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PUBLIC

Volume 2
Part 1 of 3

January 26, 2004

The Honorable Magalie R. Salas
Secretary
Federal Energy Regulatory Commission
888 First Street N.E.
Washington, D.C. 20426

**Re: Sound Energy Solutions, Application for Authority To Site, Construct, And Operate LNG Import Terminal Facilities, Docket No. CP04 58 -000**

Dear Ms. Salas:

Enclosed for filing pursuant to Section 3 of the Natural Gas Act and Part 153 of the Commission's Regulations thereunder, is an "Application for Authority to Site, Construct, and Operate LNG Import Terminal Facilities" ("Application") by Sound Energy Solutions ("SES").

SES respectfully requests that the Commission issue a final order granting SES all necessary authorizations by October 20, 2004.

The Application consists of the following 10 volumes and additional material:

- Transmittal letter, Application, Form of Notice, and Exhibits A, B, and C required by Section 153.8(a)(1), (2) and (3) of the Commission's regulations, 18 C.F.R. § 153.8(a)(1), (2) and (3). **(PUBLIC)**;

- Volume I (Environmental Report – Resource Report Numbers 1, 2, 3, 4, and 5 and Appendices) **(PUBLIC)**;

- Volume II (Environmental Report – Resource Report Number 6 and Appendices) **(PUBLIC)**;
- Volume III (Environmental Report – Resource Report Numbers 7, 8, 9, 10 and 11 and applicable Appendices for Resource Report Numbers 7, 8, 9, 10 and 11) **(PUBLIC)**;
- Volume IV (Environmental Report – Resource Report Number 9- Appendices only) **(PUBLIC)**;
- Volume V (Environmental Report – Resource Report Numbers 1, 4, 5, 6, 8, 9, 10, and 11) **(NON-INTERNET PUBLIC)**;
- Volume VI (Environmental Report – Resource Report Number 13, Appendix 13-1 Drawings) **(CRITICAL ENERGY INFRASTRUCTURE INFORMATION)**;
- Volume VII (Environmental Report – Resource Report Number 13, Appendix 13-2, Specifications and Data Sheets) **(CRITICAL ENERGY INFRASTRUCTURE INFORMATION)**;
- Volume VIII (Environmental Report – Resource Report Number 13, Appendix 13-3.1, Manufacturer Data) **(CRITICAL ENERGY INFRASTRUCTURE INFORMATION)**;
- Volume IX (Environmental Report – Resource Report Number 13, Appendix 13.3-2, Manufacturer Data) **(CRITICAL ENERGY INFRASTRUCTURE INFORMATION)**;
- Volume X (Environmental Report – Resource Report Number 13, Appendices 13.4.1, and 13.4.2 Dispersion, Release, and Threat Analyses) **(CRITICAL ENERGY INFRASTRUCTURE INFORMATION)**;
- Envelope (Environmental Report Resource Report Number 4, Cultural Resource Figures) **(PRIVILEGED AND CONFIDENTIAL)**

Pursuant to Rule 388.112 of the Commission's Rules of Practice and Procedure, 18 C.F.R. § 388.112, SES submits an original and seven (7) copies of the Transmittal letter and the body of the Application, including Exhibits A, B, and C; and Volumes Nos. I. II, III, and IV, each of which has been marked PUBLIC. SES is also submitting an original and seven (7) copies of Volume No. V which is marked **NON-INTERNET PUBLIC**. Volume Nos. VI, VII, VIII, IX, and X contain information which is sensitive, protected critical energy infrastructure information ("CEII") as defined in 18 C.F.R. § 388.113(c). Accordingly, SES is filing an original and two (2) copies of Volume Nos.

VI, VII, VIII, IX, and X, each of which is marked in bold print **CONTAINS CRITICAL ENERGY INFRASTRUCTURE INFORMATION – DO NOT RELEASE.** Finally, SES is submitting a separate envelope which contains location, character, and ownership information about cultural resources. The envelope is marked in bold print, **"CONTAINS PRIVILEGED AND CONFIDENTIAL INFORMATION – DO NOT RELEASE".**

SES is also submitting one Compact Disc containing Volumes I-V, labeled "FERC Application, Resource Reports 1 through 12"; Two Separate Compact Discs are provided containing the body of the Application and a Form of Notice suitable for the Federal Register, and are labeled "FERC Application" and "Form of Notice", respectively. All Compact Discs are formatted in MS Word.

In accordance with Rule 2011(c)(5) of the Commission's Rules of Practice and Procedure, 18 C.F.R. § 385.2011(c)(5), the undersigned states that the paper copies of this filing contain the same information as the electronic medium, and that, to the best of his information, knowledge, and belief, the contents as stated in the paper copies and the electronic medium are true.

Respectfully submitted,

John H. Burnes, Jr.
Attorney for
Sound Energy Solutions

cc: Michael Boyle – 1 copy of Volumes I-X, Application, and Cultural Resources Confidential Material
3 copies of Volumes VI-X

# Sound Energy Solutions

# Long Beach LNG Import Project

# Resource Report 6 -- Geological Resources

| FERC Requirement | Addressed in |
|---|---|
| Describe, by milepost, mineral resources that are currently or potentially exploitable. | Section 6.2 |
| Describe, by milepost, existing and potential geological hazards and areas of nonroutine geotechnical concern, such as high seismicity areas, active faults, and areas susceptible to soil liquefaction, planned, active and abandoned mines, karst terrain, and areas of potential ground failure, such as subsidence, slumping, and landsliding. Discuss the hazards posed to the facility from each one. | Section 6.3, Appendix 6-1, Appendix 6-2 |
| Describe how the project would be located or designed to avoid or minimize adverse effects to the resources or risk to itself, including geotechnical investigations and monitoring that would be conducted before, during, and after construction. Discuss also the potential for blasting to affect structures, and the measures to be taken to remedy such effects. | Section 6.4, Appendix 6-1 |
| Specify methods to prevent project-induced contamination from surface mines or from mine tailings along the right-of-way and whether the project would hinder mine reclamation or expansion efforts. | Not Applicable |
| If the application involves an LNG facility located in zones 2, 3, or 4 of the Uniform Building Code's Seismic Risk Map, or where there is potential for surface faulting or liquefaction, prepare a report on earthquake hazards and engineering in conformance with "Data Requirements for the Seismic Review of LNG Facilities." NBSIR 84-2833. This document may be obtained from the Commission staff. | Resource Report 13 |
| If the application is for underground storage facilities, (i) describe how the applicant would control and monitor the drilling activity of others within the field and buffer zone; (ii) describe how the applicant would monitor potential effects of the operation of adjacent storage or production facilities on the proposed facility, and vice versa; (iii) describe measures to be taken to locate and determine the condition of old wells within the field and buffer zone and how the applicant would reduce risk from failure of known and undiscovered wells; and (iv) identify and discuss safety and environmental safeguards required by the state and Federal drilling regulations. | Not Applicable |

| CEQA Requirements: | Addressed in: |
|---|---|
| Would the project expose people or structures to potential substantial adverse effects, including the risk of loss, injury, or death involving:<br>i) Rupture of a known earthquake fault, as delineated on the most recent Alquist-Priolo Earthquake Fault Zoning Map issued by the State Geologist for the area or based on other substantial evidence of a known fault? Refer to Division of Mines and Geology Special Publication 42.<br>ii) Strong seismic ground shaking<br>iii) Seismic-related ground failure, including liquefaction<br>iv) Landslides | Sections 6.1 and 6.3, Appendices 6-1 and 6-2 |
| Would the project be located on a geologic unit or soil that is unstable, or that would become unstable as a result of the project, and potentially result in on- or off-site landslide, lateral spreading, subsidence, liquefaction or collapse? | Section 6.3 |
| Would the project result in the loss of availability of a known mineral resource that would be of value to the region and the residents of the state? | Section 6.2 |
| Would the project result in the loss of availability of a locally-important mineral resource recovery site delineated on a local general plan, specific plan or other land use plan? | Section 6.2 |

# RESOURCE REPORT 6
# GEOLOGICAL RESOURCES
# CONTENTS

## ACRONYMS

| | |
|---|---|
| bgs | below ground surface |
| CDMG | California Division of Mines and Geology, now California Geological Survey |
| DOGGR | California Department of Conservation, Division of Oil Gas, and Geothermal Resources |
| EIS/EIR | Environmental Impact Statement/Environmental Impact Report |
| g | gravitational acceleration |
| km | kilometers |
| LNG | Liquefied Natural Gas |
| $M_L$ | Local Magnitude (older measurement scale for earthquakes) |
| MLLW | Mean Lower Low Water |
| $M_{MAX}$ | Magnitude of maximum or upper earthquake |
| $M_W$ | Moment Magnitude (newer measurement scale for earthquakes) |
| m | meters |
| mm/yr | millimeters per year |
| NFPA | National Fire Protection Association |
| NOAA | National Oceanic and Atmospheric Administration |
| OBE | Operating Basis Earthquake |
| OES | Office of Emergency Services (California) |
| PGA | Peak Ground Accelerations |
| POLB or Port | Port of Long Beach |
| PSHA | Probabilistic Seismic Hazard Analyses |
| $R_{100}$ | 100 Year Runup Height for tsunamis |
| $R_{500}$ | 500 Year Runup Height for tsunamis |
| SES | Sound Energy Solutions |
| SoCal Edison | Southern California Edison |
| SoCal Gas | Southern California Gas Company |
| SSE | Safe Shutdown Earthquake |
| THUMS-HB | THUMS-Huntington Beach Fault |
| USGS | United States Geological Survey |
| ybp | years before present |

# RESOURCE REPORT 6
# GEOLOGY

## 6 INTRODUCTION

Sound Energy Solutions (SES) has entered into a preliminary agreement with the Port of Long Beach (POLB) for a 25-acre site on the eastern portion of Pier T (Pier T East) of the former naval shipyard property that was transferred to the POLB. SES proposes to construct and operate a liquefied natural gas (LNG) import terminal where LNG will be received and vaporized. The project, known as the Long Beach LNG Import Project or "Project", will include an offloading dock, two LNG storage tanks, an LNG vehicle fuel tank, vaporization facilities, a natural gas liquids recovery unit, and a truck-loading facility on Pier T East. Associated facilities include an approximate 2.3-mile-long pipeline that will deliver natural gas to the existing pipeline system of Southern California Gas Company (SoCal Gas) at its Salt Works Station, and approximately 0.8 mile of electric distribution lines to connect the LNG terminal to the existing Southern California Edison (SoCal Edison) system. The pipeline and electric distribution lines will be constructed, owned, and operated by others, not SES.

### Purpose of Report

This report documents the geologic conditions at the LNG terminal site and along the proposed pipeline route, assesses the possible impacts to natural resources resulting from construction and operation of the proposed Project, and addresses potential hazards related to geologic and seismic conditions in the site vicinity.

### Agency Communications

Evaluation of geologic, geotechnical and seismic conditions was carried out by URS and are found in Appendix 6-1 (referenced as URS, 2003B) and Appendix 6-2 (referenced as URS, 2003a). These reports are in general conformance with *Data Requirements for the Seismic Review of LNG Facilities NBSIR 84-2833* and California Geologic Survey Note 48 *Checklist for the Review of Geologic/Seismic Reports for California Public Schools, Hospitals, and Essential Services Buildings.* No communication took place with regulatory agencies. However, URS consulted with Dr. Tom Rockwell of San Diego State University, Dr. John Shaw of Harvard University, and Michael Fisher, Daniel Ponti and Brian Edwards of the U.S. Geological Survey to obtain unpublished information and data on the potentially active faults in the site region, and confirm that the most up to date data was used in the seismic hazard assessment.

**Report Organization**

The report is organized into seven major sections. Section 6.1 describes the geologic and seismic setting for the LNG terminal and associated sendout pipeline and electric distribution line. Section 6.2 addresses geologic resources. Section 6.3 addresses potential geologic hazards, including ground shaking, liquefaction, ground rupture, and inundation by tsunamis. Environmental consequences related to geologic and seismic conditions are discussed in Section 6.4. Section 6.5 lists the references that are the basis for information presented herein. Appendix 6-1 contains the geotechnical report and Appendix 6-2 contains the seismic hazard analysis for the Project.

## 6.1 GEOLOGIC AND TECTONIC SETTING

### 6.1.1 Regional Geology

The project site is located on the southwestern margin of the Los Angeles Basin. The Basin comprises a large area that has subsided and accumulated sediments eroded from surrounding mountains over the past 4 to 6 million years. The thickness of these Miocene-age and younger sediments is over 18,000 feet (5,500 meters (m)) near the center of the Basin, several miles northeast from the site.

Older sediments within the basin consist of compressed and partially indurated layers of sandstone, and shale. Younger sediments, deposited in Pleistocene and Holocene time (within 2 million and 12,000 years before present (ybp), respectively) are less well indurated. Older sediments within the Basin have been deformed by both folding and faulting. Younger sediments are less deformed.

Younger sediments include river deposits, predominantly sands and gravels, laid down in deep channels (up to 200 feet (60 m) below present sea level) that were cut in pre-existing sediments that were exposed during late Pleistocene time when sea level was much lower. The site is located on the western edge of one of these Pleistocene channels, known as the Gaspur Aquifer that roughly follows the present course of the Los Angeles River.

The Los Angeles Basin is located at the intersection of two physiographic and tectonic provinces. The Peninsular Ranges province extends southward from the Basin as a series of fault-bounded northwest-trending mountain ranges and intervening valleys. The northern boundary of the Basin consists of mountains of the Transverse Ranges province. The east-west trend of the Transverse Ranges topography reflects the geologic structure of that province. Because the Basin is at the junction of these two provinces, it includes structural features common to both.

### 6.1.2 Tectonic Setting

The Basin is located within the active boundary zone between the Pacific and North American Plates. In this region, the width of the plate boundary extends more than 220 miles (350 kilometers (km)) from the offshore San Clemente fault zone to the Eastern California shear zone in the Mojave Desert east of the San Andreas Fault zone. At the latitude of Los Angeles the relative right-lateral motion between the Pacific and North American Plates is 1.9 inches (48 millimeters per year (mm/yr)) (DeMets et al, 1994). Deformation along the plate boundary involves northwest trending right-lateral strike-slip faulting of the San Andreas fault and parallel faults of the San Andreas system, east to northeast-trending left-lateral strike-slip and reverse oblique faulting along the southern boundary of the Transverse Ranges, and west-northwest trending thrust and reverse faults within the Transverse Ranges (Walls et al., 1998).

The high rate of relative motion between the Pacific and North American plates is accommodated along eight major and numerous smaller fault zones. From west to east, the major fault zones include the San Clemente, Santa Cruz-Santa Catalina Ridge, Palos Verdes, Newport Inglewood, Elsinore, San Jacinto, and San Andreas faults, and the Eastern California shear zone faults.

The Elsinore, San Jacinto, and San Andreas faults to the east of the Project are among the most active faults in California. Each of these faults has a high slip rate and has had at least one moderate to large magnitude historical earthquake. Movement along these three faults accounts for more than 70 percent of the overall plate regional strain rate (DeMets et al, 1994). Recurrence intervals on these faults are on the order of several hundreds of years.

Major earthquakes along these larger faults, and smaller, less frequent earthquakes on other faults in the region, account for the seismic exposure of the project site. Specific seismic sources considered for evaluating potential geologic hazards at the site are discussed in Section 6.3. The locations of regional faults are shown in Figure 6-1.

The two closest known members of the active northwest-trending set of faults associated with the San Andreas system are the Newport-Inglewood fault, located 4.3 miles (7 km) northeast of the site and the Palos Verdes fault, located about 2.5 miles (4 km) to the southwest. A blind thrust fault, the THUMS-Huntington Beach (THUMS-HB) fault, has been identified dipping shallowly to the northeast beneath the site between the Newport-Inglewood and Palos Verdes faults. The shallowest portion of the THUMS-HB fault is buried at a depth of approximately 4,000 feet (1,225 m) beneath very young sediments, about 1 mile (1.6 km) southwest of the site (Appendix 6-2, URS, 2003a). The depth of the seismogenic portion of the fault is estimated to be 4,600 feet (1.4 km).

The Project is located on the south flank of the northwest-southeast trending Wilmington anticline, a basement-cored fold situated on the upper plate of the THUMS-HB fault. The Quaternary displacement on the THUMS-HB fault is inferred to be reverse, with some undefined component of right-lateral slip, on the basis of tilted, relatively recent sediments on the south limb of the anticline (Appendix 6-2, URS, 2003a).

### 6.1.3 Site Geology

The LNG terminal site is located on up to 80 feet (25 m) of artificial fills and estuarine deposits. The estuarine deposits (silt and clay) are underlain by marine sands and sandy and gravelly sand layers of the Gaspur aquifer. Based on interpretation of a high-resolution seismic survey in the Long Beach Harbor and deep drilling (1,200 feet (368 m) below ground surface (bgs)) at a nearby location, the top of the San Pedro Formation, which is older than 200,000 ybp, occurs at a depth of about 315 feet (97 m) bgs (Edwards et. al., 2001, 2002, and 2003). The San Pedro and older strata dip to the south on the south limb of the Wilmington anticline, but there is no apparent displacement of the San Pedro and older strata in the vicinity of the site.

The pipeline route crosses similar geologic units (fill and young sedimentary deposits) for most of its extent. Surficial deposits along the northernmost 0.2 miles (0.3 km) of the route have been mapped as Holocene alluvium, consisting of soft clay, silt, silty sand and sand of distal fan deposits associated with the active Los Angeles River system (CDMG, 1998).

## 6.2 GEOLOGIC RESOURCES

### 6.2.1 Mineral Resources

Petroleum production from the Wilmington anticline, a portion of which underlies the site, has continued from the 1930s to the present. The nearest petroleum production facilities are located adjacent to the east property line of the site. No active wells are located within the site. Table 6-1 shows the active wells within 150 feet of the terminal footprint or the pipeline.

**Table 6-1 Active Production and Injection Wells within 150 Feet of the Project**

| WELL-ID | API# | type | Distance from Project | Status | Barrels Monthly Range 2003 |
|---|---|---|---|---|---|
| FE424 | 23702175 | Injection | 75' east of terminal footprint | Actively injecting in 2003 | 26,000-40,000 water |
| W426 | 23702703 | Production | 75' east of terminal footprint | Shut-in | No production |
| 3L6C | 03704034 | Prod-water, idle | 140' west of pipeline | Observation only | No production |

The production wells are at great depth (4,000+ feet, 1,220+ m). Injection wells withdraw water from the Gaspur, Gage, and Lynnwood aquifers below Pier T and reinject it into the oil sands. (Final EIS/EIR for the Disposal and Reuse of Long Beach Complex, Long Beach, California, Department of the Navy, 1998; Goldman 2003).

There are many abandoned production wells in the area of the project. There are eight abandoned wells immediately adjacent to the terminal footprint, and the pipeline route is adjacent to over 40 abandoned wells. Abandoned and active wells are available in a georeferenced database and are plotted in Figure 6-2 on an aerial photo background to show general locations of wells within 150 feet of the location of the Project components. No other geologic resource has been identified in the vicinity of the site or pipeline route.

Ground subsidence that occurred in the area due to rapid withdrawal of reservoir fluids in the 1940s and early 1950s has been controlled by reinjection of water to maintain reservoir pressure. The balance of oil production and water injection is monitored by the City of Long

Beach, Department of Oil Properties. In the biennial report entitled "Elevation Changes in the City of Long Beach, November 2001 to January 2003", the Department of Oil Properties states that less than 0.05 feet (0.6 inches, 15 mm) of subsidence occurred on all of Pier T during the reporting interval. The Department of Oil Properties is charged with a twice-yearly survey to measure and record subsidence and rebound (ground response to water injection, a phenomenon that takes at least 6 months after injection is started, (Long Beach 2003).

The Wilmington Oil Field, where oil near Pier T is extracted from oil sands at depths ranging from 4,000 to 5,000 feet (1220-1525 m) bgs (Goldman 2003), was divided into "fault block zones" and each zone was consolidated under one administrator (Long Beach 2003b). The City of Long Beach administers the block beneath Pier T and one oil company (Tidelands Oil) does all the drilling (Long Beach 2003b). There is a complex revenue distribution system from oil receipts as mandated by the 1958 California Subsidence Act that funds the studies and injection wells to monitor and control subsidence (Long Beach 2003a). Historical records show that subsidence has been controlled (Long Beach 2003).

### 6.2.2 Paleontological Resources

The terminal site and the pipeline route are located in areas of deep, man-placed fill. No undisturbed fossils are present near ground surface in the site vicinity. No paleontological resources exist in the site vicinity.

## 6.3 POTENTIAL GEOLOGIC HAZARDS

The LNG terminal site is located in a region of high seismic activity, which is concentrated to the northwest, north and southeast of the site. The earthquakes are primarily associated with the mapped fault zones that are shown on Figure 6-1. The largest historical earthquakes within about 20 km of the site are:

- 1933 Long Beach earthquake, a magnitude 6.4 event generated by the Newport-Inglewood fault approximately 13 miles (21 km) from the site, and
- two local magnitude ($M_L$) 4.8 earthquakes in October and November of 1941 in the Carson-Long Beach-Wilmington area, also within the Newport-Inglewood fault zone approximately 4.4 miles (7km) and 2.5 miles (4 km) from the site, respectively.

Large events (moment magnitude ($M_w$) ≥ 6.5) within 63 miles (100 km) of the Project are listed in Table 6-2.

**Table 6-2 Earthquakes of Magnitude Mw ≥ 6.5 Within 100 km of Project**

| Date (MO-DY-YR) | Earthquake | Causative Fault | $M_w$ | Epicentral Distance in miles (km) |
|---|---|---|---|---|
| 12-8-1812 | Wrightwood | San Andreas | 7.5 est. | 49 (81)[1] |
| 1-9-1857 | Fort Tejon | San Andreas | 7.9 est. | 49 (81)[2] |
| 2-9-1971 | San Fernando | San Fernando | 6.6 | 4 (7) |
| 1-17-1994 | Northridge | Northridge blind thrust | 6.7 | 37 (60) |

(1) The exact location of the 1812 earthquake on the San Andreas fault is uncertain but there is evidence for surface rupture on both the Wrightwood and Mojave segments. This is the closest distance from the Mojave fault segment to the LNG terminal site.

(2) This is the closest distance from the 1857 fault rupture to the LNG terminal site; epicentral distance was approximately 187 miles (300 km) northwest of site.

Similar earthquakes can be expected to occur in the site vicinity in the future. Potential hazards that might affect the site are discussed in the following subsections.

### 6.3.1 Surface Fault Rupture

Surface fault rupture hazard was evaluated by URS (2003a, Appendix 6-2) consistent with the California Board for Geologists and Geophysicists *Geologic Guidelines for Earthquake and/or Fault Hazard Reports*. No active surface faults are known to occur within the LNG terminal site boundaries or along the pipeline or electrical distribution line route (Dibblee, 1999; Ziony and Jones, 1989; Jennings, 1994), and the site is not located within an Alquist-Priolo Earthquake Fault Zone (California Division of Mines and Geology - CDMG, 2000). Consequently, there is not a potential surface fault rupture hazard at the proposed LNG terminal site or along the pipeline. The closest designated Alquist-Priolo Earthquake Fault Zone to the Project is the Newport-Inglewood fault zone, approximately 4.3 miles (7 km) northeast of the site. Although it is known to offset Holocene sediments, the Palos Verdes fault is not formally zoned by the California Geological Survey (formerly Division of Mines and Geology). The main trace of this fault is approximately 2.5 miles (4 km) southwest of the LNG terminal site.

The subsurface trace of the THUMS-HB fault is also thought to have been active during Holocene time. That fault dips northeast beneath the LNG terminal site, and projects toward the surface approximately 1 mile (1.6 km) southwest of the site. Based on the available data, the THUMS-HB fault is not considered to pose a potential surface rupture hazard at the site.

### 6.3.2 Strong Ground Shaking

The largest historical ground motion in the Project area is estimated to have been produced by the 1933 Long Beach earthquake. Peak ground accelerations (PGA) of 0.20 g (NS component) and 0.29 g (vertical component) were recorded at the nearby Long Beach Public Utilities Building during this event. PGA values of 0.20 g (330°- horizontal component) and 0.05 g (vertical component) were recorded during the 1994 Northridge earthquake at the nearby Fire Station 111 site on Terminal Island (Appendix 6-2, URS, 2003a). PGA values less than 0.1 g were recorded at (1) the nearby Southern California Edison site on Terminal Island during the 1971 San Fernando earthquake, (2) the Fire Station 111 site during the 1987 Whittier Narrows earthquake ($M_w$ 6.0), and (3) the Long Beach Public Utilities Building during the 1941 Wilmington earthquake ($M_L$ 4.8) (Appendix 6-2, URS, 2003a).

In order to estimate the likelihood and extent of ground motion during future earthquakes, both probabilistic and deterministic analyses were run by URS (2003a). Fault parameters used for the Probabilistic Seismic Hazard Analyses (PSHA) (fault type, magnitude of maximum or upper earthquake ($M_{max}$), and distance to the LNG terminal site) are summarized in Table 6-3. Only those faults potentially having a significant contribution to the ground-motion hazard at the LNG terminal site are included in the table.

**Table 6-3 Summary of Fault Parameters**

| Fault Name | Abbreviation | Type | $M_{max}$ ($M_w$) | Distance mi (km) |
|---|---|---|---|---|
| THUMS-Huntington Beach | THUMS - HB | R-RL | 7.0 | 1.4 (2.2) |
| Palos Verdes – PV & San Pedro Shelf Segments | PVF | RL-R | 7.0-7.4 | 2.5 (4) |
| Newport-Inglewood – Onshore | NIF | RL | 7.0-7.2 | 4.4 (7) |
| Palos Verdes-Santa Monica Bay | PVF-SMB | RL | 6.6 | 11.3 (18) |
| Puente Hills Thrust—Santa Fe Springs & Coyote Hills segments | PHT-SFS CH | R | 7.1 | 10.6 (17) |
| Puente Hills Thrust—Los Angeles segment | PHT-LA | R | 6.9 | 15 (24) |
| Elysian Park Thrust | EPT | R | 6.6 | 18.1 (29) |
| Newport-Inglewood – Offshore | NIOF | RL | 7.0 | 21.9 (35) |
| Santa Monica | SantaMon | LL-RO | 6.6 | 23.8 (38) |
| Whittier-Elsinore-Whittier segment | WEWhittier | RL | 6.9 | 19.4 (31) |
| Hollywood | Hollywd | LL-RO | 6.6 | 24.4 (39) |
| Raymond | Raymond | LL-RO | 6.5 | 25 (40) |
| Verdugo | Verdugo | R | 6.7 | 26.3 (42) |
| Sierra Madre | SierraMa | R | 7.4 | 30 (48) |
| Northridge | Northrdg | R | 6.9 | 35 (56) |
| San Fernando | SanFern | R | 6.7 | 35.6 (57) |
| Cucamonga | Cucamong | R | 7.0 | 36.3 (58) |
| Whittier-Elsinore-Glen Ivy segment | WEGlenIvy | RL | 6.9 | 38.1 (61) |
| Santa Susana | SantaSus | R | 6.8 | 40.6 (65) |
| Whittier-Elsinore-Temecula segment | WETemecula | RL | 7.0 | 46.9 (75) |
| San Andreas-Mojave segment | SAMojave | RL | 7.5 | 50.6 (81) |
| San Jacinto-San Bernardino segment | SJSanBer | RL | 6.75 | 52.5 (84) |
| San Andreas-San Bernardino segment | SASanBer | RL | 7.25 | 54.4 (87) |
| San Jacinto-San Jacinto segment | SJ SanJac | RL | 7.0 | 56.3 (90) |
| San Jacinto-Anza segment | SJAnza | RL | 7.4 | 74.4 (119) |
| San Andreas-Coachella Valley segment | SACoache | RL | 7.5 | 100 (160) |
| San Andreas-Carrizo segment | SACarriz | RL | 7.75 | 106.3 (170) |

Notes: LL-RO = Left lateral reverse oblique; R = Reverse; RL = Right-lateral; $M_w$ = Moment Magnitude; Distance = closest distance from fault to site.

The THUMS-HB is included as a potential seismic source based on correlation of recent (Edwards et al., 2001, 2002, and 2003) subsurface borehole and high-resolution seismic reflection data. The data indicate uplift on the Wilmington anticline has apparently deformed latest Pleistocene and possibly early Holocene strata. This uplift is inferred to be a result of reverse displacement on the blind THUMS-HB fault.

Fault parameters selected for the PSHA are the same as or similar to those used by CDMG/USGS (1996). Where appropriate, more recent data on the faults considered to be seismic sources were used to modify the CDMG/USGS parameters. Except as noted below, the $M_{max}$ used for each source is the best estimate value based on historical seismicity, physical fault parameters (e.g. fault rupture length, fault rupture area, maximum surface displacement, etc.), and empirical relationships between these fault parameters and earthquake moment magnitude by Wells and Coppersmith (1994) and Dolan et. al. (1995). A range of values for $M_{max}$ are used for the Palos Verdes and Newport-Inglewood faults because these faults contribute the greatest amount to the seismic hazard at the site and there is uncertainty associated with some of the fault parameters (e.g. slip rate, rupture length and type, etc.). A logic tree was developed for each of these faults to account for the uncertainty in $M_{max}$ as well as the recurrence rate. A simpler logic tree was also developed for the recurrence of $M_{max}$ on the THUMS-HB fault.

Strong ground motion for seismic design of the planned LNG facility was assessed consistent with criteria specified by the National Fire Protection Association Standard NFPA 59A. This assessment by URS (2003a) was also consistent with California Geologic Survey Note 48 *Checklist for the Review of Geologic/Seismic Reports for California Public Schools, Hospitals, and Essential Services Buildings.* Probabilistic and Deterministic Seismic Hazard analyses indicated horizontal PGAs of 0.44 g and 0.88 g for the selected Operating Basis Earthquake (OBE) and the selected Safe Shutdown Earthquake (SSE), respectively. As specified therein, the OBE recurrence interval is 475 years and the SSE recurrence interval is 5,000 years for probabilistic hazard analyses. OBE and SSE magnitudes of 7.0 and 7.4, respectively, were selected for liquefaction assessment based on the results of the PSHA. The Palos Verdes fault, located 2.5 mi (4 km) southwest from the site, was found to be the main contributor to the ground-motion hazard (Appendix 6-2, URS, 2003a).

### 6.3.3 Liquefaction and Lateral Spreading

Liquefaction is a phenomenon whereby saturated granular soils undergo significant loss of strength when they are subjected to vibration or large cyclic ground motions produced by earthquakes.

Loose, saturated granular soils (i.e., sands) are most susceptible to liquefaction. Factors affecting the potential for liquefaction are relative density, amplitude of loading, confining pressure, past stress history, age of soil deposit, the size, shape and gradation of soil particles, and the soil fabric structure. Liquefaction-induced ground settlement and lateral spreading have been the primary cause for extensive damage to aboveground structures, foundations and pipelines during historical earthquakes worldwide.

According to the Maps of Seismic Hazard Zones prepared by the California Department of Conservation, Division of Mines and Geology (now known as the California Geological Survey), the Project, including the pipeline and electric distribution line routes, is located within a liquefaction hazard zone (CDMG, 1998).

The combination of high seismicity, shallow groundwater conditions and weak hydraulic fills with predominantly sandy and silty soils result in a significant potential for liquefaction at the LNG terminal site. Liquefaction-induced hazards at the site include post-earthquake settlements in the hydraulic fill area, and shaking-induced lateral deformations and potential instability of the existing waterfront structures (Appendix 6-1, URS, 2003b).

Evaluation of the potential for liquefaction and shaking-induced settlements were performed by URS consistent with the *Recommended Procedures for Implementation of DMG Special Publication 117, Guidelines for Analyzing and Mitigating Liquefaction in California*. URS used the Liquepro software package (Civiltech Software, 2003) and other analytical methodologies (Seed and de Alba, 1986; Tokimatsu and Seed, 1987; Youd and Idriss, 2001). The results of the analyses show that for both the OBE and SSE events, the upper 65 feet (20 m) of loose to medium dense granular materials below groundwater tend to liquefy. However, intermittent silt and clay layers, in some cases of significant thickness, are present within this zone and will likely reduce the magnitude of liquefaction-induced settlements (Appendix 6-2, URS, 2003a).

Immediately after the earthquake, shaking-induced excess pore-water pressures in the hydraulic fills will dissipate, causing post-earthquake settlements in the fill area. The results of URS's analyses indicate that post-earthquake settlements could range from 7 to 20 inches for the OBE event and from 12 to 25 inches for the SSE event (Appendix 6-1, URS, 2003b).

### 6.3.4 Tsunami

Tsunami hazards along the Southern California coast may occur as a result of far-field (distant) earthquakes, local offshore earthquakes or submarine landslides in the continental borderland. The history of tsunamis in California from 1812 to 1975 is summarized by McCullough (1985). There have been no known southern California tsunamis since that time. No local southern California earthquakes have generated historical tsunamis of significance in Long Beach Harbor, including the 1933 event. There have been several historical tsunamis (1868, 1933, 1946, 1952 (2 events), 1957, 1960, and 1964) from distant sources (e.g. Chile, Alaska, Japan, and Kamchatka) recorded in Long Beach or Los Angeles Harbors, the largest of which has a reliable record in the 5 foot (1.5 m) range. That event was the result of the 1960 Chile earthquake of $M_w$ 9.5, the largest known historical earthquake. Tsunami risk zone maps for California are not currently available from the National Oceanic and Atmospheric Administration (NOAA) or California Office Emergency Services (OES). However, URS contacted Jose Borrero at he University of Southern California, who performed the recent tsunami modeling for NOAA/OES with Dr. Costas Synolakis. The modeled tsunami run-up values presented in the URS,2003a and in this report are based on their work.

Estimates of runup heights and/or inundation have been developed, primarily from far-field sources. The most recent estimates for the Port of Long Beach area are a 100-year ($R_{100}$) runup height of +8 feet (2.5 m) and a 500-year ($R_{500}$) runup of +15 feet (4.6 m) (Synolakis, 2003). While these estimates were not developed based on specific tsunami source scenarios with estimated probabilities of occurrence, these heights are considered to be representative values useful for emergency planning. The $R_{100}$ value is considered to be most representative of far field (i.e. Alaska, Japan, South America subduction zone earthquakes) generated tsunamis, and the $R_{500}$ value is more representative of locally (continental borderland earthquakes and/or submarine landslides) generated tsunamis (Synolakis, 2003). The LNG terminal site elevation is approximately 25 feet (7.7 m) above mean lower low water (MLLW), which is above the estimated tsunami runup values. This would also be the case if the 500-year runup of +15 feet (4.6 m) were to occur coincident with the historic high tide of +7.45 feet (2.3 m) MLLW. Thus, the tsunami hazard at the site and along the pipeline is judged to be low.

The estimated rate of eustatic sea level rise during the project lifetime is 0.04-0.08 inches per year (1-2 mm/yr) (Intergovernmental Panel on Climate Change, 2001). Assuming a 50-year project lifetime, the eustatic sea level rise would be 2-4 inches (0.05-0.10 m). This amount would not be significant relative to the flooding or tsunami hazard at the site.

## 6.4 ENVIRONMENTAL CONSEQUENCES

The LNG facility and pipeline will be designed to withstand the design ground motions and secondary ground deformation in accordance with applicable regulations (e.g. NFPA 59A) and codes (e.g. California Building Code), as well as the current state of the practice for seismic design of LNG tanks and pipelines. The POLB will evaluate the wharf and bulkhead stability with respect to the OBE and SSE and strengthen these as appropriate to meet the performance criteria for the LNG tanks and associated facility. The specific criteria and details will be determined during the design process based on the selected LNG tank design. If appropriate mitigation measures are deemed necessary to strengthen the wharf and/or bulkhead but are not implemented, the facility could be damaged beyond the level accommodated for in the structure, pipeline and tank design. Mitigation measures could include structural improvements to the wharf and/or bulkhead, ground improvement to stiffen the liquefiable soils, and/or foundation design to mitigate liquefaction (e.g. stone columns).

The pipeline will be buried above the groundwater table and placed with granular or slurry backfill surrounding it. Therefore there is a low potential for significant impact to the pipeline from liquefaction. There is not a safety problem with welded steel pipeline during a liquefaction event, because even if a lens of liquefaction occurs along its length, it can span several hundred feet unsupported without failing. In addition, in a liquefaction event, the pipeline is more likely to be buoyed up or floated than it is to be without support, and again, it can withstand the floating pressure over several hundred feet. The pipeline may float up to just below the road base and, after the liquefaction event, have insufficient cover. This may require repositioning the pipeline but would not cause a rupture and would therefore not be a catastrophic event. In the case of the channel crossing, the drill is deep and is overlain be several clay lenses. While some may liquefy, not all would, and there is no chance that the pipeline would float out of its installed location under the channel. The electric distribution lines will not be adversely impacted by liquefaction.

No blasting will be required for construction of the project.

No active surface faults are known to occur within the LNG terminal site boundaries nor along the proposed pipeline route. The site is not located within an Alquist-Priolo Earthquake Fault Zone. Consequently, there is no potential for surface fault rupture at the LNG terminal site or along the pipeline route (Appendix 6-2, URS, 2003a). Based on recent tsunami occurrence and runup models, the potential for damage due to tsunami at the site and along the pipeline route is judged to be low (Appendix 6-2, URS, 2003a) and project specific mitigation measures to mitigate a tsunami are not warranted.

Construction and operation of the LNG facility will not affect petroleum recovery operations. All wells will be located in the field just prior to construction. The California Department of Conservation, Division of Oil Gas, and Geothermal Resources (DOGGR) conducts a Construction Site Review just prior to construction and provides a complete list of mitigation measures that must be incorporated into construction to protect active production and injection wells, as well as management techniques for dealing with abandoned wells. SES will assure that the Contractor applies for a Construction Site Review and abides by the terms and conditions of the Division's requirements. Conversely, continued oil production should have no effect on the operation of the LNG facility, as subsidence has been controlled and the area is now stable and under active management. New electric distribution line poles will be located away from any production, injection, or abandoned well.

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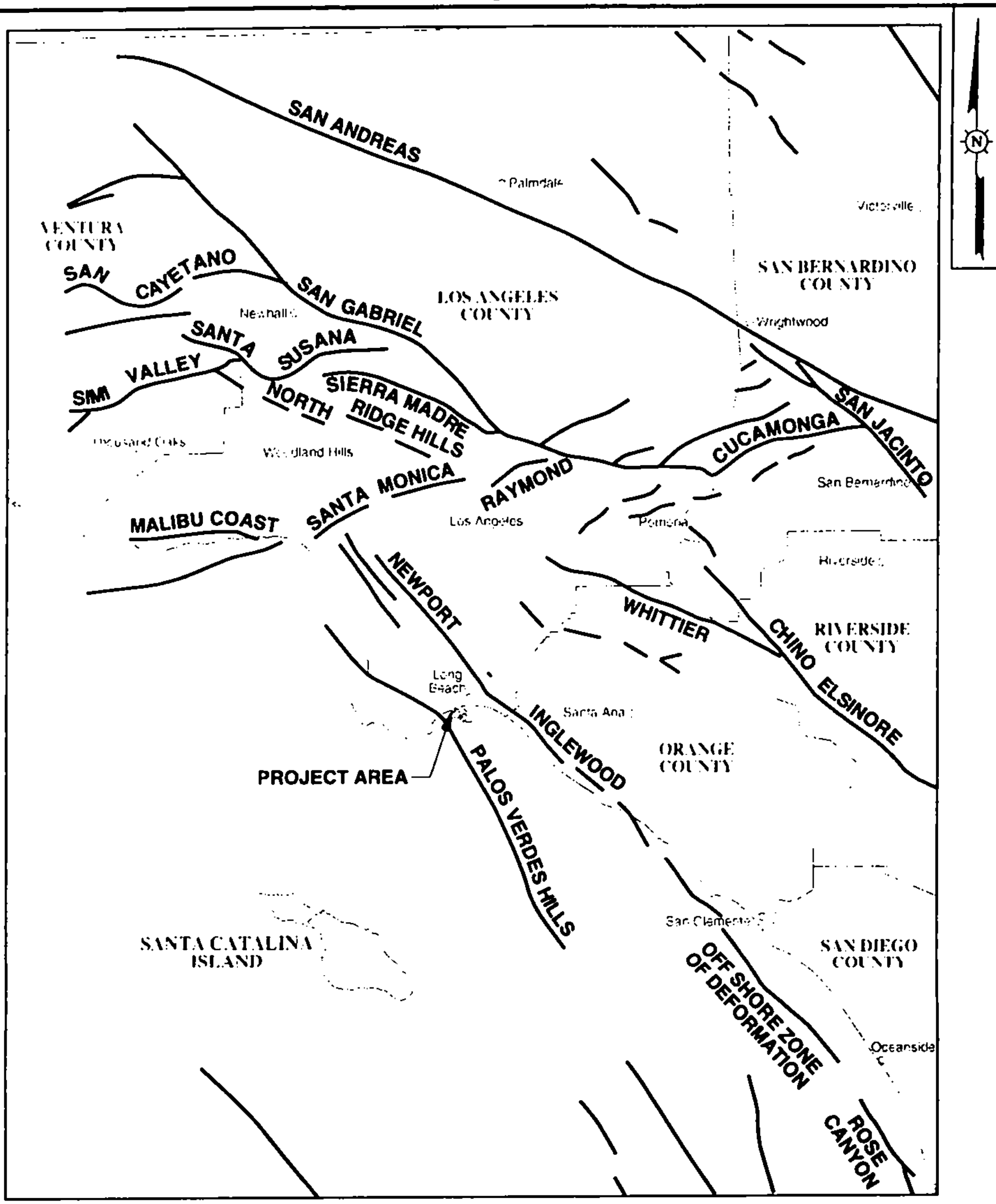



SOURCE: Ninyo & Moore, 1995.

**SOUND ENERGY SOLUTIONS**

**FAULT LOCATION MAP**

LONG BEACH LNG IMPORT PROJECT
LONG BEACH, CALIFORNIA

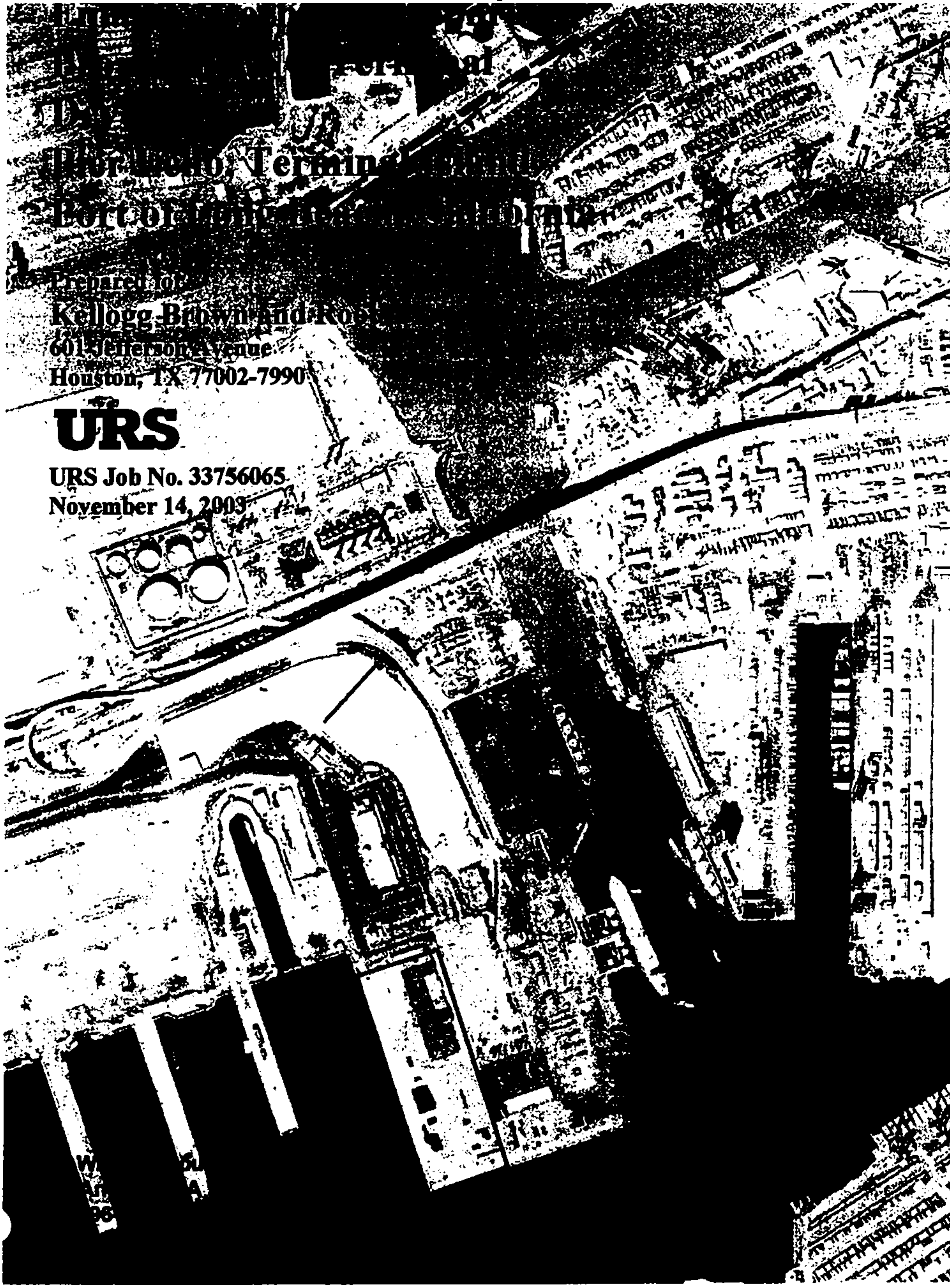
TRC

**FIGURE 6-1**

***NON-INTERNET PUBLIC***

**FIGURE 6-2**

**Oil Wells and Injection Wells within 150 feet Of the Project Area**



Prepared for:
Kellogg Brown and Root
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URS

URS Job No. 33756065
November 14, 2003

**URS**

November 14, 2003

Kellogg Brown and Root
601 Jefferson Avenue
Houston, TX 77002-7990

Attention: Mr. Vinod Duggal

Re: Final Geotechnical Report
Proposed LNG Import Terminal Development
Pier Echo, Terminal Island
Port of Long Beach, California
For Kellogg Brown and Root
URS Job No. 33756065

Dear Mr. Duggal:

This letter transmits our Final Geotechnical Report for the proposed Liquefied Natural Gas (LNG) Import Terminal Development at Pier Echo in the Port of Long Beach, California. A summary of the site history and the field exploration and laboratory testing programs performed for the project are included herein. The report includes a discussion of foundation and site improvement schemes to mitigate excessive total and differential static settlements, liquefaction-induced settlements and lateral spreading, and presents geotechnical recommendations for design and construction of the proposed LNG Terminal.

We have greatly appreciated this opportunity to assist you with this challenging project, and are looking forward to continuing services throughout the design and construction phases.

Sincerely,

**URS Corporation**

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## EXECUTIVE SUMMARY

A geotechnical investigation was performed to develop design recommendations for the proposed Liquefied Natural Gas (LNG) Import Terminal at Pier Echo in the Port of Long Beach, California. The development will include two 255-foot diameter LNG storage tanks and other major structures and support facilities. The project site is bounded by the West Basin and Middle Harbor to the west and south, respectively.

Following a review of historic site development and previous geotechnical reports, URS performed a site investigation including 9 exploratory borings, 13 cone penetration tests, and seismic-velocity testing. The northern portion of Pier Echo was reclaimed in the early 1940's, but most of the project site in the southern portion was created during a second phase of reclamation in the early 1950's. Located in the south-west corner of Pier Echo, the site is on hydraulic fill which is retained along the waterfront by a cellular steel sheetpile bulkhead in the south, and a rock dike with a pile-supported concrete wharf in the west.

Subsurface conditions consist of variable layers of loose to medium dense sands and soft silts and clays in the upper 80 feet, comprising hydraulic fill and estuarine deposits. These materials are underlain by dense to very dense marine sands and the predominantly granular sediments of the Gaspur Aquifer. As a result of oil extraction within the harbor, the project site experienced up to 14 feet of subsidence through the 1960's. Subsidence was arrested in the 1970's by water injection.

The site liquefaction potential was evaluated for an Operating Basis Earthquake (OBE) and a Safe Shutdown Earthquake (SSE); with horizontal peak ground accelerations of 0.44g and 0.88g and corresponding magnitudes of 7.0 and 7.4, respectively. The results of our analyses indicate that, without soil improvement, the upper 65 feet of loose to medium dense granular materials below groundwater would liquefy, with estimated post-earthquake settlements on the order of 19 to 25 inches for the OBE and SSE events, respectively.

Static settlements of the LNG tanks were analyzed under hydro-test loading conditions, in order to determine the need for ground-improvement to meet the specified settlement criteria. The analyses were performed in two steps. First, the compressibility of the foundation improved with stone-columns was evaluated with cylindrical axisymmetric unit-cell models consisting of a single stone column laterally confined by soil. The second analysis step involved full-size plane-strain models of the tank foundation consisting of horizontal continuum layers representing the composite (i.e. soil + stone columns) material behavior derived from the unit-cell model.

The results of our foundation analyses indicate that ground improvement and/or deep pile foundations will be necessary in order to avoid liquefaction-related damage, and to meet the stringent static-settlement criteria for the proposed LNG tanks and other major structures. Foundation options satisfying these requirements include (1) stone columns installed after pre-loading the site with a 25-foot surcharge fill; (2) stone columns installed after excavating the upper 15 feet of soils and subsequent replacement with engineered fill; (3) stone columns installed after excavating the upper 15 feet and subsequent construction of the tank at the bottom of the excavation; (4) driven piles installed after replacement of the upper 15 feet of soils with engineered fill; and (5) driven piles without soil replacement, but installed at closer spacing.

The seismic performance of the existing waterfront structures with respect to their ability to provide adequate lateral confinement for the tank foundations was also analyzed for both stone-column and driven-pile foundation options. The analysis results suggest that both the existing pile-supported concrete wharf and the cellular bulkhead would suffer moderate to extensive structural damage during OBE and SSE shaking, respectively. However, these structures would still be capable of providing the necessary confinement for the LNG-tank foundations to withstand OBE and SSE shaking without suffering excess lateral or vertical deformations.

The analysis results and recommendations provided herein should be further refined for purposes of the final-design phase of the project. Besides performing additional borings and/or CPT probes to better define the significantly varying soil conditions of this site, the as-built dimensions and integrities of the water waterfront structures should also be investigated.

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# FINAL GEOTECHNICAL REPORT
# PROPOSED LNG IMPORT TERMINAL DEVELOPMENT
# PIER ECHO, TERMINAL ISLAND
# PORT OF LONG BEACH, CALIFORNIA

## 1.0 INTRODUCTION

This report presents the results of a geotechnical investigation performed by URS Corporation (URS) for the proposed Liquefied Natural Gas (LNG) Import Terminal at Pier Echo in the Port of Long Beach (POLB), California. Our general understanding of the project is based on information provided by Kellogg Brown and Root (KBR) and Sound Energy Solutions (SES), the project owner. The proposed project includes two new 255-foot diameter LNG storage tanks and various support facilities and structures. The location of the site with respect to existing topographic features is shown on the Vicinity Map, Figure 1-1.

Our services have been performed as authorized by KBR Contract No. 6801-01-SC-001-03, dated June 5, 2003, in general accordance with URS Proposal No. 0303-040, dated March 6, 2003, our revised proposal, dated March 20, 2003, and KBR Technical Specifications K20-1C-6801, Technical Standards K20-1TS-6801 and K20-2TS-6801, and Purchasing Standard K20-1PS-6801.

This report includes a discussion of the key geotechnical issues pertinent to the proposed project, and our geotechnical recommendations for design and construction of the project. Regional tectonics and seismicity, regional and local geology, and earthquake ground-motion hazards at the site are presented in a separate report prepared by URS, titled "Final Report, Seismic Hazard Analysis for LNG Import Terminal, Port of Long Beach, California," dated September 10, 2003 (URS Job No. 33756066).

Conclusions and recommendations presented in this report are based on subsurface conditions encountered at the locations of our explorations. Soil data obtained during our field explorations were observed and interpreted at our boring locations only. Conditions may vary between boring locations, and should not be extrapolated to other areas without prior review of the geotechnical engineer.

## 1.1 PROJECT DESCRIPTION

The project site is located in the southwest corner of Pier Echo and includes Berths T-124 through T-127. Pier Echo is located in the southeast corner of Terminal Island in the Port of Long Beach, as shown in Figure 1-1. The project site is bounded by the Pier T Hanjin Marine Terminal to the north, Arco Oil Terminal and Fremont Forest lumber facilities to the east, and the West Basin and Middle Harbor to the west and south, respectively.

The proposed project consists of development of a new LNG import terminal. The terminal will include two LNG storage tanks, a LNG truck-loading storage tank, $C_2/C_3$ extraction unit and tanks, recondenser unit, boil-off gas (BOG) compressor unit, vehicle fueling station, administration and maintenance facilities, utility support infrastructure, parking areas, and an offshore berthing structure connected to the existing wharf on the west side of the site. Our scope of work did not include providing geotechnical recommendations for this berthing structure.

The proposed 255-foot diameter, 168-foot high, LNG tanks will consist of an inner tank with double steel walls, housed within a free-standing concrete wall. The 243-foot diameter, 122 ½-foot high, inner steel tank will rest on a foam glass pad and will be surrounded by expanded perlite ore insulation. The inner tank will be covered with an aluminum deck (with glass fiber insulation), which is suspended by hangers from the outer tank's domed roof. The outer steel tank will line the inside of the 255-foot outside diameter, pre-stressed concrete shell. The tank will be founded on a 260-foot diameter, 4-foot thick reinforced concrete mat established at-grade.

A 20-foot high concrete containment wall will surround the tank areas. Site preparation will include demolition of an existing building and pavements and utilities. A layout of the site with the proposed LNG tanks and terminal facilities is shown in Figure 1-2, and major structures and anticipated loads are summarized in Table 1-1.

We understand that the project will also include a utility corridor connecting the LNG terminal to the existing gas grid. The selected pipeline alignment will likely include a channel crossing. Evaluation of this pipeline alignment was not included in our scope of work.

## 1.2 PREVIOUS GEOTECHNICAL STUDIES

URS (as Dames & Moore) has previously performed geotechnical investigations at Pier Echo for the following facilities: the Scrap Metal Handling Facility at Berths T-118 and T-119 (Dames & Moore, 1993) and Arco Marine Tanker Terminal and Crude Oil

Transfer Facility at Berth T-121 (Dames & Moore, 1981). These investigations included onshore and offshore mud-rotary borings and Cone Penetrometer Tests (CPT's) to depths ranging between 46 feet and 152 feet below the existing ground surface.

URS has also performed numerous other geotechnical investigations within the general vicinity of the project site at Piers D, E, F, S, and T, and the Naval Station Mole. The geotechnical reports of these projects, as well as geotechnical investigation reports prepared by other consultants within the vicinity of the project site, were reviewed during the current study. These reports are summarized in the Reference section, and the Logs of Borings are presented in Appendix A. Locations of these borings with respect to the project site are shown in Figure 2-1.

## 1.3 PURPOSE AND SCOPE OF WORK

The purpose of our geotechnical investigation was to explore and evaluate the subsurface conditions at the site in order to develop geotechnical recommendations for design and construction of the project. Our scope of work, as outlined in the URS proposal dated March 6, 2003, included the following tasks:

- Review of available geotechnical data pertinent to the project site;
- Preparation of a site-specific Health & Safety Plan for the field investigation;
- Site reconnaissance to observe the existing site features and plan the proposed exploration locations;
- Contacting Underground Services Alert (USA) of Southern California to identify subsurface utilities, and obtain clearance for exploration locations at the site;
- Geophysical survey at selected exploration locations to identify active utility pipelines and electrical conduits;
- Drilling and sampling eight (8) mud-rotary borings to depths ranging between 100 feet and 160 feet below existing ground surface;
- Advancing thirteen (13) CPT's to depths of 100 feet below existing ground surface;
- Downhole seismic velocity testing within the 160-foot deep borings, drilled in the center of each proposed LNG storage tank;

- Surface seismic velocity testing within the proposed footprint of each LNG tank;
- Disposal of investigation-derived drilling wastes at an appropriate off-site facility;
- Geotechnical laboratory testing of representative samples to classify soils and evaluate their strength, compressibility and other pertinent geotechnical characteristics;
- Evaluation of site liquefaction potential, liquefaction-induced settlements and lateral spreading;
- Seismic-stability evaluation of the site and existing waterfront structures, including development of potential wharf strengthening and/or replacement schemes;
- Development of potential foundation and site improvement schemes, including evaluation of static total and differential settlements for these schemes;
- Evaluation of the corrosion potential of the near-surface soils at the site;
- Preparation of this engineering report, which includes our findings and recommendations.

During the course of the geotechnical investigation, visual examination of soil samples collected from the borings was performed to identify obvious signs of soil contamination. However, a detailed environmental site characterization was not included in our scope of work.

**TABLE 1-1**

**PROPOSED MAJOR STRUCTURES AT LNG TERMINAL**

| Structure | Dimensions | Anticipated Load Conditions (kips) |
|---|---|---|
| LNG Storage Tanks (x2) | 255-foot diameter, 168-foot high | 275,000 operating; 320,000 hydrotest |
| Truck-Loading Storage Tank (similar construction to large LNG storage tanks) | 65-foot diameter | 9,600 operating; 15,500 hydrotest |
| $C_2$ Tank – supported on 13 legs | 82-foot diameter | 18,200 (1,400 per leg) operating; 31,200 (2,400 per leg) hydrotest |
| $C_3$ Tanks (x2) – supported on 11 legs | 70-foot diameter | 9,900 (900 per leg) operating; 16,280 (1,480 per leg) hydrotest |
| Demethanizer Tower | 18-foot diameter, 80-foot high | 850 operating; 1670 hydrotest |
| Water Expansion Tank – supported by 2 saddle pedestals | 12 ½-foot diameter, 37-foot long | 440 (220 per pedestal) |
| Vaporizer Fluid Units (x3) – supported on 4 legs | 29-foot diameter | 600 (150 per leg) |
| BOG Compressors (x2) | N/A | 300 - 500 |
| Booster Pumps Structure (x2) | 25-foot high | Column loads of 125 axial and 8 shear |
| Main Piperack | N/A | Maximum column loading of 30-50 axial and 7-10 shear |
| Tank Area Containment Wall | 20-foot high | Pile loading of 60-120 compression, 30-60 tension, and 8 lateral |

Notes: N/A = Not Available

***NON-INTERNET PUBLIC***

**APPENDIX 6-1: FIGURE 1-1**

**Vicinity Map**

## *NON-INTERNET PUBLIC*

## APPENDIX 6-1: FIGURE 1-2

## Site Layout

# 2.0 FIELD EXPLORATION AND LABORATORY TESTING PROGRAMS

Geotechnical field exploration and testing activities were initiated on June 19, 2003 and completed on June 30, 2003. All field activities were conducted under the supervision of a geotechnical engineer. The locations of the borings and CPT's are shown in Figure 2-1.

## 2.1 HEALTH AND SAFETY

Drilling and soil sampling activities were performed in strict compliance with a site-specific Health and Safety Plan prepared by a certified URS Industrial Hygienist. The plan generally addressed the potential risks associated with conducting subsurface explorations at Pier Echo. Elements in the plan included emergency contacts, description of potential hazards, protection methods, safe work practices, respirator instructions, monitoring equipment operation, etc.

## 2.2 UTILITIES/BORING CLEARANCE

Prior to initiating any fieldwork, and in accordance with State regulations, URS contacted Underground Service Alert (USA) of Southern California regarding subsurface utility clearance at the site. USA responded by notifying various agencies that identified known underground utilities and subsurface obstructions on the property by marking the ground surface with color-coded paint.

In addition, a geophysical survey was performed by GEOVision of Corona, California at select locations prior to the start of the investigation. The primary purpose of this survey was to identify active buried utility pipelines and electrical conduits at proposed exploration locations. Exploration locations were relocated where interference with utilities was observed.

## 2.3 EXPLORATORY DRILLING PROGRAM

A total of nine (9) borings were drilled to depths ranging from 16 ½ feet to 161 ½ feet below the existing ground surface. All borings were drilled by C&L Drilling of La Habra, California using mud-rotary drilling equipment. Undisturbed samples of the subsurface soils were obtained using Dames & Moore Type-U and Shelby tube samplers. Standard penetration tests (SPT's) were also performed at selected intervals within the borings. A detailed description of the Exploratory Drilling Program, including Logs of Borings, is presented in Appendix B.

## 2.4 CONE PENETRATION TEST PROGRAM

The drilling program was supplemented by performing thirteen (13) CPT's to depths ranging from 93 feet to 100 feet below the existing ground surface. The CPT's consisted of pushing a cone-tipped probe into the subsurface soils, while electronically recording the cone resistance and local friction on the cone sleeve. The tests were performed by Gregg In-situ Drilling of Signal Hill, California, in general accordance with ASTM D-3441-86. Parameters obtained from CPT's were used directly, or were correlated with other data, to estimate soil parameters. A detailed description of the Cone Penetration Test Program, including the Gregg In-Situ, Inc. report and CPT logs, is presented in Appendix C.

## 2.5 SEISMIC VELOCITY SURVEY

A seismic velocity survey was also performed at the site to obtain seismic P-wave and S-wave velocity measurements critical to the seismic risk analysis being performed by URS concurrently with the geotechnical investigation. The survey was performed by GEOVision of Corona, California, and consisted of downhole and surface testing. Downhole testing was performed within the 160-foot deep borings drilled in the center of the LNG storage tanks. The surface testing was performed along two lines within the footprint of each tank. A summary of the Seismic Velocity Survey Program, which includes the GEOVision report, is presented in Appendix D.

## 2.6 GEOTECHNICAL LABORATORY TESTING PROGRAM

Samples obtained from the borings were transported to our Los Angeles laboratory where they were further examined and classified. Selected samples were tested to evaluate index, strength, compressibility, and other pertinent geotechnical properties. A comprehensive description and results of the Geotechnical Laboratory Testing Program is presented in Appendix E. Laboratory test results are also presented on the Logs of Borings in Appendix B.

## 2.7 CORROSIVITY TESTING PROGRAM

Eight (8) selected samples representative of the near-surface soils at the site were tested to evaluate corrosivity properties. Corrosivity testing was performed by M.J. Schiff & Associates, Inc. of Claremont, California, and consisted of performing thermal resistivity, electrical resistivity, pH, chloride, and sulfate testing. A summary of the Corrosivity Testing Program, which includes the M.J. Schiff report, is presented in Appendix F.

## 2.8 DISPOSAL OF INVESTIGATION-DERIVED WASTES

Upon completion of drilling and sampling, excess drilling mud and soil cuttings were temporarily contained onsite in DOT-approved 55-gallon steel drums until disposal. Disposal was performed by American Integrated Services, Inc. (AIS) of Wilmington, California. AIS performed chemical testing on soil samples representative of the wastes in order to characterize the materials for disposal at an appropriate off-site facility. Chemical test data and waste manifest are presented in Appendix G.

# *NON-INTERNET PUBLIC*

## APPENDIX 6-1: FIGURE 2-1

## Location of Explorations

# 3.0 SITE CONDITIONS

## 3.1 SITE HISTORY

### 3.1.1 Early Harbor Development

Prior to development, the Terminal Island area consisted of the Wilmington Lagoon and Rattlesnake Island, a barrier beach located south of Wilmington Lagoon. In 1859, the area behind Rattlesnake Island was generally covered by "mudflats" that were dissected by numerous non-navigable channels (Weinman and Stickel, 1978). The southern boundary of Rattlesnake Island formerly followed the existing alignment of Ocean Boulevard. The original terminus of the Los Angeles River (the old San Gabriel River) was at the eastern end of Rattlesnake Island.

Development of the harbor began in the late 1880's with construction of several jetty's and breakwaters. In the early 1900's periodic flooding of the Los Angeles River resulted in severe siltation of the harbor. In 1907, an entrance channel, protected by rock jetties, was constructed at the former outlet of the old San Gabriel River to connect the turning basin with several dredged navigable channels in the Long Beach Inner Harbor (Port of Long Beach, 1975). This channel would later be realigned and widened to become the Back Channel. The Cerritos Channel (along the north side of Terminal Island) was dredged to connect the Long Beach and San Pedro harbors in 1918. In 1923, the Los Angeles River outlet was relocated to its present location through Long Beach. The first significant development on Terminal Island was construction of the Southern California Edison Power Plant (now Long Beach Power Generating Facility) in 1910.

### 3.1.2 Development of Pier Echo

In 1925, a rock mole and bulkhead were constructed at the entrance channel, located within the current footprint of Pier Echo (POLB, 1983), as shown in Figure 3-1. Pier Echo was first developed in the early 1940's, when the Terminal Island Naval Base was commissioned. Development included the Naval Station and Shipyard (now the Pier T Hanjin Terminal), the Naval Station Mole, and about 60 percent of present Pier Echo (then known as Pier E) extending out to the rock mole and bulkhead (Figure 3-1). Perimeter rock dikes were constructed to facilitate reclamation of this first phase of Pier Echo.

The remainder of Pier Echo was reclaimed in the early 1950's. The hydraulic fill area was retained by a cellular steel sheetpile bulkhead at the south end and by rock dikes on the west and east sides (Figure 3-1). A wharf structure was constructed on top of the cellular bulkhead in 1955 (Berths T-122 through T-124). The pile-supported concrete wharf on the west side of Pier Echo (Berths T-125 through T-127) was constructed in 1961. That same year, the U.S Government ceded Berths T-123 through T-127, which included the project site, to the City of Long Beach.

### 3.1.3 Oil Extraction and Subsidence

The Wilmington Lagoon area and oilfield were a major source of oil extraction from the 1930's through 1950's. At present, oil extraction continues within the Port, including at Pier Echo, with several oil wells in operation east of the project site. Significant subsidence due to oil extraction occurred within the Port areas from the 1940's through the 1960's. However, some minor amounts of regional subsidence, related to groundwater extraction and possibly natural basin-sediment consolidation, were noted as early as 1928.

The maximum subsidence rate of about 2 feet per year was reached in 1951-1952 near the easterly end of Terminal Island, and northwest of the Harbor. A bowl-shaped depression of ground developed centered at the east end of Terminal Island, within Pier S, as shown in Figure 3-2. Pier Echo experienced subsidence on the order of 8 to 14 feet (POLB, 2002).

The subsidence was arrested in the 1970's by water injection into the oil reservoirs, and a small portion of the lost elevation has been restored. Horizontal movement and surface tilt due to rebound has not caused any detectable damage (Allen, 1975). As early as the 1950's, the subsided areas were raised for rehabilitation and redevelopment (Port of Long Beach, 1975). Millions of tons of fill materials, consisting of land-based materials and dredged sediments, were placed in these areas including Pier Echo.

## 3.2 SURFACE CONDITIONS

### 3.2.1 Topography and Surface Drainage

The project site has an existing ground surface elevation ranging from +20 feet to +25 feet MLLW. The site is covered with asphalt pavement and several areas of concrete pavement along the west and south waterfront areas. Several miscellaneous concrete mats were observed at the site. A large warehouse-type (former Navy) building is located in the northern area of Pier Echo and extends into the project site (Figure 2-1). The southern and western perimeters of the project site are confined by a cellular bulkhead and a rock dike with a pile-supported concrete wharf, respectively. Surface drainage is by sheet flow and is directed into storm drains that empty into the harbor.

### 3.2.2 Bathymetry

The western and southern perimeters of the project site are bounded by the West Basin and Middle Harbor (Figure 1-1). Along the southern perimeter, the seafloor adjacent to the cellular bulkhead ranges from Elevation -41 to -46 feet MLLW, west to east (POLB, 2003). The sea floor deepens to Elevation -78 feet MLLW as the Middle Harbor approaches the Long Beach Channel. Along the western perimeter, the sea floor adjacent to the wharf/dike ranges from Elevation -37 to -44 feet MLLW, north to south (POLB, 2003), deepening to about -55 feet MLLW in areas recently dredged within the West Basin as a part of the Pier T Marine Terminal Development.

### 3.2.3 Cellular Bulkhead

A cellular bulkhead confines the southern 200 feet of the western perimeter and the entire southern perimeter of the project site. The bulkhead structure consists of 68-foot diameter steel sheetpile cells containing hydraulic fill (US Navy, 1973). The sheetpiles extend to an approximate elevation of -57 feet MLLW (POLB, 1952). The original bottom deposits that comprise the former mudline were most likely left in-place inside and behind the cells. Half-circle shaped steel sheetpile walls connect each cell along the waterfront; they are supported by 110-foot long 2 ½-inch diameter steel cables connected to 3-foot thick concrete deadmen, 6 feet in length and 6 feet wide. A detail of the bulkhead structure is shown in Figure 3-3.

A 3-foot thick, 12-foot wide, concrete cap along the waterfront is supported by vertical concrete-filled, steel pipe piles on the waterside, and battered timber piles inside the cells. The steel pipe piles extend to an approximate elevation of -64 feet MLLW; the lengths of the timber piles are unknown. A concrete deck, 2-foot thick and 68-foot wide, covers the bulkhead cells. Crane rails are spaced 30 feet apart, with the waterside rail set back approximately 27 feet from the pierhead line.

### 3.2.4 Pile-Supported Wharf

The western perimeter (except the southern 200 feet) of the site is confined by a rock dike with a pile-supported concrete wharf. The original dike was constructed during land reclamation in the 1940's and 1950's. Prior to construction of the dike, a portion of the seafloor was raised using 3-inch diameter rock. The dike was then constructed starting with what appears to be a clay base, and capped with quarry run materials including rocks greater than 12 inches in dimension (Borings B-6 and B-7 had drilling refusal in this material). While a clay base is atypical of today's dike construction, we understand that in the 1940's and 1950's it was not unusual. Based on Boring B-9, the clay base appears to be about 15 feet thick

For construction of the wharf in 1961, the northern 500 feet of the existing slope from the 1940's reclamation area was cut back and capped with a 5-foot thick rock blanket. A 5- to 15-foot thick rock blanket was placed to cap the existing slope in the southern portion. The rock blankets were sloped at 1 ½:1 horizontal to vertical and consisted of rock up to 9 inches in diameter.

The 1,400-foot long, 72-foot wide wharf consists of a 3.7-foot thick concrete deck supported on 9 rows of 18-inch diameter octagonal, pre-stressed, concrete piles (POLB, 1961). The crane rails are spaced 24 feet apart, with the waterside rail set back 10 feet from the pierhead line. The piles are spaced 5 feet on-center beneath the crane rails and 10 feet on-center in the other 7 rows. Based on as-built drawings from repairs performed in 1978, the piles were driven to an approximate elevation of -75 feet MLLW. A detail of the wharf/dike system is shown in Figure 3-4.

### 3.2.5 Miscellaneous Installations

The site is crossed by a number of underground pipelines associated with former naval and oil operations, and more recent port activities. It is unclear which of the pipelines are active or inactive, or whether those that are indicated on the plans as inactive have been removed, abandoned in-place, or left untouched. Miscellaneous concrete mat foundations observed across the site most likely supported transformers and other electrical equipment.

## 3.3 SUBSURFACE CONDITIONS

### 3.3.1 General

Our interpretation of subsurface conditions is primarily based on data from borings, CPT's, and laboratory testing from our current site investigation. This information has been supplemented by the results of previous subsurface explorations performed at Pier Echo and in the general vicinity of the project site. Four cross sections were generated depicting generalized subsurface profiles as follows: Section A-A' in a north-south direction through both proposed LNG storage tanks; Section B-B' in an east-west direction through the south LNG tank; Section C-C' in an east-west direction through the north LNG tank; and Section D-D' in an east-west direction through the northern area of the project site. The cross sections are presented in Figures 3-5 through 3-8, and their locations are shown in Figure 2-1. In general, the subsurface materials may be divided into four strata as follows:

- Artificial fill materials,
- Predominantly fine-grained estuarine deposits,
- Predominantly coarse-grained marine deposits, and
- Sediments of the Gaspur Aquifer.

The subsurface conditions at the site were observed and interpreted at the locations of our explorations only. This information has been used as the basis of analyses and recommendations provided herein. Conditions may vary between borings and CPT's. If conditions encountered during construction differ from those described herein, our recommendations may need to be modified.

### 3.3.2 Artificial Fill Materials

Most of Terminal Island was man-made during various reclamation projects since the early 1900's. Most of the infilling was by hydraulic methods. However, fills placed after the occurrence of subsidence consisted of land-based materials placed by mechanical methods. As a result, the artificial fills are highly variable, ranging from loose sands to soft, compressible silts and clays with varying degrees of in-situ strength.

Fills were encountered in all borings, and were interpreted to be present in all the CPT's performed at the site. As shown on the cross-sections, the thickness of the fill materials is variable, ranging from approximately 45 to 55 feet below existing ground surface. The fills consist predominantly of loose to medium dense sands and silty sands with interbedded layers of sandy silts, plastic silts, clayey silts and silty clays. Over most of the southern portion of the site, the upper 20 to 25 feet of fill materials are predominantly fine-grained, consisting of sandy to clayey silts and silty clays, some of which are of very soft to soft consistency. However, north of the northern LNG storage tank, the upper 20 to 25 feet of the fills appear to consist predominantly of sands and silty sands of loose to medium dense consistency. Below a depth of about 25 feet, the fills over the entire site area consist predominantly of loose to medium dense sands and silty sands, with layers of medium stiff to stiff fine-grained materials. SPT blow counts and CPT tip resistances ranged from 0 to 28 and 5 to50 tons per square foot (tsf), respectively.

### 3.3.3 Predominantly Fine-Grained Estuarine Deposits

A 25- to 35-foot thick layer of estuarine deposits was encountered below the fill materials in all borings and CPT's performed at the site. These deposits represent the former mudline prior to reclamation and consist predominantly of soft to stiff clayey silts, elastic silts, and silty clays with interbedded layers of loose to medium dense silty sands and sandy silts. SPT blow counts and CPT tip resistances ranged from 2 to 24 and 10 to 30 tsf, respectively.

### 3.3.4 Predominantly Coarse-Grained Marine Deposits

Marine sands and silty sands, ranging in thickness from 5 to 20 feet, underlie the estuarine deposits. These materials range from dense to very dense in consistency, with isolated medium dense layers. Intermittent layers of fine-grained silt and clay materials were generally very stiff to hard in consistency. SPT blow counts and CPT tip resistances ranged from 28 to 70 and 175 to 250 tsf, respectively.

### 3.3.5 Sediments of the Gaspur Aquifer

The marine sands are underlain by the sediments of the Gaspur Aquifer to the maximum depth explored (161 ½ feet below the existing ground surface). The top of the Gaspur Aquifer sediments was encountered at elevations ranging from -65 to -75 feet MLLW (90 to 95 feet below the existing ground surface). These sediments generally consist of very dense gravelly sands, sands, and sands with silt. SPT blow counts and CPT tip resistances ranged from 50 to 85 and 250 to 300 tsf, respectively.

An approximately 2-foot thick, hard fine-grained layer, consisting of elastic silts and silty clays, was encountered at depths of 152 feet and 154 feet (corresponding to an approximate elevation of -132 feet MLLW) below the existing ground surface in Borings

B-9 and B-1, respectively. This layer does not appear to be continuous across the entire project site, as it was not encountered in Boring B-2.

### 3.3.6 Generalized Subsurface Profile

Based on our interpretation of the field and laboratory data, we developed a generalized subsurface profile for the southern portion of the site where the LNG tanks will be located. The upper 20 to 25 feet of soils further north appear to be more sandy than in the southern portion of the site. However, because the subsurface conditions beneath the specific major structures in the northern area must yet be verified, the soil profile developed for the LNG storage tanks was utilized for the entire site. A summary of the generalized subsurface profile and material properties used in our analyses is presented in Table 3-1.

## 3.4 GROUNDWATER CONDITIONS

Groundwater at the site is controlled by tidal fluctuations within the West Basin and Middle Harbor to the west and south of Pier Echo, respectively. During the current investigation, groundwater was measured at depths ranging between 18 ½ to 22 ½ feet below ground surface (approximate elevations of +2 to -2 feet MLLW). The tidal range in the harbor generally varies between Elevations -2 and +7 feet MLLW, with an average level of +4.8 feet MLLW.

(                (                (

## TABLE 3-1
## GENERALIZED SUBSURFACE PROFILE AND MATERIAL PROPERTIES

| Layer No. | Depth (feet) | USCS Classification | Unit Weight (pcf) | Initial Void Ratio ($e_0$) | Compression Index (Cc) | Recompression Index (Cr) | Compression Ratio (CC) | Recompression Ratio (RR) | Strength Parameters | | Shear Wave Velocity (fps) | $(N_1)_{60}$ Corrected SPT Blow Count (bpf) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | Cohesion (psf) | Friction (deg.) | | |
| 1 | 0–20 | ML/CL | 104 | 0.87 | 0.322 | 0.064 | 0.172 | 0.034 | 200 | 27 | 500 | N/A |
| 2 | 20–55 | SP/SM – SM | 122 | 0.78 | 0.15 | 0.015 | 0.084 | 0.008 | 200 | 30 | 600 | 7 |
| 3 | 55–65 | ML/CL | 117 | 0.91 | 0.391 | 0.106 | 0.205 | 0.055 | 800 | 27 | 600 | N/A |
| 4 | 65–70 | SP/SM – SM | 120 | 0.84 | 0.15 | 0.015 | 0.082 | 0.008 | 200 | 31 | 725 | 7 |
| 5 | 70–80 | ML/CL | 121 | 0.81 | 0.21 | 0.043 | 0.116 | 0.024 | 1200 | 27 | 750 | N/A |
| 6 | 80–95 | SP – SP/SM | 123 | 0.72 | 0.048 | 0.007 | 0.028 | 0.004 | 0 | 38 | 800 | 42 |
| 7 | > 95 | SP – SP/SM | 127 | 0.58 | 0.048 | 0.007 | 0.030 | 0.004 | 0 | 38 | 850 | > 50 |

Notes:
pcf = pounds per cubic foot
psf = pounds per square foot
deg = degrees
fps = feet per second
bpf = blows per foot
N/A = Not Applicable

# NON-INTERNET PUBLIC

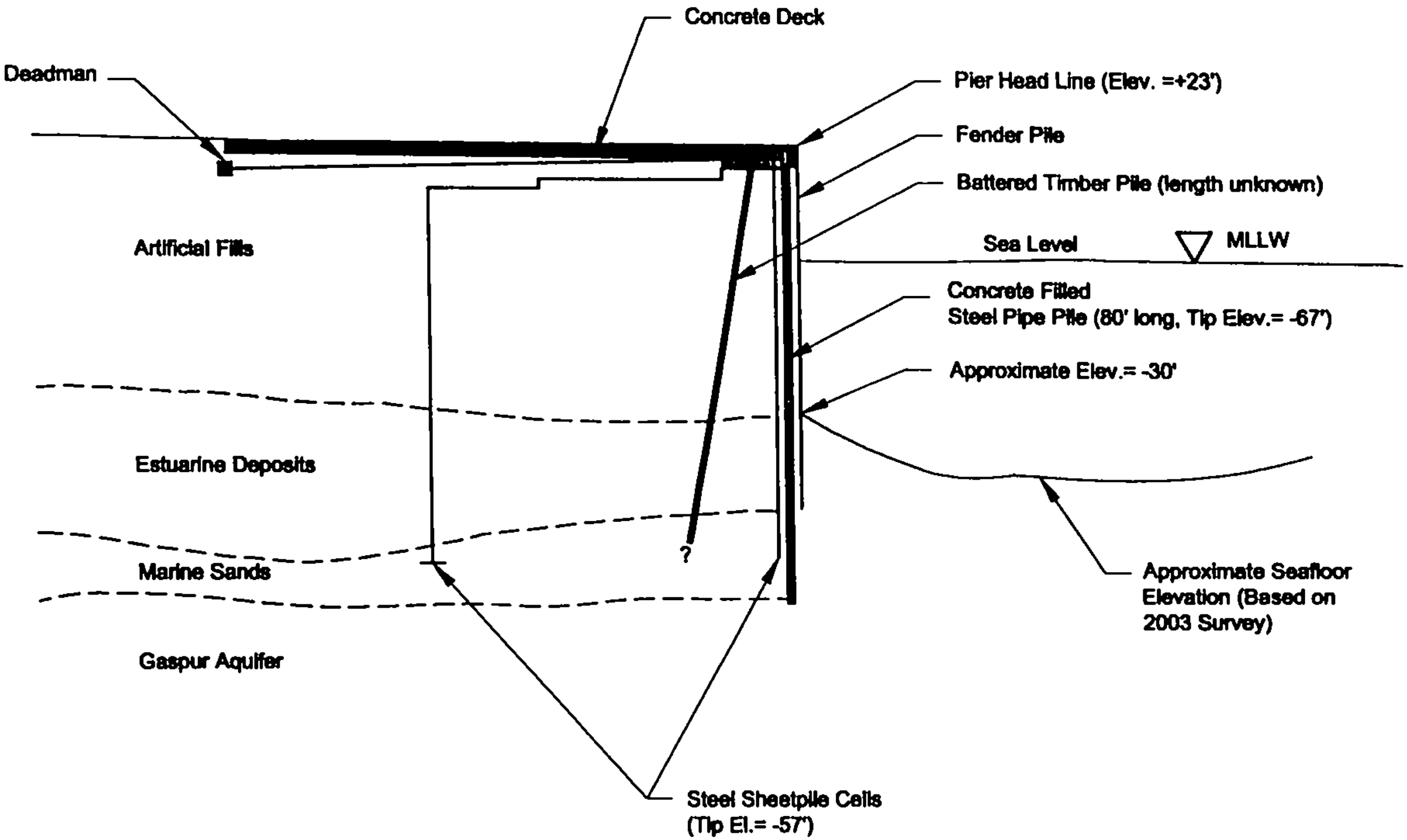
## APPENDIX 6-1: FIGURE 3-1

## Pier Echo Development

## *NON-INTERNET PUBLIC*

## APPENDIX 6-1: FIGURE 3-2

## Historic Ground Surface Subsidence



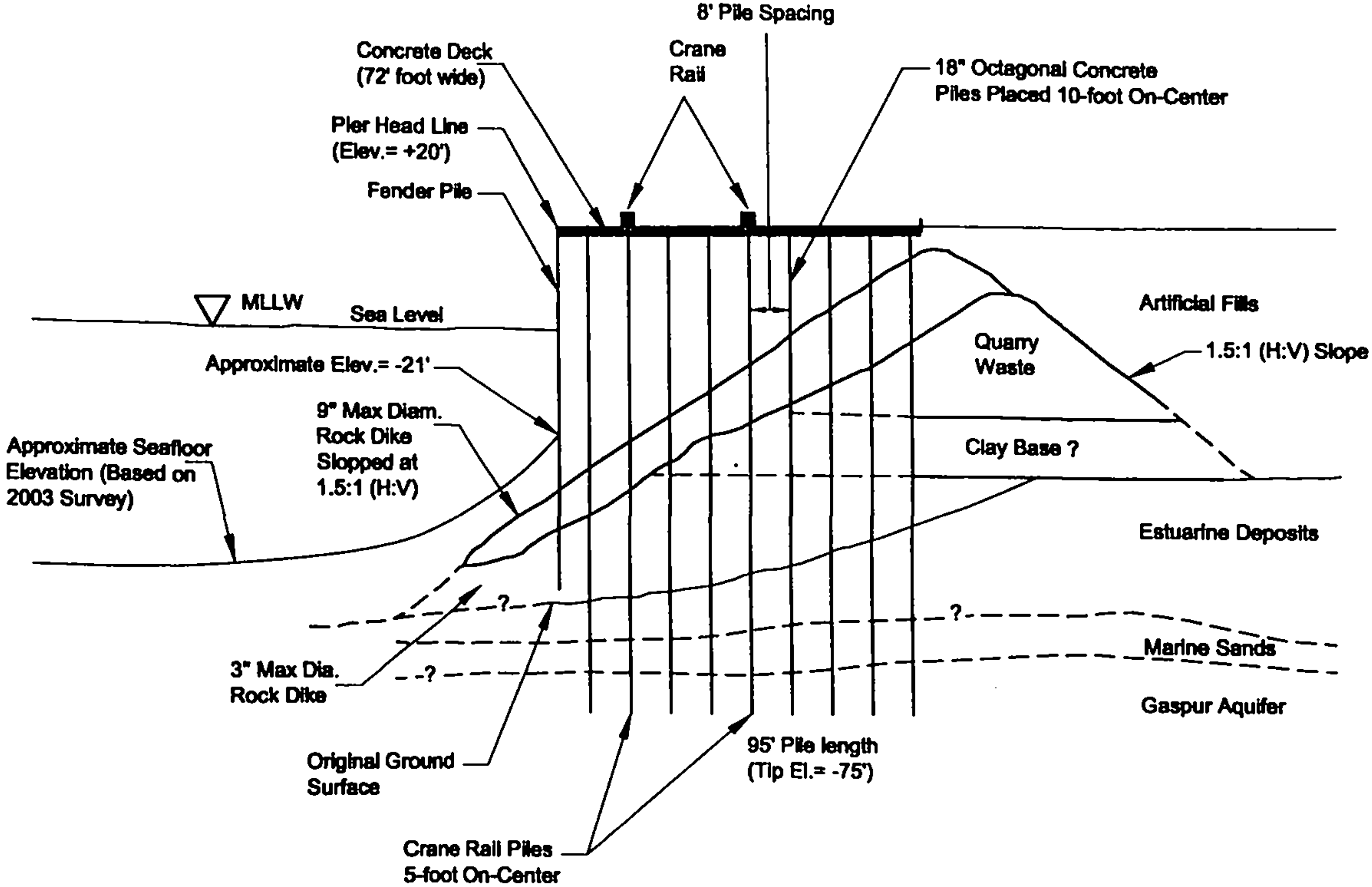

Scale 1"=30' H+V

URS

# DETAIL OF SOUTH FACE CELLULAR BULKHEAD

Proposed Liquid Natural Gas Terminal
Pier Echo, Port of Long Beach

Figure 3-3




Scale 1"=30' H+V

# DETAIL OF WEST FACE WHARF AND DIKE

Proposed Liquid Natural Gas Terminal
Pier Echo, Port of Long Beach

Figure 3-4

# LARGE-FORMAT IMAGES

One or more large-format images (over 8 ½" X 11") go here.
These images are available in FERRIS at:

For Large-Format(s):
Accession No.: 20040202-0039

Security/Availability:

☒ PUBLIC

☐ NIP

☐ CEII

☐ NON-PUBLIC/PRIVILEGED

File Date: 1\26\04 Docket No.: CP04-58

Parent Accession No.: 20040202-0039

Set No.: 1 of 1

Number of page(s) in set: 4

TRP-G REV.- 4/2003 (yellow)

# 4.0 LIQUEFACTION EVALUATION

Liquefaction is a phenomenon whereby soils undergo significant loss of strength and stiffness when they are subjected to vibration or large cyclic ground motions produced by earthquakes. Typically, cyclic loading of saturated soils leads to the build up of excess pore-water pressure as a result of soil particles being rearranged with a tendency toward denser packing. Under undrained conditions (such as during earthquake shaking), loads are transferred from the soil skeleton to the pore-water with consequent reduction in the soils' shear strength.

Saturated granular soils without cohesive fines (i.e. gravels, sands and silts) are most susceptible to liquefaction. Other factors affecting the potential for liquefaction in soils are density, amplitude of loading, confining pressure, past stress history, age of soil deposit, the size, shape and gradation of particles, and the soil fabric structure. Liquefaction-induced ground settlement and lateral spreading have been the primary cause for extensive damage to aboveground structures, foundations and pipelines during many earthquakes.

The combination of high seismicity, shallow groundwater conditions and weak hydraulic fills with predominantly sandy and silty soils result in a significant potential for liquefaction at the site. Liquefaction-induced hazards at the site include post-earthquake settlements in the hydraulic fill area, and shaking-induced lateral deformations and potential instability of the existing waterfront structures.

## 4.1 EARTHQUAKE DESIGN BASIS

### 4.1.1 Magnitude and Peak Ground Accelerations

In conjunction with this study, and in accordance with the 2001 NFPA 59A Standard for LNG tanks, Probabilistic and Deterministic Seismic Hazard Analyses (PSHA's and DSHA's, respectively) were performed for the project site for two levels of strong ground motion: (1) Operating Basis Earthquake (OBE), and (2) Safe Shutdown Earthquake (SSE). The results of these seismic evaluations are presented in a separate report (URS, 2003) indicating horizontal peak ground accelerations (PGA's) of 0.44 g and 0.88 g for the OBE and SSE, respectively. Representative OBE and SSE magnitudes of 7.0 and 7.4, respectively, were selected based on the results of the PSHA, with the Palos Verdes fault the major contributor to the ground-motion hazard. These PGA and earthquake-magnitude values were utilized to evaluate the potential for liquefaction at the site. The response spectrum for the OBE is shown in Figure 4-1.

### 4.1.2 Ground Acceleration Time Histories

As part of the seismic studies, ground acceleration time histories were developed for the OBE and SSE. Three representative records were selected for the OBE, and scaled to make their response spectra more compatible with the OBE response spectrum at 5 percent damping ratio. The records and scale factors are listed below:

1. 1940 Imperial Valley, El Centro, NS component, scale factor = 1.43;
2. 1979 Imperial Valley, Array #5, 230 degree component, scale factor = 1.11; and
3. 1989 Loma Prieta, Gilroy #3, 90 degree component, scale factor = 1.33.

The scaled OBE time histories are shown in Figure 4-2. The SSE time histories, shown in Figure 4-3, were taken as the OBE time histories scaled by a factor of 2, because the SSE was determined to be twice the OBE (URS, 2003). This record selection and simple scaling procedure were considered sufficient for the objectives of the analyses at this early stage of the project.

## 4.2 LIQUEFACTION POTENTIAL

According to the Maps of Seismic Hazard Zones prepared by the California Department of Conservation, Division of Mines and Geology, the project site is located within a liquefaction hazard zone. Evaluations of the potential for liquefaction and shaking-induced settlements were performed using the Liquepro software package (Civiltech Software, 2003) and other analytical methodologies (Seed and de Alba, 1986; Tokimatsu and Seed, 1987; Youd and Idriss, 2001).

In general, the above methodologies evaluate liquefaction potential for the site using empirical correlations based on SPT blow counts and CPT tip resistance data. To this end, a generalized subsurface profile was developed as discussed in Section 3.3.6 and summarized in Table 3-1. The site is generally underlain by up to 80 feet of artificial fill materials and estuarine deposits. Significant layers of loose to medium dense granular soils are present within the fill and, to a lesser extent, in the estuarine deposits. Since groundwater at the site is controlled by tidal fluctuations, all soils below Elevation +5 feet MLLW (approximate average level) were considered to be submerged for the purpose of our liquefaction analysis.

The results of our analyses are presented in Appendix H. Shaded areas within the 'Shear Stress Ratio' column represent soils with a factor of safety less than 1.3, i.e. potentially liquefiable. The results show that for both the OBE and SSE events, the upper 65 feet of loose to medium dense granular materials below groundwater tend to liquefy. However, intermittent silt and clay layers, in some cases of significant thickness, are present within this zone and will likely reduce the magnitude of liquefaction-induced settlements.

### 4.3 POST-EARTHQUAKE SETTLEMENTS

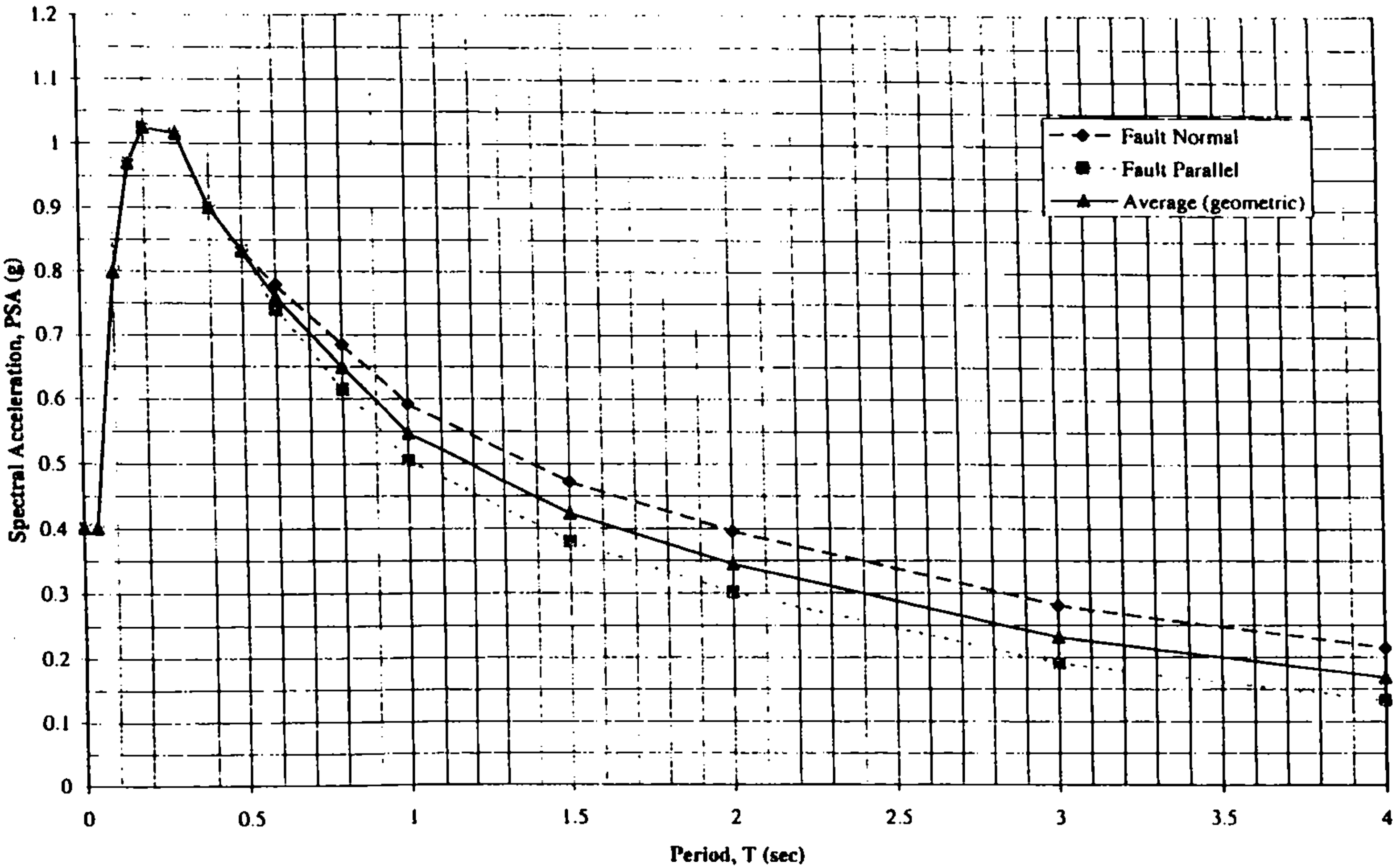
Immediately after the earthquake, shaking-induced excess pore-water pressures in the hydraulic fills will dissipate causing post-earthquake settlements in the fill areas. The results of our analyses indicate that post-earthquake settlements could range from 7 to 19 inches for the OBE event, and from 12 to 25 inches for the SSE event. Liquefaction-induced settlements compose the majority of these settlements, with dynamic settlement of dry fill sands contributing up to 4 inches for the OBE event and up to 9 inches for the SSE event.

Estimated post-earthquake settlements are summarized in Table 4-1 and presented in Appendix H. This report includes recommendations for liquefaction mitigation, so that post-earthquake settlements will not adversely affect the integrity of the proposed structures.

## TABLE 4-1
## SUMMARY OF LIQUEFACTION ANALYSES

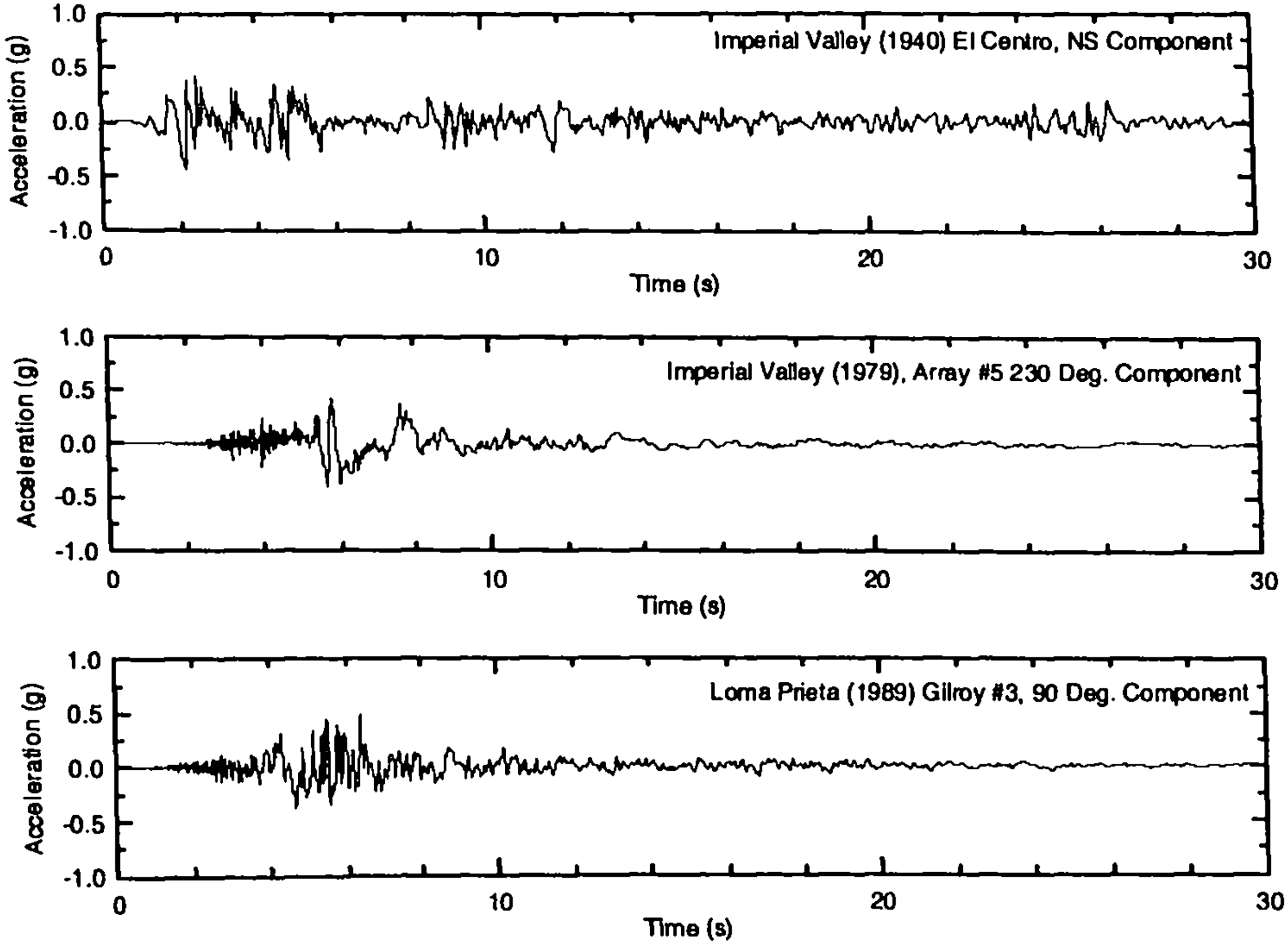
| Boring No. | Operating Basis Earthquake (OBE) | | | Safe Shutdown Earthquake (SSE) | | |
|---|---|---|---|---|---|---|
| | Liquefaction-Induced Settlement (inches) | Seismic-Induced Dry Sand Settlement (inches) | Total | Liquefaction-Induced Settlement (inches) | Seismic-Induced Dry Sand Settlement (inches) | Total |
| B-1 | 11.8 | 0.0 | 11.8 | 12.4 | 2.7 | 15.1 |
| B-2 | 18.9 | 0.0 | 18.9 | 18.9 | 0.0 | 18.9 |
| B-3 | 12.2 | 1.3 | 13.5 | 12.5 | 3.2 | 15.7 |
| B-4 | 13.3 | 0.0 | 13.36 | 14.4 | 0.0 | 14.4 |
| B-5 | 12.6 | 0.0 | 12.6 | 12.4 | 2.1 | 14.5 |
| B-8 | 15.1 | 3.6 | 18.7 | 15.7 | 9.5 | 25.2 |
| B-9 | 6.1 | 0.6 | 6.7 | 7.2 | 5.0 | 12.2 |

**Figure 8-1. OBE Response Spectra, Horizontal Components. 5% Damping. Estimated Directivity Included**




URS

FIGURE 4-1



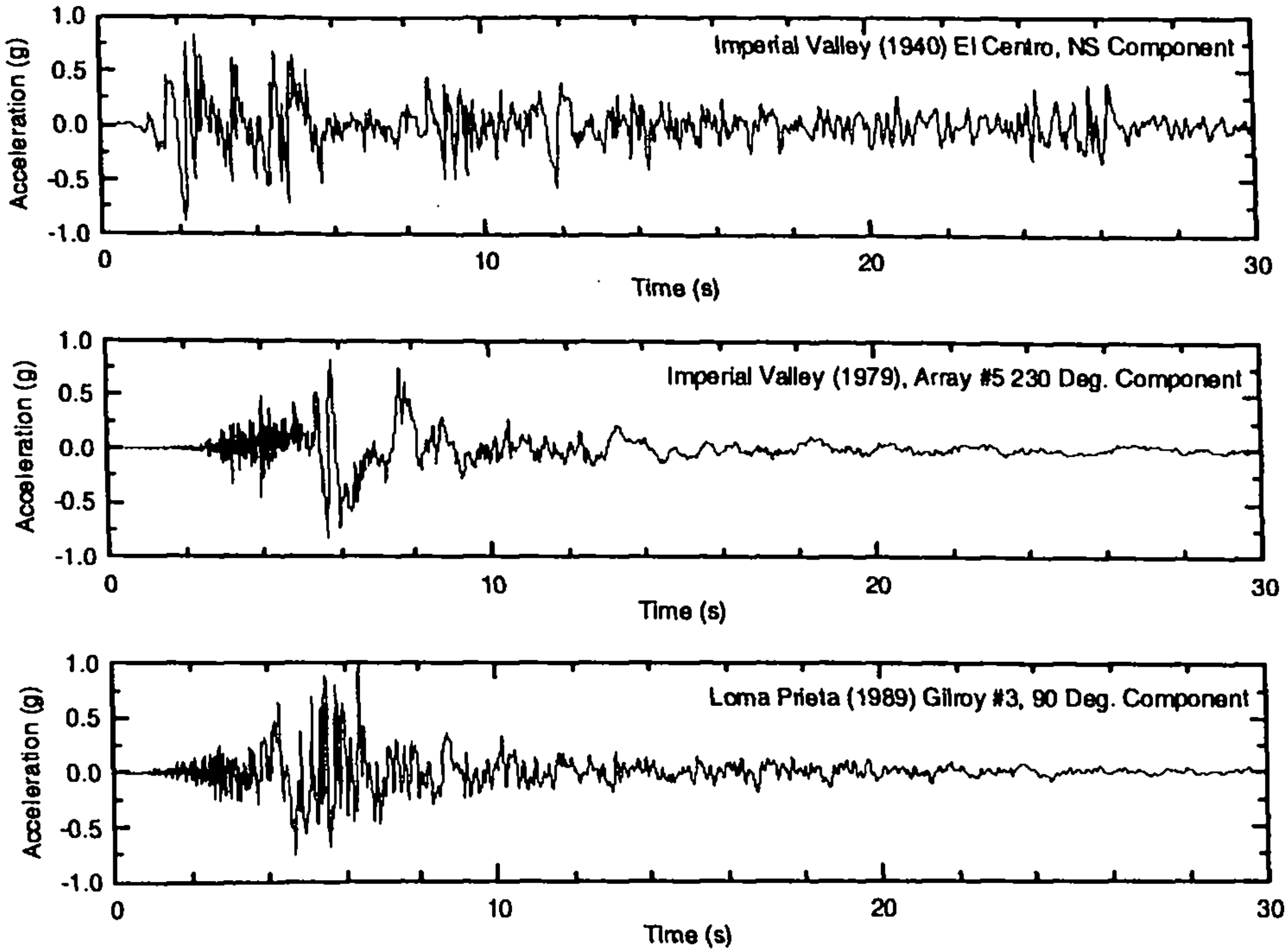

**OBE SCALED TIME HISTORIES**

Proposed LNG Import Terminal Development
Pier Echo, Terminal Island
Port of Long Beach, California

September 2003
33756066

URS

FIGURE 4-2




**SSE SCALED TIME HISTORIES**

| | |
|---|---|
| | Proposed LNG Import Terminal Development |
| September 2003 | Pier Echo, Terminal Island |
| 33756066 | Port of Long Beach, California |

URS

FIGURE 4-3

# 5.0 WATERFRONT SEISMIC STABILITY AND DEFORMATION

## 5.1 INTRODUCTION

This section presents the results of two-dimensional (2-D) nonlinear, dynamic, effective-stress analyses of the proposed LNG storage tanks adjacent to the existing wharf structures. While we understand that POLB is responsible for detailed seismic performance evaluation of the waterfront structures and development of strengthening and/or replacement schemes, if required, the objective of this evaluation was to assess how shaking-induced deformations of these structures might affect the tank foundation.

Two 255-foot diameter, 168-foot high LNG storage tanks are to be sited very close to an existing cellular bulkhead to the south and an existing pile-supported concrete wharf to the west. The tanks will be placed over approximately 80 feet of artificial fill and estuarine deposits, much of which is liquefiable. Two tank foundation schemes were analyzed: (1) supporting the tanks on piles, and (2) improving the foundation soils with stone columns (a third option of stone columns wth replacement of ht eupper 15 feet of soils was considered similar to Option 2 for the purposes of shaking-induced deformation analyses, hence, no separate analysis was performed for this scheme). Dynamic analyses have been performed for both schemes, for two perpendicular cross-sections through the site. One section includes the pile-supported wharf, while the other includes the cellular bulkhead.

Analyses were performed for both the OBE and SSE design earthquakes. The OBE is equivalent to POLB's Contingency Level Earthquake (CLE), which is POLB's standard design criteria for evaluating wharf and bulkhead structures. In addition, we understand from POLB that only minimal dredging, if required at all, will be performed in the vicinity of the proposed offshore berthing structures; no dreding will be performed adjacent to the waterfront structures. As a result, the existing sea floor elevations were used in our modeling.

## 5.2 TECHNICAL APPROACH

The computer code FLAC, Version 4.0 (Itasca, 2000) was used to perform the seismic deformation analyses. FLAC is a two-dimensional explicit finite difference program for geotechnical engineering and rock mechanics computations. FLAC offers a wide range of capabilities to solve complex problems in geomechanics, including nonlinear static and dynamic stress-strain analysis of soil continua, soil-structure interaction, and groundwater flow. FLAC has been thoroughly verified against closed-form solutions, physical models, and field-testing.

Time domain, non-linear analyses were performed using a Mohr-Coulomb (linear elastic/perfectly plastic) soil model coupled with an empirical pore pressure generation scheme. Pore-pressure is generated in response to shear stress cycles, following the cyclic-stress approach of Seed (Seed et al., 1976; Seed, 1979). However, unlike the standard cyclic stress approach where liquefaction potential is assessed as a post-processing step, pore-pressure generation is fully integrated with the dynamic analysis.

Pore-pressures are continuously updated for each element in response to shear stress cycles. Effective stresses decrease with increasing pore-pressure, and a state of liquefaction is approached for frictional materials. As the available shear strength decreases, increments of permanent deformation are accumulated. In addition, the plastic strains generated as a result of increased pore-pressures significantly contribute to the internal damping of the modeled earth structure. The simultaneous coupling of pore-pressure generation with the stress analysis results in a more realistic dynamic response than can be achieved with equivalent-linear dynamic models.

This framework, based on the Mohr-Coulomb soil model coupled with incremental pore-pressure generation, has been employed on various projects involving dynamic deformation analysis of dams (Roth et al., 1991; Roth et al., 1993; Dawson et al, 2001), analysis of dynamic soil-structure interaction of wharf structures (Roth et al., 1992), and prediction of dynamic centrifuge tests (Inel et al., 1993; Roth and Inel, 1993).

## 5.3 DESIGN EARTHQUAKES

To perform time-domain analyses it was necessary to develop ground acceleration time histories for both the OBE and SSE. Three representative records were selected for the OBE and scaled by factors to make their response spectra more compatible with the OBE response spectrum at a 5 percent damping ratio. The accelerograms were scaled so that, in the period band of most interest (0.0 - 1.0 seconds), the average of the scaled individual spectra approximates the OBE spectrum shown in Figure 5-1. The scaled OBE time histories are shown in Figure 4-2. For the SSE analyses, the OBE acceleration time histories were scaled by a factor of two as shown in Figure 4-3. The records and their scale factors are discussed in Section 4.1.

## 5.4 SECTION C-C': TANK ADJACENT TO PILE-SUPPORTED WHARF

The FLAC numerical mesh for Section C-C' is shown in Figure 5-2. The edge of the proposed LNG tank is approximately 60 feet from the pile-supported wharf and underlying rock dike. The tank is placed over approximately 80 feet of potentially liquefiable artificial fill and estuarine deposits. The details of the wharf structure are discussed in Section 3.2.4.

For the 2D numerical model, the circular LNG tank is approximated as an equivalent square with equal area. The mass of the tank is captured with a single row of continuum elements, braced with beam elements to provide additional stiffness. The 4-foot thick reinforced concrete mat beneath the tank is modeled with beam elements connected directly to the soil mesh.

The wharf piles and deck are modeled by elasto-plastic beam elements capable of developing plastic hinges at pre-determined yield moments. The structural nodes of the piles are connected with the soil mesh through elasto-plastic p-y springs representing the lateral load-displacement behavior of single piles. The parameters for these springs were derived using the procedures recommended by the American Petroleum Institute (1987). Both, the piles' section properties and the p-y springs were adjusted to account for pile spacing, so that they represent equivalent properties per unit length of wharf.

The FLAC model was subjected to horizontal shaking via an input acceleration history applied at the base of the model through an absorbing boundary. In order to minimize lateral wave trapping and interference, the left and right sides of the mesh are also absorbing boundaries, but with real-time feedback from 1-D "free field" computations simulating level ground conditions. The elasto-plastic soil constitutive model produces hysteretic damping at large strains upon reaching the yield strength. To provide damping for small strains in the elastic range, Rayleigh damping with a critical damping ratio of 3 percent at a center frequency of 3 Hertz was used for all simulations.

Soil properties used in the analysis are listed in Table 3-1, while properties for the wharf piles are listed in Table 5-1. Figure 5-3 shows the cyclic shear strength used for the loose silty sands found in the upper 80 feet of the subsurface profile. Cyclic shear strength is a measure of a material's susceptibility to liquefaction.

### 5.4.1 Stone Column Foundation Scheme

Analyses were performed for two different foundation schemes. In the first, the foundation soils are improved with stone columns, while in the second, the tank is supported on piles. For analysis of the stone column scheme, the properties of the soils within the dashed rectangle shown in Figure 5-2 were replaced with effective composite properties representing stone-column reinforcement. The properties used for the improved soil are listed in Table 5-2. To help stabilize the wharf and embankment, the stone column area was extended out to the toe of the rock dike.

Simulations were run for all three acceleration time histories for both the OBE and SSE. Typical shaking-induced excess pore pressures can be seen in Figure 5-4, which shows pore-pressures at the end of shaking for the OBE using the 1940 El Centro acceleration time history. Typical shaking-induced permanent displacements can be seen in Figure 5-5. The embankment and wharf displace laterally several inches, with the wharf deck itself moving out laterally about 7 inches. Damage to the piles is illustrated in Figure 5-6, which shows a close-up view of the wharf with displacements exaggerated 20 times. Two plastic hinges (marked with a P) have formed just below the deck at the back of the wharf.

Computed displacements of both the existing wharf and the proposed LNG-tank foundation for all earthquakes analyzed are summarized in Table 5-3. The wharf and embankment move outward 4 to 10 inches for the OBE and 2 to 4 feet for the SSE. The tank foundation settles up to about 1 and 5 inches for the OBE and SSE, respectively. Lateral displacements of the tank foundation are essentially zero and up to about 4 inches for the OBE and SSE, respectively.

### 5.4.2 Piles Foundation Scheme

Another foundation scheme considered was supporting the tank directly on piles. Analyses were performed for an array of 24-inch octagonal pre-stressed concrete piles in a triangular pattern with a center-to-center spacing of 7 ½ feet. The piles are connected directly to the tank mat and extend 95 feet down into the very dense sands. Structural properties used for the piles are listed in Table 5-4. Typical shaking-induced permanent displacements for the pile case are shown in Figure 5-7 for the OBE.

Computed displacements of both the existing wharf and the proposed LNG-tank foundation for all earthquakes analyzed are summarized in Table 5-5. The wharf and embankment move outward 6 to 12 inches for the OBE, and 3 to 4 feetfor the SSE. Tank-foundation settlements are essentially zero for both the OBE and SSE; and lateral displacements of the tank foundation are up to 1 and 6 inches for the OBE and SSE, respectively.

## 5.5 SECTION A-A': TANK ADJACENT TO CELLULAR BULKHEAD

The FLAC numerical mesh for Section A-A' is shown in Figure 5-8. The edge of the proposed LNG tank is approximately 80 feet from the cellular bulkhead that confines the southern perimeter of the site. Soil properties used in the analysis are listed in Table 3-1, and details of the bulkhead structure are discussed in Section 3.2.3.

The bulkhead structure was simulated in the 2-D numerical model by an equivalent-stiffness structural frame with hydraulic fill placed between the two vertical frame legs representing the bulkhead walls. In order to simulate the hoop action of the circular bulkhead cells, the vertical frame members were linked horizontally by cables. Ultimate strengths values for these cables were derived from the interlock strength between sheetpiles. The resistance of the bulkhead to shear distortion was approximated by placing diagonal cables in the frame, whose equivalent yield strengths were derived from friction in the sheetpile locks. Structural properties for the cellular bulkhead are listed in Table 5-6.

### 5.5.1 Stone Column Foundation Scheme

For analysis of the stone column tank foundation scheme, the properties of soil within the dashed rectangle shown in Figure 5-8 were replaced with effective composite properties representing stone-column reinforced soil. The properties used for the improved soil are listed in Table 5-2. To help stabilize the cellular bulkhead, the stone column area was extended out to the edge of the bulkhead.

Simulations were run for all three acceleration time histories for both the OBE and SSE. Typical shaking-induced permanent displacements can be seen in Figure 5-9, which shows computed displacements for the OBE using the 1940 El Centro acceleration time history. The pierhead line of the bulkhead displaces laterally about 3 inches. The deformed shape of the cellular bulkhead is illustrated in Figure 5-10, which shows a close-up view with displacements exaggerated 50 times.

Computed displacements of both the existing wharf and the proposed LNG-tank foundation for all earthquakes analyzed are summarized in Table 5-7. The wharf and embankment move outward 2 to 3 inches for the OBE and 6 to 7 inches for the SSE. The tank foundation settles up to about 0.6 and 1.3 inches for the OBE and SSE, respectively. Lateral displacements of the tank foundation are essentially zero and up to about 3 inches for the OBE and SSE, respectively.

### 5.5.2 Piles Foundation Scheme

Analyses for Section A-A' were also run for a pile-supported tank. Typical shaking-induced permanent displacements are shown in Figure 5-11 for the OBE. The pierhead line of the bulkhead displaces laterally about 5 inches for the OBE.

Computed displacements of both the existing wharf and the proposed LNG-tank foundation for all earthquakes analyzed are summarized in Table 5-8. The wharf and embankment move outward 4 to 6 inches for the OBE and 6 to 7 inches for the SSE. The tank foundation settlements are essentially zero for both the OBE and SSE; and lateral displacements of the tank foundation are up to 1 inch for the OBE. For the SSE the shaking-induced lateral displacements of the tank foundation are up to 4 inches for the scaled 1940 El Centro and 1989 Loma Prieta records.

Notwithstanding the above, the SSE-scaled 1979 Imperial Valley record produced a somewhat atypical seismic response of the tank foundation, with computed lateral displacements reaching up to 3 feet. This effect may be due to its response spectrum significantly exceeding the design spectrum for relatively long periods in excess of 2 seconds (see Figure 5-1), plus the fact that the piles are loosing lateral support as the unimproved upper soils liquefy during SSE shaking.

## 5.6 CONCLUSIONS

The seismic performance of the waterfront structures with respect to their ability to provide adequate lateral confinement for the tank foundations was analyzed for both stone-column and driven-pile foundation options. The analysis results suggest that both the existing pile-supported concrete wharf and the cellular bulkhead would suffer moderate to severe structural damage during the OBE and SSE events, respectively. However, these structures would still be capable of providing the necessary confinement for the LNG-tank foundations to withstand OBE and SSE shaking without suffering excess lateral or vertical deformations. The seismic performance of structures immediately adjacent to the wharf and/or bulkhead structures should be evaluated based on the more detailed seismic performance analyses to be performed by POLB.

**TABLE 5-1**

**PROPERTIES OF WHARF PILES**

| Property | Value |
|---|---|
| Diameter (inches) | 18 |
| I ($in^4$) | 5,745 |
| A ($in^2$) | 268 |
| E (psf) | $6.5 \times 10^8$ |
| Plastic Moment (kip-feet) | 234 |

## TABLE 5-2

## EFFECTIVE PROPERTIES FOR STONE-COLUMN IMPROVED SOIL

| Soil Type | Depth (feet) | Unit Weight (pcf) | Cohesion (psf) | Friction Angle (degrees) | Shear Wave Velocity (fps) | Poisson Ratio |
|---|---|---|---|---|---|---|
| Silty Clay | 0 -20 | 114 | 200 | 33 | 600 | 0.35 |
| Silty Sand | 20-55 | 130 | 200 | 35 | 720 | 0.30 |
| Silty Clay | 55-65 | 125 | 800 | 33 | 720 | 0.45 |
| Silty Sand | 65-70 | 130 | 200 | 35 | 870 | 0.30 |
| Stiff Clay | 70-80 | 130 | 1200 | 33 | 900 | 0.45 |

**Notes:**

pcf = pounds per cubic foot
psf = pounds per square foot
fps = feet per second

**TABLE 5-3**

**SHAKING-INDUCED PERMANENT DISPLACEMENTS**

**SECTION C-C' WITH STONE COLUMNS**

| | | OBE | | | SSE | | |
|---|---|---|---|---|---|---|---|
| | | **1940 El Centro** | **1979 Imperial Valley** | **1989 Loma Prieta** | **1940 El Centro** | **1979 Imperial Valley** | **1989 Loma Prieta** |
| Wharf Deck Lateral Displacement (inches) | | 6.5 | 9.6 | 4.5 | 26 | 44 | 24 |
| Tank Mat Settlement (inches) | Waterside | 0.9 | 2.3 | 1.0 | 3.4 | 4.7 | 2.5 |
| | Center | 0.2 | 2.7 | 0.1 | 1.0 | 3.4 | 1.2 |
| | Landside | 0.7 | 3.7 | 0.6 | 0.5 | 5.0 | 2.4 |
| Tank Mat Lateral Displacement (inches) | Waterside | 0.1 | 0.0 | 0.1 | 2.0 | 0.2 | 3.8 |
| | Center | 0.1 | 0.1 | 0.1 | 2.0 | 0.2 | 3.8 |
| | Landside | 0.1 | 0.1 | 0.1 | 2.0 | 0.2 | 3.8 |

**TABLE 5-4**

**PROPERTIES OF PILES SUPPORTING THE LNG STORAGE TANKS**

| Property | Value |
|---|---|
| Diameter (inches) | 24 |
| I ($in^4$) | 18,217 |
| A ($in^2$) | 478 |
| E (psf) | $6.5 \times 10^8$ |
| Plastic Moment (kip-feet) | 600 |

**TABLE 5-5**

**SHAKING-INDUCED PERMANENT DISPLACEMENTS**

**SECTION C-C' WITH TANK SUPPORTED BY PILES**

| | | OBE | | | SSE | | |
|---|---|---|---|---|---|---|---|
| | | **1940 El Centro** | **1979 Imperial Valley** | **1989 Loma Prieta** | **1940 El Centro** | **1979 Imperial Valley** | **1989 Loma Prieta** |
| Wharf Deck Lateral Displacement (inches) | | 7.3 | 12 | 6.1 | 34 | 53 | 32 |
| Tank Mat Settlement (inches) | Waterside | 0.1 | 0.1 | 0.1 | 0.1 | 0.1 | 0.1 |
| | Center | 0.1 | 0.1 | 0.1 | 0.1 | 0.1 | 0.1 |
| | Landside | 0.1 | 0.1 | 0.1 | 0.1 | 0.1 | 0.1 |
| Tank Mat Lateral Displacement (inches) | Waterside | 0.2 | 0.1 | 1.3 | 1.2 | 6.3 | 1.7 |
| | Center | 0.2 | 0.0 | 1.3 | 1.2 | 6.3 | 1.7 |
| | Landside | 0.2 | 0.0 | 1.3 | 1.2 | 6.3 | 1.7 |

**TABLE 5-6**

**PROPERTIES OF CELLULAR BULKHEAD SHEETPILES**

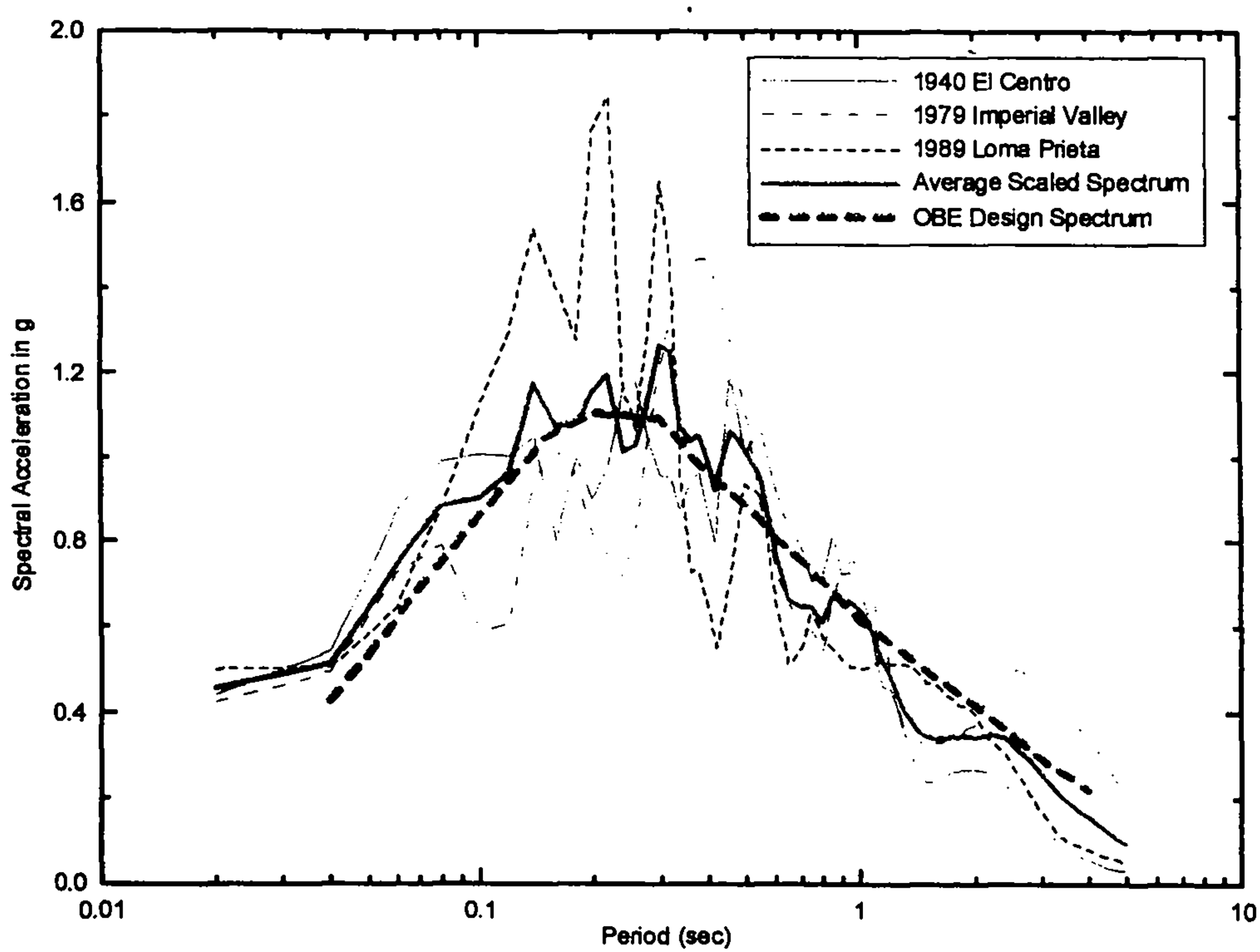
| Property | Value |
|---|---|
| I ($ft^4$) | $1.9 \times 10^{-4}$ |
| A ($ft^2$) | 0.033 |
| E (psf) | $4.2 \times 10^{9}$ |
| Interlock Strength (kips/inch) | 16 |
| Interlock Friction Coefficient | 0.3 |

## TABLE 5-7
## SHAKING-INDUCED PERMANENT DISPLACEMENTS
## SECTION A-A' WITH STONE COLUMNS

| | | OBE | | | SSE | | |
|---|---|---|---|---|---|---|---|
| | | 1940 El Centro | 1979 Imperial Valley | 1989 Loma Prieta | 1940 El Centro | 1979 Imperial Valley | 1989 Loma Prieta |
| Pierhead Line Lateral Displacement (inches) | | 2.5 | 2.5 | 1.8 | 7.2 | 6.0 | 7.2 |
| Tank Mat Settlement (inches) | Waterside | 0.4 | 0.5 | 0.6 | 1.3 | 1.2 | 0.0 |
| | Center | 0.1 | 0.1 | 0.1 | 0.9 | 1.2 | 0.0 |
| | Landside | 0.0 | 0.0 | 0.0 | 1.3 | 1.2 | 0.0 |
| Tank Mat Lateral Displacement (inches) | Waterside | 0.0 | 0.0 | 0.0 | 0.3 | 0.0 | 3.1 |
| | Center | 0.0 | 0.0 | 0.0 | 0.3 | 0.0 | 3.1 |
| | Landside | 0.0 | 0.0 | 0.0 | 0.3 | 0.0 | 3.1 |

## TABLE 5-8
## SHAKING-INDUCED PERMANENT DISPLACEMENTS
## SECTION A-A' WITH TANK SUPPORTED BY PILES

| | | OBE | | | SSE | | |
|---|---|---|---|---|---|---|---|
| | | 1940 El Centro | 1979 Imperial Valley | 1989 Loma Prieta | 1940 El Centro | 1979 Imperial Valley | 1989 Loma Prieta |
| Pierhead Line Lateral Displacement (inches) | | 4.8 | 5.5 | 4.4 | 7.1 | 6.0 | 7.2 |
| Tank Mat Settlement (inches) | Waterside | 0.1 | 0.0 | 0.1 | 0.1 | 0.2 | 0.0 |
| | Center | 0.1 | 0.1 | 0.1 | 0.1 | 0.2 | 0.0 |
| | Landside | 0.1 | 0.1 | 0.1 | 0.1 | 0.2 | 0.0 |
| Tank Mat Lateral Displacement (inches) | Waterside | 0.1 | 0.0 | 0.8 | 1.2 | 35.0 | 3.8 |
| | Center | 0.1 | 0.0 | 0.8 | 1.2 | 35.0 | 3.8 |
| | Landside | 0.1 | 0.0 | 0.8 | 1.2 | 35.0 | 3.8 |




**SCALED TIME HISTORY RESPONSE SPECTRA AND OBE RESPONSE SPECTRUM**

September 2003
33756086

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Port of Long Beach, California

URS

FIGURE 5-1

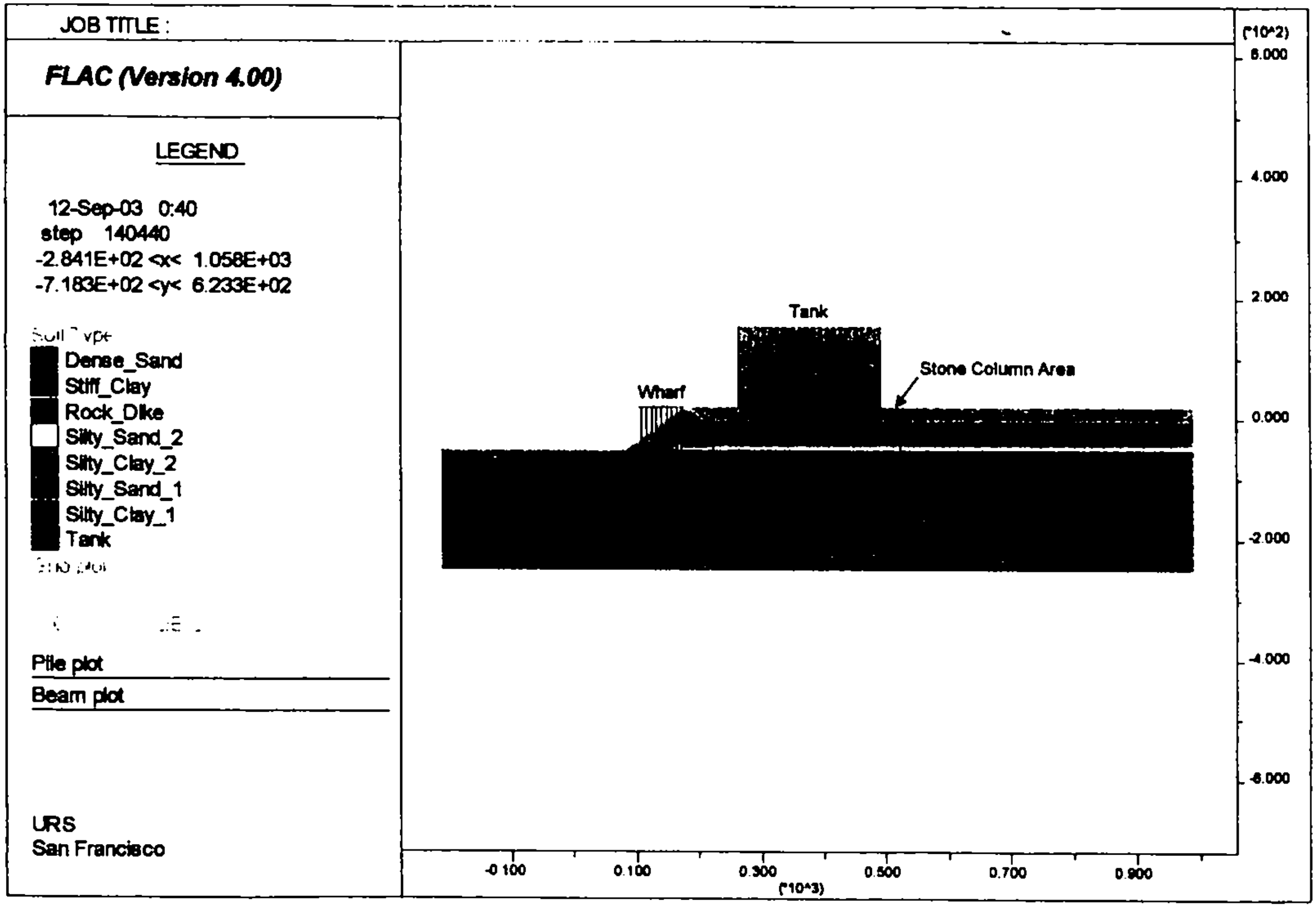


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FIGURE 5-2

**NUMERICAL MESH FOR SECTION C-C'**

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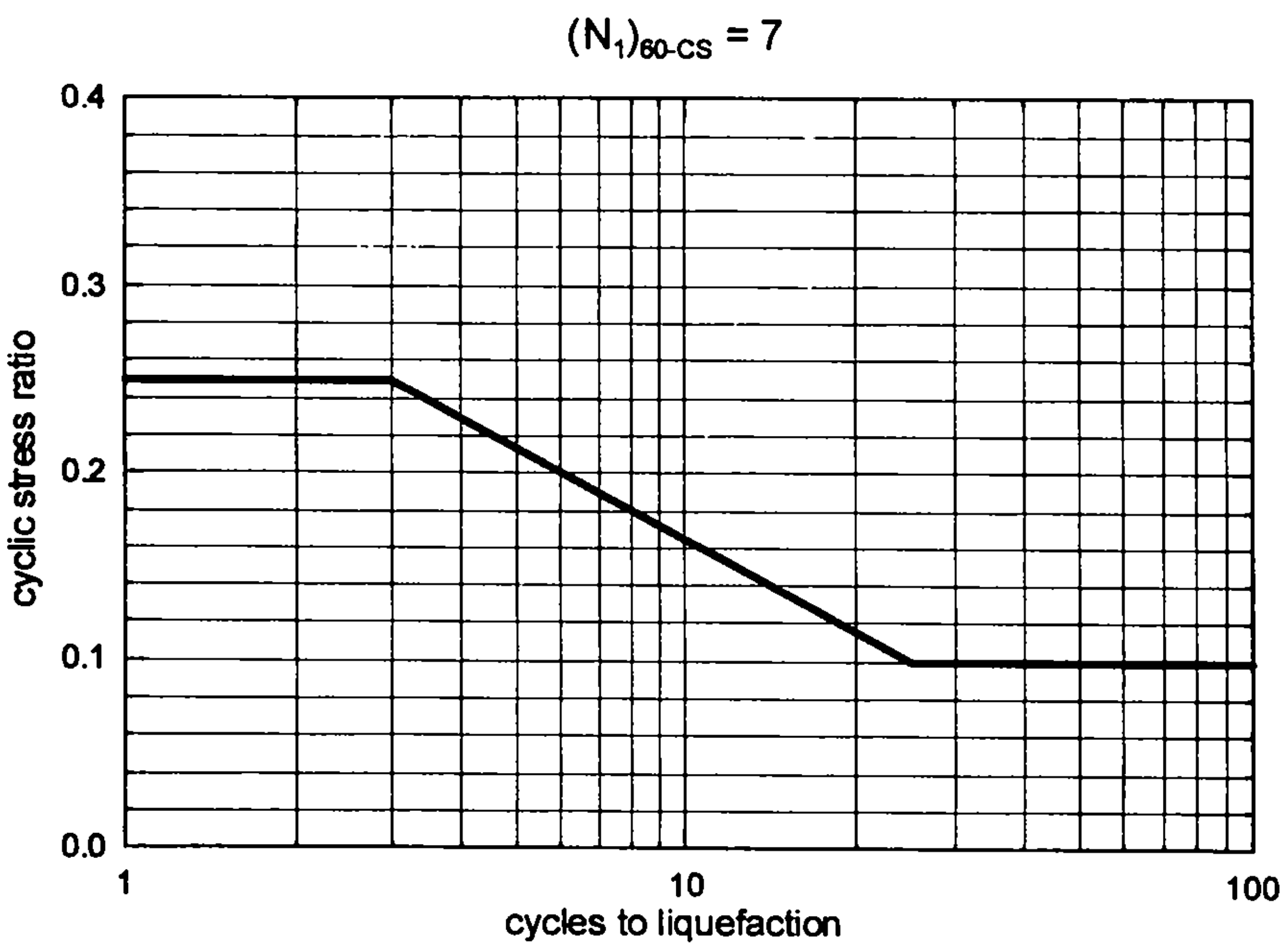
33756066 — Port of Long Beach, California




**CYCLIC SHEAR STRENGTH USED FOR LIQUEFIABLE SILTY SAND**

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Port of Long Beach, California

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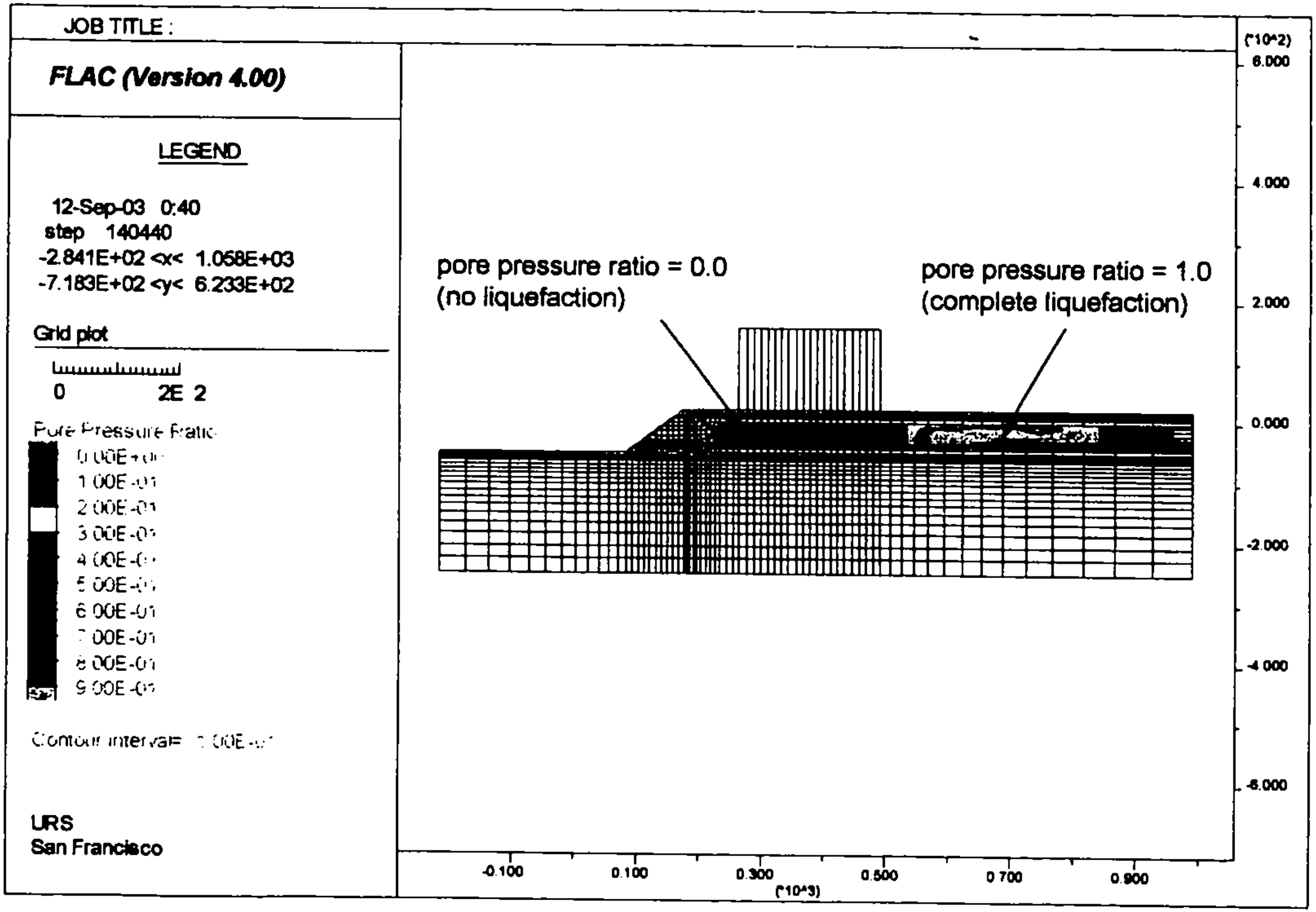
FIGURE 5-3




**PORE PRESSURE RATIO AT END OF SHAKING WITH STONE COLUMNS, SECTION C-C' OBE, 1940 EL CENTRO ACCEL. HISTORY**

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Port of Long Beach, California

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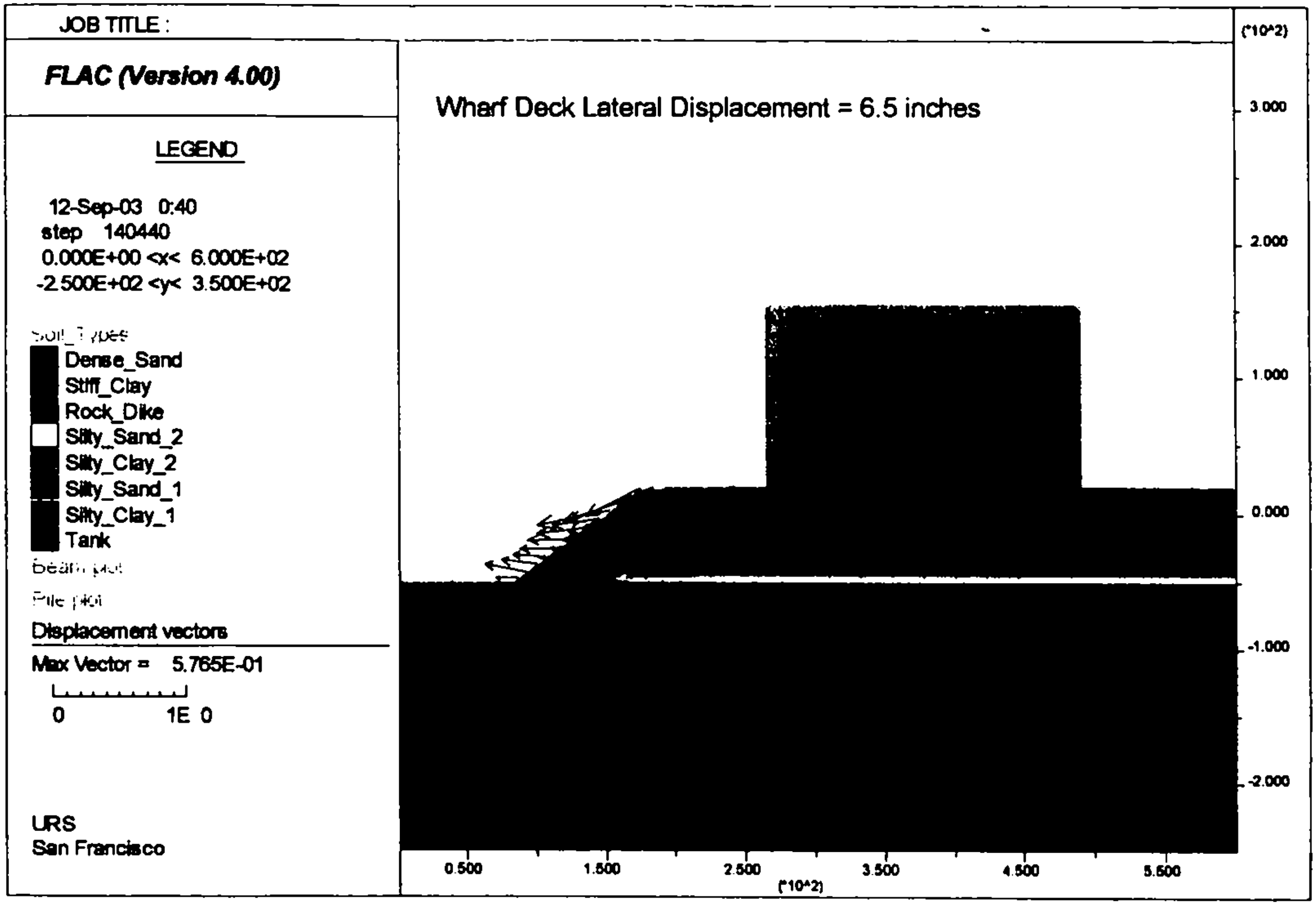
FIGURE 5-4




**SHAKING-INDUCED DISPLACEMENTS WITH STONE COLUMNS, SECTION C-C' OBE, 1940 EL CENTRO ACCEL. HISTORY**

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Port of Long Beach, California

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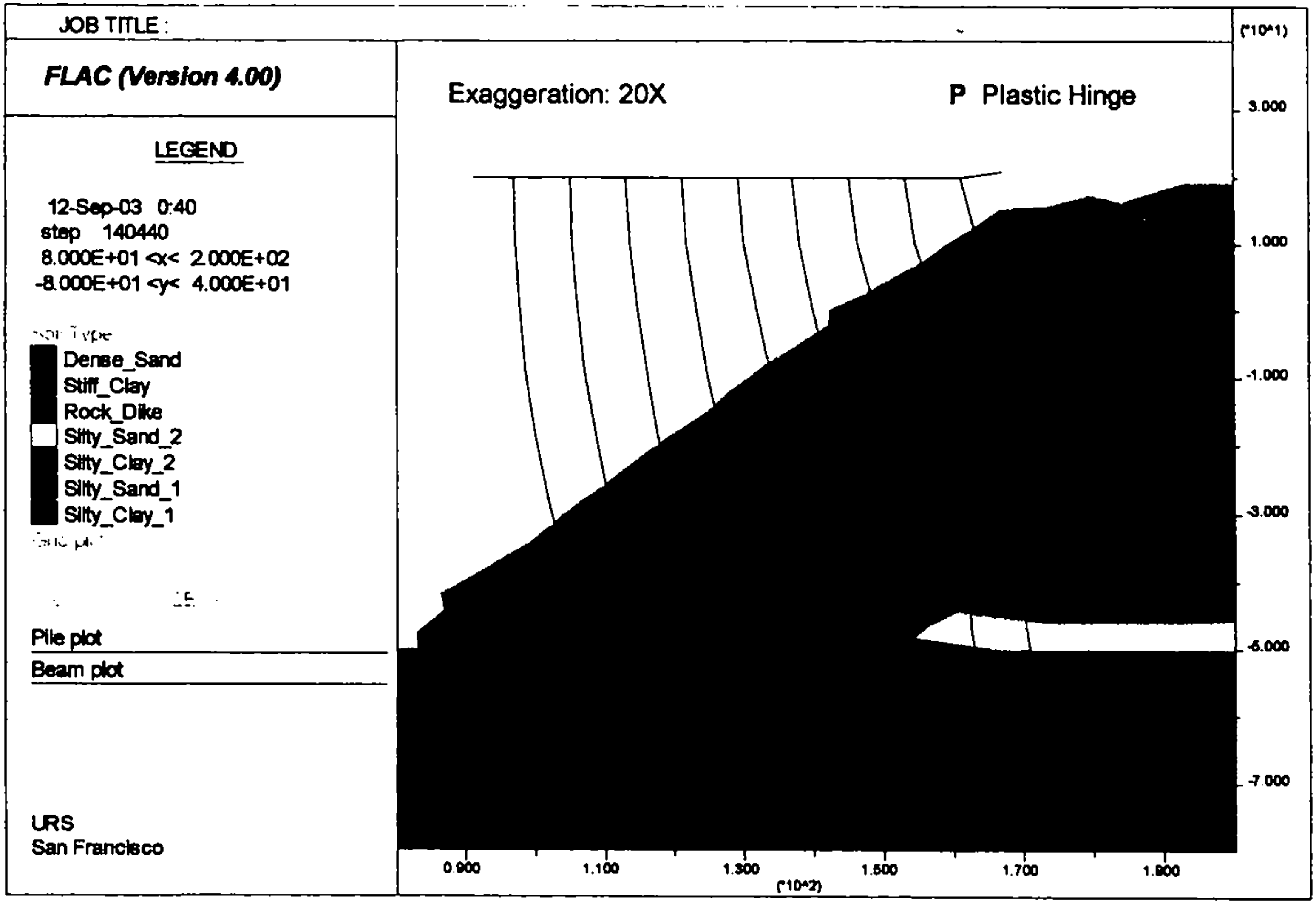
FIGURE 5-5




**DEFORMED MESH WITH EXAGGERATED DISPLACEMENTS, STONE COLUMNS SECTION C-C', OBE, 1940 EL CENTRO ACCEL. HISTORY**

| | |
|---|---|
| | Proposed LNG Import Terminal Development |
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| 33756066 | Port of Long Beach, California |

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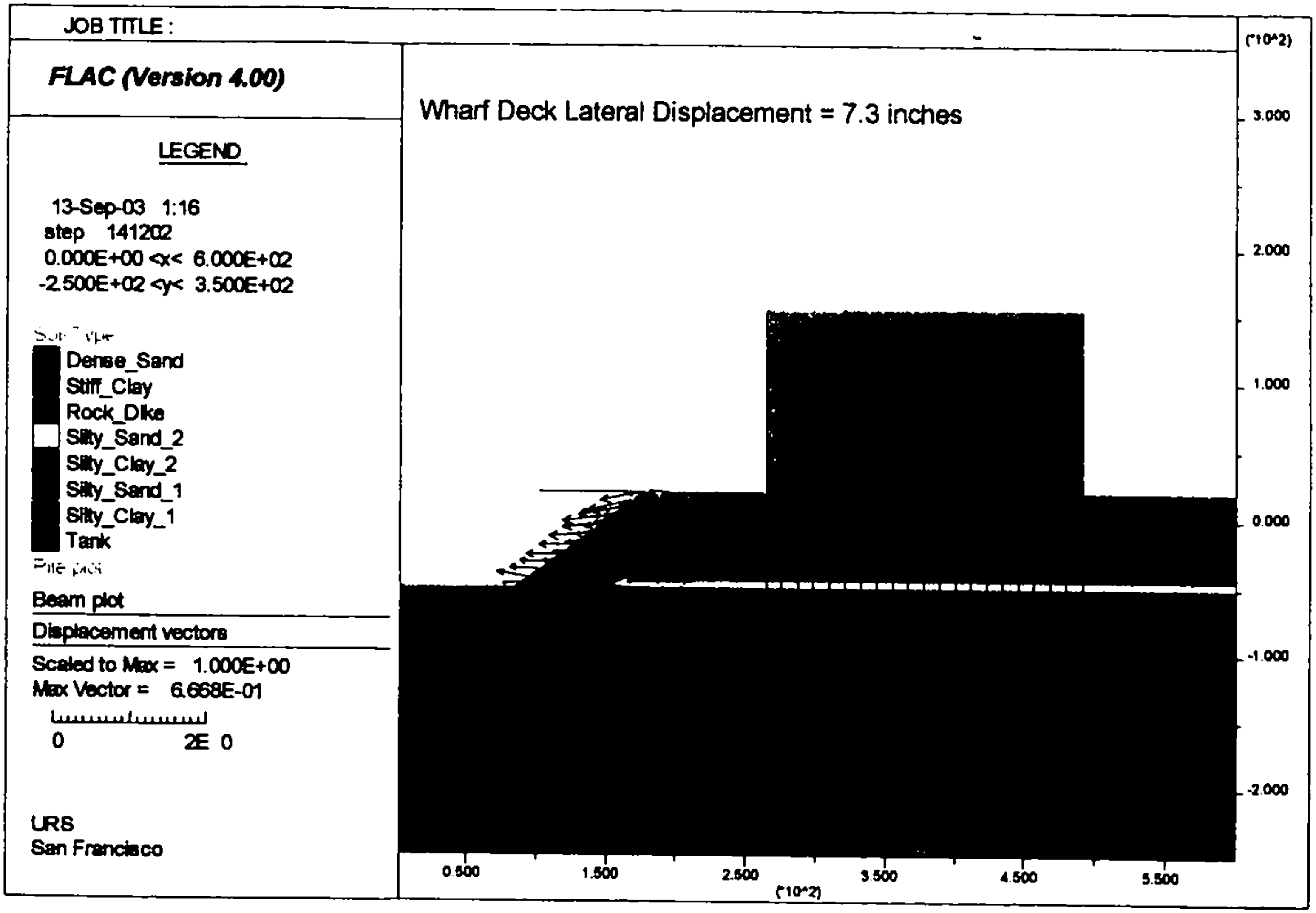
FIGURE 5-6




**SHAKING-INDUCED DISPLACEMENTS**
**TANK SUPPORTED BY PILES, SECTION C-C'**
**OBE, 1940 EL CENTRO ACCEL. HISTORY**

| | |
|---|---|
| | Proposed LNG Import Terminal Development |
| September 2003 | Pier Echo, Terminal Island |
| 33756066 | Port of Long Beach, California |

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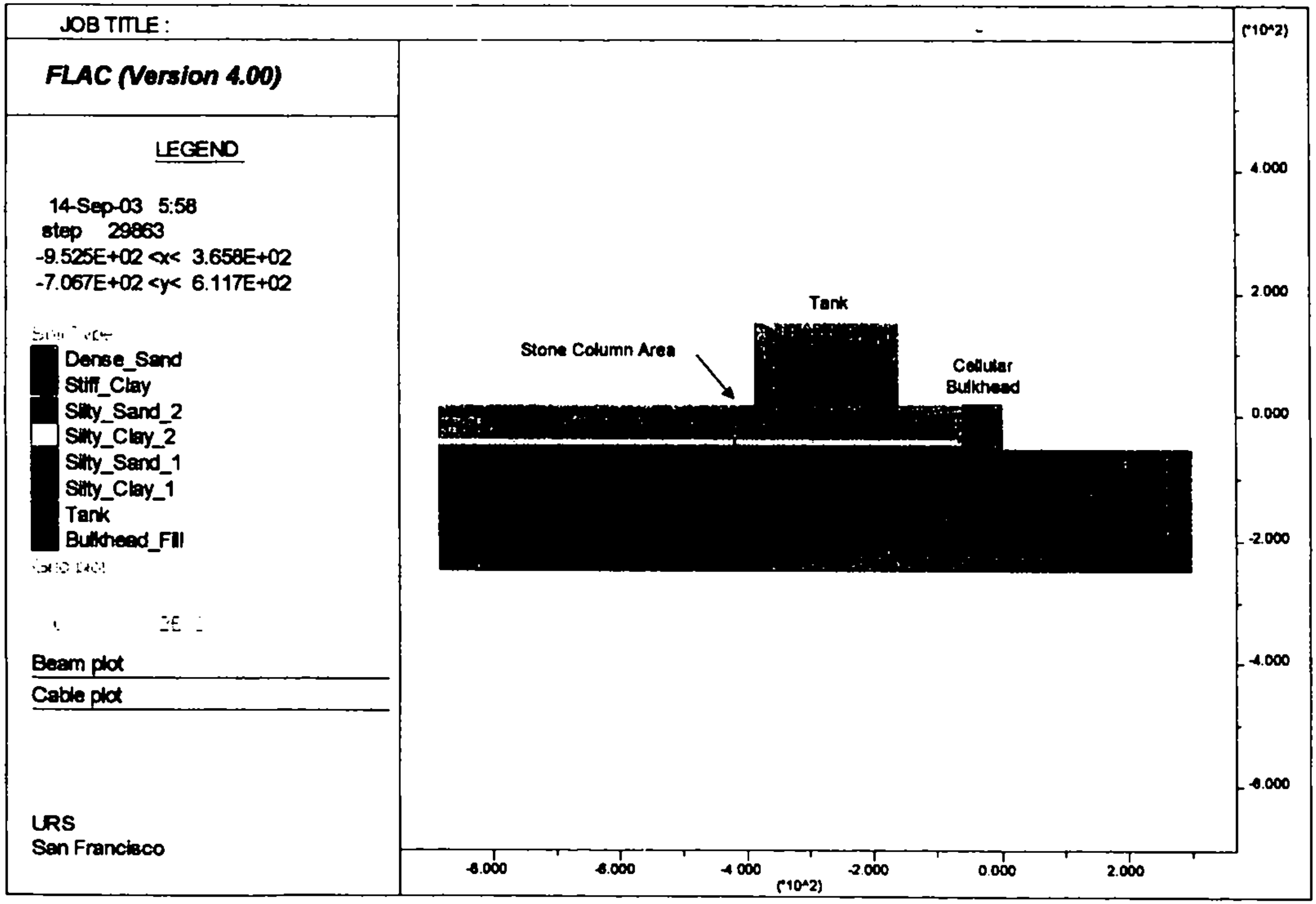
FIGURE 5-7




## NUMERICAL MESH FOR SECTION A-A'

| | |
|---|---|
| | Proposed LNG Import Terminal Development |
| September 2003 | Pier Echo, Terminal Island |
| 33756066 | Port of Long Beach, California |

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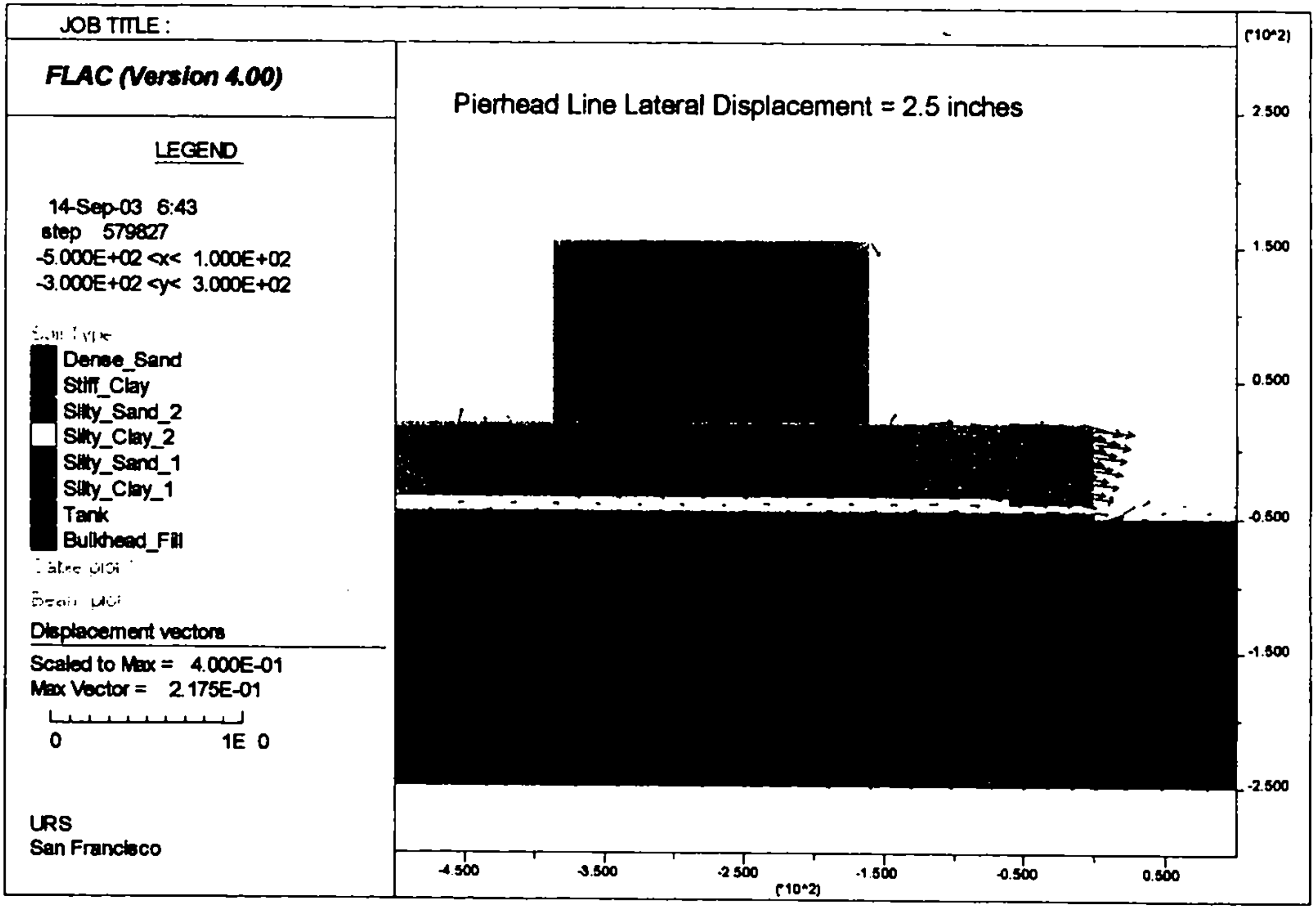
FIGURE 5-8




**SHAKING-INDUCED DISPLACEMENTS WITH STONE COLUMNS, SECTION A-A'**
**OBE, 1940 EL CENTRO ACCEL. HISTORY**

| | |
|---|---|
| | Proposed LNG Import Terminal Development |
| September 2003 | Pier Echo, Terminal Island |
| 33756066 | Port of Long Beach, California |

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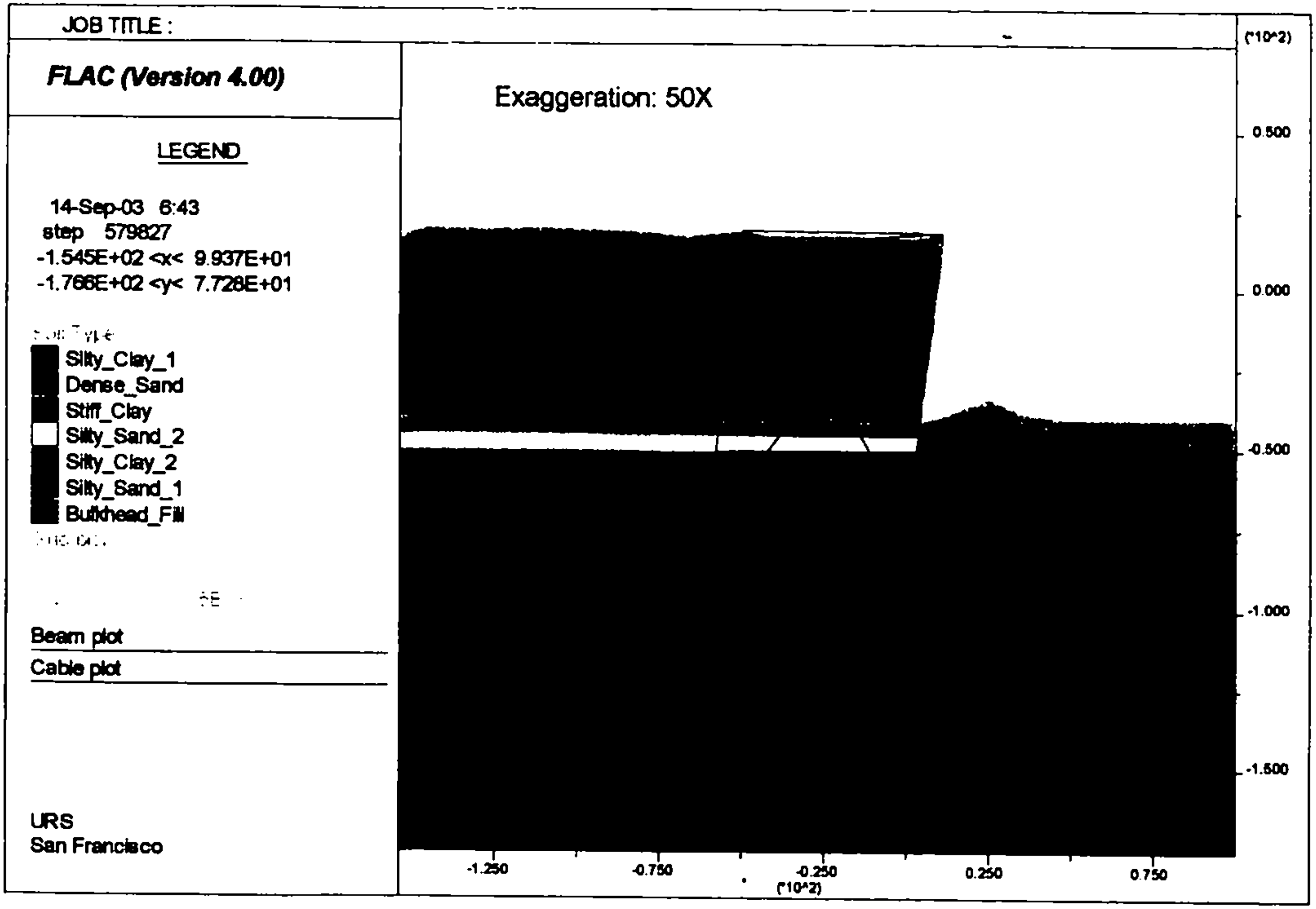
FIGURE 5-9




**DEFORMED MESH WITH EXAGGERATED DISPLACEMENTS, STONE COLUMNS SECTION A-A', OBE, 1940 EL CENTRO ACCEL. HISTORY**

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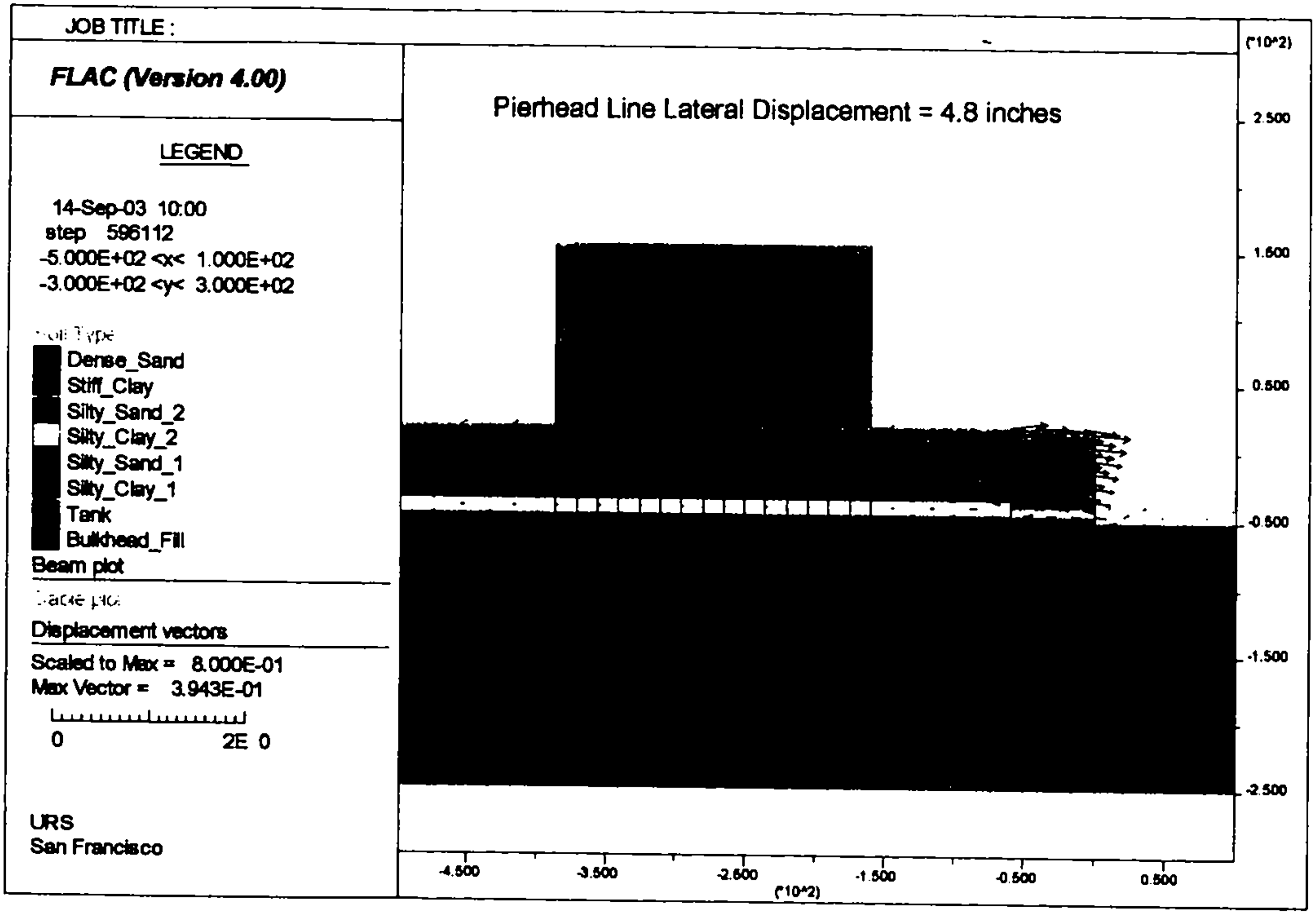
FIGURE 5-10




**SHAKING-INDUCED DISPLACEMENTS**
**TANK SUPPORTED BY PILES, SECTION A-A'**
**OBE, 1940 EL CENTRO ACCEL. HISTORY**

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Port of Long Beach, California

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FIGURE 5-11

# 6.0 FOUNDATION ANALYSES

## 6.1 LNG STORAGE TANKS

### 6.1.1 Settlement Design Criteria

As specified by KBR, maximum allowable differential settlements for the LNG storage tanks are 1/300 along the tank radius, and 1/500 between any two points along the tank perimeter; and the maximum allowable tilt of the tank is 1/500.

### 6.1.2 Settlement Analyses

Static settlements of the LNG tanks were analyzed under hydrotest loading conditions, in order to determine the need for ground-improvement to meet the specified settlement criteria. We understand that the 255-foot diameter, 168-foot high, LNG tanks will have 2-foot thick outer concrete walls and be founded on a 260-foot diameter, 4-foot thick concrete mat sitting on the ground surface. The weight of the tank and foundation mat, plus an applied fluid pressure equivalent to 125 percent of the tank design LNG level amounts to a total load of about 5,800 pounds per square foot (psf). This load was applied at the ground surface at Elevation +20 feet MLLW, and the groundwater table was at Elevation +5 feet MLLW, which represents the average tide level. The generalized subsurface profile discussed in Section 3.3.6 was used for all settlement analyses.

*Composite (Soil + Stone Columns) Compressibility*

Tank settlements were analyzed in two steps with the explicit finite-difference program FLAC. First, the compressibility of the foundation improved with stone columns was evaluated utilizing an elasto-plastic Mohr-Coulomb model with a volume yield cap. To this end, a cylindrical, axisymmetric unit-cell model was established consisting of a single stone column laterally confined by the soil layers of the generalized subsurface profile. The compression of each composite layer (i.e. soil with stone columns) in response to vertical loading was analyzed by prescribing a displacement boundary condition in the form of a constant downward velocity at the top of the model.

The material properties assumed for the stone columns include a Young's Modulus of 3,000 kips per square foot (ksf), a Poisson's Ratio of 0.35 and a friction angle of 40 degrees. The soil matrix surrounding the stone column corresponds to the generalized subsurface profile described in Section 3.3.6, and the properties of the unimproved soils in this profile are summarized in Table 3-1. For the simulation of stone columns installed without prior pre-loading, these soils were assumed to be normally consolidated, i.e. overconsolidation ratio (OCR) of 1.0, and for the case with pre-loading, OCR was adjusted to reflect the effect of surcharging. For the sandy soils in this profile, the compressibility after densification due to stone column installation was estimated to increase to a value equivalent to a CPT tip resistance of 200 tsf. This estimate was based on recent experience with stone column installations in similar soils at Pier 400 in the Port of Los Angeles.

Figures 6-1 and 6-2 show the stress-strain plots for the different composite layers resulting from analysis runs simulating soil improvement with stone columns installed with and without prior pre-loading of the site, respectively. As indicated in these figures, the stress-strain curves are distinctly nonlinear, showing a sharp decrease in modulus upon reaching an applied-load increment of 4,000 psf with pre-loading and 2,600 psf without pre-loading. Constraint moduli derived from these plots, for soil improvement by stone columns with and without pre-loading, are listed in Table 6-1.

*Tank-Foundation Model*

The second analysis step involved a full-size plane-strain model of the tank-foundation soils represented by horizontal continuum layers with composite (i.e. soil + stone columns) material parameters from the unit-cell model described above. The width of the plane-strain model was adjusted to represent a square with an area equal to the area of the round 260-foot diameter tank-foundation mat. For this second analysis step, a simple elasto-plastic Mohr-Coulomb model was utilized. Elastic bulk and shear moduli were derived from the constraint moduli listed in Table 6-1, based on elasticity theory, and are presented in Table 6-2.

Settlement analyses were performed for both a perfectly flexible tank bottom (i.e. no mat) and a tank sitting on a 4-ft thick concrete mat placed on the ground surface. The load was applied in increments, so that the accumulated vertical-stress build-up could be tracked in each soil element, and the elastic moduli decreased upon exceeding the threshold value of 2,600 psf without pre-loading and 4,000 psf with pre-loading.

### 6.1.3 Existing Soils Without Soil Improvement

The settlements for tanks founded on existing, unimproved soils were estimated for perfectly flexible foundations assuming Boussinesq stress distributions and utilizing SPT blow counts and consolidation test data for drained loading conditions. The majority of the settlements resulting from the load imposed by the LNG tanks are generated in the upper artificial fills and underlying estuarine deposits. We estimated that total settlements of LNG tanks founded on unimproved soils would be about 3 feet beneath the tank perimeter, and about 5 feet beneath the center of the tank. The resulting differential settlement of about 2 feet far exceeds the settlement tolerance criteria for this project.

### 6.1.4 Soil Improvement with Stone Columns

Additional analyses were performed to evaluate the effectiveness of stone columns in reducing total and differential settlements beneath the LNG tanks. For our analyses, we assumed an area-replacement ratio ($a_r$) of about 0.17, corresponding to a triangular pattern of 42-inch diameter stone columns at 8-foot center-to-center spacing. The stone columns were extended to depths of about 80 feet below the existing ground surface.

For the tank under hydrotesting loading conditions and assuming a perfectly flexible foundation (i.e. no mat) we estimated settlements of 21 and 37 inches beneath the tank perimeters and center, respectively, resulting in 16 inches of differential settlement. Including the 4-foot thick mat in the model produced corresponding settlements of 32 and 38 inches, or 6 inches of differential settlement. The results of our settlement analyses for this case are presented in Figures 6-3 through 6-6 and summarized in Table 6-3.

Since the differential settlements reported above exceed the specified 5-inch criteria, the following options for improving settlement performance were further investigated: (1) stone columns combined with preloading the site; and (2) stone columns combined with excavation/replacement of the upper soft soils. A third option of merely increasing the area-replacement ratio ($a_r$) by spacing the stone columns closer together was briefly considered, but then dismissed. This, because preloading or soil replacement are considered to be prudent additional improvement measures given the very poor and highly variable soil conditions, particularly within the upper 20 to 25 feet of the site.

### 6.1.5 Site Improvement with Pre-Loading and Stone Columns

In order to further reduce the magnitude of differential settlements, we evaluated pre-loading the tank foundation soils with a 25-foot high surcharge fill prior to the installation of stone columns. For the tank under hydrotesting loading conditions and assuming a perfectly flexible foundation (i.e. no mat) we estimated settlements of 6 and 13 inches beneath the tank perimeters and center, respectively, resulting in 7 inches of differential settlement. Including the 4-foot thick mat in the model produced corresponding settlements of 9 and 13 inches, or about 4 inches of differential settlement. The results of our settlement analyses for this case are presented in Figures 6-7 through 6-10 and summarized in Tables 6-3 and 6-4.

### 6.1.6 Stone Columns and Replacement of Upper Fills

Should lack of available materials or schedule constraints preclude pre-loading the site, a feasible alternative for support of the LNG storage tanks would be removal of the upper 15 feet of fill materials combined with installation of stone columns. For this option, all poor quality, highly compressible materials above the groundwater table are replaced with engineered fills of low compressibility characteristics. Stone columns, approximately 65 feet deep, are then installed at the excavation subgrade level, prior to backfilling with the engineered fills, for improvement of the underlying fills and estuarine deposits. The settlement results for this case are presented in Table 6-3.

Another option would be to construct the tank at the bottom of the excavation. Either way, the settlement performance of this removal/replacement option is expected to meet the specified differential-settlement criteria of this project.

### 6.1.7 Driven Piles

If the proposed project schedule does not allow implementation of either of the above-mentioned site development options the LNG tanks may be supported on driven piles.

*Axial Capacities*

Driven to tip elevations of about -80 feet MLLW, allowable pile capacities for 14- and 16-inch square and 24-inch octagonal piles are presented in Tables 6-5 and 6-6. Table 6-5 presents pile capacities for support of the LNG storage tanks and other structures without any subsurface improvements; Table 6-6 presents capacities with improvement of the soils in the upper 15 feet of the site. Allowable capacities with and without downdrag are presented. Downdrag results from loss of soil strength due to liquefaction during an earthquake, acting as a downward force on the pile.

Axial capacities were estimated based on conventional analyses using the methods outlined in Chapter 5 of the NavFac Design Manual 7.02 for displacement piles. A pile load test previously conducted in the Port of Los Angeles (Erickson and Anderson, 1988) confirmed the ultimate capacities for 24-inch octagonal piles. The allowable downward and upward capacities include a factor of safety of at least 2.5.

To avoid interference with adjacent piles, and to minimize group effects we recommend that the piles be spaced a minimum of 3 pile widths, center-to-center. For this minimum spacing, it will not be necessary to reduce axial capacities for group action.

The use of bitumen coatings or polyethylene sheeting on pre-cast concrete piles will reduce downdrag forces and increase the allowable capacities of the piles. The lower 10-feet of the piles should not be coated so that full end-bearing of the pile can be utilized. Specific recommendations about thickness and installation of these layers can be provided on a case-by-case. Past experiences with these applications have shown that downdrag forces could be reduced by as much as 50 to 70 percent (Fellenius, 1998, and Withworth et.al., 1993)

The axial capacities may be increased by one-third to account for short-term loading due to wind or seismic forces. Settlements of the pile foundations are expected to be less than ½ inch, excluding elastic compression of the piles under design loads.

*Lateral Resistance*

Resistance to lateral loads will be provided by the resistance of the soil against the pile, pilecaps, grade beams, and by the bending strength of the pile itself. The lateral capacity and maximum induced bending moments for 14- and 16-inch square, and 24-inch octagonal piles, presented in Tables 6-7 through 6-9 for free-head and fixed-head conditions and pile head deflections of 3/8-inch and 1 inch. Table 6-7 presents lateral capacities for the existing soil conditions at the site; Table 6-8 presents capacities with improvement of the upper 15 feet of the site; Table 6-9 presents capacities for the northern area of the site (north of the LNG tanks), where the upper fills appear to be more granular than the rest of the site. While the more granular soils to the north contribute to increased lateral capacities, the greater adhesion and friction of these soils cause larger downdrag forces and reduced axial downward capacities, as shown in Table 6-6.

Lateral pile resistance can be considered linearly proportional up to 1-inch of deflection. At full-fixity, the maximum induced bending moment occurs at the pile cap connection. There is no reduction in lateral capacity provided there is a center-to-center spacing of at least 3 pile widths normal to the loading and center-to-center spacing of at least 8 pile widths in an orientation parallel to the loading direction. At a center-to-center spacing of three pile widths parallel to the direction of loading, the lateral capacity should be reduced by 50 percent. Linear interpolation may be used for center-to-center spacing between 3 and 8 pile widths.

Additional lateral resistance may be provided by passive resistance against the embedded portion of the pile cap. Passive pressure available in existing onsite soil and compacted structural fill may be taken as equivalent to the pressure exerted by a fluid weighing 175 and 350 pounds per cubic foot (pcf), respectively.

## 6.2 OTHER MAJOR STRUCTURES

Other major structures proposed for the project include a truck-loading LNG storage tank, $C_2$ and $C_3$ tanks, water expansion tank, demethanizer tower, vaporizer fluid units, BOG compressors, and booster pump structures. The following sections discuss our evaluation of potential foundation schemes, including total and differential settlements, for these structures.

### 6.2.1 Estimated Loads

Estimated loads for other major structures, based on data provided by KBR, range as high as 6,600 psf. Uniform loads for each major structure are summarized in Table 6-10. The existing ground surface was assumed to be at Elevation +20 feet MLLW, and the groundwater table was assumed at Elevation +5 feet MLLW (average tide level), with tidal influences neglected.

### 6.2.2 Settlement Design Criteria

As specified by KBR, the criteria for tolerable differential settlements for other major structures within the LNG terminal are as follows:

1. 1-inch total or ¾-inch differential settlement between adjacent foundations other than large flexible foundations, such as for storage tanks; and

2. 0.01D total or 0.005D differential settlement for large flexible foundations, such as for storage tanks, where D is the least width dimension or diameter.

### 6.2.3 Foundation Options

Several of the proposed major structures for the LNG terminal are anticipated to have heavy loading, equivalent to the LNG storage tank loads on the order of 5,800 psf, including the truck-loading LNG storage, $C_2$ and $C_3$ tanks, and demethanizer tower. For these structures the same foundation options as discussed in Section 6.1 may be utilized to meet the differential settlement criteria. However, since the total settlement criteria for these structures is more stringent than for the LNG storage tanks, stone columns would have to be placed at a closer grid, or the upper soils removed and recompacted. Hence, driven piles would appear to be the most feasible foundation scheme for support of these structures. Likewise, for other major structures, as detailed in Table 6-10, the time and cost required for pre-loading and installation of stone columns would appear to be impractical. Therefore, we also recommend driven piles for support of these structures. Axial and lateral load pile capacities for these structures are presented in Tables 6-5 and 6-9, respectively.

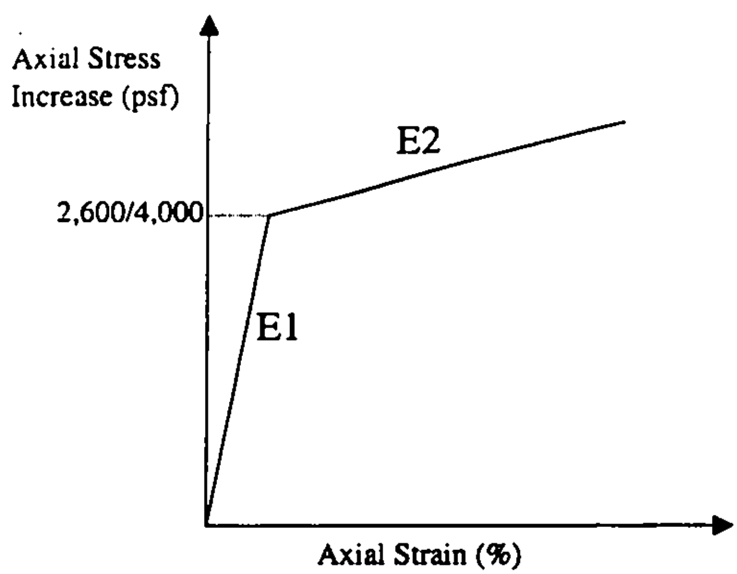
# TABLE 6-1

## IDEALIZED CONSTRAINED MODULI FOR SETTLEMENT ANALYSIS

| Layer | Constrained Moduli (ksf) | | | |
|---|---|---|---|---|
| | Stone Columns with Pre-Loading [1] | | Stone Columns without Pre-Loading [1] | |
| | Stress Increase < 4,000 psf (E1) | Stress Increase > 4,000 psf (E2) | Stress Increase < 2,600 psf (E1) | Stress Increase > 2,600 psf (E2) |
| 1 | 190 | 110 | 35 | 90 |
| 2 | 2,500 | 1,750 | 1,850 | 2,300 |
| 3 | 1,250 | 120 | 125 | 140 |
| 4 | 4,200 | 800 | 1,400 | 1,750 |
| 5 | 3,200 | 290 | 260 | 240 |

Notes:

ksf = kips per square foot
psf = pounds per square foot
(1) Constrained moduli of the soil layers, E1 and E2, are based on the figure shown below.



## TABLE 6-2
## BULK AND SHEAR MODULI OF IMPROVED SOILS

| Soil Type | Depth (feet) | Stone Column without Preloading | | | | Stone Column with Preloading | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | Stress Increase < 4,000 psf (E1) | | Stress Increase > 4,000 psf (E2) | | Stress Increase < 2,600 psf (E1) | | Stress Increase > 2,600 psf (E2) | |
| | | Bulk Modulus (ksf) | Shear Modulus (ksf) | Bulk Modulus (ksf) | Shear Modulus (ksf) | Bulk Modulus (ksf) | Shear Modulus (ksf) | Bulk Modulus (ksf) | Shear Modulus (ksf) |
| Silty Clay | 0 -20 | 130 | 45 | 75 | 25 | 25 | 8 | 60 | 20 |
| Silty Sand | 20-55 | 1,550 | 710 | 1,080 | 500 | 1,140 | 525 | 1,420 | 650 |
| Silty Clay | 65-55 | 1,100 | 110 | 105 | 10 | 110 | 12 | 120 | 13 |
| Silty Sand | 70-65 | 600 | 1,200 | 500 | 230 | 870 | 400 | 1,100 | 500 |
| Stiff Clay | 80-70 | 2,800 | 290 | 250 | 25 | 225 | 25 | 210 | 20 |

## TABLE 6-3

## SUMMARY OF ESTIMATED SETTLEMENTS DUE TO LNG TANK LOAD

| Scenario | | | Estimated Settlement (inches) | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | | Under Tank Center | | | Under Tank Perimeter | | | Differential |
| | | | Immediate | Consolidation | Total | Immediate | Consolidation | Total | |
| 1 | Stone Columns without Pre-Loading | Without Mat | 2 | 35 | 37 | 1 | 21 | 22 | 15 |
| 2 | | With Mat | 2 | 36 | 38 | 1 | 31 | 32 | 6 |
| 3 | Stone Columns with Pre-Loading | Without Mat | 8 | 4 | 12 | 6 | 0 | 6 | 6 |
| 4 | | With Mat | 9 | 4 | 13 | 8 | 1 | 9 | 4 |
| 5 | Replacement of Upper 15 feet and Stone Columns | Without Mat | 2 | 11 | 13 | 6 | 1 | 7 | 6 |
| 6 | | With Mat | 2 | 11 | 13 | 1 | 7 | 8 | 5 |

**TABLE 6-4**

**ESTIMATED SETTLEMENTS DUE TO 25-FOOT HIGH SURCHARGE FILL**

| | | Settlement (inches) | | | Duration (months) |
|---|---|---|---|---|---|
| | | Immediate | Consolidation | Total | |
| Total Settlement | Compression | 18 | 32 | 50 | 5 |
| | Rebound | NA | NA | 9 | 2 |
| After 3-month surcharge period | Compression | 18 | 24 | 42 | 3 |
| | Rebound | NA | NA | 7 | 1 |

Notes:
NA = Not Applicable
(1) 90 percent of consolidation will occur within 5 months. The remaining 3 inches of settlement will occur over a 2 to 3 year period.
(2) Assumes a uniform rate of fill placement during a 1-month construction period.

## TABLE 6-5

## AXIAL PILE CAPACITIES FOR EXISTING SOIL CONDITIONS

| Pile Dimension | Minimum Pile Length (feet) | Axial Downward Capacity without Downdrag (kips) | Axial Downward Capacity with Downdrag (kips) | Axial Upward Capacity (kips) |
|---|---|---|---|---|
| 14-inch square | 90 | 310 | 160 | 140 |
| 16-inch square | 90 | 390 | 220 | 160 |
| 24-inch octagonal | 90 | 600 | 380 | 225 |

**TABLE 6-6**

**AXIAL PILE CAPACITIES WITH IMPROVEMENT OF UPPER 15 FEET OF SOILS**

| Pile Dimension | Minimum Pile Length (feet) | Axial Downward Capacity without Downdrag (kips) | Axial Downward Capacity with Downdrag (kips) | Axial Upward Capacity (kips) |
|---|---|---|---|---|
| 14-inch square | 90 | 310 | 135 | 145 |
| 16-inch square | 90 | 390 | 190 | 170 |
| 24-inch octagonal | 90 | 600 | 340 | 240 |

## TABLE 6-7

## LATERAL PILE CAPACITIES FOR EXISTING SOIL CONDITIONS

| Pile Dimension | Pile Head Deflection (inches) | Fixed-Head Condition | | Free-Head Condition | |
|---|---|---|---|---|---|
| | | Lateral Load (kips) | Maximum Induced Moment (kip-feet) | Lateral Load (kips) | Maximum Induced Moment (kip-feet) |
| 14-inch square | 3/8 | 17 | 90 | 8 | 35 |
| | 1 | 35 | 220 | 13 | 70 |
| 16-inch square | 3/8 | 23 | 140 | 10 | 50 |
| | 1 | 44 | 310 | 17 | 110 |
| 24-inch octagonal | 3/8 | 48 | 385 | 18 | 130 |
| | 1 | 100 | 920 | 35 | 300 |

## TABLE 6-8

## LATERAL PILE CAPACITIES WITH IMPROVEMENT OF UPPER 15 FEET OF SOILS

| Pile Dimension | Pile Head Deflection (inches) | Fixed-Head Condition | | Free-Head Condition | |
|---|---|---|---|---|---|
| | | Lateral Load (kips) | Maximum Induced Moment (kip-feet) | Lateral Load (kips) | Maximum Induced Moment (kip-feet) |
| 14-inch square | 3/8 | 40 | 170 | 16 | 60 |
| | 1 | 80 | 385 | 31 | 135 |
| 16-inch square | 3/8 | 50 | 235 | 21 | 85 |
| | 1 | 100 | 525 | 40 | 190 |
| 24-inch octagonal | 3/8 | 105 | 660 | 45 | 230 |
| | 1 | 205 | 1,450 | 82 | 490 |

## TABLE 6-9

## LATERAL PILE CAPACITIES FOR OTHER MAJOR STRUCURES NORTH OF THE LNG TANKS

| Pile Dimension | Pile Head Deflection (inches) | Fixed-Head Condition | | Free-Head Condition | |
|---|---|---|---|---|---|
| | | Lateral Load (kips) | Maximum Induced Moment (kip-feet) | Lateral Load (kips) | Maximum Induced Moment (kip-feet) |
| 14-inch square | 3/8 | 30 | 140 | 11 | 45 |
| | 1 | 62 | 300 | 23 | 110 |
| 16-inch square | 3/8 | 38 | 190 | 14 | 60 |
| | 1 | 80 | 450 | 30 | 150 |
| 24-inch octagonal | 3/8 | 75 | 520 | 28 | 160 |
| | 1 | 165 | 1,250 | 62 | 390 |

STRESS-STRAIN CURVES FOR COMPOSITE MATERIAL
STONE COLUMN AND SOIL WITH PRE-LOADING
FLAC ANALYSIS - UNIT CELL MODEL


FIGURE 6-1

STRESS-STRAIN CURVES FOR COMPOSITE MATERIAL
STONE COLUMN AND SOIL WITHOUT PRE-LOADING
FLAC ANALYSIS - UNIT CELL MODEL

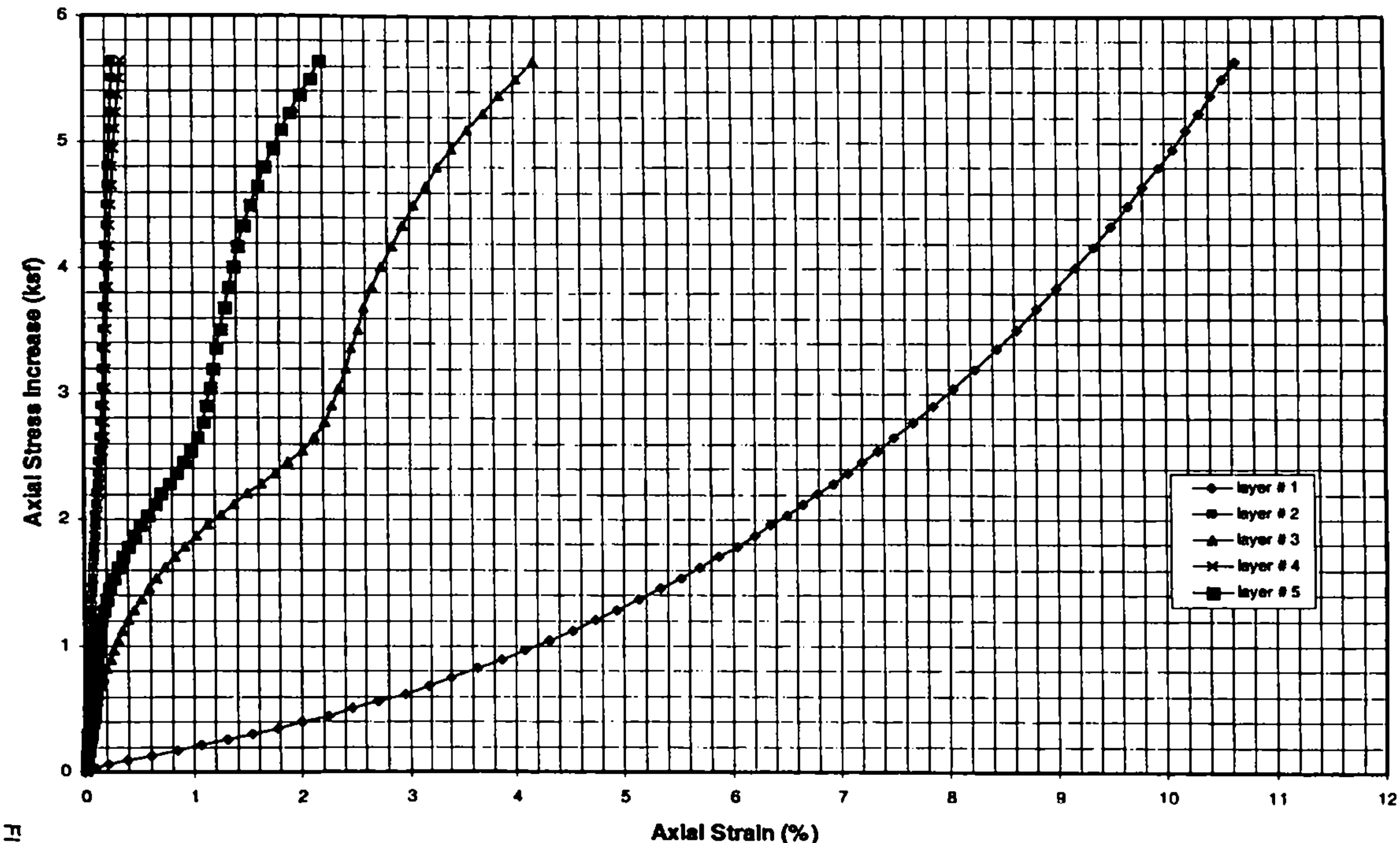
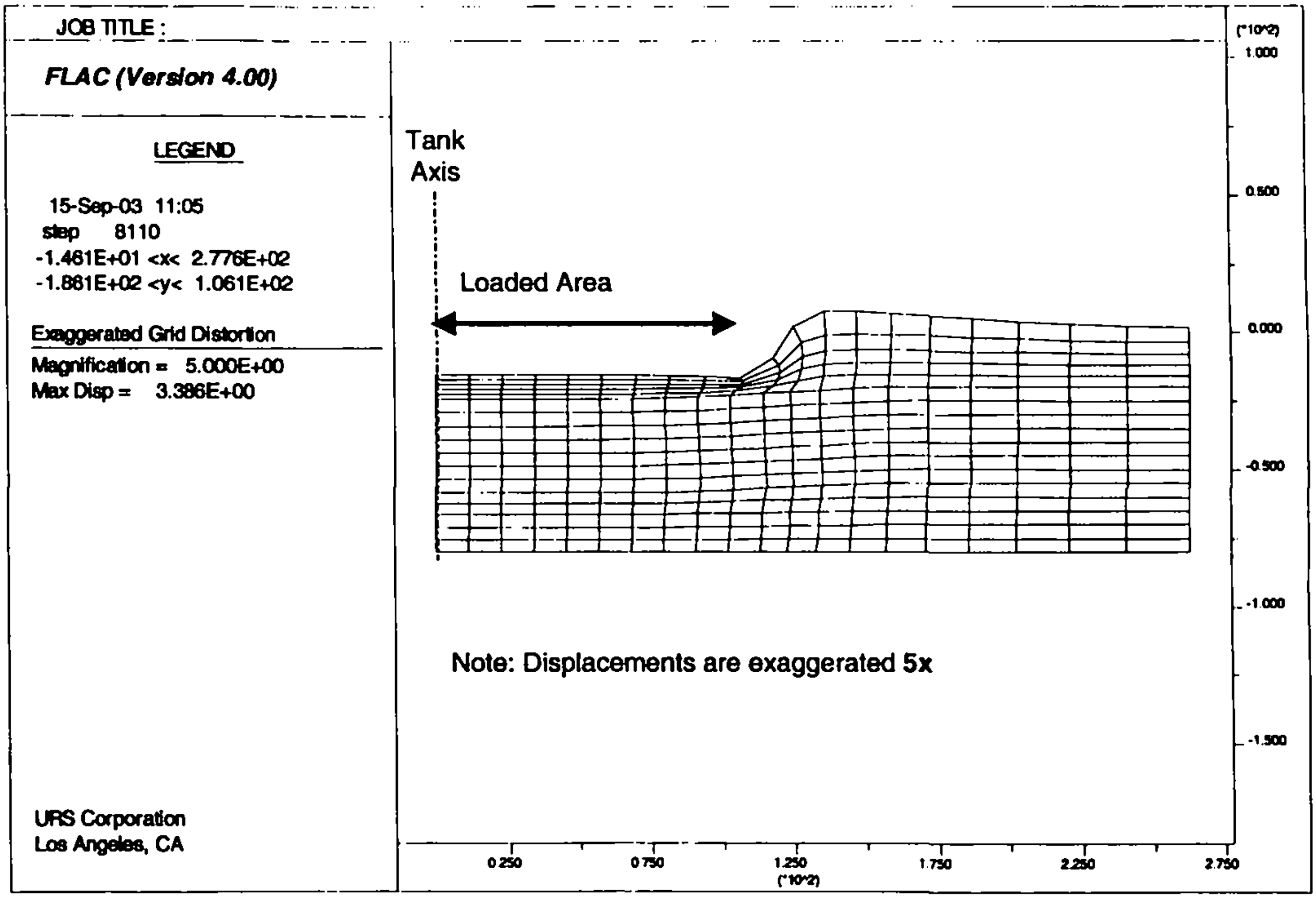



FIGURE 6-2




# Model Setup
## Stone Columns without Preloading
Without Tank-Foundation Mat

Figure 6-3

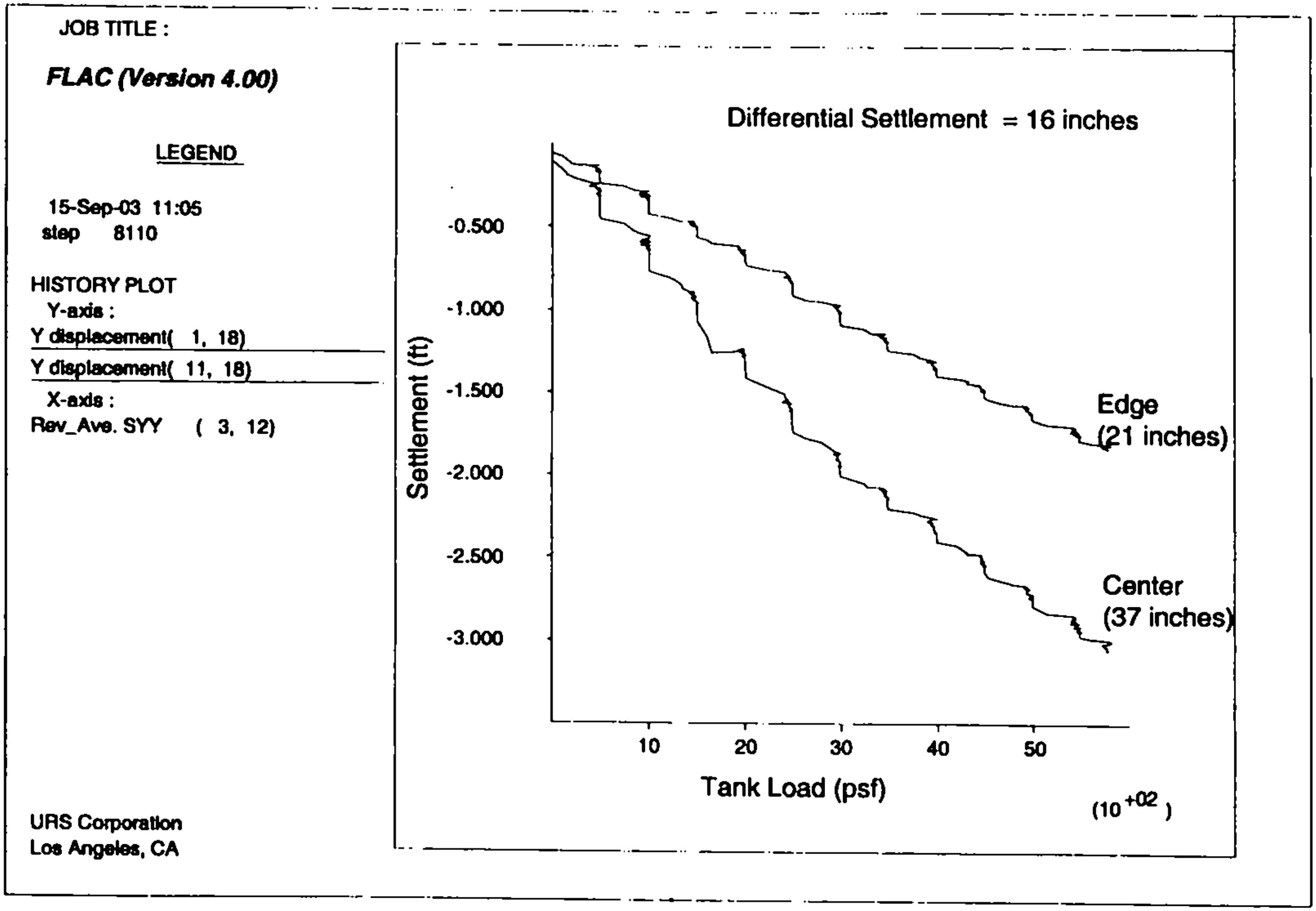
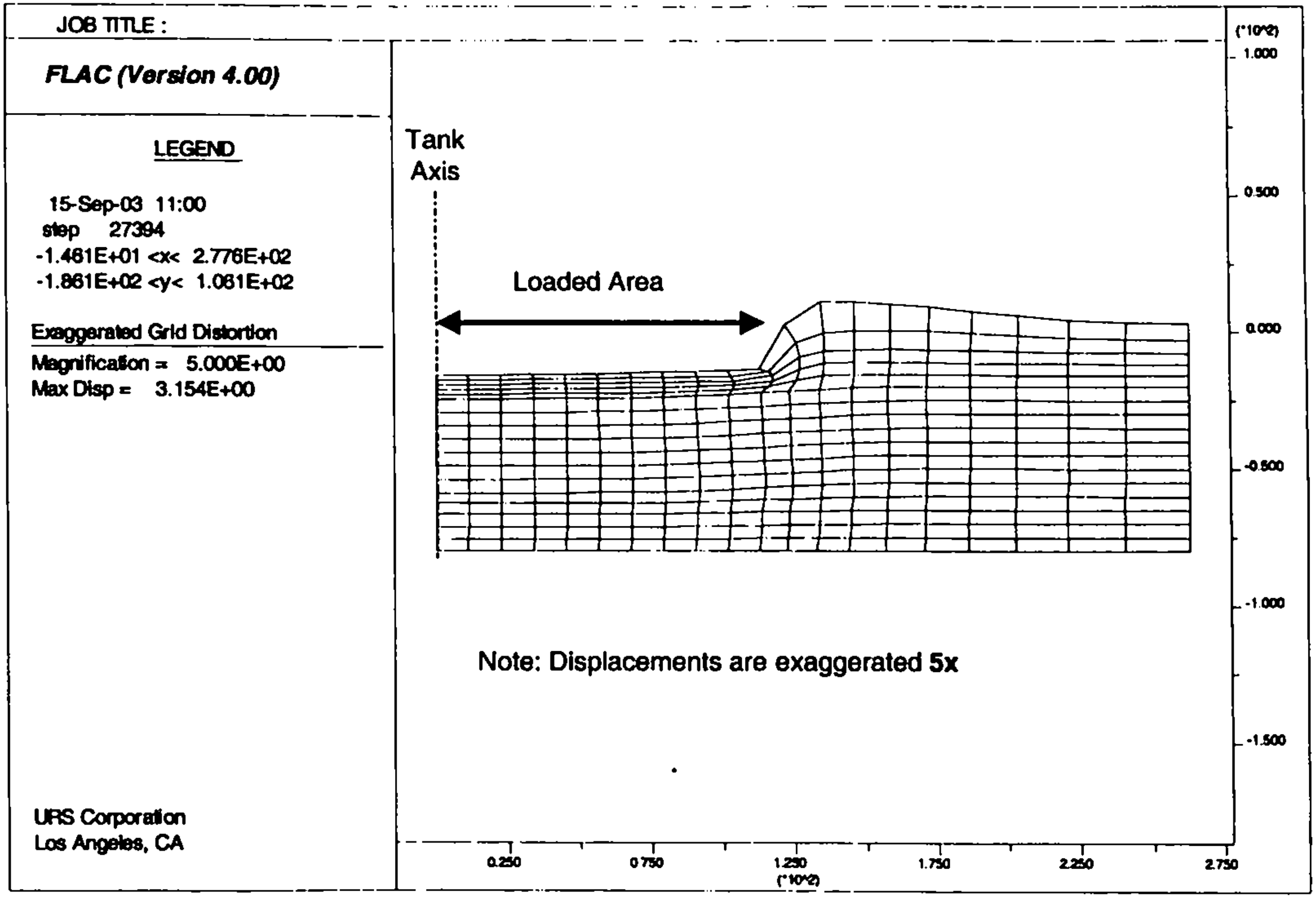



Figure 6-4

**Settlement v. Load Plot**
**Stone Columns without Preloading**
Without Tank-Foundation Mat




# Model Setup
# Stone Columns without Preloading
With 4-ft thick Tank-Foundation Mat

Figure 6-5

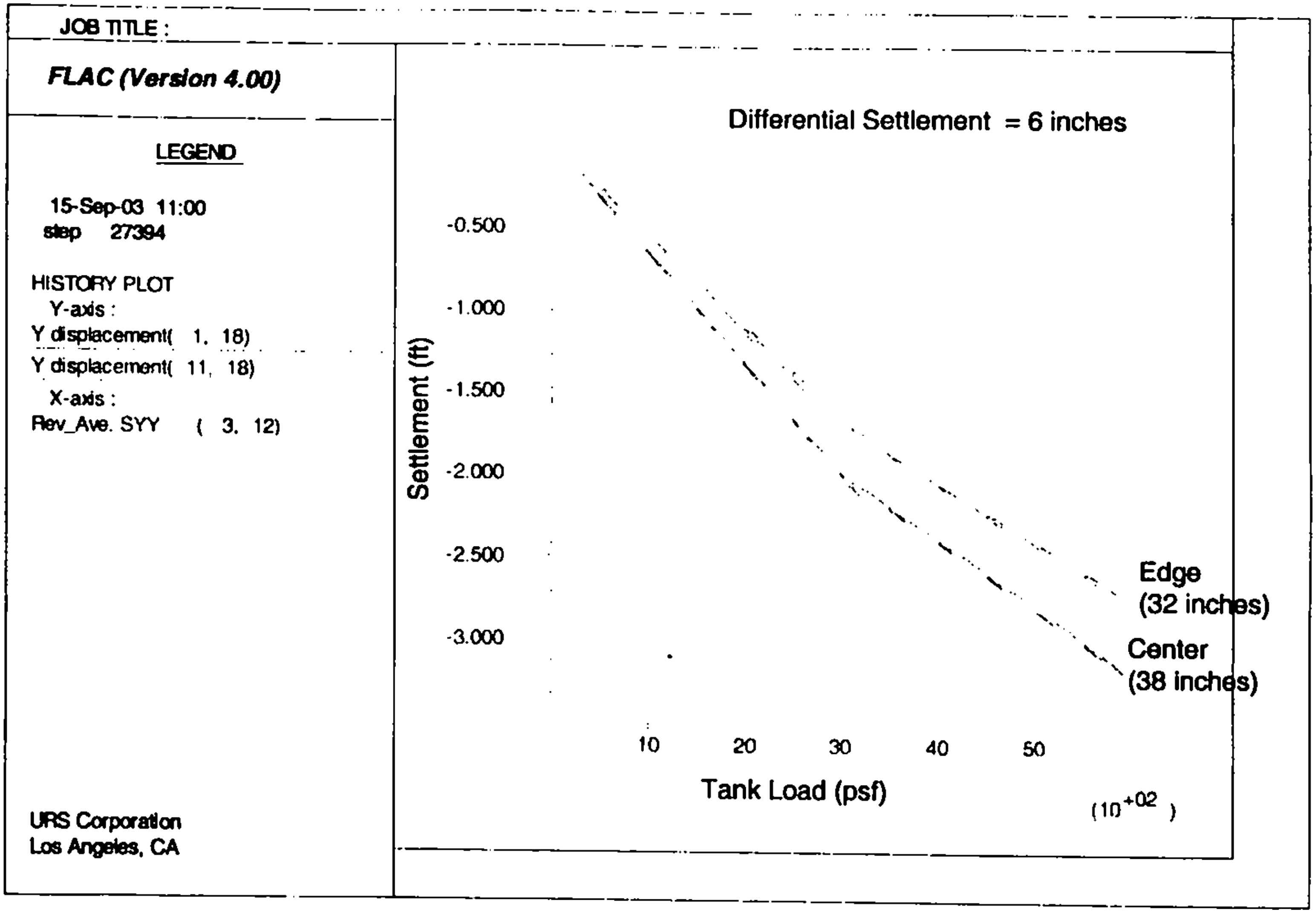
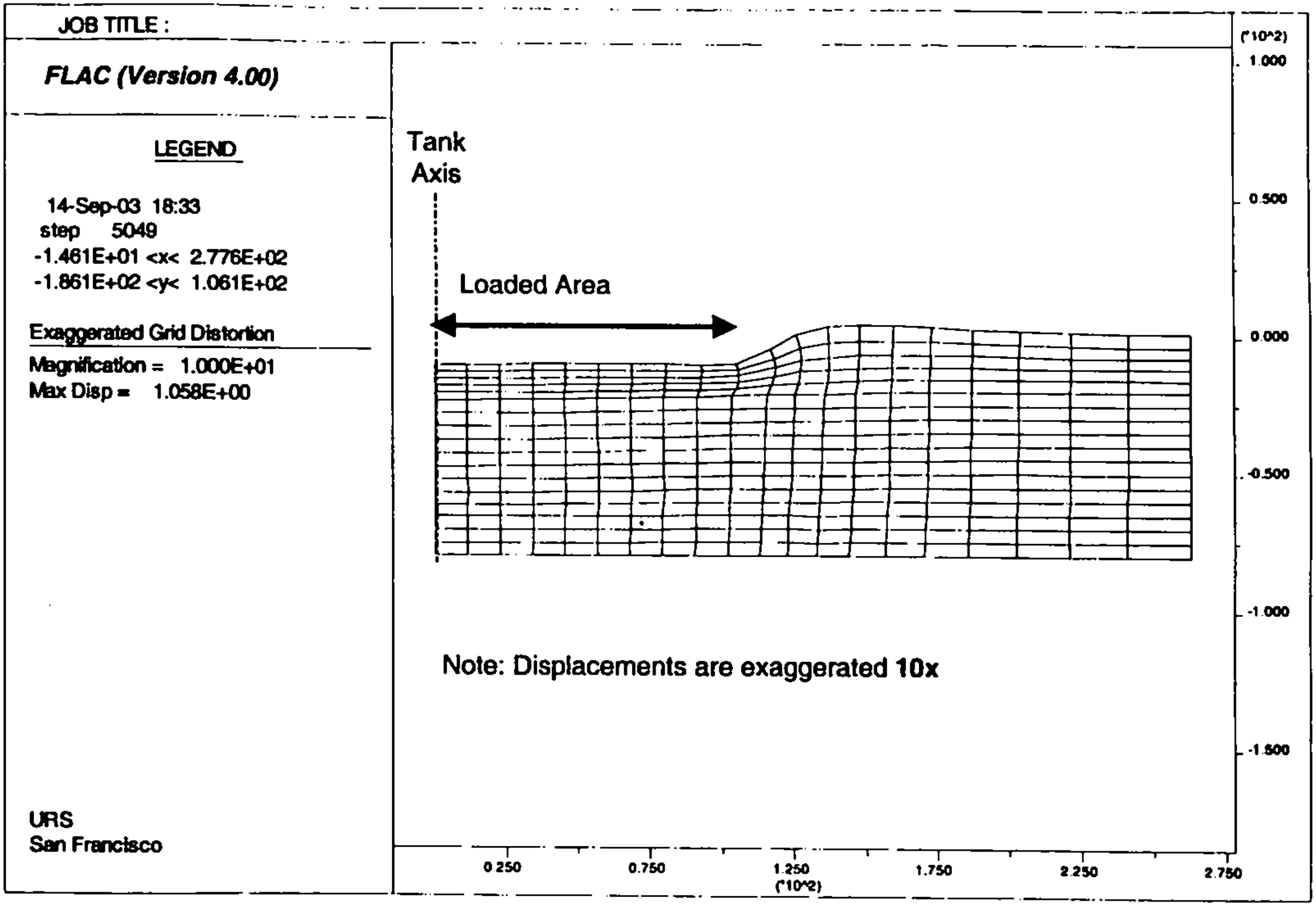



Figure 6-6

**Settlement v. Load Plot**

**Stone Columns without Preloading**

With 4-ft thick Tank-Foundation Mat




# Model Setup
## Stone Columns with Preloading
Without Tank-Foundation Mat

Figure 6-7

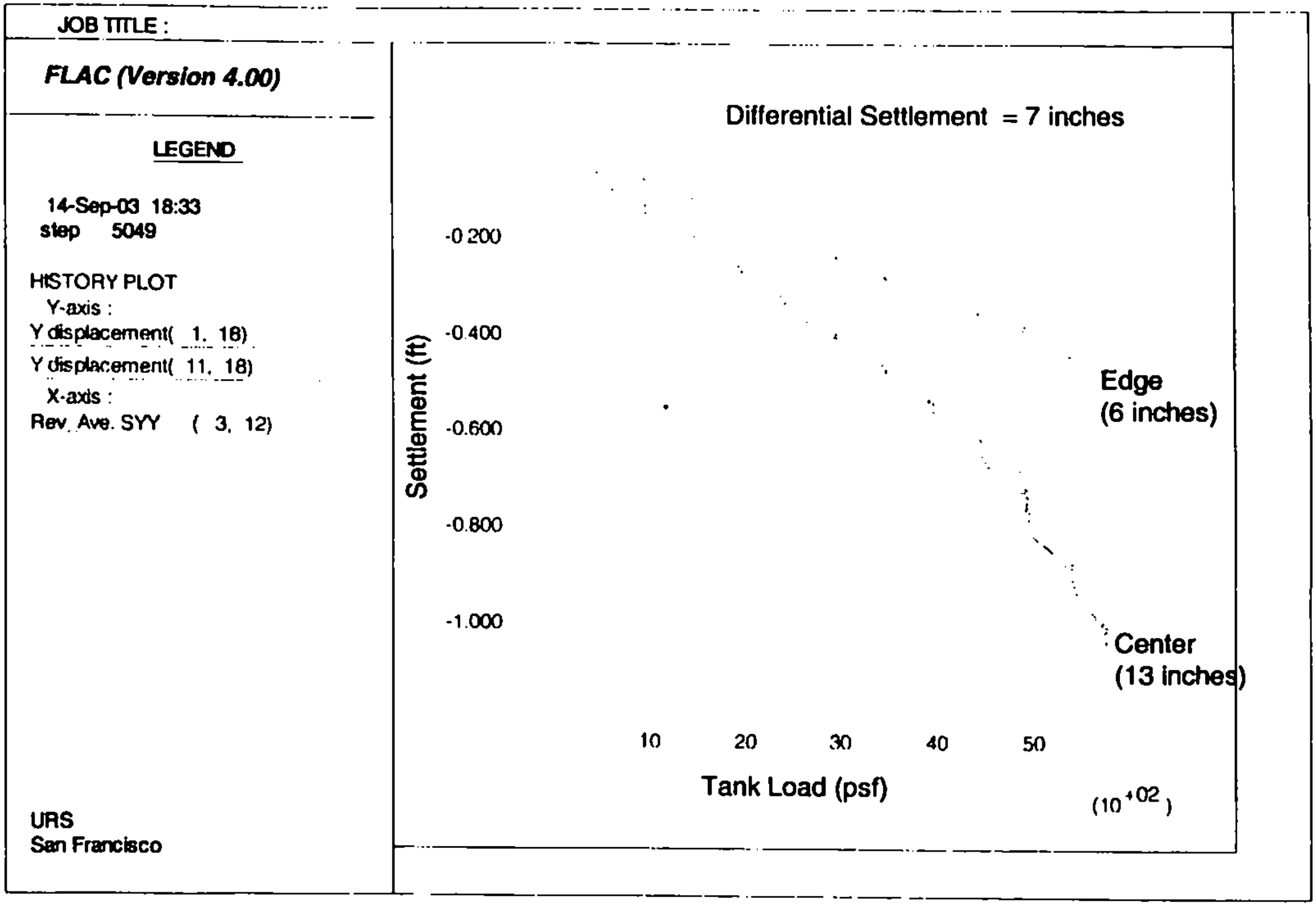



Figure 6-8

# Settlement v. Load Plot
# Stone Columns with Preloading
Without Tank-Foundation Mat

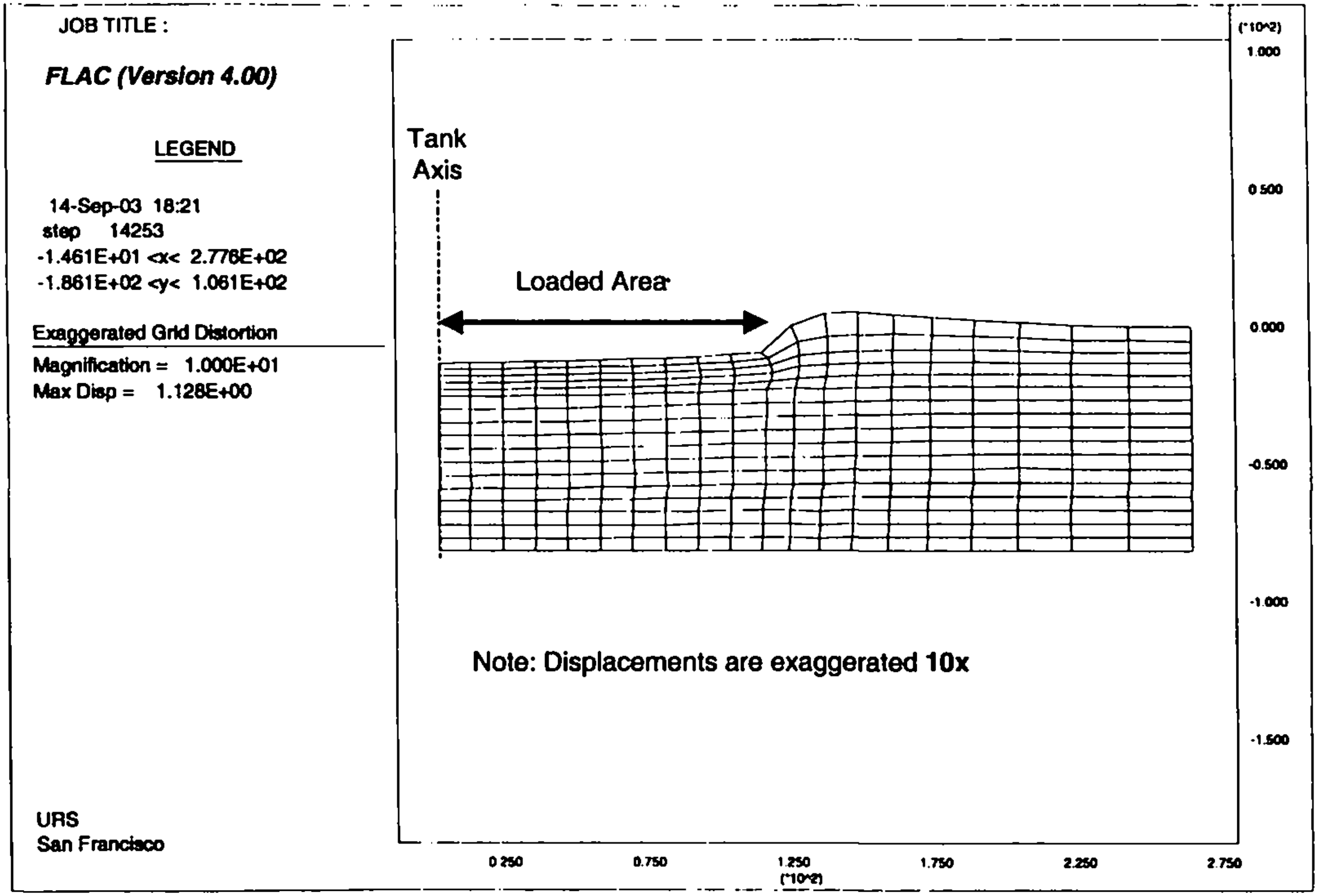
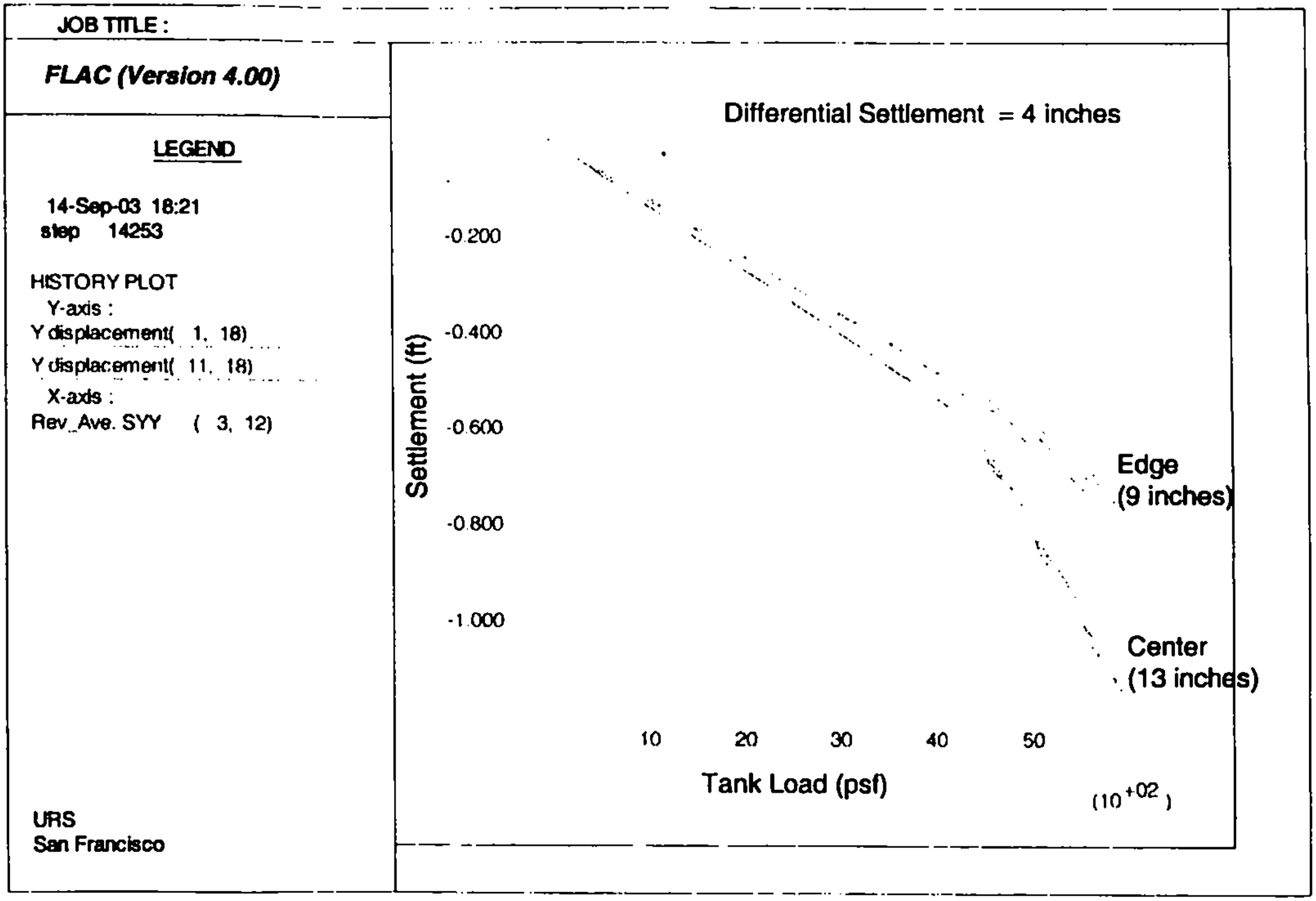



Figure 6-9

# Model Setup
# Stone Columns with Preloading
## With 4-ft thick Tank-Foundation Mat




# Settlement v. Load Plot
# Stone Columns with Preloading

With 4-ft thick Tank-Foundation Mat

Figure 6-10

# 7.0 DISCUSSION AND RECOMMENDATIONS

## 7.1 GENERAL

The proposed LNG terminal site is underlain by up to 80 feet of artificial fills and estuarine deposits consisting of loose to medium dense sands and relatively compressible silts and clays. These materials are generally unsuitable for direct support of the proposed LNG storage tanks and other major structures, with the anticipated heavy loads causing significant total and differential static settlements. In addition, the predominantly granular layers are liquefiable under the design seismic (OBE and SSE) events.

In order to reduce the differential settlements to meet the specified tolerance criteria, the LNG storage tanks and other major structures may be supported on deep piles or on the existing soils with ground improvements. Ground improvement methods considered to be most appropriate for this site include stone columns in combination with pre-loading or replacement of the upper soft soils above the groundwater table. Compared to more rigid pile foundations, a mat foundation on improved ground maintains full contact with the soil mass during earthquake shaking. This provides a significant amount of damping, which reduces the seismic forces transmitted to the tank structure.

## 7.2 SITE IMPROVEMENT WITH STONE COLUMNS

Vibro-replacement stone columns improve the liquefaction resistance of the soils both through densification and by providing preferred drainage paths for the dissipation of shaking-induced excess pore-pressures; thereby mitigating liquefaction-induced settlements and lateral spreading. Stone columns are installed by vibroprobes inserted into the ground, laterally displacing and densifying in-situ materials. The created space is backfilled with coarse gravel (stones) compacted with the vibroprobe in multiple layers. Settlements are reduced by transferring applied vertical loads to the stiff stone columns, and also by densification of the in-situ soils between the columns. The overall settlement improvement factor that can be achieved is a function of soil type, silt and clay content, initial density, vibrator type, stone shape and durability, and stone-column diameter and spacing.

Stone columns should be installed to depths of about 80 feet below the existing ground surface to the dense marine sand layer. Based on the results of our analyses, we recommend a triangular pattern of 42-inch diameter columns at 8-foot center-to-center spacing, giving an area replacement ratio of about 0.17. A detail of the recommended stone column configuration is presented in Figure 7-1. In general, the stone-column improved area should extend a minimum 40 feet beyond the tank footprint. However, due to the potential seismic instability of the waterfront structures, we recommend extending the improvement area to the toe of rock dike and the cellular bulkhead on the west and south sides of the tank area, respectively.

Stone column installation may generate subsurface lateral movements that potentially have an adverse impact on the wharf and/or bulkhead structures. Therefore, we recommend initiating installation adjacent to these structures, continuing towards the tanks. i.e. from the wharf moving to the east and from the bulkhead moving to the north. In addition, care should be exercised when installing stone columns adjacent to the concrete deadmen supporting the bulkhead structure. Stone columns should be installed simultaneously on both sides of the deadmen.

The gradation of the stone column material should be sized to provide good drainage for the surrounding soil, but also prevent clogging. To ensure an effective permeability and prevent clogging, recommendations for stone gradation are presented in Figure 7-1.

The results of our settlement analyses indicate that differential settlements for the case of stone column without preloading are close to the settlement criteria. However, due to the highly variable and compressible soils in the upper 20 feet, we recommend preloading or removal and recompaction in any case.

### 7.3 PRE-LOADING

We recommend pre-loading the tank areas with a surcharge of fill prior to installation of stone columns in order to reduce differential settlements and meet the settlement criteria. This method of site improvement was effectively used for support of the LNG storage tanks in Penuelas, Puerto Rico (Dames & Moore, 1995). By pre-loading first, the loose/soft soils beneath the tanks consolidate under the full weight of the surcharge load. In contrast, when pre-loading <u>after</u> installation of stone columns the subsurface soils are consolidated with only a fraction of the surcharge weight, due to stress concentration in the stone columns. Surcharging after installation also increases the possibility of contaminating the stone columns with fines migrating from the consolidating soils, thereby reducing permeability and impeding the dissipation of excess pore-water pressure during earthquake shaking.

We recommend a 25-foot high surcharge fill, with the full height extending the entire tank diameter. In order for the subsurface soils to experience the full effect of the surcharge load, the 25-foot fill height should be left in-place for a period of 3 months. Based on our previous surcharging experience at sites within the Port with similar subsurface conditions, namely at Berths T-118 and T-119 at Pier Echo (Dames & Moore, 1993), Pier F (Dames & Moore, 1990), Pier S (Dames & Moore, 1999), and Slip-2 at Pier E (URS, 2001), this height of surcharge and duration of pre-loading should be sufficient to allow completion of immediate settlements in sands and up to 80 percent of primary consolidation in silts and clays interlayered with fine sands. Settlements anticipated to occur during pre-loading are presented in Table 6-4. Instrumentation should be installed to observe settlements and pore-pressure dissipation during surcharging and any potential subsurface lateral movements that may have adverse impacts on the adjacent waterfront structures.

Near-future and ongoing projects at POLB may have an excess of materials available for the surcharge fill. For example, dredging of the Back Channel (on the east side of Pier Echo) will likely be performed early to mid-2004. This project may potentially have 300,000 to 500,000 cubic yards of dredge sediments available for temporary use, which would be more than enough for surcharging the LNG tank sites.

If dredge materials are used to surcharge the site, a containment dike will need to be constructed. Based on our previous experiences during reclamation of Slip-2 at Pier E at POLB (URS, 2001) a slope of 2:1 horizontal to vertical is recommended for the dike to maintain overall static slope stability. Alternatively, if land-imported fill materials are utilized, we recommend a 1 ½:1 slope. Fill should be placed in accordance with the recommendations presented in Section 7.7

In order for the stone columns to effectively dissipate excess pore-pressures generated during an earthquake, the tank mats should be underlain by a minimum 3-foot thick compacted gravel layer. The gravel layer should consist of Caltrans Class II crushed miscellaneous base (CMB) materials, compacted to at least 95 percent of the maximum dry density per ASTM D-1557. The Caltrans Class II gradation criteria are presented in Table 7-2.

## 7.4 REPLACEMENT OF UPPER FILLS

As an alternative to pre-loading, differential settlements could be reduced to meet the settlement criteria by removal and replacement of the upper poor-quality fills beneath the proposed LNG storage tanks. For this option, we recommend excavation of the upper 13 to 15 feet of the site soils, to an elevation above the highest anticipated tide level of +7 feet MLLW. These materials should be replaced with engineered fill, placed in accordance with the requirements in Section 7.7

The major drawback of this option is that the majority of fills in the upper 15 feet of the tank areas consist of silts and clays, unsuitable for re-use as engineered fill. Therefore, in addition to removing these materials from the site, suitable fill materials will have to be imported.

Alternatively, consideration may be given to constructing the LNG storage tanks at the bottom of the excavation. The excavation may even be expanded to include the tank-spill containment area, with the outer earth retaining walls doubling as spill containment. Such a configuration would also allow the tanks to be base-isolated, if required.

## 7.5 DRIVEN PILES

As an alternative to the ground improvement schemes discussed above, driven piles are also suitable for support of the LNG storage tanks. Octagonal, 24-inch diameter pre-stressed concrete piles, driven into the sediments of the Gaspur Aquifer, are typically used in the Port area for support of heavy structures. The Gaspur Aquifer was encountered between Elevations -65 and -75 feet MLLW at the project site (90 to 95 feet below the existing ground surface).

Potential vibrations from pile driving operations and their effect on adjacent facilities may need to be evaluated. If required, pile-driving operations can be controlled and vibration isolation devices/techniques can be used to keep them below a prescribed level. Recommendations for design of driven piles are presented in Section 6.1.7.

While driven piles are feasible for support of the tanks, their anticipated low damping ratio combined with the large PGA's of the OBE and SSE response spectra developed for the site will likely require base isolation. Furthermore, as a result of post-earthquake settlements, we anticipate large downdrag forces acting on the piles.

### 7.5.1 Pile Installation

Piles should be driven to effective refusal with a hammer having a rated energy of 100,000 foot-pounds per blow. For preliminary estimating purposes, the effective refusal criteria for piles are presented in Table 7-3. The driving rig should be equipped for predrilling. However, predrilling should only be performed as directed by the geotechnical engineer. If utilized, the diameter of predrilled holes should be at least 2 to 4 inches smaller than the pile size. Removal of obstructions may be necessary in some areas.

Based on the results of current and previous investigations, we do not anticipate subsurface obstructions at Pier Echo, with one exception. Based on review of old construction drawings, the rock jetty constructed in 1925 (as discussed in Section 3.1.2 and shown in Figure 3-1) appears to extend in an east-west direction across the northern edge of the site. The exact location of this jetty could not be verified. Past experiences in the port area have shown that driven piles may encounter refusal within this rock dike. Therefore, we recommend performing additional exploration (such as CPT's) to verify the location of this dike, specifically to ensure it is not located under the northern LNG tank. If the rock dike is located beneath proposed structures, we recommend driving indicator piles to confirm whether the piles can penetrate through the rock, as discussed in the following section.

Caution must be exercised during driving through the upper medium dense/stiff soils into the underlying loose/soft hydraulic fills to avoid pile damage. Prior to commencement of pile installation, the proposed pile driving equipment should be evaluated by wave equation analyses. Jetting should not be used for the concrete piles.

### 7.5.2 Indicator Pile Program

We recommend that several indicator test piles be installed at the site at selected locations to develop required pile lengths and criteria for production piles. Prior to installing the indicator piles, we recommend that CPT tests be performed at each location of the proposed test piles to provide data for correlation between CPT data and pile-penetration resistance.

All indicator piles should be driven with Pile Driving Analyzer (PDA) testing; and at least one pile should be load tested in axial compression and tension in order to calibrate PDA testing for the production piles. The piles to be tested should be selected, based on the results of the installation monitoring of the piles. Compression and tension load testing should be performed in accordance with ASTM D-1143 and D-3689, respectively. Prior to commencement of the load tests, the pile contractor should submit equipment details, proposed pile load test setup, together with hydraulic jack calibration charts, and other pertinent information.

The indicator and pile-load test program should be performed under the continuous supervision and monitoring by the geotechnical engineer of record. Detailed description and results of the indicator and load-test program should be provided in a separate Addendum Report upon completion of the program. The report should confirm the recommended pile capacities based on the load tests, and also discuss any remedial measures to supplement the capacity of any production piles that may fail to meet the specified criteria.

## 7.6 SHALLOW FOUNDATIONS

### 7.6.1 General

The proposed LNG terminal will likely include construction of various buildings and other structures not detailed in this report, such as administration and maintenance buildings, electrical substations, fueling facilities, etc. Depending upon the design loads, shallow foundations (such as spread footings or mat foundations) with site improvement may be suitable for use to support these structures. Site improvement may consist of stone columns or deep dynamic compaction (DDC) for heavier structures; and mechanically stabilized earth (MSE) composites or aggregate base sections placed beneath shallow foundations for lighter structures. DDC is currently being utilized for ground improvement beneath new buildings during the final construction phase of the Pier T Hanjin Terminal, located immediately north of the project site. We recommend performing additional subsurface explorations within the proposed footprints of future buildings and structures in order to provide specific recommendations for the design of shallow foundations.

### 7.6.2 Subgrade Preparation

Non-settlement sensitive, isolated structures may be supported on spread footings. In order to provide adequate support for these structures on shallow foundations, and to limit static settlements to within tolerable limits, we recommend improvement of the soils immediately underneath the footings. The depth of improvement below the bottom of footings is directly related to the size of the footings; 2 feet wide footing should be established on a minimum 5 feet of engineered fill; and 5 feet wide footing should be established on a minimum 10 feet of engineered fill. For intermediate footing widths, the depth of improvement can be obtained by linear interpolation. Engineered fill should be placed in accordance with the requirements of Section 7.7.

### 7.6.3 Bearing Capacity

All footings should be a minimum of 2 feet wide and established at a minimum depth of 2 feet below the lowest adjacent final grade. An allowable bearing pressure of 3,000 pounds per square foot (psf) may be used for spread footings established on compacted fill in accordance with the above recommendations. The bearing pressure may be increased by 200 psf for each additional foot of width and by 500 psf for each additional foot of depth, to a maximum value of 5,000 psf. The depth of embedment and width of the footings should be limited to 5 feet.

The allowable bearing pressure is a net value. Therefore, the weight of the foundation and the backfill over the foundation may be neglected when computing dead loads. The bearing pressure applies to dead plus live loads and includes a calculated factor of safety of at least 3. For shallow foundations installed in accordance with the above recommendations, the allowable bearing pressure value may be increased by one-third for short-term loading due to wind or seismic forces, as the potentially liquefiable soils are below the influence zone of shallow foundations.

### 7.6.4 Static Settlements

Total static settlements of individual spread footings will vary depending on the width of the footing and the actual load supported. Total static settlements of footings, designed and constructed in accordance with the preceding recommendations are estimated to be less than 1-inch. Differential settlement between similarly loaded footings may be assumed to be about half of the total settlement. Footing settlements have been estimated based on anticipated loading conditions. Static settlements of spread footings are expected to occur rapidly as a result of elastic compression of the supporting engineered fills and should be essentially complete following initial application of the loads. Estimated settlements versus bearing capacity for various footing widths are presented in Figure 7-2.

### 7.6.5 Lateral Resistance

Resistance to lateral loads may be provided by frictional resistance between poured-in-place concrete foundations and the underlying compacted soils and by passive soil pressure against the sides of the footings. The coefficient of friction between poured-in-place concrete footings and the compacted soils may be taken as 0.4. Passive pressure available in the compacted backfill may be taken as equivalent to the pressure exerted by a fluid weighing 350 pounds per cubic foot (pcf) with a maximum allowable value of 3,500 psf. The above-recommended values include a factor of safety of at least 1.5; therefore, frictional and passive resistances may be used in combination without reduction.

### 7.6.6 Seismically-Induced Settlements

Shallow foundations constructed in accordance with the recommendation above will perform satisfactory under static conditions. However, unless more rigorous soil improvement measures (i.e. stone columns or Deep Dynamic Compaction) extending to the full depth of loose soils are implemented, seismically-induced settlements may range as high as 25 inches. Structures supported on shallow footings may require repair or rebuilding after a major earthquake event. To limit seismically-induced liquefaction settlement, the loose soils below groundwater table should be improved with stone columns, or structures may be supported on pile foundations.

## 7.7 SITE EARTHWORK

### 7.7.1 Site Preparation

Site preparation will involve demolition and removal of existing buildings, surface structures, asphalt pavements, and concrete pavements and curbs. Prior to site grading, any debris, vegetation, and remnants of the demolition work should be removed and disposed of outside the construction limits. All active or inactive utilities within the proposed construction area should be relocated or abandoned. Any pipes to be abandoned in-place should be filled with sand-cement slurry after review of their location and approval by the geotechnical engineer.

Where overexcavation and replacement with engineered fill is recommended, excavations should extend beyond the footprints of the proposed structure to a distance equal to the depth of engineered fill below the bottom of the structure, but at least 5 feet

Subgrades should be proofrolled to locate any soft or loose zones. Proofrolling will involve several passes with a heavy rubber-tired equipment and observing the reaction of the subgrade under the wheel loads. Observed loose or soft zones should be compacted in-place or excavated and replaced with properly compacted backfill. If the disturbed zone is greater than about 12 inches in depth, geotextiles should be utilized to stabilize the excavation subgrade.

### 7.7.2 Temporary Excavations

Temporary excavations will be required for the option of removal and recompaction of unsuitable soils. All excavations must comply with current California or Federal OSHA requirements, as applicable. Cuts greater than 5 feet in depth must be sloped and/or shored. Temporary excavations that do not remain open more than a few days may be sloped at 1:1, horizontal to vertical, or flatter, up to a maximum depth of 10 feet below surrounding grade. Excavations greater than 10 feet in depth should be sloped at 1 ½:1, horizontal to vertical, or flatter, up to a maximum depth of 20 feet. Flatter slopes like that recommended above may be required if clean and/or loose sandy soils are encountered along the slope face, and the contractor should be prepared to flatten the slope at the direction of the geotechnical engineer.

Runoff water should be prevented from entering the excavation, and collected and disposed of outside the construction limits. To prevent runoff from adjacent areas from entering the excavation, a perimeter berm may be constructed at the top of the slope. Heavy construction equipment, building materials, excavated soil stockpiles and vehicle traffic should not be allowed near the top of the slope within a horizontal distance equal to the depth of the excavation.

We recommend that the Geotechnical Engineer review all proposed excavations for the project. If removal of unsuitable soils within the influence zone of adjacent existing shallow foundations becomes necessary, existing footings will need to be underpinned. The influence zone of an existing footing may be assumed to be below a 45-degree line projected down from the bottom edge of the footing. Specific recommendations for underpinning can be provided on a case-by-case basis if needed.

### 7.7.3 Fills and Backfills

All fills and backfills, imported or otherwise, for support of structural loads, should be placed in loose lifts not exceeding 8 inches in thickness, brought to near-optimum moisture content, and compacted to at least 95 percent of the maximum dry density per ASTM D-1557 using mechanical compaction equipment.

From a geotechnical stand point, the existing granular fill soils at the site are suitable for reuse as engineered fills for the project provided these materials are free of any debris or organic matter. All onsite and imported fill should be predominately granular in nature, less than 3 inches in maximum size, free of organic and inorganic debris, and should contain less than about 35 percent non-expansive fines (i.e. material passing the No. 200 sieve). All fill and backfill materials should be observed and tested by the geotechnical engineer prior to their use in order to evaluate their suitability. Generally, each lift of fill and backfill should be tested in the field for density/compaction requirements.

## 7.8 LATERAL EARTH PRESSURES

Subsurface walls should be designed to resist the earth pressure exerted by the retained compacted, level backfill plus any additional lateral forces that will be applied to the walls due to surface loads placed at or near the wall. The at-rest earth pressure against walls that are restrained at the top may be taken as equivalent to the pressure exerted by a fluid weighing 55 pounds per cubic foot (pcf). Fifty percent of any uniform areal surcharges placed at the top of a restrained wall should be assumed to act as a uniform horizontal pressure over the entire height of the wall.

Retaining walls that are not restrained at the top may be designed for an active earth pressure developed by an equivalent to fluid weighing 35 pcf for level backfill conditions. Thirty percent of any uniform areal surcharges placed at the top of an unrestrained wall should be assumed to act as a uniform horizontal pressure over the entire height of the wall.

For seismic conditions, the seismic lateral pressures on unrestrained walls may be taken as an inverted triangular pressure distribution with a maximum pressure at the top equal to 35**H** psf and 65**H** psf (**H** being the height of the wall in feet) for the OBE and SSE, respectively. The seismic pressure should be superimposed on the static design load.

The above-recommended values do not include hydrostatic pressures due to lateral seepage from rainwater or landscaping irrigation water. Therefore, walls should be backfilled with free draining granular material and subdrains should be provided to collect and dispose of water that may accumulate behind earth retaining structures. The granular backfill should be at least 36 inches wide behind the wall. Light equipment should be used during backfill compaction immediately behind the wall to minimize possible overstressing of the wall.

## 7.9 FLOOR SLABS AND SLABS-ON-GRADE

Due to the high liquefaction potential and excessive post-earthquake settlements, floor slabs in buildings founded on existing soils without improvement should be designed as structural slabs supported on grade beams and piles. Slabs-on-grade should be supported on a minimum 12-inch thick layer of compacted aggregate base placed in accordance with the recommendations in Section 7.7. A moisture barrier is recommended under all slabs to be overlain by moisture-sensitive floor covering. A plastic or vinyl membrane may be used for this purpose and should be placed between two layers of moist sand, each at least 2 inches thick, to promote uniform curing of the concrete and to protect the membrane during construction.

For preliminary design of slabs and rigid pavements and for estimating deflections, a modulus of subgrade reaction (k) of 300 pounds per square inch per inch deflection (pci) may be used. We recommend performing additional subsurface explorations within the proposed footprints of future buildings and structures to verify these preliminary design values.

## 7.10 PAVEMENTS

For flexible pavements, we performed design analysis using the computer program 'PAVE' and in accordance with the method outlined in 'Flexible Pavement Structural Design Guide for California Cities and Counties.' Traffic at the site will consist of heavy tanker-type trucks corresponding to Traffic Index (TI) values ranging from 6 to 8. The TI value for normal car parking and light traffic areas has been assumed to be about 4 to 5. Recommended thicknesses of new flexible pavements are provided for TI values of 4 through 8 in Table 7-4.

Prior to any pavement construction we recommend that the site be prepared in accordance with the recommendations in Section 7.7. All new pavements should be supported on a minimum 2-foot thick layer of engineered fill, compacted to at least 95 percent of the maximum dry density per ASTM D-1557 for a minimum of 12 inches. An R-Value of 40 was assumed for the compacted subgrade.

Aggregate base should satisfy Caltrans Class II gradation requirements (presented in Table 7-2) and should have a minimum R-Value of 78. The onsite crushed AC should not be used as aggregate base underneath pavements without proper testing to evaluate conformance with gradation and R-Value requirements. All gradation and R-Value requirements should be confirmed by the geotechnical engineer during construction. All base materials should be compacted to a minimum of 95 percent of the maximum dry density per ASTM D-1557.

Pavement areas are susceptible to cracking and damage as a result of liquefaction and seismic settlement due to the design earthquakes.

## 7.11 SITE EROSION POTENTIAL

For stormwater runoff purposes, the site can be divided between two general areas: (1) the LNG storage tanks and tank containment area and (2) the northern area of the site including all other support structures and facilities, an area that will likely be entirely paved. A typical surface runoff coefficient for equipment and paved areas is 0.9. We have assumed that the tank containment area will likely be capped with gravel and therefore has a surface runoff coefficient of 0.0, since precipitation within these areas will be trapped within the containment wall where it will evaporate, infiltrate, or be discharged through stormwater collection systems, if utilized.

As the site is entirely paved or covered by tanks, equipment, or containment areas, no soil is exposed and, hence, erosion potential at the site is essentially considered to be non-existent

## 7.12 SOIL CORROSION POTENTIAL

Eight (8) selected samples of near-surface (upper 15 feet) soils were tested in order to assess corrosivity effects on underground utilities and concrete foundations. In general, soils with soluble sulfate content over 2,000 parts per million (ppm) are considered corrosive to concrete; soils with chloride content over 500 ppm and minimum resistivity below 1,000 ohm-centimeters (ohm-cm) are considered severely corrosive to metal.

Based on our experience with other projects in the Port area, it is anticipated that soils in contact with seawater will exhibit very low electrical resistivity due to the presence of sodium chloride resulting from seawater. These materials are generally severely corrosive to ferrous metals. The very high chlorides can also have an adverse effect on reinforced concrete structures if the chloride ions gain access to the underlying steel. Therefore, in the case of pre-stressed concrete piles, concrete should utilize rich mixes with low water-cement ratios. Type V cement it typically recommended for this purpose.

Generally, the near surface soils at the site are severely corrosive to ferrous metals, aggressive to copper and severe for sulfate attack on concrete. The corrosion test results are summarized in Table 7-5. Specific recommendations for the protection of underground utilities and concrete foundations are provided in Appendix F.

## 7.13 WHARF STRENGTHENING SCHEMES

The seismic performance of the existing waterfront structures with respect to their ability to provide adequate lateral confinement for the tank foundations was analyzed for both stone-column and driven-pile foundation options. These structures were found to be capable of providing the necessary confinement for the LNG-tank foundations to withstand OBE and SSE shaking without suffering excess lateral or vertical deformations. However, our analysis results also indicate that the waterfront structures themselves would suffer moderate to extensive structural damage during OBE and SSE shaking, respectively.

There is also some uncertainty over whether dredging will be performed in the future to deepen the berthage areas. The proposed berthing structure for the LNG terminal along the western waterfront may require additional dredging beyond what is currently being performed for the Pier T Hanjin Terminal. Likewise, along the southern waterfront, a future liquid bulk terminal to the immediate east of the LNG terminal may also require deepening. It should also be noted that our seismic stability analyses have been based on some best-estimate assumptions concerning as-built dimensions (e.g. depths of piles and steel sheetpiles, and rock-dike geometry) and present-day integrity (e.g. possible corrosion damage) of the existing waterfront structures. Hence, whether or not deepening of the mudline will be required during future development, additional evaluations of the waterfront structures should be undertaken before completing the final design of this project. If such future work were to be performed by POLB as part of its responsibility for the waterfront structures, findings should be reviewed by the LNG-project team with respect to potential impact on the stability of the LNG tanks and other major structures.

Should the decision be made that the seismic performance of the waterfront structures (as predicted herein, or due to future dredging needs) warrants remedial measures, the following potential strengthening schemes could be considered for the wharf/dike system and the cellular bulkhead along the western and southern site boundary, respectively:

- Retrofit or replacement of the wharf concrete piles if dredging reduces the lateral confinement for the piles.
- Construction of an underwater cantilever wall to replace materials removed from the toe of the dike. This alternative was successfully implemented at Pier G (Dames & Moore, 1981) during a deepening project performed by POLB.
- Installation of shear panels inside the sheetpile bulkhead cells, oriented transverse to the pierhead line. Such panels could be constructed by Deep Mixing Methods (DMM), such as Cement Deep Soil Mixing (CDSM), or by structural slurry (diaphragm) walls
- In case of severe corrosion or inadequate depth of the existing cell walls, installation of replacement walls (sheetpiles, CDSM, or slurry walls) along the inside perimeter of the cells.

**TABLE 7-1**

**PROPOSED STONE COLUMN GRADATION DESIGN**

| Sieve Sizes | Gradation Criteria (percent passing by weight) | | |
|---|---|---|---|
| | Alternative 1 | Alternative 2 | Alternative 3 |
| 4-inch | - | - | 100 |
| 3 ½-inch | - | - | 90 – 100 |
| 3-inch | 90 - 100 | - | - |
| 2 ½-inch | - | - | 25 – 100 |
| 2-inch | 40 - 90 | 100 | - |
| 1 ½-inch | - | - | 0 - 60 |
| 1-inch | - | 2 | - |
| ¾-inch | 0 – 10 | - | 0 - 10 |
| ½-inch | 0 - 5 | - | 0 –5 |

**TABLE 7-2**

**CALTRANS CLASS II AGGREGATE BASE GRADATION CRITERIA**

| Sieve Sizes | Percentage Passing | |
|---|---|---|
| | 1 ½-inch Maximum | ¾-inch Maximum |
| 2-inch | 100 | - |
| 1 ½-inch | 90 – 100 | - |
| 1-inc | - | 100 |
| ¾-inch | 50 – 85 | 90 – 100 |
| No. 4 | 25 - 45 | 35 – 60 |
| No. 30 | 10 – 25 | 10 – 30 |
| No. 200 | 2 - 9 | 2 - 9 |

## TABLE 7-3

## RECOMMENDED DRIVEN PILE REFUSAL CRITERIA

| Pile Dimension | Recommended Effective Refusal Criteria | |
|---|---|---|
| | Blows Per Las Continuous Foot | Blows for Last 3 Consecutive Inches |
| 24-inch octagonal | 60 | 5 |
| 16-inch square | 30 | 3 |
| 14-inch square | 22 | 2 |

## TABLE 7-4

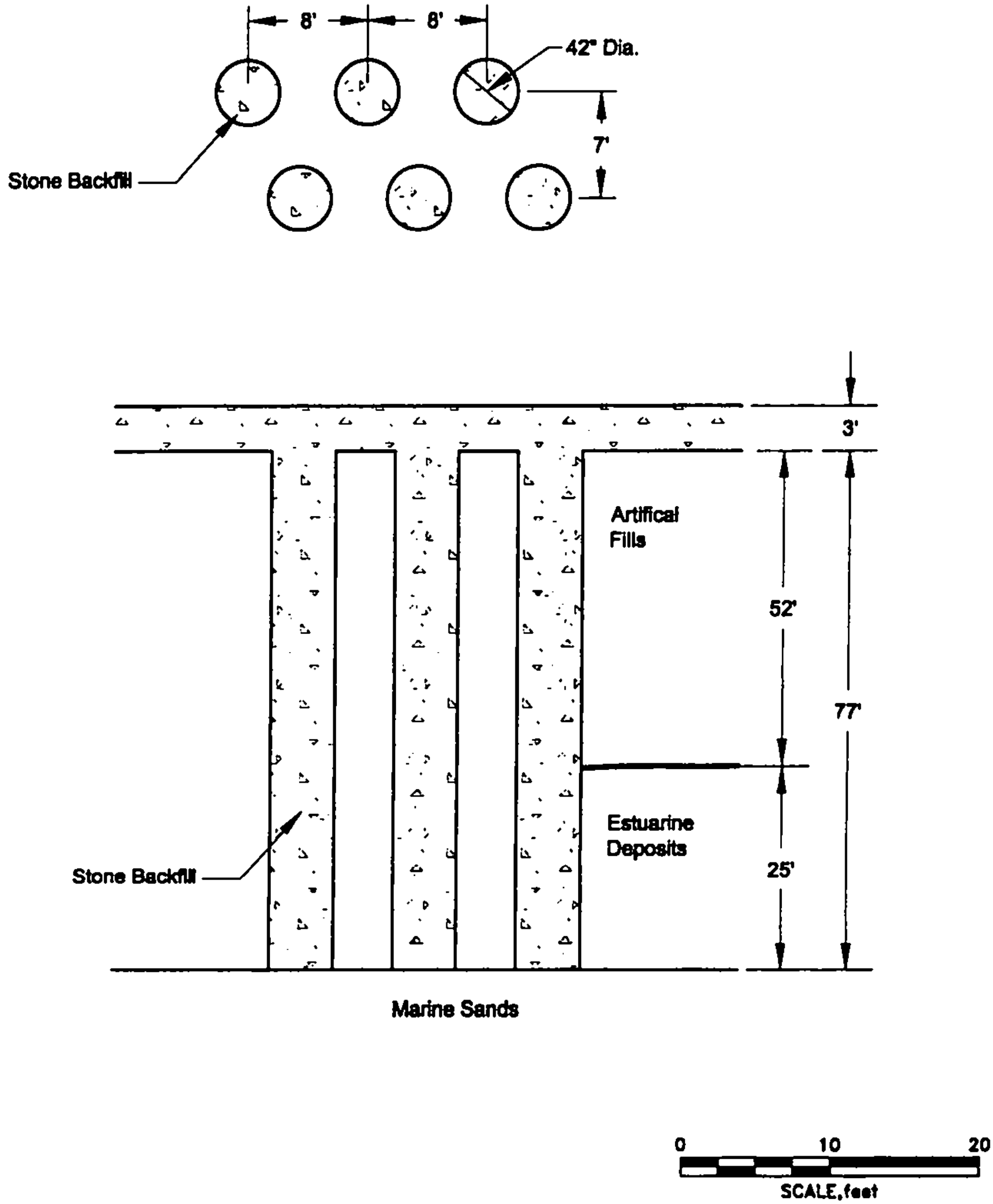
## PAVEMENT DESIGN CRITERIA

| Pavement Description | Traffic Index (TI) | Pavement Thickness (inches) | |
|---|---|---|---|
| | | Asphalt Concrete | Aggregate Base |
| Truck Drive Area | 8 | 5 | 9 |
| | 7 | 4 | 8 |
| | 6 | 3 | 6 |
| Car Drive Area | 5 | 3 | 5 |
| Car Park Area | 4 | 2 | 4 |

## TABLE 7-5
## SUMMARY OF CORROSION TEST RESULTS

| Sample ID | Soil Type | Thermal Resistivity (W/m-°C) | Electrical Resistivity (ohm-cm) | | pH | Chloride Content (ppm) | Sulfate Content (ppm) |
|---|---|---|---|---|---|---|---|
| | | | As-Received | Minimum | | | |
| B-1 & B-4 at 5 feet | SM-ML / ML | 0.94 | 410 | 410 | 7.8 | ND | 147 |
| B-3 & B-5 at 5 feet | ML / SM | 1.00 | 7,200 | 4,000 | 7.6 | 45 | 1,882 |
| B-8 at 5 feet | SM | 0.63 | 2,400 | 1,200 | 7.7 | 60 | 905 |
| B-2 & B-3 at 10 feet | CL / SM | 0.77 | 13,000 | 1,500 | 7.8 | ND | 477 |
| B-4 & B-5 at 10 feet | ML / SM | 0.81 | 5,100 | 1,900 | 8.0 | 30 | 423 |
| B-8 at 10 & 15 feet | SM | 1.16 | 5,800 | 1,700 | 7.1 | 110 | 1,699 |
| B-1 and B-4 at 15 feet | ML | 1.02 | 140 | 120 | 7.8 | 3,994 | 1,905 |
| B-3 & B-5 at 15 feet | ML / SM | 1.15 | 540 | 460 | 7.9 | 55 | 2,436 |

Notes: ND = Not Detected

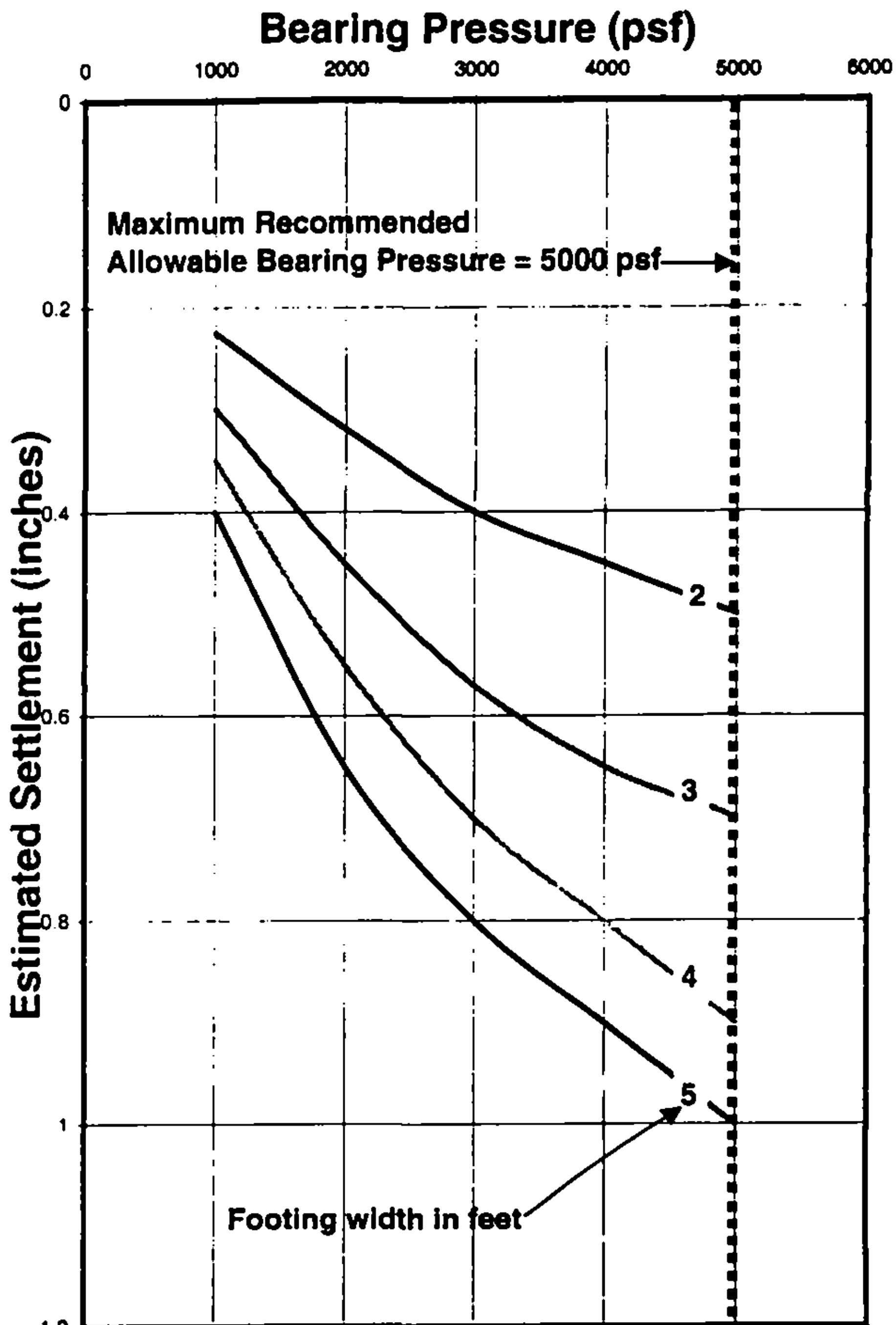



# DETAIL OF PROPOSED STONE COLUMN CONFIGURATION

Proposed Liquid Natural Gas Terminal
Pier Echo, Port of Long Beach

URS

Figure 7-1




Note:
1. Estimated settlements given above are for square footings founded in propoerly compacted fill.
2. Allowable bearing pressure applies to dead plus live loads and may be increased by 33 percent for short term loading due to wind or seismic forces.

**ESTIMATED SETTLEMENTS FOR SPREAD FOUNDATIONS**
**PROPOSED LNG TERMINAL**
**PIER ECHO, PORT OF LONG BEACH**

FIGURE 7-2

# 8.0 FUTURE INVESTIGATIONS

Due to the variability of the subsurface soils at the site, particularly within the upper 20 to 25 feet of the artificial fills, we recommend performing additional field exploration and geotechnical analyses during future phases of the project. These include:

1. Performing soil borings and CPT's within the footprint of the other proposed major structures in order to provide specific foundation design recommendations for each structure. At the time of the field investigation during the current study, the locations of these various structures were unknown. Because the soils in the northern portion of the site appear to be more competent, structure-specific soil data would likely result in more economical foundation designs. As shown in Figure 2-1, this includes the truck-unloading LNG storage, $C_2$, $C_3$, and water expansion tanks, demethanizer tower, BOG compressors, vaporizer fluid units, booster pump structures, and administration and maintenance buildings.

2. Performing additional soil borings and/or CPT's within the footprints of the LNG storage tanks in order to establish a reliable baseline soil profile for future site improvement. While the current investigation was sufficient to provide geotechnical recommendations for design of the tanks, the field and laboratory data demonstrated the variable nature of the subsurface soils. Due to the large diameter of these tanks, we therefore recommend performing additional exploration to verify that the subsurface conditions encountered in the borings and CPT's are consistent with the entire footprint area of the tanks.

3. We understand that POLB will be designing the offshore berthing structure and the strengthening or replacement schemes for the existing waterfront structures. However, should this scope of work become the responsibility of SES (and KBR), additional field exploration and analyses would be required in order to provide geotechnical recommendations for design.

4. Additional exploration through the western rock dike in order to evaluate whether the 15-foot thick clay layer encountered in Boring B-9, at a depth of about 38 feet below existing ground surface, extends through the dike to the outer rock blanket.

5. Verifying the lengths of the concrete piles supporting the wharf, and the sheetpiles and piling for the cellular bulkhead. Our modeling was based on data obtained from as-built drawings of repair work performed on these structures. Neither the repair drawings nor the original as-built construction drawings for structures indicated pile/sheetpile lengths.

6. Verifying the structural integrity of the steel sheetpiles of the cellular bulkhead. This includes evaluating the extent of corrosion and associated loss in thickness and strength of the sheetpiles and tie-backs, and verifying the location of the deadmen.

7. Verifying the location of the old rock jetty constructed in the northern portion of the site in 1925. This could be performed utilizing CPT's.

8. Implementation of a geotechnical-monitoring program during surcharging of the site. This includes installation of instrumentation to monitor settlements, pore-pressure dissipation and subsurface lateral movements.

9. Performing a field verification program upon completing implementation of all site improvement schemes (pre-loading and stone columns). We recommend that this be performed in two stages, i.e. upon completion of pre-loading and after installation of stone columns, to confirm predicated improved soil properties utilized in our analyses.

10. If driven piles are utilized for support of the LNG storage tanks, we recommend performing indicator-pile and load testing programs to provide information on the variability of the subsurface conditions and the effect on pile installation, and to develop installation criteria for production piles. Detailed recommendations for these programs are discussed in Section 7.5.2.

## 9.0 LIMITATIONS

Soil and groundwater conditions were observed and interpreted at the boring and CPT locations only. This information has been used as the basis of our analysis and recommendations provided herein. Conditions may vary between the exploration locations. If conditions are encountered during construction that differ from those described herein, our recommendation may need to be modified.

URS warrants that our services are performed, within the limits prescribed by our clients, with the usual thoroughness and competence of the engineering profession. No other warranty or representation, either expressed or implied, is included or intended in this report.

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# APPENDIX A

# LOGS OF PREVIOUS BORINGS

# APPENDIX A

## LOGS OF PREVIOUS BORINGS

Previous geotechnical reports prepared by URS and other consultants within the vicinity of the project site were reviewed during the current study. Logs of borings from these investigations are presented in Figures A-1 through A-21. Locations of the borings are shown in Figure 2-1.

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The following Logs of Previous Borings are attached and complete this appendix:

# BORING W-1

MUDLINE ELEVATION: -24.0 FEET

## LABORATORY TEST DATA

| DEPTH IN FEET | TESTS REPORTED ELSEWHERE | ATTERBERG LIMITS: LIQUID LIMIT (%) | ATTERBERG LIMITS: PLASTICITY INDEX (%) | STRENGTH TEST DATA: TYPE OF TEST | STRENGTH TEST DATA: NORMAL OR CONFINING PRESSURE (PSF) | STRENGTH TEST DATA: SHEAR STRENGTH (PSF) | STRENGTH TEST DATA: DEVIATOR STRESS (PSF) | MOISTURE CONTENT (%) | DRY DENSITY (PCF) | BLOWS/FT. | SYMBOLS | DESCRIPTION |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 0 | | | | | | | | | | | | WATER |
| 25 | SA,E | | | PP | | 1500 | | | | 6 | ML | BLACK SILT WITH SHELLS (SOFT) |
| | | | | | | | | | | | OH | DARK BROWN ORGANIC SILTY CLAY (HARD) |
| 30 | SA,E | 63 | 40 | PP | | 4000+ | | | | 4 | | |
| | | | | | | | | | | 2 | SM | GRAY MICACEOUS SILTY FINE SAND (LOOSE) |
| 35 | SA,E | | | | | | | 31.6 | 82 | 4 | CL | DARK GRAY SILTY CLAY (SOFT) |
| | | | | | | | | | | 7 | SM | GRAY MICACEOUS SILTY FINE SAND (LOOSE) |
| 40 | SA,E | | | | | | | | | 11 | | |
| | | | | | | | | | | 6 | CL | GRAY SILTY CLAY (SOFT) |
| | | | | | | | | | | | ML | DARK GRAY MICACEOUS FINE SANDY SILT (STIFF) |
| 45 | SA,E | | | | | | | | | 24 | | |
| | | | | | | | | | | 8 | CL | GRAY SILTY CLAY WITH SOME FINE SAND (MEDIUM STIFF) |
| | | | | | | | | | | | SM | DARK GRAY MICACEOUS SILTY FINE SAND (MEDIUM DENSE) |
| 50 | | | | | | | | | | 17 | | GRADING TO INCLUDE SHELL FRAGMENTS |
| | | | | | | | | | | 23 | | |
| 55 | SA,E | | | | | | | 25.8 | 101 | 45 | SP | LIGHT GRAY MICACEOUS FINE SAND (DENSE) |
| | | | | | | | | | | 37 | | |
| 60 | | | | | | | | | | 40 | | |
| | | | | | | | | 23.2 | 99 | | | |
| 65 | | | | | | | | | | 20 | ML | GRAY CLAYEY SILT (STIFF) |
| | | | | | | | | | | | SM | GRAY MICACEOUS SILTY FINE SAND (MEDIUM DENSE) |
| 70 | SA,E | | | | | | | | | 34 | | |
| 75 | | | | | | | | | | 53 | | GRADES LESS SILTY AND TO DENSE |
| 80 | | | | | | | | | | | | |

UG

LG

# LOG OF BORINGS

PIER E TANKER TERMINAL

DAMES & MOORE

# BORING W-1

## LABORATORY TEST DATA

| DEPTH IN FEET | TESTS REPORTED ELSEWHERE | ATTERBERG LIMITS: LIQUID LIMIT (%) | ATTERBERG LIMITS: PLASTICITY INDEX (%) | STRENGTH TEST DATA: TYPE OF TEST | STRENGTH TEST DATA: NORMAL OR CONFINING PRESSURE (PSF) | STRENGTH TEST DATA: SHEAR STRENGTH (PSF) | STRENGTH TEST DATA: DEVIATOR STRESS (PSF) | MOISTURE CONTENT (%) | DRY DENSITY (PCF) | BLOWS/FT. |
|---|---|---|---|---|---|---|---|---|---|---|
| 80 | SA,E | | | | | | | 25.3 | 99 | 50 |
| 85 | | | | | | | | 32.2 | 89 | 33 |
| 90 | | | | DS/CD | 1000 | 1130 | | 22.0 | 102 | 79 |
| 95 | | | | | | | | | | 71 |
| 100 | | | | DS/CD | 1000 | 1290 | | 20.0 | 96 | 62 |
| | | | | T(S) | 1000 | 450 | | | | |
| 105 | | | | | | | | 20.5 | 100 | 95 |
| 110 | | | | | | | | | | |
| 115 | | | | | | | | | | |
| 120 | | | | | | | | | | |
| 125 | | | | | | | | | | |

SAMPLES | SYMBOLS | DESCRIPTION

GRADING WITH LESS SILT

ML GRAY FINE SANDY SILT (STIFF)

SP GRAY MICACEOUS FINE TO MEDIUM SAND (VERY DENSE)

GRADING TO INCLUDE COARSE SAND WITH GRAVEL TO 2 INCHES IN DIAMETER

LA

GP GRAY SAND-GRAVEL MIXTURE (DENSE)

BORING COMPLETED ON 6/11/79

# LOG OF BORINGS

## PIER E TANKER TERMINAL

DAMES & MOORE

# BORING W-2

MUDLINE ELEVATION: -24.5 FEET

## LABORATORY TEST DATA

| DEPTH IN FEET | TESTS REPORTED ELSEWHERE | ATTERBERG LIMITS: LIQUID LIMIT (%) | ATTERBERG LIMITS: PLASTICITY INDEX (%) | STRENGTH TEST DATA: TYPE OF TEST | STRENGTH TEST DATA: NORMAL OR CONFINING PRESSURE (PSF) | STRENGTH TEST DATA: SHEAR STRENGTH (PSF) | STRENGTH TEST DATA: DEVIATOR STRESS (PSF) | MOISTURE CONTENT (%) | DRY DENSITY (PCF) | BLOWS/FT. |
|---|---|---|---|---|---|---|---|---|---|---|
| 0 | | | | | | | | | | |
| 5 | | | | | | | | | | |
| 10 | | | | | | | | | | |
| 15 | | | | | | | | | | |
| 20 | | | | | | | | | | |
| 25 | SA,E | | | | | | | | | |
| | | | | PP | | 4000+ | | | | 3 |
| 30 | SA,E | 40 | 30 | PP | | 4000+ | | | | 2 |
| 35 | SA,E | | | PP | | 4000+ | | 54.9 | 63 | 6 |
| 40 | SA,E | | | | | | | | | 9 |
| 45 | | | | | | | | 30.1 | 82 | 16 |
| 50 | | | | | | | | | | 36 |
| 55 | SA,E | | | | | | | 31.1 | 90 | 41 |
| 60 | | | | | | | | | | 26 |
| 65 | | | | | | | | | | 18 |
| | | | | | | | | | | 29 |
| 70 | SA,E | | | | | | | 23.0 | 100 | 82 |
| 75 | | | | | | | | 18.4 | 116 | 64 |
| 80 | | | | | | | | | | |

## SAMPLES / SYMBOLS / DESCRIPTION

| SYMBOLS | DESCRIPTION | |
|---|---|---|
| | WATER | |
| OL | DARK BROWN TO BLACK ORGANIC CLAYEY SILT WITH A TRACE OF FINE SAND, SHELLS AND ROOTS (SOFT) | E |
| CH | DARK BROWN ORGANIC SILTY CLAY (HARD) | |
| SM | DARK GRAY MICACEOUS SILTY FINE SAND WITH SOME CLAY LENSES (LOOSE) | UG |
| ML | DARK GRAY CLAYEY SILT WITH TRACE OF FINE SAND (MEDIUM STIFF) | |
| SM | DARK GRAY MICACEOUS SILTY FINE SAND WITH SOME SHELL FRAGMENTS (MEDIUM DENSE) | |
| SP-SM | GRAY MICACEOUS SLIGHTLY SILTY FINE SAND (DENSE) | |
| SM | GRAY MICACEOUS SILTY FINE SAND (MEDIUM DENSE) | |
| | GRADING TO INCLUDE LENSES OF FINE SAND | |
| | GRADES LESS SILTY AND TO DENSE | |
| SP | LIGHT GRAY FINE TO MEDIUM SAND (VERY DENSE) | LG |

# LOG OF BORINGS

## PIER E TANKER TERMINAL

DAMES & MOORE

# BORING W-2

## LABORATORY TEST DATA

| DEPTH IN FEET | TESTS REPORTED ELSEWHERE | ATTERBERG LIMITS: LIQUID LIMIT (%) | ATTERBERG LIMITS: PLASTICITY INDEX (%) | STRENGTH TEST DATA: TYPE OF TEST | STRENGTH TEST DATA: NORMAL OR CONFINING PRESSURE (PSF) | STRENGTH TEST DATA: SHEAR STRENGTH (PSF) | STRENGTH TEST DATA: DEVIATOR STRESS (PSF) | MOISTURE CONTENT (%) | DRY DENSITY (PCF) | BLOWS/FT. |
|---|---|---|---|---|---|---|---|---|---|---|
| 80 | SA,8 | | | | | | | | | 72 |
| 85 | | | | | | | | 22.[illegible] | 10[illegible] | 47 |
| 90 | | | | [illegible] | 2000 | 2000 | | 22.[illegible] | 10[illegible] | 74 |
| 95 | | | | | | | | | | 66 |
| 100 | | | | DS/CD<br>P(S) | 2000<br>2000 | 2350<br>1800 | | 19.0 | 110 | 83 |
| 105 | | | | | | | | | | 106 |
| 110 | | | | | | | | | | |
| 115 | | | | | | | | 17.2 | 112 | 128 |
| 120 | | | | | | | | 19.0 | 109 | 106 |
| 125 | | | | | | | | | | |

| SYMBOLS | DESCRIPTION |
|---|---|
| SM | GRAY MICACEOUS SILTY FINE SAND (DENSE) |
| SP | LIGHT GRAY FINE SAND (VERY DENSE) |
| | GRADING TO INCLUDE MEDIUM SAND |
| | GRADING TO INCLUDE SOME COARSE SAND AND GRAVEL TO TO 1 INCH DIAMETER |
| SP | GRAY FINE TO MEDIUM SAND WITH A TRACE OF SILT (VERY DENSE) |
| | GRADING TO INCLUDE COARSE SAND AND GRAVEL TO 3/4" |

LG

BORING COMPLETED ON 8/13/79

# LOG OF BORINGS

## PIER E TANKER TERMINAL

DAMES & MOORE

# BORING L-1

SURFACE ELEVATION: +16.5 FEET

## LABORATORY TEST DATA

Depth in feet: 0, 5, 10, 15, 20, 25, 30, 35, 40, 45, 50, 55, 60, 65, 70, 75, 80

| Tests reported elsewhere | Atterberg Limits: Liquid limit (%) | Atterberg Limits: Plasticity index (%) | Strength Test Data: Type of test | Strength Test Data: Normal or confining pressure (PSF) | Strength Test Data: Shear strength (PSF) | Strength Test Data: Deviator stress (PSF) | Moisture content (%) | Dry density (PCF) | Blows/Ft. |
|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | 7.0 | 97 | 40 |
| | | | | | | | | | 25 |
| | | | | | | | 21.7 | 98 | 10 |
| | | | | | | | | | 19 |
| | | | DS/CD | 1500 | 1300 | | 22.6 | 91 | 25 |
| | | | | | | | | | 14 |
| | | | | | | | | | 4 |
| | | | | | | | | | 2 |
| | 31 | 8 | UC | | 800 | | 32.5 | 91 | 8 |
| | | | | | | | | | 4 |
| | | | | | | | | | 6 |
| | | | | | | | | | 14 |
| | | | | | | | [illegible] | [illegible] | 14 |
| | | | | | | | | | 40 |
| | | | DS/CD | 2300 | 1800 | | 28.1 | 94 | 41 |
| | | | | | | | | | 9 |
| | | | | | | | | | 33 |
| | | | | | | | | | 32 |
| | | | | | | | 27.8 | 96 | 83 |

## SYMBOLS / DESCRIPTION

| Symbol | Description |
|---|---|
| | A.C. PAVEMENT AND GRAVEL BASE |
| SM | LIGHT GRAY SILTY FINE SAND WITH SOME SHELL FRAGMENTS (MEDIUM DENSE) |
| | (5/17/79) |
| SC | MOTTLED BROWN CLAYEY SAND WITH SOME GRAVEL (MEDIUM DENSE) |
| SM | MEDIUM GRAY MICACEOUS SILTY FINE SAND (MEDIUM DENSE) |
| ML | GRAY FINE SANDY SILT (SOFT-LOOSE) |
| ML | DARK GRAY MICACEOUS CLAYEY SILT (SOFT) |
| | GRADING TO MEDIUM STIFF |
| CL | DARK GRAY MICACEOUS SILTY CLAY (MEDIUM STIFF) |
| SM | DARK GRAY SILTY FINE SAND WITH SOME SHELL FRAGMENTS AND TRACE OF MICA (MEDIUM DENSE) |
| ML | DARK GRAY MICACEOUS FINE SANDY SILT WITH LENSES OF CLAYEY SILT (MEDIUM STIFF) |
| SM | GRAY MICACEOUS SILTY FINE SAND (DENSE) |
| | LENSE OF FINE SANDY SILT |
| | GRADING TO INCLUDE ABUNDANT LENSES OF SOFT TO MEDIUM STIFF CLAYEY SILT |
| | GRADING WITH LESS SILT |
| SP | GRAY FINE SAND WITH A TRACE OF SILT (VERY DENSE) |

# LOG OF BORINGS

## PIER E TANKER TERMINAL

DAMES & MOORE

# BORING L-1

## LABORATORY TEST DATA

| DEPTH IN FEET | TESTS REPORTED ELSEWHERE | ATTERBERG LIMITS: LIQUID LIMIT (%) | ATTERBERG LIMITS: PLASTICITY INDEX (%) | STRENGTH TEST DATA: TYPE OF TEST | STRENGTH TEST DATA: NORMAL OR CONFINING PRESSURE (PSF) | STRENGTH TEST DATA: SHEAR STRENGTH (PSF) | STRENGTH TEST DATA: DEVIATOR STRESS (PSF) | MOISTURE CONTENT (%) | DRY DENSITY (PCF) | BLOWS/FT. | DESCRIPTION |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 80 | | | | | | | | | | | |
| | | | | | | | | | | 54 | GRADING WITH MORE SILT |
| 85 | | | | | | | | | | | |
| | | | | | | | | | | 66 | GRADING WITH LESS SILT |
| 90 | | | | | | | | | | | |
| | | | | | | | | | | 59 | |
| 95 | | | | | | | | 25.7 | 100 | 99 | |
| | | | | | | | | | | 72 | |
| 100 | | | | | | | | | | | |
| | | | | | | | | 19.4 | 109 | 41 | GRADING TO INCLUDE LENSES OF CLAYEY SILT |
| 105 | | | | | | | | | | | |
| | | | | | | | | | | 87/9" | GRADING TO FINE TO MEDIUM SAND WITH CLAYEY SILT NODULES |
| 110 | | | | | | | | | | 50/6" | |
| 115 | | | | | | | | 20.4 | 105 | 75/7" | GRADING TO INCLUDE COARSE SAND WITH SOME FINE TO MEDIUM GRAVEL |
| 120 | | | | | | | | | | 100/9" | GRADING TO INCLUDE LENSES OF SILTY FINE SAND |
| 125 | | | | | | | | | | | |

SYMBOLS

LG

BORING COMPLETED ON 5/17/79
WATER LEVEL 14.0 FEET ON 5/17/79

# LOG OF BORINGS

## PIER E TANKER TERMINAL

DAMES & MOORE

PLATE L5

# BORING L-2

SURFACE ELEVATION: + 21.3 FEET

## LABORATORY TEST DATA

| DEPTH IN FEET | TESTS REPORTED ELSEWHERE | ATTERBERG LIMITS: LIQUID LIMIT (%) | ATTERBERG LIMITS: PLASTICITY INDEX (%) | STRENGTH TEST DATA: TYPE OF TEST | STRENGTH TEST DATA: NORMAL OR CONFINING PRESSURE (PSF) | STRENGTH TEST DATA: SHEAR STRENGTH (PSF) | STRENGTH TEST DATA: DEVIATOR STRESS (PSF) | MOISTURE CONTENT (%) | DRY DENSITY (PCF) | BLOWS/FT. |
|---|---|---|---|---|---|---|---|---|---|---|
| 5 | SA,E | | | | | | | 7.6 | 97 | 33 |
| | | | | | | | | | | 46 |
| 15 | SA,E | | | | | | | 16.5 | 102 | 36 |
| | | | | | | | | | | 5 |
| 25 | | | | | | | | 21.5 | 106 | 10 |
| 30 | SA,E | | | | | | | | | 7 |
| 35 | | | | | | | | 47.4 | 74 | 6 |
| | | | | | | | | | | 23 |
| 45 | SA,E | | | | | | | | | 32 |
| 50 | | | | | | | | 43.4 | 77 | 12 |
| 55 | | 71 | 35 | | | | | 71.5 | 84 | 14 |
| 60 | SA,E | | | | | | | 39.0 | 79 | 15 |
| 70 | | | | DS/CD | 3200 | 2200 | | 24.5 | 100 | 35 |
| 80 | SA,E | | | | | | | 25.1 | 98 | 96 |

## SYMBOLS / DESCRIPTION

| SYMBOLS | DESCRIPTION |
|---|---|
| | A.C. PAVEMENT AND GRAVEL BASE |
| SM | BROWNISH GRAY MICACEOUS SILTY FINE TO MEDIUM SAND WITH SOME SHELL FRAGMENTS (DENSE) |
| | GRADES TO SILTY FINE SAND WITH ABUNDANT SHELL FRAGMENTS |
| | ▽ (5/14/79) |
| SM | DARK GRAY MICACEOUS SILTY FINE SAND WITH ABUNDANT SHELL FRAGMENTS (LOOSE) |
| | GRADES WITH FEWER SHELL FRAGMENTS |
| CL | MEDIUM GRAY SILTY CLAY WITH LENSES AND POCKETS OF SILTY SAND AND CLAYEY SILT (MEDIUM STIFF) |
| SM | GRAY MICACEOUS SILTY FINE SAND WITH A TRACE OF SHELL FRAGMENTS (MEDIUM DENSE) |
| CL | DARK GRAY SILTY CLAY (MEDIUM STIFF) |
| OH | DARK BROWN TO BLACK ORGANIC SILTY CLAY (VERY STIFF TO HARD) |
| ML+CL | DARK GRAY MICACEOUS INTERBEDDED FINE SANDY AND SILTY CLAY WITH A TRACE OF SHELL FRAGMENTS (STIFF) |
| SM | MEDIUM GRAY SILTY FINE SAND (DENSE) |
| SP-SM | GRAY MICACEOUS SLIGHTLY SILTY FINE SAND (VERY DENSE) |

# LOG OF BORINGS
## PIER E TANKER TERMINAL

DAMES & MOORE

# BORING L-2

## LABORATORY TEST DATA

| DEPTH IN FEET | TESTS REPORTED ELSEWHERE | ATTERBERG LIMITS: LIQUID LIMIT (%) | ATTERBERG LIMITS: PLASTICITY INDEX (%) | STRENGTH TEST DATA: TYPE OF TEST | STRENGTH TEST DATA: NORMAL OR CONFINING PRESSURE (PSF) | STRENGTH TEST DATA: SHEAR STRENGTH (PSF) | STRENGTH TEST DATA: DEVIATOR STRESS (PSF) | MOISTURE CONTENT (%) | DRY DENSITY (PCF) | BLOWS/FT. | SAMPLES | SYMBOLS | DESCRIPTION |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 80 | | | | | | | | | | | | | |
| 85 | | | | | | | | | | 70 | ■ | | GRADES TO FINE TO MEDIUM SAND WITH A TRACE OF GRAVEL |
| 90 | SA,E | | | | | | | | | 42 | ■ | ML | MEDIUM GRAY FINE SANDY SILT (NEAR SM) (DENSE) |
| 95 | | | | | | | | | | 100 | ■ | SP | MEDIUM GRAY MICACEOUS FINE TO MEDIUM SAND (VERY DENSE) |
| 100 | | | | | | | | 25.6 | 98 | 71 | ■ | | |
| 105 | SA,E | | | | | | | | | 100 | ■ | | GRADES COARSER AND SLIGHTLY SILTY (SP-SM) |
| 110 | | | | | | | | | | | | | |

L8

BORING COMPLETED ON 5/11/79
WATER LEVEL AT A DEPTH OF 10 FEET ON 5/14/79

# LOG OF BORINGS
## PIER E TANKER TERMINAL

DAMES & MOORE

DN ATE 1.78

# BORING L-3

SURFACE ELEVATION: +22.9 FEET

## LABORATORY TEST DATA

| DEPTH IN FEET | TESTS REPORTED ELSEWHERE | ATTERBERG LIMITS: LIQUID LIMIT (%) | ATTERBERG LIMITS: PLASTICITY INDEX (%) | STRENGTH TEST DATA: TYPE OF TEST | STRENGTH TEST DATA: NORMAL OR CONFINING PRESSURE (PSF) | STRENGTH TEST DATA: SHEAR STRENGTH (PSF) | STRENGTH TEST DATA: DEVIATOR STRESS (PSF) | MOISTURE CONTENT (%) | DRY DENSITY (PCF) | BLOWS/FT. |
|---|---|---|---|---|---|---|---|---|---|---|
| 5 | SA,E | | | | | | | | | 10 |
| | | | | | | | | | | 11 |
| 10 | | | | | | | | 21.4 | 98 | 17 |
| | | | | | | | | | | 8 |
| 15 | SA,E | | | | | | | 26.4 | 83 | 20 |
| 20 | | | | | | | | | | 8 |
| 25 | | | | | | | | 58.9 | 60 | 8 |
| 30 | SA,E | | | UU/CD | 2700 | 2500 | | 30.3 | 94 | 31 |
| 35 | | | | | | | | | | 8 |
| 40 | | | | | | | | | | 19 |
| 45 | SA,E | | | PP<br>PP | | 2000<br>4000+ | | 53.4 | 72 | 23 |
| 50 | | 90 | 54 | PP | | 4000+ | | 67.7 | 58 | 26 |
| 55 | | | | PP | | 4000+ | | 60.7 | 60 | 18 |
| 60 | SA,E | | | PP | | 2000 | | | | 20 |
| 65 | | | | | | | | 29.3 | 94 | 40 |
| 70 | | | | CU/CD | 1500 | 1400 | | 26.7 | 98 | 51 |
| 75 | SA,E | | | | | | | 21.4 | 98 | 23 |
| 80 | | | | | | | | | | |

SAMPLES

| SYMBOLS | DESCRIPTION |
|---|---|
| GW | A.C. PAVEMENT AND GRAVEL BASE |
| SM | BROWNISH-GRAY MICACEOUS SILTY FINE SAND WITH A TRACE OF SHELL FRAGMENTS (MEDIUM DENSE) |
| ML | LIGHT GRAY SLIGHTLY MICACEOUS FINE SANDY SILT (MEDIUM STIFF AND DENSE) |
| SM | ▽ (5/9/79)<br>MEDIUM GRAY MICACEOUS SILTY FINE SAND (MEDIUM DENSE) |
| CL | GRAY SILTY CLAY (SOFT) |
| SM | DARK GRAY SILTY SAND WITH SHELL FRAGMENTS (MEDIUM DENSE) |
| SP-SM | GRAY MICACEOUS SLIGHTLY SILTY FINE SAND WITH OCCASSIONAL LENSES OF MEDIUM SAND (MEDIUM DENSE) |
| ML | DARK GRAY CLAYEY SILT (VERY STIFF) |
| OH | DARK BROWN TO BLACK ORGANIC SILTY CLAY (HARD)<br>GRAVELLY LAYER AT 57 FEET |
| ML | GRAY FINE SANDY SILT (STIFF TO MEDIUM DENSE)<br>GRADES TO STIFF CLAYEY SILT |
| SM | GRAY MICACEOUS SILTY FINE SAND WITH SHELL FRAGMENTS (DENSE) |
| ML | MEDIUM GRAY MICACEOUS SILT WITH SAND PARTINGS (VERY STIFF) |

# LOG OF BORINGS

## PIER E TANKER TERMINAL

DAMES & MOORE

# BORING L-3

## LABORATORY TEST DATA

| DEPTH IN FEET | TESTS REPORTED ELSEWHERE | ATTERBERG LIMITS: LIQUID LIMIT (%) | ATTERBERG LIMITS: PLASTICITY INDEX (%) | STRENGTH TEST DATA: TYPE OF TEST | STRENGTH TEST DATA: NORMAL OR CONFINING PRESSURE (PSF) | STRENGTH TEST DATA: SHEAR STRENGTH (PSF) | STRENGTH TEST DATA: DEVIATOR STRESS (PSF) | MOISTURE CONTENT (%) | DRY DENSITY (PCF) | BLOWS/FT. | SAMPLES |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 80 | | | | | | | | | | 23 | ■ |
| 85 | | | | | | | | 34.3 | 88 | 37 | ■ |
| 90 | SA,E | | | | | | | | | 51 | ■ |
| 95 | | | | | | | | 32.5 | 87 | 31 | ■ |
| 100 | | | | | | | | 23.9 | 100 | 36 | ■ |
| 105 | SA,E | | | | | | | | | 44 | ■ |
| 110 | | | | DS/CD | 3000 | 3100 | | | | 111 | ■ |
| 115 | | | | | | | | | | 84 | ■ |
| 120 | | | | | | | | 16.7 | 108 | 96 | ■ |
| 125 | | | | | | | | | | 131 | ■ |
| 130 | | | | DS/CD<br>F(S) | 3000<br>3000 | 2900<br>1500 | | 21.8 | 105 | 60 | ■ |
| 135 | | | | | | | | | | 100 | ■ |
| 140 | | | | | | | | | | 217 | ■ |
| 145 | | | | | | | | | | 135 | ■ |
| 150 | | | | | | | | 26.0 | 108 | 165 | ■ |
| 155 | | | | | | | | | | | |

## SYMBOLS / DESCRIPTION

SM GRAY MICACEOUS SILTY FINE SAND (DENSE)

GRADES SILTIER

GRADES LESS SILTY

SM-ML MEDIUM GRAY SLIGHTLY MICACEOUS SILTY FINE SAND TO FINE SANDY SILT (DENSE - VERY STIFF)

SP GRAY AND WHITE MICACEOUS FINE TO MEDIUM SAND WITH INTERBEDS OF SILTY CLAY (DENSE)

SM GRAY MICACEOUS SILTY FINE SAND (DENSE)

SP LIGHT GRAY MICACEOUS FINE SAND (VERY DENSE)

GRAVEL LAYER AT 118 FEET

GRADING WITH MEDIUM TO COARSE SAND, AND GRAVEL

OCCASSIONAL SILTY LENSES

GP SAND-GRAVEL MIXTURE (VERY DENSE)

SM BLUISH-GRAY MICACEOUS SILTY FINE SAND (VERY DENSE)

LB

BORING COMPLETED ON 5/9/79
WATER LEVEL AT A DEPTH OF 19' ON 5/9/79

# LOG OF BORINGS

## PIER E TANKER TERMINAL

DAMES & MOORE

# BORING L-4

SURFACE ELEVATION: -23.2 FEET

## LABORATORY TEST DATA

| DEPTH IN FEET | TESTS REPORTED ELSEWHERE | ATTERBERG LIMITS: LIQUID LIMIT (%) | ATTERBERG LIMITS: PLASTICITY INDEX (%) | STRENGTH TEST DATA: TYPE OF TEST | STRENGTH TEST DATA: NORMAL OR CONFINING PRESSURE (PSF) | STRENGTH TEST DATA: SHEAR STRENGTH (PSF) | STRENGTH TEST DATA: DEVIATOR STRESS (PSF) | MOISTURE CONTENT (%) | DRY DENSITY (PCF) | BLOWS/FT. | SAMPLES | SYMBOLS | DESCRIPTION |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 0 | | | | | | | | | | | | GM | A.C. PAVEMENT AND GRAVEL BASE |
| | | | | | | | | | | | | SM | BROWNISH-GRAY MICACEOUS SILTY FINE SAND WITH SHELL FRAGMENTS (MEDIUM DENSE) |
| 5 | | | | | | | | 5.6 | 96 | 41 | ■ | | |
| | | | | | | | | | | 12 | ■ | | GRADING GRAY |
| 10 | | | | | | | | | | | | | |
| | | | | | | | | 13.7 | 96 | 11 | ■ | | |
| 15 | | | | | | | | | | | | SM | LIGHT GRAY MICACEOUS SILTY FINE SAND (LOOSE) |
| | | | | | | | | | | 7 | ■ | | |
| 20 | | | | | | | | | | | | | (5/10/79) |
| | | | | DS/CD | 2100 | 1750 | | 28.7 | 94 | 31 | ■ | | GRADES MEDIUM DENSE |
| 25 | | | | | | | | | | 18 | ■ | | |
| 30 | | | | | | | | | | 20 | ■ | | GRADES COARSER |
| | | | | | | | | | | 17 | ■ | | |
| 35 | | | | | | | | | | | | | |
| | | | | | | | | | | 29 | ■ | | |
| | | | | | | | | | | | | ML | DARK GRAY FINE SANDY SILT WITH A TRACE OF CLAY (MEDIUM STIFF) |
| 40 | | | | | | | | | | 6 | ■ | | |
| | | | | | | | | | | | | OH | DARK BROWN TO BLACK ORGANIC SILTY CLAY (HARD) |
| 45 | | | | PP | | 4000+ | | 56.1 | 66 | 25 | ■ | | |
| | | | | | | | | | | 14 | ■ | | |
| 50 | | | | | | | | | | | | | |
| | | 78 | 42 | PP | | 4000+ | | | | 26 | ■ | | |
| 55 | | | | | | | | | | 13 | ■ | | |
| 60 | | | | PP | | 4000+ | | 67.7 | 56 | 21 | ■ | | |
| 65 | | | | | | | | | | 20 | ■ | | |
| | | | | | | | | | | | | | GRADES WITH INTERBEDDED SANDY LENSES |
| | | | | | | | | 42.6 | 79 | 18 | ■ | ML | GRAY CLAYEY SILT (STIFF TO VERY STIFF) |
| 70 | | | | | | | | | | | | | |
| | | | | | | | | | | 23 | ■ | | |
| 75 | | | | | | | | | | | | SM | MEDIUM GRAY MICACEOUS SILTY FINE SAND (DENSE) |
| | | | | | | | | 30.4 | 93 | 44 | ■ | | |
| 80 | | | | | | | | | | | | | |

# LOG OF BORINGS

## PIER E TANKER TERMINAL

DAMES & MOORE

PLATE A-2K

# BORING L-4

| DEPTH IN FEET | LABORATORY TEST DATA: TESTS REPORTED ELSEWHERE | ATTERBERG LIMITS: LIQUID LIMIT (%) | ATTERBERG LIMITS: PLASTICITY INDEX (%) | STRENGTH TEST DATA: TYPE OF TEST | STRENGTH TEST DATA: NORMAL OR CONFINING PRESSURE (PSF) | STRENGTH TEST DATA: SHEAR STRENGTH (PSF) | STRENGTH TEST DATA: DEVIATOR STRESS (PSF) | MOISTURE CONTENT (%) | DRY DENSITY (PCF) | BLOWS/FT. |
|---|---|---|---|---|---|---|---|---|---|---|
| 80 | | | | | | | | 23.1 | 101 | 18 |
| 85 | | | | | | | | | | 140 |
| 90 | | | | | | | | | | 31 |
| 95 | | | | | | | | | | 96 |
| | | | | | | | | | | 61+ |
| 100 | | | | | | | | 22.9 | 104 | 149 |
| 105 | | | | | | | | | | 72 |
| 110 | | | | | | | | | | |

SAMPLES

SYMBOLS | DESCRIPTION

SP GRAY MICACEOUS FINE SAND (VERY DENSE)

GRADES WITH MEDIUM SAND

LG

BORING COMPLETED ON 5/10/79
WATER LEVEL AT A DEPTH OF 21 FEET ON 5/10/79

# LOG OF BORINGS
## PIER E TANKER TERMINAL

DAMES & MOORE

# BORING B-8

COORDINATES:

Northing (feet): 4024521

Easting (feet): 4221099

Surface Elevation (ft. MLLW): 16

| ELEV. (FT. MLLW) | DEPTH IN FEET | LABORATORY TEST DATA: TESTS REPORTED ELSEWHERE | ATTERBERG LIMITS: LIQUID LIMIT (%) | ATTERBERG LIMITS: PLASTICITY INDEX (%) | STRENGTH TEST DATA: TYPE OF TEST | STRENGTH TEST DATA: NORMAL OR CONFINING PRESSURE (PSF) | STRENGTH TEST DATA: SHEAR STRENGTH (PSF) | PERCENT PASSING NO. 200 SIEVE | MOISTURE CONTENT (%) | DRY DENSITY (PCF) | BLOWS/FOOT | SAMPLE TYPE |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 16 | 0 | | | | | | | | | | | |
| 11 | 5 | -200 (26) | | | | | | | | | 14 | ▬ |
| 6 | 10 | | | | | | | | | | 17 | ▬ |
| 1 | 15 | | | | | | | | | | 16 | ▬ |
| -4 | 20 | -200 (14) | | | | | | | | | 28 | ▬ |
| -9 | 25 | | | | | | | | | | 26 | ▬ |
| -14 | 30 | -200 (68) | | | | | | | | | 22 | ▬ |
| -19 | 35 | | | | | | | | | | 14 | ▬ |
| -24 | 40 | | | | | | | | | | | ▬ |
| -29 | 45 | | | | | | | | | | 32 | ▬ |
| -34 | 50 | | | | | | | | | | 14 | ▬ |
| -39 | 55 | | | | | | | | | | 23 | ▬ |
| -44 | 60 | | | | | | | | | | 57 | ▬ |
| -49 | 65 | | | | | | | | | | 9 | ▬ |
| -54 | 70 | | | | | | | | | | 24 | ▬ |
| -59 | 75 | | | | | | | | | | 40 | ▬ |
| -64 | 80 | | | | | | | | | | | |

| SYMBOL | DESCRIPTION |
|---|---|
| SM | 3-inch thick asphaltic concrete pavement |
| | Light brown to grayish-brown silty fine SAND (medium dense) |
| GM | Gray silty sandy GRAVEL (dense) |
| | [Encountered gravelly material from depths of 15 through 18 feet] |
| | Grades with more sand (medium dense) |
| ML | Gray fine sandy SILT (medium dense) |
| | Grades dark gray with some clay (loose) |
| SM | Gray fine SAND with trace silt (medium dense to dense) |
| GM | Gray silty sandy GRAVEL (dense) |
| SP SM | Gray to dark gray fine SAND with silt (dense) |
| SM | Gray to dark gray silty fine SAND with zones of clayey silt (medium dense) |
| | Grades (very dense) |
| ML | Gray SILT with trace clay (very stiff to hard) |
| | Grades with trace sand |

## LOG OF BORING

**PROPOSED SCRAP METAL HANDLING FACILITY**

**BERTHS T-118 AND T-119**

**For Port of Long Beach**

Dames & Moore

FIGURE A-9

# BORING B- 8 - Continued

**COORDINATES:**

Northing (feet): 4024621
Easting (feet): 4221099

Surface Elevation (ft. MLLW): 16

| ELEV. (FT. MLLW) | DEPTH IN FEET | LABORATORY TEST DATA: TESTS REPORTED ELSEWHERE | ATTERBERG LIMITS: LIQUID LIMIT (%) | ATTERBERG LIMITS: PLASTICITY INDEX (%) | STRENGTH TEST DATA: TYPE OF TEST | STRENGTH TEST DATA: NORMAL OR CONFINING PRESSURE (PSF) | STRENGTH TEST DATA: SHEAR STRENGTH (PSF) | PERCENT PASSING NO. 200 SIEVE | MOISTURE CONTENT (%) | DRY DENSITY (PCF) | BLOWS/FOOT | SAMPLE TYPE | SYMBOL | DESCRIPTION |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| -64 | 80 | | | | | | | | | | 40 | | SP SM | Gray fine SAND with silt (dense) |
| -69 | 85 | | | | | | | | | | 83 | | | Grades (very dense) |
| -74 | 90 | | | | | | | | | | 50 /4" | | | Grades light gray with some medium sand |
| -79 | 95 | | | | | | | | | | 50 /4" | | | Boring completed to a depth of 95 feet on December 15, 1992. Boring backfilled upon completion. |
| -84 | 100 | | | | | | | | | | | | | |
| -89 | 105 | | | | | | | | | | | | | |
| -94 | 110 | | | | | | | | | | | | | |
| -99 | 115 | | | | | | | | | | | | | |
| -104 | 120 | | | | | | | | | | | | | |
| -109 | 125 | | | | | | | | | | | | | |
| -114 | 130 | | | | | | | | | | | | | |
| -119 | 135 | | | | | | | | | | | | | |
| -124 | 140 | | | | | | | | | | | | | |
| -129 | 145 | | | | | | | | | | | | | |
| -134 | 150 | | | | | | | | | | | | | |
| -139 | 155 | | | | | | | | | | | | | |
| -144 | 160 | | | | | | | | | | | | | |

## LOG OF BORING

**PROPOSED SCRAP METAL HANDLING FACILITY**

**BERTHS T-118 AND T-119**

**For Port of Long Beach**

Dames & Moore
FIGURE A-9 contd.

# BORING B-9

**COORDINATES:**

Northing (feet): 4024694
Easting (feet): 4221359

Surface Elevation (ft. MLLW): 20

| ELEV. (FT. MLLW) | DEPTH IN FEET | LABORATORY TEST DATA: TESTS REPORTED ELSEWHERE | ATTERBERG LIMITS: LIQUID LIMIT (%) | ATTERBERG LIMITS: PLASTICITY INDEX (%) | STRENGTH TEST DATA: TYPE OF TEST | STRENGTH TEST DATA: NORMAL OR CONFINING PRESSURE (PSF) | STRENGTH TEST DATA: SHEAR STRENGTH (PSF) | PERCENT PASSING NO. 200 SIEVE | MOISTURE CONTENT (%) | DRY DENSITY (PCF) | BLOWS/FOOT | SAMPLE TYPE | SYMBOL | DESCRIPTION |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 20 | 0 | | | | | | | | | | | | SM | 3-inch thick asphaltic concrete pavement<br>Brown silty fine SAND (medium dense) |
| 15 | 5 | | | | | | | | | | | | | |
| 10 | 10 | | | | | | | | | | 43 | | | Grades with some shells and more silt (dense) |
| 5 | 15 | | | | | | | | | | | | | |
| -1 | 20 | | | | | | | | | | 5 | | | |
| -6 | 25 | | | | | | | | | | | | GM<br>SM | Gray sandy silty GRAVEL (dense)<br>Gray to dark gray silty fine SAND (medium dense) |
| -11 | 30 | | | | | | | | | | 20 | | | |
| -16 | 35 | | | | | | | | | | | | | |
| -21 | 40 | | | | | | | | | | 8 | | | Grades with more silt (loose) |
| -26 | 45 | | | | | | | | | | | | | |
| -31 | 50 | | | | | | | | | | 6 | | SM<br>ML | Gray to bluish-gray silty sand and clayey fine sandy SILT (loose) |
| -36 | 55 | | | | | | | | | | | | | [Encountered a 1-foot thick layer of dense sandy silty gravel] |
| -41 | 60 | | | | | | | | | | 23 | | | Grades dark gray with occasional clayey silt (medium dense) |
| -46 | 65 | | | | | | | | | | | | | Grades with zones of clayey silt to silty clay |
| -51 | 70 | | | | | | | | | | 9 | | ML | Gray SILT with some clay (very stiff to hard) |
| -56 | 75 | | | | | | | | | | | | SM | Gray silty fine SAND (very dense) |
| -61 | 80 | | | | | | | | | | | | | |

## LOG OF BORING

**PROPOSED SCRAP METAL HANDLING FACILITY**

**BERTHS T-118 AND T-119**

**For Port of Long Beach**

Dames & Moore
FIGURE A-10

## BORING B- 9 - Continued

**COORDINATES:**

Northing (feet): 4024694
Easting (feet): 4221359

Surface Elevation (ft. MLLW): 20

| ELEV. (FT. MLLW) | DEPTH IN FEET | LABORATORY TEST DATA: TESTS REPORTED ELSEWHERE | ATTERBERG LIMITS: LIQUID LIMIT (%) | ATTERBERG LIMITS: PLASTICITY INDEX (%) | STRENGTH TEST DATA: TYPE OF TEST | STRENGTH TEST DATA: NORMAL OR CONFINING PRESSURE (PSF) | STRENGTH TEST DATA: SHEAR STRENGTH (PSF) | PERCENT PASSING NO. 200 SIEVE | MOISTURE CONTENT (%) | DRY DENSITY (PCF) | BLOWS/FOOT | SAMPLE TYPE | SYMBOL | DESCRIPTION |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| -61 | 80 | | | | | | | | | | 62 | | SM | cont'd |
| -66 | 85 | | | | | | | | | | | | | |
| -71 | 90 | | | | | | | | | | 63 | | SP | Light gray to gray fine SAND (very dense) |
| -76 | 95 | | | | | | | | | | | | | |
| -81 | 100 | | | | | | | | | | 50 /5" | | | Boring completed to a depth of 100 feet. |
| -86 | 105 | | | | | | | | | | | | | |
| -91 | 110 | | | | | | | | | | | | | |
| -96 | 115 | | | | | | | | | | | | | |
| -101 | 120 | | | | | | | | | | | | | |
| -106 | 125 | | | | | | | | | | | | | |
| -111 | 130 | | | | | | | | | | | | | |
| -116 | 135 | | | | | | | | | | | | | |
| -121 | 140 | | | | | | | | | | | | | |
| -126 | 145 | | | | | | | | | | | | | |
| -131 | 150 | | | | | | | | | | | | | |
| -136 | 155 | | | | | | | | | | | | | |
| -141 | 160 | | | | | | | | | | | | | |

# LOG OF BORING

**PROPOSED SCRAP METAL HANDLING FACILITY**

**BERTHS T-118 AND T-119**

**For Port of Long Beach**

Dames & Moore
FIGURE A-10 contd.

# BORING B-10

**COORDINATES:**

Northing (feet): 4024591
Easting (feet): 4221256

Surface Elevation (ft. MLLW): 17

**LABORATORY TEST DATA**

| ELEV. (FT. MLLW) | DEPTH IN FEET | TESTS REPORTED ELSEWHERE | ATTERBERG LIMITS: LIQUID LIMIT (%) | ATTERBERG LIMITS: PLASTICITY INDEX (%) | STRENGTH TEST DATA: TYPE OF TEST | STRENGTH TEST DATA: NORMAL OR CONFINING PRESSURE (PSF) | STRENGTH TEST DATA: SHEAR STRENGTH (PSF) | PERCENT PASSING NO. 200 SIEVE | MOISTURE CONTENT (%) | DRY DENSITY (PCF) |
|---|---|---|---|---|---|---|---|---|---|---|
| 17 | 0 | | | | | | | | | |
| 12 | 5 | -200 (58) | | | | | | | | |
| 7 | 10 | | | | | | | | | |
| 2 | 15 | | | | | | | | | |
| -3 | 20 | -200 (11) | | | | | | | | |
| -8 | 25 | | | | | | | | | |
| -13 | 30 | | | | | | | | | |
| -18 | 35 | | | | | | | | | |
| -23 | 40 | | | | | | | | | |
| -28 | 45 | | | | | | | | | |
| -33 | 50 | | | | | | | | | |
| -38 | 55 | | | | | | | | | |
| -43 | 60 | -200 (43) | | | | | | | | |
| -48 | 65 | | | | | | | | | |
| -53 | 70 | | | | | | | | | |
| -58 | 75 | | | | | | | | | |
| -63 | 80 | | | | | | | | | |

BLOWS/FOOT (samples from top to bottom): 30, 24, 25, 28, 18, 12, 15, 29 (the samples near 2 ft and 10 ft have no printed blow count)

| SYMBOL | DESCRIPTION |
|---|---|
| SM | 3-inch thick asphaltic concrete pavement |
| | Light brown to brown silty fine SAND (medium dense to dense) |
| | Grades (dense) |
| GM | Gray sandy silty GRAVEL (dense) |
| SP | Light brown fine SAND (medium dense) |
| SM SP | Gray to dark gray fine SAND with silt and fine shell fragments (medium dense) |
| SM ML | Gray silty fine SAND to fine sandy SILT (medium dense) |

Boring completed to a depth of 60 feet on December 15, 1992.
Boring backfilled upon completion.

## LOG OF BORING

**PROPOSED SCRAP METAL HANDLING FACILITY**

**BERTHS T-118 AND T-119**

**For Port of Long Beach**

Dames & Moore
FIGURE A-11

| | |
|---|---|
| BORING LOCATION (feet): N 23987 E 20103 | ELEVATION AND DATUM (feet): 16 MLLW |
| DRILLING EQUIPMENT: CME-85 | DRILLING METHOD: Rotary wash |
| BORING DIAMETER (inches): 4 | BORING DEPTH (feet): 101 |
| DATE STARTED: 6/26/00 | DATE COMPLETED: 6/26/00 |
| SPT HAMMER DROP: 30 inches WT: 140 lbs | DRIVE HAMMER DROP: 30 inches WT: 140 lbs |
| LOGGED BY: NS CHECKED BY: SW | DRIVE SAMPLER DIAMETER (inches) ID: 2.4 OD: 3 |

| Elevation (feet) | Depth (feet) | Sampler | Symbol | Blows per 6 inches | SPT N Blows per Foot | Field Unc. Comp. Str. (tsf) | DESCRIPTION | Dry Density (pcf) | Moisture Content (%) | Liquid Limit (%) | Plasticity Index (%) | Percent Passing #200 Sieve | Other Tests [PID] |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | Asphalt - 4 inches | | | | | | |
| 15 | | | | 5 5 6 | 11 | | SILTY GRAVEL with SAND (GM); gray, yellowish brown, dry, medium dense, fine to coarse gravel, fine-grained sand; BASE - 5 inches | | | | | | [0] |
| | | | | | | | SILTY SAND (SM); yellowish brown, dry, medium dense, fine-grained sand | | | | | | |
| | 5 | | | 2 2 2 | 2 | | moist, very loose | 97 | 11 | NP | NP | 40 | [0] SA |
| 10 | | | | | | | | | | | | | |
| | 10 | | | 1 1 2 | 3 | | brown, gray, fine- to medium-grained sand | | | | | | [0] |
| 5 | | | | | | | | | | | | | |
| | 15 | | | 2 7 19 | 13 | | brown, medium dense, fine-grained sand, increased fine content | 103 | 22 | | | | [0] |
| 0 | | | | | | | wet | | | | | | |
| | 20 | | | 7 8 8 | 16 | | dark gray, trace seashells | | | | | | [0] |
| -5 | | | | | | | | | | | | | |
| | 25 | | | 7 10 13 | 11 | | very dark gray | 100 | 32 | NP | NP | 22 | [0] SA |
| -10 | | | | | | | | | | | | | |
| | | | | 2 | 9 | | loose, decreased seashells | | | | | | [0] |

## LOG OF BORING UB-32

Page 1 of 3

Pier T Backland Structures

Project No. 173-05.3

PLATE

**A7**

| Elevation (feet) | Depth (feet) | Sampler | Symbol | Blows per 6 Inches | SPT N Blows per Foot | Field Unc. Comp. Str. (tsf) | DESCRIPTION | Dry Density (pcf) | Moisture Content (%) | Liquid Limit (%) | Plasticity Index (%) | Percent Passing #200 Sieve | Other Tests [PID] |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| -15 | | | | 4 5 | | | | | | | | | |
| -20 | 35 | | | 7 13 24 | 18 | | medium dense | 80 | 50 | | | | [0] |
| -25 | 40 | | | 5 5 5 | 10 | | loose to medium dense, fine- to medium-grained sand, no seashells | | | | | | [0] |
| -30 | 45 | | | 2 1 2 | 1 | 0.1 | SILT with SAND (ML); very dark gray, wet, very soft, nonplastic, fine-grained sand | 88 | 37 | NP | NP | 83 | [0] SA |
| -35 | 50 | | | 13 15 11 | 26 | | dark gray, hard | | | | | | [0] |
| -40 | 55 | | | 8 16 16 | 16 | 0.7 | SILT(ML); dark gray, wet, hard, nonplastic | 92 | 31 | NP | NP | 89 | [0] SA |
| -45 | 60 | | | 12 13 15 | 28 | | SANDY SILT (ML); dark gray, wet, hard, low plasticity, fine-grained sand | | | | | | [0] |
| -50 | 65 | | | 12 23 21 | 22 | | SILTY SAND (SM); dark gray, wet, medium dense, fine-grained sand | 96 | 27 | | | | [0] |
| | | | | 0 | 2 | | ELASTIC SILT (MH); gray, wet, very soft to soft, medium plasticity | | | | | | [0] |

## LOG OF BORING UB-32

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Pier T Backland Structures

Project No. 173-05.3

PLATE

**A8**

Template: DYL01; Prj ID: 17305.GPJ

| Elevation (feet) | Depth (feet) | Sampler | Symbol | Blows per 6 Inches | SPT N Blows per Foot | Field Unc. Comp. Str. (tsf) | DESCRIPTION | Dry Density (pcf) | Moisture Content (%) | Liquid Limit (%) | Plasticity Index (%) | Percent Passing #200 Sieve | Other Tests [PID] |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| -55 | | | | 0<br>2 | | | | | 50 | 54 | 23 | 95 | SA |
| -60 | 75 | | | 10<br>11<br>11 | 11 | | firm | | | | | | [0] |
| -65 | 80 | | | 13<br>17<br>24 | 41 | | SANDY SILT (ML); dark gray, wet, very hard, nonplastic, fine-grained sand | | | | | | [0] |
| -70 | 85 | | | 10<br>12<br>16 | 14 | 2.2 | ELASTIC SILT with SAND (MH); olive gray, wet, firm, medium plasticity, fine- to medium-grained sand | 83 | 38 | | | | [0] |
| -75 | 90 | | | 4<br>7<br>14 | 21 | | SANDY SILT (ML); very dark gray, wet, hard, low plasticity, fine-grained sand | | | | | | [0] |
| | | | | | | | POORLY GRADED SAND with SILT (SP-SM); gray, wet, dense, medium- to coarse-grained sand | | | | | | |
| -80 | 95 | | | 38<br>44<br>40 | 42 | | SILTY SAND (SM); very dark gray, wet, dense, fine- to medium-grained sand | 108 | 20 | | | 14 | [0]<br>SA |
| -85 | 100 | | | 21<br>25<br>23 | 48 | | dark gray, fine- to coarse-grained sand | | | | | | [0] |
| | | | | | | | Bottom of boring at 100.5 feet.<br>Groundwater encountered at 15.5 feet during drilling.<br>Boring backfilled with cement/bentonite grout. | | | | | | |
| -90 | 105 | | | | | | | | | | | | |

# LOG OF BORING UB-32

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Pier T Backland Structures

Project No. 173-05.3

PLATE

**A9**

| | |
|---|---|
| BORING LOCATION (feet): N 24440 E 20193 | ELEVATION AND DATUM (feet): 18 MLLW |
| DRILLING EQUIPMENT: CME-85 | DRILLING METHOD: Rotary wash |
| BORING DIAMETER (inches): 4 | BORING DEPTH (feet): 82 |
| DATE STARTED: 7/24/00 | DATE COMPLETED: 7/24/00 |
| SPT HAMMER DROP: 30 inches WT: 140 lbs | DRIVE HAMMER DROP: 30 inches WT: 140 lbs |
| LOGGED BY: NS CHECKED BY: SW | DRIVE SAMPLER DIAMETER (inches) ID: 2.4 OD: 3 |

| Elevation (feet) | Depth (feet) | Sampler | Symbol | Blows per 6 inches | SPT N Blows per Foot | Field Unc. Comp. Str. (tsf) | DESCRIPTION | Dry Density (pcf) | Moisture Content (%) | Liquid Limit (%) | Plasticity Index (%) | Percent Passing #200 Sieve | Other Tests [PID] |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | ASPHALT - 14 inches | | | | | | |
| | | | | | | | DEBRIS; yellow painted wood - 10 inches | | | | | | |
| 15 | | | | 3 5 8 | 6 | | SILTY SAND (SM); light gray, moist, loose, medium- to coarse-grained sand, trace fine gravel - SUBBASE | | | | | | [0] |
| | | | | | | | SANDY SILT (ML); dark brown, moist, firm, low plasticity, fine-grained sand, micaceous | | | | | | |
| | 5 | | | 2 2 2 | 4 | | SILTY SAND (SM); gray, moist, very loose to loose, fine-grained sand, micaceous | | | | | | [0] |
| 10 | | | | | | | | | | | | | |
| | 10 | | | 1 2 2 | 2 | 0.5 | SILT with SAND (ML); dark olive gray, moist, very soft to soft, low plasticity, fine-grained sand, micaceous | 84 | 33 | | | | [0] |
| 5 | | | | | | | | | | | | | |
| | 15 | | | 3 4 8 | 12 | | SILTY SAND (SM); very dark gray, moist, medium dense, fine-grained sand, micaceous | | | | | | [0] |
| 0 | | | | | | | | | | | | | |
| | 20 | | | 14 18 19 | 18 | | ▽ wet<br>dark gray, decreased fines | | | | | | [0] |
| -5 | | | | | | | SANDY SILT (ML); very dark gray, wet, firm, low plasticity, fine-grained sand, micaceous | | | | | | |
| | 25 | | | 1 1 7 | 8 | | thin LEAN CLAY (CL) layer; gray, wet, soft, medium plasticity | | | | | 75 | [4.0] |
| | | | | | | | SILTY SAND (SM); very dark gray, wet, loose, fine-grained sand, trace seashells, organic odor | | | | | | |
| -10 | | | | | | | | | | | | | |

## LOG OF BORING UB-33

Page 1 of 3

Pier T Backland Structures

Project No. 173-05.3

PLATE

**A10**

Template: DYL01; Prj ID: 17365.GPJ

| Elevation (feet) | Depth (feet) | Sampler | Symbol | Blows per 6 inches | SPT N Blows per Foot | Field Unc. Comp. Str. (tsf) | DESCRIPTION | Dry Density (pcf) | Moisture Content (%) | Liquid Limit (%) | Plasticity Index (%) | Percent Passing #200 Sieve | Other Tests [PID] |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | 5 6 7 | 6 | | interbedded with SANDY SILT (ML); very dark gray, firm, low plasticity, no organic odor | 91 | 32 | | | 78 | [0] |
| -15 | | | | | | | | | | | | | |
| | 35 | | | 0 0 1 | 1 | | SANDY ELASTIC SILT (MH); dark olive gray, wet, very soft, medium plasticity, fine-grained sand, micaceous | | | | | | [0] |
| -20 | | | | | | | | | | | | | |
| | 40 | | | 1 1 12 | 6 | 0.25 | ELASTIC SILT (MH); gray, wet, very soft to soft, medium plasticity, micaceous | 78 | 47 | 60 | 28 | 98 | [0] SA |
| | | | | | | | SANDY SILT (ML); very dark gray, wet, firm, low plasticity, fine-grained sand, trace seashells, micaceous | 88 | 32 | | | | |
| -25 | | | | | | | | | | | | | |
| | 45 | | | 6 8 12 | 20 | | hard, no seashells | | | | | | [0] |
| -30 | | | | | | | | | | | | | |
| | 50 | | | 8 12 16 | 14 | | firm | 87 | 36 | | | 58 | [0] SA |
| -35 | | | | | | | | | | | | | |
| | 55 | | | 3 5 7 | 12 | | dark olive gray, increased fines content | | | | | | [0] |
| -40 | | | | | | | | | | | | | |
| | 60 | | | 13 24 29 | 26 | | SILTY SAND (SM); very dark gray, wet, medium dense, fine-grained sand, micaceous | | | | | | [0] |
| -45 | | | | | | | | | | | | | |
| | 65 | | | 9 14 15 | 29 | | dark olive gray, trace seashells | | | | | | [0] |
| -50 | | | | | | | LEAN CLAY with SAND (CL); olive gray, wet, soft to firm, | | | | | | |

**LOG OF BORING UB-33**



Pier T Backland Structures

Project No. 173-05.3

PLATE

**A11**

Template: DYL01; Prj ID: 1735.GPJ

| Elevation (feet) | Depth (feet) | Sampler | Symbol | Blows per 6 Inches | SPT N Blows per Foot | Field Unc. Comp. Str. (tsf) | DESCRIPTION | Dry Density (pcf) | Moisture Content (%) | Liquid Limit (%) | Plasticity Index (%) | Percent Passing #200 Sieve | Other Tests [PID] |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | 2<br>3<br>6 | 4 | | medium plasticity, fine-grained sand, trace seashells | 91 | 32 | 36 | 14 | 74 | [0]<br>SA |
| -55 | | | | | | | | | | | | | |
| | 75 | | | 6<br>6<br>15 | 21 | | hard, no seashells | | | | | | [0] |
| | | | | | | | SILTY SAND (SM); dark gray, wet, medium dense, fine-grained sand | | | | | | |
| -60 | | | | | | | | | | | | | |
| | 80 | | | 10<br>15<br>38 | 25 | | interbedded with thin SILT (ML) layer; olive gray, hard, low plasticity | 105 | 22 | | | 89 | [0]<br>DS |
| | | | | | | | Bottom of boring at 81.5 feet.<br>Groundwater encountered at 19.5 feet during drilling.<br>Boring backfilled with cement/bentonite grout. | | | | | | |
| -65 | | | | | | | | | | | | | |
| | 85 | | | | | | | | | | | | |
| -70 | | | | | | | | | | | | | |
| | 90 | | | | | | | | | | | | |
| -75 | | | | | | | | | | | | | |
| | 95 | | | | | | | | | | | | |
| -80 | | | | | | | | | | | | | |
| | 100 | | | | | | | | | | | | |
| -85 | | | | | | | | | | | | | |
| | 105 | | | | | | | | | | | | |
| -90 | | | | | | | | | | | | | |

## LOG OF BORING UB-33

Page 3 of 3

Pier T Backland Structures

Project No. 173-05.3

PLATE

**A12**

Template: DYLG1; Prj ID: 17305.GPJ

| | |
|---|---|
| BORING LOCATION (feet): N 24629 E 20160 | ELEVATION AND DATUM (feet): 15 MLLW |
| DRILLING EQUIPMENT: CME-85 | DRILLING METHOD: Rotary wash |
| BORING DIAMETER (inches): 4 | BORING DEPTH (feet): 126 |
| DATE STARTED: 7/12/00 | DATE COMPLETED: 7/13/00 |
| SPT HAMMER DROP: 30 inches WT: 140 lbs | DRIVE HAMMER DROP: 30 inches WT: 140 lbs |
| LOGGED BY: NS CHECKED BY: SW | DRIVE SAMPLER DIAMETER (inches) ID: 2.4 OD: 3 |

| Elevation (feet) | Depth (feet) | Sampler | Symbol | Blows per 6 Inches | SPT N Blows per Foot | Field Unc. Comp. Str. (tsf) | DESCRIPTION | Dry Density (pcf) | Moisture Content (%) | Liquid Limit (%) | Plasticity Index (%) | Percent Passing #200 Sieve | Other Tests [PID] |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | ASPHALT - 3.5 inches | | | | | | |
| | | | | 11 19 19 | 19 | | SILTY GRAVEL with SAND (GM); brown, gray, moist, medium dense, fine to coarse gravel, fine-grained sand; BASE - 6 inches | | | | | | [0] |
| | | | | | | | SILTY SAND (SM); light olive brown, moist, medium dense, fine-grained sand, trace seashells, micaceous | | | | | | |
| 10 | 5 | | | 2 1 2 | 3 | | SANDY SILT (ML); olive brown, moist, soft, low plasticity, fine-grained sand, micaceous | | | | | | [0] |
| 5 | 10 | | | 4 12 22 | 17 * | | SILTY SAND (SM); light brown, moist, medium dense, fine-grained sand | 96 | 9 | NP | NP | 32 | [0] SA DS |
| 0 | 15 | | | 4 5 3 | 8 | | dark gray, loose, trace seashells | | | | | | [1.4] |
| -5 | 20 | | | 12 18 24 | 21 | | ▽ wet<br>olive gray, medium dense, no seashells | | | | | | [0] |
| -10 | 25 | | | 5 8 10 | 18 | | trace seashells, fine- to medium-grained sand<br>interbedded with thin SANDY SILT (ML) layer; dark gray, wet, hard, low plasticity, fine-grained sand | | | | | | [0.6] |
| | | | | 4 | 7 | 1.7 | | | | | | | [0] |

# LOG OF BORING UB-34

Page 1 of 4

Pier T Backland Structures

Project No. 173-05.3

PLATE

**A13**

| Elevation (feet) | Depth (feet) | Sampler | Symbol | Blows per 6 Inches | SPT N Blows per Foot | Field Unc. Comp. Str. (tsf) | DESCRIPTION | Dry Density (pcf) | Moisture Content (%) | Liquid Limit (%) | Plasticity Index (%) | Percent Passing #200 Sieve | Other Tests [PID] |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | 6<br>9 | | | SANDY SILT (ML); dark olive gray, wet, firm, nonplastic, fine-grained sand | 102 | 24 | NP | NP | 59 | SA |
| | | | | | | | SILT with SAND (ML); olive gray, wet, very soft, low plasticity, fine-grained sand | | | | | | |
| -20 | 35 | | | push | 0 | | | | | | | | [0.5] |
| | | | | | | | SILTY SAND (SM); dark olive gray, wet, medium dense to dense, fine-grained sand, trace seashells, micaceous | | | | | | |
| -25 | 40 | | | 13<br>28<br>32 | 30 | | | | | | | | [1.4] |
| -30 | 45 | | | 12<br>14<br>15 | 29 | | dark gray, medium dense, fine- to medium-grained sand | | | | | | [0.8] |
| -35 | 50 | | | 16<br>22<br>23 | 22 | | decreased seashells<br>very dark gray, increased fines | 93 | 30 | | | 33 | [1.8]<br>DS |
| -40 | 55 | | | 4<br>8<br>13 | 21 | | fine-grained sand | | | | | | [1.0] |
| -45 | 60 | | | 14<br>30<br>20 | 25 | | trace black seams | | | | | | [0.8] |
| | | | | | | | LEAN CLAY with SAND (CL); dark olive gray, wet, soft, medium plasticity, fine-grained sand, trace seashells | | | | | | |
| -50 | 65 | | | 2<br>2<br>1 | 3 | | | | 40 | 37 | 13 | 73 | [0.8]<br>SA |
| | | | | | | | LEAN CLAY (CL); gray, wet, firm, medium plasticity | | | | | | |
| | | | | 4 | 5 | 1.0 | | | | | | | [0.7] |

# LOG OF BORING UB-34



Pier T Backland Structures

Project No. 173-05.3

PLATE

**A14**

| Elevation (feet) | Depth (feet) | Sampler | Symbol | Blows per 6 Inches | SPT N Blows per Foot | Field Unc. Comp. Str. (tsf) | DESCRIPTION | Dry Density (pcf) | Moisture Content (%) | Liquid Limit (%) | Plasticity Index (%) | Percent Passing #200 Sieve | Other Tests [PID] |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | 5<br>6 | | | dark gray | | | | | | |
| | | | | | | | SILTY SAND (SM); dark gray, wet, medium dense, fine-grained sand | | | | | | |
| -60 | 75 | | | 12<br>11<br>11 | 22 | | interbedded with thin SILT (ML) layer; gray, wet, hard, low plasticity | | | | | | [0.6] |
| -65 | 80 | | | 9<br>20<br>26 | 23 | | dark olive gray, micaceous | | | | | | [0.4] |
| -70 | 85 | | | 17<br>20<br>24 | 44 | | dense | | | | | | [0.3] |
| -75 | 90 | | | 8<br>16<br>22 | 19 | 1.5 | SANDY SILT (ML); dark olive gray, wet, hard, nonplastic, fine-grained sand | | | | | | [0.5] |
| -80 | 95 | | | 5<br>12<br>13 | 25 | | | | 29 | NP | NP | 66 | [1.0]<br>SA |
| | | | | | | | LEAN CLAY with SAND (CL); gray, wet, firm, medium plasticity, fine-grained sand | | | | | | |
| -85 | 100 | | | 10<br>14<br>15 | 14 | 2.2 | | | | | | | [0.4] |
| | | | | | | | SILTY SAND (SM); very dark gray, wet, medium dense, fine-grained sand | | | | | | |
| -90 | 105 | | | 21<br>32<br>35 | 67 | | gray, very dense, fine- to coarse-grained sand | | | | | | [0.9] |
| | | | | 20 | 33 | | POORLY GRADED SAND with SILT (SP-SM); gray, wet, | 95 | 27 | | | 6 | [1.0] |

## LOG OF BORING UB-34



Pier T Backland Structures

Project No. 173-05.3

PLATE

**A15**

| Elevation (feet) | Depth (feet) | Sampler | Symbol | Blows per 6 Inches | SPT N Blows per Foot | Field Unc. Comp. Str. (tsf) | DESCRIPTION | Dry Density (pcf) | Moisture Content (%) | Liquid Limit (%) | Plasticity Index (%) | Percent Passing #200 Sieve | Other Tests [PID] |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | 24<br>42 | | | dense, medium-grained sand | | | | | | DS |
| -100 | 115 | | | 24<br>36<br>43 | 79 | | very dense | | | | | | [1.8] |
| -105 | 120 | | | 30<br>56 | >50 | | medium- to coarse-grained sand<br>fine-grained sand | | | | | | [1.0] |
| -110 | 125 | | | 46<br>42<br>46 | 88 | | medium- to coarse-grained sand | | | | | | [0.2] |
| | | | | | | | Bottom of boring at 125.5 feet.<br>Groundwater encountered at 18.5 feet during drilling.<br>Boring backfilled with cement/bentonite grout. | | | | | | |
| -115 | 130 | | | | | | | | | | | | |
| -120 | 135 | | | | | | | | | | | | |
| -125 | 140 | | | | | | | | | | | | |
| -130 | 145 | | | | | | | | | | | | |

## LOG OF BORING UB-34



Pier T Backland Structures

Project No. 173-05.3

PLATE

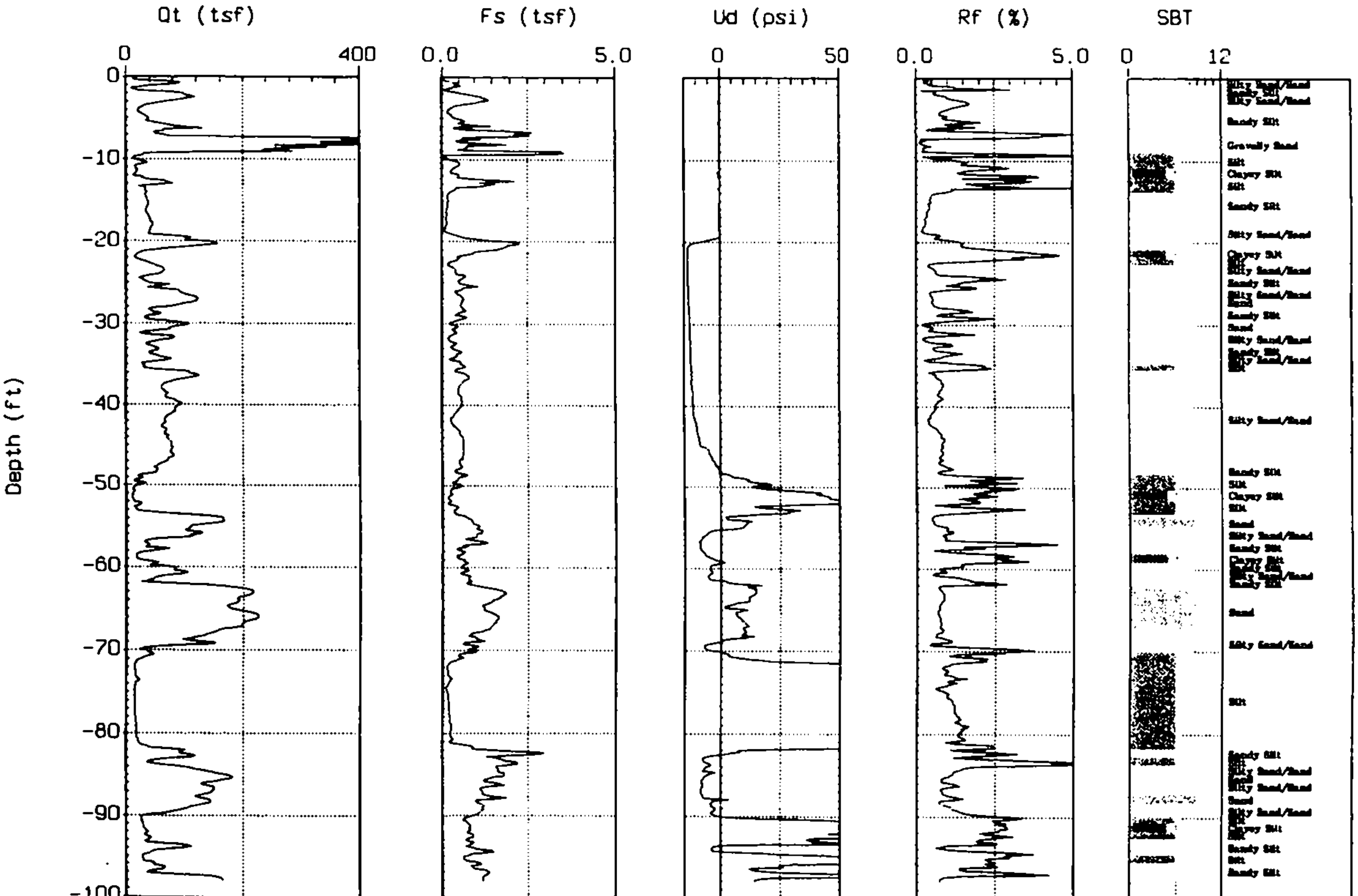
**A16**

GREGG

DIAZ YOURMAN

Site : PIER T BACKLAND
Location : UC-21

Engineer : NEVILLE SU
Date : 07:20:00 07:30




Max. Depth: 98.10 (ft)

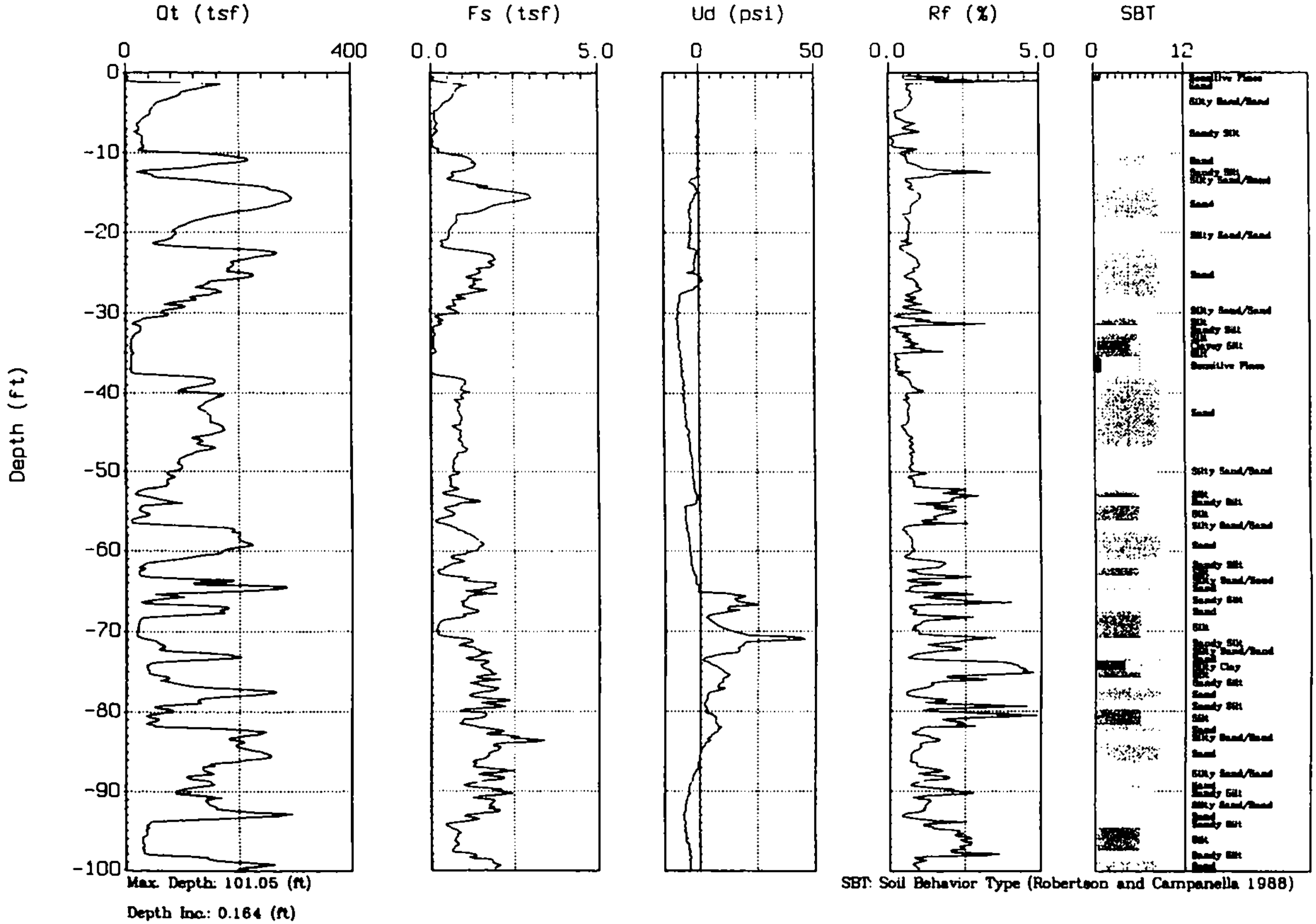
Depth Inc.: 0.164 (ft)

SBT: Soil Behavior Type (Robertson and Campanella 1988)

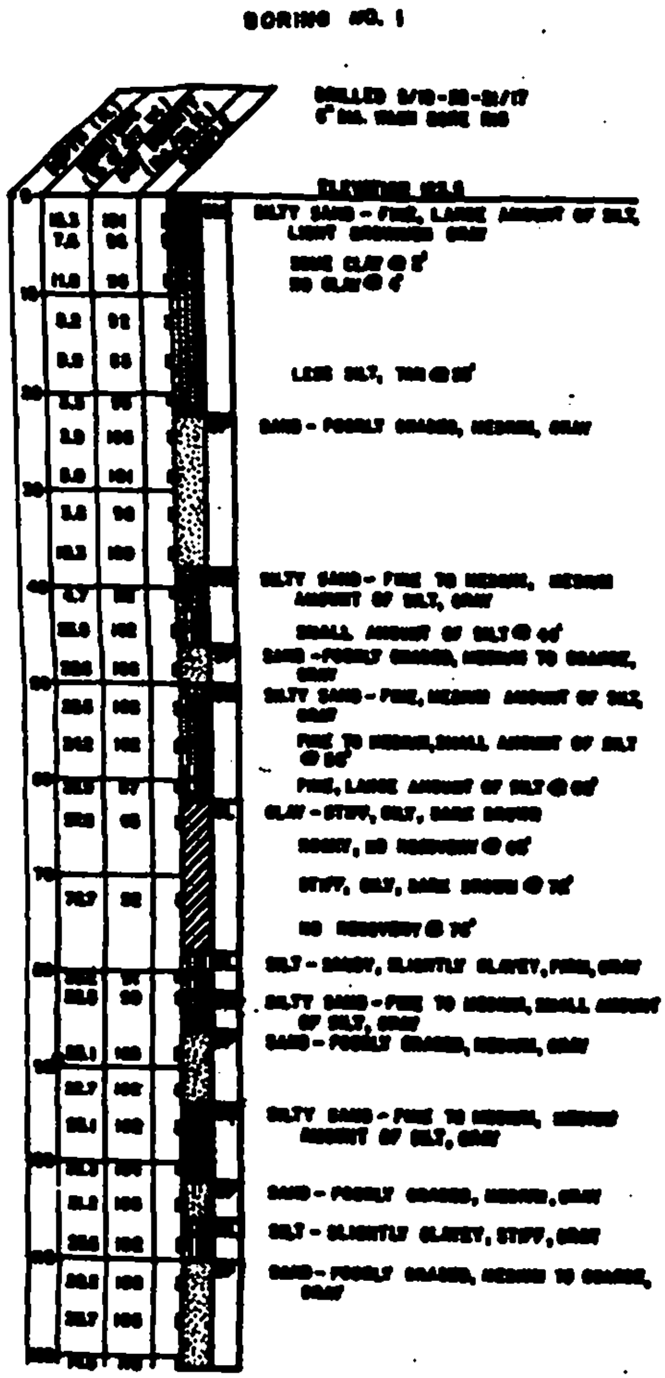
GREGG DIAZ YOURMAN

Site : PIER T BACKLAND
Location : UC-22

Engineer : NEVILLE SU
Date : 07:20:00 08:52




SBT: Soil Behavior Type (Robertson and Campanella 1988)

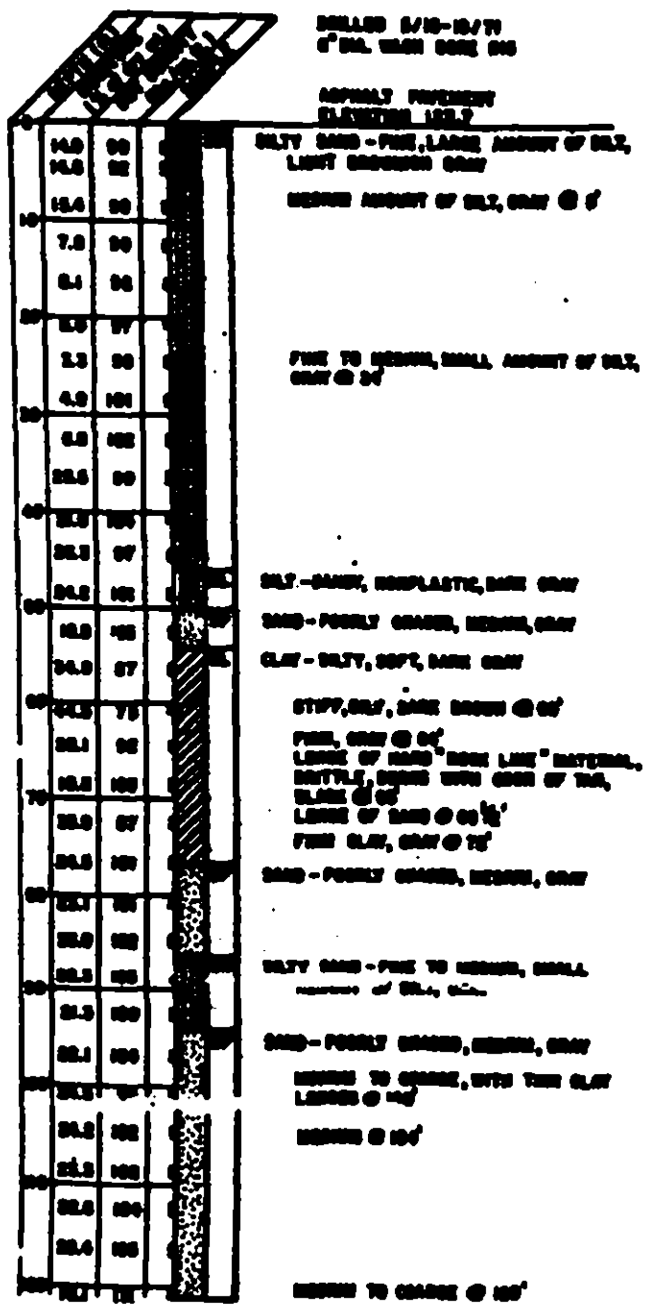


Soils Investigation By:

L.T. Evans, INC.
185 S. Alverado St.
Los Angeles, California
30 June, 1971

FROM: NAVFAC Drawing No. 6,022,453, Dated 1973

BORING NO. 2

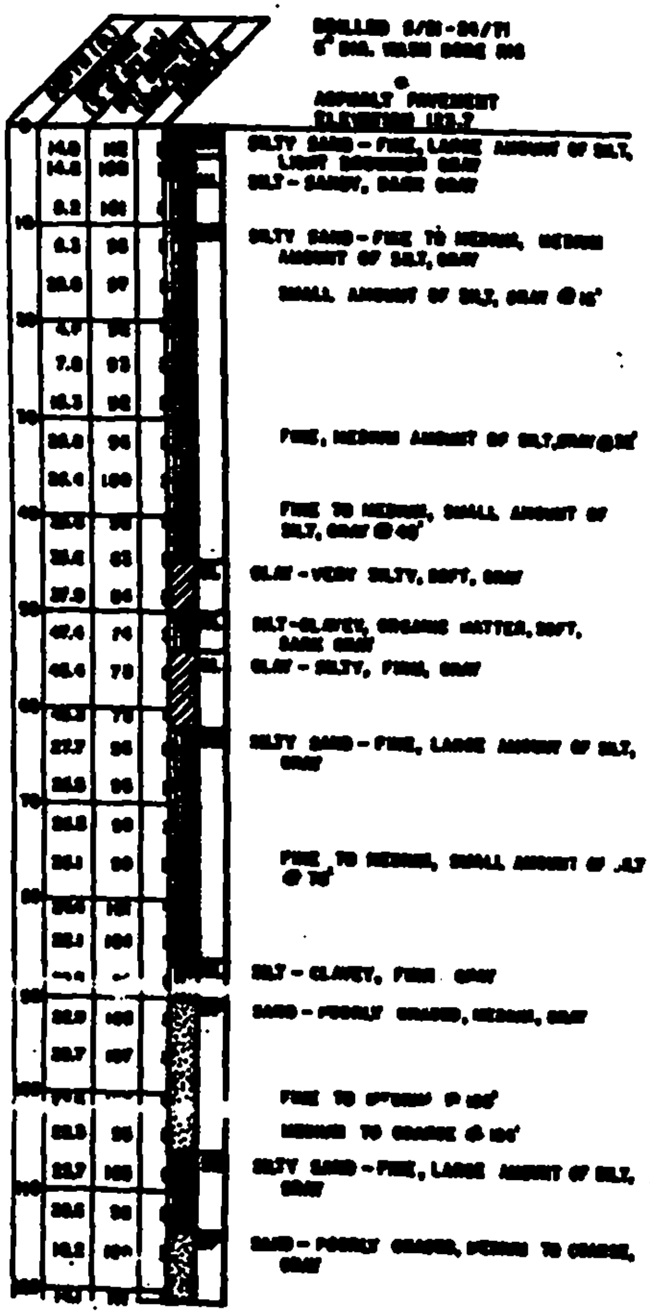


Soils Investigation By:

L.T. Evans, INC.
185 S. Alverado St.
Los Angeles, California
30 June, 1971

FROM: NAVFAC Drawing No. 6,022,453, Dated 1973

BORING NO. 3

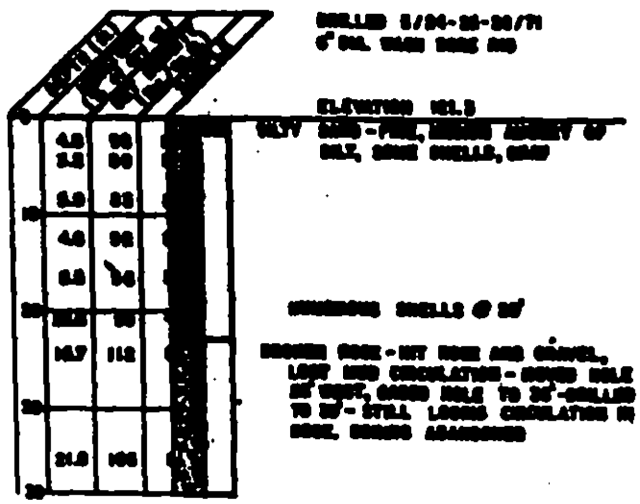


Soils Investigation By:

L.T. Evans, INC.
185 S. Alverado St.
Los Angeles, California
30 June, 1971

FROM: NAVFAC Drawing No. 6,022,453, Dated 1973

BORING NO. 5

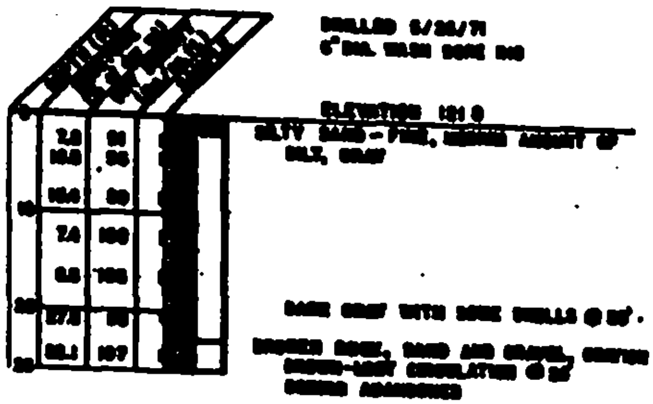


Soils Investigation By:

L.T. Evans, INC.
185 S. Alverado St.
Los Angeles, California
30 June, 1971

FROM: NAVFAC Drawing No. 6,022,453, Dated 1973

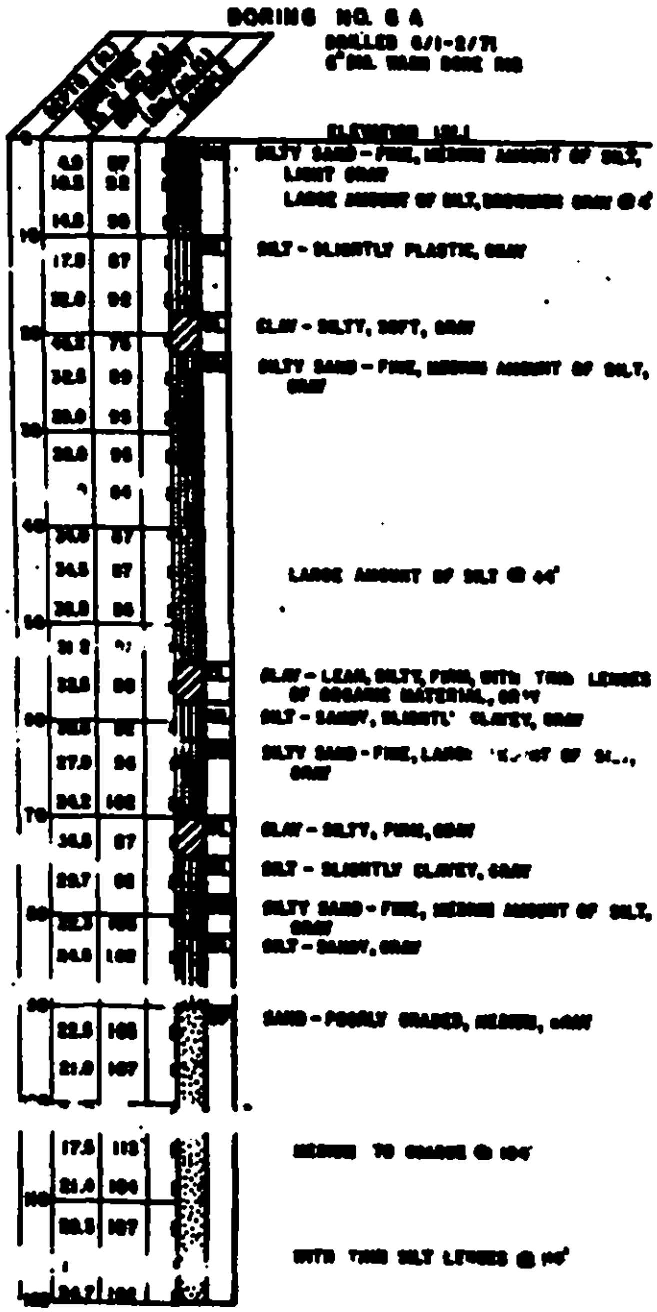
BORING NO. 6



Soils Investigation By:

L.T. Evans, INC.
185 S. Alverado St.
Los Angeles, California
30 June, 1971

FROM: NAVFAC Drawing No. 6,022,453, Dated 1973




Soils Investigation By:

L.T. Evans, INC.
185 S. Alverado St.
Los Angeles, California
30 June, 1971

FROM: NAVFAC Drawing No. 6,022,453, Dated 1973

# APPENDIX B

# EXPLORATORY DRILLING PROGRAM

# APPENDIX B

# EXPLORATORY DRILLING PROGRAM

## B.1 GENERAL

The exploratory drilling program was initiated on June 19, 2003 and completed on June 30, 2003. All field activities were performed under the technical supervision of a qualified geotechnical engineer in strict compliance with a site-specific Health and Safety Plan. Nine mud-rotary borings were drilled to depths ranging from 16 ½ feet to 161 ½ feet below existing ground surface. The locations of the borings are shown in Figure 2-1.

## B.2 DRILLING

The upper 5 feet of each boring were hand-augered as an additional precaution for subsurface utilities. The borings were drilled by C&L Drilling of La Habra, California using mud-rotary drilling equipment. This drilling technique used a rotating drill bit with continuous circulation of drilling mud. The drilling mud served multiple purposes during drilling, including circulating cuttings as the bit penetrates the formation, cooling and cleaning the drill bit, stabilizing the borehole wall, and penetrating the formation.

During drilling mud was carried to the drill bit where it was ejected through ports in the bit. As new mud was introduced at the bottom of the borehole, the cuttings were displaced and circulated to the surface. Upon reaching the surface, the mud flowed into a portable mud trough that allowed the suspended solids (cuttings) to drop out. The mud was slummed from the trough and the increasingly finer material was separated using a screen and secondary-settling trough. The viscosity of the drilling mud used depended upon the stratigraphy of materials encountered.

Borings B-6 and B-7 encountered refusal at depths of 16 ½ feet and 28 feet, respectively, where as-built drawings from construction of Pier Echo indicated the quarry run section of the rock containment dike, likely consisting of cobbles and boulders. As a result, an additional boring (Boring B-9) was drilled. This boring was located between Borings B-6 and B-7, but further back from the pier head line than these borings.

Furthermore, an approximately 2-foot thick silty clay layer was encountered in Boring B-1 (located within the center of the south LNG tank) at a depth of about 154 feet below the existing ground surface. This layer was not observed in Boring B-2 located within the center of the north LNG tank. As a result, in order to determine whether this layer was isolated to Boring B-1, or extended further than the tank footprint, Boring B-9 was drilled to a depth of 156 feet below existing ground surface.

Upon completion of drilling and sampling, the boreholes were backfilled by mixing the drilling mud with cement. The borings were capped with concrete, flush with the ground surface and matching the thickness of existing pavement section. Excess drilling mud and soil cuttings were temporarily contained onsite in DOT-approved 55-gallon steel drums until disposal.

## B.3 SAMPLING

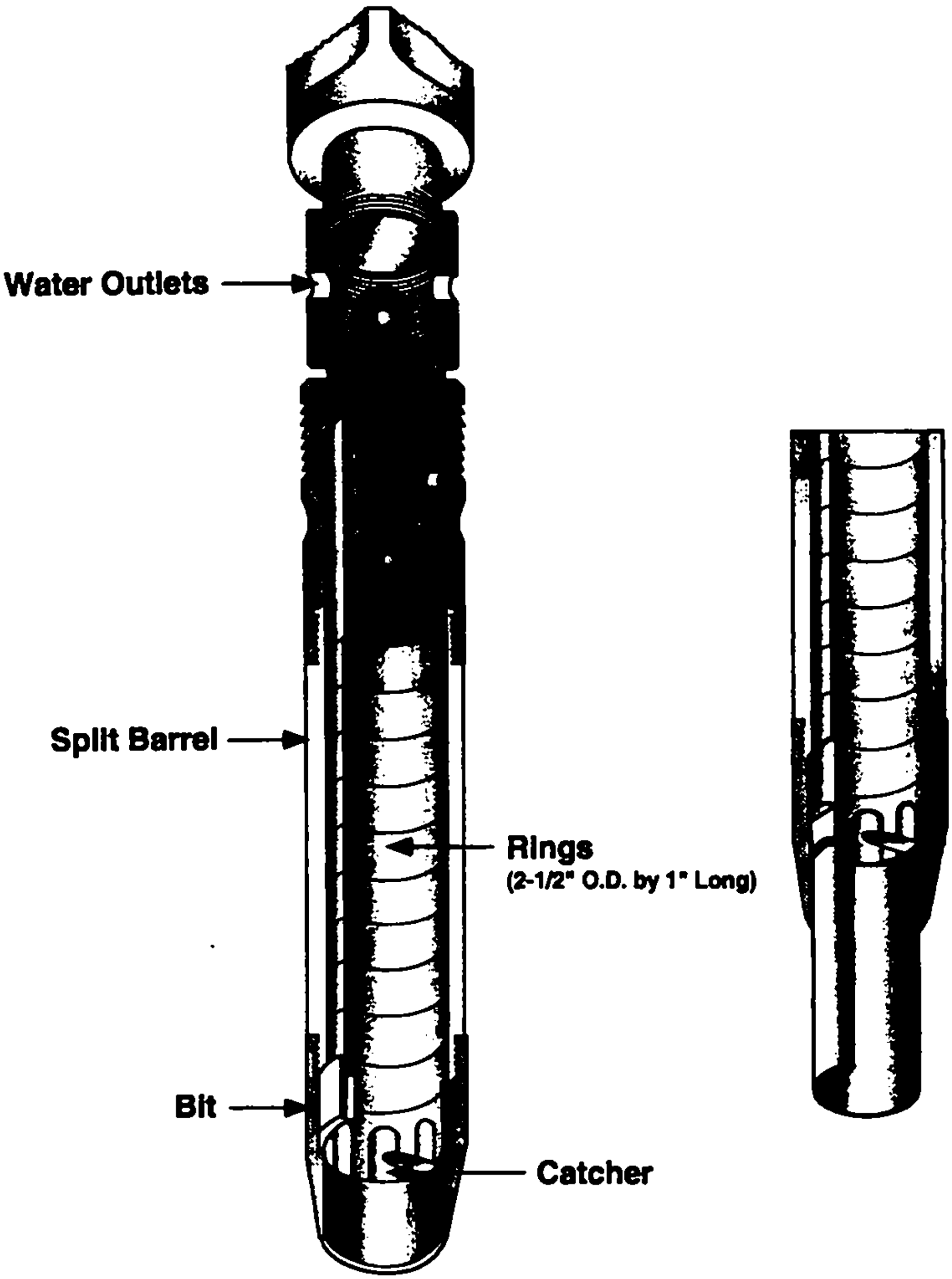
Relatively undisturbed soil samples were obtained during drilling operations using Dames & Moore Type-U (Figure B-1) and Shelby tube samplers. The Type-U sampler was driven by a hammer weighing 400 pounds and dropping 18 inches. Shelby tube sampling was performed in accordance with ASTM Test Method D-1587. In addition, Standard Penetration Tests (SPT's) were conducted per ASTM Test Method D-1586 at selected intervals in the borings. Our representative maintained logs of the borings and classified the soils encountered according to the Unified Soil Classification System. Logs of Borings are presented in Figures B-2 through B-10. A Key to the Log of Borings and description of the Unified Soil Classification System are presented in Figure B-11.

Samples were observed in the field for organic vapors and hydrocarbon-type staining. Generally, no detectable organic vapors or hydrocarbon-like staining were observed in the soil samples collected during the current investigation. Soil samples were carefully sealed and packaged to reduce moisture loss and disturbance, and were transported to our laboratory in Los Angeles for additional examination and testing.

-o0o-

The following are attached and complete this appendix:

| | |
|---|---|
| Figure B-1 | Type-U Soil Sampler |
| Figure B-2 | Log of Boring B-1 |
| Figure B-3 | Log of Boring B-2 |
| Figure B-4 | Log of Boring B-3 |
| Figure B-5 | Log of Boring B-4 |
| Figure B-6 | Log of Boring B-5 |
| Figure B-7 | Log of Boring B-6 |
| Figure B-8 | Log of Boring B-7 |
| Figure B-9 | Log of Boring B-8 |
| Figure B-10 | Log of Boring B-9 |
| Figure B-11 | Unified Soil Classification System and Key to Log of Borings |




DAMES & MOORE TYPE-U SAMPLER

URS
Figure B-1

| | | | |
|---|---|---|---|
| Date(s) Drilled | 6/18/2003 to 6/20/03 | Logged By | T.O'Brien |
| Drilling Method | Mud-Rotary | Drill Bit Size/Type | 4-3/4 inch diameter/Tricone |
| Drill Rig Type | Mayhew 1000 | Hammer Data | 140 lb/30"drop (SPT); 400 lb/18" drop (Type U) |
| Sampling Method(s) | Dames & Moore Type-U, SPT, Shelby Tube | | |
| Approximate Groundwater Depth and Date Measured | 21 feet on 6/18/03 | | |
| Comments | None | | |

# Boring B-1

Sheet 1 of 4

| | |
|---|---|
| Job Number | 33756065 |
| Total Depth Drilled (ft) | 168.5 |
| Approximate Ground Surface Elevation(ft) | 22 MSL |

| Elevation (ft) | Depth (ft) | Sample Number | Blows per 6 inches | USCS | MATERIAL DESCRIPTION | Moisture Content (%) | Dry Density (pcf) | OTHER TESTS and REMARKS |
|---|---|---|---|---|---|---|---|---|
| | 0 | | | | 3-inch thick Asphalt Concrete pavement underlain by 12 inches of aggregate base | | | |
| 20 | | | | SM | ARTIFICIAL FILL: Olive-gray silty fine SAND, moist (medium dense) | | | |
| | 5 | 1 | 5 5 5 | SM-ML | Dark gray silty fine SAND to fine sandy SILT, moist (loose to medium dense) | 23 | | CORR |
| | | | | ML | Dark gray SILT, moist (very soft) | | | |
| 10 | 10 | 2 | 1 1 1 | | | 35 | 84 | -200(91) DSCD |
| | 15 | 3 | push | | | 45 | | LL=35, PI=8 CORR |
| | | | | SM | Gray silty fine to medium SAND, wet, with abundant shell fragments (dense) | | | |
| 0 | 20 | 4 | 17 20 25 | | | 32 | 92 | DSCD |
| | 25 | 5 | 6 11 8 | | Grades (medium dense) | 28 | | -200(14) |
| -10 | 30 | 6 | 7 9 8 | | | 24 | 101 | |
| | 35 | 7 | 5 5 7 | | Grades without shells | 37 | | |
| | 40 | | | | | | | |

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## LOG OF BORING

Proposed LNG Import Terminal
Pier Echo, Port of Long Beach
FOR: Kellogg Brown and Root

URS

Figure B-2

**Pier Echo, Port of Long Beach**
**FOR: Kellogg Brown and Root**

**Boring B-1**
**Sheet 2 of 4**

| Elevation (ft) | Depth (ft) | Samples: Number | Samples: Blows per 6 inches | USCS | MATERIAL DESCRIPTION | Moisture Content (%) | Dry Density (pcf) | OTHER TESTS and REMARKS |
|---|---|---|---|---|---|---|---|---|
| | 40 | 8 | 5 5 5 | | Grades (loose) | 31 | 92 | |
| -20 | | | | | | | | |
| | 45 | 9 | 5 5 5 | | Grades fine (loose to medium dense) | 33 | | -200(20) |
| | | | | CL | **ESTUARINE DEPOSITS:** Dark gray silty CLAY, wet (soft) | | | |
| | 50 | 10A | NR | | | | | No Sample Recovery |
| -30 | | 10 | 3 4 5 | | | 25 | 97 | DSCD |
| | | | | SM | Black silty fine to medium SAND, wet, with trace shell fragments (medium dense) | | | -200(18) |
| | 55 | 11 | 7 5 6 | | | 28 | | -200(43) |
| | | | | CL | Dark gray silty CLAY, wet (medium stiff) | | | |
| | 60 | 12 | 3 3 4 | | | 42 | 79 | LL=44, PI=19 PP=1.25 |
| -40 | | | | | | | | |
| | | | | SM | Gray silty fine to medium SAND, wet, with trace shell fragments (dense) | | | |
| | 65 | 13 | 12 17 18 | | | 30 | | |
| | | | | CL | Dark gray silty CLAY, wet, with trace shell fragments (stiff) | | | |
| | 70 | 14 | 4 6 6 | | | 32 | 92 | PP=2.0 CON |
| -50 | | | | | | | | |
| | 75 | 15 | 7 7 8 | | Grades (stiff to very stiff) | 31 | | -200(93) LL=35, PI=12 |
| | 80 | 16 | 7 18 25 | SP-SM | **MARINE SANDS:** Gray fine to medium SAND with silt, wet (dense) | 27 | 97 | DSCD |
| -60 | | | | | | | | |
| | 85 | 17 | 19 30 32 | | Grades light gray (very dense) | 23 | | |
| | 90 | | | | | | | |

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Figure B-2

| Elevation (ft) | Depth (ft) | Samples: Number | Samples: Blows per 6 inches | USCS | MATERIAL DESCRIPTION | Moisture Content (%) | Dry Density (pcf) | OTHER TESTS and REMARKS |
|---|---|---|---|---|---|---|---|---|
| | 90 | 18 | 22 35 45 | | Grades gray | 24 | 104 | |
| -70 | | | | | | | | |
| | 95 | 19 | 30 50/5" | SP-SM | **GASPUR AQUIFER:** Gray fine to medium SAND with silt, wet (very dense) | 28 | | |
| | 100 | 20 | 22 55/6" | | | 23 | 104 | -200(5) |
| -80 | | | | | Grades medium to coarse with trace fine gravel | | | |
| | 105 | 21 | 26 38 39 | | | 19 | | |
| | 110 | 22 | 18 21 26 | | Grades (dense) | 27 | 97 | DSCD |
| -90 | | | | SM | Dark gray silty fine SAND, wet (very dense) | | | |
| | 115 | 23 | 22 27 28 | | | 29 | | SA(46) |
| | | | | SP-SM | Gray medium to coarse SAND with silt, wet (very dense) | | | |
| | 120 | 24 | 16 28 40 | | | 24 | 101 | DSCD |
| -100 | | | | | | | | |
| | 125 | 25 | 31 50/5" | | | 20 | | |
| | 130 | 26 | 28 53/6" | | | 15 | 112 | |
| -110 | | | | | | | | |
| | 135 | 27 | 33 50/5" | | Grades fine to coarse | 21 | | SA(12) |
| | 140 | | | | | | | |

Pier Echo, Port of Long Beach
FOR: Kellogg Brown and Root

**Boring B-1**


| Elevation (ft) | Depth (ft) | Samples: Type | Samples: Number | Samples: Blows per 6 inches | Graphic Log | USCS | MATERIAL DESCRIPTION | Moisture Content (%) | Dry Density (pcf) | OTHER TESTS and REMARKS |
|---|---|---|---|---|---|---|---|---|---|---|
| | 140 | | 28 | 39 50/5" | | | | 17 | 111 | |
| -120 | | | | | | | | | | |
| | 145 | | 29 | 40 50/4" | | | Grades with trace fine gravel | 17 | | |
| | | | | | | SM | Dark gray silty fine to medium SAND, wet (very dense) | | | |
| | 150 | | 30 | 27 57/6" | | | | 29 | 97 | |
| -130 | | | | | | | | | | |
| | | | | | | CL | Light gray to dark brown silty CLAY, wet, with seams of peat and trace fine sand (hard) | | | |
| | 155 | | 31 | 14 54/6" | | SM | Dark gray silty fine SAND, wet (very dense) | 54 | | -200(88) |
| | 160 | | 32 | 65/6" | | | Grades fine to coarse with some fine gravel | 17 | 110 | |
| -140 | | | | | | | Boring completed to 160.5 feet below the ground surface. Groundwater encountered at 21 feet below the ground surface. Boring backfilled with sand-cement grout mixed with drill mud, and patched with concrete to match the existing surface. | | | |
| | 165 | | | | | | | | | |
| | 170 | | | | | | | | | |
| -150 | | | | | | | | | | |
| | 175 | | | | | | | | | |
| | 180 | | | | | | | | | |
| -160 | | | | | | | | | | |
| | 185 | | | | | | | | | |
| | 190 | | | | | | | | | |

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Figure B-2

| | | | |
|---|---|---|---|
| Date(s) Drilled | 6/24/2003 | Logged By | T.O'Brian |
| Drilling Method | Mud-Rotary | Drill Bit Size/Type | 4-3/4 inch diameter/Tricone |
| Drill Rig Type | Mayhew 1000 | Hammer Data | 140 lb/30"drop (SPT); 400 lb/18" drop (Type U) |
| Sampling Method(s) | Dames & Moore Type-U, SPT, Shelby Tube | | |
| Approximate Groundwater Depth and Date Measured | 19.5 feet on 6/24/03 | | |
| Comments | None | | |

# Boring B-2

Sheet 1 of 4

| | |
|---|---|
| Job Number | 33758868 |
| Total Depth Drilled (ft) | 161.0 |
| Approximate Ground Surface Elevation(ft) | 22 MSL |

| Elevation (ft) | Depth (ft) | Samples: Type | Samples: Number | Samples: Blows per 6 inches | USCS | MATERIAL DESCRIPTION | Moisture Content (%) | Dry Density (pcf) | OTHER TESTS and REMARKS |
|---|---|---|---|---|---|---|---|---|---|
| | 0 | | | | CL | 3-inch thick Asphalt Concrete pavement underlain by 7 inches of aggregate base | | | |
| 20 | | | | | | ARTIFICIAL FILL: Brownish-gray silty CLAY, moist, with fine sand (soft) | | | |
| | 5 | | 1 | 1 2 2 | | | 35 | 78 | DSCD |
| | 10 | | 2 | 5 9 8 | | Grades olive-gray (very stiff) | 20 | | -200(54) LL=37, PI=15 CORR |
| 10 | | | | | ML | Olive-gray clayey SILT with some fine sand, very moist (very soft) | | | |
| | 15 | | 3 | 1 1 1 | | | 41 | 81 | LL=37, PI=11 CON DSCD |
| | | | | | SM | Dark gray silty fine SAND, wet, with trace shell fragments, (dense) | | | |
| | 20 | | 4 | 9 17 26 | | | 25 | | |
| 0 | | | | | | | | | |
| | 25 | | 5 | 7 11 14 | | Grades (medium dense) | 32 | 92 | DSCD |
| | | | | | SP-SM | Dark gray fine SAND with silt, wet, (loose to medium dense) | | | |
| | 30 | | 6 | 3 4 6 | | | 34 | | -200(12) |
| -10 | | | | | | | | | |
| | 35 | | 7 | 3 5 5 | | Grades (loose) | 28 | 95 | |
| | | | | | SM | Dark gray silty fine SAND, wet (medium dense) | | | |
| | 40 | | | | | | | | |

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## LOG OF BORING

Proposed LNG Import Terminal
Pier Echo, Port of Long Beach
FOR: Kellogg Brown and Root

URS

Figure B-3

**Pier Echo, Port of Long Beach**
**FOR: Kellogg Brown and Root**

**Boring B-2**


| Elevation (ft) | Depth (ft) | SAMPLES Type | Number | Blows per 6 Inches | Graphic Log | USCS | MATERIAL DESCRIPTION | Moisture Content (%) | Dry Density (pcf) | OTHER TESTS and REMARKS |
|---|---|---|---|---|---|---|---|---|---|---|
| | 40 | | 8 | 3 6 11 | | | | 32 | | |
| -20 | | | | | | | | | | |
| | 45 | | 9 | 5 7 8 | | | | 34 | 88 | DSCD |
| | 50 | | 10 | 7 8 10 | | | | 34 | | -200(38) |
| -30 | | | | | | | | | | |
| | 55 | | 11 | 5 6 6 | | | | 32 | 92 | |
| | | | | | | SM | **ESTUARINE DEPOSITS:** Dark gray silty fine to medium SAND, wet with 6-inch thick silty clay layer (medium dense) | | | |
| | 60 | | 12 / 13 | 2 5 8 | | | Grades fine to medium with 6-inch thick silty clay layer | 34 | | -200(45) |
| -40 | | | | | | | | | | |
| | 65 | | 14 | 11 17 20 | | | Grades fine | 28 | 97 | -200(23) DSCD |
| | 70 | | 15 | 1 1 1 | | | Grades with trace shell fragments (very loose) | 28 | | -200(46) |
| -50 | | | | | | ML | Dark gray clayey SILT, wet, with trace fine sand (stiff) | | | |
| | 75 | | 16 | 3 7 7 | | | | 27 | 95 | LL=33, PI=8 CON PP=3.25 |
| | | | | | | SM | **MARINE SANDS:** Gray fine to medium silty SAND, wet (very dense) | | | |
| | 80 | | 17 | 10 28 29 | | | | 23 | | -200(19) |
| -60 | | | | | | | | | | |
| | 85 | | 18 | 22 30 40 | | | | 26 | 99 | DSCD |
| | 90 | | | | | | | | | |

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URS

Figure B-3

| Elevation (ft) | Depth (ft) | SAMPLES: Type | SAMPLES: Number | SAMPLES: Blows per 6 inches | Graphic Log | USCS | MATERIAL DESCRIPTION | Moisture Content (%) | Dry Density (pcf) | OTHER TESTS and REMARKS |
|---|---|---|---|---|---|---|---|---|---|---|
| | 90 | | 19 | 18 31 35 | | | | 23 | | |
| -70 | | | | | | | | | | |
| | 95 | | 20 | 5 8 12 | | | Grades dark gray to black, micaceous (medium dense) | 41 | 83 | -200(33) |
| | | | | | | SP-SM | **GASPUR AQUIFIER:** Light gray fine to medium SAND with silt, wet (very dense) | | | |
| | 100 | | 21 | 21 32 35 | | | | 23 | | |
| -80 | | | | | | | | | | |
| | 105 | | | | | | | | | |
| | 110 | | 22 | 27 55/6" | | | Grades medium to coarse | 23 | 105 | DSCD |
| -90 | | | | | | | | | | |
| | 115 | | | | | | | | | |
| | | | | | | | Grades with some gravel | | | Rig chatter from 117 to 119 feet |
| | 120 | | 23 | 59/6" | | | Grades without gravel | 19 | | -200(9) |
| -100 | | | | | | | | | | |
| | 125 | | | | | | | | | |
| | 130 | | 24 | 25 55/6" | | | | 21 | 104 | |
| -110 | | | | | | | | | | |
| | 135 | | | | | | | | | |
| | 140 | | | | | | | | | |

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URS

Figure B-3

Pier Echo, Port of Long Beach
FOR: Kellogg Brown and Root

**Boring B-2**


| Elevation (ft) | Depth (ft) | Samples: Type | Samples: Number | Samples: Blows per 6 inches | Graphic Log | USCS | MATERIAL DESCRIPTION | Moisture Content (%) | Dry Density (pcf) | OTHER TESTS and REMARKS |
|---|---|---|---|---|---|---|---|---|---|---|
| | 140 | | 25 | 40 50/4" | | | Grades gray, fine to medium | 22 | | |
| -120 | | | | | | | | | | |
| | 145 | | | | | | Grades with some gravel | | | Rig chatter from 146 to 150 feet |
| | 150 | | 26 | 33 55/6" | | | | 16 | 113 | |
| -130 | | | | | | | | | | |
| | 155 | | | | | SM | Light gray, silty fine to coarse SAND with gravel, wet (very dense) | | | |
| | 160 | | 27 | 50/5" | | | Grades with 1.5" diameter gravel (granitic clasts) | 10 | | SA(14) |
| -140 | | | | | | | Boring completed to 161 feet below the ground surface. Groundwater encountered at 19.5 feet below the ground surface. Boring backfilled with sand-cement grout mixed with drill mud, and patched with concrete to match the existing surface. | | | |
| | 165 | | | | | | | | | |
| | 170 | | | | | | | | | |
| -150 | | | | | | | | | | |
| | 175 | | | | | | | | | |
| | 180 | | | | | | | | | |
| -160 | | | | | | | | | | |
| | 185 | | | | | | | | | |
| | 190 | | | | | | | | | |

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URS

Figure B-3

| | | | |
|---|---|---|---|
| Date(s) Drilled | 6/25/2003 | Logged By | T.O'Brien |
| Drilling Method | Mud-Rotary | Drill Bit Size/Type | 4-3/4 inch diameter/Tricone |
| Drill Rig Type | Mayhew 1000 | Hammer Data | 140 lb/30"drop (SPT); 400 lb/18" drop (Type U) |
| Sampling Method(s) | Dames & Moore Type-U, SPT, Shelby Tube | | |
| Approximate Groundwater Depth and Date Measured | 20.5 feet on 6/25/03 | | |
| Comments | None | | |

# Boring B-3

## Sheet 1 of 3

| | |
|---|---|
| Job Number | 33756065 |
| Total Depth Drilled (ft) | 101.5 |
| Approximate Ground Surface Elevation(ft) | 22 MSL |

| Elevation (ft) | Depth (ft) | Samples: Type | Samples: Number | Samples: Blows per 6 inches | USCS | MATERIAL DESCRIPTION | Moisture Content (%) | Dry Density (pcf) | OTHER TESTS and REMARKS |
|---|---|---|---|---|---|---|---|---|---|
| | 0 | | | | | 8-inch thick Asphalt Concrete pavement underlain by 10 inches of aggregate base | | | |
| 20 | | | | | CL | ARTIFICIAL FILL: Olive-gray silty CLAY, moist, with fine sand (soft) | | | |
| | 5 | Type U | 1 | 2 3 3 | ML | Olive-gray clayey SILT, moist, with some sand (medium stiff) | 37 | | CORR |
| | | | | | SM | Olive-gray silty fine SAND, very moist (loose) | | | |
| | 10 | SPT | 2 | 3 5 7 | | | 14 | 92 | CORR |
| 10 | | | | | ML | Olive-gray clayey SILT, wet, with fine sand (very soft) | | | |
| | 15 | Type U | 3 | push | | | 35 | | -200(68) CON CORR |
| | | | | | CL | Dark olive gray silty CLAY, wet, with fine sand (very soft) | | | |
| | | | | | SM | Gray silty fine to medium SAND, wet, with abundant shell fragments ▽ (dense) | | | |
| | 20 | SPT | 4 | 15 23 28 | | | 23 | 100 | |
| 0 | | | | | | | | | |
| | 25 | Type U | 5 | 10 12 13 | | Grades (medium dense) | 30 | | -200(16) |
| | 30 | SPT | 6 | 4 5 6 | | Grades (loose) | 34 | 86 | |
| -10 | | | | | | | | | |
| | 35 | Type U | 7 | 4 5 6 | | Grades (medium dense) | 35 | | |
| | 40 | | | | | | | | |

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## LOG OF BORING

**Proposed LNG Import Terminal**
**Pier Echo, Port of Long Beach**
**FOR: Kellogg Brown and Root**

URS

Figure B-4

| Elevation (ft) | Depth (ft) | SAMPLES Type | SAMPLES Number | SAMPLES Blows per 6 Inches | Graphic Log | USCS | MATERIAL DESCRIPTION | Moisture Content (%) | Dry Density (pcf) | OTHER TESTS and REMARKS |
|---|---|---|---|---|---|---|---|---|---|---|
| | 40 | | 8 | 6<br>10<br>10 | | | Gray silty fine to medium SAND, wet, with abundant shell fragments (medium dense) | 29 | 94 | |
| -20 | | | | | | | | | | |
| | 45 | | 9 | 5<br>6<br>7 | | | | 36 | | -200(26) |
| | 50 | | 10 | 2<br>2<br>3 | | | Grades (very loose) | 34 | 89 | |
| -30 | | | | | | | | | | |
| | | | | | | CL | **ESTUARINE DEPOSITS:**<br>Dark gray, silty CLAY, wet, with trace black shell fragments (very soft) | | | |
| | 55 | | 11 | 1<br>1<br>1 | | | | 49 | | -200(99)<br>LL=46, PI=18 |
| | | | 12 | | | | | | | |
| | 60 | | 13 | 7<br>3<br>6 | | | Grades dark gray to black (soft) | 41 | 80 | PP=1.5 |
| -40 | | | | | | | | | | |
| | | | | | | SC | Dark gray clayey fine SAND, wet, with some fine gravel, (medium dense) | | | Rig chatter from 62.5 to 63 feet |
| | 65 | | 14 | 7<br>12<br>14 | | | | 28 | | -200(40) |
| | | | | | | | Grades with abundant shell fragments | | | |
| | | | | | | ML | Dark gray clayey SILT, wet (medium stiff) | | | |
| | 70 | | 15 | 3<br>5<br>8 | | | | 33 | 91 | CON<br>LL=35, PI=10<br>PP=2.75 |
| -50 | | | 16 | | | | Grades with silt and trace fine sand | | | |
| | | | | | | CL | Dark gray silty CLAY, wet (very stiff) | | | |
| | 75 | | 17 | 6<br>8<br>9 | | | | 28 | | LL=30, PI=8 |
| | | | | | | SM | **MARINE SANDS:**<br>Gray silty fine SAND, wet (medium dense) | | | |
| | 80 | | 18 | 7<br>12<br>16 | | | | 30 | 94 | |
| -60 | | | | | | | | | | |
| | 85 | | 19 | 16<br>22<br>26 | | | Grades micaceous, with a 2-inch long root (dense) | 26 | | |
| | 90 | | | | | | | | | |

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| Elevation (ft) | Depth (ft) | Samples: Type | Samples: Number | Samples: Blows per 6 Inches | Graphic Log | USCS | MATERIAL DESCRIPTION | Moisture Content (%) | Dry Density (pcf) | OTHER TESTS and REMARKS |
|---|---|---|---|---|---|---|---|---|---|---|
| | 90 | | 20 | 14 28 35 | | | Grades dark gray | 27 | 98 | |
| -70 | | | | | | | | | | |
| | 95 | | 21 | 25 39 45 | | SM | **GASPUR AQUIFER:** Dark gray silty fine SAND, wet, micaceous (very dense) | 21 | | -200(14) |
| | 100 | | 22 | 25 35 50/5" | | | | 22 | 107 | DSCD |
| -80 | | | | | | | Boring completed to 101.6 feet below the ground surface. Groundwater encountered at 20.5 feet below the ground surface. Boring backfilled with sand-cement grout mixed with drill mud, and patched with concrete to match the existing surface. | | | |
| | 105 | | | | | | | | | |
| | 110 | | | | | | | | | |
| -90 | | | | | | | | | | |
| | 115 | | | | | | | | | |
| | 120 | | | | | | | | | |
| -100 | | | | | | | | | | |
| | 125 | | | | | | | | | |
| | 130 | | | | | | | | | |
| -110 | | | | | | | | | | |
| | 135 | | | | | | | | | |
| | 140 | | | | | | | | | |

Report: DMG4; Project File: C:\VESNA\PROJECTS\PIERT-1\PIER-T.GPJ; Data Template: DMLA.GDT Printed: 9/15/03

| | | | |
|---|---|---|---|
| Date(s) Drilled | 8/26/2003 | Logged By | T.O'Brien |
| Drilling Method | Mud-Rotary | Drill Bit Size/Type | 4-3/4 inch diameter/Tricone |
| Drill Rig Type | Mayhew 1000 | Hammer Data | 140 lb/30"drop (SPT); 400 lb/18" drop (Type U) |
| Sampling Method(s) | Dames & Moore Type-U, SPT, Shelby Tube | | |
| Approximate Groundwater Depth and Date Measured | 20.4 feet on 8/26/03 | | |
| Comments | None | | |

# Boring B-4

## Sheet 1 of 3

| | |
|---|---|
| Job Number | 33756066 |
| Total Depth Drilled (ft) | 101.0 |
| Approximate Ground Surface Elevation(ft) | 22 MSL |

| Elevation (ft) | Depth (ft) | Samples: Number | Blows per 6 inches | USCS | MATERIAL DESCRIPTION | Moisture Content (%) | Dry Density (pcf) | OTHER TESTS and REMARKS |
|---|---|---|---|---|---|---|---|---|
| | 0 | | | ML | 2.5-inch thick Asphalt Concrete pavement underlain by 4 inches of aggregate base | | | |
| 20 | | | | | ARTIFICIAL FILL: Light olive-brown sandy SILT, moist (loose) | | | |
| | 5 | 1 | 2 3 4 | | | 23 | 85 | CORR |
| | 10 | 2 | 2 2 3 | | Grades olive-brown | 31 | | CORR |
| 10 | | | | | | | | |
| | 15 | 3 | Push | | Grades dark gray to gray, wet, with more silt (very loose) | 36 | 86 | -200(85) CORR |
| | | | | SM | Gray, silty fine SAND, wet (medium dense) | | | |
| | 20 | 4 | 3 7 18 | | Grades wet | 27 | | |
| 0 | | | | | | | | |
| | 25 | 5 | 8 12 12 | | Grades with abundant shell fragments | 24 | 102 | DSCD |
| | 30 | 6 | 3 5 6 | | Grades with fewer shell fragments | 31 | | -200(18) |
| -10 | | | | | | | | |
| | 35 | 7 | 6 7 9 | | | 27 | 93 | |
| | 40 | | | | | | | |

Report: DMG4; Project File: C:\VESNA\PROJECTS\PIER T-1\PIER-T.GPJ; Data Template=DMLA.GDT Printed: 9/15/03

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# LOG OF BORING

**Proposed LNG Import Terminal**
**Pier Echo, Port of Long Beach**
**FOR: Kellogg Brown and Root**

URS

Figure B-5

| Elevation (ft) | Depth (ft) | Samples: Number | Samples: Blows per 6 inches | USCS | MATERIAL DESCRIPTION | Moisture Content (%) | Dry Density (pcf) | OTHER TESTS and REMARKS |
|---|---|---|---|---|---|---|---|---|
| | 40 | 8 | 7 12 15 | | Gray, silty fine to coarse SAND, wet (medium dense) | 28 | | |
| -20 | | | | | | | | |
| | 45 | 9 | 4 5 9 | | Grades (loose to medium dense) | 30 | 94 | |
| | 50 | 10 | 17 33 35 | | Grades with some clay and trace gravel (dense) | 29 | | SA(41) |
| | | | | GP | Reddish-brown fine to coarse GRAVEL, wet (very dense), with fine to coarse sand and volcanic gravel sized clasts >1.5" in diameter | | | |
| -30 | | | | CL | **ESTUARINE DEPOSITS:** Dark gray silty CLAY, wet, with trace rootlets and small intact shells (hard) | | | |
| | 55 | 11 | 6 19 23 | | | 26 | 93 | PP=2.5 |
| | | | | SM | Gray silty fine to medium SAND, wet (medium dense) | | | |
| | 60 | 12 | 8 17 19 | | Grades (dense) | 26 | | |
| -40 | | | | CL | Dark gray silty CLAY, wet, with fine sand and some shell fragments (very stiff) | | | |
| | 65 | 13 | 12 14 18 | | | 27 | 97 | -200(59) |
| | 70 | 14 | 5 10 14 | | Grades with trace sand | 36 | | -200(93) |
| -50 | | | | SM | **MARINE SANDS:** Dark gray silty fine SAND, wet (medium dense) | | | |
| | 75 | 15 | 6 12 18 | | | 25 | 104 | |
| | 80 | 16 | 16 34 25 | | Grades with 3 to 4-inch thick silty clay seams (very dense) | 29 | | -200(33) |
| -60 | | | | | | | | |
| | 85 | 17 | 22 38 45 | | Grades gray | 25 | 100 | |
| | 90 | | | | | | | |

Report: DMG4; Project File: C:\WESNA\PROJECTS\PIER T-1\PIER-T.GPJ; Data Template:DMLA.GDT Printed: 9/15/03

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| Elevation (ft) | Depth (ft) | SAMPLES Type | SAMPLES Number | SAMPLES Blows per 6 inches | Graphic Log | USCS | MATERIAL DESCRIPTION | Moisture Content (%) | Dry Density (pcf) | OTHER TESTS and REMARKS |
|---|---|---|---|---|---|---|---|---|---|---|
| | 90 | | 18 | 22 41 50/5" | | SM | GASPUR AQUIFIER: Light gray silty fine sand, wet (very dense) | 20 | | |
| -70 | | | | | | | | | | |
| | 95 | | 19 | 16 25 28 | | | Grades (dense) | 23 | 103 | DSCD |
| | | | | | | | Grades (very dense) | | | |
| | 100 | | 20 | 49 50/5" | | | | 22 | | SA(14) |
| -80 | | | | | | | Boring completed to 101. feet below the ground surface. Groundwater encountered at 20.4 feet below the ground surface. Boring backfilled with sand-cement grout mixed with drill mud, and patched with concrete to match the existing surface. | | | |
| | 105 | | | | | | | | | |
| | 110 | | | | | | | | | |
| -90 | | | | | | | | | | |
| | 115 | | | | | | | | | |
| | 120 | | | | | | | | | |
| -100 | | | | | | | | | | |
| | 125 | | | | | | | | | |
| | 130 | | | | | | | | | |
| -110 | | | | | | | | | | |
| | 135 | | | | | | | | | |
| | 140 | | | | | | | | | |

Report: DMG4; Project File: C:\VESNA\PROJECTS\PIER T-1\PIER-T.GPJ; Data Template: DMLA.GDT Printed: 9/15/03

URS

| | | | |
|---|---|---|---|
| Date(s) Drilled | 6/20/2003 | Logged By | T.O'Brian |
| Drilling Method | Mud-Rotary | Drill Bit Size/Type | 4-3/4 inch diameter/Tricone |
| Drill Rig Type | Mayhew 1000 | Hammer Data | 140 lb/30"drop (SPT); 400 lb/18" drop (Type U) |
| Sampling Method(s) | Dames & Moore Type-U, SPT, Shelby Tube | | |
| Approximate Groundwater Depth and Date Measured | 20.8 feet on 6/20/03 | | |
| Comments | None | | |

# Boring B-5

## Sheet 1 of 3

| | |
|---|---|
| Job Number | 33756056 |
| Total Depth Drilled (ft) | 101.5 |
| Approximate Ground Surface Elevation(ft) | 22 MSL |

| Elevation (ft) | Depth (ft) | SAMPLES Type | SAMPLES Number | SAMPLES Blows per 6 inches | Graphic Log | USCS | MATERIAL DESCRIPTION | Moisture Content (%) | Dry Density (pcf) | OTHER TESTS and REMARKS |
|---|---|---|---|---|---|---|---|---|---|---|
| | 0 | | | | | | 3-inch thick Asphalt Concrete pavement underlain by 12 inches of aggregate base | | | |
| 20 | | | | | | SM | ARTIFICIAL FILL: Olive-brown silty fine SAND, moist (medium dense) | | | |
| | | | | | | CL | Brown silty CLAY, moist, with some fine sand (stiff) | | | |
| | 5 | | 1 | 9 14 14 | | SM | Olive-gray silty fine SAND, moist (medium dense) | 19 | | CORR |
| 10 | 10 | | 2 | 9 10 12 | | | Grades with trace shell fragments | 13 | 99 | CORR |
| | 15 | | 3 | 7 10 10 | | | Grades light olive-gray | 18 | | CORR |
| 0 | 20 | | 4 | 7 12 | | | ∇ Grades gray, wet, with 2 to 3-inch thick seam of shell fragments | 27 | 99 | DSCD |
| | | | | | | CL | Dark gray silty CLAY, wet (stiff) | | | |
| | 25 | | 5A | | | | | | | -200(12) |
| | | | 5 | 6 10 14 | | SP-SM | Dark gray fine SAND with silt, wet, with trace shell fragments (medium dense) | 27 | | |
| -10 | 30 | | 6 | 6 6 8 | | | Grades with more shell fragments (loose to medium dense) | 22 | 100 | |
| | 35 | | 7 | 4 5 6 | | | Grades (medium dense) | 31 | | |
| | 40 | | | | | | | | | |

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## LOG OF BORING

Proposed LNG Import Terminal
Pier Echo, Port of Long Beach
FOR: Kellogg Brown and Root

URS

Figure B-6

Pier Echo, Port of Long Beach

FOR: Kellogg Brown and Root

**Boring B-5**



| Elevation (ft) | Depth (ft) | Samples: Number | Samples: Blows per 6 inches | USCS | MATERIAL DESCRIPTION | Moisture Content (%) | Dry Density (pcf) | OTHER TESTS and REMARKS |
|---|---|---|---|---|---|---|---|---|
| | 40 | 8 | 5 7 9 | | Gray silty fine SAND, wet (medium dense) | 26 | 127 | |
| -20 | | | | | | | | |
| | | | | | Grades gray fine to medium | | | |
| | 45 | 9 | 4 6 7 | | | 37 | | -200(17) |
| | 50 | 10 | 7 9 12 | | | 29 | 93 | |
| -30 | | | | | | | | |
| | | | | CL | **ESTUARINE DEPOSITS:** Dark gray silty CLAY, wet (soft) | | | |
| | 55 | 11 | | | | | | |
| | 60 | 12 | 2 3 3 | | Grades with trace shell fragments | | | UU |
| -40 | | | | | | | | |
| | | | | ML | Gray fine to medium sandy SILT, wet (dense) | | | |
| | 65 | 13 | 9 17 21 | | | 30 | | |
| | 70 | 14 | 7 9 12 | | Grades fine with more silt (medium dense) | 30 | 95 | -200(74) |
| -50 | | | | | | | | |
| | 75 | 15 | 15 23 24 | | Grades with less silt and trace shell fragments (dense) | 25 | | |
| | 80 | 16 | 11 15 23 | | | 28 | 96 | |
| -60 | | | | | | | | |
| | | | | SM | **MARINE SANDS:** Dark gray silty fine to medium SAND, wet (very dense) | | | |
| | 85 | 17 | 16 25 28 | | | 26 | | -200(21) |
| | 90 | | | | | | | |

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Figure B-6

Pier Echo, Port of Long Beach
FOR: Kellogg Brown and Root

**Boring B-5**
**Sheet 3 of 3**

| Elevation (ft) | Depth (ft) | Samples: Type | Samples: Number | Samples: Blows per 6 inches | Graphic Log | USCS | MATERIAL DESCRIPTION | Moisture Content (%) | Dry Density (pcf) | OTHER TESTS and REMARKS |
|---|---|---|---|---|---|---|---|---|---|---|
| | 90 | | 18 | 19 30 35 | | | Grades (dense) | 24 | 105 | DSCD |
| -70 | | | | | | | | | | |
| | | | | | | CL | Dark gray silty CLAY, wet, with fine to coarse sand, (very stiff) | | | |
| | 95 | | 19 | 5 7 12 | | | | 28 | | -200(62) LL=41, PI=19 |
| | | | | | | SP | GASPUR AQUIFER: Light gray medium to coarse SAND, wet (very dense) | | | |
| | 100 | | 20 | 23 40 50/5" | | | | 22 | 103 | |
| -80 | | | | | | | Boring completed to 101.5 feet below the ground surface. Groundwater encountered at 20.8 feet below the ground surface. Boring backfilled with sand-cement grout mixed with drill mud, and patched with concrete to match the existing surface. | | | |
| | 105 | | | | | | | | | |
| | 110 | | | | | | | | | |
| -90 | | | | | | | | | | |
| | 115 | | | | | | | | | |
| | 120 | | | | | | | | | |
| -100 | | | | | | | | | | |
| | 125 | | | | | | | | | |
| | 130 | | | | | | | | | |
| -110 | | | | | | | | | | |
| | 135 | | | | | | | | | |
| | 140 | | | | | | | | | |

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URS

Figure B-6

# Boring B-6

Sheet 1 of 1

| | | | |
|---|---|---|---|
| Date(s) Drilled | 6/27/2003 | Logged By | T.O'Brian |
| Drilling Method | Mud-Rotary | Drill Bit Size/Type | 4-3/4 inch diameter/Tricone |
| Drill Rig Type | Mayhew 1000 | Hammer Data | 140 lb/30"drop (SPT); 400 lb/18" drop (Type U) |
| Sampling Method(s) | Dames & Moore Type-U, SPT, Shelby Tube | Job Number | 33756065 |
| Approximate Groundwater Depth and Date Measured | No groundwater encountered | Total Depth Drilled (ft) | 16.5 |
| Comments | Boring terminated at 16.5 feet due to drilling refusal | Approximate Ground Surface Elevation(ft) | 21 MSL |

| Elevation (ft) | Depth (ft) | SAMPLES Type | SAMPLES Number | SAMPLES Blows per 6 Inches | Graphic Log | USCS | MATERIAL DESCRIPTION | Moisture Content (%) | Dry Density (pcf) | OTHER TESTS and REMARKS |
|---|---|---|---|---|---|---|---|---|---|---|
| 20 | 0 | | | | | | 3-inch thick Asphalt Concrete pavement underlain by 12 inches of aggregate base | | | |
| | | | | | | SM | ARTIFICIAL FILL: Olive-brown silty fine SAND, moist (loose to medium dense) | | | |
| | 5 | | 1 | 3 5 5 | | | | | | |
| 10 | 10 | | 2 | 6 14 15 | | | Grades with abundant shell fragments (medium dense) | | | |
| | | | | | | GC | Reddish-brown clayey sandy fine to coarse GRAVEL, moist, with volcanic clasts>1"diameter (medium dense) | | | |
| | 15 | | 3 | 7 7 11 | | | Grades with cobbles and boulders | | | Lost mud circulation at 16.5 feet |
| | | | | | | | Boring completed to 16.5 feet below the ground surface. Groundwater not encountered. Boring backfilled with sand-cement grout mixed with drill mud, and patched with concrete to match the existing surface. | | | |
| 0 | 20 | | | | | | | | | |
| | 25 | | | | | | | | | |
| -10 | 30 | | | | | | | | | |
| | 35 | | | | | | | | | |
| | 40 | | | | | | | | | |

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## LOG OF BORING

**Proposed LNG Import Terminal**
**Pier Echo, Port of Long Beach**
**FOR: Kellogg Brown and Root**

URS

Figure B-7

| | | | | | |
|---|---|---|---|---|---|
| Date(s) Drilled | 6/26/2003 | Logged By | T.O'Brien | **Boring B-7** Sheet 1 of 1 | |
| Drilling Method | Mud-Rotary | Drill Bit Size/Type | 4-3/4 inch diameter/Tricone | | |
| Drill Rig Type | Mayhew 1000 | Hammer Data | 140 lb/30" drop (SPT);480 lb/18" drop (Type U) | | |
| Sampling Method(s) | Dames & Moore Type-U, SPT, Shelby Tube | | | Job Number | 33756065 |
| Approximate Groundwater Depth and Date Measured | 20 feet on 6/26/03 | | | Total Depth Drilled (ft) | 28.0 |
| Comments | Boring terminated at 28 feet due to drilling refusal | | | Approximate Ground Surface Elevation(ft) | 21 MSL |

| Elevation (ft) | Depth (ft) | Samples: Type | Samples: Number | Samples: Blows per 6 inches | Graphic Log | USCS | MATERIAL DESCRIPTION | Moisture Content (%) | Dry Density (pcf) | OTHER TESTS and REMARKS |
|---|---|---|---|---|---|---|---|---|---|---|
| 20 | 0 | | | | | SM | 3-inch thick Asphalt Concrete pavement underlain by 12 inches of aggregate base<br>ARTIFICIAL FILL:<br>Olive-brown silty fine SAND, moist (loose) | | | |
| | 5 | | 1 | 2 3 4 | | | | | | |
| 10 | 10 | | 2 | 9 11 12 | | | Grades light olive-gray with shell fragments (medium dense) | | | |
| | 15 | | 3 | 7 9 9 | | | | | | |
| 0 | 20 | | 4 | 5 6 8 | | | Grades gray, wet | | | |
| | | | | | | GP | Olive-gray fine to coarse sandy fine to coarse GRAVEL, wet, with volcanic clasts >1" diameter (medium dense) | | | |
| | 25 | | 5 | 6 12 8 | | | Grades with cobbles and boulders | | | Lost mud circulation at 28 feet |
| -10 | 30 | | | | | | Boring completed to 28 feet below the ground surface.<br>Groundwater encountered at 20 feet below the ground surface.<br>Boring backfilled with sand-cement grout mixed with drill mud, and patched with concrete to match the existing surface. | | | |
| | 35 | | | | | | | | | |
| | 40 | | | | | | | | | |

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## LOG OF BORING

**Proposed LNG Import Terminal**
**Pier Echo, Port of Long Beach**
**FOR: Kellogg Brown and Root**

Report: DMG4; Project File: C:\VESNA\PROJECTS\PIERT-1\PIER-T.GPJ; Data Template:DMLA.GDT Printed: 9/15/03

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Figure B-8

| | | | |
|---|---|---|---|
| Date(s) Drilled | 6/25/2003 | Logged By | T.O'Brian |
| Drilling Method | Mud-Rotary | Drill Bit Size/Type | 4-3/4 inch diameter/Tricone |
| Drill Rig Type | Mayhew 1000 | Hammer Data | 140 lb/30"drop (SPT); 400 lb/18" drop (Type U) |
| Sampling Method(s) | Dames & Moore Type-U, SPT, Shelby Tube | | |
| Approximate Groundwater Depth and Date Measured | 22.4 feet on 6/25/03 | | |
| Comments | None | | |

# Boring B-8

Sheet 1 of 3

| | |
|---|---|
| Job Number | 33756065 |
| Total Depth Drilled (ft) | 101.2 |
| Approximate Ground Surface Elevation(ft) | 22 MSL |

| Elevation (ft) | Depth (ft) | Sample Type | Sample Number | Blows per 6 inches | USCS | MATERIAL DESCRIPTION | Moisture Content (%) | Dry Density (pcf) | OTHER TESTS and REMARKS |
|---|---|---|---|---|---|---|---|---|---|
| | 0 | | | | | 3-inch thick Asphalt Concrete pavement underlain by 12 inches of aggregate base | | | |
| 20 | | | | | SM | ARTIFICIAL FILL: Light olive-brown silty fine SAND, moist (loose) | | | |
| | 5 | | 1 | 4 4 5 | | | 9 | 89 | CORR |
| | 10 | | 2 | 2 3 4 | | Grades olive-brown | 22 | | CORR |
| 10 | | | | | | | | | |
| | 15 | | 3 | 1 1 1 | | Grades gray, very moist (very loose) | 31 | 89 | CORR |
| | | | | | ML | Dark gray clayey SILT, wet, with fine sand (very soft) | | | |
| | 20 | | 4 | Push | | | 36 | | LL=27, PI=3 |
| 0 | | | 5 | | | ▽ | | | |
| | | | | | SM/ML | Gray silty fine to medium SAND to fine to medium sandy SILT, wet (dense) | | | |
| | 25 | | 6 | 14 22 33 | | | 26 | 101 | DSCD |
| | 30 | | 7 | 1 1 1 | | Grades fine (very loose) | 42 | | -200(50) |
| -10 | | | | | | | | | |
| | 35 | | 8 | 2 2 2 | | | 28 | 97 | |
| | 40 | | | | | | | | |

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## LOG OF BORING

**Proposed LNG Import Terminal**
**Pier Echo, Port of Long Beach**
**FOR: Kellogg Brown and Root**

URS

Figure B-9

| Elevation (ft) | Depth (ft) | SAMPLES Type | Number | Blows per 6 inches | Graphic Log | USCS | MATERIAL DESCRIPTION | Moisture Content (%) | Dry Density (pcf) | OTHER TESTS and REMARKS |
|---|---|---|---|---|---|---|---|---|---|---|
| | 40 | | 9 | Push | | | | 32 | | |
| -20 | | | | | | | | | | |
| | | | | | | CH | **ESTUARINE DEPOSITS:** Dark gray CLAY, wet, with some silt and intact black shells (medium stiff) | | | |
| | 45 | | 10 | 3 4 4 | | | | 45 | 76 | -200(100) LL=59, PI=29 PP=1.25 CON |
| | 50 | | 11 | 8 12 12 | | SM | Gray silty fine to medium SAND, wet, with trace shell fragments (medium dense) | 30 | | |
| -30 | | | | | | | | | | |
| | 55 | | 12 | 8 5 5 | | | Grades with more silt and without shells (loose) | 32 | 88 | |
| | | | | | | CL | Gray silty CLAY, wet (very stiff) | | | |
| | 60 | | 13 | 2 2 12 | | | | 44 | | -200(97) |
| -40 | | | | | | | | | | |
| | | | | | | SM | Gray silty fine to medium SAND, wet, with trace shell fragments (medium dense) | | | |
| | 65 | | 14 | 10 11 14 | | | | 27 | 99 | DSCD |
| | | | | | | | Grades with abundant shell fragments | | | |
| | 70 | | 15 | 0 2 2 | | CL | Dark gray silty CLAY, wet, with 2 to 3-inch thick silty fine sand layers (soft) | 41 | | LL=38, PI=14 |
| -50 | | | | | | | | | | |
| | 75 | | 16 | 6 7 10 | | | Grades (stiff) | 30 | 96 | PP=3.25 |
| | 80 | | 17 | 4 6 14 | | | Grades with 4 to 6-inch thick silty fine sand layer (very stiff) | 33 | | |
| -60 | | | | | | | | | | |
| | 85 | | 18 | 11 12 12 | | | | 32 | 92 | -200(83) PP=1.75 |
| | | | | | | SP-SM | **MARINE SANDS:** Light gray to black fine to medium SAND with silt, wet (very dense) | | | |
| | 90 | | | | | | | | | |

Report: DMG4; Project File: C:\VESNA\PROJECTS\PIER-1\PIER-T.GPJ; Data Template:DMLA.GDT Printed: 9/18/03

URS

| Elevation (ft) | Depth (ft) | SAMPLES Type | Number | Blows per 6 inches | Graphic Log | USCS | MATERIAL DESCRIPTION | Moisture Content (%) | Dry Density (pcf) | OTHER TESTS and REMARKS |
|---|---|---|---|---|---|---|---|---|---|---|
| | 90 | | 19 | 18 36 50/3" | | | | 20 | | |
| -70 | | | | | | | | | | |
| | 95 | | 20 | 28 37 50/5" | | | | 20 | 108 | DSCD |
| | | | | | | SM | **GASPUR AQUIFER:** Light gray to black silty fine SAND, wet (very dense) | | | |
| | 100 | | 21 | 30 42 50/5" | | | | 23 | | SA(17) |
| -80 | | | | | | | Boring completed to 101.1 feet below the ground surface. Groundwater encountered at 22.4 feet below the ground surface. Boring backfilled with sand-cement grout mixed with drill mud, and patched with concrete to match the existing surface. | | | |
| | 105 | | | | | | | | | |
| | 110 | | | | | | | | | |
| -90 | | | | | | | | | | |
| | 115 | | | | | | | | | |
| | 120 | | | | | | | | | |
| -100 | | | | | | | | | | |
| | 125 | | | | | | | | | |
| | 130 | | | | | | | | | |
| -110 | | | | | | | | | | |
| | 135 | | | | | | | | | |
| | 140 | | | | | | | | | |

Report: DMG4; Project File: C:\WESNA\PROJECTS\PIERT-1\PIER-T.GPJ; Data Template: DMLA.GDT Printed: 9/15/03

URS

| | | | |
|---|---|---|---|
| Date(s) Drilled | 6/27/2003 | Logged By | T.O'Brian |
| Drilling Method | Mud-Rotary | Drill Bit Size/Type | 4-3/4 inch diameter/Tricone |
| Drill Rig Type | Mayhew 1000 | Hammer Data | 140 lb/30"drop (SPT); 400 lb/18" drop (Type U) |
| Sampling Method(s) | Dames & Moore Type-U, SPT, Shelby Tube | | |
| Approximate Groundwater Depth and Date Measured | 18.5 feet on 6/27/03 | | |
| Comments | None | | |

# Boring B-9

Sheet 1 of 4

| | |
|---|---|
| Job Number | 33756066 |
| Total Depth Drilled (ft) | 156.0 |
| Approximate Ground Surface Elevation(ft) | 21 MSL |

| Elevation (ft) | Depth (ft) | SAMPLES Type | Number | Blows per 6 inches | Graphic Log | USCS | MATERIAL DESCRIPTION | Moisture Content (%) | Dry Density (pcf) | OTHER TESTS and REMARKS |
|---|---|---|---|---|---|---|---|---|---|---|
| 20 | 0 | | | | | SM | 3-inch thick Asphalt Concrete pavement underlain by 11 inches of aggregate base<br>ARTIFICIAL FILL:<br>Olive-gray silty fine SAND, moist, with abundant shell fragments (loose to medium dense) | | | |
| | 5 | | 1 | 4<br>5<br>5 | | | Grades without shell fragments | 25 | | |
| 10 | 10 | | 2 | 8<br>10<br>11 | | | Grades with trace shell fragments (medium dense) | 11 | 93 | |
| | | | | | | | Grades with abundant shell fragments | | | |
| | 15 | | 3 | 7<br>10<br>12 | | | Grades gray, very moist | 28 | | |
| 0 | 20 | | 4 | 5<br>8<br>10 | | | Grades dark gray, wet | 31 | 93 | |
| | 25 | | 5 | 5<br>6<br>7 | | | | 32 | | |
| | | | | | | GP | Reddish-brown sandy fine to coarse GRAVEL, wet, with volcanic clasts and cobbles | | | |
| -10 | 30 | | | | | | | | | |
| | 35 | | | | | | | | | |
| | | | | 3<br>4 | | MH | Dark brown elastic SILT, wet (medium stiff) | | | |
| | 40 | | | | | | | | | |

Report: DMG4; Project File: C:\VESNA\PROJECTS\PIERT-1\PIER-T.GPJ; Data Template: DMLA.GDT Printed: 9/15/03

This log is part of the report prepared by URS for this project and should be read together with the report. This summary applies only at the location of the exploration and at the time of drilling or excavation. Subsurface conditions may differ at other locations and may change at this location with time. Data presented are a simplification of actual conditions encountered.

## LOG OF BORING

Proposed LNG Import Terminal
Pier Echo, Port of Long Beach
FOR: Kellogg Brown and Root

URS

Figure B-10

Pier Echo, Port of Long Beach
FOR: Kellogg Brown and Root

**Boring B-9**


| Elevation (ft) | Depth (ft) | Samples: Type | Samples: Number | Samples: Blows per 6 Inches | USCS | MATERIAL DESCRIPTION | Moisture Content (%) | Dry Density (pcf) | OTHER TESTS and REMARKS |
|---|---|---|---|---|---|---|---|---|---|
| -20 | 40 | | 6 | 5 5 7 15 | | Grades with some clay, (very stiff) | 51 | 69 | |
| | 45 | | 7 | 5 6 8 | | Grades with slight organic odor (stiff) | 70 | | PID Reading = 0 ppm<br>-200(96)<br>LL=90, PI=30 |
| -30 | 50 | | 8 | 6 11 14 | | Grades dark gray to black (very stiff) | 46 | 93 | CON |
| | 55 | | | 12 12 14 | | | | | |
| | | | 9 | 6 5 8 | CL | **ESTUARINE DEPOSITS:**<br>Gray silty CLAY, wet, with trace fine sand (stiff) | | | |
| -40 | 60 | | 10 | 5 9 19 | | | 54 | 76 | |
| | | | | | SM | Gray silty fine SAND, wet (medium dense)<br>Grades with abundant shell fragments | | | |
| | 65 | | 11 | 1 4 3 | | Grades with 3 to 4-inch thick silty clay layer (loose) | 28 | | -200(36) |
| | | | | | ML | Light gray clayey SILT, wet (stiff) | | | |
| -50 | 70 | | 12 | 4 5 9 | | | 36 | 87 | LL=44, PI=14<br>PP=3<br>CON |
| | 75 | | 13 | 7 12 23 | SM | **MARINE SANDS:**<br>Gray silty fine SAND, wet (dense) | 37 | | -200(96)<br>-200(30) |
| -60 | 80 | | 14 | 15 19 28 | | | 28 | 96 | |
| | | | | | SP-SM | **GASPUR AQUIFIER:**<br>Light gray fine SAND with silt, wet (very dense) | | | |
| | 85 | | 15 | 32 55/6" | | | 24 | | SA(10) |
| | 90 | | | | | | | | |

Report: DMG4; Project File: C:\VESNA\PROJECTS\PIER1-1\PIER-T.GPJ; Data Template:DMLA.GDT Printed: 9/15/03

URS

Figure B-10

| Elevation (ft) | Depth (ft) | SAMPLES Type | Number | Blows per 6 inches | Graphic Log | USCS | MATERIAL DESCRIPTION | Moisture Content (%) | Dry Density (pcf) | OTHER TESTS and REMARKS |
|---|---|---|---|---|---|---|---|---|---|---|
| -70 | 90 | | 16 | 17 28 31 | | | | 22 | 107 | DSCD |
| | 95 | | 17 | 29 36 41 | | | | 23 | | |
| -80 | 100 | | 18 | 14 15 17 | | | | 12 | 121 | |
| | | | | | | | No sampling until 145 feet | | | |
| | 105 | | | | | | | | | |
| -90 | 110 | | | | | | | | | |
| | 115 | | | | | | | | | |
| -100 | 120 | | | | | | | | | |
| | 125 | | | | | | | | | |
| -110 | 130 | | | | | | | | | |
| | 135 | | | | | | | | | |
| | 140 | | | | | | | | | |

Report: DMG4; Project File: C:\VESNA\PROJECTS\PIER T-1\PIER-T.GPJ; Data Template: DMLA.GDT Printed: 9/15/03

URS

Figure B-10

Pier Echo, Port of Long Beach
FOR: Kellogg Brown and Root

**Boring B-9**


| Elevation (ft) | Depth (ft) | SAMPLES Type | Number | Blows per 6 Inches | Graphic Log | USCS | MATERIAL DESCRIPTION | Moisture Content (%) | Dry Density (pcf) | OTHER TESTS and REMARKS |
|---|---|---|---|---|---|---|---|---|---|---|
| -120 | 140 | | | | | | | | | |
| | 145 | ■ | 19 | 30 50/5" | | SP-SM | Light gray medium to coarse SAND with silt, wet, with trace fine gravel (very dense) | | | |
| | | ■ | 20 | 20 55/6" | | | | | | |
| -130 | 150 | ■ | 21 | 27 30 36 | | | Grades fine to coarse | | | CON |
| | | ■ | 22 | 9 12 40 | | MH | Dark brown elastic SILT, wet, with some clay and abundant organics (very stiff) Grades light gray without organics | 34 | 97 | LL=65, PI=31 -200(96) PP > 4.5 |
| | 155 | ■ | 23 | 29 50/5" | | SP | Gray fine to medium SAND with silt, wet (very dense) | 21 | 107 | -200(5) |

Boring completed to 156 feet below the ground surface.
Groundwater encountered at 15 feet below the ground surface.
Boring backfilled with sand-cement grout mixed with drill mud, and patched with concrete to match the existing surface.

| Elevation (ft) | Depth (ft) |
|---|---|
| -140 | 160 |
| | 165 |
| -150 | 170 |
| | 175 |
| -160 | 180 |
| | 185 |
| | 190 |



URS

Figure B-10

# SOIL CLASSIFICATION CHART

| MAJOR DIVISIONS | | | SYMBOLS | TYPICAL DESCRIPTIONS |
|---|---|---|---|---|
| *COARSE GRAINED SOILS* MORE THAN 50% OF MATERIAL IS LARGER THAN NO. 200 SIEVE SIZE | *GRAVEL AND GRAVELLY SOILS* MORE THAN 50% OF COARSE FRACTION RETAINED ON NO. 4 SIEVE | *CLEAN GRAVELS* (LITTLE OR NO FINES) | GW | WELL-GRADED GRAVELS, GRAVEL - SAND MIXTURES, LITTLE OR NO FINES |
| | | | GP | POORLY GRADED GRAVELS, GRAVEL - SAND MIXTURES, LITTLE OR NO FINES |
| | | *GRAVELS WITH FINES* (APPRECIABLE AMOUNT OF FINES) | GM | SILTY GRAVELS, GRAVEL - SAND - SILT MIXTURES |
| | | | GC | CLAYEY GRAVELS, GRAVEL - SAND - CLAY MIXTURES |
| | *SAND AND SANDY SOILS* MORE THAN 50% OF COARSE FRACTION PASSING NO. 4 SIEVE | *CLEAN SANDS* (LITTLE OR NO FINES) | SW | WELL-GRADED SANDS, GRAVELLY SANDS, LITTLE OR NO FINES |
| | | | SP | POORLY GRADED SANDS, GRAVELLY SANDS, LITTLE OR NO FINES |
| | | *SANDS WITH FINES* (APPRECIABLE AMOUNT OF FINES) | SM | SILTY SANDS, SAND - SILT MIXTURES |
| | | | SC | CLAYEY SANDS, SAND - CLAY MIXTURES |
| *FINE GRAINED SOILS* MORE THAN 50% OF MATERIAL IS SMALLER THAN NO. 200 SIEVE SIZE | *SILTS AND CLAYS* | LIQUID LIMIT LESS THAN 50 | ML | INORGANIC SILTS AND VERY FINE SANDS, ROCK FLOUR, SILTY 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 AND ORGANIC SILTY CLAYS OF LOW PLASTICITY |
| | *SILTS AND CLAYS* | LIQUID LIMIT GREATER THAN 50 | MH | INORGANIC SILTS, MICACEOUS OR DIATOMACEOUS FINE SANDY OR SILTY SOILS, ELASTIC SILTS |
| | | | CH | INORGANIC CLAYS OF HIGH PLASTICITY |
| | | | OH | ORGANIC CLAYS OF MEDIUM TO HIGH PLASTICITY, ORGANIC SILTS |
| *HIGHLY ORGANIC SOILS* | | | PT | PEAT, HUMUS, SWAMP SOILS WITH HIGH ORGANIC CONTENTS |

NOTE: Dual symbols are used to indicate gravels or sand with 5-12% fines and soils with fines classifying as CL-ML. Symbols separated by a slash indicate borderline soil classifications.

**Other Material Symbols**

Pavement Section

**Sampler and Symbol Descriptions**

- Dames & Moore Type-U sample
- Standard Penetration Test
- No Recovery
- Disturbed Type-U Sample
- Shelby Tube Sample
- Approximate depth of perched water or groundwater

Note: Blowcounts are recorded for 6" of drive

**Laboratory and Field Test Abbreviations**

| | |
|---|---|
| CON | Consolidation test |
| CORR | Corrosivity test |
| DSCD | Consolidated drained direct shear test (normal pressure and shear strength results shown) |
| LL=29 | Liquid limit (Atterberg limits test) |
| PI=11 | Plasticity Index (Atterberg limits test) |
| PP | Pocket Penetrometer test (test result in parentheses) |
| SA | Sieve Analysis (-200 result in parentheses) |
| -200 | Percent passing #200 sieve (test result in parentheses) |
| UU | Unconsolidated Undrained Triaxial Compression Test |

## KEY TO LOG OF BORING

**Proposed LNG Import Terminal**
**Pier Echo, Port of Long Beach**
**FOR: Kellogg Brown and Root**

URS

Figure B-11

Template: DMG4 PIERE; Prj ID: PIER-T.GPJ; Printed: 9/12/03

# APPENDIX C

# CONE PENETRATION TEST PROGRAM

# APPENDIX C

## CONE PENETRATION TEST PROGRAM

The cone penetration test program was initiated on June 24, 2003 and completed on June 25, 2003 under the technical supervision of a qualified geotechnical engineer. All field activities were performed in strict compliance with a site-specific Health and Safety Plan. The subsurface conditions at the site were explored by advancing 13 cone penetration tests (CPT's) to depths ranging from 93 feet to 100 feet below existing ground surface. The upper 5 feet of all CPT's was hand-augered as an additional precaution for subsurface utilities.

The following is a presentation of the CPT exploration program performed by Gregg In Situ, Inc. of Signal Hill, California. Locations of the CPT's are shown in Figure 2-1.

-o0o-

# PRESENTATION OF CONE PENETRATION TEST DATA

## PIER T

## PORT OF LONG BEACH
## LONG BEACH, CALIFORNIA

**Prepared for:**

URS
Los Angeles, California

**Prepared by:**

GREGG IN SITU, INC.
Signal Hill, California
03-151sh

**Prepared on:**

July 1, 2003

# TABLE OF CONTENTS

# PRESENTATION OF CONE PENETRATION TEST DATA

## 1.0 INTRODUCTION

This report presents the results of a Cone Penetration Testing (CPT) program carried out at the Pier T site located in Long Beach, CA. The work was performed on June 23rd and 24th, 2003. The scope of work was performed as directed by URS personnel.

## 2.0 FIELD EQUIPMENT & PROCEDURES

The Cone Penetration Tests (CPT) were carried out by GREGG IN SITU, INC. of Signal Hill, CA using an integrated electronic cone system. The CPT soundings were performed in accordance with ASTM standards (D 5778-95). A 20 ton capacity cone was used for all of the soundings (figure 1). This cone has a tip area of 15 $cm^2$ and friction sleeve area of 225 $cm^2$. The cone is designed with an equal end area friction sleeve and a tip end area ratio of 0.85.

The cones used during the program recorded the following parameters at 5 cm depth intervals:

- Tip Resistance (qc)
- Sleeve Friction (fs)
- Dynamic Pore Pressure (U)

The above parameters were printed simultaneously on a printer and stored on a computer diskette for future analysis and reference.

The pore water pressure element was located directly behind the cone tip. The pore water pressure element was 5.0 mm thick and consisted of porous plastic. Each of the elements were saturated in silicon oil under vacuum pressure prior to penetration. Pore pressure dissipations were recorded at 5 second intervals when appropriate during pauses in the penetration.

A complete set of baseline readings was taken prior to each sounding to determine temperature shifts and any zero load offsets. Monitoring base line readings ensures that the cone electronics are operating properly.

The cones were pushed using GREGG IN SITU's CPT rig, having a down pressure capacity of approximately 20 tons. Thirteen CPT soundings were performed. The penetration tests were carried to depths of approximately 100 feet below ground surface. Test locations and depths were determined in the field by URS personnel.

The CPT sample holes were grouted using our support rig. The grouting procedure consists of pushing a hollow CPT rod with a "knock out" plug back down the hole to the test hole termination depth. Grout is then pumped under pressure as the tremie pipe is pulled from the hole.

## 3.0 CONE PENETRATION TEST DATA & INTERPRETATION

The cone penetration test data is presented in graphical form. Penetration depths are referenced to existing ground surface. This data includes CPT logs of measured soil parameters and a computer tabulation of interpreted soil types along with additional geotechnical parameters and pore pressure dissipation data.

The stratigraphic interpretation is based on relationships between cone bearing (qc), sleeve friction (fs), and penetration pore pressure (U). The friction ratio (Rf), which is sleeve friction divided by cone bearing, is a calculated parameter which is used to infer soil behavior type. Generally, cohesive soils (clays) have high friction ratios, low cone bearing and generate large excess pore water pressures. Cohesionless soils (sands) have lower friction ratios, high cone bearing and generate little in the way of excess pore water pressures.

Pore Pressure Dissipation Tests (PPDT's) were taken at various intervals in order to measure hydrostatic water pressures and approximate depth to groundwater table. In addition, the PPDT data can be used to estimate the horizontal permeability ($k_h$) of the soil. The correlation to permeability is based on the time required for 50 percent of the measured dynamic pore pressure to dissipate ($t_{50}$). The PPDT correlation figure (figure 2) is provided in the Appendix.

The interpretation of soils encountered on this project was carried out using recent correlations developed by Robertson et al, 1990. It should be noted that it is not always possible to clearly identify a soil type based on qc, fs and U. In these situations, experience and judgement and an assessment of the pore pressure dissipation data should be used to infer the soil behavior type. The soil classification chart (figure 3) used to interpret soil types based on qc and Rf is provided in the Appendix.

Interpreted output requires that depth of water be entered for calculation purposes, where depth to water is unknown an arbitrary depth in excess of 10 feet of the deepest sounding is entered as the groundwater depth.

We hope the information presented is sufficient for your purposes. We recommend that all data be carefully reviewed by qualified personnel to verify the data and make appropriate recommendations. If you have any questions, please do not hesitate to contact our office at (562) 427-6899.

Sincerely,
GREGG IN SITU, INC.

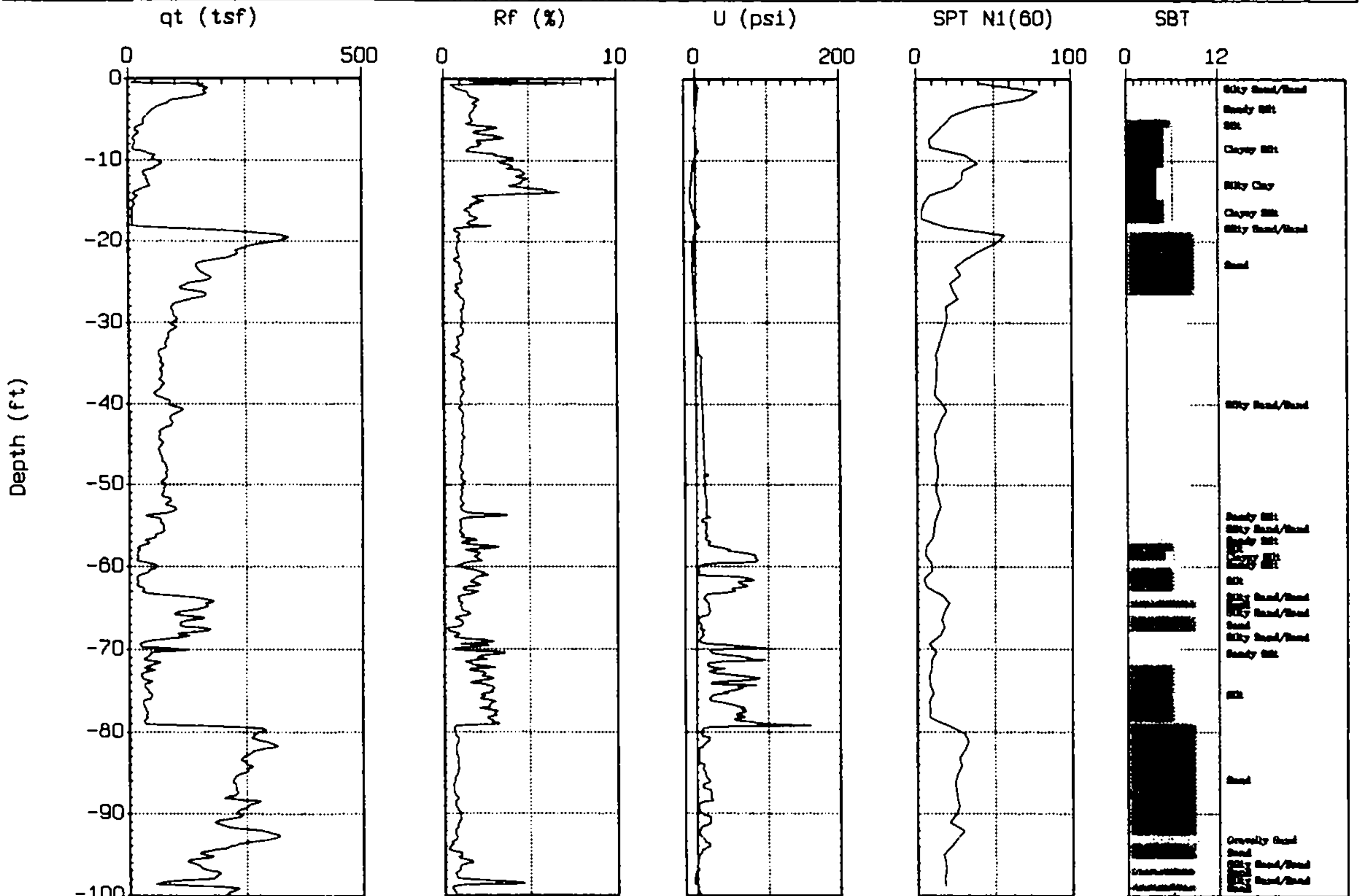
Brian Savela
Operations Manager

# 3.1 CPT PLOTS

URS

Site : PIER T LNG
Location : CPT-01

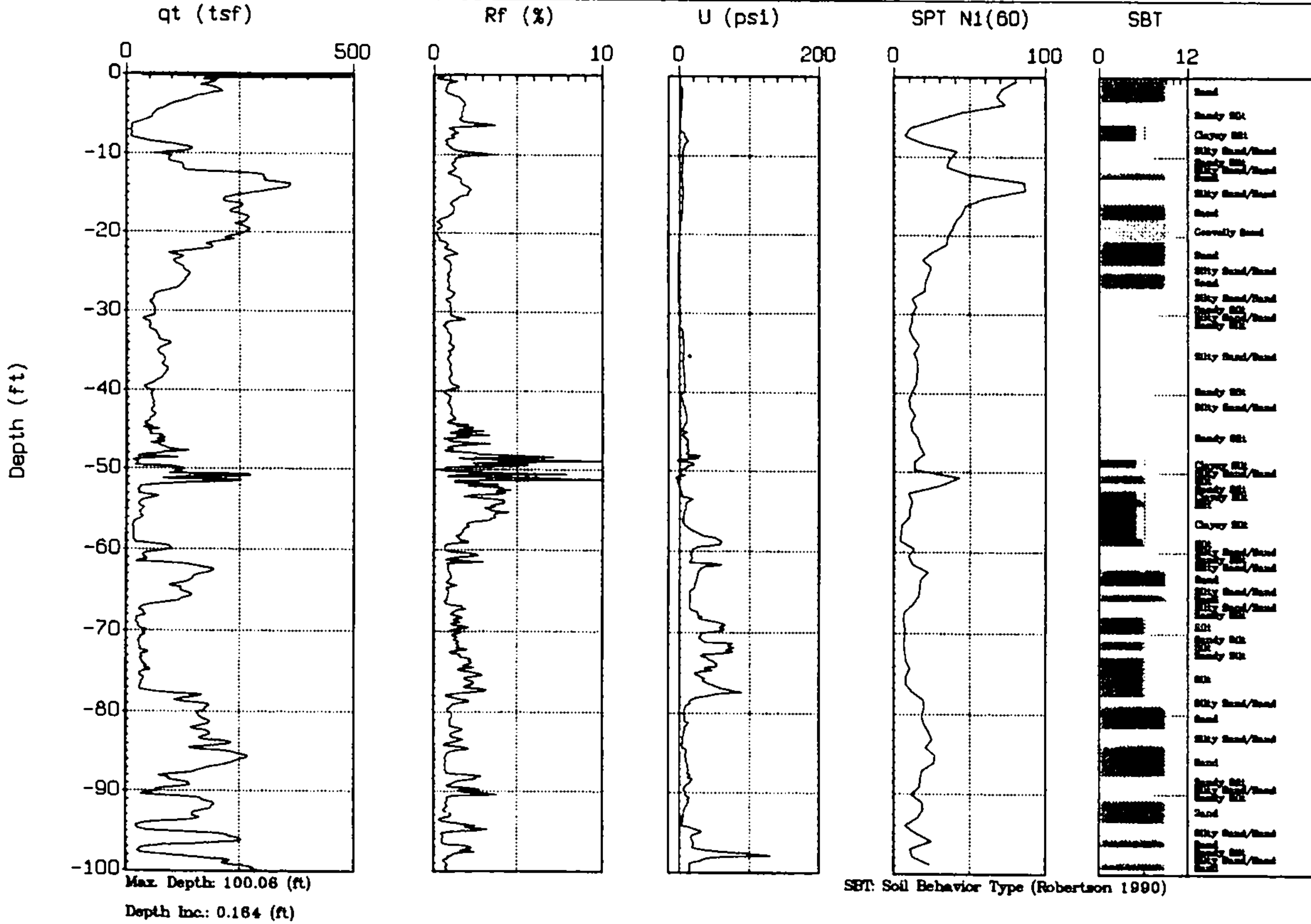
Engineer : T. O'BRIEN
Date : 06:25:03 07:27




Max. Depth: 100.08 (ft)
Depth Inc.: 0.164 (ft)

SBT: Soil Behavior Type (Robertson 1990)

GREGG | URS | Site : PIER T LNG<br>Location : CPT-02 | Engineer : T. O'BRIEN<br>Date : 06:24:03 12:55

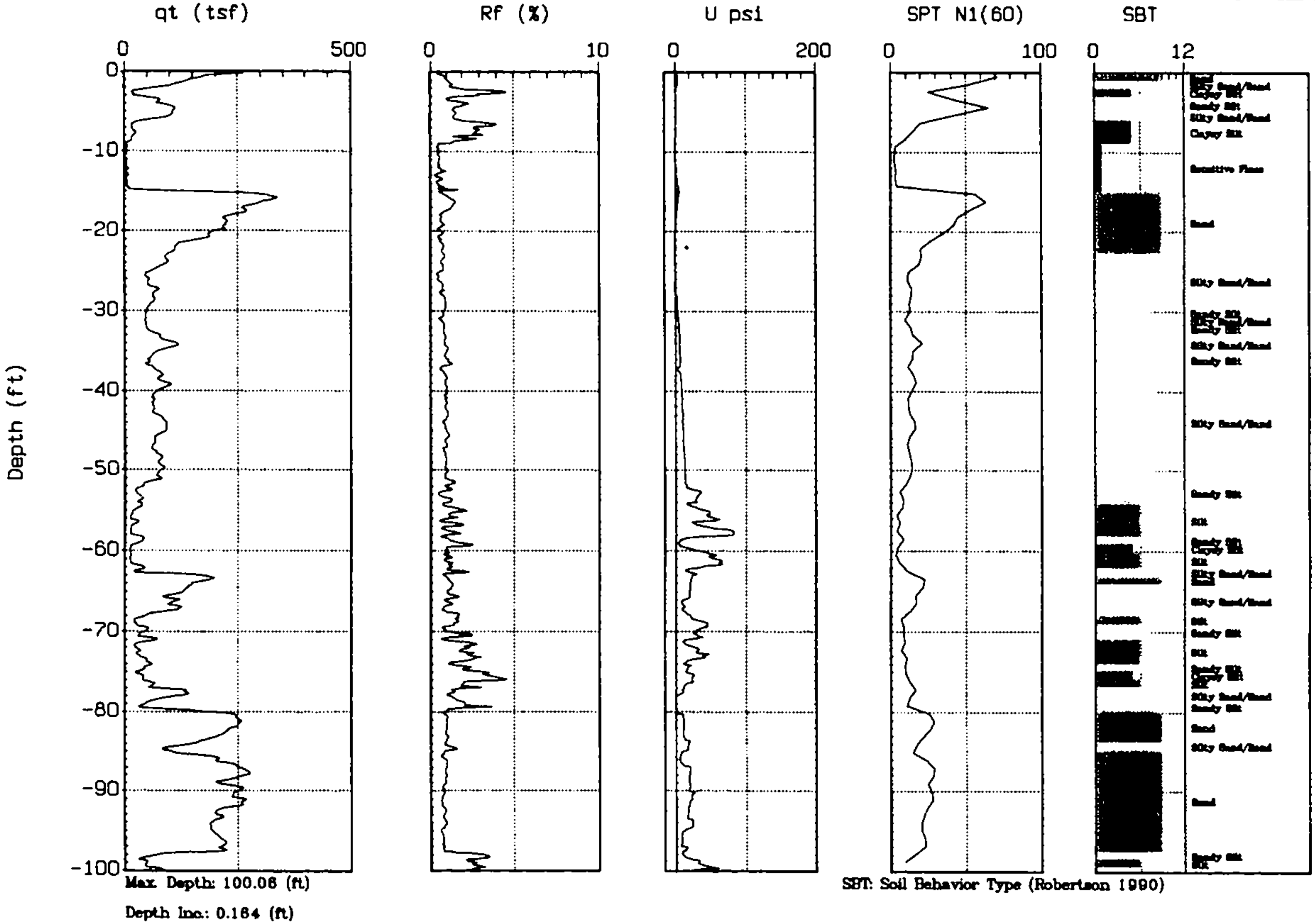


GREGG

URS

Site : PIER T LNG
Location : CPT-03

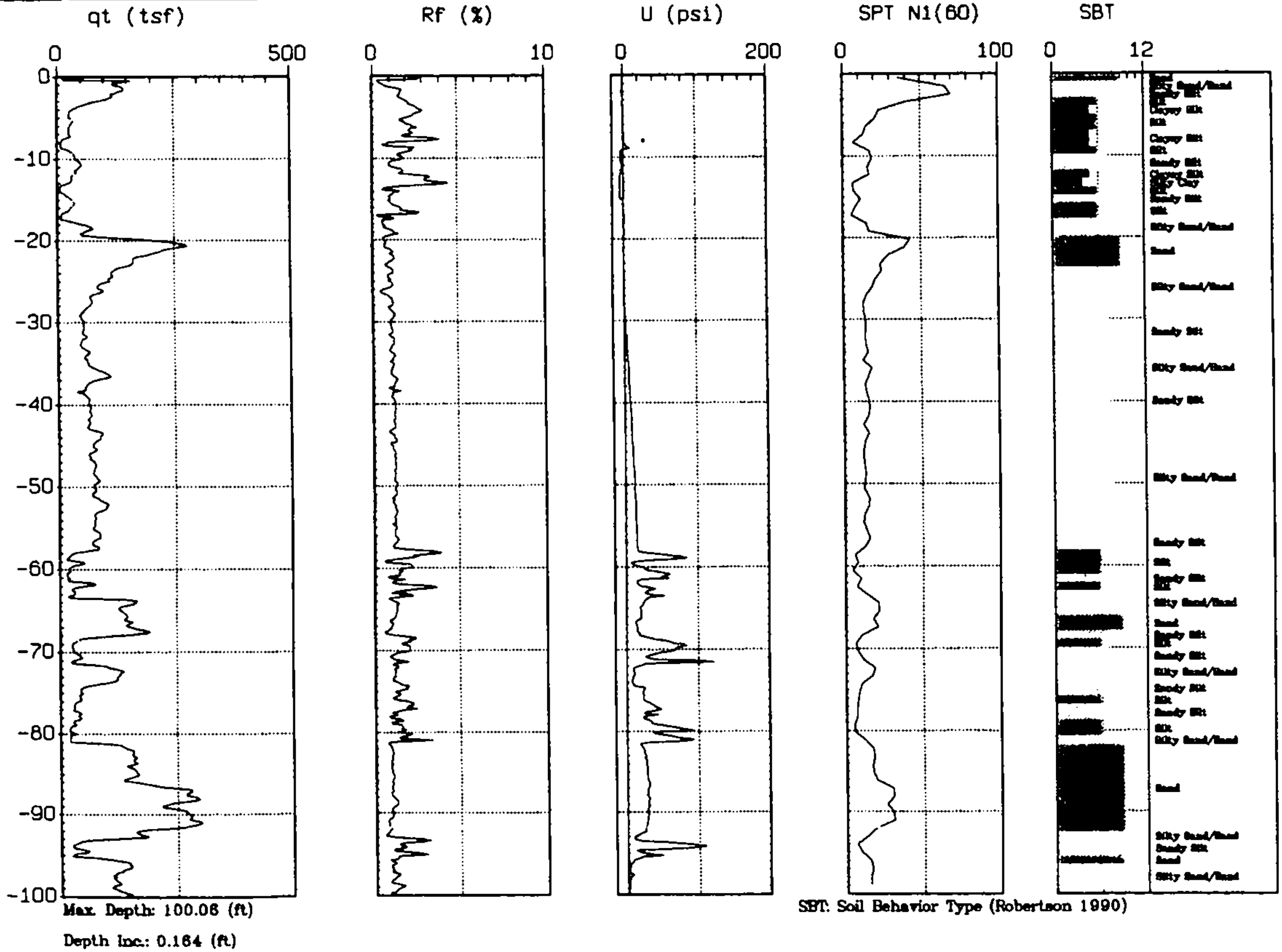
Engineer : T. O'BRIEN
Date : 06:24:03 10:12



GREGG | URS

Site : PIER T LNG
Location : CPT-04

Engineer : T. O'BRIEN
Date : 06:24:03 12:12

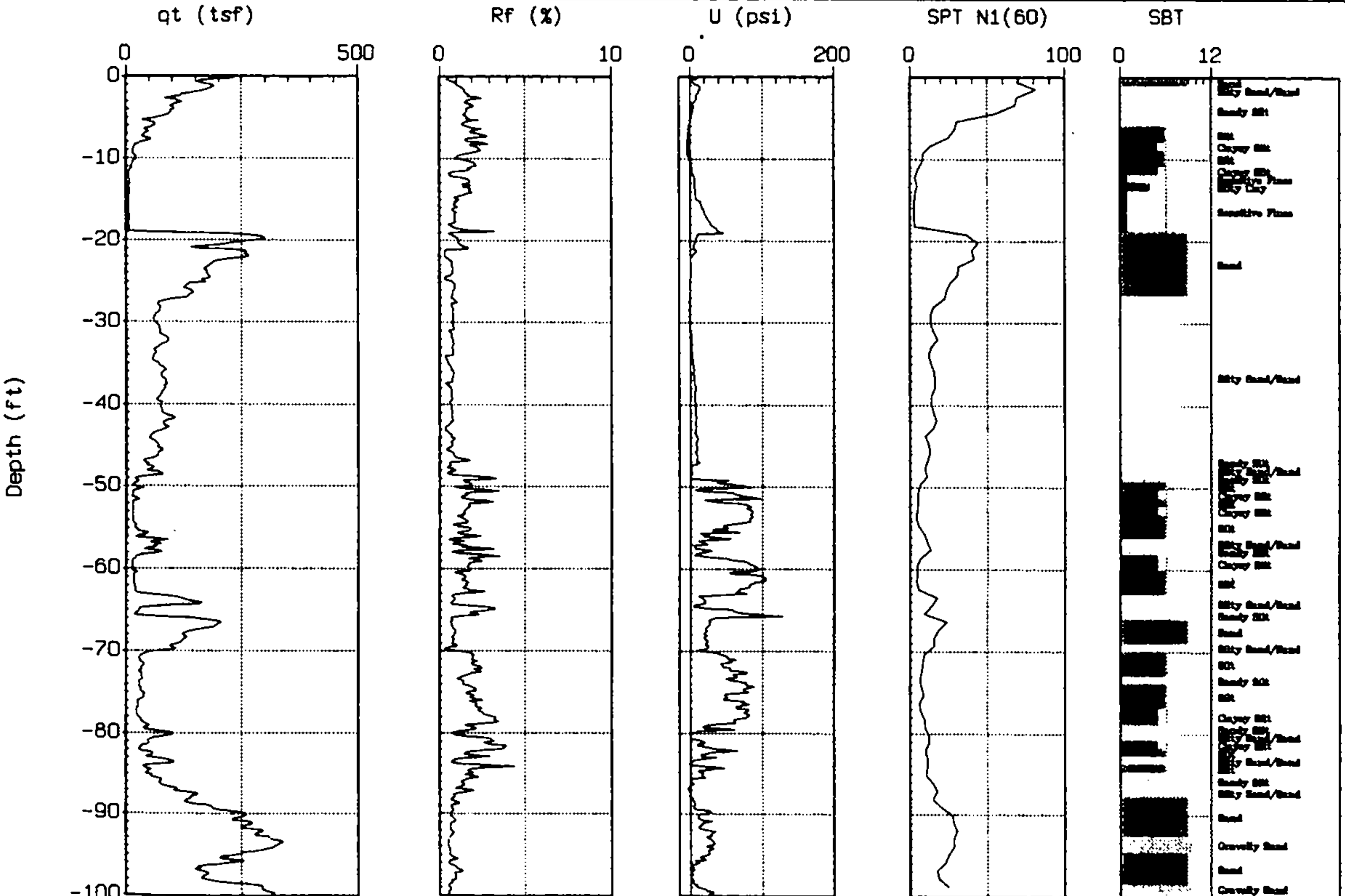


GREGG

URS

Site : PIER T LNG
Location : CPT-05

Engineer : T. O'BRIEN
Date : 06:25:03 11:45




Max. Depth: 100.06 (ft)

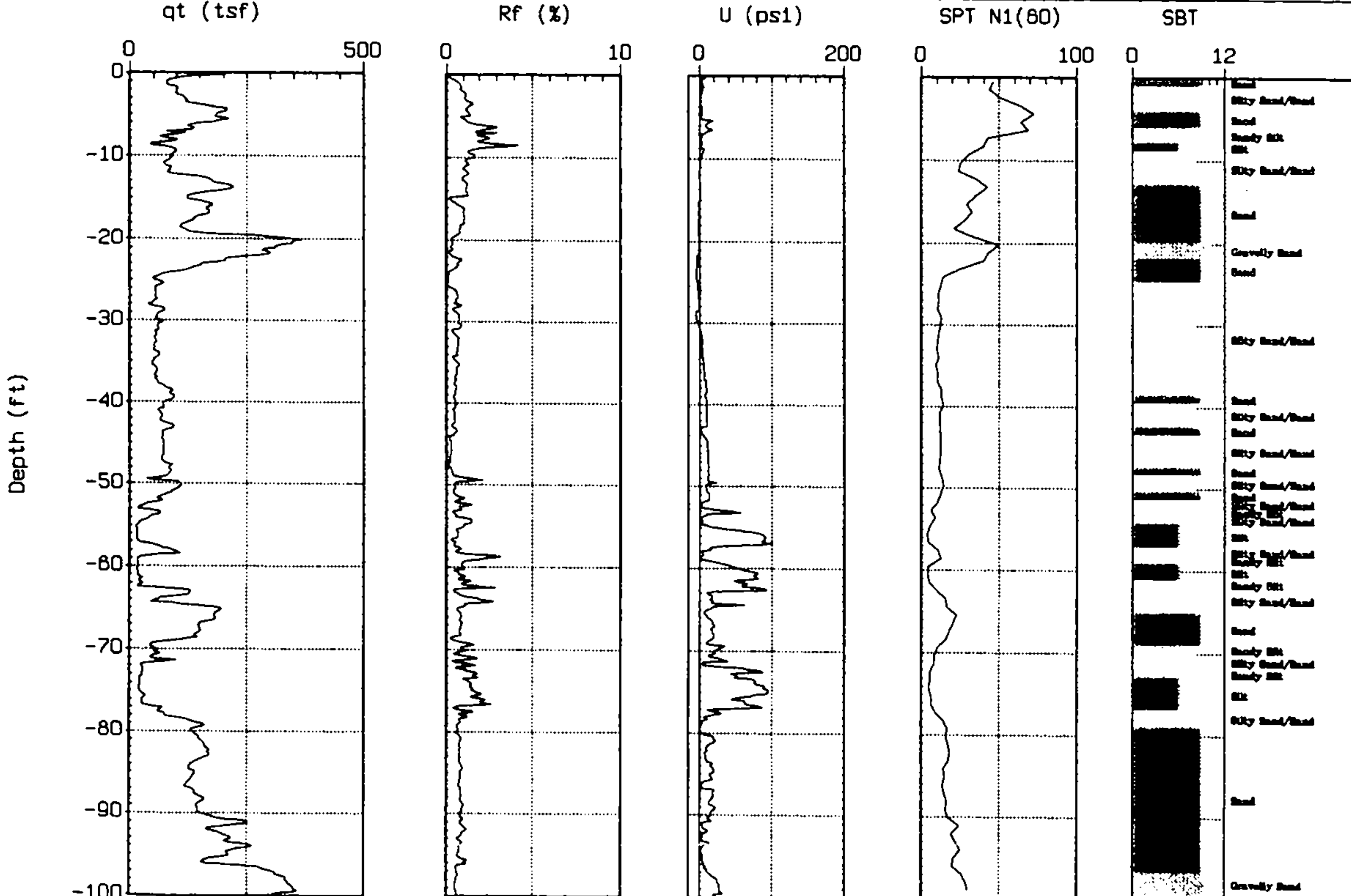
Depth Inc.: 0.164 (ft)

SBT: Soil Behavior Type (Robertson 1990)

GREGG | URS

Site : PIER T LNG
Location : CPT-06

Engineer : T. O'BRIEN
Date : 06:25:03 09:02



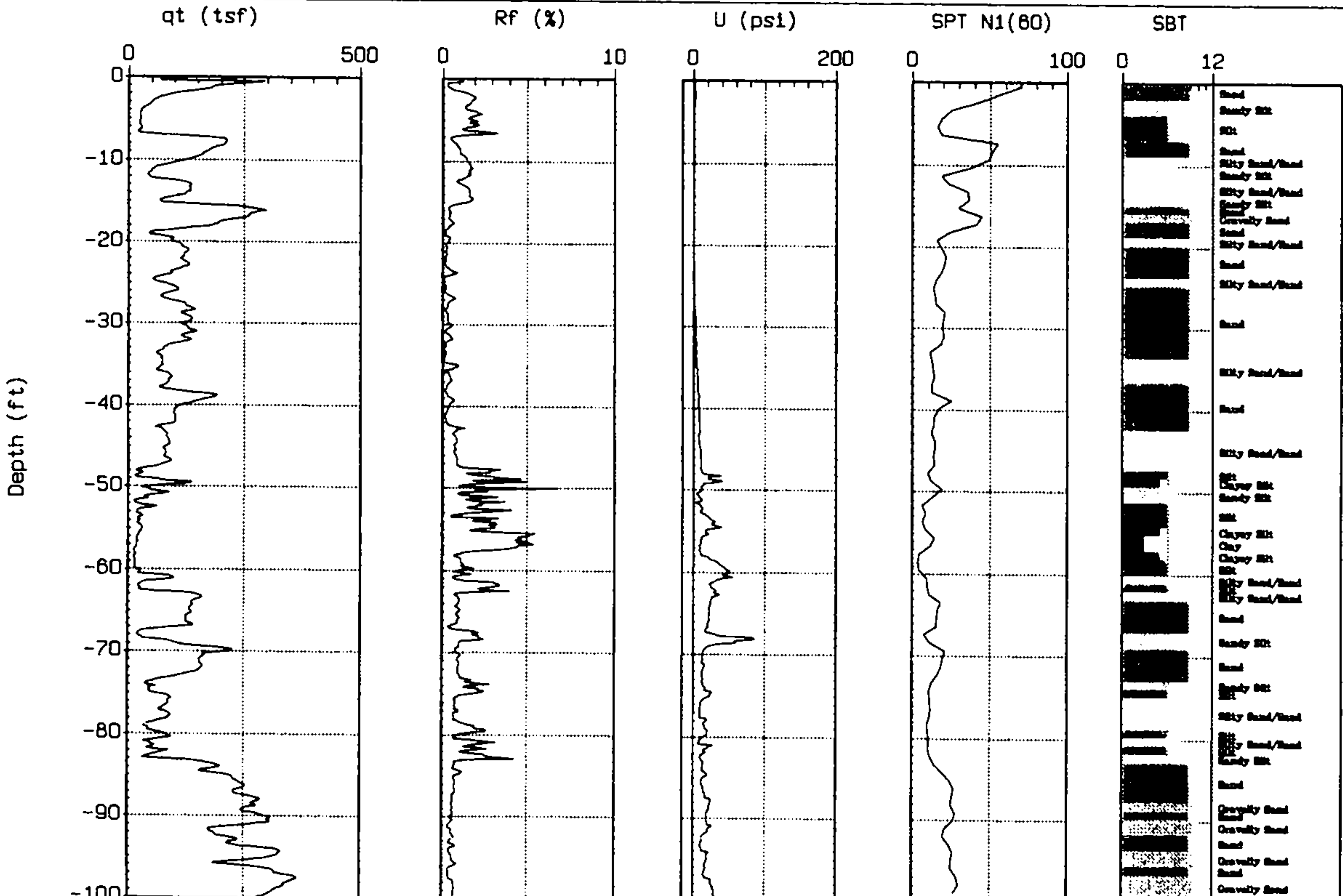

Max. Depth: 100.06 (ft)
Depth Inc.: 0.164 (ft)

SBT: Soil Behavior Type (Robertson 1990)

URS

Site : PIER T LNG
Location : CPT-07

Engineer : T. O'BRIEN
Date : 06:24:03 13:34




Max. Depth: 100.06 (ft)

Depth Inc.: 0.164 (ft)

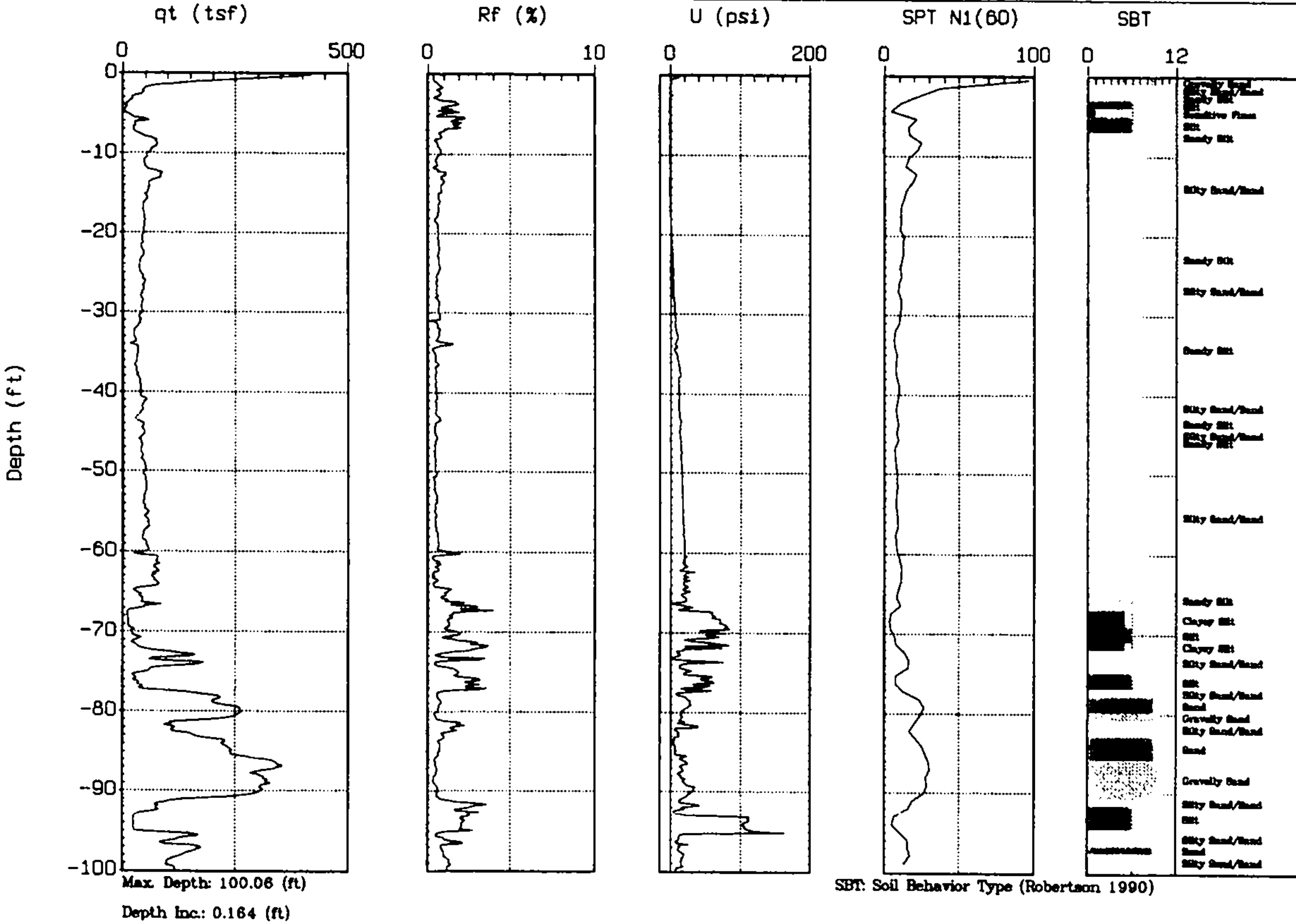
SBT: Soil Behavior Type (Robertson 1990)

GREGG

URS

Site : PIER T LNG
Location : CPT-08

Engineer : T. O'BRIEN
Date : 06:25:03 13:07

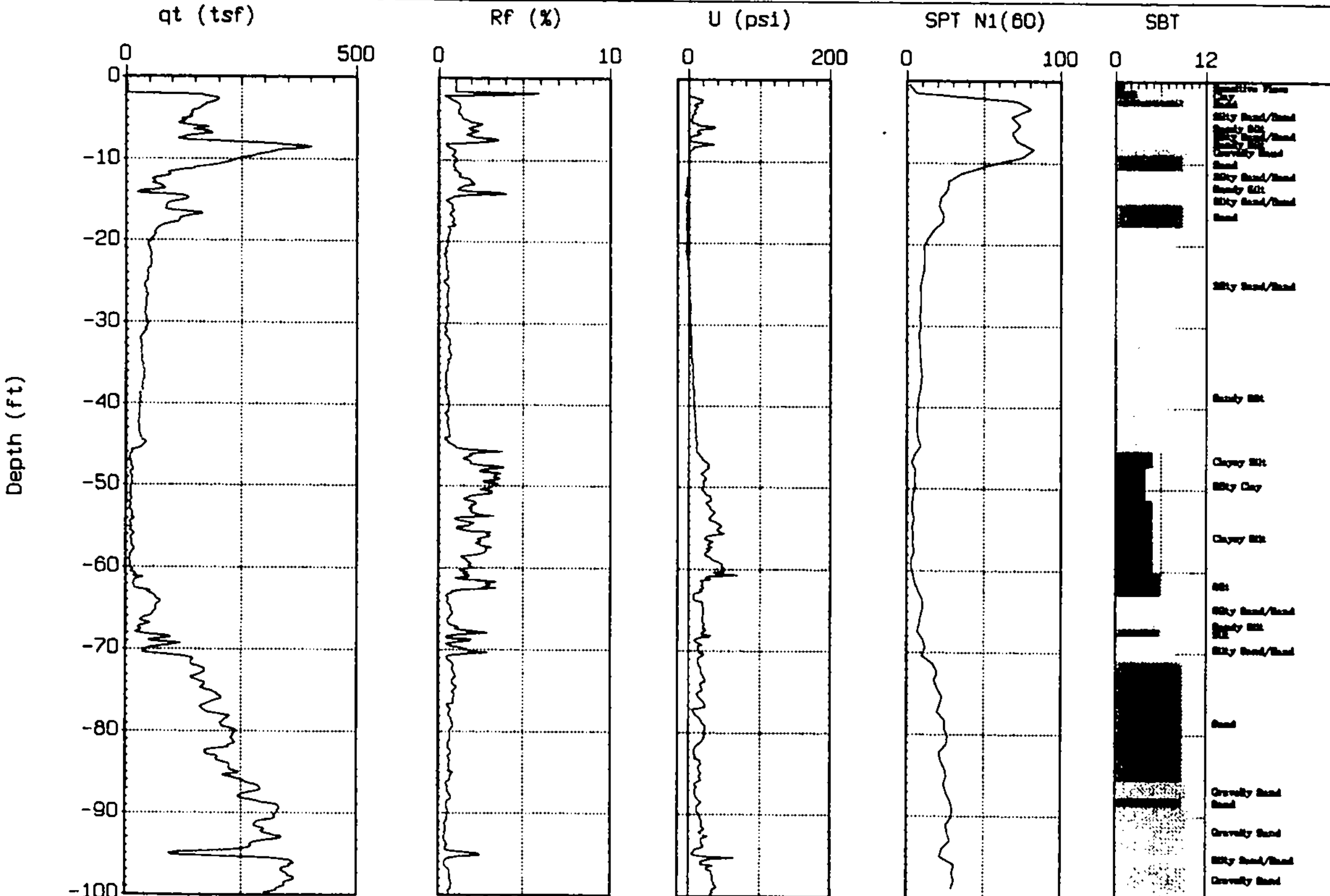


GREGG

URS

Site : PIER T LNG
Location : CPT-09

Engineer : T. O'BRIEN
Date : 06:25:03 10:15




Max. Depth: 100.06 (ft)

Depth Inc.: 0.164 (ft)

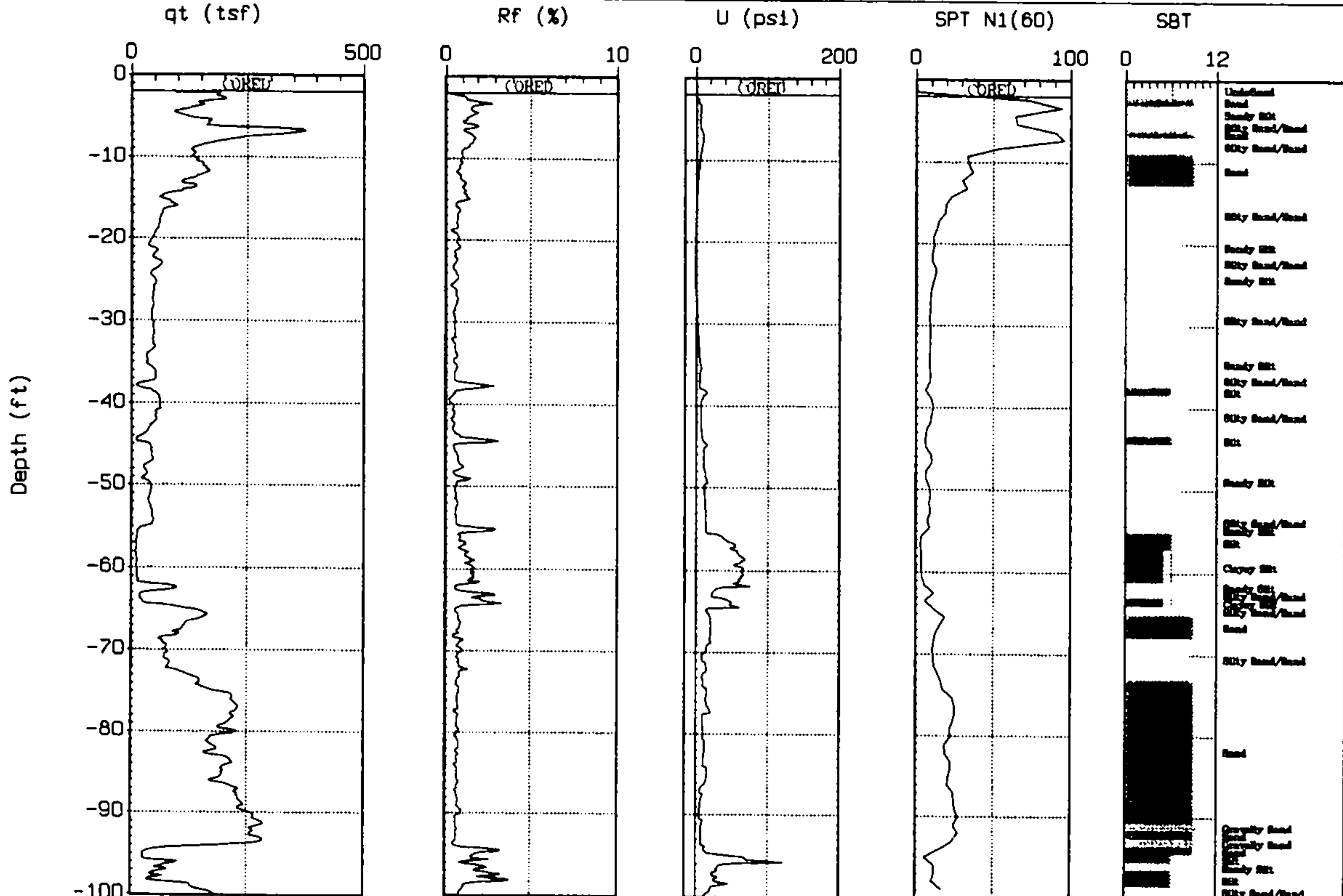
SBT: Soil Behavior Type (Robertson 1990)

GREGG

URS

Site : PIER T LNG
Location : CPT-10

Engineer : T. O'BRIEN
Date : 06:25:03 13:50




Max. Depth: 100.23 (ft)
Depth Inc.: 0.164 (ft)

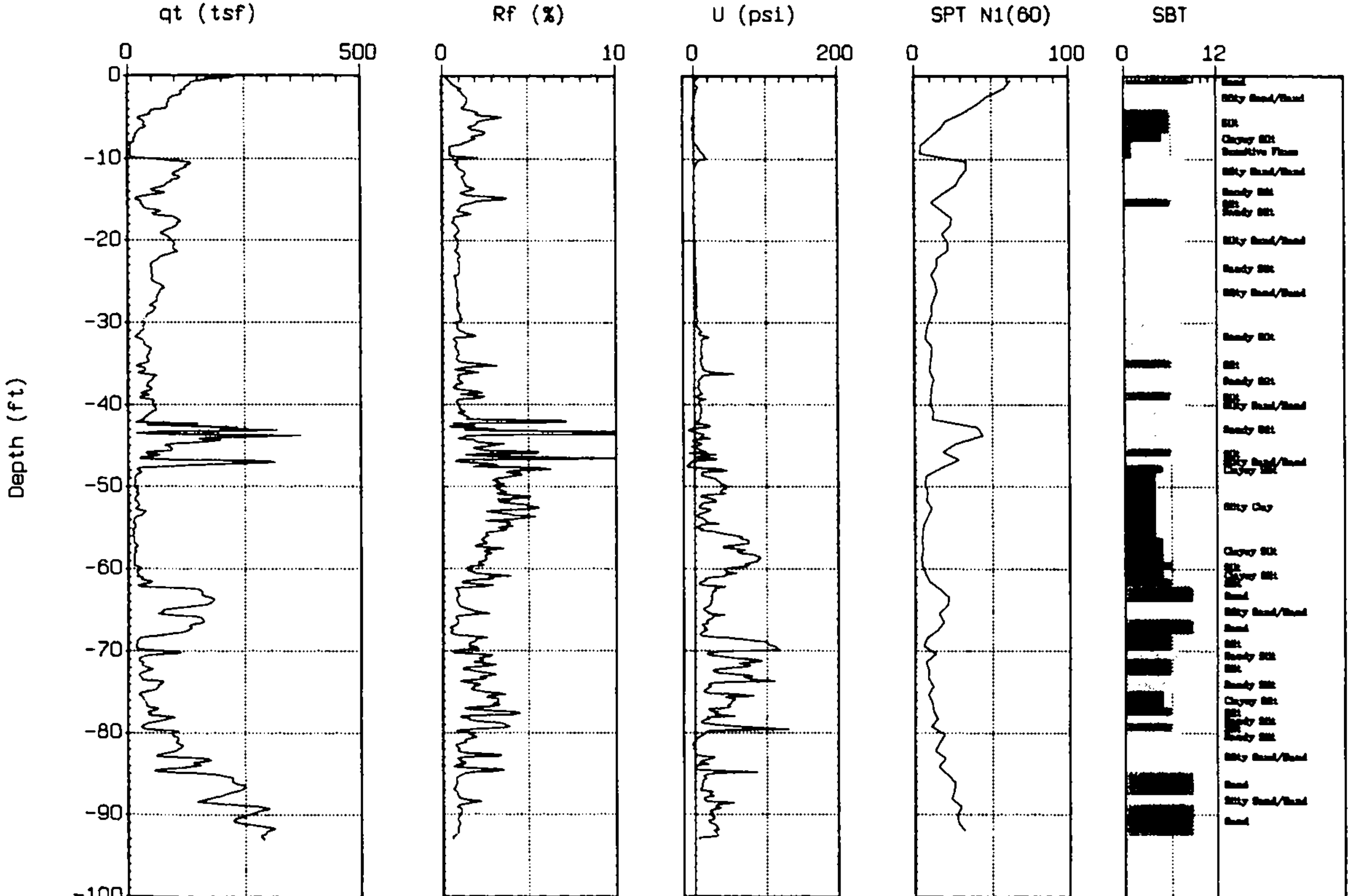
SBT: Soil Behavior Type (Robertson 1990)

GREGG

URS

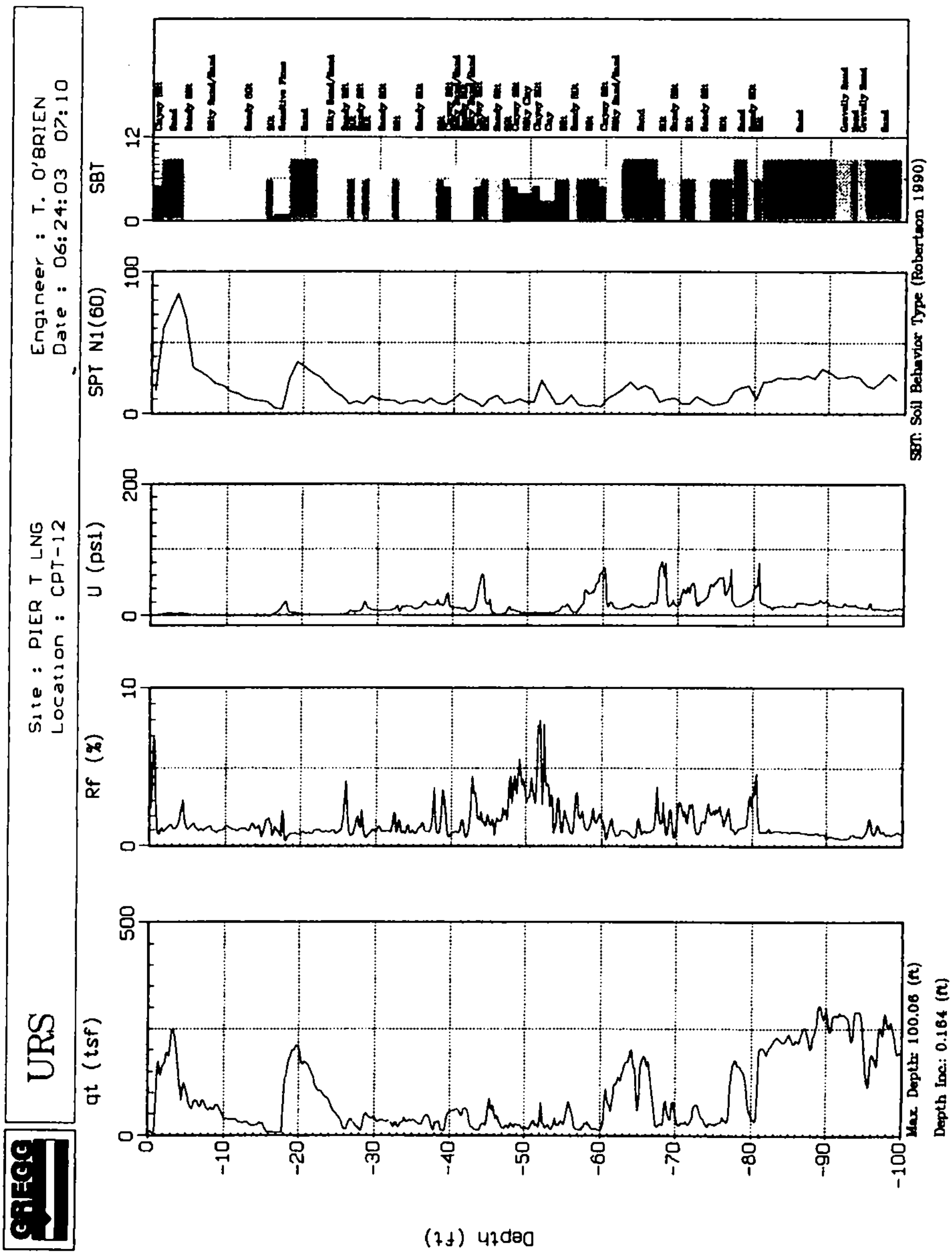
Site : PIER T LNG
Location : CPT-11

Engineer : T. O'BRIEN
Date : 06:24:03 14:30

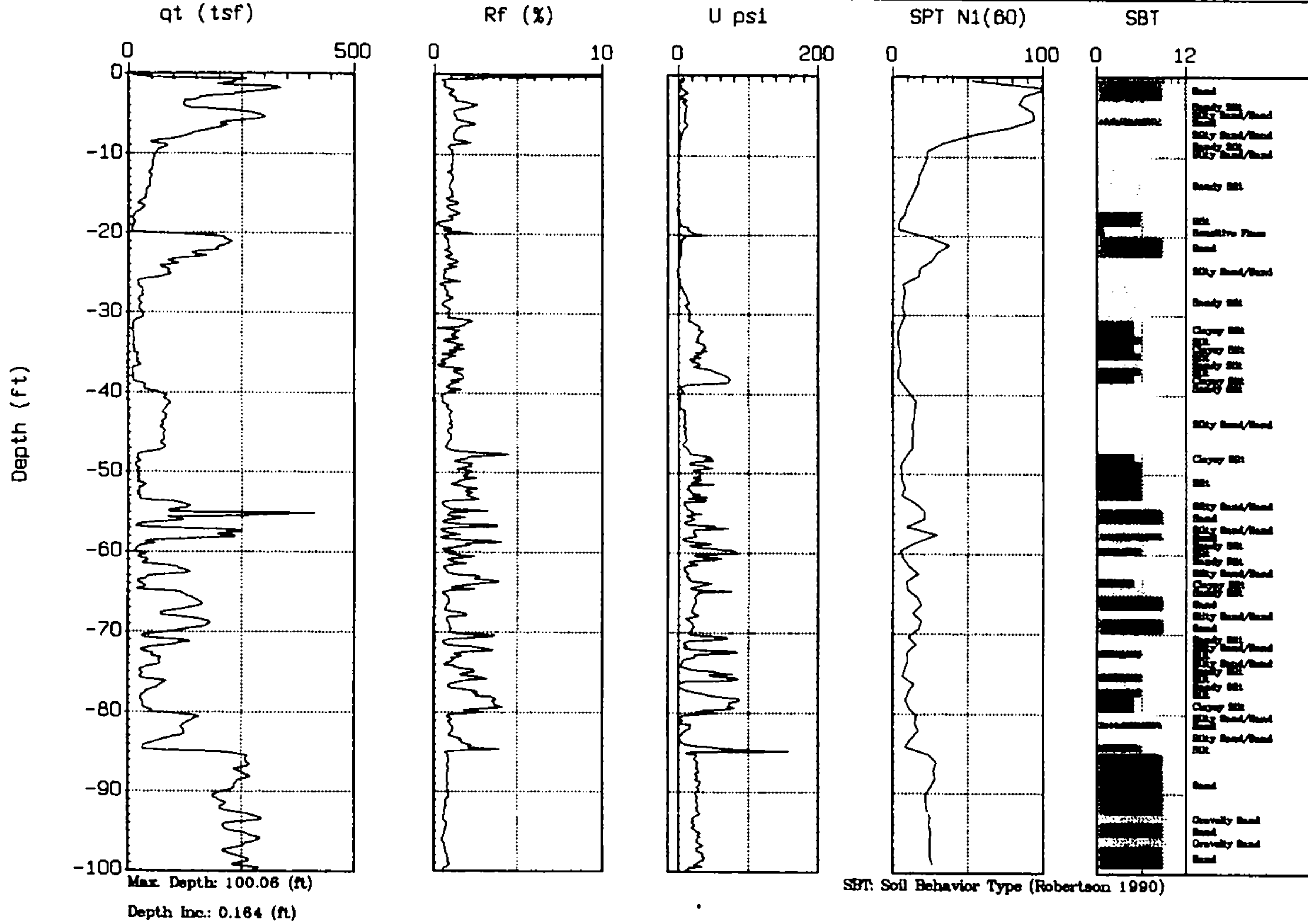



Max. Depth: 93.01 (ft)
Depth Inc.: 0.164 (ft)

SBT: Soil Behavior Type (Robertson 1990)


URS
Site : PIER T LNG
Location : CPT-12
Engineer : T. O'BRIEN
Date : 06:24:03 07:10
qt (tsf)
Rf (%)
U (psi)
SPT N1(60)
SBT
Depth (ft)
Max. Depth: 100.06 (ft)
Depth Inc: 0.164 (ft)
SBT: Soil Behavior Type (Robertson 1990)
GREGG

GREGG | URS | Site : PIER T LNG<br>Location : CPT-13 | Engineer : T. O'BRIEN<br>Date : 06:24:03 09:30



# 3.2 INTERPRETED OUTPUT

Gregg In Situ, Inc.
Interpretation Output - Release 1.00.19e
Run No: 03-0630-0942-1299
Job No: 03-151SH
Client: URS
Project: CPT SITE INVESTIGATION
Site: PIER T LNG
Location: CPT-01
Engineer: T. O'BRIEN
CPT Date: 03/25/06
CPT Time: 07:27
CPT File: 151C01.COR
Northing (m): 0.000
Easting (m): 0.000
Elevation (m): 0.000

Water Table (m): 6.10 (ft): 20.0
Su Nkt used: 12.50
Averaging Increment (m): 0.30
Phi Method : Robertson and Campanella, 1983
Dr Method : Jamiolkowski - All Sands
State Parameter M: 1.20
Used Unit Weights Assigned to Soil Zones
Values of 1.0E9 or UnDef are printed for parameters that are not valid for the material type (SBT)

| Depth (ft) | AvgQt (tsf) | AvgFs (tsf) | AvgRf (%) | AvgUd (ft) | SBT | U.Wt. pcf | TStress (tsf) | EStress (tsf) | Ueq (tsf) | Cn | N60 (blows/ft) | (N1)60 (blows/ft) | Su (tsf) | CRR |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 0.49 | 85.2 | 0.67 | 0.79 | 5.2 | 8 | 120.9 | 0.03 | 0.03 | 0.00 | 2.00 | 20.4 | 40.8 | UnDef | 0.00 |
| 1.48 | 164.2 | 2.17 | 1.32 | 8.4 | 8 | 120.9 | 0.09 | 0.09 | 0.00 | 2.00 | 39.3 | 78.6 | UnDef | 0.00 |
| 2.46 | 109.1 | 2.12 | 1.95 | 6.2 | 7 | 117.8 | 0.15 | 0.15 | 0.00 | 2.00 | 34.8 | 69.7 | UnDef | 0.00 |
| 3.44 | 59.2 | 1.15 | 1.94 | 3.1 | 7 | 117.8 | 0.21 | 0.21 | 0.00 | 2.00 | 18.9 | 37.8 | UnDef | 0.26 |
| 4.43 | 37.8 | 0.63 | 1.67 | 1.1 | 6 | 114.6 | 0.26 | 0.26 | 0.00 | 1.95 | 14.5 | 28.3 | 3.01 | 0.14 |
| 5.41 | 27.1 | 0.53 | 1.94 | -0.5 | 6 | 114.6 | 0.32 | 0.32 | 0.00 | 1.77 | 10.4 | 18.4 | 2.15 | 0.11 |
| 6.40 | 17.3 | 0.40 | 2.30 | -0.3 | 5 | 114.6 | 0.38 | 0.38 | 0.00 | 1.63 | 8.3 | 13.5 | 1.36 | 0.11 |
| 7.30 | 11.2 | 0.31 | 2.77 | 2.6 | 5 | 114.6 | 0.43 | 0.43 | 0.00 | 1.53 | 5.4 | 8.2 | 0.86 | 0.13 |
| 8.20 | 10.5 | 0.20 | 1.93 | 5.5 | 5 | 114.6 | 0.48 | 0.48 | 0.00 | 1.44 | 5.0 | 7.3 | 0.80 | 0.12 |
| 9.19 | 45.7 | 1.39 | 3.04 | 4.3 | 6 | 114.6 | 0.54 | 0.54 | 0.00 | 1.37 | 17.5 | 23.9 | 3.61 | 0.22 |
| 10.17 | 63.4 | 2.36 | 3.71 | -5.8 | 5 | 114.6 | 0.59 | 0.59 | 0.00 | 1.30 | 30.4 | 39.5 | 5.03 | 0.00 |
| 11.15 | 41.4 | 1.78 | 4.30 | -9.2 | 4 | 114.6 | 0.65 | 0.65 | 0.00 | 1.24 | 26.5 | 32.9 | 3.26 | 0.00 |
| 12.14 | 37.7 | 1.74 | 4.61 | -11.2 | 4 | 114.6 | 0.70 | 0.70 | 0.00 | 1.19 | 24.1 | 28.7 | 2.96 | 0.00 |
| 13.21 | 34.3 | 1.59 | 4.65 | -14.1 | 3 | 111.4 | 0.77 | 0.77 | 0.00 | 1.14 | 32.8 | 37.5 | 2.68 | 0.00 |
| 14.27 | 12.9 | 0.39 | 3.03 | -15.7 | 4 | 114.6 | 0.83 | 0.83 | 0.00 | 1.10 | 8.2 | 9.0 | 0.96 | 0.11 |
| 15.26 | 9.6 | 0.18 | 1.92 | -13.3 | 5 | 114.6 | 0.88 | 0.88 | 0.00 | 1.07 | 4.6 | 4.9 | 0.70 | 0.09 |
| 16.24 | 7.1 | 0.11 | 1.48 | -6.4 | 5 | 114.6 | 0.94 | 0.94 | 0.00 | 1.03 | 3.4 | 3.5 | 0.50 | 0.08 |
| 17.22 | 7.2 | 0.13 | 1.81 | 1.3 | 5 | 114.6 | 0.99 | 0.99 | 0.00 | 1.00 | 3.5 | 3.5 | 0.50 | 0.08 |
| 18.21 | 80.7 | 0.63 | 0.78 | 7.3 | 8 | 120.9 | 1.05 | 1.05 | 0.00 | 0.97 | 19.3 | 18.8 | UnDef | 0.15 |
| 19.19 | 314.8 | 2.94 | 0.93 | -3.6 | 9 | 124.1 | 1.11 | 1.11 | 0.00 | 0.95 | 60.3 | 57.2 | UnDef | 0.00 |
| 20.18 | 288.8 | 2.45 | 0.85 | -7.5 | 9 | 124.1 | 1.17 | 1.17 | 0.01 | 0.93 | 55.3 | 51.2 | UnDef | 0.00 |
| 21.16 | 233.2 | 2.00 | 0.86 | -8.8 | 9 | 124.1 | 1.23 | 1.20 | 0.04 | 0.91 | 44.7 | 40.8 | UnDef | 0.00 |
| 22.15 | 186.1 | 1.50 | 0.81 | -8.3 | 9 | 124.1 | 1.30 | 1.23 | 0.07 | 0.90 | 35.6 | 32.1 | UnDef | 0.00 |
| 23.13 | 147.2 | 1.54 | 1.05 | -8.4 | 8 | 120.9 | 1.36 | 1.26 | 0.10 | 0.89 | 35.2 | 31.4 | UnDef | 0.38 |
| 24.11 | 168.5 | 1.71 | 1.01 | -7.7 | 9 | 124.1 | 1.42 | 1.29 | 0.13 | 0.88 | 32.3 | 28.4 | UnDef | 0.00 |
| 25.10 | 131.3 | 1.26 | 0.96 | -6.8 | 8 | 120.9 | 1.48 | 1.32 | 0.16 | 0.87 | 31.4 | 27.4 | UnDef | 0.29 |
| 26.08 | 144.3 | 1.16 | 0.80 | -5.5 | 9 | 124.1 | 1.54 | 1.35 | 0.19 | 0.86 | 27.6 | 23.8 | UnDef | 0.31 |
| 27.07 | 131.3 | 1.52 | 1.16 | -4.2 | 8 | 120.9 | 1.60 | 1.38 | 0.22 | 0.85 | 31.4 | 26.8 | UnDef | 0.31 |
| 28.05 | 92.4 | 1.04 | 1.13 | -3.0 | 8 | 120.9 | 1.66 | 1.41 | 0.25 | 0.84 | 22.1 | 18.7 | UnDef | 0.19 |
| 29.04 | 98.2 | 1.08 | 1.10 | -0.8 | 8 | 120.9 | 1.72 | 1.43 | 0.28 | 0.84 | 23.5 | 19.6 | UnDef | 0.20 |
| 30.02 | 95.9 | 1.04 | 1.08 | 0.6 | 8 | 120.9 | 1.78 | 1.46 | 0.31 | 0.83 | 23.0 | 19.0 | UnDef | 0.20 |
| 31.00 | 88.5 | 1.01 | 1.14 | 2.6 | 8 | 120.9 | 1.84 | 1.49 | 0.34 | 0.82 | 21.2 | 17.3 | UnDef | 0.19 |
| 31.99 | 80.9 | 0.69 | 0.85 | 4.4 | 8 | 120.9 | 1.89 | 1.52 | 0.37 | 0.81 | 19.4 | 15.7 | UnDef | 0.15 |
| 32.97 | 73.4 | 0.61 | 0.82 | 6.8 | 8 | 120.9 | 1.95 | 1.55 | 0.41 | 0.80 | 17.6 | 14.1 | UnDef | 0.14 |
| 33.96 | 64.7 | 0.46 | 0.72 | 13.2 | 8 | 120.9 | 2.01 | 1.58 | 0.44 | 0.80 | 15.5 | 12.3 | UnDef | 0.12 |
| 34.94 | 69.3 | 0.76 | 1.09 | 16.7 | 8 | 120.9 | 2.07 | 1.61 | 0.47 | 0.79 | 16.6 | 13.1 | UnDef | 0.15 |
| 35.92 | 68.1 | 0.76 | 1.11 | 16.3 | 8 | 120.9 | 2.13 | 1.64 | 0.50 | 0.78 | 16.3 | 12.7 | UnDef | 0.15 |
| 36.91 | 68.5 | 0.76 | 1.11 | 16.7 | 8 | 120.9 | 2.19 | 1.66 | 0.53 | 0.78 | 16.4 | 12.7 | UnDef | 0.15 |
| 37.89 | 65.8 | 0.71 | 1.08 | 17.5 | 7 | 117.8 | 2.25 | 1.69 | 0.56 | 0.77 | 21.0 | 16.1 | UnDef | 0.15 |
| 38.88 | 61.6 | 0.66 | 1.06 | 18.9 | 7 | 117.8 | 2.31 | 1.72 | 0.59 | 0.76 | 19.7 | 15.0 | UnDef | 0.14 |
| 39.86 | 89.0 | 0.91 | 1.02 | 19.6 | 8 | 120.9 | 2.37 | 1.75 | 0.62 | 0.76 | 21.3 | 16.1 | UnDef | 0.17 |
| 40.85 | 105.8 | 1.13 | 1.07 | 20.5 | 8 | 120.9 | 2.43 | 1.78 | 0.65 | 0.75 | 25.3 | 19.0 | UnDef | 0.21 |

Gregg In Situ, Inc.
Run No: 03-0630-0942-1299
CPT File: 151C01.COR



| Depth (ft) | AvgQt (tsf) | AvgFs (tsf) | AvgRf (%) | AvgUd (ft) | SBT | U.Wt. pcf | TStress (tsf) | EStress (tsf) | Ueq (tsf) | Cn | N60 (blows/ft) | (N1)60 (blows/ft) | Su (tsf) | CRR |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 41.83 | 88.7 | 0.97 | 1.09 | 21.6 | 8 | 120.9 | 2.49 | 1.81 | 0.68 | 0.74 | 21.2 | 15.8 | UnDef | 0.18 |
| 42.81 | 78.2 | 0.89 | 1.14 | 21.4 | 8 | 120.9 | 2.55 | 1.83 | 0.71 | 0.74 | 18.7 | 13.8 | UnDef | 0.17 |
| 43.80 | 64.0 | 0.73 | 1.14 | 22.4 | 7 | 117.8 | 2.61 | 1.86 | 0.74 | 0.73 | 20.4 | 15.0 | UnDef | 0.16 |
| 44.78 | 68.1 | 0.73 | 1.08 | 23.7 | 8 | 120.9 | 2.66 | 1.89 | 0.77 | 0.73 | 16.3 | 11.9 | UnDef | 0.15 |
| 45.77 | 63.6 | 0.70 | 1.10 | 24.1 | 7 | 117.8 | 2.72 | 1.92 | 0.80 | 0.72 | 20.3 | 14.7 | UnDef | 0.15 |
| 46.75 | 69.8 | 0.71 | 1.02 | 24.1 | 8 | 120.9 | 2.78 | 1.95 | 0.84 | 0.72 | 16.7 | 12.0 | UnDef | 0.15 |
| 47.74 | 78.2 | 0.75 | 0.96 | 26.3 | 8 | 120.9 | 2.84 | 1.98 | 0.87 | 0.71 | 18.7 | 13.3 | UnDef | 0.16 |
| 48.72 | 77.7 | 0.83 | 1.06 | 25.8 | 8 | 120.9 | 2.90 | 2.00 | 0.90 | 0.71 | 18.6 | 13.1 | UnDef | 0.17 |
| 49.70 | 72.6 | 0.80 | 1.10 | 26.5 | 8 | 120.9 | 2.96 | 2.03 | 0.93 | 0.70 | 17.4 | 12.2 | UnDef | 0.17 |
| 50.69 | 71.2 | 0.75 | 1.06 | 27.9 | 8 | 120.9 | 3.02 | 2.06 | 0.96 | 0.70 | 17.0 | 11.9 | UnDef | 0.16 |
| 51.67 | 81.6 | 0.82 | 1.00 | 30.2 | 8 | 120.9 | 3.08 | 2.09 | 0.99 | 0.69 | 19.5 | 13.5 | UnDef | 0.17 |
| 52.66 | 90.3 | 0.93 | 1.03 | 31.5 | 8 | 120.9 | 3.14 | 2.12 | 1.02 | 0.69 | 21.6 | 14.8 | UnDef | 0.18 |
| 53.64 | 59.3 | 1.15 | 1.93 | 31.8 | 7 | 117.8 | 3.20 | 2.15 | 1.05 | 0.68 | 18.9 | 12.9 | UnDef | 0.00 |
| 54.63 | 68.7 | 0.65 | 0.95 | 25.8 | 8 | 120.9 | 3.26 | 2.17 | 1.08 | 0.68 | 16.5 | 11.2 | UnDef | 0.15 |
| 55.61 | 67.3 | 0.67 | 0.99 | 30.4 | 8 | 120.9 | 3.32 | 2.20 | 1.11 | 0.67 | 16.1 | 10.9 | UnDef | 0.16 |
| 56.59 | 44.3 | 0.58 | 1.30 | 34.0 | 7 | 117.8 | 3.37 | 2.23 | 1.14 | 0.67 | 14.1 | 9.5 | UnDef | 0.36 |
| 57.58 | 22.3 | 0.47 | 2.11 | 72.3 | 6 | 114.6 | 3.43 | 2.26 | 1.17 | 0.67 | 8.5 | 5.7 | 1.51 | 0.12 |
| 58.56 | 16.6 | 0.34 | 2.03 | 179.5 | 5 | 114.6 | 3.49 | 2.28 | 1.20 | 0.66 | 8.0 | 5.3 | 1.05 | 0.09 |
| 59.55 | 41.9 | 0.47 | 1.12 | 83.0 | 7 | 117.8 | 3.55 | 2.31 | 1.23 | 0.66 | 13.4 | 8.8 | UnDef | 0.31 |
| 60.53 | 37.0 | 0.73 | 1.97 | 5.2 | 6 | 114.6 | 3.60 | 2.34 | 1.27 | 0.65 | 14.2 | 9.3 | 2.67 | 0.23 |
| 61.52 | 16.5 | 0.30 | 1.81 | 152.6 | 6 | 114.6 | 3.66 | 2.36 | 1.30 | 0.65 | 6.3 | 4.1 | 1.03 | 0.09 |
| 62.42 | 23.9 | 0.34 | 1.41 | 138.8 | 6 | 114.6 | 3.71 | 2.39 | 1.32 | 0.65 | 9.1 | 5.9 | 1.61 | 0.12 |
| 63.32 | 79.3 | 0.86 | 1.09 | 55.4 | 8 | 120.9 | 3.76 | 2.41 | 1.35 | 0.64 | 19.0 | 12.2 | UnDef | 0.19 |
| 64.30 | 169.4 | 1.62 | 0.95 | 34.4 | 9 | 124.1 | 3.82 | 2.44 | 1.38 | 0.64 | 32.5 | 20.8 | UnDef | 0.33 |
| 65.29 | 123.0 | 1.49 | 1.21 | 40.0 | 8 | 120.9 | 3.88 | 2.47 | 1.41 | 0.64 | 29.4 | 18.7 | UnDef | 0.27 |
| 66.27 | 132.1 | 1.19 | 0.90 | 12.1 | 9 | 124.1 | 3.94 | 2.50 | 1.44 | 0.63 | 25.3 | 16.0 | UnDef | 0.23 |
| 67.26 | 138.4 | 0.71 | 0.51 | 15.0 | 9 | 124.1 | 4.01 | 2.53 | 1.48 | 0.63 | 26.5 | 16.7 | UnDef | 0.19 |
| 68.24 | 111.5 | 0.84 | 0.76 | 18.0 | 8 | 120.9 | 4.07 | 2.56 | 1.51 | 0.63 | 26.7 | 16.7 | UnDef | 0.18 |
| 69.22 | 29.3 | 0.65 | 2.22 | 56.1 | 6 | 114.6 | 4.12 | 2.59 | 1.54 | 0.62 | 11.2 | 7.0 | 2.02 | 0.15 |
| 70.21 | 70.9 | 1.19 | 1.67 | 82.5 | 7 | 117.8 | 4.18 | 2.61 | 1.57 | 0.62 | 22.6 | 14.0 | UnDef | 0.44 |
| 71.19 | 44.2 | 0.79 | 1.78 | 136.3 | 7 | 117.8 | 4.24 | 2.64 | 1.60 | 0.62 | 14.1 | 8.7 | UnDef | 0.30 |
| 72.18 | 41.8 | 0.85 | 2.03 | 51.2 | 6 | 114.6 | 4.30 | 2.67 | 1.63 | 0.61 | 16.0 | 9.8 | 3.00 | 0.26 |
| 73.16 | 27.6 | 0.70 | 2.55 | 142.9 | 6 | 114.6 | 4.35 | 2.69 | 1.66 | 0.61 | 10.6 | 6.4 | 1.86 | 0.13 |
| 74.15 | 36.2 | 0.84 | 2.31 | 111.9 | 6 | 114.6 | 4.41 | 2.72 | 1.69 | 0.61 | 13.9 | 8.4 | 2.54 | 0.20 |
| 75.13 | 42.6 | 1.10 | 2.57 | 88.3 | 6 | 114.6 | 4.47 | 2.74 | 1.72 | 0.60 | 16.3 | 9.8 | 3.05 | 0.27 |
| 76.11 | 34.2 | 0.87 | 2.55 | 61.1 | 6 | 114.6 | 4.52 | 2.77 | 1.75 | 0.60 | 13.1 | 7.9 | 2.38 | 0.17 |
| 77.10 | 33.1 | 0.90 | 2.72 | 144.9 | 6 | 114.6 | 4.58 | 2.80 | 1.78 | 0.60 | 12.7 | 7.6 | 2.28 | 0.16 |
| 78.08 | 35.2 | 1.00 | 2.83 | 133.1 | 6 | 114.6 | 4.63 | 2.82 | 1.81 | 0.60 | 13.5 | 8.0 | 2.44 | 0.18 |
| 79.07 | 131.0 | 1.20 | 0.91 | 173.0 | 9 | 124.1 | 4.69 | 2.85 | 1.84 | 0.59 | 25.1 | 14.9 | UnDef | 0.23 |
| 80.05 | 276.6 | 1.72 | 0.62 | 16.3 | 9 | 124.1 | 4.75 | 2.88 | 1.87 | 0.59 | 53.0 | 31.2 | UnDef | 0.00 |
| 81.04 | 284.7 | 2.24 | 0.79 | 34.3 | 9 | 124.1 | 4.82 | 2.91 | 1.91 | 0.59 | 54.5 | 32.0 | UnDef | 0.00 |
| 82.02 | 286.7 | 1.95 | 0.68 | 11.0 | 9 | 124.1 | 4.88 | 2.94 | 1.94 | 0.58 | 54.9 | 32.0 | UnDef | 0.00 |
| 83.00 | 244.8 | 1.87 | 0.76 | 6.9 | 9 | 124.1 | 4.94 | 2.97 | 1.97 | 0.58 | 46.9 | 27.2 | UnDef | 0.00 |
| 83.99 | 253.9 | 2.05 | 0.81 | 17.3 | 9 | 124.1 | 5.00 | 3.00 | 2.00 | 0.58 | 48.6 | 28.1 | UnDef | 0.00 |
| 84.97 | 241.3 | 1.79 | 0.74 | 25.8 | 9 | 124.1 | 5.06 | 3.03 | 2.03 | 0.57 | 46.2 | 26.5 | UnDef | 0.00 |
| 85.96 | 222.6 | 1.25 | 0.56 | 32.8 | 9 | 124.1 | 5.12 | 3.06 | 2.06 | 0.57 | 42.6 | 24.4 | UnDef | 0.36 |
| 86.94 | 228.1 | 1.21 | 0.53 | 31.6 | 9 | 124.1 | 5.18 | 3.09 | 2.09 | 0.57 | 43.7 | 24.8 | UnDef | 0.37 |
| 87.93 | 228.6 | 1.57 | 0.69 | 45.2 | 9 | 124.1 | 5.24 | 3.12 | 2.12 | 0.57 | 43.8 | 24.8 | UnDef | 0.41 |
| 88.91 | 255.7 | 1.71 | 0.67 | 8.5 | 9 | 124.1 | 5.30 | 3.15 | 2.15 | 0.56 | 49.0 | 27.6 | UnDef | 0.00 |
| 89.89 | 233.4 | 2.08 | 0.89 | 18.6 | 9 | 124.1 | 5.37 | 3.18 | 2.18 | 0.56 | 44.7 | 25.1 | UnDef | 0.00 |
| 90.88 | 194.6 | 1.67 | 0.86 | 39.6 | 9 | 124.1 | 5.43 | 3.21 | 2.21 | 0.56 | 37.3 | 20.8 | UnDef | 0.35 |
| 91.86 | 265.7 | 1.75 | 0.66 | 10.7 | 9 | 124.1 | 5.49 | 3.24 | 2.24 | 0.56 | 50.9 | 28.3 | UnDef | 0.00 |
| 92.85 | 305.8 | 2.00 | 0.65 | 15.6 | 9 | 124.1 | 5.55 | 3.27 | 2.27 | 0.55 | 58.6 | 32.4 | UnDef | 0.00 |
| 93.83 | 219.5 | 0.74 | 0.34 | 33.8 | 9 | 124.1 | 5.61 | 3.30 | 2.31 | 0.55 | 42.0 | 23.1 | UnDef | 0.23 |
| 94.82 | 163.1 | 1.31 | 0.80 | 10.3 | 9 | 124.1 | 5.67 | 3.33 | 2.34 | 0.55 | 31.2 | 17.1 | UnDef | 0.27 |
| 95.80 | 135.0 | 1.78 | 1.32 | 2.4 | 8 | 120.9 | 5.73 | 3.36 | 2.37 | 0.55 | 32.3 | 17.6 | UnDef | 0.35 |
| 96.78 | 169.5 | 1.35 | 0.80 | -0.9 | 9 | 124.1 | 5.79 | 3.39 | 2.40 | 0.54 | 32.5 | 17.6 | UnDef | 0.28 |
| 97.77 | 153.7 | 1.62 | 1.06 | -6.5 | 8 | 120.9 | 5.85 | 3.42 | 2.43 | 0.54 | 36.8 | 19.9 | UnDef | 0.31 |
| 98.75 | 147.6 | 1.62 | 1.10 | -0.9 | 8 | 120.9 | 5.91 | 3.45 | 2.46 | 0.54 | 35.3 | 19.0 | UnDef | 0.31 |

Gregg In Situ, Inc.
Interpretation Output - Release 1.00.19e
Run No: 03-0630-0942-1299
Job No: 03-151SH
Client: URS
Project: CPT SITE INVESTIGATION
Site: PIER T LNG
Location: CPT-01
Engineer: T. O'BRIEN
CPT Date: 03/25/06
CPT Time: 07:27
CPT File: 151C01.COR
Northing (m): 0.000
Easting (m): 0.000
Elevation (m): 0.000

Water Table (m): 6.10 (ft): 20.0
Su Nkt used: 12.50
Averaging Increment (m): 0.30
Phi Method : Robertson and Campanella, 1983
Dr Method : Jamiolkowski - All Sands
State Parameter M: 1.20
Used Unit Weights Assigned to Soil Zones
Values of 1.0E9 or UnDef are printed for parameters that are not valid for the material type (SBT)

| Depth (ft) | k (cm/s) | Bq | Qtn | Rfn | SBTn | Qc1N | DeltaQc1N | Qc1Ncs | Fc (%) | Phi (Deg) | Dr (%) | OCR | State Param | Del(n1)60 | (N1)60cs |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 0.49 | 5.0E-03 | 0.00 | 1000.0 | 0.79 | 10 | 163.1 | 0.0 | 163.1 | 0.0 | 50 | 95.0 | 1.0 | -0.38 | 0.0 | 40.8 |
| 1.48 | 5.0E-03 | 0.00 | 1000.0 | 1.32 | 9 | 314.5 | 0.0 | 314.5 | 1.8 | 50 | 95.0 | 1.0 | -0.44 | 0.0 | 78.6 |
| 2.46 | 5.0E-04 | 0.00 | 736.2 | 1.95 | 12 | 209.0 | UnDef | UnDef | 0.0 | 50 | 95.0 | 1.0 | -0.47 | UnDef | UnDef |
| 3.44 | 5.0E-04 | 0.00 | 286.5 | 1.95 | 9 | 113.4 | 11.7 | 125.1 | 8.5 | 46 | 74.3 | 1.0 | -0.37 | 2.4 | 40.2 |
| 4.43 | 5.0E-05 | 0.00 | 142.8 | 1.68 | 9 | 72.2 | 15.8 | 88.0 | 11.7 | 44 | 57.9 | 10.0 | -0.28 | 3.6 | 31.8 |
| 5.41 | 5.0E-05 | 0.00 | 84.0 | 1.97 | 7 | 47.0 | 24.4 | 71.4 | 17.8 | 42 | 45.6 | 10.0 | -0.24 | 5.0 | 23.4 |
| 6.40 | 5.0E-06 | 0.00 | 45.1 | 2.35 | 7 | 27.6 | 39.3 | 66.9 | 27.0 | UnDef | UnDef | 6.0 | UnDef | 7.8 | 21.4 |
| 7.30 | 5.0E-06 | 0.01 | 25.2 | 2.88 | 6 | 16.8 | 67.1 | 83.8 | 38.6 | UnDef | UnDef | 6.0 | UnDef | 8.2 | 16.4 |
| 8.20 | 5.0E-06 | 0.02 | 20.9 | 2.03 | 6 | 14.9 | 59.4 | 74.3 | 37.2 | UnDef | UnDef | 6.0 | UnDef | 7.3 | 14.5 |
| 9.19 | 5.0E-05 | 0.00 | 84.3 | 3.08 | 7 | 61.1 | 54.2 | 115.4 | 22.6 | 42 | 53.2 | 10.0 | -0.32 | 10.0 | 33.9 |
| 10.17 | 5.0E-06 | 0.00 | 106.1 | 3.75 | 12 | 80.7 | UnDef | UnDef | 0.0 | UnDef | UnDef | 10.0 | UnDef | UnDef | UnDef |
| 11.15 | 5.0E-07 | -0.01 | 62.9 | 4.37 | 6 | 50.4 | 110.5 | 160.8 | 30.7 | UnDef | UnDef | 10.0 | UnDef | 24.8 | 57.6 |
| 12.14 | 5.0E-07 | -0.01 | 52.5 | 4.70 | 6 | 43.9 | 156.6 | 200.6 | 34.2 | UnDef | UnDef | 10.0 | UnDef | 27.4 | 56.1 |
| 13.21 | 5.0E-08 | -0.01 | 43.8 | 4.76 | 6 | 38.4 | 153.4 | 191.8 | 37.1 | UnDef | UnDef | 6.0 | UnDef | 37.5 | 75.1 |
| 14.27 | 5.0E-07 | -0.04 | 14.6 | 3.24 | 4 | 13.8 | 55.4 | 69.2 | 50.9 | UnDef | UnDef | 6.0 | UnDef | 9.0 | 18.1 |
| 15.26 | 5.0E-06 | -0.05 | 9.9 | 2.11 | 6 | 10.0 | 40.1 | 50.2 | 53.0 | UnDef | UnDef | 3.0 | UnDef | 4.9 | 9.8 |
| 16.24 | 5.0E-06 | -0.03 | 6.6 | 1.70 | 4 | 7.2 | 28.9 | 36.1 | 59.9 | UnDef | UnDef | 3.0 | UnDef | 3.5 | 7.1 |
| 17.22 | 5.0E-06 | 0.01 | 6.3 | 2.10 | 4 | 7.1 | 28.4 | 35.5 | 64.4 | UnDef | UnDef | 3.0 | UnDef | 3.5 | 6.9 |
| 18.21 | 5.0E-03 | 0.00 | 75.7 | 0.79 | 9 | 77.0 | 16.1 | 93.0 | 11.5 | 40 | 59.8 | 1.0 | -0.14 | 2.3 | 21.1 |
| 19.19 | 5.0E-02 | 0.00 | 282.0 | 0.94 | 9 | 292.1 | 0.0 | 292.1 | 3.9 | 46 | 95.0 | 1.0 | -0.28 | 0.0 | 57.2 |
| 20.18 | 5.0E-02 | 0.00 | 246.2 | 0.85 | 9 | 261.5 | 0.0 | 261.5 | 4.0 | 46 | 94.8 | 1.0 | -0.26 | 0.0 | 51.2 |
| 21.16 | 5.0E-02 | 0.00 | 193.5 | 0.86 | 9 | 208.5 | 1.5 | 210.0 | 5.3 | 44 | 88.3 | 1.0 | -0.24 | 0.2 | 41.0 |
| 22.15 | 5.0E-02 | 0.00 | 150.3 | 0.81 | 9 | 164.2 | 6.6 | 170.8 | 6.4 | 44 | 81.5 | 1.0 | -0.21 | 0.8 | 32.9 |
| 23.13 | 5.0E-03 | 0.00 | 115.9 | 1.06 | 9 | 128.4 | 19.1 | 147.5 | 9.8 | 42 | 74.4 | 1.0 | -0.21 | 2.8 | 34.2 |
| 24.11 | 5.0E-02 | 0.00 | 129.7 | 1.02 | 9 | 145.3 | 16.4 | 161.6 | 8.8 | 44 | 78.0 | 1.0 | -0.21 | 1.9 | 30.4 |
| 25.10 | 5.0E-03 | 0.00 | 98.5 | 0.97 | 9 | 111.9 | 19.5 | 131.4 | 10.6 | 42 | 70.5 | 1.0 | -0.18 | 2.8 | 30.2 |
| 26.08 | 5.0E-02 | 0.00 | 106.0 | 0.81 | 9 | 121.7 | 14.0 | 135.7 | 8.9 | 42 | 72.9 | 1.0 | -0.17 | 1.6 | 25.5 |
| 27.07 | 5.0E-03 | 0.00 | 94.2 | 1.17 | 9 | 109.5 | 26.4 | 135.9 | 12.3 | 42 | 69.9 | 1.0 | -0.20 | 3.7 | 30.5 |
| 28.05 | 5.0E-03 | 0.00 | 64.6 | 1.15 | 7 | 76.3 | 30.5 | 106.8 | 15.7 | 40 | 59.5 | 1.0 | -0.16 | 4.1 | 22.7 |
| 29.04 | 5.0E-03 | 0.00 | 67.3 | 1.12 | 7 | 80.3 | 29.6 | 109.9 | 15.1 | 40 | 61.0 | 1.0 | -0.16 | 4.0 | 23.6 |
| 30.02 | 5.0E-03 | 0.00 | 64.4 | 1.10 | 7 | 77.6 | 29.9 | 107.5 | 15.4 | 40 | 60.0 | 1.0 | -0.15 | 4.0 | 23.0 |
| 31.00 | 5.0E-03 | 0.00 | 58.1 | 1.17 | 7 | 70.9 | 33.2 | 104.1 | 17.0 | 40 | 57.4 | 1.0 | -0.15 | 4.3 | 21.7 |
| 31.99 | 5.0E-03 | 0.00 | 51.9 | 0.88 | 7 | 64.2 | 26.5 | 90.7 | 15.9 | 38 | 54.6 | 1.0 | -0.11 | 3.5 | 19.2 |
| 32.97 | 5.0E-03 | 0.00 | 46.1 | 0.85 | 7 | 57.7 | 27.4 | 85.1 | 17.0 | 38 | 51.5 | 1.0 | -0.10 | 3.6 | 17.7 |
| 33.96 | 5.0E-03 | 0.00 | 39.7 | 0.74 | 7 | 50.4 | 26.2 | 76.7 | 17.8 | 38 | 47.7 | 1.0 | -0.08 | 3.4 | 15.7 |
| 34.94 | 5.0E-03 | 0.00 | 41.8 | 1.13 | 7 | 53.5 | 37.8 | 91.3 | 20.5 | 38 | 49.3 | 1.0 | -0.11 | 4.6 | 17.7 |
| 35.92 | 5.0E-03 | 0.00 | 40.3 | 1.15 | 7 | 52.1 | 39.4 | 91.5 | 21.1 | 38 | 48.6 | 1.0 | -0.11 | 4.7 | 17.4 |
| 36.91 | 5.0E-03 | 0.00 | 39.8 | 1.14 | 7 | 51.9 | 39.8 | 91.7 | 21.2 | 38 | 48.5 | 1.0 | -0.11 | 4.7 | 17.4 |
| 37.89 | 5.0E-04 | 0.00 | 37.5 | 1.12 | 7 | 49.5 | 40.4 | 89.9 | 21.8 | 38 | 47.1 | 1.0 | -0.10 | 6.3 | 22.5 |
| 38.88 | 5.0E-04 | 0.00 | 34.5 | 1.11 | 7 | 46.0 | 41.9 | 87.8 | 22.8 | 38 | 45.0 | 1.0 | -0.09 | 6.4 | 21.4 |
| 39.86 | 5.0E-03 | 0.00 | 49.5 | 1.05 | 7 | 65.8 | 34.4 | 100.2 | 17.8 | 38 | 55.3 | 1.0 | -0.12 | 4.4 | 20.5 |
| 40.85 | 5.0E-03 | 0.00 | 58.2 | 1.09 | 7 | 77.7 | 34.0 | 111.7 | 16.4 | 40 | 60.0 | 1.0 | -0.14 | 4.5 | 23.5 |

Gregg In Situ, Inc.
Run No: 03-0630-0942-1299
CPT File: 151C01.COR



| Depth (ft) | k (cm/s) | Bq | Qtn | Rfn | SBTn | Qc1N | DeltaQc1N | Qc1Ncs | Fc (%) | Phi (Deg) | Dr (%) | OCR | State Param | Del(n1)60 | (N1)60cs |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 41.83 | 5.0E-03 | 0.00 | 47.8 | 1.13 | 7 | 64.6 | 38.0 | 102.6 | 18.9 | 38 | 54.8 | 1.0 | -0.13 | 4.8 | 20.6 |
| 42.81 | 5.0E-03 | 0.00 | 41.2 | 1.18 | 7 | 56.5 | 42.5 | 99.0 | 21.1 | 38 | 50.9 | 1.0 | -0.12 | 5.1 | 18.9 |
| 43.80 | 5.0E-04 | 0.00 | 33.0 | 1.18 | 7 | 45.9 | 47.7 | 93.7 | 24.1 | 36 | 45.0 | 1.0 | -0.10 | 7.0 | 22.0 |
| 44.78 | 5.0E-03 | 0.00 | 34.6 | 1.12 | 7 | 48.5 | 44.5 | 93.0 | 22.9 | 38 | 46.5 | 1.0 | -0.10 | 5.1 | 16.9 |
| 45.77 | 5.0E-04 | 0.00 | 31.7 | 1.15 | 7 | 44.9 | 47.9 | 92.8 | 24.3 | 36 | 44.3 | 1.0 | -0.09 | 7.0 | 21.6 |
| 46.75 | 5.0E-03 | 0.00 | 34.4 | 1.06 | 7 | 49.0 | 43.1 | 92.1 | 22.5 | 38 | 46.8 | 1.0 | -0.09 | 5.0 | 16.9 |
| 47.74 | 5.0E-03 | 0.00 | 38.1 | 1.00 | 7 | 54.4 | 39.1 | 93.5 | 20.7 | 38 | 49.8 | 1.0 | -0.10 | 4.7 | 18.0 |
| 48.72 | 5.0E-03 | 0.00 | 37.3 | 1.10 | 7 | 53.7 | 43.6 | 97.3 | 21.8 | 38 | 49.5 | 1.0 | -0.10 | 5.1 | 18.3 |
| 49.70 | 5.0E-03 | 0.00 | 34.3 | 1.15 | 7 | 49.8 | 47.6 | 97.4 | 23.3 | 36 | 47.3 | 1.0 | -0.10 | 5.4 | 17.6 |
| 50.69 | 5.0E-03 | 0.00 | 33.1 | 1.10 | 7 | 48.5 | 46.9 | 95.4 | 23.4 | 36 | 46.6 | 1.0 | -0.09 | 5.3 | 17.1 |
| 51.67 | 5.0E-03 | 0.00 | 37.6 | 1.04 | 7 | 55.2 | 42.1 | 97.3 | 21.2 | 38 | 50.3 | 1.0 | -0.10 | 5.0 | 18.5 |
| 52.66 | 5.0E-03 | 0.00 | 41.1 | 1.07 | 7 | 60.7 | 41.8 | 102.5 | 20.3 | 38 | 53.0 | 1.0 | -0.11 | 5.1 | 19.9 |
| 53.64 | 5.0E-04 | 0.00 | 26.1 | 2.04 | 6 | 39.6 | 125.3 | 164.9 | 33.5 | 36 | 40.7 | 1.0 | -0.12 | 11.7 | 24.6 |
| 54.63 | 5.0E-03 | 0.00 | 30.1 | 0.99 | 7 | 45.6 | 46.0 | 91.6 | 23.8 | 36 | 44.8 | 1.0 | -0.07 | 5.1 | 16.3 |
| 55.61 | 5.0E-03 | 0.00 | 29.1 | 1.05 | 7 | 44.4 | 49.6 | 94.0 | 24.8 | 36 | 44.0 | 1.0 | -0.07 | 5.3 | 16.2 |
| 56.59 | 5.0E-04 | 0.00 | 18.3 | 1.41 | 6 | 29.0 | 116.1 | 145.2 | 35.2 | 32 | 31.8 | 1.0 | -0.05 | 9.5 | 18.9 |
| 57.58 | 5.0E-05 | 0.06 | 8.4 | 2.50 | 4 | 14.5 | 58.1 | 72.7 | 59.7 | 30 | 30.0 | 3.0 | 0.00 | 5.7 | 11.4 |
| 58.56 | 5.0E-06 | 0.33 | 5.8 | 2.56 | 4 | 10.8 | 43.1 | 53.8 | 70.1 | UnDef | UnDef | 1.5 | UnDef | 5.3 | 10.5 |
| 59.55 | 5.0E-04 | 0.04 | 16.6 | 1.22 | 6 | 26.9 | 107.8 | 134.7 | 35.5 | 32 | 30.0 | 1.0 | -0.03 | 8.8 | 17.6 |
| 60.53 | 5.0E-05 | -0.03 | 14.3 | 2.19 | 6 | 23.7 | 94.8 | 118.5 | 45.5 | 32 | 30.0 | 6.0 | -0.06 | 9.3 | 18.6 |
| 61.52 | 5.0E-05 | 0.27 | 5.4 | 2.33 | 4 | 10.5 | 42.1 | 52.6 | 70.0 | 30 | 30.0 | 1.5 | 0.08 | 4.1 | 8.2 |
| 62.42 | 5.0E-05 | 0.15 | 8.4 | 1.66 | 6 | 15.1 | 60.5 | 75.6 | 53.5 | 30 | 30.0 | 3.0 | 0.03 | 5.9 | 11.8 |
| 63.32 | 5.0E-03 | 0.00 | 31.3 | 1.14 | 7 | 50.0 | 54.2 | 104.2 | 24.5 | 36 | 47.4 | 1.0 | -0.09 | 5.9 | 18.1 |
| 64.30 | 5.0E-02 | 0.00 | 67.9 | 0.98 | 9 | 106.1 | 33.4 | 139.5 | 14.0 | 40 | 69.0 | 1.0 | -0.15 | 3.7 | 24.4 |
| 65.29 | 5.0E-03 | 0.00 | 48.2 | 1.25 | 7 | 76.6 | 49.2 | 125.8 | 19.6 | 38 | 59.6 | 1.0 | -0.14 | 6.1 | 24.8 |
| 66.27 | 5.0E-02 | -0.01 | 51.3 | 0.93 | 7 | 81.8 | 36.3 | 118.0 | 16.5 | 38 | 61.5 | 1.0 | -0.12 | 3.8 | 19.8 |
| 67.26 | 5.0E-02 | -0.01 | 53.1 | 0.53 | 9 | 85.1 | 21.3 | 106.4 | 12.5 | 40 | 62.7 | 1.0 | -0.08 | 2.4 | 19.0 |
| 68.24 | 5.0E-03 | -0.01 | 42.0 | 0.79 | 7 | 68.2 | 34.6 | 102.8 | 17.6 | 38 | 56.3 | 1.0 | -0.09 | 4.4 | 21.1 |
| 69.22 | 5.0E-05 | 0.01 | 9.7 | 2.58 | 4 | 17.8 | 71.3 | 89.2 | 56.5 | 30 | 30.0 | 3.0 | -0.03 | 7.0 | 14.0 |
| 70.21 | 5.0E-04 | 0.02 | 25.5 | 1.78 | 7 | 42.9 | 113.9 | 156.8 | 32.2 | 34 | 43.0 | 1.0 | -0.10 | 11.7 | 25.6 |
| 71.19 | 5.0E-04 | 0.07 | 15.1 | 1.97 | 6 | 26.6 | 106.5 | 133.1 | 42.9 | 32 | 30.0 | 1.0 | -0.05 | 8.7 | 17.4 |
| 72.18 | 5.0E-05 | 0.00 | 14.1 | 2.26 | 6 | 25.1 | 100.2 | 125.3 | 46.3 | 32 | 30.0 | 6.0 | -0.06 | 9.8 | 19.6 |
| 73.16 | 5.0E-05 | 0.12 | 8.6 | 3.02 | 4 | 16.5 | 65.9 | 82.4 | 62.0 | 30 | 30.0 | 3.0 | -0.01 | 6.4 | 12.9 |
| 74.15 | 5.0E-05 | 0.06 | 11.7 | 2.63 | 4 | 21.5 | 86.0 | 107.5 | 52.5 | 30 | 30.0 | 3.0 | -0.05 | 8.4 | 16.8 |
| 75.13 | 5.0E-05 | 0.03 | 13.9 | 2.87 | 6 | 25.2 | 100.6 | 125.8 | 50.1 | 32 | 30.0 | 6.0 | -0.08 | 9.8 | 19.7 |
| 76.11 | 5.0E-05 | 0.01 | 10.7 | 2.93 | 4 | 20.1 | 80.5 | 100.6 | 56.2 | 30 | 30.0 | 3.0 | -0.05 | 7.9 | 15.8 |
| 77.10 | 5.0E-05 | 0.10 | 10.2 | 3.16 | 4 | 19.3 | 77.4 | 96.7 | 58.7 | 30 | 30.0 | 3.0 | -0.04 | 7.6 | 15.2 |
| 78.08 | 5.0E-05 | 0.08 | 10.8 | 3.26 | 4 | 20.5 | 82.0 | 102.5 | 57.8 | 30 | 30.0 | 3.0 | -0.05 | 8.0 | 16.1 |
| 79.07 | 5.0E-02 | 0.03 | 44.3 | 0.95 | 7 | 76.0 | 42.1 | 118.1 | 18.4 | 38 | 59.4 | 1.0 | -0.10 | 4.3 | 19.1 |
| 80.05 | 5.0E-02 | -0.01 | 94.4 | 0.63 | 9 | 159.5 | 15.6 | 175.1 | 8.3 | 42 | 80.7 | 1.0 | -0.14 | 1.8 | 33.1 |
| 81.04 | 5.0E-02 | 0.00 | 96.2 | 0.80 | 9 | 163.3 | 22.4 | 185.8 | 9.5 | 42 | 81.3 | 1.0 | -0.16 | 2.6 | 34.6 |
| 82.02 | 5.0E-02 | -0.01 | 95.9 | 0.69 | 9 | 163.6 | 18.1 | 181.7 | 8.7 | 42 | 81.4 | 1.0 | -0.15 | 2.1 | 34.2 |
| 83.00 | 5.0E-02 | -0.01 | 80.7 | 0.78 | 9 | 139.0 | 25.6 | 164.6 | 10.8 | 42 | 76.7 | 1.0 | -0.15 | 2.9 | 30.1 |
| 83.99 | 5.0E-02 | -0.01 | 83.0 | 0.82 | 9 | 143.5 | 27.0 | 170.5 | 10.9 | 42 | 77.6 | 1.0 | -0.15 | 3.1 | 31.2 |
| 84.97 | 5.0E-02 | -0.01 | 77.9 | 0.76 | 9 | 135.6 | 25.7 | 161.3 | 11.0 | 42 | 76.0 | 1.0 | -0.14 | 2.9 | 29.5 |
| 85.96 | 5.0E-02 | 0.00 | 71.0 | 0.57 | 9 | 124.5 | 20.0 | 144.5 | 10.2 | 40 | 73.6 | 1.0 | -0.11 | 2.3 | 26.7 |
| 86.94 | 5.0E-02 | 0.00 | 72.1 | 0.54 | 9 | 126.9 | 18.4 | 145.4 | 9.8 | 40 | 74.1 | 1.0 | -0.10 | 2.1 | 27.0 |
| 87.93 | 5.0E-02 | 0.00 | 71.5 | 0.70 | 9 | 126.6 | 25.5 | 152.1 | 11.3 | 40 | 74.0 | 1.0 | -0.13 | 2.9 | 27.7 |
| 88.91 | 5.0E-02 | -0.01 | 79.4 | 0.68 | 9 | 140.9 | 22.6 | 163.6 | 10.2 | 42 | 77.1 | 1.0 | -0.13 | 2.6 | 30.2 |
| 89.89 | 5.0E-02 | -0.01 | 71.7 | 0.91 | 9 | 128.0 | 34.5 | 162.5 | 13.0 | 40 | 74.4 | 1.0 | -0.15 | 3.8 | 28.9 |
| 90.88 | 5.0E-02 | -0.01 | 58.9 | 0.89 | 9 | 106.2 | 37.1 | 143.3 | 14.7 | 40 | 69.0 | 1.0 | -0.13 | 4.0 | 24.8 |
| 91.86 | 5.0E-02 | -0.01 | 80.2 | 0.67 | 9 | 144.4 | 22.2 | 166.6 | 10.0 | 42 | 77.8 | 1.0 | -0.13 | 2.6 | 30.8 |
| 92.85 | 5.0E-02 | -0.01 | 91.7 | 0.67 | 9 | 165.4 | 18.9 | 184.3 | 8.9 | 42 | 81.7 | 1.0 | -0.14 | 2.2 | 34.6 |
| 93.83 | 5.0E-02 | -0.01 | 64.7 | 0.35 | 9 | 118.2 | 0.0 | 118.2 | 5.0 | 40 | 72.1 | 1.0 | -0.06 | 0.0 | 23.1 |
| 94.82 | 5.0E-02 | -0.01 | 47.2 | 0.83 | 7 | 87.4 | 39.4 | 126.8 | 16.6 | 38 | 63.4 | 1.0 | -0.10 | 4.1 | 21.2 |
| 95.80 | 5.0E-03 | -0.02 | 38.4 | 1.38 | 7 | 72.0 | 69.9 | 141.9 | 23.4 | 38 | 57.9 | 1.0 | -0.13 | 7.8 | 25.5 |
| 96.78 | 5.0E-02 | -0.01 | 48.2 | 0.83 | 7 | 90.1 | 39.2 | 129.2 | 16.4 | 38 | 64.3 | 1.0 | -0.10 | 4.1 | 21.8 |
| 97.77 | 5.0E-03 | -0.02 | 43.2 | 1.10 | 7 | 81.3 | 53.6 | 134.9 | 19.9 | 38 | 61.3 | 1.0 | -0.12 | 6.6 | 26.5 |
| 98.75 | 5.0E-03 | -0.02 | 41.0 | 1.14 | 7 | 77.7 | 57.1 | 134.8 | 20.9 | 38 | 60.0 | 1.0 | -0.12 | 6.8 | 25.9 |

Gregg In Situ, Inc.
Interpretation Output - Release 1.00.19e
Run No: 03-0630-0942-1365
Job No: 03-151SH
Client: URS
Project: CPT SITE INVESTIGATION
Site: PIER T LNG
Location: CPT-02
Engineer: T. O'BRIEN
CPT Date: 03/24/06
CPT Time: 12:55
CPT File: 151C02.COR
Northing (m): 0.000
Easting (m): 0.000
Elevation (m): 0.000

Water Table (m): 6.10 (ft): 20.0
Su Nkt used: 12.50
Averaging Increment (m): 0.30
Phi Method : Robertson and Campanella, 1983
Dr Method : Jamiolkowski - All Sands
State Parameter M: 1.20
Used Unit Weights Assigned to Soil Zones
Values of 1.0E9 or UnDef are printed for parameters that are not valid for the material type (SBT)

| Depth (ft) | AvgQt (tsf) | AvgFs (tsf) | AvgRf (%) | AvgUd (ft) | SBT | U.Wt. pcf | TStress (tsf) | EStress (tsf) | Ueq (tsf) | Cn | N60 (blows/ft) | (N1)60 (blows/ft) | Su (tsf) | CRR |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 0.49 | 210.5 | 1.34 | 0.64 | 1.8 | 9 | 124.1 | 0.03 | 0.03 | 0.00 | 2.00 | 40.3 | 80.6 | UnDef | 0.00 |
| 1.48 | 186.0 | 1.41 | 0.76 | 6.9 | 9 | 124.1 | 0.09 | 0.09 | 0.00 | 2.00 | 35.6 | 71.2 | UnDef | 0.00 |
| 2.46 | 176.4 | 2.06 | 1.17 | 8.1 | 8 | 120.9 | 0.15 | 0.15 | 0.00 | 2.00 | 42.2 | 84.4 | UnDef | 0.00 |
| 3.44 | 114.4 | 2.13 | 1.86 | 6.3 | 7 | 117.8 | 0.21 | 0.21 | 0.00 | 2.00 | 36.5 | 73.0 | UnDef | 0.00 |
| 4.43 | 71.9 | 1.29 | 1.79 | 5.1 | 7 | 117.8 | 0.27 | 0.27 | 0.00 | 1.93 | 23.0 | 44.3 | UnDef | 0.39 |
| 5.41 | 48.9 | 0.85 | 1.74 | 3.6 | 7 | 117.8 | 0.33 | 0.33 | 0.00 | 1.75 | 15.6 | 27.3 | UnDef | 0.18 |
| 6.40 | 13.3 | 0.32 | 2.37 | 3.1 | 5 | 114.6 | 0.38 | 0.38 | 0.00 | 1.61 | 6.4 | 10.3 | 1.04 | 0.12 |
| 7.30 | 9.9 | 0.13 | 1.29 | 17.2 | 5 | 114.6 | 0.44 | 0.44 | 0.00 | 1.52 | 4.8 | 7.2 | 0.76 | 0.09 |
| 8.20 | 40.0 | 0.31 | 0.78 | 22.0 | 7 | 117.8 | 0.49 | 0.49 | 0.00 | 1.43 | 12.8 | 18.3 | UnDef | 0.11 |
| 9.19 | 131.7 | 1.65 | 1.26 | 12.5 | 8 | 120.9 | 0.55 | 0.55 | 0.00 | 1.35 | 31.5 | 42.7 | UnDef | 0.00 |
| 10.17 | 90.0 | 1.85 | 2.06 | 11.4 | 7 | 117.8 | 0.61 | 0.61 | 0.00 | 1.29 | 28.7 | 36.9 | UnDef | 0.37 |
| 11.15 | 113.3 | 1.38 | 1.22 | 10.0 | 8 | 120.9 | 0.66 | 0.66 | 0.00 | 1.23 | 27.1 | 33.3 | UnDef | 0.39 |
| 12.14 | 191.7 | 2.10 | 1.09 | 8.3 | 9 | 124.1 | 0.72 | 0.72 | 0.00 | 1.18 | 36.7 | 43.1 | UnDef | 0.00 |
| 13.21 | 317.7 | 5.32 | 1.67 | 9.0 | 8 | 120.9 | 0.79 | 0.79 | 0.00 | 1.13 | 76.1 | 85.6 | UnDef | 0.00 |
| 14.27 | 335.6 | 7.27 | 2.17 | 11.5 | 8 | 120.9 | 0.85 | 0.85 | 0.00 | 1.08 | 80.4 | 87.0 | UnDef | 0.00 |
| 15.26 | 239.8 | 4.17 | 1.74 | 11.1 | 8 | 120.9 | 0.91 | 0.91 | 0.00 | 1.05 | 57.4 | 60.1 | UnDef | 0.00 |
| 16.24 | 242.5 | 2.73 | 1.12 | 9.8 | 9 | 124.1 | 0.97 | 0.97 | 0.00 | 1.01 | 46.5 | 47.1 | UnDef | 0.00 |
| 17.22 | 238.9 | 2.77 | 1.16 | 8.6 | 9 | 124.1 | 1.04 | 1.04 | 0.00 | 0.98 | 45.8 | 45.0 | UnDef | 0.00 |
| 18.21 | 265.8 | 1.15 | 0.43 | 5.0 | 10 | 127.3 | 1.10 | 1.10 | 0.00 | 0.95 | 42.4 | 40.5 | UnDef | 0.00 |
| 19.19 | 259.7 | 0.85 | 0.33 | 1.7 | 10 | 127.3 | 1.16 | 1.16 | 0.00 | 0.93 | 41.5 | 38.5 | UnDef | 0.00 |
| 20.18 | 244.5 | 0.50 | 0.20 | 0.3 | 10 | 127.3 | 1.22 | 1.22 | 0.01 | 0.91 | 39.0 | 35.4 | UnDef | 0.00 |
| 21.16 | 201.9 | 1.25 | 0.62 | -1.1 | 9 | 124.1 | 1.28 | 1.25 | 0.04 | 0.90 | 38.7 | 34.6 | UnDef | 0.00 |
| 22.15 | 148.5 | 1.49 | 1.00 | -1.9 | 9 | 124.1 | 1.35 | 1.28 | 0.07 | 0.88 | 28.4 | 25.2 | UnDef | 0.37 |
| 23.13 | 114.1 | 0.88 | 0.77 | -2.6 | 8 | 120.9 | 1.41 | 1.31 | 0.10 | 0.87 | 27.3 | 23.9 | UnDef | 0.22 |
| 24.11 | 118.3 | 1.20 | 1.01 | -3.0 | 8 | 120.9 | 1.47 | 1.34 | 0.13 | 0.87 | 28.3 | 24.5 | UnDef | 0.25 |
| 25.10 | 136.0 | 1.23 | 0.91 | -2.9 | 9 | 124.1 | 1.53 | 1.37 | 0.16 | 0.86 | 26.0 | 22.3 | UnDef | 0.29 |
| 26.08 | 127.6 | 1.11 | 0.87 | -2.8 | 9 | 124.1 | 1.59 | 1.40 | 0.19 | 0.85 | 24.4 | 20.7 | UnDef | 0.26 |
| 27.07 | 101.7 | 0.97 | 0.95 | -2.3 | 8 | 120.9 | 1.65 | 1.43 | 0.22 | 0.84 | 24.3 | 20.4 | UnDef | 0.20 |
| 28.05 | 60.7 | 0.62 | 1.02 | -2.2 | 7 | 117.8 | 1.71 | 1.45 | 0.25 | 0.83 | 19.4 | 16.1 | UnDef | 0.13 |
| 29.04 | 56.0 | 0.55 | 0.99 | 0.6 | 7 | 117.8 | 1.76 | 1.48 | 0.28 | 0.82 | 17.9 | 14.7 | UnDef | 0.13 |
| 30.02 | 61.8 | 0.64 | 1.04 | 2.1 | 7 | 117.8 | 1.82 | 1.51 | 0.31 | 0.81 | 19.7 | 16.1 | UnDef | 0.14 |
| 31.00 | 44.8 | 0.55 | 1.23 | 2.8 | 7 | 117.8 | 1.88 | 1.54 | 0.34 | 0.81 | 14.3 | 11.5 | UnDef | 0.14 |
| 31.99 | 53.6 | 0.39 | 0.72 | 6.7 | 8 | 120.9 | 1.94 | 1.56 | 0.37 | 0.80 | 12.8 | 10.3 | UnDef | 0.11 |
| 32.97 | 68.7 | 0.69 | 1.01 | 12.0 | 8 | 120.9 | 2.00 | 1.59 | 0.41 | 0.79 | 16.4 | 13.0 | UnDef | 0.14 |
| 33.96 | 88.0 | 0.93 | 1.05 | 13.8 | 8 | 120.9 | 2.06 | 1.62 | 0.44 | 0.79 | 21.1 | 16.5 | UnDef | 0.18 |
| 34.94 | 71.4 | 0.73 | 1.03 | 13.5 | 8 | 120.9 | 2.12 | 1.65 | 0.47 | 0.78 | 17.1 | 13.3 | UnDef | 0.15 |
| 35.92 | 83.0 | 0.74 | 0.89 | 12.5 | 8 | 120.9 | 2.18 | 1.68 | 0.50 | 0.77 | 19.9 | 15.3 | UnDef | 0.15 |
| 36.91 | 84.4 | 0.84 | 1.00 | 13.7 | 8 | 120.9 | 2.24 | 1.71 | 0.53 | 0.77 | 20.2 | 15.5 | UnDef | 0.16 |
| 37.89 | 83.7 | 0.86 | 1.03 | 16.2 | 8 | 120.9 | 2.30 | 1.74 | 0.56 | 0.76 | 20.0 | 15.2 | UnDef | 0.17 |
| 38.88 | 60.5 | 0.67 | 1.10 | 16.7 | 7 | 117.8 | 2.35 | 1.76 | 0.59 | 0.75 | 19.3 | 14.5 | UnDef | 0.15 |
| 39.86 | 49.0 | 0.43 | 0.88 | 12.9 | 7 | 117.8 | 2.41 | 1.79 | 0.62 | 0.75 | 15.6 | 11.7 | UnDef | 0.12 |
| 40.85 | 55.9 | 0.53 | 0.96 | 8.4 | 7 | 117.8 | 2.47 | 1.82 | 0.65 | 0.74 | 17.8 | 13.2 | UnDef | 0.13 |

regg In Situ, Inc.
un No: 03-0630-0942-1365
PT File: 151C02.COR



| epth (ft) | AvgQt (tsf) | AvgFs (tsf) | AvgRf (%) | AvgUd (ft) | SBT | U.Wt. pcf | TStress (tsf) | EStress (tsf) | Ueq (tsf) | Cn | N60 (blows/ft) | (N1)60 (blows/ft) | Su (tsf) | CRR |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1.83 | 59.1 | 0.57 | 0.96 | 16.2 | 7 | 117.8 | 2.53 | 1.85 | 0.68 | 0.74 | 18.9 | 13.9 | UnDef | 0.14 |
| 2.81 | 58.7 | 0.65 | 1.10 | 22.4 | 7 | 117.8 | 2.59 | 1.87 | 0.71 | 0.73 | 18.7 | 13.7 | UnDef | 0.15 |
| 3.80 | 47.8 | 0.59 | 1.24 | 20.6 | 7 | 117.8 | 2.64 | 1.90 | 0.74 | 0.73 | 15.3 | 11.1 | UnDef | 0.18 |
| 4.78 | 51.9 | 0.99 | 1.91 | 13.8 | 7 | 117.8 | 2.70 | 1.93 | 0.77 | 0.72 | 16.6 | 11.9 | UnDef | 0.44 |
| 5.77 | 68.5 | 1.06 | 1.54 | 19.0 | 7 | 117.8 | 2.76 | 1.96 | 0.80 | 0.72 | 21.9 | 15.7 | UnDef | 0.22 |
| 6.75 | 74.9 | 1.23 | 1.64 | 26.4 | 7 | 117.8 | 2.82 | 1.98 | 0.84 | 0.71 | 23.9 | 17.0 | UnDef | 0.25 |
| 7.74 | 88.9 | 1.54 | 1.73 | 34.0 | 7 | 117.8 | 2.88 | 2.01 | 0.87 | 0.71 | 28.4 | 20.0 | UnDef | 0.28 |
| 8.72 | 40.3 | 1.29 | 3.21 | 29.8 | 5 | 114.6 | 2.93 | 2.04 | 0.90 | 0.70 | 19.3 | 13.5 | 2.99 | 0.32 |
| 9.70 | 81.5 | 0.88 | 1.08 | 12.7 | 8 | 120.9 | 2.99 | 2.06 | 0.93 | 0.70 | 19.5 | 13.6 | UnDef | 0.17 |
| 0.69 | 163.0 | 5.65 | 3.47 | -0.6 | 6 | 114.6 | 3.05 | 2.09 | 0.96 | 0.69 | 62.4 | 43.2 | 12.80 | 0.00 |
| 1.67 | 137.7 | 2.63 | 1.91 | -1.5 | 7 | 117.8 | 3.11 | 2.12 | 0.99 | 0.69 | 44.0 | 30.2 | UnDef | 0.46 |
| 2.66 | 29.1 | 1.07 | 3.68 | 6.5 | 5 | 114.6 | 3.16 | 2.14 | 1.02 | 0.68 | 13.9 | 9.5 | 2.08 | 0.00 |
| 3.64 | 46.6 | 1.49 | 3.20 | 31.2 | 5 | 114.6 | 3.22 | 2.17 | 1.05 | 0.68 | 22.3 | 15.1 | 3.47 | 0.42 |
| 4.63 | 32.3 | 1.11 | 3.44 | 19.8 | 5 | 114.6 | 3.28 | 2.19 | 1.08 | 0.68 | 15.5 | 10.4 | 2.32 | 0.00 |
| 5.61 | 31.5 | 1.19 | 3.76 | 13.5 | 5 | 114.6 | 3.33 | 2.22 | 1.11 | 0.67 | 15.1 | 10.1 | 2.26 | 0.00 |
| 6.59 | 16.0 | 0.41 | 2.54 | 18.6 | 5 | 114.6 | 3.39 | 2.25 | 1.14 | 0.67 | 7.7 | 5.1 | 1.01 | 0.00 |
| 7.58 | 14.1 | 0.25 | 1.81 | 58.2 | 5 | 114.6 | 3.44 | 2.27 | 1.17 | 0.66 | 6.8 | 4.5 | 0.85 | 0.09 |
| 8.56 | 15.8 | 0.28 | 1.76 | 128.6 | 6 | 114.6 | 3.50 | 2.30 | 1.20 | 0.66 | 6.1 | 4.0 | 0.99 | 0.09 |
| 9.55 | 84.8 | 0.58 | 0.69 | 59.5 | 8 | 120.9 | 3.56 | 2.32 | 1.23 | 0.66 | 20.3 | 13.3 | UnDef | 0.14 |
| 0.53 | 45.1 | 0.82 | 1.81 | 40.2 | 7 | 117.8 | 3.62 | 2.35 | 1.27 | 0.65 | 14.4 | 9.4 | UnDef | 0.36 |
| 1.52 | 79.2 | 0.78 | 0.99 | 80.0 | 8 | 120.9 | 3.68 | 2.38 | 1.30 | 0.65 | 19.0 | 12.3 | UnDef | 0.17 |
| 2.42 | 184.4 | 1.64 | 0.89 | 64.3 | 9 | 124.1 | 3.73 | 2.41 | 1.32 | 0.64 | 35.3 | 22.8 | UnDef | 0.37 |
| 3.32 | 149.9 | 1.48 | 0.99 | 57.0 | 9 | 124.1 | 3.79 | 2.44 | 1.35 | 0.64 | 28.7 | 18.4 | UnDef | 0.29 |
| 4.30 | 113.4 | 1.09 | 0.96 | 47.9 | 8 | 120.9 | 3.85 | 2.46 | 1.38 | 0.64 | 27.2 | 17.3 | UnDef | 0.21 |
| 5.29 | 133.9 | 1.14 | 0.85 | 35.0 | 9 | 124.1 | 3.91 | 2.49 | 1.41 | 0.63 | 25.6 | 16.2 | UnDef | 0.23 |
| 6.27 | 99.0 | 0.74 | 0.75 | 35.1 | 8 | 120.9 | 3.97 | 2.52 | 1.44 | 0.63 | 23.7 | 14.9 | UnDef | 0.16 |
| 7.26 | 33.6 | 0.52 | 1.55 | 49.2 | 6 | 114.6 | 4.03 | 2.55 | 1.48 | 0.63 | 12.9 | 8.1 | 2.37 | 0.18 |
| 8.24 | 29.2 | 0.40 | 1.37 | 81.2 | 6 | 114.6 | 4.08 | 2.58 | 1.51 | 0.62 | 11.2 | 7.0 | 2.01 | 0.15 |
| 9.22 | 25.5 | 0.39 | 1.55 | 141.6 | 6 | 114.6 | 4.14 | 2.60 | 1.54 | 0.62 | 9.8 | 6.1 | 1.71 | 0.12 |
| 0.21 | 38.1 | 0.51 | 1.33 | 75.6 | 7 | 117.8 | 4.20 | 2.63 | 1.57 | 0.62 | 12.2 | 7.5 | UnDef | 0.22 |
| 1.19 | 27.7 | 0.39 | 1.41 | 122.9 | 6 | 114.6 | 4.25 | 2.66 | 1.60 | 0.61 | 10.6 | 6.5 | 1.88 | 0.13 |
| 2.18 | 35.2 | 0.49 | 1.41 | 150.4 | 7 | 117.8 | 4.31 | 2.68 | 1.63 | 0.61 | 11.2 | 6.9 | UnDef | 0.19 |
| 3.16 | 32.6 | 0.63 | 1.92 | 95.8 | 6 | 114.6 | 4.37 | 2.71 | 1.66 | 0.61 | 12.5 | 7.6 | 2.26 | 0.16 |
| 4.15 | 41.1 | 0.83 | 2.01 | 108.0 | 6 | 114.6 | 4.42 | 2.73 | 1.69 | 0.60 | 15.8 | 9.5 | 2.94 | 0.25 |
| 5.13 | 34.9 | 0.80 | 2.30 | 65.7 | 6 | 114.6 | 4.48 | 2.76 | 1.72 | 0.60 | 13.4 | 8.0 | 2.43 | 0.18 |
| 6.11 | 34.7 | 0.77 | 2.21 | 92.4 | 6 | 114.6 | 4.54 | 2.79 | 1.75 | 0.60 | 13.3 | 8.0 | 2.41 | 0.18 |
| 7.10 | 39.0 | 0.98 | 2.52 | 155.8 | 6 | 114.6 | 4.59 | 2.81 | 1.78 | 0.60 | 14.9 | 8.9 | 2.75 | 0.22 |
| 8.08 | 135.2 | 1.65 | 1.22 | 60.6 | 8 | 120.9 | 4.65 | 2.84 | 1.81 | 0.59 | 32.4 | 19.2 | UnDef | 0.30 |
| 9.07 | 165.0 | 2.05 | 1.24 | 24.3 | 8 | 120.9 | 4.71 | 2.87 | 1.84 | 0.59 | 39.5 | 23.3 | UnDef | 0.37 |
| 0.05 | 162.2 | 1.62 | 1.00 | 16.1 | 9 | 124.1 | 4.77 | 2.90 | 1.87 | 0.59 | 31.1 | 18.3 | UnDef | 0.31 |
| 1.04 | 175.5 | 1.73 | 0.99 | 21.6 | 9 | 124.1 | 4.83 | 2.93 | 1.91 | 0.58 | 33.6 | 19.7 | UnDef | 0.34 |
| 2.02 | 161.0 | 2.27 | 1.41 | 16.7 | 8 | 120.9 | 4.89 | 2.96 | 1.94 | 0.58 | 38.5 | 22.4 | UnDef | 0.41 |
| 3.00 | 173.5 | 2.18 | 1.25 | 12.1 | 8 | 120.9 | 4.95 | 2.99 | 1.97 | 0.58 | 41.5 | 24.0 | UnDef | 0.40 |
| 3.99 | 201.1 | 2.24 | 1.11 | 11.6 | 9 | 124.1 | 5.01 | 3.01 | 2.00 | 0.58 | 38.5 | 22.2 | UnDef | 0.45 |
| 4.97 | 223.5 | 2.34 | 1.05 | 21.4 | 9 | 124.1 | 5.07 | 3.05 | 2.03 | 0.57 | 42.8 | 24.5 | UnDef | 0.00 |
| 5.96 | 248.2 | 1.68 | 0.68 | 23.4 | 9 | 124.1 | 5.13 | 3.08 | 2.06 | 0.57 | 47.5 | 27.1 | UnDef | 0.00 |
| 6.94 | 182.1 | 1.25 | 0.69 | 28.0 | 9 | 124.1 | 5.20 | 3.11 | 2.09 | 0.57 | 34.9 | 19.8 | UnDef | 0.29 |
| 7.93 | 103.6 | 1.85 | 1.78 | 33.9 | 7 | 117.8 | 5.26 | 3.13 | 2.12 | 0.56 | 33.1 | 18.7 | UnDef | 0.00 |
| 8.91 | 127.5 | 1.47 | 1.16 | 26.3 | 8 | 120.9 | 5.31 | 3.16 | 2.15 | 0.56 | 30.5 | 17.2 | UnDef | 0.28 |
| 9.89 | 61.2 | 1.41 | 2.30 | 19.0 | 6 | 114.6 | 5.37 | 3.19 | 2.18 | 0.56 | 23.4 | 13.1 | 4.47 | 0.00 |
| 0.88 | 155.9 | 1.24 | 0.80 | 29.8 | 9 | 124.1 | 5.43 | 3.22 | 2.21 | 0.56 | 29.9 | 16.6 | UnDef | 0.26 |
| 1.86 | 185.4 | 1.28 | 0.69 | 19.7 | 9 | 124.1 | 5.49 | 3.25 | 2.24 | 0.55 | 35.5 | 19.7 | UnDef | 0.29 |
| 2.85 | 150.9 | 1.27 | 0.84 | 12.3 | 9 | 124.1 | 5.55 | 3.28 | 2.27 | 0.55 | 28.9 | 16.0 | UnDef | 0.26 |
| 3.83 | 76.5 | 0.51 | 0.67 | 13.6 | 8 | 120.9 | 5.61 | 3.31 | 2.31 | 0.55 | 18.3 | 10.1 | UnDef | 0.16 |
| 4.82 | 78.4 | 0.88 | 1.13 | 58.6 | 8 | 120.9 | 5.67 | 3.34 | 2.34 | 0.55 | 18.8 | 10.3 | UnDef | 0.30 |
| 5.80 | 239.0 | 1.16 | 0.49 | 41.3 | 9 | 124.1 | 5.73 | 3.37 | 2.37 | 0.55 | 45.8 | 25.0 | UnDef | 0.27 |
| 5.78 | 90.2 | 0.98 | 1.09 | 57.2 | 8 | 120.9 | 5.79 | 3.40 | 2.40 | 0.54 | 21.6 | 11.7 | UnDef | 0.26 |
| 7.77 | 67.0 | 0.79 | 1.17 | 190.3 | 7 | 117.8 | 5.85 | 3.42 | 2.43 | 0.54 | 21.4 | 11.6 | UnDef | 0.00 |
| 3.75 | 214.3 | 1.49 | 0.70 | 50.5 | 9 | 124.1 | 5.91 | 3.45 | 2.46 | 0.54 | 41.1 | 22.1 | UnDef | 0.36 |

iregg In Situ, Inc.
nterpretation Output - Release 1.00.19e
un No: 03-0630-0942-1365
ob No: 03-151SH
lient: URS
roject: CPT SITE INVESTIGATION
ite: PIER T LNG
ocation: CPT-02
ngineer: T. O'BRIEN
PT Date: 03/24/06
PT Time: 12:55
PT File: 151C02.COR
orthing (m): 0.000
asting (m): 0.000
levation (m): 0.000

Water Table (m): 6.10 (ft): 20.0
Su Nkt used: 12.50
Averaging Increment (m): 0.30
Phi Method : Robertson and Campanella, 1983
Dr Method : Jamiolkowski - All Sands
State Parameter M: 1.20
Used Unit Weights Assigned to Soil Zones
Values of 1.0E9 or UnDef are printed for parameters that are not valid for the material type (SBT)

| epth ft) | k (cm/s) | Bq | Qtn | Rfn | SBTn | Qc1N | DeltaQc1N | Qc1Ncs | Fc (%) | Phi (Deg) | Dr (%) | OCR | State Param | Del(n1)60 | (N1)60cs |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 0.49 | 5.0E-02 | 0.00 | 1000.0 | 0.64 | 10 | 403.2 | 0.0 | 403.2 | 0.0 | 50 | 95.0 | 1.0 | -0.36 | 0.0 | 80.6 |
| 1.48 | 5.0E-02 | 0.00 | 1000.0 | 0.76 | 10 | 356.2 | 0.0 | 356.2 | 0.0 | 50 | 95.0 | 1.0 | -0.37 | 0.0 | 71.2 |
| 2.46 | 5.0E-03 | 0.00 | 1000.0 | 1.17 | 9 | 337.8 | 0.0 | 337.8 | 1.2 | 50 | 95.0 | 1.0 | -0.42 | 0.0 | 84.4 |
| 3.44 | 5.0E-04 | 0.00 | 542.0 | 1.87 | 12 | 219.1 | UnDef | UnDef | 0.0 | 50 | 92.8 | 1.0 | -0.43 | UnDef | UnDef |
| .43 | 5.0E-04 | 0.00 | 266.8 | 1.80 | 9 | 135.8 | 13.0 | 148.8 | 8.3 | 46 | 76.1 | 1.0 | -0.35 | 2.6 | 46.9 |
| 5.41 | 5.0E-04 | 0.00 | 148.8 | 1.75 | 9 | 83.8 | 18.6 | 102.4 | 11.8 | 44 | 62.2 | 1.0 | -0.29 | 3.5 | 30.8 |
| .40 | 5.0E-06 | 0.01 | 33.7 | 2.44 | 6 | 21.1 | 51.8 | 72.9 | 31.6 | UnDef | UnDef | 6.0 | UnDef | 8.3 | 18.6 |
| 7.30 | 5.0E-06 | 0.06 | 21.8 | 1.35 | 7 | 14.7 | 36.8 | 51.6 | 31.7 | UnDef | UnDef | 6.0 | UnDef | 5.8 | 13.0 |
| .20 | 5.0E-04 | 0.02 | 80.9 | 0.78 | 9 | 56.0 | 10.4 | 66.4 | 10.9 | 42 | 50.6 | 1.0 | -0.14 | 2.0 | 20.2 |
| .19 | 5.0E-03 | 0.00 | 240.0 | 1.26 | 9 | 174.4 | 6.5 | 180.9 | 6.3 | 46 | 83.2 | 1.0 | -0.30 | 1.0 | 43.6 |
| .17 | 5.0E-04 | 0.00 | 147.7 | 2.07 | 7 | 113.2 | 32.2 | 145.5 | 13.3 | 44 | 70.8 | 1.0 | -0.31 | 5.9 | 42.9 |
| 1.15 | 5.0E-03 | 0.00 | 169.6 | 1.22 | 9 | 136.1 | 12.6 | 148.7 | 8.2 | 44 | 76.1 | 1.0 | -0.26 | 1.9 | 35.2 |
| .14 | 5.0E-02 | 0.00 | 263.6 | 1.10 | 9 | 220.4 | 0.2 | 220.6 | 5.0 | 46 | 89.9 | 1.0 | -0.29 | 0.0 | 43.2 |
| .21 | 5.0E-03 | 0.00 | 401.3 | 1.68 | 9 | 349.8 | 8.0 | 357.8 | 5.8 | 48 | 95.0 | 1.0 | -0.39 | 1.2 | 86.8 |
| .27 | 5.0E-03 | 0.00 | 391.9 | 2.17 | 12 | 355.4 | UnDef | UnDef | 0.0 | 48 | 95.0 | 1.0 | -0.43 | UnDef | UnDef |
| .26 | 5.0E-03 | 0.00 | 261.5 | 1.75 | 9 | 245.5 | 22.6 | 268.1 | 8.2 | 46 | 93.0 | 1.0 | -0.35 | 3.3 | 63.4 |
| .24 | 5.0E-02 | 0.00 | 248.0 | 1.13 | 9 | 240.5 | 3.2 | 243.7 | 5.5 | 46 | 92.4 | 1.0 | -0.29 | 0.4 | 47.5 |
| .22 | 5.0E-02 | 0.00 | 229.8 | 1.16 | 9 | 229.8 | 6.8 | 236.6 | 6.1 | 46 | 91.1 | 1.0 | -0.28 | 0.8 | 45.8 |
| .21 | 5.0E+00 | 0.00 | 241.3 | 0.43 | 9 | 248.3 | 0.0 | 248.3 | 1.3 | 46 | 93.3 | 1.0 | -0.19 | 0.0 | 40.5 |
| .19 | 5.0E+00 | 0.00 | 223.0 | 0.33 | 10 | 236.0 | 0.0 | 236.0 | 0.9 | 46 | 91.9 | 1.0 | -0.16 | 0.0 | 38.5 |
| .18 | 5.0E+00 | 0.00 | 199.9 | 0.20 | 10 | 216.9 | 0.0 | 216.9 | 0.2 | 46 | 89.5 | 1.0 | -0.11 | 0.0 | 35.4 |
| .16 | 5.0E-02 | 0.00 | 160.8 | 0.62 | 9 | 176.9 | 0.0 | 176.9 | 4.7 | 44 | 83.6 | 1.0 | -0.19 | 0.0 | 34.6 |
| .15 | 5.0E-02 | 0.00 | 115.1 | 1.01 | 9 | 128.5 | 18.1 | 146.6 | 9.6 | 42 | 74.5 | 1.0 | -0.20 | 2.1 | 27.3 |
| .13 | 5.0E-03 | 0.00 | 86.2 | 0.78 | 9 | 97.6 | 16.1 | 113.7 | 10.3 | 42 | 66.6 | 1.0 | -0.15 | 2.3 | 26.2 |
| .11 | 5.0E-03 | 0.00 | 87.4 | 1.03 | 9 | 100.2 | 22.8 | 123.0 | 12.0 | 42 | 67.3 | 1.0 | -0.18 | 3.2 | 27.7 |
| .10 | 5.0E-02 | 0.00 | 98.4 | 0.92 | 9 | 113.9 | 18.3 | 132.2 | 10.2 | 42 | 71.0 | 1.0 | -0.18 | 2.1 | 24.4 |
| .08 | 5.0E-02 | 0.00 | 90.2 | 0.88 | 9 | 105.7 | 18.9 | 124.6 | 10.7 | 42 | 68.9 | 1.0 | -0.17 | 2.2 | 22.9 |
| .07 | 5.0E-03 | 0.00 | 70.2 | 0.97 | 9 | 83.3 | 24.7 | 108.1 | 13.6 | 40 | 62.1 | 1.0 | -0.15 | 3.4 | 23.8 |
| .05 | 5.0E-04 | -0.01 | 40.6 | 1.05 | 7 | 49.3 | 34.0 | 83.3 | 20.3 | 38 | 47.0 | 1.0 | -0.11 | 5.5 | 21.6 |
| .04 | 5.0E-04 | 0.00 | 36.6 | 1.02 | 7 | 45.0 | 34.9 | 79.9 | 21.4 | 38 | 44.4 | 1.0 | -0.09 | 5.5 | 20.2 |
| .02 | 5.0E-04 | 0.00 | 39.7 | 1.08 | 7 | 49.2 | 35.7 | 84.9 | 20.7 | 38 | 46.9 | 1.0 | -0.11 | 5.7 | 21.8 |
| .00 | 5.0E-04 | -0.01 | 28.0 | 1.29 | 7 | 35.4 | 52.0 | 87.3 | 27.3 | 36 | 37.5 | 1.0 | -0.09 | 6.8 | 18.4 |
| .99 | 5.0E-03 | 0.00 | 33.1 | 0.75 | 7 | 42.0 | 28.9 | 70.9 | 20.3 | 36 | 42.4 | 1.0 | -0.06 | 3.5 | 13.8 |
| .97 | 5.0E-03 | 0.00 | 41.9 | 1.04 | 7 | 53.3 | 34.7 | 88.0 | 19.8 | 38 | 49.2 | 1.0 | -0.11 | 4.3 | 17.3 |
| .96 | 5.0E-03 | 0.00 | 53.0 | 1.08 | 7 | 67.6 | 33.1 | 100.7 | 17.3 | 40 | 56.1 | 1.0 | -0.15 | 4.3 | 20.8 |
| .94 | 5.0E-03 | 0.00 | 42.0 | 1.06 | 7 | 54.4 | 36.0 | 90.3 | 19.9 | 38 | 49.8 | 1.0 | -0.11 | 4.4 | 17.7 |
| .92 | 5.0E-03 | 0.00 | 48.2 | 0.91 | 7 | 62.7 | 30.0 | 92.7 | 17.1 | 38 | 53.9 | 1.0 | -0.11 | 3.9 | 19.2 |
| .91 | 5.0E-03 | 0.00 | 48.1 | 1.03 | 7 | 63.2 | 33.8 | 96.9 | 18.0 | 38 | 54.1 | 1.0 | -0.12 | 4.3 | 19.8 |
| .89 | 5.0E-03 | 0.00 | 46.9 | 1.06 | 7 | 62.2 | 35.5 | 97.6 | 18.6 | 38 | 53.7 | 1.0 | -0.12 | 4.5 | 19.7 |
| .88 | 5.0E-04 | 0.00 | 33.0 | 1.14 | 7 | 44.6 | 44.8 | 89.4 | 23.8 | 36 | 44.1 | 1.0 | -0.09 | 6.6 | 21.2 |
| .86 | 5.0E-04 | 0.00 | 26.0 | 0.93 | 7 | 35.8 | 42.6 | 78.4 | 25.3 | 34 | 37.9 | 1.0 | -0.05 | 6.0 | 17.7 |
| .85 | 5.0E-04 | -0.01 | 29.4 | 1.00 | 7 | 40.6 | 42.7 | 83.2 | 24.2 | 36 | 41.4 | 1.0 | -0.07 | 6.2 | 19.5 |

Gregg In Situ, Inc.
Run No: 03-0630-0942-1365
CPT File: 151C02.COR



| Depth (ft) | k (cm/s) | Bq | Qtn | Rfn | SBTn | Qc1N | DeltaQc1N | Qc1Ncs | Fc (%) | Phi (Deg) | Dr (%) | OCR | State Param | Del(n1)60 | (N1)60cs |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1.83 | 5.0E-04 | 0.00 | 30.6 | 1.00 | 7 | 42.6 | 42.2 | 84.8 | 23.6 | 36 | 42.8 | 1.0 | -0.08 | 6.3 | 20.2 |
| 2.81 | 5.0E-04 | 0.00 | 30.0 | 1.15 | 7 | 42.0 | 49.3 | 91.2 | 25.2 | 36 | 42.4 | 1.0 | -0.08 | 7.0 | 20.7 |
| 3.80 | 5.0E-04 | 0.00 | 23.8 | 1.31 | 7 | 33.9 | 68.0 | 102.0 | 30.0 | 34 | 36.3 | 1.0 | -0.07 | 7.9 | 19.0 |
| 4.78 | 5.0E-04 | -0.01 | 25.5 | 2.02 | 6 | 36.5 | 120.3 | 156.8 | 33.7 | 34 | 38.4 | 1.0 | -0.12 | 11.0 | 22.9 |
| 5.77 | 5.0E-04 | 0.00 | 33.7 | 1.61 | 7 | 48.0 | 66.9 | 114.9 | 26.8 | 36 | 46.2 | 1.0 | -0.13 | 9.0 | 24.6 |
| 6.75 | 5.0E-04 | 0.00 | 36.4 | 1.70 | 7 | 52.0 | 69.0 | 121.1 | 26.4 | 38 | 48.6 | 1.0 | -0.14 | 9.4 | 26.4 |
| 7.74 | 5.0E-04 | 0.00 | 42.8 | 1.79 | 7 | 61.4 | 67.7 | 129.0 | 24.6 | 38 | 53.3 | 1.0 | -0.16 | 9.8 | 29.8 |
| 8.72 | 5.0E-06 | 0.00 | 18.3 | 3.46 | 6 | 27.6 | 110.5 | 138.1 | 47.3 | UnDef | UnDef | 6.0 | UnDef | 13.5 | 27.0 |
| 9.70 | 5.0E-03 | -0.01 | 38.1 | 1.12 | 7 | 55.5 | 44.4 | 99.9 | 21.6 | 38 | 50.4 | 1.0 | -0.11 | 5.2 | 18.8 |
| 0.69 | 5.0E-05 | -0.01 | 76.5 | 3.53 | 7 | 110.3 | 132.3 | 242.6 | 25.4 | 40 | 70.1 | 10.0 | -0.34 | 22.4 | 65.6 |
| 1.67 | 5.0E-04 | -0.01 | 63.6 | 1.95 | 7 | 92.6 | 66.7 | 159.3 | 20.7 | 40 | 65.1 | 1.0 | -0.21 | 10.7 | 40.9 |
| 2.66 | 5.0E-06 | -0.03 | 12.1 | 4.13 | 1 | 19.5 | UnDef | UnDef | 100.0 | UnDef | UnDef | 3.0 | UnDef | UnDef | UnDef |
| 3.64 | 5.0E-06 | 0.00 | 20.0 | 3.44 | 6 | 30.9 | 123.8 | 154.7 | 45.5 | UnDef | UnDef | 6.0 | UnDef | 15.1 | 30.3 |
| 4.63 | 5.0E-06 | -0.02 | 13.2 | 3.83 | 1 | 21.3 | UnDef | UnDef | 100.0 | UnDef | UnDef | 6.0 | UnDef | UnDef | UnDef |
| 5.61 | 5.0E-06 | -0.02 | 12.7 | 4.20 | 1 | 20.7 | UnDef | UnDef | 100.0 | UnDef | UnDef | 6.0 | UnDef | UnDef | UnDef |
| 6.59 | 5.0E-06 | -0.04 | 5.6 | 3.22 | 1 | 10.4 | UnDef | UnDef | 100.0 | UnDef | UnDef | 1.5 | UnDef | UnDef | UnDef |
| 7.58 | 5.0E-06 | 0.06 | 4.7 | 2.39 | 4 | 9.2 | 36.6 | 45.8 | 74.8 | UnDef | UnDef | 1.5 | UnDef | 4.5 | 9.0 |
| 8.56 | 5.0E-05 | 0.23 | 5.4 | 2.26 | 4 | 10.2 | 40.9 | 51.1 | 69.9 | 30 | 30.0 | 1.5 | 0.08 | 4.0 | 8.0 |
| 9.55 | 5.0E-03 | 0.01 | 35.0 | 0.72 | 7 | 54.4 | 33.4 | 87.8 | 19.2 | 38 | 49.8 | 1.0 | -0.06 | 4.2 | 17.5 |
| 0.53 | 5.0E-04 | 0.00 | 17.7 | 1.97 | 6 | 28.8 | 115.2 | 144.0 | 39.9 | 32 | 31.6 | 1.0 | -0.08 | 9.4 | 18.8 |
| 1.52 | 5.0E-03 | 0.02 | 31.7 | 1.04 | 7 | 50.3 | 48.7 | 99.0 | 23.4 | 36 | 47.6 | 1.0 | -0.08 | 5.5 | 17.8 |
| 2.42 | 5.0E-02 | 0.00 | 75.0 | 0.91 | 9 | 116.3 | 29.1 | 145.4 | 12.5 | 40 | 71.6 | 1.0 | -0.15 | 3.3 | 26.0 |
| 3.32 | 5.0E-02 | 0.00 | 60.0 | 1.02 | 7 | 94.0 | 36.6 | 130.6 | 15.5 | 40 | 65.5 | 1.0 | -0.14 | 3.9 | 22.3 |
| 4.30 | 5.0E-03 | 0.00 | 44.5 | 0.99 | 7 | 70.7 | 40.7 | 111.4 | 18.7 | 38 | 57.3 | 1.0 | -0.11 | 5.1 | 22.4 |
| 5.29 | 5.0E-02 | 0.00 | 52.1 | 0.88 | 7 | 83.0 | 34.1 | 117.1 | 15.9 | 38 | 61.9 | 1.0 | -0.11 | 3.6 | 19.9 |
| 6.27 | 5.0E-03 | 0.00 | 37.7 | 0.78 | 7 | 61.0 | 35.8 | 96.8 | 18.9 | 38 | 53.1 | 1.0 | -0.08 | 4.5 | 19.4 |
| 7.26 | 5.0E-05 | 0.00 | 11.6 | 1.76 | 6 | 20.6 | 82.5 | 103.1 | 46.9 | 30 | 30.0 | 3.0 | -0.02 | 8.1 | 16.1 |
| 8.24 | 5.0E-05 | 0.04 | 9.7 | 1.60 | 6 | 17.8 | 71.2 | 88.9 | 49.6 | 30 | 30.0 | 3.0 | 0.01 | 7.0 | 13.9 |
| 9.22 | 5.0E-05 | 0.14 | 8.2 | 1.85 | 4 | 15.5 | 61.8 | 77.3 | 55.6 | 30 | 30.0 | 3.0 | 0.03 | 6.1 | 12.1 |
| 0.21 | 5.0E-04 | 0.02 | 12.9 | 1.49 | 6 | 23.0 | 91.9 | 114.9 | 42.7 | 32 | 30.0 | 1.0 | -0.02 | 7.5 | 15.0 |
| 1.19 | 5.0E-05 | 0.10 | 8.8 | 1.67 | 6 | 16.6 | 66.5 | 83.2 | 52.5 | 30 | 30.0 | 3.0 | 0.02 | 6.5 | 13.0 |
| 2.18 | 5.0E-04 | 0.10 | 11.5 | 1.60 | 6 | 21.0 | 84.1 | 105.1 | 45.9 | 30 | 30.0 | 1.0 | 0.00 | 6.9 | 13.7 |
| 3.16 | 5.0E-05 | 0.05 | 10.4 | 2.22 | 6 | 19.4 | 77.5 | 96.8 | 52.6 | 30 | 30.0 | 3.0 | -0.02 | 7.6 | 15.2 |
| 4.15 | 5.0E-05 | 0.05 | 13.4 | 2.25 | 6 | 24.3 | 97.4 | 121.7 | 47.2 | 32 | 30.0 | 6.0 | -0.05 | 9.5 | 19.1 |
| 5.13 | 5.0E-05 | 0.01 | 11.0 | 2.63 | 4 | 20.6 | 82.2 | 102.8 | 53.9 | 30 | 30.0 | 3.0 | -0.04 | 8.0 | 16.1 |
| 6.11 | 5.0E-05 | 0.04 | 10.8 | 2.54 | 4 | 20.4 | 81.4 | 101.8 | 53.7 | 30 | 30.0 | 3.0 | -0.04 | 8.0 | 15.9 |
| 7.10 | 5.0E-05 | 0.09 | 12.2 | 2.86 | 4 | 22.8 | 91.1 | 113.9 | 52.8 | 30 | 30.0 | 3.0 | -0.05 | 8.9 | 17.8 |
| 8.08 | 5.0E-03 | 0.00 | 46.0 | 1.26 | 7 | 78.6 | 54.4 | 133.0 | 20.3 | 38 | 60.4 | 1.0 | -0.13 | 6.6 | 25.8 |
| 9.07 | 5.0E-03 | -0.01 | 55.9 | 1.28 | 7 | 95.4 | 51.5 | 146.9 | 18.1 | 40 | 65.9 | 1.0 | -0.16 | 6.6 | 29.9 |
| 0.05 | 5.0E-02 | -0.01 | 54.4 | 1.03 | 7 | 93.3 | 42.1 | 135.4 | 16.6 | 40 | 65.3 | 1.0 | -0.13 | 4.4 | 22.7 |
| 1.04 | 5.0E-02 | -0.01 | 58.3 | 1.01 | 7 | 100.4 | 40.6 | 141.0 | 15.8 | 40 | 67.4 | 1.0 | -0.14 | 4.3 | 24.0 |
| 2.02 | 5.0E-03 | -0.01 | 52.8 | 1.46 | 7 | 91.6 | 61.0 | 152.6 | 20.0 | 40 | 64.8 | 1.0 | -0.16 | 7.5 | 29.9 |
| 3.00 | 5.0E-03 | -0.01 | 56.5 | 1.29 | 7 | 98.3 | 53.0 | 151.3 | 18.1 | 40 | 66.8 | 1.0 | -0.16 | 6.7 | 30.8 |
| 3.99 | 5.0E-02 | -0.01 | 65.0 | 1.14 | 7 | 113.3 | 44.6 | 157.9 | 15.6 | 40 | 70.9 | 1.0 | -0.16 | 4.8 | 26.9 |
| 4.97 | 5.0E-02 | -0.01 | 71.7 | 1.07 | 9 | 125.3 | 40.2 | 165.5 | 14.1 | 40 | 73.7 | 1.0 | -0.16 | 4.4 | 28.9 |
| 5.96 | 5.0E-02 | -0.01 | 79.0 | 0.69 | 9 | 138.5 | 22.9 | 161.4 | 10.3 | 42 | 76.6 | 1.0 | -0.13 | 2.6 | 29.7 |
| 6.94 | 5.0E-02 | -0.01 | 56.9 | 0.71 | 9 | 101.1 | 29.7 | 130.8 | 13.5 | 40 | 67.6 | 1.0 | -0.11 | 3.3 | 23.1 |
| 7.93 | 5.0E-04 | -0.01 | 31.4 | 1.88 | 7 | 57.3 | 109.3 | 166.5 | 29.6 | 36 | 51.3 | 1.0 | -0.13 | 13.0 | 31.7 |
| 8.91 | 5.0E-03 | -0.01 | 38.6 | 1.21 | 7 | 70.2 | 59.1 | 129.2 | 22.1 | 38 | 57.1 | 1.0 | -0.11 | 6.9 | 24.0 |
| 9.89 | 5.0E-05 | -0.03 | 17.5 | 2.52 | 6 | 33.5 | 134.1 | 167.6 | 43.5 | 32 | 36.0 | 6.0 | -0.10 | 13.1 | 26.2 |
| 0.88 | 5.0E-02 | -0.01 | 46.8 | 0.82 | 7 | 85.1 | 38.6 | 123.6 | 16.7 | 38 | 62.6 | 1.0 | -0.10 | 4.0 | 20.7 |
| 1.86 | 5.0E-02 | -0.01 | 55.4 | 0.71 | 9 | 100.7 | 31.1 | 131.7 | 13.8 | 40 | 67.5 | 1.0 | -0.10 | 3.4 | 23.1 |
| 2.85 | 5.0E-02 | -0.01 | 44.3 | 0.88 | 7 | 81.5 | 42.1 | 123.6 | 17.8 | 38 | 61.4 | 1.0 | -0.10 | 4.3 | 20.3 |
| 3.83 | 5.0E-03 | -0.03 | 21.4 | 0.73 | 7 | 41.1 | 54.2 | 95.3 | 26.3 | 34 | 41.8 | 1.0 | -0.02 | 5.6 | 15.6 |
| 4.82 | 5.0E-03 | -0.01 | 21.8 | 1.21 | 7 | 42.0 | 91.2 | 133.2 | 30.6 | 34 | 42.4 | 1.0 | -0.06 | 7.7 | 18.0 |
| 5.80 | 5.0F-02 | 0.00 | 69.3 | 0.50 | 9 | 127.5 | 0.0 | 127.5 | 5.0 | 40 | 74.2 | 1.0 | -0.09 | 0.0 | 25.0 |
| 6.78 | 5.0E-03 | -0.01 | 24.8 | 1.17 | 7 | 47.9 | 77.3 | 125.2 | 28.1 | 34 | 46.2 | 1.0 | -0.07 | 7.4 | 19.1 |
| 7.77 | 5.0E-04 | 0.06 | 17.9 | 1.29 | 6 | 35.5 | 135.2 | 170.7 | 34.7 | 32 | 37.6 | 1.0 | -0.04 | 11.4 | 22.9 |
| 8.75 | 5.0E-02 | 0.00 | 60.4 | 0.71 | 9 | 112.9 | 30.7 | 143.5 | 13.0 | 40 | 70.7 | 1.0 | -0.11 | 3.4 | 25.5 |

Gregg In Situ, Inc. Page: 1a
Interpretation Output Release 1.00.19e
Run No: 03-0630-0942-1420
Job No: 03-151SH
Client: URS
Project: CPT SITE INVESTIGATION
Site: PIER T LNG
Location: CPT-03
Engineer: T. O'BRIEN
CPT Date: 03/24/06
CPT Time: 10:12
CPT File: 151C03.COR
Northing (m): 0.000
Easting (m): 0.000
Elevation (m): 0.000

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Water Table (m): 6.10 (ft): 20.0
Su Nkt used: 12.50
Averaging Increment (m): 0.30
Phi Method : Robertson and Campanella, 1983
Dr Method : Jamiolkowski - All Sands
State Parameter M: 1.20
Used Unit Weights Assigned to Soil Zones
Values of 1.0E9 or UnDef are printed for parameters that are not valid for the material type (SBT)

| Depth (ft) | AvgQt (tsf) | AvgFs (tsf) | AvgRf (%) | AvgUd (ft) | SBT | U.Wt. pcf | TStress (tsf) | EStress (tsf) | Ueq (tsf) | Cn | N60 (blows/ft) | (N1)60 (blows/ft) | Su (tsf) | CRR |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 0.49 | 187.3 | 1.43 | 0.77 | 7.7 | 9 | 124.1 | 0.03 | 0.03 | 0.00 | 2.00 | 35.9 | 71.8 | UnDef | 0.00 |
| 1.48 | 110.0 | 1.40 | 1.27 | 6.7 | 8 | 120.9 | 0.09 | 0.09 | 0.00 | 2.00 | 26.3 | 52.7 | UnDef | 0.00 |
| 2.46 | 26.4 | 0.83 | 3.14 | 2.7 | 5 | 114.6 | 0.15 | 0.15 | 0.00 | 2.00 | 12.6 | 25.3 | 2.10 | 0.00 |
| 3.44 | 67.0 | 1.03 | 1.53 | 3.6 | 7 | 117.8 | 0.21 | 0.21 | 0.00 | 2.00 | 21.4 | 42.7 | UnDef | 0.30 |
| 4.43 | 105.3 | 1.75 | 1.66 | 3.7 | 7 | 117.8 | 0.26 | 0.26 | 0.00 | 1.95 | 33.6 | 65.4 | UnDef | 0.00 |
| 5.41 | 98.2 | 1.51 | 1.53 | 3.1 | 7 | 117.8 | 0.32 | 0.32 | 0.00 | 1.76 | 31.4 | 55.3 | UnDef | 0.00 |
| 6.40 | 25.4 | 0.73 | 2.89 | 1.5 | 5 | 114.6 | 0.38 | 0.38 | 0.00 | 1.62 | 12.2 | 19.8 | 2.00 | 0.14 |
| 7.30 | 20.4 | 0.57 | 2.79 | 1.6 | 5 | 114.6 | 0.43 | 0.43 | 0.00 | 1.52 | 9.8 | 14.9 | 1.60 | 0.14 |
| 8.20 | 17.1 | 0.39 | 2.28 | -0.4 | 5 | 114.6 | 0.48 | 0.48 | 0.00 | 1.44 | 8.2 | 11.8 | 1.33 | 0.12 |
| 9.19 | 4.7 | 0.03 | 0.63 | -2.8 | 1 | 79.6 | 0.53 | 0.53 | 0.00 | 1.37 | 2.3 | 3.1 | 0.34 | 0.08 |
| 0.17 | 4.3 | 0.02 | 0.47 | -1.9 | 1 | 79.6 | 0.57 | 0.57 | 0.00 | 1.33 | 2.1 | 2.7 | 0.30 | 0.00 |
| 1.15 | 4.0 | 0.02 | 0.50 | 0.0 | 1 | 79.6 | 0.61 | 0.61 | 0.00 | 1.28 | 1.9 | 2.5 | 0.27 | 0.00 |
| 2.14 | 5.4 | 0.03 | 0.62 | 3.0 | 1 | 79.6 | 0.65 | 0.65 | 0.00 | 1.24 | 2.6 | 3.2 | 0.38 | 0.08 |
| 3.21 | 5.2 | 0.02 | 0.38 | 5.2 | 1 | 79.6 | 0.69 | 0.69 | 0.00 | 1.20 | 2.5 | 3.0 | 0.36 | 0.00 |
| 4.27 | 6.4 | 0.05 | 0.78 | 9.6 | 1 | 79.6 | 0.73 | 0.73 | 0.00 | 1.17 | 3.1 | 3.6 | 0.45 | 0.08 |
| 5.26 | 260.5 | 2.29 | 0.88 | 11.4 | 9 | 124.1 | 0.78 | 0.78 | 0.00 | 1.13 | 49.9 | 56.4 | UnDef | 0.00 |
| 6.24 | 305.3 | 4.50 | 1.47 | 7.6 | 8 | 120.9 | 0.84 | 0.84 | 0.00 | 1.09 | 73.1 | 79.6 | UnDef | 0.00 |
| 7.22 | 265.9 | 2.78 | 1.04 | 4.9 | 9 | 124.1 | 0.90 | 0.90 | 0.00 | 1.05 | 50.9 | 53.6 | UnDef | 0.00 |
| 8.21 | 227.4 | 1.38 | 0.61 | 2.7 | 9 | 124.1 | 0.96 | 0.96 | 0.00 | 1.02 | 43.6 | 44.4 | UnDef | 0.00 |
| 9.19 | 221.8 | 1.48 | 0.67 | 0.4 | 9 | 124.1 | 1.03 | 1.03 | 0.00 | 0.99 | 42.5 | 42.0 | UnDef | 0.00 |
| 0.18 | 192.3 | 1.17 | 0.61 | -1.5 | 9 | 124.1 | 1.09 | 1.08 | 0.01 | 0.96 | 36.8 | 35.4 | UnDef | 0.00 |
| 1.16 | 147.1 | 0.89 | 0.61 | -2.1 | 9 | 124.1 | 1.15 | 1.11 | 0.04 | 0.95 | 28.2 | 26.7 | UnDef | 0.33 |
| 2.15 | 110.7 | 0.81 | 0.73 | -2.0 | 8 | 120.9 | 1.21 | 1.14 | 0.07 | 0.94 | 26.5 | 24.8 | UnDef | 0.22 |
| 3.13 | 93.3 | 0.75 | 0.81 | -2.3 | 8 | 120.9 | 1.27 | 1.17 | 0.10 | 0.92 | 22.3 | 20.7 | UnDef | 0.18 |
| 4.11 | 86.0 | 0.61 | 0.71 | -1.7 | 8 | 120.9 | 1.33 | 1.20 | 0.13 | 0.91 | 20.6 | 18.8 | UnDef | 0.16 |
| 5.10 | 53.6 | 0.30 | 0.55 | -0.6 | 8 | 120.9 | 1.39 | 1.23 | 0.16 | 0.90 | 12.8 | 11.6 | UnDef | 0.11 |
| 6.08 | 52.3 | 0.28 | 0.53 | -1.3 | 8 | 120.9 | 1.45 | 1.26 | 0.19 | 0.89 | 12.5 | 11.2 | UnDef | 0.10 |
| 7.07 | 65.9 | 0.47 | 0.71 | -2.2 | 8 | 120.9 | 1.51 | 1.28 | 0.22 | 0.88 | 15.8 | 13.9 | UnDef | 0.12 |
| 8.05 | 64.5 | 0.50 | 0.78 | 3.9 | 8 | 120.9 | 1.56 | 1.31 | 0.25 | 0.87 | 15.5 | 13.5 | UnDef | 0.13 |
| 9.04 | 59.0 | 0.54 | 0.92 | 6.2 | 7 | 117.8 | 1.62 | 1.34 | 0.28 | 0.86 | 18.8 | 16.3 | UnDef | 0.13 |
| 0.02 | 47.8 | 0.39 | 0.81 | 7.9 | 7 | 117.8 | 1.68 | 1.37 | 0.31 | 0.85 | 15.3 | 13.0 | UnDef | 0.11 |
| 1.00 | 46.2 | 0.30 | 0.66 | 9.8 | 7 | 117.8 | 1.74 | 1.40 | 0.34 | 0.85 | 14.8 | 12.5 | UnDef | 0.10 |
| 1.99 | 49.2 | 0.40 | 0.80 | 11.9 | 7 | 117.8 | 1.80 | 1.42 | 0.37 | 0.84 | 15.7 | 13.2 | UnDef | 0.11 |
| 2.97 | 74.8 | 0.65 | 0.86 | 13.4 | 8 | 120.9 | 1.86 | 1.45 | 0.41 | 0.83 | 17.9 | 14.9 | UnDef | 0.14 |
| 3.96 | 108.4 | 0.97 | 0.89 | 14.2 | 8 | 120.9 | 1.92 | 1.48 | 0.44 | 0.82 | 26.0 | 21.3 | UnDef | 0.21 |
| 4.94 | 76.0 | 0.75 | 0.98 | 14.6 | 8 | 120.9 | 1.98 | 1.51 | 0.47 | 0.81 | 18.2 | 14.8 | UnDef | 0.15 |
| 5.92 | 55.9 | 0.57 | 1.02 | 15.4 | 7 | 117.8 | 2.03 | 1.54 | 0.50 | 0.81 | 17.9 | 14.4 | UnDef | 0.13 |
| 6.91 | 59.4 | 0.47 | 0.78 | 12.0 | 8 | 120.9 | 2.09 | 1.56 | 0.53 | 0.80 | 14.2 | 11.4 | UnDef | 0.12 |
| 7.89 | 79.5 | 0.71 | 0.90 | 17.2 | 8 | 120.9 | 2.15 | 1.59 | 0.56 | 0.79 | 19.0 | 15.1 | UnDef | 0.15 |
| 8.88 | 90.0 | 0.82 | 0.91 | 20.1 | 8 | 120.9 | 2.21 | 1.62 | 0.59 | 0.79 | 21.5 | 16.9 | UnDef | 0.17 |
| 9.86 | 75.3 | 0.73 | 0.97 | 20.6 | 8 | 120.9 | 2.27 | 1.65 | 0.62 | 0.78 | 18.0 | 14.0 | UnDef | 0.15 |
| 0.85 | 63.8 | 0.58 | 0.91 | 21.7 | 8 | 120.9 | 2.33 | 1.68 | 0.65 | 0.77 | 15.3 | 11.8 | UnDef | [illegible] |

Gregg In Situ, Inc.
Run No: 03-0630-0942-1420
CPT File: 151C03.COR

| Depth (ft) | AvgQt (tsf) | Avgfs (tsf) | AvgRf (%) | AvgUd (ft) | SBT | U.Wt. pcf | TStress (tsf) | EStress (tsf) | Ueq (tsf) | Cn | N60 (blows/ft) | (N1)60 (blows/ft) | Su (tsf) | CRR |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 41.83 | 63.6 | 0.59 | 0.92 | 21.7 | 8 | 120.9 | 2.39 | 1.71 | 0.68 | 0.77 | 15.2 | 11.6 | UnDef | 0.13 |
| 42.81 | 69.0 | 0.71 | 1.03 | 23.9 | 8 | 120.9 | 2.45 | 1.74 | 0.71 | 0.76 | 16.5 | 12.5 | UnDef | 0.15 |
| 43.80 | 89.3 | 0.75 | 0.84 | 24.0 | 8 | 120.9 | 2.51 | 1.77 | 0.74 | 0.75 | 21.4 | 16.1 | UnDef | 0.16 |
| 44.78 | 90.7 | 0.86 | 0.95 | 25.4 | 8 | 120.9 | 2.57 | 1.80 | 0.77 | 0.75 | 21.7 | 16.2 | UnDef | 0.17 |
| 45.77 | 69.2 | 0.71 | 1.02 | 25.7 | 8 | 120.9 | 2.63 | 1.82 | 0.80 | 0.74 | 16.6 | 12.3 | UnDef | 0.15 |
| 46.75 | 63.5 | 0.58 | 0.92 | 26.2 | 8 | 120.9 | 2.69 | 1.85 | 0.84 | 0.73 | 15.2 | 11.2 | UnDef | 0.14 |
| 47.74 | 71.0 | 0.60 | 0.85 | 28.8 | 8 | 120.9 | 2.75 | 1.88 | 0.87 | 0.73 | 17.0 | 12.4 | UnDef | 0.14 |
| 48.72 | 77.9 | 0.73 | 0.94 | 30.2 | 8 | 120.9 | 2.81 | 1.91 | 0.90 | 0.72 | 18.7 | 13.5 | UnDef | 0.15 |
| 49.70 | 81.9 | 0.78 | 0.95 | 31.1 | 8 | 120.9 | 2.87 | 1.94 | 0.93 | 0.72 | 19.6 | 14.1 | UnDef | 0.16 |
| 50.69 | 75.1 | 0.70 | 0.93 | 32.3 | 8 | 120.9 | 2.93 | 1.97 | 0.96 | 0.71 | 18.0 | 12.8 | UnDef | 0.15 |
| 51.67 | 44.6 | 0.57 | 1.28 | 34.1 | 7 | 117.8 | 2.98 | 2.00 | 0.99 | 0.71 | 14.2 | 10.1 | UnDef | 0.23 |
| 52.66 | 26.1 | 0.20 | 0.76 | 72.7 | 7 | 117.8 | 3.04 | 2.02 | 1.02 | 0.70 | 8.3 | 5.9 | UnDef | 0.15 |
| 53.64 | 35.7 | 0.37 | 1.03 | 62.9 | 7 | 117.8 | 3.10 | 2.05 | 1.05 | 0.70 | 11.4 | 8.0 | UnDef | 0.25 |
| 54.63 | 28.8 | 0.38 | 1.32 | 71.9 | 6 | 114.6 | 3.16 | 2.08 | 1.08 | 0.69 | 11.0 | 7.7 | 2.05 | 0.17 |
| 55.61 | 13.5 | 0.16 | 1.20 | 115.5 | 6 | 114.6 | 3.21 | 2.10 | 1.11 | 0.69 | 5.2 | 3.6 | 0.82 | 0.09 |
| 56.59 | 22.5 | 0.26 | 1.16 | 82.9 | 6 | 114.6 | 3.27 | 2.13 | 1.14 | 0.69 | 8.6 | 5.9 | 1.54 | 0.12 |
| 57.58 | 13.6 | 0.16 | 1.15 | 177.2 | 6 | 114.6 | 3.33 | 2.15 | 1.17 | 0.68 | 5.2 | 3.6 | 0.83 | 0.09 |
| 58.56 | 37.8 | 0.43 | 1.14 | 29.5 | 7 | 117.8 | 3.38 | 2.18 | 1.20 | 0.68 | 12.1 | 8.2 | UnDef | 0.26 |
| 59.55 | 13.2 | 0.20 | 1.54 | 42.4 | 5 | 114.6 | 3.44 | 2.21 | 1.23 | 0.67 | 6.3 | 4.3 | 0.78 | 0.09 |
| 60.53 | 12.0 | 0.12 | 1.02 | 120.4 | 6 | 114.6 | 3.50 | 2.23 | 1.27 | 0.67 | 4.6 | 3.1 | 0.68 | 0.09 |
| 61.52 | 23.0 | 0.28 | 1.21 | 129.2 | 6 | 114.6 | 3.55 | 2.26 | 1.30 | 0.67 | 8.8 | 5.9 | 1.56 | 0.12 |
| 62.42 | 50.0 | 0.53 | 1.07 | 47.1 | 7 | 117.8 | 3.61 | 2.28 | 1.32 | 0.66 | 16.0 | 10.6 | UnDef | 0.20 |
| 63.32 | 181.3 | 1.86 | 1.02 | 51.2 | 9 | 124.1 | 3.66 | 2.31 | 1.35 | 0.66 | 34.7 | 22.9 | UnDef | 0.39 |
| 64.30 | 140.3 | 1.80 | 1.29 | 47.6 | 8 | 120.9 | 3.72 | 2.34 | 1.38 | 0.65 | 33.6 | 22.0 | UnDef | 0.32 |
| 65.29 | 107.8 | 1.35 | 1.25 | 44.6 | 8 | 120.9 | 3.78 | 2.37 | 1.41 | 0.65 | 25.8 | 16.8 | UnDef | 0.24 |
| 66.27 | 109.0 | 1.12 | 1.02 | 23.3 | 8 | 120.9 | 3.84 | 2.40 | 1.44 | 0.65 | 26.1 | 16.9 | UnDef | 0.21 |
| 67.26 | 97.2 | 0.85 | 0.87 | 27.5 | 8 | 120.9 | 3.90 | 2.42 | 1.48 | 0.64 | 23.3 | 15.0 | UnDef | 0.18 |
| 68.24 | 30.5 | 0.51 | 1.69 | 61.9 | 6 | 114.6 | 3.96 | 2.45 | 1.51 | 0.64 | 11.7 | 7.5 | 2.12 | 0.16 |
| 69.22 | 37.6 | 0.37 | 0.98 | 95.1 | 7 | 117.8 | 4.02 | 2.48 | 1.54 | 0.64 | 12.0 | 7.6 | UnDef | 0.23 |
| 70.21 | 37.5 | 0.60 | 1.61 | 69.2 | 7 | 117.8 | 4.07 | 2.51 | 1.57 | 0.63 | 12.0 | 7.6 | UnDef | 0.23 |
| 71.19 | 45.0 | 0.64 | 1.41 | 34.6 | 7 | 117.8 | 4.13 | 2.53 | 1.60 | 0.63 | 14.4 | 9.0 | UnDef | 0.33 |
| 72.18 | 27.8 | 0.58 | 2.09 | 69.3 | 6 | 114.6 | 4.19 | 2.56 | 1.63 | 0.63 | 10.7 | 6.7 | 1.89 | 0.14 |
| 73.16 | 39.7 | 1.01 | 2.54 | 77.7 | 6 | 114.6 | 4.24 | 2.58 | 1.66 | 0.62 | 15.2 | 9.5 | 2.83 | 0.24 |
| 74.15 | 50.1 | 0.84 | 1.67 | 38.0 | 7 | 117.8 | 4.30 | 2.61 | 1.69 | 0.62 | 16.0 | 9.9 | UnDef | 0.41 |
| 75.13 | 32.8 | 1.04 | 3.17 | 47.4 | 5 | 114.6 | 4.36 | 2.64 | 1.72 | 0.62 | 15.7 | 9.7 | 2.28 | 0.00 |
| 76.11 | 50.5 | 1.46 | 2.89 | 47.6 | 6 | 114.6 | 4.42 | 2.66 | 1.75 | 0.61 | 19.3 | 11.9 | 3.69 | 0.40 |
| 77.10 | 100.9 | 1.67 | 1.65 | 24.7 | 7 | 117.8 | 4.47 | 2.69 | 1.78 | 0.61 | 32.2 | 19.6 | UnDef | 0.35 |
| 78.08 | 99.4 | 1.24 | 1.25 | 2.6 | 8 | 120.9 | 4.53 | 2.72 | 1.81 | 0.61 | 23.8 | 14.4 | UnDef | 0.25 |
| 79.07 | 43.0 | 0.94 | 2.19 | -0.1 | 6 | 114.6 | 4.59 | 2.75 | 1.84 | 0.60 | 16.5 | 9.9 | 3.07 | 0.27 |
| 80.05 | 201.3 | 1.81 | 0.90 | 10.4 | 9 | 124.1 | 4.65 | 2.77 | 1.87 | 0.60 | 38.6 | 23.2 | UnDef | 0.40 |
| 81.04 | 253.3 | 2.49 | 0.98 | 26.0 | 9 | 124.1 | 4.71 | 2.80 | 1.91 | 0.60 | 48.5 | 29.0 | UnDef | 0.00 |
| 82.02 | 234.7 | 2.23 | 0.95 | 25.5 | 9 | 124.1 | 4.77 | 2.83 | 1.94 | 0.59 | 45.0 | 26.7 | UnDef | 0.00 |
| 83.00 | 200.3 | 1.98 | 0.99 | 26.8 | 9 | 124.1 | 4.83 | 2.86 | 1.97 | 0.59 | 38.4 | 22.7 | UnDef | 0.42 |
| 83.99 | 137.1 | 1.30 | 0.95 | 42.2 | 9 | 124.1 | 4.89 | 2.89 | 2.00 | 0.59 | 26.3 | 15.4 | UnDef | 0.25 |
| 84.97 | 113.0 | 1.10 | 0.97 | 26.7 | 8 | 120.9 | 4.95 | 2.92 | 2.03 | 0.58 | 27.1 | 15.8 | UnDef | 0.22 |
| 85.96 | 208.0 | 1.77 | 0.85 | 14.3 | 9 | 124.1 | 5.01 | 2.95 | 2.06 | 0.58 | 39.8 | 23.2 | UnDef | 0.40 |
| 86.94 | 255.7 | 2.41 | 0.94 | 39.2 | 9 | 124.1 | 5.07 | 2.98 | 2.09 | 0.58 | 49.0 | 28.4 | UnDef | 0.00 |
| 87.93 | 263.8 | 2.40 | 0.91 | 44.6 | 9 | 124.1 | 5.14 | 3.01 | 2.12 | 0.58 | 50.5 | 29.1 | UnDef | 0.00 |
| 88.91 | 221.1 | 1.86 | 0.84 | 44.8 | 9 | 124.1 | 5.20 | 3.04 | 2.15 | 0.57 | 42.3 | 24.3 | UnDef | 0.43 |
| 89.89 | 251.6 | 1.93 | 0.77 | 49.0 | 9 | 124.1 | 5.26 | 3.07 | 2.18 | 0.57 | 48.2 | 27.5 | UnDef | 0.00 |
| 90.88 | 253.6 | 1.68 | 0.66 | 50.7 | 9 | 124.1 | 5.32 | 3.11 | 2.21 | 0.57 | 48.6 | 27.6 | UnDef | 0.00 |
| 91.86 | 237.3 | 1.72 | 0.73 | 42.7 | 9 | 124.1 | 5.38 | 3.14 | 2.24 | 0.56 | 45.5 | 25.7 | UnDef | 0.44 |
| 92.85 | 206.3 | 1.71 | 0.83 | 40.3 | 9 | 124.1 | 5.44 | 3.17 | 2.27 | 0.56 | 39.5 | 22.2 | UnDef | 0.38 |
| 93.83 | 194.3 | 1.69 | 0.87 | 52.1 | 9 | 124.1 | 5.50 | 3.20 | 2.31 | 0.56 | 37.2 | 20.8 | UnDef | 0.36 |
| 94.82 | 191.8 | 1.31 | 0.68 | 35.4 | 9 | 124.1 | 5.56 | 3.23 | 2.34 | 0.56 | 36.7 | 20.5 | UnDef | 0.31 |
| 95.80 | 211.4 | 1.55 | 0.73 | 19.2 | 9 | 124.1 | 5.62 | 3.26 | 2.37 | 0.55 | 40.5 | 22.4 | UnDef | 0.36 |
| 96.78 | 217.5 | 1.61 | 0.74 | 24.0 | 9 | 124.1 | 5.68 | 3.29 | 2.40 | 0.55 | 41.7 | 23.0 | UnDef | 0.38 |
| 97.77 | 124.1 | 1.85 | 1.49 | 25.2 | 8 | 120.9 | 5.75 | 3.32 | 2.43 | 0.55 | 29.7 | 16.3 | UnDef | 0.39 |
| 98.75 | 41.4 | 1.09 | 2.64 | 65.7 | 6 | 114.6 | 5.80 | 3.34 | 2.46 | 0.55 | 15.9 | 8.7 | 2.85 | 0.21 |

Gregg In Situ, Inc.
Interpretation Output - Release 1.00.19e
Run No: 03-0630-0942-1420
Job No: 03-151SH
Client: URS
Project: CPT SITE INVESTIGATION
Site: PIER T LNG
Location: CPT-03
Engineer: T. O'BRIEN
CPT Date: 03/24/06
CPT Time: 10:12
CPT File: 151C03.COR
Northing (m): 0.000
Easting (m): 0.000
Elevation (m): 0.000

Water Table (m): 6.10 (ft): 20.0
Su Nkt used: 12.50
Averaging Increment (m): 0.30
Phi Method : Robertson and Campanella, 1983
Dr Method : Jamiolkowski - All Sands
State Parameter M: 1.20
Used Unit Weights Assigned to Soil Zones
Values of 1.0E9 or UnDef are printed for parameters that are not valid for the material type (SBT)

| Depth (ft) | k (cm/s) | Bq | Qtn | Rfn | SBTn | Qc1N | DeltaQc1N | Qc1Ncs | Fc (%) | Phi (Deg) | Dr (%) | OCR | State Param | Del(n1)60 | (N1)60cs |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 0.49 | 5.0E-02 | 0.00 | 1000.0 | 0.77 | 10 | 358.8 | 0.0 | 358.8 | 0.0 | 50 | 95.0 | 1.0 | -0.37 | 0.0 | 71.8 |
| 1.48 | 5.0E-03 | 0.00 | 1000.0 | 1.27 | 9 | 210.6 | 0.0 | 210.6 | 1.6 | 50 | 95.0 | 1.0 | -0.44 | 0.0 | 52.7 |
| 2.46 | 5.0E-06 | 0.00 | 176.5 | 3.16 | 12 | 50.6 | UnDef | UnDef | 0.0 | UnDef | UnDef | 10.0 | UnDef | UnDef | UnDef |
| 3.44 | 5.0E-04 | 0.00 | 324.1 | 1.54 | 9 | 128.2 | 4.1 | 132.4 | 6.2 | 48 | 77.8 | 1.0 | -0.35 | 0.8 | 43.6 |
| 4.43 | 5.0E-04 | 0.00 | 398.0 | 1.66 | 9 | 200.6 | 4.4 | 205.0 | 5.8 | 48 | 87.2 | 1.0 | -0.38 | 0.9 | 66.3 |
| 5.41 | 5.0E-04 | 0.00 | 304.2 | 1.54 | 9 | 169.4 | 6.9 | 176.3 | 6.5 | 46 | 82.4 | 1.0 | -0.34 | 1.4 | 56.7 |
| 6.40 | 5.0E-06 | 0.00 | 66.0 | 2.93 | 7 | 40.4 | 45.3 | 85.7 | 24.8 | UnDef | UnDef | 10.0 | UnDef | 9.8 | 29.5 |
| 7.30 | 5.0E-06 | 0.00 | 46.4 | 2.85 | 6 | 30.4 | 54.3 | 84.7 | 29.0 | UnDef | UnDef | 6.0 | UnDef | 10.0 | 24.8 |
| 8.20 | 5.0E-06 | 0.00 | 34.5 | 2.35 | 6 | 24.1 | 53.5 | 77.7 | 30.8 | UnDef | UnDef | 6.0 | UnDef | 8.9 | 20.8 |
| 9.19 | 1.0E-07 | -0.02 | 7.9 | 0.71 | 6 | 6.4 | 25.5 | 31.8 | 45.2 | UnDef | UnDef | 3.0 | UnDef | 3.1 | 6.2 |
| 10.17 | 1.0E-07 | -0.02 | 6.5 | 0.54 | 6 | 5.6 | 22.2 | 27.8 | 47.2 | UnDef | UnDef | 3.0 | UnDef | 2.7 | 5.4 |
| 11.15 | 1.0E-07 | 0.00 | 5.6 | 0.58 | 6 | 5.1 | 20.3 | 25.3 | 51.5 | UnDef | UnDef | 1.5 | UnDef | 2.5 | 5.0 |
| 12.14 | 1.0E-07 | 0.02 | 7.3 | 0.70 | 6 | 6.6 | 26.2 | 32.8 | 46.9 | UnDef | UnDef | 3.0 | UnDef | 3.2 | 6.4 |
| 13.21 | 1.0E-07 | 0.04 | 6.6 | 0.44 | 1 | 6.2 | UnDef | UnDef | 100.0 | UnDef | UnDef | 3.0 | UnDef | UnDef | UnDef |
| 14.27 | 1.0E-07 | 0.05 | 7.8 | 0.88 | 6 | 7.3 | 29.3 | 36.6 | 47.8 | UnDef | UnDef | 3.0 | UnDef | 3.6 | 7.2 |
| 15.26 | 5.0E-02 | 0.00 | 331.9 | 0.88 | 9 | 288.2 | 0.0 | 288.2 | 2.9 | 48 | 95.0 | 1.0 | -0.29 | 0.0 | 56.4 |
| 16.24 | 5.0E-03 | 0.00 | 361.1 | 1.48 | 9 | 325.4 | 3.7 | 329.1 | 5.4 | 48 | 95.0 | 1.0 | -0.36 | 0.6 | 80.2 |
| 17.22 | 5.0E-02 | 0.00 | 293.3 | 1.05 | 9 | 273.8 | 0.0 | 273.8 | 4.3 | 46 | 95.0 | 1.0 | -0.29 | 0.0 | 53.6 |
| 18.21 | 5.0E-02 | 0.00 | 234.8 | 0.61 | 9 | 226.6 | 0.0 | 226.6 | 2.7 | 46 | 90.7 | 1.0 | -0.22 | 0.0 | 44.4 |
| 19.19 | 5.0E-02 | 0.00 | 215.3 | 0.67 | 9 | 214.4 | 0.0 | 214.4 | 3.5 | 46 | 89.1 | 1.0 | -0.22 | 0.0 | 42.0 |
| 20.18 | 5.0E-02 | 0.00 | 176.9 | 0.61 | 9 | 181.0 | 0.0 | 181.0 | 4.1 | 44 | 84.3 | 1.0 | -0.20 | 0.0 | 35.4 |
| 21.16 | 5.0E-02 | 0.00 | 131.3 | 0.61 | 9 | 136.6 | 3.2 | 139.7 | 5.8 | 44 | 76.2 | 1.0 | -0.17 | 0.4 | 27.1 |
| 22.15 | 5.0E-03 | 0.00 | 96.0 | 0.74 | 9 | 101.4 | 12.4 | 113.8 | 9.1 | 42 | 67.7 | 1.0 | -0.16 | 1.8 | 26.6 |
| 23.13 | 5.0E-03 | 0.00 | 78.7 | 0.82 | 9 | 84.4 | 17.3 | 101.7 | 11.4 | 42 | 62.4 | 1.0 | -0.15 | 2.5 | 23.1 |
| 24.11 | 5.0E-03 | 0.00 | 70.6 | 0.72 | 9 | 76.8 | 16.4 | 93.2 | 11.6 | 40 | 59.7 | 1.0 | -0.13 | 2.3 | 21.1 |
| 25.10 | 5.0E-03 | 0.00 | 42.5 | 0.57 | 9 | 47.3 | 17.9 | 65.3 | 15.3 | 38 | 45.8 | 1.0 | -0.06 | 2.4 | 14.0 |
| 26.08 | 5.0E-03 | 0.00 | 40.5 | 0.55 | 7 | 45.7 | 18.2 | 63.9 | 15.6 | 38 | 44.8 | 1.0 | -0.05 | 2.4 | 13.6 |
| 27.07 | 5.0E-03 | 0.00 | 50.1 | 0.73 | 9 | 56.9 | 21.0 | 77.9 | 15.1 | 38 | 51.1 | 1.0 | -0.10 | 2.8 | 16.7 |
| 28.05 | 5.0E-03 | 0.00 | 47.9 | 0.80 | 7 | 55.1 | 23.4 | 78.6 | 16.2 | 38 | 50.2 | 1.0 | -0.10 | 3.1 | 16.6 |
| 29.04 | 5.0E-04 | 0.00 | 42.8 | 0.95 | 7 | 49.9 | 29.0 | 78.9 | 18.8 | 38 | 47.3 | 1.0 | -0.10 | 4.9 | 21.1 |
| 30.02 | 5.0E-04 | 0.00 | 33.7 | 0.84 | 7 | 40.0 | 29.3 | 69.3 | 20.8 | 36 | 41.0 | 1.0 | -0.07 | 4.7 | 17.7 |
| 31.00 | 5.0E-04 | 0.00 | 31.9 | 0.68 | 7 | 38.3 | 25.8 | 64.1 | 20.1 | 36 | 39.8 | 1.0 | -0.05 | 4.2 | 16.7 |
| 31.99 | 5.0E-04 | 0.00 | 33.3 | 0.84 | 7 | 40.4 | 30.0 | 70.4 | 21.0 | 36 | 41.3 | 1.0 | -0.07 | 4.8 | 18.0 |
| 32.97 | 5.0E-03 | 0.00 | 50.3 | 0.89 | 7 | 60.8 | 26.6 | 87.4 | 16.4 | 38 | 53.0 | 1.0 | -0.11 | 3.5 | 18.4 |
| 33.96 | 5.0E-03 | 0.00 | 72.0 | 0.91 | 9 | 87.2 | 23.3 | 110.5 | 12.9 | 40 | 63.4 | 1.0 | -0.15 | 3.2 | 24.6 |
| 34.94 | 5.0E-03 | 0.00 | 49.1 | 1.01 | 7 | 60.5 | 30.9 | 91.5 | 17.7 | 38 | 52.9 | 1.0 | -0.12 | 4.0 | 18.8 |
| 35.92 | 5.0E-04 | 0.00 | 35.1 | 1.06 | 7 | 44.2 | 37.7 | 81.9 | 22.3 | 38 | 43.8 | 1.0 | -0.09 | 5.8 | 20.2 |
| 36.91 | 5.0E-03 | 0.00 | 36.6 | 0.81 | 7 | 46.5 | 29.5 | 76.0 | 19.5 | 38 | 45.3 | 1.0 | -0.08 | 3.6 | 15.0 |
| 37.89 | 5.0E-03 | 0.00 | 48.5 | 0.92 | 7 | 61.6 | 29.3 | 91.0 | 17.1 | 38 | 53.4 | 1.0 | -0.11 | 3.8 | 18.9 |
| 38.88 | 5.0E-03 | 0.00 | 54.1 | 0.93 | 7 | 69.1 | 28.6 | 97.7 | 16.0 | 40 | 56.7 | 1.0 | -0.12 | 3.8 | 20.7 |
| 39.86 | 5.0E-03 | 0.00 | 44.2 | 1.00 | 7 | 57.3 | 33.7 | 91.0 | 18.9 | 38 | 51.3 | 1.0 | -0.11 | 4.2 | 18.3 |
| 40.85 | 5.0E-03 | 0.00 | 36.6 | 0.95 | 7 | 48.2 | 35.0 | 83.2 | 20.7 | 38 | 46.4 | 1.0 | -0.09 | 4.2 | 16.0 |

Gregg In Situ, Inc.
Run No: 03-0630-0942-1420
CPT File: 151C03.COR



| Depth (ft) | k (cm/s) | Bq | Qtn | Rfn | SBTn | Qc1N | DeltaQc1N | Qc1Ncs | Fc (%) | Phi (Deg) | Dr (%) | OCR | State Param | Del(n1)60 | (N1)60cs |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1.83 | 5.0E-03 | 0.00 | 35.8 | 0.96 | 7 | 47.6 | 36.0 | 83.6 | 21.1 | 38 | 46.0 | 1.0 | -0.09 | 4.3 | 15.9 |
| 2.81 | 5.0E-03 | 0.00 | 38.3 | 1.07 | 7 | 51.2 | 38.9 | 90.1 | 21.2 | 38 | 48.1 | 1.0 | -0.10 | 4.6 | 17.2 |
| 3.80 | 5.0E-03 | 0.00 | 49.1 | 0.87 | 7 | 65.8 | 29.1 | 94.8 | 16.5 | 38 | 55.3 | 1.0 | -0.11 | 3.8 | 19.9 |
| 4.78 | 5.0E-03 | 0.00 | 49.1 | 0.97 | 7 | 66.2 | 32.7 | 99.0 | 17.4 | 38 | 55.5 | 1.0 | -0.12 | 4.2 | 20.4 |
| 5.77 | 5.0E-03 | 0.00 | 36.5 | 1.06 | 7 | 50.1 | 40.5 | 90.6 | 21.7 | 38 | 47.5 | 1.0 | -0.10 | 4.8 | 17.0 |
| 6.75 | 5.0E-03 | 0.00 | 32.8 | 0.96 | 7 | 45.6 | 39.3 | 84.9 | 22.3 | 36 | 44.8 | 1.0 | -0.08 | 4.5 | 15.7 |
| 7.74 | 5.0E-03 | 0.00 | 36.3 | 0.88 | 7 | 50.7 | 35.0 | 85.6 | 20.3 | 38 | 47.8 | 1.0 | -0.08 | 4.3 | 16.7 |
| 8.72 | 5.0E-03 | 0.00 | 39.3 | 0.98 | 7 | 55.2 | 37.2 | 92.3 | 20.1 | 38 | 50.2 | 1.0 | -0.10 | 4.5 | 18.0 |
| 9.70 | 5.0E-03 | 0.00 | 40.8 | 0.99 | 7 | 57.6 | 37.3 | 94.9 | 19.7 | 38 | 51.5 | 1.0 | -0.10 | 4.6 | 18.7 |
| 0.69 | 5.0E-03 | 0.00 | 36.7 | 0.96 | 7 | 52.4 | 38.4 | 90.8 | 20.8 | 38 | 48.8 | 1.0 | -0.09 | 4.6 | 17.4 |
| 1.67 | 5.0E-04 | 0.00 | 20.8 | 1.37 | 7 | 30.9 | 87.2 | 118.1 | 32.7 | 34 | 33.6 | 1.0 | -0.06 | 8.6 | 18.7 |
| 2.66 | 5.0E-04 | 0.05 | 11.4 | 0.86 | 6 | 17.9 | 71.8 | 89.7 | 39.2 | 30 | 30.0 | 1.0 | 0.03 | 5.9 | 11.7 |
| 3.64 | 5.0E-04 | 0.03 | 15.9 | 1.13 | 6 | 24.4 | 97.6 | 122.0 | 35.4 | 32 | 30.0 | 1.0 | -0.02 | 8.0 | 15.9 |
| 4.63 | 5.0E-05 | 0.05 | 12.4 | 1.49 | 6 | 19.6 | 78.2 | 97.8 | 43.5 | 30 | 30.0 | 3.0 | -0.01 | 7.7 | 15.3 |
| 5.61 | 5.0E-05 | 0.24 | 4.9 | 1.58 | 4 | 9.1 | 36.3 | 45.4 | 67.2 | 30 | 30.0 | 1.5 | 0.10 | 3.6 | 7.1 |
| 6.59 | 5.0E-05 | 0.08 | 9.0 | 1.35 | 6 | 15.1 | 60.4 | 75.5 | 49.2 | 30 | 30.0 | 3.0 | 0.03 | 5.9 | 11.8 |
| 7.58 | 5.0E-05 | 0.42 | 4.8 | 1.52 | 4 | 9.1 | 36.4 | 45.5 | 67.1 | 30 | 30.0 | 1.5 | 0.13 | 3.6 | 7.1 |
| 8.56 | 5.0E-04 | -0.01 | 15.8 | 1.26 | 6 | 25.1 | 100.3 | 125.3 | 36.7 | 32 | 30.0 | 1.0 | -0.03 | 8.2 | 16.4 |
| 9.55 | 5.0E-06 | 0.01 | 4.4 | 2.09 | 4 | 8.7 | 34.8 | 43.5 | 74.3 | UnDef | UnDef | 1.5 | UnDef | 4.3 | 8.5 |
| 0.53 | 5.0E-05 | 0.29 | 3.8 | 1.43 | 4 | 7.9 | 31.4 | 39.3 | 73.0 | 30 | 30.0 | 1.5 | 0.14 | 3.1 | 6.2 |
| 1.52 | 5.0E-05 | 0.14 | 8.6 | 1.43 | 6 | 15.0 | 60.0 | 75.0 | 51.0 | 30 | 30.0 | 3.0 | 0.04 | 5.9 | 11.7 |
| 2.42 | 5.0E-04 | 0.00 | 20.3 | 1.15 | 7 | 32.4 | 75.8 | 108.2 | 31.2 | 34 | 35.0 | 1.0 | -0.05 | 8.2 | 18.8 |
| 3.32 | 5.0E-02 | 0.00 | 76.9 | 1.05 | 9 | 116.8 | 33.0 | 149.8 | 13.3 | 40 | 71.7 | 1.0 | -0.17 | 3.7 | 26.5 |
| 4.30 | 5.0E-03 | 0.00 | 58.4 | 1.32 | 7 | 89.8 | 47.4 | 137.2 | 17.9 | 40 | 64.2 | 1.0 | -0.16 | 6.1 | 28.0 |
| 5.29 | 5.0E-03 | 0.00 | 44.0 | 1.30 | 7 | 68.6 | 51.8 | 120.4 | 21.1 | 38 | 56.5 | 1.0 | -0.13 | 6.2 | 23.0 |
| 6.27 | 5.0E-03 | -0.01 | 43.9 | 1.06 | 7 | 68.9 | 43.0 | 111.9 | 19.4 | 38 | 56.6 | 1.0 | -0.12 | 5.3 | 22.2 |
| 7.26 | 5.0E-03 | -0.01 | 38.5 | 0.91 | 7 | 61.1 | 39.7 | 100.8 | 19.8 | 38 | 53.2 | 1.0 | -0.09 | 4.9 | 19.8 |
| 8.24 | 5.0E-05 | 0.02 | 10.8 | 1.94 | 6 | 19.1 | 76.3 | 95.4 | 49.8 | 30 | 30.0 | 3.0 | -0.02 | 7.5 | 14.9 |
| 9.22 | 5.0E-04 | 0.04 | 13.5 | 1.10 | 6 | 23.4 | 93.5 | 116.8 | 38.2 | 32 | 30.0 | 1.0 | 0.00 | 7.6 | 15.2 |
| 0.21 | 5.0E-04 | 0.02 | 13.4 | 1.80 | 6 | 23.2 | 92.9 | 116.1 | 44.3 | 32 | 30.0 | 1.0 | -0.04 | 7.6 | 15.1 |
| 1.19 | 5.0E-04 | -0.01 | 16.1 | 1.56 | 6 | 27.7 | 110.7 | 138.3 | 38.7 | 32 | 30.4 | 1.0 | -0.05 | 9.0 | 18.1 |
| 2.18 | 5.0E-05 | 0.02 | 9.2 | 2.46 | 4 | 17.0 | 68.1 | 85.1 | 57.0 | 30 | 30.0 | 3.0 | -0.02 | 6.7 | 13.3 |
| 3.16 | 5.0E-05 | 0.02 | 13.7 | 2.85 | 6 | 24.1 | 96.6 | 120.7 | 50.3 | 32 | 30.0 | 6.0 | -0.08 | 9.5 | 18.9 |
| 4.15 | 5.0E-04 | -0.01 | 17.6 | 1.82 | 6 | 30.4 | 121.4 | 151.8 | 39.0 | 32 | 33.1 | 1.0 | -0.07 | 9.9 | 19.8 |
| 5.13 | 5.0E-06 | -0.01 | 10.8 | 3.66 | 1 | 19.8 | UnDef | UnDef | 100.0 | UnDef | UnDef | 3.0 | UnDef | UnDef | UnDef |
| 6.11 | 5.0E-05 | -0.01 | 17.3 | 3.17 | 6 | 30.3 | 121.1 | 151.4 | 47.0 | 32 | 33.0 | 6.0 | -0.12 | 11.9 | 23.7 |
| 7.10 | 5.0E-04 | -0.01 | 35.8 | 1.73 | 7 | 60.2 | 83.1 | 143.3 | 26.7 | 38 | 52.7 | 1.0 | -0.14 | 11.2 | 30.8 |
| 8.08 | 5.0E-03 | -0.02 | 34.9 | 1.31 | 7 | 59.0 | 62.2 | 121.2 | 24.2 | 38 | 52.2 | 1.0 | -0.11 | 6.8 | 21.3 |
| 9.07 | 5.0E-05 | -0.05 | 14.0 | 2.45 | 6 | 25.4 | 101.5 | 126.9 | 47.6 | 32 | 30.0 | 6.0 | -0.07 | 9.9 | 19.9 |
| 0.05 | 5.0E-02 | -0.01 | 70.9 | 0.92 | 9 | 118.3 | 32.7 | 151.0 | 13.1 | 40 | 72.1 | 1.0 | -0.15 | 3.6 | 26.8 |
| 1.04 | 5.0E-02 | 0.00 | 88.7 | 1.00 | 9 | 148.1 | 32.0 | 180.1 | 11.7 | 42 | 78.5 | 1.0 | -0.18 | 3.6 | 32.6 |
| 2.02 | 5.0E-02 | 0.00 | 81.1 | 0.97 | 9 | 136.5 | 32.7 | 169.1 | 12.2 | 42 | 76.2 | 1.0 | -0.17 | 3.7 | 30.4 |
| 3.00 | 5.0E-02 | -0.01 | 68.2 | 1.02 | 9 | 115.8 | 37.7 | 153.5 | 14.2 | 40 | 71.5 | 1.0 | -0.15 | 4.1 | 26.8 |
| 3.99 | 5.0E-02 | -0.01 | 45.7 | 0.98 | 7 | 78.9 | 43.3 | 122.2 | 18.3 | 38 | 60.5 | 1.0 | -0.11 | 4.4 | 19.8 |
| 4.97 | 5.0E-03 | -0.01 | 37.0 | 1.02 | 7 | 64.7 | 49.3 | 114.0 | 21.2 | 38 | 54.8 | 1.0 | -0.10 | 5.9 | 21.7 |
| 5.96 | 5.0E-02 | -0.01 | 68.7 | 0.87 | 9 | 118.4 | 32.4 | 150.8 | 13.0 | 40 | 72.1 | 1.0 | -0.14 | 3.6 | 26.8 |
| 6.94 | 5.0E-02 | 0.00 | 84.0 | 0.96 | 9 | 144.9 | 32.5 | 177.4 | 11.9 | 42 | 77.9 | 1.0 | -0.17 | 3.7 | 32.0 |
| 7.93 | 5.0E-02 | 0.00 | 85.8 | 0.93 | 9 | 148.7 | 30.9 | 179.5 | 11.4 | 42 | 78.6 | 1.0 | -0.17 | 3.5 | 32.6 |
| 8.91 | 5.0E-02 | 0.00 | 70.9 | 0.86 | 9 | 124.0 | 31.9 | 155.9 | 12.7 | 40 | 73.4 | 1.0 | -0.14 | 3.6 | 27.8 |
| 9.89 | 5.0E-02 | 0.00 | 80.1 | 0.78 | 9 | 140.4 | 26.4 | 166.8 | 10.9 | 42 | 77.0 | 1.0 | -0.15 | 3.0 | 30.5 |
| 0.88 | 5.0E-02 | 0.00 | 80.0 | 0.68 | 9 | 140.8 | 22.0 | 162.9 | 10.1 | 42 | 77.1 | 1.0 | -0.13 | 2.5 | 30.1 |
| 1.86 | 5.0E-02 | 0.00 | 74.0 | 0.74 | 9 | 131.1 | 26.6 | 157.7 | 11.3 | 40 | 75.0 | 1.0 | -0.13 | 3.0 | 28.7 |
| 2.85 | 5.0E-02 | -0.01 | 63.4 | 0.85 | 9 | 113.5 | 34.1 | 147.5 | 13.7 | 40 | 70.9 | 1.0 | -0.13 | 3.8 | 26.0 |
| 3.83 | 5.0E-02 | 0.00 | 59.1 | 0.90 | 9 | 106.4 | 37.4 | 143.8 | 14.7 | 40 | 69.0 | 1.0 | -0.13 | 4.0 | 24.9 |
| 4.82 | 5.0E-02 | -0.01 | 57.7 | 0.70 | 9 | 104.5 | 29.9 | 134.4 | 13.3 | 40 | 68.5 | 1.0 | -0.11 | 3.3 | 23.8 |
| 5.80 | 5.0E-02 | -0.01 | 63.2 | 0.75 | 9 | 114.6 | 30.5 | 145.1 | 12.9 | 40 | 71.2 | 1.0 | -0.12 | 3.4 | 25.8 |
| 6.78 | 5.0E-02 | -0.01 | 64.4 | 0.76 | 9 | 117.4 | 30.7 | 148.1 | 12.8 | 40 | 71.9 | 1.0 | -0.12 | 3.4 | 26.4 |
| 7.77 | 5.0E-03 | -0.01 | 35.7 | 1.56 | 7 | 66.7 | 82.3 | 149.0 | 25.7 | 38 | 55.7 | 1.0 | -0.13 | 8.6 | 24.9 |
| 8.75 | 5.0E-05 | -0.01 | 10.6 | 3.07 | 4 | 22.2 | 88.6 | 110.8 | 57.1 | 30 | 30.0 | 3.0 | -0.06 | 8.7 | 17.3 |

regg In Situ, Inc.
nterpretation Output - Release 1.00.19e
un No: 03-0630-0942-1481
ob No: 03-151SH
lient: URS
roject: CPT SITE INVESTIGATION
ite: PIER T LNG
ocation: CPT-04
ngineer: T. O'BRIEN
PT Date: 03/24/06
PT Time: 12:12
PT File: 151C04.COR
orthing (m): 0.000
asting (m): 0.000
levation (m): 0.000

Water Table (m): 6.10 (ft): 20.0
Su Nkt used: 12.50
Averaging Increment (m): 0.30
Phi Method : Robertson and Campanella, 1983
Dr Method : Jamiolkowski - All Sands
State Parameter M: 1.20
Used Unit Weights Assigned to Soil Zones
Values of 1.0E9 or UnDef are printed for parameters that are not valid for the material type (SBT)

| epth (ft) | AvgQt (tsf) | AvgFs (tsf) | AvgRf (%) | AvgUd (ft) | SBT | U.Wt. pcf | TStress (tsf) | EStress (tsf) | Ueq (tsf) | Cn | N60 (blows/ft) | (N1)60 (blows/ft) | Su (tsf) | CRR |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 0.49 | 93.9 | 0.48 | 0.51 | -0.7 | 8 | 120.9 | 0.03 | 0.03 | 0.00 | 2.00 | 22.5 | 45.0 | UnDef | 0.00 |
| 1.48 | 137.6 | 1.94 | 1.41 | -2.3 | 8 | 120.9 | 0.09 | 0.09 | 0.00 | 2.00 | 33.0 | 65.9 | UnDef | 0.00 |
| 2.46 | 109.7 | 1.85 | 1.69 | -1.6 | 7 | 117.8 | 0.15 | 0.15 | 0.00 | 2.00 | 35.0 | 70.0 | UnDef | 0.00 |
| 3.44 | 52.2 | 1.25 | 2.39 | -1.4 | 6 | 114.6 | 0.21 | 0.21 | 0.00 | 2.00 | 20.0 | 40.0 | 4.16 | 0.24 |
| 4.43 | 25.0 | 0.67 | 2.69 | -0.9 | 5 | 114.6 | 0.26 | 0.26 | 0.00 | 1.96 | 12.0 | 23.4 | 1.98 | 0.13 |
| 5.41 | 30.9 | 0.58 | 1.89 | -0.8 | 6 | 114.6 | 0.32 | 0.32 | 0.00 | 1.77 | 11.8 | 21.0 | 2.45 | 0.12 |
| 6.40 | 24.1 | 0.58 | 2.40 | -0.8 | 6 | 114.6 | 0.37 | 0.37 | 0.00 | 1.63 | 9.2 | 15.1 | 1.90 | 0.12 |
| 7.30 | 20.5 | 0.49 | 2.41 | 2.0 | 5 | 114.6 | 0.43 | 0.43 | 0.00 | 1.53 | 9.8 | 15.0 | 1.60 | 0.12 |
| 8.20 | 7.1 | 0.11 | 1.56 | 5.3 | 5 | 114.6 | 0.48 | 0.48 | 0.00 | 1.45 | 3.4 | 4.9 | 0.53 | 0.09 |
| 9.19 | 30.1 | 0.56 | 1.88 | -0.6 | 6 | 114.6 | 0.53 | 0.53 | 0.00 | 1.37 | 11.5 | 15.8 | 2.36 | 0.12 |
| 0.17 | 43.8 | 0.59 | 1.35 | -6.6 | 7 | 117.8 | 0.59 | 0.59 | 0.00 | 1.30 | 14.0 | 18.2 | UnDef | 0.13 |
| 1.15 | 43.3 | 0.63 | 1.45 | -4.7 | 7 | 117.8 | 0.65 | 0.65 | 0.00 | 1.24 | 13.8 | 17.2 | UnDef | 0.13 |
| 2.14 | 31.3 | 0.87 | 2.77 | -8.2 | 5 | 114.6 | 0.71 | 0.71 | 0.00 | 1.19 | 15.0 | 17.8 | 2.45 | 0.20 |
| 3.21 | 11.5 | 0.38 | 3.31 | -10.4 | 4 | 114.6 | 0.77 | 0.77 | 0.00 | 1.14 | 7.3 | 8.4 | 0.86 | 0.10 |
| 4.27 | 16.1 | 0.18 | 1.09 | -10.4 | 6 | 114.6 | 0.83 | 0.83 | 0.00 | 1.10 | 6.2 | 6.8 | 1.23 | 0.11 |
| 5.26 | 33.4 | 0.36 | 1.07 | -3.5 | 7 | 117.8 | 0.89 | 0.89 | 0.00 | 1.06 | 10.7 | 11.3 | UnDef | 0.10 |
| 6.24 | 19.8 | 0.38 | 1.90 | -1.1 | 6 | 114.6 | 0.94 | 0.94 | 0.00 | 1.03 | 7.6 | 7.8 | 1.51 | 0.17 |
| 7.22 | 13.8 | 0.08 | 0.61 | 2.4 | 6 | 114.6 | 1.00 | 1.00 | 0.00 | 1.00 | 5.3 | 5.3 | 1.02 | 0.10 |
| 8.21 | 64.4 | 0.47 | 0.73 | 1.1 | 8 | 120.9 | 1.06 | 1.06 | 0.00 | 0.97 | 15.4 | 15.0 | UnDef | 0.13 |
| 9.19 | 72.9 | 0.70 | 0.96 | 1.3 | 8 | 120.9 | 1.12 | 1.12 | 0.00 | 0.95 | 17.4 | 16.5 | UnDef | 0.15 |
| 0.18 | 242.4 | 1.67 | 0.69 | 0.0 | 9 | 124.1 | 1.18 | 1.17 | 0.01 | 0.92 | 46.4 | 42.9 | UnDef | 0.00 |
| 1.16 | 224.3 | 2.21 | 0.98 | -0.4 | 9 | 124.1 | 1.24 | 1.20 | 0.04 | 0.91 | 43.0 | 39.2 | UnDef | 0.00 |
| 2.15 | 168.0 | 1.93 | 1.15 | 0.3 | 8 | 120.9 | 1.30 | 1.23 | 0.07 | 0.90 | 40.2 | 36.2 | UnDef | 0.00 |
| 3.13 | 141.3 | 1.23 | 0.87 | 0.2 | 9 | 124.1 | 1.36 | 1.26 | 0.10 | 0.89 | 27.1 | 24.1 | UnDef | 0.32 |
| 4.11 | 114.5 | 1.14 | 1.00 | 0.7 | 8 | 120.9 | 1.42 | 1.29 | 0.13 | 0.88 | 27.4 | 24.1 | UnDef | 0.24 |
| 5.10 | 97.8 | 1.02 | 1.04 | 1.3 | 8 | 120.9 | 1.48 | 1.32 | 0.16 | 0.87 | 23.4 | 20.4 | UnDef | 0.20 |
| 6.08 | 89.0 | 0.57 | 0.64 | 1.8 | 8 | 120.9 | 1.54 | 1.35 | 0.19 | 0.86 | 21.3 | 18.4 | UnDef | 0.15 |
| 7.07 | 70.6 | 0.72 | 1.02 | 2.0 | 8 | 120.9 | 1.60 | 1.38 | 0.22 | 0.85 | 16.9 | 14.4 | UnDef | 0.15 |
| 8.05 | 63.0 | 0.67 | 1.06 | 2.5 | 7 | 117.8 | 1.66 | 1.40 | 0.25 | 0.84 | 20.1 | 17.0 | UnDef | 0.14 |
| 9.04 | 48.9 | 0.58 | 1.19 | 3.8 | 7 | 117.8 | 1.71 | 1.43 | 0.28 | 0.84 | 15.6 | 13.0 | UnDef | 0.13 |
| 0.02 | 53.9 | 0.55 | 1.01 | 4.2 | 7 | 117.8 | 1.77 | 1.46 | 0.31 | 0.83 | 17.2 | 14.2 | UnDef | 0.13 |
| 1.00 | 53.9 | 0.58 | 1.07 | 5.2 | 7 | 117.8 | 1.83 | 1.49 | 0.34 | 0.82 | 17.2 | 14.1 | UnDef | 0.13 |
| 1.99 | 53.4 | 0.60 | 1.13 | 7.4 | 7 | 117.8 | 1.89 | 1.51 | 0.37 | 0.81 | 17.1 | 13.9 | UnDef | 0.14 |
| 2.97 | 54.5 | 0.57 | 1.05 | 8.4 | 7 | 117.8 | 1.95 | 1.54 | 0.41 | 0.81 | 17.4 | 14.0 | UnDef | 0.13 |
| 3.96 | 61.0 | 0.71 | 1.16 | 10.0 | 7 | 117.8 | 2.00 | 1.57 | 0.44 | 0.80 | 19.5 | 15.6 | UnDef | 0.15 |
| 4.94 | 65.5 | 0.73 | 1.12 | 12.2 | 7 | 117.8 | 2.06 | 1.60 | 0.47 | 0.79 | 20.9 | 16.5 | UnDef | 0.15 |
| 5.92 | 95.6 | 1.01 | 1.06 | 13.6 | 8 | 120.9 | 2.12 | 1.62 | 0.50 | 0.78 | 22.9 | 18.0 | UnDef | 0.19 |
| 6.91 | 84.5 | 1.10 | 1.30 | 14.2 | 8 | 120.9 | 2.18 | 1.65 | 0.53 | 0.78 | 20.2 | 15.7 | UnDef | 0.19 |
| 7.89 | 54.7 | 0.64 | 1.17 | 15.1 | 7 | 117.8 | 2.24 | 1.68 | 0.56 | 0.77 | 17.5 | 13.5 | UnDef | 0.15 |
| 8.88 | 59.6 | 0.65 | 1.09 | 16.6 | 7 | 117.8 | 2.30 | 1.71 | 0.59 | 0.77 | 19.0 | 14.6 | UnDef | 0.14 |
| 9.86 | 65.8 | 0.82 | 1.24 | 17.6 | 7 | 117.8 | 2.35 | 1.73 | 0.62 | 0.76 | 21.0 | 15.9 | UnDef | 0.16 |
| 0.85 | 68.3 | 0.85 | 1.24 | 18.9 | 7 | 117.8 | 2.41 | 1.76 | 0.65 | 0.75 | 21.8 | 16.4 | UnDef | 0.17 |

regg In Situ, Inc.
Page: 2a
in No: 03-0630-0942-1481
PT File: 151C04.COR

| epth (ft) | AvgQt (tsf) | AvgFs (tsf) | AvgRf (%) | AvgUd (ft) | SBT | U.Wt. pcf | TStress (tsf) | EStress (tsf) | Ueq (tsf) | Cn | N60 (blows/ft) | (N1)60 (blows/ft) | Su (tsf) | CRR |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1.83 | 65.0 | 0.79 | 1.22 | 20.8 | 7 | 117.8 | 2.47 | 1.79 | 0.68 | 0.75 | 20.8 | 15.5 | UnDef | 0.16 |
| 2.81 | 69.0 | 0.78 | 1.13 | 21.5 | 8 | 120.9 | 2.53 | 1.82 | 0.71 | 0.74 | 16.5 | 12.3 | UnDef | 0.16 |
| 3.80 | 89.6 | 1.01 | 1.13 | 21.1 | 8 | 120.9 | 2.59 | 1.85 | 0.74 | 0.74 | 21.4 | 15.8 | UnDef | 0.19 |
| 4.78 | 75.1 | 0.85 | 1.13 | 22.4 | 8 | 120.9 | 2.65 | 1.87 | 0.77 | 0.73 | 18.0 | 13.1 | UnDef | 0.17 |
| 5.77 | 71.1 | 0.84 | 1.18 | 25.1 | 8 | 120.9 | 2.71 | 1.90 | 0.80 | 0.72 | 17.0 | 12.3 | UnDef | 0.17 |
| 6.75 | 72.0 | 0.89 | 1.23 | 25.8 | 7 | 117.8 | 2.77 | 1.93 | 0.84 | 0.72 | 23.0 | 16.5 | UnDef | 0.18 |
| 7.74 | 75.8 | 0.94 | 1.24 | 27.1 | 8 | 120.9 | 2.83 | 1.96 | 0.87 | 0.71 | 18.2 | 13.0 | UnDef | 0.18 |
| 8.72 | 79.7 | 0.96 | 1.20 | 29.2 | 8 | 120.9 | 2.89 | 1.99 | 0.90 | 0.71 | 19.1 | 13.5 | UnDef | 0.18 |
| 9.70 | 76.9 | 0.99 | 1.29 | 29.3 | 8 | 120.9 | 2.94 | 2.02 | 0.93 | 0.70 | 18.4 | 13.0 | UnDef | 0.19 |
| 0.69 | 74.4 | 0.93 | 1.25 | 29.9 | 8 | 120.9 | 3.00 | 2.05 | 0.96 | 0.70 | 17.8 | 12.5 | UnDef | 0.19 |
| 1.67 | 95.1 | 1.05 | 1.11 | 31.4 | 8 | 120.9 | 3.06 | 2.07 | 0.99 | 0.69 | 22.8 | 15.8 | UnDef | 0.19 |
| 2.66 | 92.8 | 1.17 | 1.26 | 32.6 | 8 | 120.9 | 3.12 | 2.10 | 1.02 | 0.69 | 22.2 | 15.3 | UnDef | 0.21 |
| 3.64 | 75.9 | 0.93 | 1.23 | 32.8 | 8 | 120.9 | 3.18 | 2.13 | 1.05 | 0.68 | 18.2 | 12.5 | UnDef | 0.19 |
| 4.63 | 74.3 | 0.90 | 1.21 | 33.6 | 8 | 120.9 | 3.24 | 2.16 | 1.08 | 0.68 | 17.8 | 12.1 | UnDef | 0.19 |
| 5.61 | 85.5 | 1.02 | 1.20 | 35.0 | 8 | 120.9 | 3.30 | 2.19 | 1.11 | 0.68 | 20.5 | 13.8 | UnDef | 0.20 |
| 6.59 | 73.9 | 0.96 | 1.30 | 35.7 | 7 | 117.8 | 3.36 | 2.22 | 1.14 | 0.67 | 23.6 | 15.8 | UnDef | 0.20 |
| 7.58 | 61.2 | 1.08 | 1.76 | 37.5 | 7 | 117.8 | 3.42 | 2.25 | 1.17 | 0.67 | 19.6 | 13.0 | UnDef | 0.41 |
| 8.56 | 24.7 | 0.42 | 1.69 | 139.7 | 6 | 114.6 | 3.48 | 2.27 | 1.20 | 0.66 | 9.5 | 6.3 | 1.70 | 0.13 |
| 9.55 | 29.8 | 0.46 | 1.53 | 33.0 | 6 | 114.6 | 3.53 | 2.30 | 1.23 | 0.66 | 11.4 | 7.5 | 2.10 | 0.16 |
| 0.53 | 16.7 | 0.22 | 1.33 | 102.4 | 6 | 114.6 | 3.59 | 2.32 | 1.27 | 0.66 | 6.4 | 4.2 | 1.05 | 0.09 |
| 1.52 | 46.7 | 0.62 | 1.33 | 67.7 | 7 | 117.8 | 3.65 | 2.35 | 1.30 | 0.65 | 14.9 | 9.7 | UnDef | 0.39 |
| 2.42 | 28.5 | 0.75 | 2.64 | 66.2 | 6 | 114.6 | 3.70 | 2.37 | 1.32 | 0.65 | 10.9 | 7.1 | 1.98 | 0.15 |
| 3.32 | 69.3 | 0.72 | 1.05 | 78.6 | 8 | 120.9 | 3.75 | 2.40 | 1.35 | 0.65 | 16.6 | 10.7 | UnDef | 0.18 |
| 4.30 | 142.8 | 1.83 | 1.28 | 54.3 | 8 | 120.9 | 3.81 | 2.43 | 1.38 | 0.64 | 34.2 | 21.9 | UnDef | 0.32 |
| 5.29 | 139.5 | 1.73 | 1.24 | 46.0 | 8 | 120.9 | 3.87 | 2.46 | 1.41 | 0.64 | 33.4 | 21.3 | UnDef | 0.31 |
| 6.27 | 145.3 | 1.45 | 1.00 | 39.6 | 9 | 124.1 | 3.93 | 2.49 | 1.44 | 0.63 | 27.8 | 17.6 | UnDef | 0.28 |
| 7.26 | 172.2 | 1.41 | 0.82 | 34.4 | 9 | 124.1 | 3.99 | 2.52 | 1.48 | 0.63 | 33.0 | 20.8 | UnDef | 0.31 |
| 8.24 | 72.4 | 0.96 | 1.33 | 54.7 | 7 | 117.8 | 4.05 | 2.55 | 1.51 | 0.63 | 23.1 | 14.5 | UnDef | 0.25 |
| 9.22 | 25.3 | 0.49 | 1.93 | 159.9 | 6 | 114.6 | 4.11 | 2.57 | 1.54 | 0.62 | 9.7 | 6.0 | 1.70 | 0.12 |
| 0.21 | 38.0 | 0.50 | 1.33 | 121.5 | 7 | 117.8 | 4.17 | 2.60 | 1.57 | 0.62 | 12.1 | 7.5 | UnDef | 0.22 |
| 1.19 | 46.5 | 0.55 | 1.18 | 134.8 | 7 | 117.8 | 4.22 | 2.63 | 1.60 | 0.62 | 14.9 | 9.2 | UnDef | 0.34 |
| 2.18 | 124.8 | 1.50 | 1.20 | 29.9 | 8 | 120.9 | 4.28 | 2.65 | 1.63 | 0.61 | 29.9 | 18.3 | UnDef | 0.27 |
| 3.16 | 120.6 | 1.30 | 1.08 | 22.1 | 8 | 120.9 | 4.34 | 2.68 | 1.66 | 0.61 | 28.9 | 17.6 | UnDef | 0.24 |
| 4.15 | 58.4 | 0.95 | 1.63 | 27.8 | 7 | 117.8 | 4.40 | 2.71 | 1.69 | 0.61 | 18.6 | 11.3 | UnDef | 0.00 |
| 5.13 | 43.1 | 0.58 | 1.33 | 52.4 | 7 | 117.8 | 4.46 | 2.74 | 1.72 | 0.60 | 13.8 | 8.3 | UnDef | 0.27 |
| 6.11 | 34.1 | 0.58 | 1.70 | 60.8 | 6 | 114.6 | 4.52 | 2.76 | 1.75 | 0.60 | 13.1 | 7.9 | 2.37 | 0.17 |
| 7.10 | 34.5 | 0.56 | 1.62 | 90.4 | 6 | 114.6 | 4.57 | 2.79 | 1.78 | 0.60 | 13.2 | 7.9 | 2.40 | 0.18 |
| 8.08 | 36.2 | 0.42 | 1.17 | 64.9 | 7 | 117.8 | 4.63 | 2.82 | 1.81 | 0.60 | 11.5 | 6.9 | UnDef | 0.19 |
| 9.07 | 24.1 | 0.31 | 1.27 | 108.4 | 6 | 114.6 | 4.69 | 2.84 | 1.84 | 0.59 | 9.2 | 5.5 | 1.56 | 0.11 |
| 0.05 | 23.9 | 0.41 | 1.70 | 140.1 | 6 | 114.6 | 4.74 | 2.87 | 1.87 | 0.59 | 9.2 | 5.4 | 1.54 | 0.11 |
| 1.04 | 68.2 | 0.70 | 1.03 | 142.5 | 8 | 120.9 | 4.80 | 2.89 | 1.91 | 0.59 | 16.3 | 9.6 | UnDef | 0.22 |
| 2.02 | 151.1 | 1.41 | 0.94 | 51.1 | 9 | 124.1 | 4.86 | 2.92 | 1.94 | 0.58 | 28.9 | 16.9 | UnDef | 0.27 |
| 3.00 | 158.2 | 1.49 | 0.94 | 57.9 | 9 | 124.1 | 4.92 | 2.95 | 1.97 | 0.58 | 30.3 | 17.6 | UnDef | 0.29 |
| 3.99 | 153.6 | 1.37 | 0.89 | 61.7 | 9 | 124.1 | 4.98 | 2.99 | 2.00 | 0.58 | 29.4 | 17.0 | UnDef | 0.27 |
| 4.97 | 160.0 | 1.54 | 0.96 | 63.7 | 9 | 124.1 | 5.04 | 3.02 | 2.03 | 0.58 | 30.6 | 17.6 | UnDef | 0.30 |
| 5.96 | 163.0 | 1.59 | 0.97 | 66.5 | 9 | 124.1 | 5.11 | 3.05 | 2.06 | 0.57 | 31.2 | 17.9 | UnDef | 0.31 |
| 6.94 | 264.6 | 2.46 | 0.93 | 66.6 | 9 | 124.1 | 5.17 | 3.08 | 2.09 | 0.57 | 50.7 | 28.9 | UnDef | 0.00 |
| 7.93 | 282.2 | 2.92 | 1.04 | 66.2 | 9 | 124.1 | 5.23 | 3.11 | 2.12 | 0.57 | 54.1 | 30.7 | UnDef | 0.00 |
| 8.91 | 231.9 | 2.64 | 1.14 | 66.8 | 9 | 124.1 | 5.29 | 3.14 | 2.15 | 0.56 | 44.4 | 25.1 | UnDef | 0.00 |
| 9.89 | 275.2 | 2.59 | 0.94 | 64.4 | 9 | 124.1 | 5.35 | 3.17 | 2.18 | 0.56 | 52.7 | 29.6 | UnDef | 0.00 |
| 0.88 | 289.5 | 2.16 | 0.75 | 63.1 | 9 | 124.1 | 5.41 | 3.20 | 2.21 | 0.56 | 55.5 | 31.0 | UnDef | 0.00 |
| 1.86 | 198.3 | 1.54 | 0.78 | 58.3 | 9 | 124.1 | 5.47 | 3.23 | 2.24 | 0.56 | 38.0 | 21.1 | UnDef | 0.34 |
| 2.85 | 125.2 | 1.18 | 0.94 | 31.4 | 8 | 120.9 | 5.53 | 3.26 | 2.27 | 0.55 | 30.0 | 16.6 | UnDef | 0.23 |
| 3.83 | 31.2 | 0.58 | 1.84 | 170.6 | 6 | 114.6 | 5.59 | 3.28 | 2.31 | 0.55 | 12.0 | 6.6 | 2.05 | 0.14 |
| 4.82 | 44.8 | 0.69 | 1.54 | 74.8 | 7 | 117.8 | 5.65 | 3.31 | 2.34 | 0.55 | 14.3 | 7.9 | UnDef | 0.26 |
| 5.80 | 135.1 | 1.41 | 1.05 | 25.1 | 8 | 120.9 | 5.71 | 3.34 | 2.37 | 0.55 | 32.3 | 17.7 | UnDef | 0.27 |
| 6.78 | 131.5 | 1.20 | 0.91 | 6.3 | 9 | 124.1 | 5.77 | 3.37 | 2.40 | 0.54 | 25.2 | 13.7 | UnDef | 0.24 |
| 7.77 | 116.3 | 1.34 | 1.16 | 9.8 | 8 | 120.9 | 5.83 | 3.40 | 2.43 | 0.54 | 27.8 | 15.1 | UnDef | 0.28 |
| 8.75 | 117.7 | 1.48 | 1.26 | 4.8 | 8 | 120.9 | 5.89 | 3.43 | 2.46 | 0.54 | 28.2 | 15.2 | UnDef | 0.31 |

iregg In Situ, Inc.
:nterpretation Output - Release 1.00.19e
lun No: 03-0630-0942-1481
lob No: 03-151SH
:lient: URS
'roject: CPT SITE INVESTIGATION
;ite: PIER T LNG
.ocation: CPT-04
:ngineer: T. O'BRIEN
:PT Date: 03/24/06
:PT Time: 12:12
:PT File: 151C04.COR
lorthing (m): 0.000
:asting (m): 0.000
:levation (m): 0.000

Water Table (m): 6.10 (ft): 20.0
Su Nkt used: 12.50
Averaging Increment (m): 0.30
Phi Method : Robertson and Campanella, 1983
Dr Method : Jamiolkowski - All Sands
State Parameter M: 1.20
Used Unit Weights Assigned to Soil Zones
Values of 1.0E9 or UnDef are printed for parameters that are not valid for the material type (SBT)

| lepth ft) | k (cm/s) | Bq | Qtn | Rfn | SBTn | Qc1N | DeltaQc1N | Qc1Ncs | Fc (%) | Phi (Deg) | Dr (%) | OCR | State Param | Del(n1)60 | (N1)60cs |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 0.49 | 5.0E-03 | 0.00 | 1000.0 | 0.51 | 10 | 179.9 | 0.0 | 179.9 | 0.0 | 50 | 95.0 | 1.0 | -0.33 | 0.0 | 45.0 |
| 1.48 | 5.0E-03 | 0.00 | 1000.0 | 1.41 | 12 | 263.6 | UnDef | UnDef | 0.0 | 50 | 95.0 | 1.0 | -0.45 | UnDef | UnDef |
| 2.46 | 5.0E-04 | 0.00 | 739.9 | 1.69 | 12 | 210.0 | UnDef | UnDef | 0.0 | 50 | 95.0 | 1.0 | -0.45 | UnDef | UnDef |
| 3.44 | 5.0E-05 | 0.00 | 253.3 | 2.40 | 9 | 100.0 | 18.9 | 118.8 | 10.9 | 46 | 70.7 | 10.0 | -0.40 | 4.4 | 44.4 |
| 4.43 | 5.0E-06 | 0.00 | 94.7 | 2.72 | 7 | 47.9 | 32.0 | 79.9 | 20.0 | UnDef | UnDef | 10.0 | UnDef | 7.8 | 31.3 |
| 5.41 | 5.0E-05 | 0.00 | 96.2 | 1.91 | 7 | 53.7 | 22.9 | 76.5 | 16.2 | 42 | 49.4 | 10.0 | -0.25 | 4.8 | 25.8 |
| 6.40 | 5.0E-05 | 0.00 | 63.5 | 2.44 | 7 | 38.6 | 36.2 | 74.8 | 23.1 | 40 | 40.0 | 10.0 | -0.24 | 6.6 | 21.7 |
| 7.30 | 5.0E-06 | 0.00 | 47.0 | 2.46 | 7 | 30.7 | 43.6 | 74.3 | 27.0 | UnDef | UnDef | 6.0 | UnDef | 8.7 | 23.7 |
| 8.20 | 5.0E-06 | 0.02 | 13.9 | 1.67 | 6 | 10.1 | 40.4 | 50.5 | 42.4 | UnDef | UnDef | 6.0 | UnDef | 4.9 | 9.9 |
| 9.19 | 5.0E-05 | 0.00 | 55.3 | 1.91 | 7 | 40.2 | 33.8 | 74.1 | 22.1 | 40 | 41.2 | 10.0 | -0.19 | 6.3 | 22.1 |
| 0.17 | 5.0E-04 | 0.00 | 73.0 | 1.37 | 7 | 55.7 | 22.8 | 78.5 | 15.9 | 40 | 50.5 | 1.0 | -0.19 | 4.0 | 22.2 |
| 1.15 | 5.0E-04 | 0.00 | 65.7 | 1.47 | 7 | 52.6 | 26.7 | 79.3 | 17.6 | 40 | 48.9 | 1.0 | -0.18 | 4.6 | 21.7 |
| 2.14 | 5.0E-06 | -0.01 | 43.3 | 2.84 | 6 | 36.4 | 72.2 | 108.6 | 29.9 | UnDef | UnDef | 6.0 | UnDef | 12.7 | 30.5 |
| 3.21 | 5.0E-07 | -0.03 | 14.0 | 3.55 | 4 | 12.8 | 51.3 | 64.1 | 53.4 | UnDef | UnDef | 6.0 | UnDef | 8.4 | 16.7 |
| 4.27 | 5.0E-05 | -0.02 | 18.5 | 1.15 | 7 | 17.4 | 50.8 | 68.2 | 32.9 | 32 | 30.0 | 6.0 | -0.04 | 5.9 | 12.7 |
| 5.26 | 5.0E-04 | 0.00 | 36.7 | 1.10 | 7 | 34.7 | 28.7 | 63.4 | 21.9 | 38 | 37.0 | 1.0 | -0.10 | 4.5 | 15.8 |
| 6.24 | 5.0E-05 | 0.00 | 20.0 | 1.99 | 6 | 20.0 | 79.9 | 99.8 | 37.7 | 34 | 30.0 | 6.0 | -0.09 | 7.8 | 15.6 |
| 7.22 | 5.0E-05 | 0.01 | 12.8 | 0.66 | 7 | 13.5 | 49.8 | 63.3 | 34.5 | 30 | 30.0 | 6.0 | 0.04 | 5.1 | 10.4 |
| 8.21 | 5.0E-03 | 0.00 | 59.9 | 0.74 | 9 | 61.3 | 17.4 | 78.7 | 13.3 | 40 | 53.2 | 1.0 | -0.11 | 2.4 | 17.4 |
| 9.19 | 5.0E-03 | 0.00 | 64.2 | 0.97 | 9 | 67.5 | 22.8 | 90.3 | 14.5 | 40 | 56.0 | 1.0 | -0.14 | 3.1 | 19.6 |
| 0.18 | 5.0E-02 | 0.00 | 205.9 | 0.69 | 9 | 219.1 | 0.0 | 219.1 | 3.9 | 46 | 89.8 | 1.0 | -0.22 | 0.0 | 42.9 |
| 1.16 | 5.0E-02 | 0.00 | 185.6 | 0.99 | 9 | 200.3 | 7.1 | 207.4 | 6.3 | 44 | 87.2 | 1.0 | -0.24 | 0.9 | 40.1 |
| 2.15 | 5.0E-03 | 0.00 | 135.3 | 1.16 | 9 | 148.1 | 19.3 | 167.5 | 9.3 | 44 | 78.5 | 1.0 | -0.23 | 2.8 | 39.1 |
| 3.13 | 5.0E-02 | 0.00 | 111.0 | 0.88 | 9 | 123.1 | 14.8 | 137.9 | 9.0 | 42 | 73.2 | 1.0 | -0.19 | 1.7 | 25.8 |
| 4.11 | 5.0E-03 | 0.00 | 87.6 | 1.01 | 9 | 98.6 | 22.0 | 120.6 | 11.8 | 42 | 66.9 | 1.0 | -0.18 | 3.1 | 27.2 |
| 5.10 | 5.0E-03 | 0.00 | 73.0 | 1.06 | 9 | 83.3 | 25.7 | 109.0 | 13.8 | 40 | 62.0 | 1.0 | -0.16 | 3.5 | 23.9 |
| 6.08 | 5.0E-03 | 0.00 | 64.9 | 0.65 | 9 | 75.0 | 16.3 | 91.3 | 11.7 | 40 | 59.0 | 1.0 | -0.11 | 2.3 | 20.7 |
| 7.07 | 5.0E-03 | 0.00 | 50.1 | 1.05 | 7 | 58.8 | 30.3 | 89.1 | 17.7 | 38 | 52.1 | 1.0 | -0.13 | 3.9 | 18.3 |
| 3.05 | 5.0E-04 | 0.00 | 43.7 | 1.09 | 7 | 52.0 | 33.5 | 85.6 | 19.7 | 38 | 48.5 | 1.0 | -0.12 | 5.5 | 22.5 |
| 9.04 | 5.0E-04 | 0.00 | 32.9 | 1.23 | 7 | 40.0 | 43.3 | 83.3 | 24.5 | 36 | 41.0 | 1.0 | -0.10 | 6.3 | 19.3 |
| ).02 | 5.0E-04 | 0.00 | 35.7 | 1.05 | 7 | 43.7 | 36.0 | 79.6 | 21.9 | 38 | 43.5 | 1.0 | -0.09 | 5.6 | 19.9 |
| 1.00 | 5.0E-04 | 0.00 | 35.0 | 1.11 | 7 | 43.2 | 38.6 | 81.9 | 22.7 | 38 | 43.2 | 1.0 | -0.10 | 5.9 | 20.0 |
| 1.99 | 5.0E-04 | 0.00 | 34.1 | 1.17 | 7 | 42.5 | 41.7 | 84.2 | 23.5 | 36 | 42.8 | 1.0 | -0.10 | 6.2 | 20.1 |
| ?.97 | 5.0E-04 | 0.00 | 34.1 | 1.09 | 7 | 42.9 | 39.1 | 82.0 | 22.9 | 36 | 43.0 | 1.0 | -0.09 | 5.9 | 20.0 |
| 3.96 | 5.0E-04 | 0.00 | 37.6 | 1.20 | 7 | 47.7 | 41.3 | 89.0 | 22.4 | 38 | 46.1 | 1.0 | -0.11 | 6.4 | 21.9 |
| .94 | 5.0E-04 | 0.00 | 39.7 | 1.16 | 7 | 50.7 | 39.4 | 90.1 | 21.4 | 38 | 47.8 | 1.0 | -0.11 | 6.2 | 22.8 |
| 5.92 | 5.0E-03 | 0.00 | 57.6 | 1.09 | 7 | 73.4 | 32.4 | 105.8 | 16.5 | 40 | 58.4 | 1.0 | -0.14 | 4.3 | 22.2 |
| 5.91 | 5.0E-03 | 0.00 | 49.8 | 1.33 | 7 | 64.3 | 42.2 | 106.5 | 19.8 | 38 | 54.6 | 1.0 | -0.15 | 5.2 | 20.9 |
| 7.89 | 5.0E-04 | 0.00 | 31.2 | 1.22 | 7 | 41.3 | 48.2 | 89.4 | 25.2 | 36 | 41.9 | 1.0 | -0.09 | 6.8 | 20.3 |
| 3.88 | 5.0E-04 | 0.00 | 33.6 | 1.14 | 7 | 44.7 | 43.5 | 88.1 | 23.5 | 36 | 44.2 | 1.0 | -0.09 | 6.5 | 21.1 |
| ).86 | 5.0E-04 | 0.00 | 36.6 | 1.29 | 7 | 48.9 | 47.6 | 96.5 | 23.5 | 38 | 46.7 | 1.0 | -0.11 | 7.1 | 23.1 |
| ).85 | 5.0E-04 | 0.00 | 37.4 | 1.29 | 7 | 50.4 | 47.3 | 97.7 | 23.1 | 38 | 47.6 | 1.0 | -0.12 | 7.1 | 23.6 |

regg In Situ, Inc.
un No: 03-0630-0942-1481
PT File: 151C04.COR



| epth ft) | k (cm/s) | Bq | Qtn | Rfn | SBTn | Qc1N | DeltaQc1N | Qc1Ncs | Fc (%) | Phi (Deg) | Dr (%) | OCR | State Param | Del(n1)60 | (N1)60cs |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1.83 | 5.0E-04 | 0.00 | 35.0 | 1.26 | 7 | 47.6 | 48.4 | 96.0 | 23.9 | 38 | 46.0 | 1.0 | -0.11 | 7.2 | 22.7 |
| 2.81 | 5.0E-03 | 0.00 | 36.6 | 1.17 | 7 | 50.1 | 44.3 | 94.4 | 22.6 | 38 | 47.5 | 1.0 | -0.11 | 5.1 | 17.3 |
| 3.80 | 5.0E-03 | 0.00 | 47.1 | 1.16 | 7 | 64.5 | 39.9 | 104.4 | 19.3 | 38 | 54.7 | 1.0 | -0.13 | 5.0 | 20.7 |
| 4.78 | 5.0E-03 | 0.00 | 38.6 | 1.17 | 7 | 53.7 | 43.7 | 97.4 | 21.8 | 38 | 49.4 | 1.0 | -0.11 | 5.1 | 18.3 |
| 5.77 | 5.0E-03 | 0.00 | 35.9 | 1.23 | 7 | 50.4 | 47.9 | 98.4 | 23.2 | 38 | 47.7 | 1.0 | -0.11 | 5.4 | 17.8 |
| 6.75 | 5.0E-04 | 0.00 | 35.9 | 1.28 | 7 | 50.7 | 50.4 | 101.2 | 23.7 | 38 | 47.8 | 1.0 | -0.11 | 7.5 | 24.0 |
| 7.74 | 5.0E-03 | 0.00 | 37.2 | 1.29 | 7 | 53.0 | 50.1 | 103.1 | 23.2 | 38 | 49.1 | 1.0 | -0.12 | 5.7 | 18.6 |
| 8.72 | 5.0E-03 | 0.00 | 38.6 | 1.25 | 7 | 55.3 | 48.2 | 103.5 | 22.4 | 38 | 50.3 | 1.0 | -0.12 | 5.6 | 19.1 |
| 9.70 | 5.0E-03 | 0.00 | 36.6 | 1.34 | 7 | 53.0 | 53.4 | 106.4 | 23.8 | 38 | 49.1 | 1.0 | -0.12 | 5.9 | 18.9 |
| 0.69 | 5.0E-03 | 0.00 | 34.9 | 1.30 | 7 | 50.9 | 53.4 | 104.3 | 24.2 | 38 | 47.9 | 1.0 | -0.11 | 5.9 | 18.3 |
| 1.67 | 5.0E-03 | 0.00 | 44.4 | 1.15 | 7 | 64.6 | 42.7 | 107.3 | 19.9 | 38 | 54.8 | 1.0 | -0.12 | 5.2 | 21.0 |
| 2.66 | 5.0E-03 | 0.00 | 42.6 | 1.30 | 7 | 62.6 | 49.6 | 112.2 | 21.6 | 38 | 53.8 | 1.0 | -0.13 | 5.9 | 21.2 |
| 3.64 | 5.0E-03 | 0.00 | 34.1 | 1.28 | 7 | 50.9 | 54.3 | 105.2 | 24.3 | 36 | 47.9 | 1.0 | -0.11 | 5.9 | 18.4 |
| 4.63 | 5.0E-03 | 0.00 | 32.9 | 1.27 | 7 | 49.5 | 55.3 | 104.7 | 24.8 | 36 | 47.1 | 1.0 | -0.10 | 6.0 | 18.1 |
| 5.61 | 5.0E-03 | 0.00 | 37.5 | 1.24 | 7 | 56.5 | 51.1 | 107.7 | 22.8 | 38 | 50.9 | 1.0 | -0.11 | 5.8 | 19.7 |
| 6.59 | 5.0E-04 | 0.00 | 31.8 | 1.36 | 7 | 48.5 | 61.5 | 110.0 | 25.9 | 36 | 46.6 | 1.0 | -0.10 | 8.5 | 24.3 |
| 7.58 | 5.0E-04 | 0.00 | 25.8 | 1.86 | 6 | 40.0 | 111.8 | 151.8 | 32.6 | 34 | 41.0 | 1.0 | -0.11 | 11.1 | 24.2 |
| 8.56 | 5.0E-05 | 0.15 | 9.3 | 1.97 | 6 | 16.0 | 64.1 | 80.2 | 53.4 | 30 | 30.0 | 3.0 | 0.01 | 6.3 | 12.6 |
| 9.55 | 5.0E-05 | -0.01 | 11.4 | 1.74 | 6 | 19.3 | 77.0 | 96.3 | 47.1 | 30 | 30.0 | 3.0 | -0.02 | 7.5 | 15.1 |
| 0.53 | 5.0E-05 | 0.15 | 5.6 | 1.69 | 4 | 10.7 | 42.9 | 53.6 | 64.0 | 30 | 30.0 | 1.5 | 0.07 | 4.2 | 8.4 |
| 1.52 | 5.0E-04 | 0.02 | 18.3 | 1.44 | 6 | 29.8 | 119.2 | 149.0 | 35.5 | 32 | 32.6 | 1.0 | -0.05 | 9.7 | 19.4 |
| 2.42 | 5.0E-05 | 0.03 | 10.4 | 3.04 | 4 | 18.1 | 72.4 | 90.5 | 57.4 | 30 | 30.0 | 3.0 | -0.05 | 7.1 | 14.2 |
| 3.32 | 5.0E-03 | 0.02 | 27.3 | 1.11 | 7 | 43.8 | 57.0 | 100.7 | 26.2 | 36 | 43.6 | 1.0 | -0.07 | 5.9 | 16.6 |
| 4.30 | 5.0E-03 | 0.00 | 57.2 | 1.31 | 7 | 89.7 | 48.3 | 138.0 | 18.1 | 40 | 64.2 | 1.0 | -0.16 | 6.2 | 28.1 |
| 5.29 | 5.0E-03 | 0.00 | 55.2 | 1.28 | 7 | 87.1 | 47.9 | 135.0 | 18.3 | 40 | 63.3 | 1.0 | -0.15 | 6.1 | 27.4 |
| 6.27 | 5.0E-02 | 0.00 | 56.9 | 1.02 | 7 | 90.2 | 38.1 | 128.3 | 16.1 | 40 | 64.3 | 1.0 | -0.14 | 4.0 | 21.7 |
| 7.26 | 5.0E-02 | 0.00 | 66.9 | 0.84 | 9 | 106.3 | 29.0 | 135.3 | 13.0 | 40 | 69.0 | 1.0 | -0.13 | 3.2 | 24.0 |
| 8.24 | 5.0E-04 | 0.00 | 26.9 | 1.41 | 7 | 44.4 | 77.5 | 121.9 | 28.8 | 36 | 44.0 | 1.0 | -0.09 | 9.6 | 24.1 |
| 9.22 | 5.0E-05 | 0.16 | 8.2 | 2.30 | 4 | 15.4 | 61.8 | 77.2 | 58.8 | 30 | 30.0 | 3.0 | 0.02 | 6.0 | 12.1 |
| 0.21 | 5.0E-04 | 0.07 | 13.0 | 1.49 | 6 | 23.1 | 92.2 | 115.3 | 42.4 | 32 | 30.0 | 1.0 | -0.02 | 7.5 | 15.0 |
| 1.19 | 5.0E-04 | 0.06 | 16.1 | 1.30 | 6 | 28.1 | 112.5 | 140.6 | 36.7 | 32 | 30.9 | 1.0 | -0.03 | 9.2 | 18.3 |
| 2.18 | 5.0E-03 | -0.01 | 45.4 | 1.24 | 7 | 75.0 | 51.9 | 126.9 | 20.3 | 38 | 59.0 | 1.0 | -0.13 | 6.3 | 24.6 |
| 3.16 | 5.0E-03 | -0.01 | 43.3 | 1.12 | 7 | 72.1 | 48.2 | 120.3 | 20.0 | 38 | 57.9 | 1.0 | -0.12 | 5.9 | 23.5 |
| 4.15 | 5.0E-04 | -0.02 | 19.9 | 1.77 | 6 | 34.7 | 138.9 | 173.6 | 36.3 | 34 | 37.0 | 1.0 | -0.08 | 11.3 | 22.7 |
| 5.13 | 5.0E-04 | 0.00 | 14.1 | 1.49 | 6 | 25.5 | 102.1 | 127.6 | 40.8 | 32 | 30.0 | 1.0 | -0.03 | 8.3 | 16.6 |
| 6.11 | 5.0E-05 | 0.00 | 10.7 | 1.96 | 6 | 20.1 | 80.4 | 100.5 | 50.2 | 30 | 30.0 | 3.0 | -0.02 | 7.9 | 15.7 |
| 7.10 | 5.0E-05 | 0.03 | 10.7 | 1.87 | 6 | 20.2 | 80.9 | 101.1 | 49.5 | 30 | 30.0 | 3.0 | -0.01 | 7.9 | 15.8 |
| 8.08 | 5.0E-04 | 0.01 | 11.2 | 1.34 | 6 | 21.1 | 84.4 | 105.5 | 44.3 | 30 | 30.0 | 1.0 | 0.00 | 6.9 | 13.8 |
| 9.07 | 5.0E-05 | 0.08 | 6.8 | 1.58 | 4 | 14.0 | 56.1 | 70.1 | 58.0 | 30 | 30.0 | 3.0 | 0.05 | 5.5 | 11.0 |
| 0.05 | 5.0E-05 | 0.13 | 6.7 | 2.12 | 4 | 13.8 | 55.4 | 69.2 | 62.9 | 30 | 30.0 | 3.0 | 0.04 | 5.4 | 10.8 |
| 1.04 | 5.0E-03 | 0.04 | 21.9 | 1.11 | 7 | 39.2 | 75.4 | 114.6 | 29.6 | 34 | 40.5 | 1.0 | -0.05 | 6.7 | 16.3 |
| 2.02 | 5.0E-02 | 0.00 | 50.0 | 0.97 | 7 | 86.5 | 41.3 | 127.8 | 17.1 | 38 | 63.1 | 1.0 | -0.12 | 4.3 | 21.2 |
| 3.00 | 5.0E-02 | 0.00 | 51.9 | 0.97 | 7 | 90.0 | 41.1 | 131.1 | 16.7 | 38 | 64.3 | 1.0 | -0.12 | 4.3 | 21.9 |
| 3.99 | 5.0E-02 | 0.00 | 49.8 | 0.92 | 7 | 87.0 | 39.9 | 127.0 | 16.8 | 38 | 63.3 | 1.0 | -0.11 | 4.2 | 21.2 |
| 4.97 | 5.0E-02 | 0.00 | 51.4 | 1.00 | 7 | 90.1 | 42.7 | 132.8 | 17.0 | 38 | 64.3 | 1.0 | -0.12 | 4.4 | 22.1 |
| 5.96 | 5.0E-02 | 0.00 | 51.8 | 1.01 | 7 | 91.4 | 43.2 | 134.6 | 17.0 | 38 | 64.7 | 1.0 | -0.13 | 4.5 | 22.4 |
| 6.94 | 5.0E-02 | 0.00 | 84.3 | 0.95 | 9 | 147.6 | 32.3 | 179.9 | 11.7 | 42 | 78.4 | 1.0 | -0.17 | 3.7 | 32.6 |
| 7.93 | 5.0E-02 | 0.00 | 89.2 | 1.06 | 9 | 156.7 | 35.9 | 192.6 | 12.0 | 42 | 80.2 | 1.0 | -0.18 | 4.1 | 34.7 |
| 8.91 | 5.0E-02 | 0.00 | 72.2 | 1.16 | 9 | 128.1 | 44.6 | 172.7 | 14.7 | 40 | 74.4 | 1.0 | -0.17 | 4.8 | 29.9 |
| 9.89 | 5.0E-02 | 0.00 | 85.2 | 0.96 | 9 | 151.3 | 33.1 | 184.4 | 11.7 | 42 | 79.1 | 1.0 | -0.17 | 3.7 | 33.4 |
| 0.88 | 5.0E-02 | 0.00 | 88.8 | 0.76 | 9 | 158.4 | 23.7 | 182.2 | 9.9 | 42 | 80.5 | 1.0 | -0.15 | 2.8 | 33.8 |
| 1.86 | 5.0E-02 | 0.00 | 59.7 | 0.80 | 9 | 108.0 | 33.3 | 141.4 | 13.8 | 40 | 69.5 | 1.0 | -0.12 | 3.7 | 24.8 |
| 2.85 | 5.0E-03 | -0.01 | 36.7 | 0.98 | 7 | 67.9 | 50.7 | 118.5 | 21.0 | 38 | 56.2 | 1.0 | -0.09 | 6.1 | 22.7 |
| 3.83 | 5.0E-05 | 0.12 | 7.8 | 2.25 | 4 | 16.8 | 67.4 | 84.2 | 59.8 | 30 | 30.0 | 3.0 | 0.02 | 6.6 | 13.2 |
| 4.82 | 5.0E-04 | 0.00 | 11.8 | 1.76 | 6 | 24.1 | 96.3 | 120.4 | 46.6 | 30 | 30.0 | 1.0 | -0.02 | 7.9 | 15.7 |
| 5.80 | 5.0E-03 | -0.01 | 38.8 | 1.09 | 7 | 72.4 | 55.2 | 127.5 | 21.2 | 38 | 58.0 | 1.0 | -0.11 | 6.6 | 24.3 |
| 6.78 | 5.0E-02 | -0.02 | 37.3 | 0.95 | 7 | 70.1 | 49.8 | 119.9 | 20.5 | 38 | 57.1 | 1.0 | -0.09 | 4.8 | 18.5 |
| 7.77 | 5.0E-03 | -0.02 | 32.5 | 1.22 | 7 | 61.7 | 67.4 | 129.1 | 24.5 | 36 | 53.5 | 1.0 | -0.10 | 7.3 | 22.4 |
| 8.75 | 5.0E-03 | -0.02 | 32.6 | 1.32 | 7 | 62.2 | 73.7 | 135.9 | 25.3 | 36 | 53.7 | 1.0 | -0.11 | 7.8 | 23.0 |

regg In Situ, Inc.
nterpretation Output - Release 1.00.19e
un No: 03-0630-0942-1541
ob No: 03-151SH
lient: URS
roject: CPT SITE INVESTIGATION
ite: PIER T LNG
ocation: CPT-05
ngineer: T. O'BRIEN
PT Date: 03/25/06
PT Time: 11:45
PT File: 151C05.COR
orthing (m): 0.000
asting (m): 0.000
levation (m): 0.000

Water Table (m): 6.10 (ft): 20.0
Su Nkt used: 12.50
Averaging Increment (m): 0.30
Phi Method : Robertson and Campanella, 1983
Dr Method : Jamiolkowski - All Sands
State Parameter M: 1.20
Used Unit Weights Assigned to Soil Zones
Values of 1.0E9 or UnDef are printed for parameters that are not valid for the material type (SBT)

| epth (ft) | AvgQt (tsf) | AvgFs (tsf) | AvgRf (%) | AvgUd (ft) | SBT | U.Wt. pcf | TStress (tsf) | EStress (tsf) | Ueq (tsf) | Cn | N60 (blows/ft) | (N1)60 (blows/ft) | Su (tsf) | CRR |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 0.49 | 179.2 | 1.28 | 0.71 | 15.3 | 9 | 124.1 | 0.03 | 0.03 | 0.00 | 2.00 | 34.3 | 68.6 | UnDef | 0.00 |
| 1.48 | 169.5 | 2.46 | 1.45 | 29.7 | 8 | 120.9 | 0.09 | 0.09 | 0.00 | 2.00 | 40.6 | 81.2 | UnDef | 0.00 |
| 2.46 | 108.0 | 2.07 | 1.92 | 19.6 | 7 | 117.8 | 0.15 | 0.15 | 0.00 | 2.00 | 34.5 | 68.9 | UnDef | 0.00 |
| 3.44 | 106.3 | 1.90 | 1.79 | 10.2 | 7 | 117.8 | 0.21 | 0.21 | 0.00 | 2.00 | 33.9 | 67.9 | UnDef | 0.00 |
| 4.43 | 89.2 | 1.42 | 1.60 | 5.7 | 7 | 117.8 | 0.27 | 0.27 | 0.00 | 1.94 | 28.5 | 55.2 | UnDef | 0.00 |
| 5.41 | 54.2 | 0.88 | 1.62 | -0.2 | 7 | 117.8 | 0.32 | 0.32 | 0.00 | 1.76 | 17.3 | 30.4 | UnDef | 0.20 |
| 6.40 | 46.6 | 0.96 | 2.06 | -4.7 | 6 | 114.6 | 0.38 | 0.38 | 0.00 | 1.62 | 17.9 | 29.0 | 3.70 | 0.17 |
| 7.30 | 43.0 | 0.91 | 2.13 | -6.8 | 6 | 114.6 | 0.43 | 0.43 | 0.00 | 1.52 | 16.5 | 25.1 | 3.41 | 0.16 |
| 8.20 | 25.1 | 0.57 | 2.27 | -9.0 | 6 | 114.6 | 0.48 | 0.48 | 0.00 | 1.44 | 9.6 | 13.8 | 1.97 | 0.12 |
| 9.19 | 15.2 | 0.28 | 1.84 | -7.8 | 5 | 114.6 | 0.54 | 0.54 | 0.00 | 1.36 | 7.3 | 9.9 | 1.17 | 0.12 |
| 0.17 | 17.3 | 0.26 | 1.53 | 0.6 | 6 | 114.6 | 0.60 | 0.60 | 0.00 | 1.29 | 6.6 | 8.6 | 1.34 | 0.10 |
| 1.15 | 9.1 | 0.16 | 1.78 | 5.6 | 5 | 114.6 | 0.65 | 0.65 | 0.00 | 1.24 | 4.4 | 5.4 | 0.68 | 0.10 |
| 2.14 | 4.9 | 0.06 | 1.18 | 13.4 | 1 | 79.6 | 0.70 | 0.70 | 0.00 | 1.19 | 2.4 | 2.8 | 0.34 | 0.00 |
| 3.21 | 5.9 | 0.10 | 1.72 | 15.4 | 4 | 114.6 | 0.75 | 0.75 | 0.00 | 1.15 | 3.8 | 4.4 | 0.42 | 0.08 |
| 4.27 | 5.6 | 0.09 | 1.53 | 18.1 | 4 | 114.6 | 0.81 | 0.81 | 0.00 | 1.11 | 3.6 | 4.0 | 0.38 | 0.08 |
| 5.26 | 4.7 | 0.04 | 0.96 | 31.6 | 1 | 79.6 | 0.86 | 0.86 | 0.00 | 1.08 | 2.2 | 2.4 | 0.30 | 0.00 |
| 6.24 | 5.0 | 0.04 | 0.86 | 43.3 | 1 | 79.6 | 0.90 | 0.90 | 0.00 | 1.05 | 2.4 | 2.5 | 0.33 | 0.00 |
| 7.22 | 5.1 | 0.05 | 0.90 | 55.9 | 1 | 79.6 | 0.94 | 0.94 | 0.00 | 1.03 | 2.5 | 2.5 | 0.33 | 0.00 |
| 8.21 | 5.7 | 0.05 | 0.90 | 76.1 | 1 | 79.6 | 0.98 | 0.98 | 0.00 | 1.01 | 2.7 | 2.8 | 0.38 | 0.00 |
| 9.19 | 192.4 | 1.60 | 0.83 | 48.3 | 9 | 124.1 | 1.03 | 1.03 | 0.00 | 0.99 | 36.9 | 36.3 | UnDef | 0.00 |
| 0.18 | 237.3 | 2.79 | 1.18 | 14.7 | 9 | 124.1 | 1.09 | 1.09 | 0.01 | 0.96 | 45.5 | 43.6 | UnDef | 0.00 |
| 1.16 | 218.4 | 1.39 | 0.64 | 14.8 | 9 | 124.1 | 1.15 | 1.12 | 0.04 | 0.95 | 41.8 | 39.6 | UnDef | 0.00 |
| 2.15 | 230.5 | 1.11 | 0.48 | 3.3 | 9 | 124.1 | 1.21 | 1.15 | 0.07 | 0.93 | 44.1 | 41.2 | UnDef | 0.00 |
| 3.13 | 175.7 | 1.30 | 0.74 | 3.6 | 9 | 124.1 | 1.27 | 1.18 | 0.10 | 0.92 | 33.6 | 31.0 | UnDef | 0.00 |
| 4.11 | 176.2 | 0.99 | 0.56 | 2.7 | 9 | 124.1 | 1.34 | 1.21 | 0.13 | 0.91 | 33.8 | 30.7 | UnDef | 0.44 |
| 5.10 | 148.7 | 1.11 | 0.74 | -1.3 | 9 | 124.1 | 1.40 | 1.24 | 0.16 | 0.90 | 28.5 | 25.6 | UnDef | 0.34 |
| 6.08 | 137.2 | 1.10 | 0.80 | 0.1 | 9 | 124.1 | 1.46 | 1.27 | 0.19 | 0.89 | 26.3 | 23.3 | UnDef | 0.30 |
| 7.07 | 106.0 | 0.84 | 0.79 | -1.4 | 8 | 120.9 | 1.52 | 1.30 | 0.22 | 0.88 | 25.4 | 22.3 | UnDef | 0.20 |
| 8.05 | 71.5 | 0.52 | 0.73 | -1.6 | 8 | 120.9 | 1.58 | 1.33 | 0.25 | 0.87 | 17.1 | 14.9 | UnDef | 0.13 |
| 9.04 | 64.2 | 0.50 | 0.78 | -2.4 | 8 | 120.9 | 1.64 | 1.35 | 0.28 | 0.86 | 15.4 | 13.2 | UnDef | 0.12 |
| 0.02 | 64.9 | 0.50 | 0.78 | -1.9 | 8 | 120.9 | 1.70 | 1.38 | 0.31 | 0.85 | 15.5 | 13.2 | UnDef | 0.13 |
| 1.00 | 73.4 | 0.51 | 0.69 | 0.7 | 8 | 120.9 | 1.76 | 1.41 | 0.34 | 0.84 | 17.6 | 14.8 | UnDef | 0.13 |
| 1.99 | 89.2 | 0.67 | 0.75 | 5.3 | 8 | 120.9 | 1.82 | 1.44 | 0.37 | 0.83 | 21.4 | 17.8 | UnDef | 0.16 |
| 2.97 | 68.7 | 0.52 | 0.76 | 5.8 | 8 | 120.9 | 1.87 | 1.47 | 0.41 | 0.82 | 16.4 | 13.6 | UnDef | 0.13 |
| 3.96 | 60.3 | 0.34 | 0.57 | 6.3 | 8 | 120.9 | 1.93 | 1.50 | 0.44 | 0.82 | 14.4 | 11.8 | UnDef | 0.11 |
| 4.94 | 68.8 | 0.37 | 0.53 | 10.4 | 8 | 120.9 | 1.99 | 1.53 | 0.47 | 0.81 | 16.5 | 13.3 | UnDef | 0.12 |
| 5.92 | 81.0 | 0.62 | 0.76 | 12.0 | 8 | 120.9 | 2.05 | 1.56 | 0.50 | 0.80 | 19.4 | 15.5 | UnDef | 0.14 |
| 6.91 | 83.5 | 0.56 | 0.67 | 13.4 | 8 | 120.9 | 2.11 | 1.58 | 0.53 | 0.79 | 20.0 | 15.9 | UnDef | 0.14 |
| 7.89 | 83.5 | 0.49 | 0.59 | 16.6 | 8 | 120.9 | 2.17 | 1.61 | 0.56 | 0.79 | 20.0 | 15.7 | UnDef | 0.14 |
| 8.88 | 72.8 | 0.50 | 0.68 | 15.7 | 8 | 120.9 | 2.23 | 1.64 | 0.59 | 0.78 | 17.4 | 13.6 | UnDef | 0.13 |
| 9.86 | 74.7 | 0.49 | 0.65 | 17.4 | 8 | 120.9 | 2.29 | 1.67 | 0.62 | 0.77 | 17.9 | 13.8 | UnDef | 0.13 |
| 0.85 | 80.9 | 0.58 | 0.71 | 17.7 | 8 | 120.9 | 2.35 | 1.70 | 0.65 | 0.77 | 19.4 | 14.9 | UnDef | 0.14 |

iregg In Situ, Inc.
tun No: 03-0630-0942-1541
:PT File: 151C05.COR



| Depth (ft) | AvgQt (tsf) | AvgFs (tsf) | AvgRf (%) | AvgUd (ft) | SBT | U.Wt. pcf | TStress (tsf) | EStress (tsf) | Ueq (tsf) | Cn | N60 (blows/ft) | (N1)60 (blows/ft) | Su (tsf) | CRR |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1.83 | 93.0 | 0.66 | 0.71 | 18.5 | 8 | 120.9 | 2.41 | 1.73 | 0.68 | 0.76 | 22.3 | 16.9 | UnDef | 0.15 |
| 2.81 | 82.5 | 0.31 | 0.37 | 17.8 | 8 | 120.9 | 2.47 | 1.76 | 0.71 | 0.75 | 19.8 | 14.9 | UnDef | 0.10 |
| 3.80 | 54.9 | 0.38 | 0.70 | 21.0 | 8 | 120.9 | 2.53 | 1.79 | 0.74 | 0.75 | 13.1 | 9.8 | UnDef | 0.12 |
| 4.78 | 66.5 | 0.46 | 0.69 | 20.4 | 8 | 120.9 | 2.59 | 1.82 | 0.77 | 0.74 | 15.9 | 11.8 | UnDef | 0.12 |
| 5.77 | 73.1 | 0.47 | 0.64 | 20.3 | 8 | 120.9 | 2.65 | 1.84 | 0.80 | 0.74 | 17.5 | 12.9 | UnDef | 0.13 |
| 6.75 | 48.2 | 0.53 | 1.11 | 23.6 | 7 | 117.8 | 2.71 | 1.87 | 0.84 | 0.73 | 15.4 | 11.3 | UnDef | 0.15 |
| 7.74 | 54.4 | 0.34 | 0.62 | 4.5 | 8 | 120.9 | 2.77 | 1.90 | 0.87 | 0.73 | 13.0 | 9.5 | UnDef | 0.11 |
| 8.72 | 45.9 | 0.60 | 1.31 | 24.8 | 7 | 117.8 | 2.82 | 1.93 | 0.90 | 0.72 | 14.6 | 10.5 | UnDef | 0.21 |
| 9.70 | 21.8 | 0.33 | 1.49 | 120.6 | 6 | 114.6 | 2.88 | 1.95 | 0.93 | 0.72 | 8.3 | 6.0 | 1.51 | 0.12 |
| 0.69 | 14.7 | 0.33 | 2.22 | 117.5 | 5 | 114.6 | 2.94 | 1.98 | 0.96 | 0.71 | 7.1 | 5.0 | 0.94 | 0.09 |
| 1.67 | 18.2 | 0.37 | 2.05 | 130.0 | 6 | 114.6 | 2.99 | 2.01 | 0.99 | 0.71 | 7.0 | 4.9 | 1.22 | 0.10 |
| 2.66 | 13.4 | 0.22 | 1.62 | 191.9 | 5 | 114.6 | 3.05 | 2.03 | 1.02 | 0.70 | 6.4 | 4.5 | 0.83 | 0.09 |
| 3.64 | 13.3 | 0.19 | 1.43 | 193.0 | 6 | 114.6 | 3.11 | 2.06 | 1.05 | 0.70 | 5.1 | 3.6 | 0.82 | 0.09 |
| 4.63 | 19.1 | 0.27 | 1.41 | 116.5 | 6 | 114.6 | 3.16 | 2.08 | 1.08 | 0.69 | 7.3 | 5.1 | 1.28 | 0.11 |
| 5.61 | 33.6 | 0.52 | 1.56 | 78.1 | 6 | 114.6 | 3.22 | 2.11 | 1.11 | 0.69 | 12.9 | 8.9 | 2.43 | 0.21 |
| 6.59 | 68.0 | 0.64 | 0.94 | 53.2 | 8 | 120.9 | 3.28 | 2.14 | 1.14 | 0.68 | 16.3 | 11.1 | UnDef | 0.15 |
| 7.58 | 60.1 | 0.93 | 1.55 | 35.3 | 7 | 117.8 | 3.34 | 2.16 | 1.17 | 0.68 | 19.2 | 13.0 | UnDef | 0.28 |
| 8.56 | 20.4 | 0.54 | 2.62 | 93.0 | 5 | 114.6 | 3.39 | 2.19 | 1.20 | 0.68 | 9.8 | 6.6 | 1.36 | 0.11 |
| 9.55 | 13.1 | 0.24 | 1.80 | 203.7 | 5 | 114.6 | 3.45 | 2.22 | 1.23 | 0.67 | 6.3 | 4.2 | 0.77 | 0.09 |
| 0.53 | 16.8 | 0.22 | 1.32 | 188.6 | 6 | 114.6 | 3.51 | 2.24 | 1.27 | 0.67 | 6.4 | 4.3 | 1.06 | 0.10 |
| 1.52 | 15.9 | 0.25 | 1.55 | 216.9 | 6 | 114.6 | 3.56 | 2.27 | 1.30 | 0.66 | 6.1 | 4.1 | 0.99 | 0.09 |
| 2.42 | 18.9 | 0.35 | 1.84 | 165.6 | 6 | 114.6 | 3.62 | 2.29 | 1.32 | 0.66 | 7.2 | 4.8 | 1.22 | 0.10 |
| 3.32 | 91.5 | 0.78 | 0.85 | 72.8 | 8 | 120.9 | 3.67 | 2.32 | 1.35 | 0.66 | 21.9 | 14.4 | UnDef | 0.17 |
| 4.30 | 107.4 | 1.15 | 1.07 | 33.4 | 8 | 120.9 | 3.73 | 2.34 | 1.38 | 0.65 | 25.7 | 16.8 | UnDef | 0.21 |
| 5.29 | 27.2 | 0.57 | 2.10 | 188.8 | 6 | 114.6 | 3.79 | 2.37 | 1.41 | 0.65 | 10.4 | 6.8 | 1.87 | 0.14 |
| 6.27 | 179.8 | 1.20 | 0.66 | 66.4 | 9 | 124.1 | 3.84 | 2.40 | 1.44 | 0.65 | 34.4 | 22.2 | UnDef | 0.31 |
| 7.26 | 160.4 | 1.30 | 0.81 | 51.4 | 9 | 124.1 | 3.91 | 2.43 | 1.48 | 0.64 | 30.7 | 19.7 | UnDef | 0.28 |
| 8.24 | 125.1 | 0.99 | 0.79 | 48.1 | 9 | 124.1 | 3.97 | 2.46 | 1.51 | 0.64 | 24.0 | 15.3 | UnDef | 0.21 |
| 9.22 | 105.1 | 0.76 | 0.73 | 52.9 | 8 | 120.9 | 4.03 | 2.49 | 1.54 | 0.63 | 25.2 | 15.9 | UnDef | 0.17 |
| 0.21 | 46.4 | 0.68 | 1.47 | 82.0 | 7 | 117.8 | 4.09 | 2.52 | 1.57 | 0.63 | 14.8 | 9.3 | UnDef | 0.35 |
| 1.19 | 32.4 | 0.66 | 2.03 | 120.3 | 6 | 114.6 | 4.14 | 2.54 | 1.60 | 0.63 | 12.4 | 7.8 | 2.26 | 0.17 |
| 2.18 | 30.7 | 0.71 | 2.31 | 140.1 | 6 | 114.6 | 4.20 | 2.57 | 1.63 | 0.62 | 11.7 | 7.3 | 2.12 | 0.16 |
| 3.16 | 32.1 | 0.44 | 1.36 | 136.1 | 6 | 114.6 | 4.26 | 2.60 | 1.66 | 0.62 | 12.3 | 7.6 | 2.23 | 0.17 |
| 4.15 | 28.9 | 0.52 | 1.79 | 182.5 | 6 | 114.6 | 4.31 | 2.62 | 1.69 | 0.62 | 11.1 | 6.8 | 1.97 | 0.14 |
| 5.13 | 36.3 | 0.68 | 1.88 | 137.2 | 6 | 114.6 | 4.37 | 2.65 | 1.72 | 0.61 | 13.9 | 8.5 | 2.55 | 0.20 |
| 6.11 | 25.7 | 0.56 | 2.20 | 152.4 | 6 | 114.6 | 4.42 | 2.67 | 1.75 | 0.61 | 9.9 | 6.0 | 1.70 | 0.12 |
| 7.10 | 22.1 | 0.54 | 2.42 | 168.3 | 6 | 114.6 | 4.48 | 2.70 | 1.78 | 0.61 | 8.5 | 5.2 | 1.41 | 0.00 |
| 8.08 | 28.9 | 0.92 | 3.20 | 163.2 | 5 | 114.6 | 4.54 | 2.72 | 1.81 | 0.61 | 13.8 | 8.4 | 1.95 | 0.00 |
| 9.07 | 43.2 | 0.93 | 2.14 | 87.7 | 6 | 114.6 | 4.59 | 2.75 | 1.84 | 0.60 | 16.6 | 10.0 | 3.09 | 0.27 |
| 0.05 | 85.5 | 1.03 | 1.20 | 7.1 | 8 | 120.9 | 4.65 | 2.78 | 1.87 | 0.60 | 20.5 | 12.3 | UnDef | 0.23 |
| 1.04 | 45.6 | 1.41 | 3.09 | 28.7 | 5 | 114.6 | 4.71 | 2.80 | 1.91 | 0.60 | 21.8 | 13.0 | 3.27 | 0.30 |
| 2.02 | 38.5 | 0.94 | 2.45 | 83.6 | 6 | 114.6 | 4.77 | 2.83 | 1.94 | 0.59 | 14.7 | 8.8 | 2.70 | 0.21 |
| 3.00 | 71.9 | 0.98 | 1.37 | 35.3 | 7 | 117.8 | 4.82 | 2.86 | 1.97 | 0.59 | 22.9 | 13.6 | UnDef | 0.34 |
| 3.99 | 57.8 | 1.09 | 1.89 | 38.4 | 7 | 117.8 | 4.88 | 2.88 | 2.00 | 0.59 | 18.4 | 10.9 | UnDef | 0.00 |
| 4.97 | 51.3 | 1.00 | 1.95 | 37.0 | 7 | 117.8 | 4.94 | 2.91 | 2.03 | 0.59 | 16.4 | 9.6 | UnDef | 0.38 |
| 5.96 | 76.1 | 1.12 | 1.47 | 2.1 | 7 | 117.8 | 5.00 | 2.94 | 2.06 | 0.58 | 24.3 | 14.2 | UnDef | 0.40 |
| 6.94 | 115.9 | 1.62 | 1.40 | -3.5 | 8 | 120.9 | 5.06 | 2.97 | 2.09 | 0.58 | 27.8 | 16.1 | UnDef | 0.32 |
| 7.93 | 137.8 | 1.09 | 0.79 | 4.3 | 9 | 124.1 | 5.12 | 3.00 | 2.12 | 0.58 | 26.4 | 15.2 | UnDef | 0.22 |
| 8.91 | 167.7 | 1.36 | 0.81 | 13.2 | 9 | 124.1 | 5.18 | 3.03 | 2.15 | 0.57 | 32.1 | 18.5 | UnDef | 0.28 |
| 9.89 | 247.2 | 1.66 | 0.67 | 44.3 | 9 | 124.1 | 5.24 | 3.06 | 2.18 | 0.57 | 47.3 | 27.1 | UnDef | 0.00 |
| 0.88 | 254.3 | 1.93 | 0.76 | 42.3 | 9 | 124.1 | 5.30 | 3.09 | 2.21 | 0.57 | 48.7 | 27.7 | UnDef | 0.00 |
| 1.86 | 275.9 | 1.91 | 0.69 | 50.9 | 9 | 124.1 | 5.36 | 3.12 | 2.24 | 0.57 | 52.8 | 29.9 | UnDef | 0.00 |
| 2.85 | 304.3 | 1.82 | 0.60 | 63.1 | 9 | 124.1 | 5.42 | 3.15 | 2.27 | 0.56 | 58.3 | 32.9 | UnDef | 0.00 |
| 3.83 | 322.9 | 1.60 | 0.50 | 69.4 | 10 | 127.3 | 5.48 | 3.18 | 2.31 | 0.56 | 51.5 | 28.9 | UnDef | 0.00 |
| 4.82 | 248.0 | 1.50 | 0.60 | 51.5 | 9 | 124.1 | 5.55 | 3.21 | 2.34 | 0.56 | 47.5 | 26.5 | UnDef | 0.44 |
| 5.80 | 219.8 | 1.54 | 0.70 | 28.2 | 9 | 124.1 | 5.61 | 3.24 | 2.37 | 0.56 | 42.1 | 23.4 | UnDef | 0.38 |
| 6.78 | 160.3 | 1.76 | 1.10 | 6.9 | 8 | 120.9 | 5.67 | 3.27 | 2.40 | 0.55 | 38.4 | 21.2 | UnDef | 0.33 |
| 7.77 | 171.8 | 1.51 | 0.88 | 6.0 | 9 | 124.1 | 5.73 | 3.30 | 2.43 | 0.55 | 32.9 | 18.1 | UnDef | 0.30 |
| 8.75 | 272.4 | 1.59 | 0.58 | 23.3 | 9 | 124.1 | 5.79 | 3.33 | 2.46 | 0.55 | 52.2 | 28.6 | UnDef | 0.00 |

regg In Situ, Inc.
nterpretation Output - Release 1.00.19e
un No: 03-0630-0942-1541
ob No: 03-151SH
lient: URS
roject: CPT SITE INVESTIGATION
ite: PIER T LNG
ocation: CPT-05
ngineer: T. O'BRIEN
PT Date: 03/25/06
PT Time: 11:45
PT File: 151C05.COR
orthing (m): 0.000
asting (m): 0.000
levation (m): 0.000

Water Table (m): 6.10 (ft): 20.0
Su Nkt used: 12.50
Averaging Increment (m): 0.30
Phi Method : Robertson and Campanella, 1983
Dr Method : Jamiolkowski - All Sands
State Parameter M: 1.20
Used Unit Weights Assigned to Soil Zones
Values of 1.0E9 or UnDef are printed for parameters that are not valid for the material type (SBT)

| epth ft) | k (cm/s) | Bq | Qtn | Rfn | SBTn | Qc1N | DeltaQc1N | Qc1Ncs | Fc (%) | Phi (Deg) | Dr (%) | OCR | State Param | Del(n1)60 | (N1)60cs |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 0.49 | 5.0E-02 | 0.00 | 1000.0 | 0.71 | 10 | 343.2 | 0.0 | 343.2 | 0.0 | 50 | 95.0 | 1.0 | -0.37 | 0.0 | 68.6 |
| 1.48 | 5.0E-03 | 0.01 | 1000.0 | 1.45 | 12 | 324.7 | UnDef | UnDef | 0.0 | 50 | 95.0 | 1.0 | -0.46 | UnDef | UnDef |
| 2.46 | 5.0E-04 | 0.01 | 720.9 | 1.92 | 12 | 206.8 | UnDef | UnDef | 0.0 | 50 | 95.0 | 1.0 | -0.47 | UnDef | UnDef |
| 3.44 | 5.0E-04 | 0.00 | 511.3 | 1.79 | 9 | 203.6 | 1.9 | 205.5 | 5.3 | 48 | 90.9 | 1.0 | -0.42 | 0.4 | 68.3 |
| 4.43 | 5.0E-04 | 0.00 | 334.8 | 1.60 | 9 | 169.3 | 6.1 | 175.4 | 6.3 | 48 | 82.4 | 1.0 | -0.36 | 1.2 | 56.5 |
| 5.41 | 5.0E-04 | 0.00 | 166.7 | 1.63 | 9 | 93.3 | 15.7 | 109.0 | 10.4 | 44 | 65.3 | 1.0 | -0.29 | 3.0 | 33.4 |
| 6.40 | 5.0E-05 | 0.00 | 121.5 | 2.08 | 7 | 74.0 | 26.6 | 100.5 | 14.9 | 42 | 58.6 | 10.0 | -0.29 | 5.7 | 34.7 |
| 7.30 | 5.0E-05 | 0.00 | 98.6 | 2.15 | 7 | 64.1 | 30.6 | 94.7 | 17.1 | 42 | 54.5 | 10.0 | -0.27 | 6.4 | 31.4 |
| 8.20 | 5.0E-05 | -0.01 | 50.8 | 2.31 | 7 | 35.3 | 41.4 | 76.7 | 25.2 | 38 | 37.4 | 10.0 | -0.21 | 7.0 | 20.8 |
| 9.19 | 5.0E-06 | -0.02 | 27.0 | 1.91 | 7 | 20.2 | 52.6 | 72.8 | 32.1 | UnDef | UnDef | 6.0 | UnDef | 8.1 | 18.0 |
| 0.17 | 5.0E-05 | 0.00 | 28.0 | 1.58 | 7 | 21.9 | 41.1 | 63.0 | 29.4 | 36 | 30.0 | 6.0 | -0.10 | 5.9 | 14.5 |
| 1.15 | 5.0E-06 | 0.02 | 13.0 | 1.91 | 6 | 11.1 | 44.2 | 55.3 | 45.7 | UnDef | UnDef | 6.0 | UnDef | 5.4 | 10.8 |
| 2.14 | 1.0E-07 | 0.10 | 6.0 | 1.38 | 4 | 5.8 | 23.0 | 28.8 | 59.4 | UnDef | UnDef | 1.5 | UnDef | 2.8 | 5.6 |
| 3.21 | 5.0E-07 | 0.09 | 6.9 | 1.97 | 4 | 6.7 | 26.8 | 33.5 | 61.0 | UnDef | UnDef | 3.0 | UnDef | 4.4 | 8.7 |
| 4.27 | 5.0E-07 | 0.12 | 5.9 | 1.79 | 4 | 6.1 | 24.4 | 30.5 | 63.7 | UnDef | UnDef | 1.5 | UnDef | 4.0 | 8.0 |
| 5.26 | 1.0E-07 | 0.26 | 4.4 | 1.17 | 4 | 4.9 | 19.7 | 24.6 | 65.8 | UnDef | UnDef | 1.5 | UnDef | 2.4 | 4.8 |
| 6.24 | 1.0E-07 | 0.33 | 4.5 | 1.05 | 4 | 5.1 | 20.5 | 25.6 | 63.8 | UnDef | UnDef | 1.5 | UnDef | 2.5 | 5.0 |
| 7.22 | 1.0E-07 | 0.42 | 4.4 | 1.10 | 4 | 5.2 | 20.7 | 25.8 | 64.9 | UnDef | UnDef | 1.5 | UnDef | 2.5 | 5.1 |
| 8.21 | 1.0E-07 | 0.50 | 4.8 | 1.09 | 4 | 5.7 | 22.6 | 28.3 | 62.3 | UnDef | UnDef | 1.5 | UnDef | 2.8 | 5.5 |
| 9.19 | 5.0E-02 | 0.01 | 185.8 | 0.84 | 9 | 185.5 | 1.7 | 187.2 | 5.3 | 44 | 85.0 | 1.0 | -0.23 | 0.2 | 36.5 |
| 0.18 | 5.0E-02 | 0.00 | 217.6 | 1.18 | 9 | 222.9 | 9.0 | 232.0 | 6.5 | 46 | 90.3 | 1.0 | -0.28 | 1.1 | 44.7 |
| 1.16 | 5.0E-02 | 0.00 | 194.7 | 0.64 | 9 | 202.3 | 0.0 | 202.3 | 3.8 | 44 | 87.5 | 1.0 | -0.21 | 0.0 | 39.6 |
| 2.15 | 5.0E-02 | 0.00 | 200.0 | 0.48 | 9 | 210.7 | 0.0 | 210.7 | 2.5 | 46 | 88.6 | 1.0 | -0.19 | 0.0 | 41.2 |
| 3.13 | 5.0E-02 | 0.00 | 148.2 | 0.74 | 9 | 158.5 | 4.6 | 163.1 | 6.1 | 44 | 80.5 | 1.0 | -0.20 | 0.6 | 31.6 |
| 4.11 | 5.0E-02 | 0.00 | 144.9 | 0.57 | 9 | 157.0 | 0.0 | 157.0 | 4.9 | 44 | 80.2 | 1.0 | -0.17 | 0.0 | 30.7 |
| 5.10 | 5.0E-02 | 0.00 | 119.1 | 0.75 | 9 | 130.8 | 9.6 | 140.4 | 7.6 | 42 | 75.0 | 1.0 | -0.18 | 1.1 | 26.8 |
| 6.08 | 5.0E-02 | 0.00 | 107.1 | 0.81 | 9 | 119.2 | 13.4 | 132.6 | 8.8 | 42 | 72.3 | 1.0 | -0.17 | 1.6 | 24.9 |
| 7.07 | 5.0E-03 | 0.00 | 80.6 | 0.80 | 9 | 91.1 | 17.4 | 108.5 | 11.0 | 42 | 64.6 | 1.0 | -0.15 | 2.5 | 24.8 |
| 8.05 | 5.0E-03 | 0.00 | 52.7 | 0.75 | 9 | 60.8 | 21.2 | 82.0 | 14.7 | 40 | 53.0 | 1.0 | -0.10 | 2.9 | 17.7 |
| 9.04 | 5.0E-03 | -0.01 | 46.2 | 0.80 | 7 | 54.0 | 24.2 | 78.2 | 16.6 | 38 | 49.6 | 1.0 | -0.10 | 3.2 | 16.4 |
| 0.02 | 5.0E-03 | -0.01 | 45.7 | 0.80 | 7 | 54.0 | 24.6 | 78.6 | 16.7 | 38 | 49.6 | 1.0 | -0.10 | 3.2 | 16.4 |
| 1.00 | 5.0E-03 | 0.00 | 50.7 | 0.71 | 9 | 60.4 | 21.2 | 81.6 | 14.7 | 38 | 52.8 | 1.0 | -0.09 | 2.9 | 17.7 |
| 1.99 | 5.0E-03 | 0.00 | 60.7 | 0.77 | 9 | 72.7 | 21.1 | 93.8 | 13.4 | 40 | 58.2 | 1.0 | -0.12 | 2.9 | 20.7 |
| 2.97 | 5.0E-03 | 0.00 | 45.5 | 0.78 | 7 | 55.5 | 25.0 | 80.5 | 16.6 | 38 | 50.4 | 1.0 | -0.09 | 3.3 | 16.8 |
| 3.96 | 5.0E-03 | 0.00 | 39.0 | 0.59 | 7 | 48.2 | 21.5 | 69.8 | 16.6 | 38 | 46.4 | 1.0 | -0.06 | 2.8 | 14.6 |
| 4.94 | 5.0E-03 | 0.00 | 43.7 | 0.55 | 9 | 54.5 | 19.3 | 73.8 | 14.8 | 38 | 49.9 | 1.0 | -0.06 | 2.6 | 15.9 |
| 5.92 | 5.0E-03 | 0.00 | 50.7 | 0.78 | 9 | 63.5 | 24.4 | 87.9 | 15.4 | 38 | 54.3 | 1.0 | -0.10 | 3.3 | 18.8 |
| 6.91 | 5.0E-03 | 0.00 | 51.3 | 0.68 | 9 | 64.9 | 21.7 | 86.6 | 14.4 | 38 | 54.9 | 1.0 | -0.09 | 3.0 | 18.8 |
| 7.89 | 5.0E-03 | 0.00 | 50.4 | 0.61 | 9 | 64.3 | 19.8 | 84.2 | 13.8 | 38 | 54.6 | 1.0 | -0.08 | 2.7 | 18.5 |
| 8.88 | 5.0E-03 | 0.00 | 43.0 | 0.71 | 7 | 55.6 | 24.9 | 80.5 | 16.6 | 38 | 50.5 | 1.0 | -0.08 | 3.3 | 16.9 |
| 9.86 | 5.0E-03 | 0.00 | 43.3 | 0.67 | 7 | 56.5 | 24.0 | 80.5 | 16.2 | 38 | 50.9 | 1.0 | -0.08 | 3.2 | 17.0 |
| 0.85 | 5.0E-03 | 0.00 | 46.2 | 0.73 | 7 | 60.7 | 25.2 | 86.0 | 16.0 | 38 | 53.0 | 1.0 | -0.09 | 3.3 | 18.2 |

iregg In Situ, Inc.
lun No: 03-0630-0942-1541
:PT File: 151C05.COR



| lepth :ft) | k (cm/s) | Bq | Qtn | Rfn | SBTn | Qc1N | DeltaQc1N | Qc1Ncs | Fc (%) | Phi (Deg) | Dr (%) | OCR | State Param | Del(n1)60 | (N1)60cs |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1.83 | 5.0E-03 | 0.00 | 52.4 | 0.73 | 9 | 69.2 | 23.7 | 92.9 | 14.6 | 38 | 56.7 | 1.0 | -0.10 | 3.2 | 20.2 |
| 2.81 | 5.0E-03 | 0.00 | 45.5 | 0.38 | 9 | 60.9 | 0.0 | 60.9 | 5.0 | 38 | 53.1 | 1.0 | -0.04 | 0.0 | 14.9 |
| 3.80 | 5.0E-03 | 0.00 | 29.3 | 0.73 | 7 | 40.2 | 32.3 | 72.4 | 21.7 | 36 | 41.1 | 1.0 | -0.05 | 3.8 | 13.6 |
| 4.78 | 5.0E-03 | 0.00 | 35.2 | 0.72 | 7 | 48.3 | 29.2 | 77.5 | 19.1 | 38 | 46.4 | 1.0 | -0.06 | 3.6 | 15.5 |
| 5.77 | 5.0E-03 | 0.00 | 38.2 | 0.67 | 7 | 52.7 | 26.7 | 79.4 | 17.6 | 38 | 48.9 | 1.0 | -0.06 | 3.4 | 16.3 |
| 6.75 | 5.0E-04 | 0.00 | 24.3 | 1.18 | 7 | 34.5 | 58.4 | 92.9 | 28.6 | 34 | 36.8 | 1.0 | -0.07 | 7.3 | 18.5 |
| 7.74 | 5.0E-03 | -0.01 | 27.2 | 0.65 | 7 | 38.7 | 31.7 | 70.3 | 21.9 | 36 | 40.0 | 1.0 | -0.03 | 3.7 | 13.2 |
| 8.72 | 5.0E-04 | 0.00 | 22.3 | 1.39 | 7 | 32.3 | 80.1 | 112.4 | 31.7 | 34 | 34.9 | 1.0 | -0.07 | 8.5 | 19.0 |
| 9.70 | 5.0E-05 | 0.15 | 9.7 | 1.72 | 6 | 15.3 | 61.0 | 76.3 | 50.7 | 30 | 30.0 | 3.0 | 0.02 | 6.0 | 11.9 |
| 0.69 | 5.0E-06 | 0.23 | 6.0 | 2.78 | 4 | 10.3 | 41.0 | 51.3 | 70.4 | UnDef | UnDef | 1.5 | UnDef | 5.0 | 10.0 |
| 1.67 | 5.0E-05 | 0.20 | 7.6 | 2.46 | 4 | 12.6 | 50.3 | 62.9 | 61.9 | 30 | 30.0 | 3.0 | 0.03 | 4.9 | 9.9 |
| 2.66 | 5.0E-06 | 0.48 | 5.1 | 2.10 | 4 | 9.2 | 36.7 | 45.9 | 70.3 | UnDef | UnDef | 1.5 | UnDef | 4.5 | 9.0 |
| 3.64 | 5.0E-05 | 0.49 | 5.0 | 1.86 | 4 | 9.1 | 36.3 | 45.4 | 69.1 | 30 | 30.0 | 1.5 | 0.14 | 3.6 | 7.1 |
| 4.63 | 5.0E-05 | 0.16 | 7.7 | 1.69 | 4 | 13.0 | 51.9 | 64.8 | 56.1 | 30 | 30.0 | 3.0 | 0.04 | 5.1 | 10.1 |
| 5.61 | 5.0E-05 | 0.04 | 14.4 | 1.72 | 6 | 22.6 | 90.5 | 113.2 | 42.2 | 32 | 30.0 | 6.0 | -0.04 | 8.9 | 17.7 |
| 6.59 | 5.0E-03 | 0.01 | 30.3 | 0.98 | 7 | 45.5 | 45.0 | 90.6 | 23.6 | 36 | 44.7 | 1.0 | -0.07 | 5.0 | 16.2 |
| 7.58 | 5.0E-04 | 0.00 | 26.2 | 1.64 | 7 | 40.0 | 88.8 | 128.8 | 30.8 | 36 | 41.0 | 1.0 | -0.10 | 9.9 | 22.9 |
| 8.56 | 5.0E-06 | 0.10 | 7.8 | 3.15 | 4 | 13.5 | 54.0 | 67.4 | 65.4 | UnDef | UnDef | 3.0 | UnDef | 6.6 | 13.2 |
| 9.55 | 5.0E-06 | 0.53 | 4.4 | 2.45 | 4 | 8.6 | 34.5 | 43.1 | 77.4 | UnDef | UnDef | 1.5 | UnDef | 4.2 | 8.4 |
| 0.53 | 5.0E-05 | 0.35 | 5.9 | 1.67 | 4 | 11.0 | 43.9 | 54.9 | 62.5 | 30 | 30.0 | 1.5 | 0.10 | 4.3 | 8.6 |
| 1.52 | 5.0E-05 | 0.44 | 5.5 | 2.00 | 4 | 10.4 | 41.4 | 51.8 | 67.5 | 30 | 30.0 | 1.5 | 0.11 | 4.1 | 8.1 |
| 2.42 | 5.0E-05 | 0.25 | 6.7 | 2.28 | 4 | 12.2 | 48.8 | 60.9 | 64.1 | 30 | 30.0 | 3.0 | 0.05 | 4.8 | 9.5 |
| 3.32 | 5.0E-03 | 0.01 | 37.9 | 0.89 | 7 | 58.8 | 38.3 | 97.2 | 19.8 | 38 | 52.1 | 1.0 | -0.09 | 4.7 | 19.1 |
| 4.30 | 5.0E-03 | 0.00 | 44.2 | 1.10 | 7 | 68.7 | 44.0 | 112.7 | 19.6 | 38 | 56.5 | 1.0 | -0.12 | 5.4 | 22.2 |
| 5.29 | 5.0E-05 | 0.19 | 9.9 | 2.44 | 4 | 17.3 | 69.2 | 86.5 | 55.3 | 30 | 30.0 | 3.0 | 0.00 | 6.8 | 13.5 |
| 6.27 | 5.0E-02 | 0.00 | 73.3 | 0.68 | 9 | 113.6 | 21.0 | 134.6 | 10.8 | 40 | 70.9 | 1.0 | -0.12 | 2.4 | 24.6 |
| 7.26 | 5.0E-02 | 0.00 | 64.4 | 0.83 | 9 | 100.7 | 28.8 | 129.6 | 13.3 | 40 | 67.5 | 1.0 | -0.13 | 3.2 | 22.9 |
| 8.24 | 5.0E-02 | 0.00 | 49.3 | 0.82 | 7 | 78.1 | 32.6 | 110.7 | 16.0 | 38 | 60.2 | 1.0 | -0.10 | 3.5 | 18.7 |
| 9.22 | 5.0E-03 | 0.00 | 40.6 | 0.76 | 7 | 65.2 | 33.5 | 98.7 | 17.7 | 38 | 55.0 | 1.0 | -0.08 | 4.3 | 20.2 |
| 0.21 | 5.0E-04 | 0.02 | 16.8 | 1.61 | 6 | 28.6 | 114.4 | 143.1 | 38.3 | 32 | 31.4 | 1.0 | -0.05 | 9.3 | 18.7 |
| 1.19 | 5.0E-05 | 0.08 | 11.1 | 2.33 | 6 | 19.9 | 79.6 | 99.5 | 51.8 | 30 | 30.0 | 3.0 | -0.03 | 7.8 | 15.6 |
| 2.18 | 5.0E-05 | 0.10 | 10.3 | 2.67 | 4 | 18.7 | 74.8 | 93.6 | 55.7 | 30 | 30.0 | 3.0 | -0.03 | 7.3 | 14.7 |
| 3.16 | 5.0E-05 | 0.09 | 10.7 | 1.57 | 6 | 19.5 | 78.0 | 97.5 | 47.2 | 30 | 30.0 | 3.0 | 0.00 | 7.6 | 15.3 |
| 4.15 | 5.0E-05 | 0.16 | 9.4 | 2.11 | 4 | 17.5 | 69.9 | 87.4 | 54.3 | 30 | 30.0 | 3.0 | 0.01 | 6.8 | 13.7 |
| 5.13 | 5.0E-05 | 0.08 | 12.0 | 2.14 | 6 | 21.8 | 87.3 | 109.1 | 48.8 | 30 | 30.0 | 3.0 | -0.03 | 8.5 | 17.1 |
| 6.11 | 5.0E-05 | 0.14 | 8.0 | 2.65 | 4 | 15.4 | 61.6 | 77.0 | 61.9 | 30 | 30.0 | 3.0 | 0.01 | 6.0 | 12.1 |
| 7.10 | 5.0E-05 | 0.20 | 6.5 | 3.03 | 1 | 13.2 | UnDef | UnDef | 100.0 | 30 | 30.0 | 3.0 | 0.04 | UnDef | UnDef |
| 8.08 | 5.0E-06 | 0.13 | 8.9 | 3.80 | 1 | 17.1 | UnDef | UnDef | 100.0 | UnDef | UnDef | 3.0 | UnDef | UnDef | UnDef |
| 9.07 | 5.0E-05 | 0.02 | 14.1 | 2.40 | 6 | 25.5 | 102.0 | 127.6 | 47.1 | 32 | 30.0 | 6.0 | -0.06 | 10.0 | 20.0 |
| 0.05 | 5.0E-03 | -0.02 | 29.1 | 1.27 | 7 | 50.2 | 68.2 | 118.4 | 26.6 | 36 | 47.5 | 1.0 | -0.09 | 6.9 | 19.2 |
| 1.04 | 5.0E-06 | -0.02 | 14.6 | 3.44 | 4 | 26.6 | 106.5 | 133.2 | 52.0 | UnDef | UnDef | 6.0 | UnDef | 13.0 | 26.1 |
| 2.02 | 5.0E-05 | 0.02 | 11.9 | 2.80 | 4 | 22.4 | 89.5 | 111.9 | 53.1 | 30 | 30.0 | 3.0 | -0.06 | 8.8 | 17.5 |
| 3.00 | 5.0E-04 | -0.01 | 23.5 | 1.47 | 7 | 41.6 | 99.2 | 140.8 | 31.4 | 34 | 42.2 | 1.0 | -0.08 | 10.7 | 24.3 |
| 3.99 | 5.0E-04 | -0.02 | 18.3 | 2.07 | 6 | 33.3 | 133.1 | 166.4 | 39.9 | 32 | 35.7 | 1.0 | -0.09 | 10.9 | 21.7 |
| 4.97 | 5.0E-04 | -0.02 | 15.9 | 2.16 | 6 | 29.4 | 117.7 | 147.1 | 43.1 | 32 | 32.2 | 1.0 | -0.07 | 9.6 | 19.2 |
| 5.96 | 5.0E-04 | -0.03 | 24.2 | 1.57 | 7 | 43.5 | 107.4 | 150.9 | 31.7 | 34 | 43.4 | 1.0 | -0.09 | 11.4 | 25.6 |
| 6.94 | 5.0E-03 | -0.02 | 37.4 | 1.46 | 7 | 65.9 | 70.7 | 136.6 | 24.4 | 38 | 55.3 | 1.0 | -0.13 | 7.7 | 23.8 |
| 7.93 | 5.0E-02 | -0.01 | 44.3 | 0.82 | 7 | 77.9 | 38.0 | 115.9 | 17.3 | 38 | 60.1 | 1.0 | -0.10 | 3.9 | 19.2 |
| 8.91 | 5.0E-02 | -0.01 | 53.7 | 0.84 | 9 | 94.3 | 35.7 | 130.0 | 15.3 | 40 | 65.6 | 1.0 | -0.11 | 3.8 | 22.3 |
| 9.89 | 5.0E-02 | 0.00 | 79.2 | 0.68 | 9 | 138.4 | 22.4 | 160.8 | 10.2 | 42 | 76.6 | 1.0 | -0.13 | 2.6 | 29.7 |
| 0.88 | 5.0E-02 | 0.00 | 80.7 | 0.77 | 9 | 141.6 | 26.0 | 167.6 | 10.8 | 42 | 77.3 | 1.0 | -0.14 | 3.0 | 30.7 |
| 1.86 | 5.0E-02 | 0.00 | 86.8 | 0.70 | 9 | 152.9 | 21.5 | 174.4 | 9.6 | 42 | 79.5 | 1.0 | -0.14 | 2.5 | 32.4 |
| 2.85 | 5.0E-02 | 0.00 | 95.0 | 0.61 | 9 | 167.9 | 15.2 | 183.1 | 8.1 | 42 | 82.1 | 1.0 | -0.14 | 1.8 | 34.7 |
| 3.83 | 5.0E+00 | 0.00 | 99.9 | 0.50 | 9 | 177.2 | 9.0 | 186.2 | 6.8 | 42 | 83.7 | 1.0 | -0.13 | 0.9 | 29.8 |
| 4.82 | 5.0E-02 | 0.00 | 75.6 | 0.62 | 9 | 135.5 | 21.1 | 156.6 | 10.1 | 40 | 76.0 | 1.0 | -0.12 | 2.4 | 29.0 |
| 5.80 | 5.0E 02 | -0.01 | 66.1 | 0.72 | 9 | 119.5 | 28.3 | 147.7 | 12.2 | 40 | 72.4 | 1.0 | -0.12 | 3.2 | 26.6 |
| 6.78 | 5.0E-03 | -0.01 | 47.3 | 1.14 | 7 | 86.8 | 52.2 | 139.0 | 19.1 | 38 | 63.2 | 1.0 | -0.13 | 6.5 | 27.8 |
| 7.77 | 5.0E-02 | -0.01 | 50.3 | 0.91 | 7 | 92.5 | 41.4 | 133.9 | 16.6 | 38 | 65.1 | 1.0 | -0.12 | 4.3 | 22.5 |
| 8.75 | 5.0E-02 | -0.01 | 80.1 | 0.60 | 9 | 146.1 | 19.2 | 165.3 | 9.4 | 42 | 78.1 | 1.0 | -0.12 | 2.2 | 30.8 |

Gregg In Situ, Inc.
Interpretation Output - Release 1.00.19e
Run No: 03-0630-0942-1601
Job No: 03-151SH
Client: URS
Project: CPT SITE INVESTIGATION
Site: PIER T LNG
Location: CPT-06
Engineer: T. O'BRIEN
CPT Date: 03/25/06
CPT Time: 09:02
CPT File: 151C06.COR
Northing (m): 0.000
Easting (m): 0.000
Elevation (m): 0.000

Water Table (m): 6.10 (ft): 20.0
Su Nkt used: 12.50
Averaging Increment (m): 0.30
Phi Method : Robertson and Campanella, 1983
Dr Method : Jamiolkowski - All Sands
State Parameter M: 1.20
Used Unit Weights Assigned to Soil Zones
Values of 1.0E9 or UnDef are printed for parameters that are not valid for the material type (SBT)

| Depth (ft) | AvgQt (tsf) | AvgFs (tsf) | AvgRf (%) | AvgUd (ft) | SBT | U.Wt. pcf | TStress (tsf) | EStress (tsf) | Ueq (tsf) | Cn | N60 (blows/ft) | (N1)60 (blows/ft) | Su (tsf) | CRR |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 0.49 | 120.1 | 0.36 | 0.30 | 9.2 | 9 | 124.1 | 0.03 | 0.03 | 0.00 | 2.00 | 23.0 | 46.0 | UnDef | 0.00 |
| 1.48 | 91.0 | 0.77 | 0.85 | 7.9 | 8 | 120.9 | 0.09 | 0.09 | 0.00 | 2.00 | 21.8 | 43.6 | UnDef | 0.00 |
| 2.46 | 105.6 | 1.15 | 1.09 | 4.2 | 8 | 120.9 | 0.15 | 0.15 | 0.00 | 2.00 | 25.3 | 50.5 | UnDef | 0.00 |
| 3.44 | 132.6 | 1.81 | 1.37 | 5.3 | 8 | 120.9 | 0.21 | 0.21 | 0.00 | 2.00 | 31.7 | 63.5 | UnDef | 0.00 |
| 4.43 | 196.3 | 2.50 | 1.27 | 6.8 | 8 | 120.9 | 0.27 | 0.27 | 0.00 | 1.93 | 47.0 | 90.5 | UnDef | 0.00 |
| 5.41 | 191.3 | 2.16 | 1.13 | 22.2 | 9 | 124.1 | 0.33 | 0.33 | 0.00 | 1.74 | 36.6 | 63.8 | UnDef | 0.00 |
| 6.40 | 134.4 | 3.19 | 2.38 | 27.0 | 7 | 117.8 | 0.39 | 0.39 | 0.00 | 1.60 | 42.9 | 68.8 | UnDef | 0.00 |
| 7.30 | 90.9 | 2.06 | 2.27 | 6.5 | 7 | 117.8 | 0.44 | 0.44 | 0.00 | 1.50 | 29.0 | 43.6 | UnDef | 0.00 |
| 8.20 | 74.7 | 1.91 | 2.56 | 6.3 | 6 | 114.6 | 0.49 | 0.49 | 0.00 | 1.42 | 28.6 | 40.7 | 5.94 | 0.35 |
| 9.19 | 92.4 | 1.40 | 1.52 | 9.9 | 7 | 117.8 | 0.55 | 0.55 | 0.00 | 1.35 | 29.5 | 39.7 | UnDef | 0.34 |
| 10.17 | 85.9 | 1.14 | 1.33 | 3.9 | 8 | 120.9 | 0.61 | 0.61 | 0.00 | 1.28 | 20.6 | 26.3 | UnDef | 0.26 |
| 11.15 | 80.7 | 0.88 | 1.08 | 0.1 | 8 | 120.9 | 0.67 | 0.67 | 0.00 | 1.22 | 19.3 | 23.6 | UnDef | 0.21 |
| 12.14 | 113.5 | 1.16 | 1.03 | -0.6 | 8 | 120.9 | 0.73 | 0.73 | 0.00 | 1.17 | 27.2 | 31.8 | UnDef | 0.34 |
| 13.21 | 193.7 | 2.22 | 1.14 | 1.5 | 9 | 124.1 | 0.80 | 0.80 | 0.00 | 1.12 | 37.1 | 41.6 | UnDef | 0.00 |
| 14.27 | 168.7 | 1.80 | 1.07 | 1.8 | 9 | 124.1 | 0.86 | 0.86 | 0.00 | 1.08 | 32.3 | 34.8 | UnDef | 0.00 |
| 15.26 | 146.6 | 0.67 | 0.45 | -1.6 | 9 | 124.1 | 0.92 | 0.92 | 0.00 | 1.04 | 28.1 | 29.2 | UnDef | 0.39 |
| 16.24 | 168.9 | 1.66 | 0.98 | -2.7 | 9 | 124.1 | 0.98 | 0.98 | 0.00 | 1.01 | 32.3 | 32.6 | UnDef | 0.00 |
| 17.22 | 146.8 | 1.49 | 1.02 | -3.2 | 9 | 124.1 | 1.04 | 1.04 | 0.00 | 0.98 | 28.1 | 27.5 | UnDef | 0.42 |
| 18.21 | 115.0 | 0.96 | 0.83 | -4.1 | 8 | 120.9 | 1.10 | 1.10 | 0.00 | 0.95 | 27.5 | 26.2 | UnDef | 0.24 |
| 19.19 | 187.8 | 0.95 | 0.51 | -3.3 | 9 | 124.1 | 1.17 | 1.17 | 0.00 | 0.93 | 36.0 | 33.3 | UnDef | 0.00 |
| 20.18 | 345.4 | 0.99 | 0.29 | -1.9 | 10 | 127.3 | 1.23 | 1.22 | 0.01 | 0.90 | 55.1 | 49.9 | UnDef | 0.00 |
| 21.16 | 299.2 | 0.66 | 0.22 | -2.8 | 10 | 127.3 | 1.29 | 1.25 | 0.04 | 0.89 | 47.8 | 42.7 | UnDef | 0.00 |
| 22.15 | 237.0 | 1.32 | 0.56 | -8.7 | 9 | 124.1 | 1.35 | 1.28 | 0.07 | 0.88 | 45.4 | 40.1 | UnDef | 0.00 |
| 23.13 | 151.1 | 0.82 | 0.54 | -9.3 | 9 | 124.1 | 1.41 | 1.31 | 0.10 | 0.87 | 28.9 | 25.2 | UnDef | 0.30 |
| 24.11 | 84.2 | 0.09 | 0.10 | -10.3 | 9 | 124.1 | 1.47 | 1.35 | 0.13 | 0.86 | 16.1 | 13.9 | UnDef | 0.11 |
| 25.10 | 61.3 | 0.04 | 0.06 | -6.0 | 8 | 120.9 | 1.53 | 1.37 | 0.16 | 0.85 | 14.7 | 12.5 | UnDef | 0.09 |
| 26.08 | 54.9 | 0.26 | 0.48 | -4.4 | 8 | 120.9 | 1.59 | 1.40 | 0.19 | 0.84 | 13.1 | 11.1 | UnDef | 0.09 |
| 27.07 | 55.0 | 0.32 | 0.58 | -3.0 | 8 | 120.9 | 1.65 | 1.43 | 0.22 | 0.84 | 13.2 | 11.0 | UnDef | 0.11 |
| 28.05 | 52.6 | 0.28 | 0.52 | -2.1 | 8 | 120.9 | 1.71 | 1.46 | 0.25 | 0.83 | 12.6 | 10.4 | UnDef | 0.10 |
| 29.04 | 64.3 | 0.40 | 0.62 | -10.6 | 8 | 120.9 | 1.77 | 1.49 | 0.28 | 0.82 | 15.4 | 12.6 | UnDef | 0.12 |
| 30.02 | 62.5 | 0.46 | 0.73 | -4.2 | 8 | 120.9 | 1.83 | 1.52 | 0.31 | 0.81 | 15.0 | 12.1 | UnDef | 0.12 |
| 31.00 | 58.1 | 0.28 | 0.48 | 2.9 | 8 | 120.9 | 1.89 | 1.55 | 0.34 | 0.80 | 13.9 | 11.2 | UnDef | 0.09 |
| 31.99 | 54.9 | 0.35 | 0.63 | 7.7 | 8 | 120.9 | 1.95 | 1.58 | 0.37 | 0.80 | 13.2 | 10.5 | UnDef | 0.11 |
| 32.97 | 52.5 | 0.33 | 0.64 | 7.6 | 8 | 120.9 | 2.01 | 1.61 | 0.41 | 0.79 | 12.6 | 9.9 | UnDef | 0.11 |
| 33.96 | 59.5 | 0.29 | 0.49 | 10.0 | 8 | 120.9 | 2.07 | 1.63 | 0.44 | 0.78 | 14.2 | 11.1 | UnDef | 0.11 |
| 34.94 | 49.8 | 0.30 | 0.59 | 12.9 | 8 | 120.9 | 2.13 | 1.66 | 0.47 | 0.78 | 11.9 | 9.3 | UnDef | 0.11 |
| 35.92 | 56.1 | 0.31 | 0.56 | 14.6 | 8 | 120.9 | 2.19 | 1.69 | 0.50 | 0.77 | 13.4 | 10.3 | UnDef | 0.11 |
| 36.91 | 55.2 | 0.26 | 0.48 | 17.7 | 8 | 120.9 | 2.25 | 1.72 | 0.53 | 0.76 | 13.2 | 10.1 | UnDef | 0.10 |
| 37.89 | 70.8 | 0.36 | 0.51 | 21.4 | 8 | 120.9 | 2.31 | 1.75 | 0.56 | 0.76 | 16.9 | 12.8 | UnDef | 0.12 |
| 38.88 | 90.5 | 0.41 | 0.45 | 19.7 | 8 | 120.9 | 2.37 | 1.78 | 0.59 | 0.75 | 21.7 | 16.2 | UnDef | 0.11 |
| 39.86 | 79.8 | 0.40 | 0.50 | 21.8 | 8 | 120.9 | 2.43 | 1.81 | 0.62 | 0.74 | 19.1 | 14.2 | UnDef | 0.12 |
| 40.85 | 66.3 | 0.27 | 0.41 | 22.6 | 8 | 120.9 | 2.49 | 1.84 | 0.65 | 0.74 | 15.9 | 11.7 | UnDef | 0.09 |

| epth (ft) | AvgQt (tsf) | AvgFs (tsf) | AvgRf (%) | AvgUd (ft) | SBT | U.Wt. pcf | TStress (tsf) | EStress (tsf) | Ueq (tsf) | Cn | N60 (blows/ft) | (N1)60 (blows/ft) | Su (tsf) | CRR |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1.83 | 67.1 | 0.29 | 0.44 | 22.5 | 8 | 120.9 | 2.55 | 1.86 | 0.68 | 0.73 | 16.1 | 11.8 | UnDef | 0.09 |
| 2.81 | 86.9 | 0.34 | 0.39 | 11.5 | 8 | 120.9 | 2.61 | 1.89 | 0.71 | 0.73 | 20.8 | 15.1 | UnDef | 0.10 |
| 3.80 | 70.7 | 0.26 | 0.36 | 13.5 | 8 | 120.9 | 2.66 | 1.92 | 0.74 | 0.72 | 16.9 | 12.2 | UnDef | 0.09 |
| 4.78 | 71.0 | 0.16 | 0.23 | 25.3 | 8 | 120.9 | 2.72 | 1.95 | 0.77 | 0.72 | 17.0 | 12.2 | UnDef | 0.09 |
| 5.77 | 71.8 | 0.17 | 0.24 | 26.1 | 8 | 120.9 | 2.78 | 1.98 | 0.80 | 0.71 | 17.2 | 12.2 | UnDef | 0.09 |
| 6.75 | 69.3 | 0.12 | 0.18 | 27.0 | 8 | 120.9 | 2.84 | 2.01 | 0.84 | 0.71 | 16.6 | 11.7 | UnDef | 0.09 |
| 7.74 | 84.0 | 0.13 | 0.16 | 28.1 | 9 | 124.1 | 2.90 | 2.04 | 0.87 | 0.70 | 16.1 | 11.3 | UnDef | 0.10 |
| 8.72 | 80.1 | 0.47 | 0.58 | 28.0 | 8 | 120.9 | 2.96 | 2.07 | 0.90 | 0.70 | 19.2 | 13.3 | UnDef | 0.13 |
| 9.70 | 86.1 | 0.55 | 0.64 | 28.9 | 8 | 120.9 | 3.02 | 2.10 | 0.93 | 0.69 | 20.6 | 14.2 | UnDef | 0.14 |
| 0.69 | 93.7 | 0.40 | 0.43 | 27.0 | 8 | 120.9 | 3.08 | 2.12 | 0.96 | 0.69 | 22.4 | 15.4 | UnDef | 0.10 |
| 1.67 | 63.7 | 0.48 | 0.75 | 19.8 | 8 | 120.9 | 3.14 | 2.15 | 0.99 | 0.68 | 15.3 | 10.4 | UnDef | 0.13 |
| 2.66 | 28.8 | 0.26 | 0.90 | 52.0 | 7 | 117.8 | 3.20 | 2.18 | 1.02 | 0.68 | 9.2 | 6.2 | UnDef | 0.16 |
| 3.64 | 53.9 | 0.36 | 0.67 | 12.3 | 8 | 120.9 | 3.26 | 2.21 | 1.05 | 0.67 | 12.9 | 8.7 | UnDef | 0.12 |
| 4.63 | 20.7 | 0.27 | 1.28 | 27.5 | 6 | 114.6 | 3.32 | 2.24 | 1.08 | 0.67 | 7.9 | 5.3 | 1.39 | 0.11 |
| 5.61 | 15.1 | 0.09 | 0.62 | 177.9 | 6 | 114.6 | 3.37 | 2.26 | 1.11 | 0.66 | 5.8 | 3.8 | 0.94 | 0.09 |
| 6.59 | 17.2 | 0.07 | 0.43 | 207.7 | 6 | 114.6 | 3.43 | 2.29 | 1.14 | 0.66 | 6.6 | 4.4 | 1.10 | 0.10 |
| 7.58 | 68.8 | 0.42 | 0.61 | 32.9 | 8 | 120.9 | 3.49 | 2.32 | 1.17 | 0.66 | 16.5 | 10.8 | UnDef | 0.12 |
| 8.56 | 58.7 | 1.01 | 1.71 | 11.2 | 7 | 117.8 | 3.55 | 2.34 | 1.20 | 0.65 | 18.7 | 12.2 | UnDef | 0.00 |
| 9.55 | 17.1 | 0.16 | 0.94 | 93.4 | 6 | 114.6 | 3.60 | 2.37 | 1.23 | 0.65 | 6.6 | 4.3 | 1.08 | 0.10 |
| 0.53 | 16.7 | 0.12 | 0.74 | 173.6 | 6 | 114.6 | 3.66 | 2.40 | 1.27 | 0.65 | 6.4 | 4.1 | 1.04 | 0.09 |
| 1.52 | 23.3 | 0.22 | 0.95 | 145.7 | 6 | 114.6 | 3.72 | 2.42 | 1.30 | 0.64 | 8.9 | 5.7 | 1.57 | 0.12 |
| 2.42 | 50.7 | 0.39 | 0.77 | 160.8 | 7 | 117.8 | 3.77 | 2.45 | 1.32 | 0.64 | 16.2 | 10.3 | UnDef | 0.15 |
| 3.32 | 112.2 | 0.97 | 0.87 | 35.2 | 8 | 120.9 | 3.82 | 2.47 | 1.35 | 0.64 | 26.9 | 17.1 | UnDef | 0.19 |
| 4.30 | 86.8 | 1.24 | 1.43 | 60.9 | 8 | 120.9 | 3.88 | 2.50 | 1.38 | 0.63 | 20.8 | 13.1 | UnDef | 0.26 |
| 5.29 | 187.5 | 1.32 | 0.70 | 20.8 | 9 | 124.1 | 3.94 | 2.53 | 1.41 | 0.63 | 35.9 | 22.6 | UnDef | 0.33 |
| 6.27 | 174.9 | 1.42 | 0.81 | 37.3 | 9 | 124.1 | 4.00 | 2.56 | 1.44 | 0.63 | 33.5 | 20.9 | UnDef | 0.31 |
| 7.26 | 149.8 | 1.17 | 0.78 | 41.3 | 9 | 124.1 | 4.07 | 2.59 | 1.48 | 0.62 | 28.7 | 17.8 | UnDef | 0.25 |
| 8.24 | 139.7 | 0.77 | 0.55 | 41.9 | 9 | 124.1 | 4.13 | 2.62 | 1.51 | 0.62 | 26.8 | 16.5 | UnDef | 0.20 |
| 9.22 | 60.9 | 0.59 | 0.97 | 50.3 | 7 | 117.8 | 4.19 | 2.65 | 1.54 | 0.61 | 19.4 | 11.9 | UnDef | 0.19 |
| 0.21 | 55.4 | 0.41 | 0.75 | 42.6 | 8 | 120.9 | 4.24 | 2.68 | 1.57 | 0.61 | 13.3 | 8.1 | UnDef | 0.15 |
| 1.19 | 59.3 | 0.55 | 0.93 | 42.8 | 8 | 120.9 | 4.30 | 2.71 | 1.60 | 0.61 | 14.2 | 8.6 | UnDef | 0.19 |
| 2.18 | 27.0 | 0.30 | 1.13 | 141.4 | 6 | 114.6 | 4.36 | 2.73 | 1.63 | 0.60 | 10.4 | 6.3 | 1.81 | 0.13 |
| 3.16 | 23.4 | 0.35 | 1.52 | 146.2 | 6 | 114.6 | 4.42 | 2.76 | 1.66 | 0.60 | 8.9 | 5.4 | 1.52 | 0.11 |
| 4.15 | 20.6 | 0.29 | 1.43 | 200.0 | 6 | 114.6 | 4.48 | 2.78 | 1.69 | 0.60 | 7.9 | 4.7 | 1.29 | 0.10 |
| 5.13 | 25.5 | 0.45 | 1.76 | 184.6 | 6 | 114.6 | 4.53 | 2.81 | 1.72 | 0.60 | 9.8 | 5.8 | 1.68 | 0.12 |
| 6.11 | 26.1 | 0.57 | 2.19 | 145.1 | 6 | 114.6 | 4.59 | 2.84 | 1.75 | 0.59 | 10.0 | 5.9 | 1.72 | 0.12 |
| 7.10 | 57.2 | 0.51 | 0.89 | 86.4 | 7 | 117.8 | 4.65 | 2.86 | 1.78 | 0.59 | 18.3 | 10.8 | UnDef | 0.21 |
| 8.08 | 91.1 | 0.79 | 0.86 | 21.4 | 8 | 120.9 | 4.70 | 2.89 | 1.81 | 0.59 | 21.8 | 12.8 | UnDef | 0.18 |
| 9.07 | 147.6 | 0.96 | 0.65 | 4.1 | 9 | 124.1 | 4.76 | 2.92 | 1.84 | 0.59 | 28.3 | 16.5 | UnDef | 0.22 |
| 0.05 | 137.4 | 0.89 | 0.65 | 20.6 | 9 | 124.1 | 4.83 | 2.95 | 1.87 | 0.58 | 26.3 | 15.3 | UnDef | 0.20 |
| 1.04 | 152.7 | 1.19 | 0.78 | 41.9 | 9 | 124.1 | 4.89 | 2.98 | 1.91 | 0.58 | 29.2 | 16.9 | UnDef | 0.25 |
| 2.02 | 164.3 | 1.22 | 0.74 | 19.9 | 9 | 124.1 | 4.95 | 3.01 | 1.94 | 0.58 | 31.5 | 18.1 | UnDef | 0.26 |
| 3.00 | 161.0 | 1.17 | 0.73 | 20.5 | 9 | 124.1 | 5.01 | 3.04 | 1.97 | 0.57 | 30.8 | 17.7 | UnDef | 0.25 |
| 3.99 | 132.0 | 1.08 | 0.82 | 40.7 | 9 | 124.1 | 5.07 | 3.07 | 2.00 | 0.57 | 25.3 | 14.4 | UnDef | 0.22 |
| 4.97 | 135.7 | 1.07 | 0.79 | 38.8 | 9 | 124.1 | 5.13 | 3.10 | 2.03 | 0.57 | 26.0 | 14.8 | UnDef | 0.22 |
| 5.96 | 127.5 | 0.93 | 0.73 | 17.0 | 9 | 124.1 | 5.19 | 3.13 | 2.06 | 0.57 | 24.4 | 13.8 | UnDef | 0.20 |
| 6.94 | 129.9 | 0.99 | 0.76 | 32.1 | 9 | 124.1 | 5.25 | 3.16 | 2.09 | 0.56 | 24.9 | 14.0 | UnDef | 0.21 |
| 7.93 | 151.0 | 1.20 | 0.79 | 38.3 | 9 | 124.1 | 5.31 | 3.19 | 2.12 | 0.56 | 28.9 | 16.2 | UnDef | 0.25 |
| 8.91 | 145.9 | 1.32 | 0.90 | 42.7 | 9 | 124.1 | 5.38 | 3.22 | 2.15 | 0.56 | 27.9 | 15.6 | UnDef | 0.26 |
| 9.89 | 156.9 | 1.24 | 0.79 | 33.0 | 9 | 124.1 | 5.44 | 3.25 | 2.18 | 0.55 | 30.0 | 16.7 | UnDef | 0.26 |
| 0.88 | 226.7 | 1.88 | 0.83 | 18.4 | 9 | 124.1 | 5.50 | 3.28 | 2.21 | 0.55 | 43.4 | 24.0 | UnDef | 0.43 |
| 1.86 | 180.0 | 1.80 | 1.00 | 17.3 | 9 | 124.1 | 5.56 | 3.31 | 2.24 | 0.55 | 34.5 | 18.9 | UnDef | 0.35 |
| 2.85 | 207.2 | 1.50 | 0.72 | 10.6 | 9 | 124.1 | 5.62 | 3.34 | 2.27 | 0.55 | 39.7 | 21.7 | UnDef | 0.35 |
| 3.83 | 238.9 | 1.81 | 0.76 | 13.0 | 9 | 124.1 | 5.68 | 3.38 | 2.31 | 0.54 | 45.8 | 24.9 | UnDef | 0.44 |
| 4.82 | 207.0 | 1.32 | 0.64 | 7.8 | 9 | 124.1 | 5.74 | 3.41 | 2.34 | 0.54 | 39.6 | 21.5 | UnDef | 0.32 |
| 5.80 | 171.9 | 1.64 | 0.96 | 12.8 | 9 | 124.1 | 5.80 | 3.44 | 2.37 | 0.54 | 32.9 | 17.8 | UnDef | 0.32 |
| 6.78 | 293.0 | 1.56 | 0.53 | 25.0 | 10 | 127.3 | 5.86 | 3.47 | 2.40 | 0.54 | 46.8 | 25.1 | UnDef | 0.00 |
| 7.77 | 329.4 | 1.81 | 0.55 | 52.5 | 10 | 127.3 | 5.93 | 3.50 | 2.43 | 0.53 | 52.6 | 28.1 | UnDef | 0.00 |
| 5.75 | 345.1 | 1.58 | 0.46 | 62.4 | 10 | 127.3 | 5.99 | 3.53 | 2.46 | 0.53 | 55.1 | 29.3 | UnDef | 0.00 |

regg In Situ, Inc.
nterpretation Output - Release 1.00.19e
un No: 03-0630-0942-1601
ob No: 03-151SH
lient: URS
roject: CPT SITE INVESTIGATION
ite: PIER T LNG
ocation: CPT-06
ngineer: T. O'BRIEN
PT Date: 03/25/06
PT Time: 09:02
PT File: 151C06.COR
orthing (m): 0.000
asting (m): 0.000
levation (m): 0.000

Water Table (m): 6.10 (ft): 20.0
Su Nkt used: 12.50
Averaging Increment (m): 0.30
Phi Method : Robertson and Campanella, 1983
Dr Method : Jamiolkowski - All Sands
State Parameter M: 1.20
Used Unit Weights Assigned to Soil Zones
Values of 1.0E9 or UnDef are printed for parameters that are not valid for the material type (SBT)

| epth ft) | k (cm/s) | Bq | Qtn | Rfn | SBTn | Qc1N | DeltaQc1N | Qc1Ncs | Fc (%) | Phi (Deg) | Dr (%) | OCR | State Param | Del(n1)60 | (N1)60cs |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 0.49 | 5.0E-02 | 0.00 | 1000.0 | 0.30 | 10 | 230.1 | 0.0 | 230.1 | 0.0 | 50 | 95.0 | 1.0 | -0.29 | 0.0 | 46.0 |
| 1.48 | 5.0E-03 | 0.00 | 1000.0 | 0.85 | 10 | 174.3 | 0.0 | 174.3 | 0.0 | 50 | 95.0 | 1.0 | -0.39 | 0.0 | 43.6 |
| 2.46 | 5.0E-03 | 0.00 | 701.0 | 1.09 | 9 | 202.2 | 0.0 | 202.2 | 1.6 | 50 | 95.0 | 1.0 | -0.38 | 0.0 | 50.5 |
| 3.44 | 5.0E-03 | 0.00 | 630.7 | 1.37 | 9 | 254.0 | 0.0 | 254.0 | 3.0 | 50 | 95.0 | 1.0 | -0.40 | 0.0 | 63.5 |
| 4.43 | 5.0E-03 | 0.00 | 727.5 | 1.27 | 9 | 370.0 | 0.0 | 370.0 | 2.3 | 50 | 95.0 | 1.0 | -0.41 | 0.0 | 90.5 |
| 5.41 | 5.0E-02 | 0.00 | 579.1 | 1.13 | 9 | 326.0 | 0.0 | 326.0 | 2.2 | 50 | 95.0 | 1.0 | -0.37 | 0.0 | 63.8 |
| 6.40 | 5.0E-04 | 0.01 | 344.4 | 2.38 | 12 | 210.9 | UnDef | UnDef | 0.0 | 48 | 88.7 | 1.0 | -0.43 | UnDef | UnDef |
| 7.30 | 5.0E-04 | 0.00 | 204.5 | 2.28 | 9 | 133.8 | 29.8 | 163.6 | 11.8 | 46 | 75.6 | 1.0 | -0.36 | 5.6 | 49.3 |
| 8.20 | 5.0E-05 | 0.00 | 150.1 | 2.58 | 7 | 104.0 | 39.3 | 143.3 | 15.3 | 44 | 68.4 | 10.0 | -0.35 | 8.4 | 49.1 |
| 9.19 | 5.0E-04 | 0.00 | 166.4 | 1.53 | 9 | 121.7 | 18.3 | 140.0 | 9.9 | 44 | 72.9 | 1.0 | -0.28 | 3.5 | 43.2 |
| 0.17 | 5.0E-03 | 0.00 | 139.7 | 1.34 | 9 | 107.6 | 17.1 | 124.7 | 10.1 | 44 | 69.4 | 1.0 | -0.25 | 2.5 | 28.8 |
| 1.15 | 5.0E-03 | 0.00 | 119.5 | 1.09 | 9 | 96.5 | 14.4 | 110.9 | 9.8 | 42 | 66.3 | 1.0 | -0.21 | 2.1 | 25.7 |
| 2.14 | 5.0E-03 | 0.00 | 154.5 | 1.03 | 9 | 130.0 | 10.0 | 140.0 | 7.7 | 44 | 74.8 | 1.0 | -0.23 | 1.5 | 33.3 |
| 3.21 | 5.0E-02 | 0.00 | 242.7 | 1.15 | 9 | 212.6 | 4.1 | 216.8 | 5.7 | 46 | 88.9 | 1.0 | -0.29 | 0.5 | 42.1 |
| 4.27 | 5.0E-02 | 0.00 | 194.9 | 1.07 | 9 | 177.9 | 7.3 | 185.2 | 6.5 | 44 | 83.8 | 1.0 | -0.26 | 0.9 | 35.7 |
| 5.26 | 5.0E-02 | 0.00 | 157.9 | 0.46 | 9 | 149.4 | 0.0 | 149.4 | 3.5 | 44 | 78.8 | 1.0 | -0.16 | 0.0 | 29.2 |
| 6.24 | 5.0E-02 | 0.00 | 170.7 | 0.99 | 9 | 166.6 | 8.3 | 174.9 | 6.8 | 44 | 81.9 | 1.0 | -0.24 | 1.0 | 33.6 |
| 7.22 | 5.0E-02 | 0.00 | 139.6 | 1.02 | 9 | 140.6 | 13.6 | 154.2 | 8.3 | 44 | 77.0 | 1.0 | -0.22 | 1.6 | 29.1 |
| 8.21 | 5.0E-03 | 0.00 | 103.1 | 0.84 | 9 | 107.1 | 13.9 | 121.0 | 9.3 | 42 | 69.2 | 1.0 | -0.17 | 2.0 | 28.2 |
| 9.19 | 5.0E-02 | 0.00 | 160.2 | 0.51 | 9 | 170.2 | 0.0 | 170.2 | 3.9 | 44 | 82.5 | 1.0 | -0.17 | 0.0 | 33.3 |
| 0.18 | 5.0E+00 | 0.00 | 281.8 | 0.29 | 10 | 305.8 | 0.0 | 305.8 | 0.0 | 46 | 95.0 | 1.0 | -0.17 | 0.0 | 49.9 |
| 1.16 | 5.0E+00 | 0.00 | 237.7 | 0.22 | 10 | 261.6 | 0.0 | 261.6 | 0.0 | 46 | 94.8 | 1.0 | -0.14 | 0.0 | 42.7 |
| 2.15 | 5.0E-02 | 0.00 | 183.5 | 0.56 | 9 | 204.6 | 0.0 | 204.6 | 3.5 | 44 | 87.8 | 1.0 | -0.19 | 0.0 | 40.1 |
| 3.13 | 5.0E-02 | 0.00 | 113.9 | 0.55 | 9 | 129.0 | 4.6 | 133.6 | 6.3 | 42 | 74.6 | 1.0 | -0.15 | 0.6 | 25.8 |
| 4.11 | 5.0E-02 | -0.01 | 61.5 | 0.10 | 9 | 71.1 | 0.0 | 71.1 | 5.0 | 40 | 57.5 | 1.0 | 0.04 | 0.0 | 13.9 |
| 5.10 | 5.0E-03 | -0.01 | 43.5 | 0.06 | 9 | 51.1 | 0.0 | 51.1 | 5.0 | 38 | 48.1 | 1.0 | 0.11 | 0.0 | 12.5 |
| 6.08 | 5.0E-03 | -0.01 | 38.0 | 0.49 | 7 | 45.4 | 0.0 | 45.4 | 5.0 | 38 | 44.6 | 1.0 | -0.04 | 0.0 | 11.1 |
| 7.07 | 5.0E-03 | -0.01 | 37.3 | 0.60 | 7 | 45.0 | 21.6 | 66.6 | 17.2 | 38 | 44.4 | 1.0 | -0.05 | 2.8 | 13.8 |
| 8.05 | 5.0E-03 | -0.01 | 34.8 | 0.54 | 7 | 42.6 | 21.1 | 63.6 | 17.4 | 38 | 42.8 | 1.0 | -0.04 | 2.7 | 13.1 |
| 9.04 | 5.0E-03 | -0.01 | 42.0 | 0.64 | 7 | 51.6 | 22.0 | 73.6 | 16.2 | 38 | 48.3 | 1.0 | -0.07 | 2.9 | 15.5 |
| 0.02 | 5.0E-03 | -0.01 | 40.0 | 0.75 | 7 | 49.6 | 26.0 | 75.7 | 17.9 | 38 | 47.2 | 1.0 | -0.08 | 3.3 | 15.5 |
| 1.00 | 5.0E-03 | 0.00 | 36.3 | 0.50 | 7 | 45.7 | 0.0 | 45.7 | 5.0 | 38 | 44.8 | 1.0 | -0.04 | 0.0 | 11.2 |
| 1.99 | 5.0E-03 | 0.00 | 33.6 | 0.65 | 7 | 42.8 | 25.8 | 68.6 | 19.1 | 36 | 43.0 | 1.0 | -0.05 | 3.2 | 13.7 |
| 2.97 | 5.0E-03 | 0.00 | 31.4 | 0.66 | 7 | 40.5 | 27.2 | 67.7 | 20.0 | 36 | 41.4 | 1.0 | -0.05 | 3.3 | 13.2 |
| 3.96 | 5.0E-03 | 0.00 | 35.1 | 0.51 | 7 | 45.5 | 21.3 | 66.8 | 16.9 | 38 | 44.7 | 1.0 | -0.04 | 2.8 | 13.9 |
| 4.94 | 5.0E-03 | 0.00 | 28.7 | 0.62 | 7 | 37.8 | 27.6 | 65.4 | 20.8 | 36 | 39.4 | 1.0 | -0.03 | 3.3 | 12.6 |
| 5.92 | 5.0E-03 | 0.00 | 31.9 | 0.58 | 7 | 42.2 | 25.2 | 67.4 | 19.0 | 36 | 42.5 | 1.0 | -0.04 | 3.1 | 13.5 |
| 6.91 | 5.0E-03 | 0.00 | 30.8 | 0.50 | 7 | 41.2 | 23.2 | 64.3 | 18.5 | 36 | 41.9 | 1.0 | -0.02 | 2.9 | 13.0 |
| 7.89 | 5.0E-03 | 0.00 | 39.1 | 0.52 | 7 | 52.4 | 21.1 | 73.5 | 15.8 | 38 | 48.7 | 1.0 | -0.05 | 2.8 | 15.6 |
| 8.88 | 5.0E-03 | 0.00 | 49.6 | 0.46 | 9 | 66.4 | 0.0 | 66.4 | 5.0 | 38 | 55.5 | 1.0 | -0.06 | 0.0 | 16.2 |
| 9.86 | 5.0E-03 | 0.00 | 42.8 | 0.51 | 9 | 58.1 | 20.2 | 78.3 | 14.6 | 38 | 51.7 | 1.0 | -0.05 | 2.7 | 17.0 |
| 0.85 | 5.0E-03 | 0.00 | 34.8 | 0.43 | 7 | 47.9 | 0.0 | 47.9 | 5.0 | 38 | 46.2 | 1.0 | -0.02 | 0.0 | 11.7 |

regg In Situ, Inc.
un No: 03-0630-0942-1601
PT File: 151C06.COR

| epth (ft) | k (cm/s) | Bq | Qtn | Rfn | SBTn | Qc1N | DeltaQc1N | Qc1Ncs | Fc (%) | Phi (Deg) | Dr (%) | OCR | State Param | Del(n1)60 | (N1)60cs |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1.83 | 5.0E-03 | 0.00 | 34.6 | 0.46 | 7 | 48.1 | 0.0 | 48.1 | 5.0 | 38 | 46.3 | 1.0 | -0.03 | 0.0 | 11.8 |
| 2.81 | 5.0E-03 | 0.00 | 44.5 | 0.40 | 9 | 61.8 | 0.0 | 61.8 | 5.0 | 38 | 53.5 | 1.0 | -0.04 | 0.0 | 15.1 |
| 3.80 | 5.0E-03 | 0.00 | 35.4 | 0.38 | 9 | 49.9 | 0.0 | 49.9 | 5.0 | 38 | 47.3 | 1.0 | -0.01 | 0.0 | 12.2 |
| 4.78 | 5.0E-03 | 0.00 | 35.0 | 0.24 | 9 | 49.8 | 0.0 | 49.8 | 5.0 | 38 | 47.3 | 1.0 | 0.02 | 0.0 | 12.2 |
| 5.77 | 5.0E-03 | 0.00 | 34.9 | 0.25 | 9 | 49.9 | 0.0 | 49.9 | 5.0 | 38 | 47.4 | 1.0 | 0.02 | 0.0 | 12.2 |
| 6.75 | 5.0E-03 | 0.00 | 33.1 | 0.18 | 9 | 47.9 | 0.0 | 47.9 | 5.0 | 36 | 46.2 | 1.0 | 0.05 | 0.0 | 11.7 |
| 7.74 | 5.0E-02 | 0.00 | 39.8 | 0.16 | 9 | 57.6 | 0.0 | 57.6 | 5.0 | 38 | 51.4 | 1.0 | 0.04 | 0.0 | 11.3 |
| 8.72 | 5.0E-03 | 0.00 | 37.3 | 0.60 | 7 | 54.5 | 26.4 | 80.9 | 17.2 | 38 | 49.9 | 1.0 | -0.05 | 3.4 | 16.8 |
| 9.70 | 5.0E-03 | 0.00 | 39.6 | 0.66 | 7 | 58.2 | 27.8 | 86.0 | 17.1 | 38 | 51.8 | 1.0 | -0.07 | 3.6 | 17.8 |
| 0.69 | 5.0E-03 | 0.00 | 42.7 | 0.45 | 9 | 62.9 | 0.0 | 62.9 | 5.0 | 38 | 54.0 | 1.0 | -0.04 | 0.0 | 15.4 |
| 1.67 | 5.0E-03 | -0.01 | 28.1 | 0.78 | 7 | 42.5 | 38.5 | 81.0 | 22.8 | 36 | 42.7 | 1.0 | -0.05 | 4.4 | 14.8 |
| 2.66 | 5.0E-04 | 0.02 | 11.7 | 1.01 | 6 | 19.1 | 76.4 | 95.4 | 40.2 | 30 | 30.0 | 1.0 | 0.02 | 6.2 | 12.5 |
| 3.64 | 5.0E-03 | -0.01 | 22.9 | 0.72 | 7 | 35.5 | 41.3 | 76.8 | 25.1 | 34 | 37.6 | 1.0 | -0.02 | 4.4 | 13.1 |
| 4.63 | 5.0E-05 | -0.01 | 7.8 | 1.52 | 6 | 13.6 | 54.3 | 67.8 | 54.2 | 30 | 30.0 | 3.0 | 0.03 | 5.3 | 10.6 |
| 5.61 | 5.0E-05 | 0.38 | 5.2 | 0.80 | 6 | 9.8 | 39.2 | 49.1 | 56.9 | 30 | 30.0 | 1.5 | 0.15 | 3.8 | 7.7 |
| 6.59 | 5.0E-05 | 0.39 | 6.0 | 0.53 | 6 | 11.2 | 44.6 | 55.8 | 49.0 | 30 | 30.0 | 1.5 | 0.16 | 4.4 | 8.7 |
| 7.58 | 5.0E-03 | 0.00 | 28.2 | 0.64 | 7 | 44.3 | 34.0 | 78.3 | 21.3 | 36 | 43.9 | 1.0 | -0.03 | 4.0 | 14.9 |
| 8.56 | 5.0E-04 | -0.02 | 23.5 | 1.82 | 6 | 37.5 | 125.5 | 163.0 | 33.8 | 34 | 39.2 | 1.0 | -0.10 | 11.4 | 23.6 |
| 9.55 | 5.0E-05 | 0.12 | 5.7 | 1.19 | 4 | 10.9 | 43.6 | 54.5 | 58.9 | 30 | 30.0 | 1.5 | 0.09 | 4.3 | 8.5 |
| 0.53 | 5.0E-05 | 0.32 | 5.4 | 0.95 | 6 | 10.5 | 42.2 | 52.7 | 57.5 | 30 | 30.0 | 1.5 | 0.13 | 4.1 | 8.3 |
| 1.52 | 5.0E-05 | 0.17 | 8.1 | 1.13 | 6 | 14.7 | 58.7 | 73.3 | 49.5 | 30 | 30.0 | 3.0 | 0.06 | 5.7 | 11.5 |
| 2.42 | 5.0E-04 | 0.08 | 19.2 | 0.83 | 7 | 31.7 | 57.7 | 89.4 | 29.2 | 32 | 34.4 | 1.0 | -0.01 | 7.0 | 17.3 |
| 3.32 | 5.0E-03 | 0.00 | 43.8 | 0.90 | 7 | 69.8 | 37.4 | 107.2 | 18.1 | 38 | 57.0 | 1.0 | -0.10 | 4.8 | 21.9 |
| 4.30 | 5.0E-03 | 0.01 | 33.1 | 1.50 | 7 | 53.7 | 71.0 | 124.7 | 26.3 | 36 | 49.5 | 1.0 | -0.12 | 7.3 | 20.4 |
| 5.29 | 5.0E-02 | 0.00 | 72.6 | 0.72 | 9 | 115.4 | 23.2 | 138.6 | 11.3 | 40 | 71.4 | 1.0 | -0.13 | 2.6 | 25.2 |
| 6.27 | 5.0E-02 | 0.00 | 66.8 | 0.83 | 9 | 107.0 | 29.0 | 136.0 | 13.0 | 40 | 69.2 | 1.0 | -0.13 | 3.2 | 24.2 |
| 7.26 | 5.0E-02 | 0.00 | 56.3 | 0.80 | 9 | 91.1 | 30.9 | 122.0 | 14.5 | 40 | 64.6 | 1.0 | -0.11 | 3.4 | 21.2 |
| 8.24 | 5.0E-02 | 0.00 | 51.8 | 0.57 | 9 | 84.5 | 23.5 | 108.0 | 13.2 | 38 | 62.4 | 1.0 | -0.08 | 2.6 | 19.1 |
| 9.22 | 5.0E-04 | 0.00 | 21.4 | 1.05 | 7 | 36.6 | 69.1 | 105.7 | 29.5 | 34 | 38.5 | 1.0 | -0.04 | 8.3 | 20.2 |
| 0.21 | 5.0E-03 | 0.00 | 19.1 | 0.81 | 7 | 33.1 | 59.5 | 92.6 | 29.1 | 32 | 35.6 | 1.0 | -0.02 | 5.4 | 13.5 |
| 1.19 | 5.0E-03 | 0.00 | 20.3 | 1.00 | 7 | 35.3 | 69.8 | 105.1 | 29.9 | 34 | 37.4 | 1.0 | -0.04 | 6.1 | 14.8 |
| 2.18 | 5.0E-05 | 0.12 | 8.3 | 1.34 | 6 | 16.0 | 64.0 | 80.0 | 51.1 | 30 | 30.0 | 3.0 | 0.04 | 6.3 | 12.5 |
| 3.16 | 5.0E-05 | 0.15 | 6.9 | 1.87 | 4 | 13.8 | 55.1 | 68.8 | 60.3 | 30 | 30.0 | 3.0 | 0.05 | 5.4 | 10.8 |
| 4.15 | 5.0E-05 | 0.28 | 5.8 | 1.82 | 4 | 12.1 | 48.2 | 60.3 | 64.5 | 30 | 30.0 | 1.5 | 0.08 | 4.7 | 9.4 |
| 5.13 | 5.0E-05 | 0.19 | 7.5 | 2.14 | 4 | 14.9 | 59.6 | 74.5 | 60.1 | 30 | 30.0 | 3.0 | 0.04 | 5.8 | 11.7 |
| 6.11 | 5.0E-05 | 0.13 | 7.6 | 2.65 | 4 | 15.2 | 60.6 | 75.8 | 63.2 | 30 | 30.0 | 3.0 | 0.01 | 5.9 | 11.9 |
| 7.10 | 5.0E-04 | 0.02 | 18.4 | 0.97 | 7 | 33.1 | 78.0 | 111.1 | 31.3 | 32 | 35.6 | 1.0 | -0.02 | 8.5 | 19.2 |
| 8.08 | 5.0E-03 | -0.01 | 29.9 | 0.91 | 7 | 52.5 | 49.3 | 101.8 | 23.1 | 36 | 48.8 | 1.0 | -0.07 | 5.6 | 18.4 |
| 9.07 | 5.0E-02 | -0.01 | 48.9 | 0.67 | 9 | 84.5 | 29.9 | 114.4 | 14.8 | 38 | 62.5 | 1.0 | -0.09 | 3.2 | 19.8 |
| 0.05 | 5.0E-02 | -0.01 | 45.0 | 0.67 | 7 | 78.3 | 31.5 | 109.8 | 15.7 | 38 | 60.3 | 1.0 | -0.08 | 3.3 | 18.7 |
| 1.04 | 5.0E-02 | 0.00 | 49.6 | 0.80 | 7 | 86.5 | 35.3 | 121.9 | 15.9 | 38 | 63.1 | 1.0 | -0.10 | 3.8 | 20.7 |
| 2.02 | 5.0E-02 | -0.01 | 52.9 | 0.77 | 9 | 92.7 | 32.9 | 125.6 | 14.8 | 40 | 65.1 | 1.0 | -0.11 | 3.6 | 21.7 |
| 3.00 | 5.0E-02 | -0.01 | 51.3 | 0.75 | 9 | 90.4 | 33.0 | 123.4 | 15.0 | 38 | 64.4 | 1.0 | -0.10 | 3.6 | 21.2 |
| 3.99 | 5.0E-02 | -0.01 | 41.3 | 0.85 | 7 | 73.7 | 41.0 | 114.7 | 18.4 | 38 | 58.5 | 1.0 | -0.09 | 4.2 | 18.6 |
| 4.97 | 5.0E-02 | -0.01 | 42.1 | 0.82 | 7 | 75.4 | 39.5 | 114.9 | 17.9 | 38 | 59.2 | 1.0 | -0.09 | 4.0 | 18.8 |
| 5.96 | 5.0E-02 | -0.01 | 39.1 | 0.76 | 7 | 70.5 | 38.6 | 109.1 | 18.2 | 38 | 57.3 | 1.0 | -0.08 | 3.9 | 17.7 |
| 6.94 | 5.0E-02 | -0.01 | 39.4 | 0.79 | 7 | 71.5 | 40.0 | 111.4 | 18.4 | 38 | 57.6 | 1.0 | -0.08 | 4.0 | 18.0 |
| 7.93 | 5.0E-02 | -0.01 | 45.6 | 0.82 | 7 | 82.7 | 38.7 | 121.4 | 16.9 | 38 | 61.8 | 1.0 | -0.10 | 4.0 | 20.2 |
| 8.91 | 5.0E-02 | -0.01 | 43.6 | 0.94 | 7 | 79.5 | 44.7 | 124.2 | 18.5 | 38 | 60.7 | 1.0 | -0.10 | 4.5 | 20.1 |
| 9.89 | 5.0E-02 | -0.01 | 46.5 | 0.82 | 7 | 85.1 | 38.6 | 123.7 | 16.7 | 38 | 62.7 | 1.0 | -0.10 | 4.0 | 20.7 |
| 0.88 | 5.0E-02 | -0.01 | 67.4 | 0.85 | 9 | 122.4 | 33.6 | 156.0 | 13.1 | 40 | 73.1 | 1.0 | -0.14 | 3.7 | 27.7 |
| 1.86 | 5.0E-02 | -0.01 | 52.6 | 1.03 | 7 | 96.8 | 45.9 | 142.6 | 17.0 | 40 | 66.3 | 1.0 | -0.13 | 4.8 | 23.7 |
| 2.85 | 5.0E-02 | -0.01 | 60.3 | 0.74 | 9 | 110.9 | 31.4 | 142.3 | 13.3 | 40 | 70.2 | 1.0 | -0.12 | 3.5 | 25.2 |
| 3.83 | 5.0E-02 | -0.01 | 69.1 | 0.77 | 9 | 127.3 | 30.3 | 157.6 | 12.2 | 40 | 74.2 | 1.0 | -0.13 | 3.4 | 28.3 |
| 4.82 | 5.0E-02 | -0.01 | 59.1 | 0.65 | 9 | 109.8 | 28.2 | 138.0 | 12.7 | 40 | 69.9 | 1.0 | -0.10 | 3.2 | 24.6 |
| 5.80 | 5.0E-02 | -0.01 | 48.3 | 0.99 | 7 | 90.8 | 46.4 | 137.2 | 17.7 | 38 | 64.5 | 1.0 | -0.12 | 4.8 | 22.5 |
| 6.78 | 5.0E+00 | -0.01 | 82.8 | 0.54 | 9 | 154.0 | 16.4 | 170.4 | 8.6 | 42 | 79.7 | 1.0 | -0.12 | 1.6 | 26.7 |
| 7.77 | 5.0E+00 | 0.00 | 92.5 | 0.56 | 9 | 172.3 | 14.3 | 186.7 | 7.9 | 42 | 82.9 | 1.0 | -0.13 | 1.4 | 29.5 |
| 8.75 | 5.0E+00 | 0.00 | 96.0 | 0.47 | 9 | 179.7 | 0.0 | 179.7 | 5.0 | 42 | 84.1 | 1.0 | -0.12 | 0.0 | 29.3 |

regg In Situ, Inc.
nterpretation Output - Release 1.00.19e
un No: 03-0630-0942-1662
ob No: 03-151SW
lient: URS
roject: CPT SITE INVESTIGATION
ite: PIER T LNG
ocation: CPT-07
ngineer: T. O'BRIEN
PT Date: 03/24/06
PT Time: 13:34
PT File: 151C07.COR
orthing (m): 0.000
asting (m): 0.000
levation (m): 0.000

Water Table (m): 6.10 (ft): 20.0
Su Nkt used: 12.50
Averaging Increment (m): 0.30
Phi Method : Robertson and Campanella, 1983
Dr Method : Jamiolkowski - All Sands
State Parameter M: 1.20
Used Unit Weights Assigned to Soil Zones
Values of 1.0E9 or UnDef are printed for parameters that are not valid for the material type (SBT)

| epth (ft) | AvgQt (tsf) | AvgFs (tsf) | AvgRf (%) | AvgUd (ft) | SBT | U.Wt. pcf | TStress (tsf) | EStress (tsf) | Ueq (tsf) | Cn | N60 (blows/ft) | (N1)60 (blows/ft) | Su (tsf) | CRR |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1.49 | 183.8 | 0.73 | 0.40 | 3.6 | 9 | 124.1 | 0.03 | 0.03 | 0.00 | 2.00 | 35.2 | 70.4 | UnDef | 0.00 |
| 1.48 | 147.4 | 1.55 | 1.05 | 5.3 | 8 | 120.9 | 0.09 | 0.09 | 0.00 | 2.00 | 35.3 | 70.6 | UnDef | 0.00 |
| .46 | 66.6 | 1.27 | 1.91 | 3.9 | 7 | 117.8 | 0.15 | 0.15 | 0.00 | 2.00 | 21.3 | 42.5 | UnDef | 0.30 |
| .44 | 38.7 | 0.60 | 1.56 | 2.0 | 7 | 117.8 | 0.21 | 0.21 | 0.00 | 2.00 | 12.4 | 24.7 | UnDef | 0.14 |
| .43 | 25.1 | 0.50 | 1.99 | 1.3 | 6 | 114.6 | 0.26 | 0.26 | 0.00 | 1.94 | 9.6 | 18.7 | 1.98 | 0.11 |
| .41 | 24.0 | 0.46 | 1.93 | 1.2 | 6 | 114.6 | 0.32 | 0.32 | 0.00 | 1.76 | 9.2 | 16.2 | 1.89 | 0.11 |
| .40 | 30.1 | 0.50 | 1.67 | 0.7 | 6 | 114.6 | 0.38 | 0.38 | 0.00 | 1.63 | 11.5 | 18.7 | 2.37 | 0.11 |
| .30 | 185.8 | 1.05 | 0.56 | 1.3 | 9 | 124.1 | 0.43 | 0.43 | 0.00 | 1.52 | 35.6 | 54.2 | UnDef | 0.00 |
| .20 | 194.9 | 1.87 | 0.96 | 1.8 | 9 | 124.1 | 0.49 | 0.49 | 0.00 | 1.43 | 37.3 | 53.5 | UnDef | 0.00 |
| .19 | 159.1 | 2.02 | 1.27 | 3.6 | 8 | 120.9 | 0.55 | 0.55 | 0.00 | 1.35 | 38.1 | 51.5 | UnDef | 0.00 |
| .17 | 105.7 | 1.74 | 1.64 | 2.3 | 7 | 117.8 | 0.61 | 0.61 | 0.00 | 1.28 | 33.7 | 43.3 | UnDef | 0.42 |
| .15 | 51.3 | 0.88 | 1.72 | 0.6 | 7 | 117.8 | 0.66 | 0.66 | 0.00 | 1.23 | 16.4 | 20.1 | UnDef | 0.15 |
| .14 | 68.3 | 0.73 | 1.07 | 0.1 | 8 | 120.9 | 0.72 | 0.72 | 0.00 | 1.18 | 16.4 | 19.2 | UnDef | 0.16 |
| .21 | 133.0 | 2.05 | 1.54 | 0.5 | 8 | 120.9 | 0.79 | 0.79 | 0.00 | 1.13 | 31.8 | 35.9 | UnDef | 0.00 |
| .27 | 104.7 | 1.82 | 1.74 | 0.5 | 7 | 117.8 | 0.85 | 0.85 | 0.00 | 1.08 | 33.4 | 36.2 | UnDef | 0.35 |
| .26 | 147.3 | 0.81 | 0.55 | 0.2 | 9 | 124.1 | 0.91 | 0.91 | 0.00 | 1.05 | 28.2 | 29.6 | UnDef | 0.40 |
| .24 | 274.9 | 1.11 | 0.40 | 0.8 | 10 | 127.3 | 0.97 | 0.97 | 0.00 | 1.01 | 43.9 | 44.5 | UnDef | 0.00 |
| .22 | 218.5 | 1.08 | 0.50 | 1.2 | 9 | 124.1 | 1.03 | 1.03 | 0.00 | 0.98 | 41.9 | 41.2 | UnDef | 0.00 |
| .21 | 129.2 | 0.34 | 0.27 | 0.6 | 9 | 124.1 | 1.10 | 1.10 | 0.00 | 0.96 | 24.8 | 23.7 | UnDef | 0.24 |
| .19 | 69.8 | 0.23 | 0.33 | 0.4 | 8 | 120.9 | 1.16 | 1.16 | 0.00 | 0.93 | 16.7 | 15.5 | UnDef | 0.10 |
| .18 | 109.5 | 0.21 | 0.19 | 0.4 | 9 | 124.1 | 1.22 | 1.21 | 0.01 | 0.91 | 21.0 | 19.1 | UnDef | 0.17 |
| .16 | 125.2 | 0.22 | 0.18 | 0.4 | 9 | 124.1 | 1.28 | 1.24 | 0.04 | 0.90 | 24.0 | 21.5 | UnDef | 0.20 |
| .15 | 120.5 | 0.16 | 0.13 | 1.4 | 9 | 124.1 | 1.34 | 1.27 | 0.07 | 0.89 | 23.1 | 20.5 | UnDef | 0.19 |
| .13 | 112.1 | 0.51 | 0.45 | 1.1 | 9 | 124.1 | 1.40 | 1.30 | 0.10 | 0.88 | 21.5 | 18.8 | UnDef | 0.16 |
| .11 | 73.2 | 0.19 | 0.26 | 1.4 | 8 | 120.9 | 1.46 | 1.33 | 0.13 | 0.87 | 17.5 | 15.2 | UnDef | 0.10 |
| .10 | 81.9 | 0.10 | 0.12 | 2.1 | 9 | 124.1 | 1.52 | 1.36 | 0.16 | 0.86 | 15.7 | 13.4 | UnDef | 0.11 |
| .08 | 91.5 | 0.23 | 0.25 | 3.0 | 9 | 124.1 | 1.58 | 1.39 | 0.19 | 0.85 | 17.5 | 14.9 | UnDef | 0.12 |
| .07 | 93.7 | 0.40 | 0.42 | 3.7 | 8 | 120.9 | 1.64 | 1.42 | 0.22 | 0.84 | 22.4 | 18.8 | UnDef | 0.12 |
| .05 | 131.5 | 0.26 | 0.20 | 4.6 | 9 | 124.1 | 1.70 | 1.45 | 0.25 | 0.83 | 25.2 | 20.9 | UnDef | 0.19 |
| .04 | 127.3 | 0.36 | 0.28 | 5.9 | 9 | 124.1 | 1.76 | 1.48 | 0.28 | 0.82 | 24.4 | 20.0 | UnDef | 0.18 |
| .02 | 124.3 | 0.48 | 0.38 | 6.5 | 9 | 124.1 | 1.82 | 1.51 | 0.31 | 0.81 | 23.8 | 19.4 | UnDef | 0.17 |
| .00 | 131.3 | 0.35 | 0.27 | 7.2 | 9 | 124.1 | 1.88 | 1.54 | 0.34 | 0.81 | 25.2 | 20.3 | UnDef | 0.18 |
| .99 | 120.9 | 0.37 | 0.31 | 8.5 | 9 | 124.1 | 1.95 | 1.57 | 0.37 | 0.80 | 23.1 | 18.5 | UnDef | 0.16 |
| .97 | 75.9 | 0.08 | 0.11 | 8.6 | 8 | 120.9 | 2.01 | 1.60 | 0.41 | 0.79 | 18.2 | 14.4 | UnDef | 0.10 |
| .96 | 67.9 | 0.06 | 0.08 | 9.3 | 8 | 120.9 | 2.07 | 1.63 | 0.44 | 0.78 | 16.3 | 12.7 | UnDef | 0.09 |
| .94 | 71.5 | 0.47 | 0.66 | 11.8 | 8 | 120.9 | 2.13 | 1.66 | 0.47 | 0.78 | 17.1 | 13.3 | UnDef | 0.13 |
| .92 | 76.5 | 0.24 | 0.31 | 13.5 | 8 | 120.9 | 2.18 | 1.69 | 0.50 | 0.77 | 18.3 | 14.1 | UnDef | 0.10 |
| .91 | 87.2 | 0.36 | 0.41 | 14.7 | 8 | 120.9 | 2.24 | 1.72 | 0.53 | 0.76 | 20.9 | 15.9 | UnDef | 0.11 |
| .89 | 87.8 | 0.16 | 0.18 | 15.5 | 9 | 124.1 | 2.30 | 1.75 | 0.56 | 0.76 | 16.8 | 12.7 | UnDef | 0.11 |
| .88 | 176.3 | 0.83 | 0.47 | 17.9 | 9 | 124.1 | 2.37 | 1.78 | 0.59 | 0.75 | 33.8 | 25.3 | UnDef | 0.28 |
| .86 | 120.0 | 0.46 | 0.38 | 17.8 | 9 | 124.1 | 2.43 | 1.81 | 0.62 | 0.74 | 23.0 | 17.1 | UnDef | 0.14 |
| .85 | 100.1 | 0.17 | 0.17 | 18.5 | 9 | 124.1 | 2.49 | 1.84 | 0.65 | 0.74 | 19.2 | 14.1 | UnDef | [illegible] |

iregg In Situ, Inc.
tun No: 03-0630-0942-1662
PT File: 151C07.COR

Page: 2a

| Depth (ft) | AvgQt (tsf) | AvgFs (tsf) | AvgRf (%) | AvgUd (ft) | SBT | U.Wt. pcf | TStress (tsf) | EStress (tsf) | Ueq (tsf) | Cn | N60 (blows/ft) | (N1)60 (blows/ft) | Su (tsf) | CRR |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1.83 | 99.1 | 0.24 | 0.24 | 20.4 | 9 | 124.1 | 2.55 | 1.87 | 0.68 | 0.73 | 19.0 | 13.9 | UnDef | 0.11 |
| 2.81 | 70.7 | 0.61 | 0.87 | 19.6 | 8 | 120.9 | 2.61 | 1.90 | 0.71 | 0.73 | 16.9 | 12.3 | UnDef | 0.14 |
| 3.80 | 84.4 | 0.68 | 0.80 | 17.9 | 8 | 120.9 | 2.67 | 1.93 | 0.74 | 0.72 | 20.2 | 14.6 | UnDef | 0.15 |
| 4.78 | 84.0 | 0.64 | 0.76 | 22.0 | 8 | 120.9 | 2.73 | 1.95 | 0.77 | 0.72 | 20.1 | 14.4 | UnDef | 0.15 |
| 5.77 | 78.9 | 0.61 | 0.77 | 23.9 | 8 | 120.9 | 2.79 | 1.98 | 0.80 | 0.71 | 18.9 | 13.4 | UnDef | 0.14 |
| 6.75 | 85.6 | 0.75 | 0.88 | 25.0 | 8 | 120.9 | 2.85 | 2.01 | 0.84 | 0.71 | 20.5 | 14.4 | UnDef | 0.16 |
| 7.74 | 37.3 | 0.75 | 2.01 | 39.6 | 6 | 114.6 | 2.91 | 2.04 | 0.87 | 0.70 | 14.3 | 10.0 | 2.75 | 0.27 |
| 8.72 | 35.7 | 1.20 | 3.36 | 59.7 | 5 | 114.6 | 2.96 | 2.06 | 0.90 | 0.70 | 17.1 | 11.9 | 2.62 | 0.25 |
| 9.70 | 85.7 | 1.79 | 2.09 | 27.0 | 7 | 117.8 | 3.02 | 2.09 | 0.93 | 0.69 | 27.4 | 18.9 | UnDef | 0.39 |
| 0.69 | 58.2 | 1.01 | 1.74 | 18.2 | 7 | 117.8 | 3.08 | 2.12 | 0.96 | 0.69 | 18.6 | 12.8 | UnDef | 0.36 |
| 1.67 | 23.7 | 0.49 | 2.09 | 20.5 | 6 | 114.6 | 3.13 | 2.14 | 0.99 | 0.68 | 9.1 | 6.2 | 1.64 | 0.13 |
| 2.66 | 32.3 | 0.73 | 2.27 | 32.4 | 6 | 114.6 | 3.19 | 2.17 | 1.02 | 0.68 | 12.4 | 8.4 | 2.33 | 0.19 |
| 3.64 | 25.1 | 0.46 | 1.85 | 60.6 | 6 | 114.6 | 3.25 | 2.20 | 1.05 | 0.67 | 9.6 | 6.5 | 1.75 | 0.13 |
| 4.63 | 26.3 | 0.69 | 2.64 | 60.0 | 5 | 114.6 | 3.30 | 2.22 | 1.08 | 0.67 | 12.6 | 8.4 | 1.84 | 0.14 |
| 5.61 | 22.2 | 1.02 | 4.61 | 32.6 | 3 | 111.4 | 3.36 | 2.25 | 1.11 | 0.67 | 21.3 | 14.2 | 1.51 | 0.00 |
| 6.59 | 18.2 | 0.84 | 4.65 | 22.9 | 3 | 111.4 | 3.41 | 2.27 | 1.14 | 0.66 | 17.4 | 11.5 | 1.18 | 0.00 |
| 7.58 | 14.0 | 0.30 | 2.18 | 27.0 | 5 | 114.6 | 3.47 | 2.30 | 1.17 | 0.66 | 6.7 | 4.4 | 0.84 | 0.00 |
| 8.56 | 12.9 | 0.14 | 1.08 | 70.7 | 6 | 114.6 | 3.53 | 2.32 | 1.20 | 0.66 | 4.9 | 3.2 | 0.75 | 0.09 |
| 9.55 | 16.6 | 0.19 | 1.17 | 108.8 | 6 | 114.6 | 3.58 | 2.35 | 1.23 | 0.65 | 6.4 | 4.2 | 1.04 | 0.09 |
| 0.53 | 59.9 | 0.52 | 0.87 | 94.2 | 8 | 120.9 | 3.64 | 2.37 | 1.27 | 0.65 | 14.3 | 9.3 | UnDef | 0.15 |
| 1.52 | 38.1 | 0.96 | 2.51 | 58.1 | 6 | 114.6 | 3.70 | 2.40 | 1.30 | 0.65 | 14.6 | 9.4 | 2.76 | 0.24 |
| 2.42 | 53.9 | 0.77 | 1.42 | 73.4 | 7 | 117.8 | 3.75 | 2.43 | 1.32 | 0.64 | 17.2 | 11.1 | UnDef | 0.39 |
| 3.32 | 149.9 | 1.46 | 0.98 | 56.9 | 9 | 124.1 | 3.80 | 2.45 | 1.35 | 0.64 | 28.7 | 18.3 | UnDef | 0.28 |
| 4.30 | 135.5 | 1.26 | 0.93 | 52.1 | 9 | 124.1 | 3.87 | 2.48 | 1.38 | 0.63 | 25.9 | 16.5 | UnDef | 0.24 |
| 5.29 | 131.3 | 1.22 | 0.93 | 51.3 | 9 | 124.1 | 3.93 | 2.51 | 1.41 | 0.63 | 25.1 | 15.9 | UnDef | 0.24 |
| 6.27 | 130.3 | 0.93 | 0.71 | 47.1 | 9 | 124.1 | 3.99 | 2.54 | 1.44 | 0.63 | 25.0 | 15.7 | UnDef | 0.20 |
| 7.26 | 53.6 | 0.54 | 1.01 | 55.9 | 7 | 117.8 | 4.05 | 2.57 | 1.48 | 0.62 | 17.1 | 10.7 | UnDef | 0.21 |
| 8.24 | 44.1 | 0.70 | 1.59 | 148.1 | 7 | 117.8 | 4.11 | 2.60 | 1.51 | 0.62 | 14.1 | 8.7 | UnDef | 0.30 |
| 9.22 | 156.1 | 1.36 | 0.87 | 39.8 | 9 | 124.1 | 4.17 | 2.63 | 1.54 | 0.62 | 29.9 | 18.4 | UnDef | 0.28 |
| 0.21 | 178.3 | 1.77 | 0.99 | 30.6 | 9 | 124.1 | 4.23 | 2.66 | 1.57 | 0.61 | 34.1 | 20.9 | UnDef | 0.36 |
| 1.19 | 155.7 | 1.53 | 0.98 | 33.4 | 9 | 124.1 | 4.29 | 2.69 | 1.60 | 0.61 | 29.8 | 18.2 | UnDef | 0.30 |
| 2.18 | 146.7 | 1.41 | 0.96 | 29.8 | 9 | 124.1 | 4.35 | 2.72 | 1.63 | 0.61 | 28.1 | 17.0 | UnDef | 0.27 |
| 3.16 | 77.1 | 1.06 | 1.37 | 29.9 | 7 | 117.8 | 4.41 | 2.75 | 1.66 | 0.60 | 24.6 | 14.8 | UnDef | 0.29 |
| 4.15 | 45.8 | 0.94 | 2.05 | 44.0 | 6 | 114.6 | 4.46 | 2.77 | 1.69 | 0.60 | 17.6 | 10.5 | 3.31 | 0.31 |
| 5.13 | 73.3 | 0.81 | 1.11 | 41.5 | 8 | 120.9 | 4.52 | 2.80 | 1.72 | 0.60 | 17.5 | 10.5 | UnDef | 0.22 |
| 6.11 | 84.7 | 0.65 | 0.77 | 23.4 | 8 | 120.9 | 4.58 | 2.83 | 1.75 | 0.59 | 20.3 | 12.1 | UnDef | 0.16 |
| 7.10 | 77.5 | 0.59 | 0.76 | 21.7 | 8 | 120.9 | 4.64 | 2.86 | 1.78 | 0.59 | 18.5 | 11.0 | UnDef | 0.16 |
| 8.08 | 75.9 | 0.65 | 0.86 | 39.2 | 8 | 120.9 | 4.70 | 2.89 | 1.81 | 0.59 | 18.2 | 10.7 | UnDef | 0.17 |
| 9.07 | 40.2 | 0.88 | 2.19 | 42.1 | 6 | 114.6 | 4.76 | 2.92 | 1.84 | 0.59 | 15.4 | 9.0 | 2.84 | 0.22 |
| 0.05 | 79.1 | 0.83 | 1.05 | 30.4 | 8 | 120.9 | 4.82 | 2.94 | 1.87 | 0.58 | 18.9 | 11.0 | UnDef | 0.21 |
| 1.04 | 48.0 | 1.04 | 2.17 | 38.3 | 6 | 114.6 | 4.88 | 2.97 | 1.91 | 0.58 | 18.4 | 10.7 | 3.45 | 0.32 |
| 2.02 | 62.1 | 1.17 | 1.88 | 31.6 | 7 | 117.8 | 4.93 | 3.00 | 1.94 | 0.58 | 19.8 | 11.5 | UnDef | 0.00 |
| 3.00 | 105.0 | 1.22 | 1.16 | 30.7 | 8 | 120.9 | 4.99 | 3.02 | 1.97 | 0.58 | 25.1 | 14.5 | UnDef | 0.25 |
| 3.99 | 180.1 | 1.49 | 0.82 | 34.3 | 9 | 124.1 | 5.05 | 3.05 | 2.00 | 0.57 | 34.5 | 19.7 | UnDef | 0.31 |
| 4.97 | 212.4 | 1.73 | 0.81 | 33.1 | 9 | 124.1 | 5.11 | 3.08 | 2.03 | 0.57 | 40.7 | 23.2 | UnDef | 0.40 |
| 5.96 | 246.0 | 1.86 | 0.76 | 31.3 | 9 | 124.1 | 5.17 | 3.11 | 2.06 | 0.57 | 47.1 | 26.7 | UnDef | 0.00 |
| 6.94 | 235.4 | 1.68 | 0.71 | 37.9 | 9 | 124.1 | 5.23 | 3.14 | 2.09 | 0.56 | 45.1 | 25.4 | UnDef | 0.43 |
| 7.93 | 276.4 | 1.67 | 0.60 | 54.6 | 9 | 124.1 | 5.30 | 3.18 | 2.12 | 0.56 | 52.9 | 29.7 | UnDef | 0.00 |
| 8.91 | 259.2 | 1.57 | 0.61 | 47.9 | 9 | 124.1 | 5.36 | 3.21 | 2.15 | 0.56 | 49.7 | 27.7 | UnDef | 0.00 |
| 9.89 | 294.1 | 1.65 | 0.56 | 43.6 | 10 | 127.3 | 5.42 | 3.24 | 2.18 | 0.56 | 46.9 | 26.1 | UnDef | 0.00 |
| 0.88 | 260.7 | 1.07 | 0.41 | 51.1 | 10 | 127.3 | 5.48 | 3.27 | 2.21 | 0.55 | 41.6 | 23.0 | UnDef | 0.34 |
| 1.86 | 181.4 | 1.00 | 0.55 | 37.3 | 9 | 124.1 | 5.54 | 3.30 | 2.24 | 0.55 | 34.7 | 19.1 | UnDef | 0.26 |
| 2.85 | 223.9 | 1.21 | 0.54 | 26.5 | 9 | 124.1 | 5.60 | 3.33 | 2.27 | 0.55 | 42.9 | 23.5 | UnDef | 0.34 |
| 3.83 | 285.3 | 1.44 | 0.50 | 33.6 | 10 | 127.3 | 5.67 | 3.36 | 2.31 | 0.55 | 45.5 | 24.8 | UnDef | 0.00 |
| 4.82 | 306.4 | 1.66 | 0.54 | 43.5 | 10 | 127.3 | 5.73 | 3.39 | 2.34 | 0.54 | 48.9 | 26.6 | UnDef | 0.00 |
| 5.80 | 228.8 | 1.45 | 0.63 | 39.4 | 9 | 124.1 | 5.79 | 3.42 | 2.37 | 0.54 | 43.8 | 23.7 | UnDef | 0.38 |
| 6.78 | 323.9 | 1.12 | 0.35 | 35.9 | 10 | 127.3 | 5.85 | 3.46 | 2.40 | 0.54 | 51.7 | 27.8 | UnDef | 0.00 |
| 7.77 | 351.8 | 2.06 | 0.59 | 58.0 | 10 | 127.3 | 5.92 | 3.49 | 2.43 | 0.54 | 56.2 | 30.1 | UnDef | 0.00 |
| 8.75 | 321.4 | 2.25 | 0.70 | 65.2 | 9 | 124.1 | 5.98 | 3.52 | 2.46 | 0.53 | 61.6 | 32.8 | UnDef | 0.00 |

Gregg In Situ, Inc.
Interpretation Output - Release 1.00.19e
Run No: 03-0630-0942-1662
Job No: 03-151SH
Client: URS
Project: CPT SITE INVESTIGATION
Site: PIER T LNG
Location: CPT-07
Engineer: T. O'BRIEN
CPT Date: 03/24/06
CPT Time: 13:34
CPT File: 151C07.COR
Northing (m): 0.000
Easting (m): 0.000
Elevation (m): 0.000

Water Table (m): 6.10 (ft): 20.0
Su Nkt used: 12.50
Averaging Increment (m): 0.30
Phi Method : Robertson and Campanella, 1983
Dr Method : Jamiolkowski - All Sands
State Parameter M: 1.20
Used Unit Weights Assigned to Soil Zones
Values of 1.0E9 or UnDef are printed for parameters that are not valid for the material type (SBT)

| Depth (ft) | k (cm/s) | Bq | Qtn | Rfn | SBTn | Qc1N | DeltaQc1N | Qc1Ncs | Fc (%) | Phi (Deg) | Dr (%) | OCR | State Param | Del(n1)60 | (N1)60cs |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 0.49 | 5.0E-02 | 0.00 | 1000.0 | 0.40 | 10 | 352.1 | 0.0 | 352.1 | 0.0 | 50 | 95.0 | 1.0 | -0.31 | 0.0 | 70.4 |
| 1.48 | 5.0E-03 | 0.00 | 1000.0 | 1.05 | 9 | 282.3 | 0.0 | 282.3 | 0.7 | 50 | 95.0 | 1.0 | -0.41 | 0.0 | 70.6 |
| 2.46 | 5.0E-04 | 0.00 | 444.3 | 1.91 | 9 | 127.6 | 4.7 | 132.3 | 6.3 | 48 | 82.2 | 1.0 | -0.42 | 1.0 | 43.5 |
| 3.44 | 5.0E-04 | 0.00 | 185.4 | 1.57 | 9 | 74.1 | 9.8 | 83.9 | 9.4 | 44 | 62.0 | 1.0 | -0.30 | 2.0 | 26.7 |
| 4.43 | 5.0E-05 | 0.00 | 93.7 | 2.01 | 7 | 47.7 | 22.3 | 70.0 | 16.9 | 42 | 46.1 | 10.0 | -0.26 | 4.6 | 23.3 |
| 5.41 | 5.0E-05 | 0.00 | 73.7 | 1.95 | 7 | 41.4 | 25.0 | 66.4 | 19.1 | 40 | 42.0 | 10.0 | -0.23 | 5.0 | 21.2 |
| 6.40 | 5.0E-05 | 0.00 | 78.6 | 1.69 | 7 | 47.9 | 22.6 | 70.5 | 17.0 | 42 | 46.2 | 10.0 | -0.22 | 4.7 | 23.5 |
| 7.30 | 5.0E-02 | 0.00 | 430.0 | 0.57 | 10 | 276.9 | 0.0 | 276.9 | 0.2 | 48 | 95.0 | 1.0 | -0.27 | 0.0 | 54.2 |
| 8.20 | 5.0E-02 | 0.00 | 399.0 | 0.96 | 9 | 273.2 | 0.0 | 273.2 | 2.6 | 48 | 95.0 | 1.0 | -0.31 | 0.0 | 53.5 |
| 9.19 | 5.0E-03 | 0.00 | 289.6 | 1.27 | 9 | 210.4 | 2.7 | 213.1 | 5.5 | 46 | 88.6 | 1.0 | -0.32 | 0.4 | 51.9 |
| 0.17 | 5.0E-04 | 0.00 | 173.3 | 1.65 | 9 | 132.8 | 21.6 | 154.4 | 10.2 | 44 | 75.4 | 1.0 | -0.30 | 4.2 | 47.5 |
| 1.15 | 5.0E-04 | 0.00 | 76.2 | 1.74 | 7 | 61.6 | 31.2 | 92.8 | 17.6 | 40 | 53.4 | 1.0 | -0.22 | 5.3 | 25.4 |
| 2.14 | 5.0E-03 | 0.00 | 93.5 | 1.08 | 9 | 78.6 | 17.3 | 95.9 | 11.7 | 42 | 60.4 | 1.0 | -0.19 | 2.4 | 21.7 |
| 3.21 | 5.0E-03 | 0.00 | 167.9 | 1.55 | 9 | 146.7 | 22.2 | 168.9 | 9.9 | 44 | 78.3 | 1.0 | -0.28 | 3.2 | 39.1 |
| 4.27 | 5.0E-04 | 0.00 | 122.1 | 1.75 | 9 | 111.1 | 31.8 | 142.9 | 13.3 | 42 | 70.3 | 1.0 | -0.27 | 5.9 | 42.1 |
| 5.26 | 5.0E-02 | 0.00 | 160.8 | 0.55 | 9 | 151.1 | 0.0 | 151.1 | 4.2 | 44 | 79.1 | 1.0 | -0.18 | 0.0 | 29.6 |
| 6.24 | 5.0E+00 | 0.00 | 281.7 | 0.40 | 10 | 272.8 | 0.0 | 272.8 | 0.5 | 46 | 95.0 | 1.0 | -0.20 | 0.0 | 44.5 |
| 7.22 | 5.0E-02 | 0.00 | 210.3 | 0.50 | 9 | 210.3 | 0.0 | 210.3 | 2.4 | 46 | 88.6 | 1.0 | -0.19 | 0.0 | 41.2 |
| 8.21 | 5.0E-02 | 0.00 | 117.0 | 0.27 | 9 | 120.8 | 0.0 | 120.8 | 3.5 | 42 | 72.7 | 1.0 | -0.09 | 0.0 | 23.7 |
| 9.19 | 5.0E-03 | 0.00 | 59.4 | 0.33 | 9 | 63.5 | 0.0 | 63.5 | 5.0 | 40 | 54.3 | 1.0 | -0.05 | 0.0 | 15.5 |
| 0.18 | 5.0E-02 | 0.00 | 89.5 | 0.19 | 9 | 97.4 | 0.0 | 97.4 | 4.4 | 42 | 66.5 | 1.0 | -0.04 | 0.0 | 19.1 |
| 1.16 | 5.0E-02 | 0.00 | 99.9 | 0.18 | 9 | 110.0 | 0.0 | 110.0 | 3.5 | 42 | 70.0 | 1.0 | -0.04 | 0.0 | 21.5 |
| 2.15 | 5.0E-02 | 0.00 | 93.7 | 0.13 | 9 | 104.6 | 0.0 | 104.6 | 3.4 | 42 | 68.6 | 1.0 | -0.01 | 0.0 | 20.5 |
| 3.13 | 5.0E-02 | 0.00 | 85.0 | 0.46 | 9 | 96.1 | 0.0 | 96.1 | 5.0 | 42 | 66.1 | 1.0 | -0.11 | 0.0 | 18.8 |
| 4.11 | 5.0E-03 | 0.00 | 53.9 | 0.27 | 9 | 62.1 | 0.0 | 62.1 | 5.0 | 40 | 53.6 | 1.0 | -0.02 | 0.0 | 15.2 |
| 5.10 | 5.0E-02 | 0.00 | 59.1 | 0.12 | 9 | 68.7 | 0.0 | 68.7 | 5.0 | 40 | 56.5 | 1.0 | 0.03 | 0.0 | 13.4 |
| 6.08 | 5.0E-02 | 0.00 | 64.6 | 0.25 | 9 | 75.9 | 0.0 | 75.9 | 5.0 | 40 | 59.4 | 1.0 | -0.03 | 0.0 | 14.9 |
| 7.07 | 5.0E-03 | 0.00 | 64.8 | 0.43 | 9 | 76.9 | 0.0 | 76.9 | 5.0 | 40 | 59.8 | 1.0 | -0.08 | 0.0 | 18.8 |
| 8.05 | 5.0E-02 | 0.00 | 89.5 | 0.20 | 9 | 106.9 | 0.0 | 106.9 | 4.5 | 42 | 69.2 | 1.0 | -0.04 | 0.0 | 20.9 |
| 9.04 | 5.0E-02 | 0.00 | 84.8 | 0.28 | 9 | 102.4 | 0.0 | 102.4 | 5.0 | 42 | 67.9 | 1.0 | -0.07 | 0.0 | 20.0 |
| 0.02 | 5.0E-02 | 0.00 | 81.0 | 0.39 | 9 | 98.9 | 0.0 | 98.9 | 5.0 | 42 | 67.0 | 1.0 | -0.09 | 0.0 | 19.4 |
| 1.00 | 5.0E-02 | 0.00 | 84.0 | 0.27 | 9 | 103.5 | 0.0 | 103.5 | 5.0 | 42 | 68.3 | 1.0 | -0.06 | 0.0 | 20.3 |
| 1.99 | 5.0E-02 | 0.00 | 75.7 | 0.31 | 9 | 94.3 | 0.0 | 94.3 | 5.0 | 40 | 65.6 | 1.0 | -0.06 | 0.0 | 18.5 |
| 2.97 | 5.0E-03 | 0.00 | 46.1 | 0.11 | 9 | 58.7 | 0.0 | 58.7 | 5.0 | 38 | 52.0 | 1.0 | 0.06 | 0.0 | 14.4 |
| 3.96 | 5.0E-03 | 0.00 | 40.4 | 0.08 | 9 | 52.0 | 0.0 | 52.0 | 5.0 | 38 | 48.6 | 1.0 | 0.10 | 0.0 | 12.7 |
| 4.94 | 5.0E-03 | 0.00 | 41.8 | 0.68 | 7 | 54.3 | 24.4 | 78.7 | 16.6 | 38 | 49.8 | 1.0 | -0.07 | 3.2 | 16.5 |
| 5.92 | 5.0E-03 | 0.00 | 44.0 | 0.32 | 9 | 57.6 | 0.0 | 57.6 | 5.0 | 38 | 51.5 | 1.0 | -0.02 | 0.0 | 14.1 |
| 5.91 | 5.0E-03 | 0.00 | 49.5 | 0.43 | 9 | 65.1 | 0.0 | 65.1 | 5.0 | 38 | 55.0 | 1.0 | -0.05 | 0.0 | 15.9 |
| 7.89 | 5.0E-02 | 0.00 | 49.0 | 0.18 | 9 | 65.0 | 0.0 | 65.0 | 5.0 | 38 | 54.9 | 1.0 | 0.02 | 0.0 | 12.7 |
| 3.88 | 5.0E-02 | 0.00 | 97.9 | 0.48 | 9 | 129.5 | 0.0 | 129.5 | 5.0 | 42 | 74.7 | 1.0 | -0.12 | 0.0 | 25.3 |
| 9.86 | 5.0E-02 | 0.00 | 65.1 | 0.39 | 9 | 87.4 | 0.0 | 87.4 | 5.0 | 40 | 63.4 | 1.0 | -0.07 | 0.0 | 17.1 |
| 1.85 | 5.0E-02 | 0.00 | 53.1 | 0.18 | 9 | 72.3 | 0.0 | 72.3 | 5.0 | 40 | 58.0 | 1.0 | 0.01 | 0.0 | 14.1 |

iregg In Situ, Inc.
Run No: 03-0630-0942-1662
CPT File: 151C07.COR



| epth (ft) | k (cm/s) | Bq | Qtn | Rfn | SBTn | Qc1N | DeltaQc1N | Qc1Ncs | Fc (%) | Phi (Deg) | Dr (%) | OCR | State Param | Del(n1)60 | (N1)60cs |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1.83 | 5.0E-02 | 0.00 | 51.7 | 0.25 | 9 | 71.0 | 0.0 | 71.0 | 5.0 | 38 | 57.4 | 1.0 | -0.01 | 0.0 | 13.9 |
| 2.81 | 5.0E-03 | 0.00 | 35.9 | 0.90 | 7 | 50.2 | 35.8 | 86.0 | 20.6 | 38 | 47.5 | 1.0 | -0.08 | 4.3 | 16.6 |
| 3.80 | 5.0E-03 | 0.00 | 42.4 | 0.83 | 7 | 59.5 | 31.1 | 90.6 | 17.9 | 38 | 52.4 | 1.0 | -0.09 | 4.0 | 18.5 |
| 4.78 | 5.0E-03 | 0.00 | 41.6 | 0.79 | 7 | 58.8 | 30.3 | 89.1 | 17.7 | 38 | 52.1 | 1.0 | -0.09 | 3.9 | 18.3 |
| 5.77 | 5.0E-03 | 0.00 | 38.4 | 0.80 | 7 | 54.8 | 31.9 | 86.7 | 18.8 | 38 | 50.0 | 1.0 | -0.08 | 4.0 | 17.4 |
| 6.75 | 5.0E-03 | 0.00 | 41.1 | 0.91 | 7 | 59.1 | 35.1 | 94.1 | 19.0 | 38 | 52.2 | 1.0 | -0.10 | 4.4 | 18.8 |
| 7.74 | 5.0E-05 | 0.01 | 16.9 | 2.18 | 6 | 25.6 | 102.3 | 127.9 | 42.1 | 32 | 30.0 | 6.0 | -0.08 | 10.0 | 20.0 |
| 8.72 | 5.0E-06 | 0.03 | 15.9 | 3.66 | 4 | 24.3 | 97.2 | 121.6 | 51.2 | UnDef | UnDef | 6.0 | UnDef | 11.9 | 23.8 |
| 9.70 | 5.0E-04 | 0.00 | 39.5 | 2.17 | 7 | 58.0 | 90.7 | 148.7 | 27.8 | 38 | 51.7 | 1.0 | -0.17 | 11.7 | 30.6 |
| 0.69 | 5.0E-04 | -0.01 | 26.0 | 1.84 | 7 | 39.1 | 104.6 | 143.7 | 32.3 | 36 | 40.4 | 1.0 | -0.11 | 10.7 | 23.4 |
| 1.67 | 5.0E-05 | -0.02 | 9.6 | 2.41 | 4 | 15.8 | 63.3 | 79.1 | 55.8 | 30 | 30.0 | 3.0 | -0.03 | 6.2 | 12.4 |
| 2.66 | 5.0E-05 | 0.00 | 13.4 | 2.52 | 6 | 21.5 | 85.8 | 107.3 | 48.9 | 32 | 30.0 | 6.0 | -0.07 | 8.4 | 16.8 |
| 3.64 | 5.0E-05 | 0.04 | 10.0 | 2.12 | 6 | 16.6 | 66.4 | 83.0 | 53.0 | 30 | 30.0 | 3.0 | -0.01 | 6.5 | 13.0 |
| 4.63 | 5.0E-06 | 0.03 | 10.3 | 3.02 | 4 | 17.3 | 69.0 | 86.3 | 57.6 | UnDef | UnDef | 3.0 | UnDef | 8.4 | 16.9 |
| 5.61 | 5.0E-08 | 0.00 | 8.4 | 5.43 | 1 | 14.5 | UnDef | UnDef | 100.0 | UnDef | UnDef | 3.0 | UnDef | UnDef | UnDef |
| 6.59 | 5.0E-08 | -0.03 | 6.5 | 5.73 | 1 | 11.8 | UnDef | UnDef | 100.0 | UnDef | UnDef | 3.0 | UnDef | UnDef | UnDef |
| 7.58 | 5.0E-06 | -0.03 | 4.6 | 2.89 | 1 | 9.0 | UnDef | UnDef | 100.0 | UnDef | UnDef | 1.5 | UnDef | UnDef | UnDef |
| 8.56 | 5.0E-05 | 0.11 | 4.0 | 1.48 | 4 | 8.3 | 33.1 | 41.4 | 71.7 | 30 | 30.0 | 1.5 | 0.11 | 3.2 | 6.5 |
| 9.55 | 5.0E-05 | 0.17 | 5.6 | 1.49 | 4 | 10.6 | 42.5 | 53.1 | 62.6 | 30 | 30.0 | 1.5 | 0.08 | 4.2 | 8.3 |
| 0.53 | 5.0E-03 | 0.03 | 23.7 | 0.93 | 7 | 38.0 | 52.9 | 90.9 | 26.8 | 34 | 39.6 | 1.0 | -0.04 | 5.3 | 14.6 |
| 1.52 | 5.0E-05 | 0.02 | 14.3 | 2.78 | 6 | 24.1 | 96.3 | 120.4 | 48.9 | 32 | 30.0 | 6.0 | -0.08 | 9.4 | 18.9 |
| 2.42 | 5.0E-04 | 0.02 | 20.7 | 1.53 | 6 | 33.9 | 115.9 | 149.8 | 34.0 | 34 | 36.3 | 1.0 | -0.07 | 10.4 | 21.4 |
| 3.32 | 5.0E-02 | 0.00 | 59.6 | 1.00 | 7 | 93.7 | 36.4 | 130.0 | 15.5 | 40 | 65.4 | 1.0 | -0.14 | 3.9 | 22.2 |
| 4.30 | 5.0E-02 | 0.00 | 53.0 | 0.96 | 7 | 84.1 | 36.8 | 120.9 | 16.4 | 40 | 62.3 | 1.0 | -0.12 | 3.9 | 20.3 |
| 5.29 | 5.0E-02 | 0.00 | 50.7 | 0.96 | 7 | 81.0 | 37.8 | 118.8 | 16.9 | 38 | 61.2 | 1.0 | -0.12 | 3.9 | 19.8 |
| 6.27 | 5.0E-02 | 0.00 | 49.7 | 0.73 | 9 | 80.0 | 30.0 | 110.0 | 15.2 | 38 | 60.9 | 1.0 | -0.10 | 3.2 | 18.9 |
| 7.26 | 5.0E-04 | 0.01 | 19.3 | 1.09 | 7 | 32.7 | 80.3 | 113.0 | 31.6 | 34 | 35.2 | 1.0 | -0.04 | 8.5 | 19.2 |
| 8.24 | 5.0E-04 | 0.08 | 15.4 | 1.75 | 6 | 26.8 | 107.1 | 133.9 | 41.1 | 32 | 30.0 | 1.0 | -0.04 | 8.7 | 17.5 |
| 9.22 | 5.0E-02 | 0.00 | 57.8 | 0.90 | 9 | 94.2 | 34.2 | 128.5 | 15.0 | 40 | 65.6 | 1.0 | -0.13 | 3.7 | 22.1 |
| 0.21 | 5.0E-02 | 0.00 | 65.5 | 1.01 | 9 | 107.0 | 36.9 | 143.9 | 14.6 | 40 | 69.2 | 1.0 | -0.15 | 4.0 | 24.9 |
| 1.19 | 5.0E-02 | 0.00 | 56.3 | 1.01 | 7 | 92.9 | 39.4 | 132.3 | 16.1 | 40 | 65.2 | 1.0 | -0.13 | 4.2 | 22.3 |
| 2.18 | 5.0E-02 | 0.00 | 52.4 | 0.99 | 7 | 87.1 | 39.9 | 126.9 | 16.8 | 40 | 63.3 | 1.0 | -0.13 | 4.2 | 21.2 |
| 3.16 | 5.0E-04 | -0.01 | 26.4 | 1.46 | 7 | 45.5 | 85.2 | 130.7 | 29.4 | 36 | 44.7 | 1.0 | -0.09 | 10.2 | 25.1 |
| 4.15 | 5.0E-05 | -0.01 | 14.9 | 2.27 | 6 | 26.9 | 107.7 | 134.7 | 45.1 | 32 | 30.0 | 6.0 | -0.07 | 10.5 | 21.1 |
| 5.13 | 5.0E-03 | -0.01 | 24.5 | 1.18 | 7 | 42.9 | 71.8 | 114.6 | 28.4 | 34 | 43.0 | 1.0 | -0.07 | 6.7 | 17.2 |
| 6.11 | 5.0E-03 | -0.01 | 28.3 | 0.82 | 7 | 49.3 | 45.8 | 95.0 | 23.0 | 36 | 47.0 | 1.0 | -0.05 | 5.2 | 17.3 |
| 7.10 | 5.0E-03 | -0.02 | 25.5 | 0.81 | 7 | 44.8 | 48.9 | 93.7 | 24.5 | 34 | 44.3 | 1.0 | -0.04 | 5.3 | 16.3 |
| 8.08 | 5.0E-03 | -0.01 | 24.7 | 0.91 | 7 | 43.7 | 55.8 | 99.5 | 26.0 | 34 | 43.6 | 1.0 | -0.05 | 5.8 | 16.5 |
| 9.07 | 5.0E-05 | -0.01 | 12.2 | 2.48 | 6 | 23.1 | 92.2 | 115.3 | 50.8 | 30 | 30.0 | 3.0 | -0.05 | 9.0 | 18.0 |
| 10.05 | 5.0E-03 | -0.01 | 25.2 | 1.12 | 7 | 45.1 | 68.1 | 113.2 | 27.5 | 34 | 44.5 | 1.0 | -0.07 | 6.7 | 17.7 |
| 11.04 | 5.0E-05 | -0.02 | 14.5 | 2.42 | 6 | 27.3 | 109.1 | 136.4 | 46.6 | 32 | 30.0 | 6.0 | -0.07 | 10.7 | 21.4 |
| 12.02 | 5.0E-04 | -0.02 | 19.1 | 2.05 | 6 | 35.1 | 140.5 | 175.7 | 38.9 | 32 | 37.3 | 1.0 | -0.09 | 11.5 | 22.9 |
| 13.00 | 5.0E-03 | -0.01 | 33.1 | 1.22 | 7 | 59.1 | 62.8 | 121.8 | 24.3 | 36 | 52.2 | 1.0 | -0.10 | 6.9 | 21.3 |
| 13.99 | 5.0E-02 | -0.01 | 57.3 | 0.85 | 9 | 100.8 | 35.1 | 135.9 | 14.7 | 40 | 67.5 | 1.0 | -0.12 | 3.8 | 23.5 |
| 14.97 | 5.0E-02 | 0.00 | 67.2 | 0.83 | 9 | 118.4 | 31.9 | 150.3 | 13.0 | 40 | 72.1 | 1.0 | -0.13 | 3.6 | 26.7 |
| 15.96 | 5.0E-02 | 0.00 | 77.3 | 0.77 | 9 | 136.4 | 26.8 | 163.2 | 11.1 | 40 | 76.2 | 1.0 | -0.14 | 3.1 | 29.8 |
| 16.94 | 5.0E-02 | 0.00 | 73.2 | 0.73 | 9 | 129.9 | 26.3 | 156.2 | 11.3 | 40 | 74.8 | 1.0 | -0.13 | 3.0 | 28.4 |
| 7.93 | 5.0E-02 | 0.00 | 85.4 | 0.62 | 9 | 151.8 | 18.2 | 170.0 | 9.0 | 42 | 79.2 | 1.0 | -0.13 | 2.1 | 31.8 |
| 8.91 | 5.0E-02 | 0.00 | 79.2 | 0.62 | 9 | 141.7 | 20.1 | 161.8 | 9.7 | 42 | 77.3 | 1.0 | -0.12 | 2.3 | 30.1 |
| 9.89 | 5.0E+00 | 0.00 | 89.2 | 0.57 | 9 | 160.0 | 15.3 | 175.3 | 8.3 | 42 | 80.7 | 1.0 | -0.13 | 1.5 | 27.6 |
| 0.88 | 5.0E+00 | 0.00 | 78.1 | 0.42 | 9 | 141.1 | 0.0 | 141.1 | 5.0 | 42 | 77.1 | 1.0 | -0.09 | 0.0 | 23.0 |
| 1.86 | 5.0E-02 | -0.01 | 53.3 | 0.57 | 9 | 97.7 | 26.1 | 123.8 | 12.9 | 40 | 66.6 | 1.0 | -0.08 | 2.9 | 22.0 |
| 2.85 | 5.0E-02 | -0.01 | 65.6 | 0.55 | 9 | 120.1 | 21.6 | 141.7 | 10.7 | 40 | 72.5 | 1.0 | -0.10 | 2.5 | 26.0 |
| 3.83 | 5.0E+00 | 0.00 | 83.2 | 0.51 | 9 | 152.3 | 14.7 | 167.0 | 8.3 | 42 | 79.3 | 1.0 | -0.11 | 1.4 | 26.3 |
| 4.82 | 5.0E+00 | 0.00 | 88.6 | 0.55 | 9 | 162.8 | 14.9 | 177.7 | 8.1 | 42 | 81.2 | 1.0 | -0.12 | 1.5 | 28.0 |
| 5.80 | 5.0E-02 | -0.01 | 65.1 | 0.65 | 9 | 121.0 | 26.2 | 147.2 | 11.7 | 40 | 72.7 | 1.0 | -0.11 | 3.0 | 26.7 |
| 6.78 | 5.0E+00 | 0.00 | 92.0 | 0.35 | 9 | 170.5 | 0.0 | 170.5 | 5.0 | 42 | 82.6 | 1.0 | -0.09 | 0.0 | 27.8 |
| 7.77 | 5.0E+00 | 0.00 | 99.2 | 0.60 | 9 | 184.4 | 14.1 | 198.5 | 7.7 | 42 | 84.8 | 1.0 | -0.14 | 1.4 | 31.5 |
| 8.75 | 5.0E-02 | 0.00 | 89.7 | 0.71 | 9 | 167.7 | 22.4 | 190.1 | 9.4 | 42 | 82.1 | 1.0 | -0.15 | 2.6 | 35.4 |

Gregg In Situ, Inc.
Interpretation Output - Release 1.00.19e
Run No: 03-0630-0942-1717
Job No: 03-151SH
Client: URS
Project: CPT SITE INVESTIGATION
Site: PIER T LNG
Location: CPT-08
Engineer: T. O'BRIEN
CPT Date: 03/25/06
CPT Time: 13:07
CPT File: 151C08.COR
Northing (m): 0.000
Easting (m): 0.000
Elevation (m): 0.000

Water Table (m): 6.10 (ft): 20.0
Su Nkt used: 12.50
Averaging Increment (m): 0.30
Phi Method : Robertson and Campanella, 1983
Dr Method : Jamiolkowski - All Sands
State Parameter M: 1.20
Used Unit Weights Assigned to Soil Zones
Values of 1.0E9 or UnDef are printed for parameters that are not valid for the material type (SBT)

| Depth (ft) | AvgQt (tsf) | AvgFs (tsf) | AvgRf (%) | AvgUd (ft) | SBT | U.Wt. pcf | TStress (tsf) | EStress (tsf) | Ueq (tsf) | Cn | N60 (blows/ft) | (N1)60 (blows/ft) | Su (tsf) | CRR |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 0.49 | 301.4 | 1.09 | 0.36 | 9.9 | 10 | 127.3 | 0.03 | 0.03 | 0.00 | 2.00 | 48.1 | 96.2 | UnDef | 0.00 |
| 1.48 | 79.0 | 0.55 | 0.69 | -1.4 | 8 | 120.9 | 0.09 | 0.09 | 0.00 | 2.00 | 18.9 | 37.8 | UnDef | 0.40 |
| 2.46 | 36.9 | 0.26 | 0.70 | 0.3 | 7 | 117.8 | 0.15 | 0.15 | 0.00 | 2.00 | 11.8 | 23.5 | UnDef | 0.11 |
| 3.44 | 14.1 | 0.18 | 1.24 | -2.8 | 6 | 114.6 | 0.21 | 0.21 | 0.00 | 2.00 | 5.4 | 10.8 | 1.11 | 0.09 |
| 4.43 | 5.0 | 0.05 | 1.04 | -2.6 | 1 | 79.6 | 0.26 | 0.26 | 0.00 | 1.98 | 2.4 | 4.7 | 0.38 | 0.08 |
| 5.41 | 30.9 | 0.49 | 1.59 | -1.6 | 6 | 114.6 | 0.30 | 0.30 | 0.00 | 1.81 | 11.8 | 21.5 | 2.45 | 0.12 |
| 6.40 | 25.4 | 0.44 | 1.75 | -3.4 | 6 | 114.6 | 0.36 | 0.36 | 0.00 | 1.67 | 9.7 | 16.2 | 2.00 | 0.11 |
| 7.30 | 31.3 | 0.25 | 0.81 | -2.3 | 7 | 117.8 | 0.41 | 0.41 | 0.00 | 1.56 | 10.0 | 15.6 | UnDef | 0.10 |
| 8.20 | 67.0 | 0.38 | 0.57 | -1.6 | 8 | 120.9 | 0.47 | 0.47 | 0.00 | 1.46 | 16.0 | 23.5 | UnDef | 0.16 |
| 9.19 | 69.0 | 0.47 | 0.68 | -2.6 | 8 | 120.9 | 0.53 | 0.53 | 0.00 | 1.38 | 16.5 | 22.8 | UnDef | 0.16 |
| 0.17 | 53.9 | 0.35 | 0.65 | -3.1 | 8 | 120.9 | 0.59 | 0.59 | 0.00 | 1.31 | 12.9 | 16.9 | UnDef | 0.12 |
| 1.15 | 47.7 | 0.23 | 0.49 | -2.3 | 8 | 120.9 | 0.65 | 0.65 | 0.00 | 1.25 | 11.4 | 14.2 | UnDef | 0.10 |
| 2.14 | 71.5 | 0.61 | 0.85 | -1.5 | 8 | 120.9 | 0.70 | 0.70 | 0.00 | 1.19 | 17.1 | 20.4 | UnDef | 0.16 |
| 3.21 | 71.6 | 0.64 | 0.89 | -2.7 | 8 | 120.9 | 0.77 | 0.77 | 0.00 | 1.14 | 17.1 | 19.5 | UnDef | 0.16 |
| 4.27 | 56.7 | 0.46 | 0.82 | -2.5 | 8 | 120.9 | 0.83 | 0.83 | 0.00 | 1.10 | 13.6 | 14.9 | UnDef | 0.12 |
| 5.26 | 52.2 | 0.34 | 0.65 | -2.2 | 8 | 120.9 | 0.89 | 0.89 | 0.00 | 1.06 | 12.5 | 13.2 | UnDef | 0.11 |
| 6.24 | 46.0 | 0.30 | 0.65 | -2.0 | 7 | 117.8 | 0.95 | 0.95 | 0.00 | 1.03 | 14.7 | 15.1 | UnDef | 0.10 |
| 7.22 | 45.3 | 0.28 | 0.61 | -1.2 | 7 | 117.8 | 1.01 | 1.01 | 0.00 | 1.00 | 14.5 | 14.4 | UnDef | 0.10 |
| 8.21 | 47.3 | 0.22 | 0.47 | 0.4 | 8 | 120.9 | 1.07 | 1.07 | 0.00 | 0.97 | 11.3 | 11.0 | UnDef | 0.09 |
| 9.19 | 46.3 | 0.27 | 0.59 | 1.9 | 7 | 117.8 | 1.13 | 1.13 | 0.00 | 0.94 | 14.8 | 13.9 | UnDef | 0.10 |
| 0.18 | 43.5 | 0.27 | 0.62 | 3.3 | 7 | 117.8 | 1.19 | 1.18 | 0.01 | 0.92 | 13.9 | 12.8 | UnDef | 0.10 |
| 1.16 | 41.8 | 0.27 | 0.66 | 4.4 | 7 | 117.8 | 1.24 | 1.21 | 0.04 | 0.91 | 13.4 | 12.2 | UnDef | 0.10 |
| 2.15 | 43.4 | 0.28 | 0.66 | 5.8 | 7 | 117.8 | 1.30 | 1.23 | 0.07 | 0.90 | 13.9 | 12.5 | UnDef | 0.10 |
| 3.13 | 40.8 | 0.26 | 0.65 | 7.1 | 7 | 117.8 | 1.36 | 1.26 | 0.10 | 0.89 | 13.0 | 11.6 | UnDef | 0.10 |
| 4.11 | 36.9 | 0.26 | 0.70 | 8.2 | 7 | 117.8 | 1.42 | 1.29 | 0.13 | 0.88 | 11.8 | 10.4 | UnDef | 0.10 |
| 5.10 | 41.1 | 0.24 | 0.58 | 8.5 | 7 | 117.8 | 1.47 | 1.32 | 0.16 | 0.87 | 13.1 | 11.4 | UnDef | 0.10 |
| 6.08 | 46.7 | 0.25 | 0.53 | 9.1 | 8 | 120.9 | 1.53 | 1.34 | 0.19 | 0.86 | 11.2 | 9.6 | UnDef | 0.10 |
| 7.07 | 44.5 | 0.24 | 0.53 | 9.0 | 7 | 117.8 | 1.59 | 1.37 | 0.22 | 0.85 | 14.2 | 12.1 | UnDef | 0.10 |
| 8.05 | 41.2 | 0.24 | 0.57 | 10.9 | 7 | 117.8 | 1.65 | 1.40 | 0.25 | 0.85 | 13.2 | 11.1 | UnDef | 0.10 |
| 9.04 | 41.4 | 0.28 | 0.67 | 13.7 | 7 | 117.8 | 1.71 | 1.43 | 0.28 | 0.84 | 13.2 | 11.1 | UnDef | 0.10 |
| 0.02 | 39.6 | 0.27 | 0.69 | 14.9 | 7 | 117.8 | 1.77 | 1.45 | 0.31 | 0.83 | 12.6 | 10.5 | UnDef | 0.10 |
| 1.00 | 37.1 | 0.19 | 0.52 | 16.6 | 7 | 117.8 | 1.82 | 1.48 | 0.34 | 0.82 | 11.9 | 9.7 | UnDef | 0.10 |
| 1.99 | 27.7 | 0.18 | 0.66 | 19.9 | 7 | 117.8 | 1.88 | 1.51 | 0.37 | 0.81 | 8.8 | 7.2 | UnDef | 0.11 |
| 2.97 | 25.4 | 0.15 | 0.61 | 22.8 | 7 | 117.8 | 1.94 | 1.54 | 0.41 | 0.81 | 8.1 | 6.5 | UnDef | 0.11 |
| 3.96 | 26.6 | 0.22 | 0.82 | 16.4 | 7 | 117.8 | 2.00 | 1.56 | 0.44 | 0.80 | 8.5 | 6.8 | UnDef | 0.14 |
| 4.94 | 32.3 | 0.13 | 0.39 | 20.9 | 7 | 117.8 | 2.06 | 1.59 | 0.47 | 0.79 | 10.3 | 8.2 | UnDef | 0.00 |
| 5.92 | 30.3 | 0.15 | 0.50 | 25.8 | 7 | 117.8 | 2.11 | 1.62 | 0.50 | 0.79 | 9.7 | 7.6 | UnDef | 0.10 |
| 6.91 | 29.0 | 0.14 | 0.50 | 30.0 | 7 | 117.8 | 2.17 | 1.64 | 0.53 | 0.78 | 9.3 | 7.2 | UnDef | 0.10 |
| 7.89 | 33.7 | 0.15 | 0.46 | 29.1 | 7 | 117.8 | 2.23 | 1.67 | 0.56 | 0.77 | 10.8 | 8.3 | UnDef | 0.00 |
| 8.88 | 38.6 | 0.18 | 0.47 | 26.9 | 7 | 117.8 | 2.29 | 1.70 | 0.59 | 0.77 | 12.3 | 9.5 | UnDef | 0.00 |
| 9.86 | 39.1 | 0.20 | 0.51 | 27.7 | 7 | 117.8 | 2.35 | 1.73 | 0.62 | 0.76 | 12.5 | 9.5 | UnDef | 0.10 |
| 0.85 | 47.0 | 0.24 | 0.51 | 27.4 | 8 | 120.9 | 2.40 | 1.75 | 0.65 | 0.76 | 11.2 | 8.5 | UnDef | 0.10 |

Gregg In Situ, Inc.
Run No: 03-0630-0942-1717
CPT File: 151C08.COR



| Depth (ft) | AvgQt (tsf) | AvgFs (tsf) | AvgRf (%) | AvgUd (ft) | SBT | U.Wt. pcf | TStress (tsf) | EStress (tsf) | Ueq (tsf) | Cn | N60 (blows/ft) | (N1)60 (blows/ft) | Su (tsf) | CRR |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1.83 | 43.2 | 0.22 | 0.50 | 28.0 | 7 | 117.8 | 2.46 | 1.78 | 0.68 | 0.75 | 13.8 | 10.3 | UnDef | 0.10 |
| 2.81 | 34.5 | 0.19 | 0.56 | 29.9 | 7 | 117.8 | 2.52 | 1.81 | 0.71 | 0.74 | 11.0 | 8.2 | UnDef | 0.11 |
| 3.80 | 39.1 | 0.21 | 0.54 | 32.5 | 7 | 117.8 | 2.58 | 1.84 | 0.74 | 0.74 | 12.5 | 9.2 | UnDef | 0.10 |
| 4.78 | 45.4 | 0.19 | 0.42 | 30.4 | 8 | 120.9 | 2.64 | 1.86 | 0.77 | 0.73 | 10.9 | 8.0 | UnDef | 0.08 |
| 5.77 | 40.3 | 0.21 | 0.51 | 32.9 | 7 | 117.8 | 2.70 | 1.89 | 0.80 | 0.73 | 12.9 | 9.3 | UnDef | 0.10 |
| 6.75 | 41.1 | 0.18 | 0.45 | 33.7 | 7 | 117.8 | 2.75 | 1.92 | 0.84 | 0.72 | 13.1 | 9.5 | UnDef | 0.00 |
| 7.74 | 41.7 | 0.17 | 0.40 | 34.0 | 8 | 120.9 | 2.81 | 1.95 | 0.87 | 0.72 | 10.0 | 7.2 | UnDef | 0.00 |
| 8.72 | 45.6 | 0.21 | 0.46 | 36.0 | 8 | 120.9 | 2.87 | 1.98 | 0.90 | 0.71 | 10.9 | 7.8 | UnDef | 0.08 |
| 9.70 | 49.0 | 0.22 | 0.46 | 36.5 | 8 | 120.9 | 2.93 | 2.00 | 0.93 | 0.71 | 11.7 | 8.3 | UnDef | 0.08 |
| 0.69 | 49.2 | 0.20 | 0.40 | 37.1 | 8 | 120.9 | 2.99 | 2.03 | 0.96 | 0.70 | 11.8 | 8.3 | UnDef | 0.08 |
| 1.67 | 51.7 | 0.20 | 0.39 | 37.8 | 8 | 120.9 | 3.05 | 2.06 | 0.99 | 0.70 | 12.4 | 8.6 | UnDef | 0.08 |
| 2.66 | 48.8 | 0.23 | 0.48 | 38.4 | 8 | 120.9 | 3.11 | 2.09 | 1.02 | 0.69 | 11.7 | 8.1 | UnDef | 0.11 |
| 3.64 | 46.4 | 0.24 | 0.51 | 39.3 | 8 | 120.9 | 3.17 | 2.12 | 1.05 | 0.69 | 11.1 | 7.6 | UnDef | 0.11 |
| 4.63 | 51.7 | 0.22 | 0.43 | 39.7 | 8 | 120.9 | 3.23 | 2.15 | 1.08 | 0.68 | 12.4 | 8.4 | UnDef | 0.08 |
| 5.61 | 52.2 | 0.25 | 0.48 | 40.8 | 8 | 120.9 | 3.29 | 2.18 | 1.11 | 0.68 | 12.5 | 8.5 | UnDef | 0.11 |
| 6.59 | 55.9 | 0.27 | 0.48 | 42.0 | 8 | 120.9 | 3.35 | 2.21 | 1.14 | 0.67 | 13.4 | 9.0 | UnDef | 0.11 |
| 7.58 | 45.7 | 0.25 | 0.55 | 42.6 | 7 | 117.8 | 3.41 | 2.23 | 1.17 | 0.67 | 14.6 | 9.8 | UnDef | 0.11 |
| 8.56 | 47.9 | 0.30 | 0.63 | 45.2 | 7 | 117.8 | 3.47 | 2.26 | 1.20 | 0.67 | 15.3 | 10.2 | UnDef | 0.12 |
| 9.55 | 53.0 | 0.43 | 0.81 | 45.1 | 7 | 117.8 | 3.52 | 2.29 | 1.23 | 0.66 | 16.9 | 11.2 | UnDef | 0.14 |
| 0.53 | 62.1 | 0.30 | 0.49 | 46.1 | 8 | 120.9 | 3.58 | 2.32 | 1.27 | 0.66 | 14.9 | 9.8 | UnDef | 0.11 |
| 1.52 | 73.4 | 0.45 | 0.62 | 45.0 | 8 | 120.9 | 3.64 | 2.35 | 1.30 | 0.65 | 17.6 | 11.5 | UnDef | 0.13 |
| 2.42 | 74.4 | 0.33 | 0.44 | 50.0 | 8 | 120.9 | 3.70 | 2.37 | 1.32 | 0.65 | 17.8 | 11.6 | UnDef | 0.09 |
| 3.32 | 68.8 | 0.30 | 0.44 | 49.0 | 8 | 120.9 | 3.75 | 2.40 | 1.35 | 0.65 | 16.5 | 10.6 | UnDef | 0.09 |
| 4.30 | 53.1 | 0.31 | 0.58 | 50.6 | 8 | 120.9 | 3.81 | 2.43 | 1.38 | 0.64 | 12.7 | 8.2 | UnDef | 0.12 |
| 5.29 | 36.7 | 0.37 | 1.00 | 44.6 | 7 | 117.8 | 3.87 | 2.46 | 1.41 | 0.64 | 11.7 | 7.5 | UnDef | 0.22 |
| 6.27 | 51.8 | 0.91 | 1.76 | 39.8 | 7 | 117.8 | 3.93 | 2.48 | 1.44 | 0.63 | 16.5 | 10.5 | UnDef | 0.00 |
| 7.26 | 20.0 | 0.53 | 2.63 | 96.8 | 5 | 114.6 | 3.98 | 2.51 | 1.48 | 0.63 | 9.6 | 6.0 | 1.28 | 0.00 |
| 8.24 | 11.0 | 0.15 | 1.36 | 154.6 | 5 | 114.6 | 4.04 | 2.53 | 1.51 | 0.63 | 5.3 | 3.3 | 0.56 | 0.08 |
| 9.22 | 15.6 | 0.19 | 1.20 | 168.6 | 6 | 114.6 | 4.10 | 2.56 | 1.54 | 0.63 | 6.0 | 3.7 | 0.92 | 0.09 |
| 0.21 | 25.4 | 0.38 | 1.51 | 132.7 | 6 | 114.6 | 4.15 | 2.59 | 1.57 | 0.62 | 9.7 | 6.1 | 1.70 | 0.12 |
| 1.19 | 26.5 | 0.68 | 2.56 | 104.6 | 6 | 114.6 | 4.21 | 2.61 | 1.60 | 0.62 | 10.1 | 6.3 | 1.78 | 0.13 |
| 2.18 | 71.6 | 1.41 | 1.97 | 54.6 | 7 | 117.8 | 4.27 | 2.64 | 1.63 | 0.62 | 22.9 | 14.1 | UnDef | 0.00 |
| 3.16 | 108.3 | 1.31 | 1.21 | 47.8 | 8 | 120.9 | 4.33 | 2.67 | 1.66 | 0.61 | 25.9 | 15.9 | UnDef | 0.25 |
| 4.15 | 129.9 | 0.83 | 0.64 | 39.2 | 9 | 124.1 | 4.39 | 2.70 | 1.69 | 0.61 | 24.9 | 15.2 | UnDef | 0.19 |
| 5.13 | 37.3 | 0.69 | 1.86 | 77.0 | 6 | 114.6 | 4.44 | 2.72 | 1.72 | 0.61 | 14.3 | 8.7 | 2.63 | 0.21 |
| 6.11 | 29.1 | 0.83 | 2.84 | 114.8 | 5 | 114.6 | 4.50 | 2.75 | 1.75 | 0.60 | 13.9 | 8.4 | 1.97 | 0.00 |
| 7.10 | 67.8 | 1.07 | 1.57 | 67.7 | 7 | 117.8 | 4.56 | 2.78 | 1.78 | 0.60 | 21.6 | 13.0 | UnDef | 0.00 |
| 8.08 | 199.7 | 1.21 | 0.60 | 45.9 | 9 | 124.1 | 4.62 | 2.80 | 1.81 | 0.60 | 38.3 | 22.8 | UnDef | 0.32 |
| 9.07 | 222.3 | 1.56 | 0.70 | 59.0 | 9 | 124.1 | 4.68 | 2.83 | 1.84 | 0.59 | 42.6 | 25.3 | UnDef | 0.41 |
| 0.05 | 259.3 | 1.27 | 0.49 | 36.5 | 10 | 127.3 | 4.74 | 2.87 | 1.87 | 0.59 | 41.4 | 24.4 | UnDef | 0.39 |
| 1.04 | 168.6 | 1.53 | 0.91 | 38.2 | 9 | 124.1 | 4.80 | 2.90 | 1.91 | 0.59 | 32.3 | 19.0 | UnDef | 0.31 |
| 2.02 | 108.6 | 1.81 | 1.67 | 42.0 | 7 | 117.8 | 4.86 | 2.93 | 1.94 | 0.58 | 34.7 | 20.3 | UnDef | 0.40 |
| 3.00 | 173.6 | 1.55 | 0.89 | 19.5 | 9 | 124.1 | 4.92 | 2.95 | 1.97 | 0.58 | 33.2 | 19.3 | UnDef | 0.32 |
| 3.99 | 226.1 | 1.56 | 0.69 | 11.5 | 9 | 124.1 | 4.98 | 2.99 | 2.00 | 0.58 | 43.3 | 25.1 | UnDef | 0.41 |
| 4.97 | 241.2 | 1.60 | 0.66 | 22.0 | 9 | 124.1 | 5.04 | 3.02 | 2.03 | 0.58 | 46.2 | 26.6 | UnDef | 0.45 |
| 5.96 | 312.7 | 1.38 | 0.44 | 42.2 | 10 | 127.3 | 5.11 | 3.05 | 2.06 | 0.57 | 49.9 | 28.6 | UnDef | 0.00 |
| 6.94 | 338.9 | 1.66 | 0.49 | 37.3 | 10 | 127.3 | 5.17 | 3.08 | 2.09 | 0.57 | 54.1 | 30.8 | UnDef | 0.00 |
| 7.93 | 300.7 | 1.26 | 0.42 | 33.4 | 10 | 127.3 | 5.23 | 3.11 | 2.12 | 0.57 | 48.0 | 27.2 | UnDef | 0.00 |
| 8.91 | 316.2 | 1.22 | 0.39 | 51.9 | 10 | 127.3 | 5.29 | 3.14 | 2.15 | 0.56 | 50.5 | 28.5 | UnDef | 0.00 |
| 9.89 | 301.8 | 1.69 | 0.56 | 68.0 | 10 | 127.3 | 5.36 | 3.17 | 2.18 | 0.56 | 48.2 | 27.0 | UnDef | 0.00 |
| 0.88 | 168.8 | 1.37 | 0.81 | 36.6 | 9 | 124.1 | 5.42 | 3.21 | 2.21 | 0.56 | 32.3 | 18.1 | UnDef | 0.28 |
| 1.86 | 74.8 | 2.02 | 2.70 | 57.4 | 6 | 114.6 | 5.48 | 3.23 | 2.24 | 0.56 | 28.7 | 15.9 | 5.55 | 0.00 |
| 2.85 | 37.3 | 0.89 | 2.37 | 101.5 | 6 | 114.6 | 5.53 | 3.26 | 2.27 | 0.55 | 14.3 | 7.9 | 2.54 | 0.18 |
| 3.83 | 23.4 | 0.51 | 2.18 | 246.7 | 6 | 114.6 | 5.59 | 3.28 | 2.31 | 0.55 | 9.0 | 5.0 | 1.43 | 0.10 |
| 4.82 | 51.4 | 0.61 | 1.18 | 242.9 | 7 | 117.8 | 5.65 | 3.31 | 2.34 | 0.55 | 16.4 | 9.0 | UnDef | 0.33 |
| 5.80 | 132.5 | 1.04 | 0.78 | 24.4 | 9 | 124.1 | 5.71 | 3.34 | 2.37 | 0.55 | 25.4 | 13.9 | UnDef | 0.22 |
| 6.78 | 138.7 | 1.54 | 1.11 | 31.0 | 8 | 120.9 | 5.77 | 3.37 | 2.40 | 0.54 | 33.2 | 18.1 | UnDef | 0.29 |
| 7.77 | 138.2 | 1.30 | 0.94 | 37.9 | 9 | 124.1 | 5.83 | 3.40 | 2.43 | 0.54 | 26.5 | 14.4 | UnDef | 0.26 |
| 8.75 | 100.4 | 1.28 | 1.27 | 35.4 | 8 | 120.9 | 5.89 | 3.43 | 2.46 | 0.54 | 24.0 | 13.0 | UnDef | 0.32 |

regg In Situ, Inc.
nterpretation Output - Release 1.00.19e
un No: 03-0630-0942-1717
ob No: 03-151SH
lient: URS
roject: CPT SITE INVESTIGATION
ite: PIER T LNG
ocation: CPT-08
ngineer: T. O'BRIEN
PT Date: 03/25/06
PT Time: 13:07
PT File: 151C08.COR
lorthing (m): 0.000
asting (m): 0.000
levation (m): 0.000

Water Table (m): 6.10 (ft): 20.0
Su Nkt used: 12.50
Averaging Increment (m): 0.30
Phi Method : Robertson and Campanella, 1983
Dr Method : Jamiolkowski - All Sands
State Parameter M: 1.20
Used Unit Weights Assigned to Soil Zones
Values of 1.0E9 or UnDef are printed for parameters that are not valid for the material type (SBT)

| epth (ft) | k (cm/s) | Bq | Qtn | Rfn | SBTn | Qc1N | DeltaQc1N | Qc1Ncs | Fc (%) | Phi (Deg) | Dr (%) | OCR | State Param | Del(n1)60 | (N1)60cs |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 0.49 | 5.0E+00 | 0.00 | 1000.0 | 0.36 | 10 | 577.4 | 0.0 | 577.4 | 0.0 | 50 | 95.0 | 1.0 | -0.30 | 0.0 | 96.2 |
| 1.48 | 5.0E-03 | 0.00 | 853.6 | 0.69 | 10 | 151.3 | 0.0 | 151.3 | 0.0 | 50 | 94.0 | 1.0 | -0.35 | 0.0 | 37.8 |
| 2.46 | 5.0E-04 | 0.00 | 243.0 | 0.70 | 9 | 70.6 | 0.0 | 70.6 | 3.1 | 46 | 65.1 | 1.0 | -0.24 | 0.0 | 23.5 |
| 3.44 | 5.0E-05 | -0.01 | 66.7 | 1.26 | 7 | 27.0 | 11.4 | 38.4 | 16.1 | 40 | 33.0 | 10.0 | -0.17 | 2.5 | 13.3 |
| 4.43 | 1.0E-07 | -0.02 | 18.4 | 1.10 | 7 | 9.5 | 26.3 | 35.9 | 32.5 | UnDef | UnDef | 6.0 | UnDef | 4.0 | 8.7 |
| 5.41 | 5.0E-05 | 0.00 | 100.7 | 1.61 | 7 | 54.9 | 17.9 | 72.8 | 14.2 | 42 | 50.1 | 10.0 | -0.24 | 3.9 | 25.4 |
| 6.40 | 5.0E-05 | 0.00 | 69.4 | 1.77 | 7 | 41.4 | 24.0 | 65.4 | 18.7 | 40 | 42.0 | 10.0 | -0.21 | 4.8 | 21.0 |
| 7.30 | 5.0E-04 | 0.00 | 74.9 | 0.82 | 9 | 47.7 | 10.6 | 58.3 | 11.8 | 40 | 46.1 | 1.0 | -0.14 | 2.0 | 17.6 |
| 8.20 | 5.0E-03 | 0.00 | 142.7 | 0.57 | 9 | 96.0 | 0.1 | 96.1 | 5.0 | 44 | 66.1 | 1.0 | -0.17 | 0.0 | 23.5 |
| 9.19 | 5.0E-03 | 0.00 | 130.2 | 0.69 | 9 | 93.1 | 3.8 | 97.0 | 6.5 | 44 | 65.2 | 1.0 | -0.18 | 0.6 | 23.4 |
| 0.17 | 5.0E-03 | 0.00 | 91.1 | 0.66 | 9 | 68.9 | 7.9 | 76.9 | 8.9 | 42 | 56.6 | 1.0 | -0.14 | 1.2 | 18.0 |
| 1.15 | 5.0E-03 | 0.00 | 73.0 | 0.49 | 9 | 58.2 | 0.0 | 58.2 | 5.0 | 40 | 51.7 | 1.0 | -0.10 | 0.0 | 14.2 |
| 2.14 | 5.0E-03 | 0.00 | 100.5 | 0.86 | 9 | 83.4 | 11.7 | 95.1 | 9.6 | 42 | 62.1 | 1.0 | -0.17 | 1.7 | 22.1 |
| 3.21 | 5.0E-03 | 0.00 | 92.1 | 0.90 | 9 | 79.9 | 14.2 | 94.1 | 10.6 | 42 | 60.8 | 1.0 | -0.17 | 2.0 | 21.6 |
| 4.27 | 5.0E-03 | 0.00 | 67.0 | 0.83 | 9 | 60.8 | 16.3 | 77.1 | 12.9 | 40 | 53.0 | 1.0 | -0.13 | 2.3 | 17.1 |
| 5.26 | 5.0E-03 | 0.00 | 57.5 | 0.66 | 9 | 54.1 | 14.7 | 68.8 | 13.0 | 40 | 49.7 | 1.0 | -0.10 | 2.0 | 15.3 |
| 6.24 | 5.0E-04 | 0.00 | 47.4 | 0.66 | 9 | 46.2 | 17.0 | 63.2 | 15.1 | 38 | 45.1 | 1.0 | -0.08 | 3.0 | 18.1 |
| 7.22 | 5.0E-04 | 0.00 | 43.8 | 0.63 | 9 | 44.1 | 17.3 | 61.4 | 15.6 | 38 | 43.8 | 1.0 | -0.07 | 3.1 | 17.5 |
| 8.21 | 5.0E-03 | 0.00 | 43.3 | 0.48 | 9 | 44.8 | 0.0 | 44.8 | 5.0 | 38 | 44.3 | 1.0 | -0.05 | 0.0 | 11.0 |
| 9.19 | 5.0E-04 | 0.00 | 40.1 | 0.61 | 7 | 42.7 | 18.7 | 61.4 | 16.4 | 38 | 42.9 | 1.0 | -0.06 | 3.3 | 17.2 |
| 0.18 | 5.0E-04 | 0.00 | 35.8 | 0.64 | 7 | 39.2 | 21.0 | 60.1 | 18.1 | 38 | 40.4 | 1.0 | -0.05 | 3.6 | 16.3 |
| 1.16 | 5.0E-04 | 0.00 | 33.6 | 0.68 | 7 | 37.3 | 23.0 | 60.3 | 19.3 | 36 | 39.0 | 1.0 | -0.05 | 3.8 | 16.0 |
| 2.15 | 5.0E-04 | 0.00 | 34.1 | 0.68 | 7 | 38.2 | 23.1 | 61.3 | 19.1 | 36 | 39.7 | 1.0 | -0.05 | 3.8 | 16.3 |
| 3.13 | 5.0E-04 | 0.00 | 31.3 | 0.67 | 7 | 35.6 | 24.2 | 59.7 | 20.1 | 36 | 37.6 | 1.0 | -0.05 | 3.9 | 15.5 |
| 4.11 | 5.0E-04 | 0.00 | 27.5 | 0.73 | 7 | 31.8 | 28.2 | 59.9 | 22.6 | 36 | 34.4 | 1.0 | -0.04 | 4.3 | 14.7 |
| 5.10 | 5.0E-04 | 0.00 | 30.1 | 0.60 | 7 | 35.1 | 23.3 | 58.4 | 19.9 | 36 | 37.3 | 1.0 | -0.03 | 3.8 | 15.3 |
| 6.08 | 5.0E-03 | 0.00 | 33.6 | 0.55 | 7 | 39.4 | 20.8 | 60.3 | 18.0 | 36 | 40.6 | 1.0 | -0.04 | 2.7 | 12.3 |
| 7.07 | 5.0E-04 | 0.00 | 31.3 | 0.55 | 7 | 37.2 | 21.8 | 59.0 | 18.9 | 36 | 38.9 | 1.0 | -0.03 | 3.7 | 15.8 |
| 8.05 | 5.0E-04 | 0.00 | 28.3 | 0.59 | 7 | 34.1 | 24.6 | 58.7 | 20.7 | 36 | 36.5 | 1.0 | -0.03 | 4.0 | 15.1 |
| 9.04 | 5.0E-04 | 0.00 | 27.8 | 0.70 | 7 | 33.9 | 28.5 | 62.4 | 22.1 | 36 | 36.3 | 1.0 | -0.04 | 4.4 | 15.5 |
| 0.02 | 5.0E-04 | 0.00 | 26.0 | 0.72 | 7 | 32.1 | 30.6 | 62.8 | 23.3 | 34 | 34.7 | 1.0 | -0.03 | 4.6 | 15.1 |
| 1.00 | 5.0E-04 | 0.00 | 23.8 | 0.55 | 7 | 29.9 | 26.4 | 56.3 | 22.6 | 34 | 32.6 | 1.0 | -0.01 | 4.1 | 13.8 |
| 1.99 | 5.0E-04 | 0.01 | 17.1 | 0.71 | 7 | 22.1 | 43.3 | 65.4 | 29.8 | 32 | 30.0 | 1.0 | 0.01 | 5.1 | 12.3 |
| 2.97 | 5.0E-04 | 0.01 | 15.3 | 0.66 | 7 | 20.1 | 46.6 | 66.6 | 31.2 | 32 | 30.0 | 1.0 | 0.02 | 5.1 | 11.6 |
| 3.96 | 5.0E-04 | 0.00 | 15.7 | 0.88 | 7 | 20.8 | 63.4 | 84.2 | 33.2 | 32 | 30.0 | 1.0 | 0.00 | 6.0 | 12.8 |
| 4.94 | 5.0E-04 | 0.01 | 19.0 | 0.42 | 7 | 25.1 | 0.0 | 25.1 | 5.0 | 32 | 30.0 | 1.0 | 0.03 | 0.0 | 8.2 |
| 5.92 | 5.0E-04 | 0.01 | 17.4 | 0.54 | 7 | 23.3 | 34.7 | 58.0 | 27.4 | 32 | 30.0 | 1.0 | 0.02 | 4.5 | 12.2 |
| 6.91 | 5.0E-04 | 0.02 | 16.3 | 0.54 | 7 | 22.1 | 37.1 | 59.3 | 28.5 | 32 | 30.0 | 1.0 | 0.03 | 4.7 | 11.9 |
| 7.89 | 5.0E-04 | 0.01 | 18.9 | 0.49 | 7 | 25.5 | 0.0 | 25.5 | 5.0 | 32 | 30.0 | 1.0 | 0.02 | 0.0 | 8.3 |
| 8.88 | 5.0E-04 | 0.01 | 21.4 | 0.50 | 7 | 29.0 | 0.0 | 29.0 | 5.0 | 34 | 31.8 | 1.0 | 0.01 | 0.0 | 9.5 |
| 9.86 | 5.0E-04 | 0.01 | 21.3 | 0.54 | 7 | 29.1 | 30.8 | 59.9 | 24.3 | 34 | 31.9 | 1.0 | 0.00 | 4.5 | 14.0 |
| 0.85 | 5.0E-03 | 0.00 | 25.4 | 0.54 | 7 | 34.7 | 27.5 | 62.2 | 21.5 | 34 | 36.9 | 1.0 | -0.01 | 3.2 | 11.7 |

regg In Situ, Inc.
un No: 03-0630-0942-1717
PT File: 151C08.COR



| epth ft) | k (cm/s) | Bq | Qtn | Rfn | SBTn | Qc1N | DeltaQc1N | Qc1Ncs | Fc (%) | Phi (Deg) | Dr (%) | OCR | State Param | Del(n1)60 | (N1)60cs |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1.83 | 5.0E-04 | 0.00 | 22.9 | 0.53 | 7 | 31.7 | 29.3 | 61.0 | 23.0 | 34 | 34.3 | 1.0 | 0.00 | 4.4 | 14.8 |
| 2.81 | 5.0E-04 | 0.01 | 17.7 | 0.61 | 7 | 25.1 | 40.0 | 65.0 | 28.0 | 32 | 30.0 | 1.0 | 0.01 | 5.1 | 13.3 |
| 3.80 | 5.0E-04 | 0.01 | 19.9 | 0.58 | 7 | 28.2 | 34.9 | 63.2 | 25.7 | 34 | 31.0 | 1.0 | 0.01 | 4.9 | 14.1 |
| 4.78 | 5.0E-03 | 0.00 | 23.0 | 0.45 | 7 | 32.6 | 0.0 | 32.6 | 5.0 | 34 | 35.1 | 1.0 | 0.01 | 0.0 | 8.0 |
| 5.77 | 5.0E-04 | 0.01 | 19.9 | 0.55 | 7 | 28.7 | 34.3 | 62.9 | 25.4 | 34 | 31.5 | 1.0 | 0.01 | 4.8 | 14.2 |
| 6.75 | 5.0E-04 | 0.01 | 20.0 | 0.48 | 7 | 29.0 | 0.0 | 29.0 | 5.0 | 34 | 31.8 | 1.0 | 0.02 | 0.0 | 9.5 |
| 7.74 | 5.0E-03 | 0.01 | 20.0 | 0.43 | 7 | 29.3 | 0.0 | 29.3 | 5.0 | 34 | 32.1 | 1.0 | 0.03 | 0.0 | 7.2 |
| 8.72 | 5.0E-03 | 0.01 | 21.6 | 0.49 | 7 | 31.8 | 0.0 | 31.8 | 5.0 | 34 | 34.4 | 1.0 | 0.01 | 0.0 | 7.8 |
| 9.70 | 5.0E-03 | 0.00 | 23.0 | 0.49 | 7 | 33.9 | 0.0 | 33.9 | 5.0 | 34 | 36.2 | 1.0 | 0.01 | 0.0 | 8.3 |
| 0.69 | 5.0E-03 | 0.00 | 22.7 | 0.43 | 7 | 33.7 | 0.0 | 33.7 | 5.0 | 34 | 36.1 | 1.0 | 0.02 | 0.0 | 8.3 |
| 1.67 | 5.0E-03 | 0.00 | 23.6 | 0.42 | 7 | 35.3 | 0.0 | 35.3 | 5.0 | 34 | 37.4 | 1.0 | 0.02 | 0.0 | 8.6 |
| 2.66 | 5.0E-03 | 0.00 | 21.8 | 0.51 | 7 | 33.0 | 32.1 | 65.1 | 23.5 | 34 | 35.5 | 1.0 | 0.01 | 3.6 | 11.7 |
| 3.64 | 5.0E-03 | 0.00 | 20.4 | 0.55 | 7 | 31.2 | 35.7 | 66.9 | 25.0 | 34 | 33.9 | 1.0 | 0.01 | 3.8 | 11.5 |
| 4.63 | 5.0E-03 | 0.00 | 22.5 | 0.46 | 7 | 34.5 | 0.0 | 34.5 | 5.0 | 34 | 36.8 | 1.0 | 0.01 | 0.0 | 8.4 |
| 5.61 | 5.0E-03 | 0.00 | 22.4 | 0.51 | 7 | 34.6 | 32.0 | 66.6 | 23.0 | 34 | 36.8 | 1.0 | 0.01 | 3.6 | 12.1 |
| 6.59 | 5.0E-03 | 0.00 | 23.8 | 0.51 | 7 | 36.8 | 30.9 | 67.7 | 22.1 | 34 | 38.6 | 1.0 | 0.00 | 3.6 | 12.6 |
| 7.58 | 5.0E-04 | 0.00 | 18.9 | 0.60 | 7 | 29.9 | 41.5 | 71.4 | 26.8 | 32 | 32.7 | 1.0 | 0.01 | 5.6 | 15.3 |
| 8.56 | 5.0E-04 | 0.00 | 19.6 | 0.68 | 7 | 31.2 | 45.0 | 76.1 | 27.1 | 34 | 33.9 | 1.0 | 0.00 | 6.0 | 16.1 |
| 9.55 | 5.0E-04 | 0.00 | 21.6 | 0.87 | 7 | 34.3 | 52.5 | 86.8 | 27.7 | 34 | 36.6 | 1.0 | -0.03 | 6.8 | 18.0 |
| 0.53 | 5.0E-03 | 0.00 | 25.3 | 0.52 | 7 | 39.9 | 31.2 | 71.1 | 21.4 | 34 | 41.0 | 1.0 | -0.01 | 3.7 | 13.5 |
| 1.52 | 5.0E-03 | 0.00 | 29.7 | 0.65 | 7 | 46.9 | 33.6 | 80.5 | 20.6 | 36 | 45.6 | 1.0 | -0.04 | 4.1 | 15.5 |
| 2.42 | 5.0E-03 | 0.00 | 29.8 | 0.46 | 7 | 47.3 | 0.0 | 47.3 | 5.0 | 36 | 45.8 | 1.0 | -0.01 | 0.0 | 11.6 |
| 3.32 | 5.0E-03 | 0.00 | 27.1 | 0.47 | 7 | 43.5 | 0.0 | 43.5 | 5.0 | 36 | 43.4 | 1.0 | -0.01 | 0.0 | 10.6 |
| 4.30 | 5.0E-03 | 0.00 | 20.3 | 0.62 | 7 | 33.4 | 42.4 | 75.8 | 26.0 | 34 | 35.8 | 1.0 | 0.00 | 4.4 | 12.6 |
| 5.29 | 5.0E-04 | 0.00 | 13.4 | 1.12 | 6 | 22.9 | 91.7 | 114.6 | 38.6 | 32 | 30.0 | 1.0 | 0.00 | 7.5 | 15.0 |
| 6.27 | 5.0E-04 | 0.00 | 19.3 | 1.90 | 6 | 32.2 | 128.7 | 160.8 | 37.8 | 34 | 34.8 | 1.0 | -0.08 | 10.5 | 21.0 |
| 7.26 | 5.0E-06 | 0.10 | 6.4 | 3.28 | 1 | 12.3 | UnDef | UnDef | 100.0 | UnDef | UnDef | 3.0 | UnDef | UnDef | UnDef |
| 8.24 | 5.0E-06 | 0.48 | 2.8 | 2.15 | 4 | 6.8 | 27.1 | 33.9 | 90.1 | UnDef | UnDef | 1.0 | UnDef | 3.3 | 6.6 |
| 9.22 | 5.0E-05 | 0.32 | 4.5 | 1.62 | 4 | 9.6 | 38.3 | 47.8 | 69.8 | 30 | 30.0 | 1.5 | 0.12 | 3.7 | 7.5 |
| 0.21 | 5.0E-05 | 0.12 | 8.2 | 1.80 | 4 | 15.5 | 61.9 | 77.4 | 55.2 | 30 | 30.0 | 3.0 | 0.03 | 6.1 | 12.1 |
| 1.19 | 5.0E-05 | 0.07 | 8.5 | 3.04 | 4 | 16.0 | 64.1 | 80.1 | 62.4 | 30 | 30.0 | 3.0 | -0.02 | 6.3 | 12.5 |
| 2.18 | 5.0E-04 | 0.00 | 25.5 | 2.09 | 6 | 43.1 | 151.0 | 194.1 | 34.1 | 34 | 43.2 | 1.0 | -0.12 | 13.3 | 27.4 |
| 3.16 | 5.0E-03 | 0.00 | 39.0 | 1.26 | 7 | 64.9 | 56.3 | 121.2 | 22.4 | 38 | 54.9 | 1.0 | -0.12 | 6.5 | 22.4 |
| 4.15 | 5.0E-02 | 0.00 | 46.6 | 0.66 | 9 | 77.4 | 29.1 | 106.5 | 15.2 | 38 | 59.9 | 1.0 | -0.08 | 3.1 | 18.3 |
| 5.13 | 5.0E-05 | 0.02 | 12.1 | 2.11 | 6 | 22.1 | 88.4 | 110.5 | 48.6 | 30 | 30.0 | 3.0 | -0.04 | 8.7 | 17.3 |
| 6.11 | 5.0E-06 | 0.07 | 9.0 | 3.36 | 1 | 17.2 | UnDef | UnDef | 100.0 | UnDef | UnDef | 3.0 | UnDef | UnDef | UnDef |
| 7.10 | 5.0E-04 | 0.01 | 22.8 | 1.68 | 6 | 39.8 | 125.9 | 165.7 | 33.5 | 34 | 40.9 | 1.0 | -0.09 | 11.8 | 24.7 |
| 8.08 | 5.0E-02 | 0.00 | 69.6 | 0.62 | 9 | 116.7 | 21.4 | 138.1 | 10.8 | 40 | 71.7 | 1.0 | -0.11 | 2.4 | 25.3 |
| 9.07 | 5.0E-02 | 0.00 | 76.8 | 0.72 | 9 | 129.2 | 23.5 | 152.7 | 10.8 | 40 | 74.6 | 1.0 | -0.13 | 2.7 | 28.0 |
| 0.05 | 5.0E+00 | 0.00 | 88.8 | 0.50 | 9 | 149.9 | 0.0 | 149.9 | 5.0 | 42 | 78.9 | 1.0 | -0.12 | 0.0 | 24.4 |
| 1.04 | 5.0E-02 | 0.00 | 56.5 | 0.94 | 7 | 96.9 | 37.9 | 134.8 | 15.5 | 40 | 66.4 | 1.0 | -0.13 | 4.0 | 23.0 |
| 2.02 | 5.0E-04 | -0.01 | 35.5 | 1.75 | 7 | 62.1 | 88.3 | 150.4 | 27.0 | 38 | 53.6 | 1.0 | -0.14 | 11.8 | 32.0 |
| 3.00 | 5.0E-02 | -0.01 | 57.1 | 0.92 | 7 | 98.8 | 37.5 | 136.3 | 15.3 | 40 | 66.9 | 1.0 | -0.13 | 4.0 | 23.4 |
| 3.99 | 5.0E-02 | -0.01 | 74.1 | 0.71 | 9 | 128.0 | 24.4 | 152.4 | 11.0 | 40 | 74.4 | 1.0 | -0.13 | 2.8 | 27.8 |
| 4.97 | 5.0E-02 | -0.01 | 78.3 | 0.68 | 9 | 136.0 | 22.2 | 158.2 | 10.3 | 42 | 76.1 | 1.0 | -0.13 | 2.6 | 29.2 |
| 5.96 | 5.0E+00 | 0.00 | 101.0 | 0.45 | 9 | 175.3 | 0.0 | 175.3 | 5.0 | 42 | 83.4 | 1.0 | -0.12 | 0.0 | 28.6 |
| 6.94 | 5.0E+00 | 0.00 | 108.4 | 0.50 | 9 | 189.0 | 0.0 | 189.0 | 5.0 | 42 | 85.5 | 1.0 | -0.13 | 0.0 | 30.8 |
| 7.93 | 5.0E+00 | 0.00 | 95.0 | 0.43 | 9 | 166.9 | 0.0 | 166.9 | 5.0 | 42 | 81.9 | 1.0 | -0.11 | 0.0 | 27.2 |
| 8.91 | 5.0E+00 | 0.00 | 98.9 | 0.39 | 9 | 174.5 | 0.0 | 174.5 | 5.0 | 42 | 83.2 | 1.0 | -0.11 | 0.0 | 28.5 |
| 9.89 | 5.0E+00 | 0.00 | 93.4 | 0.57 | 9 | 165.8 | 13.9 | 179.7 | 7.9 | 42 | 81.8 | 1.0 | -0.13 | 1.4 | 28.4 |
| 0.88 | 5.0E-02 | -0.01 | 51.0 | 0.84 | 7 | 92.3 | 37.6 | 129.8 | 15.8 | 38 | 65.0 | 1.0 | -0.11 | 4.0 | 22.1 |
| 1.86 | 5.0E-05 | -0.01 | 21.4 | 2.91 | 6 | 40.7 | 162.8 | 203.5 | 41.7 | 34 | 41.5 | 6.0 | -0.14 | 15.9 | 31.9 |
| 2.85 | 5.0E-05 | 0.03 | 9.8 | 2.79 | 4 | 20.2 | 80.9 | 101.2 | 57.7 | 30 | 30.0 | 3.0 | -0.03 | 7.9 | 15.8 |
| 3.83 | 5.0E-05 | 0.30 | 5.4 | 2.86 | 4 | 12.7 | 50.6 | 63.3 | 73.6 | 30 | 30.0 | 1.5 | 0.08 | 5.0 | 9.9 |
| 4.82 | 5.0E-04 | 0.11 | 13.8 | 1.33 | 6 | 27.6 | 110.6 | 138.2 | 39.9 | 32 | 30.4 | 1.0 | -0.01 | 9.0 | 18.0 |
| 5.80 | 5.0E-02 | -0.01 | 37.9 | 0.82 | 7 | 70.9 | 43.0 | 113.9 | 19.1 | 38 | 57.4 | 1.0 | -0.08 | 4.3 | 18.2 |
| 6.78 | 5.0E-03 | -0.01 | 39.4 | 1.16 | 7 | 73.9 | 58.1 | 132.0 | 21.5 | 38 | 58.6 | 1.0 | -0.11 | 6.9 | 25.0 |
| 7.77 | 5.0E-02 | -0.01 | 39.0 | 0.98 | 7 | 73.4 | 50.2 | 123.6 | 20.2 | 38 | 58.4 | 1.0 | -0.10 | 4.9 | 19.3 |
| 8.75 | 5.0E-03 | -0.01 | 27.6 | 1.35 | 7 | 53.1 | 84.5 | 137.5 | 28.0 | 36 | 49.1 | 1.0 | -0.09 | 8.1 | 21.1 |

Gregg In Situ, Inc.
Interpretation Output - Release 1.00.19e
Run No: 03-0630-0942-1777
Job No: 03-151SW
Client: URS
Project: CPT SITE INVESTIGATION
Site: PIER T LNG
Location: CPT-09
Engineer: T. O'BRIEN
CPT Date: 03/25/06
CPT Time: 10:15
CPT File: 151C09.COR
Northing (m): 0.000
Easting (m): 0.000
Elevation (m): 0.000

Water Table (m): 6.10 (ft): 20.0
Su Nkt used: 12.50
Averaging Increment (m): 0.30
Phi Method : Robertson and Campanella, 1983
Dr Method : Jamiolkowski - All Sands
State Parameter M: 1.20
Used Unit Weights Assigned to Soil Zones
Values of 1.0E9 or UnDef are printed for parameters that are not valid for the material type (SBT)

| Depth (ft) | AvgQt (tsf) | AvgFs (tsf) | AvgRf (%) | AvgUd (ft) | SBT | U.Wt. pcf | TStress (tsf) | EStress (tsf) | Ueq (tsf) | Cn | N60 (blows/ft) | (N1)60 (blows/ft) | Su (tsf) | CRR |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 0.49 | 2.0 | 0.02 | 1.00 | 0.3 | 1 | 79.6 | 0.02 | 0.02 | 0.00 | 2.00 | 1.0 | 1.9 | 0.16 | 0.00 |
| 1.48 | 3.1 | 0.09 | 2.99 | 0.5 | 3 | 111.4 | 0.07 | 0.07 | 0.00 | 2.00 | 3.0 | 6.0 | 0.25 | 0.00 |
| 2.46 | 186.2 | 1.35 | 0.73 | 35.1 | 9 | 124.1 | 0.12 | 0.12 | 0.00 | 2.00 | 35.7 | 71.3 | UnDef | 0.00 |
| 3.44 | 168.4 | 2.08 | 1.24 | 22.8 | 8 | 120.9 | 0.18 | 0.18 | 0.00 | 2.00 | 40.3 | 80.6 | UnDef | 0.00 |
| 4.43 | 142.1 | 1.87 | 1.32 | 13.6 | 8 | 120.9 | 0.24 | 0.24 | 0.00 | 2.00 | 34.0 | 68.0 | UnDef | 0.00 |
| 5.41 | 126.8 | 2.78 | 2.19 | 41.8 | 7 | 117.8 | 0.30 | 0.30 | 0.00 | 1.82 | 40.5 | 73.6 | UnDef | 0.00 |
| 6.40 | 171.9 | 3.42 | 1.99 | 29.9 | 7 | 117.8 | 0.36 | 0.36 | 0.00 | 1.66 | 54.9 | 91.4 | UnDef | 0.00 |
| 7.30 | 131.1 | 3.73 | 2.85 | 12.0 | 6 | 114.6 | 0.41 | 0.41 | 0.00 | 1.56 | 50.2 | 78.1 | 10.46 | 0.00 |
| 8.20 | 339.2 | 2.49 | 0.73 | 30.9 | 9 | 124.1 | 0.47 | 0.47 | 0.00 | 1.46 | 65.0 | 95.0 | UnDef | 0.00 |
| 9.19 | 301.9 | 2.72 | 0.90 | 2.8 | 9 | 124.1 | 0.53 | 0.53 | 0.00 | 1.38 | 57.8 | 79.5 | UnDef | 0.00 |
| 10.17 | 226.1 | 2.13 | 0.94 | 2.3 | 9 | 124.1 | 0.59 | 0.59 | 0.00 | 1.30 | 43.3 | 56.4 | UnDef | 0.00 |
| 11.15 | 132.3 | 1.35 | 1.02 | 0.9 | 8 | 120.9 | 0.65 | 0.65 | 0.00 | 1.24 | 31.7 | 39.3 | UnDef | 0.00 |
| 12.14 | 76.4 | 1.19 | 1.55 | -3.9 | 7 | 117.8 | 0.71 | 0.71 | 0.00 | 1.19 | 24.4 | 29.0 | UnDef | 0.22 |
| 13.21 | 71.5 | 1.12 | 1.57 | -5.8 | 7 | 117.8 | 0.77 | 0.77 | 0.00 | 1.14 | 22.8 | 26.0 | UnDef | 0.20 |
| 14.27 | 82.9 | 1.01 | 1.22 | -5.1 | 8 | 120.9 | 0.84 | 0.84 | 0.00 | 1.09 | 19.8 | 21.7 | UnDef | 0.20 |
| 15.26 | 102.1 | 0.64 | 0.63 | -5.7 | 8 | 120.9 | 0.89 | 0.89 | 0.00 | 1.06 | 24.4 | 25.8 | UnDef | 0.21 |
| 16.24 | 119.9 | 0.88 | 0.73 | -5.0 | 9 | 124.1 | 0.95 | 0.95 | 0.00 | 1.02 | 23.0 | 23.5 | UnDef | 0.27 |
| 17.22 | 122.2 | 1.02 | 0.83 | -6.0 | 8 | 120.9 | 1.02 | 1.02 | 0.00 | 0.99 | 29.2 | 29.0 | UnDef | 0.28 |
| 18.21 | 76.6 | 0.56 | 0.74 | -5.5 | 8 | 120.9 | 1.07 | 1.07 | 0.00 | 0.96 | 18.3 | 17.7 | UnDef | 0.14 |
| 19.19 | 61.4 | 0.35 | 0.56 | -5.3 | 8 | 120.9 | 1.13 | 1.13 | 0.00 | 0.94 | 14.7 | 13.8 | UnDef | 0.11 |
| 20.18 | 50.7 | 0.24 | 0.48 | -6.1 | 8 | 120.9 | 1.19 | 1.19 | 0.01 | 0.92 | 12.1 | 11.1 | UnDef | 0.09 |
| 21.16 | 52.5 | 0.19 | 0.37 | -6.2 | 8 | 120.9 | 1.25 | 1.22 | 0.04 | 0.91 | 12.6 | 11.4 | UnDef | 0.09 |
| 22.15 | 53.7 | 0.22 | 0.41 | -3.3 | 8 | 120.9 | 1.31 | 1.25 | 0.07 | 0.90 | 12.9 | 11.5 | UnDef | 0.09 |
| 23.13 | 51.6 | 0.23 | 0.44 | -0.8 | 8 | 120.9 | 1.37 | 1.27 | 0.10 | 0.89 | 12.4 | 10.9 | UnDef | 0.09 |
| 24.11 | 47.1 | 0.24 | 0.51 | -0.3 | 8 | 120.9 | 1.43 | 1.30 | 0.13 | 0.88 | 11.3 | 9.9 | UnDef | 0.10 |
| 25.10 | 42.2 | 0.17 | 0.41 | 1.8 | 8 | 120.9 | 1.49 | 1.33 | 0.16 | 0.87 | 10.1 | 8.8 | UnDef | 0.08 |
| 26.08 | 44.1 | 0.22 | 0.50 | 3.3 | 7 | 117.8 | 1.55 | 1.36 | 0.19 | 0.86 | 14.1 | 12.1 | UnDef | 0.10 |
| 27.07 | 43.8 | 0.22 | 0.50 | 4.7 | 7 | 117.8 | 1.61 | 1.39 | 0.22 | 0.85 | 14.0 | 11.9 | UnDef | 0.10 |
| 28.05 | 42.4 | 0.20 | 0.46 | 5.8 | 7 | 117.8 | 1.67 | 1.41 | 0.25 | 0.84 | 13.5 | 11.4 | UnDef | 0.08 |
| 29.04 | 42.0 | 0.21 | 0.50 | 4.7 | 7 | 117.8 | 1.72 | 1.44 | 0.28 | 0.83 | 13.4 | 11.2 | UnDef | 0.10 |
| 30.02 | 45.4 | 0.18 | 0.40 | 6.3 | 8 | 120.9 | 1.78 | 1.47 | 0.31 | 0.82 | 10.9 | 9.0 | UnDef | 0.08 |
| 31.00 | 40.2 | 0.16 | 0.40 | 7.6 | 7 | 117.8 | 1.84 | 1.50 | 0.34 | 0.82 | 12.8 | 10.5 | UnDef | 0.08 |
| 31.99 | 31.5 | 0.19 | 0.61 | 8.5 | 7 | 117.8 | 1.90 | 1.53 | 0.37 | 0.81 | 10.1 | 8.2 | UnDef | 0.10 |
| 32.97 | 33.3 | 0.19 | 0.58 | 9.2 | 7 | 117.8 | 1.96 | 1.55 | 0.41 | 0.80 | 10.6 | 8.5 | UnDef | 0.10 |
| 33.96 | 33.7 | 0.22 | 0.65 | 10.0 | 7 | 117.8 | 2.02 | 1.58 | 0.44 | 0.80 | 10.8 | 8.6 | UnDef | 0.10 |
| 34.94 | 35.0 | 0.18 | 0.53 | 13.2 | 7 | 117.8 | 2.07 | 1.61 | 0.47 | 0.79 | 11.2 | 8.8 | UnDef | 0.10 |
| 35.92 | 38.3 | 0.16 | 0.43 | 14.0 | 7 | 117.8 | 2.13 | 1.63 | 0.50 | 0.78 | 12.2 | 9.6 | UnDef | 0.00 |
| 36.91 | 37.2 | 0.15 | 0.40 | 14.4 | 7 | 117.8 | 2.19 | 1.66 | 0.53 | 0.78 | 11.9 | 9.2 | UnDef | 0.00 |
| 37.89 | 35.2 | 0.15 | 0.41 | 17.0 | 7 | 117.8 | 2.25 | 1.69 | 0.56 | 0.77 | 11.2 | 8.6 | UnDef | 0.00 |
| 38.88 | 30.7 | 0.16 | 0.51 | 17.4 | 7 | 117.8 | 2.31 | 1.72 | 0.59 | 0.76 | 9.8 | 7.5 | UnDef | 0.10 |
| 39.86 | 29.7 | 0.17 | 0.57 | 18.0 | 7 | 117.8 | 2.36 | 1.74 | 0.62 | 0.76 | 9.5 | 7.2 | UnDef | 0.11 |
| 40.85 | 28.9 | 0.14 | 0.48 | 19.6 | 7 | 117.8 | 2.42 | 1.77 | 0.65 | 0.75 | 9.2 | 6.9 | UnDef | 0.10 |

| epth (ft) | AvgQt (tsf) | AvgFs (tsf) | AvgRf (%) | AvgUd (ft) | SBT | U.Wt. pcf | TStress (tsf) | EStress (tsf) | Ueq (tsf) | Cn | N60 (blows/ft) | (N1)60 (blows/ft) | Su (tsf) | CRR |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1.83 | 27.5 | 0.14 | 0.51 | 22.0 | 7 | 117.8 | 2.48 | 1.80 | 0.68 | 0.75 | 8.8 | 6.6 | UnDef | 0.11 |
| 2.81 | 27.9 | 0.15 | 0.55 | 22.9 | 7 | 117.8 | 2.54 | 1.82 | 0.71 | 0.74 | 8.9 | 6.6 | UnDef | 0.12 |
| 3.80 | 30.8 | 0.16 | 0.52 | 23.9 | 7 | 117.8 | 2.59 | 1.85 | 0.74 | 0.73 | 9.8 | 7.2 | UnDef | 0.11 |
| 4.78 | 38.2 | 0.28 | 0.75 | 27.1 | 7 | 117.8 | 2.65 | 1.88 | 0.77 | 0.73 | 12.2 | 8.9 | UnDef | 0.12 |
| 5.77 | 15.5 | 0.35 | 2.28 | 31.8 | 5 | 114.6 | 2.71 | 1.91 | 0.80 | 0.72 | 7.4 | 5.4 | 1.02 | 0.10 |
| 6.75 | 8.9 | 0.16 | 1.78 | 53.5 | 5 | 114.6 | 2.77 | 1.93 | 0.84 | 0.72 | 4.3 | 3.1 | 0.49 | 0.00 |
| 7.74 | 12.4 | 0.37 | 2.98 | 56.2 | 4 | 114.6 | 2.82 | 1.96 | 0.87 | 0.71 | 7.9 | 5.6 | 0.76 | 0.00 |
| 8.72 | 11.0 | 0.39 | 3.50 | 49.9 | 3 | 111.4 | 2.88 | 1.98 | 0.90 | 0.71 | 10.6 | 7.5 | 0.65 | 0.00 |
| 9.70 | 11.4 | 0.36 | 3.14 | 47.3 | 4 | 114.6 | 2.93 | 2.01 | 0.93 | 0.71 | 7.3 | 5.1 | 0.67 | 0.00 |
| 0.69 | 9.2 | 0.25 | 2.74 | 57.1 | 4 | 114.6 | 2.99 | 2.03 | 0.96 | 0.70 | 5.9 | 4.1 | 0.50 | 0.00 |
| 1.67 | 10.0 | 0.19 | 1.88 | 65.8 | 5 | 114.6 | 3.05 | 2.06 | 0.99 | 0.70 | 4.8 | 3.3 | 0.55 | 0.00 |
| 2.66 | 9.8 | 0.19 | 1.97 | 74.9 | 5 | 114.6 | 3.10 | 2.08 | 1.02 | 0.69 | 4.7 | 3.3 | 0.54 | 0.00 |
| 3.64 | 14.0 | 0.26 | 1.87 | 73.0 | 5 | 114.6 | 3.16 | 2.11 | 1.05 | 0.69 | 6.7 | 4.6 | 0.87 | 0.09 |
| 4.63 | 10.0 | 0.16 | 1.62 | 98.5 | 5 | 114.6 | 3.22 | 2.13 | 1.08 | 0.68 | 4.8 | 3.3 | 0.54 | 0.08 |
| 5.61 | 12.6 | 0.34 | 2.72 | 86.8 | 5 | 114.6 | 3.27 | 2.16 | 1.11 | 0.68 | 6.0 | 4.1 | 0.75 | 0.00 |
| 6.59 | 11.4 | 0.28 | 2.49 | 65.7 | 5 | 114.6 | 3.33 | 2.19 | 1.14 | 0.68 | 5.4 | 3.7 | 0.64 | 0.00 |
| 7.58 | 14.5 | 0.42 | 2.87 | 62.0 | 5 | 114.6 | 3.39 | 2.21 | 1.17 | 0.67 | 7.0 | 4.7 | 0.89 | 0.00 |
| 8.56 | 8.7 | 0.15 | 1.78 | 72.9 | 5 | 114.6 | 3.44 | 2.24 | 1.20 | 0.67 | 4.1 | 2.8 | 0.42 | 0.00 |
| 9.55 | 9.0 | 0.17 | 1.87 | 110.0 | 5 | 114.6 | 3.50 | 2.26 | 1.23 | 0.66 | 4.3 | 2.9 | 0.44 | 0.00 |
| 0.53 | 15.6 | 0.25 | 1.62 | 95.1 | 6 | 114.6 | 3.55 | 2.29 | 1.27 | 0.66 | 6.0 | 4.0 | 0.96 | 0.09 |
| 1.52 | 21.0 | 0.45 | 2.15 | 47.2 | 6 | 114.6 | 3.61 | 2.31 | 1.30 | 0.66 | 8.1 | 5.3 | 1.39 | 0.11 |
| 2.42 | 26.8 | 0.49 | 1.82 | 41.6 | 6 | 114.6 | 3.66 | 2.34 | 1.32 | 0.65 | 10.3 | 6.7 | 1.85 | 0.14 |
| 3.32 | 58.6 | 0.32 | 0.54 | 17.3 | 8 | 120.9 | 3.72 | 2.36 | 1.35 | 0.65 | 14.0 | 9.1 | UnDef | 0.12 |
| 4.30 | 68.9 | 0.40 | 0.59 | 45.5 | 8 | 120.9 | 3.78 | 2.39 | 1.38 | 0.65 | 16.5 | 10.7 | UnDef | 0.12 |
| 5.29 | 60.7 | 0.45 | 0.75 | 46.9 | 8 | 120.9 | 3.83 | 2.42 | 1.41 | 0.64 | 16.5 | 9.3 | UnDef | 0.14 |
| 6.27 | 39.8 | 0.22 | 0.55 | 46.4 | 7 | 117.8 | 3.89 | 2.45 | 1.44 | 0.64 | 12.7 | 8.1 | UnDef | 0.13 |
| 7.26 | 31.4 | 0.38 | 1.22 | 48.8 | 7 | 117.8 | 3.95 | 2.48 | 1.48 | 0.64 | 10.0 | 6.4 | UnDef | 0.17 |
| 8.24 | 64.3 | 0.65 | 1.02 | 41.9 | 8 | 120.9 | 4.01 | 2.50 | 1.51 | 0.63 | 15.4 | 9.7 | UnDef | 0.18 |
| 9.22 | 81.0 | 0.68 | 0.83 | 32.8 | 8 | 120.9 | 4.07 | 2.53 | 1.54 | 0.63 | 19.4 | 12.2 | UnDef | 0.16 |
| 0.21 | 53.0 | 0.82 | 1.54 | 40.1 | 7 | 117.8 | 4.13 | 2.56 | 1.57 | 0.62 | 16.9 | 10.6 | UnDef | 0.00 |
| 1.19 | 140.1 | 0.88 | 0.63 | 31.7 | 9 | 124.1 | 4.19 | 2.59 | 1.60 | 0.62 | 26.8 | 16.7 | UnDef | 0.21 |
| 2.18 | 162.3 | 1.35 | 0.83 | 40.0 | 9 | 124.1 | 4.25 | 2.62 | 1.63 | 0.62 | 31.1 | 19.2 | UnDef | 0.28 |
| 3.16 | 151.1 | 1.35 | 0.90 | 50.6 | 9 | 124.1 | 4.31 | 2.65 | 1.66 | 0.61 | 28.9 | 17.8 | UnDef | 0.27 |
| 4.15 | 166.1 | 1.49 | 0.89 | 40.6 | 9 | 124.1 | 4.37 | 2.68 | 1.69 | 0.61 | 31.8 | 19.4 | UnDef | 0.30 |
| 5.13 | 190.6 | 1.66 | 0.87 | 32.6 | 9 | 124.1 | 4.43 | 2.71 | 1.72 | 0.61 | 36.5 | 22.2 | UnDef | 0.36 |
| 6.11 | 191.0 | 1.51 | 0.79 | 48.4 | 9 | 124.1 | 4.49 | 2.74 | 1.75 | 0.60 | 36.6 | 22.1 | UnDef | 0.34 |
| 7.10 | 166.4 | 1.02 | 0.61 | 26.0 | 9 | 124.1 | 4.55 | 2.77 | 1.78 | 0.60 | 31.9 | 19.1 | UnDef | 0.25 |
| 8.08 | 212.9 | 1.41 | 0.66 | 34.8 | 9 | 124.1 | 4.62 | 2.80 | 1.81 | 0.60 | 40.8 | 24.4 | UnDef | 0.37 |
| 9.07 | 209.6 | 1.67 | 0.80 | 51.0 | 9 | 124.1 | 4.68 | 2.83 | 1.84 | 0.59 | 40.1 | 23.9 | UnDef | 0.40 |
| 0.05 | 234.9 | 1.54 | 0.66 | 50.7 | 9 | 124.1 | 4.74 | 2.86 | 1.87 | 0.59 | 45.0 | 26.6 | UnDef | 0.44 |
| 1.04 | 231.9 | 1.40 | 0.60 | 39.5 | 9 | 124.1 | 4.80 | 2.89 | 1.91 | 0.59 | 44.4 | 26.1 | UnDef | 0.41 |
| 2.02 | 195.8 | 1.19 | 0.61 | 19.8 | 9 | 124.1 | 4.86 | 2.92 | 1.94 | 0.58 | 37.5 | 21.9 | UnDef | 0.31 |
| 3.00 | 189.5 | 1.17 | 0.62 | 27.3 | 9 | 124.1 | 4.92 | 2.95 | 1.97 | 0.58 | 36.3 | 21.1 | UnDef | 0.30 |
| 3.99 | 220.2 | 1.32 | 0.60 | 36.0 | 9 | 124.1 | 4.98 | 2.98 | 2.00 | 0.58 | 42.2 | 24.4 | UnDef | 0.37 |
| 4.97 | 229.0 | 1.57 | 0.69 | 37.1 | 9 | 124.1 | 5.04 | 3.01 | 2.03 | 0.58 | 43.9 | 25.3 | UnDef | 0.42 |
| 5.96 | 252.4 | 1.42 | 0.56 | 30.2 | 9 | 124.1 | 5.10 | 3.04 | 2.06 | 0.57 | 48.3 | 27.7 | UnDef | 0.45 |
| 6.94 | 286.3 | 1.44 | 0.50 | 23.1 | 10 | 127.3 | 5.17 | 3.08 | 2.09 | 0.57 | 45.7 | 26.1 | UnDef | 0.00 |
| 7.93 | 254.7 | 1.65 | 0.65 | 29.9 | 9 | 124.1 | 5.23 | 3.11 | 2.12 | 0.57 | 48.8 | 27.7 | UnDef | 0.00 |
| 8.91 | 320.8 | 1.50 | 0.47 | 30.5 | 10 | 127.3 | 5.29 | 3.14 | 2.15 | 0.56 | 51.2 | 28.9 | UnDef | 0.00 |
| 9.89 | 325.8 | 1.69 | 0.52 | 34.3 | 10 | 127.3 | 5.35 | 3.17 | 2.18 | 0.56 | 52.0 | 29.2 | UnDef | 0.00 |
| 0.88 | 295.3 | 1.23 | 0.42 | 42.3 | 10 | 127.3 | 5.41 | 3.20 | 2.21 | 0.56 | 47.1 | 26.3 | UnDef | 0.00 |
| 1.86 | 293.5 | 1.13 | 0.39 | 44.2 | 10 | 127.3 | 5.48 | 3.23 | 2.24 | 0.56 | 46.9 | 26.1 | UnDef | 0.46 |
| 2.85 | 321.0 | 1.03 | 0.32 | 48.1 | 10 | 127.3 | 5.54 | 3.27 | 2.27 | 0.55 | 51.2 | 28.4 | UnDef | 0.00 |
| 3.83 | 269.4 | 1.13 | 0.42 | 40.3 | 10 | 127.3 | 5.60 | 3.30 | 2.31 | 0.55 | 43.0 | 23.7 | UnDef | 0.36 |
| 4.82 | 151.2 | 2.02 | 1.34 | 42.8 | 8 | 120.9 | 5.66 | 3.33 | 2.34 | 0.55 | 36.2 | 19.9 | UnDef | 0.38 |
| 5.80 | 345.5 | 1.36 | 0.39 | 54.0 | 10 | 127.3 | 5.73 | 3.36 | 2.37 | 0.55 | 55.2 | 30.1 | UnDef | 0.00 |
| 6.78 | 342.8 | 1.78 | 0.52 | 66.0 | 10 | 127.3 | 5.79 | 3.39 | 2.40 | 0.54 | 54.7 | 29.7 | UnDef | 0.00 |
| 7.77 | 356.0 | 2.32 | 0.65 | 78.2 | 10 | 127.3 | 5.85 | 3.42 | 2.43 | 0.54 | 56.8 | 30.7 | UnDef | 0.00 |
| 8.75 | 338.6 | 2.43 | 0.72 | 84.0 | 9 | 124.1 | 5.91 | 3.45 | 2.46 | 0.54 | 64.9 | 34.9 | UnDef | 0.00 |

regg In Situ, Inc.
nterpretation Output - Release 1.00.19e
un No: 03-0630-0942-1777
ob No: 03-151SN
lient: URS
roject: CPT SITE INVESTIGATION
ite: PIER T LNG
ocation: CPT-09
ngineer: T. O'BRIEN
PT Date: 03/25/06
PT Time: 10:15
PT File: 151C09.COR
orthing (m): 0.000
asting (m): 0.000
levation (m): 0.000



Water Table (m): 6.10 (ft): 20.0
Su Nkt used: 12.50
Averaging Increment (m): 0.30
Phi Method : Robertson and Campanella, 1983
Dr Method : Jamiolkowski - All Sands
State Parameter M: 1.20
Used Unit Weights Assigned to Soil Zones
Values of 1.0E9 or UnDef are printed for parameters that are not valid for the material type (SBT)

| epth ft) | k (cm/s) | Bq | Qtn | Rfn | SBTn | Qc1N | DeltaQc1N | Qc1Ncs | Fc (%) | Phi (Deg) | Dr (%) | OCR | State Param | Del(n1)60 | (N1)60cs |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 0.49 | 1.0E-07 | 0.00 | 101.2 | 1.01 | 9 | 3.8 | 0.7 | 4.5 | 10.6 | UnDef | UnDef | 10.0 | UnDef | 0.2 | 2.1 |
| 1.48 | 5.0E-08 | 0.01 | 46.3 | 3.05 | 6 | 6.0 | 12.0 | 18.0 | 29.9 | UnDef | UnDef | 6.0 | UnDef | 4.3 | 10.3 |
| 2.46 | 5.0E-02 | 0.01 | 1000.0 | 0.73 | 10 | 356.6 | 0.0 | 356.6 | 0.0 | 50 | 95.0 | 1.0 | -0.37 | 0.0 | 71.3 |
| 3.44 | 5.0E-03 | 0.00 | 909.9 | 1.24 | 9 | 322.5 | 0.0 | 322.5 | 1.6 | 50 | 95.0 | 1.0 | -0.42 | 0.0 | 80.6 |
| 4.43 | 5.0E-03 | 0.00 | 580.5 | 1.32 | 9 | 272.2 | 0.0 | 272.2 | 3.1 | 50 | 95.0 | 1.0 | -0.39 | 0.0 | 68.0 |
| 5.41 | 5.0E-04 | 0.01 | 417.5 | 2.19 | 12 | 225.5 | UnDef | UnDef | 0.0 | 48 | 90.6 | 1.0 | -0.44 | UnDef | UnDef |
| 6.40 | 5.0E-04 | 0.01 | 475.3 | 1.99 | 12 | 280.0 | UnDef | UnDef | 0.0 | 48 | 95.0 | 1.0 | -0.43 | UnDef | UnDef |
| 7.30 | 5.0E-05 | 0.00 | 316.2 | 2.85 | 12 | 199.6 | UnDef | UnDef | 0.0 | 46 | 87.1 | 10.0 | -0.47 | UnDef | UnDef |
| 8.20 | 5.0E-02 | 0.00 | 724.5 | 0.73 | 10 | 485.5 | 0.0 | 485.5 | 0.0 | 50 | 95.0 | 1.0 | -0.34 | 0.0 | 95.0 |
| 9.19 | 5.0E-02 | 0.00 | 570.0 | 0.90 | 9 | 406.3 | 0.0 | 406.3 | 1.2 | 50 | 95.0 | 1.0 | -0.34 | 0.0 | 79.5 |
| 0.17 | 5.0E-02 | 0.00 | 382.3 | 0.95 | 9 | 288.1 | 0.0 | 288.1 | 2.7 | 48 | 95.0 | 1.0 | -0.31 | 0.0 | 56.4 |
| 1.15 | 5.0E-03 | 0.00 | 202.5 | 1.03 | 9 | 160.6 | 4.4 | 165.0 | 6.0 | 46 | 80.8 | 1.0 | -0.26 | 0.7 | 40.0 |
| 2.14 | 5.0E-04 | 0.00 | 106.8 | 1.57 | 9 | 88.9 | 26.1 | 114.9 | 13.5 | 42 | 63.9 | 1.0 | -0.24 | 4.8 | 33.8 |
| 3.21 | 5.0E-04 | 0.00 | 91.7 | 1.58 | 7 | 79.7 | 28.8 | 108.5 | 14.9 | 42 | 60.8 | 1.0 | -0.23 | 5.2 | 31.2 |
| 4.27 | 5.0E-03 | 0.00 | 98.2 | 1.23 | 9 | 88.7 | 21.5 | 110.2 | 12.3 | 42 | 63.8 | 1.0 | -0.21 | 3.0 | 24.7 |
| 5.26 | 5.0E-03 | 0.00 | 113.1 | 0.63 | 9 | 105.6 | 6.0 | 111.6 | 7.0 | 42 | 68.8 | 1.0 | -0.16 | 0.9 | 26.7 |
| 6.24 | 5.0E-02 | 0.00 | 124.6 | 0.74 | 9 | 120.1 | 7.3 | 127.4 | 7.2 | 42 | 72.5 | 1.0 | -0.18 | 0.9 | 24.4 |
| 7.22 | 5.0E-03 | 0.00 | 119.3 | 0.84 | 9 | 118.6 | 11.0 | 129.7 | 8.2 | 42 | 72.2 | 1.0 | -0.19 | 1.6 | 30.7 |
| 8.21 | 5.0E-03 | 0.00 | 70.3 | 0.75 | 9 | 72.3 | 16.1 | 88.4 | 11.8 | 40 | 58.0 | 1.0 | -0.13 | 2.3 | 20.0 |
| 9.19 | 5.0E-03 | 0.00 | 53.1 | 0.57 | 9 | 56.4 | 15.2 | 71.6 | 13.0 | 40 | 50.9 | 1.0 | -0.08 | 2.1 | 15.9 |
| 0.18 | 5.0E-03 | 0.00 | 41.7 | 0.49 | 9 | 45.5 | 0.0 | 45.5 | 5.0 | 38 | 44.7 | 1.0 | -0.05 | 0.0 | 11.1 |
| 1.16 | 5.0E-03 | 0.00 | 42.1 | 0.38 | 9 | 46.6 | 0.0 | 46.6 | 5.0 | 38 | 45.4 | 1.0 | -0.03 | 0.0 | 11.4 |
| 2.15 | 5.0E-03 | 0.00 | 42.1 | 0.42 | 9 | 47.1 | 0.0 | 47.1 | 5.0 | 38 | 45.7 | 1.0 | -0.04 | 0.0 | 11.5 |
| 3.13 | 5.0E-03 | 0.00 | 39.4 | 0.45 | 9 | 44.7 | 0.0 | 44.7 | 5.0 | 38 | 44.2 | 1.0 | -0.04 | 0.0 | 10.9 |
| 4.11 | 5.0E-03 | 0.00 | 35.0 | 0.52 | 7 | 40.4 | 19.3 | 59.7 | 17.1 | 38 | 41.3 | 1.0 | -0.04 | 2.5 | 12.4 |
| 5.10 | 5.0E-03 | 0.00 | 30.5 | 0.43 | 7 | 35.8 | 0.0 | 35.8 | 5.0 | 36 | 37.8 | 1.0 | -0.01 | 0.0 | 8.8 |
| 6.08 | 5.0E-04 | 0.00 | 31.3 | 0.52 | 7 | 37.0 | 20.8 | 57.8 | 18.5 | 36 | 38.8 | 1.0 | -0.03 | 3.5 | 15.6 |
| 7.07 | 5.0E-04 | 0.00 | 30.4 | 0.52 | 7 | 36.4 | 21.3 | 57.7 | 18.8 | 36 | 38.3 | 1.0 | -0.02 | 3.6 | 15.4 |
| 8.05 | 5.0E-04 | 0.00 | 28.8 | 0.48 | 7 | 34.9 | 0.0 | 34.9 | 5.0 | 36 | 37.1 | 1.0 | -0.01 | 0.0 | 11.4 |
| 9.04 | 5.0E-04 | 0.00 | 27.9 | 0.52 | 7 | 34.2 | 22.9 | 57.1 | 20.0 | 36 | 36.5 | 1.0 | -0.02 | 3.7 | 14.9 |
| 0.02 | 5.0E-03 | 0.00 | 29.7 | 0.41 | 7 | 36.7 | 0.0 | 36.7 | 5.0 | 36 | 38.5 | 1.0 | 0.00 | 0.0 | 9.0 |
| 1.00 | 5.0E-04 | 0.00 | 25.6 | 0.42 | 7 | 32.1 | 0.0 | 32.1 | 5.0 | 34 | 34.7 | 1.0 | 0.01 | 0.0 | 10.5 |
| 1.99 | 5.0E-04 | 0.00 | 19.4 | 0.64 | 7 | 25.0 | 35.2 | 60.2 | 26.9 | 32 | 30.0 | 1.0 | 0.00 | 4.7 | 12.9 |
| 2.97 | 5.0E-04 | 0.00 | 20.2 | 0.62 | 7 | 26.2 | 33.2 | 59.4 | 25.9 | 34 | 30.0 | 1.0 | 0.00 | 4.6 | 13.1 |
| 3.96 | 5.0E-04 | 0.00 | 20.1 | 0.69 | 7 | 26.2 | 36.9 | 63.1 | 26.9 | 34 | 30.0 | 1.0 | -0.01 | 4.9 | 13.5 |
| 4.94 | 5.0E-04 | 0.00 | 20.5 | 0.56 | 7 | 27.0 | 31.1 | 58.1 | 25.0 | 34 | 30.0 | 1.0 | 0.01 | 4.4 | 13.2 |
| 5.92 | 5.0E-04 | 0.00 | 22.1 | 0.45 | 7 | 29.3 | 0.0 | 29.3 | 5.0 | 34 | 32.1 | 1.0 | 0.01 | 0.0 | 9.6 |
| 5.91 | 5.0E-04 | 0.00 | 21.1 | 0.43 | 7 | 28.3 | 0.0 | 28.3 | 5.0 | 34 | 31.1 | 1.0 | 0.02 | 0.0 | 9.2 |
| 7.89 | 5.0E-04 | 0.00 | 19.5 | 0.44 | 7 | 26.5 | 0.0 | 26.5 | 5.0 | 34 | 30.0 | 1.0 | 0.03 | 0.0 | 8.6 |
| 3.88 | 5.0E-04 | 0.00 | 16.5 | 0.55 | 7 | 22.9 | 38.2 | 61.1 | 28.4 | 32 | 30.0 | 1.0 | 0.03 | 4.8 | 12.3 |
| 9.86 | 5.0E-04 | 0.00 | 15.7 | 0.62 | 7 | 22.0 | 45.5 | 67.5 | 30.2 | 32 | 30.0 | 1.0 | 0.02 | 5.2 | 12.4 |
| 0.85 | 5.0E-04 | 0.00 | 14.9 | 0.52 | 7 | 21.2 | 41.4 | 62.6 | 29.8 | 32 | 30.0 | 1.0 | 0.04 | 4.9 | 11.8 |

regg In Situ, Inc.
un No: 03-0630-0942-1777
PT File: 151C09.COR

Page: 2b

| epth ft) | k (cm/s) | Bq | Qtn | Rfn | SBTn | Qc1N | DeltaQc1N | Qc1Ncs | Fc (%) | Phi (Deg) | Dr (%) | OCR | State Param | Del(n1)60 | (N1)60cs |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1.83 | 5.0E-04 | 0.00 | 13.9 | 0.56 | 7 | 20.1 | 48.5 | 68.6 | 31.5 | 32 | 30.0 | 1.0 | 0.04 | 5.2 | 11.8 |
| 2.81 | 5.0E-04 | 0.00 | 13.9 | 0.61 | 7 | 20.2 | 53.9 | 74.1 | 32.2 | 32 | 30.0 | 1.0 | 0.03 | 5.5 | 12.1 |
| 3.80 | 5.0E-04 | 0.00 | 15.2 | 0.57 | 7 | 22.1 | 45.0 | 67.2 | 30.1 | 32 | 30.0 | 1.0 | 0.03 | 5.2 | 12.4 |
| 4.78 | 5.0E-04 | 0.00 | 18.9 | 0.80 | 7 | 27.2 | 49.4 | 76.7 | 29.1 | 32 | 30.0 | 1.0 | -0.01 | 6.0 | 14.9 |
| 5.77 | 5.0E-06 | 0.01 | 6.7 | 2.76 | 4 | 11.0 | 43.9 | 54.9 | 67.1 | UnDef | UnDef | 3.0 | UnDef | 5.4 | 10.7 |
| 6.75 | 5.0E-06 | 0.14 | 3.2 | 2.58 | 1 | 6.3 | UnDef | UnDef | 100.0 | UnDef | UnDef | 1.5 | UnDef | UnDef | UnDef |
| 7.74 | 5.0E-07 | 0.09 | 4.9 | 3.86 | 1 | 8.7 | UnDef | UnDef | 100.0 | UnDef | UnDef | 1.5 | UnDef | UnDef | UnDef |
| 8.72 | 5.0E-08 | 0.08 | 4.1 | 4.73 | 1 | 7.7 | UnDef | UnDef | 100.0 | UnDef | UnDef | 1.5 | UnDef | UnDef | UnDef |
| 9.70 | 5.0E-07 | 0.06 | 4.2 | 4.23 | 1 | 7.8 | UnDef | UnDef | 100.0 | UnDef | UnDef | 1.5 | UnDef | UnDef | UnDef |
| 0.69 | 5.0E-07 | 0.13 | 3.1 | 4.06 | 1 | 6.3 | UnDef | UnDef | 100.0 | UnDef | UnDef | 1.0 | UnDef | UnDef | UnDef |
| 1.67 | 5.0E-06 | 0.15 | 3.4 | 2.71 | 1 | 6.8 | UnDef | UnDef | 100.0 | UnDef | UnDef | 1.5 | UnDef | UnDef | UnDef |
| 2.66 | 5.0E-06 | 0.20 | 3.2 | 2.87 | 1 | 6.7 | UnDef | UnDef | 100.0 | UnDef | UnDef | 1.5 | UnDef | UnDef | UnDef |
| 3.64 | 5.0E-06 | 0.11 | 5.2 | 2.42 | 4 | 9.5 | 37.8 | 47.3 | 72.2 | UnDef | UnDef | 1.5 | UnDef | 4.6 | 9.3 |
| 4.63 | 5.0E-06 | 0.29 | 3.2 | 2.39 | 4 | 6.7 | 26.7 | 33.4 | 87.2 | UnDef | UnDef | 1.5 | UnDef | 3.3 | 6.5 |
| 5.61 | 5.0E-06 | 0.17 | 4.3 | 3.68 | 1 | 8.4 | UnDef | UnDef | 100.0 | UnDef | UnDef | 1.5 | UnDef | UnDef | UnDef |
| 6.59 | 5.0E-06 | 0.11 | 3.7 | 3.52 | 1 | 7.5 | UnDef | UnDef | 100.0 | UnDef | UnDef | 1.5 | UnDef | UnDef | UnDef |
| 7.58 | 5.0E-06 | 0.07 | 5.0 | 3.74 | 1 | 9.6 | UnDef | UnDef | 100.0 | UnDef | UnDef | 1.5 | UnDef | UnDef | UnDef |
| 8.56 | 5.0E-06 | 0.21 | 2.3 | 2.96 | 1 | 5.7 | UnDef | UnDef | 100.0 | UnDef | UnDef | 1.0 | UnDef | UnDef | UnDef |
| 9.55 | 5.0E-06 | 0.40 | 2.4 | 3.07 | 1 | 5.8 | UnDef | UnDef | 100.0 | UnDef | UnDef | 1.0 | UnDef | UnDef | UnDef |
| 0.53 | 5.0E-05 | 0.14 | 5.3 | 2.10 | 4 | 10.1 | 40.4 | 50.5 | 69.3 | 30 | 30.0 | 1.5 | 0.07 | 4.0 | 7.9 |
| 1.52 | 5.0E-05 | 0.01 | 7.5 | 2.60 | 4 | 13.5 | 54.1 | 67.7 | 63.0 | 30 | 30.0 | 3.0 | 0.00 | 5.3 | 10.6 |
| 2.42 | 5.0E-05 | 0.00 | 9.9 | 2.10 | 6 | 17.2 | 68.7 | 85.9 | 53.0 | 30 | 30.0 | 3.0 | -0.02 | 6.7 | 13.4 |
| 3.32 | 5.0E-03 | -0.01 | 23.2 | 0.58 | 7 | 37.3 | 36.0 | 73.2 | 23.4 | 34 | 39.0 | 1.0 | -0.01 | 4.0 | 13.2 |
| 4.30 | 5.0E-03 | 0.00 | 27.2 | 0.62 | 7 | 43.6 | 34.4 | 78.0 | 21.5 | 36 | 43.5 | 1.0 | -0.03 | 4.1 | 14.7 |
| 5.29 | 5.0E-03 | 0.00 | 23.5 | 0.80 | 7 | 38.2 | 46.7 | 84.9 | 25.6 | 34 | 39.7 | 1.0 | -0.03 | 4.9 | 14.2 |
| 6.27 | 5.0E-04 | 0.00 | 14.7 | 0.61 | 7 | 24.9 | 58.4 | 83.3 | 31.3 | 32 | 30.0 | 1.0 | 0.03 | 6.3 | 14.5 |
| 7.26 | 5.0E-04 | 0.00 | 11.1 | 1.39 | 6 | 19.5 | 78.2 | 97.7 | 45.0 | 30 | 30.0 | 1.0 | 0.00 | 6.4 | 12.8 |
| 8.24 | 5.0E-03 | 0.00 | 24.1 | 1.09 | 7 | 39.8 | 62.9 | 102.7 | 27.9 | 34 | 40.8 | 1.0 | -0.06 | 6.0 | 15.8 |
| 9.22 | 5.0E-03 | -0.01 | 30.4 | 0.88 | 7 | 49.8 | 44.3 | 94.1 | 22.6 | 36 | 47.3 | 1.0 | -0.07 | 5.1 | 17.3 |
| 0.21 | 5.0E-04 | -0.01 | 19.1 | 1.67 | 6 | 32.4 | 129.5 | 161.9 | 36.5 | 32 | 35.0 | 1.0 | -0.07 | 10.6 | 21.1 |
| 1.19 | 5.0E-02 | 0.00 | 52.5 | 0.65 | 9 | 85.2 | 26.2 | 111.4 | 13.8 | 40 | 62.7 | 1.0 | -0.09 | 2.9 | 19.6 |
| 2.18 | 5.0E-02 | 0.00 | 60.3 | 0.85 | 9 | 98.1 | 31.8 | 129.9 | 14.2 | 40 | 66.7 | 1.0 | -0.13 | 3.5 | 22.7 |
| 3.16 | 5.0E-02 | 0.00 | 55.4 | 0.92 | 7 | 90.9 | 36.0 | 126.8 | 15.6 | 40 | 64.5 | 1.0 | -0.12 | 3.8 | 21.6 |
| 4.15 | 5.0E-02 | 0.00 | 60.4 | 0.92 | 9 | 99.3 | 34.7 | 134.0 | 14.7 | 40 | 67.1 | 1.0 | -0.13 | 3.8 | 23.2 |
| 5.13 | 5.0E-02 | 0.00 | 68.7 | 0.89 | 9 | 113.3 | 31.8 | 145.1 | 13.2 | 40 | 70.9 | 1.0 | -0.14 | 3.5 | 25.7 |
| 6.11 | 5.0E-02 | 0.00 | 68.1 | 0.81 | 9 | 112.9 | 28.8 | 141.7 | 12.6 | 40 | 70.8 | 1.0 | -0.13 | 3.2 | 25.3 |
| 7.10 | 5.0E-02 | -0.01 | 58.4 | 0.63 | 9 | 97.8 | 24.6 | 122.4 | 12.5 | 40 | 66.6 | 1.0 | -0.10 | 2.8 | 21.9 |
| 8.08 | 5.0E-02 | 0.00 | 74.3 | 0.68 | 9 | 124.5 | 22.3 | 146.8 | 10.7 | 40 | 73.6 | 1.0 | -0.13 | 2.6 | 26.9 |
| 9.07 | 5.0E-02 | 0.00 | 72.4 | 0.82 | 9 | 121.9 | 28.6 | 150.4 | 12.1 | 40 | 72.9 | 1.0 | -0.14 | 3.2 | 27.1 |
| 0.05 | 5.0E-02 | 0.00 | 80.4 | 0.67 | 9 | 135.9 | 20.8 | 156.6 | 10.0 | 42 | 76.1 | 1.0 | -0.13 | 2.4 | 29.0 |
| 1.04 | 5.0E-02 | 0.00 | 78.5 | 0.62 | 9 | 133.4 | 19.2 | 152.6 | 9.7 | 42 | 75.5 | 1.0 | -0.12 | 2.2 | 28.3 |
| 2.02 | 5.0E-02 | -0.01 | 65.3 | 0.62 | 9 | 112.1 | 23.2 | 135.2 | 11.4 | 40 | 70.5 | 1.0 | -0.11 | 2.6 | 24.6 |
| 3.00 | 5.0E-02 | -0.01 | 62.5 | 0.63 | 9 | 107.9 | 24.4 | 132.3 | 11.9 | 40 | 69.5 | 1.0 | -0.10 | 2.8 | 23.9 |
| 3.99 | 5.0E-02 | 0.00 | 72.1 | 0.61 | 9 | 124.7 | 21.1 | 145.8 | 10.4 | 40 | 73.6 | 1.0 | -0.12 | 2.4 | 26.8 |
| 4.97 | 5.0E-02 | 0.00 | 74.3 | 0.70 | 9 | 129.1 | 24.3 | 153.4 | 10.9 | 40 | 74.6 | 1.0 | -0.13 | 2.8 | 28.0 |
| 5.96 | 5.0E-02 | 0.00 | 81.2 | 0.57 | 9 | 141.5 | 17.1 | 158.6 | 9.0 | 42 | 77.2 | 1.0 | -0.12 | 2.0 | 29.7 |
| 6.94 | 5.0E+00 | 0.00 | 91.4 | 0.51 | 9 | 159.7 | 11.6 | 171.3 | 7.5 | 42 | 80.7 | 1.0 | -0.12 | 1.2 | 27.2 |
| 7.93 | 5.0E-02 | 0.00 | 80.3 | 0.66 | 9 | 141.4 | 21.3 | 162.7 | 9.9 | 42 | 77.2 | 1.0 | -0.13 | 2.5 | 30.1 |
| 8.91 | 5.0E+00 | 0.00 | 100.5 | 0.47 | 9 | 177.2 | 0.0 | 177.2 | 5.0 | 42 | 83.7 | 1.0 | -0.12 | 0.0 | 28.9 |
| 9.89 | 5.0E+00 | 0.00 | 101.1 | 0.53 | 9 | 179.1 | 9.7 | 188.8 | 6.9 | 42 | 84.0 | 1.0 | -0.13 | 1.0 | 30.2 |
| 0.88 | 5.0E+00 | 0.00 | 90.5 | 0.42 | 9 | 161.5 | 0.0 | 161.5 | 5.0 | 42 | 81.0 | 1.0 | -0.10 | 0.0 | 26.3 |
| 1.86 | 5.0E+00 | 0.00 | 89.1 | 0.39 | 9 | 159.7 | 0.0 | 159.7 | 5.0 | 42 | 80.7 | 1.0 | -0.10 | 0.0 | 26.1 |
| 2.85 | 5.0E+00 | 0.00 | 96.6 | 0.33 | 9 | 173.8 | 0.0 | 173.8 | 5.0 | 42 | 83.1 | 1.0 | -0.09 | 0.0 | 28.4 |
| 3.83 | 5.0E+00 | 0.00 | 80.0 | 0.43 | 9 | 145.2 | 0.0 | 145.2 | 5.0 | 42 | 78.0 | 1.0 | -0.09 | 0.0 | 23.7 |
| 4.82 | 5.0E-03 | -0.01 | 43.7 | 1.39 | 7 | 81.1 | 66.2 | 147.3 | 21.8 | 38 | 61.3 | 1.0 | -0.14 | 7.8 | 27.6 |
| 5.80 | 5.0E+00 | 0.00 | 101.2 | 0.40 | 9 | 184.5 | 0.0 | 184.5 | 5.0 | 42 | 84.8 | 1.0 | -0.11 | 0.0 | 30.1 |
| 6.78 | 5.0E+00 | 0.00 | 99.4 | 0.53 | 9 | 182.2 | 10.6 | 192.9 | 7.1 | 42 | 84.5 | 1.0 | -0.13 | 1.1 | 30.8 |
| 7.77 | 5.0E+00 | 0.00 | 102.3 | 0.66 | 9 | 188.3 | 16.3 | 204.7 | 8.0 | 42 | 85.4 | 1.0 | -0.15 | 1.6 | 32.3 |
| 8.75 | 5.0E-02 | 0.00 | 96.3 | 0.73 | 9 | 178.3 | 21.2 | 199.5 | 9.0 | 42 | 83.9 | 1.0 | -0.16 | 2.5 | 37.4 |

regg In Situ, Inc.
nterpretation Output - Release 1.00.19e
un No: 03-0630-0942-1838
ob No: 03-151SH
lient: URS
roject: CPT SITE INVESTIGATION
ite: PIER T LNG
ocation: CPT-10
ngineer: T. O'BRIEN
PT Date: 03/25/06
PT Time: 13:50
PT File: 151C10.COR
orthing (m): 0.000
asting (m): 0.000
levation (m): 0.000

Water Table (m): 6.10 (ft): 20.0
Su Nkt used: 12.50
Averaging Increment (m): 0.30
Phi Method : Robertson and Campanella, 1983
Dr Method : Jamiolkowski - All Sands
State Parameter M: 1.20
Used Unit Weights Assigned to Soil Zones
Values of 1.0E9 or UnDef are printed for parameters that are not valid for the material type (SBT)

| epth (ft) | AvgQt (tsf) | AvgFs (tsf) | AvgRf (%) | AvgUd (ft) | SBT | U.Wt. pcf | TStress (tsf) | EStress (tsf) | Ueq (tsf) | Cn | N60 (blows/ft) | (N1)60 (blows/ft) | Su (tsf) | CRR |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 0.49 | 0.0 | 0.00 | 0.00 | 0.0 | UnDef | 124.1 | 0.03 | 0.03 | 0.00 | 2.00 | UnDef | UnDef | UnDef | 0.00 |
| 1.48 | 0.0 | 0.00 | 0.00 | 0.0 | UnDef | 124.1 | 0.09 | 0.09 | 0.00 | 2.00 | UnDef | UnDef | UnDef | 0.00 |
| 2.46 | 192.2 | 2.16 | 1.12 | 6.3 | 9 | 124.1 | 0.15 | 0.15 | 0.00 | 2.00 | 36.8 | 73.6 | UnDef | 0.00 |
| 3.44 | 148.1 | 3.00 | 2.02 | 14.5 | 7 | 117.8 | 0.21 | 0.21 | 0.00 | 2.00 | 47.3 | 94.6 | UnDef | 0.00 |
| 4.43 | 105.1 | 1.75 | 1.66 | 13.7 | 7 | 117.8 | 0.27 | 0.27 | 0.00 | 1.92 | 33.6 | 64.6 | UnDef | 0.00 |
| 5.41 | 156.2 | 2.04 | 1.30 | 13.6 | 8 | 120.9 | 0.33 | 0.33 | 0.00 | 1.74 | 37.4 | 65.2 | UnDef | 0.00 |
| 6.40 | 294.6 | 3.92 | 1.33 | 18.9 | 9 | 124.1 | 0.39 | 0.39 | 0.00 | 1.60 | 56.4 | 90.5 | UnDef | 0.00 |
| 7.30 | 279.2 | 4.72 | 1.69 | 22.4 | 8 | 120.9 | 0.44 | 0.44 | 0.00 | 1.50 | 66.8 | 100.3 | UnDef | 0.00 |
| 8.20 | 172.0 | 2.56 | 1.49 | 18.7 | 8 | 120.9 | 0.50 | 0.50 | 0.00 | 1.42 | 41.2 | 58.3 | UnDef | 0.00 |
| 9.19 | 132.7 | 1.26 | 0.95 | 14.3 | 9 | 124.1 | 0.56 | 0.56 | 0.00 | 1.34 | 25.4 | 34.0 | UnDef | 0.00 |
| 0.17 | 139.3 | 1.26 | 0.91 | 11.6 | 9 | 124.1 | 0.62 | 0.62 | 0.00 | 1.27 | 26.7 | 33.9 | UnDef | 0.00 |
| 1.15 | 158.2 | 1.16 | 0.73 | 7.9 | 9 | 124.1 | 0.68 | 0.68 | 0.00 | 1.21 | 30.3 | 36.7 | UnDef | 0.00 |
| 2.14 | 146.3 | 1.23 | 0.84 | 6.1 | 9 | 124.1 | 0.74 | 0.74 | 0.00 | 1.16 | 28.0 | 32.5 | UnDef | 0.00 |
| 3.21 | 122.8 | 1.32 | 1.08 | 4.8 | 8 | 120.9 | 0.81 | 0.81 | 0.00 | 1.11 | 29.4 | 32.7 | UnDef | 0.37 |
| 4.27 | 89.8 | 1.05 | 1.17 | 4.0 | 8 | 120.9 | 0.87 | 0.87 | 0.00 | 1.07 | 21.5 | 23.0 | UnDef | 0.22 |
| 5.26 | 78.0 | 0.63 | 0.81 | 3.2 | 8 | 120.9 | 0.93 | 0.93 | 0.00 | 1.04 | 18.7 | 19.3 | UnDef | 0.16 |
| 6.24 | 78.8 | 0.58 | 0.73 | 0.7 | 8 | 120.9 | 0.99 | 0.99 | 0.00 | 1.00 | 18.9 | 19.0 | UnDef | 0.15 |
| 7.22 | 62.6 | 0.41 | 0.66 | -0.4 | 8 | 120.9 | 1.05 | 1.05 | 0.00 | 0.98 | 15.0 | 14.6 | UnDef | 0.12 |
| 8.21 | 58.7 | 0.35 | 0.59 | -1.1 | 8 | 120.9 | 1.11 | 1.11 | 0.00 | 0.95 | 14.0 | 13.3 | UnDef | 0.11 |
| 9.19 | 50.0 | 0.29 | 0.58 | -2.2 | 8 | 120.9 | 1.17 | 1.17 | 0.00 | 0.92 | 12.0 | 11.1 | UnDef | 0.10 |
| 0.18 | 40.7 | 0.28 | 0.69 | -2.7 | 7 | 117.8 | 1.23 | 1.22 | 0.01 | 0.90 | 13.0 | 11.7 | UnDef | 0.10 |
| 1.16 | 48.3 | 0.29 | 0.61 | -3.0 | 8 | 120.9 | 1.29 | 1.25 | 0.04 | 0.89 | 11.6 | 10.3 | UnDef | 0.10 |
| 2.15 | 49.5 | 0.29 | 0.58 | -3.3 | 8 | 120.9 | 1.35 | 1.28 | 0.07 | 0.88 | 11.9 | 10.5 | UnDef | 0.10 |
| 3.13 | 60.9 | 0.28 | 0.46 | -3.3 | 8 | 120.9 | 1.41 | 1.31 | 0.10 | 0.87 | 14.6 | 12.7 | UnDef | 0.09 |
| 4.11 | 43.4 | 0.28 | 0.64 | -3.3 | 7 | 117.8 | 1.47 | 1.34 | 0.13 | 0.86 | 13.9 | 12.0 | UnDef | 0.10 |
| 5.10 | 50.9 | 0.23 | 0.46 | -2.8 | 8 | 120.9 | 1.52 | 1.36 | 0.16 | 0.86 | 12.2 | 10.4 | UnDef | 0.09 |
| 6.08 | 47.2 | 0.26 | 0.56 | 0.2 | 8 | 120.9 | 1.58 | 1.39 | 0.19 | 0.85 | 11.3 | 9.6 | UnDef | 0.10 |
| 7.07 | 45.5 | 0.29 | 0.64 | 2.4 | 7 | 117.8 | 1.64 | 1.42 | 0.22 | 0.84 | 14.5 | 12.2 | UnDef | 0.10 |
| 8.05 | 46.3 | 0.25 | 0.54 | 3.3 | 8 | 120.9 | 1.70 | 1.45 | 0.25 | 0.83 | 11.1 | 9.2 | UnDef | 0.10 |
| 9.04 | 42.9 | 0.19 | 0.45 | 4.4 | 8 | 120.9 | 1.76 | 1.48 | 0.28 | 0.82 | 10.3 | 8.4 | UnDef | 0.08 |
| 0.02 | 45.5 | 0.23 | 0.51 | 4.7 | 8 | 120.9 | 1.82 | 1.51 | 0.31 | 0.81 | 10.9 | 8.9 | UnDef | 0.10 |
| 1.00 | 46.9 | 0.24 | 0.52 | 6.4 | 8 | 120.9 | 1.88 | 1.54 | 0.34 | 0.81 | 11.2 | 9.1 | UnDef | 0.10 |
| 1.99 | 46.0 | 0.20 | 0.43 | 8.3 | 8 | 120.9 | 1.94 | 1.56 | 0.37 | 0.80 | 11.0 | 8.8 | UnDef | 0.08 |
| 2.97 | 47.6 | 0.25 | 0.53 | 9.3 | 8 | 120.9 | 2.00 | 1.59 | 0.41 | 0.79 | 11.4 | 9.0 | UnDef | 0.10 |
| 3.96 | 34.9 | 0.20 | 0.59 | 11.1 | 7 | 117.8 | 2.06 | 1.62 | 0.44 | 0.79 | 11.1 | 8.7 | UnDef | 0.10 |
| 4.94 | 34.5 | 0.18 | 0.53 | 14.6 | 7 | 117.8 | 2.12 | 1.65 | 0.47 | 0.78 | 11.0 | 8.6 | UnDef | 0.10 |
| 5.92 | 49.0 | 0.26 | 0.53 | 12.9 | 8 | 120.9 | 2.17 | 1.68 | 0.50 | 0.77 | 11.7 | 9.1 | UnDef | 0.10 |
| 6.91 | 48.8 | 0.32 | 0.65 | 12.3 | 7 | 117.8 | 2.23 | 1.70 | 0.53 | 0.77 | 15.6 | 11.9 | UnDef | 0.11 |
| 7.89 | 21.3 | 0.30 | 1.40 | 21.4 | 6 | 114.6 | 2.29 | 1.73 | 0.56 | 0.76 | 8.2 | 6.2 | 1.52 | 0.13 |
| 8.88 | 55.1 | 0.19 | 0.34 | 22.6 | 8 | 120.9 | 2.35 | 1.76 | 0.59 | 0.75 | 13.2 | 9.9 | UnDef | 0.09 |
| 9.86 | 61.2 | 0.21 | 0.34 | 15.5 | 8 | 120.9 | 2.41 | 1.79 | 0.62 | 0.75 | 14.7 | 11.0 | UnDef | 0.09 |
| 1.85 | 56.3 | 0.24 | 0.43 | 15.3 | 8 | 120.9 | 2.47 | 1.82 | 0.65 | 0.74 | 13.5 | 10.0 | UnDef | 0.09 |

Gregg In Situ, Inc.
Run No: 03-0630-0942-1838
CPT File: 151C10.COR



| Depth (ft) | AvgQt (tsf) | AvgFs (tsf) | AvgRf (%) | AvgUd (ft) | SBT | U.Wt. pcf | TStress (tsf) | EStress (tsf) | Ueq (tsf) | Cn | N60 (blows/ft) | (N1)60 (blows/ft) | Su (tsf) | CRR |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 51.83 | 51.8 | 0.20 | 0.39 | 15.8 | 8 | 120.9 | 2.53 | 1.84 | 0.68 | 0.74 | 12.4 | 9.1 | UnDef | 0.08 |
| 52.81 | 39.2 | 0.17 | 0.42 | 16.8 | 7 | 117.8 | 2.59 | 1.87 | 0.71 | 0.73 | 12.5 | 9.1 | UnDef | 0.00 |
| 53.80 | 22.5 | 0.23 | 1.00 | 20.3 | 6 | 114.6 | 2.64 | 1.90 | 0.74 | 0.73 | 8.6 | 6.3 | 1.59 | 0.13 |
| 54.78 | 26.7 | 0.20 | 0.77 | 30.2 | 7 | 117.8 | 2.70 | 1.93 | 0.77 | 0.72 | 8.5 | 6.1 | UnDef | 0.16 |
| 55.77 | 42.8 | 0.25 | 0.58 | 24.4 | 7 | 117.8 | 2.76 | 1.95 | 0.80 | 0.72 | 13.7 | 9.8 | UnDef | 0.11 |
| 56.75 | 44.0 | 0.32 | 0.72 | 24.8 | 7 | 117.8 | 2.82 | 1.98 | 0.84 | 0.71 | 14.0 | 10.0 | UnDef | 0.12 |
| 57.74 | 29.0 | 0.23 | 0.80 | 27.6 | 7 | 117.8 | 2.87 | 2.01 | 0.87 | 0.71 | 9.2 | 6.5 | UnDef | 0.17 |
| 58.72 | 29.5 | 0.25 | 0.83 | 32.0 | 7 | 117.8 | 2.93 | 2.03 | 0.90 | 0.70 | 9.4 | 6.6 | UnDef | 0.18 |
| 59.70 | 39.2 | 0.23 | 0.58 | 28.0 | 7 | 117.8 | 2.99 | 2.06 | 0.93 | 0.70 | 12.5 | 8.7 | UnDef | 0.11 |
| 60.69 | 41.2 | 0.23 | 0.56 | 27.5 | 7 | 117.8 | 3.05 | 2.09 | 0.96 | 0.69 | 13.2 | 9.1 | UnDef | 0.11 |
| 61.67 | 37.3 | 0.23 | 0.62 | 29.4 | 7 | 117.8 | 3.11 | 2.12 | 0.99 | 0.69 | 11.9 | 8.2 | UnDef | 0.12 |
| 62.66 | 42.3 | 0.24 | 0.57 | 30.2 | 7 | 117.8 | 3.16 | 2.14 | 1.02 | 0.68 | 13.5 | 9.2 | UnDef | 0.11 |
| 63.64 | 45.3 | 0.26 | 0.58 | 31.2 | 7 | 117.8 | 3.22 | 2.17 | 1.05 | 0.68 | 14.5 | 9.8 | UnDef | 0.11 |
| 64.63 | 39.4 | 0.41 | 1.04 | 32.1 | 7 | 117.8 | 3.28 | 2.20 | 1.08 | 0.67 | 12.6 | 8.5 | UnDef | 0.28 |
| 65.61 | 13.4 | 0.20 | 1.52 | 65.7 | 6 | 114.6 | 3.34 | 2.22 | 1.11 | 0.67 | 5.1 | 3.5 | 0.81 | 0.09 |
| 66.59 | 11.1 | 0.11 | 0.98 | 115.3 | 6 | 114.6 | 3.39 | 2.25 | 1.14 | 0.67 | 4.3 | 2.8 | 0.62 | 0.08 |
| 67.58 | 10.3 | 0.10 | 1.01 | 128.5 | 6 | 114.6 | 3.45 | 2.28 | 1.17 | 0.66 | 4.0 | 2.6 | 0.55 | 0.08 |
| 68.56 | 10.8 | 0.16 | 1.43 | 148.5 | 5 | 114.6 | 3.51 | 2.30 | 1.20 | 0.66 | 5.2 | 3.4 | 0.59 | 0.08 |
| 69.55 | 11.0 | 0.17 | 1.53 | 141.0 | 5 | 114.6 | 3.56 | 2.33 | 1.23 | 0.66 | 5.3 | 3.4 | 0.59 | 0.08 |
| 70.53 | 11.4 | 0.19 | 1.66 | 145.6 | 5 | 114.6 | 3.62 | 2.35 | 1.27 | 0.65 | 5.4 | 3.6 | 0.62 | 0.08 |
| 71.52 | 26.8 | 0.26 | 0.97 | 132.3 | 7 | 117.8 | 3.68 | 2.38 | 1.30 | 0.65 | 8.5 | 5.5 | UnDef | 0.14 |
| 72.42 | 83.4 | 0.66 | 0.79 | 57.8 | 8 | 120.9 | 3.73 | 2.40 | 1.32 | 0.64 | 20.0 | 12.9 | UnDef | 0.15 |
| 73.32 | 19.4 | 0.45 | 2.35 | 83.1 | 5 | 114.6 | 3.78 | 2.43 | 1.35 | 0.64 | 9.3 | 6.0 | 1.25 | 0.10 |
| 74.30 | 57.5 | 0.67 | 1.17 | 92.0 | 7 | 117.8 | 3.84 | 2.46 | 1.38 | 0.64 | 18.4 | 11.7 | UnDef | 0.23 |
| 75.29 | 150.8 | 0.99 | 0.66 | 41.3 | 9 | 124.1 | 3.90 | 2.48 | 1.41 | 0.63 | 28.9 | 18.3 | UnDef | 0.23 |
| 76.27 | 133.4 | 1.07 | 0.80 | 46.9 | 9 | 124.1 | 3.96 | 2.52 | 1.44 | 0.63 | 25.6 | 16.1 | UnDef | 0.22 |
| 77.26 | 105.7 | 0.76 | 0.72 | 47.0 | 8 | 120.9 | 4.02 | 2.54 | 1.48 | 0.63 | 25.3 | 15.9 | UnDef | 0.17 |
| 78.24 | 81.2 | 0.50 | 0.61 | 45.9 | 8 | 120.9 | 4.08 | 2.57 | 1.51 | 0.62 | 19.4 | 12.1 | UnDef | 0.14 |
| 79.22 | 72.7 | 0.56 | 0.77 | 35.4 | 8 | 120.9 | 4.14 | 2.60 | 1.54 | 0.62 | 17.4 | 10.8 | UnDef | 0.15 |
| 80.21 | 74.5 | 0.56 | 0.76 | 23.1 | 8 | 120.9 | 4.20 | 2.63 | 1.57 | 0.62 | 17.8 | 11.0 | UnDef | 0.15 |
| 81.19 | 78.3 | 0.58 | 0.74 | 28.3 | 8 | 120.9 | 4.26 | 2.66 | 1.60 | 0.61 | 18.7 | 11.5 | UnDef | 0.15 |
| 82.18 | 89.5 | 0.83 | 0.93 | 30.4 | 8 | 120.9 | 4.32 | 2.69 | 1.63 | 0.61 | 21.4 | 13.1 | UnDef | 0.18 |
| 83.16 | 135.5 | 0.96 | 0.71 | 21.9 | 9 | 124.1 | 4.38 | 2.72 | 1.66 | 0.61 | 26.0 | 15.7 | UnDef | 0.21 |
| 84.15 | 148.5 | 1.04 | 0.70 | 28.8 | 9 | 124.1 | 4.44 | 2.75 | 1.69 | 0.60 | 28.4 | 17.2 | UnDef | 0.23 |
| 85.13 | 201.0 | 1.41 | 0.70 | 33.5 | 9 | 124.1 | 4.50 | 2.78 | 1.72 | 0.60 | 38.5 | 23.1 | UnDef | 0.35 |
| 86.11 | 219.7 | 1.49 | 0.68 | 34.1 | 9 | 124.1 | 4.56 | 2.81 | 1.75 | 0.60 | 42.1 | 25.1 | UnDef | 0.40 |
| 87.10 | 226.9 | 1.44 | 0.63 | 40.7 | 9 | 124.1 | 4.62 | 2.84 | 1.78 | 0.59 | 43.5 | 25.8 | UnDef | 0.41 |
| 88.08 | 216.7 | 1.46 | 0.67 | 21.4 | 9 | 124.1 | 4.68 | 2.87 | 1.81 | 0.59 | 41.5 | 24.5 | UnDef | 0.38 |
| 89.07 | 196.9 | 1.32 | 0.67 | 22.3 | 9 | 124.1 | 4.74 | 2.90 | 1.84 | 0.59 | 37.7 | 22.1 | UnDef | 0.33 |
| 90.05 | 208.3 | 1.32 | 0.63 | 23.5 | 9 | 124.1 | 4.81 | 2.93 | 1.87 | 0.58 | 39.9 | 23.3 | UnDef | 0.35 |
| 91.04 | 167.7 | 1.21 | 0.72 | 27.5 | 9 | 124.1 | 4.87 | 2.96 | 1.91 | 0.58 | 32.1 | 18.7 | UnDef | 0.27 |
| 92.02 | 175.0 | 1.19 | 0.68 | 27.6 | 9 | 124.1 | 4.93 | 2.99 | 1.94 | 0.58 | 33.5 | 19.4 | UnDef | 0.27 |
| 93.00 | 194.8 | 1.27 | 0.65 | 25.0 | 9 | 124.1 | 4.99 | 3.02 | 1.97 | 0.58 | 37.3 | 21.5 | UnDef | 0.31 |
| 93.99 | 206.9 | 1.23 | 0.59 | 29.7 | 9 | 124.1 | 5.05 | 3.05 | 2.00 | 0.57 | 39.6 | 22.7 | UnDef | 0.33 |
| 94.97 | 195.6 | 1.29 | 0.66 | 35.6 | 9 | 124.1 | 5.11 | 3.08 | 2.03 | 0.57 | 37.5 | 21.3 | UnDef | 0.31 |
| 95.96 | 183.9 | 1.27 | 0.69 | 29.0 | 9 | 124.1 | 5.17 | 3.11 | 2.06 | 0.57 | 35.2 | 20.0 | UnDef | 0.29 |
| 96.94 | 223.9 | 1.33 | 0.59 | 16.0 | 9 | 124.1 | 5.23 | 3.14 | 2.09 | 0.56 | 42.9 | 24.2 | UnDef | 0.37 |
| 97.93 | 229.9 | 1.56 | 0.68 | 17.9 | 9 | 124.1 | 5.29 | 3.17 | 2.12 | 0.56 | 44.0 | 24.7 | UnDef | 0.41 |
| 98.91 | 237.6 | 1.66 | 0.70 | 13.9 | 9 | 124.1 | 5.36 | 3.20 | 2.15 | 0.56 | 45.5 | 25.4 | UnDef | 0.43 |
| 99.89 | 254.6 | 1.97 | 0.77 | 12.5 | 9 | 124.1 | 5.42 | 3.23 | 2.18 | 0.56 | 48.8 | 27.1 | UnDef | 0.00 |
| 100.88 | 276.6 | 1.60 | 0.58 | 19.8 | 9 | 124.1 | 5.48 | 3.26 | 2.21 | 0.55 | 53.0 | 29.3 | UnDef | 0.00 |
| 101.86 | 263.4 | 1.61 | 0.61 | 16.9 | 9 | 124.1 | 5.54 | 3.29 | 2.24 | 0.55 | 50.5 | 27.8 | UnDef | 0.00 |
| 102.85 | 270.9 | 1.61 | 0.59 | 16.9 | 9 | 124.1 | 5.60 | 3.33 | 2.27 | 0.55 | 51.9 | 28.5 | UnDef | 0.00 |
| 103.83 | 187.9 | 1.23 | 0.65 | 24.5 | 9 | 124.1 | 5.66 | 3.36 | 2.31 | 0.55 | 36.0 | 19.7 | UnDef | 0.29 |
| 104.82 | 31.4 | 0.77 | 2.44 | 86.5 | 6 | 114.6 | 5.72 | 3.38 | 2.34 | 0.54 | 12.0 | 6.5 | 2.06 | 0.13 |
| 105.80 | 61.7 | 0.88 | 1.43 | 155.3 | 7 | 117.8 | 5.78 | 3.41 | 2.37 | 0.54 | 19.7 | 10.7 | UnDef | 0.00 |
| 106.78 | 62.5 | 1.39 | 2.22 | 62.5 | 6 | 114.6 | 5.83 | 3.44 | 2.40 | 0.54 | 23.9 | 12.9 | 4.53 | 0.00 |
| 107.77 | 46.3 | 1.35 | 2.92 | 64.8 | 6 | 114.6 | 5.89 | 3.46 | 2.43 | 0.54 | 17.7 | 9.5 | 3.23 | 0.25 |
| 108.75 | 118.7 | 1.35 | 1.14 | 63.6 | 8 | 120.9 | 5.95 | 3.49 | 2.46 | 0.54 | 28.4 | 15.2 | UnDef | 0.28 |

regg In Situ, Inc.
iterpretation Output - Release 1.00.19e
un No: 03-0630-0942-1838
ob No: 03-151SH
lient: URS
roject: CPT SITE INVESTIGATION
ite: PIER T LNG
ocation: CPT-10
ngineer: T. O'BRIEN
PT Date: 03/25/06
PT Time: 13:50
PT File: 151C10.COR
orthing (m): 0.000
asting (m): 0.000
levation (m): 0.000

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Water Table (m): 6.10 (ft): 20.0
Su Nkt used: 12.50
Averaging Increment (m): 0.30
Phi Method : Robertson and Campanella, 1983
Dr Method : Jamiolkowski - All Sands
State Parameter M: 1.20
Used Unit Weights Assigned to Soil Zones
Values of 1.0E9 or UnDef are printed for parameters that are not valid for the material type (SBT)

| epth (ft) | k (cm/s) | Bq | Qtn | Rfn | SBTn | Qc1N | DeltaQc1N | Qc1Ncs | Fc (%) | Phi (Deg) | Dr (%) | OCR | State Param | Del(n1)60 | (N1)60cs |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| ).49 | 1.0E-15 | 0.00 | 2.4 | 0.10 | 1 | 0.2 | UnDef | UnDef | 100.0 | UnDef | UnDef | 1.0 | UnDef | UnDef | UnDef |
| 1.48 | 1.0E-15 | 0.00 | 0.1 | 0.10 | 1 | 0.2 | UnDef | UnDef | 100.0 | UnDef | UnDef | 1.0 | UnDef | UnDef | UnDef |
| 2.46 | 5.0E-02 | 0.00 | 1000.0 | 1.13 | 9 | 368.1 | 0.0 | 368.1 | 1.0 | 50 | 95.0 | 1.0 | -0.42 | 0.0 | 73.6 |
| 3.44 | 5.0E-04 | 0.00 | 696.8 | 2.03 | 12 | 283.7 | UnDef | UnDef | 0.0 | 50 | 95.0 | 1.0 | -0.48 | UnDef | UnDef |
| 4.43 | 5.0E-04 | 0.00 | 388.1 | 1.66 | 9 | 197.9 | 5.0 | 202.9 | 5.9 | 48 | 86.8 | 1.0 | -0.38 | 1.0 | 65.6 |
| 5.41 | 5.0E-03 | 0.00 | 474.0 | 1.31 | 9 | 266.6 | 0.0 | 266.6 | 3.6 | 48 | 95.0 | 1.0 | -0.37 | 0.0 | 65.2 |
| 6.40 | 5.0E-02 | 0.00 | 756.0 | 1.33 | 9 | 462.2 | 0.0 | 462.2 | 2.4 | 50 | 95.0 | 1.0 | -0.42 | 0.0 | 90.5 |
| 7.30 | 5.0E-03 | 0.00 | 627.0 | 1.69 | 12 | 409.8 | UnDef | UnDef | 0.0 | 50 | 95.0 | 1.0 | -0.43 | UnDef | UnDef |
| 8.20 | 5.0E-03 | 0.00 | 343.7 | 1.49 | 9 | 238.3 | 4.6 | 242.9 | 5.7 | 48 | 92.2 | 1.0 | -0.35 | 0.7 | 59.0 |
| 9.19 | 5.0E-02 | 0.00 | 236.3 | 0.96 | 9 | 173.7 | 0.0 | 173.7 | 4.8 | 46 | 83.1 | 1.0 | -0.26 | 0.0 | 34.0 |
| ).17 | 5.0E-02 | 0.00 | 223.5 | 0.91 | 9 | 173.1 | 0.0 | 173.1 | 4.8 | 46 | 83.0 | 1.0 | -0.25 | 0.0 | 33.9 |
| 1.15 | 5.0E-02 | 0.00 | 231.2 | 0.74 | 9 | 187.6 | 0.0 | 187.6 | 3.6 | 46 | 85.3 | 1.0 | -0.24 | 0.0 | 36.7 |
| 2.14 | 5.0E-02 | 0.00 | 195.9 | 0.84 | 9 | 166.1 | 0.5 | 166.5 | 5.1 | 44 | 81.8 | 1.0 | -0.23 | 0.1 | 32.6 |
| 3.21 | 5.0E-03 | 0.00 | 151.0 | 1.08 | 9 | 133.7 | 12.2 | 145.8 | 8.1 | 44 | 75.6 | 1.0 | -0.23 | 1.8 | 34.5 |
| 4.27 | 5.0E-03 | 0.00 | 102.0 | 1.18 | 9 | 94.1 | 20.3 | 114.4 | 11.6 | 42 | 65.5 | 1.0 | -0.20 | 2.9 | 25.9 |
| 5.26 | 5.0E-03 | 0.00 | 82.7 | 0.82 | 9 | 79.0 | 14.8 | 93.9 | 10.9 | 42 | 60.5 | 1.0 | -0.15 | 2.1 | 21.5 |
| 6.24 | 5.0E-03 | 0.00 | 78.5 | 0.74 | 9 | 77.5 | 14.1 | 91.6 | 10.8 | 42 | 60.0 | 1.0 | -0.14 | 2.0 | 21.0 |
| 7.22 | 5.0E-03 | 0.00 | 58.6 | 0.67 | 9 | 59.8 | 16.0 | 75.8 | 12.9 | 40 | 52.5 | 1.0 | -0.10 | 2.2 | 16.9 |
| 8.21 | 5.0E-03 | 0.00 | 51.8 | 0.60 | 9 | 54.5 | 16.1 | 70.5 | 13.5 | 38 | 49.9 | 1.0 | -0.08 | 2.2 | 15.5 |
| 9.19 | 5.0E-03 | 0.00 | 41.8 | 0.60 | 7 | 45.3 | 18.3 | 63.6 | 15.8 | 38 | 44.6 | 1.0 | -0.06 | 2.4 | 13.5 |
| ).18 | 5.0E-04 | 0.00 | 32.3 | 0.71 | 7 | 36.0 | 24.5 | 60.5 | 20.2 | 36 | 38.0 | 1.0 | -0.05 | 4.0 | 15.7 |
| 1.16 | 5.0E-03 | 0.00 | 37.6 | 0.62 | 7 | 42.3 | 20.7 | 63.0 | 17.3 | 38 | 42.6 | 1.0 | -0.06 | 2.7 | 13.0 |
| 2.15 | 5.0E-03 | 0.00 | 37.6 | 0.60 | 7 | 42.8 | 20.4 | 63.3 | 17.1 | 38 | 43.0 | 1.0 | -0.05 | 2.7 | 13.1 |
| 3.13 | 5.0E-03 | 0.00 | 45.4 | 0.47 | 9 | 52.1 | 0.0 | 52.1 | 5.0 | 38 | 48.6 | 1.0 | -0.05 | 0.0 | 12.7 |
| 4.11 | 5.0E-04 | -0.01 | 31.4 | 0.66 | 7 | 36.8 | 24.6 | 61.4 | 20.0 | 36 | 38.6 | 1.0 | -0.05 | 4.0 | 16.0 |
| 5.10 | 5.0E-03 | 0.00 | 36.2 | 0.47 | 7 | 42.7 | 0.0 | 42.7 | 5.0 | 38 | 42.9 | 1.0 | -0.03 | 0.0 | 10.4 |
| 6.08 | 5.0E-03 | 0.00 | 32.7 | 0.58 | 7 | 39.1 | 22.3 | 61.4 | 18.6 | 36 | 40.4 | 1.0 | -0.04 | 2.8 | 12.4 |
| 7.07 | 5.0E-04 | 0.00 | 30.8 | 0.67 | 7 | 37.3 | 25.9 | 63.2 | 20.3 | 36 | 39.0 | 1.0 | -0.04 | 4.2 | 16.4 |
| 8.05 | 5.0E-03 | 0.00 | 30.8 | 0.56 | 7 | 37.6 | 22.9 | 60.5 | 19.2 | 36 | 39.3 | 1.0 | -0.03 | 2.9 | 12.1 |
| 9.04 | 5.0E-03 | 0.00 | 27.8 | 0.47 | 7 | 34.5 | 0.0 | 34.5 | 5.0 | 36 | 36.8 | 1.0 | -0.01 | 0.0 | 8.4 |
| ).02 | 5.0E-03 | 0.00 | 29.0 | 0.53 | 7 | 36.3 | 23.3 | 59.6 | 19.7 | 36 | 38.2 | 1.0 | -0.02 | 2.9 | 11.7 |
| .00 | 5.0E-03 | 0.00 | 29.3 | 0.54 | 7 | 37.0 | 23.6 | 60.6 | 19.6 | 36 | 38.8 | 1.0 | -0.02 | 2.9 | 12.0 |
| .99 | 5.0E-03 | 0.00 | 28.1 | 0.45 | 7 | 36.0 | 0.0 | 36.0 | 5.0 | 36 | 38.0 | 1.0 | -0.01 | 0.0 | 8.8 |
| .97 | 5.0E-03 | 0.00 | 28.6 | 0.55 | 7 | 36.9 | 24.8 | 61.7 | 20.0 | 36 | 38.7 | 1.0 | -0.02 | 3.0 | 12.1 |
| .96 | 5.0E-04 | 0.00 | 20.2 | 0.62 | 7 | 26.8 | 34.2 | 61.0 | 26.0 | 34 | 30.0 | 1.0 | 0.00 | 4.7 | 13.5 |
| .94 | 5.0E-04 | 0.00 | 19.7 | 0.57 | 7 | 26.3 | 32.8 | 59.1 | 25.8 | 34 | 30.0 | 1.0 | 0.01 | 4.6 | 13.1 |
| .92 | 5.0E-03 | 0.00 | 27.9 | 0.55 | 7 | 37.1 | 25.9 | 62.9 | 20.4 | 36 | 38.8 | 1.0 | -0.02 | 3.1 | 12.2 |
| .91 | 5.0E-04 | 0.00 | 27.3 | 0.68 | 7 | 36.6 | 31.0 | 67.6 | 22.2 | 36 | 38.5 | 1.0 | -0.04 | 4.8 | 16.7 |
| .89 | 5.0E-05 | 0.01 | 11.0 | 1.57 | 6 | 15.8 | 63.3 | 79.2 | 46.7 | 30 | 30.0 | 3.0 | -0.01 | 6.2 | 12.4 |
| .88 | 5.0E-03 | 0.00 | 30.0 | 0.35 | 7 | 40.7 | 0.0 | 40.7 | 5.0 | 36 | 41.5 | 1.0 | 0.01 | 0.0 | 9.9 |
| .86 | 5.0E-03 | 0.00 | 32.9 | 0.35 | 7 | 44.8 | 0.0 | 44.8 | 5.0 | 36 | 44.3 | 1.0 | 0.00 | 0.0 | 11.0 |
| .85 | 5.0E-03 | 0.00 | 29.6 | 0.45 | 7 | 40.8 | 0.0 | 40.8 | 5.0 | 36 | 41.6 | 1.0 | -0.01 | 0.0 | 10.0 |

iregg In Situ, Inc.
:un No: 03-0630-0942-1838
:PT File: 151C10.COR

Page: 2b

| lepth ft) | k (cm/s) | Bq | Qtn | Rfn | SBTn | Qc1N | DeltaQc1N | Qc1Ncs | Fc (%) | Phi (Deg) | Dr (%) | OCR | State Param | Del(n1)60 | (N1)60cs |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1.83 | 5.0E-03 | 0.00 | 26.7 | 0.42 | 7 | 37.3 | 0.0 | 37.3 | 5.0 | 36 | 39.0 | 1.0 | 0.00 | 0.0 | 9.1 |
| 2.81 | 5.0E-04 | -0.01 | 19.5 | 0.45 | 7 | 28.0 | 0.0 | 28.0 | 5.0 | 34 | 30.8 | 1.0 | 0.03 | 0.0 | 9.1 |
| 3.80 | 5.0E-05 | -0.01 | 10.5 | 1.14 | 6 | 16.0 | 63.9 | 79.9 | 43.9 | 30 | 30.0 | 3.0 | 0.02 | 6.3 | 12.5 |
| 4.78 | 5.0E-04 | 0.01 | 12.5 | 0.85 | 6 | 18.8 | 75.3 | 94.2 | 37.3 | 30 | 30.0 | 1.0 | 0.02 | 6.1 | 12.3 |
| 5.77 | 5.0E-04 | 0.00 | 20.5 | 0.62 | 7 | 30.0 | 37.4 | 67.5 | 25.8 | 34 | 32.8 | 1.0 | 0.00 | 5.2 | 15.0 |
| 6.75 | 5.0E-04 | 0.00 | 20.8 | 0.77 | 7 | 30.6 | 44.6 | 75.2 | 27.2 | 34 | 33.3 | 1.0 | -0.02 | 5.9 | 15.9 |
| 7.74 | 5.0E-04 | 0.00 | 13.0 | 0.88 | 6 | 20.0 | 80.0 | 100.1 | 36.8 | 32 | 30.0 | 1.0 | 0.01 | 6.5 | 13.1 |
| 8.72 | 5.0E-04 | 0.00 | 13.1 | 0.93 | 6 | 20.2 | 80.9 | 101.2 | 37.2 | 32 | 30.0 | 1.0 | 0.01 | 6.6 | 13.2 |
| 9.70 | 5.0E-04 | 0.00 | 17.6 | 0.63 | 7 | 26.7 | 44.3 | 71.1 | 28.4 | 32 | 30.0 | 1.0 | 0.01 | 5.6 | 14.3 |
| 0.69 | 5.0E-04 | 0.00 | 18.3 | 0.60 | 7 | 27.9 | 41.5 | 69.4 | 27.4 | 32 | 30.7 | 1.0 | 0.01 | 5.4 | 14.5 |
| 1.67 | 5.0E-04 | 0.00 | 16.2 | 0.68 | 7 | 25.1 | 53.0 | 78.1 | 30.4 | 32 | 30.0 | 1.0 | 0.01 | 6.0 | 14.2 |
| 2.66 | 5.0E-04 | 0.00 | 18.2 | 0.62 | 7 | 28.2 | 43.1 | 71.4 | 27.6 | 32 | 31.0 | 1.0 | 0.01 | 5.6 | 14.8 |
| 3.64 | 5.0E-04 | 0.00 | 19.4 | 0.62 | 7 | 30.1 | 41.5 | 71.5 | 26.7 | 34 | 32.8 | 1.0 | 0.00 | 5.6 | 15.4 |
| 4.63 | 5.0E-04 | 0.00 | 16.4 | 1.14 | 6 | 26.0 | 103.0 | 128.9 | 34.9 | 32 | 30.0 | 1.0 | -0.03 | 8.5 | 16.9 |
| 5.61 | 5.0E-05 | 0.09 | 4.5 | 2.03 | 4 | 8.8 | 35.3 | 44.1 | 73.0 | 30 | 30.0 | 1.5 | 0.08 | 3.5 | 6.9 |
| 6.59 | 5.0E-05 | 0.32 | 3.4 | 1.42 | 4 | 7.2 | 29.0 | 36.2 | 76.1 | 30 | 30.0 | 1.5 | 0.15 | 2.8 | 5.7 |
| 7.58 | 5.0E-05 | 0.41 | 3.0 | 1.52 | 4 | 6.7 | 26.8 | 33.5 | 81.3 | 30 | 30.0 | 1.0 | 0.18 | 2.6 | 5.2 |
| 8.56 | 5.0E-06 | 0.47 | 3.2 | 2.12 | 4 | 7.0 | 28.0 | 35.0 | 84.9 | UnDef | UnDef | 1.5 | UnDef | 3.4 | 6.8 |
| 9.55 | 5.0E-06 | 0.43 | 3.2 | 2.27 | 4 | 7.0 | 28.1 | 35.2 | 86.2 | UnDef | UnDef | 1.5 | UnDef | 3.4 | 6.9 |
| 0.53 | 5.0E-06 | 0.42 | 3.3 | 2.43 | 4 | 7.3 | 29.0 | 36.3 | 86.2 | UnDef | UnDef | 1.5 | UnDef | 3.6 | 7.1 |
| 1.52 | 5.0E-04 | 0.12 | 9.7 | 1.12 | 6 | 17.0 | 68.0 | 84.9 | 45.3 | 30 | 30.0 | 1.0 | 0.04 | 5.5 | 11.1 |
| 2.42 | 5.0E-03 | 0.01 | 33.1 | 0.83 | 7 | 52.6 | 39.1 | 91.8 | 21.0 | 36 | 48.9 | 1.0 | -0.07 | 4.7 | 17.6 |
| 3.32 | 5.0E-06 | 0.08 | 6.4 | 2.92 | 4 | 12.2 | 48.7 | 60.8 | 69.2 | UnDef | UnDef | 3.0 | UnDef | 6.0 | 11.9 |
| 4.30 | 5.0E-04 | 0.03 | 21.9 | 1.25 | 7 | 35.9 | 80.3 | 116.2 | 30.9 | 34 | 37.9 | 1.0 | -0.06 | 8.9 | 20.6 |
| 5.29 | 5.0E-02 | 0.00 | 59.1 | 0.67 | 9 | 93.6 | 24.7 | 118.3 | 12.8 | 40 | 65.4 | 1.0 | -0.10 | 2.8 | 21.1 |
| 6.27 | 5.0E-02 | 0.00 | 51.5 | 0.82 | 7 | 82.3 | 32.5 | 114.9 | 15.6 | 38 | 61.7 | 1.0 | -0.11 | 3.5 | 19.6 |
| 7.26 | 5.0E-03 | 0.00 | 40.0 | 0.75 | 7 | 64.8 | 33.9 | 98.8 | 17.9 | 38 | 54.9 | 1.0 | -0.08 | 4.3 | 20.2 |
| 8.24 | 5.0E-03 | 0.00 | 30.0 | 0.64 | 7 | 49.5 | 34.8 | 84.3 | 20.5 | 36 | 47.1 | 1.0 | -0.04 | 4.2 | 16.3 |
| 9.22 | 5.0E-03 | -0.01 | 26.4 | 0.81 | 7 | 44.1 | 45.6 | 89.7 | 24.0 | 36 | 43.8 | 1.0 | -0.05 | 5.0 | 15.8 |
| 0.21 | 5.0E-03 | -0.01 | 26.7 | 0.80 | 7 | 44.9 | 45.0 | 89.9 | 23.7 | 36 | 44.3 | 1.0 | -0.05 | 5.0 | 16.0 |
| 1.19 | 5.0E-03 | -0.01 | 27.8 | 0.79 | 7 | 47.0 | 43.4 | 90.4 | 23.0 | 36 | 45.6 | 1.0 | -0.05 | 4.9 | 16.4 |
| 2.18 | 5.0E-03 | -0.01 | 31.7 | 0.98 | 7 | 53.4 | 49.1 | 102.6 | 22.9 | 36 | 49.3 | 1.0 | -0.08 | 5.6 | 18.7 |
| 3.16 | 5.0E-02 | -0.01 | 48.2 | 0.73 | 7 | 80.4 | 31.5 | 111.9 | 15.5 | 38 | 61.0 | 1.0 | -0.09 | 3.4 | 19.1 |
| 4.15 | 5.0E-02 | -0.01 | 52.4 | 0.72 | 9 | 87.7 | 29.9 | 117.6 | 14.5 | 40 | 63.5 | 1.0 | -0.10 | 3.2 | 20.4 |
| 5.13 | 5.0E-02 | 0.00 | 70.7 | 0.72 | 9 | 118.0 | 24.8 | 142.8 | 11.5 | 40 | 72.0 | 1.0 | -0.13 | 2.8 | 25.9 |
| 6.11 | 5.0E-02 | 0.00 | 76.6 | 0.69 | 9 | 128.3 | 22.5 | 150.7 | 10.6 | 40 | 74.4 | 1.0 | -0.13 | 2.6 | 27.7 |
| 7.10 | 5.0E-02 | 0.00 | 78.3 | 0.65 | 9 | 131.8 | 20.3 | 152.0 | 10.0 | 42 | 75.2 | 1.0 | -0.13 | 2.3 | 28.1 |
| 8.08 | 5.0E-02 | -0.01 | 73.9 | 0.69 | 9 | 125.2 | 23.2 | 148.4 | 10.8 | 40 | 73.7 | 1.0 | -0.13 | 2.7 | 27.2 |
| 9.07 | 5.0E-02 | -0.01 | 66.2 | 0.69 | 9 | 113.1 | 25.3 | 138.4 | 11.8 | 40 | 70.8 | 1.0 | -0.12 | 2.9 | 25.0 |
| 0.05 | 5.0E-02 | -0.01 | 69.4 | 0.65 | 9 | 119.1 | 23.0 | 142.1 | 11.1 | 40 | 72.3 | 1.0 | -0.12 | 2.6 | 25.9 |
| 1.04 | 5.0E-02 | -0.01 | 55.0 | 0.74 | 9 | 95.4 | 31.0 | 126.3 | 14.2 | 40 | 65.9 | 1.0 | -0.11 | 3.4 | 22.0 |
| 2.02 | 5.0E-02 | -0.01 | 56.8 | 0.70 | 9 | 99.0 | 28.9 | 127.9 | 13.5 | 40 | 67.0 | 1.0 | -0.10 | 3.2 | 22.6 |
| 3.00 | 5.0E-02 | -0.01 | 62.8 | 0.67 | 9 | 109.7 | 26.2 | 135.8 | 12.2 | 40 | 69.9 | 1.0 | -0.11 | 2.9 | 24.4 |
| 3.99 | 5.0E-02 | -0.01 | 66.1 | 0.61 | 9 | 115.9 | 22.8 | 138.7 | 11.2 | 40 | 71.5 | 1.0 | -0.11 | 2.6 | 25.3 |
| 4.97 | 5.0E-02 | 0.00 | 61.8 | 0.68 | 9 | 109.0 | 27.0 | 136.0 | 12.4 | 40 | 69.8 | 1.0 | -0.11 | 3.0 | 24.4 |
| 5.96 | 5.0E-02 | -0.01 | 57.4 | 0.71 | 9 | 102.0 | 29.8 | 131.8 | 13.5 | 40 | 67.8 | 1.0 | -0.11 | 3.3 | 23.2 |
| 6.94 | 5.0E-02 | -0.01 | 69.6 | 0.61 | 9 | 123.6 | 22.1 | 145.7 | 10.7 | 40 | 73.3 | 1.0 | -0.11 | 2.5 | 26.7 |
| 7.93 | 5.0E-02 | -0.01 | 70.8 | 0.70 | 9 | 126.3 | 25.6 | 151.9 | 11.3 | 40 | 74.0 | 1.0 | -0.12 | 2.9 | 27.6 |
| 8.91 | 5.0E-02 | -0.01 | 72.5 | 0.72 | 9 | 129.9 | 26.1 | 156.0 | 11.3 | 40 | 74.8 | 1.0 | -0.13 | 3.0 | 28.4 |
| 9.89 | 5.0E-02 | -0.01 | 77.1 | 0.79 | 9 | 138.6 | 28.1 | 166.7 | 11.3 | 40 | 76.6 | 1.0 | -0.14 | 3.2 | 30.3 |
| 0.88 | 5.0E-02 | -0.01 | 83.1 | 0.59 | 9 | 149.8 | 17.9 | 167.7 | 9.0 | 42 | 78.9 | 1.0 | -0.12 | 2.1 | 31.4 |
| 1.86 | 5.0E-02 | -0.01 | 78.3 | 0.63 | 9 | 142.0 | 20.9 | 162.9 | 9.8 | 42 | 77.3 | 1.0 | -0.12 | 2.4 | 30.2 |
| 2.85 | 5.0E-02 | -0.01 | 79.8 | 0.61 | 9 | 145.4 | 19.8 | 165.2 | 9.5 | 42 | 78.0 | 1.0 | -0.12 | 2.3 | 30.8 |
| 3.83 | 5.0E-02 | -0.01 | 54.3 | 0.67 | 9 | 100.4 | 30.4 | 130.8 | 13.7 | 40 | 67.4 | 1.0 | -0.10 | 3.3 | 23.0 |
| 4.82 | 5.0E-05 | 0.01 | 7.6 | 2.99 | 4 | 16.7 | 66.9 | 83.6 | 65.1 | 30 | 30.0 | 3.0 | -0.01 | 6.5 | 13.1 |
| 5.80 | 5.0E-04 | 0.04 | 16.4 | 1.58 | 6 | 32.7 | 130.9 | 163.6 | 38.6 | 32 | 35.2 | 1.0 | -0.05 | 10.7 | 21.3 |
| 6.78 | 5.0E-05 | -0.01 | 16.5 | 2.45 | 6 | 33.0 | 132.0 | 165.0 | 44.2 | 32 | 35.5 | 6.0 | -0.09 | 12.9 | 25.8 |
| 7.77 | 5.0E-05 | -0.01 | 11.7 | 3.35 | 4 | 24.3 | 97.3 | 121.6 | 56.5 | 30 | 30.0 | 3.0 | -0.08 | 9.5 | 19.0 |
| 8.75 | 5.0E-03 | 0.00 | 32.3 | 1.20 | 7 | 62.2 | 67.5 | 129.6 | 24.5 | 36 | 53.7 | 1.0 | -0.10 | 7.3 | 22.6 |

iregg In Situ, Inc.
nterpretation Output - Release 1.00.19e
:un No: 03-0630-0942-1898
lob No: 03-151SW
:lient: URS
'roject: CPT SITE INVESTIGATION
;ite: PIER T LNG
.ocation: CPT-11
:ngineer: T. O'BRIEN
:PT Date: 03/24/06
:PT Time: 14:30
:PT File: 151C11.COR
lorthing (m): 0.000
:asting (m): 0.000
:levation (m): 0.000

Water Table (m): 6.10 (ft): 20.0
Su Nkt used: 12.50
Averaging Increment (m): 0.30
Phi Method : Robertson and Campanella, 1983
Dr Method : Jamiolkowski - All Sands
State Parameter M: 1.20
Used Unit Weights Assigned to Soil Zones
Values of 1.0E9 or UnDef are printed for parameters that are not valid for the material type (SBT)

| 'epth ft) | AvgQt (tsf) | AvgFs (tsf) | AvgRf (%) | AvgUd (ft) | SBT | U.Wt. pcf | TStress (tsf) | EStress (tsf) | Ueq (tsf) | Cn | N60 (blows/ft) | (N1)60 (blows/ft) | Su (tsf) | CRR |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 0.49 | 163.3 | 0.62 | 0.38 | 7.5 | 9 | 124.1 | 0.03 | 0.03 | 0.00 | 2.00 | 31.3 | 62.6 | UnDef | 0.00 |
| 1.48 | 121.8 | 1.22 | 1.00 | 10.1 | 8 | 120.9 | 0.09 | 0.09 | 0.00 | 2.00 | 29.2 | 58.3 | UnDef | 0.00 |
| 2.46 | 99.3 | 1.37 | 1.38 | 3.6 | 8 | 120.9 | 0.15 | 0.15 | 0.00 | 2.00 | 23.8 | 47.5 | UnDef | 0.00 |
| 3.44 | 84.8 | 1.12 | 1.32 | 1.1 | 8 | 120.9 | 0.21 | 0.21 | 0.00 | 2.00 | 20.3 | 40.6 | UnDef | 0.00 |
| 4.43 | 43.4 | 0.96 | 2.21 | -0.6 | 6 | 114.6 | 0.27 | 0.27 | 0.00 | 1.93 | 16.6 | 32.1 | 3.45 | 0.19 |
| 5.41 | 30.7 | 0.71 | 2.32 | -2.2 | 6 | 114.6 | 0.32 | 0.32 | 0.00 | 1.76 | 11.8 | 20.7 | 2.43 | 0.13 |
| 6.40 | 26.9 | 0.53 | 1.96 | -3.1 | 6 | 114.6 | 0.38 | 0.38 | 0.00 | 1.62 | 10.3 | 16.7 | 2.12 | 0.11 |
| 7.30 | 14.6 | 0.29 | 1.96 | -2.4 | 5 | 114.6 | 0.43 | 0.43 | 0.00 | 1.52 | 7.0 | 10.7 | 1.14 | 0.10 |
| 8.20 | 6.9 | 0.07 | 1.04 | 8.4 | 5 | 114.6 | 0.48 | 0.48 | 0.00 | 1.44 | 3.3 | 4.7 | 0.51 | 0.09 |
| 9.19 | 5.0 | 0.02 | 0.45 | 27.0 | 1 | 79.6 | 0.53 | 0.53 | 0.00 | 1.37 | 2.4 | 3.3 | 0.36 | 0.08 |
| 0.17 | 87.7 | 0.75 | 0.85 | 20.3 | 8 | 120.9 | 0.58 | 0.58 | 0.00 | 1.31 | 21.0 | 27.5 | UnDef | 0.23 |
| 1.15 | 116.3 | 1.23 | 1.06 | 1.6 | 8 | 120.9 | 0.64 | 0.64 | 0.00 | 1.25 | 27.8 | 34.8 | UnDef | 0.39 |
| 2.14 | 103.1 | 1.28 | 1.24 | -0.3 | 8 | 120.9 | 0.70 | 0.70 | 0.00 | 1.20 | 24.7 | 29.5 | UnDef | 0.31 |
| 3.21 | 75.0 | 1.11 | 1.48 | -0.1 | 7 | 117.8 | 0.76 | 0.76 | 0.00 | 1.14 | 24.0 | 27.4 | UnDef | 0.20 |
| 4.27 | 51.4 | 0.81 | 1.58 | -0.9 | 7 | 117.8 | 0.83 | 0.83 | 0.00 | 1.10 | 16.4 | 18.0 | UnDef | 0.15 |
| 5.26 | 26.1 | 0.47 | 1.80 | 0.1 | 6 | 114.6 | 0.88 | 0.88 | 0.00 | 1.06 | 10.0 | 10.6 | 2.02 | 0.14 |
| 6.24 | 51.9 | 0.61 | 1.17 | -0.9 | 7 | 117.8 | 0.94 | 0.94 | 0.00 | 1.03 | 16.6 | 17.1 | UnDef | 0.13 |
| 7.22 | 98.4 | 0.69 | 0.70 | -1.8 | 8 | 120.9 | 1.00 | 1.00 | 0.00 | 1.00 | 23.6 | 23.6 | UnDef | 0.19 |
| 8.21 | 98.2 | 0.81 | 0.83 | 0.7 | 8 | 120.9 | 1.06 | 1.06 | 0.00 | 0.97 | 23.5 | 22.8 | UnDef | 0.20 |
| 9.19 | 78.4 | 0.63 | 0.80 | 1.6 | 8 | 120.9 | 1.12 | 1.12 | 0.00 | 0.95 | 18.8 | 17.7 | UnDef | 0.15 |
| 0.18 | 96.5 | 0.86 | 0.90 | 2.7 | 8 | 120.9 | 1.18 | 1.17 | 0.01 | 0.92 | 23.1 | 21.3 | UnDef | 0.19 |
| 1.16 | 97.6 | 0.81 | 0.83 | 3.8 | 8 | 120.9 | 1.24 | 1.20 | 0.04 | 0.91 | 23.4 | 21.3 | UnDef | 0.19 |
| 2.15 | 64.8 | 0.62 | 0.95 | 3.9 | 8 | 120.9 | 1.30 | 1.23 | 0.07 | 0.90 | 15.5 | 14.0 | UnDef | 0.13 |
| 3.13 | 49.4 | 0.48 | 0.98 | 4.2 | 7 | 117.8 | 1.36 | 1.26 | 0.10 | 0.89 | 15.8 | 14.0 | UnDef | 0.12 |
| 4.11 | 51.1 | 0.42 | 0.82 | 5.1 | 7 | 117.8 | 1.41 | 1.29 | 0.13 | 0.88 | 16.3 | 14.4 | UnDef | 0.11 |
| 5.10 | 62.4 | 0.49 | 0.78 | 6.0 | 8 | 120.9 | 1.47 | 1.31 | 0.16 | 0.87 | 14.9 | 13.0 | UnDef | 0.12 |
| 6.08 | 69.2 | 0.60 | 0.86 | 7.1 | 8 | 120.9 | 1.53 | 1.34 | 0.19 | 0.86 | 16.6 | 14.3 | UnDef | 0.13 |
| 7.07 | 60.8 | 0.54 | 0.88 | 7.8 | 8 | 120.9 | 1.59 | 1.37 | 0.22 | 0.85 | 14.5 | 12.4 | UnDef | 0.13 |
| 8.05 | 52.9 | 0.47 | 0.88 | 6.9 | 7 | 117.8 | 1.65 | 1.40 | 0.25 | 0.85 | 16.9 | 14.3 | UnDef | 0.12 |
| 9.04 | 40.7 | 0.42 | 1.02 | 7.4 | 7 | 117.8 | 1.71 | 1.43 | 0.28 | 0.84 | 13.0 | 10.9 | UnDef | 0.12 |
| 0.02 | 32.4 | 0.28 | 0.88 | 9.5 | 7 | 117.8 | 1.77 | 1.45 | 0.31 | 0.83 | 10.3 | 8.6 | UnDef | 0.11 |
| 1.00 | 27.4 | 0.32 | 1.16 | 17.5 | 6 | 114.6 | 1.82 | 1.48 | 0.34 | 0.82 | 10.5 | 8.6 | 2.05 | 0.20 |
| 1.99 | 26.3 | 0.22 | 0.84 | 30.7 | 7 | 117.8 | 1.88 | 1.51 | 0.37 | 0.81 | 8.4 | 6.8 | UnDef | 0.13 |
| 2.97 | 43.0 | 0.34 | 0.79 | 23.1 | 7 | 117.8 | 1.94 | 1.53 | 0.41 | 0.81 | 13.7 | 11.1 | UnDef | 0.11 |
| 3.96 | 41.7 | 0.36 | 0.87 | 23.7 | 7 | 117.8 | 2.00 | 1.56 | 0.44 | 0.80 | 13.3 | 10.7 | UnDef | 0.12 |
| 4.94 | 32.8 | 0.51 | 1.55 | 23.6 | 6 | 114.6 | 2.05 | 1.59 | 0.47 | 0.79 | 12.5 | 10.0 | 2.46 | 0.27 |
| 5.92 | 37.2 | 0.43 | 1.15 | 51.9 | 7 | 117.8 | 2.11 | 1.61 | 0.50 | 0.79 | 11.9 | 9.3 | UnDef | 0.15 |
| 6.91 | 49.2 | 0.49 | 0.99 | 18.6 | 7 | 117.8 | 2.17 | 1.64 | 0.53 | 0.78 | 15.7 | 12.3 | UnDef | 0.13 |
| 7.89 | 44.1 | 0.43 | 0.99 | 15.2 | 7 | 117.8 | 2.23 | 1.67 | 0.56 | 0.77 | 14.1 | 10.9 | UnDef | 0.13 |
| 8.88 | 35.5 | 0.58 | 1.63 | 20.2 | 6 | 114.6 | 2.28 | 1.69 | 0.59 | 0.77 | 13.6 | 10.5 | 2.66 | 0.30 |
| 9.86 | 54.6 | 0.49 | 0.90 | 17.8 | 7 | 117.8 | 2.34 | 1.72 | 0.62 | 0.76 | 17.4 | 13.3 | UnDef | 0.13 |
| 0.85 | 50.0 | 0.58 | 1.15 | 21.4 | 7 | 117.8 | 2.40 | 1.75 | 0.65 | 0.76 | 15.9 | 12.1 | UnDef | 0.15 |

regg In Situ, Inc.
un No: 03-0630-0942-1898
PT File: 151C11.COR

Page: 2a

| epth ft) | AvgQt (tsf) | AvgFs (tsf) | AvgRf (%) | AvgUd (ft) | SBT | U.Wt. pcf | TStress (tsf) | EStress (tsf) | Ueq (tsf) | Cn | N60 (blows/ft) | (N1)60 (blows/ft) | Su (tsf) | CRR |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1.83 | 48.5 | 0.88 | 1.81 | 14.4 | 7 | 117.8 | 2.46 | 1.78 | 0.68 | 0.75 | 15.5 | 11.6 | UnDef | 0.32 |
| 2.81 | 169.3 | 3.57 | 2.11 | 16.7 | 7 | 117.8 | 2.51 | 1.80 | 0.71 | 0.74 | 54.0 | 40.3 | UnDef | 0.00 |
| 3.80 | 184.9 | 5.38 | 2.91 | 22.7 | 7 | 117.8 | 2.57 | 1.83 | 0.74 | 0.74 | 59.0 | 43.6 | UnDef | 0.00 |
| 4.78 | 112.4 | 2.79 | 2.48 | 7.6 | 7 | 117.8 | 2.63 | 1.86 | 0.77 | 0.73 | 35.9 | 26.3 | UnDef | 0.00 |
| 5.77 | 64.2 | 1.81 | 2.83 | 25.4 | 6 | 114.6 | 2.69 | 1.88 | 0.80 | 0.73 | 24.6 | 17.9 | 4.92 | 0.00 |
| 6.75 | 163.3 | 3.18 | 1.95 | 19.2 | 7 | 117.8 | 2.75 | 1.91 | 0.84 | 0.72 | 52.1 | 37.7 | UnDef | 0.00 |
| 7.74 | 49.1 | 1.65 | 3.35 | 29.0 | 5 | 114.6 | 2.80 | 1.94 | 0.87 | 0.72 | 23.5 | 16.9 | 3.71 | 0.00 |
| 8.72 | 15.6 | 0.61 | 3.92 | 44.2 | 3 | 111.4 | 2.86 | 1.96 | 0.90 | 0.71 | 14.9 | 10.6 | 1.02 | 0.00 |
| 9.70 | 14.1 | 0.46 | 3.27 | 91.4 | 4 | 114.6 | 2.91 | 1.99 | 0.93 | 0.71 | 9.0 | 6.4 | 0.89 | 0.00 |
| 0.69 | 18.0 | 0.68 | 3.77 | 66.0 | 4 | 114.6 | 2.97 | 2.01 | 0.96 | 0.71 | 11.5 | 8.1 | 1.20 | 0.00 |
| 1.67 | 16.7 | 0.66 | 3.98 | 48.1 | 3 | 111.4 | 3.03 | 2.04 | 0.99 | 0.70 | 16.0 | 11.2 | 1.10 | 0.00 |
| 2.66 | 23.9 | 0.94 | 3.92 | 30.2 | 4 | 114.6 | 3.08 | 2.06 | 1.02 | 0.70 | 15.3 | 10.6 | 1.67 | 0.00 |
| 3.64 | 18.0 | 0.75 | 4.14 | 19.6 | 3 | 111.4 | 3.14 | 2.09 | 1.05 | 0.69 | 17.2 | 11.9 | 1.19 | 0.00 |
| 4.63 | 12.4 | 0.46 | 3.75 | 30.2 | 3 | 111.4 | 3.19 | 2.11 | 1.08 | 0.69 | 11.9 | 8.2 | 0.74 | 0.00 |
| 5.61 | 10.4 | 0.30 | 2.85 | 88.4 | 4 | 114.6 | 3.25 | 2.14 | 1.11 | 0.68 | 6.6 | 4.5 | 0.57 | 0.00 |
| 6.59 | 13.3 | 0.32 | 2.38 | 160.5 | 5 | 114.6 | 3.30 | 2.16 | 1.14 | 0.68 | 6.4 | 4.3 | 0.80 | 0.00 |
| 7.58 | 15.0 | 0.40 | 2.68 | 126.3 | 5 | 114.6 | 3.36 | 2.19 | 1.17 | 0.68 | 7.2 | 4.8 | 0.93 | 0.00 |
| 8.56 | 12.3 | 0.31 | 2.55 | 202.3 | 5 | 114.6 | 3.42 | 2.21 | 1.20 | 0.67 | 5.9 | 4.0 | 0.71 | 0.00 |
| 9.55 | 17.2 | 0.31 | 1.81 | 145.2 | 6 | 114.6 | 3.47 | 2.24 | 1.23 | 0.67 | 6.6 | 4.4 | 1.10 | 0.10 |
| 0.53 | 20.2 | 0.50 | 2.46 | 98.4 | 5 | 114.6 | 3.53 | 2.26 | 1.27 | 0.66 | 9.7 | 6.4 | 1.34 | 0.11 |
| 1.52 | 34.6 | 0.60 | 1.75 | 26.0 | 6 | 114.6 | 3.59 | 2.29 | 1.30 | 0.66 | 13.3 | 8.8 | 2.48 | 0.21 |
| 2.42 | 120.9 | 1.02 | 0.84 | 70.0 | 8 | 120.9 | 3.64 | 2.31 | 1.32 | 0.66 | 28.9 | 19.0 | UnDef | 0.21 |
| 3.32 | 170.2 | 1.43 | 0.84 | 53.7 | 9 | 124.1 | 3.69 | 2.34 | 1.35 | 0.65 | 32.6 | 21.3 | UnDef | 0.32 |
| 4.30 | 151.7 | 1.45 | 0.95 | 44.9 | 9 | 124.1 | 3.75 | 2.37 | 1.38 | 0.65 | 29.0 | 18.9 | UnDef | 0.29 |
| 5.29 | 86.3 | 1.39 | 1.61 | 49.5 | 7 | 117.8 | 3.81 | 2.40 | 1.41 | 0.65 | 27.5 | 17.8 | UnDef | 0.30 |
| 6.27 | 155.0 | 1.28 | 0.83 | 41.1 | 9 | 124.1 | 3.87 | 2.43 | 1.44 | 0.64 | 29.7 | 19.0 | UnDef | 0.27 |
| 7.26 | 127.3 | 0.61 | 0.48 | 31.8 | 9 | 124.1 | 3.94 | 2.46 | 1.48 | 0.64 | 24.4 | 15.5 | UnDef | 0.13 |
| 8.24 | 42.6 | 0.55 | 1.30 | 85.5 | 7 | 117.8 | 3.99 | 2.49 | 1.51 | 0.63 | 13.6 | 8.6 | UnDef | 0.29 |
| 9.22 | 17.3 | 0.31 | 1.77 | 247.5 | 6 | 114.6 | 4.05 | 2.51 | 1.54 | 0.63 | 6.6 | 4.2 | 1.06 | 0.09 |
| 0.21 | 69.5 | 0.83 | 1.20 | 97.8 | 7 | 117.8 | 4.11 | 2.54 | 1.57 | 0.63 | 22.2 | 13.9 | UnDef | 0.22 |
| 1.19 | 26.2 | 0.63 | 2.40 | 174.2 | 6 | 114.6 | 4.17 | 2.57 | 1.60 | 0.62 | 10.0 | 6.3 | 1.76 | 0.13 |
| 2.18 | 38.4 | 0.68 | 1.77 | 95.8 | 6 | 114.6 | 4.22 | 2.59 | 1.63 | 0.62 | 14.7 | 9.1 | 2.74 | 0.23 |
| 3.16 | 34.2 | 0.68 | 1.99 | 182.8 | 6 | 114.6 | 4.28 | 2.62 | 1.66 | 0.62 | 13.1 | 8.1 | 2.39 | 0.18 |
| 4.15 | 64.5 | 1.20 | 1.87 | 48.4 | 7 | 117.8 | 4.34 | 2.65 | 1.69 | 0.61 | 20.6 | 12.7 | UnDef | 0.00 |
| 5.13 | 30.8 | 0.82 | 2.68 | 88.2 | 6 | 114.6 | 4.39 | 2.67 | 1.72 | 0.61 | 11.8 | 7.2 | 2.11 | 0.15 |
| 6.11 | 35.8 | 1.15 | 3.22 | 118.7 | 5 | 114.6 | 4.45 | 2.70 | 1.75 | 0.61 | 17.2 | 10.4 | 2.51 | 0.00 |
| 7.10 | 50.7 | 1.33 | 2.63 | 72.8 | 6 | 114.6 | 4.51 | 2.72 | 1.78 | 0.61 | 19.4 | 11.8 | 3.70 | 0.40 |
| 8.08 | 74.3 | 1.23 | 1.65 | 56.9 | 7 | 117.8 | 4.56 | 2.75 | 1.81 | 0.60 | 23.7 | 14.3 | UnDef | 0.46 |
| 9.07 | 35.1 | 1.12 | 3.20 | 135.2 | 5 | 114.6 | 4.62 | 2.78 | 1.84 | 0.60 | 16.8 | 10.1 | 2.44 | 0.00 |
| 0.05 | 99.5 | 1.52 | 1.53 | 31.1 | 8 | 120.9 | 4.68 | 2.80 | 1.87 | 0.60 | 23.8 | 14.2 | UnDef | 0.33 |
| 1.04 | 108.1 | 1.27 | 1.18 | -1.2 | 8 | 120.9 | 4.74 | 2.83 | 1.91 | 0.59 | 25.9 | 15.4 | UnDef | 0.25 |
| 2.02 | 99.2 | 0.98 | 0.98 | -0.2 | 8 | 120.9 | 4.80 | 2.86 | 1.94 | 0.59 | 23.8 | 14.0 | UnDef | 0.20 |
| 3.00 | 125.7 | 1.76 | 1.40 | 34.7 | 8 | 120.9 | 4.86 | 2.89 | 1.97 | 0.59 | 30.1 | 17.7 | UnDef | 0.33 |
| 3.99 | 121.5 | 1.57 | 1.29 | 12.7 | 8 | 120.9 | 4.92 | 2.92 | 2.00 | 0.59 | 29.1 | 17.0 | UnDef | 0.29 |
| 4.97 | 157.6 | 1.99 | 1.26 | 73.6 | 8 | 120.9 | 4.98 | 2.95 | 2.03 | 0.58 | 37.7 | 22.0 | UnDef | 0.36 |
| 5.96 | 229.1 | 1.75 | 0.76 | 26.8 | 9 | 124.1 | 5.04 | 2.98 | 2.06 | 0.58 | 43.9 | 25.4 | UnDef | 0.44 |
| 5.94 | 235.7 | 1.61 | 0.68 | 31.0 | 9 | 124.1 | 5.10 | 3.01 | 2.09 | 0.58 | 45.1 | 26.0 | UnDef | 0.44 |
| 7.93 | 175.7 | 2.09 | 1.19 | 41.2 | 8 | 120.9 | 5.16 | 3.04 | 2.12 | 0.57 | 42.1 | 24.1 | UnDef | 0.39 |
| 3.91 | 257.3 | 2.77 | 1.08 | 80.3 | 9 | 124.1 | 5.22 | 3.07 | 2.15 | 0.57 | 49.3 | 28.1 | UnDef | 0.00 |
| 9.89 | 257.3 | 2.60 | 1.01 | 52.7 | 9 | 124.1 | 5.28 | 3.10 | 2.18 | 0.57 | 49.3 | 28.0 | UnDef | 0.00 |
| 0.88 | 245.2 | 2.24 | 0.91 | 54.0 | 9 | 124.1 | 5.34 | 3.13 | 2.21 | 0.57 | 47.0 | 26.6 | UnDef | 0.00 |
| 1.86 | 302.6 | 2.64 | 0.87 | 67.5 | 9 | 124.1 | 5.40 | 3.16 | 2.24 | 0.56 | 57.9 | 32.6 | UnDef | 0.00 |

regg In Situ, Inc.
nterpretation Output - Release 1.00.19e
un No: 03-0630-0942-1898
ob No: 03-151SH
lient: URS
roject: CPT SITE INVESTIGATION
ite: PIER T LNG
ocation: CPT-11
ngineer: T. O'BRIEN
PT Date: 03/24/06
PT Time: 14:30
PT File: 151C11.COR
orthing (m): 0.000
asting (m): 0.000
levation (m): 0.000

Water Table (m): 6.10 (ft): 20.0
Su Nkt used: 12.50
Averaging Increment (m): 0.30
Phi Method : Robertson and Campanella, 1983
Dr Method : Jamiolkowski - All Sands
State Parameter M: 1.20
Used Unit Weights Assigned to Soil Zones
Values of 1.0E9 or UnDef are printed for parameters that are not valid for the material type (SBT)

| epth (ft) | k (cm/s) | Bq | Qtn | Rfn | SBTn | Qc1N | DeltaQc1N | Qc1Ncs | Fc (%) | Phi (Deg) | Dr (%) | OCR | State Param | Del(n1)60 | (N1)60cs |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 0.49 | 5.0E-02 | 0.00 | 1000.0 | 0.38 | 10 | 312.9 | 0.0 | 312.9 | 0.0 | 50 | 95.0 | 1.0 | -0.31 | 0.0 | 62.6 |
| 1.48 | 5.0E-03 | 0.00 | 1000.0 | 1.00 | 10 | 233.2 | 0.0 | 233.2 | 0.5 | 50 | 95.0 | 1.0 | -0.41 | 0.0 | 58.3 |
| 2.46 | 5.0E-03 | 0.00 | 659.3 | 1.38 | 9 | 190.2 | 0.0 | 190.2 | 3.0 | 50 | 93.6 | 1.0 | -0.41 | 0.0 | 47.5 |
| 3.44 | 5.0E-03 | 0.00 | 402.9 | 1.32 | 9 | 162.4 | 0.0 | 162.4 | 4.3 | 48 | 84.3 | 1.0 | -0.35 | 0.0 | 40.6 |
| 4.43 | 5.0E-05 | 0.00 | 161.1 | 2.22 | 7 | 82.1 | 23.4 | 105.5 | 13.3 | 44 | 61.6 | 10.0 | -0.33 | 5.2 | 37.3 |
| 5.41 | 5.0E-05 | 0.00 | 93.7 | 2.34 | 7 | 52.8 | 29.7 | 82.4 | 18.5 | 42 | 49.0 | 10.0 | -0.28 | 6.0 | 26.7 |
| 6.40 | 5.0E-05 | 0.00 | 69.6 | 1.99 | 7 | 42.6 | 28.0 | 70.7 | 19.9 | 40 | 42.8 | 10.0 | -0.22 | 5.5 | 22.2 |
| 7.30 | 5.0E-06 | -0.01 | 32.8 | 2.02 | 7 | 21.8 | 42.3 | 64.1 | 29.7 | UnDef | UnDef | 6.0 | UnDef | 7.5 | 18.1 |
| 8.20 | 5.0E-06 | 0.04 | 13.2 | 1.12 | 6 | 9.7 | 38.7 | 48.4 | 38.9 | UnDef | UnDef | 6.0 | UnDef | 4.7 | 9.5 |
| 9.19 | 1.0E-07 | 0.19 | 8.4 | 0.51 | 6 | 6.7 | 27.0 | 33.7 | 40.8 | UnDef | UnDef | 3.0 | UnDef | 3.3 | 6.6 |
| 0.17 | 5.0E-03 | 0.01 | 149.9 | 0.86 | 9 | 112.6 | 5.6 | 118.1 | 6.8 | 44 | 70.7 | 1.0 | -0.21 | 0.8 | 28.4 |
| 1.15 | 5.0E-03 | 0.00 | 180.6 | 1.06 | 9 | 142.2 | 7.5 | 149.8 | 6.9 | 44 | 77.4 | 1.0 | -0.25 | 1.1 | 35.9 |
| 2.14 | 5.0E-03 | 0.00 | 146.3 | 1.25 | 9 | 120.6 | 15.6 | 136.2 | 9.3 | 44 | 72.6 | 1.0 | -0.25 | 2.3 | 31.8 |
| 3.21 | 5.0E-04 | 0.00 | 97.2 | 1.50 | 9 | 84.0 | 26.3 | 110.3 | 13.9 | 42 | 62.3 | 1.0 | -0.23 | 4.8 | 32.2 |
| 4.27 | 5.0E-04 | 0.00 | 61.2 | 1.60 | 7 | 55.3 | 33.7 | 89.0 | 19.2 | 40 | 50.3 | 1.0 | -0.19 | 5.6 | 23.6 |
| 5.26 | 5.0E-05 | 0.00 | 28.5 | 1.86 | 7 | 27.2 | 61.3 | 88.5 | 31.0 | 36 | 30.0 | 6.0 | -0.12 | 8.1 | 18.8 |
| 6.24 | 5.0E-04 | 0.00 | 54.1 | 1.19 | 7 | 52.3 | 27.5 | 79.8 | 17.9 | 40 | 48.7 | 1.0 | -0.14 | 4.7 | 21.7 |
| 7.22 | 5.0E-03 | 0.00 | 97.4 | 0.70 | 9 | 96.3 | 10.5 | 106.8 | 8.7 | 42 | 66.2 | 1.0 | -0.15 | 1.5 | 25.1 |
| 8.21 | 5.0E-03 | 0.00 | 91.7 | 0.84 | 9 | 93.4 | 15.0 | 108.4 | 10.2 | 42 | 65.3 | 1.0 | -0.16 | 2.2 | 25.0 |
| 9.19 | 5.0E-03 | 0.00 | 69.1 | 0.81 | 9 | 72.5 | 18.3 | 90.8 | 12.5 | 40 | 58.1 | 1.0 | -0.13 | 2.6 | 20.3 |
| 0.18 | 5.0E-03 | 0.00 | 81.3 | 0.91 | 9 | 87.2 | 19.2 | 106.3 | 11.7 | 42 | 63.3 | 1.0 | -0.16 | 2.7 | 24.0 |
| 1.16 | 5.0E-03 | 0.00 | 80.2 | 0.84 | 9 | 87.1 | 17.9 | 105.0 | 11.4 | 42 | 63.3 | 1.0 | -0.15 | 2.5 | 23.9 |
| 2.15 | 5.0E-03 | 0.00 | 51.6 | 0.97 | 7 | 57.2 | 26.4 | 83.5 | 16.8 | 38 | 51.2 | 1.0 | -0.12 | 3.4 | 17.4 |
| 3.13 | 5.0E-04 | 0.00 | 38.1 | 1.01 | 7 | 43.1 | 31.1 | 74.2 | 20.7 | 38 | 43.1 | 1.0 | -0.10 | 5.0 | 19.0 |
| 4.11 | 5.0E-04 | 0.00 | 38.6 | 0.85 | 7 | 44.1 | 26.8 | 70.9 | 19.2 | 38 | 43.8 | 1.0 | -0.08 | 4.5 | 18.8 |
| 5.10 | 5.0E-03 | 0.00 | 46.4 | 0.80 | 7 | 53.3 | 23.9 | 77.2 | 16.6 | 38 | 49.3 | 1.0 | -0.10 | 3.1 | 16.2 |
| 6.08 | 5.0E-03 | 0.00 | 50.4 | 0.88 | 7 | 58.5 | 25.4 | 83.9 | 16.3 | 38 | 51.9 | 1.0 | -0.11 | 3.3 | 17.6 |
| 7.07 | 5.0E-03 | 0.00 | 43.2 | 0.91 | 7 | 50.8 | 28.1 | 78.9 | 18.3 | 38 | 47.9 | 1.0 | -0.10 | 3.6 | 16.0 |
| 8.05 | 5.0E-04 | 0.00 | 36.7 | 0.91 | 7 | 43.8 | 30.5 | 74.3 | 20.4 | 38 | 43.6 | 1.0 | -0.08 | 4.9 | 19.2 |
| 9.04 | 5.0E-04 | 0.00 | 27.3 | 1.06 | 7 | 33.3 | 41.7 | 75.1 | 25.8 | 36 | 35.8 | 1.0 | -0.07 | 5.8 | 16.7 |
| 0.02 | 5.0E-04 | 0.00 | 21.0 | 0.93 | 7 | 26.3 | 45.2 | 71.4 | 28.7 | 34 | 30.0 | 1.0 | -0.03 | 5.6 | 14.2 |
| 1.00 | 5.0E-05 | 0.01 | 17.3 | 1.24 | 6 | 22.1 | 87.0 | 109.0 | 34.9 | 32 | 30.0 | 6.0 | -0.04 | 8.6 | 17.2 |
| 1.99 | 5.0E-04 | 0.02 | 16.2 | 0.91 | 7 | 20.9 | 61.3 | 82.3 | 32.9 | 32 | 30.0 | 1.0 | -0.01 | 6.0 | 12.8 |
| 2.97 | 5.0E-04 | 0.01 | 26.8 | 0.83 | 7 | 34.0 | 35.0 | 69.0 | 24.0 | 36 | 36.3 | 1.0 | -0.05 | 5.2 | 16.2 |
| 3.96 | 5.0E-04 | 0.01 | 25.5 | 0.92 | 7 | 32.7 | 39.8 | 72.5 | 25.6 | 34 | 35.2 | 1.0 | -0.05 | 5.6 | 16.2 |
| 4.94 | 5.0E-05 | 0.01 | 19.3 | 1.66 | 6 | 25.4 | 101.8 | 127.2 | 36.1 | 32 | 30.0 | 6.0 | -0.07 | 10.0 | 19.9 |
| 5.92 | 5.0E-04 | 0.03 | 21.7 | 1.22 | 7 | 28.6 | 63.0 | 91.7 | 30.8 | 34 | 31.4 | 1.0 | -0.06 | 7.1 | 16.4 |
| 6.91 | 5.0E-04 | 0.00 | 28.7 | 1.04 | 7 | 37.6 | 42.5 | 80.1 | 24.9 | 36 | 39.3 | 1.0 | -0.07 | 6.1 | 18.4 |
| 7.89 | 5.0E-04 | 0.00 | 25.1 | 1.04 | 7 | 33.4 | 47.0 | 80.4 | 26.9 | 34 | 35.8 | 1.0 | -0.06 | 6.3 | 17.2 |
| 8.88 | 5.0E-05 | 0.00 | 19.6 | 1.74 | 6 | 26.7 | 106.8 | 133.5 | 36.5 | 34 | 30.0 | 6.0 | -0.08 | 10.5 | 20.9 |
| 9.86 | 5.0E-04 | 0.00 | 30.4 | 0.94 | 7 | 40.7 | 38.3 | 79.1 | 23.2 | 36 | 41.5 | 1.0 | -0.07 | 5.8 | 19.1 |
| 0.85 | 5.0E-04 | 0.00 | 27.2 | 1.21 | 7 | 37.0 | 53.2 | 90.1 | 27.1 | 36 | 38.8 | 1.0 | -0.08 | 7.1 | 19.1 |

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un No: 03-0630-0942-1898
PT File: 151C11.COR



| epth ft) | k (cm/s) | Bq | Qtn | Rfn | SBTn | Qc1N | DeltaQc1N | Qc1Ncs | Fc (%) | Phi (Deg) | Dr (%) | OCR | State Param | Del(n1)60 | (N1)60cs |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1.83 | 5.0E-04 | -0.01 | 25.9 | 1.91 | 6 | 35.6 | 102.4 | 138.0 | 32.8 | 34 | 37.7 | 1.0 | -0.11 | 10.1 | 21.7 |
| 2.81 | 5.0E-04 | 0.00 | 92.5 | 2.14 | 7 | 123.4 | 63.1 | 186.5 | 17.7 | 42 | 73.3 | 1.0 | -0.27 | 10.8 | 51.1 |
| 3.80 | 5.0E-04 | 0.00 | 99.6 | 2.95 | 7 | 133.8 | 93.4 | 227.1 | 20.4 | 42 | 75.6 | 1.0 | -0.33 | 15.1 | 58.7 |
| 4.78 | 5.0E-04 | 0.00 | 59.1 | 2.54 | 7 | 80.7 | 87.1 | 167.7 | 24.4 | 40 | 61.1 | 1.0 | -0.24 | 12.7 | 39.0 |
| 5.77 | 5.0E-05 | 0.00 | 32.6 | 2.95 | 6 | 45.8 | 173.4 | 219.1 | 34.6 | 36 | 44.9 | 6.0 | -0.19 | 17.5 | 35.5 |
| 6.75 | 5.0E-04 | 0.00 | 84.1 | 1.98 | 7 | 115.7 | 60.5 | 176.2 | 17.9 | 42 | 71.4 | 1.0 | -0.24 | 10.3 | 48.1 |
| 7.74 | 5.0E-06 | 0.00 | 23.9 | 3.56 | 6 | 34.5 | 138.2 | 172.7 | 42.6 | UnDef | UnDef | 6.0 | UnDef | 16.9 | 33.8 |
| 8.72 | 5.0E-08 | 0.04 | 6.5 | 4.80 | 1 | 10.9 | UnDef | UnDef | 100.0 | UnDef | UnDef | 3.0 | UnDef | UnDef | UnDef |
| 9.70 | 5.0E-07 | 0.17 | 5.6 | 4.12 | 1 | 9.8 | UnDef | UnDef | 100.0 | UnDef | UnDef | 1.5 | UnDef | UnDef | UnDef |
| 0.69 | 5.0E-07 | 0.07 | 7.5 | 4.51 | 1 | 12.4 | UnDef | UnDef | 100.0 | UnDef | UnDef | 3.0 | UnDef | UnDef | UnDef |
| 1.67 | 5.0E-08 | 0.04 | 6.7 | 4.85 | 1 | 11.5 | UnDef | UnDef | 100.0 | UnDef | UnDef | 3.0 | UnDef | UnDef | UnDef |
| 2.66 | 5.0E-07 | 0.00 | 10.1 | 4.50 | 1 | 16.3 | UnDef | UnDef | 100.0 | UnDef | UnDef | 3.0 | UnDef | UnDef | UnDef |
| 3.64 | 5.0E-08 | -0.03 | 7.1 | 5.02 | 1 | 12.2 | UnDef | UnDef | 100.0 | UnDef | UnDef | 3.0 | UnDef | UnDef | UnDef |
| 4.63 | 5.0E-08 | -0.02 | 4.4 | 5.05 | 1 | 8.3 | UnDef | UnDef | 100.0 | UnDef | UnDef | 1.5 | UnDef | UnDef | UnDef |
| 5.61 | 5.0E-07 | 0.23 | 3.3 | 4.16 | 1 | 6.9 | UnDef | UnDef | 100.0 | UnDef | UnDef | 1.5 | UnDef | UnDef | UnDef |
| 6.59 | 5.0E-06 | 0.39 | 4.6 | 3.17 | 1 | 8.8 | UnDef | UnDef | 100.0 | UnDef | UnDef | 1.5 | UnDef | UnDef | UnDef |
| 7.58 | 5.0E-06 | 0.24 | 5.3 | 3.45 | 1 | 9.9 | UnDef | UnDef | 100.0 | UnDef | UnDef | 1.5 | UnDef | UnDef | UnDef |
| 8.56 | 5.0E-06 | 0.57 | 4.0 | 3.53 | 1 | 8.1 | UnDef | UnDef | 100.0 | UnDef | UnDef | 1.5 | UnDef | UnDef | UnDef |
| 9.55 | 5.0E-05 | 0.24 | 6.1 | 2.27 | 4 | 11.2 | 45.0 | 56.2 | 66.3 | 30 | 30.0 | 1.5 | 0.06 | 4.4 | 8.8 |
| 0.53 | 5.0E-06 | 0.11 | 7.4 | 2.98 | 4 | 13.2 | 52.6 | 65.8 | 65.8 | UnDef | UnDef | 3.0 | UnDef | 6.4 | 12.9 |
| 1.52 | 5.0E-05 | -0.02 | 13.5 | 1.95 | 6 | 22.4 | 89.5 | 111.9 | 45.0 | 32 | 30.0 | 6.0 | -0.05 | 8.8 | 17.5 |
| 2.42 | 5.0E-03 | 0.01 | 50.7 | 0.87 | 7 | 77.7 | 33.0 | 110.8 | 16.2 | 38 | 60.1 | 1.0 | -0.11 | 4.4 | 23.4 |
| 3.32 | 5.0E-02 | 0.00 | 71.1 | 0.86 | 9 | 108.8 | 27.7 | 136.5 | 12.6 | 40 | 69.7 | 1.0 | -0.14 | 3.1 | 24.4 |
| 4.30 | 5.0E-02 | 0.00 | 62.4 | 0.98 | 9 | 96.4 | 34.2 | 130.6 | 14.8 | 40 | 66.2 | 1.0 | -0.14 | 3.7 | 22.6 |
| 5.29 | 5.0E-04 | 0.00 | 34.4 | 1.69 | 7 | 54.5 | 77.9 | 132.4 | 27.0 | 38 | 49.9 | 1.0 | -0.13 | 10.4 | 28.1 |
| 6.27 | 5.0E-02 | 0.00 | 62.2 | 0.85 | 9 | 97.3 | 30.0 | 127.3 | 13.8 | 40 | 66.5 | 1.0 | -0.13 | 3.3 | 22.3 |
| 7.26 | 5.0E-02 | 0.00 | 50.2 | 0.50 | 9 | 79.4 | 0.0 | 79.4 | 5.0 | 38 | 60.7 | 1.0 | -0.07 | 0.0 | 15.5 |
| 8.24 | 5.0E-04 | 0.03 | 15.5 | 1.44 | 6 | 26.4 | 105.6 | 132.1 | 38.5 | 32 | 30.0 | 1.0 | -0.03 | 8.6 | 17.2 |
| 9.22 | 5.0E-05 | 0.47 | 5.3 | 2.32 | 4 | 10.7 | 42.7 | 53.3 | 70.9 | 30 | 30.0 | 1.5 | 0.12 | 4.2 | 8.4 |
| 0.21 | 5.0E-04 | 0.02 | 25.7 | 1.28 | 7 | 42.7 | 71.7 | 114.3 | 28.5 | 34 | 42.9 | 1.0 | -0.08 | 9.0 | 22.9 |
| 1.19 | 5.0E-05 | 0.17 | 8.6 | 2.85 | 4 | 16.0 | 64.0 | 80.0 | 61.2 | 30 | 30.0 | 3.0 | 0.00 | 6.3 | 12.5 |
| 2.18 | 5.0E-05 | 0.04 | 13.2 | 1.98 | 6 | 23.3 | 93.4 | 116.7 | 45.8 | 32 | 30.0 | 6.0 | -0.04 | 9.1 | 18.3 |
| 3.16 | 5.0E-05 | 0.14 | 11.4 | 2.27 | 6 | 20.7 | 82.6 | 103.3 | 50.9 | 30 | 30.0 | 3.0 | -0.02 | 8.1 | 16.2 |
| 4.15 | 5.0E-04 | 0.00 | 22.7 | 2.00 | 6 | 38.8 | 155.2 | 193.9 | 35.6 | 34 | 40.1 | 1.0 | -0.10 | 12.7 | 25.3 |
| 5.13 | 5.0E-05 | 0.04 | 9.9 | 3.13 | 4 | 18.4 | 73.6 | 92.0 | 59.3 | 30 | 30.0 | 3.0 | -0.04 | 7.2 | 14.4 |
| 6.11 | 5.0E-06 | 0.06 | 11.6 | 3.67 | 1 | 21.3 | UnDef | UnDef | 100.0 | UnDef | UnDef | 3.0 | UnDef | UnDef | UnDef |
| 7.10 | 5.0E-05 | 0.01 | 17.0 | 2.88 | 6 | 30.1 | 120.3 | 150.4 | 46.0 | 32 | 32.8 | 6.0 | -0.11 | 11.8 | 23.5 |
| 8.08 | 5.0E-04 | 0.00 | 25.4 | 1.76 | 7 | 43.8 | 115.7 | 159.6 | 32.2 | 34 | 43.6 | 1.0 | -0.10 | 11.9 | 26.2 |
| 9.07 | 5.0E-06 | 0.08 | 11.0 | 3.69 | 1 | 20.6 | UnDef | UnDef | 100.0 | UnDef | UnDef | 3.0 | UnDef | UnDef | UnDef |
| 0.05 | 5.0E-03 | -0.01 | 33.8 | 1.60 | 7 | 58.1 | 80.3 | 138.4 | 26.7 | 36 | 51.7 | 1.0 | -0.13 | 8.1 | 22.3 |
| 1.04 | 5.0E-03 | -0.02 | 36.5 | 1.23 | 7 | 62.9 | 58.5 | 121.4 | 23.0 | 38 | 54.0 | 1.0 | -0.11 | 6.6 | 22.0 |
| 2.02 | 5.0E-03 | -0.02 | 33.0 | 1.03 | 7 | 57.4 | 52.2 | 109.7 | 22.8 | 36 | 51.4 | 1.0 | -0.09 | 6.0 | 20.0 |
| 3.00 | 5.0E-03 | -0.01 | 41.8 | 1.46 | 7 | 72.3 | 66.1 | 138.4 | 22.9 | 38 | 58.0 | 1.0 | -0.14 | 7.5 | 25.2 |
| 3.99 | 5.0E-03 | -0.01 | 39.9 | 1.35 | 7 | 69.6 | 62.5 | 132.0 | 22.7 | 38 | 56.9 | 1.0 | -0.13 | 7.2 | 24.2 |
| 4.97 | 5.0E-03 | 0.00 | 51.8 | 1.30 | 7 | 89.8 | 54.7 | 144.5 | 19.2 | 38 | 64.2 | 1.0 | -0.15 | 6.8 | 28.8 |
| 5.96 | 5.0E-02 | -0.01 | 75.3 | 0.78 | 9 | 129.9 | 27.1 | 157.1 | 11.5 | 40 | 74.8 | 1.0 | -0.14 | 3.1 | 28.5 |
| 6.94 | 5.0E-02 | 0.00 | 76.7 | 0.70 | 9 | 133.0 | 23.5 | 156.6 | 10.6 | 40 | 75.5 | 1.0 | -0.13 | 2.7 | 28.7 |
| 7.93 | 5.0E-03 | 0.00 | 56.1 | 1.23 | 7 | 98.6 | 50.8 | 149.4 | 17.7 | 40 | 66.9 | 1.0 | -0.15 | 6.5 | 30.7 |
| 8.91 | 5.0E-02 | 0.00 | 82.2 | 1.10 | 9 | 143.8 | 39.1 | 182.9 | 13.0 | 42 | 77.7 | 1.0 | -0.18 | 4.3 | 32.5 |
| 9.89 | 5.0E-02 | 0.00 | 81.4 | 1.03 | 9 | 143.1 | 36.6 | 179.7 | 12.6 | 42 | 77.5 | 1.0 | -0.17 | 4.1 | 32.1 |
| 0.88 | 5.0E-02 | 0.00 | 76.7 | 0.93 | 9 | 135.7 | 33.9 | 169.6 | 12.5 | 40 | 76.0 | 1.0 | -0.16 | 3.8 | 30.4 |
| 1.86 | 5.0E-02 | 0.00 | 94.1 | 0.89 | 9 | 166.6 | 27.8 | 194.4 | 10.4 | 42 | 81.9 | 1.0 | -0.17 | 3.2 | 35.8 |

regg In Situ, Inc.
nterpretation Output - Release 1.00.19e
un No: 03-0630-0942-1953
ob No: 03-151SH
lient: URS
roject: CPT SITE INVESTIGATION
ite: PIER T LNG
ocation: CPT-12
ngineer: T. O'BRIEN
PT Date: 03/24/06
PT Time: 07:10
PT File: 151C12.COR
orthing (m): 0.000
asting (m): 0.000
levation (m): 0.000

Water Table (m): 6.10 (ft): 20.0
Su Nkt used: 12.50
Averaging Increment (m): 0.30
Phi Method : Robertson and Campanella, 1983
Dr Method : Jamiolkowski - All Sands
State Parameter M: 1.20
Used Unit Weights Assigned to Soil Zones
Values of 1.0E9 or UnDef are printed for parameters that are not valid for the material type (SBT)

| epth ft) | AvgQt (tsf) | AvgFs (tsf) | AvgRf (%) | AvgUd (ft) | SBT | U.Wt. pcf | TStress (tsf) | EStress (tsf) | Ueq (tsf) | Cn | N60 | (N1)60 (blows/ft) | Su (tsf) | CRR |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 0.49 | 16.9 | 0.38 | 2.23 | 0.7 | 5 | 114.6 | 0.03 | 0.03 | 0.00 | 2.00 | 8.1 | 16.2 | 1.35 | 0.00 |
| 1.48 | 156.7 | 1.46 | 0.93 | 3.9 | 9 | 124.1 | 0.09 | 0.09 | 0.00 | 2.00 | 30.0 | 60.0 | UnDef | 0.00 |
| 2.46 | 188.2 | 2.32 | 1.23 | 7.0 | 8 | 120.9 | 0.15 | 0.15 | 0.00 | 2.00 | 45.1 | 90.1 | UnDef | 0.00 |
| 3.44 | 221.0 | 2.75 | 1.24 | 6.2 | 8 | 120.9 | 0.21 | 0.21 | 0.00 | 2.00 | 52.9 | 105.8 | UnDef | 0.00 |
| 4.43 | 109.7 | 2.20 | 2.01 | 5.6 | 7 | 117.8 | 0.27 | 0.27 | 0.00 | 1.94 | 35.0 | 67.9 | UnDef | 0.00 |
| 5.41 | 76.7 | 0.96 | 1.25 | 2.0 | 8 | 120.9 | 0.32 | 0.32 | 0.00 | 1.76 | 18.4 | 32.2 | UnDef | 0.32 |
| 6.40 | 75.8 | 0.80 | 1.06 | 1.2 | 8 | 120.9 | 0.38 | 0.38 | 0.00 | 1.61 | 18.1 | 29.3 | UnDef | 0.26 |
| 7.30 | 74.8 | 0.81 | 1.08 | 0.9 | 8 | 120.9 | 0.44 | 0.44 | 0.00 | 1.51 | 17.9 | 27.0 | UnDef | 0.23 |
| 8.20 | 61.2 | 0.65 | 1.06 | 1.0 | 7 | 117.8 | 0.49 | 0.49 | 0.00 | 1.43 | 19.5 | 27.8 | UnDef | 0.16 |
| 9.19 | 65.0 | 0.62 | 0.95 | -0.5 | 8 | 120.9 | 0.55 | 0.55 | 0.00 | 1.35 | 15.6 | 21.0 | UnDef | 0.16 |
| 0.17 | 39.2 | 0.47 | 1.21 | -1.7 | 7 | 117.8 | 0.61 | 0.61 | 0.00 | 1.28 | 12.5 | 16.0 | UnDef | 0.11 |
| 1.15 | 36.9 | 0.37 | 1.01 | -1.7 | 7 | 117.8 | 0.67 | 0.67 | 0.00 | 1.22 | 11.8 | 14.4 | UnDef | 0.10 |
| 2.14 | 30.5 | 0.33 | 1.09 | -1.3 | 7 | 117.8 | 0.73 | 0.73 | 0.00 | 1.17 | 9.7 | 11.4 | UnDef | 0.10 |
| 3.21 | 27.4 | 0.32 | 1.16 | -1.5 | 6 | 114.6 | 0.79 | 0.79 | 0.00 | 1.13 | 10.5 | 11.8 | 2.13 | 0.10 |
| 4.27 | 24.9 | 0.26 | 1.04 | -1.9 | 6 | 114.6 | 0.85 | 0.85 | 0.00 | 1.09 | 9.6 | 10.4 | 1.93 | 0.10 |
| 5.26 | 19.8 | 0.25 | 1.24 | -2.1 | 6 | 114.6 | 0.90 | 0.90 | 0.00 | 1.05 | 7.6 | 8.0 | 1.51 | 0.12 |
| 6.24 | 7.2 | 0.08 | 1.11 | 6.0 | 5 | 114.6 | 0.96 | 0.96 | 0.00 | 1.02 | 3.4 | 3.5 | 0.50 | 0.08 |
| 7.22 | 6.2 | 0.08 | 1.27 | 29.9 | 5 | 114.6 | 1.02 | 1.02 | 0.00 | 0.99 | 3.0 | 3.0 | 0.42 | 0.08 |
| 8.21 | 133.6 | 0.78 | 0.58 | 21.0 | 9 | 124.1 | 1.08 | 1.08 | 0.00 | 0.96 | 25.6 | 24.7 | UnDef | 0.28 |
| 9.19 | 200.0 | 1.50 | 0.75 | 7.1 | 9 | 124.1 | 1.14 | 1.14 | 0.00 | 0.94 | 38.3 | 35.9 | UnDef | 0.00 |
| 0.18 | 185.8 | 1.50 | 0.81 | 2.4 | 9 | 124.1 | 1.20 | 1.19 | 0.01 | 0.92 | 35.6 | 32.6 | UnDef | 0.00 |
| 1.16 | 162.4 | 1.29 | 0.80 | 1.7 | 9 | 124.1 | 1.26 | 1.22 | 0.04 | 0.90 | 31.1 | 28.1 | UnDef | 0.41 |
| 2.15 | 119.6 | 1.19 | 0.99 | 2.6 | 8 | 120.9 | 1.32 | 1.25 | 0.07 | 0.89 | 28.6 | 25.6 | UnDef | 0.26 |
| 3.13 | 96.6 | 0.86 | 0.89 | 2.0 | 8 | 120.9 | 1.38 | 1.28 | 0.10 | 0.88 | 23.1 | 20.4 | UnDef | 0.19 |
| 4.11 | 72.3 | 0.67 | 0.92 | 2.1 | 8 | 120.9 | 1.44 | 1.31 | 0.13 | 0.87 | 17.3 | 15.1 | UnDef | 0.14 |
| 5.10 | 43.9 | 0.45 | 1.03 | 3.8 | 7 | 117.8 | 1.50 | 1.34 | 0.16 | 0.86 | 14.0 | 12.1 | UnDef | 0.12 |
| 6.08 | 19.4 | 0.38 | 1.94 | 10.3 | 6 | 114.6 | 1.55 | 1.36 | 0.19 | 0.86 | 7.4 | 6.4 | 1.43 | 0.13 |
| 7.07 | 30.7 | 0.35 | 1.13 | 13.5 | 7 | 117.8 | 1.61 | 1.39 | 0.22 | 0.85 | 9.8 | 8.3 | UnDef | 0.14 |
| 8.05 | 19.9 | 0.22 | 1.08 | 31.4 | 6 | 114.6 | 1.67 | 1.42 | 0.25 | 0.84 | 7.6 | 6.4 | 1.46 | 0.13 |
| 9.04 | 45.4 | 0.34 | 0.76 | 21.5 | 7 | 117.8 | 1.73 | 1.44 | 0.28 | 0.83 | 14.5 | 12.1 | UnDef | 0.11 |
| 0.02 | 37.3 | 0.39 | 1.04 | 16.6 | 7 | 117.8 | 1.78 | 1.47 | 0.31 | 0.82 | 11.9 | 9.8 | UnDef | 0.12 |
| 1.00 | 34.8 | 0.33 | 0.94 | 17.2 | 7 | 117.8 | 1.84 | 1.50 | 0.34 | 0.82 | 11.1 | 9.1 | UnDef | 0.12 |
| 1.99 | 28.6 | 0.37 | 1.30 | 22.1 | 6 | 114.6 | 1.90 | 1.53 | 0.37 | 0.81 | 11.0 | 8.9 | 2.14 | 0.22 |
| 2.97 | 25.4 | 0.28 | 1.11 | 24.5 | 6 | 114.6 | 1.96 | 1.55 | 0.41 | 0.80 | 9.7 | 7.8 | 1.88 | 0.17 |
| 3.96 | 33.9 | 0.34 | 1.00 | 32.2 | 7 | 117.8 | 2.01 | 1.58 | 0.44 | 0.80 | 10.8 | 8.6 | UnDef | 0.13 |
| 4.94 | 34.6 | 0.30 | 0.88 | 24.6 | 7 | 117.8 | 2.07 | 1.60 | 0.47 | 0.79 | 11.1 | 8.7 | UnDef | 0.12 |
| 5.92 | 28.3 | 0.35 | 1.24 | 38.7 | 6 | 114.6 | 2.13 | 1.63 | 0.50 | 0.78 | 10.9 | 8.5 | 2.10 | 0.20 |
| 6.91 | 43.2 | 0.43 | 0.99 | 37.7 | 7 | 117.8 | 2.19 | 1.66 | 0.53 | 0.78 | 13.8 | 10.7 | UnDef | 0.13 |
| 7.89 | 23.2 | 0.34 | 1.46 | 42.0 | 6 | 114.6 | 2.24 | 1.68 | 0.56 | 0.77 | 8.9 | 6.9 | 1.68 | 0.14 |
| 8.88 | 16.9 | 0.37 | 2.19 | 52.4 | 5 | 114.6 | 2.30 | 1.71 | 0.59 | 0.76 | 8.1 | 6.2 | 1.17 | 0.10 |
| 9.86 | 52.5 | 0.38 | 0.73 | 30.1 | 8 | 120.9 | 2.36 | 1.74 | 0.62 | 0.76 | 12.6 | 9.5 | UnDef | 0.12 |
| 1.85 | 57.9 | 0.60 | 1.03 | 35.0 | 7 | 117.8 | 2.42 | 1.76 | 0.65 | 0.75 | 18.5 | 13.0 | UnDef | 0.14 |

regg In Situ, Inc.
un No: 03-0630-0942-1953
PT File: 151C12.COR



| epth ft) | AvgQt (tsf) | AvgFs (tsf) | AvgRf (%) | AvgUd (ft) | SBT | U.Wt. pcf | IStress (tsf) | EStress (tsf) | Ueq (tsf) | Cn | N60 (blows/ft) | (N1)60 (blows/ft) | Su (tsf) | CRR |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1.83 | 56.7 | 0.53 | 0.94 | 18.8 | 7 | 117.8 | 2.47 | 1.79 | 0.68 | 0.75 | 18.1 | 13.5 | UnDef | 0.13 |
| 2.81 | 23.2 | 0.74 | 3.18 | 35.3 | 5 | 114.6 | 2.53 | 1.82 | 0.71 | 0.74 | 11.1 | 8.2 | 1.66 | 0.00 |
| 3.80 | 16.2 | 0.29 | 1.77 | 115.3 | 6 | 114.6 | 2.59 | 1.84 | 0.74 | 0.74 | 6.2 | 4.6 | 1.09 | 0.10 |
| 4.78 | 45.0 | 0.68 | 1.50 | 34.7 | 7 | 117.8 | 2.64 | 1.87 | 0.77 | 0.73 | 14.4 | 10.5 | UnDef | 0.27 |
| 5.77 | 55.4 | 0.79 | 1.43 | 5.1 | 7 | 117.8 | 2.70 | 1.90 | 0.80 | 0.73 | 17.7 | 12.8 | UnDef | 0.20 |
| 6.75 | 24.9 | 0.47 | 1.89 | 8.0 | 6 | 114.6 | 2.76 | 1.92 | 0.84 | 0.72 | 9.5 | 6.9 | 1.77 | 0.14 |
| 7.74 | 22.0 | 0.70 | 3.20 | 21.9 | 5 | 114.6 | 2.82 | 1.95 | 0.87 | 0.72 | 10.5 | 7.5 | 1.53 | 0.00 |
| 8.72 | 22.4 | 1.00 | 4.47 | 12.5 | 3 | 111.4 | 2.87 | 1.97 | 0.90 | 0.71 | 21.5 | 15.3 | 1.56 | 0.00 |
| 9.70 | 17.9 | 0.66 | 3.67 | 8.3 | 4 | 114.6 | 2.93 | 2.00 | 0.93 | 0.71 | 11.4 | 8.1 | 1.20 | 0.00 |
| 0.69 | 23.5 | 0.79 | 3.37 | 8.9 | 5 | 114.6 | 2.98 | 2.03 | 0.96 | 0.70 | 11.3 | 7.9 | 1.64 | 0.00 |
| 1.67 | 34.5 | 1.67 | 4.84 | 8.0 | 3 | 111.4 | 3.04 | 2.05 | 0.99 | 0.70 | 33.1 | 23.1 | 2.52 | 0.00 |
| 2.66 | 22.6 | 1.04 | 4.61 | 8.6 | 3 | 111.4 | 3.09 | 2.07 | 1.02 | 0.69 | 21.7 | 15.0 | 1.56 | 0.00 |
| 3.64 | 22.6 | 0.45 | 2.01 | 11.4 | 6 | 114.6 | 3.15 | 2.10 | 1.05 | 0.69 | 8.6 | 6.0 | 1.55 | 0.12 |
| 4.63 | 27.3 | 0.46 | 1.68 | 29.1 | 6 | 114.6 | 3.21 | 2.12 | 1.08 | 0.69 | 10.5 | 7.2 | 1.93 | 0.15 |
| 5.61 | 58.4 | 0.67 | 1.15 | 23.0 | 7 | 117.8 | 3.26 | 2.15 | 1.11 | 0.68 | 18.6 | 12.7 | UnDef | 0.18 |
| 6.59 | 22.2 | 0.49 | 2.18 | 18.6 | 6 | 114.6 | 3.32 | 2.18 | 1.14 | 0.68 | 8.5 | 5.8 | 1.51 | 0.12 |
| 7.58 | 19.2 | 0.27 | 1.41 | 68.4 | 6 | 114.6 | 3.38 | 2.20 | 1.17 | 0.67 | 7.3 | 4.9 | 1.26 | 0.10 |
| 8.56 | 20.9 | 0.33 | 1.59 | 85.6 | 6 | 114.6 | 3.43 | 2.23 | 1.20 | 0.67 | 8.0 | 5.4 | 1.40 | 0.11 |
| 9.55 | 14.0 | 0.25 | 1.78 | 138.3 | 5 | 114.6 | 3.49 | 2.25 | 1.23 | 0.67 | 6.7 | 4.5 | 0.84 | 0.09 |
| 0.53 | 67.3 | 0.52 | 0.78 | 74.3 | 8 | 120.9 | 3.55 | 2.28 | 1.27 | 0.66 | 16.1 | 10.7 | UnDef | 0.14 |
| 1.52 | 87.8 | 0.88 | 1.01 | 28.7 | 8 | 120.9 | 3.61 | 2.31 | 1.30 | 0.66 | 21.0 | 13.8 | UnDef | 0.18 |
| 2.42 | 133.5 | 1.16 | 0.87 | 23.4 | 9 | 124.1 | 3.66 | 2.34 | 1.32 | 0.65 | 25.6 | 16.7 | UnDef | 0.23 |
| 3.32 | 168.3 | 1.44 | 0.85 | 30.9 | 9 | 124.1 | 3.72 | 2.37 | 1.35 | 0.65 | 32.2 | 21.0 | UnDef | 0.31 |
| 4.30 | 162.7 | 1.08 | 0.67 | 32.5 | 9 | 124.1 | 3.78 | 2.40 | 1.38 | 0.65 | 31.2 | 20.1 | UnDef | 0.26 |
| 5.29 | 138.5 | 1.33 | 0.96 | 29.1 | 9 | 124.1 | 3.84 | 2.43 | 1.41 | 0.64 | 26.5 | 17.0 | UnDef | 0.26 |
| 6.27 | 156.2 | 1.37 | 0.88 | 39.2 | 9 | 124.1 | 3.90 | 2.46 | 1.44 | 0.64 | 29.9 | 19.1 | UnDef | 0.28 |
| 7.26 | 42.7 | 0.79 | 1.84 | 99.4 | 7 | 117.8 | 3.96 | 2.49 | 1.48 | 0.63 | 13.6 | 8.6 | UnDef | 0.30 |
| 8.24 | 43.4 | 0.51 | 1.18 | 128.6 | 7 | 117.8 | 4.02 | 2.51 | 1.51 | 0.63 | 13.8 | 8.7 | UnDef | 0.30 |
| 9.22 | 54.4 | 0.68 | 1.26 | 40.2 | 7 | 117.8 | 4.08 | 2.54 | 1.54 | 0.63 | 17.4 | 10.9 | UnDef | 0.33 |
| 0.21 | 33.5 | 0.69 | 2.05 | 56.2 | 6 | 114.6 | 4.13 | 2.57 | 1.57 | 0.62 | 12.8 | 8.0 | 2.35 | 0.18 |
| 1.19 | 28.4 | 0.57 | 1.99 | 88.1 | 6 | 114.6 | 4.19 | 2.59 | 1.60 | 0.62 | 10.9 | 6.8 | 1.94 | 0.14 |
| 2.18 | 52.7 | 0.79 | 1.49 | 75.3 | 7 | 117.8 | 4.25 | 2.62 | 1.63 | 0.62 | 16.8 | 10.4 | UnDef | 0.46 |
| 3.16 | 50.5 | 0.62 | 1.24 | 51.6 | 7 | 117.8 | 4.31 | 2.65 | 1.66 | 0.61 | 16.1 | 9.9 | UnDef | 0.41 |
| 4.15 | 25.5 | 0.58 | 2.28 | 92.0 | 6 | 114.6 | 4.36 | 2.67 | 1.69 | 0.61 | 9.8 | 6.0 | 1.69 | 0.12 |
| 5.13 | 26.5 | 0.63 | 2.37 | 123.3 | 6 | 114.6 | 4.42 | 2.70 | 1.72 | 0.61 | 10.2 | 6.2 | 1.77 | 0.13 |
| 6.11 | 34.2 | 0.61 | 1.79 | 98.3 | 6 | 114.6 | 4.48 | 2.72 | 1.75 | 0.61 | 13.1 | 7.9 | 2.38 | 0.18 |
| 7.10 | 113.5 | 1.26 | 1.11 | 72.9 | 8 | 120.9 | 4.53 | 2.75 | 1.78 | 0.60 | 27.2 | 16.4 | UnDef | 0.24 |
| 8.08 | 165.0 | 1.76 | 1.06 | 34.0 | 9 | 124.1 | 4.59 | 2.78 | 1.81 | 0.60 | 31.6 | 19.0 | UnDef | 0.33 |
| 9.07 | 119.2 | 1.84 | 1.54 | 46.2 | 8 | 120.9 | 4.65 | 2.81 | 1.84 | 0.60 | 28.5 | 17.0 | UnDef | 0.35 |
| 0.05 | 40.0 | 1.37 | 3.43 | 87.8 | 5 | 114.6 | 4.71 | 2.84 | 1.87 | 0.59 | 19.2 | 11.4 | 2.82 | 0.00 |
| 1.04 | 176.1 | 1.72 | 0.98 | 66.0 | 9 | 124.1 | 4.77 | 2.86 | 1.91 | 0.59 | 33.7 | 19.9 | UnDef | 0.34 |
| 2.02 | 198.0 | 1.88 | 0.95 | 30.1 | 9 | 124.1 | 4.83 | 2.90 | 1.94 | 0.59 | 37.9 | 22.3 | UnDef | 0.40 |
| 3.00 | 222.8 | 2.11 | 0.95 | 30.8 | 9 | 124.1 | 4.89 | 2.93 | 1.97 | 0.58 | 42.7 | 25.0 | UnDef | 0.00 |
| 3.99 | 220.3 | 2.04 | 0.93 | 32.4 | 9 | 124.1 | 4.95 | 2.96 | 2.00 | 0.58 | 42.2 | 24.5 | UnDef | 0.46 |
| 4.97 | 228.0 | 1.98 | 0.87 | 30.4 | 9 | 124.1 | 5.01 | 2.99 | 2.03 | 0.58 | 43.7 | 25.3 | UnDef | 0.00 |
| 5.96 | 218.2 | 1.92 | 0.88 | 41.5 | 9 | 124.1 | 5.08 | 3.02 | 2.06 | 0.58 | 41.8 | 24.1 | UnDef | 0.44 |
| 6.94 | 245.0 | 1.96 | 0.80 | 41.0 | 9 | 124.1 | 5.14 | 3.05 | 2.09 | 0.57 | 46.9 | 26.9 | UnDef | 0.00 |
| 7.93 | 218.8 | 1.67 | 0.76 | 40.2 | 9 | 124.1 | 5.20 | 3.08 | 2.12 | 0.57 | 41.9 | 23.9 | UnDef | 0.40 |
| 8.91 | 283.3 | 2.11 | 0.75 | 48.2 | 9 | 124.1 | 5.26 | 3.11 | 2.15 | 0.57 | 54.3 | 30.8 | UnDef | 0.00 |
| 9.89 | 274.7 | 1.65 | 0.60 | 43.9 | 9 | 124.1 | 5.32 | 3.14 | 2.18 | 0.56 | 52.6 | 29.7 | UnDef | 0.00 |
| 0.88 | 271.8 | 1.46 | 0.54 | 33.8 | 10 | 127.3 | 5.38 | 3.17 | 2.21 | 0.56 | 43.4 | 24.4 | UnDef | 0.00 |
| 1.86 | 284.5 | 1.29 | 0.45 | 34.8 | 10 | 127.3 | 5.44 | 3.20 | 2.24 | 0.56 | 45.4 | 25.4 | UnDef | 0.43 |
| 2.85 | 260.0 | 1.41 | 0.54 | 34.6 | 9 | 124.1 | 5.51 | 3.23 | 2.27 | 0.56 | 49.8 | 27.7 | UnDef | 0.45 |
| 3.83 | 275.4 | 1.70 | 0.62 | 31.4 | 9 | 124.1 | 5.57 | 3.26 | 2.31 | 0.55 | 52.7 | 29.2 | UnDef | 0.00 |
| 4.82 | 214.6 | 1.44 | 0.67 | 26.2 | 9 | 124.1 | 5.63 | 3.29 | 2.34 | 0.55 | 41.1 | 22.7 | UnDef | 0.36 |
| 5.80 | 162.2 | 1.86 | 1.15 | 28.6 | 8 | 120.9 | 5.69 | 3.32 | 2.37 | 0.55 | 38.8 | 21.3 | UnDef | 0.35 |
| 6.78 | 207.7 | 2.14 | 1.03 | 22.4 | 9 | 124.1 | 5.75 | 3.35 | 2.40 | 0.55 | 39.8 | 21.7 | UnDef | 0.43 |
| 7.77 | 261.9 | 2.00 | 0.76 | 19.7 | 9 | 124.1 | 5.81 | 3.38 | 2.43 | 0.54 | 50.2 | 27.3 | UnDef | 0.00 |
| 8.75 | 240.3 | 1.74 | 0.72 | 21.9 | 9 | 124.1 | 5.87 | 3.41 | 2.46 | 0.54 | 46.0 | 24.9 | UnDef | 0.44 |

regg In Situ, Inc.
nterpretation Output - Release 1.00.19e



un No: 03-0630-0942-1953
ob No: 03-151SH
lient: URS
roject: CPT SITE INVESTIGATION
ite: PIER T LNG
ocation: CPT-12
ngineer: T. O'BRIEN
PT Date: 03/24/06
PT Time: 07:10
PT File: 151C12.COR
orthing (m): 0.000
asting (m): 0.000
levation (m): 0.000

Water Table (m): 6.10 (ft): 20.0
Su Nkt used: 12.50
Averaging Increment (m): 0.30
Phi Method : Robertson and Campanella, 1983
Dr Method : Jamiolkowski - All Sands
State Parameter M: 1.20
Used Unit Weights Assigned to Soil Zones
Values of 1.0E9 or UnDef are printed for parameters that are not valid for the material type (SBT)

| epth ft) | k (cm/s) | Bq | Qtn | Rfn | SBTn | Qc1N | DeltaQc1N | Qc1Ncs | Fc (%) | Phi (Deg) | Dr (%) | OCR | State Param | Del(n1)60 | (N1)60cs |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 0.49 | 5.0E-06 | 0.00 | 598.7 | 2.23 | 12 | 32.4 | UnDef | UnDef | 0.0 | UnDef | UnDef | 10.0 | UnDef | UnDef | UnDef |
| 1.48 | 5.0E-02 | 0.00 | 1000.0 | 0.93 | 10 | 300.2 | 0.0 | 300.2 | 0.2 | 50 | 95.0 | 1.0 | -0.40 | 0.0 | 60.0 |
| 2.46 | 5.0E-03 | 0.00 | 1000.0 | 1.23 | 9 | 360.4 | 0.0 | 360.4 | 1.4 | 50 | 95.0 | 1.0 | -0.43 | 0.0 | 90.1 |
| 3.44 | 5.0E-03 | 0.00 | 1000.0 | 1.24 | 9 | 423.3 | 0.0 | 423.3 | 1.5 | 50 | 95.0 | 1.0 | -0.43 | 0.0 | 105.8 |
| 4.43 | 5.0E-04 | 0.00 | 412.0 | 2.01 | 12 | 208.3 | UnDef | UnDef | 0.0 | 48 | 88.3 | 1.0 | -0.42 | UnDef | UnDef |
| 5.41 | 5.0E-03 | 0.00 | 235.4 | 1.25 | 9 | 131.7 | 5.1 | 136.9 | 6.4 | 46 | 75.2 | 1.0 | -0.29 | 0.8 | 33.0 |
| 6.40 | 5.0E-03 | 0.00 | 196.5 | 1.07 | 9 | 119.8 | 4.6 | 124.4 | 6.4 | 46 | 72.4 | 1.0 | -0.26 | 0.7 | 30.0 |
| 7.30 | 5.0E-03 | 0.00 | 169.6 | 1.09 | 9 | 110.5 | 7.7 | 118.2 | 7.4 | 44 | 70.1 | 1.0 | -0.25 | 1.1 | 28.2 |
| 8.20 | 5.0E-04 | 0.00 | 123.3 | 1.07 | 9 | 85.4 | 11.5 | 96.9 | 9.5 | 42 | 62.7 | 1.0 | -0.21 | 2.2 | 30.1 |
| 9.19 | 5.0E-03 | 0.00 | 116.9 | 0.96 | 9 | 85.7 | 10.6 | 96.3 | 9.1 | 42 | 62.8 | 1.0 | -0.20 | 1.6 | 22.5 |
| 0.17 | 5.0E-04 | 0.00 | 63.3 | 1.23 | 7 | 49.2 | 21.6 | 70.7 | 16.4 | 40 | 46.9 | 1.0 | -0.16 | 3.8 | 19.8 |
| 1.15 | 5.0E-04 | 0.00 | 54.3 | 1.03 | 7 | 44.2 | 20.0 | 64.2 | 16.7 | 40 | 43.9 | 1.0 | -0.13 | 3.5 | 17.9 |
| 2.14 | 5.0E-04 | 0.00 | 41.0 | 1.12 | 7 | 35.0 | 25.3 | 60.3 | 20.7 | 38 | 37.2 | 1.0 | -0.11 | 4.1 | 15.5 |
| 3.21 | 5.0E-05 | 0.00 | 33.8 | 1.20 | 7 | 30.2 | 30.7 | 60.9 | 23.9 | 36 | 33.0 | 6.0 | -0.10 | 5.4 | 17.3 |
| 4.27 | 5.0E-05 | 0.00 | 28.4 | 1.07 | 7 | 26.5 | 31.5 | 58.0 | 25.3 | 36 | 30.0 | 6.0 | -0.07 | 5.3 | 15.7 |
| 5.26 | 5.0E-05 | 0.00 | 20.8 | 1.30 | 7 | 20.3 | 53.4 | 73.8 | 32.1 | 34 | 30.0 | 6.0 | -0.06 | 6.6 | 14.6 |
| 6.24 | 5.0E-06 | 0.03 | 6.5 | 1.29 | 4 | 7.2 | 28.7 | 35.8 | 56.7 | UnDef | UnDef | 3.0 | UnDef | 3.5 | 7.0 |
| 7.22 | 5.0E-06 | 0.18 | 5.1 | 1.52 | 4 | 6.0 | 24.1 | 30.1 | 65.3 | UnDef | UnDef | 1.5 | UnDef | 3.0 | 5.9 |
| 8.21 | 5.0E-02 | 0.00 | 123.1 | 0.59 | 9 | 126.0 | 3.6 | 129.7 | 6.1 | 42 | 73.9 | 1.0 | -0.16 | 0.4 | 25.1 |
| 9.19 | 5.0E-02 | 0.00 | 174.8 | 0.76 | 9 | 183.5 | 0.8 | 184.3 | 5.2 | 44 | 84.7 | 1.0 | -0.21 | 0.1 | 36.0 |
| 0.18 | 5.0E-02 | 0.00 | 154.7 | 0.81 | 9 | 166.5 | 5.8 | 172.3 | 6.3 | 44 | 81.9 | 1.0 | -0.21 | 0.7 | 33.3 |
| 1.16 | 5.0E-02 | 0.00 | 131.7 | 0.80 | 9 | 143.7 | 9.1 | 152.8 | 7.2 | 44 | 77.7 | 1.0 | -0.19 | 1.1 | 29.2 |
| 2.15 | 5.0E-03 | 0.00 | 94.4 | 1.00 | 9 | 104.5 | 20.5 | 125.0 | 11.1 | 42 | 68.5 | 1.0 | -0.18 | 2.9 | 28.5 |
| 3.13 | 5.0E-03 | 0.00 | 74.3 | 0.90 | 9 | 83.5 | 21.1 | 104.6 | 12.5 | 40 | 62.1 | 1.0 | -0.15 | 2.9 | 23.4 |
| 4.11 | 5.0E-03 | 0.00 | 54.1 | 0.94 | 7 | 61.8 | 25.8 | 87.6 | 16.0 | 40 | 53.5 | 1.0 | -0.12 | 3.4 | 18.5 |
| 5.10 | 5.0E-04 | 0.00 | 31.7 | 1.07 | 7 | 37.1 | 37.2 | 74.3 | 23.7 | 36 | 38.9 | 1.0 | -0.08 | 5.5 | 17.6 |
| 6.08 | 5.0E-05 | 0.01 | 13.1 | 2.11 | 6 | 16.2 | 65.0 | 81.2 | 46.9 | 30 | 30.0 | 6.0 | -0.05 | 6.4 | 12.7 |
| 7.07 | 5.0E-04 | 0.01 | 20.9 | 1.20 | 7 | 25.5 | 59.1 | 84.6 | 31.2 | 34 | 30.0 | 1.0 | -0.05 | 6.5 | 14.8 |
| 8.05 | 5.0E-05 | 0.04 | 12.9 | 1.18 | 6 | 16.4 | 65.5 | 81.9 | 40.0 | 30 | 30.0 | 6.0 | 0.00 | 6.4 | 12.8 |
| 9.04 | 5.0E-04 | 0.01 | 30.2 | 0.79 | 7 | 37.0 | 30.3 | 67.2 | 21.9 | 36 | 38.7 | 1.0 | -0.05 | 4.7 | 16.8 |
| 0.02 | 5.0E-04 | 0.01 | 24.2 | 1.10 | 7 | 30.1 | 47.8 | 78.0 | 28.0 | 34 | 32.9 | 1.0 | -0.06 | 6.1 | 15.9 |
| 1.00 | 5.0E-04 | 0.01 | 22.0 | 0.99 | 7 | 27.8 | 46.9 | 74.7 | 28.5 | 34 | 30.6 | 1.0 | -0.04 | 5.9 | 14.9 |
| 1.99 | 5.0E-05 | 0.01 | 17.5 | 1.40 | 6 | 22.7 | 90.8 | 113.5 | 35.9 | 32 | 30.0 | 6.0 | -0.05 | 8.9 | 17.8 |
| 2.97 | 5.0E-05 | 0.02 | 15.1 | 1.20 | 6 | 20.0 | 79.9 | 99.9 | 37.0 | 32 | 30.0 | 6.0 | -0.02 | 7.8 | 15.6 |
| 3.96 | 5.0E-04 | 0.02 | 20.2 | 1.06 | 7 | 26.4 | 56.6 | 83.1 | 30.5 | 34 | 30.0 | 1.0 | -0.04 | 6.4 | 15.0 |
| 4.94 | 5.0E-04 | 0.01 | 20.3 | 0.93 | 7 | 26.8 | 49.4 | 76.2 | 29.3 | 34 | 30.0 | 1.0 | -0.03 | 6.0 | 14.7 |
| 5.92 | 5.0E-05 | 0.03 | 16.1 | 1.34 | 6 | 21.7 | 86.8 | 108.6 | 37.1 | 32 | 30.0 | 6.0 | -0.03 | 8.5 | 17.0 |
| 6.91 | 5.0E-04 | 0.02 | 24.7 | 1.04 | 7 | 32.8 | 47.5 | 80.3 | 27.1 | 34 | 35.3 | 1.0 | -0.06 | 6.3 | 17.0 |
| 7.89 | 5.0E-05 | 0.04 | 12.5 | 1.62 | 6 | 17.5 | 70.1 | 87.6 | 44.3 | 30 | 30.0 | 3.0 | -0.02 | 6.9 | 13.7 |
| 8.88 | 5.0E-06 | 0.07 | 8.6 | 2.54 | 4 | 12.7 | 50.7 | 63.3 | 59.4 | UnDef | UnDef | 3.0 | UnDef | 6.2 | 12.4 |
| 9.86 | 5.0E-03 | 0.01 | 28.9 | 0.77 | 7 | 39.0 | 33.3 | 72.3 | 22.3 | 36 | 40.3 | 1.0 | -0.05 | 3.9 | 13.4 |
| 0.85 | 5.0E-04 | 0.00 | 31.5 | 1.07 | 7 | 42.7 | 43.3 | 85.9 | 23.9 | 36 | 42.9 | 1.0 | -0.08 | 6.4 | 20.3 |

egg In Situ, Inc.
n No: 03-0630-0942-1953
T File: 151C12.COR



| pth t) | k (cm/s) | Bq | Qtn | Rfn | SBTn | Qc1N | DeltaQc1N | Qc1Ncs | Fc (%) | Phi (Deg) | Dr (%) | OCR | State Param | Del(n1)60 | (N1)60cs |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| .83 | 5.0E-04 | 0.00 | 30.2 | 0.98 | 7 | 41.4 | 41.1 | 82.5 | 23.6 | 36 | 42.0 | 1.0 | -0.07 | 6.1 | 19.6 |
| .81 | 5.0E-06 | 0.02 | 11.4 | 3.56 | 1 | 16.9 | UnDef | UnDef | 100.0 | UnDef | UnDef | 3.0 | UnDef | UnDef | UnDef |
| .80 | 5.0E-05 | 0.21 | 7.4 | 2.11 | 4 | 11.7 | 46.7 | 58.3 | 60.2 | 30 | 30.0 | 3.0 | 0.04 | 4.6 | 9.1 |
| .78 | 5.0E-04 | 0.01 | 22.7 | 1.60 | 7 | 32.2 | 94.5 | 126.7 | 32.9 | 34 | 34.8 | 1.0 | -0.08 | 9.2 | 19.7 |
| .77 | 5.0E-04 | -0.01 | 27.8 | 1.50 | 7 | 39.4 | 70.1 | 109.5 | 29.0 | 36 | 40.6 | 1.0 | -0.10 | 8.6 | 21.4 |
| .75 | 5.0E-05 | -0.03 | 11.5 | 2.13 | 6 | 17.6 | 70.3 | 87.9 | 49.7 | 30 | 30.0 | 3.0 | -0.04 | 6.9 | 13.8 |
| .74 | 5.0E-06 | -0.01 | 9.8 | 3.67 | 1 | 15.4 | UnDef | UnDef | 100.0 | UnDef | UnDef | 3.0 | UnDef | UnDef | UnDef |
| .72 | 5.0E-08 | -0.03 | 9.9 | 5.12 | 1 | 15.6 | UnDef | UnDef | 100.0 | UnDef | UnDef | 3.0 | UnDef | UnDef | UnDef |
| .70 | 5.0E-07 | -0.04 | 7.5 | 4.38 | 1 | 12.4 | UnDef | UnDef | 100.0 | UnDef | UnDef | 3.0 | UnDef | UnDef | UnDef |
| .69 | 5.0E-06 | -0.03 | 10.1 | 3.86 | 1 | 16.2 | UnDef | UnDef | 100.0 | UnDef | UnDef | 3.0 | UnDef | UnDef | UnDef |
| .67 | 5.0E-08 | -0.02 | 15.4 | 5.30 | 1 | 23.6 | UnDef | UnDef | 100.0 | UnDef | UnDef | 6.0 | UnDef | UnDef | UnDef |
| .66 | 5.0E-08 | -0.04 | 9.4 | 5.34 | 1 | 15.4 | UnDef | UnDef | 100.0 | UnDef | UnDef | 3.0 | UnDef | UnDef | UnDef |
| .64 | 5.0E-05 | -0.04 | 9.3 | 2.33 | 4 | 15.2 | 61.0 | 76.2 | 56.1 | 30 | 30.0 | 3.0 | -0.02 | 6.0 | 11.9 |
| .63 | 5.0E-05 | -0.01 | 11.3 | 1.90 | 6 | 18.3 | 73.3 | 91.6 | 48.5 | 30 | 30.0 | 3.0 | -0.03 | 7.2 | 14.3 |
| .61 | 5.0E-04 | -0.01 | 25.6 | 1.22 | 7 | 39.0 | 62.8 | 101.7 | 28.1 | 34 | 40.3 | 1.0 | -0.08 | 8.0 | 20.7 |
| .59 | 5.0E-05 | -0.03 | 8.7 | 2.57 | 4 | 14.8 | 59.0 | 73.8 | 59.2 | 30 | 30.0 | 3.0 | -0.02 | 5.8 | 11.6 |
| .58 | 5.0E-05 | 0.06 | 7.2 | 1.71 | 4 | 12.6 | 50.5 | 63.2 | 57.9 | 30 | 30.0 | 3.0 | 0.04 | 4.9 | 9.9 |
| .56 | 5.0E-05 | 0.08 | 7.8 | 1.90 | 4 | 13.7 | 54.8 | 68.5 | 57.1 | 30 | 30.0 | 3.0 | 0.02 | 5.4 | 10.7 |
| .55 | 5.0E-06 | 0.29 | 4.7 | 2.37 | 4 | 9.1 | 36.5 | 45.7 | 74.8 | UnDef | UnDef | 1.5 | UnDef | 4.5 | 8.9 |
| .53 | 5.0E-03 | 0.02 | 27.9 | 0.82 | 7 | 43.6 | 41.6 | 85.1 | 23.3 | 36 | 43.5 | 1.0 | -0.05 | 4.7 | 15.3 |
| .52 | 5.0E-03 | 0.00 | 36.5 | 1.05 | 7 | 56.5 | 45.3 | 101.8 | 21.7 | 38 | 50.9 | 1.0 | -0.10 | 5.3 | 19.2 |
| .42 | 5.0E-02 | 0.00 | 55.5 | 0.90 | 7 | 85.4 | 32.8 | 118.2 | 15.4 | 40 | 62.8 | 1.0 | -0.12 | 3.5 | 20.2 |
| .32 | 5.0E-02 | 0.00 | 69.6 | 0.87 | 9 | 107.1 | 28.8 | 135.9 | 12.9 | 40 | 69.2 | 1.0 | -0.14 | 3.2 | 24.2 |
| .30 | 5.0E-02 | 0.00 | 66.3 | 0.68 | 9 | 102.8 | 22.8 | 125.6 | 11.8 | 40 | 68.1 | 1.0 | -0.12 | 2.6 | 22.7 |
| .29 | 5.0E-02 | 0.00 | 55.5 | 0.99 | 7 | 87.0 | 36.7 | 123.8 | 16.1 | 40 | 63.3 | 1.0 | -0.13 | 3.9 | 20.9 |
| .27 | 5.0E-02 | 0.00 | 62.0 | 0.90 | 9 | 97.6 | 32.1 | 129.7 | 14.3 | 40 | 66.6 | 1.0 | -0.13 | 3.5 | 22.6 |
| .26 | 5.0E-04 | 0.04 | 15.6 | 2.03 | 6 | 26.5 | 105.9 | 132.4 | 42.8 | 32 | 30.0 | 1.0 | -0.06 | 8.6 | 17.3 |
| .24 | 5.0E-04 | 0.06 | 15.7 | 1.30 | 6 | 26.8 | 107.1 | 133.9 | 37.2 | 32 | 30.0 | 1.0 | -0.02 | 8.7 | 17.5 |
| .22 | 5.0E-04 | -0.01 | 19.8 | 1.36 | 7 | 33.4 | 105.4 | 138.8 | 33.4 | 34 | 35.8 | 1.0 | -0.06 | 9.9 | 20.8 |
| .21 | 5.0E-05 | 0.01 | 11.4 | 2.34 | 6 | 20.4 | 81.8 | 102.2 | 51.3 | 30 | 30.0 | 3.0 | -0.04 | 8.0 | 16.0 |
| .19 | 5.0E-05 | 0.05 | 9.3 | 2.34 | 4 | 17.3 | 69.1 | 86.3 | 56.0 | 30 | 30.0 | 3.0 | -0.01 | 6.8 | 13.5 |
| .18 | 5.0E-04 | 0.01 | 18.5 | 1.62 | 6 | 31.8 | 127.4 | 159.2 | 36.7 | 32 | 34.5 | 1.0 | -0.06 | 10.4 | 20.8 |
| .16 | 5.0E-04 | 0.00 | 17.5 | 1.35 | 6 | 30.4 | 121.6 | 152.0 | 35.6 | 32 | 33.1 | 1.0 | -0.04 | 9.9 | 19.8 |
| .15 | 5.0E-05 | 0.06 | 7.9 | 2.75 | 4 | 15.2 | 61.0 | 76.2 | 62.7 | 30 | 30.0 | 3.0 | 0.00 | 6.0 | 11.9 |
| .13 | 5.0E-05 | 0.10 | 8.2 | 2.85 | 4 | 15.8 | 63.2 | 79.1 | 62.3 | 30 | 30.0 | 3.0 | 0.00 | 6.2 | 12.4 |
| .11 | 5.0E-05 | 0.04 | 10.9 | 2.05 | 6 | 20.3 | 81.2 | 101.5 | 50.4 | 30 | 30.0 | 3.0 | -0.02 | 7.9 | 15.9 |
| .10 | 5.0E-03 | 0.00 | 39.6 | 1.16 | 7 | 67.0 | 52.4 | 119.4 | 21.4 | 38 | 55.8 | 1.0 | -0.11 | 6.2 | 22.6 |
| .08 | 5.0E-02 | 0.00 | 57.7 | 1.09 | 7 | 96.9 | 42.9 | 139.8 | 16.5 | 40 | 66.4 | 1.0 | -0.14 | 4.5 | 23.5 |
| .07 | 5.0E-03 | 0.00 | 40.8 | 1.60 | 7 | 69.6 | 72.8 | 142.4 | 24.2 | 38 | 56.9 | 1.0 | -0.14 | 8.0 | 25.0 |
| .05 | 5.0E-06 | 0.02 | 12.4 | 3.89 | 1 | 23.3 | UnDef | UnDef | 100.0 | UnDef | UnDef | 3.0 | UnDef | UnDef | UnDef |
| .04 | 5.0E-02 | 0.00 | 59.8 | 1.00 | 7 | 101.8 | 39.4 | 141.2 | 15.4 | 40 | 67.8 | 1.0 | -0.14 | 4.2 | 24.1 |
| .02 | 5.0E-02 | -0.01 | 66.7 | 0.97 | 9 | 113.9 | 36.6 | 150.5 | 14.1 | 40 | 71.0 | 1.0 | -0.15 | 4.0 | 26.3 |
| .00 | 5.0E-02 | 0.00 | 74.5 | 0.97 | 9 | 127.5 | 34.7 | 162.2 | 13.0 | 40 | 74.2 | 1.0 | -0.16 | 3.9 | 28.8 |
| .99 | 5.0E-02 | 0.00 | 72.8 | 0.95 | 9 | 125.4 | 34.3 | 159.7 | 13.1 | 40 | 73.8 | 1.0 | -0.15 | 3.8 | 28.4 |
| .97 | 5.0E-02 | 0.00 | 74.7 | 0.89 | 9 | 129.1 | 31.7 | 160.8 | 12.4 | 40 | 74.6 | 1.0 | -0.15 | 3.6 | 28.8 |
| .96 | 5.0E-02 | 0.00 | 70.7 | 0.90 | 9 | 122.9 | 33.4 | 156.3 | 13.0 | 40 | 73.2 | 1.0 | -0.15 | 3.7 | 27.8 |
| .94 | 5.0E-02 | 0.00 | 78.7 | 0.82 | 9 | 137.3 | 28.1 | 165.4 | 11.4 | 42 | 76.4 | 1.0 | -0.15 | 3.2 | 30.1 |
| .93 | 5.0E-02 | 0.00 | 69.4 | 0.78 | 9 | 122.1 | 29.2 | 151.3 | 12.2 | 40 | 73.0 | 1.0 | -0.13 | 3.3 | 27.2 |
| .91 | 5.0E-02 | 0.00 | 89.5 | 0.76 | 9 | 157.2 | 23.1 | 180.4 | 9.8 | 42 | 80.2 | 1.0 | -0.15 | 2.7 | 33.5 |
| .89 | 5.0E-02 | 0.00 | 85.8 | 0.61 | 9 | 151.8 | 17.8 | 169.5 | 8.9 | 42 | 79.2 | 1.0 | -0.13 | 2.1 | 31.8 |
| .88 | 5.0E+00 | 0.00 | 84.1 | 0.55 | 9 | 149.4 | 15.5 | 164.9 | 8.5 | 42 | 78.8 | 1.0 | -0.12 | 1.5 | 25.9 |
| .86 | 5.0E+00 | 0.00 | 87.2 | 0.46 | 9 | 155.6 | 0.0 | 155.6 | 5.0 | 42 | 80.0 | 1.0 | -0.11 | 0.0 | 25.4 |
| .85 | 5.0E-02 | 0.00 | 78.7 | 0.55 | 9 | 141.5 | 17.5 | 159.0 | 9.1 | 42 | 77.2 | 1.0 | -0.11 | 2.0 | 29.7 |
| .83 | 5.0E-02 | 0.00 | 82.7 | 0.63 | 9 | 149.2 | 19.8 | 169.0 | 9.4 | 42 | 78.7 | 1.0 | -0.13 | 2.3 | 31.5 |
| .82 | 5.0E-02 | -0.01 | 63.5 | 0.69 | 9 | 115.8 | 27.9 | 143.7 | 12.3 | 40 | 71.5 | 1.0 | -0.11 | 3.1 | 25.8 |
| .80 | 5.0E-03 | -0.01 | 47.1 | 1.19 | 7 | 87.1 | 55.0 | 142.0 | 19.5 | 38 | 63.3 | 1.0 | -0.11 | 6.8 | 28.1 |
| .78 | 5.0E-02 | -0.01 | 60.2 | 1.06 | 7 | 111.0 | 44.9 | 155.9 | 15.8 | 40 | 70.3 | 1.0 | -0.13 | 4.8 | 26.5 |
| .77 | 5.0E-02 | -0.01 | 75.7 | 0.78 | 9 | 139.4 | 28.8 | 168.2 | 11.4 | 40 | 76.8 | 1.0 | -0.14 | 3.3 | 30.6 |
| .75 | 5.0E-02 | -0.01 | 68.7 | 0.74 | 9 | 127.3 | 29.2 | 156.4 | 12.0 | 40 | 74.2 | 1.0 | -0.13 | 3.3 | 28.2 |

regg In Situ, Inc.
nterpretation Output - Release 1.00.19e
un No: 03-0630-0942-2013
ob No: 03-151SH
lient: URS
roject: CPT SITE INVESTIGATION
ite: PIER T LNG
ocation: CPT-13
ngineer: T. O'BRIEN
PT Date: 03/24/06
PT Time: 09:30
PT File: 151C13.COR
orthing (m): 0.000
asting (m): 0.000
levation (m): 0.000



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Water Table (m): 6.10 (ft): 20.0
Su Nkt used: 12.50
Averaging Increment (m): 0.30
Phi Method : Robertson and Campanella, 1983
Dr Method : Jamiolkowski - All Sands
State Parameter M: 1.20
Used Unit Weights Assigned to Soil Zones
Values of 1.0E9 or UnDef are printed for parameters that are not valid for the material type (SBT)

| epth (ft) | AvgQt (tsf) | AvgFs (tsf) | AvgRf (%) | AvgUd (ft) | SBT | U.Wt. pcf | TStress (tsf) | EStress (tsf) | Ueq (tsf) | Cn | N60 | (N1)60 (blows/ft) | Su (tsf) | CRR |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| ).49 | 138.6 | 1.14 | 0.82 | 12.8 | 9 | 124.1 | 0.03 | 0.03 | 0.00 | 2.00 | 26.6 | 53.1 | UnDef | 0.00 |
| 1.48 | 273.2 | 2.17 | 0.80 | 12.6 | 9 | 124.1 | 0.09 | 0.09 | 0.00 | 2.00 | 52.3 | 104.7 | UnDef | 0.00 |
| 2.46 | 229.1 | 2.37 | 1.04 | 18.5 | 9 | 124.1 | 0.15 | 0.15 | 0.00 | 2.00 | 43.9 | 87.8 | UnDef | 0.00 |
| 3.44 | 132.0 | 2.52 | 1.91 | 23.3 | 7 | 117.8 | 0.21 | 0.21 | 0.00 | 2.00 | 42.1 | 84.2 | UnDef | 0.00 |
| 4.43 | 203.4 | 2.79 | 1.37 | 23.3 | 8 | 120.9 | 0.27 | 0.27 | 0.00 | 1.92 | 48.7 | 93.6 | UnDef | 0.00 |
| 5.41 | 283.3 | 4.12 | 1.45 | 21.8 | 8 | 120.9 | 0.33 | 0.33 | 0.00 | 1.74 | 67.8 | 118.0 | UnDef | 0.00 |
| 5.40 | 204.6 | 3.93 | 1.92 | 23.3 | 8 | 120.9 | 0.39 | 0.39 | 0.00 | 1.60 | 49.0 | 78.4 | UnDef | 0.00 |
| 7.30 | 148.2 | 1.75 | 1.18 | 10.7 | 8 | 120.9 | 0.44 | 0.44 | 0.00 | 1.50 | 35.5 | 53.2 | UnDef | 0.00 |
| 3.20 | 80.3 | 1.17 | 1.45 | 5.2 | 7 | 117.8 | 0.50 | 0.50 | 0.00 | 1.42 | 25.6 | 36.3 | UnDef | 0.27 |
| ).19 | 75.3 | 0.70 | 0.93 | 2.7 | 8 | 120.9 | 0.56 | 0.56 | 0.00 | 1.34 | 18.0 | 24.2 | UnDef | 0.20 |
| ).17 | 57.0 | 0.62 | 1.08 | 0.1 | 7 | 117.8 | 0.62 | 0.62 | 0.00 | 1.27 | 18.2 | 23.2 | UnDef | 0.14 |
| 1.15 | 53.1 | 0.56 | 1.05 | -0.9 | 7 | 117.8 | 0.67 | 0.67 | 0.00 | 1.22 | 17.0 | 20.7 | UnDef | 0.13 |
| 2.14 | 48.3 | 0.47 | 0.98 | -1.2 | 7 | 117.8 | 0.73 | 0.73 | 0.00 | 1.17 | 15.4 | 18.0 | UnDef | 0.12 |
| 3.21 | 48.1 | 0.49 | 1.03 | -1.3 | 7 | 117.8 | 0.79 | 0.79 | 0.00 | 1.12 | 15.4 | 17.2 | UnDef | 0.12 |
| ..27 | 42.2 | 0.41 | 0.96 | -1.4 | 7 | 117.8 | 0.86 | 0.86 | 0.00 | 1.08 | 13.5 | 14.5 | UnDef | 0.11 |
| ..26 | 37.0 | 0.34 | 0.92 | -1.1 | 7 | 117.8 | 0.92 | 0.92 | 0.00 | 1.05 | 11.8 | 12.4 | UnDef | 0.10 |
| ).24 | 28.5 | 0.29 | 1.03 | -1.5 | 7 | 117.8 | 0.97 | 0.97 | 0.00 | 1.01 | 9.1 | 9.2 | UnDef | 0.10 |
| '.22 | 20.8 | 0.25 | 1.19 | -2.0 | 6 | 114.6 | 1.03 | 1.03 | 0.00 | 0.99 | 8.0 | 7.9 | 1.58 | 0.13 |
| 3.21 | 11.2 | 0.07 | 0.60 | 3.3 | 6 | 114.6 | 1.09 | 1.09 | 0.00 | 0.96 | 4.3 | 4.1 | 0.81 | 0.09 |
| ).19 | 8.7 | 0.05 | 0.60 | 31.2 | 6 | 114.6 | 1.14 | 1.14 | 0.00 | 0.94 | 3.3 | 3.1 | 0.60 | 0.09 |
| 1.18 | 139.7 | 0.97 | 0.69 | 35.2 | 9 | 124.1 | 1.20 | 1.20 | 0.01 | 0.91 | 26.8 | 24.5 | UnDef | 0.30 |
| 1.16 | 217.6 | 1.79 | 0.82 | 8.3 | 9 | 124.1 | 1.26 | 1.23 | 0.04 | 0.90 | 41.7 | 37.6 | UnDef | 0.00 |
| 2.15 | 170.8 | 1.44 | 0.84 | 7.7 | 9 | 124.1 | 1.32 | 1.26 | 0.07 | 0.89 | 32.7 | 29.2 | UnDef | 0.46 |
| 3.13 | 122.1 | 1.19 | 0.97 | 2.3 | 8 | 120.9 | 1.38 | 1.29 | 0.10 | 0.88 | 29.2 | 25.8 | UnDef | 0.26 |
| ..11 | 86.0 | 0.72 | 0.84 | -1.1 | 8 | 120.9 | 1.44 | 1.32 | 0.13 | 0.87 | 20.6 | 17.9 | UnDef | 0.16 |
| ..10 | 82.6 | 0.47 | 0.57 | -0.1 | 8 | 120.9 | 1.50 | 1.34 | 0.16 | 0.86 | 19.8 | 17.1 | UnDef | 0.14 |
| ..08 | 24.2 | 0.20 | 0.83 | 4.8 | 7 | 117.8 | 1.56 | 1.37 | 0.19 | 0.85 | 7.7 | 6.6 | UnDef | 0.12 |
| '.07 | 29.4 | 0.21 | 0.70 | 16.9 | 7 | 117.8 | 1.62 | 1.40 | 0.22 | 0.85 | 9.4 | 7.9 | UnDef | 0.10 |
| 5.05 | 26.5 | 0.22 | 0.84 | 29.4 | 7 | 117.8 | 1.68 | 1.43 | 0.25 | 0.84 | 8.5 | 7.1 | UnDef | 0.12 |
| '.04 | 24.7 | 0.16 | 0.64 | 29.1 | 7 | 117.8 | 1.74 | 1.45 | 0.28 | 0.83 | 7.9 | 6.5 | UnDef | 0.11 |
| '.02 | 30.1 | 0.25 | 0.83 | 36.9 | 7 | 117.8 | 1.79 | 1.48 | 0.31 | 0.82 | 9.6 | 7.9 | UnDef | 0.11 |
| .00 | 14.9 | 0.29 | 1.93 | 48.6 | 5 | 114.6 | 1.85 | 1.51 | 0.34 | 0.81 | 7.1 | 5.8 | 1.04 | 0.10 |
| .99 | 9.6 | 0.10 | 1.06 | 71.4 | 5 | 114.6 | 1.91 | 1.53 | 0.37 | 0.81 | 4.6 | 3.7 | 0.62 | 0.09 |
| .97 | 11.4 | 0.11 | 1.00 | 64.2 | 6 | 114.6 | 1.96 | 1.56 | 0.41 | 0.80 | 4.4 | 3.5 | 0.75 | 0.09 |
| .96 | 10.7 | 0.16 | 1.46 | 82.7 | 5 | 114.6 | 2.02 | 1.58 | 0.44 | 0.79 | 5.1 | 4.1 | 0.69 | 0.09 |
| .94 | 16.5 | 0.16 | 0.96 | 69.8 | 6 | 114.6 | 2.08 | 1.61 | 0.47 | 0.79 | 6.3 | 5.0 | 1.15 | 0.10 |
| .92 | 20.8 | 0.10 | 0.49 | 55.6 | 7 | 117.8 | 2.13 | 1.64 | 0.50 | 0.78 | 6.7 | 5.2 | UnDef | 0.13 |
| .91 | 12.7 | 0.12 | 0.98 | 98.1 | 6 | 114.6 | 2.19 | 1.66 | 0.53 | 0.78 | 4.8 | 3.8 | 0.84 | 0.09 |
| .89 | 10.2 | 0.16 | 1.61 | 160.6 | 5 | 114.6 | 2.25 | 1.69 | 0.56 | 0.77 | 4.9 | 3.7 | 0.63 | 0.09 |
| .88 | 29.6 | 0.28 | 0.93 | 55.8 | 7 | 117.8 | 2.30 | 1.72 | 0.59 | 0.76 | 9.4 | 7.2 | UnDef | 0.18 |
| .86 | 63.3 | 0.47 | 0.74 | 10.5 | 8 | 120.9 | 2.36 | 1.74 | 0.62 | 0.76 | 15.2 | 11.5 | UnDef | 0.12 |
| .85 | 85.8 | 0.45 | 0.53 | 5.7 | 8 | 120.9 | [illegible] | 1.77 | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] |

regg In Situ, Inc.
un No: 03-0630-0942-2013
PT File: 151C13.COR



| epth ft) | AvgQt (tsf) | AvgFs (tsf) | AvgRf (%) | AvgUd (ft) | SBT | U.Wt. pcf | TStress (tsf) | EStress (tsf) | Ueq (tsf) | Cn | N60 (blows/ft) | (N1)60 (blows/ft) | Su (tsf) | CRR |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1.83 | 82.1 | 0.70 | 0.86 | 12.1 | 8 | 120.9 | 2.48 | 1.80 | 0.68 | 0.75 | 19.7 | 14.7 | UnDef | 0.15 |
| 2.81 | 81.0 | 0.75 | 0.93 | 20.5 | 8 | 120.9 | 2.54 | 1.83 | 0.71 | 0.74 | 19.4 | 14.3 | UnDef | 0.15 |
| 3.80 | 74.1 | 0.75 | 1.01 | 21.3 | 8 | 120.9 | 2.60 | 1.86 | 0.74 | 0.73 | 17.7 | 13.0 | UnDef | 0.15 |
| 4.78 | 77.7 | 0.68 | 0.87 | 23.1 | 8 | 120.9 | 2.66 | 1.89 | 0.77 | 0.73 | 18.6 | 13.5 | UnDef | 0.15 |
| 5.77 | 75.9 | 0.70 | 0.92 | 23.1 | 8 | 120.9 | 2.72 | 1.92 | 0.80 | 0.72 | 18.2 | 13.1 | UnDef | 0.15 |
| 6.75 | 76.3 | 0.62 | 0.82 | 25.7 | 8 | 120.9 | 2.78 | 1.94 | 0.84 | 0.72 | 18.3 | 13.1 | UnDef | 0.14 |
| 7.74 | 26.2 | 0.77 | 2.94 | 72.5 | 5 | 114.6 | 2.84 | 1.97 | 0.87 | 0.71 | 12.5 | 8.9 | 1.87 | 0.15 |
| 8.72 | 19.9 | 0.35 | 1.75 | 70.1 | 6 | 114.6 | 2.89 | 2.00 | 0.90 | 0.71 | 7.6 | 5.4 | 1.36 | 0.11 |
| 9.70 | 20.7 | 0.39 | 1.91 | 72.2 | 6 | 114.6 | 2.95 | 2.02 | 0.93 | 0.70 | 7.9 | 5.6 | 1.42 | 0.11 |
| 0.69 | 21.6 | 0.39 | 1.83 | 59.4 | 6 | 114.6 | 3.01 | 2.05 | 0.96 | 0.70 | 8.3 | 5.8 | 1.48 | 0.12 |
| 1.67 | 30.4 | 0.51 | 1.68 | 47.9 | 6 | 114.6 | 3.06 | 2.07 | 0.99 | 0.69 | 11.7 | 8.1 | 2.19 | 0.18 |
| 2.66 | 23.4 | 0.51 | 2.20 | 56.0 | 6 | 114.6 | 3.12 | 2.10 | 1.02 | 0.69 | 9.0 | 6.2 | 1.62 | 0.13 |
| 3.64 | 91.5 | 0.57 | 0.63 | 44.1 | 8 | 120.9 | 3.18 | 2.13 | 1.05 | 0.69 | 21.9 | 15.0 | UnDef | 0.14 |
| 4.63 | 160.0 | 1.78 | 1.11 | 42.6 | 8 | 120.9 | 3.24 | 2.16 | 1.08 | 0.68 | 38.3 | 26.1 | UnDef | 0.35 |
| 5.61 | 159.4 | 1.58 | 0.99 | 37.6 | 9 | 124.1 | 3.30 | 2.19 | 1.11 | 0.68 | 30.5 | 20.7 | UnDef | 0.32 |
| 6.59 | 57.7 | 0.55 | 0.95 | 79.9 | 7 | 117.8 | 3.36 | 2.21 | 1.14 | 0.67 | 18.4 | 12.4 | UnDef | 0.15 |
| 7.58 | 230.4 | 1.80 | 0.78 | 50.5 | 9 | 124.1 | 3.42 | 2.24 | 1.17 | 0.67 | 44.1 | 29.5 | UnDef | 0.00 |
| 8.56 | 72.5 | 1.31 | 1.81 | 47.5 | 7 | 117.8 | 3.48 | 2.27 | 1.20 | 0.66 | 23.1 | 15.3 | UnDef | 0.36 |
| 9.55 | 19.9 | 0.20 | 0.98 | 142.8 | 6 | 114.6 | 3.53 | 2.30 | 1.23 | 0.66 | 7.6 | 5.0 | 1.31 | 0.10 |
| 0.53 | 31.9 | 0.42 | 1.30 | 80.9 | 7 | 117.8 | 3.59 | 2.32 | 1.27 | 0.66 | 10.2 | 6.7 | UnDef | 0.18 |
| 1.52 | 68.8 | 0.55 | 0.81 | 36.5 | 8 | 120.9 | 3.65 | 2.35 | 1.30 | 0.65 | 16.5 | 10.7 | UnDef | 0.14 |
| 2.42 | 120.4 | 1.06 | 0.88 | 27.7 | 8 | 120.9 | 3.70 | 2.38 | 1.32 | 0.65 | 28.8 | 18.7 | UnDef | 0.21 |
| 3.32 | 32.1 | 0.96 | 3.00 | 50.7 | 5 | 114.6 | 3.76 | 2.40 | 1.35 | 0.64 | 15.4 | 9.9 | 2.27 | 0.18 |
| 4.30 | 33.5 | 0.51 | 1.51 | 80.5 | 6 | 114.6 | 3.81 | 2.43 | 1.38 | 0.64 | 12.8 | 8.2 | 2.38 | 0.19 |
| 5.29 | 128.4 | 0.88 | 0.68 | 59.0 | 9 | 124.1 | 3.87 | 2.46 | 1.41 | 0.64 | 24.6 | 15.7 | UnDef | 0.20 |
| 6.27 | 158.1 | 1.27 | 0.80 | 54.8 | 9 | 124.1 | 3.93 | 2.49 | 1.44 | 0.63 | 30.3 | 19.2 | UnDef | 0.27 |
| 7.26 | 99.8 | 0.99 | 0.99 | 49.5 | 8 | 120.9 | 3.99 | 2.52 | 1.48 | 0.63 | 23.9 | 15.1 | UnDef | 0.20 |
| 8.24 | 140.2 | 1.22 | 0.87 | 40.8 | 9 | 124.1 | 4.05 | 2.55 | 1.51 | 0.63 | 26.9 | 16.8 | UnDef | 0.24 |
| 9.22 | 155.8 | 1.42 | 0.91 | 47.7 | 9 | 124.1 | 4.11 | 2.58 | 1.54 | 0.62 | 29.8 | 18.6 | UnDef | 0.28 |
| 0.21 | 55.9 | 0.99 | 1.77 | 85.1 | 7 | 117.8 | 4.17 | 2.61 | 1.57 | 0.62 | 17.8 | 11.0 | UnDef | 0.00 |
| 1.19 | 109.2 | 0.76 | 0.69 | 42.7 | 8 | 120.9 | 4.23 | 2.63 | 1.60 | 0.62 | 26.1 | 16.1 | UnDef | 0.17 |
| 2.18 | 40.1 | 0.96 | 2.38 | 100.1 | 6 | 114.6 | 4.29 | 2.66 | 1.63 | 0.61 | 15.4 | 9.4 | 2.86 | 0.24 |
| 3.16 | 63.8 | 0.78 | 1.22 | 33.9 | 7 | 117.8 | 4.35 | 2.69 | 1.66 | 0.61 | 20.4 | 12.4 | UnDef | 0.27 |
| 4.15 | 48.2 | 0.51 | 1.07 | 19.0 | 7 | 117.8 | 4.41 | 2.72 | 1.69 | 0.61 | 15.4 | 9.3 | UnDef | 0.35 |
| 5.13 | 27.1 | 0.58 | 2.15 | 139.9 | 6 | 114.6 | 4.46 | 2.74 | 1.72 | 0.60 | 10.4 | 6.3 | 1.81 | 0.13 |
| 6.11 | 67.4 | 1.02 | 1.51 | 68.2 | 7 | 117.8 | 4.52 | 2.77 | 1.75 | 0.60 | 21.5 | 12.9 | UnDef | 0.45 |
| 7.10 | 50.4 | 0.80 | 1.58 | 28.9 | 7 | 117.8 | 4.58 | 2.80 | 1.78 | 0.60 | 16.1 | 9.6 | UnDef | 0.38 |
| 8.08 | 28.8 | 0.94 | 3.25 | 158.5 | 5 | 114.6 | 4.64 | 2.82 | 1.81 | 0.60 | 13.8 | 8.2 | 1.93 | 0.00 |
| 9.07 | 33.7 | 1.23 | 3.65 | 168.4 | 5 | 114.6 | 4.69 | 2.85 | 1.84 | 0.59 | 16.1 | 9.6 | 2.32 | 0.00 |
| 0.05 | 94.0 | 1.24 | 1.32 | 58.1 | 8 | 120.9 | 4.75 | 2.87 | 1.87 | 0.59 | 22.5 | 13.3 | UnDef | 0.27 |
| 1.04 | 134.8 | 1.26 | 0.93 | 14.0 | 9 | 124.1 | 4.81 | 2.90 | 1.91 | 0.59 | 25.8 | 15.2 | UnDef | 0.24 |
| 2.02 | 119.8 | 1.26 | 1.05 | 29.2 | 8 | 120.9 | 4.87 | 2.93 | 1.94 | 0.58 | 28.7 | 16.7 | UnDef | 0.24 |
| 3.00 | 97.5 | 1.12 | 1.15 | 6.2 | 8 | 120.9 | 4.93 | 2.96 | 1.97 | 0.58 | 23.3 | 13.6 | UnDef | 0.24 |
| 3.99 | 41.1 | 0.81 | 1.97 | 56.2 | 6 | 114.6 | 4.99 | 2.99 | 2.00 | 0.58 | 15.7 | 9.1 | 2.89 | 0.23 |
| 4.97 | 177.2 | 1.54 | 0.87 | 126.0 | 9 | 124.1 | 5.05 | 3.02 | 2.03 | 0.58 | 33.9 | 19.5 | UnDef | 0.32 |
| 5.96 | 261.6 | 2.11 | 0.80 | 57.5 | 9 | 124.1 | 5.11 | 3.05 | 2.06 | 0.57 | 50.1 | 28.7 | UnDef | 0.00 |
| 6.94 | 250.1 | 1.95 | 0.78 | 62.5 | 9 | 124.1 | 5.17 | 3.08 | 2.09 | 0.57 | 47.9 | 27.3 | UnDef | 0.00 |
| 7.93 | 259.7 | 1.90 | 0.73 | 58.2 | 9 | 124.1 | 5.23 | 3.11 | 2.12 | 0.57 | 49.7 | 28.2 | UnDef | 0.00 |
| 8.91 | 235.8 | 1.78 | 0.76 | 67.4 | 9 | 124.1 | 5.29 | 3.14 | 2.15 | 0.56 | 45.2 | 25.5 | UnDef | 0.45 |
| 9.89 | 208.5 | 1.66 | 0.79 | 61.4 | 9 | 124.1 | 5.35 | 3.17 | 2.18 | 0.56 | 39.9 | 22.4 | UnDef | 0.38 |
| 0.88 | 198.6 | 1.41 | 0.71 | 60.1 | 9 | 124.1 | 5.41 | 3.20 | 2.21 | 0.56 | 38.0 | 21.3 | UnDef | 0.33 |
| 1.86 | 206.5 | 1.32 | 0.64 | 61.5 | 9 | 124.1 | 5.47 | 3.23 | 2.24 | 0.56 | 39.6 | 22.0 | UnDef | 0.33 |
| 2.85 | 267.0 | 1.47 | 0.55 | 59.9 | 9 | 124.1 | 5.54 | 3.26 | 2.27 | 0.55 | 51.1 | 28.3 | UnDef | 0.00 |
| 3.83 | 239.9 | 1.57 | 0.65 | 48.7 | 9 | 124.1 | 5.60 | 3.29 | 2.31 | 0.55 | 46.0 | 25.3 | UnDef | 0.42 |
| 4.82 | 230.6 | 1.38 | 0.60 | 57.7 | 9 | 124.1 | 5.66 | 3.32 | 2.34 | 0.55 | 44.2 | 24.2 | UnDef | 0.38 |
| 5.80 | 282.8 | 1.35 | 0.48 | 63.5 | 10 | 127.3 | 5.72 | 3.35 | 2.37 | 0.55 | 45.1 | 24.7 | UnDef | 0.40 |
| 6.78 | 244.6 | 1.44 | 0.59 | 68.4 | 9 | 124.1 | 5.78 | 3.38 | 2.40 | 0.54 | 46.8 | 25.5 | UnDef | 0.41 |
| 7.77 | 227.3 | 1.58 | 0.69 | 75.8 | 9 | 124.1 | 5.84 | 3.41 | 2.43 | 0.54 | 43.5 | 23.6 | UnDef | 0.39 |
| 8.75 | 251.8 | 2.06 | 0.82 | 67.5 | 9 | 124.1 | 5.90 | 3.44 | 2.46 | 0.54 | 48.2 | 26.0 | UnDef | 0.00 |

regg In Situ, Inc.
nterpretation Output - Release 1.00.19e
un No: 03-0630-0942-2013
ob No: 03-151SH
lient: URS
roject: CPT SITE INVESTIGATION
ite: PIER T LNG
ocation: CPT-13
ngineer: T. O'BRIEN
PT Date: 03/24/06
PT Time: 09:30
PT File: 151C13.COR
orthing (m): 0.000
asting (m): 0.000
levation (m): 0.000

Water Table (m): 6.10 (ft): 20.0
Su Nkt used: 12.50
Averaging Increment (m): 0.30
Phi Method : Robertson and Campanella, 1983
Dr Method : Jamiolkowski - All Sands
State Parameter M: 1.20
Used Unit Weights Assigned to Soil Zones
Values of 1.0E9 or UnDef are printed for parameters that are not valid for the material type (SBT)

| epth ft) | k (cm/s) | Bq | Qtn | Rfn | SBTn | Qc1N | DeltaQc1N | Qc1Ncs | Fc (%) | Phi (Deg) | Dr (%) | OCR | State Param | Del(n1)60 | (N1)60cs |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 0.49 | 5.0E-02 | 0.00 | 1000.0 | 0.82 | 10 | 265.5 | 0.0 | 265.5 | 0.0 | 50 | 95.0 | 1.0 | -0.38 | 0.0 | 53.1 |
| 1.48 | 5.0E-02 | 0.00 | 1000.0 | 0.80 | 10 | 523.4 | 0.0 | 523.4 | 0.0 | 50 | 95.0 | 1.0 | -0.38 | 0.0 | 104.7 |
| 2.46 | 5.0E-02 | 0.00 | 1000.0 | 1.04 | 9 | 438.9 | 0.0 | 438.9 | 0.6 | 50 | 95.0 | 1.0 | -0.41 | 0.0 | 87.8 |
| 3.44 | 5.0E-04 | 0.01 | 620.7 | 1.91 | 12 | 252.7 | UnDef | UnDef | 0.0 | 50 | 95.0 | 1.0 | -0.45 | UnDef | UnDef |
| 4.43 | 5.0E-03 | 0.00 | 749.8 | 1.37 | 9 | 382.5 | 0.0 | 382.5 | 2.6 | 50 | 95.0 | 1.0 | -0.42 | 0.0 | 93.6 |
| 5.41 | 5.0E-03 | 0.00 | 856.1 | 1.46 | 9 | 482.2 | 0.0 | 482.2 | 2.6 | 50 | 95.0 | 1.0 | -0.44 | 0.0 | 118.0 |
| 6.40 | 5.0E-03 | 0.00 | 523.5 | 1.92 | 12 | 320.5 | UnDef | UnDef | 0.0 | 48 | 95.0 | 1.0 | -0.44 | UnDef | UnDef |
| 7.30 | 5.0E-03 | 0.00 | 332.4 | 1.19 | 9 | 217.5 | 0.0 | 217.5 | 4.4 | 48 | 89.6 | 1.0 | -0.32 | 0.0 | 53.2 |
| 8.20 | 5.0E-04 | 0.00 | 160.2 | 1.46 | 9 | 111.4 | 16.5 | 127.8 | 9.8 | 44 | 70.4 | 1.0 | -0.27 | 3.2 | 39.5 |
| 9.19 | 5.0E-03 | 0.00 | 134.1 | 0.94 | 9 | 98.7 | 8.7 | 107.4 | 8.0 | 44 | 66.9 | 1.0 | -0.21 | 1.3 | 25.4 |
| 0.17 | 5.0E-04 | 0.00 | 91.5 | 1.10 | 9 | 71.1 | 16.4 | 87.5 | 12.0 | 42 | 57.5 | 1.0 | -0.19 | 3.1 | 26.3 |
| 1.15 | 5.0E-04 | 0.00 | 77.9 | 1.06 | 9 | 63.3 | 17.9 | 81.3 | 13.3 | 40 | 54.2 | 1.0 | -0.17 | 3.3 | 24.0 |
| 2.14 | 5.0E-04 | 0.00 | 65.1 | 0.99 | 9 | 55.3 | 18.8 | 74.1 | 14.5 | 40 | 50.3 | 1.0 | -0.15 | 3.4 | 21.4 |
| 3.21 | 5.0E-04 | 0.00 | 59.5 | 1.04 | 7 | 52.8 | 21.4 | 74.2 | 15.8 | 40 | 49.0 | 1.0 | -0.14 | 3.8 | 21.0 |
| 4.27 | 5.0E-04 | 0.00 | 48.2 | 0.98 | 7 | 44.6 | 22.8 | 67.3 | 17.7 | 38 | 44.1 | 1.0 | -0.12 | 3.9 | 18.4 |
| 5.26 | 5.0E-04 | 0.00 | 39.5 | 0.95 | 7 | 37.9 | 24.7 | 62.6 | 19.8 | 38 | 39.5 | 1.0 | -0.10 | 4.1 | 16.4 |
| 6.24 | 5.0E-04 | 0.00 | 28.3 | 1.07 | 7 | 28.3 | 33.6 | 61.9 | 25.3 | 36 | 31.1 | 1.0 | -0.07 | 4.7 | 14.0 |
| 7.22 | 5.0E-05 | 0.00 | 19.2 | 1.26 | 7 | 20.1 | 60.6 | 80.7 | 33.1 | 32 | 30.0 | 6.0 | -0.05 | 7.0 | 14.8 |
| 8.21 | 5.0E-05 | 0.01 | 9.3 | 0.66 | 6 | 10.5 | 42.0 | 52.6 | 40.9 | 30 | 30.0 | 3.0 | 0.07 | 4.1 | 8.2 |
| 9.19 | 5.0E-05 | 0.13 | 6.6 | 0.69 | 6 | 7.9 | 31.7 | 39.6 | 49.3 | 30 | 30.0 | 3.0 | 0.11 | 3.1 | 6.2 |
| 0.18 | 5.0E-02 | 0.01 | 115.8 | 0.70 | 9 | 125.0 | 8.4 | 133.4 | 7.4 | 42 | 73.7 | 1.0 | -0.17 | 1.0 | 25.5 |
| 1.16 | 5.0E-02 | 0.00 | 176.3 | 0.83 | 9 | 192.2 | 3.0 | 195.2 | 5.6 | 44 | 86.0 | 1.0 | -0.22 | 0.4 | 38.0 |
| 2.15 | 5.0E-02 | 0.00 | 134.8 | 0.85 | 9 | 149.1 | 10.1 | 159.2 | 7.4 | 44 | 78.7 | 1.0 | -0.20 | 1.2 | 30.4 |
| 3.13 | 5.0E-03 | 0.00 | 93.8 | 0.98 | 9 | 105.3 | 20.3 | 125.7 | 11.1 | 42 | 68.8 | 1.0 | -0.18 | 2.9 | 28.7 |
| 4.11 | 5.0E-03 | 0.00 | 64.2 | 0.86 | 9 | 73.3 | 21.8 | 95.1 | 13.6 | 40 | 58.4 | 1.0 | -0.13 | 3.0 | 20.9 |
| 5.10 | 5.0E-03 | 0.00 | 60.4 | 0.58 | 9 | 69.7 | 15.3 | 85.0 | 11.7 | 40 | 56.9 | 1.0 | -0.09 | 2.2 | 19.2 |
| 6.08 | 5.0E-04 | 0.00 | 16.5 | 0.89 | 7 | 20.3 | 55.1 | 75.4 | 32.4 | 32 | 30.0 | 1.0 | -0.01 | 5.6 | 12.2 |
| 7.07 | 5.0E-04 | 0.01 | 19.8 | 0.74 | 7 | 24.3 | 37.3 | 61.6 | 27.7 | 34 | 30.0 | 1.0 | -0.01 | 4.8 | 12.8 |
| 8.05 | 5.0E-04 | 0.03 | 17.4 | 0.89 | 7 | 21.7 | 52.6 | 74.3 | 31.5 | 32 | 30.0 | 1.0 | -0.01 | 5.6 | 12.7 |
| 9.04 | 5.0E-04 | 0.03 | 15.8 | 0.68 | 7 | 20.0 | 45.0 | 65.0 | 30.9 | 32 | 30.0 | 1.0 | 0.02 | 5.0 | 11.5 |
| 0.02 | 5.0E-04 | 0.03 | 19.1 | 0.88 | 7 | 24.2 | 47.1 | 71.3 | 29.7 | 32 | 30.0 | 1.0 | -0.02 | 5.6 | 13.5 |
| 1.00 | 5.0E-06 | 0.09 | 8.6 | 2.20 | 4 | 11.9 | 47.5 | 59.3 | 56.9 | UnDef | UnDef | 3.0 | UnDef | 5.8 | 11.6 |
| 1.99 | 5.0E-06 | 0.24 | 5.0 | 1.33 | 4 | 7.6 | 30.3 | 37.9 | 63.9 | UnDef | UnDef | 1.5 | UnDef | 3.7 | 7.4 |
| 2.97 | 5.0E-05 | 0.17 | 6.1 | 1.20 | 4 | 8.9 | 35.7 | 44.7 | 57.6 | 30 | 30.0 | 1.5 | 0.09 | 3.5 | 7.0 |
| 3.96 | 5.0E-06 | 0.25 | 5.4 | 1.80 | 4 | 8.3 | 33.1 | 41.4 | 66.0 | UnDef | UnDef | 1.5 | UnDef | 4.1 | 8.1 |
| 4.94 | 5.0E-05 | 0.12 | 9.0 | 1.10 | 6 | 12.7 | 50.9 | 63.7 | 46.9 | 30 | 30.0 | 3.0 | 0.05 | 5.0 | 10.0 |
| 5.92 | 5.0E-04 | 0.07 | 11.4 | 0.54 | 7 | 15.9 | 63.8 | 79.7 | 35.1 | 30 | 30.0 | 1.0 | 0.07 | 5.2 | 10.4 |
| 6.91 | 5.0E-05 | 0.24 | 6.3 | 1.18 | 6 | 9.6 | 38.4 | 48.0 | 56.3 | 30 | 30.0 | 3.0 | 0.09 | 3.8 | 7.5 |
| 7.89 | 5.0E-06 | 0.56 | 4.7 | 2.07 | 4 | 7.7 | 30.6 | 38.3 | 72.4 | UnDef | UnDef | 1.5 | UnDef | 3.7 | 7.5 |
| 8.88 | 5.0E-04 | 0.04 | 15.9 | 1.01 | 6 | 22.1 | 79.1 | 101.2 | 34.3 | 32 | 30.0 | 1.0 | -0.01 | 6.9 | 14.1 |
| 9.86 | 5.0E-03 | 0.00 | 35.0 | 0.77 | 7 | 46.9 | 30.5 | 77.4 | 19.8 | 38 | 45.6 | 1.0 | -0.07 | 3.8 | 15.2 |
| 0.85 | 5.0E-03 | -0.01 | 47.1 | 0.54 | 9 | 63.1 | 19.7 | 82.8 | 13.9 | 38 | 54.1 | 1.0 | -0.07 | 2.7 | 18.1 |

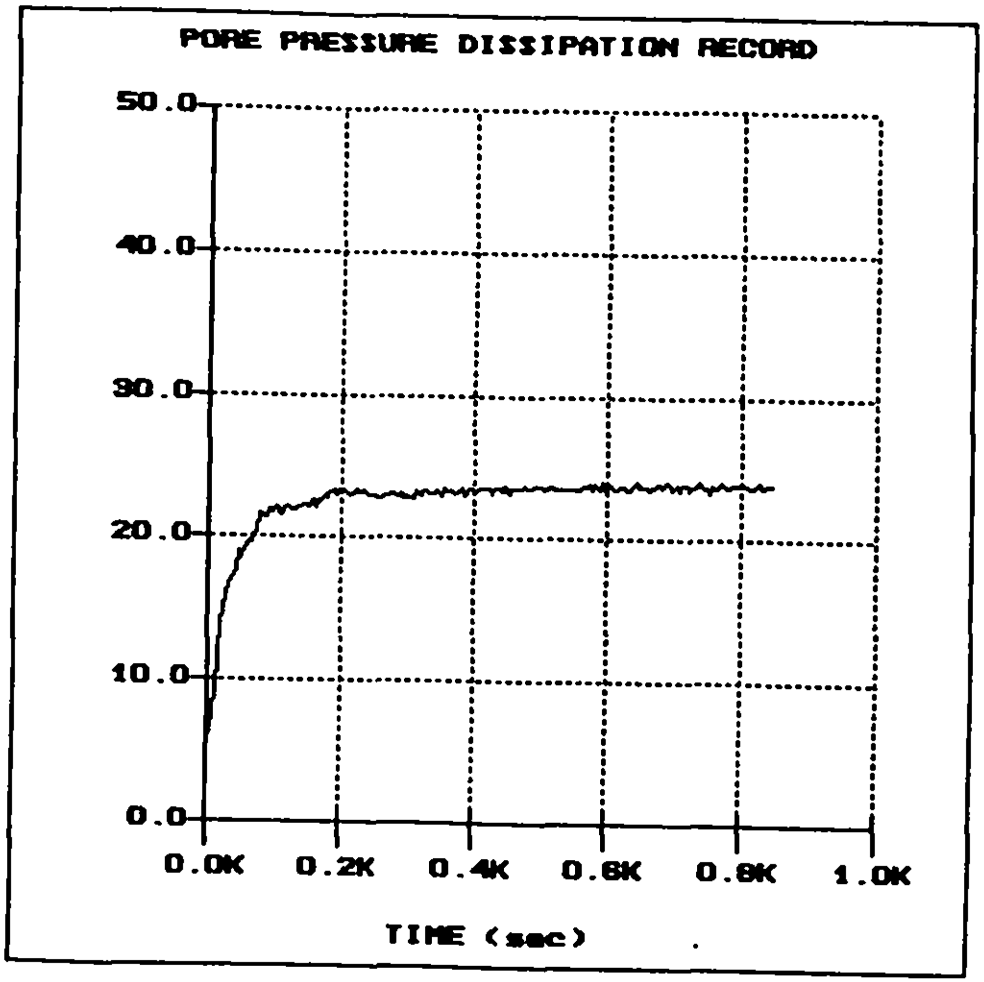
| epth (ft) | k (cm/s) | Bq | Qtn | Rfn | SBTn | Qc1N | DeltaQc1N | Qc1Ncs | Fc (%) | Phi (Deg) | Dr (%) | OCR | State Param | Del(n1)60 | (N1)60cs |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1.83 | 5.0E-03 | 0.00 | 44.2 | 0.88 | 7 | 59.9 | 31.3 | 91.2 | 17.8 | 38 | 52.6 | 1.0 | -0.10 | 4.0 | 18.7 |
| 2.81 | 5.0E-03 | 0.00 | 42.9 | 0.96 | 7 | 58.6 | 34.3 | 92.9 | 18.8 | 38 | 52.0 | 1.0 | -0.10 | 4.3 | 18.6 |
| 3.80 | 5.0E-03 | 0.00 | 38.5 | 1.05 | 7 | 53.2 | 39.4 | 92.6 | 20.9 | 38 | 49.2 | 1.0 | -0.10 | 4.7 | 17.7 |
| .78 | 5.0E-03 | 0.00 | 39.8 | 0.90 | 7 | 55.4 | 34.2 | 89.5 | 19.3 | 38 | 50.3 | 1.0 | -0.09 | 4.2 | 17.8 |
| .77 | 5.0E-03 | 0.00 | 38.2 | 0.96 | 7 | 53.7 | 37.0 | 90.7 | 20.3 | 38 | 49.4 | 1.0 | -0.09 | 4.5 | 17.6 |
| 5.75 | 5.0E-03 | 0.00 | 37.8 | 0.85 | 7 | 53.5 | 33.6 | 87.1 | 19.4 | 38 | 49.4 | 1.0 | -0.08 | 4.2 | 17.3 |
| 7.74 | 5.0E-06 | 0.06 | 11.8 | 3.29 | 4 | 18.2 | 73.0 | 91.2 | 55.9 | UnDef | UnDef | 3.0 | UnDef | 8.9 | 17.9 |
| 3.72 | 5.0E-05 | 0.08 | 8.5 | 2.05 | 4 | 13.8 | 55.2 | 69.0 | 56.2 | 30 | 30.0 | 3.0 | 0.01 | 5.4 | 10.8 |
| ?.70 | 5.0E-05 | 0.07 | 8.8 | 2.22 | 4 | 14.2 | 57.0 | 71.2 | 56.7 | 30 | 30.0 | 3.0 | 0.00 | 5.6 | 11.1 |
| ).69 | 5.0E-05 | 0.05 | 9.1 | 2.13 | 4 | 14.7 | 58.9 | 73.7 | 55.3 | 30 | 30.0 | 3.0 | 0.00 | 5.8 | 11.5 |
| 1.67 | 5.0E-05 | 0.02 | 13.2 | 1.87 | 6 | 20.7 | 82.7 | 103.4 | 45.0 | 32 | 30.0 | 6.0 | -0.04 | 8.1 | 16.2 |
| 2.66 | 5.0E-05 | 0.04 | 9.7 | 2.54 | 4 | 15.8 | 63.2 | 79.0 | 56.4 | 30 | 30.0 | 3.0 | -0.02 | 6.2 | 12.4 |
| 3.64 | 5.0E-03 | 0.00 | 41.5 | 0.65 | 7 | 61.4 | 26.9 | 88.3 | 16.4 | 38 | 53.3 | 1.0 | -0.07 | 3.5 | 18.6 |
| .63 | 5.0E-03 | 0.00 | 72.7 | 1.13 | 9 | 106.6 | 35.7 | 142.3 | 14.4 | 40 | 69.1 | 1.0 | -0.17 | 4.9 | 30.9 |
| .61 | 5.0E-02 | 0.00 | 71.4 | 1.01 | 9 | 105.5 | 32.0 | 137.6 | 13.7 | 40 | 68.8 | 1.0 | -0.16 | 3.5 | 24.2 |
| 5.59 | 5.0E-04 | 0.02 | 24.5 | 1.01 | 7 | 37.9 | 53.7 | 91.6 | 26.9 | 34 | 39.5 | 1.0 | -0.05 | 7.2 | 19.5 |
| 7.58 | 5.0E-02 | 0.00 | 101.2 | 0.79 | 9 | 150.6 | 18.3 | 168.9 | 9.1 | 42 | 79.0 | 1.0 | -0.17 | 2.1 | 31.6 |
| 3.56 | 5.0E-04 | 0.00 | 30.4 | 1.90 | 7 | 47.1 | 96.9 | 144.0 | 30.2 | 36 | 45.7 | 1.0 | -0.13 | 11.2 | 26.5 |
| ?.55 | 5.0E-05 | 0.20 | 7.1 | 1.19 | 6 | 12.9 | 51.5 | 64.4 | 53.2 | 30 | 30.0 | 3.0 | 0.07 | 5.0 | 10.1 |
| ).53 | 5.0E-04 | 0.04 | 12.2 | 1.47 | 6 | 20.5 | 82.0 | 102.4 | 43.6 | 30 | 30.0 | 1.0 | -0.01 | 6.7 | 13.4 |
| 1.52 | 5.0E-03 | 0.00 | 27.7 | 0.85 | 7 | 43.9 | 43.7 | 87.6 | 23.7 | 36 | 43.7 | 1.0 | -0.05 | 4.9 | 15.6 |
| 2.42 | 5.0E-03 | 0.00 | 49.0 | 0.91 | 7 | 76.4 | 35.3 | 111.7 | 16.8 | 38 | 59.5 | 1.0 | -0.11 | 4.6 | 23.3 |
| 3.32 | 5.0E-06 | 0.01 | 11.8 | 3.40 | 4 | 20.3 | 81.2 | 101.4 | 56.4 | UnDef | UnDef | 3.0 | UnDef | 9.9 | 19.9 |
| .30 | 5.0E-05 | 0.04 | 12.2 | 1.70 | 6 | 21.1 | 84.2 | 105.3 | 45.4 | 30 | 30.0 | 3.0 | -0.02 | 8.2 | 16.5 |
| .29 | 5.0E-02 | 0.00 | 50.7 | 0.71 | 9 | 80.1 | 28.1 | 108.3 | 14.7 | 38 | 60.9 | 1.0 | -0.09 | 3.0 | 18.7 |
| 5.27 | 5.0E-02 | 0.00 | 62.0 | 0.82 | 9 | 98.1 | 29.5 | 127.6 | 13.7 | 40 | 66.7 | 1.0 | -0.13 | 3.2 | 22.4 |
| 7.26 | 5.0E-03 | 0.00 | 38.1 | 1.04 | 7 | 61.6 | 45.8 | 107.4 | 21.0 | 38 | 53.4 | 1.0 | -0.10 | 5.5 | 20.5 |
| 3.24 | 5.0E-02 | 0.00 | 53.4 | 0.90 | 7 | 86.0 | 35.0 | 120.9 | 15.8 | 40 | 62.9 | 1.0 | -0.12 | 3.7 | 20.5 |
| ?.22 | 5.0E-02 | 0.00 | 58.9 | 0.93 | 9 | 95.0 | 34.9 | 129.9 | 15.1 | 40 | 65.8 | 1.0 | -0.13 | 3.8 | 22.3 |
| ).21 | 5.0E-04 | 0.02 | 19.8 | 1.91 | 6 | 33.9 | 135.4 | 169.3 | 37.4 | 34 | 36.2 | 1.0 | -0.08 | 11.0 | 22.1 |
| 1.19 | 5.0E-03 | 0.00 | 39.8 | 0.72 | 7 | 65.8 | 33.5 | 99.3 | 17.6 | 38 | 55.3 | 1.0 | -0.07 | 4.3 | 20.4 |
| 2.18 | 5.0E-05 | 0.04 | 13.4 | 2.67 | 6 | 24.0 | 96.2 | 120.2 | 49.7 | 32 | 30.0 | 6.0 | -0.07 | 9.4 | 18.8 |
| 3.16 | 5.0E-04 | -0.01 | 22.1 | 1.31 | 7 | 38.1 | 87.9 | 126.1 | 31.1 | 34 | 39.6 | 1.0 | -0.07 | 9.6 | 22.1 |
| .15 | 5.0E-04 | -0.03 | 16.1 | 1.17 | 6 | 28.6 | 114.5 | 143.1 | 35.6 | 32 | 31.4 | 1.0 | -0.03 | 9.3 | 18.7 |
| .13 | 5.0E-05 | 0.12 | 8.2 | 2.58 | 4 | 16.0 | 64.0 | 80.0 | 60.6 | 30 | 30.0 | 3.0 | 0.00 | 6.3 | 12.5 |
| 5.11 | 5.0E-04 | 0.01 | 22.7 | 1.62 | 6 | 39.7 | 118.2 | 157.8 | 33.0 | 34 | 40.8 | 1.0 | -0.08 | 11.4 | 24.3 |
| 7.10 | 5.0E-04 | -0.02 | 16.4 | 1.74 | 6 | 29.5 | 118.0 | 147.5 | 39.8 | 32 | 32.3 | 1.0 | -0.06 | 9.6 | 19.3 |
| 3.08 | 5.0E-06 | 0.13 | 8.6 | 3.88 | 1 | 16.8 | UnDef | UnDef | 100.0 | UnDef | UnDef | 3.0 | UnDef | UnDef | UnDef |
| ?.07 | 5.0E-06 | 0.12 | 10.2 | 4.24 | 1 | 19.5 | UnDef | UnDef | 100.0 | UnDef | UnDef | 3.0 | UnDef | UnDef | UnDef |
| ).05 | 5.0E-03 | 0.00 | 31.1 | 1.39 | 7 | 54.3 | 73.1 | 127.4 | 26.5 | 36 | 49.8 | 1.0 | -0.10 | 7.4 | 20.7 |
| 1.04 | 5.0E-02 | -0.01 | 44.8 | 0.97 | 7 | 77.4 | 43.2 | 120.6 | 18.4 | 38 | 59.9 | 1.0 | -0.11 | 4.4 | 19.5 |
| 2.02 | 5.0E-03 | -0.01 | 39.2 | 1.10 | 7 | 68.4 | 51.7 | 120.1 | 21.1 | 38 | 56.4 | 1.0 | -0.11 | 6.2 | 22.9 |
| 3.00 | 5.0E-03 | -0.02 | 31.2 | 1.21 | 7 | 55.4 | 64.0 | 119.5 | 25.1 | 36 | 50.4 | 1.0 | -0.09 | 6.8 | 20.4 |
| .99 | 5.0E-05 | -0.01 | 12.1 | 2.24 | 6 | 23.3 | 93.0 | 116.3 | 49.4 | 30 | 30.0 | 3.0 | -0.04 | 9.1 | 18.2 |
| .97 | 5.0E-02 | 0.01 | 57.1 | 0.90 | 9 | 99.8 | 36.9 | 136.7 | 15.1 | 40 | 67.2 | 1.0 | -0.12 | 4.0 | 23.5 |
| .96 | 5.0E-02 | 0.00 | 84.1 | 0.82 | 9 | 146.6 | 26.9 | 173.5 | 10.8 | 42 | 78.2 | 1.0 | -0.15 | 3.1 | 31.8 |
| .94 | 5.0E-02 | 0.00 | 79.6 | 0.80 | 9 | 139.5 | 27.2 | 166.7 | 11.1 | 42 | 76.8 | 1.0 | -0.15 | 3.1 | 30.4 |
| .93 | 5.0E-02 | 0.00 | 81.8 | 0.75 | 9 | 144.1 | 24.6 | 168.7 | 10.5 | 42 | 77.8 | 1.0 | -0.14 | 2.8 | 31.0 |
| .91 | 5.0E-02 | 0.00 | 73.4 | 0.77 | 9 | 130.2 | 28.0 | 158.2 | 11.6 | 40 | 74.8 | 1.0 | -0.14 | 3.2 | 28.7 |
| .89 | 5.0E-02 | 0.00 | 64.1 | 0.82 | 9 | 114.6 | 32.5 | 147.1 | 13.3 | 40 | 71.2 | 1.0 | -0.13 | 3.6 | 26.0 |
| .88 | 5.0E-02 | 0.00 | 60.4 | 0.73 | 9 | 108.7 | 30.1 | 138.7 | 13.1 | 40 | 69.7 | 1.0 | -0.11 | 3.3 | 24.6 |
| .86 | 5.0E-02 | 0.00 | 62.2 | 0.66 | 9 | 112.5 | 26.6 | 139.1 | 12.2 | 40 | 70.6 | 1.0 | -0.11 | 3.0 | 25.0 |
| .85 | 5.0E-02 | 0.00 | 80.2 | 0.56 | 9 | 144.7 | 17.4 | 162.1 | 9.0 | 42 | 77.9 | 1.0 | -0.12 | 2.0 | 30.4 |
| .83 | 5.0E-02 | 0.00 | 71.2 | 0.67 | 9 | 129.4 | 24.8 | 154.2 | 11.0 | 40 | 74.7 | 1.0 | -0.12 | 2.8 | 28.2 |
| .82 | 5.0E-02 | 0.00 | 67.7 | 0.61 | 9 | 123.8 | 23.5 | 147.4 | 11.0 | 40 | 73.4 | 1.0 | -0.11 | 2.7 | 26.9 |
| .80 | 5.0E+00 | 0.00 | 82.6 | 0.49 | 9 | 151.1 | 0.0 | 151.1 | 5.0 | 42 | 79.1 | 1.0 | -0.11 | 0.0 | 24.7 |
| .78 | 5.0E-02 | 0.00 | 70.6 | 0.60 | 9 | 130.1 | 22.4 | 152.6 | 10.5 | 40 | 74.8 | 1.0 | -0.11 | 2.6 | 28.1 |
| .77 | 5.0E-02 | 0.00 | 64.9 | 0.71 | 9 | 120.4 | 29.0 | 149.4 | 12.3 | 40 | 72.6 | 1.0 | -0.12 | 3.3 | 26.8 |
| .75 | 5.0E-02 | 0.00 | 71.4 | 0.84 | 9 | 132.8 | 32.7 | 165.4 | 12.4 | 40 | 75.4 | 1.0 | -0.14 | 3.7 | 29.7 |

# 3.3 PORE PRESSURE DISSIPATION PLOTS

URS

Site: PIER T LNG
Location: CPT-12

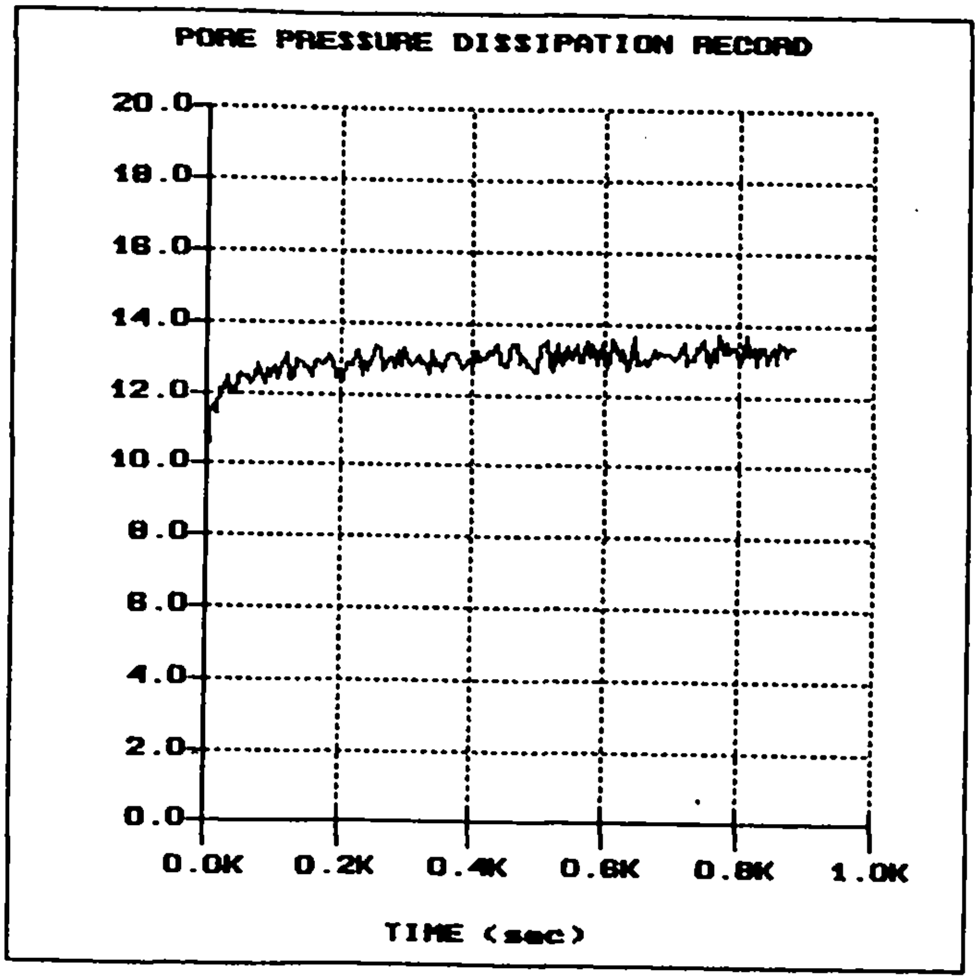
Engineer: T. O'BRIEN
Date:06:24:03 07:10




File: 151C12.PPC
Depth (m): 30.50
(ft): 100.07
Duration : 845.0s
U-min: 5.81 0.0s
U-max: 24.04 825.0s
U-eq.: 30.50
U-50 : 18.05 41.8s
ch : 17.232 cm^2/min
%Ut: 0.74

Plot u-min: 0.00
u-max: 50.00
t-min: 0.00
t-max: 1000.0
# of TicksX: 5
# of TicksY: 5
Rigidity Ir: 100.0
Water table: 0.00 m
0.00 ft

| URS | Site: PIER T LNG<br>Location: CPT-12 | Engineer: T. O'BRIEN<br>Date:06:24:03 07:10 |
|---|---|---|



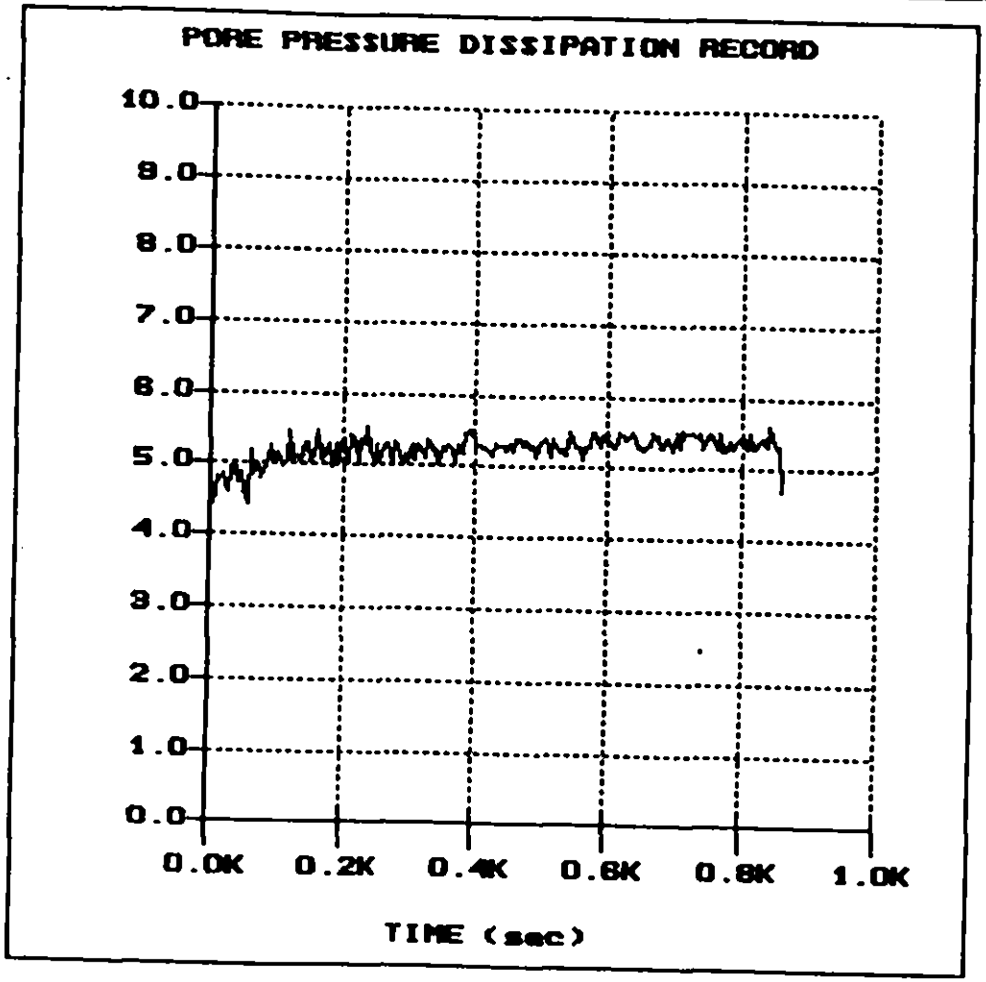

File: 151C12.PPC
Depth (m): 18.40
(ft): 69.85
Duration : 880.0s
U-min: 9.71 0.0s
U-max: 13.69 770.0s
U-eq.: 19.40
U-50 : 14.58 0.0s
ch : 0.000 cm^2/min
%Ut: 0.41

Plot u-min: 0.00
u-max: 20.00
t-min: 0.00
t-max: 1000.0
# of TicksX: 5
# of TicksY: 10
Rigidity Ir: 100.0
Water table: 0.00 m
0.00 ft

URS

Site: PIER T LNG
Location: CPT-06

Engineer: T. O'BRIEN
Date:06:25:03 09:02



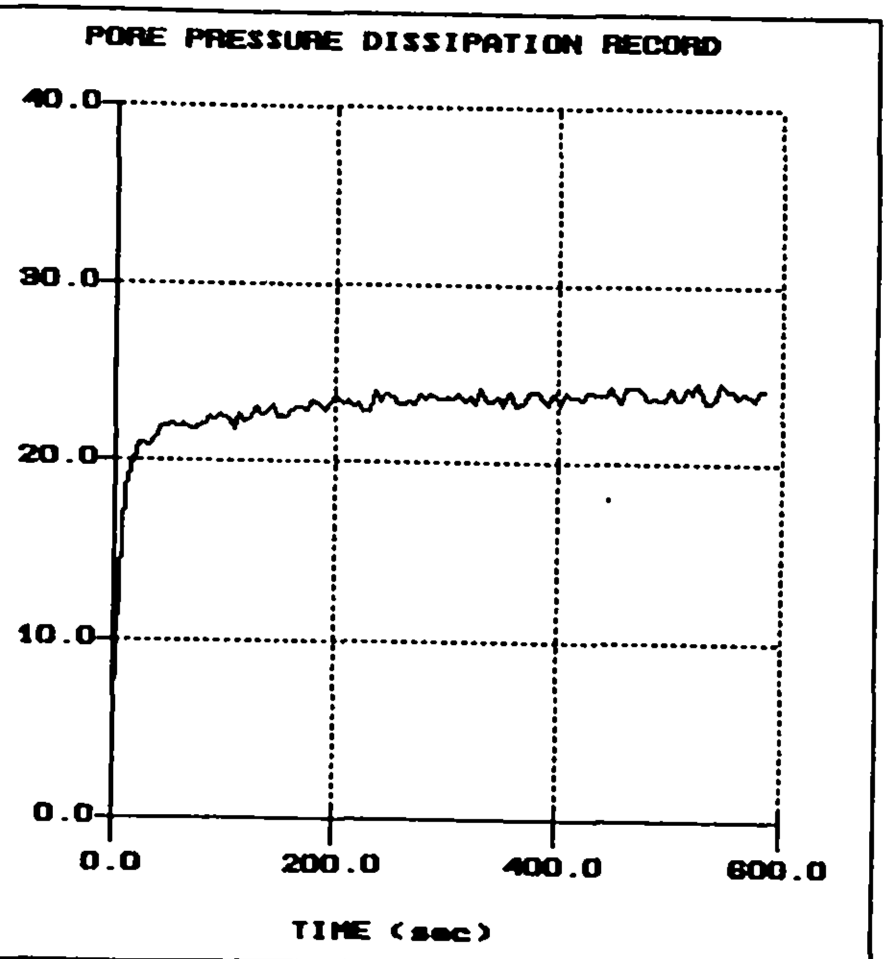

File: 151C06.PPC
Depth (m): 11.20
(ft): 36.75
Duration : 860.0s
U-min: 4.35 0.0s
U-max: 5.58 840.0s
U-eq.: 11.20
U-50 : 7.77 0.0s
ch : 0.000 cm^2/min
%Ut: 0.18

Plot u-min: 0.00
u-max: 10.00
t-min: 0.00
t-max: 1000.0
# of TicksX: 5
# of TicksY: 10
Rigidity Ir: 100.0
Water table: 0.00 m
0.00 ft

URS

Site: PIER T LNG
Location: CPT-01

Engineer: T. O'BRIEN
Date:08:25:03 07:27



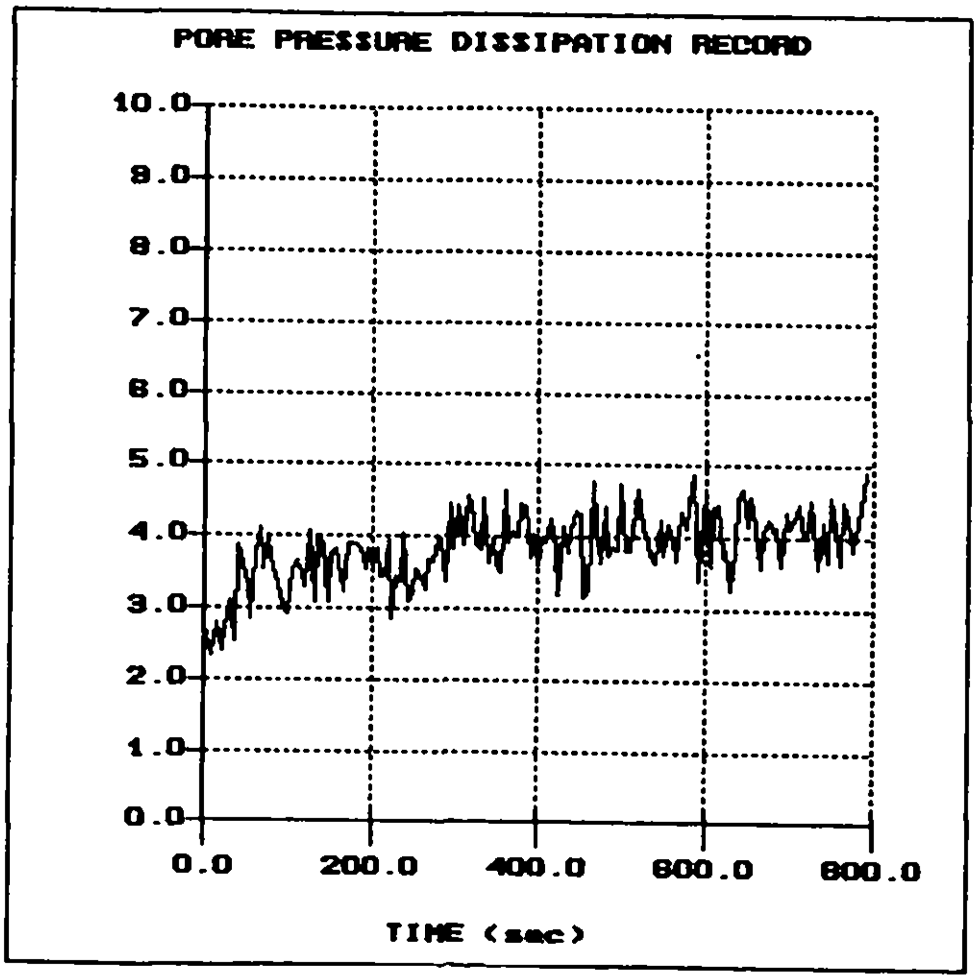

File: 151C01.PPC
Depth (m): 30.50
(ft): 100.07
Duration : 585.0s
U-min: 5.89 0.0s
U-max: 24.58 525.0s
U-eq.: 30.50
U-50 : 27.55 0.0s
ch : 0.000 cm^2/min
%Ut: 0.00

Plot u-min: 0.00
u-max: 40.00
t-min: 0.00
t-max: 600.0
# of TicksX: 3
# of TicksY: 4
Rigidity Ir: 100.0
Water table: 0.00 m
0.00 ft

URS

Site: PIER T LNG
Location: CPT-01

Engineer: T. O'BRIEN
Date:08:25:03 07:27




File: 151C01.PPC
Depth (m): 10.35
(ft): 33.96
Duration : 790.0s
U-min: 2.32 10.0s
U-max: 4.88 790.0s
U-eq.: 10.35
U-50 : 6.33 0.0s
ch : 0.000 cm^2/min
%Ut: 0.32

Plot u-min: 0.00
u-max: 10.00
t-min: 0.00
t-max: 800.0
# of TicksX: 4
# of TicksY: 10
Rigidity Ir: 100.0
Water table: 0.00 m
0.00 ft

# APPENDIX

ELECTRICAL PIEZOCONE

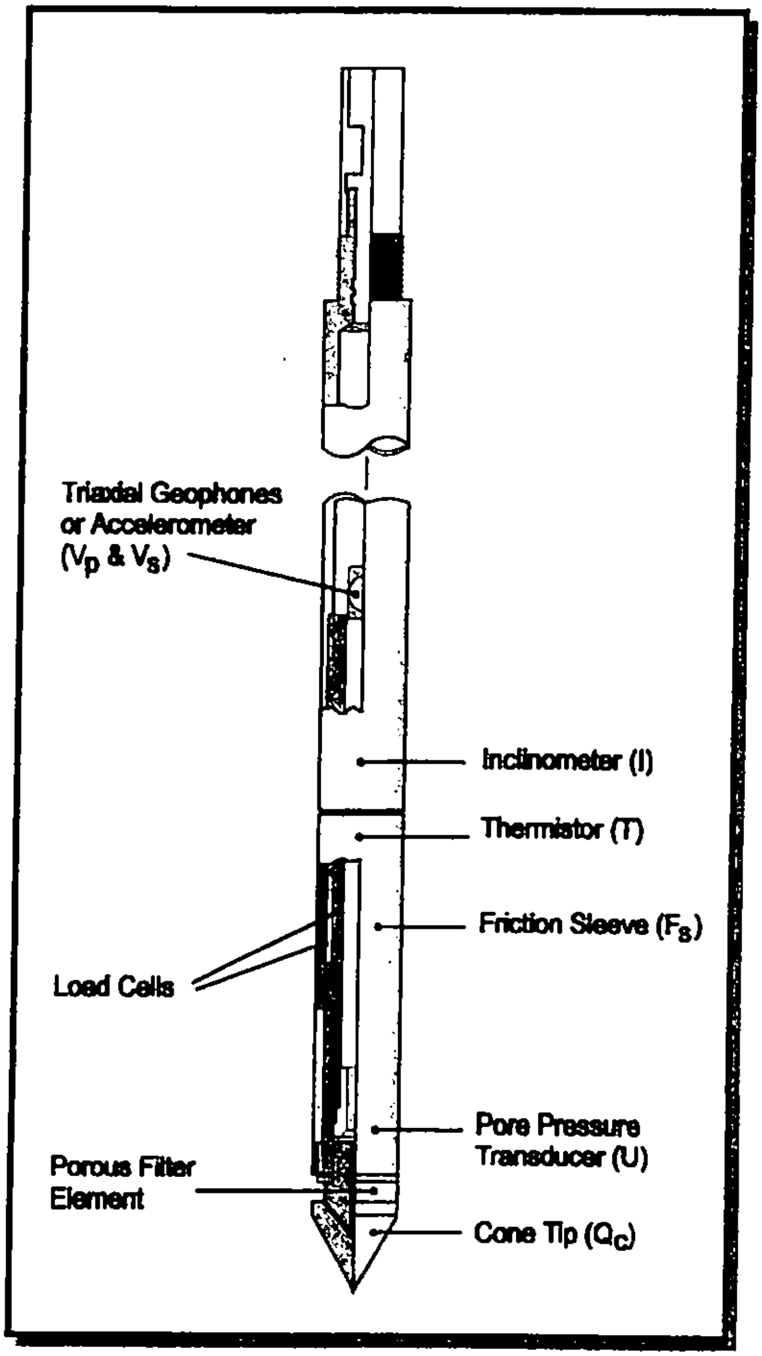
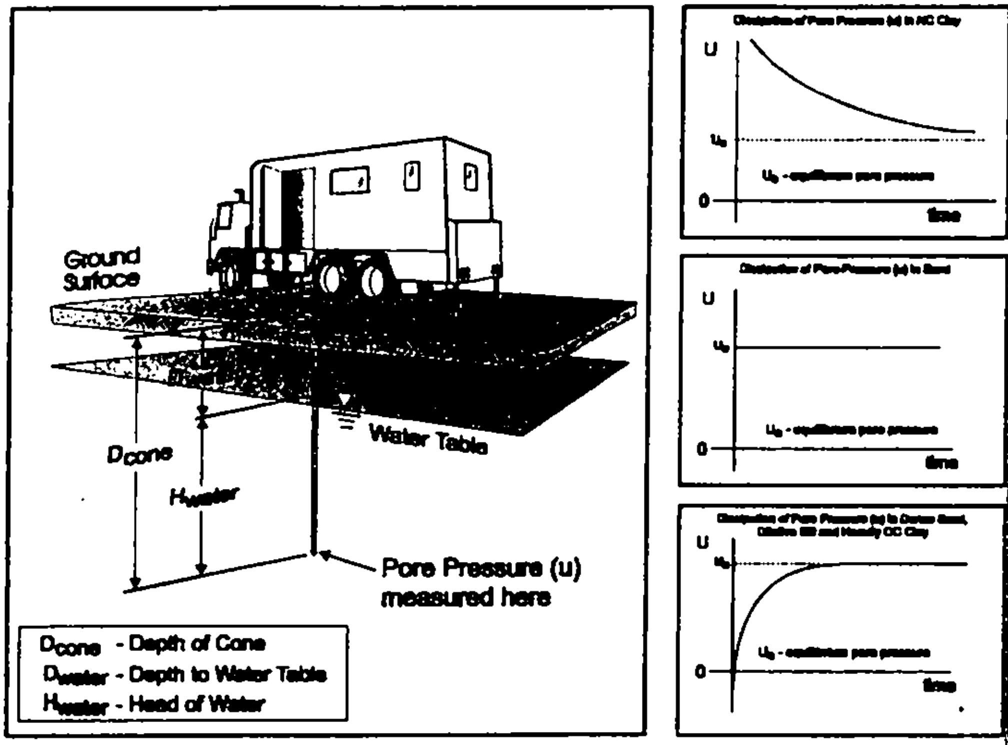



Figure 1

# PPDT CORRELATION




**Water Table Calculation**

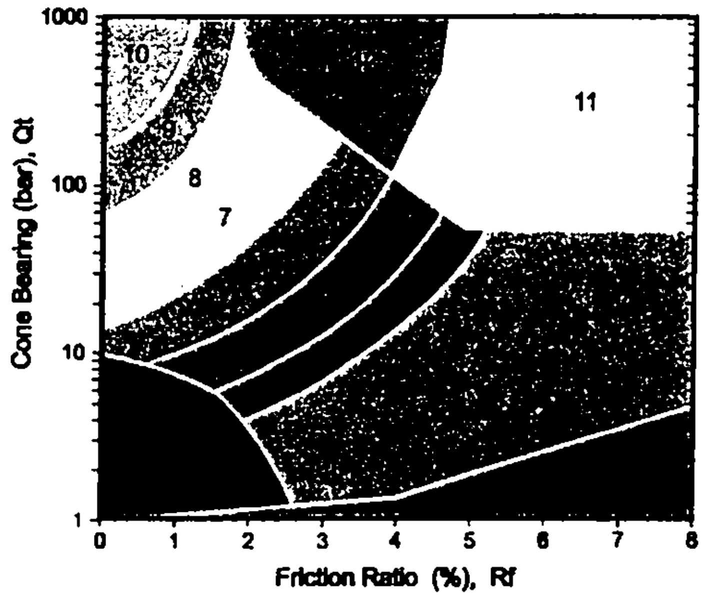
$$D_{water} = D_{cone} - H_{water}$$

where $H_{water} = U_e$ (depth units)

Useful Conversion Factors:
1psi = 0.704m = 2.31 feet (water)
1tsf = 0.958 bar = 13.9 psi
1m = 3.28 feet

Figure 2

# SOIL CLASSIFICATION CHART




| Zone | $Q_t$ / N | Soil Behaviour Type |
|---|---|---|
| 1 | 2 | sensitive fine grained |
| 2 | 1 | organic material |
| 3 | 1 | clay |
| 4 | 1.5 | silty clay to clay |
| 5 | 2 | clayey silt to silty clay |
| 6 | 2.5 | sandy silt to clayey silt |
| 7 | 3 | silty sand to sandy silt |
| 8 | 4 | sand to silty sand |
| 9 | 5 | sand |
| 10 | 6 | gravelly sand to sand |
| 11 | 1 | very stiff fine grained * |
| 12 | 2 | sand to clayey sand * |

* overconsolidated or cemented

After Robertson and Campenella

Figure 3

# REFERENCES

Robertson, P.K. and Campanella, R.G. and Wightman, A., 1983 "SPT-CPT Correlations", Journal of the Geotechnical Division, ASCE, Vol. 109, No. GT11, Nov., pp. 1449-1460.

Robertson, P.K. and Wride C.E., 1998 "Evaluating Cyclic Liquefaction Potential Using The Cone Penetration Test", Journal of Geotechnical Division, Mar. 1998, pp. 442-459.

Robertson, P.K. and Campanella, R.G., Gillespie, D. and Greig, J., 1986, "Use of Piezometer Cone Data", Proceedings of In Situ 86, ASCE Specialty Conference, Blacksburg, Virginia.

Robertson, P.K. and Campanella, R.G., 1988, "Guidelines for Use, Interpretation and Application of the CPT and CPTU", UBC, Soil Mechanics Series No. 105, Civil Eng. Dept., Vancouver, B.C., V6T 1W5, Canada.

Robertson, P.K., Campanella, R.G., Gillespie, D. and Rice, A., 1986, "Seismic CPT to Measure In Situ Shear Wave Velocity", Journal of Geotechnical Engineering, ASCE, Vol. 112, No. 8, pp. 791-803.

# Gregg In Situ

Environmental and Geotechnical Site Investigation Contractors

**Gregg In Situ CPT Interpretations as of January 7, 1999 (Release 1.00.19)**

Gregg In Situ's interpretation routine should be considered a calculator of current published CPT correlations and is subject to change to reflect the current state of practice. The interpreted values are not considered valid for all soil types. The interpretations are presented only as a guide for geotechnical use and should be carefully scrutinized for consideration in any geotechnical design. Reference to current literature is strongly recommended.

The CPT interpretations are based on values of tip, sleeve friction and pore pressure averaged over a user specified interval (typically 0.25m). Note that Qt is the recorded tip value, Qc, corrected for pore pressure effects. Since all Gregg In Situ cones have equal end area friction sleeves, pore pressure corrections to sleeve friction, Fs, are not required.

The tip correction is: $Qt = Qc + (1-a) \bullet Ud$

where: *Qt* is the corrected tip load
*Qc* is the recorded tip load
*Ud* is the recorded dynamic pore pressure
*a* is the Net Area Ratio for the cone (typically 0.85 for Gregg In Situ cones)

Effective vertical overburden stresses are calculated based on a hydrostatic distribution of equilibrium pore pressures below the water table or from a user defined equilibrium pore pressure profile (this can be obtained from CPT dissipation tests). The stress calculations use unit weights assigned to the Soil Behavior Type zones or from a user defined unit weight profile.

Details regarding the interpretation methods for all of the interpreted parameters is given in table 1. The appropriate references referred to in table 1 are listed in table 2.

The estimated Soil Behavior Type is based on the charts developed by Robertson and Campanella shown in figure 1.

**Table 1 CPT Interpretation Methods**

| Interpreted Parameter | Description | Equation | Ref |
|---|---|---|---|
| Depth | mid layer depth | | |
| AvgQt | Averaged corrected tip (Qt) | $AvgQt = \frac{1}{n}\sum_{i=1}^{n} Qt_i$ | |
| AvgFs | Averaged sleeve friction (Fs) | $AvgFs = \frac{1}{n}\sum_{i=1}^{n} Fs_i$ | |
| AvgRf | Averaged friction ratio (Rf) | $AvgRf = 100\% \bullet \frac{AvgFs}{AvgQt}$ | |
| AvgUd | Averaged dynamic pore pressure (Ud) | $AvgUd = \frac{1}{n}\sum_{i=1}^{n} Ud_i$ | |
| SBT | Soil Behavior Type as defined by Robertson and Campanella | | 1 |

## CPT Interpretations

| | | | |
|---|---|---|---|
| U.Wt. | Unit Weight of soil determined from: 1) uniform value or 2) value assigned to each SBT zone 3) user supplied unit weight profile | | |
| TStress | Total vertical overburden stress at mid layer depth | $TStress = \sum_{i=1}^{n} \gamma_i h_i$ where $\gamma_i$ is layer unit weight, $h_i$ is layer thickness | |
| EStress | Effective vertical overburden stress at mid layer depth | $EStress = TStress - Ueq$ | |
| Ueq | Equilibrium pore pressure determined from: 1) hydrostatic from water table depth 2) user supplied profile | | |
| Cn | SPT $N_{60}$ overburden correction factor | $Cn = (\sigma_v')^{-0.5}$ where $\sigma_v'$ is in tsf, $0.5 < C_n < 2.0$ | |
| $N_{60}$ | SPT N value at 60% energy calculated from Qt/N ratios assigned to each SBT zone | | 3 |
| $(N1)_{60}$ | SPT $N_{60}$ value corrected for overburden pressure | $N1_{60} = Cn \cdot N_{60}$ | 3 |
| $\Delta(N1)_{60}$ | Equivalent Clean Sand Correction to $(N1)_{60}$ | $\Delta(N1)_{60} = \frac{K_{SPT}}{1 - K_{SPT}} \cdot (N1)_{60}$<br>Where: $K_{SPT}$ is defined as:<br>0.0 for FC < 5%<br>0.0167 • (FC - 5) for 5% < FC < 35%<br>0.5 for FC > 35%<br>FC - Fines Content in % | 7 |
| $(N1)_{60cs}$ | Equivalent Clean Sand $(N1)_{60}$ | $(N1)_{60cs} = (N1)_{60} + \Delta(N1)_{60}$ | 7 |
| Su | Undrained shear strength - Nkt is use selectable | $Su = \frac{Qt - \sigma_v}{N_{kt}}$ | 2 |
| k | Coefficient of permeability (assigned to each SBT zone) | | 6 |
| Bq | Pore pressure parameter | $Bq = \frac{\Delta u}{Qt - \sigma_v}$ | 2 |
| Qtn | Normalized Qt for Soil Behavior Type classification as defined by Robertson, 1990 | $Qtn = \frac{Qt - \sigma_v}{\sigma'_v}$ | 4 |
| Rfn | Normalized Rf for Soil Behavior Type classification as defined by Robertson, 1990 | $Rfn = 100\% \cdot \frac{f_s}{Qt - \sigma_v}$ | 4 |
| SBTn | Normalized Soil Behavior Type (slightly modified from that published by Robertson, 1990. This version includes all the soil zones of the original non-normalized SBT chart - see figure 1) | | 4 |
| Qc1 | Normalized Qt for seismic analysis | $qc1 = qc \cdot (Pa/\sigma_v')^{0.5}$ where: Pa = atm. pressure | 5 |
| Qc1N | Dimensionless Normalized Qt1 | qc1N = qc1 / Pa where: Pa = atm. pressure | |

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## CPT Interpretations

| | | | |
|---|---|---|---|
| ΔQc1N1 | Equivalent clean sand correction | $\Delta qc1N = \frac{K_{CPT}}{1-K_{CPT}} \bullet qc1N$<br>Where: $K_{CPT}$ is defined as:<br>0.0 for FC < 5%<br>0.0267 • (FC - 5) for 5% < FC < 35%<br>0.5 for FC > 35%<br>FC - Fines Content in % | 5 |
| Qc1Ncs | Clean Sand equivalent Qc1N | $qc1Ncs = qc1N + \Delta qc1N$ | 5 |
| Ic | Soil index for estimating grain characteristics | $Ic = [(3.47 - \log Q)^2 + (\log F + 1.22)^2]^{0.5}$ | 5 |
| FC | Fines content (%) | $FC=1.75(Ic^{3.25}) - 3.7$<br>$FC=100$ for $Ic > 3.5$<br>$FC=0$ for $Ic < 1.26$<br>$FC = 5\%$ if $1.64 < Ic < 2.6$ AND $Rfn<0.5$ | 8 |
| PHI | Friction Angle | Campanella and Robertson<br>Durunoglu and Mitchel<br>Janbu | 1 |
| Dr | Relative Density | Ticino Sand<br>Hokksund Sand<br>Schmertmann 1976<br>Jamiolkowski - All Sands | 1 |
| OCR | Over Consolidation Ratio | | 1 |
| State Parameter | | | 9 |
| CRR | Cyclic Resistance Ratio | | 7 |

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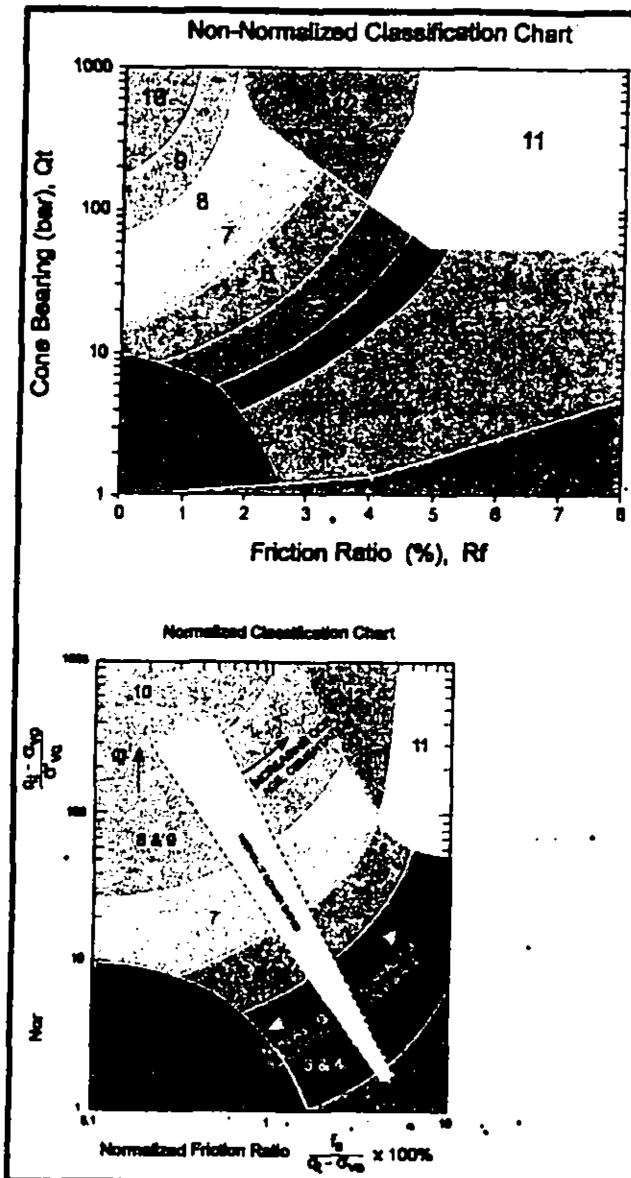
CPT Interpretations




| Zone | | $Q_t$ / N | Soil Behaviour Type |
|---|---|---|---|
| 1 | | 2 | sensitive fine grained |
| 2 | | 1 | organic material |
| 3 | | 1 | clay |
| 4 | | 1.5 | silty clay to clay |
| 5 | | 2 | clayey silt to silty clay |
| 6 | | 2.5 | sandy silt to clayey silt |
| 7 | | 3 | |
| 8 | | 4 | and to silty sand |
| 9 | | 5 | sand |
| 10 | | 6 | gravelly sand to sand |
| 11 | | 1 | very stiff fine grained * |
| 12 | | 2 | sand to clayey sand * |

Figure 1 Non-Normalized and Normalized Soil Behavior Type Classification Charts

GREGG

**Table 2 References**



| No. | Reference |
|---|---|
| 1 | Robertson, P.K. and Campanella, R.G., 1986, "Guidelines for Use, Interpretation and Application of the CPT and CPTU", UBC, Soil Mechanics Series No. 105, Civil Eng. Dept., Vancouver, B.C., Canada |
| 2 | Robertson, P.K., Campanella, R.G., Gillespie, D. and Greig, J., 1986, "Use of Piezometer Cone Data", Proceedings of InSitu 86, ASCE Specialty Conference, Blacksburg, Virginia. |
| 3 | Robertson, P.K. and Campanella, R.G., 1989, "Guidelines for Geotechnical Design Using CPT and CPTU", UBC, Soil Mechanics Series No. 120, Civil Eng. Dept., Vancouver, B.C., Canada |
| 4 | Robertson, P.K., 1990, "Soil Classification Using the Cone Penetration Test", Canadian Geotechnical Journal, Volume 27. |
| 5 | Robertson, P.K. and Fear, C.E., 1995, "Liquefaction of Sands and its Evaluation", Keynote Lecture, First International Conference on Earthquake Geotechnical Engineering, Tokyo, Japan. |
| 6 | Gregg In Situ Internal Report |
| 7 | Robertson, P.K. and Wride, C.E., 1997, "Cyclic Liquefaction and its Evaluation Based on SPT and CPT", NCEER Workshop Paper, January 22, 1997 |
| 8 | Wride, C.E. and Robertson, P.K., 1997, "Phase II Data Review Report (Massey and Kidd Sites, Fraser River Delta)", Volume 1 - Data Report (June 1997), University of Alberta. |
| 9 | Plewes, H.D., Davies, M.P. and Jefferies, M.G., 1992, "CPT Based Screening Procedure for Evaluating Liquefaction Susceptibility", 45th Canadian Geotechnical Conference, Toronto, Ontario, October 1992. |