**LEIGHTON AND ASSOCIATES, INC.**

Geotechnical and Environmental Engineering Consultants

# PRELIMINARY GEOTECHNICAL INVESTIGATION OF LIQUEFACTION AND SETTLEMENT POTENTIAL, PROPOSED RESIDENTIAL DEVELOPMENT AT THE LOWLAND PORTION OF NEWPORT/BANNING RANCH, NORTHEAST OF PACIFIC COAST HIGHWAY AND THE SANTA ANA RIVER, CITY OF NEWPORT BEACH, CALIFORNIA

May 16, 1997

Project No. 1970011-01

Prepared for:

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Geotechnical and Environmental Engineering Consultants

May 16, 1997

Project No. 1970011-01

To: Taylor Woodrow Homes
24461 Ridge Route Drive
Laguna Hills, California 92653-1686

Attention: Mr. Tom Redwitz

Subject: Preliminary Geotechnical Investigation of Liquefaction and Settlement Potential, Lowland Portion of Newport/Banning Ranch, Northeast of Pacific Coast Highway and Santa Ana River, City of Newport Beach, California

In accordance with your request, Leighton and Associates, Inc. (Leighton) has performed a preliminary geotechnical investigation of liquefaction and settlement potential at the lowland portion of the Newport/Banning Ranch. The Newport/Banning Ranch is located northeast of Pacific Coast Highway and Santa Ana River, in the City of Newport Beach, California. The purpose of the geotechnical investigation is to characterize the subsurface conditions, evaluate the liquefaction and settlement potential of the subsurface soils, and provide preliminary recommendations for remediation measures. Our scope of work for this study included review of existing reports, field exploration consisting of hollow stem borings and CPT soundings, laboratory testing, geotechnical analyses of collected data, and preparation of this report.

This report presents the results of our field investigation, laboratory testing, and geotechnical analyses, and provides our conclusions and recommendations for remediation measures of liquefaction and settlement potential at the site.

If you have any questions regarding this report, please do not hesitate to contact this office. We appreciate this opportunity to be of service.

Respectfully submitted,

LEIGHTON AND ASSOCIATES, INC.

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# 1.0 INTRODUCTION

## 1.1 Purpose and Scope

This report presents the results of our preliminary geotechnical investigation at the subject site. The purpose of this study was to characterize the subsurface soil conditions, and to evaluate the potential of liquefaction and settlement of the subsurface soils. The evaluation of a splay of the Newport-Inglewood fault that has been reported to cross the southwestern portion of the Newport/Banning Ranch is not part of this report. The scope of work of this study included the following tasks:

- Review available data pertinent to the site to obtain necessary information and clearances for the field investigation.
- Perform subsurface exploration consisting of excavating, logging, and sampling of 6 geotechnical borings. Representative undisturbed and bulk soil samples were collected at selected depth intervals and transported to our laboratory for testing. In addition, 10 CPT soundings were performed at selected locations to obtain continuous stratigraphy and strength data of subsurface soils.
- Perform laboratory tests on selected representative samples to evaluate engineering characteristics of onsite soils within the exploration depths.
- Perform geotechnical evaluation of collected data to assess liquefaction and settlement potential at the site.
- Prepare this report summarizing our findings, conclusions and recommendations.

## 1.2 Site Description and Proposed Development

The Newport/Banning Ranch is located north of the Pacific Coast Highway, immediately east of the Santa Ana River. The western one-third of the property consists of low-lying lands (average elevations of 4 to 6 feet) which rise abruptly to elevations 50 to 105 feet along an east-west to north trending escarpment. The current study area is the lowland portion of the Newport/Banning Ranch (see Figure 1). This parcel is roughly rectangular in shape, approximately 125 acres in area, and has been a producing oil field since the early 1940s. Oil wells, pipelines, roads, buildings, and other facilities exist over the site. Vegetated areas including bushes and trees are scattered throughout the site. No specific design plans were available at the time this report was prepared.

## 1.3 Field Investigation

Prior to field exploration, a site reconnaissance was performed by a project engineer and a principal geologist from our staff to evaluate and mark the proposed locations of field exploration, taking into consideration access for heavy equipment and subsurface structures. The subsurface investigation program consisted of hollow-stem borings and Cone Penetration Tests (CPT) soundings.

Six borings (B-1 through B-6) were drilled on November 4, 1996, using an 8-inch-diameter, hollow-stem auger, to a depth of 51.5 feet below existing ground surface. The borings were logged and sampled using the SPT and California Ring samplers at selected intervals. The SPT and Ring samplers were driven using a 140-pound hammer (automatic hammer) falling freely for 30 inches for a total penetration of 18 inches, and the blow counts were noted for every six inches of penetration. Sampling procedures generally followed Standard Penetration Test (SPT) and Split-Barrel Sampling of Soils (ASTM D1586). In addition, representative bulk samples were collected from the borings. Each soil sample collected was inspected and described in accordance with the Unified Soil Classification System. The soil descriptions were entered on the boring logs which are included in Appendix B. All samples were sealed and packaged for transportation to our laboratory. The borings were backfilled with bentonite chips after completion of drilling. Figure 2 and Plate 1 shows the approximate locations of the boreholes within the subject site.

The Cone Penetration Tests were performed according to ASTM D3441-94. The tests consisted of pushing an instrumented cone-tipped probe at a rate of 20-mm per second (approximately 4 feet per minute) into the ground while simultaneously recording the tip resistance and side friction resistance of the soil during penetration. A 23-ton truck, used to transport and house the test equipment, provided the required reaction weight for pushing the cone assembly. A total of 10 CPT soundings were performed on November 4 and 5, 1996, to collect continuous stratigraphy and strength data of subsurface soils. The depth of soundings varied from 32 to 52 feet. Locations of the CPT soundings are shown on the boring and CPT location maps (Figure 2 and Plate 1). Three of the soundings were performed with continuous pore pressure measurement and with two pore pressure dissipation tests per sounding. Plots of friction and tip resistance along with interpretation of the CPT soundings describing subsurface stratigraphy, converted SPT blowcounts, relative density, and strength characteristics are included in Appendix C.

## 1.4 Laboratory Testing

Laboratory tests were performed on representative samples to verify the field classification of the recovered samples and to determine the geotechnical properties of the subsurface soils. The following tests were performed:

- In-situ moisture content and density
- Grain-size distribution
- Atterberg Limits
- Consolidation

All laboratory testing was performed in general accordance with ASTM or Caltrans procedures. The results of the in-situ moisture and density tests are shown on our geotechnical boring logs (Appendix B). The results of other laboratory tests are presented in Appendix D.

# 2.0 GEOTECHNICAL FINDINGS

## 2.1 Previous Geotechnical Studies

Geotechnical investigations were previously performed for the site by Guptill and Heath (1981), Woodward-Clyde Consultants (1985), the Earth Technology Corporation (1986), and Pacific Soils Engineering, Inc. (1993). The studies conducted by Guptill and Heath and the Earth Technology were mainly related to the geological evaluation of splays of the Newport-Inglewood fault. Two distinct zones of faulting were identified within the site. The studies by Woodward-Clyde Consultants and Pacific Soils Engineering, Inc., covered other geotechnical aspects including liquefaction and settlement. Both studies concluded that the upper 10 to 12 feet of the subsurface soils were highly susceptible to liquefaction. Below 10 to 12 feet, localized zones of liquefiable soils were encountered. In addition, the study by Woodward-Clyde found that the upper 4 to 10 feet of the subsurface materials contained soft, highly plastic clay that might not be suitable for use as structural fill. The borings and CPT soundings performed by Woodward-Clyde and Pacific Soils Engineering, Inc., are presented on Figure 2 and Plate 1.

## 2.2 Subsurface Soil and Ground-Water Conditions

A layer of clay was encountered in our borings and CPT soundings within the upper 15 feet of the subsurface soils. The clay was generally soft and highly plastic, ranging in thickness from approximately 1 to 13 feet. Below 15 feet, the subsurface soils to the depth of our borings mainly consisted of fine to coarse grained sand and silty sand, with pockets of silt and silty clay. The consistency of the sand ranged from loose to medium dense to a depth of 30 feet and medium dense to dense below 30 feet. Ground-water was encountered in our borings at depths of 6 to 10 feet below existing ground surface.

## 2.3 Soil Compressibility

Consolidation tests were performed on representative samples of the highly plastic clay encountered within the upper 15 feet of our borings. Our observations during field explorations and the consolidation test results indicate that the clay layer is highly compressible.

## 2.4 Seismic Design Parameters

Woodward-Clyde used a peak ground acceleration of 0.25g and an earthquake magnitude of 7.0 for liquefaction analysis. Pacific Soils Engineering, Inc., used a peak ground acceleration of 0.7g and an earthquake magnitude of 7.5. We have performed deterministic and probabilistic seismic analyses for the site assuming that the main active trace of the Newport-Inglewood fault is less than 1 mile from the site and the Palos Verdes fault is within 11 miles from the site. The results of the analyses are presented in Appendix E. The above-mentioned faults are capable of generating significant ground shaking at the site. With a 10 percent probability of exceedance in 50 years, the peak ground acceleration at the site is estimated to be approximately 0.32g. This ground acceleration value along with an

earthquake magnitude of 7.1 were used in our liquefaction analysis. These parameters were estimated based on the earthquake database currently available.

## 2.5 Liquefaction Potential and Seismically-Induced Settlement

Liquefaction is the loss of soil strength or stiffness due to a build-up of pore-water pressure during a shaking event. Liquefaction is associated primarily with loose, saturated, fine- to medium-grained cohesionless soils. As the shaking action of an earthquake progresses, the soil grains are rearranged and the soil densifies. Densification of the soil results in a build-up of pore-water pressure. When the pore-water pressure equals the total overburden pressure, soil strength becomes near zero and liquefaction occurs. Effects of liquefaction on level ground include sand boils, settlement, and bearing capacity failures below structural foundations.

The liquefaction analysis was performed using the computer program LIQUEFY2 which is based on the simplified SPT blow count method presented by Seed et al. (1983 and 1985). The SPT blowcounts obtained during our field investigation were converted to standard SPT blowcounts by applying correction factors for hammer efficiency, effective overburden pressure, and fine contents. The analysis assumed no major changes in grade and a ground water depth at 5 feet. The results of the analysis are presented in Appendix F and plotted on Figures 3 and 4 in term of blowcounts versus depths.

The thick line on Figures 3 and 4 represents the critical blowcount for which the factor of safety of 1.0 was calculated for liquefaction. The line is discontinuous where the soil layers are not considered susceptible to liquefaction. When the actual blowcounts from borings or CPT soundings are plotted to the left of the thick line, the potential for liquefaction is considered high. Conversely, the liquefaction potential is considered low when the blowcounts are plotted to the right of the line. These figures indicate the presence of soil layers that are susceptible to liquefaction. These soil layers appear to be localized and relatively thin, with thicknesses ranging from 1 to 10 feet. These layers were encountered at depths varying from 6 to 50 feet below existing ground surface and do not appear to be continuous throughout the site. As such, lateral spreading or horizontal deformation as a result of liquefaction of underlying soils is not expected to be significant.

Seismically induced settlement was evaluated using the method suggested by Tokimatsu and Seed (1987). The settlement was estimated to be on the order of 1 to 3 inches. The depth of liquefiable layer in each boring and CPT, and the estimated liquefaction induced settlement are presented in the table below.

Estimated Liquefaction-Induced Settlement

| Boring or CPT Nos. | Depth of Liquefiable Layers (feet) | Estimated Liquefaction-Induced Settlement (in.) |
|---|---|---|
| B-1 | 25 - 27 | < 1.0 |
| B-2 | 6 - 15 and 20 - 25 | 2.8 |
| B-3 | - | - |
| B-4 | 11 - 15 and 40 - 45 | 1.9 |
| B-5 | 8 - 20 | 2.5 |
| B-6 | 15 - 25 and 35 - 40 | 3.0 |
| CPT-1 | 7 - 9.5, 11 - 13, 21 - 23, and 27 - 29.5 | 1.3 |
| CPT-2 | - | - |
| CPT-3 | 10 - 16 and 48 - 50 | 1.7 |
| CPT-4 | - | - |
| CPT-5 | 19 - 21 and 28 - 30 | 1.3 |
| CPT-6 | 8 - 9 | < 1.0 |
| CPT-7 | 8- 10, 16 - 18, 28 - 34, and 36 - 38 | 2.7 |
| CPT-8 | 7 - 11 and 16 - 17 | 1.4 |
| CPT-9 | 7 - 11 and 31 - 33 | 1.6 |
| CPT-10 | - | - |

## 2.6 Settlement of Clay Layer

The clay layer within the upper 15 feet of the subsurface soils is generally soft and highly plastic. This layer is likely to undergo settlement and is not suitable for support of structural fill and/or structures without remediation. One of the remedial measures that may be considered is preloading the area for a period of time until the remaining settlement is acceptable for construction. We have evaluated the settlement of a 15-foot thick clay layer with a surcharge load consisting of 15 feet of fill. This analysis was performed to provide a preliminary estimate of the waiting period for construction. The assumption of 15 feet of clay is conservative since the thickness of the clay layer encountered during our field investigation varied from 1 to 13 feet. We have evaluated two alternatives: one without removal and one with 5 feet of removal prior to placement of the surcharge load. The remaining settlement as a function of time after placement of 15 feet of fill is summarized in the following table.

Remaining Settlement with 15-foot Surcharge

| Time since completion of fill placement (days) | Remaining Settlement (inches) | |
|---|---|---|
| | 10′ Clay Layer (w/ 5′removal) | 15′ Clay Layer (without removal) |
| 30 | 2.1 | 2.8 |
| 60 | 1.7 | 2.5 |
| 90 | 1.4 | 2.3 |
| 120 | 1.2 | 2.1 |
| 50 | 1.1 | 2.0 |
| 180 | 1.0 | 1.8 |
| 210 | 1.0 | 1.7 |
| 240 | 0.9 | 1.6 |
| 270 | 0.9 | 1.5 |
| 300 | 0.6 | 1.5 |
| 330 | 0.6 | 1.4 |
| 360 | 0.6 | 1.3 |

## 3.0 CONCLUSIONS

- Based on our preliminary investigation, we conclude that, with proper planning, design, and sound construction practices, the hazards of liquefaction and settlement can be mitigated for anticipated land use. The recommendations presented in this report should be fully implemented in design and construction of the project.

- A highly plastic clay layer ranging from 1 to 13 feet in thickness was encountered in the upper 15 feet of our borings and CPT soundings. The clay is soft and highly plastic. Below 15 feet, the subsurface soils generally consist of sand and silty sand.

- Ground water was encountered in our borings at the depths of 6 to 10 feet.

- The clay layer is highly compressible and, without remediation, is not suitable for support of structures.

- Layers of potentially liquefiable soils were encountered between 6 and 50 feet below existing ground surface in our borings and CPT soundings. The layers appear to be relatively thin and localized. Seismically induced settlement, without remediation, was estimated to be on the order of 1 to 3 inches. The potential for lateral spreading is expected to be low.

# 4.0 RECOMMENDATIONS

## 4.1 Remediation Measures for Liquefaction

The recommendations presented below are intended for preliminary planning purposes. When plans are available, additional field investigation and laboratory testing should be performed to refine the liquefaction analysis based on proposed development. The preliminary project design should include measures to mitigate the liquefaction hazards. Mitigation measures may include one or a combination of the following alternatives:

### 4.1.1 Stiffened Foundation System

The majority of borings and CPT soundings at the site indicate seismically induced settlement on the order of 1 to 3 inches. Reinforced floor slabs properly designed to tolerate the potential settlement and prevent potential cracking damage to the structures may be considered for support of the buildings. However, there are localized areas where higher magnitude of settlement may occur. In such areas, this foundation system may not be economical. Other improvements would not be protected.

### 4.1.2 Gravel Blanket

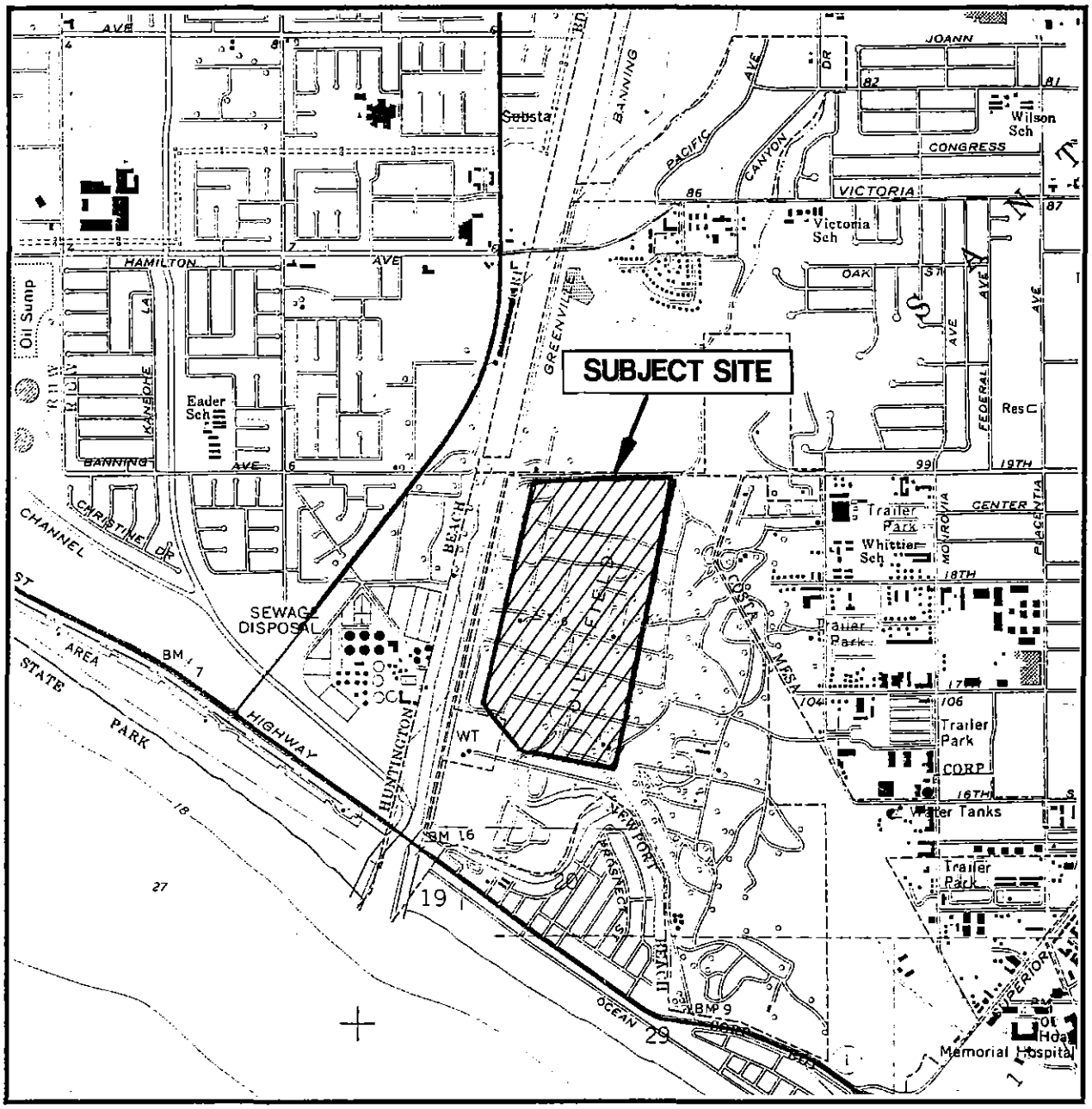
Another liquefaction-related concern is potential surface damage in the forms of ground cracking and sand boils. To mitigate this concern, a gravel or well-graded sand blanket about one foot thick may be placed at the removal bottom prior to fill placement. The gravel layer will serve to provide horizontal drainage resulting in controlled and more rapid dissipation of excess pore water pressure and preventing sand boils from propagating to the ground surface.

### 4.1.3 Grouting

Grouting may be performed in areas where the subsurface soils are susceptible to liquefaction. Since the liquefiable layers are localized and relatively thin, grouting can be performed on the specific layers to improve the in-place density. Additional field exploration will be required to delineate areas and subsurface layers where grouting should be performed.

## 4.2 Remediation Measures for Consolidation Settlement

Remediation measures will be required to reduce the amount of settlement of the clay layer. Removal of the clay layer and replacement with relatively sandy material may be performed. However, the clay layer extends below the groundwater table, and removal and recompaction of soils below groundwater table may not be economical. Preloading along with removal of the compressible layer above groundwater table may be considered. The preloading may consist of placement of surcharge fill and monitoring the settlement. Estimated settlement period for a 15-foot high surcharge fill with and without partial removal of the clay layer is presented in Section 2.6. Settlement gages should be installed to monitor the actual settlement in the field. The surcharge fill may be removed once the remaining settlement is considered acceptable for construction of proposed structures.




# SITE LOCATION MAP

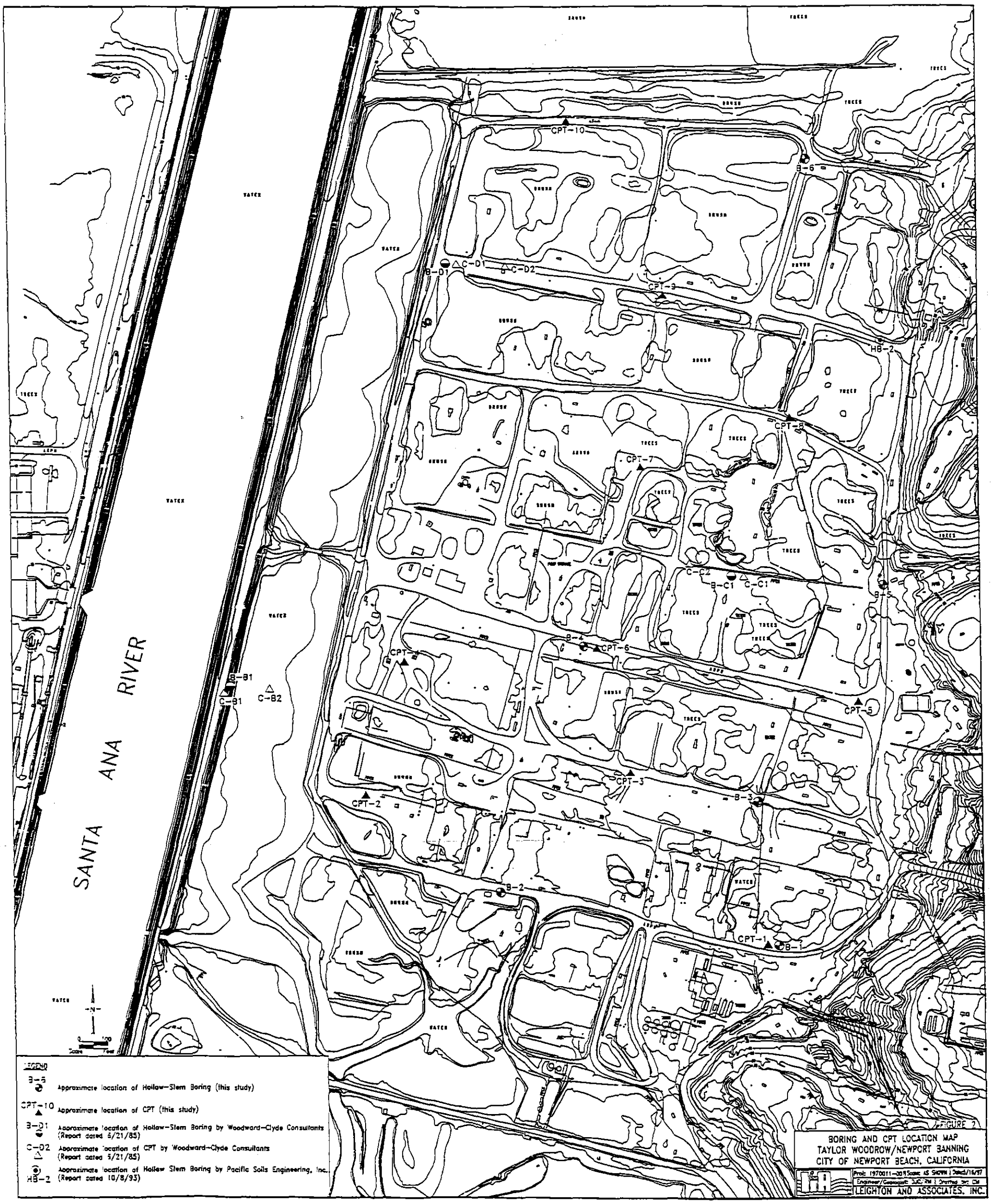
BASE MAP: USGS 7.5 MINUTE NEWPORT BEACH QUADRANGLE (PHOTOREVISED 1972)

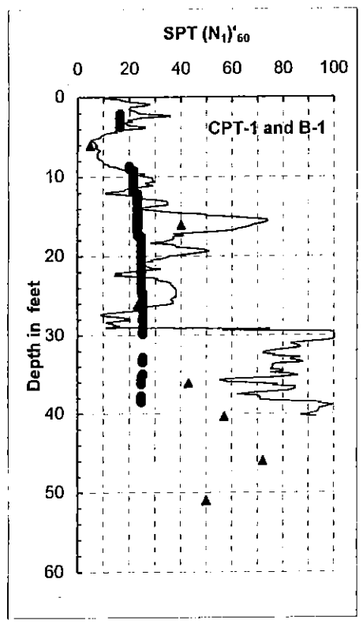
**LOWLAND PORTION OF**
**NEWPORT / BANNING RANCH**
**CITY OF NEWPORT BEACH, CALIFORNIA**

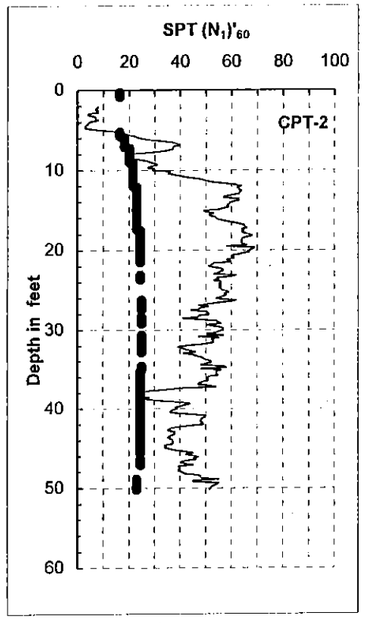
Project No. 1970011-01

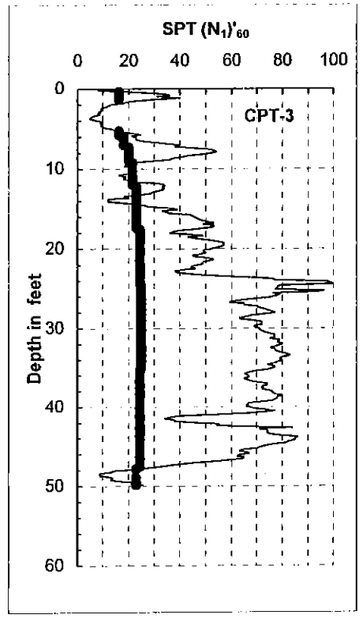
Date 5/16/97

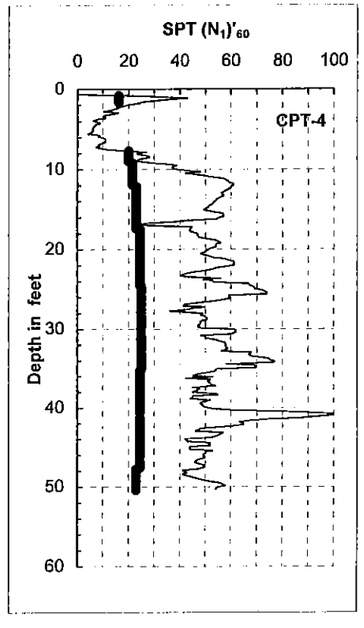
Figure No. 1

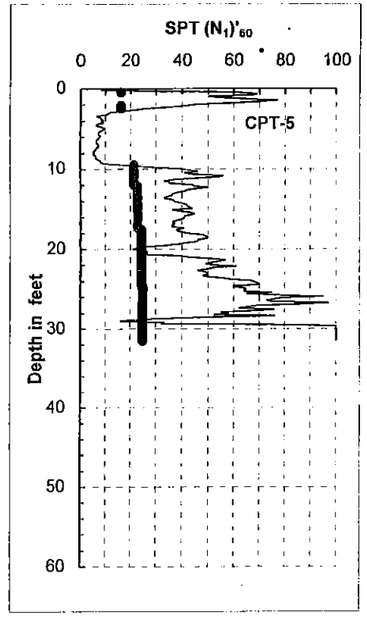

SANTA ANA RIVER
CPT-10
B-6
B-D1
C-D1
C-D2
CPT-9
HB-2
CPT-8
CPT-7
C-C2
B-C1
C-C1
B-5
B-4
CPT-6
CPT-4
B-B1
C-B1
C-B2
CPT-5
CPT-3
B-3
CPT-2
B-2
CPT-1
B-1
N
0
100
Scale
Feet
LEGEND
B-6 Approximate location of Hollow-Stem Boring (this study)
CPT-10 Approximate location of CPT (this study)
B-D1 Approximate location of Hollow-Stem Boring by Woodward-Clyde Consultants (Report dated 5/21/85)
C-D2 Approximate location of CPT by Woodward-Clyde Consultants (Report dated 5/21/85)
HB-2 Approximate location of Hollow Stem Boring by Pacific Soils Engineering, Inc. (Report dated 10/8/93)
FIGURE 2
BORING AND CPT LOCATION MAP
TAYLOR WOODROW/NEWPORT BANNING
CITY OF NEWPORT BEACH, CALIFORNIA
LEIGHTON AND ASSOCIATES, INC.



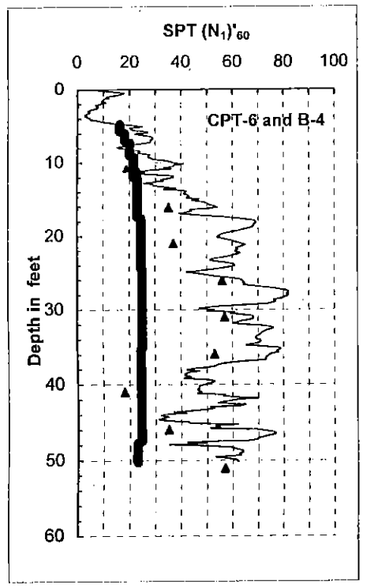



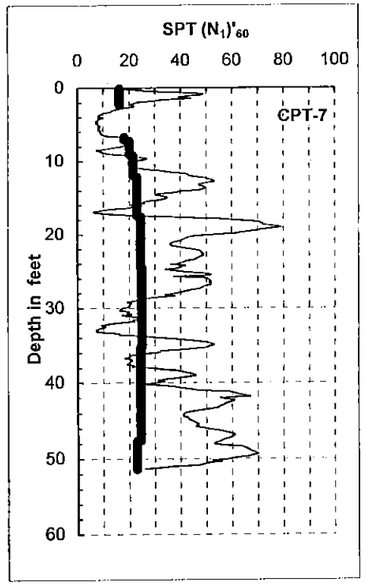



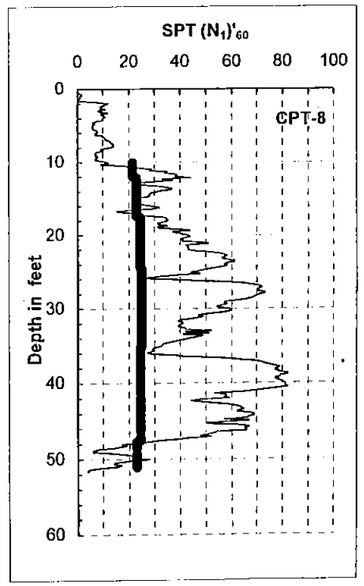



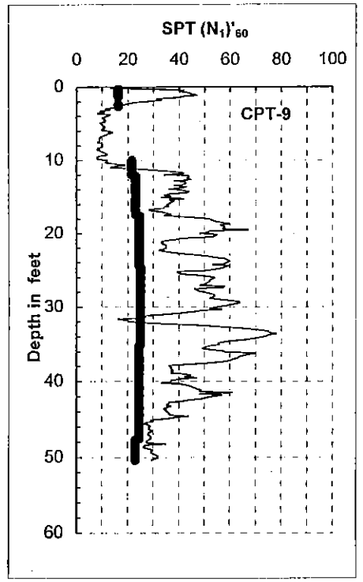

**LEGEND:**

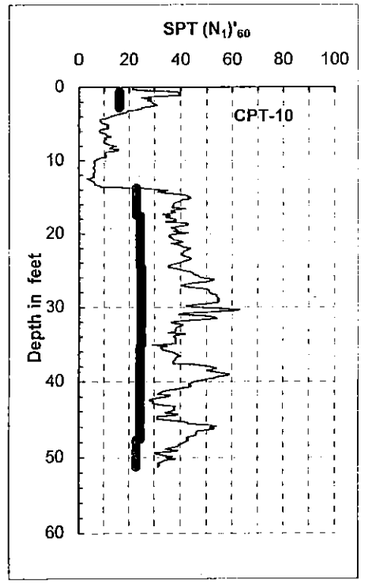
- Blow Count Estimated from CPT data
- Blow Count Required to Prevent Liquefaction
- ▲ Blow Count from HSA Boring



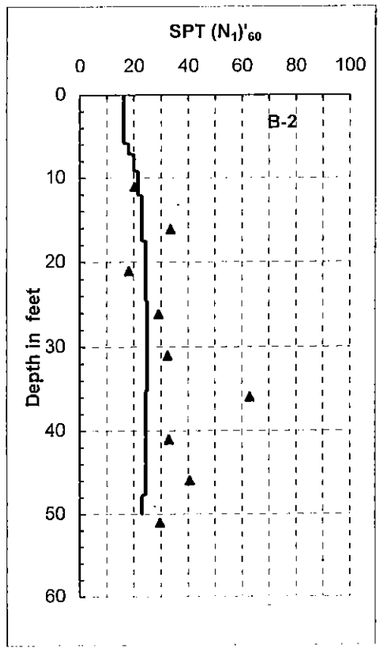



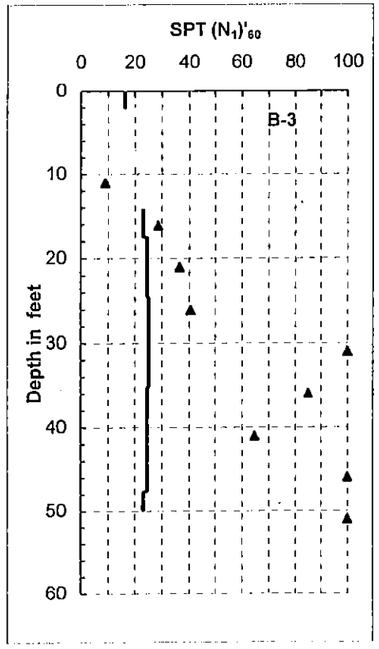



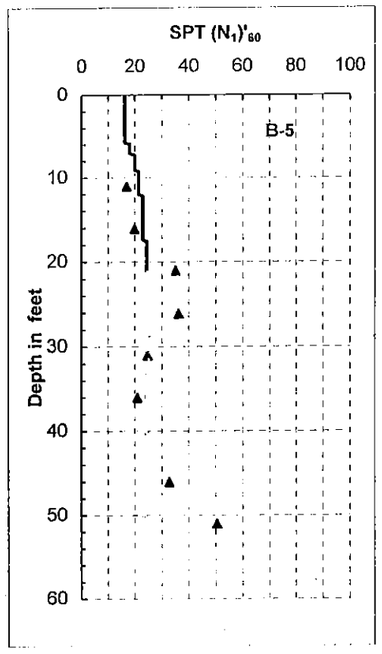

SPT BLOWCOUNTS FROM BORINGS B-1 AND B-4 AND CPT DATA VERSUS CRITICAL BLOWCOUNTS

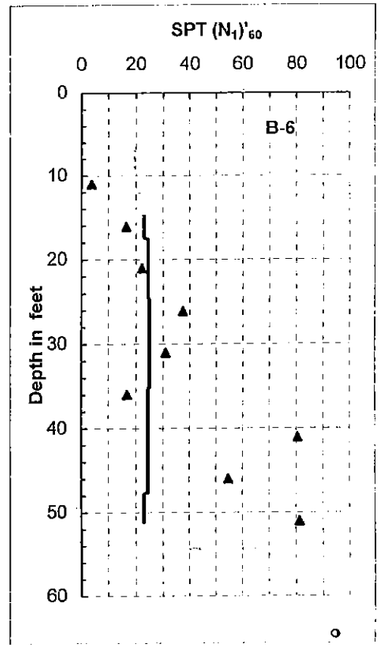
| | |
|---|---|
| Project No. | 1970011-01 |
| Scale | NONE |
| Eng | DJC/RM |
| Drafted By | LAF |
| Date | 5/16/97 |

Figure No. 3




See Figure 3 for legend

SPT BLOWCOUNTS FROM BORINGS B-2, B-3, B-5 AND B-6 Vs. CRITICIAL BLOWCOUNTS

| | |
|---|---|
| Project No. | 1970011-01 |
| Scale | NONE |
| Eng | DJC/RM |
| Drafted By | LAF |
| Date | 5/16/97 |

Figure No. 4

# APPENDIX A

## References

Blake, T.F., 1994, "LIQUEFY2 User's Manual".

Earth Technology Corporation, 1986, "Geological Evaluation of Faulting Potential, West Newport Oil Field, Orange County, California", Project No. 86-820-01, dated July 31, 1986.

Guptill, P.D., and Heath, E.G., 1981, "Surface Faulting Along the Newport-Inglewood Zone at Deformation", California Geology, pp. 136-148, 1981.

Pacific Soils Engineering, Inc., 1993, "Geotechnical Feasibility Investigation, Newport/Banning Ranch Project, County of Orange, California, Work Order 500236, dated October 8, 1993.

Seed, H. B., Idriss, I. M., Arango, I., 1983, "Evaluation of Liquefaction Potential Using Field Performance Data", Journal of Geotechnical Engineering, ASCE, Vol. 09, No. 3.

Seed, H. B., Tokimatsu, K., and Harder, L. F., 1985, "Influence of Standard Penetration Test Procedures in Soil Liquefaction Resistance Evaluations", Journal of Geotechnical Engineering, ASCE, Vol. 111, No. 12.

Tokimatsu, K., and Seed, H.B., 1987, "Evaluation of Settlements in Sands due to Earthquake Shaking", Journal of Geotechnical Engineering, ASCE, Vol. 113, No. 8.

Woodward-Clyde Consultants, 1985, "Preliminary Geotechnical Engineering Studies, Long Range Planning Program, West Newport Oil Company", Project No. 41890A, dated June 21, 1985.

# GEOTECHNICAL BORING LOG B-1

Date 11-4-96 | Sheet 1 of 2

Project TW Homes/Banning Lowland | Project No. 1970011-01

Drilling Co. 2R DRILLING | Type of Rig CME-55

Hole Diameter 8" | Drive Weight 140 lbs | Drop 30"

Elevation Top of Hole 5' | Location See Plate 1

Logged By DXS

Sampled By DXS

| Elevation Feet | Depth Feet | Graphic Log | Attitudes | Tube Sample No. | Blows Per Foot | Dry Density pcf | Moisture Content, % | Soil Class. (U.S.C.S.) | GEOTECHNICAL DESCRIPTION | Type of Tests |
|---|---|---|---|---|---|---|---|---|---|---|
| | 0 | | | Bag #1 | | | | | SILTY CLAY with sand and gravel, medium stiff, grey, slightly moist | |
| | | | | R-1 | 17 | | | SP | 2': SAND, loose, yellowish brown, slightly moist, fine grained sand | |
| 0 | 5 | | | S-1 | 3 | | | CH | 5': SILTY CLAY, soft, greyish blue, very moist, high plasticity | AL |
| | | | | | | | | | 7': Ground water encountered | |
| -5 | 10 | | | R-2 | 11 | | | SM | 10': SILTY SAND, medium dense, bluish grey, saturated, fine to coarse grained sand, shell at tip, trace gravel | |
| -10 | 15 | | | S-2 | 24 | | | SM | 15': Same material, layers of sea shell and pea gravel | SA |
| -15 | 20 | | | R-3 | 13 | | | | 20': Coarser sand | |
| -20 | 25 | | | S-3 | 17 | | | | 25': Fine grained sand, no sea shell | |
| -25 | 30 | | | | | | | | | |

SAMPLE TYPES:
- S SPLIT SPOON
- R RING SAMPLE
- B BULK SAMPLE
- T TUBE SAMPLE

TYPE OF TESTS:
- DS DIRECT SHEAR
- MD MAXIMUM DENSITY
- CN CONSOLIDATION
- CR CORROSION
- SA SIEVE ANALYSIS
- AL ATTERBERG LIMITS
- EI EXPANSION INDEX
- HD HYDROMETER & SIEVE

# GEOTECHNICAL BORING LOG B-1

Date 11-4-96 Sheet 2 of 2

Project TW Homes/Banning Lowland Project No. 1970011-01

Drilling Co. 2R DRILLING Type of Rig CME-55

Hole Diameter 8" Drive Weight 140 lbs Drop 30"

Elevation Top of Hole 5' Location See Plate 1

| Elevation Feet | Depth Feet | Graphic Log | Attitudes | Tube Sample No. | Blows Per Foot | Dry Density pcf | Moisture Content, % | Soil Class. (U.S.C.S.) | GEOTECHNICAL DESCRIPTION | Type of Tests |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | Logged By DXS<br>Sampled By DXS | |
| | 30 | | | R-4 | 59 | | | SM | 30': SILTY SAND, medium dense to dense, grey, very moist, fine to coarse grained sand, silt (20 %), trace gravel | |
| -30 | 35 | | | S-4 | 33 | | | SP-SM | 35': SAND, dense, grey, saturated, rounded and some angular gravel pieces, pea gravel | |
| -35 | 40 | | | S-5 | 49 | | | SW-SM | 40': SAND with silt and gravel, more pea gravel, rounded and angular gravel pieces | SA |
| -40 | 45 | | | S-6 | 64 | | | | 45': Same material | |
| -45 | 50 | | | S-7 | 44 | | | | 50': Same material | |
| -50 | 55 | | | | | | | | NOTES:<br>Total depth = 51'6"<br>Ground water encountered at 7'<br>Backfilled with native and bentonite chips upto 20' | |
| -55 | 60 | | | | | | | | | |

SAMPLE TYPES:
- S SPLIT SPOON
- R RING SAMPLE
- B BULK SAMPLE
- T TUBE SAMPLE

TYPE OF TESTS:
- DS DIRECT SHEAR
- MD MAXIMUM DENSITY
- CN CONSOLIDATION
- CR CORROSION
- SA SIEVE ANALYSIS
- AL ATTERBERG LIMITS
- EI EXPANSION INDEX
- HD HYDROMETER & SIEVE

# GEOTECHNICAL BORING LOG B-2

Date 11-4-96 | Sheet 1 of 2

Project TW Homes/Banning Lowland | Project No. 1970011-01

Drilling Co. 2R DRILLING | Type of Rig CME-55

Hole Diameter 8" | Drive Weight 140 lbs | Drop 30"

Elevation Top of Hole 5' | Location See Plate 1

Logged By DXS

Sampled By DXS

| Elevation Feet | Depth Feet | Graphic Log | Attitudes | Tube Sample No. | Blows Per Foot | Dry Density pcf | Moisture Content, % | Soil Class. (U.S.C.S.) | GEOTECHNICAL DESCRIPTION | Type of Tests |
|---|---|---|---|---|---|---|---|---|---|---|
| | 0 | | | Bag #1 | | | | | SAND, loose, brown, moist, fine to coarse grained sand with some gravel | |
| | | | | R-1 | 6 | | | SP | 2': Same material | |
| 0 | 5 | | | R-2 | 9 | | | CL | 5': Top 1', silty clay, soft, grey, very moist, high plasticity; followed by SILTY SAND, loose, grey, saturated<br>6': Ground water encountered | |
| -5 | 10 | | | S-1 | 11 | | | SM | 10': Same material | SA |
| -10 | 15 | | | S-2 | 20 | | | SM | 15': medium dense, grey, saturated, fine grained sand | |
| -15 | 20 | | | S-3 | 12 | | | | 20': Some mica, rounded gravel | |
| -20 | 25 | | | S-4 | 21 | | | | 25': Same material, shell, and pea gravel | |
| -25 | 30 | | | | | | | | | |

SAMPLE TYPES:
- S SPLIT SPOON
- R RING SAMPLE
- B BULK SAMPLE
- T TUBE SAMPLE

TYPE OF TESTS:
- DS DIRECT SHEAR
- MD MAXIMUM DENSITY
- CN CONSOLIDATION
- CR CORROSION
- SA SIEVE ANALYSIS
- AL ATTERBERG LIMITS
- EI EXPANSION INDEX
- HD HYDROMETER & SIEVE

# GEOTECHNICAL BORING LOG B-2

Date 11-4-96 Sheet 2 of 2

Project TW Homes/Banning Lowland Project No. 1970011-01

Drilling Co. 2R DRILLING Type of Rig CME-55

Hole Diameter 8" Drive Weight 140 lbs Drop 30"

Elevation Top of Hole 5' Location See Plate 1

| Elevation Feet | Depth Feet | Graphic Log | Attitudes | Tube Sample No. | Blows Per Foot | Dry Density pcf | Moisture Content, % | Soil Class. (U.S.C.S.) | GEOTECHNICAL DESCRIPTION | Type of Tests |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | Logged By DXS<br>Sampled By DXS | |
| | 30 | | | S-5 | 25 | | | SP-SM | 30': SAND, medium dense, grey, saturated, fine to coarse grained sand, trace gravel, some shell, black specks | SA |
| -30 | 35 | | | S-6 | 51 | | | | 35': Same material, very dense, a lot of shell, mica, pea gravel, coarser sand | |
| -35 | 40 | | | S-7 | 28 | | | | 40': finer sand, medium dense | |
| -40 | 45 | | | S-8 | 36 | | | | 45': Same material, dense | |
| -45 | 50 | | | S-9 | 27 | | | | 50': Same material | |
| | | | | | | | | | NOTES:<br><br>Total depth = 51'6"<br>Ground water encountered at 6'<br>Backfilled with native and bentonite chips upto 20' | |
| -50 | 55 | | | | | | | | | |
| -55 | 60 | | | | | | | | | |

SAMPLE TYPES:
- S SPLIT SPOON
- R RING SAMPLE
- B BULK SAMPLE
- T TUBE SAMPLE

TYPE OF TESTS:
- DS DIRECT SHEAR
- MD MAXIMUM DENSITY
- CN CONSOLIDATION
- CR CORROSION
- SA SIEVE ANALYSIS
- AL ATTERBERG LIMITS
- EI EXPANSION INDEX
- HD HYDROMETER & SIEVE

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# GEOTECHNICAL BORING LOG B-3

Date 11-4-96 | Sheet 1 of 2

Project TW Homes/Banning Lowland | Project No. 1970011-01

Drilling Co. 2R DRILLING | Type of Rig CME-55

Hole Diameter 8" | Drive Weight 140 lbs | Drop 30"

Elevation Top of Hole 5' | Location See Plate 1

Logged By DXS

Sampled By DXS

| Elevation Feet | Depth Feet | Tube Sample No. | Blows Per Foot | Dry Density pcf | Moisture Content, % | Soil Class. (U.S.C.S.) | GEOTECHNICAL DESCRIPTION | Type of Tests |
|---|---|---|---|---|---|---|---|---|
| | 0 | Bag #1 | | | | | GRAVELLY SAND, loose, brown, moist, fine to coarse grained sand with some clay | |
| | | R-1 | 47 | | | SC | 2': CLAYEY SAND, medium dense, dark grey, moist, fine to coarse grained, some oil smell | |
| 0 | 5 | R-2 | 6 | 79.4 | 40.2 | CL | 5': SILTY CLAY, soft, grey, very moist, high plasticity; | AL,CN |
| | | | | | | | 6': Ground water encountered | |
| -5 | 10 | S-1 | 5 | | | SC | 10': CLAYEY SAND, loose, grey, very moist, fine to coarse grained sand | |
| -10 | 15 | S-2 | 17 | | | ML | 15': SILT with sand, very stiff, grey, saturated, fine grained sand | SA |
| -15 | 20 | S-3 | 24 | | | SP-SM | 20': SAND, medium dense, grey, saturated, mica, shell, rounded gravel | |
| -20 | 25 | S-4 | 29 | | | | 25': Same material | |
| -25 | 30 | | | | | | | |

SAMPLE TYPES:
- S SPLIT SPOON
- R RING SAMPLE
- B BULK SAMPLE
- T TUBE SAMPLE

TYPE OF TESTS:
- DS DIRECT SHEAR
- MD MAXIMUM DENSITY
- CN CONSOLIDATION
- CR CORROSION
- SA SIEVE ANALYSIS
- AL ATTERBERG LIMITS
- EI EXPANSION INDEX
- HD HYDROMETER & SIEVE

# GEOTECHNICAL BORING LOG B-3

Date 11-4-96 | Sheet 2 of 2

Project TW Homes/Banning Lowland | Project No. 1970011-01

Drilling Co. 2R DRILLING | Type of Rig CME-55

Hole Diameter 8" | Drive Weight 140 lbs | Drop 30"

Elevation Top of Hole 5' | Location See Plate 1

| Elevation Feet | Depth Feet | Graphic Log | Attitudes | Tube Sample No. | Blows Per Foot | Dry Density pcf | Moisture Content, % | Soil Class. (U.S.C.S.) | GEOTECHNICAL DESCRIPTION | Type of Tests |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | Logged By DXS<br>Sampled By DXS | |
| | 30 | | | S-5 | 83 | | | SP-SM | 30': SAND, very dense, dark grey, saturated, coarse grained sand, rounded and angular gravel pieces, some shell, black specks, and pea gravel | SA |
| -30 | 35 | | | S-6 | 69 | | | | 35': Same material, a lot of rounded and angular gravel | |
| -35 | 40 | | | S-7 | 55 | | | | 40': GRAVELLY SAND, very dense, grey, saturated, coarse sand, rounded and angular gravel pieces, pea gravel | |
| -40 | 45 | | | S-8 | 95/11.5" | | | SP-SM | 45': Same material | SA |
| -45 | 50 | | | S-9 | 94/11.5" | | | | 50': Same material | |
| -50 | 55 | | | | | | | | NOTES:<br>Total depth = 51'6"<br>Ground water encountered at 6'<br>Backfilled with native and bentonite chips upto 20' | |
| -55 | 60 | | | | | | | | | |

SAMPLE TYPES:
- S SPLIT SPOON
- R RING SAMPLE
- B BULK SAMPLE
- T TUBE SAMPLE

TYPE OF TESTS:
- DS DIRECT SHEAR
- MD MAXIMUM DENSITY
- CN CONSOLIDATION
- CR CORROSION
- SA SIEVE ANALYSIS
- AL ATTERBERG LIMITS
- EI EXPANSION INDEX
- HD HYDROMETER & SIEVE

# GEOTECHNICAL BORING LOG B-4

Date 11-4-96 | Sheet 1 of 2

Project TW Homes/Banning Lowland | Project No. 1970011-01

Drilling Co. 2R DRILLING | Type of Rig CME-55

Hole Diameter 8" | Drive Weight 140 lbs | Drop 30"

Elevation Top of Hole 5' | Location See Plate 1

Logged By DXS

Sampled By DXS

| Elevation Feet | Depth Feet | Graphic Log | Attitudes | Tube Sample No. | Blows Per Foot | Dry Density pcf | Moisture Content, % | Soil Class. (U.S.C.S.) | GEOTECHNICAL DESCRIPTION | Type of Tests |
|---|---|---|---|---|---|---|---|---|---|---|
| | 0 | | | Bag #1 | | | | | SILTY CLAY, stiff, grey, moist, high plasticity | |
| | | | | R-1 | 5 | 73.3 | 46.7 | CL | 2': SILTY CLAY, medium stiff, grey, very moist, high plasticity, bottom rings consist of SILTY SAND, loose, bluish, very moist, fine grained | CN |
| 0 | 5 | | | R-2 | 12 | | | SP | 5': SAND with some silt, loose, brownish grey, very moist | |
| | | | | | | | | | 7': Ground water encountered | |
| -5 | 10 | | | S-1 | 10 | | | SP-SM | 10': SAND with silt, loose, grey, saturated, fine grained | SA |
| -10 | 15 | | | S-2 | 21 | | | | 15': Same material | |
| -15 | 20 | | | S-3 | 25 | | | SP-SM | 20': medium dense, mica, shell, rounded gravel | |
| -20 | 25 | | | S-4 | 41 | | | | 25': Same material, dense, a lot of shell, pea gravel | |
| -25 | 30 | | | | | | | | | |

SAMPLE TYPES:
- S SPLIT SPOON
- R RING SAMPLE
- B BULK SAMPLE
- T TUBE SAMPLE

TYPE OF TESTS:
- DS DIRECT SHEAR
- MD MAXIMUM DENSITY
- CN CONSOLIDATION
- CR CORROSION
- SA SIEVE ANALYSIS
- AL ATTERBERG LIMITS
- EI EXPANSION INDEX
- HD HYDROMETER & SIEVE

# GEOTECHNICAL BORING LOG B-4

Date 11-4-96 Sheet 2 of 2

Project TW Homes/Banning Lowland Project No. 1970011-01

Drilling Co. 2R DRILLING Type of Rig CME-55

Hole Diameter 8" Drive Weight 140 lbs Drop 30"

Elevation Top of Hole 5' Location See Plate 1

| Elevation Feet | Depth Feet | Graphic Log | Attitudes | Tube Sample No. | Blows Per Foot | Dry Density pcf | Moisture Content, % | Soil Class. (U.S.C.S.) | GEOTECHNICAL DESCRIPTION | Type of Tests |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | Logged By DXS<br>Sampled By DXS | |
| | 30 | | | S-5 | 44 | | | SP-SM | 30': SAND, dense, grey, saturated, fine to coarse grained sand (20 to 30 % silt) | SA |
| -30 | 35 | | | S-6 | 43 | | | | 35': Same material | |
| -35 | 40 | | | S-7 | 16 | | | | 40': Same material, medium dense, mica, rounded and angular gravel pieces, pea gravel | |
| -40 | 45 | | | S-8 | 31 | | | SM | 45': SILTY SAND, medium dense to dense, grey, saturated, mica, pea gravel | SA |
| -45 | 50 | | | S-9 | 51 | | | | 50': SAND with gravel, very dense, saturated, angular and rounded gravel pieces, pea gravel | |
| -50 | 55 | | | | | | | | NOTES:<br>Total depth = 51'6"<br>Ground water encountered at 7'<br>Backfilled with native and bentonite chips upto 20' | |
| -55 | 60 | | | | | | | | | |

SAMPLE TYPES:
- S SPLIT SPOON
- R RING SAMPLE
- B BULK SAMPLE
- T TUBE SAMPLE

TYPE OF TESTS:
- DS DIRECT SHEAR
- MD MAXIMUM DENSITY
- CN CONSOLIDATION
- CR CORROSION
- SA SIEVE ANALYSIS
- AL ATTERBERG LIMITS
- EI EXPANSION INDEX
- HD HYDROMETER & SIEVE

# GEOTECHNICAL BORING LOG B-5

Date 11-4-96 | Sheet 1 of 2

Project TW Homes/Banning Lowland | Project No. 1970011-01

Drilling Co. 2R DRILLING | Type of Rig CME-55

Hole Diameter 8" | Drive Weight 140 lbs | Drop 30"

Elevation Top of Hole 10' | Location See Plate 1

Logged By DXS

Sampled By DXS

| Elevation Feet | Depth Feet | Graphic Log | Attitudes | Tube Sample No. | Blows Per Foot | Dry Density pcf | Moisture Content, % | Soil Class. (U.S.C.S.) | GEOTECHNICAL DESCRIPTION | Type of Tests |
|---|---|---|---|---|---|---|---|---|---|---|
| 10 | 0 | | | Bag #1 | | | | | SAND, loose, brown, slightly moist, fine to coarse grained sand. | |
| | | | | R-1 | 16 | | | SP | 2': Same material | |
| 5 | 5 | | | R-2 | 23 | | | SM | 5': SILTY SAND, medium dense, brownish grey, moist, fine to coarse grained sand. | |
| 0 ▼ | 10 | | | S-1 | 10 | | | SM | 10': Ground water encountered<br>10': SILTY SAND to SANDY SILT, loose, grey, saturated, fine grained | SA |
| -5 | 15 | | | S-2 | 13 | | | | 15': Same material, medium dense, 30% silt | |
| -10 | 20 | | | S-3 | 25 | | | | 20': Same material<br>21': SANDY CLAY, very stiff, yellowish, brown, moist, low to medium plasticity | |
| -15 | 25 | | | S-4 | 26 | | | CL | 25': Same material | SA |
| -20 | 30 | | | | | | | | | |

SAMPLE TYPES:
- S SPLIT SPOON
- R RING SAMPLE
- B BULK SAMPLE
- T TUBE SAMPLE

TYPE OF TESTS:
- DS DIRECT SHEAR
- MD MAXIMUM DENSITY
- CN CONSOLIDATION
- CR CORROSION
- SA SIEVE ANALYSIS
- AL ATTERBERG LIMITS
- EI EXPANSION INDEX
- HD HYDROMETER & SIEVE

# GEOTECHNICAL BORING LOG B-5

Date 11-4-96 | Sheet 2 of 2

Project TW Homes/Banning Lowland | Project No. 1970011-01

Drilling Co. 2R DRILLING | Type of Rig CME-55

Hole Diameter 8" | Drive Weight 140 lbs | Drop 30"

Elevation Top of Hole 10' | Location See Plate 1

| Elevation Feet | Depth Feet | Graphic Log | Attitudes | Tube Sample No. | Blows Per Foot | Dry Density pcf | Moisture Content, % | Soil Class. (U.S.C.S.) | GEOTECHNICAL DESCRIPTION<br>Logged By DXS<br>Sampled By DXS | Type of Tests |
|---|---|---|---|---|---|---|---|---|---|---|
| -20 | 30 | | | S-5 | 19 | | | CL | 30': SANDY CLAY, very stiff, yellowish brown, moist | |
| -25 | 35 | | | S-6 | 17 | | | | 35': Same material | |
| -30 | 40 | | | R-3 | 63 | | | | 40': hard, brownish grey, very moist, fine grained sand, medium plasticity | |
| -35 | 45 | | | S-7 | 29 | | | CL | 45': CLAY with sand | SA |
| -40 | 50 | | | S-8 | 46 | | | | 50': Same material | |
| -45 | 55 | | | | | | | | NOTES:<br>Total depth = 51'6"<br>Ground water encountered at 10'<br>Backfilled with native and bentonite chips upto 20' | |
| -50 | 60 | | | | | | | | | |

SAMPLE TYPES:
- S SPLIT SPOON
- R RING SAMPLE
- B BULK SAMPLE
- T TUBE SAMPLE

TYPE OF TESTS:
- DS DIRECT SHEAR
- MD MAXIMUM DENSITY
- CN CONSOLIDATION
- CR CORROSION
- SA SIEVE ANALYSIS
- AL ATTERBERG LIMITS
- EI EXPANSION INDEX
- HD HYDROMETER & SIEVE

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# GEOTECHNICAL BORING LOG B-6

Date 11-4-96 Sheet 1 of 2

Project TW Homes/Banning Lowland Project No. 1970011-01

Drilling Co. 2R DRILLING Type of Rig CME-55

Hole Diameter 8" Drive Weight 140 lbs Drop 30"

Elevation Top of Hole 9' Location See Plate 1

Logged By DXS

Sampled By DXS

| Elevation Feet | Depth Feet | Graphic Log | Attitudes | Tube Sample No. | Blows Per Foot | Dry Density pcf | Moisture Content, % | Soil Class. (U.S.C.S.) | GEOTECHNICAL DESCRIPTION | Type of Tests |
|---|---|---|---|---|---|---|---|---|---|---|
| | 0 | | | Bag #1 | | | | | CLAYEY SAND, loose, brown, moist, fine to coarse grained sand | |
| | | | | R-1 | 5 | | | CL | 2': SILTY CLAY, medium stiff, brownish grey, moist, high plasticity, white caliche | AL |
| 5 | 5 | | | R-2 | 5 | 76.6 | 42.5 | | 5': Same material | CN |
| | | | | | | | | | 7': Ground water encountered | |
| 0 | 10 | | | S-1 | 2 | | | CL | 10': CLAY with sand, very soft, grey, saturated, fine grained sand, sea shell, medium to high plasticity | SA |
| -5 | 15 | | | S-2 | 10 | | | SP-SM | 15': SILTY SAND, loose, grey, saturated, a lot of sea shell, fine grained sand | |
| -10 | 20 | | | S-3 | 15 | | | | 20': medium dense, mica, shell, pea gravel and rounded gravel pieces | |
| -15 | 25 | | | S-4 | 29 | | | | 25': Same material | |
| -20 | 30 | | | | | | | | | |

SAMPLE TYPES:
- S SPLIT SPOON
- R RING SAMPLE
- B BULK SAMPLE
- T TUBE SAMPLE

TYPE OF TESTS:
- DS DIRECT SHEAR
- MD MAXIMUM DENSITY
- CN CONSOLIDATION
- CR CORROSION
- SA SIEVE ANALYSIS
- AL ATTERBERG LIMITS
- EI EXPANSION INDEX
- HD HYDROMETER & SIEVE

# GEOTECHNICAL BORING LOG B-6

Date 11-4-96 | Sheet 2 of 2

Project TW Homes/Banning Lowland | Project No. 1970011-01

Drilling Co. 2R DRILLING | Type of Rig CME-55

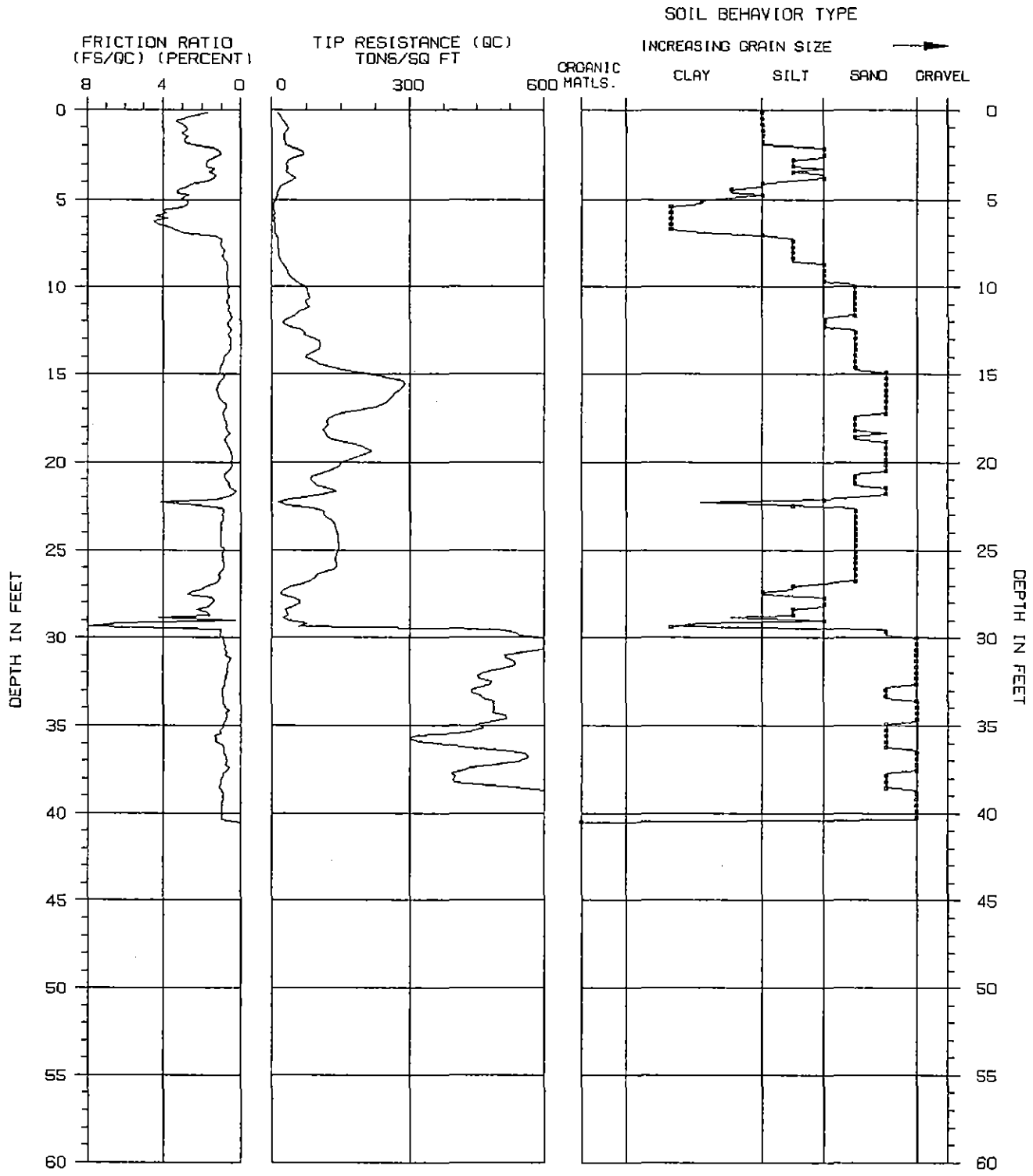
Hole Diameter 8" | Drive Weight 140 lbs | Drop 30"

Elevation Top of Hole 9' | Location See Plate 1

| Elevation Feet | Depth Feet | Graphic Log | Attitudes | Tube Sample No. | Blows Per Foot | Dry Density pcf | Moisture Content, % | Soil Class. (U.S.C.S.) | GEOTECHNICAL DESCRIPTION | Type of Tests |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | Logged By DXS<br>Sampled By DXS | |
| | 30 | | | S-5 | 24 | | | SP | 30': SAND with silt, medium dense, grey, saturated, coarse grained sand, pea gravel, a lot of sea shell | SA |
| -25 | 35 | | | S-6 | 14 | | | | 35': Same material | |
| -30 | 40 | | | S-7 | 69 | | | | 40': SAND with some gravel, very dense, saturated, coarse sand, mica, rounded and angular gravel pieces, pea gravel | |
| -35 | 45 | | | S-8 | 49 | | | | 45': Same material with a clay lense of 6 inch thick | |
| -40 | 50 | | | S-9 | 74 | | | | 50': Same material | |
| -45 | 55 | | | | | | | | NOTES:<br>Total depth = 51'6"<br>Ground water encountered at 7'<br>Backfilled with native and bentonite chips upto 20' | |
| -50 | 60 | | | | | | | | | |

SAMPLE TYPES:
- S SPLIT SPOON
- R RING SAMPLE
- B BULK SAMPLE
- T TUBE SAMPLE

TYPE OF TESTS:
- DS DIRECT SHEAR
- MD MAXIMUM DENSITY
- CN CONSOLIDATION
- CR CORROSION
- SA SIEVE ANALYSIS
- AL ATTERBERG LIMITS
- EI EXPANSION INDEX
- HD HYDROMETER & SIEVE




TIP RESISTANCE NOT CORRECTED FOR END AREA EFFECT

ASSUMED TOTAL UNIT WT = 120 PCF

ASSUMED DEPTH OF WATER TABLE = 5.0 FT

SOIL BEHAVIOR TYPE INTERPRETATIONS BASED ON: GUIDELINES FOR GEOTECHNICAL DESIGN USING THE CPT AND CPTU. SOIL MECHANICS SERIES #120. UNIVERSITY OF BRITISH COLUMBIA, SEPTEMBER 1989. BY P.K. ROBERTSON AND R.G. CAMPANELLA.

CONE PENETRATION TEST

SOUNDING NUMBER: CPT-01

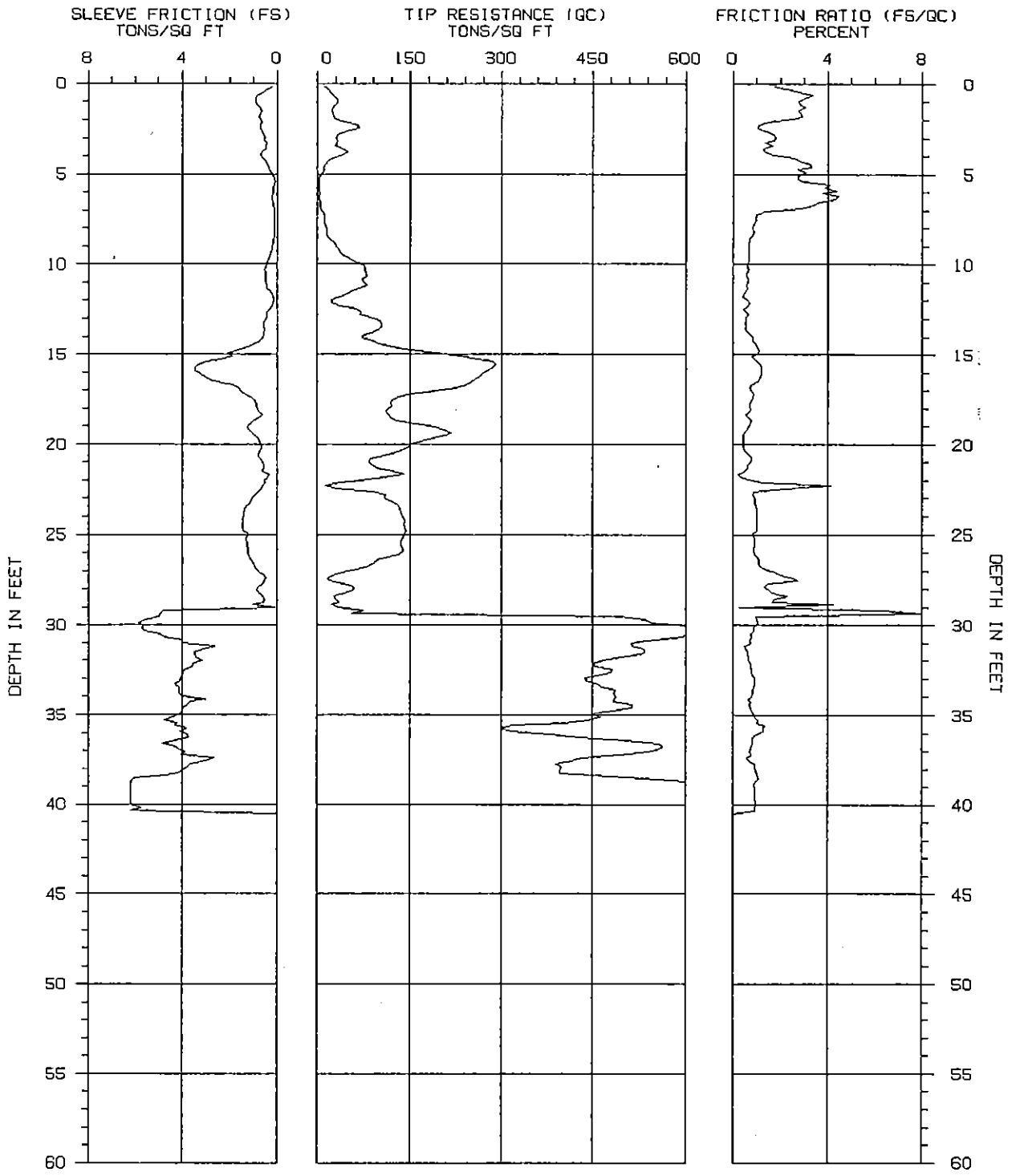
PROJECT NAME : L&A\TYLR-WOODROW

CONE/RIG : 469\#1

PROJECT NUMBER : 970011-001

DATE/TIME: 11-04-96 12:49

HFA




TIP RESISTANCE NOT CORRECTED FOR END AREA EFFECT

CONE PENETRATION TEST

SOUNDING NUMBER: CPT-01

PROJECT NAME : L&A\TYLR-WOODROW

PROJECT NUMBER : 970011-001

CONE/RIG : 469\#1

DATE/TIME: 11-04-96 12:49

HFA

# CPT INTERPRETATIONS

SOUNDING : CPT-01 PROJECT No.: 970011-001
PROJECT : L&A\TYLR-WOODROW CONE/RIG : 469\#1
DATE/TIME: 11-04-96 12:49



| DEPTH (m) | DEPTH (ft) | TIP RESISTANCE (tsf) | FRICTION RATIO (%) | SOIL BEHAVIOR TYPE | N(60) | N1(60) | Dr (%) | Su (tsf) | PHI (Degrees) |
|---|---|---|---|---|---|---|---|---|---|
| .150 | .49 | 21.71 | 2.95 | CLAYEY SILT to SILTY CLAY | 11 | 17 | | 1.4 | |
| .300 | .98 | 34.40 | 2.76 | CLAYEY SILT to SILTY CLAY | 17 | 28 | | 2.3 | |
| .450 | 1.48 | 24.67 | 2.72 | CLAYEY SILT to SILTY CLAY | 12 | 20 | | 1.6 | |
| .600 | 1.97 | 28.85 | 2.50 | CLAYEY SILT to SILTY CLAY | 14 | 23 | | 1.9 | |
| .750 | 2.46 | 67.86 | 1.05 | SILTY SAND to SANDY SILT | 23 | 36 | 65 | | 47.0 |
| .900 | 2.95 | 30.17 | 1.79 | SANDY SILT to CLAYEY SILT | 12 | 19 | | 2.4 | |
| 1.050 | 3.44 | 28.94 | 1.66 | SANDY SILT to CLAYEY SILT | 12 | 19 | | 2.3 | |
| 1.200 | 3.94 | 40.98 | 1.71 | SANDY SILT to CLAYEY SILT | 16 | 26 | | 3.3 | |
| 1.350 | 4.43 | 13.81 | 3.26 | CLAY to SILTY CLAY | 9 | 15 | | .9 | |
| 1.500 | 4.92 | 8.82 | 3.06 | CLAY to SILTY CLAY | 6 | 9 | | .6 | |
| 1.650 | 5.41 | 3.36 | 2.98 | CLAY | 3 | 5 | | .2 | |
| 1.800 | 5.91 | 4.36 | 4.36 | CLAY | 4 | 7 | | .3 | |
| 1.950 | 6.40 | 4.65 | 4.30 | CLAY | 5 | 7 | | .3 | |
| 2.100 | 6.89 | 5.23 | 2.87 | CLAY | 5 | 8 | | .4 | |
| 2.250 | 7.38 | 12.39 | .97 | SANDY SILT to CLAYEY SILT | 5 | 8 | | 1.2 | |
| 2.400 | 7.87 | 14.26 | .84 | SANDY SILT to CLAYEY SILT | 6 | 9 | | 1.4 | |
| 2.550 | 8.37 | 16.40 | .85 | SANDY SILT to CLAYEY SILT | 7 | 10 | | 1.6 | |
| 2.700 | 8.86 | 28.15 | .67 | SILTY SAND to SANDY SILT | 9 | 15 | 40 | | 38.5 |
| 2.850 | 9.35 | 37.33 | .70 | SILTY SAND to SANDY SILT | 12 | 19 | 48 | | 39.5 |
| 3.000 | 9.84 | 60.59 | .66 | SAND to SILTY SAND | 15 | 23 | 62 | | 42.0 |
| 3.150 | 10.33 | 77.27 | .66 | SAND to SILTY SAND | 19 | 29 | 69 | | 43.0 |
| 3.300 | 10.83 | 72.36 | .69 | SAND to SILTY SAND | 18 | 26 | 67 | | 42.5 |
| 3.450 | 11.32 | 66.52 | .65 | SAND to SILTY SAND | 17 | 24 | 65 | | 42.0 |
| 3.600 | 11.81 | 38.07 | .42 | SILTY SAND to SANDY SILT | 13 | 18 | 49 | | 39.0 |
| 3.750 | 12.30 | 36.94 | .62 | SILTY SAND to SANDY SILT | 12 | 17 | 48 | | 38.5 |
| 3.900 | 12.80 | 68.15 | .67 | SAND to SILTY SAND | 17 | 24 | 65 | | 42.0 |
| 4.050 | 13.29 | 103.59 | .55 | SAND to SILTY SAND | 26 | 35 | 77 | | 43.5 |
| 4.200 | 13.78 | 86.47 | .66 | SAND to SILTY SAND | 22 | 29 | 71 | | 42.5 |
| 4.350 | 14.27 | 88.78 | .84 | SAND to SILTY SAND | 22 | 29 | 72 | | 42.5 |
| 4.500 | 14.76 | 150.80 | 1.11 | SAND to SILTY SAND | 38 | 49 | 87 | | 44.5 |
| 4.650 | 15.26 | 259.61 | .94 | SAND | 52 | 67 | 100 | | 47.0 |
| 4.800 | 15.75 | 285.19 | 1.22 | SAND | 57 | 73 | 100 | | 47.0 |
| 4.950 | 16.24 | 263.44 | 1.16 | SAND | 53 | 67 | 100 | | 46.5 |
| 5.100 | 16.73 | 242.36 | .78 | SAND | 48 | 61 | 99 | | 46.5 |
| 5.250 | 17.22 | 151.28 | .90 | SAND | 30 | 37 | 85 | | 44.5 |
| 5.400 | 17.72 | 119.46 | .75 | SAND to SILTY SAND | 30 | 37 | 78 | | 43.0 |
| 5.550 | 18.21 | 110.35 | .71 | SAND to SILTY SAND | 28 | 33 | 75 | | 42.5 |
| 5.700 | 18.70 | 127.55 | .79 | SAND to SILTY SAND | 32 | 38 | 79 | | 43.5 |
| 5.850 | 19.19 | 204.38 | .59 | SAND | 41 | 49 | 92 | | 45.0 |
| 6.000 | 19.69 | 186.87 | .44 | SAND | 37 | 44 | 90 | | 44.5 |
| 6.150 | 20.18 | 147.16 | .45 | SAND | 29 | 34 | 82 | | 43.5 |

*INDICATES OVERCONSOLIDATED OR CEMENTED MATERIAL
ASSUMED TOTAL UNIT WT = 120 pcf
ASSUMED DEPTH OF WATER TABLE = 5.0 ft
N(60) = EQUIVALENT SPT VALUE (60% Energy)
N1(60) = OVERBURDEN NORMALIZED EQUIVALENT SPT VALUE (60% Energy)
Dr = OVERBURDEN NORMALIZED EQUIVALENT RELATIVE DENSITY
Su = OVERBURDEN NORMALIZED UNDRAINED SHEAR STRENGTH
PHI = OVERBURDEN NORMALIZED EQUIVALENT FRICTION ANGLE



*Interpretations based on: Robertson and Campanella, 1989.*

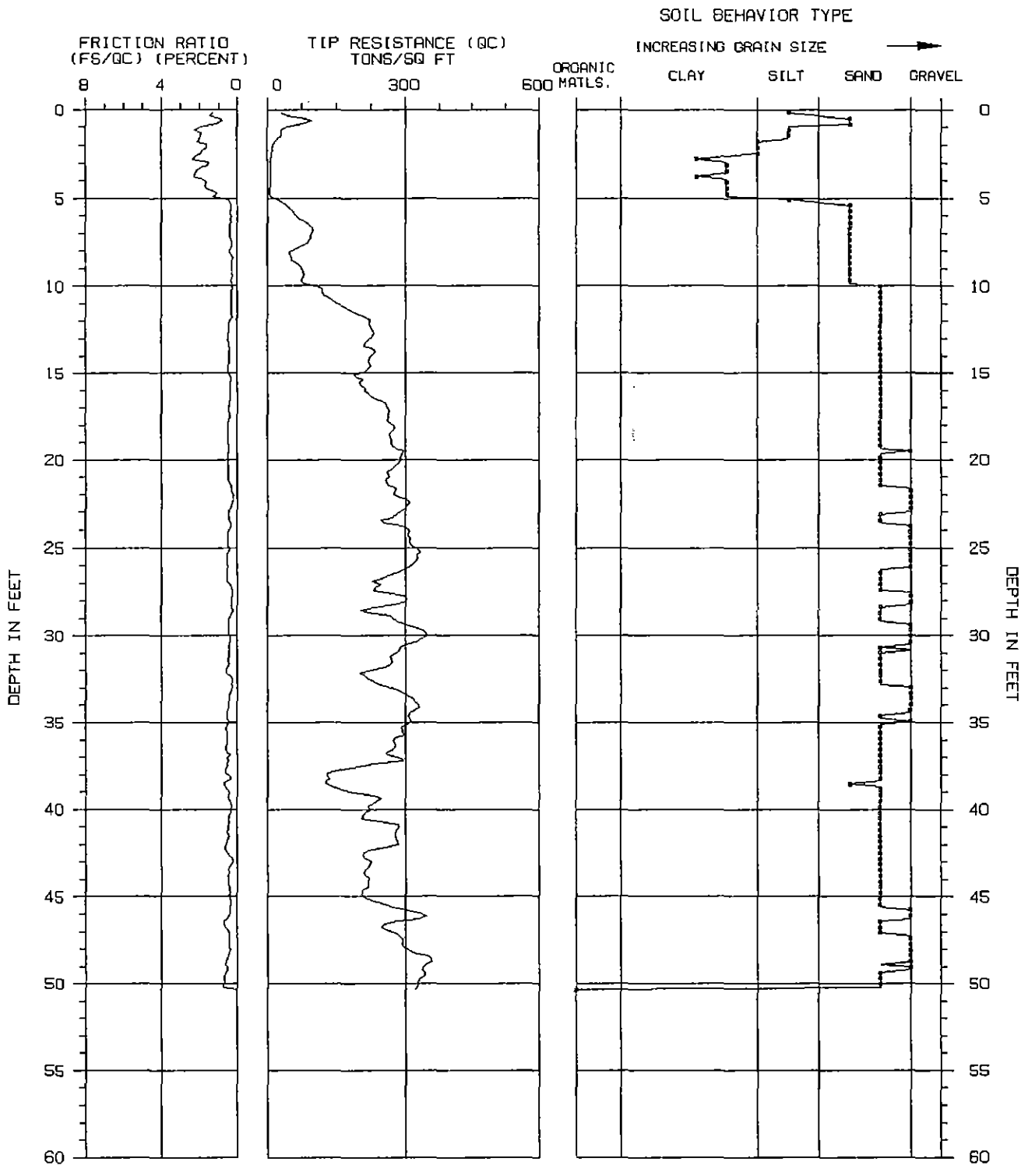
SOUNDING : CPT-01

| DEPTH (m) | DEPTH (ft) | TIP RESISTANCE (tsf) | FRICTION RATIO (%) | SOIL BEHAVIOR TYPE | N(60) | N1(60) | Dr (%) | Su (tsf) | PHI (Degrees) |
|---|---|---|---|---|---|---|---|---|---|
| 6.300 | 20.67 | 99.87 | .79 | SAND to SILTY SAND | 25 | 29 | 71 | | 42.0 |
| 6.450 | 21.16 | 88.91 | .63 | SAND to SILTY SAND | 22 | 25 | 67 | | 41.0 |
| 6.600 | 21.65 | 139.62 | .24 | SAND | 28 | 32 | 80 | | 43.0 |
| 6.750 | 22.15 | 37.65 | 1.25 | SILTY SAND to SANDY SILT | 13 | 14 | 42 | | 37.0 |
| 6.900 | 22.64 | 88.99 | .90 | SAND to SILTY SAND | 22 | 25 | 67 | | 40.5 |
| 7.050 | 23.13 | 116.80 | .93 | SAND to SILTY SAND | 29 | 32 | 74 | | 42.0 |
| 7.200 | 23.62 | 133.35 | 1.04 | SAND to SILTY SAND | 33 | 36 | 78 | | 42.5 |
| 7.350 | 24.11 | 140.75 | 1.05 | SAND to SILTY SAND | 35 | 38 | 79 | | 43.0 |
| 7.500 | 24.61 | 142.13 | 1.04 | SAND to SILTY SAND | 36 | 38 | 79 | | 43.0 |
| 7.650 | 25.10 | 140.75 | .91 | SAND to SILTY SAND | 35 | 38 | 79 | | 42.5 |
| 7.800 | 25.59 | 135.88 | .93 | SAND to SILTY SAND | 34 | 36 | 77 | | 42.5 |
| 7.950 | 26.08 | 132.42 | .95 | SAND to SILTY SAND | 33 | 35 | 76 | | 42.5 |
| 8.100 | 26.57 | 91.93 | 1.09 | SAND to SILTY SAND | 23 | 24 | 66 | | 40.0 |
| 8.250 | 27.07 | 40.96 | 1.81 | SANDY SILT to CLAYEY SILT | 16 | 17 | | 3.1 | |
| 8.400 | 27.56 | 19.91 | 2.71 | CLAYEY SILT to SILTY CLAY | 10 | 10 | | 1.2 | |
| 8.550 | 28.05 | 58.15 | 1.53 | SILTY SAND to SANDY SILT | 19 | 20 | 52 | | 38.0 |
| 8.700 | 28.54 | 31.29 | 1.73 | SANDY SILT to CLAYEY SILT | 13 | 13 | | 2.4 | |
| 8.850 | 29.04 | 33.99 | .26 | SILTY SAND to SANDY SILT | 11 | 11 | 36 | | 36.0 |
| 9.000 | 29.53 | 493.94 | 1.01 | SAND | 99 | 98 | 100 | | 47.0 |
| 9.150 | 30.02 | 606.35 | .93 | GRAVELLY SAND to SAND | 100 | 100 | 100 | | |
| 9.300 | 30.51 | 629.97 | .78 | GRAVELLY SAND to SAND | 100 | 100 | 100 | | |
| 9.450 | 31.00 | 512.02 | .78 | GRAVELLY SAND to SAND | 85 | 83 | 100 | | 47.0 |
| 9.600 | 31.50 | 535.99 | .65 | GRAVELLY SAND to SAND | 89 | 87 | 100 | | |
| 9.750 | 31.99 | 467.39 | .67 | GRAVELLY SAND to SAND | 78 | 75 | 100 | | 46.5 |
| 9.900 | 32.48 | 481.94 | .81 | GRAVELLY SAND to SAND | 80 | 77 | 100 | | 47.0 |
| 10.050 | 32.97 | 437.92 | .93 | SAND | 88 | 83 | 100 | | 46.5 |
| 10.200 | 33.46 | 464.26 | .89 | SAND | 93 | 88 | 100 | | 46.5 |
| 10.350 | 33.96 | 487.40 | .81 | GRAVELLY SAND to SAND | 81 | 76 | 100 | | 46.5 |
| 10.500 | 34.45 | 514.27 | .74 | GRAVELLY SAND to SAND | 86 | 80 | 100 | | 47.0 |
| 10.650 | 34.94 | 447.10 | .91 | SAND | 89 | 83 | 100 | | 46.5 |
| 10.800 | 35.43 | 404.20 | 1.04 | SAND | 81 | 75 | 100 | | 46.0 |
| 10.950 | 35.93 | 317.19 | 1.29 | SAND | 63 | 58 | 98 | | 45.0 |
| 11.100 | 36.42 | 503.61 | .85 | GRAVELLY SAND to SAND | 84 | 76 | 100 | | 46.5 |
| 11.250 | 36.91 | 559.31 | .76 | GRAVELLY SAND to SAND | 93 | 84 | 100 | | |
| 11.400 | 37.40 | 433.16 | .61 | GRAVELLY SAND to SAND | 72 | 65 | 100 | | 46.0 |
| 11.550 | 37.89 | 399.08 | .94 | SAND | 80 | 71 | 100 | | 45.5 |
| 11.700 | 38.39 | 450.92 | 1.04 | SAND | 90 | 80 | 100 | | 46.0 |
| 11.850 | 38.88 | 679.75 | .91 | GRAVELLY SAND to SAND | 100 | 100 | 100 | | |
| 12.000 | 39.37 | 642.89 | .96 | GRAVELLY SAND to SAND | 100 | 94 | 100 | | |
| 12.150 | 39.86 | 635.20 | .97 | GRAVELLY SAND to SAND | 100 | 93 | 100 | | |
| 12.300 | 40.35 | 641.06 | .96 | GRAVELLY SAND to SAND | 100 | 93 | 100 | | |

*INDICATES OVERCONSOLIDATED OR CEMENTED MATERIAL
ASSUMED TOTAL UNIT WT = 120 pcf
ASSUMED DEPTH OF WATER TABLE = 5.0 ft
N(60) = EQUIVALENT SPT VALUE (60% Energy)
N1(60) = OVERBURDEN NORMALIZED EQUIVALENT SPT VALUE (60% Energy)
Dr = OVERBURDEN NORMALIZED EQUIVALENT RELATIVE DENSITY
Su = OVERBURDEN NORMALIZED UNDRAINED SHEAR STRENGTH
PHI = OVERBURDEN NORMALIZED EQUIVALENT FRICTION ANGLE



*Interpretations based on: Robertson and Campanella, 1989.*




TIP RESISTANCE NOT CORRECTED FOR END AREA EFFECT

ASSUMED TOTAL UNIT WT = 120 PCF

ASSUMED DEPTH OF WATER TABLE = 5.0 FT

SOIL BEHAVIOR TYPE INTERPRETATIONS BASED ON: GUIDELINES FOR GEOTECHNICAL DESIGN USING THE CPT AND CPTU. SOIL MECHANICS SERIES #120. UNIVERSITY OF BRITISH COLUMBIA. SEPTEMBER 1989. BY P.K. ROBERTSON AND R.G. CAMPANELLA.

CONE PENETRATION TEST

SOUNDING NUMBER: CPT-02

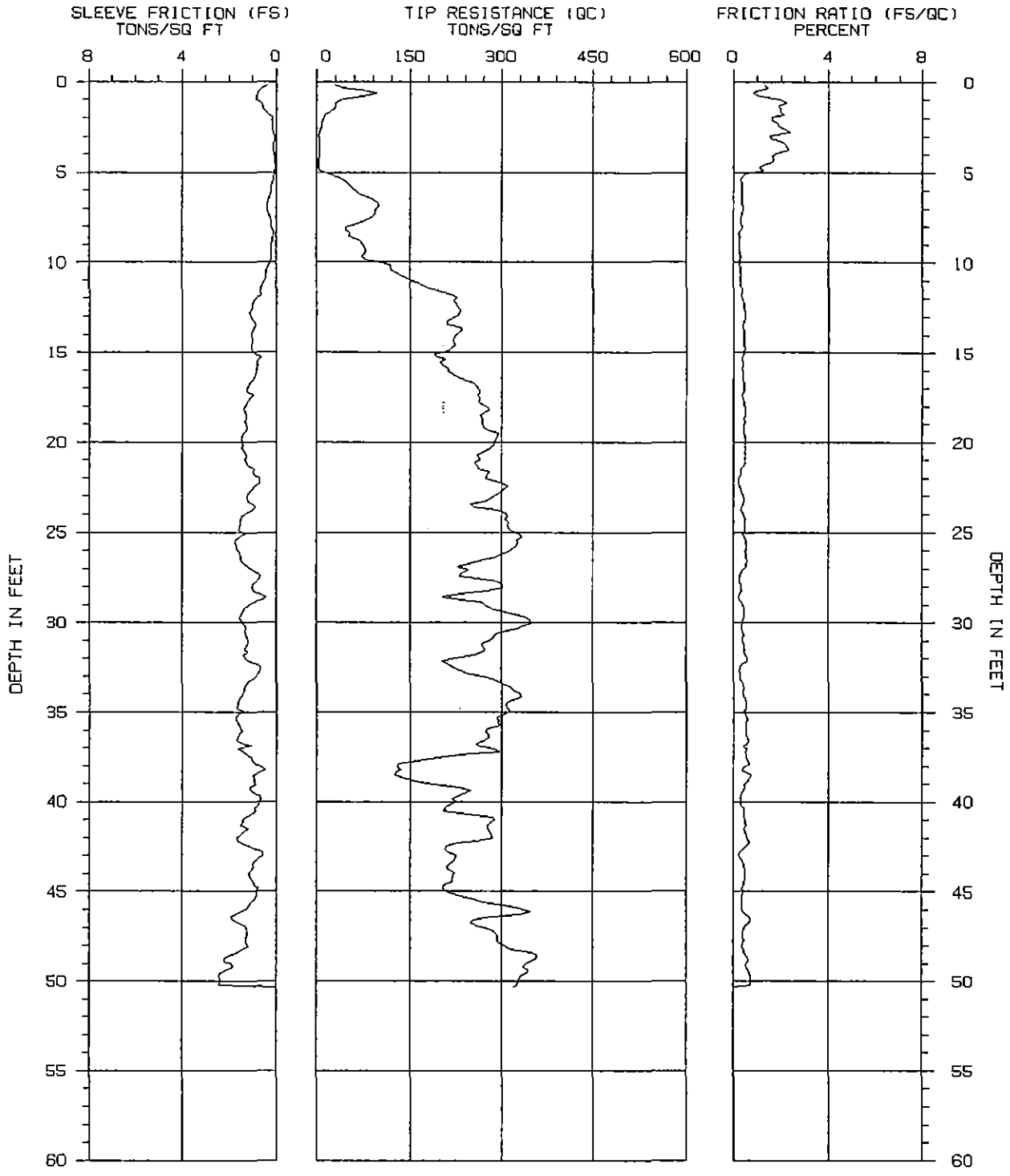
PROJECT NAME : L&A\TYLR-WOODROW

PROJECT NUMBER : 970011-001

CONE/RIG : 469\#1

DATE/TIME: 11-04-96 08:42

HFA




TIP RESISTANCE NOT CORRECTED FOR END AREA EFFECT

CONE PENETRATION TEST

SOUNDING NUMBER: CPT-02

PROJECT NAME : L&A\TYLR-WOODROW

PROJECT NUMBER : 970011-001

CONE/RIG : 469\#1

DATE/TIME: 11-04-96 08:42

HFA

# CPT INTERPRETATIONS

SOUNDING : CPT-02 PROJECT No.: 970011-001
PROJECT : L&A\TYLR-WOODROW CONE/RIG : 469\#1
DATE/TIME: 11-04-96 08:42



| DEPTH (m) | DEPTH (ft) | TIP RESISTANCE (tsf) | FRICTION RATIO (%) | SOIL BEHAVIOR TYPE | N(60) | N1(60) | Dr (%) | Su (tsf) | PHI (Degrees) |
|---|---|---|---|---|---|---|---|---|---|
| .150 | .49 | 81.26 | .91 | SAND to SILTY SAND | 20 | 32 | 70 | | |
| .300 | .98 | 42.60 | 1.95 | SANDY SILT to CLAYEY SILT | 17 | 27 | | 2.8 | |
| .450 | 1.48 | 29.57 | 1.96 | SANDY SILT to CLAYEY SILT | 12 | 19 | | 2.4 | |
| .600 | 1.97 | 11.73 | 1.62 | CLAYEY SILT to SILTY CLAY | 6 | 9 | | .9 | |
| .750 | 2.46 | 8.82 | 1.93 | CLAYEY SILT to SILTY CLAY | 4 | 7 | | .7 | |
| .900 | 2.95 | 4.57 | 1.53 | SENSITIVE FINE GRAINED | 2 | 4 | | .4 | |
| 1.050 | 3.44 | 6.50 | 2.15 | CLAY to SILTY CLAY | 4 | 7 | | .5 | |
| 1.200 | 3.94 | 5.06 | 1.78 | CLAY to SILTY CLAY | 3 | 5 | | .4 | |
| 1.350 | 4.43 | 4.36 | 1.61 | SENSITIVE FINE GRAINED | 2 | 3 | | .4 | |
| 1.500 | 4.92 | 6.27 | 1.28 | SENSITIVE FINE GRAINED | 3 | 5 | | .6 | |
| 1.650 | 5.41 | 41.70 | .34 | SAND to SILTY SAND | 10 | 17 | 51 | | 42.0 |
| 1.800 | 5.91 | 58.23 | .38 | SAND to SILTY SAND | 15 | 23 | 61 | | 43.0 |
| 1.950 | 6.40 | 82.47 | .36 | SAND to SILTY SAND | 21 | 33 | 71 | | 44.5 |
| 2.100 | 6.89 | 99.00 | .39 | SAND to SILTY SAND | 25 | 40 | 76 | | 45.0 |
| 2.250 | 7.38 | 91.78 | .35 | SAND to SILTY SAND | 23 | 37 | 74 | | 44.5 |
| 2.400 | 7.87 | 63.37 | .33 | SAND to SILTY SAND | 16 | 25 | 63 | | 43.0 |
| 2.550 | 8.37 | 53.07 | .24 | SAND to SILTY SAND | 13 | 21 | 58 | | 42.0 |
| 2.700 | 8.86 | 70.15 | .27 | SAND to SILTY SAND | 18 | 27 | 66 | | 43.0 |
| 2.850 | 9.35 | 79.60 | .29 | SAND to SILTY SAND | 20 | 31 | 70 | | 43.5 |
| 3.000 | 9.84 | 79.54 | .29 | SAND to SILTY SAND | 20 | 30 | 70 | | 43.0 |
| 3.150 | 10.33 | 119.03 | .32 | SAND | 24 | 35 | 81 | | 45.0 |
| 3.300 | 10.83 | 139.94 | .33 | SAND | 28 | 41 | 86 | | 45.5 |
| 3.450 | 11.32 | 173.00 | .35 | SAND | 35 | 50 | 92 | | 46.0 |
| 3.600 | 11.81 | 214.36 | .31 | SAND | 43 | 61 | 98 | | 46.5 |
| 3.750 | 12.30 | 225.73 | .45 | SAND | 45 | 63 | 100 | | 47.0 |
| 3.900 | 12.80 | 229.93 | .49 | SAND | 46 | 63 | 100 | | 47.0 |
| 4.050 | 13.29 | 210.98 | .45 | SAND | 42 | 57 | 97 | | 46.5 |
| 4.200 | 13.78 | 233.74 | .44 | SAND | 47 | 63 | 100 | | 46.5 |
| 4.350 | 14.27 | 220.44 | .47 | SAND | 44 | 59 | 98 | | 46.5 |
| 4.500 | 14.76 | 217.46 | .49 | SAND | 43 | 57 | 97 | | 46.0 |
| 4.650 | 15.26 | 193.67 | .35 | SAND | 39 | 50 | 93 | | 46.0 |
| 4.800 | 15.75 | 203.44 | .40 | SAND | 41 | 52 | 94 | | 46.0 |
| 4.950 | 16.24 | 220.05 | .40 | SAND | 44 | 56 | 96 | | 46.0 |
| 5.100 | 16.73 | 252.83 | .44 | SAND | 51 | 63 | 100 | | 46.5 |
| 5.250 | 17.22 | 264.50 | .47 | SAND | 53 | 66 | 100 | | 46.5 |
| 5.400 | 17.72 | 260.91 | .46 | SAND | 52 | 64 | 100 | | 46.5 |
| 5.550 | 18.21 | 279.20 | .49 | SAND | 56 | 68 | 100 | | 46.5 |
| 5.700 | 18.70 | 267.75 | .48 | SAND | 54 | 64 | 100 | | 46.5 |
| 5.850 | 19.19 | 271.11 | .46 | SAND | 54 | 64 | 100 | | 46.5 |
| 6.000 | 19.69 | 293.52 | .50 | SAND | 59 | 69 | 100 | | 46.5 |
| 6.150 | 20.18 | 286.06 | .50 | SAND | 57 | 67 | 100 | | 46.5 |

*INDICATES OVERCONSOLIDATED OR CEMENTED MATERIAL
ASSUMED TOTAL UNIT WT = 120 pcf
ASSUMED DEPTH OF WATER TABLE = 5.0 ft
N(60) = EQUIVALENT SPT VALUE (60% Energy)
N1(60) = OVERBURDEN NORMALIZED EQUIVALENT SPT VALUE (60% Energy)
Dr = OVERBURDEN NORMALIZED EQUIVALENT RELATIVE DENSITY
Su = OVERBURDEN NORMALIZED UNDRAINED SHEAR STRENGTH
PHI = OVERBURDEN NORMALIZED EQUIVALENT FRICTION ANGLE



*Interpretations based on: Robertson and Campanella, 1989.*

SOUNDING : CPT-02

| DEPTH (m) | DEPTH (ft) | TIP RESISTANCE (tsf) | FRICTION RATIO (%) | SOIL BEHAVIOR TYPE | N(60) | N1(60) | Dr (%) | Su (tsf) | PHI (Degrees) |
|---|---|---|---|---|---|---|---|---|---|
| 6.300 | 20.67 | 260.65 | .49 | SAND | 52 | 60 | 99 | | 46.0 |
| 6.450 | 21.16 | 255.51 | .51 | SAND | 51 | 58 | 98 | | 46.0 |
| 6.600 | 21.65 | 280.20 | .34 | GRAVELLY SAND to SAND | 47 | 53 | 100 | | 46.0 |
| 6.750 | 22.15 | 283.45 | .24 | GRAVELLY SAND to SAND | 47 | 53 | 100 | | 46.0 |
| 6.900 | 22.64 | 302.91 | .34 | GRAVELLY SAND to SAND | 50 | 56 | 100 | | 46.0 |
| 7.050 | 23.13 | 281.13 | .45 | SAND | 56 | 62 | 99 | | 46.0 |
| 7.200 | 23.62 | 252.98 | .35 | SAND | 51 | 55 | 96 | | 45.5 |
| 7.350 | 24.11 | 309.32 | .47 | GRAVELLY SAND to SAND | 52 | 56 | 100 | | 46.0 |
| 7.500 | 24.61 | 309.11 | .50 | GRAVELLY SAND to SAND | 52 | 55 | 100 | | 46.0 |
| 7.650 | 25.10 | 326.17 | .41 | GRAVELLY SAND to SAND | 54 | 58 | 100 | | 46.0 |
| 7.800 | 25.59 | 326.96 | .54 | GRAVELLY SAND to SAND | 54 | 58 | 100 | | 46.0 |
| 7.950 | 26.08 | 307.94 | .51 | GRAVELLY SAND to SAND | 51 | 54 | 100 | | 46.0 |
| 8.100 | 26.57 | 262.71 | .57 | SAND | 53 | 55 | 96 | | 45.0 |
| 8.250 | 27.07 | 244.85 | .41 | SAND | 49 | 51 | 94 | | 45.0 |
| 8.400 | 27.56 | 258.83 | .28 | GRAVELLY SAND to SAND | 43 | 44 | 95 | | 45.0 |
| 8.550 | 28.05 | 300.87 | .34 | GRAVELLY SAND to SAND | 50 | 51 | 99 | | 45.5 |
| 8.700 | 28.54 | 202.76 | .22 | SAND | 41 | 41 | 88 | | 44.0 |
| 8.850 | 29.04 | 273.34 | .43 | SAND | 55 | 55 | 96 | | 45.0 |
| 9.000 | 29.53 | 321.18 | .46 | GRAVELLY SAND to SAND | 54 | 53 | 100 | | 45.5 |
| 9.150 | 30.02 | 347.63 | .41 | GRAVELLY SAND to SAND | 58 | 57 | 100 | | 46.0 |
| 9.300 | 30.51 | 302.31 | .43 | GRAVELLY SAND to SAND | 50 | 50 | 98 | | 45.5 |
| 9.450 | 31.00 | 279.90 | .43 | SAND | 56 | 55 | 96 | | 45.0 |
| 9.600 | 31.50 | 272.57 | .49 | SAND | 55 | 53 | 95 | | 44.5 |
| 9.750 | 31.99 | 225.00 | .60 | SAND | 45 | 43 | 89 | | 44.0 |
| 9.900 | 32.48 | 219.33 | .31 | SAND | 44 | 42 | 88 | | 44.0 |
| 10.050 | 32.97 | 259.85 | .31 | GRAVELLY SAND to SAND | 43 | 41 | 93 | | 44.5 |
| 10.200 | 33.46 | 305.33 | .43 | GRAVELLY SAND to SAND | 51 | 48 | 97 | | 45.0 |
| 10.350 | 33.96 | 330.23 | .43 | GRAVELLY SAND to SAND | 55 | 52 | 99 | | 45.5 |
| 10.500 | 34.45 | 310.58 | .53 | GRAVELLY SAND to SAND | 52 | 48 | 97 | | 45.0 |
| 10.650 | 34.94 | 313.30 | .45 | GRAVELLY SAND to SAND | 52 | 48 | 98 | | 45.0 |
| 10.800 | 35.43 | 294.45 | .58 | SAND | 59 | 54 | 96 | | 44.5 |
| 10.950 | 35.93 | 276.03 | .55 | SAND | 55 | 51 | 94 | | 44.5 |
| 11.100 | 36.42 | 277.92 | .60 | SAND | 56 | 51 | 94 | | 44.5 |
| 11.250 | 36.91 | 259.46 | .41 | SAND | 52 | 47 | 91 | | 44.0 |
| 11.400 | 37.40 | 230.25 | .54 | SAND | 46 | 41 | 88 | | 43.5 |
| 11.550 | 37.89 | 131.53 | .66 | SAND | 26 | 24 | 72 | | 40.5 |
| 11.700 | 38.39 | 127.92 | .56 | SAND | 26 | 23 | 71 | | 40.0 |
| 11.850 | 38.88 | 157.89 | .58 | SAND | 32 | 28 | 77 | | 41.5 |
| 12.000 | 39.37 | 248.05 | .43 | SAND | 50 | 44 | 89 | | 43.5 |
| 12.150 | 39.86 | 217.70 | .31 | SAND | 44 | 38 | 85 | | 43.0 |
| 12.300 | 40.35 | 206.27 | .44 | SAND | 41 | 36 | 84 | | 42.5 |
| 12.450 | 40.85 | 285.53 | .46 | SAND | 57 | 49 | 93 | | 44.0 |
| 12.600 | 41.34 | 277.39 | .54 | SAND | 55 | 48 | 92 | | 44.0 |
| 12.750 | 41.83 | 283.41 | .54 | SAND | 57 | 49 | 92 | | 44.0 |
| 12.900 | 42.32 | 226.13 | .66 | SAND | 45 | 39 | 86 | | 43.0 |
| 13.050 | 42.81 | 211.34 | .27 | SAND | 42 | 36 | 84 | | 42.5 |
| 13.200 | 43.31 | 219.31 | .42 | SAND | 44 | 37 | 85 | | 42.5 |
| 13.350 | 43.80 | 211.96 | .49 | SAND | 42 | 36 | 83 | | 42.5 |
| 13.500 | 44.29 | 218.52 | .48 | SAND | 44 | 37 | 84 | | 42.5 |
| 13.650 | 44.78 | 204.08 | .38 | SAND | 41 | 34 | 82 | | 42.0 |

*INDICATES OVERCONSOLIDATED OR CEMENTED MATERIAL
ASSUMED TOTAL UNIT WT = 120 pcf
ASSUMED DEPTH OF WATER TABLE = 5.0 ft
N(60) = EQUIVALENT SPT VALUE (60% Energy)
N1(60) = OVERBURDEN NORMALIZED EQUIVALENT SPT VALUE (60% Energy)
Dr = OVERBURDEN NORMALIZED EQUIVALENT RELATIVE DENSITY
Su = OVERBURDEN NORMALIZED UNDRAINED SHEAR STRENGTH
PHI = OVERBURDEN NORMALIZED EQUIVALENT FRICTION ANGLE



*Interpretations based on: Robertson and Campanella, 1989.*

SOUNDING : CPT-02

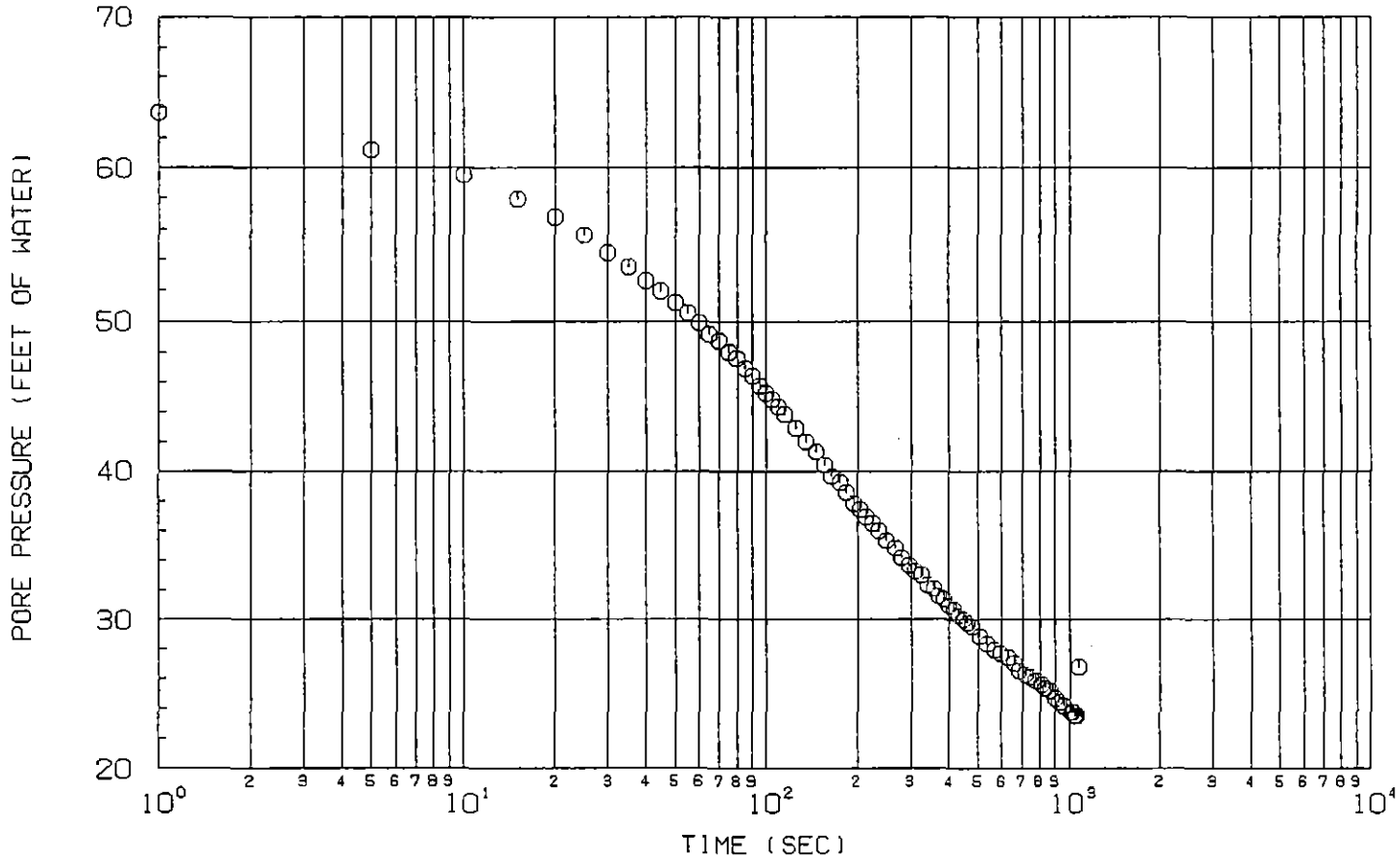
| DEPTH (m) | DEPTH (ft) | TIP RESISTANCE (tsf) | FRICTION RATIO (%) | SOIL BEHAVIOR TYPE | N(60) | N1(60) | Dr (%) | Su (tsf) | PHI (Degrees) |
|---|---|---|---|---|---|---|---|---|---|
| 13.800 | 45.28 | 232.27 | .37 | SAND | 46 | 38 | 86 | | 42.5 |
| 13.950 | 45.77 | 303.10 | .39 | GRAVELLY SAND to SAND | 51 | 42 | 93 | | 44.0 |
| 14.100 | 46.26 | 330.23 | .53 | GRAVELLY SAND to SAND | 55 | 45 | 96 | | 44.0 |
| 14.250 | 46.75 | 247.52 | .67 | SAND | 50 | 40 | 87 | | 43.0 |
| 14.400 | 47.24 | 287.46 | .43 | GRAVELLY SAND to SAND | 48 | 39 | 91 | | 43.5 |
| 14.550 | 47.74 | 290.82 | .44 | GRAVELLY SAND to SAND | 48 | 39 | 91 | | 43.5 |
| 14.700 | 48.23 | 315.21 | .46 | GRAVELLY SAND to SAND | 53 | 42 | 94 | | 44.0 |
| 14.850 | 48.72 | 357.00 | .62 | GRAVELLY SAND to SAND | 60 | 48 | 97 | | 44.0 |
| 15.000 | 49.21 | 335.37 | .56 | GRAVELLY SAND to SAND | 56 | 45 | 95 | | 44.0 |
| 15.150 | 49.70 | 331.91 | .73 | SAND | 66 | 53 | 95 | | 44.0 |
| 15.300 | 50.20 | 325.41 | .75 | SAND | 65 | 51 | 94 | | 44.0 |

*INDICATES OVERCONSOLIDATED OR CEMENTED MATERIAL
ASSUMED TOTAL UNIT WT = 120 pcf
ASSUMED DEPTH OF WATER TABLE = 5.0 ft
N(60) = EQUIVALENT SPT VALUE (60% Energy)
N1(60) = OVERBURDEN NORMALIZED EQUIVALENT SPT VALUE (60% Energy)
Dr = OVERBURDEN NORMALIZED EQUIVALENT RELATIVE DENSITY
Su = OVERBURDEN NORMALIZED UNDRAINED SHEAR STRENGTH
PHI = OVERBURDEN NORMALIZED EQUIVALENT FRICTION ANGLE



*Interpretations based on: Robertson and Campanella, 1989.*

## PORE PRESSURE DISSIPATION CURVES




DEPTH: ⏀ 17.6 FT

TIP-SENSING PIEZOMETRIC CPT

SOUNDING NUMBER: CPT-02

PROJECT NAME : L&A\TYLR-WOODROW

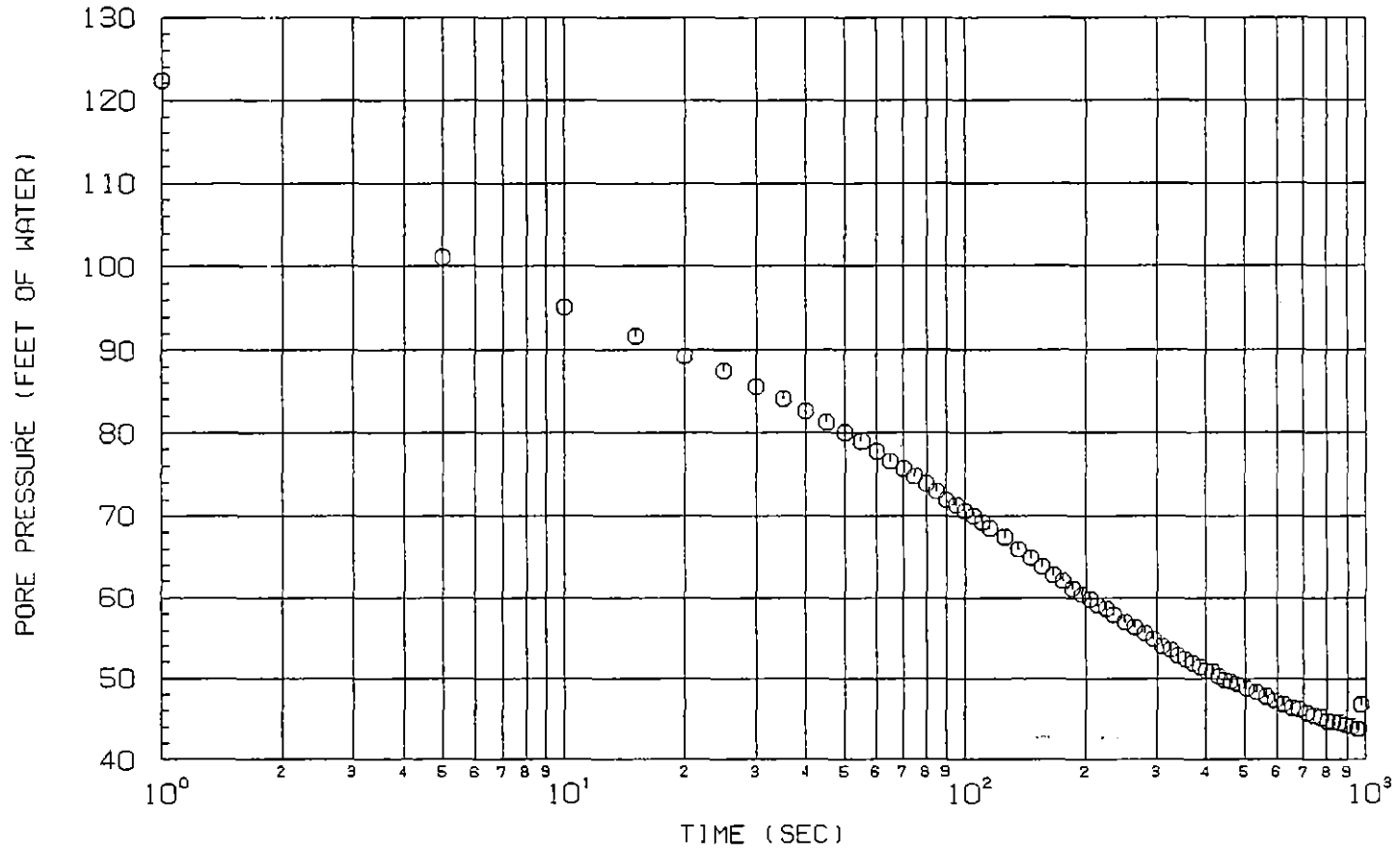
PROJECT NUMBER : 970011-001

CONE/RIG : 469\#1

DATE/TIME: 11-04-96 08:42

HFA

## PORE PRESSURE DISSIPATION CURVES




DEPTH: ⏲ 38.4 FT

TIP-SENSING PIEZOMETRIC CPT

SOUNDING NUMBER: CPT-02

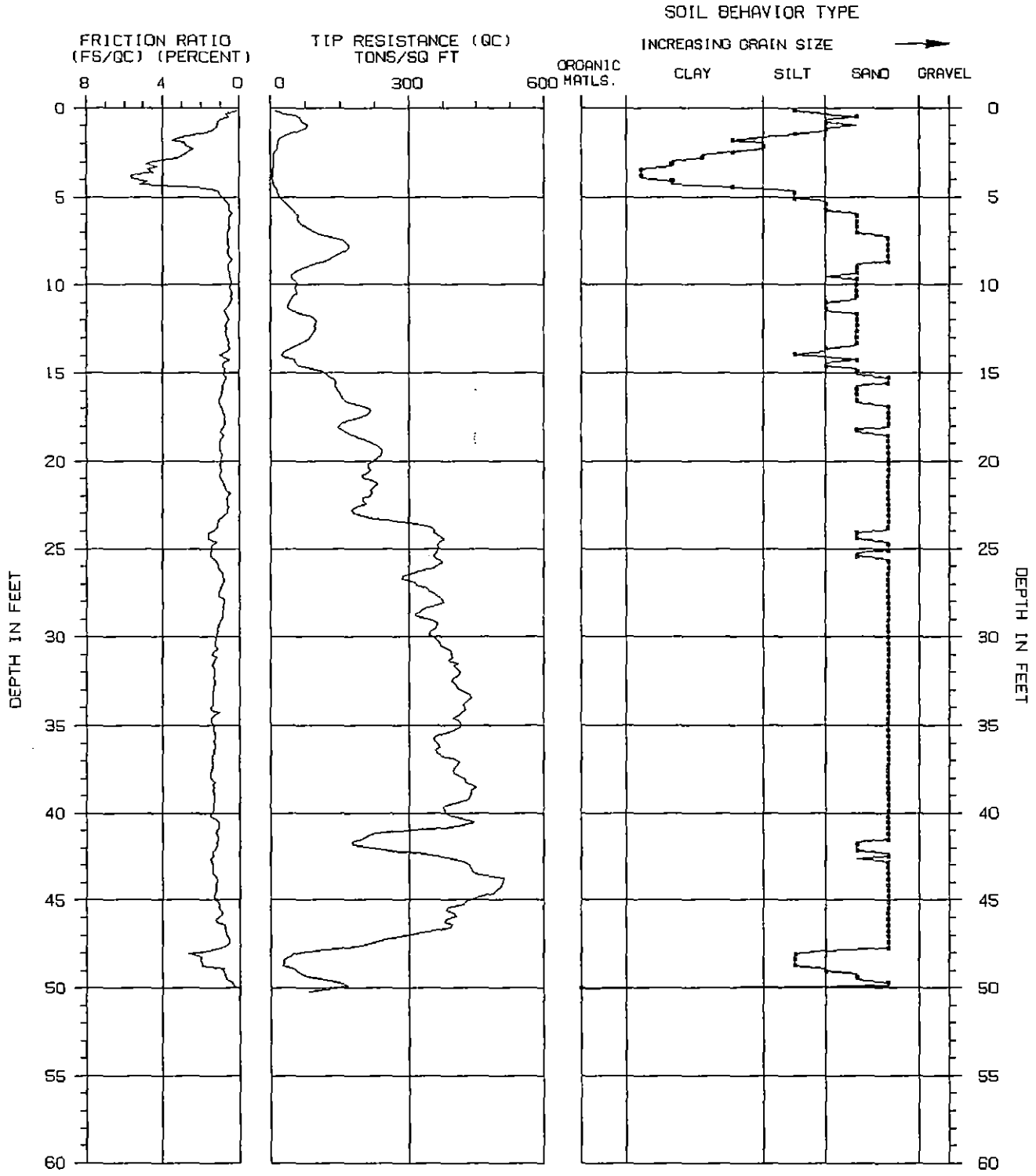
PROJECT NAME : L&A\TYLR-WOODROW

PROJECT NUMBER : 970011-001

CONE/RIG : 469\#1

DATE/TIME: 11-04-96 08:42

HFA




TIP RESISTANCE NOT CORRECTED FOR END AREA EFFECT

ASSUMED TOTAL UNIT WT = 120 PCF

ASSUMED DEPTH OF WATER TABLE = 5.0 FT

SOIL BEHAVIOR TYPE INTERPRETATIONS BASED ON: GUIDELINES FOR GEOTECHNICAL DESIGN USING THE CPT AND CPTU. SOIL MECHANICS SERIES #120. UNIVERSITY OF BRITISH COLUMBIA. SEPTEMBER 1989. BY P.K. ROBERTSON AND R.G. CAMPANELLA.

CONE PENETRATION TEST

SOUNDING NUMBER: CPT-03

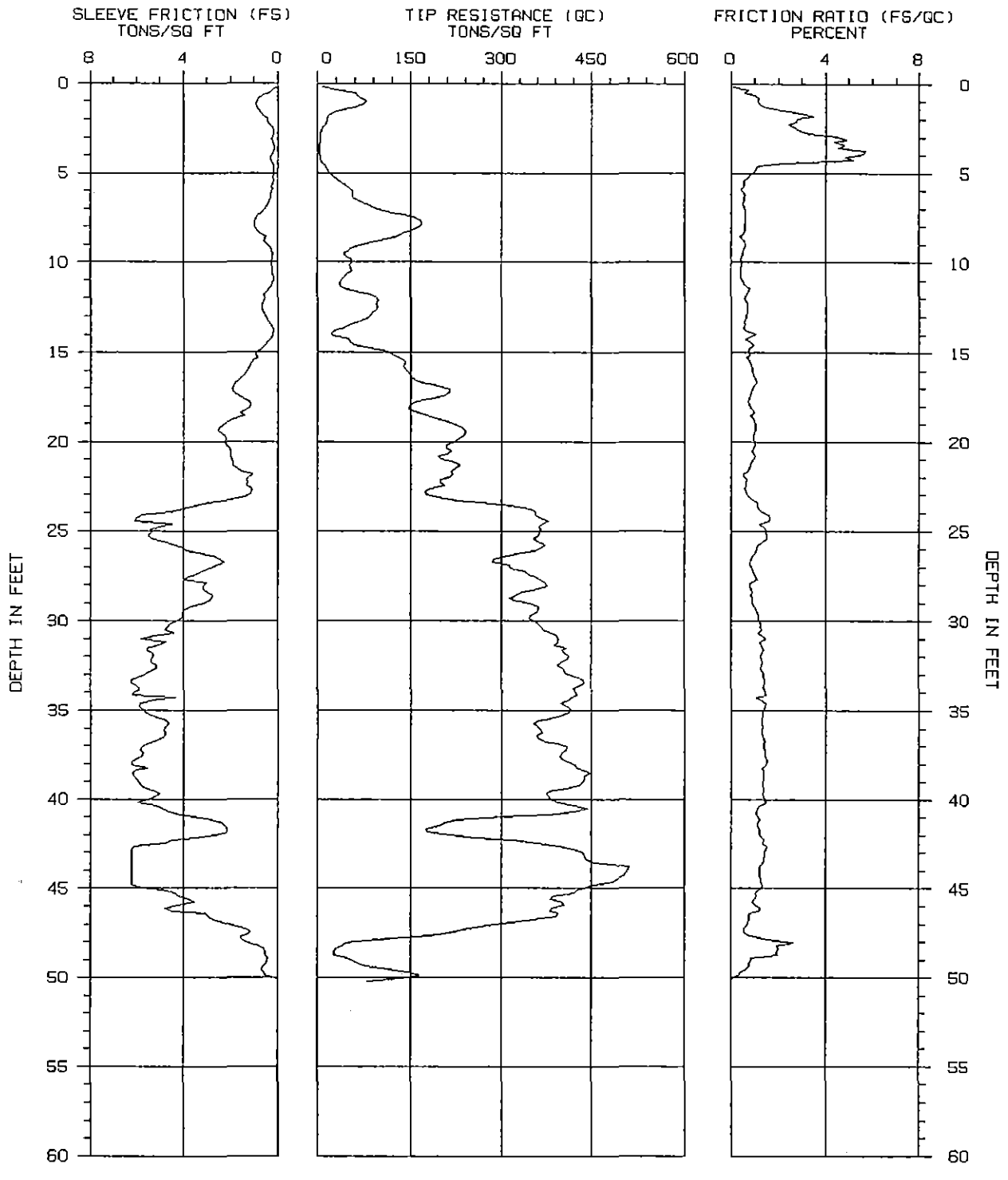
PROJECT NAME : L&A\TYLR-WOODROW

CONE/RIG : 469\#1

PROJECT NUMBER : 970011-001

DATE/TIME: 11-04-96 12:00

HFA




TIP RESISTANCE NOT CORRECTED FOR END AREA EFFECT

CONE PENETRATION TEST

SOUNDING NUMBER: CPT-03

PROJECT NAME : L&A\TYLR-WOODROW

PROJECT NUMBER : 970011-001

CONE/RIG : 469\#1

DATE/TIME: 11-04-96 12:00

HFA

# CPT INTERPRETATIONS

SOUNDING : CPT-03 PROJECT No.: 970011-001
PROJECT : L&A\TYLR-WOODROW CONE/RIG : 469\#1
DATE/TIME: 11-04-96 12:00



| DEPTH (m) | DEPTH (ft) | TIP RESISTANCE (tsf) | FRICTION RATIO (%) | SOIL BEHAVIOR TYPE | N(60) | N1(60) | Dr (%) | Su (tsf) | PHI (Degrees) |
|---|---|---|---|---|---|---|---|---|---|
| .150 | .49 | 62.93 | .56 | SAND to SILTY SAND | 16 | 25 | 63 | | |
| .300 | .98 | 78.31 | 1.14 | SAND to SILTY SAND | 20 | 31 | 69 | | |
| .450 | 1.48 | 37.96 | 2.13 | SANDY SILT to CLAYEY SILT | 15 | 24 | | 2.5 | |
| .600 | 1.97 | 16.27 | 2.83 | CLAYEY SILT to SILTY CLAY | 8 | 13 | | 1.1 | |
| .750 | 2.46 | 8.88 | 2.70 | CLAY to SILTY CLAY | 6 | 9 | | .7 | |
| .900 | 2.95 | 4.91 | 4.48 | CLAY | 5 | 8 | | .3 | |
| 1.050 | 3.44 | 3.74 | 4.81 | CLAY | 4 | 6 | | .2 | |
| 1.200 | 3.94 | 4.12 | 5.58 | CLAY | 4 | 7 | | .3 | |
| 1.350 | 4.43 | 9.01 | 2.22 | CLAY to SILTY CLAY | 6 | 10 | | .7 | |
| 1.500 | 4.92 | 17.12 | .99 | SANDY SILT to CLAYEY SILT | 7 | 11 | | 1.3 | |
| 1.650 | 5.41 | 33.65 | .53 | SILTY SAND to SANDY SILT | 11 | 18 | 45 | | 40.5 |
| 1.800 | 5.91 | 53.05 | .41 | SAND to SILTY SAND | 13 | 21 | 58 | | 42.5 |
| 1.950 | 6.40 | 57.81 | .55 | SAND to SILTY SAND | 14 | 23 | 61 | | 43.0 |
| 2.100 | 6.89 | 87.89 | .53 | SAND to SILTY SAND | 22 | 35 | 73 | | 44.5 |
| 2.250 | 7.38 | 137.94 | .60 | SAND | 28 | 44 | 86 | | 46.0 |
| 2.400 | 7.87 | 169.15 | .57 | SAND | 34 | 54 | 91 | | 47.0 |
| 2.550 | 8.37 | 136.84 | .56 | SAND | 27 | 43 | 85 | | 46.0 |
| 2.700 | 8.86 | 93.07 | .60 | SAND to SILTY SAND | 23 | 36 | 74 | | 44.0 |
| 2.850 | 9.35 | 50.54 | .51 | SAND to SILTY SAND | 13 | 19 | 57 | | 41.0 |
| 3.000 | 9.84 | 56.09 | .41 | SAND to SILTY SAND | 14 | 21 | 60 | | 42.0 |
| 3.150 | 10.33 | 54.15 | .42 | SAND to SILTY SAND | 14 | 20 | 59 | | 41.5 |
| 3.300 | 10.83 | 43.91 | .41 | SAND to SILTY SAND | 11 | 16 | 53 | | 39.5 |
| 3.450 | 11.32 | 37.73 | .69 | SILTY SAND to SANDY SILT | 13 | 18 | 48 | | 39.0 |
| 3.600 | 11.81 | 87.17 | .67 | SAND to SILTY SAND | 22 | 31 | 72 | | 43.0 |
| 3.750 | 12.30 | 94.45 | .70 | SAND to SILTY SAND | 24 | 33 | 75 | | 43.5 |
| 3.900 | 12.80 | 88.78 | .70 | SAND to SILTY SAND | 22 | 31 | 73 | | 43.0 |
| 4.050 | 13.29 | 67.22 | .57 | SAND to SILTY SAND | 17 | 23 | 64 | | 41.5 |
| 4.200 | 13.78 | 27.55 | .65 | SILTY SAND to SANDY SILT | 9 | 12 | 39 | | 37.5 |
| 4.350 | 14.27 | 50.44 | .57 | SAND to SILTY SAND | 13 | 17 | 55 | | 39.5 |
| 4.500 | 14.76 | 85.79 | .77 | SAND to SILTY SAND | 21 | 28 | 70 | | 42.5 |
| 4.650 | 15.26 | 128.59 | .65 | SAND | 26 | 33 | 82 | | 44.0 |
| 4.800 | 15.75 | 138.32 | .86 | SAND to SILTY SAND | 35 | 44 | 83 | | 44.0 |
| 4.950 | 16.24 | 149.22 | .94 | SAND to SILTY SAND | 37 | 47 | 85 | | 44.5 |
| 5.100 | 16.73 | 168.28 | 1.08 | SAND to SILTY SAND | 42 | 53 | 88 | | 45.0 |
| 5.250 | 17.22 | 214.13 | .86 | SAND | 43 | 53 | 95 | | 46.0 |
| 5.400 | 17.72 | 162.37 | .74 | SAND | 32 | 40 | 87 | | 44.5 |
| 5.550 | 18.21 | 146.44 | .92 | SAND to SILTY SAND | 37 | 44 | 83 | | 44.0 |
| 5.700 | 18.70 | 191.82 | .95 | SAND | 38 | 46 | 91 | | 45.0 |
| 5.850 | 19.19 | 234.35 | 1.05 | SAND | 47 | 56 | 96 | | 46.0 |
| 6.000 | 19.69 | 237.52 | .93 | SAND | 48 | 56 | 96 | | 46.0 |
| 6.150 | 20.18 | 209.01 | 1.05 | SAND | 42 | 49 | 92 | | 45.0 |

*INDICATES OVERCONSOLIDATED OR CEMENTED MATERIAL
ASSUMED TOTAL UNIT WT = 120 pcf
ASSUMED DEPTH OF WATER TABLE = 5.0 ft
N(60) = EQUIVALENT SPT VALUE (60% Energy)
N1(60) = OVERBURDEN NORMALIZED EQUIVALENT SPT VALUE (60% Energy)
Dr = OVERBURDEN NORMALIZED EQUIVALENT RELATIVE DENSITY
Su = OVERBURDEN NORMALIZED UNDRAINED SHEAR STRENGTH
PHI = OVERBURDEN NORMALIZED EQUIVALENT FRICTION ANGLE



*Interpretations based on: Robertson and Campanella, 1989.*

SOUNDING : CPT-03

| DEPTH (m) | DEPTH (ft) | TIP RESISTANCE (tsf) | FRICTION RATIO (%) | SOIL BEHAVIOR TYPE | N(60) | N1(60) | Dr (%) | Su (tsf) | PHI (Degrees) |
|---|---|---|---|---|---|---|---|---|---|
| 6.300 | 20.67 | 209.67 | .96 | SAND | 42 | 48 | 92 | | 45.0 |
| 6.450 | 21.16 | 223.88 | .86 | SAND | 45 | 51 | 94 | | 45.5 |
| 6.600 | 21.65 | 216.14 | .72 | SAND | 43 | 49 | 93 | | 45.0 |
| 6.750 | 22.15 | 198.89 | .66 | SAND | 40 | 45 | 90 | | 44.5 |
| 6.900 | 22.64 | 183.83 | .60 | SAND | 37 | 41 | 87 | | 44.0 |
| 7.050 | 23.13 | 195.20 | .80 | SAND | 39 | 43 | 89 | | 44.5 |
| 7.200 | 23.62 | 314.85 | 1.11 | SAND | 63 | 69 | 100 | | 46.0 |
| 7.350 | 24.11 | 356.87 | 1.63 | SAND to SILTY SAND | 89 | 97 | 100 | | 46.5 |
| 7.500 | 24.61 | 368.70 | 1.21 | SAND | 74 | 79 | 100 | | 46.5 |
| 7.650 | 25.10 | 362.76 | 1.48 | SAND | 73 | 77 | 100 | | 46.5 |
| 7.800 | 25.59 | 359.55 | 1.35 | SAND | 72 | 76 | 100 | | 46.5 |
| 7.950 | 26.08 | 354.94 | 1.08 | SAND | 71 | 75 | 100 | | 46.5 |
| 8.100 | 26.57 | 286.55 | .85 | SAND | 57 | 60 | 98 | | 45.5 |
| 8.250 | 27.07 | 315.40 | .92 | SAND | 63 | 65 | 100 | | 46.0 |
| 8.400 | 27.56 | 356.51 | 1.06 | SAND | 71 | 73 | 100 | | 46.0 |
| 8.550 | 28.05 | 376.80 | .84 | SAND | 75 | 77 | 100 | | 46.5 |
| 8.700 | 28.54 | 323.98 | .85 | SAND | 65 | 66 | 100 | | 46.0 |
| 8.850 | 29.04 | 345.67 | .91 | SAND | 69 | 69 | 100 | | 46.0 |
| 9.000 | 29.53 | 358.72 | 1.12 | SAND | 72 | 72 | 100 | | 46.0 |
| 9.150 | 30.02 | 356.89 | 1.22 | SAND | 71 | 71 | 100 | | 46.0 |
| 9.300 | 30.51 | 369.04 | 1.30 | SAND | 74 | 73 | 100 | | 46.0 |
| 9.450 | 31.00 | 394.01 | 1.47 | SAND | 79 | 77 | 100 | | 46.0 |
| 9.600 | 31.50 | 408.58 | 1.36 | SAND | 82 | 79 | 100 | | 46.5 |
| 9.750 | 31.99 | 413.72 | 1.28 | SAND | 83 | 80 | 100 | | 46.5 |
| 9.900 | 32.48 | 392.69 | 1.31 | SAND | 79 | 75 | 100 | | 46.0 |
| 10.050 | 32.97 | 408.54 | 1.37 | SAND | 82 | 78 | 100 | | 46.0 |
| 10.200 | 33.46 | 438.17 | 1.41 | SAND | 88 | 83 | 100 | | 46.5 |
| 10.350 | 33.96 | 423.26 | 1.44 | SAND | 85 | 79 | 100 | | 46.0 |
| 10.500 | 34.45 | 410.75 | 1.30 | SAND | 82 | 77 | 100 | | 46.0 |
| 10.650 | 34.94 | 415.38 | 1.39 | SAND | 83 | 77 | 100 | | 46.0 |
| 10.800 | 35.43 | 381.00 | 1.32 | SAND | 76 | 70 | 100 | | 46.0 |
| 10.950 | 35.93 | 359.10 | 1.32 | SAND | 72 | 66 | 100 | | 45.5 |
| 11.100 | 36.42 | 357.61 | 1.34 | SAND | 72 | 65 | 100 | | 45.5 |
| 11.250 | 36.91 | 394.58 | 1.40 | SAND | 79 | 71 | 100 | | 46.0 |
| 11.400 | 37.40 | 401.31 | 1.43 | SAND | 80 | 72 | 100 | | 46.0 |
| 11.550 | 37.89 | 410.49 | 1.51 | SAND | 82 | 74 | 100 | | 46.0 |
| 11.700 | 38.39 | 434.63 | 1.38 | SAND | 87 | 77 | 100 | | 46.0 |
| 11.850 | 38.88 | 438.13 | 1.37 | SAND | 88 | 78 | 100 | | 46.0 |
| 12.000 | 39.37 | 410.07 | 1.37 | SAND | 82 | 72 | 100 | | 45.5 |
| 12.150 | 39.86 | 379.22 | 1.37 | SAND | 76 | 66 | 100 | | 45.5 |
| 12.300 | 40.35 | 421.56 | 1.22 | SAND | 84 | 73 | 100 | | 45.5 |
| 12.450 | 40.85 | 380.22 | 1.09 | SAND | 76 | 66 | 100 | | 45.0 |
| 12.600 | 41.34 | 206.46 | 1.14 | SAND | 41 | 36 | 83 | | 42.5 |
| 12.750 | 41.83 | 176.99 | 1.21 | SAND to SILTY SAND | 44 | 38 | 79 | | 42.0 |
| 12.900 | 42.32 | 317.69 | 1.41 | SAND | 64 | 54 | 96 | | 44.5 |
| 13.050 | 42.81 | 419.54 | 1.48 | SAND | 84 | 71 | 100 | | 45.5 |
| 13.200 | 43.31 | 439.47 | 1.41 | SAND | 88 | 74 | 100 | | 45.5 |
| 13.350 | 43.80 | 511.00 | 1.21 | SAND | 100 | 86 | 100 | | 46.0 |
| 13.500 | 44.29 | 501.97 | 1.23 | SAND | 100 | 84 | 100 | | 46.0 |
| 13.650 | 44.78 | 454.85 | 1.36 | SAND | 91 | 76 | 100 | | 45.5 |

*INDICATES OVERCONSOLIDATED OR CEMENTED MATERIAL
ASSUMED TOTAL UNIT WT = 120 pcf
ASSUMED DEPTH OF WATER TABLE = 5.0 ft
N(60) = EQUIVALENT SPT VALUE (60% Energy)
N1(60) = OVERBURDEN NORMALIZED EQUIVALENT SPT VALUE (60% Energy)
Dr = OVERBURDEN NORMALIZED EQUIVALENT RELATIVE DENSITY
Su = OVERBURDEN NORMALIZED UNDRAINED SHEAR STRENGTH
PHI = OVERBURDEN NORMALIZED EQUIVALENT FRICTION ANGLE



*Interpretations based on: Robertson and Campanella, 1989.*

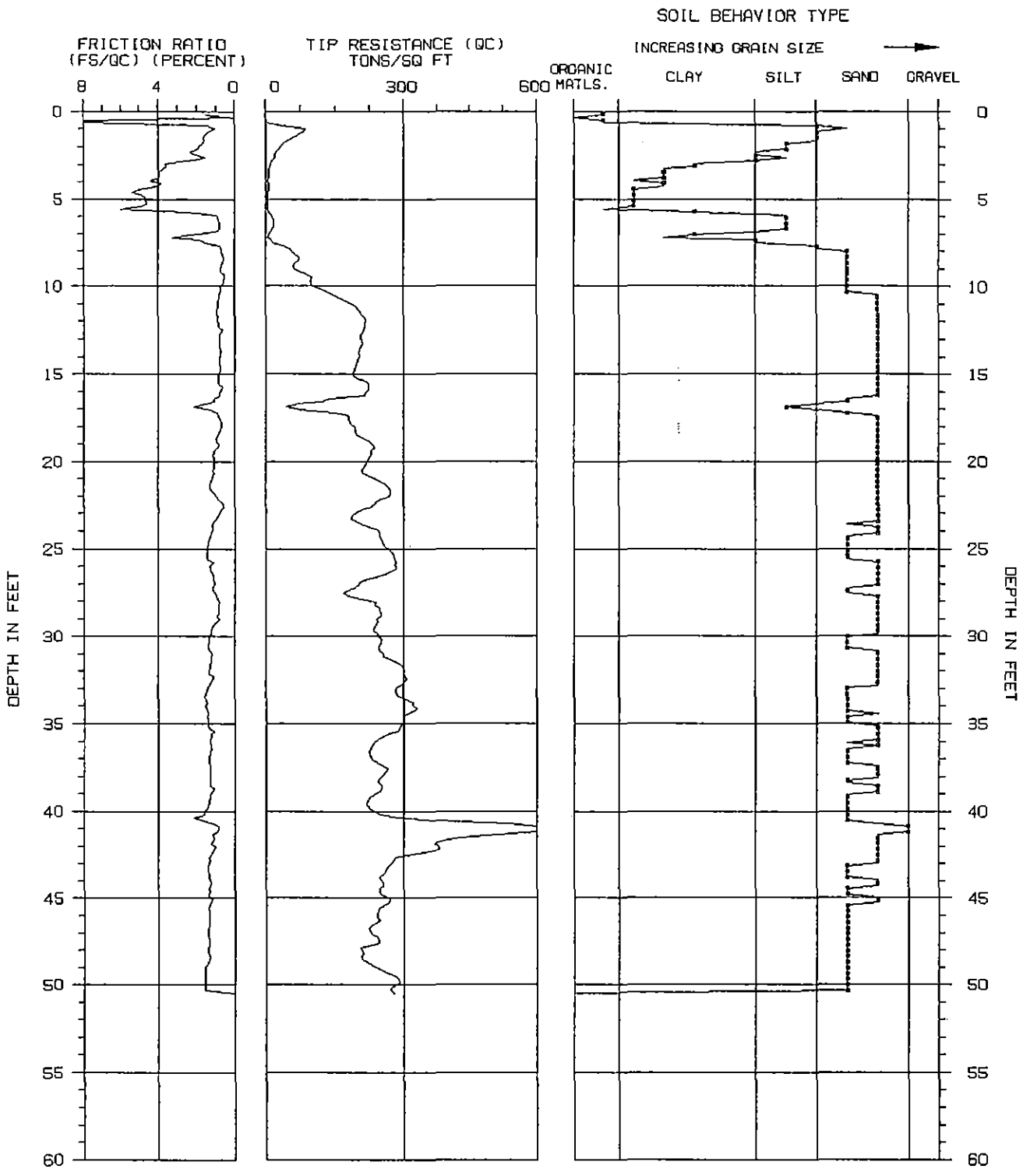
SOUNDING : CPT-03

| DEPTH (m) | DEPTH (ft) | TIP RESISTANCE (tsf) | FRICTION RATIO (%) | SOIL BEHAVIOR TYPE | N(60) | N1(60) | Dr (%) | Su (tsf) | PHI (Degrees) |
|---|---|---|---|---|---|---|---|---|---|
| 13.800 | 45.28 | 421.50 | 1.03 | SAND | 84 | 70 | 100 | | 45.0 |
| 13.950 | 45.77 | 400.97 | .88 | SAND | 80 | 66 | 100 | | 45.0 |
| 14.100 | 46.26 | 380.94 | 1.17 | SAND | 76 | 62 | 100 | | 44.5 |
| 14.250 | 46.75 | 353.41 | .78 | SAND | 71 | 58 | 97 | | 44.5 |
| 14.400 | 47.24 | 245.21 | .55 | SAND | 49 | 40 | 87 | | 42.5 |
| 14.550 | 47.74 | 162.37 | .97 | SAND | 32 | 26 | 75 | | 40.5 |
| 14.700 | 48.23 | 40.60 | 1.92 | SANDY SILT to CLAYEY SILT | 16 | 13 | | 2.5 | |
| 14.850 | 48.72 | 26.56 | 1.96 | SANDY SILT to CLAYEY SILT | 11 | 9 | | 1.9 | |
| 15.000 | 49.21 | 63.97 | .77 | SAND to SILTY SAND | 16 | 13 | 48 | | 36.5 |
| 15.150 | 49.70 | 145.89 | .40 | SAND | 29 | 23 | 71 | | 39.5 |
| 15.300 | 50.20 | 81.07 | ***** | | 0 | 0 | | | 44.0 |

*INDICATES OVERCONSOLIDATED OR CEMENTED MATERIAL
ASSUMED TOTAL UNIT WT = 120 pcf
ASSUMED DEPTH OF WATER TABLE = 5.0 ft
N(60) = EQUIVALENT SPT VALUE (60% Energy)
N1(60) = OVERBURDEN NORMALIZED EQUIVALENT SPT VALUE (60% Energy)
Dr = OVERBURDEN NORMALIZED EQUIVALENT RELATIVE DENSITY
Su = OVERBURDEN NORMALIZED UNDRAINED SHEAR STRENGTH
PHI = OVERBURDEN NORMALIZED EQUIVALENT FRICTION ANGLE



*Interpretations based on: Robertson and Campanella, 1989.*




TIP RESISTANCE NOT CORRECTED FOR END AREA EFFECT

ASSUMED TOTAL UNIT WT = 120 PCF

ASSUMED DEPTH OF WATER TABLE = 5.0 FT

SOIL BEHAVIOR TYPE INTERPRETATIONS BASED ON: GUIDELINES FOR GEOTECHNICAL DESIGN USING THE CPT AND CPTU. SOIL MECHANICS SERIES #120. UNIVERSITY OF BRITISH COLUMBIA, SEPTEMBER 1989. BY P.K. ROBERTSON AND R.G. CAMPANELLA.

## CONE PENETRATION TEST

SOUNDING NUMBER: CPT-04

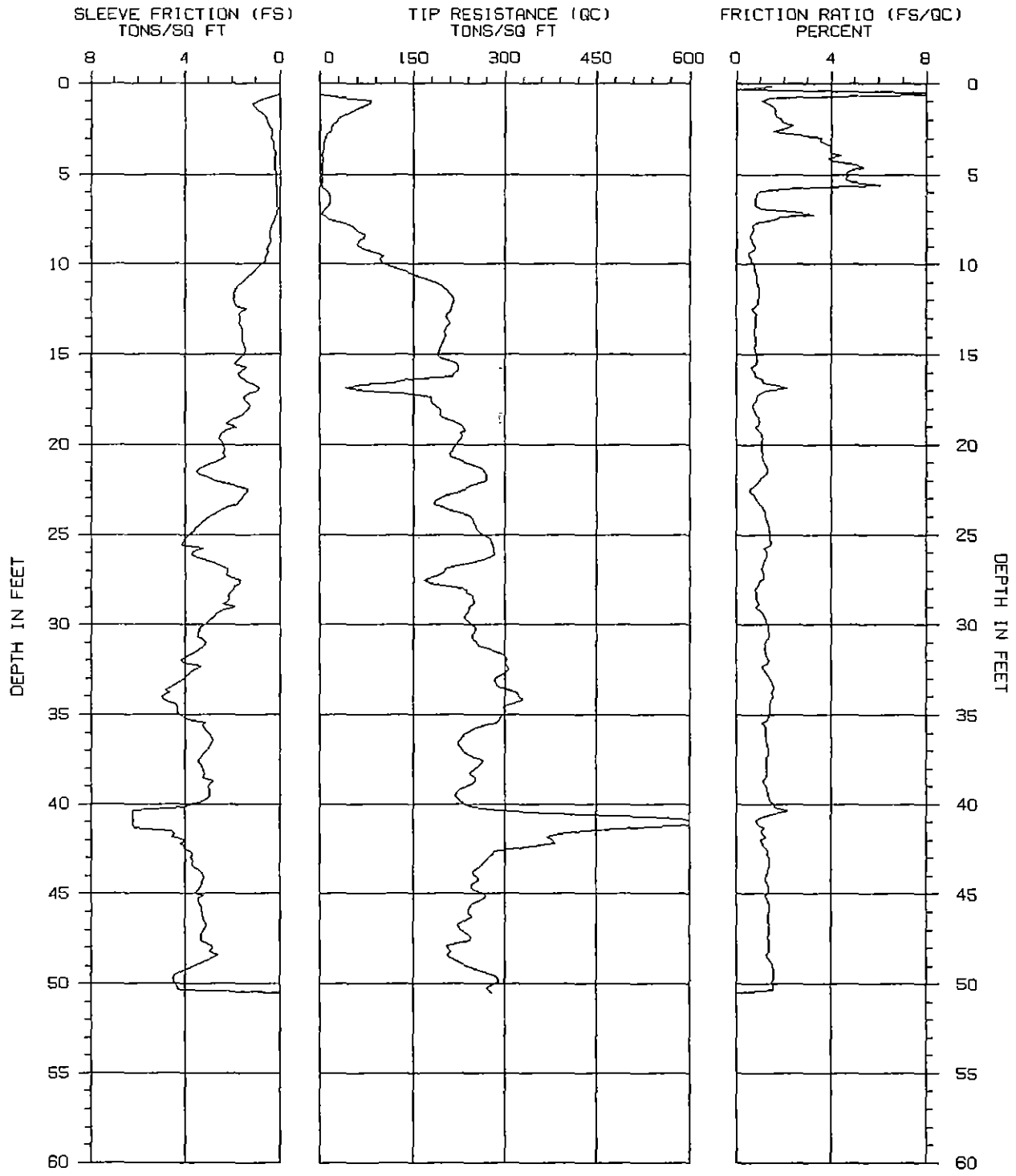
PROJECT NAME : L&A\TYLR-WOODROW

PROJECT NUMBER : 970011-001

CONE/RIG : 469\#1

DATE/TIME: 11-04-96 11:19

HFA




TIP RESISTANCE NOT CORRECTED FOR END AREA EFFECT

CONE PENETRATION TEST

SOUNDING NUMBER: CPT-04

PROJECT NAME : L&A\TYLR-WOODROW

PROJECT NUMBER : 970011-001

CONE/RIG : 469\#1

DATE/TIME: 11-04-96 11:19

HFA

# CPT INTERPRETATIONS

SOUNDING : CPT-04 PROJECT No.: 970011-001
PROJECT : L&A\TYLR-WOODROW CONE/RIG : 469\#1
DATE/TIME: 11-04-96 11:19



| DEPTH (m) | DEPTH (ft) | TIP RESISTANCE (tsf) | FRICTION RATIO (%) | SOIL BEHAVIOR TYPE | N(60) | N1(60) | Dr (%) | Su (tsf) | PHI (Degrees) |
|---|---|---|---|---|---|---|---|---|---|
| .150 | .49 | .06 | 12.00 | ORGANIC MATERIAL | 0 | 0 | | .0 | |
| .300 | .98 | 82.43 | 1.08 | SAND to SILTY SAND | 21 | 33 | 71 | | |
| .450 | 1.48 | 55.90 | 1.68 | SILTY SAND to SANDY SILT | 19 | 30 | 60 | | 48.0 |
| .600 | 1.97 | 31.27 | 1.87 | SANDY SILT to CLAYEY SILT | 13 | 20 | | 2.5 | |
| .750 | 2.46 | 19.12 | 2.06 | CLAYEY SILT to SILTY CLAY | 10 | 15 | | 1.5 | |
| .900 | 2.95 | 9.92 | 3.62 | CLAY | 10 | 16 | | .6 | |
| 1.050 | 3.44 | 6.54 | 3.96 | CLAY | 7 | 10 | | .4 | |
| 1.200 | 3.94 | 3.65 | 4.41 | CLAY | 4 | 6 | | .2 | |
| 1.350 | 4.43 | 4.61 | 5.03 | CLAY | 5 | 7 | | .3 | |
| 1.500 | 4.92 | 3.97 | 4.69 | CLAY | 4 | 6 | | .2 | |
| 1.650 | 5.41 | 3.25 | 4.91 | CLAY | 3 | 5 | | .2 | |
| 1.800 | 5.91 | 13.02 | .97 | SANDY SILT to CLAYEY SILT | 5 | 8 | | 1.3 | |
| 1.950 | 6.40 | 16.87 | .84 | SANDY SILT to CLAYEY SILT | 7 | 11 | | 1.6 | |
| 2.100 | 6.89 | 10.60 | 1.03 | CLAYEY SILT to SILTY CLAY | 5 | 8 | | 1.0 | |
| 2.250 | 7.38 | 11.24 | 1.84 | CLAYEY SILT to SILTY CLAY | 6 | 9 | | .9 | |
| 2.400 | 7.87 | 51.56 | .70 | SILTY SAND to SANDY SILT | 17 | 27 | 57 | | 42.0 |
| 2.550 | 8.37 | 71.66 | .60 | SAND to SILTY SAND | 18 | 28 | 67 | | 43.0 |
| 2.700 | 8.86 | 59.87 | .70 | SAND to SILTY SAND | 15 | 23 | 62 | | 42.5 |
| 2.850 | 9.35 | 89.59 | .57 | SAND to SILTY SAND | 22 | 34 | 73 | | 44.0 |
| 3.000 | 9.84 | 99.21 | .62 | SAND to SILTY SAND | 25 | 37 | 76 | | 44.0 |
| 3.150 | 10.33 | 130.55 | .77 | SAND to SILTY SAND | 33 | 48 | 84 | | 45.0 |
| 3.300 | 10.83 | 169.68 | .87 | SAND | 34 | 50 | 91 | | 46.0 |
| 3.450 | 11.32 | 200.74 | .93 | SAND | 40 | 58 | 96 | | 46.5 |
| 3.600 | 11.81 | 213.11 | .92 | SAND | 43 | 61 | 98 | | 46.5 |
| 3.750 | 12.30 | 213.04 | .87 | SAND | 43 | 60 | 98 | | 46.5 |
| 3.900 | 12.80 | 205.22 | .84 | SAND | 41 | 57 | 97 | | 46.5 |
| 4.050 | 13.29 | 210.54 | .81 | SAND | 42 | 57 | 97 | | 46.5 |
| 4.200 | 13.78 | 200.57 | .79 | SAND | 40 | 54 | 95 | | 46.0 |
| 4.350 | 14.27 | 198.38 | .80 | SAND | 40 | 53 | 95 | | 46.0 |
| 4.500 | 14.76 | 192.61 | .77 | SAND | 39 | 51 | 94 | | 46.0 |
| 4.650 | 15.26 | 198.85 | .86 | SAND | 40 | 52 | 94 | | 46.0 |
| 4.800 | 15.75 | 222.92 | .63 | SAND | 45 | 57 | 97 | | 46.0 |
| 4.950 | 16.24 | 213.15 | .79 | SAND | 43 | 54 | 95 | | 46.0 |
| 5.100 | 16.73 | 67.35 | 1.55 | SILTY SAND to SANDY SILT | 22 | 28 | 62 | | 40.5 |
| 5.250 | 17.22 | 146.70 | .93 | SAND to SILTY SAND | 37 | 45 | 84 | | 44.0 |
| 5.400 | 17.72 | 180.56 | .73 | SAND | 36 | 44 | 90 | | 45.0 |
| 5.550 | 18.21 | 193.03 | .75 | SAND | 39 | 47 | 91 | | 45.0 |
| 5.700 | 18.70 | 214.21 | .98 | SAND | 43 | 51 | 94 | | 45.5 |
| 5.850 | 19.19 | 235.86 | .95 | SAND | 47 | 56 | 96 | | 46.0 |
| 6.000 | 19.69 | 228.04 | 1.12 | SAND | 46 | 54 | 95 | | 45.5 |
| 6.150 | 20.18 | 215.55 | 1.08 | SAND | 43 | 50 | 93 | | 45.5 |

*INDICATES OVERCONSOLIDATED OR CEMENTED MATERIAL
ASSUMED TOTAL UNIT WT = 120 pcf
ASSUMED DEPTH OF WATER TABLE = 5.0 ft
N(60) = EQUIVALENT SPT VALUE (60% Energy)
N1(60) = OVERBURDEN NORMALIZED EQUIVALENT SPT VALUE (60% Energy)
Dr = OVERBURDEN NORMALIZED EQUIVALENT RELATIVE DENSITY
Su = OVERBURDEN NORMALIZED UNDRAINED SHEAR STRENGTH
PHI = OVERBURDEN NORMALIZED EQUIVALENT FRICTION ANGLE



*Interpretations based on: Robertson and Campanella, 1989.*

SOUNDING : CPT-04

| DEPTH (m) | DEPTH (ft) | TIP RESISTANCE (tsf) | FRICTION RATIO (%) | SOIL BEHAVIOR TYPE | N(60) | N1(60) | Dr (%) | Su (tsf) | PHI (Degrees) |
|---|---|---|---|---|---|---|---|---|---|
| 6.300 | 20.67 | 211.30 | 1.10 | SAND | 42 | 49 | 93 | | 45.0 |
| 6.450 | 21.16 | 248.25 | 1.26 | SAND | 50 | 57 | 97 | | 46.0 |
| 6.600 | 21.65 | 270.60 | 1.24 | SAND | 54 | 61 | 99 | | 46.0 |
| 6.750 | 22.15 | 257.87 | .91 | SAND | 52 | 58 | 97 | | 46.0 |
| 6.900 | 22.64 | 226.75 | .61 | SAND | 45 | 50 | 93 | | 45.0 |
| 7.050 | 23.13 | 185.32 | .92 | SAND | 37 | 41 | 87 | | 44.0 |
| 7.200 | 23.62 | 205.39 | 1.19 | SAND to SILTY SAND | 51 | 56 | 90 | | 44.5 |
| 7.350 | 24.11 | 246.38 | 1.27 | SAND | 49 | 53 | 95 | | 45.0 |
| 7.500 | 24.61 | 254.09 | 1.39 | SAND to SILTY SAND | 64 | 68 | 96 | | 45.5 |
| 7.650 | 25.10 | 268.41 | 1.43 | SAND to SILTY SAND | 67 | 72 | 97 | | 45.5 |
| 7.800 | 25.59 | 280.54 | 1.47 | SAND to SILTY SAND | 70 | 74 | 98 | | 45.5 |
| 7.950 | 26.08 | 284.06 | 1.32 | SAND | 57 | 60 | 98 | | 45.5 |
| 8.100 | 26.57 | 245.27 | 1.15 | SAND | 49 | 51 | 94 | | 45.0 |
| 8.250 | 27.07 | 200.51 | 1.10 | SAND | 40 | 41 | 88 | | 44.0 |
| 8.400 | 27.56 | 167.09 | 1.01 | SAND to SILTY SAND | 42 | 43 | 82 | | 43.0 |
| 8.550 | 28.05 | 239.13 | .82 | SAND | 48 | 49 | 92 | | 44.5 |
| 8.700 | 28.54 | 248.22 | .86 | SAND | 50 | 50 | 93 | | 44.5 |
| 8.850 | 29.04 | 241.34 | .79 | SAND | 48 | 48 | 92 | | 44.5 |
| 9.000 | 29.53 | 233.82 | 1.17 | SAND | 47 | 47 | 91 | | 44.5 |
| 9.150 | 30.02 | 244.63 | 1.33 | SAND to SILTY SAND | 61 | 61 | 92 | | 44.5 |
| 9.300 | 30.51 | 248.01 | 1.39 | SAND to SILTY SAND | 62 | 61 | 93 | | 44.5 |
| 9.450 | 31.00 | 255.64 | 1.22 | SAND | 51 | 50 | 93 | | 44.5 |
| 9.600 | 31.50 | 285.08 | 1.25 | SAND | 57 | 55 | 96 | | 45.0 |
| 9.750 | 31.99 | 303.29 | 1.37 | SAND | 61 | 58 | 98 | | 45.0 |
| 9.900 | 32.48 | 306.31 | 1.17 | SAND | 61 | 59 | 98 | | 45.0 |
| 10.050 | 32.97 | 285.38 | 1.40 | SAND to SILTY SAND | 71 | 68 | 96 | | 44.5 |
| 10.200 | 33.46 | 288.61 | 1.59 | SAND to SILTY SAND | 72 | 68 | 96 | | 44.5 |
| 10.350 | 33.96 | 321.43 | 1.54 | SAND to SILTY SAND | 80 | 75 | 99 | | 45.0 |
| 10.500 | 34.45 | 310.64 | 1.42 | SAND | 62 | 58 | 97 | | 45.0 |
| 10.650 | 34.94 | 299.49 | 1.43 | SAND to SILTY SAND | 75 | 69 | 96 | | 44.5 |
| 10.800 | 35.43 | 286.63 | 1.10 | SAND | 57 | 53 | 95 | | 44.5 |
| 10.950 | 35.93 | 243.23 | 1.27 | SAND | 49 | 45 | 90 | | 44.0 |
| 11.100 | 36.42 | 226.43 | 1.26 | SAND to SILTY SAND | 57 | 52 | 88 | | 43.5 |
| 11.250 | 36.91 | 227.91 | 1.33 | SAND to SILTY SAND | 57 | 52 | 88 | | 43.5 |
| 11.400 | 37.40 | 252.49 | 1.32 | SAND | 50 | 45 | 91 | | 44.0 |
| 11.550 | 37.89 | 256.11 | 1.29 | SAND | 51 | 46 | 91 | | 44.0 |
| 11.700 | 38.39 | 245.44 | 1.31 | SAND to SILTY SAND | 61 | 55 | 89 | | 43.5 |
| 11.850 | 38.88 | 246.86 | 1.20 | SAND | 49 | 44 | 89 | | 43.5 |
| 12.000 | 39.37 | 219.88 | 1.34 | SAND to SILTY SAND | 55 | 48 | 86 | | 43.0 |
| 12.150 | 39.86 | 226.07 | 1.46 | SAND to SILTY SAND | 57 | 49 | 87 | | 43.0 |
| 12.300 | 40.35 | 289.44 | 2.14 | SAND to SILTY SAND | 72 | 63 | 93 | | 44.0 |
| 12.450 | 40.85 | 713.17 | .87 | GRAVELLY SAND to SAND | 100 | 100 | 100 | | |
| 12.600 | 41.34 | 512.53 | 1.20 | SAND | 100 | 88 | 100 | | 46.5 |
| 12.750 | 41.83 | 368.89 | 1.24 | SAND | 74 | 63 | 100 | | 45.0 |
| 12.900 | 42.32 | 358.10 | 1.13 | SAND | 72 | 61 | 99 | | 45.0 |
| 13.050 | 42.81 | 279.24 | 1.32 | SAND | 56 | 47 | 92 | | 44.0 |
| 13.200 | 43.31 | 263.67 | 1.39 | SAND to SILTY SAND | 66 | 56 | 90 | | 43.5 |
| 13.350 | 43.80 | 247.88 | 1.34 | SAND to SILTY SAND | 62 | 52 | 88 | | 43.0 |
| 13.500 | 44.29 | 256.13 | 1.28 | SAND | 51 | 43 | 89 | | 43.0 |
| 13.650 | 44.78 | 250.16 | 1.39 | SAND to SILTY SAND | 63 | 52 | 88 | | 43.0 |

*INDICATES OVERCONSOLIDATED OR CEMENTED MATERIAL
ASSUMED TOTAL UNIT WT = 120 pcf
ASSUMED DEPTH OF WATER TABLE = 5.0 ft
N(60) = EQUIVALENT SPT VALUE (60% Energy)
N1(60) = OVERBURDEN NORMALIZED EQUIVALENT SPT VALUE (60% Energy)
Dr = OVERBURDEN NORMALIZED EQUIVALENT RELATIVE DENSITY
Su = OVERBURDEN NORMALIZED UNDRAINED SHEAR STRENGTH
PHI = OVERBURDEN NORMALIZED EQUIVALENT FRICTION ANGLE



*Interpretations based on: Robertson and Campanella, 1989.*

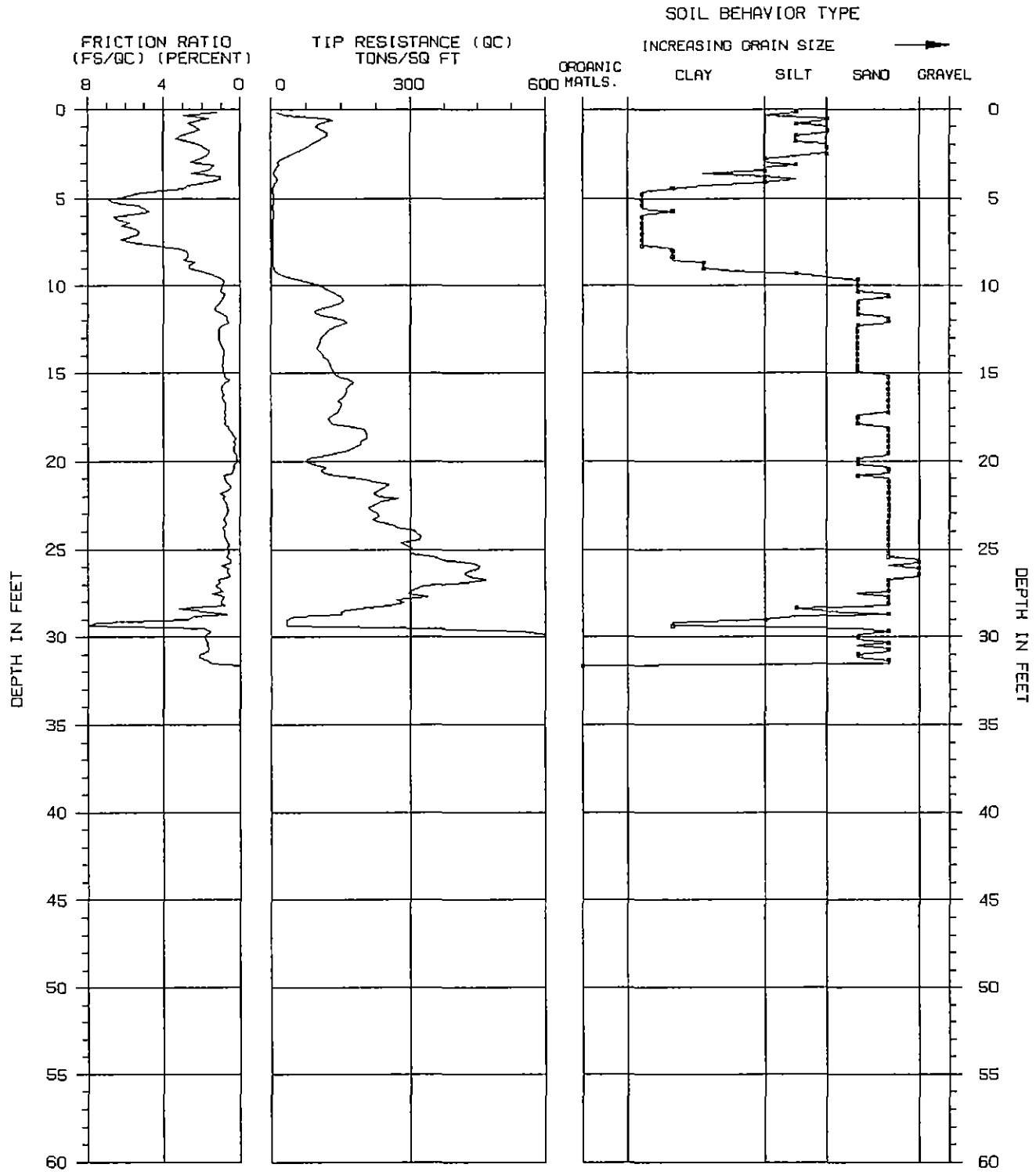
SOUNDING : CPT-04

| DEPTH (m) | DEPTH (ft) | TIP RESISTANCE (tsf) | FRICTION RATIO (%) | SOIL BEHAVIOR TYPE | N(60) | N1(60) | Dr (%) | Su (tsf) | PHI (Degrees) |
|---|---|---|---|---|---|---|---|---|---|
| 13.800 | 45.28 | 266.56 | 1.30 | SAND | 53 | 44 | 90 | | 43.5 |
| 13.950 | 45.77 | 241.87 | 1.37 | SAND to SILTY SAND | 60 | 50 | 87 | | 43.0 |
| 14.100 | 46.26 | 246.18 | 1.33 | SAND to SILTY SAND | 62 | 50 | 87 | | 43.0 |
| 14.250 | 46.75 | 223.86 | 1.38 | SAND to SILTY SAND | 56 | 46 | 84 | | 42.5 |
| 14.400 | 47.24 | 239.49 | 1.38 | SAND to SILTY SAND | 60 | 49 | 86 | | 42.5 |
| 14.550 | 47.74 | 230.80 | 1.37 | SAND to SILTY SAND | 58 | 47 | 85 | | 42.5 |
| 14.700 | 48.23 | 211.41 | 1.40 | SAND to SILTY SAND | 53 | 43 | 82 | | 42.0 |
| 14.850 | 48.72 | 221.14 | 1.43 | SAND to SILTY SAND | 55 | 44 | 83 | | 42.0 |
| 15.000 | 49.21 | 252.07 | 1.57 | SAND to SILTY SAND | 63 | 50 | 87 | | 42.5 |
| 15.150 | 49.70 | 288.82 | 1.56 | SAND to SILTY SAND | 72 | 57 | 91 | | 43.5 |
| 15.300 | 50.20 | 272.32 | 1.59 | SAND to SILTY SAND | 68 | 54 | 89 | | 43.0 |

*INDICATES OVERCONSOLIDATED OR CEMENTED MATERIAL
ASSUMED TOTAL UNIT WT = 120 pcf
ASSUMED DEPTH OF WATER TABLE = 5.0 ft
N(60) = EQUIVALENT SPT VALUE (60% Energy)
N1(60) = OVERBURDEN NORMALIZED EQUIVALENT SPT VALUE (60% Energy)
Dr = OVERBURDEN NORMALIZED EQUIVALENT RELATIVE DENSITY
Su = OVERBURDEN NORMALIZED UNDRAINED SHEAR STRENGTH
PHI = OVERBURDEN NORMALIZED EQUIVALENT FRICTION ANGLE



*Interpretations based on: Robertson and Campanella, 1989.*




TIP RESISTANCE NOT CORRECTED FOR END AREA EFFECT

ASSUMED TOTAL UNIT WT = 120 PCF

ASSUMED DEPTH OF WATER TABLE = 5.0 FT

SOIL BEHAVIOR TYPE INTERPRETATIONS BASED ON: GUIDELINES FOR GEOTECHNICAL DESIGN USING THE CPT AND CPTU. SOIL MECHANICS SERIES #120, UNIVERSITY OF BRITISH COLUMBIA, SEPTEMBER 1989, BY P.K. ROBERTSON AND R.G. CAMPANELLA.

CONE PENETRATION TEST

SOUNDING NUMBER: CPT-05

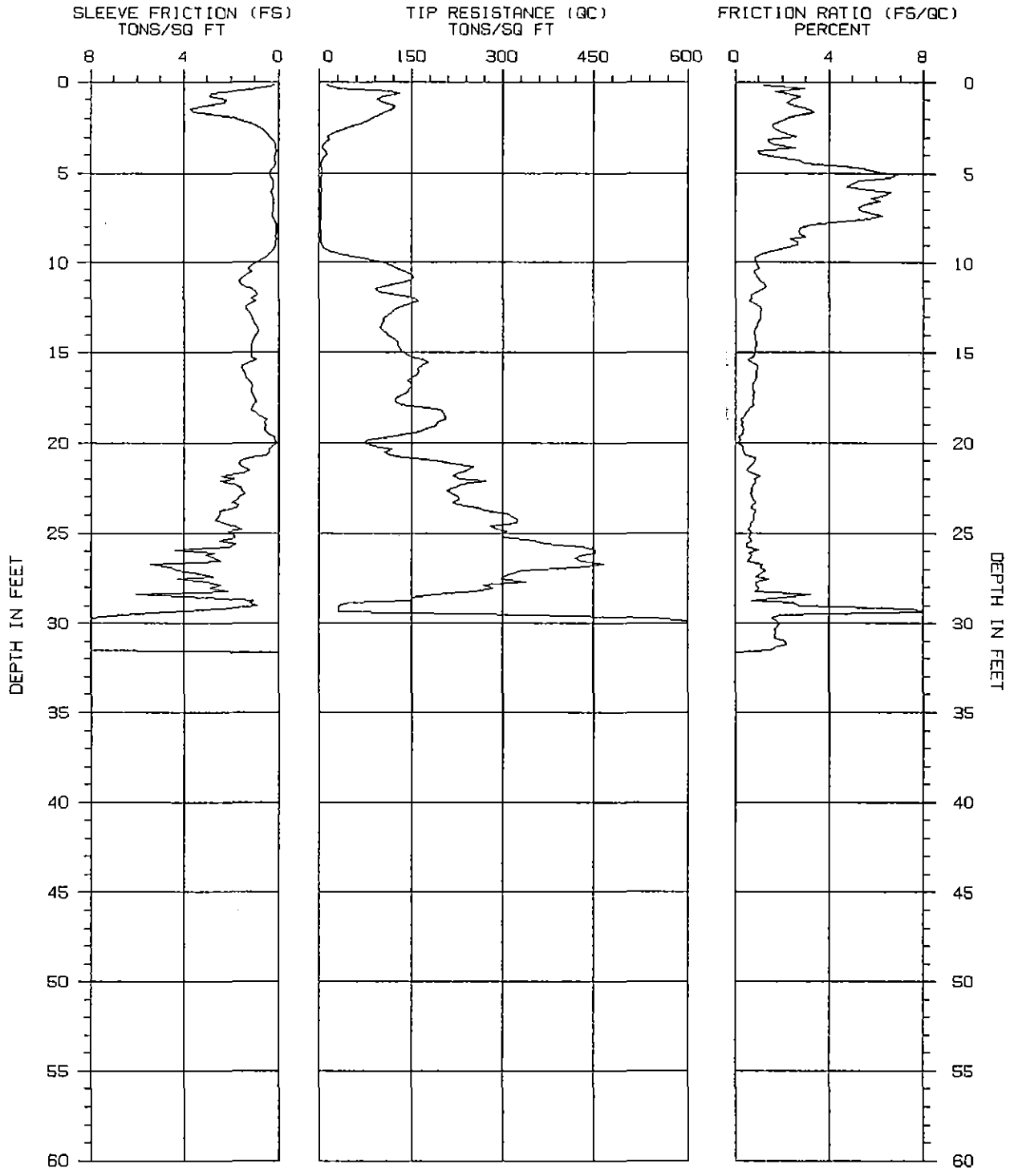
PROJECT NAME : L&A\TYLR-WOODROW

PROJECT NUMBER : 970011-001

CONE/RIG : 469\#1

DATE/TIME: 11-04-96 14:38

HFA




TIP RESISTANCE NOT CORRECTED FOR END AREA EFFECT

CONE PENETRATION TEST

SOUNDING NUMBER: CPT-05

PROJECT NAME : L&A\TYLR-WOODROW

PROJECT NUMBER : 970011-001

CONE/RIG : 469\#1

DATE/TIME: 11-04-96 14:38

HFA

# CPT INTERPRETATIONS

SOUNDING : CPT-05 PROJECT No.: 970011-001
PROJECT : L&A\TYLR-WOODROW CONE/RIG : 469\#1
DATE/TIME: 11-04-96 14:38



| DEPTH (m) | DEPTH (ft) | TIP RESISTANCE (tsf) | FRICTION RATIO (%) | SOIL BEHAVIOR TYPE | N(60) | N1(60) | Dr (%) | Su (tsf) | PHI (Degrees) |
|---|---|---|---|---|---|---|---|---|---|
| .150 | .49 | 115.17 | 1.69 | SILTY SAND to SANDY SILT | 38 | 61 | 80 | | |
| .300 | .98 | 94.14 | 2.37 | SILTY SAND to SANDY SILT | 31 | 50 | 75 | | |
| .450 | 1.48 | 120.16 | 3.11 | SANDY SILT to CLAYEY SILT | 48 | 77 | | 7.1 | |
| .600 | 1.97 | 87.19 | 2.21 | SILTY SAND to SANDY SILT | 29 | 46 | 72 | | 49.0 |
| .750 | 2.46 | 48.59 | 1.62 | SILTY SAND to SANDY SILT | 16 | 26 | 56 | | 46.0 |
| .900 | 2.95 | 14.62 | 2.58 | CLAYEY SILT to SILTY CLAY | 7 | 12 | | 1.0 | |
| 1.050 | 3.44 | 8.05 | 1.68 | CLAYEY SILT to SILTY CLAY | 4 | 6 | | .6 | |
| 1.200 | 3.94 | 14.74 | 1.05 | SANDY SILT to CLAYEY SILT | 6 | 9 | | 1.2 | |
| 1.350 | 4.43 | 4.06 | 2.95 | CLAY | 4 | 6 | | .3 | |
| 1.500 | 4.92 | 6.22 | 6.00 | CLAY | 6 | 10 | | .4 | |
| 1.650 | 5.41 | 4.38 | 5.30 | CLAY | 4 | 7 | | .3 | |
| 1.800 | 5.91 | 4.91 | 5.68 | CLAY | 5 | 8 | | .3 | |
| 1.950 | 6.40 | 3.87 | 5.78 | CLAY | 4 | 6 | | .2 | |
| 2.100 | 6.89 | 4.10 | 5.26 | CLAY | 4 | 7 | | .2 | |
| 2.250 | 7.38 | 4.02 | 6.27 | CLAY | 4 | 6 | | .2 | |
| 2.400 | 7.87 | 2.83 | 3.24 | CLAY | 3 | 5 | | .2 | |
| 2.550 | 8.37 | 3.95 | 2.75 | CLAY | 4 | 6 | | .3 | |
| 2.700 | 8.86 | 4.25 | 2.68 | CLAY | 4 | 7 | | .3 | |
| 2.850 | 9.35 | 16.44 | 1.57 | SANDY SILT to CLAYEY SILT | 7 | 10 | | 1.3 | |
| 3.000 | 9.84 | 85.43 | .88 | SAND to SILTY SAND | 21 | 32 | 72 | | 43.5 |
| 3.150 | 10.33 | 125.22 | 1.03 | SAND to SILTY SAND | 31 | 46 | 83 | | 45.0 |
| 3.300 | 10.83 | 153.79 | .98 | SAND to SILTY SAND | 38 | 56 | 89 | | 46.0 |
| 3.450 | 11.32 | 103.55 | 1.36 | SAND to SILTY SAND | 26 | 37 | 77 | | 44.0 |
| 3.600 | 11.81 | 124.77 | .71 | SAND | 25 | 35 | 83 | | 44.5 |
| 3.750 | 12.30 | 143.36 | .91 | SAND to SILTY SAND | 36 | 50 | 87 | | 45.0 |
| 3.900 | 12.80 | 117.38 | 1.07 | SAND to SILTY SAND | 29 | 41 | 81 | | 44.0 |
| 4.050 | 13.29 | 104.38 | 1.01 | SAND to SILTY SAND | 26 | 36 | 77 | | 43.5 |
| 4.200 | 13.78 | 104.35 | .82 | SAND to SILTY SAND | 26 | 35 | 77 | | 43.5 |
| 4.350 | 14.27 | 121.18 | .87 | SAND to SILTY SAND | 30 | 40 | 81 | | 44.0 |
| 4.500 | 14.76 | 130.17 | .88 | SAND to SILTY SAND | 33 | 43 | 82 | | 44.0 |
| 4.650 | 15.26 | 150.54 | .78 | SAND | 30 | 39 | 86 | | 44.5 |
| 4.800 | 15.75 | 166.73 | .92 | SAND | 33 | 43 | 89 | | 45.0 |
| 4.950 | 16.24 | 158.68 | .89 | SAND | 32 | 40 | 87 | | 44.5 |
| 5.100 | 16.73 | 148.67 | .78 | SAND | 30 | 37 | 85 | | 44.5 |
| 5.250 | 17.22 | 143.36 | .80 | SAND | 29 | 36 | 83 | | 44.0 |
| 5.400 | 17.72 | 124.22 | .74 | SAND to SILTY SAND | 31 | 38 | 79 | | 43.5 |
| 5.550 | 18.21 | 198.70 | .59 | SAND | 40 | 48 | 92 | | 45.5 |
| 5.700 | 18.70 | 205.56 | .23 | SAND | 41 | 49 | 93 | | 45.5 |
| 5.850 | 19.19 | 175.65 | .35 | SAND | 35 | 42 | 88 | | 44.5 |
| 6.000 | 19.69 | 115.66 | .17 | SAND | 23 | 27 | 76 | | 42.5 |
| 6.150 | 20.18 | 89.33 | .32 | SAND to SILTY SAND | 22 | 26 | 68 | | 41.5 |

*INDICATES OVERCONSOLIDATED OR CEMENTED MATERIAL
ASSUMED TOTAL UNIT WT = 120 pcf
ASSUMED DEPTH OF WATER TABLE = 5.0 ft
N(60) = EQUIVALENT SPT VALUE (60% Energy)
N1(60) = OVERBURDEN NORMALIZED EQUIVALENT SPT VALUE (60% Energy)
Dr = OVERBURDEN NORMALIZED EQUIVALENT RELATIVE DENSITY
Su = OVERBURDEN NORMALIZED UNDRAINED SHEAR STRENGTH
PHI = OVERBURDEN NORMALIZED EQUIVALENT FRICTION ANGLE



*Interpretations based on: Robertson and Campanella, 1989.*

SOUNDING : CPT-05

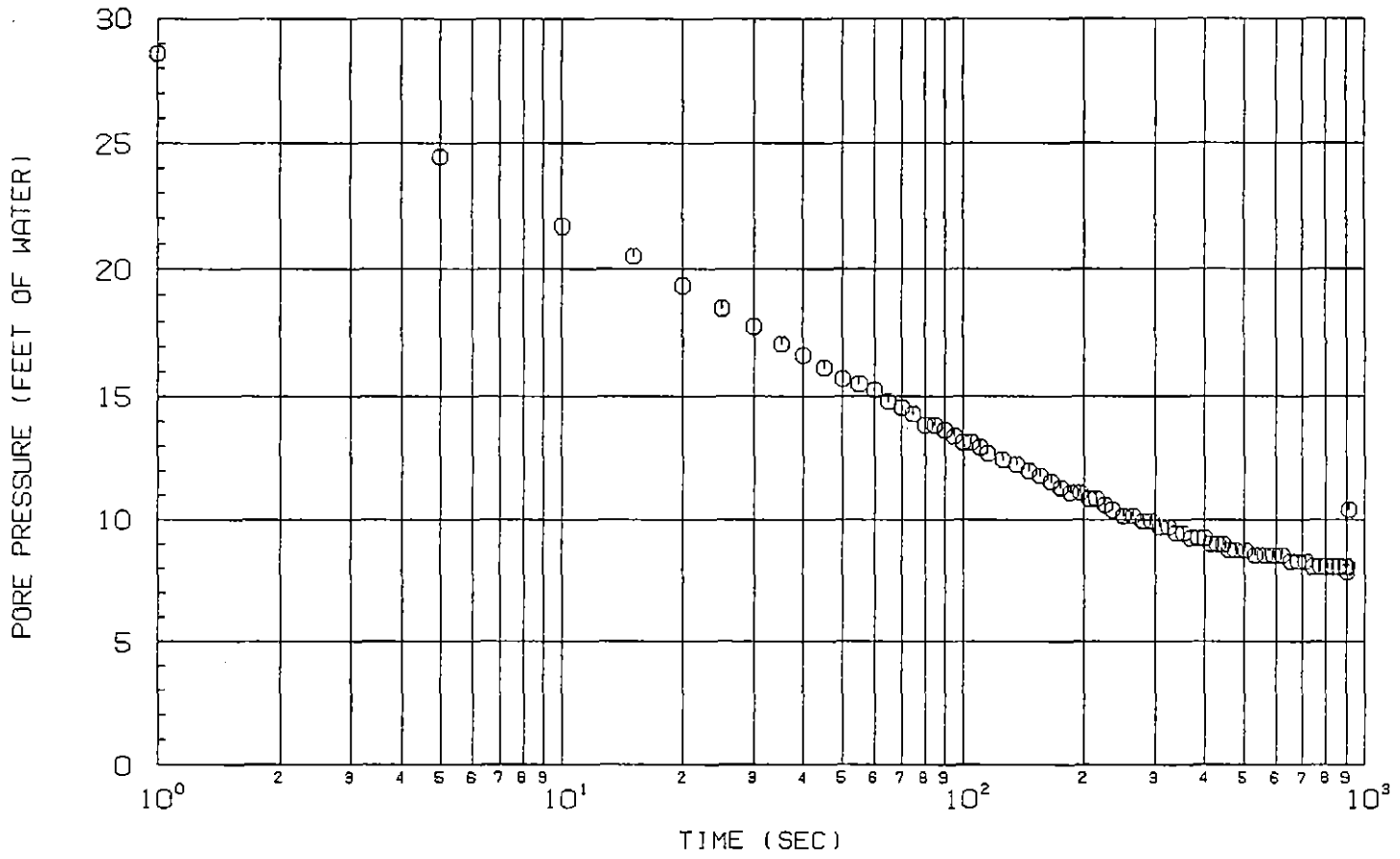
| DEPTH (m) | DEPTH (ft) | TIP RESISTANCE (tsf) | FRICTION RATIO (%) | SOIL BEHAVIOR TYPE | N(60) | N1(60) | Dr (%) | Su (tsf) | PHI (Degrees) |
|---|---|---|---|---|---|---|---|---|---|
| 6.300 | 20.67 | 115.15 | .46 | SAND | 23 | 27 | 75 | | 42.5 |
| 6.450 | 21.16 | 217.40 | .78 | SAND | 43 | 50 | 93 | | 45.0 |
| 6.600 | 21.65 | 229.15 | .67 | SAND | 46 | 52 | 94 | | 45.5 |
| 6.750 | 22.15 | 272.34 | .90 | SAND | 54 | 61 | 99 | | 46.0 |
| 6.900 | 22.64 | 208.39 | .74 | SAND | 42 | 46 | 91 | | 44.5 |
| 7.050 | 23.13 | 228.62 | .76 | SAND | 46 | 50 | 93 | | 45.0 |
| 7.200 | 23.62 | 257.87 | .69 | SAND | 52 | 56 | 97 | | 45.5 |
| 7.350 | 24.11 | 315.17 | .81 | SAND | 63 | 68 | 100 | | 46.0 |
| 7.500 | 24.61 | 280.13 | .67 | SAND | 56 | 60 | 99 | | 46.0 |
| 7.650 | 25.10 | 299.23 | .63 | SAND | 60 | 64 | 100 | | 46.0 |
| 7.800 | 25.59 | 369.06 | .50 | GRAVELLY SAND to SAND | 62 | 65 | 100 | | 46.5 |
| 7.950 | 26.08 | 452.11 | .60 | GRAVELLY SAND to SAND | 75 | 79 | 100 | | 47.5 |
| 8.100 | 26.57 | 431.10 | .57 | GRAVELLY SAND to SAND | 72 | 75 | 100 | | 47.0 |
| 8.250 | 27.07 | 331.36 | 1.29 | SAND | 66 | 69 | 100 | | 46.0 |
| 8.400 | 27.56 | 296.05 | 1.44 | SAND to SILTY SAND | 74 | 76 | 99 | | 45.5 |
| 8.550 | 28.05 | 283.96 | 1.02 | SAND | 57 | 58 | 97 | | 45.5 |
| 8.700 | 28.54 | 150.60 | 1.99 | SILTY SAND to SANDY SILT | 50 | 51 | 79 | | 42.5 |
| 8.850 | 29.04 | 32.59 | 2.71 | CLAYEY SILT to SILTY CLAY | 16 | 16 | | 2.1 | |
| 9.000 | 29.53 | 343.27 | 1.94 | SAND to SILTY SAND | 86 | 86 | 100 | | 46.0 |
| 9.150 | 30.02 | 679.92 | 1.89 | SAND to SILTY SAND | 100 | 100 | 100 | | |
| 9.300 | 30.51 | 795.45 | 1.74 | SAND to SILTY SAND | 100 | 100 | 100 | | |
| 9.450 | 31.00 | 766.96 | 2.14 | *SAND to CLAYEY SAND | 100 | 100 | | | |
| 9.600 | 31.50 | 948.71 | 1.52 | SAND | 100 | 100 | 100 | | |

*INDICATES OVERCONSOLIDATED OR CEMENTED MATERIAL
ASSUMED TOTAL UNIT WT = 120 pcf
ASSUMED DEPTH OF WATER TABLE = 5.0 ft
N(60) = EQUIVALENT SPT VALUE (60% Energy)
N1(60) = OVERBURDEN NORMALIZED EQUIVALENT SPT VALUE (60% Energy)
Dr = OVERBURDEN NORMALIZED EQUIVALENT RELATIVE DENSITY
Su = OVERBURDEN NORMALIZED UNDRAINED SHEAR STRENGTH
PHI = OVERBURDEN NORMALIZED EQUIVALENT FRICTION ANGLE



*Interpretations based on: Robertson and Campanella, 1989.*

## PORE PRESSURE DISSIPATION CURVES




DEPTH: ⏀ 10.7 FT

TIP-SENSING PIEZOMETRIC CPT

SOUNDING NUMBER: CPT-05

PROJECT NAME : L&A\TYLR-WOODROW

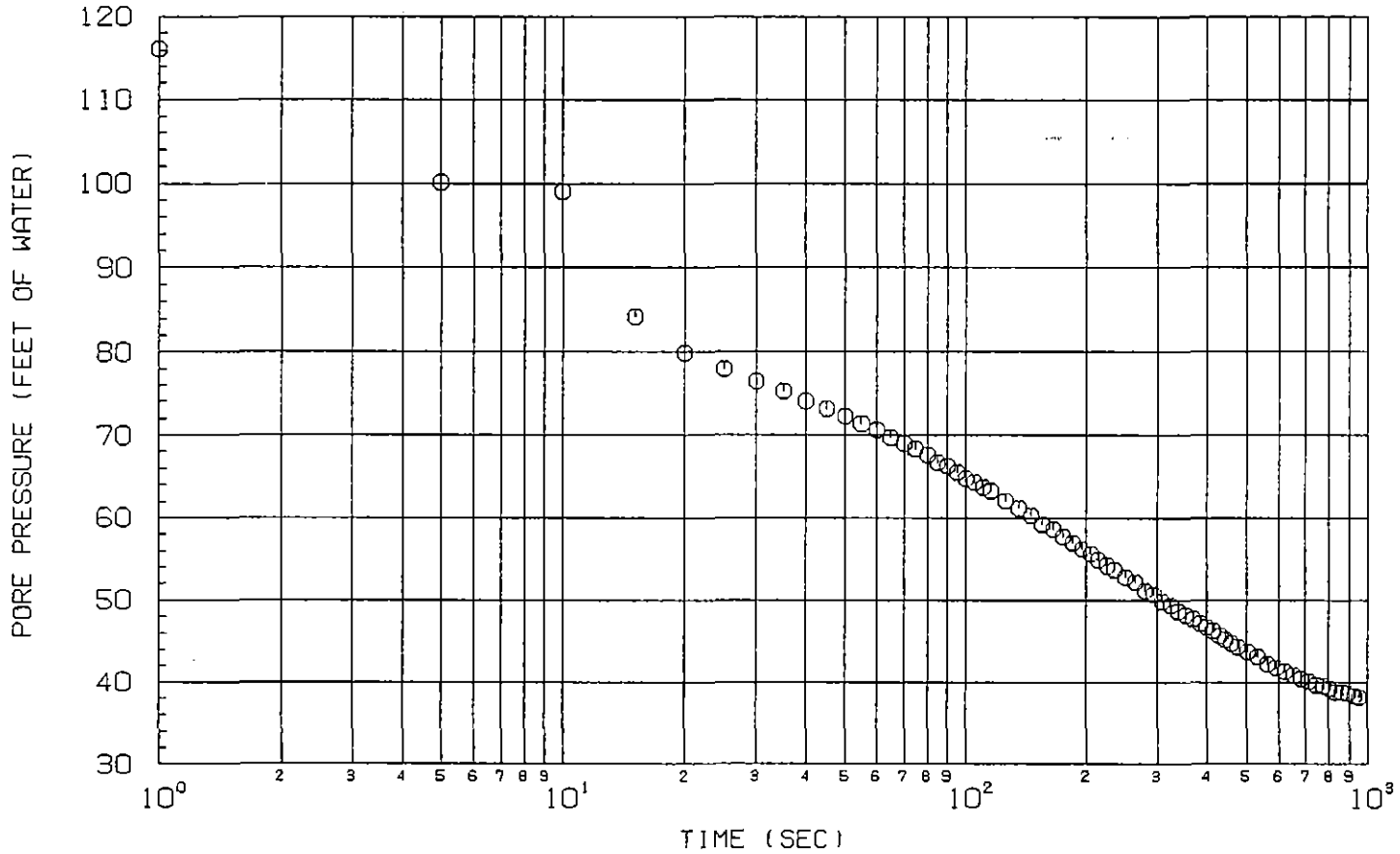
PROJECT NUMBER : 970011-001

CONE/RIG : 469\#1

DATE/TIME: 11-04-96 14:38

HFA

## PORE PRESSURE DISSIPATION CURVES




DEPTH: ⏱ 31.8 FT

TIP-SENSING PIEZOMETRIC CPT

SOUNDING NUMBER: CPT-05

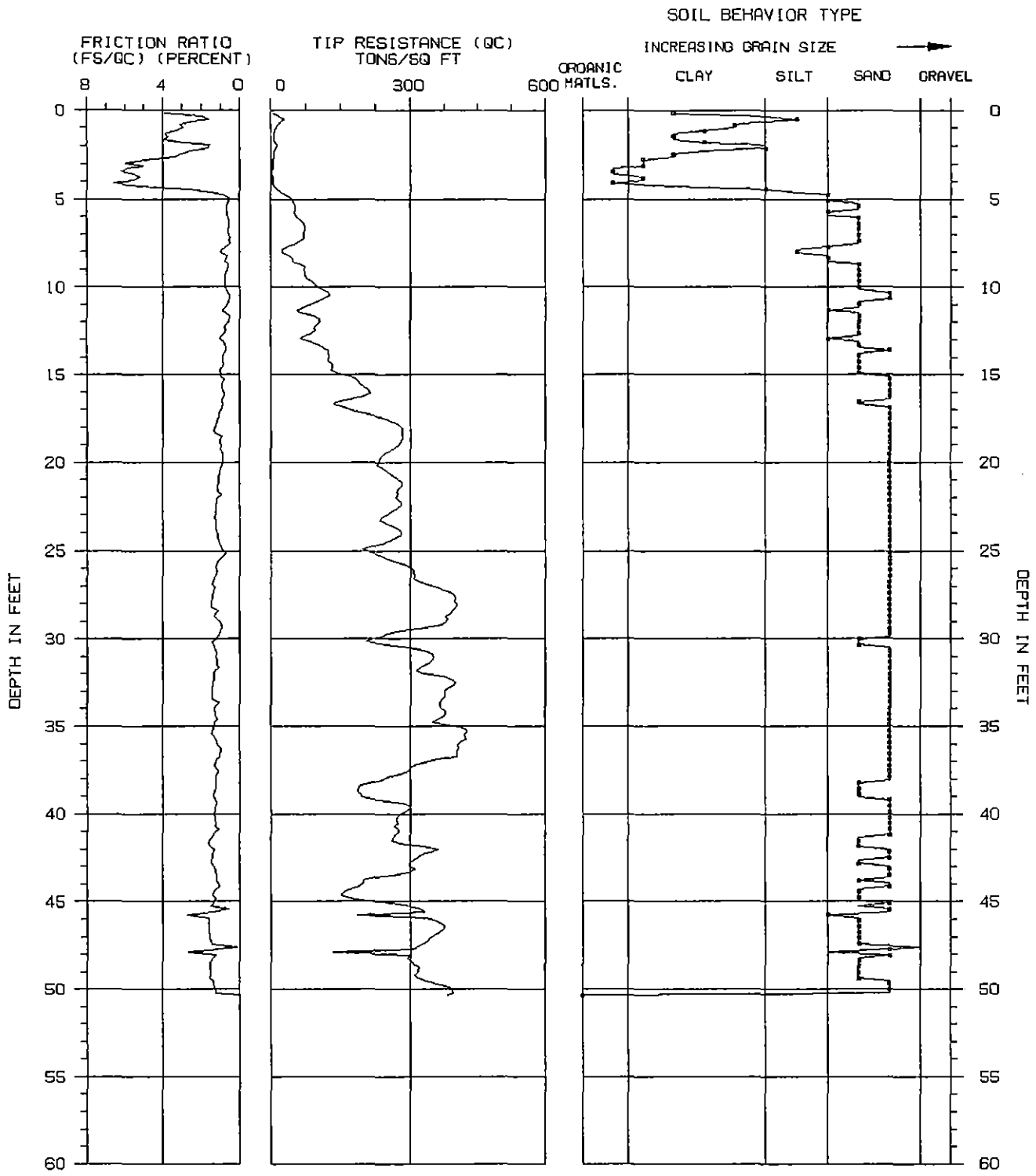
PROJECT NAME : L&A\TYLR-WOODROW

PROJECT NUMBER : 970011-001

CONE/RIG : 469\#1

DATE/TIME: 11-04-96 14:38

HFA




TIP RESISTANCE NOT CORRECTED FOR END AREA EFFECT

ASSUMED TOTAL UNIT WT = 120 PCF

ASSUMED DEPTH OF WATER TABLE = 5.0 FT

SOIL BEHAVIOR TYPE INTERPRETATIONS BASED ON: GUIDELINES FOR GEOTECHNICAL DESIGN USING THE CPT AND CPTU. SOIL MECHANICS SERIES #120, UNIVERSITY OF BRITISH COLUMBIA, SEPTEMBER 1989, BY P.K. ROBERTSON AND R.G. CAMPANELLA.

CONE PENETRATION TEST

SOUNDING NUMBER: CPT-06

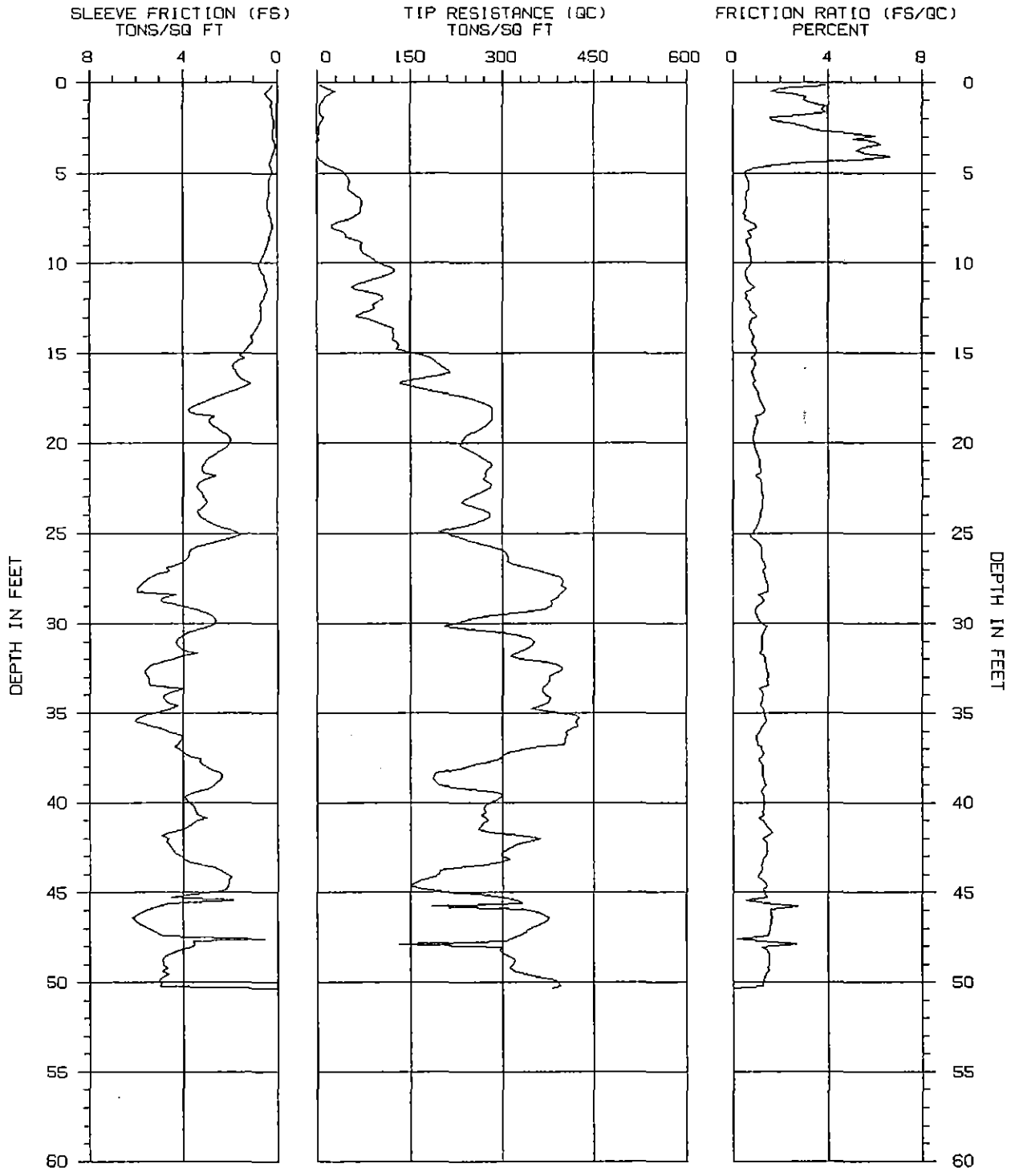
PROJECT NAME : L&A\TYLR-WOODROW

PROJECT NUMBER : 970011-001

CONE/RIG : 469\#1

DATE/TIME: 11-04-96 10:32

HFA




TIP RESISTANCE NOT CORRECTED FOR END AREA EFFECT

CONE PENETRATION TEST SOUNDING NUMBER: CPT-06

PROJECT NAME : L&A\TYLR-WOODROW CONE/RIG : 469\#1

PROJECT NUMBER : 970011-001 DATE/TIME: 11-04-96 10:32

HFA

# CPT INTERPRETATIONS

SOUNDING : CPT-06 PROJECT No.: 970011-001
PROJECT : L&A\TYLR-WOODROW CONE/RIG : 469\#1
DATE/TIME: 11-04-96 10:32



| DEPTH (m) | DEPTH (ft) | TIP RESISTANCE (tsf) | FRICTION RATIO (%) | SOIL BEHAVIOR TYPE | N(60) | N1(60) | Dr (%) | Su (tsf) | PHI (Degrees) |
|---|---|---|---|---|---|---|---|---|---|
| .150 | .49 | 28.11 | 1.60 | SANDY SILT to CLAYEY SILT | 11 | 18 | | 2.2 | |
| .300 | .98 | 9.92 | 2.93 | CLAY to SILTY CLAY | 7 | 11 | | .7 | |
| .450 | 1.48 | 6.27 | 3.76 | CLAY | 6 | 10 | | .4 | |
| .600 | 1.97 | 11.64 | 1.56 | CLAYEY SILT to SILTY CLAY | 6 | 9 | | .9 | |
| .750 | 2.46 | 4.72 | 3.05 | CLAY | 5 | 8 | | .4 | |
| .900 | 2.95 | 2.74 | 6.00 | CLAY | 3 | 4 | | .2 | |
| 1.050 | 3.44 | 1.66 | 6.20 | ORGANIC MATERIAL | 2 | 3 | | .1 | |
| 1.200 | 3.94 | 2.93 | 5.59 | CLAY | 3 | 5 | | .2 | |
| 1.350 | 4.43 | 12.32 | 2.63 | CLAYEY SILT to SILTY CLAY | 6 | 10 | | .8 | |
| 1.500 | 4.92 | 41.87 | .54 | SILTY SAND to SANDY SILT | 14 | 22 | 51 | | 42.0 |
| 1.650 | 5.41 | 51.67 | .66 | SAND to SILTY SAND | 13 | 21 | 57 | | 43.0 |
| 1.800 | 5.91 | 51.16 | .67 | SILTY SAND to SANDY SILT | 17 | 27 | 57 | | 42.5 |
| 1.950 | 6.40 | 69.94 | .56 | SAND to SILTY SAND | 17 | 28 | 66 | | 44.0 |
| 2.100 | 6.89 | 70.45 | .60 | SAND to SILTY SAND | 18 | 28 | 66 | | 43.5 |
| 2.250 | 7.38 | 62.91 | .54 | SAND to SILTY SAND | 16 | 25 | 63 | | 43.0 |
| 2.400 | 7.87 | 23.62 | .94 | SANDY SILT to CLAYEY SILT | 9 | 15 | | 1.9 | |
| 2.550 | 8.37 | 45.40 | .72 | SILTY SAND to SANDY SILT | 15 | 24 | 54 | | 41.0 |
| 2.700 | 8.86 | 71.43 | .59 | SAND to SILTY SAND | 18 | 28 | 67 | | 43.0 |
| 2.850 | 9.35 | 71.83 | .74 | SAND to SILTY SAND | 18 | 28 | 67 | | 43.0 |
| 3.000 | 9.84 | 94.41 | .77 | SAND to SILTY SAND | 24 | 36 | 75 | | 44.0 |
| 3.150 | 10.33 | 123.33 | .60 | SAND | 25 | 37 | 82 | | 45.0 |
| 3.300 | 10.83 | 97.58 | .59 | SAND to SILTY SAND | 24 | 36 | 76 | | 44.0 |
| 3.450 | 11.32 | 54.96 | .90 | SILTY SAND to SANDY SILT | 18 | 26 | 59 | | 41.0 |
| 3.600 | 11.81 | 103.31 | .58 | SAND to SILTY SAND | 26 | 37 | 77 | | 44.0 |
| 3.750 | 12.30 | 91.01 | .76 | SAND to SILTY SAND | 23 | 32 | 74 | | 43.0 |
| 3.900 | 12.80 | 72.10 | .92 | SAND to SILTY SAND | 18 | 25 | 67 | | 42.0 |
| 4.050 | 13.29 | 97.81 | .76 | SAND to SILTY SAND | 24 | 33 | 75 | | 43.5 |
| 4.200 | 13.78 | 122.31 | .81 | SAND to SILTY SAND | 31 | 41 | 81 | | 44.0 |
| 4.350 | 14.27 | 122.41 | .86 | SAND to SILTY SAND | 31 | 41 | 81 | | 44.0 |
| 4.500 | 14.76 | 129.08 | 1.01 | SAND to SILTY SAND | 32 | 42 | 82 | | 44.0 |
| 4.650 | 15.26 | 182.94 | .76 | SAND | 37 | 47 | 92 | | 45.5 |
| 4.800 | 15.75 | 199.96 | .95 | SAND | 40 | 51 | 94 | | 46.0 |
| 4.950 | 16.24 | 200.04 | .84 | SAND | 40 | 51 | 94 | | 46.0 |
| 5.100 | 16.73 | 133.35 | .87 | SAND to SILTY SAND | 33 | 42 | 82 | | 44.0 |
| 5.250 | 17.22 | 198.02 | 1.07 | SAND | 40 | 49 | 93 | | 45.5 |
| 5.400 | 17.72 | 263.54 | 1.18 | SAND | 53 | 65 | 100 | | 46.5 |
| 5.550 | 18.21 | 283.49 | 1.32 | SAND | 57 | 69 | 100 | | 46.5 |
| 5.700 | 18.70 | 282.62 | 1.01 | SAND | 57 | 68 | 100 | | 46.5 |
| 5.850 | 19.19 | 264.69 | .95 | SAND | 53 | 63 | 100 | | 46.0 |
| 6.000 | 19.69 | 239.13 | .85 | SAND | 48 | 56 | 97 | | 46.0 |
| 6.150 | 20.18 | 230.44 | .92 | SAND | 46 | 54 | 95 | | 45.5 |

*INDICATES OVERCONSOLIDATED OR CEMENTED MATERIAL
ASSUMED TOTAL UNIT WT = 120 pcf
ASSUMED DEPTH OF WATER TABLE = 5.0 ft
N(60) = EQUIVALENT SPT VALUE (60% Energy)
N1(60) = OVERBURDEN NORMALIZED EQUIVALENT SPT VALUE (60% Energy)
Dr = OVERBURDEN NORMALIZED EQUIVALENT RELATIVE DENSITY
Su = OVERBURDEN NORMALIZED UNDRAINED SHEAR STRENGTH
PHI = OVERBURDEN NORMALIZED EQUIVALENT FRICTION ANGLE



*Interpretations based on: Robertson and Campanella, 1989.*

SOUNDING : CPT-06

| DEPTH (m) | DEPTH (ft) | TIP RESISTANCE (tsf) | FRICTION RATIO (%) | SOIL BEHAVIOR TYPE | N(60) | N1(60) | Dr (%) | Su (tsf) | PHI (Degrees) |
|---|---|---|---|---|---|---|---|---|---|
| 6.300 | 20.67 | 259.25 | 1.05 | SAND | 52 | 60 | 98 | | 46.0 |
| 6.450 | 21.16 | 282.26 | 1.10 | SAND | 56 | 65 | 100 | | 46.0 |
| 6.600 | 21.65 | 271.02 | 1.16 | SAND | 54 | 61 | 99 | | 46.0 |
| 6.750 | 22.15 | 273.76 | 1.18 | SAND | 55 | 61 | 99 | | 46.0 |
| 6.900 | 22.64 | 271.13 | 1.22 | SAND | 54 | 60 | 99 | | 46.0 |
| 7.050 | 23.13 | 237.88 | 1.27 | SAND | 48 | 52 | 95 | | 45.0 |
| 7.200 | 23.62 | 258.36 | 1.24 | SAND | 52 | 57 | 97 | | 45.5 |
| 7.350 | 24.11 | 279.65 | 1.15 | SAND | 56 | 61 | 99 | | 46.0 |
| 7.500 | 24.61 | 237.26 | 1.04 | SAND | 47 | 51 | 94 | | 45.0 |
| 7.650 | 25.10 | 214.15 | .73 | SAND | 43 | 46 | 91 | | 44.5 |
| 7.800 | 25.59 | 265.82 | 1.12 | SAND | 53 | 56 | 97 | | 45.5 |
| 7.950 | 26.08 | 306.18 | 1.21 | SAND | 61 | 64 | 100 | | 46.0 |
| 8.100 | 26.57 | 308.75 | 1.29 | SAND | 62 | 64 | 100 | | 46.0 |
| 8.250 | 27.07 | 360.31 | 1.26 | SAND | 72 | 75 | 100 | | 46.5 |
| 8.400 | 27.56 | 398.79 | 1.38 | SAND | 80 | 82 | 100 | | 46.5 |
| 8.550 | 28.05 | 404.61 | 1.47 | SAND | 81 | 82 | 100 | | 46.5 |
| 8.700 | 28.54 | 389.10 | 1.25 | SAND | 78 | 79 | 100 | | 46.5 |
| 8.850 | 29.04 | 380.52 | 1.05 | SAND | 76 | 76 | 100 | | 46.5 |
| 9.000 | 29.53 | 283.38 | .99 | SAND | 57 | 56 | 97 | | 45.0 |
| 9.150 | 30.02 | 214.45 | 1.26 | SAND to SILTY SAND | 54 | 53 | 89 | | 44.0 |
| 9.300 | 30.51 | 298.51 | 1.28 | SAND | 60 | 59 | 98 | | 45.0 |
| 9.450 | 31.00 | 350.75 | 1.22 | SAND | 70 | 68 | 100 | | 46.0 |
| 9.600 | 31.50 | 330.91 | 1.21 | SAND | 66 | 64 | 100 | | 45.5 |
| 9.750 | 31.99 | 328.81 | 1.35 | SAND | 66 | 63 | 100 | | 45.5 |
| 9.900 | 32.48 | 397.38 | 1.38 | SAND | 79 | 76 | 100 | | 46.0 |
| 10.050 | 32.97 | 376.52 | 1.46 | SAND | 75 | 72 | 100 | | 46.0 |
| 10.200 | 33.46 | 369.19 | 1.46 | SAND | 74 | 70 | 100 | | 46.0 |
| 10.350 | 33.96 | 369.91 | 1.28 | SAND | 74 | 69 | 100 | | 46.0 |
| 10.500 | 34.45 | 374.86 | 1.23 | SAND | 75 | 70 | 100 | | 46.0 |
| 10.650 | 34.94 | 381.45 | 1.32 | SAND | 76 | 71 | 100 | | 46.0 |
| 10.800 | 35.43 | 421.16 | 1.44 | SAND | 84 | 78 | 100 | | 46.0 |
| 10.950 | 35.93 | 411.38 | 1.18 | SAND | 82 | 75 | 100 | | 46.0 |
| 11.100 | 36.42 | 402.87 | 1.00 | SAND | 81 | 73 | 100 | | 46.0 |
| 11.250 | 36.91 | 359.04 | 1.21 | SAND | 72 | 65 | 100 | | 45.5 |
| 11.400 | 37.40 | 300.68 | 1.25 | SAND | 60 | 54 | 96 | | 44.5 |
| 11.550 | 37.89 | 251.86 | 1.25 | SAND | 50 | 45 | 90 | | 44.0 |
| 11.700 | 38.39 | 192.67 | 1.25 | SAND to SILTY SAND | 48 | 43 | 82 | | 42.5 |
| 11.850 | 38.88 | 191.95 | 1.34 | SAND to SILTY SAND | 48 | 42 | 82 | | 42.5 |
| 12.000 | 39.37 | 282.77 | 1.20 | SAND | 57 | 50 | 93 | | 44.0 |
| 12.150 | 39.86 | 291.50 | 1.32 | SAND | 58 | 51 | 94 | | 44.0 |
| 12.300 | 40.35 | 269.68 | 1.31 | SAND | 54 | 47 | 91 | | 44.0 |
| 12.450 | 40.85 | 274.02 | 1.10 | SAND | 55 | 47 | 92 | | 44.0 |
| 12.600 | 41.34 | 264.33 | 1.42 | SAND to SILTY SAND | 66 | 57 | 91 | | 43.5 |
| 12.750 | 41.83 | 328.72 | 1.49 | SAND to SILTY SAND | 82 | 70 | 97 | | 44.5 |
| 12.900 | 42.32 | 326.21 | 1.41 | SAND | 65 | 56 | 96 | | 44.5 |
| 13.050 | 42.81 | 298.32 | 1.45 | SAND to SILTY SAND | 75 | 63 | 94 | | 44.0 |
| 13.200 | 43.31 | 295.09 | 1.24 | SAND | 59 | 50 | 93 | | 44.0 |
| 13.350 | 43.80 | 198.68 | 1.20 | SAND to SILTY SAND | 50 | 42 | 82 | | 42.0 |
| 13.500 | 44.29 | 169.24 | 1.23 | SAND to SILTY SAND | 42 | 35 | 77 | | 41.0 |
| 13.650 | 44.78 | 169.72 | 1.27 | SAND to SILTY SAND | 42 | 35 | 77 | | 41.0 |

*INDICATES OVERCONSOLIDATED OR CEMENTED MATERIAL
ASSUMED TOTAL UNIT WT = 120 pcf
ASSUMED DEPTH OF WATER TABLE = 5.0 ft
N(60) = EQUIVALENT SPT VALUE (60% Energy)
N1(60) = OVERBURDEN NORMALIZED EQUIVALENT SPT VALUE (60% Energy)
Dr = OVERBURDEN NORMALIZED EQUIVALENT RELATIVE DENSITY
Su = OVERBURDEN NORMALIZED UNDRAINED SHEAR STRENGTH
PHI = OVERBURDEN NORMALIZED EQUIVALENT FRICTION ANGLE



*Interpretations based on: Robertson and Campanella, 1989.*

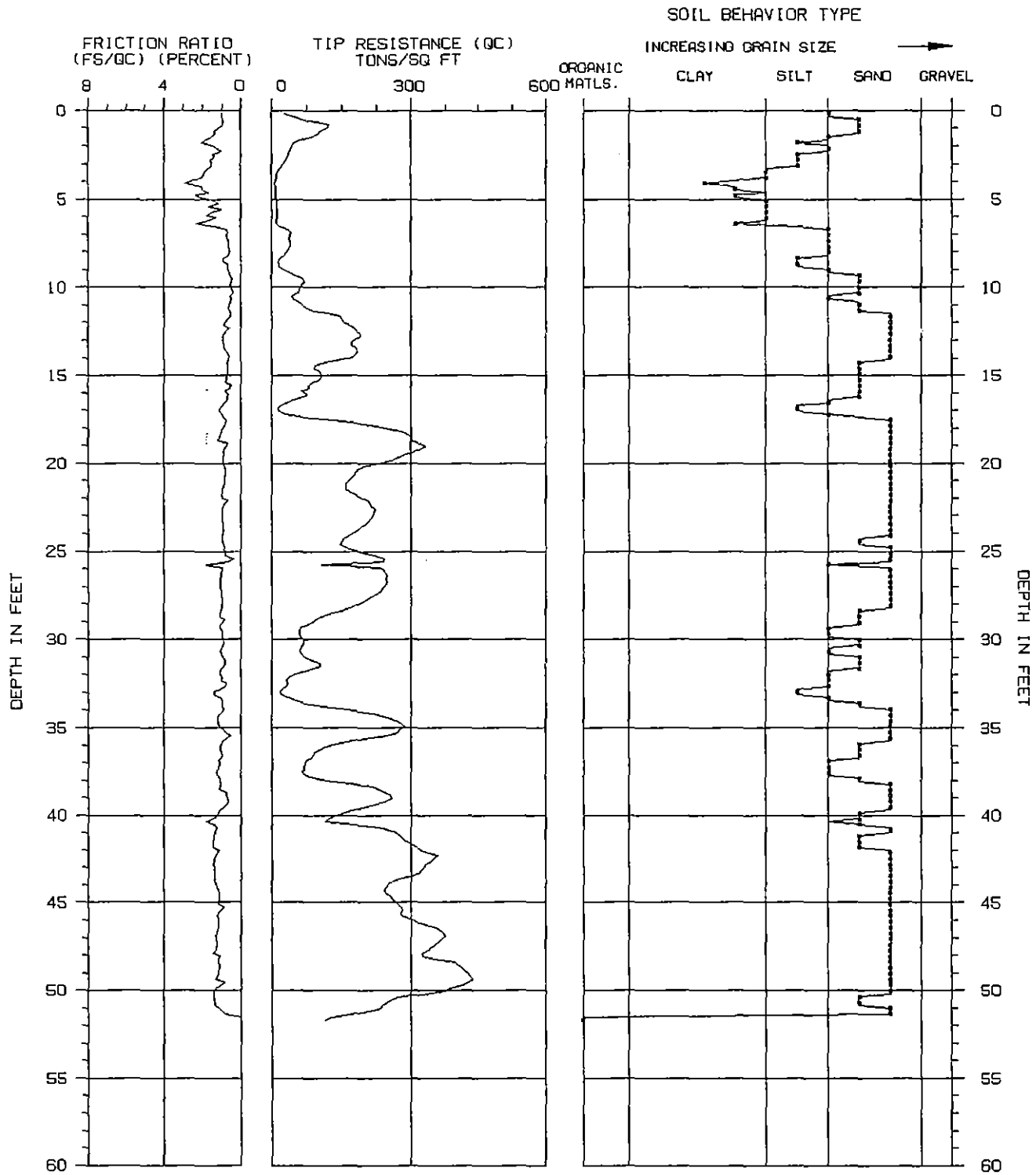
SOUNDING : CPT-06

| DEPTH (m) | DEPTH (ft) | TIP RESISTANCE (tsf) | FRICTION RATIO (%) | SOIL BEHAVIOR TYPE | N(60) | N1(60) | Dr (%) | Su (tsf) | PHI (Degrees) |
|---|---|---|---|---|---|---|---|---|---|
| 13.800 | 45.28 | 298.36 | 1.49 | SAND to SILTY SAND | 75 | 62 | 93 | | 44.0 |
| 13.950 | 45.77 | 185.59 | 2.73 | SILTY SAND to SANDY SILT | 62 | 51 | 79 | | 41.5 |
| 14.100 | 46.26 | 368.53 | 1.63 | SAND to SILTY SAND | 92 | 76 | 99 | | 44.5 |
| 14.250 | 46.75 | 364.26 | 1.60 | SAND to SILTY SAND | 91 | 74 | 98 | | 44.5 |
| 14.400 | 47.24 | 337.83 | 1.50 | SAND to SILTY SAND | 84 | 69 | 96 | | 44.0 |
| 14.550 | 47.74 | 307.16 | 1.16 | SAND | 61 | 50 | 93 | | 44.0 |
| 14.700 | 48.23 | 294.18 | 1.42 | SAND to SILTY SAND | 74 | 59 | 92 | | 43.5 |
| 14.850 | 48.72 | 320.39 | 1.52 | SAND to SILTY SAND | 80 | 64 | 94 | | 44.0 |
| 15.000 | 49.21 | 311.13 | 1.50 | SAND to SILTY SAND | 78 | 62 | 93 | | 43.5 |
| 15.150 | 49.70 | 357.93 | 1.36 | SAND | 72 | 57 | 97 | | 44.0 |
| 15.300 | 50.20 | 394.98 | 1.26 | SAND | 79 | 62 | 100 | | 44.5 |

*INDICATES OVERCONSOLIDATED OR CEMENTED MATERIAL
ASSUMED TOTAL UNIT WT = 120 pcf
ASSUMED DEPTH OF WATER TABLE = 5.0 ft
N(60) = EQUIVALENT SPT VALUE (60% Energy)
N1(60) = OVERBURDEN NORMALIZED EQUIVALENT SPT VALUE (60% Energy)
Dr = OVERBURDEN NORMALIZED EQUIVALENT RELATIVE DENSITY
Su = OVERBURDEN NORMALIZED UNDRAINED SHEAR STRENGTH
PHI = OVERBURDEN NORMALIZED EQUIVALENT FRICTION ANGLE



*Interpretations based on: Robertson and Campanella, 1989.*




TIP RESISTANCE NOT CORRECTED FOR END AREA EFFECT

ASSUMED TOTAL UNIT WT = 120 PCF

ASSUMED DEPTH OF WATER TABLE = 5.0 FT

SOIL BEHAVIOR TYPE INTERPRETATIONS BASED ON: GUIDELINES FOR GEOTECHNICAL DESIGN USING THE CPT AND CPTU. SOIL MECHANICS SERIES #120. UNIVERSITY OF BRITISH COLUMBIA. SEPTEMBER 1989. BY P.K. ROBERTSON AND R.G. CAMPANELLA.

CONE PENETRATION TEST

SOUNDING NUMBER: CPT-07

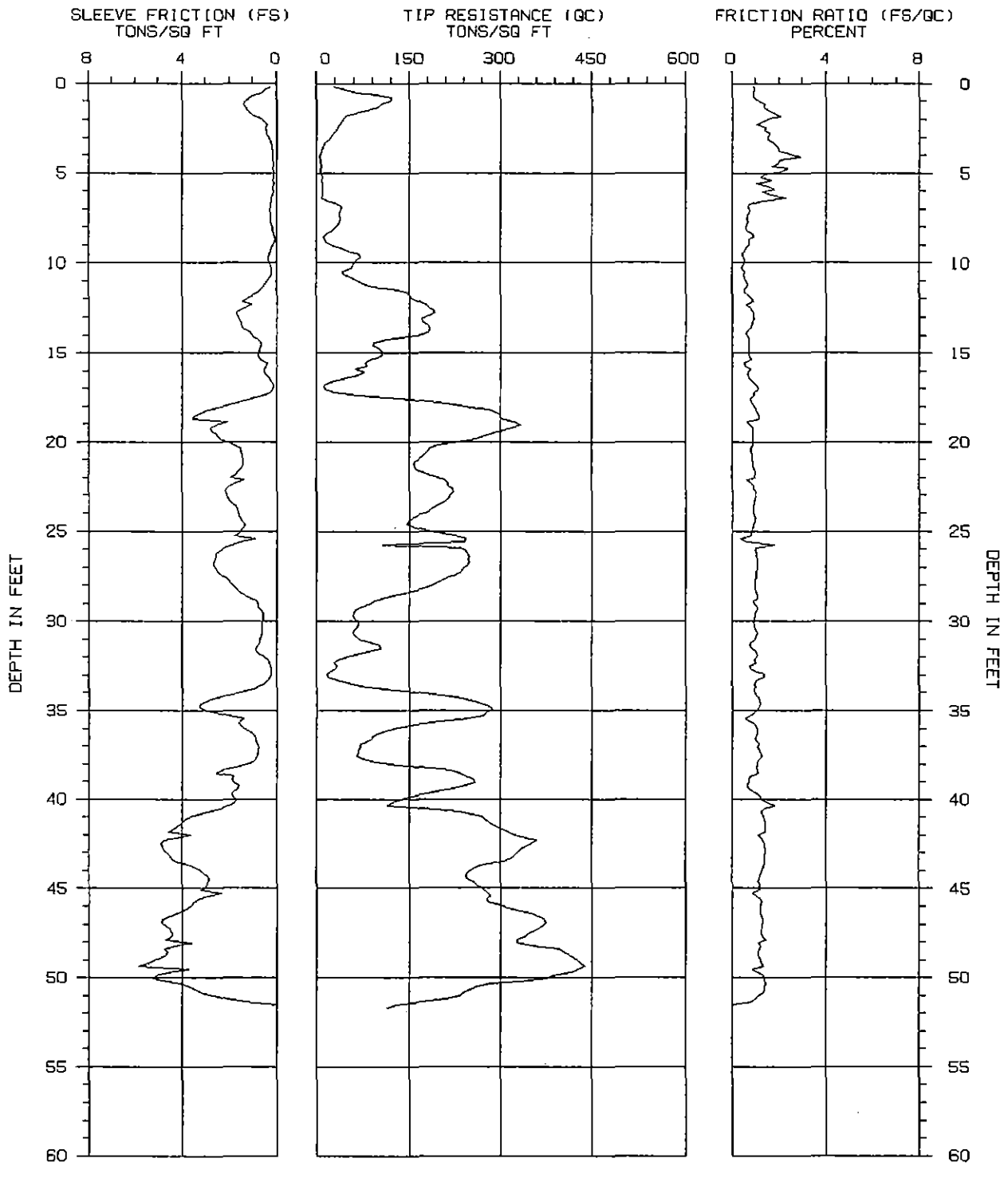
PROJECT NAME : L&A\TYLR-WOODROW

PROJECT NUMBER : 970011-001

CONE/RIG : 469\#1

DATE/TIME: 11-05-96 10:46

HFA




TIP RESISTANCE NOT CORRECTED FOR END AREA EFFECT

CONE PENETRATION TEST

SOUNDING NUMBER: CPT-07

PROJECT NAME : L&A\TYLR-WOODROW

PROJECT NUMBER : 970011-001

CONE/RIG : 469\#1

DATE/TIME: 11-05-96 10:46

HFA

# CPT INTERPRETATIONS

SOUNDING : CPT-07 PROJECT No.: 970011-001
PROJECT : L&A\TYLR-WOODROW CONE/RIG : 469\#1
DATE/TIME: 11-05-96 10:46



| DEPTH (m) | DEPTH (ft) | TIP RESISTANCE (tsf) | FRICTION RATIO (%) | SOIL BEHAVIOR TYPE | N(60) | N1(60) | Dr (%) | Su (tsf) | PHI (Degrees) |
|---|---|---|---|---|---|---|---|---|---|
| .150 | .49 | 66.05 | .92 | SAND to SILTY SAND | 17 | 26 | 64 | | |
| .300 | .98 | 119.33 | 1.13 | SAND to SILTY SAND | 30 | 48 | 81 | | |
| .450 | 1.48 | 82.11 | 1.52 | SILTY SAND to SANDY SILT | 27 | 44 | 71 | | |
| .600 | 1.97 | 43.21 | 1.57 | SILTY SAND to SANDY SILT | 14 | 23 | 52 | | 46.0 |
| .750 | 2.46 | 33.89 | 1.45 | SANDY SILT to CLAYEY SILT | 14 | 22 | | 2.7 | |
| .900 | 2.95 | 23.22 | 1.51 | SANDY SILT to CLAYEY SILT | 9 | 15 | | 1.8 | |
| 1.050 | 3.44 | 12.53 | 1.84 | CLAYEY SILT to SILTY CLAY | 6 | 10 | | 1.0 | |
| 1.200 | 3.94 | 7.29 | 2.47 | CLAY to SILTY CLAY | 5 | 8 | | .6 | |
| 1.350 | 4.43 | 7.56 | 1.98 | CLAY to SILTY CLAY | 5 | 8 | | .6 | |
| 1.500 | 4.92 | 7.05 | 2.13 | CLAY to SILTY CLAY | 5 | 8 | | .5 | |
| 1.650 | 5.41 | 9.48 | 1.69 | CLAYEY SILT to SILTY CLAY | 5 | 8 | | .7 | |
| 1.800 | 5.91 | 10.71 | 1.77 | CLAYEY SILT to SILTY CLAY | 5 | 9 | | .8 | |
| 1.950 | 6.40 | 9.60 | 2.29 | CLAY to SILTY CLAY | 6 | 10 | | .7 | |
| 2.100 | 6.89 | 40.15 | .67 | SILTY SAND to SANDY SILT | 13 | 21 | 50 | | 41.0 |
| 2.250 | 7.38 | 37.77 | .66 | SILTY SAND to SANDY SILT | 13 | 20 | 48 | | 40.0 |
| 2.400 | 7.87 | 34.97 | .63 | SILTY SAND to SANDY SILT | 12 | 19 | 46 | | 39.5 |
| 2.550 | 8.37 | 16.51 | .91 | SANDY SILT to CLAYEY SILT | 7 | 10 | | 1.3 | |
| 2.700 | 8.86 | 15.42 | .71 | SANDY SILT to CLAYEY SILT | 6 | 10 | | 1.5 | |
| 2.850 | 9.35 | 49.88 | .56 | SAND to SILTY SAND | 12 | 19 | 56 | | 41.0 |
| 3.000 | 9.84 | 63.90 | .56 | SAND to SILTY SAND | 16 | 24 | 63 | | 42.5 |
| 3.150 | 10.33 | 56.34 | .41 | SAND to SILTY SAND | 14 | 21 | 60 | | 41.5 |
| 3.300 | 10.83 | 57.11 | .54 | SAND to SILTY SAND | 14 | 21 | 60 | | 41.5 |
| 3.450 | 11.32 | 90.78 | .62 | SAND to SILTY SAND | 23 | 33 | 74 | | 43.5 |
| 3.600 | 11.81 | 150.22 | .69 | SAND | 30 | 43 | 88 | | 45.5 |
| 3.750 | 12.30 | 177.12 | .60 | SAND | 35 | 50 | 93 | | 46.0 |
| 3.900 | 12.80 | 191.14 | .90 | SAND | 38 | 53 | 95 | | 46.0 |
| 4.050 | 13.29 | 172.61 | .87 | SAND | 35 | 47 | 91 | | 46.0 |
| 4.200 | 13.78 | 181.24 | .65 | SAND | 36 | 49 | 93 | | 46.0 |
| 4.350 | 14.27 | 114.47 | .71 | SAND to SILTY SAND | 29 | 38 | 79 | | 44.0 |
| 4.500 | 14.76 | 100.66 | .71 | SAND to SILTY SAND | 25 | 33 | 75 | | 43.0 |
| 4.650 | 15.26 | 99.36 | .77 | SAND to SILTY SAND | 25 | 32 | 74 | | 43.0 |
| 4.800 | 15.75 | 80.39 | .55 | SAND to SILTY SAND | 20 | 26 | 68 | | 42.0 |
| 4.950 | 16.24 | 65.52 | .69 | SAND to SILTY SAND | 16 | 21 | 62 | | 40.5 |
| 5.100 | 16.73 | 18.27 | .93 | SANDY SILT to CLAYEY SILT | 7 | 9 | | 1.4 | |
| 5.250 | 17.22 | 29.04 | .96 | SILTY SAND to SANDY SILT | 10 | 12 | 38 | | 37.0 |
| 5.400 | 17.72 | 182.07 | .82 | SAND | 36 | 45 | 90 | | 45.0 |
| 5.550 | 18.21 | 279.31 | 1.03 | SAND | 56 | 68 | 100 | | 46.5 |
| 5.700 | 18.70 | 299.62 | 1.18 | SAND | 60 | 72 | 100 | | 46.5 |
| 5.850 | 19.19 | 317.57 | .88 | SAND | 64 | 75 | 100 | | 47.0 |
| 6.000 | 19.69 | 272.87 | .91 | SAND | 55 | 64 | 100 | | 46.0 |
| 6.150 | 20.18 | 197.00 | .89 | SAND | 39 | 46 | 91 | | 45.0 |

*INDICATES OVERCONSOLIDATED OR CEMENTED MATERIAL
ASSUMED TOTAL UNIT WT = 120 pcf
ASSUMED DEPTH OF WATER TABLE = 5.0 ft
N(60) = EQUIVALENT SPT VALUE (60% Energy)
N1(60) = OVERBURDEN NORMALIZED EQUIVALENT SPT VALUE (60% Energy)
Dr = OVERBURDEN NORMALIZED EQUIVALENT RELATIVE DENSITY
Su = OVERBURDEN NORMALIZED UNDRAINED SHEAR STRENGTH
PHI = OVERBURDEN NORMALIZED EQUIVALENT FRICTION ANGLE



*Interpretations based on: Robertson and Campanella, 1989.*

SOUNDING : CPT-07

| DEPTH (m) | DEPTH (ft) | TIP RESISTANCE (tsf) | FRICTION RATIO (%) | SOIL BEHAVIOR TYPE | N(60) | N1(60) | Dr (%) | Su (tsf) | PHI (Degrees) |
|---|---|---|---|---|---|---|---|---|---|
| 6.300 | 20.67 | 175.80 | .84 | SAND | 35 | 41 | 87 | | 44.5 |
| 6.450 | 21.16 | 159.42 | .88 | SAND | 32 | 36 | 84 | | 44.0 |
| 6.600 | 21.65 | 166.47 | .97 | SAND | 33 | 38 | 85 | | 44.0 |
| 6.750 | 22.15 | 207.94 | .65 | SAND | 42 | 47 | 91 | | 45.0 |
| 6.900 | 22.64 | 221.90 | .96 | SAND | 44 | 49 | 93 | | 45.0 |
| 7.050 | 23.13 | 212.96 | .97 | SAND | 43 | 47 | 91 | | 44.5 |
| 7.200 | 23.62 | 192.73 | .91 | SAND | 39 | 42 | 88 | | 44.5 |
| 7.350 | 24.11 | 164.29 | .96 | SAND | 33 | 36 | 84 | | 43.5 |
| 7.500 | 24.61 | 145.68 | .92 | SAND to SILTY SAND | 36 | 39 | 80 | | 43.0 |
| 7.650 | 25.10 | 193.86 | .80 | SAND | 39 | 41 | 88 | | 44.0 |
| 7.800 | 25.59 | 240.17 | .64 | SAND | 48 | 51 | 94 | | 45.0 |
| 7.950 | 26.08 | 242.55 | 1.00 | SAND | 49 | 51 | 94 | | 45.0 |
| 8.100 | 26.57 | 245.97 | 1.07 | SAND | 49 | 51 | 94 | | 45.0 |
| 8.250 | 27.07 | 238.32 | 1.07 | SAND | 48 | 49 | 93 | | 44.5 |
| 8.400 | 27.56 | 215.15 | 1.01 | SAND | 43 | 44 | 90 | | 44.0 |
| 8.550 | 28.05 | 183.09 | .99 | SAND | 37 | 37 | 85 | | 43.5 |
| 8.700 | 28.54 | 123.94 | 1.09 | SAND to SILTY SAND | 31 | 31 | 73 | | 42.0 |
| 8.850 | 29.04 | 87.85 | .93 | SAND to SILTY SAND | 22 | 22 | 63 | | 39.5 |
| 9.000 | 29.53 | 59.68 | .99 | SILTY SAND to SANDY SILT | 20 | 20 | 52 | | 38.0 |
| 9.150 | 30.02 | 67.26 | .91 | SAND to SILTY SAND | 17 | 17 | 55 | | 38.5 |
| 9.300 | 30.51 | 61.04 | 1.02 | SILTY SAND to SANDY SILT | 20 | 20 | 52 | | 38.0 |
| 9.450 | 31.00 | 68.83 | 1.00 | SAND to SILTY SAND | 17 | 17 | 56 | | 38.5 |
| 9.600 | 31.50 | 104.46 | .85 | SAND to SILTY SAND | 26 | 25 | 67 | | 40.0 |
| 9.750 | 31.99 | 50.97 | 1.08 | SILTY SAND to SANDY SILT | 17 | 16 | 47 | | 37.0 |
| 9.900 | 32.48 | 34.12 | .76 | SILTY SAND to SANDY SILT | 11 | 11 | 35 | | 35.0 |
| 10.050 | 32.97 | 17.10 | 1.40 | SANDY SILT to CLAYEY SILT | 7 | 7 | | 1.2 | |
| 10.200 | 33.46 | 50.78 | .98 | SILTY SAND to SANDY SILT | 17 | 16 | 46 | | 37.0 |
| 10.350 | 33.96 | 160.78 | .95 | SAND | 32 | 30 | 79 | | 42.0 |
| 10.500 | 34.45 | 249.75 | 1.17 | SAND | 50 | 47 | 91 | | 44.0 |
| 10.650 | 34.94 | 286.25 | 1.08 | SAND | 57 | 53 | 95 | | 44.5 |
| 10.800 | 35.43 | 247.16 | .56 | SAND | 49 | 46 | 91 | | 44.0 |
| 10.950 | 35.93 | 139.56 | 1.05 | SAND to SILTY SAND | 35 | 32 | 74 | | 41.0 |
| 11.100 | 36.42 | 89.87 | 1.02 | SAND to SILTY SAND | 22 | 20 | 61 | | 38.5 |
| 11.250 | 36.91 | 71.13 | 1.18 | SILTY SAND to SANDY SILT | 24 | 21 | 54 | | 38.0 |
| 11.400 | 37.40 | 66.67 | 1.21 | SILTY SAND to SANDY SILT | 22 | 20 | 52 | | 38.0 |
| 11.550 | 37.89 | 95.67 | 1.07 | SAND to SILTY SAND | 24 | 21 | 63 | | 39.0 |
| 11.700 | 38.39 | 216.74 | 1.09 | SAND | 43 | 39 | 86 | | 43.0 |
| 11.850 | 38.88 | 255.00 | .74 | SAND | 51 | 45 | 90 | | 43.5 |
| 12.000 | 39.37 | 221.35 | .74 | SAND | 44 | 39 | 86 | | 43.0 |
| 12.150 | 39.86 | 155.66 | 1.19 | SAND to SILTY SAND | 39 | 34 | 76 | | 41.5 |
| 12.300 | 40.35 | 113.15 | 1.81 | SILTY SAND to SANDY SILT | 38 | 33 | 67 | | 39.0 |
| 12.450 | 40.85 | 253.58 | 1.31 | SAND | 51 | 44 | 90 | | 43.5 |
| 12.600 | 41.34 | 282.11 | 1.42 | SAND to SILTY SAND | 71 | 61 | 92 | | 44.0 |
| 12.750 | 41.83 | 313.59 | 1.45 | SAND to SILTY SAND | 78 | 67 | 95 | | 44.5 |
| 12.900 | 42.32 | 359.74 | 1.32 | SAND | 72 | 61 | 99 | | 45.0 |
| 13.050 | 42.81 | 333.90 | 1.43 | SAND | 67 | 57 | 97 | | 44.5 |
| 13.200 | 43.31 | 317.44 | 1.40 | SAND | 63 | 54 | 95 | | 44.0 |
| 13.350 | 43.80 | 261.10 | 1.34 | SAND | 52 | 44 | 89 | | 43.5 |
| 13.500 | 44.29 | 242.68 | 1.20 | SAND | 49 | 41 | 87 | | 43.0 |
| 13.650 | 44.78 | 260.40 | 1.15 | SAND | 52 | 43 | 89 | | 43.0 |

*INDICATES OVERCONSOLIDATED OR CEMENTED MATERIAL
ASSUMED TOTAL UNIT WT = 120 pcf
ASSUMED DEPTH OF WATER TABLE = 5.0 ft
N(60) = EQUIVALENT SPT VALUE (60% Energy)
N1(60) = OVERBURDEN NORMALIZED EQUIVALENT SPT VALUE (60% Energy)
Dr = OVERBURDEN NORMALIZED EQUIVALENT RELATIVE DENSITY
Su = OVERBURDEN NORMALIZED UNDRAINED SHEAR STRENGTH
PHI = OVERBURDEN NORMALIZED EQUIVALENT FRICTION ANGLE

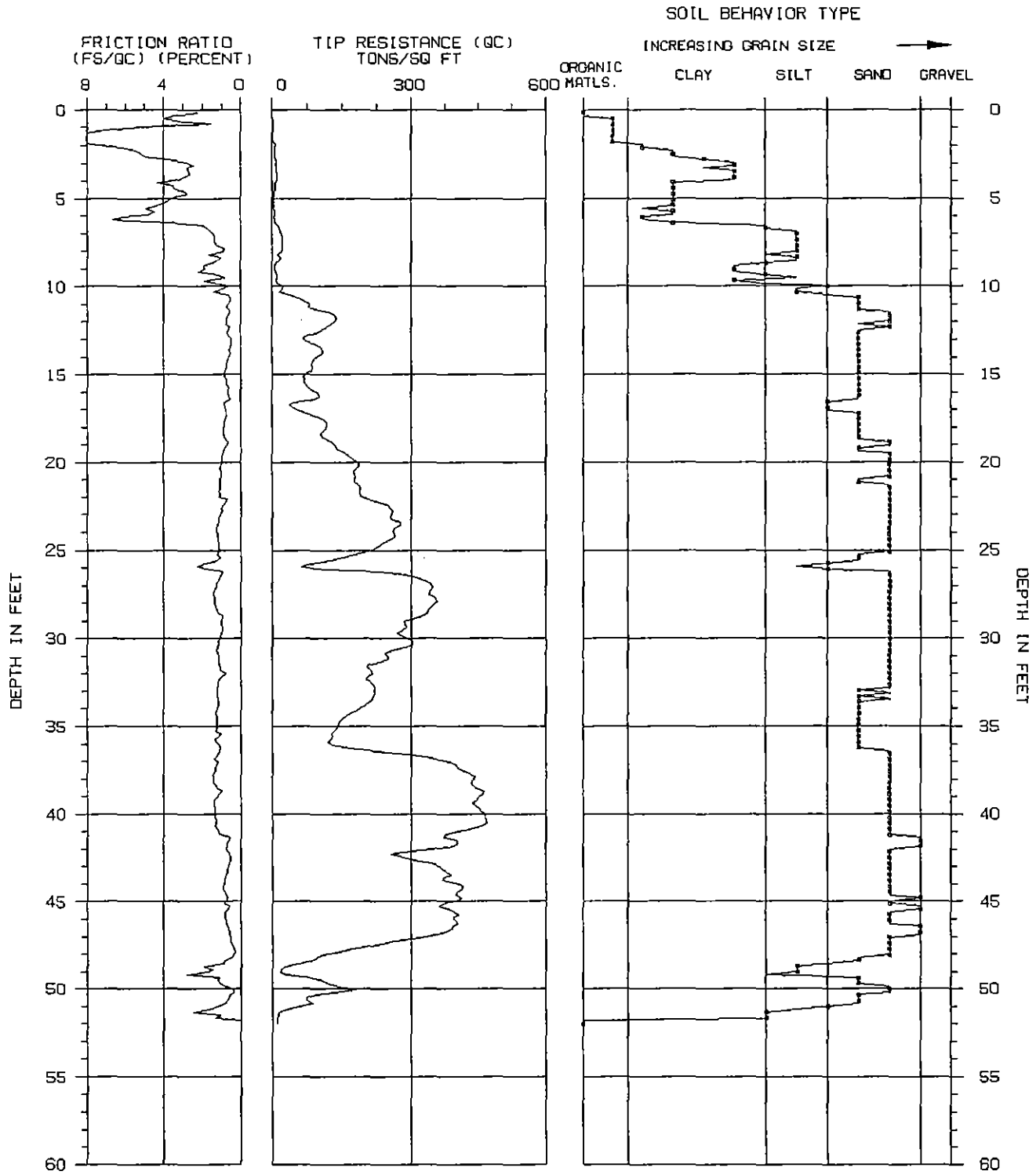
SOUNDING : CPT-07

| DEPTH (m) | DEPTH (ft) | TIP RESISTANCE (tsf) | FRICTION RATIO (%) | SOIL BEHAVIOR TYPE | N(60) | N1(60) | Dr (%) | Su (tsf) | PHI (Degrees) |
|---|---|---|---|---|---|---|---|---|---|
| 13.800 | 45.28 | 277.58 | .85 | SAND | 56 | 46 | 91 | | 43.5 |
| 13.950 | 45.77 | 280.03 | 1.25 | SAND | 56 | 46 | 91 | | 43.5 |
| 14.100 | 46.26 | 333.29 | 1.20 | SAND | 67 | 55 | 96 | | 44.0 |
| 14.250 | 46.75 | 372.00 | 1.30 | SAND | 74 | 61 | 99 | | 44.5 |
| 14.400 | 47.24 | 362.44 | 1.25 | SAND | 72 | 59 | 98 | | 44.5 |
| 14.550 | 47.74 | 340.38 | 1.32 | SAND | 68 | 55 | 96 | | 44.0 |
| 14.700 | 48.23 | 352.09 | 1.22 | SAND | 70 | 57 | 97 | | 44.0 |
| 14.850 | 48.72 | 412.74 | 1.14 | SAND | 83 | 66 | 100 | | 45.0 |
| 15.000 | 49.21 | 431.42 | 1.26 | SAND | 86 | 69 | 100 | | 45.0 |
| 15.150 | 49.70 | 415.46 | 1.10 | SAND | 83 | 66 | 100 | | 45.0 |
| 15.300 | 50.20 | 331.55 | 1.38 | SAND | 66 | 52 | 95 | | 44.0 |
| 15.450 | 50.69 | 249.29 | 1.37 | SAND to SILTY SAND | 62 | 49 | 86 | | 42.5 |
| 15.600 | 51.18 | 210.11 | .99 | SAND | 42 | 33 | 81 | | 42.0 |

*INDICATES OVERCONSOLIDATED OR CEMENTED MATERIAL
ASSUMED TOTAL UNIT WT = 120 pcf
ASSUMED DEPTH OF WATER TABLE = 5.0 ft
N(60) = EQUIVALENT SPT VALUE (60% Energy)
N1(60) = OVERBURDEN NORMALIZED EQUIVALENT SPT VALUE (60% Energy)
Dr = OVERBURDEN NORMALIZED EQUIVALENT RELATIVE DENSITY
Su = OVERBURDEN NORMALIZED UNDRAINED SHEAR STRENGTH
PHI = OVERBURDEN NORMALIZED EQUIVALENT FRICTION ANGLE



*Interpretations based on: Robertson and Campanella, 1989.*




TIP RESISTANCE NOT CORRECTED FOR END AREA EFFECT

ASSUMED TOTAL UNIT WT = 120 PCF

ASSUMED DEPTH OF WATER TABLE = 6.0 FT

SOIL BEHAVIOR TYPE INTERPRETATIONS BASED ON: GUIDELINES FOR GEOTECHNICAL DESIGN USING THE CPT AND CPTU. SOIL MECHANICS SERIES #120, UNIVERSITY OF BRITISH COLUMBIA. SEPTEMBER 1989. BY P.K. ROBERTSON AND R.G. CAMPANELLA.

## CONE PENETRATION TEST

SOUNDING NUMBER: CPT-08

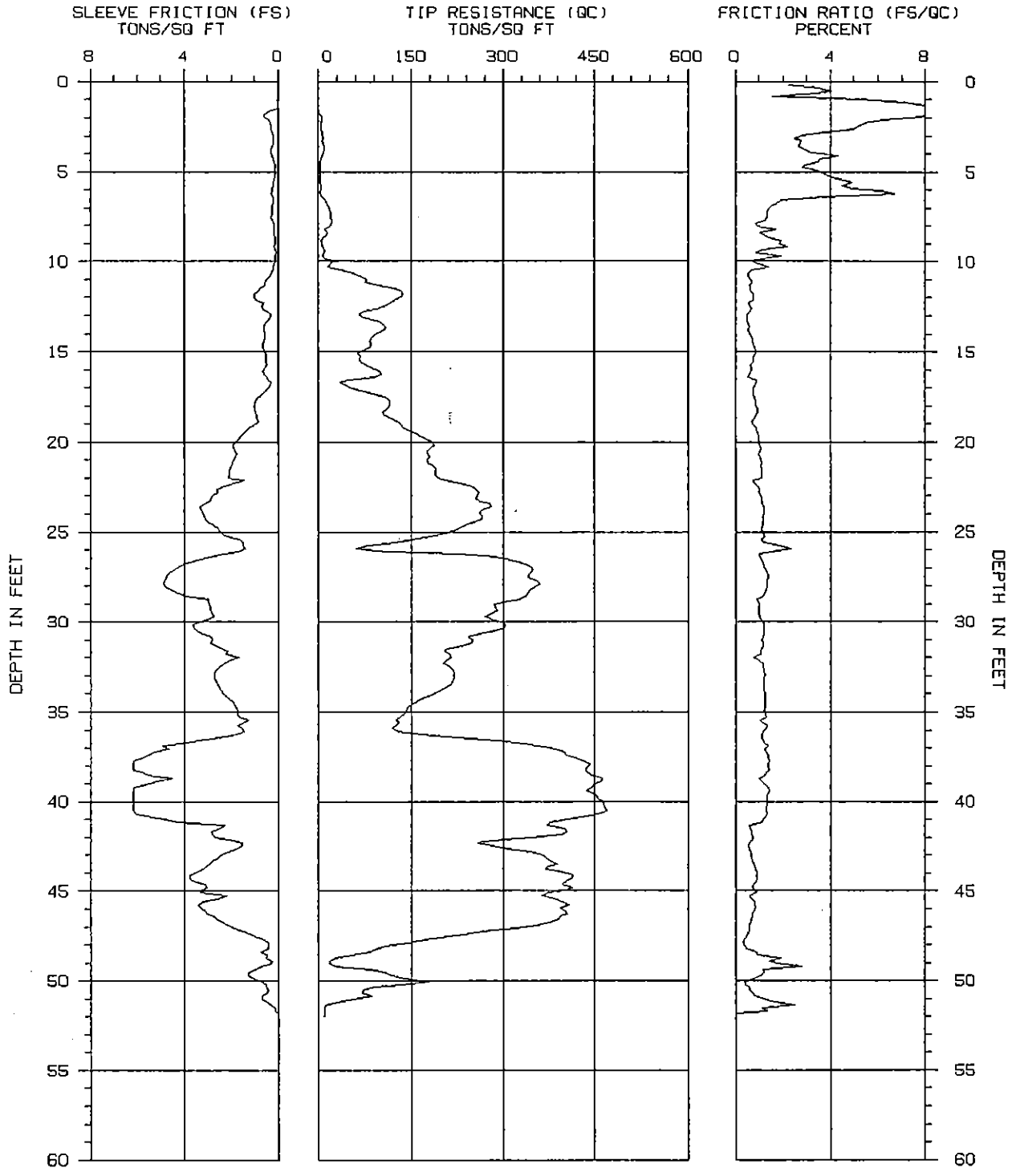
PROJECT NAME : L&A\TYLR-WOODROW

PROJECT NUMBER : 970011-001

CONE/RIG : 469\#1

DATE/TIME: 11-05-96 10:03

HFA




TIP RESISTANCE NOT CORRECTED FOR END AREA EFFECT

CONE PENETRATION TEST

SOUNDING NUMBER: CPT-08

PROJECT NAME : L&A\TYLR-WOODROW

PROJECT NUMBER : 970011-001

CONE/RIG : 469\#1

DATE/TIME: 11-05-96 10:03

HFA

# CPT INTERPRETATIONS

SOUNDING : CPT-08 PROJECT No.: 970011-001
PROJECT : L&A\TYLR-WOODROW CONE/RIG : 469\#1
DATE/TIME: 11-05-96 10:03



| DEPTH (m) | DEPTH (ft) | TIP RESISTANCE (tsf) | FRICTION RATIO (%) | SOIL BEHAVIOR TYPE | N(60) | N1(60) | Dr (%) | Su (tsf) | PHI (Degrees) |
|---|---|---|---|---|---|---|---|---|---|
| .150 | .49 | .11 | 4.00 | ORGANIC MATERIAL | 0 | 0 | | .0 | |
| .300 | .98 | .42 | 5.24 | ORGANIC MATERIAL | 0 | 1 | | .0 | |
| .450 | 1.48 | .23 | 19.26 | ORGANIC MATERIAL | 0 | 0 | | .0 | |
| .600 | 1.97 | 7.75 | 7.85 | CLAY | 8 | 12 | | .5 | |
| .750 | 2.46 | 5.74 | 5.16 | CLAY | 6 | 9 | | .4 | |
| .900 | 2.95 | 7.65 | 2.81 | CLAY to SILTY CLAY | 5 | 8 | | .6 | |
| 1.050 | 3.44 | 8.20 | 2.72 | CLAY to SILTY CLAY | 5 | 9 | | .6 | |
| 1.200 | 3.94 | 9.41 | 3.20 | CLAY to SILTY CLAY | 6 | 10 | | .6 | |
| 1.350 | 4.43 | 4.59 | 3.47 | CLAY | 5 | 7 | | .3 | |
| 1.500 | 4.92 | 3.72 | 3.40 | CLAY | 4 | 6 | | .3 | |
| 1.650 | 5.41 | 3.87 | 4.41 | CLAY | 4 | 6 | | .2 | |
| 1.800 | 5.91 | 4.99 | 4.88 | CLAY | 5 | 8 | | .3 | |
| 1.950 | 6.40 | 6.52 | 3.71 | CLAY | 7 | 10 | | .4 | |
| 2.100 | 6.89 | 16.53 | 1.54 | SANDY SILT to CLAYEY SILT | 7 | 11 | | 1.3 | |
| 2.250 | 7.38 | 21.10 | 1.35 | SANDY SILT to CLAYEY SILT | 8 | 13 | | 1.7 | |
| 2.400 | 7.87 | 21.84 | .85 | SANDY SILT to CLAYEY SILT | 9 | 14 | | 1.7 | |
| 2.550 | 8.37 | 15.87 | 1.03 | SANDY SILT to CLAYEY SILT | 6 | 10 | | 1.2 | |
| 2.700 | 8.86 | 6.42 | 1.93 | CLAY to SILTY CLAY | 4 | 7 | | .5 | |
| 2.850 | 9.35 | 9.82 | 1.14 | CLAYEY SILT to SILTY CLAY | 5 | 8 | | .9 | |
| 3.000 | 9.84 | 12.19 | 1.16 | CLAYEY SILT to SILTY CLAY | 6 | 9 | | .9 | |
| 3.150 | 10.33 | 14.98 | 1.39 | SANDY SILT to CLAYEY SILT | 6 | 9 | | 1.1 | |
| 3.300 | 10.83 | 67.47 | .56 | SAND to SILTY SAND | 17 | 25 | 65 | | 42.0 |
| 3.450 | 11.32 | 98.17 | .59 | SAND to SILTY SAND | 25 | 35 | 76 | | 44.0 |
| 3.600 | 11.81 | 136.50 | .75 | SAND | 27 | 39 | 85 | | 45.0 |
| 3.750 | 12.30 | 116.23 | .54 | SAND | 23 | 33 | 81 | | 44.0 |
| 3.900 | 12.80 | 73.38 | .63 | SAND to SILTY SAND | 18 | 25 | 67 | | 42.0 |
| 4.050 | 13.29 | 92.97 | .49 | SAND to SILTY SAND | 23 | 32 | 74 | | 43.0 |
| 4.200 | 13.78 | 107.14 | .57 | SAND to SILTY SAND | 27 | 36 | 77 | | 43.5 |
| 4.350 | 14.27 | 84.62 | .70 | SAND to SILTY SAND | 21 | 28 | 70 | | 42.5 |
| 4.500 | 14.76 | 83.28 | .79 | SAND to SILTY SAND | 21 | 27 | 69 | | 42.0 |
| 4.650 | 15.26 | 68.68 | .75 | SAND to SILTY SAND | 17 | 22 | 64 | | 41.0 |
| 4.800 | 15.75 | 75.19 | .65 | SAND to SILTY SAND | 19 | 24 | 66 | | 41.5 |
| 4.950 | 16.24 | 101.87 | .59 | SAND to SILTY SAND | 25 | 32 | 74 | | 43.0 |
| 5.100 | 16.73 | 36.26 | .88 | SILTY SAND to SANDY SILT | 12 | 15 | 44 | | 38.0 |
| 5.250 | 17.22 | 73.02 | .77 | SAND to SILTY SAND | 18 | 23 | 64 | | 40.5 |
| 5.400 | 17.72 | 115.40 | .85 | SAND to SILTY SAND | 29 | 35 | 77 | | 43.0 |
| 5.550 | 18.21 | 109.69 | .93 | SAND to SILTY SAND | 27 | 33 | 75 | | 42.5 |
| 5.700 | 18.70 | 116.46 | .81 | SAND to SILTY SAND | 29 | 35 | 77 | | 43.0 |
| 5.850 | 19.19 | 137.45 | .89 | SAND to SILTY SAND | 34 | 41 | 81 | | 43.5 |
| 6.000 | 19.69 | 164.37 | .98 | SAND | 33 | 39 | 86 | | 44.0 |
| 6.150 | 20.18 | 187.21 | 1.04 | SAND | 37 | 44 | 89 | | 44.5 |

*INDICATES OVERCONSOLIDATED OR CEMENTED MATERIAL
ASSUMED TOTAL UNIT WT = 120 pcf
ASSUMED DEPTH OF WATER TABLE = 5.0 ft
N(60) = EQUIVALENT SPT VALUE (60% Energy)
N1(60) = OVERBURDEN NORMALIZED EQUIVALENT SPT VALUE (60% Energy)
Dr = OVERBURDEN NORMALIZED EQUIVALENT RELATIVE DENSITY
Su = OVERBURDEN NORMALIZED UNDRAINED SHEAR STRENGTH
PHI = OVERBURDEN NORMALIZED EQUIVALENT FRICTION ANGLE



*Interpretations based on: Robertson and Campanella, 1989.*

SOUNDING : CPT-08

| DEPTH (m) | DEPTH (ft) | TIP RESISTANCE (tsf) | FRICTION RATIO (%) | SOIL BEHAVIOR TYPE | N(60) | N1(60) | Dr (%) | Su (tsf) | PHI (Degrees) |
|---|---|---|---|---|---|---|---|---|---|
| 6.300 | 20.67 | 176.42 | 1.00 | SAND | 35 | 41 | 87 | | 44.5 |
| 6.450 | 21.16 | 176.84 | 1.10 | SAND to SILTY SAND | 44 | 51 | 87 | | 44.5 |
| 6.600 | 21.65 | 187.85 | 1.12 | SAND | 38 | 43 | 89 | | 44.5 |
| 6.750 | 22.15 | 205.93 | .70 | SAND | 41 | 46 | 91 | | 44.5 |
| 6.900 | 22.64 | 254.47 | 1.02 | SAND | 51 | 57 | 97 | | 45.5 |
| 7.050 | 23.13 | 254.85 | 1.12 | SAND | 51 | 56 | 97 | | 45.5 |
| 7.200 | 23.62 | 279.33 | 1.19 | SAND | 56 | 61 | 99 | | 46.0 |
| 7.350 | 24.11 | 265.77 | 1.19 | SAND | 53 | 58 | 97 | | 45.5 |
| 7.500 | 24.61 | 236.96 | 1.15 | SAND | 47 | 51 | 94 | | 45.0 |
| 7.650 | 25.10 | 205.56 | 1.16 | SAND | 41 | 44 | 89 | | 44.5 |
| 7.800 | 25.59 | 123.37 | 1.22 | SAND to SILTY SAND | 31 | 33 | 75 | | 42.0 |
| 7.950 | 26.08 | 111.71 | 1.55 | SILTY SAND to SANDY SILT | 37 | 39 | 72 | | 41.5 |
| 8.100 | 26.57 | 311.05 | 1.11 | SAND | 62 | 65 | 100 | | 46.0 |
| 8.250 | 27.07 | 348.29 | 1.26 | SAND | 70 | 72 | 100 | | 46.0 |
| 8.400 | 27.56 | 340.34 | 1.39 | SAND | 68 | 70 | 100 | | 46.0 |
| 8.550 | 28.05 | 350.75 | 1.36 | SAND | 70 | 71 | 100 | | 46.0 |
| 8.700 | 28.54 | 335.75 | 1.17 | SAND | 67 | 68 | 100 | | 46.0 |
| 8.850 | 29.04 | 285.51 | 1.02 | SAND | 57 | 57 | 97 | | 45.0 |
| 9.000 | 29.53 | 280.84 | .99 | SAND | 56 | 56 | 96 | | 45.0 |
| 9.150 | 30.02 | 296.05 | 1.16 | SAND | 59 | 59 | 98 | | 45.5 |
| 9.300 | 30.51 | 286.61 | 1.21 | SAND | 57 | 56 | 97 | | 45.0 |
| 9.450 | 31.00 | 250.41 | 1.12 | SAND | 50 | 49 | 93 | | 44.5 |
| 9.600 | 31.50 | 206.05 | 1.14 | SAND | 41 | 40 | 87 | | 43.5 |
| 9.750 | 31.99 | 215.27 | .78 | SAND | 43 | 41 | 88 | | 43.5 |
| 9.900 | 32.48 | 211.07 | 1.18 | SAND | 42 | 40 | 87 | | 43.5 |
| 10.050 | 32.97 | 218.80 | 1.24 | SAND to SILTY SAND | 55 | 52 | 88 | | 43.5 |
| 10.200 | 33.46 | 214.55 | 1.20 | SAND | 43 | 41 | 87 | | 43.5 |
| 10.350 | 33.96 | 188.02 | 1.24 | SAND to SILTY SAND | 47 | 44 | 83 | | 43.0 |
| 10.500 | 34.45 | 158.97 | 1.24 | SAND to SILTY SAND | 40 | 37 | 78 | | 42.0 |
| 10.650 | 34.94 | 141.96 | 1.23 | SAND to SILTY SAND | 35 | 33 | 75 | | 41.5 |
| 10.800 | 35.43 | 125.49 | 1.01 | SAND to SILTY SAND | 31 | 29 | 71 | | 40.5 |
| 10.950 | 35.93 | 119.14 | 1.32 | SAND to SILTY SAND | 30 | 27 | 69 | | 40.0 |
| 11.100 | 36.42 | 225.77 | 1.12 | SAND | 45 | 41 | 88 | | 43.5 |
| 11.250 | 36.91 | 354.04 | 1.39 | SAND | 71 | 64 | 100 | | 45.5 |
| 11.400 | 37.40 | 403.18 | 1.37 | SAND | 81 | 73 | 100 | | 46.0 |
| 11.550 | 37.89 | 442.83 | 1.39 | SAND | 89 | 79 | 100 | | 46.0 |
| 11.700 | 38.39 | 437.15 | 1.31 | SAND | 87 | 78 | 100 | | 46.0 |
| 11.850 | 38.88 | 460.97 | 1.12 | SAND | 92 | 82 | 100 | | 46.0 |
| 12.000 | 39.37 | 436.60 | 1.41 | SAND | 87 | 77 | 100 | | 46.0 |
| 12.150 | 39.86 | 455.96 | 1.35 | SAND | 91 | 80 | 100 | | 46.0 |
| 12.300 | 40.35 | 467.30 | 1.32 | SAND | 93 | 81 | 100 | | 46.0 |
| 12.450 | 40.85 | 428.42 | 1.25 | SAND | 86 | 74 | 100 | | 46.0 |
| 12.600 | 41.34 | 372.04 | .61 | GRAVELLY SAND to SAND | 62 | 53 | 100 | | 45.0 |
| 12.750 | 41.83 | 396.79 | .70 | GRAVELLY SAND to SAND | 66 | 57 | 100 | | 45.5 |
| 12.900 | 42.32 | 256.87 | .61 | SAND | 51 | 44 | 89 | | 43.5 |
| 13.050 | 42.81 | 343.72 | .62 | SAND | 69 | 58 | 98 | | 44.5 |
| 13.200 | 43.31 | 377.07 | .74 | SAND | 75 | 64 | 100 | | 45.0 |
| 13.350 | 43.80 | 368.72 | .87 | SAND | 74 | 62 | 99 | | 45.0 |
| 13.500 | 44.29 | 413.38 | .91 | SAND | 83 | 69 | 100 | | 45.0 |
| 13.650 | 44.78 | 412.15 | .74 | GRAVELLY SAND to SAND | 69 | 57 | 100 | | 45.0 |

*INDICATES OVERCONSOLIDATED OR CEMENTED MATERIAL
ASSUMED TOTAL UNIT WT = 120 pcf
ASSUMED DEPTH OF WATER TABLE = 5.0 ft
N(60) = EQUIVALENT SPT VALUE (60% Energy)
N1(60) = OVERBURDEN NORMALIZED EQUIVALENT SPT VALUE (60% Energy)
Dr = OVERBURDEN NORMALIZED EQUIVALENT RELATIVE DENSITY
Su = OVERBURDEN NORMALIZED UNDRAINED SHEAR STRENGTH
PHI = OVERBURDEN NORMALIZED EQUIVALENT FRICTION ANGLE



*Interpretations based on: Robertson and Campanella, 1989.*

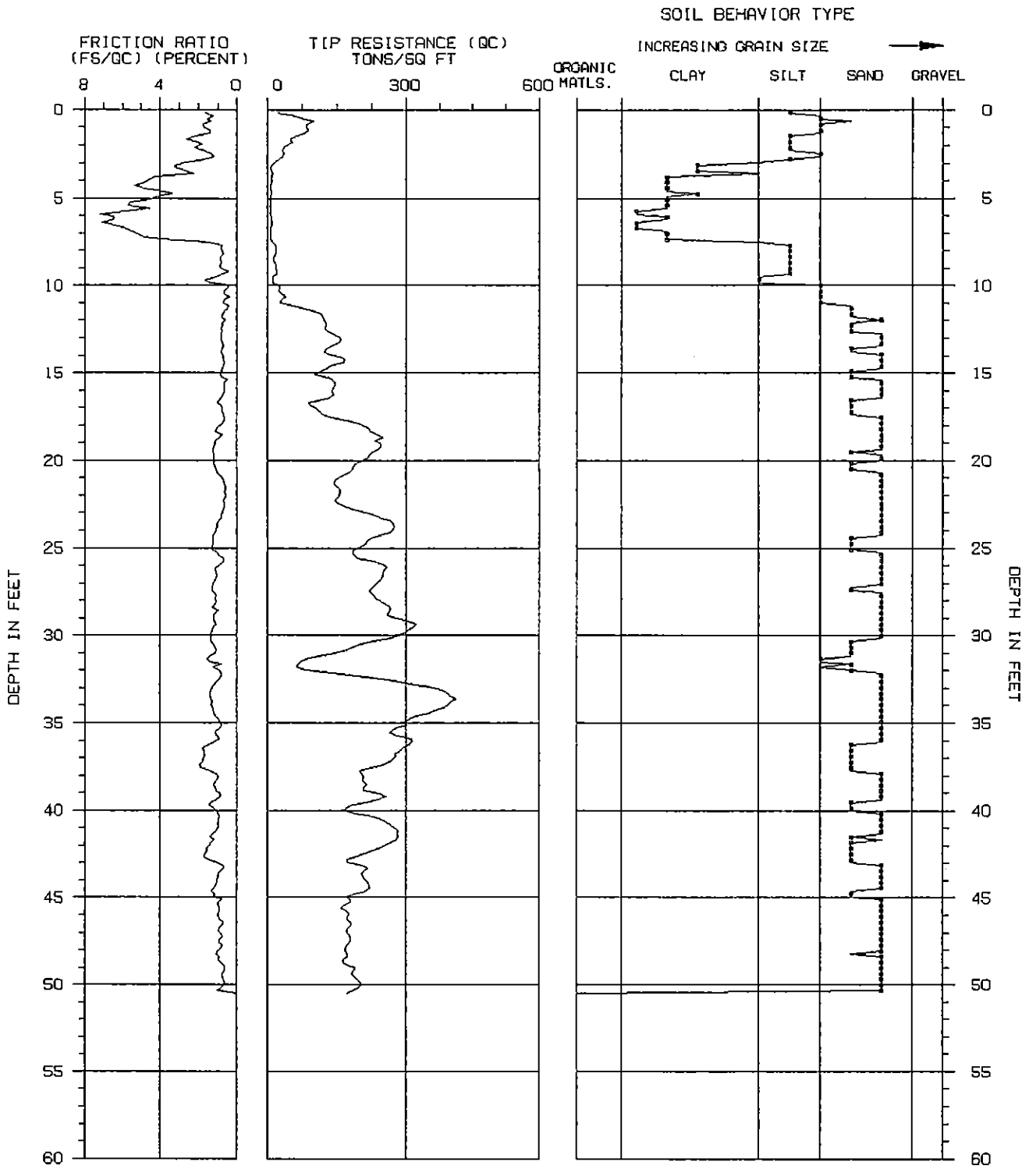
SOUNDING : CPT-08

| DEPTH (m) | DEPTH (ft) | TIP RESISTANCE (tsf) | FRICTION RATIO (%) | SOIL BEHAVIOR TYPE | N(60) | N1(60) | Dr (%) | Su (tsf) | PHI (Degrees) |
|---|---|---|---|---|---|---|---|---|---|
| 13.800 | 45.28 | 362.86 | .61 | GRAVELLY SAND to SAND | 60 | 50 | 98 | | 44.5 |
| 13.950 | 45.77 | 407.58 | .84 | SAND | 82 | 67 | 100 | | 45.0 |
| 14.100 | 46.26 | 404.31 | .75 | SAND | 81 | 66 | 100 | | 45.0 |
| 14.250 | 46.75 | 376.78 | .63 | GRAVELLY SAND to SAND | 63 | 51 | 99 | | 44.5 |
| 14.400 | 47.24 | 264.92 | .58 | SAND | 53 | 43 | 89 | | 43.0 |
| 14.550 | 47.74 | 172.66 | .37 | SAND | 35 | 28 | 77 | | 41.0 |
| 14.700 | 48.23 | 94.43 | .47 | SAND to SILTY SAND | 24 | 19 | 59 | | 38.0 |
| 14.850 | 48.72 | 26.47 | 1.94 | SANDY SILT to CLAYEY SILT | 11 | 8 | | 1.9 | |
| 15.000 | 49.21 | 27.45 | 2.76 | CLAYEY SILT to SILTY CLAY | 14 | 11 | | 1.6 | |
| 15.150 | 49.70 | 118.72 | 1.08 | SAND to SILTY SAND | 30 | 24 | 65 | | 38.5 |
| 15.300 | 50.20 | 132.91 | .40 | SAND | 27 | 21 | 68 | | 39.0 |
| 15.450 | 50.69 | 71.15 | .70 | SAND to SILTY SAND | 18 | 14 | 50 | | 37.0 |
| 15.600 | 51.18 | 30.42 | 1.66 | SANDY SILT to CLAYEY SILT | 12 | 10 | | 2.2 | |
| 15.750 | 51.67 | 11.07 | 1.34 | CLAYEY SILT to SILTY CLAY | 6 | 4 | | .6 | |

*INDICATES OVERCONSOLIDATED OR CEMENTED MATERIAL
ASSUMED TOTAL UNIT WT = 120 pcf
ASSUMED DEPTH OF WATER TABLE = 5.0 ft
N(60) = EQUIVALENT SPT VALUE (60% Energy)
N1(60) = OVERBURDEN NORMALIZED EQUIVALENT SPT VALUE (60% Energy)
Dr = OVERBURDEN NORMALIZED EQUIVALENT RELATIVE DENSITY
Su = OVERBURDEN NORMALIZED UNDRAINED SHEAR STRENGTH
PHI = OVERBURDEN NORMALIZED EQUIVALENT FRICTION ANGLE



*Interpretations based on: Robertson and Campanella, 1989.*




TIP RESISTANCE NOT CORRECTED FOR END AREA EFFECT

ASSUMED TOTAL UNIT WT = 120 PCF

ASSUMED DEPTH OF WATER TABLE = 5.0 FT

SOIL BEHAVIOR TYPE INTERPRETATIONS BASED ON: GUIDELINES FOR GEOTECHNICAL DESIGN USING THE CPT AND CPTU. SOIL MECHANICS SERIES #120. UNIVERSITY OF BRITISH COLUMBIA. SEPTEMBER 1989. BY P.K. ROBERTSON AND R.D. CAMPANELLA.

CONE PENETRATION TEST

SOUNDING NUMBER: CPT-09

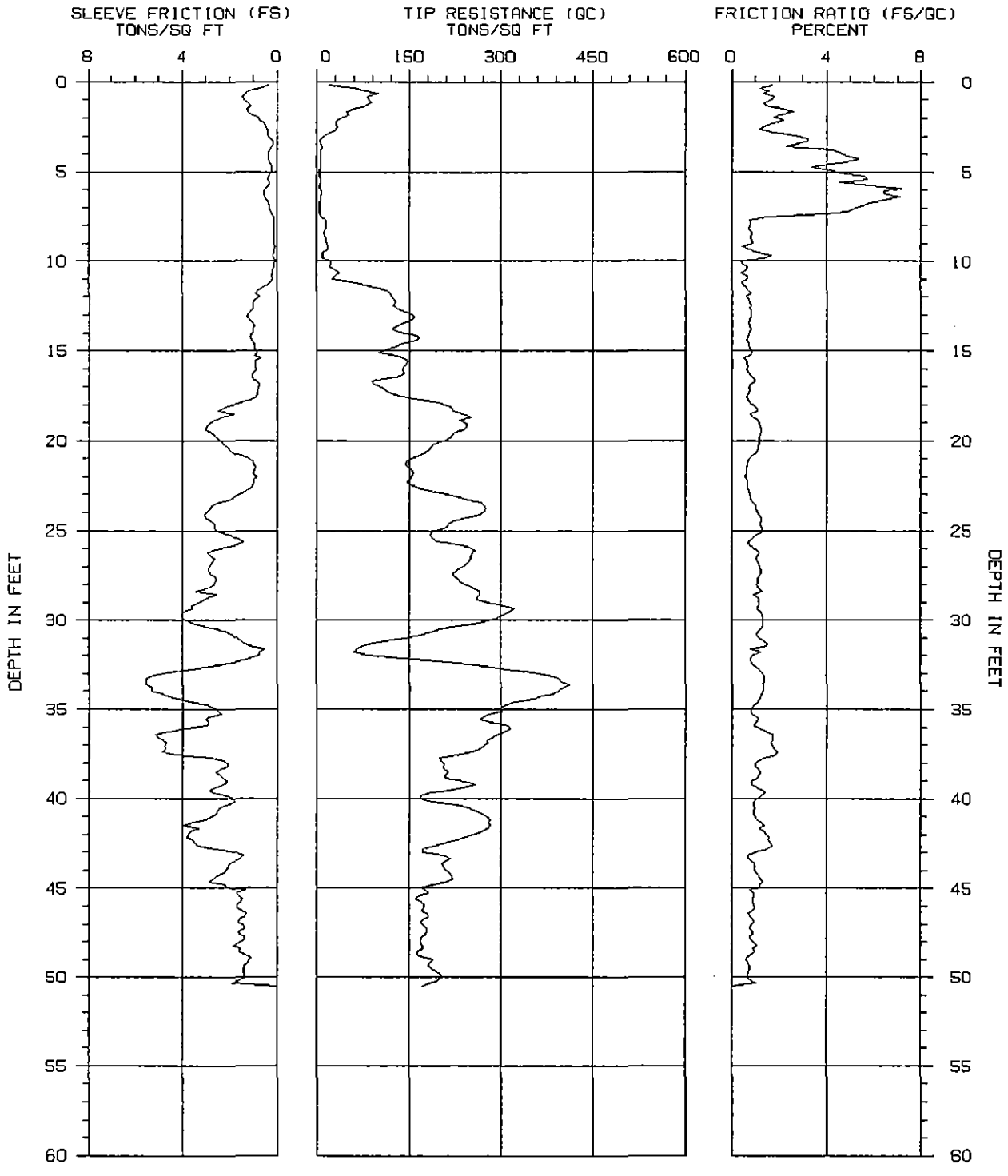
PROJECT NAME : L&A\TYLR-WOODROW

CONE/RIG : 495\#1

PROJECT NUMBER : 970011-001

DATE/TIME: 11-04-96 16:02

HFA




TIP RESISTANCE NOT CORRECTED FOR END AREA EFFECT

CONE PENETRATION TEST SOUNDING NUMBER: CPT-09

PROJECT NAME : L&A\TYLR-WOODROW CONE/RIG : 495\#1

PROJECT NUMBER : 970011-001 DATE/TIME: 11-04-96 16:02

HFA

# CPT INTERPRETATIONS

SOUNDING : CPT-09 PROJECT No.: 970011-001
PROJECT : L&A\TYLR-WOODROW CONE/RIG : 495\#1
DATE/TIME: 11-04-96 16:02



| DEPTH (m) | DEPTH (ft) | TIP RESISTANCE (tsf) | FRICTION RATIO (%) | SOIL BEHAVIOR TYPE | N(60) | N1(60) | Dr (%) | Su (tsf) | PHI (Degrees) |
|---|---|---|---|---|---|---|---|---|---|
| .150 | .49 | 78.29 | 1.59 | SILTY SAND to SANDY SILT | 26 | 42 | 69 | | |
| .300 | .98 | 83.79 | 1.70 | SILTY SAND to SANDY SILT | 28 | 45 | 71 | | |
| .450 | 1.48 | 60.65 | 2.13 | SANDY SILT to CLAYEY SILT | 24 | 39 | | 4.0 | |
| .600 | 1.97 | 44.19 | 1.81 | SANDY SILT to CLAYEY SILT | 18 | 28 | | 2.9 | |
| .750 | 2.46 | 34.59 | 1.37 | SILTY SAND to SANDY SILT | 12 | 18 | 46 | | 44.5 |
| .900 | 2.95 | 14.21 | 2.66 | CLAYEY SILT to SILTY CLAY | 7 | 11 | | .9 | |
| 1.050 | 3.44 | 6.88 | 2.75 | CLAY | 7 | 11 | | .5 | |
| 1.200 | 3.94 | 7.33 | 4.60 | CLAY | 7 | 12 | | .5 | |
| 1.350 | 4.43 | 6.63 | 4.84 | CLAY | 7 | 11 | | .4 | |
| 1.500 | 4.92 | 5.69 | 4.17 | CLAY | 6 | 9 | | .4 | |
| 1.650 | 5.41 | 6.69 | 5.73 | CLAY | 7 | 11 | | .4 | |
| 1.800 | 5.91 | 6.50 | 7.21 | CLAY | 7 | 10 | | .4 | |
| 1.950 | 6.40 | 7.44 | 7.09 | CLAY | 7 | 12 | | .5 | |
| 2.100 | 6.89 | 5.78 | 5.50 | CLAY | 6 | 9 | | .4 | |
| 2.250 | 7.38 | 5.40 | 3.93 | CLAY | 5 | 9 | | .3 | |
| 2.400 | 7.87 | 16.17 | .80 | SANDY SILT to CLAYEY SILT | 6 | 10 | | 1.6 | |
| 2.550 | 8.37 | 13.07 | .87 | SANDY SILT to CLAYEY SILT | 5 | 8 | | 1.3 | |
| 2.700 | 8.86 | 16.34 | .88 | SANDY SILT to CLAYEY SILT | 7 | 10 | | 1.3 | |
| 2.850 | 9.35 | 18.25 | .76 | SANDY SILT to CLAYEY SILT | 7 | 11 | | 1.8 | |
| 3.000 | 9.84 | 10.86 | 1.37 | CLAYEY SILT to SILTY CLAY | 5 | 8 | | .8 | |
| 3.150 | 10.33 | 22.56 | .66 | SILTY SAND to SANDY SILT | 8 | 11 | 34 | | 37.5 |
| 3.300 | 10.83 | 30.08 | .66 | SILTY SAND to SANDY SILT | 10 | 15 | 42 | | 38.0 |
| 3.450 | 11.32 | 78.97 | .51 | SAND to SILTY SAND | 20 | 28 | 70 | | 43.0 |
| 3.600 | 11.81 | 118.50 | .80 | SAND to SILTY SAND | 30 | 42 | 81 | | 44.5 |
| 3.750 | 12.30 | 126.36 | .79 | SAND to SILTY SAND | 32 | 44 | 83 | | 44.5 |
| 3.900 | 12.80 | 138.03 | .80 | SAND | 28 | 38 | 85 | | 45.0 |
| 4.050 | 13.29 | 153.26 | .76 | SAND | 31 | 42 | 88 | | 45.0 |
| 4.200 | 13.78 | 121.61 | .83 | SAND to SILTY SAND | 30 | 41 | 81 | | 44.0 |
| 4.350 | 14.27 | 167.43 | .69 | SAND | 33 | 44 | 90 | | 45.5 |
| 4.500 | 14.76 | 128.53 | .75 | SAND | 26 | 34 | 82 | | 44.0 |
| 4.650 | 15.26 | 128.79 | .77 | SAND to SILTY SAND | 32 | 42 | 82 | | 44.0 |
| 4.800 | 15.75 | 145.78 | .64 | SAND | 29 | 37 | 85 | | 44.5 |
| 4.950 | 16.24 | 142.34 | .71 | SAND | 28 | 36 | 84 | | 44.0 |
| 5.100 | 16.73 | 88.61 | 1.01 | SAND to SILTY SAND | 22 | 28 | 70 | | 42.0 |
| 5.250 | 17.22 | 111.47 | .76 | SAND to SILTY SAND | 28 | 35 | 76 | | 43.0 |
| 5.400 | 17.72 | 169.17 | .67 | SAND | 34 | 41 | 88 | | 44.5 |
| 5.550 | 18.21 | 218.76 | 1.03 | SAND | 44 | 53 | 95 | | 46.0 |
| 5.700 | 18.70 | 249.44 | .92 | SAND | 50 | 60 | 98 | | 46.0 |
| 5.850 | 19.19 | 244.00 | 1.21 | SAND | 49 | 58 | 97 | | 46.0 |
| 6.000 | 19.69 | 219.80 | 1.20 | SAND | 44 | 52 | 94 | | 45.5 |
| 6.150 | 20.18 | 190.50 | 1.18 | SAND to SILTY SAND | 48 | 55 | 90 | | 44.5 |

*INDICATES OVERCONSOLIDATED OR CEMENTED MATERIAL
ASSUMED TOTAL UNIT WT = 120 pcf
ASSUMED DEPTH OF WATER TABLE = 5.0 ft
N(60) = EQUIVALENT SPT VALUE (60% Energy)
N1(60) = OVERBURDEN NORMALIZED EQUIVALENT SPT VALUE (60% Energy)
Dr = OVERBURDEN NORMALIZED EQUIVALENT RELATIVE DENSITY
Su = OVERBURDEN NORMALIZED UNDRAINED SHEAR STRENGTH
PHI = OVERBURDEN NORMALIZED EQUIVALENT FRICTION ANGLE



*Interpretations based on: Robertson and Campanella, 1989.*

SOUNDING : CPT-09

| DEPTH (m) | DEPTH (ft) | TIP RESISTANCE (tsf) | FRICTION RATIO (%) | SOIL BEHAVIOR TYPE | N(60) | N1(60) | Dr (%) | Su (tsf) | PHI (Degrees) |
|---|---|---|---|---|---|---|---|---|---|
| 6.300 | 20.67 | 175.86 | 1.06 | SAND | 35 | 41 | 87 | | 44.5 |
| 6.450 | 21.16 | 144.68 | .70 | SAND | 29 | 33 | 81 | | 43.5 |
| 6.600 | 21.65 | 155.45 | .62 | SAND | 31 | 35 | 83 | | 43.5 |
| 6.750 | 22.15 | 151.99 | .63 | SAND | 30 | 34 | 82 | | 43.5 |
| 6.900 | 22.64 | 165.39 | .68 | SAND | 33 | 37 | 84 | | 44.0 |
| 7.050 | 23.13 | 231.99 | .79 | SAND | 46 | 51 | 94 | | 45.0 |
| 7.200 | 23.62 | 271.44 | 1.01 | SAND | 54 | 59 | 98 | | 46.0 |
| 7.350 | 24.11 | 265.45 | 1.16 | SAND | 53 | 58 | 97 | | 45.5 |
| 7.500 | 24.61 | 214.02 | 1.22 | SAND to SILTY SAND | 54 | 58 | 91 | | 44.5 |
| 7.650 | 25.10 | 187.46 | 1.31 | SAND to SILTY SAND | 47 | 50 | 87 | | 44.0 |
| 7.800 | 25.59 | 193.56 | .73 | SAND | 39 | 41 | 88 | | 44.0 |
| 7.950 | 26.08 | 257.36 | 1.08 | SAND | 51 | 54 | 95 | | 45.0 |
| 8.100 | 26.57 | 250.37 | 1.05 | SAND | 50 | 52 | 94 | | 45.0 |
| 8.250 | 27.07 | 234.08 | 1.23 | SAND | 47 | 48 | 92 | | 44.5 |
| 8.400 | 27.56 | 223.45 | 1.17 | SAND | 45 | 46 | 91 | | 44.5 |
| 8.550 | 28.05 | 244.68 | 1.08 | SAND | 49 | 50 | 93 | | 44.5 |
| 8.700 | 28.54 | 265.75 | .96 | SAND | 53 | 54 | 95 | | 45.0 |
| 8.850 | 29.04 | 277.78 | 1.18 | SAND | 56 | 56 | 96 | | 45.0 |
| 9.000 | 29.53 | 315.23 | 1.25 | SAND | 63 | 63 | 100 | | 45.5 |
| 9.150 | 30.02 | 279.03 | 1.34 | SAND | 56 | 55 | 96 | | 45.0 |
| 9.300 | 30.51 | 199.72 | 1.26 | SAND to SILTY SAND | 50 | 49 | 86 | | 43.5 |
| 9.450 | 31.00 | 144.34 | 1.16 | SAND to SILTY SAND | 36 | 35 | 77 | | 42.0 |
| 9.600 | 31.50 | 69.73 | 1.39 | SILTY SAND to SANDY SILT | 23 | 23 | 56 | | 38.5 |
| 9.750 | 31.99 | 81.33 | .91 | SAND to SILTY SAND | 20 | 20 | 60 | | 38.5 |
| 9.900 | 32.48 | 244.46 | .92 | SAND | 49 | 47 | 91 | | 44.0 |
| 10.050 | 32.97 | 352.49 | 1.30 | SAND | 70 | 67 | 100 | | 45.5 |
| 10.200 | 33.46 | 397.53 | 1.38 | SAND | 80 | 75 | 100 | | 46.0 |
| 10.350 | 33.96 | 393.20 | 1.36 | SAND | 79 | 74 | 100 | | 46.0 |
| 10.500 | 34.45 | 353.75 | 1.19 | SAND | 71 | 66 | 100 | | 45.5 |
| 10.650 | 34.94 | 298.11 | .88 | SAND | 60 | 55 | 96 | | 44.5 |
| 10.800 | 35.43 | 269.17 | 1.08 | SAND | 54 | 50 | 93 | | 44.0 |
| 10.950 | 35.93 | 310.83 | .95 | SAND | 62 | 57 | 97 | | 45.0 |
| 11.100 | 36.42 | 293.67 | 1.75 | SAND to SILTY SAND | 73 | 67 | 95 | | 44.5 |
| 11.250 | 36.91 | 278.56 | 1.67 | SAND to SILTY SAND | 70 | 63 | 93 | | 44.0 |
| 11.400 | 37.40 | 251.75 | 1.91 | SAND to SILTY SAND | 63 | 57 | 90 | | 44.0 |
| 11.550 | 37.89 | 201.78 | 1.10 | SAND | 40 | 36 | 84 | | 42.5 |
| 11.700 | 38.39 | 207.58 | 1.16 | SAND | 42 | 37 | 85 | | 43.0 |
| 11.850 | 38.88 | 208.07 | 1.08 | SAND | 42 | 37 | 84 | | 43.0 |
| 12.000 | 39.37 | 238.43 | 1.10 | SAND | 48 | 42 | 88 | | 43.5 |
| 12.150 | 39.86 | 169.00 | 1.26 | SAND to SILTY SAND | 42 | 37 | 78 | | 42.0 |
| 12.300 | 40.35 | 226.79 | .94 | SAND | 45 | 40 | 86 | | 43.0 |
| 12.450 | 40.85 | 268.15 | .95 | SAND | 54 | 46 | 91 | | 44.0 |
| 12.600 | 41.34 | 280.37 | 1.27 | SAND | 56 | 48 | 92 | | 44.0 |
| 12.750 | 41.83 | 267.81 | 1.37 | SAND to SILTY SAND | 67 | 57 | 91 | | 43.5 |
| 12.900 | 42.32 | 228.28 | 1.56 | SAND to SILTY SAND | 57 | 49 | 86 | | 43.0 |
| 13.050 | 42.81 | 171.66 | 1.53 | SAND to SILTY SAND | 43 | 36 | 78 | | 41.5 |
| 13.200 | 43.31 | 217.06 | .72 | SAND | 43 | 37 | 84 | | 42.5 |
| 13.350 | 43.80 | 205.63 | .99 | SAND | 41 | 35 | 83 | | 42.5 |
| 13.500 | 44.29 | 217.97 | 1.16 | SAND | 44 | 36 | 84 | | 42.5 |
| 13.650 | 44.78 | 188.38 | 1.15 | SAND to SILTY SAND | 47 | 39 | 80 | | 42.0 |

*INDICATES OVERCONSOLIDATED OR CEMENTED MATERIAL
ASSUMED TOTAL UNIT WT = 120 pcf
ASSUMED DEPTH OF WATER TABLE = 5.0 ft
N(60) = EQUIVALENT SPT VALUE (60% Energy)
N1(60) = OVERBURDEN NORMALIZED EQUIVALENT SPT VALUE (60% Energy)
Dr = OVERBURDEN NORMALIZED EQUIVALENT RELATIVE DENSITY
Su = OVERBURDEN NORMALIZED UNDRAINED SHEAR STRENGTH
PHI = OVERBURDEN NORMALIZED EQUIVALENT FRICTION ANGLE



*Interpretations based on: Robertson and Campanella, 1989.*

SOUNDING : CPT-09

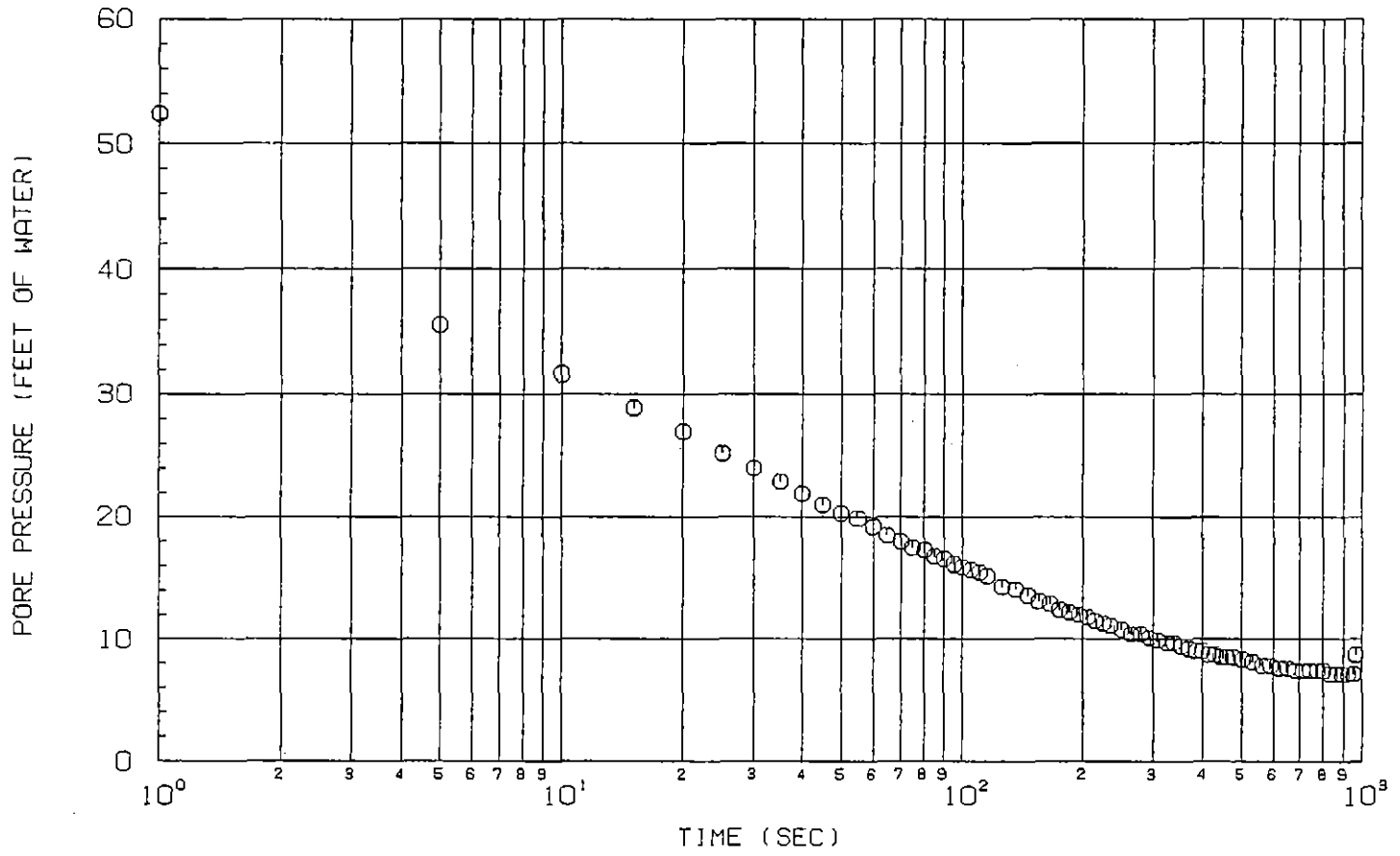
| DEPTH (m) | DEPTH (ft) | TIP RESISTANCE (tsf) | FRICTION RATIO (%) | SOIL BEHAVIOR TYPE | N(60) | N1(60) | Dr (%) | Su (tsf) | PHI (Degrees) |
|---|---|---|---|---|---|---|---|---|---|
| 13.800 | 45.28 | 181.18 | .97 | SAND | 36 | 30 | 79 | | 41.5 |
| 13.950 | 45.77 | 170.00 | .91 | SAND | 34 | 28 | 77 | | 41.0 |
| 14.100 | 46.26 | 170.85 | .86 | SAND | 34 | 28 | 77 | | 41.0 |
| 14.250 | 46.75 | 173.78 | .91 | SAND | 35 | 28 | 77 | | 41.0 |
| 14.400 | 47.24 | 177.88 | .78 | SAND | 36 | 29 | 78 | | 41.0 |
| 14.550 | 47.74 | 172.34 | .79 | SAND | 34 | 28 | 76 | | 41.0 |
| 14.700 | 48.23 | 172.66 | 1.08 | SAND to SILTY SAND | 43 | 35 | 76 | | 40.5 |
| 14.850 | 48.72 | 162.10 | .81 | SAND | 32 | 26 | 74 | | 40.0 |
| 15.000 | 49.21 | 184.36 | .68 | SAND | 37 | 29 | 78 | | 41.0 |
| 15.150 | 49.70 | 194.77 | .73 | SAND | 39 | 31 | 79 | | 41.5 |
| 15.300 | 50.20 | 195.01 | .87 | SAND | 39 | 31 | 79 | | 41.5 |

*INDICATES OVERCONSOLIDATED OR CEMENTED MATERIAL
ASSUMED TOTAL UNIT WT = 120 pcf
ASSUMED DEPTH OF WATER TABLE = 5.0 ft
N(60) = EQUIVALENT SPT VALUE (60% Energy)
N1(60) = OVERBURDEN NORMALIZED EQUIVALENT SPT VALUE (60% Energy)
Dr = OVERBURDEN NORMALIZED EQUIVALENT RELATIVE DENSITY
Su = OVERBURDEN NORMALIZED UNDRAINED SHEAR STRENGTH
PHI = OVERBURDEN NORMALIZED EQUIVALENT FRICTION ANGLE



*Interpretations based on: Robertson and Campanella, 1989.*

## PORE PRESSURE DISSIPATION CURVES




DEPTH: ⏀ 12.1 FT

TIP-SENSING PIEZOMETRIC CPT

SOUNDING NUMBER: CPT-09

PROJECT NAME : L&A\TYLR-WOODROW

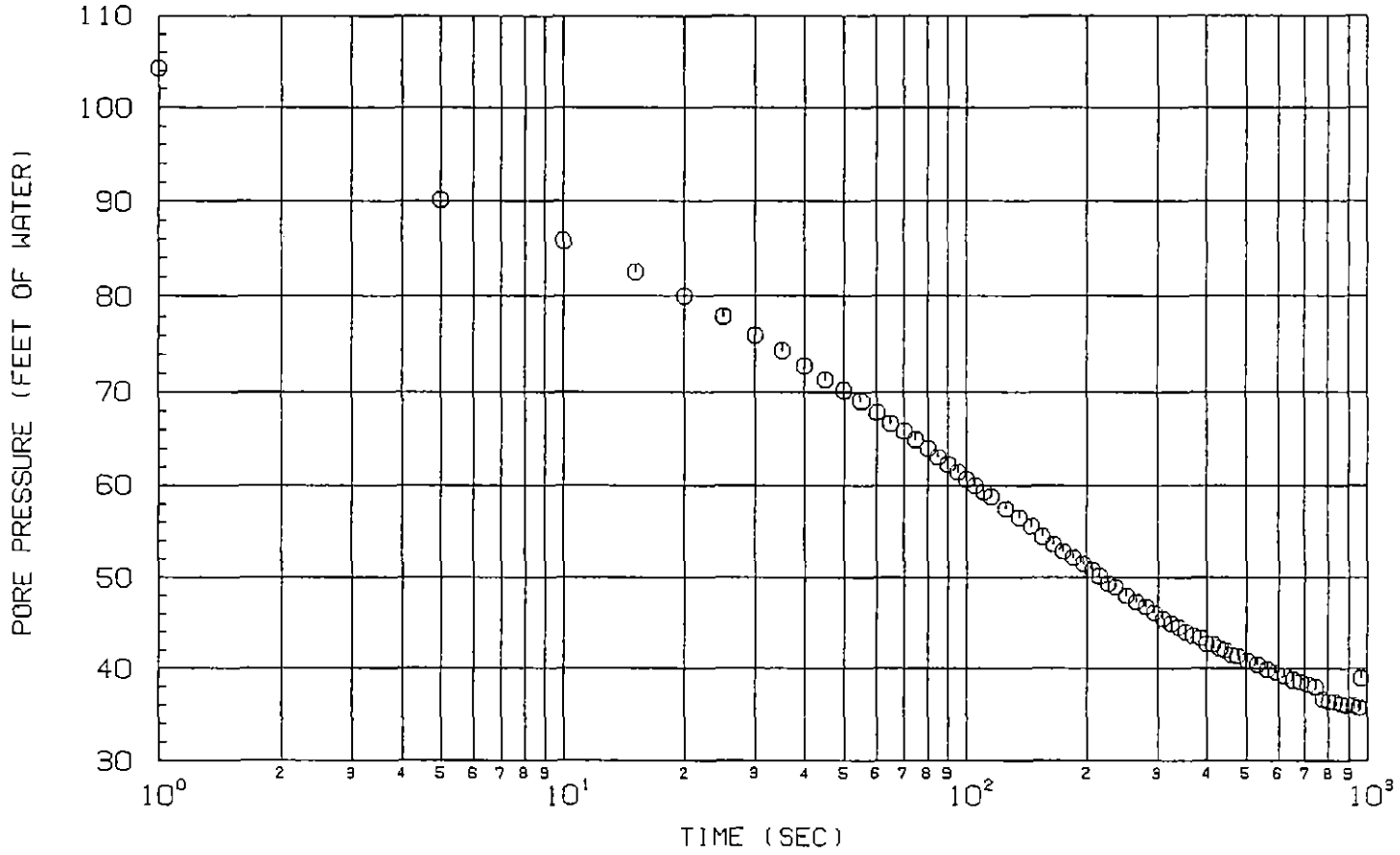
PROJECT NUMBER : 970011-001

CONE/RIG : 495\#1

DATE/TIME: 11-04-96 16:02

HFA

## PORE PRESSURE DISSIPATION CURVES




DEPTH: ⏱ 37.9 FT

TIP-SENSING PIEZOMETRIC CPT

SOUNDING NUMBER: CPT-09

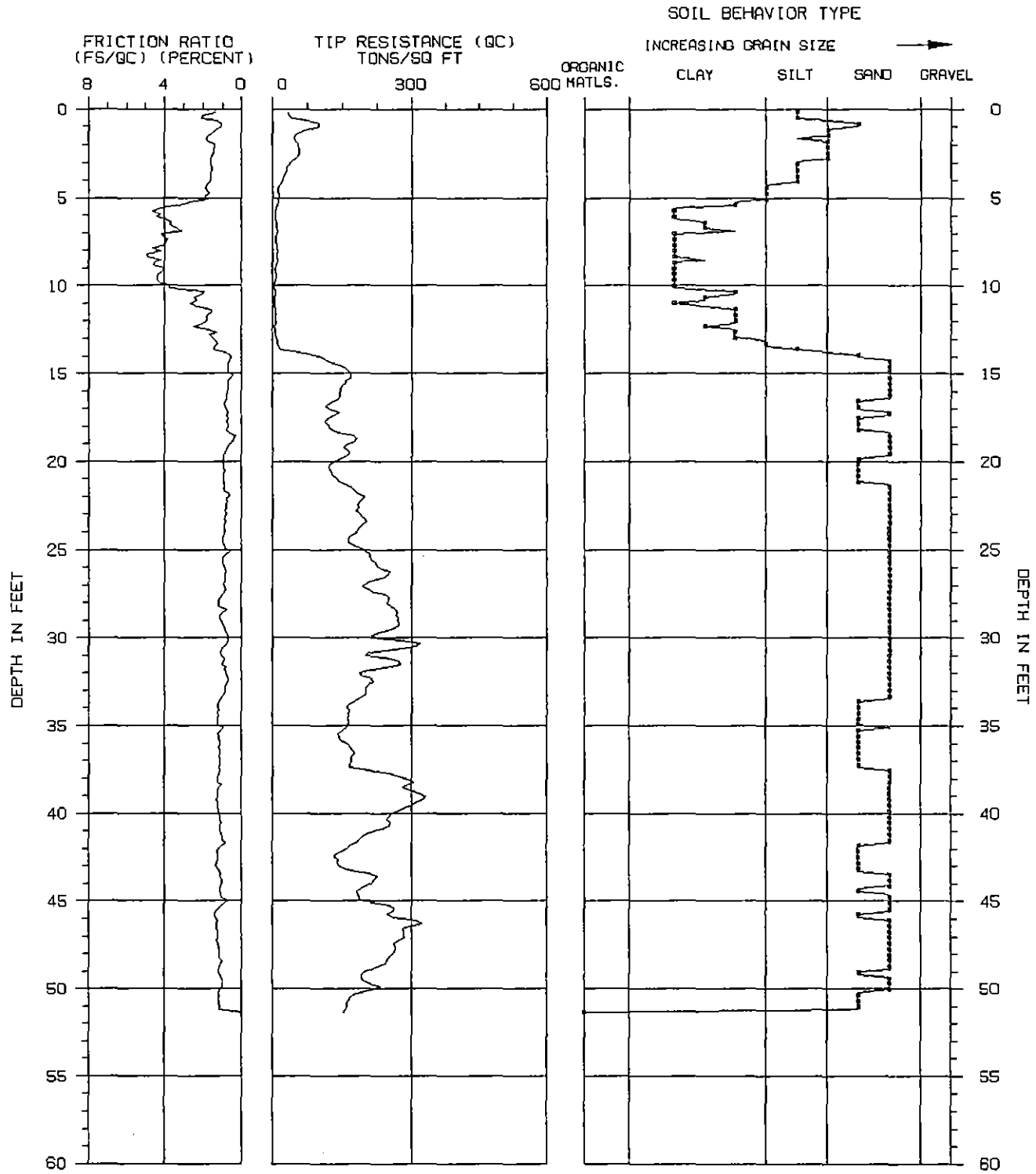
PROJECT NAME : L&A\TYLR-WOODROW

PROJECT NUMBER : 970011-001

CONE/RIG : 495\¤1

DATE/TIME: 11-04-96 16:02

HFA




TIP RESISTANCE NOT CORRECTED FOR END AREA EFFECT

ASSUMED TOTAL UNIT WT = 120 PCF

ASSUMED DEPTH OF WATER TABLE = 5.0 FT

SOIL BEHAVIOR TYPE INTERPRETATIONS BASED ON: GUIDELINES FOR GEOTECHNICAL DESIGN USING THE CPT AND CPTU. SOIL MECHANICS SERIES #120, UNIVERSITY OF BRITISH COLUMBIA. SEPTEMBER 1989. BY P.K. ROBERTSON AND R.G. CAMPANELLA.

CONE PENETRATION TEST

SOUNDING NUMBER: CPT-10

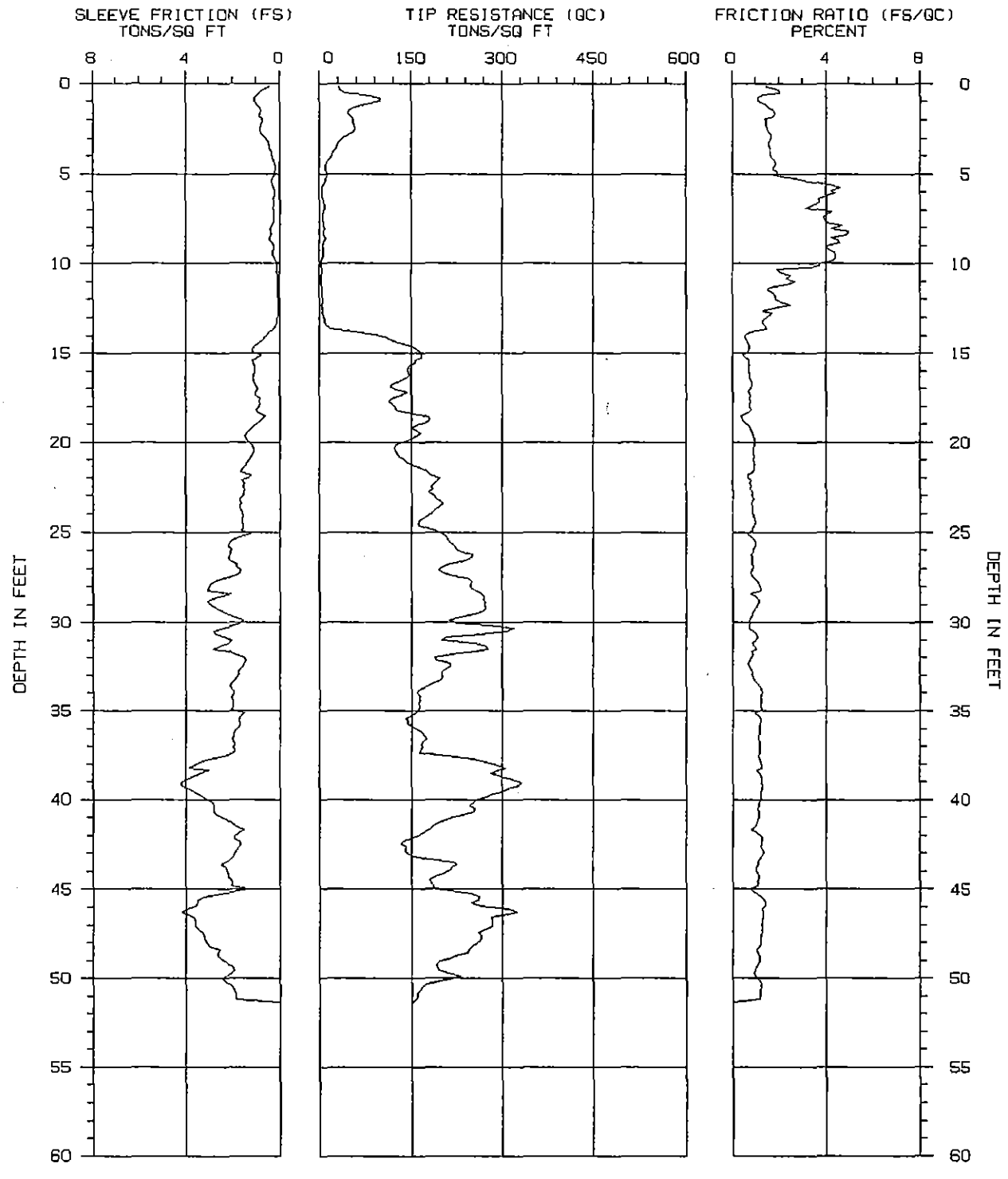
PROJECT NAME : L&A\TYLR-WOODROW

PROJECT NUMBER : 970011-001

CONE/RIG : 469\#1

DATE/TIME: 11-05-96 11:36

HFA




TIP RESISTANCE NOT CORRECTED FOR END AREA EFFECT

CONE PENETRATION TEST

SOUNDING NUMBER: CPT-10

PROJECT NAME : L&A\TYLR-WOODROW

PROJECT NUMBER : 970011-001

CONE/RIG : 469\#1

DATE/TIME: 11-05-96 11:36

HFA

# CPT INTERPRETATIONS

SOUNDING : CPT-10 PROJECT No.: 970011-001
PROJECT : L&A\TYLR-WOODROW CONE/RIG : 469\#1
DATE/TIME: 11-05-96 11:36



| DEPTH (m) | DEPTH (ft) | TIP RESISTANCE (tsf) | FRICTION RATIO (%) | SOIL BEHAVIOR TYPE | N(60) | N1(60) | Dr (%) | Su (tsf) | PHI (Degrees) |
|---|---|---|---|---|---|---|---|---|---|
| .150 | .49 | 40.68 | 2.07 | SANDY SILT to CLAYEY SILT | 16 | 26 | | 2.7 | |
| .300 | .98 | 98.09 | 1.08 | SAND to SILTY SAND | 25 | 39 | 76 | | |
| .450 | 1.48 | 46.78 | 1.73 | SILTY SAND to SANDY SILT | 16 | 25 | 55 | | 47.5 |
| .600 | 1.97 | 53.64 | 1.41 | SILTY SAND to SANDY SILT | 18 | 29 | 58 | | 47.0 |
| .750 | 2.46 | 57.32 | 1.46 | SILTY SAND to SANDY SILT | 19 | 31 | 60 | | 46.5 |
| .900 | 2.95 | 38.81 | 1.64 | SANDY SILT to CLAYEY SILT | 16 | 25 | | 3.1 | |
| 1.050 | 3.44 | 29.15 | 1.55 | SANDY SILT to CLAYEY SILT | 12 | 19 | | 2.3 | |
| 1.200 | 3.94 | 20.99 | 1.62 | SANDY SILT to CLAYEY SILT | 8 | 13 | | 1.7 | |
| 1.350 | 4.43 | 10.56 | 1.88 | CLAYEY SILT to SILTY CLAY | 5 | 8 | | .8 | |
| 1.500 | 4.92 | 11.85 | 1.95 | CLAYEY SILT to SILTY CLAY | 6 | 9 | | .9 | |
| 1.650 | 5.41 | 10.47 | 3.23 | CLAY to SILTY CLAY | 7 | 11 | | .7 | |
| 1.800 | 5.91 | 5.23 | 4.24 | CLAY | 5 | 8 | | .3 | |
| 1.950 | 6.40 | 6.78 | 3.65 | CLAY | 7 | 11 | | .4 | |
| 2.100 | 6.89 | 9.56 | 3.11 | CLAY to SILTY CLAY | 6 | 10 | | .6 | |
| 2.250 | 7.38 | 6.44 | 3.87 | CLAY | 6 | 10 | | .4 | |
| 2.400 | 7.87 | 7.31 | 4.66 | CLAY | 7 | 12 | | .5 | |
| 2.550 | 8.37 | 7.50 | 4.91 | CLAY | 8 | 12 | | .5 | |
| 2.700 | 8.86 | 7.18 | 4.60 | CLAY | 7 | 11 | | .4 | |
| 2.850 | 9.35 | 7.41 | 4.34 | CLAY | 7 | 11 | | .5 | |
| 3.000 | 9.84 | 4.44 | 4.21 | CLAY | 4 | 7 | | .3 | |
| 3.150 | 10.33 | 6.18 | 1.91 | CLAY to SILTY CLAY | 4 | 6 | | .4 | |
| 3.300 | 10.83 | 4.14 | 2.33 | CLAY | 4 | 6 | | .3 | |
| 3.450 | 11.32 | 5.84 | 1.62 | CLAY to SILTY CLAY | 4 | 6 | | .4 | |
| 3.600 | 11.81 | 5.40 | 1.83 | CLAY to SILTY CLAY | 4 | 5 | | .4 | |
| 3.750 | 12.30 | 4.14 | 2.45 | CLAY | 4 | 6 | | .3 | |
| 3.900 | 12.80 | 5.86 | 1.69 | CLAY to SILTY CLAY | 4 | 5 | | .4 | |
| 4.050 | 13.29 | 9.05 | 1.24 | CLAYEY SILT to SILTY CLAY | 5 | 6 | | .8 | |
| 4.200 | 13.78 | 55.43 | .82 | SILTY SAND to SANDY SILT | 18 | 25 | 59 | | 40.0 |
| 4.350 | 14.27 | 115.02 | .61 | SAND | 23 | 31 | 79 | | 44.0 |
| 4.500 | 14.76 | 158.76 | .72 | SAND | 32 | 42 | 88 | | 45.0 |
| 4.650 | 15.26 | 167.18 | .58 | SAND | 33 | 43 | 89 | | 45.0 |
| 4.800 | 15.75 | 146.72 | .73 | SAND | 29 | 38 | 85 | | 44.5 |
| 4.950 | 16.24 | 146.21 | .77 | SAND | 29 | 37 | 85 | | 44.5 |
| 5.100 | 16.73 | 121.97 | .86 | SAND to SILTY SAND | 30 | 38 | 79 | | 43.5 |
| 5.250 | 17.22 | 143.55 | .70 | SAND | 29 | 36 | 83 | | 44.0 |
| 5.400 | 17.72 | 111.30 | .79 | SAND to SILTY SAND | 28 | 34 | 76 | | 43.0 |
| 5.550 | 18.21 | 124.28 | .80 | SAND to SILTY SAND | 31 | 38 | 79 | | 43.5 |
| 5.700 | 18.70 | 179.65 | .41 | SAND | 36 | 43 | 89 | | 44.5 |
| 5.850 | 19.19 | 151.67 | .79 | SAND | 30 | 36 | 84 | | 44.0 |
| 6.000 | 19.69 | 158.49 | .91 | SAND | 32 | 37 | 85 | | 44.0 |
| 6.150 | 20.18 | 122.88 | .95 | SAND to SILTY SAND | 31 | 36 | 77 | | 43.0 |

*INDICATES OVERCONSOLIDATED OR CEMENTED MATERIAL
ASSUMED TOTAL UNIT WT = 120 pcf
ASSUMED DEPTH OF WATER TABLE = 5.0 ft
N(60) = EQUIVALENT SPT VALUE (60% Energy)
N1(60) = OVERBURDEN NORMALIZED EQUIVALENT SPT VALUE (60% Energy)
Dr = OVERBURDEN NORMALIZED EQUIVALENT RELATIVE DENSITY
Su = OVERBURDEN NORMALIZED UNDRAINED SHEAR STRENGTH
PHI = OVERBURDEN NORMALIZED EQUIVALENT FRICTION ANGLE



*Interpretations based on: Robertson and Campanella, 1989.*

SOUNDING : CPT-10

| DEPTH (m) | DEPTH (ft) | TIP RESISTANCE (tsf) | FRICTION RATIO (%) | SOIL BEHAVIOR TYPE | N(60) | N1(60) | Dr (%) | Su (tsf) | PHI (Degrees) |
|---|---|---|---|---|---|---|---|---|---|
| 6.300 | 20.67 | 126.66 | .91 | SAND to SILTY SAND | 32 | 37 | 78 | | 43.0 |
| 6.450 | 21.16 | 143.02 | .95 | SAND to SILTY SAND | 36 | 41 | 81 | | 43.5 |
| 6.600 | 21.65 | 177.29 | .92 | SAND | 35 | 40 | 87 | | 44.0 |
| 6.750 | 22.15 | 193.56 | .83 | SAND | 39 | 43 | 89 | | 44.5 |
| 6.900 | 22.64 | 185.85 | .79 | SAND | 37 | 41 | 88 | | 44.5 |
| 7.050 | 23.13 | 190.69 | .89 | SAND | 38 | 42 | 88 | | 44.5 |
| 7.200 | 23.62 | 194.64 | .88 | SAND | 39 | 43 | 89 | | 44.5 |
| 7.350 | 24.11 | 177.44 | .88 | SAND | 35 | 38 | 86 | | 44.0 |
| 7.500 | 24.61 | 162.06 | .97 | SAND | 32 | 35 | 83 | | 43.5 |
| 7.650 | 25.10 | 198.09 | .63 | SAND | 40 | 42 | 88 | | 44.0 |
| 7.800 | 25.59 | 214.49 | .99 | SAND | 43 | 45 | 90 | | 44.5 |
| 7.950 | 26.08 | 233.10 | .89 | SAND | 47 | 49 | 93 | | 44.5 |
| 8.100 | 26.57 | 240.60 | .86 | SAND | 48 | 50 | 93 | | 45.0 |
| 8.250 | 27.07 | 194.84 | .85 | SAND | 39 | 40 | 87 | | 44.0 |
| 8.400 | 27.56 | 243.68 | .96 | SAND | 49 | 50 | 93 | | 44.5 |
| 8.550 | 28.05 | 248.10 | 1.20 | SAND | 50 | 51 | 94 | | 44.5 |
| 8.700 | 28.54 | 269.32 | .98 | SAND | 54 | 54 | 96 | | 45.0 |
| 8.850 | 29.04 | 269.21 | 1.08 | SAND | 54 | 54 | 95 | | 45.0 |
| 9.000 | 29.53 | 253.26 | .85 | SAND | 51 | 50 | 94 | | 44.5 |
| 9.150 | 30.02 | 225.87 | .76 | SAND | 45 | 45 | 90 | | 44.0 |
| 9.300 | 30.51 | 308.45 | .91 | SAND | 62 | 61 | 99 | | 45.5 |
| 9.450 | 31.00 | 200.30 | 1.01 | SAND | 40 | 39 | 86 | | 43.5 |
| 9.600 | 31.50 | 275.97 | 1.02 | SAND | 55 | 54 | 95 | | 44.5 |
| 9.750 | 31.99 | 188.19 | .81 | SAND | 38 | 36 | 84 | | 43.0 |
| 9.900 | 32.48 | 215.12 | .73 | SAND | 43 | 41 | 88 | | 43.5 |
| 10.050 | 32.97 | 199.93 | .86 | SAND | 40 | 38 | 85 | | 43.0 |
| 10.200 | 33.46 | 185.36 | 1.09 | SAND | 37 | 35 | 83 | | 43.0 |
| 10.350 | 33.96 | 158.23 | 1.24 | SAND to SILTY SAND | 40 | 37 | 78 | | 42.0 |
| 10.500 | 34.45 | 164.18 | 1.21 | SAND to SILTY SAND | 41 | 38 | 79 | | 42.0 |
| 10.650 | 34.94 | 162.69 | 1.24 | SAND to SILTY SAND | 41 | 38 | 79 | | 42.0 |
| 10.800 | 35.43 | 140.68 | 1.22 | SAND to SILTY SAND | 35 | 32 | 74 | | 41.5 |
| 10.950 | 35.93 | 150.63 | 1.15 | SAND to SILTY SAND | 38 | 35 | 76 | | 42.0 |
| 11.100 | 36.42 | 172.30 | 1.14 | SAND to SILTY SAND | 43 | 39 | 80 | | 42.0 |
| 11.250 | 36.91 | 167.15 | 1.15 | SAND to SILTY SAND | 42 | 38 | 79 | | 42.0 |
| 11.400 | 37.40 | 164.35 | 1.18 | SAND to SILTY SAND | 41 | 37 | 78 | | 42.0 |
| 11.550 | 37.89 | 271.89 | 1.23 | SAND | 54 | 49 | 92 | | 44.0 |
| 11.700 | 38.39 | 293.82 | 1.02 | SAND | 59 | 52 | 95 | | 44.5 |
| 11.850 | 38.88 | 316.80 | 1.25 | SAND | 63 | 56 | 97 | | 44.5 |
| 12.000 | 39.37 | 308.58 | 1.26 | SAND | 62 | 54 | 96 | | 44.5 |
| 12.150 | 39.86 | 272.76 | 1.20 | SAND | 55 | 48 | 92 | | 44.0 |
| 12.300 | 40.35 | 244.80 | 1.14 | SAND | 49 | 43 | 89 | | 43.5 |
| 12.450 | 40.85 | 235.01 | 1.13 | SAND | 47 | 41 | 87 | | 43.0 |
| 12.600 | 41.34 | 192.16 | 1.05 | SAND | 38 | 33 | 81 | | 42.0 |
| 12.750 | 41.83 | 167.86 | 1.04 | SAND to SILTY SAND | 42 | 36 | 77 | | 41.5 |
| 12.900 | 42.32 | 136.80 | 1.27 | SAND to SILTY SAND | 34 | 29 | 71 | | 40.0 |
| 13.050 | 42.81 | 138.60 | 1.30 | SAND to SILTY SAND | 35 | 29 | 72 | | 40.0 |
| 13.200 | 43.31 | 179.05 | 1.16 | SAND to SILTY SAND | 45 | 38 | 79 | | 42.0 |
| 13.350 | 43.80 | 217.38 | 1.05 | SAND | 43 | 37 | 84 | | 42.5 |
| 13.500 | 44.29 | 188.91 | 1.15 | SAND to SILTY SAND | 47 | 39 | 80 | | 42.0 |
| 13.650 | 44.78 | 184.77 | 1.10 | SAND | 37 | 31 | 79 | | 42.0 |

*INDICATES OVERCONSOLIDATED OR CEMENTED MATERIAL
ASSUMED TOTAL UNIT WT = 120 pcf
ASSUMED DEPTH OF WATER TABLE = 5.0 ft
N(60) = EQUIVALENT SPT VALUE (60% Energy)
N1(60) = OVERBURDEN NORMALIZED EQUIVALENT SPT VALUE (60% Energy)
Dr = OVERBURDEN NORMALIZED EQUIVALENT RELATIVE DENSITY
Su = OVERBURDEN NORMALIZED UNDRAINED SHEAR STRENGTH
PHI = OVERBURDEN NORMALIZED EQUIVALENT FRICTION ANGLE



*Interpretations based on: Robertson and Campanella, 1989.*

SOUNDING : CPT-10

| DEPTH (m) | DEPTH (ft) | TIP RESISTANCE (tsf) | FRICTION RATIO (%) | SOIL BEHAVIOR TYPE | N(60) | N1(60) | Dr (%) | Su (tsf) | PHI (Degrees) |
|---|---|---|---|---|---|---|---|---|---|
| 13.800 | 45.28 | 249.07 | 1.02 | SAND | 50 | 41 | 88 | | 43.0 |
| 13.950 | 45.77 | 247.82 | 1.40 | SAND to SILTY SAND | 62 | 51 | 87 | | 43.0 |
| 14.100 | 46.26 | 323.60 | 1.28 | SAND | 65 | 53 | 95 | | 44.0 |
| 14.250 | 46.75 | 283.09 | 1.26 | SAND | 57 | 46 | 91 | | 43.5 |
| 14.400 | 47.24 | 271.83 | 1.27 | SAND | 54 | 44 | 90 | | 43.0 |
| 14.550 | 47.74 | 265.20 | 1.21 | SAND | 53 | 43 | 89 | | 43.0 |
| 14.700 | 48.23 | 249.92 | 1.18 | SAND | 50 | 40 | 87 | | 42.5 |
| 14.850 | 48.72 | 224.15 | 1.17 | SAND | 45 | 36 | 84 | | 42.0 |
| 15.000 | 49.21 | 191.67 | 1.14 | SAND to SILTY SAND | 48 | 38 | 79 | | 41.5 |
| 15.150 | 49.70 | 210.45 | .97 | SAND | 42 | 33 | 82 | | 42.0 |
| 15.300 | 50.20 | 190.82 | 1.19 | SAND to SILTY SAND | 48 | 38 | 79 | | 41.5 |
| 15.450 | 50.69 | 163.25 | 1.18 | SAND to SILTY SAND | 41 | 32 | 74 | | 40.0 |
| 15.600 | 51.18 | 157.40 | 1.18 | SAND to SILTY SAND | 39 | 31 | 73 | | 39.5 |

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ASSUMED TOTAL UNIT WT = 120 pcf
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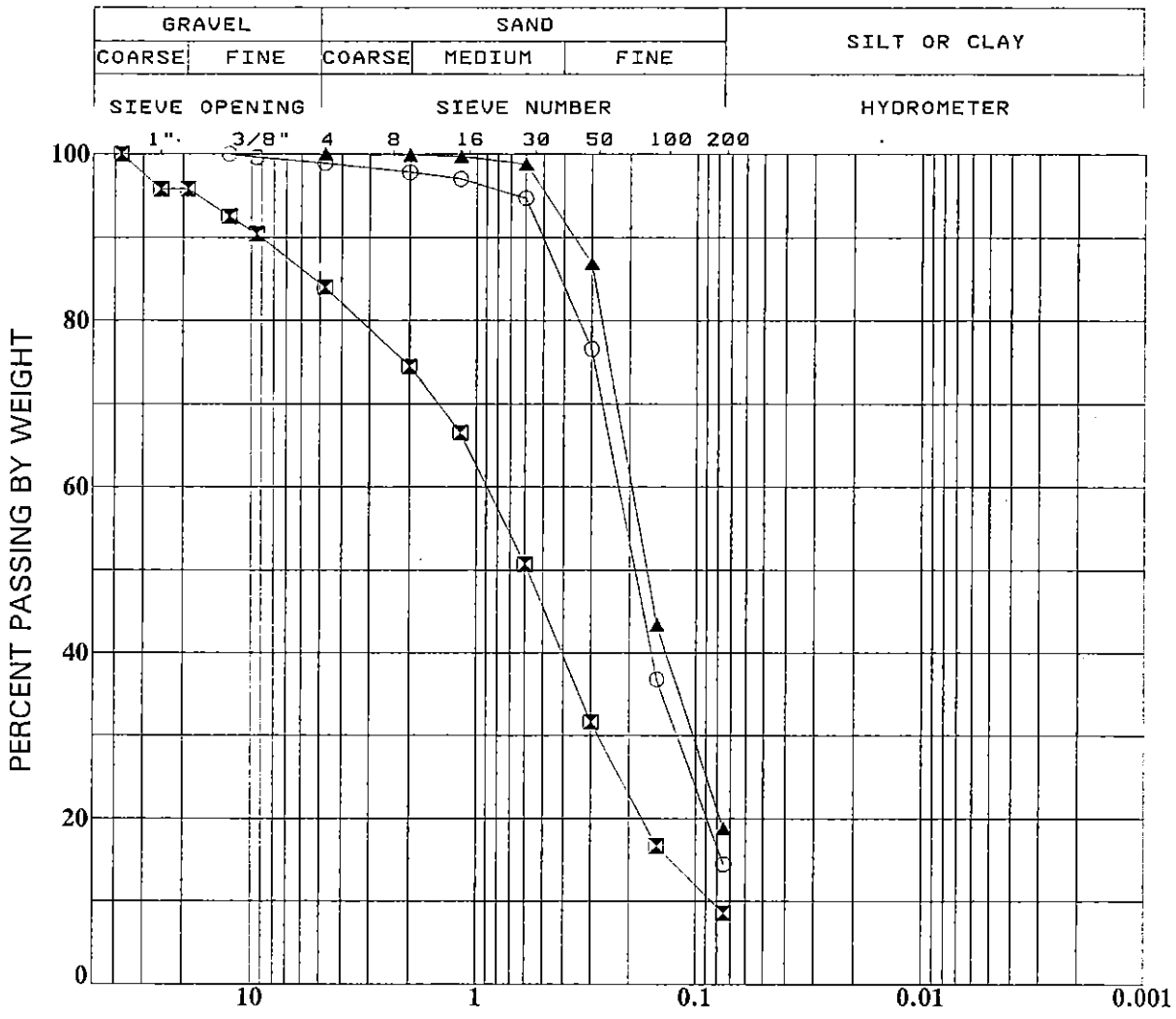
N(60) = EQUIVALENT SPT VALUE (60% Energy)
N1(60) = OVERBURDEN NORMALIZED EQUIVALENT SPT VALUE (60% Energy)
Dr = OVERBURDEN NORMALIZED EQUIVALENT RELATIVE DENSITY
Su = OVERBURDEN NORMALIZED UNDRAINED SHEAR STRENGTH
PHI = OVERBURDEN NORMALIZED EQUIVALENT FRICTION ANGLE



*Interpretations based on: Robertson and Campanella, 1989.*



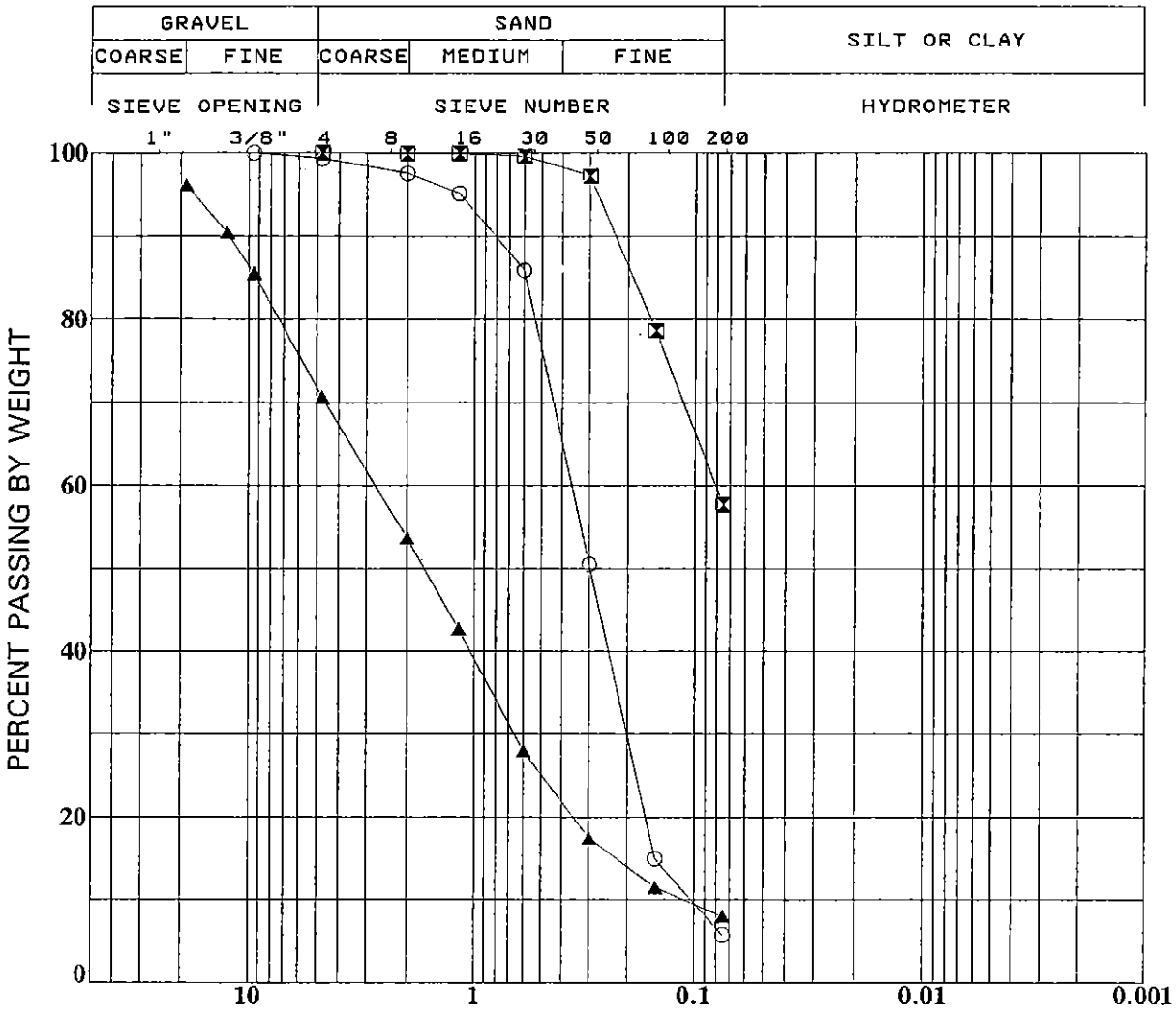

| Symbol | Boring Number | Sample Number | Sample Depth (feet) | Percent Passing No. 200 Sieve | Soil Type |
|---|---|---|---|---|---|
| ○ | B-1 | S-2 | 15.0 | 15 | SM |
| ⊠ | B-1 | S-5 | 40.0 | 9 | SW-SM |
| ▲ | B-2 | S-1 | 10.0 | 19 | SM |

**GRAIN SIZE DISTRIBUTION CURVE**
**ASTM D422**

Project No. 1970011-01

Project Name TW Homes/Banning Lowland

Date 5/16/97 Figure No. D-1



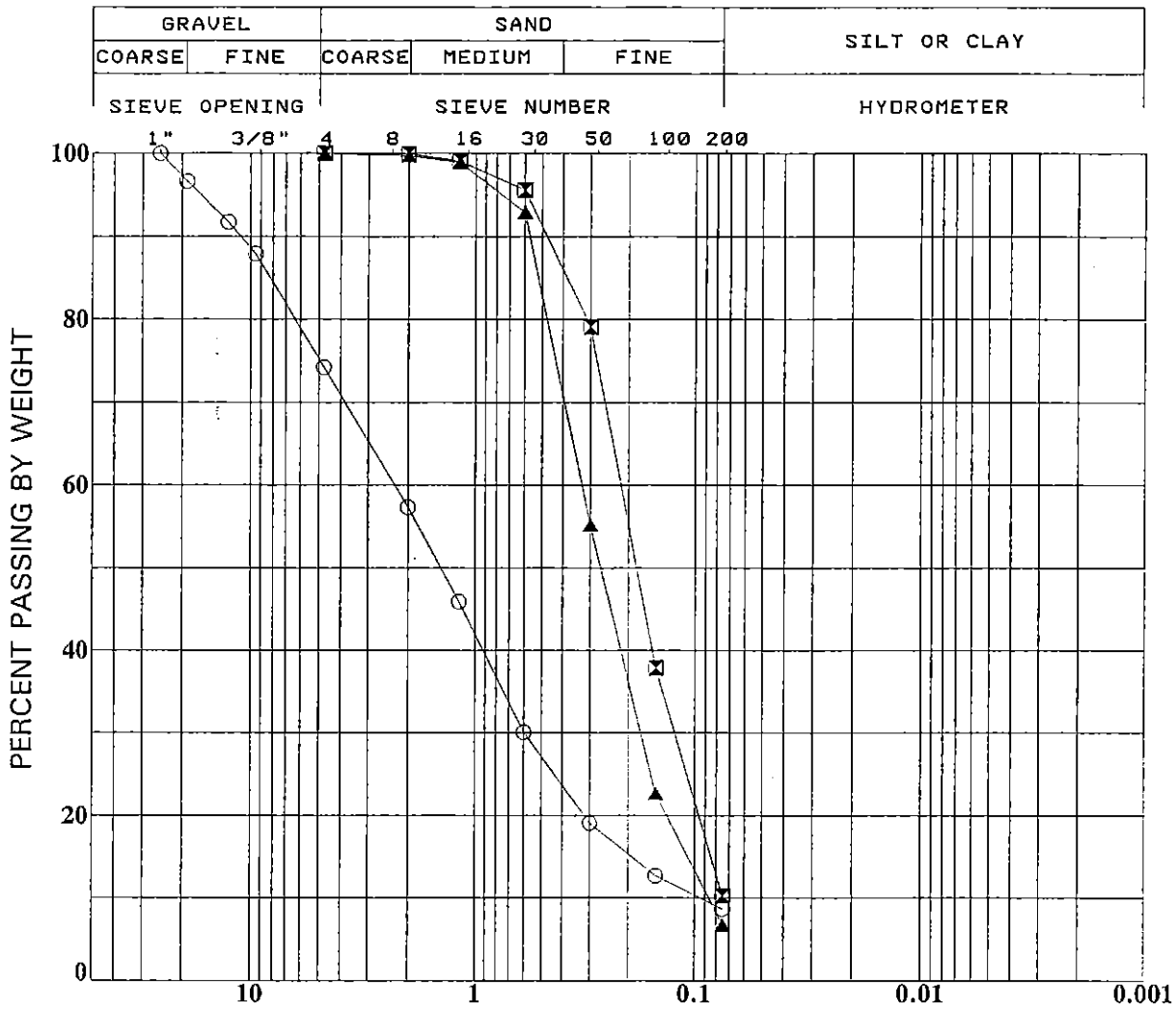

| Symbol | Boring Number | Sample Number | Sample Depth (feet) | Percent Passing No. 200 Sieve | Soil Type |
|---|---|---|---|---|---|
| ○ | B-2 | S-5 | 30.0 | 6 | SP-SM |
| ⊠ | B-3 | S-2 | 15.0 | 58 | ML |
| ▲ | B-3 | S-5 | 30.0 | 8 | SP-SM |

**GRAIN SIZE DISTRIBUTION CURVE**
**ASTM D422**

Project No. 1970011-01

Project Name TW Homes/Banning Lowland

Date 5/16/97 Figure No. D-2



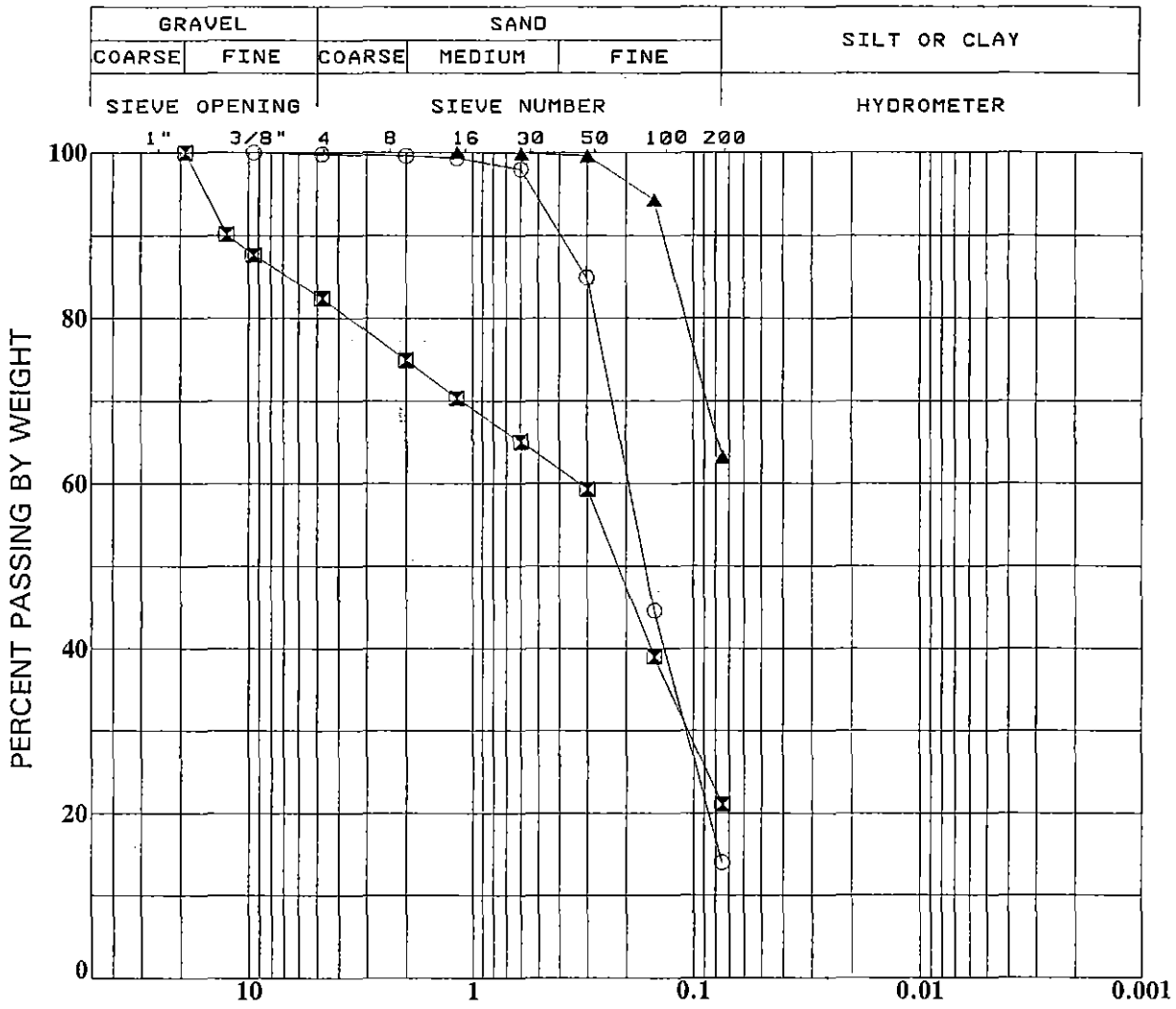

| Symbol | Boring Number | Sample Number | Sample Depth (feet) | Percent Passing No. 200 Sieve | Soil Type |
|---|---|---|---|---|---|
| ○ | B-3 | S-8 | 45.0 | 9 | SP-SM |
| ⊠ | B-4 | S-1 | 10.0 | 10 | SP-SM |
| ▲ | B-4 | S-5 | 30.0 | 7 | SP-SM |

**GRAIN SIZE DISTRIBUTION CURVE**
**ASTM D422**

Project No. 1970011-01

Project Name TW Homes/Banning Lowland

Date 5/16/97 Figure No. D-3



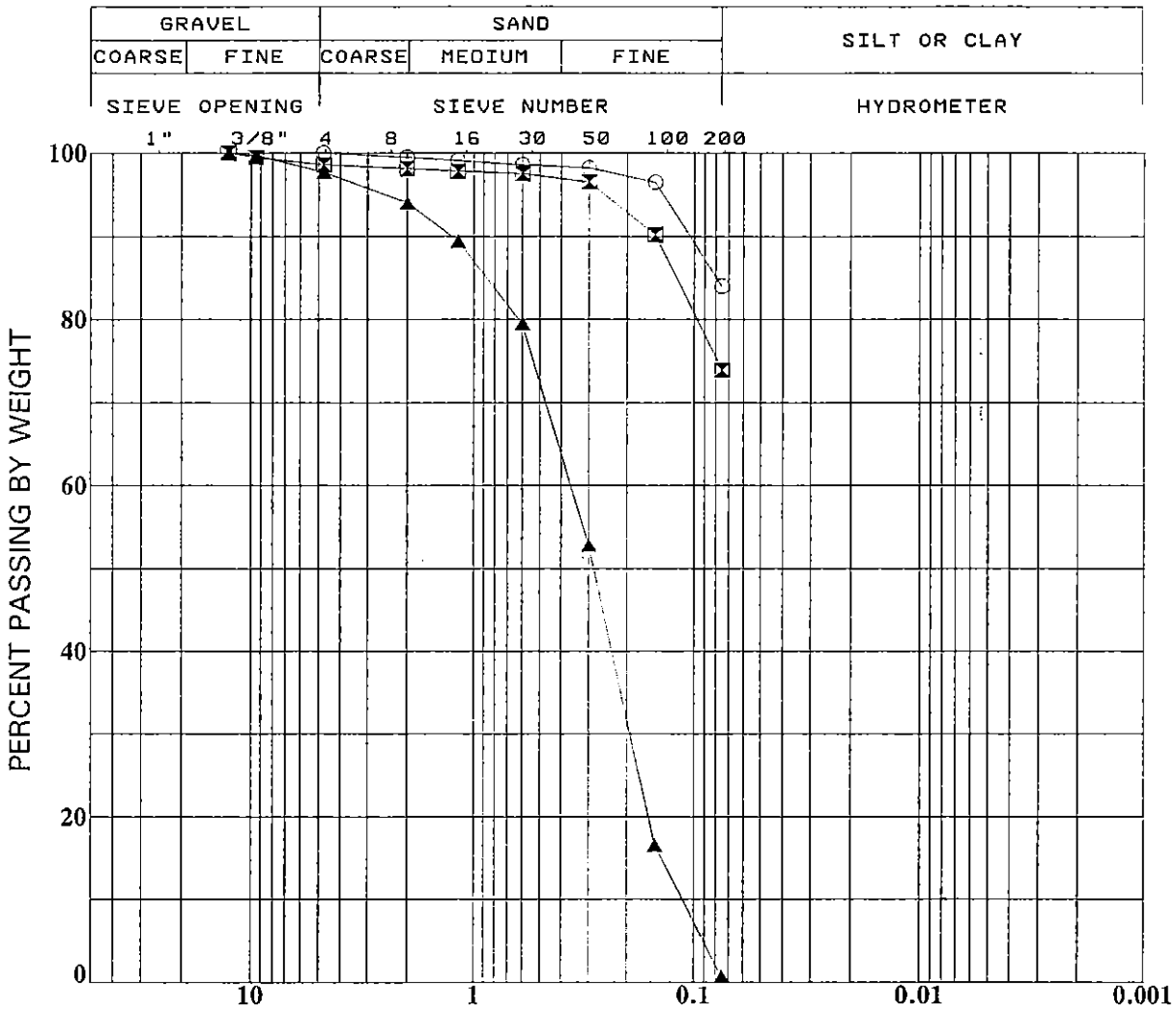

| Symbol | Boring Number | Sample Number | Sample Depth (feet) | Percent Passing No. 200 Sieve | Soil Type |
|---|---|---|---|---|---|
| ○ | B-4 | S-8 | 45.0 | 14 | SM |
| ⊠ | B-5 | S-1 | 10.0 | 21 | SM |
| ▲ | B-5 | S-4 | 25.0 | 63 | CL |

**GRAIN SIZE DISTRIBUTION CURVE**
**ASTM D422**

Project No. 1970011-01

Project Name TW Homes/Banning Lowland

Date 5/16/97 Figure No. D-4



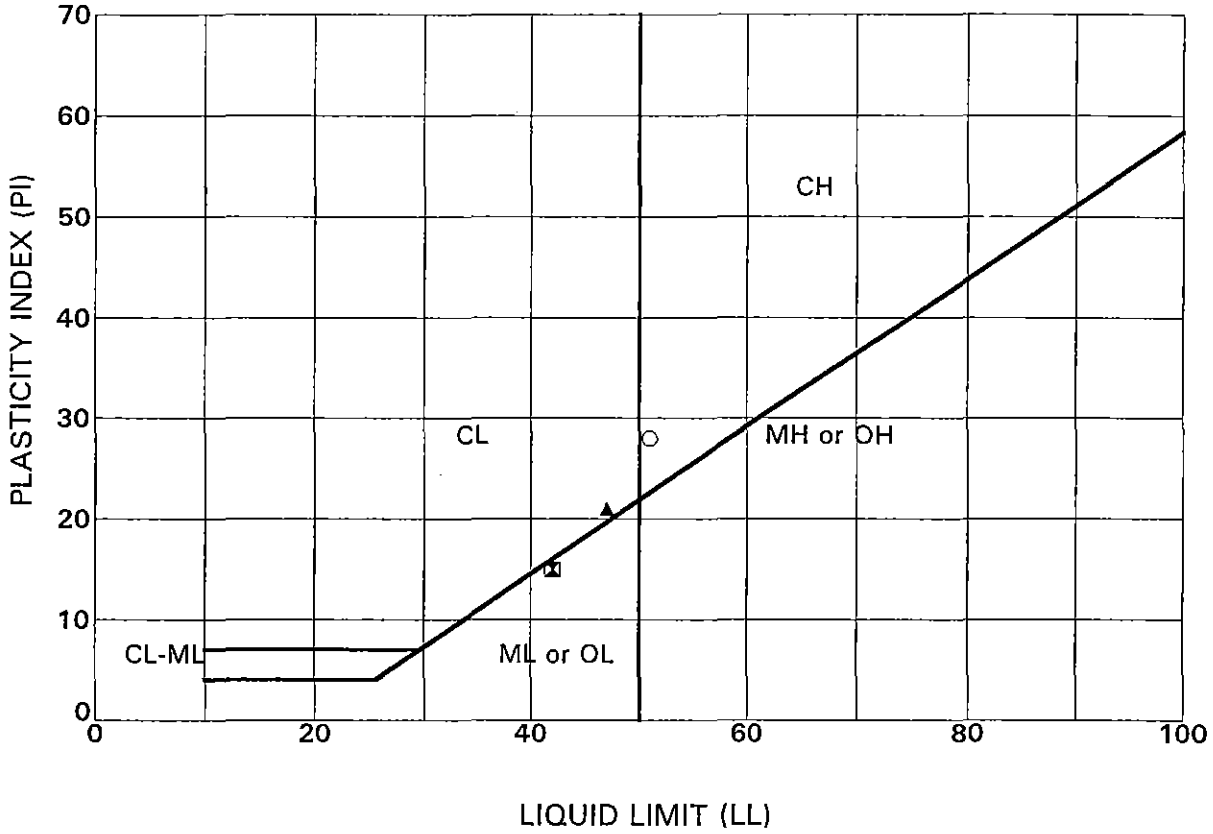

| Symbol | Boring Number | Sample Number | Sample Depth (feet) | Percent Passing No. 200 Sieve | Soil Type |
|---|---|---|---|---|---|
| ○ | B-5 | S-7 | 45.0 | 84 | CL |
| ⊠ | B-6 | S-1 | 10.0 | 74 | CL |
| ▲ | B-6 | S-5 | 30.0 | 1 | SP |

**GRAIN SIZE DISTRIBUTION CURVE**
**ASTM D422**

Project No. 1970011-01

Project Name TW Homes/Banning Lowland

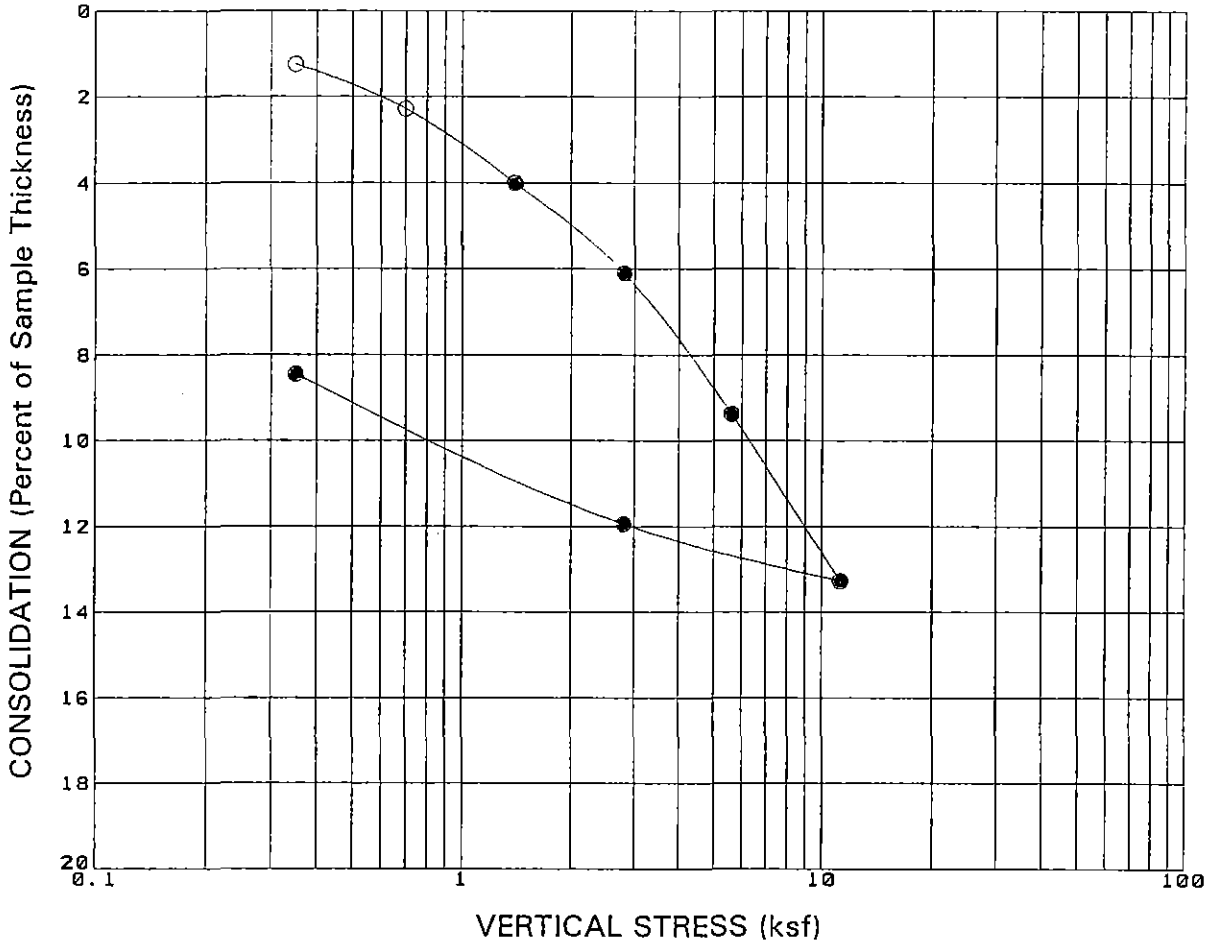
Date 5/16/97 Figure No. D-5




| Symbol | Boring Number | Sample Number | Depth (feet) | Field Moisture (%) | LL | PI | U.S.C.S. Symbol |
|---|---|---|---|---|---|---|---|
| ○ | B-1 | S-1 | 5.0 | | 51 | 28 | CH |
| ⊠ | B-3 | R-2 | 5.0 | 40.2 | 42 | 15 | ML |
| ▲ | B-6 | R-1 | 2.0 | | 47 | 21 | CL |
| | | | | | | | |
| | | | | | | | |
| | | | | | | | |

**ATTERBERG LIMITS**
**ASTM D4318**

Project No. 1970011-01
Project Name TW Homes/Banning Lowland
Date 5/16/97 Figure No. D-6




LEGEND: ○ At Field Moisture
● After Addition of Water

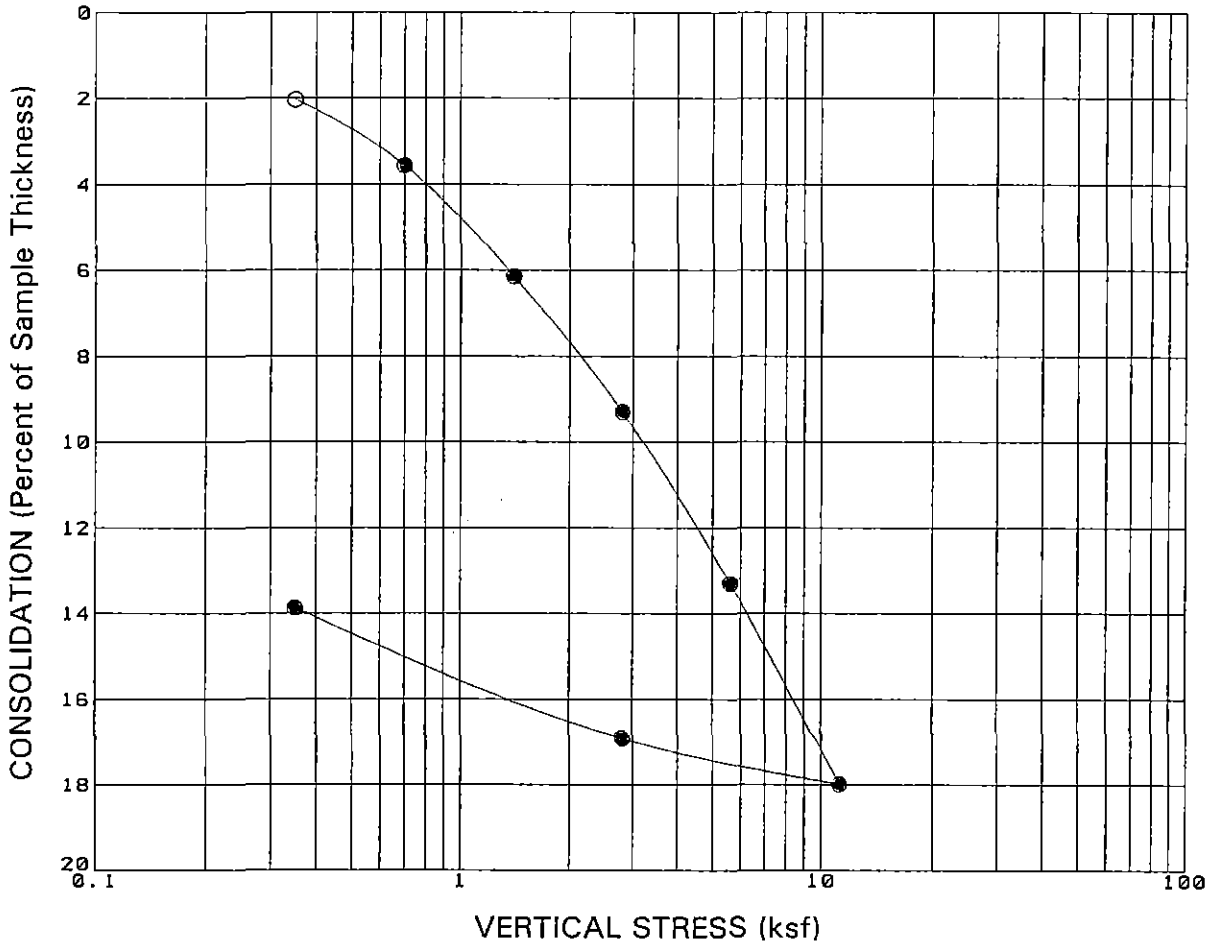
| | | | |
|---|---|---|---|
| Boring No. | B-3 | Dry Density (psf) | 79.4 |
| Sample No. | R-2 | Moisture Content (%): | |
| Depth (ft) | 5.0 | Before | 40.2 |
| Soil Type | CL | After | 35.7 |
| Sample Description | Silty Clay | | |

# CONSOLIDATION CURVE
# ASTM D2435

Project No. 1970011-01

Project Name TW Homes/Banning Lowland

Date 5/16/97 Figure No. 9-7

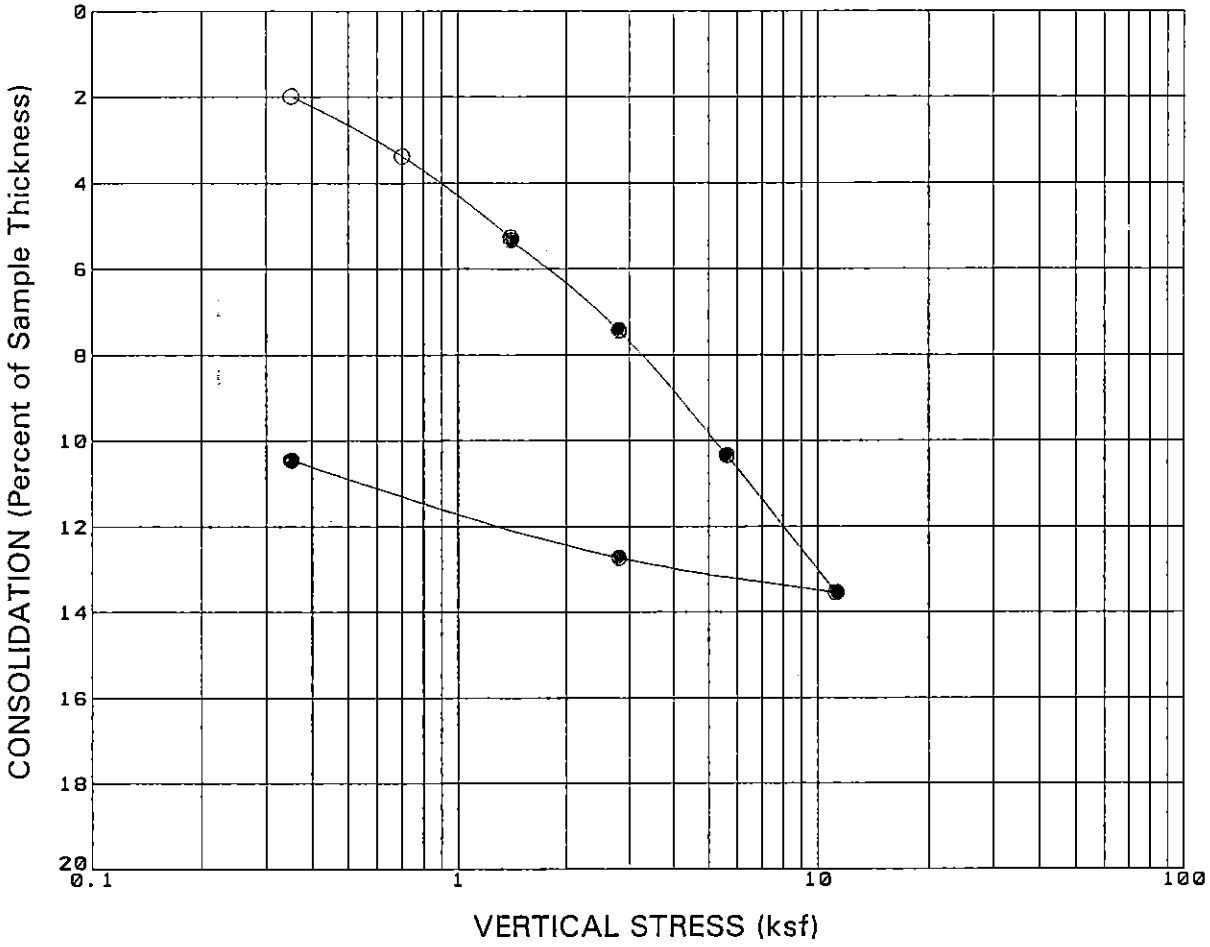



LEGEND: ○ At Field Moisture
● After Addition of Water

| | | | |
|---|---|---|---|
| Boring No. | B-4 | Dry Density (psf) | 73.3 |
| Sample No. | R-1 | Moisture Content (%): | |
| Depth (ft) | 2.0 | Before | 46.7 |
| Soil Type | CL | After | 37.9 |
| Sample Description | Silty Clay | | |

# CONSOLIDATION CURVE
# ASTM D2435

Project No. 1970011-01
Project Name TW Homes/Banning Lowland
Date 5/16/97 Figure No. D-8




LEGEND: ○ At Field Moisture
● After Addition of Water

| | | | |
|---|---|---|---|
| Boring No. | B-6 | Dry Density (psf) | 76.6 |
| Sample No. | R-2 | Moisture Content (%): | |
| Depth (ft) | 5.0 | Before | 42.5 |
| Soil Type | CL | After | 36.9 |
| Sample Description | Silty Clay | | |

# CONSOLIDATION CURVE
# ASTM D2435

Project No. 1970011-01

Project Name TW Homes/Banning Lowland

Date 5/16/97 Figure No. D-9

DATE: Friday, November 1, 1996

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*                                    *
*           E Q F A U L T            *
*                                    *
*             Ver. 2.20              *
*                                    *
*                                    *
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(Estimation of Peak Horizontal Acceleration
From Digitized California Faults)

SEARCH PERFORMED FOR:

JOB NUMBER: 970011-01

JOB NAME: Newport Buildings

SITE COORDINATES:
LATITUDE: 33.6333 N
LONGITUDE: 117.95 W

SEARCH RADIUS: 62 mi

ATTENUATION RELATION: 1) Campbell & Bozorgnia (1994) Horiz. - Alluvium

UNCERTAINTY (M=Mean, S=Mean+1-Sigma): M

SCOND: 0

COMPUTE PEAK HORIZONTAL ACCELERATION

FAULT-DATA FILE USED: CALIFLT.DAT

SOURCE OF DEPTH VALUES (A=Attenuation File, F=Fault Data File): A

## DETERMINISTIC SITE PARAMETERS

Page 1

| ABBREVIATED FAULT NAME | APPROX. DISTANCE mi (km) | MAX. CREDIBLE EVENT | | | MAX. PROBABLE EVENT | | |
|---|---|---|---|---|---|---|---|
| | | MAX. CRED. MAG. | PEAK SITE ACC. g | SITE INTENS MM | MAX. PROB. MAG. | PEAK SITE ACC. g | SITE INTENS MM |
| ANACAPA | 52 ( 84) | 7.00 | 0.044 | VI | 5.70 | 0.016 | IV |
| CASA LOMA-CLARK (S.Jacin.) | 54 ( 88) | 7.00 | 0.043 | VI | 7.00 | 0.043 | VI |
| CATALINA ESCARPMENT | 32 ( 51) | 7.00 | 0.085 | VII | 6.10 | 0.039 | V |
| CHINO | 25 ( 41) | 7.00 | 0.117 | VII | 5.40 | 0.034 | V |
| CLAMSHELL-SAWPIT | 37 ( 60) | 6.60 | 0.051 | VI | 4.90 | 0.013 | III |
| CORONADO BANK-AGUA BLANCA | 19 ( 30) | 7.50 | 0.229 | IX | 6.70 | 0.127 | VIII |
| CUCAMONGA | 40 ( 65) | 6.90 | 0.058 | VI | 6.10 | 0.031 | V |
| ELSINORE | 27 ( 43) | 7.50 | 0.157 | VIII | 6.60 | 0.076 | VII |
| ELYSIAN PARK SEISMIC ZONE | 30 ( 48) | 7.10 | 0.103 | VII | 5.80 | 0.038 | V |
| GLN.HELEN-LYTLE CR-CLREMNT | 48 ( 77) | 7.00 | 0.051 | VI | 6.70 | 0.039 | V |
| HOT S-BUCK RDG.(S.Jacinto) | 60 ( 97) | 7.00 | 0.038 | V | 6.10 | 0.017 | IV |
| MALIBU COAST | 45 ( 72) | 6.90 | 0.051 | VI | 5.60 | 0.018 | IV |
| NEWPORT-INGLEWOOD (NORTH) | 18 ( 29) | 6.70 | 0.133 | VIII | 4.20 | 0.015 | IV |
| NEWPORT-INGLEWOOD-OFFSHORE | 1 ( 1) | 7.10 | 0.499 | X | 5.90 | 0.394 | X |
| NORTH FRONTAL FAULT ZONE | 54 ( 87) | 7.70 | 0.081 | VII | 6.00 | 0.018 | IV |
| NORTHRIDGE HILLS | 51 ( 82) | 6.50 | 0.031 | V | 5.50 | 0.014 | III |
| OAK RIDGE (Eastern Blind) | 52 ( 84) | 7.00 | 0.065 | VI | 5.50 | 0.020 | IV |
| PALOS VERDES HILLS | 11 ( 18) | 7.20 | 0.295 | IX | 6.20 | 0.153 | VIII |
| RAYMOND | 35 ( 56) | 7.50 | 0.111 | VII | 4.90 | 0.014 | IV |
| ROSE CANYON | 46 ( 74) | 7.00 | 0.053 | VI | 5.90 | 0.020 | IV |
| SAN ANDREAS (Mojave) | 53 ( 85) | 8.00 | 0.107 | VII | 7.40 | 0.064 | VI |
| SAN ANDREAS (S. Bern.Mtn.) | 52 ( 84) | 8.00 | 0.108 | VII | 6.70 | 0.035 | V |
| SAN CLEMENTE - SAN ISIDRO | 52 ( 84) | 8.00 | 0.107 | VII | 6.50 | 0.029 | V |
| SAN DIEGO TRGH.-BAHIA SOL. | 45 ( 73) | 7.50 | 0.084 | VII | 6.20 | 0.027 | V |
| SAN GABRIEL | 39 ( 62) | 7.40 | 0.094 | VII | 5.60 | 0.019 | IV |

DETERMINISTIC SITE PARAMETERS



| ABBREVIATED FAULT NAME | APPROX. DISTANCE mi (km) | MAX. CREDIBLE EVENT | | | MAX. PROBABLE EVENT | | |
|---|---|---|---|---|---|---|---|
| | | MAX. CRED. MAG. | PEAK SITE ACC. g | SITE INTENS MM | MAX. PROB. MAG. | PEAK SITE ACC. g | SITE INTENS MM |
| SAN GORGONIO - BANNING | 49 ( 80) | 7.50 | 0.070 | VI | 6.60 | 0.034 | V |
| SAN JOSE | 30 ( 48) | 6.70 | 0.071 | VI | 5.00 | 0.016 | IV |
| SANTA MONICA - HOLLYWOOD | 37 ( 60) | 7.00 | 0.069 | VI | 5.80 | 0.027 | V |
| SANTA MONICA MTNS. THRUST | 39 ( 63) | 7.20 | 0.114 | VII | 6.30 | 0.057 | VI |
| SANTA SUSANA | 56 ( 90) | 6.90 | 0.037 | V | 6.30 | 0.023 | IV |
| SIERRA MADRE-SAN FERNANDO | 35 ( 57) | 7.30 | 0.094 | VII | 6.30 | 0.044 | VI |
| SIMI - SANTA ROSA | 62 ( 99) | 7.10 | 0.038 | V | 5.40 | 0.010 | III |
| VERDUGO | 35 ( 57) | 6.70 | 0.060 | VI | 5.20 | 0.018 | IV |
| WHITTIER - NORTH ELSINORE | 21 ( 35) | 7.10 | 0.148 | VIII | 6.00 | 0.059 | VI |
| WILSHIRE ARCH | 34 ( 54) | 5.70 | 0.044 | VI | 5.00 | 0.025 | V |

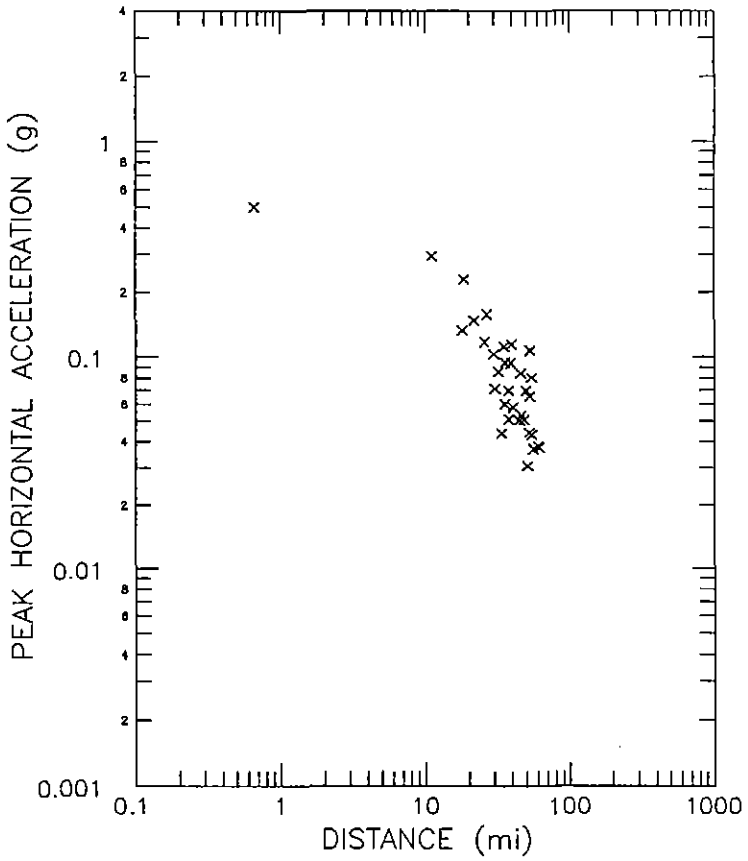
35 FAULTS FOUND WITHIN THE SPECIFIED SEARCH RADIUS.

THE NEWPORT-INGLEWOOD-OFFSHORE FAULT IS CLOSEST TO THE SITE.
IT IS ABOUT 0.7 MILES AWAY.

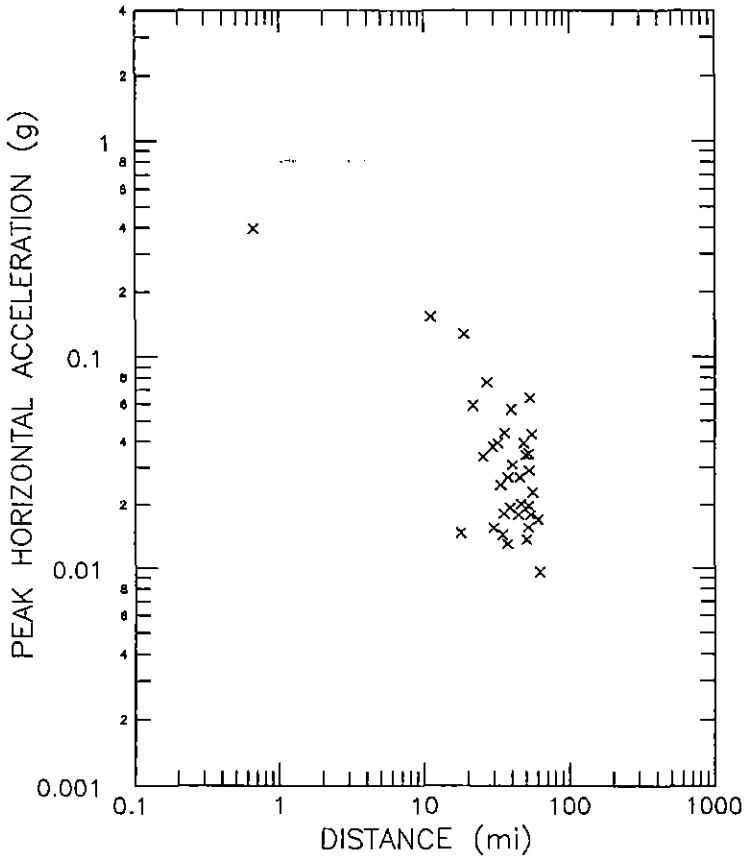
**LARGEST MAXIMUM-CREDIBLE SITE ACCELERATION: 0.499 g**
**LARGEST MAXIMUM-PROBABLE SITE ACCELERATION: 0.394 g**

# COMPARISON OF MAXIMUM EARTHQUAKES

## MAXIMUM CREDIBLE EARTHQUAKES

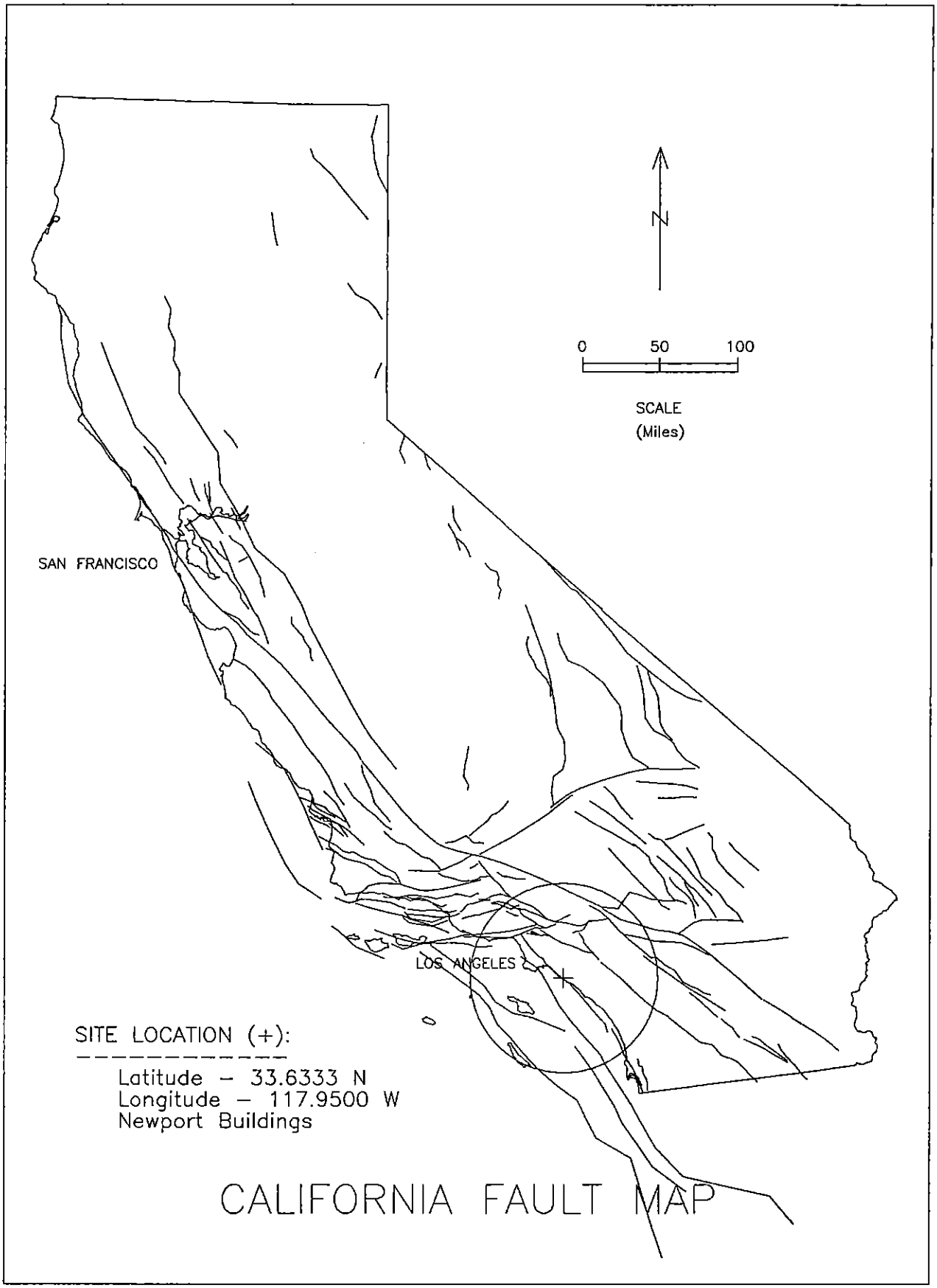



## MAXIMUM PROBABLE EARTHQUAKES




JOB NO.: 970011-01

LATITUDE: 33.6333 N – LONGITUDE: 117.9500 W


N
0
50
100
SCALE
(Miles)
SAN FRANCISCO
LOS ANGELES
SITE LOCATION (+):
Latitude – 33.6333 N
Longitude – 117.9500 W
Newport Buildings
CALIFORNIA FAULT MAP

DATE: Friday, November 1, 1996

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*                                    *
*          E Q S E A R C H           *
*                                    *
*             Ver. 2.01              *
*                                    *
*                                    *
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(Estimation of Peak Horizontal Acceleration
From California Earthquake Catalogs)

SEARCH PERFORMED FOR:

JOB NUMBER: 970011-01

JOB NAME: Newport Buildings

SITE COORDINATES:
LATITUDE: 33.6333 N
LONGITUDE: 117.95 W

TYPE OF SEARCH: RADIUS
SEARCH RADIUS: 62 mi

SEARCH MAGNITUDES: 4.0 TO 9.0

SEARCH DATES: 1800 TO 1997

ATTENUATION RELATION: 1) Campbell (1993) Horiz. - 0=Soil 1=Rock

UNCERTAINTY (M=Mean, S=Mean+1-Sigma): M

SCOND: 0

FAULT TYPE ASSUMED (DS=Reverse, SS=Strike-Slip): DS

COMPUTE PEAK HORIZONTAL ACCELERATION

EARTHQUAKE-DATA FILE USED: ALLQUAKE.DAT

TIME PERIOD OF EXPOSURE FOR STATISTICAL COMPARISON: 25 years

SOURCE OF DEPTH VALUES (A=Attenuation File, E=Earthquake Catalog): A

| FILE CODE | LAT. NORTH | LONG. WEST | DATE | TIME (GMT) H M Sec | DEPTH (km) | QUAKE MAG. | SITE ACC. g | SITE MM INT. | APPROX. DISTANCE mi (km) |
|---|---|---|---|---|---|---|---|---|---|
| DMG | 33.000 | 117.300 | 11/22/1800 | 2130 0.0 | 3.0 | 6.50 | 0.023 | IV | 58 [ 93] |
| DMG | 33.700 | 117.900 | 12/ 8/1812 | 15 0 0.0 | 3.0 | 6.90 | 0.511 | X | 5 [ 9] |
| T-A | 34.000 | 118.250 | 9/23/1827 | 0 0 0.0 | 7.3 | 5.00 | 0.021 | IV | 31 [ 49] |
| MGI | 34.100 | 118.100 | 7/11/1855 | 415 0.0 | 3.0 | 6.30 | 0.048 | VI | 33 [ 54] |
| T-A | 34.000 | 118.250 | 1/10/1856 | 0 0 0.0 | 7.3 | 5.00 | 0.021 | IV | 31 [ 49] |
| T-A | 34.000 | 118.250 | 5/ 2/1856 | 810 0.0 | 7.3 | 4.30 | 0.012 | III | 31 [ 49] |
| T-A | 34.000 | 118.250 | 1/17/1857 | 1 0 0.0 | 7.3 | 4.30 | 0.012 | III | 31 [ 49] |
| T-A | 34.000 | 118.250 | 5/ 4/1857 | 6 0 0.0 | 7.3 | 4.30 | 0.012 | III | 31 [ 49] |
| MGI | 34.000 | 117.500 | 12/16/1858 | 10 0 0.0 | 3.0 | 7.00 | 0.071 | VI | 36 [ 58] |
| T-A | 34.170 | 117.320 | 12/ 2/1859 | 2210 0.0 | 7.3 | 4.30 | 0.005 | II | 52 [ 83] |
| MGI | 34.100 | 118.200 | 1/27/1860 | 830 0.0 | 7.3 | 4.30 | 0.010 | III | 35 [ 57] |
| T-A | 34.000 | 118.250 | 3/26/1860 | 0 0 0.0 | 7.3 | 5.00 | 0.021 | IV | 31 [ 49] |
| T-A | 34.080 | 117.250 | 10/ 7/1869 | 0 0 0.0 | 7.3 | 4.30 | 0.005 | II | 51 [ 81] |
| T-A | 34.000 | 118.250 | 3/21/1880 | 1425 0.0 | 7.3 | 4.30 | 0.012 | III | 31 [ 49] |
| T-A | 33.500 | 117.070 | 12/29/1880 | 7 0 0.0 | 7.3 | 4.30 | 0.005 | II | 51 [ 83] |
| T-A | 34.170 | 118.170 | 3/ 7/1888 | 1554 0.0 | 7.3 | 4.30 | 0.008 | III | 39 [ 63] |
| T-A | 34.000 | 117.420 | 4/12/1888 | 1315 0.0 | 7.3 | 4.30 | 0.008 | III | 40 [ 64] |
| DMG | 34.100 | 117.900 | 8/28/1889 | 215 0.0 | 6.8 | 5.20 | 0.022 | IV | 32 [ 52] |
| DMG | 34.200 | 117.500 | 6/14/1892 | 1325 0.0 | 7.3 | 4.90 | 0.010 | III | 47 [ 75] |
| DMG | 34.300 | 118.600 | 4/ 4/1893 | 1940 0.0 | 6.2 | 5.40 | 0.009 | III | 59 [ 95] |
| DMG | 34.300 | 117.600 | 7/30/1894 | 512 0.0 | 4.0 | 5.90 | 0.019 | IV | 50 [ 81] |
| DMG | 34.200 | 117.400 | 7/22/1899 | 046 0.0 | 5.8 | 5.50 | 0.014 | III | 50 [ 81] |
| DMG | 34.300 | 117.500 | 7/22/1899 | 2032 0.0 | 3.0 | 6.50 | 0.027 | V | 53 [ 85] |
| DMG | 33.800 | 117.000 | 12/25/1899 | 1225 0.0 | 3.0 | 6.60 | 0.026 | V | 56 [ 90] |
| MGI | 34.100 | 117.300 | 12/27/1901 | 11 0 0.0 | 7.3 | 4.60 | 0.007 | II | 49 [ 79] |
| MGI | 33.800 | 117.900 | 5/22/1902 | 740 0.0 | 7.3 | 4.30 | 0.041 | V | 12 [ 19] |
| DMG | 33.700 | 117.100 | 6/11/1902 | 245 0.0 | 7.3 | 4.50 | 0.007 | II | 49 [ 79] |
| MGI | 33.700 | 117.900 | 7/ 8/1902 | 945 0.0 | 7.3 | 4.00 | 0.066 | VI | 5 [ 9] |
| DMG | 33.800 | 117.600 | 9/16/1903 | 1210 0.0 | 7.3 | 4.00 | 0.015 | IV | 23 [ 37] |
| MGI | 34.000 | 118.000 | 12/25/1903 | 1745 0.0 | 7.3 | 5.00 | 0.027 | V | 25 [ 41] |
| MGI | 34.100 | 117.300 | 7/15/1905 | 2041 0.0 | 6.5 | 5.30 | 0.012 | III | 49 [ 79] |
| MGI | 34.000 | 118.300 | 9/ 3/1905 | 540 0.0 | 6.5 | 5.30 | 0.024 | V | 32 [ 52] |
| MGI | 34.000 | 117.400 | 5/22/1907 | 652 0.0 | 7.3 | 4.60 | 0.010 | III | 40 [ 65] |
| DMG | 34.000 | 117.500 | 7/ 3/1908 | 1255 0.0 | 7.3 | 4.00 | 0.008 | II | 36 [ 58] |
| DMG | 33.700 | 117.400 | 4/11/1910 | 757 0.0 | 7.3 | 5.00 | 0.019 | IV | 32 [ 51] |
| DMG | 33.700 | 117.400 | 5/13/1910 | 620 0.0 | 7.3 | 5.00 | 0.019 | IV | 32 [ 51] |
| DMG | 33.700 | 117.400 | 5/15/1910 | 1547 0.0 | 3.5 | 6.00 | 0.041 | V | 32 [ 51] |
| DMG | 34.100 | 118.800 | 5/10/1911 | 1340 0.0 | 7.3 | 4.00 | 0.003 | I | 58 [ 94] |
| MGI | 34.100 | 117.300 | 11/22/1911 | 257 0.0 | 7.3 | 4.00 | 0.004 | I | 49 [ 79] |
| MGI | 34.200 | 117.300 | 4/13/1913 | 1045 0.0 | 7.3 | 4.00 | 0.004 | I | 54 [ 87] |
| DMG | 33.800 | 118.000 | 10/21/1913 | 938 0.0 | 7.3 | 4.00 | 0.034 | V | 12 [ 19] |
| DMG | 34.000 | 118.500 | 11/ 8/1914 | 1140 0.0 | 7.3 | 4.50 | 0.009 | III | 40 [ 65] |
| MGI | 33.800 | 118.500 | 6/18/1915 | 15 5 0.0 | 7.3 | 4.00 | 0.009 | III | 34 [ 54] |
| MGI | 34.100 | 118.200 | 5/ 2/1916 | 1432 0.0 | 7.3 | 4.00 | 0.008 | III | 35 [ 57] |
| MGI | 34.000 | 118.200 | 2/13/1917 | 13 5 0.0 | 7.3 | 4.60 | 0.017 | IV | 29 [ 47] |
| MGI | 33.800 | 117.800 | 5/19/1917 | 635 0.0 | 7.3 | 4.00 | 0.027 | V | 14 [ 23] |
| MGI | 33.800 | 117.800 | 5/19/1917 | 719 0.0 | 7.3 | 4.00 | 0.027 | V | 14 [ 23] |
| MGI | 33.800 | 117.800 | 5/20/1917 | 945 0.0 | 7.3 | 4.00 | 0.027 | V | 14 [ 23] |
| MGI | 34.000 | 118.200 | 6/26/1917 | 424 0.0 | 7.3 | 4.00 | 0.011 | III | 29 [ 47] |
| MGI | 34.000 | 118.200 | 6/26/1917 | 2115 0.0 | 7.3 | 4.60 | 0.017 | IV | 29 [ 47] |
| MGI | 34.000 | 118.200 | 6/26/1917 | 2120 0.0 | 7.3 | 4.60 | 0.017 | IV | 29 [ 47] |
| MGI | 34.000 | 118.200 | 6/26/1917 | 2130 0.0 | 7.3 | 4.60 | 0.017 | IV | 29 [ 47] |
| DMG | 34.000 | 118.500 | 3/ 6/1918 | 1820 0.0 | 7.3 | 4.00 | 0.006 | II | 40 [ 65] |
| MGI | 34.000 | 118.500 | 3/ 8/1918 | 1230 0.0 | 7.3 | 4.00 | 0.006 | II | 40 [ 65] |
| DMG | 33.750 | 117.000 | 4/21/1918 | 223225.0 | 3.0 | 6.80 | 0.031 | V | 55 [ 89] |
| MGI | 33.800 | 117.600 | 4/22/1918 | 2115 0.0 | 7.3 | 5.00 | 0.031 | V | 23 [ 37] |
| MGI | 33.800 | 116.900 | 4/23/1918 | 1415 0.0 | 7.3 | 4.00 | 0.003 | I | 61 [ 99] |
| MGI | 33.800 | 116.900 | 4/29/1918 | 2 0 0.0 | 7.3 | 4.00 | 0.003 | I | 61 [ 99] |

| FILE CODE | LAT. NORTH | LONG. WEST | DATE | TIME (GMT) H M Sec | DEPTH (km) | QUAKE MAG. | SITE ACC. g | SITE MM INT. | APPROX. DISTANCE mi | [km] |
|---|---|---|---|---|---|---|---|---|---|---|
| DMG | 33.750 | 117.000 | 6/ 6/1918 | 2232 0.0 | 7.3 | 5.00 | 0.008 | II | 55 | [ 89] |
| MGI | 33.800 | 116.900 | 6/14/1918 | 1024 0.0 | 7.3 | 4.00 | 0.003 | I | 61 | [ 99] |
| MGI | 34.000 | 118.500 | 11/19/1918 | 2018 0.0 | 7.3 | 5.00 | 0.013 | III | 40 | [ 65] |
| MGI | 34.000 | 118.400 | 2/22/1920 | 1610 0.0 | 7.3 | 4.60 | 0.012 | III | 36 | [ 58] |
| DMG | 33.500 | 118.250 | 6/18/1920 | 10 8 0.0 | 7.3 | 4.50 | 0.027 | V | 20 | [ 31] |
| DMG | 34.000 | 118.500 | 6/22/1920 | 248 0.0 | 7.3 | 4.90 | 0.012 | III | 40 | [ 65] |
| MGI | 34.000 | 118.300 | 6/22/1920 | 2035 0.0 | 7.3 | 4.00 | 0.009 | III | 32 | [ 52] |
| MGI | 34.000 | 118.500 | 6/23/1920 | 1220 0.0 | 7.3 | 4.00 | 0.006 | II | 40 | [ 65] |
| MGI | 34.000 | 118.300 | 6/30/1920 | 350 0.0 | 7.3 | 4.00 | 0.009 | III | 32 | [ 52] |
| MGI | 34.080 | 118.260 | 7/16/1920 | 18 8 0.0 | 7.3 | 5.00 | 0.017 | IV | 36 | [ 57] |
| MGI | 34.100 | 118.300 | 7/16/1920 | 2022 0.0 | 7.3 | 4.60 | 0.011 | III | 38 | [ 61] |
| MGI | 34.100 | 118.300 | 7/16/1920 | 2127 0.0 | 7.3 | 4.60 | 0.011 | III | 38 | [ 61] |
| MGI | 34.100 | 118.300 | 7/16/1920 | 2130 0.0 | 7.3 | 4.60 | 0.011 | III | 38 | [ 61] |
| MGI | 34.100 | 118.300 | 7/26/1920 | 1215 0.0 | 7.3 | 4.00 | 0.007 | II | 38 | [ 61] |
| T-A | 34.000 | 117.420 | 9/10/1920 | 1415 0.0 | 7.3 | 4.30 | 0.008 | III | 40 | [ 64] |
| MGI | 33.800 | 116.900 | 12/18/1920 | 1726 0.0 | 7.3 | 4.00 | 0.003 | I | 61 | [ 99] |
| MGI | 34.200 | 118.000 | 1/ 9/1921 | 530 0.0 | 7.3 | 4.60 | 0.011 | III | 39 | [ 63] |
| MGI | 34.100 | 118.200 | 4/21/1921 | 1538 0.0 | 7.3 | 4.00 | 0.008 | III | 35 | [ 57] |
| MGI | 34.100 | 117.200 | 4/23/1923 | 2113 0.0 | 7.3 | 4.00 | 0.004 | I | 54 | [ 86] |
| DMG | 34.000 | 117.000 | 6/30/1923 | 022 0.0 | 7.3 | 4.50 | 0.004 | I | 60 | [ 97] |
| DMG | 34.000 | 117.250 | 7/23/1923 | 73026.0 | 3.0 | 6.25 | 0.027 | V | 47 | [ 76] |
| DMG | 33.500 | 117.000 | 8/ 8/1925 | 1013 0.0 | 7.3 | 4.50 | 0.005 | II | 55 | [ 89] |
| MGI | 33.800 | 117.800 | 11/ 4/1926 | 2238 0.0 | 7.3 | 4.60 | 0.041 | V | 14 | [ 23] |
| MGI | 33.800 | 117.800 | 11/ 7/1926 | 1948 0.0 | 7.3 | 4.60 | 0.041 | V | 14 | [ 23] |
| MGI | 33.800 | 117.800 | 11/ 9/1926 | 1535 0.0 | 7.3 | 4.60 | 0.041 | V | 14 | [ 23] |
| MGI | 33.800 | 117.800 | 11/10/1926 | 1723 0.0 | 7.3 | 4.60 | 0.041 | V | 14 | [ 23] |
| MGI | 34.000 | 118.400 | 1/29/1927 | 2324 0.0 | 7.3 | 4.00 | 0.008 | II | 36 | [ 58] |
| MGI | 34.000 | 118.400 | 2/ 7/1927 | 429 0.0 | 7.3 | 4.60 | 0.012 | III | 36 | [ 58] |
| DMG | 34.000 | 118.500 | 8/ 4/1927 | 1224 0.0 | 7.3 | 5.00 | 0.013 | III | 40 | [ 65] |
| MGI | 33.900 | 118.200 | 10/ 8/1927 | 1914 0.0 | 7.3 | 4.60 | 0.023 | IV | 23 | [ 38] |
| MGI | 33.800 | 118.300 | 12/31/1928 | 1045 0.0 | 7.3 | 4.00 | 0.015 | IV | 23 | [ 37] |
| MGI | 34.000 | 118.000 | 5/ 5/1929 | 1 7 0.0 | 7.3 | 4.60 | 0.020 | IV | 25 | [ 41] |
| MGI | 34.000 | 118.000 | 5/ 5/1929 | 735 0.0 | 7.3 | 4.00 | 0.013 | III | 25 | [ 41] |
| DMG | 33.900 | 118.100 | 7/ 8/1929 | 1646 6.7 | 7.3 | 4.70 | 0.029 | V | 20 | [ 33] |
| DMG | 33.630 | 118.200 | 9/13/1929 | 132338.2 | 7.3 | 4.00 | 0.027 | V | 14 | [ 23] |
| MGI | 34.000 | 117.700 | 12/ 3/1929 | 9 5 0.0 | 7.3 | 4.00 | 0.011 | III | 29 | [ 47] |
| MGI | 34.100 | 118.000 | 1/27/1930 | 2026 0.0 | 7.3 | 4.60 | 0.014 | IV | 32 | [ 52] |
| DMG | 33.950 | 118.632 | 8/31/1930 | 04036.0 | 6.8 | 5.20 | 0.013 | III | 45 | [ 72] |
| MGI | 34.000 | 118.400 | 10/ 1/1930 | 040 0.0 | 7.3 | 4.60 | 0.012 | III | 36 | [ 58] |
| DMG | 34.100 | 117.300 | 2/16/1931 | 1327 0.0 | 7.3 | 4.00 | 0.004 | I | 49 | [ 79] |
| DMG | 34.100 | 117.800 | 3/31/1931 | 2033 0.0 | 7.3 | 4.00 | 0.009 | III | 33 | [ 54] |
| DMG | 33.770 | 118.480 | 4/24/1931 | 182754.8 | 7.3 | 4.40 | 0.013 | III | 32 | [ 51] |
| DMG | 33.800 | 118.300 | 11/ 3/1931 | 16 5 0.0 | 7.3 | 4.00 | 0.015 | IV | 23 | [ 37] |
| DMG | 34.000 | 117.250 | 11/ 1/1932 | 445 0.0 | 7.3 | 4.00 | 0.005 | II | 47 | [ 76] |
| DMG | 33.617 | 117.967 | 3/11/1933 | 154 7.8 | 3.0 | 6.30 | 0.691 | XI | 1 | [ 2] |
| DMG | 33.750 | 118.083 | 3/11/1933 | 2 4 0.0 | 7.3 | 4.90 | 0.067 | VI | 11 | [ 18] |
| DMG | 33.750 | 118.083 | 3/11/1933 | 2 5 0.0 | 7.3 | 4.30 | 0.044 | VI | 11 | [ 18] |
| DMG | 33.750 | 118.083 | 3/11/1933 | 2 9 0.0 | 7.3 | 5.00 | 0.072 | VII | 11 | [ 18] |
| DMG | 33.750 | 118.083 | 3/11/1933 | 210 0.0 | 7.3 | 4.60 | 0.055 | VI | 11 | [ 18] |
| DMG | 33.750 | 118.083 | 3/11/1933 | 211 0.0 | 7.3 | 4.40 | 0.048 | VI | 11 | [ 18] |
| DMG | 33.750 | 118.083 | 3/11/1933 | 216 0.0 | 7.3 | 4.80 | 0.063 | VI | 11 | [ 18] |
| DMG | 33.600 | 118.000 | 3/11/1933 | 217 0.0 | 7.3 | 4.50 | 0.116 | VII | 4 | [ 6] |
| DMG | 33.750 | 118.083 | 3/11/1933 | 222 0.0 | 7.3 | 4.00 | 0.036 | V | 11 | [ 18] |
| DMG | 33.750 | 118.083 | 3/11/1933 | 227 0.0 | 7.3 | 4.60 | 0.055 | VI | 11 | [ 18] |
| DMG | 33.750 | 118.083 | 3/11/1933 | 230 0.0 | 7.1 | 5.10 | 0.078 | VII | 11 | [ 18] |
| DMG | 33.600 | 118.000 | 3/11/1933 | 231 0.0 | 7.3 | 4.40 | 0.108 | VII | 4 | [ 6] |
| DMG | 33.750 | 118.083 | 3/11/1933 | 252 0.0 | 7.3 | 4.00 | 0.036 | V | 11 | [ 18] |
| DMG | 33.750 | 118.083 | 3/11/1933 | 257 0.0 | 7.3 | 4.20 | 0.041 | V | 11 | [ 18] |

| FILE CODE | LAT. NORTH | LONG. WEST | DATE | TIME (GMT) H M Sec | DEPTH (km) | QUAKE MAG. | SITE ACC. g | SITE MM INT. | APPROX. DISTANCE mi [km] |
|---|---|---|---|---|---|---|---|---|---|
| DMG | 33.750 | 118.083 | 3/11/1933 | 258 0.0 | 7.3 | 4.00 | 0.036 | V | 11 [ 18] |
| DMG | 33.750 | 118.083 | 3/11/1933 | 259 0.0 | 7.3 | 4.60 | 0.055 | VI | 11 [ 18] |
| DMG | 33.750 | 118.083 | 3/11/1933 | 3 5 0.0 | 7.3 | 4.20 | 0.041 | V | 11 [ 18] |
| DMG | 33.750 | 118.083 | 3/11/1933 | 3 9 0.0 | 7.3 | 4.40 | 0.048 | VI | 11 [ 18] |
| DMG | 33.750 | 118.083 | 3/11/1933 | 311 0.0 | 7.3 | 4.20 | 0.041 | V | 11 [ 18] |
| DMG | 33.750 | 118.083 | 3/11/1933 | 323 0.0 | 7.3 | 5.00 | 0.072 | VII | 11 [ 18] |
| DMG | 33.750 | 118.083 | 3/11/1933 | 336 0.0 | 7.3 | 4.00 | 0.036 | V | 11 [ 18] |
| DMG | 33.750 | 118.083 | 3/11/1933 | 339 0.0 | 7.3 | 4.00 | 0.036 | V | 11 [ 18] |
| DMG | 33.750 | 118.083 | 3/11/1933 | 347 0.0 | 7.3 | 4.10 | 0.039 | V | 11 [ 18] |
| DMG | 33.750 | 118.083 | 3/11/1933 | 436 0.0 | 7.3 | 4.60 | 0.055 | VI | 11 [ 18] |
| DMG | 33.750 | 118.083 | 3/11/1933 | 439 0.0 | 7.3 | 4.90 | 0.067 | VI | 11 [ 18] |
| DMG | 33.750 | 118.083 | 3/11/1933 | 440 0.0 | 7.3 | 4.70 | 0.059 | VI | 11 [ 18] |
| DMG | 33.700 | 118.067 | 3/11/1933 | 51022.0 | 7.1 | 5.10 | 0.105 | VII | 8 [ 13] |
| DMG | 33.750 | 118.083 | 3/11/1933 | 513 0.0 | 7.3 | 4.70 | 0.059 | VI | 11 [ 18] |
| DMG | 33.750 | 118.083 | 3/11/1933 | 515 0.0 | 7.3 | 4.00 | 0.036 | V | 11 [ 18] |
| DMG | 33.575 | 117.983 | 3/11/1933 | 518 4.0 | 6.8 | 5.20 | 0.176 | VIII | 4 [ 7] |
| DMG | 33.750 | 118.083 | 3/11/1933 | 521 0.0 | 7.3 | 4.40 | 0.048 | VI | 11 [ 18] |
| DMG | 33.750 | 118.083 | 3/11/1933 | 524 0.0 | 7.3 | 4.20 | 0.041 | V | 11 [ 18] |
| DMG | 33.750 | 118.083 | 3/11/1933 | 553 0.0 | 7.3 | 4.00 | 0.036 | V | 11 [ 18] |
| DMG | 33.750 | 118.083 | 3/11/1933 | 555 0.0 | 7.3 | 4.00 | 0.036 | V | 11 [ 18] |
| DMG | 33.750 | 118.083 | 3/11/1933 | 611 0.0 | 7.3 | 4.40 | 0.048 | VI | 11 [ 18] |
| DMG | 33.750 | 118.083 | 3/11/1933 | 618 0.0 | 7.3 | 4.20 | 0.041 | V | 11 [ 18] |
| DMG | 33.850 | 118.267 | 3/11/1933 | 629 0.0 | 7.3 | 4.40 | 0.019 | IV | 24 [ 38] |
| DMG | 33.750 | 118.083 | 3/11/1933 | 635 0.0 | 7.3 | 4.20 | 0.041 | V | 11 [ 18] |
| DMG | 33.683 | 118.050 | 3/11/1933 | 658 3.0 | 5.8 | 5.50 | 0.171 | VIII | 7 [ 11] |
| DMG | 33.750 | 118.083 | 3/11/1933 | 751 0.0 | 7.3 | 4.20 | 0.041 | V | 11 [ 18] |
| DMG | 33.750 | 118.083 | 3/11/1933 | 759 0.0 | 7.3 | 4.10 | 0.039 | V | 11 [ 18] |
| DMG | 33.750 | 118.083 | 3/11/1933 | 8 8 0.0 | 7.3 | 4.50 | 0.051 | VI | 11 [ 18] |
| DMG | 33.750 | 118.083 | 3/11/1933 | 832 0.0 | 7.3 | 4.20 | 0.041 | V | 11 [ 18] |
| DMG | 33.750 | 118.083 | 3/11/1933 | 837 0.0 | 7.3 | 4.00 | 0.036 | V | 11 [ 18] |
| DMG | 33.700 | 118.067 | 3/11/1933 | 85457.0 | 7.1 | 5.10 | 0.105 | VII | 8 [ 13] |
| DMG | 33.750 | 118.083 | 3/11/1933 | 910 0.0 | 7.1 | 5.10 | 0.078 | VII | 11 [ 18] |
| DMG | 33.750 | 118.083 | 3/11/1933 | 911 0.0 | 7.3 | 4.40 | 0.048 | VI | 11 [ 18] |
| DMG | 33.750 | 118.083 | 3/11/1933 | 926 0.0 | 7.3 | 4.10 | 0.039 | V | 11 [ 18] |
| DMG | 33.750 | 118.083 | 3/11/1933 | 1025 0.0 | 7.3 | 4.00 | 0.036 | V | 11 [ 18] |
| DMG | 33.750 | 118.083 | 3/11/1933 | 1045 0.0 | 7.3 | 4.00 | 0.036 | V | 11 [ 18] |
| DMG | 33.750 | 118.083 | 3/11/1933 | 11 0 0.0 | 7.3 | 4.00 | 0.036 | V | 11 [ 18] |
| DMG | 33.750 | 118.133 | 3/11/1933 | 11 4 0.0 | 7.3 | 4.60 | 0.045 | VI | 13 [ 21] |
| DMG | 33.750 | 118.083 | 3/11/1933 | 1129 0.0 | 7.3 | 4.00 | 0.036 | V | 11 [ 18] |
| DMG | 33.750 | 118.083 | 3/11/1933 | 1138 0.0 | 7.3 | 4.00 | 0.036 | V | 11 [ 18] |
| DMG | 33.750 | 118.083 | 3/11/1933 | 1141 0.0 | 7.3 | 4.20 | 0.041 | V | 11 [ 18] |
| DMG | 33.750 | 118.083 | 3/11/1933 | 1147 0.0 | 7.3 | 4.40 | 0.048 | VI | 11 [ 18] |
| DMG | 33.683 | 118.050 | 3/11/1933 | 1250 0.0 | 7.3 | 4.40 | 0.075 | VII | 7 [ 11] |
| DMG | 33.733 | 118.100 | 3/11/1933 | 1350 0.0 | 7.3 | 4.40 | 0.048 | VI | 11 [ 18] |
| DMG | 33.750 | 118.083 | 3/11/1933 | 1357 0.0 | 7.3 | 4.00 | 0.036 | V | 11 [ 18] |
| DMG | 33.850 | 118.267 | 3/11/1933 | 1425 0.0 | 7.3 | 5.00 | 0.030 | V | 24 [ 38] |
| DMG | 33.733 | 118.100 | 3/11/1933 | 1447 0.0 | 7.3 | 4.40 | 0.048 | VI | 11 [ 18] |
| DMG | 33.883 | 118.317 | 3/11/1933 | 1457 0.0 | 7.3 | 4.90 | 0.023 | IV | 27 [ 44] |
| DMG | 33.733 | 118.100 | 3/11/1933 | 15 9 0.0 | 7.3 | 4.40 | 0.048 | VI | 11 [ 18] |
| DMG | 33.750 | 118.083 | 3/11/1933 | 1547 0.0 | 7.3 | 4.00 | 0.036 | V | 11 [ 18] |
| DMG | 33.750 | 118.083 | 3/11/1933 | 1653 0.0 | 7.3 | 4.80 | 0.063 | VI | 11 [ 18] |
| DMG | 33.750 | 118.083 | 3/11/1933 | 1944 0.0 | 7.3 | 4.00 | 0.036 | V | 11 [ 18] |
| DMG | 33.750 | 118.083 | 3/11/1933 | 1956 0.0 | 7.3 | 4.20 | 0.041 | V | 11 [ 18] |
| DMG | 33.750 | 118.083 | 3/11/1933 | 22 0 0.0 | 7.3 | 4.40 | 0.048 | VI | 11 [ 18] |
| DMG | 33.750 | 118.083 | 3/11/1933 | 2231 0.0 | 7.3 | 4.40 | 0.048 | VI | 11 [ 18] |
| DMG | 33.750 | 118.083 | 3/11/1933 | 2232 0.0 | 7.3 | 4.10 | 0.039 | V | 11 [ 18] |
| DMG | 33.750 | 118.083 | 3/11/1933 | 2240 0.0 | 7.3 | 4.40 | 0.048 | VI | 11 [ 18] |
| DMG | 33.750 | 118.083 | 3/11/1933 | 23 5 0.0 | 7.3 | 4.20 | 0.041 | V | 11 [ 18] |

| FILE CODE | LAT. NORTH | LONG. WEST | DATE | TIME (GMT) H M Sec | DEPTH (km) | QUAKE MAG. | SITE ACC. g | SITE MM INT. | APPROX. DISTANCE mi [km] |
|---|---|---|---|---|---|---|---|---|---|
| DMG | 33.750 | 118.083 | 3/12/1933 | 027 0.0 | 7.3 | 4.40 | 0.048 | VI | 11 [ 18] |
| DMG | 33.750 | 118.083 | 3/12/1933 | 034 0.0 | 7.3 | 4.00 | 0.036 | V | 11 [ 18] |
| DMG | 33.750 | 118.083 | 3/12/1933 | 448 0.0 | 7.3 | 4.00 | 0.036 | V | 11 [ 18] |
| DMG | 33.750 | 118.083 | 3/12/1933 | 546 0.0 | 7.3 | 4.40 | 0.048 | VI | 11 [ 18] |
| DMG | 33.750 | 118.083 | 3/12/1933 | 6 1 0.0 | 7.3 | 4.20 | 0.041 | V | 11 [ 18] |
| DMG | 33.750 | 118.083 | 3/12/1933 | 616 0.0 | 7.3 | 4.60 | 0.055 | VI | 11 [ 18] |
| DMG | 33.750 | 118.083 | 3/12/1933 | 740 0.0 | 7.3 | 4.20 | 0.041 | V | 11 [ 18] |
| DMG | 33.750 | 118.083 | 3/12/1933 | 835 0.0 | 7.3 | 4.20 | 0.041 | V | 11 [ 18] |
| DMG | 33.750 | 118.083 | 3/12/1933 | 15 2 0.0 | 7.3 | 4.20 | 0.041 | V | 11 [ 18] |
| DMG | 33.750 | 118.083 | 3/12/1933 | 1651 0.0 | 7.3 | 4.00 | 0.036 | V | 11 [ 18] |
| DMG | 33.750 | 118.083 | 3/12/1933 | 1738 0.0 | 7.3 | 4.50 | 0.051 | VI | 11 [ 18] |
| DMG | 33.750 | 118.083 | 3/12/1933 | 1825 0.0 | 7.3 | 4.10 | 0.039 | V | 11 [ 18] |
| DMG | 33.750 | 118.083 | 3/12/1933 | 2128 0.0 | 7.3 | 4.10 | 0.039 | V | 11 [ 18] |
| DMG | 33.750 | 118.083 | 3/12/1933 | 2354 0.0 | 7.3 | 4.50 | 0.051 | VI | 11 [ 18] |
| DMG | 33.750 | 118.083 | 3/13/1933 | 343 0.0 | 7.3 | 4.10 | 0.039 | V | 11 [ 18] |
| DMG | 33.750 | 118.083 | 3/13/1933 | 432 0.0 | 7.3 | 4.70 | 0.059 | VI | 11 [ 18] |
| DMG | 33.750 | 118.083 | 3/13/1933 | 617 0.0 | 7.3 | 4.00 | 0.036 | V | 11 [ 18] |
| DMG | 33.750 | 118.083 | 3/13/1933 | 131828.0 | 6.5 | 5.30 | 0.091 | VII | 11 [ 18] |
| DMG | 33.750 | 118.083 | 3/13/1933 | 1532 0.0 | 7.3 | 4.10 | 0.039 | V | 11 [ 18] |
| DMG | 33.750 | 118.083 | 3/13/1933 | 1929 0.0 | 7.3 | 4.20 | 0.041 | V | 11 [ 18] |
| DMG | 33.750 | 118.083 | 3/14/1933 | 036 0.0 | 7.3 | 4.20 | 0.041 | V | 11 [ 18] |
| DMG | 33.750 | 118.083 | 3/14/1933 | 1219 0.0 | 7.3 | 4.50 | 0.051 | VI | 11 [ 18] |
| DMG | 33.617 | 118.017 | 3/14/1933 | 19 150.0 | 7.1 | 5.10 | 0.170 | VIII | 4 [ 6] |
| DMG | 33.750 | 118.083 | 3/14/1933 | 2242 0.0 | 7.3 | 4.10 | 0.039 | V | 11 [ 18] |
| DMG | 33.750 | 118.083 | 3/15/1933 | 2 8 0.0 | 7.3 | 4.10 | 0.039 | V | 11 [ 18] |
| DMG | 33.750 | 118.083 | 3/15/1933 | 432 0.0 | 7.3 | 4.10 | 0.039 | V | 11 [ 18] |
| DMG | 33.750 | 118.083 | 3/15/1933 | 540 0.0 | 7.3 | 4.20 | 0.041 | V | 11 [ 18] |
| DMG | 33.617 | 118.017 | 3/15/1933 | 111332.0 | 7.3 | 4.90 | 0.146 | VIII | 4 [ 6] |
| DMG | 33.750 | 118.083 | 3/16/1933 | 1456 0.0 | 7.3 | 4.00 | 0.036 | V | 11 [ 18] |
| DMG | 33.750 | 118.083 | 3/16/1933 | 1529 0.0 | 7.3 | 4.20 | 0.041 | V | 11 [ 18] |
| DMG | 33.750 | 118.083 | 3/16/1933 | 1530 0.0 | 7.3 | 4.10 | 0.039 | V | 11 [ 18] |
| DMG | 33.750 | 118.083 | 3/17/1933 | 1651 0.0 | 7.3 | 4.10 | 0.039 | V | 11 [ 18] |
| DMG | 33.750 | 118.083 | 3/18/1933 | 2052 0.0 | 7.3 | 4.20 | 0.041 | V | 11 [ 18] |
| DMG | 33.750 | 118.083 | 3/19/1933 | 2123 0.0 | 7.3 | 4.20 | 0.041 | V | 11 [ 18] |
| DMG | 33.750 | 118.083 | 3/20/1933 | 1358 0.0 | 7.3 | 4.10 | 0.039 | V | 11 [ 18] |
| DMG | 33.750 | 118.083 | 3/21/1933 | 326 0.0 | 7.3 | 4.10 | 0.039 | V | 11 [ 18] |
| DMG | 33.750 | 118.083 | 3/23/1933 | 840 0.0 | 7.3 | 4.10 | 0.039 | V | 11 [ 18] |
| DMG | 33.750 | 118.083 | 3/23/1933 | 1831 0.0 | 7.3 | 4.10 | 0.039 | V | 11 [ 18] |
| DMG | 33.750 | 118.083 | 3/25/1933 | 1346 0.0 | 7.3 | 4.10 | 0.039 | V | 11 [ 18] |
| DMG | 33.750 | 118.083 | 3/30/1933 | 1225 0.0 | 7.3 | 4.40 | 0.048 | VI | 11 [ 18] |
| DMG | 33.750 | 118.083 | 3/31/1933 | 1049 0.0 | 7.3 | 4.10 | 0.039 | V | 11 [ 18] |
| DMG | 33.750 | 118.083 | 4/ 1/1933 | 642 0.0 | 7.3 | 4.20 | 0.041 | V | 11 [ 18] |
| DMG | 33.750 | 118.083 | 4/ 2/1933 | 8 0 0.0 | 7.3 | 4.00 | 0.036 | V | 11 [ 18] |
| DMG | 33.750 | 118.083 | 4/ 2/1933 | 1536 0.0 | 7.3 | 4.00 | 0.036 | V | 11 [ 18] |
| DMG | 33.750 | 118.167 | 5/16/1933 | 205855.0 | 7.3 | 4.00 | 0.026 | V | 15 [ 24] |
| DMG | 33.750 | 118.183 | 8/ 4/1933 | 41748.0 | 7.3 | 4.00 | 0.025 | V | 16 [ 25] |
| DMG | 33.783 | 118.133 | 10/ 2/1933 | 91017.6 | 6.2 | 5.40 | 0.072 | VI | 15 [ 24] |
| DMG | 33.617 | 118.017 | 10/ 2/1933 | 1326 1.0 | 7.3 | 4.00 | 0.079 | VII | 4 [ 6] |
| DMG | 33.950 | 118.133 | 10/25/1933 | 7 046.0 | 7.3 | 4.30 | 0.017 | IV | 24 [ 39] |
| DMG | 33.867 | 118.200 | 11/13/1933 | 2128 0.0 | 7.3 | 4.00 | 0.016 | IV | 22 [ 35] |
| DMG | 33.783 | 118.133 | 11/20/1933 | 1032 0.0 | 7.3 | 4.00 | 0.026 | V | 15 [ 24] |
| DMG | 34.100 | 117.683 | 1/ 9/1934 | 1410 0.0 | 7.3 | 4.50 | 0.011 | III | 36 [ 57] |
| DMG | 34.100 | 117.683 | 1/18/1934 | 214 0.0 | 7.3 | 4.00 | 0.008 | II | 36 [ 57] |
| DMG | 33.617 | 118.117 | 1/20/1934 | 2117 0.0 | 7.3 | 4.50 | 0.059 | VI | 10 [ 16] |
| DMG | 33.567 | 117.983 | 4/17/1934 | 1833 0.0 | 7.3 | 4.00 | 0.070 | VI | 5 [ 8] |
| DMG | 33.633 | 118.400 | 10/17/1934 | 938 0.0 | 7.3 | 4.00 | 0.013 | III | 26 [ 42] |
| DMG | 33.750 | 118.000 | 11/16/1934 | 2126 0.0 | 7.3 | 4.00 | 0.046 | VI | 9 [ 14] |
| DMG | 33.267 | 117.017 | 6/ 7/1935 | 1633 0.0 | 7.3 | 4.00 | 0.003 | I | 59 [ 96] |

| FILE CODE | LAT. NORTH | LONG. WEST | DATE | TIME (GMT) H M Sec | DEPTH (km) | QUAKE MAG. | SITE ACC. g | SITE MM INT. | APPROX. DISTANCE mi | [km] |
|---|---|---|---|---|---|---|---|---|---|---|
| DMG | 33.717 | 117.517 | 6/19/1935 | 1117 0.0 | 7.3 | 4.00 | 0.013 | III | 26 | [ 41] |
| DMG | 34.200 | 117.900 | 7/13/1935 | 105416.5 | 7.3 | 4.70 | 0.011 | III | 39 | [ 63] |
| DMG | 34.033 | 117.317 | 9/ 3/1935 | 647 0.0 | 7.3 | 4.50 | 0.008 | II | 46 | [ 73] |
| DMG | 33.500 | 116.917 | 11/ 4/1935 | 355 0.0 | 7.3 | 4.50 | 0.004 | I | 60 | [ 97] |
| DMG | 33.600 | 118.017 | 12/25/1935 | 1715 0.0 | 7.3 | 4.50 | 0.105 | VII | 4 | [ 7] |
| DMG | 34.127 | 117.338 | 2/23/1936 | 222042.7 | 7.3 | 4.50 | 0.007 | II | 49 | [ 79] |
| DMG | 34.140 | 117.339 | 2/26/1936 | 93327.6 | 7.3 | 4.00 | 0.004 | I | 50 | [ 80] |
| DMG | 33.454 | 116.898 | 7/29/1936 | 142252.8 | 7.3 | 4.00 | 0.003 | I | 62 | [ 99] |
| DMG | 33.767 | 117.817 | 8/22/1936 | 521 0.0 | 7.3 | 4.00 | 0.033 | V | 12 | [ 19] |
| DMG | 33.561 | 118.058 | 1/15/1937 | 183547.0 | 7.3 | 4.00 | 0.049 | VI | 8 | [ 13] |
| DMG | 34.112 | 117.426 | 3/19/1937 | 12338.4 | 7.3 | 4.00 | 0.005 | II | 45 | [ 72] |
| DMG | 33.567 | 117.983 | 7/ 7/1937 | 1112 0.0 | 7.3 | 4.00 | 0.070 | VI | 5 | [ 8] |
| DMG | 34.211 | 117.530 | 9/ 1/1937 | 1348 8.2 | 7.3 | 4.50 | 0.007 | II | 47 | [ 75] |
| DMG | 34.183 | 117.548 | 9/ 1/1937 | 163533.5 | 7.3 | 4.50 | 0.008 | II | 44 | [ 71] |
| DMG | 33.038 | 118.734 | 9/13/1937 | 221439.5 | 7.3 | 4.00 | 0.003 | I | 61 | [ 98] |
| DMG | 33.617 | 118.033 | 5/21/1938 | 944 0.0 | 7.3 | 4.00 | 0.071 | VI | 5 | [ 8] |
| DMG | 33.699 | 117.511 | 5/31/1938 | 83455.4 | 5.8 | 5.50 | 0.039 | V | 26 | [ 41] |
| DMG | 33.456 | 116.896 | 6/16/1938 | 55916.9 | 7.3 | 4.00 | 0.003 | I | 62 | [ 100] |
| DMG | 33.682 | 117.553 | 7/ 5/1938 | 18 655.7 | 7.3 | 4.50 | 0.021 | IV | 23 | [ 37] |
| DMG | 33.717 | 117.507 | 8/ 6/1938 | 22 056.0 | 7.3 | 4.00 | 0.013 | III | 26 | [ 42] |
| DMG | 33.759 | 118.253 | 8/31/1938 | 31814.2 | 7.3 | 4.50 | 0.027 | V | 19 | [ 31] |
| DMG | 33.903 | 118.431 | 11/29/1938 | 192115.8 | 7.3 | 4.00 | 0.009 | III | 33 | [ 54] |
| DMG | 34.000 | 118.417 | 12/ 7/1938 | 338 0.0 | 7.3 | 4.00 | 0.007 | II | 37 | [ 59] |
| DMG | 34.127 | 117.521 | 12/27/1938 | 10 928.6 | 7.3 | 4.00 | 0.006 | II | 42 | [ 68] |
| DMG | 34.043 | 117.228 | 4/ 3/1939 | 25044.7 | 7.3 | 4.00 | 0.004 | I | 50 | [ 81] |
| DMG | 33.767 | 118.117 | 11/ 4/1939 | 2141 0.0 | 7.3 | 4.00 | 0.030 | V | 13 | [ 21] |
| DMG | 34.000 | 117.283 | 11/ 7/1939 | 1852 8.4 | 7.3 | 4.70 | 0.009 | III | 46 | [ 74] |
| DMG | 33.783 | 118.200 | 12/27/1939 | 192849.0 | 7.3 | 4.70 | 0.035 | V | 18 | [ 28] |
| DMG | 33.783 | 118.133 | 1/13/1940 | 749 7.0 | 7.3 | 4.00 | 0.026 | V | 15 | [ 24] |
| DMG | 33.700 | 118.067 | 2/ 8/1940 | 165617.0 | 7.3 | 4.00 | 0.048 | VI | 8 | [ 13] |
| DMG | 33.983 | 118.300 | 2/11/1940 | 192410.0 | 7.3 | 4.00 | 0.010 | III | 31 | [ 51] |
| DMG | 34.017 | 117.050 | 2/19/1940 | 12 655.7 | 7.3 | 4.60 | 0.005 | II | 58 | [ 93] |
| DMG | 34.033 | 117.350 | 4/18/1940 | 184343.9 | 7.3 | 4.40 | 0.007 | II | 44 | [ 71] |
| DMG | 33.833 | 117.400 | 6/ 5/1940 | 82727.0 | 7.3 | 4.00 | 0.008 | III | 34 | [ 55] |
| DMG | 33.700 | 118.067 | 7/20/1940 | 4 113.0 | 7.3 | 4.00 | 0.048 | VI | 8 | [ 13] |
| DMG | 33.767 | 118.450 | 10/11/1940 | 55712.3 | 7.3 | 4.70 | 0.017 | IV | 30 | [ 49] |
| DMG | 33.783 | 118.417 | 10/12/1940 | 024 0.0 | 7.3 | 4.00 | 0.011 | III | 29 | [ 46] |
| DMG | 33.783 | 118.417 | 10/14/1940 | 205111.0 | 7.3 | 4.00 | 0.011 | III | 29 | [ 46] |
| DMG | 33.783 | 118.417 | 11/ 1/1940 | 725 3.0 | 7.3 | 4.00 | 0.011 | III | 29 | [ 46] |
| DMG | 33.633 | 118.200 | 11/ 1/1940 | 20 046.0 | 7.3 | 4.00 | 0.027 | V | 14 | [ 23] |
| DMG | 33.783 | 118.417 | 11/ 2/1940 | 25826.0 | 7.3 | 4.00 | 0.011 | III | 29 | [ 46] |
| DMG | 33.967 | 118.050 | 1/30/1941 | 13446.9 | 7.3 | 4.10 | 0.015 | IV | 24 | [ 38] |
| DMG | 33.517 | 118.100 | 3/22/1941 | 82240.0 | 7.3 | 4.00 | 0.034 | V | 12 | [ 19] |
| DMG | 34.217 | 117.467 | 3/25/1941 | 234341.0 | 7.3 | 4.00 | 0.005 | II | 49 | [ 79] |
| DMG | 33.950 | 117.583 | 4/11/1941 | 12024.0 | 7.3 | 4.00 | 0.010 | III | 30 | [ 49] |
| DMG | 33.817 | 118.217 | 10/22/1941 | 65718.5 | 7.3 | 4.90 | 0.035 | V | 20 | [ 32] |
| DMG | 33.783 | 118.250 | 11/14/1941 | 84136.3 | 6.2 | 5.40 | 0.049 | VI | 20 | [ 32] |
| DMG | 32.800 | 117.833 | 1/24/1942 | 214148.0 | 7.3 | 4.00 | 0.003 | I | 58 | [ 93] |
| DMG | 33.367 | 118.150 | 4/16/1942 | 72833.0 | 7.3 | 4.00 | 0.016 | IV | 22 | [ 35] |
| DMG | 32.850 | 117.483 | 2/23/1943 | 92112.0 | 7.3 | 4.00 | 0.003 | I | 60 | [ 97] |
| DMG | 33.933 | 117.367 | 10/24/1943 | 02921.0 | 7.3 | 4.00 | 0.007 | II | 39 | [ 63] |
| DMG | 33.867 | 118.217 | 6/19/1944 | 0 333.0 | 7.3 | 4.50 | 0.023 | IV | 22 | [ 36] |
| DMG | 33.867 | 118.217 | 6/19/1944 | 3 6 7.0 | 7.3 | 4.40 | 0.021 | IV | 22 | [ 36] |
| DMG | 34.400 | 117.800 | 2/24/1946 | 6 752.0 | 7.3 | 4.10 | 0.004 | I | 54 | [ 86] |
| DMG | 34.167 | 117.533 | 3/ 1/1948 | 81213.0 | 7.3 | 4.70 | 0.009 | III | 44 | [ 71] |
| DMG | 34.183 | 117.583 | 10/ 3/1948 | 24628.0 | 7.3 | 4.00 | 0.006 | II | 43 | [ 70] |
| DMG | 33.939 | 118.205 | 1/11/1950 | 214135.0 | 7.3 | 4.10 | 0.014 | IV | 26 | [ 41] |
| DMG | 34.118 | 117.341 | 9/22/1951 | 82239.1 | 7.3 | 4.30 | 0.006 | II | 48 | [ 78] |

| FILE CODE | LAT. NORTH | LONG. WEST | DATE | TIME (GMT) H M Sec | DEPTH (km) | QUAKE MAG. | SITE ACC. g | SITE MM INT. | APPROX. DISTANCE mi | [km] |
|---|---|---|---|---|---|---|---|---|---|---|
| DMG | 32.817 | 118.350 | 12/26/1951 | 04654.0 | 4.0 | 5.90 | 0.013 | III | 61 | [ 98] |
| DMG | 32.867 | 118.250 | 2/13/1952 | 151337.0 | 7.3 | 4.70 | 0.006 | II | 56 | [ 90] |
| DMG | 33.996 | 117.270 | 2/17/1952 | 123658.3 | 7.3 | 4.50 | 0.007 | II | 46 | [ 75] |
| DMG | 33.733 | 117.467 | 10/26/1954 | 162226.0 | 7.3 | 4.10 | 0.012 | III | 29 | [ 46] |
| DMG | 34.124 | 117.480 | 5/15/1955 | 17 326.0 | 7.3 | 4.00 | 0.006 | II | 43 | [ 70] |
| DMG | 33.725 | 117.498 | 1/ 3/1956 | 02548.9 | 7.3 | 4.70 | 0.020 | IV | 27 | [ 43] |
| DMG | 34.116 | 117.475 | 6/28/1960 | 20 048.0 | 7.3 | 4.10 | 0.006 | II | 43 | [ 69] |
| DMG | 33.854 | 117.752 | 10/ 4/1961 | 22131.6 | 7.3 | 4.10 | 0.021 | IV | 19 | [ 31] |
| DMG | 33.654 | 117.994 | 10/20/1961 | 194950.5 | 7.3 | 4.30 | 0.110 | VII | 3 | [ 5] |
| DMG | 33.659 | 117.981 | 10/20/1961 | 20 714.5 | 7.3 | 4.00 | 0.093 | VII | 3 | [ 4] |
| DMG | 33.665 | 117.979 | 10/20/1961 | 214240.7 | 7.3 | 4.00 | 0.091 | VII | 3 | [ 4] |
| DMG | 33.671 | 118.012 | 10/20/1961 | 223534.2 | 7.3 | 4.10 | 0.081 | VII | 4 | [ 7] |
| DMG | 33.680 | 117.993 | 11/20/1961 | 85334.7 | 7.3 | 4.00 | 0.078 | VII | 4 | [ 7] |
| DMG | 33.738 | 117.187 | 4/27/1962 | 91232.1 | 7.3 | 4.10 | 0.006 | II | 44 | [ 72] |
| DMG | 33.543 | 118.340 | 9/14/1963 | 35116.2 | 7.3 | 4.20 | 0.017 | IV | 23 | [ 37] |
| DMG | 33.710 | 116.925 | 9/23/1963 | 144152.6 | 7.3 | 5.00 | 0.007 | II | 59 | [ 95] |
| DMG | 34.268 | 118.445 | 8/30/1964 | 225737.1 | 7.3 | 4.00 | 0.004 | I | 52 | [ 84] |
| DMG | 34.140 | 117.515 | 1/ 1/1965 | 8 418.0 | 7.3 | 4.40 | 0.008 | II | 43 | [ 69] |
| DMG | 34.132 | 117.426 | 4/15/1965 | 20 833.3 | 7.3 | 4.50 | 0.008 | II | 46 | [ 74] |
| DMG | 33.632 | 118.467 | 1/ 8/1967 | 73730.4 | 7.3 | 4.00 | 0.010 | III | 30 | [ 48] |
| DMG | 33.663 | 118.413 | 1/ 8/1967 | 738 5.3 | 7.3 | 4.00 | 0.012 | III | 27 | [ 43] |
| DMG | 33.996 | 117.975 | 6/15/1967 | 458 5.5 | 7.3 | 4.10 | 0.014 | IV | 25 | [ 40] |
| DMG | 34.304 | 117.570 | 5/ 5/1969 | 16 2 9.6 | 7.3 | 4.40 | 0.006 | II | 51 | [ 82] |
| DMG | 33.545 | 117.807 | 10/27/1969 | 1316 2.3 | 7.3 | 4.50 | 0.055 | VI | 10 | [ 16] |
| DMG | 34.267 | 117.518 | 9/12/1970 | 141011.2 | 7.3 | 4.10 | 0.005 | II | 50 | [ 81] |
| DMG | 34.270 | 117.540 | 9/12/1970 | 143053.0 | 6.2 | 5.40 | 0.013 | III | 50 | [ 80] |
| DMG | 34.281 | 117.552 | 9/13/1970 | 44748.6 | 7.3 | 4.40 | 0.006 | II | 50 | [ 81] |
| DMG | 34.411 | 118.401 | 2/ 9/1971 | 14 041.8 | 3.0 | 6.40 | 0.020 | IV | 60 | [ 96] |
| DMG | 34.411 | 118.401 | 2/ 9/1971 | 14 1 8.0 | 4.5 | 5.80 | 0.013 | III | 60 | [ 96] |
| DMG | 34.411 | 118.401 | 2/ 9/1971 | 14 133.0 | 7.3 | 4.20 | 0.004 | I | 60 | [ 96] |
| DMG | 34.411 | 118.401 | 2/ 9/1971 | 14 140.0 | 7.3 | 4.10 | 0.003 | I | 60 | [ 96] |
| DMG | 34.411 | 118.401 | 2/ 9/1971 | 14 150.0 | 7.3 | 4.50 | 0.005 | II | 60 | [ 96] |
| DMG | 34.411 | 118.401 | 2/ 9/1971 | 14 154.0 | 7.3 | 4.20 | 0.004 | I | 60 | [ 96] |
| DMG | 34.411 | 118.401 | 2/ 9/1971 | 14 159.0 | 7.3 | 4.10 | 0.003 | I | 60 | [ 96] |
| DMG | 34.411 | 118.401 | 2/ 9/1971 | 14 2 3.0 | 7.3 | 4.10 | 0.003 | I | 60 | [ 96] |
| DMG | 34.411 | 118.401 | 2/ 9/1971 | 14 230.0 | 7.3 | 4.30 | 0.004 | I | 60 | [ 96] |
| DMG | 34.411 | 118.401 | 2/ 9/1971 | 14 231.0 | 7.3 | 4.70 | 0.005 | II | 60 | [ 96] |
| DMG | 34.411 | 118.401 | 2/ 9/1971 | 14 244.0 | 4.5 | 5.80 | 0.013 | III | 60 | [ 96] |
| DMG | 34.411 | 118.401 | 2/ 9/1971 | 14 325.0 | 7.3 | 4.40 | 0.004 | I | 60 | [ 96] |
| DMG | 34.411 | 118.401 | 2/ 9/1971 | 14 346.0 | 7.3 | 4.10 | 0.003 | I | 60 | [ 96] |
| DMG | 34.411 | 118.401 | 2/ 9/1971 | 14 4 7.0 | 7.3 | 4.10 | 0.003 | I | 60 | [ 96] |
| DMG | 34.411 | 118.401 | 2/ 9/1971 | 14 434.0 | 7.3 | 4.20 | 0.004 | I | 60 | [ 96] |
| DMG | 34.411 | 118.401 | 2/ 9/1971 | 14 439.0 | 7.3 | 4.10 | 0.003 | I | 60 | [ 96] |
| DMG | 34.411 | 118.401 | 2/ 9/1971 | 14 444.0 | 7.3 | 4.10 | 0.003 | I | 60 | [ 96] |
| DMG | 34.411 | 118.401 | 2/ 9/1971 | 14 446.0 | 7.3 | 4.20 | 0.004 | I | 60 | [ 96] |
| DMG | 34.411 | 118.401 | 2/ 9/1971 | 14 541.0 | 7.3 | 4.10 | 0.003 | I | 60 | [ 96] |
| DMG | 34.411 | 118.401 | 2/ 9/1971 | 14 550.0 | 7.3 | 4.10 | 0.003 | I | 60 | [ 96] |
| DMG | 34.411 | 118.401 | 2/ 9/1971 | 14 710.0 | 7.3 | 4.00 | 0.003 | I | 60 | [ 96] |
| DMG | 34.411 | 118.401 | 2/ 9/1971 | 14 730.0 | 7.3 | 4.00 | 0.003 | I | 60 | [ 96] |
| DMG | 34.411 | 118.401 | 2/ 9/1971 | 14 745.0 | 7.3 | 4.50 | 0.005 | II | 60 | [ 96] |
| DMG | 34.411 | 118.401 | 2/ 9/1971 | 14 8 4.0 | 7.3 | 4.00 | 0.003 | I | 60 | [ 96] |
| DMG | 34.411 | 118.401 | 2/ 9/1971 | 14 8 7.0 | 7.3 | 4.20 | 0.004 | I | 60 | [ 96] |
| DMG | 34.411 | 118.401 | 2/ 9/1971 | 14 838.0 | 7.3 | 4.50 | 0.005 | II | 60 | [ 96] |
| DMG | 34.411 | 118.401 | 2/ 9/1971 | 14 853.0 | 7.3 | 4.60 | 0.005 | II | 60 | [ 96] |
| DMG | 34.361 | 118.306 | 2/ 9/1971 | 141021.5 | 7.3 | 4.70 | 0.006 | II | 54 | [ 87] |
| DMG | 34.411 | 118.401 | 2/ 9/1971 | 141028.0 | 6.5 | 5.30 | 0.009 | III | 60 | [ 96] |
| DMG | 34.339 | 118.332 | 2/ 9/1971 | 141612.9 | 7.3 | 4.10 | 0.004 | I | 53 | [ 86] |
| DMG | 34.357 | 118.406 | 2/ 9/1971 | 141950.2 | 7.3 | 4.00 | 0.003 | I | 56 | [ 91] |

| FILE CODE | LAT. NORTH | LONG. WEST | DATE | TIME (GMT) H M Sec | DEPTH (km) | QUAKE MAG. | SITE ACC. g | SITE MM INT. | APPROX. DISTANCE mi (km) |
|---|---|---|---|---|---|---|---|---|---|
| DMG | 34.387 | 118.364 | 2/ 9/1971 | 143917.8 | 7.3 | 4.00 | 0.003 | I | 57 ( 92) |
| DMG | 34.433 | 118.398 | 2/ 9/1971 | 144017.4 | 7.3 | 4.10 | 0.003 | I | 61 ( 98) |
| DMG | 34.308 | 118.454 | 2/ 9/1971 | 144346.7 | 6.8 | 5.20 | 0.009 | III | 55 ( 88) |
| DMG | 34.335 | 118.331 | 2/ 9/1971 | 155820.7 | 7.3 | 4.80 | 0.007 | II | 53 ( 86) |
| DMG | 34.370 | 118.302 | 2/10/1971 | 31212.0 | 7.3 | 4.00 | 0.004 | I | 55 ( 88) |
| DMG | 34.411 | 118.329 | 2/10/1971 | 5 636.0 | 7.3 | 4.30 | 0.004 | I | 58 ( 93) |
| DMG | 34.426 | 118.414 | 2/10/1971 | 518 7.2 | 7.3 | 4.50 | 0.004 | I | 61 ( 98) |
| DMG | 34.384 | 118.455 | 2/10/1971 | 113134.6 | 7.3 | 4.20 | 0.004 | I | 59 ( 96) |
| DMG | 34.399 | 118.419 | 2/10/1971 | 134953.7 | 7.3 | 4.30 | 0.004 | I | 59 ( 95) |
| DMG | 34.361 | 118.487 | 2/10/1971 | 143526.7 | 7.3 | 4.20 | 0.004 | I | 59 ( 95) |
| DMG | 34.396 | 118.366 | 2/10/1971 | 173855.1 | 7.3 | 4.20 | 0.004 | I | 58 ( 93) |
| DMG | 34.397 | 118.439 | 2/21/1971 | 55052.6 | 7.3 | 4.70 | 0.005 | II | 60 ( 96) |
| DMG | 34.392 | 118.427 | 2/21/1971 | 71511.7 | 7.3 | 4.50 | 0.005 | II | 59 ( 95) |
| DMG | 34.353 | 118.456 | 3/ 7/1971 | 13340.5 | 7.3 | 4.50 | 0.005 | II | 58 ( 93) |
| DMG | 34.356 | 118.474 | 3/25/1971 | 2254 9.9 | 7.3 | 4.20 | 0.004 | I | 58 ( 94) |
| DMG | 34.296 | 118.464 | 3/30/1971 | 85443.3 | 7.3 | 4.10 | 0.004 | I | 54 ( 88) |
| DMG | 34.286 | 118.515 | 3/31/1971 | 145222.5 | 7.3 | 4.60 | 0.006 | II | 55 ( 89) |
| DMG | 34.428 | 118.413 | 4/ 1/1971 | 15 3 3.6 | 7.3 | 4.10 | 0.003 | I | 61 ( 98) |
| DMG | 34.284 | 118.528 | 4/ 2/1971 | 54025.0 | 7.3 | 4.00 | 0.004 | I | 56 ( 90) |
| DMG | 34.265 | 118.577 | 4/15/1971 | 111432.0 | 7.3 | 4.20 | 0.004 | I | 56 ( 91) |
| DMG | 34.368 | 118.314 | 4/25/1971 | 1448 6.5 | 7.3 | 4.00 | 0.004 | I | 55 ( 88) |
| DMG | 34.273 | 118.532 | 6/21/1971 | 16 1 8.5 | 7.3 | 4.00 | 0.004 | I | 55 ( 89) |
| DMG | 33.748 | 117.479 | 6/22/1971 | 104119.0 | 7.3 | 4.20 | 0.013 | III | 28 ( 45) |
| DMG | 34.399 | 118.473 | 3/ 9/1974 | 05431.9 | 7.3 | 4.70 | 0.005 | II | 61 ( 98) |
| DMG | 34.431 | 118.369 | 8/14/1974 | 144555.2 | 7.3 | 4.20 | 0.004 | I | 60 ( 97) |
| PAS | 32.756 | 117.988 | 1/12/1975 | 212214.8 | 7.3 | 4.80 | 0.006 | II | 61 ( 98) |
| PAS | 33.965 | 117.886 | 1/ 1/1976 | 172012.9 | 7.3 | 4.20 | 0.017 | IV | 23 ( 37) |
| PAS | 32.759 | 117.906 | 10/18/1976 | 172753.1 | 7.3 | 4.20 | 0.004 | I | 60 ( 97) |
| PAS | 34.380 | 118.459 | 8/12/1977 | 21926.1 | 7.3 | 4.50 | 0.005 | II | 59 ( 95) |
| PAS | 33.944 | 118.681 | 1/ 1/1979 | 231438.9 | 7.3 | 5.00 | 0.010 | III | 47 ( 76) |
| PAS | 33.933 | 118.669 | 10/17/1979 | 205237.3 | 7.3 | 4.20 | 0.006 | II | 46 ( 74) |
| PAS | 34.211 | 117.530 | 10/19/1979 | 122237.8 | 7.3 | 4.10 | 0.005 | II | 47 ( 75) |
| PAS | 33.630 | 119.020 | 10/23/1981 | 172816.9 | 7.3 | 4.60 | 0.005 | II | 62 ( 99) |
| PAS | 33.538 | 118.207 | 5/25/1982 | 134430.3 | 7.3 | 4.10 | 0.025 | V | 16 ( 26) |
| PAS | 34.135 | 117.448 | 1/ 8/1983 | 71930.4 | 7.3 | 4.10 | 0.006 | II | 45 ( 72) |
| PAS | 33.033 | 117.944 | 2/22/1983 | 21830.4 | 7.3 | 4.30 | 0.008 | II | 41 ( 67) |
| PAS | 33.471 | 118.061 | 2/27/1984 | 101815.0 | 7.3 | 4.00 | 0.031 | V | 13 ( 21) |
| PAS | 32.945 | 117.806 | 9/ 7/1984 | 11 313.4 | 7.3 | 4.30 | 0.006 | II | 48 ( 78) |
| PAS | 34.023 | 117.245 | 10/ 2/1985 | 234412.4 | 7.3 | 4.80 | 0.008 | III | 49 ( 78) |
| PAS | 32.971 | 117.870 | 7/13/1986 | 1347 8.2 | 6.5 | 5.30 | 0.014 | III | 46 ( 74) |
| PAS | 32.990 | 117.849 | 7/13/1986 | 14 133.0 | 7.3 | 4.60 | 0.008 | III | 45 ( 72) |
| PAS | 32.970 | 117.803 | 7/14/1986 | 03246.2 | 7.3 | 4.00 | 0.005 | II | 47 ( 75) |
| USG | 33.017 | 117.817 | 7/14/1986 | 11112.6 | 7.3 | 4.12 | 0.006 | II | 43 ( 70) |
| USG | 33.017 | 117.817 | 7/16/1986 | 1247 3.7 | 7.3 | 4.11 | 0.006 | II | 43 ( 70) |
| PAS | 32.933 | 117.841 | 7/29/1986 | 81741.6 | 7.3 | 4.30 | 0.006 | II | 49 ( 78) |
| PAS | 32.945 | 117.831 | 7/29/1986 | 81741.8 | 7.3 | 4.10 | 0.005 | II | 48 ( 77) |
| PAS | 32.986 | 117.844 | 10/ 1/1986 | 201218.6 | 7.3 | 4.00 | 0.005 | II | 45 ( 73) |
| USG | 34.139 | 117.386 | 2/21/1987 | 231530.1 | 7.3 | 4.07 | 0.005 | II | 48 ( 77) |
| PAS | 34.061 | 118.079 | 10/ 1/1987 | 144220.0 | 4.0 | 5.90 | 0.041 | V | 30 ( 49) |
| PAS | 34.049 | 118.101 | 10/ 1/1987 | 144541.5 | 7.3 | 4.70 | 0.017 | IV | 30 ( 48) |
| PAS | 34.076 | 118.090 | 10/ 1/1987 | 1448 3.1 | 7.3 | 4.10 | 0.010 | III | 32 ( 51) |
| PAS | 34.060 | 118.100 | 10/ 1/1987 | 1449 5.9 | 7.3 | 4.70 | 0.017 | IV | 31 ( 49) |
| PAS | 34.052 | 118.090 | 10/ 1/1987 | 151231.8 | 7.3 | 4.70 | 0.017 | IV | 30 ( 48) |
| PAS | 34.050 | 118.087 | 10/ 1/1987 | 155953.5 | 7.3 | 4.00 | 0.010 | III | 30 ( 48) |
| PAS | 34.073 | 118.098 | 10/ 4/1987 | 105938.2 | 6.5 | 5.30 | 0.025 | V | 32 ( 51) |
| PAS | 34.077 | 118.047 | 2/11/1988 | 152555.7 | 7.3 | 4.70 | 0.016 | IV | 31 ( 50) |
| PAS | 34.136 | 117.709 | 6/26/1988 | 15 458.5 | 7.3 | 4.60 | 0.011 | III | 37 ( 60) |
| PAS | 33.508 | 118.071 | 11/20/1988 | 53928.7 | 7.3 | 4.50 | 0.051 | VI | 11 ( 18) |

| FILE CODE | LAT. NORTH | LONG. WEST | DATE | TIME (GMT) H M Sec | DEPTH (km) | QUAKE MAG. | SITE ACC. g | SITE MM INT. | APPROX. DISTANCE mi [km] |
|---|---|---|---|---|---|---|---|---|---|
| PAS | 34.149 | 118.135 | 12/ 3/1988 | 113826.4 | 7.3 | 4.90 | 0.014 | IV | 37 [ 60] |
| PAS | 32.947 | 117.736 | 1/15/1989 | 153955.2 | 7.3 | 4.20 | 0.005 | II | 49 [ 79] |
| PAS | 33.919 | 118.627 | 1/19/1989 | 65328.8 | 7.3 | 5.00 | 0.012 | III | 44 [ 70] |
| PAS | 34.006 | 117.739 | 2/18/1989 | 717 4.8 | 7.3 | 4.30 | 0.014 | IV | 28 [ 46] |
| GSP | 33.620 | 117.900 | 4/ 7/1989 | 200730.2 | 7.3 | 4.50 | 0.125 | VII | 3 [ 5] |
| GSP | 34.030 | 118.180 | 6/12/1989 | 165718.4 | 7.3 | 4.40 | 0.014 | III | 30 [ 49] |
| GSP | 34.020 | 118.180 | 6/12/1989 | 172225.5 | 7.3 | 4.10 | 0.011 | III | 30 [ 48] |
| GSP | 34.190 | 117.390 | 12/28/1989 | 094108.1 | 7.3 | 4.50 | 0.006 | II | 50 [ 81] |
| GSP | 34.140 | 117.700 | 2/28/1990 | 234336.6 | 6.8 | 5.20 | 0.017 | IV | 38 [ 61] |
| GSP | 34.130 | 117.700 | 3/ 1/1990 | 003457.1 | 7.3 | 4.00 | 0.007 | II | 37 [ 60] |
| GSP | 34.150 | 117.720 | 3/ 1/1990 | 032303.0 | 7.3 | 4.70 | 0.012 | III | 38 [ 61] |
| GSP | 34.140 | 117.690 | 3/ 2/1990 | 172625.4 | 7.3 | 4.60 | 0.011 | III | 38 [ 61] |
| GSP | 32.970 | 117.810 | 4/ 4/1990 | 085439.3 | 7.3 | 4.00 | 0.005 | II | 47 [ 75] |
| GSP | 34.110 | 117.720 | 4/17/1990 | 223227.2 | 7.3 | 4.60 | 0.012 | III | 35 [ 57] |
| GSP | 34.262 | 118.002 | 6/28/1991 | 144354.5 | 6.2 | 5.40 | 0.016 | IV | 44 [ 70] |
| GSP | 34.250 | 117.990 | 6/28/1991 | 170055.5 | 7.3 | 4.30 | 0.007 | II | 43 [ 69] |
| GSP | 34.213 | 118.537 | 1/17/1994 | 123055.4 | 3.0 | 6.70 | 0.032 | V | 52 [ 84] |
| GSP | 34.261 | 118.534 | 1/17/1994 | 123939.8 | 7.3 | 4.50 | 0.005 | II | 55 [ 88] |
| GSP | 34.269 | 118.576 | 1/17/1994 | 125546.8 | 7.3 | 4.10 | 0.004 | I | 57 [ 91] |
| GSP | 34.254 | 118.545 | 1/17/1994 | 130627.9 | 7.3 | 4.60 | 0.006 | II | 55 [ 88] |
| GSP | 34.317 | 118.455 | 1/17/1994 | 132644.7 | 7.3 | 4.70 | 0.006 | II | 55 [ 89] |
| GSB | 34.285 | 118.624 | 1/17/1994 | 135602.4 | 7.3 | 4.70 | 0.005 | II | 59 [ 95] |
| GSP | 34.331 | 118.442 | 1/17/1994 | 141430.3 | 7.3 | 4.50 | 0.005 | II | 56 [ 90] |
| GSP | 34.304 | 118.473 | 1/17/1994 | 150703.2 | 7.3 | 4.20 | 0.004 | I | 55 [ 89] |
| GSP | 34.228 | 118.573 | 1/17/1994 | 175608.2 | 7.3 | 4.60 | 0.006 | II | 54 [ 88] |
| GSP | 34.311 | 118.456 | 1/17/1994 | 193534.3 | 7.3 | 4.00 | 0.004 | I | 55 [ 89] |
| GSB | 34.301 | 118.565 | 1/17/1994 | 204602.4 | 6.8 | 5.20 | 0.008 | III | 58 [ 93] |
| GSG | 34.334 | 118.484 | 1/17/1994 | 223152.1 | 7.3 | 4.20 | 0.004 | I | 57 [ 92] |
| GSB | 34.333 | 118.623 | 1/18/1994 | 072356.0 | 7.3 | 4.30 | 0.004 | I | 62 [ 99] |
| GSP | 34.218 | 118.607 | 1/18/1994 | 113509.9 | 7.3 | 4.20 | 0.004 | I | 55 [ 89] |
| GSB | 34.319 | 118.558 | 1/18/1994 | 132444.1 | 7.3 | 4.50 | 0.005 | II | 59 [ 95] |
| GSP | 34.245 | 118.471 | 1/18/1994 | 155144.9 | 7.3 | 4.00 | 0.004 | I | 52 [ 83] |
| GSB | 34.360 | 118.571 | 1/19/1994 | 044048.0 | 7.3 | 4.50 | 0.004 | I | 61 [ 99] |
| GSP | 34.287 | 118.466 | 1/19/1994 | 071406.2 | 7.3 | 4.00 | 0.004 | I | 54 [ 87] |
| GSP | 34.215 | 118.510 | 1/19/1994 | 140914.8 | 7.3 | 4.50 | 0.006 | II | 51 [ 83] |
| GSP | 34.292 | 118.466 | 1/19/1994 | 144635.2 | 7.3 | 4.00 | 0.004 | I | 54 [ 87] |
| GSB | 34.300 | 118.466 | 1/21/1994 | 183915.3 | 7.3 | 4.70 | 0.006 | II | 55 [ 88] |
| GSB | 34.310 | 118.474 | 1/21/1994 | 184228.8 | 7.3 | 4.20 | 0.004 | I | 56 [ 89] |
| GSP | 34.301 | 118.452 | 1/21/1994 | 185244.2 | 7.3 | 4.30 | 0.005 | II | 54 [ 87] |
| GSP | 34.297 | 118.458 | 1/21/1994 | 185344.6 | 7.3 | 4.30 | 0.005 | II | 54 [ 87] |
| GSB | 34.299 | 118.428 | 1/23/1994 | 085508.7 | 7.3 | 4.20 | 0.004 | I | 53 [ 86] |
| GSB | 34.345 | 118.552 | 1/24/1994 | 041518.8 | 7.3 | 4.80 | 0.006 | II | 60 [ 97] |
| GSP | 34.274 | 118.563 | 1/27/1994 | 171958.8 | 7.3 | 4.60 | 0.005 | II | 56 [ 91] |
| GSP | 34.374 | 118.495 | 1/28/1994 | 200953.4 | 7.3 | 4.20 | 0.004 | I | 60 [ 96] |
| GSP | 34.305 | 118.579 | 1/29/1994 | 112036.0 | 7.1 | 5.10 | 0.008 | II | 59 [ 95] |
| GSP | 34.278 | 118.611 | 1/29/1994 | 121656.4 | 7.3 | 4.30 | 0.004 | I | 58 [ 94] |
| GSP | 34.299 | 118.439 | 2/ 3/1994 | 162335.4 | 7.3 | 4.20 | 0.004 | I | 54 [ 87] |
| GSP | 34.291 | 118.476 | 2/ 6/1994 | 131926.9 | 7.3 | 4.10 | 0.004 | I | 54 [ 88] |
| GSP | 34.357 | 118.480 | 2/25/1994 | 125912.6 | 7.3 | 4.10 | 0.003 | I | 58 [ 94] |
| GSP | 34.231 | 118.475 | 3/20/1994 | 212012.3 | 6.5 | 5.30 | 0.011 | III | 51 [ 82] |
| GSP | 34.312 | 118.393 | 5/25/1994 | 125657.1 | 7.3 | 4.40 | 0.005 | II | 53 [ 86] |
| GSP | 34.311 | 118.398 | 6/15/1994 | 055948.6 | 7.3 | 4.20 | 0.004 | I | 53 [ 86] |
| GSP | 34.293 | 118.389 | 12/ 6/1994 | 034834.5 | 7.3 | 4.50 | 0.006 | II | 52 [ 84] |
| PDP | 32.985 | 117.818 | 6/21/1995 | 211736.2 | 7.3 | 4.10 | 0.006 | II | 45 [ 73] |

**********

-END OF SEARCH- 460 RECORDS FOUND

COMPUTER TIME REQUIRED FOR EARTHQUAKE SEARCH: 0.8 minutes

MAXIMUM SITE ACCELERATION DURING TIME PERIOD 1800 TO 1997: 0.691g

MAXIMUM SITE INTENSITY (MM) DURING TIME PERIOD 1800 TO 1997: XI

MAXIMUM MAGNITUDE ENCOUNTERED IN SEARCH: 7.00

NEAREST HISTORICAL EARTHQUAKE WAS ABOUT 1 MILES AWAY FROM SITE.

NUMBER OF YEARS REPRESENTED BY SEARCH: 198 years

RESULTS OF PROBABILITY ANALYSES

TIME PERIOD OF SEARCH: 1800 TO 1997
LENGTH OF SEARCH TIME: 198 years
ATTENUATION RELATION: 1) Campbell (1993) Horiz. - 0=Soil 1=Rock
*** TIME PERIOD OF EXPOSURE FOR PROBABILITY: 25 years

PROBABILITY OF EXCEEDANCE FOR ACCELERATION

| ACC. g | NO.OF TIMES EXCED | AVE. OCCUR. #/yr | RECURR. INTERV. years | COMPUTED PROBABILITY OF EXCEEDANCE in 0.5 yr | in 1 yr | in 10 yr | in 50 yr | in 75 yr | in 100 yr | in *** yr |
|---|---|---|---|---|---|---|---|---|---|---|
| 0.01 | 270 | 1.364 | 0.733 | 0.4943 | 0.7443 | 1.0000 | 1.0000 | 1.0000 | 1.0000 | 1.0000 |
| 0.02 | 189 | 0.955 | 1.048 | 0.3795 | 0.6150 | 0.9999 | 1.0000 | 1.0000 | 1.0000 | 1.0000 |
| 0.03 | 154 | 0.778 | 1.286 | 0.3222 | 0.5406 | 0.9996 | 1.0000 | 1.0000 | 1.0000 | 1.0000 |
| 0.04 | 101 | 0.510 | 1.960 | 0.2251 | 0.3996 | 0.9939 | 1.0000 | 1.0000 | 1.0000 | 1.0000 |
| 0.05 | 49 | 0.247 | 4.041 | 0.1164 | 0.2192 | 0.9158 | 1.0000 | 1.0000 | 1.0000 | 0.9979 |
| 0.06 | 34 | 0.172 | 5.824 | 0.0823 | 0.1578 | 0.8204 | 0.9998 | 1.0000 | 1.0000 | 0.9863 |
| 0.07 | 29 | 0.146 | 6.828 | 0.0706 | 0.1362 | 0.7688 | 0.9993 | 1.0000 | 1.0000 | 0.9743 |
| 0.08 | 17 | 0.086 | 11.647 | 0.0420 | 0.0823 | 0.5762 | 0.9863 | 0.9984 | 0.9998 | 0.8831 |
| 0.09 | 16 | 0.081 | 12.375 | 0.0396 | 0.0776 | 0.5543 | 0.9824 | 0.9977 | 0.9997 | 0.8674 |
| 0.10 | 13 | 0.066 | 15.231 | 0.0323 | 0.0635 | 0.4814 | 0.9625 | 0.9927 | 0.9986 | 0.8063 |
| 0.11 | 9 | 0.045 | 22.000 | 0.0225 | 0.0444 | 0.3653 | 0.8970 | 0.9669 | 0.9894 | 0.6790 |
| 0.12 | 7 | 0.035 | 28.286 | 0.0175 | 0.0347 | 0.2978 | 0.8293 | 0.9295 | 0.9709 | 0.5868 |
| 0.13 | 6 | 0.030 | 33.000 | 0.0150 | 0.0298 | 0.2614 | 0.7802 | 0.8970 | 0.9517 | 0.5312 |
| 0.14 | 6 | 0.030 | 33.000 | 0.0150 | 0.0298 | 0.2614 | 0.7802 | 0.8970 | 0.9517 | 0.5312 |
| 0.15 | 5 | 0.025 | 39.600 | 0.0125 | 0.0249 | 0.2232 | 0.7171 | 0.8495 | 0.9200 | 0.4681 |
| 0.16 | 5 | 0.025 | 39.600 | 0.0125 | 0.0249 | 0.2232 | 0.7171 | 0.8495 | 0.9200 | 0.4681 |
| 0.17 | 4 | 0.020 | 49.500 | 0.0101 | 0.0200 | 0.1829 | 0.6358 | 0.7802 | 0.8674 | 0.3965 |
| 0.18 | 2 | 0.010 | 99.000 | 0.0050 | 0.0101 | 0.0961 | 0.3965 | 0.5312 | 0.6358 | 0.2232 |
| 0.19 | 2 | 0.010 | 99.000 | 0.0050 | 0.0101 | 0.0961 | 0.3965 | 0.5312 | 0.6358 | 0.2232 |
| 0.20 | 2 | 0.010 | 99.000 | 0.0050 | 0.0101 | 0.0961 | 0.3965 | 0.5312 | 0.6358 | 0.2232 |
| 0.21 | 2 | 0.010 | 99.000 | 0.0050 | 0.0101 | 0.0961 | 0.3965 | 0.5312 | 0.6358 | 0.2232 |
| 0.22 | 2 | 0.010 | 99.000 | 0.0050 | 0.0101 | 0.0961 | 0.3965 | 0.5312 | 0.6358 | 0.2232 |
| 0.23 | 2 | 0.010 | 99.000 | 0.0050 | 0.0101 | 0.0961 | 0.3965 | 0.5312 | 0.6358 | 0.2232 |
| 0.24 | 2 | 0.010 | 99.000 | 0.0050 | 0.0101 | 0.0961 | 0.3965 | 0.5312 | 0.6358 | 0.2232 |
| 0.25 | 2 | 0.010 | 99.000 | 0.0050 | 0.0101 | 0.0961 | 0.3965 | 0.5312 | 0.6358 | 0.2232 |
| 0.26 | 2 | 0.010 | 99.000 | 0.0050 | 0.0101 | 0.0961 | 0.3965 | 0.5312 | 0.6358 | 0.2232 |
| 0.27 | 2 | 0.010 | 99.000 | 0.0050 | 0.0101 | 0.0961 | 0.3965 | 0.5312 | 0.6358 | 0.2232 |
| 0.28 | 2 | 0.010 | 99.000 | 0.0050 | 0.0101 | 0.0961 | 0.3965 | 0.5312 | 0.6358 | 0.2232 |
| 0.29 | 2 | 0.010 | 99.000 | 0.0050 | 0.0101 | 0.0961 | 0.3965 | 0.5312 | 0.6358 | 0.2232 |
| 0.30 | 2 | 0.010 | 99.000 | 0.0050 | 0.0101 | 0.0961 | 0.3965 | 0.5312 | 0.6358 | 0.2232 |
| 0.31 | 2 | 0.010 | 99.000 | 0.0050 | 0.0101 | 0.0961 | 0.3965 | 0.5312 | 0.6358 | 0.2232 |
| 0.32 | 2 | 0.010 | 99.000 | 0.0050 | 0.0101 | 0.0961 | 0.3965 | 0.5312 | 0.6358 | 0.2232 |
| 0.33 | 2 | 0.010 | 99.000 | 0.0050 | 0.0101 | 0.0961 | 0.3965 | 0.5312 | 0.6358 | 0.2232 |
| 0.34 | 2 | 0.010 | 99.000 | 0.0050 | 0.0101 | 0.0961 | 0.3965 | 0.5312 | 0.6358 | 0.2232 |
| 0.35 | 2 | 0.010 | 99.000 | 0.0050 | 0.0101 | 0.0961 | 0.3965 | 0.5312 | 0.6358 | 0.2232 |
| 0.36 | 2 | 0.010 | 99.000 | 0.0050 | 0.0101 | 0.0961 | 0.3965 | 0.5312 | 0.6358 | 0.2232 |
| 0.37 | 2 | 0.010 | 99.000 | 0.0050 | 0.0101 | 0.0961 | 0.3965 | 0.5312 | 0.6358 | 0.2232 |
| 0.38 | 2 | 0.010 | 99.000 | 0.0050 | 0.0101 | 0.0961 | 0.3965 | 0.5312 | 0.6358 | 0.2232 |
| 0.39 | 2 | 0.010 | 99.000 | 0.0050 | 0.0101 | 0.0961 | 0.3965 | 0.5312 | 0.6358 | 0.2232 |
| 0.40 | 2 | 0.010 | 99.000 | 0.0050 | 0.0101 | 0.0961 | 0.3965 | 0.5312 | 0.6358 | 0.2232 |
| 0.41 | 2 | 0.010 | 99.000 | 0.0050 | 0.0101 | 0.0961 | 0.3965 | 0.5312 | 0.6358 | 0.2232 |
| 0.42 | 2 | 0.010 | 99.000 | 0.0050 | 0.0101 | 0.0961 | 0.3965 | 0.5312 | 0.6358 | 0.2232 |
| 0.43 | 2 | 0.010 | 99.000 | 0.0050 | 0.0101 | 0.0961 | 0.3965 | 0.5312 | 0.6358 | 0.2232 |
| 0.44 | 2 | 0.010 | 99.000 | 0.0050 | 0.0101 | 0.0961 | 0.3965 | 0.5312 | 0.6358 | 0.2232 |
| 0.45 | 2 | 0.010 | 99.000 | 0.0050 | 0.0101 | 0.0961 | 0.3965 | 0.5312 | 0.6358 | 0.2232 |
| 0.46 | 2 | 0.010 | 99.000 | 0.0050 | 0.0101 | 0.0961 | 0.3965 | 0.5312 | 0.6358 | 0.2232 |
| 0.47 | 2 | 0.010 | 99.000 | 0.0050 | 0.0101 | 0.0961 | 0.3965 | 0.5312 | 0.6358 | 0.2232 |
| 0.48 | 2 | 0.010 | 99.000 | 0.0050 | 0.0101 | 0.0961 | 0.3965 | 0.5312 | 0.6358 | 0.2232 |
| 0.49 | 2 | 0.010 | 99.000 | 0.0050 | 0.0101 | 0.0961 | 0.3965 | 0.5312 | 0.6358 | 0.2232 |
| 0.50 | 2 | 0.010 | 99.000 | 0.0050 | 0.0101 | 0.0961 | 0.3965 | 0.5312 | 0.6358 | 0.2232 |
| 0.51 | 2 | 0.010 | 99.000 | 0.0050 | 0.0101 | 0.0961 | 0.3965 | 0.5312 | 0.6358 | 0.2232 |

| ACC. g | NO.OF TIMES EXCED | AVE. OCCUR. #/yr | RECURR. INTERV. years | COMPUTED PROBABILITY OF EXCEEDANCE in 0.5 yr | in 1 yr | in 10 yr | in 50 yr | in 75 yr | in 100 yr | in *** yr |
|---|---|---|---|---|---|---|---|---|---|---|
| 0.52 | 1 | 0.005 | 198.000 | 0.0025 | 0.0050 | 0.0493 | 0.2232 | 0.3153 | 0.3965 | 0.1186 |
| 0.53 | 1 | 0.005 | 198.000 | 0.0025 | 0.0050 | 0.0493 | 0.2232 | 0.3153 | 0.3965 | 0.1186 |
| 0.54 | 1 | 0.005 | 198.000 | 0.0025 | 0.0050 | 0.0493 | 0.2232 | 0.3153 | 0.3965 | 0.1186 |
| 0.55 | 1 | 0.005 | 198.000 | 0.0025 | 0.0050 | 0.0493 | 0.2232 | 0.3153 | 0.3965 | 0.1186 |
| 0.56 | 1 | 0.005 | 198.000 | 0.0025 | 0.0050 | 0.0493 | 0.2232 | 0.3153 | 0.3965 | 0.1186 |
| 0.57 | 1 | 0.005 | 198.000 | 0.0025 | 0.0050 | 0.0493 | 0.2232 | 0.3153 | 0.3965 | 0.1186 |
| 0.58 | 1 | 0.005 | 198.000 | 0.0025 | 0.0050 | 0.0493 | 0.2232 | 0.3153 | 0.3965 | 0.1186 |
| 0.59 | 1 | 0.005 | 198.000 | 0.0025 | 0.0050 | 0.0493 | 0.2232 | 0.3153 | 0.3965 | 0.1186 |
| 0.60 | 1 | 0.005 | 198.000 | 0.0025 | 0.0050 | 0.0493 | 0.2232 | 0.3153 | 0.3965 | 0.1186 |
| 0.61 | 1 | 0.005 | 198.000 | 0.0025 | 0.0050 | 0.0493 | 0.2232 | 0.3153 | 0.3965 | 0.1186 |
| 0.62 | 1 | 0.005 | 198.000 | 0.0025 | 0.0050 | 0.0493 | 0.2232 | 0.3153 | 0.3965 | 0.1186 |
| 0.63 | 1 | 0.005 | 198.000 | 0.0025 | 0.0050 | 0.0493 | 0.2232 | 0.3153 | 0.3965 | 0.1186 |
| 0.64 | 1 | 0.005 | 198.000 | 0.0025 | 0.0050 | 0.0493 | 0.2232 | 0.3153 | 0.3965 | 0.1186 |
| 0.65 | 1 | 0.005 | 198.000 | 0.0025 | 0.0050 | 0.0493 | 0.2232 | 0.3153 | 0.3965 | 0.1186 |
| 0.66 | 1 | 0.005 | 198.000 | 0.0025 | 0.0050 | 0.0493 | 0.2232 | 0.3153 | 0.3965 | 0.1186 |
| 0.67 | 1 | 0.005 | 198.000 | 0.0025 | 0.0050 | 0.0493 | 0.2232 | 0.3153 | 0.3965 | 0.1186 |
| 0.68 | 1 | 0.005 | 198.000 | 0.0025 | 0.0050 | 0.0493 | 0.2232 | 0.3153 | 0.3965 | 0.1186 |
| 0.69 | 1 | 0.005 | 198.000 | 0.0025 | 0.0050 | 0.0493 | 0.2232 | 0.3153 | 0.3965 | 0.1186 |

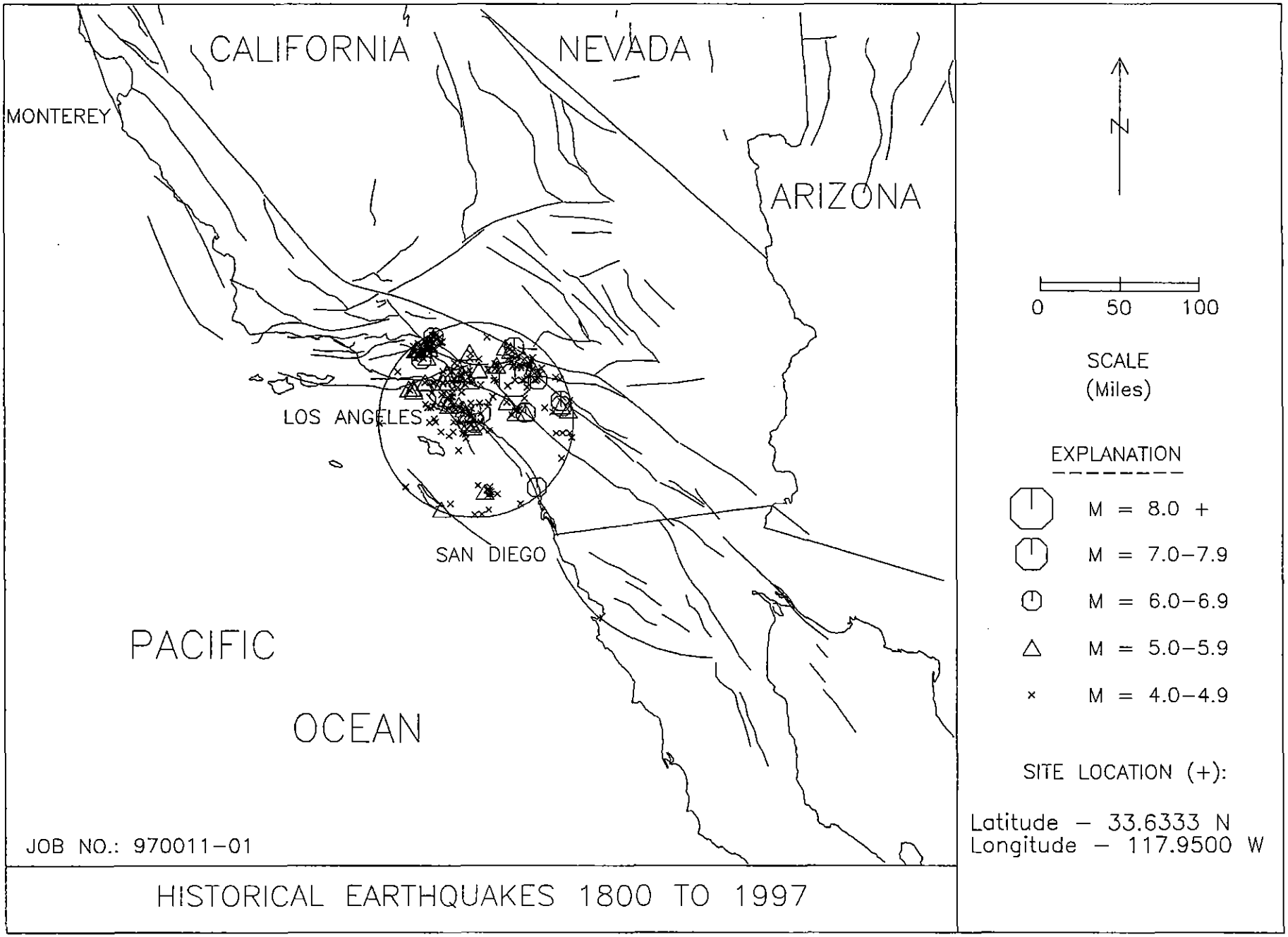
PROBABILITY OF EXCEEDANCE FOR MAGNITUDE

| MAG. | NO.OF TIMES EXCED | AVE. OCCUR. #/yr | RECURR. INTERV. years | COMPUTED PROBABILITY OF EXCEEDANCE in 0.5 yr | in 1 yr | in 10 yr | in 50 yr | in 75 yr | in 100 yr | in *** yr |
|---|---|---|---|---|---|---|---|---|---|---|
| 4.00 | 460 | 2.323 | 0.430 | 0.6870 | 0.9020 | 1.0000 | 1.0000 | 1.0000 | 1.0000 | 1.0000 |
| 4.50 | 175 | 0.884 | 1.131 | 0.3572 | 0.5868 | 0.9999 | 1.0000 | 1.0000 | 1.0000 | 1.0000 |
| 5.00 | 61 | 0.308 | 3.246 | 0.1428 | 0.2651 | 0.9541 | 1.0000 | 1.0000 | 1.0000 | 0.9995 |
| 5.50 | 20 | 0.101 | 9.900 | 0.0493 | 0.0961 | 0.6358 | 0.9936 | 0.9995 | 1.0000 | 0.9200 |
| 6.00 | 12 | 0.061 | 16.500 | 0.0298 | 0.0588 | 0.4545 | 0.9517 | 0.9894 | 0.9977 | 0.7802 |
| 6.50 | 7 | 0.035 | 28.286 | 0.0175 | 0.0347 | 0.2978 | 0.8293 | 0.9295 | 0.9709 | 0.5868 |
| 7.00 | 1 | 0.005 | 198.000 | 0.0025 | 0.0050 | 0.0493 | 0.2232 | 0.3153 | 0.3965 | 0.1186 |

GUTENBERG & RICHTER RECURRENCE RELATIONSHIP:

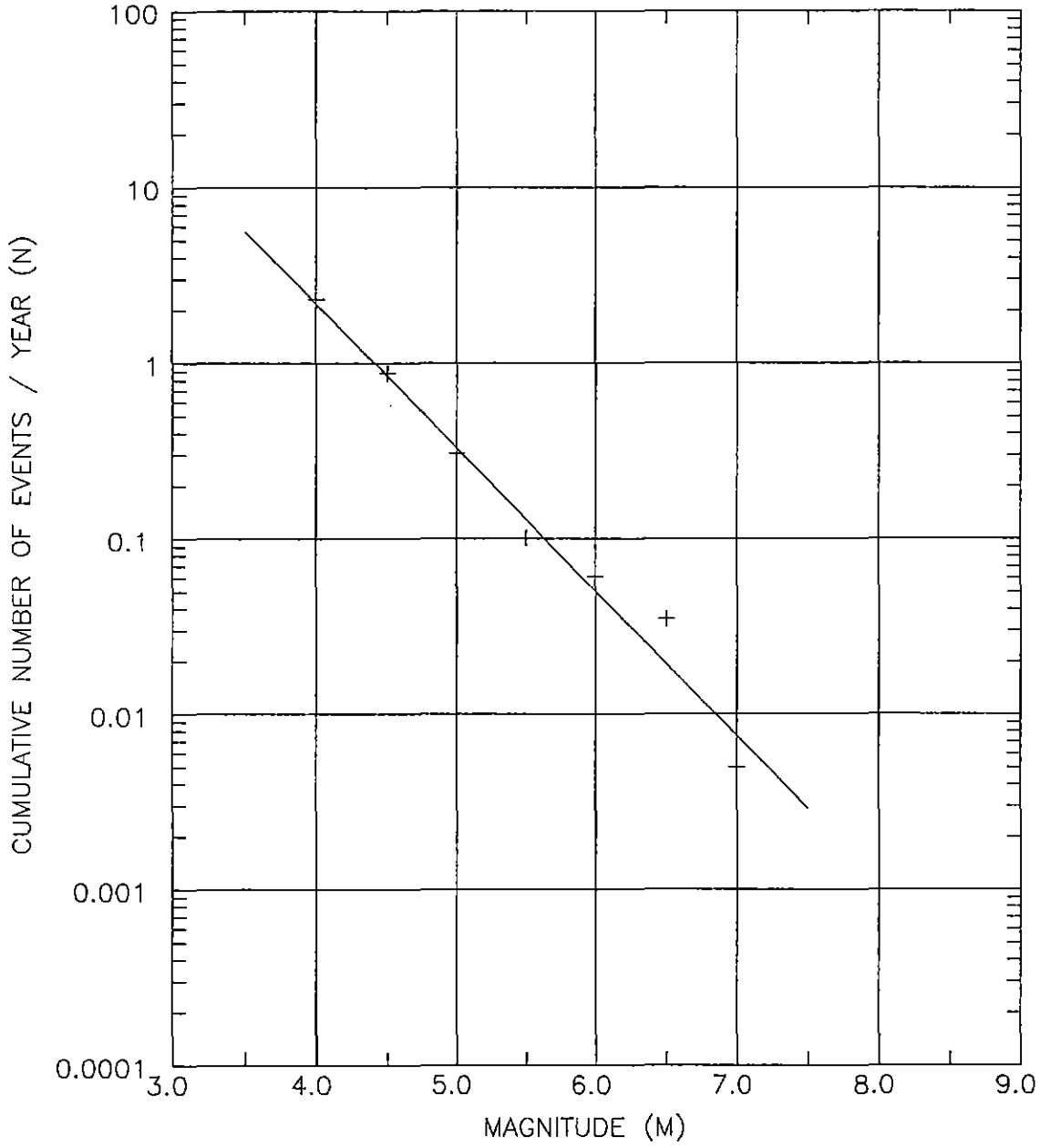
a-value= 3.627
b-value= 0.822

beta-value= 1.892




HISTORICAL EARTHQUAKES 1800 TO 1997

LOG N = 3.627 − 0.822M

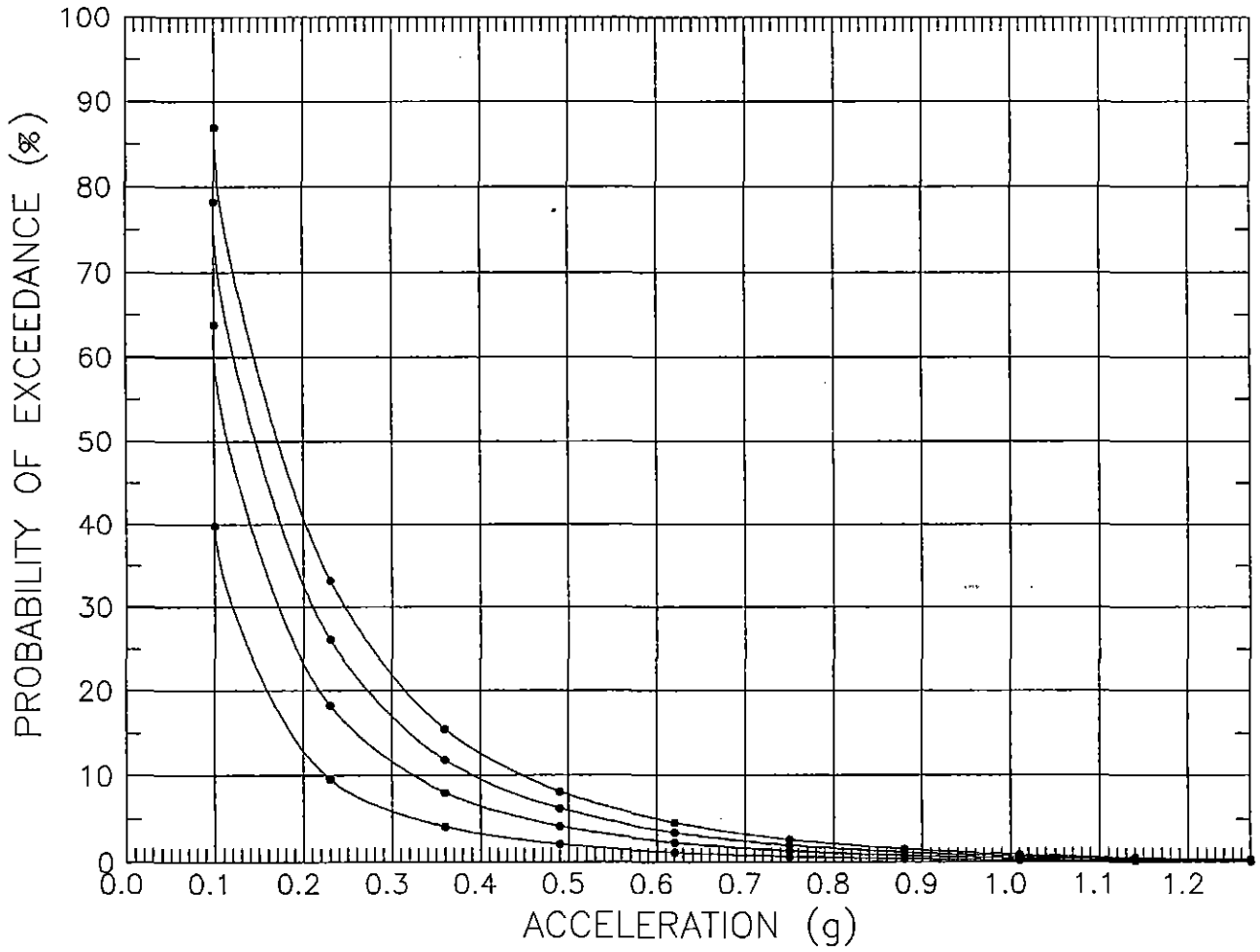



# SEISMIC RECURRENCE CURVE

HISTORICAL EARTHQUAKES FROM 1800 TO 1997

Newport Buildings

# PROBABILITY OF EXCEEDANCE vs. ACCELERATION



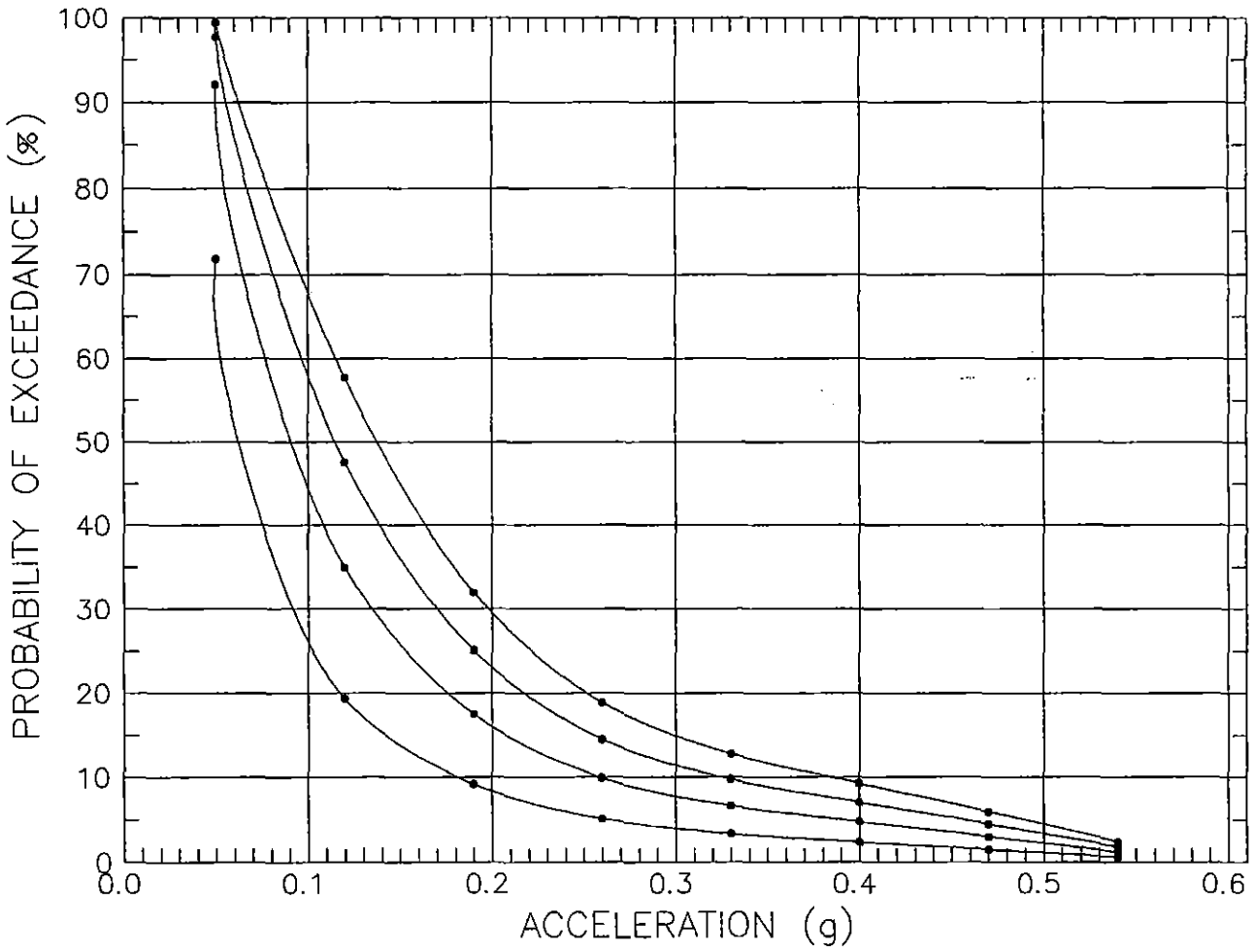

EXPOSURE PERIODS:

| | |
|---|---|
| 25 years | 75 years |
| 50 years | 100 years |

CAMPBELL (1993) HORZ. + DISP

JOB No.: 970011-01

# PROBABILITY OF EXCEEDANCE vs. ACCELERATION

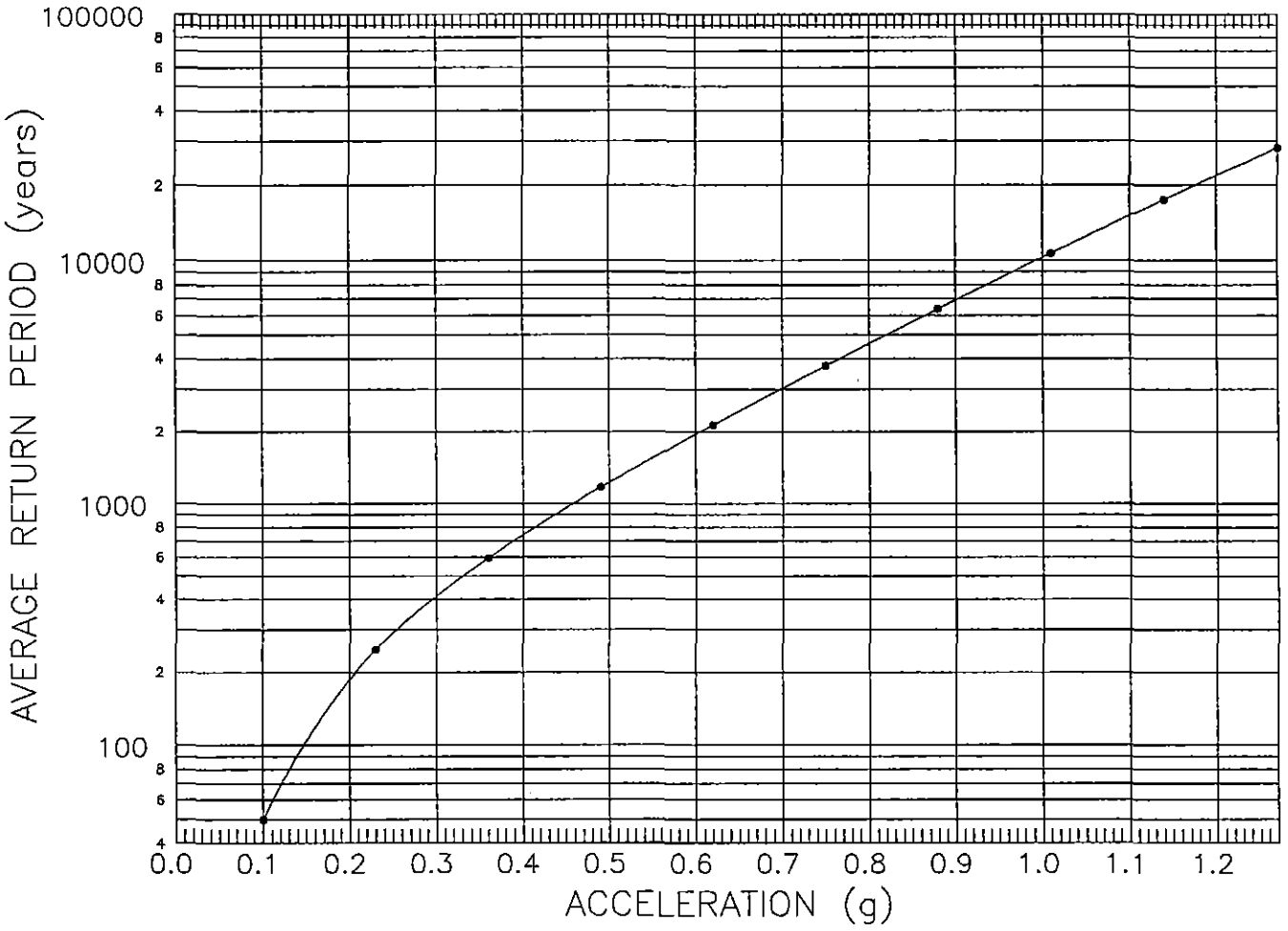



EXPOSURE PERIODS:
25 years 75 years
50 years 100 years

CAMPBELL (1993) HORZ. MEAN

JOB No.: 970011-01

# AVERAGE RETURN PERIOD vs. ACCELERATION

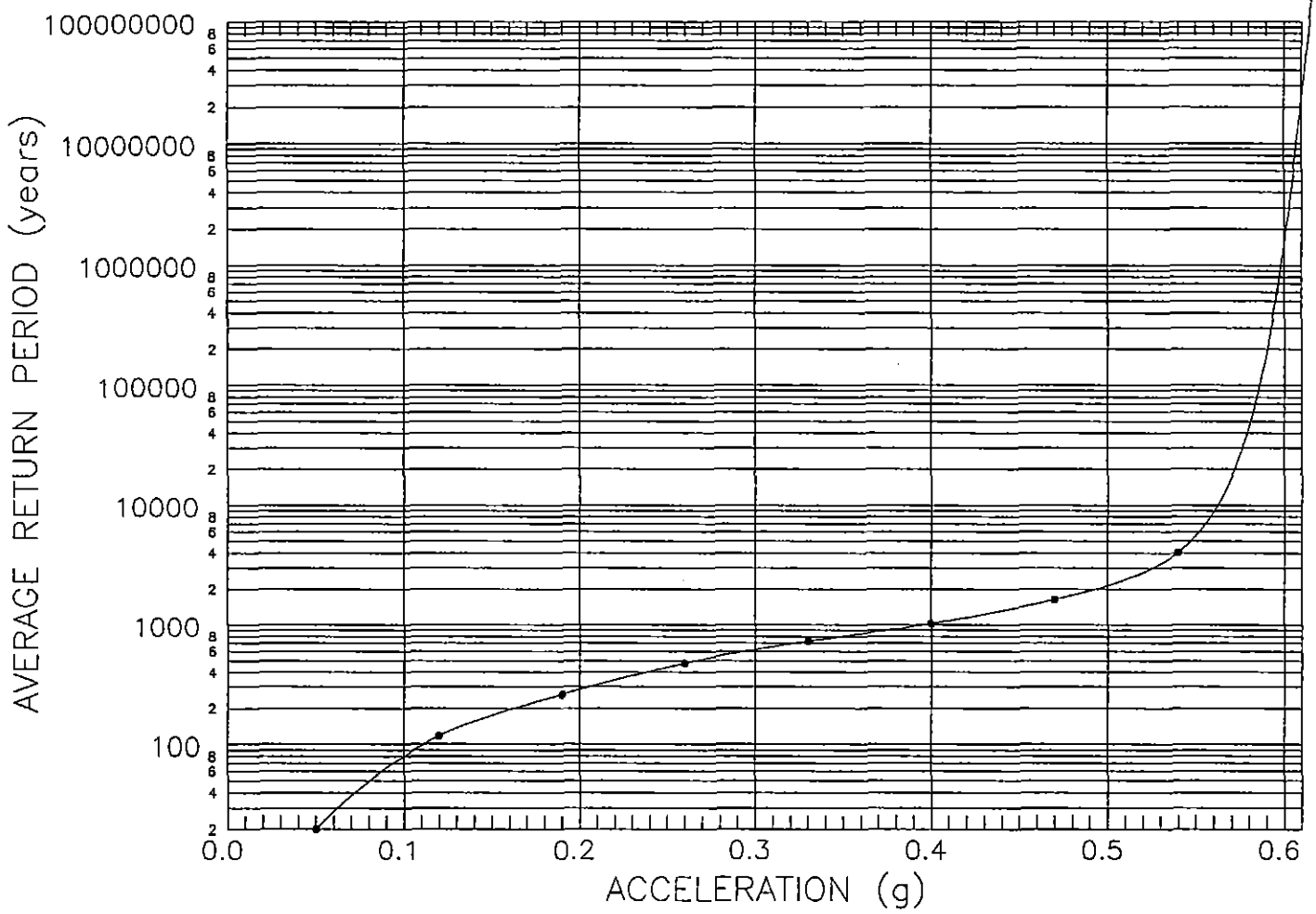



NEWPORT BUILDINGS

CAMPBELL (1993) HORZ. + DISP

JOB No.: 970011-01

# AVERAGE RETURN PERIOD vs. ACCELERATION




NEWPORT BUILDINGS

CAMPBELL (1993) HORZ. MEAN

JOB No.: 970011-01

**********
*  SOIL PROFILE LOG  *
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SOIL PROFILE NAME: TWB1

| LAYER # | BASE DEPTH (ft) | SPT FIELD-N (blows/ft) | LIQUEFACTION SUSCEPTIBILITY | WET UNIT WT. (pcf) | FINES %<#200 | D (mm) 50 | DEPTH OF SPT (ft) |
|---|---|---|---|---|---|---|---|
| 1 | 7.0 | 3.0 | UNSUSCEPTIBLE (0) | 120.0 | 15.0 | 0.200 | 5.25 |
| 2 | 20.0 | 24.0 | SUSCEPTIBLE (1) | 120.0 | 15.0 | 0.200 | 15.25 |
| 3 | 30.0 | 17.0 | SUSCEPTIBLE (1) | 120.0 | 15.0 | 0.200 | 25.25 |
| 4 | 35.0 | 33.0 | SUSCEPTIBLE (1) | 120.0 | 15.0 | 0.200 | 30.25 |
| 5 | 40.0 | 33.0 | SUSCEPTIBLE (1) | 120.0 | 9.0 | 0.600 | 35.25 |
| 6 | 45.0 | 49.0 | SUSCEPTIBLE (1) | 120.0 | 9.0 | 0.600 | 40.25 |
| 7 | 50.0 | 64.0 | SUSCEPTIBLE (1) | 120.0 | 9.0 | 0.600 | 45.25 |

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*        *
* L I Q U E F Y 2 *
*        *
*  Version  1.20  *
*        *
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EMPIRICAL PREDICTION OF
EARTHQUAKE-INDUCED LIQUEFACTION POTENTIAL

JOB NUMBER: 970011-01 DATE: Wednesday, November 13, 1996

JOB NAME: TW HOMES - BANNING LOWLAND

LIQUEFACTION CALCULATION NAME: BORING B-1

SOIL-PROFILE NAME: TWB1

GROUND WATER DEPTH: 7.0 ft

DESIGN EARTHQUAKE MAGNITUDE: 7.10

SITE PEAK GROUND ACCELERATION: 0.320 g

K sigma BOUND: M

rd BOUND: M

N60 CORRECTION: 1.33

FIELD SPT N-VALUES < 10 FT DEEP ARE CORRECTED FOR SHORT LENGTH OF DRIVE RODS

NOTE: Relative density values listed below are estimated using equations of Giuliani and Nicoll (1982).



LIQUEFACTION ANALYSIS SUMMARY

Seed and Others [1985] Method



| SOIL NO. | CALC. DEPTH (ft) | TOTAL STRESS (tsf) | EFF. STRESS (tsf) | FIELD N (B/ft) | Est.D r (%) | C N | CORR. (N1)60 (B/ft) | LIQUE. STRESS RATIO | r d | INDUC. STRESS RATIO | LIQUE. SAFETY FACTOR |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 0.25 | 0.015 | 0.015 | 3 | ~ | @ | @ | @ | @ | @ | @ @ |
| 1 | 0.75 | 0.045 | 0.045 | 3 | ~ | @ | @ | @ | @ | @ | @ @ |
| 1 | 1.25 | 0.075 | 0.075 | 3 | ~ | @ | @ | @ | @ | @ | @ @ |
| 1 | 1.75 | 0.105 | 0.105 | 3 | ~ | @ | @ | @ | @ | @ | @ @ |
| 1 | 2.25 | 0.135 | 0.135 | 3 | ~ | @ | @ | @ | @ | @ | @ @ |
| 1 | 2.75 | 0.165 | 0.165 | 3 | ~ | @ | @ | @ | @ | @ | @ @ |
| 1 | 3.25 | 0.195 | 0.195 | 3 | ~ | @ | @ | @ | @ | @ | @ @ |
| 1 | 3.75 | 0.225 | 0.225 | 3 | ~ | @ | @ | @ | @ | @ | @ @ |
| 1 | 4.25 | 0.255 | 0.255 | 3 | ~ | @ | @ | @ | @ | @ | @ @ |
| 1 | 4.75 | 0.285 | 0.285 | 3 | ~ | @ | @ | @ | @ | @ | @ @ |
| 1 | 5.25 | 0.315 | 0.315 | 3 | ~ | @ | @ | @ | @ | @ | @ @ |
| 1 | 5.75 | 0.345 | 0.345 | 3 | ~ | @ | @ | @ | @ | @ | @ @ |
| 1 | 6.25 | 0.375 | 0.375 | 3 | ~ | @ | @ | @ | @ | @ | @ @ |
| 1 | 6.75 | 0.405 | 0.405 | 3 | ~ | @ | @ | @ | @ | @ | @ @ |
| 2 | 7.25 | 0.435 | 0.427 | 24 | 80 | 1.236 | 39.5 | Infin | 0.985 | 0.209 | Infin |
| 2 | 7.75 | 0.465 | 0.442 | 24 | 80 | 1.236 | 39.5 | Infin | 0.984 | 0.216 | Infin |
| 2 | 8.25 | 0.495 | 0.456 | 24 | 80 | 1.236 | 39.5 | Infin | 0.983 | 0.222 | Infin |
| 2 | 8.75 | 0.525 | 0.470 | 24 | 80 | 1.236 | 39.5 | Infin | 0.982 | 0.228 | Infin |
| 2 | 9.25 | 0.555 | 0.485 | 24 | 80 | 1.236 | 39.5 | Infin | 0.981 | 0.234 | Infin |
| 2 | 9.75 | 0.585 | 0.499 | 24 | 80 | 1.236 | 39.5 | Infin | 0.980 | 0.239 | Infin |
| 2 | 10.25 | 0.615 | 0.514 | 24 | 80 | 1.236 | 39.5 | Infin | 0.979 | 0.244 | Infin |
| 2 | 10.75 | 0.645 | 0.528 | 24 | 80 | 1.236 | 39.5 | Infin | 0.978 | 0.249 | Infin |
| 2 | 11.25 | 0.675 | 0.542 | 24 | 80 | 1.236 | 39.5 | Infin | 0.977 | 0.253 | Infin |
| 2 | 11.75 | 0.705 | 0.557 | 24 | 80 | 1.236 | 39.5 | Infin | 0.976 | 0.257 | Infin |
| 2 | 12.25 | 0.735 | 0.571 | 24 | 80 | 1.236 | 39.5 | Infin | 0.975 | 0.261 | Infin |
| 2 | 12.75 | 0.765 | 0.586 | 24 | 80 | 1.236 | 39.5 | Infin | 0.974 | 0.265 | Infin |
| 2 | 13.25 | 0.795 | 0.600 | 24 | 80 | 1.236 | 39.5 | Infin | 0.972 | 0.268 | Infin |
| 2 | 13.75 | 0.825 | 0.614 | 24 | 80 | 1.236 | 39.5 | Infin | 0.971 | 0.271 | Infin |
| 2 | 14.25 | 0.855 | 0.629 | 24 | 80 | 1.236 | 39.5 | Infin | 0.970 | 0.274 | Infin |
| 2 | 14.75 | 0.885 | 0.643 | 24 | 80 | 1.236 | 39.5 | Infin | 0.969 | 0.277 | Infin |
| 2 | 15.25 | 0.915 | 0.658 | 24 | 80 | 1.236 | 39.5 | Infin | 0.968 | 0.280 | Infin |
| 2 | 15.75 | 0.945 | 0.672 | 24 | 80 | 1.236 | 39.5 | Infin | 0.967 | 0.283 | Infin |

| | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 2 | 16.25 | 0.975 | 0.686 | 24 | 80 | 1.236 | 39.5 | Infin | 0.966 | 0.285 | Infin |
| 2 | 16.75 | 1.005 | 0.701 | 24 | 80 | 1.236 | 39.5 | Infin | 0.965 | 0.288 | Infin |
| 2 | 17.25 | 1.035 | 0.715 | 24 | 80 | 1.236 | 39.5 | Infin | 0.964 | 0.290 | Infin |
| 2 | 17.75 | 1.065 | 0.730 | 24 | 80 | 1.236 | 39.5 | Infin | 0.963 | 0.292 | Infin |
| 2 | 18.25 | 1.095 | 0.744 | 24 | 80 | 1.236 | 39.5 | Infin | 0.961 | 0.294 | Infin |
| 2 | 18.75 | 1.125 | 0.758 | 24 | 80 | 1.236 | 39.5 | Infin | 0.960 | 0.296 | Infin |
| 2 | 19.25 | 1.155 | 0.773 | 24 | 80 | 1.236 | 39.5 | Infin | 0.959 | 0.298 | Infin |
| 2 | 19.75 | 1.185 | 0.787 | 24 | 80 | 1.236 | 39.5 | Infin | 0.958 | 0.300 | Infin |
| 3 | 20.25 | 1.215 | 0.802 | 17 | 62 | 1.031 | 23.3 | 0.415 | 0.957 | 0.302 | 1.38 |
| 3 | 20.75 | 1.245 | 0.816 | 17 | 62 | 1.031 | 23.3 | 0.415 | 0.955 | 0.303 | 1.37 |
| 3 | 21.25 | 1.275 | 0.830 | 17 | 62 | 1.031 | 23.3 | 0.415 | 0.954 | 0.305 | 1.36 |
| 3 | 21.75 | 1.305 | 0.845 | 17 | 62 | 1.031 | 23.3 | 0.415 | 0.952 | 0.306 | 1.36 |
| 3 | 22.25 | 1.335 | 0.859 | 17 | 62 | 1.031 | 23.3 | 0.415 | 0.951 | 0.307 | 1.35 |
| 3 | 22.75 | 1.365 | 0.874 | 17 | 62 | 1.031 | 23.3 | 0.415 | 0.949 | 0.308 | 1.34 |

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Seed and Others [1985] Method PAGE 2

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| SOIL NO. | CALC. DEPTH (ft) | TOTAL STRESS (tsf) | EFF. STRESS (tsf) | FIELD N (B/ft) | Est.D r (%) | C N | CORR. (N1)60 (B/ft) | LIQUE. STRESS RATIO | r d | INDUC. STRESS RATIO | LIQUE. SAFETY FACTOR |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 3 | 23.25 | 1.395 | 0.888 | 17 | 62 | 1.031 | 23.3 | 0.415 | 0.947 | 0.310 | 1.34 |
| 3 | 23.75 | 1.425 | 0.902 | 17 | 62 | 1.031 | 23.3 | 0.415 | 0.946 | 0.311 | 1.34 |
| 3 | 24.25 | 1.455 | 0.917 | 17 | 62 | 1.031 | 23.3 | 0.415 | 0.944 | 0.312 | 1.33 |
| 3 | 24.75 | 1.485 | 0.931 | 17 | 62 | 1.031 | 23.3 | 0.415 | 0.943 | 0.313 | 1.33 |
| 3 | 25.25 | 1.515 | 0.946 | 17 | 62 | 1.031 | 23.3 | 0.415 | 0.941 | 0.314 | 1.32 |
| 3 | 25.75 | 1.545 | 0.960 | 17 | 62 | 1.031 | 23.3 | 0.415 | 0.939 | 0.314 | 1.32 |
| 3 | 26.25 | 1.575 | 0.974 | 17 | 62 | 1.031 | 23.3 | 0.415 | 0.937 | 0.315 | 1.32 |
| 3 | 26.75 | 1.605 | 0.989 | 17 | 62 | 1.031 | 23.3 | 0.415 | 0.934 | 0.315 | 1.31 |
| 3 | 27.25 | 1.635 | 1.003 | 17 | 62 | 1.031 | 23.3 | 0.415 | 0.932 | 0.316 | 1.31 |
| 3 | 27.75 | 1.665 | 1.018 | 17 | 62 | 1.031 | 23.3 | 0.414 | 0.930 | 0.317 | 1.31 |
| 3 | 28.25 | 1.695 | 1.032 | 17 | 62 | 1.031 | 23.3 | 0.414 | 0.928 | 0.317 | 1.31 |
| 3 | 28.75 | 1.725 | 1.046 | 17 | 62 | 1.031 | 23.3 | 0.413 | 0.926 | 0.317 | 1.30 |
| 3 | 29.25 | 1.755 | 1.061 | 17 | 62 | 1.031 | 23.3 | 0.413 | 0.923 | 0.318 | 1.30 |
| 3 | 29.75 | 1.785 | 1.075 | 17 | 62 | 1.031 | 23.3 | 0.413 | 0.921 | 0.318 | 1.30 |
| 4 | 30.25 | 1.815 | 1.090 | 33 | 84 | 0.968 | 42.5 | Infin | 0.919 | 0.318 | Infin |
| 4 | 30.75 | 1.845 | 1.104 | 33 | 84 | 0.968 | 42.5 | Infin | 0.916 | 0.318 | Infin |
| 4 | 31.25 | 1.875 | 1.118 | 33 | 84 | 0.968 | 42.5 | Infin | 0.913 | 0.318 | Infin |
| 4 | 31.75 | 1.905 | 1.133 | 33 | 84 | 0.968 | 42.5 | Infin | 0.910 | 0.318 | Infin |
| 4 | 32.25 | 1.935 | 1.147 | 33 | 84 | 0.968 | 42.5 | Infin | 0.907 | 0.318 | Infin |
| 4 | 32.75 | 1.965 | 1.162 | 33 | 84 | 0.968 | 42.5 | Infin | 0.904 | 0.318 | Infin |
| 4 | 33.25 | 1.995 | 1.176 | 33 | 84 | 0.968 | 42.5 | Infin | 0.902 | 0.318 | Infin |
| 4 | 33.75 | 2.025 | 1.190 | 33 | 84 | 0.968 | 42.5 | Infin | 0.899 | 0.318 | Infin |
| 4 | 34.25 | 2.055 | 1.205 | 33 | 84 | 0.968 | 42.5 | Infin | 0.896 | 0.318 | Infin |
| 4 | 34.75 | 2.085 | 1.219 | 33 | 84 | 0.968 | 42.5 | Infin | 0.893 | 0.318 | Infin |
| 5 | 35.25 | 2.115 | 1.234 | 33 | 81 | 0.916 | 40.2 | Infin | 0.890 | 0.317 | Infin |
| 5 | 35.75 | 2.145 | 1.248 | 33 | 81 | 0.916 | 40.2 | Infin | 0.886 | 0.317 | Infin |
| 5 | 36.25 | 2.175 | 1.262 | 33 | 81 | 0.916 | 40.2 | Infin | 0.882 | 0.316 | Infin |
| 5 | 36.75 | 2.205 | 1.277 | 33 | 81 | 0.916 | 40.2 | Infin | 0.878 | 0.315 | Infin |
| 5 | 37.25 | 2.235 | 1.291 | 33 | 81 | 0.916 | 40.2 | Infin | 0.874 | 0.315 | Infin |
| 5 | 37.75 | 2.265 | 1.306 | 33 | 81 | 0.916 | 40.2 | Infin | 0.870 | 0.314 | Infin |



| | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 5 | 38.25 | 2.295 | 1.320 | 33 | 81 | 0.916 | 40.2 | Infin | 0.866 | 0.313 | Infin |
| 5 | 38.75 | 2.325 | 1.334 | 33 | 81 | 0.916 | 40.2 | Infin | 0.862 | 0.313 | Infin |
| 5 | 39.25 | 2.355 | 1.349 | 33 | 81 | 0.916 | 40.2 | Infin | 0.858 | 0.312 | Infin |
| 5 | 39.75 | 2.385 | 1.363 | 33 | 81 | 0.916 | 40.2 | Infin | 0.855 | 0.311 | Infin |
| 6 | 40.25 | 2.415 | 1.378 | 49 | 96 | 0.878 | 57.2 | Infin | 0.850 | 0.310 | Infin |
| 6 | 40.75 | 2.445 | 1.392 | 49 | 96 | 0.878 | 57.2 | Infin | 0.845 | 0.309 | Infin |
| 6 | 41.25 | 2.475 | 1.406 | 49 | 96 | 0.878 | 57.2 | Infin | 0.840 | 0.308 | Infin |
| 6 | 41.75 | 2.505 | 1.421 | 49 | 96 | 0.878 | 57.2 | Infin | 0.836 | 0.306 | Infin |
| 6 | 42.25 | 2.535 | 1.435 | 49 | 96 | 0.878 | 57.2 | Infin | 0.831 | 0.305 | Infin |
| 6 | 42.75 | 2.565 | 1.450 | 49 | 96 | 0.878 | 57.2 | Infin | 0.826 | 0.304 | Infin |
| 6 | 43.25 | 2.595 | 1.464 | 49 | 96 | 0.878 | 57.2 | Infin | 0.821 | 0.303 | Infin |
| 6 | 43.75 | 2.625 | 1.478 | 49 | 96 | 0.878 | 57.2 | Infin | 0.816 | 0.301 | Infin |
| 6 | 44.25 | 2.655 | 1.493 | 49 | 96 | 0.878 | 57.2 | Infin | 0.811 | 0.300 | Infin |
| 6 | 44.75 | 2.685 | 1.507 | 49 | 96 | 0.878 | 57.2 | Infin | 0.806 | 0.299 | Infin |
| 7 | 45.25 | 2.715 | 1.522 | 64 | 107 | 0.843 | 71.8 | Infin | 0.801 | 0.297 | Infin |
| 7 | 45.75 | 2.745 | 1.536 | 64 | 107 | 0.843 | 71.8 | Infin | 0.796 | 0.296 | Infin |
| 7 | 46.25 | 2.775 | 1.550 | 64 | 107 | 0.843 | 71.8 | Infin | 0.791 | 0.295 | Infin |
| 7 | 46.75 | 2.805 | 1.565 | 64 | 107 | 0.843 | 71.8 | Infin | 0.786 | 0.293 | Infin |
| 7 | 47.25 | 2.835 | 1.579 | 64 | 107 | 0.843 | 71.8 | Infin | 0.781 | 0.292 | Infin |
| 7 | 47.75 | 2.865 | 1.594 | 64 | 107 | 0.843 | 71.8 | Infin | 0.776 | 0.290 | Infin |
| 7 | 48.25 | 2.895 | 1.608 | 64 | 107 | 0.843 | 71.8 | Infin | 0.771 | 0.289 | Infin |
| 7 | 48.75 | 2.925 | 1.622 | 64 | 107 | 0.843 | 71.8 | Infin | 0.765 | 0.287 | Infin |
| 7 | 49.25 | 2.955 | 1.637 | 64 | 107 | 0.843 | 71.8 | Infin | 0.760 | 0.286 | Infin |

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Seed and Others [1985] Method PAGE 3

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| SOIL NO. | CALC. DEPTH (ft) | TOTAL STRESS (tsf) | EFF. STRESS (tsf) | FIELD N (B/ft) | Est.D r (%) | C N | CORR. (N1)60 (B/ft) | LIQUE. STRESS RATIO | r d | INDUC. STRESS RATIO | LIQUE. SAFETY FACTOR |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 7 | 49.75 | 2.985 | 1.651 | 64 | 107 | 0.843 | 71.8 | Infin | 0.755 | 0.284 | Infin |

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*  SOIL PROFILE LOG  *
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SOIL PROFILE NAME: TWB2
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| LAYER # | BASE DEPTH (ft) | SPT FIELD-N (blows/ft) | LIQUEFACTION SUSCEPTIBILITY | WET UNIT WT. (pcf) | FINES %<#200 | D (mm) 50 | DEPTH OF SPT (ft) |
|---|---|---|---|---|---|---|---|
| 1 | 6.0 | 9.0 | UNSUSCEPTIBLE (0) | 120.0 | 6.0 | 0.300 | 3.25 |
| 2 | 10.0 | 9.0 | SUSCEPTIBLE (1) | 120.0 | 6.0 | 0.300 | 5.25 |
| 3 | 15.0 | 11.0 | SUSCEPTIBLE (1) | 120.0 | 6.0 | 0.300 | 10.25 |
| 4 | 20.0 | 20.0 | SUSCEPTIBLE (1) | 120.0 | 19.0 | 0.180 | 15.25 |
| 5 | 25.0 | 12.0 | SUSCEPTIBLE (1) | 120.0 | 19.0 | 0.180 | 20.25 |
| 6 | 30.0 | 21.0 | SUSCEPTIBLE (1) | 120.0 | 19.0 | 0.180 | 25.25 |
| 7 | 35.0 | 25.0 | SUSCEPTIBLE (1) | 120.0 | 6.0 | 0.300 | 30.25 |
| 8 | 40.0 | 51.0 | SUSCEPTIBLE (1) | 120.0 | 6.0 | 0.300 | 35.25 |
| 9 | 45.0 | 28.0 | SUSCEPTIBLE (1) | 120.0 | 6.0 | 0.300 | 40.25 |
| 10 | 50.0 | 36.0 | SUSCEPTIBLE (1) | 120.0 | 6.0 | 0.300 | 45.25 |

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*        *
* L I Q U E F Y 2 *
*        *
*  Version  1.20  *
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EMPIRICAL PREDICTION OF
EARTHQUAKE-INDUCED LIQUEFACTION POTENTIAL

JOB NUMBER: 970011-01 DATE: Wednesday, November 13, 1996

JOB NAME: TW HOMES - BANNING LOWLAND

LIQUEFACTION CALCULATION NAME: BORING B-2

SOIL-PROFILE NAME: TWB2

GROUND WATER DEPTH: 6.0 ft

DESIGN EARTHQUAKE MAGNITUDE: 7.10

SITE PEAK GROUND ACCELERATION: 0.320 g

K sigma BOUND: M

rd BOUND: M

N60 CORRECTION: 1.33

FIELD SPT N-VALUES < 10 FT DEEP ARE CORRECTED FOR SHORT LENGTH OF DRIVE RODS

NOTE: Relative density values listed below are estimated using equations of Giuliani and Nicoll (1982).



LIQUEFACTION ANALYSIS SUMMARY

Seed and Others [1985] Method



| SOIL NO. | CALC. DEPTH (ft) | TOTAL STRESS (tsf) | EFF. STRESS (tsf) | FIELD N (B/ft) | Est.D r (%) | C N | CORR. (N1)60 (B/ft) | LIQUE. STRESS RATIO | r d | INDUC. STRESS RATIO | LIQUE. SAFETY FACTOR |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 0.25 | 0.015 | 0.015 | 9 | - | @ | @ | @ | @ | @ | @ @ |
| 1 | 0.75 | 0.045 | 0.045 | 9 | - | @ | @ | @ | @ | @ | @ @ |
| 1 | 1.25 | 0.075 | 0.075 | 9 | - | @ | @ | @ | @ | @ | @ @ |
| 1 | 1.75 | 0.105 | 0.105 | 9 | - | @ | @ | @ | @ | @ | @ @ |
| 1 | 2.25 | 0.135 | 0.135 | 9 | - | @ | @ | @ | @ | @ | @ @ |
| 1 | 2.75 | 0.165 | 0.165 | 9 | - | @ | @ | @ | @ | @ | @ @ |
| 1 | 3.25 | 0.195 | 0.195 | 9 | - | @ | @ | @ | @ | @ | @ @ |
| 1 | 3.75 | 0.225 | 0.225 | 9 | - | @ | @ | @ | @ | @ | @ @ |
| 1 | 4.25 | 0.255 | 0.255 | 9 | - | @ | @ | @ | @ | @ | @ @ |
| 1 | 4.75 | 0.285 | 0.285 | 9 | - | @ | @ | @ | @ | @ | @ @ |
| 1 | 5.25 | 0.315 | 0.315 | 9 | - | @ | @ | @ | @ | @ | @ @ |
| 1 | 5.75 | 0.345 | 0.345 | 9 | - | @ | @ | @ | @ | @ | @ @ |
| 2 | 6.25 | 0.375 | 0.367 | 9 | 55 | 1.740 | 15.6 | 0.192 | 0.987 | 0.210 | 0.91 |
| 2 | 6.75 | 0.405 | 0.382 | 9 | 55 | 1.740 | 15.6 | 0.192 | 0.986 | 0.218 | 0.88 |
| 2 | 7.25 | 0.435 | 0.396 | 9 | 55 | 1.740 | 15.6 | 0.192 | 0.985 | 0.225 | 0.85 |
| 2 | 7.75 | 0.465 | 0.410 | 9 | 55 | 1.740 | 15.6 | 0.192 | 0.984 | 0.232 | 0.83 |
| 2 | 8.25 | 0.495 | 0.425 | 9 | 55 | 1.740 | 15.6 | 0.192 | 0.983 | 0.238 | 0.80 |
| 2 | 8.75 | 0.525 | 0.439 | 9 | 55 | 1.740 | 15.6 | 0.192 | 0.982 | 0.244 | 0.78 |
| 2 | 9.25 | 0.555 | 0.454 | 9 | 55 | 1.740 | 15.6 | 0.192 | 0.981 | 0.250 | 0.77 |
| 2 | 9.75 | 0.585 | 0.468 | 9 | 55 | 1.740 | 15.6 | 0.192 | 0.980 | 0.255 | 0.75 |
| 3 | 10.25 | 0.615 | 0.482 | 11 | 57 | 1.397 | 20.4 | 0.251 | 0.979 | 0.260 | 0.97 |
| 3 | 10.75 | 0.645 | 0.497 | 11 | 57 | 1.397 | 20.4 | 0.251 | 0.978 | 0.264 | 0.95 |
| 3 | 11.25 | 0.675 | 0.511 | 11 | 57 | 1.397 | 20.4 | 0.251 | 0.977 | 0.268 | 0.94 |
| 3 | 11.75 | 0.705 | 0.526 | 11 | 57 | 1.397 | 20.4 | 0.251 | 0.976 | 0.272 | 0.92 |
| 3 | 12.25 | 0.735 | 0.540 | 11 | 57 | 1.397 | 20.4 | 0.251 | 0.975 | 0.276 | 0.91 |
| 3 | 12.75 | 0.765 | 0.554 | 11 | 57 | 1.397 | 20.4 | 0.251 | 0.974 | 0.279 | 0.90 |
| 3 | 13.25 | 0.795 | 0.569 | 11 | 57 | 1.397 | 20.4 | 0.251 | 0.972 | 0.283 | 0.89 |
| 3 | 13.75 | 0.825 | 0.583 | 11 | 57 | 1.397 | 20.4 | 0.251 | 0.971 | 0.286 | 0.88 |
| 3 | 14.25 | 0.855 | 0.598 | 11 | 57 | 1.397 | 20.4 | 0.251 | 0.970 | 0.289 | 0.87 |
| 3 | 14.75 | 0.885 | 0.612 | 11 | 57 | 1.397 | 20.4 | 0.251 | 0.969 | 0.292 | 0.86 |
| 4 | 15.25 | 0.915 | 0.626 | 20 | 73 | 1.263 | 33.6 | Infin | 0.968 | 0.294 | Infin |
| 4 | 15.75 | 0.945 | 0.641 | 20 | 73 | 1.263 | 33.6 | Infin | 0.967 | 0.297 | Infin |

| | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 4 | 16.25 | 0.975 | 0.655 | 20 | 73 | 1.263 | 33.6 | Infin | 0.966 | 0.299 | Infin |
| 4 | 16.75 | 1.005 | 0.670 | 20 | 73 | 1.263 | 33.6 | Infin | 0.965 | 0.301 | Infin |
| 4 | 17.25 | 1.035 | 0.684 | 20 | 73 | 1.263 | 33.6 | Infin | 0.964 | 0.303 | Infin |
| 4 | 17.75 | 1.065 | 0.698 | 20 | 73 | 1.263 | 33.6 | Infin | 0.963 | 0.305 | Infin |
| 4 | 18.25 | 1.095 | 0.713 | 20 | 73 | 1.263 | 33.6 | Infin | 0.961 | 0.307 | Infin |
| 4 | 18.75 | 1.125 | 0.727 | 20 | 73 | 1.263 | 33.6 | Infin | 0.960 | 0.309 | Infin |
| 4 | 19.25 | 1.155 | 0.742 | 20 | 73 | 1.263 | 33.6 | Infin | 0.959 | 0.311 | Infin |
| 4 | 19.75 | 1.185 | 0.756 | 20 | 73 | 1.263 | 33.6 | Infin | 0.958 | 0.312 | Infin |
| 5 | 20.25 | 1.215 | 0.770 | 12 | 55 | 1.144 | 18.3 | 0.295 | 0.957 | 0.314 | 0.94 |
| 5 | 20.75 | 1.245 | 0.785 | 12 | 55 | 1.144 | 18.3 | 0.295 | 0.955 | 0.315 | 0.94 |
| 5 | 21.25 | 1.275 | 0.799 | 12 | 55 | 1.144 | 18.3 | 0.295 | 0.954 | 0.316 | 0.93 |
| 5 | 21.75 | 1.305 | 0.814 | 12 | 55 | 1.144 | 18.3 | 0.295 | 0.952 | 0.318 | 0.93 |
| 5 | 22.25 | 1.335 | 0.828 | 12 | 55 | 1.144 | 18.3 | 0.295 | 0.951 | 0.319 | 0.93 |
| 5 | 22.75 | 1.365 | 0.842 | 12 | 55 | 1.144 | 18.3 | 0.295 | 0.949 | 0.320 | 0.92 |



| SOIL NO. | CALC. DEPTH (ft) | TOTAL STRESS (tsf) | EFF. STRESS (tsf) | FIELD N (B/ft) | Est.D r (%) | C N | CORR. (N1)60 (B/ft) | LIQUE. STRESS RATIO | r d | INDUC. STRESS RATIO | LIQUE. SAFETY FACTOR |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 5 | 23.25 | 1.395 | 0.857 | 12 | 55 | 1.144 | 18.3 | 0.295 | 0.947 | 0.321 | 0.92 |
| 5 | 23.75 | 1.425 | 0.871 | 12 | 55 | 1.144 | 18.3 | 0.295 | 0.946 | 0.322 | 0.92 |
| 5 | 24.25 | 1.455 | 0.886 | 12 | 55 | 1.144 | 18.3 | 0.295 | 0.944 | 0.323 | 0.91 |
| 5 | 24.75 | 1.485 | 0.900 | 12 | 55 | 1.144 | 18.3 | 0.295 | 0.943 | 0.324 | 0.91 |
| 6 | 25.25 | 1.515 | 0.914 | 21 | 70 | 1.049 | 29.3 | Infin | 0.941 | 0.324 | Infin |
| 6 | 25.75 | 1.545 | 0.929 | 21 | 70 | 1.049 | 29.3 | Infin | 0.939 | 0.325 | Infin |
| 6 | 26.25 | 1.575 | 0.943 | 21 | 70 | 1.049 | 29.3 | Infin | 0.937 | 0.325 | Infin |
| 6 | 26.75 | 1.605 | 0.958 | 21 | 70 | 1.049 | 29.3 | Infin | 0.934 | 0.326 | Infin |
| 6 | 27.25 | 1.635 | 0.972 | 21 | 70 | 1.049 | 29.3 | Infin | 0.932 | 0.326 | Infin |
| 6 | 27.75 | 1.665 | 0.986 | 21 | 70 | 1.049 | 29.3 | Infin | 0.930 | 0.327 | Infin |
| 6 | 28.25 | 1.695 | 1.001 | 21 | 70 | 1.049 | 29.3 | Infin | 0.928 | 0.327 | Infin |
| 6 | 28.75 | 1.725 | 1.015 | 21 | 70 | 1.049 | 29.3 | Infin | 0.926 | 0.327 | Infin |
| 6 | 29.25 | 1.755 | 1.030 | 21 | 70 | 1.049 | 29.3 | Infin | 0.923 | 0.327 | Infin |
| 6 | 29.75 | 1.785 | 1.044 | 21 | 70 | 1.049 | 29.3 | Infin | 0.921 | 0.328 | Infin |
| 7 | 30.25 | 1.815 | 1.058 | 25 | 73 | 0.979 | 32.6 | Infin | 0.919 | 0.328 | Infin |
| 7 | 30.75 | 1.845 | 1.073 | 25 | 73 | 0.979 | 32.6 | Infin | 0.916 | 0.328 | Infin |
| 7 | 31.25 | 1.875 | 1.087 | 25 | 73 | 0.979 | 32.6 | Infin | 0.913 | 0.328 | Infin |
| 7 | 31.75 | 1.905 | 1.102 | 25 | 73 | 0.979 | 32.6 | Infin | 0.910 | 0.327 | Infin |
| 7 | 32.25 | 1.935 | 1.116 | 25 | 73 | 0.979 | 32.6 | Infin | 0.907 | 0.327 | Infin |
| 7 | 32.75 | 1.965 | 1.130 | 25 | 73 | 0.979 | 32.6 | Infin | 0.904 | 0.327 | Infin |
| 7 | 33.25 | 1.995 | 1.145 | 25 | 73 | 0.979 | 32.6 | Infin | 0.902 | 0.327 | Infin |
| 7 | 33.75 | 2.025 | 1.159 | 25 | 73 | 0.979 | 32.6 | Infin | 0.899 | 0.327 | Infin |
| 7 | 34.25 | 2.055 | 1.174 | 25 | 73 | 0.979 | 32.6 | Infin | 0.896 | 0.326 | Infin |
| 7 | 34.75 | 2.085 | 1.188 | 25 | 73 | 0.979 | 32.6 | Infin | 0.893 | 0.326 | Infin |
| 8 | 35.25 | 2.115 | 1.202 | 51 | 102 | 0.927 | 62.9 | Infin | 0.890 | 0.326 | Infin |
| 8 | 35.75 | 2.145 | 1.217 | 51 | 102 | 0.927 | 62.9 | Infin | 0.886 | 0.325 | Infin |
| 8 | 36.25 | 2.175 | 1.231 | 51 | 102 | 0.927 | 62.9 | Infin | 0.882 | 0.324 | Infin |
| 8 | 36.75 | 2.205 | 1.246 | 51 | 102 | 0.927 | 62.9 | Infin | 0.878 | 0.323 | Infin |
| 8 | 37.25 | 2.235 | 1.260 | 51 | 102 | 0.927 | 62.9 | Infin | 0.874 | 0.322 | Infin |
| 8 | 37.75 | 2.265 | 1.274 | 51 | 102 | 0.927 | 62.9 | Infin | 0.870 | 0.322 | Infin |



| | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 8 | 38.25 | 2.295 | 1.289 | 51 | 102 | 0.927 | 62.9 | Infin | 0.866 | 0.321 | Infin |
| 8 | 38.75 | 2.325 | 1.303 | 51 | 102 | 0.927 | 62.9 | Infin | 0.862 | 0.320 | Infin |
| 8 | 39.25 | 2.355 | 1.318 | 51 | 102 | 0.927 | 62.9 | Infin | 0.858 | 0.319 | Infin |
| 8 | 39.75 | 2.385 | 1.332 | 51 | 102 | 0.927 | 62.9 | Infin | 0.855 | 0.318 | Infin |
| 9 | 40.25 | 2.415 | 1.346 | 28 | 73 | 0.886 | 33.0 | Infin | 0.850 | 0.317 | Infin |
| 9 | 40.75 | 2.445 | 1.361 | 28 | 73 | 0.886 | 33.0 | Infin | 0.845 | 0.316 | Infin |
| 9 | 41.25 | 2.475 | 1.375 | 28 | 73 | 0.886 | 33.0 | Infin | 0.840 | 0.315 | Infin |
| 9 | 41.75 | 2.505 | 1.390 | 28 | 73 | 0.886 | 33.0 | Infin | 0.836 | 0.313 | Infin |
| 9 | 42.25 | 2.535 | 1.404 | 28 | 73 | 0.886 | 33.0 | Infin | 0.831 | 0.312 | Infin |
| 9 | 42.75 | 2.565 | 1.418 | 28 | 73 | 0.886 | 33.0 | Infin | 0.826 | 0.311 | Infin |
| 9 | 43.25 | 2.595 | 1.433 | 28 | 73 | 0.886 | 33.0 | Infin | 0.821 | 0.309 | Infin |
| 9 | 43.75 | 2.625 | 1.447 | 28 | 73 | 0.886 | 33.0 | Infin | 0.816 | 0.308 | Infin |
| 9 | 44.25 | 2.655 | 1.462 | 28 | 73 | 0.886 | 33.0 | Infin | 0.811 | 0.307 | Infin |
| 9 | 44.75 | 2.685 | 1.476 | 28 | 73 | 0.886 | 33.0 | Infin | 0.806 | 0.305 | Infin |
| 10 | 45.25 | 2.715 | 1.490 | 36 | 81 | 0.850 | 40.7 | Infin | 0.801 | 0.304 | Infin |
| 10 | 45.75 | 2.745 | 1.505 | 36 | 81 | 0.850 | 40.7 | Infin | 0.796 | 0.302 | Infin |
| 10 | 46.25 | 2.775 | 1.519 | 36 | 81 | 0.850 | 40.7 | Infin | 0.791 | 0.301 | Infin |
| 10 | 46.75 | 2.805 | 1.534 | 36 | 81 | 0.850 | 40.7 | Infin | 0.786 | 0.299 | Infin |
| 10 | 47.25 | 2.835 | 1.548 | 36 | 81 | 0.850 | 40.7 | Infin | 0.781 | 0.297 | Infin |
| 10 | 47.75 | 2.865 | 1.562 | 36 | 81 | 0.850 | 40.7 | Infin | 0.776 | 0.296 | Infin |
| 10 | 48.25 | 2.895 | 1.577 | 36 | 81 | 0.850 | 40.7 | Infin | 0.771 | 0.294 | Infin |
| 10 | 48.75 | 2.925 | 1.591 | 36 | 81 | 0.850 | 40.7 | Infin | 0.765 | 0.293 | Infin |
| 10 | 49.25 | 2.955 | 1.606 | 36 | 81 | 0.850 | 40.7 | Infin | 0.760 | 0.291 | Infin |



| SOIL NO. | CALC. DEPTH (ft) | TOTAL STRESS (tsf) | EFF. STRESS (tsf) | FIELD N (B/ft) | Est.D r (%) | C N | CORR. (N1)60 (B/ft) | LIQUE. STRESS RATIO | r d | INDUC. STRESS RATIO | LIQUE. SAFETY FACTOR |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 10 | 49.75 | 2.985 | 1.620 | 36 | 81 | 0.850 | 40.7 | Infin | 0.755 | 0.289 | Infin |

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*  SOIL PROFILE LOG  *
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SOIL PROFILE NAME: TWB3
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| LAYER # | BASE DEPTH (ft) | SPT FIELD-N (blows/ft) | LIQUEFACTION SUSCEPTIBILITY | WET UNIT WT. (pcf) | FINES %<#200 | D (mm) 50 | DEPTH OF SPT (ft) |
|---|---|---|---|---|---|---|---|
| 1 | 6.0 | 6.0 | UNSUSCEPTIBLE (0) | 120.0 | 39.0 | 0.130 | 5.25 |
| 2 | 10.0 | 6.0 | UNSUSCEPTIBLE (0) | 120.0 | 39.0 | 0.130 | 5.25 |
| 3 | 15.0 | 5.0 | UNSUSCEPTIBLE (0) | 120.0 | 39.0 | 0.130 | 10.25 |
| 4 | 20.0 | 17.0 | SUSCEPTIBLE (1) | 120.0 | 39.0 | 0.130 | 15.25 |
| 5 | 25.0 | 24.0 | SUSCEPTIBLE (1) | 120.0 | 8.0 | 1.800 | 20.25 |
| 6 | 30.0 | 29.0 | SUSCEPTIBLE (1) | 120.0 | 8.0 | 1.800 | 25.25 |
| 7 | 35.0 | 83.0 | SUSCEPTIBLE (1) | 120.0 | 8.0 | 1.800 | 30.25 |
| 8 | 40.0 | 69.0 | SUSCEPTIBLE (1) | 120.0 | 8.0 | 1.800 | 35.25 |
| 9 | 45.0 | 55.0 | SUSCEPTIBLE (1) | 120.0 | 9.0 | 1.300 | 40.25 |
| 10 | 50.0 | 95.0 | SUSCEPTIBLE (1) | 120.0 | 9.0 | 1.300 | 45.25 |

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*        *
* L I Q U E F Y 2 *
*        *
*  Version  1.20  *
*        *
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EMPIRICAL PREDICTION OF
EARTHQUAKE-INDUCED LIQUEFACTION POTENTIAL

JOB NUMBER: 970011-001 DATE: Wednesday, November 13, 1996

JOB NAME: TW HOMES - BANNING LOWLAND

LIQUEFACTION CALCULATION NAME: BORING B-3

SOIL-PROFILE NAME: TWB3

GROUND WATER DEPTH: 6.0 ft

DESIGN EARTHQUAKE MAGNITUDE: 7.10

SITE PEAK GROUND ACCELERATION: 0.320 g

K sigma BOUND: M

rd BOUND: M

N60 CORRECTION: 1.33

FIELD SPT N-VALUES < 10 FT DEEP ARE CORRECTED FOR SHORT LENGTH OF DRIVE RODS

NOTE: Relative density values listed below are estimated using equations of Giuliani and Nicoll (1982).



LIQUEFACTION ANALYSIS SUMMARY

Seed and Others [1985] Method



| SOIL NO. | CALC. DEPTH (ft) | TOTAL STRESS (tsf) | EFF. STRESS (tsf) | FIELD N (B/ft) | Est.D r (%) | C N | CORR. (N1)60 (B/ft) | LIQUE. STRESS RATIO | r d | INDUC. STRESS RATIO | LIQUE. SAFETY FACTOR |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 0.25 | 0.015 | 0.015 | 6 | ~ | @ | @ | @ | @ | @ | @ @ |
| 1 | 0.75 | 0.045 | 0.045 | 6 | ~ | @ | @ | @ | @ | @ | @ @ |
| 1 | 1.25 | 0.075 | 0.075 | 6 | ~ | @ | @ | @ | @ | @ | @ @ |
| 1 | 1.75 | 0.105 | 0.105 | 6 | ~ | @ | @ | @ | @ | @ | @ @ |
| 1 | 2.25 | 0.135 | 0.135 | 6 | ~ | @ | @ | @ | @ | @ | @ @ |
| 1 | 2.75 | 0.165 | 0.165 | 6 | ~ | @ | @ | @ | @ | @ | @ @ |
| 1 | 3.25 | 0.195 | 0.195 | 6 | ~ | @ | @ | @ | @ | @ | @ @ |
| 1 | 3.75 | 0.225 | 0.225 | 6 | ~ | @ | @ | @ | @ | @ | @ @ |
| 1 | 4.25 | 0.255 | 0.255 | 6 | ~ | @ | @ | @ | @ | @ | @ @ |
| 1 | 4.75 | 0.285 | 0.285 | 6 | ~ | @ | @ | @ | @ | @ | @ @ |
| 1 | 5.25 | 0.315 | 0.315 | 6 | ~ | @ | @ | @ | @ | @ | @ @ |
| 1 | 5.75 | 0.345 | 0.345 | 6 | ~ | @ | @ | @ | @ | @ | @ @ |
| 2 | 6.25 | 0.375 | 0.367 | 6 | ~ | ~ | ~ | ~ | ~ | ~ | -- |
| 2 | 6.75 | 0.405 | 0.382 | 6 | ~ | ~ | ~ | ~ | ~ | ~ | -- |
| 2 | 7.25 | 0.435 | 0.396 | 6 | ~ | ~ | ~ | ~ | ~ | ~ | -- |
| 2 | 7.75 | 0.465 | 0.410 | 6 | ~ | ~ | ~ | ~ | ~ | ~ | -- |
| 2 | 8.25 | 0.495 | 0.425 | 6 | ~ | ~ | ~ | ~ | ~ | ~ | -- |
| 2 | 8.75 | 0.525 | 0.439 | 6 | ~ | ~ | ~ | ~ | ~ | ~ | -- |
| 2 | 9.25 | 0.555 | 0.454 | 6 | ~ | ~ | ~ | ~ | ~ | ~ | -- |
| 2 | 9.75 | 0.585 | 0.468 | 6 | ~ | ~ | ~ | ~ | ~ | ~ | -- |
| 3 | 10.25 | 0.615 | 0.482 | 5 | ~ | ~ | ~ | ~ | ~ | ~ | -- |
| 3 | 10.75 | 0.645 | 0.497 | 5 | ~ | ~ | ~ | ~ | ~ | ~ | -- |
| 3 | 11.25 | 0.675 | 0.511 | 5 | ~ | ~ | ~ | ~ | ~ | ~ | -- |
| 3 | 11.75 | 0.705 | 0.526 | 5 | ~ | ~ | ~ | ~ | ~ | ~ | -- |
| 3 | 12.25 | 0.735 | 0.540 | 5 | ~ | ~ | ~ | ~ | ~ | ~ | -- |
| 3 | 12.75 | 0.765 | 0.554 | 5 | ~ | ~ | ~ | ~ | ~ | ~ | -- |
| 3 | 13.25 | 0.795 | 0.569 | 5 | ~ | ~ | ~ | ~ | ~ | ~ | -- |
| 3 | 13.75 | 0.825 | 0.583 | 5 | ~ | ~ | ~ | ~ | ~ | ~ | -- |
| 3 | 14.25 | 0.855 | 0.598 | 5 | ~ | ~ | ~ | ~ | ~ | ~ | -- |
| 3 | 14.75 | 0.885 | 0.612 | 5 | ~ | ~ | ~ | ~ | ~ | ~ | -- |
| 4 | 15.25 | 0.915 | 0.626 | 17 | 68 | 1.263 | 28.6 | Infin | 0.968 | 0.294 | Infin |
| 4 | 15.75 | 0.945 | 0.641 | 17 | 68 | 1.263 | 28.6 | Infin | 0.967 | 0.297 | Infin |

| | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 4 | 16.25 | 0.975 | 0.655 | 17 | 68 | 1.263 | 28.6 | Infin | 0.966 | 0.299 | Infin |
| 4 | 16.75 | 1.005 | 0.670 | 17 | 68 | 1.263 | 28.6 | Infin | 0.965 | 0.301 | Infin |
| 4 | 17.25 | 1.035 | 0.684 | 17 | 68 | 1.263 | 28.6 | Infin | 0.964 | 0.303 | Infin |
| 4 | 17.75 | 1.065 | 0.698 | 17 | 68 | 1.263 | 28.6 | Infin | 0.963 | 0.305 | Infin |
| 4 | 18.25 | 1.095 | 0.713 | 17 | 68 | 1.263 | 28.6 | Infin | 0.961 | 0.307 | Infin |
| 4 | 18.75 | 1.125 | 0.727 | 17 | 68 | 1.263 | 28.6 | Infin | 0.960 | 0.309 | Infin |
| 4 | 19.25 | 1.155 | 0.742 | 17 | 68 | 1.263 | 28.6 | Infin | 0.959 | 0.311 | Infin |
| 4 | 19.75 | 1.185 | 0.756 | 17 | 68 | 1.263 | 28.6 | Infin | 0.958 | 0.312 | Infin |
| 5 | 20.25 | 1.215 | 0.770 | 24 | 77 | 1.144 | 36.5 | Infin | 0.957 | 0.314 | Infin |
| 5 | 20.75 | 1.245 | 0.785 | 24 | 77 | 1.144 | 36.5 | Infin | 0.955 | 0.315 | Infin |
| 5 | 21.25 | 1.275 | 0.799 | 24 | 77 | 1.144 | 36.5 | Infin | 0.954 | 0.316 | Infin |
| 5 | 21.75 | 1.305 | 0.814 | 24 | 77 | 1.144 | 36.5 | Infin | 0.952 | 0.318 | Infin |
| 5 | 22.25 | 1.335 | 0.828 | 24 | 77 | 1.144 | 36.5 | Infin | 0.951 | 0.319 | Infin |
| 5 | 22.75 | 1.365 | 0.842 | 24 | 77 | 1.144 | 36.5 | Infin | 0.949 | 0.320 | Infin |

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| SOIL NO. | CALC. DEPTH (ft) | TOTAL STRESS (tsf) | EFF. STRESS (tsf) | FIELD N (B/ft) | Est.D r (%) | C N | CORR. (N1)60 (B/ft) | LIQUE. STRESS RATIO | r d | INDUC. STRESS RATIO | LIQUE. SAFETY FACTOR |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 5 | 23.25 | 1.395 | 0.857 | 24 | 77 | 1.144 | 36.5 | Infin | 0.947 | 0.321 | Infin |
| 5 | 23.75 | 1.425 | 0.871 | 24 | 77 | 1.144 | 36.5 | Infin | 0.946 | 0.322 | Infin |
| 5 | 24.25 | 1.455 | 0.886 | 24 | 77 | 1.144 | 36.5 | Infin | 0.944 | 0.323 | Infin |
| 5 | 24.75 | 1.485 | 0.900 | 24 | 77 | 1.144 | 36.5 | Infin | 0.943 | 0.324 | Infin |
| 6 | 25.25 | 1.515 | 0.914 | 29 | 82 | 1.049 | 40.5 | Infin | 0.941 | 0.324 | Infin |
| 6 | 25.75 | 1.545 | 0.929 | 29 | 82 | 1.049 | 40.5 | Infin | 0.939 | 0.325 | Infin |
| 6 | 26.25 | 1.575 | 0.943 | 29 | 82 | 1.049 | 40.5 | Infin | 0.937 | 0.325 | Infin |
| 6 | 26.75 | 1.605 | 0.958 | 29 | 82 | 1.049 | 40.5 | Infin | 0.934 | 0.326 | Infin |
| 6 | 27.25 | 1.635 | 0.972 | 29 | 82 | 1.049 | 40.5 | Infin | 0.932 | 0.326 | Infin |
| 6 | 27.75 | 1.665 | 0.986 | 29 | 82 | 1.049 | 40.5 | Infin | 0.930 | 0.327 | Infin |
| 6 | 28.25 | 1.695 | 1.001 | 29 | 82 | 1.049 | 40.5 | Infin | 0.928 | 0.327 | Infin |
| 6 | 28.75 | 1.725 | 1.015 | 29 | 82 | 1.049 | 40.5 | Infin | 0.926 | 0.327 | Infin |
| 6 | 29.25 | 1.755 | 1.030 | 29 | 82 | 1.049 | 40.5 | Infin | 0.923 | 0.327 | Infin |
| 6 | 29.75 | 1.785 | 1.044 | 29 | 82 | 1.049 | 40.5 | Infin | 0.921 | 0.328 | Infin |
| 7 | 30.25 | 1.815 | 1.058 | 83 | 134 | 0.979 | 108.1 | Infin | 0.919 | 0.328 | Infin |
| 7 | 30.75 | 1.845 | 1.073 | 83 | 134 | 0.979 | 108.1 | Infin | 0.916 | 0.328 | Infin |
| 7 | 31.25 | 1.875 | 1.087 | 83 | 134 | 0.979 | 108.1 | Infin | 0.913 | 0.328 | Infin |
| 7 | 31.75 | 1.905 | 1.102 | 83 | 134 | 0.979 | 108.1 | Infin | 0.910 | 0.327 | Infin |
| 7 | 32.25 | 1.935 | 1.116 | 83 | 134 | 0.979 | 108.1 | Infin | 0.907 | 0.327 | Infin |
| 7 | 32.75 | 1.965 | 1.130 | 83 | 134 | 0.979 | 108.1 | Infin | 0.904 | 0.327 | Infin |
| 7 | 33.25 | 1.995 | 1.145 | 83 | 134 | 0.979 | 108.1 | Infin | 0.902 | 0.327 | Infin |
| 7 | 33.75 | 2.025 | 1.159 | 83 | 134 | 0.979 | 108.1 | Infin | 0.899 | 0.327 | Infin |
| 7 | 34.25 | 2.055 | 1.174 | 83 | 134 | 0.979 | 108.1 | Infin | 0.896 | 0.326 | Infin |
| 7 | 34.75 | 2.085 | 1.188 | 83 | 134 | 0.979 | 108.1 | Infin | 0.893 | 0.326 | Infin |
| 8 | 35.25 | 2.115 | 1.202 | 69 | 118 | 0.927 | 85.1 | Infin | 0.890 | 0.326 | Infin |
| 8 | 35.75 | 2.145 | 1.217 | 69 | 118 | 0.927 | 85.1 | Infin | 0.886 | 0.325 | Infin |
| 8 | 36.25 | 2.175 | 1.231 | 69 | 118 | 0.927 | 85.1 | Infin | 0.882 | 0.324 | Infin |
| 8 | 36.75 | 2.205 | 1.246 | 69 | 118 | 0.927 | 85.1 | Infin | 0.878 | 0.323 | Infin |
| 8 | 37.25 | 2.235 | 1.260 | 69 | 118 | 0.927 | 85.1 | Infin | 0.874 | 0.322 | Infin |
| 8 | 37.75 | 2.265 | 1.274 | 69 | 118 | 0.927 | 85.1 | Infin | 0.870 | 0.322 | Infin |



| | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 8 | 38.25 | 2.295 | 1.289 | 69 | 118 | 0.927 | 85.1 | Infin | 0.866 | 0.321 | Infin |
| 8 | 38.75 | 2.325 | 1.303 | 69 | 118 | 0.927 | 85.1 | Infin | 0.862 | 0.320 | Infin |
| 8 | 39.25 | 2.355 | 1.318 | 69 | 118 | 0.927 | 85.1 | Infin | 0.858 | 0.319 | Infin |
| 8 | 39.75 | 2.385 | 1.332 | 69 | 118 | 0.927 | 85.1 | Infin | 0.855 | 0.318 | Infin |
| 9 | 40.25 | 2.415 | 1.346 | 55 | 103 | 0.886 | 64.8 | Infin | 0.850 | 0.317 | Infin |
| 9 | 40.75 | 2.445 | 1.361 | 55 | 103 | 0.886 | 64.8 | Infin | 0.845 | 0.316 | Infin |
| 9 | 41.25 | 2.475 | 1.375 | 55 | 103 | 0.886 | 64.8 | Infin | 0.840 | 0.315 | Infin |
| 9 | 41.75 | 2.505 | 1.390 | 55 | 103 | 0.886 | 64.8 | Infin | 0.836 | 0.313 | Infin |
| 9 | 42.25 | 2.535 | 1.404 | 55 | 103 | 0.886 | 64.8 | Infin | 0.831 | 0.312 | Infin |
| 9 | 42.75 | 2.565 | 1.418 | 55 | 103 | 0.886 | 64.8 | Infin | 0.826 | 0.311 | Infin |
| 9 | 43.25 | 2.595 | 1.433 | 55 | 103 | 0.886 | 64.8 | Infin | 0.821 | 0.309 | Infin |
| 9 | 43.75 | 2.625 | 1.447 | 55 | 103 | 0.886 | 64.8 | Infin | 0.816 | 0.308 | Infin |
| 9 | 44.25 | 2.655 | 1.462 | 55 | 103 | 0.886 | 64.8 | Infin | 0.811 | 0.307 | Infin |
| 9 | 44.75 | 2.685 | 1.476 | 55 | 103 | 0.886 | 64.8 | Infin | 0.806 | 0.305 | Infin |
| 10 | 45.25 | 2.715 | 1.490 | 95 | 131 | 0.850 | 107.5 | Infin | 0.801 | 0.304 | Infin |
| 10 | 45.75 | 2.745 | 1.505 | 95 | 131 | 0.850 | 107.5 | Infin | 0.796 | 0.302 | Infin |
| 10 | 46.25 | 2.775 | 1.519 | 95 | 131 | 0.850 | 107.5 | Infin | 0.791 | 0.301 | Infin |
| 10 | 46.75 | 2.805 | 1.534 | 95 | 131 | 0.850 | 107.5 | Infin | 0.786 | 0.299 | Infin |
| 10 | 47.25 | 2.835 | 1.548 | 95 | 131 | 0.850 | 107.5 | Infin | 0.781 | 0.297 | Infin |
| 10 | 47.75 | 2.865 | 1.562 | 95 | 131 | 0.850 | 107.5 | Infin | 0.776 | 0.296 | Infin |
| 10 | 48.25 | 2.895 | 1.577 | 95 | 131 | 0.850 | 107.5 | Infin | 0.771 | 0.294 | Infin |
| 10 | 48.75 | 2.925 | 1.591 | 95 | 131 | 0.850 | 107.5 | Infin | 0.765 | 0.293 | Infin |
| 10 | 49.25 | 2.955 | 1.606 | 95 | 131 | 0.850 | 107.5 | Infin | 0.760 | 0.291 | Infin |

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| SOIL NO. | CALC. DEPTH (ft) | TOTAL STRESS (tsf) | EFF. STRESS (tsf) | FIELD N (B/ft) | Est.D r (%) | C N | CORR. (N1)60 (B/ft) | LIQUE. STRESS RATIO | r d | INDUC. STRESS RATIO | LIQUE. SAFETY FACTOR |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 10 | 49.75 | 2.985 | 1.620 | 95 | 131 | 0.850 | 107.5 | Infin | 0.755 | 0.289 | Infin |

**********
*  SOIL PROFILE LOG  *
**********

SOIL PROFILE NAME: TWB4

| LAYER # | BASE DEPTH (ft) | SPT FIELD-N (blows/ft) | LIQUEFACTION SUSCEPTIBILITY | WET UNIT WT. (pcf) | FINES %<#200 | D (mm) 50 | DEPTH OF SPT (ft) |
|---|---|---|---|---|---|---|---|
| 1 | 7.0 | 12.0 | UNSUSCEPTIBLE (0) | 120.0 | 10.0 | 0.180 | 5.25 |
| 2 | 10.0 | 10.0 | SUSCEPTIBLE (1) | 120.0 | 10.0 | 0.180 | 5.25 |
| 3 | 15.0 | 10.0 | SUSCEPTIBLE (1) | 120.0 | 10.0 | 0.180 | 10.25 |
| 4 | 20.0 | 21.0 | SUSCEPTIBLE (1) | 120.0 | 10.0 | 0.180 | 15.25 |
| 5 | 25.0 | 25.0 | SUSCEPTIBLE (1) | 120.0 | 7.0 | 0.280 | 20.25 |
| 6 | 30.0 | 41.0 | SUSCEPTIBLE (1) | 120.0 | 7.0 | 0.280 | 25.25 |
| 7 | 35.0 | 44.0 | SUSCEPTIBLE (1) | 120.0 | 7.0 | 0.280 | 30.25 |
| 8 | 40.0 | 43.0 | SUSCEPTIBLE (1) | 120.0 | 7.0 | 0.280 | 35.25 |
| 9 | 45.0 | 16.0 | SUSCEPTIBLE (1) | 120.0 | 7.0 | 0.280 | 40.25 |
| 10 | 50.0 | 31.0 | SUSCEPTIBLE (1) | 120.0 | 14.0 | 0.170 | 45.25 |

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*        *
* L I Q U E F Y 2 *
*        *
*  Version  1.20  *
*        *
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EMPIRICAL PREDICTION OF
EARTHQUAKE-INDUCED LIQUEFACTION POTENTIAL

JOB NUMBER: 970011-001 DATE: Wednesday, November 13, 1996

JOB NAME: TW HOMES - BANNING LOWLAND

LIQUEFACTION CALCULATION NAME: BORING B-4

SOIL-PROFILE NAME: TWB4

GROUND WATER DEPTH: 7.0 ft

DESIGN EARTHQUAKE MAGNITUDE: 7.10

SITE PEAK GROUND ACCELERATION: 0.320 g

K sigma BOUND: M

rd BOUND: M

N60 CORRECTION: 1.33

FIELD SPT N-VALUES < 10 FT DEEP ARE CORRECTED FOR SHORT LENGTH OF DRIVE RODS

NOTE: Relative density values listed below are estimated using equations of Giuliani and Nicoll (1982).



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LIQUEFACTION ANALYSIS SUMMARY
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Seed and Others [1985] Method
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| SOIL NO. | CALC. DEPTH (ft) | TOTAL STRESS (tsf) | EFF. STRESS (tsf) | FIELD N (B/ft) | Est.D r (%) | C N | CORR. (N1)60 (B/ft) | LIQUE. STRESS RATIO | r d | INDUC. STRESS RATIO | LIQUE. SAFETY FACTOR |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 0.25 | 0.015 | 0.015 | 12 | ~ | @ | @ | @ | @ | @ | @ @ |
| 1 | 0.75 | 0.045 | 0.045 | 12 | ~ | @ | @ | @ | @ | @ | @ @ |
| 1 | 1.25 | 0.075 | 0.075 | 12 | ~ | @ | @ | @ | @ | @ | @ @ |
| 1 | 1.75 | 0.105 | 0.105 | 12 | ~ | @ | @ | @ | @ | @ | @ @ |
| 1 | 2.25 | 0.135 | 0.135 | 12 | ~ | @ | @ | @ | @ | @ | @ @ |
| 1 | 2.75 | 0.165 | 0.165 | 12 | ~ | @ | @ | @ | @ | @ | @ @ |
| 1 | 3.25 | 0.195 | 0.195 | 12 | ~ | @ | @ | @ | @ | @ | @ @ |
| 1 | 3.75 | 0.225 | 0.225 | 12 | ~ | @ | @ | @ | @ | @ | @ @ |
| 1 | 4.25 | 0.255 | 0.255 | 12 | ~ | @ | @ | @ | @ | @ | @ @ |
| 1 | 4.75 | 0.285 | 0.285 | 12 | ~ | @ | @ | @ | @ | @ | @ @ |
| 1 | 5.25 | 0.315 | 0.315 | 12 | ~ | @ | @ | @ | @ | @ | @ @ |
| 1 | 5.75 | 0.345 | 0.345 | 12 | ~ | @ | @ | @ | @ | @ | @ @ |
| 1 | 6.25 | 0.375 | 0.375 | 12 | ~ | @ | @ | @ | @ | @ | @ @ |
| 1 | 6.75 | 0.405 | 0.405 | 12 | ~ | @ | @ | @ | @ | @ | @ @ |
| 2 | 7.25 | 0.435 | 0.427 | 10 | 58 | 1.740 | 17.4 | 0.240 | 0.985 | 0.209 | 1.15 |
| 2 | 7.75 | 0.465 | 0.442 | 10 | 58 | 1.740 | 17.4 | 0.240 | 0.984 | 0.216 | 1.11 |
| 2 | 8.25 | 0.495 | 0.456 | 10 | 58 | 1.740 | 17.4 | 0.240 | 0.983 | 0.222 | 1.08 |
| 2 | 8.75 | 0.525 | 0.470 | 10 | 58 | 1.740 | 17.4 | 0.240 | 0.982 | 0.228 | 1.05 |
| 2 | 9.25 | 0.555 | 0.485 | 10 | 58 | 1.740 | 17.4 | 0.240 | 0.981 | 0.234 | 1.03 |
| 2 | 9.75 | 0.585 | 0.499 | 10 | 58 | 1.740 | 17.4 | 0.240 | 0.980 | 0.239 | 1.01 |
| 3 | 10.25 | 0.615 | 0.514 | 10 | 54 | 1.358 | 18.1 | 0.250 | 0.979 | 0.244 | 1.03 |
| 3 | 10.75 | 0.645 | 0.528 | 10 | 54 | 1.358 | 18.1 | 0.250 | 0.978 | 0.249 | 1.01 |
| 3 | 11.25 | 0.675 | 0.542 | 10 | 54 | 1.358 | 18.1 | 0.250 | 0.977 | 0.253 | 0.99 |
| 3 | 11.75 | 0.705 | 0.557 | 10 | 54 | 1.358 | 18.1 | 0.250 | 0.976 | 0.257 | 0.97 |
| 3 | 12.25 | 0.735 | 0.571 | 10 | 54 | 1.358 | 18.1 | 0.250 | 0.975 | 0.261 | 0.96 |
| 3 | 12.75 | 0.765 | 0.586 | 10 | 54 | 1.358 | 18.1 | 0.250 | 0.974 | 0.265 | 0.95 |
| 3 | 13.25 | 0.795 | 0.600 | 10 | 54 | 1.358 | 18.1 | 0.250 | 0.972 | 0.268 | 0.93 |
| 3 | 13.75 | 0.825 | 0.614 | 10 | 54 | 1.358 | 18.1 | 0.250 | 0.971 | 0.271 | 0.92 |
| 3 | 14.25 | 0.855 | 0.629 | 10 | 54 | 1.358 | 18.1 | 0.250 | 0.970 | 0.274 | 0.91 |
| 3 | 14.75 | 0.885 | 0.643 | 10 | 54 | 1.358 | 18.1 | 0.250 | 0.969 | 0.277 | 0.90 |
| 4 | 15.25 | 0.915 | 0.658 | 21 | 74 | 1.236 | 34.5 | Infin | 0.968 | 0.280 | Infin |
| 4 | 15.75 | 0.945 | 0.672 | 21 | 74 | 1.236 | 34.5 | Infin | 0.967 | 0.283 | Infin |

| | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 4 | 16.25 | 0.975 | 0.686 | 21 | 74 | 1.236 | 34.5 | Infin | 0.966 | 0.285 | Infin |
| 4 | 16.75 | 1.005 | 0.701 | 21 | 74 | 1.236 | 34.5 | Infin | 0.965 | 0.288 | Infin |
| 4 | 17.25 | 1.035 | 0.715 | 21 | 74 | 1.236 | 34.5 | Infin | 0.964 | 0.290 | Infin |
| 4 | 17.75 | 1.065 | 0.730 | 21 | 74 | 1.236 | 34.5 | Infin | 0.963 | 0.292 | Infin |
| 4 | 18.25 | 1.095 | 0.744 | 21 | 74 | 1.236 | 34.5 | Infin | 0.961 | 0.294 | Infin |
| 4 | 18.75 | 1.125 | 0.758 | 21 | 74 | 1.236 | 34.5 | Infin | 0.960 | 0.296 | Infin |
| 4 | 19.25 | 1.155 | 0.773 | 21 | 74 | 1.236 | 34.5 | Infin | 0.959 | 0.298 | Infin |
| 4 | 19.75 | 1.185 | 0.787 | 21 | 74 | 1.236 | 34.5 | Infin | 0.958 | 0.300 | Infin |
| 5 | 20.25 | 1.215 | 0.802 | 25 | 78 | 1.119 | 37.2 | Infin | 0.957 | 0.302 | Infin |
| 5 | 20.75 | 1.245 | 0.816 | 25 | 78 | 1.119 | 37.2 | Infin | 0.955 | 0.303 | Infin |
| 5 | 21.25 | 1.275 | 0.830 | 25 | 78 | 1.119 | 37.2 | Infin | 0.954 | 0.305 | Infin |
| 5 | 21.75 | 1.305 | 0.845 | 25 | 78 | 1.119 | 37.2 | Infin | 0.952 | 0.306 | Infin |
| 5 | 22.25 | 1.335 | 0.859 | 25 | 78 | 1.119 | 37.2 | Infin | 0.951 | 0.307 | Infin |
| 5 | 22.75 | 1.365 | 0.874 | 25 | 78 | 1.119 | 37.2 | Infin | 0.949 | 0.308 | Infin |

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Seed and Others [1985] Method PAGE 2

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| SOIL NO. | CALC. DEPTH (ft) | TOTAL STRESS (tsf) | EFF. STRESS (tsf) | FIELD N (B/ft) | Est.D r (%) | C N | CORR. (N1)60 (B/ft) | LIQUE. STRESS RATIO | r d | INDUC. STRESS RATIO | LIQUE. SAFETY FACTOR |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 5 | 23.25 | 1.395 | 0.888 | 25 | 78 | 1.119 | 37.2 | Infin | 0.947 | 0.310 | Infin |
| 5 | 23.75 | 1.425 | 0.902 | 25 | 78 | 1.119 | 37.2 | Infin | 0.946 | 0.311 | Infin |
| 5 | 24.25 | 1.455 | 0.917 | 25 | 78 | 1.119 | 37.2 | Infin | 0.944 | 0.312 | Infin |
| 5 | 24.75 | 1.485 | 0.931 | 25 | 78 | 1.119 | 37.2 | Infin | 0.943 | 0.313 | Infin |
| 6 | 25.25 | 1.515 | 0.946 | 41 | 96 | 1.031 | 56.2 | Infin | 0.941 | 0.314 | Infin |
| 6 | 25.75 | 1.545 | 0.960 | 41 | 96 | 1.031 | 56.2 | Infin | 0.939 | 0.314 | Infin |
| 6 | 26.25 | 1.575 | 0.974 | 41 | 96 | 1.031 | 56.2 | Infin | 0.937 | 0.315 | Infin |
| 6 | 26.75 | 1.605 | 0.989 | 41 | 96 | 1.031 | 56.2 | Infin | 0.934 | 0.315 | Infin |
| 6 | 27.25 | 1.635 | 1.003 | 41 | 96 | 1.031 | 56.2 | Infin | 0.932 | 0.316 | Infin |
| 6 | 27.75 | 1.665 | 1.018 | 41 | 96 | 1.031 | 56.2 | Infin | 0.930 | 0.317 | Infin |
| 6 | 28.25 | 1.695 | 1.032 | 41 | 96 | 1.031 | 56.2 | Infin | 0.928 | 0.317 | Infin |
| 6 | 28.75 | 1.725 | 1.046 | 41 | 96 | 1.031 | 56.2 | Infin | 0.926 | 0.317 | Infin |
| 6 | 29.25 | 1.755 | 1.061 | 41 | 96 | 1.031 | 56.2 | Infin | 0.923 | 0.318 | Infin |
| 6 | 29.75 | 1.785 | 1.075 | 41 | 96 | 1.031 | 56.2 | Infin | 0.921 | 0.318 | Infin |
| 7 | 30.25 | 1.815 | 1.090 | 44 | 97 | 0.968 | 56.6 | Infin | 0.919 | 0.318 | Infin |
| 7 | 30.75 | 1.845 | 1.104 | 44 | 97 | 0.968 | 56.6 | Infin | 0.916 | 0.318 | Infin |
| 7 | 31.25 | 1.875 | 1.118 | 44 | 97 | 0.968 | 56.6 | Infin | 0.913 | 0.318 | Infin |
| 7 | 31.75 | 1.905 | 1.133 | 44 | 97 | 0.968 | 56.6 | Infin | 0.910 | 0.318 | Infin |
| 7 | 32.25 | 1.935 | 1.147 | 44 | 97 | 0.968 | 56.6 | Infin | 0.907 | 0.318 | Infin |
| 7 | 32.75 | 1.965 | 1.162 | 44 | 97 | 0.968 | 56.6 | Infin | 0.904 | 0.318 | Infin |
| 7 | 33.25 | 1.995 | 1.176 | 44 | 97 | 0.968 | 56.6 | Infin | 0.902 | 0.318 | Infin |
| 7 | 33.75 | 2.025 | 1.190 | 44 | 97 | 0.968 | 56.6 | Infin | 0.899 | 0.318 | Infin |
| 7 | 34.25 | 2.055 | 1.205 | 44 | 97 | 0.968 | 56.6 | Infin | 0.896 | 0.318 | Infin |
| 7 | 34.75 | 2.085 | 1.219 | 44 | 97 | 0.968 | 56.6 | Infin | 0.893 | 0.318 | Infin |
| 8 | 35.25 | 2.115 | 1.234 | 43 | 93 | 0.916 | 52.4 | Infin | 0.890 | 0.317 | Infin |
| 8 | 35.75 | 2.145 | 1.248 | 43 | 93 | 0.916 | 52.4 | Infin | 0.886 | 0.317 | Infin |
| 8 | 36.25 | 2.175 | 1.262 | 43 | 93 | 0.916 | 52.4 | Infin | 0.882 | 0.316 | Infin |
| 8 | 36.75 | 2.205 | 1.277 | 43 | 93 | 0.916 | 52.4 | Infin | 0.878 | 0.315 | Infin |
| 8 | 37.25 | 2.235 | 1.291 | 43 | 93 | 0.916 | 52.4 | Infin | 0.874 | 0.315 | Infin |
| 8 | 37.75 | 2.265 | 1.306 | 43 | 93 | 0.916 | 52.4 | Infin | 0.870 | 0.314 | Infin |



| | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 8 | 38.25 | 2.295 | 1.320 | 43 | 93 | 0.916 | 52.4 | Infin | 0.866 | 0.313 | Infin |
| 8 | 38.75 | 2.325 | 1.334 | 43 | 93 | 0.916 | 52.4 | Infin | 0.862 | 0.313 | Infin |
| 8 | 39.25 | 2.355 | 1.349 | 43 | 93 | 0.916 | 52.4 | Infin | 0.858 | 0.312 | Infin |
| 8 | 39.75 | 2.385 | 1.363 | 43 | 93 | 0.916 | 52.4 | Infin | 0.855 | 0.311 | Infin |
| 9 | 40.25 | 2.415 | 1.378 | 16 | 55 | 0.854 | 18.2 | 0.226 | 0.850 | 0.310 | 0.73 |
| 9 | 40.75 | 2.445 | 1.392 | 16 | 55 | 0.854 | 18.2 | 0.226 | 0.845 | 0.309 | 0.73 |
| 9 | 41.25 | 2.475 | 1.406 | 16 | 55 | 0.854 | 18.2 | 0.226 | 0.840 | 0.308 | 0.74 |
| 9 | 41.75 | 2.505 | 1.421 | 16 | 55 | 0.854 | 18.2 | 0.226 | 0.836 | 0.306 | 0.74 |
| 9 | 42.25 | 2.535 | 1.435 | 16 | 55 | 0.854 | 18.2 | 0.226 | 0.831 | 0.305 | 0.74 |
| 9 | 42.75 | 2.565 | 1.450 | 16 | 55 | 0.854 | 18.2 | 0.226 | 0.826 | 0.304 | 0.74 |
| 9 | 43.25 | 2.595 | 1.464 | 16 | 55 | 0.854 | 18.2 | 0.226 | 0.821 | 0.303 | 0.75 |
| 9 | 43.75 | 2.625 | 1.478 | 16 | 55 | 0.854 | 18.2 | 0.226 | 0.816 | 0.301 | 0.75 |
| 9 | 44.25 | 2.655 | 1.493 | 16 | 55 | 0.854 | 18.2 | 0.225 | 0.811 | 0.300 | 0.75 |
| 9 | 44.75 | 2.685 | 1.507 | 16 | 55 | 0.854 | 18.2 | 0.225 | 0.806 | 0.299 | 0.75 |
| 10 | 45.25 | 2.715 | 1.522 | 31 | 75 | 0.843 | 34.8 | Infin | 0.801 | 0.297 | Infin |
| 10 | 45.75 | 2.745 | 1.536 | 31 | 75 | 0.843 | 34.8 | Infin | 0.796 | 0.296 | Infin |
| 10 | 46.25 | 2.775 | 1.550 | 31 | 75 | 0.843 | 34.8 | Infin | 0.791 | 0.295 | Infin |
| 10 | 46.75 | 2.805 | 1.565 | 31 | 75 | 0.843 | 34.8 | Infin | 0.786 | 0.293 | Infin |
| 10 | 47.25 | 2.835 | 1.579 | 31 | 75 | 0.843 | 34.8 | Infin | 0.781 | 0.292 | Infin |
| 10 | 47.75 | 2.865 | 1.594 | 31 | 75 | 0.843 | 34.8 | Infin | 0.776 | 0.290 | Infin |
| 10 | 48.25 | 2.895 | 1.608 | 31 | 75 | 0.843 | 34.8 | Infin | 0.771 | 0.289 | Infin |
| 10 | 48.75 | 2.925 | 1.622 | 31 | 75 | 0.843 | 34.8 | Infin | 0.765 | 0.287 | Infin |
| 10 | 49.25 | 2.955 | 1.637 | 31 | 75 | 0.843 | 34.8 | Infin | 0.760 | 0.286 | Infin |

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Seed and Others [1985] Method PAGE 3

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| SOIL NO. | CALC. DEPTH (ft) | TOTAL STRESS (tsf) | EFF. STRESS (tsf) | FIELD N (B/ft) | Est.D r (%) | C N | CORR. (N1)60 (B/ft) | LIQUE. STRESS RATIO | r d | INDUC. STRESS RATIO | LIQUE. SAFETY FACTOR |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 10 | 49.75 | 2.985 | 1.651 | 31 | 75 | 0.843 | 34.8 | Infin | 0.755 | 0.284 | Infin |

**********
*  SOIL PROFILE LOG  *
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SOIL PROFILE NAME: TWB5

| LAYER # | BASE DEPTH (ft) | SPT FIELD-N (blows/ft) | LIQUEFACTION SUSCEPTIBILITY | WET UNIT WT. (pcf) | FINES %<#200 | D (mm) 50 | DEPTH OF SPT (ft) |
|---|---|---|---|---|---|---|---|
| 1 | 10.0 | 10.0 | UNSUSCEPTIBLE (0) | 120.0 | 21.0 | 0.210 | 5.25 |
| 2 | 15.0 | 10.0 | SUSCEPTIBLE (1) | 120.0 | 21.0 | 0.210 | 10.25 |
| 3 | 20.0 | 13.0 | SUSCEPTIBLE (1) | 120.0 | 21.0 | 0.210 | 15.25 |
| 4 | 21.0 | 25.0 | SUSCEPTIBLE (1) | 120.0 | 21.0 | 0.210 | 20.25 |
| 5 | 25.0 | 25.0 | UNSUSCEPTIBLE (0) | 120.0 | 63.0 | 0.500 | 20.25 |
| 6 | 30.0 | 26.0 | UNSUSCEPTIBLE (0) | 120.0 | 63.0 | 0.500 | 25.25 |
| 7 | 35.0 | 19.0 | UNSUSCEPTIBLE (0) | 120.0 | 63.0 | 0.500 | 30.25 |
| 8 | 40.0 | 17.0 | UNSUSCEPTIBLE (0) | 120.0 | 63.0 | 0.500 | 35.25 |
| 9 | 45.0 | 29.0 | UNSUSCEPTIBLE (0) | 120.0 | 63.0 | 0.500 | 40.25 |
| 10 | 50.0 | 29.0 | UNSUSCEPTIBLE (0) | 120.0 | 63.0 | 0.500 | 45.25 |

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* L I Q U E F Y 2 *
*        *
*  Version  1.20  *
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EMPIRICAL PREDICTION OF
EARTHQUAKE-INDUCED LIQUEFACTION POTENTIAL

JOB NUMBER: 970011-001 DATE: Wednesday, November 13, 1996

JOB NAME: TW HOMES - BANNING LOWLAND

LIQUEFACTION CALCULATION NAME: BORING B-5

SOIL-PROFILE NAME: TWB5

GROUND WATER DEPTH: 10.0 ft

DESIGN EARTHQUAKE MAGNITUDE: 7.10

SITE PEAK GROUND ACCELERATION: 0.320 g

K sigma BOUND: M

rd BOUND: M

N60 CORRECTION: 1.33

FIELD SPT N-VALUES < 10 FT DEEP ARE CORRECTED FOR SHORT LENGTH OF DRIVE RODS

NOTE: Relative density values listed below are estimated using equations of Giuliani and Nicoll (1982).



LIQUEFACTION ANALYSIS SUMMARY

Seed and Others [1985] Method



| SOIL NO. | CALC. DEPTH (ft) | TOTAL STRESS (tsf) | EFF. STRESS (tsf) | FIELD N (B/ft) | Est.D r (%) | C N | CORR. (N1)60 (B/ft) | LIQUE. STRESS RATIO | r d | INDUC. STRESS RATIO | LIQUE. SAFETY FACTOR |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 0.25 | 0.015 | 0.015 | 10 | ~ | @ | @ | @ | @ | @ | @ @ |
| 1 | 0.75 | 0.045 | 0.045 | 10 | ~ | @ | @ | @ | @ | @ | @ @ |
| 1 | 1.25 | 0.075 | 0.075 | 10 | ~ | @ | @ | @ | @ | @ | @ @ |
| 1 | 1.75 | 0.105 | 0.105 | 10 | ~ | @ | @ | @ | @ | @ | @ @ |
| 1 | 2.25 | 0.135 | 0.135 | 10 | ~ | @ | @ | @ | @ | @ | @ @ |
| 1 | 2.75 | 0.165 | 0.165 | 10 | ~ | @ | @ | @ | @ | @ | @ @ |
| 1 | 3.25 | 0.195 | 0.195 | 10 | ~ | @ | @ | @ | @ | @ | @ @ |
| 1 | 3.75 | 0.225 | 0.225 | 10 | ~ | @ | @ | @ | @ | @ | @ @ |
| 1 | 4.25 | 0.255 | 0.255 | 10 | ~ | @ | @ | @ | @ | @ | @ @ |
| 1 | 4.75 | 0.285 | 0.285 | 10 | ~ | @ | @ | @ | @ | @ | @ @ |
| 1 | 5.25 | 0.315 | 0.315 | 10 | ~ | @ | @ | @ | @ | @ | @ @ |
| 1 | 5.75 | 0.345 | 0.345 | 10 | ~ | @ | @ | @ | @ | @ | @ @ |
| 1 | 6.25 | 0.375 | 0.375 | 10 | ~ | @ | @ | @ | @ | @ | @ @ |
| 1 | 6.75 | 0.405 | 0.405 | 10 | ~ | @ | @ | @ | @ | @ | @ @ |
| 1 | 7.25 | 0.435 | 0.435 | 10 | ~ | @ | @ | @ | @ | @ | @ @ |
| 1 | 7.75 | 0.465 | 0.465 | 10 | ~ | @ | @ | @ | @ | @ | @ @ |
| 1 | 8.25 | 0.495 | 0.495 | 10 | ~ | @ | @ | @ | @ | @ | @ @ |
| 1 | 8.75 | 0.525 | 0.525 | 10 | ~ | @ | @ | @ | @ | @ | @ @ |
| 1 | 9.25 | 0.555 | 0.555 | 10 | ~ | @ | @ | @ | @ | @ | @ @ |
| 1 | 9.75 | 0.585 | 0.585 | 10 | ~ | @ | @ | @ | @ | @ | @ @ |
| 2 | 10.25 | 0.615 | 0.607 | 10 | 52 | 1.279 | 17.0 | 0.279 | 0.979 | 0.206 | 1.35 |
| 2 | 10.75 | 0.645 | 0.622 | 10 | 52 | 1.279 | 17.0 | 0.279 | 0.978 | 0.211 | 1.32 |
| 2 | 11.25 | 0.675 | 0.636 | 10 | 52 | 1.279 | 17.0 | 0.279 | 0.977 | 0.216 | 1.30 |
| 2 | 11.75 | 0.705 | 0.650 | 10 | 52 | 1.279 | 17.0 | 0.279 | 0.976 | 0.220 | 1.27 |
| 2 | 12.25 | 0.735 | 0.665 | 10 | 52 | 1.279 | 17.0 | 0.279 | 0.975 | 0.224 | 1.25 |
| 2 | 12.75 | 0.765 | 0.679 | 10 | 52 | 1.279 | 17.0 | 0.279 | 0.974 | 0.228 | 1.23 |
| 2 | 13.25 | 0.795 | 0.694 | 10 | 52 | 1.279 | 17.0 | 0.279 | 0.972 | 0.232 | 1.21 |
| 2 | 13.75 | 0.825 | 0.708 | 10 | 52 | 1.279 | 17.0 | 0.279 | 0.971 | 0.235 | 1.19 |
| 2 | 14.25 | 0.855 | 0.722 | 10 | 52 | 1.279 | 17.0 | 0.279 | 0.970 | 0.239 | 1.17 |
| 2 | 14.75 | 0.885 | 0.737 | 10 | 52 | 1.279 | 17.0 | 0.279 | 0.969 | 0.242 | 1.15 |
| 3 | 15.25 | 0.915 | 0.751 | 13 | 57 | 1.159 | 20.0 | 0.343 | 0.968 | 0.245 | 1.40 |
| 3 | 15.75 | 0.945 | 0.766 | 13 | 57 | 1.159 | 20.0 | 0.343 | 0.967 | 0.248 | 1.38 |

| | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 3 | 16.25 | 0.975 | 0.780 | 13 | 57 | 1.159 | 20.0 | 0.343 | 0.966 | 0.251 | 1.37 |
| 3 | 16.75 | 1.005 | 0.794 | 13 | 57 | 1.159 | 20.0 | 0.343 | 0.965 | 0.254 | 1.35 |
| 3 | 17.25 | 1.035 | 0.809 | 13 | 57 | 1.159 | 20.0 | 0.343 | 0.964 | 0.257 | 1.34 |
| 3 | 17.75 | 1.065 | 0.823 | 13 | 57 | 1.159 | 20.0 | 0.343 | 0.963 | 0.259 | 1.33 |
| 3 | 18.25 | 1.095 | 0.838 | 13 | 57 | 1.159 | 20.0 | 0.343 | 0.961 | 0.261 | 1.31 |
| 3 | 18.75 | 1.125 | 0.852 | 13 | 57 | 1.159 | 20.0 | 0.343 | 0.960 | 0.264 | 1.30 |
| 3 | 19.25 | 1.155 | 0.866 | 13 | 57 | 1.159 | 20.0 | 0.343 | 0.959 | 0.266 | 1.29 |
| 3 | 19.75 | 1.185 | 0.881 | 13 | 57 | 1.159 | 20.0 | 0.343 | 0.958 | 0.268 | 1.28 |
| 4 | 20.25 | 1.215 | 0.895 | 25 | 76 | 1.060 | 35.2 | Infin | 0.957 | 0.270 | Infin |
| 4 | 20.75 | 1.245 | 0.910 | 25 | 76 | 1.060 | 35.2 | Infin | 0.955 | 0.272 | Infin |
| 5 | 21.25 | 1.275 | 0.924 | 25 | ~ | ~ | ~ | ~ | ~ | ~ | ~~ |
| 5 | 21.75 | 1.305 | 0.938 | 25 | ~ | ~ | ~ | ~ | ~ | ~ | ~~ |
| 5 | 22.25 | 1.335 | 0.953 | 25 | ~ | ~ | ~ | ~ | ~ | ~ | ~~ |
| 5 | 22.75 | 1.365 | 0.967 | 25 | ~ | ~ | ~ | ~ | ~ | ~ | ~~ |

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| SOIL NO. | CALC. DEPTH (ft) | TOTAL STRESS (tsf) | EFF. STRESS (tsf) | FIELD N (B/ft) | Est.D r (%) | C N | CORR. (N1)60 (B/ft) | LIQUE. STRESS RATIO | r d | INDUC. STRESS RATIO | LIQUE. SAFETY FACTOR |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 5 | 23.25 | 1.395 | 0.982 | 25 | ~ | ~ | ~ | ~ | ~ | ~ | ~~ |
| 5 | 23.75 | 1.425 | 0.996 | 25 | ~ | ~ | ~ | ~ | ~ | ~ | ~~ |
| 5 | 24.25 | 1.455 | 1.010 | 25 | ~ | ~ | ~ | ~ | ~ | ~ | ~~ |
| 5 | 24.75 | 1.485 | 1.025 | 25 | ~ | ~ | ~ | ~ | ~ | ~ | ~~ |
| 6 | 25.25 | 1.515 | 1.039 | 26 | ~ | ~ | ~ | ~ | ~ | ~ | ~~ |
| 6 | 25.75 | 1.545 | 1.054 | 26 | ~ | ~ | ~ | ~ | ~ | ~ | ~~ |
| 6 | 26.25 | 1.575 | 1.068 | 26 | ~ | ~ | ~ | ~ | ~ | ~ | ~~ |
| 6 | 26.75 | 1.605 | 1.082 | 26 | ~ | ~ | ~ | ~ | ~ | ~ | ~~ |
| 6 | 27.25 | 1.635 | 1.097 | 26 | ~ | ~ | ~ | ~ | ~ | ~ | ~~ |
| 6 | 27.75 | 1.665 | 1.111 | 26 | ~ | ~ | ~ | ~ | ~ | ~ | ~~ |
| 6 | 28.25 | 1.695 | 1.126 | 26 | ~ | ~ | ~ | ~ | ~ | ~ | ~~ |
| 6 | 28.75 | 1.725 | 1.140 | 26 | ~ | ~ | ~ | ~ | ~ | ~ | ~~ |
| 6 | 29.25 | 1.755 | 1.154 | 26 | ~ | ~ | ~ | ~ | ~ | ~ | ~~ |
| 6 | 29.75 | 1.785 | 1.169 | 26 | ~ | ~ | ~ | ~ | ~ | ~ | ~~ |
| 7 | 30.25 | 1.815 | 1.183 | 19 | ~ | ~ | ~ | ~ | ~ | ~ | ~~ |
| 7 | 30.75 | 1.845 | 1.198 | 19 | ~ | ~ | ~ | ~ | ~ | ~ | ~~ |
| 7 | 31.25 | 1.875 | 1.212 | 19 | ~ | ~ | ~ | ~ | ~ | ~ | ~~ |
| 7 | 31.75 | 1.905 | 1.226 | 19 | ~ | ~ | ~ | ~ | ~ | ~ | ~~ |
| 7 | 32.25 | 1.935 | 1.241 | 19 | ~ | ~ | ~ | ~ | ~ | ~ | ~~ |
| 7 | 32.75 | 1.965 | 1.255 | 19 | ~ | ~ | ~ | ~ | ~ | ~ | ~~ |
| 7 | 33.25 | 1.995 | 1.270 | 19 | ~ | ~ | ~ | ~ | ~ | ~ | ~~ |
| 7 | 33.75 | 2.025 | 1.284 | 19 | ~ | ~ | ~ | ~ | ~ | ~ | ~~ |
| 7 | 34.25 | 2.055 | 1.298 | 19 | ~ | ~ | ~ | ~ | ~ | ~ | ~~ |
| 7 | 34.75 | 2.085 | 1.313 | 19 | ~ | ~ | ~ | ~ | ~ | ~ | ~~ |
| 8 | 35.25 | 2.115 | 1.327 | 17 | ~ | ~ | ~ | ~ | ~ | ~ | ~~ |
| 8 | 35.75 | 2.145 | 1.342 | 17 | ~ | ~ | ~ | ~ | ~ | ~ | ~~ |
| 8 | 36.25 | 2.175 | 1.356 | 17 | ~ | ~ | ~ | ~ | ~ | ~ | ~~ |
| 8 | 36.75 | 2.205 | 1.370 | 17 | ~ | ~ | ~ | ~ | ~ | ~ | ~~ |
| 8 | 37.25 | 2.235 | 1.385 | 17 | ~ | ~ | ~ | ~ | ~ | ~ | ~~ |
| 8 | 37.75 | 2.265 | 1.399 | 17 | ~ | ~ | ~ | ~ | ~ | ~ | ~~ |



| | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 8 | 38.25 | 2.295 | 1.414 | 17 | ~ | ~ | ~ | ~ | ~ | ~ | ~~ |
| 8 | 38.75 | 2.325 | 1.428 | 17 | ~ | ~ | ~ | ~ | ~ | ~ | ~~ |
| 8 | 39.25 | 2.355 | 1.442 | 17 | ~ | ~ | ~ | ~ | ~ | ~ | ~~ |
| 8 | 39.75 | 2.385 | 1.457 | 17 | ~ | ~ | ~ | ~ | ~ | ~ | ~~ |
| 9 | 40.25 | 2.415 | 1.471 | 29 | ~ | ~ | ~ | ~ | ~ | ~ | ~~ |
| 9 | 40.75 | 2.445 | 1.486 | 29 | ~ | ~ | ~ | ~ | ~ | ~ | ~~ |
| 9 | 41.25 | 2.475 | 1.500 | 29 | ~ | ~ | ~ | ~ | ~ | ~ | ~~ |
| 9 | 41.75 | 2.505 | 1.514 | 29 | ~ | ~ | ~ | ~ | ~ | ~ | ~~ |
| 9 | 42.25 | 2.535 | 1.529 | 29 | ~ | ~ | ~ | ~ | ~ | ~ | ~~ |
| 9 | 42.75 | 2.565 | 1.543 | 29 | ~ | ~ | ~ | ~ | ~ | ~ | ~~ |
| 9 | 43.25 | 2.595 | 1.558 | 29 | ~ | ~ | ~ | ~ | ~ | ~ | ~~ |
| 9 | 43.75 | 2.625 | 1.572 | 29 | ~ | ~ | ~ | ~ | ~ | ~ | ~~ |
| 9 | 44.25 | 2.655 | 1.586 | 29 | ~ | ~ | ~ | ~ | ~ | ~ | ~~ |
| 9 | 44.75 | 2.685 | 1.601 | 29 | ~ | ~ | ~ | ~ | ~ | ~ | ~~ |
| 10 | 45.25 | 2.715 | 1.615 | 29 | ~ | ~ | ~ | ~ | ~ | ~ | ~~ |
| 10 | 45.75 | 2.745 | 1.630 | 29 | ~ | ~ | ~ | ~ | ~ | ~ | ~~ |
| 10 | 46.25 | 2.775 | 1.644 | 29 | ~ | ~ | ~ | ~ | ~ | ~ | ~~ |
| 10 | 46.75 | 2.805 | 1.658 | 29 | ~ | ~ | ~ | ~ | ~ | ~ | ~~ |
| 10 | 47.25 | 2.835 | 1.673 | 29 | ~ | ~ | ~ | ~ | ~ | ~ | ~~ |
| 10 | 47.75 | 2.865 | 1.687 | 29 | ~ | ~ | ~ | ~ | ~ | ~ | ~~ |
| 10 | 48.25 | 2.895 | 1.702 | 29 | ~ | ~ | ~ | ~ | ~ | ~ | ~~ |
| 10 | 48.75 | 2.925 | 1.716 | 29 | ~ | ~ | ~ | ~ | ~ | ~ | ~~ |
| 10 | 49.25 | 2.955 | 1.730 | 29 | ~ | ~ | ~ | ~ | ~ | ~ | ~~ |

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| SOIL NO. | CALC. DEPTH (ft) | TOTAL STRESS (tsf) | EFF. STRESS (tsf) | FIELD N (B/ft) | Est.D r (%) | C N | CORR. (N1)60 (B/ft) | LIQUE. STRESS RATIO | r d | INDUC. STRESS RATIO | LIQUE. SAFETY FACTOR |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 10 | 49.75 | 2.985 | 1.745 | 29 | ~ | ~ | ~ | ~ | ~ | ~ | ~~ |

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**********
*  SOIL PROFILE LOG  *
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SOIL PROFILE NAME: TWB6

| LAYER # | BASE DEPTH (ft) | SPT FIELD-N (blows/ft) | LIQUEFACTION SUSCEPTIBILITY | WET UNIT WT. (pcf) | FINES %<#200 | D (mm) 50 | DEPTH OF SPT (ft) |
|---|---|---|---|---|---|---|---|
| 1 | 7.0 | 2.0 | UNSUSCEPTIBLE (0) | 120.0 | 39.0 | 0.130 | 5.25 |
| 2 | 10.0 | 2.0 | UNSUSCEPTIBLE (0) | 120.0 | 39.0 | 0.130 | 5.25 |
| 3 | 15.0 | 2.0 | SUSCEPTIBLE (1) | 120.0 | 1.0 | 0.290 | 10.25 |
| 4 | 20.0 | 10.0 | SUSCEPTIBLE (1) | 120.0 | 1.0 | 0.290 | 15.25 |
| 5 | 25.0 | 15.0 | SUSCEPTIBLE (1) | 120.0 | 1.0 | 0.290 | 20.25 |
| 6 | 30.0 | 29.0 | SUSCEPTIBLE (1) | 120.0 | 1.0 | 0.290 | 29.75 |
| 7 | 35.0 | 24.0 | SUSCEPTIBLE (1) | 120.0 | 1.0 | 0.290 | 30.25 |
| 8 | 40.0 | 14.0 | SUSCEPTIBLE (1) | 120.0 | 1.0 | 0.290 | 35.25 |
| 9 | 45.0 | 69.0 | SUSCEPTIBLE (1) | 120.0 | 1.0 | 0.290 | 40.25 |
| 10 | 50.0 | 49.0 | SUSCEPTIBLE (1) | 120.0 | 1.0 | 0.290 | 45.25 |

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*        *
* L I Q U E F Y 2 *
*        *
*  Version  1.20  *
*        *
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EMPIRICAL PREDICTION OF
EARTHQUAKE-INDUCED LIQUEFACTION POTENTIAL

JOB NUMBER: 970011-001 DATE: Wednesday, November 13, 1996

JOB NAME: TW HOMES - BANNING LOWLAND

LIQUEFACTION CALCULATION NAME: BORING B-6

SOIL-PROFILE NAME: TWB6

GROUND WATER DEPTH: 7.0 ft

DESIGN EARTHQUAKE MAGNITUDE: 7.10

SITE PEAK GROUND ACCELERATION: 0.320 g

K sigma BOUND: M

rd BOUND: M

N60 CORRECTION: 1.33

FIELD SPT N-VALUES < 10 FT DEEP ARE CORRECTED FOR SHORT LENGTH OF DRIVE RODS

NOTE: Relative density values listed below are estimated using equations of Giuliani and Nicoll (1982).



LIQUEFACTION ANALYSIS SUMMARY

Seed and Others [1985] Method



| SOIL NO. | CALC. DEPTH (ft) | TOTAL STRESS (tsf) | EFF. STRESS (tsf) | FIELD N (B/ft) | Est.D r (%) | C N | CORR. (N1)60 (B/ft) | LIQUE. STRESS RATIO | r d | INDUC. STRESS RATIO | LIQUE. SAFETY FACTOR |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 0.25 | 0.015 | 0.015 | 2 | ~ | @ | @ | @ | @ | @ | @ @ |
| 1 | 0.75 | 0.045 | 0.045 | 2 | ~ | @ | @ | @ | @ | @ | @ @ |
| 1 | 1.25 | 0.075 | 0.075 | 2 | ~ | @ | @ | @ | @ | @ | @ @ |
| 1 | 1.75 | 0.105 | 0.105 | 2 | ~ | @ | @ | @ | @ | @ | @ @ |
| 1 | 2.25 | 0.135 | 0.135 | 2 | ~ | @ | @ | @ | @ | @ | @ @ |
| 1 | 2.75 | 0.165 | 0.165 | 2 | ~ | @ | @ | @ | @ | @ | @ @ |
| 1 | 3.25 | 0.195 | 0.195 | 2 | ~ | @ | @ | @ | @ | @ | @ @ |
| 1 | 3.75 | 0.225 | 0.225 | 2 | ~ | @ | @ | @ | @ | @ | @ @ |
| 1 | 4.25 | 0.255 | 0.255 | 2 | ~ | @ | @ | @ | @ | @ | @ @ |
| 1 | 4.75 | 0.285 | 0.285 | 2 | ~ | @ | @ | @ | @ | @ | @ @ |
| 1 | 5.25 | 0.315 | 0.315 | 2 | ~ | @ | @ | @ | @ | @ | @ @ |
| 1 | 5.75 | 0.345 | 0.345 | 2 | ~ | @ | @ | @ | @ | @ | @ @ |
| 1 | 6.25 | 0.375 | 0.375 | 2 | ~ | @ | @ | @ | @ | @ | @ @ |
| 1 | 6.75 | 0.405 | 0.405 | 2 | ~ | @ | @ | @ | @ | @ | @ @ |
| 2 | 7.25 | 0.435 | 0.427 | 2 | ~ | ~ | ~ | ~ | ~ | ~ | ~~ |
| 2 | 7.75 | 0.465 | 0.442 | 2 | ~ | ~ | ~ | ~ | ~ | ~ | ~~ |
| 2 | 8.25 | 0.495 | 0.456 | 2 | ~ | ~ | ~ | ~ | ~ | ~ | ~~ |
| 2 | 8.75 | 0.525 | 0.470 | 2 | ~ | ~ | ~ | ~ | ~ | ~ | ~~ |
| 2 | 9.25 | 0.555 | 0.485 | 2 | ~ | ~ | ~ | ~ | ~ | ~ | ~~ |
| 2 | 9.75 | 0.585 | 0.499 | 2 | ~ | ~ | ~ | ~ | ~ | ~ | ~~ |
| 3 | 10.25 | 0.615 | 0.514 | 2 | 24 | 1.358 | 3.6 | 0.042 | 0.979 | 0.244 | 0.17 |
| 3 | 10.75 | 0.645 | 0.528 | 2 | 24 | 1.358 | 3.6 | 0.042 | 0.978 | 0.249 | 0.17 |
| 3 | 11.25 | 0.675 | 0.542 | 2 | 24 | 1.358 | 3.6 | 0.042 | 0.977 | 0.253 | 0.17 |
| 3 | 11.75 | 0.705 | 0.557 | 2 | 24 | 1.358 | 3.6 | 0.042 | 0.976 | 0.257 | 0.17 |
| 3 | 12.25 | 0.735 | 0.571 | 2 | 24 | 1.358 | 3.6 | 0.042 | 0.975 | 0.261 | 0.16 |
| 3 | 12.75 | 0.765 | 0.586 | 2 | 24 | 1.358 | 3.6 | 0.042 | 0.974 | 0.265 | 0.16 |
| 3 | 13.25 | 0.795 | 0.600 | 2 | 24 | 1.358 | 3.6 | 0.042 | 0.972 | 0.268 | 0.16 |
| 3 | 13.75 | 0.825 | 0.614 | 2 | 24 | 1.358 | 3.6 | 0.042 | 0.971 | 0.271 | 0.16 |
| 3 | 14.25 | 0.855 | 0.629 | 2 | 24 | 1.358 | 3.6 | 0.042 | 0.970 | 0.274 | 0.15 |
| 3 | 14.75 | 0.885 | 0.643 | 2 | 24 | 1.358 | 3.6 | 0.042 | 0.969 | 0.277 | 0.15 |
| 4 | 15.25 | 0.915 | 0.658 | 10 | 51 | 1.236 | 16.4 | 0.193 | 0.968 | 0.280 | 0.69 |
| 4 | 15.75 | 0.945 | 0.672 | 10 | 51 | 1.236 | 16.4 | 0.193 | 0.967 | 0.283 | 0.68 |

| | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 4 | 16.25 | 0.975 | 0.686 | 10 | 51 | 1.236 | 16.4 | 0.193 | 0.966 | 0.285 | 0.68 |
| 4 | 16.75 | 1.005 | 0.701 | 10 | 51 | 1.236 | 16.4 | 0.193 | 0.965 | 0.288 | 0.67 |
| 4 | 17.25 | 1.035 | 0.715 | 10 | 51 | 1.236 | 16.4 | 0.193 | 0.964 | 0.290 | 0.66 |
| 4 | 17.75 | 1.065 | 0.730 | 10 | 51 | 1.236 | 16.4 | 0.193 | 0.963 | 0.292 | 0.66 |
| 4 | 18.25 | 1.095 | 0.744 | 10 | 51 | 1.236 | 16.4 | 0.193 | 0.961 | 0.294 | 0.66 |
| 4 | 18.75 | 1.125 | 0.758 | 10 | 51 | 1.236 | 16.4 | 0.193 | 0.960 | 0.296 | 0.65 |
| 4 | 19.25 | 1.155 | 0.773 | 10 | 51 | 1.236 | 16.4 | 0.193 | 0.959 | 0.298 | 0.65 |
| 4 | 19.75 | 1.185 | 0.787 | 10 | 51 | 1.236 | 16.4 | 0.193 | 0.958 | 0.300 | 0.64 |
| 5 | 20.25 | 1.215 | 0.802 | 15 | 60 | 1.119 | 22.3 | 0.265 | 0.957 | 0.302 | 0.88 |
| 5 | 20.75 | 1.245 | 0.816 | 15 | 60 | 1.119 | 22.3 | 0.265 | 0.955 | 0.303 | 0.88 |
| 5 | 21.25 | 1.275 | 0.830 | 15 | 60 | 1.119 | 22.3 | 0.265 | 0.954 | 0.305 | 0.87 |
| 5 | 21.75 | 1.305 | 0.845 | 15 | 60 | 1.119 | 22.3 | 0.265 | 0.952 | 0.306 | 0.87 |
| 5 | 22.25 | 1.335 | 0.859 | 15 | 60 | 1.119 | 22.3 | 0.265 | 0.951 | 0.307 | 0.86 |
| 5 | 22.75 | 1.365 | 0.874 | 15 | 60 | 1.119 | 22.3 | 0.265 | 0.949 | 0.308 | 0.86 |

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Seed and Others [1985] Method PAGE 2

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| SOIL NO. | CALC. DEPTH (ft) | TOTAL STRESS (tsf) | EFF. STRESS (tsf) | FIELD N (B/ft) | Est.D r (%) | C N | CORR. (N1)60 (B/ft) | LIQUE. STRESS RATIO | r d | INDUC. STRESS RATIO | LIQUE. SAFETY FACTOR |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 5 | 23.25 | 1.395 | 0.888 | 15 | 60 | 1.119 | 22.3 | 0.265 | 0.947 | 0.310 | 0.86 |
| 5 | 23.75 | 1.425 | 0.902 | 15 | 60 | 1.119 | 22.3 | 0.265 | 0.946 | 0.311 | 0.85 |
| 5 | 24.25 | 1.455 | 0.917 | 15 | 60 | 1.119 | 22.3 | 0.265 | 0.944 | 0.312 | 0.85 |
| 5 | 24.75 | 1.485 | 0.931 | 15 | 60 | 1.119 | 22.3 | 0.265 | 0.943 | 0.313 | 0.85 |
| 6 | 25.25 | 1.515 | 0.946 | 29 | 79 | 0.973 | 37.5 | Infin | 0.941 | 0.314 | Infin |
| 6 | 25.75 | 1.545 | 0.960 | 29 | 79 | 0.973 | 37.5 | Infin | 0.939 | 0.314 | Infin |
| 6 | 26.25 | 1.575 | 0.974 | 29 | 79 | 0.973 | 37.5 | Infin | 0.937 | 0.315 | Infin |
| 6 | 26.75 | 1.605 | 0.989 | 29 | 79 | 0.973 | 37.5 | Infin | 0.934 | 0.315 | Infin |
| 6 | 27.25 | 1.635 | 1.003 | 29 | 79 | 0.973 | 37.5 | Infin | 0.932 | 0.316 | Infin |
| 6 | 27.75 | 1.665 | 1.018 | 29 | 79 | 0.973 | 37.5 | Infin | 0.930 | 0.317 | Infin |
| 6 | 28.25 | 1.695 | 1.032 | 29 | 79 | 0.973 | 37.5 | Infin | 0.928 | 0.317 | Infin |
| 6 | 28.75 | 1.725 | 1.046 | 29 | 79 | 0.973 | 37.5 | Infin | 0.926 | 0.317 | Infin |
| 6 | 29.25 | 1.755 | 1.061 | 29 | 79 | 0.973 | 37.5 | Infin | 0.923 | 0.318 | Infin |
| 6 | 29.75 | 1.785 | 1.075 | 29 | 79 | 0.973 | 37.5 | Infin | 0.921 | 0.318 | Infin |
| 7 | 30.25 | 1.815 | 1.090 | 24 | 71 | 0.968 | 30.9 | Infin | 0.919 | 0.318 | Infin |
| 7 | 30.75 | 1.845 | 1.104 | 24 | 71 | 0.968 | 30.9 | Infin | 0.916 | 0.318 | Infin |
| 7 | 31.25 | 1.875 | 1.118 | 24 | 71 | 0.968 | 30.9 | Infin | 0.913 | 0.318 | Infin |
| 7 | 31.75 | 1.905 | 1.133 | 24 | 71 | 0.968 | 30.9 | Infin | 0.910 | 0.318 | Infin |
| 7 | 32.25 | 1.935 | 1.147 | 24 | 71 | 0.968 | 30.9 | Infin | 0.907 | 0.318 | Infin |
| 7 | 32.75 | 1.965 | 1.162 | 24 | 71 | 0.968 | 30.9 | Infin | 0.904 | 0.318 | Infin |
| 7 | 33.25 | 1.995 | 1.176 | 24 | 71 | 0.968 | 30.9 | Infin | 0.902 | 0.318 | Infin |
| 7 | 33.75 | 2.025 | 1.190 | 24 | 71 | 0.968 | 30.9 | Infin | 0.899 | 0.318 | Infin |
| 7 | 34.25 | 2.055 | 1.205 | 24 | 71 | 0.968 | 30.9 | Infin | 0.896 | 0.318 | Infin |
| 7 | 34.75 | 2.085 | 1.219 | 24 | 71 | 0.968 | 30.9 | Infin | 0.893 | 0.318 | Infin |
| 8 | 35.25 | 2.115 | 1.234 | 14 | 53 | 0.902 | 16.8 | 0.195 | 0.890 | 0.317 | 0.61 |
| 8 | 35.75 | 2.145 | 1.248 | 14 | 53 | 0.902 | 16.8 | 0.195 | 0.886 | 0.317 | 0.62 |
| 8 | 36.25 | 2.175 | 1.262 | 14 | 53 | 0.902 | 16.8 | 0.195 | 0.882 | 0.316 | 0.62 |
| 8 | 36.75 | 2.205 | 1.277 | 14 | 53 | 0.902 | 16.8 | 0.194 | 0.878 | 0.315 | 0.62 |
| 8 | 37.25 | 2.235 | 1.291 | 14 | 53 | 0.902 | 16.8 | 0.194 | 0.874 | 0.315 | 0.62 |
| 8 | 37.75 | 2.265 | 1.306 | 14 | 53 | 0.902 | 16.8 | 0.194 | 0.870 | 0.314 | 0.62 |



| | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 8 | 38.25 | 2.295 | 1.320 | 14 | 53 | 0.902 | 16.8 | 0.194 | 0.866 | 0.313 | 0.62 |
| 8 | 38.75 | 2.325 | 1.334 | 14 | 53 | 0.902 | 16.8 | 0.194 | 0.862 | 0.313 | 0.62 |
| 8 | 39.25 | 2.355 | 1.349 | 14 | 53 | 0.902 | 16.8 | 0.194 | 0.858 | 0.312 | 0.62 |
| 8 | 39.75 | 2.385 | 1.363 | 14 | 53 | 0.902 | 16.8 | 0.194 | 0.855 | 0.311 | 0.62 |
| 9 | 40.25 | 2.415 | 1.378 | 69 | 114 | 0.878 | 80.6 | Infin | 0.850 | 0.310 | Infin |
| 9 | 40.75 | 2.445 | 1.392 | 69 | 114 | 0.878 | 80.6 | Infin | 0.845 | 0.309 | Infin |
| 9 | 41.25 | 2.475 | 1.406 | 69 | 114 | 0.878 | 80.6 | Infin | 0.840 | 0.308 | Infin |
| 9 | 41.75 | 2.505 | 1.421 | 69 | 114 | 0.878 | 80.6 | Infin | 0.836 | 0.306 | Infin |
| 9 | 42.25 | 2.535 | 1.435 | 69 | 114 | 0.878 | 80.6 | Infin | 0.831 | 0.305 | Infin |
| 9 | 42.75 | 2.565 | 1.450 | 69 | 114 | 0.878 | 80.6 | Infin | 0.826 | 0.304 | Infin |
| 9 | 43.25 | 2.595 | 1.464 | 69 | 114 | 0.878 | 80.6 | Infin | 0.821 | 0.303 | Infin |
| 9 | 43.75 | 2.625 | 1.478 | 69 | 114 | 0.878 | 80.6 | Infin | 0.816 | 0.301 | Infin |
| 9 | 44.25 | 2.655 | 1.493 | 69 | 114 | 0.878 | 80.6 | Infin | 0.811 | 0.300 | Infin |
| 9 | 44.75 | 2.685 | 1.507 | 69 | 114 | 0.878 | 80.6 | Infin | 0.806 | 0.299 | Infin |
| 10 | 45.25 | 2.715 | 1.522 | 49 | 94 | 0.843 | 54.9 | Infin | 0.801 | 0.297 | Infin |
| 10 | 45.75 | 2.745 | 1.536 | 49 | 94 | 0.843 | 54.9 | Infin | 0.796 | 0.296 | Infin |
| 10 | 46.25 | 2.775 | 1.550 | 49 | 94 | 0.843 | 54.9 | Infin | 0.791 | 0.295 | Infin |
| 10 | 46.75 | 2.805 | 1.565 | 49 | 94 | 0.843 | 54.9 | Infin | 0.786 | 0.293 | Infin |
| 10 | 47.25 | 2.835 | 1.579 | 49 | 94 | 0.843 | 54.9 | Infin | 0.781 | 0.292 | Infin |
| 10 | 47.75 | 2.865 | 1.594 | 49 | 94 | 0.843 | 54.9 | Infin | 0.776 | 0.290 | Infin |
| 10 | 48.25 | 2.895 | 1.608 | 49 | 94 | 0.843 | 54.9 | Infin | 0.771 | 0.289 | Infin |
| 10 | 48.75 | 2.925 | 1.622 | 49 | 94 | 0.843 | 54.9 | Infin | 0.765 | 0.287 | Infin |
| 10 | 49.25 | 2.955 | 1.637 | 49 | 94 | 0.843 | 54.9 | Infin | 0.760 | 0.286 | Infin |

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Seed and Others [1985] Method PAGE 3

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| SOIL NO. | CALC. DEPTH (ft) | TOTAL STRESS (tsf) | EFF. STRESS (tsf) | FIELD N (B/ft) | Est.D r (%) | C N | CORR. (N1)60 (B/ft) | LIQUE. STRESS RATIO | r d | INDUC. STRESS RATIO | LIQUE. SAFETY FACTOR |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 10 | 49.75 | 2.985 | 1.651 | 49 | 94 | 0.843 | 54.9 | Infin | 0.755 | 0.284 | Infin |

## Consolidation Parameters For Undisturbed Samples - TW Homes/Banning Lowland

| Soil Type | Bore hole | Depth (ft) | Cce | Cre | Average Ca | Average Cv (ft^2/day) | Pc (psf) |
|---|---|---|---|---|---|---|---|
| CL | B-3 | 5.0 | 0.129 | 0.032 | 0.0035 | 0.080 | 3100 |
| CL | B-4 | 2.0 | 0.157 | 0.027 | 0.0033 | 0.074 | 2000 |
| CL | B-6 | 5.0 | 0.107 | 0.020 | 0.0029 | 0.210 | 2600 |
| | | AVERAGE: | **0.131** | **0.026** | **0.00323** | **0.121** | **2567** |

## TABLE 1: ESTIMATED SETTLEMENT OF A 10 ft. THICK SILTY CLAY LAYER (In case of 5 ft. removal)

| | | | |
|---|---|---|---|
| Unit Weight of Compacted Fill = | 125 pcf | Cce = | 0.131 |
| Height of Compacted Fill = | 20 ft | Cre = | 0.026 |
| Unit Weight of Silty Clay Deposi | 120 pcf | | |

| Layer No. | Layer thickness H (ft) | In-situ Normal Stress (psf) | Stress Increment (psf) | P'c (psf) | Total Stress (psf) | NC or OC | Layer Settlement (in) |
|---|---|---|---|---|---|---|---|
| 1 | 1 | 60 | 2500 | 2567 | 2560 | OC | 0.5 |
| 2 | 1 | 180 | 2500 | 2567 | 2680 | NC | 0.4 |
| 3 | 1 | 300 | 2500 | 2567 | 2800 | NC | 0.4 |
| 4 | 1 | 420 | 2500 | 2567 | 2920 | NC | 0.3 |
| 5 | 1 | 540 | 2500 | 2567 | 3040 | NC | 0.3 |
| 6 | 1 | 660 | 2500 | 2567 | 3160 | NC | 0.3 |
| 7 | 1 | 780 | 2500 | 2567 | 3280 | NC | 0.3 |
| 8 | 1 | 900 | 2500 | 2567 | 3400 | NC | 0.3 |
| 9 | 1 | 1020 | 2500 | 2567 | 3520 | NC | 0.3 |
| 10 | 1 | 1140 | 2500 | 2567 | 3640 | NC | 0.3 |
| | | | | | **Total Settlement =** | | **3.59** |

## TABLE 2: ESTIMATED SETTLEMENT OF A 15 ft. THICK SILTY CLAY LAYER

| | | | |
|---|---|---|---|
| Unit Weight of Compacted Fill = | 125 pcf | Cce = | 0.131 |
| Height of Compacted Fill = | 15 ft | Cre = | 0.026 |
| Unit Weight of Silty Clay Deposi | 120 pcf | | |

| Layer No. | Layer thickness H (ft) | In-situ Normal Stress (psf) | Stress Increment (psf) | P'c (psf) | Total Stress (psf) | NC or OC | Layer Settlement (in) |
|---|---|---|---|---|---|---|---|
| 1 | 1 | 60 | 1875 | 2567 | 1935 | OC | 0.5 |
| 2 | 1 | 180 | 1875 | 2567 | 2055 | OC | 0.3 |
| 3 | 1 | 300 | 1875 | 2567 | 2175 | OC | 0.3 |
| 4 | 1 | 420 | 1875 | 2567 | 2295 | OC | 0.2 |
| 5 | 1 | 540 | 1875 | 2567 | 2415 | OC | 0.2 |
| 6 | 1 | 660 | 1875 | 2567 | 2535 | OC | 0.2 |
| 7 | 1 | 780 | 1875 | 2567 | 2655 | NC | 0.2 |
| 8 | 1 | 900 | 1875 | 2567 | 2775 | NC | 0.2 |
| 9 | 1 | 1020 | 1875 | 2567 | 2895 | NC | 0.2 |
| 10 | 1 | 1140 | 1875 | 2567 | 3015 | NC | 0.2 |
| 11 | 1 | 1260 | 1875 | 2567 | 3135 | NC | 0.2 |
| 12 | 1 | 1380 | 1875 | 2567 | 3255 | NC | 0.2 |
| 13 | 1 | 1500 | 1875 | 2567 | 3375 | NC | 0.3 |
| 14 | 1 | 1620 | 1875 | 2567 | 3495 | NC | 0.3 |
| 15 | 1 | 1740 | 1875 | 2567 | 3615 | NC | 0.3 |
| | | | | | Total Settlement = | | 3.79 |

## EVALUATION OF POST-CONSTRUCTION SETTLEMENT

| 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Layer Thickness H, (ft) | Drainage Path Length (ft) | Cv (ft^2/day) | t98 field (days) | Construction Period, tc (days) | Total Settlement (in) | Secondary Settlement (in) | Tv till the End of Construction | U (%) till the End of Construction | Remaining settlement at end of construction (in) | Tv at time tg | 1-U at time tg (%) | Remain. settlement at time tg (in) |
| **10** | 5 | 0.121 | 77.48 | 20 | 3.59 | 0.83 | 0.10 | 35.1 | 2.6 | 1.84 | 0.87 | **0.6** |
| **15** | 7.5 | 0.121 | 174.33 | 15 | 3.79 | 1.04 | 0.03 | 20.3 | 3.2 | 0.81 | 11.07 | **1.3** |

**NOTES:**

1. Assumed rate of fill placement = **1** ft/day
2. Secondary Compression Ratio, Ca = **0.0032**
3. Time for completion of total settlement, t = **30** years (including secondary)
4. Time since completion of Grading, tg = **360** days
5. U = degree of consolidation (%), and Tv = time factor

**EXPLANATION FOR COLUMNS 4 THROUGH 13**

**COLUMN NO:**

***4*** Time (tp) for 98% of primary consolidation to be over, from equation tp = Tv*H^2/Cv, with Tv=1.5

***5*** Construction period (tc) at the assumed filling rate.

***6*** Total settlement estimated in Tables 1 and 2, respectively.

***7*** Secondary settlement evaluated from equation Ca *H*100* log(t/tp), where tp is time(days) for 98% of primary consolidation in column 4, H is the layer thickness.

***8*** Time factor Tv considered at the end of construction based on Tv=Cv*tc/(H/2)^2, where tc is time taken for construction (column 5).

***9*** Degree of primary consolidation from equation U= (4*Tv^2/pi) for Tv < 0.287 and U=100 - 10^((1.781-Tv)/0.933) for Tv> 0.287

***10*** Remaining settlement at end of construction, from equation [ (column 9)*(column 6- column 7)/100 +column 7] when(column 9)< 98% and from equation [column 7- Ca*H*100*log(tc/tp) ] when (column 9)> 98%.

***11*** Time factor Tv for the fill thickness considered at end of construction based on Tv=Cv*(tc+t)/H^2, where tc is time taken for construction (column 5).

***12*** Remaining primary consolidation , (1-U) where U is the Degree of consolidation from equation U= (4*(column 11)^2/pi) for (column 11) < 0.287 and U=100 - 10^((1.781-(column 11))/0.933) for (column 11) > 0.287

***13*** Remaining settlement at time (t+tc), from equation [ (column12)*(column 6- column 7)/100 +column 7] when column 12>2, and from equation [column 7- Ca*H*100*log((tc+t)/tp)] when column 12 <2.

**SUMMARY TABLE OF REMAINING SETTLEMENT**

| tg * (days) | Remaining Settlement (in) 10 ft. Layer | 15 ft. Layer |
|---|---|---|
| 30 | 2.1 | 2.8 |
| 60 | 1.7 | 2.5 |
| 90 | 1.4 | 2.3 |
| 120 | 1.2 | 2.1 |
| 150 | 1.1 | 2.0 |
| 180 | 1.0 | 1.8 |
| 210 | 1.0 | 1.7 |
| 240 | 0.9 | 1.6 |
| 270 | 0.9 | 1.5 |
| 300 | 0.6 | 1.5 |
| 330 | 0.6 | 1.4 |
| 360 | 0.6 | 1.3 |

* Time since completion of grading