APPENDIX G

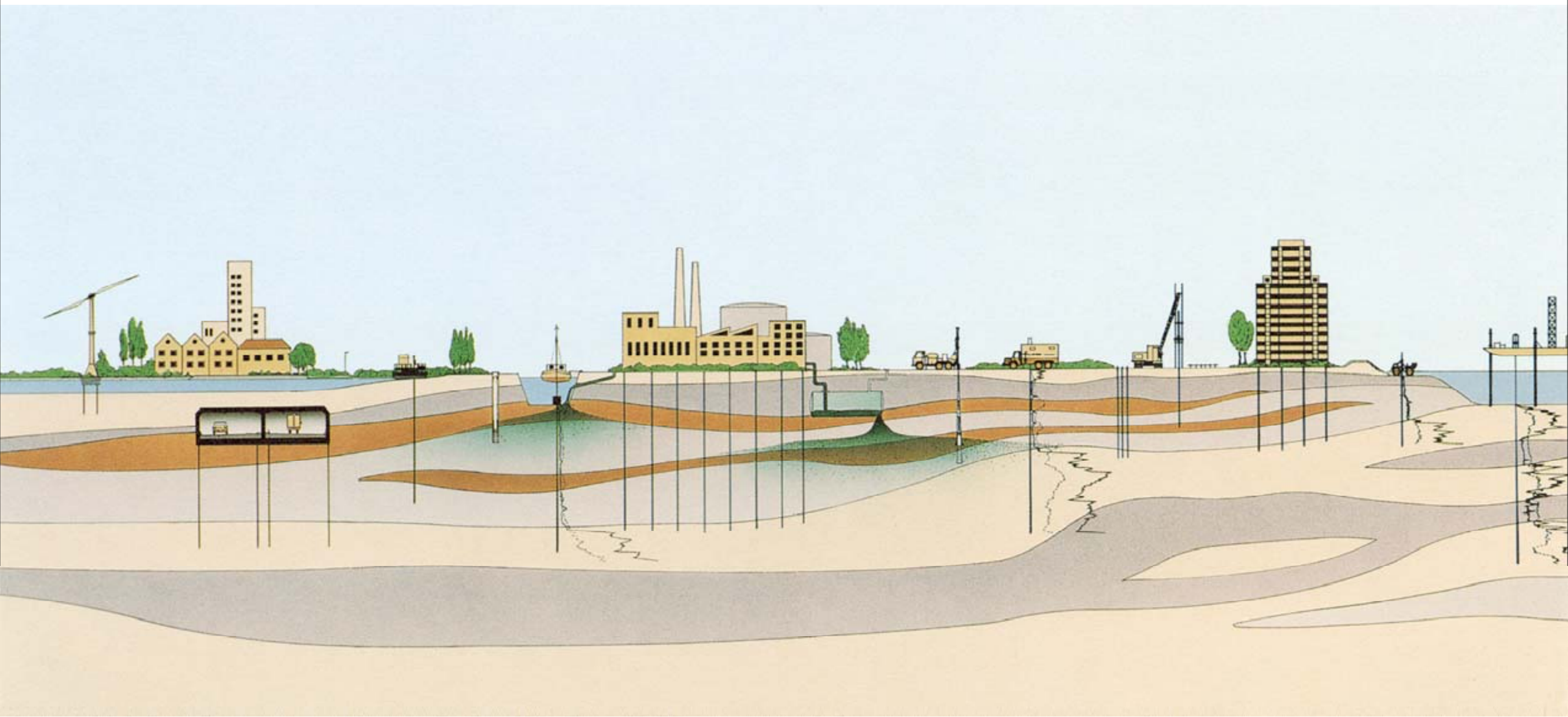
Geotechnical Report

FUGRO WEST, INC.

FINAL GEOTECHNICAL INVESTIGATION REPORT KARL HOLTON STATE YOUTH FACILITY, STOCKTON, CALIFORNIA

Prepared for:
KMD ARCHITECTS AND PLANNERS

SEPTEMBER 2007
Project No. 1832.001



FUGRO WEST, INC.

502 Giuseppe Court, Suite 11
Roseville, California 95678
Tel: (916) 773-2600
Fax: (916) 782-4846

September 21, 2007
Project No. 1832.001

KMD Architects and Planners
421 SW Sixth Avenue, Suite 1300
Portland, Oregon 97204

Attention: Mr. Paul Busch

Subject: Final Geotechnical Investigation Report, Northern California Core Treatment Facility, Karl Holton State Youth Facility, Stockton, California.

Dear Mr. Almon:

Enclosed is our Final Geotechnical Investigation Report for the California Department of Corrections and Rehabilitation (CDCR), Division of Juvenile Justice, Project Number 3270 R4, Northern California Core Treatment Facility Investigation. Our work was completed on behalf of KMD Architects (KMD) in accordance with our Scope of Services listed in our proposal dated February 8, 2007.

This report includes the findings of our field work, laboratory testing, and analyses and also addresses comments made by John Petropoulos of CDCR, dated August 27, 2007. Recommendations for design and construction of the proposed project, including analyses for faulting, liquefaction, and seismic response, are also presented in this report.

In general, the site is considered to be suitable for the proposed development if designed and constructed in accordance with our recommendations. Of significance is our recommendation to over-excavate, lime treat and recompact expansive, shallow, sub-surface soils or import and compact non-expansive fill as a replacement.

Geotechnical studies utilizing a limited number of exploratory borings rely on an assumption of uniformity of soil between probes. Often during construction, we find this not to be the case. Therefore, in presenting this report we do so with the understanding that we will be allowed to continue on this project by providing geotechnical observation, testing, and inspection services during site grading and construction.

Please call us if you have any questions. Thank you for the opportunity to work with you on this project.

Sincerely,
FUGRO WEST, INC.

Original Signed

Michael Hughes
Associate Engineer

Original Signed

Carlos España, P.E., G.E.
Principal Engineer

TABLE OF CONTENTS

INTRODUCTION 1

Location and Description of Project Site 1
Project Description 1
Purpose and Scope 2
Previous Work 4

SITE CONDITIONS 4

Regional Geology 4
Site Specific Geologic Conditions 4
Faulting and Seismicity 5
Surface Conditions 7
Subsurface Soil Conditions 7
Expansive Soil 8
Groundwater 8
Regional Groundwater Conditions 8
Local Groundwater Conditions 9

LABORATORY AND FIELD TESTING 9

Laboratory Testing 9
Field Testing 10

CONCLUSIONS 10

Faulting 11
Ground Shaking 12
Liquefaction Potential 12
Seismically Induced Settlement 13
Expansive Soil 13
Compressible Soil 13
Slope Stability 13
Soil Shrinkage/Swell Potential 13
Materials Suitability 14
Soil Corrosivity 14

RECOMMENDATIONS 14

Site Grading 14
Foundations 18
Slabs-on-Grade 19
Lateral Earth Pressures 19
Pavements 21
Buried Pipe Design 22
Trench Excavation 23

TABLE OF CONTENTS (continued)

Temporary Excavations 24
Drainage 24
General Erosion Control 24

LIMITATIONS 25

REFERENCES 27

PLATES

Vicinity Map – Plate 1

Site Plan (Existing Layout) – Plate 2a

Site Plan (Proposed Layout) – Plate 2b

Site Geology Map – Plate 3

Regional Fault Map – Plate 4

Lateral Earth Pressures – Plate 5

APPENDIX A – FIELD EXPLORATIONS
- Logs of Borings – Plates A-1 through A-14
- Boring Legend – Plate A-15
- Summary of Elevations and Coordinates – Table A-1
- CPT Logs
- Seismic Logs

APPENDIX B - LABORATORY TESTING PROGRAM
- Summary of Corrosion Test Results – Table B-1
- Summary of Expansion Index Test Results – Table B-2
- Summary of R-Value Test Results – Table B-3
- Summary of Laboratory Results – Plate B-1
- Atterberg Limits Results – Plate B-2
- Grain Size Distribution – Plate B-3
- Compaction Test Results – Plate B-4

APPENDIX C – GROUNDWATER MONITORING

APPENDIX D – FIELD RESISTIVITY TESTING

APPENDIX E – ESTIMATION OF SOIL SHRINKAGE POTENTIAL

INTRODUCTION

Location and Description of Project Site

This report presents the results of our geotechnical study at the Northern California Core Treatment Facility (NCCTF), located in Stockton, California. We understand the California Department of Corrections and Rehabilitation's (CDCR) Division of Juvenile Justice proposes to construct a new facility at the existing Karl Holton State Youth Facility, hereafter referred to as the Site, located at the northeast corner of the NCCTF. An environmental study was also undertaken as part of our work, the results of which are reported separately.

The NCCTF facility is located southeast of the City of Stockton and roughly 1.5 miles east of Highway 99, at 7650 S Newcastle Road. A Vicinity Map is included as Plate 1. The Site under investigation encompasses an area of approximately 72 acres, bounded by CDCR Juvenile facilities on the south and west and predominantly open fields on the north and east.

Site Maps, showing the existing layout of the Site and the proposed new layout, are included as Plate 2a and 2b, respectively.

Project Description

The Architect and Engineering services requested by CDCR at this stage of the project are for pre-design. As such, the exact layout of the proposed facility is subject to schematic design and design development modifications. In accordance with the Scope of Services for the project, the new facilities at the Site are to be designed to promote reform and rehabilitation in a friendlier environment through the use of a campus style layout, using natural light and warmer materials.

In accordance with the proposed layout at the time of preparing this report, the new facilities at the Site will include housing units, administration and visitors facilities, gymnasiums, outdoor recreation, swimming pool, education, food services, access roads, parking, and other support facilities. Significant landscape, hardscape, and walkways are also planned.

Structural details were not available at the time of this report. On the basis of other pre-design information, Fugro expects that the housing units and other secure buildings are to be constructed of masonry block. Non-secure support buildings are to be of wood or metal-framed construction. Maximum service loads for the two-story housing units are expected to be on the order of 3.5 kips per lineal foot for walls and 70 kips for column loads. The remaining structures are expected to have maximum wall and column loads of approximately 1.5 kips per lineal foot and 50 kips, respectively.

The Site is essentially flat with a surface elevation of between 35 and 40 feet (National Geodetic Vertical Datum of 1929). The site is surrounded by agricultural fields to the north and east and existing facilities to the south and west. Littlejohn's Creek lies about 1 mile to the south of the site. The creek flows in a west-southwest direction and discharges into Lone Tree Creek. A sanitary landfill, Forward Inc., lies about 1 mile to the south of the existing facility.

Purpose and Scope

This Geotechnical Report, prepared by Fugro West, Incorporated, is intended for use by the architects and engineers involved in planning the Karl Holton State Youth Facility project. The purpose of our study was to explore and evaluate the subsurface conditions at the subject site in order to provide geotechnical recommendations for design and construction of the project. Based on our understanding of the project and CDCR's scope of services, our scope of work for the geotechnical investigation of the planned facility was outlined in our proposal to KMD dated February 8, 2007 and comprised the following:

1. Reviewed available published geotechnical and geologic data.

2. Completed forms, provided required information, and coordinated with existing facility operations for security clearances, access, and completion of work.

3. Prepared a plan of subsurface exploration locations for submittal to CDCR for approval; marked the proposed boring and Cone Penetration Test (CPT) sounding locations in the field for utility clearance and requested the team surveyor to survey the boring/CPT locations.

4. Met with CDCR representatives and/or USA subscribers to verify location of existing underground utilities. Checked for presence of any obstacles to drilling.

5. Obtained drilling permits from the Environmental Health Department of San Joaquin County.

6. Completed drilling and soil sampling of fourteen (14) borings. Twelve (12) borings (B-1 through B-12) were drilled to a depth of 25 feet on a rough grid at approximately 300 to 500 feet spacing. Four (4) of these borings were deepened to 75 feet. Piezometers (2-inch diameter) were installed in three (3) of the deepened borings (B-1, B-3, B-8) for monitoring and sampling of groundwater. A temporary 2-inch diameter PVC casing surrounded by sand backfill was installed in the other deepened boring (B-5) to allow for geophysical testing by others. Two (2) borings (B-13 and B-14) were drilled to a depth of 5 feet in areas of anticipated parking.

7. Completed seven (7) CPT soundings, with four (4) using the seismic cone to a depth of 75 feet (SC-1 through SC-4) and three (3) using piezo-cone to depths of 25 to 75 feet (PC-1 through PC-3).

8. Completed twenty (20) field resistivity surveys using the Wenner 4-Pin Method. Pin spacings were selected to provide information over the anticipated depth of planned utilities. Each survey, comprised two (2) tests performed perpendicular to each other about a common center point.

9. Performed laboratory tests on selected bulk and relatively undisturbed soil samples, including in-place moisture content and density, sieve analysis, Atterberg Limits, unconfined compression, direct shear, organic content, compaction, Expansion Index, R-value, and general corrosivity tests (pH, resistivity, and sulfate and chloride content).

10. Provided a Technical Memorandum to designers with design parameters and recommendations prior to the Geotechnical Report, as required to assist with calculations for structures and foundations.

11. Provided corrosion laboratory testing and field resistivity survey data for the team's corrosion engineer for further evaluation of pipeline protection issues and recommendations. We have not performed site pipeline corrosion evaluations.

12. Prepared a geotechnical report with: (i) the results of our field and laboratory investigations, (ii) a description of soil and groundwater conditions encountered, and (iii) recommendations for design and construction of the proposed improvements including:

    a. Site clearing and preparation
    b. Site grading
    c. Seismic design parameters (UBC)
    d. Foundation design
    e. Flatwork and slab-on-grade design
    f. Pavement design, and
    g. Retaining wall design parameters

13. Review Plans and Specifications to verify that drawings and specifications are in conformance with recommendations provided in the geotechnical report.

KMD indicated in a draft timeline schedule that Geotechnical Design parameters were needed in parallel with the pre-design phase. As such, the specific number and locations of planned buildings was not known and, instead of using the CDCR guidelines for numbers of borings per building, a boring and Cone Penetrometer Test (CPT) sounding layout was planned based on a grid pattern of about 500 feet between borings with selected in-filling with CPTs. Our boring explorations focused on shallow foundations with CPT soundings used to supplement subsurface data and as a tool for seismic and liquefaction assessments.

Our professional services were performed, our findings obtained, and our comments prepared in accordance with generally accepted geotechnical engineering principles and practices. This warranty is in lieu of all other warranties, either expressed or implied.

Previous Work

No related geotechnical reports were identified by KMD for the Site.

SITE CONDITIONS

Regional Geology

The subject site is located in the northern part of the San Joaquin Valley, San Joaquin County, California. Physiographically, the site is located within the mid-portion of the Great Valley Geomorphic Province. This province encompasses the San Joaquin Valley in the south and the Sacramento Valley in the north and is bounded by the tilted block of the Sierra Nevada Mountains to the east and the complexly folded and faulted Coast Ranges to the west.

The Great Valley is a broad (typically 50 miles wide), elongated (about 400 miles long), structural trough that extends from near Red Bluff on the north to Bakersfield on the south. The valley represents the alluvial, flood and delta plains of two major rivers (the Sacramento and San Joaquin rivers) and their tributaries. The region persisted as a lowland or shallow marine embayment during the Cenozoic and at least the later Mesozoic and has been filled with a thick sequence of sediments. The eastern margin of the valley is formed by the west sloping Sierran bedrock surface that extends westward beneath the alluvium and older sedimentary bedrock within the valley. The western border is underlain by east dipping rock of the Coast Ranges.

The relatively flat surface of the San Joaquin Valley is underlain by thousands of feet of alluvial (river), lacustrine (lake), and marine (ocean) deposits that have accumulated as a structural trough formed when the adjacent mountain ranges were elevated. The main axis of the trough is oriented north-south along the valley's main drainage axis. Drainage in the San Joaquin Valley is primarily northwestward into the San Joaquin-Sacramento River Delta. Drainages within the site region flow west-southwest into Lone Tree Creek and the San Joaquin River.

During the late Mesozoic and through most of Tertiary time (approximately 100 million to 20 million years before present), deposition of thousands of feet of marine sediments occurred within the Great Valley. Continental deposits (generally alluvium) of late Tertiary and Quaternary age (approximately 20 million years ago to the present) overlie these marine deposits. Both the continental deposits and the underlying marine sediments form a wedge of sediments that generally thickens from east to west.

Site Specific Geologic Conditions

The project site is generally flat and has been mapped as being immediately underlain by Quaternary (Pleistocene age) alluvium of the Modesto Formation (Plate 3). Quaternary alluvium is expected to be several hundred feet thick and comprise Arkosic alluvium of gravel, sand and silt. Older alluvium and other continental deposits are estimated to extend to depths of more than 2,500 feet below the surface. Tertiary age sedimentary rock is estimated to extend to more than 10,000 feet below the surface (Bartow, 1991).

Faulting and Seismicity

The site is located in the northern San Joaquin Valley, which is a region with low historic earthquake and fault activity. In general, earthquakes occur as a result of movement along faults. For the purpose of fault classification, faults are often grouped into the following categories:

Holocene	- displacement has occurred within the last 10,000 years
Late Quaternary	- displacement has occurred within the last 700,000 years but evidence of Holocene activity is lacking.
Quaternary	- evidence of displacement within the last 1.6 million years.
Pre-Quaternary	- no recognized evidence of displacement in Quaternary time.

In general, faults with Holocene rupture are often considered to be "active". Late Quaternary or Quaternary faults are often referred to as "potentially active". A Regional Fault Map showing the general location of Holocene and Late Quaternary age faults is included as Plate 4.

The computer program EQFAULT (Blake, 2000), was used to search a 63-mile (100 km) radius around the site to locate seismic sources that will have the highest potential for ground shaking at the project location. Table 1 provides a summary of seismic sources (faults) found within the search radius, their approximate distance from the site and the maximum earthquake magnitudes (moment magnitude).

TABLE 1

HOLOCENE/LATE QUATERNARY FAULTS WITHIN A 63 MILE (100 KM) RADIUS

Fault Name	Approx. Distance (miles)	Moment Magnitude
GREAT VALLEY 7	20.8	6.7
GREAT VALLEY 6	21.9	6.7
FOOTHILLS FAULT SYSTEM)	25.6	6.5
GREENVILLE	29.8	6.9
GREAT VALLEY 8	32.1	6.6

TABLE 1 (continued)

HOLOCENE/LATE QUATERNARY FAULTS WITHIN A 63 MILE (100 KM) RADIUS		
Fault Name	**Approx. Distance (miles)**	**Moment Magnitude**
GREAT VALLEY 5	33.1	6.5
CALAVERAS (No.of Calaveras Res)	42.8	6.8
CONCORD - GREEN VALLEY	42.9	6.9
ORTIGALITA	43.1	6.9
CALAVERAS (So.of Calaveras Res)	45.9	6.2
HAYWARD (Total Length)	45.9	7.1
HAYWARD (South)	45.9	6.9
GREAT VALLEY 4	47.2	6.6
HAYWARD (SE Extension)	48.7	6.4
HAYWARD (North)	52.6	6.9
GREAT VALLEY 9	56.0	6.6
MONTE VISTA - SHANNON	59.2	6.8
WEST NAPA	60.5	6.5
RODGERS CREEK	64.1	7.0
SARGENT	64.8	6.8
SAN ANDREAS (1906)	66.4	7.9
SAN ANDREAS (Peninsula)	66.4	7.1
SAN ANDREAS (Santa Cruz Mtn.)	66.7	7.0
HUNTING CREEK - BERRYESSA	67.1	6.9
QUIEN SABE	67.8	6.4
GREAT VALLEY 3	69.6	6.8
ZAYANTE-VERGELES	70.3	6.8
SAN ANDREAS (Pajaro)	70.7	6.8
SAN GREGORIO	76.1	7.3
SAN ANDREAS (Creeping)	76.2	6.5
SAN ANDREAS (North Coast)	76.8	7.6
GREAT VALLEY 10	79.4	6.4
MONTEREY BAY - TULARCITOS	84.4	7.1
POINT REYES	88.8	6.8
RINCONADA	89.8	7.3
GREAT VALLEY 11	91.6	6.4
PALO COLORADO - SUR	92.3	7.0
GENOA	92.3	6.9
MOHWAK - HONEY LAKE ZONE	93.8	7.3
MAACAMA (South)	94.4	6.9

A total of forty (40) potentially active faults were identified as seismic sources within a 63-mile radius of the site. The site is quite distant from major faults, with the closest being the

A total of forty (40) potentially active faults were identified as seismic sources within a 63-mile radius of the site. The site is quite distant from major faults, with the closest being the Great Valley 7 fault, located 20.8 miles to the southwest and with a maximum earthquake magnitude of 6.7. The Great Valley Zone is a relatively recently recognized seismic source. Faulting within this zone is not well-defined at the surface; however, numerous earthquakes along the boundary between the Coast Ranges and the Central Valley have been noted since the 1892 Vacaville-Winters earthquakes, with approximate Richter magnitudes ranging from 5.5 to 6.4. The zone is considered to comprise thrust faults that do not necessarily cause surface rupture. The most recent significant event within this zone is the 1983 Coalinga earthquake of Richter magnitude 6.7 (moment magnitude of approximately 6.2).

Surface rupture due to faulting at the site is not expected to occur unless some unknown fault were to rupture. The site does not lie within or immediately adjacent to an Alquist-Priolo Earthquake Fault Zone (Fault Rupture Hazard Zones; Hart and Bryant, 1997).

Surface Conditions

The subject site has been modified from its native condition by grading for construction of the existing juvenile facility and probably for agricultural purposes before that. The predominant land use in the vicinity of the subject site is agricultural. The existing facility under investigation consists of an area of approximately 72 acres that contains numerous single story structures and open areas focused around a central running track. An access road traverses the perimeter of the fenced facility and an open drainage ditch lies at an offset of about 100 to 150 feet to the north and east of the facility. The site is essentially flat, with elevations between 35 feet to the west of the site and 40 feet to the east.

During the investigation, it was noted that areas of the site contained numerous burrows from ground squirrels that are present at the site. Burrows were about 4 inches in diameter and are estimated to between 3 to 4 feet deep.

Subsurface Soil Conditions

The soil conditions were characterized by interpreting the information obtained from our borings (B-1 through B-14) and CPT soundings (SC-1 through SC-4 and PC-1 through PC-3). With conventional boring programs, sampling is typically performed every 5 feet and soil layer depictions on boring logs are based on the similarity between samples, visual observation of excavated cuttings, and drill rig performance. Major changes in subsurface conditions are generally the only changes observed using such procedures. Where subsurface soil layering changes often, or where thin but important layers must be identified, borings sampled at 5 foot intervals may not permit interpretation of such details. The continuous nature of the CPT allows for a more detailed representation of soil changes with depth and an indication of a variety of soil properties correlated to such soil changes. The combination of the borings and CPTs substantially improves the understanding of subsurface conditions for some sites.

The soil profile interpreted from the CPT soundings and observed in the exploratory borings is variable throughout the site. However, some generalizations can be made. Based depth of 20 feet, materials are more intensely interbedded, with clay layers between 1 feet and 4 feet thick and some sand lenses up to 4 feet thick.

The soil within the upper 20 feet of the ground surface is medium dense to very dense or stiff to hard, with SPT N-values typically between 17 and 40. The SPT N-values at a depth of between 5 and 10 feet below ground surface (bgs) show a general increase to between 30 and 60. The SPT blow count in a number of borings reached refusal at depths of between 2 and 7.5 feet bgs, indicating the presence of a possible hardpan layer between these depths. Some lower blow counts of between 9 and 12 were encountered within 5 feet of the ground surface in borings B-5, B13 and B-14. This may be an indication of shallow surface disturbance due to rodent activity. Numerous ground squirrels and surface burrows were observed across the site making shallow disturbance a distinct possibility. Between 20 and 75 feet bgs, there is a general increasing trend in SPT N-values from 50 to greater than 100. The exception is at a depth of around 50 to 60 feet, where SPT N-values drop back to between 30 and 60.

The soil profiles described above are very generalized; therefore, the reader is advised to review the logs of the borings and interpreted CPT data sheets in Appendix A if the soil conditions at a specific location are desired. On the boring logs, the soil type, color, moisture, consistency, and Unified Soil Classification symbol are indicated. On the CPT data sheets the interpreted basic soil behavior type is shown in addition to side friction, tip resistance and friction ratio.

The locations of borings and CPT soundings were based on survey information provided by Boyle Engineering. Boring and CPT locations are shown on Plate 2a and 2b. The coordinates for all boring and CPT locations are presented in Table A-1 in Appendix A.

Expansive Soil

Clayey soil that was considered to be potentially expansive was encountered at various locations and depths across the site. Expansion Index tests were run on selected samples of the soil in order to quantify the expansion potential. The results of this testing are discussed later in this report.

Groundwater

Regional Groundwater Conditions

Based on groundwater data from the California Department of Water Resources web site, it is estimated that the groundwater level in the vicinity of the subject site generally lies at a depth of about 60 to 80 feet bgs. Perched groundwater may exist above these depths, particularly during the rainy season and in flood prone areas.

Local Groundwater Conditions

Groundwater was encountered during drilling of all four (4) of the deep borings undertaken at the site at a depth of between 66 and 70 feet bgs. Perched water was not encountered during geotechnical drilling.

Groundwater observation wells were installed at boring locations B-1, B-3, and B-8. In each boring, a single well was completed with a screen between a depth of 63 and 75 feet. Groundwater monitoring on April 30, 2007, showed the groundwater level to have stabilized at a depth of about 67 feet bgs. Well installation details are shown as Plates C-1 through C-3, Appendix C and monitoring results are presented in Table C-1, Appendix C.

It should be noted that groundwater observations were made at the time and under the conditions stated. The hydrostatic groundwater level can fluctuate with variations in precipitation, irrigation, groundwater withdrawal or injection, and other factors.

In addition to the measurement of groundwater depths in our borings and wells, CPT recording tips were equipped with a tip sensing pore pressure transducer. This provides a continuous pore pressure profile that enables the estimation of static water levels and/or the presence of confined aquifers with higher than anticipated static pressures. No evidence of a static ground water table was indicated by the CPT soundings, but at probe locations SC-3 and SC-4 possible perched water table conditions were indicated at depths of about 50 and 70 feet bgs. At probe location SC-3, a possible perched water table is indicated between 20 and 68 feet bgs.

It should be noted that it is common to experience anomalous results when penetrating fine-grained soils, which can cause clogging of the porous media on the transducer.

Based on the groundwater levels observed in the observation wells, the depth to groundwater appears to be about 67 feet bgs, which corresponds to an elevation of about –29 feet.

LABORATORY AND FIELD TESTING

Laboratory Testing

Selected samples obtained during drilling were tested to determine a variety of physical and chemical properties. The test types, procedures used, and test results are presented in Appendix B. Test results are also presented on the Boring Logs in Appendix A.

Dry densities of undisturbed samples ranged from a low of 87 pounds per cubic foot (pcf) to a high of 112 pcf and moisture contents were between 9 and 27 percent.

Grain size distribution tests performed on samples of soil retrieved from the borings confirmed the presence of sandy silt and silty sand within the site.

Modified Proctor Compaction tests (ASTM Test Method D 1557) were performed on three (3) bulk soil samples from borings B-1, B-2 and B-12. Maximum dry densities ranged from 114 to 116 pcf and the optimum water contents ranged from 14 to 14.6 percent.

R-value tests were performed on four (4) bulk soil samples from borings B-5, B-12, B-13 and B-14. Testing resulted in R-values of 25 for the sample from boring B-13 and 6 to 8 for the samples from the remaining borings.

Expansion Index (EI) tests (ASTM Test Method D 4829) undertaken on samples of clay from borings B-4, B-6 and B-11 at depths of between 2 and 5 feet indicated an EI of between 20 and 75, which represent soil with a low to medium swell potential.

Compressibility of soils, as determined from consolidation tests on samples of remolded soil, compacted to 90 percent of ASTM Test Method D 1557, appears to be moderate.

Strength parameters were determined by direct shear testing (ASTM D3080) or unconfined compression testing (ASTM D2166). Unconfined compressive strength tests performed on eleven (11) undisturbed soil samples retrieved at depths of between 6 to 11 feet indicated strengths from 0.4 tons per square foot (tsf) to 1.2 tsf. Direct shear tests performed on four (4) undisturbed soil samples retrieved at depths of between 5.5 to 8.5 feet indicated friction angles in the range of 25 to 30 degrees and cohesion from 392 to 1189 pounds per square foot (psf).

Organic content tests (ASTM F1647-98) were performed on six (6) soil samples at depths of between 2 and 6 feet. The test results indicate the amount of organic matter to be between 4.9 and 8.6 percent.

Samples of soil anticipated to be in contact with pipelines and new structures were tested for sulfate and chloride content, pH and resistivity. The test results indicate that the site soils have a relatively neutral pH of about 8, are low in sulfate and chloride levels (typically less than 200 part per million) and have low resistivity (typically less than 1000 ohm-cm).

Field Testing

Soil resistivity tests were conducted in the field at a total of twenty (20) locations (R-1 through R-20) between April 24 and 26, 2007. The locations of tests are shown on Plates 2a and 2b and the test method and results are presented in Appendix D.

CONCLUSIONS

Our exploration program was developed for a pre-design phase in which final building types, locations, and design details (loading, utilities, soft and hard surface locations, etc.) were unknown. Geotechnical exploration probes were laid out based on a general grid pattern with a spacing of 300 to 500 feet between probes. Since the probes are not necessarily located within building footprints or specific improvement locations, conclusions and recommendations for foundation and pavement design and grading are based on conservative soil parameters from findings over the entire grid pattern.

This site may undergo several construction grading phases involving a) hazardous materials-related demolition and soil removal, b) demolition removal of non-hazardous existing slabs, foundations and utilities, and c) special overexcavation requirements for construction of future foundations. Therefore, variable fill depths adjacent to undisturbed native soils may result under the footprint of a planned building. Generally, it is not advisable to place new foundations for an individual structure on variable depths of fill combined with undisturbed native soils.

We observed significant animal burrows in some site areas and our best estimate of the impacted depth is 3 to 4 feet. Soils in the upper 5 to 6 feet contain more than 5 percent organic material, and neither burrows nor organic soils are desirable in soils supporting foundations. And, the upper soils are moderately expansive, such that without deepening foundations and adding more than typical reinforcing steel in footings and slabs, differential movements may occur.

Therefore, with the potential adverse soil conditions of burrows, expansive soil and organic content, compounded by different demolition excavation depths and relative compaction criteria for fill under planned building locations, we conclude that foundations should be either founded deeper than normal depths (e.g. 48 inches rather than 12 to 18 inches) or that removal and/or stabilization of soils to a depth of four feet, followed by recompaction of engineering fill placed in thin layers, should be the basis of foundation recommendations for planned structures.

More refined (less conservative) recommendations could potentially be derived from supplemental exploration probes, laboratory testing and geotechnical evaluation when final facility layouts and design details are established. Refinements may more favorably impact costs of construction related to the extent and depth of removal and recompaction, bearing capacities, roadway section design, and soil improvement needs. Examples of field exploration and testing include backhoe test pits to 5 feet to note a) depths of animal burrows and whether burrows are limited to specific site areas, b) depth and variation of moderately expansive soils, c) depth of existing foundations, d) variation of organic content and a statistically larger sampling for testing, and e) statistically larger sampling and testing for R-values. Additionally, more exploration probes at the perimeter of the site area, particularly at the southern boundary, would establish confidence in the applicability of our conclusions and recommendations.

If a LEEDS credit is applicable, we suggest retention and processing of existing asphalt, base rock, concrete sidewalk materials for reuse as fill or subbase materials. Processing may require crushing, removal of materials larger than 3 inches and/or achieving a specific gradation requirement. Another possible LEEDS credit source may be the use of rubberized asphalt for pavement surfaces. Modest reductions in pavement thickness as well as surface temperatures during hot summer months are potential benefits.

Faulting

The subject site does not lie within or adjacent to an Alquist-Priolo Earthquake Fault Zone (Fault Rupture Hazard Zones; Hart and Bryant, 1997). Field reconnaissance and review of geologic literature did not disclose the presence of faulting within or adjacent to the site. No known Holocene or Late Quaternary faults pass near the site or trend directly toward the site. Surface rupture due to faulting at the site is not expected to occur.

Ground Shaking

Based on our present knowledge of the geologic conditions within the site, the primary effects of seismic activity will be some degree of ground motion resulting from activity on nearby faults. The most severe ground motion would be expected to occur if there were to be significant activity along the Foothills Fault System or the Great Valley Zone.

Using the California Geological Survey (CGS) Probabilistic Seismic Hazards Assessment (PSHA) Models, which are available on the worldwide web, the peak horizontal acceleration for a 10 percent probability of exceedence in 50 years for alluvial site conditions is 0.24 g.

The site is located within Seismic Zone 3 of the 2001 California Building Code (CBC) and the design criteria for the site are as follows:

The Seismic Zone Factor, Z, is 0.30 (Table 16-I).

Soil Profile Type,S, is S_D (Table 16-J).

Near Source Factor, Na, is 1 (Table 16A-S).

Near Source Factor, Nv, is 1 (Table 16A-T).

The Seismic Coefficient, Ca, is 0.36 (Table 16A-Q).

The Seismic Coefficient, Cv, is 0.54 (Table 16A-R).

The shear wave velocity for the soils encountered on site was calculated from the seismic cone data recorded in the field. An average shear wave velocity of between 872 feet per second (fps) and 1004 fps was calculated in accordance with guidelines given in CBC 1636A.2.1. This is consistent with soils in Soil Profile Type S_D of the CBC.

Liquefaction Potential

Liquefaction can occur when loose to medium dense, granular, saturated soils generally within 50 feet of the surface are subjected to ground shaking. The site is underlain by medium dense to very dense sands and very stiff to hard silts and, with the exception of some isolated occurrence of perched groundwater, groundwater is greater than 50 feet bgs. Based on the site soil and groundwater conditions, the soils underlying the site are not considered to be liquefiable.

Seismically Induced Settlement

During a seismic event, ground shaking can cause densification of soil that can result in settlement of the ground surface. Considering the typically medium dense to very dense and very stiff to hard nature of the soils underlying the site, the potential for seismically induced settlement is considered to be low.

Expansive Soil

Clayey soils are sometimes subject to expansion when wetted and contraction when dried. The results of Expansion Index test undertaken on selected samples of soil retrieved from the site typically indicate a medium expansion potential.

Compressible Soil

Consolidation tests were undertaken on three (3) samples of remolded soil compacted to 90 percent of ASTM Test Method D 1557. The results indicate that recompacted soil at the site will be moderately compressible. As such, remolded soils as fill are not considered to have a significant potential for compressibility under light to moderate structural loads.

Slope Stability

Due to the general low topographic relief within the site, landsliding is not expected to occur unless unstable slopes are created during grading. Given the soil conditions and geologic structure (relatively flat lying deposits) at the site, cut and fill slopes are expected to be grossly stable at gradients of 2:1 (horizontal to vertical) or flatter. Construction of new slopes should be completed in accordance with the grading recommendations provided in this report.

Soil Shrinkage/Swell Potential

In-place soil densities were obtained from soil samples retrieved from the exploratory borings. These densities were compared to available compaction test results in order to evaluate approximate soil shrinkage/swell potential after excavation and compaction. We expect most of the areas that are to receive structural fill will require a minimum of 90 to 95 percent (ASTM D1557) relative compaction. The actual average compaction, however, is typically greater than the specified minimum. Our experience indicates 2 to 3 percent over the required minimum. Therefore, selected samples have been evaluated against a relative compaction of 92 percent. The results indicate a large degree of variability with a calculated shrinkage factor ranging from -6 (bulking) to 24 percent (shrinkage). An average of 5 percent was calculated for shallow soils in the uppermost 5 feet. The results of are included in Appendix E, Table E-1, for reference.

Shrinkage values are estimates only and consider only very limited data. During construction, many factors can contribute to variations from estimated shrinkage values. These factors include variable thicknesses of soil horizons and the degree of uniformity across the site, contractor equipment and compaction processes used, over-compaction or under-compaction, deep compaction of underlying layers, wind loss during grading, stripping losses, topographic changes not reflected on the final site map, and errors in calculations and staking. Prospective users of this data must evaluate these factors in light of their own methods, procedures, and experience.

Materials Suitability

Fill materials are expected to consist of site soils excavated from below grade structure areas. These materials are expected to consist of a mixture of clays, silts, sandy silts and silty sands, which, after lime treatment, will be suitable for construction of building pads, structure backfill and trench backfill.

Soil Corrosivity

Samples of soil anticipated to be in contact with the new structures and piping were tested for sulfate and chloride content, pH and resistivity, and sulfide and redox potential. Both sulfate and chloride levels were low (less than 220 parts per million). The pH for all samples was typically about 8 (relatively neutral) and resistivities ranged from 460 to 1880 ohm-cm with a mean value of 794 ohm-cm.

Corrosion test results are presented in Appendix B, Table B-1 for further review, analysis, and specific corrosion mitigation recommendations by a corrosion engineer (refer to separate Soils Corrosivity Report prepared by JDH Corrosion Consultants, Inc.).

RECOMMENDATIONS

Site Grading

General

We anticipate that the soil at the site will be excavatable with conventional grading equipment. However, SPT data from the borings does indicate the possible presence of a hard pan layer at a depth of between 2 and 7.5 feet, which may require heavier construction equipment to excavate.

Based on laboratory test results, the some site soils within 5 feet of the ground surface have in-place moisture contents well above the optimum moisture content (about 14%) and moisture conditioning may be required to bring the in situ moisture contents to near optimum moisture content (per ASTM D1557).

If grading commences in the early spring or after a period of heavy rainfall, it is possible that the surface soil may be saturated due to underlying, relatively low permeability soil trapping water near the surface. This may create loading, hauling, and fill placement difficulties. Often, a period of at least a month after the last heavy rain of the season is necessary to allow the surface soil to dry sufficiently so that heavy grading equipment can operate effectively. Additional recommendations for wet weather construction can be provided at the time of construction, if required.

Based on the moderately expansive nature of the site soils, as indicated by our laboratory test results, lime treatment will be needed to render site soils suitable for use as non-expansive fill material. Native soil will also need to be free of concentrations of organic matter and debris, and screened to remove rock fragments greater than 4 inches in any dimension. Imported soil should be essentially granular (less than 50 percent passing the No. 200 sieve) and have a Plasticity Index (P.I.) less than 12.

At this time, we estimate that a hydrated lime concentration of 5% by dry weight mixed and cured within onsite surface soils prior to recompaction will reduce the soil expansion potential to low. We can perform supplementary laboratory testing to refine the required percentage of lime treated.

Grading Preparation

Grading preparation should include removal of all dense vegetation, debris, and any saturated (yielding or pumping) soils prior to site work operations. Following general clearing operations, grasses should be stripped from the surface of the site. Where applicable, stripping should extend to a depth of 2 to 3 inches below the surface. Strippings are not to be used within embankment, structural, or pavement fills. Strippings could be stockpiled and used as topsoil in nonstructural areas such as landscape areas (if acceptable to the landscape architect). Strippings used as fill in landscape areas should be placed in the uppermost portion of the fill and not exceed 1 foot in total thickness. Structure locations should be verified prior to placement of strippings in proximity to any structures.

The existing structures and walkways are to be completely demolished and removed from the site. It is also possible that the existing asphalt concrete and aggregate baserock in the parking lot area will be removed. Existing utilities are to be removed and trench backfill will be removed and recompacted. Where applicable, trench backfill should be recompacted from the base of the trench to existing grade in accordance with the recommendations below. Following demolition, the site should be cleared of all remaining debris.

If the asphalt and baserock is removed from the existing parking lot and access roads, it may be ground and/or crushed and used as fill provided that 1) there are no pieces of asphalt or rock greater than 3 inches in diameter, and 2) enough soil is combined and thoroughly mixed with the asphalt and baserock to fill any voids that may occur within these materials. We recommend that silty sand or sandy silt, approved by the project geotechnical engineer, be mixed with the asphalt and baserock at a quantity of at least 30 percent by weight. Alternatively, asphalt may be removed from the site.

Demolition of the existing structures, foundations, sidewalks and utilities is expected to significantly disturb the upper few feet of soil. Therefore, following clearing and stripping, soil within and 5 feet beyond the footprint of demolished structures, sidewalks and utilities should be overexcavated and recompacted. The depth of overexcavation should be a minimum of 2 feet bgs following clearing and stripping.

Where tree roots or existing piping or utilities are to be removed, the backfill must be recompacted in accordance with recommendations in the "Trench Excavation and Backfill" section of this report.

Existing open drainage ditches along portions of the northern and northeastern site boundary may need to be filled as part of the new development. Loose/soft soil should be removed from all existing drainage ditches that are to be filled. The depth of loose/soft soil must be determined by the project engineer at the time of grading. Removal depths of at least 1 to 2 feet should be anticipated.

General Grading

Areas to receive new buildings should be overexcavated to a depth of 48 inches below finished grade and recompacted using lime treated native soil or non-expansive import soil brought to rough grade in level lifts that do not exceed 6 inches when compacted. Overexcavation should extend a minimum lateral distance of 5 feet beyond the footing or a distance equal to the depth of overexcavation, whichever distance is greater. For lime treated soil, hydrated lime concentrate should be thoroughly mixed with native soils and then allowed to cure for 48-hours before compaction.

Areas to receive concrete flatwork should be overexcavated to a depth of 12 inches below finished grade and recompacted using lime treated native soil or non-expansive import soil brought to rough grade in level lifts that do not exceed 6 inches when compacted.

Where placement of fill will be required and following grading preparation, the areas to receive fill should be scarified to a depth of 6 inches, moisture-conditioned to approximately the optimum moisture content, and recompacted to not less than 90 percent relative compaction. Relative compaction should be based on ASTM D 1557 test specifications.

Overexcavation and recompaction may result in some soil volume loss and require the use of imported soil.

Slope Construction

Significant slopes are not anticipated; however, all cut/fill slopes should be graded no steeper than 2:1 (horizontal to vertical). Track-walking is not an acceptable method of slope compaction. Slopes should be overbuilt and cut back to finish grade.

Soil Stabilization

Some areas of saturated soil may be encountered that will create difficulties in placing fill and obtaining stable subgrades. Yielding soil conditions can typically be stabilized using one of the methods listed below; however, soil conditions and mitigation methods should be reviewed and approved by the project geotechnical engineer when encountered.

Option 1) Deep scarify and allow to air dry to near optimum moisture content and recompact in accordance with the project specifications for fill placement.

Option 2) Remove wet soils to a firm base and allow the wet soil to dry to near optimum moisture content and/or replace with drier soil.

Option 3) Lime or cement treat to reduce the moisture content. For dry-back, typical lime and/or cement quantities of 2% to 4% are commonly used. Mixing and pulverization using disc harrows or rotary mixers may be required to achieve a treated material with even distribution of lime and/or cement (no streaks or pockets of lime/cement).

In pavement areas, travel on treated subgrade should be minimized for a period of 24 - 48 hours to avoid initiating pumping conditions. A test section should be proof rolled with heavy rubber-tired equipment to determine if the subgrade will be stable enough for construction to proceed. If severe subgrade yielding (yielding which may create pumping conditions during base and asphalt placement) is observed, work should be stopped and determination of the appropriate procedures for continuing work should be made by the project geotechnical engineer.

Option 4) Yielding soils can be removed to a firm base or 2 feet below subgrade elevation, whichever is less. The bottom of the overexcavated area should be observed by the project engineer. If the bottom of the overexcavated area is soft or wet, a layer of stabilization fabric (such as Mirafi 500X or equivalent) should be placed and the overexcavation backfilled with a coarse crushed rock (3-inch minus) or Class 2 aggregate baserock compacted in accordance with the project specifications for fill placement. If the bottom of the excavation is firm and relatively unyielding, it may be backfilled with native soil (lime treated native soil in building pad and pavement areas) or approved imported soil placed and compacted in accordance with the project specifications for fill placement.

Structure Backfill

Structure backfill should consist of lime treated native soils or approved import, free of material larger than 4 inches in diameter and any trash or excessive organics (greater than a 5% concentration). Backfill must be placed in horizontal lifts not exceeding 6 inches in compacted thickness. Each lift should be compacted to a minimum of 90% relative compaction, at or above the optimum moisture content (typically no more than 2 to 3 percent above to avoid pumping soil conditions).

Foundations

Shallow Foundations

Provided our grading recommendations are followed, it is our opinion that the site is suited to conventional shallow foundations. Interior continuous strip and isolated interior footings should be embedded a minimum of 12 inches into the prepared soil subgrade. Perimeter strip footings and exterior spread footings should be embedded a minimum of 18 inches into the prepared subgrade. All footings should be a minimum of 12 inches wide and sized not to exceed an allowable bearing capacity of 2,500 psf for dead plus live loads. The allowable bearing capacity may be increased by 33 percent for transient loading such as from wind or seismic.

As an alternative to conventional shallow foundations, drilled piers to below 4 feet with associated grade beams and connected floor slabs could be used. This would minimize the amount of overexcavation, lime treatment and recompaction required to mitigate against underlying burrows and organic and expansive soils at the site.

Drilled piers should be designed so as not to exceed an allowable bearing capacity of 4,000 psf for dead and live load.

Reinforcement of the footings should be determined by the design engineer. As a minimum, perimeter footings should be reinforced with two (2) No. 4 bars, one near the top and one near the bottom of the footing. A minimum of 3 inches of concrete coverage should be maintained around the bars.

We estimate that total settlement for building foundations should not exceed ½ to ¾ inch. Differential settlement due to foundation loading should be less than ½ inch. This differential settlement could be assumed to occur over a distance of approximately 30 to 50 feet.

Prior to placement of reinforcement or concrete in footing excavations, all debris and loose soil should be removed. The project engineer should be allowed to observe footing excavations prior to placement of concrete or reinforcement.

Mat Foundations

Mat foundations, including mats carrying vibratory loads, can be designed using a modulus of subgrade reaction (k) of 150 pounds per cubic inch (pci), Young's Modulus of 3000 pounds per square inch (psi), and Poissons Ratio of 0.35.

The modulus of subgrade reaction should be corrected for the plan area of the foundation based on the following formula (Terzaghi, 1955):

$$k_b = k \frac{(m+0.5)}{1.5m}$$

Where:

k_b = coefficient of subgrade reaction for width "b" (k_b is no less than 0.67(k))
k = coefficient of subgrade reaction for a 1' x 1' plate (200 pci)
b = width of bays or spacing of line loads or columns
m = length of loaded area divided by "b"

Mat foundations may be placed directly on the prepared subgrade without the use of a rock underlayment.

Where mat foundations are located within 10 feet of existing structures, further foundation analyses should be performed to verify if the new or existing foundations will impact one another.

Foundations - Flag and Light Poles

Foundations for pole-type structures may be designed using the formula in the California Building Code (1998, Section 1806). An allowable lateral soil-bearing pressure of 150 pounds per square foot (psf) per foot of depth is applicable to native soils and fill. Where the poles will not be adversely affected by ½-inch of lateral motion at the ground surface due to short-term lateral loading, an allowable lateral soil-bearing pressure of 300 psf per foot of depth is applicable.

Slabs-on-Grade

Interior concrete slabs-on-grade should be a minimum of 4 inches thick in areas subjected to floor loads of less than 250 psf and a minimum of 5 inches thick where floor loads are equal to or greater than 250 psf. The slab should be underlain by 4 inches of washed, compacted, crushed rock overlain by a 10 mil vapor barrier. The vapor barrier should be overlain by a minimum of 2 inches of clean sand. In slab areas that will not be sensitive to moisture migration through the slab, an alternative to the vapor barrier would be to underlay the slab with 6 inches of washed, compacted, crushed rock. Crushed rock used beneath floor slabs should be graded so that 100 percent passes the three quarter-inch sieve and less than 5 percent passes the No. 4 sieve. Crushed rock should be compacted with a minimum of 3 passes with a vibratory type compactor

Concrete floor slabs may be designed using a Modulus of Subgrade Reaction, k, of 150 pci. Minimum slab thickness and reinforcement are provided based on the site soil and typical construction conditions; required slab thickness and reinforcement should be determined by the design engineer.

Lateral Earth Pressures

Lateral earth pressures will be used in the design of retaining walls, buried structures, thrust blocks, and for determining passive resistance at footings. Active and at-rest pressures should be calculated based on the equivalent fluid weights provided below and on the pressure diagrams shown in Plate 5, which include both static and earthquake induced pressures. For non-yielding walls, residual lateral earth pressures due to compaction equipment should be included, as indicated on Plate 5. Typical values of lateral pressure due to compaction equipment are 250 psf for plate compactors, 400 psf for light vibratory compactors (such as a Dynapac CA12PD), and 1000 psf for heavy vibratory compactors (such as a Dynapac CA25PD). Lateral pressures due to compaction equipment can be maintained below 400 psf by using compaction equipment with line loads (static plus dynamic) less than 350 pounds per inch within 6 feet of the wall being backfilled; heavier equipment can be used without restriction at distances greater than 6 feet from the wall. Backfill within 0.5 feet of the wall should be compacted using vibratory plate compactors. If necessary during construction, other compaction equipment load/distance combinations can be evaluated for use behind the wall.

For shallow foundations (i.e. structural slabs or spread footing), lateral load resistance can be developed by bottom friction under the floor slab and footing, as well as side friction between the below-grade walls and surrounding soil. Under long-term static loading, an ultimate bottom friction coefficient of 0.35 and 0.45 is recommended for foundations supported on native soils and on compacted Class 2 Aggregate Base directly over native soils, respectively. For side friction, an ultimate frictional resistance equal to 0.45 times the at-rest horizontal pressure (excluding the earthquake pressure) on the below-grade walls is recommended, assuming that import fills used for backfill materials consist of silty, sandy gravel.

In addition to side and bottom resistances, below-grade structures will also develop lateral load resistances through passive soil pressures acting against the below-grade walls and foundations. Distribution of the equivalent fluid passive resistance should be taken from the adjacent ground surface level. The total passive resistance acting on the uppermost foot should be ignored unless it is confined by slab or pavement, and the passive resistance of the soil should be limited to 3,500 psf. The equivalent fluid weights provided in the table below may be used for design of the proposed structures with horizontal backfill. The drained condition assumes that the backfill behind the wall is adequately drained to avoid saturation and introduction of hydrostatic pressure.

EQUIVALENT FLUID WEIGHTS		
Condition	**Drained Backfill (pcf)**	**Undrained Backfill (pcf)**
Active Condition	40	80
At-Rest Condition	60	90
Passive Condition	375	250 (submerged)

In the design of retaining structures, if any surface loads are closer to the edge of the retaining wall than half of the height, then the design wall pressure should be increased by 0.30q over the whole area of the retaining wall. In this expression, q is the surface surcharge load in psf.

The aforementioned values are ultimate values, considering various amounts of wall and/or footing deflection. It is the responsibility of the structural engineer to choose appropriate safety factors when converting ultimate resistance values to allowable.

Pavements

R-Value tests were performed on shallow soil samples retrieved from borings B-5, B-12, B-13 and B-14. The tests resulted in R-values of between 6 and 8 for borings B-5, B-12 and B-14, and 25 for boring B-13. We recommend using an R-value of 7 for pavement design.

Recommended pavement sections are included below and are based on the assumption that the native subgrade soil is overexcavated as recommended in the “Site Grading” section of this report, the fill is uniformly compacted to a minimum of 90 percent maximum dry density based on the ASTM D 1557 test method, and the baserock is uniformly compacted to a minimum of 95 percent maximum dry density based on the ASTM D 1557 test method. Pavement areas should be sloped to allow for positive surface drainage. Adequate surface slope, subgrade crown, and uniform compaction contribute to long-term pavement performance.

It is important that the drainage of pavement areas be designed so that water is not allowed under the paved areas. If water is trapped under paving, the water can saturate the base course and soil subgrade, which could result in premature pavement failures. Baserock for pavement areas should not extend into shoulder areas unless covered by asphalt or some other relatively impermeable surfacing.

Cutoff curbs should be installed where pavement abuts irrigation or drainage areas. These cutoff curbs should extend to a minimum depth of 4 inches below pavement subgrade to reduce the amount of water that can seep beneath the pavement. Where cutoff walls are undesirable, subgrade drains can be constructed to remove excess water or an impermeable barrier could be placed at the back of curb to a depth of approximately 2 feet below subgrade.

Flexible Pavement

We developed the following alternative preliminary pavement sections using Topic 608 of the State of California Department of Transportation Highway Design Manual, an R-value of 7, and assumed traffic indices (TI). Recommended pavement structural sections are included in Table 2. The TI is a measure of wheel load, frequency, and intensity. It has been our experience that a TI of 4.0 is often used for hard courts, of 4.5 for automobile parking, of 5.5 for fire truck access, and of 6.5 for channelized flow and bus traffic. The actual project TI will need to be provided by the project designer.

It should be noted that if construction traffic will drive on the finished pavement sections, the design TI may not be adequate for a full service life. Adjustments to the TI may be necessary to accommodate construction traffic. If lime treated native soil or imported soil is used in areas of overexcavation beneath proposed pavements, confirming R-value tests should be performed and pavement sections re-evaluated.

TABLE 2

RECOMMENDED PAVEMENT SECTIONS		
T.I.	**Asphalt Concrete (inches)**	**Class 2 Aggregate Base (inches)**
4.0	**2.0**	**8.5**
4.5	**2.5**	**9.0**
5.5	**3.0**	**11.5**
6.5	**3.5**	**14.5**

Note: Design sections based on an assumed R-value of 7 for subgrade materials.

Concrete Pavement

Concrete pavement can be designed using a Modulus of Subgrade Reaction (k) equal to 150 pci. For a T.I. of 5.5 to 6.0, we recommend a minimum concrete (compressive strength of 4000 psi) thickness of 5 inches and for a T.I. of 6.5 to 7.0, we recommend a minimum concrete thickness of 6 inches. Concrete pavement should be thickened a minimum of 2 inches at the edges (a tapered thickening starting 3 feet back from the edge should be used), and crack control joints should be provided at minimum intervals of approximately 10 feet. Isolation joints should be used where the slab abuts wall, pole, or column footings. Construction joints should be doweled and/or keyed to reduce potential separation over time.

Buried Pipe Design

Embedment and Backfill

Considering soil types and groundwater elevations, it is anticipated that subgrade soils within the project site could be considered non-yielding. However, some yielding soil should be anticipated and subgrade stabilization may be necessary to obtain a uniform base for pipe placement and backfilling.

Pipe bedding and the initial backfill materials should consist of imported sand, gravel or crushed rock conforming to the project specifications. Based on the results of our field and laboratory investigations, native soils are not suitable for bedding or initial backfill.

Native soil excavated from the site is expected to be suitable for general trench backfill provided that recommendations for the use of coatings, and/or polythene encasement, supplemented with cathodic protection as per the Soils Corrosion Report, prepared by JDH Corrosion Consultants Inc., are followed. Alternatively, approved import material could be used. The soil used for backfill, whether native or imported, should be free of material larger than 4 inches in diameter, and any trash or excessive organics (greater than a 5% concentration). Import soil used for trench backfill should be graded so that 100% passes the 2-inch sieve and

20% to 50% passes the #200 sieve, and should have a Plasticity Index not greater than 20, a Liquid Limit less than 35, and an Expansion Index not exceeding 20.

To facilitate compaction, excessively wet soils will need to be dried back to less than 2% to 4% over optimum moisture content prior to use as backfill. In-place soil moisture contents at various depths are shown on the boring logs in Appendix A and in Plate B-1 in Appendix B. These should be reviewed so that the depth and extent of soils with high moisture contents can be approximated prior to excavation.

Trench backfill should be compacted to a minimum of 90% relative compaction, based on the ASTM D1557 test method, using mechanical methods. The upper 24 inches of backfill should be compacted to a minimum of 95% relative compaction when within existing roadways. Where trench backfill depths greater than 10 feet are required, fill within 10 feet of the surface should be compacted to a minimum of 95% relative compaction at or above optimum moisture content (typically no more than 2 to 3 percent above to avoid pumping soil conditions) to reduce the potential for future settlement. Jetting is not an acceptable method of compaction. We recommend maximum lift thicknesses of 1 foot.

Where utility trenches are located or cross beneath structures or pavement areas, the trench should be plugged to reduce the lateral transmission of water beneath the structures. Plugging can be accomplished by omitting granular bedding and initial backfill within five feet (either side) of the edge of buildings or pavement areas. The utility shall be placed directly on the native soil, and all granular backfill replaced with an impermeable grout plug, such as bentonite, native clayey soils or non-granular Controlled Density Fill (CDF). Grout plugs should extend from the base of the trench to a height of 2 feet above the pipe or 2 foot below the finished ground surface, whichever height is less, for the full width of the pipe trench. Clay used for plugs should be fully hydrated during placement.

Trench Excavation

We anticipate that the soil at the site will be excavatable with conventional grading equipment. However, SPT data from the borings does indicate the possible presence of a hard pan layer at a depth of between 2 and 7.5 feet. The depth to a permanent groundwater level is expected to be deeper than 60 feet below existing ground surface. Based on our observations, we do not expect that groundwater will be encountered during excavations for utilities. Perched water is possible, and may be present in isolated locations during the rainy season.

Trenches should be sloped or braced in accordance with the recommendations in the "Temporary Excavations" section of the report (see section below), and in accordance with current Cal/OSHA requirements.

Dewatering is not anticipated to be necessary for installation of utility lines, assuming that construction takes place in the drier months of the year when the surface soil is not saturated and there is no surface water on the site. If water is found in the trench, it should be removed with a sump prior to any utility installation.

Temporary Excavations

The owner and contractor should be familiar with applicable local, state, and federal safety regulations, including the current OSHA Excavation and Trench Safety Standards. Construction site safety is generally the sole responsibility of the Contractor, who shall also be solely responsible for the means, methods, and sequencing of construction operations. Under no circumstances should the information provided below be interpreted to mean that Fugro West, Inc. is assuming responsibility for construction site safety or the Contractor's activities; such responsibility is not being implied and should not be inferred.

According to the Federal Register, 29 CFR Part 1926, Occupational Safety and Health Standards - Excavations, undisturbed native soils are classified as either Type A, Type B or Type C. In general, Type A soils are defined as cohesive soils with a minimum unconfined compressive strength of 3000 psf. Type B soils are defined as cohesive soils with an unconfined compressive strength of 1000 psf, or granular soils consisting of silt, sandy silt or sandy clay. Type C soils are defined as cohesive soil with an unconfined compressive strength of less than 1000 psf, or consist of gravel or sand. The presence of fissures, water, dipping soil layers, soil disturbances, vibrations or surcharge loads may require that the soil type to be reclassified (lower). Open cut trenches in Type A soils may be cut at a minimum slope angle of ¾:1 (h:v) to a depth of 15 feet. Open cut trenches in Type B soils may be cut at a minimum slope angle of 1:1 and Type C soils may be cut at a minimum slope angle of 1½:1 (h:v).

According to 29 CFR, Part 1926, the soil at the subject site appears that it should be classified as a Type B soil in the upper 10 feet. The impact of traffic vibrations, actual soil conditions exposed in the open trenches, and other factors that may promote trench wall instability must be evaluated at the time of construction and trench sloping adjusted accordingly. Surcharge loads such as trench spoils, equipment, etc. should not be placed adjacent to an open excavation (within a distance of ½ the height of the trench).

Drainage

Proper drainage is important in the development of the project. Final grading adjacent to structures should be sloped so that the surface water drains away from the buildings. Final backfill placed adjacent to building foundations should be free of construction debris, properly compacted, and sloped so that storm, roof drain water, or irrigation water is not allowed to pond or rest next to the footings. Landscape grading should be designed so that surface water is directed to properly designed drainage facilities.

General Erosion Control

The erosion potential of soils located on or near the surface of the subject site is considered to be low to moderate. Erosion control measures should be implemented during and after construction to minimize soil erosion. This can be accomplished during construction using the following methods:

- Site grading should be avoided around heavy rains whenever possible.
- Temporary slopes should be maintained at the flattest possible gradient.

- During the rainy season, exposed soil on sloping ground or drainage swales should be covered as soon as possible. Covers could consist of grass and/or mulch (straw, wood chips, manmade fibers, etc.).

- Water flows over areas disturbed by grading should be minimized. This can be accomplished by placing temporary earth berms at the top of sloped areas.

- Dust should be controlled by sprinkling exposed soil with water or an approved dust pallative.

- Debris basins should be constructed to trap debris and silt prior to entering drainage channels.

Following construction, permanent slopes should be vegetated (planted with grasses or shrubs) or covered with a mulch or erosion control fabric to minimize soil erosion. Concentrated flows should be directed away from slopes and be piped or channeled into suitable drainage facilities.

Based on the soil types encountered within the site, flow velocities in unlined channels should not exceed 1.5 feet per second (fps). Where flows will exceed a velocity of 1.5 fps, erosion could occur and channels should be lined to reduce the potential for erosion. If channels are lined with jute mats or a similar stabilization, flow velocities less than 2.5 fps should be non-eroding. Where channel flow velocities will exceed 2.5 fps, geotextile channel liners or rip-rap could be used to reduce erosion.

LIMITATIONS

The analyses, conclusions, and recommendations contained in our report are based on site conditions as they existed at the time of our study, and further assume that probes such as exploratory borings are representative of the subsurface conditions throughout the site; i.e., the subsurface conditions everywhere are not significantly different from those disclosed by the probes.

If during construction different subsurface conditions from those encountered during our exploration or assumed in design are observed or appear to be present, or where variations from our design recommendations are made, we must be advised promptly so that we can review these conditions and modify the applicable recommendations, if necessary. We cannot be held responsible for differing site conditions or variations in design or field recommendations not brought to our attention.

Soil conditions cannot be fully determined by borings and, therefore, unanticipated soil conditions are commonly encountered. Such unexpected soil conditions often require that additional expenditures be made to attain a properly constructed project. Therefore, some contingency fund is recommended to accommodate such potential extra costs.

A determination of flooding potential or the existence of wetlands was beyond the scope of this report.

An investigation regarding the existence, location, and type of possible hazardous materials was performed as part of a concurrent environmental study, the results of which are presented in a separate report. If an investigation is necessary, we should be advised. In addition, if any hazardous materials are encountered during construction of the project, the proper regulatory officials should be notified immediately.

Other standards or documents referenced in any given standard cited in this report, or otherwise relied upon by authors of this report, are only mentioned in the given standard; they are not incorporated into it or "included by reference", as that latter term is used relative to contracts or other matters of law.

Our professional services were performed, our findings obtained, and our comments presented in accordance with generally accepted geotechnical engineering principles and practices in the greater Sacramento area. This warranty is in lieu of all other warranties, either expressed or implied.

REFERENCES

2001 California Building Code, 2002, California Code of Regulations Title 24, Part 2, Volume 2.

Bartow, J. A., 1991, The Cenozoic Evolution of the San Joaquin Valley, California; U.S. Geological Survey Professional Paper 1501.

Blake, T.F., 2000, EQFAULT, A Computer Program for the Deterministic Prediction of Peak Horizontal Acceleration From Digitized California Faults, Version 3.0.

Department of Water Resources, State of California, Central District, November 1990, Historical Groundwater Levels in San Joaquin County.

Hart, E.W. and Bryant, W.A., 1997, Fault-Rupture Hazard Zones in California: California Department of Conservation, Division of Mines and Geology, Special Publication 42.

Helley, E.J. and Harwood, D.S., 1985, Geologic Map of the Late Cenozoic Deposits of the Sacramento Valley and Northern Sierran Foothills, California: U.S. Geological Survey, Map MF-1790.

Spangler, M.G., 1941, The Structural Design of Flexible Pipe Culverts, The Iowa State College Bulletin, Ames, Iowa.

USBR, 1997, Method for Prediction of Flexible Pipe Deflection, Reclamation Service Center, Denver Federal Center, Denver.

PLATES

July 2007
Project No. 1832.001

Source: Aerial photo subscribed from Google Earth Pro.

VICINITY MAP

Karl Holton State Youth Facility
Stockton, California

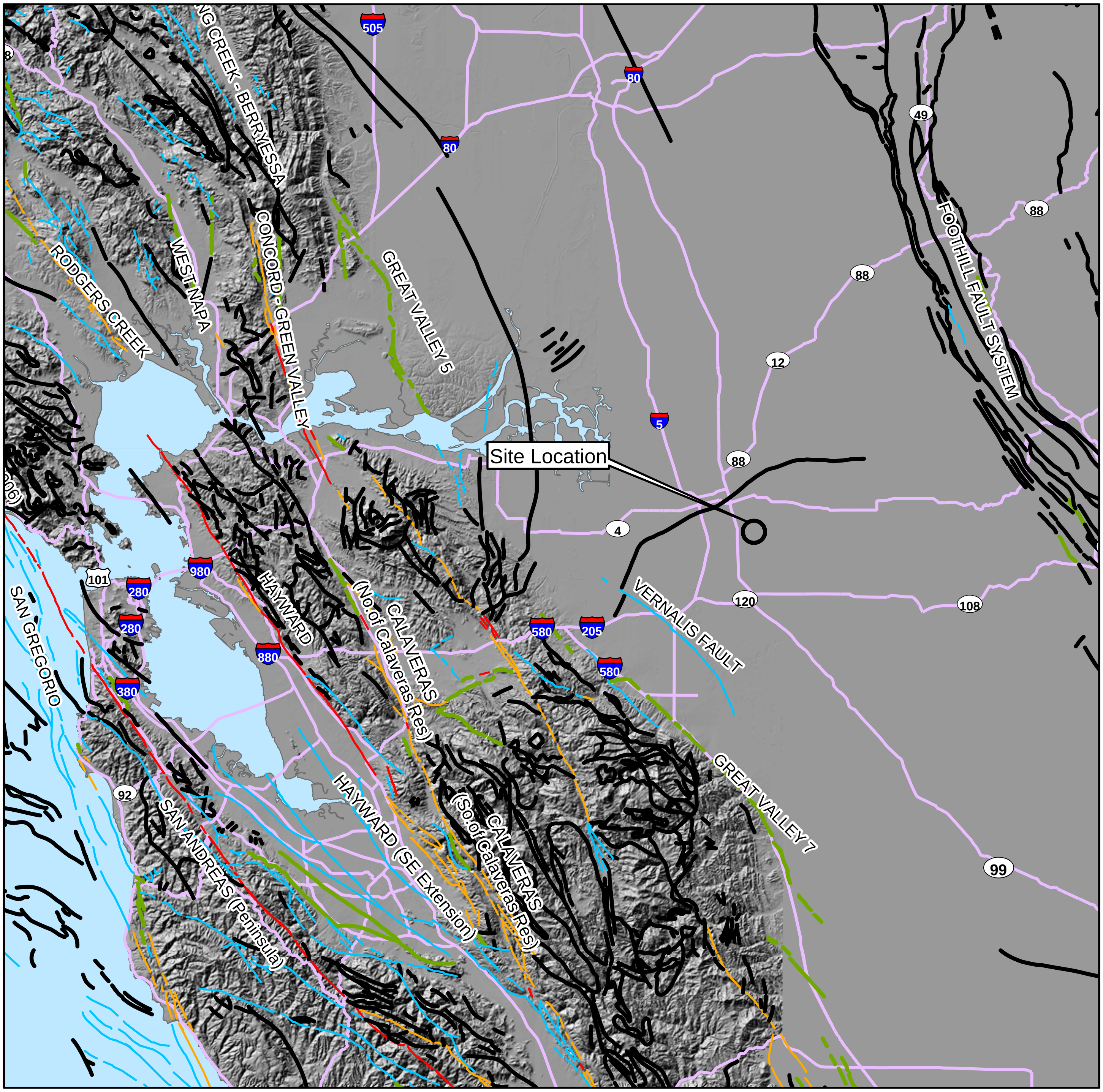
N

0 750 1,500 3,000 Feet

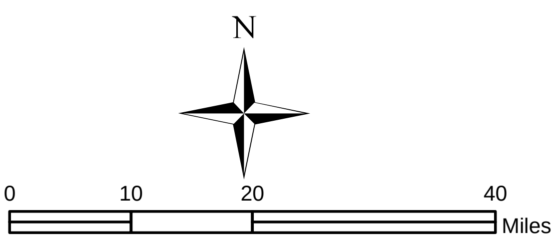
PLATE 1

G:\jobdocs\1832\1832.001\GIS\MXD\Plate1_Vicinity.mxd, 05/10/07, Vtong

July 2007
Project No. 1832.001



Source: California Division of Mines and Geology (California Geological Survey)
http://gmw.consrv.ca.gov/shmp/index.htm, (2000)



LEGEND

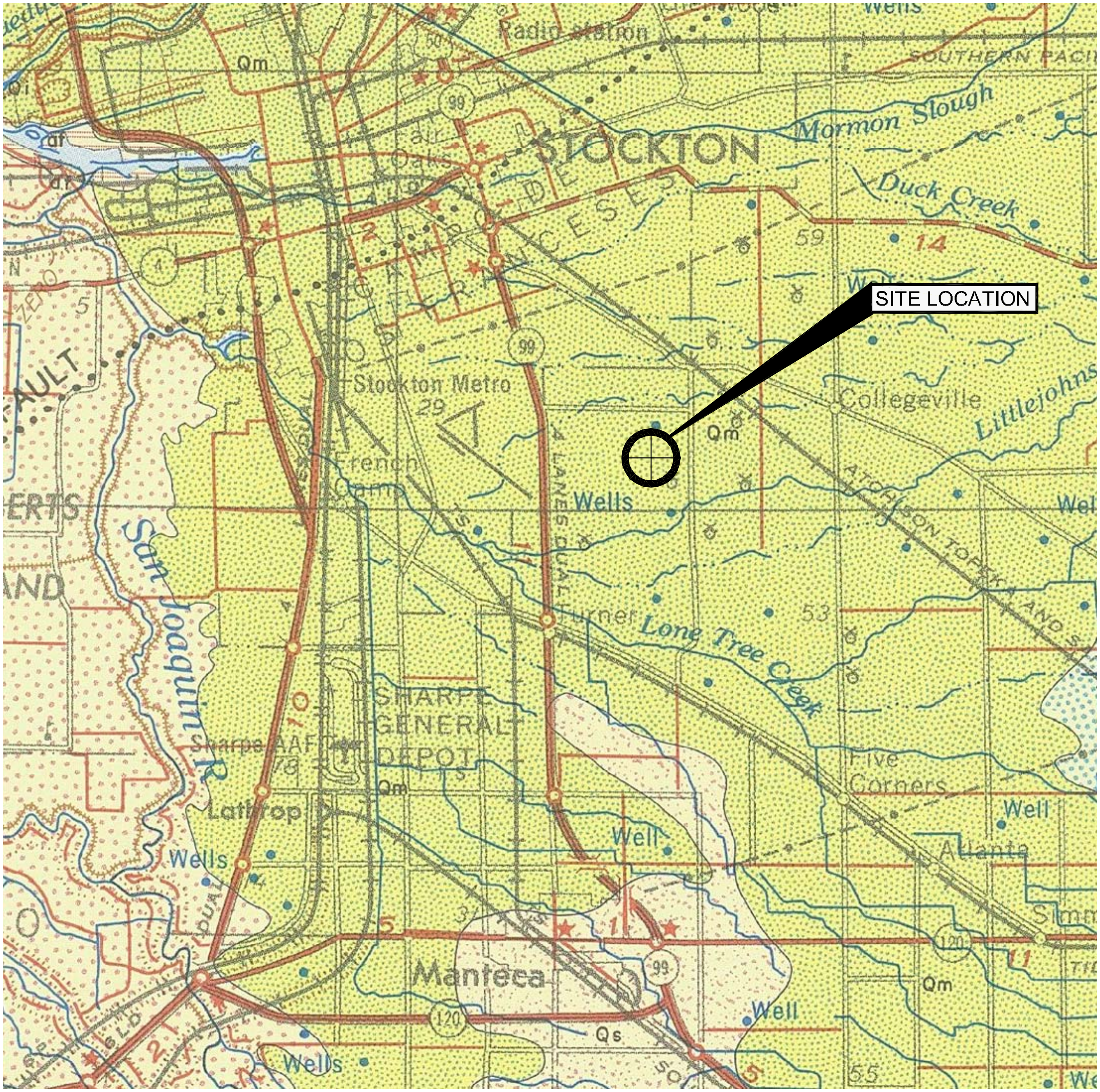
- HISTORIC
- HOLOCENE
- LATE QUATERNARY
- QUATERNARY
- PREQUATERNARY
- MAJOR ROAD

REGIONAL FAULT MAP

Karl Holton State Youth Facility
Stockton, California

PLATE 4

G:\jobdocs\1825\1825.001\GIS\MXD\Plate4_RegionalFaults.mxd, 04/16/07, rwong



LEGEND

Modesto Formation

Dune Sand

Dos Palos Alluvium

NORTH

0 2 4

MILES

SITE GEOLOGY MAP

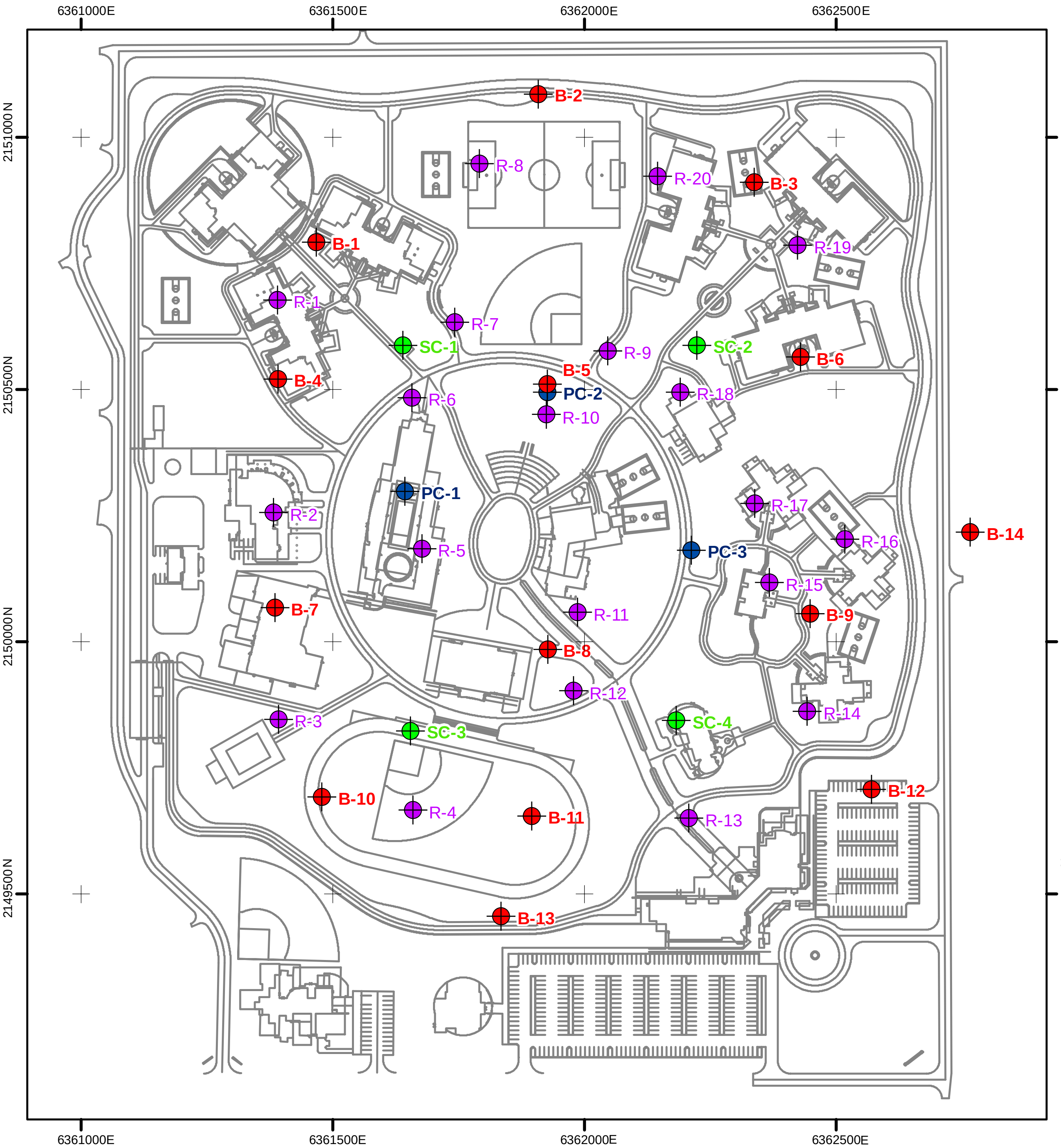
Karl Holton State Youth Facility

Stockton, California

PLATE 3

G:\jobdocs\1832\1832.001\Drawings\A1832_001_01.dwg 7-17-07 09:00:28 AM vtong

July 2007
Project No. 1832.001



Source: Aerial photo subscribed from Google Earth Pro.

SITE PLAN
(PROPOSED LAYOUT)
Karl Holton State Youth Facility
Stockton, California

LEGEND:
- Location of Auger Boring
- Location of Piezocone Penetration Testing
- Location of Piezocone Penetration Testing with Shear Wave Velocity Measurements
- Location of Resistivity Testing

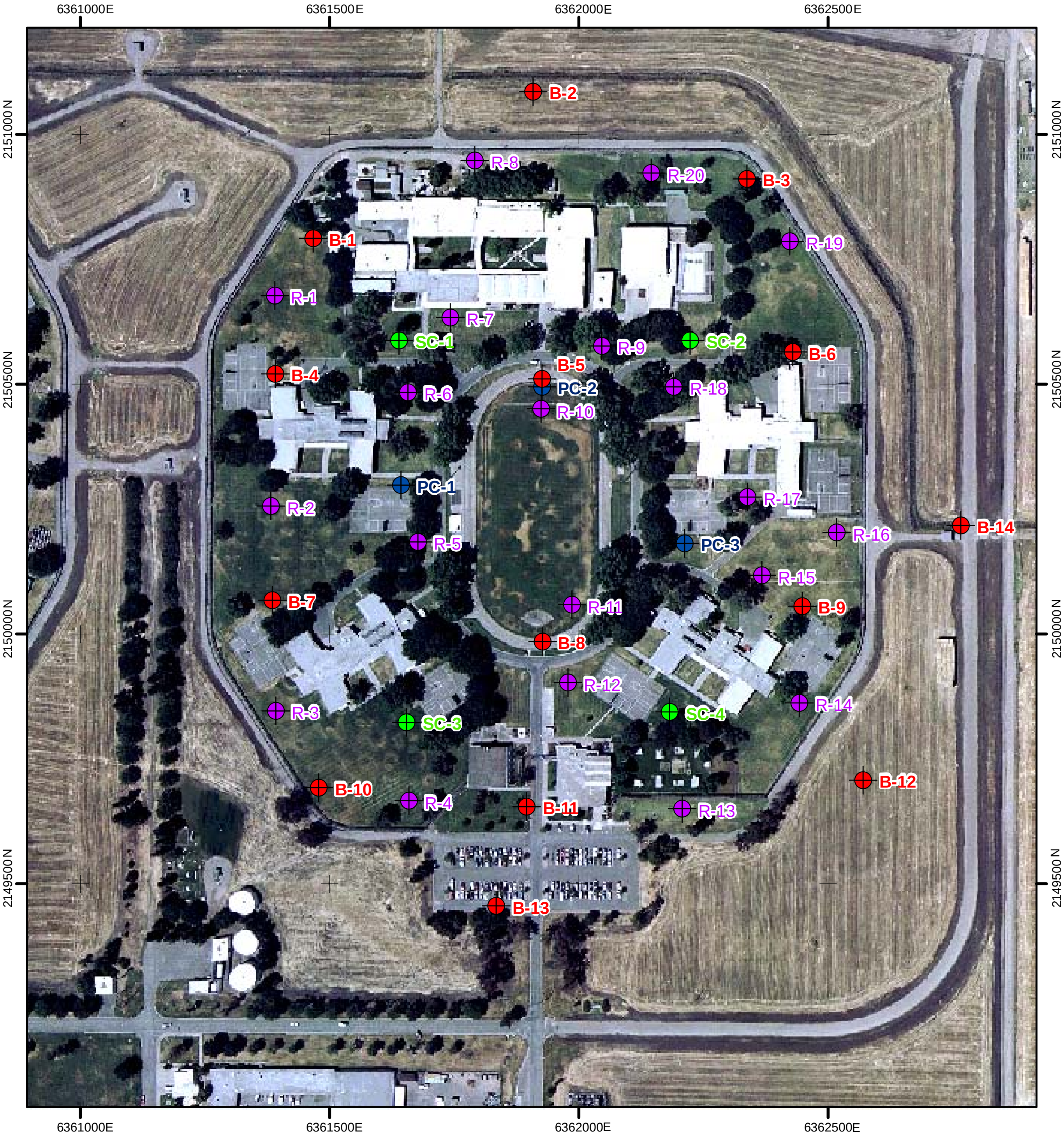
N

0 150 300 600 Feet

PLATE 2b

G:\jobdocs\1832\1832.001\GIS\MXD\Plate2b_SitePlan.mxd, 06/21/07, rwong

July 2007
Project No. 1832.001



Source: Aerial photo subscribed from Google Earth Pro.

SITE PLAN
(EXISTING LAYOUT)
Karl Holton State Youth Facility
Stockton, California

LEGEND:
- Location of Auger Boring
- Location of Piezocone Penetration Testing
- Location of Piezocone Penetration Testing with Shear Wave Velocity Measurements
- Location of Resistivity Testing

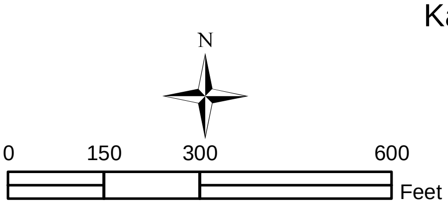
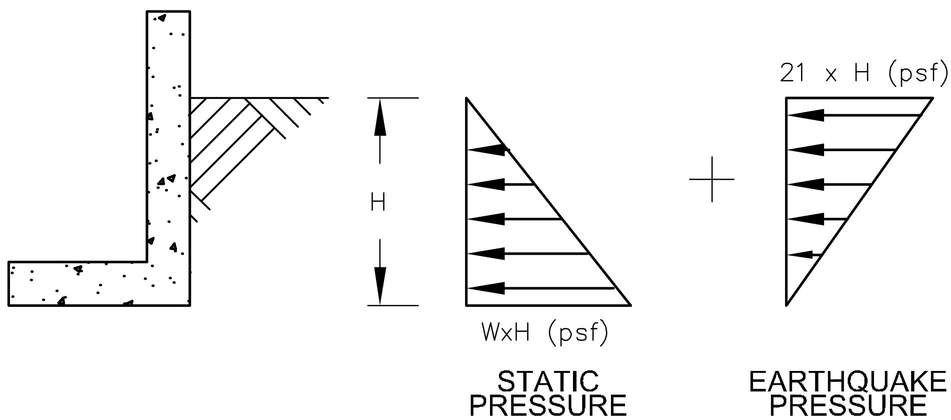


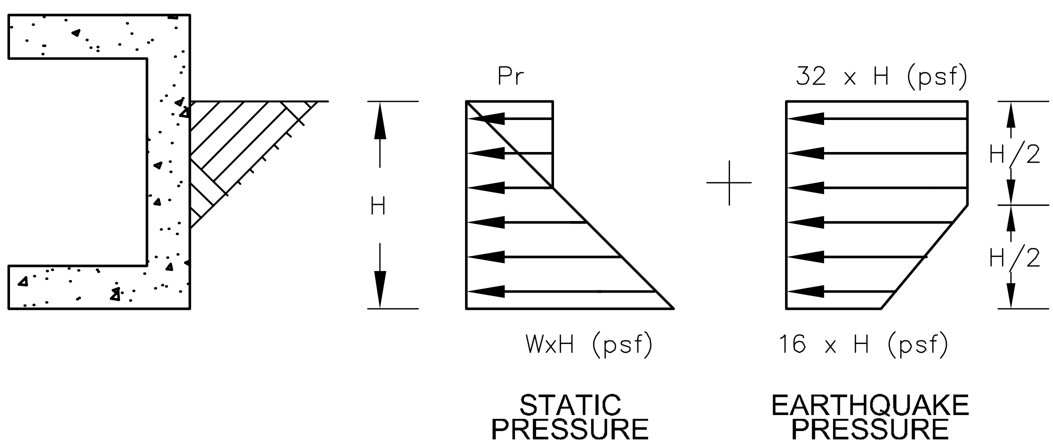
PLATE 2a

G:\jobdocs\1832\1832.001\GIS\MXD\Plate2a_SitePlan.mxd, 06/21/07, rwong

ACTIVE PRESSURE DISTRIBUTION (YIELDING WALLS)



AT-REST PRESSURE DISTRIBUTION (NON-YIELDING WALLS)



Notes

W = Equivalent Fluid Weight of Soil
Pr = Pressure due to compaction of backfill against non-yielding walls.
Typical values are:
Heavy Vibratory rollers: 48kPa (1000psf);
Light Vibratory rollers: 19kPa (400psf);
Plate Compactors: 12kPa (250psf)

LATERAL EARTH PRESSURES
Karl Holton State Youth Facility
Stockton, California

APPENDIX A
FIELD EXPLORATIONS

APPENDIX A
FIELD EXPLORATIONS

Our field investigation was conducted between April 23 and 27, 2007. The investigation consisted of fourteen borings (B-1 through B-14) and seven Cone Penetration Test (CPT) soundings (PC1 through PC-3 and SC-1 through SC-4). The exploratory borings were drilled to depths of between 5 and 75 feet. The borings were drilled with a truck mounted CME-75 drill rig, using 8-inch diameter hollow-stem augers. The locations of the borings are shown on Plate 2. Materials encountered in the borings were logged in the field by our representative and described in accordance with the Unified Soil Classification System (ASTM D-2487). The data obtained from the borings and CPT soundings are presented in the accompanying Plates and Tables included as part of this appendix.

Representative soil samples were obtained from the borings using a Modified California split-barrel drive sampler (outside diameter of 3.0 inches, inside diameter of 2.5 inches) and a Standard Penetration Test (SPT) split-barrel drive sampler (outside diameter of 2.0 inches, inside diameter of 1.375 inches). Both sampler types are indicated in the "Sample Type" column of the boring logs as designated in Plate A-15. Bulk samples were taken from the cuttings and collected in plastic bags as the drilling progressed. All samples were transmitted to our laboratory for evaluation and appropriate testing.

Observation wells were installed at boring locations B-1, B-3 and B-8. Details of the installation are included in Appendix C. Installation consisted of placing various lengths of 2-inch diameter, Schedule 40, 0.020-inch slotted and blank PVC pipe through the hollow stem augers. All wells received a sand backfill (#3 Lonestar) around the slotted pipe, followed by a hydrated bentonite-pellet sanitary seal (minimum of 2-foot thick). The remainder of the borehole was backfilled with cement grout and secured with a flush-mounted Christy-box well cover. Boring B-5 was completed with PVC casing and backfilled with sand for the purpose of geophysical testing by others at a later date, if necessary. The remaining borings were backfilled with cement grout.

The samplers were driven a depth of 18 inches by dropping a 140-pound hammer through a 30-inch free fall using an automatic hammer system. The resistance blow counts were recorded for each 6 inches of penetration. The resistance blow counts for the initial 6 inches of penetration were considered as seating blows and only the resistance blow counts for the last 12 inches of penetration were used for the field blow count. If the test was curtailed due to hard driving, defined as 50 blows for less than 6 inches penetration, the number of blows to achieve actual penetration were recorded, e.g. 50 blows for 4 inches. Penetration resistance values presented on the boring logs are direct values measured in the field. Due to the greater efficiency of the automatic hammer system, the resistance blow counts recorded for the last 12 inches of penetration for a SPT sampler need to be multiplied by a factor of about 1.5 to approximate SPT N-values. When driving a Modified California split-barrel sampler using an auto hammer, the resistance blows for the last 12 inches of penetration are considered approximately equal to SPT N-values.

The CPT soundings were performed by Fugro Consultants, Inc. and involved pushing a cone-tipped probe vertically into the soil at a constant rate of 2 centimeters per second in accordance with ASTM Standard D-5778-95 and recording the resistance of the soil to penetration. The test equipment consists of a cone assembly, a series of hollow rods, hydraulics to push the cone and rods, an analog strip chart recorder, and a truck to transport the test equipment and provide the needed thrust capacity to push the cone. The cone assembly consists of a conical tip with a 60^{o} apex angle and a cylindrical friction sleeve. The cone assembly used at the site has a cross sectional area of 15 square centimeters, and a sleeve surface area of 200 square centimeters. The device is instrumented with strain gages to simultaneously measure cone and sleeve resistance to penetration. The cone was also equipped with an internal pressure transducer capable of measuring dynamic pore pressures induced during advancement of the cone. Electric signals from the strain gages are transmitted by cable to the ground surface where the cone and sleeve resistance is recorded versus depth. The data obtained from the CPT soundings was interpreted and compared to the data from the borings.

The CPT soundings are presented as interpreted logs indicating normalized tip resistance (qc), friction ratio (FR) and an interpretation of basic soil behavior type. The soil behavior type is not equivalent to soil classification by a standard classification system such as USCS. Rather, it is an estimation of soil types known to act similarly when subjected to foundation loading and deformation. The interpreted CPT soundings are included in this Appendix under Section “CPT Logs”

Four (4) of the seven (7) CPT soundings were undertaken using an additional seismic tool, containing three (3) geophones, attached to the backend of the piezocone. The geophones are orientated in a triaxial manner (X, Y and Z) and are used to measure the arrival times of seismic waves generated at the surface. The test is performed as outlined in ASTM Standard D-5778-95 and “Seismic Cone Penetration test” by Robertson, Campanella and Gillespie. Shear waves are transmitted into the ground by striking a steel beam with a hammer. The beam is positioned on the ground surface close to the cone truck and perpendicular to the axis of the cone rods. The beam is struck alternately at opposite sides, which generates shear waves with opposite polarity. Hammer blows on the beam trigger the seismograph to record the time histories of the generated seismic waves as they travel through the soil and are detected by the geophones. Tests are performed at successively deeper test levels to build up a seismic data set at a particular location.

The data retrieved from the seismic soundings is digitally filtered and processed by Fugro’s proprietary software to produced plots of average arrival time versus waveform travel distance and shear wave interval velocity versus vertical depth. The results are included in this Appendix under the Section “Seismic Logs”.

Neither Fugro West, Inc. nor Fugro Consultants, Inc. make any guarantee or warranty, express or implied, regarding the use of these data by others. Interpretation or use of this information by others shall be at the user's sole risk regardless of any fault or negligence of Fugro West, Inc. or Fugro Consultants, Inc.

The locations and elevations of the borings and CPT's were determined by survey information provided by Boyle Engineering (Plate 2). A summary of the coordinates and elevations is presented in Table A-1.

TABLE A-1

SUMMARY OF ELEVATIONS AND COORDINATES			
ITEM	NORTHING	EASTING	GROUND ELEVATION
B-1	7963.07	12419.67	37.87
B-2	8096.31	12874.17	38.75
B-3	8082.15	13291.48	37.60
B-4	7692.47	12344.36	38.81
B-5	7681.74	12878.99	38.06
B-6	7736.51	13383.95	39.52
B-7	7237.72	12338.13	38.15
B-8	7156.32	12879.98	38.20
B-9	7225.75	13402.41	39.42
B-10	6862.67	12431.71	37.07
B-11	6825.18	12848.29	38.77
B-12	6874.69	13307.36	39.08
B-13	6687.51	12787.60	39.37
B-14	7409.00	13732.03	39.70
PC-1	7469.34	12595.86	38.13
PC-2	7666.22	12879.57	37.69
PC-3	7352.08	13166.45	38.09
SC-1	7758.94	12592.85	37.77
SC-2	7759.48	13177.63	38.78
SC-3	6994.31	12607.02	38.51
SC-4	7014.46	13136.78	39.42

SOIL BORING LOGS

Surface Elevation: 37.9 ft MSL	**Date Drilled:** 04/25/07
Drilling Method: CME 75 w/ 8-in HSA	**Logged By:** Gopalan Vishnan
Drilling Contractor: Spectrum Drilling	**Checked By:** Micheal Hughes
Hammer: 140 lb. auto-hammer 30-in drop	**Depth to Groundwater:** 67.3 ft BGS

Material Description and Classification	Depth (feet)	Elevation	Soil Type	Sample Type	Field Blows	Dry Density (pcf)	Moisture Content (%)	Unc. Comp. Strength (ksf)	Pocket Pen. (ksf)	Torvane (ksf)	Remarks and Other Lab Tests
SILTY SAND (SM), medium dense, brown, moist, fine sand to medium sand, trace clay.	0		SM								
				■	11						
				■	11						
				■	9	94	10				
		35		■	10						
LEAN CLAY with Sand (CL), hard, dark gray, moist, fine sand.			CL	■	15				9.0		
				■	18	96	13				
SILTY SAND (SM), very dense, light brown, moist, fine sand to medium sand, moderate cementation.	5		SM	■	50/3"						
Uncemented, medium dense.				■	13	87	27				
		30		■	11						
				■	12						
	10			■	5						
				■	5						
				■	6						
		25									
LEAN CLAY with Sand (CL), hard, brown, moist, fine sand.	15		CL	■	13						
				■	22						
				■	14	104	22		9.0		
		20									

Boring Terminated At 75.0 ft BGS

LOG OF BORING B-1

CDCR Karl Holton State Youth Facility Investigation

7650 Newcastle Road, Stockton, California

FUGRO

502 Giuseppe Court, Suite 11, Roseville, CA 95678
Telephone: (916) 773-2600 Fax: (916) 782-4846

Project No. 1832.001

Plate A-1

Surface Elevation: 37.9 ft MSL	Date Drilled: 04/25/07
Drilling Method: CME 75 w/ 8-in HSA	Logged By: Gopalan Vishnan
Drilling Contractor: Spectrum Drilling	Checked By: Micheal Hughes
Hammer: 140 lb. auto-hammer 30-in drop	Depth to Groundwater: 67.3 ft BGS

Material Description and Classification	Depth (feet)	Elevation	Soil Type	Sample Type	Field Blows	Dry Density (pcf)	Moisture Content (%)	Unc. Comp. Strength (ksf)	Pocket Pen. (ksf)	Torvane (ksf)	Remarks and Other Lab Tests
	20				10 22 33	110	17		9.0		
		15									
SANDY LEAN CLAY (CL), hard, brown and dark gray, moist, fine sand.	25				10 17 25						
		10									
	30				9 18 32				9.0		
		5									
	35										
		0									

Boring Terminated At 75.0 ft BGS

LOG OF BORING B-1

CDCR Karl Holton State Youth Facility Investigation
7650 Newcastle Road, Stockton, California

FUGRO
502 Giuseppe Court, Suite 11, Roseville, CA 95678
Telephone: (916) 773-2600 Fax: (916) 782-4846

Project No. 1832.001

Plate A-1

Surface Elevation: 37.9 ft MSL	**Date Drilled:** 04/25/07
Drilling Method: CME 75 w/ 8-in HSA	**Logged By:** Gopalan Vishnan
Drilling Contractor: Spectrum Drilling	**Checked By:** Micheal Hughes
Hammer: 140 lb. auto-hammer 30-in drop	**Depth to Groundwater:** 67.3 ft BGS

Material Description and Classification	Depth (feet)	Elevation	Soil Type	Sample Type	Field Blows	Dry Density (pcf)	Moisture Content (%)	Unc. Comp. Strength (ksf)	Pocket Pen. (ksf)	Torvane (ksf)	Remarks and Other Lab Tests
SANDY LEAN CLAY (CL), hard, brown and dark gray, moist, fine sand to medium sand, trace mica.	40				15 25 21				9.0		
		-5									
	45										
		-10									
SANDY SILT (ML), hard, light green and reddish brown, moist, fine sand.	50				3 7 25				9.0		
		-15									
	55										
		-20									

Boring Terminated At 75.0 ft BGS

LOG OF BORING B-1

CDCR Karl Holton State Youth Facility Investigation

7650 Newcastle Road, Stockton, California

FUGRO

502 Giuseppe Court, Suite 11, Roseville, CA 95678
Telephone: (916) 773-2600 Fax: (916) 782-4846

Project No. 1832.001

Plate A-1

Surface Elevation: 37.9 ft MSL	Date Drilled: 04/25/07
Drilling Method: CME 75 w/ 8-in HSA	Logged By: Gopalan Vishnan
Drilling Contractor: Spectrum Drilling	Checked By: Micheal Hughes
Hammer: 140 lb. auto-hammer 30-in drop	Depth to Groundwater: 67.3 ft BGS

Material Description and Classification	Depth (feet)	Elevation	Soil Type	Sample Type	Field Blows	Dry Density (pcf)	Moisture Content (%)	Unc. Comp. Strength (ksf)	Pocket Pen. (ksf)	Torvane (ksf)	Remarks and Other Lab Tests
LEAN CLAY (CL), very stiff, green-brown, moist, fine sand, trace sand.	60				4 8 12				8.0		
		-25									
	65										
		-30									
SANDY LEAN CLAY (CL), hard, brown, moist, fine sand to medium sand.	70				12 30 40				9.0		
		-35									
	75										
		-40									

Boring Terminated At 75.0 ft BGS

LOG OF BORING B-1

CDCR Karl Holton State Youth Facility Investigation

7650 Newcastle Road, Stockton, California

502 Giuseppe Court, Suite 11, Roseville, CA 95678
Telephone: (916) 773-2600 Fax: (916) 782-4846

Project No. 1832.001

Plate A-1

Surface Elevation: 38.8 ft MSL	**Date Drilled:** 04/27/07
Drilling Method: CME 75 w/ 8-in HSA	**Logged By:** Gopalan Vishnan
Drilling Contractor: Spectrum Drilling	**Checked By:** Micheal Hughes
Hammer: 140 lb. auto-hammer 30-in drop	**Depth to Groundwater:** Not Encountered

Material Description and Classification	Depth (feet)	Elevation	Soil Type	Sample Type	Field Blows	Dry Density (pcf)	Moisture Content (%)	Unc. Comp. Strength (ksf)	Pocket Pen. (ksf)	Torvane (ksf)	Remarks and Other Lab Tests
SILTY SAND (SM), loose, dark brown, moist, coarse sand to fine sand.	0										
SANDY LEAN CLAY (CL), very stiff, dark gray, moist, fine sand.					8 8 10						
LEAN CLAY with Sand (CL), very stiff, brown, moist, fine sand.		35			8 9 12				8.0		
	5				8 10 11	91	17	0.8	7.5		
Hard.		30			6 14 35	96	21	1.5	9.0		
	10				16 23 28	97	22		9.0		
		25									
Very stiff.	15				5 6 11						
SILTY SAND (SM), dense, brown, moist, medium sand to fine sand.		20									

Boring Terminated At 26.5 ft BGS

LOG OF BORING B-2
CDCR Karl Holton State Youth Facility Investigation
7650 Newcastle Road, Stockton, California

FUGRO
502 Giuseppe Court, Suite 11, Roseville, CA 95678
Telephone: (916) 773-2600 Fax: (916) 782-4846

Project No. 1832.001

Plate A-2

Surface Elevation: 38.8 ft MSL	Date Drilled: 04/27/07
Drilling Method: CME 75 w/ 8-in HSA	Logged By: Gopalan Vishnan
Drilling Contractor: Spectrum Drilling	Checked By: Micheal Hughes
Hammer: 140 lb. auto-hammer 30-in drop	Depth to Groundwater: Not Encountered

Material Description and Classification	Depth (feet)	Elevation	Soil Type	Sample Type	Field Blows	Dry Density (pcf)	Moisture Content (%)	Unc. Comp. Strength (ksf)	Pocket Pen. (ksf)	Torvane (ksf)	Remarks and Other Lab Tests
	20				6 6 12						
LEAN CLAY (CL), very stiff, brown, moist.											
		15									
	25				6 8 10						
		10									
	30										
		5									
	35										
		0									

Boring Terminated At 26.5 ft BGS

LOG OF BORING B-2

CDCR Karl Holton State Youth Facility Investigation

7650 Newcastle Road, Stockton, California

FUGRO

502 Giuseppe Court, Suite 11, Roseville, CA 95678
Telephone: (916) 773-2600 Fax: (916) 782-4846

Project No. 1832.001

Plate A-2

LOG OF BORING 1832.001.GPJ ESPANA GEOTECH.GDT 9/19/07

Surface Elevation: 37.6 ft MSL	Date Drilled: 04/24/07
Drilling Method: CME 75 w/ 8-in HSA	**Logged By:** Gopalan Vishnan
Drilling Contractor: Spectrum Drilling	**Checked By:** Micheal Hughes
Hammer: 140 lb. auto-hammer 30-in drop	**Depth to Groundwater:** 66.7 ft BGS

Material Description and Classification	Depth (feet)	Elevation	Soil Type	Sample Type	Field Blows	Dry Density (pcf)	Moisture Content (%)	Unc. Comp. Strength (ksf)	Pocket Pen. (ksf)	Torvane (ksf)	Remarks and Other Lab Tests
FAT CLAY (CH), hard, dark gray and dark brown, moist, trace sand.	0										
					16						
					17				9.0		
					22	105	13				
		35			15						
					16				9.0		
LEAN CLAY with Sand (CL), hard, light brown, moist, fine sand.					17						
SILTY, CLAYEY SAND (SC-SM), very dense, light brown, moist, fine sand.	5				21						
					50/6"	90	25				
LEAN CLAY with Sand (CL), hard, light brown, moist, fine sand.		30			12						
					16				9.0		
					15	91	16	1.5			
SANDY SILT (ML), hard, light brown, moist, fine sand.	10				11						
					16				9.0		
					22	97	11				
		25									
SILTY SAND (SM), dense, light brown, moist, medium sand to fine sand.	15				13						
					15						
					16	103	9				
		20									

Boring Terminated At 75.0 ft BGS

LOG OF BORING B-3

CDCR Karl Holton State Youth Facility Investigation
7650 Newcastle Road, Stockton, California

FUGRO
502 Giuseppe Court, Suite 11, Roseville, CA 95678
Telephone: (916) 773-2600 Fax: (916) 782-4846

Project No. 1832.001

Plate A-3

Surface Elevation: 37.6 ft MSL	Date Drilled: 04/24/07
Drilling Method: CME 75 w/ 8-in HSA	Logged By: Gopalan Vishnan
Drilling Contractor: Spectrum Drilling	Checked By: Micheal Hughes
Hammer: 140 lb. auto-hammer 30-in drop	Depth to Groundwater: 66.7 ft BGS

Material Description and Classification	Depth (feet)	Elevation	Soil Type	Sample Type	Field Blows	Dry Density (pcf)	Moisture Content (%)	Unc. Comp. Strength (ksf)	Pocket Pen. (ksf)	Torvane (ksf)	Remarks and Other Lab Tests
SANDY LEAN CLAY (CL), hard, brown, moist, fine sand.	20				17 14 50/4"				9.0		
		15									
SANDY SILT (ML), hard, brown, moist, fine sand, trace mica.	25				18 39 50/5"				9.0		
		10									
SAND with Silt (SP-SM), very dense, reddish brown, moist, medium sand to fine sand.	30				12 19 36						
		5									
	35										
		0									

Boring Terminated At 75.0 ft BGS

LOG OF BORING B-3

CDCR Karl Holton State Youth Facility Investigation

7650 Newcastle Road, Stockton, California

502 Giuseppe Court, Suite 11, Roseville, CA 95678
Telephone: (916) 773-2600 Fax: (916) 782-4846

Project No. 1832.001

Plate A-3

Surface Elevation: 37.6 ft MSL	Date Drilled: 04/24/07
Drilling Method: CME 75 w/ 8-in HSA	Logged By: Gopalan Vishnan
Drilling Contractor: Spectrum Drilling	Checked By: Micheal Hughes
Hammer: 140 lb. auto-hammer 30-in drop	Depth to Groundwater: 66.7 ft BGS

Material Description and Classification	Depth (feet)	Elevation	Soil Type	Sample Type	Field Blows	Dry Density (pcf)	Moisture Content (%)	Unc. Comp. Strength (ksf)	Pocket Pen. (ksf)	Torvane (ksf)	Remarks and Other Lab Tests
SILTY SAND (SM), very dense, reddish brown, moist, coarse sand to fine sand.	40				24 44 50/5"						
		-5									
	45										
		-10									
SANDY LEAN CLAY (CL), hard, grayish brown, moist, medium sand to fine sand.	50				6 9 13						
		-15									
	55										
		-20									

Boring Terminated At 75.0 ft BGS

LOG OF BORING B-3

CDCR Karl Holton State Youth Facility Investigation

7650 Newcastle Road, Stockton, California

FUGRO
502 Giuseppe Court, Suite 11, Roseville, CA 95678
Telephone: (916) 773-2500 Fax: (916) 782-4846

Project No. 1832.001

Plate A-3

Surface Elevation: 37.6 ft MSL	**Date Drilled:** 04/24/07
Drilling Method: CME 75 w/ 8-in HSA	**Logged By:** Gopalan Vishnan
Drilling Contractor: Spectrum Drilling	**Checked By:** Micheal Hughes
Hammer: 140 lb. auto-hammer 30-in drop	**Depth to Groundwater:** 66.7 ft BGS

Material Description and Classification	Depth (feet)	Elevation	Soil Type	Sample Type	Field Blows	Dry Density (pcf)	Moisture Content (%)	Unc. Comp. Strength (ksf)	Pocket Pen. (ksf)	Torvane (ksf)	Remarks and Other Lab Tests
Becoming brown and reddish brown from a depth of about 60 feet.	60				10 19 21				9.0		
		-25									
	65										
		-30									
	70				18 19 20						
		-35									
	75										
		-40									

Boring Terminated At 75.0 ft BGS

LOG OF BORING B-3

CDCR Karl Holton State Youth Facility Investigation
7650 Newcastle Road, Stockton, California

FUGRO
502 Giuseppe Court, Suite 11, Roseville, CA 95678
Telephone: (916) 773-2600 Fax: (916) 782-4846

Project No. 1832.001

Plate A-3

Surface Elevation: 38.8 ft MSL	**Date Drilled:** 04/25/07
Drilling Method: CME 75 w/ 8-in HSA	**Logged By:** Gopalan Vishnan
Drilling Contractor: Spectrum Drilling	**Checked By:** Micheal Hughes
Hammer: 140 lb. auto-hammer 30-in drop	**Depth to Groundwater:** Not Encountered

Material Description and Classification	Depth (feet)	Elevation	Soil Type	Sample Type	Field Blows	Dry Density (pcf)	Moisture Content (%)	Unc. Comp. Strength (ksf)	Pocket Pen. (ksf)	Torvane (ksf)	Remarks and Other Lab Tests
SILTY SAND (SM), loose, dark brown and dark gray, moist, coarse sand to fine sand, trace gravel.	0										
FAT CLAY (CH), very stiff, dark brown and dark gray, moist, few sand.					10						
					14	103	8				
LEAN CLAY with Sand (CL), very stiff, dark brown, moist, fine sand.					10						
					5						
FAT CLAY (CH), very stiff, dark gray, moist, fine sand.					7				6.0		
		35			10						
LEAN CLAY with Sand (CL), hard, brown, moist, fine sand.	5				12		15				
					17				9.0		
					42	92	23				
SILTY SAND (SM), very dense, gray brown, moist, coarse sand to fine sand, weak cementation.					20						
					32						
		30			50/4"	108	13				
LEAN CLAY with Sand (CL), hard, brown, moist, fine sand.	10				14						
					22				9.0		
					28	95	26				
		25									
	15				4						
					6						
					7						
		20									

Boring Terminated At 26.5 ft bgs

LOG OF BORING B-4

CDCR Karl Holton State Youth Facility Investigation

7650 Newcastle Road, Stockton, California

FUGRO
502 Giuseppe Court, Suite 11, Roseville, CA 95678
Telephone: (916) 773-2600 Fax: (916) 782-4846

Project No. 1832.001

Plate A-4

Surface Elevation: 38.8 ft MSL	Date Drilled: 04/25/07
Drilling Method: CME 75 w/ 8-in HSA	Logged By: Gopalan Vishnan
Drilling Contractor: Spectrum Drilling	Checked By: Micheal Hughes
Hammer: 140 lb. auto-hammer 30-in drop	Depth to Groundwater: Not Encountered

Material Description and Classification	Depth (feet)	Elevation	Soil Type	Sample Type	Field Blows	Dry Density (pcf)	Moisture Content (%)	Unc. Comp. Strength (ksf)	Pocket Pen. (ksf)	Torvane (ksf)	Remarks and Other Lab Tests
SANDY LEAN CLAY (CL), very stiff, brown, moist, fine sand.	20				6 9 11				7.0		
		15									
SANDY SILT (ML), very stiff, brown, moist, fine sand.	25				6 9 12				7.0		
		10									
	30										
		5									
	35										
		0									

Boring Terminated At 26.5 ft bgs

LOG OF BORING B-4

CDCR Karl Holton State Youth Facility Investigation
7650 Newcastle Road, Stockton, California

FUGRO
502 Giuseppe Court, Suite 11, Roseville, CA 95678
Telephone: (916) 773-2600 Fax: (916) 782-4846

Project No. 1832.001

Plate A-4

Surface Elevation: 38.1 ft MSL	**Date Drilled:** 04/24/07
Drilling Method: CME 75 w/ 8-in HSA	**Logged By:** Gopalan Vishnan
Drilling Contractor: Spectrum Drilling	**Checked By:** Micheal Hughes
Hammer: 140 lb. auto-hammer 30-in drop	**Depth to Groundwater:** 67.4 ft BGS

Material Description and Classification	Depth (feet)	Elevation	Soil Type	Sample Type	Field Blows	Dry Density (pcf)	Moisture Content (%)	Unc. Comp. Strength (ksf)	Pocket Pen. (ksf)	Torvane (ksf)	Remarks and Other Lab Tests
ASPHALTIC CONRETE (AC), 1.5-inch thick.	0										
AGGREGATE BASE (AB), 4.5-inch thick.											
LEAN CLAY with Sand (CL), stiff, dark brown, moist, fine sand.					2 4 8	85	27		4.0		
SANDY LEAN CLAY (CL), hard, brown, moist, medium sand to fine sand.		35			15 16 17						
	5				13 36 37	100	23	2.2	8.0		
		30			8 12 23	97	27	1.2	9.0		
SANDY SILT (ML), hard, brown, moist, medium sand to fine sand.	10				16 23 24	108	20		9.0		
		25									
LEAN CLAY with Sand (CL), very stiff, brown, moist, fine sand.	15				10 12 17	103	23		6.0		
		20									

Boring Terminated At 75.0 ft BGS

LOG OF BORING B-5

CDCR Karl Holton State Youth Facility Investigation

7650 Newcastle Road, Stockton, California

FUGRO

502 Giuseppe Court, Suite 11, Roseville, CA 95678
Telephone: (916) 773-2600 Fax: (916) 782-4846

Project No. 1832.001

Plate A-5

Surface Elevation: 38.1 ft MSL	Date Drilled: 04/24/07
Drilling Method: CME 75 w/ 8-in HSA	**Logged By:** Gopalan Vishnan
Drilling Contractor: Spectrum Drilling	**Checked By:** Micheal Hughes
Hammer: 140 lb. auto-hammer 30-in drop	**Depth to Groundwater:** 67.4 ft BGS

Material Description and Classification	Depth (feet)	Elevation	Soil Type	Sample Type	Field Blows	Dry Density (pcf)	Moisture Content (%)	Unc. Comp. Strength (ksf)	Pocket Pen. (ksf)	Torvane (ksf)	Remarks and Other Lab Tests
SANDY LEAN CLAY (CL), hard, brown, moist, medium sand to fine sand.	20				4 12 24				9.0		
		15									
SAND with Silt (SP-SM), dense, dark brown, moist, medium sand to fine sand.	25				7 10 13						Lost Sample
		10									
	30				8 13 13						
		5									
	35										
		0									

Boring Terminated At 75.0 ft BGS

LOG OF BORING B-5

CDCR Karl Holton State Youth Facility Investigation

7650 Newcastle Road, Stockton, California

FUGRO
502 Giuseppe Court, Suite 11, Roseville, CA 95678
Telephone: (916) 773-2600 Fax: (916) 782-4846

Project No. 1832.001

Plate A-5

Surface Elevation: 38.1 ft MSL	**Date Drilled:** 04/24/07
Drilling Method: CME 75 w/ 8-in HSA	**Logged By:** Gopalan Vishnan
Drilling Contractor: Spectrum Drilling	**Checked By:** Micheal Hughes
Hammer: 140 lb. auto-hammer 30-in drop	**Depth to Groundwater:** 67.4 ft BGS

Material Description and Classification	Depth (feet)	Elevation	Soil Type	Sample Type	Field Blows	Dry Density (pcf)	Moisture Content (%)	Unc. Comp. Strength (ksf)	Pocket Pen. (ksf)	Torvane (ksf)	Remarks and Other Lab Tests
SANDY LEAN CLAY (CL), hard, dark brown and gray, moist, fine sand.	40				14 13 50/5"				9.0		
		-5									
	45										
SAND with Silt (SP-SM), dense, brown, moist, coarse sand to fine sand.		-10									
	50				14 14						
LEAN CLAY (CL), hard, gray, moist, trace sand.					17				9.0		
		-15									
	55										
		-20									

Boring Terminated At 75.0 ft BGS

LOG OF BORING B-5

CDCR Karl Holton State Youth Facility Investigation

7650 Newcastle Road, Stockton, California

FUGRO

502 Giuseppe Court, Suite 11, Roseville, CA 95678
Telephone: (916) 773-2600 Fax: (916) 782-4846

Project No. 1832.001

Plate A-5

Surface Elevation: 38.1 ft MSL	**Date Drilled:** 04/24/07
Drilling Method: CME 75 w/ 8-in HSA	**Logged By:** Gopalan Vishnan
Drilling Contractor: Spectrum Drilling	**Checked By:** Micheal Hughes
Hammer: 140 lb. auto-hammer 30-in drop	**Depth to Groundwater:** 67.4 ft BGS

Material Description and Classification	Depth (feet)	Elevation	Soil Type	Sample Type	Field Blows	Dry Density (pcf)	Moisture Content (%)	Unc. Comp. Strength (ksf)	Pocket Pen. (ksf)	Torvane (ksf)	Remarks and Other Lab Tests
SANDY LEAN CLAY (CL), hard, light brown, moist, medium sand to fine sand.	60				13 17 21						
		-25									
	65										
		-30									
	70				16 34 50/6"						
		-35									
	75										
		-40									

Boring Terminated At 75.0 ft BGS

LOG OF BORING B-5

CDCR Karl Holton State Youth Facility Investigation

7650 Newcastle Road, Stockton, California

FUGRO
502 Giuseppe Court, Suite 11, Roseville, CA 95678
Telephone: (916) 773-2600 Fax: (916) 782-4846

Project No. 1832.001

Plate A-5

Surface Elevation: 39.5 ft MSL	**Date Drilled:** 04/27/07
Drilling Method: CME 75 w/ 8-in HSA	**Logged By:** Gopalan Vishnan
Drilling Contractor: Spectrum Drilling	**Checked By:** Micheal Hughes
Hammer: 140 lb. auto-hammer 30-in drop	**Depth to Groundwater:** Not Encountered

Material Description and Classification	Depth (feet)	Elevation	Soil Type	Sample Type	Field Blows	Dry Density (pcf)	Moisture Content (%)	Unc. Comp. Strength (ksf)	Pocket Pen. (ksf)	Torvane (ksf)	Remarks and Other Lab Tests
SILTY SAND (SM), loose, dark brown, moist, coarse sand to fine sand.	0										
LEAN CLAY (CL), very stiff, dark brown, moist.					13 13 16	107	11		9.0		
LEAN CLAY with Sand (CL), hard, brown, moist, fine sand.					11 50/5"				9.0		
		35									
SILTY, CLAYEY SAND (SC-SM), very dense, brown, moist, coarse sand to fine sand.	5				25 21 50/4"	98	25				
LEAN CLAY with Sand (CL), hard, brown, moist, fine sand.					14 18 27	100	23	1.4	9.0		
		30									
	10				10 15 22	105	20		8.0		
		25									
	15				8 17 32	112	18		8.0		
SILTY, CLAYEY SAND (SC-SM), medium dense, brown and green-brown, moist, medium sand to fine sand.											
		20									

Boring Terminated At 26.5 ft BGS

LOG OF BORING B-6

CDCR Karl Holton State Youth Facility Investigation
7650 Newcastle Road, Stockton, California

FUGRO
502 Giuseppe Court, Suite 11, Roseville, CA 95678
Telephone: (916) 773-2600 Fax: (916) 782-4846

Project No. 1832.001

Plate A-6

Surface Elevation: 39.5 ft MSL	**Date Drilled:** 04/27/07
Drilling Method: CME 75 w/ 8-in HSA	**Logged By:** Gopalan Vishnan
Drilling Contractor: Spectrum Drilling	**Checked By:** Micheal Hughes
Hammer: 140 lb. auto-hammer 30-in drop	**Depth to Groundwater:** Not Encountered

Material Description and Classification	Depth (feet)	Elevation	Soil Type	Sample Type	Field Blows	Dry Density (pcf)	Moisture Content (%)	Unc. Comp. Strength (ksf)	Pocket Pen. (ksf)	Torvane (ksf)	Remarks and Other Lab Tests
	20				6 7 12						
		15									
	25				5 6 8						
		10									
	30										
		5									
	35										
		0									

Boring Terminated At 26.5 ft BGS

LOG OF BORING B-6

CDCR Karl Holton State Youth Facility Investigation
7650 Newcastle Road, Stockton, California

FUGRO
502 Giuseppe Court, Suite 11, Roseville, CA 95678
Telephone: (916) 773-2600 Fax: (916) 782-4846

Project No. 1832.001

Plate A-6

LOG OF BORING 1832.001.GPJ ESPANA GEOTECH.GDT 9/19/07

Surface Elevation: 38.2 ft MSL	**Date Drilled:** 04/26/07
Drilling Method: CME 75 w/ 8-in HSA	**Logged By:** Gopalan Vishnan
Drilling Contractor: Spectrum Drilling	**Checked By:** Micheal Hughes
Hammer: 140 lb. auto-hammer 30-in drop	**Depth to Groundwater:** Not Encountered

Material Description and Classification	Depth (feet)	Elevation	Field Blows	Dry Density (pcf)	Moisture Content (%)	Unc. Comp. Strength (ksf)	Pocket Pen. (ksf)	Torvane (ksf)	Remarks and Other Lab Tests
SILTY SAND (SM), loose, dark gray, moist, coarse sand to fine sand.	0								
SANDY LEAN CLAY (CL), hard, dark gray, moist, fine sand.			9						
			16						
			24	89	12		9.0		
			12						
		35	17				9.0		
			18	110	15				
LEAN CLAY with Sand (CL), hard, brown, moist, fine sand.	5		18						
			14						
			23	105	19		9.0		
			8						
		30	12						
			19				9.0		
SANDY SILT (ML), very stiff, brown and light green, moist, medium sand to fine sand.	10		8						
			10						
			13	109	18		8.0		
		25							
LEAN CLAY with Sand (CL), very stiff, brown and black, moist, medium sand to fine sand.	15		4						
			8						
			9				7.0		
		20							

Boring Terminated At 26.5 ft BGS

LOG OF BORING B-7

CDCR Karl Holton State Youth Facility Investigation

7650 Newcastle Road, Stockton, California

FUGRO

502 Giuseppe Court, Suite 11, Roseville, CA 95678
Telephone: (916) 773-2600 Fax: (916) 782-4846

Project No. 1832.001

Plate A-7

LOG OF BORING 1832.001.GPJ ESPANA GEOTECH.GDT 9/19/07

Surface Elevation: 38.2 ft MSL	**Date Drilled:** 04/26/07
Drilling Method: CME 75 w/ 8-in HSA	**Logged By:** Gopalan Vishnan
Drilling Contractor: Spectrum Drilling	**Checked By:** Micheal Hughes
Hammer: 140 lb. auto-hammer 30-in drop	**Depth to Groundwater:** Not Encountered

Material Description and Classification	Depth (feet)	Elevation	Soil Type	Sample Type	Field Blows	Dry Density (pcf)	Moisture Content (%)	Unc. Comp. Strength (ksf)	Pocket Pen. (ksf)	Torvane (ksf)	Remarks and Other Lab Tests
SAND with Silt (SP-SM), medium dense, brown, moist, coarse sand to fine sand.	20				6 8 9						
		15									
SANDY LEAN CLAY (CL), hard, brown and light green, moist, fine sand.	25				10 14 19						
		10									
	30										
		5									
	35										
		0									

Boring Terminated At 26.5 ft BGS

LOG OF BORING B-7

CDCR Karl Holton State Youth Facility Investigation

7650 Newcastle Road, Stockton, California

FUGRO

502 Giuseppe Court, Suite 11, Roseville, CA 95678
Telephone: (916) 773-2600 Fax: (916) 782-4846

Project No. 1832.001

Plate A-7

Surface Elevation: 38.2 ft MSL	**Date Drilled:** 04/23/07
Drilling Method: CME 75 w/ 8-in HSA	**Logged By:** Gopalan Vishnan
Drilling Contractor: Spectrum Drilling	**Checked By:** Micheal Hughes
Hammer: 140 lb. auto-hammer 30-in drop	**Depth to Groundwater:** 66.3 ft BGS

Material Description and Classification	Depth (feet)	Elevation	Field Blows	Dry Density (pcf)	Moisture Content (%)	Unc. Comp. Strength (ksf)	Pocket Pen. (ksf)	Torvane (ksf)	Remarks and Other Lab Tests
ASPHALTIC CONRETE (AC), 2-inches.	0								
AGGREGATE BASE (AB).									
SILTY SAND (SM), medium dense, dark gray, moist, coarse sand to fine sand.			4						
			7						
LEAN CLAY (CL), very stiff, dark brown, moist.			13				4.0		
			6	86	22				
		35	9						
			18						
Brown, little sand.									
LEAN CLAY (CL), very stiff, light brown, moist, fine sand.	5		6						
			8						
			12	95	26	0.9	5.0		
SILTY SAND (SM), medium dense, brown, moist, coarse sand to fine sand, little clay.			8						
		30	13						
			18	98	23				
	10		8						
			7						
SAND with Silt (SP-SM), medium dense, brown, moist, medium sand to fine sand.			11	90	30				
		25							
SANDY LEAN CLAY (CL), very stiff, light brown, moist, medium sand to fine sand.	15		3						
			5						
			8						
		20							

Boring Terminated At 76.5 ft BGS

LOG OF BORING B-8

CDCR Karl Holton State Youth Facility Investigation
7650 Newcastle Road, Stockton, California

FUGRO
502 Giuseppe Court, Suite 11, Roseville, CA 95678
Telephone: (916) 773-2600 Fax: (916) 782-4846

Project No. 1832.001

Plate A-8

Surface Elevation: 38.2 ft MSL	**Date Drilled:** 04/23/07
Drilling Method: CME 75 w/ 8-in HSA	**Logged By:** Gopalan Vishnan
Drilling Contractor: Spectrum Drilling	**Checked By:** Micheal Hughes
Hammer: 140 lb. auto-hammer 30-in drop	**Depth to Groundwater:** 66.3 ft BGS

Material Description and Classification	Depth (feet)	Elevation	Soil Type	Sample Type	Field Blows	Dry Density (pcf)	Moisture Content (%)	Unc. Comp. Strength (ksf)	Pocket Pen. (ksf)	Torvane (ksf)	Remarks and Other Lab Tests
LEAN CLAY with Sand (CL), very stiff, light brown, moist, fine sand.	20				13 12 17	103	22		8.0		
		15									
SILTY, CLAYEY SAND (SC-SM), medium dense, light brown, moist, coarse sand to fine sand.	25				4 4 5						
		10									
SAND with Silt (SP-SM), very dense, brown, moist, coarse sand to fine sand.	30				27 24 31						
		5									
	35										
LEAN CLAY (CL), hard, light brown, moist, trace sand.											
		0									

Boring Terminated At 76.5 ft BGS

LOG OF BORING B-8

CDCR Karl Holton State Youth Facility Investigation
7650 Newcastle Road, Stockton, California

FUGRO
502 Giuseppe Court, Suite 11, Roseville, CA 95678
Telephone: (916) 773-2600 Fax: (916) 782-4846

Project No. 1832.001

Plate A-8

Surface Elevation: 38.2 ft MSL	**Date Drilled:** 04/23/07
Drilling Method: CME 75 w/ 8-in HSA	**Logged By:** Gopalan Vishnan
Drilling Contractor: Spectrum Drilling	**Checked By:** Micheal Hughes
Hammer: 140 lb. auto-hammer 30-in drop	**Depth to Groundwater:** 66.3 ft BGS

Material Description and Classification	Depth (feet)	Elevation	Soil Type	Sample Type	Field Blows	Dry Density (pcf)	Moisture Content (%)	Unc. Comp. Strength (ksf)	Pocket Pen. (ksf)	Torvane (ksf)	Remarks and Other Lab Tests
	40				14 17 16				9.0		
		-5									
	45										
		-10									
SAND (SP), dense, light brown, moist, medium sand to fine sand.	50				18 24						
LEAN CLAY (CL), hard, gray, moist, trace sand.					32				8.0		
		-15									
	55										
		-20									

Boring Terminated At 76.5 ft BGS

LOG OF BORING B-8

CDCR Karl Holton State Youth Facility Investigation

7650 Newcastle Road, Stockton, California

FUGRO

502 Giuseppe Court, Suite 11, Roseville, CA 95678
Telephone: (916) 773-2600 Fax: (916) 782-4846

Project No. 1832.001

Plate A-8

Surface Elevation: 38.2 ft MSL	**Date Drilled:** 04/23/07
Drilling Method: CME 75 w/ 8-in HSA	**Logged By:** Gopalan Vishnan
Drilling Contractor: Spectrum Drilling	**Checked By:** Micheal Hughes
Hammer: 140 lb. auto-hammer 30-in drop	**Depth to Groundwater:** 66.3 ft BGS

Material Description and Classification	Depth (feet)	Elevation	Soil Type	Sample Type	Field Blows	Dry Density (pcf)	Moisture Content (%)	Unc. Comp. Strength (ksf)	Pocket Pen. (ksf)	Torvane (ksf)	Remarks and Other Lab Tests
Few sand.	60				13 24 25				9.0		
		-25									
	65										
SAND (SP), very dense, light brown, wet, coarse sand to fine sand.		-30									
	70				22 48 50/4"						
		-35									
	75				14 22 26						
		-40									

Boring Terminated At 76.5 ft BGS

LOG OF BORING B-8

CDCR Karl Holton State Youth Facility Investigation
7650 Newcastle Road, Stockton, California

FUGRO
502 Giuseppe Court, Suite 11, Roseville, CA 95678
Telephone: (916) 773-2600 Fax: (916) 782-4846

Project No. 1832.001

Plate A-8

Surface Elevation: 39.4 ft MSL	**Date Drilled:** 04/23/07
Drilling Method: CME 75 w/ 8-in HSA	**Logged By:** Gopalan Vishnan
Drilling Contractor: Spectrum Drilling	**Checked By:** Micheal Hughes
Hammer: 140 lb. auto-hammer 30-in drop	**Depth to Groundwater:** Not Encountered

Material Description and Classification	Depth (feet)	Elevation	Soil Type	Sample Type	Field Blows	Dry Density (pcf)	Moisture Content (%)	Unc. Comp. Strength (ksf)	Pocket Pen. (ksf)	Torvane (ksf)	Remarks and Other Lab Tests
SANDY LEAN CLAY (CL), very stiff, dark gray, moist.	0										
					8						
					11						
With Sand.					13	103	11		8.0		
					17						
					11						
					16	105	17				
		35									
Hard.	5				8						
					19						
					34	95	15		9.0		
					11						
					21						
					33				9.0		
		30									
SANDY LEAN CLAY (CL), hard, light brown, moist, coarse sand to fine sand.	10				9						
					14						
					20	96	24		7.5		
		25									
Very stiff, trace sand.	15				4						
					5						
					9						
		20									

Boring Terminated At 26.5 ft BGS

LOG OF BORING B-9

CDCR Karl Holton State Youth Facility Investigation

7650 Newcastle Road, Stockton, California

FUGRO
502 Giuseppe Court, Suite 11, Roseville, CA 95678
Telephone: (916) 773-2600 Fax: (916) 782-4846

Project No. 1832.001

Plate A-9

Surface Elevation: 39.4 ft MSL	Date Drilled: 04/23/07
Drilling Method: CME 75 w/ 8-in HSA	Logged By: Gopalan Vishnan
Drilling Contractor: Spectrum Drilling	Checked By: Micheal Hughes
Hammer: 140 lb. auto-hammer 30-in drop	Depth to Groundwater: Not Encountered

Material Description and Classification	Depth (feet)	Elevation	Soil Type	Sample Type	Field Blows	Dry Density (pcf)	Moisture Content (%)	Unc. Comp. Strength (ksf)	Pocket Pen. (ksf)	Torvane (ksf)	Remarks and Other Lab Tests
SILTY SAND (SM), dense, brown and dark gray, moist, medium sand to fine sand.	20				9 14 26						
SANDY LEAN CLAY (CL), very stiff, light brown, moist, fine sand.	25	15			8 10 12				7.0		
	30	10									
	35	5									
		0									

Boring Terminated At 26.5 ft BGS

LOG OF BORING B-9

CDCR Karl Holton State Youth Facility Investigation
7650 Newcastle Road, Stockton, California

FUGRO
502 Giuseppe Court, Suite 11, Roseville, CA 95678
Telephone: (916) 773-2600 Fax: (916) 782-4846

Project No. 1832.001

Plate A-9

Surface Elevation: 37.1 ft MSL	Date Drilled: 04/26/07
Drilling Method: CME 75 w/ 8-in HSA	Logged By: Gopalan Vishnan
Drilling Contractor: Spectrum Drilling	Checked By: Micheal Hughes
Hammer: 140 lb. auto-hammer 30-in drop	Depth to Groundwater: Not Encountered

Material Description and Classification	Depth (feet)	Elevation	Field Blows	Dry Density (pcf)	Moisture Content (%)	Unc. Comp. Strength (ksf)	Pocket Pen. (ksf)	Torvane (ksf)	Remarks and Other Lab Tests
SILTY SAND (SM), loose, dark gray, moist, coarse sand to fine sand.	0								
FAT CLAY (CH), hard, dark brown, moist.			11						
			14						
SILTY SAND (SM), very dense, brown, moist, coarse sand to fine sand.		35	18	99	10		9.0		
			15						
			27						
			27	105	9				
CLAYEY SAND with Gravel (SC), dense, brown, moist, coarse sand to fine sand, angular.	5		18						
			11						
SANDY LEAN CLAY (CL), hard, brown, moist, fine sand.			16	105	13	2.3			
		30							
			18						
			18						
			24	94	16		9.0		
LEAN CLAY with Sand (CL), hard, brown, moist, fine sand.	10		13						
			21						
			50/4"	107	10	2.4	9.0		
		25							
SILTY SAND (SM), medium dense, brown, moist, medium sand to fine sand, trace gravel.	15		3						
			3						
			5						
		20							

Boring Terminated At 26.5 ft BGS

LOG OF BORING B-10

CDCR Karl Holton State Youth Facility Investigation

7650 Newcastle Road, Stockton, California

FUGRO

502 Giuseppe Court, Suite 11, Roseville, CA 95678
Telephone: (916) 773-2600 Fax: (916) 782-4846

Project No. 1832.001

Plate A-10

Surface Elevation: 37.1 ft MSL	**Date Drilled:** 04/26/07
Drilling Method: CME 75 w/ 8-in HSA	**Logged By:** Gopalan Vishnan
Drilling Contractor: Spectrum Drilling	**Checked By:** Micheal Hughes
Hammer: 140 lb. auto-hammer 30-in drop	**Depth to Groundwater:** Not Encountered

Material Description and Classification	Depth (feet)	Elevation	Soil Type	Sample Type	Field Blows	Dry Density (pcf)	Moisture Content (%)	Unc. Comp. Strength (ksf)	Pocket Pen. (ksf)	Torvane (ksf)	Remarks and Other Lab Tests
	20				6 8 14						
		15									
SANDY LEAN CLAY (CL), hard, brown, moist, medium sand to fine sand.	25				12 13 16						
		10									
	30										
		5									
	35										
		0									

Boring Terminated At 26.5 ft BGS

LOG OF BORING B-10

CDCR Karl Holton State Youth Facility Investigation
7650 Newcastle Road, Stockton, California

FUGRO
502 Giuseppe Court, Suite 11, Roseville, CA 95678
Telephone: (916) 773-2600 Fax: (916) 782-4846

Project No. 1832.001

Plate A-10

LOG OF BORING 1832.001.GPJ ESPANA GEOTECH.GDT 9/19/07

Surface Elevation: 38.8 ft MSL	**Date Drilled:** 04/26/07
Drilling Method: CME 75 w/ 8-in HSA	**Logged By:** Gopalan Vishnan
Drilling Contractor: Spectrum Drilling	**Checked By:** Micheal Hughes
Hammer: 140 lb. auto-hammer 30-in drop	**Depth to Groundwater:** Not Encountered

Material Description and Classification	Depth (feet)	Elevation	Soil Type	Sample Type	Field Blows	Dry Density (pcf)	Moisture Content (%)	Unc. Comp. Strength (ksf)	Pocket Pen. (ksf)	Torvane (ksf)	Remarks and Other Lab Tests
SILTY SAND (SM), loose, dark gray, moist, medium sand to fine sand.	0										
FAT CLAY (CH), hard, dark gray, moist.					7 17 13 20	 108	 17		 9.0		
SILTY SAND (SM), very dense, brown, moist, fine sand.		35			28 50/3"	 111	 16				
	5				26 28 40	 86	 24				
SANDY LEAN CLAY (CL), hard, brown, moist, fine sand.		30			12 21 37	 107	 16		 8.0		
SAND with Silt (SP-SM), dense, brown, moist, coarse sand to fine sand.	10				14 25 20						
LEAN CLAY (CL), hard, brown, moist.		25									
	15				6 9 16						
SILTY SAND (SM), dense, brown, moist, medium sand to fine sand.		20									

Boring Terminated At 26.5 ft BGS

LOG OF BORING B-11

CDCR Karl Holton State Youth Facility Investigation

7650 Newcastle Road, Stockton, California

FUGRO
502 Giuseppe Court, Suite 11, Roseville, CA 95678
Telephone: (916) 773-2600 Fax: (916) 782-4846

Project No. 1832.001

Plate A-11

Surface Elevation: 38.8 ft MSL	**Date Drilled:** 04/26/07
Drilling Method: CME 75 w/ 8-in HSA	**Logged By:** Gopalan Vishnan
Drilling Contractor: Spectrum Drilling	**Checked By:** Micheal Hughes
Hammer: 140 lb. auto-hammer 30-in drop	**Depth to Groundwater:** Not Encountered

Material Description and Classification	Depth (feet)	Elevation	Soil Type	Sample Type	Field Blows	Dry Density (pcf)	Moisture Content (%)	Unc. Comp. Strength (ksf)	Pocket Pen. (ksf)	Torvane (ksf)	Remarks and Other Lab Tests
SANDY SILT (ML), very stiff, green-brown, moist, fine sand.	20				5 6 10						
		15									
	25				6 9 15				8.0		
		10									
	30										
		5									
	35										
		0									

Boring Terminated At 26.5 ft BGS

LOG OF BORING B-11

CDCR Karl Holton State Youth Facility Investigation

7650 Newcastle Road, Stockton, California

FUGRO

502 Giuseppe Court, Suite 11, Roseville, CA 95678
Telephone: (916) 773-2600 Fax: (916) 782-4846

Project No. 1832.001

Plate A-11

Surface Elevation: 39.1 ft MSL	**Date Drilled:** 04/26/07
Drilling Method: CME 75 w/ 8-in HSA	**Logged By:** Gopalan Vishnan
Drilling Contractor: Spectrum Drilling	**Checked By:** Micheal Hughes
Hammer: 140 lb. auto-hammer 30-in drop	**Depth to Groundwater:** Not Encountered

Material Description and Classification	Depth (feet)	Elevation	Soil Type	Sample Type	Field Blows	Dry Density (pcf)	Moisture Content (%)	Unc. Comp. Strength (ksf)	Pocket Pen. (ksf)	Torvane (ksf)	Remarks and Other Lab Tests
SILTY SAND with Gravel (SM), loose, dark gray, moist, coarse sand to fine sand, rounded to angular.	0										
FAT CLAY (CH), hard, dark gray, moist.					12						
					14	111	15				
					19				9.0		
					16						
LEAN CLAY with Sand (CL), hard, brown, moist, fine sand.					32						
					50/3"	105	19		9.0		
		35									
SANDY SILT (ML), hard, light brown, moist, fine sand.	5				12						
					36						
					50/4"	112	15	2.1	9.0		
SANDY LEAN CLAY (CL), hard, brown, moist, coarse sand to fine sand.											
					24				9.0		
					50/3"	98	18	1.6			
		30									
	10				10						
					23						
					30	104	18				
		25									
SANDY LEAN CLAY (CL), hard, brown, moist, fine sand.	15				8						
					11						
					14				7.0		
		20									

Boring Terminated At 26.5 ft BGS

LOG OF BORING B-12

CDCR Karl Holton State Youth Facility Investigation

7650 Newcastle Road, Stockton, California

FUGRO

502 Giuseppe Court, Suite 11, Roseville, CA 95678
Telephone: (916) 773-2600 Fax: (916) 782-4846

Project No. 1832.001

Plate A-12

Surface Elevation: 39.1 ft MSL	**Date Drilled:** 04/26/07
Drilling Method: CME 75 w/ 8-in HSA	**Logged By:** Gopalan Vishnan
Drilling Contractor: Spectrum Drilling	**Checked By:** Micheal Hughes
Hammer: 140 lb. auto-hammer 30-in drop	**Depth to Groundwater:** Not Encountered

Material Description and Classification	Depth (feet)	Elevation	Soil Type	Sample Type	Field Blows	Dry Density (pcf)	Moisture Content (%)	Unc. Comp. Strength (ksf)	Pocket Pen. (ksf)	Torvane (ksf)	Remarks and Other Lab Tests
SILTY SAND (SM), dense, brown, moist, medium sand to fine sand.	20				9 10 12						
		15									
Very dense.	25				16 24 24						
		10									
	30										
		5									
	35										
		0									

Boring Terminated At 26.5 ft BGS

LOG OF BORING B-12

CDCR Karl Holton State Youth Facility Investigation

7650 Newcastle Road, Stockton, California

FUGRO
502 Giuseppe Court, Suite 11, Roseville, CA 95678
Telephone: (916) 773-2600 Fax: (916) 782-4846

Project No. 1832.001

Plate A-12

Surface Elevation: 39.4 ft MSL	Date Drilled: 04/27/07
Drilling Method: CME 75 w/ 8-in HSA	Logged By: Gopalan Vishnan
Drilling Contractor: Spectrum Drilling	Checked By: Micheal Hughes
Hammer: 140 lb. auto-hammer 30-in drop	Depth to Groundwater: Not Encountered

Material Description and Classification	Depth (feet)	Elevation	Soil Type	Sample Type	Field Blows	Dry Density (pcf)	Moisture Content (%)	Unc. Comp. Strength (ksf)	Pocket Pen. (ksf)	Torvane (ksf)	Remarks and Other Lab Tests
ASPHALTIC CONCRETE (AC) 3-inch.	0										
SILTY CLAY (CL-ML), stiff, brown, moist.					7						
					5						
LEAN CLAY with Sand (CL), very stiff, dark gray, moist, fine sand.					7				6.0		
					3						
					6						
					11	98	23				
		35									
LEAN CLAY (CL), hard, brown, moist.	5				16						
					38						
					50/3"	105	19				
		30									
	10										
		25									
	15										
		20									

Boring Terminated At 6.3 ft BGS

LOG OF BORING B-13

CDCR Karl Holton State Youth Facility Investigation
7650 Newcastle Road, Stockton, California

FUGRO

502 Giuseppe Court, Suite 11, Roseville, CA 95678
Telephone: (916) 773-2600 Fax: (916) 782-4846

Project No. 1832.001

Plate A-13

Surface Elevation: 39.7 ft MSL	**Date Drilled:** 04/27/07
Drilling Method: CME 75 w/ 8-in HSA	**Logged By:** Gopalan Vishnan
Drilling Contractor: Spectrum Drilling	**Checked By:** Micheal Hughes
Hammer: 140 lb. auto-hammer 30-in drop	**Depth to Groundwater:** Not Encountered

Material Description and Classification	Depth (feet)	Elevation	Soil Type	Sample Type	Field Blows	Dry Density (pcf)	Moisture Content (%)	Unc. Comp. Strength (ksf)	Pocket Pen. (ksf)	Torvane (ksf)	Remarks and Other Lab Tests
ASPHALTIC CONCRETE (AC), 3-inch.	0										
LEAN CLAY (CL), stiff, dark gray, moist.					10						
					4						
					5				3.5		
					4						
					6						
					4				4.0		
		35									
	5										
		30									
	10										
		25									
	15										
		20									

Boring Terminated At 5.0 ft BGS

LOG OF BORING B-14

CDCR Karl Holton State Youth Facility Investigation

7650 Newcastle Road, Stockton, California

FUGRO

502 Giuseppe Court, Suite 11, Roseville, CA 95678
Telephone: (916) 773-2600 Fax: (916) 782-4846

Project No. 1832.001

Plate A-14

UNIFIED SOIL CLASSIFICATION SYSTEM

Major Divisions		grf	ltr	Description
Coarse Grained Soils	Gravel And Gravelly Soils		GW	Well-graded gravels or gravel sand mixtures, little or no fines
			GP	Poorly-graded gravels or gravel sand mixture, little or no fines
			GM	Silty gravels, gravel-sand-silt mixtures
			GC	Clayey gravels, gravel-sand-clay mixtures
	Sand And Sandy Soils		SW	Well-graded sands or gravelly sands, little or no fines
			SP	Poorly-graded sands or gravelly sands, little or no fines
			SM	Silty sands, sand-silt mixtures
			SC	Clayey sands, and-clay mixtures

Major Divisions		grf	ltr	Description
Fine Grained Soils	Silts And Clays LL < 50		ML	Inorganic silts and very fine sands, rock flour, silty or clayey fine sands or clayey silts with slight plasticity
			CL	Inorganic clays of low to medium plasticity, gravelly clays, sandy clays, silty clays, lean clays
			OL	Organic silts or clays of low plasticity
	Silts And Clays LL > 50		MH	Inorganic silts, micaceous or diatomaceous fine or silty soils, elastic silts
			CH	Inorganic clays of high plasticity, fat clays
			OH	Organic silts or clays of medium to high plasticity
Highly Organic Soils			PT	Peat and other highly organic soils

GRAIN SIZES

U.S. STANDARD SERIES SIEVE — CLEAR SQUARE SIEVE OPENINGS

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

Silts and Clays	Sand			Gravel		Cobbles	Boulders
	Fine	Medium	Coarse	Fine	Coarse		

RELATIVE DENSITY

Sands and Gravels	Blows/Foot*
Very Loose	0 - 4
Loose	5 - 10
Medium Dense	11 - 30
Dense	31 - 50
Very Dense	Over 50

CONSISTENCY

Silts and Clays	Blows/Foot*	Strength (Ksf)**
Very Soft	0 - 1	0 - 1/2
Soft	2 - 4	1/2 - 1
Firm	5 - 8	1 - 2
Stiff	9 - 15	2 - 4
Very Stiff	16 - 30	4 - 8
Hard	Over 31	Over 8

*Number of Blows for a 140-pound safety hammer falling 30 inches, driving a 2-inch O.D. (1-3/8" I.D.) split spoon sampler.

**Unconfined compressive strength.

SYMBOLS

- Standard Penetration sample (1-3/8" ID)
- Modified California sample (2.5" ID)
- California sample (2" ID)
- Shelby Tube sample
- Acetate Sleeve (1-1/2" ID)
- Bulk Sample from Cuttings
- Groundwater Level During Drilling
- Stabilized Groundwater Level

Notes

bgs Below Ground Surface
bbd Below Barge Deck
MDD Maximum Dry Density
OMC Optimum Moisture Content
c cohesion
psf pounds per square foot
pcf pounds per cubic foot
LL Liquid Limit
PI Plasticity Index
-200 Passing the #200 Sieve
CGI Combustible Gas Indicator
VOC Volatile Organic Compound
CO Carbon Monoxide
LEL Lower Explosive Limit
H_2S Hydrogen Sulfide
ppm parts per million
TV Torvane Shear Test
PP Pocket Penetrometer
AC Asphalt Concrete
AB Aggregate Base
PCC Portland Cement Concrete

Increasing Visual Moisture Designation

Dry
Moist
Wet

BORING LEGEND

CDCR Karl Holton State Youth Facility Investigation

7650 Newcastle Road, Stockton, California

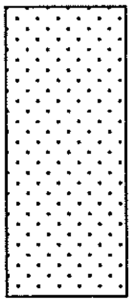
FUGRO
502 Giuseppe Court, Suite 11, Roseville, CA 95678
Telephone: (916) 773-2600 Fax: (916) 782-4846

Project No. 1832.001

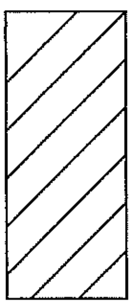
Plate A-15

CPT LOGS

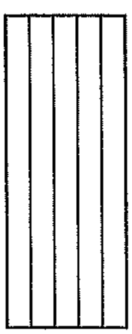
KEY TO SOIL BEHAVIOR TYPE



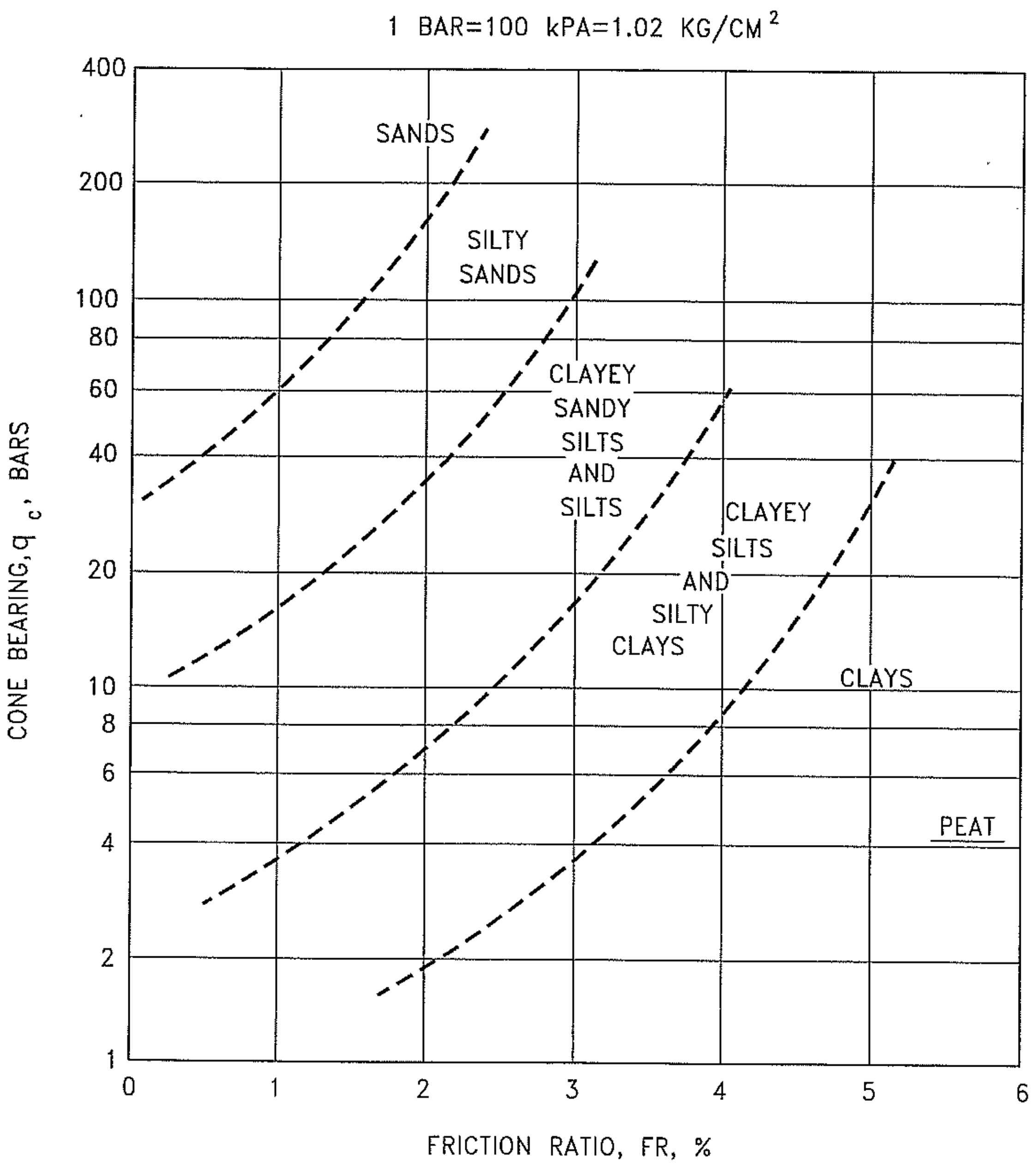
SAND AND SANDY SOIL



CLAY AND CLAYEY SOIL

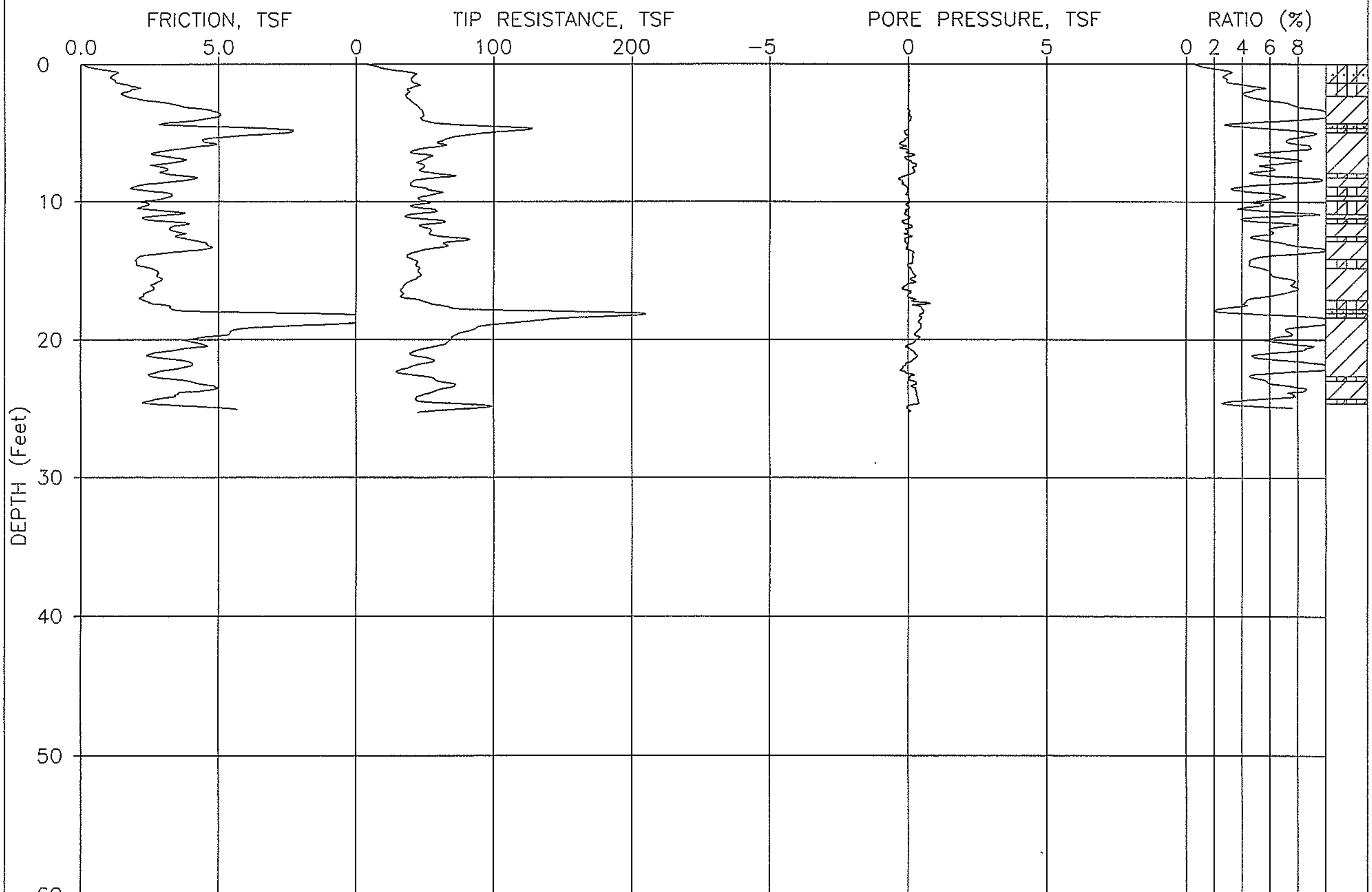


SILT AND SILTY SOIL



MODIFIED CAMPANELLA AND ROBERTSON SOIL BEHAVIOR CHART (1983)

CPT LOGS



JOB NUMBER: 0907-0024

ELEVATION: 0.00

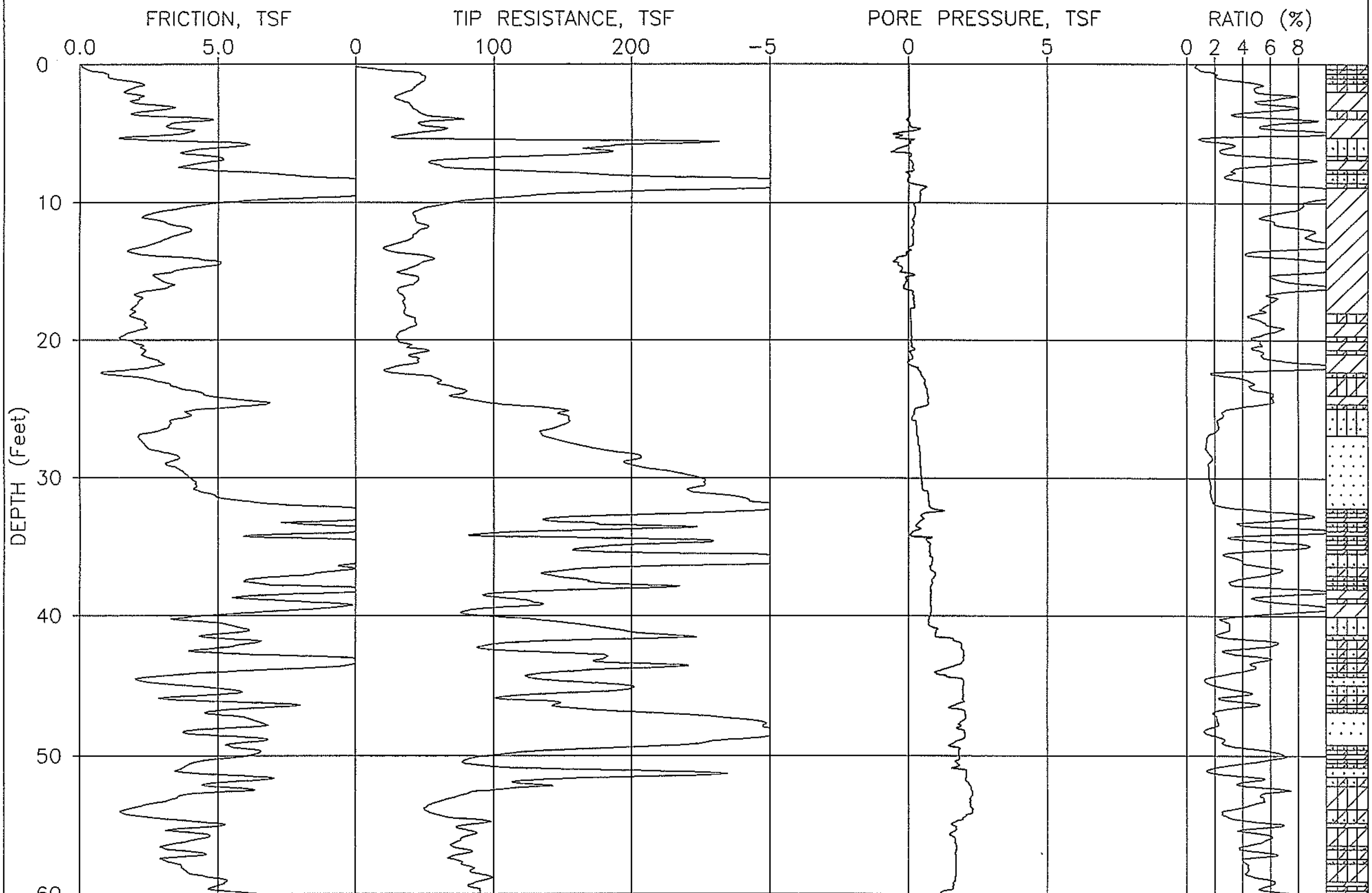
CPT NUMBER: PC1

CONE NUMBER: F7.5CKEW1300

DATE: 04-24-2007

PLATE: 1 OF 1

FUGRO GEOSCIENCES,INC



JOB NUMBER: 0907-0024

ELEVATION: 0.00

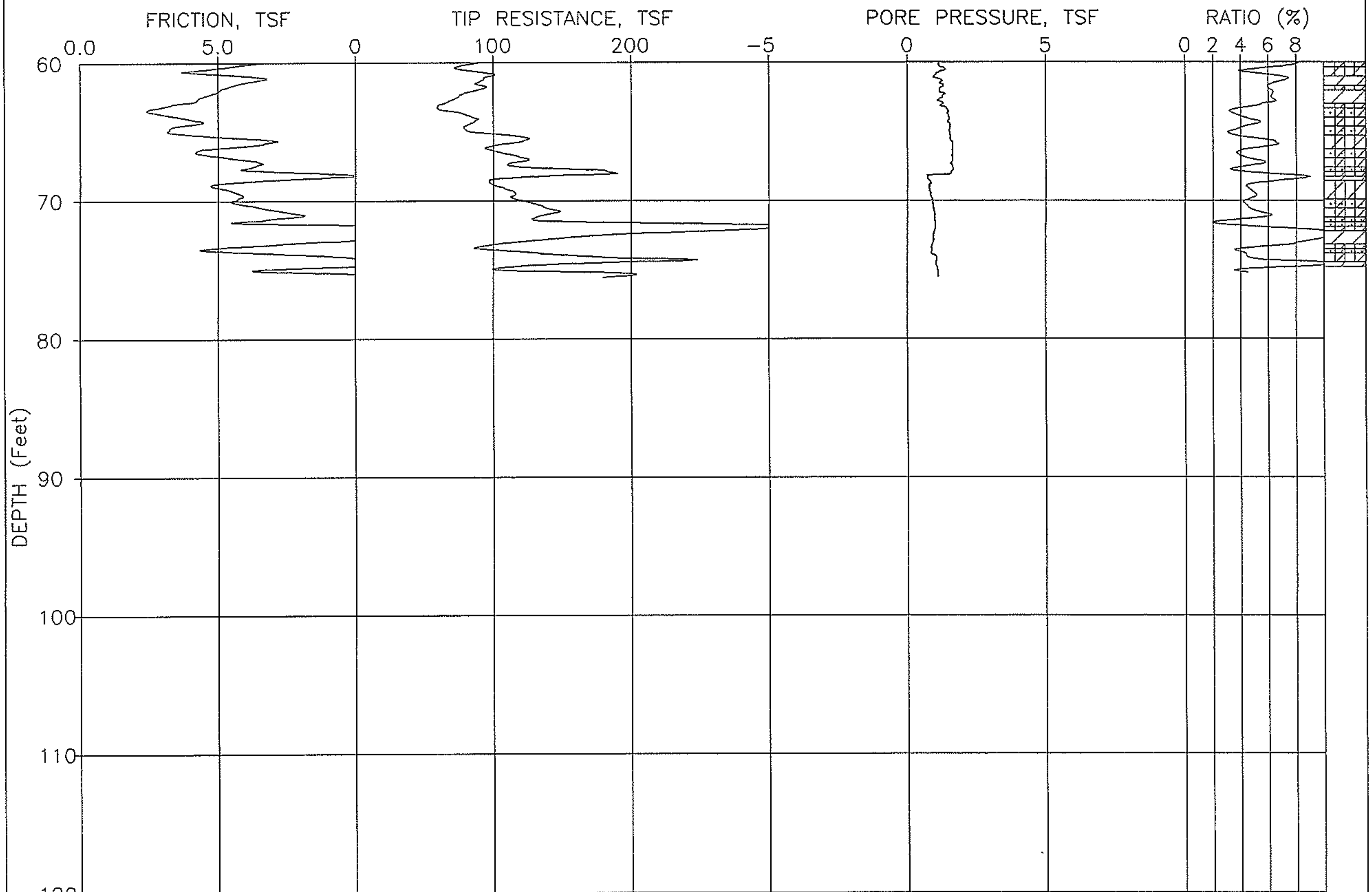
CPT NUMBER: PC2

CONE NUMBER: F7.5CKEW1300

DATE: 04-24-2007

PLATE: 1 OF 2

FUGRO GEOSCIENCES,INC



JOB NUMBER: 0907-0024

ELEVATION: 0.00

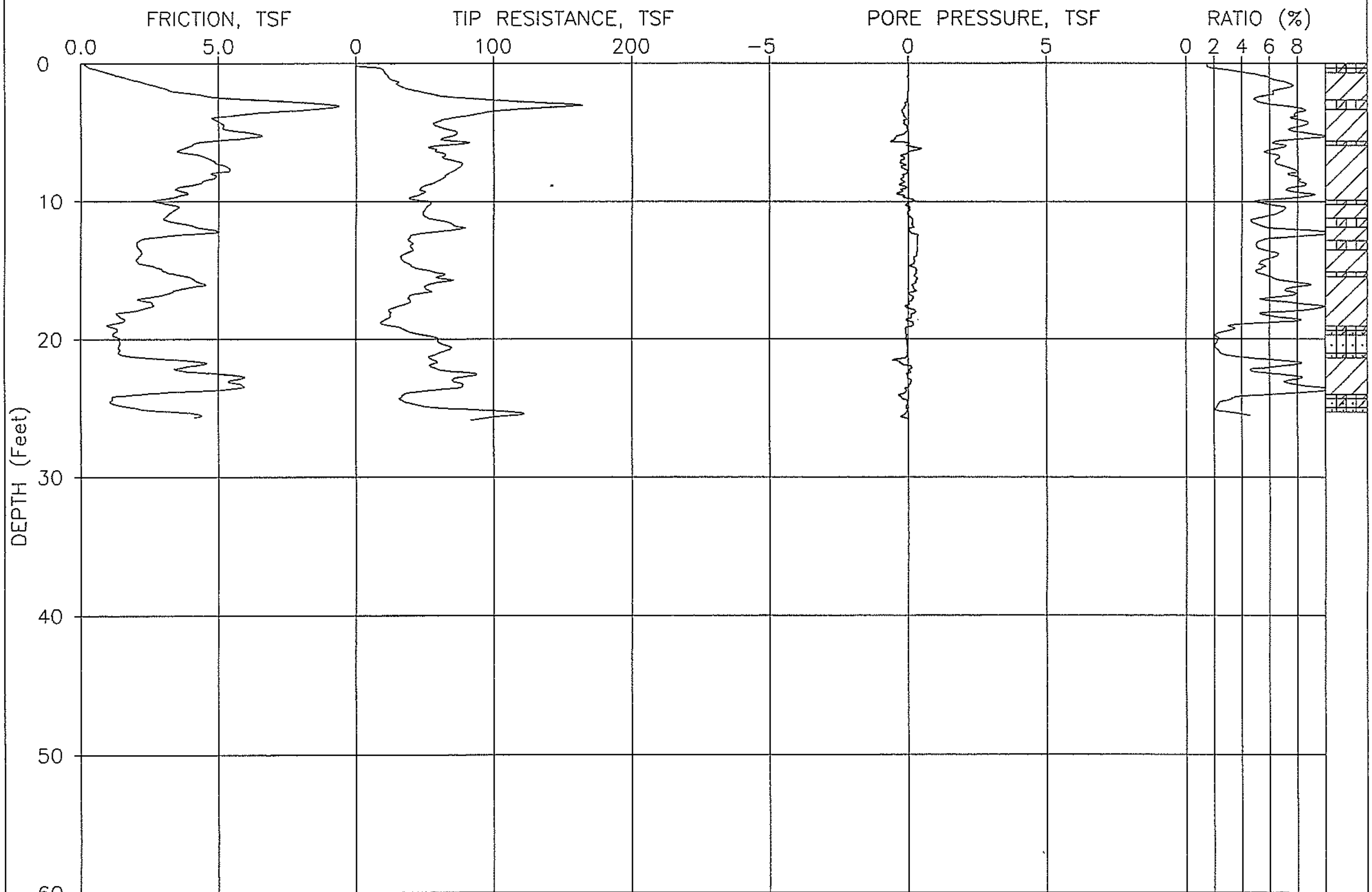
CPT NUMBER: PC2

CONE NUMBER: F7.5CKEW1300

DATE: 04-24-2007

PLATE: 2 OF 2

FUGRO GEOSCIENCES,INC



JOB NUMBER: 0907-0024

ELEVATION: 0.00

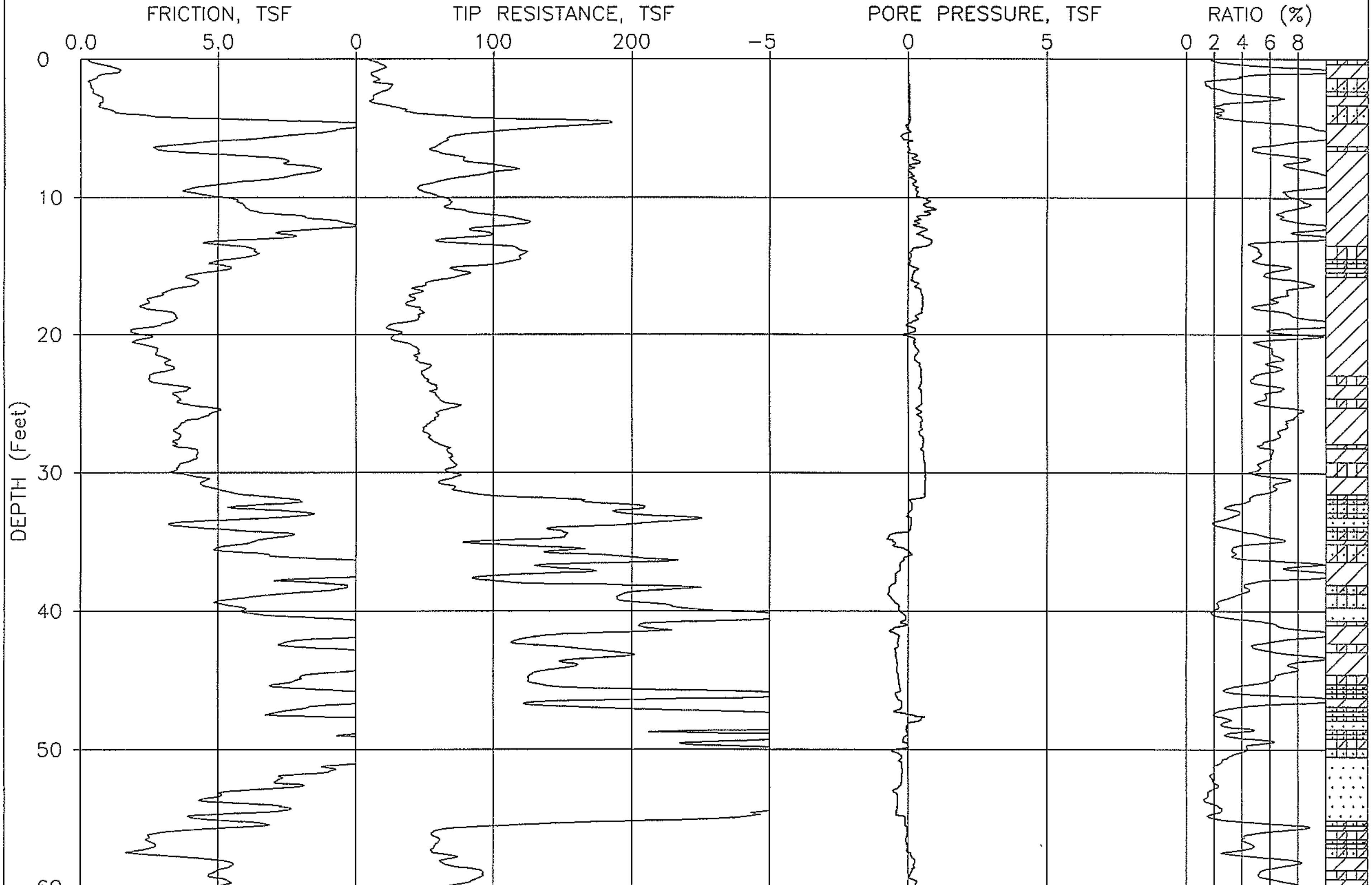
CPT NUMBER: PC3

CONE NUMBER: F7.5CKEW1300

DATE: 04-24-2007

PLATE: 1 OF 1

FUGRO GEOSCIENCES,INC



JOB NUMBER: 0907-0024

ELEVATION: 0.00

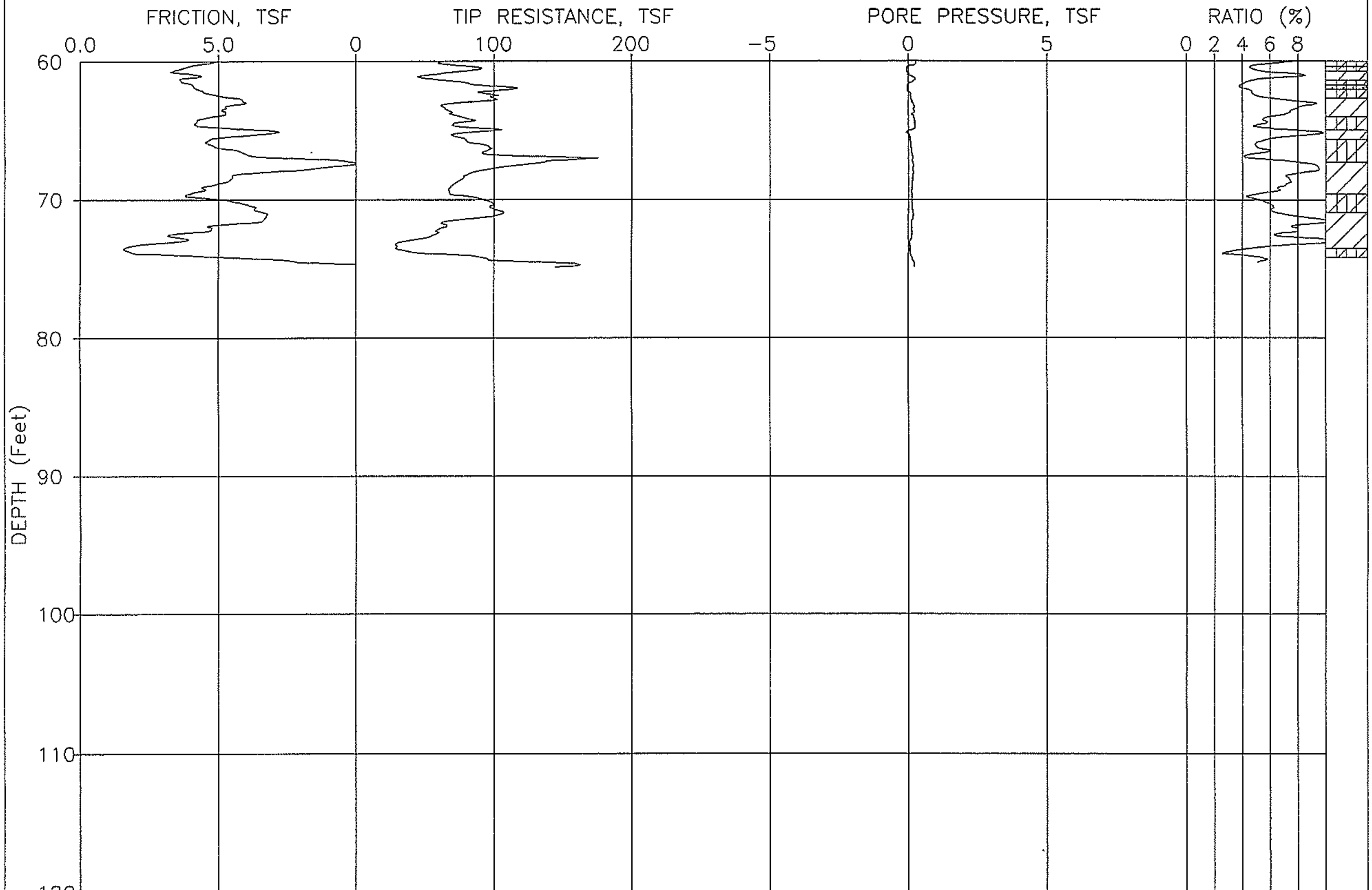
CPT NUMBER: SC1

CONE NUMBER: F7.5CKESW1645

DATE: 04-24-2007

PLATE: 1 OF 2

FUGRO GEOSCIENCES,INC



JOB NUMBER: 0907-0024

ELEVATION: 0.00

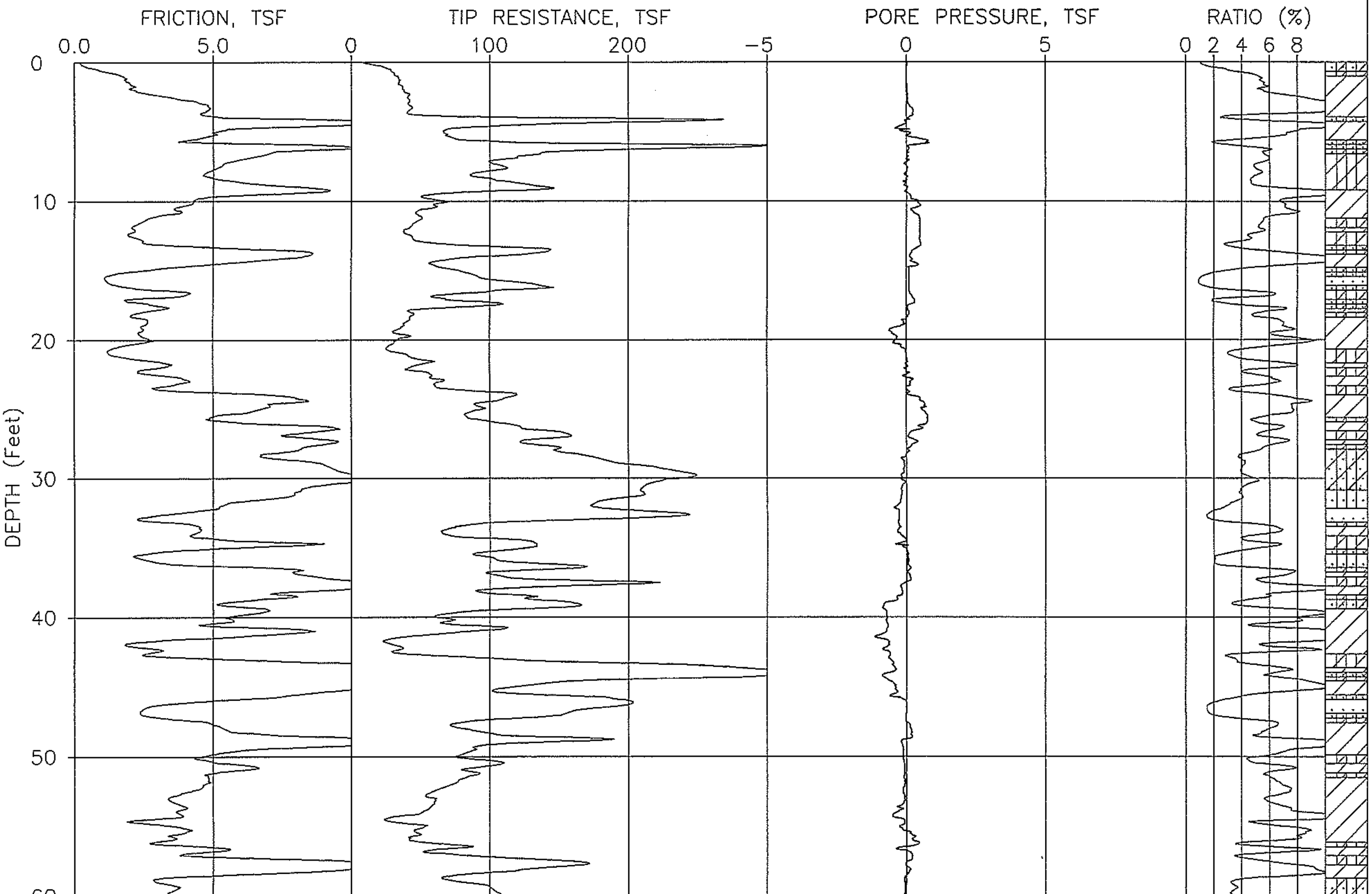
CPT NUMBER: SC1

CONE NUMBER: F7.5CKESW1645

DATE: 04-24-2007

PLATE: 2 OF 2

FUGRO GEOSCIENCES,INC



JOB NUMBER: 0907-0024

ELEVATION: 0.00

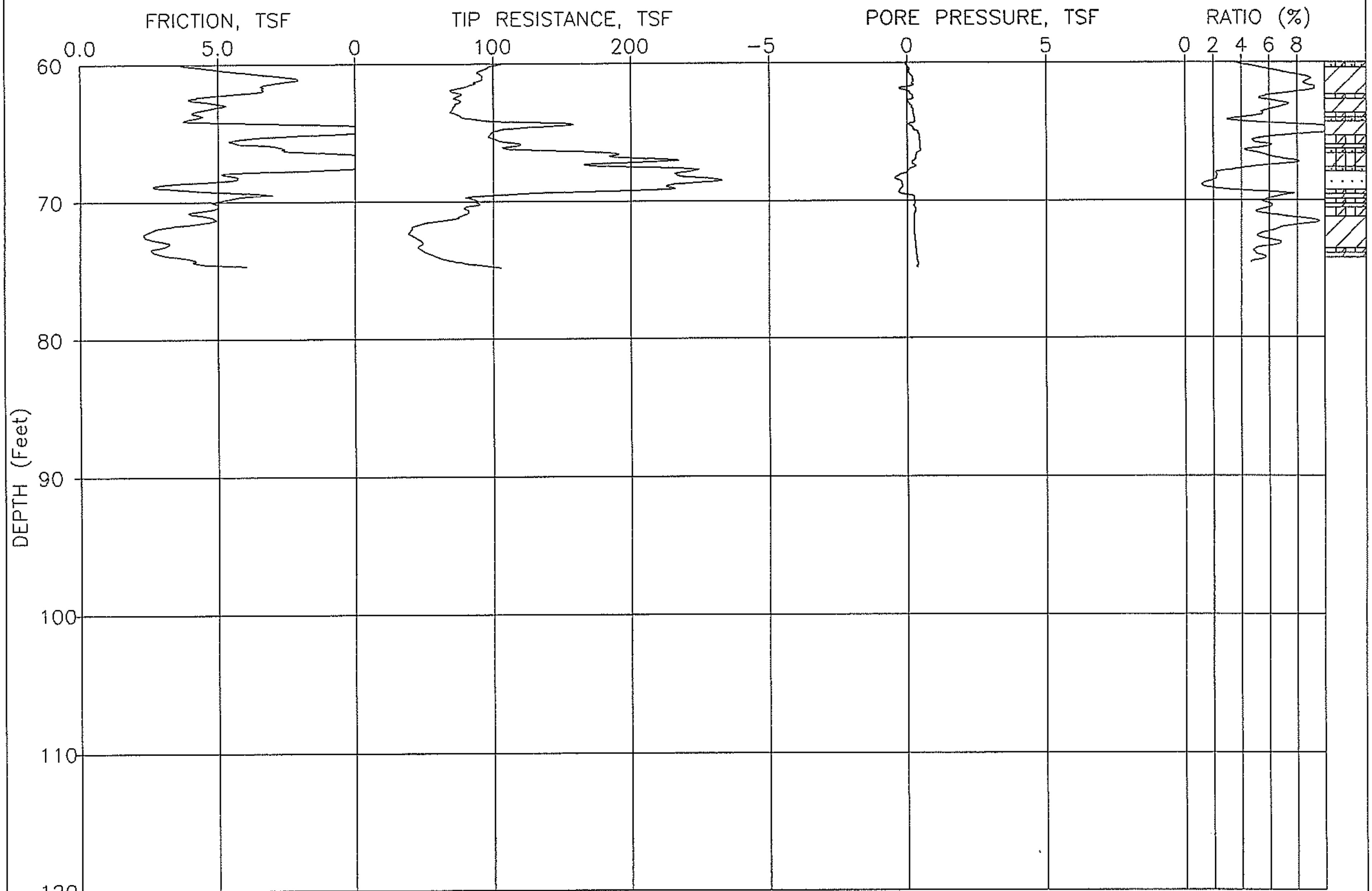
CPT NUMBER: SC2

CONE NUMBER: F7.5CKESW1645

DATE: 04-24-2007

PLATE: 1 OF 2

FUGRO GEOSCIENCES,INC



JOB NUMBER: 0907-0024

ELEVATION: 0.00

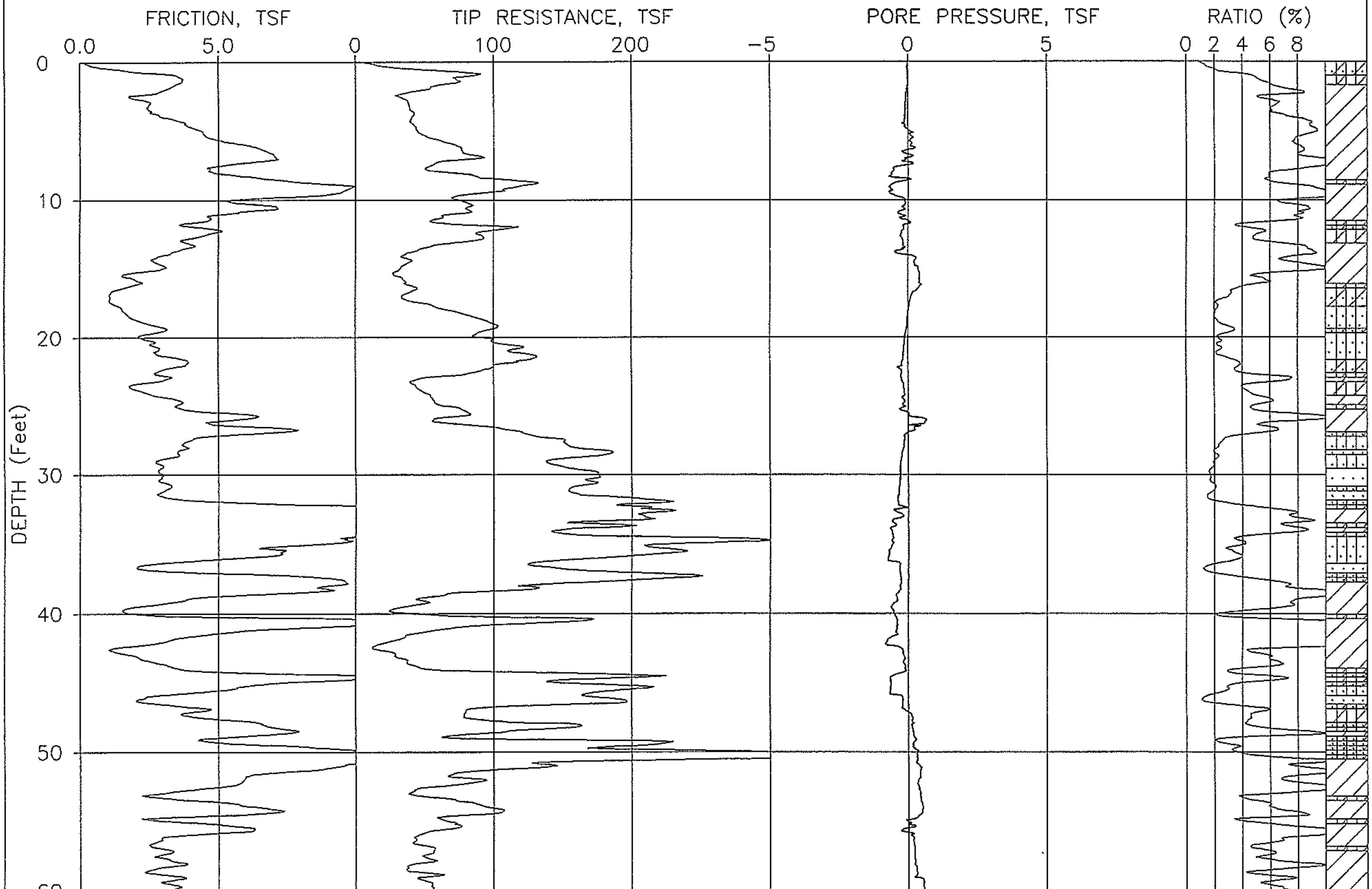
CPT NUMBER: SC2

CONE NUMBER: F7.5CKESW1645

DATE: 04-24-2007

PLATE: 2 OF 2

FUGRO GEOSCIENCES,INC



JOB NUMBER: 0907-0024

ELEVATION: 0.00

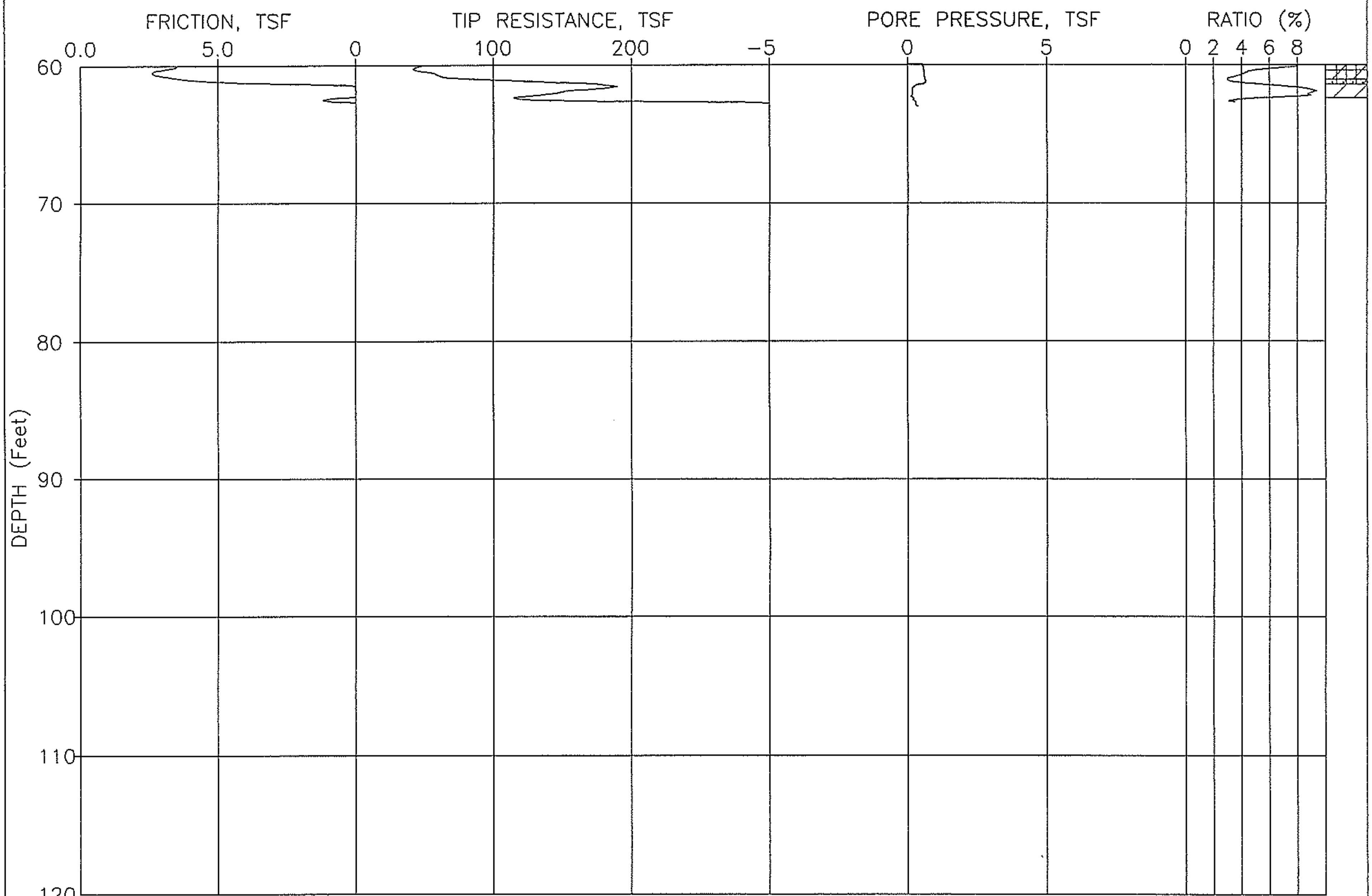
CPT NUMBER: SC3

CONE NUMBER: F7.5CKESW1645

DATE: 04-25-2007

PLATE: 1 OF 2

FUGRO GEOSCIENCES,INC



JOB NUMBER: 0907-0024

ELEVATION: 0.00

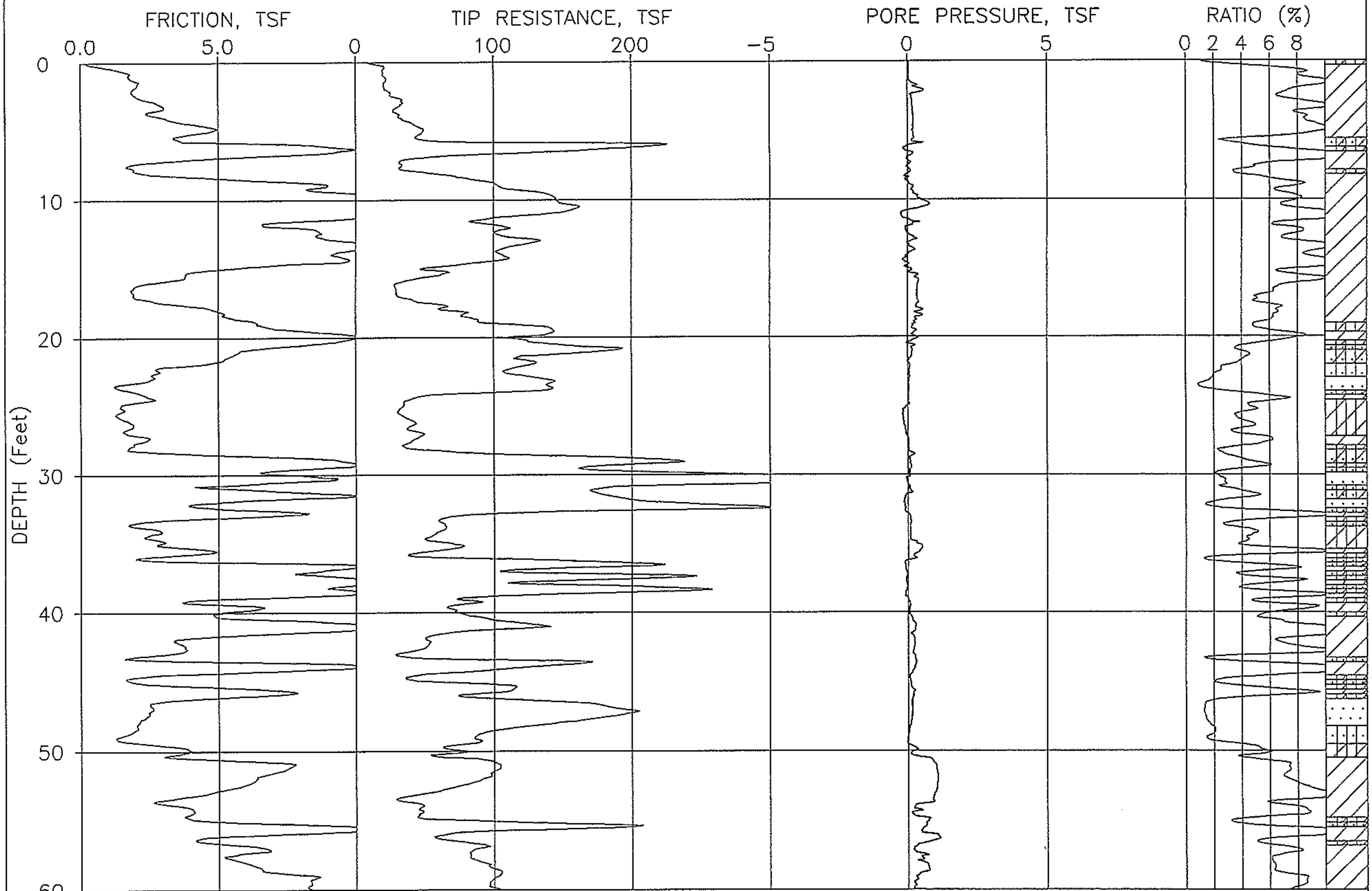
CPT NUMBER: SC3

CONE NUMBER: F7.5CKESW1645

DATE: 04-25-2007

PLATE: 2 OF 2

FUGRO GEOSCIENCES,INC



JOB NUMBER: 0907-0024

ELEVATION: 0.00

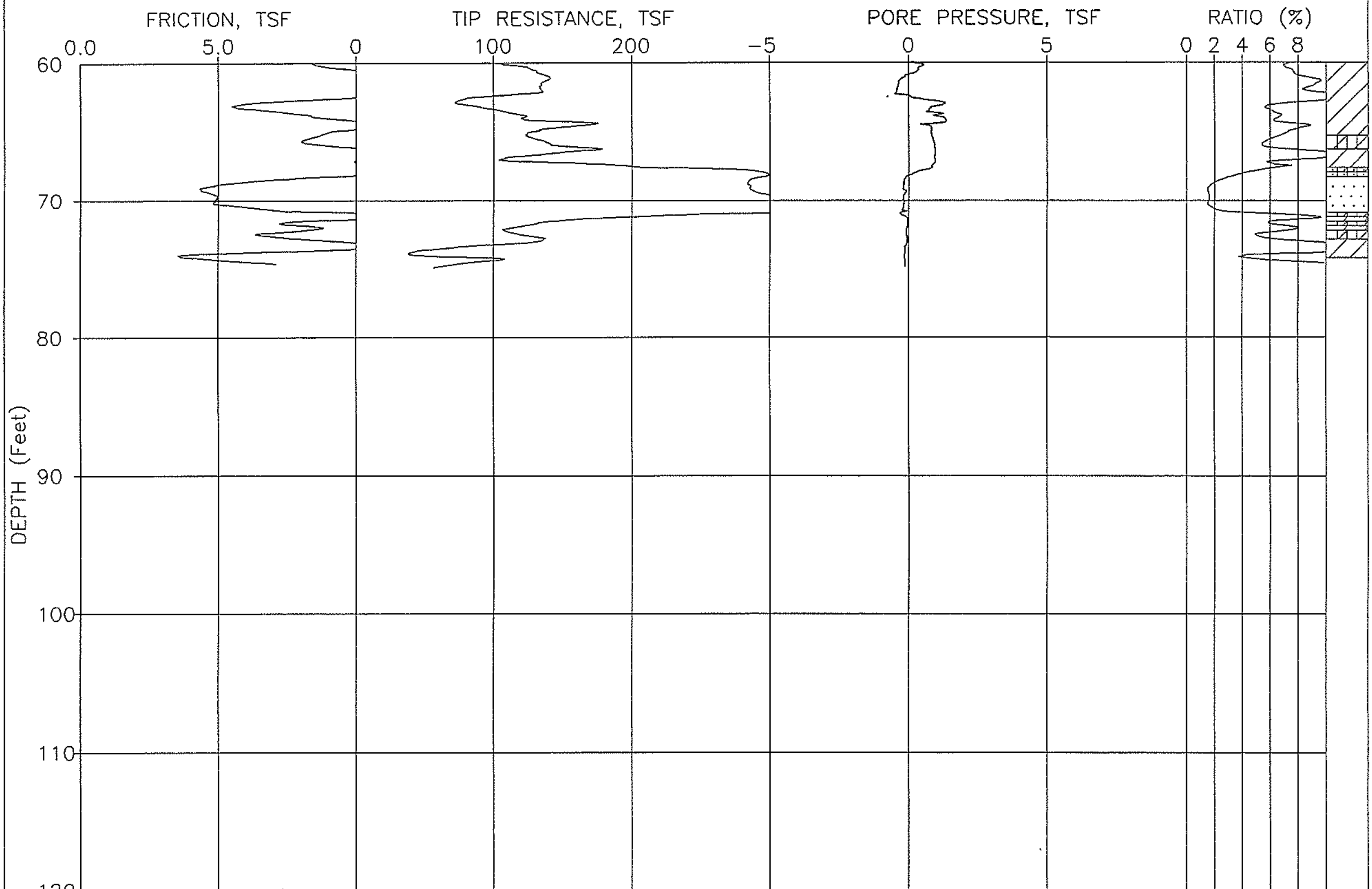
CPT NUMBER: SC4

CONE NUMBER: F7.5CKESW1645

DATE: 04-25-2007

PLATE: 1 OF 2

FUGRO GEOSCIENCES,INC



JOB NUMBER: 0907-0024

ELEVATION: 0.00

CPT NUMBER: SC4

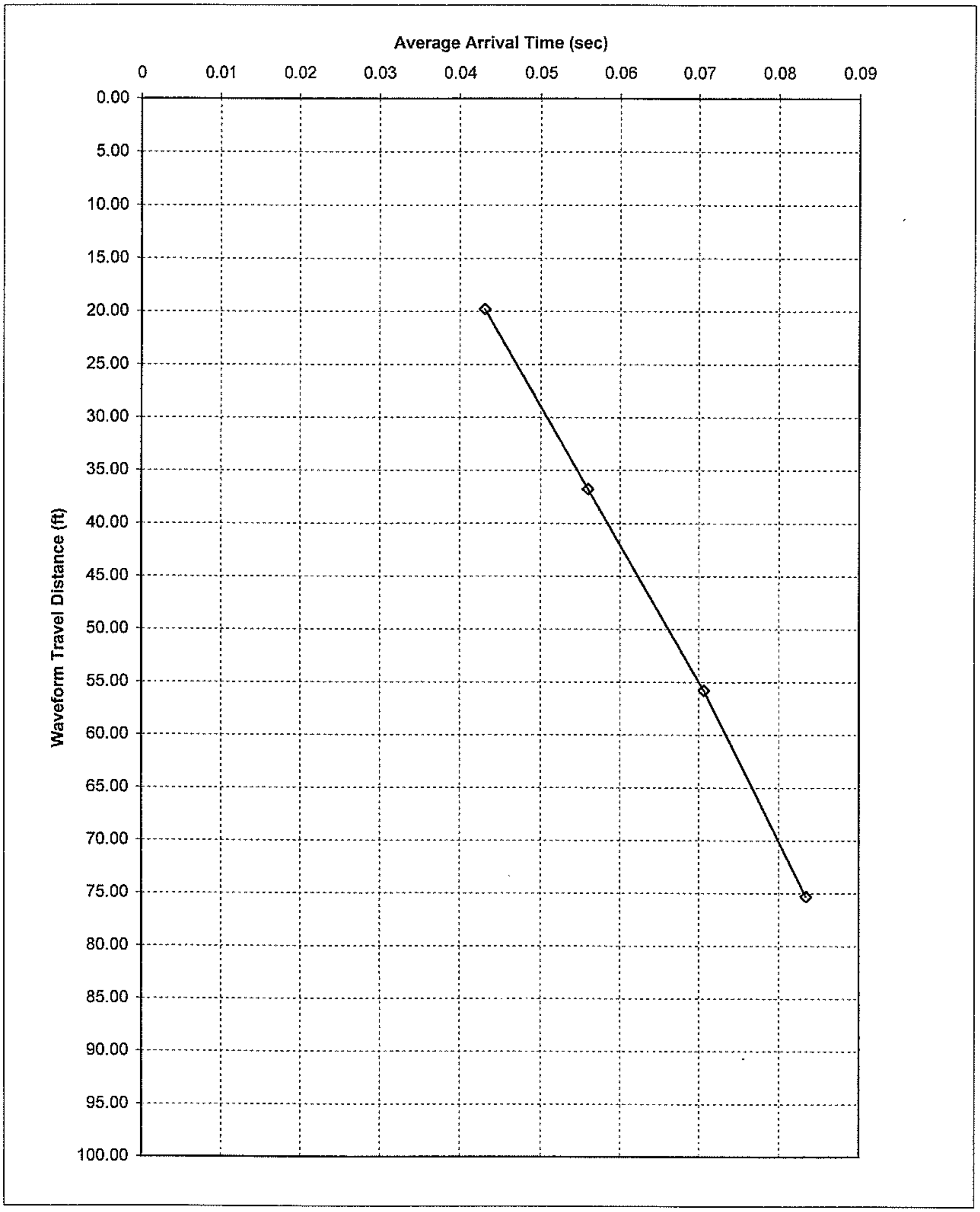
CONE NUMBER: F7.5CKESW1645

DATE: 04-25-2007

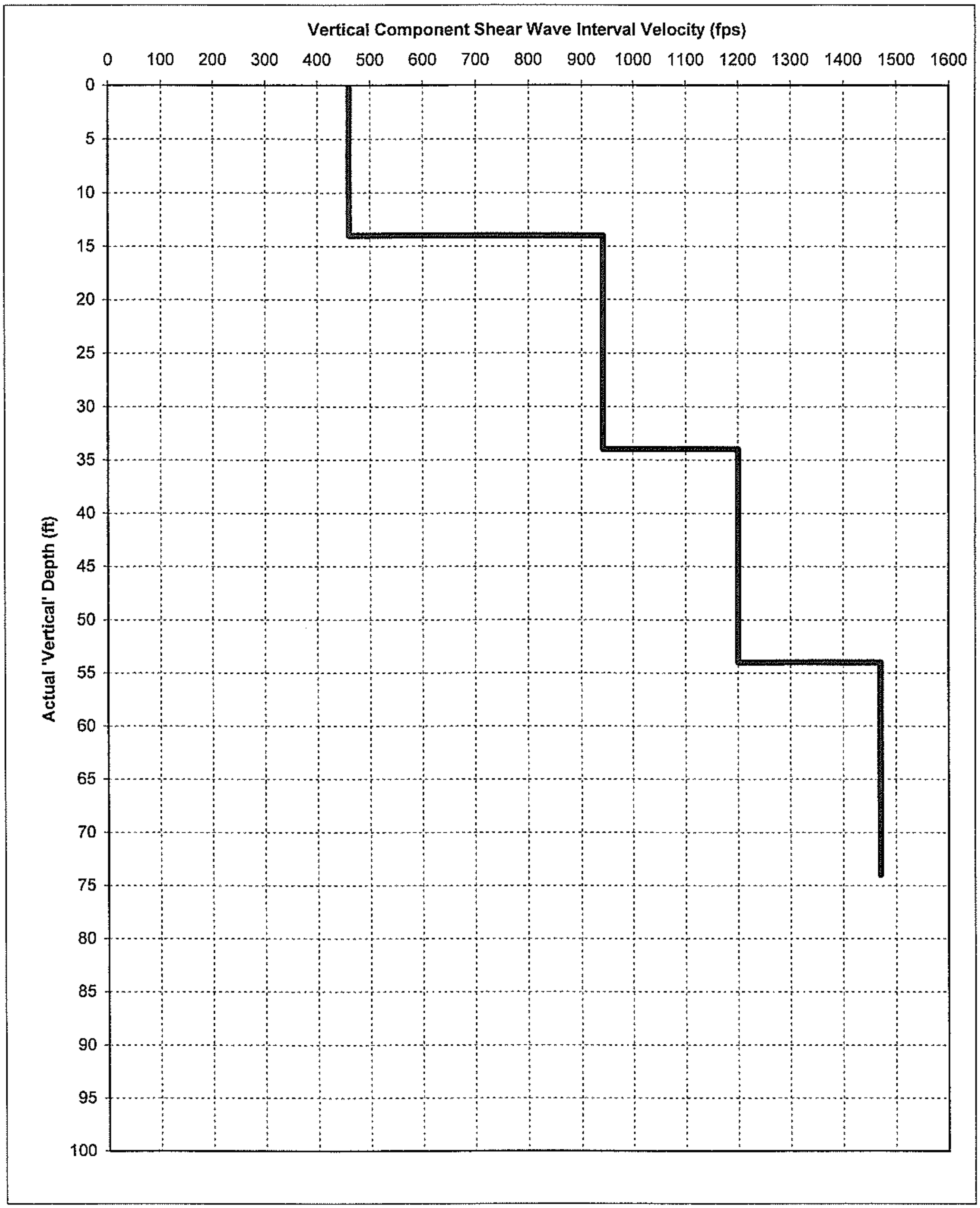
PLATE: 2 OF 2

FUGRO GEOSCIENCES,INC

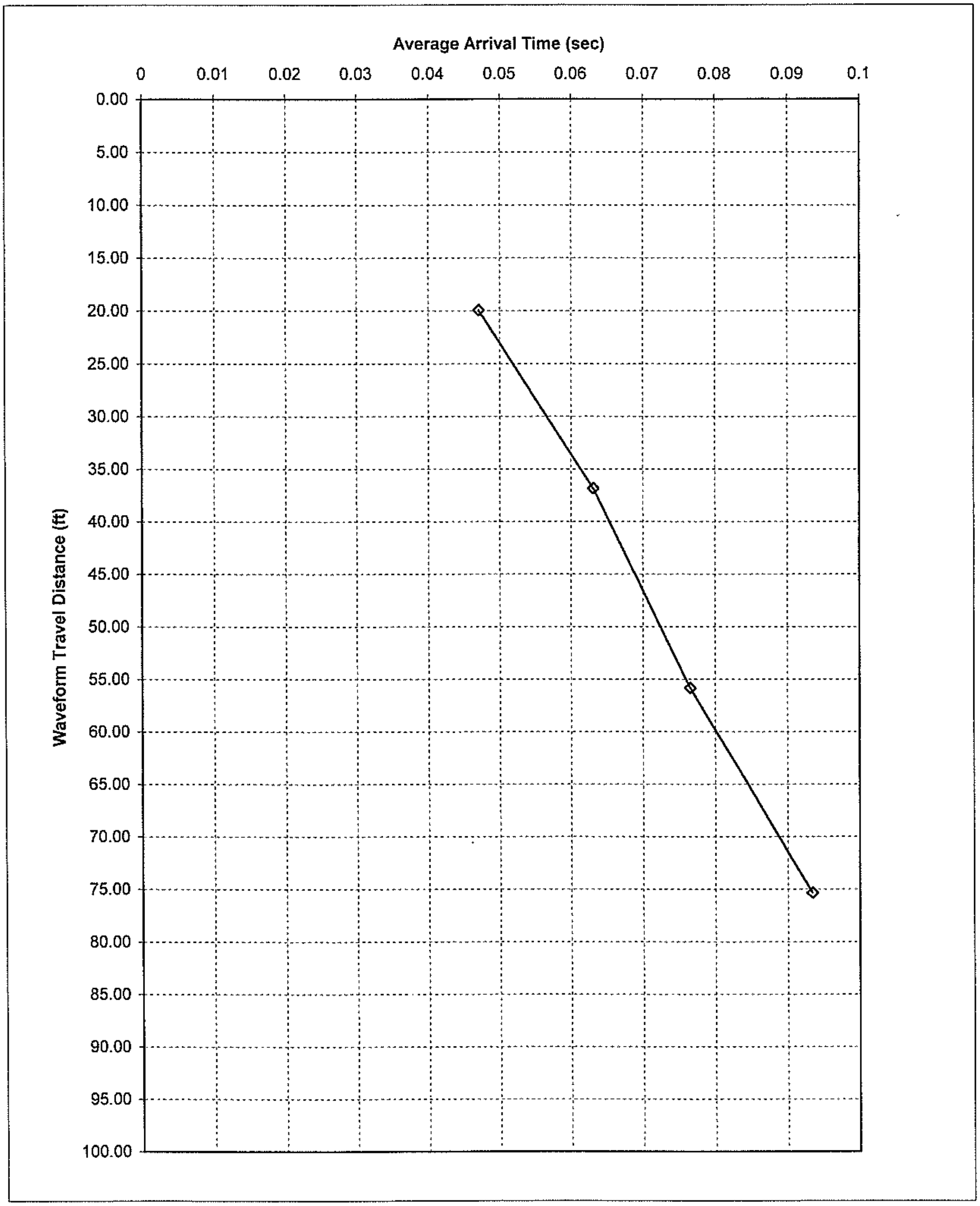
SEISMIC LOGS



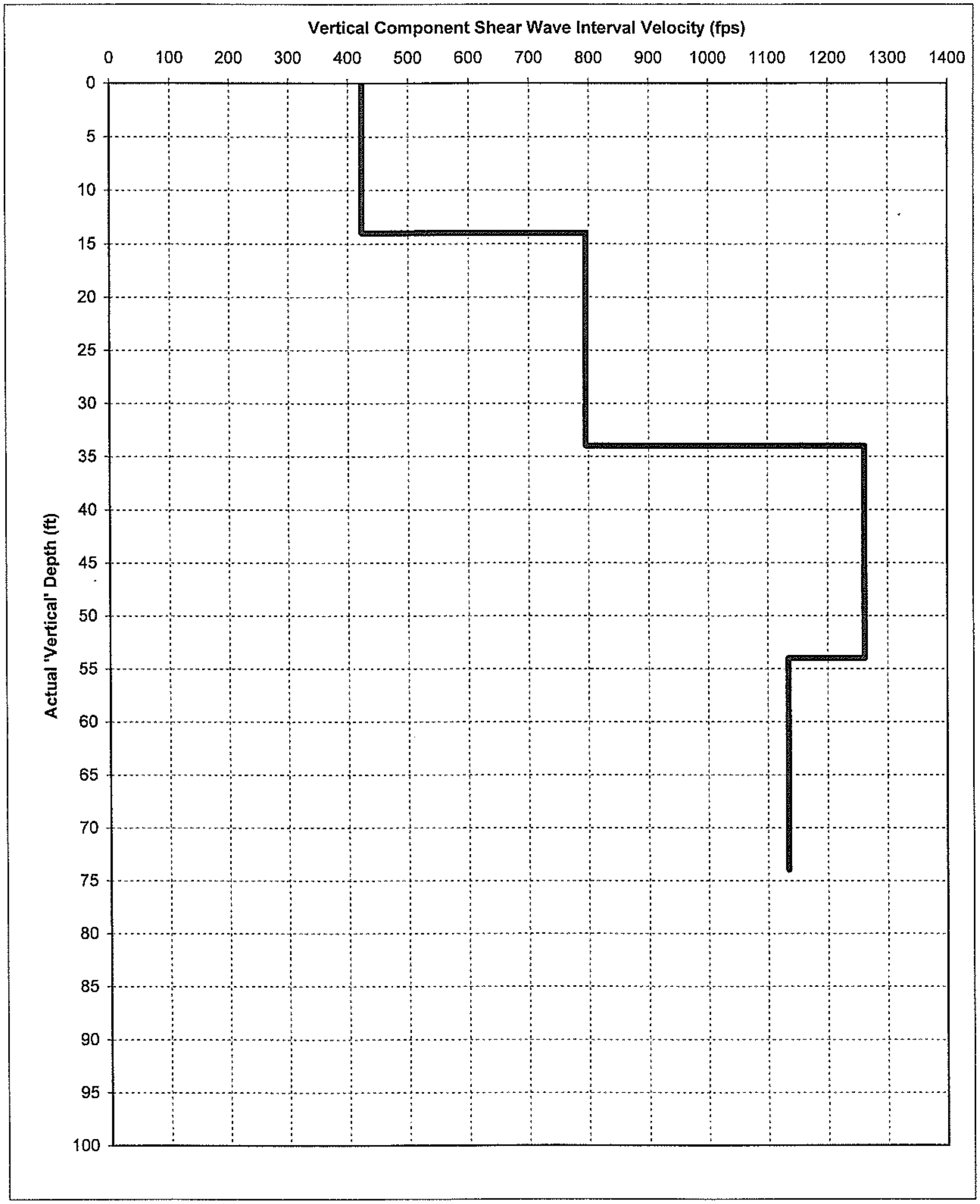
AVERAGE ARRIVAL TIME VERSUS WAVEFORM TRAVEL DISTANCE (SC4)



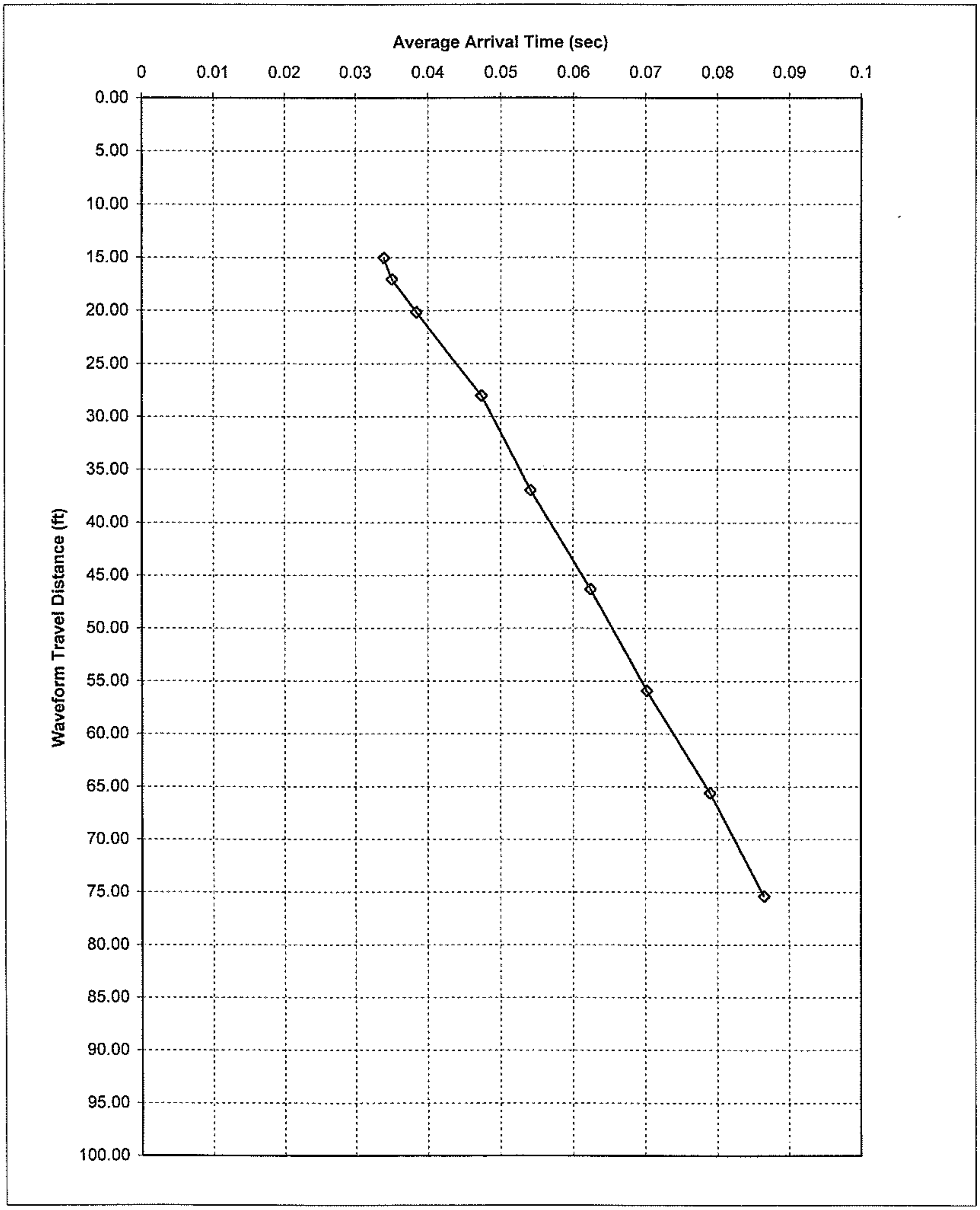
SHEAR WAVE INTERVAL VELOCITY VERSUS VERTICAL DEPTH
(SC4)



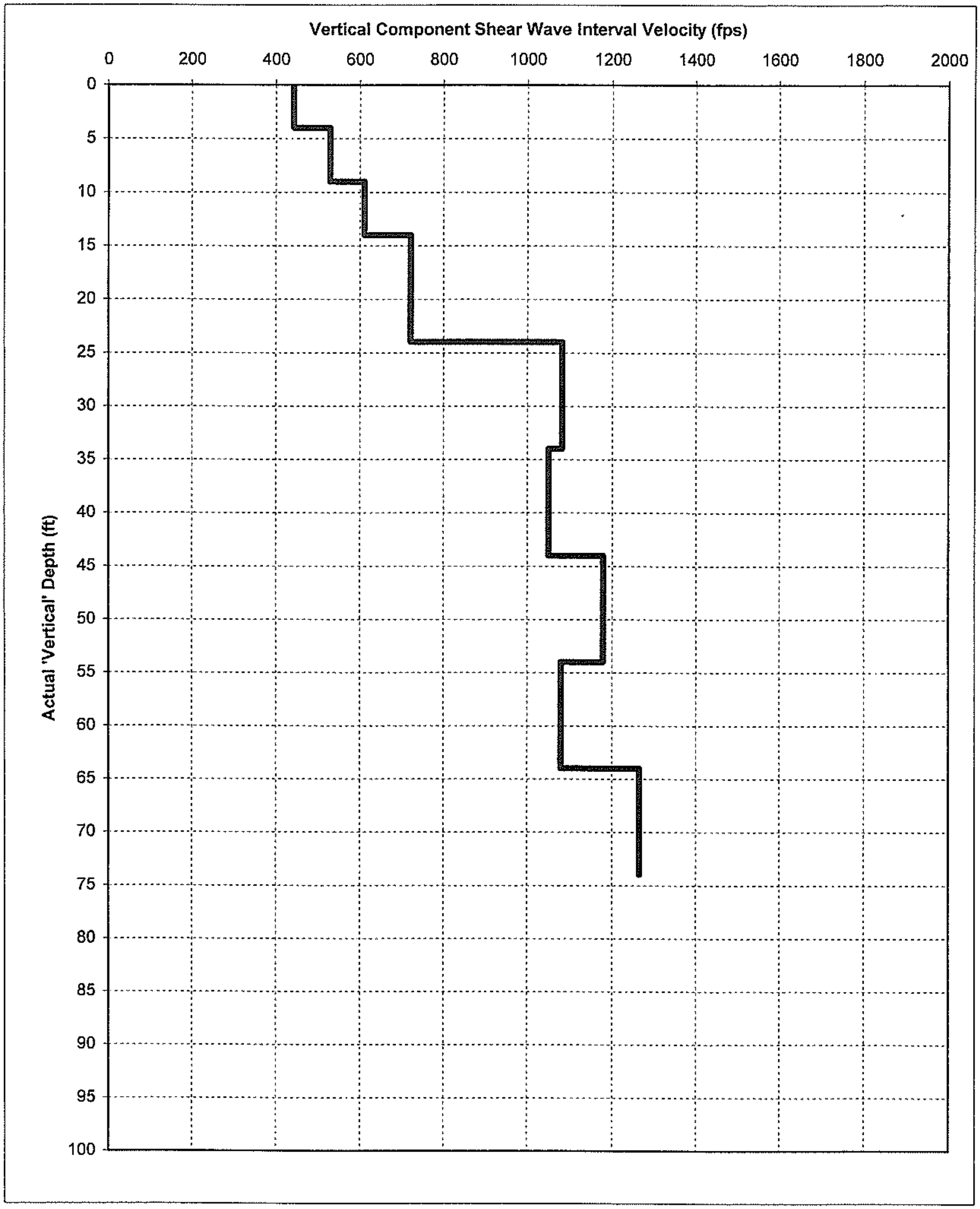
AVERAGE ARRIVAL TIME VERSUS WAVEFORM TRAVEL DISTANCE (SC1)



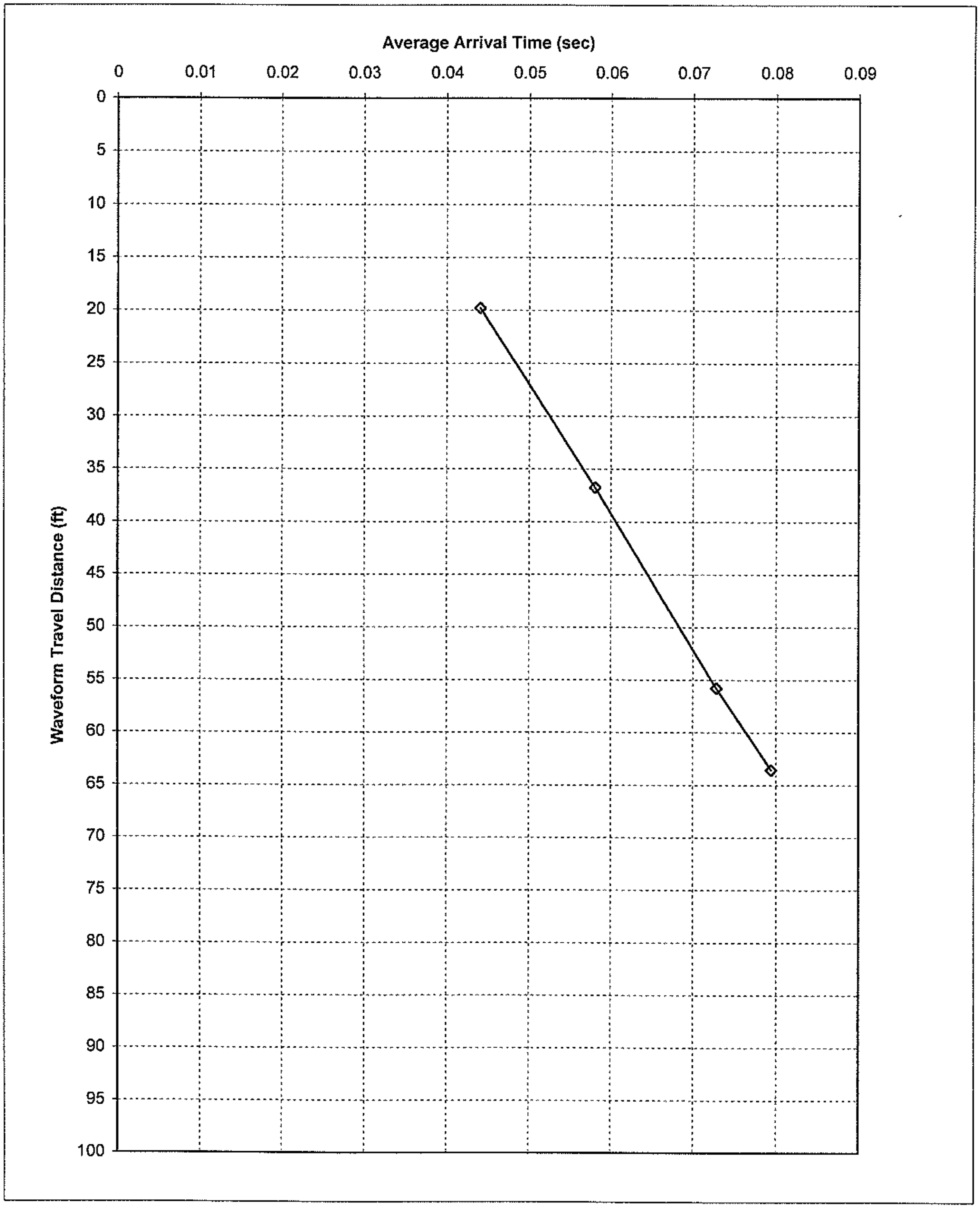
SHEAR WAVE INTERVAL VELOCITY VERSUS VERTICAL DEPTH
(SC1)



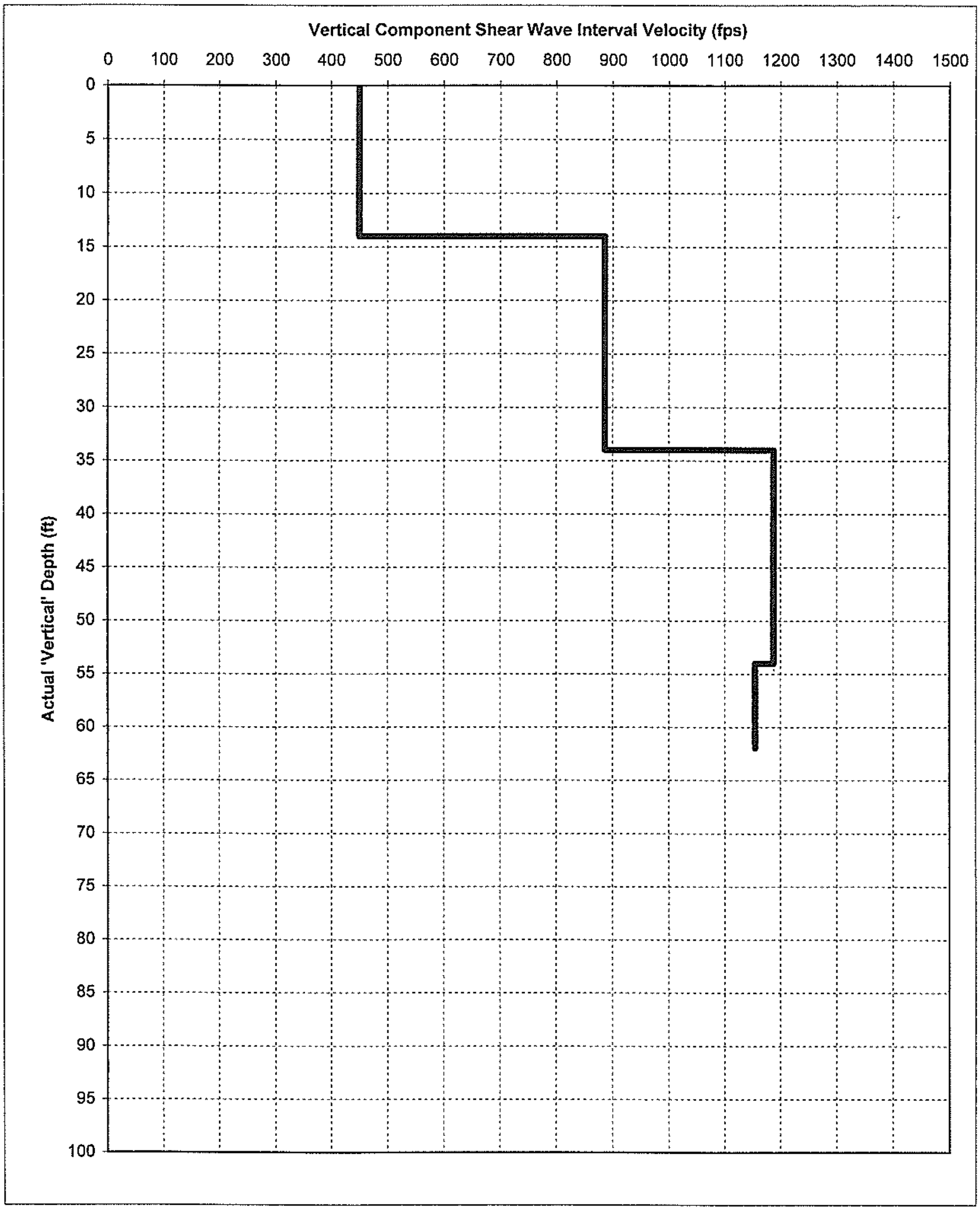
AVERAGE ARRIVAL TIME VERSUS WAVEFORM TRAVEL DISTANCE
(SC2)



SHEAR WAVE INTERVAL VELOCITY VERSUS VERTICAL DEPTH
(SC2)



AVERAGE ARRIVAL TIME VERSUS WAVEFORM TRAVEL DISTANCE
(SC3)



SHEAR WAVE INTERVAL VELOCITY VERSUS VERTICAL DEPTH
(SC3)

APPENDIX B
LABORATORY TESTING PROGRAM

APPENDIX B
LABORATORY TESTING PROGRAM

Samples obtained from the field exploration were contained in sealed brass tubes, bulk sample bags, and small plastic bags depending on the technique used during sampling. The samples were shipped to the laboratory for soils testing. The tests performed on selected samples are described below. Test results are presented in the accompanying Tables and Plates, with a summary of the main test results presented on Plate B-1, Appendix B.

Laboratory Soil Classification

The field classification is verified in the laboratory by visual examination and by ASTM methods in accordance with the Unified Soil Classification System. The classification tests include grain size analysis (ASTM D 422) and Atterberg Limits (ASTM D 4318). The soil classifications are shown on the boring logs, Plates A-1 through A-14, Appendix A. The results of the Atterberg Limits testing are presented on Plate B-2 and grain size analyses are shown on Plates B-3 and B-4.

Moisture-Density

The moisture-density information (ASTM D 2216) provides the dry unit weight and field moisture content for selected undisturbed samples. The results are shown on the respective boring logs and summarized on Plate B-1.

Maximum Density-Optimum Moisture Content

Representative soil samples were tested in the laboratory to determine the maximum dry density and optimum moisture content using ASTM D 1557 compaction test method. This procedure uses 25 blows of a 10-pound hammer falling a height of 18 inches on each of five layers in a 1/30 cubic foot cylinder. Test results are shown on Plate B-5.

Unconfined Compressive Strength

The unconfined compressive strength (ASTM D 2166) provides an approximation of the compressive strength of a cohesive soil in terms of total stresses. The soil sample is placed in a compression device and the load is increased and recorded until the load values decrease with increasing strain or until 15 percent strain is reached. The results are presented on Plate B-1.

Direct Shear Test

Direct shear tests (ASTM D 3080) were conducted in a direct shear apparatus at a constant rate of strain. A normal load approximately equal to the existing weight of soil above the point of sampling was applied vertically and the soil shear strength determined at this load. Samples were tested at two higher normal loads in order to determine the angle of internal friction and the cohesion. The results are presented on Plate B-1.

Corrosion Testing

Selected samples were tested for corrosivity evaluation by Sunland Analytical. Laboratory tests included pH and minimum resistivity (California Department of Transport (CA DOT) Test # 643), sulfates (CA DOT Test # 417) and chlorides (CA DOT Test # 422). Test results are shown in Table B-1.

Expansion Index

Remolded, representative samples were tested for their Expansion Index in accordance with ASTM D 4829. During the Expansion Index test, the sample is compacted into a metal ring so that the degree of saturation is between 40 and 60 percent. The sample is loaded with a surcharge of 144 psf and saturated for a period of 24 hours, at which time the deformation is recorded. The test results are shown in Table B-2.

R-Value

R-Value tests were performed on four bulk samples of the near surface soil to determine R-Values for pavement design. Tests were run in accordance with Caltrans Test 301. The test result is shown in Table B-3.

Consolidation

The apparatus used for the consolidation test (ASTM D2435) is designed to use brass rings into which undisturbed tube samples are extruded or remolded soils are recompacted. Loads are applied to the test specimen in several increments, and the resulting deformations are recorded at selected time intervals. Porous stones are placed in contact with the top and bottom of the specimen to permit the ready addition or release of water. Samples are tested at the field and saturated moisture contents. Saturation allows observing the soil's susceptibility to collapse or swell. Consolidation test results are shown on Plate B-6.

Organic Content

The dry weight percentage of organics (ASTM D2974) was measured for selected soil samples observed to potentially contain organic material. Using test method C, the moisture content of the sample is removed at a temperature of approximately 105° C, then the material is heated in a muffle furnace at 440° C until no further weight loss is recorded. Test results are shown on Table B-4.

TABLE B-1

SUMMARY OF CORROSIVITY TEST RESULTS					
Sample No.	**Depth (ft)**	**pH**	**Resistivity (ohm-cm)**	**Sulfate (mg/kg)**	**Chloride (mg/kg)**
B-1	2	7.9	1100	13.3	14.2
B-1	3	7.99	590	41.1	25.9
B-3	2	7.87	540	108.6	52.5
B-4	1.5	7.87	1880	6.4	9.1
B-4	6	8.21	640	34.5	144.2
B-5	2	7.84	590	11.6	19.8
B-8	2.5	8.07	620	16.8	11.9
B-9	6	8.21	510	105.8	159.2
B-10	2	7.96	780	14.8	17.5
B-10	8.5	8.23	460	155.1	211.1
B-11	6	8.11	990	31.4	46.2
B-11	8.5	8.4	830	18.2	38.2

mg/kg = milligrams per kilogram (parts per million) of dry soil

TABLE B-2

SUMMARY OF EXPANSION INDEX TEST RESULTS		
Sample No.	**Depth (ft)**	**Expansion Index**
B-4	2-5	49
B-4	3.5	75
B-6	1.5	20
B-11	2	63

TABLE B-3

SUMMARY OF R-VALUE TEST RESULTS			
Sample No.	**Depth (ft)**	**Dry Density (pcf)**	**R Value**
B-5	2-5	111.9	6
B-12	1-5	101.7	7
B-13	2-5	121.4	25
B-14	1-5	116.1	8

TABLE B-4

SUMMARY OF ORGANIC CONTENT TEST RESULTS		
Sample No.	**Depth (ft)**	**Organic Matter (%)**
B-1	3	8.6
B-4	6	7.6
B-8	2.5	8.0
B-9	6	4.9
B-10	2	7.3
B-11	6	6.2

Boring	Depth (feet)	Liquid Limit	Plasticity Index	Maximum Size	%<#200 Sieve	Class-ification	Water Content (%)	Dry Density (pcf)	Phi, degrees	Apparent Cohesion (psf)	Unconfined Compressive Strength (psf)
B-1	2.0						9.6	93.5			
B-1	3.5						12.8	96.4			
B-1	7.0			3/8 in	29		26.6	87.0	25	392	
B-1	16.0						21.5	104.4			
B-1	21.0						17.1	109.7			
B-10	2.0						9.8	99.0			
B-10	3.5						9.4	105.0			
B-10	6.0						12.6	105.1			2,271
B-10	8.5						15.5	94.1			
B-10	11.0						9.9	107.4			2,445
B-10	15.0			#4	31						
B-11	2.0	47	29				16.6	107.6			
B-11	3.5						16.2	111.1			
B-11	6.0						24.3	86.1			
B-11	8.5						16.4	107.0			
B-12	1.5						15.3	110.8			
B-12	3.5						19.3	104.8			
B-12	6.0			3/8 in	65		15.3	112.1			2,145
B-12	8.5	32	12				17.7	97.8			1,563
B-12	11.0						17.9	104.2			
B-13	3.5						22.6	97.9			
B-13	6.0						19.4	104.7			
B-2	6.0	31	18				16.8	91.4			761
B-2	8.5						21.0	96.2			1,512
B-2	11.0						22.2	96.8			
B-3	2.0						13.2	105.4			
B-3	5.5			3/8 in	43		25.0	90.4	30	758	
B-3	8.5	38	20				16.4	91.0			1,484
B-3	11.0			3/8 in	62		11.3	97.0			
B-3	16.0			#4	42		9.2	103.2			
B-4	1.5						7.9	102.9			
B-4	3.5	57	34								
B-4	5.0	33	24				14.8				
B-4	6.0						23.3	92.4			
B-4	8.5						13.2	107.7			
B-4	11.0						25.6	95.0			
B-5	2.0						27.0	84.7			
B-5	6.0						22.8	100.2			2,193
B-5	8.5						26.6	97.1			1,234
B-5	11.0						20.2	107.9			
B-5	16.0						22.8	102.7			
B-6	1.5	27	13				11.0	106.9			

SUMMARY OF LABORATORY RESULTS

CDCR Karl Holton State Youth Facility
Investigation
7650 Newcastle Road, Stockton, California

FUGRO

502 Giuseppe Court, Suite 11, Roseville, CA 95678
Telephone: (916) 773-2600 Fax: (916) 782-4846

Project No.
1832.001

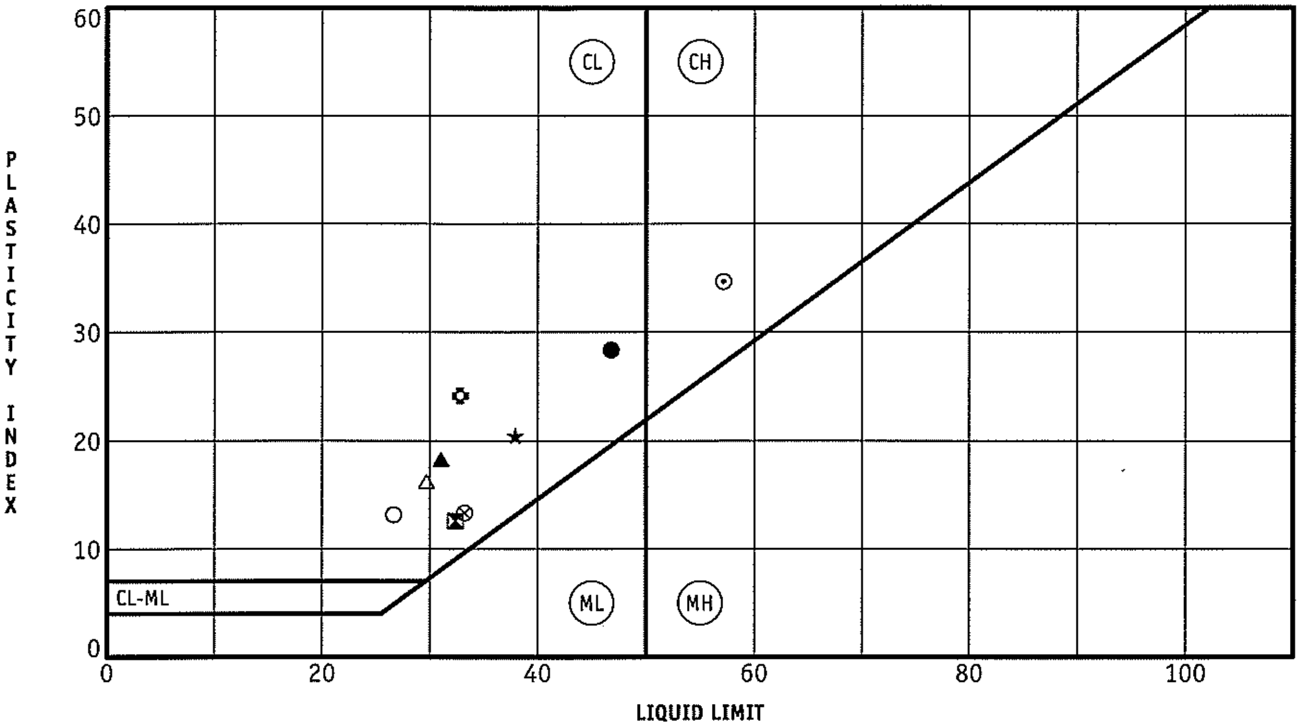
Plate B-1

Boring	Depth (feet)	Liquid Limit	Plasticity Index	Maximum Size	%<#200 Sieve	Class-ification	Water Content (%)	Dry Density (pcf)	Phi, degrees	Apparent Cohesion (psf)	Unconfined Compressive Strength (psf)
B-6	6.0			3/8 in	64		24.9	97.5	30	1,189	
B-6	8.5	30	17				22.5	100.4			1,426
B-6	11.0						20.2	104.9			
B-6	16.0						17.8	112.2			
B-7	2.0						11.6	88.9			
B-7	3.5						15.5	110.5			
B-7	6.0						18.7	104.8			
B-7	11.0						17.7	108.8			
B-8	2.5						21.6	85.7			
B-8	6.0	33	13				26.0	95.4			859
B-8	8.5			3/8 in	45		22.8	97.7	29	735	
B-8	11.0						29.8	90.1			
B-8	21.0						22.0	103.2			
B-9	2.0						10.9	102.8			
B-9	3.5						16.9	105.3			
B-9	6.0						14.7	95.4			
B-9	11.0						24.0	96.0			

SUMMARY OF LABORATORY RESULTS
CDCR Karl Holton State Youth Facility Investigation
7650 Newcastle Road, Stockton, California

FUGRO
502 Giuseppe Court, Suite 11, Roseville, CA 95678
Telephone: (916) 773-2600 Fax: (916) 782-4846

Project No. 1832.001



Sym	Specimen Identification Sample	Depth (ft)	LL	PL	PI	Fines	Classification
●	B-11	2.0	47	18	29		
⊠	B-12	8.5	32	20	12		
▲	B-2	6.0	31	13	18		
★	B-3	8.5	38	18	20		
⊙	B-4	3.5	57	23	34		
✪	B-4	5.0	33	9	24		
○	B-6	1.5	27	14	13		
△	B-6	8.5	30	13	17		
⊗	B-8	6.0	33	20	13		

ATTERBERG LIMITS RESULTS

CDCR Karl Holton State Youth Facility Investigation

7650 Newcastle Road, Stockton, California

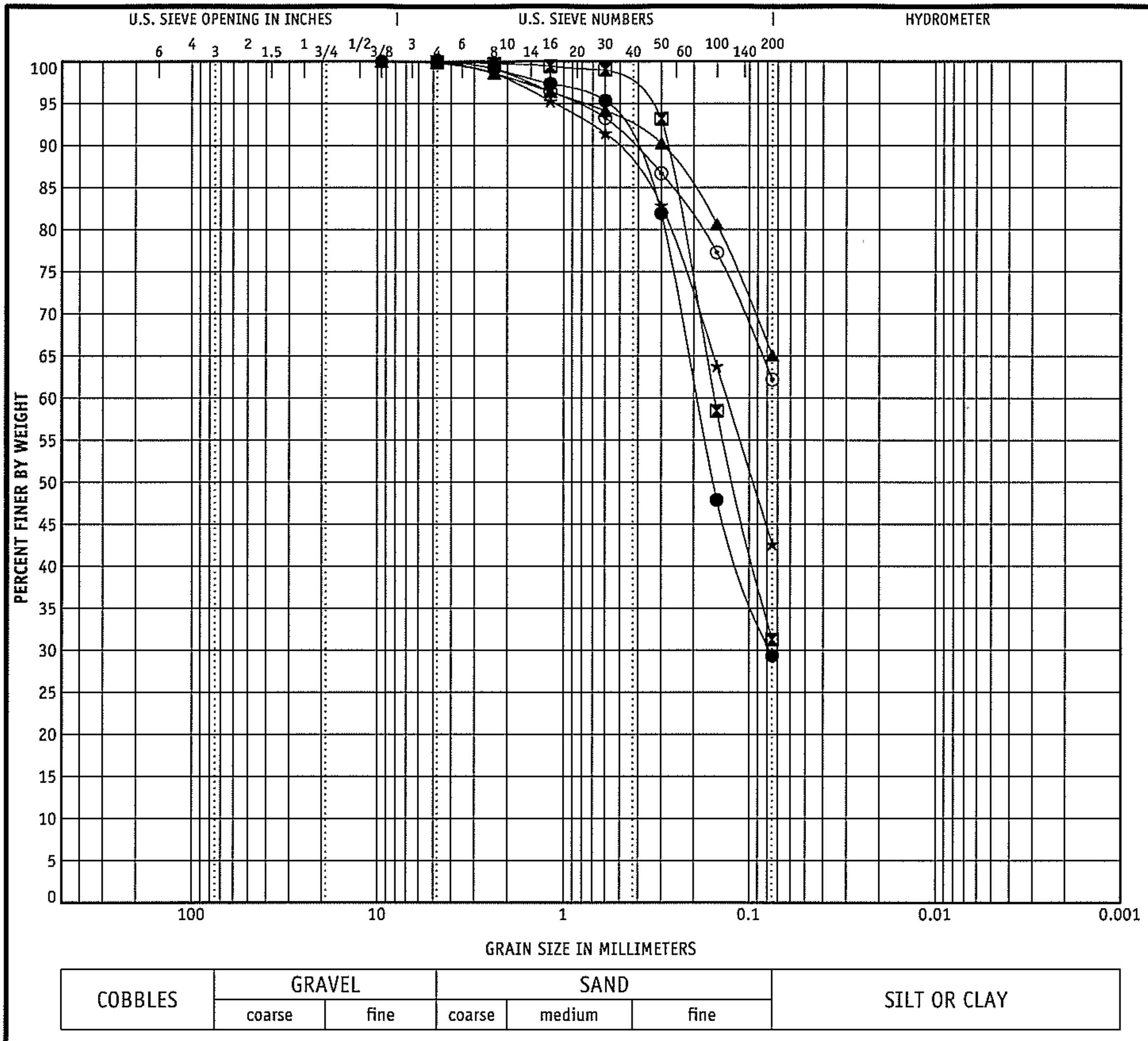
FUGRO

502 Giuseppe Court, Suite 11, Roseville, CA 95678
Telephone: (916) 773-2600 Fax: (916) 782-4846

Project No. 1832.001

Plate B-2

ATTERBERG LIMITS 1832.001.GPJ ESPANA GEOTECH.GDT 8/6/07



Sym	Specimen Identification Boring	Depth (ft)	Classification	LL	PL	PI	C_c	C_u
●	B-1	7.0						
⊠	B-10	15.0						
▲	B-12	6.0						
★	B-3	5.5						
⊙	B-3	11.0						

Sym	Specimen Identification	Depth (ft)	D_{100},mm	D_{60},mm	D_{30},mm	D_{10},mm	%Gravel	%Sand	%Silt / %Clay
●	B-1	7.0	9.5	0.192	0.077		0.0	70.6	29.3
⊠	B-10	15.0	4.75	0.155				68.8	31.2
▲	B-12	6.0	9.5				0.2	34.8	65.0
★	B-3	5.5	9.5	0.133			0.1	57.3	42.6
⊙	B-3	11.0	9.5				0.1	37.7	62.2

GRAIN SIZE DISTRIBUTION

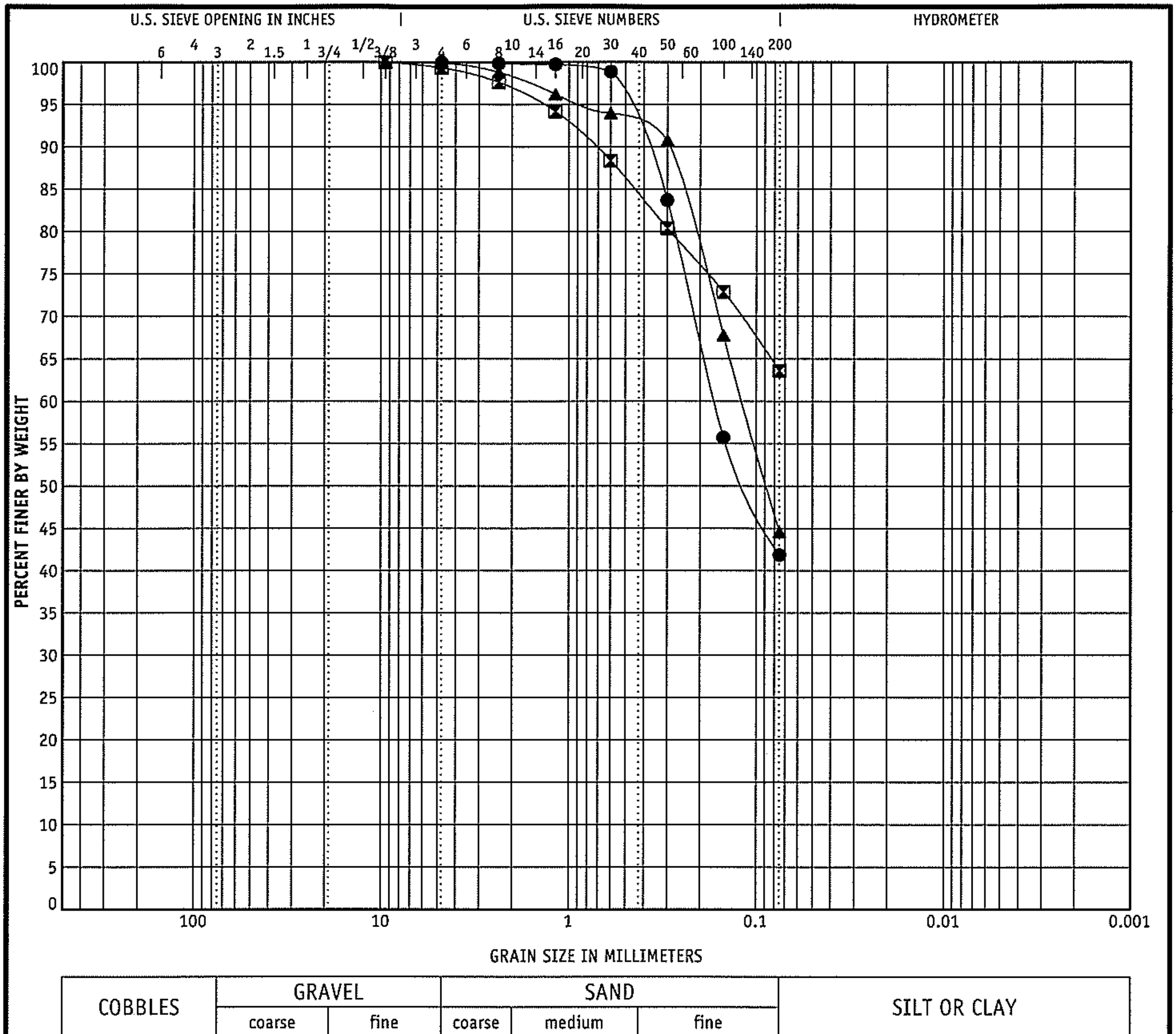
CDCR Karl Holton State Youth Facility Investigation
7650 Newcastle Road, Stockton, California

FUGRO
502 Giuseppe Court, Suite 11, Roseville, CA 95678
Telephone: (916) 773-2600 Fax: (916) 782-4846

Project No. 1832.001

Plate B-3

GRAIN SIZE 1832.001.GPJ ESPANA GEOTECH.GDT 8/6/07



Sym	Specimen Identification Boring	Depth (ft)	Classification	LL	PL	PI	C_c	C_u
●	B-3	16.0						
⊠	B-6	6.0						
▲	B-8	8.5						

Sym	Specimen Identification		D_{100},mm	D_{60},mm	D_{30},mm	D_{10},mm	%Gravel	%Sand	%Silt	%Clay
●	B-3	16.0	4.75	0.167				58.2	41.8	
⊠	B-6	6.0	9.5				0.7	35.8	63.6	
▲	B-8	8.5	9.5	0.119			0.1	55.3	44.6	

GRAIN SIZE 1832.001.GPJ ESPANA GEOTECH.GDT 8/6/07

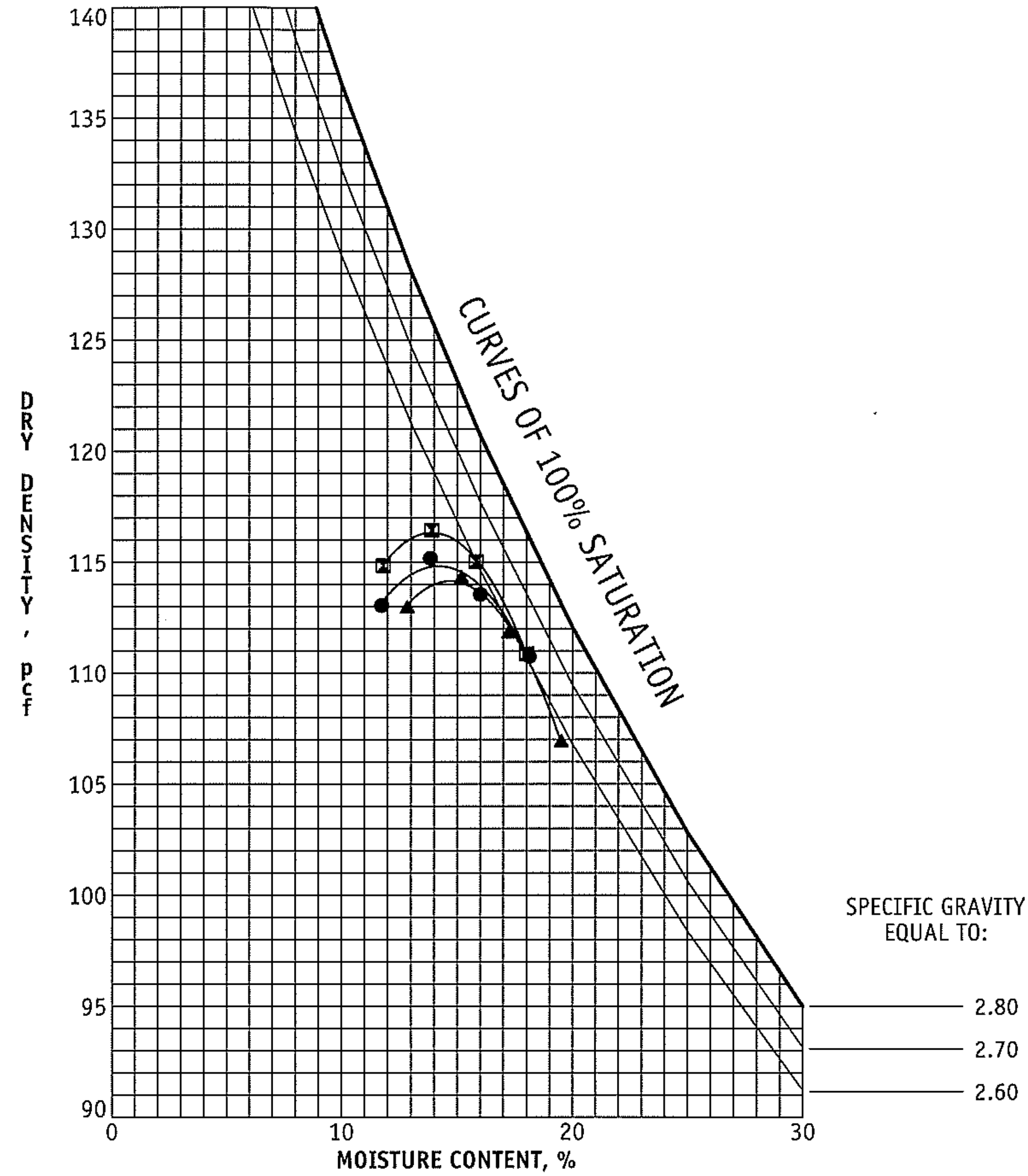
GRAIN SIZE DISTRIBUTION

CDCR Karl Holton State Youth Facility Investigation
7650 Newcastle Road, Stockton, California

FUGRO
502 Giuseppe Court, Suite 11, Roseville, CA 95678
Telephone: (916) 773-2600 Fax: (916) 782-4846

Project No. 1832.001

Plate B-4



Key Symbol	Location	Depth (Feet)	Sample Description	Maximum Dry Density (pcf)	Optimum Water Content (%)	Test Designation
●	B-1	5.0		115.2	14.2	ASTM D1557 Method A
⧗	B-12	5.0		116.5	14.0	ASTM D1557 Method A
▲	B-2	5.0		114.4	14.6	ASTM D1557 Method A

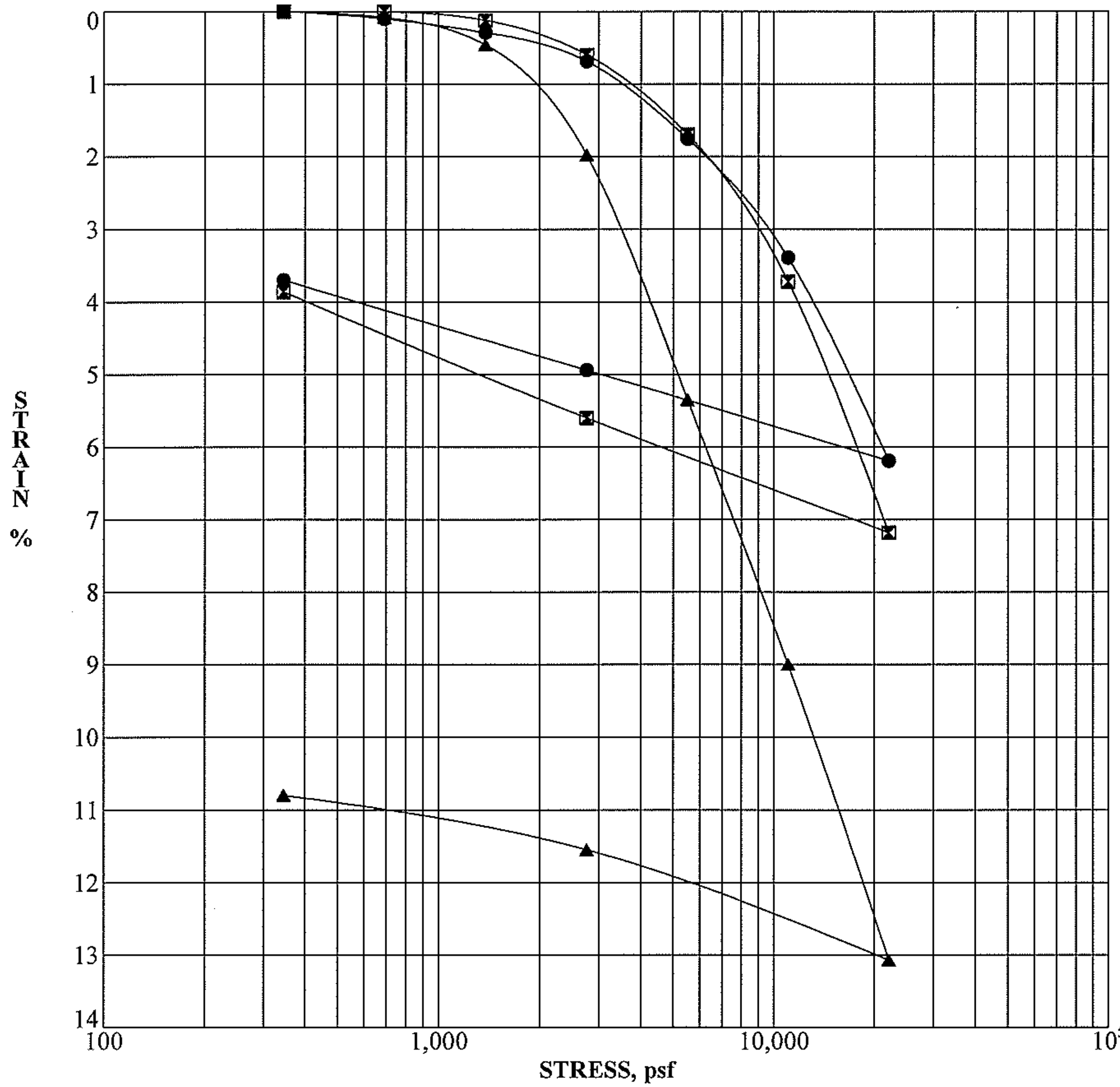
COMPACTION - 4 CURVES - DESIGN 1832.001.GPJ ESPANA GEOTECH.GDT 8/6/07

COMPACTION TEST RESULTS
CDCR Karl Holton State Youth Facility Investigation
7650 Newcastle Road, Stockton, California

FUGRO
502 Giuseppe Court, Suite 11, Roseville, CA 95678
Telephone: (916) 773-2600 Fax: (916) 782-4846

Project No. 1832.001

Plate B-5



Key Symbol	Boring No.	Depth (Feet)	Water Content (%)		Dry Density (pcf)		Void Ratio		Saturation (%)		Max. Past Pressure (psf)	Compr. Index,Ce	Recompr. Index,Cer
			Initial	Final	Initial	Final	Initial	Final	Initial	Final			
●	B-1	3.0	15.1	20.2	105.0	109.0	0.605	0.546	67.6	99.9			
⊠	B-6	2.0	14.0	21.0	103.5	107.7	0.628	0.564	60.2	100.3			
▲	B-8	2.0	14.5	16.9	103.4	115.8	0.629	0.455	62.3	100.3			

FUGRO

PREP'D BY:
APP'D BY:
DATE: 8/6/07
DWG FILE:

CONSOLIDATION TEST RESULTS

CDCR KARL HOLTON STATE YOUTH FACILITY
Stockton, California

FIGURE **B-6**

PROJECT No. 1832.001

CONSOL_STRAIN 1832_001 V012505.GPJ STD.GDT 8/6/07

APPENDIX C
GROUNDWATER MONITORING

APPENDIX C
GROUNDWATER MONITORING

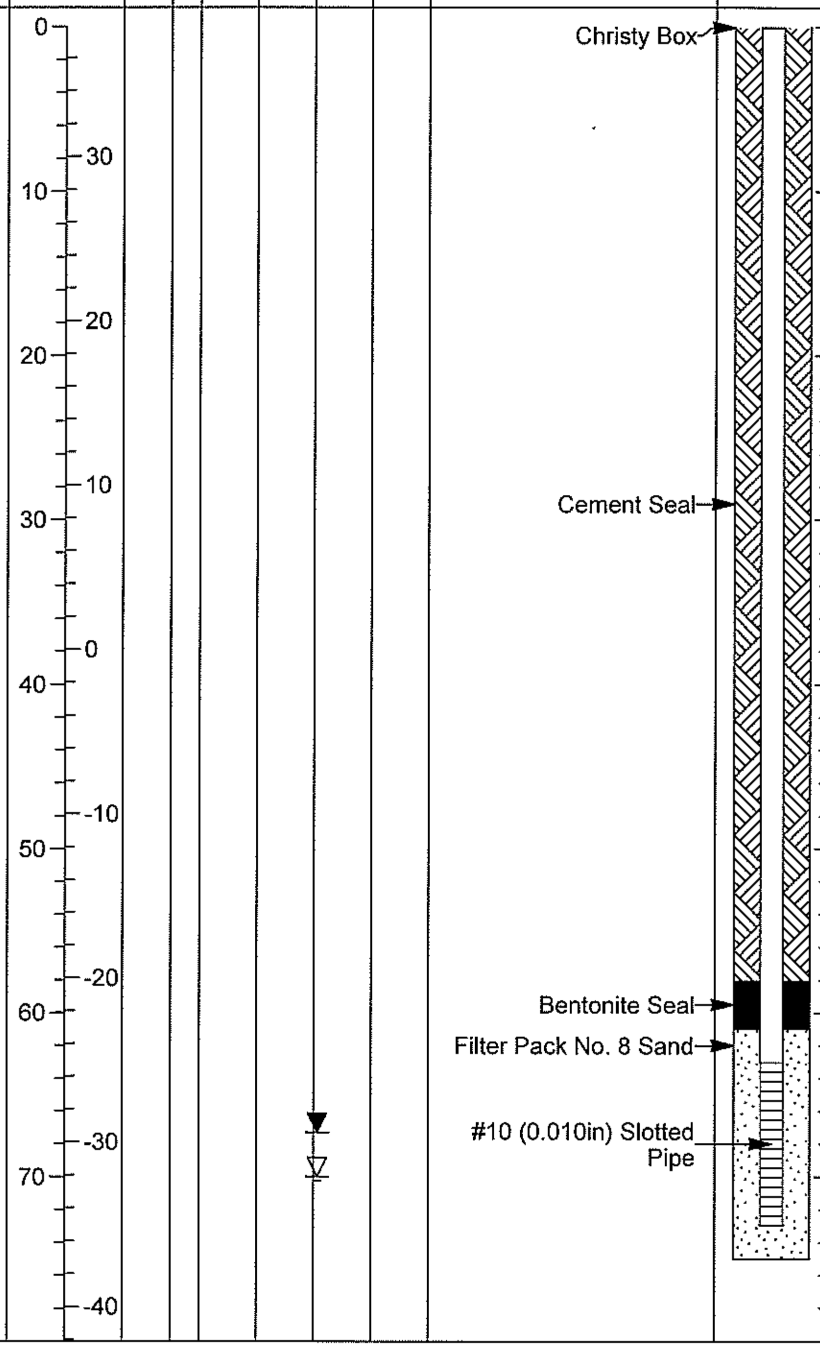
TABLE C -1

SUMMARY OF GROUNDWATER ELEVATIONS IN OBSERVATION WELLS

Well No.	Surface Elevation1 (ft. msl)	Well Depth (ft)	Bottom Elevation (ft)	Groundwater Depth (ft)
B-1	37.87	75	-37.13	67.1 (4/30/07)
B-3	37.6	75	-37.4	66.6 (4/30/07)
B-8	38.2	75	-36.8	66.2 (4/30/07)

Surface Elevation: 37.9 ft MSL	**Date Drilled:** 04/25/07
Drilling Method: CME 75 w/ 8-in HSA	**Logged By:** Gopalan Vishnan
Drilling Contractor: Spectrum Drilling	**Checked By:** Micheal Hughes
Hammer: 140 lb. auto-hammer 30-in drop	**Depth to Groundwater:** 67.3 ft BGS

Material Description and Classification	Depth (feet) Elevation	Soil Type	Sample Type	Field Blows	Dry Density (pcf)	Moisture Content (%)	Unc. Comp. Strength (ksf)	Piezometer Information: Notes	Piezometer Information: Graphic



Boring Terminated At 75.0 ft BGS

LOG OF BORING B-1 (Well)

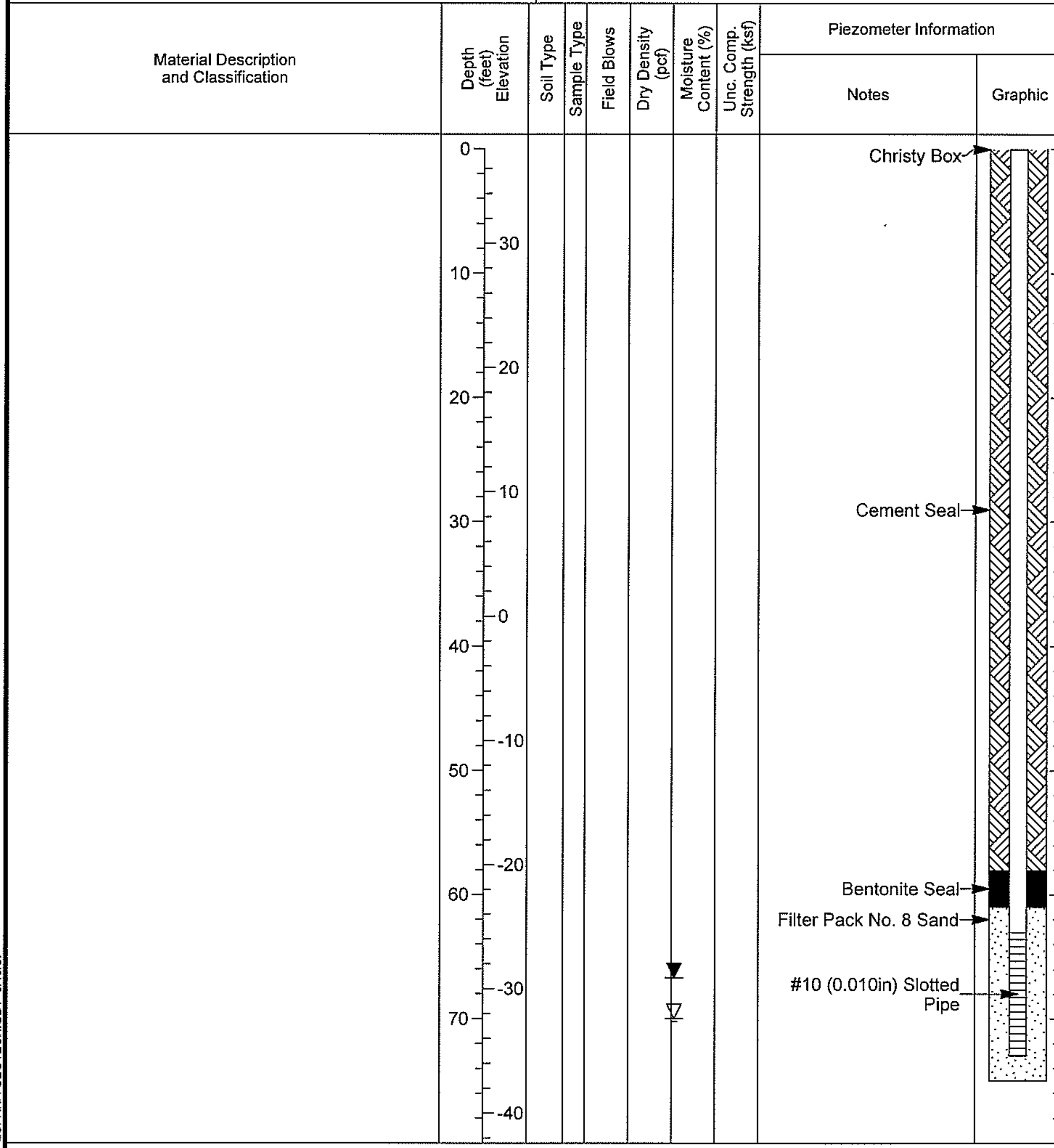
CDCR Karl Holton State Youth Facility Investigation
7650 Newcastle Road, Stockton, California

FUGRO
502 Giuseppe Court, Suite 11, Roseville, CA 95678
Telephone: (916) 773-2600 Fax: (916) 782-4846

Project No. 1832.001

Plate C-1

Surface Elevation: 37.6 ft MSL	**Date Drilled:** 04/24/07
Drilling Method: CME 75 w/ 8-in HSA	**Logged By:** Gopalan Vishnan
Drilling Contractor: Spectrum Drilling	**Checked By:** Micheal Hughes
Hammer: 140 lb. auto-hammer 30-in drop	**Depth to Groundwater:** 66.7 ft BGS



Boring Terminated At 75.0 ft BGS

LOG OF BORING B-3 (Well)

CDCR Karl Holton State Youth Facility Investigation

7650 Newcastle Road, Stockton, California

FUGRO

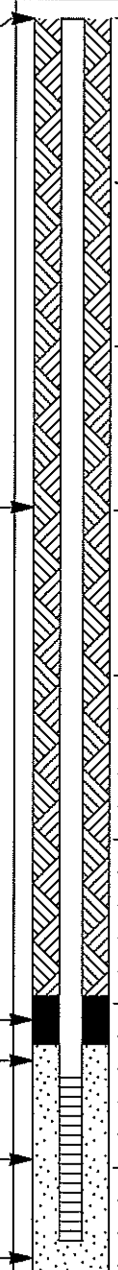
502 Giuseppe Court, Suite 11, Roseville, CA 95678
Telephone: (916) 773-2600 Fax: (916) 782-4846

Project No. 1832.001

Plate C-2

Surface Elevation: 38.2 ft MSL	**Date Drilled:** 04/23/07
Drilling Method: CME 75 w/ 8-in HSA	**Logged By:** Gopalan Vishnan
Drilling Contractor: Spectrum Drilling	**Checked By:** Micheal Hughes
Hammer: 140 lb. auto-hammer 30-in drop	**Depth to Groundwater:** 66.3 ft BGS

Material Description and Classification	Depth (feet) Elevation	Soil Type	Sample Type	Field Blows	Dry Density (pcf)	Moisture Content (%)	Unc. Comp. Strength (ksf)	Piezometer Information: Notes	Piezometer Information: Graphic
	0							Christy Box	
	10 (elev. 30)								
	20 (elev. 20)								
	30 (elev. 10)							Cement Seal	
	40 (elev. 0)								
	50 (elev. -10)								
	60 (elev. -20)							Bentonite Seal	
								Filter Pack No. 8 Sand	
	70 (elev. -30)							#10 (0.010in) Slotted Pipe	
								Filter Pack No. 8 Sand	
	(elev. -40)								



Boring Terminated At 76.5 ft BGS

LOG OF BORING B-8 (Well)
CDCR Karl Holton State Youth Facility Investigation
7650 Newcastle Road, Stockton, California

FUGRO
502 Giuseppe Court, Suite 11, Roseville, CA 95678
Telephone: (916) 773-2600 Fax: (916) 782-4846

Project No. 1832.001

Plate C-3

APPENDIX D
FIELD RESISTIVITY TESTING

APPENDIX D
FIELD RESISTIVITY TESTING

Field resistivity testing was performed by the Wenner Four-Pin Method in accordance with ASTM G57 and the equipment manufacturer's instructions. A Nilson Model 400 Four-Pin Soil Resistance Meter was used to deliver a low frequency AC signal between the two outer pins and measure the soil resistance across the two inner pins. At each test location, resistance measurements were taken at increasing pin spacings along two straight lines orientated perpendicular to each other about a common center point. A total of seven measurements were taken along each line at set pin spacings of 2.5, 5, 10, 15, 20, 25 and 30 feet. The meter records resistance in ohms, which is converted to values of ohm-centimeters using the following conversion formula:

Ohm-centimeters = 191.5 x Probe Spacing (feet) x Meter Reading (ohms)

The locations of tests are shown on Plates 2a and 2b and the test results are presented in Table D1.

APPENDIX D
FIELD RESISTIVITY TESTING

TABLE D-1

SUMMARY OF FIELD RESISTIVITY TEST RESULTS							
Location No.	Resistivity (Ohm-Centimeters) for Probe Spacing and Location						
	2.5 Feet	5 Feet	10 Feet	15 Feet	20 Feet	25 Feet	30 Feet
R-1, N-S	6,224	1,915	1,178	732	613	575	689
R-1, E-W	4,548	1,341	709	603	498	479	460
R-2, N-S	2,983	1,915	910	919	728	527	718
R-2, E-W	3,208	1,867	1,149	1,077	1,072	1,053	862
R-3, N-S	1,915	1,245	977	1,005	709	958	488
R-3, E-W	2,681	1,245	1,015	862	1,034	1,005	575
R-4, N-S	2,202	1,915	1,436	1,206	1,647	1,532	1,695
R-4, E-S	3,016	1,724	1,149	1,034	1,226	1,197	1,149
R-5, N-S	1,436	1,245	575	833	613	575	632
R-5, E-W	1,341	1,628	1,092	1,005	689	718	402
R-6, N-S	2,513	2,394	1,245	862	613	287	86
R-6, E-W	2,537	1,963	1,216	919	460	551	471
R-7, N-S	1,388	1,628	1,015	1,235	594	479	632
R-7, E-W	2,059	1,532	1,321	1,350	996	1,005	1,034
R-8, N-S	2,825	2,107	1,302	890	575	1,436	1,264
R-8, E-W	5,745	1,436	1,379	1,235	1,341	718	1,206
R-9, N-S	1,891	1,915	996	1,135	1,551	1,436	1,321
R-9, E-W	2,322	1,915	766	905	1,187	1,388	1,206
R-10, N-S	6,224	1,771	1,341	790	-	-	-
R-10, E-W	10,772	2,107	919	1,379	1,302	-	-
R-11, N-S	24,656	6,224	11,873	-	-	-	-
R-11, E-W	22,980	8,522	287	-	-	-	-
R-12, N-S	8,378	2,107	1,589	1,034	1,206	1,029	862
R-12, E-W	4,141	2,394	862	661	1,072	1,005	356
R-13, N-S	3,854	3,256	1,513	1,321	670	766	1,321
R-13, E-W	3,830	2,920	1,896	1,551	958	77	259
R-14, N-S	1,963	2,202	1,149	1,063	977	718	948

Note : Resistivity reading (ohm-centimeters) = 191.5 x probed spacing (feet) x field meter reading (ohms)

- indicates that a balanced reading in the X100K range setting could not be achieved on the meter .

TABLE D-1 (continued)

SUMMARY OF FIELD RESISTIVITY TEST RESULTS							
Location No.	Resistivity (Ohm-Centimeters) for Probe Spacing and Location						
	2.5 Feet	5 Feet	10 Feet	15 Feet	20 Feet	25 Feet	30 Feet
R-14, E-W	4,022	1,724	958	1,063	1,072	1,149	977
R-15, N-S	1,915	1,341	996	776	613	-	-
R-15, E-W	2,274	1,628	977	661	536	766	316
R-16, N-S	4,405	1,819	670	661	345	479	-
R-16, E-W	2,633	2,059	1,245	718	555	551	747
R-17, N-S	3,447	3,064	756	488	498	814	-
R-17, E-W	3,423	2,394	1,398	589	287	-	-
R-18, N-S	2,154	1,341	1,341	1,350	1,226	1,293	345
R-18, E-W	2,059	1,436	1,455	1,408	1,149	886	776
R-19, N-S	2,609	2,107	1,724	1,580	1,532	1,819	2,413
R-19, E-W	2,705	2,202	2,298	2,068	2,221	1,915	1,953
R-20, N-S	1,197	814	823	833	1,072	958	919
R-20, E-W	1,317	862	1,034	1,178	1,072	1,388	1,321

Note : Resistivity reading (ohm-centimeters) = 191.5 x probed spacing (feet) x field meter reading (ohms)

- indicates that a balanced reading in the X100K range setting could not be achieved on the meter .

APPENDIX E
ESTIMATION OF SOIL SHRINKAGE POTENTIAL

APPENDIX E
ESTIMATION OF SOIL SHRINKAGE POTENTIAL

TABLE E-1

ESTIMATED SOIL SHRINKAGE POTENTIAL						
Boring No.	**Test Depth (ft)**	**In-Place Dry Density (pcf)**	**Maximum Dry Density* (pcf)**	**Percentage Shrinkage at 92% Comp.**	**In-Place Moisture (%)**	**Optimum Moisture* (%)**
B-1	2	93.5	115.2	13	9.6	14.2
B-1	3.5	96.4	114.4	9	12.8	14.6
B-1	7	87.0	115.2	22	26.6	14.2
B-1	16	104.4	114.4	1	21.5	14.6
B-1	21	109.7	114.4	-4	17.1	14.6
B-2	6	91.4	114.4	15	16.8	14.6
B-2	8.5	96.2	114.4	9	21.0	14.6
B-2	11	96.8	114.4	9	22.2	14.6
B-3	2	105.4	114.4	0	13.2	14.6
B-3	5.5	90.4	115.2	17	25.0	14.2
B-3	8.5	91.0	114.4	16	16.4	14.6
B-3	11	97.0	116.5	11	11.3	14.0
B-3	16	103.2	115.2	3	9.2	14.2
B-4	1.5	102.9	114.4	2	7.9	14.6
B-4	6	92.4	114.4	14	23.3	14.6
B-4	8.5	107.7	115.2	-2	13.2	14.2
B-4	11	95.0	114.4	11	25.6	14.6
B-5	2	84.7	114.4	24	27.0	14.6
B-5	6	100.2	114.4	5	22.8	14.6
B-5	8.5	97.1	114.4	8	26.6	14.6
B-5	11	107.9	116.5	-1	20.2	14.0
B-5	16	102.7	114.4	2	22.8	14.6
B-6	1.5	106.9	114.4	-2	11.0	14.6
B-6	6	97.5	114.4	8	24.9	14.6
B-6	11	104.9	114.4	0	20.2	14.6
B-6	8.5	100.4	114.4	5	22.5	14.6

TABLE E-1 (continued)

ESTIMATED SOIL SHRINKAGE POTENTIAL						
Boring No.	**Test Depth (ft)**	**In-Place Dry Density (pcf)**	**Maximum Dry Density* (pcf)**	**Percentage Shrinkage at 92% Comp.**	**In-Place Moisture (%)**	**Optimum Moisture* (%)**
B-6	16	112.2	114.4	-6	17.8	14.6
B-7	2	88.9	114.4	18	11.6	14.6
B-7	3.5	110.5	114.4	-5	15.5	14.6
B-7	6	104.8	114.4	0	18.7	14.6
B-7	11	108.8	116.5	-2	17.7	14.0
B-8	2.5	85.7	114.4	23	21.6	14.6
B-8	6	95.4	114.4	10	26.0	14.6
B-8	8.5	97.7	115.2	8	22.8	14.2
B-8	11	90.1	115.2	18	29.8	14.2
B-8	21	103.2	114.4	2	22.0	14.6
B-9	2	102.8	114.4	2	10.9	14.6
B-9	3.5	105.3	114.4	0	16.9	14.6
B-9	6	95.4	114.4	10	14.7	14.6
B-9	11	103.1	114.4	2	24.0	14.6
B-10	2	99.0	114.4	6	9.8	14.6
B-10	3.5	105.0	115.2	1	9.4	14.2
B-10	6	105.1	114.4	0	12.6	14.6
B-10	8.5	94.1	114.4	12	15.5	14.6
B-10	11	107.4	114.4	-2	9.9	14.6
B-11	3.5	111.1	115.2	-5	16.2	14.2
B-11	6	86.1	115.2	23	24.3	14.2
B-11	8.5	107.0	114.4	-2	16.4	14.6
B-12	1.5	110.8	114.4	-5	15.3	14.6
B-12	3.5	104.8	114.4	0	19.3	14.6
B-12	6	112.1	116.5	-4	15.3	14.0
B-12	8.5	97.8	114.4	8	17.7	14.6
B-12	11	104.2	114.4	1	17.9	14.6
B-13	3.5	97.9	114.4	7	22.6	14.6
B-13	6	104.7	114.4	1	19.4	14.6