0	292.6	2.411	0.947	0.938	0.458	22.80	7 S	7.89	0
7.00	22.97	322.70	1.18	1.378	0.000	1.378	0.37	233	1.35	268	1.30	253	1.32	1.30	0.50	0.87	269	1.0	269.0	1.890	0.946	0.942	0.459	22.97	6 S	6.18	0
7.05	23.13	336.00	0.86	1.388	0.000	1.388	0.26	241	1.26	278	1.20	263	1.23	1.20	0.50	0.87	279	1.0	279.1	2.102	0.946	0.947	0.460	23.13	7 S	6.85	0
7.10	23.30	350.60	0.86	1.398	0.000	1.398	0.25	250	1.23	289	1.18	273	1.20	1.18	0.50	0.86	290	1.0	290.2	2.353	0.946	0.952	0.461	23.30	7 S	7.66	0
7.15	23.46	356.40	1.18	1.408	0.000	1.408	0.33	252	1.30	293	1.25	276	1.27	1.25	0.50	0.86	294	1.0	294.0	2.443	0.945	0.956	0.462	23.46	7 S	7.94	0
7.20	23.62	380.10	1.52	1.417	0.000	1.417	0.40	267	1.33	311	1.28	293	1.30	1.28	0.50	0.86	312	1.0	312.4	2.916	0.945	0.961	0.462	23.62	6 S	9.46	0
7.25	23.79	421.70	1.77	1.427	0.000	1.427	0.42	294	1.31	344	1.26	323	1.28	1.26	0.50	0.86	345	1.0	345.4	3.913	0.945	0.966	0.463	23.79	7 S	12.68	0
7.30	23.95	460.20	1.89	1.437	0.000	1.437	0.41	319	1.28	374	1.23	351	1.25	1.23	0.50	0.85	376	1.0	375.7	5.010	0.944	0.971	0.464	23.95	7 S	16.21	0
7.35	24.12	462.80	2.08	1.447	0.000	1.447	0.45	319	1.30	375	1.25	352	1.27	1.25	0.50	0.85	376	1.0	376.5	5.043	0.944	0.975	0.464	24.12	7 S	16.29	0
7.40	24.28	467.80	2.10	1.457	0.000	1.457	0.45	320	1.30	378	1.25	354	1.27	1.25	0.50	0.85	379	1.0	379.3	5.154	0.943	0.980	0.465	24.28	7 S	16.62	0
7.45	24.44	432.90	1.58	1.467	0.000	1.467	0.37	294	1.27	349	1.21	326	1.24	1.21	0.50	0.84	350	1.0	349.8	4.061	0.943	0.985	0.466	24.44	7 S	13.07	0
7.50	24.61	395.00	1.87	1.476	0.000	1.476	0.48	267	1.38	317	1.32	296	1.34	1.32	0.50	0.84	318	1.0	318.1	3.074	0.943	0.989	0.467	24.61	6 S	9.88	0
7.55	24.77	363.00	1.49	1.486	0.000	1.486	0.41	243	1.37	290	1.31	270	1.33	1.31	0.50	0.84	291	1.0	291.4	2.381	0.942	0.994	0.467	24.77	6 S	7.64	0

old Factor of Safety
e water or Soil Behavior Type is not liquefiable

RTF Job: 2005-052-01
PROJECT :
CPT: CPT-1 CPT DATE: 12/2/05 KTE
DATE : 11/10/2008
amax = 0.53 g
M = 6.60

Soil
Clay to Silty Clay
Clayey Silt to Silty Clay
Silty Sand to Sandy Silt
Clean Sand to Silty Sand
Gravelly Sand to Sand

Sum of Liquefiable Thickness (m)	Sum of Non-Liq Thickness (m)	Ratio of Non-Liq to Liquefiable 110.00	Liq. 0.03 in. Settlement (in) Settlement	N-Value Conversion (tsf) qc	qc/N	N-Value	CSR	H_Index	V_Index	Liquefaction Settlement Strain%	Settlement	0.03 in. Cumulative Settlement	Dry Settlement Cyc Shear Avg Stress	Gmax	Acoeff	Bcoeff	Cyc Strain	Eps15	Nc	EpsNc	Settlement
0.00	5.00	---	16.4050	235.30	8	29.4	0.4185	35	16	9.00E-03	0.00E+00	0.00	5.000	0.000	0.00E+00	0.1240	0.0	#DIV/0!	#DIV/0!	7.95	#DIV/0!	#DIV/0!
0.00	5.05	---	16.5691	229.90	8	28.7	0.4198	34	16	9.00E-03	0.00E+00	0.00	5.050	0.000	0.00E+00	0.1240	0.0	#DIV/0!	#DIV/0!	7.95	#DIV/0!	#DIV/0!
0.00	5.10	---	16.7331	235.00	8	29.4	0.4210	35	16	9.00E-03	0.00E+00	0.00	5.100	0.000	0.00E+00	0.1240	0.0	#DIV/0!	#DIV/0!	7.95	#DIV/0!	#DIV/0!
0.00	5.15	---	16.8972	244.90	8	30.6	0.4223	36	16	7.00E-03	0.00E+00	0.00	5.150	0.000	0.00E+00	0.1240	0.0	#DIV/0!	#DIV/0!	7.95	#DIV/0!	#DIV/0!
0.00	5.20	---	17.0612	244.50	8	30.6	0.4235	36	16	7.00E-03	0.00E+00	0.00	5.200	0.000	0.00E+00	0.1240	0.0	#DIV/0!	#DIV/0!	7.95	#DIV/0!	#DIV/0!
0.00	5.25	---	17.2253	267.60	8	33.5	0.4248	39	16	1.80E-03	0.00E+00	0.00	5.250	0.000	0.00E+00	0.1240	0.0	#DIV/0!	#DIV/0!	7.95	#DIV/0!	#DIV/0!
0.00	5.30	---	17.3893	286.30	8	35.8	0.4260	42	16	0.00E+00	0.00E+00	0.00	5.300	0.000	0.00E+00	0.1240	0.0	#DIV/0!	#DIV/0!	7.95	#DIV/0!	#DIV/0!
0.00	5.35	---	17.5534	296.10	8	37.0	0.4272	42	16	0.00E+00	0.00E+00	0.00	5.350	0.000	0.00E+00	0.1240	0.0	#DIV/0!	#DIV/0!	7.95	#DIV/0!	#DIV/0!
0.00	5.40	---	17.7174	292.00	8	36.5	0.4283	42	16	0.00E+00	0.00E+00	0.00	5.400	0.000	0.00E+00	0.1240	0.0	#DIV/0!	#DIV/0!	7.95	#DIV/0!	#DIV/0!
0.00	5.45	---	17.8815	294.80	8	36.9	0.4295	42	16	0.00E+00	0.00E+00	0.00	5.450	0.000	0.00E+00	0.1240	0.0	#DIV/0!	#DIV/0!	7.95	#DIV/0!	#DIV/0!
0.00	5.50	---	18.0455	297.50	8	37.2	0.4306	42	16	0.00E+00	0.00E+00	0.00	5.500	0.000	0.00E+00	0.1240	0.0	#DIV/0!	#DIV/0!	7.95	#DIV/0!	#DIV/0!
0.00	5.55	---	18.2096	283.00	8	35.4	0.4318	42	16	0.00E+00	0.00E+00	0.00	5.550	0.000	0.00E+00	0.1240	0.0	#DIV/0!	#DIV/0!	7.95	#DIV/0!	#DIV/0!
0.00	5.60	---	18.3736	273.50	8	34.2	0.4329	41	16	0.00E+00	0.00E+00	0.00	5.600	0.000	0.00E+00	0.1240	0.0	#DIV/0!	#DIV/0!	7.95	#DIV/0!	#DIV/0!
0.00	5.65	---	18.5377	282.30	6	47.1	0.4340	42	16	0.00E+00	0.00E+00	0.00	5.650	0.000	0.00E+00	0.1240	0.0	#DIV/0!	#DIV/0!	7.95	#DIV/0!	#DIV/0!
0.00	5.70	---	18.7017	264.30	6	44.1	0.4351	42	16	0.00E+00	0.00E+00	0.00	5.700	0.000	0.00E+00	0.1240	0.0	#DIV/0!	#DIV/0!	7.95	#DIV/0!	#DIV/0!
0.00	5.75	---	18.8658	313.70	6	52.3	0.4362	42	16	0.00E+00	0.00E+00	0.00	5.750	0.000	0.00E+00	0.1240	0.0	#DIV/0!	#DIV/0!	7.95	#DIV/0!	#DIV/0!
0.00	5.80	---	19.0298	327.50	6	54.6	0.4372	42	16	0.00E+00	0.00E+00	0.00	5.800	0.000	0.00E+00	0.1240	0.0	#DIV/0!	#DIV/0!	7.95	#DIV/0!	#DIV/0!
0.00	5.85	---	19.1939	330.50	8	41.3	0.4383	42	16	0.00E+00	0.00E+00	0.00	5.850	0.000	0.00E+00	0.1240	0.0	#DIV/0!	#DIV/0!	7.95	#DIV/0!	#DIV/0!
0.00	5.90	---	19.3579	321.90	8	40.2	0.4393	42	16	0.00E+00	0.00E+00	0.00	5.900	0.000	0.00E+00	0.1240	0.0	#DIV/0!	#DIV/0!	7.95	#DIV/0!	#DIV/0!
0.00	5.95	---	19.5220	317.90	8	39.7	0.4403	42	16	0.00E+00	0.00E+00	0.00	5.950	0.000	0.00E+00	0.1240	0.0	#DIV/0!	#DIV/0!	7.95	#DIV/0!	#DIV/0!
0.00	6.00	---	19.6860	312.10	8	39.0	0.4413	42	16	0.00E+00	0.00E+00	0.00	6.000	0.000	0.00E+00	0.1240	0.0	#DIV/0!	#DIV/0!	7.95	#DIV/0!	#DIV/0!
0.00	6.05	---	19.8501	327.30	8	40.9	0.4423	42	16	0.00E+00	0.00E+00	0.00	6.050	0.000	0.00E+00	0.1240	0.0	#DIV/0!	#DIV/0!	7.95	#DIV/0!	#DIV/0!
0.00	6.10	---	20.0141	320.50	6	53.4	0.4433	42	16	0.00E+00	0.00E+00	0.00	6.100	0.000	0.00E+00	0.1240	0.0	#DIV/0!	#DIV/0!	7.95	#DIV/0!	#DIV/0!
0.00	6.15	---	20.1782	326.90	6	54.5	0.4443	42	16	0.00E+00	0.00E+00	0.00	6.150	0.000	0.00E+00	0.1240	0.0	#DIV/0!	#DIV/0!	7.95	#DIV/0!	#DIV/0!
0.00	6.20	---	20.3422	367.70	6	61.3	0.4453	42	16	0.00E+00	0.00E+00	0.00	6.200	0.000	0.00E+00	0.1240	0.0	#DIV/0!	#DIV/0!	7.95	#DIV/0!	#DIV/0!
0.00	6.25	---	20.5063	392.50	6	65.4	0.4462	42	16	0.00E+00	0.00E+00	0.00	6.250	0.000	0.00E+00	0.1240	0.0	#DIV/0!	#DIV/0!	7.95	#DIV/0!	#DIV/0!
0.00	6.30	---	20.6703	479.70	6	80.0	0.4472	42	16	0.00E+00	0.00E+00	0.00	6.300	0.000	0.00E+00	0.1240	0.0	#DIV/0!	#DIV/0!	7.95	#DIV/0!	#DIV/0!
0.00	6.35	---	20.8344	591.80	6	98.6	0.4481	42	16	0.00E+00	0.00E+00	0.00	6.350	0.000	0.00E+00	0.1240	0.0	#DIV/0!	#DIV/0!	7.95	#DIV/0!	#DIV/0!
0.00	6.40	---	20.9984	671.80	6	112.0	0.4490	42	16	0.00E+00	0.00E+00	0.00	6.400	0.000	0.00E+00	0.1240	0.0	#DIV/0!	#DIV/0!	7.95	#DIV/0!	#DIV/0!
0.00	6.45	---	21.1625	701.10	6	116.9	0.4499	42	16	0.00E+00	0.00E+00	0.00	6.450	0.000	0.00E+00	0.1240	0.0	#DIV/0!	#DIV/0!	7.95	#DIV/0!	#DIV/0!
0.00	6.50	---	21.3265	606.60	6	101.1	0.4508	42	17	0.00E+00	0.00E+00	0.00	6.500	0.000	0.00E+00	0.1240	0.0	#DIV/0!	#DIV/0!	7.95	#DIV/0!	#DIV/0!
0.00	6.55	---	21.4906	557.90	6	93.0	0.4517	42	17	0.00E+00	0.00E+00	0.00	6.550	0.000	0.00E+00	0.1240	0.0	#DIV/0!	#DIV/0!	7.95	#DIV/0!	#DIV/0!
0.00	6.60	---	21.6546	492.70	6	82.1	0.4526	42	17	0.00E+00	0.00E+00	0.00	6.600	0.000	0.00E+00	0.1240	0.0	#DIV/0!	#DIV/0!	7.95	#DIV/0!	#DIV/0!
0.00	6.65	---	21.8187	402.00	8	50.3	0.4534	42	17	0.00E+00	0.00E+00	0.00	6.650	0.000	0.00E+00	0.1240	0.0	#DIV/0!	#DIV/0!	7.95	#DIV/0!	#DIV/0!
0.00	6.70	---	21.9827	370.70	8	46.3	0.4543	42	17	0.00E+00	0.00E+00	0.00	6.700	0.000	0.00E+00	0.1240	0.0	#DIV/0!	#DIV/0!	7.95	#DIV/0!	#DIV/0!
0.00	6.75	---	22.1468	352.20	8	44.0	0.4551	42	17	0.00E+00	0.00E+00	0.00	6.750	0.000	0.00E+00	0.1240	0.0	#DIV/0!	#DIV/0!	7.95	#DIV/0!	#DIV/0!
0.00	6.80	---	22.3108	348.90	8	43.6	0.4560	42	17	0.00E+00	0.00E+00	0.00	6.800	0.000	0.00E+00	0.1240	0.0	#DIV/0!	#DIV/0!	7.95	#DIV/0!	#DIV/0!
0.00	6.85	---	22.4749	376.00	8	47.0	0.4568	42	17	0.00E+00	0.00E+00	0.00	6.850	0.000	0.00E+00	0.1240	0.0	#DIV/0!	#DIV/0!	7.95	#DIV/0!	#DIV/0!
0.00	6.90	---	22.6389	373.30	8	46.7	0.4576	42	17	0.00E+00	0.00E+00	0.00	6.900	0.000	0.00E+00	0.1240	0.0	#DIV/0!	#DIV/0!	7.95	#DIV/0!	#DIV/0!
0.00	6.95	---	22.8030	349.80	8	43.7	0.4584	42	17	0.00E+00	0.00E+00	0.00	6.950	0.000	0.00E+00	0.1240	0.0	#DIV/0!	#DIV/0!	7.95	#DIV/0!	#DIV/0!
0.00	7.00	---	22.9670	322.70	6	53.8	0.4592	42	17	0.00E+00	0.00E+00	0.00	7.000	0.000	0.00E+00	0.1240	0.0	#DIV/0!	#DIV/0!	7.95	#DIV/0!	#DIV/0!
0.00	7.05	---	23.1311	336.00	8	42.0	0.4600	42	17	0.00E+00	0.00E+00	0.00	7.050	0.000	0.00E+00	0.1240	0.0	#DIV/0!	#DIV/0!	7.95	#DIV/0!	#DIV/0!
0.00	7.10	---	23.2951	350.60	8	43.8	0.4607	42	17	0.00E+00	0.00E+00	0.00	7.100	0.000	0.00E+00	0.1240	0.0	#DIV/0!	#DIV/0!	7.95	#DIV/0!	#DIV/0!
0.00	7.15	---	23.4592	356.40	8	44.6	0.4615	42	17	0.00E+00	0.00E+00	0.00	7.150	0.000	0.00E+00	0.1240	0.0	#DIV/0!	#DIV/0!	7.95	#DIV/0!	#DIV/0!
0.00	7.20	---	23.6232	380.10	6	63.4	0.4623	42	17	0.00E+00	0.00E+00	0.00	7.200	0.000	0.00E+00	0.1240	0.0	#DIV/0!	#DIV/0!	7.95	#DIV/0!	#DIV/0!
0.00	7.25	---	23.7873	421.70	8	52.7	0.4630	42	17	0.00E+00	0.00E+00	0.00	7.250	0.000	0.00E+00	0.1240	0.0	#DIV/0!	#DIV/0!	7.95	#DIV/0!	#DIV/0!
0.00	7.30	---	23.9513	460.20	8	57.5	0.4638	42	17	0.00E+00	0.00E+00	0.00	7.300	0.000	0.00E+00	0.1240	0.0	#DIV/0!	#DIV/0!	7.95	#DIV/0!	#DIV/0!
0.00	7.35	---	24.1154	462.80	8	57.9	0.4645	42	17	0.00E+00	0.00E+00	0.00	7.350	0.000	0.00E+00	0.1240	0.0	#DIV/0!	#DIV/0!	7.95	#DIV/0!	#DIV/0!
0.00	7.40	---	24.2794	467.80	8	58.5	0.4652	42	17	0.00E+00	0.00E+00	0.00	7.400	0.000	0.00E+00	0.1240	0.0	#DIV/0!	#DIV/0!	7.95	#DIV/0!	#DIV/0!
0.00	7.45	---	24.4435	432.90	8	54.1	0.4659	42	17	0.00E+00	0.00E+00	0.00	7.450	0.000	0.00E+00	0.1240	0.0	#DIV/0!	#DIV/0!	7.95	#DIV/0!	#DIV/0!
0.00	7.50	---	24.6075	395.00	6	65.8	0.4666	42	17	0.00E+00	0.00E+00	0.00	7.500	0.000	0.00E+00	0.1240	0.0	#DIV/0!	#DIV/0!	7.95	#DIV/0!	#DIV/0!
0.00	7.55	---	24.7716	363.00	6	60.5	0.4673	42	17	0.00E+00	0.00E+00	0.00	7.550	0.000	0.00E+00	0.1240	0.0	#DIV/0!	#DIV/0!	7.95	#DIV/0!	#DIV/0!

SPREADSHEET TO CALCULATE CYCLIC RESISTANCE RATIO USING CPT DATA

RTF Job: 2005-052-01
PROJECT :
CPT: CPT-1 CPT DATE: 12/2/05 KTE
DATE : 11/10/2008
amax = 0.53 g
M = 6.60
MSF = 1.5

Ic = (((3.47-LOG(Q))^2)+(LOG(F%)+1.22)^2)^0.5
dqc1N = IF(FC>=35,60,IF(FC<=5,0,2*(FC-5)))
CRR = IF(qc1Ncs<50,(0.833*(qc1Ncs/1000)+0.05),(93*(qc1Ncs/1000)^3+0.08))
MSF = 10^2.24/M^2.56
CSR = 0.65(amax/g)(sigv/sigv')rd = Seed's Equation
Z = IF(Ic<1.31,7,IF(C<2.05,6,IF(Ic<2.6,5,IF(Ic<2.95,4,IF(Ic<3.6,3,2)))))
Q = [(qc-St)/Pa]*[(Pa/S')^n] Kc = IF(Ic<=1.64,1,(-0.403*Ic^4+5.581*Ic^3-21.63*Ic^2+33.75*Ic-17.88))

Liquefiable Soil (Type 5+ or 6+) = 2.4
Seismic Settlement Soil (Type) = 6
Actual Water = 30 feet
Design Water = 9 feet
Gamma = 120 pcf
rd = 2

Added Fill = 2 feet
Fill Density = 125 pcf
Pa = 1.04427 tsf = 100 kPa
Threshold FS = 1.10

FS = CRR*MSF/CSR

FS = Thresh
NL = Above
Z
3
4
5
6
7

Depth (m)	Depth (ft)	Tip Resist qc (tsf)	Sleeve Fric fs (tsf)	Total Stress (tsf) 0.00	Water Pressure (tsf) Sw	Effective Stress (tsf) S' = St - Sw	Norm. Fr. Ratio F (%) = fs/(qc-St)	Norm. Pen. Res. Q for n=1 (qc-St)/S'	Soil Index Ic for n=1	Norm. Pen. Res. Q for n= 0.5	Soil Index Ic for n=0.5	Norm. Pen. Res. Q for n= 0.7	Soil Index Ic for n=0.7	Soil Index Ic	Cq exp n	Overburden Correction Cq = 1.7 > (Pa/S')^n	Norm. Cone Res. qc1N = qc*Cq/Pa	Grain Char. Corr. Kc	Equivalent Clean Sand Cone Res. (qc1N)cs = Kc*qc1N	Cyclic Resistance Ratio CRR	rd	Design Effective Stress (tsf) S' = St - Sw	Cyclic Stress Ratio CSR	Depth (ft) Depth	Soil Behavior Type Z	Factor of Safety FS	Liquefiable Layers
7.60	24.94	353.20	1.38	1.496	0.000	1.496	0.39	235	1.37	281	1.31	262	1.33	1.31	0.50	0.84	283	1.0	282.6	2.178	0.942	0.999	0.468	24.94	6 S	6.98	0
7.65	25.10	350.60	1.20	1.506	0.000	1.506	0.34	232	1.34	278	1.27	259	1.30	1.27	0.50	0.83	280	1.0	279.6	2.112	0.941	1.004	0.469	25.10	6 S	6.76	0
7.70	25.26	365.10	1.21	1.516	0.000	1.516	0.33	240	1.32	289	1.25	268	1.28	1.25	0.50	0.83	290	1.0	290.2	2.353	0.941	1.008	0.469	25.26	6 S	7.52	0
7.75	25.43	369.00	1.07	1.526	0.000	1.526	0.29	241	1.29	291	1.22	270	1.24	1.22	0.50	0.83	292	1.0	292.3	2.404	0.941	1.013	0.470	25.43	7 S	7.67	0
7.80	25.59	362.90	1.24	1.536	0.000	1.536	0.34	235	1.33	285	1.26	264	1.29	1.26	0.50	0.82	287	1.0	286.6	2.269	0.940	1.018	0.471	25.59	6 S	7.23	0
7.85	25.76	377.50	1.61	1.545	0.000	1.545	0.43	243	1.38	296	1.31	274	1.34	1.31	0.50	0.82	297	1.0	297.2	2.520	0.940	1.023	0.471	25.76	6 S	8.02	0
7.90	25.92	386.80	1.71	1.555	0.000	1.555	0.44	248	1.38	302	1.32	279	1.34	1.32	0.50	0.82	304	1.0	303.5	2.680	0.940	1.027	0.472	25.92	6 S	8.52	0
7.95	26.08	388.20	1.82	1.565	0.000	1.565	0.47	247	1.40	302	1.33	279	1.36	1.33	0.50	0.82	304	1.0	303.7	2.684	0.939	1.032	0.473	26.08	6 S	8.52	0
8.00	26.25	400.40	1.90	1.575	0.000	1.575	0.48	253	1.39	311	1.33	286	1.35	1.33	0.50	0.81	312	1.0	312.2	2.911	0.939	1.037	0.473	26.25	6 S	9.23	0
8.05	26.41	448.00	2.14	1.585	0.000	1.585	0.48	282	1.36	347	1.29	319	1.32	1.29	0.50	0.81	348	1.0	348.3	4.008	0.938	1.041	0.474	26.41	6 S	12.69	0
8.10	26.58	444.50	2.25	1.595	0.000	1.595	0.51	278	1.38	343	1.32	315	1.34	1.32	0.50	0.81	344	1.0	344.5	3.881	0.938	1.046	0.474	26.58	6 S	12.27	0
8.15	26.74	420.30	1.98	1.604	0.000	1.604	0.47	261	1.38	323	1.31	297	1.34	1.31	0.50	0.81	325	1.0	324.7	3.264	0.938	1.051	0.475	26.74	6 S	10.31	0
8.20	26.90	375.60	2.07	1.614	0.000	1.614	0.55	232	1.47	288	1.40	264	1.42	1.40	0.50	0.80	289	1.0	289.3	2.332	0.937	1.056	0.476	26.90	6 S	7.35	0
8.25	27.07	343.80	2.20	1.624	0.000	1.624	0.64	211	1.54	263	1.47	241	1.50	1.47	0.50	0.80	264	1.0	264.0	1.791	0.937	1.060	0.476	27.07	6 S	5.64	0
8.30	27.23	331.00	2.61	1.634	0.000	1.634	0.79	202	1.62	252	1.55	231	1.57	1.55	0.50	0.80	253	1.0	253.4	1.593	0.937	1.065	0.477	27.23	6 S	5.01	0
8.35	27.40	313.30	2.21	1.644	0.000	1.644	0.71	190	1.60	238	1.53	217	1.56	1.53	0.50	0.80	239	1.0	239.1	1.352	0.936	1.070	0.477	27.40	6 S	4.25	0
8.40	27.56	320.30	1.96	1.654	0.000	1.654	0.62	193	1.56	242	1.48	221	1.51	1.48	0.50	0.79	244	1.0	243.7	1.427	0.936	1.075	0.478	27.56	6 S	4.48	0
8.45	27.72	309.30	1.37	1.663	0.000	1.663	0.45	185	1.48	233	1.40	213	1.44	1.40	0.50	0.79	235	1.0	234.7	1.282	0.935	1.079	0.479	27.72	6 S	4.02	0
8.50	27.89	337.70	1.06	1.673	0.000	1.673	0.32	201	1.37	254	1.28	231	1.32	1.28	0.50	0.79	255	1.0	255.5	1.631	0.935	1.084	0.479	27.89	6 S	5.11	0
8.55	28.05	359.30	1.31	1.683	0.000	1.683	0.37	212	1.39	270	1.30	245	1.33	1.30	0.50	0.79	271	1.0	271.0	1.931	0.935	1.089	0.480	28.05	6 S	6.04	0
8.60	28.22	364.70	1.43	1.693	0.000	1.693	0.39	214	1.40	273	1.32	248	1.35	1.32	0.50	0.79	274	1.0	274.3	1.999	0.934	1.093	0.480	28.22	6 S	6.24	0
8.65	28.38	376.30	2.49	1.703	0.000	1.703	0.66	220	1.54	281	1.46	255	1.49	1.46	0.50	0.78	282	1.0	282.2	2.170	0.934	1.098	0.481	28.38	6 S	6.77	0
8.70	28.54	388.30	2.55	1.713	0.000	1.713	0.66	226	1.53	289	1.45	262	1.48	1.45	0.50	0.78	290	1.0	290.4	2.356	0.933	1.103	0.481	28.54	6 S	7.34	0
8.75	28.71	407.90	1.95	1.723	0.000	1.723	0.48	236	1.42	303	1.34	274	1.37	1.34	0.50	0.78	304	1.0	304.1	2.696	0.933	1.108	0.482	28.71	6 S	8.39	0
8.80	28.87	367.30	2.37	1.732	0.000	1.732	0.65	211	1.54	272	1.46	246	1.49	1.46	0.50	0.78	273	1.0	273.1	1.974	0.933	1.112	0.482	28.87	6 S	6.14	0
8.85	29.04	393.20	1.90	1.742	0.000	1.742	0.49	225	1.44	290	1.35	262	1.39	1.35	0.50	0.77	292	1.0	291.5	2.384	0.932	1.117	0.483	29.04	6 S	7.41	0
8.90	29.20	359.50	1.34	1.752	0.000	1.752	0.37	204	1.41	264	1.31	238	1.35	1.31	0.50	0.77	266	1.0	265.8	1.826	0.932	1.122	0.483	29.20	6 S	5.67	0
8.95	29.36	333.70	1.72	1.762	0.000	1.762	0.52	188	1.52	245	1.43	220	1.46	1.43	0.50	0.77	246	1.0	246.0	1.465	0.932	1.127	0.484	29.36	6 S	4.54	0
9.00	29.53	343.50	1.93	1.772	0.000	1.772	0.56	193	1.53	251	1.45	226	1.48	1.45	0.50	0.77	253	1.0	252.5	1.578	0.931	1.131	0.484	29.53	6 S	4.89	0
9.05	29.69	395.00	1.72	1.782	0.000	1.782	0.44	221	1.42	288	1.33	259	1.36	1.33	0.50	0.77	290	1.0	289.6	2.339	0.931	1.136	0.485	29.69	6 S	7.24	0
9.10	29.86	371.40	1.86	1.791	0.000	1.791	0.50	206	1.48	270	1.39	243	1.42	1.39	0.50	0.76	272	1.0	271.5	1.942	0.930	1.141	0.485	29.86	6 S	6.00	0
9.15	30.02	341.00	1.49	1.801	0.001	1.801	0.44	188	1.47	247	1.38	222	1.42	1.38	0.50	0.76	249	1.0	248.7	1.510	0.930	1.145	0.486	30.02	6 S	4.66	0
9.20	30.19	343.10	1.39	1.811	0.006	1.805	0.41	189	1.45	249	1.36	223	1.40	1.36	0.50	0.76	250	1.0	249.9	1.531	0.928	1.150	0.486	30.19	6 S	4.73	0
9.25	30.35	327.10	1.19	1.821	0.011	1.810	0.37	180	1.45	237	1.35	212	1.39	1.35	0.50	0.76	238	1.0	237.9	1.332	0.927	1.155	0.486	30.35	6 S	4.12	0
9.30	30.51	408.30	4.16	1.831	0.016	1.815	1.02	224	1.66	295	1.59	264	1.62	1.59	0.50	0.76	297	1.0	296.6	2.506	0.926	1.160	0.486	30.51	6 S	7.74	0
9.35	30.68	482.20	4.89	1.841	0.021	1.820	1.02	264	1.61	348	1.54	312	1.57	1.54	0.50	0.76	350	1.0	349.8	4.061	0.924	1.164	0.485	30.68	6 S	12.55	0
9.40	30.84	541.70	4.42	1.850	0.026	1.824	0.82	296	1.51	391	1.43	350	1.46	1.43	0.50	0.76	392	1.0	392.5	5.702	0.923	1.169	0.485	30.84	6 S	17.62	0
9.45	31.01	513.10	3.98	1.860	0.031	1.829	0.78	280	1.51	370	1.43	331	1.46	1.43	0.50	0.76	371	1.0	371.3	4.840	0.922	1.174	0.485	31.01	6 S	14.96	0
9.50	31.17	485.10	2.59	1.870	0.036	1.834	0.54	264	1.41	349	1.33	312	1.36	1.33	0.50	0.75	351	1.0	350.6	4.087	0.920	1.178	0.485	31.17	6 S	12.63	0
9.55	31.33	531.50	1.80	1.880	0.042	1.838	0.34	288	1.26	382	1.16	341	1.20	1.16	0.50	0.75	384	1.0	383.6	5.329	0.919	1.183	0.485	31.33	7 S	16.47	0
9.60	31.50	476.60	1.37	1.890	0.047	1.843	0.29	258	1.26	342	1.16	305	1.20	1.16	0.50	0.75	344	1.0	343.5	3.850	0.918	1.188	0.485	31.50	7 S	11.90	0
9.65	31.66	465.40	0.86	1.900	0.052	1.848	0.19	251	1.18	334	1.07	298	1.11	1.07	0.50	0.75	335	1.0	335.0	3.577	0.916	1.193	0.485	31.66	7 S	11.06	0
9.70	31.83	453.20	1.02	1.910	0.057	1.853	0.23	244	1.23	324	1.12	289	1.16	1.12	0.50	0.75	326	1.0	325.8	3.297	0.915	1.197	0.485	31.83	7 S	10.20	0
9.75	31.99	424.90	0.94	1.919	0.062	1.857	0.22	228	1.25	304	1.14	271	1.18	1.14	0.50	0.75	305	1.0	305.1	2.721	0.914	1.202	0.485	31.99	7 S	8.42	0
9.80	32.15	406.40	0.96	1.929	0.067	1.862	0.24	217	1.28	290	1.17	258	1.21	1.17	0.50	0.75	291	1.0	291.4	2.382	0.912	1.207	0.485	32.15	7 S	7.37	0
9.85	32.32	375.30	0.75	1.939	0.072	1.867	0.20	200	1.28	267	1.17	238	1.21	1.17	0.50	0.75	269	1.0	268.8	1.886	0.911	1.212	0.485	32.32	7 S	5.84	0
9.90	32.48	363.00	0.65	1.949	0.077	1.871	0.18	193	1.28	258	1.16	230	1.21	1.16	0.50	0.75	260	1.0	259.7	1.708	0.910	1.216	0.485	32.48	7 S	5.29	0
9.95	32.65	324.40	0.74	1.959	0.083	1.876	0.23	172	1.36	230	1.25	205	1.30	1.25	0.50	0.75	232	1.0	231.8	1.238	0.908	1.221	0.484	32.65	6 S	3.83	0
10.00	32.81	302.50	0.62	1.969	0.088	1.881	0.21	160	1.37	214	1.26	191	1.30	1.26	0.50	0.75	216	1.0	215.8	1.015	0.907	1.226	0.484	32.81	6 S	3.14	0
10.05	32.97	293.00	0.66	1.978	0.093	1.886	0.23	154	1.40	207	1.29	184	1.34	1.29	0.50	0.74	209	1.0	208.8	0.927	0.906	1.230	0.484	32.97	6 S	2.87	0
10.10	33.14	279.00	0.68	1.988	0.098	1.890	0.25	147	1.44	197	1.32	175	1.37	1.32	0.50	0.74	199	1.0	198.6	0.808	0.904	1.235	0.484	33.14	6 S	2.50	0
10.15	33.30	269.80	0.67	1.998	0.103	1.895	0.25	141	1.46	190	1.34	169	1.39	1.34	0.50	0.74	192	1.0	191.8	0.736	0.903	1.240	0.484	33.30	6 S	2.28	0

old Factor of Safety
e water or Soil Behavior Type is not liquefiable

Soil
Clay to Silty Clay
Clayey Silt to Silty Clay
Silty Sand to Sandy Silt
Clean Sand to Silty Sand
Gravelly Sand to Sand

RTF Job: 2005-052-01
PROJECT :
CPT: CPT-1 CPT DATE: 12/2/05 KTE
DATE : 11/10/2008
amax = 0.53 g
M = 6.60

Sum of Liquefiable Thickness (m)	Sum of Non-Liq Thickness (m)	Ratio of Non-Liq to Liquefiable 110.00	Liq. 0.03 in. Settlement (in) Settlement	N-Value Conversion (tsf) qc	qc/N	N-Value	Liquefaction Settlement CSR	H_Index	V_Index	Strain%	0.03 in. Settlement	Cumulative Settlement	Dry Settlement Cyc Shear Avg Stress	Gmax	Acoeff	Bcoeff	Cyc Strain	Eps15	Nc	EpsNc	Settlement
0.00	7.60	---	24.9356	353.20	6	58.9	0.4680	42	17	0.00E+00	0.00E+00	0.00	7.600	0.000	0.00E+00	0.1240	0.0	#DIV/0!	#DIV/0!	7.95	#DIV/0!	#DIV/0!
0.00	7.65	---	25.0997	350.60	6	58.4	0.4687	42	17	0.00E+00	0.00E+00	0.00	7.650	0.000	0.00E+00	0.1240	0.0	#DIV/0!	#DIV/0!	7.95	#DIV/0!	#DIV/0!
0.00	7.70	---	25.2637	365.10	6	60.9	0.4694	42	17	0.00E+00	0.00E+00	0.00	7.700	0.000	0.00E+00	0.1240	0.0	#DIV/0!	#DIV/0!	7.95	#DIV/0!	#DIV/0!
0.00	7.75	---	25.4278	369.00	8	46.1	0.4700	42	17	0.00E+00	0.00E+00	0.00	7.750	0.000	0.00E+00	0.1240	0.0	#DIV/0!	#DIV/0!	7.95	#DIV/0!	#DIV/0!
0.00	7.80	---	25.5918	362.90	6	60.5	0.4707	42	17	0.00E+00	0.00E+00	0.00	7.800	0.000	0.00E+00	0.1240	0.0	#DIV/0!	#DIV/0!	7.95	#DIV/0!	#DIV/0!
0.00	7.85	---	25.7559	377.50	6	62.9	0.4713	42	17	0.00E+00	0.00E+00	0.00	7.850	0.000	0.00E+00	0.1240	0.0	#DIV/0!	#DIV/0!	7.95	#DIV/0!	#DIV/0!
0.00	7.90	---	25.9199	386.80	6	64.5	0.4720	42	17	0.00E+00	0.00E+00	0.00	7.900	0.000	0.00E+00	0.1240	0.0	#DIV/0!	#DIV/0!	7.95	#DIV/0!	#DIV/0!
0.00	7.95	---	26.0840	388.20	6	64.7	0.4726	42	17	0.00E+00	0.00E+00	0.00	7.950	0.000	0.00E+00	0.1240	0.0	#DIV/0!	#DIV/0!	7.95	#DIV/0!	#DIV/0!
0.00	8.00	---	26.2480	400.40	6	66.7	0.4732	42	17	0.00E+00	0.00E+00	0.00	8.000	0.000	0.00E+00	0.1240	0.0	#DIV/0!	#DIV/0!	7.95	#DIV/0!	#DIV/0!
0.00	8.05	---	26.4121	448.00	6	74.7	0.4738	42	17	0.00E+00	0.00E+00	0.00	8.050	0.000	0.00E+00	0.1240	0.0	#DIV/0!	#DIV/0!	7.95	#DIV/0!	#DIV/0!
0.00	8.10	---	26.5761	444.50	6	74.1	0.4745	42	17	0.00E+00	0.00E+00	0.00	8.100	0.000	0.00E+00	0.1240	0.0	#DIV/0!	#DIV/0!	7.95	#DIV/0!	#DIV/0!
0.00	8.15	---	26.7402	420.30	6	70.1	0.4751	42	17	0.00E+00	0.00E+00	0.00	8.150	0.000	0.00E+00	0.1240	0.0	#DIV/0!	#DIV/0!	7.95	#DIV/0!	#DIV/0!
0.00	8.20	---	26.9042	375.60	6	62.6	0.4757	42	17	0.00E+00	0.00E+00	0.00	8.200	0.000	0.00E+00	0.1240	0.0	#DIV/0!	#DIV/0!	7.95	#DIV/0!	#DIV/0!
0.00	8.25	---	27.0683	343.80	6	57.3	0.4763	42	17	0.00E+00	0.00E+00	0.00	8.250	0.000	0.00E+00	0.1240	0.0	#DIV/0!	#DIV/0!	7.95	#DIV/0!	#DIV/0!
0.00	8.30	---	27.2323	331.00	6	55.2	0.4768	42	17	0.00E+00	0.00E+00	0.00	8.300	0.000	0.00E+00	0.1240	0.0	#DIV/0!	#DIV/0!	7.95	#DIV/0!	#DIV/0!
0.00	8.35	---	27.3964	313.30	6	52.2	0.4774	42	17	0.00E+00	0.00E+00	0.00	8.350	0.000	0.00E+00	0.1240	0.0	#DIV/0!	#DIV/0!	7.95	#DIV/0!	#DIV/0!
0.00	8.40	---	27.5604	320.30	6	53.4	0.4780	42	17	0.00E+00	0.00E+00	0.00	8.400	0.000	0.00E+00	0.1240	0.0	#DIV/0!	#DIV/0!	7.95	#DIV/0!	#DIV/0!
0.00	8.45	---	27.7245	309.30	6	51.6	0.4785	42	17	0.00E+00	0.00E+00	0.00	8.450	0.000	0.00E+00	0.1240	0.0	#DIV/0!	#DIV/0!	7.95	#DIV/0!	#DIV/0!
0.00	8.50	---	27.8885	337.70	6	56.3	0.4791	42	17	0.00E+00	0.00E+00	0.00	8.500	0.000	0.00E+00	0.1240	0.0	#DIV/0!	#DIV/0!	7.95	#DIV/0!	#DIV/0!
0.00	8.55	---	28.0526	359.30	6	59.9	0.4797	42	17	0.00E+00	0.00E+00	0.00	8.550	0.000	0.00E+00	0.1240	0.0	#DIV/0!	#DIV/0!	7.95	#DIV/0!	#DIV/0!
0.00	8.60	---	28.2166	364.70	6	60.8	0.4802	42	17	0.00E+00	0.00E+00	0.00	8.600	0.000	0.00E+00	0.1240	0.0	#DIV/0!	#DIV/0!	7.95	#DIV/0!	#DIV/0!
0.00	8.65	---	28.3807	376.30	6	62.7	0.4807	42	17	0.00E+00	0.00E+00	0.00	8.650	0.000	0.00E+00	0.1240	0.0	#DIV/0!	#DIV/0!	7.95	#DIV/0!	#DIV/0!
0.00	8.70	---	28.5447	388.30	6	64.7	0.4813	42	17	0.00E+00	0.00E+00	0.00	8.700	0.000	0.00E+00	0.1240	0.0	#DIV/0!	#DIV/0!	7.95	#DIV/0!	#DIV/0!
0.00	8.75	---	28.7088	407.90	6	68.0	0.4818	42	17	0.00E+00	0.00E+00	0.00	8.750	0.000	0.00E+00	0.1240	0.0	#DIV/0!	#DIV/0!	7.95	#DIV/0!	#DIV/0!
0.00	8.80	---	28.8728	367.30	6	61.2	0.4823	42	17	0.00E+00	0.00E+00	0.00	8.800	0.000	0.00E+00	0.1240	0.0	#DIV/0!	#DIV/0!	7.95	#DIV/0!	#DIV/0!
0.00	8.85	---	29.0369	393.20	6	65.5	0.4828	42	17	0.00E+00	0.00E+00	0.00	8.850	0.000	0.00E+00	0.1240	0.0	#DIV/0!	#DIV/0!	7.95	#DIV/0!	#DIV/0!
0.00	8.90	---	29.2009	359.50	6	59.9	0.4833	42	17	0.00E+00	0.00E+00	0.00	8.900	0.000	0.00E+00	0.1240	0.0	#DIV/0!	#DIV/0!	7.95	#DIV/0!	#DIV/0!
0.00	8.95	---	29.3650	333.70	6	55.6	0.4838	42	17	0.00E+00	0.00E+00	0.00	8.950	0.000	0.00E+00	0.1240	0.0	#DIV/0!	#DIV/0!	7.95	#DIV/0!	#DIV/0!
0.00	9.00	---	29.5290	343.50	6	57.3	0.4843	42	17	0.00E+00	0.00E+00	0.00	9.000	0.000	0.00E+00	0.1240	0.0	#DIV/0!	#DIV/0!	7.95	#DIV/0!	#DIV/0!
0.00	9.05	---	29.6931	395.00	6	65.8	0.4848	42	17	0.00E+00	0.00E+00	0.00	9.050	0.000	0.00E+00	0.1240	0.0	#DIV/0!	#DIV/0!	7.95	#DIV/0!	#DIV/0!
0.00	9.10	---	29.8571	371.40	6	61.9	0.4853	42	17	0.00E+00	0.00E+00	0.00	9.100	0.000	0.00E+00	0.1240	0.0	#DIV/0!	#DIV/0!	7.95	#DIV/0!	#DIV/0!
0.00	9.15	---	30.0212	341.00	6	56.8	0.4858	42	17	0.00E+00	0.00E+00	0.00	9.150	0.000	0.00E+00	0.1240	0.0	#DIV/0!	#DIV/0!	7.95	#DIV/0!	#DIV/0!
0.00	9.20	---	30.1852	343.10	6	57.2	0.4856	42	17	0.00E+00	0.00E+00	0.00	9.200	0.000	0.00E+00	0.1240	0.0	#DIV/0!	#DIV/0!	7.95	#DIV/0!	#DIV/0!
0.00	9.25	---	30.3493	327.10	6	54.5	0.4856	42	17	0.00E+00	0.00E+00	0.00	9.250	0.000	0.00E+00	0.1240	0.0	#DIV/0!	#DIV/0!	7.95	#DIV/0!	#DIV/0!
0.00	9.30	---	30.5133	408.30	6	68.1	0.4855	42	17	0.00E+00	0.00E+00	0.00	9.300	0.000	0.00E+00	0.1240	0.0	#DIV/0!	#DIV/0!	7.95	#DIV/0!	#DIV/0!
0.00	9.35	---	30.6774	482.20	6	80.4	0.4855	42	17	0.00E+00	0.00E+00	0.00	9.350	0.000	0.00E+00	0.1240	0.0	#DIV/0!	#DIV/0!	7.95	#DIV/0!	#DIV/0!
0.00	9.40	---	30.8414	541.70	6	90.3	0.4854	42	17	0.00E+00	0.00E+00	0.00	9.400	0.000	0.00E+00	0.1240	0.0	#DIV/0!	#DIV/0!	7.95	#DIV/0!	#DIV/0!
0.00	9.45	---	31.0055	513.10	6	85.5	0.4854	42	17	0.00E+00	0.00E+00	0.00	9.450	0.000	0.00E+00	0.1240	0.0	#DIV/0!	#DIV/0!	7.95	#DIV/0!	#DIV/0!
0.00	9.50	---	31.1695	485.10	6	80.9	0.4853	42	17	0.00E+00	0.00E+00	0.00	9.500	0.000	0.00E+00	0.1240	0.0	#DIV/0!	#DIV/0!	7.95	#DIV/0!	#DIV/0!
0.00	9.55	---	31.3336	531.50	8	66.4	0.4852	42	17	0.00E+00	0.00E+00	0.00	9.550	0.000	0.00E+00	0.1240	0.0	#DIV/0!	#DIV/0!	7.95	#DIV/0!	#DIV/0!
0.00	9.60	---	31.4976	476.60	8	59.6	0.4852	42	17	0.00E+00	0.00E+00	0.00	9.600	0.000	0.00E+00	0.1240	0.0	#DIV/0!	#DIV/0!	7.95	#DIV/0!	#DIV/0!
0.00	9.65	---	31.6617	465.40	8	58.2	0.4851	42	17	0.00E+00	0.00E+00	0.00	9.650	0.000	0.00E+00	0.1240	0.0	#DIV/0!	#DIV/0!	7.95	#DIV/0!	#DIV/0!
0.00	9.70	---	31.8257	453.20	8	56.7	0.4850	42	17	0.00E+00	0.00E+00	0.00	9.700	0.000	0.00E+00	0.1240	0.0	#DIV/0!	#DIV/0!	7.95	#DIV/0!	#DIV/0!
0.00	9.75	---	31.9898	424.90	8	53.1	0.4849	42	17	0.00E+00	0.00E+00	0.00	9.750	0.000	0.00E+00	0.1240	0.0	#DIV/0!	#DIV/0!	7.95	#DIV/0!	#DIV/0!
0.00	9.80	---	32.1538	406.40	8	50.8	0.4848	42	17	0.00E+00	0.00E+00	0.00	9.800	0.000	0.00E+00	0.1240	0.0	#DIV/0!	#DIV/0!	7.95	#DIV/0!	#DIV/0!
0.00	9.85	---	32.3179	375.30	8	46.9	0.4847	42	17	0.00E+00	0.00E+00	0.00	9.850	0.000	0.00E+00	0.1240	0.0	#DIV/0!	#DIV/0!	7.95	#DIV/0!	#DIV/0!
0.00	9.90	---	32.4819	363.00	8	45.4	0.4846	42	17	0.00E+00	0.00E+00	0.00	9.900	0.000	0.00E+00	0.1240	0.0	#DIV/0!	#DIV/0!	7.95	#DIV/0!	#DIV/0!
0.00	9.95	---	32.6460	324.40	6	54.1	0.4844	42	17	0.00E+00	0.00E+00	0.00	9.950	0.000	0.00E+00	0.1240	0.0	#DIV/0!	#DIV/0!	7.95	#DIV/0!	#DIV/0!
0.00	10.00	---	32.8100	302.50	6	50.4	0.4843	42	17	0.00E+00	0.00E+00	0.00	10.000	0.000	0.00E+00	0.1240	0.0	#DIV/0!	#DIV/0!	7.95	#DIV/0!	#DIV/0!
0.00	10.05	---	32.9741	293.00	6	48.8	0.4842	42	17	0.00E+00	0.00E+00	0.00	10.050	0.000	0.00E+00	0.1240	0.0	#DIV/0!	#DIV/0!	7.95	#DIV/0!	#DIV/0!
0.00	10.10	---	33.1381	279.00	6	46.5	0.4840	42	17	0.00E+00	0.00E+00	0.00	10.100	0.000	0.00E+00	0.1240	0.0	#DIV/0!	#DIV/0!	7.95	#DIV/0!	#DIV/0!
0.00	10.15	---	33.3022	269.80	6	45.0	0.4839	42	17	0.00E+00	0.00E+00	0.00	10.150	0.000	0.00E+00	0.1240	0.0	#DIV/0!	#DIV/0!	7.95	#DIV/0!	#DIV/0!

SPREADSHEET TO CALCULATE CYCLIC RESISTANCE RATIO USING CPT DATA

RTF Job: 2005-052-01
PROJECT :
CPT: CPT-1 CPT DATE: 12/2/05 KTE
DATE : 11/10/2008
amax = 0.53 g
M = 6.60
MSF = 1.5

Ic = (((3.47-LOG(Q))^2)+(LOG(F%)+1.22)^2)^0.5
dqc1N = IF(FC>=35,60,IF(FC<=5,0,2*(FC-5)))
CRR = IF(qc1Ncs<50,(0.833*(qc1Ncs/1000)+0.05),(93*(qc1Ncs/1000)^3+0.08))
MSF = 10^2.24/M^2.56
CSR = 0.65(amax/g)(sigv/sigv')rd = Seed's Equation
Z = IF(Ic<1.31,7,IF(Ic<2.05,6,IF(Ic<2.6,5,IF(Ic<2.95,4,IF(Ic<3.6,3,2)))))
Q = [(qc-St)/Pa]*[(Pa/S')^n] Kc = IF(Ic<=1.64,1,(-0.403*Ic^4+5.581*Ic^3-21.63*Ic^2+33.75*Ic-17.88))

Liquefiable Soil (Type 5+ or 6+) = 2.4
Seismic Settlement Soil (Type) = 6
Actual Water = 30 feet
Design Water = 9 feet
Gamma = 120 pcf
rd = 2

Added Fill = 2 feet
Fill Density = 125 pcf
Pa = 1.04427 tsf = 100 kPa
Threshold FS = 1.10
FS = CRR*MSF/CSR

FS = Threshc
NL = Above
Z
3
4
5
6
7

Depth (m)	Depth (ft)	Tip Resist qc (tsf)	Sleeve Fric fs (tsf)	Total Stress (tsf) 0.00	Water Pressure (tsf) Sw	Effective Stress (tsf) S' = St - Sw	Norm. Fr. Ratio F (%) = fs/(qc-St)	Norm. Pen. Res. Q for n=1 (qc-St)/S'	Soil Index Ic for n=1	Norm. Pen. Res. Q for n= 0.5	Soil Index Ic for n=0.5	Norm. Pen. Res. Q for n= 0.7	Soil Index Ic for n=0.7	Soil Index Ic	Cq exp n	Overburden Correction Cq = 1.7 > (Pa/S')^n	Norm. Cone Res. qc1N = qc*Cq/Pa	Grain Char. Corr. Kc	Equivalent Clean Sand Cone Res. (qc1N)cs = Kc*qc1N	Cyclic Resistance Ratio CRR	rd	Design Effective Stress (tsf) S' = St - Sw	Cyclic Stress Ratio CSR	Depth (ft) Depth	Soil Behavior Type Z	Factor of Safety FS	Liquefiable Layers
10.20	33.47	265.40	0.47	2.008	0.108	1.900	0.18	139	1.41	187	1.29	166	1.34	1.29	0.50	0.74	188	1.0	188.4	0.702	0.902	1.245	0.484	33.47	6 S	2.18	0
10.25	33.63	252.50	0.52	2.018	0.113	1.905	0.21	132	1.45	178	1.33	157	1.38	1.33	0.50	0.74	179	1.0	179.0	0.614	0.900	1.249	0.484	33.63	6 S	1.90	0
10.30	33.79	245.70	0.59	2.028	0.118	1.909	0.24	128	1.49	173	1.37	153	1.42	1.37	0.50	0.74	174	1.0	174.0	0.570	0.899	1.254	0.483	33.79	6 S	1.77	0
10.35	33.96	237.80	0.67	2.038	0.124	1.914	0.28	123	1.54	167	1.42	148	1.46	1.42	0.50	0.74	168	1.0	168.2	0.523	0.898	1.259	0.483	33.96	6 S	1.62	0
10.40	34.12	231.00	0.90	2.047	0.129	1.919	0.39	119	1.61	162	1.50	143	1.55	1.50	0.50	0.74	163	1.0	163.2	0.484	0.896	1.264	0.483	34.12	6 S	1.50	0
10.45	34.29	234.60	1.55	2.057	0.134	1.923	0.67	121	1.74	164	1.63	145	1.67	1.63	0.50	0.74	166	1.0	165.5	0.502	0.895	1.268	0.483	34.29	6 S	1.56	0
10.50	34.45	253.90	1.89	2.067	0.139	1.928	0.75	131	1.74	177	1.64	157	1.68	1.64	0.50	0.74	179	1.0	178.3	0.607	0.894	1.273	0.483	34.45	6 S	1.89	0
10.55	34.61	221.40	1.65	2.077	0.144	1.933	0.75	113	1.79	154	1.69	136	1.73	1.69	0.50	0.74	156	1.0	160.3	0.463	0.892	1.278	0.483	34.61	6 S	1.44	0
10.60	34.78	215.80	1.62	2.087	0.149	1.938	0.76	110	1.80	150	1.70	133	1.74	1.70	0.50	0.73	152	1.0	157.2	0.441	0.891	1.282	0.482	34.78	6 S	1.37	0
10.65	34.94	246.30	1.23	2.097	0.154	1.942	0.50	126	1.65	171	1.54	151	1.59	1.54	0.50	0.73	173	1.0	172.9	0.561	0.890	1.287	0.482	34.94	6 S	1.75	0
10.70	35.11	354.90	1.55	2.106	0.159	1.947	0.44	181	1.49	247	1.38	218	1.42	1.38	0.50	0.73	249	1.0	248.9	1.514	0.888	1.292	0.482	35.11	6 S	4.71	0
10.75	35.27	378.60	2.31	2.116	0.164	1.952	0.61	193	1.56	264	1.45	233	1.49	1.45	0.50	0.73	265	1.0	265.2	1.814	0.887	1.297	0.482	35.27	6 S	5.65	0
10.80	35.43	341.90	2.60	2.126	0.170	1.957	0.77	174	1.65	238	1.55	210	1.59	1.55	0.50	0.73	239	1.0	239.2	1.353	0.886	1.301	0.482	35.43	6 S	4.21	0
10.85	35.60	318.70	1.72	2.136	0.175	1.961	0.54	161	1.58	221	1.48	195	1.52	1.48	0.50	0.73	223	1.0	222.7	1.107	0.884	1.306	0.481	35.60	6 S	3.45	0
10.90	35.76	321.60	1.46	2.146	0.180	1.966	0.46	162	1.54	223	1.43	196	1.47	1.43	0.50	0.73	224	1.0	224.5	1.132	0.883	1.311	0.481	35.76	6 S	3.53	0
10.95	35.93	275.60	1.24	2.156	0.185	1.971	0.45	139	1.59	191	1.48	168	1.52	1.48	0.50	0.73	192	1.0	192.1	0.739	0.882	1.315	0.481	35.93	6 S	2.31	0
11.00	36.09	218.90	1.36	2.165	0.190	1.975	0.63	110	1.75	151	1.64	133	1.69	1.64	0.50	0.73	152	1.0	152.3	0.408	0.880	1.320	0.481	36.09	6 S	1.27	0
11.05	36.26	190.30	1.45	2.175	0.195	1.980	0.77	95	1.86	131	1.75	115	1.79	1.75	0.50	0.73	132	1.1	141.7	0.344	0.879	1.325	0.480	36.26	6 S	1.08	1
11.10	36.42	174.20	1.97	2.185	0.200	1.985	1.15	87	2.00	119	1.89	105	1.93	1.89	0.50	0.73	121	1.2	142.8	0.351	0.878	1.330	0.480	36.42	6 S	1.10	1
11.15	36.58	177.30	2.14	2.195	0.205	1.990	1.22	88	2.01	121	1.90	107	1.95	1.90	0.50	0.72	123	1.2	146.8	0.374	0.876	1.334	0.480	36.58	6 S	1.17	0
11.20	36.75	184.80	2.05	2.205	0.211	1.994	1.12	92	1.97	127	1.87	111	1.91	1.87	0.50	0.72	128	1.2	148.4	0.384	0.875	1.339	0.480	36.75	6 S	1.20	0
11.25	36.91	192.20	1.60	2.215	0.216	1.999	0.84	95	1.88	131	1.77	115	1.81	1.77	0.50	0.72	133	1.1	144.5	0.361	0.874	1.344	0.479	36.91	6 S	1.13	0
11.30	37.08	206.90	1.50	2.225	0.221	2.004	0.73	102	1.82	141	1.71	124	1.75	1.71	0.50	0.72	143	1.0	149.2	0.389	0.872	1.349	0.479	37.08	6 S	1.22	0
11.35	37.24	199.60	1.46	2.234	0.226	2.008	0.74	98	1.84	136	1.72	120	1.77	1.72	0.50	0.72	138	1.1	145.2	0.365	0.871	1.353	0.479	37.24	6 S	1.14	0
11.40	37.40	209.90	1.44	2.244	0.231	2.013	0.69	103	1.80	143	1.69	126	1.73	1.69	0.50	0.72	145	1.0	149.2	0.389	0.870	1.358	0.479	37.40	6 S	1.22	0
11.45	37.57	219.80	1.60	2.254	0.236	2.018	0.74	108	1.80	150	1.69	131	1.73	1.69	0.50	0.72	151	1.0	156.1	0.434	0.868	1.363	0.478	37.57	6 S	1.36	0
11.50	37.73	227.60	1.67	2.264	0.241	2.023	0.74	111	1.79	155	1.68	136	1.72	1.68	0.50	0.72	157	1.0	160.5	0.464	0.867	1.367	0.478	37.73	6 S	1.46	0
11.55	37.90	234.80	1.57	2.274	0.246	2.027	0.68	115	1.76	160	1.64	140	1.69	1.64	0.50	0.72	161	1.0	161.3	0.470	0.866	1.372	0.478	37.90	6 S	1.48	0
11.60	38.06	258.80	1.69	2.284	0.251	2.032	0.66	126	1.72	176	1.61	154	1.65	1.61	0.50	0.72	178	1.0	177.7	0.601	0.864	1.377	0.477	38.06	6 S	1.89	0
11.65	38.22	307.80	1.61	2.293	0.257	2.037	0.53	150	1.60	209	1.49	183	1.53	1.49	0.50	0.72	211	1.0	211.0	0.954	0.863	1.382	0.477	38.22	6 S	3.00	0
11.70	38.39	353.70	1.82	2.303	0.262	2.042	0.52	172	1.55	241	1.43	210	1.48	1.43	0.50	0.72	242	1.0	242.2	1.402	0.862	1.386	0.477	38.39	6 S	4.41	0
11.75	38.55	378.10	2.11	2.313	0.267	2.046	0.56	184	1.55	257	1.44	225	1.48	1.44	0.50	0.71	259	1.0	258.7	1.689	0.860	1.391	0.477	38.55	6 S	5.32	0
11.80	38.72	407.40	2.26	2.323	0.272	2.051	0.56	198	1.52	277	1.41	242	1.45	1.41	0.50	0.71	278	1.0	278.4	2.086	0.859	1.396	0.476	38.72	6 S	6.57	0
11.85	38.88	417.60	2.39	2.333	0.277	2.056	0.58	202	1.52	283	1.41	248	1.46	1.41	0.50	0.71	285	1.0	285.0	2.233	0.858	1.401	0.476	38.88	6 S	7.04	0
11.90	39.04	416.10	2.71	2.343	0.282	2.060	0.65	201	1.56	282	1.45	246	1.50	1.45	0.50	0.71	284	1.0	283.7	2.203	0.856	1.405	0.476	39.04	6 S	6.95	0
11.95	39.21	438.30	3.60	2.352	0.287	2.065	0.83	211	1.61	297	1.51	259	1.55	1.51	0.50	0.71	298	1.0	298.5	2.553	0.855	1.410	0.475	39.21	6 S	8.05	0
12.00	39.37	498.90	3.83	2.362	0.292	2.070	0.77	240	1.55	338	1.45	295	1.49	1.45	0.50	0.71	339	1.0	339.3	3.714	0.854	1.415	0.475	39.37	6 S	11.73	0
12.05	39.54	577.40	3.84	2.372	0.298	2.075	0.67	277	1.47	391	1.36	341	1.40	1.36	0.50	0.71	392	1.0	392.3	5.694	0.852	1.419	0.475	39.54	6 S	17.99	0
12.10	39.70	541.30	4.52	2.382	0.303	2.079	0.84	259	1.56	366	1.46	319	1.50	1.46	0.50	0.71	367	1.0	367.3	4.690	0.851	1.424	0.474	39.70	6 S	14.83	0
12.15	39.86	532.90	4.06	2.392	0.308	2.084	0.77	255	1.53	360	1.43	313	1.47	1.43	0.50	0.71	361	1.0	361.2	4.464	0.850	1.429	0.474	39.86	6 S	14.12	0
12.20	40.03	488.40	3.18	2.402	0.313	2.089	0.65	233	1.51	329	1.41	286	1.45	1.41	0.50	0.71	331	1.0	330.7	3.443	0.848	1.434	0.474	40.03	6 S	10.90	0
12.25	40.19	479.80	3.18	2.412	0.318	2.094	0.67	228	1.52	323	1.42	281	1.46	1.42	0.50	0.71	324	1.0	324.5	3.258	0.847	1.438	0.473	40.19	6 S	10.32	0
12.30	40.36	436.50	2.98	2.421	0.323	2.098	0.69	207	1.56	293	1.46	255	1.50	1.46	0.50	0.71	295	1.0	294.9	2.465	0.846	1.443	0.473	40.36	6 S	7.82	0
12.35	40.52	399.40	3.90	2.431	0.328	2.103	0.98	189	1.70	268	1.60	233	1.64	1.60	0.50	0.70	270	1.0	269.5	1.901	0.844	1.448	0.473	40.52	6 S	6.03	0
12.40	40.68	376.50	4.38	2.441	0.333	2.108	1.17	177	1.78	252	1.67	219	1.71	1.67	0.50	0.70	254	1.0	258.9	1.693	0.843	1.453	0.472	40.68	6 S	5.38	0
12.45	40.85	396.50	4.80	2.451	0.338	2.112	1.22	187	1.77	265	1.67	230	1.71	1.67	0.50	0.70	267	1.0	272.2	1.955	0.842	1.457	0.472	40.85	6 S	6.21	0
12.50	41.01	424.00	5.16	2.461	0.344	2.117	1.22	199	1.76	284	1.66	246	1.70	1.66	0.50	0.70	285	1.0	287.5	2.290	0.840	1.462	0.472	41.01	6 S	7.28	0
12.55	41.18	451.50	4.94	2.471	0.349	2.122	1.10	212	1.70	302	1.60	262	1.64	1.60	0.50	0.70	303	1.0	303.3	2.675	0.839	1.467	0.471	41.18	6 S	8.51	0
12.60	41.34	420.40	4.00	2.480	0.354	2.127	0.96	197	1.68	280	1.58	243	1.62	1.58	0.50	0.70	282	1.0	282.1	2.168	0.838	1.471	0.471	41.34	6 S	6.91	0
12.65	41.50	398.10	3.13	2.490	0.359	2.131	0.79	186	1.64	265	1.53	230	1.57	1.53	0.50	0.70	267	1.0	266.8	1.847	0.836	1.476	0.471	41.50	6 S	5.89	0
12.70	41.67	378.50	2.84	2.500	0.364	2.136	0.76	176	1.64	252	1.53	218	1.58	1.53	0.50	0.70	253	1.0	253.4	1.594	0.835	1.481	0.470	41.67	6 S	5.08	0
12.75	41.83	377.70	3.55	2.510	0.369	2.141	0.95	175	1.71	251	1.61	217	1.65	1.61	0.50	0.70	253	1.0	252.6	1.579	0.834	1.486	0.470	41.83	6 S	5.04	0

old Factor of Safety
e water or Soil Behavior Type is not liquefiable

Soil
Clay to Silty Clay
Clayey Silt to Silty Clay
Silty Sand to Sandy Silt
Clean Sand to Silty Sand
Gravelly Sand to Sand

RTF Job: 2005-052-01
PROJECT :
CPT: CPT-1 CPT DATE: 12/2/05 KTE
DATE : 11/10/2008
amax = 0.53 g
M = 6.60

Sum of Liquefiable Thickness (m)	Sum of Non-Liq Thickness (m)	Ratio of Non-Liq to Liquefiable 110.00	Liq. 0.03 in. Settlement (in) Settlement	N-Value Conversion (tsf) qc	qc/N	N-Value	Liquefaction Settlement CSR	H_Index	V_Index	Strain%	Settlement	0.03 in. Cumulative Settlement	Dry Settlement Cyc Shear	Avg Stress	Gmax	Acoeff	Bcoeff	Cyc Strain	Eps15	Nc	EpsNc	Settlement
0.00	10.20	---	33.4662	265.40	6	44.2	0.4837	42	17	0.00E+00	0.00E+00	0.00	10.200	0.000	0.00E+00	0.1240	0.0	#DIV/0!	#DIV/0!	7.95	#DIV/0!	#DIV/0!
0.00	10.25	---	33.6303	252.50	6	42.1	0.4836	42	17	0.00E+00	0.00E+00	0.00	10.250	0.000	0.00E+00	0.1240	0.0	#DIV/0!	#DIV/0!	7.95	#DIV/0!	#DIV/0!
0.00	10.30	---	33.7943	245.70	6	41.0	0.4834	42	17	0.00E+00	0.00E+00	0.00	10.300	0.000	0.00E+00	0.1240	0.0	#DIV/0!	#DIV/0!	7.95	#DIV/0!	#DIV/0!
0.00	10.35	---	33.9584	237.80	6	39.6	0.4833	42	17	0.00E+00	0.00E+00	0.00	10.350	0.000	0.00E+00	0.1240	0.0	#DIV/0!	#DIV/0!	7.95	#DIV/0!	#DIV/0!
0.00	10.40	---	34.1224	231.00	6	38.5	0.4831	42	17	0.00E+00	0.00E+00	0.00	10.400	0.000	0.00E+00	0.1240	0.0	#DIV/0!	#DIV/0!	7.95	#DIV/0!	#DIV/0!
0.00	10.45	---	34.2865	234.60	6	39.1	0.4829	42	17	0.00E+00	0.00E+00	0.00	10.450	0.000	0.00E+00	0.1240	0.0	#DIV/0!	#DIV/0!	7.95	#DIV/0!	#DIV/0!
0.00	10.50	---	34.4505	253.90	6	42.3	0.4827	42	17	0.00E+00	0.00E+00	0.00	10.500	0.000	0.00E+00	0.1240	0.0	#DIV/0!	#DIV/0!	7.95	#DIV/0!	#DIV/0!
0.00	10.55	---	34.6146	221.40	6	36.9	0.4825	42	17	0.00E+00	0.00E+00	0.00	10.550	0.000	0.00E+00	0.1240	0.0	#DIV/0!	#DIV/0!	7.95	#DIV/0!	#DIV/0!
0.00	10.60	---	34.7786	215.80	6	36.0	0.4823	42	17	0.00E+00	0.00E+00	0.00	10.600	0.000	0.00E+00	0.1240	0.0	#DIV/0!	#DIV/0!	7.95	#DIV/0!	#DIV/0!
0.00	10.65	---	34.9427	246.30	6	41.1	0.4822	42	17	0.00E+00	0.00E+00	0.00	10.650	0.000	0.00E+00	0.1240	0.0	#DIV/0!	#DIV/0!	7.95	#DIV/0!	#DIV/0!
0.00	10.70	---	35.1067	354.90	6	59.2	0.4819	42	17	0.00E+00	0.00E+00	0.00	10.700	0.000	0.00E+00	0.1240	0.0	#DIV/0!	#DIV/0!	7.95	#DIV/0!	#DIV/0!
0.00	10.75	---	35.2708	378.60	6	63.1	0.4817	42	17	0.00E+00	0.00E+00	0.00	10.750	0.000	0.00E+00	0.1240	0.0	#DIV/0!	#DIV/0!	7.95	#DIV/0!	#DIV/0!
0.00	10.80	---	35.4348	341.90	6	57.0	0.4815	42	17	0.00E+00	0.00E+00	0.00	10.800	0.000	0.00E+00	0.1240	0.0	#DIV/0!	#DIV/0!	7.95	#DIV/0!	#DIV/0!
0.00	10.85	---	35.5989	318.70	6	53.1	0.4813	42	17	0.00E+00	0.00E+00	0.00	10.850	0.000	0.00E+00	0.1240	0.0	#DIV/0!	#DIV/0!	7.95	#DIV/0!	#DIV/0!
0.00	10.90	---	35.7629	321.60	6	53.6	0.4811	42	17	0.00E+00	0.00E+00	0.00	10.900	0.000	0.00E+00	0.1240	0.0	#DIV/0!	#DIV/0!	7.95	#DIV/0!	#DIV/0!
0.00	10.95	---	35.9270	275.60	6	45.9	0.4809	42	17	0.00E+00	0.00E+00	0.00	10.950	0.000	0.00E+00	0.1240	0.0	#DIV/0!	#DIV/0!	7.95	#DIV/0!	#DIV/0!
0.00	11.00	---	36.0910	218.90	6	36.5	0.4806	42	17	0.00E+00	0.00E+00	0.00	11.000	0.000	0.00E+00	0.1240	0.0	#DIV/0!	#DIV/0!	7.95	#DIV/0!	#DIV/0!
0.05	11.00	220.00	36.2551	190.30	6	31.7	0.4804	38	17	5.00E-03	9.84E-03	0.01	11.000	0.050	3.16E+02	0.1259	-1060.6	8.8814E-01	5.1071E-01	7.95	0.38	1.5113
0.10	11.00	110.00	36.4191	174.20	6	29.0	0.4801	34	17	1.00E-02	1.97E-02	0.03	11.000	0.100	4.34E+02	0.1279	-1607.6	8.8661E-01	5.6608E-01	7.95	0.43	1.6775
0.10	11.05	110.50	36.5832	177.30	6	29.6	0.4799	35	17	9.00E-03	0.00E+00	0.03	11.050	0.100	4.37E+02	0.1279	-1607.6	8.8661E-01	5.5501E-01	7.95	0.42	1.6424
0.10	11.10	111.00	36.7472	184.80	6	30.8	0.4797	37	17	6.50E-03	0.00E+00	0.03	11.100	0.100	4.43E+02	0.1279	-1607.6	8.8661E-01	5.2809E-01	7.95	0.40	1.5627
0.10	11.15	111.50	36.9113	192.20	6	32.0	0.4794	38	17	5.00E-03	0.00E+00	0.03	11.150	0.100	4.49E+02	0.1279	-1607.6	8.8661E-01	5.0379E-01	7.95	0.38	1.4908
0.10	11.20	112.00	37.0753	206.90	6	34.5	0.4791	41	17	1.00E-03	0.00E+00	0.03	11.200	0.100	4.60E+02	0.1279	-1607.6	8.8661E-01	4.6115E-01	7.95	0.35	1.3646
0.10	11.25	112.50	37.2394	199.60	6	33.3	0.4789	39	17	4.00E-03	0.00E+00	0.03	11.250	0.100	4.55E+02	0.1279	-1607.6	8.8661E-01	4.8146E-01	7.95	0.36	1.4247
0.10	11.30	113.00	37.4034	209.90	6	35.0	0.4786	41	17	1.00E-03	0.00E+00	0.03	11.300	0.100	4.62E+02	0.1279	-1607.6	8.8661E-01	4.5325E-01	7.95	0.34	1.3412
0.10	11.35	113.50	37.5675	219.80	6	36.6	0.4783	42	17	0.00E+00	0.00E+00	0.03	11.350	0.100	4.69E+02	0.1279	-1607.6	8.8661E-01	4.2886E-01	7.95	0.32	1.2691
0.10	11.40	114.00	37.7315	227.60	6	37.9	0.4781	42	17	0.00E+00	0.00E+00	0.03	11.400	0.100	4.75E+02	0.1279	-1607.6	8.8661E-01	4.1129E-01	7.95	0.31	1.2171
0.10	11.45	114.50	37.8956	234.80	6	39.1	0.4778	42	17	0.00E+00	0.00E+00	0.03	11.450	0.100	4.80E+02	0.1279	-1607.6	8.8661E-01	3.9620E-01	7.95	0.30	1.1724
0.10	11.50	115.00	38.0596	258.80	6	43.1	0.4775	42	17	0.00E+00	0.00E+00	0.03	11.500	0.100	4.96E+02	0.1279	-1607.6	8.8661E-01	3.5253E-01	7.95	0.26	1.0432
0.10	11.55	115.50	38.2237	307.80	6	51.3	0.4772	42	17	0.00E+00	0.00E+00	0.03	11.550	0.100	5.25E+02	0.1279	-1607.6	8.8661E-01	2.8630E-01	7.95	0.22	0.8472
0.10	11.60	116.00	38.3877	353.70	6	59.0	0.4769	42	17	0.00E+00	0.00E+00	0.03	11.600	0.100	5.50E+02	0.1279	-1607.6	8.8661E-01	2.4232E-01	7.95	0.18	0.7171
0.10	11.65	116.50	38.5518	378.10	6	63.0	0.4766	42	17	0.00E+00	0.00E+00	0.03	11.650	0.100	5.63E+02	0.1279	-1607.6	8.8661E-01	2.2368E-01	7.95	0.17	0.6619
0.10	11.70	117.00	38.7158	407.40	6	67.9	0.4763	42	17	0.00E+00	0.00E+00	0.03	11.700	0.100	5.77E+02	0.1279	-1607.6	8.8661E-01	2.0452E-01	7.95	0.15	0.6052
0.10	11.75	117.50	38.8799	417.60	6	69.6	0.4760	42	17	0.00E+00	0.00E+00	0.03	11.750	0.100	5.81E+02	0.1279	-1607.6	8.8661E-01	1.9854E-01	7.95	0.15	0.5875
0.10	11.80	118.00	39.0439	416.10	6	69.4	0.4757	42	17	0.00E+00	0.00E+00	0.03	11.800	0.100	5.81E+02	0.1279	-1607.6	8.8661E-01	1.9939E-01	7.95	0.15	0.5900
0.10	11.85	118.50	39.2080	438.30	6	73.1	0.4754	42	17	0.00E+00	0.00E+00	0.03	11.850	0.100	5.91E+02	0.1279	-1607.6	8.8661E-01	1.8734E-01	7.95	0.14	0.5544
0.10	11.90	119.00	39.3720	498.90	6	83.2	0.4750	42	17	0.00E+00	0.00E+00	0.03	11.900	0.100	6.17E+02	0.1279	-1607.6	8.8661E-01	1.6037E-01	7.95	0.12	0.4746
0.10	11.95	119.50	39.5361	577.40	6	96.2	0.4747	42	17	0.00E+00	0.00E+00	0.03	11.950	0.100	6.48E+02	0.1279	-1607.6	8.8661E-01	1.3458E-01	7.95	0.10	0.3982
0.10	12.00	120.00	39.7001	541.30	6	90.2	0.4744	42	17	0.00E+00	0.00E+00	0.03	12.000	0.100	6.34E+02	0.1279	-1607.6	8.8661E-01	1.4542E-01	7.95	0.11	0.4303
0.10	12.05	120.50	39.8642	532.90	6	88.8	0.4741	42	17	0.00E+00	0.00E+00	0.03	12.050	0.100	6.31E+02	0.1279	-1607.6	8.8661E-01	1.4818E-01	7.95	0.11	0.4385
0.10	12.10	121.00	40.0282	488.40	6	81.4	0.4737	42	17	0.00E+00	0.00E+00	0.03	12.100	0.100	6.13E+02	0.1279	-1607.6	8.8661E-01	1.6452E-01	7.95	0.12	0.4868
0.10	12.15	121.50	40.1923	479.80	6	80.0	0.4734	42	17	0.00E+00	0.00E+00	0.03	12.150	0.100	6.09E+02	0.1279	-1607.6	8.8661E-01	1.6807E-01	7.95	0.13	0.4973
0.10	12.20	122.00	40.3563	436.50	6	72.8	0.4731	42	17	0.00E+00	0.00E+00	0.03	12.200	0.100	5.90E+02	0.1279	-1607.6	8.8661E-01	1.8827E-01	7.95	0.14	0.5571
0.10	12.25	122.50	40.5204	399.40	6	66.6	0.4727	42	17	0.00E+00	0.00E+00	0.03	12.250	0.100	5.73E+02	0.1279	-1607.6	8.8661E-01	2.0944E-01	7.95	0.16	0.6198
0.10	12.30	123.00	40.6844	376.50	6	62.8	0.4724	42	17	0.00E+00	0.00E+00	0.03	12.300	0.100	5.62E+02	0.1279	-1607.6	8.8661E-01	2.2482E-01	7.95	0.17	0.6653
0.10	12.35	123.50	40.8485	396.50	6	66.1	0.4720	42	17	0.00E+00	0.00E+00	0.03	12.350	0.100	5.71E+02	0.1279	-1607.6	8.8661E-01	2.1128E-01	7.95	0.16	0.6252
0.10	12.40	124.00	41.0125	424.00	6	70.7	0.4716	42	17	0.00E+00	0.00E+00	0.03	12.400	0.100	5.84E+02	0.1279	-1607.6	8.8661E-01	1.9494E-01	7.95	0.15	0.5769
0.10	12.45	124.50	41.1766	451.50	6	75.3	0.4713	42	17	0.00E+00	0.00E+00	0.03	12.450	0.100	5.97E+02	0.1279	-1607.6	8.8661E-01	1.8078E-01	7.95	0.14	0.5350
0.10	12.50	125.00	41.3406	420.40	6	70.1	0.4709	42	17	0.00E+00	0.00E+00	0.03	12.500	0.100	5.83E+02	0.1279	-1607.6	8.8661E-01	1.9695E-01	7.95	0.15	0.5828
0.10	12.55	125.50	41.5047	398.10	6	66.4	0.4706	42	17	0.00E+00	0.00E+00	0.03	12.550	0.100	5.72E+02	0.1279	-1607.6	8.8661E-01	2.1026E-01	7.95	0.16	0.6222
0.10	12.60	126.00	41.6687	378.50	6	63.1	0.4702	42	17	0.00E+00	0.00E+00	0.03	12.600	0.100	5.63E+02	0.1279	-1607.6	8.8661E-01	2.2339E-01	7.95	0.17	0.6611
0.10	12.65	126.50	41.8328	377.70	6	63.0	0.4698	42	17	0.00E+00	0.00E+00	0.03	12.650	0.100	5.62E+02	0.1279	-1607.6	8.8661E-01	2.2396E-01	7.95	0.17	0.6627

SPREADSHEET TO CALCULATE CYCLIC RESISTANCE RATIO USING CPT DATA

RTF Job: 2005-052-01
PROJECT :
CPT: CPT-1 CPT DATE: 12/2/05 KTE
DATE : 11/10/2008
amax = 0.53 g
M = 6.60
MSF = 1.5

Ic = (((3.47-LOG(Q))^2)+(LOG(F%)+1.22)^2)^0.5
dqc1N = IF(FC>=35,60,IF(FC<=5,0,2*(FC-5)))
CRR = IF(qc1Ncs<50,(0.833*(qc1Ncs/1000)+0.05),(93*(qc1Ncs/1000)^3+0.08))
MSF = 10^2.24/M^2.56
CSR = 0.65(amax/g)(sigv/sigv')rd = Seed's Equation
Z = IF(Ic<1.31,7,IF(Ic<2.05,6,IF(Ic<2.6,5,IF(Ic<2.95,4,IF(Ic<3.6,3,2)))))
Q = [(qc-St)/Pa]*[(Pa/S')^n] Kc = IF(Ic<=1.64,1,(-0.403*Ic^4+5.581*Ic^3-21.63*Ic^2+33.75*Ic-17.88))

Liquefiable Soil (Type 5+ or 6+) = 2.4
Seismic Settlement Soil (Type) = 6
Actual Water = 30 feet
Design Water = 9 feet
Gamma = 120 pcf
rd = 2

Added Fill = 2 feet
Fill Density = 125 pcf
Pa = 1.04427 tsf = 100 kPa
Threshold FS = 1.10

FS = CRR*MSF/CSR

FS = Thresh
NL = Above
Z
3
4
5
6
7

Depth (m)	Depth (ft)	Tip Resist qc (tsf)	Sleeve Fric fs (tsf)	Total Stress (tsf) 0.00	Water Pressure (tsf) Sw	Effective Stress (tsf) S' = St - Sw	Norm. Fr. Ratio F (%) = fs/(qc-St)	Norm. Pen. Res. Q for n=1 (qc-St)/S'	Soil Index Ic for n=1	Norm. Pen. Res. Q for n= 0.5	Soil Index Ic for n=0.5	Norm. Pen. Res. Q for n= 0.7	Soil Index Ic for n=0.7	Soil Index Ic	Cq exp n	Overburden Correction Cq = 1.7 > (Pa/S')^n	Norm. Cone Res. qc1N = qc*Cq/Pa	Grain Char. Corr. Kc	Equivalent Clean Sand Cone Res. (qc1N)cs = Kc*qc1N	Cyclic Resistance Ratio CRR	rd	Design Effective Stress (tsf) S' = St - Sw	Cyclic Stress Ratio CSR	Depth (ft)	Soil Behavior Type Z	Factor of Safety FS	Liquefiable Layers
12.80	42.00	392.20	3.56	2.520	0.374	2.146	0.91	182	1.69	260	1.58	225	1.63	1.58	0.50	0.70	262	1.0	262.0	1.753	0.832	1.490	0.469	42.00	6 S	5.60	0
12.85	42.16	351.40	3.56	2.530	0.379	2.150	1.02	162	1.76	233	1.65	202	1.69	1.65	0.50	0.70	235	1.0	235.5	1.294	0.831	1.495	0.469	42.16	6 S	4.14	0
12.90	42.32	342.20	3.03	2.539	0.385	2.155	0.89	158	1.73	226	1.62	196	1.66	1.62	0.50	0.70	228	1.0	228.1	1.184	0.830	1.500	0.469	42.32	6 S	3.79	0
12.95	42.49	361.20	3.44	2.549	0.390	2.160	0.96	166	1.73	239	1.62	207	1.67	1.62	0.50	0.70	241	1.0	240.5	1.374	0.828	1.504	0.468	42.49	6 S	4.40	0
13.00	42.65	419.40	4.30	2.559	0.395	2.164	1.03	193	1.71	277	1.61	240	1.65	1.61	0.50	0.69	279	1.0	279.0	2.099	0.827	1.509	0.468	42.65	6 S	6.73	0
13.05	42.82	479.30	3.72	2.569	0.400	2.169	0.78	220	1.58	317	1.48	274	1.52	1.48	0.50	0.69	318	1.0	318.5	3.084	0.826	1.514	0.467	42.82	6 S	9.89	0
13.10	42.98	507.40	3.22	2.579	0.405	2.174	0.64	232	1.51	335	1.39	289	1.44	1.39	0.50	0.69	337	1.0	336.8	3.632	0.824	1.519	0.467	42.98	6 S	11.66	0
13.15	43.15	432.00	3.25	2.589	0.410	2.179	0.76	197	1.61	285	1.50	246	1.54	1.50	0.50	0.69	286	1.0	286.4	2.265	0.823	1.523	0.467	43.15	6 S	7.28	0
13.20	43.31	396.10	3.02	2.599	0.415	2.183	0.77	180	1.64	261	1.53	225	1.57	1.53	0.50	0.69	262	1.0	262.3	1.759	0.822	1.528	0.466	43.31	6 S	5.66	0
13.25	43.47	434.00	2.91	2.608	0.420	2.188	0.67	197	1.58	285	1.46	246	1.50	1.46	0.50	0.69	287	1.0	287.1	2.281	0.820	1.533	0.466	43.47	6 S	7.34	0
13.30	43.64	489.40	3.19	2.618	0.425	2.193	0.66	222	1.53	322	1.41	277	1.46	1.41	0.50	0.69	323	1.0	323.4	3.226	0.819	1.538	0.465	43.64	6 S	10.40	0
13.35	43.80	569.60	4.12	2.628	0.431	2.197	0.73	258	1.51	374	1.40	323	1.45	1.40	0.50	0.69	376	1.0	376.0	5.024	0.818	1.542	0.465	43.80	6 S	16.20	0
13.40	43.97	576.20	4.70	2.638	0.436	2.202	0.82	260	1.55	378	1.44	326	1.48	1.44	0.50	0.69	380	1.0	380.0	5.181	0.816	1.547	0.465	43.97	6 S	16.73	0
13.45	44.13	559.00	3.76	2.648	0.441	2.207	0.68	252	1.50	366	1.39	316	1.43	1.39	0.50	0.69	368	1.0	368.2	4.723	0.815	1.552	0.464	44.13	6 S	15.26	0
13.50	44.29	596.30	5.54	2.658	0.446	2.212	0.93	268	1.58	391	1.48	336	1.52	1.48	0.50	0.69	392	1.0	392.4	5.698	0.814	1.556	0.464	44.29	6 S	18.43	0
13.55	44.46	593.70	3.92	2.667	0.451	2.216	0.66	267	1.47	388	1.36	334	1.41	1.36	0.50	0.69	390	1.0	390.2	5.607	0.812	1.561	0.463	44.46	6 S	18.15	0
13.60	44.62	586.50	3.98	2.677	0.456	2.221	0.68	263	1.49	383	1.38	330	1.42	1.38	0.50	0.69	385	1.0	385.1	5.391	0.811	1.566	0.463	44.62	6 S	17.47	0
13.65	44.79	596.20	3.87	2.687	0.461	2.226	0.65	267	1.47	389	1.36	335	1.40	1.36	0.50	0.68	391	1.0	391.1	5.642	0.810	1.571	0.463	44.79	6 S	18.30	0
13.70	44.95	593.10	3.95	2.697	0.466	2.231	0.67	265	1.48	387	1.37	332	1.41	1.37	0.50	0.68	389	1.0	388.6	5.538	0.808	1.575	0.462	44.95	6 S	17.98	0
13.75	45.11	535.60	3.92	2.707	0.472	2.235	0.74	238	1.54	349	1.43	300	1.47	1.43	0.50	0.68	351	1.0	350.6	4.087	0.807	1.580	0.462	45.11	6 S	13.28	0
13.80	45.28	507.40	3.46	2.717	0.477	2.240	0.69	225	1.54	330	1.42	283	1.47	1.42	0.50	0.68	332	1.0	331.8	3.476	0.806	1.585	0.461	45.28	6 S	11.30	0
13.85	45.44	482.00	2.90	2.727	0.482	2.245	0.61	214	1.52	313	1.40	269	1.44	1.40	0.50	0.68	315	1.0	314.8	2.982	0.804	1.590	0.461	45.44	6 S	9.71	0
13.90	45.61	478.50	3.42	2.736	0.487	2.249	0.72	212	1.57	310	1.45	266	1.50	1.45	0.50	0.68	312	1.0	312.2	2.910	0.803	1.594	0.460	45.61	6 S	9.48	0
13.95	45.77	474.70	2.62	2.746	0.492	2.254	0.56	209	1.50	308	1.38	264	1.42	1.38	0.50	0.68	309	1.0	309.4	2.834	0.802	1.599	0.460	45.77	6 S	9.25	0
14.00	45.93	462.90	1.76	2.756	0.497	2.259	0.38	204	1.41	300	1.28	257	1.33	1.28	0.50	0.68	301	1.0	301.4	2.626	0.800	1.604	0.459	45.93	6 S	8.57	0
14.05	46.10	488.80	3.05	2.766	0.502	2.264	0.63	215	1.53	316	1.41	271	1.45	1.41	0.50	0.68	318	1.0	317.9	3.068	0.799	1.608	0.459	46.10	6 S	10.03	0
14.10	46.26	497.80	3.01	2.776	0.507	2.268	0.61	218	1.51	322	1.39	275	1.44	1.39	0.50	0.68	323	1.0	323.4	3.227	0.798	1.613	0.459	46.26	6 S	10.56	0
14.15	46.43	510.60	3.58	2.786	0.512	2.273	0.70	223	1.55	330	1.43	282	1.48	1.43	0.50	0.68	331	1.0	331.4	3.465	0.796	1.618	0.458	46.43	6 S	11.35	0
14.20	46.59	556.60	3.99	2.795	0.518	2.278	0.72	243	1.53	359	1.41	307	1.46	1.41	0.50	0.68	361	1.0	360.9	4.451	0.795	1.623	0.458	46.59	6 S	14.59	0
14.25	46.75	555.10	3.82	2.805	0.523	2.283	0.69	242	1.52	358	1.40	306	1.45	1.40	0.50	0.68	360	1.0	359.5	4.403	0.794	1.627	0.457	46.75	6 S	14.45	0
14.30	46.92	557.00	4.78	2.815	0.528	2.287	0.86	242	1.59	359	1.47	307	1.52	1.47	0.50	0.68	360	1.0	360.4	4.434	0.792	1.632	0.457	46.92	6 S	14.56	0
14.35	47.08	544.00	6.00	2.825	0.533	2.292	1.11	236	1.67	350	1.57	299	1.61	1.57	0.50	0.67	352	1.0	351.6	4.123	0.791	1.637	0.456	47.08	6 S	13.56	0
14.40	47.25	502.40	6.17	2.835	0.538	2.297	1.24	218	1.73	323	1.63	276	1.67	1.63	0.50	0.67	324	1.0	324.4	3.255	0.790	1.641	0.456	47.25	6 S	10.71	0
14.45	47.41	468.10	4.70	2.845	0.543	2.301	1.01	202	1.69	300	1.58	256	1.62	1.58	0.50	0.67	302	1.0	301.9	2.640	0.788	1.646	0.455	47.41	6 S	8.70	0
14.50	47.57	484.70	3.93	2.854	0.548	2.306	0.82	209	1.61	310	1.50	265	1.54	1.50	0.50	0.67	312	1.0	312.3	2.914	0.787	1.651	0.455	47.57	6 S	9.61	0
14.55	47.74	530.30	4.25	2.864	0.553	2.311	0.81	228	1.58	340	1.47	290	1.51	1.47	0.50	0.67	341	1.0	341.4	3.780	0.786	1.656	0.454	47.74	6 S	12.48	0
14.60	47.90	599.20	5.80	2.874	0.559	2.316	0.97	258	1.61	383	1.50	327	1.54	1.50	0.50	0.67	385	1.0	385.3	5.401	0.784	1.660	0.454	47.90	6 S	17.85	0
14.65	48.07	690.20	6.13	2.884	0.564	2.320	0.89	296	1.54	442	1.43	376	1.47	1.43	0.50	0.67	443	1.0	443.4	8.187	0.783	1.665	0.453	48.07	6 S	27.09	0
14.70	48.23	749.50	7.27	2.894	0.569	2.325	0.97	321	1.55	479	1.44	408	1.48	1.44	0.50	0.67	481	1.0	481.0	10.430	0.782	1.670	0.453	48.23	6 S	34.55	0
14.75	48.39	777.80	4.83	2.904	0.574	2.330	0.62	333	1.39	497	1.28	423	1.32	1.28	0.50	0.67	499	1.0	498.7	11.612	0.780	1.675	0.452	48.39	6 S	38.51	0
14.80	48.56	729.90	4.84	2.914	0.579	2.334	0.67	311	1.43	466	1.32	396	1.36	1.32	0.50	0.67	467	1.0	467.5	9.581	0.779	1.679	0.452	48.56	6 S	31.81	0
14.85	48.72	661.20	4.18	2.923	0.584	2.339	0.63	281	1.44	421	1.33	358	1.37	1.33	0.50	0.67	423	1.0	423.0	7.121	0.778	1.684	0.451	48.72	6 S	23.67	0
14.90	48.89	587.80	3.94	2.933	0.589	2.344	0.67	250	1.50	374	1.38	318	1.43	1.38	0.50	0.67	376	1.0	375.7	5.012	0.776	1.689	0.451	48.89	6 S	16.68	0
14.95	49.05	566.40	2.99	2.943	0.594	2.349	0.53	240	1.44	360	1.31	306	1.36	1.31	0.50	0.67	362	1.0	361.7	4.479	0.775	1.693	0.450	49.05	6 S	14.92	0
15.00	49.22	527.00	2.23	2.953	0.600	2.353	0.43	223	1.41	334	1.27	284	1.32	1.27	0.50	0.67	336	1.0	336.2	3.613	0.774	1.698	0.450	49.22	6 S	12.05	0
15.05	49.38	505.00	1.11	2.963	0.605	2.358	0.22	213	1.27	320	1.12	272	1.18	1.12	0.50	0.67	322	1.0	321.8	3.179	0.772	1.703	0.449	49.38	7 S	10.61	0
15.10	49.54	484.70	1.26	2.973	0.610	2.363	0.26	204	1.32	307	1.17	260	1.23	1.17	0.50	0.66	309	1.0	308.6	2.812	0.771	1.708	0.449	49.54	6 S	9.40	0
15.15	49.71	440.60	1.26	2.982	0.615	2.368	0.29	185	1.38	278	1.23	236	1.29	1.23	0.50	0.66	280	1.0	280.2	2.126	0.769	1.712	0.448	49.71	6 S	7.11	0
15.20	49.87	360.80	1.26	2.992	0.620	2.372	0.35	151	1.50	227	1.35	193	1.41	1.35	0.50	0.66	229	1.0	229.2	1.200	0.768	1.717	0.448	49.87	6 S	4.02	0

old Factor of Safety
e water or Soil Behavior Type is not liquefiable

RTF Job: 2005-052-01
PROJECT :
CPT: CPT-1 CPT DATE: 12/2/05 KTE
DATE : 11/10/2008
amax = 0.53 g
M = 6.60

Soil
Clay to Silty Clay
Clayey Silt to Silty Clay
Silty Sand to Sandy Silt
Clean Sand to Silty Sand
Gravelly Sand to Sand

Sum of Liquefiable Thickness (m)	Sum of Non-Liq Thickness (m)	Ratio of Non-Liq to Liquefiable 110.00	Liq. 0.03 in. Settlement (in) Settlement	N-Value Conversion (tsf) qc	qc/N	N-Value	Liquefaction Settlement CSR	H_Index	V_Index	Strain%	Settlement	0.03 in. Cumulative Settlement	Dry Settlement Cyc Shear	Avg Stress	Gmax	Acoeff	Bcoeff	Cyc Strain	Eps15	Nc	EpsNc	Settlement
0.10	12.70	127.00	41.9968	392.20	6	65.4	0.4694	42	17	0.00E+00	0.00E+00	0.03	12.700	0.100	5.69E+02	0.1279	-1607.6	8.8661E-01	2.1406E-01	7.95	0.16	0.6334
0.10	12.75	127.50	42.1609	351.40	6	58.6	0.4691	42	17	0.00E+00	0.00E+00	0.03	12.750	0.100	5.49E+02	0.1279	-1607.6	8.8661E-01	2.4422E-01	7.95	0.18	0.7227
0.10	12.80	128.00	42.3249	342.20	6	57.0	0.4687	42	17	0.00E+00	0.00E+00	0.03	12.800	0.100	5.44E+02	0.1279	-1607.6	8.8661E-01	2.5212E-01	7.95	0.19	0.7461
0.10	12.85	128.50	42.4890	361.20	6	60.2	0.4683	42	17	0.00E+00	0.00E+00	0.03	12.850	0.100	5.54E+02	0.1279	-1607.6	8.8661E-01	2.3629E-01	7.95	0.18	0.6992
0.10	12.90	129.00	42.6530	419.40	6	69.9	0.4679	42	17	0.00E+00	0.00E+00	0.03	12.900	0.100	5.82E+02	0.1279	-1607.6	8.8661E-01	1.9751E-01	7.95	0.15	0.5845
0.10	12.95	129.50	42.8171	479.30	6	79.9	0.4675	42	17	0.00E+00	0.00E+00	0.03	12.950	0.100	6.09E+02	0.1279	-1607.6	8.8661E-01	1.6828E-01	7.95	0.13	0.4980
0.10	13.00	130.00	42.9811	507.40	6	84.6	0.4671	42	17	0.00E+00	0.00E+00	0.03	13.000	0.100	6.20E+02	0.1279	-1607.6	8.8661E-01	1.5716E-01	7.95	0.12	0.4650
0.10	13.05	130.50	43.1452	432.00	6	72.0	0.4667	42	17	0.00E+00	0.00E+00	0.03	13.050	0.100	5.88E+02	0.1279	-1607.6	8.8661E-01	1.9062E-01	7.95	0.14	0.5641
0.10	13.10	131.00	43.3092	396.10	6	66.0	0.4663	42	17	0.00E+00	0.00E+00	0.03	13.100	0.100	5.71E+02	0.1279	-1607.6	8.8661E-01	2.1154E-01	7.95	0.16	0.6260
0.10	13.15	131.50	43.4733	434.00	6	72.3	0.4659	42	17	0.00E+00	0.00E+00	0.03	13.150	0.100	5.89E+02	0.1279	-1607.6	8.8661E-01	1.8957E-01	7.95	0.14	0.5610
0.10	13.20	132.00	43.6373	489.40	6	81.6	0.4655	42	17	0.00E+00	0.00E+00	0.03	13.200	0.100	6.13E+02	0.1279	-1607.6	8.8661E-01	1.6412E-01	7.95	0.12	0.4856
0.10	13.25	132.50	43.8014	569.60	6	94.9	0.4651	42	17	0.00E+00	0.00E+00	0.03	13.250	0.100	6.45E+02	0.1279	-1607.6	8.8661E-01	1.3679E-01	7.95	0.10	0.4048
0.10	13.30	133.00	43.9654	576.20	6	96.0	0.4647	42	17	0.00E+00	0.00E+00	0.03	13.300	0.100	6.47E+02	0.1279	-1607.6	8.8661E-01	1.3492E-01	7.95	0.10	0.3992
0.10	13.35	133.50	44.1295	559.00	6	93.2	0.4642	42	17	0.00E+00	0.00E+00	0.03	13.350	0.100	6.41E+02	0.1279	-1607.6	8.8661E-01	1.3991E-01	7.95	0.11	0.4140
0.10	13.40	134.00	44.2935	596.30	6	99.4	0.4638	42	17	0.00E+00	0.00E+00	0.03	13.400	0.100	6.55E+02	0.1279	-1607.6	8.8661E-01	1.2948E-01	7.95	0.10	0.3831
0.10	13.45	134.50	44.4576	593.70	6	99.0	0.4634	42	17	0.00E+00	0.00E+00	0.03	13.450	0.100	6.54E+02	0.1279	-1607.6	8.8661E-01	1.3016E-01	7.95	0.10	0.3852
0.10	13.50	135.00	44.6216	586.50	6	97.8	0.4630	42	17	0.00E+00	0.00E+00	0.03	13.500	0.100	6.51E+02	0.1279	-1607.6	8.8661E-01	1.3208E-01	7.95	0.10	0.3908
0.10	13.55	135.50	44.7857	596.20	6	99.4	0.4625	42	17	0.00E+00	0.00E+00	0.03	13.550	0.100	6.55E+02	0.1279	-1607.6	8.8661E-01	1.2950E-01	7.95	0.10	0.3832
0.10	13.60	136.00	44.9497	593.10	6	98.9	0.4621	42	17	0.00E+00	0.00E+00	0.03	13.600	0.100	6.54E+02	0.1279	-1607.6	8.8661E-01	1.3032E-01	7.95	0.10	0.3856
0.10	13.65	136.50	45.1138	535.60	6	89.3	0.4617	42	17	0.00E+00	0.00E+00	0.03	13.650	0.100	6.32E+02	0.1279	-1607.6	8.8661E-01	1.4728E-01	7.95	0.11	0.4358
0.10	13.70	137.00	45.2778	507.40	6	84.6	0.4612	42	17	0.00E+00	0.00E+00	0.03	13.700	0.100	6.20E+02	0.1279	-1607.6	8.8661E-01	1.5716E-01	7.95	0.12	0.4650
0.10	13.75	137.50	45.4419	482.00	6	80.3	0.4608	42	17	0.00E+00	0.00E+00	0.03	13.750	0.100	6.10E+02	0.1279	-1607.6	8.8661E-01	1.6715E-01	7.95	0.13	0.4946
0.10	13.80	138.00	45.6059	478.50	6	79.8	0.4603	42	17	0.00E+00	0.00E+00	0.03	13.800	0.100	6.08E+02	0.1279	-1607.6	8.8661E-01	1.6861E-01	7.95	0.13	0.4990
0.10	13.85	138.50	45.7700	474.70	6	79.1	0.4599	42	17	0.00E+00	0.00E+00	0.03	13.850	0.100	6.07E+02	0.1279	-1607.6	8.8661E-01	1.7023E-01	7.95	0.13	0.5038
0.10	13.90	139.00	45.9340	462.90	6	77.2	0.4594	42	17	0.00E+00	0.00E+00	0.03	13.900	0.100	6.02E+02	0.1279	-1607.6	8.8661E-01	1.7546E-01	7.95	0.13	0.5192
0.10	13.95	139.50	46.0981	488.80	6	81.5	0.4590	42	17	0.00E+00	0.00E+00	0.03	13.950	0.100	6.13E+02	0.1279	-1607.6	8.8661E-01	1.6436E-01	7.95	0.12	0.4864
0.10	14.00	140.00	46.2621	497.80	6	83.0	0.4585	42	17	0.00E+00	0.00E+00	0.03	14.000	0.100	6.17E+02	0.1279	-1607.6	8.8661E-01	1.6080E-01	7.95	0.12	0.4758
0.10	14.05	140.50	46.4262	510.60	6	85.1	0.4581	42	17	0.00E+00	0.00E+00	0.03	14.050	0.100	6.22E+02	0.1279	-1607.6	8.8661E-01	1.5597E-01	7.95	0.12	0.4616
0.10	14.10	141.00	46.5902	556.60	6	92.8	0.4576	42	17	0.00E+00	0.00E+00	0.03	14.100	0.100	6.40E+02	0.1279	-1607.6	8.8661E-01	1.4064E-01	7.95	0.11	0.4162
0.10	14.15	141.50	46.7543	555.10	6	92.5	0.4571	42	17	0.00E+00	0.00E+00	0.03	14.150	0.100	6.39E+02	0.1279	-1607.6	8.8661E-01	1.4109E-01	7.95	0.11	0.4175
0.10	14.20	142.00	46.9183	557.00	6	92.8	0.4567	42	17	0.00E+00	0.00E+00	0.03	14.200	0.100	6.40E+02	0.1279	-1607.6	8.8661E-01	1.4052E-01	7.95	0.11	0.4158
0.10	14.25	142.50	47.0824	544.00	6	90.7	0.4562	42	17	0.00E+00	0.00E+00	0.03	14.250	0.100	6.35E+02	0.1279	-1607.6	8.8661E-01	1.4455E-01	7.95	0.11	0.4278
0.10	14.30	143.00	47.2464	502.40	6	83.7	0.4557	42	17	0.00E+00	0.00E+00	0.03	14.300	0.100	6.18E+02	0.1279	-1607.6	8.8661E-01	1.5903E-01	7.95	0.12	0.4706
0.10	14.35	143.50	47.4105	468.10	6	78.0	0.4552	42	17	0.00E+00	0.00E+00	0.03	14.350	0.100	6.04E+02	0.1279	-1607.6	8.8661E-01	1.7312E-01	7.95	0.13	0.5123
0.10	14.40	144.00	47.5745	484.70	6	80.8	0.4548	42	17	0.00E+00	0.00E+00	0.03	14.400	0.100	6.11E+02	0.1279	-1607.6	8.8661E-01	1.6603E-01	7.95	0.12	0.4913
0.10	14.45	144.50	47.7386	530.30	6	88.4	0.4543	42	17	0.00E+00	0.00E+00	0.03	14.450	0.100	6.30E+02	0.1279	-1607.6	8.8661E-01	1.4905E-01	7.95	0.11	0.4411
0.10	14.50	145.00	47.9026	599.20	6	99.9	0.4538	42	17	0.00E+00	0.00E+00	0.03	14.500	0.100	6.56E+02	0.1279	-1607.6	8.8661E-01	1.2873E-01	7.95	0.10	0.3809
0.10	14.55	145.50	48.0667	690.20	6	115.0	0.4533	42	17	0.00E+00	0.00E+00	0.03	14.550	0.100	6.87E+02	0.1279	-1607.6	8.8661E-01	1.0864E-01	7.95	0.08	0.3215
0.10	14.60	146.00	48.2307	749.50	6	124.9	0.4528	42	17	0.00E+00	0.00E+00	0.03	14.600	0.100	7.07E+02	0.1279	-1607.6	8.8661E-01	9.8407E-02	7.95	0.07	0.2912
0.10	14.65	146.50	48.3948	777.80	6	129.6	0.4523	42	17	0.00E+00	0.00E+00	0.03	14.650	0.100	7.15E+02	0.1279	-1607.6	8.8661E-01	9.4126E-02	7.95	0.07	0.2785
0.10	14.70	147.00	48.5588	729.90	6	121.7	0.4518	42	17	0.00E+00	0.00E+00	0.03	14.700	0.100	7.00E+02	0.1279	-1607.6	8.8661E-01	1.0159E-01	7.95	0.08	0.3006
0.10	14.75	147.50	48.7229	661.20	6	110.2	0.4514	42	17	0.00E+00	0.00E+00	0.03	14.750	0.100	6.78E+02	0.1279	-1607.6	8.8661E-01	1.1438E-01	7.95	0.09	0.3385
0.10	14.80	148.00	48.8869	587.80	6	98.0	0.4509	42	17	0.00E+00	0.00E+00	0.03	14.800	0.100	6.52E+02	0.1279	-1607.6	8.8661E-01	1.3173E-01	7.95	0.10	0.3898
0.10	14.85	148.50	49.0510	566.40	6	94.4	0.4504	42	17	0.00E+00	0.00E+00	0.03	14.850	0.100	6.44E+02	0.1279	-1607.6	8.8661E-01	1.3772E-01	7.95	0.10	0.4075
0.10	14.90	149.00	49.2150	527.00	6	87.8	0.4499	42	16	0.00E+00	0.00E+00	0.03	14.900	0.100	6.28E+02	0.1279	-1607.6	8.8661E-01	1.5017E-01	7.95	0.11	0.4444
0.10	14.95	149.50	49.3791	505.00	8	63.1	0.4493	42	16	0.00E+00	0.00E+00	0.03	14.950	0.100	5.63E+02	0.1279	-1607.6	8.8661E-01	2.2322E-01	7.95	0.17	0.6605
0.10	15.00	150.00	49.5431	484.70	6	80.8	0.4488	42	16	0.00E+00	0.00E+00	0.03	15.000	0.100	6.11E+02	0.1279	-1607.6	8.8661E-01	1.6603E-01	7.95	0.12	0.4913
0.10	15.05	150.50	49.7072	440.60	6	73.4	0.4483	42	16	0.00E+00	0.00E+00	0.03	15.050	0.100	5.92E+02	0.1279	-1607.6	8.8661E-01	1.8616E-01	7.95	0.14	0.5509
0.10	15.10	151.00	49.8712	360.80	6	60.1	0.4478	42	16	0.00E+00	0.00E+00	0.03	15.100	0.100	5.54E+02	0.1279	-1607.6	8.8661E-01	2.3661E-01	7.95	0.18	0.7002

SPREADSHEET TO CALCULATE CYCLIC RESISTANCE RATIO USING CPT DATA

Enter the raw CPT data on each sheet (use the existing data as a guide).
Adjust the project name, date, water level, density, earthquake, factor of safety, liquefiable soil type on this sheet.

WORKBOOK TO CALCULATE LIQUEFACTION POTENTIAL AND SEISMIC SETTLEMENT

REFERENCE:
Youd, T. L., Idriss, I. M., plus 19 others, 2001, "Liquefaction Resistance of Soils: Summary Report from the 1996 NCEER and 1998 NCEER/NSF Workshops on Evaluation of Liquefaction Resistance of Soils," Journal of Geotechnical and Geoenvironmental Engineering, ASCE, Vol. 127, No. 10 (October 2001), pp. 817-833.

SUMMARY SHEET

CLIENT: Vista Canyon LLC
CTF JOB: 2005-052-01
PROJ. :
BY: DA
DATE: 11/10/2008

Z	Ic	Soil	rd#	Reference
3	>2.95	Clay to Silty Clay	1	Tokimatsu & Yoshimi (1983)
4	<2.95	Clayey Silt to Silty Clay	2	Seed & Idriss mean (1971) and Youd (1997)
5	<2.6	Silty Sand to Sandy Silt	3	Seed & Idriss lower limit (1971)
6	<2.05	Clean Sand to Silty Sand	4	Idriss & Golesorkhi (1997)
7	<1.31	Gravelly Sand to Sand	5	Site-Specific

FS = Threshold Factor of Safety = 1.10
NL = Not liquefiable
Liquefiable Ic (between 1.5 and 2.6) = 2.40 (usu. 2.05 to 2.6)
Seismic Settlement Soil (Type) = 6

amax = 0.53 g
Mag = 6.6 MSF 1.5
Pa = 1.04427 tsf
Fill Density = 125 pcf

Depth	CPT-1 12/2/05			CPT-2 12/2/05			CPT-3 12/2/05			CPT-4 12/2/05			CPT-5 12/2/05			CPT-6 12/2/05			CPT-7 12/3/05			CPT-8 12/3/05			CPT-9 12/3/05		
Elevation -->	1515	Sht.	1	1515	Sht.	2	1508	Sht.	3	1501	Sht.	4	1498	Sht.	5	1492	Sht.	6	1505	Sht.	7	1484	Sht.	8	1502	Sht.	9
Meas. Water -->	A Water	30.0	30.0	A Water	30.0	30.0	A Water	30.0	30.0	A Water	17.0	17.0	A Water	14.0	14.0	A Water	13.0	13.0	A Water	30.0	30.0	A Water	30.0	30.0	A Water	30.0	30.0
Design Water -->	D Water	9.0	9.0 feet	D Water	15.0	15.0 feet	D Water	9.0	9.0 feet	D Water	9.0	9.0 feet	D Water	9.0	9.0 feet	D Water	9.0	9.0 feet	D Water	9.0	9.0 feet	D Water	9.0	9.0 feet	D Water	9.0	9.0 feet
Soil Density -->	Gamma	120	120.0 pcf	Gamma	120	120.0 pcf	Gamma	120	120.0 pcf	Gamma	120	120.0 pcf	Gamma	120	120.0 pcf	Gamma	120	120.0 pcf	Gamma	120	120.0 pcf	Gamma	120	120.0 pcf	Gamma	120	120.0 pcf
Site rd -->	rd	2	2.0	rd	2	2.0	rd	2	2.0	rd	2	2.0	rd	2	2.0	rd	2	2.0	rd	2	2.0	rd	2	2.0	rd	2	2.0
R & R -->	R and R	5.0	feet	R and R	30.0	feet	R and R	15.0	feet	R and R	5.0	feet	R and R	14.0	feet	R and R	5.0	feet	R and R	5.0	feet	R and R	5.0	feet	R and R	10.0	feet
Added Fill -->	Fill	2.0	feet	Fill	4.0	feet	Fill	7.0	feet	Fill	9.0	feet	Fill	8.0	feet	Fill	9.0	feet	Fill	8.0	feet	Fill	10.0	feet	Fill	0.0	feet
Ratio -->		116.10			31.49			11.91			5.22			15.58			133.86			9999			9999			2.00	
Liq Settlement	Liq.	0.03	0.03 inches	Liq.	0.26	0.00 inches	Liq.	0.32	0.10 inches	Liq.	0.56	0.56 inches	Liq.	0.13	0.13 inches	Liq.	0.00	0.00 inches	Liq.	0.00	0.00 inches	Liq.	0.00	0.00 inches	Liq.	0.11	0.11 inches
Total After R&R	Total	0.03	inches	Total	0.00	inches	Total	0.10	inches	Total	0.56	inches	Total	0.13	inches	Total	0.00	inches	Total	0.00	inches	Total	0.00	inches	Total	0.11	inches
meters feet	Soil	CPT-1	Ishihara F.S.	Soil	CPT-2	Ishihara F.S.	Soil	CPT-3	Ishihara F.S.	Soil	CPT-4	Ishihara F.S.	Soil	CPT-5	Ishihara F.S.	Soil	CPT-6	Ishihara F.S.	Soil	CPT-7	Ishihara F.S.	Soil	CPT-8	Ishihara F.S.	Soil	CPT-9	Ishihara F.S.
0 0	'1'IAF19	1		'2'IAF19	1		'3'IAF19	1		'4'IAF19	1		'5'IAF19	1		'6'IAF19	1		'7'IAF19	1		'8'IAF19	1		'9'IAF19	1	
1 0.05 0.16	6 S	---	NL	7 S	---	NL	7 S	---	NL	6 S	---	NL	6 S	---	NL	7 S	---	NL	7 S	---	NL	7 S	---	NL	7 S	---	NL
2 0.10 0.33	7 S	---	NL	7 S	---	NL	7 S	---	NL	7 S	---	NL	7 S	---	NL	7 S	---	NL	7 S	---	NL	7 S	---	NL	7 S	---	NL
3 0.15 0.49	7 S	---	NL	7 S	---	NL	7 S	---	NL	7 S	---	NL	7 S	---	NL	7 S	---	NL	7 S	---	NL	7 S	---	NL	7 S	---	NL
4 0.20 0.66	7 S	---	NL	7 S	---	NL	7 S	---	NL	7 S	---	NL	7 S	---	NL	7 S	---	NL	7 S	---	NL	7 S	---	NL	6 S	---	NL
5 0.25 0.82	7 S	---	NL	7 S	---	NL	7 S	---	NL	7 S	---	NL	7 S	---	NL	7 S	---	NL	7 S	---	NL	7 S	---	NL	7 S	---	NL
6 0.30 0.98	7 S	---	NL	7 S	---	NL	6 S	---	NL	7 S	---	NL	6 S	---	NL	6 S	---	NL	7 S	---	NL	6 S	---	NL	7 S	---	NL
7 0.35 1.15	7 S	---	NL	7 S	---	NL	6 S	---	NL	7 S	---	NL	6 S	---	NL	6 S	---	NL	6 S	---	NL	6 S	---	NL	6 S	---	NL
8 0.40 1.31	6 S	---	NL	7 S	---	NL	6 S	---	NL	7 S	---	NL	6 S	---	NL	6 S	---	NL	7 S	---	NL	6 S	---	NL	6 S	---	NL
9 0.45 1.48	6 S	---	NL	7 S	---	NL	6 S	---	NL	7 S	---	NL	6 S	---	NL	6 S	---	NL	7 S	---	NL	6 S	---	NL	6 S	---	NL
10 0.50 1.64	6 S	---	NL	7 S	---	NL	6 S	---	NL	7 S	---	NL	6 S	---	NL	7 S	---	NL	7 S	---	NL	6 S	---	NL	6 S	---	NL
11 0.55 1.80	6 S	---	NL	7 S	---	NL	6 S	---	NL	7 S	---	NL	6 S	---	NL	6 S	---	NL	7 S	---	NL	6 S	---	NL	6 S	---	NL
12 0.60 1.97	6 S	---	NL	7 S	---	NL	6 S	---	NL	7 S	---	NL	6 S	---	NL	7 S	---	NL	6 S	---	NL	6 S	---	NL	6 S	---	NL
13 0.65 2.13	6 S	---	NL	7 S	---	NL	6 S	---	NL	6 S	---	NL	5 M	---	NL	7 S	---	NL	7 S	---	NL	6 S	---	NL	6 S	---	NL
14 0.70 2.30	6 S	---	NL	7 S	---	NL	6 S	---	NL	6 S	---	NL	5 M	---	NL	7 S	---	NL	7 S	---	NL	6 S	---	NL	6 S	---	NL
15 0.75 2.46	6 S	---	NL	7 S	---	NL	5 M	---	NL	6 S	---	NL	5 M	---	NL	7 S	---	NL	7 S	---	NL	6 S	---	NL	6 S	---	NL
16 0.80 2.62	6 S	---	NL	7 S	---	NL	5 M	---	NL	5 M	---	NL	5 M	---	NL	7 S	---	NL	7 S	---	NL	6 S	---	NL	6 S	---	NL
17 0.85 2.79	6 S	---	NL	7 S	---	NL	5 M	---	NL	5 M	---	NL	5 M	---	NL	7 S	---	NL	7 S	---	NL	6 S	---	NL	6 S	---	NL
18 0.90 2.95	6 S	---	NL	6 S	---	NL	5 M	---	NL	5 M	---	NL	5 M	---	NL	7 S	---	NL	7 S	---	NL	7 S	---	NL	6 S	---	NL
19 0.95 3.12	6 S	---	NL	6 S	---	NL	5 M	---	NL	5 M	---	NL	5 M	---	NL	7 S	---	NL	7 S	---	NL	7 S	---	NL	6 S	---	NL
20 1.00 3.28	6 S	---	NL	6 S	---	NL	6 S	---	NL	5 M	---	NL	5 M	---	NL	7 S	---	NL	7 S	---	NL	7 S	---	NL	6 S	---	NL
21 1.05 3.44	6 S	---	NL	7 S	---	NL	6 S	---	NL	5 M	---	NL	5 M	---	NL	7 S	---	NL	7 S	---	NL	7 S	---	NL	6 S	---	NL
22 1.10 3.61	6 S	---	NL	6 S	---	NL	5 M	---	NL	5 M	---	NL	5 M	---	NL	7 S	---	NL	7 S	---	NL	7 S	---	NL	6 S	---	NL
23 1.15 3.77	6 S	---	NL	6 S	---	NL	5 M	---	NL	5 M	---	NL	5 M	---	NL	7 S	---	NL	7 S	---	NL	7 S	---	NL	6 S	---	NL
24 1.20 3.94	6 S	---	NL	6 S	---	NL	5 M	---	NL	5 M	---	NL	5 M	---	NL	7 S	---	NL	7 S	---	NL	7 S	---	NL	6 S	---	NL
25 1.25 4.10	6 S	---	NL	6 S	---	NL	5 M	---	NL	5 M	---	NL	5 M	---	NL	7 S	---	NL	7 S	---	NL	7 S	---	NL	6 S	---	NL
26 1.30 4.27	6 S	---	NL	6 S	---	NL	5 M	---	NL	5 M	---	NL	5 M	---	NL	7 S	---	NL	7 S	---	NL	7 S	---	NL	5 M	---	NL
27 1.35 4.43	6 S	---	NL	7 S	---	NL	5 M	---	NL	5 M	---	NL	5 M	---	NL	7 S	---	NL	7 S	---	NL	7 S	---	NL	6 S	---	NL
28 1.40 4.59	6 S	---	NL	7 S	---	NL	5 M	---	NL	5 M	---	NL	5 M	---	NL	7 S	---	NL	7 S	---	NL	7 S	---	NL	6 S	---	NL
29 1.45 4.76	6 S	---	NL	7 S	---	NL	5 M	---	NL	5 M	---	NL	5 M	---	NL	7 S	---	NL	7 S	---	NL	7 S	---	NL	6 S	---	NL
30 1.50 4.92	6 S	---	NL	7 S	---	NL	5 M	---	NL	5 M	---	NL	5 M	---	NL	7 S	---	NL	7 S	---	NL	7 S	---	NL	6 S	---	NL
31 1.55 5.09	6 S	---	NL	7 S	---	NL	5 M	---	NL	5 M	---	NL	5 M	---	NL	7 S	---	NL	7 S	---	NL	6 S	---	NL	6 S	---	NL
32 1.60 5.25	6 S	---	NL	7 S	---	NL	5 M	---	NL	6 S	---	NL	5 M	---	NL	7 S	---	NL	7 S	---	NL	7 S	---	NL	6 S	---	NL
33 1.65 5.41	6 S	---	NL	6 S	---	NL	6 S	---	NL	6 S	---	NL	5 M	---	NL	7 S	---	NL	7 S	---	NL	7 S	---	NL	6 S	---	NL
34 1.70 5.58	6 S	---	NL	6 S	---	NL	6 S	---	NL	6 S	---	NL	5 M	---	NL	7 S	---	NL	7 S	---	NL	6 S	---	NL	6 S	---	NL
35 1.75 5.74	6 S	---	NL	6 S	---	NL	5 M	---	NL	6 S	---	NL	5 M	---	NL	7 S	---	NL	7 S	---	NL	7 S	---	NL	6 S	---	NL
36 1.80 5.91	6 S	---	NL	5 M	---	NL	5 M	---	NL	6 S	---	NL	5 M	---	NL	7 S	---	NL	7 S	---	NL	7 S	---	NL	6 S	---	NL
37 1.85 6.07	6 S	---	NL	5 M	---	NL	5 M	---	NL	6 S	---	NL	5 M	---	NL	7 S	---	NL	7 S	---	NL	7 S	---	NL	6 S	---	NL
38 1.90 6.23	6 S	---	NL	5 M	---	NL	5 M	---	NL	6 S	---	NL	5 M	---	NL	7 S	---	NL	7 S	---	NL	6 S	---	NL	6 S	---	NL
39 1.95 6.40	6 S	---	NL	5 M	---	NL	5 M	---	NL	6 S	---	NL	5 M	---	NL	6 S	---	NL	7 S	---	NL	6 S	---	NL	6 S	---	NL
40 2.00 6.56	6 S	---	NL	5 M	---	NL	5 M	---	NL	5 M	---	NL	5 M	---	NL	7 S	---	NL	7 S	---	NL	7 S	---	NL	6 S	---	NL
41 2.05 6.73	6 S	---	NL	5 M	---	NL	5 M	---	NL	6 S	---	NL	5 M	---	NL	6 S	---	NL	7 S	---	NL	6 S	---	NL	6 S	---	NL
42 2.10 6.89	6 S	---	NL	5 M	---	NL	5 M	---	NL	6 S	---	NL	5 M	---	NL	6 S	---	NL	7 S	---	NL	6 S	---	NL	6 S	---	NL
43 2.15 7.05	6 S	---	NL	5 M	---	NL	5 M	---	NL	6 S	---	NL	5 M	---	NL	7 S	---	NL	7 S	---	NL	6 S	---	NL	6 S	---	NL
44 2.20 7.22	6 S	---	NL	5 M	---	NL	5 M	---	NL	6 S	---	NL	5 M	---	NL	7 S	---	NL	7 S	---	NL	6 S	---	NL	6 S	---	NL
45 2.25 7.38	6 S	---	NL	5 M	---	NL	5 M	---	NL	6 S	---	NL	5 M	---	NL	6 S	---	NL	7 S	---	NL	6 S	---	NL	6 S	---	NL

SUMMARY SHEET

of Geotechnical and Geoenvironmental Engineering, ASCE, Vol. 127, No. 10 (October 2001), pp. 817-833.

CLIENT: Vista Canyon LLC
RTF JOB: 2005-052-01
PROJ. :
BY: DA
DATE: 11/10/2008

Z	Ic	Soil	rd#	Reference
3	>2.95	Clay to Silty Clay	1	Tokimatsu & Yoshimi (1983)
4	<2.95	Clayey Silt to Silty Clay	2	Seed & Idriss mean (1971) and Youd (1997)
5	<2.6	Silty Sand to Sandy Silt	3	Seed & Idriss lower limit (1971)
6	<2.05	Clean Sand to Silty Sand	4	Idriss & Golesorkhi (1997)
7	<1.31	Gravelly Sand to Sand	5	Site-Specific

FS = Threshold Factor of Safety = 1.10
NL = Not liquefiable
Liquefiable Ic (between 1.5 and 2.6) = 2.40 (usu. 2.05 to 2.6)
Seismic Settlement Soil (Type) = 6

amax = 0.53 g
Mag = 6.6 MSF 1.5
Pa = 1.04427 tsf
Fill Density = 125 pcf

Depth			CPT-1 12/2/05			CPT-2 12/2/05			CPT-3 12/2/05			CPT-4 12/2/05			CPT-5 12/2/05			CPT-6 12/2/05			CPT-7 12/3/05			CPT-8 12/3/05			CPT-9 12/3/05		
46	2.30	7.55	6 S	---	NL	5 M	---	NL	5 M	---	NL	6 S	---	NL	5 M	---	NL	6 S	---	NL	7 S	---	NL	6 S	---	NL	6 S	---	NL
47	2.35	7.71	6 S	---	NL	6 S	---	NL	5 M	---	NL	6 S	---	NL	5 M	---	NL	6 S	---	NL	7 S	---	NL	6 S	---	NL	6 S	---	NL
48	2.40	7.87	7 S	---	NL	6 S	---	NL	5 M	---	NL	6 S	---	NL	5 M	---	NL	7 S	---	NL	7 S	---	NL	6 S	---	NL	6 S	---	NL
49	2.45	8.04	6 S	---	NL	6 S	---	NL	5 M	---	NL	6 S	---	NL	5 M	---	NL	6 S	---	NL	6 S	---	NL	6 S	---	NL	6 S	---	NL
50	2.50	8.20	6 S	---	NL	6 S	---	NL	5 M	---	NL	6 S	---	NL	5 M	---	NL	6 S	---	NL	6 S	---	NL	6 S	---	NL	6 S	---	NL
51	2.55	8.37	7 S	---	NL	6 S	---	NL	5 M	---	NL	6 S	---	NL	6 S	---	NL	6 S	---	NL	6 S	---	NL	6 S	---	NL	6 S	---	NL
52	2.60	8.53	6 S	---	NL	6 S	---	NL	4 C	---	NL	6 S	---	NL	6 S	---	NL	6 S	---	NL	6 S	---	NL	6 S	---	NL	6 S	---	NL
53	2.65	8.69	7 S	---	NL	6 S	---	NL	4 C	---	NL	6 S	---	NL	5 M	---	NL	6 S	---	NL	6 S	---	NL	6 S	---	NL	6 S	---	NL
54	2.70	8.86	7 S	---	NL	5 M	---	NL	4 C	---	NL	6 S	---	NL	5 M	---	NL	6 S	---	NL	6 S	---	NL	7 S	---	NL	6 S	---	NL
55	2.75	9.02	7 S	---	24.88	5 M	---	NL	5 M	---	NL	5 M	---	1.14	5 M	---	0.90	6 S	---	11.52	6 S	---	3.67	7 S	---	32.76	6 S	---	1.90
56	2.80	9.19	7 S	---	28.01	5 M	---	NL	5 M	---	0.69	5 M	---	NL	5 M	---	NL	6 S	---	9.76	6 S	---	4.59	7 S	---	42.75	6 S	---	2.03
57	2.85	9.35	7 S	---	19.43	5 M	---	NL	6 S	---	0.71	3 C	---	NL	5 M	---	NL	6 S	---	7.49	6 S	---	4.53	6 S	---	30.04	6 S	---	2.23
58	2.90	9.51	6 S	---	15.44	5 M	---	NL	6 S	---	0.89	3 C	---	NL	4 C	---	NL	6 S	---	6.00	6 S	---	4.64	6 S	---	27.13	6 S	---	2.27
59	2.95	9.68	6 S	---	11.39	5 M	---	NL	6 S	---	1.54	3 C	---	NL	4 C	---	NL	6 S	---	7.71	6 S	---	6.43	6 S	---	22.50	6 S	---	3.48
60	3.00	9.84	6 S	---	8.09	5 M	---	NL	6 S	---	4.49	3 C	---	NL	4 C	---	NL	6 S	---	6.55	7 S	---	10.31	6 S	---	20.58	6 S	---	5.42
61	3.05	10.01	6 S	---	6.68	5 M	---	NL	6 S	---	7.14	3 C	---	NL	4 C	---	NL	6 S	---	5.75	7 S	---	17.25	7 S	---	22.92	6 S	---	7.94
62	3.10	10.17	6 S	---	5.45	5 M	---	NL	6 S	---	8.00	3 C	---	NL	5 M	---	NL	6 S	---	5.65	7 S	---	19.30	7 S	---	23.33	6 S	---	6.62
63	3.15	10.33	6 S	---	7.11	5 M	---	NL	6 S	---	7.66	3 C	---	NL	5 M	---	NL	6 S	---	5.63	7 S	---	19.02	6 S	---	24.70	6 S	---	4.29
64	3.20	10.50	6 S	---	11.71	5 M	---	NL	6 S	---	8.32	3 C	---	NL	5 M	---	NL	6 S	---	5.61	7 S	---	17.48	6 S	---	31.56	6 S	---	2.06
65	3.25	10.66	6 S	---	20.08	4 C	---	NL	6 S	---	13.28	3 C	---	NL	5 M	---	NL	6 S	---	5.04	7 S	---	20.35	7 S	---	42.48	6 S	---	1.91
66	3.30	10.83	6 S	---	37.83	4 C	---	NL	6 S	---	21.73	4 C	---	NL	5 M	---	NL	6 S	---	4.74	7 S	---	31.16	6 S	---	41.86	6 S	---	1.87
67	3.35	10.99	6 S	---	62.61	4 C	---	NL	6 S	---	17.24	5 M	---	NL	4 C	---	NL	6 S	---	5.20	7 S	---	58.33	6 S	---	33.49	6 S	---	1.96
68	3.40	11.15	6 S	---	20.54	4 C	---	NL	6 S	---	12.41	6 S	<1>	121.86	0.63	4 C	---	NL	6 S	---	3.67	7 S	---	108.77	6 S	---	27.89	6 S	---	1.99
69	3.45	11.32	6 S	---	18.98	4 C	---	NL	6 S	---	8.82	6 S	<1>	60.93	0.78	4 C	---	NL	6 S	---	3.42	7 S	---	113.59	6 S	---	30.59	6 S	---	2.01
70	3.50	11.48	6 S	---	24.55	4 C	---	NL	6 S	---	5.12	6 S	<1>	40.62	0.75	4 C	---	NL	6 S	---	2.17	7 S	---	109.17	6 S	---	29.28	6 S	---	1.93
71	3.55	11.65	6 S	---	36.09	4 C	---	NL	6 S	---	3.78	6 S	<1>	30.47	0.76	5 M	---	NL	6 S	---	1.82	6 S	---	111.56	6 S	---	27.89	6 S	---	1.81
72	3.60	11.81	6 S	---	45.12	4 C	---	NL	6 S	---	3.51	6 S	<1>	24.37	0.78	5 M	---	NL	6 S	---	1.27	7 S	---	105.55	6 S	---	25.95	5 M	---	1.74
73	3.65	11.98	6 S	---	31.30	4 C	---	NL	6 S	---	4.43	6 S	<1>	20.31	0.70	5 M	---	NL	6 S	---	1.69	7 S	---	95.07	6 S	---	17.63	5 M	---	1.69
74	3.70	12.14	6 S	---	28.87	4 C	---	NL	6 S	---	3.68	6 S	<1>	17.41	0.55	5 M	---	NL	5 M	---	1.49	7 S	---	113.36	6 S	---	12.41	5 M	---	1.65
75	3.75	12.30	7 S	---	26.95	4 C	---	NL	6 S	---	2.19	5 M	<1>	15.23	0.46	5 M	---	NL	5 M	---	NL	7 S	---	92.09	6 S	---	12.07	5 M	---	1.58
76	3.80	12.47	7 S	---	30.33	4 C	---	NL	6 S	---	1.50	5 M		15.36	NL	5 M	---	NL	5 M	---	NL	7 S	---	70.49	6 S	---	12.23	5 M	---	1.43
77	3.85	12.63	7 S	---	28.43	4 C	---	NL	6 S	---	1.53	4 C		15.48	NL	5 M	---	NL	5 M	---	NL	7 S	---	48.55	6 S	---	11.64	5 M	---	1.28
78	3.90	12.80	6 S	---	46.57	4 C	---	NL	6 S	---	1.25	4 C		15.61	NL	4 C	---	NL	5 M	---	NL	7 S	---	28.06	6 S	---	9.37	5 M	---	1.21
79	3.95	12.96	7 S	---	62.36	4 C	---	NL	6 S	---	1.55	4 C		15.73	NL	4 C	---	NL	5 M	---	NL	7 S	---	21.81	6 S	---	8.85	5 M	---	1.17
80	4.00	13.12	7 S	---	51.81	3 C	---	NL	6 S	---	1.77	4 C		15.86	NL	3 C	---	NL	5 M	<1>	133.86	0.63	7 S	---	25.08	6 S	---	6.77	5 M	---	1.12
81	4.05	13.29	7 S	---	37.75	3 C	---	NL	6 S	---	1.29	4 C		15.98	NL	3 C	---	NL	6 S		134.86	1.15	7 S	---	21.53	6 S	---	6.56	5 M	<1>	80.00	1.07
82	4.10	13.45	7 S	---	28.30	3 C	---	NL	6 S	---	0.99	4 C		16.11	NL	4 C	---	NL	6 S		135.86	1.75	7 S	---	25.78	6 S	---	14.03	5 M	<1>	40.00	0.98
83	4.15	13.62	7 S	---	21.97	3 C	---	NL	6 S	---	0.72	5 M		16.23	NL	5 M	---	0.53	6 S		136.86	2.13	7 S	---	22.30	6 S	---	8.40	5 M	<1>	26.67	0.99
84	4.20	13.78	7 S	---	19.01	4 C	---	NL	6 S	---	0.66	5 M		16.36	NL	5 M	---	0.56	6 S		137.86	2.04	7 S	---	13.58	6 S	---	8.25	5 M	<1>	20.00	0.98
85	4.25	13.94	7 S	---	12.39	4 C	---	NL	5 M	---	0.51	4 C		16.48	NL	5 M	---	0.60	6 S		138.86	2.07	7 S	---	12.24	7 S	---	8.77	5 M	<1>	16.00	0.93
86	4.30	14.11	7 S	---	9.99	4 C	---	NL	5 M	---	NL	4 C		16.61	NL	5 M	<1>	133.77	0.62	6 S		139.86	1.78	6 S	---	10.08	7 S	---	10.90	5 M	<1>	13.33	0.89
87	4.35	14.27	7 S	---	6.96	4 C	---	NL	5 M	---	NL	5 M		16.73	NL	5 M	<1>	66.88	0.67	6 S		140.86	2.44	6 S	---	11.54	6 S	---	10.72	5 M	<1>	11.43	0.83
88	4.40	14.44	7 S	---	6.57	4 C	---	NL	5 M	---	NL	5 M	<1>	14.87	0.46	5 M	<1>	44.59	0.76	6 S		141.86	4.46	7 S	---	19.89	6 S	---	10.55	5 M	<1>	10.00	0.81
89	4.45	14.60	7 S	---	5.18	4 C	---	NL	4 C	---	NL	5 M	<1>	13.39	0.47	5 M	<1>	33.44	0.80	6 S		142.86	4.83	7 S	---	19.14	6 S	---	12.28	5 M	<1>	8.89	0.81
90	4.50	14.76	7 S	---	4.12	3 C	---	NL	4 C	---	NL	5 M	<1>	12.17	0.50	5 M	<1>	26.75	0.93	6 S		143.86	6.39	6 S	---	14.50	6 S	---	8.63	5 M	<1>	8.00	0.82
91	4.55	14.93	6 S	---	3.65	3 C	---	NL	4 C	---	NL	5 M		12.26	NL	6 S		26.95	1.35	6 S		144.86	4.65	6 S	---	8.74	6 S	---	6.10	5 M	<1>	7.27	0.81
92	4.60	15.09	7 S	---	5.63	3 C	---	NL	3 C	---	NL	4 C		12.35	NL	6 S		27.15	1.49	6 S		145.86	4.55	7 S	---	8.77	6 S	---	6.66	5 M	<1>	6.67	0.77
93	4.65	15.26	7 S	---	10.78	3 C	---	NL	3 C	---	NL	4 C		12.44	NL	6 S		27.35	1.44	6 S		146.86	6.52	6 S	---	6.69	6 S	---	7.62	5 M	<1>	6.15	0.73
94	4.70	15.42	6 S	---	9.81	3 C	---	NL	5 M	---	NL	4 C		12.53	NL	6 S		27.55	1.27	6 S		147.86	7.38	7 S	---	6.56	6 S	---	6.60	5 M	<1>	5.71	0.73
95	4.75	15.58	6 S	---	8.38	4 C	---	NL	4 C	---	NL	4 C		12.62	NL	6 S	<1>	22.96	1.04	6 S		148.86	6.24	7 S	---	6.69	6 S	---	9.51	5 M	<1>	5.33	0.75
96	4.80	15.75	6 S	---	6.08	4 C	---	NL	4 C	---	NL	5 M		12.71	NL	5 M	<1>	19.68	0.92	6 S		149.86	6.41	7 S	---	6.83	6 S	---	13.18	5 M	<1>	5.00	0.75
97	4.85	15.91	7 S	---	6.19	4 C	---	NL	4 C	---	NL	5 M	<1>	11.66	0.48	5 M	<1>	17.22	1.06	6 S		150.86	6.13	7 S	---	8.89	6 S	---	7.53	5 M	<1>	4.71	0.75
98	4.90	16.08	7 S	---	5.08	3 C	---	NL	5 M	<1>	139.67	0.45	5 M	<1>	10.76	0.52	6 S		17.35	1.46	6 S		151.86	6.03	6 S	---	10.01	7 S	---	6.77	5 M	<1>	4.44	0.76
99	4.95	16.24	7 S	---	5.07	3 C	---	NL	5 M	<1>	69.84	0.45	5 M	<1>	9.99	0.61	6 S		17.47	2.72	6 S		152.86	5.06	7 S	---	9.36	7 S	---	5.99	5 M	<1>	4.21	0.78
100	5.00	16.40	7 S	---	4.45	3 C	---	NL	5 M		70.34	NL	5 M	<1>	9.32	0.61	6 S		17.60	3.46	6 S		153.86	2.64	7 S	---	9.54	7 S	---	5.24	5 M	<1>	4.00	0.77
101	5.05	16.57	7 S	---	4.10	3 C	---	NL	5 M		70.84	NL	6 S	<1>	8.74	0.63	6 S		17.72	3.88	6 S		154.86	4.52	6 S	---	10.27	7 S	---	5.55	5 M	<1>	3.81	0.72
102	5.10	16.73	7 S	---	4.29	3 C	---	NL	4 C		71.34	NL	6 S	<1>	8.23	0.59	6 S		17.85	5.65	6 S		155.86	4.64	7 S	---	10.39	6 S	---	4.03	5 M	<1>	3.64	0.69
103	5.15	16.90	7 S	---	4.74	4 C	---	NL	3 C		71.84	NL	6 S	<1>	7.77	0.54	6 S		17.97	9.71	6 S		156.86	4.08	7 S	---	9.90	6 S	---	3.61	5 M	<1>	3.48	0.68
104	5.20	17.06	7 S	---	4.64	4 C	---	NL	4 C		72.34	NL	5 M	<1>	7.36	0.56	6 S		18.10	10.80	6 S		157.86	4.28	7 S	---	9.65	6 S	---	6.44	5 M	<1>	3.33	0.66
105	5.25	17.22	7 S	---	5.90	3 C	---	NL	4 C		72.84	NL	5 M	<1>	6.99	0.70	6 S		18.22	8.36	6 S		158.86	4.73	6 S	---	10.17	6 S	---	7.29	5 M	<1>	3.20	0.64
106	5.30	17.39	7 S	---	7.04	3 C	---	NL	5 M		73.34	NL	5 M	<1>	6.66	0.95	6 S		18.35	7.09	6 S		159.86	5.29	6 S	---	10.47	6 S	---	7.67	5 M	<1>	3.08	0.65
107	5.35	17.55	7 S	---	7.63	3 C	---	NL	4 C		73.84	NL	5 M		6.71	1.12	6 S		18.47	6.31	6 S		160.86	5.68	6 S	---	11.09	6 S	---	7.42	5 M	<1>	2.96	0.66
108	5.40	17.72	7 S	---	7.21	4 C	---	NL	3 C		74.34	NL	5 M	<1>	6.40	0.97	6 S		18.60	6.82	6 S		161.86	7.68	6 S	---	7.30	6 S	---	4.37	5 M	<1>	2.86	0.64
109	5.45	17.88	7 S	---	7.30	4 C	---	NL	3 C		74.84	NL	5 M	<1>	6.12	0.86	6 S		18.72	8.60	6 S		162.86	8.11	7 S	---	6.83	6 S	---	4.02	5 M	<1>	2.76	0.66
110	5.50	18.04	7 S	---	7.37	3 C	---	NL	3 C		75.34	NL	5 M	<1>	5.87	0.73	6 S		18.85	5.90	6 S		163.86	6.30	6 S	---	8.13	6 S	---	2.33	5 M	<1>	2.67	0.70
111	5.55	18.21	7 S	---	6.29	3 C	---	NL	3 C		75.84	NL	5 M	<1>	5.63	0.76	6 S		18.97	4.61	6 S		164.86	5.82	6 S	---	7.36	6 S	---	2.50	5 M	<1>	2.58	0.71
112	5.60	18.37	7 S	---	5.61	3 C	---	NL	5 M		76.34	NL	6 S	<1>	5.42	0.77	6 S		19.10	4.13	6 S		165.86	5.94	6 S	---	8.57	6 S	---	2.43	5 M	<1>	2.50	0.71
113	5.65	18.54	6 S	---	6.05	3 C	---	NL	5 M	<1>	50.89	0.40	6 S	<1>	5.22	1.06	6 S		19.22	4.32	6 S		166.86	7.09	6 S	---	10.52	6 S	---	2.04	5 M	<1>	2.42	0.69
114	5.70	18.70	6 S	---	4.94	3 C	---	NL	6 S	<1>	38.17	0.41	6 S		5.25	2.08	6 S		19.35	4.68	7 S		167.86	7.45	6 S	---	11.49	6 S	---	1.88	5 M	<1>	2.35	0.66

SUMMARY SHEET

of Geotechnical and Geoenvironmental Engineering, ASCE, Vol. 127, No. 10 (October 2001), pp. 817-833.

CLIENT: Vista Canyon LLC
RTF JOB: 2005-052-01
PROJ.:
BY: DA
DATE: 11/10/2008

Z	Ic	Soil	rd#	Reference
3	>2.95	Clay to Silty Clay	1	Tokimatsu & Yoshimi (1983)
4	<2.95	Clayey Silt to Silty Clay	2	Seed & Idriss mean (1971) and Youd (1997)
5	<2.6	Silty Sand to Sandy Silt	3	Seed & Idriss lower limit (1971)
6	<2.05	Clean Sand to Silty Sand	4	Idriss & Golesorkhi (1997)
7	<1.31	Gravelly Sand to Sand	5	Site-Specific

FS = Threshold Factor of Safety = 1.10 amax = 0.53 g
NL = Not liquefiable Mag = 6.6 MSF 1.5
Liquefiable Ic (between 1.5 and 2.6) = 2.40 (usu. 2.05 to 2.6) Pa = 1.04427 tsf
Seismic Settlement Soil (Type) = 6 Fill Density = 125 pcf

Depth			CPT-1 12/2/05			CPT-2 12/2/05			CPT-3 12/2/05			CPT-4 12/2/05			CPT-5 12/2/05			CPT-6 12/2/05			CPT-7 12/3/05			CPT-8 12/3/05			CPT-9 12/3/05			
115	5.75	18.86	6 S	—	7.96	3 C	—	NL	6 S	<1>	30.53	0.40	6 S		5.29	2.98	6 S	19.47	5.05	7 S	168.86	8.20	6 S	—	6.69	6 S	—	1.90	5 M	<1>	2.29	0.91
116	5.80	19.03	6 S	—	8.88	3 C	—	NL	5 M	<1>	25.45	0.43	6 S		5.33	3.94	6 S	19.60	5.29	7 S	169.86	8.81	6 S	—	8.54	6 S	—	2.05	5 M	<1>	2.22	1.04
117	5.85	19.19	7 S	—	8.99	3 C	—	NL	5 M	<1>	21.81	0.50	6 S		5.37	4.89	6 S	19.72	6.07	6 S	170.86	9.56	7 S	—	16.45	6 S	—	2.52	5 M		2.25	3.83
118	5.90	19.36	7 S	—	8.20	3 C	—	NL	5 M	<1>	19.08	0.47	6 S		5.40	5.41	6 S	19.85	7.13	6 S	171.86	11.36	7 S	—	13.28	6 S	—	2.39	5 M		2.28	3.98
119	5.95	19.52	7 S	—	7.80	3 C	—	NL	5 M	<1>	16.96	0.45	6 S		5.44	5.48	6 S	19.97	7.50	6 S	172.86	9.43	7 S	—	15.02	6 S	—	2.40	5 M		2.31	2.16
120	6.00	19.69	7 S	—	7.29	3 C	—	NL	5 M		17.07	NL	6 S		5.48	4.18	6 S	20.10	10.13	6 S	173.86	9.69	7 S	—	12.64	6 S	—	2.62	5 M		2.33	2.01
121	6.05	19.85	7 S	—	8.24	3 C	—	NL	4 C		17.19	NL	6 S		5.51	4.91	6 S	20.22	13.43	6 S	174.86	12.80	7 S	—	10.01	6 S	—	2.54	5 M	<1>	2.27	0.97
122	6.10	20.01	6 S	—	7.65	3 C	—	NL	4 C		17.30	NL	6 S		5.55	4.16	6 S	20.35	8.08	6 S	175.86	11.44	7 S	—	11.59	6 S	—	2.81	6 S	<1>	2.31	0.86
123	6.15	20.18	6 S	—	7.99	3 C	—	NL	3 C		17.41	NL	6 S		5.59	3.08	6 S	20.47	7.93	6 S	176.86	14.08	7 S	—	11.68	6 S	—	2.62	6 S		2.24	1.32
124	6.20	20.34	6 S	—	11.09	3 C	—	NL	3 C		17.52	NL	6 S		5.62	2.70	6 S	20.60	5.57	6 S	177.86	15.30	7 S	—	9.58	6 S	—	2.19	5 M		2.26	1.74
125	6.25	20.51	6 S	—	13.25	3 C	—	NL	3 C		17.63	NL	6 S		5.66	2.62	6 S	20.72	3.94	6 S	178.86	12.05	7 S	—	7.49	6 S	—	2.20	6 S		2.29	1.79
126	6.30	20.67	6 S	—	23.63	4 C	—	NL	4 C		17.74	NL	6 S		5.70	2.81	6 S	20.85	2.59	6 S	179.86	11.99	7 S	—	7.59	6 S	—	2.04	6 S		2.32	2.80
127	6.35	20.83	6 S	—	43.53	4 C	—	NL	5 M	<1>	15.97	0.65	6 S		5.74	3.11	6 S	20.97	2.24	6 S	180.86	10.49	7 S	—	6.94	6 S	—	1.76	6 S		2.34	3.31
128	6.40	21.00	6 S	—	62.69	4 C	—	NL	5 M		16.07	NL	6 S		5.77	3.81	6 S	21.10	2.41	6 S	181.86	10.50	7 S	—	7.47	6 S	—	1.64	5 M		2.37	2.26
129	6.45	21.16	6 S	—	70.25	3 C	—	NL	4 C		16.17	NL	6 S		5.81	4.19	6 S	21.22	3.27	6 S	182.86	10.60	7 S	—	8.04	6 S	—	1.59	6 S		2.39	1.52
130	6.50	21.33	6 S	—	44.98	3 C	—	NL	4 C		16.27	NL	6 S		5.85	4.08	6 S	21.35	2.49	6 S	183.86	9.32	7 S	—	9.16	6 S	—	1.82	6 S		2.42	1.49
131	6.55	21.49	6 S	—	34.59	3 C	—	NL	4 C		16.37	NL	6 S		5.88	3.65	6 S	21.47	2.66	6 S	184.86	10.67	7 S	—	8.75	6 S	—	1.83	5 M		2.45	1.85
132	6.60	21.65	6 S	—	23.59	3 C	—	NL	3 C		16.47	NL	6 S		5.92	4.00	6 S	21.60	3.02	6 S	185.86	12.21	7 S	—	8.39	6 S	—	1.82	5 M		2.47	1.84
133	6.65	21.82	7 S	—	12.77	3 C	—	NL	4 C		16.57	NL	6 S		5.96	4.42	6 S	21.72	3.64	6 S	186.86	15.73	7 S	—	9.38	6 S	—	1.81	6 S		2.50	1.77
134	6.70	21.98	7 S	—	9.94	3 C	—	NL	4 C		16.67	NL	6 S		5.99	2.78	6 S	21.85	4.81	7 S	187.86	16.01	7 S	—	9.39	6 S	—	1.81	5 M		2.53	1.59
135	6.75	22.15	7 S	—	8.46	3 C	—	NL	4 C		16.77	NL	6 S		6.03	3.98	6 S	21.97	4.94	7 S	188.86	15.74	7 S	—	11.54	6 S	—	2.08	5 M	<1>	2.46	0.88
136	6.80	22.31	7 S	—	8.13	3 C	—	NL	4 C		16.87	NL	6 S		6.07	5.11	6 S	22.10	4.09	6 S	189.86	11.20	7 S	—	10.44	6 S	—	2.42	5 M	<1>	2.40	0.75
137	6.85	22.47	7 S	—	9.98	3 C	—	NL	5 M	<1>	15.33	0.48	6 S		6.11	9.41	6 S	22.22	4.80	6 S	190.86	11.18	7 S	—	9.65	6 S	—	3.07	5 M	<1>	2.34	0.90
138	6.90	22.64	7 S	—	9.65	3 C	—	NL	5 M		15.42	NL	6 S		6.14	6.72	6 S	22.35	4.51	6 S	191.86	13.00	7 S	—	9.01	6 S	—	3.87	5 M		2.37	1.38
139	6.95	22.80	7 S	—	7.89	4 C	—	NL	5 M		15.52	NL	6 S		6.18	5.30	6 S	22.47	4.08	6 S	192.86	13.56	7 S	—	8.41	6 S	—	4.23	6 S		2.39	1.36
140	7.00	22.97	6 S	—	6.18	4 C	—	NL	5 M	<1>	14.22	0.48	6 S		6.22	4.58	6 S	22.60	3.78	6 S	193.86	16.23	7 S	—	8.32	6 S	—	5.62	5 M	<1>	2.33	1.08
141	7.05	23.13	7 S	—	6.85	4 C	—	NL	5 M	<1>	13.13	0.47	6 S		6.25	4.80	6 S	22.72	3.35	6 S	194.86	21.19	7 S	—	6.52	6 S	—	5.39	5 M	<1>	2.28	0.93
142	7.10	23.29	7 S	—	7.66	5 M	—	0.48	4 C		13.21	NL	6 S		6.29	4.81	6 S	22.85	4.14	6 S	195.86	30.29	7 S	—	7.04	6 S	—	5.63	5 M	<1>	2.23	0.89
143	7.15	23.46	7 S	—	7.94	6 S	—	0.70	4 C		13.28	NL	6 S		6.33	3.77	6 S	22.97	5.56	6 S	196.86	38.17	6 S	—	7.06	6 S	—	4.54	5 M	<1>	2.18	0.93
144	7.20	23.62	6 S	—	9.46	6 S	—	0.88	4 C		13.36	NL	6 S		6.37	3.00	6 S	23.10	9.62	6 S	197.86	41.06	6 S	—	7.64	6 S	—	5.48	6 S	<1>	2.13	0.98
145	7.25	23.79	7 S	—	12.68	6 S	—	0.84	4 C		13.44	NL	6 S		6.40	2.08	6 S	23.22	13.26	6 S	198.86	44.14	6 S	—	7.28	6 S	—	5.51	6 S		2.15	1.24
146	7.30	23.95	7 S	—	16.21	6 S	—	0.59	3 C		13.51	NL	6 S		6.44	1.40	6 S	23.35	14.27	6 S	199.86	38.12	7 S	—	7.63	6 S	—	7.27	6 S		2.17	1.42
147	7.35	24.11	7 S	—	16.29	6 S	—	0.46	3 C		13.59	NL	6 S		6.48	1.21	7 S	23.47	15.09	6 S	200.86	19.67	7 S	—	7.68	6 S	—	7.83	6 S		2.20	1.34
148	7.40	24.28	7 S	—	16.62	5 M	—	0.41	3 C		13.67	NL	6 S		6.51	1.51	7 S	23.60	18.51	6 S	201.86	17.01	6 S	—	8.19	6 S	—	7.13	6 S		2.22	1.22
149	7.45	24.44	7 S	—	13.07	5 M	—	NL	4 C		13.74	NL	6 S		6.55	2.48	6 S	23.72	15.07	6 S	202.86	12.36	6 S	—	9.31	6 S	—	4.31	6 S	<1>	2.17	1.08
150	7.50	24.61	6 S	—	9.88	4 C	—	NL	5 M	<1>	12.76	0.54	6 S		6.59	3.90	6 S	23.85	10.31	6 S	203.86	12.62	6 S	—	8.69	6 S	—	2.90	5 M	<1>	2.12	0.99
151	7.55	24.77	6 S	—	7.64	3 C	—	NL	5 M	<1>	11.91	0.66	6 S		6.62	5.14	6 S	23.97	8.79	6 S	204.86	13.02	7 S	—	10.46	6 S	—	2.82	5 M	<1>	2.08	0.90
152	7.60	24.93	6 S	—	6.98	3 C	—	NL	6 S		11.98	1.22	6 S		6.66	5.59	6 S	24.10	8.06	6 S	205.86	20.63	7 S	—	11.08	6 S	—	2.87	5 M	<1>	2.04	0.90
153	7.65	25.10	6 S	—	6.76	3 C	—	NL	6 S		12.04	2.25	6 S		6.70	5.53	6 S	24.22	7.72	6 S	206.86	16.81	7 S	—	11.29	6 S	—	2.11	5 M	<1>	2.00	0.98
154	7.70	25.26	6 S	—	7.52	3 C	—	NL	6 S		12.11	3.61	6 S		6.74	6.54	6 S	24.35	10.16	6 S	207.86	7.69	7 S	—	12.34	6 S	—	1.86	5 M		2.02	1.11
155	7.75	25.43	7 S	—	7.67	3 C	—	NL	6 S		12.18	4.09	6 S		6.77	11.59	6 S	24.47	15.58	6 S	208.86	5.67	7 S	—	11.96	6 S	—	1.95	5 M		2.04	1.12
156	7.80	25.59	6 S	—	7.23	3 C	—	NL	6 S		12.24	5.24	6 S		6.81	18.51	6 S	24.60	20.49	6 S	209.86	3.12	7 S	—	11.34	6 S	—	2.10	5 M		2.06	1.29
157	7.85	25.75	6 S	—	8.02	3 C	—	NL	6 S		12.31	6.16	6 S		6.85	22.26	6 S	24.72	18.99	6 S	210.86	2.52	7 S	—	11.66	6 S	—	2.21	5 M		2.08	1.24
158	7.90	25.92	6 S	—	8.52	4 C	—	NL	6 S		12.38	5.83	7 S		6.88	24.07	6 S	24.85	11.90	6 S	211.86	2.91	7 S	—	11.67	6 S	—	2.88	5 M		2.10	1.15
159	7.95	26.08	6 S	—	8.52	4 C	—	NL	6 S		12.44	5.09	6 S		6.92	17.03	6 S	24.97	12.90	6 S	212.86	6.03	6 S	—	10.28	6 S	—	3.79	5 M		2.12	1.14
160	8.00	26.25	6 S	—	9.23	3 C	—	NL	6 S		12.51	6.08	6 S		6.96	14.32	6 S	25.10	13.07	6 S	213.86	11.40	6 S	—	11.81	6 S	—	3.61	5 M		2.14	1.14
161	8.05	26.41	6 S	—	12.69	3 C	—	NL	6 S		12.58	7.37	6 S		6.99	10.86	6 S	25.22	9.84	6 S	214.86	12.20	6 S	—	14.53	6 S	—	2.87	5 M		2.16	1.12
162	8.10	26.57	6 S	—	12.27	4 C	—	NL	6 S		12.64	10.94	6 S		7.03	8.70	6 S	25.35	10.15	6 S	215.86	12.54	7 S	—	18.72	6 S	—	2.85	5 M		2.18	1.14
163	8.15	26.74	6 S	—	10.31	3 C	—	NL	6 S		12.71	8.83	6 S		7.07	7.17	6 S	25.47	13.71	6 S	216.86	8.19	6 S	—	13.94	6 S	—	2.62	5 M		2.20	1.17
164	8.20	26.90	6 S	—	7.35	3 C	—	NL	6 S		12.78	6.04	6 S		7.11	7.14	6 S	25.60	17.01	6 S	217.86	8.65	7 S	—	11.57	6 S	—	2.45	5 M		2.22	1.27
165	8.25	27.07	6 S	—	5.64	3 C	—	NL	6 S		12.84	4.82	6 S		7.14	7.36	6 S	25.72	18.39	6 S	218.86	8.55	6 S	—	8.02	6 S	—	2.74	5 M		2.24	1.40
166	8.30	27.23	6 S	—	5.01	3 C	—	NL	6 S		12.91	3.64	6 S		7.18	7.86	6 S	25.85	18.77	6 S	219.86	8.91	6 S	—	6.14	6 S	—	3.19	5 M		2.25	1.38
167	8.35	27.40	6 S	—	4.25	3 C	—	NL	6 S		12.98	2.78	6 S		7.22	9.45	6 S	25.97	24.20	6 S	220.86	7.02	7 S	—	5.29	6 S	—	2.17	5 M		2.27	1.55
168	8.40	27.56	6 S	—	4.48	4 C	—	NL	6 S		13.04	2.84	6 S		7.25	12.49	6 S	26.10	18.44	6 S	221.86	6.44	6 S	—	3.92	6 S	—	2.02	5 M		2.29	1.61
169	8.45	27.72	6 S	—	4.02	5 M	—	NL	6 S		13.11	3.77	7 S		7.29	17.50	6 S	26.22	11.63	6 S	222.86	6.15	6 S	—	2.99	6 S	—	2.12	6 S		2.31	1.60
170	8.50	27.89	6 S	—	5.11	5 M	—	NL	6 S		13.18	5.30	7 S		7.33	29.45	6 S	26.35	8.43	6 S	223.86	7.73	6 S	—	2.79	6 S	—	3.26	6 S		2.33	1.47
171	8.55	28.05	6 S	—	6.04	5 M	—	0.54	6 S		13.24	6.41	6 S		7.37	16.53	6 S	26.47	6.54	6 S	224.86	6.46	6 S	—	3.31	6 S	—	2.63	5 M		2.35	1.32
172	8.60	28.22	6 S	—	6.24	6 S	—	0.61	6 S		13.31	6.16	6 S		7.40	18.44	6 S	26.60	3.35	6 S	225.86	5.74	6 S	—	5.87	6 S	—	2.82	5 M		2.37	1.22
173	8.65	28.38	6 S	—	6.77	6 S	—	0.57	6 S		13.38	6.76	7 S		7.44	19.93	6 S	26.72	2.27	6 S	226.86	9.72	6 S	—	8.41	6 S	—	2.26	5 M		2.39	1.25
174	8.70	28.54	6 S	—	7.34	6 S	—	0.51	7 S		13.44	7.66	6 S		7.48	17.52	6 S	26.85	2.54	6 S	227.86	8.65	6 S	—	5.73	6 S	—	2.46	5 M		2.41	1.32
175	8.75	28.71	6 S	—	8.39	5 M	—	0.46	7 S		13.51	7.79	6 S		7.51	13.88	6 S	26.97	3.31	6 S	228.86	10.34	6 S	—	6.06	6 S	—	3.28	5 M		2.43	1.37
176	8.80	28.87	6 S	—	6.14	5 M	—	0.43	7 S		13.58	7.64	6 S		7.55	7.52	6 S	27.10	3.77	6 S	229.86	8.70	6 S	—	7.35	6 S	—	4.17	5 M		2.45	1.31
177	8.85	29.04	6 S	—	7.41	4 C	—	NL	7 S		13.64	6.98	6 S		7.59	3.94	6 S	27.22	4.78	6 S	230.86	7.35	6 S	—	6.87	6 S	—	2.49	5 M		2.47	1.26
178	8.90	29.20	6 S	—	5.67	3 C	—	NL	6 S		13.71	6.11	6 S		7.62	2.02	6 S	27.35	5.33	6 S	231.86	6.50	6 S	—	5.10	6 S	—	2.78	5 M		2.49	1.39
179	8.95	29.36	6 S	—	4.54	4 C	—	NL	6 S		13.78	8.17	6 S		7.66	1.46	6 S	27.47	3.97	6 S	232.86	5.41	6 S	—	5.92	6 S	—	3.45	5 M		2.51	1.50
180	9.00	29.53	6 S	—	4.89	5 M	—	NL	6 S		13.84	10.16	6 S	<1>	7.39	1.07	6 S	27.60	4.18	6 S	233.86	5.28	6 S	—	6.71	6 S	—	4.57	5 M		2.53	1.46
181	9.05	29.69	6 S	—	7.24	4 C	—	NL	6 S		13.91	12.75	5 M	<1>	7.13	0.82	6 S	27.72	4.09	6 S	234.86	5.90	6 S	—	8.72	6 S	—	4.51	5 M		2.55	1.52
182	9.10	29.86	6 S	—	6.00	3 C	—	NL	6 S		13.98	16.76	5 M	<1>	6.90	0.55	6 S	27.85	4.20	6 S	235.86	6.18	6 S	—	11.18	6 S	—	3.34	5 M		2.57	1.54
183	9.15	30.02	6 S	—	4.66	3 C	—	NL	6 S		14.04	12.85	5 M	<1>	6.67	0.70	6 S	27.97	5.02	6 S	236.86	4.81	6 S	—	9.43	6 S	—	4.33	5 M		2.59	1.55

SUMMARY SHEET

of Geotechnical and Geoenvironmental Engineering, ASCE, Vol. 127, No. 10 (October 2001), pp. 817-833.

CLIENT: **Vista Canyon LLC**
RTF JOB: **2005-052-01**
PROJ.:
BY: **DA**
DATE: **11/10/2008**

Z	Ic	Soil	rd#	Reference
3	>2.95	Clay to Silty Clay	1	Tokimatsu & Yoshimi (1983)
4	<2.95	Clayey Silt to Silty Clay	2	Seed & Idriss mean (1971) and Youd (1997)
5	<2.6	Silty Sand to Sandy Silt	3	Seed & Idriss lower limit (1971)
6	<2.05	Clean Sand to Silty Sand	4	Idriss & Golesorkhi (1997)
7	<1.31	Gravelly Sand to Sand	5	Site-Specific

FS = Threshold Factor of Safety = 1.10 amax = 0.53 g
NL = Not liquefiable Mag = 6.6 MSF 1.5
Liquefiable Ic (between 1.5 and 2.6) = 2.40 (usu. 2.05 to 2.6) Pa = 1.04427 tsf
Seismic Settlement Soil (Type) = 6 Fill Density = 125 pcf

	Depth		CPT-1	12/2/05		CPT-2	12/2/05		CPT-3	12/2/05		CPT-4	12/2/05		CPT-5	12/2/05		CPT-6	12/2/05		CPT-7	12/3/05		CPT-8	12/3/05		CPT-9	12/3/05	
184	9.20	30.18	6 S	---	4.73	3 C	---	NL	6 S	14.11	10.64	6 S	6.71	5.51	6 S	28.10	4.32	6 S	237.86	5.37	6 S	---	9.65	6 S	---	2.89	5 M	2.61	1.47
185	9.25	30.35	6 S	---	4.12	3 C	---	NL	6 S	14.18	5.15	6 S	6.74	6.70	6 S	28.22	3.90	6 S	238.86	5.67	6 S	---	8.27	6 S	---	2.48	5 M	2.63	NL
186	9.30	30.51	6 S	---	7.74	3 C	---	NL	6 S	14.24	4.29	6 S	6.77	6.48	6 S	28.35	3.52	6 S	239.86	4.78	6 S	---	8.73	6 S	---	1.79	4 C	2.65	NL
187	9.35	30.68	6 S	---	12.55	3 C	---	NL	6 S	14.31	4.35	6 S	6.80	6.84	6 S	28.47	2.60	6 S	240.86	4.43	6 S	---	9.64	6 S	---	1.82	4 C	2.67	NL
188	9.40	30.84	6 S	---	17.62	3 C	---	NL	6 S	14.38	5.61	6 S	6.83	5.66	6 S	28.60	2.15	6 S	241.86	4.73	6 S	---	10.39	6 S	---	1.95	5 M	2.69	NL
189	9.45	31.00	6 S	---	14.96	3 C	---	NL	6 S	14.44	6.99	6 S	6.87	5.20	6 S	28.72	1.76	6 S	242.86	5.70	6 S	---	13.05	6 S	---	2.05	5 M	<1>	2.63	1.04
190	9.50	31.17	6 S	---	12.63	3 C	---	NL	6 S	14.51	7.91	6 S	6.90	5.41	6 S	28.85	1.51	6 S	243.86	7.45	6 S	---	11.83	6 S	---	2.37	5 M		2.65	1.18
191	9.55	31.33	7 S	---	16.47	3 C	---	NL	6 S	14.58	11.28	6 S	6.93	6.16	5 M	28.97	1.50	7 S	244.86	14.14	6 S	---	11.57	6 S	---	2.04	5 M	<1>	2.60	1.06
192	9.60	31.50	7 S	---	11.90	3 C	---	NL	6 S	14.64	14.12	6 S	6.96	6.95	6 S	29.10	1.94	6 S	245.86	15.42	6 S	---	13.10	6 S	---	2.04	5 M	<1>	2.56	1.00
193	9.65	31.66	7 S	---	11.06	3 C	---	NL	6 S	14.71	23.57	6 S	7.00	7.86	6 S	29.22	1.83	6 S	246.86	12.58	6 S	---	12.67	6 S	---	1.12	5 M	<1>	2.51	0.93
194	9.70	31.82	7 S	---	10.20	3 C	---	NL	6 S	14.78	18.16	6 S	7.03	10.23	6 S	<1> 25.97	0.96	6 S	247.86	11.65	6 S	---	13.87	6 S	---	2.48	5 M	<1>	2.46	0.91
195	9.75	31.99	7 S	---	8.42	3 C	---	NL	6 S	14.84	15.67	6 S	7.06	12.15	6 S	<1> 23.38	0.61	6 S	248.86	7.98	6 S	---	15.37	6 S	---	2.29	5 M	<1>	2.42	0.97
196	9.80	32.15	7 S	---	7.37	3 C	---	NL	6 S	14.91	13.43	6 S	7.09	10.09	6 S	<1> 21.25	0.50	6 S	249.86	7.07	6 S	---	15.99	6 S	---	2.80	5 M	<1>	2.38	0.98
197	9.85	32.32	7 S	---	5.84	3 C	---	NL	6 S	14.98	11.82	6 S	7.12	7.82	5 M	<1> 19.48	0.44	6 S	250.86	6.64	6 S	---	15.88	6 S	---	3.30	5 M	<1>	2.34	0.93
198	9.90	32.48	7 S	---	5.29	3 C	---	NL	6 S	15.04	8.21	6 S	7.16	7.20	5 M	<1> 17.98	0.45	6 S	251.86	7.85	6 S	---	14.99	6 S	---	3.93	5 M	<1>	2.30	0.91
199	9.95	32.64	6 S	---	3.83	4 C	---	NL	6 S	15.11	6.32	6 S	7.19	6.93	5 M	<1> 16.70	0.51	6 S	252.86	9.02	6 S	---	14.89	6 S	---	3.44	5 M	<1>	2.26	0.98
200	10.00	32.81	6 S	---	3.14	4 C	---	NL	6 S	15.18	6.36	6 S	7.22	6.62	5 M	<1> 15.58	0.69	6 S	253.86	11.53	6 S	---	14.36	6 S	---	3.31	5 M	<1>	2.23	1.06
201	10.05	32.97	6 S	---	2.87	4 C	---	NL	6 S	15.24	7.83	6 S	7.25	6.10	6 S	15.65	1.21	6 S	254.86	11.38	6 S	---	17.37	6 S	---	3.23	5 M	<1>	2.19	1.08
202	10.10	33.14	6 S	---	2.50	4 C	---	NL	6 S	15.31	6.79	6 S	7.29	7.44	6 S	15.72	3.53	6 S	255.86	13.56	6 S	---	19.11	6 S	---	2.60	5 M	<1>	2.16	1.10
203	10.15	33.30	6 S	---	2.28	3 C	---	NL	6 S	15.38	6.92	6 S	7.32	13.03	6 S	15.78	5.08	6 S	256.86	17.71	6 S	---	17.36	6 S	---	2.79	5 M		2.17	1.24
204	10.20	33.46	6 S	---	2.18	3 C	---	NL	6 S	15.44	7.23	6 S	7.35	15.33	6 S	15.85	7.00	6 S	257.86	17.01	6 S	---	16.59	6 S	---	3.68	5 M		2.19	1.12
205	10.25	33.63	6 S	---	1.90	3 C	---	NL	6 S	15.51	7.44	6 S	7.38	15.11	6 S	15.92	6.76	6 S	258.86	16.57	6 S	---	17.60	6 S	---	5.97	5 M		2.20	NL
206	10.30	33.79	6 S	---	1.77	3 C	---	NL	6 S	15.58	8.01	6 S	7.41	16.42	6 S	15.98	7.99	6 S	259.86	15.28	6 S	---	16.69	6 S	---	10.06	5 M		2.22	1.68
207	10.35	33.96	6 S	---	1.62	3 C	---	NL	6 S	15.64	14.38	7 S	7.45	19.29	6 S	16.05	9.00	6 S	260.86	16.75	6 S	---	12.41	6 S	---	8.54	5 M		2.23	1.84
208	10.40	34.12	6 S	---	1.50	3 C	---	NL	6 S	15.71	11.28	6 S	7.48	26.69	6 S	16.12	9.24	6 S	261.86	17.04	6 S	---	16.38	5 M	---	9.58	6 S		2.25	2.64
209	10.45	34.28	6 S	---	1.56	3 C	---	NL	6 S	15.78	10.98	6 S	7.51	26.50	6 S	16.18	9.14	6 S	262.86	16.95	6 S	---	20.91	6 S	---	13.29	6 S		2.27	2.54
210	10.50	34.45	6 S	---	1.89	4 C	---	NL	6 S	15.84	11.63	6 S	7.54	25.32	6 S	16.25	9.16	6 S	263.86	14.81	6 S	---	21.86	6 S	---	22.92	5 M		2.28	2.57
211	10.55	34.61	6 S	---	1.44	3 C	---	NL	6 S	15.91	11.73	6 S	7.58	28.42	6 S	16.32	10.41	6 S	264.86	14.64	6 S	---	20.78	6 S	---	28.15	5 M		2.30	2.44
212	10.60	34.78	6 S	---	1.37	4 C	---	NL	6 S	15.98	9.56	6 S	7.61	25.24	6 S	16.38	11.20	6 S	265.86	15.41	6 S	---	14.08	6 S	---	29.60	5 M		2.31	1.96
213	10.65	34.94	6 S	---	1.75	4 C	---	NL	6 S	16.04	8.17	6 S	7.64	23.59	6 S	16.45	9.82	6 S	266.86	16.61	6 S	---	14.77	6 S	---	33.98	6 S		2.33	2.27
214	10.70	35.10	6 S	---	4.71	4 C	---	NL	6 S	16.11	6.10	6 S	7.67	17.56	6 S	16.52	9.12	6 S	267.86	18.63	7 S	---	13.67	6 S	---	42.40	5 M		2.34	2.44
215	10.75	35.27	6 S	---	5.65	3 C	---	NL	6 S	16.18	5.12	6 S	7.71	13.23	6 S	16.58	8.60	6 S	268.86	18.93	7 S	---	13.65	6 S	---	50.09	5 M		2.36	1.63
216	10.80	35.43	6 S	---	4.21	3 C	---	NL	6 S	16.24	2.64	6 S	7.74	11.34	6 S	16.65	7.90	6 S	269.86	22.76	7 S	---	11.21	6 S	---	36.65	5 M		2.38	1.20
217	10.85	35.60	6 S	---	3.45	3 C	---	NL	5 M	16.31	1.56	6 S	7.77	11.71	6 S	16.72	7.09	6 S	270.86	28.33	6 S	---	11.95	6 S	---	17.54	5 M	<1>	2.34	0.93
218	10.90	35.76	6 S	---	3.53	3 C	---	NL	6 S	16.38	1.82	6 S	7.80	18.09	6 S	16.78	7.08	6 S	271.86	31.51	6 S	---	11.95	5 M	---	10.07	5 M	<1>	2.30	0.72
219	10.95	35.93	6 S	---	2.31	4 C	---	NL	6 S	16.44	3.27				6 S	16.85	7.71	6 S	272.86	25.81	6 S	---	11.04	5 M	---	4.94	5 M	<1>	2.27	0.49
220	11.00	36.09	6 S	---	1.27	5 M	<1> 243.38	0.51	6 S	16.51	6.94				6 S	16.92	9.23	6 S	273.86	27.89	6 S	---	11.17	5 M	---	5.22	5 M	<1>	2.24	0.39
221	11.05	36.25	6 S	<1> 232.19	1.08	5 M	<1> 121.69	0.49	6 S	16.58	8.72				6 S	16.98	10.80	6 S	274.86	21.82	7 S	---	12.56				4 C		2.25	NL
222	11.10	36.42	6 S	<1> 116.10	1.10	5 M	<1> 81.13	0.44	6 S	16.64	11.01				6 S	17.05	11.84	6 S	275.86	8.81	7 S	---	13.45				4 C		2.26	NL
223	11.15	36.58	6 S	116.60	1.17	5 M	<1> 60.85	0.45	6 S	16.71	13.52				6 S	17.12	9.03	6 S	276.86	5.95	7 S	---	13.44				3 C		2.28	NL
224	11.20	36.75	6 S	117.10	1.20	5 M	61.10	NL	6 S	16.78	13.21				6 S	17.18	8.08	5 M	277.86	3.05	7 S	---	13.31				3 C		2.29	NL
225	11.25	36.91	6 S	117.60	1.13	4 C	61.35	NL	6 S	16.84	16.98				6 S	17.25	9.03	6 S	278.86	7.00	7 S	---	13.39				4 C		2.31	NL
226	11.30	37.07	6 S	118.10	1.22	4 C	61.60	NL	6 S	16.91	13.53				6 S	17.32	10.19	6 S	279.86	17.70	7 S	---	14.68				4 C		2.32	NL
227	11.35	37.24	6 S	118.60	1.14	3 C	61.85	NL	6 S	16.98	10.64				6 S	17.38	11.81	6 S	280.86	18.38	7 S	---	15.77				5 M	<1>	2.29	0.53
228	11.40	37.40	6 S	119.10	1.22	5 M	<1> 49.48	0.55	6 S	17.04	9.29				6 S	17.45	13.01	6 S	281.86	18.04	6 S	---	15.19				5 M	<1>	2.26	0.50
229	11.45	37.57	6 S	119.60	1.36	5 M	<1> 41.23	0.52	6 S	17.11	9.44				6 S	17.53	15.20	6 S	282.86	21.39	6 S	---	18.38				5 M	<1>	2.23	0.48
230	11.50	37.73	6 S	120.10	1.46	4 C	41.40	NL	6 S	17.18	9.59				6 S	17.58	20.56	6 S	283.86	24.31	6 S	---	22.08				5 M	<1>	2.19	0.45
231	11.55	37.89	6 S	120.60	1.48	4 C	41.56	NL	6 S	17.24	7.39				6 S	17.65	17.33	6 S	284.86	22.48	6 S	---	21.86				5 M	<1>	2.16	0.44
232	11.60	38.06	6 S	121.10	1.89	3 C	41.73	NL	6 S	17.31	6.27				6 S	17.72	16.41	6 S	285.86	23.87	6 S	---	20.94				5 M		2.18	NL
233	11.65	38.22	6 S	121.60	3.00	3 C	41.90	NL	6 S	17.38	5.08				6 S	17.78	13.90	6 S	286.86	22.99	6 S	---	22.33				4 C		2.19	NL
234	11.70	38.39	6 S	122.10	4.41	3 C	42.06	NL	6 S	17.44	4.71				6 S	17.85	14.79	6 S	287.86	18.32	6 S	---	21.63				3 C		2.21	NL
235	11.75	38.55	6 S	122.60	5.32	3 C	42.23	NL	6 S	17.51	4.67				6 S	17.92	15.75	6 S	288.86	39.44	6 S	---	20.36				3 C		2.22	NL
236	11.80	38.71	6 S	123.10	6.57	3 C	42.40	NL	6 S	17.58	5.76				6 S	17.98	22.08	6 S	289.86	42.78	6 S	---	20.68				3 C		2.23	NL
237	11.85	38.88	6 S	123.60	7.04	3 C	42.56	NL	6 S	17.64	6.62				6 S	18.05	20.93	6 S	290.86	63.67	6 S	---	9.51				3 C		2.25	NL
238	11.90	39.04	6 S	124.10	6.95	3 C	42.73	NL	6 S	17.71	8.57				6 S	18.12	21.22				6 S	---	8.44				3 C		2.26	NL
239	11.95	39.21	6 S	124.60	8.05	3 C	42.90	NL	6 S	17.78	9.46				6 S	18.18	16.67				6 S	---	9.42				3 C		2.27	NL
240	12.00	39.37	6 S	125.10	11.73	3 C	43.06	NL	6 S	17.84	8.54				6 S	18.25	16.48				6 S	---	11.55				3 C		2.29	NL
241	12.05	39.53	6 S	125.60	17.99	3 C	43.23	NL	6 S	17.91	8.29				6 S	18.32	21.81				6 S	---	8.26				3 C		2.30	NL
242	12.10	39.70	6 S	126.10	14.83	3 C	43.40	NL	6 S	17.98	7.87				6 S	18.38	24.18				6 S	---	9.85				3 C		2.32	NL
243	12.15	39.86	6 S	126.60	14.12	3 C	43.56	NL	6 S	18.04	5.80				6 S	18.45	18.12				6 S	---	5.15				3 C		2.33	NL
244	12.20	40.03	6 S	127.10	10.90	3 C	43.73	NL	6 S	18.11	5.04				6 S	18.52	21.37				6 S	---	8.04				3 C		2.34	NL
245	12.25	40.19	6 S	127.60	10.32	3 C	43.90	NL	6 S	18.18	4.61				6 S	18.58	24.62				6 S	---	9.67				3 C		2.36	NL
246	12.30	40.35	6 S	128.10	7.82	3 C	44.06	NL	6 S	18.24	5.43				6 S	18.65	23.26				6 S	---	12.74				3 C		2.37	NL
247	12.35	40.52	6 S	128.60	6.03	3 C	44.23	NL	6 S	18.31	8.54				6 S	18.72	32.52				6 S	---	11.55				3 C		2.38	NL
248	12.40	40.68	6 S	129.10	5.38	3 C	44.40	NL	6 S	18.38	12.27				6 S	18.78	34.92				6 S	---	10.55				3 C		2.40	NL
249	12.45	40.85	6 S	129.60	6.21	3 C	44.56	NL	6 S	18.44	14.32				6 S	18.85	19.35				6 S	---	8.38				3 C		2.41	NL
250	12.50	41.01	6 S	130.10	7.28	4 C	44.73	NL	6 S	18.51	11.72				6 S	18.92	18.51				7 S	---	8.69				3 C		2.42	NL
251	12.55	41.17	6 S	130.60	8.51	3 C	44.90	NL	6 S	18.58	9.47				6 S	18.98	14.17				7 S	---	9.25				3 C		2.44	NL
252	12.60	41.34	6 S	131.10	6.91	3 C	45.06	NL	6 S	18.64	9.55				6 S	19.05	14.13				6 S	---	8.65				3 C		2.45	NL

SUMMARY SHEET

of Geotechnical and Geoenvironmental Engineering, ASCE, Vol. 127, No. 10 (October 2001), pp. 817-833.

CLIENT: Vista Canyon LLC
RTF JOB: 2005-052-01
PROJ. :
BY: DA
DATE: 11/10/2008

Z	Ic	Soil	rd#	Reference
3	>2.95	Clay to Silty Clay	1	Tokimatsu & Yoshimi (1983)
4	<2.95	Clayey Silt to Silty Clay	2	Seed & Idriss mean (1971) and Youd (1997)
5	<2.6	Silty Sand to Sandy Silt	3	Seed & Idriss lower limit (1971)
6	<2.05	Clean Sand to Silty Sand	4	Idriss & Golesorkhi (1997)
7	<1.31	Gravelly Sand to Sand	5	Site-Specific

FS = Threshold Factor of Safety = 1.10
NL = Not liquefiable
Liquefiable Ic (between 1.5 and 2.6) = 2.40 (usu. 2.05 to 2.6)
Seismic Settlement Soil (Type) = 6

amax = 0.53 g
Mag = 6.6 MSF 1.5
Pa = 1.04427 tsf
Fill Density = 125 pcf

Depth			CPT-1 12/2/05		CPT-2 12/2/05			CPT-3 12/2/05		CPT-4 12/2/05	CPT-5 12/2/05		CPT-6 12/2/05	CPT-7 12/3/05			CPT-8 12/3/05	CPT-9 12/3/05		
253	12.65	41.50	6 S	131.60 5.89	3 C	45.23	NL	6 S	18.71	11.80		6 S 19.12 13.37		6 S	---	9.52		3 C	2.47	NL
254	12.70	41.67	6 S	132.10 5.08	4 C	45.40	NL	6 S	18.78	9.14		6 S 19.18 12.63		6 S	---	9.50		3 C	2.48	NL
255	12.75	41.83	6 S	132.60 5.04	4 C	45.56	NL	6 S	18.84	11.41		6 S 19.25 9.80		6 S	---	8.41		3 C	2.49	NL
256	12.80	41.99	6 S	133.10 5.60	4 C	45.73	NL	6 S	18.91	11.36		6 S 19.32 8.31		6 S	---	7.66		3 C	2.51	NL
257	12.85	42.16	6 S	133.60 4.14	3 C	45.90	NL	6 S	18.98	10.29		6 S 19.38 7.61		6 S	---	9.04		3 C	2.52	NL
258	12.90	42.32	6 S	134.10 3.79	3 C	46.06	NL	6 S	19.04	9.63		6 S 19.45 7.54		6 S	---	8.17		3 C	2.53	NL
259	12.95	42.49	6 S	134.60 4.40	3 C	46.23	NL	6 S	19.11	8.20		6 S 19.52 8.00		6 S	---	6.64		2 C	2.55	NL
260	13.00	42.65	6 S	135.10 6.73	3 C	46.40	NL	6 S	19.18	7.92		6 S 19.58 8.25		6 S	---	7.32		2 C	2.56	NL
261	13.05	42.81	6 S	135.60 9.89	3 C	46.56	NL	6 S	19.24	9.63		6 S 19.65 7.69		6 S	---	6.81		2 C	2.58	NL
262	13.10	42.98	6 S	136.10 11.66	5 M	46.73	NL	6 S	19.31	12.49		6 S 19.72 7.63		7 S	---	7.54		3 C	2.59	NL
263	13.15	43.14	6 S	136.60 7.28	5 M	46.90	NL	6 S	19.38	14.13		6 S 19.78 7.35		6 S	---	8.20		2 C	2.60	NL
264	13.20	43.31	6 S	137.10 5.66	4 C	47.06	NL	6 S	19.44	14.54		6 S 19.85 7.35		6 S	---	7.57		3 C	2.62	NL
265	13.25	43.47	6 S	137.60 7.34	4 C	47.23	NL	6 S	19.51	16.69		6 S 19.92 7.54		6 S	---	7.91		3 C	2.63	NL
266	13.30	43.64	6 S	138.10 10.40	5 M <1>	40.48	0.56	6 S	19.58	19.33		6 S 19.98 7.47		6 S	---	8.88		3 C	2.64	NL
267	13.35	43.80	6 S	138.60 16.20	5 M <1>	35.42	0.52	6 S	19.64	21.08		6 S 20.05 6.55		6 S	---	9.13		3 C	2.66	NL
268	13.40	43.96	6 S	139.10 16.73	5 M <1>	31.49	0.44	6 S	19.71	18.93		6 S 20.12 5.87		6 S	---	8.02		3 C	2.67	NL
269	13.45	44.13	6 S	139.60 15.26	4 C	31.60	NL	6 S	19.78	18.19		6 S 20.18 5.20		6 S	---	8.32		3 C	2.68	NL
270	13.50	44.29	6 S	140.10 18.43	3 C	31.71	NL	6 S	19.84	21.56		6 S 20.25 5.60		6 S	---	8.29		3 C	2.70	NL
271	13.55	44.46	6 S	140.60 18.15	3 C	31.82	NL	6 S	19.91	17.54		6 S 20.32 9.55		6 S	---	9.21		3 C	2.71	NL
272	13.60	44.62	6 S	141.10 17.47	3 C	31.93	NL	6 S	19.98	13.81		6 S 20.38 10.87		6 S	---	13.26		3 C	2.73	NL
273	13.65	44.78	6 S	141.60 18.30	3 C	32.04	NL	6 S	20.04	15.45		6 S 20.45 10.99		6 S	---	20.20		3 C	2.74	NL
274	13.70	44.95	6 S	142.10 17.98	3 C	32.15	NL	6 S	20.11	15.10		6 S 20.52 11.06		6 S	---	34.09		3 C	2.75	NL
275	13.75	45.11	6 S	142.60 13.28	4 C	32.26	NL	6 S	20.18	15.87		6 S 20.58 11.17		6 S	---	24.70		3 C	2.77	NL
276	13.80	45.28	6 S	143.10 11.30	3 C	32.38	NL	6 S	20.24	15.42		6 S 20.65 11.29		6 S	---	19.21		3 C	2.78	NL
277	13.85	45.44	6 S	143.60 9.71	3 C	32.49	NL	6 S	20.31	14.17		6 S 20.72 12.29		6 S	---	14.59		4 C	2.79	NL
278	13.90	45.60	6 S	144.10 9.48	3 C	32.60	NL	6 S	20.38	13.03		6 S 20.78 11.78		6 S	---	9.47		4 C	2.81	NL
279	13.95	45.77	6 S	144.60 9.25	3 C	32.71	NL	6 S	20.44	12.50		6 S 20.85 11.33		6 S	---	8.70		3 C	2.82	NL
280	14.00	45.93	6 S	145.10 8.57	3 C	32.82	NL	6 S	20.51	6.99		6 S 20.92 12.70		6 S	---	9.13		3 C	2.84	NL
281	14.05	46.10	6 S	145.60 10.03	3 C	32.93	NL	6 S	20.58	6.76		6 S 20.98 17.23		6 S	---	10.92		3 C	2.85	NL
282	14.10	46.26	6 S	146.10 10.56	3 C	33.04	NL	6 S	20.64	7.59		6 S 21.05 22.38		6 S	---	8.67		3 C	2.86	NL
283	14.15	46.42	6 S	146.60 11.35	3 C	33.15	NL	6 S	20.71	10.10		6 S 21.12 24.90		6 S	---	7.95		4 C	2.88	NL
284	14.20	46.59	6 S	147.10 14.59	3 C	33.26	NL	6 S	20.78	13.39		6 S 21.18 30.74		6 S	---	8.18		4 C	2.89	NL
285	14.25	46.75	6 S	147.60 14.45	3 C	33.38	NL	6 S	20.84	17.36				7 S	---	10.23		5 M	2.90	NL
286	14.30	46.92	6 S	148.10 14.56	3 C	33.49	NL	6 S	20.91	24.48				6 S	---	12.26		5 M	2.92	NL
287	14.35	47.08	6 S	148.60 13.56	4 C	33.60	NL	7 S	20.98	29.06				6 S	---	10.36	<1>	5 M	2.88	0.41
288	14.40	47.24	6 S	149.10 10.71	4 C	33.71	NL	6 S	21.04	24.10				6 S	---	12.61		5 M	2.89	NL
289	14.45	47.41	6 S	149.60 8.70	3 C	33.82	NL	6 S	21.11	16.95				6 S	---	11.27		4 C	2.91	NL
290	14.50	47.57	6 S	150.10 9.61	3 C	33.93	NL	6 S	21.18	15.87				6 S	---	9.90		4 C	2.92	NL
291	14.55	47.74	6 S	150.60 12.48	3 C	34.04	NL	6 S	21.24	12.92				7 S	---	10.29		3 C	2.93	NL
292	14.60	47.90	6 S	151.10 17.85	3 C	34.15	NL	6 S	21.31	13.54				7 S	---	10.83	<1>	5 M	2.89	0.46
293	14.65	48.06	6 S	151.60 27.09	3 C	34.26	NL	6 S	21.38	15.41				6 S	---	11.50	<1>	6 S	2.86	0.63
294	14.70	48.23	6 S	152.10 34.55	3 C	34.38	NL	6 S	21.44	18.15				6 S	---	12.94		6 S	2.87	2.10
295	14.75	48.39	6 S	152.60 38.51	4 C	34.49	NL	6 S	21.51	14.37				6 S	---	13.67		5 M	2.88	2.17
296	14.80	48.56	6 S	153.10 31.81	4 C	34.60	NL	6 S	21.58	14.45				6 S	---	15.07		5 M	2.89	6.80
297	14.85	48.72	6 S	153.60 23.67	4 C	34.71	NL	6 S	21.64	14.15				6 S	---	13.35		6 S	2.91	6.78
298	14.90	48.88	6 S	154.10 16.68	4 C	34.82	NL	6 S	21.71	13.35				6 S	---	8.90		6 S	2.92	4.06
299	14.95	49.05	6 S	154.60 14.92	4 C	34.93	NL	6 S	21.78	13.77				6 S	---	8.97		6 S	2.93	4.11
300	15.00	49.21	6 S	155.10 12.05	4 C	35.04	NL	6 S	21.84	12.42				6 S	---	7.34		6 S	2.95	11.30
301	15.05	49.38	7 S	155.60 10.61	3 C	35.15	NL	6 S	21.91	11.97				6 S	---	5.83		6 S	2.96	6.36
302	15.10	49.54	6 S	156.10 9.40	4 C	35.26	NL	6 S	21.98	10.28				6 S	---	5.65		6 S	2.97	5.68
303	15.15	49.70	6 S	156.60 7.11	4 C	35.38	NL	6 S	22.04	6.77				6 S	---	7.04		6 S	2.99	7.12
304	15.20	49.87	6 S	157.10 4.02	4 C	35.49	NL	6 S	22.11	5.72				6 S	---	7.78		6 S	3.00	9.19
305	15.25	50.03			6 S	35.60	6.87							6 S	---	6.71				

SPREADSHEET TO CALCULATE CYCLIC RESISTANCE RATIO USING CPT DATA

Enter the raw CPT data on each sheet (use the existing data as a guide).
Adjust the project name, date, water level, density, earthquake, factor of safety, liquefiable soil type on this sheet.

WORKBOOK TO CALCULATE LIQUEFACTION POTENTIAL AND SEISMIC SETTLEMENT

REFERENCE:
Youd, T. L., Idriss, I. M., plus 19 others, 2001, "Liquefaction Resistance of Soils: Sum 1996 NCEER and 1998 NCEER/NSF Workshops on Evaluation of Liquefaction Resist of Geotechnical and Geoenvironmental Engineering, ASCE, Vol. 127, No. 10 (Octobe

SUMMARY SHEET

CLIENT: **Vista Canyon LLC**
RTF JOB: **2005-052-01**
PROJ. :
BY: **DA**
DATE: **11/10/2008**

Z	Ic	Soil	rd#	Reference
3	>2.95	Clay to Silty Clay	1	Tokimatsu & Yoshimi (1983)
4	<2.95	Clayey Silt to Silty Clay	2	Seed & Idriss mean (1971) and Youd (1997)
5	<2.6	Silty Sand to Sandy Silt	3	Seed & Idriss lower limit (1971)
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7	<1.31	Gravelly Sand to Sand	5	Site-Specific

FS = Threshold Factor of Safety = **1.10**
NL = Not liquefiable
Liquefiable Ic (between 1.5 and 2.6) = **2.40** (usu. 2.05 to 2.6)
Seismic Settlement Soil (Type) = **6**

amax = **0.53** g
Mag = **6.6** MSF 1.5
Pa = 1.04427 tsf
Fill Density = **125** pcf

Depth	CPT-9	12/3/05		CPT-10	12/3/05		CPT-11	12/3/05		CPT-1 *	5/30/07		CPT-2 *	5/30/07	
Elevation -->	1502	Sht.	1	1490	Sht.	2	1483	Sht.	3	1482	Sht.	4	1477	Sht.	5
Meas. Water -->	A Water	**30.0**	30.0	A Water	**29.0**	29.0	A Water	**30.0**	30.0	A Water	**44.0**	44.0	A Water	**44.0**	44.0
Design Water -->	D Water	**9.0**	9.0 feet	D Water	**15.0**	15.0 feet	D Water	**15.0**	15.0 feet	D Water	**9.0**	9.0 feet	D Water	**9.0**	9.0 feet
Soil Density -->	Gamma	**120**	120.0 pcf	Gamma	**120**	120.0 pcf	Gamma	**120**	120.0 pcf	Gamma	**120**	120.0 pcf	Gamma	**120**	120.0 pcf
Site rd -->	rd	**2**	2.0	rd	**2**	2.0	rd	**2**	2.0	rd	**2**	2.0	rd	**2**	2.0
R & R -->	R and R	**10.0**	feet	R and R	**15.0**	feet	R and R	**5.0**	feet	R and R	**8.0**	feet	R and R	**10.0**	feet
Added Fill -->	Fill	**0.0**	feet	Fill	**0.0**	feet	Fill	**7.0**	feet	Fill	**2.0**	feet	Fill	**5.0**	feet
Ratio -->		**2.00**			**54.00**			**9999**			**18.40**			**18.90**	
Liq Settlement	Liq.	0.11	0.11 inches	Liq.	0.00	0.00 inches	Liq.	0.00	0.00 inches	Liq.	0.23	0.23 inches	Liq.	0.24	0.16 inches
Total After R&R	Total	0.11	inches	Total	0.00	inches	Total	0.00	inches	Total	0.23	inches	Total	0.16	inches

	meters	feet	Soil	CPT-9	Ishihara	F.S.	Soil	CPT-10	Ishihara	F.S.	Soil	CPT-11	Ishihara	F.S.	Soil	CPT-1 *	Ishihara	F.S.	Soil	CPT-2 *	Ishihara	F.S.
	0	0	'1'!AF19	1			'2'!AF19	1			'3'!AF19	1			'4'!AF19	1			'5'!AF19	1		
1	0.05	**0.16**	7 S		---	NL	7 S		---	NL	7 S		---	NL	7 S		---	NL	6 S		---	NL
2	0.10	**0.33**	7 S		---	NL	7 S		---	NL	7 S		---	NL	7 S		---	NL	7 S		---	NL
3	0.15	**0.49**	7 S		---	NL	7 S		---	NL	7 S		---	NL	7 S		---	NL	6 S		---	NL
4	0.20	**0.66**	6 S		---	NL	6 S		---	NL	7 S		---	NL	7 S		---	NL	6 S		---	NL
5	0.25	**0.82**	7 S		---	NL	6 S		---	NL	7 S		---	NL	6 S		---	NL	6 S		---	NL
6	0.30	**0.98**	7 S		---	NL	6 S		---	NL	7 S		---	NL	6 S		---	NL	6 S		---	NL
7	0.35	**1.15**	6 S		---	NL	6 S		---	NL	7 S		---	NL	6 S		---	NL	6 S		---	NL
8	0.40	**1.31**	6 S		---	NL	6 S		---	NL	7 S		---	NL	6 S		---	NL	6 S		---	NL
9	0.45	**1.48**	6 S		---	NL	6 S		---	NL	7 S		---	NL	6 S		---	NL	6 S		---	NL
10	0.50	**1.64**	6 S		---	NL	6 S		---	NL	7 S		---	NL	6 S		---	NL	6 S		---	NL
11	0.55	**1.80**	6 S		---	NL	6 S		---	NL	7 S		---	NL	6 S		---	NL	6 S		---	NL
12	0.60	**1.97**	6 S		---	NL	6 S		---	NL	7 S		---	NL	6 S		---	NL	6 S		---	NL
13	0.65	**2.13**	6 S		---	NL	6 S		---	NL	7 S		---	NL	6 S		---	NL	7 S		---	NL
14	0.70	**2.30**	6 S		---	NL	6 S		---	NL	7 S		---	NL	6 S		---	NL	6 S		---	NL
15	0.75	**2.46**	6 S		---	NL	6 S		---	NL	7 S		---	NL	5 M		---	NL	6 S		---	NL
16	0.80	**2.62**	6 S		---	NL	6 S		---	NL	7 S		---	NL	5 M		---	NL	6 S		---	NL
17	0.85	**2.79**	6 S		---	NL	6 S		---	NL	7 S		---	NL	5 M		---	NL	5 M		---	NL
18	0.90	**2.95**	6 S		---	NL	6 S		---	NL	7 S		---	NL	5 M		---	NL	5 M		---	NL
19	0.95	**3.12**	6 S		---	NL	6 S		---	NL	7 S		---	NL	5 M		---	NL	6 S		---	NL
20	1.00	**3.28**	6 S		---	NL	6 S		---	NL	7 S		---	NL	5 M		---	NL	6 S		---	NL
21	1.05	**3.44**	6 S		---	NL	6 S		---	NL	7 S		---	NL	5 M		---	NL	6 S		---	NL
22	1.10	**3.61**	6 S		---	NL	6 S		---	NL	7 S		---	NL	5 M		---	NL	4 C		---	NL
23	1.15	**3.77**	6 S		---	NL	6 S		---	NL	7 S		---	NL	5 M		---	NL	5 M		---	NL

SUMMARY SHEET

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Z	Ic	Soil	rd#	Reference
3	>2.95	Clay to Silty Clay	1	Tokimatsu & Yoshimi (1983)
4	<2.95	Clayey Silt to Silty Clay	2	Seed & Idriss mean (1971) and Youd (1997)
5	<2.6	Silty Sand to Sandy Silt	3	Seed & Idriss lower limit (1971)
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FS = Threshold Factor of Safety = **1.10**
NL = Not liquefiable
Liquefiable Ic (between 1.5 and 2.6) = **2.40** (usu. 2.05 to 2.6)
Seismic Settlement Soil (Type) = **6**

amax = **0.53** g
Mag = **6.6** MSF 1.5
Pa = 1.04427 tsf
Fill Density = **125** pcf

Depth			CPT-9 12/3/05			CPT-10 12/3/05			CPT-11 12/3/05			CPT-1 * 5/30/07			CPT-2 * 5/30/07			
24	1.20	3.94	6 S	---	NL	6 S	---	NL	7 S	---	NL	5 M	---	NL	5 M		---	NL
25	1.25	4.10	6 S	---	NL	6 S	---	NL	7 S	---	NL	5 M	---	NL	6 S		---	NL
26	1.30	4.27	5 M	---	NL	6 S	---	NL	7 S	---	NL	5 M	---	NL	6 S		---	NL
27	1.35	4.43	6 S	---	NL	6 S	---	NL	7 S	---	NL	5 M	---	NL	6 S		---	NL
28	1.40	4.59	6 S	---	NL	6 S	---	NL	7 S	---	NL	5 M	---	NL	5 M		---	NL
29	1.45	4.76	6 S	---	NL	6 S	---	NL	7 S	---	NL	5 M	---	NL	6 S		---	NL
30	1.50	4.92	6 S	---	NL	6 S	---	NL	7 S	---	NL	5 M	---	NL	6 S		---	NL
31	1.55	5.09	6 S	---	NL	5 M	---	NL	7 S	---	NL	4 C	---	NL	6 S		---	NL
32	1.60	5.25	6 S	---	NL	6 S	---	NL	7 S	---	NL	4 C	---	NL	6 S		---	NL
33	1.65	5.41	6 S	---	NL	5 M	---	NL	6 S	---	NL	5 M	---	NL	7 S		---	NL
34	1.70	5.58	6 S	---	NL	6 S	---	NL	6 S	---	NL	6 S	---	NL	6 S		---	NL
35	1.75	5.74	6 S	---	NL	5 M	---	NL	6 S	---	NL	6 S	---	NL	6 S		---	NL
36	1.80	5.91	6 S	---	NL	5 M	---	NL	6 S	---	NL	6 S	---	NL	5 M		---	NL
37	1.85	6.07	6 S	---	NL	5 M	---	NL	6 S	---	NL	6 S	---	NL	5 M		---	NL
38	1.90	6.23	6 S	---	NL	5 M	---	NL	6 S	---	NL	6 S	---	NL	5 M		---	NL
39	1.95	6.40	6 S	---	NL	5 M	---	NL	6 S	---	NL	6 S	---	NL	5 M		---	NL
40	2.00	6.56	6 S	---	NL	5 M	---	NL	6 S	---	NL	6 S	---	NL	5 M		---	NL
41	2.05	6.73	6 S	---	NL	5 M	---	NL	7 S	---	NL	7 S	---	NL	5 M		---	NL
42	2.10	6.89	6 S	---	NL	5 M	---	NL	7 S	---	NL	7 S	---	NL	5 M		---	NL
43	2.15	7.05	6 S	---	NL	5 M	---	NL	7 S	---	NL	7 S	---	NL	5 M		---	NL
44	2.20	7.22	6 S	---	NL	5 M	---	NL	7 S	---	NL	7 S	---	NL	5 M		---	NL
45	2.25	7.38	6 S	---	NL	5 M	---	NL	6 S	---	NL	7 S	---	NL	6 S		---	NL
46	2.30	7.55	6 S	---	NL	5 M	---	NL	7 S	---	NL	7 S	---	NL	6 S		---	NL
47	2.35	7.71	6 S	---	NL	5 M	---	NL	7 S	---	NL	7 S	---	NL	6 S		---	NL
48	2.40	7.87	6 S	---	NL	5 M	---	NL	6 S	---	NL	7 S	---	NL	6 S		---	NL
49	2.45	8.04	6 S	---	NL	5 M	---	NL	6 S	---	NL	7 S	---	NL	6 S		---	NL
50	2.50	8.20	6 S	---	NL	5 M	---	NL	7 S	---	NL	7 S	---	NL	6 S		---	NL
51	2.55	8.37	6 S	---	NL	5 M	---	NL	7 S	---	NL	7 S	---	NL	6 S		---	NL
52	2.60	8.53	6 S	---	NL	5 M	---	NL	7 S	---	NL	7 S	---	NL	6 S		---	NL
53	2.65	8.69	6 S	---	NL	5 M	---	NL	7 S	---	NL	7 S	---	NL	6 S		---	NL
54	2.70	8.86	6 S	---	NL	5 M	---	NL	7 S	---	NL	7 S	---	NL	6 S		---	NL
55	2.75	9.02	6 S	---	1.90	5 M	---	NL	6 S	---	NL	7 S	---	17.07	6 S		---	1.42
56	2.80	9.19	6 S	---	2.03	5 M	---	NL	7 S	---	NL	7 S	---	25.31	6 S		---	0.96
57	2.85	9.35	6 S	---	2.23	5 M	---	NL	7 S	---	NL	7 S	---	38.07	6 S		---	0.79
58	2.90	9.51	6 S	---	2.27	5 M	---	NL	7 S	---	NL	7 S	---	34.20	5 M		---	1.14
59	2.95	9.68	6 S	---	3.48	5 M	---	NL	7 S	---	NL	7 S	---	30.56	5 M		---	1.48
60	3.00	9.84	6 S	---	5.42	5 M	---	NL	6 S	---	NL	7 S	---	23.85	5 M		---	NL
61	3.05	10.01	6 S	---	7.94	5 M	---	NL	6 S	---	NL	7 S	---	17.88	5 M		---	NL
62	3.10	10.17	6 S	---	6.62	5 M	---	NL	6 S	---	NL	7 S	---	13.55	5 M		---	NL
63	3.15	10.33	6 S	---	4.29	5 M	---	NL	6 S	---	NL	7 S	---	11.68	5 M		---	NL
64	3.20	10.50	6 S	---	2.06	5 M	---	NL	7 S	---	NL	7 S	---	12.10	5 M		---	NL
65	3.25	10.66	6 S	---	1.91	5 M	---	NL	6 S	---	NL	6 S	---	12.58	5 M	<1>	94.48	0.60
66	3.30	10.83	6 S	---	1.87	5 M	---	NL	6 S	---	NL	6 S	---	9.96	5 M	<1>	47.24	0.61
67	3.35	10.99	6 S	---	1.96	5 M	---	NL	6 S	---	NL	6 S	---	10.98	6 S	<1>	31.49	0.62
68	3.40	11.15	6 S	---	1.99	5 M	---	NL	6 S	---	NL	7 S	---	17.08	6 S	<1>	23.62	0.62
69	3.45	11.32	6 S	---	2.01	5 M	---	NL	6 S	---	NL	7 S	---	24.06	6 S	<1>	18.90	0.68

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FS = Threshold Factor of Safety = **1.10** amax = **0.53** g
NL = Not liquefiable Mag = **6.6** MSF 1.5
Liquefiable Ic (between 1.5 and 2.6) = **2.40** (usu. 2.05 to 2.6) Pa = 1.04427 tsf
Seismic Settlement Soil (Type) = **6** Fill Density = **125** pcf

Depth			CPT-9	12/3/05		CPT-10	12/3/05		CPT-11	12/3/05		CPT-1 *	5/30/07		CPT-2 *	5/30/07	
70	3.50	11.48	6 S	---	1.93	5 M	---	NL	6 S	---	NL	6 S	---	19.00	6 S	19.10	1.98
71	3.55	11.65	6 S	---	1.81	5 M	---	NL	5 M	---	NL	6 S	---	18.62	6 S	19.30	3.77
72	3.60	11.81	5 M	---	1.74	5 M	---	NL	5 M	---	NL	6 S	---	11.79	7 S	19.50	6.58
73	3.65	11.98	5 M	---	1.69	5 M	---	NL	4 C	---	NL	6 S	---	13.14	7 S	19.70	9.98
74	3.70	12.14	5 M	---	1.65	5 M	---	NL	4 C	---	NL	7 S	---	10.94	7 S	19.90	13.06
75	3.75	12.30	5 M	---	1.58	5 M	---	NL	5 M	---	NL	7 S	---	8.53	7 S	20.10	13.44
76	3.80	12.47	5 M	---	1.43	5 M	---	NL	5 M	---	NL	7 S	---	7.74	7 S	20.30	13.24
77	3.85	12.63	5 M	---	1.28	5 M	---	NL	6 S	---	NL	7 S	---	8.09	7 S	20.50	11.61
78	3.90	12.80	5 M	---	1.21	5 M	---	NL	6 S	---	NL	7 S	---	8.51	6 S	20.70	8.83
79	3.95	12.96	5 M	---	1.17	5 M	---	NL	6 S	---	NL	7 S	---	9.70	6 S	20.90	10.73
80	4.00	13.12	5 M	---	1.12	5 M	---	NL	6 S	---	NL	7 S	---	11.78	7 S	21.10	23.86
81	4.05	13.29	5 M	<1>	80.00	1.07	5 M	---	NL	6 S	---	NL	6 S	---	12.79	7 S	21.30	31.63
82	4.10	13.45	5 M	<1>	40.00	0.98	5 M	---	NL	6 S	---	NL	6 S	---	15.51	7 S	21.50	25.31
83	4.15	13.62	5 M	<1>	26.67	0.99	5 M	---	NL	6 S	---	NL	6 S	---	8.55	7 S	21.70	23.15
84	4.20	13.78	5 M	<1>	20.00	0.98	5 M	---	NL	6 S	---	NL	6 S	---	6.97	6 S	21.90	22.94
85	4.25	13.94	5 M	<1>	16.00	0.93	5 M	---	NL	6 S	---	NL	6 S	---	6.68	7 S	22.10	20.11
86	4.30	14.11	5 M	<1>	13.33	0.89	5 M	---	NL	6 S	---	NL	6 S	---	5.31	6 S	22.30	15.31
87	4.35	14.27	5 M	<1>	11.43	0.83	5 M	---	NL	6 S	---	NL	6 S	---	4.23	6 S	22.50	14.63
88	4.40	14.44	5 M	<1>	10.00	0.81	5 M	---	NL	6 S	---	NL	6 S	---	3.25	6 S	22.70	14.82
89	4.45	14.60	5 M	<1>	8.89	0.81	5 M	---	NL	6 S	---	NL	6 S	---	2.32	6 S	22.90	12.18
90	4.50	14.76	5 M	<1>	8.00	0.82	5 M	---	NL	6 S	---	NL	6 S	---	2.56	6 S	23.10	13.59
91	4.55	14.93	5 M	<1>	7.27	0.81	5 M	---	NL	6 S	---	NL	6 S	---	3.20	7 S	23.30	18.15
92	4.60	15.09	5 M	<1>	6.67	0.77	4 C	---	NL	6 S	---	9.74	6 S	---	2.64	6 S	23.50	20.44
93	4.65	15.26	5 M	<1>	6.15	0.73	4 C	---	NL	7 S	---	10.53	6 S	---	2.86	6 S	23.70	16.43
94	4.70	15.42	5 M	<1>	5.71	0.73	4 C	---	NL	7 S	---	13.14	6 S	---	3.15	6 S	23.90	33.75
95	4.75	15.58	5 M	<1>	5.33	0.75	4 C	---	NL	7 S	---	18.91	6 S	---	2.97	6 S	24.10	11.88
96	4.80	15.75	5 M	<1>	5.00	0.75	4 C	---	NL	7 S	---	27.20	6 S	---	3.64	6 S	24.30	7.68
97	4.85	15.91	5 M	<1>	4.71	0.75	4 C	---	NL	7 S	---	32.27	6 S	---	1.54	6 S	24.50	4.14
98	4.90	16.08	5 M	<1>	4.44	0.76	4 C	---	NL	6 S	---	21.23	6 S	---	1.58	6 S	24.70	4.00
99	4.95	16.24	5 M	<1>	4.21	0.78	4 C	---	NL	6 S	---	14.49	6 S	---	1.65	6 S	24.90	3.67
100	5.00	16.40	5 M	<1>	4.00	0.77	4 C	---	NL	6 S	---	11.20	6 S	---	1.32	6 S	25.10	3.63
101	5.05	16.57	5 M	<1>	3.81	0.72	4 C	---	NL	6 S	---	12.10	6 S	<1>	112.19	0.93	6 S	25.30	4.62
102	5.10	16.73	5 M	<1>	3.64	0.69	4 C	---	NL	7 S	---	17.67	6 S		113.19	1.36	6 S	25.50	5.64
103	5.15	16.90	5 M	<1>	3.48	0.68	4 C	---	NL	7 S	---	25.30	6 S		114.19	2.94	6 S	25.70	6.17
104	5.20	17.06	5 M	<1>	3.33	0.66	4 C	---	NL	7 S	---	34.89	6 S		115.19	6.92	6 S	25.90	6.63
105	5.25	17.22	5 M	<1>	3.20	0.64	3 C	---	NL	6 S	---	26.57	6 S		116.19	6.97	6 S	26.10	7.03
106	5.30	17.39	5 M	<1>	3.08	0.65	4 C	---	NL	6 S	---	33.65	6 S		117.19	6.07	6 S	26.30	7.69
107	5.35	17.55	5 M	<1>	2.96	0.66	4 C	---	NL	7 S	---	43.01	6 S		118.19	5.60	6 S	26.50	7.52
108	5.40	17.72	5 M	<1>	2.86	0.64	4 C	---	NL	7 S	---	40.16	6 S		119.19	5.25	6 S	26.70	7.60
109	5.45	17.88	5 M	<1>	2.76	0.66	4 C	---	NL	7 S	---	29.16	6 S		120.19	5.23	6 S	26.90	8.07
110	5.50	18.04	5 M	<1>	2.67	0.70	4 C	---	NL	7 S	---	19.05	6 S		121.19	6.02	6 S	27.10	7.12
111	5.55	18.21	5 M	<1>	2.58	0.71	4 C	---	NL	7 S	---	15.41	6 S		122.19	9.16	6 S	27.30	5.57
112	5.60	18.37	5 M	<1>	2.50	0.71	4 C	---	NL	6 S	---	11.93	6 S		123.19	8.39	6 S	27.50	8.27
113	5.65	18.54	5 M	<1>	2.42	0.69	3 C	---	NL	6 S	---	9.61	6 S		124.19	8.38	6 S	27.70	9.15
114	5.70	18.70	5 M	<1>	2.35	0.66	4 C	---	NL	6 S	---	8.06	6 S		125.19	8.92	6 S	27.90	12.77
115	5.75	18.86	5 M	<1>	2.29	0.91	4 C	---	NL	6 S	---	8.00	7 S		126.19	9.00	6 S	28.10	29.36

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Pa = 1.04427 tsf
Fill Density = **125** pcf

Depth			CPT-9		12/3/05		CPT-10		12/3/05		CPT-11		12/3/05		CPT-1 *		5/30/07		CPT-2 *		5/30/07	
116	5.80	19.03	5 M	<1>	2.22	1.04	5 M	---	NL		6 S	---	10.83		7 S		127.19	9.68	6 S		28.30	49.58
117	5.85	19.19	5 M		2.25	3.83	5 M	---	NL		6 S	---	9.95		7 S		128.19	8.65	6 S		28.50	45.18
118	5.90	19.36	5 M		2.28	3.98	4 C	---	NL		6 S	---	15.38		7 S		129.19	7.76	6 S		28.70	55.28
119	5.95	19.52	5 M		2.31	2.16	4 C	---	NL		6 S	---	12.17		7 S		130.19	6.50	6 S		28.90	45.01
120	6.00	19.69	5 M		2.33	2.01	4 C	---	NL		6 S	---	16.42		6 S		131.19	6.45	7 S		29.10	42.59
121	6.05	19.85	5 M	<1>	2.27	0.97	4 C	---	NL		7 S	---	20.38		6 S		132.19	7.41	7 S		29.30	57.58
122	6.10	20.01	6 S	<1>	2.21	0.86	3 C	---	NL		6 S	---	17.08		6 S		133.19	9.36	7 S		29.50	69.22
123	6.15	20.18	6 S		2.24	1.32	3 C	---	NL		6 S	---	17.57		6 S		134.19	11.13	6 S		29.70	52.52
124	6.20	20.34	5 M		2.26	1.74	3 C	---	NL		7 S	---	21.34		6 S		135.19	20.31	6 S		29.90	43.66
125	6.25	20.51	6 S		2.29	1.79	3 C	---	NL		6 S	---	23.07		6 S		136.19	13.82	6 S		30.10	27.89
126	6.30	20.67	6 S		2.32	2.80	3 C	---	NL		7 S	---	29.64		6 S		137.19	14.62	6 S		30.30	29.64
127	6.35	20.83	6 S		2.34	3.31	3 C	---	NL		7 S	---	31.69		7 S		138.19	13.04	6 S		30.50	14.70
128	6.40	21.00	5 M		2.37	2.26	3 C	---	NL		7 S	---	24.38		6 S		139.19	10.59	6 S		30.70	9.86
129	6.45	21.16	6 S		2.39	1.52	3 C	---	NL		7 S	---	21.66		6 S		140.19	8.85	6 S		30.90	8.14
130	6.50	21.33	6 S		2.42	1.49	3 C	---	NL		7 S	---	16.50		6 S		141.19	5.83	6 S		31.10	4.05
131	6.55	21.49	5 M		2.45	1.85	3 C	---	NL		7 S	---	15.65		6 S		142.19	4.32	6 S		31.30	2.33
132	6.60	21.65	5 M		2.47	1.84	3 C	---	NL		7 S	---	14.23		6 S		143.19	3.01	6 S		31.50	2.21
133	6.65	21.82	6 S		2.50	1.77	3 C	---	NL		7 S	---	13.41		6 S		144.19	1.98	6 S		31.70	1.98
134	6.70	21.98	5 M		2.53	1.59	3 C	---	NL		6 S	---	11.87		6 S		145.19	1.62	6 S		31.90	2.19
135	6.75	22.15	5 M	<1>	2.46	0.88	3 C	---	NL		6 S	---	11.45		6 S	<1>	72.60	0.94	6 S		32.10	4.53
136	6.80	22.31	5 M	<1>	2.40	0.75	3 C	---	NL		6 S	---	11.49		6 S	<1>	48.40	0.72	6 S		32.30	7.67
137	6.85	22.47	5 M	<1>	2.34	0.90	3 C	---	NL		7 S	---	12.99		6 S	<1>	36.30	0.51	6 S		32.50	13.54
138	6.90	22.64	5 M		2.37	1.38	3 C	---	NL		6 S	---	12.21		6 S	<1>	29.04	0.39	6 S		32.70	20.36
139	6.95	22.80	6 S		2.39	1.36	3 C	---	NL		6 S	---	10.04		5 M		29.24	NL	7 S		32.90	24.45
140	7.00	22.97	5 M	<1>	2.33	1.08	3 C	---	NL		7 S	---	9.48		5 M		29.44	NL	6 S		33.10	17.17
141	7.05	23.13	5 M	<1>	2.28	0.93	3 C	---	NL		6 S	---	8.09		5 M	<1>	24.53	0.51	6 S		33.30	17.33
142	7.10	23.29	5 M	<1>	2.23	0.89	3 C	---	NL		6 S	---	6.45		6 S	<1>	21.03	0.64	6 S		33.50	18.62
143	7.15	23.46	5 M	<1>	2.18	0.93	3 C	---	NL		6 S	---	6.70		6 S	<1>	18.40	0.94	6 S		33.70	17.23
144	7.20	23.62	6 S	<1>	2.13	0.98	3 C	---	NL		6 S	---	6.14		6 S		18.52	1.68	6 S		33.90	13.74
145	7.25	23.79	6 S		2.15	1.24	3 C	---	NL		6 S	---	10.90		6 S		18.65	3.07	6 S		34.10	10.18
146	7.30	23.95	6 S		2.17	1.42	3 C	---	NL		6 S	---	14.29		6 S		18.77	5.89	6 S		34.30	9.67
147	7.35	24.11	6 S		2.20	1.34	3 C	---	NL		6 S	---	14.70		6 S		18.90	9.59	6 S		34.50	9.70
148	7.40	24.28	6 S		2.22	1.22	3 C	---	NL		6 S	---	10.30		6 S		19.02	16.73	6 S		34.70	10.31
149	7.45	24.44	6 S	<1>	2.17	1.08	3 C	---	NL		6 S	---	10.93		6 S		19.15	15.89	6 S		34.90	10.89
150	7.50	24.61	5 M	<1>	2.12	0.99	2 C	---	NL		6 S	---	13.53		6 S		19.27	12.14	6 S		35.10	8.20
151	7.55	24.77	5 M	<1>	2.08	0.90	2 C	---	NL		6 S	---	9.47		6 S		19.40	11.48	6 S		35.30	9.58
152	7.60	24.93	5 M	<1>	2.04	0.90	3 C	---	NL		6 S	---	10.99		6 S		19.52	10.31	6 S		35.50	9.91
153	7.65	25.10	5 M	<1>	2.00	0.98	3 C	---	NL		6 S	---	13.70		7 S		19.65	9.90	6 S		35.70	9.42
154	7.70	25.26	5 M		2.02	1.11	3 C	---	NL		6 S	---	24.16		6 S		19.77	9.29	6 S		35.90	10.06
155	7.75	25.43	5 M		2.04	1.12	3 C	---	NL		6 S	---	21.05		6 S		19.90	9.08	6 S		36.10	10.45
156	7.80	25.59	5 M		2.06	1.29	3 C	---	NL		6 S	---	11.63		6 S		20.02	8.07	6 S		36.30	9.51
157	7.85	25.75	5 M		2.08	1.24	3 C	---	NL		6 S	---	7.79		6 S		20.15	6.92	6 S		36.50	9.24
158	7.90	25.92	5 M		2.10	1.15	3 C	---	NL		6 S	---	5.81		6 S		20.27	7.18	6 S		36.70	10.04
159	7.95	26.08	5 M		2.12	1.14	3 C	---	NL		6 S	---	6.04		6 S		20.40	7.61	6 S		36.90	9.59
160	8.00	26.25	5 M		2.14	1.14	3 C	---	NL		6 S	---	6.41		6 S		20.52	12.21	6 S		37.10	12.43
161	8.05	26.41	5 M		2.16	1.12	4 C	---	NL		6 S	---	6.07		6 S		20.65	12.96	6 S		37.30	6.74

SUMMARY SHEET

CLIENT: **Vista Canyon LLC**
RTF JOB: **2005-052-01**
PROJ. :
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Z	Ic	Soil	rd#	Reference
3	>2.95	Clay to Silty Clay	1	Tokimatsu & Yoshimi (1983)
4	<2.95	Clayey Silt to Silty Clay	2	Seed & Idriss mean (1971) and Youd (1997)
5	<2.6	Silty Sand to Sandy Silt	3	Seed & Idriss lower limit (1971)
6	<2.05	Clean Sand to Silty Sand	4	Idriss & Golesorkhi (1997)
7	<1.31	Gravelly Sand to Sand	5	Site-Specific

FS = Threshold Factor of Safety = **1.10**
NL = Not liquefiable
Liquefiable Ic (between 1.5 and 2.6) = **2.40** (usu. 2.05 to 2.6)
Seismic Settlement Soil (Type) = **6**

amax = **0.53** g
Mag = **6.6** MSF 1.5
Pa = 1.04427 tsf
Fill Density = **125** pcf

Depth			CPT-9	12/3/05		CPT-10	12/3/05		CPT-11	12/3/05		CPT-1 *	5/30/07		CPT-2 *	5/30/07	
162	8.10	**26.57**	5 M	2.18	**1.14**	5 M	---	NL	6 S	---	**6.74**	6 S	20.77	**10.91**	6 S	37.50	**6.26**
163	8.15	**26.74**	5 M	2.20	**1.17**	5 M <1>	162.00	**0.49**	6 S	---	**8.89**	6 S	20.90	**9.83**	6 S	37.70	**6.41**
164	8.20	**26.90**	5 M	2.22	**1.27**	5 M <1>	81.00	**0.44**	6 S	---	**9.20**	7 S	21.02	**15.60**	6 S	37.90	**6.61**
165	8.25	**27.07**	5 M	2.24	**1.40**	5 M <1>	54.00	**0.45**	6 S	---	**8.75**	7 S	21.15	**15.60**	6 S	38.10	**6.07**
166	8.30	**27.23**	5 M	2.25	**1.38**	4 C	54.33	NL	6 S	---	**8.71**	6 S	21.27	**9.81**	6 S	38.30	**5.01**
167	8.35	**27.40**	5 M	2.27	**1.55**	4 C	54.67	NL	6 S	---	**10.00**	6 S	21.40	**8.49**	6 S	38.50	**4.81**
168	8.40	**27.56**	5 M	2.29	**1.61**	4 C	55.00	NL	6 S	---	**12.98**	6 S	21.52	**6.37**	6 S	38.70	**5.47**
169	8.45	**27.72**	6 S	2.31	**1.60**	4 C	55.33	NL	6 S	---	**16.83**	6 S	21.65	**6.69**	6 S	38.90	**6.11**
170	8.50	**27.89**	6 S	2.33	**1.47**	4 C	55.67	NL	6 S	---	**27.71**	6 S	21.77	**7.63**	6 S	39.10	**5.97**
171	8.55	**28.05**	5 M	2.35	**1.32**	3 C	56.00	NL	6 S	---	**44.52**	6 S	21.90	**8.08**	6 S	39.30	**5.43**
172	8.60	**28.22**	5 M	2.37	**1.22**	3 C	56.33	NL	6 S	---	**48.16**	6 S	22.02	**9.88**	6 S	39.50	**8.22**
173	8.65	**28.38**	5 M	2.39	**1.25**	3 C	56.67	NL	6 S	---	**22.83**	6 S	22.15	**11.21**	6 S	39.70	**12.04**
174	8.70	**28.54**	5 M	2.41	**1.32**	3 C	57.00	NL	6 S	---	**18.67**	6 S	22.27	**11.76**	6 S	39.90	**9.51**
175	8.75	**28.71**	5 M	2.43	**1.37**	3 C	57.33	NL	6 S	---	**14.03**	6 S	22.40	**9.12**	6 S	40.10	**9.97**
176	8.80	**28.87**	5 M	2.45	**1.31**	3 C	57.67	NL	6 S	---	**11.91**	6 S	22.52	**6.42**	6 S	40.30	**9.44**
177	8.85	**29.04**	5 M	2.47	**1.26**	3 C	58.00	NL	6 S	---	**10.75**	6 S	22.65	**4.23**	6 S	40.50	**9.91**
178	8.90	**29.20**	5 M	2.49	**1.39**	3 C	58.33	NL	6 S	---	**9.44**	6 S	22.77	**1.95**	6 S	40.70	**11.74**
179	8.95	**29.36**	5 M	2.51	**1.50**	3 C	58.67	NL	6 S	---	**6.95**	6 S	22.90	**1.81**	6 S	40.90	**10.05**
180	9.00	**29.53**	5 M	2.53	**1.46**	3 C	59.00	NL	6 S	---	**6.86**	6 S	23.02	**1.76**	6 S	41.10	**9.15**
181	9.05	**29.69**	5 M	2.55	**1.52**	3 C	59.33	NL	6 S	---	**5.62**	6 S	23.15	**8.23**	6 S	41.30	**8.06**
182	9.10	**29.86**	5 M	2.57	**1.54**	3 C	59.67	NL	6 S	---	**5.59**	6 S	23.27	**11.45**	6 S	41.50	**12.40**
183	9.15	**30.02**	5 M	2.59	**1.55**	3 C	60.00	NL	6 S	---	**6.06**	6 S	23.40	**12.88**	6 S	41.70	**23.29**
184	9.20	**30.18**	5 M	2.61	**1.47**	3 C	60.33	NL	6 S	---	**7.05**	6 S	23.52	**9.84**	7 S	41.90	**51.14**
185	9.25	**30.35**	5 M	2.63	**NL**	3 C	60.67	NL	6 S	---	**7.02**	6 S	23.65	**9.75**			
186	9.30	**30.51**	4 C	2.65	**NL**	3 C	61.00	NL	6 S	---	**7.65**	6 S	23.77	**7.66**			
187	9.35	**30.68**	4 C	2.67	**NL**	3 C	61.33	NL	6 S	---	**9.68**	6 S	23.90	**6.67**			
188	9.40	**30.84**	5 M	2.69	**NL**	3 C	61.67	NL	6 S	---	**17.27**	6 S	24.02	**5.78**			
189	9.45	**31.00**	5 M <1>	2.63	**1.04**	3 C	62.00	NL	6 S	---	**22.75**	6 S	24.15	**5.16**			
190	9.50	**31.17**	5 M	2.65	**1.18**	3 C	62.33	NL	7 S	---	**26.63**	6 S	24.27	**6.12**			
191	9.55	**31.33**	5 M <1>	2.60	**1.06**	4 C	62.67	NL	7 S	---	**24.09**	6 S	24.40	**7.04**			
192	9.60	**31.50**	5 M <1>	2.56	**1.00**	4 C	63.00	NL	6 S	---	**19.64**	6 S	24.52	**7.11**			
193	9.65	**31.66**	5 M <1>	2.51	**0.93**	4 C	63.33	NL	7 S	---	**14.58**	6 S	24.65	**7.82**			
194	9.70	**31.82**	5 M <1>	2.46	**0.91**	4 C	63.67	NL	6 S	---	**11.15**	6 S	24.77	**6.74**			
195	9.75	**31.99**	5 M <1>	2.42	**0.97**	4 C	64.00	NL	6 S	---	**10.26**	6 S	24.90	**6.79**			
196	9.80	**32.15**	5 M <1>	2.38	**0.98**	4 C	64.33	NL	6 S	---	**7.96**	6 S	25.02	**5.91**			
197	9.85	**32.32**	5 M <1>	2.34	**0.93**	4 C	64.67	NL	6 S	---	**6.91**	6 S	25.15	**4.44**			
198	9.90	**32.48**	5 M <1>	2.30	**0.91**	3 C	65.00	NL	6 S	---	**6.30**	6 S	25.27	**3.19**			
199	9.95	**32.64**	5 M <1>	2.26	**0.98**	3 C	65.33	NL	6 S	---	**7.07**	6 S	25.40	**2.23**			
200	10.00	**32.81**	5 M <1>	2.23	**1.06**	3 C	65.67	NL	6 S	---	**7.89**	6 S <1>	22.58	**0.91**			
201	10.05	**32.97**	5 M <1>	2.19	**1.08**	3 C	66.00	NL	6 S	---	**7.71**	5 M <1>	20.32	**0.46**			
202	10.10	**33.14**	5 M <1>	2.16	**1.10**	4 C	66.33	NL	6 S	---	**8.73**	5 M <1>	18.47	**0.47**			
203	10.15	**33.30**	5 M	2.17	**1.24**	4 C	66.67	NL	6 S	---	**9.76**	4 C	18.56	**NL**			
204	10.20	**33.46**	5 M	2.19	**1.12**	3 C	67.00	NL	6 S	---	**11.48**	3 C	18.65	**NL**			
205	10.25	**33.63**	5 M	2.20	**NL**	3 C	67.33	NL	6 S	---	**12.44**	3 C	18.74	**NL**			
206	10.30	**33.79**	5 M	2.22	**1.68**	3 C	67.67	NL	6 S	---	**11.06**	3 C	18.84	**NL**			
207	10.35	**33.96**	5 M	2.23	**1.84**	3 C	68.00	NL	6 S	---	**8.52**	3 C	18.93	**NL**			

SUMMARY SHEET

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RTF JOB: **2005-052-01**
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Z	Ic	Soil	rd#	Reference
3	>2.95	Clay to Silty Clay	1	Tokimatsu & Yoshimi (1983)
4	<2.95	Clayey Silt to Silty Clay	2	Seed & Idriss mean (1971) and Youd (1997)
5	<2.6	Silty Sand to Sandy Silt	3	Seed & Idriss lower limit (1971)
6	<2.05	Clean Sand to Silty Sand	4	Idriss & Golesorkhi (1997)
7	<1.31	Gravelly Sand to Sand	5	Site-Specific

FS = Threshold Factor of Safety = **1.10** amax = **0.53** g
NL = Not liquefiable Mag = **6.6** MSF 1.5
Liquefiable Ic (between 1.5 and 2.6) = **2.40** (usu. 2.05 to 2.6) Pa = 1.04427 tsf
Seismic Settlement Soil (Type) = 6 Fill Density = **125** pcf

Depth			CPT-9		12/3/05		CPT-10	12/3/05		CPT-11	12/3/05		CPT-1 *	5/30/07		CPT-2 *	5/30/07
208	10.40	34.12	6 S		2.25	2.64	3 C	68.33	NL	6 S	---	7.81	3 C	19.02	NL		
209	10.45	34.28	6 S		2.27	2.54	3 C	68.67	NL	6 S	---	7.86	3 C	19.11	NL		
210	10.50	34.45	5 M		2.28	2.57	3 C	69.00	NL	6 S	---	8.44	3 C	19.20	NL		
211	10.55	34.61	5 M		2.30	2.44	3 C	69.33	NL	6 S	---	7.33	3 C	19.29	NL		
212	10.60	34.78	5 M		2.31	1.96	3 C	69.67	NL	6 S	---	7.91	3 C	19.38	NL		
213	10.65	34.94	6 S		2.33	2.27	3 C	70.00	NL	6 S	---	10.60	3 C	19.47	NL		
214	10.70	35.10	5 M		2.34	2.44	3 C	70.33	NL	6 S	---	13.07	4 C	19.56	NL		
215	10.75	35.27	5 M		2.36	1.63	3 C	70.67	NL	6 S	---	13.37	4 C	19.65	NL		
216	10.80	35.43	5 M		2.38	1.20	3 C	71.00	NL	6 S	---	13.87	4 C	19.74	NL		
217	10.85	35.60	5 M	<1>	2.34	0.93	3 C	71.33	NL	6 S	---	15.69	3 C	19.84	NL		
218	10.90	35.76	5 M	<1>	2.30	0.72	3 C	71.67	NL	6 S	---	23.85	3 C	19.93	NL		
219	10.95	35.93	5 M	<1>	2.27	0.49	3 C	72.00	NL	6 S	---	36.54	3 C	20.02	NL		
220	11.00	36.09	5 M	<1>	2.24	0.39	3 C	72.33	NL	6 S	---	36.13	4 C	20.11	NL		
221	11.05	36.25	4 C		2.25	NL	3 C	72.67	NL	6 S	---	24.93	3 C	20.20	NL		
222	11.10	36.42	4 C		2.26	NL	3 C	73.00	NL	6 S	---	14.80	3 C	20.29	NL		
223	11.15	36.58	3 C		2.28	NL	3 C	73.33	NL	6 S	---	14.86	3 C	20.38	NL		
224	11.20	36.75	3 C		2.29	NL	3 C	73.67	NL	6 S	---	26.38	3 C	20.47	NL		
225	11.25	36.91	4 C		2.31	NL	3 C	74.00	NL	6 S	---	27.76	3 C	20.56	NL		
226	11.30	37.07	4 C		2.32	NL	3 C	74.33	NL	6 S	---	19.20	3 C	20.65	NL		
227	11.35	37.24	5 M	<1>	2.29	0.53	3 C	74.67	NL	6 S	---	16.04	3 C	20.74	NL		
228	11.40	37.40	5 M	<1>	2.26	0.50	3 C	75.00	NL	6 S	---	15.23	3 C	20.84	NL		
229	11.45	37.57	5 M	<1>	2.23	0.48	3 C	75.33	NL	6 S	---	14.34	3 C	20.93	NL		
230	11.50	37.73	5 M	<1>	2.19	0.45	3 C	75.67	NL	6 S	---	14.63	3 C	21.02	NL		
231	11.55	37.89	5 M	<1>	2.16	0.44	3 C	76.00	NL	6 S	---	16.60	3 C	21.11	NL		
232	11.60	38.06	5 M		2.18	NL	3 C	76.33	NL	6 S	---	19.35	3 C	21.20	NL		
233	11.65	38.22	4 C		2.19	NL	3 C	76.67	NL	6 S	---	22.89	3 C	21.29	NL		
234	11.70	38.39	3 C		2.21	NL	3 C	77.00	NL	6 S	---	22.23	3 C	21.38	NL		
235	11.75	38.55	3 C		2.22	NL	3 C	77.33	NL	6 S	---	20.74	3 C	21.47	NL		
236	11.80	38.71	3 C		2.23	NL	3 C	77.67	NL	6 S	---	23.01	3 C	21.56	NL		
237	11.85	38.88	3 C		2.25	NL	3 C	78.00	NL	6 S	---	21.89	3 C	21.65	NL		
238	11.90	39.04	3 C		2.26	NL	3 C	78.33	NL	6 S	---	17.79	3 C	21.74	NL		
239	11.95	39.21	3 C		2.27	NL	3 C	78.67	NL	6 S	---	17.63	3 C	21.84	NL		
240	12.00	39.37	3 C		2.29	NL	3 C	79.00	NL	6 S	---	25.00	3 C	21.93	NL		
241	12.05	39.53	3 C		2.30	NL	3 C	79.33	NL	6 S	---	30.87	3 C	22.02	NL		
242	12.10	39.70	3 C		2.32	NL	3 C	79.67	NL	6 S	---	29.07	3 C	22.11	NL		
243	12.15	39.86	3 C		2.33	NL	3 C	80.00	NL	6 S	---	23.89	3 C	22.20	NL		
244	12.20	40.03	3 C		2.34	NL	3 C	80.33	NL	6 S	---	25.36	3 C	22.29	NL		
245	12.25	40.19	3 C		2.36	NL	3 C	80.67	NL	6 S	---	24.86	3 C	22.38	NL		
246	12.30	40.35	3 C		2.37	NL	3 C	81.00	NL	6 S	---	25.64	3 C	22.47	NL		
247	12.35	40.52	3 C		2.38	NL	3 C	81.33	NL	6 S	---	32.64	3 C	22.56	NL		
248	12.40	40.68	3 C		2.40	NL	3 C	81.67	NL	6 S	---	28.53	3 C	22.65	NL		
249	12.45	40.85	3 C		2.41	NL	3 C	82.00	NL	6 S	---	25.78	3 C	22.74	NL		
250	12.50	41.01	3 C		2.42	NL	3 C	82.33	NL	6 S	---	19.99	3 C	22.84	NL		
251	12.55	41.17	3 C		2.44	NL	3 C	82.67	NL	6 S	---	21.13	3 C	22.93	NL		
252	12.60	41.34	3 C		2.45	NL	3 C	83.00	NL	6 S	---	24.38	3 C	23.02	NL		
253	12.65	41.50	3 C		2.47	NL	3 C	83.33	NL	6 S	---	24.52	3 C	23.11	NL		

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Z	Ic	Soil	rd#	Reference
3	>2.95	Clay to Silty Clay	1	Tokimatsu & Yoshimi (1983)
4	<2.95	Clayey Silt to Silty Clay	2	Seed & Idriss mean (1971) and Youd (1997)
5	<2.6	Silty Sand to Sandy Silt	3	Seed & Idriss lower limit (1971)
6	<2.05	Clean Sand to Silty Sand	4	Idriss & Golesorkhi (1997)
7	<1.31	Gravelly Sand to Sand	5	Site-Specific

FS = Threshold Factor of Safety = **1.10**
NL = Not liquefiable
Liquefiable Ic (between 1.5 and 2.6) = **2.40** (usu. 2.05 to 2.6)
Seismic Settlement Soil (Type) = **6**

amax = **0.53** g
Mag = **6.6** MSF 1.5
Pa = 1.04427 tsf
Fill Density = **125** pcf

Depth			CPT-9	12/3/05		CPT-10	12/3/05		CPT-11	12/3/05		CPT-1 *	5/30/07		CPT-2 *	5/30/07
254	12.70	41.67	3 C	2.48	NL	3 C	83.67	NL	6 S	---	26.79	3 C	23.20	NL		
255	12.75	41.83	3 C	2.49	NL	3 C	84.00	NL	6 S	---	23.66	3 C	23.29	NL		
256	12.80	41.99	3 C	2.51	NL	3 C	84.33	NL	6 S	---	16.77	3 C	23.38	NL		
257	12.85	42.16	3 C	2.52	NL	3 C	84.67	NL	6 S	---	15.63	3 C	23.47	NL		
258	12.90	42.32	3 C	2.53	NL	3 C	85.00	NL	6 S	---	18.81	2 C	23.56	NL		
259	12.95	42.49	2 C	2.55	NL	3 C	85.33	NL	6 S	---	21.89	2 C	23.65	NL		
260	13.00	42.65	2 C	2.56	NL	3 C	85.67	NL	6 S	---	26.25	3 C	23.74	NL		
261	13.05	42.81	2 C	2.58	NL	3 C	86.00	NL	6 S	---	37.51	3 C	23.84	NL		
262	13.10	42.98	3 C	2.59	NL	3 C	86.33	NL	6 S	---	38.65	3 C	23.93	NL		
263	13.15	43.14	2 C	2.60	NL	4 C	86.67	NL	6 S	---	40.32	3 C	24.02	NL		
264	13.20	43.31	3 C	2.62	NL	3 C	87.00	NL	6 S	---	23.61	3 C	24.11	NL		
265	13.25	43.47	3 C	2.63	NL	3 C	87.33	NL	6 S	---	16.89	3 C	24.20	NL		
266	13.30	43.64	3 C	2.64	NL	4 C	87.67	NL	6 S	---	13.14	3 C	24.29	NL		
267	13.35	43.80	3 C	2.66	NL	3 C	88.00	NL	6 S	---	15.37	3 C	24.38	NL		
268	13.40	43.96	3 C	2.67	NL	4 C	88.33	NL	6 S	---	20.91	3 C	24.47	NL		
269	13.45	44.13	3 C	2.68	NL	4 C	88.67	NL	6 S	---	24.42	3 C	24.56	NL		
270	13.50	44.29	3 C	2.70	NL	4 C	89.00	NL	6 S	---	19.79	3 C	24.65	NL		
271	13.55	44.46	3 C	2.71	NL	3 C	89.33	NL	6 S	---	22.68	3 C	24.74	NL		
272	13.60	44.62	3 C	2.73	NL	3 C	89.67	NL	6 S	---	26.98	3 C	24.84	NL		
273	13.65	44.78	3 C	2.74	NL	3 C	90.00	NL	6 S	---	24.20	3 C	24.93	NL		
274	13.70	44.95	3 C	2.75	NL	3 C	90.33	NL	6 S	---	21.00	3 C	25.02	NL		
275	13.75	45.11	3 C	2.77	NL	4 C	90.67	NL	6 S	---	15.09	3 C	25.11	NL		
276	13.80	45.28	3 C	2.78	NL	4 C	91.00	NL	6 S	---	8.66	3 C	25.20	NL		
277	13.85	45.44	4 C	2.79	NL	4 C	91.33	NL	6 S	---	5.66	3 C	25.29	NL		
278	13.90	45.60	4 C	2.81	NL	4 C	91.67	NL	6 S	---	4.33	3 C	25.38	NL		
279	13.95	45.77	3 C	2.82	NL	4 C	92.00	NL	6 S	---	3.52	3 C	25.47	NL		
280	14.00	45.93	3 C	2.84	NL	4 C	92.33	NL	6 S	---	3.06	3 C	25.56	NL		
281	14.05	46.10	3 C	2.85	NL	4 C	92.67	NL	6 S	---	2.55	3 C	25.65	NL		
282	14.10	46.26	3 C	2.86	NL	4 C	93.00	NL	6 S	---	2.28	3 C	25.74	NL		
283	14.15	46.42	4 C	2.88	NL	4 C	93.33	NL	6 S	---	2.00	3 C	25.84	NL		
284	14.20	46.59	4 C	2.89	NL	3 C	93.67	NL	6 S	---	3.63	3 C	25.93	NL		
285	14.25	46.75	5 M	2.90	NL	3 C	94.00	NL	6 S	---	6.40	3 C	26.02	NL		
286	14.30	46.92	5 M	2.92	NL	3 C	94.33	NL	6 S	---	8.87	3 C	26.11	NL		
287	14.35	47.08	5 M <1>	2.88	0.41	3 C	94.67	NL	6 S	---	8.92	3 C	26.20	NL		
288	14.40	47.24	5 M	2.89	NL	4 C	95.00	NL	6 S	---	9.04	3 C	26.29	NL		
289	14.45	47.41	4 C	2.91	NL	3 C	95.33	NL	6 S	---	9.93	3 C	26.38	NL		
290	14.50	47.57	4 C	2.92	NL	3 C	95.67	NL	6 S	---	12.44	3 C	26.47	NL		
291	14.55	47.74	3 C	2.93	NL	3 C	96.00	NL	7 S	---	13.73	3 C	26.56	NL		
292	14.60	47.90	5 M <1>	2.89	0.46	3 C	96.33	NL	6 S	---	12.82	3 C	26.65	NL		
293	14.65	48.06	6 S <1>	2.86	0.63	3 C	96.67	NL	6 S	---	9.63	3 C	26.74	NL		
294	14.70	48.23	6 S	2.87	2.10	3 C	97.00	NL	6 S	---	7.90	3 C	26.84	NL		
295	14.75	48.39	5 M	2.88	2.17	3 C	97.33	NL	6 S	---	10.04	3 C	26.93	NL		
296	14.80	48.56	5 M	2.89	6.80	3 C	97.67	NL	6 S	---	13.94	3 C	27.02	NL		
297	14.85	48.72	6 S	2.91	6.78	3 C	98.00	NL	6 S	---	21.38	3 C	27.11	NL		
298	14.90	48.88	6 S	2.92	4.06	3 C	98.33	NL	6 S	---	22.98	3 C	27.20	NL		
299	14.95	49.05	6 S	2.93	4.11	3 C	98.67	NL	6 S	---	20.36	3 C	27.29	NL		

SUMMARY SHEET

CLIENT: **Vista Canyon LLC**
RTF JOB: **2005-052-01**
PROJ. :
BY: **DA**
DATE: **11/10/2008**

Z	Ic	Soil	rd#	Reference
3	>2.95	Clay to Silty Clay	1	Tokimatsu & Yoshimi (1983)
4	<2.95	Clayey Silt to Silty Clay	2	Seed & Idriss mean (1971) and Youd (1997)
5	<2.6	Silty Sand to Sandy Silt	3	Seed & Idriss lower limit (1971)
6	<2.05	Clean Sand to Silty Sand	4	Idriss & Golesorkhi (1997)
7	<1.31	Gravelly Sand to Sand	5	Site-Specific

FS = Threshold Factor of Safety = **1.10**
NL = Not liquefiable
Liquefiable Ic (between 1.5 and 2.6) = **2.40** (usu. 2.05 to 2.6)
Seismic Settlement Soil (Type) = **6**

amax = **0.53** g
Mag = **6.6** MSF 1.5
Pa = 1.04427 tsf
Fill Density = **125** pcf

Depth			CPT-9	12/3/05		CPT-10	12/3/05		CPT-11	12/3/05		CPT-1 *	5/30/07		CPT-2 *	5/30/07
300	15.00	**49.21**	6 S	2.95	**11.30**	3 C	99.00	NL	6 S	---	**25.24**	3 C	27.38	NL		
301	15.05	**49.38**	6 S	2.96	**6.36**	3 C	99.33	NL	7 S	---	**36.24**	3 C	27.47	NL		
302	15.10	**49.54**	6 S	2.97	**5.68**	3 C	99.67	NL	6 S	---	**31.89**	3 C	27.56	NL		
303	15.15	**49.70**	6 S	2.99	**7.12**	3 C	100.00	NL	6 S	---	**14.10**	3 C	27.65	NL		
304	15.20	**49.87**	6 S	3.00	**9.19**	3 C	100.33	NL	6 S	---	**7.52**	3 C	27.74	NL		
305	15.25	**50.03**				3 C	100.67	NL				3 C	27.84	NL		
306	15.30	**50.20**										3 C	27.93	NL		

Vista Canyon Ranch, LLC
November 14, 2008
2005-052-01

APPENDIX D

SLOPE STABILITY ANALYSES

RTF&A
GEOTECHNICAL ENGINEERING & ENGINEERING GEOLOGY

APPENDIX D

SLOPE STABILITY ANALYSES

GENERAL

Stability analyses were performed on several selected Geotechnical Cross Sections. The stability analyses utilized cross sections constructed to illustrate critical structural geometries and maximum slope heights for each analyzed slope. Our evaluation included gross, (both static and pseudostatic), and surficial stability were considered.

SHEAR STRENGTH PARAMETERS

The shear strength values used in our analyses are presented in the following table. All of the shear strength values are for saturated samples. Details of the test procedure and the test results are presented in Appendix B.

MATERIAL	Cohesion (psf)	Angle of Internal Friction (degrees)
Mint Canyon Cross-Bedding	600	29
Mint Canyon Along Bedding (static)	250	22
Mint Canyon Along Bedding (Pseudostatic)	400	29
Compacted Fill	300	35
Terrace Deposits	300	28
Alluvium	450	35

In our analyses, the bedrock cross-bedding residual strengths and bedrock along bedding reshear strengths were used in static stability analyses. Peak strengths were used in pseudo-static slope stability analyses. The compacted fill strength used in our analyses is based upon the shear strengths obtained on tests on remolded samples.

GROUNDWATER

Review of ground water data in the vicinity boring log data indicates that the proposed cut-slopes are above historic high ground water levels. No perched groundwater was observed within the bedrock.

GROSS SLOPE STABILITY

Two-dimensional limit equilibrium analyses were performed using the computer program GSTABL7 Version2.004 (June 2003) of "GSTABLE7 with STEwin"(tm), a software package supplied by Gregory Geotechnical Software. Potential failure planes (both circular and along bedding) were analyzed using The Modified Bishop's Method (circular) and The Simplified Janbu's Method (bedding), and the analyses accounted for both static and seismic conditions. Our slope stability analyses are presented in this Appendix. The analyzed cut-slopes, proposed grades, remedial grades and compacted fill slopes comply with City of Santa Clarita building codes minimum requirements for gross stability under static and pseudostatic (seismic coefficient of 0.15g) loading conditions (static factors of safety in excess of 1.5, and seismic factors of safety in excess of 1.1), provided our recommendations are followed and incorporated into project construction.

SURFICIAL SLOPE STABILITY

The surficial slope stability was analyzed by assuming all slopes to be of infinite height with a constant slope gradient. The slip plane is located at a given depth below and parallel to the ground surface; the depth of the slip plane considered was 4 feet in accordance with City of Santa Clarita/County of Los Angeles guidelines. The soils above the slip plane are assumed to be saturated, with the water flowing parallel to the slope surface. The surficial slope stability analyses are presented in this Appendix. A minimum factor of safety in excess of 1.5 of the Uniform Building Code minimum was obtained.

SLOPE STABILITY ANALYSES RESULTS

TABLE D-1

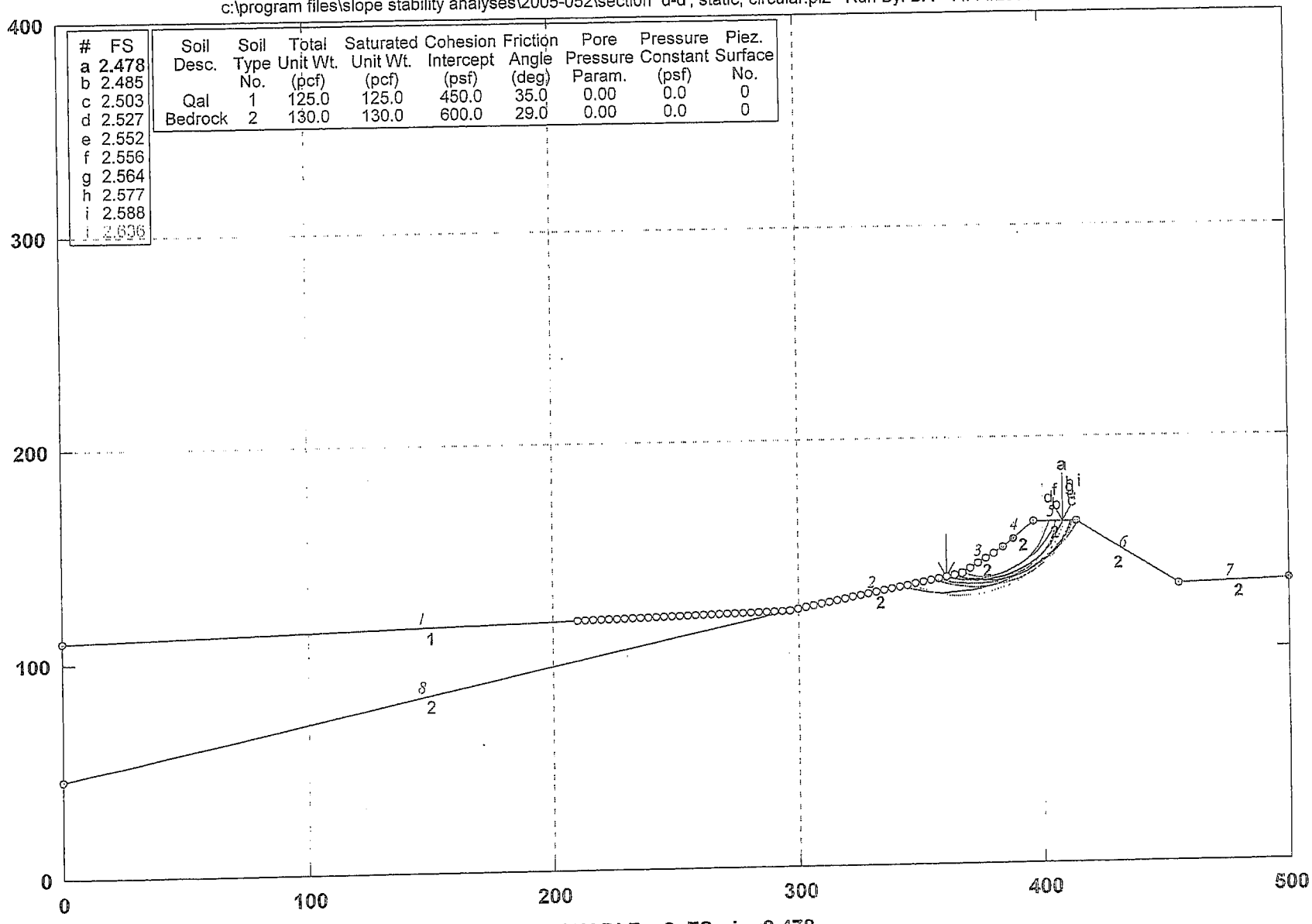
CROSS SECTION	ANALYZED PLANE	FACTOR OF SAFETY		REMARKS
		Static	Pseudo	
D-D'	Circular	2.48		Minimum factor of safety
	Circular		1.95	Peak shear strength not used in pseudostatic stability analyses
	Bedding	3.07		Minimum factor of safety, Static
	Bedding		2.17	Minimum factor of safety, Pseudostatic
	Bedding	3.09		Shallower search
	Bedding	3.08		Deeper search
E-E'	Circular	2.09		Minimum factor of safety, Static
	Circular		1.65	Minimum factor of safety, Pseudostatic
F-F'	Circular	2.39		Minimum factor of safety
	Circular		1.86	Minimum factor of safety, Pseudostatic
	Bedding	1.73		Minimum factor of safety, Static
	Bedding		1.69	Minimum factor of safety, Pseudostatic
	Bedding	1.74		Shallower search
	Bedding	1.75		Deeper search
Typical 50 feet	Circular	2.46		Minimum factor of safety, Static
high fill slope	Circular		1.74	Minimum factor of safety, Pseudostatic
Surficial	-	2.04		Terrace Deposits - Weakest shear strength

Cross Section D-D', Static, circular Vista Canyon

c:\program files\slope stability analyses\2005-052\section d-d', static, circular.pl2 Run By: DA 11/14/2008 01:22PM

#	FS
a	2.478
b	2.485
c	2.503
d	2.527
e	2.552
f	2.556
g	2.564
h	2.577
i	2.588
j	2.606

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.
Qal	1	125.0	125.0	450.0	35.0	0.00	0.0	0
Bedrock	2	130.0	130.0	600.0	29.0	0.00	0.0	0



GSTABL7 v.2 FSmin=2.478

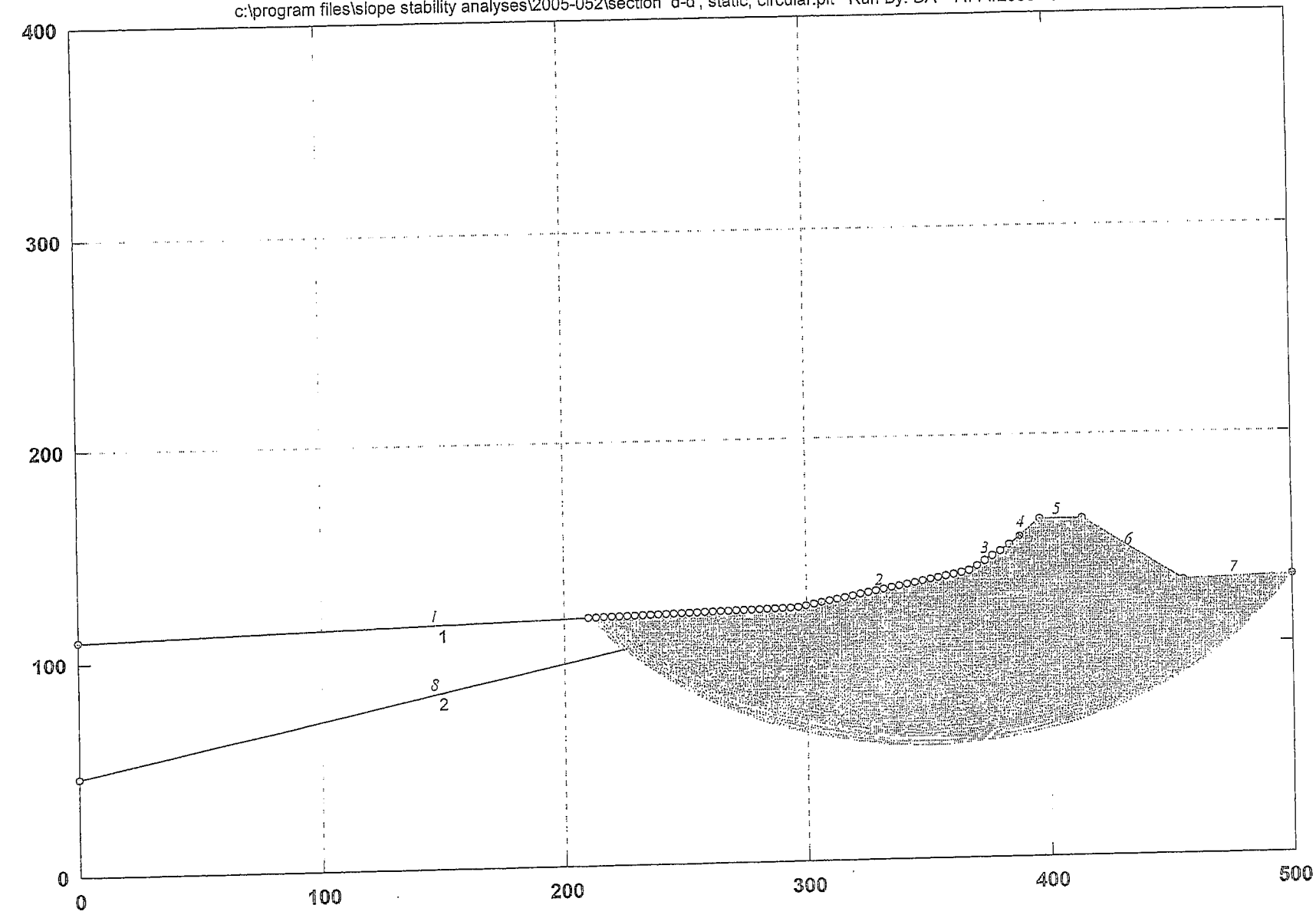
Safety Factors Are Calculated By The Modified Bishop Method

GSTABL7

For use with report dated 11/14/2008; RTF Job No. 2005-052-01

Cross Section D-D', Static, circular Vista Canyon

c:\program files\slope stability analyses\2005-052\section d-d', static, circular.plt Run By: DA 11/14/2008 01:22PM



GSTABL7

*** GSTABL7 ***
** GSTABL7 by Garry H. Gregory, P.E. **
** Original Version 1.0, January 1996; Current Version 2.004, June 2003 **

****

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: 11/14/2008
Time of Run: 01:22PM
Run By: DA
Input Data Filename: C:\Program Files\Slope stability analyses\2005-052\section D-D', static, circular.in
Output Filename: C:\Program Files\Slope stability analyses\2005-052\section D-D', static, circular.OUT
Unit System: English
Plotted Output Filename: C:\Program Files\Slope stability analyses\2005-052\section D-D', static, circular.PLT
PROBLEM DESCRIPTION: Cross Section D-D', Static, circular
Vista Canyon

BOUNDARY COORDINATES
7 Top Boundaries
8 Total Boundaries

Boundary No.	X-Left (ft)	Y-Left (ft)	X-Right (ft)	Y-Right (ft)	Soil Type Below Bnd
1	0.00	110.00	296.00	120.00	1
2	296.00	120.00	367.00	136.00	2
3	367.00	136.00	384.00	148.00	2
4	384.00	148.00	396.00	160.00	2
5	396.00	160.00	414.00	160.00	2
6	414.00	160.00	455.00	130.00	2
7	455.00	130.00	500.00	132.00	2
8	0.00	45.00	296.00	120.00	2

Default Y-Origin = 0.00(ft)
Default X-Plus Value = 0.00(ft)
Default Y-Plus Value = 0.00(ft)

ISOTROPIC SOIL PARAMETERS
2 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	125.0	125.0	450.0	35.0	0.00	0.0	0
2	130.0	130.0	600.0	29.0	0.00	0.0	0

A Critical Failure Surface Searching Method, Using A Random
Technique For Generating Circular Surfaces, Has Been Specified.
1600 Trial Surfaces Have Been Generated.
10 Surface(s) Initiate(s) From Each Of 160 Points Equally Spaced
Along The Ground Surface Between X = 210.00(ft)
and X = 380.00(ft)
Each Surface Terminates Between X = 388.00(ft)
and X = 500.00(ft)
Unless Further Limitations Were Imposed, The Minimum Elevation
At Which A Surface Extends Is Y = 0.00(ft)
6.00(ft) Line Segments Define Each Trial Failure Surface.
Restrictions Have Been Imposed Upon The Angle Of Initiation.
The Angle Has Been Restricted Between The Angles Of -50.0
And -5.0 deg.
The Factor Of Safety For The Trial Failure Surface Defined
By The Coordinates Listed Below Is Misleading.
Failure Surface Defined By 35 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)

1	324.40	126.40
2	328.34	121.87
3	332.51	117.56
4	336.91	113.48
5	341.52	109.64
6	346.34	106.06
7	351.34	102.75
8	356.52	99.72
9	361.85	96.96
10	367.32	94.51
11	372.92	92.35
12	378.63	90.50
13	384.43	88.96
14	390.30	87.74
15	396.23	86.83
16	402.20	86.26
17	408.20	86.00
18	414.20	86.07
19	420.19	86.47
20	426.14	87.19
21	432.05	88.23
22	437.89	89.59
23	443.66	91.27
24	449.32	93.25
25	454.86	95.54
26	460.28	98.13
27	465.54	101.00
28	470.65	104.16
29	475.57	107.59
30	480.30	111.28
31	484.82	115.23
32	489.12	119.41
33	493.19	123.82
34	497.02	128.44
35	499.64	131.98

Factor Of Safety For The Preceding Specified Surface =*******
The Factor Of Safety For The Trial Failure Surface Defined
By The Coordinates Listed Below Is Misleading.
Failure Surface Defined By 35 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	325.47	126.64
2	329.34	122.06
3	333.46	117.69
4	337.81	113.56
5	342.38	109.68
6	347.17	106.05
7	352.14	102.70
8	357.29	99.62
9	362.60	96.83
10	368.06	94.34
11	373.65	92.16
12	379.35	90.28
13	385.14	88.73
14	391.02	87.49
15	396.95	86.59
16	402.92	86.01
17	408.91	85.76
18	414.91	85.84
19	420.90	86.25
20	426.85	87.00
21	432.76	88.07
22	438.59	89.46
23	444.34	91.17
24	449.99	93.20
25	455.51	95.54
26	460.90	98.18

27	466.14	101.11
28	471.20	104.33
29	476.08	107.82
30	480.76	111.58
31	485.23	115.58
32	489.46	119.83
33	493.46	124.31
34	497.20	129.00
35	499.32	131.97

Factor Of Safety For The Preceding Specified Surface =*******
The Factor Of Safety For The Trial Failure Surface Defined
By The Coordinates Listed Below Is Misleading.
Failure Surface Defined By 33 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	327.61	127.12
2	332.03	123.07
3	336.66	119.25
4	341.47	115.66
5	346.46	112.33
6	351.61	109.25
7	356.91	106.45
8	362.35	103.91
9	367.91	101.65
10	373.58	99.68
11	379.34	98.01
12	385.18	96.62
13	391.08	95.54
14	397.03	94.76
15	403.01	94.28
16	409.01	94.11
17	415.00	94.24
18	420.99	94.67
19	426.94	95.42
20	432.85	96.46
21	438.70	97.80
22	444.47	99.44
23	450.15	101.37
24	455.73	103.59
25	461.18	106.09
26	466.50	108.86
27	471.68	111.90
28	476.69	115.20
29	481.52	118.75
30	486.18	122.54
31	490.63	126.56
32	494.87	130.81
33	495.77	131.81

Factor Of Safety For The Preceding Specified Surface =*******
The Factor Of Safety For The Trial Failure Surface Defined
By The Coordinates Listed Below Is Misleading.
Failure Surface Defined By 31 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	329.75	127.61
2	334.45	123.88
3	339.33	120.39
4	344.38	117.15
5	349.58	114.16
6	354.93	111.43
7	360.40	108.97
8	365.99	106.79
9	371.68	104.88
10	377.46	103.26
11	383.31	101.93
12	389.21	100.89
13	395.17	100.14

14	401.15	99.69
15	407.15	99.53
16	413.15	99.67
17	419.13	100.11
18	425.09	100.84
19	431.00	101.87
20	436.85	103.19
21	442.63	104.80
22	448.32	106.69
23	453.92	108.87
24	459.40	111.31
25	464.75	114.03
26	469.96	117.00
27	475.01	120.23
28	479.90	123.71
29	484.61	127.42
30	489.14	131.37
31	489.30	131.52

Factor Of Safety For The Preceding Specified Surface =*******
The Factor Of Safety For The Trial Failure Surface Defined
By The Coordinates Listed Below Is Misleading.
Failure Surface Defined By 34 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	330.82	127.85
2	334.68	123.25
3	338.79	118.89
4	343.15	114.76
5	347.74	110.89
6	352.54	107.29
7	357.53	103.97
8	362.71	100.95
9	368.06	98.22
10	373.55	95.80
11	379.17	93.71
12	384.90	91.93
13	390.73	90.49
14	396.63	89.38
15	402.58	88.61
16	408.56	88.19
17	414.56	88.10
18	420.55	88.36
19	426.52	88.96
20	432.45	89.91
21	438.31	91.18
22	444.09	92.80
23	449.77	94.74
24	455.33	97.00
25	460.74	99.58
26	466.01	102.46
27	471.10	105.64
28	476.00	109.10
29	480.69	112.84
30	485.16	116.84
31	489.40	121.09
32	493.38	125.57
33	497.10	130.28
34	498.26	131.92

Factor Of Safety For The Preceding Specified Surface =-52.144
The Factor Of Safety For The Trial Failure Surface Defined
By The Coordinates Listed Below Is Misleading.
Failure Surface Defined By 31 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	330.82	127.85
2	334.69	123.27
3	338.85	118.94

4	343.26	114.87
5	347.91	111.09
6	352.80	107.60
7	357.89	104.42
8	363.16	101.56
9	368.60	99.04
10	374.19	96.85
11	379.91	95.02
12	385.72	93.54
13	391.62	92.43
14	397.57	91.69
15	403.56	91.32
16	409.56	91.31
17	415.55	91.68
18	421.50	92.42
19	427.40	93.53
20	433.22	95.00
21	438.93	96.83
22	444.52	99.01
23	449.97	101.53
24	455.24	104.39
25	460.33	107.56
26	465.22	111.05
27	469.88	114.83
28	474.29	118.89
29	478.45	123.22
30	482.32	127.80
31	484.96	131.33

Factor Of Safety For The Preceding Specified Surface =*******
The Factor Of Safety For The Trial Failure Surface Defined
By The Coordinates Listed Below Is Misleading.
Failure Surface Defined By 33 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	331.89	128.09
2	335.82	123.55
3	340.00	119.25
4	344.41	115.19
5	349.06	111.39
6	353.91	107.86
7	358.95	104.61
8	364.18	101.66
9	369.56	99.00
10	375.08	96.66
11	380.73	94.64
12	386.49	92.94
13	392.33	91.57
14	398.24	90.54
15	404.20	89.85
16	410.19	89.50
17	416.19	89.48
18	422.18	89.82
19	428.14	90.49
20	434.06	91.50
21	439.90	92.84
22	445.66	94.52
23	451.32	96.52
24	456.85	98.84
25	462.24	101.47
26	467.48	104.41
27	472.53	107.64
28	477.40	111.15
29	482.06	114.93
30	486.49	118.98
31	490.69	123.26
32	494.63	127.79
33	497.83	131.90

Factor Of Safety For The Preceding Specified Surface =-46.394
The Factor Of Safety For The Trial Failure Surface Defined
By The Coordinates Listed Below Is Misleading.
Failure Surface Defined By 30 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	331.89	128.09
2	336.64	124.42
3	341.56	121.00
4	346.65	117.82
5	351.89	114.90
6	357.27	112.24
7	362.78	109.85
8	368.39	107.74
9	374.11	105.90
10	379.90	104.36
11	385.77	103.10
12	391.69	102.13
13	397.65	101.46
14	403.64	101.08
15	409.64	101.00
16	415.64	101.22
17	421.61	101.73
18	427.56	102.54
19	433.46	103.64
20	439.29	105.04
21	445.05	106.72
22	450.72	108.68
23	456.29	110.92
24	461.74	113.44
25	467.05	116.22
26	472.23	119.26
27	477.24	122.55
28	482.09	126.09
29	486.75	129.86
30	488.58	131.49

Factor Of Safety For The Preceding Specified Surface =*******
The Factor Of Safety For The Trial Failure Surface Defined
By The Coordinates Listed Below Is Misleading.
Failure Surface Defined By 33 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	331.89	128.09
2	336.23	123.95
3	340.79	120.05
4	345.55	116.39
5	350.49	112.98
6	355.60	109.84
7	360.86	106.96
8	366.27	104.37
9	371.81	102.06
10	377.46	100.04
11	383.21	98.32
12	389.04	96.91
13	394.94	95.79
14	400.88	94.99
15	406.86	94.50
16	412.86	94.32
17	418.86	94.46
18	424.84	94.90
19	430.79	95.66
20	436.70	96.73
21	442.54	98.11
22	448.30	99.78
23	453.96	101.76
24	459.52	104.03
25	464.95	106.58

26	470.23	109.42
27	475.37	112.53
28	480.33	115.90
29	485.11	119.52
30	489.70	123.39
31	494.08	127.49
32	498.23	131.82
33	498.33	131.93

Factor Of Safety For The Preceding Specified Surface =-47.216
The Factor Of Safety For The Trial Failure Surface Defined
By The Coordinates Listed Below Is Misleading.
Failure Surface Defined By 31 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	332.96	128.33
2	337.55	124.47
3	342.34	120.85
4	347.31	117.49
5	352.44	114.38
6	357.72	111.54
7	363.14	108.97
8	368.69	106.68
9	374.35	104.68
10	380.10	102.97
11	385.93	101.55
12	391.82	100.44
13	397.77	99.63
14	403.75	99.12
15	409.74	98.92
16	415.74	99.03
17	421.73	99.44
18	427.69	100.16
19	433.60	101.18
20	439.45	102.50
21	445.23	104.12
22	450.91	106.04
23	456.49	108.24
24	461.96	110.72
25	467.28	113.48
26	472.46	116.51
27	477.48	119.80
28	482.32	123.34
29	486.98	127.13
30	491.44	131.15
31	491.93	131.64

Factor Of Safety For The Preceding Specified Surface =-64.145
The Factor Of Safety For The Trial Failure Surface Defined
By The Coordinates Listed Below Is Misleading.
Failure Surface Defined By 29 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	332.96	128.33
2	337.77	124.75
3	342.76	121.41
4	347.90	118.32
5	353.19	115.50
6	358.62	112.94
7	364.17	110.66
8	369.83	108.65
9	375.57	106.93
10	381.40	105.50
11	387.29	104.35
12	393.23	103.51
13	399.20	102.96
14	405.20	102.71
15	411.20	102.75
16	417.19	103.10

17	423.15	103.74
18	429.08	104.68
19	434.95	105.92
20	440.76	107.44
21	446.47	109.25
22	452.10	111.35
23	457.61	113.72
24	463.00	116.36
25	468.24	119.27
26	473.34	122.44
27	478.27	125.85
28	483.03	129.51
29	485.18	131.34

Factor Of Safety For The Preceding Specified Surface =*******
The Factor Of Safety For The Trial Failure Surface Defined
By The Coordinates Listed Below Is Misleading.
Failure Surface Defined By 33 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	334.03	128.57
2	337.89	123.98
3	342.01	119.62
4	346.38	115.51
5	350.98	111.65
6	355.79	108.07
7	360.81	104.77
8	366.00	101.77
9	371.36	99.08
10	376.87	96.69
11	382.50	94.63
12	388.25	92.90
13	394.08	91.51
14	399.99	90.45
15	405.95	89.74
16	411.94	89.37
17	417.94	89.35
18	423.93	89.68
19	429.89	90.35
20	435.80	91.37
21	441.65	92.73
22	447.40	94.42
23	453.05	96.44
24	458.58	98.79
25	463.95	101.45
26	469.17	104.41
27	474.20	107.68
28	479.04	111.23
29	483.66	115.05
30	488.06	119.14
31	492.21	123.47
32	496.11	128.03
33	499.08	131.96

Factor Of Safety For The Preceding Specified Surface =-34.478
The Factor Of Safety For The Trial Failure Surface Defined
By The Coordinates Listed Below Is Misleading.
Failure Surface Defined By 31 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	334.03	128.57
2	338.86	125.01
3	343.84	121.68
4	348.98	118.58
5	354.25	115.71
6	359.65	113.09
7	365.16	110.72
8	370.78	108.61
9	376.48	106.75

10	382.27	105.16
11	388.12	103.83
12	394.03	102.78
13	399.98	101.99
14	405.95	101.48

##################### 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 The Modified Bishop Method * *
Total Number of Trial Surfaces Attempted = 1600
Number of Trial Surfaces with Misleading FS = 217
Number of Trial Surfaces With Valid FS = 1383
Percentage of Trial Surfaces With Non-Valid FS Solutions
of the Total Attempted = 13.6 %
Statistical Data On All Valid FS Values:
FS Max = 383.443 FS Min = 2.478 FS Ave = 10.304
Standard Deviation = 22.581 Coefficient of Variation = 219.16 %
Failure Surface Specified By 12 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	360.755	134.593
2	366.543	133.013
3	372.514	132.422
4	378.500	132.835
5	384.333	134.240
6	389.849	136.600
7	394.895	139.846
8	399.328	143.889
9	403.025	148.615
10	405.881	153.892
11	407.817	159.571
12	407.887	160.000

Circle Center At X = 373.053 ; Y = 168.198 ; and Radius = 35.785

Factor of Safety
*** 2.478 ***

Individual data on the 14 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	5.8	1085.1	0.0	0.0	0.	0.	0.0	0.0	0.0
2	0.5	175.7	0.0	0.0	0.	0.	0.0	0.0	0.0
3	5.5	3764.3	0.0	0.0	0.	0.	0.0	0.0	0.0
4	6.0	7296.6	0.0	0.0	0.	0.	0.0	0.0	0.0
5	5.5	8981.8	0.0	0.0	0.	0.	0.0	0.0	0.0
6	0.3	604.1	0.0	0.0	0.	0.	0.0	0.0	0.0
7	5.5	11238.7	0.0	0.0	0.	0.	0.0	0.0	0.0
8	5.0	11904.8	0.0	0.0	0.	0.	0.0	0.0	0.0
9	1.1	2743.1	0.0	0.0	0.	0.	0.0	0.0	0.0
10	3.3	7627.5	0.0	0.0	0.	0.	0.0	0.0	0.0
11	3.7	6606.4	0.0	0.0	0.	0.	0.0	0.0	0.0
12	2.9	3247.6	0.0	0.0	0.	0.	0.0	0.0	0.0
13	1.9	822.5	0.0	0.0	0.	0.	0.0	0.0	0.0
14	0.1	1.9	0.0	0.0	0.	0.	0.0	0.0	0.0

Failure Surface Specified By 11 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	359.686	134.352
2	365.593	133.301
3	371.592	133.195
4	377.533	134.037
5	383.267	135.804
6	388.650	138.454
7	393.548	141.919
8	397.839	146.113
9	401.415	150.931

10	404.186	156.252
11	405.436	160.000

Circle Center At X = 369.260 ; Y = 171.059 ; and Radius = 37.935

Factor of Safety

*** 2.485 ***

Failure Surface Specified By 13 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	357.547	133.870
2	363.290	132.133
3	369.223	131.237
4	375.223	131.200
5	381.166	132.023
6	386.930	133.689
7	392.396	136.164
8	397.451	139.397
9	401.990	143.321
10	405.920	147.854
11	409.160	152.904
12	411.644	158.366
13	412.119	160.000

Circle Center At X = 372.479 ; Y = 172.876 ; and Radius = 41.766

Factor of Safety

*** 2.503 ***

Failure Surface Specified By 11 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	361.824	134.834
2	367.668	133.475
3	373.665	133.274
4	379.587	134.238
5	385.210	136.331
6	390.321	139.474
7	394.727	143.547
8	398.261	148.396
9	400.788	153.838
10	402.214	159.666
11	402.229	160.000

Circle Center At X = 371.694 ; Y = 164.043 ; and Radius = 30.832

Factor of Safety

*** 2.527 ***

Failure Surface Specified By 13 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	355.409	133.388
2	360.981	131.164
3	366.823	129.793
4	372.803	129.308
5	378.789	129.719
6	384.647	131.016
7	390.247	133.170
8	395.464	136.135
9	400.181	139.842
10	404.294	144.211
11	407.710	149.143
12	410.355	154.529
13	412.089	160.000

Circle Center At X = 373.054 ; Y = 169.500 ; and Radius = 40.193

Factor of Safety

*** 2.552 ***

Failure Surface Specified By 11 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	363.962	135.315
2	369.589	133.232
3	375.526	132.367
4	381.514	132.758

5	387.288	134.387
6	392.597	137.183
7	397.206	141.024
8	400.914	145.741
9	403.559	151.127
10	405.023	156.946
11	405.135	160.000

Circle Center At X = 376.666 ; Y = 160.988 ; and Radius = 28.644

Factor of Safety

*** 2.556 ***

Failure Surface Specified By 12 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	363.962	135.315
2	369.657	133.426
3	375.594	132.556
4	381.591	132.734
5	387.466	133.952
6	393.039	136.175
7	398.140	139.334
8	402.614	143.332
9	406.323	148.049
10	409.154	153.338
11	411.022	159.040
12	411.158	160.000

Circle Center At X = 377.585 ; Y = 166.730 ; and Radius = 34.241

Factor of Safety

*** 2.564 ***

Failure Surface Specified By 11 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	367.170	136.120
2	372.958	134.539
3	378.936	134.027
4	384.908	134.603
5	390.679	136.246
6	396.058	138.903
7	400.870	142.487
8	404.957	146.881
9	408.183	151.939
10	410.445	157.497
11	410.965	160.000

Circle Center At X = 378.759 ; Y = 167.151 ; and Radius = 33.124

Factor of Safety

*** 2.577 ***

Failure Surface Specified By 16 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	341.510	130.256
2	347.283	128.624
3	353.190	127.567
4	359.171	127.097
5	365.170	127.216
6	371.128	127.925
7	376.987	129.216
8	382.692	131.076
9	388.185	133.489
10	393.415	136.429
11	398.331	139.870
12	402.884	143.777
13	407.032	148.113
14	410.733	152.835
15	413.952	157.899
16	414.740	159.458

Circle Center At X = 360.960 ; Y = 187.901 ; and Radius = 60.838

Factor of Safety

*** 2.588 ***

Failure Surface Specified By 15 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	345.786	131.219
2	351.186	128.604
3	356.901	126.776
4	362.817	125.775
5	368.815	125.619
6	374.775	126.311
7	380.577	127.838
8	386.106	130.170
9	391.250	133.258
10	395.906	137.042
11	399.981	141.446
12	403.393	146.382
13	406.074	151.749
14	407.970	157.442
15	408.435	160.000

Circle Center At X = 366.916 ; Y = 167.954 ; and Radius = 42.378

Factor of Safety

*** 2.636 ***

**** END OF GSTABL7 OUTPUT ****

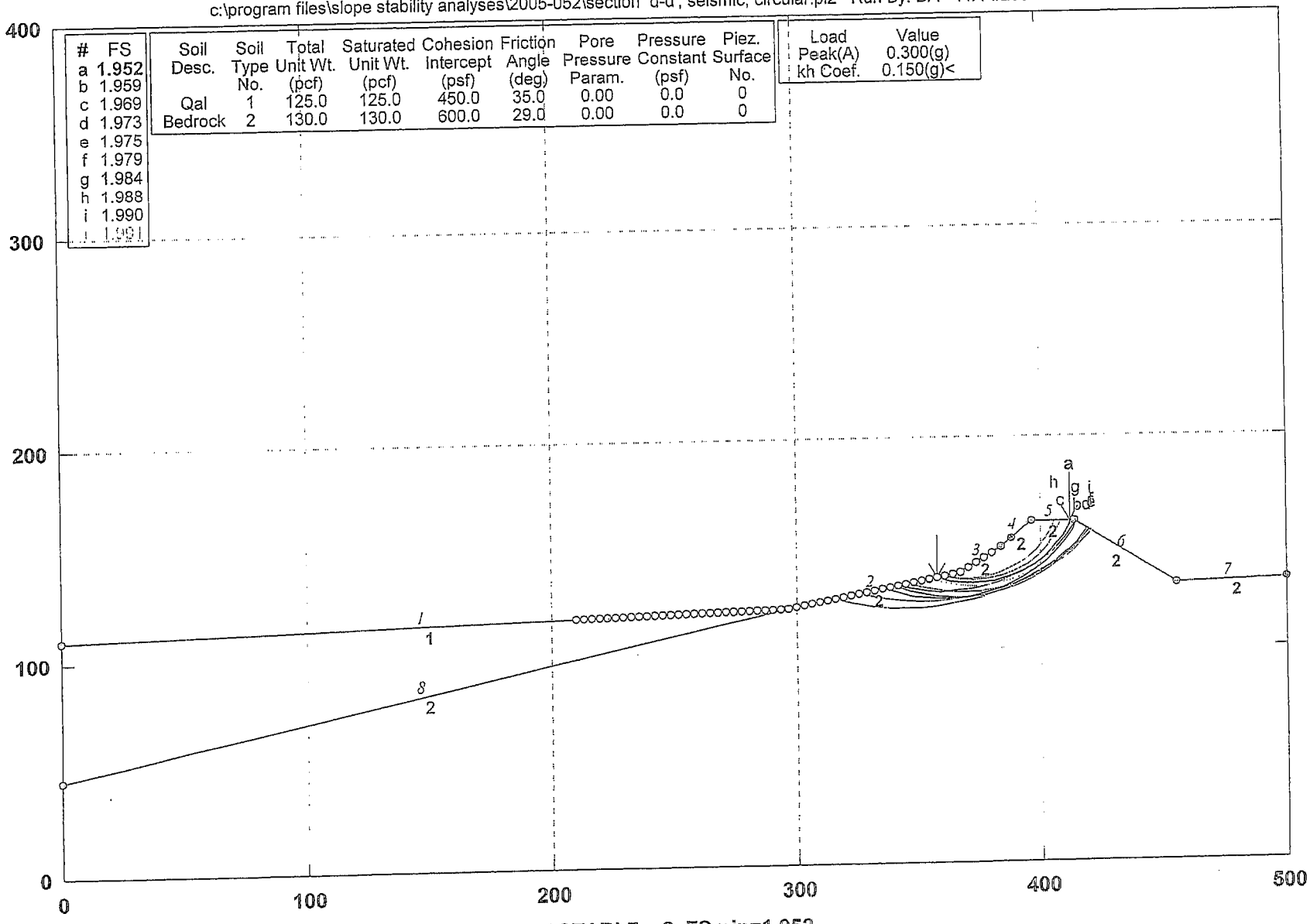
Cross Section D-D', Seismic, circular Vista Canyon

c:\program files\slope stability analyses\2005-052\section d-d', seismic, circular.pl2 Run By: DA 11/14/2008 01:30PM

#	FS
a	1.952
b	1.959
c	1.969
d	1.973
e	1.975
f	1.979
g	1.984
h	1.988
i	1.990
j	1.991

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.
Qal	1	125.0	125.0	450.0	35.0	0.00	0.0	0
Bedrock	2	130.0	130.0	600.0	29.0	0.00	0.0	0

Load	Value
Peak(A)	0.300(g)
kh Coef.	0.150(g)<



GSTABL7 v.2 FSmin=1.952

Safety Factors Are Calculated By The Modified Bishop Method

GSTABL7

*** GSTABL7 ***
** GSTABL7 by Garry H. Gregory, P.E. **
** Original Version 1.0, January 1996; Current Version 2.004, June 2003 **

****

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: 11/14/2008
Time of Run: 01:30PM
Run By: DA
Input Data Filename: C:\Program Files\Slope stability analyses\2005-052\section D-D', seismic, circular.in
Output Filename: C:\Program Files\Slope stability analyses\2005-052\section D-D', seismic, circular.OUT
Unit System: English
Plotted Output Filename: C:\Program Files\Slope stability analyses\2005-052\section D-D', seismic, circular.PLT
PROBLEM DESCRIPTION: Cross Section D-D', Seismic, circular
Vista Canyon

BOUNDARY COORDINATES
7 Top Boundaries
8 Total Boundaries

Boundary No.	X-Left (ft)	Y-Left (ft)	X-Right (ft)	Y-Right (ft)	Soil Type Below Bnd
1	0.00	110.00	296.00	120.00	1
2	296.00	120.00	367.00	136.00	2
3	367.00	136.00	384.00	148.00	2
4	384.00	148.00	396.00	160.00	2
5	396.00	160.00	414.00	160.00	2
6	414.00	160.00	455.00	130.00	2
7	455.00	130.00	500.00	132.00	2
8	0.00	45.00	296.00	120.00	2

Default Y-Origin = 0.00(ft)
Default X-Plus Value = 0.00(ft)
Default Y-Plus Value = 0.00(ft)

ISOTROPIC SOIL PARAMETERS
2 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	125.0	125.0	450.0	35.0	0.00	0.0	0
2	130.0	130.0	600.0	29.0	0.00	0.0	0

Specified Peak Ground Acceleration Coefficient (A) = 0.300(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.
1600 Trial Surfaces Have Been Generated.
10 Surface(s) Initiate(s) From Each Of 160 Points Equally Spaced
Along The Ground Surface Between X = 210.00(ft)
and X = 380.00(ft)
Each Surface Terminates Between X = 388.00(ft)
and X = 500.00(ft)
Unless Further Limitations Were Imposed, The Minimum Elevation
At Which A Surface Extends Is Y = 0.00(ft)
6.00(ft) Line Segments Define Each Trial Failure Surface.
Restrictions Have Been Imposed Upon The Angle Of Initiation.
The Angle Has Been Restricted Between The Angles Of -50.0
And -5.0 deg.
The Factor Of Safety For The Trial Failure Surface Defined

By The Coordinates Listed Below Is Misleading.
Failure Surface Defined By 25 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	366.10	135.80
2	370.52	131.73
3	375.18	127.96
4	380.06	124.48
5	385.16	121.31
6	390.45	118.47
7	395.90	115.97
8	401.50	113.82
9	407.23	112.02
10	413.05	110.58
11	418.96	109.52
12	424.92	108.82
13	430.91	108.50
14	436.91	108.56
15	442.89	108.99
16	448.84	109.80
17	454.72	110.98
18	460.52	112.53
19	466.21	114.44
20	471.76	116.70
21	477.17	119.30
22	482.40	122.24
23	487.43	125.50
24	492.26	129.08
25	495.49	131.80

Factor Of Safety For The Preceding Specified Surface =*******
The Factor Of Safety For The Trial Failure Surface Defined
By The Coordinates Listed Below Is Misleading.
Failure Surface Defined By 26 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	367.17	136.12
2	371.30	131.77
3	375.71	127.70
4	380.38	123.94
5	385.30	120.49
6	390.43	117.39
7	395.76	114.64
8	401.27	112.25
9	406.92	110.24
10	412.69	108.61
11	418.56	107.37
12	424.50	106.52
13	430.49	106.08
14	436.49	106.04
15	442.48	106.40
16	448.43	107.16
17	454.32	108.32
18	460.11	109.87
19	465.79	111.81
20	471.33	114.12
21	476.70	116.80
22	481.87	119.84
23	486.83	123.21
24	491.56	126.91
25	496.02	130.91
26	496.95	131.86

Factor Of Safety For The Preceding Specified Surface =-53.710
The Factor Of Safety For The Trial Failure Surface Defined
By The Coordinates Listed Below Is Misleading.
Failure Surface Defined By 24 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)

1	367.17	136.12
2	371.41	131.88
3	375.94	127.94
4	380.73	124.32
5	385.76	121.05
6	391.00	118.13
7	396.43	115.58
8	402.02	113.41
9	407.76	111.64
10	413.60	110.26
11	419.52	109.30
12	425.49	108.74
13	431.49	108.60
14	437.48	108.88
15	443.44	109.57
16	449.34	110.67
17	455.15	112.17
18	460.84	114.08
19	466.38	116.37
20	471.76	119.05
21	476.93	122.08
22	481.88	125.47
23	486.59	129.19
24	489.14	131.52

Factor Of Safety For The Preceding Specified Surface =-59.123
The Factor Of Safety For The Trial Failure Surface Defined
By The Coordinates Listed Below Is Misleading.
Failure Surface Defined By 26 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	367.17	136.12
2	371.12	131.60
3	375.37	127.37
4	379.90	123.44
5	384.70	119.84
6	389.74	116.58
7	395.00	113.69
8	400.44	111.16
9	406.05	109.03
10	411.79	107.29
11	417.64	105.95
12	423.57	105.03
13	429.55	104.53
14	435.55	104.44
15	441.54	104.77
16	447.49	105.52
17	453.38	106.68
18	459.17	108.25
19	464.84	110.22
20	470.35	112.58
21	475.69	115.32
22	480.82	118.43
23	485.72	121.89
24	490.37	125.68
25	494.75	129.79
26	496.66	131.85

Factor Of Safety For The Preceding Specified Surface =-46.857
The Factor Of Safety For The Trial Failure Surface Defined
By The Coordinates Listed Below Is Misleading.
Failure Surface Defined By 21 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	368.24	136.87
2	373.14	133.42
3	378.25	130.27
4	383.54	127.43
5	388.99	124.93

6	394.58	122.75
7	400.30	120.92
8	406.11	119.44
9	412.00	118.32
10	417.95	117.55
11	423.94	117.15
12	429.94	117.11
13	435.93	117.43
14	441.89	118.12
15	447.80	119.17
16	453.63	120.57
17	459.37	122.33
18	464.99	124.43
19	470.47	126.87
20	475.80	129.63
21	478.13	131.03

Factor Of Safety For The Preceding Specified Surface =*******
The Factor Of Safety For The Trial Failure Surface Defined
By The Coordinates Listed Below Is Misleading.
Failure Surface Defined By 24 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	368.24	136.87
2	373.29	133.64
3	378.49	130.65
4	383.83	127.91
5	389.30	125.44
6	394.88	123.24
7	400.56	121.31
8	406.33	119.67
9	412.18	118.30
10	418.08	117.22
11	424.03	116.43
12	430.00	115.92
13	436.00	115.71
14	442.00	115.79
15	447.99	116.17
16	453.95	116.83
17	459.88	117.78
18	465.75	119.02
19	471.55	120.54
20	477.27	122.35
21	482.90	124.43
22	488.42	126.78
23	493.82	129.40
24	498.46	131.93

Factor Of Safety For The Preceding Specified Surface =*******
The Factor Of Safety For The Trial Failure Surface Defined
By The Coordinates Listed Below Is Misleading.
Failure Surface Defined By 25 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	368.24	136.87
2	372.25	132.41
3	376.57	128.24
4	381.17	124.40
5	386.05	120.90
6	391.16	117.77
7	396.49	115.01
8	402.00	112.64
9	407.67	110.67
10	413.47	109.12
11	419.36	108.00
12	425.32	107.30
13	431.32	107.04
14	437.31	107.20
15	443.28	107.81

16	449.19	108.84
17	455.01	110.29
18	460.72	112.16
19	466.27	114.44
20	471.64	117.12
21	476.80	120.17
22	481.73	123.59
23	486.40	127.36
24	490.79	131.45
25	490.92	131.60

Factor Of Safety For The Preceding Specified Surface =-34.153
The Factor Of Safety For The Trial Failure Surface Defined
By The Coordinates Listed Below Is Misleading.
Failure Surface Defined By 24 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	369.31	137.63
2	373.17	133.04
3	377.36	128.75
4	381.87	124.78
5	386.65	121.16
6	391.69	117.91
7	396.97	115.05
8	402.44	112.58
9	408.08	110.53
10	413.85	108.91
11	419.74	107.73
12	425.69	106.99
13	431.68	106.69
14	437.68	106.84
15	443.65	107.44
16	449.56	108.49
17	455.37	109.97
18	461.06	111.89
19	466.59	114.22
20	471.93	116.96
21	477.04	120.09
22	481.92	123.59
23	486.51	127.45
24	490.75	131.59

Factor Of Safety For The Preceding Specified Surface =-25.370
The Factor Of Safety For The Trial Failure Surface Defined
By The Coordinates Listed Below Is Misleading.
Failure Surface Defined By 24 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	369.31	137.63
2	374.33	134.34
3	379.50	131.30
4	384.82	128.52
5	390.27	126.01
6	395.83	123.76
7	401.50	121.79
8	407.25	120.10
9	413.09	118.69
10	418.98	117.57
11	424.92	116.74
12	430.90	116.21
13	436.89	115.96
14	442.89	116.02
15	448.88	116.36
16	454.85	117.00
17	460.78	117.93
18	466.65	119.15
19	472.46	120.65
20	478.19	122.44
21	483.82	124.51

22	489.34	126.85
23	494.75	129.46
24	499.36	131.97

Factor Of Safety For The Preceding Specified Surface =-70.421
The Factor Of Safety For The Trial Failure Surface Defined
By The Coordinates Listed Below Is Misleading.
Failure Surface Defined By 24 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	369.31	137.63
2	374.48	134.60
3	379.79	131.80
4	385.22	129.24
5	390.75	126.92
6	396.39	124.86
7	402.11	123.05
8	407.91	121.50
9	413.77	120.21
10	419.68	119.19
11	425.63	118.43
12	431.61	117.94
13	437.61	117.72
14	443.61	117.76
15	449.60	118.08
16	455.57	118.66
17	461.51	119.51
18	467.40	120.62
19	473.24	122.00
20	479.02	123.64
21	484.71	125.53
22	490.31	127.68
23	495.81	130.08
24	499.71	131.99

Factor Of Safety For The Preceding Specified 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	370.38	138.38
2	375.34	135.00
3	380.49	131.93
4	385.81	129.17
5	391.30	126.74
6	396.92	124.64
7	402.66	122.88
8	408.49	121.47
9	414.40	120.41
10	420.35	119.72
11	426.34	119.38
12	432.34	119.40
13	438.33	119.78
14	444.29	120.53
15	450.18	121.63
16	456.01	123.08
17	461.73	124.88
18	467.33	127.03
19	472.80	129.50
20	475.47	130.91

Factor Of Safety For The Preceding Specified Surface =-51.229
The Factor Of Safety For The Trial Failure Surface Defined
By The Coordinates Listed Below Is Misleading.
Failure Surface Defined By 24 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	370.38	138.38
2	374.61	134.13

3	379.12	130.17
4	383.88	126.52
5	388.87	123.19
6	394.07	120.21
7	399.47	117.58
8	405.02	115.31
9	410.72	113.42
10	416.53	111.92
11	422.42	110.80
12	428.38	110.09
13	434.37	109.77
14	440.37	109.85
15	446.35	110.34
16	452.29	111.22
17	458.15	112.50
18	463.91	114.16
19	469.55	116.21
20	475.04	118.63
21	480.36	121.40
22	485.48	124.53
23	490.38	128.00
24	495.04	131.78

Factor Of Safety For The Preceding Specified Surface =-23.934
The Factor Of Safety For The Trial Failure Surface Defined
By The Coordinates Listed Below Is Misleading.
Failure Surface Defined By 21 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	370.38	138.38
2	374.23	133.79
3	378.48	129.55
4	383.09	125.71
5	388.02	122.28
6	393.23	119.31
7	398.68	116.80
8	404.33	114.79
9	410.14	113.29
10	416.06	112.30
11	422.04	111.84
12	428.04	111.91
13	434.01	112.51
14	439.90	113.63
15	445.68	115.28
16	451.28	117.42
17	456.67	120.05
18	461.81	123.15
19	466.66	126.68
20	471.17	130.64
21	471.25	130.72

Factor Of Safety For The Preceding Specified Surface =-26.293
The Factor Of Safety For The Trial Failure Surface Defined
By The Coordinates Listed Below Is Misleading.
Failure Surface Defined By 17 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	371.45	139.14
2	375.34	134.58
3	379.68	130.43
4	384.42	126.75
5	389.50	123.56
6	394.88	120.91
7	400.51	118.82
8	406.31	117.30
9	412.24	116.38
10	418.23	116.07
11	424.23	116.37
12	430.16	117.27

13	435.97	118.77
14	441.60	120.85
15	446.99	123.49
16	452.08	126.66
17	456.48	130.07

Factor Of Safety For The Preceding Specified Surface =-90.162
The Factor Of Safety For The Trial Failure Surface Defined
By The Coordinates Listed Below Is Misleading.
Failure Surface Defined By 21 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	371.45	139.14
2	376.60	136.07
3	381.91	133.27
4	387.35	130.73
5	392.91	128.48
6	398.57	126.51
7	404.33	124.83
8	410.17	123.44
9	416.07	122.34
10	422.02	121.55
11	428.00	121.05
12	433.99	120.86
13	439.99	120.97
14	445.98	121.39
15	451.93	122.11
16	457.85	123.12
17	463.70	124.43
18	469.48	126.04
19	475.18	127.94
20	480.77	130.12
21	483.30	131.26

Factor Of Safety For The Preceding Specified Surface =-37.274
The Factor Of Safety For The Trial Failure Surface Defined
By The Coordinates Listed Below Is Misleading.
###################### 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 The Modified Bishop Method * *
Total Number of Trial Surfaces Attempted = 1600
Number of Trial Surfaces with Misleading FS = 52
Number of Trial Surfaces With Valid FS = 1548
Percentage of Trial Surfaces With Non-Valid FS Solutions
of the Total Attempted = 3.2 %
Statistical Data On All Valid FS Values:
FS Max = 332.877 FS Min = 1.952 FS Ave = 5.662
Standard Deviation = 16.790 Coefficient of Variation = 296.56 %
Failure Surface Specified By 13 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	357.547	133.870
2	363.290	132.133
3	369.223	131.237
4	375.223	131.200
5	381.166	132.023
6	386.930	133.689
7	392.396	136.164
8	397.451	139.397
9	401.990	143.321
10	405.920	147.854
11	409.160	152.904
12	411.644	158.366
13	412.119	160.000

Circle Center At X = 372.479 ; Y = 172.876 ; and Radius = 41.766
Factor of Safety
*** 1.952 ***

Individual data on the 15 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)	Surcharge Ver (lbs)	Surcharge Load (lbs)
1	5.7	1131.5	0.0	0.0	0.	0.	169.7	0.0	0.0
2	3.7	1798.5	0.0	0.0	0.	0.	269.8	0.0	0.0
3	2.2	1554.8	0.0	0.0	0.	0.	233.2	0.0	0.0
4	6.0	6605.3	0.0	0.0	0.	0.	990.8	0.0	0.0
5	5.9	9496.0	0.0	0.0	0.	0.	1424.4	0.0	0.0
6	2.8	5366.4	0.0	0.0	0.	0.	805.0	0.0	0.0
7	2.9	6170.7	0.0	0.0	0.	0.	925.6	0.0	0.0
8	5.5	13312.9	0.0	0.0	0.	0.	1996.9	0.0	0.0
9	3.6	9783.4	0.0	0.0	0.	0.	1467.5	0.0	0.0
10	1.5	3972.8	0.0	0.0	0.	0.	595.9	0.0	0.0
11	4.5	11000.4	0.0	0.0	0.	0.	1650.1	0.0	0.0
12	3.9	7364.0	0.0	0.0	0.	0.	1104.6	0.0	0.0
13	3.2	4052.5	0.0	0.0	0.	0.	607.9	0.0	0.0
14	2.5	1409.1	0.0	0.0	0.	0.	211.4	0.0	0.0
15	0.5	50.4	0.0	0.0	0.	0.	7.6	0.0	0.0

Failure Surface Specified By 16 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	341.510	130.256
2	347.283	128.624
3	353.190	127.567
4	359.171	127.097
5	365.170	127.216
6	371.128	127.925
7	376.987	129.216
8	382.692	131.076
9	388.185	133.489
10	393.415	136.429
11	398.331	139.870
12	402.884	143.777
13	407.032	148.113
14	410.733	152.835
15	413.952	157.899
16	414.740	159.458

Circle Center At X = 360.960 ; Y = 187.901 ; and Radius = 60.838

Factor of Safety

*** 1.959 ***

Failure Surface Specified By 12 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	360.755	134.593
2	366.543	133.013
3	372.514	132.422
4	378.500	132.835
5	384.333	134.240
6	389.849	136.600
7	394.895	139.846
8	399.328	143.889
9	403.025	148.615
10	405.881	153.892
11	407.817	159.571
12	407.887	160.000

Circle Center At X = 373.053 ; Y = 168.198 ; and Radius = 35.785

Factor of Safety

*** 1.969 ***

Failure Surface Specified By 17 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	340.440	130.015
2	345.985	127.722
3	351.732	125.999
4	357.624	124.865

5	363.600	124.330
6	369.600	124.401
7	375.562	125.076
8	381.425	126.348
9	387.130	128.206
10	392.620	130.629
11	397.836	133.592
12	402.728	137.067
13	407.244	141.017
14	411.339	145.403
15	414.971	150.179
16	418.103	155.296
17	418.708	156.555

Circle Center At X = 365.902 ; Y = 183.726 ; and Radius = 59.441

Factor of Safety

*** 1.973 ***

Failure Surface Specified By 16 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	345.786	131.219
2	351.456	129.255
3	357.290	127.856
4	363.234	127.035
5	369.229	126.800
6	375.219	127.153
7	381.145	128.091
8	386.951	129.605
9	392.581	131.680
10	397.980	134.296
11	403.097	137.429
12	407.883	141.048
13	412.291	145.118
14	416.280	149.601
15	419.810	154.452
16	420.343	155.359

Circle Center At X = 368.623 ; Y = 187.891 ; and Radius = 61.100

Factor of Safety

*** 1.975 ***

Failure Surface Specified By 19 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	326.541	126.882
2	332.307	125.224
3	338.175	123.969
4	344.115	123.126
5	350.100	122.697
6	356.100	122.686
7	362.086	123.091
8	368.030	123.911
9	373.902	125.142
10	379.675	126.778
11	385.320	128.812
12	390.810	131.232
13	396.118	134.029
14	401.220	137.187
15	406.089	140.692
16	410.704	144.527
17	415.040	148.674
18	419.078	153.112
19	420.667	155.122

Circle Center At X = 353.269 ; Y = 208.938 ; and Radius = 86.299

Factor of Safety

*** 1.979 ***

Failure Surface Specified By 17 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	336.164	129.051

2	341.727	126.805
3	347.492	125.142
4	353.397	124.080
5	359.381	123.630
6	365.378	123.798
7	371.327	124.580
8	377.164	125.970
9	382.827	127.952
10	388.257	130.505
11	393.396	133.602
12	398.189	137.211
13	402.586	141.293
14	406.541	145.805
15	410.011	150.700
16	412.960	155.925
17	414.558	159.592

Circle Center At X = 360.755 ; Y = 181.944 ; and Radius = 58.330

Factor of Safety

*** 1.984 ***

Failure Surface Specified By 11 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	359.686	134.352
2	365.593	133.301
3	371.592	133.195
4	377.533	134.037
5	383.267	135.804
6	388.650	138.454
7	393.548	141.919
8	397.839	146.113
9	401.415	150.931
10	404.186	156.252
11	405.436	160.000

Circle Center At X = 369.260 ; Y = 171.059 ; and Radius = 37.935

Factor of Safety

*** 1.988 ***

Failure Surface Specified By 21 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	315.849	124.473
2	321.585	122.712
3	327.422	121.323
4	333.336	120.312
5	339.303	119.684
6	345.298	119.441
7	351.297	119.585
8	357.273	120.114
9	363.203	121.026
10	369.063	122.318
11	374.827	123.984
12	380.472	126.017
13	385.974	128.410
14	391.311	131.151
15	396.461	134.230
16	401.402	137.634
17	406.114	141.349
18	410.577	145.359
19	414.772	149.648
20	418.684	154.198
21	419.837	155.729

Circle Center At X = 346.071 ; Y = 212.661 ; and Radius = 93.223

Factor of Safety

*** 1.990 ***

Failure Surface Specified By 13 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	355.409	133.388

2	360.981	131.164
3	366.823	129.793
4	372.803	129.308
5	378.789	129.719
6	384.647	131.016
7	390.247	133.170
8	395.464	136.135
9	400.181	139.842
10	404.294	144.211
11	407.710	149.143
12	410.355	154.529
13	412.089	160.000

Circle Center At X = 373.054 ; Y = 169.500 ; and Radius = 40.193

Factor of Safety

*** 1.991 ***

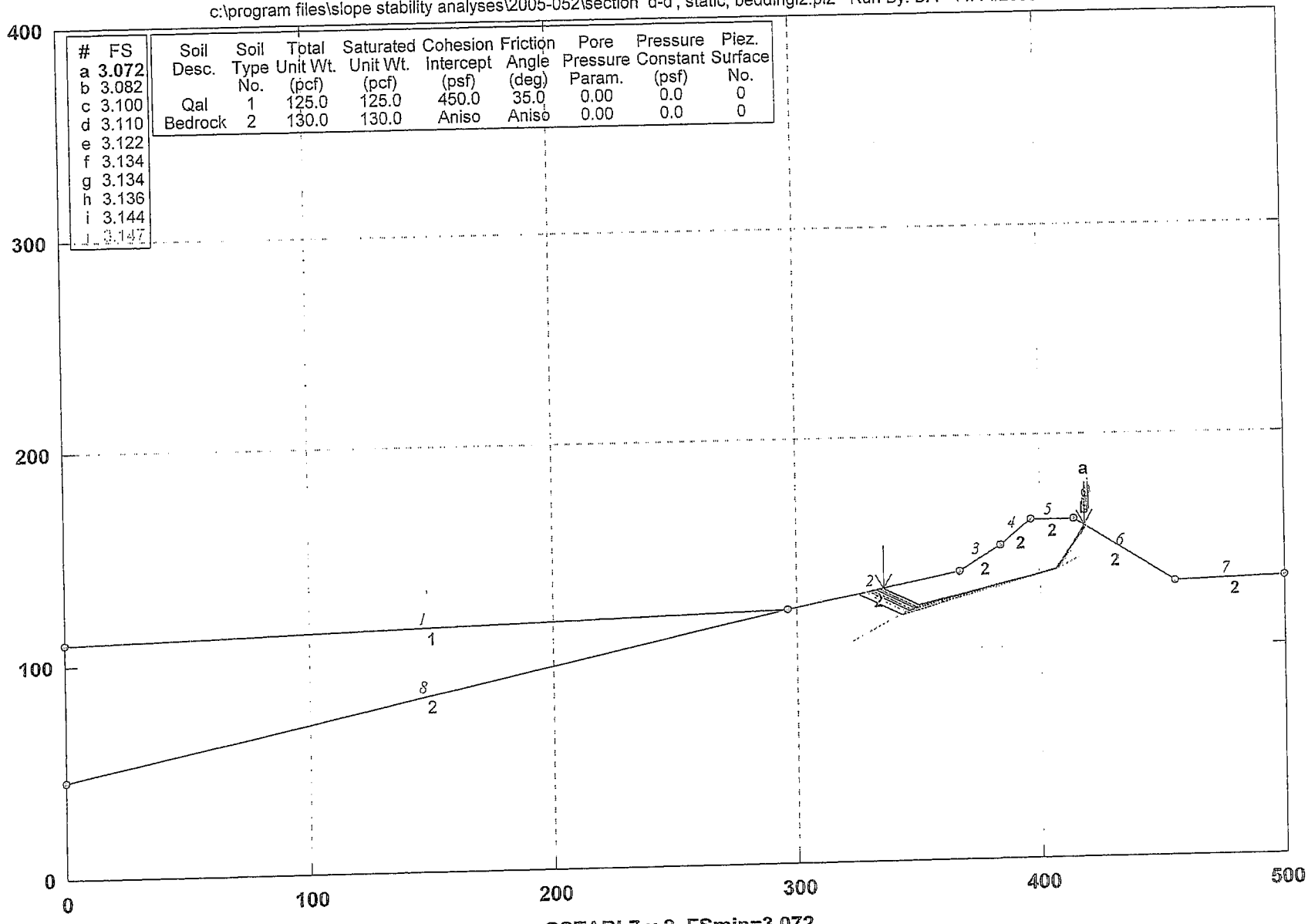
**** END OF GSTABL7 OUTPUT ****

Cross Section D-D', Static, Bedding Vista Canyon (Minimum F.S)

c:\program files\slope stability analyses\2005-052\section d-d', static, beddingl2.pl2 Run By: DA 11/14/2008 01:53PM

#	FS
a	3.072
b	3.082
c	3.100
d	3.110
e	3.122
f	3.134
g	3.134
h	3.136
i	3.144
j	3.147

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.
Qal	1	125.0	125.0	450.0	35.0	0.00	0.0	0
Bedrock	2	130.0	130.0	Aniso	Aniso	0.00	0.0	0



GSTABL7 v.2 FSmin=3.072

Safety Factors Are Calculated By The Simplified Janbu Method for the case of c & phi both > 0

GSTABL7

*** GSTABL7 ***
** GSTABL7 by Garry H. Gregory, P.E. **
** Original Version 1.0, January 1996; Current Version 2.004, June 2003 **

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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: 11/14/2008
Time of Run: 01:53PM
Run By: DA
Input Data Filename: C:\Program Files\Slope stability analyses\2005-052\section D-D', static, Beddingl2.in
Output Filename: C:\Program Files\Slope stability analyses\2005-052\section D-D', static, Beddingl2.OUT
Unit System: English
Plotted Output Filename: C:\Program Files\Slope stability analyses\2005-052\section D-D', static, Beddingl2.PLT
PROBLEM DESCRIPTION: Cross Section D-D', Static, Bedding
Vista Canyon

BOUNDARY COORDINATES
7 Top Boundaries
8 Total Boundaries

Boundary No.	X-Left (ft)	Y-Left (ft)	X-Right (ft)	Y-Right (ft)	Soil Type Below Bnd
1	0.00	110.00	296.00	120.00	1
2	296.00	120.00	367.00	136.00	2
3	367.00	136.00	384.00	148.00	2
4	384.00	148.00	396.00	160.00	2
5	396.00	160.00	414.00	160.00	2
6	414.00	160.00	455.00	130.00	2
7	455.00	130.00	500.00	132.00	2
8	0.00	45.00	296.00	120.00	2

Default Y-Origin = 0.00(ft)
Default X-Plus Value = 0.00(ft)
Default Y-Plus Value = 0.00(ft)

ISOTROPIC SOIL PARAMETERS
2 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	125.0	125.0	450.0	35.0	0.00	0.0	0
2	130.0	130.0	600.0	29.0	0.00	0.0	0

ANISOTROPIC STRENGTH PARAMETERS
1 soil type(s)
Soil Type 2 Is Anisotropic
Number Of Direction Ranges Specified = 3

Direction Range No.	Counterclockwise Direction Limit (deg)	Cohesion Intercept (psf)	Friction Angle (deg)
1	29.0	600.00	29.00
2	32.0	250.00	22.00
3	90.0	600.00	29.00

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.
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.
100 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 10.0

Box No.	X-Left (ft)	Y-Left (ft)	X-Right (ft)	Y-Right (ft)	Height (ft)
1	322.00	104.00	352.00	121.67	0.00
2	406.00	136.00	416.00	141.89	0.00

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 = 100
Number of Trial Surfaces With Valid FS = 100
Statistical Data On All Valid FS Values:
FS Max = 3.553 FS Min = 3.072 FS Ave = 2.470
Standard Deviation = 0.757 Coefficient of Variation = 30.66 %
Failure Surface Specified By 7 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	335.893	128.990
2	341.543	125.661
3	350.160	120.586
4	406.046	136.027
5	411.121	144.643
6	416.197	153.260
7	418.310	156.847

Factor of Safety
*** 3.072 ***
Individual data on the 10 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	5.7	1690.2	0.0	0.0	0.	0.	0.0	0.0	0.0
2	8.6	9084.6	0.0	0.0	0.	0.	0.0	0.0	0.0
3	16.8	24497.4	0.0	0.0	0.	0.	0.0	0.0	0.0
4	17.0	31851.8	0.0	0.0	0.	0.	0.0	0.0	0.0
5	12.0	34953.9	0.0	0.0	0.	0.	0.0	0.0	0.0
6	10.0	33120.0	0.0	0.0	0.	0.	0.0	0.0	0.0
7	5.1	12974.9	0.0	0.0	0.	0.	0.0	0.0	0.0
8	2.9	4832.7	0.0	0.0	0.	0.	0.0	0.0	0.0
9	2.2	2227.7	0.0	0.0	0.	0.	0.0	0.0	0.0
10	2.1	705.0	0.0	0.0	0.	0.	0.0	0.0	0.0

Failure Surface Specified By 7 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	333.054	128.350
2	339.581	124.505
3	348.197	119.430
4	406.095	136.056
5	411.170	144.672
6	416.245	153.288
7	418.332	156.830

Factor of Safety
*** 3.082 ***
Failure Surface Specified By 7 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	333.859	128.532
2	340.137	124.833
3	348.754	119.758
4	406.827	136.487

5	411.902	145.103
6	416.978	153.720
7	418.666	156.586

Factor of Safety
*** 3.100 ***

Failure Surface Specified By 7 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	328.265	127.271
2	336.270	122.555
3	344.886	117.480
4	406.475	136.280
5	411.551	144.896
6	416.626	153.513
7	418.506	156.703

Factor of Safety
*** 3.110 ***

Failure Surface Specified By 7 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	328.180	127.252
2	336.211	122.521
3	344.828	117.446
4	406.925	136.545
5	412.000	145.161
6	417.075	153.777
7	418.711	156.553

Factor of Safety
*** 3.122 ***

Failure Surface Specified By 8 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	325.341	126.612
2	325.632	126.440
3	334.249	121.365
4	342.865	116.289
5	406.974	136.573
6	412.049	145.190
7	417.124	153.806
8	418.733	156.537

Factor of Safety
*** 3.134 ***

Failure Surface Specified By 7 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	328.095	127.233
2	336.153	122.486
3	344.769	117.411
4	407.374	136.809
5	412.449	145.426
6	417.525	154.042
7	418.916	156.403

Factor of Safety
*** 3.134 ***

Failure Surface Specified By 7 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	330.850	127.853
2	338.057	123.608
3	346.673	118.533
4	407.774	137.045
5	412.850	145.661
6	417.925	154.278
7	419.098	156.270

Factor of Safety
*** 3.136 ***

Failure Surface Specified By 7 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	329.875	127.634
2	337.383	123.211
3	346.000	118.136
4	407.940	137.143
5	413.016	145.759
6	418.091	154.375
7	419.174	156.214

Factor of Safety

*** 3.144 ***

Failure Surface Specified By 7 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	328.010	127.214
2	336.094	122.452
3	344.711	117.377
4	407.823	137.074
5	412.898	145.690
6	417.974	154.306
7	419.121	156.253

Factor of Safety

*** 3.147 ***

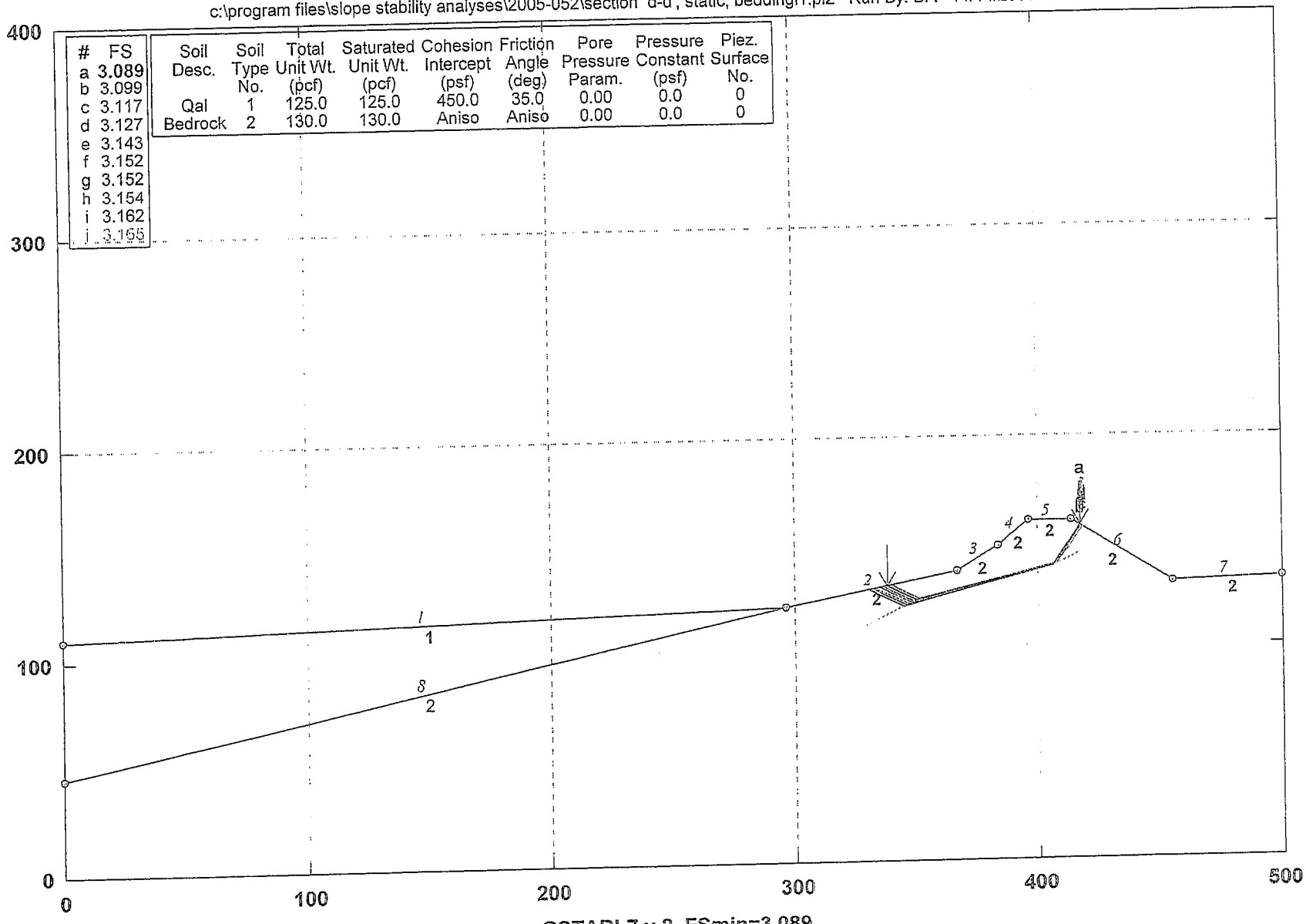
**** END OF GSTABL7 OUTPUT ****

Cross Section D-D', Static, Bedding Vista Canyon (Shallow Search)

c:\program files\slope stability analyses\2005-052\section d-d', static, beddingl1.pl2 Run By: DA 11/14/2008 01:51PM

#	FS
a	3.089
b	3.099
c	3.117
d	3.127
e	3.143
f	3.152
g	3.152
h	3.154
i	3.162
j	3.165

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.
Qal	1	125.0	125.0	450.0	35.0	0.00	0.0	0
Bedrock	2	130.0	130.0	Aniso	Aniso	0.00	0.0	0



GSTABL7 v.2 FSmin=3.089

Safety Factors Are Calculated By The Simplified Janbu Method for the case of c & phi both > 0

GSTABL7

*** GSTABL7 ***
** GSTABL7 by Garry H. Gregory, P.E. **
** Original Version 1.0, January 1996; Current Version 2.004, June 2003 **

****

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: 11/14/2008
Time of Run: 01:51PM
Run By: DA
Input Data Filename: C:\Program Files\Slope stability analyses\2005-052\section D-D', static, Beddingl1.in
Output Filename: C:\Program Files\Slope stability analyses\2005-052\section D-D', static, Beddingl1.OUT
Unit System: English
Plotted Output Filename: C:\Program Files\Slope stability analyses\2005-052\section D-D', static, Beddingl1.PLT
PROBLEM DESCRIPTION: Cross Section D-D', Static, Bedding
Vista Canyon

BOUNDARY COORDINATES
7 Top Boundaries
8 Total Boundaries

Boundary No.	X-Left (ft)	Y-Left (ft)	X-Right (ft)	Y-Right (ft)	Soil Type Below Bnd
1	0.00	110.00	296.00	120.00	1
2	296.00	120.00	367.00	136.00	2
3	367.00	136.00	384.00	148.00	2
4	384.00	148.00	396.00	160.00	2
5	396.00	160.00	414.00	160.00	2
6	414.00	160.00	455.00	130.00	2
7	455.00	130.00	500.00	132.00	2
8	0.00	45.00	296.00	120.00	2

Default Y-Origin = 0.00(ft)
Default X-Plus Value = 0.00(ft)
Default Y-Plus Value = 0.00(ft)

ISOTROPIC SOIL PARAMETERS
2 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	125.0	125.0	450.0	35.0	0.00	0.0	0
2	130.0	130.0	600.0	29.0	0.00	0.0	0

ANISOTROPIC STRENGTH PARAMETERS
1 soil type(s)
Soil Type 2 Is Anisotropic
Number Of Direction Ranges Specified = 3

Direction Range No.	Counterclockwise Direction Limit (deg)	Cohesion Intercept (psf)	Friction Angle (deg)
1	29.0	600.00	29.00
2	32.0	250.00	22.00
3	90.0	600.00	29.00

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.
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.
100 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 10.0

Box No.	X-Left (ft)	Y-Left (ft)	X-Right (ft)	Y-Right (ft)	Height (ft)
1	322.00	106.00	352.00	123.67	0.00
2	406.00	138.00	416.00	143.89	0.00

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 = 100
Number of Trial Surfaces With Valid FS = 100
Statistical Data On All Valid FS Values:
FS Max = 3.580 FS Min = 3.089 FS Ave = 2.714
Standard Deviation = 0.586 Coefficient of Variation = 21.60 %
Failure Surface Specified By 7 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	338.349	129.543
2	341.543	127.661
3	350.160	122.586
4	406.046	138.027
5	411.121	146.643
6	416.197	155.260
7	417.486	157.449

Factor of Safety
*** 3.089 ***
Individual data on the 10 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	3.2	540.3	0.0	0.0	0.	0.	0.0	0.0	0.0
2	8.6	6844.3	0.0	0.0	0.	0.	0.0	0.0	0.0
3	16.8	20119.0	0.0	0.0	0.	0.	0.0	0.0	0.0
4	17.0	27431.8	0.0	0.0	0.	0.	0.0	0.0	0.0
5	12.0	31833.9	0.0	0.0	0.	0.	0.0	0.0	0.0
6	10.0	30508.1	0.0	0.0	0.	0.	0.0	0.0	0.0
7	5.1	11655.3	0.0	0.0	0.	0.	0.0	0.0	0.0
8	2.9	4084.2	0.0	0.0	0.	0.	0.0	0.0	0.0
9	2.2	1656.6	0.0	0.0	0.	0.	0.0	0.0	0.0
10	1.3	262.7	0.0	0.0	0.	0.	0.0	0.0	0.0

Failure Surface Specified By 7 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	335.509	128.904
2	339.581	126.505
3	348.197	121.430
4	406.095	138.056
5	411.170	146.672
6	416.245	155.288
7	417.509	157.433

Factor of Safety
*** 3.099 ***
Failure Surface Specified By 7 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	336.315	129.085
2	340.137	126.833
3	348.754	121.758
4	406.827	138.487

5	411.902	147.103
6	416.978	155.720
7	417.843	157.188

Factor of Safety
*** 3.117 ***

Failure Surface Specified By 7 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	330.721	127.824
2	336.270	124.555
3	344.886	119.480
4	406.475	138.280
5	411.551	146.896
6	416.626	155.513
7	417.682	157.306

Factor of Safety
*** 3.127 ***

Failure Surface Specified By 7 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	339.874	129.887
2	342.598	128.283
3	351.214	123.207
4	407.960	139.154
5	413.035	147.771
6	418.111	156.387
7	418.360	156.810

Factor of Safety
*** 3.143 ***

Failure Surface Specified By 7 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	335.170	128.827
2	339.346	126.367
3	347.963	121.292
4	407.891	139.114
5	412.967	147.730
6	418.042	156.347
7	418.329	156.833

Factor of Safety
*** 3.152 ***

Failure Surface Specified By 7 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	330.551	127.786
2	336.153	124.486
3	344.769	119.411
4	407.374	138.809
5	412.449	147.426
6	417.525	156.042
7	418.092	157.006

Factor of Safety
*** 3.152 ***

Failure Surface Specified By 7 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	333.306	128.407
2	338.057	125.608
3	346.673	120.533
4	407.774	139.045
5	412.850	147.661
6	417.925	156.278
7	418.275	156.872

Factor of Safety
*** 3.154 ***

Failure Surface Specified By 7 Coordinate Points

Point	X-Surf	Y-Surf

No.	(ft)	(ft)
1	332.331	128.187
2	337.383	125.211
3	346.000	120.136
4	407.940	139.143
5	413.016	147.759
6	418.091	156.375
7	418.351	156.816

Factor of Safety

*** 3.162 ***

Failure Surface Specified By 6 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	336.950	129.228
2	340.577	127.092
3	349.193	122.017
4	408.458	139.448
5	413.533	148.064
6	418.587	156.644

Factor of Safety

*** 3.165 ***

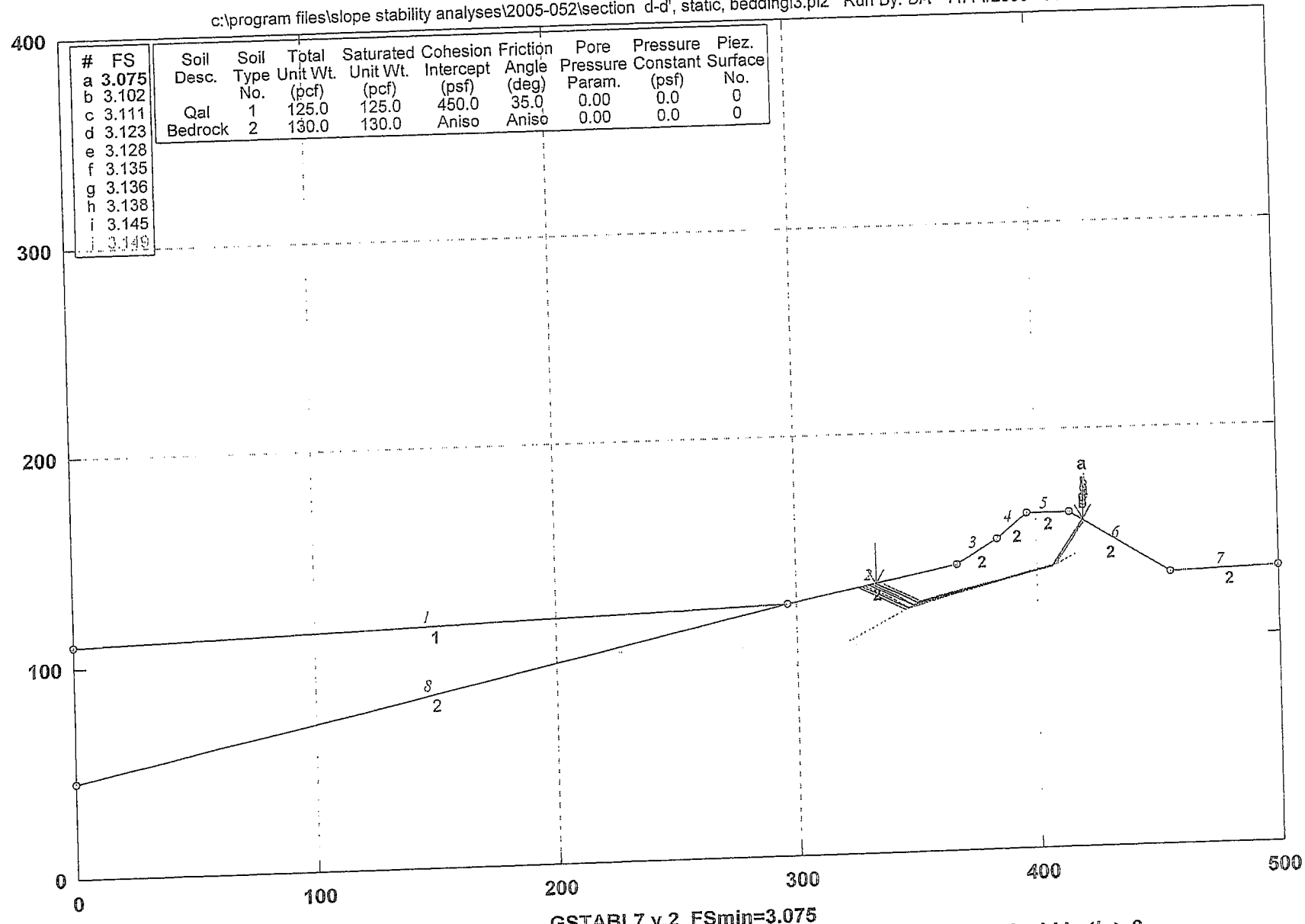
**** END OF GSTABL7 OUTPUT ****

Cross Section D-D', Static, Bedding Vista Canyon (Deeper Search)

c:\program files\slope stability analyses\2005-052\section d-d', static, beddingl3.pl2 Run By: DA 11/14/2008 01:56PM

#	FS
a	3.075
b	3.102
c	3.111
d	3.123
e	3.128
f	3.135
g	3.136
h	3.138
i	3.145
j	3.149

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.
Qal	1	125.0	125.0	450.0	35.0	0.00	0.0	0
Bedrock	2	130.0	130.0	Aniso	Aniso	0.00	0.0	0



GSTABL7 v.2 FSmin=3.075

Safety Factors Are Calculated By The Simplified Janbu Method for the case of c & phi both > 0

GSTABL7

*** GSTABL7 ***

** GSTABL7 by Garry H. Gregory, P.E. **

** Original Version 1.0, January 1996; Current Version 2.004, June 2003 **

****

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: 11/14/2008
Time of Run: 01:56PM
Run By: DA
Input Data Filename: C:\Program Files\Slope stability analyses\2005-052\section D-D', static, Bedding13.in
Output Filename: C:\Program Files\Slope stability analyses\2005-052\section D-D', static, Bedding13.OUT
Unit System: English
Plotted Output Filename: C:\Program Files\Slope stability analyses\2005-052\section D-D', static, Bedding13.PLT

PROBLEM DESCRIPTION: Cross Section D-D', Static, Bedding
Vista Canyon

BOUNDARY COORDINATES
7 Top Boundaries
8 Total Boundaries

Boundary No.	X-Left (ft)	Y-Left (ft)	X-Right (ft)	Y-Right (ft)	Soil Type Below Bnd
1	0.00	110.00	296.00	120.00	1
2	296.00	120.00	367.00	136.00	2
3	367.00	136.00	384.00	148.00	2
4	384.00	148.00	396.00	160.00	2
5	396.00	160.00	414.00	160.00	2
6	414.00	160.00	455.00	130.00	2
7	455.00	130.00	500.00	132.00	2
8	0.00	45.00	296.00	120.00	2

Default Y-Origin = 0.00(ft)
Default X-Plus Value = 0.00(ft)
Default Y-Plus Value = 0.00(ft)

ISOTROPIC SOIL PARAMETERS
2 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	125.0	125.0	450.0	35.0	0.00	0.0	0
2	130.0	130.0	600.0	29.0	0.00	0.0	0

ANISOTROPIC STRENGTH PARAMETERS
1 soil type(s)
Soil Type 2 Is Anisotropic
Number Of Direction Ranges Specified = 3

Direction Range No.	Counterclockwise Direction Limit (deg)	Cohesion Intercept (psf)	Friction Angle (deg)
1	29.0	600.00	29.00
2	32.0	250.00	22.00
3	90.0	600.00	29.00

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.

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.
100 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 10.0

Box No.	X-Left (ft)	Y-Left (ft)	X-Right (ft)	Y-Right (ft)	Height (ft)
1	322.00	102.00	352.00	119.67	0.00
2	406.00	134.00	416.00	139.89	0.00

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 = 100
Number of Trial Surfaces With Valid FS = 100
Statistical Data On All Valid FS Values:
FS Max = 3.551 FS Min = 3.075 FS Ave = 2.627
Standard Deviation = 0.633 Coefficient of Variation = 24.09 %
Failure Surface Specified By 7 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	333.437	128.437
2	341.543	123.661
3	350.160	118.586
4	406.046	134.027
5	411.121	142.643
6	416.197	151.260
7	419.133	156.244

Factor of Safety
*** 3.075 ***
Individual data on the 10 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	8.1	3478.6	0.0	0.0	0.	0.	0.0	0.0	0.0
2	8.6	11324.8	0.0	0.0	0.	0.	0.0	0.0	0.0
3	16.8	28875.9	0.0	0.0	0.	0.	0.0	0.0	0.0
4	17.0	36271.8	0.0	0.0	0.	0.	0.0	0.0	0.0
5	12.0	38073.9	0.0	0.0	0.	0.	0.0	0.0	0.0
6	10.0	35731.9	0.0	0.0	0.	0.	0.0	0.0	0.0
7	5.1	14294.5	0.0	0.0	0.	0.	0.0	0.0	0.0
8	2.9	5581.2	0.0	0.0	0.	0.	0.0	0.0	0.0
9	2.2	2798.8	0.0	0.0	0.	0.	0.0	0.0	0.0
10	2.9	1361.4	0.0	0.0	0.	0.	0.0	0.0	0.0

Failure Surface Specified By 8 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	331.403	127.978
2	331.521	127.909
3	340.137	122.833
4	348.754	117.758
5	406.827	134.487
6	411.902	143.103
7	416.978	151.720
8	419.489	155.983

Factor of Safety
*** 3.102 ***
Failure Surface Specified By 8 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	325.809	126.718
2	327.654	125.631
3	336.270	120.555

4	344.886	115.480
5	406.475	134.280
6	411.551	142.896
7	416.626	151.513
8	419.329	156.101

Factor of Safety
*** 3.111 ***

Failure Surface Specified By 8 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	325.724	126.698
2	327.595	125.596
3	336.211	120.521
4	344.828	115.446
5	406.925	134.545
6	412.000	143.161
7	417.075	151.777
8	419.534	155.951

Factor of Safety
*** 3.123 ***

Failure Surface Specified By 7 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	334.963	128.780
2	342.598	124.283
3	351.214	119.207
4	407.960	135.154
5	413.035	143.771
6	418.111	152.387
7	420.006	155.605

Factor of Safety
*** 3.128 ***

Failure Surface Specified By 8 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	325.639	126.679
2	327.537	125.562
3	336.153	120.486
4	344.769	115.411
5	407.374	134.809
6	412.449	143.426
7	417.525	152.042
8	419.739	155.801

Factor of Safety
*** 3.135 ***

Failure Surface Specified By 8 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	330.259	127.720
2	330.730	127.443
3	339.346	122.367
4	347.963	117.292
5	407.891	135.114
6	412.967	143.730
7	418.042	152.347
8	419.975	155.628

Factor of Safety
*** 3.136 ***

Failure Surface Specified By 8 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	328.394	127.300
2	329.441	126.683
3	338.057	121.608
4	346.673	116.533
5	407.774	135.045
6	412.850	143.661

7	417.925	152.278
8	419.922	155.667

Factor of Safety
*** 3.138 ***

Failure Surface Specified By 8 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	327.419	127.080
2	328.767	126.287
3	337.383	121.211
4	346.000	116.136
5	407.940	135.143
6	413.016	143.759
7	418.091	152.375
8	419.997	155.612

Factor of Safety
*** 3.145 ***

Failure Surface Specified By 7 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	332.039	128.121
2	340.577	123.092
3	349.193	118.017
4	408.458	135.448
5	413.533	144.064
6	418.609	152.680
7	420.234	155.439

Factor of Safety
*** 3.149 ***

**** END OF GSTABL7 OUTPUT ****

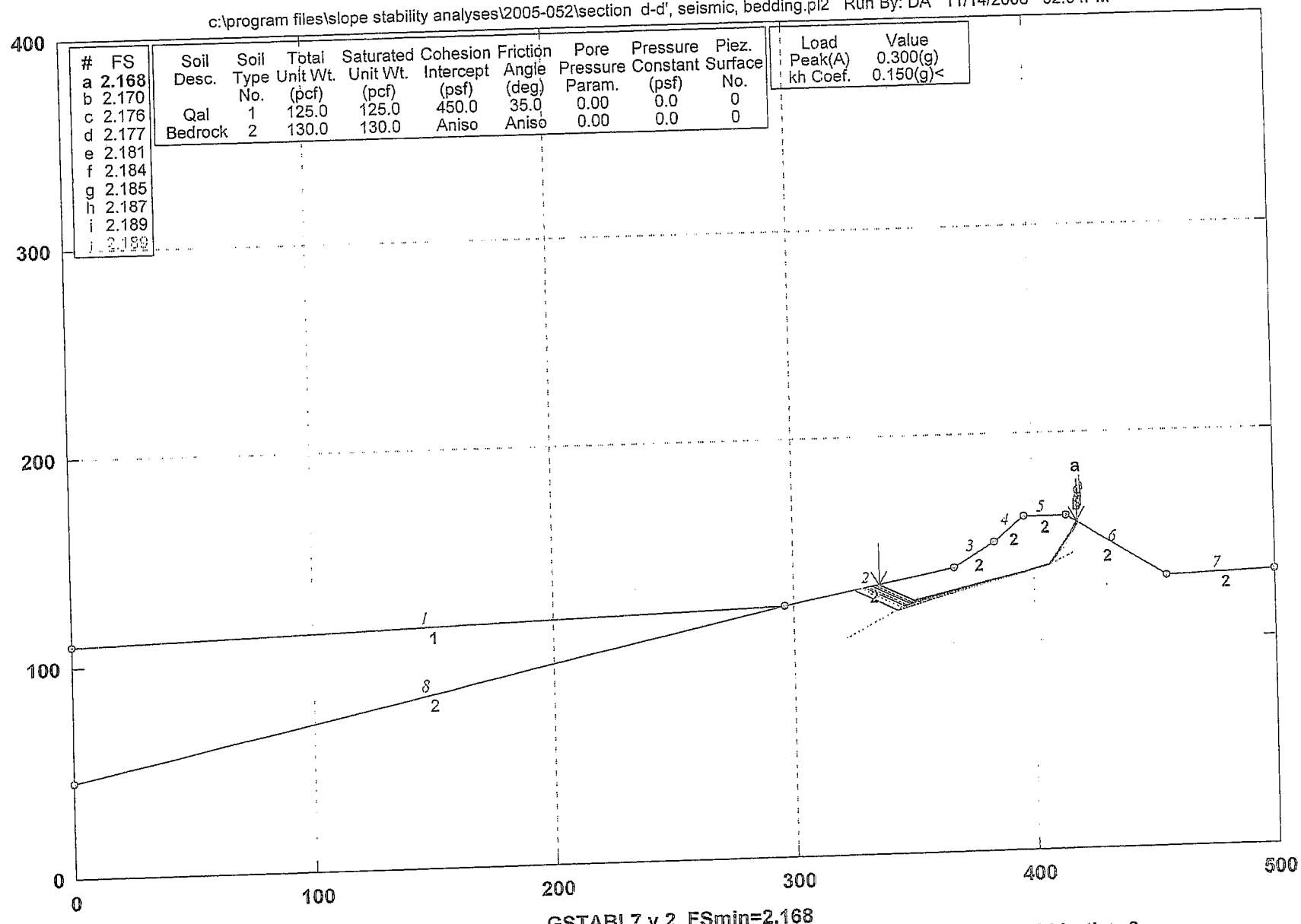
Cross Section D-D', Seismic, Bedding Vista Canyon

c:\program files\slope stability analyses\2005-052\section d-d', seismic, bedding.pl2 Run By: DA 11/14/2008 02:04PM

#	FS
a	2.168
b	2.170
c	2.176
d	2.177
e	2.181
f	2.184
g	2.185
h	2.187
i	2.189
j	2.189

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.
Qal	1	125.0	125.0	450.0	35.0	0.00	0.0	0
Bedrock	2	130.0	130.0	Aniso	Aniso	0.00	0.0	0

Load	Value
Peak(A)	0.300(g)
kh Coef.	0.150(g)<



GSTABL7 v.2 FSmin=2.168

Safety Factors Are Calculated By The Simplified Janbu Method for the case of c & phi both > 0

GSTABL7

*** GSTABL7 ***
** GSTABL7 by Garry H. Gregory, P.E. **
** Original Version 1.0, January 1996; Current Version 2.004, June 2003 **

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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: 11/14/2008
Time of Run: 02:04PM
Run By: DA
Input Data Filename: C:\Program Files\Slope stability analyses\2005-052\section d-d', seismic, bedding.in
Output Filename: C:\Program Files\Slope stability analyses\2005-052\section d-d', seismic, bedding.OUT
Unit System: English
Plotted Output Filename: C:\Program Files\Slope stability analyses\2005-052\section d-d', seismic, bedding.PLT
PROBLEM DESCRIPTION: Cross Section D-D', Seismic, Bedding
Vista Canyon

BOUNDARY COORDINATES
7 Top Boundaries
8 Total Boundaries

Boundary No.	X-Left (ft)	Y-Left (ft)	X-Right (ft)	Y-Right (ft)	Soil Type Below Bnd
1	0.00	110.00	296.00	120.00	1
2	296.00	120.00	367.00	136.00	2
3	367.00	136.00	384.00	148.00	2
4	384.00	148.00	396.00	160.00	2
5	396.00	160.00	414.00	160.00	2
6	414.00	160.00	455.00	130.00	2
7	455.00	130.00	500.00	132.00	2
8	0.00	45.00	296.00	120.00	2

Default Y-Origin = 0.00(ft)
Default X-Plus Value = 0.00(ft)
Default Y-Plus Value = 0.00(ft)

ISOTROPIC SOIL PARAMETERS
2 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	125.0	125.0	450.0	35.0	0.00	0.0	0
2	130.0	130.0	600.0	29.0	0.00	0.0	0

ANISOTROPIC STRENGTH PARAMETERS
1 soil type(s)
Soil Type 2 Is Anisotropic
Number Of Direction Ranges Specified = 3

Direction Range No.	Counterclockwise Direction Limit (deg)	Cohesion Intercept (psf)	Friction Angle (deg)
1	29.0	600.00	29.00
2	32.0	400.00	29.00
3	90.0	600.00	29.00

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.
Specified Peak Ground Acceleration Coefficient (A) = 0.300(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.
100 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 10.0

Box No.	X-Left (ft)	Y-Left (ft)	X-Right (ft)	Y-Right (ft)	Height (ft)
1	322.00	104.00	352.00	121.67	0.00
2	406.00	136.00	416.00	141.89	0.00

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 = 100
Number of Trial Surfaces With Valid FS = 100
Statistical Data On All Valid FS Values:
FS Max = 2.333 FS Min = 2.168 FS Ave = 1.672
Standard Deviation = 0.509 Coefficient of Variation = 30.46 %
Failure Surface Specified By 7 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	335.893	128.990
2	341.543	125.661
3	350.160	120.586
4	406.046	136.027
5	411.121	144.643
6	416.197	153.260
7	418.310	156.847

Factor of Safety
*** 2.168 ***
Individual data on the 10 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)	Surcharge Load Ver (lbs)	Surcharge Load (lbs)
1	5.7	1690.2	0.0	0.0	0.	0.	253.5	0.0	0.0
2	8.6	9084.6	0.0	0.0	0.	0.	1362.7	0.0	0.0
3	16.8	24497.4	0.0	0.0	0.	0.	3674.6	0.0	0.0
4	17.0	31851.8	0.0	0.0	0.	0.	4777.8	0.0	0.0
5	12.0	34953.9	0.0	0.0	0.	0.	5243.1	0.0	0.0
6	10.0	33120.0	0.0	0.0	0.	0.	4968.0	0.0	0.0
7	5.1	12974.9	0.0	0.0	0.	0.	1946.2	0.0	0.0
8	2.9	4832.7	0.0	0.0	0.	0.	724.9	0.0	0.0
9	2.2	2227.7	0.0	0.0	0.	0.	334.2	0.0	0.0
10	2.1	705.0	0.0	0.0	0.	0.	105.8	0.0	0.0

Failure Surface Specified By 7 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	333.054	128.350
2	339.581	124.505
3	348.197	119.430
4	406.095	136.056
5	411.170	144.672
6	416.245	153.288
7	418.332	156.830

Factor of Safety
*** 2.170 ***
Failure Surface Specified By 7 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)

1	333.859	128.532
2	340.137	124.833
3	348.754	119.758
4	406.827	136.487
5	411.902	145.103
6	416.978	153.720
7	418.666	156.586

Factor of Safety
*** 2.176 ***

Failure Surface Specified By 7 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	328.265	127.271
2	336.270	122.555
3	344.886	117.480
4	406.475	136.280
5	411.551	144.896
6	416.626	153.513
7	418.506	156.703

Factor of Safety
*** 2.177 ***

Failure Surface Specified By 7 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	328.180	127.252
2	336.211	122.521
3	344.828	117.446
4	406.925	136.545
5	412.000	145.161
6	417.075	153.777
7	418.711	156.553

Factor of Safety
*** 2.181 ***

Failure Surface Specified By 8 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	325.341	126.612
2	325.632	126.440
3	334.249	121.365
4	342.865	116.289
5	406.974	136.573
6	412.049	145.190
7	417.124	153.806
8	418.733	156.537

Factor of Safety
*** 2.184 ***

Failure Surface Specified By 7 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	328.095	127.233
2	336.153	122.486
3	344.769	117.411
4	407.374	136.809
5	412.449	145.426
6	417.525	154.042
7	418.916	156.403

Factor of Safety
*** 2.185 ***

Failure Surface Specified By 7 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	330.850	127.853
2	338.057	123.608
3	346.673	118.533
4	407.774	137.045
5	412.850	145.661
6	417.925	154.278

7	419.098	156.270

Factor of Safety
*** 2.187 ***

Failure Surface Specified By 7 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	329.875	127.634
2	337.383	123.211
3	346.000	118.136
4	407.940	137.143
5	413.016	145.759
6	418.091	154.375
7	419.174	156.214

Factor of Safety
*** 2.189 ***

Failure Surface Specified By 7 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	328.010	127.214
2	336.094	122.452
3	344.711	117.377
4	407.823	137.074
5	412.898	145.690
6	417.974	154.306
7	419.121	156.253

Factor of Safety
*** 2.189 ***

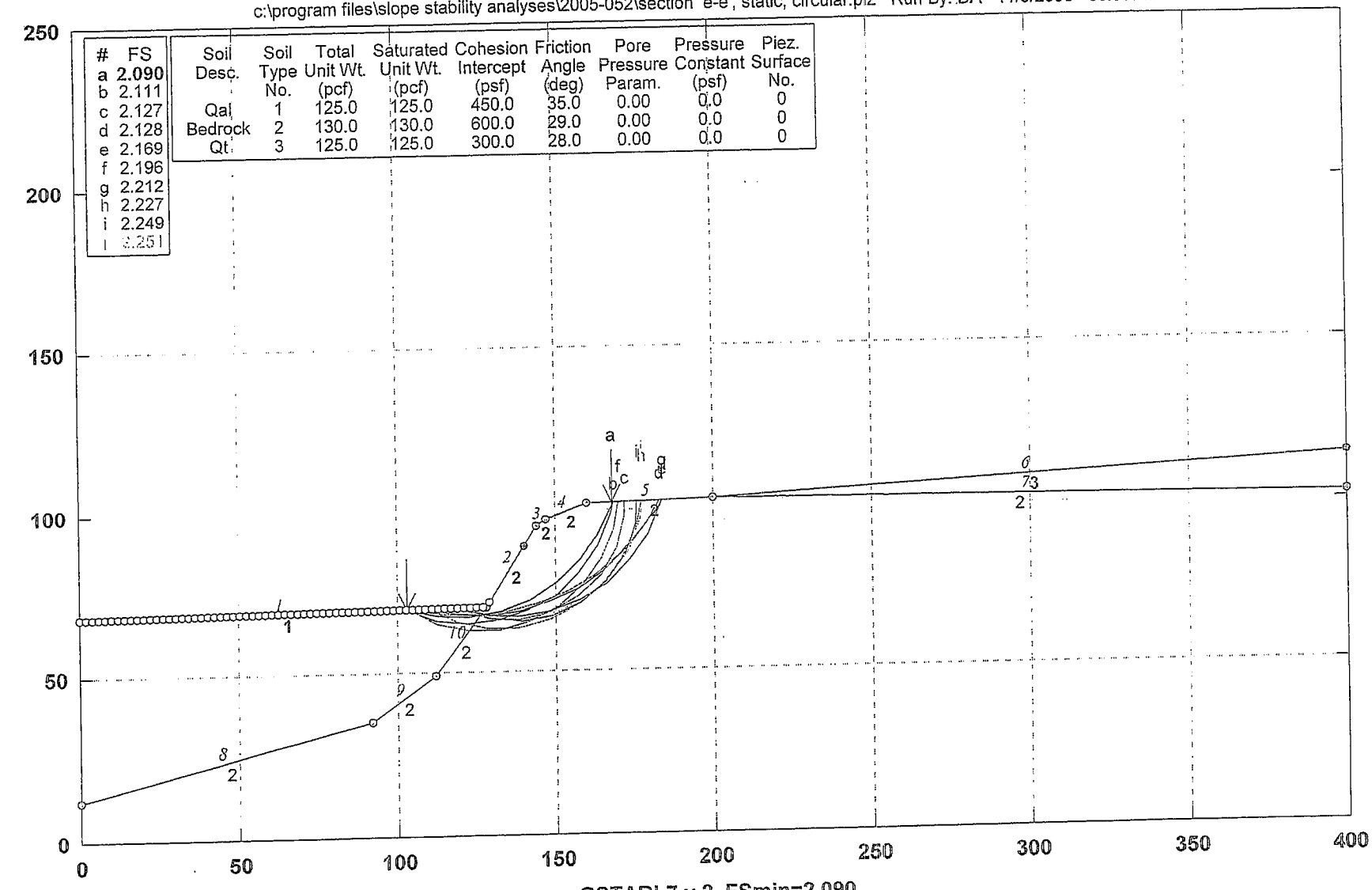
**** END OF GSTABL7 OUTPUT ****

Cross Section E-E', Static, circular Vista Canyon Ranch

c:\program files\slope stability analyses\2005-052\section e-e', static, circular.pl2 Run By: DA 11/5/2008 03:39PM

#	FS
a	2.090
b	2.111
c	2.127
d	2.128
e	2.169
f	2.196
g	2.212
h	2.227
i	2.249
j	2.251

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.
Qal	1	125.0	125.0	450.0	35.0	0.00	0.0	0
Bedrock	2	130.0	130.0	600.0	29.0	0.00	0.0	0
Qt	3	125.0	125.0	300.0	28.0	0.00	0.0	0



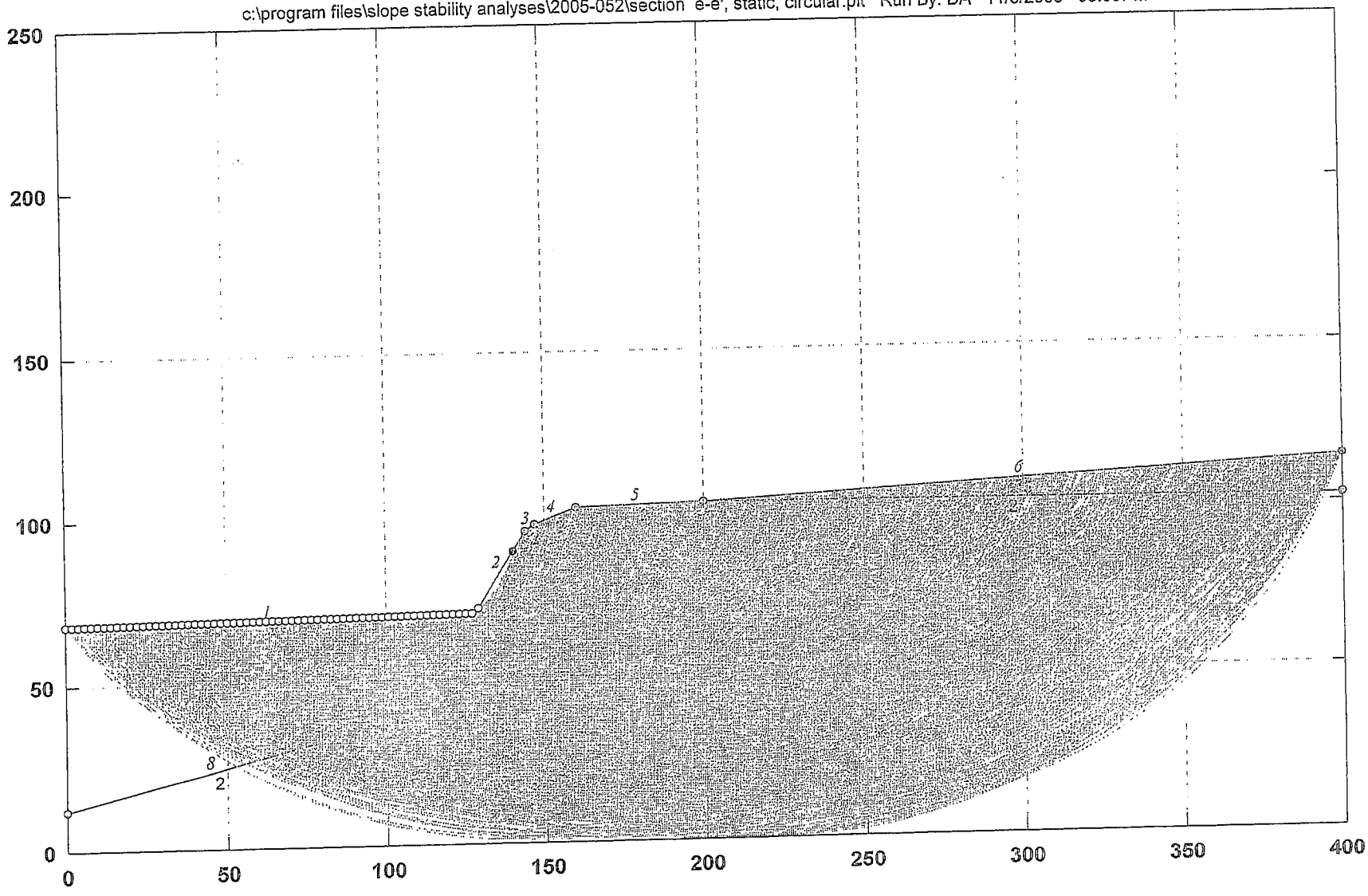
GSTABL7 v.2 FSmin=2.090

Safety Factors Are Calculated By The Modified Bishop Method

GSTABL7

Cross Section E-E', Static, circular Vista Canyon Ranch

c:\program files\slope stability analyses\2005-052\section e-e', static, circular.plt Run By: DA 11/5/2008 03:39PM



GSTABL7

*** GSTABL7 ***
** GSTABL7 by Garry H. Gregory, P.E. **
** Original Version 1.0, January 1996; Current Version 2.004, June 2003 **

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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: 11/5/2008
Time of Run: 03:39PM
Run By: DA
Input Data Filename: C:\Program Files\Slope stability analyses\2005-052\section E-E', static, circular.in
Output Filename: C:\Program Files\Slope stability analyses\2005-052\section E-E', static, circular.OUT
Unit System: English
Plotted Output Filename: C:\Program Files\Slope stability analyses\2005-052\section E-E', static, circular.PLT

PROBLEM DESCRIPTION: Cross Section E-E', Static, circular
Vista Canyon Ranch

BOUNDARY COORDINATES
6 Top Boundaries
10 Total Boundaries

Boundary No.	X-Left (ft)	Y-Left (ft)	X-Right (ft)	Y-Right (ft)	Soil Type Below Bnd
1	0.00	68.00	128.00	70.00	1
2	128.00	70.00	144.00	95.00	2
3	144.00	95.00	147.00	97.00	2
4	147.00	97.00	160.00	102.00	2
5	160.00	102.00	200.00	103.00	2
6	200.00	103.00	400.00	114.00	3
7	200.00	103.00	400.00	102.00	2
8	0.00	12.00	92.00	35.00	2
9	92.00	35.00	112.00	49.00	2
10	112.00	49.00	128.00	70.00	2

Default Y-Origin = 0.00(ft)
Default X-Plus Value = 0.00(ft)
Default Y-Plus Value = 0.00(ft)

ISOTROPIC SOIL PARAMETERS
3 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	125.0	125.0	450.0	35.0	0.00	0.0	0
2	130.0	130.0	600.0	29.0	0.00	0.0	0
3	125.0	125.0	300.0	28.0	0.00	0.0	0

A Critical Failure Surface Searching Method, Using A Random
Technique For Generating Circular Surfaces, Has Been Specified.
1300 Trial Surfaces Have Been Generated.
10 Surface(s) Initiate(s) From Each Of 130 Points Equally Spaced
Along The Ground Surface Between X = 0.00(ft)
and X = 130.00(ft)
Each Surface Terminates Between X = 140.00(ft)
and X = 400.00(ft)
Unless Further Limitations Were Imposed, The Minimum Elevation
At Which A Surface Extends Is Y = 0.00(ft)
10.00(ft) Line Segments Define Each Trial Failure Surface.
Restrictions Have Been Imposed Upon The Angle Of Initiation.
The Angle Has Been Restricted Between The Angles Of -50.0
And -10.0 deg.
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 = 1300
Number of Trial Surfaces With Valid FS = 1300
Statistical Data On All Valid FS Values:
FS Max = 36.546 FS Min = 2.090 FS Ave = 5.316
Standard Deviation = 2.651 Coefficient of Variation = 49.88 %
Failure Surface Specified By 10 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	102.791	69.606
2	112.537	67.367
3	122.532	67.044
4	132.402	68.650
5	141.779	72.123
6	150.314	77.334
7	157.687	84.090
8	163.623	92.137
9	167.902	101.176
10	168.162	102.204

Circle Center At X = 119.208 ; Y = 118.529 ; and Radius = 51.604
Factor of Safety
*** 2.090 ***
Individual data on the 14 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)	Surcharge Ver (lbs)	Surcharge Load (lbs)
1	9.7	1456.5	0.0	0.0	0.	0.	0.0	0.0	0.0
2	10.0	3286.6	0.0	0.0	0.	0.	0.0	0.0	0.0
3	3.7	1193.3	0.0	0.0	0.	0.	0.0	0.0	0.0
4	1.8	503.1	0.0	0.0	0.	0.	0.0	0.0	0.0
5	4.4	2945.6	0.0	0.0	0.	0.	0.0	0.0	0.0
6	9.4	16845.1	0.0	0.0	0.	0.	0.0	0.0	0.0
7	2.2	5907.6	0.0	0.0	0.	0.	0.0	0.0	0.0
8	3.0	8426.0	0.0	0.0	0.	0.	0.0	0.0	0.0
9	3.3	9182.7	0.0	0.0	0.	0.	0.0	0.0	0.0
10	7.4	18192.6	0.0	0.0	0.	0.	0.0	0.0	0.0
11	2.3	4780.2	0.0	0.0	0.	0.	0.0	0.0	0.0
12	3.6	5823.9	0.0	0.0	0.	0.	0.0	0.0	0.0
13	4.3	3051.8	0.0	0.0	0.	0.	0.0	0.0	0.0
14	0.3	17.3	0.0	0.0	0.	0.	0.0	0.0	0.0

Failure Surface Specified By 10 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	102.791	69.606
2	112.198	66.215
3	122.114	64.922
4	132.077	65.788
5	141.621	68.771
6	150.303	73.734
7	157.717	80.444
8	163.519	88.589
9	167.437	97.790
10	168.270	102.207

Circle Center At X = 123.102 ; Y = 110.868 ; and Radius = 45.990
Factor of Safety
*** 2.111 ***
Failure Surface Specified By 9 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	118.915	69.858
2	128.375	66.616
3	138.357	66.024
4	148.134	68.126
5	156.991	72.768
6	164.283	79.611
7	169.478	88.155

8	172.196	97.779
9	172.216	102.305

Circle Center At X = 135.536 ; Y = 102.938 ; and Radius = 37.021

Factor of Safety

*** 2.127 ***

Failure Surface Specified By 10 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	108.837	69.701
2	118.657	67.813
3	128.651	67.466
4	138.579	68.667
5	148.202	71.387
6	157.289	75.561
7	165.622	81.089
8	173.001	87.838
9	179.249	95.646
10	183.216	102.580

Circle Center At X = 125.901 ; Y = 131.667 ; and Radius = 64.273

Factor of Safety

*** 2.128 ***

Failure Surface Specified By 11 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	104.806	69.638
2	114.649	67.870
3	124.641	67.489
4	134.590	68.501
5	144.301	70.886
6	153.586	74.599
7	162.265	79.568
8	170.168	85.694
9	177.143	92.861
10	183.052	100.928
11	183.950	102.599

Circle Center At X = 122.375 ; Y = 139.183 ; and Radius = 71.730

Factor of Safety

*** 2.169 ***

Failure Surface Specified By 10 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	103.798	69.622
2	112.743	65.151
3	122.482	62.879
4	132.482	62.930
5	142.197	65.301
6	151.095	69.863
7	158.692	76.366
8	164.571	84.456
9	168.412	93.689
10	169.791	102.245

Circle Center At X = 127.249 ; Y = 105.244 ; and Radius = 42.648

Factor of Safety

*** 2.196 ***

Failure Surface Specified By 10 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	118.915	69.858
2	128.614	67.426
3	138.604	66.969
4	148.485	68.505
5	157.865	71.972
6	166.369	77.234
7	173.659	84.079
8	179.444	92.236
9	183.494	101.379
10	183.761	102.594

Circle Center At X = 135.898 ; Y = 116.811 ; and Radius = 49.930

Factor of Safety

*** 2.212 ***

Failure Surface Specified By 10 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	109.845	69.716
2	118.901	65.474
3	128.674	63.360
4	138.674	63.478
5	148.395	65.824
6	157.347	70.279
7	165.081	76.619
8	171.205	84.525
9	175.411	93.597
10	177.287	102.432

Circle Center At X = 133.138 ; Y = 107.570 ; and Radius = 44.447

Factor of Safety

*** 2.227 ***

Failure Surface Specified By 9 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	119.922	69.874
2	129.301	66.402
3	139.256	65.460
4	149.119	67.111
5	158.225	71.243
6	165.962	77.579
7	171.809	85.691
8	175.373	95.035
9	176.143	102.404

Circle Center At X = 137.879 ; Y = 103.982 ; and Radius = 38.546

Factor of Safety

*** 2.249 ***

Failure Surface Specified By 9 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	121.938	69.905
2	131.475	66.897
3	141.462	66.387
4	151.255	68.408
5	160.225	72.830
6	167.792	79.368
7	173.469	87.600
8	176.890	96.996
9	177.407	102.435

Circle Center At X = 138.461 ; Y = 105.669 ; and Radius = 39.396

Factor of Safety

*** 2.251 ***

**** END OF GSTABL7 OUTPUT ****

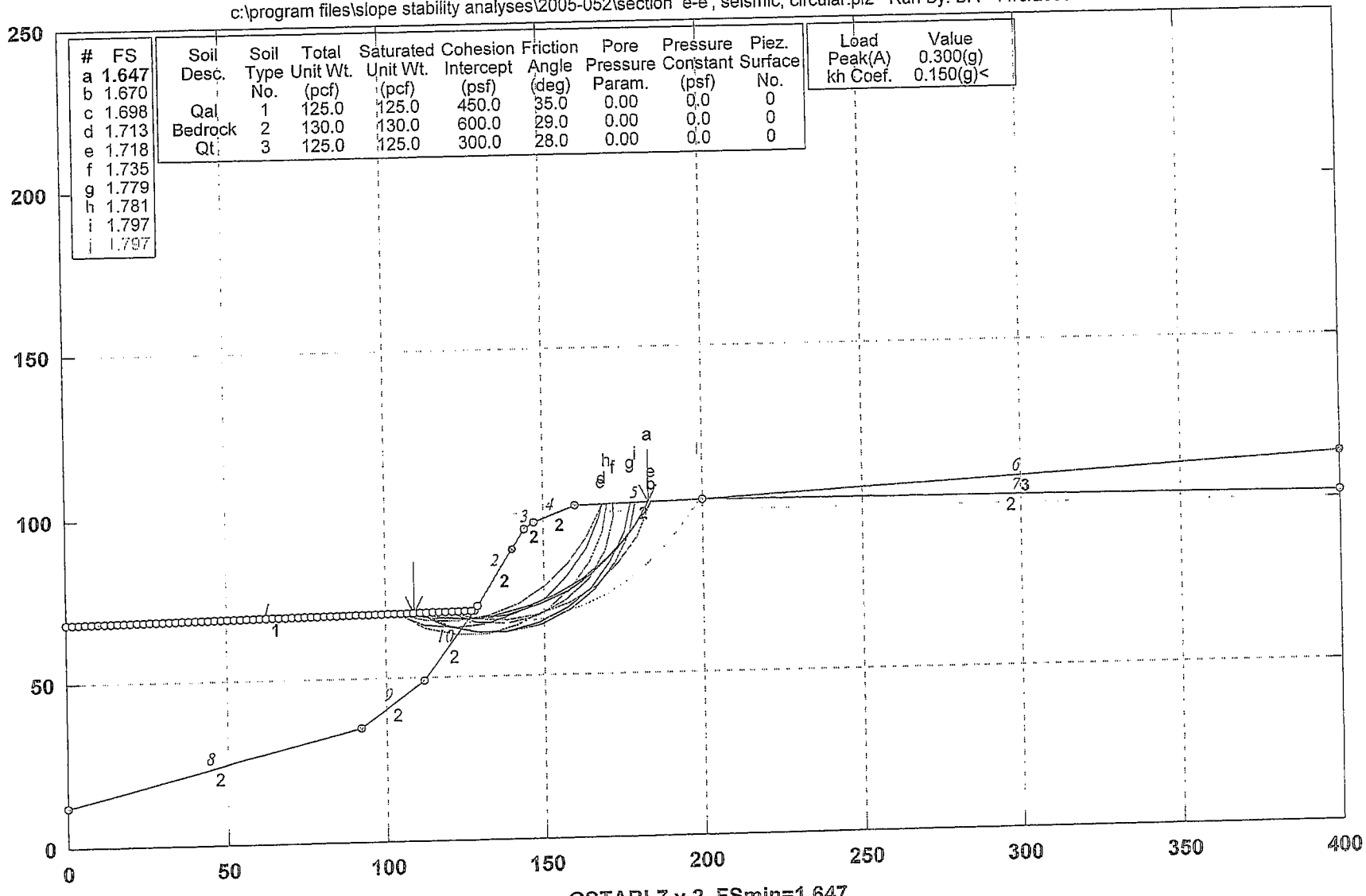
Cross Section E-E', Seismic, circular Vista Canyon Ranch

c:\program files\slope stability analyses\2005-052\section e-e', seismic, circular.pl2 Run By: DA 11/5/2008 03:35PM

#	FS
a	1.647
b	1.670
c	1.698
d	1.713
e	1.718
f	1.735
g	1.779
h	1.781
i	1.797
j	1.797

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.
Qal	1	125.0	125.0	450.0	35.0	0.00	0.0	0
Bedrock	2	130.0	130.0	600.0	29.0	0.00	0.0	0
Qt	3	125.0	125.0	300.0	28.0	0.00	0.0	0

Load	Value
Peak(A)	0.300(g)
kh Coef.	0.150(g)<



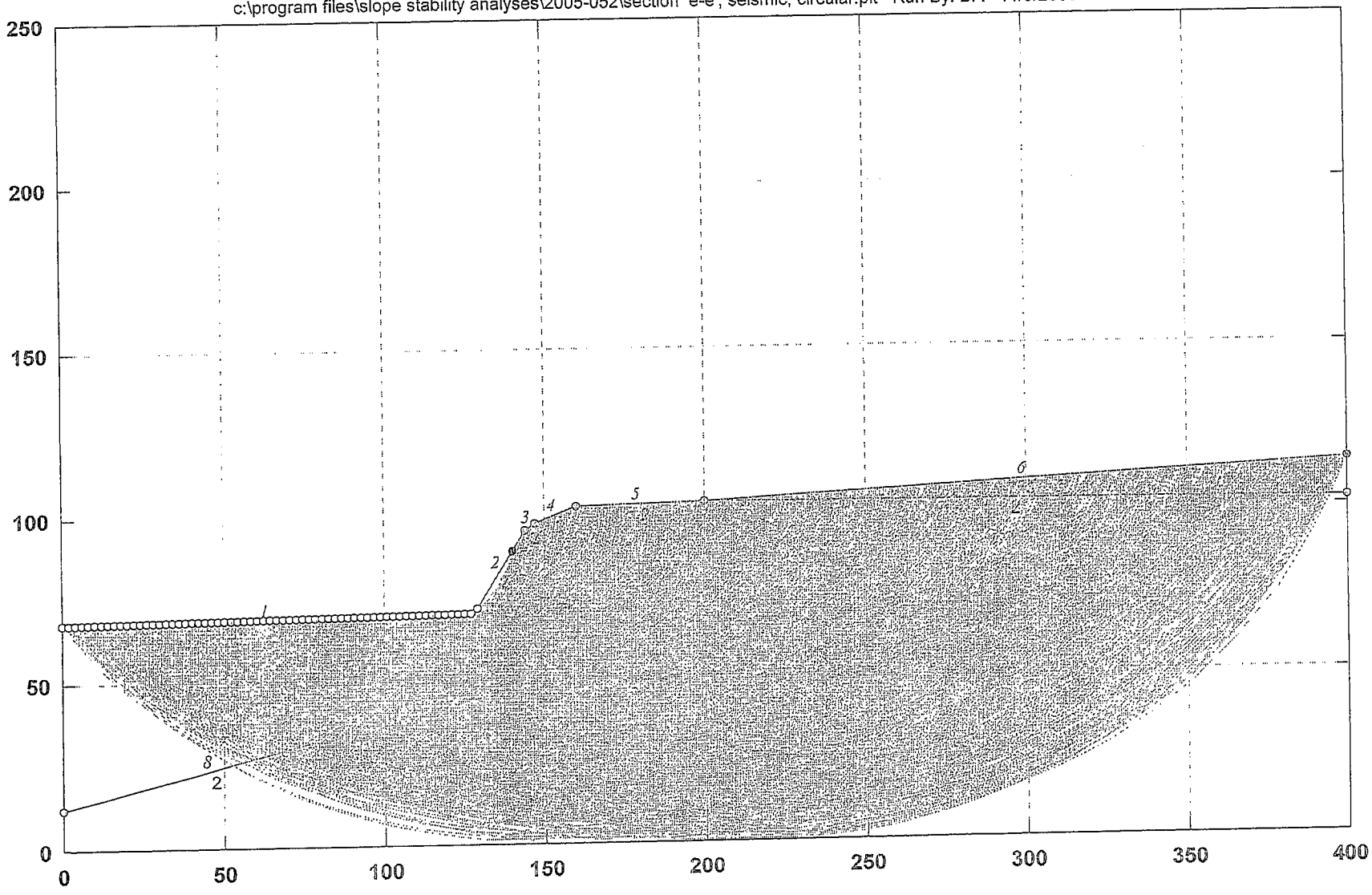
GSTABL7 v.2 FSmin=1.647

Safety Factors Are Calculated By The Modified Bishop Method

GSTABL7

Cross Section E-E', Seismic, circular Vista Canyon Ranch

c:\program files\slope stability analyses\2005-052\section e-e', seismic, circular.plt · Run By: DA 11/5/2008 03:35PM



GSTABL7

*** GSTABL7 ***
** GSTABL7 by Garry H. Gregory, P.E. **
** Original Version 1.0, January 1996; Current Version 2.004, June 2003 **

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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: 11/5/2008
Time of Run: 03:35PM
Run By: DA
Input Data Filename: C:\Program Files\Slope stability analyses\2005-052\section E-E', seismic, circular.in
Output Filename: C:\Program Files\Slope stability analyses\2005-052\section E-E', seismic, circular.OUT
Unit System: English
Plotted Output Filename: C:\Program Files\Slope stability analyses\2005-052\section E-E', seismic, circular.PLT

PROBLEM DESCRIPTION: Cross Section E-E', Seismic, circular
Vista Canyon Ranch

BOUNDARY COORDINATES
6 Top Boundaries
10 Total Boundaries

Boundary No.	X-Left (ft)	Y-Left (ft)	X-Right (ft)	Y-Right (ft)	Soil Type Below Bnd
1	0.00	68.00	128.00	70.00	1
2	128.00	70.00	144.00	95.00	2
3	144.00	95.00	147.00	97.00	2
4	147.00	97.00	160.00	102.00	2
5	160.00	102.00	200.00	103.00	2
6	200.00	103.00	400.00	114.00	3
7	200.00	103.00	400.00	102.00	2
8	0.00	12.00	92.00	35.00	2
9	92.00	35.00	112.00	49.00	2
10	112.00	49.00	128.00	70.00	2

Default Y-Origin = 0.00(ft)
Default X-Plus Value = 0.00(ft)
Default Y-Plus Value = 0.00(ft)

ISOTROPIC SOIL PARAMETERS
3 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	125.0	125.0	450.0	35.0	0.00	0.0	0
2	130.0	130.0	600.0	29.0	0.00	0.0	0
3	125.0	125.0	300.0	28.0	0.00	0.0	0

Specified Peak Ground Acceleration Coefficient (A) = 0.300(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.
1300 Trial Surfaces Have Been Generated.
10 Surface(s) Initiate(s) From Each Of 130 Points Equally Spaced
Along The Ground Surface Between X = 0.00(ft)
and X = 130.00(ft)
Each Surface Terminates Between X = 140.00(ft)
and X = 400.00(ft)
Unless Further Limitations Were Imposed, The Minimum Elevation
At Which A Surface Extends Is Y = 0.00(ft)
10.00(ft) Line Segments Define Each Trial Failure Surface.
Restrictions Have Been Imposed Upon The Angle Of Initiation.

The Angle Has Been Restricted Between The Angles Of -50.0
And -10.0 deg.
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 = 1300
Number of Trial Surfaces With Valid FS = 1300
Statistical Data On All Valid FS Values:
FS Max = 7.492 FS Min = 1.647 FS Ave = 2.891
Standard Deviation = 0.732 Coefficient of Variation = 25.31 %
Failure Surface Specified By 10 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	108.837	69.701
2	118.657	67.813
3	128.651	67.466
4	138.579	68.667
5	148.202	71.387
6	157.289	75.561
7	165.622	81.089
8	173.001	87.838
9	179.249	95.646
10	183.216	102.580

Circle Center At X = 125.901 ; Y = 131.667 ; and Radius = 64.273
Factor of Safety
*** 1.647 ***
Individual data on the 14 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	1252.6	0.0	0.0	0.	0.	187.9	0.0	0.0
2	7.5	2083.8	0.0	0.0	0.	0.	312.6	0.0	0.0
3	1.9	586.0	0.0	0.0	0.	0.	87.9	0.0	0.0
4	0.7	256.7	0.0	0.0	0.	0.	38.5	0.0	0.0
5	9.9	13819.2	0.0	0.0	0.	0.	2072.9	0.0	0.0
6	5.4	15033.2	0.0	0.0	0.	0.	2255.0	0.0	0.0
7	3.0	9897.1	0.0	0.0	0.	0.	1484.6	0.0	0.0
8	1.2	4064.9	0.0	0.0	0.	0.	609.7	0.0	0.0
9	9.1	30402.6	0.0	0.0	0.	0.	4560.4	0.0	0.0
10	2.7	8816.9	0.0	0.0	0.	0.	1322.5	0.0	0.0
11	5.6	16697.9	0.0	0.0	0.	0.	2504.7	0.0	0.0
12	7.4	17045.4	0.0	0.0	0.	0.	2556.8	0.0	0.0
13	6.2	8658.7	0.0	0.0	0.	0.	1298.8	0.0	0.0
14	4.0	1762.7	0.0	0.0	0.	0.	264.4	0.0	0.0

Failure Surface Specified By 11 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	104.806	69.638
2	114.649	67.870
3	124.641	67.489
4	134.590	68.501
5	144.301	70.886
6	153.586	74.599
7	162.265	79.568
8	170.168	85.694
9	177.143	92.861
10	183.052	100.928
11	183.950	102.599

Circle Center At X = 122.375 ; Y = 139.183 ; and Radius = 71.730
Factor of Safety
*** 1.670 ***
Failure Surface Specified By 10 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	102.791	69.606

2	112.537	67.367
3	122.532	67.044
4	132.402	68.650
5	141.779	72.123
6	150.314	77.334
7	157.687	84.090
8	163.623	92.137
9	167.902	101.176
10	168.162	102.204

Circle Center At X = 119.208 ; Y = 118.529 ; and Radius = 51.604

Factor of Safety

*** 1.698 ***

Failure Surface Specified By 10 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	102.791	69.606
2	112.198	66.215
3	122.114	64.922
4	132.077	65.788
5	141.621	68.771
6	150.303	73.734
7	157.717	80.444
8	163.519	88.589
9	167.437	97.790
10	168.270	102.207

Circle Center At X = 123.102 ; Y = 110.868 ; and Radius = 45.990

Factor of Safety

*** 1.713 ***

Failure Surface Specified By 10 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	118.915	69.858
2	128.614	67.426
3	138.604	66.969
4	148.485	68.505
5	157.865	71.972
6	166.369	77.234
7	173.659	84.079
8	179.444	92.236
9	183.494	101.379
10	183.761	102.594

Circle Center At X = 135.898 ; Y = 116.811 ; and Radius = 49.930

Factor of Safety

*** 1.718 ***

Failure Surface Specified By 9 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	118.915	69.858
2	128.375	66.616
3	138.357	66.024
4	148.134	68.126
5	156.991	72.768
6	164.283	79.611
7	169.478	88.155
8	172.196	97.779
9	172.216	102.305

Circle Center At X = 135.536 ; Y = 102.938 ; and Radius = 37.021

Factor of Safety

*** 1.735 ***

Failure Surface Specified By 10 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	109.845	69.716
2	118.901	65.474
3	128.674	63.360
4	138.674	63.478
5	148.395	65.824

6	157.347	70.279
7	165.081	76.619
8	171.205	84.525
9	175.411	93.597
10	177.287	102.432

Circle Center At X = 133.138 ; Y = 107.570 ; and Radius = 44.447

Factor of Safety
*** 1.779 ***

Failure Surface Specified By 10 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	103.798	69.622
2	112.743	65.151
3	122.482	62.879
4	132.482	62.930
5	142.197	65.301
6	151.095	69.863
7	158.692	76.366
8	164.571	84.456
9	168.412	93.689
10	169.791	102.245

Circle Center At X = 127.249 ; Y = 105.244 ; and Radius = 42.648

Factor of Safety
*** 1.781 ***

Failure Surface Specified By 10 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	110.853	69.732
2	119.906	65.485
3	129.673	63.338
4	139.673	63.396
5	149.414	65.656
6	158.418	70.007
7	166.241	76.236
8	172.500	84.035
9	176.886	93.022
10	179.118	102.478

Circle Center At X = 134.410 ; Y = 108.152 ; and Radius = 45.067

Factor of Safety
*** 1.797 ***

Failure Surface Specified By 12 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	111.860	69.748
2	121.516	67.145
3	131.438	65.898
4	141.437	66.030
5	151.322	67.538
6	160.906	70.394
7	170.004	74.544
8	178.444	79.908
9	186.064	86.383
10	192.719	93.847
11	198.282	102.157
12	198.675	102.967

Circle Center At X = 135.487 ; Y = 138.052 ; and Radius = 72.275

Factor of Safety
*** 1.797 ***

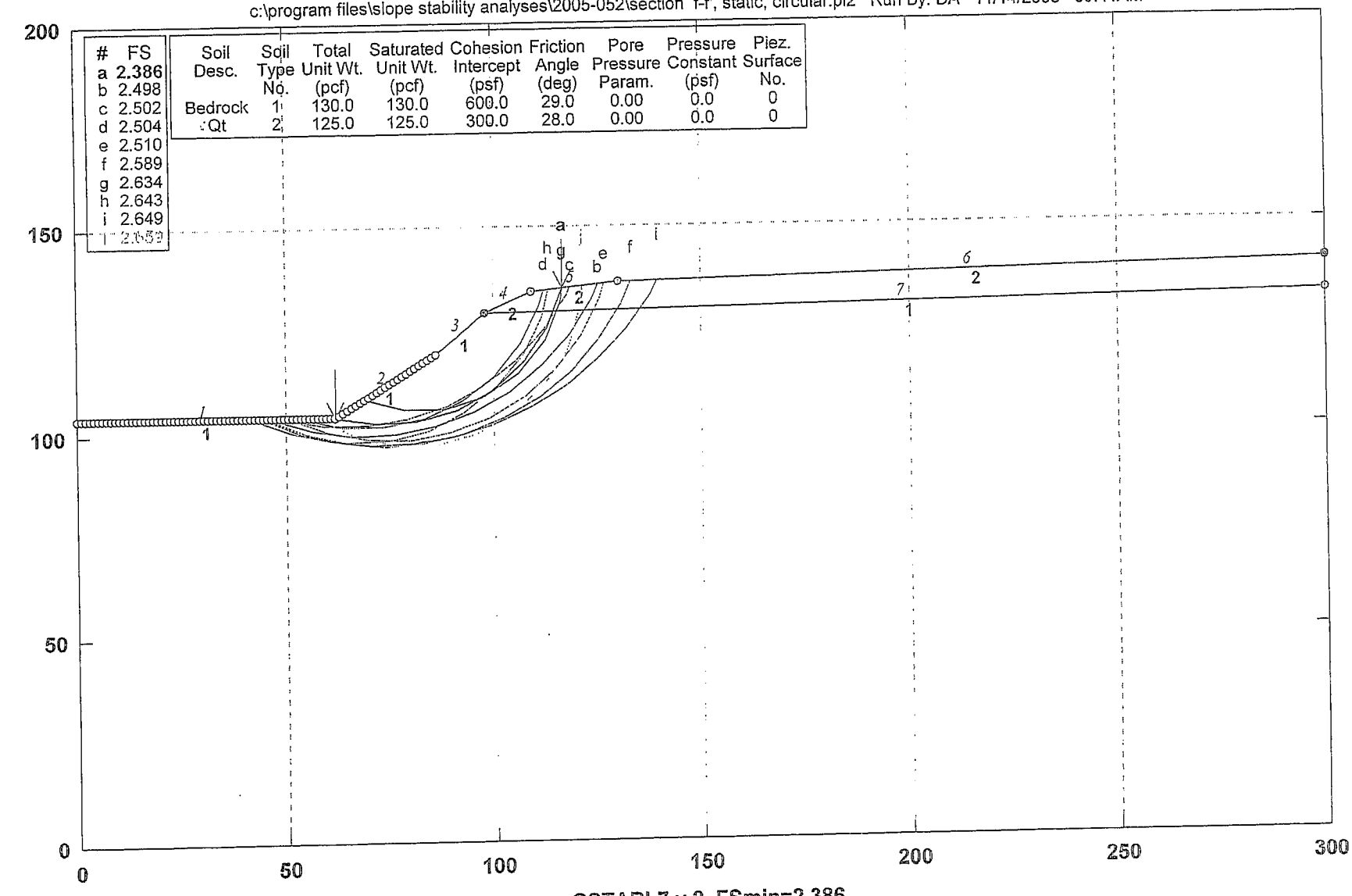
**** END OF GSTABL7 OUTPUT ****

Cross Section F-F', Static, circular Vista Canyon Ranch

c:\program files\slope stability analyses\2005-052\section f-f', static, circular.pl2 Run By: DA 11/14/2008 09:41AM

#	FS
a	2.386
b	2.498
c	2.502
d	2.504
e	2.510
f	2.589
g	2.634
h	2.643
i	2.649
j	2.659

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	130.0	130.0	600.0	29.0	0.00	0.0	0
Qt	2	125.0	125.0	300.0	28.0	0.00	0.0	0



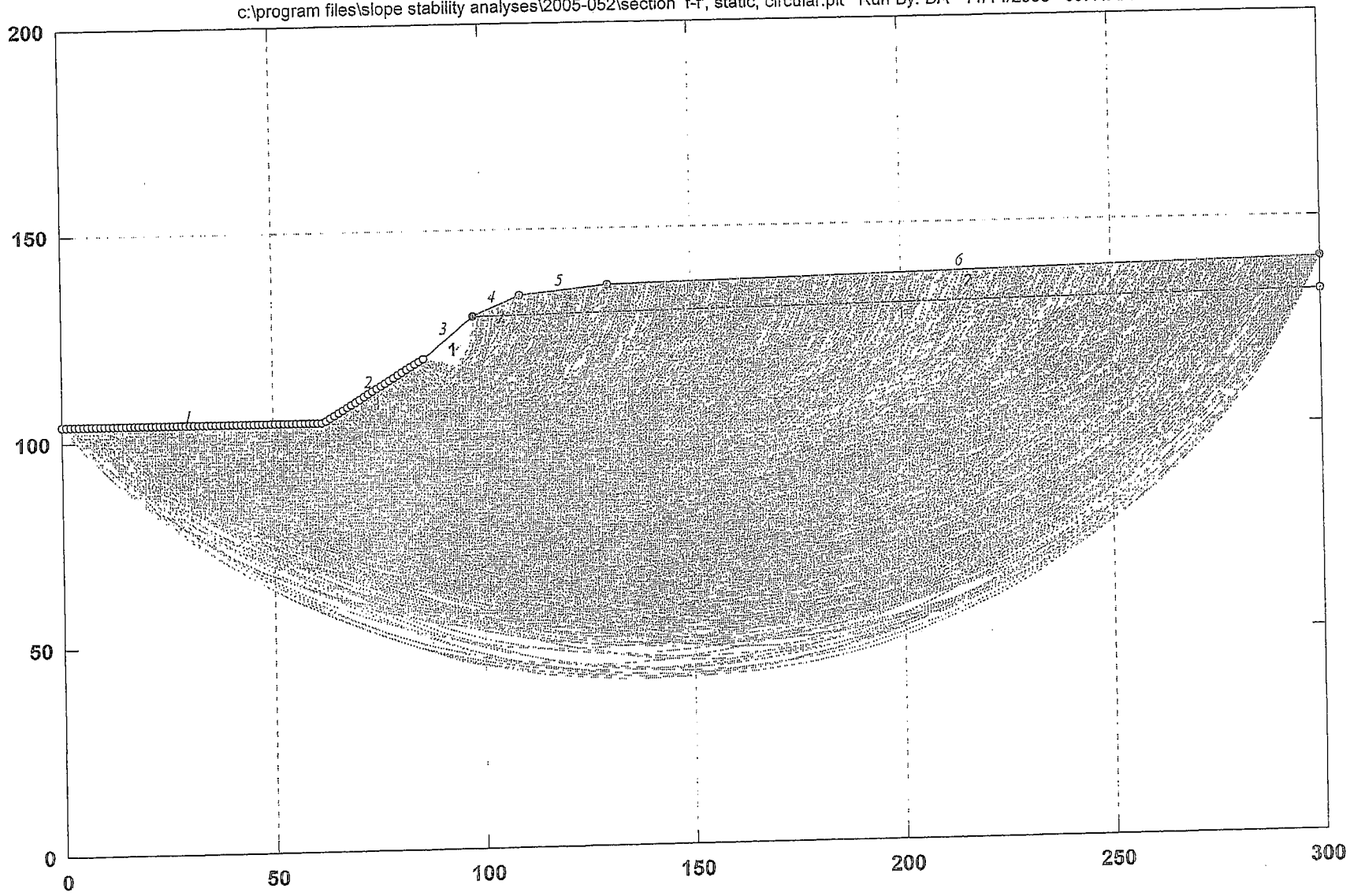
GSTABL7 v.2 FSmin=2.386

Safety Factors Are Calculated By The Modified Bishop Method

GSTABL7

Cross Section F-F', Static, circular Vista Canyon Ranch

c:\program files\slope stability analyses\2005-052\section f-f', static, circular.plt Run By: DA 11/14/2008 09:41AM



GSTABL7

*** GSTABL7 ***
** GSTABL7 by Garry H. Gregory, P.E. **
** Original Version 1.0, January 1996; Current Version 2.004, June 2003 **

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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: 11/14/2008
Time of Run: 09:41AM
Run By: DA
Input Data Filename: C:\Program Files\Slope stability analyses\2005-052\section f-f', static, circular.in
Output Filename: C:\Program Files\Slope stability analyses\2005-052\section f-f', static, circular.OUT
Unit System: English
Plotted Output Filename: C:\Program Files\Slope stability analyses\2005-052\section f-f', static, circular.PLT
PROBLEM DESCRIPTION: Cross Section F-F', Static, circular
Vista Canyon Ranch

BOUNDARY COORDINATES
6 Top Boundaries
7 Total Boundaries

Boundary No.	X-Left (ft)	Y-Left (ft)	X-Right (ft)	Y-Right (ft)	Soil Type Below Bnd
1	0.00	104.00	62.00	104.00	1
2	62.00	104.00	86.00	119.00	1
3	86.00	119.00	98.00	129.00	1
4	98.00	129.00	109.00	134.00	2
5	109.00	134.00	130.00	136.00	2
6	130.00	136.00	300.00	140.00	2
7	98.00	129.00	300.00	132.00	1

Default Y-Origin = 0.00(ft)
Default X-Plus Value = 0.00(ft)
Default Y-Plus Value = 0.00(ft)

ISOTROPIC SOIL PARAMETERS
2 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	130.0	130.0	600.0	29.0	0.00	0.0	0
2	125.0	125.0	300.0	28.0	0.00	0.0	0

A Critical Failure Surface Searching Method, Using A Random
Technique For Generating Circular Surfaces, Has Been Specified.
860 Trial Surfaces Have Been Generated.
10 Surface(s) Initiate(s) From Each Of 86 Points Equally Spaced
Along The Ground Surface Between X = 0.00(ft)
and X = 86.00(ft)
Each Surface Terminates Between X = 98.00(ft)
and X = 300.00(ft)
Unless Further Limitations Were Imposed, The Minimum Elevation
At Which A Surface Extends Is Y = 0.00(ft)
10.00(ft) Line Segments Define Each Trial Failure Surface.
Restrictions Have Been Imposed Upon The Angle Of Initiation.
The Angle Has Been Restricted Between The Angles Of -50.0
And -10.0 deg.
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 = 860
Number of Trial Surfaces With Valid FS = 860

Statistical Data On All Valid FS Values:
FS Max = 19.098 FS Min = 2.386 FS Ave = 5.654
Standard Deviation = 2.710 Coefficient of Variation = 47.92 %

Failure Surface Specified By 8 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	61.718	104.000
2	71.554	102.196
3	81.541	102.691
4	91.150	105.459
5	99.871	110.354
6	107.239	117.115
7	112.864	125.383
8	116.442	134.709

Circle Center At X = 74.413 ; Y = 145.492 ; and Radius = 43.391

Factor of Safety
*** 2.386 ***

Individual data on the 12 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	0.3	1.0	0.0	0.0	0.	0.	0.0	0.0	0.0
2	9.6	4860.4	0.0	0.0	0.	0.	0.0	0.0	0.0
3	10.0	13826.4	0.0	0.0	0.	0.	0.0	0.0	0.0
4	4.5	8273.3	0.0	0.0	0.	0.	0.0	0.0	0.0
5	5.2	10999.7	0.0	0.0	0.	0.	0.0	0.0	0.0
6	6.8	16708.5	0.0	0.0	0.	0.	0.0	0.0	0.0
7	1.9	4761.5	0.0	0.0	0.	0.	0.0	0.0	0.0
8	7.4	16950.7	0.0	0.0	0.	0.	0.0	0.0	0.0
9	1.8	3438.7	0.0	0.0	0.	0.	0.0	0.0	0.0
10	3.9	5750.3	0.0	0.0	0.	0.	0.0	0.0	0.0
11	1.5	1333.5	0.0	0.0	0.	0.	0.0	0.0	0.0
12	2.1	690.4	0.0	0.0	0.	0.	0.0	0.0	0.0

Failure Surface Specified By 11 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	46.541	104.000
2	56.068	100.960
3	65.963	99.519
4	75.962	99.716
5	85.793	101.547
6	95.192	104.961
7	103.906	109.866
8	111.700	116.131
9	118.365	123.586
10	123.720	132.032
11	125.208	135.544

Circle Center At X = 69.764 ; Y = 160.324 ; and Radius = 60.923

Factor of Safety
*** 2.498 ***

Failure Surface Specified By 10 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	49.576	104.000
2	59.395	102.106
3	69.393	101.902
4	79.281	103.395
5	88.774	106.541
6	97.596	111.249
7	105.494	117.383
8	112.238	124.766
9	117.635	133.184
10	118.357	134.891

Circle Center At X = 65.607 ; Y = 160.325 ; and Radius = 58.561

Factor of Safety
*** 2.502 ***

Failure Surface Specified By 9 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	53.624	104.000
2	63.337	101.625
3	73.336	101.457
4	83.124	103.507
5	92.215	107.671
6	100.161	113.743
7	106.565	121.423
8	111.112	130.330
9	112.120	134.297

Circle Center At X = 69.083 ; Y = 146.171 ; and Radius = 44.915

Factor of Safety

*** 2.504 ***

Failure Surface Specified By 11 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	50.588	104.000
2	59.898	100.349
3	69.716	98.452
4	79.716	98.372
5	89.564	100.112
6	98.931	103.613
7	107.505	108.759
8	115.000	115.379
9	121.167	123.251
10	125.800	132.113
11	126.906	135.705

Circle Center At X = 75.153 ; Y = 152.946 ; and Radius = 54.764

Factor of Safety

*** 2.510 ***

Failure Surface Specified By 12 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	44.518	104.000
2	53.740	100.133
3	63.448	97.736
4	73.411	96.868
5	83.387	97.549
6	93.139	99.763
7	102.432	103.456
8	111.043	108.540
9	118.766	114.893
10	125.415	122.362
11	130.830	130.769
12	133.182	136.075

Circle Center At X = 73.990 ; Y = 161.113 ; and Radius = 64.269

Factor of Safety

*** 2.589 ***

Failure Surface Specified By 8 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	68.800	108.250
2	78.447	105.617
3	88.444	105.842
4	97.963	108.908
5	106.213	114.560
6	112.509	122.329
7	116.330	131.570
8	116.657	134.729

Circle Center At X = 82.680 ; Y = 139.650 ; and Radius = 34.331

Factor of Safety

*** 2.634 ***

Failure Surface Specified By 10 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)

1	45.529	104.000
2	54.679	99.964
3	64.484	98.000
4	74.482	98.202
5	84.200	100.560
6	93.179	104.962
7	100.995	111.200
8	107.278	118.980
9	111.731	127.933
10	113.342	134.414

Circle Center At X = 68.533 ; Y = 143.516 ; and Radius = 45.724

Factor of Safety

*** 2.643 ***

Failure Surface Specified By 13 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	41.482	104.000
2	50.834	100.457
3	60.568	98.168
4	70.518	97.170
5	80.513	97.482
6	90.382	99.098
7	99.955	101.990
8	109.067	106.109
9	117.563	111.384
10	125.296	117.724
11	132.134	125.020
12	137.960	133.148
13	139.605	136.226

Circle Center At X = 73.140 ; Y = 173.455 ; and Radius = 76.330

Factor of Safety

*** 2.649 ***

Failure Surface Specified By 10 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	57.671	104.000
2	66.569	99.437
3	76.305	97.157
4	86.304	97.296
5	95.974	99.845
6	104.742	104.654
7	112.089	111.438
8	117.581	119.795
9	120.892	129.231
10	121.451	135.186

Circle Center At X = 80.704 ; Y = 137.707 ; and Radius = 40.825

Factor of Safety

*** 2.659 ***

**** END OF GSTABL7 OUTPUT ****

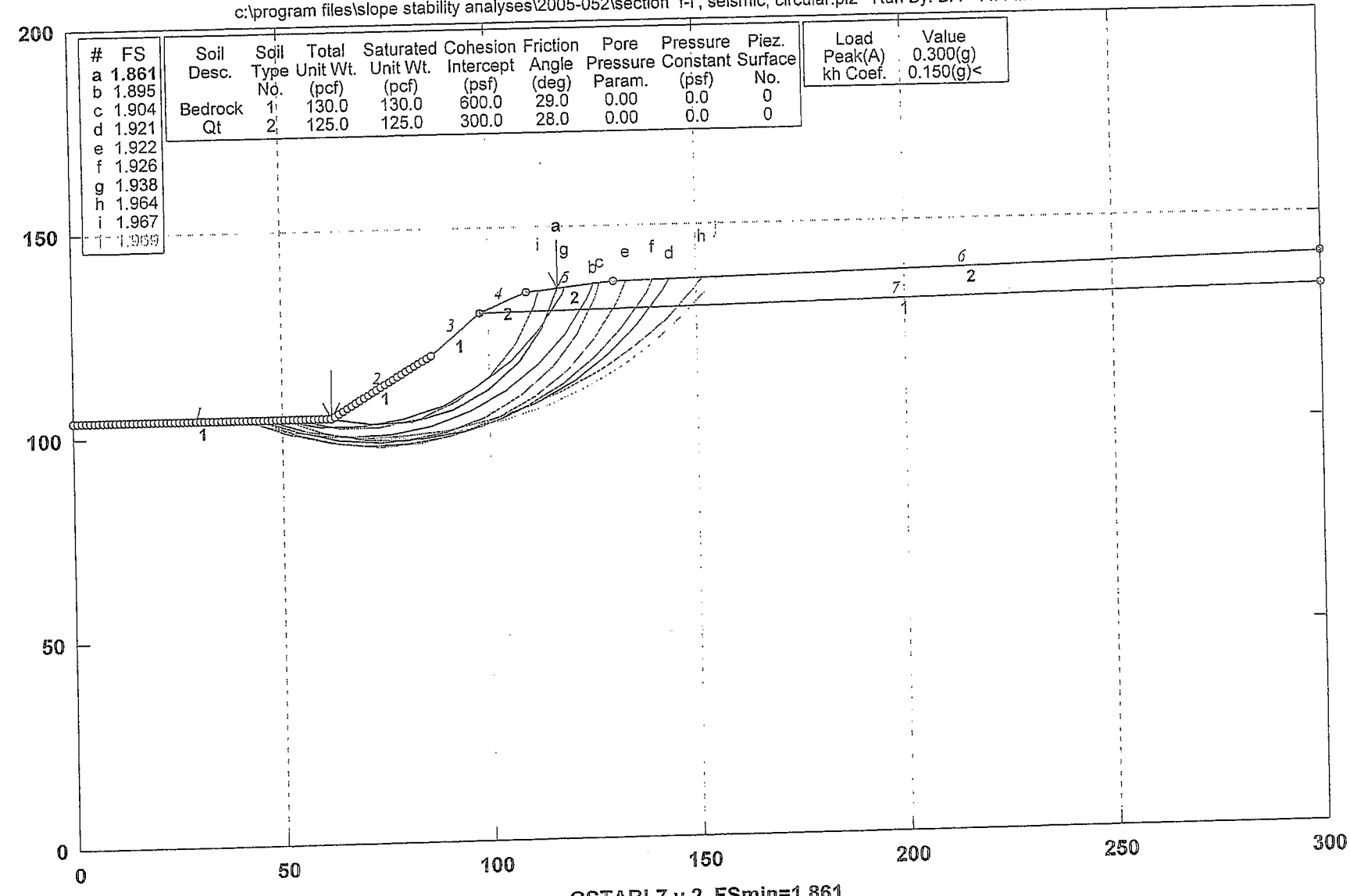
Cross Section F-F', Seismic, circular Vista Canyon Ranch

c:\program files\slope stability analyses\2005-052\section f-f', seismic, circular.pl2 Run By: DA 11/14/2008 09:45AM

#	FS
a	1.861
b	1.895
c	1.904
d	1.921
e	1.922
f	1.926
g	1.938
h	1.964
i	1.967
j	1.969

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	130.0	130.0	600.0	29.0	0.00	0.0	0
Qt	2	125.0	125.0	300.0	28.0	0.00	0.0	0

Load	Value
Peak(A)	0.300(g)
kh Coef.	0.150(g)<



GSTABL7 v.2 FSmin=1.861

Safety Factors Are Calculated By The Modified Bishop Method

GSTABL7

*** GSTABL7 ***

** GSTABL7 by Garry H. Gregory, P.E. **

** Original Version 1.0, January 1996; Current Version 2.004, June 2003 **

****

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: 11/14/2008
Time of Run: 09:45AM
Run By: DA
Input Data Filename: C:\Program Files\Slope stability analyses\2005-052\section f-f', seismic, circular.in
Output Filename: C:\Program Files\Slope stability analyses\2005-052\section f-f', seismic, circular.OUT
Unit System: English
Plotted Output Filename: C:\Program Files\Slope stability analyses\2005-052\section f-f', seismic, circular.PLT
PROBLEM DESCRIPTION: Cross Section F-F', Seismic, circular
Vista Canyon Ranch

BOUNDARY COORDINATES
6 Top Boundaries
7 Total Boundaries

Boundary No.	X-Left (ft)	Y-Left (ft)	X-Right (ft)	Y-Right (ft)	Soil Type Below Bnd
1	0.00	104.00	62.00	104.00	1
2	62.00	104.00	86.00	119.00	1
3	86.00	119.00	98.00	129.00	1
4	98.00	129.00	109.00	134.00	2
5	109.00	134.00	130.00	136.00	2
6	130.00	136.00	300.00	140.00	2
7	98.00	129.00	300.00	132.00	1

Default Y-Origin = 0.00(ft)
Default X-Plus Value = 0.00(ft)
Default Y-Plus Value = 0.00(ft)

ISOTROPIC SOIL PARAMETERS
2 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	130.0	130.0	600.0	29.0	0.00	0.0	0
2	125.0	125.0	300.0	28.0	0.00	0.0	0

Specified Peak Ground Acceleration Coefficient (A) = 0.300(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.
860 Trial Surfaces Have Been Generated.
10 Surface(s) Initiate(s) From Each Of 86 Points Equally Spaced
Along The Ground Surface Between X = 0.00(ft)
and X = 86.00(ft)
Each Surface Terminates Between X = 98.00(ft)
and X = 300.00(ft)
Unless Further Limitations Were Imposed, The Minimum Elevation
At Which A Surface Extends Is Y = 0.00(ft)
10.00(ft) Line Segments Define Each Trial Failure Surface.
Restrictions Have Been Imposed Upon The Angle Of Initiation.
The Angle Has Been Restricted Between The Angles Of -50.0
And -10.0 deg.
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 = 860
Number of Trial Surfaces With Valid FS = 860
Statistical Data On All Valid FS Values:
FS Max = 5.155 FS Min = 1.861 FS Ave = 3.010
Standard Deviation = 0.699 Coefficient of Variation = 23.23 %
Failure Surface Specified By 8 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	61.718	104.000
2	71.554	102.196
3	81.541	102.691
4	91.150	105.459
5	99.871	110.354
6	107.239	117.115
7	112.864	125.383
8	116.442	134.709

Circle Center At X = 74.413 ; Y = 145.492 ; and Radius = 43.391
Factor of Safety
*** 1.861 ***
Individual data on the 12 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)	Surcharge Ver (lbs)	Surcharge Load (lbs)
1	0.3	1.0	0.0	0.0	0.	0.	0.1	0.0	0.0
2	9.6	4860.4	0.0	0.0	0.	0.	729.1	0.0	0.0
3	10.0	13826.4	0.0	0.0	0.	0.	2074.0	0.0	0.0
4	4.5	8273.3	0.0	0.0	0.	0.	1241.0	0.0	0.0
5	5.2	10999.7	0.0	0.0	0.	0.	1650.0	0.0	0.0
6	6.8	16708.5	0.0	0.0	0.	0.	2506.3	0.0	0.0
7	1.9	4761.5	0.0	0.0	0.	0.	714.2	0.0	0.0
8	7.4	16950.7	0.0	0.0	0.	0.	2542.6	0.0	0.0
9	1.8	3438.7	0.0	0.0	0.	0.	515.8	0.0	0.0
10	3.9	5750.3	0.0	0.0	0.	0.	862.5	0.0	0.0
11	1.5	1333.5	0.0	0.0	0.	0.	200.0	0.0	0.0
12	2.1	690.4	0.0	0.0	0.	0.	103.6	0.0	0.0

Failure Surface Specified By 11 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	46.541	104.000
2	56.068	100.960
3	65.963	99.519
4	75.962	99.716
5	85.793	101.547
6	95.192	104.961
7	103.906	109.866
8	111.700	116.131
9	118.365	123.586
10	123.720	132.032
11	125.208	135.544

Circle Center At X = 69.764 ; Y = 160.324 ; and Radius = 60.923
Factor of Safety
*** 1.895 ***
Failure Surface Specified By 11 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	50.588	104.000
2	59.898	100.349
3	69.716	98.452
4	79.716	98.372
5	89.564	100.112
6	98.931	103.613
7	107.505	108.759
8	115.000	115.379
9	121.167	123.251

10	125.800	132.113
11	126.906	135.705

Circle Center At X = 75.153 ; Y = 152.946 ; and Radius = 54.764

Factor of Safety
*** 1.904 ***

Failure Surface Specified By 13 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	44.518	104.000
2	53.991	100.798
3	63.788	98.793
4	73.758	98.015
5	83.747	98.477
6	93.603	100.172
7	103.173	103.073
8	112.310	107.135
9	120.875	112.297
10	128.735	118.479
11	135.770	125.587
12	141.871	133.510
13	143.525	136.318

Circle Center At X = 75.033 ; Y = 178.670 ; and Radius = 80.665

Factor of Safety
*** 1.921 ***

Failure Surface Specified By 12 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	44.518	104.000
2	53.740	100.133
3	63.448	97.736
4	73.411	96.868
5	83.387	97.549
6	93.139	99.763
7	102.432	103.456
8	111.043	108.540
9	118.766	114.893
10	125.415	122.362
11	130.830	130.769
12	133.182	136.075

Circle Center At X = 73.990 ; Y = 161.113 ; and Radius = 64.269

Factor of Safety
*** 1.922 ***

Failure Surface Specified By 13 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	41.482	104.000
2	50.834	100.457
3	60.568	98.168
4	70.518	97.170
5	80.513	97.482
6	90.382	99.098
7	99.955	101.990
8	109.067	106.109
9	117.563	111.384
10	125.296	117.724
11	132.134	125.020
12	137.960	133.148
13	139.605	136.226

Circle Center At X = 73.140 ; Y = 173.455 ; and Radius = 76.330

Factor of Safety
*** 1.926 ***

Failure Surface Specified By 10 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	49.576	104.000
2	59.395	102.106
3	69.393	101.902

4	79.281	103.395
5	88.774	106.541
6	97.596	111.249
7	105.494	117.383
8	112.238	124.766
9	117.635	133.184
10	118.357	134.891

Circle Center At X = 65.607 ; Y = 160.325 ; and Radius = 58.561

Factor of Safety

*** 1.938 ***

Failure Surface Specified By 14 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	40.471	104.000
2	50.116	101.360
3	59.972	99.673
4	69.947	98.953
5	79.943	99.208
6	89.868	100.435
7	99.626	102.622
8	109.124	105.749
9	118.273	109.787
10	126.985	114.696
11	135.177	120.430
12	142.773	126.935
13	149.699	134.148
14	151.558	136.507

Circle Center At X = 72.328 ; Y = 201.198 ; and Radius = 102.286

Factor of Safety

*** 1.964 ***

Failure Surface Specified By 9 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	53.624	104.000
2	63.337	101.625
3	73.336	101.457
4	83.124	103.507
5	92.215	107.671
6	100.161	113.743
7	106.565	121.423
8	111.112	130.330
9	112.120	134.297

Circle Center At X = 69.083 ; Y = 146.171 ; and Radius = 44.915

Factor of Safety

*** 1.967 ***

Failure Surface Specified By 14 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	44.518	104.000
2	54.151	101.318
3	64.003	99.604
4	73.977	98.876
5	83.973	99.140
6	93.894	100.395
7	103.642	102.627
8	113.120	105.815
9	122.236	109.927
10	130.898	114.923
11	139.023	120.753
12	146.529	127.361
13	153.343	134.680
14	154.791	136.583

Circle Center At X = 76.309 ; Y = 199.301 ; and Radius = 100.464

Factor of Safety

*** 1.969 ***

**** END OF GSTABL7 OUTPUT ****

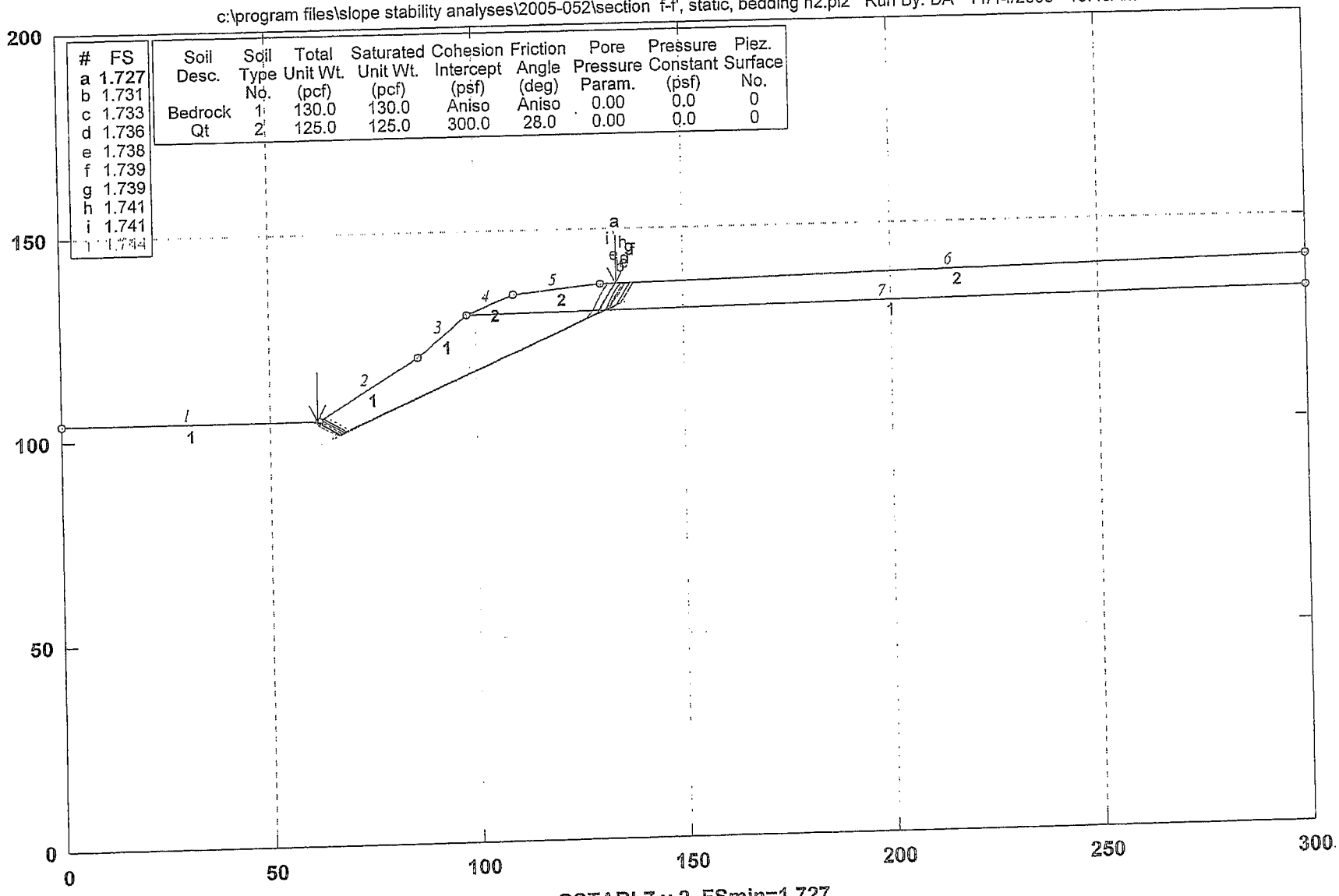
(MINIMUM F.S.)

Cross Section F-F', Static, bedding Vista Canyon Ranch

c:\program files\slope stability analyses\2005-052\section f-f', static, bedding h2.pl2 Run By: DA 11/14/2008 10:48AM

#	FS
a	1.727
b	1.731
c	1.733
d	1.736
e	1.738
f	1.739
g	1.739
h	1.741
i	1.741
j	1.744

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	130.0	130.0	Aniso	Aniso	0.00	0.0	0
Qt	2	125.0	125.0	300.0	28.0	0.00	0.0	0



GSTABL7 v.2 FSmin=1.727

Safety Factors Are Calculated By The Simplified Janbu Method for the case of c & phi both > 0

GSTABL7

*** GSTABL7 ***
** GSTABL7 by Garry H. Gregory, P.E. **
** Original Version 1.0, January 1996; Current Version 2.004, June 2003 **

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: 11/14/2008
Time of Run: 10:48AM
Run By: DA
Input Data Filename: C:\Program Files\Slope stability analyses\2005-052\section f-f', static, bedding H2.in
Output Filename: C:\Program Files\Slope stability analyses\2005-052\section f-f', static, bedding H2.OUT
Unit System: English
Plotted Output Filename: C:\Program Files\Slope stability analyses\2005-052\section f-f', static, bedding H2.PLT
PROBLEM DESCRIPTION: Cross Section F-F', Static, bedding
Vista Canyon Ranch

BOUNDARY COORDINATES
6 Top Boundaries
7 Total Boundaries

Boundary No.	X-Left (ft)	Y-Left (ft)	X-Right (ft)	Y-Right (ft)	Soil Type Below Bnd
1	0.00	104.00	62.00	104.00	1
2	62.00	104.00	86.00	119.00	1
3	86.00	119.00	98.00	129.00	1
4	98.00	129.00	109.00	134.00	2
5	109.00	134.00	130.00	136.00	2
6	130.00	136.00	300.00	140.00	2
7	98.00	129.00	300.00	132.00	1

Default Y-Origin = 0.00(ft)
Default X-Plus Value = 0.00(ft)
Default Y-Plus Value = 0.00(ft)

ISOTROPIC SOIL PARAMETERS
2 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	130.0	130.0	600.0	29.0	0.00	0.0	0
2	125.0	125.0	300.0	28.0	0.00	0.0	0

ANISOTROPIC STRENGTH PARAMETERS
1 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	23.5	600.00	29.00
2	26.5	250.00	22.00
3	90.0	600.00	29.00

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.
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.
100 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 5.0

Box No.	X-Left (ft)	Y-Left (ft)	X-Right (ft)	Y-Right (ft)	Height (ft)
1	62.00	98.33	82.00	107.67	0.00
2	126.00	127.00	136.00	131.67	0.00

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 = 100
Number of Trial Surfaces With Valid FS = 100
Statistical Data On All Valid FS Values:
FS Max = 2.000 FS Min = 1.727 FS Ave = 1.839
Standard Deviation = 0.076 Coefficient of Variation = 4.14 %
Failure Surface Specified By 7 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	61.345	104.000
2	62.696	103.204
3	67.004	100.667
4	129.395	128.586
5	129.919	129.474
6	132.494	133.760
7	133.895	136.092

Factor of Safety
*** 1.727 ***
Individual data on the 11 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	0.7	16.4	0.0	0.0	0.	0.	0.0	0.0	0.0
2	0.7	73.1	0.0	0.0	0.	0.	0.0	0.0	0.0
3	4.3	2153.7	0.0	0.0	0.	0.	0.0	0.0	0.0
4	19.0	20118.5	0.0	0.0	0.	0.	0.0	0.0	0.0
5	12.0	18950.8	0.0	0.0	0.	0.	0.0	0.0	0.0
6	11.0	20604.8	0.0	0.0	0.	0.	0.0	0.0	0.0
7	20.4	28452.8	0.0	0.0	0.	0.	0.0	0.0	0.0
8	0.5	454.9	0.0	0.0	0.	0.	0.0	0.0	0.0
9	0.1	65.6	0.0	0.0	0.	0.	0.0	0.0	0.0
10	2.5	1354.4	0.0	0.0	0.	0.	0.0	0.0	0.0
11	1.4	201.3	0.0	0.0	0.	0.	0.0	0.0	0.0

Failure Surface Specified By 7 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	63.075	104.672
2	64.297	103.952
3	68.605	101.415
4	130.977	129.324
5	131.076	129.491
6	133.651	133.777
7	135.058	136.119

Factor of Safety
*** 1.731 ***
Failure Surface Specified By 6 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	60.925	104.000
2	62.461	103.095
3	66.769	100.557
4	132.091	129.844

5	134.666	134.130
6	135.872	136.138

Factor of Safety
*** 1.733 ***

Failure Surface Specified By 6 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	62.973	104.608
2	64.180	103.898
3	68.488	101.360
4	132.325	129.954
5	134.900	134.240
6	136.043	136.142

Factor of Safety
*** 1.736 ***

Failure Surface Specified By 7 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	60.610	104.000
2	62.285	103.013
3	66.594	100.475
4	129.112	128.453
5	129.712	129.471
6	132.287	133.757
7	133.687	136.087

Factor of Safety
*** 1.738 ***

Failure Surface Specified By 6 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	62.022	104.014
2	63.086	103.387
3	67.394	100.849
4	134.903	131.158
5	137.478	135.444
6	137.925	136.186

Factor of Safety
*** 1.739 ***

Failure Surface Specified By 6 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	62.481	104.300
2	63.613	103.633
3	67.922	101.095
4	133.839	130.661
5	136.414	134.947
6	137.148	136.168

Factor of Safety
*** 1.739 ***

Failure Surface Specified By 6 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	60.189	104.000
2	62.051	102.903
3	66.359	100.366
4	131.807	129.712
5	134.383	133.998
6	135.666	136.133

Factor of Safety
*** 1.741 ***

Failure Surface Specified By 7 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	60.960	104.000
2	62.481	103.104
3	66.789	100.566
4	126.866	127.404

5	128.069	129.447
6	130.644	133.732
7	132.035	136.048

Factor of Safety

*** 1.741 ***

Failure Surface Specified By 7 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	63.602	105.001
2	64.903	104.235
3	69.211	101.697
4	129.015	128.408
5	129.640	129.470
6	132.215	133.756
7	133.615	136.085

Factor of Safety

*** 1.744 ***

**** END OF GSTABL7 OUTPUT ****

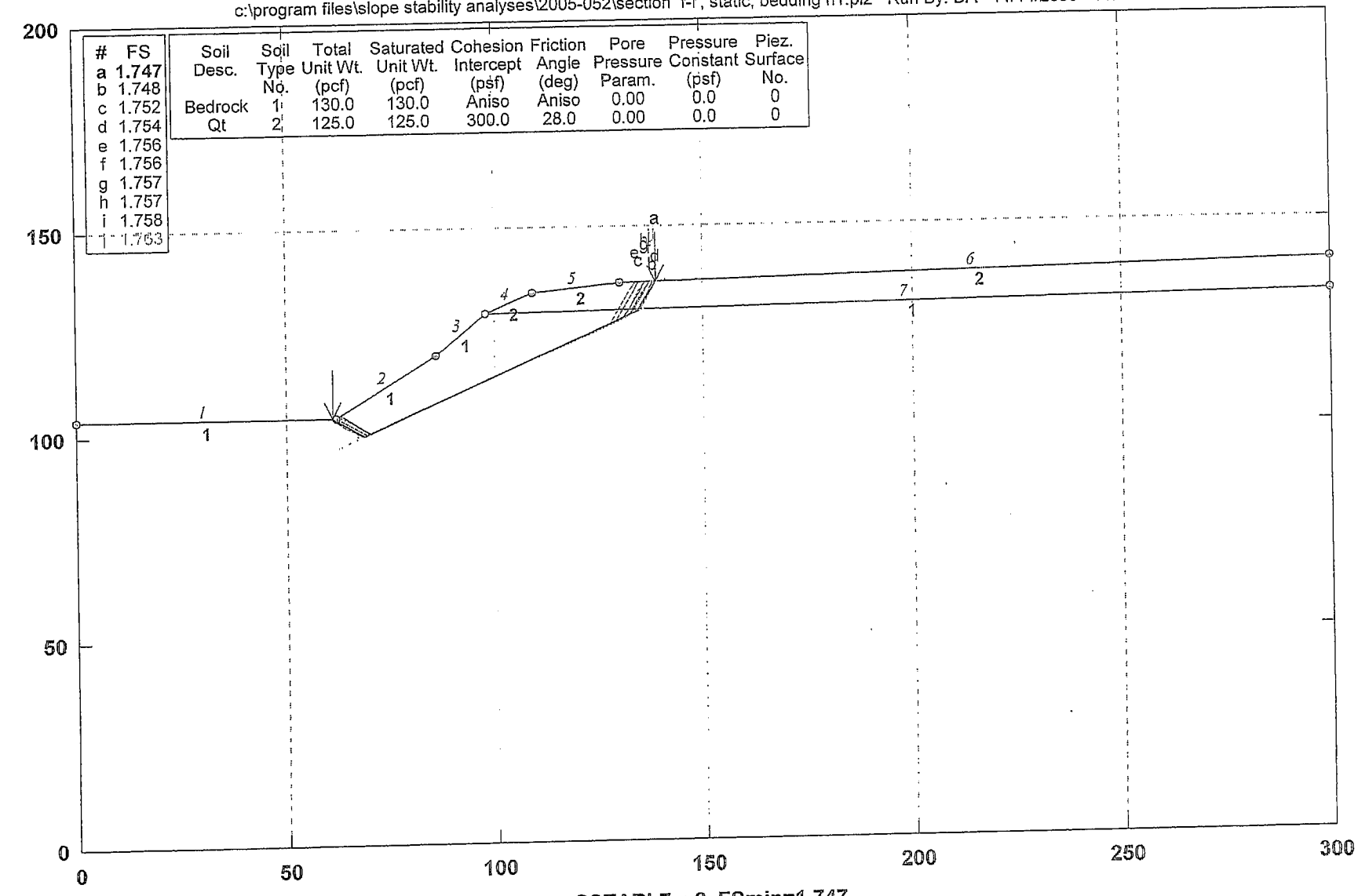
(DEEPER SEARCH)

Cross Section F-F', Static, bedding Vista Canyon Ranch

c:\program files\slope stability analyses\2005-052\section f-f', static, bedding h1.pl2 Run By: DA 11/14/2008 11:10AM

#	FS
a	1.747
b	1.748
c	1.752
d	1.754
e	1.756
f	1.756
g	1.757
h	1.757
i	1.758
j	1.763

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	130.0	130.0	Aniso	Aniso	0.00	0.0	0
Qt	2	125.0	125.0	300.0	28.0	0.00	0.0	0



GSTABL7 v.2 FSmin=1.747

Safety Factors Are Calculated By The Simplified Janbu Method for the case of c & phi both > 0

GSTABL7

*** GSTABL7 ***
** GSTABL7 by Garry H. Gregory, P.E. **
** Original Version 1.0, January 1996; Current Version 2.004, June 2003 **

****

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: 11/14/2008
Time of Run: 11:10AM
Run By: DA
Input Data Filename: C:\Program Files\Slope stability analyses\2005-052\section f-f', static, bedding h1.in
Output Filename: C:\Program Files\Slope stability analyses\2005-052\section f-f', static, bedding h1.OUT
Unit System: English
Plotted Output Filename: C:\Program Files\Slope stability analyses\2005-052\section f-f', static, bedding h1.PLT

PROBLEM DESCRIPTION: Cross Section F-F', Static, bedding
Vista Canyon Ranch

BOUNDARY COORDINATES
6 Top Boundaries
7 Total Boundaries

Boundary No.	X-Left (ft)	Y-Left (ft)	X-Right (ft)	Y-Right (ft)	Soil Type Below Bnd
1	0.00	104.00	62.00	104.00	1
2	62.00	104.00	86.00	119.00	1
3	86.00	119.00	98.00	129.00	1
4	98.00	129.00	109.00	134.00	2
5	109.00	134.00	130.00	136.00	2
6	130.00	136.00	300.00	140.00	2
7	98.00	129.00	300.00	132.00	1

Default Y-Origin = 0.00(ft)
Default X-Plus Value = 0.00(ft)
Default Y-Plus Value = 0.00(ft)

ISOTROPIC SOIL PARAMETERS
2 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	130.0	130.0	600.0	29.0	0.00	0.0	0
2	125.0	125.0	300.0	28.0	0.00	0.0	0

ANISOTROPIC STRENGTH PARAMETERS
1 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	23.5	600.00	29.00
2	26.5	250.00	22.00
3	90.0	600.00	29.00

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.

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.
100 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 5.0

Box No.	X-Left (ft)	Y-Left (ft)	X-Right (ft)	Y-Right (ft)	Height (ft)
1	62.00	96.33	82.00	105.67	0.00
2	126.00	125.00	136.00	129.67	0.00

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 = 100
Number of Trial Surfaces With Valid FS = 100
Statistical Data On All Valid FS Values:
FS Max = 2.005 FS Min = 1.747 FS Ave = 1.843
Standard Deviation = 0.076 Coefficient of Variation = 4.12 %
Failure Surface Specified By 7 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	61.066	104.000
2	64.434	102.016
3	68.742	99.478
4	134.405	128.925
5	134.771	129.546
6	137.346	133.832
7	138.773	136.206

Factor of Safety
*** 1.747 ***
Individual data on the 11 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)	Surcharge Force Ver (lbs)	Surcharge Load (lbs)
1	0.9	33.4	0.0	0.0	0.	0.	0.0	0.0	0.0
2	2.4	641.5	0.0	0.0	0.	0.	0.0	0.0	0.0
3	4.3	3427.6	0.0	0.0	0.	0.	0.0	0.0	0.0
4	17.3	23015.8	0.0	0.0	0.	0.	0.0	0.0	0.0
5	12.0	21982.6	0.0	0.0	0.	0.	0.0	0.0	0.0
6	11.0	23367.9	0.0	0.0	0.	0.	0.0	0.0	0.0
7	21.0	34235.6	0.0	0.0	0.	0.	0.0	0.0	0.0
8	4.4	4502.7	0.0	0.0	0.	0.	0.0	0.0	0.0
9	0.4	314.7	0.0	0.0	0.	0.	0.0	0.0	0.0
10	2.6	1433.6	0.0	0.0	0.	0.	0.0	0.0	0.0
11	1.4	208.7	0.0	0.0	0.	0.	0.0	0.0	0.0

Failure Surface Specified By 7 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	61.206	104.000
2	64.512	102.053
3	68.820	99.515
4	133.507	128.506
5	134.114	129.536
6	136.689	133.822
7	138.112	136.191

Factor of Safety
*** 1.748 ***
Failure Surface Specified By 7 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	61.906	104.000
2	64.903	102.235
3	69.211	99.697
4	129.015	126.408

5	130.829	129.488
6	133.404	133.773
7	134.810	136.113

Factor of Safety
*** 1.752 ***

Failure Surface Specified By 7 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	60.261	104.000
2	63.985	101.806
3	68.293	99.269
4	134.571	129.003
5	134.892	129.548
6	137.467	133.834
7	138.895	136.209

Factor of Safety
*** 1.754 ***

Failure Surface Specified By 7 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	62.056	104.035
2	65.020	102.290
3	69.328	99.752
4	127.667	125.778
5	129.843	129.473
6	132.418	133.759
7	133.819	136.090

Factor of Safety
*** 1.756 ***

Failure Surface Specified By 7 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	60.611	104.000
2	64.180	101.898
3	68.488	99.360
4	132.325	127.954
5	133.250	129.524
6	135.825	133.809
7	137.244	136.170

Factor of Safety
*** 1.756 ***

Failure Surface Specified By 7 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	60.821	104.000
2	64.297	101.952
3	68.605	99.415
4	130.977	127.324
5	132.264	129.509
6	134.839	133.795
7	136.253	136.147

Factor of Safety
*** 1.757 ***

Failure Surface Specified By 7 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	62.566	104.354
2	65.606	102.563
3	69.914	100.026
4	130.929	127.302
5	132.228	129.508
6	134.804	133.794
7	136.217	136.146

Factor of Safety
*** 1.757 ***

Failure Surface Specified By 7 Coordinate Points

Point	X-Surf	Y-Surf

No.	(ft)	(ft)
1	62.821	104.513
2	65.899	102.700
3	70.207	100.163
4	132.559	128.063
5	133.421	129.526
6	135.996	133.812
7	137.416	136.174

Factor of Safety
*** 1.758 ***

Failure Surface Specified By 7 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	59.595	104.000
2	63.613	101.633
3	67.922	99.095
4	133.839	128.661
5	134.357	129.540
6	136.932	133.826
7	138.356	136.197

Factor of Safety
*** 1.763 ***

**** END OF GSTABL7 OUTPUT ****

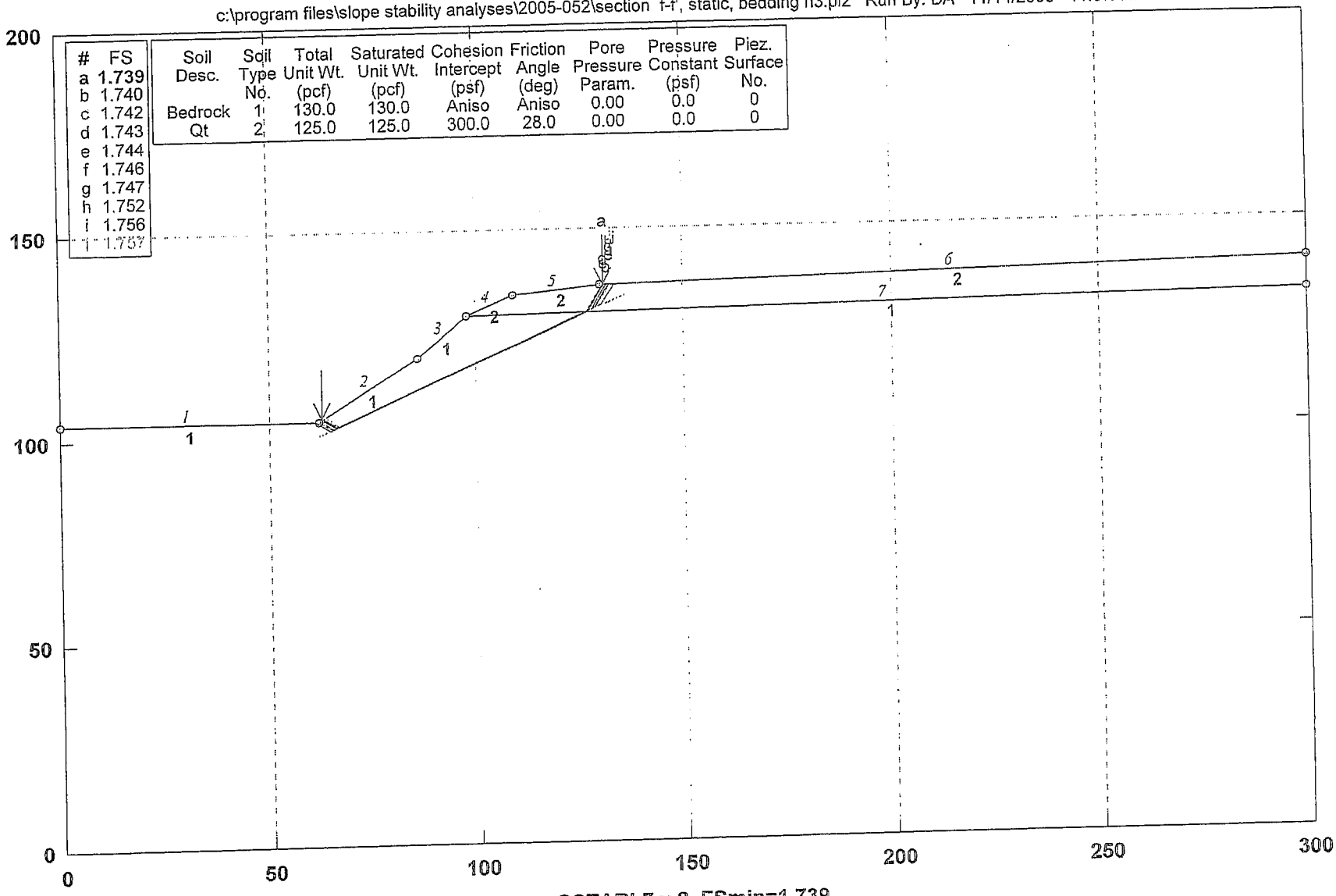
(SHALLOW SURFACE)

Cross Section F-F', Static, bedding Vista Canyon Ranch

c:\program files\slope stability analyses\2005-052\section f-f', static, bedding h3.pl2 Run By: DA 11/14/2008 11:07AM

#	FS
a	1.739
b	1.740
c	1.742
d	1.743
e	1.744
f	1.746
g	1.747
h	1.752
i	1.756
j	1.757

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	130.0	130.0	Aniso	Aniso	0.00	0.0	0
Qt	2	125.0	125.0	300.0	28.0	0.00	0.0	0



GSTABL7 v.2 FSmin=1.739

Safety Factors Are Calculated By The Simplified Janbu Method for the case of c & phi both > 0

GSTABL7

*** GSTABL7 ***
** GSTABL7 by Garry H. Gregory, P.E. **
** Original Version 1.0, January 1996; Current Version 2.004, June 2003 **
(All Rights Reserved-Unauthorized Use Prohibited)

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: 11/14/2008
Time of Run: 11:07AM
Run By: DA
Input Data Filename: C:\Program Files\Slope stability analyses\2005-052\section f-f', static, bedding H3.in
Output Filename: C:\Program Files\Slope stability analyses\2005-052\section f-f', static, bedding H3.OUT
Unit System: English
Plotted Output Filename: C:\Program Files\Slope stability analyses\2005-052\section f-f', static, bedding H3.PLT
PROBLEM DESCRIPTION: Cross Section F-F', Static, bedding
Vista Canyon Ranch

BOUNDARY COORDINATES
6 Top Boundaries
7 Total Boundaries

Boundary No.	X-Left (ft)	Y-Left (ft)	X-Right (ft)	Y-Right (ft)	Soil Type Below Bnd
1	0.00	104.00	62.00	104.00	1
2	62.00	104.00	86.00	119.00	1
3	86.00	119.00	98.00	129.00	1
4	98.00	129.00	109.00	134.00	2
5	109.00	134.00	130.00	136.00	2
6	130.00	136.00	300.00	140.00	2
7	98.00	129.00	300.00	132.00	1

Default Y-Origin = 0.00(ft)
Default X-Plus Value = 0.00(ft)
Default Y-Plus Value = 0.00(ft)

ISOTROPIC SOIL PARAMETERS
2 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	130.0	130.0	600.0	29.0	0.00	0.0	0
2	125.0	125.0	300.0	28.0	0.00	0.0	0

ANISOTROPIC STRENGTH PARAMETERS
1 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	23.5	600.00	29.00
2	26.5	250.00	22.00
3	90.0	600.00	29.00

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.

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.
100 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 5.0

Box No.	X-Left (ft)	Y-Left (ft)	X-Right (ft)	Y-Right (ft)	Height (ft)
1	62.00	100.33	82.00	109.67	0.00
2	126.00	129.00	136.00	133.67	0.00

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 = 100
Number of Trial Surfaces With Valid FS = 100
Statistical Data On All Valid FS Values:
FS Max = 2.039 FS Min = 1.739 FS Ave = 1.859
Standard Deviation = 0.078 Coefficient of Variation = 4.20 %
Failure Surface Specified By 5 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	62.752	104.470
2	66.340	102.357
3	127.032	129.482
4	129.607	133.768
5	130.962	136.023

Factor of Safety
*** 1.739 ***
Individual data on the 9 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	3.6	1015.8	0.0	0.0	0.	0.	0.0	0.0	0.0
2	19.7	15606.3	0.0	0.0	0.	0.	0.0	0.0	0.0
3	12.0	15872.9	0.0	0.0	0.	0.	0.0	0.0	0.0
4	11.0	17792.4	0.0	0.0	0.	0.	0.0	0.0	0.0
5	17.9	21456.5	0.0	0.0	0.	0.	0.0	0.0	0.0
6	0.1	92.0	0.0	0.0	0.	0.	0.0	0.0	0.0
7	2.6	1356.8	0.0	0.0	0.	0.	0.0	0.0	0.0
8	0.4	92.6	0.0	0.0	0.	0.	0.0	0.0	0.0
9	1.0	94.9	0.0	0.0	0.	0.	0.0	0.0	0.0

Failure Surface Specified By 5 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	62.293	104.183
2	65.812	102.110
3	128.097	129.979
4	130.672	134.265
5	131.739	136.041

Factor of Safety
*** 1.740 ***
Failure Surface Specified By 6 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	63.143	104.714
2	66.789	102.566
3	126.866	129.404
4	126.880	129.429
5	129.456	133.715
6	130.841	136.020

Factor of Safety
*** 1.742 ***
Failure Surface Specified By 5 Coordinate Points

Point	X-Surf	Y-Surf

No.	(ft)	(ft)
1	61.204	104.000
2	65.031	101.745
3	127.081	129.505
4	129.656	133.791
5	130.998	136.023

Factor of Safety
*** 1.743 ***

Failure Surface Specified By 5 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	61.729	104.000
2	65.324	101.882
3	128.712	130.266
4	131.287	134.552
5	132.188	136.051

Factor of Safety
*** 1.744 ***

Failure Surface Specified By 5 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	62.191	104.120
2	65.695	102.056
3	129.444	130.608
4	132.019	134.894
5	132.722	136.064

Factor of Safety
*** 1.746 ***

Failure Surface Specified By 5 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	62.616	104.385
2	66.183	102.284
3	128.829	130.321
4	131.404	134.607
5	132.273	136.053

Factor of Safety
*** 1.747 ***

Failure Surface Specified By 5 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	62.973	104.608
2	66.594	102.475
3	129.112	130.453
4	131.687	134.739
5	132.480	136.058

Factor of Safety
*** 1.752 ***

Failure Surface Specified By 5 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	62.480	104.300
2	66.027	102.211
3	130.626	131.160
4	133.201	135.446
5	133.585	136.084

Factor of Safety
*** 1.756 ***

Failure Surface Specified By 5 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	63.330	104.831
2	67.004	102.667
3	129.395	130.586
4	131.971	134.871
5	132.687	136.063

Factor of Safety

*** 1.757 ***
**** END OF GSTABL7 OUTPUT ****

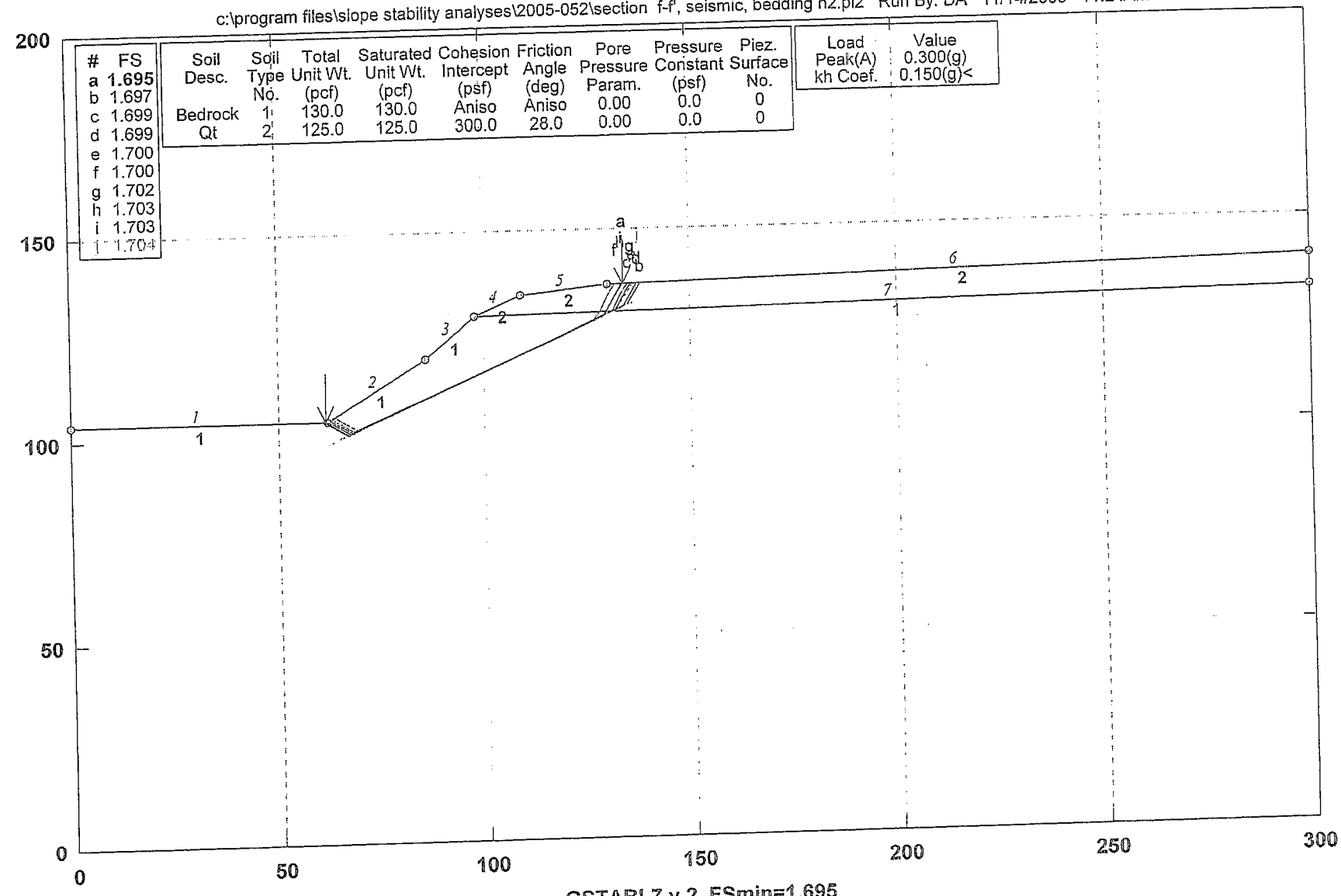
Cross Section F-F', Seismic, bedding Vista Canyon Ranch

c:\program files\slope stability analyses\2005-052\section f-f', seismic, bedding h2.pl2 Run By: DA 11/14/2008 11:24AM

#	FS
a	1.695
b	1.697
c	1.699
d	1.699
e	1.700
f	1.700
g	1.702
h	1.703
i	1.703
j	1.704

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	130.0	130.0	Aniso	Aniso	0.00	0.0	0
Qt	2	125.0	125.0	300.0	28.0	0.00	0.0	0

Load	Value
Peak(A)	0.300(g)
kh Coef.	0.150(g)<



GSTABL7 v.2 FSmin=1.695

Safety Factors Are Calculated By The Simplified Janbu Method for the case of c & phi both > 0

GSTABL7

*** GSTABL7 ***
** GSTABL7 by Garry H. Gregory, P.E. **
** Original Version 1.0, January 1996; Current Version 2.004, June 2003 **

****

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: 11/14/2008
Time of Run: 11:24AM
Run By: DA
Input Data Filename: C:\Program Files\Slope stability analyses\2005-052\section f-f', seismic, bedding h2.in
Output Filename: C:\Program Files\Slope stability analyses\2005-052\section f-f', seismic, bedding h2.OUT
Unit System: English
Plotted Output Filename: C:\Program Files\Slope stability analyses\2005-052\section f-f', seismic, bedding h2.PLT
PROBLEM DESCRIPTION: Cross Section F-F', Seismic, bedding
Vista Canyon Ranch

BOUNDARY COORDINATES
6 Top Boundaries
7 Total Boundaries

Boundary No.	X-Left (ft)	Y-Left (ft)	X-Right (ft)	Y-Right (ft)	Soil Type Below Bnd
1	0.00	104.00	62.00	104.00	1
2	62.00	104.00	86.00	119.00	1
3	86.00	119.00	98.00	129.00	1
4	98.00	129.00	109.00	134.00	2
5	109.00	134.00	130.00	136.00	2
6	130.00	136.00	300.00	140.00	2
7	98.00	129.00	300.00	132.00	1

Default Y-Origin = 0.00(ft)
Default X-Plus Value = 0.00(ft)
Default Y-Plus Value = 0.00(ft)

ISOTROPIC SOIL PARAMETERS
2 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	130.0	130.0	600.0	29.0	0.00	0.0	0
2	125.0	125.0	300.0	28.0	0.00	0.0	0

ANISOTROPIC STRENGTH PARAMETERS
1 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	23.5	600.00	29.00
2	26.5	400.00	29.00
3	90.0	600.00	29.00

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.

Specified Peak Ground Acceleration Coefficient (A) = 0.300(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.
100 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 5.0

Box No.	X-Left (ft)	Y-Left (ft)	X-Right (ft)	Y-Right (ft)	Height (ft)
1	62.00	98.33	82.00	107.67	0.00
2	126.00	127.00	136.00	131.67	0.00

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 = 100
Number of Trial Surfaces With Valid FS = 100
Statistical Data On All Valid FS Values:
FS Max = 1.866 FS Min = 1.695 FS Ave = 1.769
Standard Deviation = 0.050 Coefficient of Variation = 2.85 %
Failure Surface Specified By 7 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	61.345	104.000
2	62.696	103.204
3	67.004	100.667
4	129.395	128.586
5	129.919	129.474
6	132.494	133.760
7	133.895	136.092

Factor of Safety
*** 1.695 ***
Individual data on the 11 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	0.7	16.4	0.0	0.0	0.	0.	2.5	0.0	0.0
2	0.7	73.1	0.0	0.0	0.	0.	11.0	0.0	0.0
3	4.3	2153.7	0.0	0.0	0.	0.	323.1	0.0	0.0
4	19.0	20118.5	0.0	0.0	0.	0.	3017.8	0.0	0.0
5	12.0	18950.8	0.0	0.0	0.	0.	2842.6	0.0	0.0
6	11.0	20604.8	0.0	0.0	0.	0.	3090.7	0.0	0.0
7	20.4	28452.8	0.0	0.0	0.	0.	4267.9	0.0	0.0
8	0.5	454.9	0.0	0.0	0.	0.	68.2	0.0	0.0
9	0.1	65.6	0.0	0.0	0.	0.	9.8	0.0	0.0
10	2.5	1354.4	0.0	0.0	0.	0.	203.2	0.0	0.0
11	1.4	201.3	0.0	0.0	0.	0.	30.2	0.0	0.0

Failure Surface Specified By 6 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	62.022	104.014
2	63.086	103.387
3	67.394	100.849
4	134.903	131.158
5	137.478	135.444
6	137.925	136.186

Factor of Safety
*** 1.697 ***
Failure Surface Specified By 7 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	63.075	104.672

2	64.297	103.952
3	68.605	101.415
4	130.977	129.324
5	131.076	129.491
6	133.651	133.777
7	135.058	136.119

Factor of Safety
*** 1.699 ***

Failure Surface Specified By 6 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	62.481	104.300
2	63.613	103.633
3	67.922	101.095
4	133.839	130.661
5	136.414	134.947
6	137.148	136.168

Factor of Safety
*** 1.699 ***

Failure Surface Specified By 6 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	62.973	104.608
2	64.180	103.898
3	68.488	101.360
4	132.325	129.954
5	134.900	134.240
6	136.043	136.142

Factor of Safety
*** 1.700 ***

Failure Surface Specified By 7 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	60.960	104.000
2	62.481	103.104
3	66.789	100.566
4	126.866	127.404
5	128.069	129.447
6	130.644	133.732
7	132.035	136.048

Factor of Safety
*** 1.700 ***

Failure Surface Specified By 6 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	60.925	104.000
2	62.461	103.095
3	66.769	100.557
4	132.091	129.844
5	134.666	134.130
6	135.872	136.138

Factor of Safety
*** 1.702 ***

Failure Surface Specified By 7 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	63.602	105.001
2	64.903	104.235
3	69.211	101.697
4	129.015	128.408
5	129.640	129.470
6	132.215	133.756
7	133.615	136.085

Factor of Safety
*** 1.703 ***

Failure Surface Specified By 7 Coordinate Points

Point	X-Surf	Y-Surf

No.	(ft)	(ft)
1	60.610	104.000
2	62.285	103.013
3	66.594	100.475
4	129.112	128.453
5	129.712	129.471
6	132.287	133.757
7	133.687	136.087

Factor of Safety
*** 1.703 ***

Failure Surface Specified By 6 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	62.803	104.502
2	63.985	103.806
3	68.293	101.269
4	134.571	131.003
5	137.146	135.289
6	137.682	136.181

Factor of Safety
*** 1.704 ***

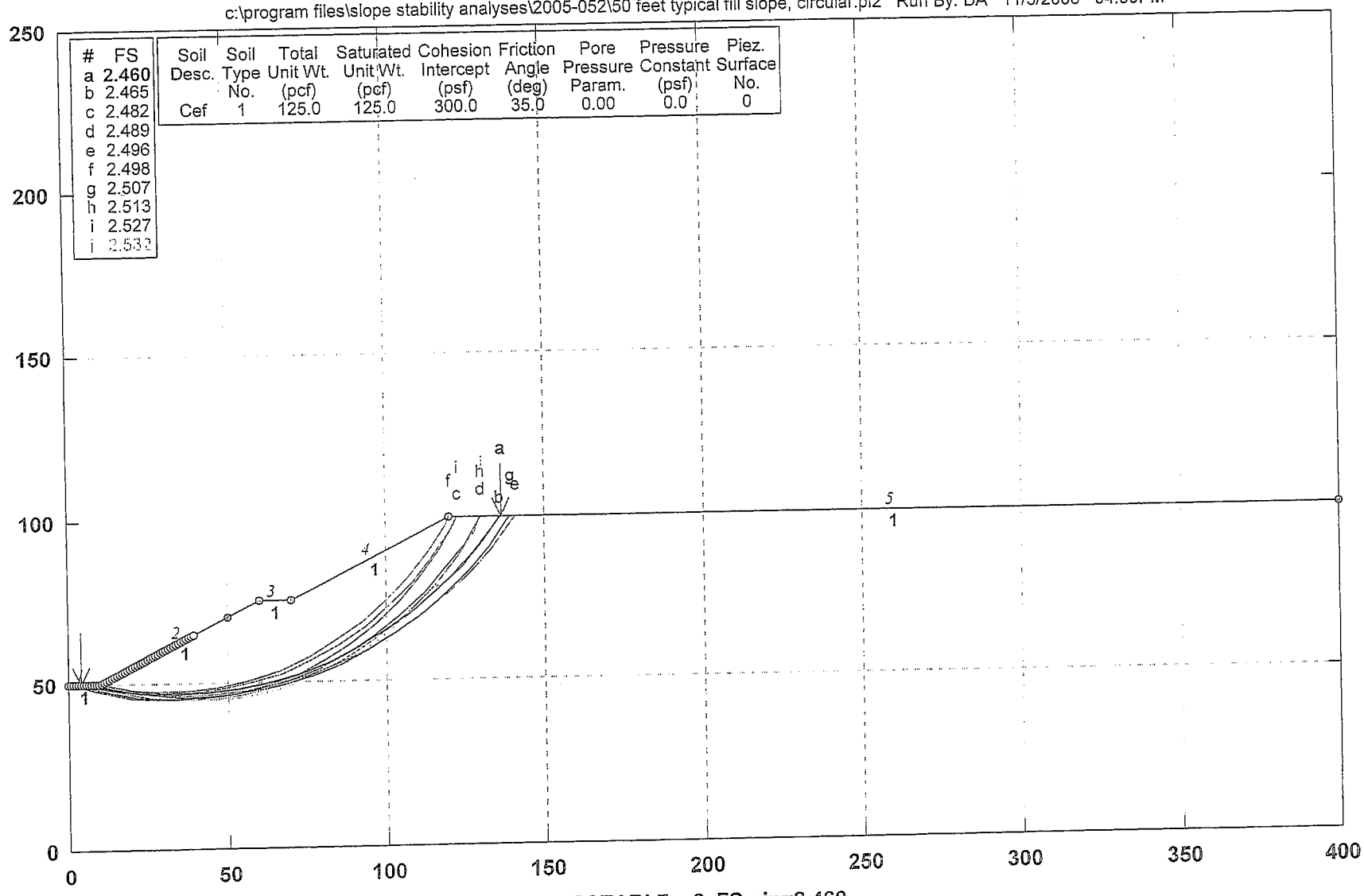
**** END OF GSTABL7 OUTPUT ****

50 ' fill slope, Static, circular Vista Canyon Ranch

c:\program files\slope stability analyses\2005-052\50 feet typical fill slope, circular.pl2 Run By: DA 11/5/2008 04:00PM

#	FS
a	2.460
b	2.465
c	2.482
d	2.489
e	2.496
f	2.498
g	2.507
h	2.513
i	2.527
j	2.532

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.
Cef	1	125.0	125.0	300.0	35.0	0.00	0.0	0



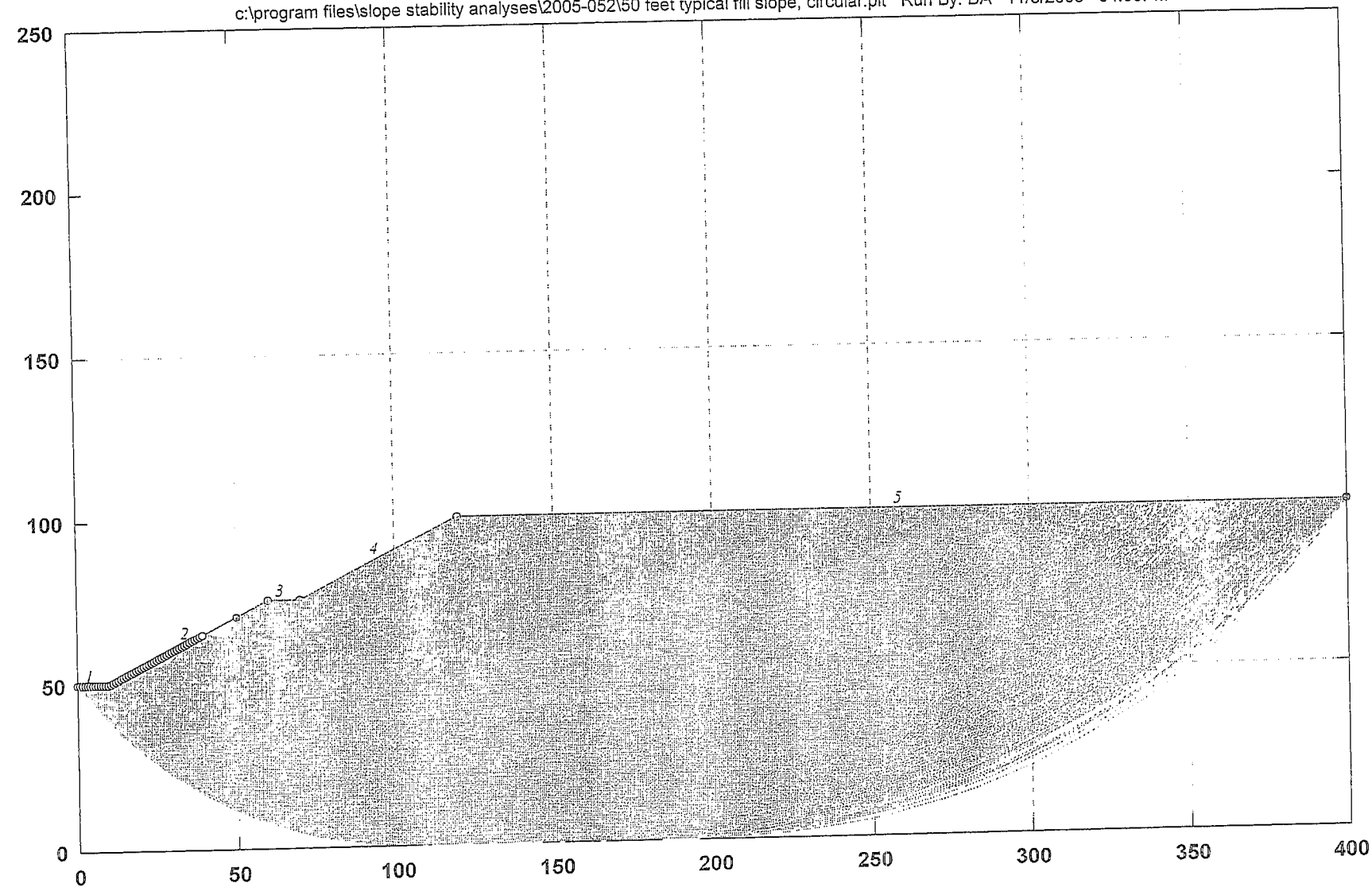
GSTABL7 v.2 FSmin=2.460

Safety Factors Are Calculated By The Modified Bishop Method

GSTABL7

50 ' fill slope, Static, circular Vista Canyon Ranch

c:\program files\slope stability analyses\2005-052\50 feet typical fill slope, circular.plt Run By: DA 11/5/2008 04:00PM



GSTABL7

*** GSTABL7 ***
** GSTABL7 by Garry H. Gregory, P.E. **
** Original Version 1.0, January 1996; Current Version 2.004, June 2003 **

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: 11/5/2008
Time of Run: 04:00PM
Run By: DA
Input Data Filename: C:\Program Files\Slope stability analyses\2005-052\50 feet typical fill slope, circular.in
Output Filename: C:\Program Files\Slope stability analyses\2005-052\50 feet typical fill slope, circular.OUT
Unit System: English
Plotted Output Filename: C:\Program Files\Slope stability analyses\2005-052\50 feet typical fill slope, circular.PLT
PROBLEM DESCRIPTION: 50 ' fill slope, Static, circular
Vista Canyon Ranch

BOUNDARY COORDINATES
5 Top Boundaries
5 Total Boundaries

Boundary No.	X-Left (ft)	Y-Left (ft)	X-Right (ft)	Y-Right (ft)	Soil Type Below Bnd
1	0.00	50.00	10.00	50.00	1
2	10.00	50.00	60.00	75.00	1
3	60.00	75.00	70.00	75.00	1
4	70.00	75.00	120.00	100.00	1
5	120.00	100.00	400.00	100.00	1

Default Y-Origin = 0.00(ft)
Default X-Plus Value = 0.00(ft)
Default Y-Plus Value = 0.00(ft)

ISOTROPIC SOIL PARAMETERS
1 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	125.0	125.0	300.0	35.0	0.00	0.0	0

A Critical Failure Surface Searching Method, Using A Random
Technique For Generating Circular Surfaces, Has Been Specified.
4000 Trial Surfaces Have Been Generated.
10 Surface(s) Initiate(s) From Each Of 400 Points Equally Spaced
Along The Ground Surface Between X = 0.00(ft)
and X = 40.00(ft)
Each Surface Terminates Between X = 50.00(ft)
and X = 400.00(ft)
Unless Further Limitations Were Imposed, The Minimum Elevation
At Which A Surface Extends Is Y = 0.00(ft)
10.00(ft) Line Segments Define Each Trial Failure Surface.
Restrictions Have Been Imposed Upon The Angle Of Initiation.
The Angle Has Been Restricted Between The Angles Of -50.0
And -10.0 deg.
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 = 4000
Number of Trial Surfaces With Valid FS = 4000
Statistical Data On All Valid FS Values:
FS Max = 15.677 FS Min = 2.460 FS Ave = 5.356
Standard Deviation = 2.172 Coefficient of Variation = 40.55 %

Failure Surface Specified By 17 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	3.910	50.000
2	13.709	48.004
3	23.635	46.797
4	33.627	46.388
5	43.619	46.779
6	53.549	47.966
7	63.351	49.944
8	72.964	52.699
9	82.326	56.213
10	91.378	60.464
11	100.061	65.425
12	108.319	71.064
13	116.100	77.345
14	123.355	84.227
15	130.036	91.668
16	136.102	99.619
17	136.347	100.000

Circle Center At X = 33.745 ; Y = 171.414 ; and Radius = 125.026

Factor of Safety

*** 2.460 ***

Individual data on the 20 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	6.1	472.2	0.0	0.0	0.	0.	0.0	0.0	0.0
2	3.7	1180.0	0.0	0.0	0.	0.	0.0	0.0	0.0
3	9.9	8605.8	0.0	0.0	0.	0.	0.0	0.0	0.0
4	10.0	15890.3	0.0	0.0	0.	0.	0.0	0.0	0.0
5	10.0	22143.4	0.0	0.0	0.	0.	0.0	0.0	0.0
6	9.9	27205.3	0.0	0.0	0.	0.	0.0	0.0	0.0
7	6.5	19974.8	0.0	0.0	0.	0.	0.0	0.0	0.0
8	3.4	10637.5	0.0	0.0	0.	0.	0.0	0.0	0.0
9	6.6	20032.3	0.0	0.0	0.	0.	0.0	0.0	0.0
10	3.0	8695.4	0.0	0.0	0.	0.	0.0	0.0	0.0
11	9.4	28516.0	0.0	0.0	0.	0.	0.0	0.0	0.0
12	9.1	28384.9	0.0	0.0	0.	0.	0.0	0.0	0.0
13	8.7	27041.5	0.0	0.0	0.	0.	0.0	0.0	0.0
14	8.3	24621.2	0.0	0.0	0.	0.	0.0	0.0	0.0
15	7.8	21302.2	0.0	0.0	0.	0.	0.0	0.0	0.0
16	3.9	9666.2	0.0	0.0	0.	0.	0.0	0.0	0.0
17	3.4	7282.1	0.0	0.0	0.	0.	0.0	0.0	0.0
18	6.7	10065.6	0.0	0.0	0.	0.	0.0	0.0	0.0
19	6.1	3303.1	0.0	0.0	0.	0.	0.0	0.0	0.0
20	0.2	5.9	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	10.025	50.013
2	19.858	48.195
3	29.809	47.205
4	39.808	47.051
5	49.785	47.732
6	59.670	49.245
7	69.394	51.578
8	78.889	54.716
9	88.089	58.636
10	96.928	63.311
11	105.347	68.708
12	113.285	74.790
13	120.687	81.514
14	127.501	88.833
15	133.680	96.696
16	135.856	100.000

Circle Center At X = 36.676 ; Y = 166.293 ; and Radius = 119.296

Factor of Safety

*** 2.465 ***

Failure Surface Specified By 15 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	7.719	50.000
2	17.527	48.050
3	27.478	47.060
4	37.478	47.039
5	47.433	47.987
6	57.249	49.896
7	66.834	52.748
8	76.097	56.515
9	84.952	61.162
10	93.314	66.645
11	101.106	72.914
12	108.253	79.908
13	114.689	87.562
14	120.352	95.803
15	122.672	100.000

Circle Center At X = 32.694 ; Y = 149.973 ; and Radius = 103.045

Factor of Safety

*** 2.482 ***

Failure Surface Specified By 16 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	0.702	50.000
2	10.358	47.400
3	20.209	45.682
4	30.175	44.860
5	40.175	44.939
6	50.127	45.920
7	59.950	47.795
8	69.563	50.547
9	78.889	54.156
10	87.852	58.591
11	96.378	63.816
12	104.399	69.789
13	111.848	76.461
14	118.664	83.777
15	124.794	91.679
16	130.121	100.000

Circle Center At X = 34.296 ; Y = 155.538 ; and Radius = 110.756

Factor of Safety

*** 2.489 ***

Failure Surface Specified By 17 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	6.416	50.000
2	16.205	47.958
3	26.125	46.691
4	36.113	46.208
5	46.109	46.510
6	56.049	47.595
7	65.874	49.459
8	75.523	52.088
9	84.935	55.466
10	94.052	59.573
11	102.819	64.384
12	111.181	69.868
13	119.087	75.992
14	126.487	82.717
15	133.336	90.004
16	139.592	97.805
17	141.086	100.000

Circle Center At X = 37.272 ; Y = 173.448 ; and Radius = 127.245

Factor of Safety
*** 2.496 ***
Failure Surface Specified By 15 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	7.218	50.000
2	17.052	48.186
3	27.016	47.339
4	37.015	47.467
5	46.954	48.569
6	56.739	50.634
7	66.275	53.644
8	75.473	57.568
9	84.244	62.371
10	92.506	68.005
11	100.179	74.418
12	107.190	81.548
13	113.474	89.327
14	118.969	97.682
15	120.187	100.000

Circle Center At X = 30.705 ; Y = 149.749 ; and Radius = 102.476

Factor of Safety
*** 2.498 ***
Failure Surface Specified By 17 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	7.118	50.000
2	16.859	47.739
3	26.755	46.299
4	36.736	45.689
5	46.733	45.915
6	56.677	46.975
7	66.498	48.861
8	76.127	51.559
9	85.497	55.053
10	94.542	59.316
11	103.201	64.319
12	111.412	70.027
13	119.117	76.401
14	126.264	83.395
15	132.802	90.962
16	138.685	99.048
17	139.263	100.000

Circle Center At X = 39.033 ; Y = 165.374 ; and Radius = 119.707

Factor of Safety
*** 2.507 ***
Failure Surface Specified By 16 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	6.416	50.000
2	16.061	47.357
3	25.915	45.656
4	35.887	44.911
5	45.885	45.130
6	55.815	46.311
7	65.585	48.443
8	75.104	51.505
9	84.285	55.470
10	93.041	60.300
11	101.291	65.952
12	108.958	72.371
13	115.972	79.499
14	122.267	87.269
15	127.784	95.610
16	130.114	100.000

Circle Center At X = 38.622 ; Y = 148.336 ; and Radius = 103.475

Factor of Safety

*** 2.513 ***
Failure Surface Specified By 16 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	3.008	50.000
2	12.641	47.318
3	22.497	45.624
4	32.473	44.938
5	42.468	45.264
6	52.378	46.601
7	62.102	48.934
8	71.540	52.239
9	80.595	56.483
10	89.173	61.622
11	97.188	67.603
12	104.555	74.364
13	111.201	81.837
14	117.056	89.944
15	122.060	98.602
16	122.689	100.000

Circle Center At X = 34.257 ; Y = 143.437 ; and Radius = 98.524

Factor of Safety
*** 2.527 ***
Failure Surface Specified By 16 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	5.714	50.000
2	15.300	47.152
3	25.119	45.255
4	35.076	44.329
5	45.076	44.382
6	55.022	45.413
7	64.820	47.413
8	74.375	50.362
9	83.596	54.233
10	92.394	58.987
11	100.684	64.580
12	108.386	70.957
13	115.428	78.057
14	121.741	85.812
15	127.264	94.149
16	130.364	100.000

Circle Center At X = 39.539 ; Y = 146.051 ; and Radius = 101.833

Factor of Safety
*** 2.532 ***
**** END OF GSTABL7 OUTPUT ****

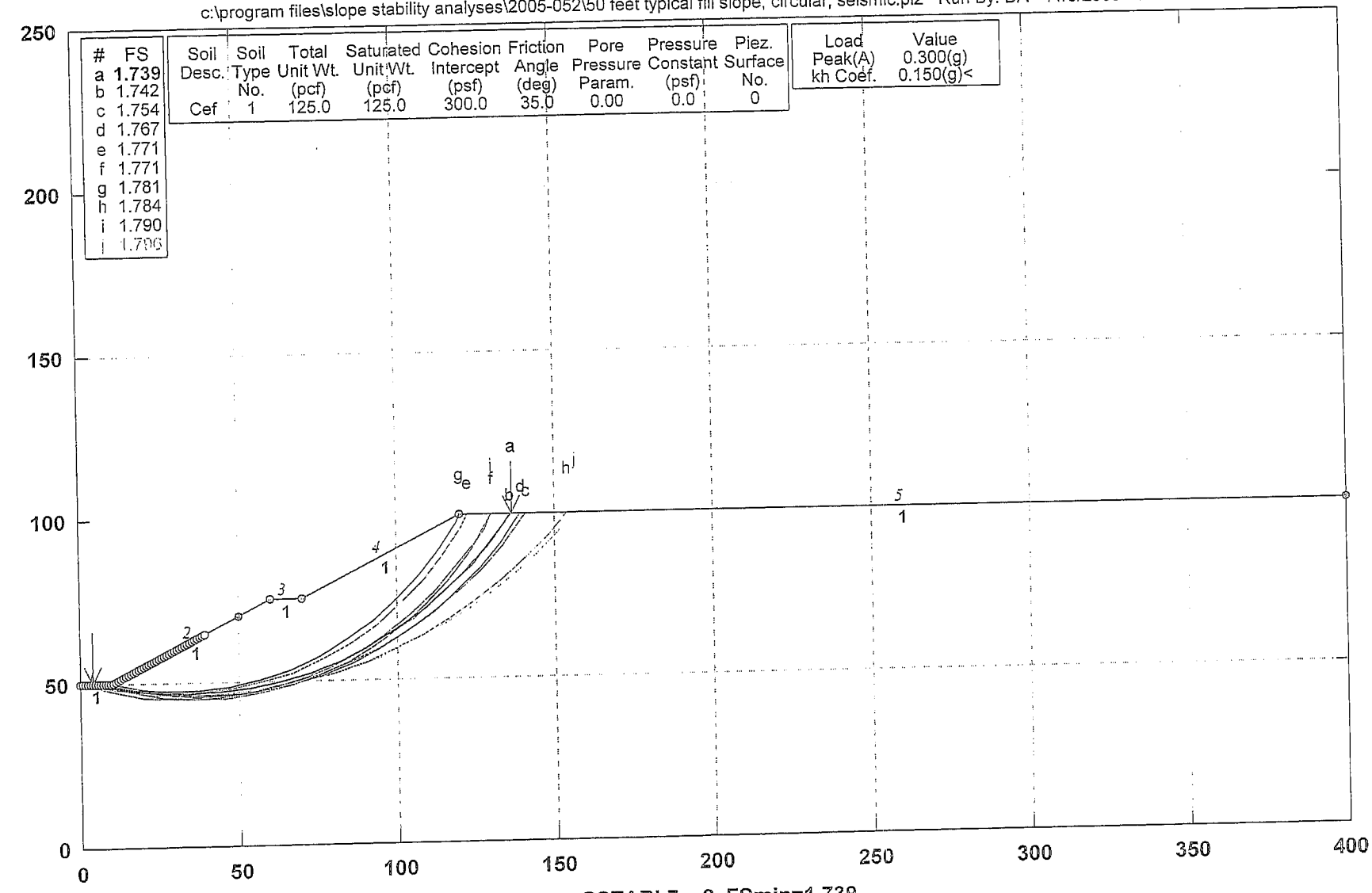
50 ' fill slope, Seismic, circular Vista Canyon Ranch

c:\program files\slope stability analyses\2005-052\50 feet typical fill slope, circular, seismic.pl2 Run By: DA 11/5/2008 04:05PM

#	FS
a	1.739
b	1.742
c	1.754
d	1.767
e	1.771
f	1.771
g	1.781
h	1.784
i	1.790
j	1.796

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.
Cef	1	125.0	125.0	300.0	35.0	0.00	0.0	0

Load	Value
Peak(A)	0.300(g)
kh Coef.	0.150(g)<



GSTABL7 v.2 FSmin=1.739

Safety Factors Are Calculated By The Modified Bishop Method

GSTABL7

*** GSTABL7 ***
** GSTABL7 by Garry H. Gregory, P.E. **
** Original Version 1.0, January 1996; Current Version 2.004, June 2003 **
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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: 11/5/2008
Time of Run: 04:05PM
Run By: DA
Input Data Filename: C:\Program Files\Slope stability analyses\2005-052\50 feet typical fill slope, circular, seismic.in
Output Filename: C:\Program Files\Slope stability analyses\2005-052\50 feet typical fill slope, circular, seismic.OUT
Unit System: English
Plotted Output Filename: C:\Program Files\Slope stability analyses\2005-052\50 feet typical fill slope, circular, seismic.PLT
PROBLEM DESCRIPTION: 50 ' fill slope, Seismic, circular
Vista Canyon Ranch

BOUNDARY COORDINATES
5 Top Boundaries
5 Total Boundaries

Boundary No.	X-Left (ft)	Y-Left (ft)	X-Right (ft)	Y-Right (ft)	Soil Type Below Bnd
1	0.00	50.00	10.00	50.00	1
2	10.00	50.00	60.00	75.00	1
3	60.00	75.00	70.00	75.00	1
4	70.00	75.00	120.00	100.00	1
5	120.00	100.00	400.00	100.00	1

Default Y-Origin = 0.00(ft)
Default X-Plus Value = 0.00(ft)
Default Y-Plus Value = 0.00(ft)

ISOTROPIC SOIL PARAMETERS
1 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	125.0	125.0	300.0	35.0	0.00	0.0	0

Specified Peak Ground Acceleration Coefficient (A) = 0.300(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.
4000 Trial Surfaces Have Been Generated.
10 Surface(s) Initiate(s) From Each Of 400 Points Equally Spaced
Along The Ground Surface Between X = 0.00(ft)
and X = 40.00(ft)
Each Surface Terminates Between X = 50.00(ft)
and X = 400.00(ft)
Unless Further Limitations Were Imposed, The Minimum Elevation
At Which A Surface Extends Is Y = 0.00(ft)
10.00(ft) Line Segments Define Each Trial Failure Surface.
Restrictions Have Been Imposed Upon The Angle Of Initiation.
The Angle Has Been Restricted Between The Angles Of -50.0
And -10.0 deg.
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 = 4000

Number of Trial Surfaces With Valid FS = 4000
Statistical Data On All Valid FS Values:
FS Max = 4.940 FS Min = 1.739 FS Ave = 3.094
Standard Deviation = 0.651 Coefficient of Variation = 21.04 %
Failure Surface Specified By 17 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	3.910	50.000
2	13.709	48.004
3	23.635	46.797
4	33.627	46.388
5	43.619	46.779
6	53.549	47.966
7	63.351	49.944
8	72.964	52.699
9	82.326	56.213
10	91.378	60.464
11	100.061	65.425
12	108.319	71.064
13	116.100	77.345
14	123.355	84.227
15	130.036	91.668
16	136.102	99.619
17	136.347	100.000

Circle Center At X = 33.745 ; Y = 171.414 ; and Radius = 125.026
Factor of Safety
*** 1.739 ***
Individual data on the 20 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	6.1	472.2	0.0	0.0	0.	0.	70.8	0.0	0.0
2	3.7	1180.0	0.0	0.0	0.	0.	177.0	0.0	0.0
3	9.9	8605.8	0.0	0.0	0.	0.	1290.9	0.0	0.0
4	10.0	15890.3	0.0	0.0	0.	0.	2383.5	0.0	0.0
5	10.0	22143.4	0.0	0.0	0.	0.	3321.5	0.0	0.0
6	9.9	27205.3	0.0	0.0	0.	0.	4080.8	0.0	0.0
7	6.5	19974.8	0.0	0.0	0.	0.	2996.2	0.0	0.0
8	3.4	10637.5	0.0	0.0	0.	0.	1595.6	0.0	0.0
9	6.6	20032.3	0.0	0.0	0.	0.	3004.8	0.0	0.0
10	3.0	8695.4	0.0	0.0	0.	0.	1304.3	0.0	0.0
11	9.4	28516.0	0.0	0.0	0.	0.	4277.4	0.0	0.0
12	9.1	28384.9	0.0	0.0	0.	0.	4257.7	0.0	0.0
13	8.7	27041.5	0.0	0.0	0.	0.	4056.2	0.0	0.0
14	8.3	24621.2	0.0	0.0	0.	0.	3693.2	0.0	0.0
15	7.8	21302.2	0.0	0.0	0.	0.	3195.3	0.0	0.0
16	3.9	9666.2	0.0	0.0	0.	0.	1449.9	0.0	0.0
17	3.4	7282.1	0.0	0.0	0.	0.	1092.3	0.0	0.0
18	6.7	10065.6	0.0	0.0	0.	0.	1509.8	0.0	0.0
19	6.1	3303.1	0.0	0.0	0.	0.	495.5	0.0	0.0
20	0.2	5.9	0.0	0.0	0.	0.	0.9	0.0	0.0

Failure Surface Specified By 16 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	10.025	50.013
2	19.858	48.195
3	29.809	47.205
4	39.808	47.051
5	49.785	47.732
6	59.670	49.245
7	69.394	51.578
8	78.889	54.716
9	88.089	58.636
10	96.928	63.311
11	105.347	68.708
12	113.285	74.790

13	120.687	81.514
14	127.501	88.833
15	133.680	96.696
16	135.856	100.000

Circle Center At X = 36.676 ; Y = 166.293 ; and Radius = 119.296

Factor of Safety

*** 1.742 ***

Failure Surface Specified By 17 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	6.416	50.000
2	16.205	47.958
3	26.125	46.691
4	36.113	46.208
5	46.109	46.510
6	56.049	47.595
7	65.874	49.459
8	75.523	52.088
9	84.935	55.466
10	94.052	59.573
11	102.819	64.384
12	111.181	69.868
13	119.087	75.992
14	126.487	82.717
15	133.336	90.004
16	139.592	97.805
17	141.086	100.000

Circle Center At X = 37.272 ; Y = 173.448 ; and Radius = 127.245

Factor of Safety

*** 1.754 ***

Failure Surface Specified By 17 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	7.118	50.000
2	16.859	47.739
3	26.755	46.299
4	36.736	45.689
5	46.733	45.915
6	56.677	46.975
7	66.498	48.861
8	76.127	51.559
9	85.497	55.053
10	94.542	59.316
11	103.201	64.319
12	111.412	70.027
13	119.117	76.401
14	126.264	83.395
15	132.802	90.962
16	138.685	99.048
17	139.263	100.000

Circle Center At X = 39.033 ; Y = 165.374 ; and Radius = 119.707

Factor of Safety

*** 1.767 ***

Failure Surface Specified By 15 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	7.719	50.000
2	17.527	48.050
3	27.478	47.060
4	37.478	47.039
5	47.433	47.987
6	57.249	49.896
7	66.834	52.748
8	76.097	56.515
9	84.952	61.162
10	93.314	66.645
11	101.106	72.914

12	108.253	79.908
13	114.689	87.562
14	120.352	95.803
15	122.672	100.000

Circle Center At X = 32.694 ; Y = 149.973 ; and Radius = 103.045

Factor of Safety

*** 1.771 ***

Failure Surface Specified By 16 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	0.702	50.000
2	10.358	47.400
3	20.209	45.682
4	30.175	44.860
5	40.175	44.939
6	50.127	45.920
7	59.950	47.795
8	69.563	50.547
9	78.889	54.156
10	87.852	58.591
11	96.378	63.816
12	104.399	69.789
13	111.848	76.461
14	118.664	83.777
15	124.794	91.679
16	130.121	100.000

Circle Center At X = 34.296 ; Y = 155.538 ; and Radius = 110.756

Factor of Safety

*** 1.771 ***

Failure Surface Specified By 15 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	7.218	50.000
2	17.052	48.186
3	27.016	47.339
4	37.015	47.467
5	46.954	48.569
6	56.739	50.634
7	66.275	53.644
8	75.473	57.568
9	84.244	62.371
10	92.506	68.005
11	100.179	74.418
12	107.190	81.548
13	113.474	89.327
14	118.969	97.682
15	120.187	100.000

Circle Center At X = 30.705 ; Y = 149.749 ; and Radius = 102.476

Factor of Safety

*** 1.781 ***

Failure Surface Specified By 18 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	1.704	50.000
2	11.512	48.047
3	21.425	46.733
4	31.403	46.065
5	41.403	46.044
6	51.383	46.672
7	61.301	47.945
8	71.117	49.859
9	80.787	52.404
10	90.273	55.571
11	99.533	59.346
12	108.529	63.713
13	117.223	68.654
14	125.578	74.148

15	133.560	80.173
16	141.135	86.701
17	148.271	93.707
18	153.899	100.000

Circle Center At X = 36.721 ; Y = 200.046 ; and Radius = 154.078

Factor of Safety

*** 1.784 ***

Failure Surface Specified By 16 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	6.416	50.000
2	16.061	47.357
3	25.915	45.656
4	35.887	44.911
5	45.885	45.130
6	55.815	46.311
7	65.585	48.443
8	75.104	51.505
9	84.285	55.470
10	93.041	60.300
11	101.291	65.952
12	108.958	72.371
13	115.972	79.499
14	122.267	87.269
15	127.784	95.610
16	130.114	100.000

Circle Center At X = 38.622 ; Y = 148.336 ; and Radius = 103.475

Factor of Safety

*** 1.790 ***

Failure Surface Specified By 18 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	6.516	50.000
2	16.358	48.226
3	26.292	47.086
4	36.280	46.584
5	46.279	46.723
6	56.248	47.502
7	66.148	48.918
8	75.936	50.964
9	85.573	53.634
10	95.019	56.915
11	104.236	60.795
12	113.186	65.256
13	121.831	70.282
14	130.137	75.851
15	138.069	81.941
16	145.595	88.526
17	152.683	95.579
18	156.591	100.000

Circle Center At X = 39.125 ; Y = 202.348 ; and Radius = 155.799

Factor of Safety

*** 1.796 ***

**** END OF GSTABL7 OUTPUT ****

Vista Canyon Ranch, LLC
November 14, 2008
2005-052-01

APPENDIX E

GROUNDWATER WELL DATA

RTF&A
GEOTECHNICAL ENGINEERING & ENGINEERING GEOLOGY

For use with report dated 11/14/2008; RTF Job No. 2005-052-01

Reading for well No. 7178B

State Well No. 4N15W23E01

Thomas Guide Page: 4552 **Grid:** B2

High Water Surface Elevation: ~~1542.5 on 05/11/1993~~ 1506.4 on 4/6/1970

Low Water Surface Elevation: 1463.5 on 04/15/1977

Measure date	Ground Surface Elevation	Ground Surface to Water Surface	Water Surface Elevation	No Measurement	Questionable Measurement
11/7/2006	1,515.0	0.0	0.0	Well has been destroyed	
11/29/1999	0.0	0.0	0.0	Temporarily inaccessible	
5/25/1999	0.0	0.0	0.0	Temporarily inaccessible	
10/29/1997	1,515.0	55.7	1,459.3		
5/19/1997	1,515.0	43.4	1,471.6		
5/21/1996	1,515.0	15.1	1,499.9		
12/21/1993	0.0	0.0	0.0		
5/11/1993	0.0	0.0	0.0	Temporarily inaccessible	
4/20/1992	1,515.0	0.0	0.0	Temporarily inaccessible	
11/13/1991	1,515.0	0.0	0.0	Temporarily inaccessible	
10/17/1990	1,515.0	99.2	1,415.8		
10/25/1989	1,515.0	71.2	1,443.8		
5/10/1989	1,515.0	55.9	1,459.1		
11/7/1988	1,515.0	54.4	1,460.6		
4/27/1988	1,515.0	49.2	1,465.8		
5/13/1987	1,515.0	43.2	1,471.8		
4/15/1986	1,515.0	18.2	1,496.8		
11/21/1985	1,515.0	29.7	1,485.3		
5/20/1985	1,515.0	19.4	1,495.6		
11/7/1984	1,515.0	18.5	1,496.5		
4/23/1984	1,515.0	10.7	1,504.3		
11/21/1983	1,515.0	9.1	1,505.9		
4/14/1983	1,515.0	9.2	1,505.8		
11/5/1982	1,515.0	26.6	1,488.4		
5/5/1982	1,515.0	12.4	1,502.6		
11/18/1981	1,515.0	19.2	1,495.8		
4/13/1981	1,515.0	10.2	1,504.8		

11/12/1980	1,515.0	10.3	1,504.7		
5/27/1980	1,515.0	9.8	1,505.2		
11/7/1979	1,515.0	11.4	1,503.6		
4/23/1979	1,515.0	9.1	1,505.9		
11/27/1978	1,515.0	9.7	1,505.3		
4/21/1978	1,515.0	9.2	1,505.8		
11/4/1977	1,515.0	85.5	1,429.5		
4/7/1977	1,515.0	72.2	1,442.8		
11/2/1976	1,515.0	66.8	1,448.2		
4/9/1976	1,515.0	53.1	1,461.9		
11/19/1975	1,515.0	51.5	1,463.5		
5/1/1975	1,515.0	36.8	1,478.2		
11/19/1974	1,515.0	36.1	1,478.9		
4/4/1974	1,515.0	29.4	1,485.6		
11/7/1973	1,515.0	36.3	1,478.7		
4/9/1973	1,515.0	24.5	1,490.5		
11/30/1972	1,515.0	31.8	1,483.2		
4/20/1972	1,515.0	20.4	1,494.6		
11/18/1971	1,515.0	19.5	1,495.5		
4/12/1971	1,515.0	14.2	1,500.8		
11/2/1970	1,515.0	11.8	1,503.2		
4/6/1970	1,515.0	8.6	1,506.4		
10/28/1969	1,515.0	9.5	1,505.5		
4/21/1969	1,515.0	9.6	1,505.4		
10/23/1968	1,515.0	15.1	1,499.9		
3/25/1968	1,515.0	10.6	1,504.4		
10/24/1967	1,515.0	11.2	1,503.8		
4/17/1967	1,515.0	16.3	1,498.7		
12/13/1966	1,515.0	42.1	1,472.9		
11/18/1964	1,515.0	69.1	1,445.9		
11/19/1963	1,515.0	53.4	1,461.6		
11/26/1962	1,515.0	58.1	1,456.9		
11/28/1960	1,515.0	52.4	1,462.6		
11/23/1959	0.0	0.0	0.0	Tape hung up	
11/18/1958	1,515.0	38.5	1,476.5		
11/4/1957	1,515.0	66.2	1,448.8		
12/3/1956	1,515.0	57.5	1,457.5		
11/16/1955	1,515.0	39.7	1,475.3		
11/19/1954	1,515.0	26.3	1,488.7		
11/25/1953	1,515.0	16.1	1,498.9		

12/10/1952	1,515.0	11.3	1,503.7		
11/26/1951	1,515.0	66.6	1,448.4		
12/12/1950	1,515.0	55.1	1,459.9		
12/9/1949	1,515.0	41.1	1,473.9		
12/7/1948	1,515.0	26.5	1,488.5		
12/6/1948	1,515.0	25.8	1,489.2		
8/9/1948	1,515.0	21.7	1,493.3		

For use with report dated 11/14/2008; RTF Job No. 2005-052-01

Reading for well No. 7168C

State Well No. 4N15W22J01

Thomas Guide Page: 4552 **Grid:** B3

High Water Surface Elevation: 1468 on 04/01/1998

Low Water Surface Elevation: 1389 on 10/15/1990

Measure date	Ground Surface Elevation	Ground Surface to Water Surface	Water Surface Elevation	No Measurement	Questionable Measurement
5/3/2008	1,485.0	71.0	1,414.0		
10/31/2007	1,485.0	65.0	1,420.0		
4/30/2007	1,485.0	42.0	1,443.0		
9/30/2006	1,485.0	27.0	1,458.0		
4/30/2006	1,485.0	16.0	1,469.0		
10/31/2005	1,485.0	26.0	1,459.0		
4/30/2005	1,485.0	18.0	1,467.0		
11/30/2004	1,485.0	90.0	1,395.0		
5/31/2004	1,485.0	87.0	1,398.0		
3/31/2004	1,485.0	82.0	1,403.0		
10/31/2003	1,485.0	80.0	1,405.0		
10/15/2002	1,485.0	90.0	1,395.0		
4/30/2002	1,485.0	76.0	1,409.0		
3/31/2001	1,485.0	52.0	1,433.0		
10/31/2000	1,485.0	56.0	1,429.0		
5/31/2000	1,485.0	38.0	1,447.0		
10/31/1999	1,485.0	38.0	1,447.0		
4/30/1999	1,485.0	23.0	1,462.0		
11/1/1998	1,485.0	26.0	1,459.0		
4/1/1998	1,485.0	17.0	1,468.0		
10/1/1997	1,485.0	53.0	1,432.0		
4/1/1997	1,485.0	35.0	1,450.0		
10/31/1996	1,485.0	31.0	1,454.0		
4/30/1996	1,485.0	20.0	1,465.0		
10/31/1995	1,485.0	24.0	1,461.0		
4/28/1995	1,485.0	22.0	1,463.0		
10/31/1994	1,485.0	28.0	1,457.0		
4/30/1994	1,485.0	17.0	1,468.0		
4/30/1993	1,485.0	20.0	1,465.0		
9/30/1992	1,485.0	48.0	1,437.0		
4/30/1992	1,485.0	28.0	1,457.0		

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10/31/1991	1,485.0	89.0	1,396.0		
4/15/1991	1,485.0	80.0	1,405.0		
10/15/1990	1,485.0	96.0	1,389.0		
4/15/1990	1,485.0	78.0	1,407.0		
10/15/1989	1,485.0	76.0	1,409.0		
12/30/1988	1,485.0	57.0	1,428.0		
11/30/1988	1,485.0	59.0	1,426.0		
10/30/1988	1,485.0	60.0	1,425.0		
5/30/1988	1,485.0	52.0	1,433.0		
4/30/1988	1,485.0	48.0	1,437.0		
3/30/1988	1,485.0	41.0	1,444.0		
2/29/1988	1,485.0	48.0	1,437.0		
1/30/1988	1,485.0	52.0	1,433.0		
12/30/1987	1,485.0	52.0	1,433.0		
11/30/1987	1,485.0	54.0	1,431.0		
10/30/1987	1,485.0	55.0	1,430.0		
9/30/1987	1,485.0	55.0	1,430.0		
8/25/1987	1,485.0	52.0	1,433.0		
7/30/1987	1,485.0	50.0	1,435.0		
6/28/1987	1,485.0	48.0	1,437.0		
5/25/1987	1,485.0	44.0	1,441.0		
4/25/1987	1,485.0	43.0	1,442.0		
3/25/1987	1,485.0	42.0	1,443.0		
2/25/1987	1,485.0	40.0	1,445.0		
1/25/1987	1,485.0	40.0	1,445.0		
12/30/1986	1,485.0	42.0	1,443.0		
11/25/1986	1,485.0	42.0	1,443.0		
10/25/1986	1,485.0	42.0	1,443.0		
9/25/1986	1,485.0	43.0	1,442.0		
8/25/1986	1,485.0	40.0	1,445.0		
7/25/1986	1,485.0	36.0	1,449.0		
6/25/1986	1,485.0	32.0	1,453.0		
5/25/1986	1,485.0	29.0	1,456.0		
4/25/1986	1,485.0	28.0	1,457.0		
3/25/1986	1,485.0	28.0	1,457.0		
2/25/1986	1,485.0	35.0	1,450.0		
1/25/1986	1,485.0	35.0	1,450.0		
12/30/1985	1,485.0	35.0	1,450.0		
3/30/1985	1,485.0	23.0	1,462.0		
1/30/1985	1,485.0	21.0	1,464.0		

12/30/1984	1,485.0	25.0	1,460.0		
10/30/1984	1,485.0	27.0	1,458.0		
7/30/1984	1,485.0	24.0	1,461.0		
4/30/1984	1,485.0	19.0	1,466.0		
1/30/1984	1,485.0	20.0	1,465.0		
11/30/1983	1,485.0	17.0	1,468.0		
9/30/1983	1,485.0	17.0	1,468.0		
7/30/1983	1,485.0	21.0	1,464.0		
3/30/1983	1,485.0	17.0	1,468.0		
1/30/1983	1,485.0	35.0	1,450.0		

Ground Water Wells Website

Tools mode: Zoom In

GIS Map Tools

Instructions | Tools Help

Map Layers

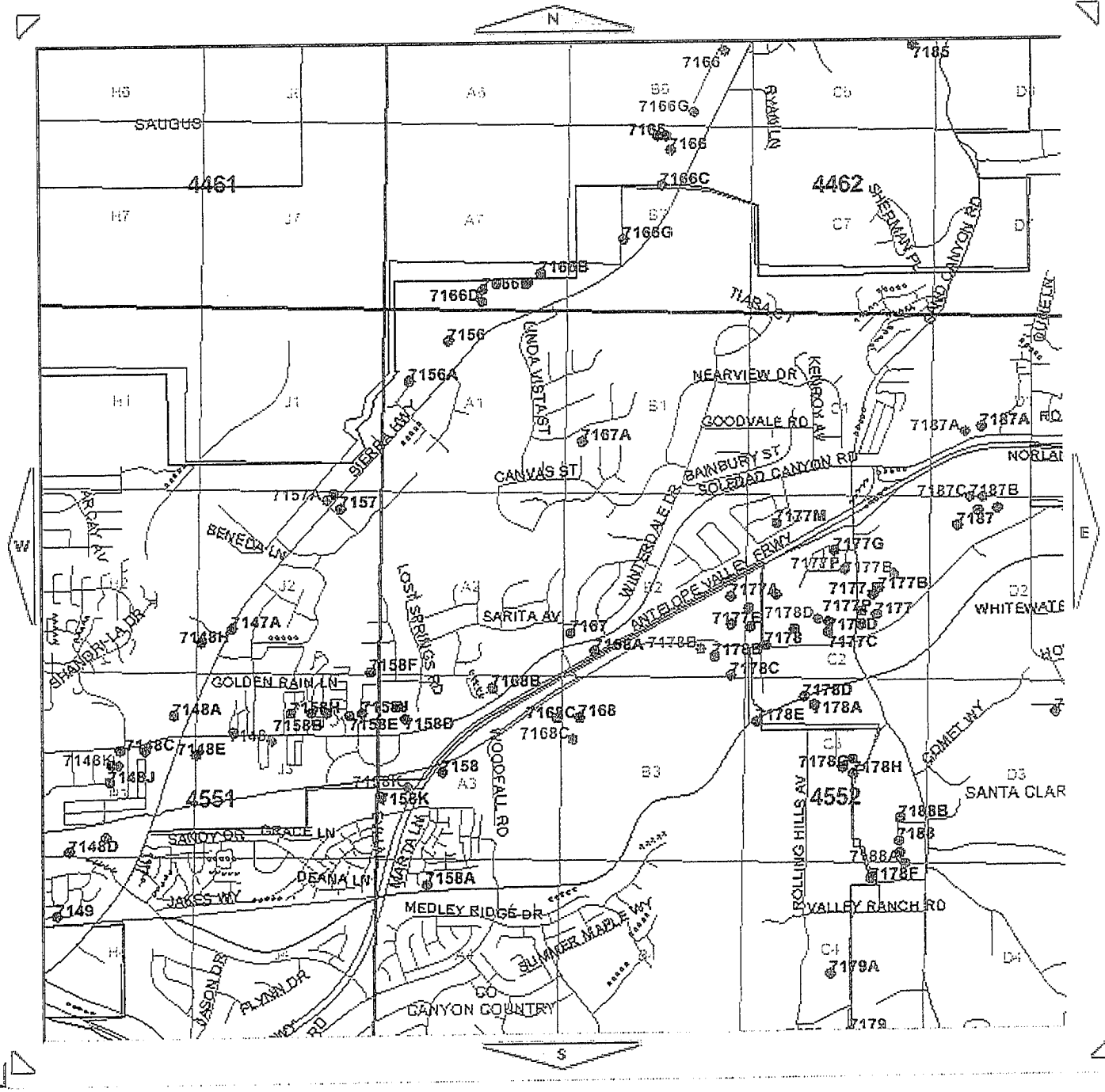
Search Criteria

Wells

All Wells

Active Wells

County



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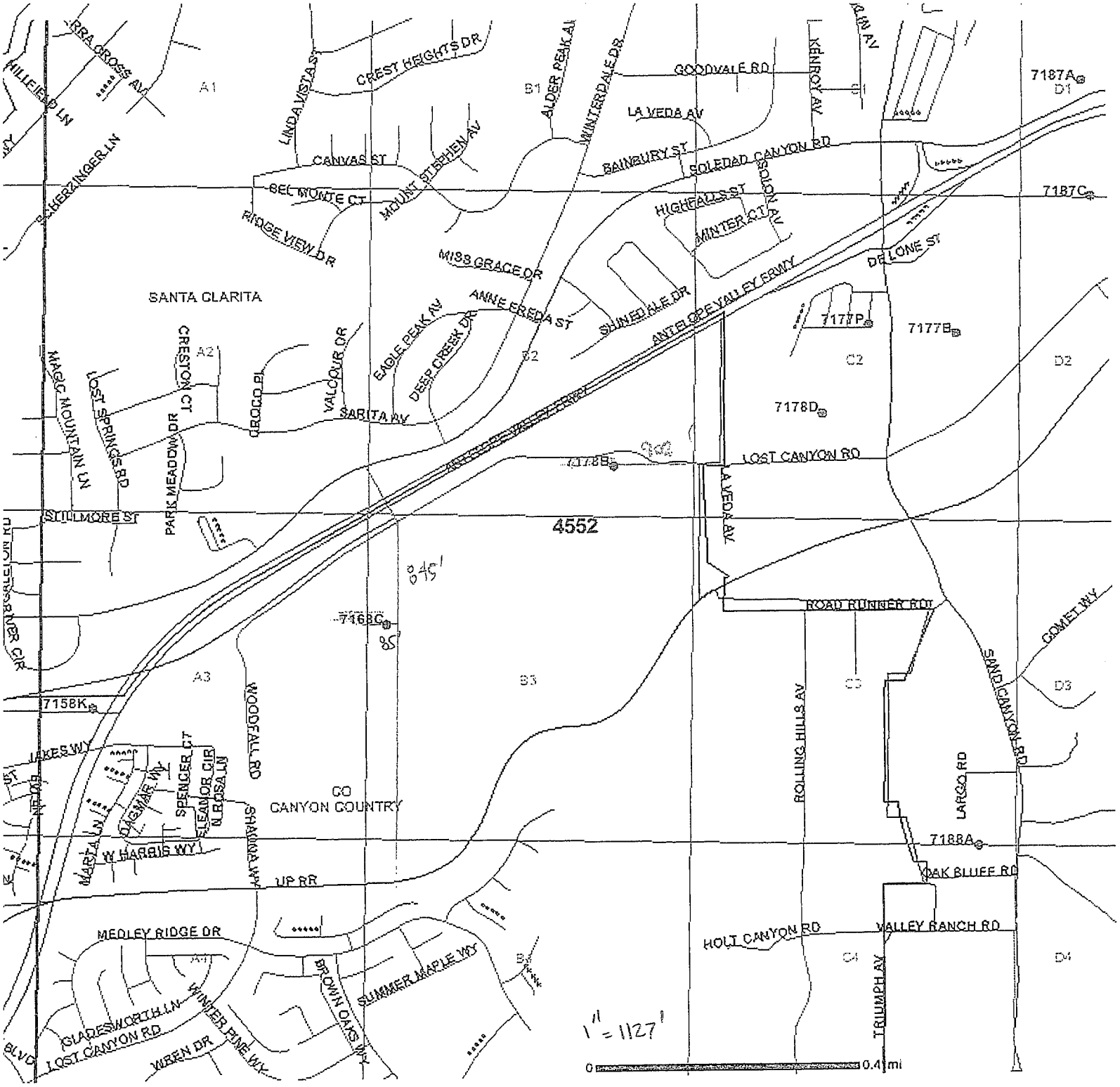
10/30/2008

http://dpwgis.co.la.ca.us/website/wells/viewer.asp


SANTA CLARITA
CANYON COUNTRY
CO
4552
LOST CANYON RD
SOLEDAD CANYON RD
GOODVALE RD
LA VEDA AV
BAINBURY ST
CANVAS ST
BEL MONTE CT
RIDGE VIEW DR
MISS GRACE DR
HIGHEAD ST
MINTER CT
DE LONE ST
ANNE EREDIA ST
SHINEDALE DR
EAGLE PEAK AV
DEER CREEK DR
VALCOUR DR
CROGO PL
SARITA AV
CRESTON CT
PARK MEADOW DR
LOST SPRINGS RD
MAGIC MOUNTAIN LN
STILLMORE ST
ROAD RUNNER RDG
ROLLING HILLS AV
SAND CANYON RD
COMET WY
LARGO RD
OAK BLUFF RD
VALLEY RANCH RD
HOLT CANYON RD
TRIUMPH AV
WOODFALL RD
SHANNWAY
JAKES WY
SPENCER CT
ELEANOR CIR
N ROSA LN
OAKMAR WY
MARTA LN
W HARRIS WY
UP RR
MEDLEY RIDGE DR
BROWN OAKS WY
SUMMER MAPLE WY
WINTER PINE WY
GLADESWORTH LN
LOST CANYON RD
WREN DR
7187A
7187C
7177P
7177B
7178D
7178B
7168C
7158K
7188A
A1
A2
A3
B1
B2
B3
C2
C3
C4
D1
D2
D3
D4
1" = 1127'
0
0.4 mi