APPENDIX 8.13A

Environmental Due Diligence

FLUOR DANIEL GTI

PHASE I ENVIRONMENTAL SITE ASSESSMENT
SOUTH BAY POWER PLANT
990 BAY BOULEVARD
CHULA VISTA, CALIFORNIA

FD GTI Project 103589

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EXECUTIVE SUMMARY

Fluor Daniel GTI was retained by San Diego Gas & Electric (SDG&E) to conduct a Phase I Environmental Site Assessment for the properties that include the South Bay Power Plant (SBPP) located in Chula Vista, California, the National City Terminal (NCT) located in National City, California and the fuel oil pipeline connecting the two locations. SDG&E currently operates the subject properties, referred to in aggregate as the Site, as an electrical generation facility and associated marine terminal. The Site is currently active and is located in an area of light to heavy industrial and commercial properties. The pipeline connecting the SBPP and the NCT traverses under industrial properties, roadways, and wetland areas.

The purpose of the assessment was to identify, to the extent and pursuant to the processes prescribed by American Standards and Testing Method (ASTM) Standard E 1527-97, recognized environmental conditions in connection with the properties. The term *"recognized environmental conditions"*, as used in this report, means the presence or likely presence of any hazardous substances or petroleum products on the properties under conditions that indicate an existing release, a past release, or a material threat of a release of any hazardous substances or petroleum products into structures on the properties or into the ground, groundwater, or surface water of the properties. The term includes hazardous substances or petroleum products used in compliance with applicable laws, but does not include *de minimis* conditions that do not pose a material risk or harm to public health or environment.

The following activities comprise the scope of services conducted during this investigation:

- An inspection of the subject properties and a drive-through inspection of the surrounding areas
- Interviews with knowledgeable persons
- Review of readily available regional information, including topographic maps, geologic and hydrogeologic data
- Review of the history of the Site and surrounding area (inclusive of 50-year chain-of-ownership, Sanborn or similar fire insurance maps, historic aerial photographs, and previous Site investigative documents)
- An environmental database search of California state files and U.S. Environmental Protection Agency (U.S. EPA) files for the subject properties and surrounding areas,

obtained from Environmental Data Resources (EDR) and a review of records at selected agencies' offices

- Review of SDG&E files, including internal correspondence, regulatory agency correspondence, and consultant reports
- Preparation of this summary ESA which discusses the Site activities and identifies potential environmental and regulatory issues associated with the properties

The following issues are not part of an ASTM Phase I environmental site assessment and were not included in the scope:

- Evaluation of lead-based paint and asbestos adhering to structures or equipment
- Review of facility compliance with environmental regulations, except to the extent that permitted or unpermitted discharges could impact soil or groundwater of the facility
- Air emissions
- Discharges to San Diego Bay
- Ecological assessment of the property and surrounding environs
- Compliance with the California Environmental Quality Act (CEQA)

Fluor Daniel GTI conducted the Phase I site visit on February 23, 1998, with follow-up visits on March 9, 24, 27, and 30, 1998.

The assessment activities and findings have lead to the following conclusions, which are subject to the limitations discussed in the report:

- The assessment meets or exceeds the guidelines presented in ASTM Standard E 1527-97 for Phase I ESAs
- The assessment constitutes *appropriate inquiry*[1] into environmental conditions at the SBPP

[1] The term *appropriate inquiry* is discussed at length in ASTM E 1527-97, and is intended to have the meaning as employed under CERCLA. For a legal opinion of what constitutes appropriate inquiry, the report user is encouraged to employ the services of a competent environmental attorney. This report does not constitute a legal opinion.

- The findings of the assessment are sufficient to warrant intrusive sampling (Phase II assessment) at selected locations on the Site

- The Phase I ESA identified potential environmental conditions that will be evaluated by a Phase II assessment. The potential environmental conditions at SBPP and NCT are summarized in Table ES-1

- The Phase I ESA has not identified any additional potential environmental conditions beyond those listed in Table ES-1

An objective of the Phase II ESA will be to identify which potential environmental concerns from Phase I ESA require risk quantification and remediation, and which are not to be considered further. The sampling protocols and methodologies to be employed in Phase II will be described in the Phase II Field Sampling Plan

TABLE ES-1

SUMMARY OF POTENTIAL ENVIRONMENTAL CONDITIONS IDENTIFIED DURING PHASE I INVESTIGATIONS

SOUTH BAY POWER PLANT AND NATIONAL CITY TERMINAL

Inv. Area No.	Investigation Area Description	Potential Environmental Conditions	Recommended Phase II Action
1a	North Tank Farm	▪ Potential unidentified releases of hydrocarbons from four ASTs, pipelines, and the pump deck. ▪ Releases at the pump pit and berm pond. ▪ Releases at the displacement oil AST and heat exchanger. ▪ Potential impact to soil or groundwater from the use of corrosion inhibiting oils in the construction of ASTs.	Soil and groundwater sampling for fuel hydrocarbons and metals
1b	South Tank Farm	▪ Releases of No. 6 fuel oil from ASTs 1, 2, and 3. ▪ Potential unidentified releases of hydrocarbons from pipelines and the pump deck ▪ Potential impact to soil or groundwater from the use of corrosion inhibiting oils in the construction of ASTs.	Soil and groundwater sampling for fuel hydrocarbons and metals.
1c	Jet Fuel Area	▪ Potential unidentified releases of hydrocarbons from the AST, pipelines, and the pump deck. ▪ Potential impact to soil or groundwater from the use of corrosion inhibiting oils in the construction of ASTs.	Soil and groundwater sampling for fuel hydrocarbons and metals.
1d	UST Area	▪ Release of diesel and gasoline from USTs, pipelines, and pumps.	Sample groundwater from existing wells for fuel hydrocarbons and metals.
2a	Process Water Treatment Area	▪ Potential unidentified losses of treatment water, containing hydrocarbons and metals from ASTs and pipelines.	Sample soil and groundwater for hydrocarbons and metals.
2b	Former Surface Impoundments[1]	▪ Metals remaining in soil in 1st Generation Impoundment Area.	No additional sampling required.
3a	Power Plant and Immediate Vicinity	▪ Potential release of PCB[2]-containing oil. ▪ Potential hydrocarbon releases from pipelines. ▪ Releases from wastewater transfer sump of wastewater	Soil and groundwater sampling for hydrocarbons, metals, and PCBs.

TABLE ES-1
SUMMARY OF POTENTIAL ENVIRONMENTAL CONDITIONS IDENTIFIED DURING PHASE I INVESTIGATIONS
SOUTH BAY POWER PLANT AND NATIONAL CITY TERMINAL

Inv. Area No.	Investigation Area Description	Potential Environmental Conditions	Recommended Phase II Action
		potentially bearing oil, metals, and volatile organic compounds. ▪ Potential releases during handling sodium dichromate.	
3b	Maintenance Area	▪ Releases of unidentified hydrocarbons from pipelines between the ASTs and the power plant. ▪ Potential releases of wastewater or routine cleaning liquids used during maintenance and painting operations. ▪ Potential releases of volatile organic compounds and metals.	Soil and groundwater sampling for fuel hydrocarbons, metals, and VOCs[3].
3c	Gas Turbine	▪ Potential releases of hydrocarbons from pipelines and AST within the Gas Turbine compound.	Soil sampling for fuel hydrocarbons and metals.
4a	Former Drum Storage and Laydown Area	▪ Area previously investigated and closed.	Sample soil in or near this area for SVOCs[4].
4b	Construction Yard	▪ Potential impact of metals to soils due to abrasive blasting.	Soil sampling for metals.
4c	Hazardous Materials Storage Area	▪ Potential releases of hazardous wastes within storage area. ▪ Potential impact of metals to soils due to abrasive blasting.	Soil sampling for metals, fuel hydrocarbons, VOCs.
5a	Open Area	▪ Potential unidentified releases of hydrocarbons from the truck unloading station for Tank No. 7. ▪ Potential impact of metals to soils due to abrasive blasting. ▪ Potential presence in soils of semi-volatile compounds from coal tar used to coat the traveling screens. ▪ Potential releases of contaminants due to unidentified or uncontrolled dumping within the open areas.	Shallow soil sampling for fuel hydrocarbons, metals, PCBs, and groundwater sampling at edge of site for metals, fuel hydrocarbons, and VOCs.
5b	Switchyard Border	▪ Potential unidentified releases of PCBs and other contaminants from the switchyard onto the site.	Sample soil and groundwater for PCBs and hydrocarbons around edge of switchyard.

TABLE ES-1

SUMMARY OF POTENTIAL ENVIRONMENTAL CONDITIONS IDENTIFIED DURING PHASE I INVESTIGATIONS SOUTH BAY POWER PLANT AND NATIONAL CITY TERMINAL

Inv. Area No.	Investigation Area Description	Potential Environmental Conditions	Recommended Phase II Action
5c	Septic/Leach Field	▪ Impact to groundwater and soil from potential introduction of hydrocarbons, metals, and other contaminants into the septic system.	Sample soil and groundwater for fuel hydrocarbons, VOCs and metals.
6	National City Terminal	▪ Release of No. 6 fuel oil from Tank 1. ▪ Release diesel from pipeline. ▪ Potential unidentified releases of hydrocarbons from ASTs, pipelines, and pumps. ▪ Potential unidentified release of PCBs	Sample soil and groundwater for fuel hydrocarbons, metals and PCBs.
	Off-site Areas	▪ Potential release of hydrocarbons from former LNG[5] plant and migration onto SBPP property. ▪ Unidentified releases from automobile junkyard located on adjacent property.	Sample groundwater along common SBPP perimeter for fuel hydrocarbons, metals, VOCs.

[1] Includes both 1st and 2nd Generation Impoudments
[2] PCB Polychlorinataed Biphenyls
[3] VOC Volatile Organic Compound
[4] SVOC Semi-volatile Organic Compound
[5] LNG Liquid Natural Gas

GLOSSARY OF ABBREVIATIONS

AST	aboveground storage tank
ASTM	American Society for Testing and Materials
bbls	barrels
bgs	below ground surface
BTEX	benzene, toluene, ethylbenzene, and total xylenes
CAA	Clean Air Act
CEQA	California Environmental Quality Act
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CERCLIS	Comprehensive Environmental Response, Compensation, and Liability Information System
CWA	Clean Water Act
DO	displacement oil
DRO	Diesel Range Organic
DTSC	Department of Toxic Substances Control
EDR	Environmental Data Resources
EPA	US Environmental Protection Agency
ERNS	Emergency Response Notification System
EW	Extended Wastes
FINDS	Facility Index Database System
FDGTI	Fluor Daniel GTI, Inc.
GRO	Gasoline Range Organic
HDPE	High Density Polyethylene
IUD	Industrial User Discharge
KV	kilovolts
LNG	Liquefied Natural Gas
LUST	leaking underground storage tank
LVW	low volume wastewater
MCL	maximum contaminant level
MCW	Metals Cleaning Wastewater
mg/L	milligrams per liter
pCi/l	pico curies per liter
psi	pounds per square inch
µg/L	micrograms per liter
MSDS	material safety data sheet
MW	megawatt
NANCY Pipeline	National City Pipeline
NAPL	Nonaqueous Phase Liquids

NCT	National City Terminal
NOV	Notice of Violation
NPDES	National Pollutant Discharge Elimination System
NPL	National Priorities List
PAH	polychlorinated aromatic hydrocarbons
PCB	polychlorinated biphenyl
pCi/L	picoCuries per liter
PID	Photoionization Detector
ppb	parts per billion
ppm	parts per million
RAATS	RCRA Administrative Action Tracking System
RCRA	Resource Conservation and Recovery Act
RWQCB	California Regional Water Quality Control Board - San Diego Region
SBPP	South Bay Power Plant
SDG&E	San Diego Gas and Electric
SHW	State Hazardous Waste
SVOC	Semi-volatile organic compound
SWF/LS	Solid Waste Facilities/Landfill Sites
SWMU	Solid Waste Management Unit
SWPPP	Storm Water Pollution Prevention Plan
TCLP	toxicity characteristic leaching procedure
TDS	Total Dissolved Solids
TPCA	California Toxic Pits Cleanup Act
TPH	Total Petroleum Hydrocarbons
TRPH	Total Recoverable Petroleum Hydrocarbons
TSCA	Toxic Substances Control Act
TSDF	Treatment, Storage, and Disposal Facility
TTLC	Total Threshold Limit Concentration
UD	User Discharge
USGS	United States Geological Survey
USEPA	United States Environmental Protection Agency
UST	underground storage tank
VOC	volatile organic compound
WWTP	Wastewater Treatment Plant

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1. 0 INTRODUCTION

San Diego Gas & Electric (SDG&E) retained Fluor Daniel GTI to conduct a Phase I Environmental Site Assessment (ESA) for properties that include the South Bay Power Plant (SBPP) located in Chula Vista, California, the National City Terminal (NCT) located in National City, California (Figures 1-1a and 1-1b, respectively, Site Location Map), and the fuel oil pipeline connecting the two locations. The subject properties, referred to in aggregate as the Site (Figures 1-2a and 1-2b, respectively, Site Plan), are currently operated as an electrical generation facility and associated marine terminal. The facilities are currently active and are located in an area of light to heavy industrial and commercial properties (Figures 1-3a and 1-3b, respectively, Area Land Use Map). The pipeline connecting the SBPP and the NCT traverses under industrial properties, roadways, and wetland areas.

1.1 Project Objective and Scope

The purpose of the Phase I ESA was to identify, to the extent feasible and pursuant to the processes prescribed by American Standards and Testing Method (ASTM) Standard E 1527-97, recognized environmental conditions in connection with the properties. The term, "*recognized environmental conditions*", as used in this report, means the presence, or likely presence of any hazardous substances or petroleum products on the properties under conditions that indicate an existing release, a past release, or a material threat of a release of any hazardous substances or petroleum products into structures on the properties or into the ground, groundwater, or surface water of the properties. The term includes hazardous substances or petroleum products used in compliance with applicable laws, but does not include *de minimis* conditions that do not pose a material risk of harm to public health or the environment.

The following activities comprise the scope of services conducted during this investigation:

- An inspection of the subject properties and a drive-through inspection of the surrounding areas
- Interviews with knowledgeable persons
- Review of readily available regional information, including topographic maps, geologic and hydrogeologic data
- Review of the history of the Site and surrounding area (inclusive of the 50-year chain-of-ownership, Sanborn or similar fire insurance maps, historic aerial photographs, and previous Site investigative documents)

- An environmental database search of California state files and United States Environmental Protection Agency (U.S. EPA) files for the subject properties and surrounding areas, obtained from Environmental Data Resources (EDR) and a review of records at selected regulatory agencies' offices
- Review of SDG&E files, including internal correspondence, regulatory agency correspondence, and consultants reports
- Preparation of this summary assessment report which discusses the Site activities and identifies potential environmental and regulatory issues associated with the properties

The following issues are not a part of an ASTM Phase I ESA and were not included in the scope:

- Evaluation of lead-based paint and asbestos adhering to structures or equipment
- Review of facility compliance with environmental regulations, except to the extent that permitted or unpermitted discharges could impact soil or groundwater of the facility
- Air emissions
- Discharges to San Diego Bay
- Ecological assessment of the property and environment
- Compliance with the California Environmental Quality Act (CEQA)

1.2 Basis for and Limitation of Work Product

Fluor Daniel GTI has reviewed information concerning the potential presence of contamination on the subject properties, and has prepared this report in a professional manner using that degree of skill and care exercised for similar projects under similar conditions by reputable and competent environmental consultants. The information contained in this report, including its conclusions, is based on the information which was made available to Fluor Daniel GTI during the investigation and upon the services described. Because this report is based on available information, some of its conclusions could be different if the information upon which it is based is determined to be false, inaccurate, misleading or contradicted by additional information.

Fluor Daniel GTI makes no representation concerning the legal significance of its findings or of the value of the property investigated. Fluor Daniel GTI has no contractual liabilities to third parties for the information or opinions contained in this report. This report is not intended to satisfy the requirements of the National Contingency Plan.

2.0 INFORMATION FROM SITE RECONNAISSANCE AND INTERVIEWS

The purpose of the Site reconnaissance was to inspect the properties for visible signs or indications of environmental conditions that are currently, or have in the past, presented potentially adverse impacts to the Site. On February 23, 1998, David Cornue and other Fluor Daniel GTI personnel performed a walk-through of the subject Site in the presence of Ms. Lynn Jahn, Principal Environmental Analyst, to assess and evaluate the activities occurring at the Site. Subsequent visits were also conducted on March 9, 24, 27 and 30, 1998. Photographs were taken during the field inspections to document areas of interest and/or environmental conditions. Selected Site photographs are provided in Appendix A.

In addition to the Site walk, interviews were conducted with several SDG&E personnel.

2.1 Site Location and Site Description

General. SBPP is located at 990 Bay Boulevard, along the eastern shore of San Diego Bay in Chula Vista, San Diego County, California (Figures 1-1a and 1-2a). The power plant occupies approximately 150 acres of land. The associated marine terminal and connecting pipeline (Figures 1-1b and 1-2b) are also included in the Site. The National City Terminal, also known as the 24th Street Marine Terminal, is located at 2600 Terminal Avenue, along the Eastern Shore of San Diego Bay in National City, San Diego County, California. The terminal occupies approximately 5.7 acres of land. A 4.3-mile, 10-inch diameter, steel, delivery pipeline connects the terminal with the power plant and traverses commercial/industrial properties and intertidal salt marshes. Pipelines also connect the terminal with three berths located west of the terminal.

The power plant is located in Township 18 South, Range 2 West (Section not specified on the USGS topographic map). The terminal is located in Township 17 South, Range 2 West (Section not specified on the USGS topographic map).

Power Plant. The SBPP is an outdoor plant without an external building constructed around the generators and boilers (Figure 1-2a and Photographs A-9, A-23, and F-6). The power plant is comprised of a thermal power plant, a small gas turbine plant, switchyard, aboveground storage tanks (ASTs) for fuel oil, a cooling water system, and ancillary systems. The power plant has four steam turbine-driven generating units fired by natural gas or Residual No. 6 fuel oil. Natural gas is the primary fuel; however, the power plant retains the ability to revert to fuel oil at any time as a contingency against cost and supply fluctuations. Prior to 1972, the power plant was fired with Bunker C fuel oil.

Located within the power plant is a 138 kilovolt (kV) switchyard. A smaller 69 kV switchyard is located north of the facility (Photographs A-6 and A-23). The switchyards contain 31 circuit breakers and 27

transformers. SDG&E will retain the switchyards, which are not part of this assessment. The main and auxiliary transformers (total of ten) for the generating units are located immediately northeast of the power plant (Photograph A-9). The main and auxiliary transformer capacities range from 1,390 gallons to 11,300 gallons of dielectric oil. Five lubricating oil storage tanks are located within the plant containing a total of 25,000 gallons of lubricating oil. In addition, each unit has a turbine oil conditioner tank with capacities up to 1,000 gallons. Descriptions of current and past tankage at the power plant are contained in Table 1-2.

The North-40 (Photographs A-1 through A-4) and the South-40 (Photographs A-17 and 18), contain ASTs for fuel oil and diesel displacement oil.

The majority of the property is unpaved, except for asphalt-paved access roads. Limited portions of the spill containment berms are coated with a black, asphalt-like, erosion control product.

Gas Turbine. A 22-megawatt (MW) gas turbine peaking unit is located approximately 250 feet north-northwest of the power plant (Photograph A-8). The gas turbine is enclosed in an integral steel structure. All associated equipment is located within a fenced enclosure.

The gas turbine is fueled with Jet-A fuel stored in a 100,000-gallon AST (Photograph A-7) located a short distance northwest of the gas turbine unit. The gas turbine also has a built-in 1,070-gallon lubricating oil storage tank. Other materials that have been, or are currently, managed within the gas turbine enclosure are:

- Mobile Jet II synthetic oil (lubrication oil)
- sulfuric acid (batteries)

Marine Terminal. The National City Tank Farm and Marine Terminal are located at 2600 Terminal Avenue in National City, California (Figure 2b and Photograph A-29). The tank farm is located approximately 1,900 feet east of San Diego Bay and includes an area of approximately 5.7 acres. The terminal has two AST for fuel oil storage (Table 1-1). Fuel oil is delivered at pump rates of up to 14,000 bbls/hr from tanker vessels (typical capacity 230,000 bbls) and up to 10,000 bbls/hr from barges (typical capacity 50,000 bbls). Fuel oil is temporarily stored in two ASTs at the terminal for reconciliation of delivery volume; thereafter, it is transferred through the National City pipeline to the SBPP (SDG&E, 1991).

Diesel fuel, which is stored in a 36,500-gallon AST, is used as a cutting oil to flush fuel oil pipelines after fuel transfer operations. Diesel fuel is left in the pipeline as displacement fluid while the pipeline is idle between delivery events.

The majority of the property is unpaved except for asphalt-paved access roads. Limited portions of the spill containment berms are coated with a black, asphalt-like, erosion control product.

National City Pipeline. The National City Pipeline (occasionally referred to as the "Nancy Pipeline") is a 10-inch diameter, underground pipeline of approximately 4.3 miles in length (Photographs A-24 through A-28). It connects the NCT with the SBPP tank farms. This unheated pipeline is constructed of steel and has impressed current cathodic protection (SDG&E, 1991 and 1993b).

The No. 6 fuel oil is heated to a temperature of 180°F prior to transfer to the SBPP to prevent plugging of the pipeline. SDG&E employs electric recirculating heaters at each terminal AST and a steam package boiler, which burns either diesel fuel or No. 6 fuel oil, to provide heating (SDG&E, 1991).

This pipeline is underground for the majority of its length. It is exposed at the surface at three locations: 1) in a storm drain berm within the northeastern portion of the power plant (Photograph A-24); 2) as part of an aerial crossing of the Sweetwater River (Photograph A-27); and 3) in the base of a tidal channel in Sweetwater Marsh (Photograph A-26). For much of its length, the pipeline is centrally located within the footprint of the transmission towers for the SDG&E power line.

2.2 Description of Operations

The following sections describe the operations conducted at the Site and associated potential impacts. Power plant operations will be described first, followed by wastewater treatment, and fuel handling and storage.

Power Plant. The power plant is a steam-driven electric generation facility capable of producing 728 MW of electrical energy (Table 1-1). The boilers provide superheated steam used to rotate the turbines and generate electrical current which is routed to the switchyard via the main transformers. At the main transformers and in the switchyard, line voltage is transformed and routed to the various transmission lines exiting the facility.

For at least the last seven years, the primary fuel for the power plant has been natural gas. No. 6 fuel oil is mainly used as a back up to the natural gas fuel and is rarely used by the generating plant. In 1997, fuel oil was burned in various generating units on only 10 different calendar days. Prior to 1990, No. 6 fuel oil was the primary fuel for the power plant. Prior to 1972, the power plant was fueled with Bunker C fuel oil.

The power plant cooling system uses approximately 600 million gals per day of "once-through" non-contract cooling water which is drawn from San Diego Bay through an inlet channel (Figure 1-2a and Photograph A-16); (RWQCB-San Diego, 1988). Cooling water circulates through condenser tubes to cool and condense the boiler steam to water for reuse in steam generation. The cooling

water is discharged to the San Diego Bay through a discharge channel (Figure 1-2a). A dike that extends westward into the Bay separates the two channels. This dike expands at its western end approximately 2.500 feet from the plant to form the Chula Vista Wildlife Refuge, a least tern nesting area (Photograph A-22). The warmer discharge water significantly enhances the growth of marine grasses in this channel which, in turn, attracts green and black sea turtles that feed on the marine grasses (Sea World Research Institute, 1990).

SDG&E uses sodium hypochlorite to chlorinate the "once-through" cooling water to minimize biofouling. Hydrazine (35 percent solution) is used as an oxygen scavenger in the boiler feed water to minimize internal corrosion of the boiler. Sodium hydroxide and sulfuric acid (98 percent solution) are used for regeneration of the water demineralizer. Other water treatment chemicals are also used in the boiler make-up water. This report discuss waste streams and associated Solid Waste Management Units (SWMU) in subsequent sections.

Wastewater Treatment. The Waste Water Treatment Plan (WWTP) is located southeast of the power plant (Photographs A-13 and A-14). It consists of six-wastewater holding ASTs (four primary, two secondary) ranging from 56,000 gallons to 357,000 gallons and a few treatment ASTs (Table 1-1). SDG&E manages low volume wastewater (LVW) in a primary AST from where it is pumped to a coalesce to remove oil and grease and then filtered before discharge to the sewer. Metals cleaning wastewater (MCW) is managed in the AST. It is treated by adjusting the pH to remove metals. Then this wastewater stream is transferred to a secondary AST until it can be discharged to the sewer. The entire WWTP is provided with secondary containment (SDG&E, 1995). Section 2.6.2 of the report provides a more complete description of the wastewater treatment processes.

Fuel Transfer and Handling. Oil is delivered to the NCT by tankers which are moored at either Berth 24-4 (deep-water berth) or Berth 24-1.5 (shallow draft berth). A third berth, Berth 24-3, is currently out-of-service. The berths are connected to the terminal tank farm by aboveground and belowground pipelines. Flexible, aboveground hoses connect the individual berth pipelines to tanker vessels for off-loading of fuel. Pipelines of 10-inch diameter and 1,650-foot length (Berth 24-1.5) and 18-inch diameter and 2,725-foot length (Berth 24-4) off-load fuel oil from tanker ships and barges moored at the two wharf berths and transfer it to the terminal AST area (SDG&E, 1993b). Fuel oil is temporarily stored in two ASTs at the terminal for reconciliation of delivery volume and then transferred to the SBPP tank farms via the National City Pipeline.

Prior to transfer, the specific berth pipeline is pressure-tested to 100 psi for 30 mins to check for leaks. This practice is typically performed within 24 hours of vessel arrival. The 10-inch National City Pipeline is tested to 650 psi for 30 minutes prior to a fuel oil transfer event. Tank gauges are observed hourly, and readings are compared to the input readings at the terminal during fuel transfer to further ensure that pipeline leaks are not occurring. The pipeline right-of-way is visually inspected

twice daily during fuel oil transfer events. When the pipeline is not in use, it is inspected twice a month (SDG&E, 1993b).

Six ASTs in two tank farms ("North-40" and "South-40") are employed for storage of No. 6 fuel oil (Table 1-2 and Figure 1-2a). Tanks 1, 2, and 3 (South-40 tank farm; Photograph A-18) are insulated, floating roof ASTs. A fourth, uninsulated diesel tank (AST 7) is also located at the South-40. AST 7 was intended for use with several gas turbine peaking units; however, these units were never installed. AST 7 is currently out-of-service. It had been partially filled at one time, but was emptied and only has limited residual liquid remaining in the tank.

Tanks 4, 5, and 6 (North-40; Photographs A-1 and A-2) are insulated, floating roof ASTs (Table 1-1). Fuel oil is pumped through heat exchangers and transfer pumps located in a pumping pit adjacent to Tank 5 from these ASTs to the power plant for firing the boilers. A cone-roofed, double-bottomed 420,000 bbl AST (North-40) stores diesel for displacement oil. West of the gas turbine is a cone-roofed, double-bottomed, 100,000-gallon AST used to store Jet-A fuel for the gas turbine facility which is located north of the power plant building (Figure 1-2a). All fuel ASTs at both the NCT and the SBPP are surrounded by secondary containment berms of 110 percent capacity of the largest AST within the berms. Each fuel oil AST is individually bermed (SDG&E 1993a, 1995, and 1997b).

According to SDG&E's Pollution Response Plan (1997a) and Marine Terminal Operation Manual (1997c), the No. 6 fuel oil, currently handled at the NCT and at the SBPP, has a pour-point temperature range of 40° - 140°F [60°F according to a Chevron Fuel Oil No. 6 Material Safety Data Sheet (MSDS)]. According to SDG&E personnel, SDG&E used Bunker C fuel oil at the facility prior to 1972. Bunker C oil has a pour-point temperature in the 30°F-40°F range, and is substantially similar to No. 6 fuel oil, except that it has a lower pour point. Therefore, Bunker C oil has a slightly greater propensity to migrate through fine-grain soils than does residual No. 6 fuel oil .

When the National City Pipeline and the berth pipelines are in use, they contain No. 6 fuel oil. When they are not in use, they contain diesel which is used to displace the residual fuel oil and eliminate blockage that can occur from semi-solidification of No. 6 fuel oil (SDG&E, 1993b). The pipeline has a capacity of approximately 1,800 bbls. During transfer of fuel oil from the NCT to the SBPP, heated No. 6 fuel oil displaces the diesel fuel. The diesel fuel is diverted to the displacement oil AST at the North-40 tank farm (Table 1-1 and Figure 1-2a). Once a total of 1,600 bbls of displacement oil has been received at the displacement oil AST, the remaining displacement oil and the transferred fuel oil are diverted to a fuel oil AST. Therefore, a total of approximately 200 bbls of diesel is "metered" into each fuel oil transfer event and is ultimately burned in the generating units with the fuel oil.

The total, worst-case spill volume of the combined pipeline is 6,600 bbls (based on a pipeline volume of 1,800 bbls, a flow rate of 4,800 bbl/hr, and a shutdown time of one hour (SDG&E, 1993b).

The displacement oil (i.e. diesel fuel) serves two purposes (IWG, 1994). On rare occasions, prior to delivery at the SBPP, displacement oil can be heated and circulated through the berth lines and the NCT Pipeline (which are not heat-traced) in order to bring the entire piping system up to a temperature suitable for pumping of the Residual No. 6 fuel oil (high pour-point fuel). It also occupies the berth lines and pipeline when at rest. This practice prevents solidification and plugging of the pipelines and valves by No. 6 fuel oil as it cools.

The pipeline traverses the Sweetwater Marsh National Wildlife Refuge which is listed as an Area of Special Concern for the following species:

- American Coot,
- Black Necked Stilt,
- Caspian Tern,
- Clapper Rail,
- Elegant Tern,
- Forrester's Tern,
- Killdeer,
- Least Tern,
- Snowy Plover,
- Jacknife and Littleneck Clams, and
- Green Sea Turtle (SDG&E, 1993b).

For this project, Fluor Daniel GTI divided the Site into seven areas (Figures 1-2a and 1-2b):

- the North-40 and South-40 Tank Farms and the Jet-A AST (Area 1);
- the Wastewater Treatment Plant (WWTP) and former, first and second-generation wastewater treatment impoundments (Area 2);
- the power plant operational areas and gas turbine (Area 3);
- the former drum storage cage, the abrasive blasting area, the aqueous ammonia ASTs, the current hazardous materials/waste storage shed and the maintenance storage area (Area 4);
- the "undeveloped" eastern portions of the property (excluding the switchyard, which is not part of the Site) (Area 5);
- the NCT (Area 6); and
- the National City Pipeline (Area 7).

2.3 Building Characteristics

Power Plant. An outdoor steel-framed structure without perimeter walls houses the generating units (Photographs A-9, A-23, and F-6). General building construction is slab-on-grade for the various support buildings. Asphalt and unpaved parking areas are located adjacent to the buildings.

The Sweetwater Water Authority and the City of San Diego Metropolitan Industrial Waste Program supply public water and sewage services to the power plant. Electric power is supplied on-site.

Fluor Daniel GTI personnel observed sumps and oil/water separators at the site. Floor drains are present in the plant as well as in various support buildings. The drains in the power plant connect with the facility's low volume wastewater (LVW) treatment system.

The surface water drainage system includes parking areas, AST berms, the WWTP, the power plant and switchyard, and various support buildings and areas. Storm water runoff is directed to San Diego Bay under a Storm Water Pollution Prevention Plan (SWPPP) (Brown and Caldwell, 1997).

The only septic leachfield known to exist at the power plant supports the "schoolhouse" in the southeastern part of the property. Its exact location is uncertain. According to SDG&E personnel, it receives only restroom sanitary wastewater and no chemical wastewaters.

Marine Terminal. The only buildings at the NCT are a cinder block construction electrical switch house and a small operating building.

2.4 Physical Setting Analysis

2.4.1 Topography

The western edge of SBPP borders the San Diego Bay. The topography of the property rises gently eastward. The west-dipping gentle slope is bisected by the Telegraph Canyon Creek and an unnamed drainage north of the power plant. Locally, berms have been built around fuel storage facilities, and walls have been constructed around wastewater treatment areas to contain potential spills. Vegetation is limited to low shrubs and trees maintained at specific locations by an irrigation system.

The NCT property is flat, except for man-made bermed areas around fuel storage areas. The property along the pipeline between NCT and SBPP is essentially flat in areas where industrial facilities operate. Along the northern route of the pipeline, the topography includes estuarine gullies and embankments.

2.4.2 Geology

Regional Geology. SBPP is located within the Peninsular Range physiographic province which is characterized by northwest-to-southeast trending faults (predominantly strike-slip lateral faults). No known faults are present on the power plant property (Woodward-Clyde, 1986). The Site is underlain by the following strata (Woodward-Clyde, 1986):

- Tertiary marine sediments overlain by,
- Quaternary marine deltaic and bay sediments and terrestrial alluvial sediments of the Pleistocene-aged Bay Point Formation (see Appendix C.2.4).

Site Geology. Over the lifespan of the SBPP, several geotechnical studies have been conducted in support of facility construction, expansion, and earthquake preparedness. These studies included the installation of numerous soil borings and are summarized below (see Appendices C.2.4 and C.8.1).

Woodward-Clyde (1976) performed a geotechnical soil investigation for construction of the first-generation wastewater treatment impoundments. The following is summarized from their report and is presented in a north to south progression:

- A soil boring was advanced to a depth of 19 feet below ground surface (bgs) near the Jet-A AST location. This boring encountered silty sand and silty clay fill material to a depth of 9 feet bgs and fine sandy to silty native clays below that depth. Groundwater was encountered at a depth of 7.5 feet bgs.
- A soil boring was advanced to a depth of 24 feet bgs just north of the first-generation wastewater treatment impoundment location. This boring encountered silty clay fill material to a depth of 8.5 feet bgs, silty fine sand and "scattered gravel" to a depth of 13 feet bgs, and clayey sand to sandy clay below that depth. Groundwater was encountered at a depth of 8.5 feet bgs.
- A soil boring was advanced to a depth of 28 feet bgs near the east end of the power plant and south of the switchyard location. This boring encountered sandy gravel fill to a depth of 2 feet bgs, clayey sand to sandy clay to a depth of 9.25 feet bgs, and interbedded (approximate unit thicknesses of 2 - 3 feet) medium to fine-grained sand and sandy or silty clays. Groundwater was encountered at a depth of 11.25 feet bgs.
- A soil boring was advanced to a depth of 28 feet bgs near the middle area of the second-generation wastewater treatment impoundment location. This boring encountered interbedded (approximate unit thickness of 2 - 3 feet) sandy clays and silty to clayey sands to a depth of 15 feet bgs, a fine sandy clay from 15 to 23.5 feet bgs, and

interbedded silty clay and silty sand below that depth. Groundwater was encountered at a depth of 9.5 feet bgs.

- A soil boring was advanced to a depth of 12 feet bgs east of the railroad tracks and east of the fueling UST location. This boring encountered silty medium to fine sand with gravel to a depth of 3.5 feet bgs, silty fine sand to a depth of 8.5 feet bgs, and a sandy clay to the total depth of exploration. Depth to groundwater was not noted.

Additional geotechnical borings of interest from other studies include:

- A soil boring was advanced to a depth of 24 feet bgs northeast of the North-40 Tank Farm location. This boring encountered silty clay, interpreted as bay sediments, to a depth of 3.5 feet bgs. Clay, fine sandy clay, and silty clay were observed to the total depth of exploration. Saturated soils were present at the ground surface in this location (Benton, 1967);

- A soil boring was advanced to a depth of 100 feet bgs prior to construction of the power plant, approximately in the area of Unit #4. This boring encountered sandy loam and sandy clay loam to approximately 9.5 feet bgs. This material is underlain by interbeds of coarse to fine-grained sands, sandy or silty clays, and clays to a depth of approximately 48 feet bgs, which is underlain by predominantly clay-rich soils/sediments to the total depth of exploration. Depth to groundwater was noted at approximately 5 feet bgs (Dames & Moore, 1954);

- A soil boring was advanced to a depth of 212 feet bgs prior to construction of the power plant approximately in the area of the east end of the intake channel. This boring encountered sandy loam to a depth of approximately 24 feet bgs (with a formational contact noted at 15 feet bgs). This material is underlain by medium to fine-grained sands with clay lenses to a depth of approximately 67 feet bgs, which is underlain by predominantly sandy soils/sediments to an approximate depth of 153.5 feet bgs. Gravel predominates to a depth of 205 feet bgs, and sandy loam continues to the total depth of exploration at 212 feet bgs. Depth to groundwater was noted at approximately 4.5 feet bgs (Dames & Moore, 1957).

- A soil boring was advanced to a depth of 45 feet bgs prior to construction of the gas turbine. This boring encountered silty fine sand and silty clay to a depth of 5.5 feet bgs. This material is underlain by clayey medium to fine-grained sands, sandy clay, and silty clay to a depth of approximately 12.25 feet bgs, and silty clay to the total depth of exploration. Depth to groundwater was noted at a depth of approximately 6.6 feet bgs (Benton, 1966).

The SBPP is characterized by varying thicknesses of fill material composed of silty to clayey sand, underlain by clayey sand, silty sand, and fine sand alluvial deposits. This material, in turn, is underlain by the Bay Point Formation which is composed of silty to sandy clays with interbeds of medium sand to clayey sand and interbedded sands, silty sands, clayey sands, and clays. Gravel is present at depths exceeding 150 feet bgs (Woodward-Clyde, 1986 and Dames & Moore, 1984).

Site-specific geologic information for the NCT was not available in SDG&E's files. However, based on similar physiographic setting and relative proximity (the two areas are approximately 3 air miles apart), Fluor Daniel GTI expects the basic geology to be similar to that of the SBPP. However, the NCT was constructed on a significantly larger quantity of fill material (see Section 3.3 herein) than the SBPP. A fill thickness of at least 10 feet may be present above natural bay sediments at this Site.

2.4.3 Hydrogeology

Regional Hydrogeology. The SBPP is located within the Telegraph Hydrographic Subarea of the Lower Sweetwater Hydrographic Subunit of San Diego County (Woodward-Clyde, 1986). The NCT is located within the La Nacion Hydrographic Subarea of the Lower Sweetwater Hydrographical Area of the Sweetwater Hydrographic Unit. Both properties are considered beneficial water use areas for municipal, agricultural and industrial, and are considered sensitive groundwater basins due to their proximity to San Diego Bay. Recharge is from regional precipitation and local infiltration from streamflow in the Otay River, Telegraph Canyon Creek, and the Sweetwater River. Regional discharge is generally to San Diego Bay (Woodward-Clyde, 1986).

According to SDG&E, no groundwater supply wells are located at either the power plant, terminal, or pipeline properties.

The same public water supply well is identified as the "nearest water supply well" to both SBPP and NCT. According to the EDR report:

- SBPP: no water supply wells are located downgradient of the subject property. The nearest public water supply well is located approximately three-quarters of a mile to the east.

- NCT: no water supply wells are located downgradient of the subject property. The nearest public water supply well is located more than 5 miles to the south.

This well is located at significant distances from both properties. Therefore, Fluor Daniel GTI considers Site activities are unlikely to impact groundwater quality at these wells.

According to Woodward-Clyde (1986), irrigation water supply wells in this area are typically completed at depths of approximately 125 to 650 feet bgs in the Bay Point, Lindavista, and San Diego

Formations. Depth to groundwater in these wells typically ranges from 70 to 140 feet bgs. As stated by Woodward-Clyde (1986), and supported by Fluor Daniel GTI, it is highly unlikely that Site activities could impact these wells because of their distance from the Site.

Site Hydrogeology. Woodward-Clyde (1986) installed eight groundwater monitoring wells surrounding the second-generation wastewater impoundment area. Woodward-Clyde drilled six wells to 20 feet bgs in the upper fill and alluvial sequence and two wells to 60 feet bgs into the basal alluvial sand just above the uppermost clay of the Bay Point Formation.

Woodward-Clyde found the depth too shallow groundwater in this area to be 6 to 9 feet bgs in the second-generation impoundment area. They performed a groundwater elevation study to investigate potential tidal influence. Woodward-Clyde was unable to identify a clear relationship between the groundwater elevation fluctuations and tidal. They determined that groundwater flow in the second-generation impoundment area, and presumably the entire power plant area, is in a west-southwesterly direction, toward San Diego Bay. Hydraulic gradient was measured to be 0.005 feet/feet.

Depth completed to groundwater in the deep monitoring wells (completed to 60 feet bgs) was similar to that in the shallow wells (20 feet bgs). Therefore, Woodward-Clyde (1986) concluded that the shallow and deep water-bearing zones are in hydraulic communication with each other.

Woodward-Clyde (1986) performed slug tests to estimate hydraulic conductivity of the water-bearing zones. Soil samples were also tested in the laboratory to estimate the hydraulic conductivity of the clay zones. The shallow water-bearing sands had conductivities of 0.2 feet/day to 0.9 feet/day (0.6-feet/day average) and the deeper water-bearing sands had conductivities estimated at 1.5 feet/day to 4.8 feet/day (2.8-feet/day average). The clays had conductivities of 2.1×10^{-4} feet/day to 5.0×10^{-4} feet/day. Porosity of the silty sands was estimated at 35 to 39 percent. Average linear flow velocity was estimated at 3 feet/year in the shallow sands and 15 feet/year in the deeper Bay Point Formation sands. These conductivities and flow rates are estimates averaged for the stratigraphic column measured; actual conductivities and flow rates for specific sand beds can be expected to be greater.

Based on previous groundwater sampling, total dissolved solids (TDS) values for groundwater samples ranged from 1,800 to 4,500 mg/l, indicating brackish conditions unsuitable for drinking water. This result is consistent with sodium-calcium-chloride waters typical of the Lower Sweetwater Hydrographic Subunit. Woodward-Clyde (1986) concluded that saltwater intrusion of the water-bearing zones exists at the SBPP.

SDG&E files did not include site-specific hydrogeologic information for the NCT. However, based on a similar physiographic setting and relative proximity (the two areas are approximately 3 miles apart), the basic hydrogeology is probably substantially similar to that of the SBPP. The primary exception would be that the NCT is the location of even more significant fill material emplacement (see Section

3.3 herein) than at the SBPP. Therefore, porosity, conductivity, and average linear flow velocity are possibly greater at the NCT, assuming that the fill material is less well compacted than natural soils and sediments, and assuming that the fill materials are not predominated by clays.

2.4.4 Surface Water Hydrology

Surface water bodies in the Site vicinity were identified from the following United States Geological Survey (USGS) topographic maps: Imperial Beach, California - Baja California Norte quadrangle (USGS, 1975a), for the SBPP; and the National City California quadrangle (USGS, 1975b), for the NCT. These surface water bodies include (proceeding west to east and south to north):

- San Diego Bay, which abuts the Site to the west.
- Salt evaporation impoundments, owned and operated by Western Salt, which abut the SBPP to the south and southwest.
- Otay River, which is located approximately 1.1 miles south of the southern margin of the SBPP.
- Telegraph Canyon Creek, which is located east of the power plant and bisects it north of the generating units and south of the North-40 Tank Farm. The creek flows through a concrete lined channel on-site prior to discharge into San Diego Bay. According to Woodward-Clyde (1986), this creek once flowed through an unlined channel.
- An unnamed, improved surface water drainage, which is located at the north boundary of the SBPP property and separates it from the J Street Marina. According to Woodward-Clyde (1986), this drainage is a storm water run-off outfall from a portion of the City of Chula Vista drainage system located east of Interstate 5.
- Coastal salt marshes and associated tidal channels located west of, and along the course of, the National City Pipeline; a portion of these tidal marshlands is located within the Sweetwater Marsh National Wildlife Refuge, which is a protected breeding area for the Clapper Rail.
- The Sweetwater River, which is located east of the National City Pipeline and crosses to the west beneath the pipeline at approximately C Street.
- Paradise Creek and associated marsh lands, which are located approximately 0.4 miles east of the Marine Terminal Site and proximal to the northern potion of the National City Pipeline.

Figures 1-1a and 1-1b show the relationship of these surface water bodies to the Site.

San Diego Bay waters are saline. Water within the intertidal marshes and channels is presumed to be saline to brackish. The water within Western Salt evaporation impoundments most likely is hypersaline. San Diego Bay has a mean tidal range of 4.3 feet (Woodward-Clyde, 1986).

The portion of the power plant north of the South-40 Tank Farm is located within the 100-year floodplain of Telegraph Canyon Creek (Woodward-Clyde, 1986). Fluor Daniel GTI found no evidence of environmental impact from previous flooding during this Phase I investigation.

Undeveloped areas of the property consist of bare soil and grass with shrubs and trees in landscaped areas. Fluor Daniel GTI did not observe wetlands on the power plant or terminal properties; proper wetlands are present off-site to the south (Western Salt evaporation ponds) and west (Chula Vista Wildlife Refuge) of the SBPP. Numerous wetland areas, most notably the Sweetwater Marsh intertidal marshlands, are located along the course of the pipeline.

Fluor Daniel GTI did not observe evidence of stressed vegetation that appeared to be related to Site activities. However, the examination of vegetation was limited to those areas where Site operations are most concentrated.

2.4.5 Climatology

The Site is characterized by an arid climate with a mean annual rainfall of 9 inches. The area has warm, dry summers and mild winters; approximately 90 percent of the annual rainfall occur between the months of November and April (Brown and Caldwell, 1997).

2.5 Environmental Permits

A complete review of compliance history with environmental permits is beyond the scope of an ASTM Phase I ESA. However, Fluor Daniel GTI reviewed SDG&E files for Notices of Violation (NOV) which have the potential to affect soil or groundwater quality at the site. Notifications regarding air emissions and water discharges through routine, permitted discharge points are not included. SDG&E has not received any NOVs or other permit notifications concerning issues that may have the potential to impact soil or groundwater during the last three calendar years (1995, 1996 and 1997).

2.6 Hazardous Materials/Hazardous Waste

2.6.1 Hazardous Materials

SDG&E manage various hazardous materials at the SBPP and NCT. These materials include primarily petroleum fuels and water treatment chemicals. Appendix C contains copies of Material Safety Data Sheets (MSDS) for the primary products.

Fluor Daniel GTI made the following observations regarding hazardous materials at the Site:

- Two USTs and one belowgrade AST were observed on the Site. (See Table 1-2 for details of the UST system.)
- Staining was noted on several main transformers (Photograph A-10) and at the South-40 fuel oil pump pads (Photograph A-19). The observed staining appeared to be minor and does not present a significant concern.
- Numerous ASTs were observed on the Site (Table1-1). (See Section 2-2 for details regarding the AST.)
- The SBPP has a three-sided, hazardous waste storage shed located on its property (Figure 1-2a). The shed floor is bermed and pitched to the rear. A floor drain within the shed has a normally closed valve and lock. Following inspection and approval, discharge is routed to the storm drain system.
- The Site has an Emergency Response Plan and an Employee Training Program in effect.

According to information contained within the regulatory database provided by EDR and the SDG&E files, the subject properties have not had any reportable spills of oil or hazardous materials.

2.6.2 Hazardous Waste

The power plant has managed its hazardous waste simply as a large-quantity generator. No storage occurs beyond the 90-day storage time. Hazardous wastes are transported to off-site facilities for recycling, treatment and/or disposal.

The Site is a large-quantity generator of hazardous wastes under EPA ID #CAT000619056. Listings of waste materials for the SBPP and the NCT are provided in Appendices C.8.3 through C.8.5. Hazardous waste generation and its disposal or treatment at the Site are summarized as follows:

- The 1997 annual reports of hazardous waste generated and a five-year summary (1993-97) is provided in Appendix C. The primary wastes generated over the past five years include: abrasive sandblast with paints; asbestos; boiler fireside debris; Mobil DTE; oil contaminated soils, and water; PCB oils; sump sludge; turbine oil; and wastewater treatment filter cake. The presence and use of these products are considered normal for the operations of this type of facility.

- According to SDG&E personnel, SDG&E primarily utilizes Chemical Waste Management (Kettleman Hills, CA) Crosby and Overton (Long Beach, CA), Ensco West (Los Angeles, CA), Laidlaw Environmental Systems (Westmoreland, CA), Safety Kleen Corporation and TPS, to recycle, treat and/or dispose of hazardous wastes from the Site.

- The SBPP has a WWTP that processes two categories of wastewater generated by the power plant operations, LVW and MCW. These types of wastewater are explained below.

LVW includes: boiler blowdown (after 1997); boiler room and turbine room sump and trench liquids; city water used in the plant; lube oil; and pump packing leak run-off LVW is collected in trenches and drains throughout the power plant structure. From the drains, it is routed to the LVW holding tanks (two tanks which are used in a daily rotation), then to a coalescer which functions as an oil/water separator, and then to an after-treatment holding sump (see Appendix C.8.6). From the sump, it is discharged to the municipal sewer under the City of Chula Vista, IUD Permit No. 13-0019-00B.

MCW includes boiler fireside cleaning rinsate (pressure and/or steam wash water) and boiler waterside cleaning fluids. Historically, the waterside was cleaned with an acid wash or a chelant wash, but since 1993 only chelant washes are used. MCW is directed to the T5 sump and then pumped to MCW holding tanks at the WWTP. From the MCW tank, waste are treated in Flash Tank 1 where they are mixed with caustic or lime to adjust the pH. Then, wastes are routed to the reactivator tank where polymers are added to flocculate and separate solids. The resulting sludges are removed to the sludge thickening tank (a holding tank), and the liquids are removed to Flash Tank 2. Diatomaceous earth is added to the sludge in the contact tank where it is then pressed into a filter cake. The filter cake is disposed of as a hazardous waste, due to its metals or oil content, at Chemical Waste Management's Kettleman Hills, California, facility. From Flash Tank 2, which acts as a holding tank, the liquids are processed through the monoscour filter (an anthracite coal and sand bed filter for final solids removal). The effluent from the monoscour filter is routed to one of two treated water holding tanks. The treated water holding tanks are tested for parameters required by the IUD permit, and if standards are met, discharged to the municipal sewer. Prior to 1997, the water was discharged to San Diego Bay.

A laboratory located in the power plant structure conducts all permit-related water testing. Appropriate power plant process water streams are piped directly to the laboratory. The laboratory analyzes water samples for silica, chloride, ammonia, phosphate, conductivity, as well as oil and grease. According to SDG&E personnel, no known releases of sample media or laboratory reagents have occurred in the laboratory. Floor drains in the laboratory are piped to the municipal sewer.

The WWTP treats approximately 84,000 gals/day of LVW. Once every three years the WWTP also treats approximately 250,000 gallons of wastewater during the chemical cleaning of each boiler.

The WWTP is located on top of a bermed concrete pad. All WWTP tanks are ASTs, and all piping is aboveground (prior to 1990, piping was underground). According to SDG&E personnel, no known releases have occurred from tanks or piping to the plant pad. In addition, no known releases through the underground piping have occurred.

Since 1978, wastewater treatment was accomplished with the same basic processes, except that prior to 1978, the wastewater was stored in the lined second-generation impoundments rather than in ASTs. Prior to the existence of the second-generation impoundments, the first-generation wastewater impoundments were used for wastewater treatment. The only treatment employed during the tenure of the first-generation impoundments was settling of solids prior to discharge. Further discussion of the first and second impoundments is provided in Section 3.5, Previous Investigations.

2.6.3 Solid Waste Management Units (SWMU)

The "Tiered Permitting Phase I Environmental Assessment Checklist for the SBPP" (Applied Geosciences, 1995) identifies SWMUs at the SBPP. Table 2-1 briefly summarizes on-site SWMUs. Table 2-2 briefly summarizes off-site SWMUs for which SDG&E had responsibility. According to SDG&E personnel no SWMUs are present on the NCT property.

2.7 Solid Waste/Nonhazardous Waste

According to SDG&E personnel, nonhazardous solid wastes generated at the SBPP are treated, recycled and/or disposed of off-site primarily through Laidlaw Environmental Systems. The SBPP has recycling programs for waste asphalt, concrete, metal, plastic, and wood.

2.8 Water, Storm Water, and Wastewater

Findings:

- The Sweetwater Water Authority supplies the Site with water.

- Surface drainage on the Site flows into catch basins located throughout the property. A copy of the site drainage map from the SWPPP (Brown and Caldwell, 1997) is provided in Appendix C.8.7.

  The SWPPP identifies sources of pollution affecting industrial storm water discharges and approved nonstorm water discharges. It also implements practices focused on the reduction or prevention of pollutants in storm water discharges. The SWPPP divides the Site into 11 surface drainage areas or basins. The SWPPP includes wet-season storm water sampling, laboratory analytical (pH, total suspended solids, specific conductance, oil and grease, and iron) and annual reporting requirements for the facility. Generally, storm water flow across the Site is from east to west toward San Diego Bay.

  Bermed areas have valved outlet drains. Prior to any discharge of storm water, SDG&E inspect the water to be discharged for visible sheens. Samples are collected during two storm events every year and analyzed. In compliance with a tag-out procedure and the SWPPP, plant operators discharged water only after approval by designated supervisors. This tag-out procedure prevents inadvertent discharges or discharges not in compliance with the SWPPP/NPDES Permits.

- Power plant wastewater is treated in the WWTP. This process is fully described in Section 2.6.2. Discharge from the WWTP is to the municipal sewer in accordance with the IUD permit.

2.9 Polychlorinated Biphenyls (PCB)

PCB-bearing oils have historically been used as a cooling agent in electrical transformers. The U.S. EPA banned the use of PCBs in these oils in 1979. Fluor Daniel GTI performed a visual inspection and file review noting the presence or absence of any electrical transformers, capacitors, or other oil-containing apparatus, whether or not such apparatus was labeled as "containing" or "not containing" PCBs, and whether such apparatus appeared to be leaking. Because the switchyard is a retained property and not part of the Site, Fluor Daniel GTI did not specifically review this area.

During the operational lifetime of the subject properties, various transformers, circuit breakers, and other dielectric oil-cooled equipment have used PCB-containing dielectric oils. SDG&E has converted this equipment to non-PCB-containing, mineral oil-based dielectric fluids. No transformers on-site contain PCB oils. EnecoTech Southwest, Inc. (1997b) conducted sampling investigations for PCB in the SBPP switchyard (not included in the current investigation site) and at the NCT transformer and circuit breaker equipment areas in Fall 1996 (see Appendix C.5.I). The objective of the investigation was to assess stains and discoloration of soil and concrete structures adjacent to oil-containing transformers and circuit breakers. EnecoTech Southwest, Inc. collected soil samples and surface

wipe samples, utilizing a 100 cm^2 square template. It was determined that the stains were caused by a combination of leaking chain valves and leaking transformer cooling fin assemblies.

The PCB investigation by EnecoTech Southwest at the SBPP was conducted as follows:

- Seventeen wipe samples were collected from oily stains on equipment concrete bases in the transformer and circuit breaker equipment area. A copy of EnecoTech Southwest, Inc.'s sample location map is included in Appendix C.
- The 100-µg/100-cm^2 limit for low contact was not exceeded in any wipe samples. A copy of EnecoTech Southwest, Inc.'s sample results table is included in Appendix C.
- Eighteen soil samples were collected from areas of surface discoloration due to leaking valves on oil circuit breakers and transformers and/or leaking transformer coding. A copy of EnecoTech Southwest, Inc.'s sample location map is included in Appendix C.
- Soil samples results indicated PCB concentrations well below 10 mg/kg, the federal and California State cleanup level for PCB, in accordance with the Universal Treatment Standard in 40 CFR 268.48 and in the California Code of Regulations 66268. A copy of EnecoTech Southwest, Inc.'s sample results table is included in Appendix C.
- The primary PCB detected was Arochlor 1260; also present was Arochlor 1254. No other Arochlor congeners were detected.
- EnecoTech Southwest, Inc. concluded that the placarding on equipment conformed to the analytical results.
- EnecoTech Southwest, Inc. concluded that the subject property does not require further action to comply with spill response and agency reporting requirements.

EnecoTech Southwest conducted the PCB assessment at the NCT as follows:

- Seven wipe samples were collected from oily stains on equipment concrete bases in the transformer and circuit breaker equipment area. A copy of EnecoTech Southwest, Inc.'s sample location map is included in Appendix C.2.5.
- The 100-µg/100-cm^2 limit for low contact was not exceeded in any wipe samples. A copy of EnecoTech Southwest, Inc.'s sample results table is included in Appendix C.2.5.
- The only PCB congener detected was Arochlor 1260.

- EnecoTech Southwest, Inc. concluded that the subject property does not require further action to comply with spill response and agency reporting requirements.

2.10 Underground and Aboveground Storage Tanks

The property assessments included a visual survey to locate any USTs or ASTs. Numerous ASTs were present at both the SBPP and the NCT facilities. The power plant has three USTs. Table 1-1 summarizes the current and past ASTs and USTs on the Site and on abutting SDG&E properties. Section 3.4 of this report discusses any releases from these tanks.

2.11 Pesticides/Herbicides

According to SDG&E personnel, operations at the Site do not utilize, generate, or dispose of pesticides. Certified subcontractors complete all pesticide applications.

SDG&E applies herbicides to various portions of the Site. The herbicides used include Round-up, Oust, and Treflan. Historically, a fungicide has been used at the SBPP. According to SDG&E personnel, all applied herbicidal and fungicidal chemicals are EPA registered products and SDG&E personnel use these products in accordance with manufacturers' specifications. No storage of herbicidal or fungicidal chemicals occurs on-site.

2.12 Other Environmental Observations

Additional observations made during the course of this investigation which may pose an environmental concern include the following:

South Bay Power Plant

- The closed-loop service water cooling system for the power plant generators has historically used a sodium dichromate solution to prevent corrosion. On June 28, 1996, the power plant converted to sodium molybdate in place of the more hazardous sodium dichromate. Concerns relative to sodium dichromate include the storage and mixing of this material. According to SDG&E personnel interviewed, pallets of bagged sodium dichromate powder were historically stored on-site. Storage was in an unpaved area adjacent to the largest surge tank (80,000 gals) on the circulated water deck (the paved area between the generating units and the intake channel). Sodium Dichromate was mixed in this area. During mixing, some powder or solution would often spill onto bare ground. Also, the pallets of sodium dichromate were not protected from the weather. Bags of the powder occasionally broke open with the contents released onto bare

ground. This storage practice has been discontinued, and the area has been paved. No assessment sampling or remedial activities are believed to have been executed in this area.

- According to SDG&E personnel, the Unit #3 collector AST bottom failed, releasing sodium dichromate service water onto the circulated water deck. The release was removed for disposal by vacuum truck from Pacific Treatment.

- At the North-40 Tank Farm, periodic small releases of fuel oil have occurred in the pump pit located east of the tanks. These releases were often pumped out into a small earthen pond located within the AST #5 berm. Thereafter, the oil was removed using a vacuum truck.

- A fuel oil pipeline is exposed in the channel of a typically dry drainage ditch at the power plant with no protective rip-rap or other structural reinforcement.

- Southwest of the gas turbine and inside the fenced enclosure is a below-grade AST. It is currently a double-walled steel tank located within a concrete vault. This AST is known as the false start AST and provides secondary containment in the event of a release of Jet-A fuel. According to SDG&E personnel interviewed, when the gas turbine false starts or goes off-line, the pressure in the fuel lines is bled-off to this sump. The sump has no outlet and is emptied by pumping it with a portable pump within 24 hours of a release. No information is available as to whether or not a sump was present earlier. Most of the SDG&E gas turbines have a false-start sump constructed from a concrete vault. Fluor Daniel GTI found a 1987 permit to remove three USTs at the site: the two vehicle fueling USTs and a waste oil tank (UST #1603) at this same location. Based on this document, Fluor Daniel GTI speculates that a previous sump may have existed. Based on comments regarding other gas turbine sites, Fluor Daniel GTI presumes that if such a sump existed, the sump probably consisted of an underground drum. No assessment sampling or remedial action, except for removal of the previous sump, has been conducted at this location.

- Over the history of the power plant, there have been three abrasive blasting areas: 1) on unpaved ground in the area currently occupied by the existing abrasive blast enclosure, 2) on unpaved ground in the area west and southwest of the WWTP (in part, where the aqueous ammonia tanks are located; [Photograph A-14], and 3) in the current abrasive blast enclosure located along the southeast wall of the power plant. According to SDG&E personnel, some abrasive blasting residue may still be present in the first two areas, most particularly the first one. Also, SDG&E personnel believe that spent grit and blast waste were used to pave a dirt road located along the northeast margin of the

power plant property east of the North-40 Tank Farm. This material may also have been piled or spread in the undeveloped area northeast of the switchyards and southeast of the North-40 Tank Farm.

- On the east side of Bay Boulevard just north of the SBPP entrance gate is a vacant property with a small concrete slab foundation. An aerial photographs from 1960 shows that this area appears to have been an automobile salvage yard. Discussions with SDG&E personnel have confirmed this former use of the property. This location is directly upgradient from SBPP. It is possible that gasoline, oil or solvent impacted groundwater could migrate onto the SBPP property.

- Mercury flow meters, pressure alarms, and liquid level alarms are present at the SBPP. However, there are no known mercury releases.

- Minor amounts of condensate oil with mercaptans are periodically drained from the gas pipeline scrubbers (20 to 30 gals every to 2 to 3 years). No releases have been associated with this activity.

National City Terminal

- No additional environmental observations were made which may pose an environmental concern.

National City Pipeline

- On March 27, 1998, Mr. David Cornue of Fluor Daniel GTI, in the presence of Ms. Lynn Jahn and Mr. Donald Waller of SDG&E conducted an inspection of the entire length of the pipeline. The inspection was conducted on foot (approximately 75 percent) and from a slow moving vehicle (approximately 25 percent). The inspected detected neither the presence of oil or oil-like odors nor stained soils or stressed vegetation attributable to the fuel oil pipeline along the entire length of the pipeline. In several areas the presence of extremely thick vegetation significantly limited the visibility of the soil surface. However, thick, healthy vegetation would not likely exist if a significant release were present. In a few areas general refuse was present along the pipeline right-of-way. This included two pieces of pipe: one which was steel, one which was possibly a transite-like material. However, there is no reason to suspect that any of these refuse materials were related to SDG&E activity along the pipeline. In all likelihood this refuse was present as a result of indiscriminate dumping by the public.

- The pipeline traverses the Sweetwater National Wildlife Refuge; therefore, any release that might occur in this area has the potential to impact environmentally sensitive areas.

- The pipeline traverses an unnamed tidal channel south of the Sweetwater (Photograph A-26). Here the pipeline is exposed in the base of the channel with no protective riprap or other structural reinforcement (Photograph A-24). No evidence of stressed vegetation, hydrocarbon sheen on the surface water, or stained soil was observed at this location.

Former Off-site LNG Plant

- In October 1986 Tri Coast Engineering, of Corona, California, removed three USTs from the LNG plant area. There was no information available from SDG&E's files regarding the condition of these tanks or remaining soils. Based on the proximity of the Western Salt evaporation ponds bordering the LNG plant, these USTs were probably located in across-gradient location from the SBPP. Therefore, any release(s) from these tanks, would probably have no impact on the SBPP property.

3.0 SITE HISTORY

3.1 Past Property Ownership

Fluor Daniel GTI reviewed deeds for the SBPP property provided by San Diego Gas & Electric Company. The subject property is currently owned by San Diego Gas & Electric Company and has been since June 27, 1956. Historically, the power plant property was part of the Rancho de la Nacion.

According to the deeds (Appendix C), the following transactions are on record regarding the power plant real property:

Description	Date Acquired	Previous Owner
Book 982, Page 232	June 17, 1924	San Diego Lands, Inc.
Book 6157, Page 222	June 27, 1956	Western Salt Company

Based on this deed information and on the interviews with SDG&E personnel, the subject property was in part previously used for agricultural purposes, in part previously used for salt evaporation ponds, and was in part previously undeveloped land.

3.2 Sanborn Fire Insurance Map Review

Environmental Data Resources, Inc. (EDR) conducted a Sanborn Fire Insurance map search for the subject properties. EDR has indicated that Sanborn maps are not available from their files for these areas. As EDR is the largest single source for Sanborn maps, it is unlikely that Sanborn maps would be available for these areas from other data supply sources. Fluor Daniel GTI also reviewed the files of the San Diego Historical Society for Sanborn Maps, and none were available for the subject properties.

3.3 Historical Topographic Map and Aerial Photograph Review

Fluor Daniel GTI reviewed several historical USGS topographic maps obtained through EDR (Appendix E). Fluor Daniel GTI also reviewed aerial and historic photographs available from SDG&E's files and the San Diego Historical Society (Appendix F). Observations from specific maps and photographs indicate the following:

South Bay Power Plant

- A 1925 oblique aerial photograph (Photograph F-1) indicates that the area was developed as salt evaporation ponds to the west and agricultural or undeveloped land on the eastern half and off-site to the east.

- A 1930 topographic map indicates that the area was an undeveloped intertidal marshland (as noted above, information available from the San Diego Historical Society indicates that Western Salt was already in operation at this time). The Southern Pacific Railroad borders the subject property to the east.

- Several aerial photographs from 1930 through 1941 indicate that Rohr Aircraft and the Chula Vista School of Aviation were in operation to the north of the subject property. The western end of G Street appears to have been the School's runway.

- Two 1953 topographic maps indicate that the area was partially developed on its western margin as salt evaporation ponds operated by Western Salt. A road loops through the eastern half of the subject property, presumably for access to the salt ponds. The railroad bordering the eastern margin of the subject property is labeled "San Diego and Arizona Eastern." At the western end of J Street (the northern margin of the subject property) are three apparent ASTs or circular impoundments labeled "sewage disposal." The Rohr plant is visible to the north of J Street.

- A 1955 aerial photograph (Photograph F-2) indicates that the area was a combination of salt evaporation ponds, agricultural, and undeveloped land. The area to the east of the subject property was comprised of agricultural land and transportation corridors, and the three ASTs at the "sewage disposal" facility are visible.

- An April 30, 1960 oblique aerial photograph (Photograph F-3) indicates that a plot of land north of the subject property entrance road and south of L Street in between Bay Boulevard and I-5 was developed as an apparent auto salvage yard (confirmed by SDG&E personnel). The area east of I-5 shows residential properties, the subject property shows ASTs #1 and #2 in the South-40 Tank Farm and the first-generation impoundments.

- A 1965 (approximately) photograph (Photograph F-4) shows construction of the initial LNG plant.

- Two 1967 topographic maps indicate that the area has been developed as a power plant. The power plant structure, the South-40 Tank Farm (only AST #1 and #2 are present), and the first generation wastewater impoundments are visible. The LNG facility is also present. Additional surface impoundments are present to the south of the subject property which, presumably, are related to Western Salt's operations. The "sewage disposal" plant and ASTs visible on the 1953 maps are not present. Rohr has expanded its plant significantly with two ASTs located just north of the J Street drainage ditch which is visible on the maps for the first time. There is a small building a short distance

northeast of the entrance to the SBPP which may be related to the auto salvage yard apparent on air photos.

- A 1970 (approximately) photograph (Photograph F-5) shows the gas turbine, the first-generation impoundments, and construction of the North-40 Tank Farm.

- A 1971 (approximately) photograph (Photograph F-6) shows the power plant structure during construction of Unit #4.

- An undated aerial photographs (Photograph F-7) from approximately mid- to late 1970s shows the power plant in full development including the second-generation impoundments. Significant apparent abrasive blasting activity (visible as soil discoloration) is taking place in the Study Area 4C. There is also some discolored or wet soil in the 5A area to the north of the Telegraph Creek channel which may be either rain water or abrasive blasting debris spreading.

National City Terminal

- A 1888 photograph (Photograph F-8) indicates that the area that would become the terminal is open water in San Diego Bay to the south (left in the photograph) of the National City Wharf. There is a small frame building at the foot of the wharf and a pair of rail lines visible with a spur extending out onto the wharf.

- A 1930 topographic map indicates that the area is largely undeveloped with an east-west trending road and a small building (this may be a remnant of the National City Wharf area noted from San Diego Historical Society file information). A small rail yard is located just north of the subject property. The shoreline may be natural or only slightly modified by fill.

- A 1944 topographic map indicates that the area has been extensively developed as a large rail yard, presumably built to support expansion of the San Diego Naval Station during World War II. The coastline appears substantially unchanged from that in the 1930 map.

- A 1952 oblique aerial photograph (Photograph F-9) suggests that the large rail yard is considerably diminished in activity with many tracks having been removed. Four ASTs are visible on the southeast corner of the rail yard adjacent to Paradise Creek, the shoreline has been extensively advanced to the west with fill materials, and there are two old submerged ship hulls in the National City Wharf area. A second air photograph (Photograph F-10) from the same time has an area of fill activity in the southwest along

the old Paradise Creek cut that appears to possibly be dumping of refuse materials rather than earthen fill.

- A 1953 topographic map indicates that the area of San Diego Bay west of the rail yard has been extended westward into San Diego Bay by addition of fill materials. The rail yard appears substantially reduced in activity and four ASTs labeled "oil tanks" are visible to the east along Paradise Creek. A road is visible on the western strand area.

- A 1967 topographic map indicates that the terminal is present with a single AST and that additional large building development has taken place along Quay and 23rd Street. Terminal Road has not yet been constructed. The rail yard has been further reduced with only an area of several spurs present to the east and the four oil ASTs are not present. A jetty extends out into the Bay just south of 24th Street and is surrounded by three shipwrecks. The channel of Paradise Creek has been infilled, and eight ASTs are present in the Pepper Oil Company area.

National City Pipeline

- A 1956 oblique aerial photograph (Photograph F-11) shows the entire pipeline run from the vicinity of what would become the North-40 Tank Farm all the way to the NCT. Western Salt's salt evaporation ponds are still present in the area that would become the SBPP. Rohr Aircraft is developed as a large manufacturing facility with three ASTs and two possible surface impoundments on its southern margin at J Street and two more ASTs a short distance north of J Street. The majority of the remaining pipeline course to the north of Rohr Aircraft extends through agricultural and intertidal salt marsh lands.

- A 1959 oblique aerial photograph (Photograph F-12) indicates that the SBPP and ASTs #1 and #2 are present as is the NCT with AST #1. Other visible features are substantially similar to those seen in the 1956 photograph.

- A 1961 oblique aerial photograph (Photograph F-13) shows the NCT with AST #1 and significant warehouse-like development to the east of it.

3.4 Known Releases and Previous Investigations

Table 3-1 briefly summarizes documented releases and potential releases on-site. Further discussion of the releases that raise potential environmental conditions as presented in the following paragraphs.

3.4.1 South Bay Power Plant

3.4.1.1 ASTs, USTs, and Fuel Delivery Systems. During the power plant's history, the older South-40 ASTs, fuel lines, and USTs have experienced minor leaks and repairs. Based on available documents and interview information, these events are described below.

ASTs. In 1980 a visual and ultrasonic inspection of the AST #2 tank bottom (constructed of 1/4-inch thick carbon steel plates) resulted in the discovery of approximately 200 corrosion holes (Stromp 1981). The majority of the holes were within 12-feet of the perimeter of the AST. The tank floor was scoured by abrasive blasting and re-inspected, at which time an approximately 150 additional holes were discovered. The ultrasonic inspections revealed that the corrosion had begun outside the tank and worked inwards. Each hole was repaired by seal-welding patches over the corroded areas. After repair the tank floor, and sidewalls to a height of one-foot, was coated with Inertia 160 to provide further corrosion resistance.

On March 19, 1983, AST #2 developed a leak on the east side of the tank. The tank was emptied, and an inspection determined that the coating process used in 1980 had failed, and the tank bottom was in "very poor condition due to external corrosion" (Guiles, 1983). At that time the AST and auxiliary equipment were taken out of service. It was later returned to service and subsequently repaired twice in 1988. It is currently in service.

SDG&E discovered a leak in AST #3 on November 4, 1988. Previous spot ultrasonic inspection in 1984 had indicated that the tank bottom was in good condition. In May 1988 SDG&E discovered a water leak on the northeast side of the tank. SDG&E drained the tank and conducted spot inspection. External corrosion was detected, including four holes in the vicinity of the water leak. Identified corrosion was limited to the outer two-feet of the tank bottom where up to 70 percent of the floor exhibited thinning (Shoemaker and Otahal, 1988). SDG&E completed a patch repair of the inside of the tank in the perimeter area. Welds and sumps were pressure-tested and soap-tested in accordance with API 650, and two small remaining leaks were repaired. The tank was then hydrotested by filling the tank partially with water (to seven-feet in depth). The repaired tank passed this testing.

Other AST related issues include:

- SDG&E replaced the floor of AST #1 in approximately 1985.
- As of 1987 the ASTs in North-40 Tank Farm had not been cleaned or inspected. In summer and fall 1993, SDG&E upgraded the tank bottom of the displacement oil (diesel) AST in the North-40 Tank Farm by installation of a double steel bottom with a high-density polyethylene (HDPE) membrane (SDG&E, 1993d). This was done as part of a regulatory upgrade required for diesel ASTs.

- SDG&E installed AST #7 at the South-40 Tank Farm for diesel gas turbine (diesel) peaking units that, according to SDG&E, were never installed. Because the tank was not intended for No. 6 fuel oil storage, it was not insulated. The tank was never filled with diesel to support the gas turbine. It was used to store fuel oil with thinning additives. SDG&E also used it once for storage of salvage fuel (a mixture of diesel and crude oil) from SDG&E's Station B, San Diego. This fuel was burned at the SBPP for energy recovery. AST #7 is currently empty, clean and gas free (1992).

- SDG&E constructed all fuel ASTs on top of a sand bed impregnated with an anti-corrosion oil (believed to be diesel or No. 2 fuel oil or a similar product) to protect the steel floors.

East-Loop Pipeline

In 1991 SDG&E discovered a failed section of fuel oil pipeline southeast of the power plant adjacent to the intake channel and replaced the section. SDG&E estimates that up to 50 bbls of fuel oil may have been released. Impacted soil was excavated to a depth of approximately 8 to 10 ft. bgs. SDG&E excavated and disposed of an undetermined volume of soil.

In November 1996, EnecoTech Southwest (1997a) (see Appendix C.3.1) advanced 3 soil borings adjacent to the limits of the former pipeline excavation to depths of up to 15 ft. bgs. Eight soil samples were analyzed for TPH-gasoline range organic (GRO), TPH-diesel range organic (DRO), and for total recoverable hydrocarbons (TRPH). GRO and DRO compounds are typically comprised of hydrocarbons with fewer than C_{25}. Oils, such as Bunker C or No. 6 Fuel Oil, are comprised of hydrocarbon chains greater than C_{25}. Laboratory results indicated that only long chain hydrocarbons (C_{30} and higher) were present in soil samples collected between 6 to 11.5 feet bgs. The concentrations varied from 1.3 mg/kg to 1,600 mg/kg (exceeding the 1000 ppm standard). No detectable concentrations of petroleum hydrocarbons were encountered at 10-ft. bgs. EnecoTech Southwest recommended no further action because the petroleum hydrocarbons involved consisted of C_{30} and higher compounds, which are generally immobile, insoluble, semi-solid materials. The concentrations encountered are relatively low and limited to areas of less than approximately 6 feet bgs (groundwater was encountered at 10 to 14 feet bgs). This pipeline section was one of two pipelines that supply alternate fuel to the power plant and have been taken out of service.

USTs. SDG&E operates a vehicle fueling station with two USTs and associated pumps located east of the South-40 Tank Farm (Table 1-1 and Photograph A-20). These USTs, Tanks #1601 and #1602, historically contained diesel and gasoline, respectively. Because of the age of the tanks (installed in approximately 1960), Fluor Daniel GTI has assumed that both leaded and unleaded gasoline have been handled here. Prior to an upgrade on December 10, 1986, a leak test was performed. The diesel tank (#1601) passed; however, the gasoline tank (#1602) failed the pressure test (SDG&E,

1987). The quantity of gasoline released is unknown. In September 1987, both tanks were removed and replaced. Non-aqueous phase liquid (NAPL) was observed in an open excavation at a depth of approximately 7 to 8 ft. bgs.

In November 1987, Woodward-Clyde (1988a; see Appendix C.1.1) performed an assessment installing 25 soil borings to groundwater and 5 monitoring wells to depths of 20 ft. Groundwater was encountered at 6 to 7 ft. bgs. The groundwater flow direction was determined to be west to northwest. NAPL was not observed in their monitoring wells. Woodward-Clyde concluded that fuel hydrocarbons in the gasoline range were present in soil and groundwater and, based on the observed groundwater flow direction, that hydrocarbons likely migrated beneath AST #7. However, no apparent hydrocarbon contamination was encountered during excavation for the replacement USTs (approximately 45 feet south of the former UST field).

Soil remediation by excavation was conducted March 16 through 22, 1988 (SDG&E, 1988b; see Appendix C.1.2 and C.1.3). During excavation, a slight sheen of gasoline on groundwater was observed. This was removed using sorbent pads. On April 1, 1988, groundwater and NAPL were pumped off using a vacuum truck. When groundwater refilled the excavation a sheen was again observed. This was also removed by vacuum truck. Confirmation samples of soil and groundwater were taken on April 13, 1988. Laboratory results indicated soil TPH concentrations ranged from non-detectable to 340 milligrams per kilogram (mg/kg), and that groundwater TPH concentration was 27 mg/l. The soil concentrations were below the applicable soil cleanup criteria for TPH of 1,000 ppm.

Woodward-Clyde (1988b; see Appendix C.1.4) also prepared a one dimensional, simple transport model for benzene. Based on their model, Woodward-Clyde concluded that it was unlikely that benzene or other hydrocarbon constituents would migrate west and discharge to San Diego Bay at concentrations exceeding applicable water quality criteria.

On September 30, 1988, the County of San Diego Department of Health Services, Environmental Health Services (EHS, 1988; see Appendix C.1.5) issued a letter to SDG&E stating that, under then current regulations, no further action would be required concerning the gasoline UST release.

3.4.1.2 Wastewater Treatment Impoundments. Two different sets of wastewater treatment impoundments have existed at the SBPP. The first-generation impoundments were installed when the power plant was constructed in 1960. There were two unlined impoundments located a short distance north of the current gas turbine area and south of the former drum storage area (Photographs A-5, A-6 and A-7). These impoundments operated from 1960 until 1978, when they were replaced by the second-generation of impoundments. The second-generation impoundments were installed with liners along with the WWTP. These impoundments were located east of the power plant structure, and north of the WWTP (Photographs A-12 and F-7). The second-generation impoundments operated until 1990, when they were replaced by ASTs for wastewater maintenance.

First Generation Impoundments. The two first generation wastewater impoundments were unlined, with dimensions of about 200 ft. by 185 ft. and 8 to 10 ft. deep. They received untreated wastewater and served as settling basins for the removal of solids prior to discharge. The first-generation impoundments received wastewater volumes of (SDG&E, 1974):

- Nonhazardous waste stream (LVW): 8,000 gals/day from sample drains and floor drains.
- MCW: Approximately 3,700,000 gals/year from air preheater wash (nine washes per year), plant cleanup (four washes per year), and boiler fireside wash (17 washes per year).

In 1982, SDG&E removed the first-generation impoundments and decommissioned them by excavating settled solids and discolored native soils to 8 to 10 ft. depth, then backfilling with former overburden and berm materials and imported fill (SDG&E, 1982a and b; see Appendix C.2.1). Only the eastern pond was considered necessary to remediate because the western pond had been bulldozed into the eastern pond when they were closed. Oily sludge (visibly identifiable as a black sludge) and contaminated soils were removed and temporarily spread on-site to dry prior to removal for off-site disposal (see photographs in SDG&E, 1982b; copy provided in Appendix C). A total of 920 tons of impacted soils were disposed of at the BKK West Covina Landfill.

In November 1996, EnecoTech Southwest (1997a) completed a site assessment to verify the effectiveness of the remediation activities performed by SDG&E in 1982. EnecoTech Southwest drilled eight soil borings and collected soil samples. Laboratory results on the soil samples detected concentrations of Title 22 metals at levels approaching or exceeding total threshold limit concentration (TTLC) standards (primarily chromium and nickel)

In November 1997, EnecoTech Southwest (1998; see Appendix C.2.2) conducted additional site assessment. They installed seven trenches (later backfilled with the excavated soil) and drilled 15 soil borings. Groundwater-saturated soil was encountered between 9 to 14 ft. bgs. Seventy-four soil samples and four groundwater samples were obtained and analyzed for specific Title 22 metals: As, Be, Cr, Pb, Ni, and V. Laboratory results indicated soil samples with concentrations of Title 22 metals exceeding TTLC standards. The highest concentrations of chromium and nickel (4,100 and 2,200 mg/kg, respectively) were found in a trench at the western margin of the remedial excavation area adjacent to the Jet-A AST. EnecoTech Southwest, Inc. found that the metal concentrations decreased at depths of 12 to 14 feet bgs.

In summary, EnecoTech Southwest concluded that the lateral and vertical extents of contamination had been defined, and that further remediation would be necessary.

Second Generation Wastewater Impoundments. The second-generation impoundments were constructed in 1978 (RWQCB, 1988a) and operated until 1990. From west to east these consisted of:

- two treated water holding impoundments (No. 1 and No. 2 with capacities of 165,000 gallons and 175,000 gallons, respectively).
- two low-volume waste impoundments (No. 3 and No. 4 with capacities of 1,300,000 gallons each), and
- two metal-cleaning waste impoundments (No. 5 and No. 6 with storage capacities of 750,000 gallons and 725,000 gallons respectively).

The WWTP was also constructed at this time for pre-treatment of wastewaters. Section 2.6.2 provides an explanation of the water treatment processes. The treatment process used at the time of the second-generation impoundments was substantially similar to that used today. However, today ASTs serve as holding vessels much as the impoundments did in the past. The composition of the wastewater stream (low volume and extended wastes) has not changed.

The estimated daily wastewater volumes received by the second-generation impoundments were (RWQCB, 1988a):

- LVW (Nonhazardous waste stream): 250,000 gal/day from: condensate boiler blowdown, evaporator blowdown, sample drains, floor drains, demineralizer, zeolite softener regeneration, condenser cleaning, reverse osmosis, purged groundwater from monitoring wells, and treated low volume waste.
- MCW 3,500,000 gal/day from: boiler chemical cleaning (two boilers per year), evaporator chemical cleaning, air heater wash, boiler fireside wash (three fireside washes per unit per year; 12 total annually), condenser chemical cleaning, reverse osmosis cleaning, and treated metal cleaning waste (occasionally, the treated metal cleaning wastewater contained hazardous waste constituents and was handled as a hazardous waste).

The second-generation impoundments were subject to discharge limitations for: pH, arsenic, cadmium, copper, total chromium, lead, molybdenum, nickel, vanadium, zinc, total suspended solids, and oil and grease. During the active life of the second-generation impoundments, SDG&E operated under a groundwater monitoring permit (Monitoring and Reporting Program No. 88-82; RWQCB, 1988a).

In Spring 1988 SDG&E informed the RWQCB of its intent to replace the second-generation impoundments with ASTs for metal cleaning and treated wastes and an in-line system for low volume

nonhazardous waste. RWQCB issued Cease and Desist Order No. 88-83 (RWQCB, 1988b) requiring SDG&E to comply with a time schedule to cease continued discharge and to achieve regulatory closure of the second-generation impoundments pursuant to the Toxic Pits Cleanup Act of 1984 (TPCA). The Cease and Desist Order required that SDG&E cease discharge of hazardous waste and free liquids to the impoundments by July 31, 1990 and achieve regulatory closure of the second-generation impoundments by August 1, 1991.

In 1991, the wastewater treatment impoundments were closed pursuant to Title 23 of the California Code of Regulations and the TPCA under the jurisdiction of the RWQCB. Closure was performed in accordance with a Closure Plan approved by the RWQCB (Mittelhauser, 1989). The cleanup standards were set at 1,000 mg/kg (ppm) for total petroleum hydrocarbons (TPH) and background-based standards for total metals (arsenic, barium, chromium, copper, lead, mercury, nickel, vanadium, and zinc). The metals background soil standards were based on the arithmetic mean plus three standard deviations (Appendix C) for each of four soil types (berm fill, calcareous sands, non-calcareous silty sand, and composite soil).

Influent and effluent wastewater piping to the impoundments was diverted to the new AST-based treatment system on May 21, 1990. The piping was first disconnected and flushed with water until analysis indicated that the rinse water was non-hazardous. The piping was removed and plugs were applied to the locations where the piping was cut for removal. According to Mittelhauser (1991) there was no indication that the pipes had leaked.

Remaining wastewater and sludge were removed by vacuum truck. The liquids were processed in the new treatment system. The sludge was processed into filter cake and disposed at Chemical Waste Management's Kettleman Hills, CA facility. The impoundment surfaces were hydroblasted and steam cleaned, and the rinse water was treated by the new wastewater treatment system. The thin tar-like covering and upper liners were inspected for deterioration. Desiccation cracks were observed in the tar-like covering in each impoundment, and in some areas the covering was eroded away exposing the upper liner. Pitting of the tar-like covering and upper liner was observed in some of the impoundments. Iron and oil staining was also observed on the tar-like covering and upper liner.

The upper and lower liners (constructed of hydraulic asphalt concrete), intervening gravel, leachate liquids, and underlying soils were sampled and found to be non-hazardous waste materials. With the exception of mercury, each of the target analyte metals was detected in numerous samples. of the liners and gravel. Arsenic was present in relatively few samples at low concentrations. The soil sample results indicated the presence of each of the target analyte metals in numerous soil samples. Arsenic was present in relatively few samples at low concentrations; mercury was present at low concentration in only two samples. TPH was also present at low concentrations in numerous samples. The maximum concentration detected was 700 ppm compared to a standard of 1,000 ppm.

The majority of the sample results were less than 10 ppm. All soils were deemed uncontaminated, and the excavated soils were spread on-site.

After removal of the liners, a visual inspection of the underlying soils was conducted. Several areas of staining/discoloration were observed beneath impoundment No. 4 and proximal to inlet, outlet, and sump structures associated with impoundments No. 3 through 6. The observed discoloration included green staining, with or without, a petroleum odor, gray/black staining also with, or without, a petroleum odor, and yellow staining without mention of associated odor. These soils were sampled, and analytical results indicated that various samples exhibited concentrations of barium, chromium, copper, nickel, vanadium, and zinc exceeding site-specific background concentrations. TPH concentrations also exceeded the cleanup standard at two locations. Mittelhauser (1991) concluded that the liners themselves had not leaked; however, releases had occurred from the inlet and outlet piping structures. With the exception of three sample areas in sump No. 6 and two areas in impoundment No. 4, the soil beneath the impoundments was managed as uncontaminated soil, with RWQCB approval.

On-site spreading of uncontaminated soil occurred in two areas. Uncontaminated (<1,000 ppm or TPH) soil was used as backfill for grading the excavated impoundment areas. Uncontaminated soils were also spread in an area to the south of the southern berm of the LNG Plant area (Mittelhauser, 1991). According to SDG&E personnel, approximately 27,000 yd^3 of uncontaminated soil was spread in these areas with the majority placed in the LNG Area.

The three areas with more significantly impacted soil (sump No. 6 and two in impoundment No. 4) were excavated. Approximately 51 yd^3 were removed and disposed at Chemical Waste Management's Kettleman Hills, CA facility. Confirmation soil samples were obtained and analyzed for total chromium, hexavalent chromium, and TPH. The chromium results and TPH closure standards were below the site-specific background closure values (Mittelhauser, 1991).

The leachate in the gravel between the upper and lower liners was removed and processed by the wastewater treatment system. The liners and gravel were removed and recycled at Nelson Sloan in Otay Mesa, CA. The underlying soil was inspected and sampled. Impacts were noted at the inlet to impoundment No. 4 and at sump No. 6. Soil in those two areas was excavated and disposed at Chemical Waste Management in Kettleman Hills, CA. Confirmation samples were obtained and analyses indicated that the closure standards had been satisfied (Mittelhauser, 1991; see Appendix C.2.6).

A network of groundwater monitoring wells surrounded the former second-generation wastewater treatment impoundments (Woodward-Clyde, 1988). Initial sampling of these wells in 1986 indicated detectable concentrations of *trans*-1,2-dichloroethylene, 1,1-dichloroethylene, and trichloroethylene and the metals barium, lead, mercury, nickel, selenium, silver, vanadium, and zinc (Woodward-

Clyde, 1986). VOC concentrations were found at low to trace levels in well MW-3, which is located centrally in the impoundment area.

The monitoring well network was monitored on a quarterly frequency from fourth quarter 1988 until first quarter 1991 (Mittelhauser 1991). Water quality protection standards for arsenic, cadmium, copper, molybdenum, nickel, and vanadium were exceeded at various locations and times during the monitoring period. Mercury, which was later noted during closure as exceeding site-specific soil background cleanup standards at two locations, was not included in the groundwater-monitoring program. However, state and/or federal standards for these metals either did not exist at the time of Mittelhauser's study or were not exceeded. Therefore, Mittelhauser recommended that post-closure groundwater monitoring beyond the third quarter of 1991 was not required. According to SDG&E personnel, these wells were abandoned by pulling the tubing and backfilling.

On November 8, 1991 the RWQCB issued an order (Order No. 91-89) rescinding Cease and Desist Order No. 88-83 and granting clean closure of the second-generation impoundments to SDG&E (RWQCB, 1991b). The RWQCB (1991a) concurred with Mittelhauser that groundwater had not been adversely impacted and, therefore, also granted that post-closure groundwater monitoring would not be required. The California Environmental Protection Agency (CalEPA) Department of Toxic Substances Control (DTSC) also accepted closure certification of the second-generation surface impoundments (DTSC, 1992). Copies of the closure acceptance letters are provided in Appendix C.2.7.

In summary, the regulatory closure and detailed sampling conducted for this area indicates that further investigation is not required.

3.4.1.3 Former Fleet Operations Drum Storage Area. In fall 1983 Fleet Operations installed a fenced enclosure and small shed in this area to provide restricted access to the storage area. The fenced enclosure was approximately 55 feet by 60 feet in area, except for the chain-link fence and small shed. The area was unpaved. According to SDG&E personnel, no secondary containment or impervious flooring was present. The drums and other materials were stored in direct contact with the soils or on pallets above the soil. This cage was used for the storage of drummed materials including: pentachlorophenol (PCP) wrap materials for pole protection, off-specification paints, coatings, and two-part epoxides. The drum storage area was used from Fall 1983 until 1992.

In 1992, SDG&E (1993c; Appendix C.4.1) discontinued the storage of PCP wrap in this area. At that time, the packaging on a number of pole wrap packages had deteriorated, resulting in a release of PCP bearing materials onto the soil surface. Therefore, SDG&E engaged in an assessment and remediation of soil within the enclosure. In March of 1993, a total of 22 shallow soil samples (6-inch depth) were obtained and analyzed for PCP by modified EPA Method 8150. With the exception of one

soil sample, all results ranged from non-detect to 0.23 mg/kg; the one exception exhibited a concentration of 1,400 mg/kg.

SDG&E (1993c) conducted a second round of sampling in April 1993. Eight samples surrounding the one impacted area and one deeper soil sample (18-inch depth, below the most impacted shallow sample location) were obtained and analyzed for PCP by modified EPA Method 8150. The results of all of the samples including the one obtained from below the original impacted sample, ranged from 0.27 to 1.7 mg/kg; all below the California Hazardous Waste cleanup standard for soil of 17 mg/kg.

In May 1993, the area of impact exceeding the CHWR standard for PCP was remediated by excavation of the impacted soils. A total of 5 drums of impacted soil, 4 drums of debris, and 1 drum of water were removed and disposed. Confirmation samples of remaining soils were analyzed for semi-volatile organic compounds (SVOC) by EPA Method 8270. Results indicated non-detect for PCP, 64 to 0.070 mg/kg (2-ethylhexyl)phthalate, and 0.073 mg/kg di-n-butylphthalate (SDG&E, 1993c).

On January 23, 1995, the DTSC issued a Stipulation and Order to SDG&E (Docket HWCA 94/95-039) requiring that 40 drums of PCP stored beyond the 90-day hazardous waste unpermitted storage time be removed and appropriately disposed, and requiring removal and disposal of impacted soils. SDG&E had previously, voluntarily removed the drummed wastes, characterized the soils and removed those requiring disposal, and provided confirmatory sampling indicating no significant residual PCP contamination. DTSC found that no further remedial action with regards to PCP would be required. Therefore, the Stipulation and Order and the no further action determination are one combined document (Appendix C.4.2).

In summary, the results of soil sampling after remediation indicated that remediation was complete, and the DTSC provided a "No Further Action" determination for this area of the subject property.

3.4.1.4 Transformers. *Unit #1 Transformer, Minor PCB Release*. A minor PCB release was discovered on December 31, 1987 at the Unit #1 north supply transformer (4160/480). Several drops of PCB dielectric oil had leaked from a secondary drain valve on to the concrete pad below. Initial cleanup started December 31, 1987 and finished February 16, 1988. SDG&E removed a small area of concrete pad and changed the valve. Confirmation samples were taken. Final laboratory results indicated that the surface cleanup standard of 10 µg/100 cm^2 had been satisfied (SDG&E, 1988a).

Switchyard and Generating Transformer PCB Investigations. EnecoTech Southwest (1997b) performed a surface wipe and soil sampling assessment in the power plant transformer and switchyard areas. The objective of the study was to assess stains and discoloration of soil and concrete structures adjacent to oil containing transformers and circuit breakers. The stains had been caused by a combination of leaking chain valves and leaking transformer cooling fin assemblies. Surface wipe sampling was done utilizing a 100 cm^2 square template.

Sampling results are described in Section 2.10 of this report. EnecoTech Southwest (1997b) concluded that PCBs were present at concentrations less than applicable threshold criteria.

3.4.2 National City Terminal

Tank Farm Releases. A release of "distillate oil" (diesel) occurred in the terminal tank farm on March 9, 1979 as a result of a "blown expansion joint". The release of an unspecified volume of oil occurred to an unspecified area of soil. According to SDG&E, maintenance personnel "cleaned the area" (Soderlund, 1979).

The NCT AST #1 floor was mat-coated in about 1982. On July 15, 1982 overfilling NCT AST #1 resulted in a release of approximately 100 to 300 bbls of No. 6 fuel oil onto the ground surface. All of the oil was captured within the secondary containment berm (SDG&E, 1993c, and 1997b; see Appendix C.6.1).

On or about July 1, 1987, a leak of approximately 200 gallons of 5.6 percent hydrochloric acid occurred while acid-cleaning the terminal boiler. While the majority of the acidic solution was contained within emergency soil dikes some did impact soils. According to SDG&E personnel, the volume of impacted soil was estimated at less than one drum. The acidic solution was removed using a vacuum truck, and all material was neutralized with a 1- percent soda ash solution to a pH of approximately 7. The neutralized waste was removed by tanker truck (Stroman, 1987; see Appendix C.6.2).

EnecoTech Southwest (1997a; see Appendix C.3.I) conducted a Preliminary Site Assessment to determine the necessity and extent of remediation at the terminal. The assessment conducted in fall 1996 identified impacts to soil from the combination of previous tank and line releases at the terminal. Based on these findings, remedial activities were conducted by EnecoTech Southwest in fall 1997 (EnecoTech Southwest, Inc. 1998, see Appendix C.6.3).

From November 6 through 20, 1997, EnecoTech Southwest excavated 38 areas at the terminal by hand shovel. Excavation was carried out to depths ranging from four inches to five feet below grade. The excavation was continued to the maximum extent of visible impact or until further advancement of the excavation was not possible due to subsurface equipment foundations. A total of 50.6 tons of soil were removed and transported to Soil Wash Technologies, Inc. of San Diego for processing. At each excavation area the in-place remaining soil was sampled for laboratory analysis. The excavations were lined with polyethylene sheeting and backfilled with clean, imported sand and gravel fill.

The laboratory results from in-place, remaining soil samples indicated that TPH decreased after remediation in 68 out of 81 samples. The boiling point range of compounds indicated that areas impacted primarily with No. 6 fuel oil exhibited a hard, asphalt-like crust in the shallow subsurface. In six areas a silty-sand layer at approximately one-foot below grade was heavily impacted or saturated

with diesel fuel. EnecoTech Southwest suggested that these areas would likely require additional remedial efforts.

In the 38 areas excavated, soil remaining in 14 areas was below the 1,000 ppm TPH guideline typically employed at sites of this nature. EnecoTech Southwest (1998) opined that these 14 areas should not require further remedial action. In six additional areas the remaining soil exhibited impacts between 100 and 1,000 ppm. Excavation in these areas had been hindered by equipment foundations. However, additional remediation was not an expected requirement for these areas. The remaining 18 areas exceeded the 1,000 ppm TPH threshold. In most areas, there was a deeper, more extensive area of impact present that could not be further excavated due to appurtenances preventing further access.

In summary, EnecoTech Southwest (1998; see Appendix C.6.3) categorized areas of the subject property into three categories; no further action areas, low priority areas, and high priority areas. EnecoTech Southwest recommended that the low and high priority areas receive additional assessment and remedial activities, as necessary.

Terminal Releases. On February 13, 1976, approximately five barrels of diesel displacement oil were released from the Berth 24-4 hose connection as a result of operator error (Dilloway, 1976). The diesel was released onto the dock from the containment pit, and approximately two barrels of diesel fuel was released to San Diego Bay (USCG, 1976). The diesel fuel was temporarily contained by wave and tidal action and ultimately a containment boom. The fuel was removed with sorbent materials and vacuum trucks. The spill cleanup was deemed complete when approximately 95 percent of the diesel fuel had been recovered (on February 15, 1976). The United States Coast Guard (USCG) levied a modest fine.

On December 6, 1977 approximately 2 bbls of No. 6 fuel oil (75 F pour point) was released from a barge at Berth 24-3. The release occurred due to a small slit in the side of the barge. The spill was contained with a boom placed around the barge and under the pier. The fuel oil was removed with sorbent materials and vacuum trucks. The USCG was satisfied with the spill cleanup effort (Aden, 1977).

On April 30, 1979 a release of approximately 25 bbls of diesel fuel occurred from a valve in the Berth 24-2 vault during vessel off-loading. An estimated 300 gals of diesel fuel were released to San Diego Bay. Approximately 20 gals of diesel fuel believed to be related to the initial release were again observed on bay waters on May 3, 1979. The diesel was contained with booms and removed with sorbent materials. This release was believed to be the result of valving damaged by Scrap Disposal, Inc. during loading of scrap metal into a docked vessel (Rodriguez, 1979).

In April 1984 a leak from piping under the pier occurred. Less than 30 bbls of diesel fuel were released into San Diego Bay. As a contingency measure a boom had been pre-deployed surrounding the tanker ship; therefore, the spill was immediately contained. All of the under-pier piping was subsequently replaced by abovegrade hoses from a vault to barge (SDG&E, 1993c and 1997b).

On April 24, 1984 approximately 1270 gals of low sulfur Bunker fuel oil was released into San Diego Bay as a result of a material pipe failure in a transfer pipe (USCG, 1984). This release occurred during loading of a barge at Berth 24-4. The release was contained using booms and cleaned up to the satisfaction of the USCG using sorbent pads. The USCG levied a modest fine to SDG&E.

In summary, these releases were mitigated at the time of occurrence and did not produce an environmental impact at the NCT. Therefore, none of these releases are considered to be potential environmental conditions requiring further consideration in the Phase II ESA.

3.4.3 National City Terminal

Two releases from the National City Pipeline are known to have occurred. One occurred in the 1970s east of Sweetwater Road. The second occurred on January 28, 1986 nearly opposite E Street. The following paragraphs briefly discuss each event.

Sweetwater Road Release. According to SDG&E personnel, a release of Bunker C occurred from the pipeline on the west side of Paradise Creek nearly opposite Sweetwater Road (Photograph A-28). In the early 1970s the leak occurred as a result of internal pipeline erosion at a bend in the pipeline. Reportedly, SDG&E excavated and repaired the pipeline. The volume of the release is unknown and disposition of impacted soils is not documented. Of the three individuals interviewed, two had been on-site and recollected that the soil was excavated and removed, the other was uncertain if excavated soil had been removed or returned to the excavation. These persons indicated that, considering the date of the release, confirmatory sampling was unlikely. No written documentation of this release was available in the files that SDG&E provided to Fluor Daniel GTI.

E Street Release. On January 28, 1986, a leak was discovered during a routine pre-transfer pressure test on the pipeline. The exact location of the leak was determined to be west of Interstate 5, and approximately 0.2 miles north of E Street (Photograph A-25). SDG&E estimated approximately 2,500 to 4,800 gallons of displacement oil (diesel) had been released (SDG&E, 1986; see Appendix C.7.1). Approximately 200 gallons of this release reached a pond adjacent to Sweetwater Marsh. A dike was constructed to contain the release, and sorbent materials were used to manage the spill.

The leak was determined to be the result of a flange gasket failure. The pipeline was repaired and retested. In response to the release, SDG&E excavated approximately 1,100 cu. yd. of oil-contaminated soil at the time of the repair from around the pipeline in the interidal marshland.

Approximately 52,000 gals of oil and groundwater were removed from the pipeline excavation (RWQCB, 1986).

Woodward-Clyde investigated the site to determine the extent of contamination. Seven monitoring wells (5 outside excavation, 2 inside) were installed. Soil and groundwater samples were obtained. Groundwater contained less than 3 mg/L of TPH and less than 0.5 mg/L phenols. Pond sediments were also sampled and found to be satisfactory. Because the cleanup levels were expected to be based on aquatic levels (1-15 THC), approximately 300-yds^3 additional soil was excavated. On September 19, 1986, the RWQCB (1986; see Appendix C.7.2) issued a no further remedial action letter in response to the spill cleanup.

In 1993 and again in 1998, independent testing firms, approved by the Office of the State Fire Marshall, performed an independent pressure test of the 10" and 18" National City Berth Pipelines. The 1993 test was certified as acceptable and within the California Pipeline Safety Act (CAPSA) allowable loss rate on May 18, 1993. This certification is required by CAPSA every 5 years. A copy of the independent certification was sent to the Office of the State Fire Marshall, lead agency for CAPSA. On Februrary 25, 1998, an independent testing firm approved by the office of the State Fire Marshall performed an independent pressure test of the National City-South Bay Fuel Oil Pipeline (commonly referred to as the National City Pipeline).

The test was certified in a letter transmitted on March 6, 1998 as acceptable and within the CAPSA allowable loss rate. A copy of the independent certification was sent to the Office of the State Fire Marshall, lead agency for CAPSA. The fire Marshall has reportedly accepted the procedures and results of the testing of the pipeline. Copies of both hydrotest results can be found in Appendix C.7.3.

SDG&E provided copies of various annual pressure tests for the National City Terminal that they conduct as part of their pipeline safety program, in addition to the state CAPSA program. Upon review, the tests appear to have been conducted under appropriate procedures.

In summary, the agency-regulated testing and annual testing by SDG&E indicate that the pipeline is not leaking.

3.4.4 Off-Site Releases on SDG&E Properties

Releases and potential releases on abutting properties for which SDG&E has or may have responsibility are discussed in the following paragraphs.

LNG Plant Mercaptan Release. A release of methyl Mercaptan (mercaptan) occurred prior to 1987 at a location approximately 300 feet southeast of the southeastern edge of AST #7 and approximately 200 feet north of the north edge of the former eastern (smaller) LNG AST. Mercaptans are sulfur containing hydrocarbons (boiling point of 43° F and specific gravity of 0.9 at 32° F) used as an odorant

for the liquefied natural gas. A 55-gallon drum of mercaptan was spilled onto bare soil adjacent to a partially demolished concrete foundation.

According to EnecoTech Southwest (1997a; see Appendix C.3.1), no evidence was visible of a release at the location. At the time of their site visit (November 5, 1996) annual grasses had partially overgrown the area. EnecoTech Southwest advanced one hand augered soil boring, centrally located in the area identified as the spill site. The soil boring was advanced to a depth of 5.5 feet below ground surface (bgs). The soil samples were obtained at 2 feet bgs and at 5 feet bgs for laboratory analysis (ASTM Method D1945 - "Analysis of Natural Gas by Gas Chromatography Modified for Sulfur-containing Compounds"). Detectable concentrations of mercaptans were not identified in either sample. Field screening with a photoionization detector (PID) also did not indicate the presence of ionizable volatile compounds.

Based on their findings, EnecoTech Southwest concluded that the mercaptans had volatilized as a result of their high vapor pressure and were no longer present in the soil at the spill site. EnecoTech Southwest recommended no further remedial action (EnecoTech Southwest 1997a). This release is not considered to be a potential environmental condition requiring further consideration in the Phase II ESA.

4.0 ADJACENT PROPERTY INFORMATION

Information was collected on potential sources of surface contamination, airborne contamination, and waterborne contamination from adjacent properties, such as:

- containers
- drums
- underground and aboveground storage tanks
- other storage units
- tank-related manholes or concrete pads
- surface depressions
- air stacks and vents
- drainage onto the Site
- dumps
- pits
- landfills
- waste transporting-storage-disposal businesses
- borrow pits
- capacitors
- hydraulic lifts
- oil–water separators, and
- central vehicle fluid-dispensing systems.

An automobile tour of surrounding properties was conducted to search for conditions that may present an adverse environmental impact to the Site. The tour was conducted from public rights-of-way and did not include access to buildings or entry onto private properties.

Surrounding properties are described in this section and are shown on Figures 1-3a and 1-3b, the Area Land Use Maps.

4.1 Properties Surrounding the SBPP

- North of the SBPP is Rohr Aircraft, to the northwest is J Street Marina, to the northeast is an office complex occupied by Community Health Group and currently unoccupied office and warehouse space.

- South of the SBPP is the Bayside Business Park, Grainger, and Western Salt Company. To the southeast is an unnamed business park for small commercial and industrial businesses (a list is provided in Appendix A). The businesses of primary interest are discussed in Section 5.1 of this report.

- East of the SBPP are undeveloped land and the railroad, Bay Boulevard, and I-5 corridors. To the southeast is a business park for small commercial and industrial businesses (see Appendix A for a list).

- West of the SBPP is San Diego Bay and the Chula Vista Wildlife Refuge, a least tern nesting area on the dike that separates the inlet and outlet channels.

4.2 Properties Surrounding the NCT

- North and northwest of the terminal is the Port of San Diego National City Marine Terminal operated by Pasha Marine Services (vehicle carrier ship offloading, temporary storage transfer lot, and railcar loading).

- South of the terminal is a Dixieline Lumber Co. lumbers storage lot. Two fuel pumps were visible from the road. Because storage tanks were not visible, it is assumed that UST(s) are present. The fueling area is approximately 150 yards south of the subject property.

- East of the terminal is Dixieline Lumber Co. Wood Products and Truss Division (manufacturer of pre-fabricated wood trusses and lumber storage). To the southeast is a food distribution warehouse.

- West of the terminal is Pasha Marine Services, the SDG&E terminal berths, and San Diego Bay. To the southwest Pasha operates a vehicle preparation facility inside of a high-bay warehouse building.

4.3 Pipeline

- Properties along the pipeline include industrial facilities and marshes, as described in earlier sections.

5.0 REGULATORY REVIEW

Fluor Daniel GTI contracted EDR to conduct an environmental database search of California state files and U.S. EPA files for the subject properties and surrounding area (see Appendix E for EDR database search). The search area was based on the Site address. The search radius for each specific state or federal database ranged from one-half mile or one mile (which meets or exceeds the minimum search radius stipulated by the ASTM Standard E 1527-97).

The following sections describe the reported findings of regulatory records for properties in the vicinity of the SBPP and of the NCT.

5.1 South Bay Power Plant

The following facilities were reported in the California State files:

- 0 - registered UST sites
- 0 - registered AST sites
- 2 - site leaking underground storage tank sites (LUST)
- 0 - registered solid waste disposal facilities/landfills (SWF/LS sites)
- 1 - CAL-Sites (state hazardous waste sites)
- 2 - sites related to Cortese Act (public drinking water wells with detectable impacts)
- 0 - sites related to Preposition 65 Notification Act (notifications of releases that could impact drinking water supply)
- 0 - Bond Expenditure Plan (BEP) sites. The BEP is for appropriation of Hazardous Substance Cleanup Bond Act funds
- 0 - sites per the California hazardous material incident reporting system (CHMIRS)
- 0 - TPCA sites (sites suspected of containing hazardous substances where clean up has not been completed)
- 0 - CA FID sites (historical listing of active and inactive UST facilities)
- 0 - ISMUDS/SWAT (inventory of waste management units)

- 0 - sites per Hazardous Waste Information System (HAZNET) (information concerning manifested hazardous waste disposal)
- 0 - sites per Hazardous Materials Management Division (HMMD) database including the Unauthorized Releases List
- 0 - CA SLIC (contaminated sites impacting or potentially impacting groundwater)
- 0 - sites per the California (Waste Discharge System (CA WDS) requirements

The subject property is listed on the following state and regional databases: Toxic pits, UST, LUST, AST, ISMUDS/SWAT, HAZNET, RCRIS, FINDS, HMMD, and CA WDS. The information from these lists concerning the subject property is consistent with that in SDG&E's facility files.

The following facilities were reported in the U.S. EPA files:

- 0 - RAATS (enforcement actions issued under RCRA pertaining to major violations)
- 0 - HMIRS (hazardous material spills to DOT)
- 0 - PADS (PCB waste handler)
- 0 - ERNS (reported releases of oil and hazardous substances to the US Coast Guard)
- 0 - FINDS (reviewed or made aware of various regulatory programs)
- 0 - TRIS (released toxic chemicals to the air, water, and/or land)
- 0 - TSCA (manufacture or importer of toxic substances)
- 0 - NPL (uncontrolled or abandoned hazardous waste sites)
- 0 - RCRIS-TSDF (facilities that generate, transport, or dispose of hazardous waste)
- 0 - CERCLIS (facilities investigated for a release or threatened release of hazardous substances)
- 3 - RCRA, SQG (small quantity generators)
- 0 - RCRA, LQG (large quantity generators)
- 0 - ROD (Records of Decision mandating a permanent remedy at a NPL site)

- 0 - CONSENT (CERCLA Consent Decrees establishing responsibility and standards for cleanup at NPL sites)
- 0 - MLTS (list of sites subject to Nuclear Regulatory Commission Regulations)
- 0 - NPL Liens (list of federal liens of CERCLA sites)
- 0 - CORRACTS (identifies hazardous waste handlers subject to RCRA corrective action activities)

Properties with environmental issues/incidents identified within the radius covered by the EDR database search (Appendix E-1) are listed below. Based on the distance from the subject property, extreme cross-gradient location from the subject property, or because no further remedial actions are required at these properties by regulatory agencies, these properties' activities do not pose a significant environmental risk to the SBPP.

- Western Salt Co., 1135 Bay Boulevard - - a preliminary endangerment assessment indicated that there is no known use of hazardous materials at the site, and that the site does not pose an environmental threat.
- ARCO Products Co., Palomar Road Site and Broadway Site - - located a significant distance across gradient. The Palomar Road site has been issued a no further action response.
- PHD Corp., 910 Industrial Boulevard - - a large quantity generator of hazardous waste with a gasoline LUST impacted soil. Remedial action has been completed or deemed unnecessary.
- Ratner Corp., 642 Arizona Street - - a LUST site with impacted groundwater. Remedial action has been completed or deemed unnecessary.

Three small quantity generators are listed in the business park abutting the subject site to the southeast. They include:

- MGM Custom Machine and Fabrication
- QEB Systems, Inc.
- Fisher Price

The site visit notes include a list of other tenants in the business park that handle hazardous material or hazardous wastes.

A total of 33 orphan sites were reported in the database search. Orphan properties are properties missing address information that cannot be properly located. Fluor Daniel GTI personnel did not observe any orphan properties or businesses adjacent to the subject property posing a potential environmental concern to the subject property.

5.2 National City Terminal

The following facilities were reported in the California State files:

- 5 - registered UST sites (underground storage tanks)
- 9 - LUST site (leaking underground storage tank)
- 0 - registered SWF/LS sites (solid waste disposal facilities/landfills)
- 5 - CAL sites (state hazardous waste sites targeted for cleanup)
- 18 - Cortese (public drinking water wells with detectable impacts)
- 2 - Notify 65 (notifications of releases that could impact drinking water supplies)
- 0 - BEP site (bond expenditure plan for appropriation of Hazardous Substance Cleanup Bond Act funds)
- 8 - CHMIRS (hazardous material incident reporting system)
- 0 - Toxic Pits (sites suspected of containing hazardous substances where clean up has not been completed)
- 0 - CA FID (historical listing of active and inactive UST facilities)
- 0 - ISMUDS/SWAT (inventory of waste management units)
- 9 - HAZNET (information concerning manifested hazardous waste disposal)
- 0 - HMMD (Hazardous Materials Management Division database including the Unauthorized Releases List)
- 2 - CA SLIC (contaminated sites impacting or potentially impacting groundwater)
- 0 – sites per the California Waste Discharge system (CAA WDS) requirements.

The subject property is listed on the following state and federal databases: TCP\PA, UST,LUST, AST, ISMUDS/SWAT, HAZBET, RCRIS, FINDS, HMMD, and CA WDS. The information from these lists concerning the subject property is consistent with that in SDG&E's facility files.

The following facilities were reported in the U.S. EPA files:

- 0 - RAATS (enforcement actions issued under RCRA pertaining to major violations)
- 0 - HMIRS (hazardous material spills to DOT)
- 0 - PADS (PCB waste handler)
- 0 - ERNS (reported releases of oil and hazardous substances to the US Coast Guard)
- 0 - FINDS (reviewed or made aware of various regulatory programs)
- 0 - TRIS (released toxic chemicals to the air, water, and/or land)
- 0 - TSCA (manufacture or importer of toxic substances)
- 0 - NPL (uncontrolled or abandoned hazardous waste sites)
- 5 - RCRIS-TSDF (facilities that generate, transport, or dispose of hazardous waste)
- 0 - CERCLIS (facilities investigated for a release or threatened release of hazardous substances)
- 4 - RCRA, SQG (small quantity generators)
- 1 - RCRA, LQG (large quantity generators)
- 0 - ROD (Records of Decision mandating a permanent remedy at a NPL site)
- 0 CONSENT (CERCLA Consent Decrees establishing responsibility and standards for cleanup at NPL sites)
- 0 - MLTS (List of federal liens of CERCLA sites)
- 0 - CORRACTS (identifies hazardous waste handlers subject to RCRA corrective action activities)

Many properties with environmental issues/incidents were identified within the radius covered by the EDR database search (Appendix E-2). The majority are located too distant in an up-or cross-gradient position to pose a practical environmental concern to the subject property. Also, the Paradise Creek wetlands area (located approximately one-half mile east, upgradient, of the subject property) forms a probable groundwater migration barrier from potential release properties located further upgradient. Those properties posing the greatest potential concern to the subject property are noted below:

Abutting Properties

- Pasha Maritime Services, 2500 Terminal Avenue - - listed as having manifested hazardous wastes (unspecified solvent mixture) for disposal.

- San Diego Unified Port District, 2720 Terminal Avenue - - a 10,000 gallons diesel UST is listed for this location. This UST was not observed during the neighborhood drive through inspection.

- CBE Distribution, Inc., 2722 Terminal Avenue - - listed as being a hazardous waste transporter. Evidence of CBE's operation was not visibly apparent during the neighborhood drive-through inspection.

- National City Marine Terminal, corners of 24th Street and Terminal Avenue - - from 1979 until 1985 copper ore concentrate was stockpiled for loading onto ships at this location. The RWQCB issued a Cleanup and Abatement Order for sediments in 1985. No information was available regarding the completion of this order.

- Dixieline Lumber Co., 1400 West 28th Street - - listed as a LUST location with groundwater impacted by gasoline. Remediation including the excavation and disposal of soils, removal of non-aqueous phase liquid (NAPL), and pumping and treatment of groundwater was conducted. A regulatory sign-off on the remedial action has been issued. Dixieline is also listed as having manifested PCB containing materials for disposal and listed as storing a variety of hazardous materials onsite including: lube oil (1,000 gallons AST) and welding materials. USTs removed from the site include: regular leaded gasoline (7,600 gals), diesel (10,000 gals), and waste oil (1,000 gals). Listed as having a permit to operate USTs: unleaded gasoline (8,000 gals), diesel (10,000 gals), and waste oil (1,000 gals). Pumps presumably related to these USTs were observed during the neighborhood drive through inspection. Further listing includes having manifested hazardous wastes for disposal including: waste oil, hydrocarbon solvents, degreasing sludge, oil filters, and used batteries.

- National City Distribution Yard, 1400 West 28th Street - - listed as having permitted USTs for storage of regular gasoline (7,600 gals), diesel (10,000 gals), and waste oil (1,000 gals).

Nearby Properties

- RMI, Inc. Shipyard Operations, 1313 West 24th Street - - listed as having USTs including unleaded gasoline (two 550 gallons tanks) and diesel (550 gal).

- A & E Industries, Inc., 1313 West 24th Street - - listed as having manifested hazardous wastes for disposal including: oxygenated solvents (e.g. acetone) and halogenated liquids. DTSC has required preparation of a Preliminary Endangerment Assessment.

- Knight and Carver Yacht Center, 1313 West 24th Street - - listed as a small quantity generator of hazardous wastes.

- Ortiz & Allds Abrasive blasting and Painting, 1313 West 24th Street - - listed as a small quantity generator of hazardous wastes. Listed as having removed three 550 gallons USTs. Listed as having manifested hazardous wastes for disposal including: still bottom waste and waste oil. Listed as having hazardous materials on site including paint and paint thinner. Listed as having been cited for hazardous waste violations related to: lack of proper documentation, storage in excess of allowable time, improper labeling, and disposal to an unauthorized location (ground, storm drain, sewer system, trash, or air).

- Boise Cascade Corp. 2745 Tidelands Avenue - - listed as having USTs onsite including: unleaded gasoline (10,000 gal), diesel (10,000 and 12,000 gal), waste oil (280 gal), and unspecified oil product (two 280 gallons tanks). Listed as a large quantity and a small quantity generator of hazardous wastes. Listed as having manifested hazardous wastes for disposal including halogenated solvents.

- Pepper Oil Co., Inc., 2300 Tidelands Avenue - - listed as a CERCLIS-NFRAP site. (NFRAP sites are CERCLA sites with a designation of "no further remedial action planned". Such sites may be sites where no contamination was found, contamination was removed quickly, or contamination was not significant enough to require Federal Superfund action or NPL consideration.) Listed as a hazardous waste transporter under the name of Xclusive Transportation Corp. The facility was listed as a high priority violator. A large drum storage area existed on site with over 500 drums (labeled "corrosive, flammable, and hazardous when empty") and 20 bulk storage tanks. Large areas of stained soil were observed both on-site and on an adjacent property. Listed as

having USTs on-site including: waste oils (2,000 gal) and two unspecified waste tanks of unspecified volume.

- Apple Environmental Services, 2300 Tidelands Avenue - - listed as having manifested hazardous wastes for disposal including laboratory waste chemicals.

- Southern California Truck Stop, 2250 Tidelands Avenue - - listed as a LUST site with a preliminary assessment underway for diesel impacts to groundwater.

- 3040 Terminal Avenue - - listed as a location of a hazardous material incident: presence of "Black Beauty Sandblast" grit.

- San Diego Unified Port District, 3040 Tidelands Avenue - - listed as a LUST site with remedial action in progress where gasoline has impacted groundwater. NAPL recovery and soil vapor extraction is listed as ongoing.

- Pacific Coast Cement Corp., 1030 West 24th Street - - listed as a LUST site with remedial action completed relative to a release of gasoline impacting groundwater and listed as having possible soil contamination. Listed as having removed USTs including a 10,000 gallons diesel and a 280 gallons waste oil UST. Listed as storing/using diesel, lubricating oil, hydraulic oil, and welding materials. Listed as having manifested hazardous wastes for disposal including waste oil, used oil filters, and hydrocarbon solvents. Listed as having been cited for violations related to lack of proper documentation and labeling.

- Harvest Meat Company, 1022 West 24th Street - - listed as a LUST site with remedial action completed relative to a release of gasoline impacting soil. Contaminated soil was excavated and disposed. Also listed as having a diesel UST that failed a tightness test and NAPL present on groundwater with a notation of drinking water impact. Listed as having removed USTs including: diesel (four 10,000 gallons diesel USTs), motors oil (500 gal), and waste oils (550 gal). Listed as managing hazardous materials on-site including ammonia gas and oil. Listed as having manifested hazardous wastes for disposal including: waste oil and hydrocarbon solvents. Listed as having been cited for numerous violations related to: lack of proper documentation and labeling, storage beyond applicable time limits, spill control equipment that was not available or properly maintained, and emergency plans that were not properly updated.

- WDP National Associates, 1022 24th Street - - listed as a LUST site with remedial action completed relative to a release of diesel. Groundwater and soil were impacted and contaminated soil was excavated and disposed.

A total of 43 orphan sites were reported in the database search. Orphan properties are properties missing address information that cannot be properly located. Fluor Daniel GTI personnel identified one orphan property or business adjacent to the subject property posing a potential environmental concern to the subject property. This is listed as the "24th Street Marine Terminal Landfill" (end of 24th Street). The EDR report did not contain additional information concerning this landfill. It is possible that it is related to the general in-filling/reclamation of these lands observed in the aerial photography.

5.3 Division of Oil, Gas, and Geothermal Resources

Division of Oil, Gas, and Geothermal Resources Maps, available at Fluor Daniel GTI's internal library, were reviewed for oil and gas wells. Maps reviewed were dated September 28, 1996. The nearest oil well is located approximately one mile to the east of SBPP. This well was drilled for W.P. Hanson, and is currently listed as idle. Other wells were more than three miles away from SBPP. No active oil and gas wells are located in the vicinity of SBPP or the National City Terminal. Therefore, it is highly unlikely that drilling for oil and gas impacted environmental conditions at SBPP.

5.4 Public Agency File Review

Fluor Daniel GTI conducted an analysis of public agency records for the Site. The objective of the search was to determine if any files existed that contained information on site specific environmental conditions resulting from a release or potential release of a hazardous substance or petroleum product at the Site. The following government agencies were contacted and requested to conduct a file search:

- California Regional Water Quality Control Board, San Diego Region
- Cal/EPA Department of Toxic Substances Control
- San Diego County Department of Environmental Health
- City of Chula Vista Fire Department

The findings of the file searches are summarized below.

The RWQCB was provided the Site addresses and requested to conduct a file search on April 13, 1998. The principal contact assigned to conduct the search was Ms. Amy Fortyn (619/627-3988). Ms. Fortyn responded on April 21, 1998 by telephone that she could not locate any files for this site regarding USTs, or hazardous materials spills or leaks. The file search request was forwarded to five other persons in the RWQCB, in sections dealing with storm water permits, ASTs, dredging permits, and NPDES permits and discharge reporting. Two responses were generated from these sections. Ms. Soyra Ramy indicated that files existed related to storm water permits, and Mr. Paul Richter indicated that the NPDES section had files regarding discharge permits and discharge compliance

reports. There was no indication that these files contained any information bearing on soil or groundwater environmental conditions at the site.

The DTSC offices in Cypress (Ms. Julie Johnson, 714/484-5300) and Glendale (Joan Barrio, 818/551-2886) were contacted on April 13, 1998, regarding a file search. No files for this site were found in the DTSC Cypress office files. The Glendale office indicated that they have files on the South Bay Power Plant address. Fluor Daniel GTI has requested to review these files at the earliest possible time, however, the DTSC has not been able to provide these files for review by the time this Phase I investigation was completed.

Fluor Daniel GTI contacted the DEH on April 13, 1998. Ms. Ermie Esquibel (619/338-2222) performed a preliminary file check over the phone and confirmed that the DEH had a file for this site (H13941). File review request forms were submitted by facsimile on April 14, 1998. The files were reviewed by Fluor Daniel GTI on May 26, 1998, and no new findings were discovered.

On May 26, 1998, Fluor Daniel GTI reviewed the files for the SBPP at the Chula Vista Fire Department, after obtaining approval from the City Attorney. No new findings were discovered.

6.0 CONCLUSIONS

Fluor Daniel GTI has conducted a Phase I ESA of the SBPP, the NCT, and the fuel oil pipeline connecting these locations. The purpose of the ESA was to identify recognized environmental conditions in connection with these facilities, to the extent feasible pursuant to the processes prescribed by ASTM E 1527-97. The term *recognized environmental conditions* means the presence or likely presence of any hazardous substances or petroleum products on the facility under conditions that indicate an existing release, a past release, or a material threat of a release of any hazardous substances or petroleum products into structures on the facility or into the ground, groundwater, or surface water at the site. The term includes hazardous substances or petroleum products used in compliance with applicable laws, but does not include *de minimis* conditions that do not pose a material risk of harm to public healthy or the environment.

The assessment has consisted of extensive Site inspections, interviews with knowledgeable persons, reviews of historical documents and records, analysis of public agency records and information, and preparation of this report. The following conclusions, subject to the limitations discussed in Section 1.2, are drawn:

- The assessment meets or exceeds the guidelines presented in ASTM E 1527-97 for Phase I environmental site assessments.
- This assessment constitutes *appropriate inquiry*[2] into environmental conditions at the Site.
- The findings of the assessment are sufficient to warrant intrusive sampling (Phase II assessment) at selected locations on the Site.
- The Phase I ESA identified potential environmental conditions that will be evaluated by a Phase II assessment. The potential environmental conditions at SBPP and NCT are summarized in Table 6-1.
- The Phase I ESA has not identified any additional potential environmental conditions beyond those listed in Table 6-1.

An objective of the Phase II ESA will be to identify which potential environmental concerns from Phase I require risk quantification and remediation, and which are not to be considered further. The

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2 The term *appropriate inquiry* is discussed at length in ASTM E 1527-97, and is intended to have the meaning as employed under CERCLA. For a legal opinion of what constitutes appropriate inquiry, the report user is encouraged to employ the services of a competent environmental attorney. This report does not constitute a legal opinion

sampling protocols and methodologies to be employed in Phase II will be described in the Phase II Field Sampling Plan.

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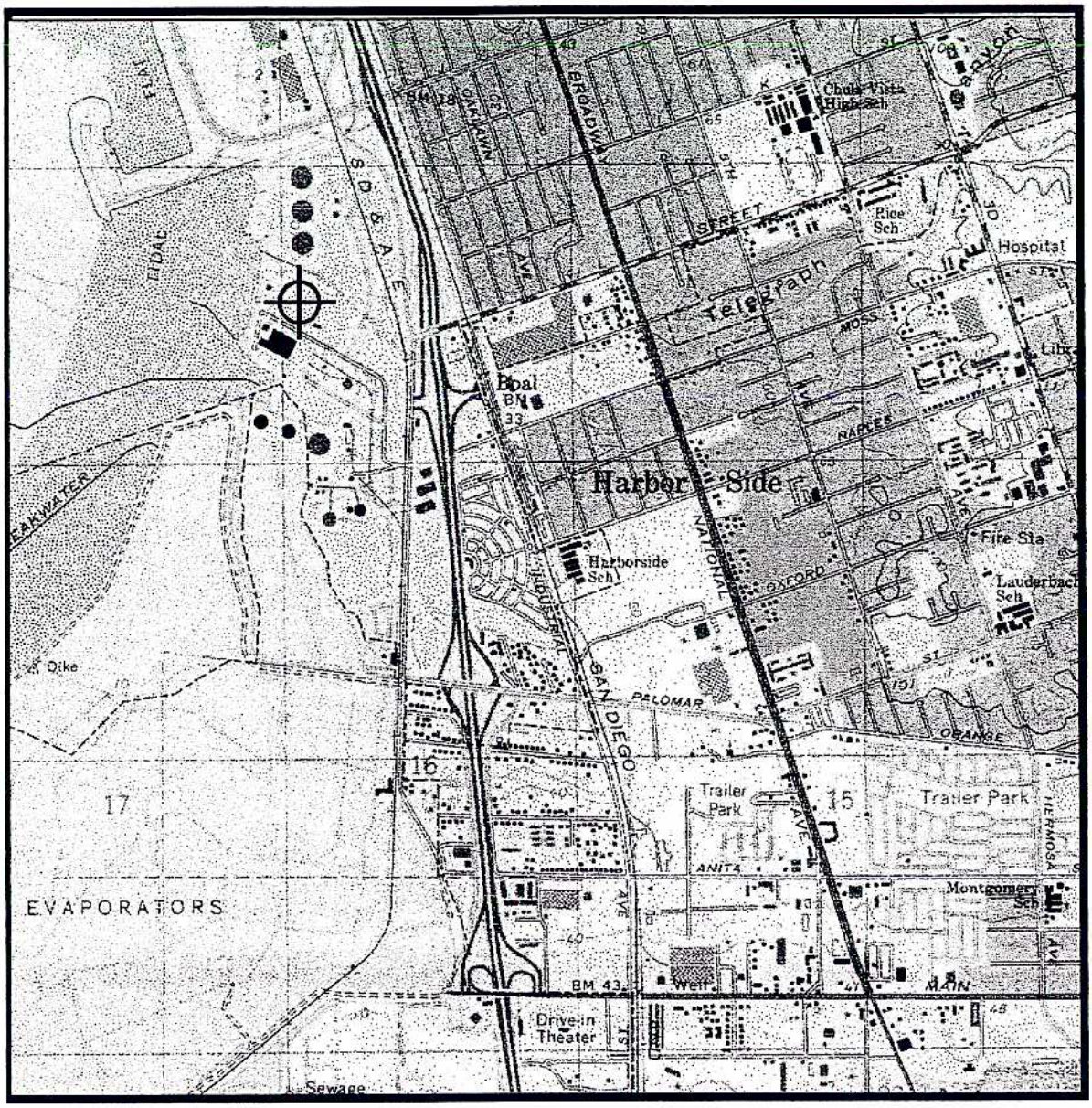
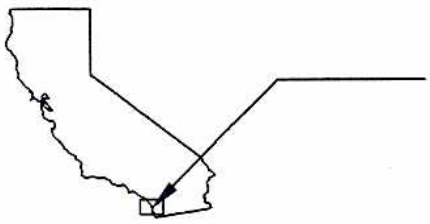
FIGURES

1. Site Location Map (1A: South Bay Power Plant; 1B National City Terminal)
2. Site Plan (2A: South Bay Power Plant; 2B National City Terminal)
3. Area Land Use Map (3A: South Bay Power Plant; 3B National City Terminal)



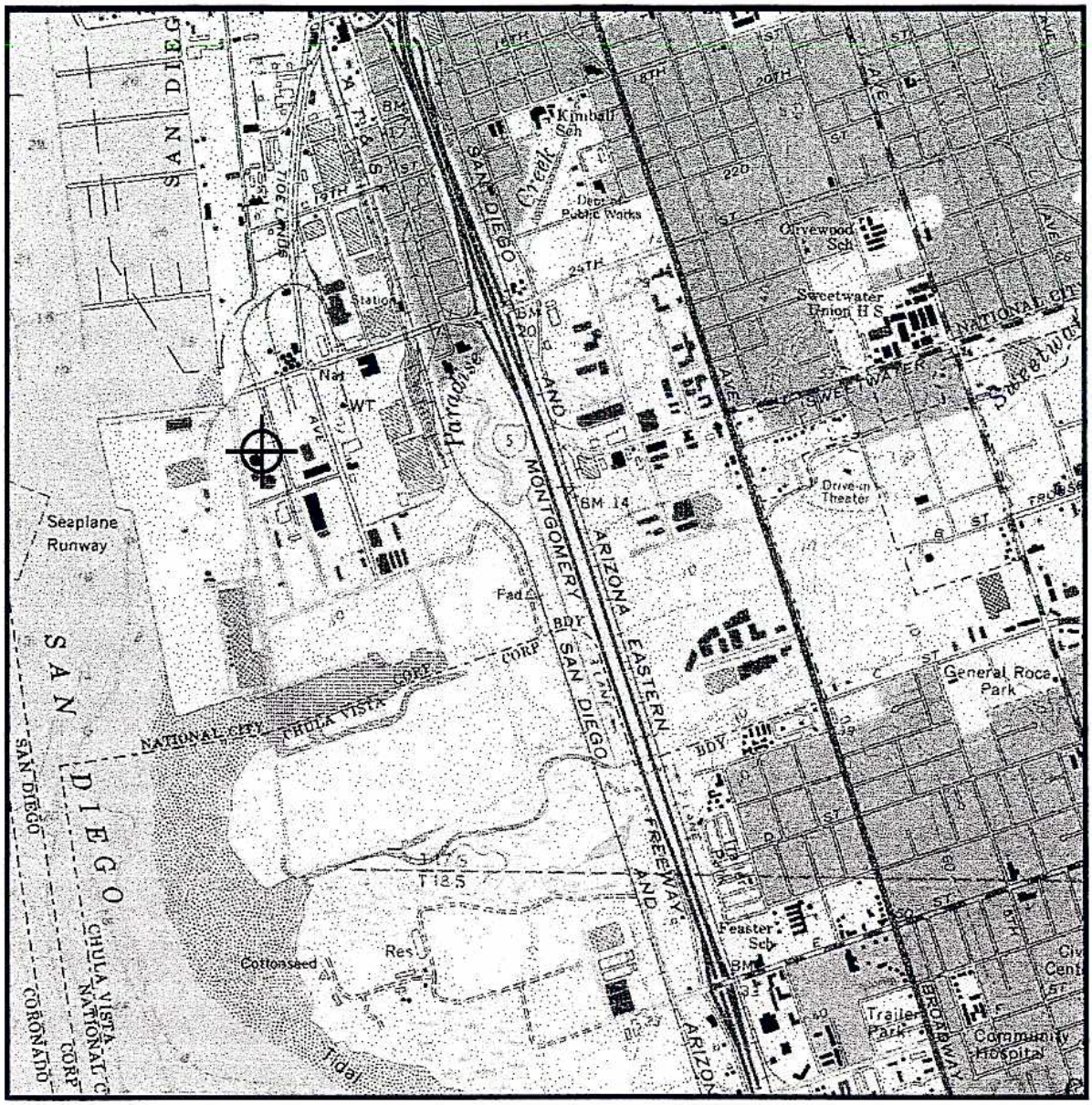
SOURCE: U.S.G.S. TOPOGRAPHIC QUADRANGLE
IMPERIAL BEACH, CALIF.
7.5 MINUTE SERIES
1967 / PHOTOREVISED 1975
REPRODUCTION NOT TO SCALE



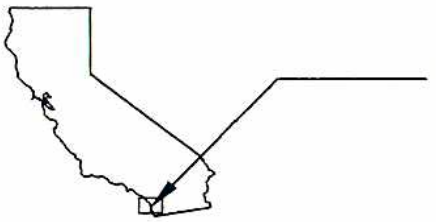
FLUOR DANIEL GTI

SITE LOCATION MAP
SOUTH BAY POWER PLANT

CLIENT: SAN DIEGO GAS AND ELECTRIC	FILE: 3589SBSM (1:1)		PROJECT NO.:	PM	PE/RG
	REV.			FIGURE:	
LOCATION: CHULA VISTA, CA.	DES. PG	DET. JR	DATE: 5/18/98	1-1A	



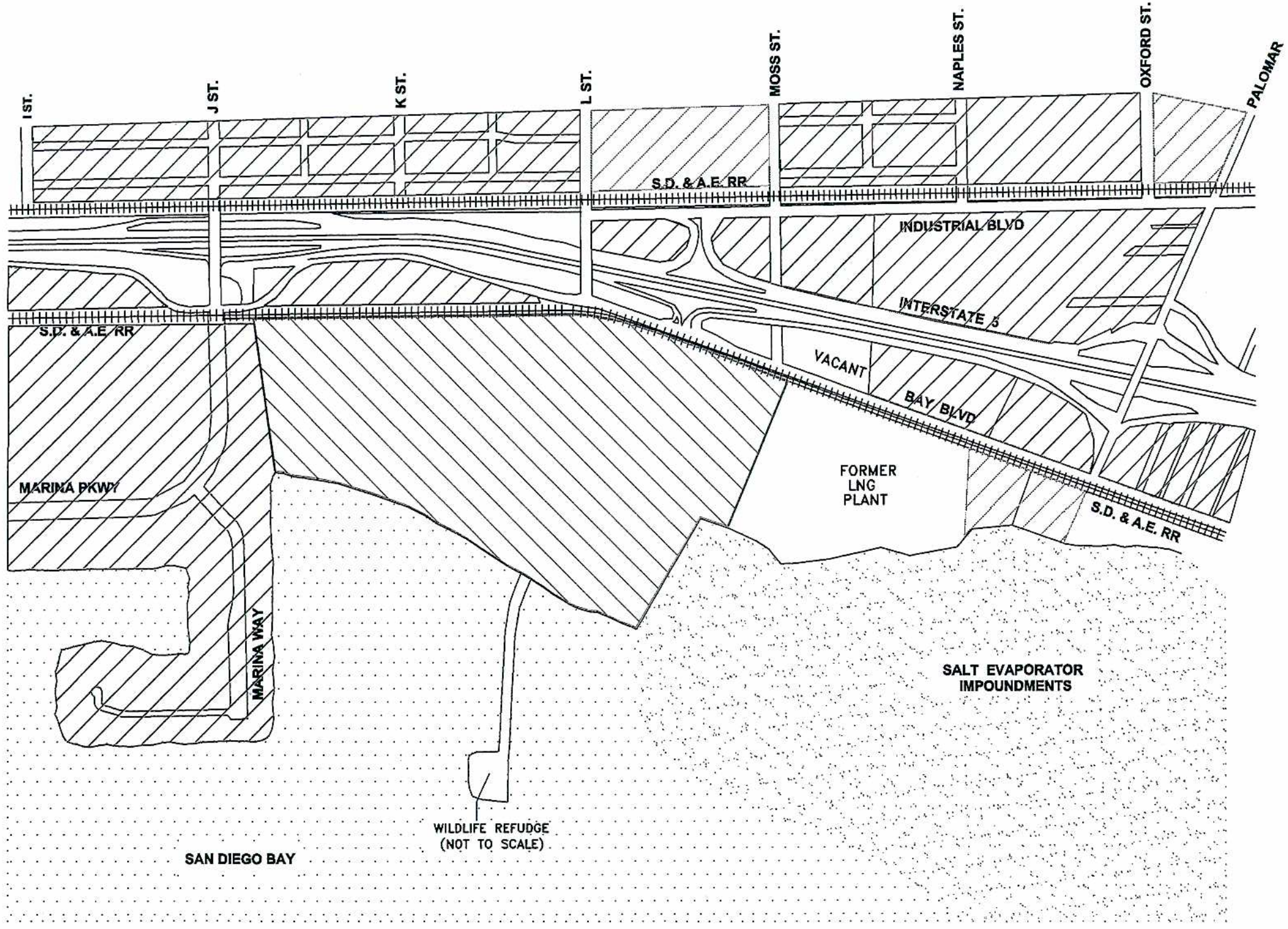
SOURCE: U.S.G.S. TOPOGRAPHIC QUADRANGLE
NATIONAL CITY, CALIF.
7.5 MINUTE SERIES
1967 / PHOTOREVISED 1975
REPRODUCTION NOT TO SCALE



FLUOR DANIEL GTI

SITE LOCATION MAP
NATIONAL CITY TERMINAL

CLIENT: SAN DIEGO GAS AND ELECTRIC	FILE: 3589NCSM (1:1)		PROJECT NO.:	PM	PE/RG
	REV.			FIGURE: 1-1B	
LOCATION: NATIONAL CITY, CA.	DES. PG	DET. JR	DATE: 5/18/98		



N

LEGEND

- SITE
- COMMERCIAL
- RESIDENTIAL
- INDUSTRIAL

FLUOR DANIEL GTI

0 FEET 600
SCALE

SOUTH BAY POWER PLANT
AREA LAND USE MAP

CLIENT: SAN DIEGO GAS & ELECTRIC

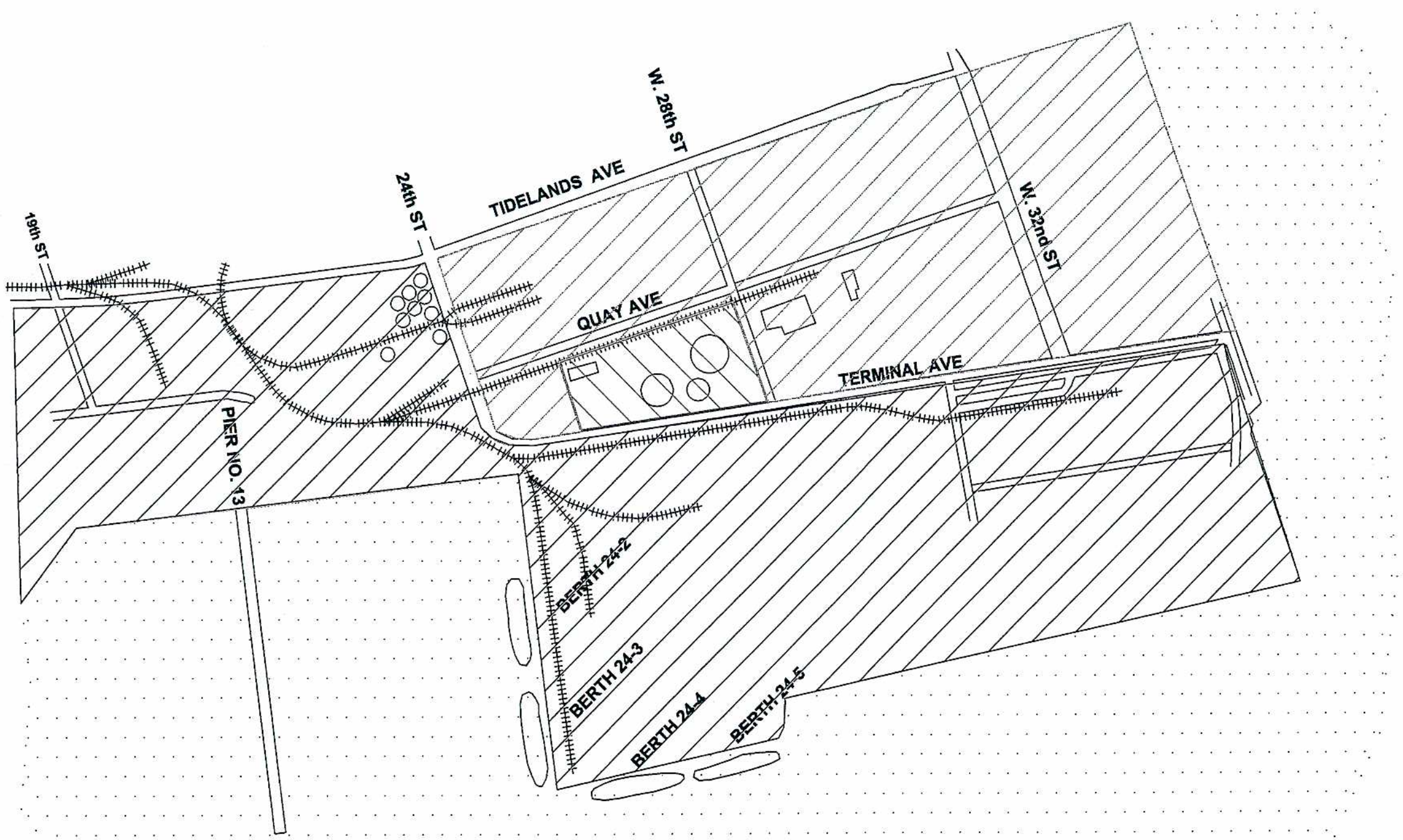
LOCATION: 990 BAY BLVD.
CHULA VISTA, CALIFORNIA

FILE:	PROJECT NO.:
3589LU (1:1.5)	103589

REV.:

DES.:	DET.:	DATE:	FIGURE:
WP	JR	5/18/98	1-3A

PM: PE/RG:



LEGEND

- SITE
- PORT OF SAN DIEGO MARINE TERMINAL
- INDUSTRIAL

FLUOR DANIEL GTI

0 FEET 520
SCALE

NATIONAL CITY MARINE TERMINAL AREA LAND USE MAP

CLIENT: SAN DIEGO GAS & ELECTRIC

LOCATION: 2600 TERMINAL AVE
NATIONAL CITY, CALIFORNIA

FILE:	PROJECT NO.:
3589NLU (1:1)	103589

REV.:

DES.:	DET.:	DATE:	FIGURE:
WP	JR	5/18/98	1-3B

PM: PE/RG:

TABLES

1. Current and Past Tankage
2. Solid Waste Management Units
3. Off-site SDG&E Solid Waste Management Units
4. Site Release History
5. Summary of Potential Environmental Conditions Identified During Phase I Investigation

TABLE 1-1
CURRENT AND PAST TANKAGE
SOUTH BAY POWER PLANT

Area				Date Installed	Status	Volume in gals	Contents	Comments
On-Site Underground Storage Tanks, South Bay Power Plant								
1d	Vehicle Fueling Station	1601	SW	1960	Removed 1987	500	diesel	passed tightness test, but replaced with gas tank
1d	Vehicle Fueling Station	1601a	DW	1987	in use	500	diesel	passed tightness test 3/7/95
1d	Vehicle Fueling Station	1602	SW	1960	Removed 1987	500	unleaded gasoline	failed tightness test, removed tank; age indicates leaded gasoline also stored
1d	Vehicle Fueling Station	1602a	DW	1987	in use	500	unleaded gasoline	passed tightness test 3/7/95
3c	GT False Start Waste oil Sump	1603	SW	1966	removed 1987	50	waste oil	
3c	GT False Start Waste oil Sump	1603a	DW	1987	in use	130	waste oil	double walled steel above ground tank in a below grade concrete vault
Off-Site SDG&E Underground Storage Tanks, South Bay Power Plant								
	LNG Plant	701	fbrgls	1984	removed 1986	550	diesel	control building generator (interview and SDG&E, 1985)
	LNG Plant	702	steel	Approx. 1965	removed 1986	15	LNG	condensate drip tank (interview and SDG&E, 1985)
	LNG Plant	703	steel	After 1965	removed 1986	450	LNG	condensate drip tank (interview and SDG&E, 1985)
	South Bay Service Center	3501a	DW	1988	in use	20,000	unleaded gasoline	
	South Bay Service Center	3502a	DW	1988	in use	10,000	diesel	
	South Bay Service Center	3503a	DW	1988	in use	500	waste oil	

TABLE 1-1
CURRENT AND PAST TANKAGE
SOUTH BAY POWER PLANT

Area				Date Installed	Status	Volume in gals	Contents	Comments
On-Site Above Ground Storage Tanks, South Bay Power Plant								
1a	North-40	4	FR	1970	in use	15,372k	fuel oil	North-40
1a	North-40	5	FR	1970	in use	15,372k	fuel oil	North-40
1a	North-40	6	FR	1970	in use	15,372k	fuel oil	North-40
1a	North-40		CR	1970	in use	420,000	diesel	North-40, displacement oil
1b	South-40	1	FR	1959	in use	5,250k	fuel oil	South-40
1b	South-40	2	FR	1959	in use	5,250k	fuel oil	South-40
1b	South-40	3	FR	1963	in use	9,996k	fuel oil	South-40
1b	South-40	7	FR	1973	out of service	8,190k	diesel	South-40
1c	Gas Turbine		CR	1965	in use	100,000	Jet-A	gas turbine fuel
2a	Waste water				in use	56,000	waste water	low volume waste
2a	Waste water				in use	56,000	waste water	low volume waste
2a	Waste water				in use	357,000	waste water	extended waste
2a	Waste water				in use	657,000	waste water	extended waste
2a	Waste water				in use	95,000	waste water	treated waste
2a	Waste water				in use	95,000	waste water	treated waste
2a	Waste water				in use	1,000	98% sulfuric acid	waste water treatment (SDG&E, 1996b)

TABLE 1-1
CURRENT AND PAST TANKAGE
SOUTH BAY POWER PLANT

Area				Date Installed	Status	Volume in gals	Contents	Comments
2a	Waste water				in use	3,000	50% sodium hydroxide	waste water treatment (SDG&E, 1996b)
3a	Plant				in use	5,000	turbine oil	
3a	Plant				in use	6,000	98% sulfuric acid	demineralizer plant (SDG&E, 1996b)
3a	Plant				in use	7,000	50% sodium hydroxide	demineralizer plant (SDG&E, 1996b)
3a	Plant				in use	7,000	sodium hypochlorite	circulating water deck biocide for once-through cooling water (SDG&E, 1996b)
3a	Plant				in use	400	36% sulfuric acid	demineralizer plant (SDG&E, 1996b)
3a	Plant				in use	6,000	calcium nitrate	NALCO fuel additive
3a	Plant				in use	11,000	lube oil	inside Plant building (SDG&E, 1996b)
3a	Plant				in use	2,400	foam	fire suppressant foam
4c	Aqueous ammonia				in use	22,500	ammonia	Unit #1, selective catalytic reduction system (SDG&E, 1997d)
4c	Aqueous ammonia				in use	22,500	ammonia	Unit #1, selective catalytic reduction system (SDG&E, 1997d)

TABLE 1-1
CURRENT AND PAST TANKAGE
SOUTH BAY POWER PLANT

Area				Date Installed	Status	Volume in gals	Contents	Comments
On-Site Above Ground Storage Tanks, National City Terminal								
6	Terminal	1	FR	1960	in use	5,523k	fuel oil	
6	Terminal	2	FR	1972	in use	7,560k	fuel oil	
6	Terminal	DO	CR	1972	in use	1,533k	diesel	displacement oil
Off-Site SDG&E Above Ground Storage Tanks								
	LNG Plant				removed 1989		LNG	
	LNG Plant				removed 1989		LNG	

Notes: SW = Single wall
DW = Double wall
FR = Floating roof
CR = Cone roof

Unless otherwise noted, this table was assembled from information provided in the "Tiered Permitting Phase I" (AGI, 1995) and in the SDG&E electronic file printouts titled "Aboveground Storage Tanks" and Underground Fuel Tanks".

TABLE 2-1
SOLID WASTE MANAGEMENT UNITS
South Bay Power Plant

SWMU Name	Area/Description	Material Managed	Volume Managed	Purpose of SWMU	Status of SWMU
3a	Low volume waste trench and sump system (= secondary containment for entire plant)	normally limited to wash down water and steam condensate caustic soda sulfuric acid	system does not normally handle hazardous wastes	secondary containment	operational * permitted under NPDES
2a	Low volume waste treatment system tanks, separators and coalescers	caustic acid sulfuric acid	3,000,000 gal/month	process	operational *+ notification has been made under DTSC Tiered Permit Program
2a	Extended Waste Treatment System	Fireside: wash rinsate with soot, ash, and metals (iron, nickel, chromium, vanadium, and zinc) Boiler Waterside: metals (copper, nickel, calcium, magnesium, aluminum), silica; citric acid, alkali, sodium bromate ammonia,	fireside cleaning waste once/year/unit (4/year) boiler chemical cleaning wastes once/8 years/unit (½ years)	process	operational * permitted under NPDES and notification has been made under DTSC Tiered Permit Program
3a	Unit 1 & 2 Service Water System	water with 350 ppm sodium dichromate	closed system with 10,250 gal capacity	process - cooling	open *+
3a	Unit 3 & 4 Service Water System	water with 350 ppm sodium dichromate	closed system with 21,000 gal capacity	process - cooling	open *+
3c	Gas Turbine Fuel System	Jet-A	105,000 gal capacity typical usage ~55 bbl/month	process	open + air permit
3	East Loop Fuel System	No. 6 fuel oil	out-of-service	fuel transfer	out-of-service
3	West Loop Fuel System	No. 6 fuel oil	piping has a 1,380 gal capacity	fuel transfer	open *+

TABLE 2-1
SOLID WASTE MANAGEMENT UNITS
South Bay Power Plant

SWMU Name Area/Description		Material Managed	Volume Managed	Purpose of SWMU	Status of SWMU
1a	North Tank Farm	No. 6 fuel oil Diesel fuel	1,125,000 bbl No. 6 36,500 bbl diesel	storage	open *+
1b	South Tank Farm	No. 6 fuel oil	678,000 bbl	storage	open *+
1a	North Tank Farm Fire Protection System	aero-foam XL3	356 gal	process	open *+
1b	South Tank Farm Fire Protection System	aero-foam XL3	550 gal	process	open *+
4c	Hazardous Waste/Material Storage Building	various	~1.87 tons/month capacity: 150 55-gal drums, 46 yds^3 in bins	storage	open *+
3b	Chemical Storage Room at storeroom	various, including drums of: kerosene, lacquer thinner, paint remover, mineral spirits, lube oil, hydraulic oil, dielectric oil, coagulant polymer, anti-foam, oxygen scavenger, cyclohexlamine (corrosion inhibitor), fuel oil additive, HCFC-22, cleaning compound	unknown	storage	open *+

TABLE 2-1
SOLID WASTE MANAGEMENT UNITS
South Bay Power Plant

SWMU Name Area/Description		Material Managed	Volume Managed	Purpose of SWMU	Status of SWMU
3a	Combustion Catalyst AST	calcium nitrate combustion catalyst (non-haz, will no longer consider a SWMU, previously used ethoxylated nonylphenol haz additive)	6,500 gal	storage	open + soil sampled 7/21/86 for pH
3a	Sodium hypochlorite AST	sodium hypochlorite 12.5%	6,080 gal/month	storage	open *+
3a	Plant Transformer Banks	dielectric oil	4 x 10,000 gal capacity no through put	voltage control	open *+
1d	Gasoline UST	gasoline	350 gal/month 500 gal capacity	storage	open * permitted UST originally installed single wall UST 1960, replaced with double wall UST 1987, replaced piping and added sensors 1993
1d	Diesel UST	diesel fuel	200 gal/month 500 gal capacity	storage	open * permitted UST originally installed single wall UST 1960, replaced with double wall UST 1987, replaced piping and added sensors 1993

Notes: * = No sampling conducted
+ = SWMU not permitted

Unless otherwise noted, this table was assembled from information provided in the "Tiered Permitting Phase I" (AGI, 1995) document.

TABLE 2-2
OFFSITE SDG&E SOLID WASTE MANAGEMENT UNITS
SOUTH BAY POWER PLANT

SWMU Name Area/Description		Material Managed	Volume Managed	Purpose of SWMU	Status of SWMU
5b	Substation transformers and circuit breakers	dielectric oil	75,000 gal total no throughput	voltage control	open *+

Notes: * = No sampling conducted
+ = SWMU not permitted

Unless otherwise noted, this table was assembled from information provided in the "Tiered Permitting Phase I" (AGI, 1995) document.

TABLE 3-1
SITE RELEASE HISTORY
SOUTH BAY POWER PLANT

Location Area/Description		Date	Material/Volume	Actions Taken
1a	North-40 Tank Farm, AST#5, release from heater unit	unknown	fuel oil/~15-20 gals	none * (interviews)
1a	North-40 Tank Farm, DO AST heat exchanger	unknown	periodic minor leaks of diesel	none * (interviews)
1a	North-40 pump pit	periodic	fuel oil	discharged from pump pit to east side of AST #5 berm then pumped off and disposed (interviews)
1b	South-40 Tank Farm, AST 2 leak in tank bottom, east side	3/19/83	fuel oil	AST taken out of service (AGI, 1995 and Guiles, 1983)
1b	South-40 Tank Farm, AST 2 leak in tank bottom	prior to 1988	No. 6 fuel oil/15 bbl	soil removed and disposed * tank bottom repaired (AGI, 1995)
1b	South-40 Tank Farm, AST 3 leak in tank bottom	prior to 1988	No. 6 fuel oil/15 bbl	soil removed and disposed * tank bottom repaired (AGI, 1995 and interviews)
1b	South-40 Tank Farm, AST 1 leak in tank bottom	prior to 1989 (early 1970s)	No. 6 fuel oil/10 bbl, possibly Bunker C	soil removed and disposed * tank bottom repaired (AGI, 1995 and interviews)
1b	South-40 Tank Farm, pump packing leaks to pads, occasional overflows	continuous	fuel oil/unknown	oil removed* (interviews)
1d	Vehicle fueling UST, original and replacement gasoline and diesel	12/10/86 failed tightness test	gasoline/unknown	tank removed, soil removed, NAPL vacuumed off, impacted groundwater has migrated beneath AST #7 RWQCB granted NFA letter
2b	Original, unlined, wastewater impoundments (east pond)	1960 to 1978	black sludge bearing nickel, chromium, and other metals	excavate and dispose of 920 tons soil elevated O&G and nickel levels remain in place

TABLE 3-1
SITE RELEASE HISTORY
SOUTH BAY POWER PLANT

Location Area/Description		Date	Material/Volume	Actions Taken
2c	Second Generation Impoundments	1978 to 1990	nickel, chromium and other metals	excavate and dispose of soil, remaining concentrations acceptable groundwater has shown exceedences NFA granted
3	Fuel system, east loop believed due to external corrosion	10/17/91	No. 6 fuel oil/<50 bbl	excavated and disposed of undetermined volume of soil, post excavation sampling indicated exceedence shallow but not at depth, NFA recommended by EnecoTech (1997a)
3a	Unit 1 supply line release inside Plant building	~1985	fuel oil/~100 gals	release captured by floor drain/trench system then discharged to intake channel* drains subsequently rerouted to low volume waste treatment plant (interviews)
3a	Combustion catalyst AST, released through AST drain plug (south), secondary contain drain also open, emptied into east end of cooling water intake channel	7/21/86	NALCO -1225 combustion catalyst (calcium nitrate with ethyl alcohol, and polyethylene glycol nonylphenyl ether)/700 gal	removed 7 yds^3 impacted soil between AST and storm drain *, no apparent stress to marine life (inspected by Department of Fish & Game)
3a	Unit 1 transformer	1987	PCB bearing dielectric oil	none* (AGI, 1995 and interviews)
3a	Boiler make-up water demineralizer AST	7/3/95	98% sulfuric/unknown	acid overfill was captured within containment basin and neutralized * (interviews)
3a	Main transformer collection sump, north of and between Unit 1 and 2 transformer	continual minor releases	non-PCB bearing dielectric mineral oils/few ounces to few gallons per event	periodically pumped off with vacuum truck water and oil accumulated in sump, no known large volume catastrophic releases* (interviews)
3a	Plant transformer banks, various minor leaks from gaskets, fittings, and valves onto concrete pads, containment basins, or in gravel blotter	unknown, several years	dielectric oil (currently SDG&E uses mineral oil, non PCB bearing, old oil could have had PCB)/150 ft^2 stained concrete	no remediation or sampling conducted * (AGI, 1995)

TABLE 3-1
SITE RELEASE HISTORY
SOUTH BAY POWER PLANT

Location Area/Description		Date	Material/Volume	Actions Taken
3a	Day Tank area caustic releases to bare ground	unknown	caustic and acid/unknown	no remediation * (interviews)
3a	Circulated Water Deck, former sodium dichromate storage area on bare ground near hypochlorite AST	unknown	sodium dichromate/unknown	no remediation * (interviews)
3a	Gas Turbine false start sump	periodic	Jet-A/unknown	liquids pumped off and disposed replaced with a below grade AST (interviews)
3a	Service Water leaks	numerous	sodium dichromate/unknown	leaks contained within circulating water cooling system and discharged to Bay, no remediation or sampling applicable (interviews)
3a	Waste Water Transfer Sump	probably in use since 1960	wastewater	No known releases
4a	Retired Fleet Operations drum storage area, weather affected packaging failure	in use 1983 to 1992	Pole wrap material (PCP), off-specification paints and epoxies	approximately 5 drums PCP impacted soil removed and disposed sampling conducted, remaining concentrations for PCP meet applicable standards (SDG&E, 1993c and interviews) No sampling conducted for VOC or metals Stipulation and Order w/NFA issued
4c	Former sand blasting area, open ground	after 1976	sand blast wastes, paint, coal tar/unknown	wastes may have been left in place * some waste may have been moved to northeastern 5a area (interviews)
4c	Current sand blasting area, on open ground prior to former sand blast area and prior to sand blast shed	before 1976	sand blast wastes, paint, coal tar/unknown	some wastes may have been left in place * some waste may have been moved to northeastern 5a area (interviews)
4c	Haz mat/waste storage building			no known releases

TABLE 3-1
SITE RELEASE HISTORY
SOUTH BAY POWER PLANT

Location Area/Description		Date	Material/Volume	Actions Taken
5a	Sand blast grit "disposal" northeastern 5a area	1970s	sand blast wastes, paint, coal tar/unknown quantity, possibly several yds^3	may remain in place * (interviews)
5a	Sand blast waste in dirt road near North 40 #			
5c	Septic leach field at "Schoolhouse"	continuous	restroom septic/continual	not anticipated to be an environmental concern, according to SDG&E personnel nothing other than restroom septic would have been emplaced (interviews)
6	Terminal fuel oil pipeline expansion joint west of AST #1	3/9/79	diesel/unknown	reportedly cleaned area, later addressed where accessible by EnecoTech remedial effort
6	Terminal AST #1, tank overfill	7/15/82	No.6 fuel oil	captured within secondary containment and removed
7	Pipeline release west of Sweetwater Road	early-mid 1970s	most likely Bunker C or diesel/unknown	repaired pipeline, uncertain if soil was excavated and removed * (interviews)
7	Pipeline release west of E Street	1/28/86	diesel displacement oil	dike constructed to contain spill, 52,000 gals of oil and water were recovered, 1,400 yds3 of soil removed RWQCB granted NFA

Notes: * = no confirmatory samples taken

Marine releases not included in Phase I ESA.

TABLE 6-1
SUMMARY OF POTENTIAL ENVIRONMENTAL CONDITIONS IDENTIFIED DURING PHASE I INVESTIGATIONS
SOUTH BAY POWER PLANT AND NATIONAL CITY TERMINAL

Inv. Area No.	Investigation Area Description	Potential Environmental Conditions	Recommended Phase II Action
1a	North Tank Farm	▪ Potential unidentified releases of hydrocarbons from four ASTs, pipelines, and the pump deck. ▪ Releases at the pump pit and berm pond. ▪ Releases at the displacement oil AST and heat exchanger. ▪ Potential impact to soil or groundwater from the use of corrosion inhibiting oils in the construction of ASTs.	Soil and groundwater sampling for fuel hydrocarbons and metals
1b	South Tank Farm	Releases of No. 6 fuel oil from ASTs 1, 2, and 3. ▪ Potential unidentified releases of hydrocarbons from pipelines and the pump deck Potential impact to soil or groundwater from the use of corrosion inhibiting oils in the construction of ASTs.	Soil and groundwater sampling for fuel hydrocarbons and metals.
1c	Jet Fuel Area	Potential unidentified releases of hydrocarbons from the AST, pipelines, and the pump deck. Potential impact to soil or groundwater from the use of corrosion inhibiting oils in the construction of ASTs.	Soil and groundwater sampling for fuel hydrocarbons and metals.
1d	UST Area	▪ Release of diesel and gasoline from USTs, pipelines, and pumps.	Sample groundwater from existing wells for fuel hydrocarbons and metals.
2a	Process Water Treatment Area	▪ Potential unidentified losses of treatment water, containing hydrocarbons and metals from ASTs and pipelines.	Sample soil and groundwater for hydrocarbons and metals.
2b	Former Surface Impoundments[1]	Metals remaining in soil in 1st Generation Impoundment Area.	No additional sampling required.

TABLE 6-1
SUMMARY OF POTENTIAL ENVIRONMENTAL CONDITIONS IDENTIFIED DURING PHASE I INVESTIGATIONS
SOUTH BAY POWER PLANT AND NATIONAL CITY TERMINAL

Inv. Area No.	Investigation Area Description	Potential Environmental Conditions	Recommended Phase II Action
3a	Power Plant and Immediate Vicinity	▪ Potential release of PCB[2]-containing oil. ▪ Potential hydrocarbon releases from pipelines. ▪ Releases from wastewater transfer sump of wastewater potentially bearing oil, metals, and volatile organic compounds. ▪ Potential releases during handling sodium dichromate.	Soil and groundwater sampling for hydrocarbons, metals, and PCBs.
3b	Maintenance Area	▪ Releases of unidentified hydrocarbons from pipelines between the ASTs and the power plant. ▪ Potential releases of wastewater or routine cleaning liquids used during maintenance and painting operations. ▪ Potential releases of volatile organic compounds and metals.	Soil and groundwater sampling for fuel hydrocarbons, metals, and VOCs[3].
3c	Gas Turbine	▪ Potential releases of hydrocarbons from pipelines and AST within the Gas Turbine compound.	Soil sampling for fuel hydrocarbons and metals.
4a	Former Drum Storage and Laydown Area	▪ Area previously investigated and closed.	Sample soil in or near this area for SVOCs[4].
4b	Construction Yard	▪ Potential impact of metals to soils due to abrasive blasting.	Soil sampling for metals.
4c	Hazardous Materials Storage Area	▪ Potential releases of hazardous wastes within storage area. ▪ Potential impact of metals to soils due to abrasive blasting.	Soil sampling for metals, fuel hydrocarbons, VOCs.
5a	Open Area	▪ Potential unidentified releases of hydrocarbons from the truck unloading station for Tank No. 7. ▪ Potential impact of metals to soils due to abrasive blasting. ▪ Potential presence in soils of semi-volatile compounds from coal tar used to coat the traveling screens. ▪ Potential releases of contaminants due to unidentified or uncontrolled dumping within the open areas.	Shallow soil sampling for fuel hydrocarbons, metals, PCBs, and groundwater sampling at edge of site for metals, fuel hydrocarbons, and VOCs.
5b	Switchyard Border	▪ Potential unidentified releases of PCBs and other contaminants from the switchyard onto the site.	Sample soil and groundwater for PCBs and hydrocarbons around edge of switchyard.
5c	Septic/Leach Field	▪ Impact to groundwater and soil from potential introduction of hydrocarbons, metals, and other contaminants into the septic system.	Sample soil and groundwater for fuel hydrocarbons, VOCs and metals.

TABLE 6-1
SUMMARY OF POTENTIAL ENVIRONMENTAL CONDITIONS IDENTIFIED DURING PHASE I INVESTIGATIONS
SOUTH BAY POWER PLANT AND NATIONAL CITY TERMINAL

Inv. Area No.	Investigation Area Description	Potential Environmental Conditions	Recommended Phase II Action
6	National City Terminal	▪ Release of No. 6 fuel oil from Tank 1. ▪ Release diesel from pipeline. ▪ Potential unidentified releases of hydrocarbons from ASTs, pipelines, and pumps. ▪ Potential unidentified release of PCBs	Sample soil and groundwater for fuel hydrocarbons, metals and PCBs.
	Off-site Areas	▪ Potential release of hydrocarbons from former LNG[5] plant and migration onto SBPP property. ▪ Unidentified releases from automobile junkyard located on adjacent property.	Sample groundwater along common SBPP perimeter for fuel hydrocarbons, metals, VOCs.

1 Includes both 1st and 2nd Generation Impoudments
2 PCB Polychlorinataed Biphenyls
3 VOC Volatile Organic Compound

FLUOR DANIEL GTI

PHASE II ENVIRONMENTAL SITE ASSESSMENT

SOUTH BAY POWER PLANT
990 BAY BOULEVARD
CHULA VISTA, CALIFORNIA

FD GTI Project 103589

July 1998

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"Fluor Daniel, GTI, Inc. has reviewed the information concerning the subject report in a professional manner using that degree of skill and care exercised for similar projects under similar conditions by reputable and competent environmental consultants. The information contained in this report, including its conclusions, is based, in part, on the information which was made available to Fluor Daniel GTI, Inc. during its investigation and upon the Services described. To the extent that the report is based on information furnished by others and not within the control of Fluor Daniel GTI, Inc., Fluor Daniel GTI, Inc., makes no representation concerning the accuracy of the information herein.

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EXECUTIVE SUMMARY
PHASE II ENVIRONMENTAL SITE ASSESSMENT
SAN DIEGO GAS & ELECTRIC
SOUTH BAY POWER PLANT

July 1998

Fluor Daniel GTI

This report presents the results of the Phase II Environmental Site Assessment (ESA) that was performed by Fluor Daniel GTI at San Diego Gas & Electric's (SDG&E) South Bay Power Plant (SBPP) and National City Terminal (NCT). This Executive Summary briefly describes the background, methodology and key findings of the Phase II ESA.

The SBPP occupies approximately 158 acres in San Diego County. The power plant is located at 990 Bay Avenue, Chula Vista, California. The NCT is located at 2600 Terminal Avenue and occupies 4.7 acres. A 4.3-mile pipeline connects the NCT with the SBPP. The SBPP and NCT are collectively referred to as the Site.

The SBPP is a steam-electric generation facility with four steam turbine units fired primarily by natural gas and, to a lesser extent, by No. 6 Fuel Oil.

PURPOSE AND OBJECTIVES

The general approach taken by Fluor Daniel GTI to this project consists of two phases: Phase I ESA (completed in May 1998) and Phase II ESA (completed in June 1998). The purpose and objectives of the Phase II ESA are to:

- Establish a baseline definition of chemical distribution in soil, sediment, and groundwater at the Site.
- Establish a database of chemical information to support a baseline health risk assessment (BHRA).
- Present the current understanding of the environmental conditions at the Site through the use of a conceptual site model (CSM).
- Determine the numerical risks to human health and the environment that might be posed by the chemical concentrations detected at the Site if no remedial action were to be implemented. This is achieved by performing a BHRA.
- Determine if remediation of soil or groundwater is required to protect human health and the environment.

- Determine if remediation is required to comply with environmental laws and regulations.
- Describe the methodology for developing site-specific cleanup levels if the results of the risk assessment or assessment of environmental laws and regulations should indicate that remediation is warranted.
- Establish the information required to support an analysis of alternative remediation technologies and a remediation cost estimation.
- Present a report of the data and findings of the Phase II ESA for the use of potential buyers of the Site.

PHASE II FIELD INVESTIGATIONS

Fluor Daniel GTI established a biased grid for soil and groundwater sampling to provide the necessary data to achieve the project objectives. A biased grid shows areas where sample locations are adjusted from the grid toward areas at the Site where a suspected or potential historical release may have occurred. A soil and groundwater sampling plan was prepared and the Site was divided into six investigation areas. After an initial phase of investigation, the results of analyses were reviewed and a second phase of investigation was conducted to complement the initial Phase II results. A summary of the work that was completed during the Phase II subsurface testing program is provided in Table ES-1 below.

Table ES-1 Summary of Phase II Field Work

Subsurface Testing Completed Between March and April, 1998
▪ Drilled 244 soil borings.
▪ Installed 45 temporary groundwater monitoring wells and 8 permanent monitoring wells.
▪ Collected and analyzed 554 soil samples (including duplicates) and 48 groundwater samples.
▪ Sampled 4 existing monitoring wells.

Soil and groundwater samples were submitted for chemical analysis. The selection of analytes was based on the types of potential chemical releases that could have occurred in an area due to past and present operations.

The Phase II ESA results were complemented by applicable data from previous investigations to provide a comprehensive baseline of soil and groundwater conditions at the Site.

PHASE II ESA REPORT CONTENTS

The Phase II ESA Report presents Phase II investigation data and develops a comprehensive environmental baseline for the Site. The report is organized as follows:

- *Executive Summary* - provides summary information concerning the investigation approach used and results of the Phase II ESA.
- *Section 1 - Introduction* - describes the purpose, objectives, approach, and contents of the Phase II ESA.
- *Section 2 - Investigation Approach* - describes the locations and frequencies of samples collected from each environmental medium investigated, the sampling methods used, and analytical procedures employed during the performance of the Phase II investigations.
- *Section 3.0 - Phase II ESA Results and Environmental Baseline* - describes the baseline environmental conditions in soil and groundwater including naturally occurring or background levels of chemicals in soil and groundwater at the Site. The baseline environmental conditions are based on the Phase II ESA and applicable analytical data from previous investigations.
- *Section 4.0 - Applicable Regulatory Limits* - presents applicable laws and regulations and defines regulatory limits for remediation. Included in this section are an evaluation of Site data and a definition of areas potentially requiring remediation in order to comply with environmental laws and regulations.
- *Section 5.0 - Baseline Health Risk Assessment* - presents the methodology and results of the baseline health risk assessment (BHRA) associated with the concentrations of chemicals detected at the Site. The risk assessment exposure units, screening risk evaluation, chemicals of potential concern (COPCs), exposure assessment, toxicity assessment, and risk assessment results are presented in this section. This section also contains proposed cleanup levels, if any, that are established to be protective of human health and the environment.
- *Section 6.0 - Summary of Findings and Conclusions* - presents the summary of the data collected during the Phase I and Phase II ESAs.
- *References* - presents a listing of references that are cited in the report.

DISCUSSION OF FINDINGS

The data collected at the Site during the Phase II ESA were used to further describe the site characteristics, to describe the nature and extent of chemicals in soil and groundwater, and to define site and background chemical concentrations for comparison to site concentrations. A summary of the Phase II investigation results is provided in Table ES-2:

Table ES-2 Summary of Phase II Investigation

PHASE II ESA RESULTS

Total Extractable Hydrocarbons (TEH)

- 521 soil samples analyzed for TEH.
  - No samples exceeded 1,000 mg/kg at the SBPP and the NCT.
  - 12 samples exceeded 100 mg/kg at the SBPP.
  - 3 samples of 41 samples analyzed exceeded 100 mg/kg at the NCT.
- Impact of TEH limited to:
  - Fuel storage tanks.
  - Former drum storage area.
  - Construction yard.
  - Hazardous materials storage area.
- Impact of TEH at the NCT localized to Fuel Oil Tanks #1 and #2 and areas identified in Phase I.

Volatile Organic Compounds (VOCs)

- 129 soil samples analyzed for VOCs.
- Minor xylenes and ethylbenzene detected at the SBPP.
- VOCs detected in two soil borings at concentrations below 0.1 mg/kg at the NCT.
- All other VOCs were nondetectable.

Semi-volatile Organic Compounds (SVOCs)

- 10 soil samples analyzed for SVOCs.
- One SVOC detected in one sample collected from the SBPP.

Polynuclear Aromatic Hydrocarbons (PAHs)

- 27 soil samples analyzed for PAHs.
- Acenaphthene and naphthalene detected at the SBPP at concentrations collected less than 1 mg/kg.
- Naphthalene, acenaphthene, chrysene, and pyrene detected at the NCT below 5 mg/kg.

Polychlorinated Biphenyls (PCBs)

- 319 samples analyzed for PCBs.
- PCBs detected in 6 samples at the SBPP, and in no samples at the NCT.
- All detected PCB concentrations were below 0.2 mg/kg.

Metals

- 521 soil samples analyzed for metals.
- 14 metals detected in SBPP soil; 10 metals detected in the NCT soil.
- Concentrations distribution of all metals outside the First Generation Surface Impoundments Area appears to conform with the background concentration distribution.

Asbestos

- 6 soil samples analyzed for asbestos. Asbestos was not detected.

Pesticides and Herbicides

- 1 sample analyzed for pesticides and herbicides.
- No pesticides or herbicides detected.

PREVIOUS SOIL RESULTS

Previous Soil Chemical Results

- Former First Generation Surface Impoundments: metal concentrations above screening levels, and TPH/TRPH concentrations above 1,000 mg/kg.
- East Fuel Loop: Localized TPH/TRPH concentration over 1,000 mg/kg.
- National City Terminal, soil samples contain TPH/TRPH concentrations exceeding 100 mg/kg.

GROUNDWATER RESULTS

TEH

- 48 groundwater samples analyzed for TEH.
- 4 SBPP samples and one NCT sample exceeded 1,000 mg/kg TEH.
- Jet fuel identified in the well near Jet Fuel Storage Tank; TEH concentration was 1,400 µg/L.
- Highest TEH (1,700 µg/L) at SBPP near "East Fuel Loop" fuel lines.
- Highest TEH (2,600 µg/L) at NCT near Fuel Oil Storage Tank #2.

VOCs

- 38 groundwater samples analyzed for VOCs.
- Detectable VOCs in four locations at the SBPP. Highest VOC concentrations in each location were:
  - UST Area: BTEX (benzene–460 µg/L, toluene–38 µg/L, and ethylbenzene–26 µg/L) and 1,1–dichloroethene (DCE) (3 µg/L).
  - Open Area: Trichloroethene (TCE) (59 µg/L) and cis-1,2-DCE (19 µg/L).
  - Jet Fuel Area: BTEX (4.2 µg/L)
  - West of Switchyard: 1,1-dichloroethane (DCE) (14 µg/L)
- One VOC detected at NCT – TCE (4 µg/L)

SVOCs

- One groundwater sample analyzed for SVOCs.
- No SVOCs detected.

PAHs

- 30 groundwater samples analyzed for PAHs.
- Naphthalene and fluorene detected.
- Concentrations below health-based risk screening criteria at both the SBPP and the NCT.

PCBs

- 19 groundwater samples analyzed for PCBs.
- No PCBs detected.

Metals

- 48 groundwater samples analyzed for metals.
- 12 metals detected in groundwater at the SBPP and 6 metals at the NCT.
- All metal analyses except thallium at the SBPP, are at background concentrations.

Applicable cleanup regulations for the Site were evaluated to determine what chemicals would require remediation under the various county, state, and federal regulatory programs governing remediation of soil and groundwater.

The following cleanup levels were identified for the chemicals in soil and groundwater at the Site.

MEDIA	COPCs	Clean-Up Levels
Soil	Petroleum Hydrocarbons	1,000 mg/kg
		100 mg/kg (National City Terminal)
Groundwater	Free-Phase Hydrocarbons	Free-phase removal
	VOCs	Misc: BTEX and PAHs
	Miscellaneous	Basin Plan

A BHRA was performed to determine the estimated numerical human health risks that may be posed by the chemical concentrations detected at the Site, and to develop site-specific cleanup levels if the results of the risk assessment should indicate that remediation may be required. The risk assessment was based on the baseline conditions of the Site and on the current and projected land use of the Site.

Four exposure units at the SBPP and one exposure unit at the NCT were selected to represent exposure to site workers, trench workers, and visitors at the site.

The initial screening step in the BHRA included comparison with regulatory levels statistical comparison to background site concentrations. The screening at the Site identified five metals (As, Sb, Cd, Na, and Va), chemicals of potential concern (COPCs) in soil in the exposure area including the power plant. COPCs in groundwater included benzene, TCE, 1,1DCE, chloroform, and thallium.

Fate and transport modeling of metal contaminants in the area of the First Generation Surface Impoundments indicate likely metal contamination of groundwater due to soil. Modeling of dissolved contaminant transport towards the San Diego Bay indicates that metal concentrations at the Bay would not exceed screening levels.

For the Site, the numerical risk posed by exposures to environmental media was defined as acceptable if the cumulative risk due to exposure to all the chemicals in an exposure unit does not exceed $1x10^{-5}$, or 1 in 100,000; the acceptable level of cumulative hazard index was established at 1.0. Remediation would be recommended if the quantitative risk estimates exceed these levels.

The results of the BHRA demonstrated that the chemical levels detected in the soils and groundwater at the Site do not pose unacceptable levels of risk to human health or the environment. Therefore, there are no chemicals of concern that warrant risk-based remediation.

CONCLUSIONS

The Phase I ESA identified potential environmental conditions which were investigated during the Phase II ESA. The findings of the Phase II ESA and applicable previous analytical data were combined in a data set representing baseline environmental conditions, which were compared to regulatory screening levels, and were incorporated in a BHRA. A review of applicable regulations indicate that six areas at the Site would require remediation. The BHRA concluded that risks to human health are acceptable for continued industrial use of the Site. The fate and transport modeling indicated that groundwater contamination may be caused by metals in soil in the First Generation Surface Impoundments area. Results of the investigation, regulatory evaluation, and BHRA identify six recognized environmental conditions at the Site associated with Site operations that have impacted soil or groundwater

- I: Jet Fuel Tank Area – Free-phase fuel hydrocarbons on groundwater and soil contamination with hydrocarbon. The presence of free-phase hydrocarbon will require remediation.
- II: First Generation Surface Impoundments – Metal and hydrocarbons contamination in soil was identified in the First Generation Surface Impoundment area. Fate and transport modeling indicates potential groundwater contamination from metals. Recommend evaluating remediation approach for metals and hydrocarbons.
- III: UST Area – The benzene concentration in groundwater in a monitoring well near the USTs exceeded RWQCB criteria. Recommend evaluating remediation approach for benzene in groundwater.
- IV: TCE and DCE in groundwater - A plume of dissolved TCE and DCE was identified in the eastern part of the SBPP at levels exceeding Basin Plan groundwater action levels. Recommend identifying the source of the TCE contamination and evaluating the remediation approach for TCE and DCE in groundwater.
- V: East Loop – A fuel release impacted soils in an area south of the SBPP, known as the "East Loop". Soils were excavated and remediated, but subsequent borings identified localized remaining hydrocarbon concentrations exceeding 1,000 mg/kg TEH. Recommend evaluation of soil remediation approach for TEH concentrations greater than 1,000 mg/kg.
- VI: National City Terminal – Localized areas of shallow hydrocarbon contamination in soil exceeding 100 mg/kg TEH (action level recommended by National City) have been identified. Recommend evaluating remediation approach for TEH.

Several locations at the Site could not be assessed because samples could not be collected from beneath existing structures. These inaccessible areas under tanks, piping, the power plant, and buildings represent potential environmental conditions that should be addressed at decommissioning.

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GLOSSARY OF ABBREVIATIONS

ACM	Asbestos – containing – material
API	American Petroleum Institute
AST	aboveground storage tank
ASTM	American Society for Testing and Materials
AWQC	Ambient Water Quality Criteria
bbl	barrel
bgs	below ground surface
BHRA	Baseline Health Risk Assessment
BTEX	benzene, toluene, ethylbenzene, and xylenes
Cal/EPA	California Environmental Protection Agency
CAM	California Assessment Manual
cm/s	centimeters per second
COC	chain-of-custody
COPCs	Chemicals of Potential Concern
CPT	Cone Penetrometer Testing
CSM	conceptual site model
DAF	dilution attenuation factor
DEHP	Bis_2-ethylhexylphthalate
DQO	Data Quality Objective
DTSC	Department of Toxic Substances Control
EDD	electronic data deliverable
EPA	United States Environmental Protection Agency
EPC	exposure point concentrations
ER-L	effect range-low
ESA	Environmental Site Assessment
Fluor Daniel GTI	Fluor Daniel GTI, Inc.
ft	feet
FSP	Field Sampling Plan
GIS	Geographic Information System
GT	Gas Turbine
HSA	Hollow-Stem Auger
MCL	maximum contaminant level
mg/kg	milligrams per kilogram
mg/l	milligrams per liter
MRL	method reporting limit

MSL	mean sea level
MTBE	methyl tert-butyl ether
NCT	National City Terminal
PAHs	polynuclear aromatic hydrocarbons
PCBs	polychlorinated biphenyls
PEA	Preliminary Endangerment Assessment
PLM	Polarized Light Microscope
PVC	polyvinyl chloride
PID	photoionization detector
ppb	parts per billion
ppm	parts per million
PRGs	preliminary remediation goals
QAPP	Quality Assurance Project Plan
QA/QC	quality assurance/quality control
RG	California Registered Geologist
RME	reasonable maximum exposure
RWQCB	Regional Water Quality Control Board, San Diego Region
SDG&E	San Diego Gas & Electric Company
SHSP	Site Health and Safety Plan
SBPP	South Bay Power Plant
SSLs	soil screening levels
SVOCs	semi-volatile organic compounds
TDS	total dissolved solids
TEH	total extractable hydrocarbons
TOC	total organic carbon
TPH	total petroleum hydrocarbons
TRPH	total recoverable petroleum hydrocarbons
TSS	total suspended solids
UCL	upper confidence limit of arithmatic mean
USCS	Unified Soil Classification System
UST	underground storage tank
UTL	upper tolerance limit
VOCs	volatile organic compounds
WWTP	wastewater treatment plant
μg/l	micrograms per liter

1.0 INTRODUCTION

This report (Volume II) presents the results of the Phase II Environmental Site Assessment (ESA) for soil and groundwater at the South Bay Power Plant (SBPP) located in Chula Vista, San Diego County, California (Figure 1-1a) and the National City Terminal (NCT) located in National City, San Diego County, California (Figure 1-1b). Volume I presented the results of the Phase I ESA. The work was performed by Fluor Daniel GTI, Inc. (Fluor Daniel GTI) at the request of Legal Counsel for the San Diego Gas and Electric Company (SDG&E). This report was generated based upon assessment, quality assurance/quality control (QA/QC), and health and safety objectives presented in the *Project Management Plan* for the Phase II ESA. The *Project Management Plan* is comprised of the following documents:

- Field Sampling Plan (FSP) (Fluor Daniel GTI, 1998),
- Quality Assurance Project Plan (QAPP) (Fluor Daniel GTI, 1998),
- Data Management Plan (Fluor Daniel GTI, 1998),
- Site Health and Safety Plan (Fluor Daniel GTI, 1998), and
- Communication Plan (Fluor Daniel GTI, 1998).

1.1 Purpose and Objectives of the Phase II ESA

The purpose and objectives of the Phase II ESA are to:

- Establish a baseline definition of chemical distribution in soil and groundwater at the Site (SBPP and NCT).
- Establish a database of chemical information to support a baseline health risk assessment (BHRA).
- Present the current understanding of the environmental conditions at the Site through the use of a conceptual site model (CSM).
- Determine the numerical risks to human health or the environment that might be posed by the chemical concentrations detected at the Site if no remedial action were to be implemented. This is achieved by performing a BHRA.

- Determine if remediation of soil, sediment, or groundwater is required to protect human health or the environment.
- Determine if remediation is required to comply with environmental laws and regulations.
- Describe the methodology for developing site-specific cleanup levels if the results of the risk assessment or assessment of environmental laws and regulations should indicate that remediation is warranted.
- Establish the information required to support an analysis of alternative remediation technologies and a remediation cost estimation.
- Present a report of the data and findings of the Phase II ESA for use by the potential buyers of the Site.

1.2 Overview of Project Approach

The general project approach taken by Fluor Daniel GTI consists of two phases (Phase I and Phase II). This volume presents the results of Phase II. The project approach incorporates the use of the data quality objective (DQO) process developed by the United States Environmental Protection Agency (EPA) for the development of FSPs, site investigations, and risk assessments (EPA, 1994). The DQO process includes eight tasks which are described below and on Figure 1-2. In following the DQO process, Fluor Daniel GTI completed Task 1 in the Phase I ESA and Tasks 2 through 5 in the Phase II ESA. Certain "potential environmental conditions" were identified in the Phase I ESA. These potential environmental conditions were investigated and evaluated in this Phase II Report in accordance with Tasks 2 through 5. This investigation and evaluation defined certain "recognized environmental conditions" and recommendations are made that such conditions be further considered in accordance with Tasks 6 through 8. The project approach was also performed in accordance with generally accepted industry, state, and federal regulatory standards.

Task 1. Phase I ESA
Evaluate existing data, conduct interviews with SDG&E personnel, and visit the Site to identify environmental issues and develop the Phase II ESA FSP.

Task 2. Phase II Investigations, Additional Data Collection
Collect additional data to define the nature and extent of chemicals in the soil and groundwater at the Site.

Task 3. Risk Quantification

Determine the baseline risks to human health or the environment from the chemicals detected at the SBPP and NCT in the environmental media being investigated.

Task 4. Cleanup Level Determination

Establish risk-based cleanup levels, if necessary or appropriate, for each of the affected environmental media and compare the risk-based levels to cleanup levels established in applicable regulations.

Task 5. Areas Requiring Remediation

Establish areas at the Site that potentially require remediation based on the BHRA or other regulatory requirements.

Task 6. Evaluate Composition and Physical Properties of Chemicals

Evaluate the composition and physical properties of chemicals within each area potentially requiring remediation.

Task 7. Specify Remediation Technology

Specify the remediation technologies that could reasonably be used to reduce the chemicals in each environmental medium to concentrations below the cleanup levels identified in Task 4.

Task 8. Cost Estimate

Estimate the costs to implement the specified remediation technologies.

The number and locations of soil and groundwater samples are discussed further in Section 2.0. Potential environmental conditions identified in the Phase I ESA are summarized in Table 1-1.

1.3 Definitions

The following terms are defined for future use in this report:

- Baseline: Baseline soil or groundwater conditions represent the comprehensive set of data from the Phase II ESA (Phases IIA and IIB), and all applicable data from previous investigations.

- Estimated Values: Concentrations detected at less than the reporting limit. A value flagged as an estimated value indicates that the analyte has been identified and the quantification of concentration is at less than the 99 percent confidence level.

- Method Reporting Limit: The method reporting limit (MRL) is defined as the minimum concentration of an analyte that can be identified, measured and reported with a 99 percent confidence level.

- Reporting Limit: The reporting limit for a particular analysis. The reporting limit equals the method reporting limit multiplied by the dilution factor. Dilution factors are sample matrix-dependent and are affected by matrix interferences.

- On-site: Land within the physical boundaries of the current SDG&E property. This term does not include properties to be retained by SDG&E.

- Phase IIA: The Phase IIA investigation is defined as the field work and laboratory analyses completed on targeted environmental media during the initial portion of the invasive investigation process. The sampling locations were determined using a risk-based assessment approach for the current and industrial site as specified in the FSP, as well as site-specific potential environmental conditions identified in the Phase I ESA Report (Fluor Daniel GTI, 1998).

- Phase IIB: The Phase IIB investigation is defined as the field work and laboratory analyses completed on targeted environmental media at various property locations after the Phase IIA investigation. Sampling locations for the Phase IIB investigation were selected based on two evaluations: (1) review of Phase II analytical data, which identified locations requiring more in-depth evaluation, and (2) identification of additional potential environmental conditions identified in the Phase I ESA review after the start of the Phase IIA investigation.

- Potential Environmental Condition: Possible environmental condition recommended for further evaluation.

- Recognized Environmental Condition: Environmental condition identified at the end of Phase II ESA. These conditions are recognized based on analytes exceeding regulatory limits or posing unacceptable risks to human health or environment as determined by the BHRA.

1.4 Report Organization

This Phase II ESA Report is organized as described below:

Section 1.0: Introduction

- The introduction describes the purpose, objectives and contents of the Phase II ESA. This section includes descriptions of the project approach, definitions, a summary of the facility history and physical setting, and previous investigations.

Section 2.0: Investigation Approach

- This section describes the locations and frequencies of samples collected from each environmental medium investigated, the sampling methods used, and analytical procedures employed during the performance of the Phase II investigations. This section corresponds to Task 2 (Phase II Investigation, Additional Data Collection) of the project approach.

  The FSP describes the detailed plans for the work performed during Task 2. The FSP provides the rationale for sample collection at each of the six investigation areas established by Fluor Daniel GTI for the Site. A description of the DQO process as well as field and laboratory QA/QC processes, including data validation procedures used in performance of the Phase II ESA, are discussed in this section.

Section 3.0: Phase II ESA Results and Environmental Baseline

- This section further interprets the physical characteristics at and near the Site and describes the baseline environmental conditions in soil and groundwater including naturally occurring or background levels of chemicals in soil and groundwater at the Site. The baseline environmental conditions are based on the Phase II ESA and applicable analytical data from previous investigations. The information discussed in this section also corresponds to a portion of Task 2 of the project approach.

Section 4.0: Applicable Regulatory Limits

- This section presents applicable laws and regulations and regulatory limits considering regulatory acceptance. Included in this section are an evaluation of site data and a definition of areas potentially requiring remediation in order to comply with environmental laws and regulations. This section corresponds to Task 5 (Areas Requiring Remediation).

Section 5.0: Baseline Health Risk Assessment

- This section presents the methodology and results of the BHRA associated with the concentrations of chemicals detected at the Site. The risk assessment exposure units, screening risk evaluation, chemicals of potential concern (COPCs), exposure assessment, toxicity assessment, and risk assessment results are presented in this section. This section also contains proposed cleanup levels, if any, that are established to be protective of human health or the environment. This section corresponds to Tasks 3 and 4 of the project approach (Risk Quantification and Cleanup Level Determination).

Section 6.0: Summary of Findings and Conclusions

- This section presents the summary of the data collected during the Phase I and Phase II ESAs.

References

- This section lists the references cited in the text.

1.5 Site Background

The following is a brief summary of background information pertinent to the Site. This summary includes information regarding the historical operations of the facility, its location, site history, physical characteristics, surface features, geology, hydrogeology, and land use.

1.5.1 Site Location

The SBPP project includes two separate sites: the main power generation plant located approximately eight miles south-southeast of San Diego at 990 Bay Boulevard, in Chula Vista, California (Figure 1-1a), and the 24th St. Marine Terminal (National City), located approximately five miles south of San Diego, at 2600 Terminal Avenue, in National City, California (Figure 1-1b). The pipelines linking the berths, Marine Terminal and SBPP are also considered part of the Site.

1.5.2 Overview of Facility Operations

The SBPP site is north-south-oriented, measuring approximately 0.34 miles wide by 1 mile long. The site includes a thermal power plant, a small gas turbine plant, switchyards, fuel oil aboveground storage tanks (ASTs), a cooling water system, wastewater treatment plant, and ancillary systems. The thermal power plant has four steam turbine-driven power generating units fired by natural gas or

No. 6 fuel oil. Until the mid-1970s, the plant was primarily fueled using Bunker C. Until the mid-1980s, the plant was primarily fueled using No. 6 fuel oil. Since then, the power plant is fueled primarily by natural gas. Diesel oil is also present on-site and is used for displacing the residual oil in pipelines (to prevent the residual oil from hardening in pipelines and valves as it cools).

Fuel oil and diesel are delivered to the NCT by tankers which are moored at one of two berths on San Diego Bay, located directly west of the terminal. A pipeline is used to transfer product from the tankers to the two ASTs at the NCT. A third AST is used for displacement oil storage. A 10-inch pipeline is then used to transport No. 6 fuel oil south to the SBPP over a distance of approximately four miles.

No. 6 fuel oil is stored in two areas at the SBPP. The southern tank farm includes four fuel oil tanks and the northern tank farm includes three fuel oil tanks and a displacement oil tank. All of the ASTs are surrounded by secondary containment berms having a capacity of 110 percent of the tank volume.

The boilers provide steam used to rotate the turbines and generate electricity which is routed to the switchyard. The line voltage is transformed at the main transformers and in the switchyard and is routed to various transmission lines exiting the facility. Cooling water is collected from an intake channel located south of the plant. The cooling water circulates through condenser tubes to cool and condense the steam for reuse in steam generation. The spent cooling water is routed to the discharge channel and then to San Diego Bay. Boiler blowdown is collected in ASTs, treated at the wastewater treatment plant (WWTP), and routed to the sewer.

A site plan and facility layout for the SBPP and the NCT are provided on Figures 1-3a and 1-3b, respectively. A detailed description of the SBPP facilities and operations can be found in the Phase I ESA Report (Fluor Daniel GTI, 1998).

1.5.3 Physical Characteristics of the Study Area

The following sections briefly describe the surficial, regional geologic, hydrogeologic, and land use features of the Site.

1.5.3.1 Site Topography. The western edge of the SBPP borders San Diego Bay. The topography of the property rises gently eastward. The west-dipping gentle slope is bisected by the Telegraph Canyon Creek and an unnamed drainage north of the power plant. Locally, berms have been built around fuel storage facilities, and walls have been constructed around wastewater treatment areas to contain potential spills. Vegetation is limited to low shrubs and trees maintained at specific locations by an irrigation system.

The NCT property is flat, except for the man-made bermed areas around fuel storage areas. The property along the pipeline between the NCT and the SBPP is essentially flat in areas where industrial facilities operate. Along the northern route of the pipeline, the topography includes estuarine gullies and embankments.

1.5.3.2 Regional Geology. The San Diego area lies within the Peninsular Ranges Province in the southwest corner of southern California. The Peninsular Ranges Province is comprised of Cretaceous granite rocks of the southern California batholith, older metamorphic rocks associated with the intrusion of the batholith, and sedimentary rocks derived from the weathering of the intrusive and metamorphic rocks. The sedimentary rocks range from terrestrial conglomerates to marine sands and the bay mud. The province is a large westward-sloping block uplifted abruptly along the eastern edge.

The San Diego coastal topography is characterized by uplifted marine terraces of Tertiary sedimentary rocks formed by rivers creating steep-sided river valleys. Inland, where the rocks of the southern California batholith are exposed, the topography has a more gentle rolling relief. Elevations in the Peninsular Ranges Province range from 10,831 feet at Mount San Jacinto (approximately 70 miles northeast of San Diego) to sea level along the coast.

The SBPP and the NCT are located on the southeast shore of San Diego Bay and range in elevation from approximately 0 to 20 feet above mean sea level (MSL). The sites are located within the Peninsular Ranges Province of southern California. The sites are located on a coastal plain underlain by Tertiary marine and terrestrial formations and alluvial deposits (Kennedy and Tan, 1977). Quaternary sediments in the vicinity of the sites are characteristic of deltaic and shallow bay depositional environments.

Previous investigations at the SBPP indicate that it is underlain by fill material, Quaternary alluvium, and the Pleistocene Bay Point Formation. The fill material generally is comprised of silty sand to clayey sand, and varies from 0 to 10 feet in thickness throughout the SBPP. The Quaternary alluvium is comprised of clayey sand, silty sand and fine sand and varies between 4 and 11 feet in thickness. The upper portion of the Bay Point Formation is comprised of silty to sand clays interbedded with medium to clayey sand.

1.5.3.3 Regional Hydrology. The SBPP and NCT sites are located within the Telegraph (Subarea 9.11) and La Nacion (Subarea 9.12) subareas of the Sweetwater Hydrologic Area, respectively. No recorded water supply wells are located on either site. Eight water wells were identified within one mile of the SBPP during previous investigations (Woodward Clyde, 1986).

Results of previous groundwater analyses indicate that the groundwater at the SBPP contains concentrations of total dissolved solids (TDS) in groundwater samples ranging from 1,800 to 4,500 parts per million (ppm). Although shallow groundwater under the SBPP appears to be nonpotable, the SBPP is included in an area designated for usable groundwater

Depth to groundwater has been recorded between 6 to 9 feet below ground surface (bgs) near the second generation surface impoundments and between 6 and 7 feet bgs in the vicinity of the former underground storage tank (UST) (Woodward Clyde, 1986 1988). Pressure transducer records during these previous investigations indicated tidal fluctuations of 0.2 feet near the second generation surface impoundments. Seasonal fluctuations are also expected. Groundwater gradient direction varies between westerly to northwesterly with a gradient of approximately 0.005.

Groundwater depth gauging in March 1998 indicates depth to water of about 6 to 15 feet below grade at the SBPP, with increasing depths to water at the eastern part of the site due to rising topography.

Surface waters at the SBPP include San Diego Bay and Telegraph Canyon Creek. San Diego Bay is the source and end point for cooling water used by the power plant. Treated water is discharged to the sewer.

1.5.3.4 Designated Beneficial Uses of Groundwater and Surface Water. As described in Section 3.1.3.1, the SBPP and the NCT are located within the Lower Sweetwater Hydrographic Unit, and both properties are identified by the Regional Water Quality Control Board (RWQCB) as beneficial water use areas for municipal, agricultural and industrial use. Both properties are also considered sensitive groundwater basins due to their proximity to San Diego Bay.

The site-specific analyses of groundwater quality, however, as described in Section 3.2, clearly indicate that the inorganics concentration in groundwater would not allow the groundwater to be used without treatment for drinking water. Locally, the TDS values for groundwater samples were found to exceed 3,000 ppm, which has been set as one of the criterion for drinking water sources by California Resolution 88-63.

1.5.3.5 Land Use. Land use of the properties surrounding the Site is discussed in the Phase I ESA. Figures 3a and 3b of that document display land use in the vicinity of the SBPP and the NCT.

1.5.4 Site History

The SBPP was commissioned in July 1960. Based on an initial review of aerial photographs, the site was used for agricultural purposes prior to construction of the power plant. The plant initially had three ASTs (Tanks 1-3), located in the southern tank farm, adjacent to the current southern boundary

of the site. An additional five tanks were constructed in 1972. Four tanks were constructed at the northern tank farm and an additional tank was constructed at the southern tank farm. One of the ASTs is used for storing cutter oil.

1.5.5 Environmental Issues Identified During the Phase I ESA

The Phase I ESA for the SBPP and the NCT identified potential environmental conditions to be assessed during a Phase II investigation. These issues provided the basis for the Phase II FSP.

These issues are listed in Table 1-1. In Section 5.0, these issues are reconciled with the findings from the Phase II investigations.

1.6 Work Product Limitation

Fluor Daniel GTI has reviewed information concerning the potential presence of contamination on the subject properties, and has prepared this report in a professional manner using that degree of skill and care exercised for similar projects under similar conditions by reputable and competent environmental consultants. The information contained in this report, including its conclusions, is based on the information which was made available to Fluor Daniel GTI during the investigation and upon the services described. Because this report is based on available information, some of its conclusions could be different if the information upon which it is based is determined to be false, inaccurate, misleading or contradicted by additional information.

Fluor Daniel GTI makes no representation concerning the legal significance of its findings or of the value of the property investigated. Fluor Daniel GTI has no contractual liabilities to third parties for the information or opinions contained in this report. This report is not intended to satisfy the requirements of the National Contingency Plan.

2.0 INVESTIGATION APPROACH

This section of the Phase II ESA Report provides an overview of the investigation approach and methodology implemented for the Phase II investigations and deviations from the FSP. The work presented in this section of the report corresponds to Task 2 (Additional Data Collection) of the project approach. Fluor Daniel GTI completed the following activities during the mobilizations for the Phase IIA and Phase IIB investigations (Tables 2-1a and 2-1b):

- Drilled 244 borings, including 191 hand-augered borings and 53 soil borings by push-probe or hollow stem auger (HSA) rigs,
- collected and analyzed 554 soil samples (including duplicates),
- installed and abandoned 45 temporary groundwater monitoring wells,
- installed eight 2-inch permanent monitoring wells,
- measured liquid levels in all wells,
- collected and analyzed groundwater samples from the 45 temporary monitoring wells, from the 2-inch monitoring wells, and from four previous monitoring wells, and
- collected and analyzed two water quality samples.

2.1 Investigation Methodology

This section presents an overview of the investigation-specific DQOs, as well as a summary of the techniques used to collect samples of the various environmental media. This section also details the specific laboratory analytical methods used to analyze the environmental media samples collected during the Phase II investigations. A detailed description of the Phase II investigation approach is presented in the FSP (Fluor Daniel GTI, 1998)

2.1.1 Data Quality Objectives (DQO)

The DQO process for determining the location, depth of samples, and analytical tests used to obtain the information to develop the FSP is based on the EPA's *Guidance for the Data Quality Objectives Process, EPA QA/G-4* (EPA, 1994). To ensure that the samples collected were of the appropriate number and quality, a detailed strategy was necessary to fulfill the requirements for evaluating the potential risk to human health or environmental receptors associated with the potential presence of

chemicals in soil and groundwater. The DQO process is described in the FSP. The following paragraphs outline the sampling and analysis program defined by the DQO process.

The locations and depth intervals of proposed samples were selected based on a review of previously collected data and site information regarding known or potential source areas in conjunction with historical information, records review, personnel interviews, and site visits. Additional considerations included whether baseline conditions had been previously defined in other studies, the depth to water, and the physical characteristics of the compounds of interest.

The issues that were identified during the development of the Phase I ESA provided the primary basis for the investigation of potential sources of chemicals to soil and groundwater (Table 1-1). A preliminary conceptual site model (CSM) was developed based on this information. The preliminary CSM for this site is presented on Figure 2-1. The Phase II investigation approach was formulated based on the Phase I ESA and the preliminary CSM.

A biased sampling and grid plan was then developed (see FSP Section 4.2) to provide the data necessary to address the project-specific data requirements. A grid spacing of approximately 150 feet was selected to provide the data necessary to achieve the above-stated objectives. This grid spacing provided a 95 percent probability of detecting a plume with a radius of at least 100 feet.

A biased grid consisted of a grid-based distribution of sampling points, where the detailed location of each sampling point within each grid cell is placed at or near a location of a suspected containment source. This approach results in a conservative bias of the sampling locations in each grid cell. For example, if a grid cell included a sampling location in a fuel storage area, the sampling location was biased by locating the sampling point adjacent to a potential containment source such as a transfer pump pit or a valve unit.

A biased sampling grid was selected for the Phase II soil investigations for the following reasons:

- The approach provides sufficient areal coverage to discover any contaminated soil zones exceeding a 100-foot radius, if they exist, anywhere on the site.
- The approach provides sufficient data to establish baseline environmental conditions for soil.
- This approach provides data to determine if releases had resulted from potential source areas identified in the Phase I ESA.

- A biased grid provides data of sufficient quality and quantity for use in a BHRA.
- The approach provides sufficient data to estimate remediation costs.

Groundwater sampling locations were selected in suspected source areas or downgradient from source areas; in upgradient and cross-gradient locations to identify potential migration of contaminants from off-site sources; in a grid pattern in non-operational areas; and along the edge of San Diego Bay (FSP, 1998).

The sampling plan divided the site into six investigation areas, including 16 subareas. These areas and subareas were defined on the basis of operational practices and types of chemicals of interest associated with the various types of operations. The SBPP areas and subareas are:

- Investigation Area 1: Fuel Storage Area
  - Subarea 1a: North Tank Farm
  - Subarea 1b: South Tank Farm
  - Subarea 1c: Jet Fuel Tank Area
  - Subarea 1d: UST Area
- Investigation Area 2: Process Treatment and Former Surface Impoundments
  - Subarea 2a: Process Water Treatment
  - Subarea 2b: Former First Generation Surface Impoundments
  - Subarea 2c: Former Second Generation Surface Impoundments
- Investigation Area 3: Power Generation
  - Subarea 3a: Power Plant Units 1-4
  - Subarea 3b: Maintenance Area
  - Subarea 3c: Gas Turbine
- Investigation Area 4: Construction Yard and Hazardous Material Storage
  - Subarea 4a: Former Drum Storage Area
  - Subarea 4b: Construction Yard
  - Subarea 4c: Hazardous Material Storage

- Investigation Area 5: Non-operational Areas
  - Subarea 5a: Open Areas
  - Subarea 5b: Switchyard Border
  - Subarea 5c: Septic/Leach Field
- Investigation Area 6: National City Terminal

Additional information concerning these investigation areas is provided in Section 2.3 of the FSP and in Section 2.2 of this report.

2.1.2 Field and Laboratory Methodology

Soil and groundwater samples were collected in accordance with the Standard Operating Procedures presented in the QAPP. The following sections detail the sample collection, handling, and analysis procedures used to complete the field portion of the Phase II investigations.

Field operations started on March 9, 1998. Sampling locations were marked and cleared by geophysical contractors during the first week of operations. Field sampling at the site was conducted from March 16 to March 31, 1998 (Phase IIA), and from April 15 to 21, 1998 (Phase IIB). Temporary groundwater sampling points were abandoned on May 7 and 8, 1998. Appendix B-2 contains photographs documenting field operations.

The soil and groundwater samples were analyzed for the presence of contaminants by state-certified Del Mar Analytical Laboratories (Irvine, California). Physical soil analyses were performed by PTS Laboratories (Santa Fe Springs, California). Drilling services were provided by Haz Mat West (Anaheim, California) and BC2 (Irvine, California).

2.1.2.1 Soil Sampling Methodology. Soil samples were collected using hand auger, geoprobe, or HSA drilling methods. All sampling locations are illustrated on Figures 2-2a (SBPP) and 2-2b (NCT). Soil samples were typically collected from within the 0 to 1-foot interval, from within the 4 to 6-foot interval, and from within the 10 to 15-inch interval near the groundwater depth. All soil samples were collected in containers according to the specifications in the FSP and QAPP.

Soil sample lithology was recorded at the time of sample collection, and logged by a Fluor Daniel GTI field geologist under the direct supervision of a California Registered Geologist (RG). Soil sample lithology was described using the Unified Soil Classification System (USCS) and recorded on the drilling logs (see Appendix A), as required by the FSP and the QAPP. A portion of each soil sample was also field-screened for vapor phase volatile organic compounds (VOCs) using a photoionization detector (PID), in accordance with the procedures detailed in the FSP.

Disposable Nitrile™ gloves were worn while sampling activities were performed and were changed after collection of each sample. To prevent cross-contamination between samples, sampling equipment was decontaminated, as specified in the QAPP. Soil cuttings produced during drilling were drummed at the end of each day, in accordance with the QAPP.

Each sample container was labeled, field documentation and chain-of-custody (COC) records were completed, and duplicate and field equipment rinsate samples were collected under the supervision of the field QA/QC sample manager, as specified in the FSP. Additional soil samples were collected for the analysis of soil physical and geotechnical properties. A brief summary of the soil sampling methodologies employed during the Phase II investigations follows.

Sampling locations were surveyed by a SDG&E subcontractor, and the survey data are included in Appendix C.

Tables 2-1a and 2-1b provide a summary of soil boring methods, drilling methods, and depth of borings during Phases IIA and IIB, respectively. Table 2-2 provides a summary of soil analyses. Table 2-3 summarizes well construction details.

Field conditions required occasional deviations from the FSP. These deviations are listed in Table 2-4.

Hand Auger Borings. One hundred and ninety-one soil borings were completed manually. Shallow sampling locations and soil borings in locations (Figures 2-2a and 2-2b) that were inaccessible by a rig were completed using a stainless-steel hand auger. The borings were advanced and sampled to the depths specified in the FSP, site conditions permitting. The soil samples were collected in stainless-steel sleeves directly from the bit of the auger once soil was removed from the specified depths. One end of a sleeve was capped and sealed and the remaining open end was pushed into soil on the auger until all headspace in the sleeve was removed.

Drilled Borings. Fifty-three borings were drilled and sampled using either a push-probe or other rig. Samples were obtained in stainless-steel sleeves from the soil borehole using a push-probe sampler or a California-modified split-spoon sampler. For each sampling event, the set of stainless-steel sleeves was placed on a plastic-covered work surface. A 6-inch-long section of the sample was selected by the field geologist for laboratory analysis. This section was then covered at both ends with Teflon™ tape, capped, sealed with tape, and placed on ice in a cooler pending delivery to the laboratory.

2.1.2.2 Groundwater Sampling Methodology. Groundwater sampling points and monitoring wells are shown on Figures 2-2a (SBPP) and 2-2b (NCT). Groundwater samples were collected directly from

the formation at specified soil boring locations using temporary monitoring points, 2-inch monitoring wells or existing monitoring wells.

The groundwater samples were collected, labeled, preserved, and containerized in accordance with the FSP and QAPP requirements. Disposable Nitrile™ gloves were changed between samples to prevent cross-contamination. Water samples collected for metals analysis were filtered and preserved in the field (excluding one water sample where water was laboratory-filtered and preserved). In addition, as part of the Phase IIA investigation, both unfiltered and filtered water samples were collected and analyzed for Polynuclear Aromatic Hydrocarbons (PAHs) from selected groundwater sampling locations. A trip blank, prepared by the laboratory, accompanied all ice chests containing samples that were to be analyzed for VOCs. A brief summary of the groundwater sampling methodologies employed during the Phase II investigations follows.

Temporary Monitoring Points and 2-inch Monitoring Wells. Temporary monitoring points were installed either with a hand-auger or push-probe equipment (depending on site conditions). A ½-inch to ¾-inch-diameter, slotted polyvinyl chloride (PVC) casing, covered with a filter sock, was placed in each borehole, and each temporary well was completed with a bentonite seal. Eight 2-inch-diameter wells with slotted PVC casings were completed with a sand filler pack and bentonite seal (Appendix A). Construction summaries for the temporary monitoring points and 2-inch monitoring wells are included in Table 2-3 and on each boring log (Appendix A). All groundwater gauging and sampling data were recorded on groundwater field sampling forms (Appendix B). Groundwater samples were then collected from the wells using a peristaltic pump and disposable tubing, and placed in appropriate sample containers.

The slow recharge of groundwater in some wells delayed the sample collection process, resulting in multiple sampling days. Due to slow recharge, the collection of samples was also locally reduced and some analyses were not performed.

The temporary wells were abandoned after completion of sampling. The 2-inch monitoring wells were left on-site for future monitoring, if necessary. The wellhead elevations of the 2-inch monitoring wells and selected temporary wells were surveyed by a professional contractor. The elevation of the wellhead of other temporary wells was estimated using available site engineering drawings.

Existing Monitoring Wells. Four of five existing on-site monitoring wells were sampled during Phase II. Each well was purged using a submersible pump until pH, conductivity, and temperature stabilized (within 10 percent) in three consecutive measurements or until a minimum of three well volumes was removed. All purging data were recorded on groundwater field sampling forms (see Appendix B-1). Purge water was collected and managed using the procedures specified in the QAPP. To prevent cross-contamination between samples, the pump was decontaminated as specified in the QAPP.

Groundwater samples were then collected from the wells, using a disposable PVC bailer, and placed in appropriate sample containers.

2.1.2.3 Field QA/QC Methodology: As outlined in the QAPP and FSP, QA/QC of field sampling was implemented in the field for soil and groundwater sampling. These procedures included collection of duplicate samples of soil and groundwater, rinsate samples for soil sampling equipment, and water trip blanks. QA/QC procedures included detailed field documentation of sampling methods and verification of COCs.

The rinsate samples for soil sampling equipment were analyzed for the primary analytes of concern (as listed in Table 2-2), and, if additional analyses (EPA 8310 or 8020) were conducted, the rinsate samples were also analyzed for these compounds.

2.1.2.4 Laboratory Methodology. Soil and groundwater samples were typically analyzed following QC procedures established for assessing hazardous waste sites in *Test Methods for Evaluating Solid Waste* (EPA, 1986). Samples were analyzed by the Del Mar Analytical Laboratories in accordance with EPA sampling and analysis methods as described in the QAPP. Specifics of the EPA methods, including analytical procedure, accuracy and precision of the method, limitations on sample retention, etc., are stated in the EPA methods. The collected soil and groundwater samples were then analyzed as follows.

Soil Samples. Five hundred and twenty-one soil samples (excluding duplicates) were analyzed at the project-designated laboratory during the Phase IIA and IIB investigations at the Site. The analytical schedule of soil samples is summarized in Table 2-2. The soil samples were analyzed as follows:

- Total Extractable Hydrocarbons (TEH). Five hundred and twenty-one soil samples were analyzed for TEH in the range of C_9 to C_{40} using EPA Method 8015 (modified). If the TEH concentration exceeded 100 mg/kg, the sample was also analyzed for PAHs and Benzene, Toluene, Ethylbenzene and Xylenes (BTEX).

- VOCs. One hundred and twenty-nine samples were analyzed for VOCs using EPA Method 8260.

- BTEX. Analyses were conducted using EPA Method 8020 on selected samples for which EPA Method 8260 was not conducted, and where TEH concentrations exceeded 100 mg/kg.

- Semi-volatile Organic Compounds (SVOCs). Ten soil samples were analyzed for SVOCs using EPA Method 8270.

- PAHs. Twenty-seven soil samples were analyzed for PAHs using EPA Method 8310.
- Polychlorinated Biphenyls (PCBs). Three hundred and nineteen samples were analyzed for PCBs in accordance with EPA Method 8081.
- pH. All soil samples were analyzed for pH.
- Metals. Five hundred and twenty-one soil samples were analyzed for the California Assessment Manual (CAM) metals in accordance with EPA Method 6010. Five hundred and twenty soil samples were analyzed for mercury in accordance with EPA Method 7471.
- Asbestos. Six soil samples were analyzed for asbestos using EPA Method 600/R-93/116, Polarized Light Microscopy (PLM).

Physical characteristics for 11 soil samples and total organic carbon (TOC) content were also determined for these samples.

Groundwater Samples. Forty-eight groundwater samples (excluding duplicates and blanks) were collected and analyzed at the project–designated laboratory during the Phase II investigations at the Site. Due to the slow recharge of some wells at the Site, the suite of analyses conducted was reduced, and sampling was focused on the most likely contaminants for each location. The groundwater samples were analyzed as follows:

- TEH. Forty-eight groundwater samples and one hydrocarbon sample were analyzed for TEH using EPA Method 8015 (modified).
- VOCs. Thirty-eight groundwater samples were analyzed for VOCs using EPA Method 8260.
- BTEX. Analyses were conducted on all groundwater samples using EPA Method 8020 or as part of EPA Method 8260. Four groundwater samples were analyzed for methyl tert-butyl ether (MTBE) using PA Method 8020.
- PAHs. Seventy-nine groundwater samples (30 filtered and 49 unfiltered) were analyzed for PAHs using EPA Method 8310.
- PCBs. Nineteen groundwater samples were analyzed for PCBs in accordance with EPA Method 8081.

- pH. Measurements were conducted either in the field or in the laboratory for all groundwater samples.

- Metals. Forty-seven groundwater samples were analyzed for the CAM metals in accordance with the EPA Method 6000 and 7000 series.

2.2 Investigation Approach

Fluor Daniel GTI selected six investigation areas (listed in Section 2.1.1) and associated subareas to be assessed during Phase II. These areas were identified based on information gathered during the Phase I ESA. The boundaries of these areas are illustrated on Figures 2-2a and 2-2b. The physical features of each area are summarized in the following sections and described in detail in the FSP.

Proposed sample locations for Phase II were illustrated in the FSP. All soil and groundwater sampling locations for Phase II are shown on Figures 2-2a and 2-2b. The FSP also contains tables that present area-specific FSPs, including sampling methods, number of locations and depths, sample intervals, and analytical methods for each sample. The soil and groundwater sample-naming protocol for this project is discussed in Section 5.4.2 of the QAPP.

Data gaps were identified based on a review of the analytical results of samples collected during Phase IIA, and additional information gathered during the Phase I ESA. This review included identification of maximum detected concentrations, statistical analyses, comparisons with conservative remediation standards, and a comparison of the Phase IIA data set with the objectives defined in the Phase IIA FSP. A Phase IIB assessment program was then designed to complete the characterization of each area. The Phase IIB approach is presented in Appendix C of the FSP.

2.2.1 Investigation Area 1: Fuel Storage Area

Four subareas at the SBPP are associated with fuel storage. These subareas include:

- Subarea 1a: North Tank Farm
- Subarea 1b: South Tank Farm
- Subarea 1c: Jet Fuel Tank Area
- Subarea 1d: UST Area

The specific Area 1 soil and groundwater sampling intervals, as well as the prescribed analytical method for each retained Phase IIA and Phase IIB environmental media samples, are detailed in the FSP. Actual soil sample intervals may vary from those intervals given in the FSP due to conditions

encountered at the site that impeded sampling at the planned depth (Table 2-4). Appendices A and G-1 include the actual depth intervals for all soil samples collected during Phase II.

2.2.1.1 Subarea 1a: North Tank Farm. The North Tank Farm (Subarea 1a) includes four tanks. Three tanks (#4-6) store No. 6 fuel oil, and one tank stores displacement or cutter oil (No. 2 diesel). Three fuel oil tanks have a capacity of 375,000 barrels (bbl), and the displacement oil tank has a capacity of 10,000 bbl. A detailed description of the fuel storage area is included in the FSP. The specific soil and groundwater sampling locations and intervals, and the analytical parameters prescribed for each interval, are summarized below.

Forty-seven borings were installed in Subarea 1a during the Phase II investigations, 46 borings using hand auger sample collection techniques and one boring using the push-probe sampling technique. Forty-five borings were completed during Phase IIA (SB1-024 to SB1-067, SB1-071 to SB1-072), and one additional hand boring (SB1-038A) was completed during Phase IIB. In addition, eight groundwater samples were collected and analyzed as part of the Phase II investigations. All borings were installed to investigate the storage tanks and surrounding areas.

2.2.1.2 Subarea 1b: South Tank Farm. The South Tank Farm (Subarea 1b) includes four ASTs (Tanks #1-3 and #7). Tanks #1-3 store No. 6 fuel oil. Tanks #1 and 2 have a capacity of 131,500 bbl and Tank #3 has a capacity of 249,500 bbl. Tank #7, with a capacity of 200,000 bbl, was constructed to store diesel fuel and is currently out of service.

Twenty-six borings were installed in Subarea 1b, 21 borings using push-probe sampling techniques and five borings using hand auger sampling techniques. Four groundwater samples were collected and analyzed as part of the Phase II investigations.

2.2.1.3 Subarea 1c: Jet Fuel Tank Area. The Jet Fuel Tank Area (Subarea 1c) includes one 1,000,000-gallon tank which stores jet fuel (JP5) for the emergency gas turbine generator.

During Phase IIA, two soil borings were installed using hand auger sampling techniques. Based on field indications of soil contamination, one hand auger (SB01-070) was converted to a temporary well. No groundwater sample from that temporary well was collected because separate phase hydrocarbons were detected. In Phase IIB, four 2-inch monitoring wells were installed using HSA. Free-phase hydrocarbons were not detected in the newly installed wells. Four groundwater samples were collected and analyzed. A sample of separate phase hydrocarbons was also collected from SB01-070 for product identification.

2.2.1.4 Subarea 1d: UST Area: The UST Area (Subarea 1d), located east of the South Tank Farm, includes two 500-gallon capacity USTs, one tank storing gasoline and the other tank storing diesel

fuel. This area was previously investigated, remediated, and closed by the regulatory agency. One soil boring (SB01-068) was installed using geoprobe techniques in the northern part of this area. Four groundwater samples were collected and analyzed from existing wells.

2.2.2 Investigation Area 2: Process Treatment and Former Surface Impoundments

Three subareas of the site, grouped under "Area 2," include operations and equipment associated with wastewater treatment or disposal. The subareas include:

- Subarea 2a: Process Water Treatment
- Subarea 2b: Former First Generation Surface Impoundments
- Subarea 2c: Former Second Generation Surface Impoundments

The WWTP (Subarea 2a) is located to the southeast of the power plant. The plant is comprised of various neutralization, equalization, precipitation and storage tanks, sludge thickeners and pumps.

There have been two generations of wastewater impoundments at the site. The First Generation Surface Impoundment was located to the northwest of the power plant (Subarea 2b), and the Second Generation Surface Impoundment to the southeast of the power plant (Subarea 2c). These impoundments received wastewater similar to the wastewater entering the current WWTP. The First Generation Surface Impoundments were partially remediated. The remaining contamination of concern was investigated in detail.

The Second Generation Surface Impoundments (Subarea 2c) were decommissioned and "clean closure" was attained in 1991 from the RWQCB, with concurrence by DTSC in 1992. No further investigation of this area was included in Phase II of the assessment.

Eight soil borings were installed in Subareas 2a and 2b during the Phase II investigations, using push-probe (3) and hand auger (5) sample collection techniques (SB02-001 to SB02-008). No additional borings were completed within Area 2 during Phase IIB. In addition, two groundwater samples were collected for analysis as part of the Phase II investigations. Sampling locations were installed to investigate around the WWTP and the receiving wastewater impoundment.

The specific Area 2 soil and groundwater sampling intervals, as well as the prescribed analytical method for each retained Phase IIA and Phase IIB environmental media sample, are detailed in Table 5-3 of the FSP. In some cases, actual soil sample intervals may vary from those intervals given in the FSP due to conditions encountered at the site. Appendices A and G-1 include the actual depth intervals for all soil samples collected during Phase II.

2.2.3 Investigation Area 3: Power Generation

Three subareas of the site, grouped as "Area 3," include operations and equipment associated with power generation. The subareas include:

- Subarea 3a: Power Plant Units 1-4
- Subarea 3b: Maintenance Area
- Subarea 3c: Gas Turbine

The power plant (Subarea 3a) includes four generating units, transformers and associated equipment. Investigation of soil and groundwater conditions immediately around the power plant was conducted; however, no sampling inside the power plant was proposed due to safety concerns and the reduced risk in this area that is widely paved.

The Maintenance Area (Subarea 3b) is located directly to the south of the power plant and is underlain by fuel pipelines from the South Tank Farm.

The Gas Turbine (Subarea 3c) is located to the northwest of the power plant.

The specific Area 3 soil and groundwater sampling intervals, as well as the prescribed analytical method for each retained Phase IIA and Phase IIB environmental media sample, are detailed in the FSP. Actual soil sample intervals may vary from those intervals given in the FSP due to conditions encountered at the site (see Table 2-4). Appendices A and G-1 include the actual depth intervals for all soil samples collected during Phase II.

2.2.3.1 Subareas 3a and 3b: Power Generation Units 1-4 and Maintenance Area. Twenty-four borings were installed in Subareas 3a and 3b using geoprobe (2), HSA (1) and hand auger techniques (21), during the Phase II investigations. The borings completed in Phase IIA included SB03-001 to SB03-020, SB03-022 and SB03-024 (note that Boring SB03-015 was not drilled to subsurface utilities). In addition, six groundwater samples were collected for analysis as part of the Phase II investigations.

2.2.3.2 Subarea 3c: Gas Turbine. Two borings (SB03-021 and SB03-023) were installed in Subarea 3c using HSA techniques during the Phase II investigations. One monitoring well was installed near SB03-023, outside the Gas Turbine (GT) fenced area during Phase IIB (see Section 2.2.1.3).

2.2.4 Investigation Area 4: Construction Yard and Hazardous Materials Storage Area.

Three subareas of the plant, grouped as "Area 4," include equipment and materials storage areas. The subareas include:

- Subarea 4a: Former Drum Storage and Laydown Area
- Subarea 4b: Construction Yard
- Subarea 4c: Hazardous Materials Storage Area

The Former Drum Storage and Laydown Area (Subarea 4a) is located to the northwest of the power plant. The fenced drum storage area housed several chemicals, including pentachlorophenol. The laydown area has been used for storage of various materials. Previous investigation reports document soil conditions in this area, which was granted closure by the regulatory agency.

The Construction Yard (Subarea 4b), located to the southeast of the power plant, has been used for abrasive blasting, spray painting, and storage of materials, possibly including asbestos. An experimental desalination plant operated in the area between 1965 and 1967. Flash distillation and reverse osmosis technologies were tested in this plant.

The Hazardous Materials Storage Area (Subarea 4c), located to the south of the power plant, has been used to store motor oil, transformer oil, vehicle waste fluids and other wastes. No spill incidents have been reported for this area.

The specific Area 4 soil and groundwater sampling intervals, as well as the prescribed analytical method for each retained Phase IIA and Phase IIB environmental media sample, are detailed in the FSP. (Note that actual soil sample intervals may vary from those intervals given in the FSP due to conditions encountered at the site.) Appendices A and G-1 include the actual depth intervals for all soil samples collected during Phase II.

2.2.4.1 Subarea: 4a Former Drum Storage and Laydown Area. Five soil borings were installed in Subarea 4a during the Phase II investigations using hand auger sampling techniques (4 borings) and push-probe sampling techniques (1 boring) . In addition, one groundwater sample was collected for analysis.

2.2.4.2 Subarea 4b: Construction Yard. Five soil borings were installed in Subarea 4b during the Phase II investigations using hand auger (4 borings) and one boring (SB04-005) using push-probe sampling techniques. In addition, one groundwater sample was collected for analysis.

2.2.4.3 Subarea 4c: Hazardous Material Storage Area. Five soil borings were installed in Subarea 4c during the Phase II investigations using hand auger (3 borings) and push-probe (2 borings) sampling techniques. In addition, one groundwater sample was collected for analysis.

2.2.5 Investigation Area 5: Non-operational Areas

The large areas where no previous operations associated with the power plant have occurred were grouped as "Area 5," divided into three subareas. The subareas include:

- Subarea 5a: Open Areas
- Subarea 5b: Switchyard Border
- Subarea 5c: Septic/Leach Field

The Open Areas (Subarea 5a) are the largest areas of the site and include the southeast and east portions of the site and the area to the west of the power plant and areas bordering San Diego Bay. Abrasive blasting grit was identified northeast of the Open Areas. Gas and oil supply lines traverse the area.

The Switchyard, located immediately to the north of the power plant, is a potential source of contaminants, including transformer oils. The area adjacent to the Switchyard has been identified as Subarea 5b.

A Septic Leach Field (Subarea 5c) was identified to the west of the warehouse and southeast of the power plant.

A detailed description of sampling in the Non-operational Areas is included in the FSP. The specific soil and groundwater sampling locations and intervals and the analytical parameters prescribed for each interval are summarized below.

The specific Area 5 soil and groundwater sampling intervals, as well as the prescribed analytical method for each retained Phase IIA and Phase IIB environmental media sample, are detailed in the FSP. Actual soil sample intervals may vary from those intervals given in the FSP due to conditions encountered at the site (see Table 2-4). Appendices A and G-1 include the actual depth intervals for all soil samples collected during Phase II.

2.2.5.1 Subarea 5a: Open Areas. Eighty-three soil borings were installed in Subarea 5a during the Phase II investigations using hand auger (70), push-probe (11), and HSA (2) sampling techniques. Thirteen borings were converted to temporary well points. During Phase IIB, two 2-inch monitoring

wells (SB5-041A and SB5-043A) were installed and subsequent water samples were collected and analyzed.

2.2.5.2 Subarea 5b: Switchyard Border. Nine soil borings were installed in Subarea 5b during the Phase II investigations using hand auger (7) and push-probe (2) sampling techniques. In addition, water samples were collected and analyzed.

2.2.5.3 Subarea 5c: Septic/Leach Field. Four soil borings were installed in Subarea 5c during the Phase II investigations using hand auger (3) and push-probe (1) sampling techniques. In addition, one water sample was collected and analyzed.

2.2.6 Investigation Area 6: National City Terminal

The NCT was included as "Area 6" of the SBPP. The NCT includes three large ASTs; two tanks store No. 6 fuel oil (Tanks #1 and #2), and one tank stores displacement oil. The tanks have a capacity of 131,000, 180,000 and 36,500 bbl, respectively. A detailed description of the NCT is included in the FSP.

The specific Area 6 soil and groundwater sampling intervals, as well as the prescribed analytical method for each retained Phase IIA and Phase IIB environmental media sample, are detailed in the FSP. Actual soil sample intervals may vary from those intervals given in the FSP due to conditions encountered at the site (see Table 2-4). Appendices A and G-1 include the actual depth intervals for all soil samples collected during Phase II.

The specific soil and groundwater sampling locations, intervals, and the analytical parameters prescribed for each interval are summarized below.

Twenty soil borings were installed in Area 6 during the Phase II investigations using push-probe (4) and hand auger (16) sample collection techniques. The soil borings installed included SB06-001 through SB06-020. In addition, four groundwater samples were collected and analyzed as part of the Phase II investigations.

2.3 Additional Data Gathering Activities

Additional data gathering tasks completed at the site included site surveying, depth to groundwater gauging, physical soil, and groundwater parameter testing (e.g., testing of grain size, distribution, pH, etc.), and site-specific hydrogeologic material testing. A brief description of each additional data gathering activity is provided in the following sections.

2.3.1 Site Survey

The elevations of the top of casings for the Phase IIB wells and selected temporary wells were professionally surveyed. The elevations of the temporary wells and the soil sampling locations were based on site topographic maps and detailed site plans. All boring locations were surveyed by a SDG&E subcontractor. The survey data are included in Appendix C.

2.3.2 Physical Soil Sampling Parameters

Selected soil sampling intervals throughout the site were collected from boring locations SB1-072, SB2-001, SB3-024, SB5-043, SB6-005, SB2-002A, SB3-016A and SB4-010A and analyzed for general physical, soil geotechnical and organic carbon analytical parameters. These locations and depth intervals were selected to represent different subsurface soil horizons at the site, and provide spatial coverage of the areas of investigation. Physical soil analysis parameters include grain size distribution, moisture content, hydraulic conductivity, TOC, and bulk density.

2.3.3 General Water Quality Parameters

Groundwater samples were collected from temporary well points SB02-002 and SB05-054 and analyzed for general water quality parameters. All sampling protocols were carried out in accordance with the project-specific FSP and QAPP. The general water quality parameters analyzed included calcium (Ca), iron (Fe), manganese (Mn), magnesium (Mg), potassium (K), zinc (Zn), chloride (Cl), sodium (Na), nitrate (NO_3), bromide (Br), alkalinity, hardness, sulfate (SO_4), pH, conductivity, TDS and fluoride (F).

2.3.4 Liquid Level Gauging

The depth to groundwater at each temporary well point and monitoring well installed, and in accessible existing monitoring locations, was measured in March 1998 using an interface probe. The depth to groundwater was measured before water samples were collected and are presented in Appendix B and in Table 2-3. While sampling temporary well SB01-070 in Subarea 1c, free-phase hydrocarbons were observed in the purge liquid. On June 9, 1998, the free-phase hydrocarbon thickness in the narrow well SB01-070 was measured at 0.11 feet, using a submerged clear tubing. The nearly 2-inch well did not have a measurable thickness of free-phase hydrocarbon, when measured in April and June, 1998.

2.4 Data Management

Due to the large amount of data collected for this project, GIS/Key was selected to store, manage, report, and visualize the data. GIS/Key is an environmental data management software package

which utilizes AutoCAD™ as its graphic engine, FOXPRO™ as its database engine, and QUICKSURF™ as its contouring package.

Soil boring log information was collected on field sampling forms, then entered into GIS/Key. Final boring logs were then generated, and the data were used in generating geologic cross sections.

Analytical field sampling information was collected in the field and entered into a sample tracking spreadsheet. This spreadsheet was converted to a normalized database file and was then merged with an electronic data deliverable (EDD) from the laboratory delivered in GIS/Key version 2.2 database format. The merged file was run through the GIS/Key build routine, supplied by GIS/Solutions, which checks for valid data flags and data relations, then parses the data into a relational database structure for direct import into GIS/Key.

Once the data were imported into GIS/Key, QA checks were conducted to ensure that the data delivered on laboratory hard copy matched the data sent in the EDD and to confirm that all data requested from the laboratory were received. FOXPRO™ routines were then created to perform various calculations and database queries. A graphical summary of the flow of data from the FSP to the database output is presented on Figure 2-3. This summary also shows the QC checks performed by Fluor Daniel GTI to ensure that data integrity was maintained throughout the process. A description of each QC check is provided in Appendix D. Any revisions to data resulting from the data validation process (see Appendix E) were manually entered into the database.

3.0 PHASE II ESA RESULTS AND ENVIRONMENTAL BASELINE

One of the Phase II ESA objectives was to develop a comprehensive site-wide environmental baseline for the SBPP and the NCT. A baseline was developed by combining the Phase II Investigation results with relevant and valid data from prior environmental investigations. This section presents the combined database prepared with data from Phase II ESA investigations on soil and groundwater. Fluor Daniel GTI reviewed the information reported during investigations conducted prior to the Phase I and Phase II ESA for validity and relevancy to present site conditions. Relevant data from these prior investigations were then incorporated into the soil and groundwater database for the Site. The goals of this presentation are to: (1) further describe the physical characteristics of each site, (2) describe the nature and extent of the presence of chemicals in soil and groundwater from the data collected during the Phase II investigations, and (3) determine if the potential source areas identified in the Phase I ESA have impacted underlying soil and groundwater. The data evaluation is organized by environmental media and analytical method and includes information regarding:

- Frequency of detection for the chemical analytes
- Lateral and vertical distribution of selected chemicals
- Correlation to issues previously identified or assessed at the SBPP and the NCT with the data collected in the Phase II investigations
- Likely sources of chemicals in soil and groundwater

As with Section 2.0, this section corresponds to Task 2 (Additional Data Collection) of the project approach described in Section 1.2.

3.1 Description of Physical and Chemical Site Characteristics

This section of the report provides descriptions of the physical characteristics near and at each site. The physical characteristics were briefly described in Section 1.5. Additional data collected during the Phase II investigations have resulted in further understanding of site conditions, including surface water, site geology and hydrogeology, and anthropogenic (man-made) structures. This additional information is presented below.

3.1.1 Surface Water

The distribution of surface water at each site was described, in detail, in the Phase I ESA Report. As described in that report, surface waters at the SBPP include mainly the San Diego Bay to the west, the salt evaporation impoundments which abut the SBPP to the south and southwest and Telegraph

Canyon Creek which transects the property in a now-concrete-lined channel from east to west in the central part of the SBPP. An unnamed, improved surface water drainage is located at the northern boundary of the SBPP property.

Several storm water management ditches and berms exist throughout the SBPP, and berms have been built around the fuel storage tanks to control potential spills. These bermed areas form localized ponding during rain events, and accumulated storm water is inspected visually prior to discharge from the containment area, in accordance with the existing Storm Water Management Plan. During the Phase II investigations performed in March and April 1998, rainwater and surface water run-off was observed in the containment bermed areas, and no hydrocarbon sheens were observed.

As indicated in the Phase I ESA Report, no particular issues concerning surface waters were identified, and no surface water sampling was conducted. However, the results of the subsurface investigation at the SBPP should be evaluated to determine potential impacts from groundwater to surface water.

At the NCT, surface water issues are also presently handled through implementation of a Storm Water Management Plan. Rainwater accumulates locally in contained bermed areas, and the ponded water observed during the Phase II rain events did not display hydrocarbon sheens or odors of concern.

Along the route of the pipeline which links the NCT and the SBPP, surface water includes coastal salt water marshes and tidal channels, including a portion of the Sweetwater River and Paradise Creek. The Phase I ESA Report identified two fuel spills that could have impacted surface waters. A spill in the vicinity of E Street was remediated and closure was granted by the regulatory agency. A spill reported in the northern part of the pipeline in the vicinity of the wetlands was reported to have been remediated, and this area was not investigated during the Phase II investigations. A visual inspection of the entire length of the pipeline was conducted on March 24, 1998, and no evidence of hydrocarbon sheen was observed in open surface water bodies adjacent to the pipeline route (see the Phase I ESA Report).

3.1.2 Site Geology

The Phase I ESA Report describes, in detail, the regional geologic setting of the SBPP and the NCT, and the Phase II investigations confirmed the Phase I geologic interpretation. As described in the Phase I ESA Report, previous investigations at the SBPP and the NCT have included shallow borings, monitoring wells, and deeper borings to as much as 212 feet below grade.

3.1.2.1 Lithologic Description. Soils at the SBPP were found to consist of mostly fine-grained sediments (silts and clays), with local sand stringers. The western part of the property, in the vicinity of the Jet Fuel Tank Area and the former impoundments and former storage yard, were found to

contain construction debris (asphalt and concrete), confirming historical reports that excavations and backfilling operations were conducted at the SBPP.

The lithologic description of the soils encountered during drilling were logged using the USCS soil classification system, and all boring logs are included as Appendix A. Representative lithologic cross-sections (labeled A-A' and B-B') were prepared to present the distribution of lithologies under the SBPP. Figure 3-1a illustrates the location of the borings transected by the cross-sections, and the cross-sections are included as Figures 3-1b and 3-1c. The lithology at the NCT was found to be similar to the SBPP; thus, no cross-sections were prepared for the NCT.

3.1.2.2 Physical Parameters. To further define the physical characteristics of the lithologic units at the SBPP and the NCT, 11 samples from the vadose and water-saturated zones were collected at selected locations for analysis of physical parameters. Samples were collected from locations at the eastern edge of the SBPP property, the western edge of the SBPP property in the vicinity of the San Diego Bay, and in the central area around the generating plant. At the NCT, one vadose zone sample and one saturated zone sample were collected from a boring located at the western edge of the property.

Six samples were collected from the vadose zone, and five samples were collected from the saturated zone. The soil samples were analyzed for physical parameters using American Society of Testing and Metals (ASTM) Method D2216, American Petroleum Institute (API) Method RP 40, EPA Method 9100, and the Walkley-Black Method. These analyses included grain size distribution, bulk and grain density, effective porosity, moisture content, pore fluid saturation, TOC, and permeability values (Appendix F).

The grain size analyses confirm the overall fine-grained lithologies, with most samples containing silt as the predominant grain size, followed by clay and fine sand fractions. The grain size analyses also demonstrate the wide range of lithologies, with occasional samples having sand as the predominant grain size. The results of other physical analyses are summarized in Table 3-1.

The range of physical properties of the vadose zone samples is:

- Moisture Content: 7.2 to 19.2% by weight
- Bulk Density: 1.55 to 1.67 g/cc
- Grain Density: 2.57 to 2.68 g/cc
- Effective Porosity: 36.3 to 41.7%
- Water Saturation: 31.3 to 99.9%

- Permeability (Air): 0.44 to 15,082 millidarcies

The range of physical properties of the saturated zone samples is:

- Moisture Content: 13.1 to 24.1% by weight
- Bulk Density: 1.55 to 1.69 g/cc
- Grain Density: 2.54 to 2.61 g/cc
- Effective Porosity: 33.6 to 40.2%
- Water Saturation: 65.2 to 99.8%
- Permeability (Water): 2.97 to 2359 millidarcies
- Hydraulic Conductivity: 2.85 E-06 to 2.28 E-03

The wide range of reported hydraulic conductivity values confirms the field observations of heterogeneous lithologic conditions at the SBPP, and the reported values generally conform with the values reported in previous reports (Woodward-Clyde, 1986). Overall, the values of physical parameters for the NCT were similar to the SBPP samples.

3.1.3 Site Hydrogeology

This section includes a discussion of site-specific hydrogeologic conditions, aquifer parameters, general water quality and designated beneficial uses of groundwater and surface water. The Phase II investigations confirmed the findings on local hydrogeologic conditions at each site reported during previous site investigations. Additional information collected at each site during the Phase II investigations included gauging of groundwater and sampling of groundwater in temporary wells or monitoring wells, and resampling of previously installed monitoring wells.

3.1.3.1 Hydrogeologic Setting. The hydrogeologic setting of the SBPP and the NCT, as described in the Phase I ESA Report, was confirmed during this investigation.

Regionally, the SBPP is located within the Telegraph Hydrographic Subarea of the Lower Sweetwater Hydrographic Subunit of San Diego County (Woodward Clyde, 1986). The NCT is located within the La Nacion Hydrographic Subarea of the Lower Sweetwater Hydrographic Unit. Recharge is from regional precipitation and local infiltration from streamflow in the Otay River, Telegraph Canyon Creek, and the Sweetwater River. Regional discharge is generally to the San Diego Bay (Woodward Clyde, 1986).

No groundwater supply wells are located at the SBPP or at the NCT. The same water supply well is nearest to the SBPP and the NCT, and is located 0.75 miles east of the SBPP (EDR Report included in the Phase I ESA Report), and is believed to be screened from a depth of at least 125 feet below grade. An earlier report (Woodward-Clyde, 1988) also indicates water wells within 0.25 miles of the SBPP.

The SBPP and the NCT are underlain by a shallow groundwater saturated zone found at a depth of about 10 to 15 feet below grade, as measured in temporary groundwater sampling points and monitoring wells during sampling (Table 2-3). Groundwater occurs in alternating fine-grained layers with local sand stringers. Based on groundwater elevations, a generalized potentiometric surface map was prepared for the SBPP (Figure 3-2). As illustrated on this figure, groundwater at the SBPP was determined to generally flow westward toward the San Diego Bay, similar to the groundwater gradient measured during previous investigations. At the NCT, the groundwater gradient was not calculated, as wellhead elevations were not surveyed. It is possible that groundwater at the NCT is tidally influenced.

3.1.3.2 Aquifer Parameters. During the Phase II investigations, five samples were collected for estimation of aquifer parameters. As described in Section 3.1.2.2, the physical analyses of saturated soil samples indicated hydraulic conductivities of 2.97 cm/s to 2,197 cm/s at the SBPP, and 2,359 cm/s at the NCT, corresponding to approximately 0.01 ft/day to 5 ft/day.

The mean effective porosity was approximately 37 percent. Based on these values, and a groundwater gradient of about 0.005 ft/ft, the groundwater seepage velocity can be estimated to range from <1 ft/year to 25 ft/year. It should be noted that local sand layers may provide higher migration rates.

The TOC concentrations in analyzed soil samples ranged from below the detection limit (<100 mg/kg) to 1,250 mg/kg.

3.2 General Groundwater Quality

Previous sampling of groundwater at the SBPP (Woodward Clyde, 1986) indicated that the shallow groundwater is brackish, with TDS concentrations unsuitable for potable groundwater, ranging from 1,800 to 4,500 mg/l. This finding was consistent with the reported calcium-chloride classification of groundwater in the Sweetwater Hydrographic Unit. Saltwater intrusion was also reported to occur at the SBPP (Woodward Clyde, 1986).

Groundwater samples from two selected wells at the SBPP were collected to evaluate the background water quality of groundwater. The results of the inorganic analyses confirm the brackish groundwater

conditions (defined as having TDS concentrations of 1,000 to 10,000 ppm), with TDS concentrations at the SBPP exceeding 1,000 ppm (Section 2.3).

The locations of the samples SB02-002 and SB05-054 for evaluation of background inorganic groundwater quality were selected in the central part of the site.

3.3 Approach to Presentation of Chemical Data

The chemical data for the Site consist of organic and inorganic analysis. The analytical results of organic analytes can be described and interpreted in a relatively straightforward manner, as organic analytes detected can usually be readily identified with potential man-made sources or operations. Inorganic analytes include metals which occur naturally in soils and groundwater. Interpretation of metal data must consider the natural background concentrations existing at the Site. A review of metal concentration data generally requires the establishment of natural or background concentrations. The background concentrations are used as a basis for comparison to other areas in which elevated concentrations may potentially be present. After presenting relevant data from previous investigation in Section 3.4, naturally occurring metal concentrations are established in Section 3.5.

Sections 3.6 through 3.8 present the baseline conditions for soil and groundwater. The baseline conditions do not include background data for metals in soil and groundwater. These sections discuss only the analytes with at least one detectable concentration. A complete listing of analytical results is presented in Appendices G-1 to G-4 for Phase II investigations and Appendix G-5 for previous investigations. Graphical presentation of baseline data is limited to only significant analytes. For the purposes of graphical presentation of data, significant analytes are those analytes that exceed applicable regulatory limits (see Section 4.0) or were determined to be COPCs in the BHRA (see Section 5.4.4).

3.4 Previous Analytical Data

3.4.1 Previous Soil Analytical Data

The previous investigation reports on the Site included soil concentration data from fuel areas (UST area, East Loop Fuel area, and the NCT) and from the First and Second Generation Surface Impoundments.

Soil samples collected from the UST area included pre- and post-remediation samples. The post-remediation hydrocarbon concentrations available from the reports, and some soil data from borings

outside the excavated areas, were included in the baseline database for the site (UST Investigation, Woodward-Clyde Consultants, 1988; UST Remediation, IT Corporation, 1988).

Soil samples collected from borings in the area of the East Loop Fuel release contained post-remediation hydrocarbon concentrations, and these data were included in the baseline database (EnecoTech Report, 1997).

Soil samples collected at the NCT after the remediation efforts (EnecoTech Report, 1997) contained important information concerning environmental conditions at the NCT, and this set of data was incorporated into the database.

Soil analytical data from the First Generation Surface Impoundments included Total Petroleum Hydrocarbon (TPH) Total Recoverable Petroleum Hydrocarbon (TRPH), and metal concentration data which were incorporated into the database, and will be considered as an integral part of the baseline data for the Site. The soil data collected from the investigation and remediation of the Second Generation Surface Impoundments were not incorporated into the database, because the pre-excavation samples were not representative of present (post-remediation) conditions, and because the accuracy of the depth of the post-excavation sampling locations was limited. During the investigation of the Second Generation Surface Impoundments, soil samples were also collected at locations in the eastern part of the SBPP, to be used for determination of background conditions. As a much larger number of background samples was collected during the Phase II investigations, these previous background data were not included within the baseline soil conditions for the Site.

3.4.2 Previous Groundwater Analytical Data

Groundwater samples were collected during previous investigations in the UST area and the Second Generation Surface Impoundments Area of the SBPP.

The groundwater information from the UST investigation was not considered representative of present baseline groundwater conditions; therefore, these data were not included in the baseline database for the SBPP. Groundwater was resampled from the monitoring wells in the UST area during the Phase II ESA to reflect present conditions.

Groundwater information from the Second Generation Surface Impoundments included mostly pre-remediation analytical information, and was not considered representative of present conditions. The information regarding ranges of metal concentrations that were considered acceptable for closure by the regulatory agencies will be used for data evaluation and screening in Section 4.6.6. The Phase II ESA included sampling of groundwater in the area around the Second Generation Surface Impoundments.

No previous groundwater investigation data were found for the NCT.

3.5 Naturally Occurring Metal Concentrations

The analytical results of organic compounds can be described and interpreted in a relatively straightforward manner, as organic compounds detected can be readily identified with man-made sources or operations. Inorganic compounds, on the other hand, include metals which occur naturally in soils and groundwater and evaluation and identification of metals above background may require further evaluation by comparison with site-specific background data. Therefore, interpretation of metal data must consider the natural background concentrations existing at the Site. A review of metal concentration data generally requires the establishment of a natural background or baseline concentration. The background concentration is used as a basis for comparison to other areas in which elevated concentrations may potentially be present.

As specified in the DTSC guidelines (DTSC 1997), the main criteria for establishing a background area were that the area should not have a past or present operational history of releasing metals to the soil or groundwater and that the data set for the area should contain a sufficient number of samples for statistical evaluation.

Metal concentrations naturally occur in native soils and groundwater, and a background distribution of metal concentrations in soil and groundwater at the Site was calculated to provide a benchmark to determine if metal-related activities have impacted the Site.

The DTSC's final policy, dated February 1997, also specifies that the nonparametric statistical procedure, the Wilcoxon Rank Sum Test, should be used when comparing the potentially site-impacted population to the background population of soil and groundwater samples to determine if metals have impacted soils and groundwater, respectively, at the Site. Details concerning the application of this test are provided in Appendix H. Results of this analysis are presented in Sections 4.5.6 and 4.6.6 when metal results are discussed for the baseline data for soil and groundwater, respectively.

3.5.1 Background Metal Concentrations in Soils

Soil samples from Investigation Area 5, Non-operational, were classified as the background data set for metals at the SBPP and the NCT. A previous background study at the SBPP also relied on this part of the site for background studies.

Two hundred and one soil samples were collected from the soil borings in Investigation Area 5. Borings SB05-082 and 083 were excluded on the basis that the localized area in which they were drilled might have been impacted by metal-related activities, as determined during the Phase I ESA. According to the DTSC guidelines, and as described in detail in Appendix H, the background concentrations of metals (C_{bkg}) in soil were calculated to be the 95 percentile value. It should be noted that there were no detections of beryllium and antimony. Thus, a value of one-half of the method

reporting limit was used. A summary of background metal concentrations in soil, as determined above, is presented in Table 3-2. Background metal concentrations were also determined previously for the SBPP during closure of the Second Generation Surface Impoundments and were referred to as the cleanup goals (Mittlehauser, 1992). These cleanup goals, along with the metal background concentrations in soil at the Site, are shown in Appendix H (Table H-1). However, these 1992 background calculations were not used in this report because the mathematical procedures used previously for addressing site background values do not conform to the present guidelines (DTSC, 1997). Additionally, the present study included a much larger set of soil samples than the 1992 study, thereby improving the reliability of background value estimates.

3.5.2 Background Metal Concentrations in Groundwater

The background data set for groundwater can be similarly established using wells or monitoring points upgradient of an area that does not have a past or present operational history that could release metals to soil or groundwater. Eleven temporary monitoring points located at the eastern edge of the SBPP were considered as upgradient wells for metal concentrations and were used to establish background groundwater metal concentrations. According to the DTSC guidelines, and as described in detail in Appendix H, the background concentrations of metals (C_{bkg}) in groundwater were calculated to be the 95 percent upper confidence limit (UCL) value. A summary of background metal concentrations in groundwater is presented in Table 3-3.

3.6 Distribution of Chemicals in Soil

This section provides a discussion of the analytical results of the Phase II investigations for soil. The distribution of chemicals detected during the Phase II investigations is presented and discussed by chemical group or analytical method. All soil sample results in this section are discussed on a wet weight basis, unless otherwise noted. The discussions contained in the following sections are based on summary tables. The summary tables list:

- each chemical analyte detected,
- the number of soil samples analyzed,
- the total number of samples where the analyte was detected above the method reporting limit for the sample,
- the total number of samples where the analyte was detected below the method reporting limit for the sample (i.e., estimated values),
- the maximum detected concentration,

- the location and depth of that detection,
- the arithmetic mean,
- the normal standard deviation, and
- the 95 percent upper confidence limit of arithmetic mean (UCL).

The reporting limit of an analyte for a sample is the method reporting limit for the analyte multiplied by the dilution factor. Sometimes, dilution is required due to matrix interference during analysis in the laboratory. Detection of an analyte at less than the reporting limit indicates that the analyte has been identified, but quantification of the concentration is at less than the 99 percent confidence level. A complete listing of the laboratory results of soil analyses is provided in Appendix G-1 for the Phase II investigations and Appendix G-5 for previous investigations.

A complete listing of the laboratory results is provided in Appendices G-1 to G-4. A listing of applicable analytical results from previous investigations is provided in Appendix G-5.

3.6.1 Total Extractable Hydrocarbons

Tables 3-4 and 3-5 provide a summary of the TEH detected in soil samples during the Phase II investigations and previous investigations at the SBPP and the NCT, respectively. Tables 3-4 and 3-5 also summarize TEH, TPH and TRPH concentrations from previous investigations. TEH concentrations exceeded 1,000 mg/kg in four soil samples at the SBPP; three samples were collected from the First Generation Surface Impoundments, ranging in depth from 7.5 to 9 feet bgs, with boring B6 containing the highest concentration of TEH at 8,300 mg/kg collected from 9 feet bgs. The other sample was collected from the "East Loop" Fuel area at a depth of 6 feet bgs. The following samples contained TEH concentrations greater than 1,000 mg/kg at the SBPP:

- B6@9 8,300 mg/kg
- B8@7.5 2,700 mg/kg
- B5@7.5 2,600 mg/kg
- ELB1@6 1,600 mg/kg

TEH concentrations exceeded 100 mg/kg in 24 of the 523 soil samples analyzed at the SBPP. Fourteen soil samples contained TEH concentration between 50 and 100 mg/kg. All other samples contained TEH concentrations of less than 50 mg/kg.

At the NCT, TEH concentrations exceeded 1,000 mg/kg in 17 soil samples. All of these samples were collected as surface samples (at a depth of less than 1.5 ft.). Boring #12, located near Fuel Oil Tank

#1, Pump No. 2, contained the highest concentration of TEH (34,000 mg/kg) collected from less than 1.5 feet bgs. The following samples had TEH concentrations greater than 1,000 mg/kg at the NCT:

- #02@1 14,400 mg/kg
- #03@1 4,400 mg/kg
- #04@1 2,400 mg/kg
- #05@1 2,200 mg/kg
- #06@1 18,000 mg/kg
- #10@1 3,700 mg/kg
- #12@1 34,000 mg/kg
- #13@1 10,000 mg/kg
- #14@1 3,100 mg/kg
- #16@1 1,500 mg/kg
- #17@1 18,000 mg/kg
- #18@1 1,300 mg/kg
- #19@1 4,500 mg/kg
- #22@1 1,400 mg/kg
- #23@1 5,500 mg/kg
- #26@1 1,200 mg/kg
- #30@1 4,900 mg/kg

TEH concentrations exceeded 100 mg/kg in 23 of the 74 soil samples analyzed. Seven soil samples contained TEH concentrations between 50 and 100 mg/kg. All other samples contained less than 50 mg/kg of TEH.

Figures 3-1a and 3-1b depict TEH concentrations in soil samples collected during the Phase II investigations and previous investigations. Due to the large number of samples collected, and the focus on the areas of potential concern, only TEH concentrations greater than, or equal to, 100 mg/kg are shown on Figures 3-1a and 3-1b for the SBPP and the NCT, respectively. Previous remedial actions in the central part of the SBPP were conducted based on a 1,000 mg/kg TEH cleanup level for this Site. Based on that precedent, the 100 mg/kg screening level is conservative. Any Phase II ESA sample where the TEH concentration was greater than, or equal to, 100 mg/kg was also analyzed for PAHs. The rationale for this criterion is discussed in the FSP. The results of these analyses are discussed in Section 3.6.4.

All Phase II ESA soil samples with TEH concentrations above 100 mg/kg were analyzed for PAHs and BTEX. These results are presented in Sections 3.6.2 and 3.6.4.

TEH impacts are mostly in shallow soils, with possible sources being current and historic ASTs, underground and aboveground piping, and equipment associated with the SBPP and the NCT.

3.6.2 Volatile Organic Compounds

One hundred and twenty-nine soil samples collected during the Phase II ESA at the locations reported in Appendix G-1 were analyzed for VOCs by EPA Method 8260 and for BTEX by EPA Method 8020. No VOC samples from previous investigations were incorporated in the baseline data. Soil samples were also analyzed for BTEX where TEH concentrations exceeded 100 mg/kg. Soil samples from the following areas were analyzed for VOCs:

- Investigation Subarea 3a: Power Plant Units 1-4
- Investigation Subarea 3b: Maintenance Area
- Investigation Subarea 4a: Former Drum Storage and Laydown Area
- Investigation Subarea 4b: Construction Yard
- Investigation Subarea 4c: Hazardous Materials Storage
- Investigation Subarea 5c: Septic/Leach Field
- Investigation Area 6: NCT

Table 3-4a summarizes the results of the two VOCs detected in soil samples collected at the SBPP during the Phase II investigations. VOCs detected were xylenes and ethylbenzene. Table 3-5 summarizes the results of the four VOCs detected in soil samples collected at the NCT during the Phase II investigations. VOCs detected in the NCT soil samples were xylenes, n-butylbenzene, sec-butylbenzene and tert-butylbenzene.

At the SBPP, VOCs in soil were detected in Investigation Area 1, near the Jet Fuel Tank Area and near Fuel Oil Tank #6 in the North Tank Farm. Boring SB01-070A contained the highest concentration of both VOCs detected, ethylbenzene and xylenes, at 3.5 and 7.5 mg/kg, respectively. The soil sample was collected from a depth of 8.5 to 9.0 feet bgs, near the depth of the groundwater table.

At the NCT, VOCs in soil were detected at two boring locations. Boring SB06-014 contained the highest concentration of both xylenes and tert-butylbenzene at 0.0093 and 0.062 mg/kg, respectively. The soil sample was collected from a depth of 4.0 to 5.0 feet bgs. Boring SB06-006 contained the highest concentration of both n-butylbenzene and sec-butylbenzene at 0.0042 and 0.013 mg/kg, respectively. The soil sample was collected from a depth of 4.0 to 5.0 feet bgs. Boring SB06-014 is located near Fuel Oil Storage Tank #1 and Boring SB06-006 is located near Fuel Oil Storage Tank #2.

The sources of VOC impacts are suspected to be primarily fuel releases from ASTs and associated piping.

3.6.3 Semivolatile Organic Compounds

Ten soil samples for analysis of SVOCs using EPA Method 8270 were collected only at the SBPP in Investigation Subarea 4a, Former Drum Storage and Laydown Area. Their locations are reported in Appendix G-1. Table 3-4 provides a summary of the SVOCs detected at the SBPP.

The only SVOC detected in the ten samples analyzed was Bis(2-ethylhexy)phthalate (DEHP). Boring SB04-015 contained a very low concentration (0.001 mg/kg) in soil samples collected from a depth of 4.0 to 5.0 feet bgs. The suspected source of the SVOC impact is unknown, but DEHP is a common laboratory contaminant.

The results indicate that SVOCs are not a concern at the Site.

3.6.4 Polynuclear Aromatic Hydrocarbons

Twenty-seven soil samples collected at the locations reported in Appendix G-1 were analyzed for PAHs by EPA Method 8310 during the Phase II ESA. Fifteen of these samples had TEH concentrations exceeding 100 mg/kg. PAH concentrations at the SBPP were below 1 mg/kg, and below 5 mg/kg at the NCT. Two PAHs were detected in soil at the SBPP (Table 3-4a). Four PAHs were detected in the NCT soils (Table 3-5). The summary tables for naphthalene include results of analyses using EPA Methods 8260, 8270 and 8310. The summary tables for acenaphthene include results of analyses using EPA Methods 8270 and 8310. PAHs detected at the SBPP were acenaphthene and naphthalene; at the NCT, the PAHs detected were naphthalene, acenaphthene, chrysene and pyrene.

At the SBPP, PAHs in soil were detected in Investigation Areas 1 and 3 near the Jet Fuel Tank Area and the GT. Naphthalene was detected in two samples at Borings SB01-070 and SB03-023. The highest concentration (0.16 mg/kg) was contained in Boring SB01-070 at a depth of 9.0 to 10.0 feet bgs near the depth of the groundwater table. This sample also contained the highest detected concentration of TEH. Acenaphthene was detected in one sample collected at Boring SB03-023. The concentration was 0.23 mg/kg and was collected from 3.5 to 4.5 feet bgs.

The source of the detected PAHs at the SBPP is believed to be associated with the release of fuel, which is likely to be the Jet Fuel Tank Area and associated underground piping.

At the NCT, all PAHs in soil were detected from the same boring, SB06-014. This boring is located near Fuel Oil Storage Tank #1 and the sample containing PAHs was collected from a depth of 4.0 to 5.0 feet bgs. The concentrations of naphthalene, acenaphthene, pyrene and chrysene were all below 2.5 mg/kg.

The limited impact of PAHs at the SBPP and NCT appears to be localized in several ASTs and related to fuel releases.

3.6.5 Polychlorinated Biphenyls

Three hundred and nineteen soil samples collected during the Phase II ESA at the locations reported in Appendix G-1 were analyzed for PCBs using EPA Method 8081. Of the six samples that had

detectable concentrations of PCBs, only two samples contained PCB concentrations above the method reporting limit of 0.05 mg/kg. Soil samples were analyzed for PCBs in the following areas:

- Investigation Area 3: Power Generation
- Investigation Subarea 4a: Former Drum Storage and Laydown Area
- Investigation Subarea 5a: Open Area
- Investigation Subarea 5b: Switchyard Border
- Investigation Area 6: NCT

Table 3-4 and 3-5 summarize the results of PCBs detected in soil samples collected during the Phase II investigations at the Site. PCBs were detected in six soil samples, all collected from the SBPP. NCT had no detectable concentrations of PCBs in the 41 samples analyzed. The maximum concentration detected at the SBPP was 0.171 mg/kg located at SB05-090, near the maintenance building, collected from a depth of 1.5 to 2 feet bgs. The deeper sample collected from that location at 4.0 to 5.0 feet bgs contained no detectable PCB concentrations.

These results indicate that PCBs are not a concern at the Site.

3.6.6 pH

The analyses for soil pH were conducted on all Phase II ESA soil samples analyzed for CAM metals. The range of reported soil pH was 5.4 to 9.5 at the SBPP and 7.5 to 9.3 at the NCT. These ranges are within typical ranges for shallow soil. Appendix G-1 contains pH data for all soil samples.

3.6.7 Metals

During the Phase II ESA investigation, 521 soil samples collected at the locations reported in Appendix G-1 were analyzed using EPA Methods 6010 and 7471 for the 17 metals listed in Section 66261.24 of Title 22 of the California Code of Regulations. Previous metal analyses results from the First Generation Surface Impoundments were also incorporated into the baseline environmental data set. Table 3-6 summarizes the results of the 14 metals detected in SBPP soils during the Phase II investigations and previous studies, and Table 3-7 summarizes the results of the 10 metals that were detected in the NCT soil samples collected during the Phase II investigations.

Arsenic, barium, chromium, cobalt, copper, lead, nickel, vanadium, and zinc were detected in most of the samples. These metals are known to occur in native soils. Beryllium and molybdenum were detected in three and four samples, respectively. Antimony was detected in seven samples, all below the method reporting limit (6 mg/kg).

The results of the Phase II ESA and previous metal analyses indicate that soils in the First Generation Surface Impoundments area have been impacted by metals. Additionally, Phase II ESA boring SB05-082 contained the highest detected concentrations of molybdenum (190 mg/kg) and copper (320 mg/kg). This boring is located in an area where disposal of metal-impacted soil and abrasive blasting might have occurred, as determined during the Phase I ESA. However, the range of metal concentrations and the apparent distribution of metals in areas not associated with potential sources indicate that the reported metal concentrations in soil may be related to background soil characteristics.

Because metals are known to occur in native soils, soil borings at the SBPP and the NCT were grouped for the purpose of evaluating CAM metals into a background area (represented by 201 samples) and areas potentially impacted by site-related metal activities. Three hundred and fifty-three soil samples were collected from soil borings in areas potentially impacted by site-related metal activities at the SBPP. Table 3-8 summarizes the results of the 15 metals detected in these soil samples during the Phase II investigations and previous investigations. Forty-one soil samples were collected from soil borings in areas potentially impacted by site-related metal activities at the NCT. Table 3-9 summarizes the results of the ten metals detected in these soil samples during the Phase II investigations. No previous investigation data for metals were included at the NCT.

Based on a comparison with soil standards (discussed later in Section 5.0), the concentration of eight metals (arsenic, lead, nickel, molybdenum, antimony, beryllium, cadmium, and chromium) exceeded screening levels at the SBPP (see Section 5.0 for a detailed description of soil screening procedures). Background distribution calculations were performed for the eight metals exceeding screening levels at the SBPP for all samples collected during the Phase II investigations, but excluding the previous investigation data for the First Generation Surface Impoundments (Appendix H). The calculations indicate that the distribution of all these metals concentrations, except antimony, are similar to the distribution in the background soil. The concentrations of antimony that exceeded the method reporting limit were all from the former First Generation Surface Impoundments. All other boring locations were from Phase II investigations and had detectable concentrations below the method reporting limit of 6 mg/kg (i.e., estimated values). Therefore, it can be concluded that arsenic, antimony, cadmium, and beryllium impacts to the site are limited tot he First Generation Surface Impoundments area and that the metals in the remaining areas of the site do not present a concern. Further evaluation of metal concentration in the First Generation Surface Impoundments area will be presented in Section 5.4.5.

The distributions of four metals (molybdenum, chromium, lead, and nickel) in potentially impacted areas were determined to be consistent with their naturally occurring concentration distribution in the background soil population (Appendix H).

At the NCT, based on a comparison with soil standards, the concentration of arsenic and lead exceeded screening levels (see BHRA, Section 5.0). The distributions of arsenic and lead at the NCT were determined to be consistent with their naturally occurring concentration distribution in the background soil population (Appendix H).

It is important to note that, by virtue of a comparison with the 95th percentile concentration in background soils, some site soil concentrations are expected to exceed calculated background concentrations, even if soils were not impacted by site-related activities and, in fact, represent background concentrations. Based on the background calculations (Appendix H), the impact of metals in the area of boring SB05-082 is not a concern. It appears that soil in the Former First Generation Surface Impoundments Area (Investigation Subarea 2b) is potentially impacted by site-related activities and this area appears to be the reason concentrations of arsenic, antimony, beryllium, and cadmium were found not to be similar to the background soil distribution. Among the four metals not demonstrated to be at background (arsenic, antimony, beryllium, and cadmium), only arsenic was determined by the BHRA to be a COPC.

3.6.8 Asbestos

Six soil samples collected at the locations reported in Appendix G-1 were analyzed for asbestos using EPA Method 600 by PLM. Asbestos was not detected in any of the six samples for which an asbestos analysis was performed and is not a contaminant of concern at the Site.

3.6.9 Pesticides and Herbicides

One soil sample was specifically analyzed near a location of possible herbicide surface soil staining noted in the field (SB05-032) for pesticides and herbicides using EPA Method 8150/8081. No pesticides or herbicides were detected in the soil sample analyzed.

3.7 Distribution of Chemicals in Groundwater

This section presents a discussion of the occurrence and lateral distribution of chemicals in shallow groundwater underlying the Site. The discussions contained in the following sections are based on summary tables. The summary tables list:

- each chemical analyte detected,
- the number of groundwater samples analyzed,
- the total number of samples where the analyte was detected above the method reporting limit for the sample,

- the total number of samples where the analyte was detected below the method reporting limit for the sample (i.e., estimated values),
- the maximum detected concentration,
- the location of that detection,
- the normal arithmetic mean,
- the normal standard deviation, and
- the normal 95 percent UCL.

Detection of an analyte at less than the reporting limit indicates that the analyte has been identified but the quantification of concentration is at less than the 99 percent confidence level.

A complete listing of the groundwater laboratory results is provided in Appendix G-2. No groundwater data from previous groundwater sampling at the Site were incorporated in the baseline environmental data set.

3.7.1 Total Extractable Hydrocarbons

Forty-eight groundwater samples were collected at the locations reported in Appendix G-2 and analyzed for TEH using EPA Method 8015M. Tables 3-10 and 3-11 summarize the results for the samples that contained detectable TEH concentrations in the SBPP and the NCT groundwater, respectively.

Six groundwater samples analyzed contained TEH concentrations exceeding 1,000 µg/l (1 mg/l). Five samples were collected from the SBPP, the other sample was collected from the NCT. The following samples contained TEH concentrations greater than 1,000 µg/l:

- SB6-006 2600 µg/l
- SB3-003A 1700 µg/l
- SB5-018 1600 µg/l
- SB5-094 1500 µg/l
- SB1-070A 1400 µg/l
- SB5-029 1500 µg/l

Seven groundwater samples contained TEH concentrations between 500 and 1,000 µg/l. The remaining groundwater samples contained TEH concentrations less than 500 µg/l.

At the SBPP, well SB01-070 contained free product, identified as jet fuel. The laboratory analysis for the free product is provided in Appendix G-4. Wells SB01-070 and SB01-070A are located near the Jet Fuel Tank Area and underground fuel supply piping to the GT. The TEH concentration detected in groundwater at SB01-070A was 1,400 µg/l.

Well SB03-003A, located in the area of the "east loop" fuel lines release, contained the highest TEH concentration (1,700 µg/l) at the SBPP. Three other groundwater samples at the SBPP contained TEH concentrations greater than 1,000 µg/l, all located in Investigation Area 5, at SB05-018, -029 and -094. The source of these impacts is unknown, but it should be noted that SB05-018 and -029 are located near the underground fuel oil supply line that traverses the eastern portion of the site.

At the NCT, well SB06-006 contained the highest concentration of TEH at 2,600 µg/l. Well SB06-006 is located near Fuel Oil Storage Tank #2, a likely source of the detected TEH. The other three groundwater samples detected TEH at concentrations less than 500 µg/l.

For all groundwater samples where TEH was detected at concentrations greater than 1,000 µg/l, BTEX analyses were conducted using EPA Method 8020. The data were reviewed and only SB01-070A had detectable BTEX concentrations, indicating that the dissolved TEH concentrations are typically not associated with BTEX compounds at the Site (see Section 3.7.2).

As a result of the observed free-phase hydrocarbon, and in accordance with the San Diego RWQCB requirements, Fluor Daniel GTI recommends that a remediation evaluation be performed for groundwater near the Jet Fuel Tank Area.

3.7.2 Volatile Organic Compounds

Thirty-eight groundwater samples were collected at the locations reported in Appendix G-2 and analyzed for VOCs and BTEX using EPA Method 8260. Samples from the UST area were also analyzed for MTBE using EPA Method 8020. Table 3-10 depicts the results of the ten VOCs detected in the SBPP groundwater. Table 3-11 depicts the results of the one VOC that was detected in the NCT groundwater.

At the SBPP, the impact of VOCs to groundwater appears to be limited to the following areas:

- Investigation Subarea 1c: Jet Fuel Tank Area
- Investigation Subarea 1d: UST Area
- Investigation Subarea 5a: Open Area

VOCs were detected in Subarea 1d from existing wells MW-3 and MW-4, particularly BTEX, MTBE and 1, 1-DCE. The maximum concentrations of benzene, toluene, ethylbenzene and MTBE were located at MW-4. These concentrations were 460, 38, 26, and 11 µg/l respectively. The suspected source of the BTEX impacts is most likely from the residual soil around former USTs or the existing UST. BTEX was also detected in SB01-070A, the location of the observed free-phase hydrocarbon, at a concentration of 4.2 µg/l . 1, 1-DCE was detected in MW-3 at an estimated value of 3 µg/l, below the method reporting limit (5 µg/l).

Samples collected from several locations in Subarea 5a contained detected concentrations of TCE and cis-1, 2-DCE. The highest concentrations of both analytes were from SB05-041A at 59 and 19 µg/l, respectively. The suspected source of this impact is unknown, but appears limited to the area between SB05-041 and SB05-043. Upgradient well SB05-043A did not contain detectable VOC concentrations.

At SB05-094, just to the west of the switchyard border, 1,1-DCA was detected at a concentration of 14 µg/l. Surrounding groundwater samples did not contain chlorinated VOCs.

At SB03-003A, near the Unit No. 4 screens, chloroform was detected at an estimated value of 3.6 µg/l, and below the method reporting limit (5 µg/l).

At the NCT, one VOC was detected, TCE, at a concentration of 4 µg/l from SB06-009. No VOCs were detected in the groundwater sample from SB6-006, which was reported to have 2,600 µg/l of TEH.

The impacts of benzene, 1,1-DCE, TCE and chloroform in groundwater at the SBPP and the impact of TCE on groundwater at the NCT will be further evaluated in a BHRA.

3.7.3 Semivolatile Organic Compounds

A groundwater sample was collected at location SB04-011 in the former drum storage area, and analyzed for SVOCs by EPA Method 8270. There was no detection of SVOCs in this sample and SVOCs are not a concern at the Site.

3.7.4 Polynuclear Aromatic Hydrocarbons

Thirty groundwater samples were collected at the locations reported in Appendix G-2 and analyzed for PAHs using EPA Method 8310. Tables 3-10 and 3-11 summarize the results of the two PAHs detected at the SBPP and the one PAH detected at the NCT, respectively.

At the SBPP, naphthalene and fluorene were the two PAHs detected in the groundwater samples collected. The highest concentration of naphthalene was 71 µg/l, located at SB01-070A in the area of the observed free-phase hydrocarbon. The highest concentration of fluorene was 8 µg/l, located at

SB05-038. The suspected source of the naphthalene in SB01-070A is the Jet Fuel Tank Area, primarily based on the free product found in SB01-070. The suspected source of the low fluorene concentration in SB05-038 is unknown.

At the NCT, fluorene was detected in one of the groundwater samples collected at location SB06-017, at a low concentration of 4.6 µg/l. The reported PAH concentrations indicate that PAHs are not a concern for groundwater at the Site.

3.7.5 Polychlorinated Biphenyls

Nineteen groundwater samples were collected at the locations reported in Appendix G-2 and analyzed for PCBs using EPA Method 8081. There were no detections of PCBs in any of the samples analyzed, and PCBs are not a concern at the Site.

3.7.6 pH

The pH of water was measured in the field when Phase IIA groundwater samples were collected. The field pH values for Phase IIA sampling are reported on the groundwater field sampling forms presented in Appendix B. For Phase IIB sampling, pH values were measured by laboratory analysis.

The measured pH values ranged from 6.3 to 7.9, within the normal range for groundwater.

3.7.7 Metals

Forty-eight water samples were collected at the locations reported in Appendix G-2 and analyzed for CAM metals using EPA Methods 6010 and 7471. Table 3-12 summarizes the 12 metals that were detected in the SBPP groundwater, and Table 3-13 summarizes the six metals that were detected in the NCT groundwater. Table 3-3 (see Section 3.5) presents the metal concentration for background groundwater samples.

At the SBPP, lead and zinc were the most frequently detected metals (31 and 33 of the 48 samples, respectively) Arsenic was detected 20 times with six samples exceeding the method reporting limit. Copper was detected 25 times with nine samples exceeding the method reporting limit. Antimony was not detected above the method reporting limit.

Thallium and nickel were detected above the method reporting limit in one and four samples, respectively.

At the NCT, lead was the most frequently detected metal (3 of 4 samples). Arsenic, barium, copper and molybdenum were detected once, at a concentration less than the method reporting limit for these analytes.

The range of metal concentrations in groundwater and the apparent distribution of metals in groundwater in areas not associated with potential sources indicate that the reported metal concentrations in groundwater are likely related to background groundwater characteristics. It should be noted that none of the maximum groundwater concentrations are co-located with the maximum soil concentrations for any of the metals. No specific sources for the observed metals concentrations in groundwater were identified.

Because metals are known to occur in native groundwater, well borings at the SBPP and the NCT were grouped into a background area and potentially impacted areas due to site-related metal activities for the purpose of evaluating CAM metals.

Tables 3-14 and 3-15 summarize the metals detected in "potentially site-impacted" groundwater during the Phase II investigations for the SBPP and the NCT, respectively.

Screening of metals in groundwater in the BHRA (see Section 5.0), indicated that concentrations of six metals (arsenic, lead, antimony, thallium, copper, and nickel) exceeded screening criteria at the SBPP, and concentrations of two metals at the NCT (arsenic and lead) exceeded screening criteria. Based on statistical comparison to background concentrations, all metals in groundwater at the NCT are at background levels, and only two metals (thallium and nickel) at SBPP were not at background.

Thallium was detected in five groundwater samples. The maximum detected concentration was 13 µg/l located at SB3-018. Thallium concentrations will be evaluated in the BHRA. Nickel was detected in seven groundwater samples, with three of the detections below the method reporting limit (40 µg/l). The maximum detected concentration was 74 µg/l located at SB2-002. A review of groundwater monitoring data from previous investigations at the SBPP indicates that groundwater concentrations of nickel ranged between 10 and 760 µg/l. These values were accepted under closure of the Second Generation Surface Impoundments by the DTSC (see Appendix C.2.7, Phase I ESA Report by Fluor Daniel GTI, 1998). Therefore, the concentrations of nickel in groundwater measured during the Phase II investigations at the SBPP (with the highest nickel concentration of 74 µg/l) can be considered not to be materially impacted by site-related metal activities.

In summary, groundwater at the Site has not been impacted by metals from site operations.

4.0 APPLICABLE REGULATORY LIMITS

This section presents the process used to identify and define the issues and areas that may require remediation based on applicable environmental laws and regulations. Section 5.0 will identify and define areas that may require remediation based on a BHRA. The work presented in this section of the report corresponds to Tasks 4 and 5 of the overall project approach (see Figure 1-2).

4.1 Remediation Potentially Required to Comply with Environmental Laws and Regulations

To determine if remediation of soil or groundwater may be required, the two questions shown in Task 3 of Figure 1-2 need to be answered. The two questions are:

1. Is remediation potentially required to protect human health or the environment?

2. Is remediation potentially required to comply with applicable laws and regulations?

An evaluation of whether remediation may be required for protection of human health or the environment is presented in Section 5.0. An evaluation of whether remediation may be required to comply with environmental laws and regulations is presented below in Section 4.1.1 through 4.1.2 for soils and groundwater. Cleanup levels for chemicals that may require remediation as a result of this evaluation are proposed in Section 4.2. This evaluation corresponds to Task 4 of the overall project approach (see Figure 1-2).

Once the cleanup levels are established, the baseline data collected during the Phase II ESA are compared to the cleanup levels in Section 4.3. This comparison establishes the areas of the Site that may require remediation (see Task 5 on Figure 1-2).

4.1.1 Applicable Environmental Laws and Regulations for Soil

Applicable cleanup regulations for the Site were evaluated to determine what chemicals would require remediation under the various county, state, and federal regulatory programs governing remediation of soil.

Depending on site conditions, remediation of petroleum hydrocarbons in soil has been required by regulatory agencies in California, as follows:

- Remediate soils impacted above 10 mg/kg. This concentration level is typically used where gasoline is near a drinking water aquifer. This level is not applicable at the Site because

the groundwater under the site is not potable and the hydrocarbons are of relatively low mobility.

- Remediate soils impacted above 100 mg/kg. This concentration level is typically used where diesel fuel is threatening a drinking water supply. This level is also not applicable at the Site because the shallow groundwater is not potable. However, based on SDG&E personnel, the Port District of San Diego, as land owner of the NCT, may require a 100 mg/kg cleanup level for the NCT.

- Remediate soils impacted above 1,000 mg/kg. This concentration is typically used where hydrocarbons of low mobility are threatening nonpotable groundwater. Below this concentration, natural attenuation will usually continue to remediate the soils and groundwater if no further hydrocarbons are released. This cleanup level is considered applicable for the SBPP. Remediation of petroleum hydrocarbons in soil at the Site, to TEH concentrations over 1,000 mg/kg, is consistent with previous regulatory requirements at the SBPP imposed during decommissioning of the Second Generation Surface Impoundments.

4.1.2 Applicable Environmental Laws and Regulations for Groundwater

Various county, state, and federal environmental laws and regulations were reviewed for applicability to groundwater at the SBPP. Groundwater at the Site is classified as usable.

Removal of free-phase hydrocarbons from groundwater is an established regulatory requirement in California.

The RWQCB has issued action levels for low-risk hydrocarbon contamination sites located within 1,000 feet of marine waters. These action levels include a 400 µg/l benzene concentration, which is applicable at the SBPP. Tables 4-1 and 4-2 list the Site concentrations and RWQCB low risk site action levels. The RWQCB Basin Plan also includes regulatory levels for organic contaminants which are applicable to the Site, and these regulatory levels are listed in the screening tables described in Section 5.0.

4.2 Cleanup Levels

Based on the foregoing discussion, the following cleanup levels are proposed for the chemicals in soil and groundwater at the Site. The only clean-up required to comply with environmental laws and regulations at the Site is petroleum hydrocarbon-contaminated soil.

MEDIA	COPCs	Cleanup Levels	Comments
Soil	Petroleum Hydrocarbons	1,000 mg/kg	To eliminate a potential source of groundwater contamination, SBPP.
		100 mg/kg	To satisfy landowner requirements, NCT.
Groundwater	Free-Phase Hydrocarbons	Free-phase hydrocarbon removal	Source removal.
	VOCs	Misc: BTEX and PAHs	Contaminant levels for low-risk sites.
		Misc: Basin Plan	Organics contaminants concentrations to protect groundwater

4.3 Areas Potentially Requiring Remediation

The baseline data presented in Section 3.0 were compared with the cleanup levels established in Section 4.2 to identify issues at the Site that would likely require remediation to comply with environmental laws and regulations. This data comparison identified five remedial issues at the Site.

- Removal of soils with hydrocarbon concentrations exceeding 1,000 mg/kg, SBPP.
- Removal of soils with hydrocarbon concentrations exceeding 100 mg/kg, NCT.
- Removal of free-phase hydrocarbons from groundwater, SBPP.
- Remediation of benzene in groundwater, SBPP.
- Remediation of TCE in groundwater, SBPP.

These areas are shown on Figure 4-1.

Section 5.0 will define additional areas that may require remediation to be protective of human health or the environment.

5.0 BASELINE HEALTH RISK ASSESSMENT

This section describes the methodology, rationale, and results of the BHRA conducted at the Site. The risk assessment is based on present site conditions. If the risk assessment demonstrates that chemical concentrations pose a risk to human health above the level considered acceptable for the site and its use, then site-specific cleanup levels will be developed.

The DQO process has been applied to establish the decision criteria for both the site investigations and the risk assessment. The DQO process is a dynamic tool for ensuring that the field sampling activities fulfill the data requirements for a comprehensive site characterization and a BHRA. A detailed description of the integration of the DQO framework into the risk assessment is schematically illustrated in Figure 5-1 and discussed in Appendix I. Through this process, the data collected during the Phase II investigations are of sufficient quality and quantity to meet the requirements of a valid risk assessment.

5.1 Purpose and Objectives

The purpose and objectives of the BHRA are to:

- present the current understanding of the environmental conditions at the Site through the use of a CSM;
- determine the estimated human health risks that may be posed by the chemical concentrations detected at the Site, if no remedial action is implemented; and
- describe the methodology for developing site-specific cleanup levels if the results of the risk assessment should indicate that remediation may be required.

The risk assessment is based on the baseline conditions of the Site and on the current and projected industrial use of the Site. This risk assessment incorporates available site-specific parameters to minimize the extent of uncertainties in the risk assessment.

5.2 Guidance Documents

The BHRA was conducted in accordance with the guidelines established in the following documents:

- Superfund Exposure Assessment Manual (EPA, 1988)

- Risk Assessment Guidance for Superfund, Part A, Vol. 1: Human Health Evaluation Manual (EPA, 1989)
- Memorandum regarding the Human Health Evaluation Manual, Supplemental Guidance: Standard Default Exposure Factors (EPA, 1991)
- Supplemental Guidance to RAGS: Calculating the Concentration Term, (EPA, 1992)
- Dermal Exposure Assessment: Principles and Applications (EPA, 1992)
- Guidance for Data Usability in Risk Assessment (EPA, 1992)
- Preliminary Endangerment Assessment (PEA) Manual, Department of Toxic Substances Control (DTSC), California Environmental Protection Agency (Cal/EPA, 1994)
- Selecting Inorganic Constituents as Chemicals of Potential Concern at Risk Assessments at Hazardous Waste Sites and Permitted Facilities (Cal/EPA, 1997)

Other regulatory guidance documents used as sources of numerical criteria applied in the different phases of the risk assessment will be cited in the appropriate sections.

5.3 Overview of the Health Risk Assessment

The different components of a risk assessment are as follows:

- Data collection and evaluation: The risk assessment is supported by data presented in the comprehensive environmental baseline (Section 3.0). The collected data have been reviewed and evaluated for usability in the risk assessment and have been used to generate a site-specific conceptual model. Data were collected to provide site-specific parameters that may be used to predict the fate and transport of chemicals through the environmental media.
- Exposure unit identification: Current and future use of the Site was considered in the development of the exposure unit . An exposure unit is defined as the area wherein a target receptor population is assumed to have similar exposures to chemicals in soil and groundwater within designated physical boundaries.
- Screening risk evaluation: The screening evaluation was performed by comparing chemical concentrations to the conservative residential PRGs developed by EPA Region IX. The screening evaluation allows the quantitative site-specific risk evaluation to

focus only on those constituents with concentrations that exceeded the screening criteria and does not prejudge any applicable remediation standards or criteria. Hence, although the Site's current and future use is considered industrial, the initial screening risk evaluation was conducted using residential PRGs, in accordance with Cal/EPA's PEA guidelines (Cal/EPA, 1994). Chemical concentrations above residential PRGs do not indicate that unacceptable risks to human health or the environment are present at the Site or trigger a response action. The evaluation of remedial actions, if needed, will be based on applicable PRGs developed for the site-specific industrial scenarios.

- Identification of COPCs: COPCs are the constituents that will be evaluated in the quantitative site-specific risk assessment because they exceeded the residential screening criteria.

- Exposure assessment: The exposure assessment identifies and describes potential receptors, develops exposure pathways, estimates exposure point concentrations (EPCs) for specific media, and estimates the chemical intake rate for each receptor.

- Toxicity assessment: The toxicity assessment summarizes information concerning potential human health effects that may be caused by exposure to the COPCs.

- Risk characterization: Risk characterization is an estimation of potential risks posed by the COPCs encountered at the Site as determined during the site-specific risk evaluation analysis.

5.4 Baseline Health Risk Assessment

This section provides the detailed descriptions of the work performed for the BHRA, as identified in Section 5.3.

5.4.1 Data Collection

The risk assessment at the Site used the results of the Phase II ESA and previous investigations (environmental baseline), as presented in Section 3.0. The environmental baseline data were used to develop the site-specific approach and assumptions applied to estimate risks.

The DQO process was utilized to plan and to guide data collection for the Phase II investigations. The CSM is an important element in evaluating potential exposures at the site. Upon completing the Phase II investigations, the preliminary CSM (presented as Figure 2-1) was revised to reflect the data collected and to incorporate the site-specific conditions. The final CSM is presented as Figure 5-2.

The final CSM incorporates the results of the initial risk screening evaluation and COPC selection process presented in Sections 5.4.3 and 5.4.4.

5.4.2 Identification of Exposure Unit

An exposure unit is based on worker activity patterns within the various operational areas of a facility. Using this concept, exposure units were defined for the Site. Selection of the entire site as a single exposure unit was rejected as not being sufficiently conservative to evaluate potential human exposures; in a single exposure unit, any potential exposure is diluted by spreading the worker's activities over many different areas. The subdivision of the Site into exposure units considered two factors: (1) current operations, and (2) the division of worker activities among the areas housing these operations.

The exposure units are illustrated on Figure 5-3 and were defined as follows:

- Area A includes the power plant, the wastewater treatment area, the administration building and the areas surrounding the power plant and GT, which could be used for ongoing operation of the plant.
- Area B includes the North Tank Farm; Area D includes the South Tank Farm.
- Area C includes the nonoperational area east of the power plant.
- The National City Terminal.

The current use exposure scenario divides worker activities into Area A, combined Areas B and D, and Area C. The activities of workers in Area A are focused on the power plant operations and the wastewater treatment operations. The activities of workers in Exposure Areas B and D are focused on the operation and maintenance activities associated with the tank farms. The activities in Area C are limited to driving through the area and occasional landscaping activities.

These exposure units are consistent with current and future site use, since future site use is considered to remain identical to current use.

The soil depth also defines the vertical boundaries of an exposure unit. The on-site worker is assumed to come in contact with surface soils only (0 through 2 feet bgs). However, the on-site worker is not expected to come in contact with deeper soils. Although standard practice commonly considers surface soils to be between 0 and 6 inches bgs, the thickness of the asphalt or concrete surface at various locations throughout the Site did not make it feasible to collect samples at this

depth. Based on this condition, the surficial exposure unit was modified to be between 0 and 2 feet bgs.

The hypothetical construction worker is assumed to have contact with soils from the surface to the subsurface depth of 15 feet bgs. The soil profile from 0 to 15 feet bgs will be referred to in the remainder of this report as "subsurface soil". Redevelopment or excavation activities may result in intrusive activities that could expose the hypothetical construction worker to subsurface soil.

5.4.3 Acceptable Level of Risk

The BHRA consists of two levels of risk evaluation. The initial evaluation determines a screening risk for an exposure unit based on the conservative assumptions of a residential scenario in accordance with Cal/EPA's PEA guidelines (DTSC, 1994). The screening risk is calculated solely to identify chemicals for further evaluation through site-specific risk quantification. For the screening evaluation, the acceptable cumulative carcinogenic risk is 1 in 1,000,000 ($1x10^{-6}$), and the acceptable cumulative hazard index is 1.0. If the cumulative screening risk and hazard index for the exposure unit exceed these acceptable levels, a quantitative risk characterization is performed.

The quantitative risk characterization in the BHRA is the second level of evaluation and is based on site-specific conditions. The EPA, as a policy, considers a risk level greater than 1 in 10,000 ($1x10^{-4}$) as a "significant" risk, and a level less than 1 in 1,000,000 ($1x10^{-6}$) is considered "insignificant". A risk level between 1 in 10,000 ($1x10^{-4}$) and 1 in 1,000,000 ($1x10^{-6}$) would mean that a risk management decision based on site-specific conditions and a cost-benefit analysis will be made. The terms "significant" and "insignificant" are not meant to imply acceptability; however, they help place the numerical estimates developed in this risk assessment into perspective. In general, a potential excess lifetime cancer risk of 1 in 10,000 ($1x10^{-4}$) is considered by the EPA as the numerical health risk that would justify remedial action. Similarly, if the hazard index is less than 1.0, then no chronic health effects are expected to occur due to exposure to a chemical. If the hazard index is greater than 1.0, then adverse health impacts are possible.

For the Site, the numerical risk posed by exposures to environmental media is deemed acceptable, for the purpose of this assessment, if the cumulative risk due to exposure to all the chemicals in an exposure unit does not exceed $1x10^{-5}$, or 1 in 100,000; the acceptable level of cumulative hazard index was established at 1.0. Remediation will be recommended if the quantitative risk estimates exceed these levels. Cleanup levels are established for chemicals that are the principal contributors to the risk exceeding $1x10^{-5}$.

5.4.4 Screening Evaluation

The selection of residential PRGs as screening criteria is recommended in Cal/EPA's PEA guidelines (DTSC, 1994). Although the potential future land use of the Site is considered industrial, the application of residential PRGs provides a conservative screening evaluation to ensure that chemicals eliminated from a quantitative evaluation would not pose potential health effects under the most stringent assumptions. As mentioned in Section 5.3, although the screening process uses residential PRGs, the evaluation of remedial actions, when required, will be based on applicable PRGs developed for the site-specific industrial scenarios. Chemical concentrations above residential PRGs do not indicate that unacceptable risks to human health or the environment are present at the Site or trigger a response action. Exceeding a residential PRG merely results in inclusion of the chemical in the site-specific risk evaluation.

5.4.4.1 Methodology. Figure 5-4 is the decision tree used for the screening evaluation process. In accordance with the recommendations in the EPA Region IX PRG Memorandum (EPA, 1998), chemicals with cancer risk-based PRGs were segregated from those with noncancer risk-based PRGs. PRGs for some chemicals are not risk-based but based, instead, on the soil saturation equation. Such chemicals are not included in the calculation of cumulative screening risks.

The first step in the screening evaluation is the calculation of the Site concentration. The exposure unit sample population consists of samples in the exposure unit that were not included in the background population of that chemical. The Site concentration is selected as the lower of the maximum detected concentration or the 95 percent UCL of the arithmetic mean concentration (EPA, 1992). The second step in the screening evaluation is the calculation of the chemical-specific screening risk for carcinogens and chemical-specific hazard index. Since residential PRGs are based on a risk value of $1x10^{-6}$ for carcinogens, the chemical-specific screening risk is calculated by multiplying $1x10^{-6}$ and the ratio of the chemical's site concentration to that chemical's residential PRG. The cumulative screening risk is the sum of the chemical-specific screening risks for all carcinogens. Similarly, the residential PRGs for noncarcinogens are based on a hazard index of 1.0. The chemical-specific hazard index is equal to the ratio of the chemical's site concentration to that chemical's residential PRG. The cumulative screening hazard index is the sum of the chemical-specific hazard indexes. If an exposure unit has a cumulative screening cancer risk exceeding $1x10^{-6}$ or has a cumulative screening hazard index exceeding 1.0, then the exposure unit is further evaluated in a quantitative, site-specific risk calculation.

5.4.4.2 Screening Risk Estimates. This section presents the results of the screening evaluation for the Site. It should be noted that these screening risk estimates do not portray the actual risks of the potential environmental conditions, since the exposures are based on a residential land use rather

than on the industrial use of the facility. By screening each exposure unit under the most stringent residential assumptions, the screening evaluation is being conducted in a conservative manner.

Tables 5-1 to 5-11 present the screening risk evaluation of the surface and subsurface soils in Exposure Areas A to D and the NCT. As the estimated risks under a subdivided site are a conservative estimate of site-wide risk estimates (current site use), a site-specific site-wide risk was not estimated. The cumulative screening risks of carcinogens detected in all exposure areas exceeded 1 X 10^{-6}, except in Exposure Area C, and the cumulative hazard indices exceeded 1.0 in Exposure Area A only. The constituent with an individual screening risk that exceeded 1 x 10^{-6} was arsenic in Exposure Area A. Constituents with a chemical-specific hazard index greater than 0.1 were antimony, cadmium, nickel and vanadium in Area A. As stated in Section 5.4.4.1, these results preliminarily indicate that these constituents may be COPCs that require further evaluation in the quantitative BHRA.

5.4.5 Identification of Human Health COPCs

The objective of identifying the COPCs is to focus the quantitative risk assessment on constituents that require further evaluation by incorporating site-specific conditions. The methodology for selecting the soil COPCs is illustrated on Figure 5-5. The identification of COPCs depends on whether the constituent is inorganic or organic. For inorganic constituents with chemical-specific screening cancer risks higher than $1x10^{-6}$, the constituent concentrations in the exposure area population were also compared to the corresponding constituent concentrations in the background population prior to being identified as COPCs (Cal/EPA, 1997). The methodology for determining if a constituent is at ambient or background concentrations is presented in Appendix H. Only inorganic constituents that were above the background levels and which had a chemical-specific screening cancer risk higher than $1x10^{-6}$ were also identified as COPCs. Organic constituents with a chemical-specific screening cancer risk higher than $1x10^{-6}$ were also identified as COPCs. Organic constituents were not compared to background levels because background concentrations of organic chemicals are assumed to be zero.

5.4.5.1 *Soil COPCs.* Tables 5-1 through 5-10 also present the rationale for the identification of COPCs in the surface and subsurface soils. Arsenic was determined to be a COPC in Exposure Area A and will be included in the quantitative BHRA.

The screening evaluation for Exposure Area A in surface and subsurface soils identified arsenic as a potential COPC because the cumulative screening risk was higher than $1x10^{-6}$, and arsenic concentrations are not at background levels in this Exposure Area. Thus, arsenic was further evaluated in a quantitative BHRA. The total screening hazard index for subsurface soils in Exposure Area A exceeded 1.0. Constituents which exceeded a hazard quotient of 0.1 included antimony,

cadmium, nickel, and vanadium. All these metals area above background levels. Therefore, these metals were identified as COPCs.

In Exposure Units B, D, and NCT, the analytes detected in surface and subsurface soils were subjected to a similar screening process. The initial result suggested that arsenic be further evaluated because the cumulative screening risk was higher than $1x10^{-6}$. However, the arsenic concentrations in surface and subsurface soils in these Exposure Areas are at background levels; thus, arsenic is eliminated as a surface and subsurface soil COPC for these Exposure Units at the Site.

In Exposure Unit C, analytes detected in surface and subsurface soil had a cumulative screening risk less than $1x10^{-6}$. Therefore, no further quantitative evaluation was required.

All organic constituents detected in soils at the Site had cumulative screening risk lower than $1x10^{-6}$, thus, no further quantitative evaluation was required in any of the Exposure Units.

5.4.5.2 *Soil Chemicals with Potential Effects on Groundwater Quality.* All chemicals detected in the soil were also evaluated for future potential impact to groundwater. Figure 5-6 illustrates the selection of COPCs in soil with potential effects on groundwater quality. The maximum concentration of each constituent was compared with published soil screening levels (SSLs) for that constituent. The SSLs for a chemical represent the concentration in soil that may leach to groundwater without impacting the groundwater quality (EPA, 1996). A dilution- attenuation factor (DAF) of 20 was used for SSLs because of the relatively higher pH at the site than the DAF_1 values for metals. Chemicals in soil that did not exceed their corresponding SSLs were not evaluated for potential migration to groundwater. Chemicals that were above background levels (for inorganic chemicals only) and that exceeded the SSLs (in organic as well as organic chemicals) may potentially affect groundwater quality, thus, chemical fate and transport modeling was performed to evaluate the possibility that leachate from the soil might affect groundwater quality.

Table 5-12 presents the evaluation of soil COPCs for potential effects on groundwater quality. The results indicated that the maximum concentrations of metals in the First Generation Surface Impoundments exceed corresponding SSLs. Further evaluation of this potential metal impact to groundwater included fate and transport modeling (Section 5.4.6).

5.4.5.3 *Groundwater COPCs.* Figure 5-6 illustrates the selection of groundwater COPCs. Two criteria were applied to identify the groundwater COPCs for the BHRA. If both criteria are available for a specific chemical, the screening criterion is the lower of the two values:

- Drinking Water Maximum Contaminated Levels (MCLs) Department of Water Resources, 1995);
- Tap Water PRGs (EPA, 1998).

Similar to the methodology for soil COPCs, chemical concentrations of inorganics in groundwater were also compared to background levels if they exceeded the screening criteria. Only chemicals that have site concentrations greater than either of the two screening criteria and are also above background levels are to be retained as COPCs.

Tables 5-12 and 5-13 list the chemicals detected in the groundwater at the Site and the rationale for the selection of groundwater COPCs. The table also presents the frequency of detection, the maximum concentration detected in the groundwater, the 95 percent UCL of the arithmetic mean, the site concentration, the MCL, the tap water PRG, and the rationale for selecting a chemical as a groundwater COPC.

The concentration of four organics (benzene, TCE, 1,1DCE and chloroform) and four inorganics (thallium, arsenic, lead, and antimony) exceeded either tapwater PRGs or Cal/Fed MCLs. However, arsenic, lead, and antimony concentrations area at background levels, and are not considered a COPC. Therefore, at the SBPP, only four organic compounds and thallium are COPCs in groundwater. At the NCT, TCE is a COPC in groundwater.

5.4.5.4 *Groundwater Chemicals with Potential Effects on Surface Water Quality.* The evaluation of potential effects on surface water quality was conducted through a comparison of the groundwater site concentrations to ambient water quality criteria (AWQC) for marine waters.

The use of AWQC criteria for marine water does not imply that it is the appropriate criteria for remediation of surface water. The AWQC marine water criteria was used as a screening criteria for groundwater for the following purpose. If the concentration of a chemical in groundwater was less than the AWQC marine water criteria, then the possibility of groundwater impacting surface water is eliminated. If a chemical concentration exceeds AWQCB marine water criteria, fate and transport modeling is required to determine the surface water concentration. This screening process is illustrated on Figure 5-7 and is also presented in Table 5-11. The results demonstrate that, although the detected concentrations of copper, mercury, and nickel in groundwater exceeded corresponding

AWQC marine water criteria, the site concentrations of copper and mercury inorganics were at background levels (Appendix H). Therefore, nickel was the only COPC in groundwater identified for potential impact on surface water quality.

This process is illustrated on Figure 5-7 and is also presented in Tables 5-14 and 5-15. The results demonstrate that, although the detected concentrations of arsenic, copper, and nickel in groundwater at the SBPP exceeded corresponding AWQC marine water criteria, the site concentrations of arsenic, copper, and nickel were at ambient levels at the SBPP. At the NCT, only copper exceeded AWQC marine water criteria. However, copper concentrations were at background levels. Therefore, no surface water COPCs were identified at the SBPP or NCT.

5.4.6 Chemical Fate and Transport Modeling

The effects and interactions of fate and transport processes on chemical movement can be evaluated through the mathematical simulation of soil/groundwater interactions and subsurface flow of water and dissolved chemicals. Available literature on this subject contains many numerical and analytical models that have been applied to soil and groundwater. Computer models have been developed with the goals of simplifying chemical transport processes and making it feasible to simulate contaminant transport in a timely manner. These simplifications can sometimes be made without compromising the results. However, in some cases, the assumptions brought about by these simplifications can lead to erroneous results. Therefore, it is important to choose a model that is appropriate for the task (EPA, 1988).

It should be recognized that the use of a model to estimate future concentrations of chemicals in various media will introduce uncertainty into this evaluation. These uncertainties are inherent to the use of a model since, by definition, a model is a simplified depiction of a real system. To address these uncertainties, conservative parameters are used, so that the models will tend to over-estimate EPC at the site. For this reason, the results of the modeling are used as a screening tool and not as a quantitative prediction of future chemical concentrations.

The computer code VLEACH (Dynamac Corporation, 1993) was selected for simulating the movement of chemicals in the vadose zone soils at this site, and the computer code TRANS1D (Colorado School of Mines, 1997) was selected for simulating the movement of chemicals in the saturated zone. A detailed discussion on the input parameters for the VLEACH and TRANS1D models is presented in Appendix C. Discussions pertaining to the use of the VLEACH and TRANS1D models as part of this risk assessment are presented below.

5.4.6.1 *VLEACH.* VLEACH is a one dimensional numerical vadose zone leaching model initially developed by CH2M-Hill for the EPA, Region IX. The model describes the movement of an organic or inorganic contaminant within three phases: (1) as a solute dissolved in water, (2) as a gas in the vapor phase, and (3) as an adsorbed compound in a solid phase. The leaching process is simulated in a number of distinct user-defined soil columns or polygons vertically divided into a series of user-defined cells. At the completion of the simulation, the results from each soil column are used to determine an area-weighted groundwater impact for the modeled area.

The VLEACH modeling simulation performed for the SBPP incorporated a number of conservative assumptions to contour the inherent uncertainties in the data set. Each of these assumptions results in greater amounts of leaching than would actually be produced at the site. The conservative assumptions for the VLEACH modeling simulation performed at the SBPP include:

- The assumption that 20 percent of all rainfall will reach the underlying soil. Since some of these soils are currently located underneath a concrete pad or other paving, rainfall would not be expected to reach these soils. However, some moisture may reach these soils through cracks in the cover. Furthermore, some of the rainfall will leave the site as runoff while some will be lost to evapotranspiration. Therefore, the estimated amount of recharge to the aquifer, assuming minimal site cover, and the assumption that no evapotranspiration occurs, results in a conservative estimate.

- The soil column was assumed to contain concentrations of COPCs down to the saturated zone. If the maximum concentration of the COPC was present in a boring for which only one soil sample was submitted for chemical analysis, then the entire soil column from the ground surface to the water table was assumed to contain the COPC at its maximum concentration.

- The vadose zone is in a steady-state condition with respect to water movement. More specifically, the moisture content profile is held constant.

- Liquid phase dispersion is neglected. Hence, the migration of the contaminant will be simulated as a "plug." This assumption causes predicted dissolved compound concentrations to be higher than would occur in reality.

- The contaminant is not subject to degradation and is not a product of chemical reactions. This assumption is conservative for organic contaminants and to a lesser degree for inorganics.

The VLEACH model was applied to the metal concentrations in the First Generation Surface Impoundments to determine the potential metal concentration in the leachate from the soil. Concentrations of eight metals (antimony, arsenic, chromium, copper, lead, nickel, thallium and zinc) were estimated. The modeling procedures and results are included in Appendix J. The results of the VLEACH model indicate that the expected leachate concentrations of antimony and zinc were below AWQC marine water criteria, indicating that further evaluation of these metals is not necessary. The modeled concentration for copper was 2.5 µg/l, only slightly above AWQC marine water criteria (2.4 µg/l) and was not further evaluated. As thallium AWQC marine water criteria values do not exist, and this compound is not a likely contaminant from operations at the Site, thallium was not further modeled.

The estimated leachate concentration for the remaining metals (arsenic, nickel, lead and chromium) were modeled to be greater than the AWQC, indicating that the concentration of metals in soil at the site could impact groundwater to metal concentrations above AWQC. Therefore, these metals were further evaluated by modeling the lateral transport of metals and their potential to impact San Diego Bay.

5.4.6.2 *TRANS1D.* TRANS1D is a one-dimensional groundwater solute transport program based on the analytical solution described by Van Genuchten and Alves (1982). The processes considered include advection, dispersion, degradation, and sorption. The model assumes that the flow field is uniform, the aquifer contains homogeneous and isotropic material, and groundwater moves at a constant rate. Degradation is modeled using first order kinetic reactions. Sorption is modeled as a reversible and linear process occurring at the equilibrium. Both continuous and finite sources of contamination may be modeled.

The lateral transport of metals from the First Generation Surface Impoundments toward San Diego Bay was modeled using the Trans1D code. The modeling focused on 4 metals (arsenic, nickel, lead and chromium) which had been modeled to raise potential groundwater concentrations in the First Generation Surface Impoundments above the AWQC marine water criteria. Lateral transport of metals from the source area to the San Diego Bay, located approximately 100 ft from the source area, was modeled for 100 years, assuming a continuous source of metals at the source area. The results (Appendix C) indicate that the modeled metal concentration would not reach the San Diego Bay within the 100-year modeled period.

5.4.7 Exposure Assessment

A receptor may come in contact with chemicals in the soil through the exposure routes, or pathways, established in the CSM. The chemical intake of each receptor through each exposure pathway is

quantified in the exposure assessment. Figure 5-8 is a decision tree depicting the manner in which the quantification of exposure precedes and influences the estimation of risk. Figure 5-8 also shows the factors considered in evaluating the exposure:

- current and future receptor populations
- potential exposure pathways
- exposure parameters

5.4.7.1 *Potential Receptors and Exposure Pathways.* A complete exposure pathway consists of the following elements:

- source of chemical release
- transport mechanism through the environmental media
- exposure route through which the COPCs may contact a potential receptor
- potential receptor

An exposure pathway is incomplete when any of the above-mentioned elements is missing. The current and future receptors evaluated in this BHRA were based on the continued commercial/ industrial land use of the site.

On-Site Worker. Under the assumption that the surface soil is uncovered, the current and future on-site worker may come in contact with constituents in the surface soil (0 to 2 feet bgs) while performing activities associated with the operation of the facility. The on-site worker is not expected to come in contact with subsurface soils (deeper than 2 feet bgs) under both current and future scenarios. There is no indirect exposure through inhalation of volatiles because there are no volatile COPCs in the soil.

Groundwater was included in the quantitative BHRA because there were volatile groundwater COPCs. In summary, the on-site worker was evaluated for potential exposures through the following pathways:

- Inhalation of dust-borne particulates from surface soils;
- Incidental ingestion of, and dermal contact with, surface soils;
- Inhalation of contaminants volatilizing from groundwater.

Additionally, the future site worker was assumed to be exposed to groundwater by ingestion, dermal contact and inhalation, in the event that groundwater is extracted and used for industrial purposes at the Site in the future.

Construction Worker. A hypothetical construction worker may come in contact with both surface and subsurface soils while involved with excavation or trenching activities. Current and future construction workers were evaluated for exposures through incidental ingestion of soil transferred from the hands to the mouth, dermal contact, and inhalation of dust-borne particulates. Inhalation of volatile emissions from soil is incomplete because there are no volatile COPCs.

As the current and future construction workers may have possible exposure to groundwater, inhalation of volatile COPCs from groundwater was also included in the risk estimates. In summary, the current and future construction workers were evaluated for the following exposures:

- Inhalation of dust-borne particulates from surface and subsurface soils;
- Incidental ingestion of surface and subsurface soils;
- Dermal contact with surface and subsurface soils;
- Inhalation of contaminants volatilizing from groundwater; and
- Ingestion and dermal contact with contaminants in groundwater.

Site Visitor/Trespasser. A site visitor or trespasser would have similar exposures to surface soils as the on-site worker. Also similar to the on-site worker, the visitor or trespasser has no contact with soils deeper than 2 feet bgs. Because the exposure duration of the on-site worker is greater than that of a potential site visitor/trespasser, the latter will be evaluated only if the risk posed to the on-site worker is above the acceptable level established for the site.

5.4.7.2 *Exposure Parameters.* The assumed exposure parameters used to calculate the chemical intake of the on-site worker, the future construction worker, and the site visitor/trespasser are listed in Tables 5-16 through 5-23a showing the risk calculations. Default regulatory parameters were applied [Human Health Evaluation Manual, Supplemental Guidance, Standard Default Exposure Factors: Interim Final, (EPA, 1991)], except for the following:

- The skin surface area that comes in contact with the soil COPCs (assumed to be the forearms and the hands).
- The bioavailability of the chemical.
- The duration of construction activities at the site. This activity was assumed to occur over a period of 120 days.

5.4.7.3 *Estimation of Exposure Point Concentration.* In a deterministic risk assessment, such as this BHRA, the site concentration used to calculate risk is termed EPC and is determined according to the guidelines in the *Supplemental Guidance to RAGS: Calculating the Concentration Term* (EPA, 1992). The EPC represents the chemical concentration that may be contacted at a site over time and is

either the 95 percent UCL of the arithmetic mean of a normally distributed data set or the maximum detected concentration, whichever is lower.

The data in the environmental baseline at the Site were assumed to be normally distributed for the purpose of establishing the EPC. The assumption of normally distributed data results in less error in determining the 95 percent UCL of the arithmetic mean than if the data were to be considered lognormally distributed. A small (i.e., less than 30) number of samples typically results in a data distribution that is neither normal nor lognormal. Assuming a lognormal distribution when the data are not lognormally distributed results in a greater error in determining the 95 percent UCL of the arithmetic mean because the error is exponentiated when converted back to a linear scale; thus, small errors are significantly magnified.

5.4.7.4 *Algorithms for Calculating Exposure Dose.* The dose, or chemical intake, is the fraction of the concentration detected in the environmental medium that actually comes in contact with the receptor. The calculation of dose is based on a reasonable maximum exposure (RME) and is derived as the highest exposure that could be reasonably expected for a given exposure pathway at a site. The RME takes into account the activity patterns of the receptor, the physiological characteristics, and the chemical properties of the COPCs. The dose calculation introduces recent scientific information that the bioavailable portion of a chemical is a significant factor in an exposure assessment. There is still a lack of information regarding the bioavailability of chemicals among humans; thus, most of the bioavailability factors are extrapolations from animal studies.

The algorithms for calculating the intake through ingestion, dermal contact, and inhalation are based on equations established in the *Risk Assessment Guidance for Superfund: Volume 1, Human Health Evaluation Manual*, Part A (EPA, 1989).

5.4.8 Toxicity Assessment

The toxicity assessment examines information concerning the potential human health effects of exposure to COPCs. The toxicological evaluation involves a critical review and interpretation of toxicity data from epidemiological, clinical, animal, and *in vitro* studies. The scientific data consist of the health effects associated with a particular chemical and the probability that a given dose of a chemical could result in an adverse health effect. The primary sources of toxicity values are the Integrated Risk Information Service (IRIS) compiled by EPA, and the Health Effects Assessment Summary Tables (HEAST) (EPA, 1995).

For carcinogens, it is assumed that any dose may result in cancer induction. The slope factor (SF) is the toxicity value used to quantitatively express the carcinogenic risk of cancer-causing chemicals. The product of the SF and the exposure dose is an estimate of the risk of developing cancer from

exposure to COPCs. The cancer risks from multiple COPCs are assumed to be additive. EPA's weight-of-evidence classification for a compound's carcinogenicity is based on the degree of confidence in the supporting data. The weight-of-evidence classification can be used in the interpretation of the significance of a calculated risk.

For noncarcinogens, it is assumed that a dose exists below which no adverse health effects will be experienced. The reference dose (RfD) is the toxicity value used to quantitatively express the potential hazard for toxicological effects other than carcinogenicity.

5.4.9 Risk Characterization

Characterization of risk to human health is the estimation of the incidence and severity of the adverse effects likely to occur in a human population due to chemical exposures which are expressed as risk estimations. Risk characterization involves the integration of health effects information with exposure estimates developed as part of the exposure assessment. The result is a quantitative estimate of chronic and noncarcinogenic risks based on the presumption that a threshold dose is required to elicit a response; as well as a quantitative estimate of carcinogenic risks presumed to exist, regardless of the dose.

5.4.9.1 *Results of the Risk Characterization.* The numerical estimates of risks posed to human health and environmental receptors are discussed in this section. As the site is under active industrial use, environmental receptors for soil or groundwater contamination have been assumed to be limited to aquatic receptors potentially affected by migration of groundwater into surface water bodies. Therefore, impacts on environmental receptors were estimated by modeling the fate and transport of dissolved COPCs in groundwater to surface water. At the SBPP, potential concentrations of metals in groundwater in the First Generation Surface Impoundments area were shown by modeling to exceed AWQC marine water criteria in the source area. Fate and transport modeling of four metals was conducted at the SBPP. Results of the fate and transport modeling show that these metals will not reach surface water bodies at concentrations higher than the AWQC marine water criteria and will not adversely affect surface water quality.

Human Health Risk Estimates. The calculations of the risks are presented in Tables 5-16 through 5-23a. Table 5-24 summarizes the results of the cumulative human health risk characterization.

Current and Future On-Site Worker. The carcinogenic risks posed to the current and future on-site worker at the Site due to exposure to surface soil and groundwater are:

Soils	Carcinogenic Risk	
Exposure Area A	1.7×10^{-6}	(see Table 5-16)
Exposure Area B	No further quantitative evaluation warranted	
Exposure Area C	No further quantitative evaluation warranted	
Exposure Area D	No further quantitative evaluation warranted	
National City Terminal	No further quantitative evaluation warranted	

Soils	Carcinogenic Risk	
South Bay (Current)	1.7×10^{-7}	(see Table 5-18)
South Bay (Future)	6.4×10^{-6}	(see Table 5-19)
NCT (Current)	2.7×10^{-11}	(see Table 5-20)
NCT (Future)	7.0×10^{-8}	(see Table 5-21)

Noncarcinogens were not included in the quantitative evaluation because their concentrations were below the screening levels or at background levels.

The estimated risks associated with soil and groundwater exposures of a current and future on-site worker are, therefore, within the level of risk considered acceptable under regulatory policies. As stated in Section 5.4.7.1, the hypothetical site visitor/trespasser was not evaluated since the potential risk posed to the more highly exposed on-site worker is considered acceptable under regulatory policies.

Hypothetical Construction Worker. The carcinogenic risk posed to the hypothetical construction worker due to exposure to subsurface soil and groundwater are:

Soils	Carcinogenic Risk	Noncarcinogenic Hazard Index
Exposure Area A	4.86×10^{-8} (see Table 5-17)	6.5×10^{-4}
Exposure Area B	No further quantitative evaluation warranted	No further quantitative evaluation warranted
Exposure Area C	No further quantitative evaluation warranted	No further quantitative evaluation warranted
Exposure Area D	No further quantitative evaluation warranted	No further quantitative evaluation warranted
National City Terminal	No further quantitative evaluation warranted	No further quantitative evaluation warranted

Groundwater	Carcinogenic Risk	Noncarcinogenic Hazard Index
South Bay (Future)	1.09×10^{-7} (see Table 5-22)	No further quantitative evaluation warranted
NCT (Future)	1.18×10^{-9} (see Table 5-23)	No further quantitative evaluation warranted

These results demonstrate that the carcinogenic cumulative risks and the total noncarcinogenic hazard index posed to the hypothetical construction worker are well below the acceptable level of risk established for the Site.

5.5 Uncertainties in the Risk Assessment

The risk assessment has associated uncertainties. One element of uncertainty is in the exposure assessment. The exposure duration and exposure frequency assumed for the on-site worker are based on an RME value that leads to an overestimation rather than an underestimation of risk.

Furthermore, the assumed worker exposure does not take into consideration that the worker may experience a change in the nature and location of the work. The exposure assessment also assumes that the worker will be exposed to the same chemical concentrations for the entire duration of 25 years. EPA is in the process of revising the exposure duration of a worker based on new data which show that job tenure in recent years is considerably shorter than 25 years.

The bioavailability of the COPCs contacted through other exposure routes is another uncertainty. The estimated dose assumes that the detected concentrations in the soil and groundwater are totally available to the biological system. This topic is a subject of experimental studies in the scientific community and the degree of confidence in different results is in a rather broad range. Because bioavailability was only accounted for in the estimation of dermal dose, the estimated cumulative risk due to exposure through all the other routes may be an overestimation rather than an underestimation.

The toxicity assessment also has inherent uncertainties. The toxicity values are generally based on experimental studies on animals; thus, extrapolations were made to establish human toxicity values. This process may also lead to an overestimation of risk.

Another uncertainty is in the risk characterization. Carcinogenic effects of arsenic due to exposure through ingestion are being reevaluated by Cal/EPA (Cal/EPA, 1994) because their data suggest that the ingestion pathway was not considered to be an appropriate exposure route for arsenic to cause carcinogenic effects. In the interim, the toxicity value for arsenic established by EPA was applied in the risk characterization. Incorporating the toxicity of arsenic through ingestion could lead to an overestimation of risk.

5.6 Summary of Baseline Health Risk Assessment

The approach taken to complete the BHRA was summarized in Section 3.3 and described in detail in Section 3.4. This section of the BHRA presents an overall summary of the results of the risk assessment. Data from the environmental baseline (Phase II ESA Report) were used to:

- refine and finalize the CSM, and
- determine the EPCs for the chemicals detected in each of the environmental media.

A screening evaluation was performed by comparing the EPCs (minimum of the 95 percent UCL of the arithmetic mean and maximum detected concentrations) to the residential PRGs. The purpose of the screening risk evaluation was to determine the need for a quantitative risk characterization. This evaluation for the SBPP showed that a quantitative risk characterization was needed for Exposure

Area A, and that a quantitative risk characterization was not required for Exposure Areas B, C, D and NCT.

A quantitative risk characterization was also determined to be required for groundwater at the Site.

In order to complete the quantitative risk characterization, three components of the risk assessment were defined. These three components are:

- identification of COPCs,
- exposure assessment, and
- toxicity assessment.

The process used to establish the soil COPCs was described in Section 5.4.5 and presented on Figures 5-4 through 5-7. Soil COPCs identified in the exposure units are summarized below:

EXPOSURE UNIT	COPCs
Area A	Arsenic, antimony, cadmium, nickel, vanadium
Area B	None
Area C	None
Area D	None
NCT	None

Additionally, COPCs for groundwater were identified as benzene, TCE, 1,1-DCE, chloroform, and thallium at the SBPP and TCE at the NCT.

The exposure assessment provided information on the receptor populations, potential exposure routes, exposure parameters, and algorithms for calculating the exposure dose. The exposure assessment identified the following receptor populations:

- current and future on-site worker
- hypothetical current and future construction worker
- potential site visitor/trespasser (only evaluated if the risk posed to the current on-site worker was unacceptable)

The future exposure routes that were identified during the exposure assessment include:

- Inhalation of dust-borne particulates
- Incidental ingestion of, and dermal contact with, soil
- Inhalation of volatiles from groundwater
- Ingestion and dermal contact with groundwater

The results of the BHRA demonstrate that the chemical levels detected in the soils and groundwater at the Site do not pose unacceptable levels of risk to human health or the environment. Therefore, no chemicals of concern warrant risk-based remediation. However, the Site concentrations and identification of free-phase hydrocarbons were compared with regulatory levels and identified as requiring remediation (see Section 4.3).

6.0 SUMMARY OF FINDINGS AND CONCLUSIONS

Phase II investigations were conducted in March and April 1998 at the Site (SBPP and the NCT) to further evaluate the issues identified in the Phase I ESA Report. The Phase II soil investigation was based on a biased grid approach that provided a 95 percent probability of detecting a plume with a radius of at least 100 feet. The field program included drilling 244 borings, and collecting 521 soil samples and 48 groundwater samples for analysis. This section summarizes the Phase II ESA findings.

The Phase II ESA has met the objectives stated in Section 1.1 of this report:

- A comprehensive environmental baseline defining the chemical distribution in soil and groundwater has been established (see Section 3.0).
- Chemical data and findings are provided in Section 3.0 to support potential buyers in evaluating the environmental condition of the SBPP and the NCT.
- The chemical database was used to determine the potential need for remediation based on environmental regulations and the BHRA.
- The resolution has been completed for the of Potential Environmental Conditions identified in Phase I, with respect to whether each potential environmental condition requires no further action or needs additional evaluation/remediation.

The Phase I ESA identified potential environmental conditions associated with each Investigation Area at the SBPP and the NCT and made recommendations for further investigating these conditions through the Phase II investigations. In Section 6.1, Summary, the potential environmental conditions associated with each Investigation Area are evaluated in light of the Phase II ESA findings. Each potential environmental condition is assessed in terms of whether further action is required. Potential environmental conditions requiring no further action are identified. Fluor Daniel GTI recommends remediation evaluation for the recognized environmental conditions identified based on the Phase II investigation results.

6.1 Summary

The Phase I ESA report defined Investigation Areas at the Site and established a list of potential environmental conditions within each Investigation Area. This information was presented in Table 6-1 of the Phase I ESA Report (Fluor Daniel GTI, 1998). The FSP further defined the Investigation Areas and Subareas at the Site (Fluor Daniel GTI, 1998).

With the completion of the Phase II activities and the integration of results from previous investigations, the list of potential environmental conditions is reevaluated in Table 6-1. Location of the remaining potential environmental conditions (i.e., recognized environmental conditions) are discussed in Section 6.2 and are shown on Figure 6.1.

Subarea 1a - North Tank Farm and Subarea 1b - South Tank Farm

No contamination of soil or groundwater was found during the Phase II ESA sampling activities. localized TEH concentrations over 100 mg/kg were detected in shallow soil, but no areas of hydrocarbons over 1,000 mg/kg TEH were identified. All metal concentrations associated with this type of contaminant were below screening levels or were found to match background values.

These findings indicate that contamination in this area is not an environmental condition. However, the Phase I ESA identified previous reports of leaks from the ASTs. These releases indicate that the areas under the tanks and piping remain a potential environmental condition to be addressed at decommissioning.

Subarea 1c - Jet Fuel Tank Area

Free-phase hydrocarbons detected in groundwater in this area indicate that remediation will be required (Location I). Therefore, this area represents a recognized environmental condition. The distribution of hydrocarbons in soil in this area overlaps with the First Generation Surface Impoundments, and remediation of these two areas may require a combined remediation program. Evaluation of remediation methods is recommended.

Subarea 1d - UST Area

Benzene concentrations in groundwater in the UST area exceeded the RWQCB action levels; this area represents a recognized environmental condition where remediation may be required (Location III). It is unclear if groundwater contamination is due to residual hydrocarbons in soil from the former USTs, or is due to a more recent release from the current USTs. Evaluation of remedial methods is recommended.

Subarea 2a - Process Water Treatment Area

Sampling of soil and groundwater in accessible areas at and near the Process Water Treatment Area indicated that soil or groundwater contamination has not occurred in this area of the site. No environmental condition exists in this area.

No sampling of the Process Water Treatment Area was performed due to limited access. Therefore, the potential release of contaminants beneath this area is unknown and remains a potential environmental condition, to be addressed during decommissioning.

Subarea 2b - Former Surface Impoundments

The First Generation Surface Impoundments contain metal concentrations above SSLs and residential PRGs, and TEH concentrations above action levels (Location II). This area represents a recognized environmental condition and the remediation of metal concentrations in soil should be evaluated.

No Phase II ESA sampling was conducted in the area of the Second Generation Surface Impoundments, and this area is not a potential environmental condition.

Subarea 3a - Power Plant and Immediate Vicinity

Phase II ESA sampling at the periphery of the SBPP, including the wastewater transfer sump at the northwestern edge of the power plant, indicated that soil contamination has not occurred. However, previous investigation reports of TEH concentrations over 1,000 mg/kg indicate that additional localized remediation of soil in the East Loop Fuel area may be required. The Phase II ESA groundwater sampling in that area indicated that groundwater has not been impacted by hydrocarbons. Evaluation of soil remediation methods is recommended.

No sampling of the power plant area was performed due to inaccessibility. Therefore, the potential release of contaminants beneath the power plant and associated structures should be evaluated during decommissioning.

Subarea 3b - Maintenance Area

Sampling of this area indicated that no soil or groundwater contamination from the power plant has occurred. No environmental condition exists in this area.

Subarea 3c - Gas Turbine

Sampling of the southern and northern edges of the Gas Turbine Area indicated TEH in soil at the northern sampling location; however, the TEH concentration was less than 1,000 mg/kg. No sampling under the GT was performed due to inaccessibility. Therefore, the potential release of contaminants beneath the GT is unknown and should be addressed during decommissioning.

Subarea 4a - Former Drum Storage Area

This area was previously sampled and closed by the DTSC, and the results of the biased grid sampling of soil and groundwater in the vicinity of this area indicated that no potential environmental condition remains, and no further action is recommended.

Subarea 4b - Construction Yard

The potential impact of soil and groundwater from these operations was investigated by sampling the soil and groundwater, and no contamination was found. No potential environmental condition remains in this area, and no further action is recommended.

Subarea 4c - Hazardous Materials Storage Area

Soil and groundwater sampling south of this area indicated that contamination has not occurred from the Hazardous Material Storage Area. No potential environmental condition remains in this area.

Subarea 5a - Open Area

Grid-based shallow soil sampling and groundwater sampling indicated that a plume of TCE and DCE contamination exists in groundwater in the eastern part of the SBPP (Location IV). The dissolved chlorinated VOC plume does not extend east of sampling point SB05-041, as demonstrated by upgradient well SB05-043, which did not contain VOCs. The source of this plume is unknown, and further assessment, with remediation, is recommended.

Concentrations of PCBs and metals in this area indicate that no contamination caused by these compounds has occurred.

Subarea 5b - Switchyard Border

Sampling of soil and groundwater for PCBs, hydrocarbons and metals indicates that no contamination has occurred in this area. No potential environmental condition remains in this area.

Subarea 5c - Septic/Leach Field

Sampling of soil and groundwater for petroleum hydrocarbons, solvents and metals indicates that no contamination has occurred in this area. No potential environmental condition remains in this area.

Area 6 - National City Terminal

Sampling of soil and groundwater at the NCT indicated localized areas of TEH contamination over 100 mg/kg. These areas represent a recognized environmental condition and will require remediation.

Groundwater samples at the NCT indicated TEH concentrations up to 2,600 µg/l, but concentrations of PAHs, BTEX, and VOCs indicated that no dissolved contaminants above action levels were found at the NCT. Groundwater contamination at the NCT is not an environmental condition.

Off-site Areas

Sampling of soil and groundwater at the periphery of the Site indicated that off-site sources of contamination have not affected the soil or groundwater at the Site. Only the minor groundwater TCE concentration (below action levels) found at the NCT may be due to off-site sources. At the SBPP, the on-site (Subarea 5a) TCE groundwater contamination is separated from upgradient sources by an upgradient well which did not contain dissolved VOCs, and it can be concluded that off-site sources are not an environmental condition and have not affected the SBPP.

6.2 Conclusions

The Phase I ESA identified potential environmental conditions which were investigated during the Phase II ESA. The findings of the Phase II ESA and applicable previous analytical data were combined in a data set representing baseline environmental conditions, which were compared to regulatory screening levels, and were incorporated in a BHRA. The BHRA concluded that risks to human health are acceptable for continued industrial use of the Site. The fate and transport modeling indicated that groundwater contamination may be caused by metals in soil in the First Generation Surface Impoundments area. Results of the investigation, regulatory evaluation, and BHRA identify six recognized environmental conditions at the Site associated with Site operations that have impacted soil or groundwater.

- I: Jet Fuel Tank Area – Free-phase fuel hydrocarbons on groundwater and soil contamination with hydrocarbon. The presence of free-phase hydrocarbon will require remediation.

- II: First Generation Surface Impoundments – Metal and hydrocarbons contamination in soil was identified in the First Generation Surface Impoundment area. Fate and transport modeling indicates potential groundwater contamination from metals. Recommend evaluating remediation approach for metals and hydrocarbons.

- III: UST Area – The benzene concentration in groundwater in a monitoring well near the USTs exceeded RWQCB criteria. Recommend evaluating remediation approach for benzene in groundwater.

- IV: TCE and DCE in groundwater - A plume of dissolved TCE and DCE was identified in the eastern part of the SBPP at levels exceeding Basin Plan groundwater action levels. Recommend identifying the source of the TCE contamination and evaluating the remediation approach for TCE and DCE in groundwater.

- V: East Loop – A fuel release impacted soils in an area south of the SBPP, known as the "East Loop". Soils were excavated and remediated, but subsequent borings identified localized remaining hydrocarbon concentrations exceeding 1,000 mg/kg TEH. Recommend evaluation of soil remediation approach for TEH concentrations greater than 1,000 mg/kg.

- VI: National City Terminal – Localized areas of shallow hydrocarbon contamination in soil exceeding 100 mg/kg TEH have been identified. Recommend evaluating remediation approach for TEH.

Several locations at the SBPP and the NCT could not be assessed because samples could not be collected from beneath existing structures. These inaccessible areas under tanks, piping, the power plant, and buildings represent potential environmental conditions that should be addressed at decommissioning.

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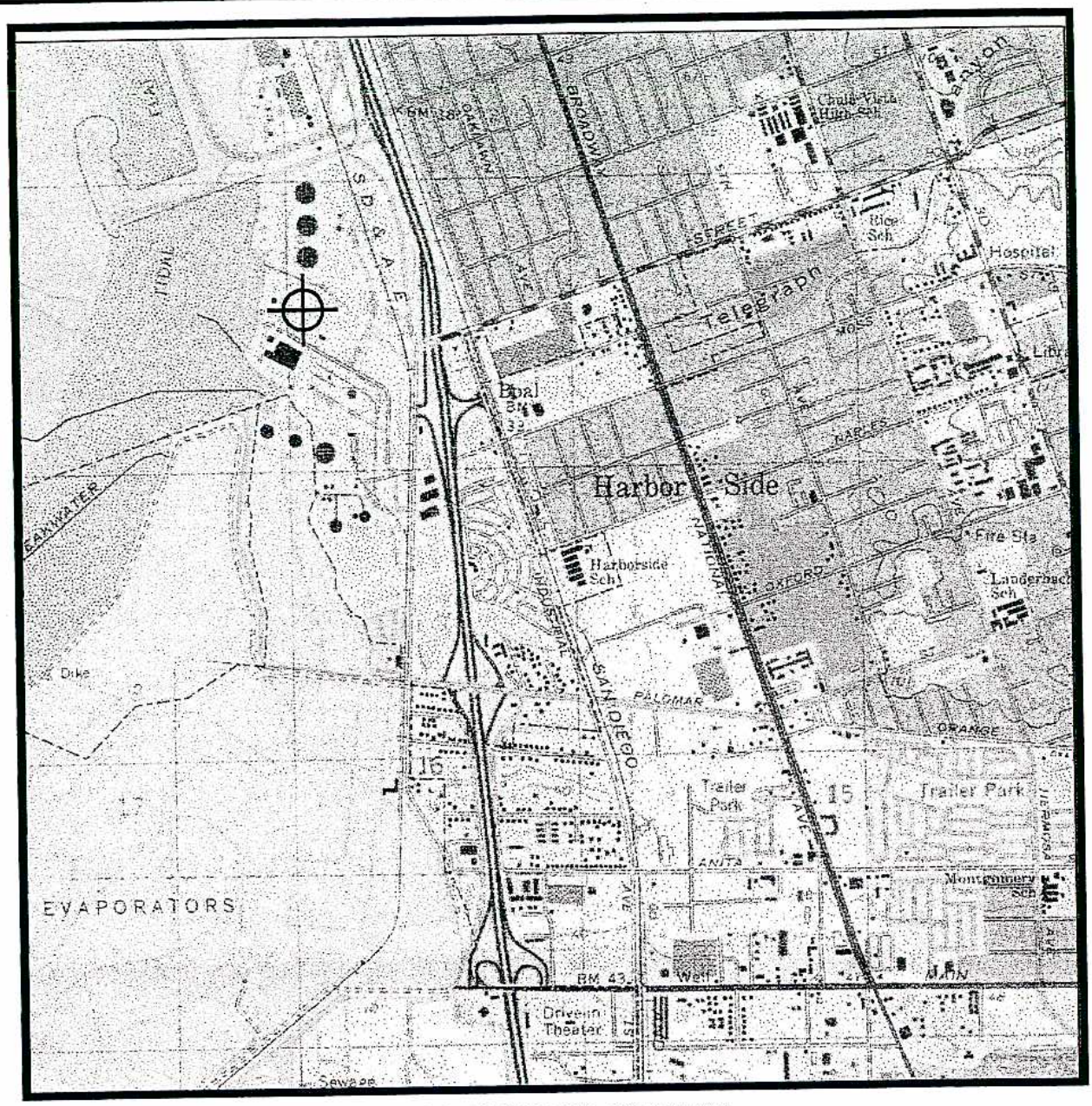
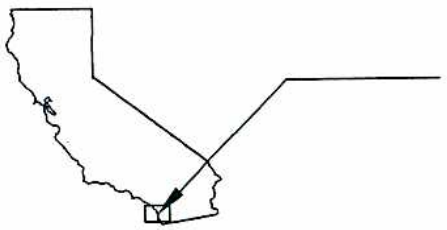


SOURCE: U.S.G.S. TOPOGRAPHIC QUADRANGLE
IMPERIAL BEACH, CALIF.
7.5 MINUTE SERIES
1967 / PHOTOREVISED 1975
REPRODUCTION NOT TO SCALE

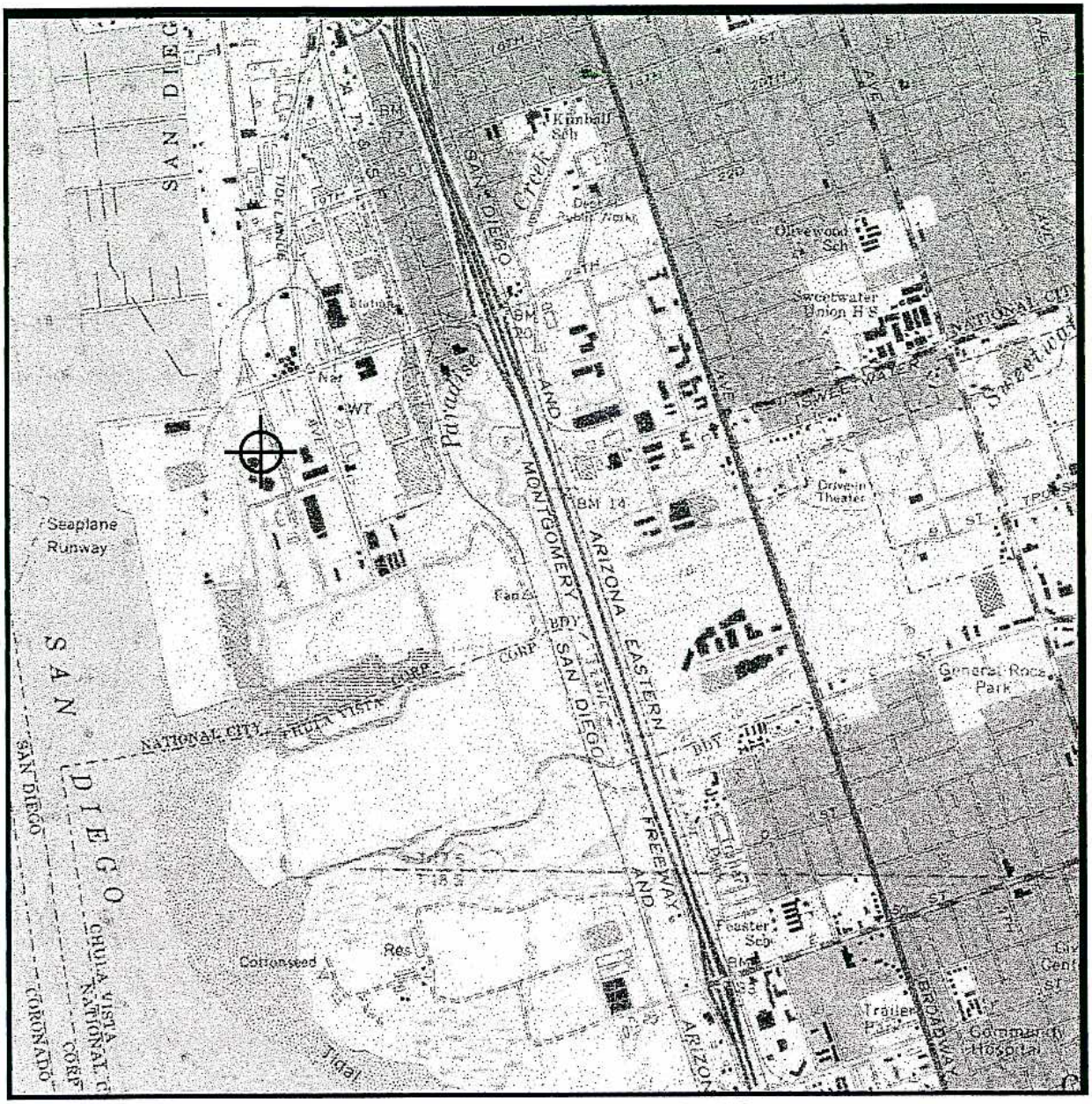


SITE LOCATION

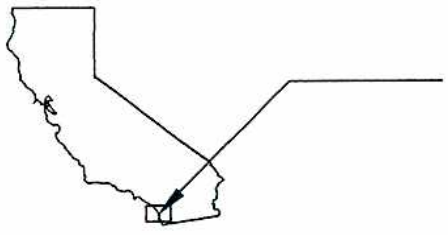
FLUOR DANIEL GTI

SITE LOCATION MAP
SOUTH BAY POWER PLANT

CLIENT: SAN DIEGO GAS AND ELECTRIC	FILE: 3589ASLM (1:1)	PROJECT NO.:	PM	PE/RG
	REV.		FIGURE: 1-1a	
LOCATION: CHULA VISTA, CA.	DES. PG	DET. RG	DATE: 5/11/98	



SOURCE: U.S.G.S. TOPOGRAPHIC QUADRANGLE
NATIONAL CITY, CALIF.
7.5 MINUTE SERIES
1967 / PHOTOREVISED 1975
REPRODUCTION NOT TO SCALE



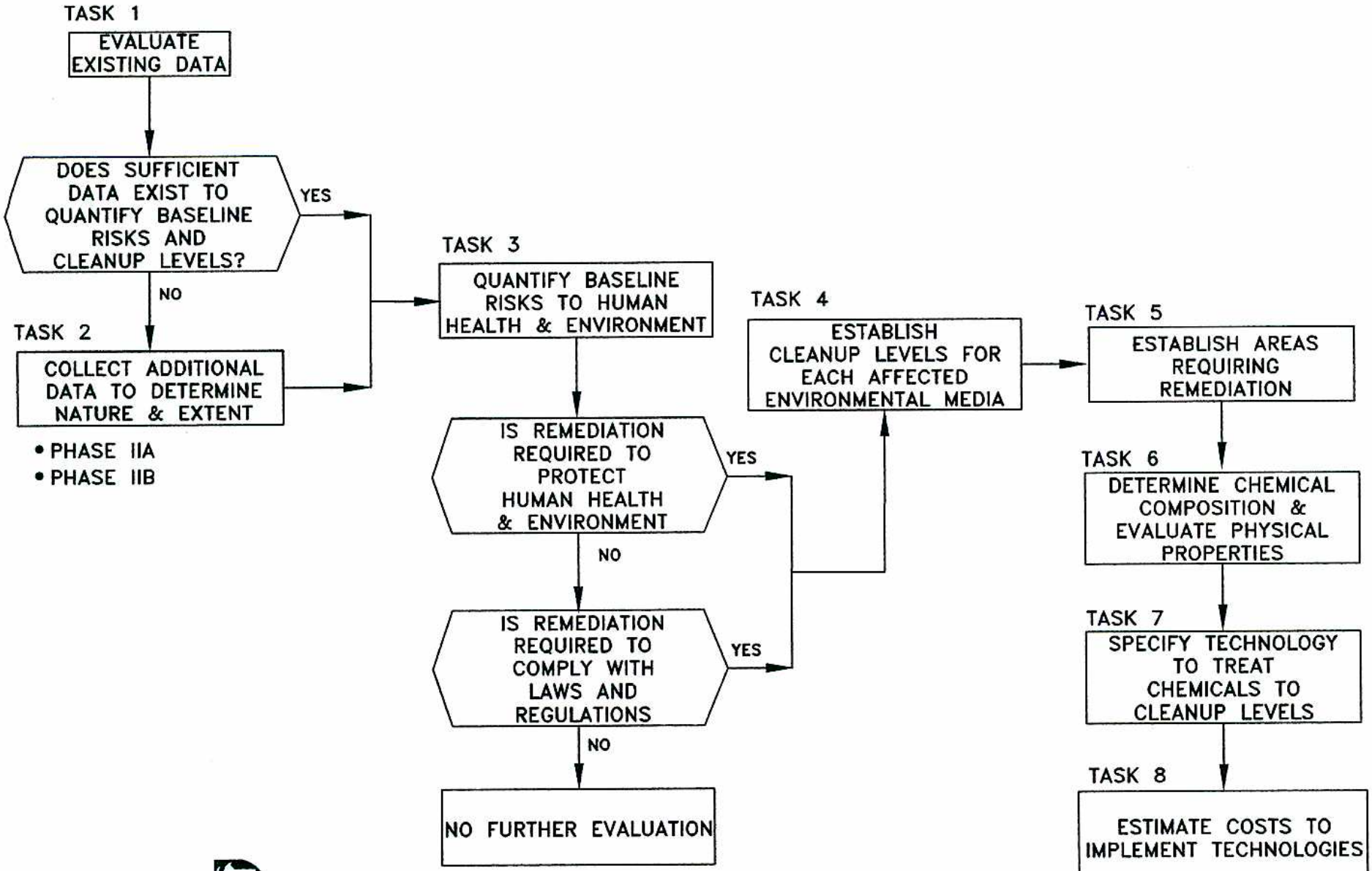
SITE LOCATION

FLUOR DANIEL GTI

SITE LOCATION MAP
NATIONAL CITY TERMINAL

CLIENT: SAN DIEGO GAS AND ELECTRIC	FILE: 3589bslm (1:1)	PROJECT NO.:	PM	PE/RG
	REV.		FIGURE: 1-1b	
LOCATION: NATIONAL CITY, CA.	DES. PG	DET. RG	DATE: 5/11/98	

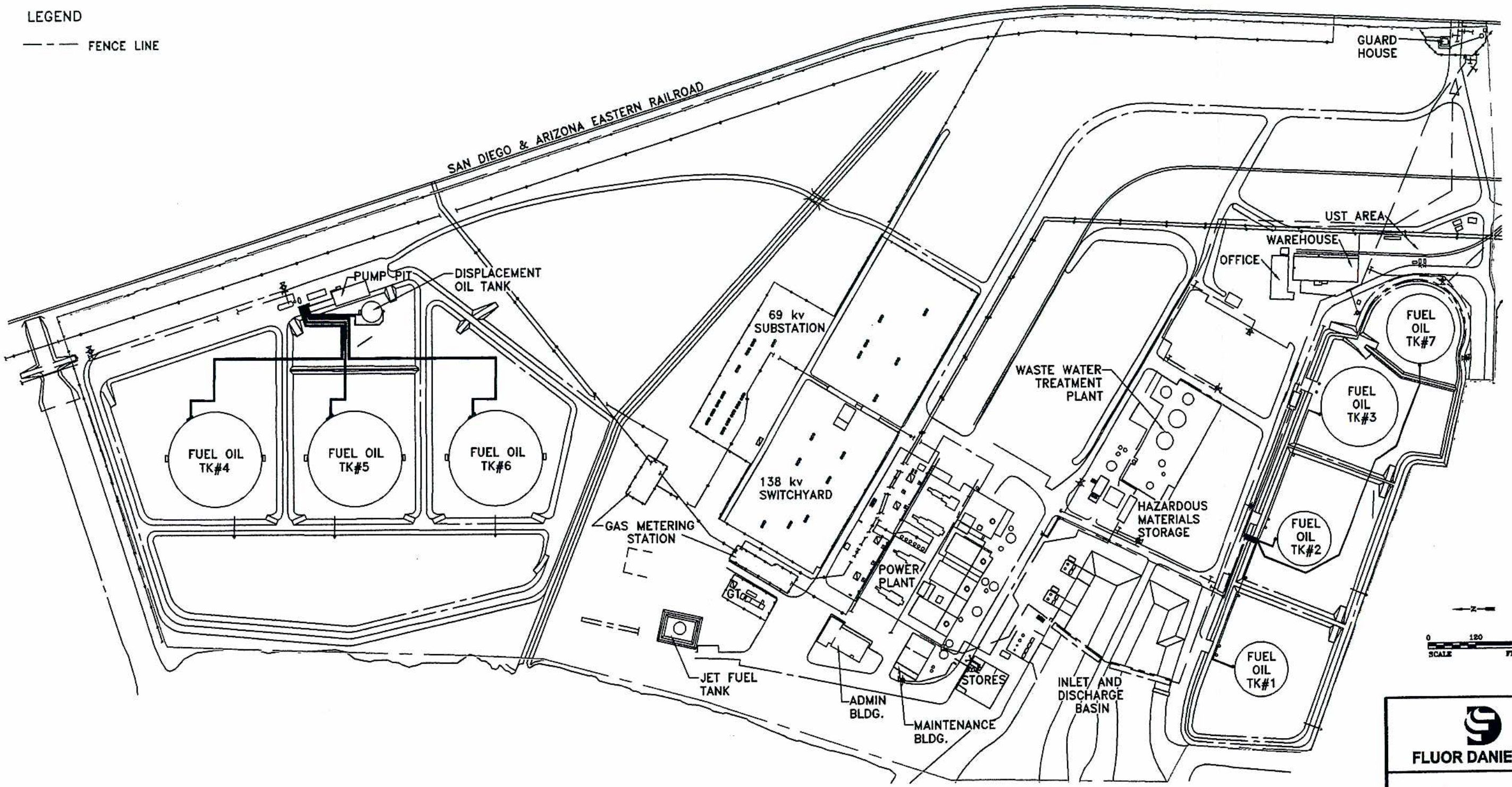
FIGURE 1-2
GRAPHICAL SUMMARY OF PROJECT APPROACH
SDG&E PHASE II ENVIRONMENTAL SITE ASSESSMENT
SOUTH BAY POWER PLANT AND
NATIONAL CITY TERMINAL FACILITY



FLUOR DANIEL GTI
6/5/98 3589GSPA

LEGEND

— — — FENCE LINE



S A N D I E G O

B A Y

FLUOR DANIEL GTI

SAN DIEGO GAS AND ELECTRIC

SOUTH BAY POWER PLANT
CHULA VISTA, CALIFORNIA

SITE PLAN AND FACILITY LAYOUT

DESIGNED BY:	DRAWN BY:	CHECKED BY:
KS	RG	

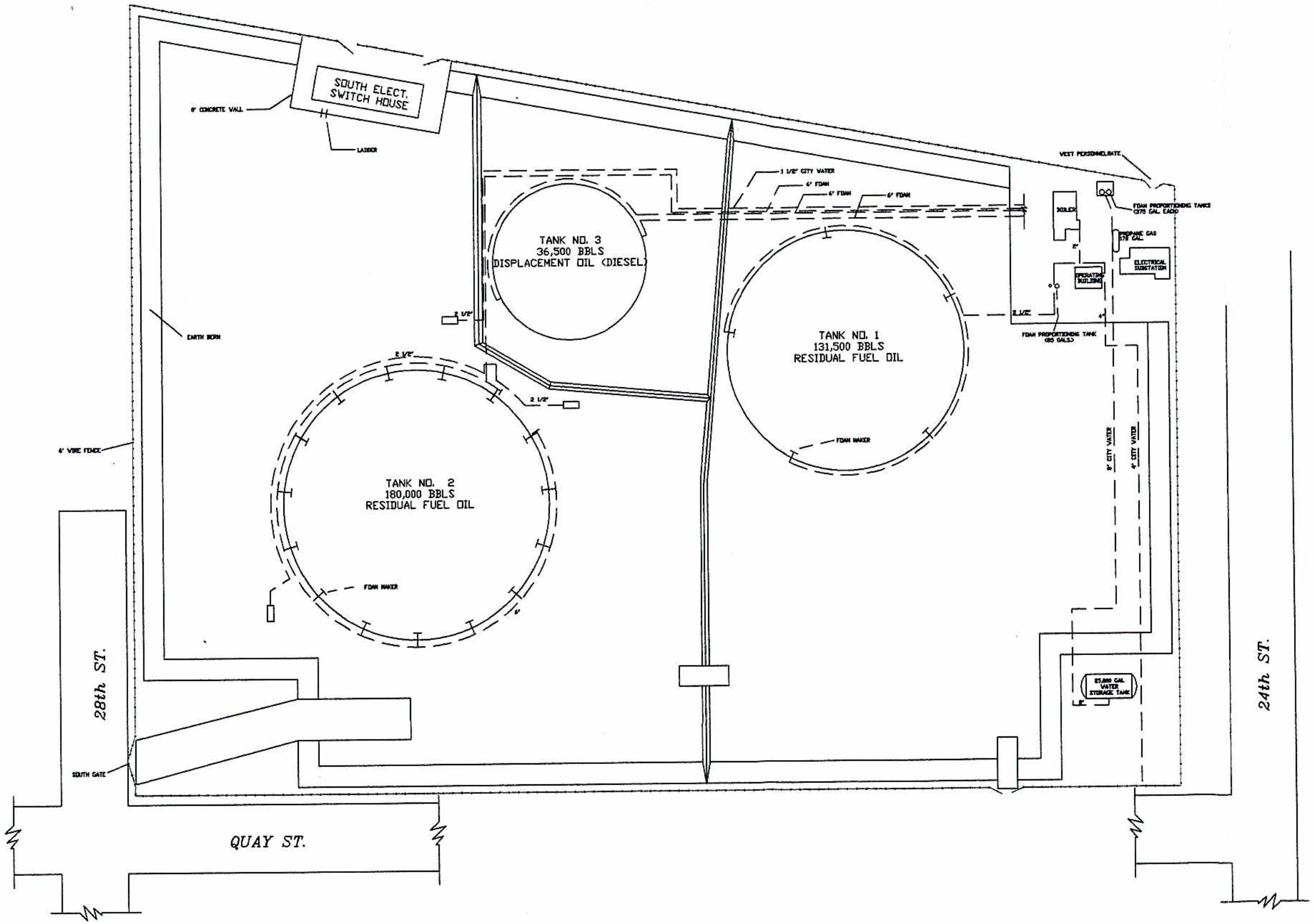
DATE:	FILE:
6/15/98	3589spl (1:120)

PROJECT NO.:	CONTRACT:
103589	

DRAWING: **1-3a**

LEGEND

FENCE



N

SCALE: 0 50 100 FEET

NOTE 1: PIPING NOT TO SCALE

NOTE 2: NOT ALL PIPING SYSTEMS PRESENT

FLUOR DANIEL GTI

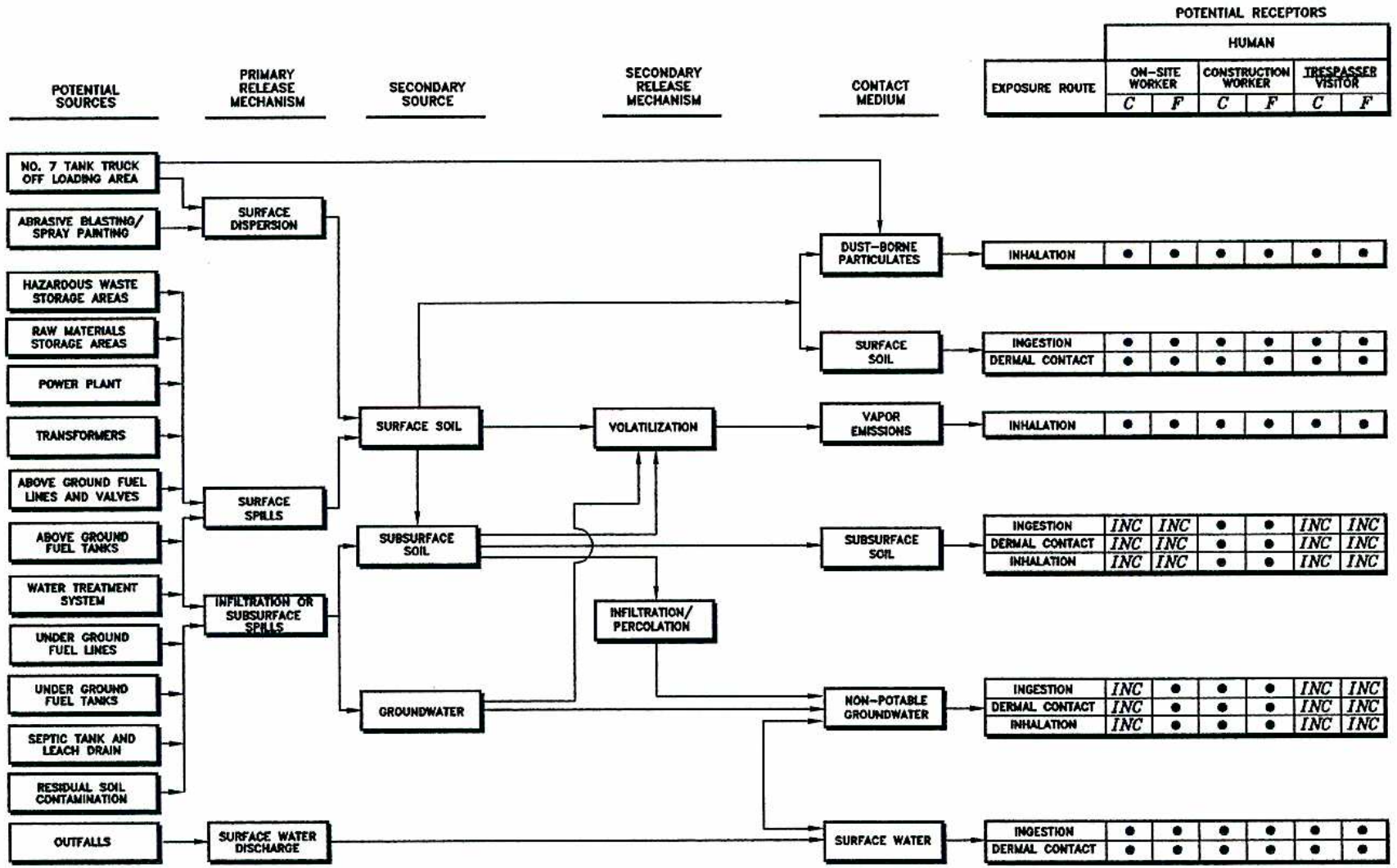
SAN DIEGO GAS AND ELECTRIC

NATIONAL CITY
FUEL OIL HANDLING FACILITY
NATIONAL CITY, CALIFORNIA

SITE PLAN AND FACILITY LAYOUT

DESIGNED BY:	DRAWN BY:	CHECKED BY:
TB	RG	
DATE: 5/11/98	FILE: 3589BSP	
PROJECT NO.: 103589	CONTRACT:	

DRAWING: 1-3b



FLUOR DANIEL GTI	CLIENT: SAN DIEGO GAS AND ELECTRIC COMPANY	PRELIMINARY CONCEPTUAL SITE MODEL	
FILE: 3589PCSM (1:1)	PROJECT NO.: 103589	LOCATION: SOUTH BAY POWER PLANT CHULA VISTA, CALIFORNIA	PM:
REV.:	DES.: PA / DET.: JR / DATE: 5/11/98		PE/RG:
			FIGURE: 2-1

LEGEND

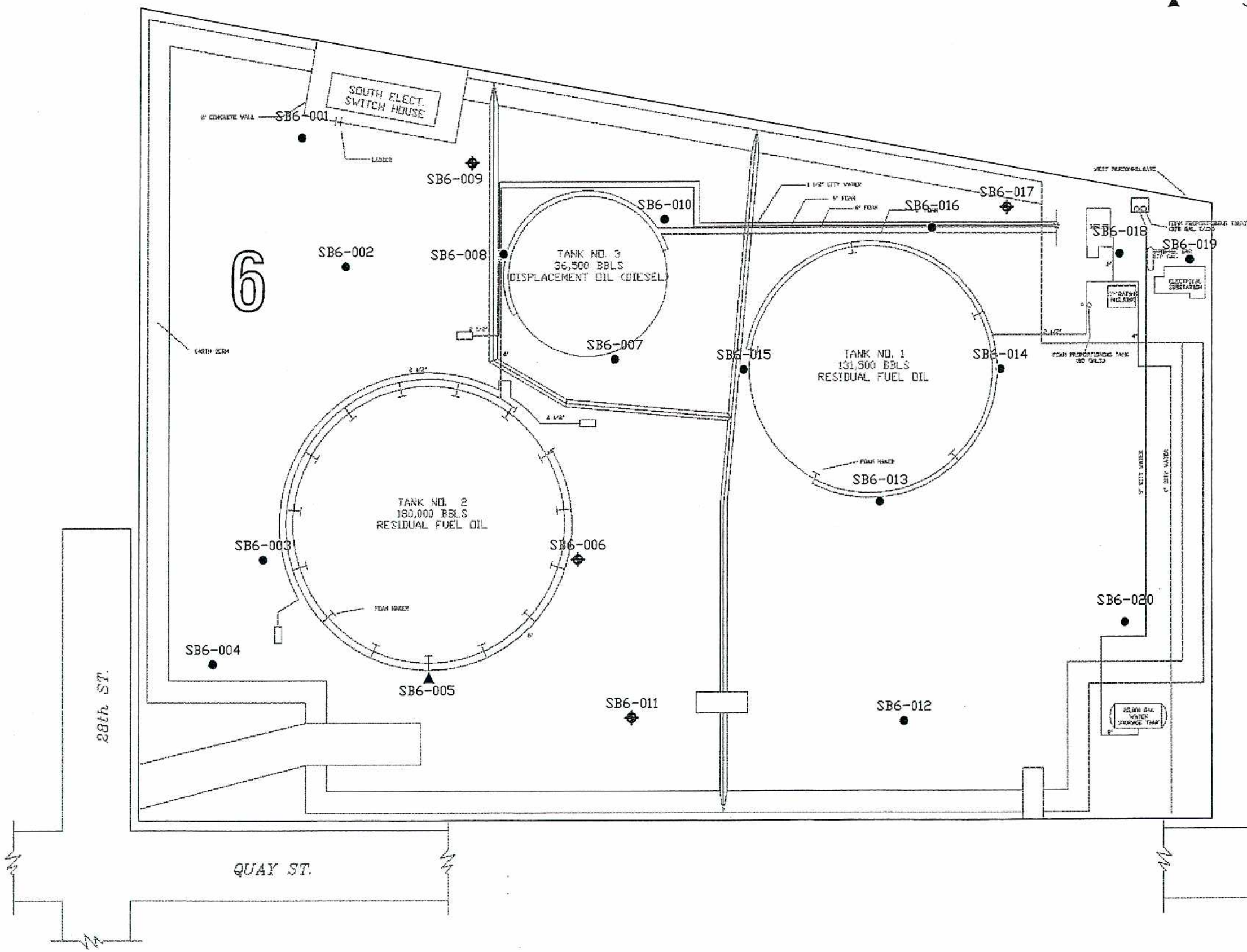
6 — Area Designation

——— Area Boundary

SB1-063 — Groundwater Sampling Point

SB6-015 — Soil Boring 0' – 5'

SB6-005 — Soil Boring Depth at 7'



SCALE: 20 0 20 40 FEET

NOTE 1: PIPING NOT TO SCALE

NOTE 2: NOT ALL PIPING SYSTEMS PRESENT

FLUOR DANIEL GTI

SAN DIEGO GAS AND ELECTRIC

NATIONAL CITY
FUEL OIL HANDLING FACILITY
NATIONAL CITY, CALIFORNIA

SAMPLING LOCATIONS

DESIGNED BY:	DRAWN BY:	CHECKED BY:
TB	JR	

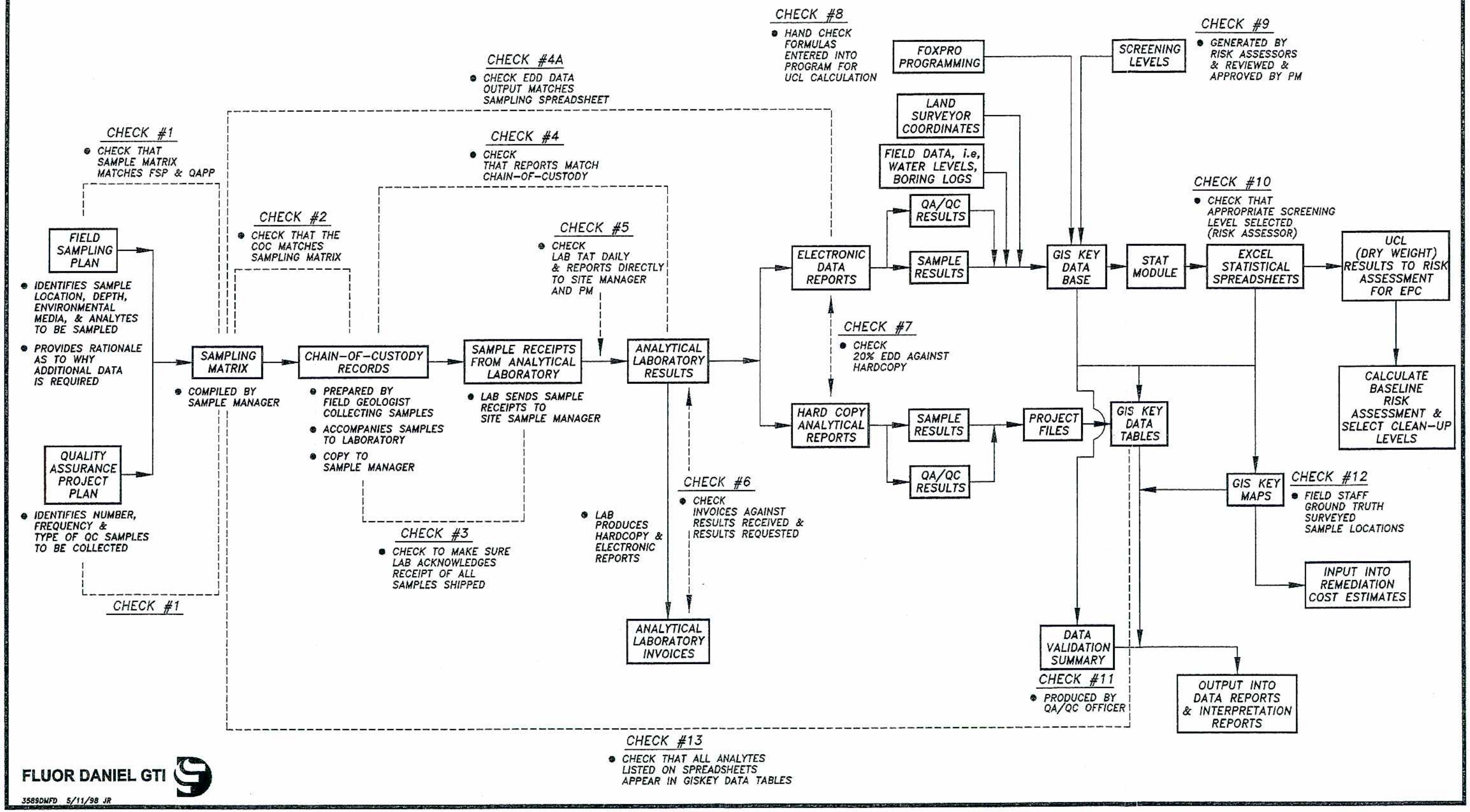
DATE:	FILE:
5/22/98	3589BSAM

PROJECT NO.:	CONTRACT:
103589	

DRAWING:

FIGURE 2-2b

FIGURE 2-3
DATA MANAGEMENT FLOW DIAGRAM (& INTERNAL QC CHECKS)
DATA GENERATED DURING PHASE II ENVIRONMENTAL SITE INVESTIGATIONS
SDG&E POWER PLANT DIVESTITURES



FLUOR DANIEL GTI

3589DMFD 5/11/98 JR

LEGEND

- Area Boundary
- Sub-Area Boundary
- 1 Area Description
- SB3-023 / 3.5-4.5 | 130 — Phase II ESA Site Identification; TEH (mg/kg); Depth (feet)
- Phase II ESA – Boring containing TEH concentrations from 50 – 100 mg/kg (All other locations had TEH < 50 mg/kg)
- B5 / 7.5 | 2,600 / 9 | 51 / 12 | 5.1 — Previous data site identification; TPH or TRPH (mg/kg); Depth (feet)

Note: For each sampling location where any sample concentration exceeded 100 mg/kg TEH, all samples from that location are displayed.

- SB1-070C — 2 Inch Monitoring Well
- MW5 — Previously Drilled Monitoring Well
- SB1-063 — Groundwater Sampling Point
- SB1-045 — Soil Boring 0' – 5.5'
- SB1-062 — Soil Boring 6' – 15'
- Excavation Limits

Note: Detailed survey data included in appendix of report. Approximate Sampling Locations.

SB1-036	
0-1	190
4.5-5	ND

SB1-027	
0-1	140

SB5-045	
0-1	120
4-5	2.2

SB4-002	
0.5-1	190
4-5	ND

SB5-018	
0-1	220
5-6	3.2

SB2-005	
0.5-1	67
2.5-3	120
4-5	190

B8	
7.5	2,700
10	5.5
12	<1.0

B-18	
7.5	470

SAMPLE#	CONC.
B-1	190
C-1	330
D-1	340
DEPTH UNKNOWN	

SB4-006	
0.5-1	21
4-5	130

SB4-011	
0.5-1	270
4-5	10

B6	
7	330
9	8,300
14	4.7

B4	
9	56
11	630
13	3.3

B1	
8	160
10	57
12	3.9

SB1-070	
0.5-1	2.5
4-5	ND
9-10	780

SB1-070B	
6-6.5	2.5
10.5-11	350

B5	
7.5	2,600
9	51
12	5.1

SB3-023	
0.5-1	ND
3.5-4.5	130
5.5-6	ND

EL B2	
7	800
9	1.5
10	<1.0

EL B1	
6	1,600
9.5	3.0
11.5	1.3

SAN DIEGO BAY

0 120 240
SCALE FEET

FLUOR DANIEL GTI

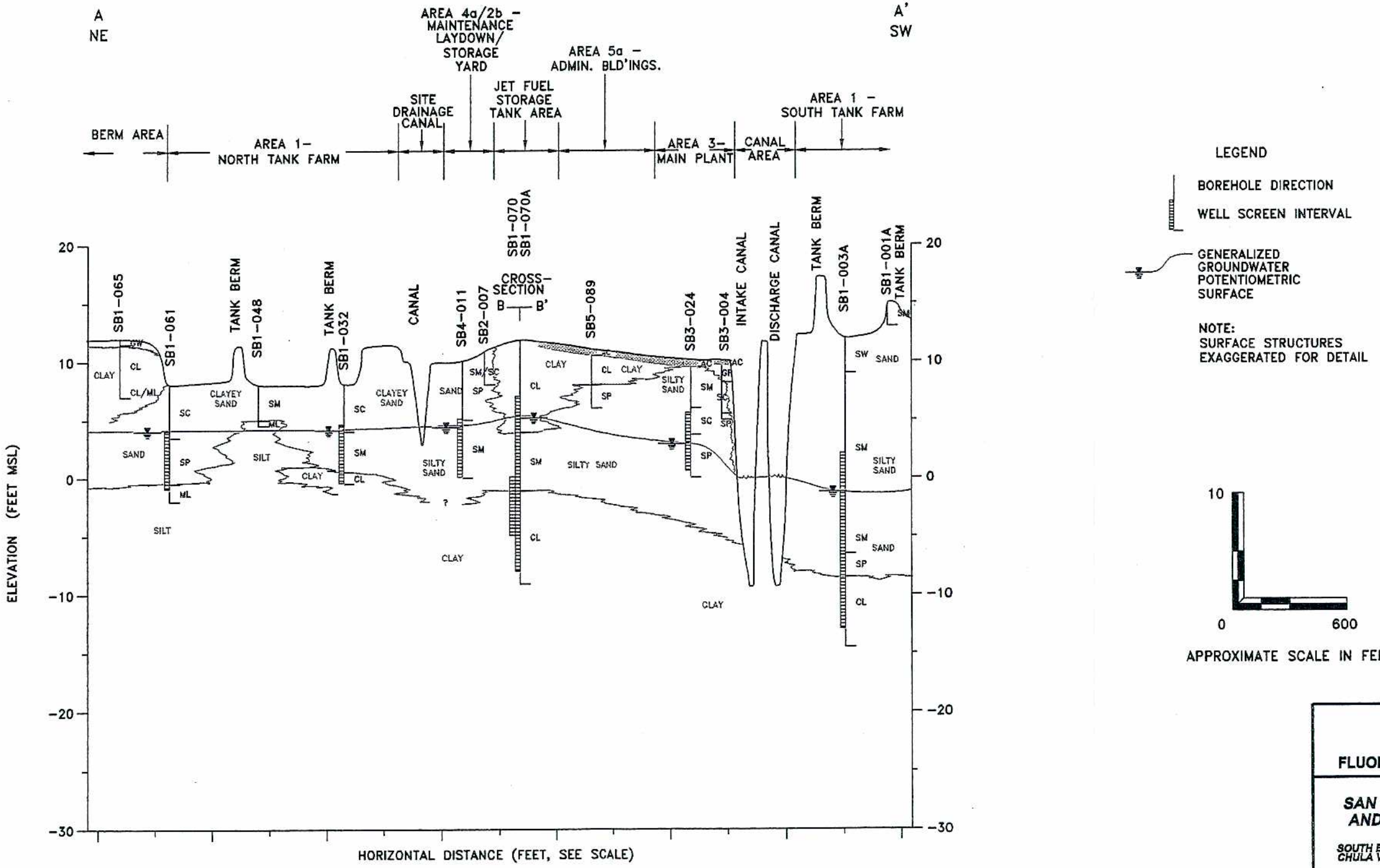
SAN DIEGO GAS AND ELECTRIC

SOUTH BAY POWER PLANT
CHULA VISTA, CALIFORNIA

BASELINE DISTRIBUTION OF TEH/TPH IN SOIL

DESIGNED BY:	DRAWN BY:	CHECKED BY:
KS	RG	
DATE: 6/30/98	FILE: 3589ATEH	
PROJECT NO.: 103589	CONTRACT:	

DRAWING: **FIGURE 3-3a**



LEGEND

BOREHOLE DIRECTION

WELL SCREEN INTERVAL

GENERALIZED GROUNDWATER POTENTIOMETRIC SURFACE

NOTE:
SURFACE STRUCTURES EXAGGERATED FOR DETAIL

APPROXIMATE SCALE IN FEET

FLUOR DANIEL GTI

SAN DIEGO GAS AND ELECTRIC

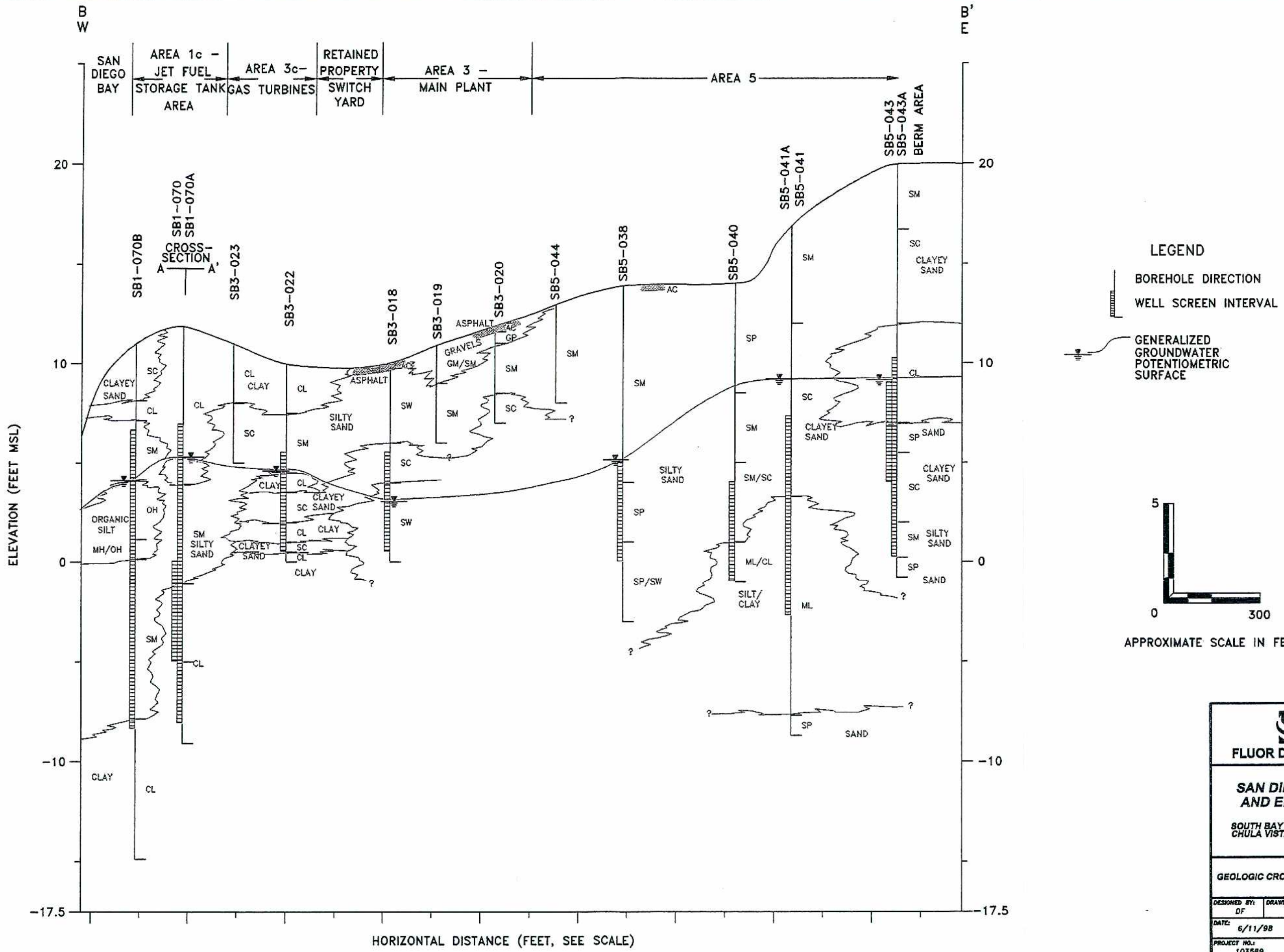
SOUTH BAY POWER PLANT
CHULA VISTA, CALIFORNIA

GEOLOGIC CROSS SECTION (A-A')

DESIGNED BY:	DRAWN BY:	CHECKED BY:
DF	JR	
DATE: 6/11/98	FILE: 3589XAA (1:10)	
PROJECT NO.: 103589	CONTRACT:	

DRAWING:

FIGURE 3-1b



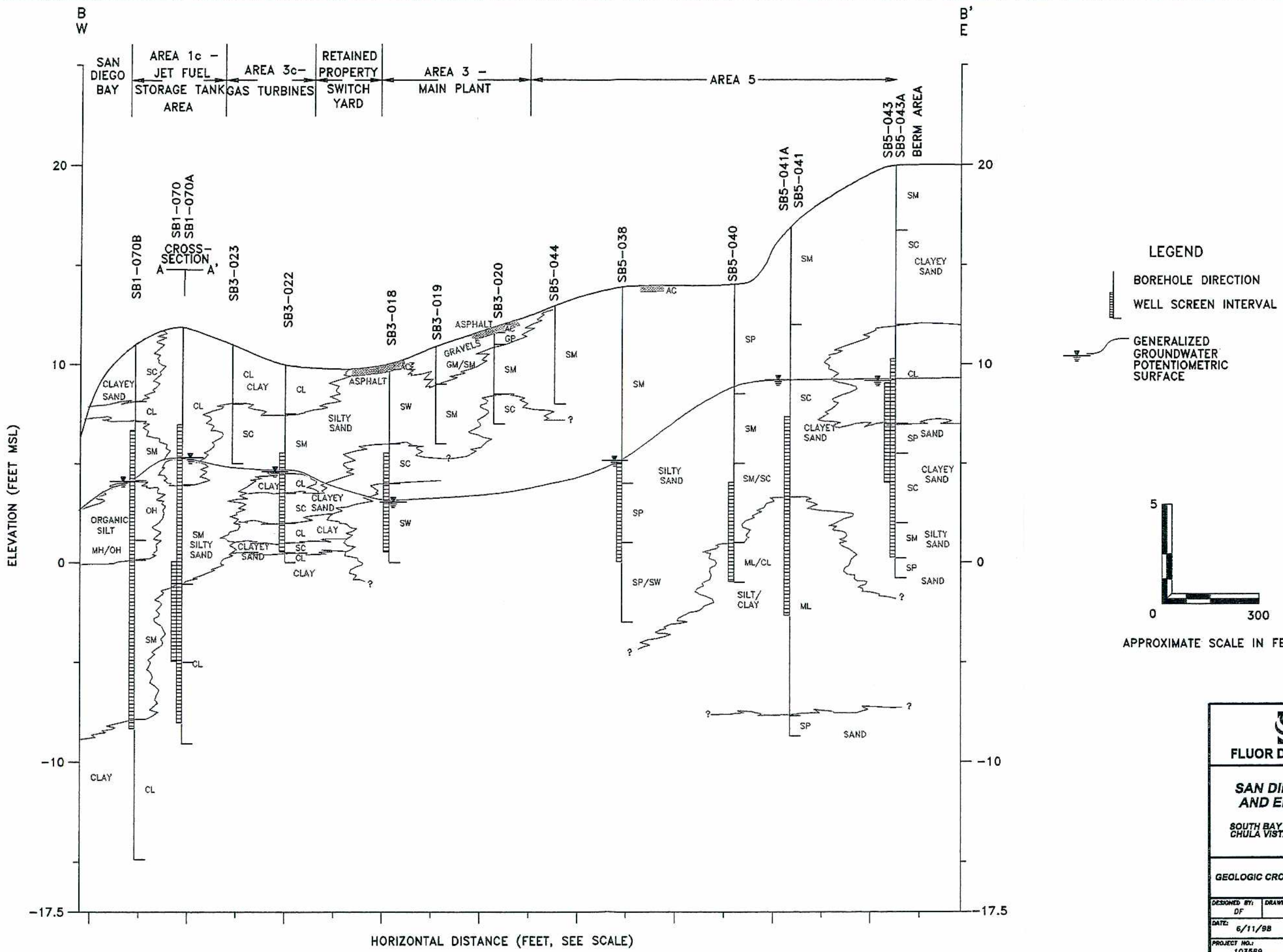
FLUOR DANIEL GTI

SAN DIEGO GAS AND ELECTRIC

SOUTH BAY POWER PLANT
CHULA VISTA, CALIFORNIA

GEOLOGIC CROSS SECTION (B-B')

DESIGNED BY: DF	DRAWN BY: JR	CHECKED BY:
DATE: 6/11/98	FILE: 3589XBB (1:5)	
PROJECT NO.: 103589	CONTRACT:	
DRAWING: FIGURE 3-1C		



FLUOR DANIEL GTI

SAN DIEGO GAS AND ELECTRIC

SOUTH BAY POWER PLANT
CHULA VISTA, CALIFORNIA

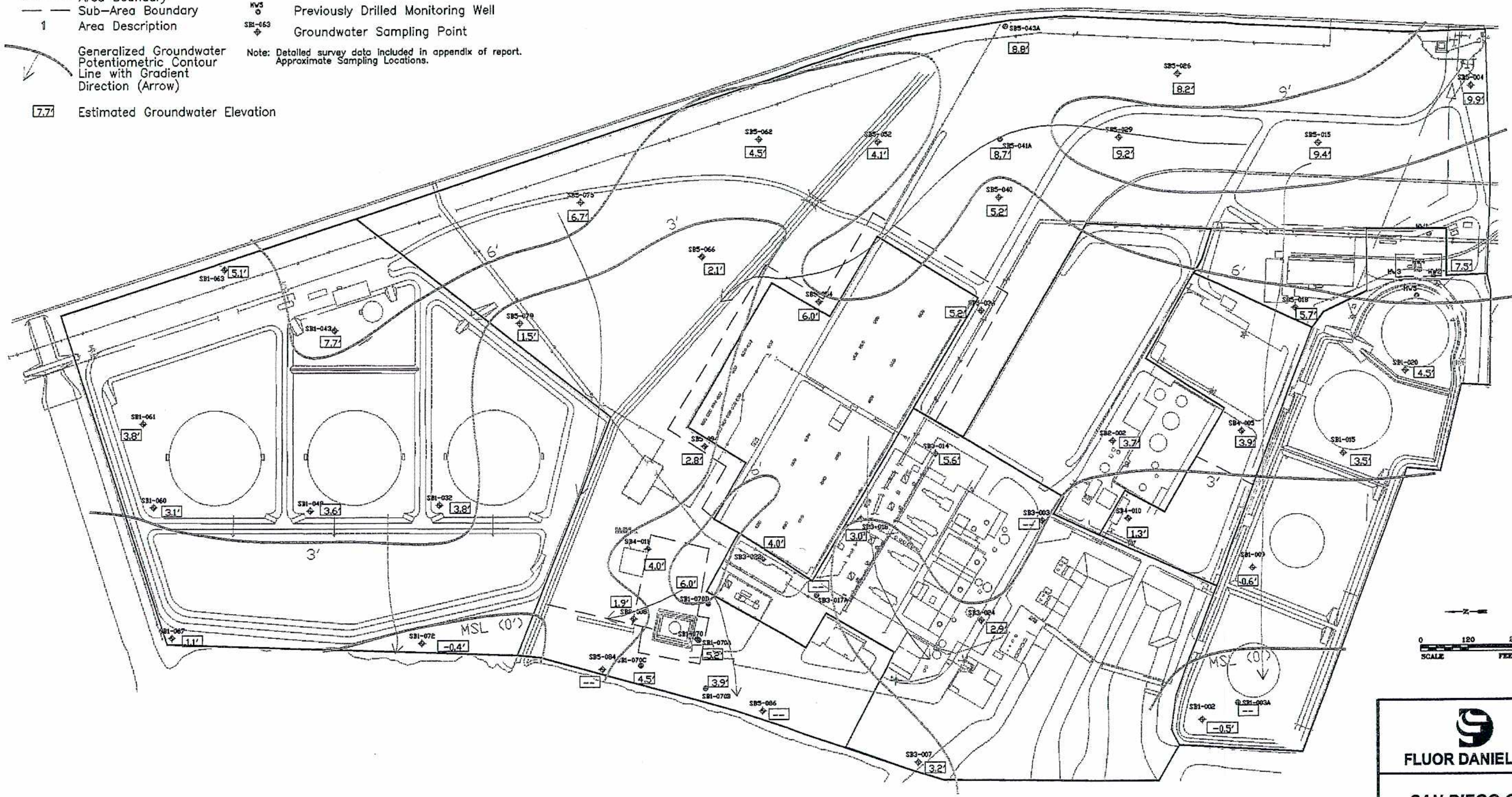
GEOLOGIC CROSS SECTION (B-B')

DESIGNED BY: DF	DRAWN BY: JR	CHECKED BY:
DATE: 6/11/98	FILE: 3589XBB (1:5)	
PROJECT NO.: 103589	CONTRACT:	
DRAWING: FIGURE 3-1C		

LEGEND

- Area Boundary
- Sub–Area Boundary
- 1 Area Description
- Generalized Groundwater Potentiometric Contour Line with Gradient Direction (Arrow)
- 7.7' Estimated Groundwater Elevation
- SB1-070C — 2 Inch Monitoring Well
- MW5 — Previously Drilled Monitoring Well
- SB1-063 — Groundwater Sampling Point

Note: Detailed survey data included in appendix of report. Approximate Sampling Locations.



Note:
Groundwater potentiometric surface based on surveyed elevation of some wells and approximate well head elevations for temporary monitoring wells.

S A N D I E G O

B A Y

FLUOR DANIEL GTI

SAN DIEGO GAS AND ELECTRIC

SOUTH BAY POWER PLANT
CHULA VISTA, CALIFORNIA

GENERALIZED POTENTIOMETRIC SURFACE MAP (MARCH / APRIL, 1998)

DESIGNED BY:	DRAWN BY:	CHECKED BY:
KS	JR	
DATE: 6/8/98	FILE: 3589PSM	
PROJECT NO.: 103589	CONTRACT:	

DRAWING:

FIGURE 3-2

LEGEND

A —— A' Geologic Cross Section

SB1-070C 2 Inch Monitoring Well

MW5 Previously Drilled Monitoring Well

SB1-063 Groundwater Sampling Point

SB1-045 Soil Boring 0' – 5.5'

SB1-062 Soil Boring 6' – 15'

Note: Detailed survey data included in appendix of report. Approximate sampling locations.

A

B

B'

A'

S A N D I E G O

B A Y

0 120 240

SCALE FEET

FLUOR DANIEL GTI

SAN DIEGO GAS AND ELECTRIC

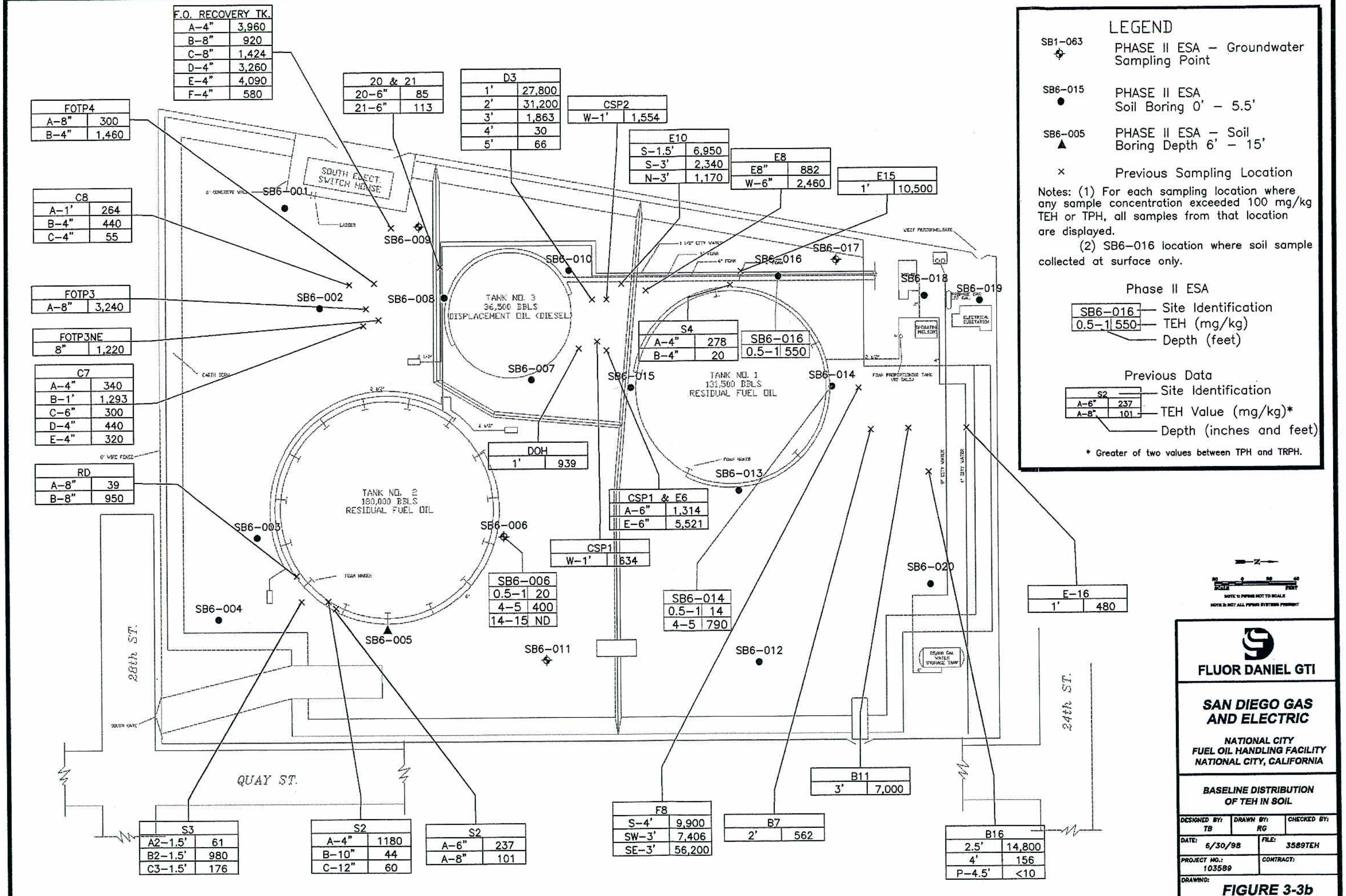
SOUTH BAY POWER PLANT
CHULA VISTA, CALIFORNIA

SITE PLAN SHOWING
GEOLOGIC CROSS SECTIONS
(A-A' AND B-B')

DESIGNED BY:	DRAWN BY:	CHECKED BY:
KS	JR	
DATE: 6/8/98	FILE: 3589XGEO	
PROJECT NO.: 103589	CONTRACT:	

DRAWING:

FIGURE 3-1a


F.O. RECOVERY TK.
A–4" 3,960
B–8" 920
C–8" 1,424
D–4" 3,260
E–4" 4,090
F–4" 580
20 & 21
20–6" 85
21–6" 113
D3
1' 27,800
2' 31,200
3' 1,863
4' 30
5' 66
CSP2
W–1' 1,554
E10
S–1.5' 6,950
S–3' 2,340
N–3' 1,170
E8
E8" 882
W–6" 2,460
E15
1' 10,500
FOTP4
A–8" 300
B–4" 1,460
C8
A–1' 264
B–4" 440
C–4" 55
FOTP3
A–8" 3,240
FOTP3NE
8" 1,220
C7
A–4" 340
B–1' 1,293
C–6" 300
D–4" 440
E–4" 320
RD
A–8" 39
B–8" 950
SOUTH ELECT. SWITCH HOUSE
SB6–001
SB6–009
SB6–010
SB6–016
SB6–017
SB6–018
SB6–019
SB6–002
SB6–008
TANK NO. 3
36,500 BBLS
DISPLACEMENT OIL (DIESEL)
S4
A–4" 278
B–4" 20
SB6–016
0.5–1 550
SB6–007
SB6–015
TANK NO. 1
131,500 BBLS
RESIDUAL FUEL OIL
SB6–014
SB6–013
DOH
1' 939
TANK NO. 2
180,000 BBLS
RESIDUAL FUEL OIL
CSP1 & E6
A–6" 1,314
E–6" 5,521
SB6–003
SB6–006
CSP1
W–1' 634
SB6–006
0.5–1 20
4–5 400
14–15 ND
SB6–020
E–16
1' 480
SB6–004
SB6–005
SB6–011
SB6–012
SB6–014
0.5–1 14
4–5 790
28th ST.
24th ST.
QUAY ST.
S3
A2–1.5' 61
B2–1.5' 980
C3–1.5' 176
S2
A–4" 1180
B–10" 44
C–12" 60
S2
A–6" 237
A–8" 101
F8
S–4' 9,900
SW–3' 7,406
SE–3' 56,200
B7
2' 562
B11
3' 7,000
B16
2.5' 14,800
4' 156
P–4.5' <10
LEGEND
SB1–063 PHASE II ESA – Groundwater Sampling Point
SB6–015 PHASE II ESA Soil Boring 0' – 5.5'
SB6–005 PHASE II ESA – Soil Boring Depth 6' – 15'
× Previous Sampling Location
Notes: (1) For each sampling location where any sample concentration exceeded 100 mg/kg TEH or TPH, all samples from that location are displayed.
(2) SB6–016 location where soil sample collected at surface only.
Phase II ESA
SB6–016 — Site Identification
0.5–1 550 — TEH (mg/kg)
Depth (feet)
Previous Data
S2 — Site Identification
A–6" 237 — TEH Value (mg/kg)*
A–8" 101 — Depth (inches and feet)
* Greater of two values between TPH and TRPH.
FLUOR DANIEL GTI
SAN DIEGO GAS AND ELECTRIC
NATIONAL CITY FUEL OIL HANDLING FACILITY NATIONAL CITY, CALIFORNIA
BASELINE DISTRIBUTION OF TEH IN SOIL
DESIGNED BY: TB
DRAWN BY: RG
CHECKED BY:
DATE: 6/30/98
FILE: 3589TEH
PROJECT NO.: 103589
CONTRACT:
DRAWING:
FIGURE 3-3b

LEGEND

- Area Boundary
- Sub-Area Boundary
- 1 Area Description
- Site Idenitfication
- Value (µg/L)
- Chemical

SB5-075	
TCE	15

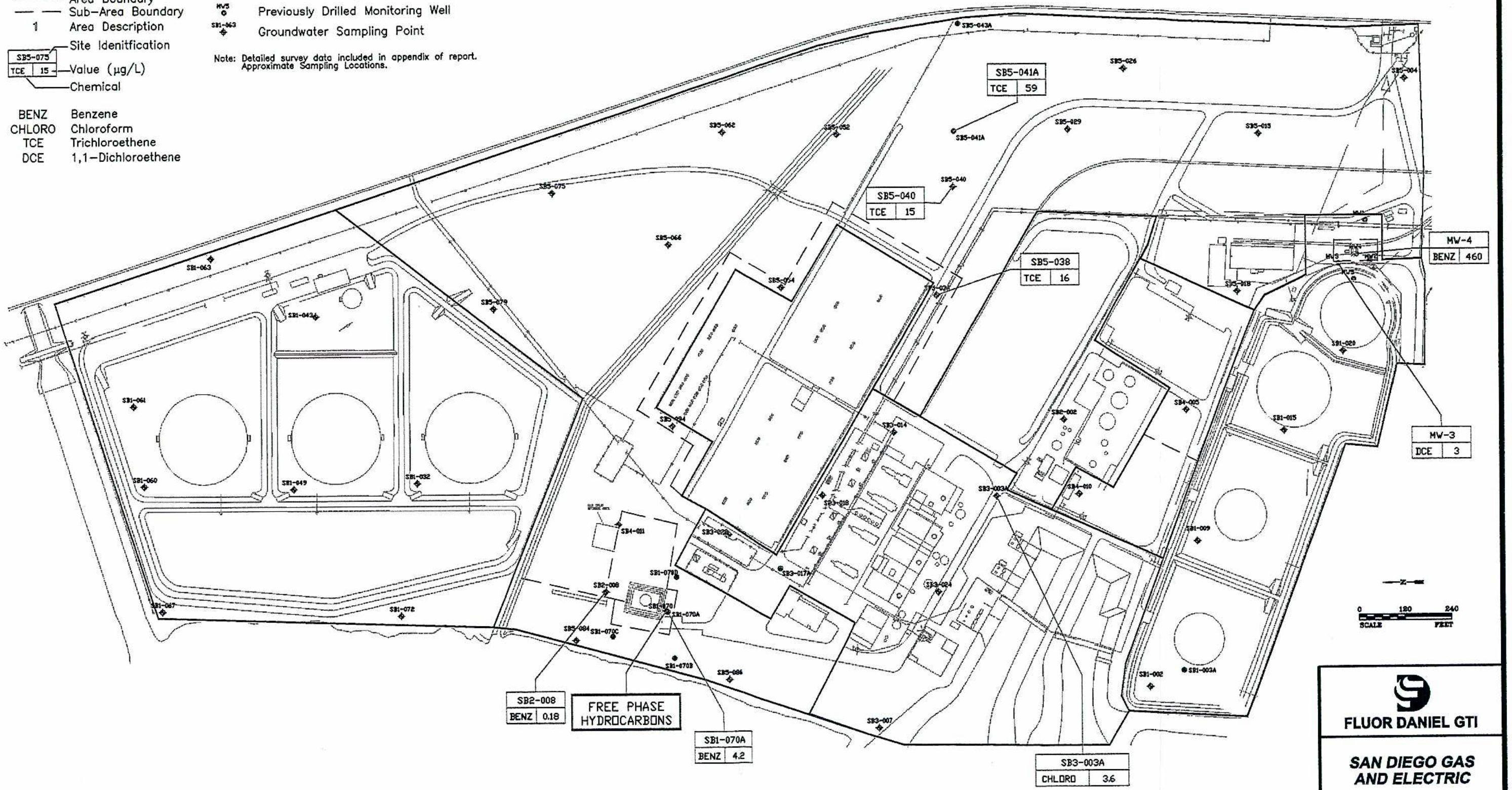
BENZ	Benzene
CHLORO	Chloroform
TCE	Trichloroethene
DCE	1,1-Dichloroethene

SB1-070C 2 Inch Monitoring Well

MW5 Previously Drilled Monitoring Well

SB1-063 Groundwater Sampling Point

Note: Detailed survey data included in appendix of report. Approximate Sampling Locations.



Note 1:

Figure depicts distribution of organics with 95% UCL exceeding Tap Water PRGs, Cal/Fed MCLs, or AWQC Marine criteria. For metal concentrations see text (Appendix H).

S A N D I E G O B A Y

FLUOR DANIEL GTI

SAN DIEGO GAS AND ELECTRIC

SOUTH BAY POWER PLANT
CHULA VISTA, CALIFORNIA

BASELINE CRITERIA-BASED DISTRIBUTION OF ORGANICS IN GROUNDWATER
(SEE NOTE 1)

DESIGNED BY:	DRAWN BY:	CHECKED BY:
KS	RG	
DATE: 6/30/98	FILE: 35890RGW	
PROJECT NO.: 103589	CONTRACT:	

DRAWING:

FIGURE 3-4a

LEGEND

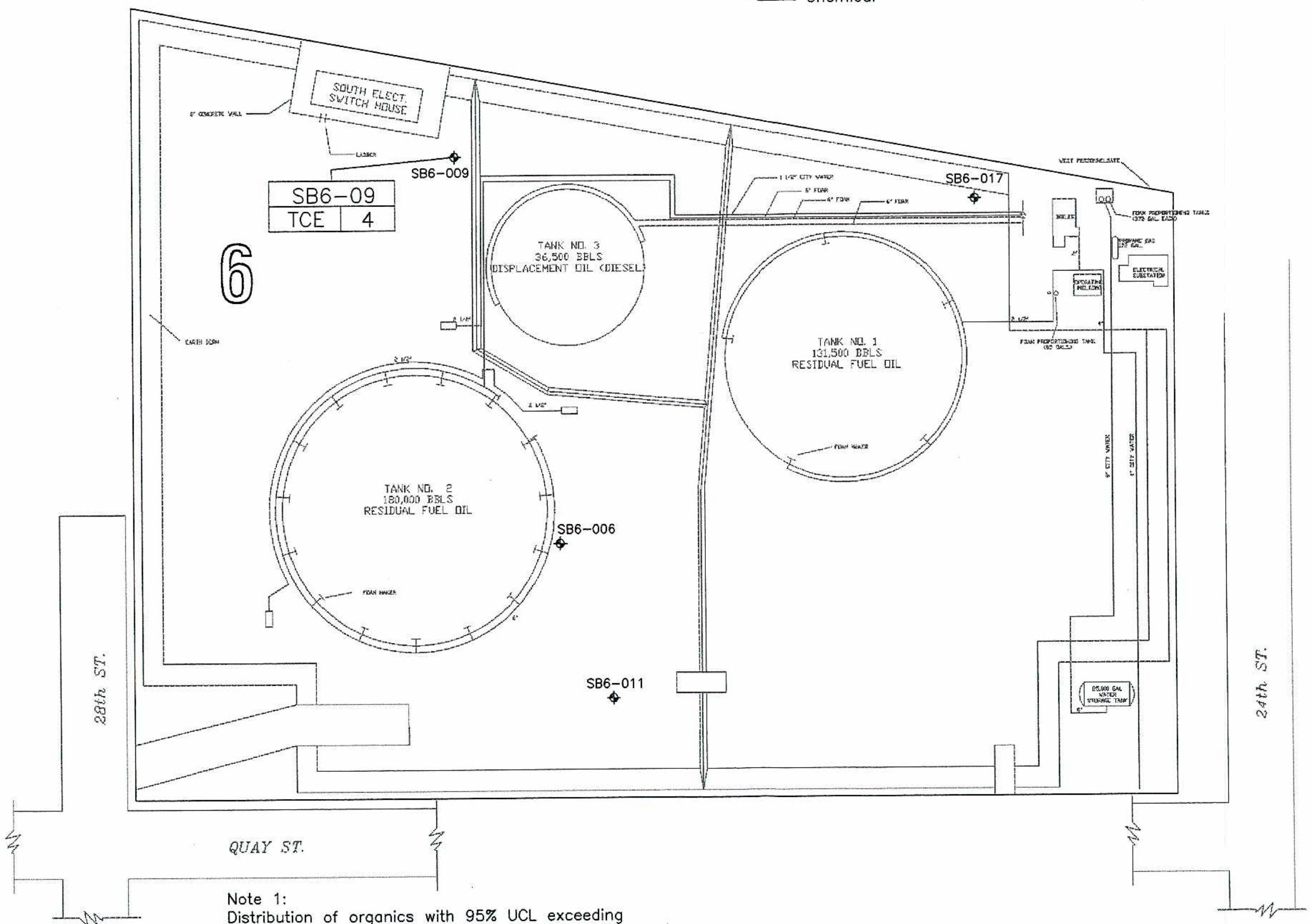
6 — Area Designation

——— Area Boundary

SB6-09	— Site Identification
TCE | 4	— TCE Value (µg/L)

— Chemical

SB1-063 — Groundwater Sampling Point



Note 1:
Distribution of organics with 95% UCL exceeding Tap Water PRGs, Cal/Fed MCLs, or AWQC Marine criteria. For metal concentrations see text (Appendix H).

NOTE 1: PIPING NOT TO SCALE

NOTE 2: NOT ALL PIPING SYSTEMS PRESENT

FLUOR DANIEL GTI

SAN DIEGO GAS AND ELECTRIC

NATIONAL CITY FUEL OIL HANDLING FACILITY NATIONAL CITY, CALIFORNIA

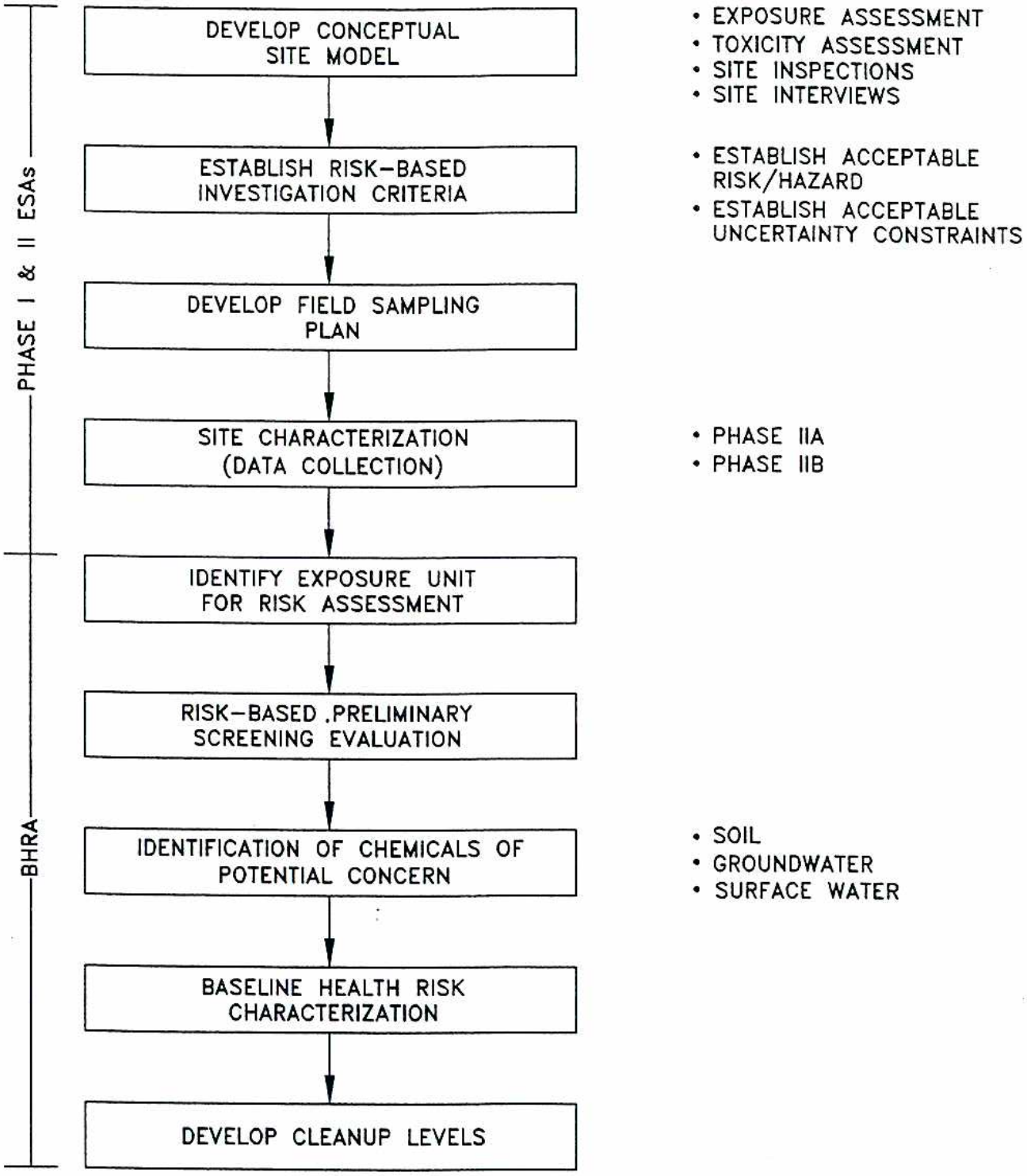
BASELINE CRITERIA-BASED DISTRIBUTION OF ORGANICS IN GROUNDWATER (SEE NOTE 1)

DESIGNED BY: TB	DRAWN BY: JR	CHECKED BY:
DATE: 6/11/98	FILE: 3589BOGW	
PROJECT NO.: 103589	CONTRACT:	

DRAWING:

FIGURE 3-4b

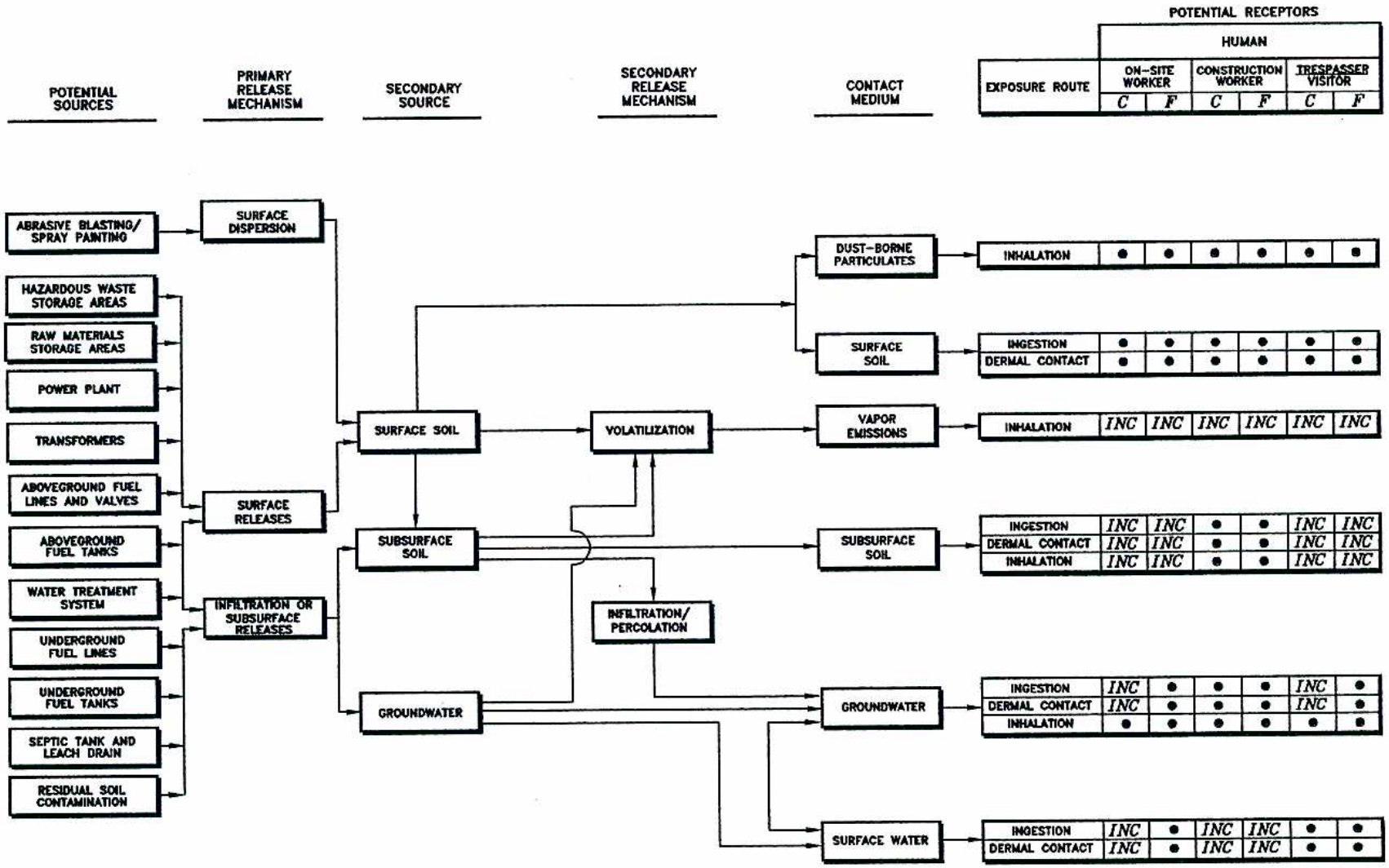
FIGURE 5-1
INTEGRATION OF DQO APPROACH WITH BHRA



BHRA = BASELINE HEALTH RISK ASSESSMENT
ESA = ENVIRONMENTAL SITE ASSESSMENT

FLUOR DANIEL GTI

6/15/98 – 3587DQO(1:1)



NOTE:
FINAL CONCEPTUAL SITE MODEL INCORPORATES THE RESULTS OF INITIAL SCREENING AND COPC SELECTION.

C = CURRENT PATHWAY
F = FUTURE PATHWAY (ASSUMES UNPAVED SURFACE)
INC = INCOMPLETE PATHWAY EXISTS
● = COMPLETE PATHWAY EXISTS

FLUOR DANIEL GTI		CLIENT: SAN DIEGO GAS AND ELECTRIC COMPANY		FINAL CONCEPTUAL SITE MODEL
FILE: 3589PCSM (1:1)	PROJECT NO.: 103589	LOCATION: SOUTH BAY POWER PLANT CHULA VISTA, CALIFORNIA	PM:	PE/RG:
REV.:		DES.: PA / DET.: RG / DATE: 6/15/98		FIGURE: 5-2

AREA C

AREA B

RETAINED PROPERTY

AREA A

AREA D

NATIONAL CITY TERMINAL

S A N D I E G O

B A Y

FLUOR DANIEL GTI

SAN DIEGO GAS AND ELECTRIC

SOUTH BAY POWER PLANT
AND NATIONAL CITY TERMINAL
CHULA VISTA AND NATIONAL CITY
CALIFORNIA

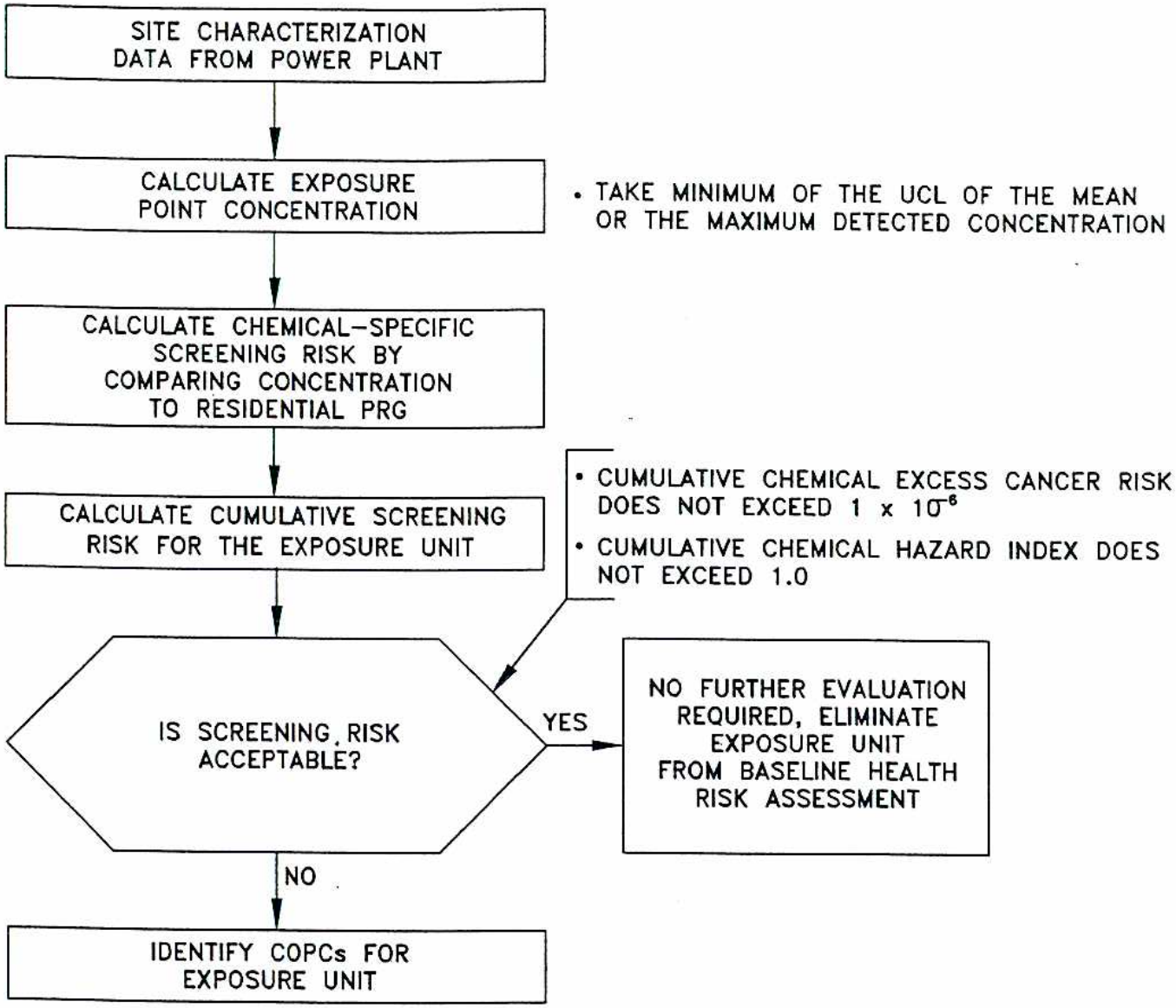
EXPOSURE UNITS FOR BHRA

DESIGNED BY:	DRAWN BY:	CHECKED BY:
KS	RG	
DATE: 6/15/98	FILE: 3589EUFB	
PROJECT NO.: 103589	CONTRACT:	

DRAWING:

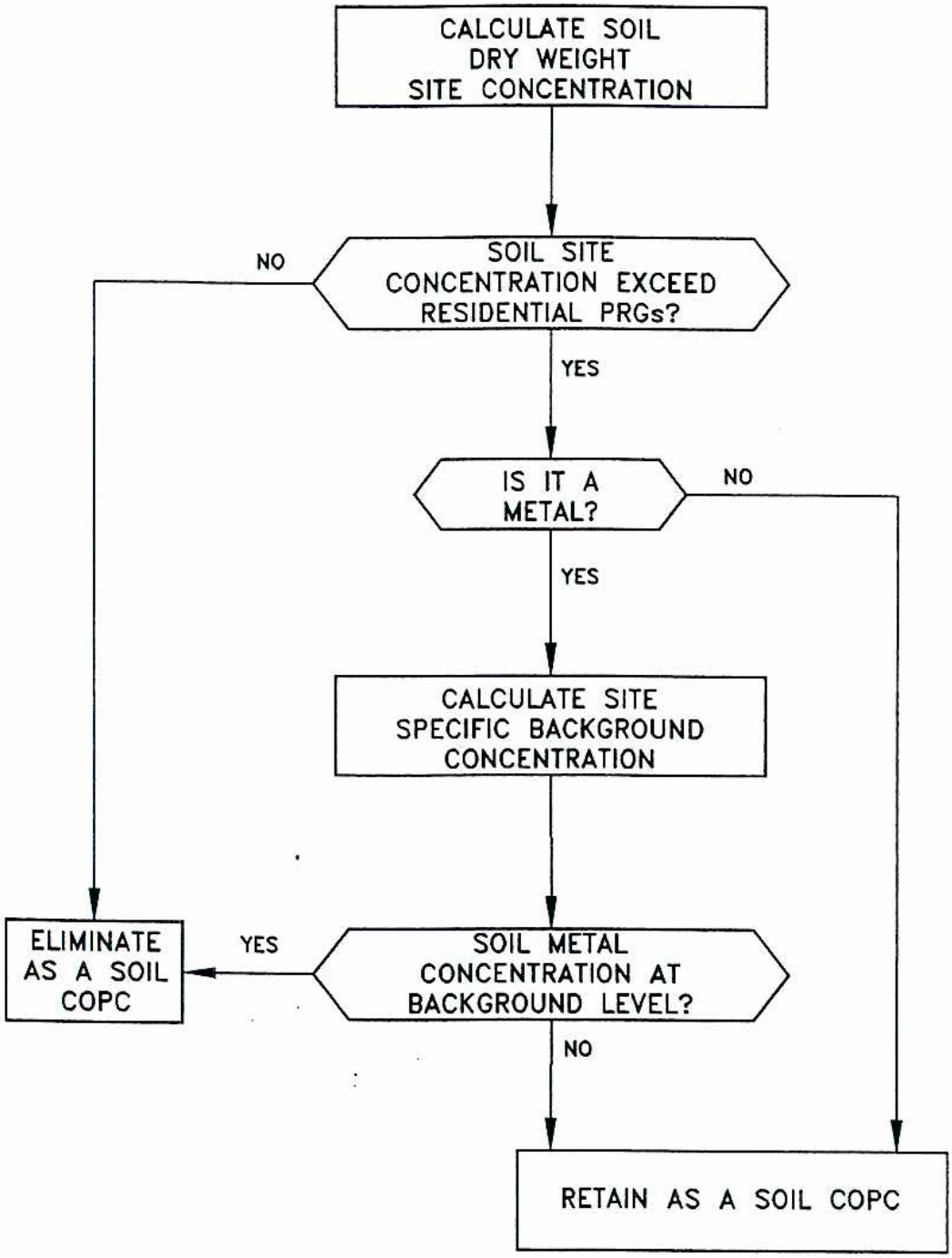
FIGURE 5-3

FIGURE 5-4
DECISION TREE FOR THE RISK-BASED SCREENING EVALUATION



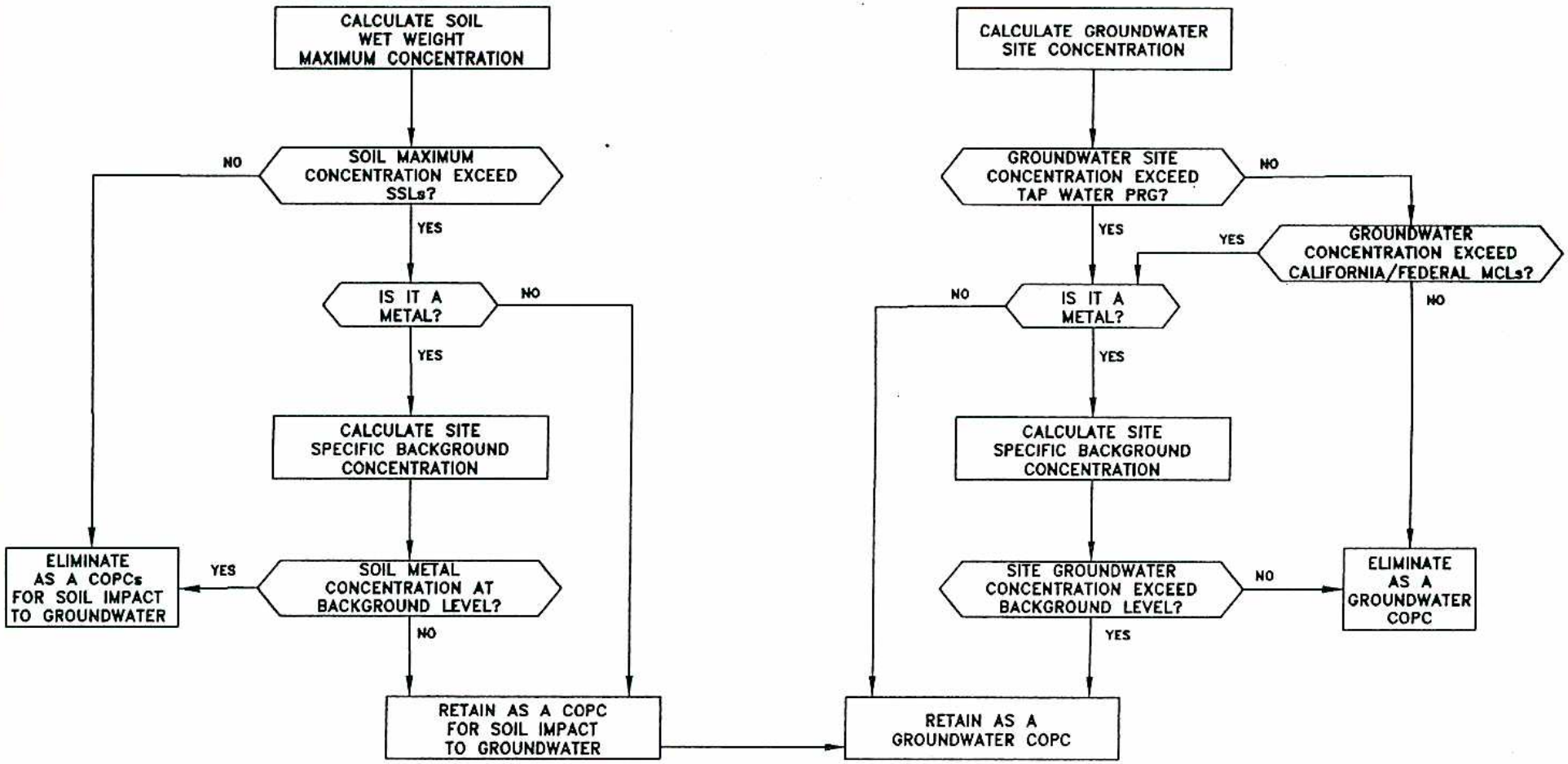
COPC = CHEMICAL OF POTENTIAL CONCERN
PRG = PRELIMINARY REMEDIATION GOAL
UCL = 95% UPPER CONFIDENCE LIMIT OF ARITHMATIC MEAN

FIGURE 5-5
FLOW CHART FOR SELECTION OF SOIL COPCs



COPC = CHEMICAL OF POTENTIAL CONCERN
PRG = PRELIMINARY REMEDIATION GOAL

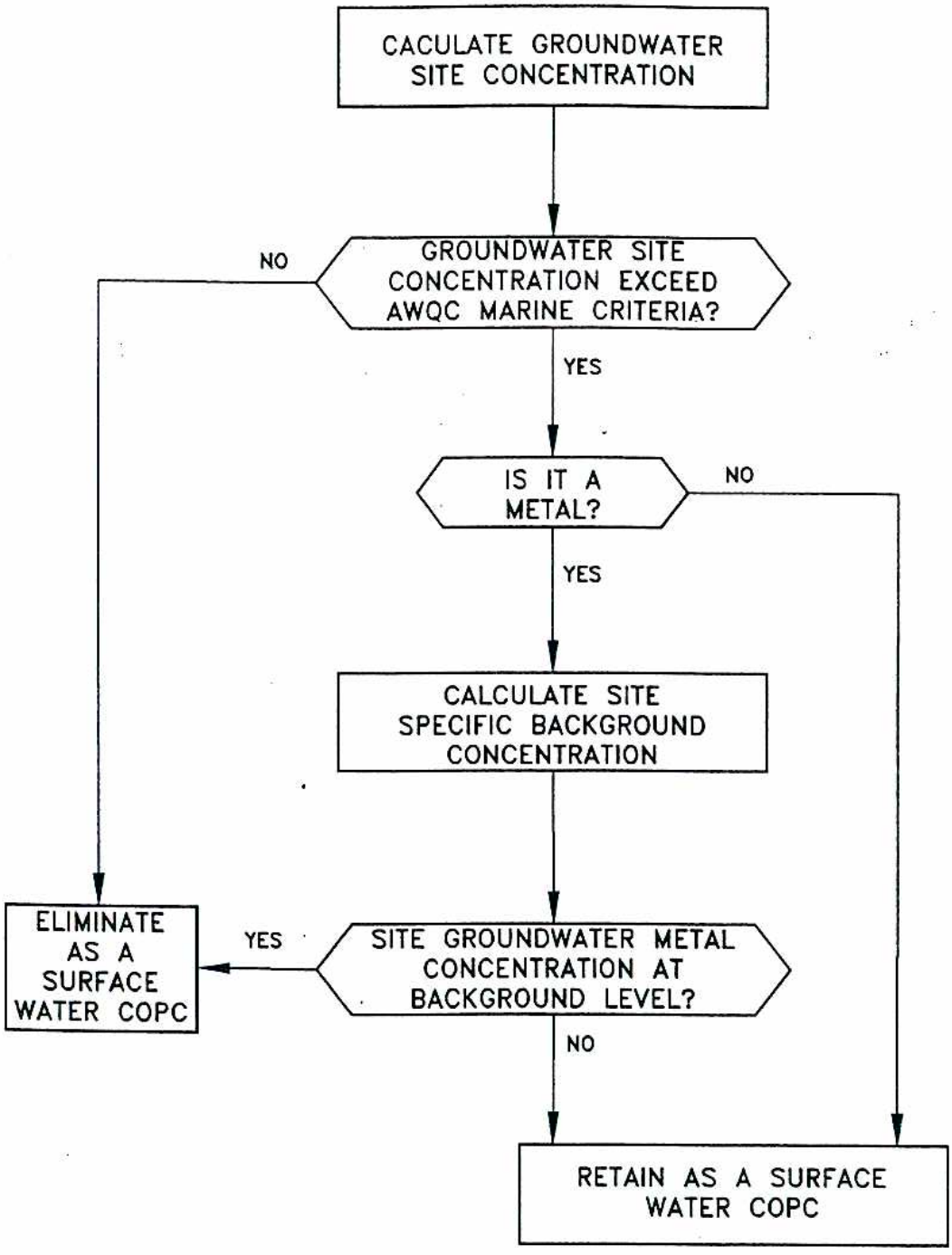
FIGURE 5-6
FLOW CHART FOR SELECTION OF GROUNDWATER COPCs



COPC = CHEMICAL OF POTENTIAL CONCERN
MCL = DRINKING WATER MAXIMUM CONTAMINATION LEVEL
PRG = PRELIMINARY REMEDIATION GOAL
SSL = SOIL SCREENING LEVEL

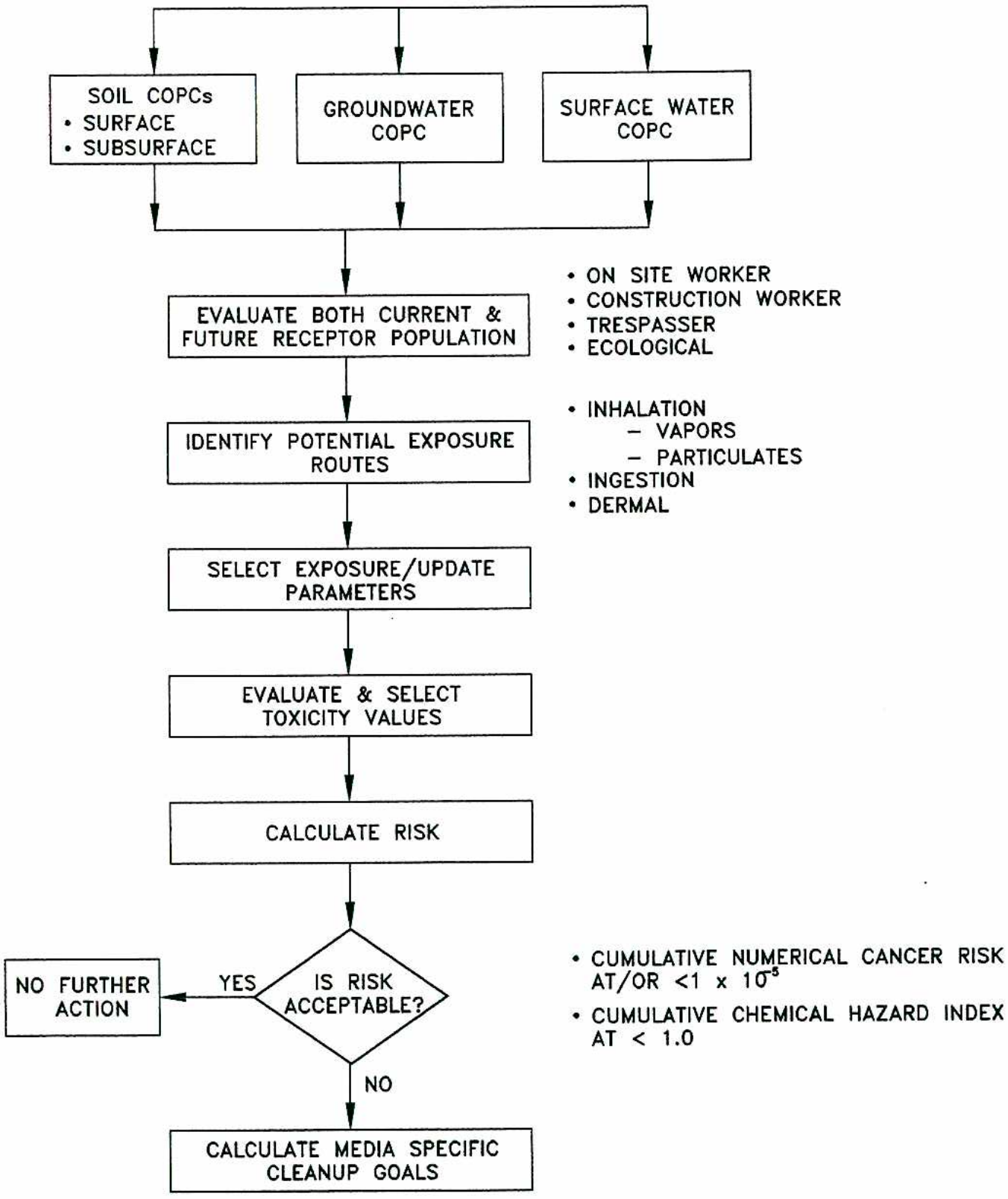
FLUOR DANIEL GTI
6/30/98 3587FC2

FIGURE 5-7
FLOW CHART FOR SELECTION OF SURFACE WATER COPCs



AWQC = AMBIENT WATER QUALITY CRITERIA
COPC = CONTAMINANT OF POTENTIAL CONCERN

FIGURE 5-8
DECISION TREE FOR RISK CHARACTERIZATION

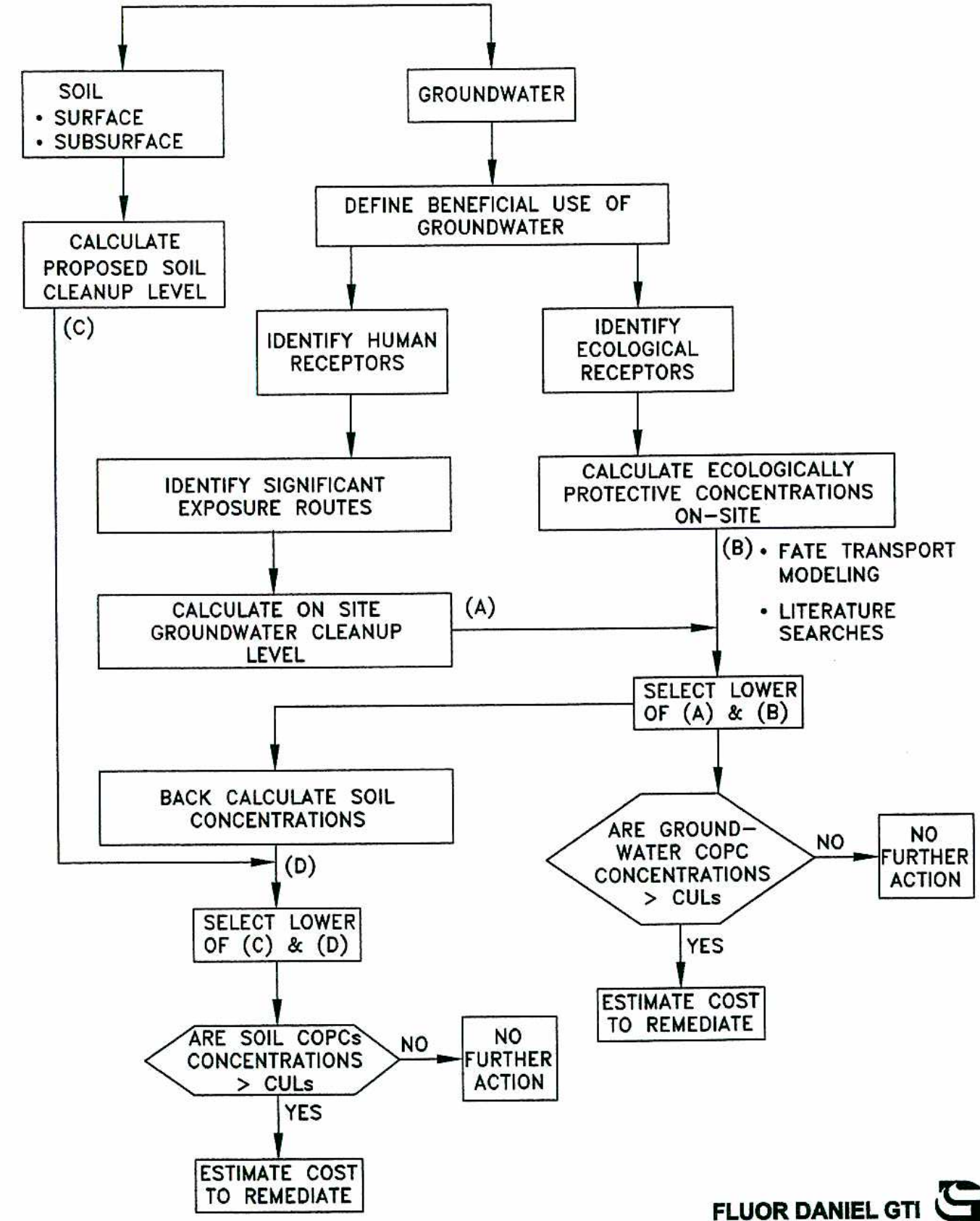


COPC = CHEMICAL OF POTENTIAL CONCERN

FLUOR DANIEL GTI

6/15/98 – 3589RC(1:1)

FIGURE 5-9
DEVELOPMENT OF CLEANUP LEVELS



COPC = CHEMICAL OF POTENTIAL CONCERN
CUL = CLEANUP LEVELS

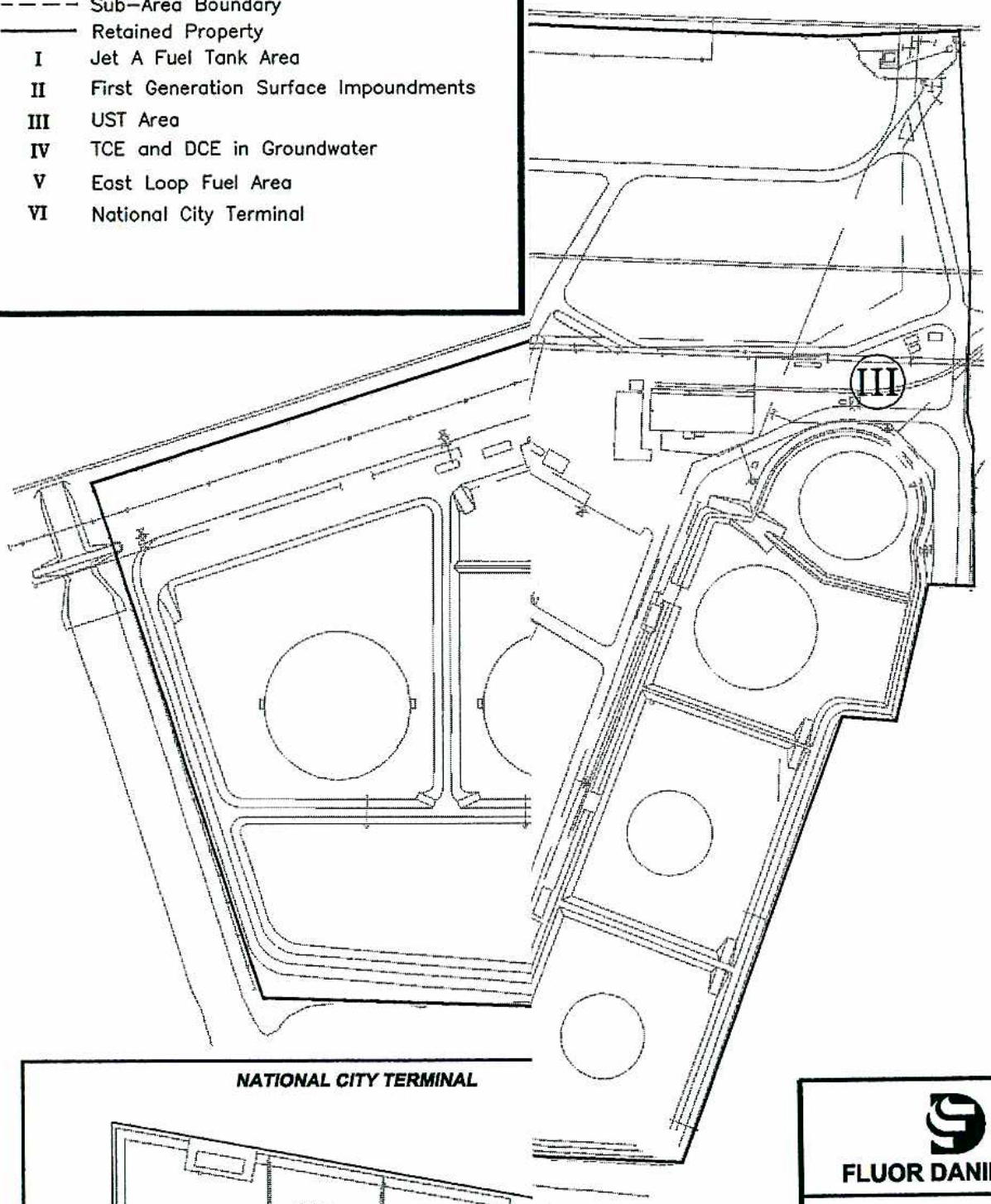
FLUOR DANIEL GTI

6/15/98 – 3589DOCL(1:1)

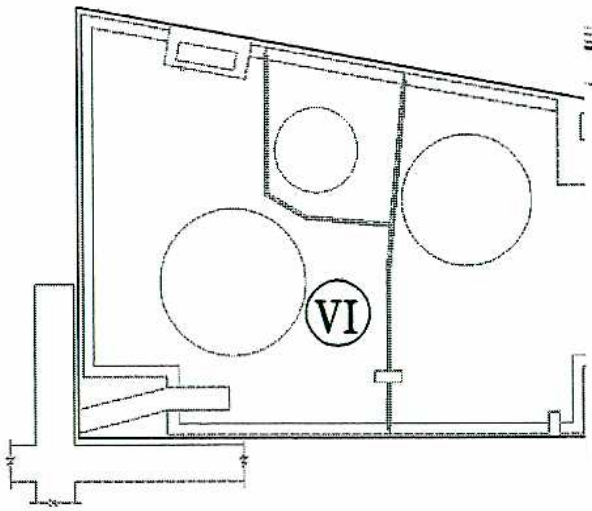
LEGEND

——— Property Boundary
- - - - Sub-Area Boundary
——— Retained Property

I Jet A Fuel Tank Area
II First Generation Surface Impoundments
III UST Area
IV TCE and DCE in Groundwater
V East Loop Fuel Area
VI National City Terminal



NATIONAL CITY TERMINAL



FLUOR DANIEL GTI

SAN DIEGO GAS AND ELECTRIC

SOUTH BAY POWER PLANT
AND NATIONAL CITY TERMINAL
CHULA VISTA AND NATIONAL CITY
CALIFORNIA

LOCATIONS OF RECOGNIZED ENVIRONMENTAL CONDITIONS AT THE END OF PHASE II ESA

DESIGNED BY:	DRAWN BY:	CHECKED BY:
KS	JR	
DATE: 6/10/98	FILE: 3589REC	
PROJECT NO.: 103589	CONTRACT:	

DRAWING: **FIGURE 6-1**

TABLE 1-1
Summary of Environmental Conditions Identified During Phase I Investigations
South Bay Power Plant

Issue #	Description of Issue
1a North Tank Farm	
1	The potential exists for unidentified hydrocarbon losses from the four ASTs, pipe lines and the pump deck.
2	Potential impact to soil or groundwater from spills at the pump pit and berm pond.
3	Potential impact from spills at the displacement oil AST and heat exchanger.
1b South Tank Farm	
1	March 1983, loss No. 6 fuel oil through base of east side of Tank 2, tank bottom repaired.
2	Prior to 1988, 15 bbl loss No. 6 fuel oil through base of Tank 2, tank bottom repaired.
3	Prior to 1988, 15 bbl loss No. 6 fuel oil through base of Tank 3, tank bottom repaired
4	Prior to 1989, 10 bbl loss No. 6 fuel oil through base of Tank 1, tank bottom repaired
5	The potential exists for unidentified hydrocarbon losses from the four ASTs, pipe lines and the pump decks. This includes the truck unloading station for Tank 7, located to the east of the tank within subarea 5.
1c Jet Fuel Area	
1	The potential exists for unidentified losses from the AST, pipe lines and the pump deck.
All above ground tanks	All ASTs at both the North-40 and South-40 and the Jet-A AST used for the storage of fuel oil or diesel/displacement oil were originally constructed with a corrosion inhibiting oil impregnated sand base. This oil is a diesel-like product. Therefore, all of these AST areas have the potential to impact soil or groundwater from the use of corrosion inhibiting oils in the tank construction.
1d UST Area	
1	September 1987. Diesel UST Tank 1601 and Gasoline Tank 1602 removed after failing pressure test.
2	December 1987. Soil and groundwater investigation concluded hydrocarbons had migrated up to 70 ft to west/west north west towards San Diego Bay. Up to 470 ppm hydrocarbons in soil and 32 ppm in groundwater were detected.
3	April 1988. Limited soil investigation following removal of the two USTs detected up to 340 ppm residual hydrocarbons in soil in the vicinity of the excavation.
4	May 1988. Contaminant Transport Assessment Report. The report concluded that benzene and other hydrocarbons in groundwater at the UST site were unlikely to migrate into San Diego Bay at concentrations that would exceed RWQCB water quality guidelines. Some hydrocarbons may extend to water tank #7.
5	The potential exists for unidentified hydrocarbon losses from new USTs, pipe lines and pumps, although a leak detection system has been installed.
2a Process Water Treatment Area	
1	The potential exists for treatment water losses from ASTs and pipe lines. Potential contaminants include hydrocarbons and metals entrained in the waste water and treatment additives such as sodium dichromate.
2	Sand blasting was reported to have occurred in the area prior to construction of

TABLE 1-1
Summary of Environmental Conditions Identified During Phase I Investigations
South Bay Power Plant

Issue #	Description of Issue
	the treatment plant. The potential exists for metal impact.
2b Former Surface Impoundment (First Generation)	
1	The former first generation surface impoundment area was located to the north west of the power plant. The impoundments were decommissioned in 1982, including excavation of impacted soil.
2	April 1997. A soil investigation concluded metal impacted soil remained in some locations below the 1982 excavation.
3	December 1997. Additional soil investigation concluded that the highest metal concentrations were between 7.5 and 10 ft below grade (beneath the 1982 excavations). Risk assessment, encapsulation or excavation were recommended, and costs were estimated.
2c Former Surface Impoundment (Second Generation)	
1	The second generation former surface impoundment area was located to the east of the power plant. The impoundment was decommissioned in 1990.
2	September 1986. A soil and groundwater investigation was conducted to allow operation of the impoundment according to TCPA requirements. It was concluded that no constituents from the impoundments had migrated into the vadose zone, surface water bodies, perched water or aquifers.
3	November 1991. Closure certification granted by RWQCB.
3a Power Plant Units 1-4	
1	July 1986. Loss of Nalco 1225 (combustion catalyst) to south of power plant. Approximately 7 cubic yards impacted soil excavated.
2	October 1991. Loss of No. 6 fuel oil from the east loop fuel oil pipeline located to the south east of the power plant. Impacted soil was excavated. April 1997: The report concluded that hydrocarbon impact was relatively low (<1600 ppm) and was limited to depths of less than 6 ft. Report recommends no further action.
3	The potential exists for hydrocarbon losses from other sections of pipe line between the above ground storage tanks and the power plant.
4	The potential exists for hydrocarbon losses from pipelines and PCB losses from transformers within the power plant and adjacent to the power plant.
5	Unpaved area south southwest of the Power Plant used for storage and handling of dichromate – potential spills during handling or from broken containers of dichromate powder.
6	A wastewater transfer sump is located northwest of the Plant. No known releases have occurred; however, the potential exists for impacts to soil and groundwater from wastewaters bearing oils, metals, and possibly volatile organic compounds.

TABLE 1-1
Summary of Environmental Conditions Identified During Phase I Investigations
South Bay Power Plant

Issue #	Description of Issue
3b Maintenance Area	
1	The potential exists for hydrocarbon losses from pipe lines between the above ground storage tanks and the power plant.
2	The potential exists for occasional spills of waste water or routine cleaning liquids used during maintenance and painting operations.
3	The Stores Building was/is a location of storage of paints and solvents. The potential exists for discharges of volatile organics and metals. No known releases are documented.
3c Gas Turbine	
1	The potential exists for hydrocarbon losses from pipelines and AST and PCB losses from the transformer within the Gas Turbine compound.
2	The false-start sump consists of a below grade AST, and is believed to have previously been a simple sump constructed from 1 55-gallon drum. It is believed that releases due to overfilling of the sump may have occurred, creating the potential for impacts to soil or groundwater.
4a Former Drum Storage and Laydown Area	
1	March 1993. Soil investigation identified PCP impact at one location within the fenced drum storage yard located to the north west of the power plant. April/May 1993. Additional soil investigation confirmed limited extent of impact and the area was remediated by soil excavation. No sampling for VOC or metals was conducted. A stipulation and Order including an NFA was issued.
4b Construction Yard	
1	Sandblasting has been conducted in the area, the potential exists for metal impact.
4c Hazardous Materials Storage	
1	Hazardous materials have been stored in the area. The potential exists for a variety of contaminants impacting the area.
2	Sandblasting has been conducted in the area, the potential exists for metal impact. Also included is the current sandblast area (in 3a) where historical sand blasting took place prior to paving.
5a Open Area	
1	April 1997. A soil investigation was conducted into a mercaptan loss at the LNG plant located immediately to the south of the current investigation area. No evidence of impact was detected. Prior to decommissioning of the LNG plant, three USTs (1 Diesel, 2 LNG) were located at the plant. The potential exists for unidentified losses from the LNG facility migrating onto the site.
2	The potential exists for unidentified losses from the truck unloading station for Tank 7, located to the east of the tank.
3	Sandblasting grit was observed in the north east corner of the open area. The potential exists for metal impact and impact of semi-volatiles including coal tar used to coat the traveling screens. According to SDG&E personnel, other portions of this area may also have been used for stock piling of sandblast grit wastes.
4	The potential also exists for unidentified losses or dumping of contaminants anywhere within the open areas.

TABLE 1-1
Summary of Environmental Conditions Identified During Phase I Investigations
South Bay Power Plant

Issue #	Description of Issue
5b Switchyard Border	
1	The potential exists for unidentified PCB and other contaminant losses from the switchyard onto the site.
5c Septic/Leach Field	
1	The septic system and leach field are located to the west of the warehouse. The potential exists for hydrocarbons, metals and other contaminants to have entered the septic system and impacted soil and groundwater.
6 National City	
1	July 1982. An unknown volume of No. 6 fuel oil was lost due to overfilling from Tank 1.
2	April 1997. A soil investigation concluded that of the 33 soil stains at the site, the largest was expected to extend vertically between 2 and 5 ft and laterally over 10 ft.
3	January 1998. Soil excavated from areas of staining. Significant residual impact detected at 6 locations.
4	The potential exists for unidentified hydrocarbon losses from the ASTs, pipe lines and pumps.
5	The potential exists for minor spills of liquid used during site operation.
6	March 1979 release of diesel fuel from a pipeline expansion joint located west of AST #1.
National City to South Bay Pipeline	
1	January 1986. Between 60-115 barrels of diesel were lost from the pipeline at a location just north of E street. Approximately 1,400 cubic yards of impacted soil was excavated.
2	Release of hydrocarbons occurred in the 1970's. The pipeline was repaired, and soil excavated may have been conducted. No confirmation was found that soil excavation was conducted.
Off-Site Areas	
1	A former automobile junkyard located just east of the power plant site may have impacted groundwater. This area is directly upgradient from the power plant site.
2	The switchyard operation could have impacted adjacent areas (see Item 3a-4).

TABLE 2-1A
SOUTH BAY POWER PLANT
SAMPLE LOCATION SUMMARY
PHASE IIA ENVIRONMENTAL SITE ASSESSMENT

Area	Drilling Method		Number of Boreholes Max Depth			Number of Wells
			0 – 5	6 – 15	16 – 25	
1a	Geoprobe			1		
	Hand Auger		27	18		8
1b	Geoprobe			17	3	4
	Hand Auger		4			
1c	Geoprobe					
	Hand Auger			2		1
1d	Groundwater sampling of existing wells					
2a	Geoprobe			2		1
	Hand Auger		2			
2b	Geoprobe			1		1
	Hand Auger		3			
3a&b	Geoprobe			2		3
	Hand Auger		15	4		2
3c	Geoprobe					
	Hand Auger		1	1		
4a	Geoprobe			1		
	Hand Auger		4			1
4b	Geoprobe			1		1
	Hand Auger		4			
4c	Geoprobe		1	1		1
	Hand Auger		3			
5a	Geoprobe			8	3	11
	Hand Auger		66		4	3
5b	Geoprobe			1	1	2
	Hand Auger		6	1		1
5c	Geoprobe				1	
	Hand Auger		3			1
6	Geoprobe			3	1	3
	Hand Auger		15	1		1
Total			154	65	13	44

TABLE 2-1B
SOUTH BAY POWER PLANT
SAMPLE LOCATION SUMMARY
PHASE IIB ENVIRONMENTAL SITE ASSESSMENT

Area	Drilling Method	Number of Boreholes Max Depth			Number of Wells
		0 – 5	6 – 15	16 – 25	
1a	Geoprobe				
	Hand Auger	1			8
1b	Hollow Stem Auger			1	1
	Hand Auger	1			
1c	Hollow Stem Auger			4	4
	Hand Auger				
3a&b	Hollow Stem Auger			1	1
	Hand Auger	1	1		1
5a	Hollow Stem Auger	2		2	2
	Hand Auger				
Total		3	1	8	9

TABLE 2-2
SOUTH BAY POWER PLANT
SUMMARY OF PHASE II ESA SOIL ANALYSES

Area	Number of Borings	Number of Soil Samples (Excluding Duplicates)	Analyses	Remarks
1: Fuel Storage Areas	79	174	TEH (8015), CAM Metals (6010/7471), pH, * PAH (8310) * BTEX (8020)	* PAHs and BTEX analyses conducted only on soil samples with TEH over 100 mg/kg.
2: Process Treatment and Former Surface Impoundments	8	17	TEH (8015), CAM Metals (6010/7471), pH, * PAH (8310) * BTEX (8020)	* PAHs and BTEX analyses conducted only on soil samples with TEH over 100 mg/kg.
3: Power Generation	26	54	TEH (8015), CAM Metals (6010/7471), pH, * PAH (8310) * BTEX (8020) VOC's (8260) PCB's (8081)	* PAHs and BTEX analyses conducted only on soil samples with TEH over 100 mg/kg.
4: Construction yard and Hazardous Materials Storage	15	30	TEH (8015), CAM Metals (6010/7471), pH, * PAH (8310) * BTEX (8020) PCB's (8081) VOC's (8260)	* PAHs and BTEX analyses conducted only on soil samples with TEH over 100 mg/kg. SVOC's also analyzed in Area 4a. Asbestos analysis conducted in Area 4b.
5: Non operational Areas	96	205	TEH (8015), CAM Metals (6010/7471), pH, PCBs (8081) * PAH (8310) * BTEX (8020) * VOC's (8260)	* PAHs and BTEX analyses conducted only on soil samples with TEH over 100 mg/kg. Some soil samples also analyzed for 8260 in Phase IIB.
6: National City Terminal	20	41	TEH (8015), CAM Metals (6010/7471), pH, * PAH (8310) * BTEX (8020) VOC's (8260) PCB's (8021)	* PAHs and BTEX analyses conducted only on soil samples with TEH over 100 mg/kg.

TABLE 2-3
WELL CONSTRUCTION SUMMARY AND MEASURED DEPTH TO WATER
PHASE II ENVIRONMENTAL SITE ASSESSMENT
South Bay Power Plant

WELL #	SCREEN TOP DEPTH (ft below grade)	SCREEN BOTTOM DEPTH (ft below grade)	CASING DIAMETER (inches)	DEPTH TO WATER (feet)
SB1-002	15	18	0.5	11.80
SB1-003A	10	25	2	NM
SB1-009	8	16	0.5	10.45
SB1-015	9	14	0.5	10.07
SB1-020	12	17	0.75	NM
SB1-032	3.5	8.5	0.75	5.19
SB1-043	1	6	0.75	1.26
SB1-049	3	8	0.75	5.44
SB1-060	4	9	0.75	5.90
SB1-061	4	9	0.75	5.23
SB1-063	7	10	0.5	5.91
SB1-067	5	8	0.5	7.87
SB1-070	8	13	0.5	7.85
SB1-070A	5	20	2	NM
SB1-070B	4.5	19.5	2	NM
SB1-070C	5	20	2	NM
SB1-070D	5	20	2	NM
SB1-072	6	9	0.5	9.36
SB2-002	9	14	0.5	8.31
SB2-008	6	11	0.5	7.15
SB3-003A	7.5	12.5	0.5	NM
SB3-007	4.5	9.5	0.5	5.85
SB3-014	4.5	9.5	0.5	5.40
SB3-017A	10	20	2	NM
SB3-018	4.5	9.5	0.5	8.02
SB3-022	4.5	9.5	0.75	7.00
SB3-024	4.5	9.5	0.5	8.15
SB4-005	9	14	0.5	8.58
SB4-010	9	14	0.5	9.75
SB4-011	5	10	0.5	8.00
SB5-004	8.5	13.5	0.5	12.12
SB5-015	9	17	0.5	13.56
SB5-018	8	17	0.5	7.30
SB5-026	21	24	0.5	15.76
SB5-029	10	15	0.5	11.84
SB5-038	9	14	0.5	9.76
SB5-040	10	15	0.5	9.78
SB5-041A	10	20	2	NM
SB5-043	11	16	0.75	DRY
SB5-043A	10	20	2	NM
SB5-052	9.5	14.5	0.75	NM

TABLE 2-3
WELL CONSTRUCTION SUMMARY AND MEASURED DEPTH TO WATER
PHASE II ENVIRONMENTAL SITE ASSESSMENT
South Bay Power Plant

WELL #	SCREEN TOP DEPTH (ft below grade)	SCREEN BOTTOM DEPTH (ft below grade)	CASING DIAMETER (inches)	DEPTH TO WATER (feet)
SB5-054	8	13	0.5	6.98
SB5-062	9.5	14.5	0.5	10.52
SB5-066	9	14	0.5	10.88
SB5-075	13	16	0.5	6.35
SB5-079	13	16	0.5	9.52
SB5-084	5	10	0.5	NM
SB5-086	10	15	0.5	NM
SB5-094	8	13	0.5	8.20
SB6-006	12	17	0.5	8.35
SB6-009	10	15	0.5	7.90
SB6-011	6	11	0.5	8.40
SB6-017	7	10	0.75	7.88

NOTE:
NM - NOT MEASURED

TABLE 2-4
SUMMARY OF DEVIATIONS
PHASE II ENVIRONMENTAL SITE ASSESSMENT
SOUTH BAY POWER PLANT

Boring Location / Issue	Planned	Final	Reason for Change
All locations	BTEX analyses on samples with low-end C range values in TEH >100 ppm	BTEX analyses run on all samples with TEH >100 ppm	Low number of samples with TEH >100 ppm
SB-01-001, 041, -063, -055	Borings or wells	Relocated sampling point	Buried utilities
SB-01-027, -028, -029, -033, -034, -037, -040, -042, -047, -048, -052, -057	Sampling to 5 ft	Shallower sampling	Buried utilities or obstructions
SB-01-070	Soil Sampling only	Temporary well installed	Hydrocarbons found in soil during drilling
SB-01-070A to -070C	Well installation to 25 ft	Well installed to 20 ft	Hydrogeologic conditions
SB-01-002 and -015	Water sampling for full suite	Water analytical suite reduced	Limited groundwater recharge for sampling
SB-01-009	Water Sampling	Water not sampled	No groundwater flow in wells
SB-02-005, -006, -007	Sampling to 5 ft	Shallower sampling	Buried utilities or obstructions
SB-02-007, -008	One boring, one temporary well	Reversed location of well and boring	Drilling refusal in SB-02-007
SB-03-013	Sampling to 5 ft	Shallower sampling	Buried utilities or obstructions
SB-03-015	Boring	Not drilled	Electrical equipment prevented access
SB-03-003	Well installation to 25 ft	Well installed to 12.5 ft	Only hand-augering possible
SB-04-004	Sampling to 5 ft	Shallower sampling	Buried utilities or obstructions
SB-05-057	Sampling to 5 ft	Shallower sampling	Buried utilities or obstructions
SB-05-026 and -027	One boring, one temporary well	Reversed location of well and boring	Suspected underground utilities
SB-05-041A and -003A	Wells installed to 25 ft	Wells installed to 20 ft	Hydrogeologic conditions
SB-05-004, -043, -084	Water Sampling	Water not sampled	No groundwater flow in wells
SB-05-015, -026, -029, -038, -040, -086, -094	Water Sampling	Water analytical suite reduced	Limited groundwater recharge for sampling
SB-06-006	Soil Boring	Well installed	Hydrocarbons found in soil during drilling
SB-06-016	Sampling to 5 ft	Shallower sampling	Buried utilities or obstructions

TABLE 3-1
Summary of Soil Physical Parameters
Phase II Environmental Site Assessment
South Bay Power Plant

Physical Parameters	Vadose Zone		Saturated Zone	
	Range	Mean	Range	Mean
Moisture Content (% by weight)	7.2 to 19.2	15.7	13.1 to 24.1	19.2
Bulk Density (gm/cc)	1.55 to 1.67	1.61	1.55 to 1.69	1.64
Grain Density (gm/cc)	2.57 to 2.68	2.63	2.54 to 2.61	2.59
Effective Porosity (percent)	36.3 to 41.7	39	33.6 to 40.2	36.7
Pore Fluid Saturation				
Water (percent)	31.3 to 99.9	68.4	65.2 to 99.8	84.7
Hydrocarbons (percent)	ND	ND	ND	ND
Total Organic Carbon (mg/kg)	<100 to 1250	<100	<100 to 1200	<100
Native Permeability to Air (millidarcy)	0.444 to 15082	2680	NA	NA
Specific Permeability to Water (millidarcy)	NA	NA	2.97 to 2359	972
Specific Hydraulic Conductivity (cm/sec)	NA	NA	2.85E-06 to 2.28E-03	9.36E-04

ND - not detected

TABLE 3-2
Background Metal Concentrations in Soil
EPA Method 6010, 7471
Phase II Environmental Site Assessment
South Bay Power Plant and National City Terminal

Analyte	Number of Samples	Number of Detections Above Reporting Limit[2]	Number of Detections Below Reporting Limit[2]	Maximum Conc Detected[1]	Location Of Maximum Conc Detected[1]	Normal Arithmetic Mean[1]	Normal Standard Deviation[1]	Normal Upper 95% Confidence Level	95th Percentile[1,3]
Mercury	200	34	26	2.4	SB5-005@4-5	0.067	0.2	0.09	0.21
Lead	201	201	0	24	SB5-056@4-5	4.5	2.5	4.8	7.9
Molybdenum	201	0	1	5.7	SB5-056@4-5	5	0.05	5	5
Nickel	201	193	8	28	SB5-061@0.5-1	9.8	4.5	10.3	19
Arsenic	201	199	0	15	SB5-009@0.5-1	2.3	1.8	2.5	4.9
Barium	201	198	3	310	SB5-026@14-15	62	37	66	120
Cadmium	201	0	1	1.3	SB5-037@4-5	1	0.02	1	1
Chromium	201	201	0	54	SB5-064@4-5	12	7	12.4	24
Cobalt	201	54	131	17	SB5-090@1.5-2	4.5	1.7	4.7	7
Copper	201	178	22	56	SB5-056@4-5	5.3	4.7	5.8	9.8
Vanadium	201	201	0	51	SB5-069@4-5	27	8	28	42
Zinc	201	201	0	190	SB5-056@4-5	24	16	26	43

1 - concentration is in mg/kg
2 - reporting limit for a sample is the method reporting limit times the dilution factor required for the sample due to matrix interference
3 - background value
4 - note that antimony and beryllium were not detected

TABLE 3-3
Background Metal Concentrations in Groundwater
EPA Method 6010, 7471
Phase II Environmental Site Assessment
South Bay Power Plant and National City Terminal

Analyte	Number of Samples	Number of Detections Above Reporting Limit[2]	Number of Detections Below Reporting Limit[2]	Maximum Conc Detected[1]	Location Of Maximum Conc Detected[1]	Normal Arithmetic Mean[1]	Normal Standard Deviation[1]	Normal Upper 95% Confidence Level[1,3]
Lead	11	5	2	15	SB5-075@03/24/98	5.9	4.8	8.6
Molybdenum	11	1	0	140	SB5-052@03/24/98	58	27	73
Nickel	11	0	1	22	SB5-075@03/24/98	20.2	0.6	20.5
Antimony	11	0	2	36	SB1-061@03/23/98	31	2.2	32.2
Arsenic	11	2	2	19	SB1-061@03/23/98	7.4	4.5	9.8
Barium	11	1	0	290	SB5-052@03/24/98	117	57	149
Cobalt	11	0	1	26	SB1-063@03/30/98	25.1	0.3	25.2
Copper	11	0	7	21	SB1-043@03/26/98, SB5-041A@04/17/98	15.9	3.6	17.9
Vanadium	11	0	3	34	SB5-043A@04/20/98	26.1	2.7	27.6
Zinc	11	10	0	63	SB1-043@03/26/98	37	15	45
Mercury	11	2	1	1.5	SB5-052@03/24/98	0.47	0.48	0.74

Metals detected at least once are shown in this table. All other compounds were non-detected. For a complete list of analytes, please refer to Appendix G-2.
Footnotes:

1 - concentration is in ug/L
2 - reporting limit for a sample is the method reporting limit times the dilution factor required for the sample due to matrix interference
3 - background value

TABLE 3-4
Baseline Soil Results for TEH and Organics
EPA Method 418.1, 8015M, 8020, 8081, 8260, 8270, 8310
Phase II Environmental Site Assessment
South Bay Power Plant

Analyte	Number of Samples	Number of Detections Above Reporting Limit[3]	Number of etections Belo Reporting Limit	Maximum Conc Detected[1]	Location Of Maximum Conc Detected[1]	Normal Arithmetic Mean[1]	Normal Standard Deviation[1]	Normal Upper 95% Confidence Level[1]
Total Extractable Hydrocarbons[4]	523	266	33	8300	B6@9	46.5	408.7	75.9
Volatile Organic Compounds (VOCs)								
Ethylbenzene[2]	107	1	1	3.5	SB1-070A@8.5-9	0.04	0.34	0.09
Xylenes[2]	107	2	2	7.5	SB1-070A@8.5-9	0.09	0.74	0.21
Polychlorinated Biphenyls (PCBs)								
Aroclor 1260	278	0	1	0.046	SB5-057@0.5-1	0.025	0.001	0.025
Aroclor 1254	278	1	2	0.171	SB5-090@1.5-2	0.025	0.009	0.026
Aroclor 1248	278	0	1	0.025	SB5-082@4-5	0.025	0	0.025
Aroclor 1242	278	1	0	0.088	SB5-049@4-5	0.025	0.004	0.026
Polynuclear Aromatic Hydrocarbons (PAHs)								
Naphthalene[2]	122	2	0	0.16	SB1-070@9-10	0.016	0.028	0.02
Acenaphthene[2]	34	1	0	0.23	SB3-023@3.5-4.5	0.05	0.04	0.06
Semivolatile Organic Compounds (SVOCs)								
Bis (2-ethylhexyl) phthalate	10	1	0	0.001	SB4-015@4-5	0.002	0.003	0.004

TEH and Organics detected at least once are shown in this table. All other compounds were non-detected. For a complete list of analytes from Phase II ESA, please refer to Appendix For a list of analytes from previous investigations, please refer to Appendix G-5.

Footnotes:

1 - concentration is in mg/kg

2 - compound was analyzed under multiple methods.

3 - reporting limit for a sample is the method reporting limit times the dilution factor required for the sample due to matrix interference

4 - also includes TPH and TRPH reported by EPA Methods 8015M and 418.1.

TABLE 3-5
Baseline Soil Results for TEH and Organics
EPA Method 418.1, 8015M, 8020, 8081, 8260, 8310
Phase II Environmental Site Assessment
National City Terminal

Analyte	Number of Samples	Number of Detections Above Reporting Limit[3]	Number of Detections Below Reporting Limit[3]	Maximum Conc Detected[1]	Location Of Maximum Conc Detected[1]	Normal Arithmetic Mean[1]	Normal Standard Deviation[1]	Normal Upper 95% Confidence Level[1]
Total Extractable Hydrocarbons[4]	74	63	0	34000	#12@1	1891	5266	2909
Volatile Organic Compounds (VOCs)								
Xylenes	41	1	0	0.0093	SB6-014@4-5	0.0027	0.0011	0.003
tert-Butylbenzene	41	1	0	0.062	SB6-014@4-5	0.0039	0.0093	0.0064
n-Butylbenzene	41	0	1	0.0042	SB6-006@4-5	0.0025	0.0003	0.0026
sec-Butylbenzene	41	1	0	0.013	SB6-006@4-5	0.0028	0.0016	0.0032
Polynuclear Aromatic Hydrocarbons (PAHs)								
Naphthalene[2]	44	1	0	0.069	SB6-014@4-5	0.006	0.014	0.01
Acenaphthene	3	1	0	1.1	SB6-014@4-5	0.4	0.61	1.42
Pyrene	3	1	0	2.3	SB6-014@4-5	0.8	1.3	2.99
Chrysene	3	1	0	2	SB6-014@4-5	0.7	1.13	2.6

TEH and organics detected at least once are shown in this table. All other compounds were non-detected. For a complete list of analytes from Phase II ESA, please refer to Appendix G-1.
For a list of analytes from previous investigations, please refer to Appendix G-5.
Footnotes:

1 - concentration is in mg/kg
2 - compound was analyzed under multiple methods
3 - reporting limit for a sample is the method reporting limit times the dilution factor required for the sample due to matrix interference
4 - also includes TPH and TRPH reported by EPA Methods 418.1 and 8015M.

TABLE 3-6
Baseline Soil Results for CAM Metals
EPA Method 6010, 7471, 8015M
Phase II Environmental Site Assessment
South Bay Power Plant

Analyte	Number of Samples	Number of Detections Above Reporting Limit[2]	Number of Detections Below Reporting Limit[2]	Maximum Conc Detected[1]	Location Of Maximum Conc Detected[1]	Normal Arithmetic Mean[1]	Normal Standard Deviation[1]	Normal Upper 95% Confidence Level[1]
Lead	554	519	0	190	T3@8	6.4	13.8	7.4
Molybdenum	554	7	2	190	SB5-082@0.5-1	5	8	5
Nickel	554	516	18	2220	B1@8	20	114	28
Thallium	554	8	0	6.1	B2@12	0.8	0.8	0.9
Antimony	554	21	7	31	B1@8	3.4	2.4	3.5
Arsenic	554	487	0	44	B1@8	2.6	3.1	2.8
Barium	554	483	16	330	SB1-003@14-15	57	40	60
Beryllium	554	7	2	68	SB3-008@9-10	0.4	2.9	0.6
Cadmium	554	22	5	8.7	SB1-022@4-5	1	0.4	1
Chromium	554	548	2	4100	T3@4-5	30.5	221.4	45.9
Cobalt	554	162	300	120	B1@8	4.6	5.5	5
Copper	554	454	47	320	SB5-082@0.5-1	7.7	21.1	9.2
Vanadium	554	551	0	2100	T3@8	37.9	117.8	46.1
Zinc	554	504	0	810	B1@8	25	38	28
Mercury	503	74	52	2.4	SB5-005@4-5	0.06	0.15	0.07

Metals detected at least once are shown in this table. All other compounds were non-detected. For a complete list of analytes from Phase II ESA, please refer to Appendix G-1. For a list of analytes from previous investigations, please refer to Appendix G-5.

Footnotes:

1 - concentration is in mg/kg

2 - reporting limit for a sample is the method reporting limit times the dilution factor required for the sample due to matrix interference

TABLE 3-7
Baseline Soil Results for CAM Metals[3]
EPA Method 6010, 7471
Phase II Environmental Site Assessment
National City Terminal

Analyte	Number of Samples	Number of Detections Above Reporting Limit[2]	Number of Detections Below Reporting Limit[2]	Maximum Conc Detected[1]	Location Of Maximum Conc Detected[1]	Normal Arithmetic Mean[1]	Normal Standard Deviation[1]	Normal Upper 95% Confidence Level[1]
Lead	41	41	0	140	SB6-009@9-10	8	21	13
Nickel	41	39	2	16	SB6-008@4-5	8	3	9
Arsenic	41	41	0	11	SB6-014@0.5-1	2	2	2
Barium	41	39	2	120	SB6-003@0.5-1	50	22	55
Chromium	41	41	0	21	SB6-008@4-5	11	4	12
Cobalt	41	15	21	9.4	SB6-008@4-5	4.6	1.8	5
Copper	41	40	1	180	SB6-016@0-1	14	27	21
Vanadium	41	41	0	55	SB6-008@4-5	30	9	32
Zinc	41	41	0	130	SB6-009@9-10	30	24	36
Mercury	41	11	12	0.43	SB6-009@0.5-1	0.052	0.068	0.07

Metals detected at least once are shown in this table. All other compounds were non-detected. For a complete list of analytes, please refer to Appendix G-1.
Footnotes:

1 - concentration is in mg/kg
2 - reporting limit for a sample is the method reporting limit times the dilution factor required for the sample due to matrix interference
3 - identical to Table 3-3b since no previous investigations data was included

TABLE 3-8
Potentially Site-Impacted Baseline Soil Results for CAM Metals
EPA Method 6010, 7471
Phase II Environmental Site Assessment
South Bay Power Plant

Analyte	Number of Samples	Number of Detections Above Reporting Limit[2]	Number of Detections Below Reporting Limit[2]	Maximum Conc Detected[1]	Location Of Maximum Conc Detected[1]	Normal Arithmetic Mean[1]	Normal Standard Deviation[1]	Normal Upper 95% Confidence Level[1]
Lead	353	318	0	190	T3@8	7.5	17.1	9
Molybdenum	353	7	1	190	SB5-082@0.5-1	4.7	10.1	5.6
Nickel	353	323	10	2220	B1@8	26	142	38
Thallium	353	8	0	6.1	B2@12	1	1	1.1
Antimony	353	21	7	31	B1@8	3.6	3	3.9
Arsenic	353	288	0	44	B1@8	2.7	3.7	3.1
Barium	353	285	13	330	SB1-003@14-15	54	41	58
Beryllium	353	9	0	68	SB3-008@9-10	0.5	3.6	0.9
Cadmium	353	22	4	8.7	SB1-022@4-5	1	0.5	1
Chromium	353	349	0	4100	T3@4-5	41	277	65
Cobalt	353	108	169	120	B1@8	4.6	6.8	5.2
Copper	353	276	25	320	SB5-082@0.5-1	9.1	26.2	11.4
Vanadium	353	350	0	2100	T3@8	44	147	57
Zinc	353	303	0	810	B1@8	26	46	30
Mercury	303	40	26	1.2	B4@9	0.05	0.1	0.06

Metals detected at least once are shown in this table. All other compounds were non-detected. For a complete list of analytes from Phase II ESA, please refer to Appendix G-1. For a list of analytes from previous investigations, please refer to Appendix G-5.

Footnotes:

1 - concentration is in mg/kg

2 - reporting limit for a sample is the method reporting limit times the dilution factor required for the sample due to matrix interference

TABLE 3-9
Potentially Site-Impacted Baseline Soil Results for CAM Metals[3]
EPA Method 6010, 7471
Phase II Environmental Site Assessment
National City Terminal

Analyte	Number of Samples	Number of Detections Above Reporting Limit[2]	Number of Detections Below Reporting Limit[2]	Maximum Conc Detected[1]	Location Of Maximum Conc Detected[1]	Normal Arithmetic Mean[1]	Normal Standard Deviation[1]	Normal Upper 95% Confidence Level[1]
Lead	41	41	0	140	SB6-009@9-10	8	21	13
Nickel	41	39	2	16	SB6-008@4-5	8	3	9
Arsenic	41	41	0	11	SB6-014@0.5-1	2	2	2
Barium	41	39	2	120	SB6-003@0.5-1	50	22	55
Chromium	41	41	0	21	SB6-008@4-5	11	4	12
Cobalt	41	15	21	9.4	SB6-008@4-5	4.6	1.8	5
Copper	41	40	1	180	SB6-016@0-1	14	27	21
Vanadium	41	41	0	55	SB6-008@4-5	30	9	32
Zinc	41	41	0	130	SB6-009@9-10	30	24	36
Mercury	41	11	12	0.43	SB6-009@0.5-1	0.052	0.068	0.07

Metals detected at least once are shown in this table. All other compounds were non-detected. For a complete list of analytes, please refer to Appendix G-1.
Footnotes:
1 - concentration is in mg/kg
2 - reporting limit for a sample is the method reporting limit times the dilution factor required for the sample due to matrix interference
3 - identical to Table 4-5b since no background area defined at NCT

TABLE 3-10

Baseline Groundwater Results for TEH and Organics[6]
EPA Method 8015M, 8020, 8081, 8260, 8270, 8310
Phase II Environmental Site Assessment
South Bay Power Plant

Analyte	Number of Samples	Number of Detections Above Reporting Limit[5]	Number of Detections Below Reporting Limit[5]	Maximum Conc Detected[1]	Location Of Maximum Conc Detected[1]	Normal Arithmetic Mean[1]	Normal Standard Deviation[1]	Normal Upper 95% Confidence Level[1]
Total Extractable Hydrocarbons	44	34	0	1700	SB3-003A@04/20/98	411	452	525
Volatile Organic Compounds (VOCs)								
Benzene[2]	52	2	1	460	MW-4@03/31/98	11	63	26
Ethylbenzene[2]	52	3	0	38	MW-4@03/31/98	27	5.5	3.9
Toluene[2]	52	5	0	26	MW-4@03/31/98	2.2	3.5	3
Xylenes[2]	52	2	0	5	SB5-062@03/27/98	2	1.9	2.4
Chloroform	34	0	1	3.6	SB3-003A@04/20/98	2.8	1.7	3.3
1,1-Dichloroethane	34	1	0	14	SB5-094@04/16/98	3.1	2.6	3.9
1,1-Dichloroethene	34	0	1	3	MW-3@03/31/98	2.8	1.7	3.3
Trichloroethene	34	5	0	59	SB5-041A@04/17/98	5.5	10.1	8.4
cis-1,2-Dichloroethene	34	4	1	19	SB5-041A@04/17/98	3.7	3.5	4.8
Methyl tert-butyl ether	4	1	1	11	MW-4@03/31/98	8	3	11
Polynuclear Aromatic Hydrocarbons (PAHs)								
Naphthalene[2,4]	80	4	0	71	SB1-070A@04/21/98	2.7	7.9	4.2
Fluorene[2,3]	26	20	0	8	SB5-038@03/30/98	3	1	3

TEH and Organics detected at least once are shown in this table. All other compounds were non-detected. For a complete list of analytes, please refer to Appendix G-2.
Footnotes:

1 - concentration is in ug/L
2 - compound was analyzed under multiple methods
3 - detected in filtered analyte only
4 - detected in unfiltered analyte only
5 - reporting limit for a sample is the method reporting limit times the dilution factor required for the sample due to matrix interference
6 - identical to Table 3-4a since no previous investigations data was included

TABLE 3-11
Baseline Groundwater Results for TEH and Organics[4]
EPA Method 8015M, 8020, 8081, 8260, 8310
Phase II Environmental Site Assessment
National City Terminal

Analyte	Number of Samples	Number of Detections Above Reporting Limit[3]	Number of Detections Below Reporting Limit[3]	Maximum Conc Detected[1]	Location Of Maximum Conc Detected[1]	Normal Arithmetic Mean[1]	Normal Standard Deviation[1]	Normal Upper 95% Confidence Level[1]
Total Extractable Hydrocarbons	4	4	0	2600	SB6-006@03/27/98	889	1154	2247
Volatile Organic Compounds (VOCs)								
Trichloroethene	4	0	1	4	SB6-009@03/27/98	2.9	0.7	3.8
Polynuclear Aromatic Hydrocarbons (PAHs)								
Fluorene[2]	4	1	0	4.6	SB6-017@03/27/98	1.9	1.8	4

TEH and Organics detected at least once are shown in this table. All other compounds were non-detected. For a complete list of analytes, please refer to Appendix G-2.
Footnotes:
1 - concentration is in ug/L
2 - detected in filtered analyte only
3 - reporting limit for a sample is the method reporting limit times the dilution factor required for the sample due to matrix interference
4 - identical to Table 3-4b since no previous investigations data was included

TABLE 3-12
Baseline Groundwater Results for CAM Metals[3]
EPA Method 6010, 7471
Phase II Environmental Site Assessment
South Bay Power Plant

Analyte	Number of Samples	Number of Detections Above Reporting Limit[2]	Number of Detections Below Reporting Limit[2]	Maximum Conc Detected[1]	Location Of Maximum Conc Detected[1]	Normal Arithmetic Mean[1]	Normal Standard Deviation[1]	Normal Upper 95% Confidence Level[1]
Lead	43	26	5	20	SB1-060@03/26/98	7	5	8
Molybdenum	43	3	2	250	SB4-011@04/16/98	59	34	67
Nickel	43	4	4	74	SB2-002@03/30/98	24	12	27
Thallium	43	1	1	13	SB3-018@03/30/98	5	1	6
Antimony	43	0	9	40	MW-3@03/31/98	31	2	32
Arsenic	43	6	14	19	SB1-061@03/23/98	7	3	8
Barium	43	4	4	1300	SB1-070A@04/21/98	142	185	189
Cobalt	43	1	1	76	SB1-003A@04/20/98	26	8	28
Copper	43	9	16	170	SB1-070C@04/21/98	24.2	26.5	31
Vanadium	43	3	16	72	SB3-003A@04/20/98	31	11	34
Zinc	43	33	0	130	SB1-070C@04/21/98	37	24	38
Mercury	43	2	1	1.5	SB5-052@03/24/98	0.31	0.26	0.37

Metals detected at least once are shown in this table. All other compounds were non-detected. For a complete list of analytes, please refer to Appendix G-2.
Footnotes:
1 - concentration is in ug/L
2 - reporting limit for a sample is the method reporting limit times the dilution factor required for the sample due to matrix interference
3 - identical to Table 3-5a since no previous investigations data was included

TABLE 3-13
Baseline Groundwater Results for CAM Metals[3]
EPA Method 6010, 7471
Phase II Environmental Site Assessment
National City Terminal

Analyte	Number of Samples	Number of Detections Above Reporting Limit[2]	Number of Detections Below Reporting Limit[2]	Maximum Conc Detected[1]	Location Of Maximum Conc Detected[1]	Normal Arithmetic Mean[1]	Normal Standard Deviation[1]	Normal Upper 95% Confidence Level[1]
Lead	4	2	1	4.5	SB6-006@03/27/98	3.4	1.2	4.9
Molybdenum	4	0	1	52	SB6-011@03/27/98	50	1	52
Arsenic	4	0	1	9.8	SB6-009@03/27/98	6.2	2.4	9
Barium	4	0	1	110	SB6-009@03/27/98	102	5	108
Copper	4	0	1	17	SB6-011@03/27/98	13.6	2.25	16.27
Vanadium	4	0	2	30	SB6-017@03/27/98	26	2	29

Metals detected at least once are shown in this table. All other compounds were non-detected. For a complete list of analytes, please refer to Appendix G-2.
Footnotes:

1 - concentration is in ug/L
2 - reporting limit for a sample is the method reporting limit times the dilution factor required for the sample due to matrix interference
3 - identical to Table 3-5b since no previous investigations data was included

TABLE 3-14
Potentially Site-Impacted Baseline Groundwater Results for CAM Metals
EPA Method 6010, 7471
Phase II Environmental Site Assessment
South Bay Power Plant

Analyte	Number of Samples	Number of Detections Above Reporting Limit[2]	Number of Detections Below Reporting Limit[2]	Maximum Conc Detected[1]	Location Of Maximum Conc Detected[1]	Normal Arithmetic Mean[1]	Normal Standard Deviation[1]	Normal Upper 95% Confidence Level[1]
Lead	32	21	3	20	SB1-060@03/26/98	7	4.7	8.4
Molybdenum	32	4	0	250	SB4-011@04/16/98	59	36	70
Nickel	32	4	3	74	SB2-002@03/30/98	25.2	13.5	29.3
Thallium	32	2	0	13	SB3-018@03/30/98	5.3	1.5	5.8
Antimony	32	0	7	40	MW-3@03/31/98	31.1	2.5	31.9
Arsenic	32	4	12	14	SB1-070C@4/21/98	6.7	2.4	7.5
Barium	32	7	0	1300	SB1-070A@04/21/98	150	212	213
Cobalt	32	1	0	76	SB1-003A@04/20/98	26.6	9	29.3
Copper	32	9	9	170	SB1-070C@04/21/98	27.1	30.2	36.1
Vanadium	32	3	13	72	SB3-003A@04/20/98	32.7	12.1	36.3
Zinc	32	23	0	130	SB1-070C@04/21/98	38	27	46

Metals detected at least once are shown in this table. All other compounds were non-detected. For a complete list of analytes, please refer to Appendix G-2.
Footnotes:
1 - concentration is in ug/L
2 - reporting limit for a sample is the method reporting limit times the dilution factor required for the sample due to matrix interference

TABLE 3-15

Potentially Site-Impacted Baseline Groundwater Results for CAM Metals[3]
EPA Method 6010, 7471
Phase II Environmental Site Assessment
National City Terminal

Analyte	Number of Samples	Number of Detections Above Reporting Limit[2]	Number of Detections Below Reporting Limit[2]	Maximum Conc Detected[1]	Location Of Maximum Conc Detected[1]	Normal Arithmetic Mean[1]	Normal Standard Deviation[1]	Normal Upper 95% Confidence Level[1]
Lead	4	2	1	4.5	SB6-006@03/27/98	3.4	1.2	4.9
Molybdenum	4	0	1	52	SB6-011@03/27/98	50	1	52
Arsenic	4	0	1	9.8	SB6-009@03/27/98	6.2	2.4	9
Barium	4	0	1	110	SB6-009@03/27/98	102	5	108
Copper	4	0	1	17	SB6-011@03/27/98	13.6	2.25	16.27
Vanadium	4	0	2	30	SB6-017@03/27/98	26	2	29

Metals detected at least once are shown in this table. All other compounds were non-detected. For a complete list of analytes, please refer to Appendix G-2.
Footnotes:

1 - concentration is in ug/L
2 - reporting limit for a sample is the method reporting limit times the dilution factor required for the sample due to matrix interference
3 - identical to Table 4-9b since no background area defined at NCT

TABLE 4-1

Summary of Chemicals Compared to San Diego RWQCB Cleanup Goals for Groundwater
Within 1000 Feet of a Marine Surface Water
Phase II Environmental Site Assessment
South Bay Power Plant

Analyte	Maximum Detected Concentration (ug/l)	San Diego RWQCB[2] (ug/l)	Max Detected Conc > RWQCB?
Volatile Organic Compounds (VOCs)			
Benzene	460	400	Yes
Toluene	26	3700	No
Ethylbenzene	38	430	No
Xylenes	5	10000	No
Polynuclear Aromatic Hydrocarbons (PAHs)			
PNAs[1]	8	300	No
Naphthalene	71	2350	No

1 - acenaphthylene, anthracene, 1,2-benzanthracene, 3,4-benzofluoranthene, benzo[k]fluoranthene, 1,12-benzoperylene, benzo[a]pyrene, chrysene, dibenzo[a,h]anthracene, fluorene, indeno[1,2,3-cd]pyrene, phenanthrene and pyrene

2 - change goals for low risk sites

TABLE 4-2

Summary of Chemicals Compared to San Diego RWQCB Cleanup Goals for Groundwater
Within 1000 Feet of a Marine Surface Water
Phase II Environmental Site Assessment
National City Terminal

Analyte	Maximum Detected Concentration (ug/l)	San Diego RWQCB[2] (ug/l)	Max Detected Conc > RWQCB?
Volatile Organic Compounds (VOCs)			
Benzene	<5	400	No
Toluene	<5	3700	No
Ethylbenzene	<5	430	No
Xylenes	<5	10000	No
Polynuclear Aromatic Hydrocarbons (PAHs)			
PNAs[1]	4.6	300	No
Naphthalene	<2	2350	No

1 - acenaphthylene, anthracene, 1,2-benzanthracene, 3,4-benzofluoranthene, benzo[k]fluoranthene, 1,12-benzoperylene, benzo[a]pyrene, chrysene, dibenzo[a,h]anthracene, fluorene, indeno[1,2,3-cd]pyrene, phenanthrene and pyrene

2 - cleanup goals for low-risk sites

Table 5-1
Soil Screening Risks and Selection of Chemicals of Potential Concern in Surface Soils for Exposure Area "A"
Phase II Environmental Site Assessment
South Bay Power Plant

Analyte	Number of Samples	Number of Detects	Frequency of Detection	Maximum Detected Concentration (mg/kg)	Normal 95% UCL (mg/kg)	Site Concentration (mg/kg)	Residential PRG (mg/kg)	Chemical Specific Risk	Chemical Specific Hazard Index	COPC?	Rationale
CARCINOGENS											
Inorganics											
Arsenic	49	48	98.0%	25	5.21	5.21	0.38	1.37E-05	na	Yes	**Chemical Specific Risk is greater than 1E-06**
Chromium (total)	49	48	98.0%	80	16.69	16.69	210	7.95E-08	na	No	Chemical Specific Risk is less than 1E-06
Polychlorinated Biphenyls (PCBs)											
Aroclor 1254	58	1	1.7%	0.201	0.037	0.037	0.20	1.85E-07	na	No	Chemical Specific Risk is less than 1E-06
Total Cumulative Screening Risk								**1.40E-05**			
NON-CARCINOGENS											
Inorganics											
Antimony	49	1	2.0%	3.78	3.45	3.45	30	na	0.115	No	Total Screening Hazard Index is less than 1
Barium	49	48	98.0%	209.30	76.03	76.03	5200	na	0.015	No	Total Screening Hazard Index is less than 1
Cobalt	49	47	95.9%	9.76	5.21	5.21	3300	na	0.002	No	Total Screening Hazard Index is less than 1
Copper	49	48	98.0%	162.79	18.35	18.35	2800	na	0.007	No	Total Screening Hazard Index is less than 1
Lead	49	48	98.0%	65.17	9.52	9.52	130	na	0.073	No	Total Screening Hazard Index is less than 1
Mercury	48	12	25.0%	0.58	0.09	0.09	22	na	0.004	No	Total Screening Hazard Index is less than 1
Nickel	49	48	98.0%	66.67	17.97	17.97	150	na	0.120	No	Total Screening Hazard Index is less than 1
Vanadium	49	48	98.0%	92.22	36.96	36.96	520	na	0.071	No	Total Screening Hazard Index is less than 1
Zinc	49	48	98.0%	90.59	36.35	36.35	22000	na	0.002	No	Total Screening Hazard Index is less than 1
Total Screening Hazard Index									**0.408**		

na - not applicable

Table 5-2
Soil Screening Risks and Selection of Chemicals of Potential Concern in Subsurface Soils for Exposure Area "A"
Phase II Environmental Site Assessment
South Bay Power Plant

Analyte	Number of Samples	Number of Detects	Frequency of Detection	Maximum Detected Concentration (mg/kg)	Normal 95% UCL (mg/kg)	Site Concentration (mg/kg)	Residential PRG (mg/kg)	Chemical Specific Risk	Chemical Specific Hazard Index	COPC?	Rationale
CARCINOGENS											
Inorganics											
Arsenic	187	124	66.3%	53.66	4.21	4.21	0.38	**1.11E-05**	na	**Yes**	**Chemical Specific Risk is greater than 1E-06**
Chromium (total)	187	184	98.4%	5000.00	136.67	136.67	210	6.51E-07	na	No	Chemical Specific Risk is less than 1E-06
Semi-volatile Organic Compounds (SVOCs)											
Bis(2-ethylhexyl)phthalate	10	1	10.0%	0.001	0.004	0.001	32	3.13E-11	na	No	Chemical Specific Risk is less than 1E-06
Polychlorinated Biphenyls (PCBs)											
Arocior 1254	124	2	1.6%	0.201	0.033	0.033	0.20	1.65E-07	na	No	Chemical Specific Risk is less than 1E-06
Total Cumulative Screening Risk								**1.19E-05**			
NON-CARCINOGENS											
Inorganics											
Antimony	187	23	12.3%	37.80	5.49	5.49	30	na	0.183	Yes	Chemical Specific hazard index is greater that 0.1
Barium	187	136	72.7%	243.90	60.75	60.75	5200	na	0.012	No	Concentration is less than the background values
Beryllium	187	7	3.7%	81.93	1.68	1.68	150	na	0.011	No	Chemical Specific hazard index is less than that 0.1
Cadmium	187	20	10.7%	2.44	1.11	1.11	9	na	0.123	Yes	Chemical Specific hazard index is greater that 0.1
Cobalt	187	129	69.0%	146.34	7.10	7.10	3300	na	0.002	No	Chemical Specific hazard index is less than that 0.1
Copper	187	137	73.3%	317.07	14.65	14.65	2800	na	0.005	No	Chemical Specific hazard index is less than that 0.1
Lead	187	156	83.4%	231.71	12.15	12.15	130	na	0.093	No	Chemical Specific hazard index is less than that 0.1
Mercury	137	33	24.1%	1.46	0.10	0.10	22	na	0.005	No	Concentration is less than the background values
Molybdenum	187	6	3.2%	10.61	4.20	4.20	370	na	0.011	No	Concentration is less than the background values
Nickel	187	170	90.9%	2707.32	76.24	76.24	150	na	0.508	Yes	Chemical Specific hazard index is greater that 0.1
Thallium	187	8	4.3%	7.44	1.88	1.88	na	na	na	No	No applicable PRGs
Vanadium	187	186	99.5%	2560.98	100.83	100.83	520	na	0.194	Yes	Chemical Specific hazard index is greater that 0.1
Zinc	187	137	73.3%	987.80	39.11	39.11	22000	na	0.002	No	Chemical Specific hazard index is less than that 0.1
Volatile Organic Compounds (VOCs)											
Ethylbenzene	97	1	1.0%	4.32	0.13	0.13	230	na	0.001	No	Chemical Specific hazard index is less than that 0.1
Xylenes	97	3	3.1%	9.26	0.28	0.28	280	na	0.001	No	Chemical Specific hazard index is less than that 0.1
Polynuclear Aromatic Hydrocarbons (PAHs)											
Acenaphthene	3	1	33.3%	0.29	0.07	0.07	2600	na	0.00003	No	Chemical Specific hazard index is less than that 0.1
Naphthalene	44	1	2.3%	0.22	0.02	0.02	55	na	0.00036	No	Chemical Specific hazard index is less than that 0.1
Total Screening Hazard Index									**1.152**		

na - not applicable

Table 5-3
Soil Screening Risks and Selection of Chemicals of Potential Concern in Surface Soils for Exposure Area "B"
Phase II Environmental Site Assessment
South Bay Power Plant

Analyte	Number of Samples	Number of Detects	Frequency of Detection	Maximum Detected Concentration (mg/kg)	Normal 95% UCL (mg/kg)	Site Concentration (mg/kg)	Residential PRG (mg/kg)	Chemical Specific Risk	Chemical Specific Hazard Index	COPC?	Rationale
CARCINOGENS											
Inorganics											
Arsenic	48	48	100.0%	21.3	4.6	4.6	0.38	1.21E-05	na	No	Site concentration at background levels
Chromium (total)	48	48	100.0%	218	28	28	210	1.33E-07	na	No	Chemical Specific Risk is less than 1E-06
Total Cumulative Screening Risk								**1.22E-05**			
NON-CARCINOGENS											
Inorganics											
Antimony	48	4	8.3%	6.2	3.7	3.7	30	na	0.123	No	Total Screening Hazard Index is less than 1
Barium	48	48	100.0%	180	90	90	5200	na	0.017	No	Total Screening Hazard Index is less than 1
Cadmium	48	1	2.1%	1.3	1.2	1.2	9	na	0.133	No	Total Screening Hazard Index is less than 1
Cobalt	48	46	95.8%	14.8	6.3	6.3	3300	na	0.002	No	Total Screening Hazard Index is less than 1
Copper	48	48	100.0%	360	34	34	2800	na	0.012	No	Total Screening Hazard Index is less than 1
Lead	48	48	100.0%	164	23	23	130	na	0.177	No	Total Screening Hazard Index is less than 1
Mercury	48	14	29.2%	0.75	0.1	0.1	22	na	0.005	No	Total Screening Hazard Index is less than 1
Molybdenum	48	2	4.2%	213	18	18	370	na	0.049	No	Total Screening Hazard Index is less than 1
Nickel	48	48	100.0%	30	15	15	150	na	0.100	No	Total Screening Hazard Index is less than 1
Vanadium	48	48	100.0%	76	41	41	520	na	0.079	No	Total Screening Hazard Index is less than 1
Zinc	48	48	100.0%	157	48	48	22000	na	0.002	No	Total Screening Hazard Index is less than 1
Volatile Organic Compounds (VOCs)											
Ethylbenzene	3	1	33.3%	0.003	0.003	0.003	230	na	0.00001	No	Total Screening Hazard Index is less than 1
Xylenes	3	1	33.3%	0.021	0.025	0.021	280	na	0.00008	No	Total Screening Hazard Index is less than 1
Total Screening Hazard Index									**0.699**		

na - not applicable

Table 5-4
Soil Screening Risks and Selection of Chemicals of Potential Concern in Subsurface Soils for Exposure Area "B"
Phase II Environmental Site Assessment
South Bay Power Plant

Analyte	Number of Samples	Number of Detects	Frequency of Detection	Maximum Detected Concentration (mg/kg)	Normal 95% UCL (mg/kg)	Site Concentration (mg/kg)	Residential PRG (mg/kg)	Chemical Specific Risk	Chemical Specific Hazard Index	COPC?	Rationale
CARCINOGENS											
Inorganics											
Arsenic	106	104	98.1%	21.3	3.8	3.8	0.38	1.00E-05	na	No	Site concentration at background levels
Chromium (total)	106	105	99.1%	218	21	21	210	1.00E-07	na	No	Chemical Specific Risk is less than 1E-06
Polychlorinated Biphenyls (PCBs)											
Aroclor 1248	9	1	11.1%	0.03	0.032	0.03	0.20	1.50E-07	na	No	Chemical Specific Risk is less than 1E-06
Total Cumulative Screening Risk								**1.03E-05**			
NON-CARCINOGENS											
Inorganics											
Antimony	106	5	4.7%	6.2	3.8	3.8	30	na	0.127	No	Total Screening Hazard Index is less than 1
Barium	106	103	97.2%	208	80	80	5200	na	0.015	No	Total Screening Hazard Index is less than 1
Cadmium	106	5	4.7%	3.4	1.3	1.3	9	na	0.144	No	Total Screening Hazard Index is less than 1
Cobalt	106	93	87.7%	16.1	6.1	6.1	3300	na	0.002	No	Total Screening Hazard Index is less than 1
Copper	106	106	100.0%	360	20	20	2800	na	0.007	No	Total Screening Hazard Index is less than 1
Lead	106	103	97.2%	164	14	14	130	na	0.108	No	Total Screening Hazard Index is less than 1
Mercury	106	28	26.4%	0.75	0.08	0.08	22	na	0.004	No	Total Screening Hazard Index is less than 1
Molybdenum	106	2	1.9%	213	11	11	370	na	0.030	No	Total Screening Hazard Index is less than 1
Nickel	106	103	97.2%	37	14	14	150	na	0.093	No	Total Screening Hazard Index is less than 1
Vanadium	106	104	98.1%	89	38	38	520	na	0.073	No	Total Screening Hazard Index is less than 1
Zinc	106	106	100.0%	157	40	40	22000	na	0.002	No	Total Screening Hazard Index is less than 1
Volatile Organic Compounds (VOCs)											
Ethylbenzene	4	1	25.0%	0.003	0.003	0.003	230	na	1.30E-05	No	Total Screening Hazard Index is less than 1
Xylenes	4	1	25.0%	0.021	0.019	0.019	280	na	6.79E-05	No	Total Screening Hazard Index is less than 1
Total Screening Hazard Index									**0.605**		

na - not applicable

Table 5-5
Soil Screening Risks and Selection of Chemicals of Potential Concern in Surface Soils for Exposure Area "C"
Phase II Environmental Site Assessment
South Bay Power Plant

Analyte[1]	Number of Samples	Number of Detects	Frequency of Detection	Maximum Detected Concentration (mg/kg)	Normal 95% UCL (mg/kg)	Site Concentration (mg/kg)	Residential PRG (mg/kg)	Chemical Specific Risk	Chemical Specific Hazard Index	COPC?	Rationale
CARCINOGENS											
Polychlorinated Biphenyls (PCBs)											
Aroclor 1260	66	1	1.5%	0.051	0.029	0.029	0.2	1.45E-07	na	No	Chemical Specific Risk is less than 1E-06
Total Cumulative Screening Risk								**1.45E-07**			

na - not applicable
1 - Soils in the Exposure Area C were considered as background soils for metals.

Table 5-6
Soil Screening Risks and Selection of Chemicals of Potential Concern in Subsurface Soils for Exposure Area "C"
Phase II Environmental Site Assessment
South Bay Power Plant

Analyte[1]	Number of Samples	Number of Detects	Frequency of Detection	Maximum Detected Concentration (mg/kg)	Normal 95% UCL (mg/kg)	Site Concentration (mg/kg)	Residential PRG (mg/kg)	Chemical Specific Risk	Chemical Specific Hazard Index	COPC?	Rationale
CARCINOGENS											
Polychlorinated Biphenyls (PCBs)											
Aroclor 1260	144	1	0.7%	0.051	0.029	0.029	0.2	1.45E-07	na	No	Chemical Specific Risk is less than 1E-06
Aroclor 1254	144	1	0.7%	0.029	0.029	0.029	0.2	1.45E-07	na	No	Chemical Specific Risk is less than 1E-06
PCB 1242	144	1	0.7%	0.1	0.030	0.030	0.2	1.50E-07	na	No	Chemical Specific Risk is less than 1E-06
Total Cumulative Screening Risk								**4.40E-07**			

na - not applicable
1 - Soils in the Exposure Area C were considered as background soils for metals.

Table 5-7
Soil Screening Risks and Selection of Chemicals of Potential Concern in Surface Soils for Exposure Area "D"
Phase II Environmental Site Assessment
South Bay Power Plant

Analyte	Number of Samples	Number of Detects	Frequency of Detection	Maximum Detected Concentration (mg/kg)	Normal 95% UCL (mg/kg)	Site Concentration (mg/kg)	Residential PRG (mg/kg)	Chemical Specific Risk	Chemical Specific Hazard Index	COPC?	Rationale
CARCINOGENS											
Inorganics											
Arsenic	26	26	100.0%	13.2	3.8	3.8	0.38	1.01E-05	na	No	Site concentration at background levels
Chromium (total)	26	26	100.0%	25	16	16	210	7.42E-08	na	No	Chemical Specific Risk is less than 1E-06
Total Cumulative Screening Risk								**1.01E-05**			
NON-CARCINOGENS											
Inorganics											
Barium	26	26	100.0%	253	114	114	5200	na	0.022	No	Total Screening Hazard Index is less than 1
Beryllium	26	1	3.8%	0.4	0.3	0.3	150	na	0.002	No	Total Screening Hazard Index is less than 1
Cobalt	26	26	100.0%	10.3	6.4	6.4	3300	na	0.002	No	Total Screening Hazard Index is less than 1
Copper	26	26	100.0%	11.6	7.6	7.6	2800	na	0.003	No	Total Screening Hazard Index is less than 1
Lead	26	26	100.0%	11	7	7	130	na	0.055	No	Total Screening Hazard Index is less than 1
Mercury	26	2	7.7%	0.06	0.03	0.03	22	na	0.001	No	Total Screening Hazard Index is less than 1
Nickel	26	26	100.0%	31	16	16	150	na	0.105	No	Total Screening Hazard Index is less than 1
Vanadium	26	26	100.0%	55	35	35	520	na	0.068	No	Total Screening Hazard Index is less than 1
Zinc	26	26	100.0%	50	36	36	22000	na	0.002	No	Total Screening Hazard Index is less than 1
Volatile Organic Compounds (VOCs)											
Ethylbenzene	97	1	1.0%	4.32	0.13	0.13	230	na	0.001	No	Total Screening Hazard Index is less than 1
Xylenes	97	3	3.1%	9.26	0.28	0.28	280	na	0.001	No	Total Screening Hazard Index is less than 1
Polynuclear Aromatic Hydrocarbons (PAHs)											
Acenaphthene	3	1	33.3%	0.29	0.07	0.07	2600	na	0.00003	No	Total Screening Hazard Index is less than 1
Naphthalene	44	1	2.3%	0.22	0.02	0.02	55	na	0.00036	No	Total Screening Hazard Index is less than 1
Total Screening Hazard Index									**0.261**		

na - not applicable

Table 5-8
Soil Screening Risks and Selection of Chemicals of Potential Concern in Subsurface Soils for Exposure Area "D"
Phase II Environmental Site Assessment
South Bay Power Plant

Analyte	Number of Samples	Number of Detects	Frequency of Detection	Maximum Detected Concentration (mg/kg)	Normal 95% UCL (mg/kg)	Site Concentration (mg/kg)	Residential PRG (mg/kg)	Chemical Specific Risk	Chemical Specific Hazard Index	COPC?	Rationale
CARCINOGENS											
Inorganics											
Arsenic	63	63	100.0%	13.23	2.84	2.84	0.38	7.47E-06	na	No	Site concentration at background levels
Chromium (total)	63	63	100.0%	25.00	12.58	12.58	210	5.99E-08	na	No	Chemical Specific Risk is less than 1E-06
Total Cumulative Screening Risk								**7.53E-06**			
NON-CARCINOGENS											
Inorganics											
Barium	63	62	98.4%	383.72	95.92	95.92	5200	na	0.018	No	Total Screening Hazard Index is less than 1
Beryllium	63	2	3.2%	0.39	0.30	0.30	150.00	na	0.002	No	Total Screening Hazard Index is less than 1
Cadmium	63	1	1.6%	10.00	1.56	1.56	9	na	0.173	No	Total Screening Hazard Index is less than 1
Cobalt	63	57	90.5%	11.20	5.44	5.44	3300	na	0.002	No	Total Screening Hazard Index is less than 1
Copper	63	61	96.8%	11.55	5.98	5.98	2800	na	0.002	No	Total Screening Hazard Index is less than 1
Lead	63	62	98.4%	27.09	5.81	5.81	130	na	0.045	No	Total Screening Hazard Index is less than 1
Mercury	63	7	11.1%	0.07	0.03	0.03	22	na	0.001	No	Total Screening Hazard Index is less than 1
Nickel	63	63	100.0%	30.87	11.75	11.75	150	na	0.078	No	Total Screening Hazard Index is less than 1
Vanadium	63	63	100.0%	55.00	31.23	31.23	520	na	0.060	No	Total Screening Hazard Index is less than 1
Zinc	63	63	100.0%	68.26	28.98	28.98	22000	na	0.001	No	Total Screening Hazard Index is less than 1
Volatile Organic Compounds (VOCs)											
Ethylbenzene	97	1	1.0%	4.32	0.13	0.13	230	na	0.001	No	Total Screening Hazard Index is less than 1
Xylenes	97	3	3.1%	9.26	0.28	0.28	280	na	0.001	No	Total Screening Hazard Index is less than 1
Polynuclear Aromatic Hydrocarbons (PAHs)											
Acenaphthene	3	1	33.3%	0.29	0.07	0.07	2600	na	0.00003	No	Total Screening Hazard Index is less than 1
Naphthalene	44	1	2.3%	0.22	0.02	0.02	55	na	0.00036	No	Total Screening Hazard Index is less than 1
Total Screening Hazard Index									**0.385**		

na - not applicable

Table 5-9
Soil Screening Risks and Selection of Chemicals of Potential Concern in Surface Soils
Phase II Environmental Site Assessment
National City Marine Terminal

Analyte	Number of Samples	Number of Detects	Frequency of Detection	Maximum Detected Concentration (mg/kg)	Normal 95% UCL (mg/kg)	Site Concentration (mg/kg)	Residential PRG (mg/kg)	Chemical Specific Risk	Chemical Specific Hazard Index	COPC?	Rationale
CARCINOGENS											
Inorganics											
Arsenic	20	20	100.0%	12.5	3.45	3.45	0.38	9.08E-06	na	No	Site concentration at background levels
Chromium (total)	20	20	100.0%	25	14.94	14.94	210	7.11E-08	na	No	Chemical Specific Risk is less than 1E-06
Total Cumulative Screening Risk								**9.15E-06**			
NON-CARCINOGENS											
Inorganics											
Barium	20	20	100.0%	141.18	68.28	68.28	5200	na	0.013	No	Total Screening Hazard Index is less than 1
Cobalt	20	20	100.0%	9.66	6.22	6.22	3300	na	0.002	No	Total Screening Hazard Index is less than 1
Copper	20	20	100.0%	204.55	37.38	37.38	2800	na	0.013	No	Total Screening Hazard Index is less than 1
Lead	20	20	100.0%	21.84	8.60	8.60	130	na	0.066	No	Total Screening Hazard Index is less than 1
Mercury	20	13	65.0%	0.51	0.12	0.12	22	na	0.005	No	Total Screening Hazard Index is less than 1
Nickel	20	20	100.0%	17.10	11.09	11.09	150	na	0.074	No	Total Screening Hazard Index is less than 1
Vanadium	20	20	100.0%	49.41	38.10	38.10	520	na	0.073	No	Total Screening Hazard Index is less than 1
Zinc	20	20	100.0%	136.36	47.49	47.49	22000	na	0.002	No	Total Screening Hazard Index is less than 1
Total Screening Hazard Index									**0.249**		

na - not applicable

Table 5-10
Soil Screening Risks and Selection of Chemicals of Potential Concern in Subsurface Soils
Phase II Environmental Site Assessment
National City Marine Terminal

Analyte	Number of Samples	Number of Detects	Frequency of Detection	Maximum Detected Concentration (mg/kg)	Normal 95% UCL (mg/kg)	Site Concentration (mg/kg)	Residential PRG (mg/kg)	Chemical Specific Risk	Chemical Specific Hazard Index	COPC?	Rationale
CARCINOGENS											
Inorganics											
Arsenic	41	41	100.0%	12.50	2.46	2.46	0.38	6.47E-06	na	No	Site concentration at background levels
Chromium (total)	41	41	100.0%	26.58	14.79	14.79	210	7.04E-08	na	No	Site concentration below residential PRG
Total Cumulative Screening Risk								**6.54E-06**			
NON-CARCINOGENS											
Inorganics											
Barium	41	41	100.0%	141.18	65.99	65.99	5200	na	0.013	No	Total Screening hazard index is less than 1.0
Cobalt	41	36	87.8%	11.90	6.00	6.00	3300	na	0.002	No	Total Screening hazard index is less than 1.0
Copper	41	41	100.0%	204.55	24.04	24.04	2800	na	0.009	No	Total Screening hazard index is less than 1.0
Lead	41	41	100.0%	166.67	15.63	15.63	130	na	0.120	No	Total Screening hazard index is less than 1.0
Mercury	41	23	56.1%	0.51	0.08	0.08	22	na	0.004	No	Total Screening hazard index is less than 1.0
Nickel	41	41	100.0%	20.25	10.65	10.65	150	na	0.071	No	Total Screening hazard index is less than 1.0
Vanadium	41	41	100.0%	69.62	37.82	37.82	520	na	0.073	No	Total Screening hazard index is less than 1.0
Zinc	41	41	100.0%	154.76	42.56	42.56	22000	na	0.002	No	Total Screening hazard index is less than 1.0
Volatile Organic Compounds (VOCs)											
n-butylbenzene	41	1	2.4%	0.005	0.003	0.003	130	na	0.00002	No	Total Screening hazard index is less than 1.0
sec-butylbenzene	41	1	2.4%	0.015	0.004	0.004	100	na	0.00004	No	Total Screening hazard index is less than 1.0
tert-butylbenzene	41	1	2.4%	0.075	0.008	0.008	120	na	0.00007	No	Total Screening hazard index is less than 1.0
xylenes	41	1	2.4%	0.011	0.003	0.003	280	na	0.00001	No	Total Screening hazard index is less than 1.0
Polynuclear Aromatic Hydrocarbons (PAHs)											
Acenaphthene	3	1	33.3%	1.32	1.71	1.32	2600	na	0.001	No	Total Screening hazard index is less than 1.0
Chrysene	3	1	33.3%	2.41	3.13	2.41	6.1	na	0.395	No	Total Screening hazard index is less than 1.0
Naphthalene	44	1	2.3%	0.08	0.01	0.01	55	na	0.00018	No	Total Screening hazard index is less than 1.0
Pyrene	3	1	33.3%	2.77	3.60	2.77	1500	na	0.002	No	Total Screening hazard index is less than 1.0
Total Screening Hazard Index									**0.690**		

na - not applicable

Table 5-11
Summary of Soil Screening Risk Estimates
Phase II Environmental Site Assessment
South Bay Power Plant

Evaluation Criteria	Surface Soil	Subsurface Soil	Comments
Exposure Area A			
Carcinogenic Risk	1.40E-05	1.20E-05	Cumulative screening risk in soil is attributed to inorganics which are present at ambient levels, except for arsenic. Therefore, no further evaluation is warranted for inorganics in soils, except arsenic, antimony, cadmium, nickel, and vanadium, in surface and subsurface soil.
Hazard Index	0.33	1.05	
Exposure Area B			
Carcinogenic Risk	1.24E-05	1.04E-05	Cumulative screening risk in soil is attributed to inorganics which are present at ambient levels, except for beryllium in subsurface soil. Therefore, no further evaluation for surface soil is warranted, but subsurface soils will be evaluated further.
Hazard Index	0.52	0.50	
Exposure Area C			
Carcinogenic Risk	1.45E-07	4.40E-07	No further evaluation is warranted.
Hazard Index	NA	NA	
Exposure Area D			
Carcinogenic Risk	1.02E-05	7.58E-06	Cumulative screening risk in soil is attributed to inorganics which are present at ambient levels, except for beryllium in subsurface soil. Therefore, no further evaluation for surface soil is warranted, but subsurface soils will be evaluated further.
Hazard Index	0.20	0.34	
National City			
Carcinogenic Risk	9.22E-06	6.66E-06	Cumulative screening risk in soil is attributed to inorganics which are present at ambient levels, except for beryllium in subsurface soil. Therefore, no further evaluation for surface soil is warranted, but subsurface soils will be evaluated further.
Hazard Index	0.18	0.57	

Table 5-12
Selection of Chemicals of Potential Concern for Groundwater
Phase II Environmental Site Assessment
South Bay Power Plant

Analyte	Number of Samples	Number of Detects	Frequency of Detection	Maximum Detected Concentration (ug/L)	Normal 95% UCL (ug/l)	Site Concentration (ug/l)	Tap Water PRG (ug/l)	Basin Plan MCL or Cal/Fed MCL (ug/L)	Site Concentration > Tap Water PRG or Cal/Fed MCL?	COPC?	Rationale
CARCINOGENS											
Inorganics											
Arsenic	32	16	50.0%	14	7.5	7.5	0.045	50	Yes	No	Site concentration at background levels
Volatile Organic Compounds (VOCs)											
Benzene	52	3	5.8%	460	26	26	0.39	1	Yes	Yes	Site concentration exceeds tap water PRG
1,1-Dichloroethene	34	1	2.9%	3	3.3	3	0.046	6	Yes	Yes	Site concentration exceeds tap water PRG
Trichloroethene	34	2	5.9%	59	8.4	8.4	1.60	5	Yes	Yes	Site concentration exceeds tap water PRG
Chloroform	34	1	2.9%	3.6	3.3	3.3	0.16	100	Yes	Yes	Site concentration exceeds tap water PRG
NON-CARCINOGENS											
Inorganics											
Antimony	32	7	21.9%	40	31.9	31.9	15.00	6	Yes	No	Site concentration at background levels
Barium	32	7	21.9%	1300	213	213	2600	1000	No	No	Site concentration below tapwater PRG and MCL
Cobalt	32	1	3.1%	76	29.3	29.3	2200	na	No	No	Site concentration below tapwater PRG
Copper	32	18	56.3%	170	36.1	36.1	1400	1000	No	No	Site concentration below tapwater PRG and MCL
Lead	32	24	75.0%	20	8.4	8.4	4	15	Yes	No	Site concentration at background levels
Molybdenum	32	4	12.5%	250	70	70	180	na	No	No	Site concentration below tapwater PRG
Nickel	32	7	21.9%	74	29.3	29.3	730	100	No	No	Site concentration below tapwater PRG and MCL
Thallium	32	2	6.3%	13	5.8	5.8	2.6	2	Yes	Yes	Site concentration exceeds Cal/Fed MCL
Vanadium	32	16	50.0%	72	36	36	260	na	No	No	Site concentration below tapwater PRG
Zinc	32	23	71.9%	130	46	46	11000	5000	No	No	Site concentration below tapwater PRG and MCL
Volatile Organic Compounds (VOCs)											
cis-1,2-Dichloroethe	34	5	14.7%	19	4.8	4.8	61	6	No	No	Site concentration below tapwater PRG and MCL
1,1-Dichloroethane	34	1	2.9%	14	3.9	3.9	810	5	No	No	Site concentration below tapwater PRG and MCL
Ethylbenzene	52	3	5.8%	38	3.9	3.9	1300	700	No	No	Site concentration below tapwater PRG and MCL
Toluene	52	5	9.6%	26	3	3	720	150	No	No	Site concentration below tapwater PRG and MCL
Xylenes	52	2	3.8%	5	2.4	2.4	1400	1750	No	No	Site concentration below tapwater PRG and MCL
Methyl tert-butyl eth	4	2	50.0%	11	11	11	20	35	No	No	Site concentration below tapwater PRG and MCL
Polycyclic Aromatic Hydrocarbons (PAHs)											
Fluorene	26	20	76.9%	8	3.4	3.4	240	na	No	No	Site concentration below tapwater PRG
Naphthalene	80	4	5.0%	71	4.9	4.9	6.2	na	No	No	Site concentration below tapwater PRG

na - not applicable

Table 5-13
Selection of Chemicals of Potential Concern for Groundwater
Phase II Environmental Site Assessment
National City Terminal

Analyte	Number of Samples	Number of Detects	Frequency of Detection	Maximum Detected Concentration (ug/L)	Normal 95% UCL (ug/l)	Site Concentration (ug/l)	Tap Water PRG (ug/l)	Basin Plan MCL or Cal/Fed MCL (ug/L)	Site Concentration > Tap Water PRG or Cal/Fed MCL?	COPC?	Rationale
CARCINOGENS											
Inorganics											
Arsenic	4	1	25.0%	9.8	9.02	9.02	0.045	50	Yes	No	Site concentration at background levels
Lead	4	3	75.0%	4.5	4.88	4.50	4	15	Yes	No	Site concentration at background levels
Volatile Organic Compounds (VOCs)											
Trichloroethene	4	1	25.0%	4	3.76	3.76	1.6	5	Yes	Yes	Site concentration exceeds tap water PRG
NON-CARCINOGENS											
Inorganics											
Barium	4	1	25.0%	110	108.38	108.38	2600	1000	No	No	Site concentration below tapwater PRG and MCL
Copper	4	1	25.0%	17	16.27	16.27	1400	1000	No	No	Site concentration below tapwater PRG and MCL
Molybdenum	4	1	25.0%	52	51.68	51.68	180	na	No	No	Site concentration below tapwater PRG
Vanadium	4	1	25.0%	30	29.30	29.30	260	na	No	No	Site concentration below tapwater PRG
Polycyclic Aromatic Hydrocarbons (PAHs)											
Fluorene	4	1	25.0%	4.6	4.02	4.02	240	na	No	No	Site concentration below tapwater PRG

na - not applicable

Table 5-14
Selection of Chemicals of Potential Concern for Groundwater to Surface Water
Phase II Environmental Site Assessment
South Bay Power Plant

Analyte	Number of Samples	Number of Detects	Frequency of Detection	Maximum Detected Concentration (ug/L)	Normal 95% UCL (ug/l)	Site Concentration (ug/l)	AWQC Marine Criteria (ug/L)	Site Concentration > AWQC?	COPC?	Rationale
CARCINOGENS										
Inorganics										
Arsenic	32	16	50.0%	14	7.5	7.5	36	No	No	Site concentration below AWQC
Volatile Organic Compounds (VOCs)										
Benzene	52	3	5.8%	460	26	26	na	No	No	No applicable AWQC
1,1-Dichloroethen	34	1	2.9%	3	3.3	3	na	No	No	No applicable AWQC
Trichloroethene	34	2	5.9%	59	8.4	8.4	na	No	No	No applicable AWQC
Chloroform	34	1	2.9%	3.6	3.3	3.3	na	No	No	No applicable AWQC
NON-CARCINOGENS										
Inorganics										
Antimony	32	7	21.9%	40	31.9	31.9	500	No	No	Site concentration below AWQC
Barium	32	7	21.9%	1300	213	213	na	No	No	No applicable AWQC
Cobalt	32	1	3.1%	76	29.3	29.3	na	No	No	No applicable AWQC
Copper	32	18	56.3%	170	36.1	36.1	2.4	Yes	No	Site concentration at background levels
Lead	32	24	75.0%	20	8.4	8.4	8.1	Yes	No	Site concentration at background levels
Molybdenum	32	4	12.5%	250	70	70	na	No	No	No applicable AWQC
Nickel	32	7	21.9%	74	29.3	29.3	8.2	Yes	No	Site concentration at background levels
Thallium	32	2	6.3%	13	5.8	5.8	na	No	No	No applicable AWQC
Vanadium	32	16	50.0%	72	36	36	na	No	No	No applicable AWQC
Zinc	32	23	71.9%	130	46	46	81	No	No	Site concentration below AWQC
Volatile Organic Compounds (VOCs)										
cis-1,2-Dichloroet	34	5	14.7%	19	4.8	4.8	na	No	No	No applicable AWQC
1,1-Dichloroethan	34	1	2.9%	14	3.9	3.9	na	No	No	No applicable AWQC
Ethylbenzene	52	3	5.8%	38	3.9	3.9	na	No	No	No applicable AWQC
Toluene	52	5	9.6%	26	3.0	3.0	na	No	No	No applicable AWQC
Xylenes	52	2	3.8%	5	2.4	2.4	na	No	No	No applicable AWQC
Methyl tert-butyl et	4	2	50.0%	11	11	11	na	No	No	No applicable AWQC
Polycyclic Aromatic Hydrocarbons (PAHs)										
Fluorene	26	20	76.9%	8	3.4	3.4	na	No	No	No applicable AWQC
Naphthalene	80	4	5.0%	71	4.9	4.9	na	No	No	No applicable AWQC

na - not applicable

Table 5-15
Selection of Chemicals of Potential Concern for Groundwater to Surface Water
Phase II Environmental Site Assessment
National City Terminal

Analyte	Number of Samples	Number of Detects	Frequency of Detection	Maximum Detected Concentration (ug/L)	Normal 95% UCL (ug/l)	Site Concentration (ug/l)	AWQC Marine Criteria (ug/L)	Site Concentration > AWQC?	COPC?	Rationale
CARCINOGENS										
Inorganics										
Arsenic	4	1	25.0%	9.8	9.02	9.02	36	No	No	Site concentration below AWQC
Volatile Organic Compounds (VOCs)										
Trichloroethene	4	1	25.0%	4	3.76	3.76	na	No	No	Site concentration below AWQC
NON-CARCINOGENS										
Inorganics										
Barium	4	1	25.0%	110	108.38	108.38	na	No	No	Site concentration below AWQC
Copper	4	1	25.0%	17	16.27	16.27	2.4	Yes	No	Site concentration at background levels
Lead	4	3	75.0%	4.5	4.88	4.50	8.1	No	No	Site concentration below AWQC
Molybdenum	4	1	25.0%	52	51.68	51.68	na	No	No	Site concentration below AWQC
Vanadium	4	1	25.0%	30	29.30	29.30	na	No	No	Site concentration below AWQC
Polycyclic Aromatic Hydrocarbons (PAHs)										
Fluorene	4	1	25.0%	4.6	4.02	4.02	na	No	No	Site concentration below AWQC

na - not applicable

TABLE 5-16
Calculation of Risk from Exposure to Surface Soil
Current and Future On-Site Worker, Area A
Phase II Environmental Site Assessment
South Bay Power Plant

	Dose	Hazard Index	Risk
ingestion:	$Dose_{ing} = \frac{Cs * IRs * EF * ED * CF1}{BW * AP}$	$HI_{ing} = Dose_{ing}/RfDo$	$Risk_{ing} = Dose_{ing} * CSFo$
dermal contact:	$Dose_{der} = \frac{Cs * SSA * ABS * SAR * EF * ED * CF1}{BW * AP}$	$HI_{der} = Dose_{der}/RfDo$	$Risk_{der} = Dose_{der} * CSFo$
inhalation:	$Dose_{inh} = \frac{Ca * InhRs * EF * ED}{BW * AP}$	$HI_{inh} = Dose_{inh}/RfDi$	$Risk_{inh} = Dose_{inh} * CSFi$

$Ca = Cs * 5 \times 10^{-5}$

Parameter	Description	Units	Value	Reference
Dose	Dose of chemical	mg/kg-day	See below	Calculated
HI	Hazard index	unitless	See below	Calculated
Risk	Risk	unitless	See below	Calculated
Cs	Chemical concentration in soil	mg/kg	See below	Exposure Unit site concentration (see Table 5-1)
Ca	Chemical concentration in air	mg/m^3	See below	Calculated
IRs	Soil ingestion rate	mg/day	50	USEPA, 1998
EF	Exposure frequency	days/year	250	USEPA, 1998
ED	Exposure duration	years	25	USEPA, 1998
BW	Body weight	kg	70	USEPA, 1998
AP	Averaging period	days	See below	USEPA, 1989
SSA	Skin surface area	cm^2	2000	USEPA, 1998
ABS	Absorption factor	unitless	See below	USEPA, 1998
SAR	Soil adherence rate	mg/cm^2	0.08	USEPA, 1998
InhRs	Inhalation rate	m^3/day	20	USEPA, 1998
CF1	Conversion factor, mg to kg	kg/mg	1.00E-06	Constant
RfDo	Oral reference dose	mg/kg-day	See below	CALEPA, 1996; USEPA, 1998
RfDi	Inhalation reference dose	mg/kg-day	See below	CALEPA, 1996; USEPA, 1998
CSFo	Oral cancer slope factor	$(mg/kg-day)^{-1}$	See below	CALEPA, 1996; USEPA, 1998
CSFi	Inhalation cancer slope factor	$(mg/kg-day)^{-1}$	See below	CALEPA, 1996; USEPA, 1998

Carcinogens			*AP =*	*25,550 days*								Total
Compound	Cs	ABS	Ca	CSFo	CSFi	$Dose_{ing}$	$Dose_{der}$	$Dose_{inh}$	$Risk_{ing}$	$Risk_{der}$	$Risk_{inh}$	Risk
Arsenic	5.21	0.03	2.61E-07	1.50E+00	1.50E+01	9.10E-07	8.74E-08	1.82E-08	1.37E-06	1.31E-07	2.73E-07	1.77E-06
										Total Risk		1.77E-06

TABLE 5-17
Calculation of Risk from Exposure to Subsurface Soil
Current and Future Construction Worker, Area A
Phase II Environmental Site Assessment
South Bay Power Plant

	Dose		Hazard Index		Risk	
ingestion:	$Dose_{ing}$ =	$\frac{Cs * IRs * EF * ED * CF1}{BW * AP}$	HI_{ing} =	$Dose_{ing}/RfDo$	$Risk_{ing}$ =	$Dose_{ing} * CSFo$
dermal contact:	$Dose_{der}$ =	$\frac{Cs * SSA * ABS * SAR * EF * ED * CF1}{BW * AP}$	HI_{der} =	$Dose_{der}/RfDo$	$Risk_{der}$ =	$Dose_{der} * CSFo$
inhalation:	$Dose_{inh}$ =	$\frac{Ca * InhRs * EF * ED}{BW * AP}$	HI_{inh} =	$Dose_{inh}/RfDi$	$Risk_{inh}$ =	$Dose_{inh} * CSFi$

$Ca = Cs * 5 \times 10^{-8}$

Parameter	Description	Units	Value	Reference
Dose	Dose of chemical	mg/kg-day	See below	Calculated
HI	Hazard index	unitless	See below	Calculated
Risk	Risk	unitless	See below	Calculated
Cs	Chemical concentration in soil	mg/kg	See below	Exposure Unit site concentration (see Table 5-2)
Ca	Chemical concentration in air	mg/m^3	See below	Calculated
IRs	Soil ingestion rate	mg/day	100	USEPA, 1998
EF	Exposure frequency	days/year	120	USEPA, 1998
ED	Exposure duration	years	1	USEPA, 1998
BW	Body weight	kg	70	USEPA, 1998
AP	Averaging period	days	See below	USEPA, 1989
SSA	Skin surface area	cm^2/day	2000	USEPA, 1998
ABS	Absorption factor	unitless	See below	USEPA, 1998
SAR	Soil adherence rate	mg/cm^2	0.09	USEPA, 1998
InhRs	Inhalation rate	m^3/day	20	USEPA, 1998
CF1	Conversion factor, mg to kg	kg/mg	1.00E-06	Constant
RfDo	Oral reference dose	mg/kg-day	See below	CALEPA, 1996; USEPA, 1998
RfDi	Inhalation reference dose	mg/kg-day	See below	CALEPA, 1996; USEPA, 1998
CSFo	Oral cancer slope factor	$(mg/kg-day)^{-1}$	See below	CALEPA, 1996; USEPA, 1998
CSFi	Inhalation cancer slope factor	$(mg/kg-day)^{-1}$	See below	CALEPA, 1996; USEPA, 1998

Carcinogens			AP =	25,550 days							Total
Compound	Cs	Ca	ABS	CSFo	CSFI	$Dose_{ing}$	$Dose_{der}$	$Dose_{inh}$	$Risk_{ing}$	$Risk_{der}$	$Risk_{inh}$	Risk
Arsenic	4.21	2.11E-07	0.03	1.50E+00	1.20E+01	2.82E-08	1.53E-09	2.82E-10	4.24E-08	2.29E-09	3.39E-09	4.80E-08
											Total Risk	4.80E-08

NON-CARCINOGENS		AP=9125 days		DOSE			REFERENCE DOSE		HAZARD QUOTIENT			
Chemical	Cs mg/kg	Ca (mg/m^3)	ABS (dermal)	Ingestion	Inhalation (mg/kg-day)	Dermal	RfDing	RfDinh (mg/kg-day)-1	Ingestion	Inhalation	Dermal	Total
Antimony	5.49E+00	2.70E-07	0.01	1.03E-07	1.03E-09	1.65E-09	4.00E-04	---	2.58E-04	---	4.13E-06	2.62E-04
Cadmium	1.11E+00	5.60E-08	0.01	2.09E-08	2.09E-10	3.34E-10	5.00E-04	5.70E-05	4.17E-05	1.19E-14	6.67E-07	4.24E-05
Nickel	7.62E+01	3.80E-06	0.01	1.43E-06	1.43E-08	2.29E-08	2.00E-02	---	7.16E-05	---	1.15E-06	7.28E-05
Vanadium	1.01E+02	5.00E-06	0.01	1.89E-06	1.89E-08	3.03E-08	7.00E-03	---	2.71E-04	---	4.33E-06	2.75E-04
											Total Hazard Index =	6.52E-04

TABLE 5-18
Calculation of Risk from Exposure to Groundwater
Current On-Site Worker
Phase II Environmental Site Assessment
South Bay Power Plant

$$DOSEinh = \frac{EPCa * InhR * EF * ED}{BW * AT} \qquad RISK = DOSE * SF \qquad HI = \frac{DOSE}{RfD}$$

Parameter	Description	Units	Values	Reference
Dose	Dose of chemical	mg/kg-day	See below	Calculated
Risk	Carcinogenic Risk	unitless	See below	Calculated
HI	Hazard Index	unitless	See below	Calculated
EPCw	Groundwater concentration	ug/L	See below	Site concentration (see Table 5-12)
EPCa	Air concentration	mg/m^3	See below	Calculated
EF	Exposure frequency	days/year	250	USEPA, 1998
ED	Exposure duration	years	25	USEPA, 1998
ET	Exposure time	hours/day	8	USEPA, 1998
BW	Body weight	kg	70	USEPA, 1998
ATnc	Averaging time, noncarcinogens	days	9125	USEPA, 1998
ATc	Averaging time, carcinogens	days	25550	USEPA, 1998
InhR	Inhalation rate	m^3/day	20	USEPA, 1998
CF1	Conversion factor	mg/ug	1.00E-03	Constant
CF2	Conversion factor	L/cm^3	1.00E-03	Constant
CSFo	Oral cancer slope factor	kg-day/mg	See below	CALEPA, 1996; USEPA, 1998
CSFi	Inhalation cancer slope factor	kg-day/mg	See below	CALEPA, 1996; USEPA, 1998
RfDo	Oral reference dose	mg/kg-day	See below	CALEPA, 1996; USEPA, 1998
RfDi	Inhalation reference dose	mg/kg-day	See below	CALEPA, 1996; USEPA, 1998

CARCINOGENS				DOSE			TOXICITY FACTOR		RISK			
Chemical	EPCw ug/L	EPCa (mg/m^3)	PC (cm/hr)	Ingestion	Inhalation (mg/kg-day)	Dermal	SFing	SFinh $(mg/kg-day)^{-1}$	Ingestion	Inhalation	Dermal	Total
Benzene	2.60E+01	1.33E-07	2.10E-02	---	9.31E-09	---	1.00E-01	1.00E-01	---	9.31E-10	---	9.31E-10
1,1-Dichloroethene	3.00E+00	1.02E-07	1.60E-02	---	7.09E-09	---	6.00E-01	1.80E-01	---	1.28E-09	---	1.28E-09
Trichloroethene	8.40E+00	1.15E-07	1.60E-02	---	8.03E-09	---	1.50E-02	1.00E-02	---	8.03E-11	---	8.03E-11
Chloroform	3.30E+00	8.07E-09	8.90E-03	---	5.64E-10	---	3.10E-02	1.90E-02	---	1.07E-11	---	1.07E-11
											Total Cumulative Risk =	2.30E-09

NON-CARCINOGENS				DOSE			REFERENCE DOSE		HAZARD QUOTIENT			
Chemical	EPC ug/L	EPCa (mg/m^3)	PC (cm/hr)	Ingestion	Inhalation (mg/kg-day)	Dermal	RfDing	RfDinh (mg/kg-day)	Ingestion	Inhalation	Dermal	Total
Thallium	5.79E+00	—	1.00E-03	---	—	—	7.00E-05	---	—	---	---	---
											Total Hazard Index =	0.000

Note: see table 5-18a for input calculations

TABLE 5-18a
Vapor Migration from Groundwater into Indoor Air
On-Site Building
Phase II Environmental Site Assessment
South Bay Power Plant

Calculation of Total Aquifer Concentration (particles and water)

$Kdaq = Koc * focaq$

$Cpaq = Cwaq * Kdaq$

$Pfaq = Ppaq * (1 - naq) + (naq * Pw)$

$$Ctaq = \frac{Cwaq * naq + Cpaq * Ppaq * (1 - naq)}{Pfaq}$$

Parameter	Description	Units	Value	Reference
Koc	Organic carbon partition coefficient	L/kg	See below	Montgomery, 1996
focaq	Aquifer fraction organic carbon	unitless	0.002	USEPA, 1996
Kdaq	Aquifer distribution coefficient	L/kg	See below	Calculated
Cwaq	Chemical concentration in aquifer water	ug/L	See below	See Table 5-18
Cpaq	Chemical concentration sorbed to aquifer pa	ug/kg	See below	Calculated
naq	Total porosity of aquifer materials	unitless	0.43	Calculated
Pfaq	Saturated density of aquifer	kg/L	See below	Calculated
Ppaq	Aquifer particle density	kg/L	2.65	USEPA, 1998
Pw	Density of water	kg/L	1	Constant
Ctaq	Total chemical concentration in aquifer (parti	ug/kg	See below	Calculated

Compound	Koc	Kdaq	Cwaq	Cpaq	Pfaq	Ctaq
Benzene	4.90E+01	9.80E-02	2.60E+01	2.55E+00	1.93E+00	7.81E+00
1,1-Dichloroethene	6.46E+01	1.29E-01	3.00E+00	3.87E-01	1.93E+00	9.74E-01
Trichloroethene	6.46E+01	1.29E-01	8.40E+00	1.08E+00	1.93E+00	2.73E+00
Chloroform	6.31E+01	1.26E-01	3.30E+00	4.16E-01	1.93E+00	1.06E+00

Calculation of Soil Gas Concentration

$nw = Pb * W / Pw$

$na = n - nw$

$Pb = Pp * (1-n)$

$Kd = Koc * foc$

$$Csg = \frac{Ctaq * Pb}{na + (nw/H) + (Kd * Pb/H)}$$

Parameter	Description	Units	Value	Reference
Ctaq	Total chemical concentration in aquifer (parti	ug/kg	See below	Calculated
Kd	Distribution coefficient	L/kg	See below	Calculated
Koc	Soil organic carbon partition coefficient	L/kg	See below	Montgomery, 1996
foc	Soil fraction organic carbon	unitless	0.002	USEPA, 1998
Pb	Dry soil builk density	kg/L	1.50	USEPA, 1998
W	Soil moisture content	unitless	0.2	Fetter, 1980
n	Total soil porosity	unitless	0.43	Calculated
na	Air-filled soil porosity	unitless	0.13	Calculated
Pp	Soil particle density	kg/L	2.65	USEPA, 1998
nw	Water-filled soil porosi	unitless	0.30	USEPA, 1998
Pw	Density of water	kg/L	1.00	Constant
H	Henry's Law constant	unitless	See below	Montgomery, 1996
Csg	Soil gas concentration	ug/L	See below	Calculated

Compounds	Koc	H	Ctaq	Kd	Csg
Benzene	4.90E+01	2.25E-01	7.81E+00	9.80E-02	5.52E+00
1,1-Dichloroethene	6.46E+01	6.15E-01	9.74E-01	1.29E-01	1.56E+00
Trichloroethene	6.46E+01	3.73E-01	2.73E+00	1.29E-01	2.81E+00
Chloroform	6.31E+01	1.39E-01	1.06E+00	1.26E-01	4.37E-01

TABLE 5-18a
Vapor Migration from Groundwater into Indoor Air
On-Site Building
Phase II Environmental Site Assessment
South Bay Power Plant

Calculation of Effective Diffusion Coefficient

$Dsg = (na\ u3.33 / n\ u2) * Da$ $\quad De = (H * Dsg + Dsw)/(Pb * Kd + nw + na * H)$
$Dsw = (nw\ u3.33 / n\ u2) * Dl$

Parameter	Description	Units	Value	Reference
Da	Diffusion coefficient in air	cm^2/s	See below	Lyman et al, 1991
Dl	Diffusion coefficient in water	cm^2/s	See below	Lyman et al, 1991
Dsg	Diffusion coefficient in soil gas	cm^2/s	See below	Calculated
Dsw	Diffusion coefficient in soil water	cm^2/s	See below	Calculated
De	Effective diffusion coefficient	cm^2/s	See below	Calculated
n	Total soil porosity	unitless	0.43	Calculated
na	Air-filled soil porosity	unitless	0.13	Calculated
nw	Water-filled soil porosity	unitless	0.30	USEPA, 1998
H	Henry's Law constant	unitless	See below	Montgomery, 1996
Kd	Distribution coefficient	L/kg	See below	Calcuated
Pb	Dry soil bulk density	kg/L	1.5	USEPA, 1998

Compound	Da	Dl	Kd	H	Dsg	Dsw	De
Benzene	1.94E-02	1.03E-05	9.80E-02	2.25E-01	1.28E-04	9.92E-07	6.23E-05
1,1-Dichloroethen	2.37E-02	1.10E-05	1.29E-01	6.15E-01	1.56E-04	1.06E-06	1.68E-04
Trichloroethene	2.30E-02	9.65E-06	1.29E-01	3.73E-01	1.51E-04	9.30E-07	1.06E-04
Chloroform	2.54E-02	1.05E-05	1.26E-01	1.39E-01	1.67E-04	1.01E-06	4.77E-05

Calculation of Indoor Air Concentrations

$Q = De * Csg * A * CF1 * CF2 / L$ $\quad Cair = \frac{f * CF3 * CF4}{Vb * E}$
$Qf = Q * AF$

Parameter	Description	Units	Value	Reference
Q	Emission rate from soil gas	ug/s	See below	Calculated
De	Effective diffusion coefficient	cm^2/s	See below	Calculated
Csg	Soil gas concentration	ug/L	See below	Calculated
A	Area of building	m^2	185.80	Assumes 2000 ft2
L	Depth to contamination	m	3.05	Assumes 10 feet
CF1	Conversion factor, cm2 to m2	m^2/cm^2	0.0001	Constant
CF2	Conversion factor, L to m3	L/m^3	1000	Constant
Qf	Emission rate through foundation	ug/s	See below	Calculated
AF	Attenuation factor	unitless	0.01	PCA, 1979
Vb	Volume of building	m^3	566.32	Assumes 10 ft ceilings
E	Air exchange rate	1/hour	1	Prichard and Gessell, 1983
CF3	Conversion factor, s to hr	s/hour	3600	Constant
CF4	Conversion factor, ug to mg	mg/ug	1.00E-03	Constant
Ca	Indoor air concentration	mg/m^3	See below	Calculated

Compound	De	Csg	Q	Qf	Cair
Benzene	6.23E-05	5.52E+00	2.10E-03	2.10E-05	1.33E-07
1,1-Dichloroethen	1.68E-04	1.56E+00	1.60E-03	1.60E-05	1.02E-07
Trichloroethene	1.06E-04	2.81E+00	1.81E-03	1.81E-05	1.15E-07
Chloroform	4.77E-05	4.37E-01	1.27E-04	1.27E-06	8.07E-09

TABLE 5-19
Calculation of Risk from Exposure to Groundwater
Future On-Site Worker
Phase II Environmental Site Assessment
South Bay Power Plant

$$DOSEing = \frac{EPCw * IR * EF * ED * CF1}{BW * AT}$$

$$DOSEd = \frac{EPCw * SSA * PC * ET * EF * ED * CF1 * CF2}{BW * AT}$$

$$DOSEinh = \frac{EPCa * InhR * EF * ED}{BW * AT}$$

$$RISK = DOSE * SF$$

$$HI = \frac{DOSE}{RfD}$$

Parameter	Description	Units	Values	Reference
Dose	Dose of chemical	mg/kg-day	See below	Calculated
Risk	Carcinogenic Risk	unitless	See below	Calculated
HI	Hazard Index	unitless	See below	Calculated
EPCw	Groundwater concentration	ug/L	See below	Site concentration (see Table 5-12)
EPCa	Air concentration	mg/m^3	See below	Calculated
EF	Exposure frequency	days/year	250	USEPA, 1998
ED	Exposure duration	years	25	USEPA, 1998
ET	Exposure time	hours/day	8	USEPA, 1998
BW	Body weight	kg	70	USEPA, 1998
ATnc	Averaging time, noncarcinogens	days	9125	USEPA, 1998
ATc	Averaging time, carcinogens	days	25550	USEPA, 1998
SSA	Skin surface area	cm^2	2000	USEPA, 1998
PC	Permeability Constant	cm/hr	See below	USEPA, 1998
IRw	Water ingestion rate	L/day	0.1	USEPA, 1998
InhR	Inhalation rate	m^3/day	15	USEPA, 1998
CF1	Conversion factor	mg/ug	1.00E-03	Constant
CF2	Conversion factor	L/cm^3	1.00E-03	Constant
CSFo	Oral cancer slope factor	kg-day/mg	See below	CALEPA, 1996; USEPA, 1998
CSFi	Inhalation cancer slope factor	kg-day/mg	See below	CALEPA, 1996; USEPA, 1998
RfDo	Oral reference dose	mg/kg-day	See below	CALEPA, 1996; USEPA, 1998
RfDi	Inhalation reference dose	mg/kg-day	See below	CALEPA, 1996; USEPA, 1998

CARCINOGENS				DOSE			TOXICITY FACTOR		RISK			
Chemical	EPCw ug/L	EPCa (mg/m^3)	PC (cm/hr)	Ingestion	Inhalation (mg/kg-day)	Dermal	SFing $(mg/kg-day)^{-1}$	SFinh $(mg/kg-day)^{-1}$	Ingestion	Inhalation	Dermal	Total
Benzene	2.60E+01	1.33E-07	2.10E-02	9.09E-06	9.31E-09	3.05E-05	1.00E-01	1.00E-01	9.09E-07	9.31E-10	3.05E-06	3.96E-06
1,1-Dichloroethene	3.00E+00	1.02E-07	1.60E-02	1.05E-06	7.09E-09	2.68E-06	6.00E-01	1.80E-01	6.29E-07	1.28E-09	1.61E-06	2.24E-06
Trichloroethene	8.40E+00	1.15E-07	1.60E-02	2.94E-06	8.03E-09	7.51E-06	1.50E-02	1.00E-02	4.40E-08	8.03E-11	1.13E-07	1.57E-07
Chloroform	3.30E+00	8.07E-09	8.90E-03	1.15E-06	5.64E-10	1.64E-06	3.10E-02	1.90E-02	3.57E-08	1.07E-11	5.09E-08	8.67E-08
											Total Cumulative Risk =	**6.45E-06**

NON-CARCINOGENS				DOSE			REFERENCE DOSE		HAZARD QUOTIENT			
Chemical	EPC ug/L	EPCa (mg/m^3)	PC (cm/hr)	Ingestion	Inhalation (mg/kg-day)	Dermal	RfDing (mg/kg-day)	RfDinh	Ingestion	Inhalation	Dermal	Total
Thallium	5.79E+00	---	1.00E-03	5.67E-06	---	9.06E-07	7.00E-05	---	8.09E-02	---	1.29E-02	9.39E-02
											Total Hazard Index =	**0.09**

Note: see Table 5-19a for input calculations

TABLE 5-19a
Vapor Migration from Groundwater into Indoor Air
On-Site Building
Phase II Environmental Site Assessment
South Bay Power Plant

Calculation of Total Aquifer Concentration (particles and water)

$K_{daq} = K_{oc} * f_{ocaq}$ $\qquad P_{faq} = P_{paq} * (1 - n_{aq}) + (n_{aq} * P_w)$

$C_{paq} = C_{waq} * K_{daq}$ $\qquad C_{taq} = \frac{C_{waq} * n_{aq} + C_{paq} * P_{paq} * (1 - n_{aq})}{P_{faq}}$

Parameter	Description	Units	Value	Reference
Koc	Organic carbon partition coef	L/kg	See below	Montgomery, 1996
focaq	Aquifer fraction organic carb	unitless	0.002	USEPA, 1998
Kdaq	Aquifer distribution coefficien	L/kg	See below	Calculated
Cwaq	Chemical concentration in aq	ug/L	See below	See Table 5-19
Cpaq	Chemical concentration sorb	ug/kg	See below	Calculated
naq	Total porosity of aquifer mate	unitless	0.43	Calculated
Pfaq	Saturated density of aquifer	kg/L	See below	Calculated
Ppaq	Aquifer particle density	kg/L	2.65	USEPA, 1998
Pw	Density of water	kg/L	1	Constant
Ctaq	Total chemical concentration	ug/kg	See below	Calculated

Compound	Koc	Kdaq	Cwaq	Cpaq	Pfaq	Ctaq
Benzene	4.90E+01	9.80E-02	2.60E+01	2.55E+00	1.93E+00	7.81E+00
1,1-Dichloroethene	6.46E+01	1.29E-01	3.00E+00	3.87E-01	1.93E+00	9.74E-01
Trichloroethene	6.46E+01	1.29E-01	8.40E+00	1.08E+00	1.93E+00	2.73E+00
Chloroform	6.31E+01	1.26E-01	3.30E+00	4.16E-01	1.93E+00	1.06E+00

Calculation of Soil Gas Concentration

$n_w = P_b * W / P_w$
$n_a = n - n_w$
$P_b = P_p * (1-n)$
$K_d = K_{oc} * f_{oc}$

$C_{sg} = \frac{C_{taq} * P_b}{n_a + (n_w/H) + (K_d * P_b/H)}$

Parameter	Description	Units	Value	Reference
Ctaq	Total chemical concentration	ug/kg	See below	Calculated
Kd	Distribution coefficient	L/kg	See below	Calcuated
Koc	Soil organic carbon partition	L/kg	See below	Montgomery, 1996
foc	Soil fraction organic carbon	unitless	0.002	USEPA, 1998
Pb	Dry soil bulk density	kg/L	1.50	USEPA, 1998
W	Soil moisture content	unitless	0.2	Fetter, 1980
n	Total soil porosity	unitless	0.43	Calculated
na	Air-filled soil porosity	unitless	0.13	Calculated
Pp	Soil particle density	kg/L	2.65	USEPA, 1998
nw	Water-filled s	unitless	0.30	USEPA, 1998
Pw	Density of water	kg/L	1.00	Constant
H	Henry's Law constant	unitless	See below	Montgomery, 1996
Csg	Soil gas concentration	ug/L	See below	Calculated

Compounds	Koc	H	Ctaq	Kd	Csg
Benzene	4.90E+01	2.25E-01	7.81E+00	9.80E-02	5.52E+00
1,1-Dichloroethene	6.46E+01	6.15E-01	9.74E-01	1.29E-01	1.56E+00
Trichloroethene	6.46E+01	3.73E-01	2.73E+00	1.29E-01	2.81E+00
Chloroform	6.31E+01	1.39E-01	1.06E+00	1.26E-01	4.37E-01

TABLE 5-19a
Vapor Migration from Groundwater into Indoor Air
On-Site Building
Phase II Environmental Site Assessment
South Bay Power Plant

Calculation of Effective Diffusion Coefficient

Dsg = (na u3.33 /n u2) * D De = (H * Dsg + Dsw)/(Pb * Kd + nw + na * H)
Dsw = (nw u3.33 /n u2) * Dl

Parameter	Description	Units	Value	Reference
Da	Diffusion coefficient in air	cm^2/s	See below	Lyman et al, 1991
Dl	Diffusion coefficient in water	cm^2/s	See below	Lyman et al, 1991
Dsg	Diffusion coefficient in soil ga	cm^2/s	See below	Calculated
Dsw	Diffusion coefficient in soil w	cm^2/s	See below	Calculated
De	Effective diffusion coefficient	cm^2/s	See below	Calculated
n	Total soil porosity	unitless	0.43	Calculated
na	Air-filled soil porosity	unitless	0.13	Calculated
nw	Water-filled soil porosity	unitless	0.30	USEPA, 1998
H	Henry's Law constant	unitless	See below	Montgomery, 1996
Kd	Distribution coefficient	L/kg	See below	Calcuated
Pb	Dry soil bulk density	kg/L	1.5	USEPA, 1998

Compound	Da	Dl	Kd	H	Dsg	Dsw	De
Benzene	1.94E-02	1.03E-05	9.80E-02	2.25E-01	1.28E-04	9.92E-07	6.23E-05
1,1-Dichloroethen	2.37E-02	1.10E-05	1.29E-01	6.15E-01	1.56E-04	1.06E-06	1.68E-04
Trichloroethene	2.30E-02	9.65E-06	1.29E-01	3.73E-01	1.51E-04	9.30E-07	1.06E-04
Chloroform	2.54E-02	1.05E-05	1.26E-01	1.39E-01	1.67E-04	1.01E-06	4.77E-05

Calculation of Indoor Air Concentrations

Q = De * Csg * A * CF1 * CF2 / L **Cair = $\frac{f * CF3 * CF4}{Vb * E}$**
Qf = Q * AF

Parameter	Description	Units	Value	Reference
Q	Emission rate from soil gas	ug/s	See below	Calculated
De	Effective diffusion coefficient	cm^2/s	See below	Calculated
Csg	Soil gas concentration	ug/L	See below	Calculated
A	Area of building	m^2	185.80	Assumes 2000 ft2
L	Depth to contamination	m	3.05	Assumes 10 feet
CF1	Conversion factor, cm2 to m	m^2/cm^2	0.0001	Constant
CF2	Conversion factor, L to m3	L/m^3	1000	Constant
Qf	Emission rate through found	ug/s	See below	Calculated
AF	Attenuation factor	unitless	0.01	PCA, 1979
Vb	Volume of building	m^3	566.32	Assumes 10 ft ceilings
E	Air exchange rate	1/hour	1	Prichard and Gessell, 1983
CF3	Conversion factor, s to hr	s/hour	3600	Constant
CF4	Conversion factor, ug to mg	mg/ug	1.00E-03	Constant
Ca	Indoor air concentration	mg/m^3	See below	Calculated

Compound	De	Csg	Q	Qf	Cair
Benzene	6.23E-05	5.52E+00	2.10E-03	2.10E-05	1.33E-07
1,1-Dichloroethen	1.68E-04	1.56E+00	1.60E-03	1.60E-05	1.02E-07
Trichloroethene	1.06E-04	2.81E+00	1.81E-03	1.81E-05	1.15E-07
Chloroform	4.77E-05	4.37E-01	1.27E-04	1.27E-06	8.07E-09

Note: Same data input and calculations as Table 5-18a

TABLE 5-20
Calculation of Risk from Exposure to Groundwater
Current On-Site Worker
Phase II Environmental Site Assessment
National City Terminal

$$DOSEinh = \frac{EPCa * InhR * EF * ED}{BW * AT}$$

$$RISK = DOSE * SF$$

$$HI = \frac{DOSE}{RfD}$$

Parameter	Description	Units	Values	Reference
Dose	Dose of chemical	mg/kg-day	See below	Calculated
Risk	Carcinogenic Risk	unitless	See below	Calculated
HI	Hazard Index	unitless	See below	Calculated
EPCw	Groundwater concentration	ug/L	See below	Site concentration (see Table 5-13)
EPCa	Air concentration	mg/m^3	See below	Calculated
EF	Exposure frequency	days/year	250	USEPA, 1998
ED	Exposure duration	years	25	USEPA, 1998
ET	Exposure time	hours/day	8	USEPA, 1998
BW	Body weight	kg	70	USEPA, 1998
ATnc	Averaging time, noncarcinogens	days	9125	USEPA, 1998
ATc	Averaging time, carcinogens	days	25550	USEPA, 1998
SSA	Skin surface area	cm^2	2000	USEPA, 1998
PC	Permeability Constant	cm/hr	See below	USEPA, 1998
IRw	Water ingestion rate	L/day	0.1	USEPA, 1998
InhR	Inhalation rate	m^3/day	20	USEPA, 1998
CF1	Conversion factor	mg/ug	1.00E-03	Constant
CF2	Conversion factor	L/cm^3	1.00E-03	Constant
CSFo	Oral cancer slope factor	g-day/mg	See below	CALEPA, 1996; USEPA, 1998
CSFi	Inhalation cancer slope factor	g-day/mg	See below	CALEPA, 1996; USEPA, 1998
RfDo	Oral reference dose	g/kg-day	See below	CALEPA, 1996; USEPA, 1998
RfDi	Inhalation reference dose	g/kg-day	See below	CALEPA, 1996; USEPA, 1998

CARCINOGENS				DOSE			TOXICITY FACTOR		RISK			
Chemical	EPCw ug/L	EPCa (mg/m^3)	PC (cm/hr)	Ingestion	Inhalation (mg/kg-day)	Dermal	SFing ($(mg/kg-day)^{-1}$)	SFinh	Ingestion	Inhalation	Dermal	Total
Trichloroethene	3.76E+00	5.14E-08	1.60E-02	---	3.59E-09	---	1.50E-02	1.00E-02	---	3.59E-11	---	3.59E-11
										Total Cumulative Risk =		3.59E-11

Note: see Table 5-20a for input calculations

TABLE 5-20a
Vapor Migration from Groundwater into Indoor Air
On-Site Building
Phase II Environmental Site Assessment
National City Terminal

Calculation of Total Aquifer Concentration (particles and water)

$$Kdaq = Koc * focaq \qquad Pfaq = Ppaq * (1 - naq) + (naq * Pw)$$

$$Cpaq = Cwaq * Kdaq \qquad Ctaq = \frac{Cwaq * naq + Cpaq * Ppaq * (1 - naq)}{Pfaq}$$

Parameter	Description	Units	Value	Reference
Koc	Organic carbon partition coefficient	L/kg	See below	Montgomery, 1996
focaq	Aquifer fraction organic carbon	unitless	0.002	USEPA, 1998
Kdaq	Aquifer distribution coefficient	L/kg	See below	Calculated
Cwaq	Chemical concentration in aquifer water	ug/L	See below	See Table 5-20
Cpaq	Chemical concentration sorbed to aquifer p	ug/kg	See below	Calculated
naq	Total porosity of aquifer materials	unitless	0.43	Calculated
Pfaq	Saturated density of aquifer	kg/L	See below	Calculated
Ppaq	Aquifer particle density	kg/L	2.65	USEPA, 1998
Pw	Density of water	kg/L	1	Constant
Ctaq	Total chemical concentration in aquifer (par	ug/kg	See below	Calculated

Compound	Koc	Kdaq	Cwaq	Cpaq	Pfaq	Ctaq
Trichloroethene	6.46E+01	1.29E-01	3.76E+00	4.86E-01	1.93E+00	1.22E+00

Calculation of Soil Gas Concentration

$$nw = Pb * W / Pw \qquad Csg = \frac{Ctaq * Pb}{na + (nw/H) + (Kd * Pb/H)}$$

$$na = n - nw$$

$$Pb = Pp * (1-n)$$

$$Kd = Koc * foc$$

Parameter	Description	Units	Value	Reference
Ctaq	Total chemical concentration in aquifer (par	ug/kg	See below	Calculated
Kd	Distribution coefficient	L/kg	See below	Calcuated
Koc	Soil organic carbon partition coefficient	L/kg	See below	Montgomery, 1996
foc	Soil fraction organic carbon	unitless	0.002	USEPA, 1998
Pb	Dry soil builk density	kg/L	1.50	USEPA, 1998
W	Soil moisture content	unitless	0.2	Fetter, 1980
n	Total soil porosity	unitless	0.43	Calculated
na	Air-filled soil porosity	unitless	0.13	Calculated
Pp	Soil particle density	kg/L	2.65	USEPA, 1998
nw	Water-filled soil p	unitless	0.30	USEPA, 1998
Pw	Density of water	kg/L	1.00	Constant
H	Henry's Law constant	unitless	See below	Montgomery, 1996
Csg		ug/L	See below	Calculated

Compounds	Koc	H	Ctaq	Kd	Csg
Trichloroethene	6.46E+01	3.73E-01	1.22E+00	1.29E-01	1.26E+00

TABLE 5-20a
Vapor Migration from Groundwater into Indoor Air
On-Site Building
Phase II Environmental Site Assessment
National City Terminal

Calculation of Effective Diffusion Coefficient

$Dsg = (na\ u3.33 / n\ u2) * Da$ $\quad De = (H * Dsg + Dsw)/(Pb * Kd + nw + na * H)$
$Dsw = (nw\ u3.33 / n\ u2) * Dl$

Parameter	Description	Units	Value	Reference
Da	Diffusion coefficient in air	cm^2/s	See below	Lyman et al, 1991
Dl	Diffusion coefficient in water	cm^2/s	See below	Lyman et al, 1991
Dsg	Diffusion coefficient in soil gas	cm^2/s	See below	Calculated
Dsw	Diffusion coefficient in soil water	cm^2/s	See below	Calculated
De	Effective diffusion coefficient	cm^2/s	See below	Calculated
n	Total soil porosity	unitless	0.43	Calculated
na	Air-filled soil porosity	unitless	0.13	Calculated
nw	Water-filled soil porosity	unitless	0.30	USEPA, 1998
H	Henry's Law constant	unitless	See below	Montgomery, 1996
Kd	Distribution coefficient	L/kg	See below	Calcuated
Pb	Dry soil bulk density	kg/L	1.5	USEPA, 1998

Compound	Da	Dl	Kd	H	Dsg	Dsw	De
Trichloroethene	2.30E-02	9.65E-06	1.29E-01	3.73E-01	1.51E-04	9.30E-07	1.06E-04

Calculation of Indoor Air Concentrations

$Q = De * Csg * A * CF1 * CF2 / L$ $\quad Cair = \frac{f * CF3 * CF4}{Vb * E}$
$Qf = Q * AF$

Parameter	Description	Units	Value	Reference
Q	Emission rate from soil gas	ug/s	See below	Calculated
De	Effective diffusion coefficient	cm^2/s	See below	Calculated
Csg	Soil gas concentration	ug/L	See below	Calculated
A	Area of building	m^2	185.80	Assumes 2000 ft2
L	Depth to contamination	m	3.05	Assumes 10 feet
CF1	Conversion factor, cm2 to m2	m^2/cm^2	0.0001	Constant
CF2	Conversion factor, L to m3	L/m^3	1000	Constant
Qf	Emission rate through foundation	ug/s	See below	Calculated
AF	Attenuation factor	unitless	0.01	PCA, 1979
Vb	Volume of building	m^3	566.32	Assumes 10 ft ceilings
E	Air exchange rate	1/hour	1	Prichard and Gessell, 1983
CF3	Conversion factor, s to hr	s/hour	3600	Constant
CF4	Conversion factor, ug to mg	mg/ug	1.00E-03	Constant
Ca	Indoor air concentration	mg/m^3	See below	Calculated

Compound	De	Csg	Q	Qf	Cair
Trichloroethene	1.06E-04	1.26E+00	8.08E-04	8.08E-06	5.14E-08

TABLE 5-21
Calculation of Risk from Exposure to Groundwater
Future On-Site Worker
Phase II Environmental Site Assessment
National City Terminal

$$DOSEIng = \frac{EPCw * IR * EF * ED * CF1}{BW * AT} \qquad RISK = DOSE * SF$$

$$DOSEd = \frac{EPCw * SSA * PC * ET * EF * ED * CF1 * CF2}{BW * AT} \qquad HI = \frac{DOSE}{RfD}$$

$$DOSEInh = \frac{EPCa * InhR * EF * ED}{BW * AT}$$

Parameter	Description	Units	Values	Reference
Dose	Dose of chemical	mg/kg-day	See below	Calculated
Risk	Carcinogenic Risk	unitless	See below	Calculated
HI	Hazard Index	unitless	See below	Calculated
EPCw	Groundwater concentration	ug/L	See below	Site concentration (see Table 5-14)
EPCa	Air concentration	mg/m^3	See below	Calculated
EF	Exposure frequency	days/year	250	USEPA, 1998
ED	Exposure duration	years	25	USEPA, 1998
ET	Exposure time	hours/day	8	USEPA, 1998
BW	Body weight	kg	70	USEPA, 1998
ATnc	Averaging time, noncarcinogens	days	9125	USEPA, 1998
ATc	Averaging time, carcinogens	days	25550	USEPA, 1998
SSA	Skin surface area	cm^2	2000	USEPA, 1998
PC	Permeability Constant	cm/hr	See below	USEPA, 1998
IRw	Water ingestion rate	L/day	0.1	USEPA, 1998
InhR	Inhalation rate	m^3/day	20	USEPA, 1998
CF1	Conversion factor	mg/ug	1.00E-03	Constant
CF2	Conversion factor	L/cm^3	1.00E-03	Constant
CSFo	Oral cancer slope factor	kg-day/mg	See below	CALEPA, 1996; USEPA, 1998
CSFi	Inhalation cancer slope factor	kg-day/mg	See below	CALEPA, 1996; USEPA, 1998
RfDo	Oral reference dose	mg/kg-day	See below	CALEPA, 1996; USEPA, 1998
RfDi	Inhalation reference dose	mg/kg-day	See below	CALEPA, 1996; USEPA, 1998

CARCINOGENS				DOSE			TOXICITY FACTOR		RISK			
Chemical	EPCw ug/L	EPCa (mg/m^3)	PC (cm/hr)	Ingestion	Inhalation	Dermal	SFing	SFinh	Ingestion	Inhalation	Dermal	Total
				(mg/kg-day)			$(mg/kg-day)^{-1}$					
Trichloroethene	3.76E+00	5.14E-08	1.60E-02	1.31E-06	3.59E-09	3.36E-06	1.50E-02	1.00E-02	1.97E-08	3.59E-11	5.05E-08	7.02E-08
											Total Cumulative Risk =	7.02E-08

note: see Table 5-21a for input calculations

TABLE 5-21a
Vapor Migration from Groundwater into Indoor Air
On-Site Building
Phase II Environmental Site Assessment
National City Terminal

Calculation of Total Aquifer Concentration (particles and water)

$Kdaq = Koc * focaq$
$Cpaq = Cwaq * Kdaq$

$Pfaq = Ppaq * (1 - naq) + (naq * Pw)$
$Ctaq = \frac{Cwaq * naq + Cpaq * Ppaq * (1 - naq)}{Pfaq}$

Parameter	Description	Units	Value	Reference
Koc	Organic carbon partition coefficient	L/kg	See below	Montgomery, 1996
focaq	Aquifer fraction organic carbon	unitless	0.002	USEPA, 1998
Kdaq	Aquifer distribution coefficient	L/kg	See below	Calculated
Cwaq	Chemical concentration in aquifer water	ug/L	See below	See Table 5-21
Cpaq	Chemical concentration sorbed to aquifer p	ug/kg	See below	Calculated
naq	Total porosity of aquifer materials	unitless	0.43	Calculated
Pfaq	Saturated density of aquifer	kg/L	See below	Calculated
Ppaq	Aquifer particle density	kg/L	2.65	USEPA, 1998
Pw	Density of water	kg/L	1	Constant
Ctaq	Total chemical concentration in aquifer (par	ug/kg	See below	Calculated

Compound	Koc	Kdaq	Cwaq	Cpaq	Pfaq	Ctaq
Trichloroethene	6.46E+01	1.29E-01	3.76E+00	4.86E-01	1.93E+00	1.22E+00

Calculation of Soil Gas Concentration

$nw = Pb * W / Pw$
$na = n - nw$
$Pb = Pp * (1-n)$
$Kd = Koc * foc$

$Csg = \frac{Ctaq * Pb}{na + (nw/H) + (Kd * Pb/H)}$

Parameter	Description	Units	Value	Reference
Ctaq	Total chemical concentration in aquifer (par	ug/kg	See below	Calculated
Kd	Distribution coefficient	L/kg	See below	Calcuated
Koc	Soil organic carbon partition coefficient	L/kg	See below	Montgomery, 1996
foc	Soil fraction organic carbon	unitless	0.002	USEPA, 1998
Pb	Dry soil bulk density	kg/L	1.50	USEPA, 1998
W	Soil moisture content	unitless	0.2	Fetter, 1980
n	Total soil porosity	unitless	0.43	Calculated
na	Air-filled soil porosity	unitless	0.13	Calculated
Pp	Soil particle density	kg/L	2.65	USEPA, 1998
nw	Water-filled soil p	unitless	0.30	USEPA, 1998
Pw	Density of water	kg/L	1.00	Constant
H	Henry's Law constant	unitless	See below	Montgomery, 1996
Csg		ug/L	See below	Calculated

Compounds	Koc	H	Ctaq	Kd	Csg
Trichloroethene	6.46E+01	3.73E-01	1.22E+00	1.29E-01	1.26E+00

TABLE 5-21a
Vapor Migration from Groundwater into Indoor Air
On-Site Building
Phase II Environmental Site Assessment
National City Terminal

Calculation of Effective Diffusion Coefficient

$Dsg = (na\ u3.33 / n\ u2) * Da$ $De = (H * Dsg + Dsw)/(Pb * Kd + nw + na * H)$
$Dsw = (nw\ u3.33 / n\ u2) * Dl$

Parameter	Description	Units	Value	Reference
Da	Diffusion coefficient in air	cm^2/s	See below	Lyman et al, 1991
Dl	Diffusion coefficient in water	cm^2/s	See below	Lyman et al, 1991
Dsg	Diffusion coefficient in soil gas	cm^2/s	See below	Calculated
Dsw	Diffusion coefficient in soil water	cm^2/s	See below	Calculated
De	Effective diffusion coefficient	cm^2/s	See below	Calculated
n	Total soil porosity	unitless	0.43	Calculated
na	Air-filled soil porosity	unitless	0.13	Calculated
nw	Water-filled soil porosity	unitless	0.30	USEPA, 1998
H	Henry's Law constant	unitless	See below	Montgomery, 1996
Kd	Distribution coefficient	L/kg	See below	Calcuated
Pb	Dry soil builk density	kg/L	1.5	USEPA, 1998

Compound	Da	Dl	Kd	H	Dsg	Dsw	De
Trichloroethene	2.30E-02	9.65E-06	1.29E-01	3.73E-01	1.51E-04	9.30E-07	1.06E-04

Calculation of Indoor Air Concentrations

$Q = De * Csg * A * CF1 * CF2 / L$ $Cair = \frac{f * CF3 * CF4}{Vb * E}$
$Qf = Q * AF$

Parameter	Description	Units	Value	Reference
Q	Emission rate from soil gas	ug/s	See below	Calculated
De	Effective diffusion coefficient	cm^2/s	See below	Calculated
Csg	Soil gas concentration	ug/L	See below	Calculated
A	Area of building	m^2	185.80	Assumes 2000 ft2
L	Depth to contamination	m	3.05	Assumes 10 feet
CF1	Conversion factor, cm2 to m2	m^2/cm^2	0.0001	Constant
CF2	Conversion factor, L to m3	L/m^3	1000	Constant
Qf	Emission rate through foundation	ug/s	See below	Calculated
AF	Attenuation factor	unitless	0.01	PCA, 1979
Vb	Volume of building	m^3	566.32	Assumes 10 ft ceilings
E	Air exchange rate	1/hour	1	Prichard and Gessell, 1983
CF3	Conversion factor, s to hr	s/hour	3600	Constant
CF4	Conversion factor, ug to mg	mg/ug	1.00E-03	Constant
Ca	Indoor air concentration	mg/m^3	See below	Calculated

Compound	De	Csg	Q	Qf	Cair
Trichloroethene	1.06E-04	1.26E+00	8.08E-04	8.08E-06	5.14E-08

Note: see Table 5-21a for input calculations
Note: Same data input and calculations as Table 5-20a

TABLE 5-22
Calculation of Risk from Exposure to Groundwater
Future On-Site Construction Worker
Phase II Environmental Site Assessment
South Bay Power Plant

$$DOSEing = \frac{EPCw * IR * EF * ED * CF1}{BW * AT} \qquad RISK = DOSE * SF$$

$$DOSEd = \frac{EPCw * SSA * PC * ET * EF * ED * CF1 * CF2}{BW * AT} \qquad HI = \frac{DOSE}{RfD}$$

$$DOSEinh = \frac{EPCa * InhR * EF * ED}{BW * AT}$$

Parameter	Description	Units	Values	Reference
Dose	Dose of chemical	mg/kg-day	See below	Calculated
Risk	Carcinogenic Risk	unitless	See below	Calculated
HI	Hazard Index	unitless	See below	Calculated
EPCw	Groundwater concentration	ug/L	See below	Site concentration (see Table 5-12)
EPCa	Air concentration	mg/m^3	See below	Calculated
EF	Exposure frequency	days/year	104	USEPA, 1998
ED	Exposure duration	years	1	USEPA, 1998
ET	Exposure time	hours/day	8	USEPA, 1998
BW	Body weight	kg	70	USEPA, 1998
ATnc	Averaging time, noncarcinogens	days	365	USEPA, 1998
ATc	Averaging time, carcinogens	days	25550	USEPA, 1998
SSA	Skin surface area	cm^2	2000	USEPA, 1998
PC	Permeability Constant	cm/hr	See below	USEPA, 1998
IRw	Water ingestion rate	L/day	0.1	USEPA, 1998
InhR	Inhalation rate	m^3/day	15	USEPA, 1998
CF1	Conversion factor	mg/ug	1.00E-03	Constant
CF2	Conversion factor	L/cm^3	1.00E-03	Constant
CSFo	Oral cancer slope factor	kg-day/mg	See below	CALEPA, 1996; USEPA, 1998
CSFi	Inhalation cancer slope factor	kg-day/mg	See below	CALEPA, 1996; USEPA, 1998
RfDo	Oral reference dose	mg/kg-day	See below	CALEPA, 1996; USEPA, 1998
RfDi	Inhalation reference dose	mg/kg-day	See below	CALEPA, 1996; USEPA, 1998

CARCINOGENS				DOSE			TOXICITY FACTOR		RISK			
Chemical	EPCw ug/L	EPCa (mg/m^3)	PC (cm/hr)	Ingestion	Inhalation (mg/kg-day)	Dermal	SFing	SFinh $(mg/kg-day)^{-1}$	Ingestion	Inhalation	Dermal	Total
Benzene	2.60E+01	1.31E-05	2.10E-02	1.51E-07	1.52E-08	5.08E-07	1.00E-01	1.00E-01	1.51E-08	1.52E-09	5.08E-08	6.74E-08
1,1-Dichloroethene	3.00E+00	1.38E-06	1.60E-02	1.74E-08	1.60E-09	4.47E-08	6.00E-01	1.80E-01	1.05E-08	2.88E-10	2.68E-08	3.75E-08
Trichloroethene	8.40E+00	3.38E-06	1.60E-02	4.88E-08	3.93E-09	1.25E-07	1.50E-02	1.00E-02	7.33E-10	3.93E-11	1.88E-09	2.65E-09
Chloroform	3.30E+00	1.38E-06	8.90E-03	1.92E-08	1.60E-09	2.73E-08	3.10E-02	1.90E-02	5.95E-10	3.04E-11	8.47E-10	1.47E-09
											Total Cumulative Risk =	1.09E-07

NON-CARCINOGENS				DOSE			REFERENCE DOSE		HAZARD QUOTIENT			
Chemical	EPC ug/L	EPCa (mg/m^3)	PC (cm/hr)	Ingestion	Inhalation (mg/kg-day)	Dermal	RfDing	RfDinh (mg/kg-day)	Ingestion	Inhalation	Dermal	Total
Thallium	5.79E+00	—	1.00E-03	2.36E-08	—	3.77E-07	7.00E-05	—	3.37E-02	—	5.39E-03	3.91E-02
											Total Hazard Index =	0.039

Note: see Table 5-22a for input calculations

TABLE 5-22a
Volatilization of Volatiles from Groundwater Into Ambient Air During On-Site Trenching Activities
Phase II Environmental Site Assessment
South Bay Power Plant

Step 1
Calculation Endpoints: LIQUID PHASE, GAS PHASE, AND OVERALL TRANSFER COEFFICIENTS

kl = 23.51 * (WS^0.969/Z^0.673) * Sqrt (32/MW)
kg = 1137.5 * (AS + WS) * Sqrt(18/MW)
1/KL = 1/kl + 1/(kg * H)

Parameter	Description	Units	Value	Reference
Z	Depth of water in excavation	m	0.1	Professional judgment
MW	Molecular weight of chemical	g/mol	See below	Montgomery, 1996
kl	Liquid phase transfer coefficient	cm/hr	See below	Calculated
AS	Air speed	m/s	2.25	USEPA, 1991
WS	Water speed	m/s	0.005	Professional judgment
H	Henry's Law coefficient	unitless	See below	Montgomery, 1996
kg	Gas phase transfer coefficient	cm/hr	See below	Calculated
KL	Overall transfer coefficient	cm/hr	See below	Calculated
Ca(average)	Average concentration in ambient air	mg/m3	See below	Calculated

Compound	MW	kl	H	kg	KL	Ca (average)
Benzene	78.11	4.18E-01	2.25E-01	1.23E+03	4.17E-01	1.31E-05
1,1-Dichloroethene	96.94	3.75E-01	6.15E-01	1.11E+03	3.75E-01	1.38E-06
Trichloroethene	131.39	3.22E-01	3.73E-01	9.49E+02	3.22E-01	3.38E-06
Chloroform	119.38	3.38E-01	1.39E-01	9.96E+02	3.37E-01	1.38E-06

Step 2
Calculation Endpoint: AVERAGE CONCENTRATION IN AIR DURING 4-HOUR EXPOSURE PERIOD

Cw(n) = Cw(i) * exp(-KL * n/(Z*C1))
Mw(n) = Cw(n) * Vw
Ma(n) = Mw(n-1) - Mw(n)

Vw = Aw * Z * C2
Va = LT * MH * AS * C3
Ca(n) = Ma(n) * C4/Va
Cs(a) = Sum[Ca(i-n)]/n

Parameter	Description	Units	Value	Reference
Ca	Average concentration in air during exposure	mg/m3	See below	Calculated
n	hours	hours	See below	Calculated
Cwi	Initial concentration in water	µg/L	See below	See Table 3-12
Cw(n)	Mass in air during n hour	µg/L	See below	Calculated
Mwi	Initial mass in water	µg	See below	Calculated
Mw(n)	Mass in water after n hours	ug	See below	Calculated
Cai	Initial Concentration in air	mg/m3	See below	Calculated
Ca(n)	Concentration in air during n hour	mg/m3	See below	Calculated
Mai	Initial mass in air	µg	See below	Calculated
Ma(n)	mass in air	µg	See below	Calculated
Aw	Area of water in excavation	m2	25	Assumed 5m x 5m
Vw	Volume of water in trench	L	2500	Calculated
LT	Length of excavation perpendicular to wind	m	5	Assume side of excavation
MH	Mixing height	m	2	breathing zone height
Va	Volume flux of air in box	m3/hr	176400	Calculated
C1	Conversion factor, m to cm	cm/m	100	Constant
C2	Conversion factor, m3 to L	L/m3	1000	Constant
C3	Conversion factor, s to hour	s/hour	3600	Constant
C4	Conversion factor, ug to mg	mg/ug	1.00E-03	Constant

TABLE 5-22a
Volatilization of Volatiles from Groundwater into Ambient Air During On-Site Trenching Activities
Phase II Environmental Site Assessment
South Bay Power Plant

Cw(n) = Cw(i) * exp(-KL *	Cwi	Cw(1)	Cw(2)	Cw(3)	Cw(4)	Cw(5)	Cw(4)	Cw(4)	Cw(8)
hours (n)		1	2	3	4	5	6	7	8
Benzene	26.00	2.49E+01	2.39E+01	2.29E+01	2.20E+01	2.11E+01	2.02E+01	1.94E+01	1.86E+01
1,1-Dichloroethene	3.00	2.89E+00	2.78E+00	2.68E+00	2.58E+00	2.49E+00	2.40E+00	2.31E+00	2.22E+00
Trichloroethene	8.40	8.13E+00	7.88E+00	7.63E+00	7.39E+00	7.15E+00	6.93E+00	6.71E+00	6.49E+00
Chloroform	3.30	3.19E+00	3.08E+00	2.98E+00	2.88E+00	2.79E+00	2.70E+00	2.61E+00	2.52E+00
Mw(n) = Cw(n) * Vw	**Initial**	**hour 1**	**hour 2**	**hour 3**	**hour 4**	**hour 5**	**hour 6**	**hour 7**	**hour 8**
Benzene	6.50E+04	6.23E+04	5.98E+04	5.74E+04	5.50E+04	5.28E+04	5.06E+04	4.85E+04	4.66E+04
1,1-Dichloroethene	7.50E+03	7.22E+03	6.96E+03	6.70E+03	6.46E+03	6.22E+03	5.99E+03	5.77E+03	5.56E+03
Trichloroethene	2.10E+04	2.03E+04	1.97E+04	1.91E+04	1.85E+04	1.79E+04	1.73E+04	1.68E+04	1.62E+04
Chloroform	8.25E+03	7.98E+03	7.71E+03	7.46E+03	7.21E+03	6.97E+03	6.74E+03	6.52E+03	6.30E+03
Ma(n) = Mw(n-1) - Mw(n)	**Initial**	**hour 1**	**hour 2**	**hour 3**	**hour 4**	**hour 5**	**hour 6**	**hour 7**	**hour 8**
Benzene		2.65E+03	2.55E+03	2.44E+03	2.34E+03	2.25E+03	2.16E+03	2.07E+03	1.98E+03
1,1-Dichloroethene		2.76E+02	2.66E+02	2.56E+02	2.46E+02	2.37E+02	2.29E+02	2.20E+02	2.12E+02
Trichloroethene		6.65E+02	6.44E+02	6.23E+02	6.04E+02	5.85E+02	5.66E+02	5.48E+02	5.31E+02
Chloroform		2.73E+02	2.64E+02	2.56E+02	2.47E+02	2.39E+02	2.31E+02	2.23E+02	2.16E+02
Ca(n) = Ma(n)/Va		**hour 1**	**hour 2**	**hour 3**	**hour 4**	**hour 5**	**hour 6**	**hour 7**	**hour 8**
Benzene		1.50E-05	1.44E-05	1.38E-05	1.33E-05	1.27E-05	1.22E-05	1.17E-05	1.12E-05
1,1-Dichloroethene		1.56E-06	1.51E-06	1.45E-06	1.40E-06	1.35E-06	1.30E-06	1.25E-06	1.20E-06
Trichloroethene		3.77E-06	3.65E-06	3.53E-06	3.42E-06	3.31E-06	3.21E-06	3.11E-06	3.01E-06
Chloroform		1.55E-06	1.50E-06	1.45E-06	1.40E-06	1.35E-06	1.31E-06	1.27E-06	1.22E-06

TABLE 5-23
Calculation of Risk from Exposure to Groundwater
Future On-Site Construction Worker
Phase II Environmental Site Assessment
National City Terminal

$$DOSEIng = \frac{EPCw * IR * EF * ED * CF1}{BW * AT}$$

$$DOSEd = \frac{EPCw * SSA * PC * ET * EF * ED * CF1 * CF2}{BW * AT}$$

$$DOSEinh = \frac{EPCa * InhR * EF * ED}{BW * AT}$$

$$RISK = DOSE * SF$$

$$HI = \frac{DOSE}{RfD}$$

Parameter	Description	Units	Values	Reference
Dose	Dose of chemical	mg/kg-day	See below	Calculated
Risk	Carcinogenic Risk	unitless	See below	Calculated
HI	Hazard Index	unitless	See below	Calculated
EPCw	Groundwater concentration	ug/L	See below	Site concentration (see Table 5-14)
EPCa	Air concentration	mg/m^3	See below	Calculated
EF	Exposure frequency	days/year	104	USEPA, 1998
ED	Exposure duration	years	1	USEPA, 1998
ET	Exposure time	hours/day	8	USEPA, 1998
BW	Body weight	kg	70	USEPA, 1998
ATnc	Averaging time, noncarcinogens	days	365	USEPA, 1998
ATc	Averaging time, carcinogens	days	25550	USEPA, 1998
SSA	Skin surface area	cm^2	2000	USEPA, 1998
PC	Permeability Constant	cm/hr	See below	USEPA, 1998
IRw	Water ingestion rate	L/day	0.1	USEPA, 1998
InhR	Inhalation rate	m^3/day	20	USEPA, 1998
CF1	Conversion factor	mg/ug	1.00E-03	Constant
CF2	Conversion factor	L/cm^3	1.00E-03	Constant
CSFo	Oral cancer slope factor	kg-day/mg	See below	CALEPA, 1996; USEPA, 1998
CSFi	Inhalation cancer slope factor	kg-day/mg	See below	CALEPA, 1996; USEPA, 1998
RfDo	Oral reference dose	mg/kg-day	See below	CALEPA, 1996; USEPA, 1998
RfDi	Inhalation reference dose	mg/kg-day	See below	CALEPA, 1996; USEPA, 1998

CARCINOGENS				DOSE			TOXICITY FACTOR		RISK			
Chemical	EPCw ug/L	EPCa (mg/m^3)	PC (cm/hr)	Ingestion	Inhalation (mg/kg-day)	Dermal	SFing	SFinh $(mg/kg-day)^{-1}$	Ingestion	Inhalation	Dermal	Total
Trichloroethene	3.76E+00	1.51E-06	1.60E-02	2.19E-08	1.76E-09	5.60E-08	1.50E-02	1.00E-02	3.28E-10	1.76E-11	8.40E-10	1.18E-09
											Total Cumulative Risk =	1.18E-09

Note: see Table 5-23a for input calculations

TABLE 5-23a
Volatilization of Volatiles from Groundwater into Ambient Air During On-site Trenching Activities
Phase II Environmental Site Assessment
National City Terminal

Step 1
Calculation Endpoints: LIQUID PHASE, GAS PHASE, AND OVERALL TRANSFER COEFFICIENTS

kl = 23.51 * (WS^0.969/Z^0.673) * Sqrt (32/MW)
kg = 1137.5 * (AS + WS) * Sqrt(18/MW)
1/KL = 1/kl + 1/(kg * H)

Parameter	Description	Units	Value	Reference
Z	Depth of water in excavation	m	0.1	Professional judgment
MW	Molecular weight of chemical	g/mol	See below	Montgomery, 1996
kl	Liquid phase transfer coefficient	cm/hr	See below	Calculated
AS	Air speed	m/s	2.25	USEPA, 1991
WS	Water speed	m/s	0.005	Professional judgment
H	Henry's Law coefficient	unitless	See below	Montgomery, 1996
kg	Gas phase transfer coefficient	cm/hr	See below	Calculated
KL	Overall transfer coefficient	cm/hr	See below	Calculated
Ca(average)	Average concentration in ambient air	mg/m3	See below	Calculated

Compound	MW	kl	H	kg	KL	Ca (average)
Trichloroethene	131.39	3.22E-01	3.73E-01	9.49E+02	3.22E-01	1.51E-06

Step 2
Calculation Endpoint: AVERAGE CONCENTRATION IN AIR DURING 4-HOUR EXPOSURE PERIOD

Cw(n) = Cw(i) * exp(-KL * n/(Z*C1))
Mw(n) = Cw(n) * Vw
Ma(n) = Mw(n-1) - Mw(n)

Vw = Aw * Z * C2
Va = LT * MH * AS * C3
Ca(n) = Ma(n) * C4/Va
Cs(a) = Sum[Ca(l-n)]/n

Parameter	Description	Units	Value	Reference
Ca	Average concentration in air during exposure	mg/m3	See below	Calculated
n	hours	hours	See below	Calculated
Cwi	Initial concentration in water	µg/L	See below	See Table 5-14
Cw(n)	Mass in air during n hour	µg/L	See below	Calculated
Mwi	Initial mass in water	µg	See below	Calculated
Mw(n)	Mass in water after n hours	ug	See below	Calculated
Cai	Initial Concentration in air	mg/m3	See below	Calculated
Ca(n)	Concentration in air during n hour	mg/m3	See below	Calculated
Mai	Initial mass in air	µg	See below	Calculated
Ma(n)	mass in air	µg	See below	Calculated
Aw	Area of water in excavation	m2	25	Assumed 5m x 5m
Vw	Volume of water in trench	L	2500	Calculated
LT	Length of excavation perpendicular to wind	m	5	Assume side of excavation
MH	Mixing height	m	2	breathing zone height
Va	Volume flux of air in box	m3/hr	176400	Calculated
C1	Conversion factor, m to cm	cm/m	100	Constant
C2	Conversion factor, m3 to L	L/m3	1000	Constant
C3	Conversion factor, s to hour	s/hour	3600	Constant
C4	Conversion factor, ug to mg	mg/ug	1.00E-03	Constant

Cw(n) = Cw(i) * exp(-KL *	Cwi	Cw(1)	Cw(2)	Cw(3)	Cw(4)	Cw(5)	Cw(4)	Cw(4)	Cw(8)
hours (n)		1	2	3	4	5	6	7	8
Trichloroethene	3.76	3.64E+00	3.53E+00	3.41E+00	3.31E+00	3.20E+00	3.10E+00	3.00E+00	2.91E+00
Mw(n) = Cw(n) * Vw	**initial**	**hour 1**	**hour 2**	**hour 3**	**hour 4**	**hour 5**	**hour 6**	**hour 7**	**hour 8**
Trichloroethene	9.40E+03	9.10E+03	8.81E+03	8.54E+03	8.26E+03	8.00E+03	7.75E+03	7.50E+03	7.27E+03
Ma(n) = Mw(n-1) - Mw(n)	**initial**	**hour 1**	**hour 2**	**hour 3**	**hour 4**	**hour 5**	**hour 6**	**hour 7**	**hour 8**
Trichloroethene		2.98E+02	2.88E+02	2.79E+02	2.70E+02	2.62E+02	2.53E+02	2.45E+02	2.38E+02
Ca(n) = Ma(n)/Va		**hour 1**	**hour 2**	**hour 3**	**hour 4**	**hour 5**	**hour 6**	**hour 7**	**hour 8**
Trichloroethene		1.69E-06	1.63E-06	1.58E-06	1.53E-06	1.48E-06	1.44E-06	1.39E-06	1.35E-06

TABLE 5-24
Summary of Results of Human Health Risk Characterization
Phase II Environmental Site Assessment
South Bay Power Plant

	Soil					Groundwater (South Bay)	Groundwater (NCT)
	Area A	Area B	Area C	Area D	NCT		
Current Land Use							
Current On-Site Worker							
Risk	1.77E-06	NFE	NFE	NFE	NFE	2.30E-09	3.59E-11
Hazard Index	NFE	NFE	NFE	NFE	NFE	0.00E+00	NFE
Current Construction Worker							
Risk	4.80E-06	NFE	NFE	NFE	NFE	1.25E-07	1.18E-09
Hazard Index	NFE	NFE	NFE	NFE	NFE	3.91E-02	NFE
Future Land Use							
Future On-Site Worker							
Risk	1.68E-06	NFE	NFE	NFE	NFE	6.45E-06	7.02E-08
Hazard Index	NFE	NFE	NFE	NFE	NFE	9.39E-02	NFE
Future Construction Worker							
Risk	4.80E-06	NFE	NFE	NFE	NFE	1.09E-07	1.18E-09
Hazard Index	NFE	NFE	NFE	NFE	NFE	3.91E-02	NFE
Future Site Visitor/Trespasser (not evaluated because on-site worker risk is acceptable)							

NFE = No Further Evaluation

TABLE 6-1
SUMMARY OF POTENTIAL ENVIRONMENTAL CONDITIONS IDENTIFIED DURING PHASE I INVESTIGATIONS
SOUTH BAY POWER PLANT AND NATIONAL CITY TERMINAL

Potential Environmental Conditions	Phase II Action	Phase II Results	Recommendations
Area Number 1a: North Tank Farm			
▪ Potential unidentified releases of hydrocarbons from four ASTs, pipelines, and the pump deck. ▪ Releases at the pump pit and berm pond. ▪ Releases at the displacement oil AST and heat exchanger. ▪ Potential impact to soil or groundwater from the use of corrosion inhibiting oils in the construction of ASTs.	Sampled soil and groundwater for fuel hydrocarbons and metals.	▪ No TEH concentration over 1,000 mg/kg. ▪ Metals at background levels.	▪ No area identified requiring remediation. ▪ Areas under tanks remain a potential environmental condition.
Area Number 1b: South Tank Farm			
▪ Releases of No. 6 fuel oil from ASTs 1, 2, and 3. ▪ Potential unidentified releases of hydrocarbons from pipelines and the pump deck ▪ Potential impact to soil or groundwater from the use of corrosion inhibiting oils in the construction of ASTs.	Sampled soil and groundwater for fuel hydrocarbons and metals.	▪ No TEH concentrations over 1,000 mg/kg. ▪ Metals at background levels.	▪ No area identified requiring remediation. ▪ Areas under tanks remain a potential environmental condition.
Area Number 1c: Jet Fuel Area			
▪ Potential unidentified releases of hydrocarbons from the AST, pipelines, and the pump deck. ▪ Potential impact to soil or groundwater from the use of corrosion inhibiting oils in the construction of ASTs.	Sampled soil and groundwater for fuel hydrocarbons and metals.	▪ Free-phase hydrocarbon on groundwater. ▪ Hydrocarbon concentrations over 1,000 mg/kg.	▪ Hydrocarbon remediation required. ▪ Remediation will overlap with first generation surface impoundments area.
Area Number 1d: UST Area			
▪ Release of diesel and gasoline from USTs, pipelines, and pumps.	Sampled groundwater from existing wells for fuel hydrocarbons and metals.	▪ Benzene detected in groundwater above RWQCB level.	▪ Remediation required under RWQCB guidelines.

TABLE 6-1
SUMMARY OF POTENTIAL ENVIRONMENTAL CONDITIONS IDENTIFIED DURING PHASE I INVESTIGATIONS
SOUTH BAY POWER PLANT AND NATIONAL CITY TERMINAL

Potential Environmental Conditions	Phase II Action	Phase II Results	Recommendations
Area Number 2a: Process Water Treatment Area			
▪ Potential unidentified losses of treatment water, containing hydrocarbons and metals from ASTs and pipelines.	Sampled soil and groundwater for hydrocarbons and metals.	▪ No contaminant concentrations of concern.	▪ Area under the treatment area remains a potential environmental condition.
Area Number 2b: Former Surface Impoundments			
▪ Metals remaining in soil in First Generation Surface Impoundment Area.	No additional sampling required.	▪ ***First Generation Ponds:*** Metal contamination in soil overlapping with hydrocarbon contamination of Area 1c. ▪ ***Second Generation Ponds:*** No new contamination detected.	▪ First generation surface impoundments will require remediation, based on hydrocarbon concentration over 1,000 mg/kg and potential metal leaching into groundwater. ▪ No potential environmental condition remains for the second generation impoundments.
Area Number 3a: Power Plant and Immediate Vicinity			
▪ Potential release of PCB-containing oil. ▪ Potential hydrocarbon releases from pipelines between the ASTs and the power plant. ▪ Releases from wastewater transfer sump of wastewater potentially bearing oil, metals, and volatile organic compounds. ▪ Potential releases during handling of `sodium dichromate.	Sampled soil and groundwater for fuel hydrocarbons, metals, VOCs, and PCBs.	▪ No contaminant concentrations of concern in soil or groundwater, except for previously recognized hydrocarbons in East Loop fuel release area.	▪ Soil remediation required in area of former East Loop fuel release. ▪ Investigation around the power plant indicated no potential environmental condition. ▪ The area under the power plant remains a potential environmental condition.
Area Number 3b: Maintenance Area			
▪ Potential releases of wastewater or routine cleaning liquids used during maintenance and painting operations. ▪ Potential releases of volatile organic compounds and metals.	Sampled soil and groundwater for fuel hydrocarbons, metals, and VOCs.	▪ No contaminant concentration of concern.	▪ Inaccessible areas remain potential environmental conditions.

TABLE 6-1
SUMMARY OF POTENTIAL ENVIRONMENTAL CONDITIONS IDENTIFIED DURING PHASE I INVESTIGATIONS
SOUTH BAY POWER PLANT AND NATIONAL CITY TERMINAL

Potential Environmental Conditions	Phase II Action	Phase II Results	Recommendations
Area Number 3c: Gas Turbine			
▪ Potential releases of hydrocarbons from pipelines and AST within the Gas Turbine compound.	Sampled soil for fuel hydrocarbons and metals.	▪ TEH concentration under 1000 mg/kg	▪ Area under the GT remains a potential environmental condition.
Area Number 4a: Former Drum			
▪ Area previously investigated and closed.	Sampled soil in and near this area for SVOCs.	▪ No contaminant concentration of concern.	▪ No potential environmental condition.
Area Number 4b: Construction Yard			
▪ Potential impact of metals to soils due to abrasive blasting.	Sampled soil sampling for metals.	▪ No metal concentration of concern.	▪ No potential environmental condition.
Area Number 4c: Hazardous Materials Storage Area			
▪ Potential releases of hazardous wastes within storage area. ▪ Potential impact of metals to soils due to abrasive blasting.	Sampled soil for metals, fuel hydrocarbons, VOCs.	▪ No contaminant concentration of concern.	▪ No potential environmental condition.
Area Number 5a: Open Area			
▪ Potential unidentified releases of hydrocarbons from the truck unloading station for Tank No. 7 (near AST area). ▪ Potential impact of metals to soils due to abrasive blasting. ▪ Potential presence in soils of semi-volatile compounds from coal tar used to coat the traveling screens. ▪ Potential releases of contaminants due to unidentified or uncontrolled dumping within the open areas.	Sampled shallow soil for fuel hydrocarbons, metals, PCBs. Sampled groundwater in grid pattern and at edge of site for metals, fuel hydrocarbons, and VOCs.	▪ One area of TCE and DCE contamination in groundwater. ▪ No metals, PCBs, TEH, or PAHs concentrations of concern.	▪ Source of TCE to be investigated and TCE in soil and groundwater to be remediated.
Area Number 5b: Switchyard Border			
▪ Potential unidentified releases of PCBs and other contaminants from the switchyard onto the site.	Sampled soil and groundwater for PCBs and hydrocarbons around edge of switchyard.	▪ No PCBs or petroleum hydrocarbons found in soil or groundwater.	▪ No potential environmental condition.

TABLE 6-1
SUMMARY OF POTENTIAL ENVIRONMENTAL CONDITIONS IDENTIFIED DURING PHASE I INVESTIGATIONS
SOUTH BAY POWER PLANT AND NATIONAL CITY TERMINAL

Potential Environmental Conditions	Phase II Action	Phase II Results	Recommendations
Area Number5c: Septic/Leach Field			
▪ Impact to groundwater and soil from potential introduction of hydrocarbons, metals, and other contaminants into the septic system.	Sampled soil and groundwater for fuel hydrocarbons, VOCs and metals.	▪ No contaminant concentration of concern.	▪ No potential environmental condition.
Area Number 6: National City Terminal			
▪ Release of No. 6 fuel oil from Tank 1. ▪ Release of diesel from pipeline. ▪ Potential unidentified releases of hydrocarbons from ASTs, pipelines, and pumps. ▪ Potential unidentified release of PCBs	Sampled soil and groundwater for fuel hydrocarbons, metals and PCBs.	▪ Areas of shallow soil with hydrocarbons over 100 mg/kg. ▪ Groundwater TEH found at up to 2.5 mg/L, but no BTEX or PAH dissolved concentrations of concern. ▪ TCE concentration in one groundwater sample found at below MCL.	▪ Remediation of all hydrocarbons in soil over 100 mg/kg will be required. ▪ No groundwater remediation required.
Off-site Areas			
▪ Potential release of hydrocarbons from former LNG5 plant and migration onto SBPP property. ▪ Unidentified releases from automobile junkyard located on adjacent property.	Sampled groundwater along common SBPP perimeter for fuel hydrocarbons, metals, VOCs.	▪ Groundwater at eastern and southern edge of site does not contain contaminant concentrations of concern. ▪ Present data indicate that source of TCE in Area 5a is not an off-site source east of SBPP.	▪ No potential environmental condition.

Environmental Assessment Report
for the
Port of San Diego Former Liquefied Natural Gas Facility

Bay Boulevard
Chula Vista, San Diego County, California

Prepared for:

Duke Energy℠

DUKE ENERGY SOUTH BAY, LLC

Prepared by:

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A Duke Energy Company

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August 8, 2001

Duke Engineering & Services
A Duke Energy Company

To the best of my knowledge, the data contained herein are true and accurate and satisfy the scope of work prescribed by the client for this project. The recommendations, data, and professional opinions appear to have been prepared in accordance with generally accepted professional engineering and geologic practices. I make no other warranty, either expressed or implied.

Michael Wade
Project Manager
Registered Geologist #5267

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1.0 INTRODUCTION

Duke Engineering & Services (DE&S) was contracted by Duke Energy North America to plan and conduct a Phase II Environmental Investigation of the Liquefied Natural Gas (LNG) site. This site is a 33-acre property bordering the south side of the Duke Energy LLC South Bay Power Plant site. This facility was formerly used to store and process liquefied natural gas (LNG). The South Bay Power Plant is an electric power generating station located at 990 Bay Boulevard in Chula Vista, California (refer to Figure 1). The LNG site is located adjacent to a salt mining operation along the southeastern edge of San Diego Bay, which is part of the South San Diego Bay National Wildlife Refuge. A 1998 high-resolution aerial-orthophotograph of the LNG site, including spatial coordinates and topographic contours, was obtained from the City of Chula Vista for use as the project base map. The photo of the LNG Site and the surrounding power plant grounds is presented in Figure 2.

As outlined in the DE&S Sampling and Analysis Plan (SAP), soil and groundwater characterization were to be conducted in up to two stages, depending on the need as determined from findings of the initial investigation. This report describes the results of the first stage of this Phase II investigation, which provides broad-based chemical and physical screening of potentially contaminated areas and identifies potential contaminants of concern in these areas.

why?

At the onset of the fieldwork for this Phase II investigation, a biological assessment of the site was also performed by DE&S. The findings of the ecological assessment are presented in Appendix A as a stand-alone report. No attempt is made throughout the body of this report to summarize the ecological assessment findings.

2.0 STAGE 1-HISTORICAL RESEARCH AND FIELD ACTIVITIES

Initial research consisted of review of previous reports, drawings, historical aerial photos and chemicals associated with liquefied natural gas operations. Also, facility personnel who might have had knowledge of historical operations were interviewed. Prior to conducting field operations, a site-wide walk-through was conducted to examine all notable features (e.g., unusual mounds, depressions, concrete foundations, sumps, pipes, etc).

2.1 METHODS

Historical research was conducted as part of this Phase II investigation. Former site employees were interviewed, and a literature search of the history of the

South Bay LNG site was performed. Some of the items referenced below were conducted prior to mobilizing to the field while others were conducted in conjunction with site assessment field activities. Information obtained from the historical research was used to augment and refine the site-specific workplan and the sampling strategy as presented in this report.

2.2 RESULTS AND OBSERVATIONS

San Diego Gas and Electric (SDG&E) purchased the subject property in approximately 1950 and built the first LNG storage facilities on the subject property in 1964. The land occupied by the LNG Site was apparently undeveloped prior to construction of the LNG facility. Therefore, no historical activity is expected to have left the site contaminated prior to development. An early aerial photo (October 26, 1966) of the region, including the original LNG facility, was obtained from the U.S. Geological Survey and is shown in Figure 3. Noteworthy features visible on the photo include:

- Most of the 33-acres appears to have been relatively undisturbed and shows little to no evidence of past industrial activities;
- As originally configured, there was only one large spherical LNG tank and an adjacent smaller spherical tank, ringed by an east-west trending oval containment berm;
- The northwest corner of the site, most recently occupied by the cooling tower, was the site of a storage yard, apparently associated with a warehouse and/or maintenance shop facility immediately to the north of the LNG site. Those discernable objects in the storage yard appear to be about 3 to 10 feet across and of varied shapes. While the possibility that these objects could be electrical transformers is not ruled out, their general appearance and the layout of the area suggests something other than utility operations.
- A second storage area is apparent to the south-southeast of the LNG tank and is surrounded by an unpaved road or vehicle pathway. The identity of the material in this location cannot be discerned except that the objects are well defined (e.g., piping and equipment rather than loose materials such as soil or rubble). Remnants of this unpaved road are still visible in the 1998 aerial photo, located to the east of the LNG perimeter berm;
- At the southwest corner of the LNG site, an unpaved road leads to an area that appears to be used for disposal of debris, soil, or rubble;
- The southern boundary of the site is adjacent to surface impoundments possibly associated with the nearby salt operations. By 1998, this neighboring property is occupied by a commercial building and parking lot.

The LNG facility was in operation until approximately 1985 and was demolished by 1989. The site is currently owned by the Port of San Diego and is vacant with the exception of numerous foundations from former buildings and LNG above-ground storage tanks (refer to Figure 4). A containment berm encompasses

approximately 11 of the 33 acres of the LNG site. Based on interviews and the findings of the DE&S field geologist, the berm is mostly comprised of dredge spoil. Soil sampling was performed to ascertain if contamination was present in the dredge material.

Previous reports regarding this site contained only general environmental information. In 1994, Converse Consultants West conducted a minimal Phase I preliminary site assessment for this site. This was followed by an environmental due diligence performed by Earth Tech Inc. in 1998 which summarized the earlier Phase I findings. Due to the lack of sampling, there was little quantitative information about the presence or absence of contamination at the LNG site. The main findings of the Phase I preliminary site assessment are:

- no obvious areas of soil staining were noted during site reconnaissance
- the presence of environmental concerns were not indicated based on review of available public records, and
- there is a possibility of contamination related to historic onsite activities based on site interviews (cooling tower operation and maintenance, a documented historic spill of natural gas odorant (mercaptans), waste liquefaction byproducts, maintenance and repair wastes)

These initial research efforts provided some useful insights for this Phase II investigation and are presented as follows:

- The aerial photograph from 1998 which was used as the project base map indicates no anomalies, disturbed areas, abandoned equipment, pipelines, depressions or mounds, debris, or anomalous vegetation, other than what would be associated with the LNG operation. The LNG operation was focused primarily on the northern part of the site.
- Few noteworthy features of potential environmental concern were evident in the 1966 aerial photo of the site (as discussed above and noted on Figure 3).
- Based on the apparent distribution of facilities and operations on the site, this investigation focused sampling in the area of the former LNG storage tanks and the operations complex immediately to the north.
- The southern part of the site was included in the sampling and was also surveyed with a terrain conductivity instrument for possible salinity and magnetic anomalies (e.g. buried pipes or drums) to rule out the possibility of any unidentified contamination.

Based on the available information, the chemicals typically associated with LNG operations that were considered in performing this investigation include:

- Light hydrocarbons (condensate)
- Lube oil

- Fuels hydrocarbons (e.g., diesel or gasoline)
- Polychlorinated Biphenyls (PCBs)
- Chromium (Cr)
- Mercury (Hg)
- Mercaptans
- Herbicides, and
- Chlorinated hydrocarbons (CHCs)

The County of San Diego Department of Environmental Health, Site Assessment and Mitigation Section was also consulted in the selection of analytical parameters and methods. Methods of analysis and findings are presented in the following sections of this report.

3.0 ELECTROMAGNETIC SURVEY

As part of this Phase II investigation, an electromagnetic (EM) survey was performed. The objective of this activity was to identify any subsurface features, such as tanks and piping, that may have been associated with subsurface contamination or might otherwise present a potential environmental liability.

3.1 FIELD ACTIVITIES

An EM survey was performed on November 16 and 17, 2000. Using survey flags, a fiberglass tape, and/or a global positioning system (GPS) recorder, survey lines were laid out and EM measurements were obtained at regularly spaced intervals using a Geonic's EM31. All field activity photographs, including those for the EM survey, are included in Appendix B. Functional checks and calibrations were performed each day before the geophysical equipment was used.

The EM31 was consistently operated waist high in the vertical dipole mode allowing the upper 15 feet of the subsurface to be measured. Readings from the instrument's in-phase component and its quadrature phase component were recorded at each station location. The inphase component measures the ratio of the induced secondary magnetic field to the primary magnetic field in parts per thousand (ppt) and is significantly more sensitive to large metallic objects such as buried tanks. The quadrature phase (quad-phase) component measures the apparent ground conductivity in millisiemens per meter (mS/m) and is more sensitive to long extended targets that are in adequate electrical contact with the ground, such as a pipeline. The geophysical data were downloaded from a Geonic's polycorder to a mobile computer.

3.2 RESULTS AND OBSERVATIONS

EM readings were taken along the grid presented in Figure 5. EM location coordinates were recorded using a Trimble™ Pathfinder Pro XRF GPS accurate to within one meter. The transmitter and receiver coils of the EM31 were kept parallel to the orientation of the survey line. The EM31 was consistently operated in both the quadrature mode and the inphase mode as readings were obtained typically every 50 feet along a total of 32 survey lines.

Due to the lack of anomalous readings in areas not possessing concrete tank pads and foundations, it was determined that quad-phase and inphase isocontour maps were not necessary. The data generated by the EM survey is presented in Appendix C and the EM anomalies are depicted by Figure 6. All EM anomalies at the site were located in the northern part of the site (i.e., from the LNG tank pads to the northern boundary of the site). The vast majority of the EM anomalies are easily explained by observable surface features, including steel-reinforced concrete tank pads, building foundations, and piping-support structures. Other observable surface features that caused EM anomalies included a metal staircase (used to ascend to the top of the berm) and partially exposed subsurface pipe/conduits, that extended close to or through the north end of the berm. On a precautionary note, all of the above-noted surface features produce electromagnetic fields capable of masking subsurface objects located in their immediate vicinity. This means that tanks or piping cannot be discerned using these kinds of EM survey techniques when they are underneath a steel-reinforced concrete structure.

Three EM anomalies (A-1, A-2, and A-3) were noted north of the northeast LNG tank pad (refer to Figure 6) that were, perhaps, not explainable by observable surface features. A discussion of these anomalies follows:

- Anomaly A-1 cannot, with certainty, be explained by the nearby concrete structures. This EM anomaly may be due to a possible disturbance of the subsurface soil or the possible presence of one or more subsurface metallic objects.
- Anomaly A-2 is also in the vicinity of small, nearby concrete structures, yet the distribution and magnitude of the associated EM readings suggest the presence of one or more subsurface metallic objects. This anomaly appears to have a north to south orientation that possibly suggests buried piping.
- Anomaly A-3 is located in, or possibly beneath, the berm at the location depicted by Figure 6. This anomaly appears to be at least partially due to piping/conduit that intersects the berm material from the area immediately to the north. The orientation of this anomaly suggests that there may be multiple segments of piping/conduit or other metallic objects within the berm material at this location.

3.3 CONCLUSIONS AND RECOMMENDATIONS

The lack of many anomalous readings in the LNG site suggests that there is probably little environmental threat from buried metallic objects. There may be a few buried metallic objects in the subsurface at the north edge of the berm and northward in the northeast part of the site. It is unlikely that these potential objects pose an environmental threat to the site based on the lack of contamination found during this investigation, however, excavation at these areas is recommended if site clearing is ever performed to remove the concrete structures at the site. No further geophysical surveys are recommended at this time. A follow up geophysical survey could be performed during or after possible site clearing operations if excavation and demolition indicate additional environmental concerns.

4.0 SOIL INVESTIGATION

As part of this Phase II investigation, 34 soil samples were collected from 31 locations. The objective of this activity was to obtain enough analytical data and field data to determine if impacted soil is present and, if so, to ascertain the nature and the extent of contamination.

4.1 FIELD ACTIVITIES

Gregg Drilling & Testing, Inc. (Gregg Drilling) performed cone penetrometer testing (CPT) coupled with ultraviolet induced fluorescence (UVIF) on November 14 and 15, 2000. The CPT operations provided information on stratigraphy by measuring tip resistance, sleeve friction, and pore water pressure while the UVIF field screening provided information on the presence or absence of hydrocarbons. Direct-push soil cores were collected using six-inch long stainless steel sample cores. All soil cores were visually described, field screened for volatile aromatic hydrocarbons using a photo-ionization detector (PID), and sampled for laboratory analysis. Photographs of CPT drilling and soil sampling operations are provided in Appendix B. Copies of the CPT and boring logs are included in Appendices D and E. Upon completion of drilling and sampling activities, all borings were grouted with a cement/bentonite slurry using tremie pipe. Other shallow soil samples were collected manually using stainless steel hand trowels. Soil samples were collected near the top of the ground surface when no evidence of contamination was detected with UVIF screening, PID field screening, and visual and olfactory screening. Figure 7 presents all soil sample locations.

The distribution of samples included coverage of the entire LNG site, but with locations biased toward operational areas and specific unit locations where contamination, if present, would be more likely (e.g., spill locations, tank and building foundations, and the cooling tower). These locations were chosen to address the majority of the site while focusing on specific areas warranting more investigation due to process knowledge. Even at locations where groundwater characterization was the primary objective, soil samples were also collected.

A typical total depth of 10 feet below ground surface (bgs) was sufficient for boreholes intended for soil characterization only. At these locations, the absence of UVIF and PID detections assisted in confirming that a contaminant source area had not been encountered.

Sample collection was performed in accordance with the DE&S Quality Assurance Project Plan (QAPjP) and Field Sampling and Analysis Plan (SAP) for the site. Quality assurance and quality control (QA/QC) samples were collected on a one (1) per 20 basis.

4.2 RESULTS AND OBSERVATIONS

CPT logs were recorded while drilling and compared to soil cuttings on site. The "soil behavior type" column of the CPT logs sometimes suggested the soil was a little coarser than what visual observations of the soil cuttings actually showed. DE&S generally agrees with the findings of the driller's CPT logs as an approximation of soil types and depths of changes in grain size. Copies of the CPT logs and soil boring logs are included in Appendices C and D, respectively.

During soil sampling operations, no hydrocarbon contamination was detected through field screening (e.g., UVIF, PID, and visual screening). For this reason, samples collected for laboratory analyses were collected from the shallow subsurface. CPT soil samples were collected from the 0.5 to 1.0 foot interval while hand-trowel soil samples were collected from the 0.0 to 0.5 foot interval. Most samples were analyzed only for total petroleum hydrocarbons (TPH) as diesel-range organics (DRO) due to the field screening results and in accordance with the SAP.

Hydrocarbons

All 33 soil samples (SB001 – SB033) were analyzed for TPH in the diesel range using EPA Method 8015M. The results are shown in Table 1. A majority of the samples (24 of 33) possessed trace to small concentrations (slightly above the detection limit of 5.0 mg/kg) of TPH. Based on sample locations outside of the normal operational areas, these low-level detections are apparently typical of background conditions in this area, averaging about 9 mg/kg. Sources may include wind drift of auto and diesel exhaust and road oils from Interstate 5 immediately east of the site. Some of these samples exhibited "late elevated

baselines" on chromatograms, suggesting high molecular weight materials that are consistent with oils or asphaltic material.

The highest concentrations of 64 mg/kg and 37 mg/kg were from CPT-17 and SS-9, respectively. Both of these sample locations were in the northwest part of the site where former piping and related equipment existed. Samples of the berm material were collected at SS-30 and SS-31 where TPH concentrations were 34 and 33 mg/kg, respectively. These levels are probably explained by the fact that the berms were historically oiled for erosion control. Overall, only scattered samples exhibited slightly elevated TPH above area background levels.

Volatile Organic Compounds (VOCs)

Eight soil samples from seven locations (CPT-5, CPT-8, CPT-10, CPT-11, CPT-13, CPT-14, and SS-12) were tested for VOCs using EPA Method 8260B. The locations of these samples were chosen so as to correspond with former locations where VOCs were stored, handled, or possibly spilled (refer to the SAP for location selection rationale). All VOC samples were analyzed and found to be below the laboratory detection limit, DL, of 50 µg/kg. The VOC analytical results are shown in Table 2. Based on the analytical results and the UVIF and PID field screening, this site shows no evidence of currently being impacted by VOCs.

Metals

Nine soil samples at seven locations were tested for California Method 17 (CAM 17) metals using EPA Methods 6010B and 7471A. The samples were taken from the vicinity of the cooling tower (CPT-5 and SS-6), the LNG process area (CPT-7), the berm soil (SS-30 and SS-31), and other areas of the site for spatial coverage (CPT-23 and CPT-24). Table 3 provides the analytical results for these samples as well as average native metal concentrations in United States (U.S.) soil, U.S. Environmental Protection Agency (EPA) soil screening levels, and EPA Industrial Preliminary Remediation Goals (PRGs). Six of the metals (Sb, Be, Mo, Se, Ag, and Tl) were not detected, two other metals (Cd and Hg) were only detected in trace amounts in one to two of the samples, and the other nine metals (As, Ba, Cr, Co, Cu, Pb, Ni, V, and Zn) were mostly at or near background or natural concentrations. Examination of the metal analytical results yielded a couple of outlier concentrations including a nickel concentration of 240 mg/kg for CPT-23 (versus 3.0 to 22 mg/kg for all others) and a lead concentration of 53 mg/kg for CPT-7 (versus 2.4 to 24 mg/kg for all others). The nickel concentration of 240 mg/kg is the only metal concentration that exceeded a soil screening level (100 mg/kg for nickel). Nickel concentrations at the site are at least two orders of magnitude below the industrial PRG. No metal concentrations exceeded an industrial PRG.

A soil sample collected from CPT-15 was analyzed for ten chlorinated herbicides using EPA Method 8151. The results indicated no herbicides above the detection limit (DL). Table 4 presents the analytes and results of the herbicide screening.

4.3 CONCLUSIONS AND RECOMMENDATIONS

TPH in near-surface soil and berm material is at low levels that present no risk based on regulatory criteria. In addition to TPH and non-detect VOC analytical results, UVIF continuous screening also indicated no significant hydrocarbon concentrations. Therefore, any significant hydrocarbon contamination at the site, if present, is at most very localized and would be identified only by future demolition or construction earthwork. Soil testing and analytical results indicate trace to low concentrations of metals in the shallow subsurface. These findings, coupled with the above-mentioned site hydrocarbon characterization results, suggest that the site is currently not appreciably impacted by contamination. Thus, additional site characterization is not recommended at this time.

5.0 GROUNDWATER INVESTIGATION

The objective of this activity was to obtain enough analytical data and field data to determine if groundwater is impacted and, if so, to ascertain the nature and the approximate extent of contamination. To this end, 13 groundwater samples were collected from 12 locations.

5.1 FIELD ACTIVITIES

Gregg Drilling performed CPT drilling on November 14 and 15 of 2000, and DE&S personnel sampled locations that were either downgradient (i.e., San Diego Bay side) of potential source areas or were at other potential release areas. The objective in choosing these locations was to provide spatial distribution of groundwater samples that would be most likely to identify significant contamination, if present. Borings were advanced to depths sufficient to collect groundwater samples through temporary ¾ inch-diameter PVC wells, staying close to the top of the water table. Site activity photographs, some depicting the installation and monitoring of the temporary monitor wells, are provided in Appendix B. DE&S found that a depth of 20 feet bgs was sufficient to collect groundwater samples; however, pushes up to 25 feet provided better hydraulic communication with the water-bearing zone and expedited sample collection. One sample location, CPT-28, did not provide sufficient groundwater for sampling purposes, even several hours after the temporary well (with a 10-foot long screen) was installed. In addition to collecting samples for laboratory analysis, DE&S measured water quality parameters (specific conductance, pH, and temperature) from select locations and observed relative differences in well yield across the site to characterize the water-bearing zone.

As discussed in Section 4.1, CPT boring logs, together with select material descriptions from the DE&S field geologist, were used to characterize the subsurface stratigraphy and the potential for contaminant migration.

Sample collection was performed in accordance with the DE&S QAPjP and SAP for the site. Quality assurance and quality control (QA/QC) samples were collected at a minimum of one (1) per 20 basis.

5.2 RESULTS AND OBSERVATIONS

During the CPT drilling and groundwater sampling operations, no hydrocarbon contamination was detected using field screening techniques (i.e., UVIF, PID, visual, and olfactory screening). For this reason, fewer groundwater samples were collected than were originally planned in the SAP. Additionally, groundwater sample analyses were restricted to TPH in the diesel range except for VOCs and CAM 17 metals as outlined in the SAP.

Hydrocarbons

Thirteen groundwater samples were collected from 12 locations (CPT-1, 3, 5, 8, 11, 13, 14, 15, 16, 19, 24 and 27) and analyzed for TPH in the diesel range using EPA Method 8015M. A duplicate sample was collected from CPT-11. The results for these samples are shown in Table 5. Three of the samples did not exhibit TPH concentrations above the detection limit of 0.20 mg/L. The other 10 samples showed a TPH content ranging from a high of 0.44 mg/L to a low of 0.21 mg/L. The highest concentrations of 0.43 mg/L and 0.44 mg/L (twice the detection limit) were detected at CPT-13 and CPT-14, respectively. These locations were in the northeastern corner of the site in the vicinity of former LNG process equipment and buildings. Overall, TPH is detectable in groundwater across the site, but at low concentrations.

Volatile Organic Compounds

Six groundwater samples were collected from five locations (CPT-5, 8, 11, 13, and 14) and tested for volatile organic compounds (VOCs) using EPA Method 8260B. The groundwater samples were collected from locations where potential spills or leaks of hydrocarbons, solvents, or odorants may reasonably have occurred while the LNG facility was operating. Refer to the SAP for additional information on the selection of these locations. None of the samples tested exceeded the laboratory detection limit. Table 6 provides the results for the VOC tests. Based on this information, no VOC impacts were identified in groundwater at the site.

Metals

Four groundwater samples were collected from three locations (CPT-1, CPT-5, and CPT-24) and tested for CAM 17 metals using EPA Methods 6010B and 7470A. The CPT-1 location was chosen due to its proximity to the former LNG process operation, and the CPT-24 location was chosen to represent the southern part of the site. The CPT-5 location provided metals characterization for the vicinity of the former cooling tower near the northwestern corner of the site. A fifth water sample was collected from the concrete catch basin (rainwater)

underneath the concrete pad of the former cooling tower. The analytical results for these samples are provided in Table 7. Table 7 also provides drinking water maximum contaminant levels (MCLs) and tap water preliminary remediation goals (PRGs) for these metals. Six of the metals (Sb, Be, Cd, Hg, Mo, and Ag) were not detected in the samples, while the other 11 metals (As, Ba, Cr, Co, Cu, Pb, Ni, Se, Tl, V, and Zn) were detected at very low concentrations of less than or equal to 0.20 mg/L. MCLs were exceeded at the catch basin for Arsenic and Thallium, and in all the groundwater samples for selenium. PRGs were exceeded for Arsenic and Thallium at the catch basin, and for Thallium at CPT-1.

General Water Quality Field Measurements

During the groundwater investigation, DE&S recorded field water-quality readings from CPT-13, CPT-16, CPT-24, and CPT-27. These results give only a general idea of water quality since they were not sampled from a properly purged and developed well. Water samples were measured in the field for temperature, conductivity (in microsiemens/cm), pH and general appearance. The results of general water quality testing are presented in Table 8.

In summary, specific conductance was elevated for a freshwater aquifer and the samples appeared slightly cloudy. This may be due to tidal influences or saltwater intrusion from the bay. Field pH was approximately neutral, and temperature was near average monthly ambient air temperature (69-53 deg F range, average 62). DE&S also observed decreased well yields and much slower recovery for the temporary monitor wells installed closest to the bay.

5.3 CONCLUSIONS AND RECOMMENDATIONS

The higher specific conductance of the groundwater and the lower well yield and rate of recovery from the temporary monitor wells closest to the bay indicates that the bay influences the shallow groundwater at the site. Based on specific conductance measurements, the total dissolved solids (probably due to salinity) content is in the range of 3,800 to 7,400 mg/L. This extremely high salinity (10% to 20% of seawater) renders the groundwater undesirable for beneficial use based on the salt content and total dissolved solids.

Groundwater analytical results indicate trace concentrations of TPH and metals. These findings, coupled with the lack of any VOC or field screening detections in both the soil and groundwater, provide substantial evidence that groundwater at the site is currently not appreciably impacted by contamination. Based on these results, DE&S does not recommend additional investigations of the groundwater beneath the LNG site at this time.

The water in the catch basin of the former cooling tower is isolated from groundwater yet possesses a concentration of one of the metals (arsenic) that

exceeds federal drinking water standards. For this reason, water and any possible sediments in this catch basin may need to be further characterized for proper disposal.

6.0 OVERALL SITE CONCLUSIONS AND RECOMMENDATIONS

Based on the results of the November 2000 field effort, a second targeted investigation is not proposed. Several contaminants were detected at low concentrations, and these appear typical of a former industrial site. Arsenic was found above the drinking water standard in a concrete catch basin from the location of the former cooling tower. Selenium was detected above the drinking water standard in all three groundwater samples tested for metals, suggesting that this may be representative of background conditions. No further investigation of the LNG site is recommended at this time. Should the site be developed in the future, DE&S recommends that an environmental professional be present during all excavation and grading activities to inspect for the presence of any previously undisclosed environmental conditions.

7.0 REFERENCES

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Table 1 - TPH Results for Soil Samples from the LNG Site

Sample Location	Depth Interval (ft)	Sample ID	TPH (mg/kg) EPA 8015M	
			Diesel HC (C12-C24)	Notes
CPT-1	0.5-1.0	SB020	**8.7**	C10 - C28+, non-diesel pattern, late elevated baseline
CPT-2	0.5-1.0	SB009	**6.5**	C12 - C24, hydrocarbon pattern
CPT-3	0.5-1.0	SB004	< 5.0	
CPT- 5	0.5-1.0	SB007	< 5.0	
CPT-5	0.5-1.0	SB006	**6.0**	C12 - C24, hydrocarbon pattern
CPT-7	0.5-1.0	SB008	**5.2**	C12 - C24, hydrocarbon pattern
CPT-8	0.5-1.0	SB021	**34**	C10 - C28+, non-diesel pattern
CPT-10	0.5-1.0	SB010	**5.0**	C12 - C24, hydrocarbon pattern
CPT-11	0.5-1.0	SB019	< 5.0	
CPT-13	0.5-1.0	SB002	< 5.0	
CPT-14	0.5-1.0	SB001	< 5.0	
CPT-15	0.5-1.0	SB003	< 5.0	
CPT-16	0.5-1.0	SB018	**6.8**	C12 - C24, hydrocarbon pattern
CPT-17	0.5-1.0	SB014	**64**	C12 - C24, hydrocarbon pattern
CPT-18	0.5-1.0	SB011	**12**	
CPT-19	0.5-1.0	SB005	< 5.0	
CPT-20	0.5-1.0	SB015	**7.8**	C12 - C24, hydrocarbon pattern
CPT-23	0.5-1.0	SB012	< 5.0	C12 - C24, hydrocarbon pattern
CPT-24	0.5-1.0	SB017	< 5.0	
CPT-25	0.5-1.0	SB013	**7.0**	C12 - C24, hydrocarbon pattern
CPT-27	0.5-1.0	SB022	**9.7**	C10 - C28+, non-diesel pattern
CPT-28	0.5-1.0	SB016	**18**	C12 - C24, hydrocarbon pattern
SS-12	0.5	SB025	**6.9**	C12 - C28+, non-diesel pattern, late elevated baseline
SS-21	0.5	SB030	**17**	C14 - C28+, late elevated baseline
SS-22	0.5	SB027	**11**	C10 - C28+, non-diesel pattern, late elevated baseline
SS-26	0.5	SB028	**12**	C10 - C28+, non-diesel pattern, late elevated baseline
SS-29	0.5	SB029	**14**	C10 - C28+, non-diesel pattern, late elevated baseline
SS-30	0.5	SB031	**34**	C14 - C28+, late elevated baseline
SS-31	0.5	SB032	**17**	C14 - C28+, late elevated baseline
SS-31	0.5	SB033	**33**	C14 - C28+, late elevated baseline
SS-4	0.5	SB026	**5.6**	C12 - C28+, non-diesel pattern, late elevated baseline
SS-6	0.5	SB023	**9.7**	C12 - C28+, non-diesel pattern, late elevated baseline
SS-9	0.5	SB024	**37**	C14 - C28+, non-diesel pattern, late elevated baseline

NA = Not Applicable
Bold = Concentrations above detection limit

Table 2 - VOC Results for Soil Samples from the LNG Site

Sample Location	CPT-5	CPT-5	CPT-8	CPT-10	CPT-11	CPT-13	CPT-14	SS-12
Depth Interval (ft)	0.5-1.0	0.5-1.0	0.5-1.0	0.5-1.0	0.5-1.0	0.5-1.0	0.5-1.0	0.5
Sample ID	SB006	SB007	SB021	SB010	SB019	SB002	SB001	SB025
	Concentration (µg/kg)							
Acetone	< 250.0	< 250.0	< 250.0	< 250.0	< 250.0	< 250.0	< 250.0	< 250.0
Benzene	< 50.0	< 50.0	< 50.0	< 50.0	< 50.0	< 50.0	< 50.0	< 50.0
Bromobenzene	< 50.0	< 50.0	< 50.0	< 50.0	< 50.0	< 50.0	< 50.0	< 50.0
Bromodichloromethane	< 50.0	< 50.0	< 50.0	< 50.0	< 50.0	< 50.0	< 50.0	< 50.0
Bromoform	< 50.0	< 50.0	< 50.0	< 50.0	< 50.0	< 50.0	< 50.0	< 50.0
Bromomethane	< 50.0	< 50.0	< 50.0	< 50.0	< 50.0	< 50.0	< 50.0	< 50.0
2-Butanone	< 100.0	< 100.0	< 100.0	< 100.0	< 100.0	< 100.0	< 100.0	< 100.0
n-Butylbenzene	< 50.0	< 50.0	< 50.0	< 50.0	< 50.0	< 50.0	< 50.0	< 50.0
sec-Butylbenzene	< 50.0	< 50.0	< 50.0	< 50.0	< 50.0	< 50.0	< 50.0	< 50.0
tert_Butylbenzene	< 50.0	< 50.0	< 50.0	< 50.0	< 50.0	< 50.0	< 50.0	< 50.0
Carbon disulfide	< 50.0	< 50.0	< 50.0	< 50.0	< 50.0	< 50.0	< 50.0	< 50.0
Carbon tetrachloride	< 50.0	< 50.0	< 50.0	< 50.0	< 50.0	< 50.0	< 50.0	< 50.0
Chlorobenzene	< 50.0	< 50.0	< 50.0	< 50.0	< 50.0	< 50.0	< 50.0	< 50.0
Chloroethane	< 50.0	< 50.0	< 50.0	< 50.0	< 50.0	< 50.0	< 50.0	< 50.0
Chloroform	< 50.0	< 50.0	< 50.0	< 50.0	< 50.0	< 50.0	< 50.0	< 50.0
Chloromethane	< 50.0	< 50.0	< 50.0	< 50.0	< 50.0	< 50.0	< 50.0	< 50.0
2-Chlorotoluene	< 50.0	< 50.0	< 50.0	< 50.0	< 50.0	< 50.0	< 50.0	< 50.0
4-Chlorotoluene	< 50.0	< 50.0	< 50.0	< 50.0	< 50.0	< 50.0	< 50.0	< 50.0
Dibromochloromethane	< 50.0	< 50.0	< 50.0	< 50.0	< 50.0	< 50.0	< 50.0	< 50.0
1,2-Dibromo-3-chloropropane	< 50.0	< 50.0	< 50.0	< 50.0	< 50.0	< 50.0	< 50.0	< 50.0
1,2-Dibromoethane	< 50.0	< 50.0	< 50.0	< 50.0	< 50.0	< 50.0	< 50.0	< 50.0
Dibromomethane	< 50.0	< 50.0	< 50.0	< 50.0	< 50.0	< 50.0	< 50.0	< 50.0
1,2-Dichlorobenzene	< 50.0	< 50.0	< 50.0	< 50.0	< 50.0	< 50.0	< 50.0	< 50.0
1,3-Dichlorobenzene	< 50.0	< 50.0	< 50.0	< 50.0	< 50.0	< 50.0	< 50.0	< 50.0
1,4-Dichlorobenzene	< 50.0	< 50.0	< 50.0	< 50.0	< 50.0	< 50.0	< 50.0	< 50.0
Dichlorodifluoromethane	< 50.0	< 50.0	< 50.0	< 50.0	< 50.0	< 50.0	< 50.0	< 50.0
1,1-Dichloroethane	< 50.0	< 50.0	< 50.0	< 50.0	< 50.0	< 50.0	< 50.0	< 50.0
1,2-Dichloroethane	< 50.0	< 50.0	< 50.0	< 50.0	< 50.0	< 50.0	< 50.0	< 50.0
1,1-Dichloroethene	< 50.0	< 50.0	< 50.0	< 50.0	< 50.0	< 50.0	< 50.0	< 50.0
cis-1,2-Dichloroethene	< 50.0	< 50.0	< 50.0	< 50.0	< 50.0	< 50.0	< 50.0	< 50.0
trans-1,2-Dichloroethene	< 50.0	< 50.0	< 50.0	< 50.0	< 50.0	< 50.0	< 50.0	< 50.0
1,2-Dichloropropane	< 50.0	< 50.0	< 50.0	< 50.0	< 50.0	< 50.0	< 50.0	< 50.0
1,3-Dichloropropane	< 50.0	< 50.0	< 50.0	< 50.0	< 50.0	< 50.0	< 50.0	< 50.0
2,2-Dichloropropane	< 50.0	< 50.0	< 50.0	< 50.0	< 50.0	< 50.0	< 50.0	< 50.0
1,1-Dichloropropene	< 50.0	< 50.0	< 50.0	< 50.0	< 50.0	< 50.0	< 50.0	< 50.0
cis-1,3-Dichloropropene	< 50.0	< 50.0	< 50.0	< 50.0	< 50.0	< 50.0	< 50.0	< 50.0
trans1,3-Dichloropropene	< 50.0	< 50.0	< 50.0	< 50.0	< 50.0	< 50.0	< 50.0	< 50.0
Ethylbenzene	< 50.0	< 50.0	< 50.0	< 50.0	< 50.0	< 50.0	< 50.0	< 50.0
Hexachlorobutadiene	< 50.0	< 50.0	< 50.0	< 50.0	< 50.0	< 50.0	< 50.0	< 50.0
2-Hexanone	< 100.0	< 100.0	< 100.0	< 100.0	< 100.0	< 100.0	< 100.0	< 100.0
Isopropylbenzene	< 50.0	< 50.0	< 50.0	< 50.0	< 50.0	< 50.0	< 50.0	< 50.0
p-Isopropyltoluene	< 50.0	< 50.0	< 50.0	< 50.0	< 50.0	< 50.0	< 50.0	< 50.0

Table 2 - VOC Results for Soil Samples from the LNG Site

Sample Location	CPT-5	CPT-5	CPT-8	CPT-10	CPT-11	CPT-13	CPT-14	SS-12
Depth Interval (ft)	0.5-1.0	0.5-1.0	0.5-1.0	0.5-1.0	0.5-1.0	0.5-1.0	0.5-1.0	0.5
Sample ID	SB006	SB007	SB021	SB010	SB019	SB002	SB001	SB025
	Concentration (µg/kg)							
Methylene chloride	< 100.0	< 100.0	< 100.0	< 100.0	< 100.0	< 100.0	< 100.0	< 100.0
Methyl tert-butyl ether	< 50.0	< 50.0	< 50.0	< 50.0	< 50.0	< 50.0	< 50.0	< 50.0
4-Methyl-2-pentanone	< 100.0	< 100.0	< 100.0	< 100.0	< 100.0	< 100.0	< 100.0	< 100.0
Napthalene	< 50.0	< 50.0	< 50.0	< 50.0	< 50.0	< 50.0	< 50.0	< 50.0
n-Propylbenzene	< 50.0	< 50.0	< 50.0	< 50.0	< 50.0	< 50.0	< 50.0	< 50.0
Styrene	< 50.0	< 50.0	< 50.0	< 50.0	< 50.0	< 50.0	< 50.0	< 50.0
1,1,1,2-Tetrachloroethane	< 50.0	< 50.0	< 50.0	< 50.0	< 50.0	< 50.0	< 50.0	< 50.0
1,1,2,2-Tetrachloroethane	< 50.0	< 50.0	< 50.0	< 50.0	< 50.0	< 50.0	< 50.0	< 50.0
Tetrachloroethene	< 50.0	< 50.0	< 50.0	< 50.0	< 50.0	< 50.0	< 50.0	< 50.0
Toluene	< 50.0	< 50.0	< 50.0	< 50.0	< 50.0	< 50.0	< 50.0	< 50.0
1,2,3-Trichlorobenzene	< 50.0	< 50.0	< 50.0	< 50.0	< 50.0	< 50.0	< 50.0	< 50.0
1,2,4-Trichlorobenzene	< 50.0	< 50.0	< 50.0	< 50.0	< 50.0	< 50.0	< 50.0	< 50.0
1,1,1-Trichloroethane	< 50.0	< 50.0	< 50.0	< 50.0	< 50.0	< 50.0	< 50.0	< 50.0
1,1,2-Trichloroethane	< 50.0	< 50.0	< 50.0	< 50.0	< 50.0	< 50.0	< 50.0	< 50.0
Trichloroethene	< 50.0	< 50.0	< 50.0	< 50.0	< 50.0	< 50.0	< 50.0	< 50.0
Trichlorofluoromethane	< 50.0	< 50.0	< 50.0	< 50.0	< 50.0	< 50.0	< 50.0	< 50.0
1,2,3-Trichloropropane	< 50.0	< 50.0	< 50.0	< 50.0	< 50.0	< 50.0	< 50.0	< 50.0
1,2,4-Trimethylbenzene	< 50.0	< 50.0	< 50.0	< 50.0	< 50.0	< 50.0	< 50.0	< 50.0
1,3,5-Trimethylbenzene	< 50.0	< 50.0	< 50.0	< 50.0	< 50.0	< 50.0	< 50.0	< 50.0
Vinyl acatate	< 50.0	< 50.0	< 50.0	< 50.0	< 50.0	< 50.0	< 50.0	< 50.0
Vinyl chloride	< 50.0	< 50.0	< 50.0	< 50.0	< 50.0	< 50.0	< 50.0	< 50.0
m,p-Xylene	< 100.0	< 100.0	< 100.0	< 100.0	< 100.0	< 100.0	< 100.0	< 100.0
o-Xylene	< 50.0	< 50.0	< 50.0	< 50.0	< 50.0	< 50.0	< 50.0	< 50.0

NA = Not Applicable

Table 3 - Metal Results for Soil Samples from the LNG Site

Sample Location	Depth Interval (ft)	Sample ID	CAM 17 Metals (mg/kg)															
			Antimony (Sb)	Arsenic (Ar)	Barium (Ba)	Beryllium (Be)	Cadmium (Cd)	Chromium (Cr)	Cobalt (Co)	Copper (Cu)	Lead (Pb)	Mercury (Hg)	Molybdenum (Mo)	Nickel (Ni)	Selenium (Se)	Silver (Ag)	Thallium (Tl)	Vanadium (V)	Zinc (Zn)
US Typical Soil* Avg (Range)	NA	NA	(2-10)	5 (1-50)	430 (100-3,000)	6 (0.1-40)	0.06 (0.01-0.7)	100 (1-1,000)	8 (1-40)	30 (2-100)	10 (2-200)	0.03 (0.01-0.3)	2 (0.2-5)	40 (5-500)	0.3 (0.1-2)	0.05 (0.01-5)	9	100 (20-500)	50 (10-300)
Soil Screening Level			5	29	1600	63	8	40	NL	NL	NL	NL	NL	100	5	30	0.7	6000	10000
Industrial PRG			820	440**	100000	2200	810	450	100000	76000	1000	610	10000	41000	10000	10000	160	14000	100000
CPT-5	0.5-1	SB006	< 10	11	83	< 0.5	< 0.5	19	3.6	46	23	< 0.02	< 2.0	8.9	< 2.0	< 1.0	< 10	29	110
CPT-5	0.5-1	SB007	< 10	2	55	< 0.5	< 0.5	10	4.4	8.6	15	< 0.02	< 2.0	5.4	< 2.0	< 1.0	< 10	29	27
CPT-7	0.5-1	SB008	< 10	6.5	42	< 0.5	< 0.5	24	3.6	12	53	< 0.02	< 2.0	22	< 2.0	< 1.0	< 10	42	71
CPT-23	0.5-1	SB012	< 10	7.6	65	< 0.5	< 0.5	10	4.8	46	24	< 0.02	< 2.0	240	< 2.0	< 1.0	< 10	27	21
CPT-24	0.5-2	SB017	< 10	12	53	< 0.5	< 0.5	11	5.4	11	14	< 0.02	< 2.0	16	< 2.0	< 1.0	< 10	46	99
SS-6	0.5	SB023	< 10	2.8	72	< 0.5	1.8	7.4	4.9	7.7	4.5	< 0.02	< 2.0	8.6	< 2.0	< 1.0	< 10	16	100
SS-30	0.5	SB031	< 10	8.6	29	< 0.5	< 0.5	4.7	2.5	3.6	2.4	< 0.02	< 2.0	3.0	< 2.0	< 1.0	< 10	16	11
SS-31	0.5	SB032	< 10	4.0	53	< 0.5	< 0.5	10	4.2	20	13	0.61	< 2.0	21	< 2.0	< 1.0	< 10	42	38
SS-31	0.5	SB033	< 10	5.7	48	< 0.5	< 0.5	10	4.1	11	14	0.72	< 2.0	20	< 2.0	< 1.0	< 10	40	37

* = USEPA. 1983. Hazardous Waste Land Treatment. SW-874. USEPA Office of Solid Waste and Emergency Response. Washington, DC. 671 pp.
** = the industrial PRG for arsenic as a noncancer endpoint is 440 mg/kg while the industrial PRG is 2.7 mg/kg if it is a cancer endpoint.
PRG = Preliminary Remediation Goal (set by EPA Region 9 with some California modifications)
NA = Not Applicable
Chromium = Total Chromium (1:6 Ratio of Cr VI : Cr III)
CAM 17 = California Method 17
Bold = Concentrations above detection limit

= Highest analyte concentration, exceeds soil screening level yet not the industrial PRG

Table 4- Herbicides in Soil Results

Sample Location	CPT-15	
Depth Interval (ft)	0.5-1.0	
Sample ID	SB-003	
Concentration (micrograms/kg)		
Analyte	**Result**	**Reporting Limit**
2,4-D	ND	40.0
2,4-DB	ND	40.0
2,4,5-T	ND	40.0
2,4,5-TP (Silvex)	ND	40.0
Dalapon	ND	40.0
Dicamba	ND	40.0
Dichlorprop	ND	40.0
Dinoseb	ND	40.0
MCPA	ND	20000
MCPP	ND	20000

Table 5 - TPH Results for Groundwater Samples from the LNG Site

Sample Location	Depth Interval (ft)	Sample ID	Duplicate Sample ID	TPH (mg/L) EPA 8015M	
				Diesel HC (C12-C24)	Notes
CPT-1	10-20	GW011	NA	**0.28**	C10 - C22, hydrocarbon pattern
CPT-3	14-19	GW004	NA	**0.27**	C10 - C22, hydrocarbon pattern
CPT-5	12-22	GW006	NA	**0.21**	C10 - C22, hydrocarbon pattern
CPT-8	10-20	GW013	NA	**0.26**	C10 - C22, hydrocarbon pattern
CPT-11	10-20	GW009	GW010	< 0.20	
CPT-11	10-20	GW010	GW009	< 0.20	
CPT-13	14-19	GW002	NA	**0.43**	C10 - C24, hydrocarbon pattern
CPT-14	10-15	GW001	NA	**0.44**	C10 - C24, hydrocarbon pattern
CPT-15	14-19	GW003	NA	**0.22**	C10 - C22, hydrocarbon pattern
CPT-16	5-25	GW008	NA	**0.23**	C10 - C22, hydrocarbon pattern
CPT-19	14-19	GW005	NA	**0.33**	C10 - C22, hydrocarbon pattern
CPT-24	11-21	GW007	NA	**0.22**	C10 - C22, hydrocarbon pattern
CPT-27	10-25	GW014	NA	< 0.20	

NA = Not Applicable
Bold = Concentrations above detection limit

Table 6 - VOC Results for Groundwater Samples from the LNG Site

Sample Location	CPT-5	CPT-8	CPT-11	CPT-11	CPT-13	CPT-14
Depth Interval (ft)	12-22	10-20	10-20	10-20	14-19	10-15
Sample ID	GW006	GW013	GW009	GW010	GW002	GW001
	Concentration (µg/L)					
Acetone	< 25.0	< 25.0	< 25.0	< 25.0	< 25.0	< 25.0
Benzene	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0
Bromobenzene	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0
Bromodichloromethane	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0
Bromoform	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0
Bromomethane	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0
2-Butanone	< 10.0	< 10.0	< 10.0	< 10.0	< 10.0	< 10.0
n-Butylbenzene	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0
sec-Butylbenzene	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0
tert_Butylbenzene	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0
Carbon disulfide	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0
Carbon tetrachloride	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0
Chlorobenzene	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0
Chloroethane	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0
Chloroform	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0
Chloromethane	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0
2-Chlorotoluene	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0
4-Chlorotoluene	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0
Dibromochloromethane	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0
1,2-Dibromo-3-chloropropane	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0
1,2-Dibromoethane	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0
Dibromomethane	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0
1,2-Dichlorobenzene	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0
1,3-Dichlorobenzene	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0
1,4-Dichlorobenzene	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0
Dichlorodifluoromethane	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0
1,1-Dichloroethane	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0
1,2-Dichloroethane	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0
1,1-Dichloroethene	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0
cis-1,2-Dichloroethene	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0
trans-1,2-Dichloroethene	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0
1,2-Dichloropropane	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0
1,3-Dichloropropane	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0
2,2-Dichloropropane	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0
1,1-Dichloropropene	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0
cis-1,3-Dichloropropene	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0
trans1,3-Dichloropropene	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0
Ethylbenzene	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0

Table 6 - VOC Results for Groundwater Samples from the LNG Site

Sample Location	CPT-5	CPT-8	CPT-11	CPT-11	CPT-13	CPT-14
Depth Interval (ft)	12-22	10-20	10-20	10-20	14-19	10-15
Sample ID	GW006	GW013	GW009	GW010	GW002	GW001
	Concentration (µg/L)					
Hexachlorobutadiene	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0
2-Hexanone	< 10.0	< 10.0	< 10.0	< 10.0	< 10.0	< 10.0
Isopropylbenzene	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0
p-Isopropyltoluene	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0
Methylene chloride	< 10.0	< 10.0	< 10.0	< 10.0	< 10.0	< 10.0
Methyl tert-butyl ether	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0
4-Methyl-2-pentanone	< 10.0	< 10.0	< 10.0	< 10.0	< 10.0	< 10.0
Napthalene	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0
n-Propylbenzene	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0
Styrene	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0
1,1,1,2-Tetrachloroethane	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0
1,1,2,2-Tetrachloroethane	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0
Tetrachloroethene	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0
Toluene	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0
1,2,3-Trichlorobenzene	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0
1,2,4-Trichlorobenzene	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0
1,1,1-Trichloroethane	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0
1,1,2-Trichloroethane	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0
Trichloroethene	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0
Trichlorofluoromethane	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0
1,2,3-Trichloropropane	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0
1,2,4-Trimethylbenzene	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0
1,3,5-Trimethylbenzene	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0
Vinyl acatate	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0
Vinyl chloride	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0
m,p-Xylene	< 10.0	< 10.0	< 10.0	< 10.0	< 10.0	< 10.0
o-Xylene	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0

Table 7 - Metal Results for Groundwater Samples from the LNG Site

Sample Location	Depth Interval (ft)	Sample ID	CAM 17 Metals (mg/L)															
			Antimony (Sb)	Arsenic (Ar)	Barium (Ba)	Beryllium (Be)	Cadmium (Cd)	Chromium (Cr)	Cobalt (Co)	Copper (Cu)	Lead (Pb)	Mercury (Hg)	Molybdenum (Mo)	Nickel (Ni)	Selenium (Se)	Silver (Ag)	Thallium (Tl)	Vanadium (V)	Zinc (Zn)
MCL	NA	NA	0.005	0.05	2	0.004	0.005	0.1	NL	1.3	0.015	0.04	NL	10	0.004	NL	1	NL	NL
CPT-1	10-20	GW011	< 0.01	< 0.005	0.083	< 0.004	< 0.005	< 0.005	0.011	< 0.01	< 0.005	< 0.0002	< 0.02	0.032	0.013	< 0.01	< 0.005	0.012	< 0.020
CPT-1	10-20	GW012	< 0.01	< 0.005	0.074	< 0.004	< 0.005	< 0.005	< 0.01	< 0.01	< 0.005	< 0.0002	< 0.02	0.025	0.014	< 0.01	0.0085	0.013	< 0.020
CPT-5	12-22	GW006	< 0.01	< 0.005	0.20	< 0.004	< 0.005	0.022	0.038	0.017	0.0090	< 0.0002	< 0.02	0.037	0.014	< 0.01	< 0.005	0.15	0.074
CPT-24	11-21	GW007	< 0.01	< 0.005	0.096	< 0.004	< 0.005	< 0.005	0.011	< 0.01	< 0.005	< 0.0002	< 0.02	0.03	0.0079	< 0.01	< 0.005	0.016	< 0.020
Catch Basin (Not Ground Water)	NA	GW016	< 0.01	0.12	< 0.01	< 0.004	< 0.005	< 0.005	< 0.01	0.036	< 0.005	< 0.0002	< 0.02	< 0.01	< 0.0050	< 0.01	0.0056	< 0.01	0.067

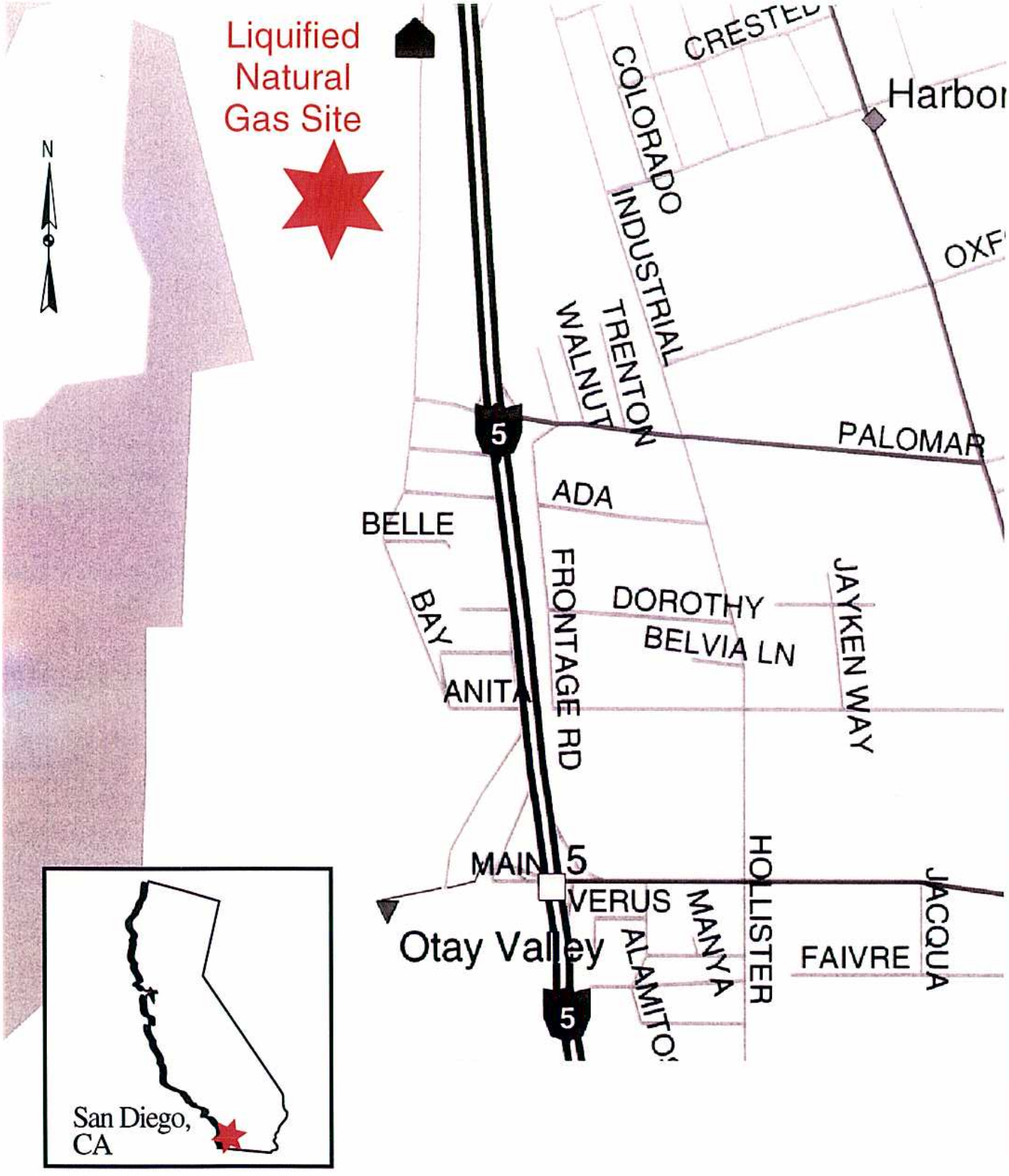
MCL = Maximum Contaminant Level (EPA drinking water standard)
NA = Not Applicable
NL = Not Listed
Chromium = Total Chromium (1:6 Ratio of Cr VI : Cr III)
CAM 17 = California Method 17
Bold = Concentrations above detection limit

= Concentration exceeds federal drinking water MCL

Table 8 - Field Water Quality Parameters

Sample Location	CPT-13	CPT-24	CPT-16	CPT-27
Sample Medium	Liquid	Liquid	Liquid	Liquid
Depth Interval (ft)	14-19	11-21	5-25	10-25
Sample ID	GW002	GW007	GW008	GW014
Date	11/14/00	11/15/00	11/15/00	11/15/00
Time	(13:43)	(12:30)	(14:15)	(18:15)
Temp (deg. F)	70.4	NM	NM	NM
Conductivity (microS/cm)	5880	9240	11390	7350
pH (pH units)	7.07	7.22	7.14	6.4
Comments	Cloudy, light brown, no odor	Light brown, slightly cloudy, no odor	Light brown, slightly cloudy, no odor	Light brown, slightly cloudy, no odor

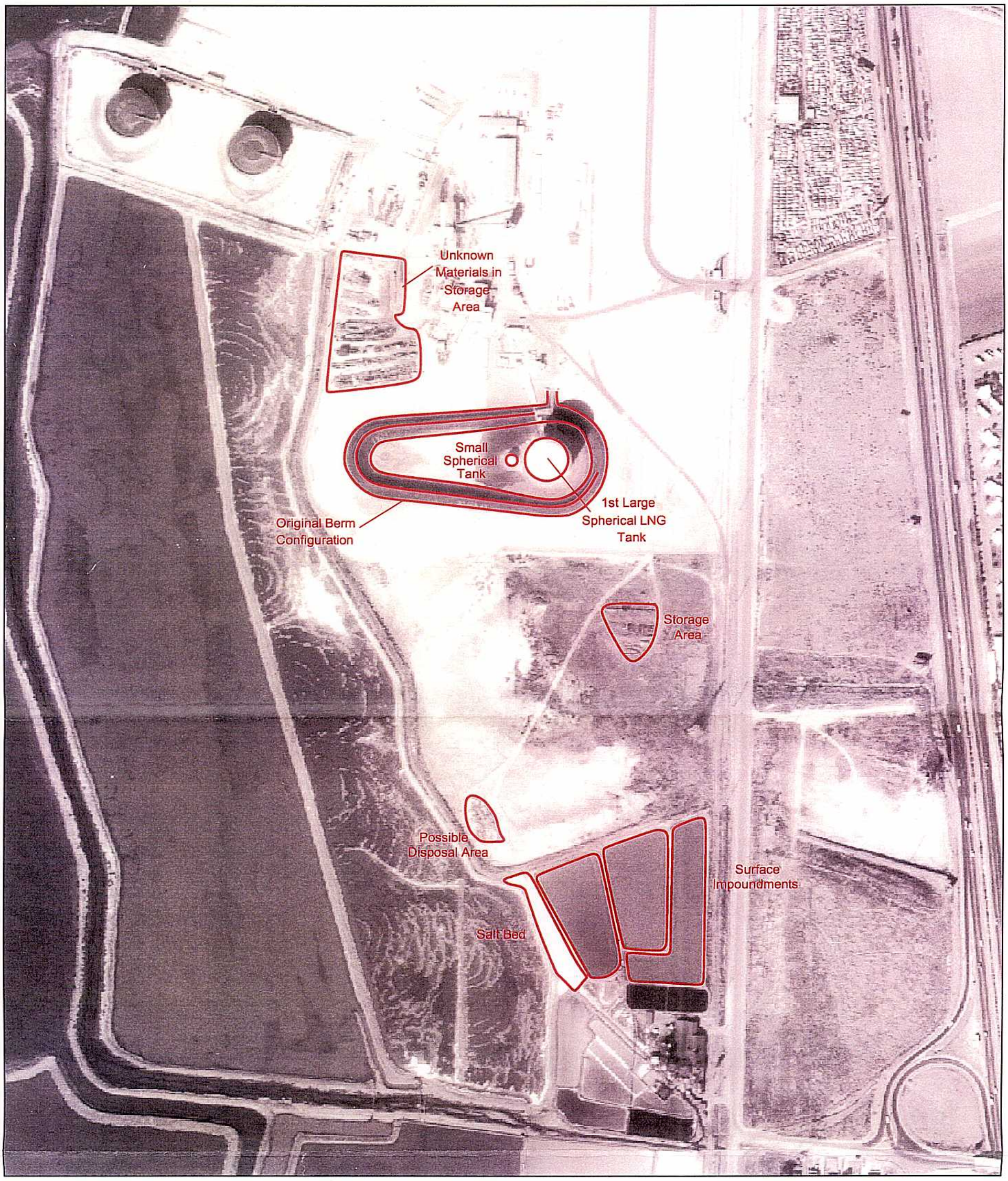
NM = Not Measured



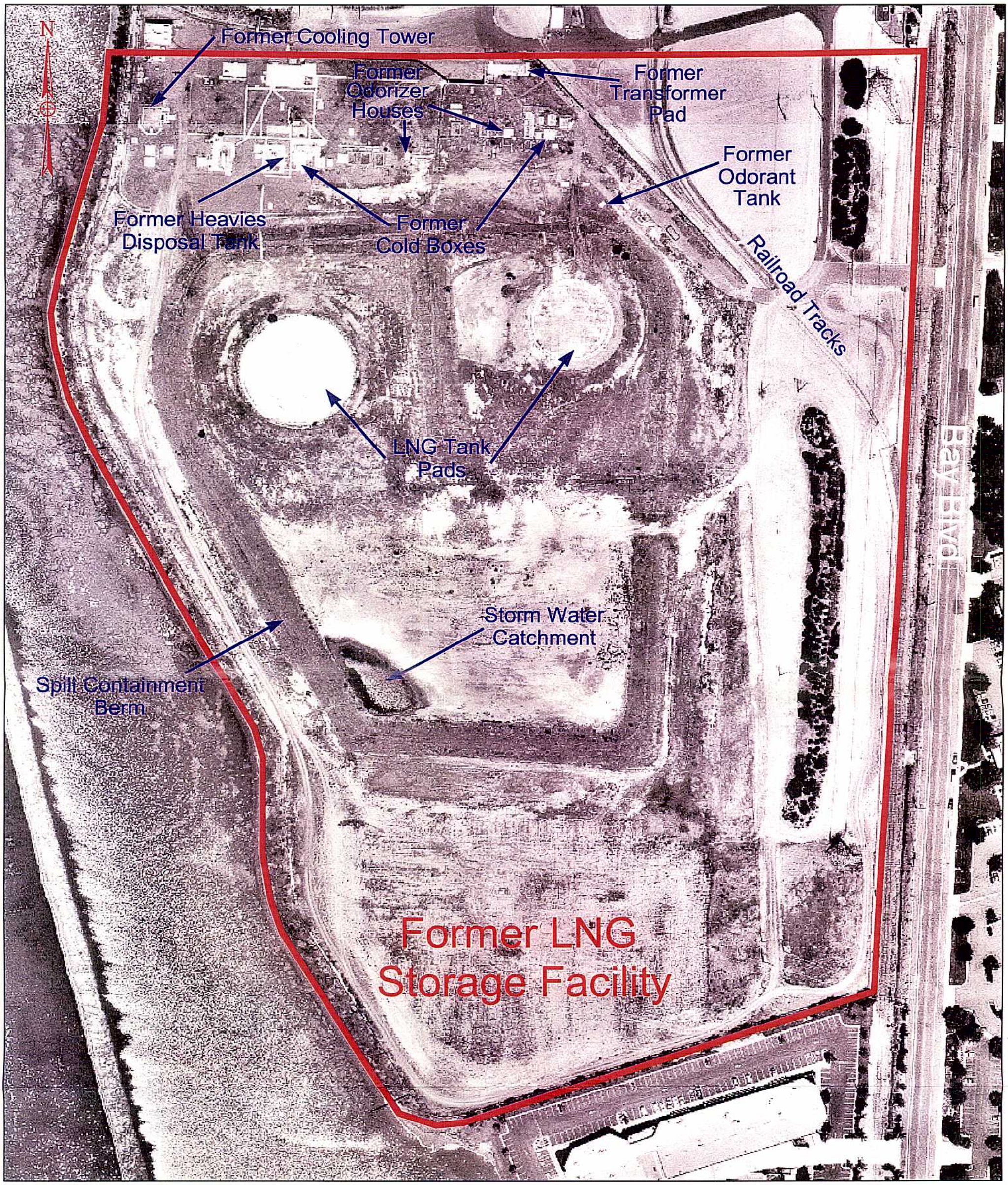
DATE: 07/23/01	Liquified Natural Gas Site Location Map	
REF: 0009.04.0155.03.00001		
FILE: Location.xar		
Duke Engineering & Services, A Duke Energy Company	South Bay Power Plant, Chula Vista, California	Figure 1

Date: 07/23/01 Ref: 00009.04.0155.00.00001 File: Photo_boundary.dwg	Map of LNG Site and Surrounding Area	
Duke Engineering & Services A Duke Energy Company	Former LNG Storage Facility, Chula Vista, CA	Figure 2

Date: 07/23/01	Map of LNG Site and Surrounding Area
Ref: 00009.04.0155.00.00001	
File: Photo_boundary.dwg	
Duke Engineering & Services, Inc. A Duke Energy Company	Former LNG Storage Facility, Chula Vista, CA — Figure 2



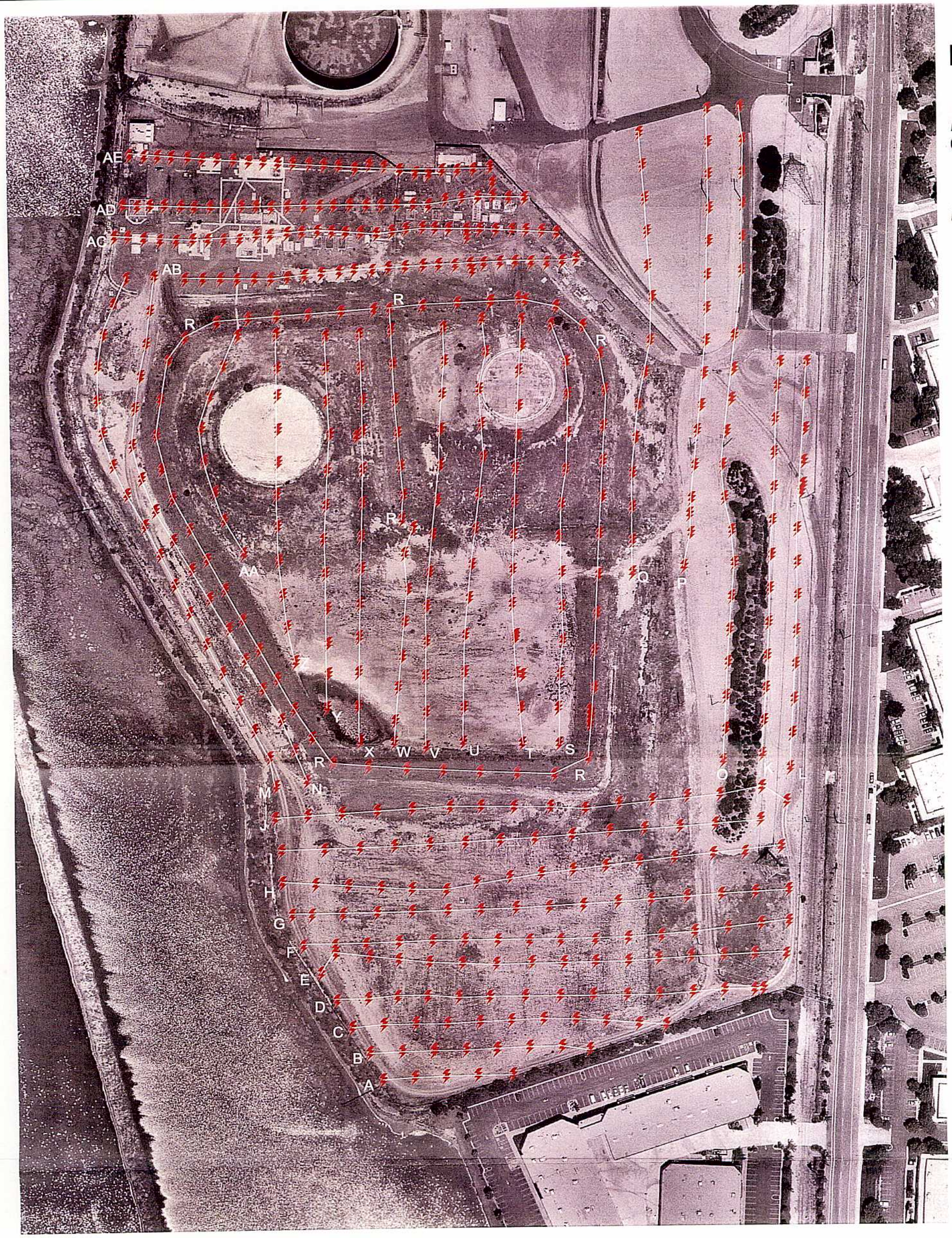
Date: 07/23/01	Appearance of the LNG Site in an Early Stage of Development (Photo: October 26, 1966 from the US Geological Survey)	
Ref: 00009.04.0155.00.00001		
File: 1996-scale.dwg		
Duke Engineering & Services, Inc. A Duke Energy Company	LNG Site at South Bay Power Plant Chula Vista, California	Figure 3



0 100 200

Approximate Scale In Feet

Date: 07/23/01	Map of LNG Site	
Ref: 00009.04.0155.00.00001		
File: Photo_LNG_facility		
Duke Engineering & Services, Inc. A Duke Energy Company	LNG Site at South Bay Power Plant Chula Vista, California	Figure 4



Em Reading

0 50 100 150 200 250 Feet

Date: 07/23/01	Electromagnetic Survey Locations	
Ref: 00009.04.0155.03.00001		
Layout: EM Data		
Duke Engineering & Services A Duke Energy Company	LNG Site at South Bay Power Plant Chula Vista, California	Figure 5

Observable Surface Features that Emit Strong EM Fields

EM Anomaly Unexplained by Observable Surface Features

0 50 100 150 200 250 Feet

Date: 07/23/01

Ref: 00009.04.0155.03.00001

Layout: Anomalies

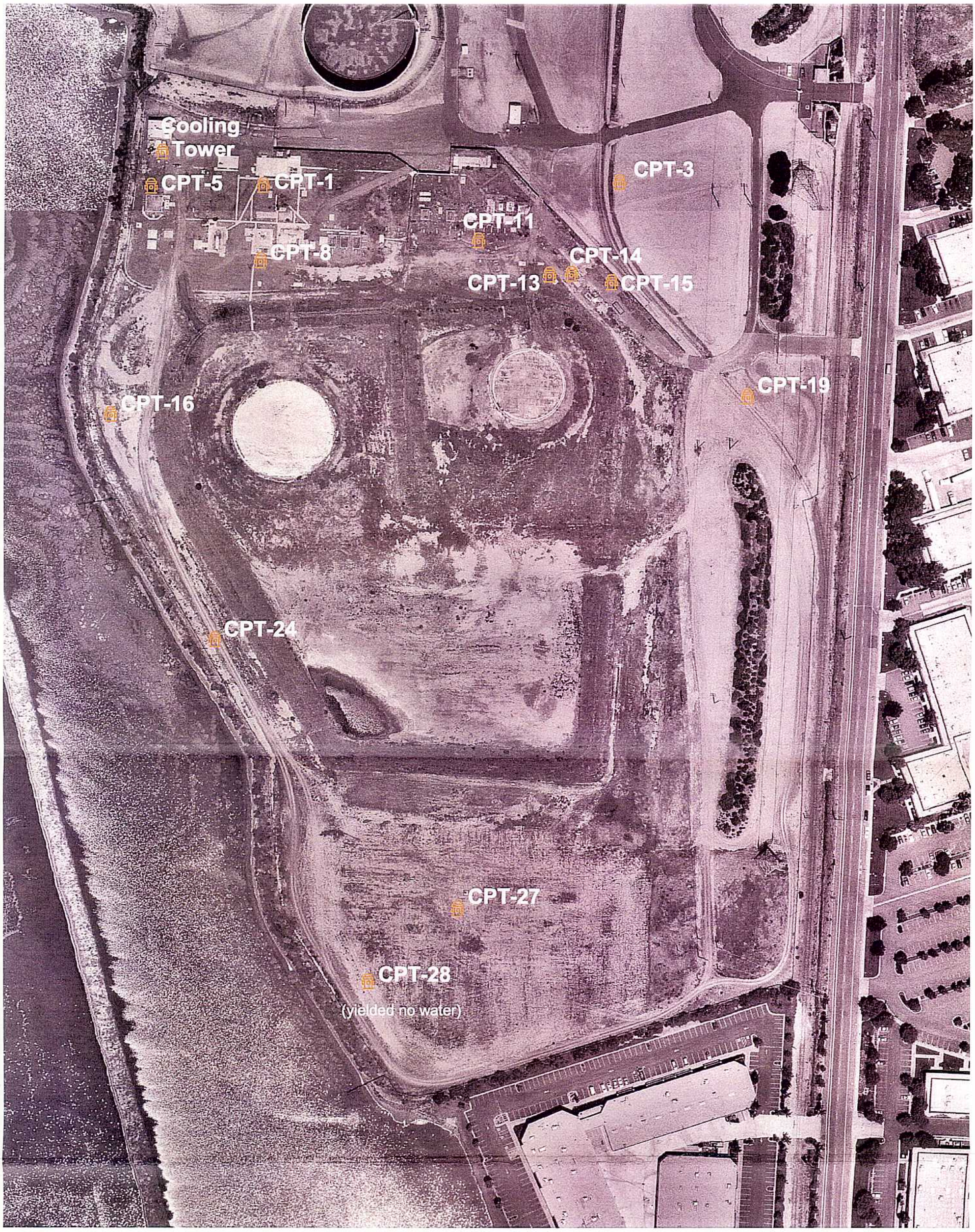
Locations of Electronmagnetic Anomalies

Duke Engineering & Services
A Duke Energy Company

LNG Site at South Bay Power Plant
Chula Vista, California

Figure 6

Date: 07/23/01	# Soil Sample Locations	
Ref: 00009.04.0155.03.00001		
View: Soil, CPT & GW Maps Layout: Soil Sample Locations		
Duke Engineering & Services SM A Duke Energy Company	LNG Site at South Bay Power Plant Chula Vista, California	Figure 7



CPT Soil Sample Locations

0 50 100 150 200 250 Feet

Date: 07/23/01	Groundwater Sample Locations	
Ref: 00009.04.0155.03.00001		
View: Soil, CPT & GW Maps Layout: Groundwater		
Duke Engineering & Services SM A Duke Energy Company	LNG Site at South Bay Power Plant Chula Vista, California	Figure 8

APPENDIX A

Biological Assessment Report

BIOLOGICAL ASSESSMENT OF PROPOSED CORE SAMPLING SITES AT THE FORMER LIQUEFIED NATURAL GAS FACILITY CHULA VISTA, CALIFORNIA

INTRODUCTION

On November 13, 2000, a general reconnaissance wildlife survey was performed at 30 proposed core sampling stations located on the Port of San Diego's former Liquefied Natural Gas (LNG) facility immediately adjacent to Duke Energy North America's South Bay Power Plant. Rick Williams, a Certified Wildlife Biologist with Duke Engineering & Services, performed the survey. The primary purpose of this survey was to determine if any special-status wildlife species would be potentially impacted by the proposed action.

BACKGROUND

The South Bay Power Plant is an electric power generating station located at 990 Bay Boulevard in Chula Vista, California. The study area consists of the southern 33-acres immediately adjacent to the plant property that was formerly used to store and process liquefied natural gas. The power plant site is located adjacent to a salt mining operation along the southeastern edge of San Diego Bay. San Diego Gas and Electric (SDG&E) purchased the property in approximately 1950 and built the LNG storage facility on the subject property in 1964. The LNG facility was in operation until approximately 1985 and was demolished by 1989. The site is currently owned by the San Diego Port Authority and is vacant with the exception of numerous foundations from former buildings and LNG above-ground storage tanks. The LNG site is highly disturbed area with heavy industrial development on the north, east, and south sides of the property; salt ponds border the west side of the site.

DESCRIPTION OF ACTION

Duke Engineering & Services has been contracted by Duke Energy North America to plan and conduct a Phase II Environmental Investigation of the former LNG site. Soil and groundwater samples were collected between November 13-22, 2000, using a truck-mounted drill at approximately 30 locations distributed across the site. Soil borings averaged 8-10 feet in depth. Representative photographs of these sampling locations are provided in Appendix A1.

GENERAL BIOLOGICAL DESCRIPTION OF STUDY AREA

The LNG site is located on the southeastern shore of South San Diego Bay. Important wildlife habitats adjacent to the site include: (1) salt evaporation ponds located west of the property; (2) the Chula Vista Wildlife Reserve, a small peninsula created from dredge deposits, located to the northwest; and (3) tidal flats and salt marsh at various locations on the edge of San Diego Bay within 5,000 feet of the site. These areas provide feeding, roosting, and breeding habitat for numerous shore birds, rails, herons, and ducks, in contrast with the industrial lands immediately east of the LNG site that offer only minimal value to wildlife.

The LNG site is a heavily disturbed industrial parcel that has been colonized by ruderal vegetation since the demolition of on-site facilities in 1989. ~~Weedy grasses, forbs, and shrubs now cover much of the site and provide cover and forage for a variety of wildlife species.~~ Species observed during reconnaissance of the site on November 13, 2000 included the following 16 birds and 3 mammals:

Birds	
Red-tailed hawk	*Buteo jamaicensis*
Osprey (flyover)	*Pandion haliaetus*
American kestrel	*Falco sparverius*
Killdeer	*Charadrius vociferus*
Mourning dove	*Zenaida macroura*
Anna's hummingbird	*Calypte anna*
Western kingbird	*Tyrannus verticalis*
Say's phoebe	*Sayornis saya*
Northern mockingbird	*Mimus polyglottos*
European starling	*Sturnus vulgaris*
Yellow-rumped warbler	*Dendroica coronata*
House finch	*Carpodacus mexicanus*
Savannah sparrow	*Passerculus sandwichensis*
White-crowned sparrow	*Zonotrichia leucophrys*
Golden-crowned sparrow	*Zonotrichis atricapilla*
Song sparrow	*Melospiza melodia*
Mammals	
Virginia opossum (dead)	*Didelphus virginiana*
Botta's pocket gopher (mounds)	*Thomomys bottae*
Desert cottontail	*Sylvilagus audubonii*

SPECIAL-STATUS WILDLIFE SPECIES

No special-status wildlife species are expected to occur on the LNG site. However, the following special-status terrestrial wildlife species have been reported from the general vicinity (< 2 miles) of the project area (Environmental Science Associates 1997, California Natural Diversity Data Base [CNDDB] 2000):

San Diego Horned Lizard

The San Diego horned lizard (*Phrynosoma coronatum blainvillei*), a Federal and State species of concern, frequents open areas of sandy soil and low vegetation such as chaparral and coastal sage scrub. The CNDDB has a historic record of this subspecies from Palm City, approximately two miles south of the LNG site. Although the site offers suitable habitat for the species, the horned lizard has likely been extirpated in the area because of widespread industrial development leading to habitat loss and fragmentation. As a result, the San Diego horned lizard is not expected to occur on site.

California Brown Pelican

The California brown pelican (*Pelecanus occidentalis californicus*), a Federal-and State-listed endangered species, is a resident species along the California coast. Pelicans frequently roost along the dikes of the Chula Vista Wildlife Preserve and salt ponds adjacent to the LNG site, and also forage in the South Bay Power Plant intake and discharge channels. Although pelicans occasionally fly over the LNG site, no suitable roosting or foraging habitat exists on the site and the species is not expected to occur.

Peregrine Falcon

The peregrine falcon (*Falco peregrinus anatum*), a State-listed endangered species, is frequently observed perching on elevated structures at the South Bay Power Plant and preying on birds such as the California least tern and snowy plover at the Chula Vista Wildlife Reserve. Individuals are expected to fly over the LNG site on occasion when traveling between perching and foraging sites. However, peregrines are not likely to occur on the site due to the absence of elevated perches and relative scarcity of prey.

Light-footed Clapper Rail

The light-footed clapper rail (*Rallus longirostris levipes*), a Federal- and State-listed endangered species, is an extremely rare non-migratory resident of salt and brackish marshes in coastal southern California, including the marshes of south San Diego Bay. Extant populations are known to occur at the Sweetwater Marsh National Wildlife Refuge approximately two miles north of the LNG site. However, suitable marsh habitat

is entirely absent from the LNG site, thereby precluding the occurrence of any clapper rails on the property.

Western Snowy Plover

The Western snowy plover (*Charadrius alexandrinus nivosus*), a Federal-listed threatened species, nests along the salt work dikes and at the Chula Vista Wildlife Reserve, immediately adjacent to the LNG site. However, suitable nesting and foraging habitat for the snowy plover is absent from the LNG site, and the species is not expected to occur.

California Least Tern

The California least tern (*Sterna antillarum browni*), a Federal- and State-listed endangered species, nests at the Chula Vista Wildlife Reserve and the salt pond dikes immediately west of the LNG site. However, suitable nesting and foraging habitat for the least tern is absent from the LNG site and the species is not expected to occur.

Elegant Tern

The elegant tern (*Sterna elegans*), a Federal and State species of concern, breeds at only two locations in the United States, one of which is the diked area between the Chula Vista Wildlife Reserve and the salt ponds adjacent to the LNG site (Environmental Science Associates 1997, USFWS 1994). Suitable nesting and foraging habitat for the elegant tern is absent from the LNG site and the species is not expected to occur.

Belding's Savannah Sparrow

The Belding's savannah sparrow (*Passerculus sandwichensis beldingi*), a State-listed endangered species and Federal species of concern, is a nonmigratory resident of coastal pickleweed salt marshes of southern California. The CNDDB has records from the salt pond dikes and marshes immediately adjacent to the LNG site and the species is presumed extant at these locations. However, marsh habitat required by the Belding's savannah sparrow is absent from the LNG property, and the subspecies is not expected to occur. The savannah sparrows observed during a reconnaissance of the LNG site on November 13, 2000 (see table above), were foraging around weedy grasses and shrubs and are believed to be individuals of other migratory subspecies.

IMPACT ASSESSMENT

Core sampling at the site is not expected to result in any significant effects on wildlife, including any special-status species known to occur in the vicinity of the LNG site. Access to drilling locations will be mainly over existing roads and otherwise disturbed ground; therefore, disturbance to vegetation will be negligible. Furthermore, core

sampling will occur outside of the normal nesting season for birds, thereby avoiding disruption of nesting behavior or direct impacts to eggs, nests, or young.

LITERATURE CITED

California Natural Diversity Data Base. 2000. Search of Imperial Beach and Point Loma USGS Quads. California Department of Fish and Game. Sacramento.

Environmental Science Associates. 1997. Initial Study for San Diego Gas & Electric Company's Application No. 97-12-039.

United States Fish and Wildlife Service (USFWS). 1994. Coastal Ecosystem Program, Avifauna of South San Diego Bay: The Western Salt Works, 1993-1994.

APPENDIX A1

REPRESENTATIVE SAMPLING LOCATIONS

Core Sampling Station Number 8

Core Sampling Station Number 13

Core Sampling Station Number 16

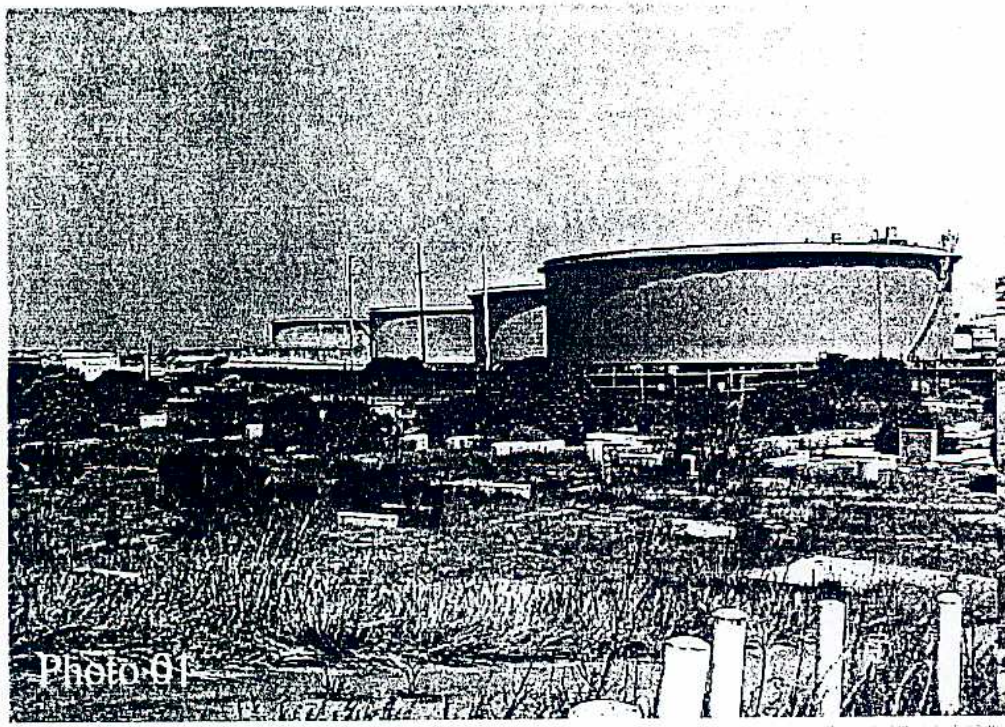
Core Sampling Station Number 27

APPENDIX B

Site Activity Photographs

SBPP LNG Site - Photo Log

Photograph #	File Name	Facing	Image Description
1	Mvc-006f.jpg	NW	Concrete structures at north end of site. Power plant ASTs in background.
2	Mvc-016f.jpg	N/NW	NW corner of site. Power plant in background.
3	Mvc-014f.jpg	S/SE	Westernmost LNG tank pad.
4	Mvc-005f.jpg	S/SW	Easternmost LNG tank pad.
5	Mvc-015f.jpg	N	Concrete foundations/structures at north end of site.
6	Mvc-001g.jpg	NE	Concrete foundations/structures at north end of site, close-up view.
7	Mvc-002g.jpg	W/NW	Cooling tower pad at NW corner of site.
8	Mvc-132f.jpg	E	Opening to catch basin for the former cooling tower.
9	Mvc-133f.jpg	--	Lime green colored water in catch basin of former cooling tower.
10	Mvc-003f.jpg	SW	Staircase to top of berm.
11	Mvc-134f.jpg	E	Eastward view of north part of site as seen from NW corner of site.
12	Mvc-136f.jpg	E/SE	Concrete structures at NE part of site.
13	Mvc-140f.jpg	N	Partial piping in N-S orientation near north edge of berm.
14	Mvc-142f.jpg	N	Piping support near berm staircase.
15	Mvc-124f.jpg	N	Operation of GPS and electronic data capture.
16	Mvc-126f.jpg	--	Close-up view of ruggedized field computer and GPS antennae
17	Mvc-122f.jpg	NW	Geonics™ EM31 instrument. Boom holds transmitter and receiver coils.
18	Mvc-121f.jpg	SE	EM survey in NW part of the site.
19	Mvc-106f.jpg	NE	CPT rig with support truck trailing.
20	Mvc-110f.jpg	NW	CPT rig and support truck along west side of the site.
21	Mvc-115f.jpg	--	Sample SB016 in labeled stainless steel collection tube with end caps.
22	Mvc-108f.jpg	N	CPT rig along west side of site.
23	Mvc-116f.jpg	--	CPT drilling in progress with real time data displayed by a monitor.
24	Mvc-103f.jpg	--	CPT rig with stainless steel cabinets, sinks, and work spaces.
25	Mvc-104f.jpg	--	Installation of temporary monitor well from inside CPT truck.
26	Mvc-114f.jpg	N	Water level monitoring of temporary monitoring well.
27	Mvc-111f.jpg	N/NE	View of SW part of the site.
28	Mvc-112f.jpg	N/NE	View of south central part of the site.
29	Mvc-109f.jpg	SE	View of SE part of the site.
30	Mvc-113f.jpg	SW	Salt mining operations S/SW of site.



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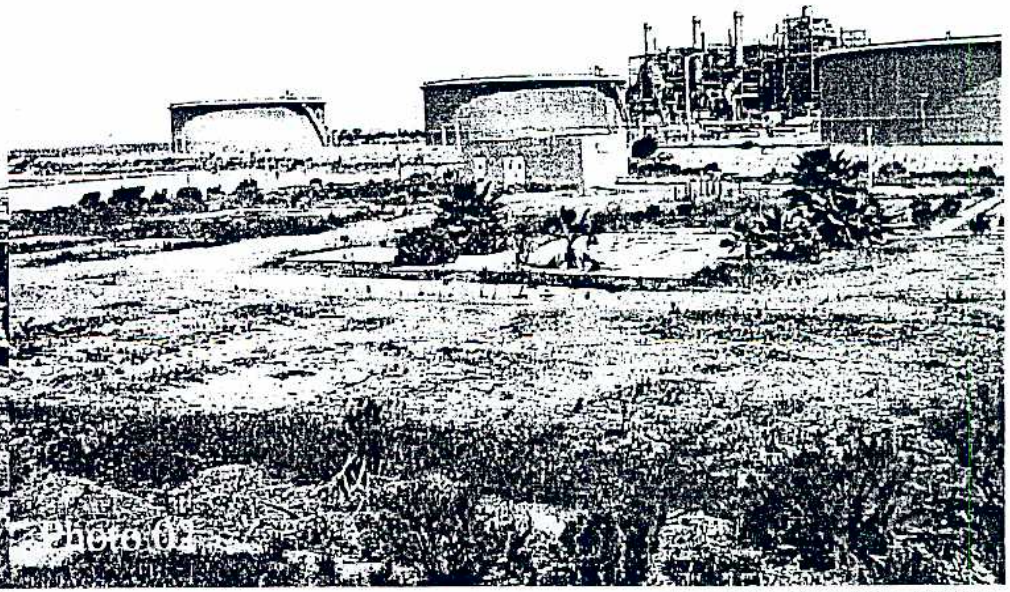

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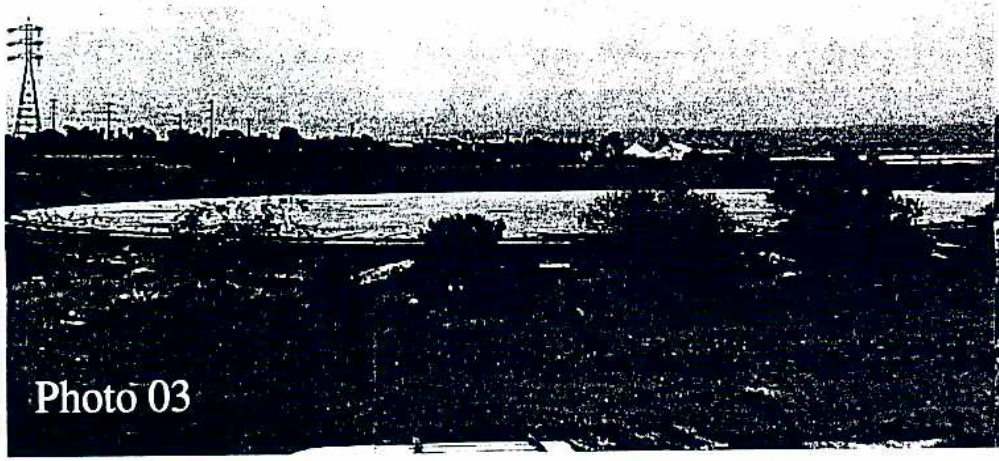

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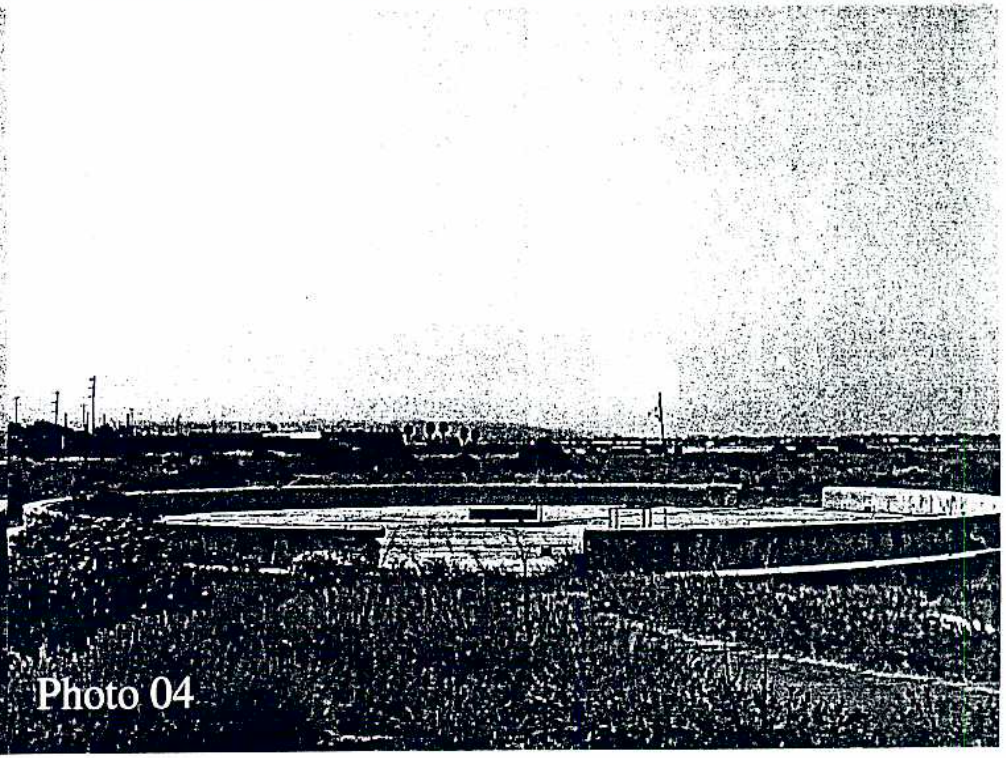

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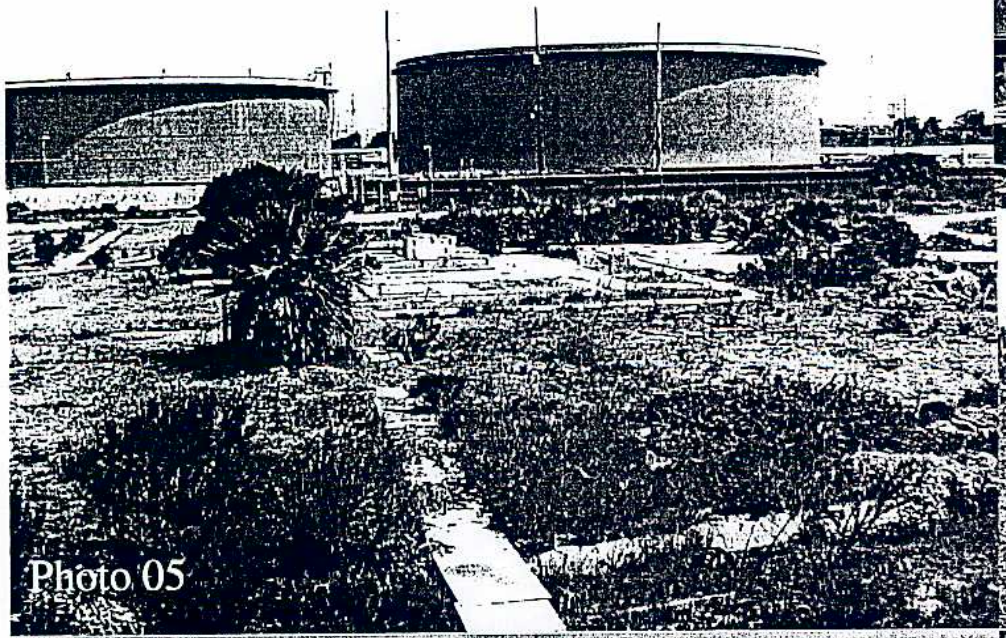

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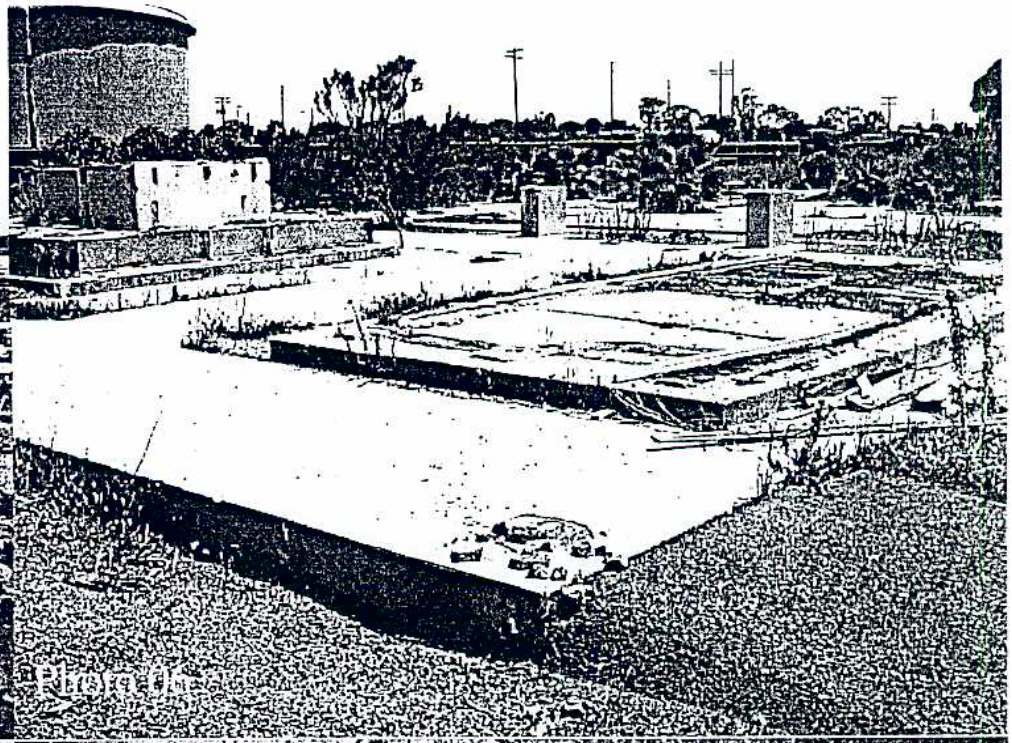

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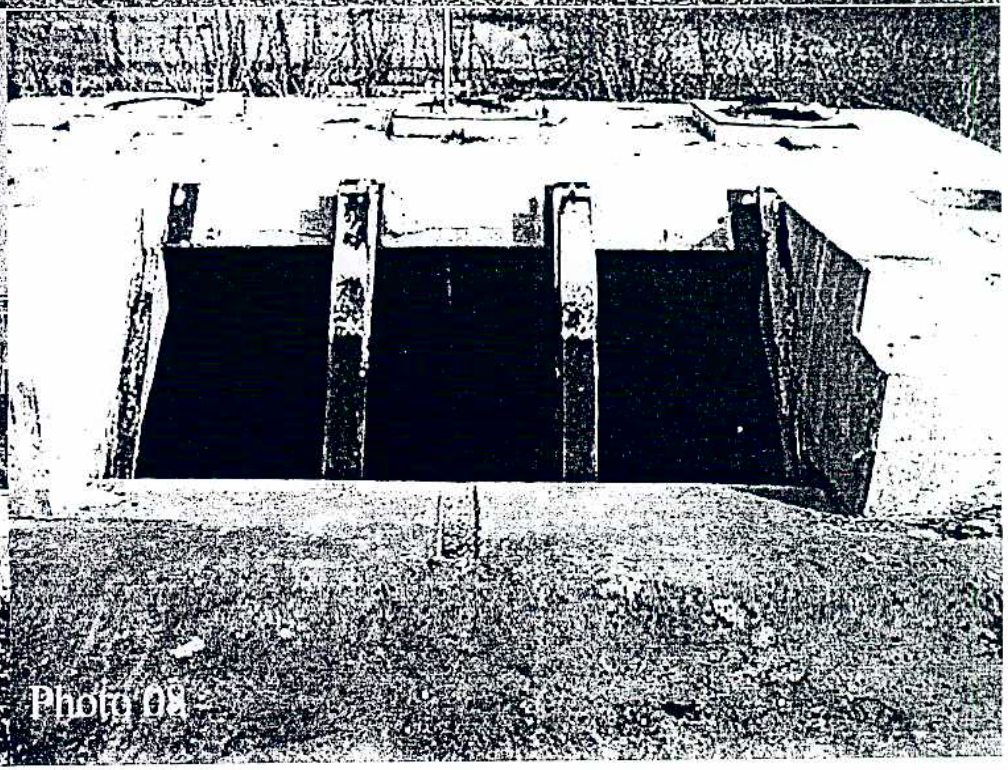
Photo 07



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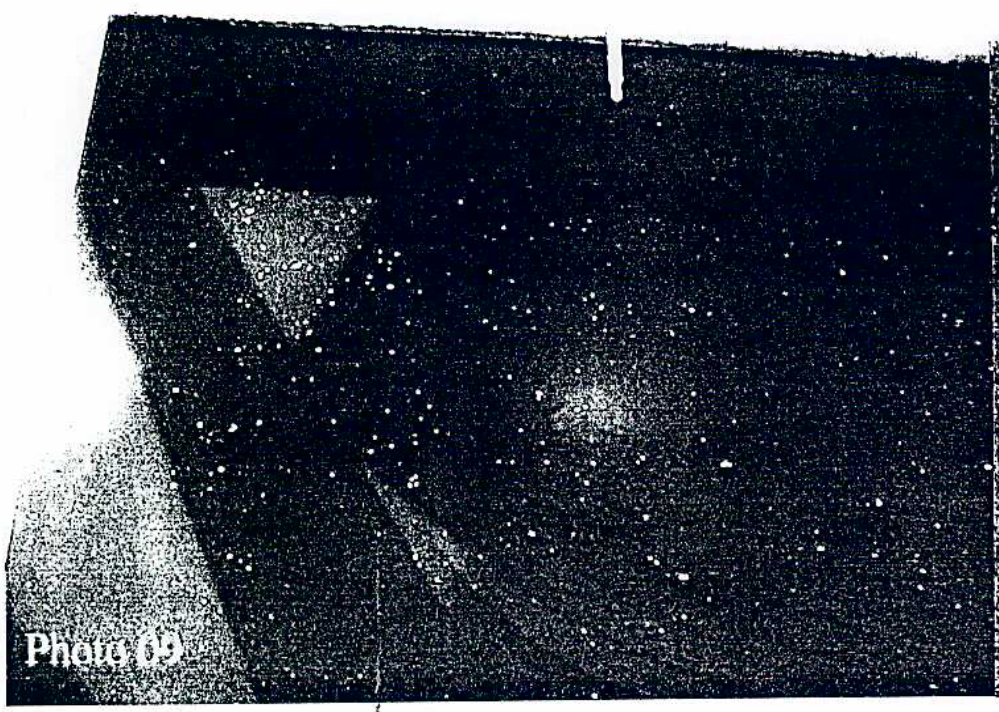

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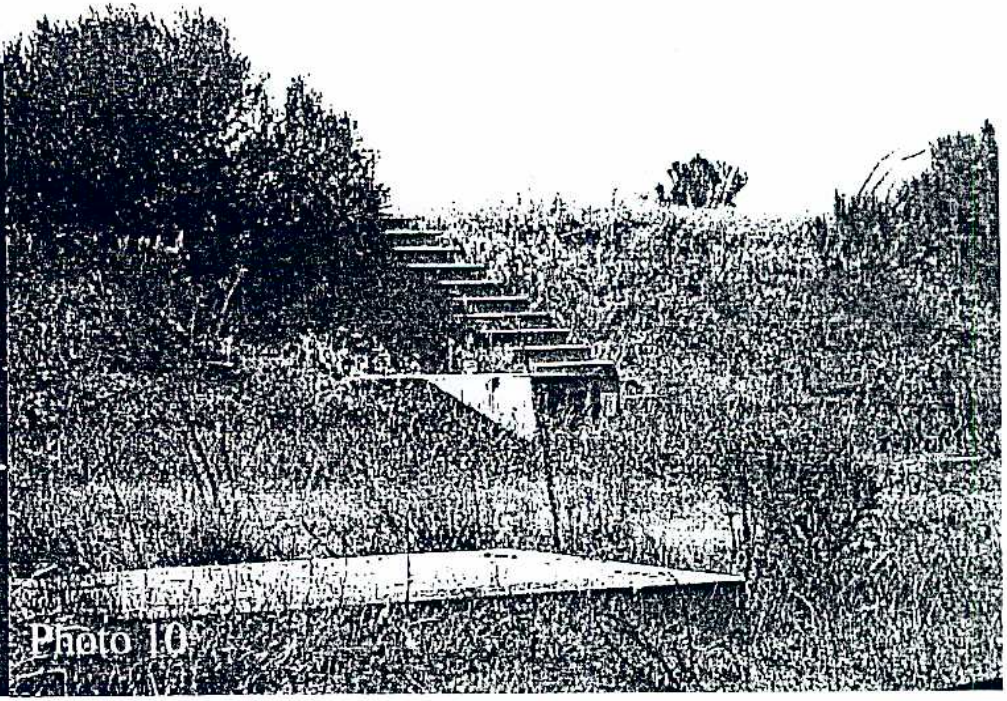

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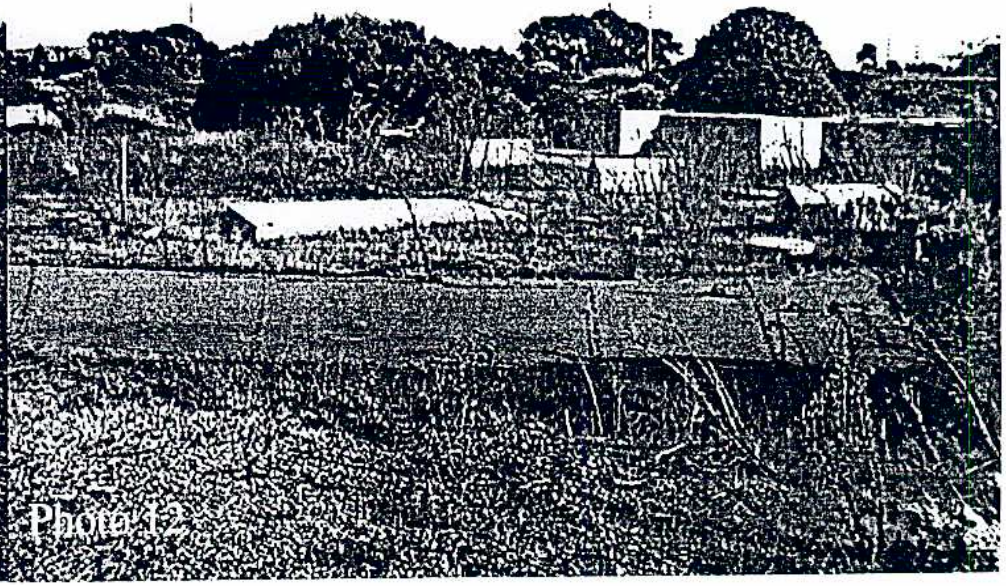

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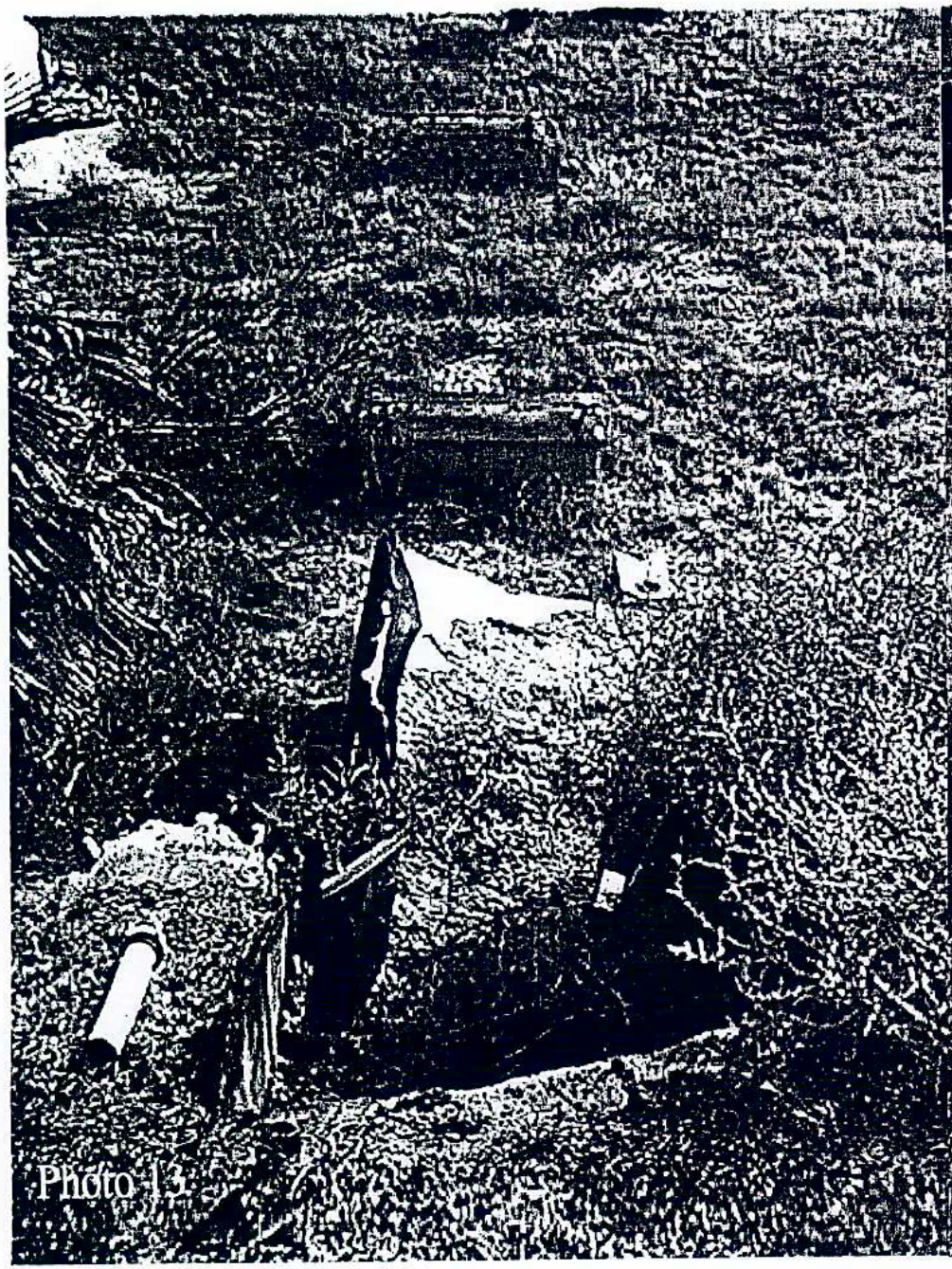

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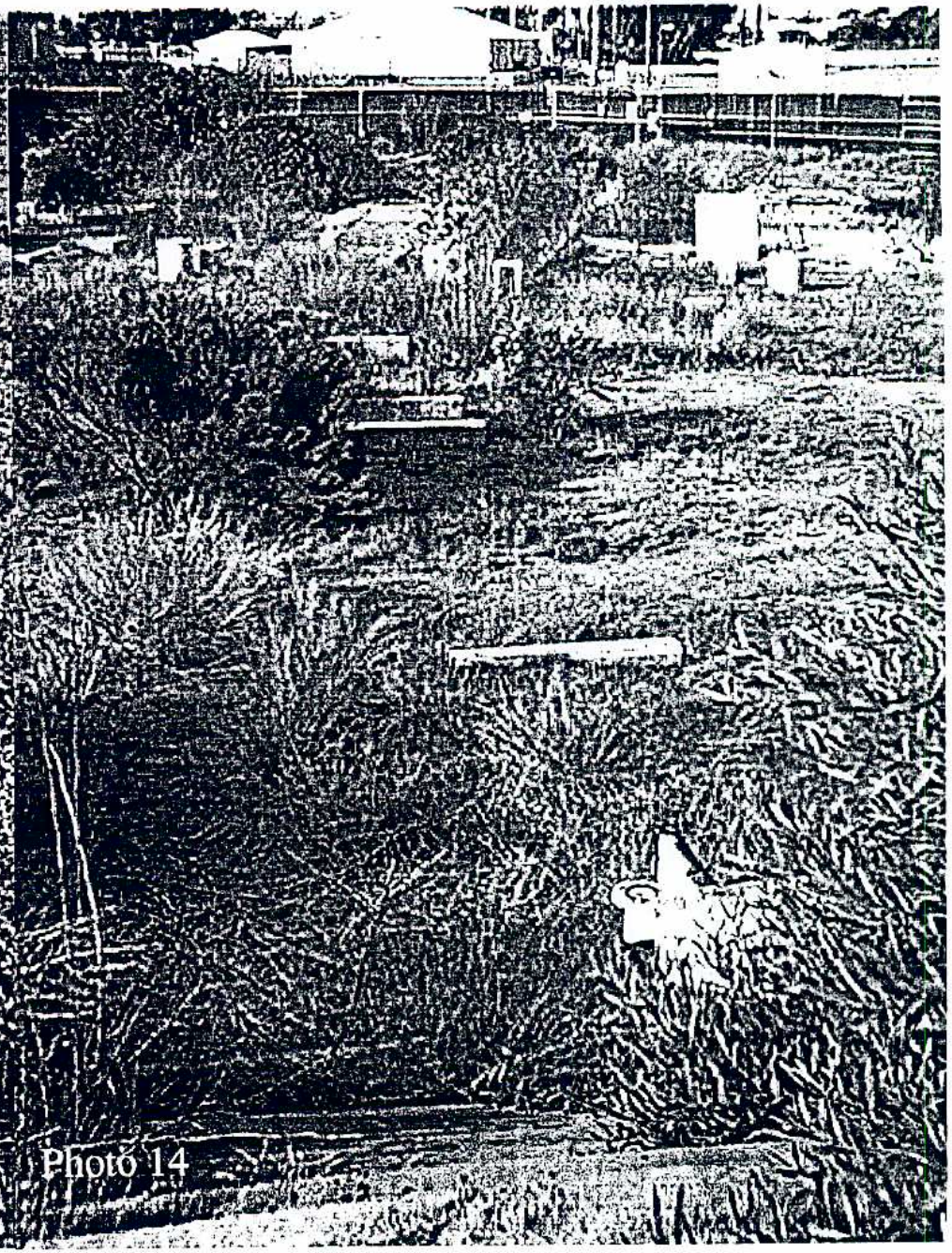

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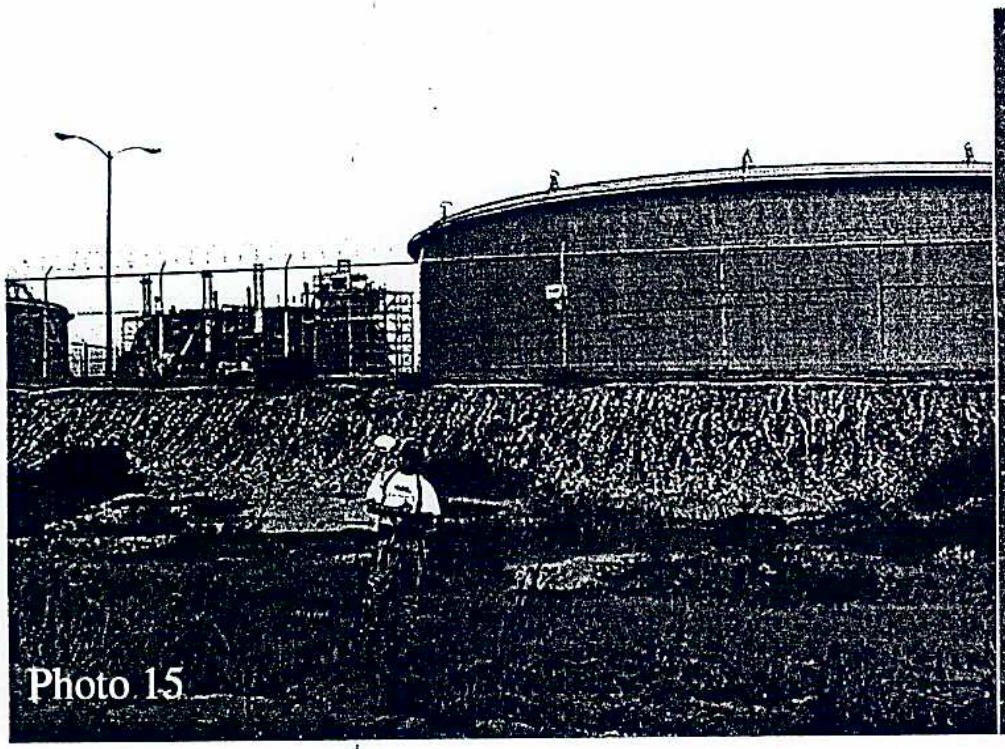

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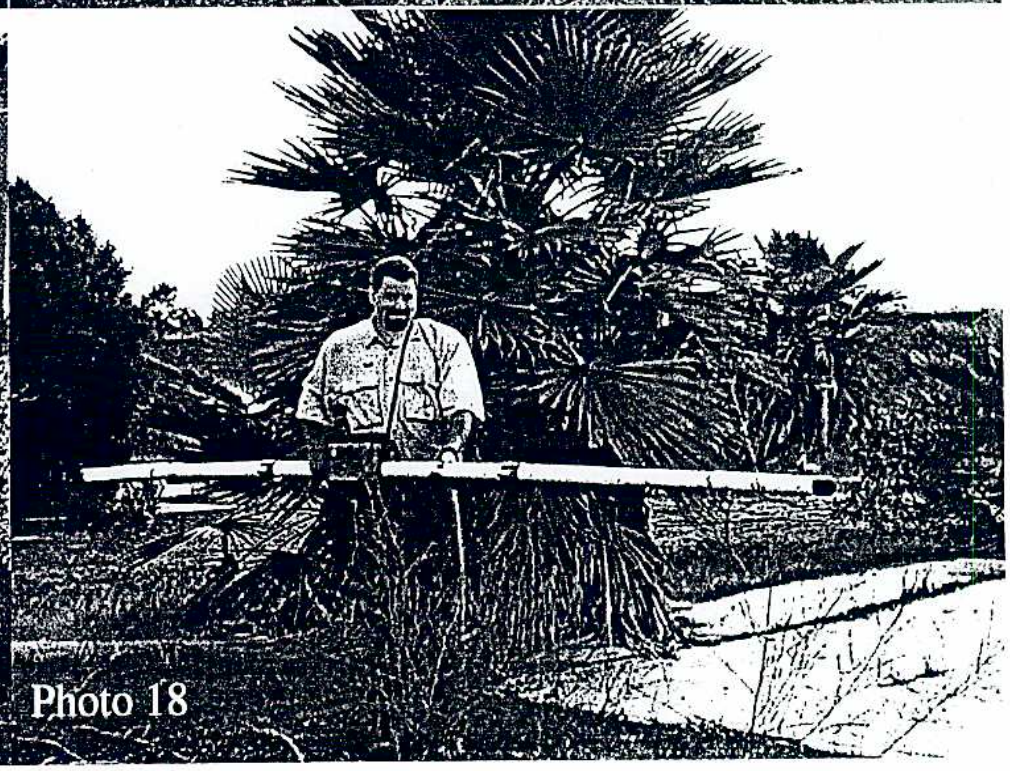
Photo 16

Photo 17



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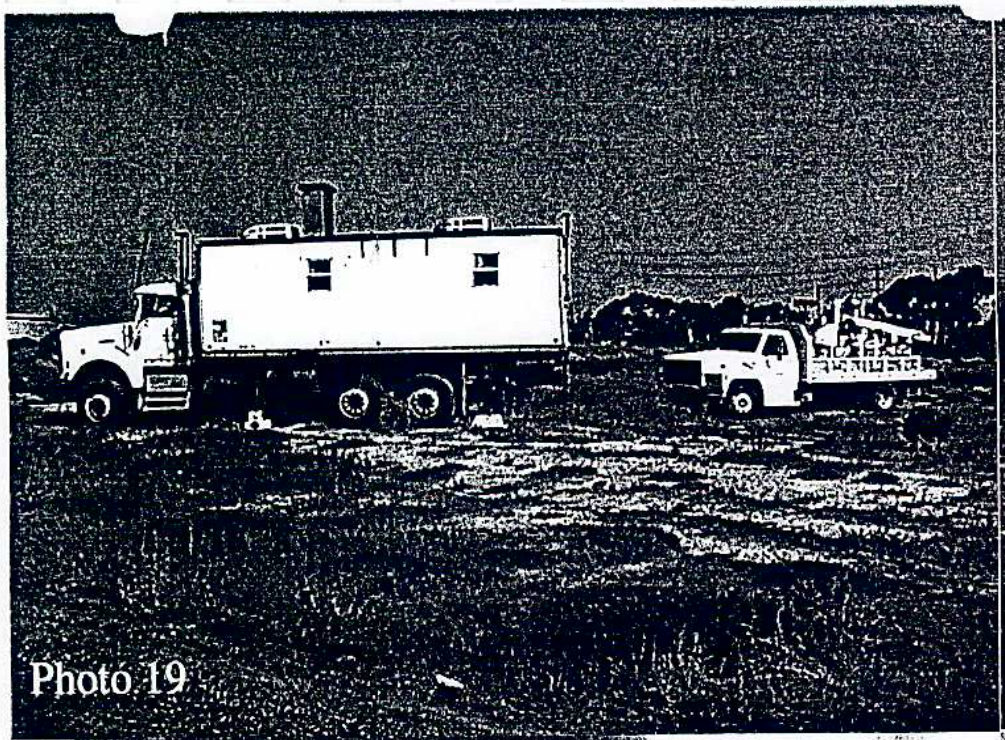

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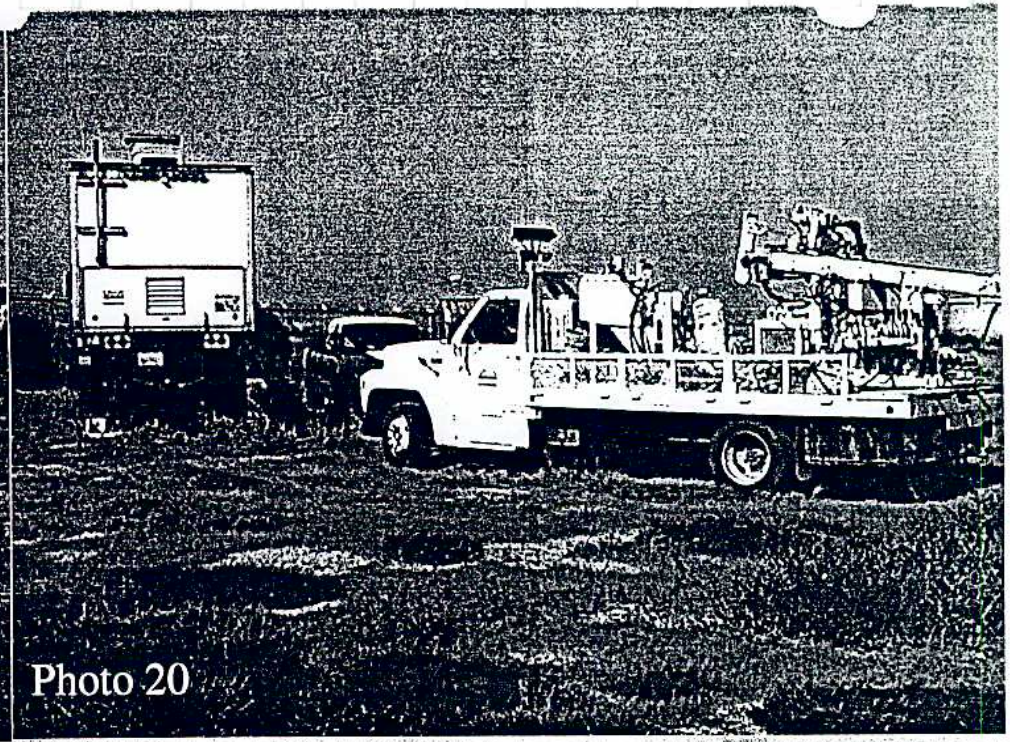

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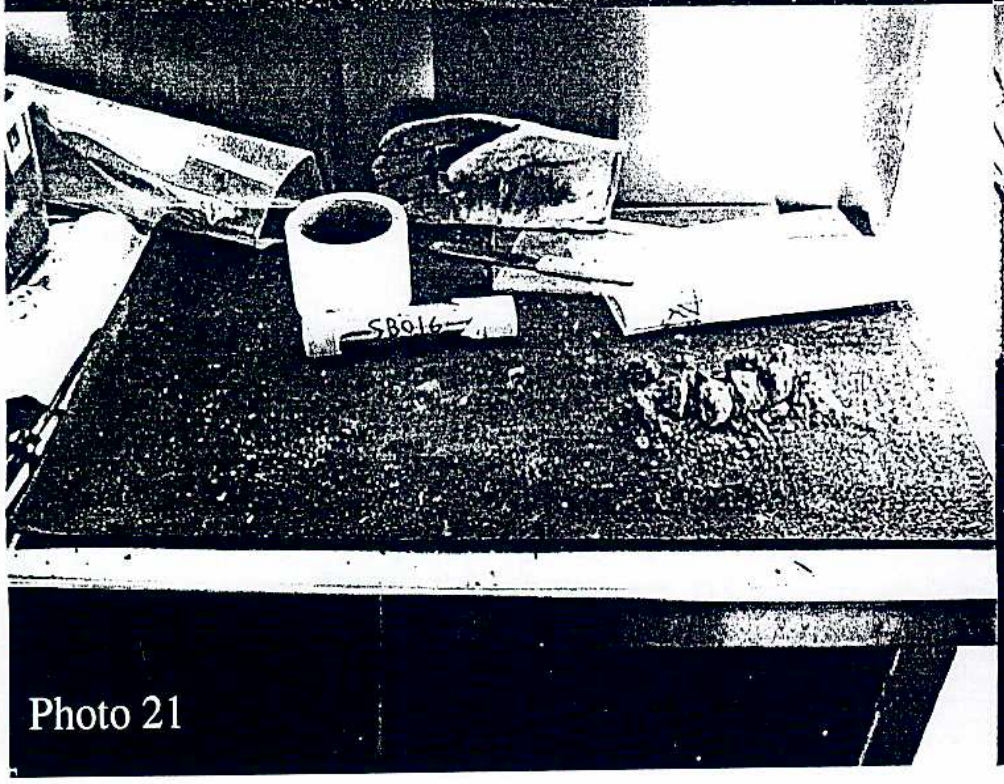

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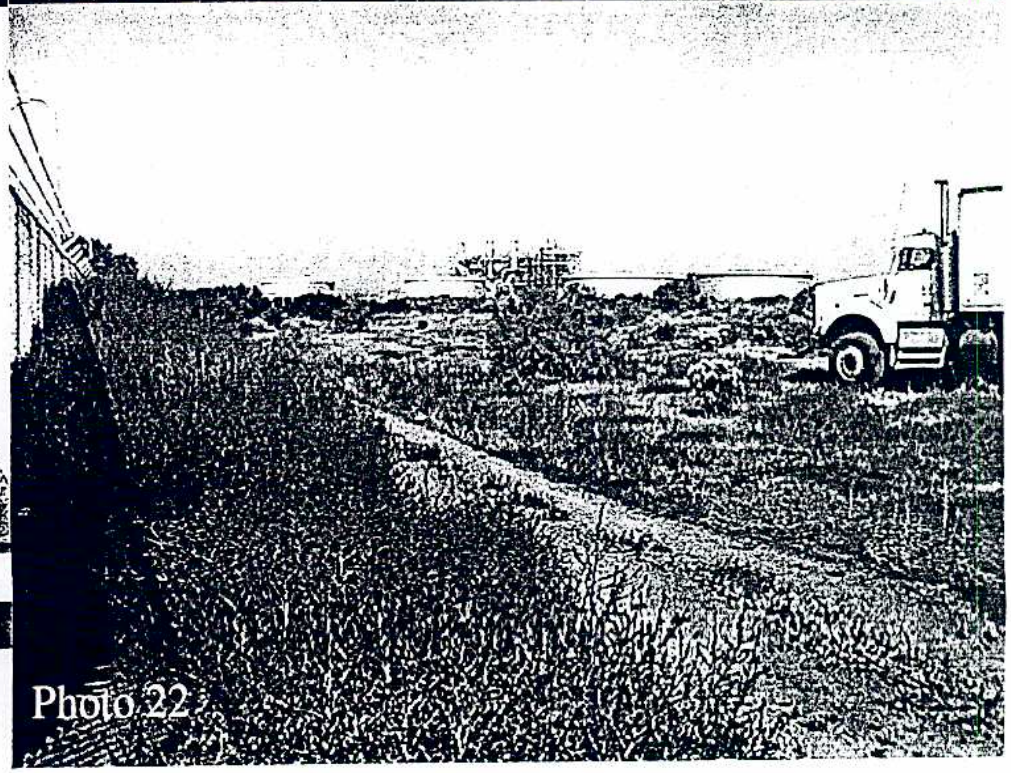

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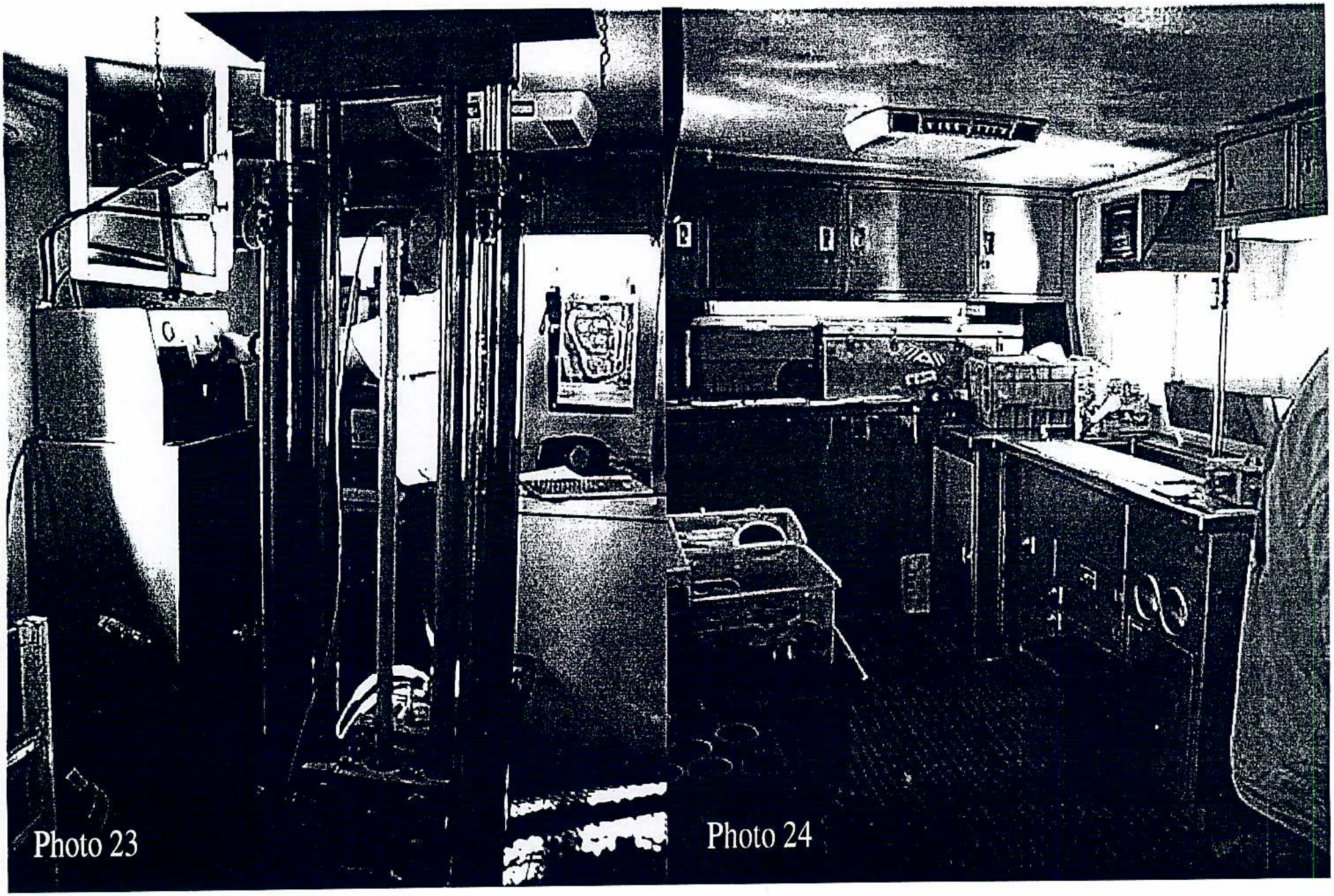

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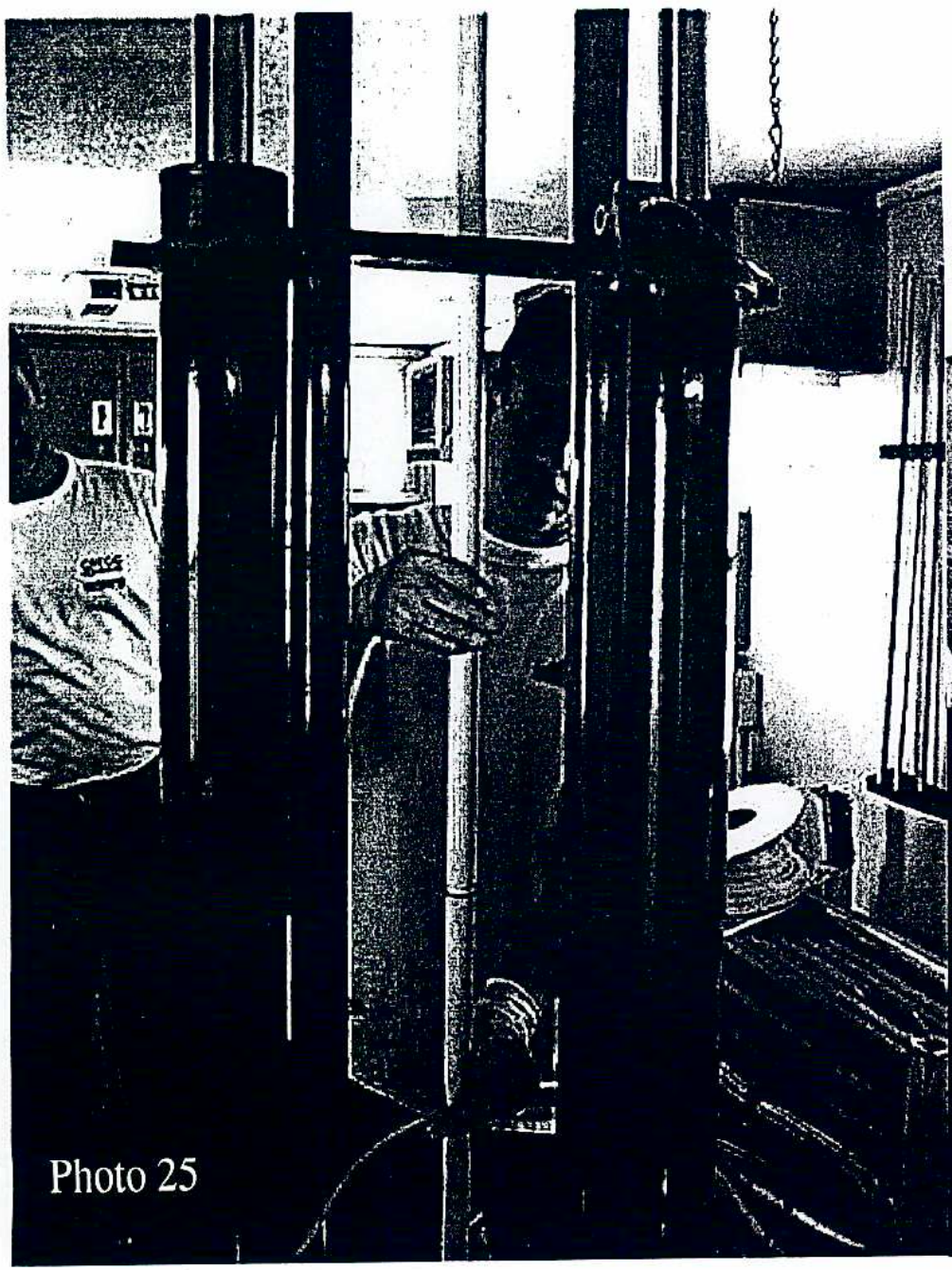

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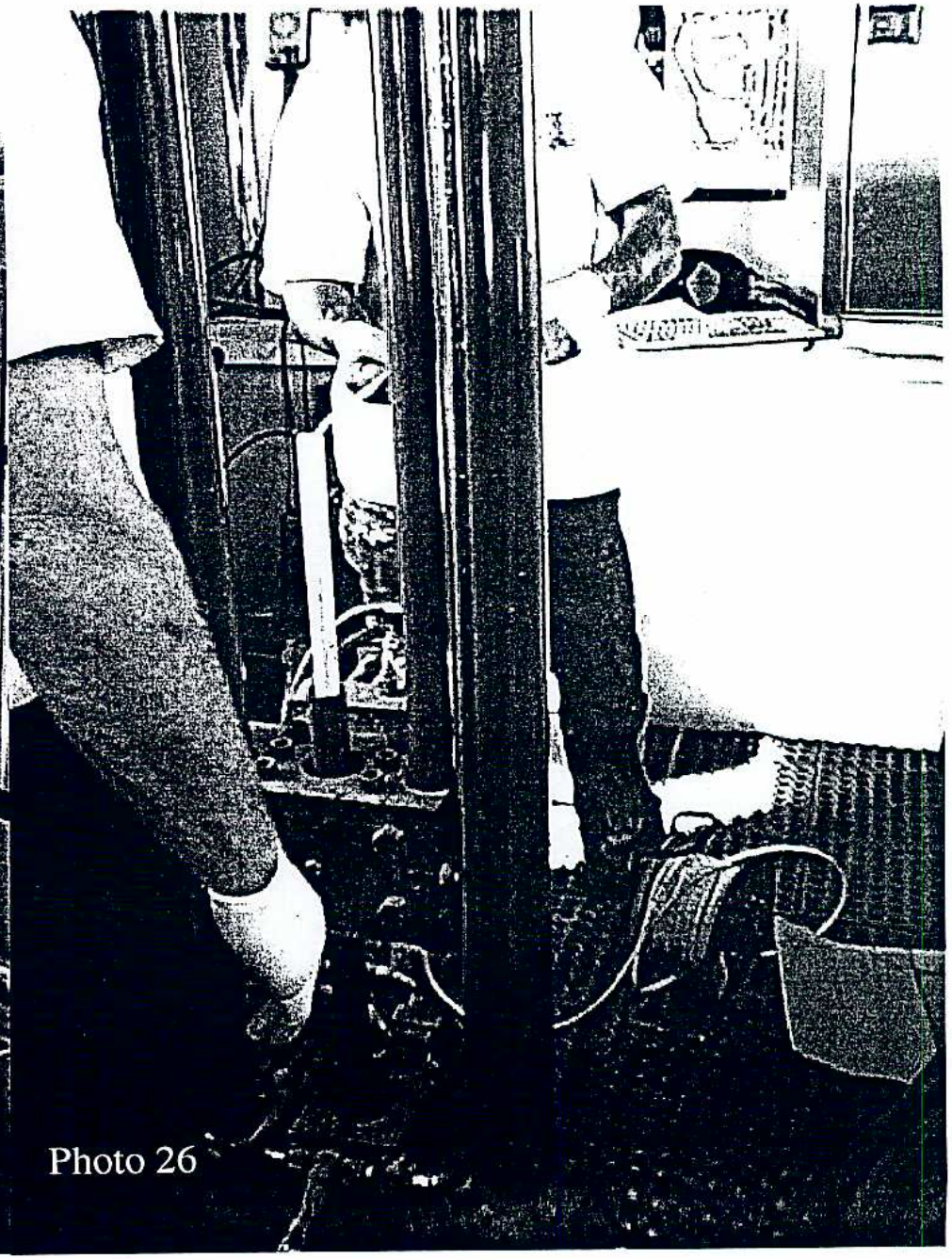

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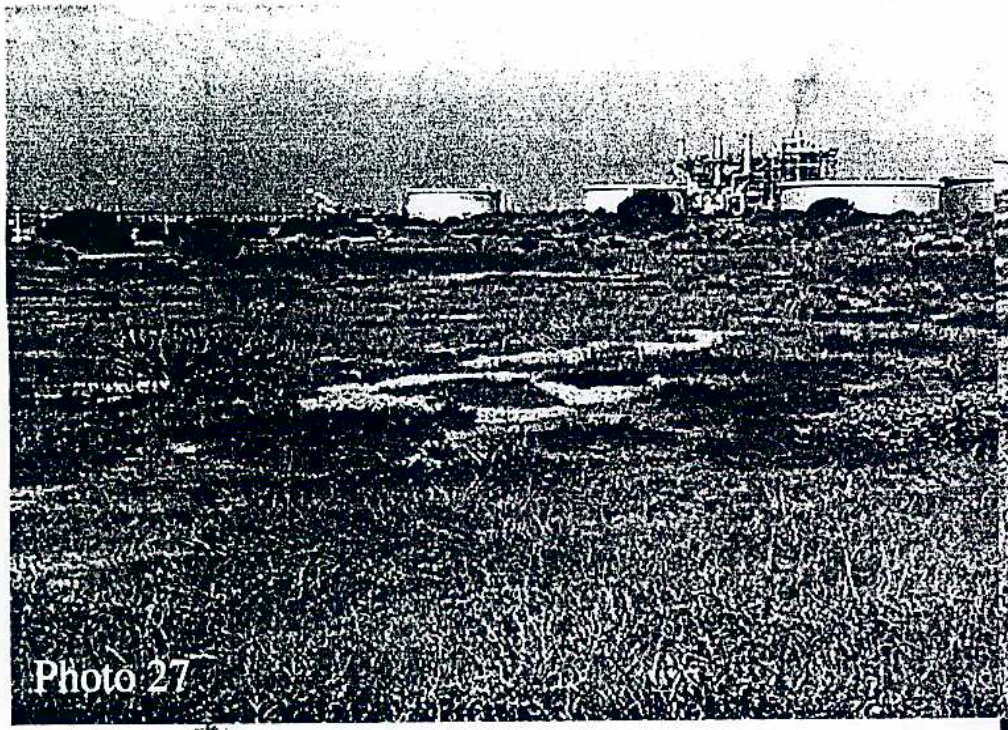

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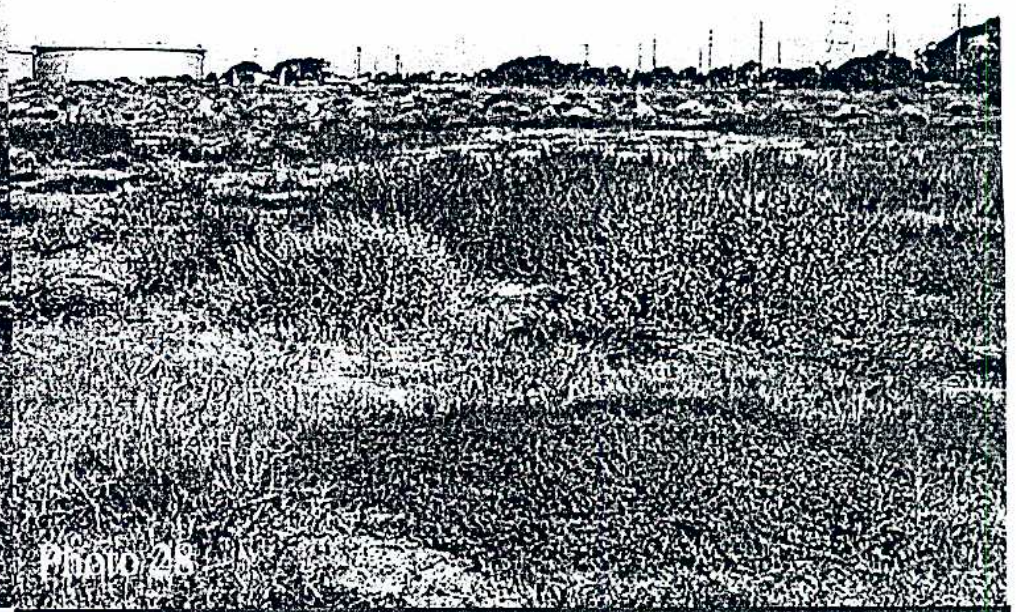

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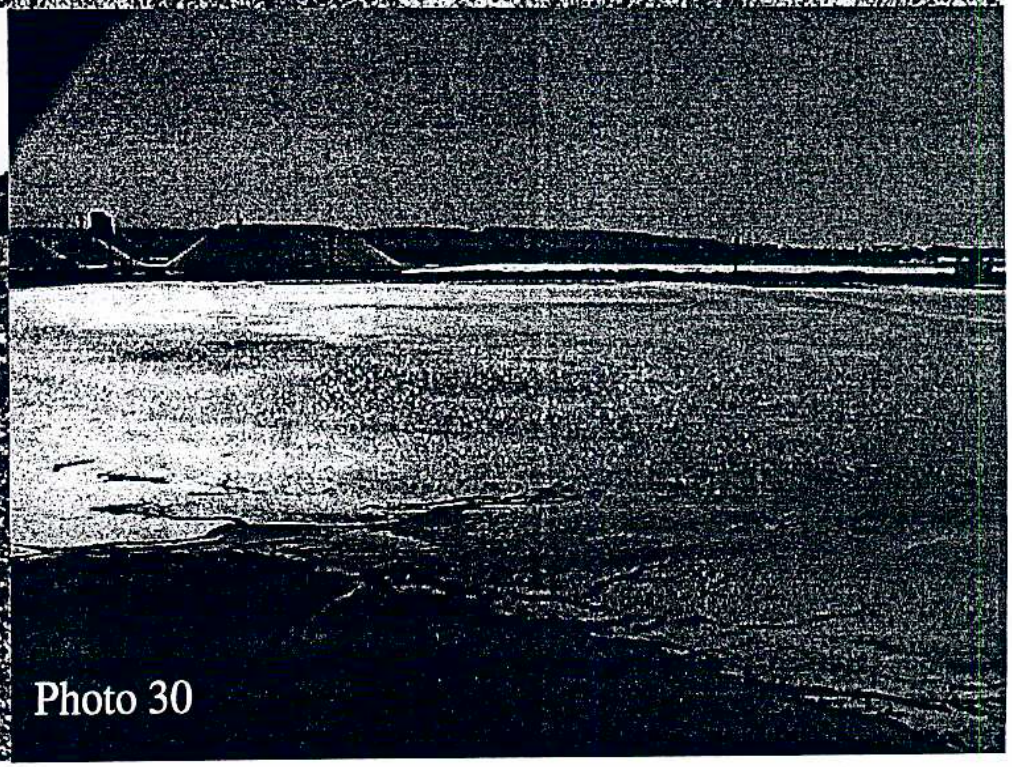

Photo 30

APPENDIX C

Electromagnetic Survey Data

Line	Station	Survey Direction	Quadrature (mS/m)	Inphase (ppt)	Comments
A	1	E	204.775	20.477	fence nearby
A	2	E	104.800	7.560	
A	3	E	94.200	3.980	
A	4	E	103.300	6.260	
A	5	E	134.200	10.560	
B	1	E	137.500	15.070	fence nearby
B	2	E	113.400	4.210	
B	3	E	77.000	-0.527	
B	4	E	66.900	-1.550	
B	5	E	76.100	-1.090	
B	6	E	89.600	0.170	
B	7	E	100.100	3.385	
B	8	E	121.375	7.430	
C	1	E	93.000	6.790	fence nearby
C	2	E	87.600	0.300	
C	3	E	80.400	-1.100	
C	4	E	65.025	-1.840	
C	5	E	73.900	-1.680	
C	6	E	86.900	-0.970	
C	7	E	95.800	-0.300	
C	8	E	98.300	0.770	
C	9	E	92.700	1.770	
C	10	E	128.900	8.450	
D	1	E	109.900	8.150	
D	2	E	97.700	3.550	
D	3	E	77.800	-4.617	
D	4	E	74.825	-5.480	
D	5	E	65.000	-5.950	
D	6	E	70.925	-5.667	
D	7	E	83.800	-4.767	
D	8	E	100.200	-3.470	
D	9	E	102.000	-3.270	
D	10	E	100.900	-3.730	
D	11	E	110.300	-3.700	
D	12	E	92.400	-4.730	
D	13	E	77.100	-5.310	
D	14	E	92.100	-4.162	
D	15	E	110.400	-0.315	
E	1	W	93.400	-3.787	
E	2	W	86.100	-6.330	
E	3	W	106.500	-6.180	
E	4	W	91.500	-5.630	
E	5	W	85.175	-4.987	
E	6	W	101.000	-4.190	
E	7	W	88.600	-3.570	
E	8	W	90.600	-4.140	
E	9	W	86.200	-4.312	
E	10	W	69.700	-5.600	
E	11	W	60.800	-6.510	
E	12	W	56.200	-6.447	
E	13	W	71.200	-6.090	

Line	Station	Survey Direction	Quadrature (mS/m)	Inphase (ppt)	Comments
E	14	W	71.625	-4.256	
E	15	W	68.200	-3.850	
E	16	W	86.100	3.332	
F	1	E	77.300	1.172	
F	2	E	75.700	-3.930	
F	3	E	68.000	-4.520	
F	4	E	66.975	-4.260	
F	5	E	61.750	-5.932	
F	6	E	72.500	-5.420	
F	7	E	71.100	-5.687	
F	8	E	76.750	-5.120	
F	9	E	78.600	-4.840	
F	10	E	86.900	-4.530	
F	11	E	84.500	-5.060	
F	12	E	86.100	-5.607	
F	13	E	109.600	-4.880	
F	14	E	120.900	-5.100	
F	15	E	94.200	-6.080	
F	16	E	93.300	-2.060	
G	1	W	96.400	-3.240	
G	2	W	110.100	-5.040	
G	3	W	107.050	-5.112	
G	4	W	110.000	-4.960	
G	5	W	98.300	-5.070	
G	6	W	95.400	-4.190	
G	7	W	86.925	-4.780	
G	8	W	91.550	-4.247	
G	9	W	93.100	-3.830	
G	10	W	89.200	-3.592	
G	11	W	74.800	-5.770	
G	12	W	65.900	-6.040	
G	13	W	70.800	-5.060	
G	14	W	78.000	-3.690	
G	15	W	72.900	-3.110	
G	16	W	72.400	-0.480	
H	1	E	80.700	0.410	
H	2	E	75.300	-3.820	
H	3	E	77.900	-4.280	
H	4	E	73.300	-6.100	
H	5	E	62.000	-5.957	
H	6	E	73.100	-6.000	
H	7	E	82.800	-4.637	
H	8	E	97.400	-4.060	
H	9	E	101.775	-3.810	
H	10	E	112.600	-3.847	
H	11	E	117.700	-3.910	
H	12	E	124.425	-3.950	
H	13	E	117.300	-4.247	
H	14	E	106.200	-5.360	
H	15	E	90.800	-5.500	
H	16	E	101.000	0.972	

Line	Station	Survey Direction	Quadrature (mS/m)	Inphase (ppt)	Comments
I	1	W	94.525	-5.900	
I	2	W	106.925	-4.830	
I	3	W	102.300	-5.057	
I	4	W	125.200	-3.987	
I	5	W	108.300	-3.910	
I	6	W	105.100	-3.750	
I	7	W	103.800	-3.337	
I	8	W	91.000	-4.457	
I	9	W	73.275	-5.577	
I	10	W	74.000	-5.610	
I	11	W	70.250	-4.960	
I	12	W	91.400	-2.830	
I	13	W	72.800	-1.167	
J	1	E	81.100	-0.080	
J	2	E	101.300	-1.800	
J	3	E	89.500	-3.227	
J	4	E	73.800	-4.990	
J	5	E	72.600	-5.637	
J	6	E	83.700	-5.240	
J	7	E	104.700	-4.230	
J	8	E	103.000	-4.280	
J	9	E	102.525	-4.960	
J	10	E	107.700	-5.026	
J	11	E	111.800	-5.325	
J	12	E	87.725	-5.857	
J	13	E	96.300	-5.827	
J	14	E	92.000	-5.506	
K	1	N	92.400	-5.877	
K	2	N	83.600	-7.100	
K	3	N	82.400	-6.710	
K	4	N	97.200	-5.510	
K	5	N	111.500	-4.235	
K	6	N	121.800	-3.885	
K	7	N	111.900	-4.750	
K	8	N	109.675	-4.850	
K	9	N	109.600	-4.705	
K	10	N	119.725	-5.410	
K	11	N	125.000	-4.150	
K	12	N	113.300	-4.755	
K	13	N	103.300	-5.407	
K	14	N	116.200	-5.170	
K	15	N	121.200	-2.470	
K	16	N	160.800	4.307	
L	1	S	164.475	3.365	
L	2	S	140.400	-0.650	
L	3	S	131.375	-3.867	
L	4	S	121.100	-4.550	
L	5	S	132.600	-2.325	
L	6	S	153.250	-2.567	
L	7	S	128.625	-1.725	
L	8	S	145.800	-1.142	

Line	Station	Survey Direction	Quadrature (mS/m)	Inphase (ppt)	Comments
L	9	S	145.675	-1.875	
L	10	S	160.775	-1.985	
L	11	S	111.550	-4.705	slightly anomalous
L	12	S	83.600	-5.095	slightly anomalous
L	13	S	75.200	-4.970	slightly anomalous
M	1		106.100	-0.170	
M	2		125.700	1.745	
M	3		114.300	0.810	
M	4		107.600	0.740	
M	5		100.200	0.260	
M	6		105.700	-0.765	
M	7		112.500	-0.800	
M	8		96.600	-1.480	
M	9		105.300	-0.822	
M	10		125.300	1.397	
M	11		147.225	2.852	
M	12		129.800	1.010	
M	13		128.600	0.970	
M	14		119.800	0.372	
M	15		139.900	0.430	
M	16		121.900	-0.920	
M	17		87.000	-3.360	
M	18		109.300	-2.740	
N	1		160.700	-1.230	
N	2		154.200	-0.920	
N	3		165.100	1.702	
N	4		197.700	7.372	
N	5		158.400	3.460	
N	6		152.200	2.712	
N	7		204.775	6.425	
N	8		204.775	8.230	
N	9		152.200	2.677	
N	10		133.675	0.070	
N	11		138.800	0.490	
N	12		116.500	-1.372	
N	13		113.400	0.097	
N	14		119.925	-0.600	
N	15		119.400	-1.970	
N	16		106.000	-2.180	
N	17		92.000	-2.620	
O	1	N	88.400	-6.477	
O	2	N	91.500	-6.066	
O	3	N	97.400	-6.135	
O	4	N	123.700	-5.587	
O	5	N	128.025	-6.857	
O	6	N	145.900	-6.932	
O	7	N	123.100	-7.125	
O	8	N	159.100	-7.046	
O	9	N	113.800	-7.060	
O	10	N	106.800	-6.816	
O	11	N	120.300	-5.157	

Line	Station	Survey Direction	Quadrature (mS/m)	Inphase (ppt)	Comments
O	12	N	121.800	-5.776	
O	13	N	112.900	-2.250	
O	14	N	119.100	-3.112	
O	15	N	68.200	-6.140	
O	16	N	80.200	-5.752	
O	17	N	79.000	-5.967	
O	18	N	90.600	-5.290	
O	19	N	100.300	-4.550	
O	20	N	118.875	-5.302	
O	21	N	94.700	-3.900	
P	1	S	93.600	-4.427	
P	2	S	120.400	-3.637	
P	3	S	105.650	-3.690	
P	4	S	100.800	-4.380	
P	5	S	86.900	-4.905	
P	6	S	93.300	-5.250	
P	7	S	112.400	-3.712	
P	8	S	115.825	-3.950	
P	9	S	110.025	-5.360	
P	10	S	102.300	-5.492	
P	11	S	98.100	-5.765	
P	12	S	98.000	-5.960	
P	13	S	85.500	-6.490	
P	14	S	91.300	-6.910	
P	15	S	83.125	-6.660	
Q	1	N	104.200	-5.080	
Q	2	N	104.000	-5.890	
Q	3	N	79.100	-6.420	
Q	4	N	89.300	-6.187	
Q	5	N	92.600	-5.790	
Q	6	N	99.200	-5.480	
Q	7	N	109.800	-4.380	
Q	8	N	142.750	0.052	slightly anomalous
Q	9	N	125.700	-2.247	
Q	10	N	96.500	-4.430	
Q	11	N	99.700	-4.420	
Q	12	N	126.500	-3.512	
Q	13	N	93.400	-4.270	
Q	14	N	83.200	-5.137	
R	1	N/CW	40.625	-7.995	CW = clockwise
R	2	N/CW	37.200	-7.360	
R	3	N/CW	44.175	-7.370	
R	4	N/CW	47.000	-7.100	
R	5	N/CW	46.100	-6.937	
R	6	N/CW	45.600	-6.780	
R	7	N/CW	45.800	-7.670	
R	8	N/CW	40.900	-5.802	
R	9	N/CW	32.525	20.477	anomalous, in berm
R	10	N/CW	172.400	15.540	anomalous, in berm
R	11	N/CW	65.700	20.477	anomalous, in berm
R	12	N/CW	204.775	20.477	anomalous, in berm

Line	Station	Survey Direction	Quadrature (mS/m)	Inphase (ppt)	Comments
R	13	N/CW	49.500	-5.407	
R	14	N/CW	54.200	-5.820	
R	15	N/CW	53.600	-5.910	
R	16	N/CW	50.900	-6.670	
R	17	N/CW	50.925	-7.110	
R	18	N/CW	58.500	-6.850	
R	19	N/CW	57.800	-7.032	
R	20	N/CW	65.000	-7.170	
R	21	N/CW	130.900	-3.790	slightly anomalous
R	22	N/CW	55.975	-6.732	
R	23	N/CW	53.600	-7.140	
R	24	N/CW	57.400	-6.900	
R	25	N/CW	59.950	-6.730	
R	26	N/CW	69.875	-6.470	
R	27	N/CW	55.500	-6.917	
R	28	N/CW	54.425	-7.050	
R	29	N/CW	53.400	-6.562	
R	30	N/CW	44.800	-6.980	
R	31	N/CW	44.000	-6.450	
R	32	N/CW	49.400	-6.010	
R	33	N/CW	55.725	-5.450	
R	34	N/CW	65.500	-5.430	
R	35	N/CW	68.600	-5.006	
R	36	N/CW	66.200	-4.117	
R	37	N/CW	57.225	-4.227	
R	38	N/CW	54.650	-5.022	
R	39	N/CW	67.800	-4.440	
R	40	N/CW	70.900	-3.895	
R	41	N/CW	79.900	-2.390	
R	42	N/CW	65.200	-3.150	
R	43	N/CW	53.525	-4.830	
R	44	N/CW	54.875	-4.810	
R	45	N/CW	64.400	-3.870	
R	46	N/CW	78.700	-2.290	
R	47	N/CW	57.000	-5.776	
R	48	N/CW	48.000	-6.460	
R	49	N/CW	47.300	-6.807	
R	50	N/CW	31.800	-20.470	anomalous, berm staircase
R	51	N/CW	46.600	-7.077	
R	52	N/CW	41.975	-6.990	
R	53	N/CW	41.200	-6.820	
S	1	S	135.400	1.010	
S	2	S	-14.200	-20.470	anomalous, LNG tank pad
S	3	S	33.000	-15.785	anomalous, LNG tank pad
S	4	S	146.000	0.010	
S	5	S	115.400	-4.010	
S	6	S	110.050	-4.250	
S	7	S	121.200	-4.060	
S	8	S	137.275	-2.990	
S	9	S	120.900	-3.540	
S	10	S	111.100	-3.740	

Line	Station	Survey Direction	Quadrature (mS/m)	Inphase (ppt)	Comments
S	11	S	126.900	-3.330	
S	12	S	117.200	-3.840	
S	13	S	122.000	-3.310	
T	1	N	112.700	-3.500	
T	2	N	139.400	-1.592	
T	3	N	134.975	-2.370	
T	4	N	126.400	-3.070	
T	5	N	129.225	-3.467	
T	6	N	124.625	-3.740	
T	7	N	126.150	-4.860	
T	8	N	97.000	-4.670	
T	9	N	112.800	-3.450	
T	10	N	127.300	15.847	anomalous, LNG tank pad
T	11	N	-118.975	20.477	anomalous, LNG tank pad
T	12	N	-182.524	20.477	anomalous, LNG tank pad
T	13	N	162.800	20.477	anomalous, LNG tank pad
T	14	N	86.800	0.840	
U	1	S	60.400	-11.950	anomalous, LNG tank pad
U	2	S	204.775	20.477	anomalous, LNG tank pad
U	3	S	-98.350	-20.470	anomalous, LNG tank pad
U	4	S	58.800	-9.559	anomalous, LNG tank pad
U	5	S	92.800	-3.405	
U	6	S	99.200	-4.120	
U	7	S	98.800	-4.862	
U	8	S	117.100	-4.090	
U	9	S	113.700	-3.822	
U	10	S	115.975	-3.300	
U	11	S	128.025	-1.990	
U	12	S	138.500	-2.010	
U	13	S	116.300	-2.550	
V	1	N	125.500	-0.807	
V	2	N	155.900	0.452	
V	3	N	141.025	-0.240	
V	4	N	137.450	-1.430	
V	5	N	119.200	-2.727	
V	6	N	115.600	-3.220	
V	7	N	93.900	-4.707	
V	8	N	88.000	-4.210	
V	9	N	90.675	-4.776	
V	10	N	90.700	-3.830	
V	11	N	82.750	-2.665	
V	12	N	122.350	6.580	
V	13	N	121.500	-2.340	
W	1	S	98.400	-4.420	
W	2	S	115.100	-2.420	
W	3	S	133.200	-2.350	
W	4	S	132.100	-1.860	
W	5	S	168.600	0.500	
W	6	S	155.400	0.730	
W	7	S	188.000	2.910	
W	8	S	172.900	2.445	

Line	Station	Survey Direction	Quadrature (mS/m)	Inphase (ppt)	Comments
X	1	N	134.500	0.640	
X	2	N	156.300	0.310	
X	3	N	134.800	-1.840	
X	4	N	143.400	-0.846	
X	5	N	158.600	0.285	
X	6	N	124.400	-2.347	
X	7	N	90.200	-3.830	
X	8	N	103.125	-3.310	
X	9	N	104.900	-2.740	
X	10	N	124.700	-1.910	
X	11	N	114.500	-1.730	
X	12	N	108.600	-2.015	
X	13	N	102.800	-3.690	
Y	1	S	114.100	-2.197	
Y	2	S	156.200	19.430	anomalous, LNG tank pad
Y	3	S	157.400	20.477	anomalous, LNG tank pad
Y	4	S	204.775	20.477	anomalous, LNG tank pad
Y	5	S	96.600	2.925	
Y	6	S	86.500	-1.987	
Y	7	S	85.600	-2.180	
Y	8	S	113.200	-1.410	
Y	9	S	139.800	1.362	
Y	10	S	177.600	2.660	
Y	11	S	132.400	-0.877	
Y	12	S	167.200	0.920	
Z	1	N	195.000	6.470	
Z	2	N	163.700	4.100	
Z	3	N	137.000	0.905	
Z	4	N	104.275	-0.777	
Z	5	N	99.400	-0.822	
Z	6	N	117.200	13.060	anomalous, LNG tank pad
Z	7	N	-27.400	20.477	anomalous, LNG tank pad
Z	8	N	-26.775	20.477	anomalous, LNG tank pad
Z	9	N	-23.975	20.477	anomalous, LNG tank pad
Z	10	N	-2.200	-20.470	anomalous, LNG tank pad
Z	11	N	106.100	1.017	
AA	1	S	111.900	-0.880	
AA	2	S	116.300	-0.830	
AA	3	S	98.950	1.650	
AA	4	S	115.400	4.387	
AA	5	S	111.100	2.750	
AA	6	S	86.600	-0.440	
AA	7	S	124.825	1.700	
AA	8	S	138.700	2.010	
AB	1	E	111.500	-6.327	
AB	2	E	121.600	-6.365	
AB	3	E	105.325	-6.827	
AB	4	E	99.600	-6.316	
AB	5	E	118.750	-5.972	
AB	6	E	106.725	-6.770	
AB	7	E	87.500	-6.952	

Line	Station	Survey Direction	Quadrature (mS/m)	Inphase (ppt)	Comments
AB	8	E	98.300	-6.740	
AB	9	E	97.700	-7.470	
AB	10	E	102.900	-7.820	
AB	11	E	108.400	-7.625	
AB	12	E	103.300	-7.720	
AB	13	E	106.200	-6.670	
AB	14	E	109.700	-6.480	
AB	15	E	141.050	-3.477	
AB	16	E	95.875	-6.210	
AB	17	E	126.225	3.382	anomalous, concrete pads
AB	18	E	127.400	12.755	anomalous, concrete pads
AB	19	E	56.900	-10.600	anomalous, concrete pads
AB	20	E	104.000	-0.760	
AB	21	E	139.200	-0.315	
AB	22	E	100.800	-4.372	
AB	23	E	100.900	-2.970	
AB	24	E	51.900	-20.470	anomalous, concrete pads
AB	25	E	-95.025	20.477	anomalous, concrete pads
AC	1	W	151.925	5.140	
AC	2	W	137.700	-3.110	
AC	3	W	204.775	14.600	anomalous, concrete pads
AC	4	W	146.200	20.477	anomalous, concrete pads
AC	5	W	101.300	20.477	anomalous, concrete pads
AC	6	W	131.725	20.477	anomalous, concrete pads
AC	7	W	204.775	20.477	anomalous, concrete pads
AC	8	W	196.825	20.477	anomalous, concrete pads
AC	9	W	193.225	20.477	anomalous, concrete pads
AC	10	W	149.500	6.300	
AC	11	W	133.175	-0.560	
AC	12	W	144.000	-5.390	
AC	13	W	79.100	-7.590	
AC	14	W	103.500	-2.637	
AC	15	W	-204.700	-20.470	anomalous, concrete pads
AC	16	W	-204.700	-20.470	anomalous, concrete pads
AC	17	W	-204.700	-20.470	anomalous, concrete pads
AC	18	W	88.000	-0.767	
AC	19	W	38.900	-20.470	anomalous, concrete pads
AC	20	W	24.600	-20.470	anomalous, concrete pads
AC	21	W	204.775	20.477	anomalous, concrete pads
AC	22	W	-81.824	-20.470	anomalous, concrete pads
AC	23	W	106.700	1.750	
AC	24	W	204.775	20.477	anomalous, concrete pads
AC	25	W	126.175	-20.470	anomalous, concrete pads
AC	26	W	134.100	20.477	anomalous, concrete pads
AC	27	W	143.750	13.210	anomalous, concrete pads
AC	28	W	145.900	-6.375	
AC	29	W	100.600	-1.350	
AC	30	W	91.900	-2.950	
AD	1	E	113.800	3.010	
AD	2	E	-204.700	20.477	anomalous, cooling tower
AD	3	E	181.475	20.477	anomalous, cooling tower

Line	Station	Survey Direction	Quadrature (mS/m)	Inphase (ppt)	Comments
AD	4	E	124.100	-2.955	
AD	5	E	118.400	-3.880	
AD	6	E	84.725	-4.710	
AD	7	E	95.600	-5.075	
AD	8	E	99.100	-5.400	
AD	9	E	98.000	-4.960	
AD	10	E	96.475	-2.040	
AD	11	E	86.100	-13.075	anomalous, concrete pads
AD	12	E	85.050	-12.550	anomalous, concrete pads
AD	13	E	97.400	-8.677	
AD	14	E	95.725	-6.310	
AD	15	E	103.300	-5.305	
AD	16	E	97.900	-7.050	
AD	17	E	111.500	-4.520	
AD	18	E	134.850	-5.960	
AD	19	E	134.800	-5.377	
AD	20	E	189.900	1.342	anomalous, concrete pads
AD	21	E	-204.700	-20.470	anomalous, concrete pads
AD	22	E	71.700	-20.470	anomalous, concrete pads
AD	23	E	137.900	20.477	anomalous, concrete pads
AD	24	E	100.000	20.477	anomalous, concrete pads
AD	25	E	-39.099	-20.470	anomalous, concrete pads
AD	26	E	158.025	20.477	anomalous, concrete pads
AD	27	E	163.400	-20.470	anomalous, concrete pads
AD	28	E	204.775	20.477	anomalous, concrete pads
AE	1	W	173.100	20.477	anomalous, concrete pads
AE	2	W	134.200	16.620	anomalous, concrete pads
AE	3	W	204.775	20.477	anomalous, concrete pads
AE	4	W	191.600	20.477	anomalous, concrete pads
AE	5	W	204.775	11.380	anomalous, concrete pads
AE	6	W	117.575	-9.427	
AE	7	W	163.875	12.735	anomalous, concrete pads
AE	8	W	144.100	2.180	
AE	9	W	135.675	-3.882	
AE	10	W	126.900	-4.550	
AE	11	W	129.600	-5.000	
AE	12	W	111.525	-6.550	
AE	13	W	99.775	-6.955	
AE	14	W	98.700	-20.365	anomalous, concrete pads
AE	15	W	125.025	14.937	anomalous, concrete pads
AE	16	W	0.300	-18.600	anomalous, concrete pads
AE	17	W	44.100	-20.470	anomalous, concrete pads
AE	18	W	172.900	17.547	anomalous, concrete pads
AE	19	W	173.950	20.477	anomalous, concrete pads
AE	20	W	193.800	10.265	anomalous, concrete pads
AE	21	W	108.425	-2.220	
AE	22	W	120.100	-1.472	
AE	23	W	126.200	-0.980	
AE	24	W	21.700	-20.470	anomalous, concrete pads
AE	25	W	115.700	3.802	
roam	1		15.300	-20.470	Anomaly A-3

Line	Station	Survey Direction	Quadrature (mS/m)	Inphase (ppt)	Comments
roam	2		-6.900	-20.470	Anomaly A-2
roam	3		3.100	-20.470	Anomaly A-1

APPENDIX D

CPT Logs and Driller's Report

PRESENTATION OF CONE PENETRATION TEST DATA

SOUTH BAY LNG

CHULA VISTA, CALIFORNIA

Prepared for:

DUKE ENGINEERING
Austin, Texas

Prepared by:

GREGG IN SITU, INC.
Signal Hill, California
00-844sh

Prepared on:

November 18, 2000

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- Chart 1 Soil Classification Chart
- References

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- Computer Diskette with ASCII Files

PRESENTATION OF CONE PENETRATION TEST DATA

1.0 INTRODUCTION

This report presents the results of a Cone Penetration Testing (CPT) and in situ soil & groundwater sampling program carried out at the South Bay LNG site located in Chula Vista, CA. The work was performed on November 14th and 15th, 2000. The scope of work was performed as directed by Duke Engineering 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 (D3441). A 20-ton capacity cone was used for all of the soundings (figure 1). This cone has a tip area of 15 sq.cm. and friction sleeve area of 225 sq.cm. 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 (Ut)
- Ultra Violet Induced Florescence

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 glycerin under vacuum pressure prior to penetration. Pore pressure dissipations were recorded at 5 second intervals when appropriate during pauses in the penetration.

The UVIF (ultra violet induced florescence) module is located approximately 2 feet behind the cone tip. As the CPT is advanced through the soil the UV light source is emitted through a sapphire window on the module. The high energy ultra violet light causes florescence of contaminants in the surrounding soil and groundwater. The florescence is then collected through the sapphire window into

a photo multiplier tube in the UVIF module. This data is then sent up into the data acquisition system via electrical analog signal. The output is then measured in voltages.

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 25 tons. 21 CPT soundings were performed. The penetration tests were carried to depths of approximately 10 to 25 feet below ground surface. Test locations and depths were determined in the field by Duke Engineering personnel.

In situ groundwater samples were taken at 9 Locations. Groundwater samples were collected using the Hydropunch groundwater sampling system (figure 2). The Hydropunch operates by pushing 1.75 diameter hollow rods with a retrievable tip. A stainless steel filter screen is attached to the tip. At the desired sampling depth, the rods are retracted exposing the filter screen and allowing for groundwater infiltration. A small diameter bailer is then used to collect groundwater samples through the hollow rod.

Soil samples were taken using a piston type soil sampler (figure 3). The soil samples were collected in approximately 1 1/8 inch diameter stainless steel sample rings.

The CPT/Hydropunch 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 (Ut). 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.

The interpretation of soils encountered on this project was carried out using recent correlations developed by Robertson et al, 1998. It should be noted that it is not always possible to clearly identify a soil type based on Qc, Fs and Ut. 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 (chart 1) used to interpret soil types based on Qc and Rf is provided in the Appendix.

GREGG IN SITU, INC.
November 18, 2000
00-844

Duke Engineering
South Bay LNG
Chula Vista, Ca.

We hope the information presented is sufficient for your purposes. 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

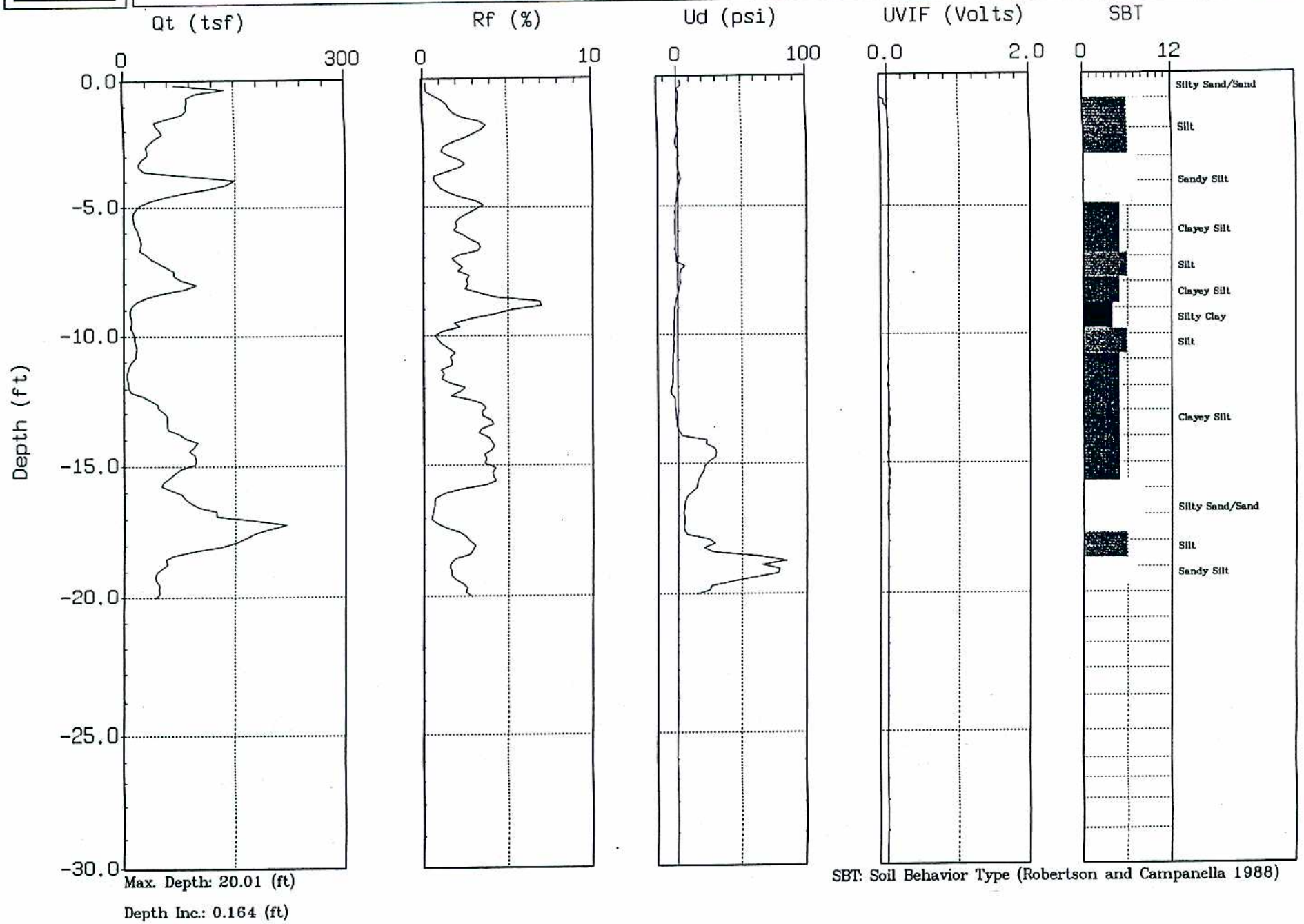
3.1 CPT PLOTS

GREGG

DUKE ENGINEERING

Site : S. BAY LNG
Location : CPT-FFD-1

Geologist : J. SCHEERHORN
Date : 11:15:00 15:23



Max. Depth: 20.01 (ft)

Depth Inc.: 0.164 (ft)

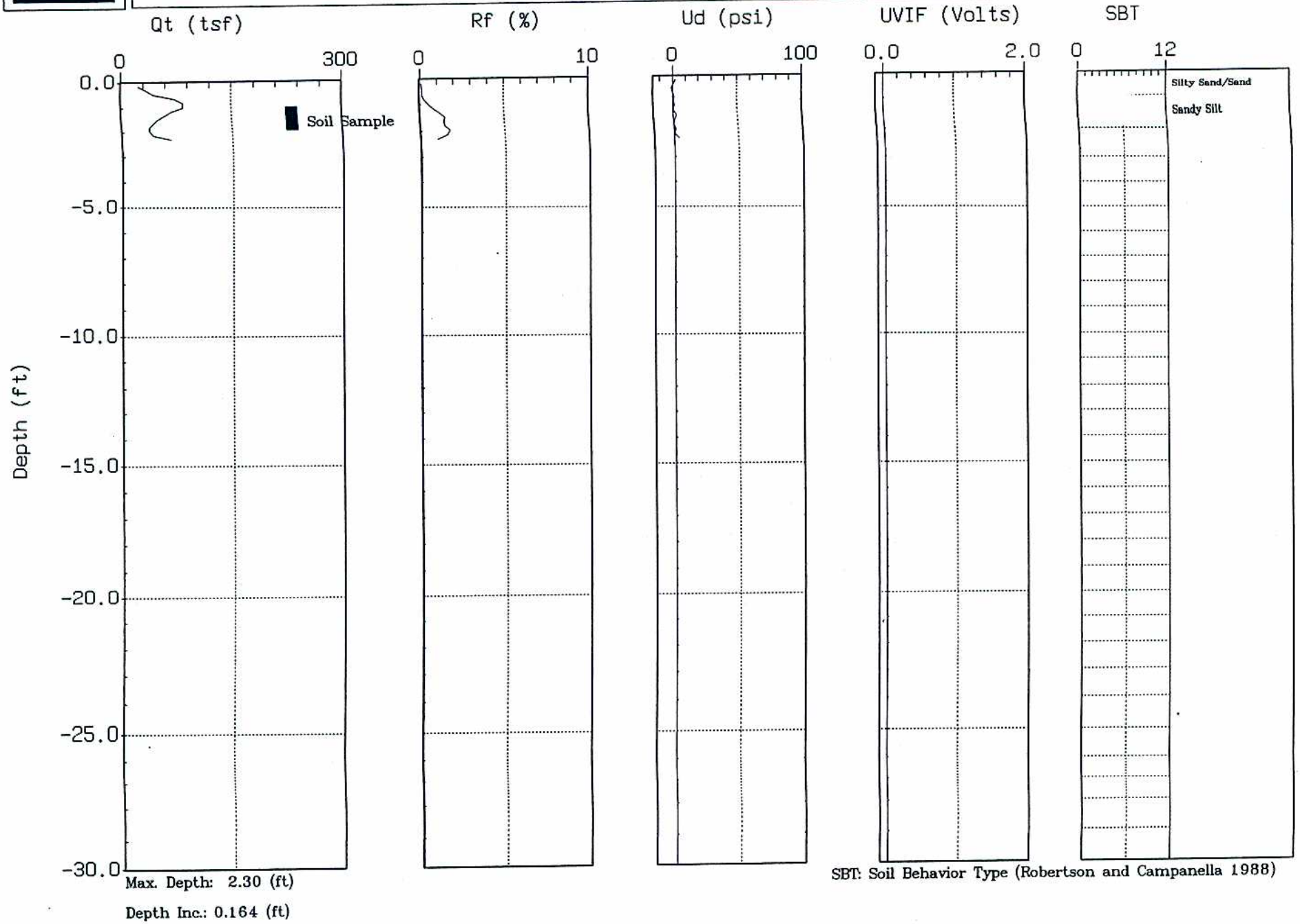
SBT: Soil Behavior Type (Robertson and Campanella 1988)

GREGG

DUKE ENGINEERING

Site : S. BAY LNG
Location : CPT-FFD-2

Geologist : J. SCHEERHORN
Date : 11:15:00 08:33



Max. Depth: 2.30 (ft)

Depth Inc.: 0.164 (ft)

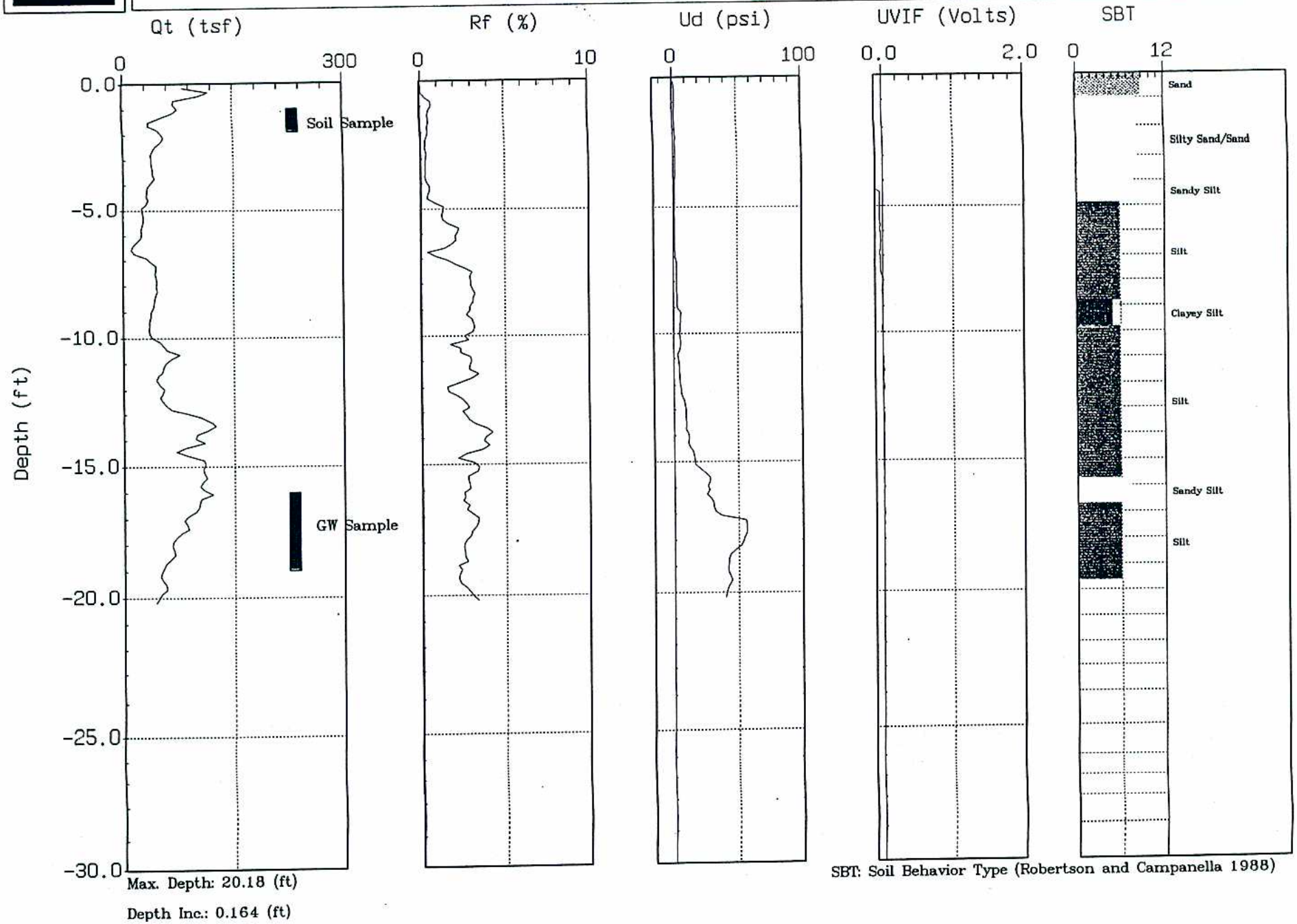
SBT: Soil Behavior Type (Robertson and Campanella 1988)

GREGG

DUKE ENGINEERING

Site : S. BAY LNG
Location : CPT-FFD-3

Geologist : J. SCHEERHORN
Date : 11:14:00 15:57



Max. Depth: 20.18 (ft)

Depth Inc.: 0.164 (ft)

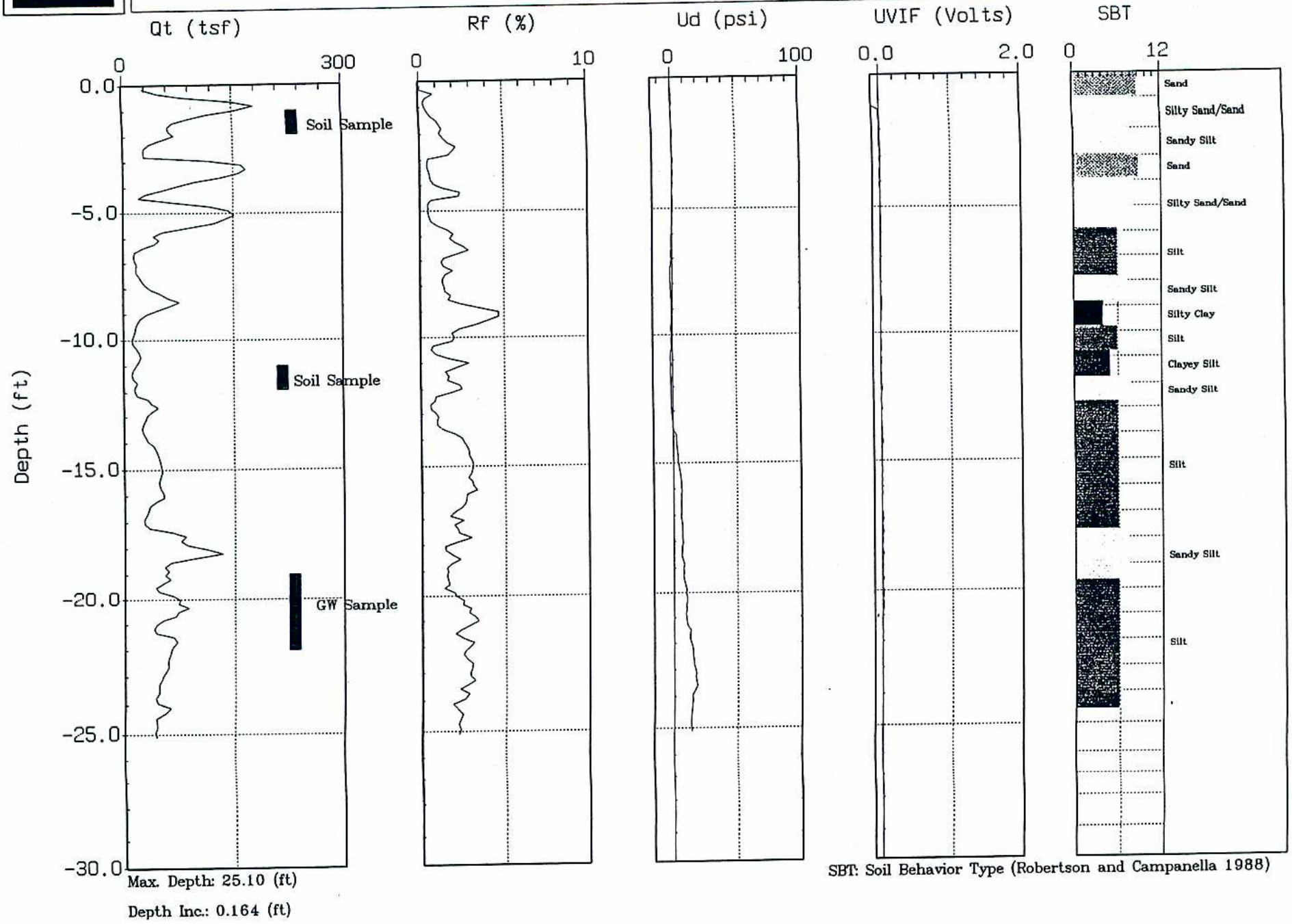
SBT: Soil Behavior Type (Robertson and Campanella 1988)

GREGG

DUKE ENGINEERING

Site : S. BAY LNG
Location : CPT-FFD-5

Geologist : J. SCHEERHORN
Date : 11:14:00 18:25



Max. Depth: 25.10 (ft)

Depth Inc.: 0.164 (ft)

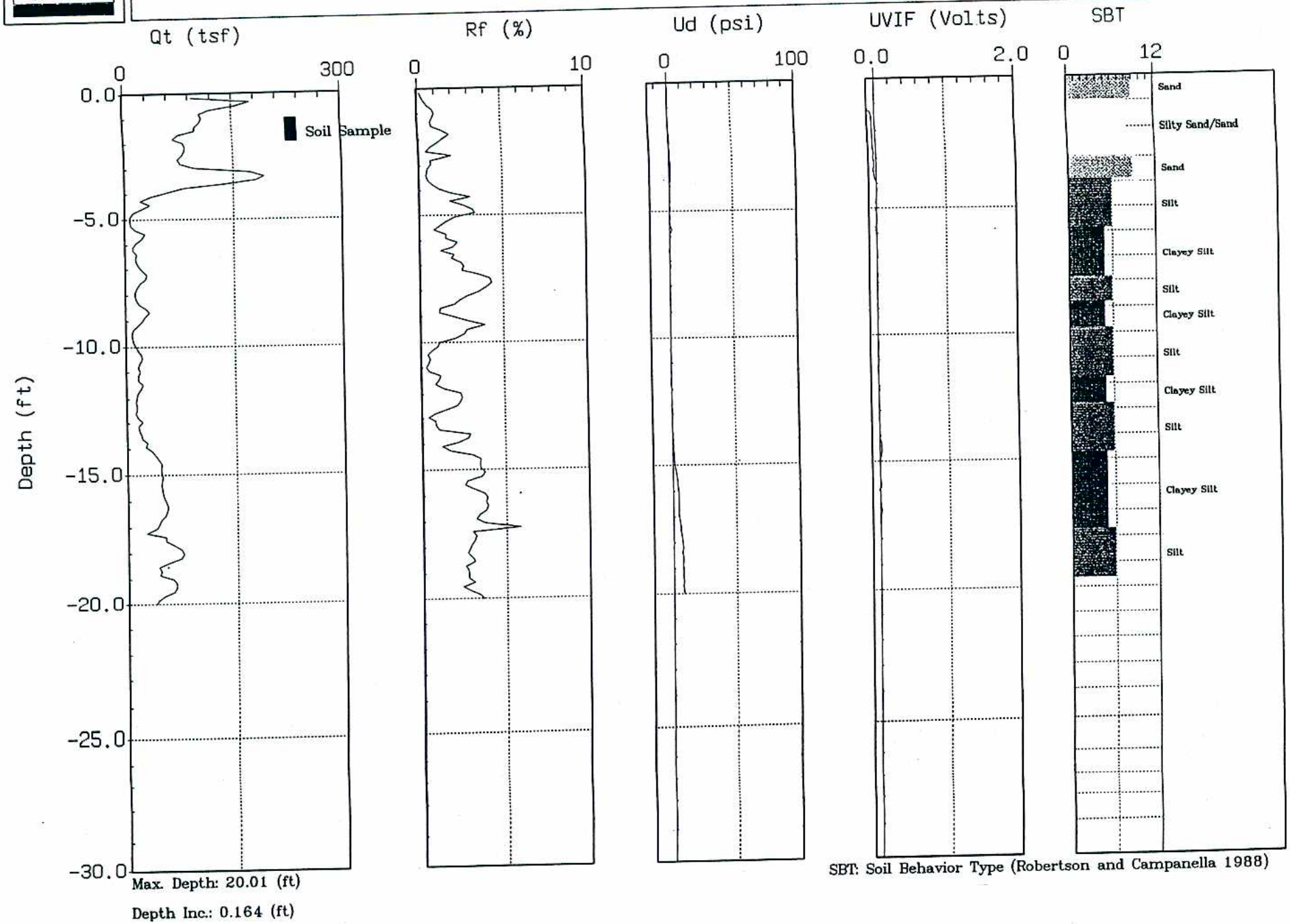
SBT: Soil Behavior Type (Robertson and Campanella 1988)

GREGG

DUKE ENGINEERING

Site : S. BAY LNG
Location : CPT-FFD-7

Geologist : J. SCHEERHORN
Date : 11:14:00 19:23



Max. Depth: 20.01 (ft)

Depth Inc.: 0.164 (ft)

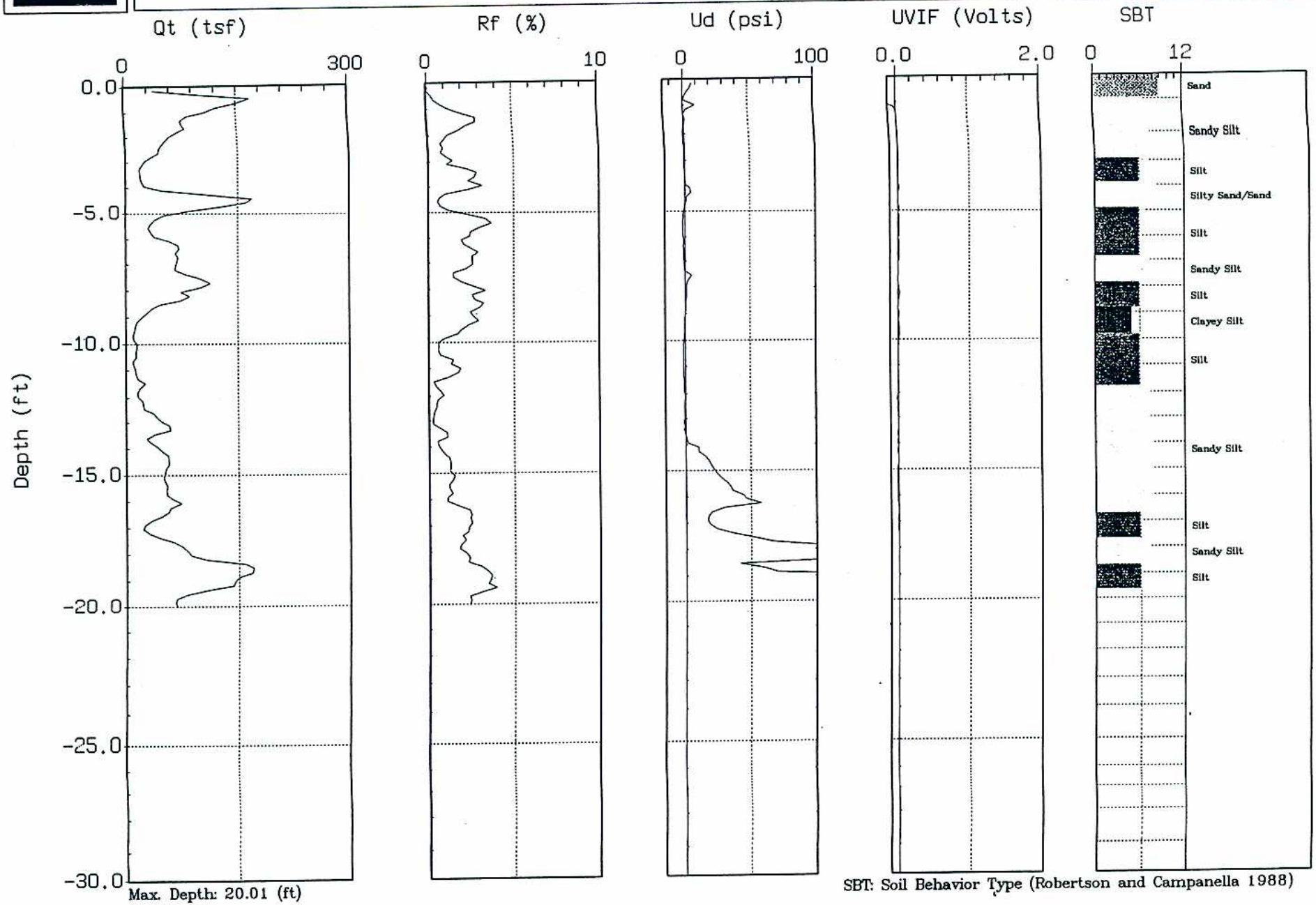
SBT: Soil Behavior Type (Robertson and Campanella 1988)

GREGG

DUKE ENGINEERING

Site : S. BAY LNG
Location : CPT-FFD-8

Geologist : J. SCHEERHORN
Date : 11:15:00 16:21



Max. Depth: 20.01 (ft)

Depth Inc.: 0.164 (ft)

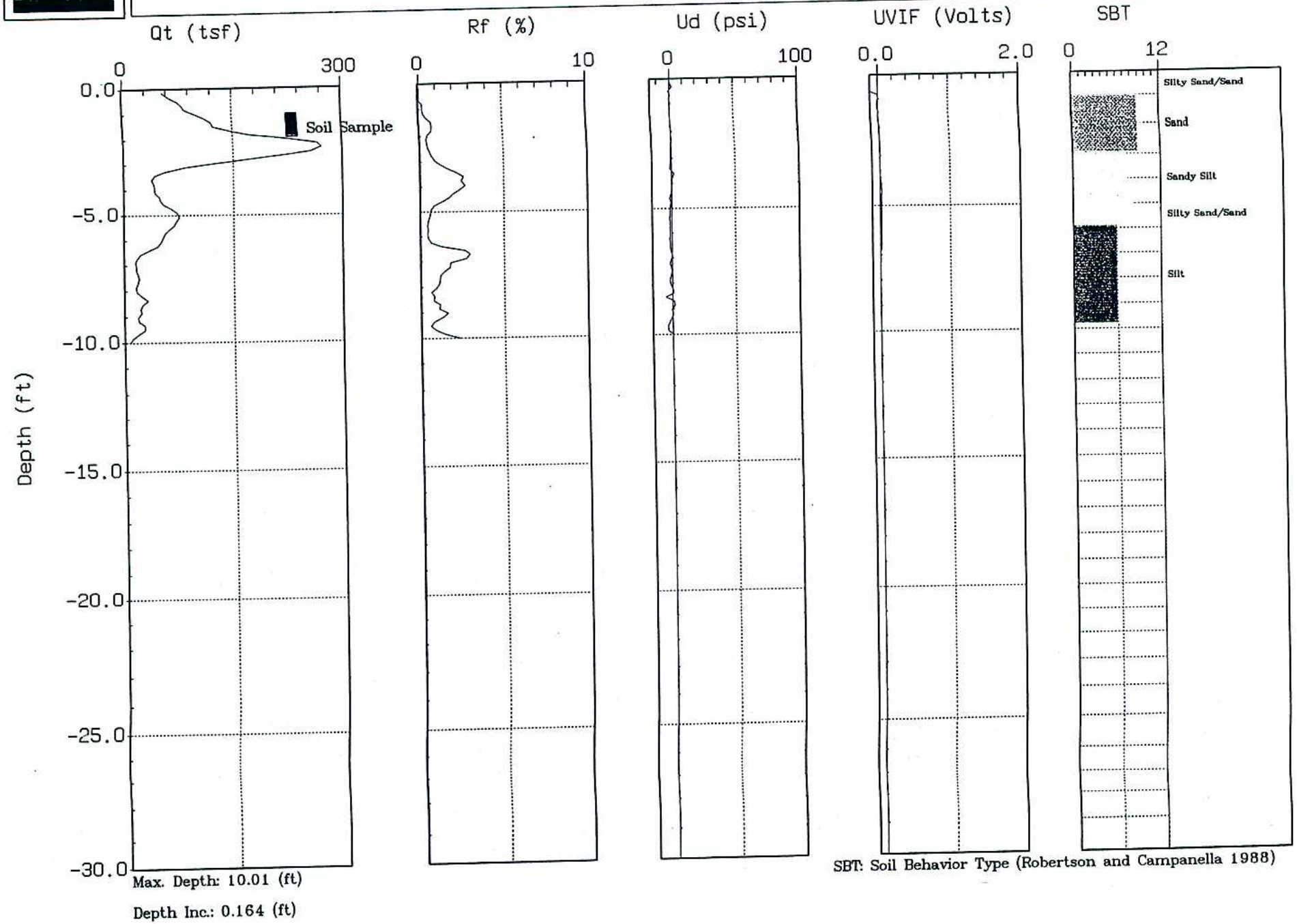
SBT: Soil Behavior Type (Robertson and Campanella 1988)

GREGG

DUKE ENGINEERING

Site : S. BAY LNG
Location : CPT-FFD-10

Geologist : J. SCHEERHORN
Date : 11:15:00 08:50



Max. Depth: 10.01 (ft)

Depth Inc.: 0.164 (ft)

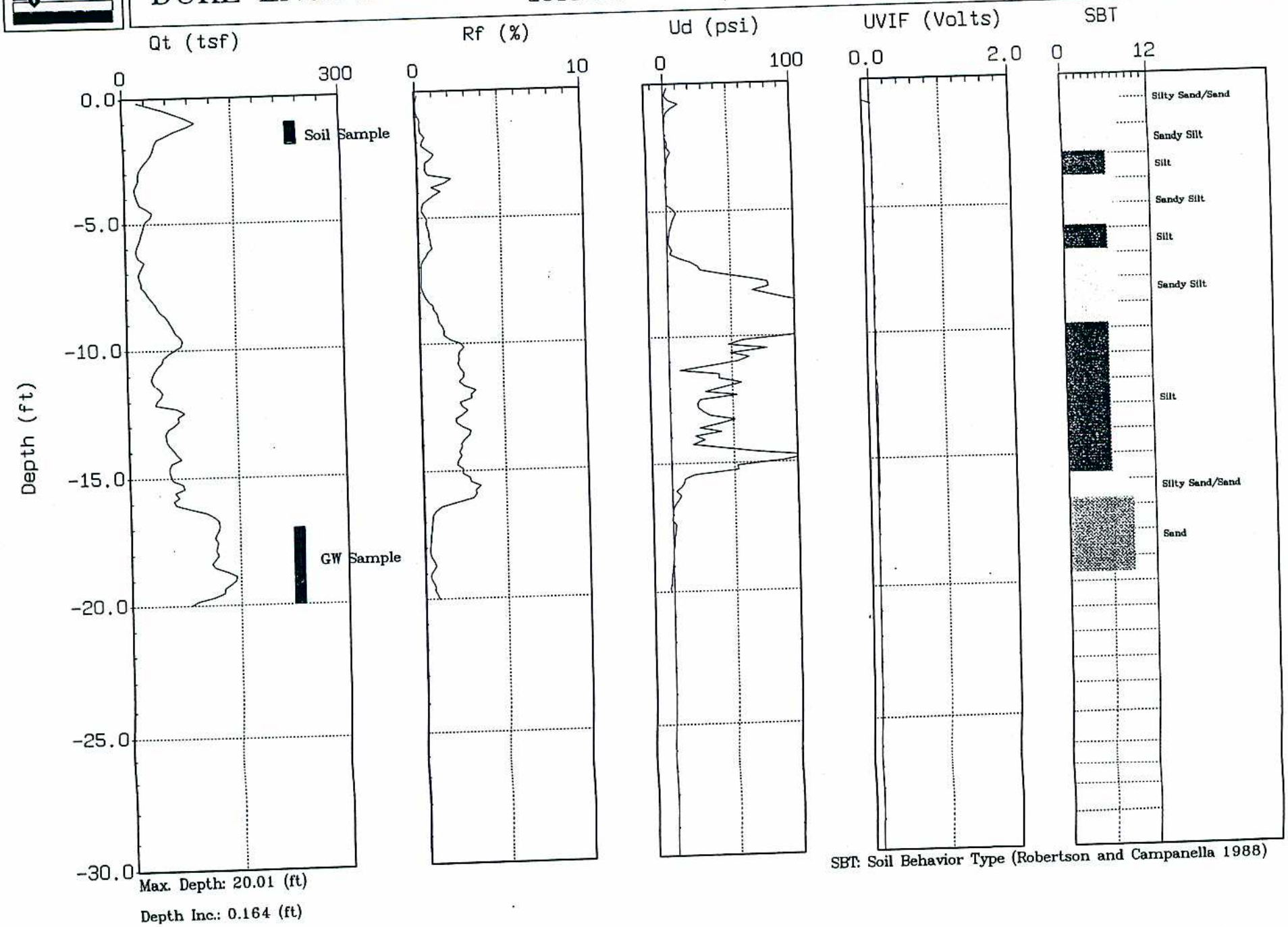
SBT: Soil Behavior Type (Robertson and Campanella 1988)

GREGG

DUKE ENGINEERING

Site : S. BAY LNG
Location : CPT-FFD-11

Geologist : J. SCHEERHORN
Date : 11:15:00 14:21

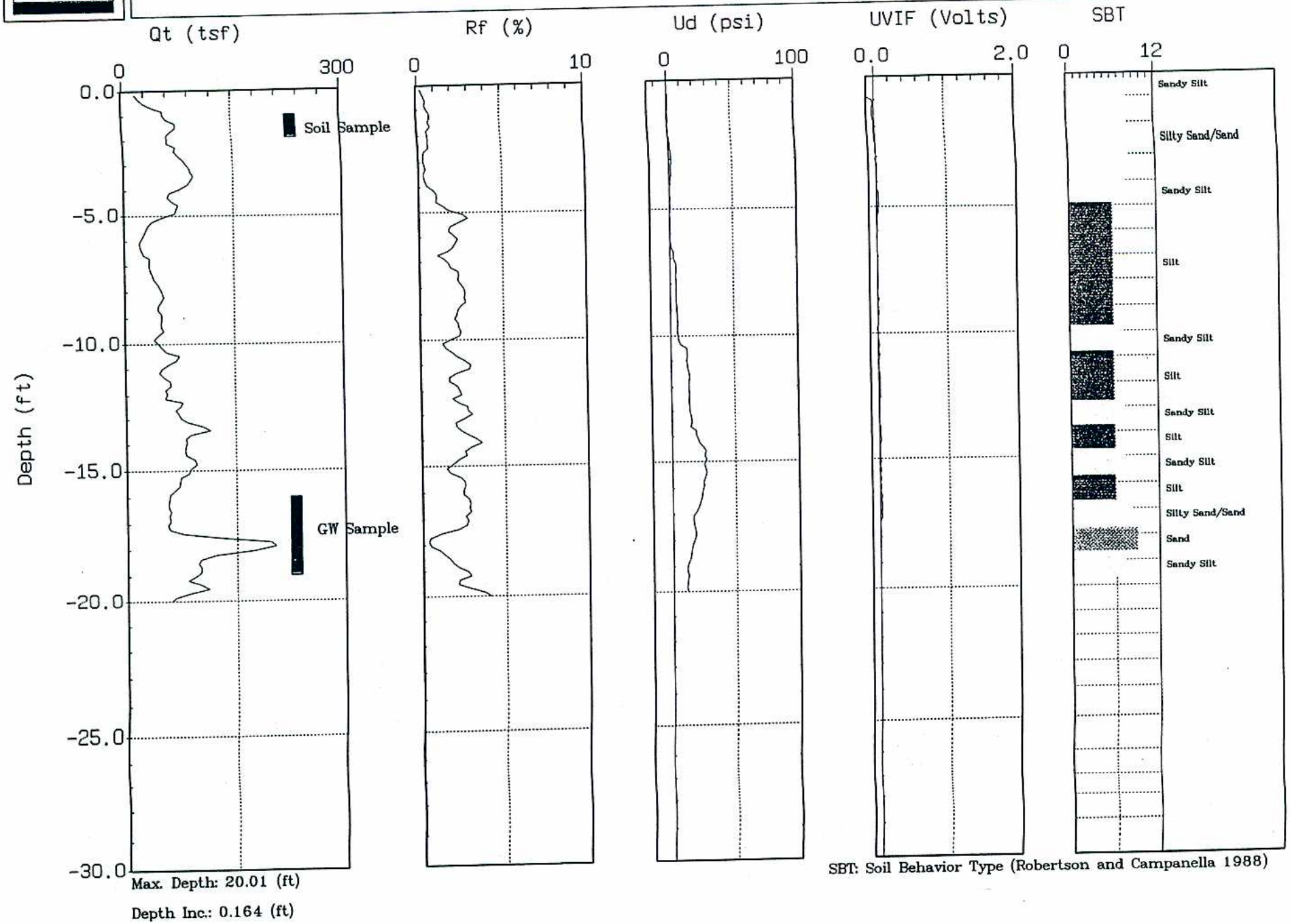


GREGG

DUKE ENGINEERING

Site : S. BAY LNG
Location : CPT-FFD-13

Geologist : J. SCHEERHORN
Date : 11:14:00 14:13



Max. Depth: 20.01 (ft)

Depth Inc.: 0.164 (ft)

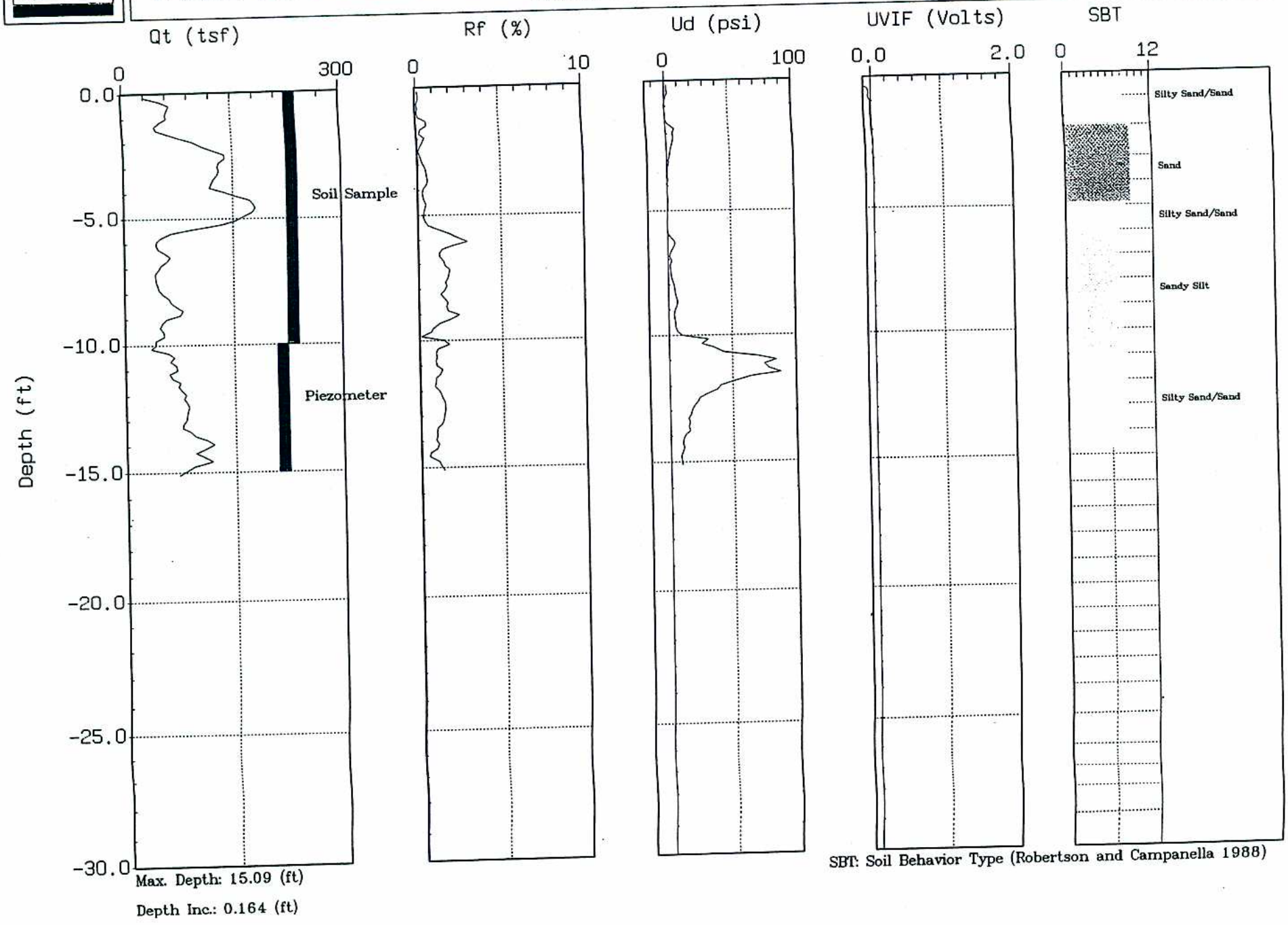
SBT: Soil Behavior Type (Robertson and Campanella 1988)

GREGG

DUKE ENGINEERING

Site : S. BAY LNG
Location : CPT-FFD-14

Geologist : J. SCHEERHORN
Date : 11:14:00 11:36

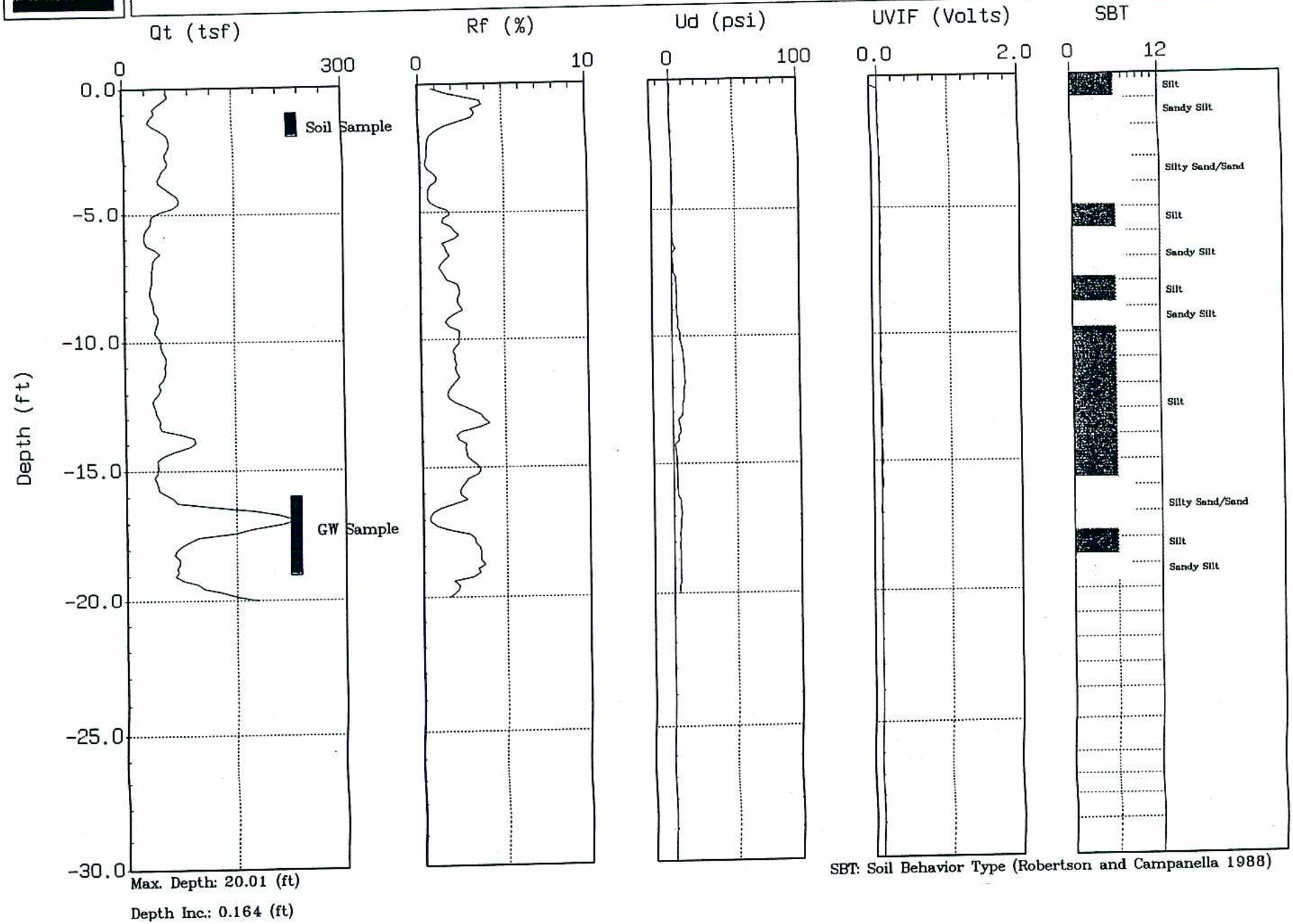


GREGG

DUKE ENGINEERING

Site : S. BAY LNG
Location : CPT-FFD-15

Geologist : J. SCHEERHORN
Date : 11:14:00 15:05



Max. Depth: 20.01 (ft)

Depth Inc.: 0.164 (ft)

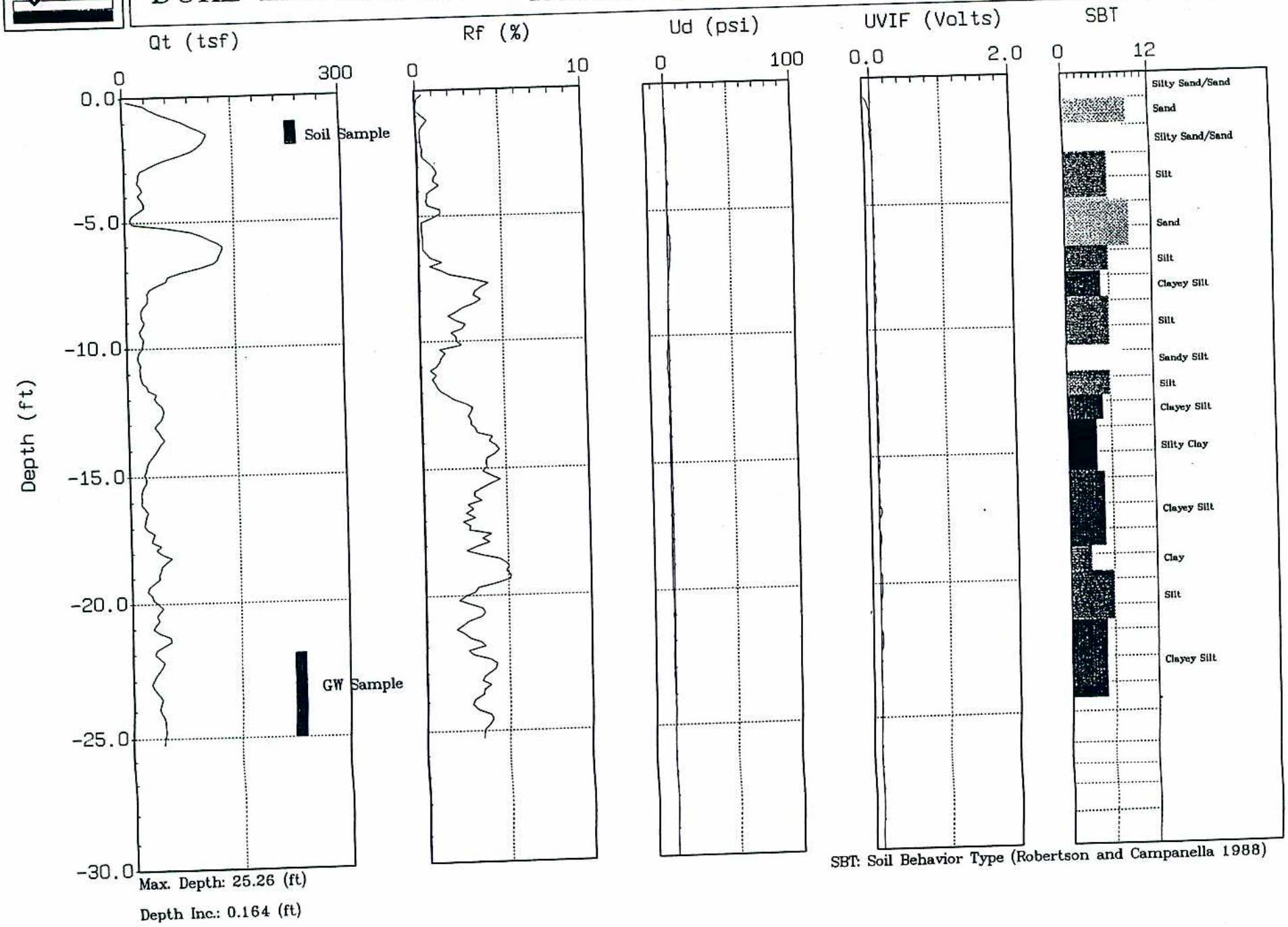
SBT: Soil Behavior Type (Robertson and Campanella 1988)

GREGG

DUKE ENGINEERING

Site : S. BAY LNG
Location : CPT-FFD-16

Geologist : J. SCHEERHORN
Date : 11:15:00 13:19



Max. Depth: 25.26 (ft)

Depth Inc.: 0.164 (ft)

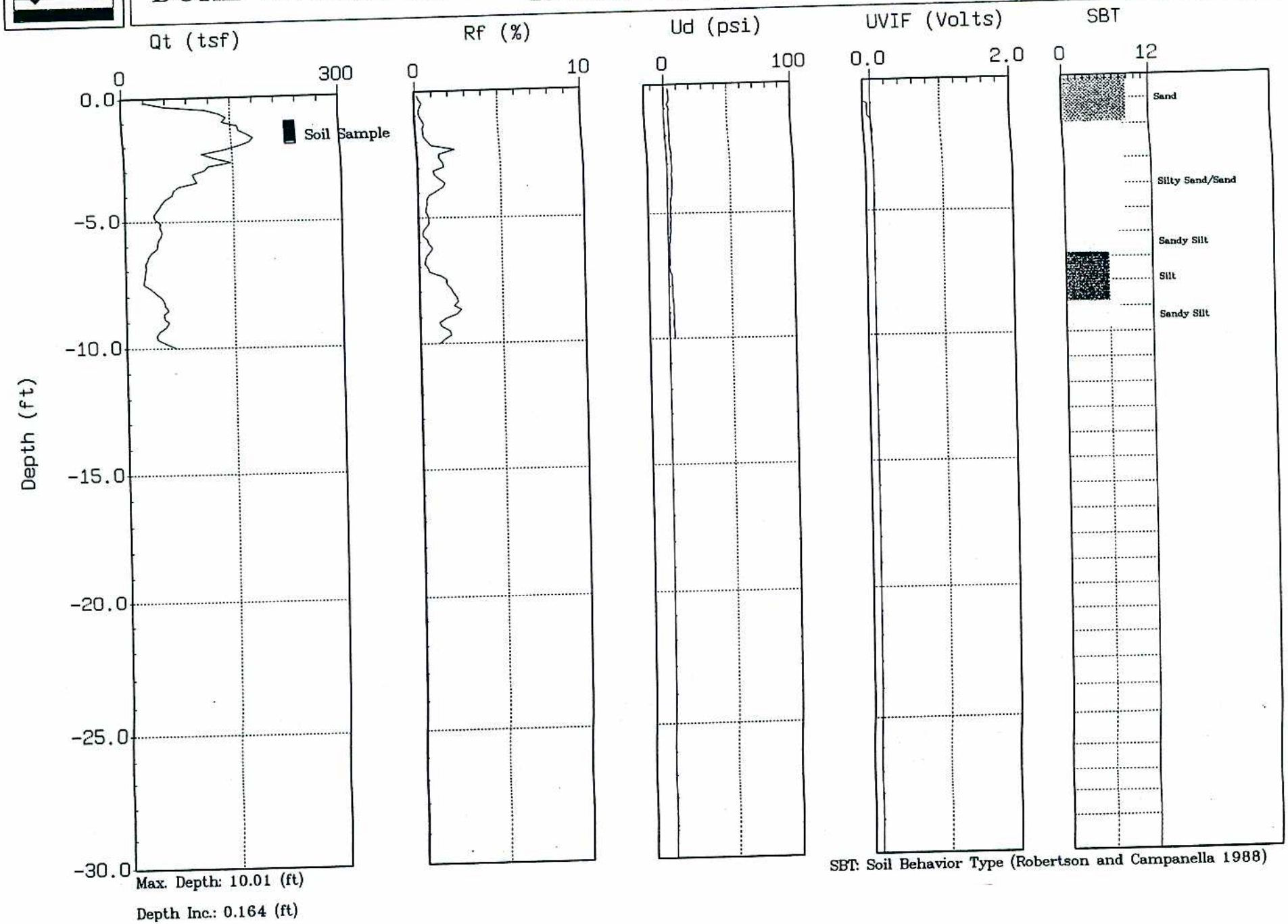
SBT: Soil Behavior Type (Robertson and Campanella 1988)

GREGG

DUKE ENGINEERING

Site : S. BAY LNG
Location : CPT-FFD-17

Geologist : J. SCHEERHORN
Date : 11:15:00 09:18



Max. Depth: 10.01 (ft)

Depth Inc.: 0.164 (ft)

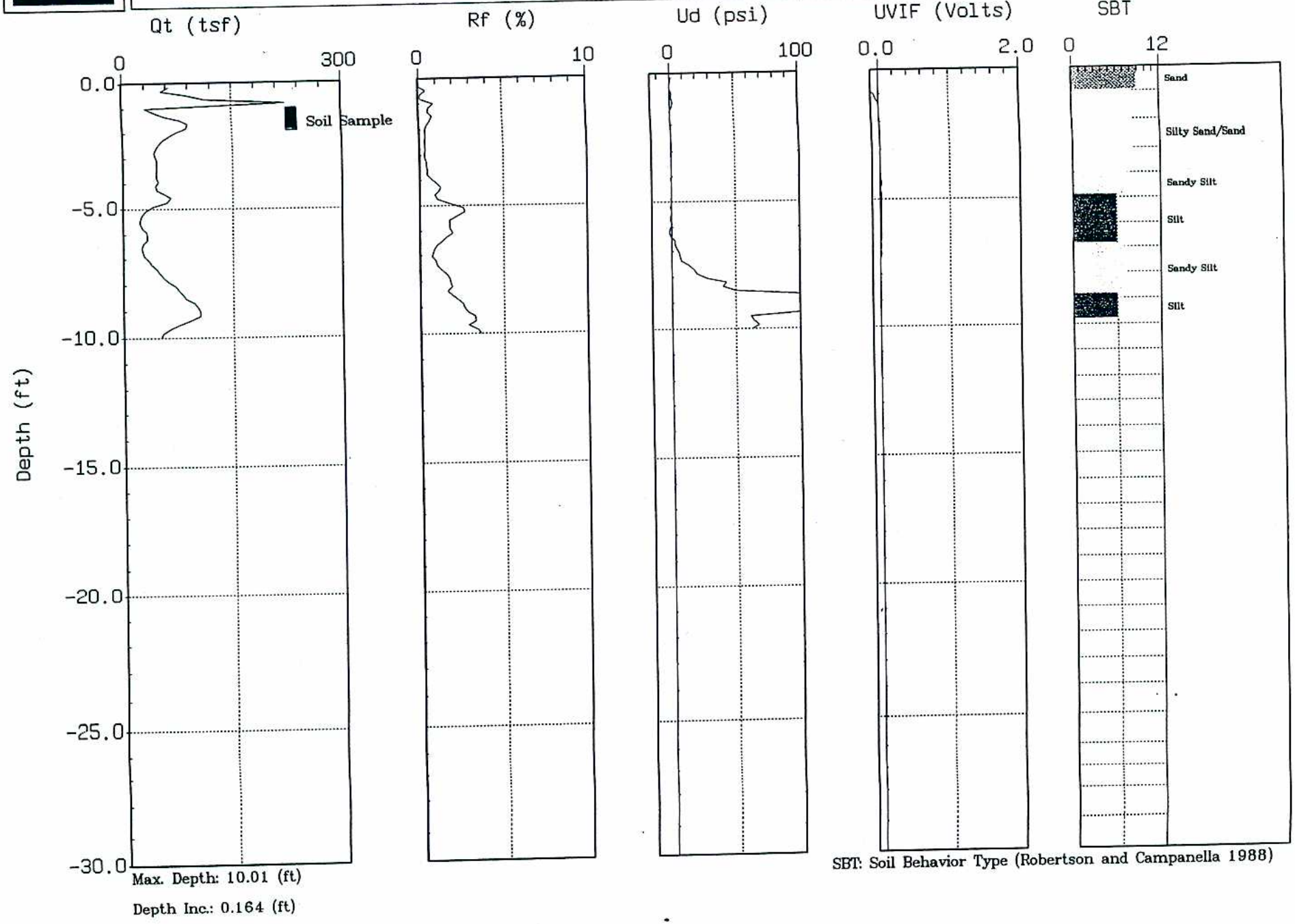
SBT: Soil Behavior Type (Robertson and Campanella 1988)

GREGG

DUKE ENGINEERING

Site : S. BAY LNG
Location : CPT-FFD-18

Geologist : J. SCHEERHORN
Date : 11:15:00 09:18



Max. Depth: 10.01 (ft)

Depth Inc.: 0.164 (ft)

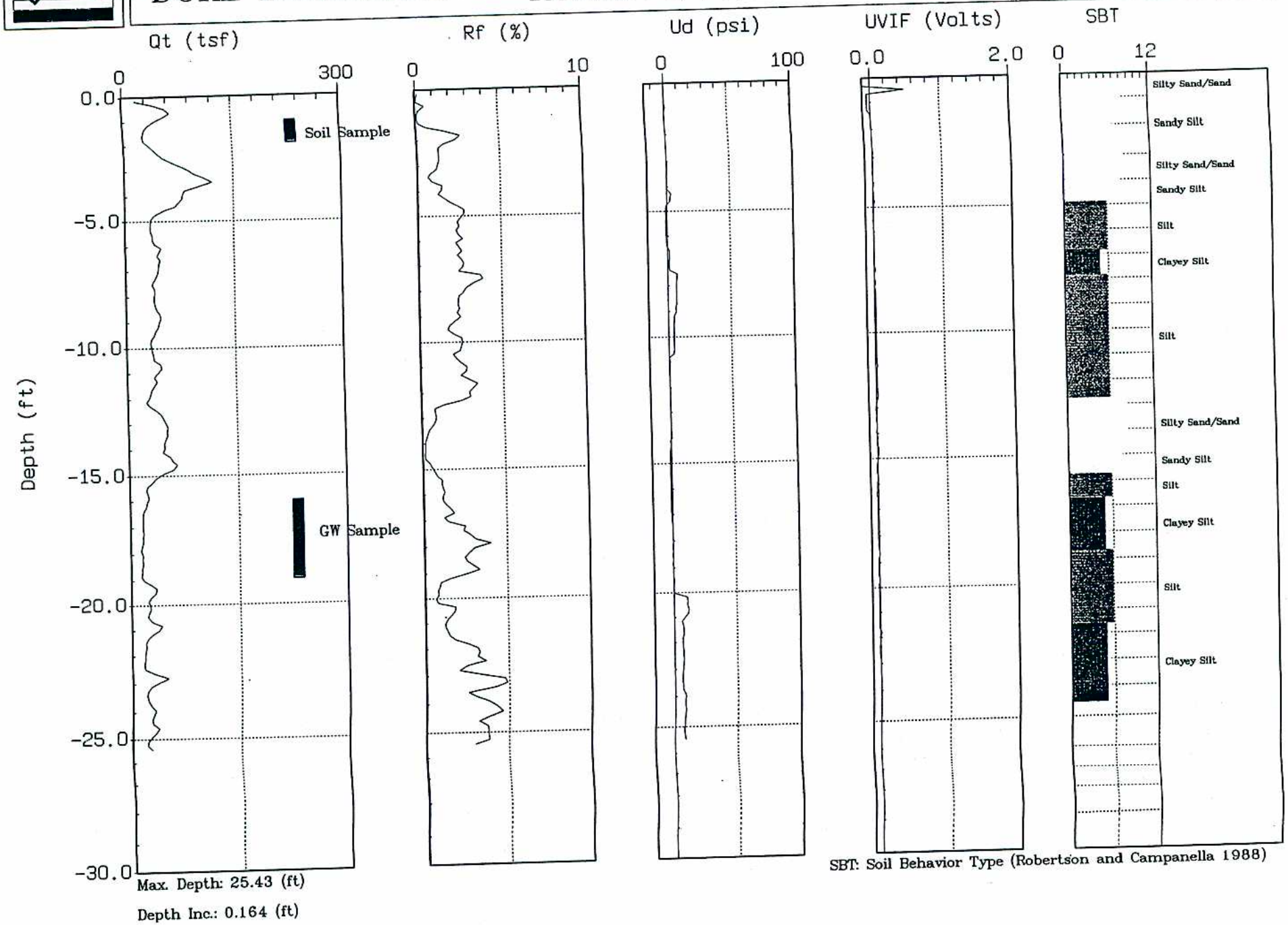
SBT: Soil Behavior Type (Robertson and Campanella 1988)

GREGG

DUKE ENGINEERING

Site : S. BAY LNG
Location : CPT-FFD-19

Geologist : J. SCHEERHORN
Date : 11:14:00 16:41



Max. Depth: 25.43 (ft)

Depth Inc.: 0.164 (ft)

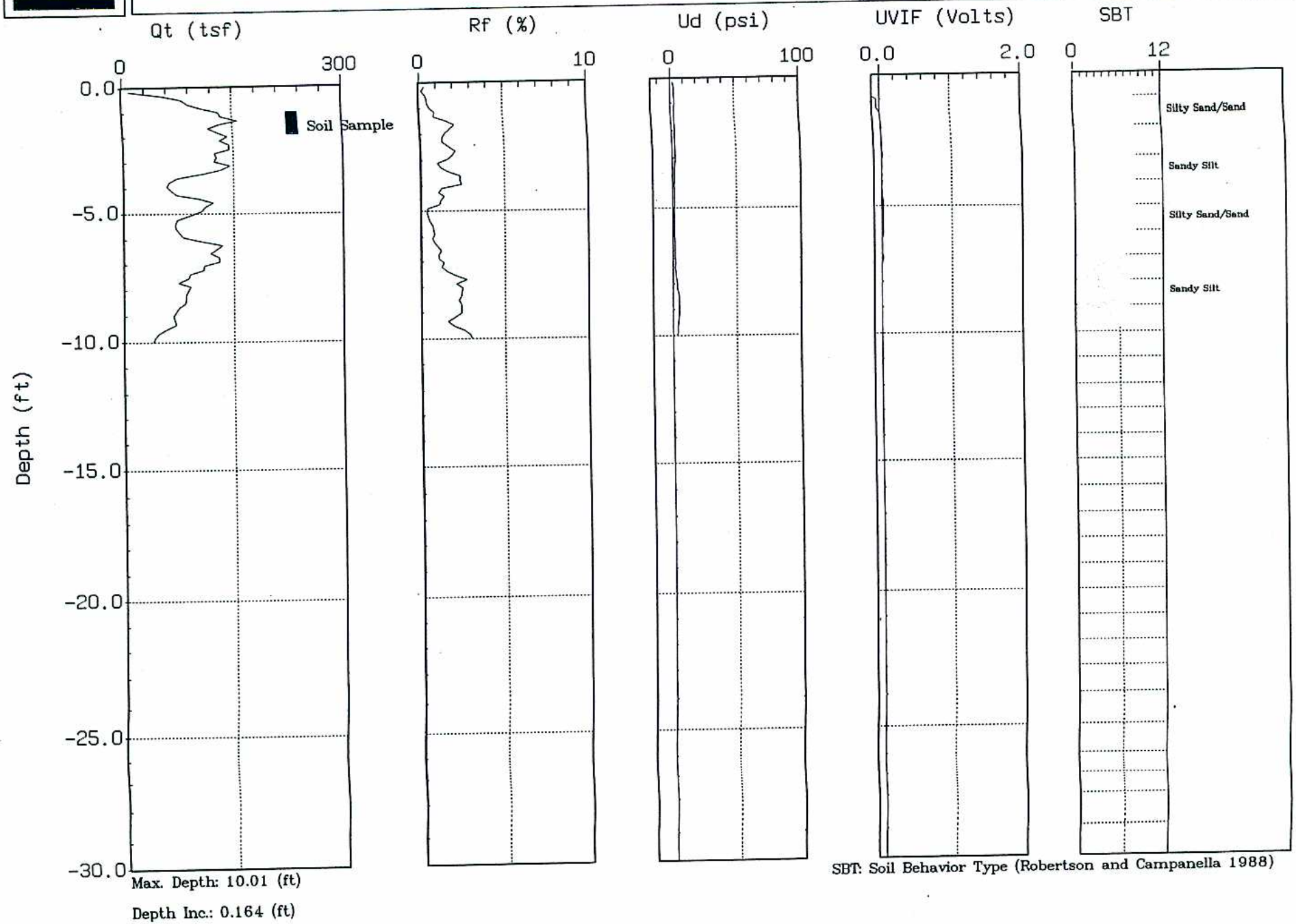
SBT: Soil Behavior Type (Robertson and Campanella 1988)

GREGG

DUKE ENGINEERING

Site : S. BAY LNG
Location : CPT-FFD-20

Geologist : J. SCHEERHORN
Date : 11:15:00 09:37



Max. Depth: 10.01 (ft)

Depth Inc.: 0.164 (ft)

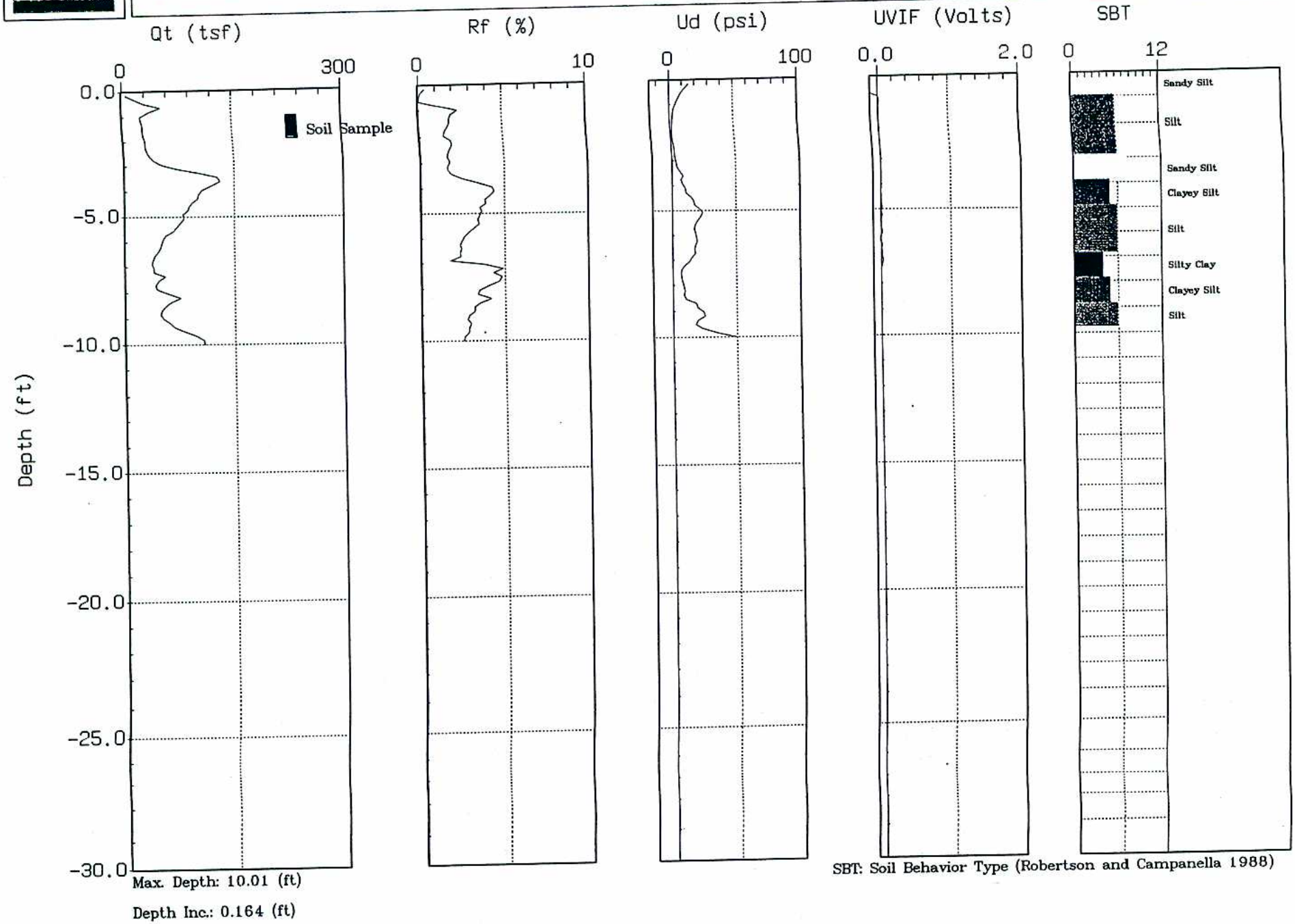
SBT: Soil Behavior Type (Robertson and Campanella 1988)

GREGG

DUKE ENGINEERING

Site : S. BAY LNG
Location : CPT-FFD-23

Geologist : J. SCHEERHORN
Date : 11:15:00 09:37



Max. Depth: 10.01 (ft)

Depth Inc.: 0.164 (ft)

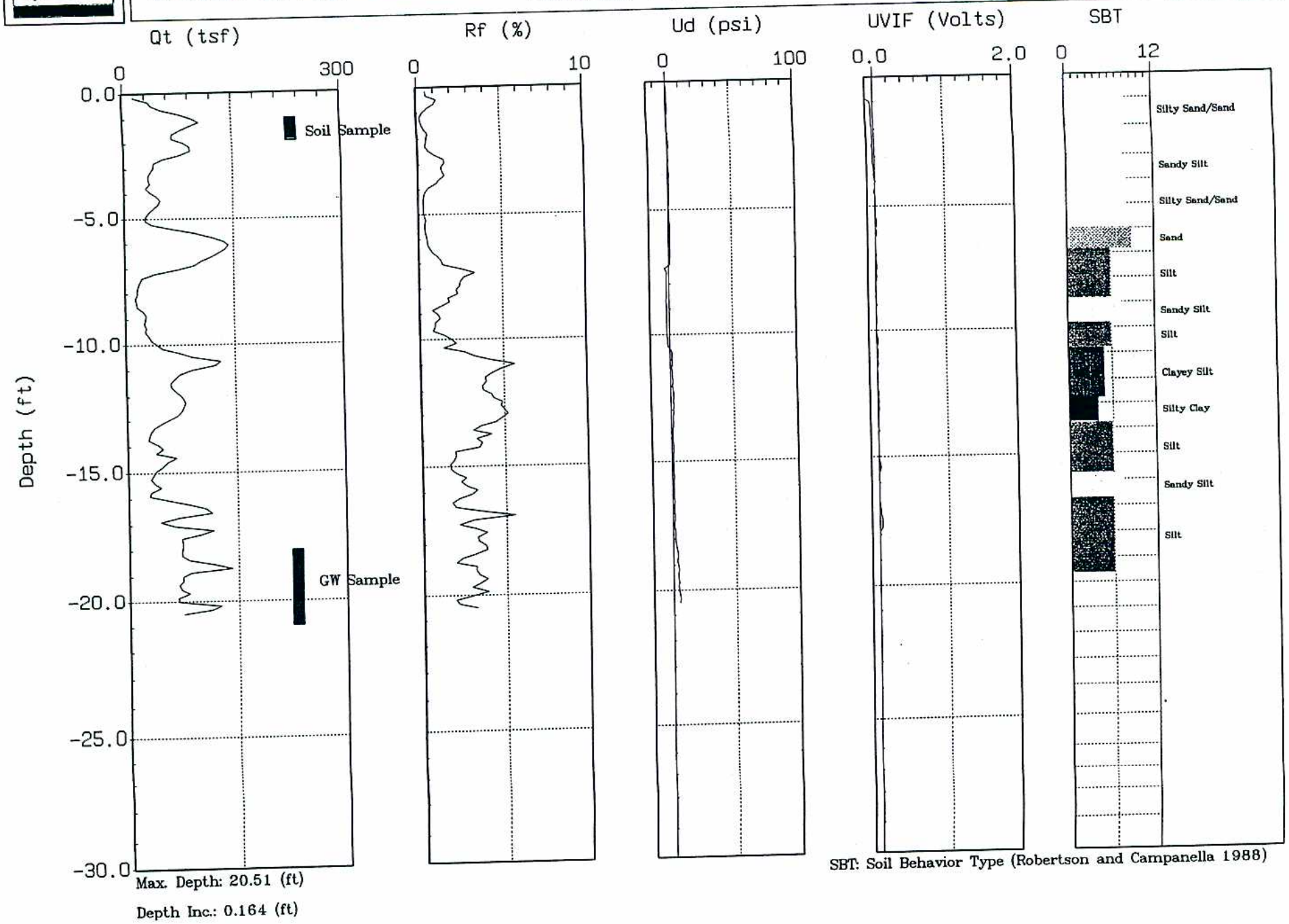
SBT: Soil Behavior Type (Robertson and Campanella 1988)

GREGG

DUKE ENGINEERING

Site : S. BAY LNG
Location : CPT-FFD-24

Geologist : J. SCHEERHORN
Date : 11:15:00 11:03



Max. Depth: 20.51 (ft)

Depth Inc.: 0.164 (ft)

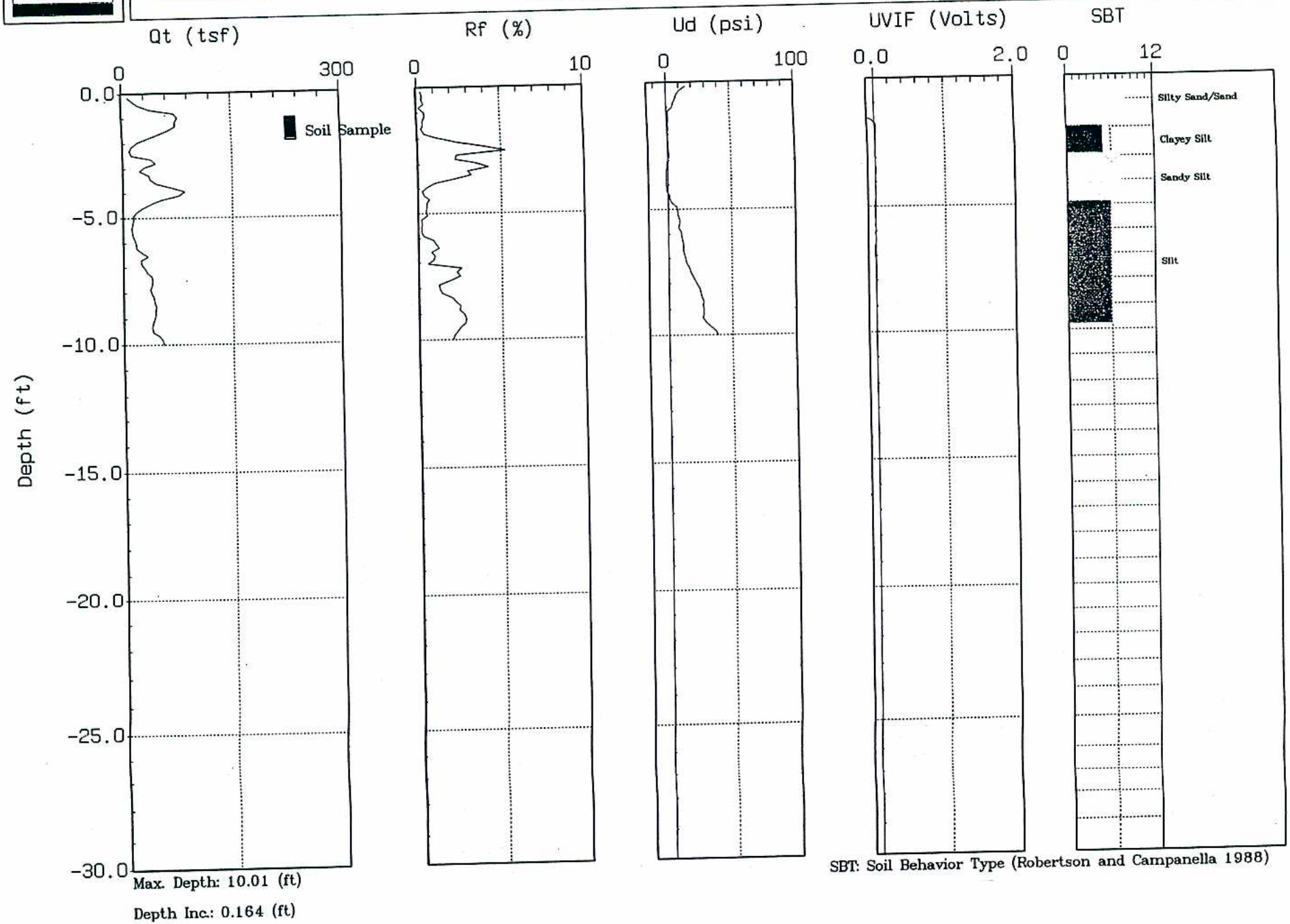
SBT: Soil Behavior Type (Robertson and Campanella 1988)

GREGG

DUKE ENGINEERING

Site : S. BAY LNG
Location : CPT-FFD-25

Geologist : J. SCHEERHORN
Date : 11:15:00 10:00

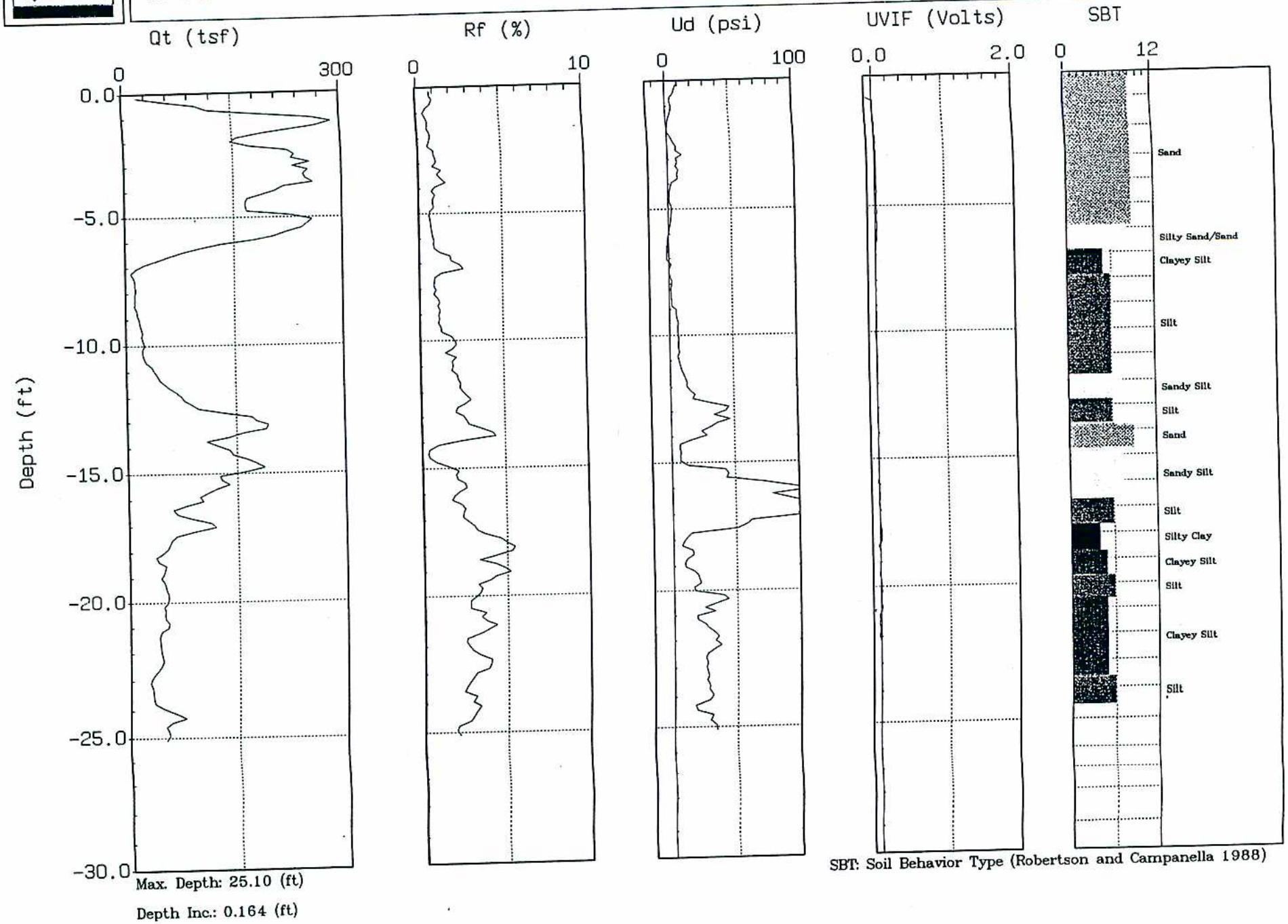


GREGG

DUKE ENGINEERING

Site : S. BAY LNG
Location : CPT-FFD-27

Geologist : J. SCHEERHORN
Date : 11:15:00 17:15



Max. Depth: 25.10 (ft)

Depth Inc.: 0.164 (ft)

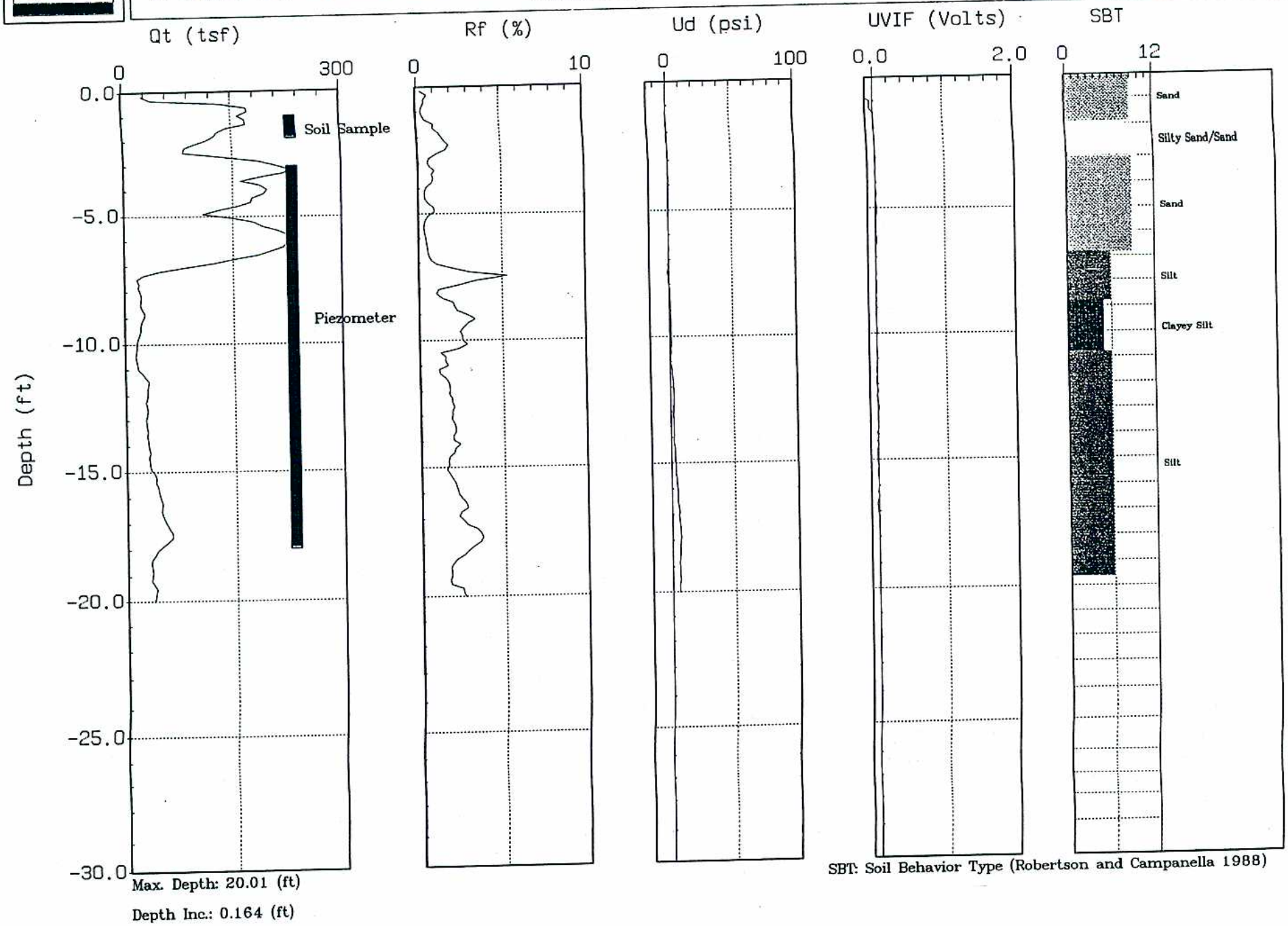
SBT: Soil Behavior Type (Robertson and Campanella 1988)

GREGG

DUKE ENGINEERING

Site : S. BAY LNG
Location : CPT-FFD-28

Geologist : J. SCHEERHORN
Date : 11:15:00 10:11



Max. Depth: 20.01 (ft)

Depth Inc.: 0.164 (ft)

SBT: Soil Behavior Type (Robertson and Campanella 1988)

APPENDIX

GREGG IN SITU, INC.

Geotechnical and Enviormental In Situ Testing Contractors

ELECTRICAL PIEZOCONE

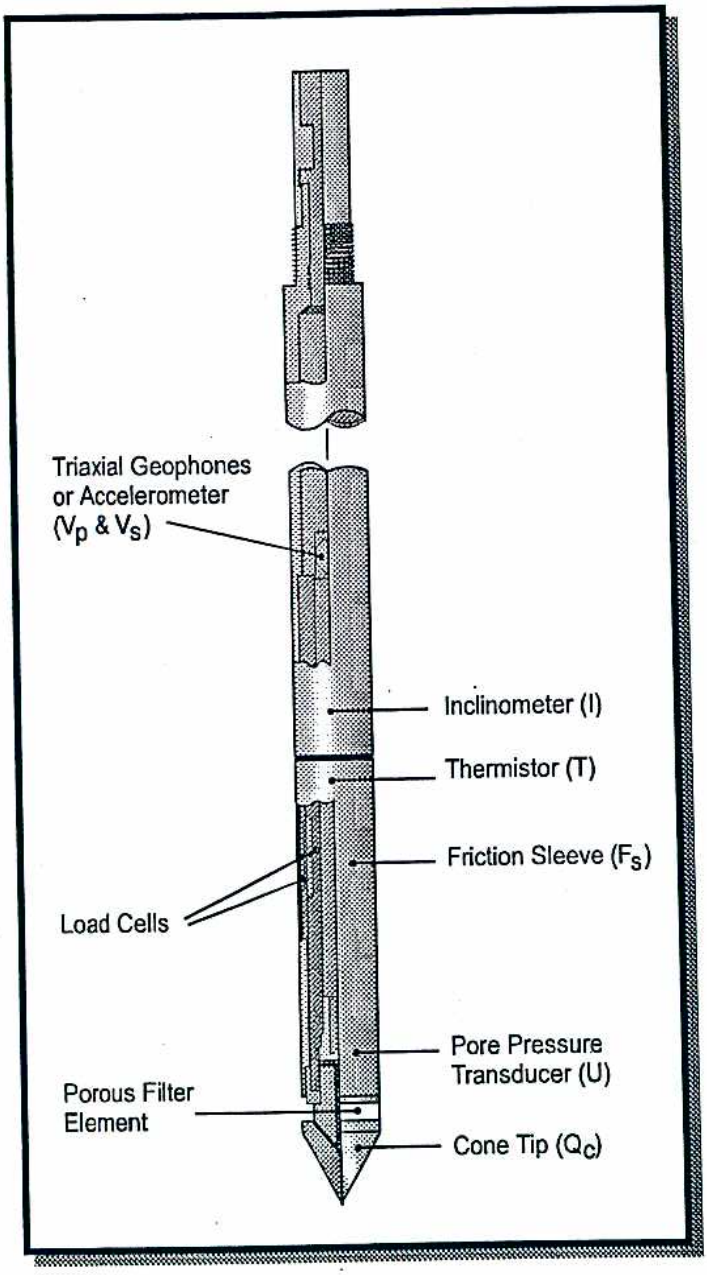


Figure 1

GREGG IN SITU, INC.

Geotechnical and Enviormental In Situ Testing Contractors

GROUNDWATER SAMPLER (HYDROPUNCH)

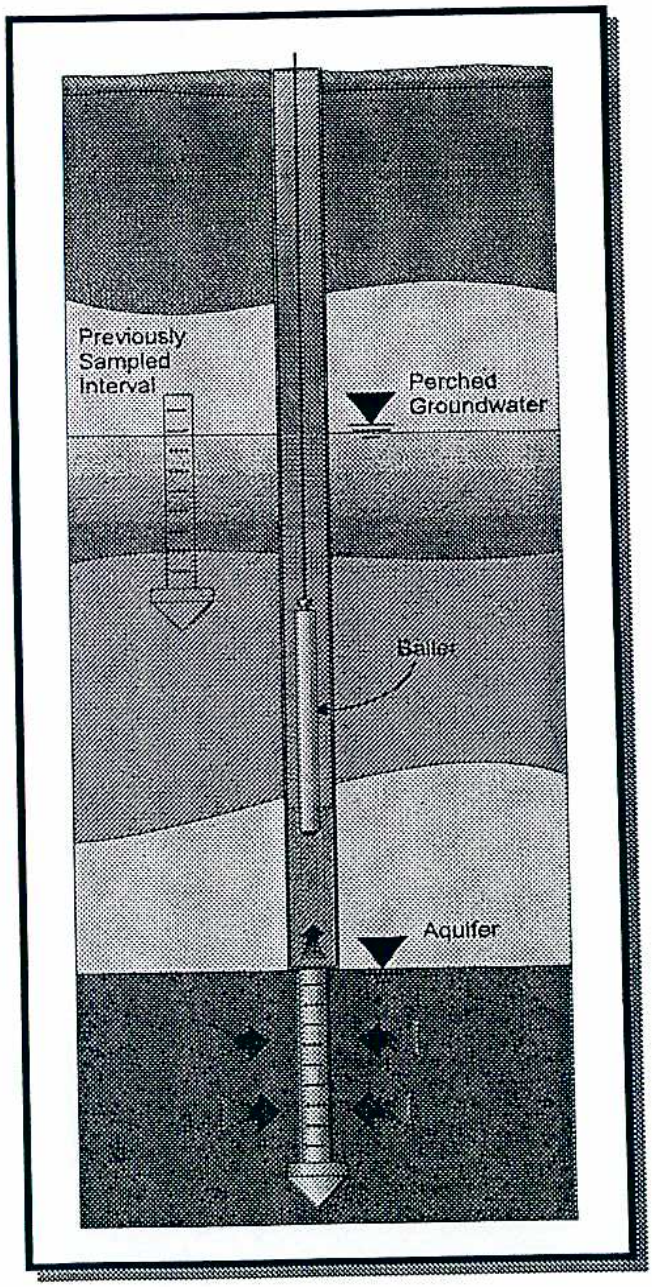


Figure 2

GREGG IN SITU, INC.

Geotechnical and Enviormental In Situ Testing Contractors

PISTON TYPE SOIL SAMPLER

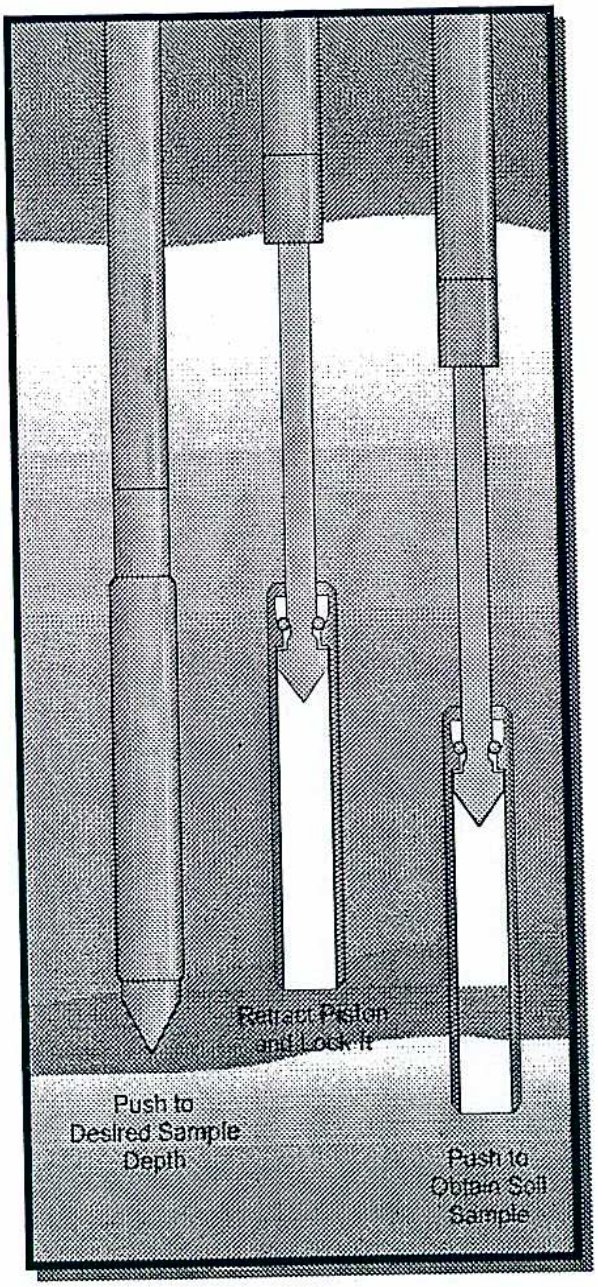
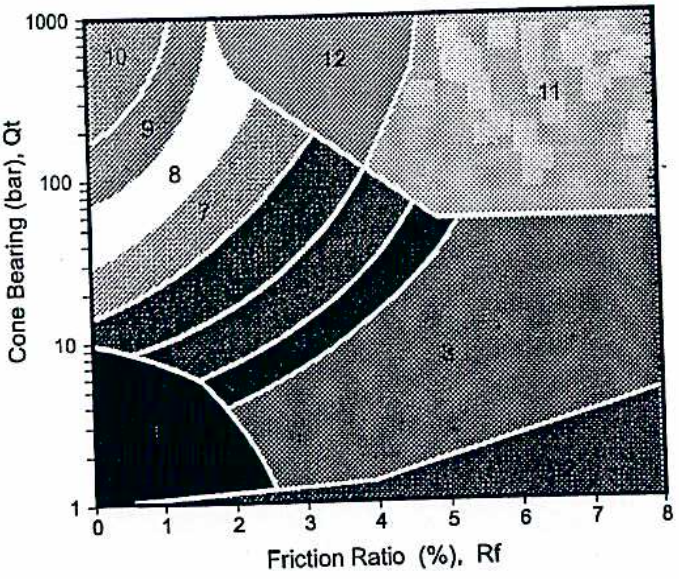


Figure 3

GREGG IN SITU, INC.

Geotechnical and Enviornmental In Situ Testing Contractors

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

Chart 1

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.

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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; also available from Hogentogler and Co., P.O. Box 385, Gaithersburg, MD 20877, 3rd Edition, 197 pp.

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.

APPENDIX E

Soil Boring Logs

Duke Engineering & Services
A Duke Energy Company

LOG OF BORING CPT-1

LNG Site

Date : 11/15/00
Drilling Method : CPT Direct Push
Sampling Method : 6" Split Spoon Core
Drilling Company : Gregg In-Situ
Logged By : Jeff Scheerhorn

Sample Condition
- Modified California Split Spoon
- Larger Diameter Split Spoon
- Ground Water Sample
- Continous Core 4" CPT Sampler

Depth in Feet	% Recovery	Samples	Sample No.	OVM/HNU (ppm)	GRAPHIC	USCS	DESCRIPTION
0	40 100		SB020	0 0		GP	Sandy GRAVEL, medium size, sub-angular, loose, poorly graded, heterogenous, no odor, moist. Less gravel with depth.
5							Refer to CPT profile logs for subsurface information with depth.
10							
15							
			GW011				End of Boring at 20 ft. GW sample collected.
20							
25							

Note: All borings installed as temporary only. No permanent wells installed during investigation. All borings backfilled with bentonite slurry upon completion.

C:\MTECH6\LOGS\SOUTH BAY\CPT-1.BOR
07-24-2001

Duke Engineering & Services
A Duke Energy Company

LOG OF BORING CPT-2

LNG Site

Date : 11/15/00
Drilling Method : CPT Direct Push
Sampling Method : 6" Split Spoon Core
Drilling Company : Gregg In-Situ
Logged By : Jeff Scheerhorn

Sample Condition
- Modified California Split Spoon
- Larger Diameter Split Spoon
- Ground Water Sample
- Continous Core 4" CPT Sampler

Depth in Feet	% Recovery	Samples	Sample No.	OVM/HNU (ppm)	GRAPHIC	USCS	DESCRIPTION
0	100		SB009	0 0		GW	Gravel, fine near surface SAND below gravel
							End of Boring at 2.5 ft. due to hard material (e.g, concrete) encountered. No GW sample collected.
5							
10							
15							
20							
25							

Note: All borings installed as temporary only. No permanent wells installed during this investigation. All borings backfilled with bentonite slurry upon completion.

C:\MTECH5\LOGS\SOUTH BAY\CPT-2.BOR
07-24-2001

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A Duke Energy Company

LOG OF BORING CPT-3

LNG Site

Date : 11/14/00
Drilling Method : CPT Direct Push
Sampling Method : 6" Split Spoon Core
Drilling Company : Gregg In-Situ
Logged By : Jeff Scheerhorn

Sample Condition
- Modified California Split Spoon
- Larger Diameter Split Spoon
- Ground Water Sample
- Continous Core 4" CPT Sampler

Depth in Feet	% Recovery	Samples	Sample No.	OVM/HNU (ppm)	GRAPHIC	USCS	DESCRIPTION
0	.4		SB004	0 0		GW SW	Fine gravel SAND
5							Refer to CPT log for subsurface information with depth.
10							
15			GW004				Groundwater screen exposed 14' to 19'.
20							End of boring at 20'
25							

Note: All borings installed as temporary only. No permanent wells installed during investigation. All borings backfilled with bentonite slurry upon completion.

C:\MTECH5\LOGS\SOUTH BAY\CPT-3.BOR
07-24-2001

Duke Engineering & Services
A Duke Energy Company

LOG OF BORING CPT-5

LNG Site

Date : 11/14/00
Drilling Method : CPT Direct Push
Sampling Method : 6" Split Spoon Core
Drilling Company : Gregg In-Situ
Logged By : Jeff Scheerhom

Sample Condition
- Modified California Split Spoon
- Larger Diameter Split Spoon
- Ground Water Sample
- Continous Core 4" CPT Sampler

Depth in Feet	% Recovery	Samples	Sample No.	OVM/HNU (ppm)	GRAPHIC	USCS	DESCRIPTION
0	100 100		SB006	0 0		SW	SAND with trace angular gravel (fine), med-brown, medium-grained, rounded, loose, uniform, homogeneous, no odor, moist.
5							Refer to CPT log for subsurface information with depth
10							
15							
20			GW006				Screened interval 12' to 22' Pushed 10' of screen to 22'
25							End of boring at 25'

Note: All borings installed as temporary only. No permanent wells installed during investigation. All borings backfilled with bentonite slurry upon completion.

C:\MTECH5\LOGS\SOUTH BAY\CPT-5.BOR
07-24-2001

Duke Engineering & Services
A Duke Energy Company

LOG OF BORING CPT-7

LNG Site

Date : 11/14/00
Drilling Method : CPT Direct Push
Sampling Method : 6" Split Spoon Core
Drilling Company : Gregg In-Situ
Logged By : Jeff Scheerhorn

Sample Condition
- Modified California Split Spoon
- Larger Diameter Split Spoon
- Ground Water Sample
- Continous Core 4" CPT Sampler

Depth in Feet	% Recovery	Samples	Sample No.	OVM/HNU (ppm)	GRAPHIC	USCS	DESCRIPTION
0	20 60		SB008	0 0		SW	SAND with little gravel
5							Refer to CPT profile log for subsurface information with depth.
10							No screen set and no GW sample collected.
15							
20							End of boring at 20'.
25							

Note: All borings installed as temporary only. No permanent wells installed during investigation. All borings backfilled with bentonite slurry upon completion.

07-24-2001 C:\MTECH5\LOGS\SOUTH BAY\CPT-7.BOR

Duke Engineering & Services SM
A Duke Energy Company

LOG OF BORING CPT-8

LNG Site

Date : 11/15/00
Drilling Method : CPT Direct Push
Sampling Method : 6" Split Spoon Core
Drilling Company : Gregg In-Situ
Logged By : Jeff Scheerhorn

Sample Condition
- Modified California Split Spoon
- Larger Diameter Split Spoon
- Ground Water Sample
- Continous Core 4" CPT Sampler

Depth in Feet	% Recovery	Samples	Sample No.	OVM/HNU (ppm)	GRAPHIC	USCS	DESCRIPTION
0	10 100		SB021	0 0		GP	Sandy GRAVEL, fine-medium size, loose, heterogeneous, no odor, damp.
							Less gravel with depth.
5							Refer to CPT profile log for subsurface information with depth.
10							Screen set to 10'-20'
15			GW013				End of boring at 20' GW sample collected
20							
25							

Note: All borings installed as temporary only. No permanent wells installed during investigation. All borings backfilled with bentonite slurry upon completion.

07-24-2001 C:\MTECH5\LOGS\SOUTH BAY\CPT-8.BOR

Duke Engineering & Services
A Duke Energy Company

LOG OF BORING CPT-11

LNG Site

Date : 11/15/00
Drilling Method : CPT Direct Push
Sampling Method : 6" Split Spoon Core
Drilling Company : Gregg In-Situ
Logged By : Jeff Scheerhorn

Sample Condition
- Modified California Split Spoon
- Larger Diameter Split Spoon
- Ground Water Sample
- Continous Core 4" CPT Sampler

Depth in Feet	% Recovery	Samples	Sample No.	OVM/HNU (ppm)	GRAPHIC	USCS	DESCRIPTION
0	90 100		SB019	0 0		SW	SAND, medium brown, fine to med. grained, loose, uniform, homogeneous, no odor, moist.
5							Refer to CPT profile log for subsurface information with depth.
10							Screen at 10'-20'
15			GW009				
20							End of boring at 20' GW sample collected
25							

Note: All borings installed as temporary only. No permanent wells installed during investigation. All borings backfilled with bentonite slurry upon completion.

07-24-2001 C:\MTECH5\LOGS\SOUTH BAY\CPT-11.BOR

Duke Engineering & Services
A Duke Energy Company

LOG OF BORING CPT-13

LNG Site

Date : 11/15/00
Drilling Method : CPT Direct Push
Sampling Method : 6" Split Spoon Core
Drilling Company : Gregg In-Situ
Logged By : Jeff Scheerhorn

Sample Condition
- Modified California Split Spoon
- Larger Diameter Split Spoon
- Ground Water Sample
- Continous Core 4" CPT Sampler

Depth in Feet	% Recovery	Samples	Sample No.	OVM/HNU (ppm)	GRAPHIC	USCS	DESCRIPTION
0	75 100		SB002	0 0		SW	SAND, medium brown, med. grained, rounded, loose, uniform, homogeneous, no odor, moist.
5							Refer to CPT profile log for subsurface information with depth
10							
15			GW002				Pushed 5' screen to 19' (i.e., screen at 14'-19'). End of boring at 20'.
20							
25							

Note: All borings installed as temporary only. No permanent wells installed during investigation. All borings backfilled with bentonite slurry upon completion.

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07-24-2001

Duke Engineering & Services
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LOG OF BORING CPT-14

LNG Site

Date	: 11/14/00	Water Level (bls)	: 6.0'-7.8'
Drilling Method	: CPT Direct Push	Surface Conditions	: level, little vegetation
Sampling Method	: 6" Split Spoon Core		
Drilling Company	: Gregg In-Situ		
Logged By	: Jeff Scheerhorn		

Sample Condition
- Modified California Split Spoon
- Larger Diameter Split Spoon
- Ground Water Sample
- Continous Core 4" CPT Sampler

Depth in Feet	% Recovery	Samples	Sample No.	OVM/HNU (ppm)	GRAPHIC	USCS	DESCRIPTION
0			SB001	0		SP	SAND, med-brown, fine with little med., rounded, dense, poorly-graded, heterogeneous, no odor, damp. At 1', some trace fine angular gravel, trace black organics (natural).
				0		SC	Same, light brown, 6" clayey SAND lense saturated.
				0			
				0			
				0			
				0			
				0			
5				0		CL	Sandy CLAY, dark brown, stiff, homogeneous, no odor, moist-wet.
				0			
				0			
				0			
				0		CL/ML	Silty CLAY and clayey SILT, dark brown, stiff-very stiff, plastic, poorly graded, heterogeneous, no odor, moist-wet.
				0			
				0			
				0			
10				0			Screen at 10'-15'.
							No ground water sample collected, insufficient water.
15							End of boring at 15'.
20							
25							

Note: All borings installed as temporary only. No permanent wells installed during investigation. All borings backfilled with bentonite slurry upon completion.

07-24-2001 C:\MTECH5\LOGS\SOUTH BAY\CPT-14.BOR

Duke Engineering & Services
A Duke Energy Company

LOG OF BORING CPT-15

LNG Site

Date : 11/14/00
Drilling Method : CPT Direct Push
Sampling Method : 6" Split Spoon Core
Drilling Company : Gregg In-Situ
Logged By : Jeff Scheerhorn

Sample Condition
- Modified California Split Spoon
- Larger Diameter Split Spoon
- Ground Water Sample
- Continous Core 4" CPT Sampler

Depth in Feet	% Recovery	Samples	Sample No.	OVM/HNU (ppm)	GRAPHIC	USCS	DESCRIPTION
0	100 100		SB003	0 0		SM/SC	Silty and clayey SAND, medium-brown, medium-grained, uniform, homogeneous, no odor, moist.
							No core samples collected below 1.0'.
5							Refer to CPT log for subsurface information with depth.
10							
15			GW003				
20							5' screen pushed to bottom depth of 19.0' End of boring at 20'.
25							

Note: All borings installed as temporary only. No permanent wells installed during investigation. All borings backfilled with bentonite slurry upon completion.

C:\MTECHS\LOGS\SOUTH BAY\CPT-15.BOR
07-24-2001

Duke Engineering & Services
A Duke Energy Company

LOG OF BORING CPT-16

LNG Site

Date : 11/15/00
Drilling Method : CPT Direct Push
Sampling Method : 6" Split Spoon Core
Drilling Company : Gregg In-Situ
Logged By : Jeff Scheerhorn

Sample Condition
- Modified Califomia Split Spoon
- Larger Diameter Split Spoon
- Ground Water Sample
- Continous Core 4" CPT Sampler

Depth in Feet	% Recovery	Samples	Sample No.	OVM/HNU (ppm)	GRAPHIC	USCS	DESCRIPTION
0	80 100		SB018	0 0		SP-SC	SAND and clayey SAND, med. brown, fine-medium grained, loose, heterogeneous, poorly graded, no odor, moist.
5							Refer to CPT profile logs for subsurface information with depth
10							Screen set at 5'-25'
15							
20			GW008				
25							End of boring at 25' GW sample collected.

Note: All borings installed as temporary only. No permanent wells installed during investigation. All borings backfilled with bentonite slurry upon completion.

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Duke Engineering & Services
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LOG OF BORING CPT-17

LNG Site

Date : 11/15/00
Drilling Method : CPT Direct Push
Sampling Method : 6" Split Spoon Core
Drilling Company : Gregg In-Situ
Logged By : Jeff Scheerhorn

Sample Condition
- Modified California Split Spoon
- Larger Diameter Split Spoon
- Ground Water Sample
- Continous Core 4" CPT Sampler

Depth in Feet	% Recovery	Samples	Sample No.	OVM/HNU (ppm)	GRAPHIC	USCS	DESCRIPTION
0	100 100		SB014	0 0		SW	SAND with trace fine angular gravel, lt. brown, med-grained, loose, uniform, homogeneous, no odor, moist
5							
10							No GW sample collected. End of boring at 10'.
15							
20							
25							

Note: All borings installed as temporary only. No permanent wells installed during investigation. All borings backfilled with bentonite slurry upon completion.

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Duke Engineering & Services
A Duke Energy Company

LOG OF BORING CPT-18

LNG Site

Date : 11/15/00
Drilling Method : CPT Direct Push
Sampling Method : 6" Split Spoon Core
Drilling Company : Gregg In-Situ
Logged By : Jeff Scheerhorn

Sample Condition
- Modified California Split Spoon
- Larger Diameter Split Spoon
- Ground Water Sample
- Continous Core 4" CPT Sampler

Depth in Feet	% Recovery	Samples	Sample No.	OVM/HNU (ppm)	GRAPHIC	USCS	DESCRIPTION
0	80 100		SB011	0 0		SP	SAND, medium-brown, medium-grained, loose, poorly-graded, heterogeneous due to trace black slag, no odor, moist.
5							Refer to CPT log for subsurface information with depth.
10							No GW sample collected. End of boring at 10'.
15							
20							
25							

Note: All borings installed as temporary only. No permanent wells installed during investigation. All borings backfilled with bentonite slurry upon completion.

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07-24-2001

Duke Engineering & Services
A Duke Energy Company

LOG OF BORING CPT-19

LNG Site

Date : 11/14/00
Drilling Method : CPT Direct Push
Sampling Method : 6" Split Spoon Core
Drilling Company : Gregg In-Situ
Logged By : Jeff Scheerhorn

Sample Condition
- Modified California Split Spoon
- Larger Diameter Split Spoon
- Ground Water Sample
- Continous Core 4" CPT Sampler

Depth in Feet	% Recovery	Samples	Sample No.	OVM/HNU (ppm)	GRAPHIC	USCS	DESCRIPTION
0	100 100		SB005	0 0		SP	SAND, light-medium brown, fine grained, uniform, homogeneous, no odor, moist.
5							Refer to CPT log for subsurface information with depth.
10							
15							
20							5' of screen pushed to bottom depth of 19'.
25			GW005				End of boring at 25'. GW sample collected.

Note: All borings installed as temporary only. No permanent wells installed during investigation. All borings backfilled with bentonite slurry upon completion.

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Duke Engineering & Services
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LOG OF BORING CPT-20

LNG Site

Date : 11/15/00
Drilling Method : CPT Direct Push
Sampling Method : 6" Split Spoon Core
Drilling Company : Gregg In-Situ
Logged By : Jeff Scheerhorn

Sample Condition
- Modified California Split Spoon
- Larger Diameter Split Spoon
- Ground Water Sample
- Continous Core 4" CPT Sampler

Depth in Feet	% Recovery	Samples	Sample No.	OVM/HNU (ppm)	GRAPHIC	USCS	DESCRIPTION
0	100 100		SB015	0 0		SW	SAND with little fine angular gravel and trace clay, medium brown, loose to medium dense, uniform, no odor, moist.
5							Refer to CPT log profiles for subsurface information with depth.
10							No GW sample collected. End of boring at 10'.
15							
20							
25							

Note: All borings installed as temporary only. No permanent wells installed during investigation. All borings backfilled with bentonite slurry upon completion.

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Duke Engineering & Services
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LOG OF BORING CPT-23

LNG Site

Date : 11/15/00
Drilling Method : CPT Direct Push
Sampling Method : 6" Split Spoon Core
Drilling Company : Gregg In-Situ
Logged By : Jeff Scheerhorn

Sample Condition
- Modified California Split Spoon
- Larger Diameter Split Spoon
- Ground Water Sample
- Continous Core 4" CPT Sampler

Depth in Feet	% Recovery	Samples	Sample No.	OVM/HNU (ppm)	GRAPHIC	USCS	DESCRIPTION
0	100 100		SB012	0 0		SP	SAND with little clay, medium brown, fine-medium grained, loose, poorly graded, homogeneous, no odor, moist.
5							Refer to CPT log profiles for subsurface information with depth.
10							No GW sample collected. End of boring at 10'.
15							
20							
25							

Note: All borings installed as temporary only. No permanent wells installed during investigation. All borings backfilled with bentonite slurry upon completion.

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Duke Engineering & Services
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LOG OF BORING CPT-24

LNG Site

Date : 11/15/00
Drilling Method : CPT Direct Push
Sampling Method : 6" Split Spoon Core
Drilling Company : Gregg In-Situ
Logged By : Jeff Scheerhorn

Sample Condition
- Modified California Split Spoon
- Larger Diameter Split Spoon
- Ground Water Sample
- Continous Core 4" CPT Sampler

Depth in Feet	% Recovery	Samples	Sample No.	OVM/HNU (ppm)	GRAPHIC	USCS	DESCRIPTION
0	20 100		SB017	0 0		SP	SAND with little fine-medium angular gravel, medium brown, fine-medium grained, loose, heterogeneous, no odor, moist.
5							Refer to CPT log profiles for subsurface information with depth.
10							Screen set at 11'-21'.
15			GW007				
20							End of boring at 21'. GW sample collected.
25							

Note: All borings installed as temporary only. No permanent wells installed during investigation. All borings backfilled with bentonite slurry upon completion.

07-24-2001 C:\MTECH5\LOGS\SOUTH BAY\CPT-24.BOR

Duke Engineering & Services
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LOG OF BORING CPT-25

LNG Site

Date : 11/15/00
Drilling Method : CPT Direct Push
Sampling Method : 6" Split Spoon Core
Drilling Company : Gregg In-Situ
Logged By : Jeff Scheerhorn

Sample Condition
- Modified California Split Spoon
- Larger Diameter Split Spoon
- Ground Water Sample
- Continous Core 4" CPT Sampler

Depth in Feet	% Recovery	Samples	Sample No.	OVM/HNU (ppm)	GRAPHIC	USCS	DESCRIPTION
0	60 100		SB013	0 0		SP	SAND with trace fine angular gravel, medium brown, loose, medium grained, uniform, homogeneous, no odor, moist.
5							Refer to CPT log for subsurface information with depth.
10							No GW sample collected. End of boring at 10'.
15							
20							
25							

Note: All borings installed as temporary only. No permanent wells installed during investigation. All borings backfilled with bentonite slurry upon completion.

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07-24-2001

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LOG OF BORING CPT-27

LNG Site

Date : 11/15/00
Drilling Method : CPT Direct Push
Sampling Method : 6" Split Spoon Core
Drilling Company : Gregg In-Situ
Logged By : Jeff Scheerhorn

Sample Condition
- Modified California Split Spoon
- Larger Diameter Split Spoon
- Ground Water Sample
- Continous Core 4" CPT Sampler

Depth in Feet	% Recovery	Samples	Sample No.	OVM/HNU (ppm)	GRAPHIC	USCS	DESCRIPTION
0	80 100		SB022	0 0		SP	SAND, medium-brown, fine grained, loose, uniform, homogeneous, no odor, moist.
5							Refer to CPT log profiles for subsurface information with depth.
10							Screen set at 10'-25'.
15							
20			GW014				GW sample collected.
25							End of boring at 25'.

Note: All borings installed as temporary only. No permanent wells installed during investigation. All borings backfilled with bentonite slurry upon completion.

C:\MTECH5\LOGS\SOUTH BAY\CPT-27.BOR
07-24-2001

Duke Engineering & Services
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LOG OF BORING CPT-28

LNG Site

Date : 11/15/00
Drilling Method : CPT Direct Push
Sampling Method : 6" Split Spoon Core
Drilling Company : Gregg In-Situ
Logged By : Jeff Scheerhorn

Sample Condition
- Modified California Split Spoon
- Larger Diameter Split Spoon
- Ground Water Sample
- Continous Core 4" CPT Sampler

Depth in Feet	% Recovery	Samples	Sample No.	OVM/HNU (ppm)	GRAPHIC	USCS	DESCRIPTION
0	100 100		SB016	0 0		SW	SAND with trace fine gravel, light brown, fine-grained, loose, uniform, homogeneous.
5							Refer to CPT log profiles for subsurface information with depth.
10							Screen at 10'-20'.
15							Screen set but no GW inflow, no sample collected. End of boring at 20'.
20							
25							

Note: All borings installed as temporary only. No permanent wells installed during investigation. All borings backfilled with bentonite slurry upon completion.

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APPENDIX F

Analytical Results

STAR ANALYTICAL

14500 Trinity Boulevard, Suite 106 • Fort Worth, Texas 76155
(817) 571-6800 • Metro (817) 540-6982 • FAX (817) 267-5431

QUALITY ETHICS SERVICE
BCL Environmental Sciences

Duke Engineering & Svcs - Austin	Project: LNG Facility - SBPP	
9111 Research Blvd.	Project Number: none	**Reported:**
Austin TX, 78758	Project Manager: Jeff Scheerhorn	12/06/00 12:19

ANALYTICAL REPORT FOR SAMPLES

Sample ID	Laboratory ID	Matrix	Date Sampled	Date Received
GW001	V011177-01	Liquid	11/14/00 12:30	11/17/00 10:00
GW002	V011177-02	Liquid	11/14/00 13:30	11/17/00 10:00
SB001	V011177-03	Solid	11/14/00 10:30	11/17/00 10:00
SB002	V011177-04	Solid	11/14/00 14:00	11/17/00 10:00
SB003	V011177-05	Solid	11/14/00 15:00	11/17/00 10:00
SB004	V011177-06	Solid	11/14/00 15:30	11/17/00 10:00
SB005	V011177-07	Solid	11/14/00 16:50	11/17/00 10:00
GW003	V011177-08	Liquid	11/14/00 14:45	11/17/00 10:00
GW004	V011177-09	Liquid	11/14/00 16:00	11/17/00 10:00
GW005	V011177-10	Liquid	11/14/00 16:30	11/17/00 10:00
GW006	V011177-11	Liquid	11/14/00 17:50	11/17/00 10:00
SB006	V011177-12	Solid	11/14/00 18:00	11/17/00 10:00
SB007	V011177-13	Solid	11/14/00 18:10	11/17/00 10:00
SB008	V011177-14	Solid	11/14/00 18:30	11/17/00 10:00
SB009	V011177-15	Solid	11/15/00 07:20	11/17/00 10:00
SB010	V011177-16	Solid	11/15/00 08:00	11/17/00 10:00
SB011	V011177-17	Solid	11/15/00 08:30	11/17/00 10:00
SB012	V011177-18	Solid	11/15/00 08:50	11/17/00 10:00
SB013	V011177-19	Solid	11/15/00 09:10	11/17/00 10:00
SB014	V011177-20	Solid	11/15/00 09:30	11/17/00 10:00
SB015	V011177-21	Solid	11/15/00 09:55	11/17/00 10:00
SB016	V011177-22	Solid	11/15/00 11:00	11/17/00 10:00
SB017	V011177-23	Solid	11/15/00 13:00	11/17/00 10:00
GW007	V011177-24	Liquid	11/15/00 12:15	11/17/00 10:00
GW008	V011177-25	Liquid	11/15/00 14:00	11/17/00 10:00
SB018	V011177-26	Solid	11/15/00 14:15	11/17/00 10:00
GW009	V011177-27	Liquid	11/15/00 14:45	11/17/00 10:00
GW010	V011177-28	Liquid	11/15/00 15:00	11/17/00 10:00
SB019	V011177-29	Solid	11/15/00 15:05	11/17/00 10:00

Star Analytical, Inc.

The results in this report apply to the samples analyzed in accordance with the chain of custody document. This analytical report must be reproduced in its entirety.

Anthony Dilday, Lab Director

STAR ANALYTICAL

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Duke Engineering & Svcs - Austin	Project: LNG Facility - SBPP	
9111 Research Blvd.	Project Number: none	**Reported:**
Austin TX, 78758	Project Manager: Jeff Scheerhorn	12/06/00 12:19

ANALYTICAL REPORT FOR SAMPLES

Sample ID	Laboratory ID	Matrix	Date Sampled	Date Received
SB020	V011177-30	Solid	11/15/00 16:25	11/17/00 10:00
GW011	V011177-31	Liquid	11/15/00 16:10	11/17/00 10:00
GW012	V011177-32	Liquid	11/15/00 16:20	11/17/00 10:00
GW013	V011177-33	Liquid	11/15/00 17:00	11/17/00 10:00
SB021	V011177-34	Solid	11/15/00 17:05	11/17/00 10:00
SB022	V011177-35	Solid	11/15/00 18:15	11/17/00 10:00
GW014	V011177-36	Liquid	11/15/00 18:05	11/17/00 10:00
TB001	V011177-37	Liquid	11/02/00 00:00	11/17/00 10:00
TB002	V011177-38	Liquid	11/02/00 00:00	11/17/00 10:00

The results in this report apply to the samples analyzed in accordance with the chain of custody document. This analytical report must be reproduced in its entirety.

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Duke Engineering & Svcs - Austin	Project: LNG Facility - SBPP	
9111 Research Blvd.	Project Number: none	**Reported:**
Austin TX, 78758	Project Manager: Jeff Scheerhorn	12/06/00 12:19

Diesel Hydrocarbons (C12-C24) by EPA Method 8015M (modified)

Star Analytical, Inc.

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
GW001 (V011177-01) Liquid	**Sampled: 11/14/00 12:30**	**Received: 11/17/00 10:00**							
Diesel Range Hydrocarbons	**0.44**	0.20	mg/l	1	V0K2005	11/20/00	11/21/00	EPA 8015 mod.	D-22b
Surrogate: o-Terphenyl		*95 %*	*49-167*		"	"	"	"	
GW002 (V011177-02) Liquid	**Sampled: 11/14/00 13:30**	**Received: 11/17/00 10:00**							
Diesel Range Hydrocarbons	**0.43**	0.20	mg/l	1	V0K2005	11/20/00	11/21/00	EPA 8015 mod.	D-22b
Surrogate: o-Terphenyl		*110 %*	*49-167*		"	"	"	"	
SB001 (V011177-03) Solid	**Sampled: 11/14/00 10:30**	**Received: 11/17/00 10:00**							
Diesel Range Hydrocarbons	ND	5.0	mg/kg	1	V0K2206	11/22/00	11/28/00	EPA 8015 mod.	
Surrogate: o-Terphenyl		*82 %*	*49-167*		"	"	"	"	
SB002 (V011177-04) Solid	**Sampled: 11/14/00 14:00**	**Received: 11/17/00 10:00**							
Diesel Range Hydrocarbons	ND	5.0	mg/kg	1	V0K2206	11/22/00	11/28/00	EPA 8015 mod.	
Surrogate: o-Terphenyl		*88 %*	*49-167*		"	"	"	"	
SB003 (V011177-05) Solid	**Sampled: 11/14/00 15:00**	**Received: 11/17/00 10:00**							
Diesel Range Hydrocarbons	ND	5.0	mg/kg	1	V0K2206	11/22/00	11/28/00	EPA 8015 mod.	
Surrogate: o-Terphenyl		*110 %*	*49-167*		"	"	"	"	
SB004 (V011177-06) Solid	**Sampled: 11/14/00 15:30**	**Received: 11/17/00 10:00**							
Diesel Range Hydrocarbons	ND	5.0	mg/kg	1	V0K2206	11/22/00	11/28/00	EPA 8015 mod.	
Surrogate: o-Terphenyl		*76 %*	*49-167*		"	"	"	"	
SB005 (V011177-07) Solid	**Sampled: 11/14/00 16:50**	**Received: 11/17/00 10:00**							
Diesel Range Hydrocarbons	ND	5.0	mg/kg	1	V0K2206	11/22/00	11/28/00	EPA 8015 mod.	
Surrogate: o-Terphenyl		*94 %*	*49-167*		"	"	"	"	

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Duke Engineering & Svcs - Austin	Project: LNG Facility - SBPP	
9111 Research Blvd.	Project Number: none	**Reported:**
Austin TX, 78758	Project Manager: Jeff Scheerhorn	12/06/00 12:19

Diesel Hydrocarbons (C12-C24) by EPA Method 8015M (modified)

Star Analytical, Inc.

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
GW003 (V011177-08) Liquid	**Sampled: 11/14/00 14:45**	**Received: 11/17/00 10:00**							
Diesel Range Hydrocarbons	**0.22**	0.20	mg/l	1	V0K2005	11/20/00	11/21/00	EPA 8015 mod.	D-22a
Surrogate: o-Terphenyl		*77 %*	*49-167*		"	"	"	"	
GW004 (V011177-09) Liquid	**Sampled: 11/14/00 16:00**	**Received: 11/17/00 10:00**							
Diesel Range Hydrocarbons	**0.27**	0.20	mg/l	1	V0K2005	11/20/00	11/21/00	EPA 8015 mod.	D-22a
Surrogate: o-Terphenyl		*110 %*	*49-167*		"	"	"	"	
GW005 (V011177-10) Liquid	**Sampled: 11/14/00 16:30**	**Received: 11/17/00 10:00**							
Diesel Range Hydrocarbons	**0.33**	0.20	mg/l	1	V0K2005	11/20/00	11/22/00	EPA 8015 mod.	D-22
Surrogate: o-Terphenyl		*110 %*	*49-167*		"	"	"	"	
GW006 (V011177-11) Liquid	**Sampled: 11/14/00 17:50**	**Received: 11/17/00 10:00**							
Diesel Range Hydrocarbons	**0.21**	0.20	mg/l	1	V0K2005	11/20/00	11/22/00	EPA 8015 mod.	D-22
Surrogate: o-Terphenyl		*88 %*	*49-167*		"	"	"	"	
SB006 (V011177-12) Solid	**Sampled: 11/14/00 18:00**	**Received: 11/17/00 10:00**							
Diesel Range Hydrocarbons	**6.0**	5.0	mg/kg	1	V0K2206	11/22/00	11/29/00	EPA 8015 mod.	D-22e
Surrogate: o-Terphenyl		*110 %*	*49-167*		"	"	"	"	
SB007 (V011177-13) Solid	**Sampled: 11/14/00 18:10**	**Received: 11/17/00 10:00**							
Diesel Range Hydrocarbons	ND	5.0	mg/kg	1	V0K2206	11/22/00	11/28/00	EPA 8015 mod.	
Surrogate: o-Terphenyl		*82 %*	*49-167*		"	"	"	"	
SB008 (V011177-14) Solid	**Sampled: 11/14/00 18:30**	**Received: 11/17/00 10:00**							
Diesel Range Hydrocarbons	**5.2**	5.0	mg/kg	1	V0K2206	11/22/00	11/28/00	EPA 8015 mod.	D-22e
Surrogate: o-Terphenyl		*88 %*	*49-167*		"	"	"	"	

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Duke Engineering & Svcs - Austin	Project: LNG Facility - SBPP	
9111 Research Blvd.	Project Number: none	**Reported:**
Austin TX, 78758	Project Manager: Jeff Scheerhorn	12/06/00 12:19

Diesel Hydrocarbons (C12-C24) by EPA Method 8015M (modified)

Star Analytical, Inc.

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
SB009 (V011177-15) Solid	**Sampled: 11/15/00 07:20**	**Received: 11/17/00 10:00**							
Diesel Range Hydrocarbons	**6.5**	5.0	mg/kg	1	V0K2206	11/22/00	11/29/00	EPA 8015 mod.	D-22e
Surrogate: o-Terphenyl		*94 %*	*49-167*		"	"	"	"	
SB010 (V011177-16) Solid	**Sampled: 11/15/00 08:00**	**Received: 11/17/00 10:00**							
Diesel Range Hydrocarbons	**5.0**	5.0	mg/kg	1	V0K2206	11/22/00	11/28/00	EPA 8015 mod.	D-22e
Surrogate: o-Terphenyl		*88 %*	*49-167*		"	"	"	"	
SB011 (V011177-17) Solid	**Sampled: 11/15/00 08:30**	**Received: 11/17/00 10:00**							
Diesel Range Hydrocarbons	**12**	5.0	mg/kg	1	V0K2206	11/22/00	11/29/00	EPA 8015 mod.	D-22e
Surrogate: o-Terphenyl		*110 %*	*49-167*		"	"	"	"	
SB012 (V011177-18) Solid	**Sampled: 11/15/00 08:50**	**Received: 11/17/00 10:00**							
Diesel Range Hydrocarbons	ND	5.0	mg/kg	1	V0K2206	11/22/00	11/28/00	EPA 8015 mod.	
Surrogate: o-Terphenyl		*65 %*	*49-167*		"	"	"	"	
SB013 (V011177-19) Solid	**Sampled: 11/15/00 09:10**	**Received: 11/17/00 10:00**							
Diesel Range Hydrocarbons	**7.0**	5.0	mg/kg	1	V0K2206	11/22/00	11/29/00	EPA 8015 mod.	D-22e
Surrogate: o-Terphenyl		*110 %*	*49-167*		"	"	"	"	
SB014 (V011177-20) Solid	**Sampled: 11/15/00 09:30**	**Received: 11/17/00 10:00**							
Diesel Range Hydrocarbons	**64**	5.0	mg/kg	1	V0K2206	11/22/00	11/29/00	EPA 8015 mod.	D-22e
Surrogate: o-Terphenyl		*190 %*	*49-167*		"	"	"	"	*O-02*
SB015 (V011177-21) Solid	**Sampled: 11/15/00 09:55**	**Received: 11/17/00 10:00**							
Diesel Range Hydrocarbons	**7.8**	5.0	mg/kg	1	V0K2206	11/22/00	11/28/00	EPA 8015 mod.	D-22e
Surrogate: o-Terphenyl		*110 %*	*49-167*		"	"	"	"	

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Duke Engineering & Svcs - Austin	Project: LNG Facility - SBPP	
9111 Research Blvd.	Project Number: none	**Reported:**
Austin TX, 78758	Project Manager: Jeff Scheerhorn	12/06/00 12:19

Diesel Hydrocarbons (C12-C24) by EPA Method 8015M (modified)

Star Analytical, Inc.

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
SB016 (V011177-22) Solid Sampled: 11/15/00 11:00 Received: 11/17/00 10:00									
Diesel Range Hydrocarbons	18	5.0	mg/kg	1	V0K2206	11/22/00	11/29/00	EPA 8015 mod.	D-22e
Surrogate: o-Terphenyl		*110 %*	*49-167*		"	"	"	"	
SB017 (V011177-23) Solid Sampled: 11/15/00 13:00 Received: 11/17/00 10:00									
Diesel Range Hydrocarbons	ND	5.0	mg/kg	1	V0K2206	11/22/00	11/28/00	EPA 8015 mod.	
Surrogate: o-Terphenyl		*88 %*	*49-167*		"	"	"	"	
GW007 (V011177-24) Liquid Sampled: 11/15/00 12:15 Received: 11/17/00 10:00									
Diesel Range Hydrocarbons	0.22	0.20	mg/l	1	V0K2005	11/20/00	11/22/00	EPA 8015 mod.	D-22
Surrogate: o-Terphenyl		*100 %*	*49-167*		"	"	"	"	
GW008 (V011177-25) Liquid Sampled: 11/15/00 14:00 Received: 11/17/00 10:00									
Diesel Range Hydrocarbons	0.23	0.20	mg/l	1	V0K2005	11/20/00	11/22/00	EPA 8015 mod.	D-22
Surrogate: o-Terphenyl		*90 %*	*49-167*		"	"	"	"	
SB018 (V011177-26) Solid Sampled: 11/15/00 14:15 Received: 11/17/00 10:00									
Diesel Range Hydrocarbons	6.8	5.0	mg/kg	1	V0K2206	11/22/00	11/29/00	EPA 8015 mod.	D-22e
Surrogate: o-Terphenyl		*94 %*	*49-167*		"	"	"	"	
GW009 (V011177-27) Liquid Sampled: 11/15/00 14:45 Received: 11/17/00 10:00									
Diesel Range Hydrocarbons	ND	0.20	mg/l	1	V0K2005	11/20/00	11/22/00	EPA 8015 mod.	
Surrogate: o-Terphenyl		*70 %*	*49-167*		"	"	"	"	
GW010 (V011177-28) Liquid Sampled: 11/15/00 15:00 Received: 11/17/00 10:00									
Diesel Range Hydrocarbons	ND	0.20	mg/l	1	V0K2005	11/20/00	11/22/00	EPA 8015 mod.	
Surrogate: o-Terphenyl		*91 %*	*49-167*		"	"	"	"	

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QUALITY ETHICS SERVICE
RCL Environmental Sciences

Duke Engineering & Svcs - Austin	Project: LNG Facility - SBPP	
9111 Research Blvd.	Project Number: none	**Reported:**
Austin TX, 78758	Project Manager: Jeff Scheerhorn	12/06/00 12:19

Diesel Hydrocarbons (C12-C24) by EPA Method 8015M (modified)

Star Analytical, Inc.

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
SB019 (V011177-29) Solid Sampled: 11/15/00 15:05 Received: 11/17/00 10:00									
Diesel Range Hydrocarbons	ND	5.0	mg/kg	1	V0K2206	11/22/00	11/28/00	EPA 8015 mod.	
Surrogate: o-Terphenyl		*82 %*	*49-167*		"	"	"	"	
SB020 (V011177-30) Solid Sampled: 11/15/00 16:25 Received: 11/17/00 10:00									
Diesel Range Hydrocarbons	**8.7**	5.0	mg/kg	1	V0K2206	11/22/00	11/28/00	EPA 8015 mod.	D-22c
Surrogate: o-Terphenyl		*88 %*	*49-167*		"	"	"	"	
GW011 (V011177-31) Liquid Sampled: 11/15/00 16:10 Received: 11/17/00 10:00									
Diesel Range Hydrocarbons	**0.28**	0.20	mg/l	1	V0K2005	11/20/00	11/22/00	EPA 8015 mod.	D-22
Surrogate: o-Terphenyl		*110 %*	*49-167*		"	"	"	"	
GW013 (V011177-33) Liquid Sampled: 11/15/00 17:00 Received: 11/17/00 10:00									
Diesel Range Hydrocarbons	**0.26**	0.20	mg/l	1	V0K2005	11/20/00	11/22/00	EPA 8015 mod.	D-22
Surrogate: o-Terphenyl		*87 %*	*49-167*		"	"	"	"	
SB021 (V011177-34) Solid Sampled: 11/15/00 17:05 Received: 11/17/00 10:00									
Diesel Range Hydrocarbons	**34**	7.0	mg/kg	1	V0K2711	11/27/00	11/29/00	EPA 8015 mod.	D-22d
Surrogate: o-Terphenyl		*150 %*	*49-167*		"	"	"	"	
SB022 (V011177-35) Solid Sampled: 11/15/00 18:15 Received: 11/17/00 10:00									
Diesel Range Hydrocarbons	**9.7**	7.0	mg/kg	1	V0K2711	11/27/00	11/29/00	EPA 8015 mod.	D-22d
Surrogate: o-Terphenyl		*110 %*	*49-167*		"	"	"	"	
GW014 (V011177-36) Liquid Sampled: 11/15/00 18:05 Received: 11/17/00 10:00									
Diesel Range Hydrocarbons	ND	0.20	mg/l	1	V0K2005	11/20/00	11/22/00	EPA 8015 mod.	
Surrogate: o-Terphenyl		*87 %*	*49-167*		"	"	"	"	

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Duke Engineering & Svcs - Austin	Project: LNG Facility - SBPP	
9111 Research Blvd.	Project Number: none	**Reported:**
Austin TX, 78758	Project Manager: Jeff Scheerhorn	12/06/00 12:19

Volatile Organic Compounds by EPA Method 8260B

Star Analytical, Inc.

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
GW001 (V011177-01) Liquid	**Sampled: 11/14/00 12:30**	**Received: 11/17/00 10:00**							
Acetone	ND	25.0	ug/l	1	V0K2708	11/21/00	11/21/00	EPA 8260B	
Benzene	ND	5.00	"	"	"	"	"	"	
Bromobenzene	ND	5.00	"	"	"	"	"	"	
Bromodichloromethane	ND	5.00	"	"	"	"	"	"	
Bromoform	ND	5.00	"	"	"	"	"	"	
Bromomethane	ND	5.00	"	"	"	"	"	"	
2-Butanone	ND	10.0	"	"	"	"	"	"	
n-Butylbenzene	ND	5.00	"	"	"	"	"	"	
sec-Butylbenzene	ND	5.00	"	"	"	"	"	"	
tert-Butylbenzene	ND	5.00	"	"	"	"	"	"	
Carbon disulfide	ND	5.00	"	"	"	"	"	"	
Carbon tetrachloride	ND	5.00	"	"	"	"	"	"	
Chlorobenzene	ND	5.00	"	"	"	"	"	"	
Chloroethane	ND	5.00	"	"	"	"	"	"	
Chloroform	ND	5.00	"	"	"	"	"	"	
Chloromethane	ND	5.00	"	"	"	"	"	"	
2-Chlorotoluene	ND	5.00	"	"	"	"	"	"	
4-Chlorotoluene	ND	5.00	"	"	"	"	"	"	
Dibromochloromethane	ND	5.00	"	"	"	"	"	"	
1,2-Dibromo-3-chloropropane	ND	5.00	"	"	"	"	"	"	
1,2-Dibromoethane	ND	5.00	"	"	"	"	"	"	
Dibromomethane	ND	5.00	"	"	"	"	"	"	
1,2-Dichlorobenzene	ND	5.00	"	"	"	"	"	"	
1,3-Dichlorobenzene	ND	5.00	"	"	"	"	"	"	
1,4-Dichlorobenzene	ND	5.00	"	"	"	"	"	"	
Dichlorodifluoromethane	ND	5.00	"	"	"	"	"	"	
1,1-Dichloroethane	ND	5.00	"	"	"	"	"	"	
1,2-Dichloroethane	ND	5.00	"	"	"	"	"	"	
1,1-Dichloroethene	ND	5.00	"	"	"	"	"	"	
cis-1,2-Dichloroethene	ND	5.00	"	"	"	"	"	"	
trans-1,2-Dichloroethene	ND	5.00	"	"	"	"	"	"	
1,2-Dichloropropane	ND	5.00	"	"	"	"	"	"	
1,3-Dichloropropane	ND	5.00	"	"	"	"	"	"	
2,2-Dichloropropane	ND	5.00	"	"	"	"	"	"	
1,1-Dichloropropene	ND	5.00	"	"	"	"	"	"	
cis-1,3-Dichloropropene	ND	5.00	"	"	"	"	"	"	
trans-1,3-Dichloropropene	ND	5.00	"	"	"	"	"	"	
Ethylbenzene	ND	5.00	"	"	"	"	"	"	
Hexachlorobutadiene	ND	5.00	"	"	"	"	"	"	
2-Hexanone	ND	10.0	"	"	"	"	"	"	

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QUALITY ETHICS SERVICE

Duke Engineering & Svcs - Austin	Project: LNG Facility - SBPP	
9111 Research Blvd.	Project Number: none	**Reported:**
Austin TX, 78758	Project Manager: Jeff Scheerhorn	12/06/00 12:19

Volatile Organic Compounds by EPA Method 8260B

Star Analytical, Inc.

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
GW001 (V011177-01) Liquid	**Sampled: 11/14/00 12:30**	**Received: 11/17/00 10:00**							
Isopropylbenzene	ND	5.00	ug/l	1	V0K2708	11/21/00	11/21/00	EPA 8260B	
p-Isopropyltoluene	ND	5.00	"	"	"	"	"	"	
Methylene chloride	ND	10.0	"	"	"	"	"	"	
Methyl tert-butyl ether	ND	5.00	"	"	"	"	"	"	
4-Methyl-2-pentanone	ND	10.0	"	"	"	"	"	"	
Naphthalene	ND	5.00	"	"	"	"	"	"	
n-Propylbenzene	ND	5.00	"	"	"	"	"	"	
Styrene	ND	5.00	"	"	"	"	"	"	
1,1,1,2-Tetrachloroethane	ND	5.00	"	"	"	"	"	"	
1,1,2,2-Tetrachloroethane	ND	5.00	"	"	"	"	"	"	
Tetrachloroethene	ND	5.00	"	"	"	"	"	"	
Toluene	ND	5.00	"	"	"	"	"	"	
1,2,3-Trichlorobenzene	ND	5.00	"	"	"	"	"	"	
1,2,4-Trichlorobenzene	ND	5.00	"	"	"	"	"	"	
1,1,1-Trichloroethane	ND	5.00	"	"	"	"	"	"	
1,1,2-Trichloroethane	ND	5.00	"	"	"	"	"	"	
Trichloroethene	ND	5.00	"	"	"	"	"	"	
Trichlorofluoromethane	ND	5.00	"	"	"	"	"	"	
1,2,3-Trichloropropane	ND	5.00	"	"	"	"	"	"	
1,2,4-Trimethylbenzene	ND	5.00	"	"	"	"	"	"	
1,3,5-Trimethylbenzene	ND	5.00	"	"	"	"	"	"	
Vinyl acetate	ND	5.00	"	"	"	"	"	"	
Vinyl chloride	ND	5.00	"	"	"	"	"	"	
m,p-Xylene	ND	10.0	"	"	"	"	"	"	
o-Xylene	ND	5.00	"	"	"	"	"	"	
Surrogate: DBFM		*107 %*	*86-118*		"	"	"	"	
Surrogate: Toluene-d8		*101 %*	*88-110*		"	"	"	"	
Surrogate: 4-BFB		*110 %*	*86-115*		"	"	"	"	

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Duke Engineering & Svcs - Austin	Project: LNG Facility - SBPP	
9111 Research Blvd.	Project Number: none	**Reported:**
Austin TX, 78758	Project Manager: Jeff Scheerhorn	12/06/00 12:19

Volatile Organic Compounds by EPA Method 8260B

Star Analytical, Inc.

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
GW002 (V011177-02) Liquid	**Sampled: 11/14/00 13:30**	**Received: 11/17/00 10:00**							
Acetone	ND	25.0	ug/l	1	V0K2708	11/21/00	11/21/00	EPA 8260B	
Benzene	ND	5.00	"	"	"	"	"	"	
Bromobenzene	ND	5.00	"	"	"	"	"	"	
Bromodichloromethane	ND	5.00	"	"	"	"	"	"	
Bromoform	ND	5.00	"	"	"	"	"	"	
Bromomethane	ND	5.00	"	"	"	"	"	"	
2-Butanone	ND	10.0	"	"	"	"	"	"	
n-Butylbenzene	ND	5.00	"	"	"	"	"	"	
sec-Butylbenzene	ND	5.00	"	"	"	"	"	"	
tert-Butylbenzene	ND	5.00	"	"	"	"	"	"	
Carbon disulfide	ND	5.00	"	"	"	"	"	"	
Carbon tetrachloride	ND	5.00	"	"	"	"	"	"	
Chlorobenzene	ND	5.00	"	"	"	"	"	"	
Chloroethane	ND	5.00	"	"	"	"	"	"	
Chloroform	ND	5.00	"	"	"	"	"	"	
Chloromethane	ND	5.00	"	"	"	"	"	"	
2-Chlorotoluene	ND	5.00	"	"	"	"	"	"	
4-Chlorotoluene	ND	5.00	"	"	"	"	"	"	
Dibromochloromethane	ND	5.00	"	"	"	"	"	"	
1,2-Dibromo-3-chloropropane	ND	5.00	"	"	"	"	"	"	
1,2-Dibromoethane	ND	5.00	"	"	"	"	"	"	
Dibromomethane	ND	5.00	"	"	"	"	"	"	
1,2-Dichlorobenzene	ND	5.00	"	"	"	"	"	"	
1,3-Dichlorobenzene	ND	5.00	"	"	"	"	"	"	
1,4-Dichlorobenzene	ND	5.00	"	"	"	"	"	"	
Dichlorodifluoromethane	ND	5.00	"	"	"	"	"	"	
1,1-Dichloroethane	ND	5.00	"	"	"	"	"	"	
1,2-Dichloroethane	ND	5.00	"	"	"	"	"	"	
1,1-Dichloroethene	ND	5.00	"	"	"	"	"	"	
cis-1,2-Dichloroethene	ND	5.00	"	"	"	"	"	"	
trans-1,2-Dichloroethene	ND	5.00	"	"	"	"	"	"	
1,2-Dichloropropane	ND	5.00	"	"	"	"	"	"	
1,3-Dichloropropane	ND	5.00	"	"	"	"	"	"	
2,2-Dichloropropane	ND	5.00	"	"	"	"	"	"	
1,1-Dichloropropene	ND	5.00	"	"	"	"	"	"	
cis-1,3-Dichloropropene	ND	5.00	"	"	"	"	"	"	
trans-1,3-Dichloropropene	ND	5.00	"	"	"	"	"	"	
Ethylbenzene	ND	5.00	"	"	"	"	"	"	
Hexachlorobutadiene	ND	5.00	"	"	"	"	"	"	
2-Hexanone	ND	10.0	"	"	"	"	"	"	

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STAR ANALYTICAL

14500 Trinity Boulevard, Suite 106 • Fort Worth, Texas 76155
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QUALITY ETHICS SERVICE

Duke Engineering & Svcs - Austin	Project: LNG Facility - SBPP	
9111 Research Blvd.	Project Number: none	**Reported:**
Austin TX, 78758	Project Manager: Jeff Scheerhorn	12/06/00 12:19

Volatile Organic Compounds by EPA Method 8260B

Star Analytical, Inc.

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
GW002 (V011177-02) Liquid	**Sampled: 11/14/00 13:30**	**Received: 11/17/00 10:00**							
Isopropylbenzene	ND	5.00	ug/l	1	V0K2708	11/21/00	11/21/00	EPA 8260B	
p-Isopropyltoluene	ND	5.00	"	"	"	"	"	"	
Methylene chloride	ND	10.0	"	"	"	"	"	"	
Methyl tert-butyl ether	ND	5.00	"	"	"	"	"	"	
4-Methyl-2-pentanone	ND	10.0	"	"	"	"	"	"	
Naphthalene	ND	5.00	"	"	"	"	"	"	
n-Propylbenzene	ND	5.00	"	"	"	"	"	"	
Styrene	ND	5.00	"	"	"	"	"	"	
1,1,1,2-Tetrachloroethane	ND	5.00	"	"	"	"	"	"	
1,1,2,2-Tetrachloroethane	ND	5.00	"	"	"	"	"	"	
Tetrachloroethene	ND	5.00	"	"	"	"	"	"	
Toluene	ND	5.00	"	"	"	"	"	"	
1,2,3-Trichlorobenzene	ND	5.00	"	"	"	"	"	"	
1,2,4-Trichlorobenzene	ND	5.00	"	"	"	"	"	"	
1,1,1-Trichloroethane	ND	5.00	"	"	"	"	"	"	
1,1,2-Trichloroethane	ND	5.00	"	"	"	"	"	"	
richloroethene	ND	5.00	"	"	"	"	"	"	
Trichlorofluoromethane	ND	5.00	"	"	"	"	"	"	
1,2,3-Trichloropropane	ND	5.00	"	"	"	"	"	"	
1,2,4-Trimethylbenzene	ND	5.00	"	"	"	"	"	"	
1,3,5-Trimethylbenzene	ND	5.00	"	"	"	"	"	"	
Vinyl acetate	ND	5.00	"	"	"	"	"	"	
Vinyl chloride	ND	5.00	"	"	"	"	"	"	
m,p-Xylene	ND	10.0	"	"	"	"	"	"	
o-Xylene	ND	5.00	"	"	"	"	"	"	
Surrogate: DBFM		*108 %*	*86-118*		"	"	"	"	
Surrogate: Toluene-d8		*101 %*	*88-110*		"	"	"	"	
Surrogate: 4-BFB		*115 %*	*86-115*		"	"	"	"	

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Duke Engineering & Svcs - Austin	Project: LNG Facility - SBPP	
9111 Research Blvd.	Project Number: none	**Reported:**
Austin TX, 78758	Project Manager: Jeff Scheerhorn	12/06/00 12:19

Volatile Organic Compounds by EPA Method 8260B

Star Analytical, Inc.

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
SB001 (V011177-03) Solid Sampled: 11/14/00 10:30 Received: 11/17/00 10:00									
Acetone	ND	250	ug/kg	1	V0K2914	11/27/00	11/27/00	EPA 8260B	
Benzene	ND	50.0	"	"	"	"	"	"	
Bromobenzene	ND	50.0	"	"	"	"	"	"	
Bromodichloromethane	ND	50.0	"	"	"	"	"	"	
Bromoform	ND	50.0	"	"	"	"	"	"	
Bromomethane	ND	50.0	"	"	"	"	"	"	
2-Butanone	ND	100	"	"	"	"	"	"	
n-Butylbenzene	ND	50.0	"	"	"	"	"	"	
sec-Butylbenzene	ND	50.0	"	"	"	"	"	"	
tert-Butylbenzene	ND	50.0	"	"	"	"	"	"	
Carbon disulfide	ND	50.0	"	"	"	"	"	"	
Carbon tetrachloride	ND	50.0	"	"	"	"	"	"	
Chlorobenzene	ND	50.0	"	"	"	"	"	"	
Chloroethane	ND	50.0	"	"	"	"	"	"	
Chloroform	ND	50.0	"	"	"	"	"	"	
Chloromethane	ND	50.0	"	"	"	"	"	"	
-Chlorotoluene	ND	50.0	"	"	"	"	"	"	
4-Chlorotoluene	ND	50.0	"	"	"	"	"	"	
Dibromochloromethane	ND	50.0	"	"	"	"	"	"	
1,2-Dibromo-3-chloropropane	ND	50.0	"	"	"	"	"	"	
1,2-Dibromoethane	ND	50.0	"	"	"	"	"	"	
Dibromomethane	ND	50.0	"	"	"	"	"	"	
1,2-Dichlorobenzene	ND	50.0	"	"	"	"	"	"	
1,3-Dichlorobenzene	ND	50.0	"	"	"	"	"	"	
1,4-Dichlorobenzene	ND	50.0	"	"	"	"	"	"	
Dichlorodifluoromethane	ND	50.0	"	"	"	"	"	"	
1,1-Dichloroethane	ND	50.0	"	"	"	"	"	"	
1,2-Dichloroethane	ND	50.0	"	"	"	"	"	"	
1,1-Dichloroethene	ND	50.0	"	"	"	"	"	"	
cis-1,2-Dichloroethene	ND	50.0	"	"	"	"	"	"	
trans-1,2-Dichloroethene	ND	50.0	"	"	"	"	"	"	
1,2-Dichloropropane	ND	50.0	"	"	"	"	"	"	
1,3-Dichloropropane	ND	50.0	"	"	"	"	"	"	
2,2-Dichloropropane	ND	50.0	"	"	"	"	"	"	
1,1-Dichloropropene	ND	50.0	"	"	"	"	"	"	
cis-1,3-Dichloropropene	ND	50.0	"	"	"	"	"	"	
trans-1,3-Dichloropropene	ND	50.0	"	"	"	"	"	"	
Ethylbenzene	ND	50.0	"	"	"	"	"	"	
Hexachlorobutadiene	ND	50.0	"	"	"	"	"	"	
2-Hexanone	ND	100	"	"	"	"	"	"	

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Duke Engineering & Svcs - Austin	Project: LNG Facility - SBPP	
9111 Research Blvd.	Project Number: none	**Reported:**
Austin TX, 78758	Project Manager: Jeff Scheerhorn	12/06/00 12:19

Volatile Organic Compounds by EPA Method 8260B

Star Analytical, Inc.

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
SB001 (V011177-03) Solid	**Sampled: 11/14/00 10:30**	**Received: 11/17/00 10:00**							
Isopropylbenzene	ND	50.0	ug/kg	1	V0K2914	11/27/00	11/27/00	EPA 8260B	
p-Isopropyltoluene	ND	50.0	"	"	"	"	"	"	
Methylene chloride	ND	100	"	"	"	"	"	"	
Methyl tert-butyl ether	ND	50.0	"	"	"	"	"	"	
4-Methyl-2-pentanone	ND	100	"	"	"	"	"	"	
Naphthalene	ND	50.0	"	"	"	"	"	"	
n-Propylbenzene	ND	50.0	"	"	"	"	"	"	
Styrene	ND	50.0	"	"	"	"	"	"	
1,1,1,2-Tetrachloroethane	ND	50.0	"	"	"	"	"	"	
1,1,2,2-Tetrachloroethane	ND	50.0	"	"	"	"	"	"	
Tetrachloroethene	ND	50.0	"	"	"	"	"	"	
Toluene	ND	50.0	"	"	"	"	"	"	
1,2,3-Trichlorobenzene	ND	50.0	"	"	"	"	"	"	
1,2,4-Trichlorobenzene	ND	50.0	"	"	"	"	"	"	
1,1,1-Trichloroethane	ND	50.0	"	"	"	"	"	"	
1,1,2-Trichloroethane	ND	50.0	"	"	"	"	"	"	
Trichloroethene	ND	50.0	"	"	"	"	"	"	
Trichlorofluoromethane	ND	50.0	"	"	"	"	"	"	
1,2,3-Trichloropropane	ND	50.0	"	"	"	"	"	"	
1,2,4-Trimethylbenzene	ND	50.0	"	"	"	"	"	"	
1,3,5-Trimethylbenzene	ND	50.0	"	"	"	"	"	"	
Vinyl acetate	ND	50.0	"	"	"	"	"	"	
Vinyl chloride	ND	50.0	"	"	"	"	"	"	
m,p-Xylene	ND	100	"	"	"	"	"	"	
o-Xylene	ND	50.0	"	"	"	"	"	"	
Surrogate: DBFM		*80.0 %*	*76-120*		"	"	"	"	
Surrogate: Toluene-d8		*98.6 %*	*81-117*		"	"	"	"	
Surrogate: 4-BFB		*98.2 %*	*74-121*		"	"	"	"	

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Duke Engineering & Svcs - Austin	Project: LNG Facility - SBPP	
9111 Research Blvd.	Project Number: none	**Reported:**
Austin TX, 78758	Project Manager: Jeff Scheerhorn	12/06/00 12:19

Volatile Organic Compounds by EPA Method 8260B

Star Analytical, Inc.

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
SB002 (V011177-04) Solid Sampled: 11/14/00 14:00 Received: 11/17/00 10:00									
Acetone	ND	250	ug/kg	1	V0K2914	11/27/00	11/27/00	EPA 8260B	
Benzene	ND	50.0	"	"	"	"	"	"	
Bromobenzene	ND	50.0	"	"	"	"	"	"	
Bromodichloromethane	ND	50.0	"	"	"	"	"	"	
Bromoform	ND	50.0	"	"	"	"	"	"	
Bromomethane	ND	50.0	"	"	"	"	"	"	
2-Butanone	ND	100	"	"	"	"	"	"	
n-Butylbenzene	ND	50.0	"	"	"	"	"	"	
sec-Butylbenzene	ND	50.0	"	"	"	"	"	"	
tert-Butylbenzene	ND	50.0	"	"	"	"	"	"	
Carbon disulfide	ND	50.0	"	"	"	"	"	"	
Carbon tetrachloride	ND	50.0	"	"	"	"	"	"	
Chlorobenzene	ND	50.0	"	"	"	"	"	"	
Chloroethane	ND	50.0	"	"	"	"	"	"	
Chloroform	ND	50.0	"	"	"	"	"	"	
Chloromethane	ND	50.0	"	"	"	"	"	"	
-Chlorotoluene	ND	50.0	"	"	"	"	"	"	
4-Chlorotoluene	ND	50.0	"	"	"	"	"	"	
Dibromochloromethane	ND	50.0	"	"	"	"	"	"	
1,2-Dibromo-3-chloropropane	ND	50.0	"	"	"	"	"	"	
1,2-Dibromoethane	ND	50.0	"	"	"	"	"	"	
Dibromomethane	ND	50.0	"	"	"	"	"	"	
1,2-Dichlorobenzene	ND	50.0	"	"	"	"	"	"	
1,3-Dichlorobenzene	ND	50.0	"	"	"	"	"	"	
1,4-Dichlorobenzene	ND	50.0	"	"	"	"	"	"	
Dichlorodifluoromethane	ND	50.0	"	"	"	"	"	"	
1,1-Dichloroethane	ND	50.0	"	"	"	"	"	"	
1,2-Dichloroethane	ND	50.0	"	"	"	"	"	"	
1,1-Dichloroethene	ND	50.0	"	"	"	"	"	"	
cis-1,2-Dichloroethene	ND	50.0	"	"	"	"	"	"	
trans-1,2-Dichloroethene	ND	50.0	"	"	"	"	"	"	
1,2-Dichloropropane	ND	50.0	"	"	"	"	"	"	
1,3-Dichloropropane	ND	50.0	"	"	"	"	"	"	
2,2-Dichloropropane	ND	50.0	"	"	"	"	"	"	
1,1-Dichloropropene	ND	50.0	"	"	"	"	"	"	
cis-1,3-Dichloropropene	ND	50.0	"	"	"	"	"	"	
trans-1,3-Dichloropropene	ND	50.0	"	"	"	"	"	"	
Ethylbenzene	ND	50.0	"	"	"	"	"	"	
Hexachlorobutadiene	ND	50.0	"	"	"	"	"	"	
2-Hexanone	ND	100	"	"	"	"	"	"	

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Duke Engineering & Svcs - Austin	Project: LNG Facility - SBPP	
9111 Research Blvd.	Project Number: none	**Reported:**
Austin TX, 78758	Project Manager: Jeff Scheerhorn	12/06/00 12:19

Volatile Organic Compounds by EPA Method 8260B

Star Analytical, Inc.

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
SB002 (V011177-04) Solid	**Sampled: 11/14/00 14:00**	**Received: 11/17/00 10:00**							
Isopropylbenzene	ND	50.0	ug/kg	1	V0K2914	11/27/00	11/27/00	EPA 8260B	
p-Isopropyltoluene	ND	50.0	"	"	"	"	"	"	
Methylene chloride	ND	100	"	"	"	"	"	"	
Methyl tert-butyl ether	ND	50.0	"	"	"	"	"	"	
4-Methyl-2-pentanone	ND	100	"	"	"	"	"	"	
Naphthalene	ND	50.0	"	"	"	"	"	"	
n-Propylbenzene	ND	50.0	"	"	"	"	"	"	
Styrene	ND	50.0	"	"	"	"	"	"	
1,1,1,2-Tetrachloroethane	ND	50.0	"	"	"	"	"	"	
1,1,2,2-Tetrachloroethane	ND	50.0	"	"	"	"	"	"	
Tetrachloroethene	ND	50.0	"	"	"	"	"	"	
Toluene	ND	50.0	"	"	"	"	"	"	
1,2,3-Trichlorobenzene	ND	50.0	"	"	"	"	"	"	
1,2,4-Trichlorobenzene	ND	50.0	"	"	"	"	"	"	
1,1,1-Trichloroethane	ND	50.0	"	"	"	"	"	"	
1,1,2-Trichloroethane	ND	50.0	"	"	"	"	"	"	
richloroethene	ND	50.0	"	"	"	"	"	"	
Trichlorofluoromethane	ND	50.0	"	"	"	"	"	"	
1,2,3-Trichloropropane	ND	50.0	"	"	"	"	"	"	
1,2,4-Trimethylbenzene	ND	50.0	"	"	"	"	"	"	
1,3,5-Trimethylbenzene	ND	50.0	"	"	"	"	"	"	
Vinyl acetate	ND	50.0	"	"	"	"	"	"	
Vinyl chloride	ND	50.0	"	"	"	"	"	"	
m,p-Xylene	ND	100	"	"	"	"	"	"	
o-Xylene	ND	50.0	"	"	"	"	"	"	
Surrogate: DBFM		*84.4 %*	*76-120*		"	"	"	"	
Surrogate: Toluene-d8		*98.0 %*	*81-117*		"	"	"	"	
Surrogate: 4-BFB		*96.6 %*	*74-121*		"	"	"	"	

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Duke Engineering & Svcs - Austin	Project: LNG Facility - SBPP	
9111 Research Blvd.	Project Number: none	**Reported:**
Austin TX, 78758	Project Manager: Jeff Scheerhorn	12/06/00 12:19

Volatile Organic Compounds by EPA Method 8260B

Star Analytical, Inc.

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
GW006 (V011177-11) Liquid	**Sampled: 11/14/00 17:50**	**Received: 11/17/00 10:00**							
Acetone	ND	25.0	ug/l	1	V0K2708	11/21/00	11/21/00	EPA 8260B	
Benzene	ND	5.00	"	"	"	"	"	"	
Bromobenzene	ND	5.00	"	"	"	"	"	"	
Bromodichloromethane	ND	5.00	"	"	"	"	"	"	
Bromoform	ND	5.00	"	"	"	"	"	"	
Bromomethane	ND	5.00	"	"	"	"	"	"	
2-Butanone	ND	10.0	"	"	"	"	"	"	
n-Butylbenzene	ND	5.00	"	"	"	"	"	"	
sec-Butylbenzene	ND	5.00	"	"	"	"	"	"	
tert-Butylbenzene	ND	5.00	"	"	"	"	"	"	
Carbon disulfide	ND	5.00	"	"	"	"	"	"	
Carbon tetrachloride	ND	5.00	"	"	"	"	"	"	
Chlorobenzene	ND	5.00	"	"	"	"	"	"	
Chloroethane	ND	5.00	"	"	"	"	"	"	
Chloroform	ND	5.00	"	"	"	"	"	"	
Chloromethane	ND	5.00	"	"	"	"	"	"	
2-Chlorotoluene	ND	5.00	"	"	"	"	"	"	
4-Chlorotoluene	ND	5.00	"	"	"	"	"	"	
Dibromochloromethane	ND	5.00	"	"	"	"	"	"	
1,2-Dibromo-3-chloropropane	ND	5.00	"	"	"	"	"	"	
1,2-Dibromoethane	ND	5.00	"	"	"	"	"	"	
Dibromomethane	ND	5.00	"	"	"	"	"	"	
1,2-Dichlorobenzene	ND	5.00	"	"	"	"	"	"	
1,3-Dichlorobenzene	ND	5.00	"	"	"	"	"	"	
1,4-Dichlorobenzene	ND	5.00	"	"	"	"	"	"	
Dichlorodifluoromethane	ND	5.00	"	"	"	"	"	"	
1,1-Dichloroethane	ND	5.00	"	"	"	"	"	"	
1,2-Dichloroethane	ND	5.00	"	"	"	"	"	"	
1,1-Dichloroethene	ND	5.00	"	"	"	"	"	"	
cis-1,2-Dichloroethene	ND	5.00	"	"	"	"	"	"	
trans-1,2-Dichloroethene	ND	5.00	"	"	"	"	"	"	
1,2-Dichloropropane	ND	5.00	"	"	"	"	"	"	
1,3-Dichloropropane	ND	5.00	"	"	"	"	"	"	
2,2-Dichloropropane	ND	5.00	"	"	"	"	"	"	
1,1-Dichloropropene	ND	5.00	"	"	"	"	"	"	
cis-1,3-Dichloropropene	ND	5.00	"	"	"	"	"	"	
trans-1,3-Dichloropropene	ND	5.00	"	"	"	"	"	"	
Ethylbenzene	ND	5.00	"	"	"	"	"	"	
Hexachlorobutadiene	ND	5.00	"	"	"	"	"	"	
2-Hexanone	ND	10.0	"	"	"	"	"	"	

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QUALITY ETHICS SERVICE

Duke Engineering & Svcs - Austin	Project: LNG Facility - SBPP	
9111 Research Blvd.	Project Number: none	**Reported:**
Austin TX, 78758	Project Manager: Jeff Scheerhorn	12/06/00 12:19

Volatile Organic Compounds by EPA Method 8260B

Star Analytical, Inc.

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
GW006 (V011177-11) Liquid	**Sampled: 11/14/00 17:50**	**Received: 11/17/00 10:00**							
Isopropylbenzene	ND	5.00	ug/l	1	V0K2708	11/21/00	11/21/00	EPA 8260B	
p-Isopropyltoluene	ND	5.00	"	"	"	"	"	"	
Methylene chloride	ND	10.0	"	"	"	"	"	"	
Methyl tert-butyl ether	ND	5.00	"	"	"	"	"	"	
4-Methyl-2-pentanone	ND	10.0	"	"	"	"	"	"	
Naphthalene	ND	5.00	"	"	"	"	"	"	
n-Propylbenzene	ND	5.00	"	"	"	"	"	"	
Styrene	ND	5.00	"	"	"	"	"	"	
1,1,1,2-Tetrachloroethane	ND	5.00	"	"	"	"	"	"	
1,1,2,2-Tetrachloroethane	ND	5.00	"	"	"	"	"	"	
Tetrachloroethene	ND	5.00	"	"	"	"	"	"	
Toluene	ND	5.00	"	"	"	"	"	"	
1,2,3-Trichlorobenzene	ND	5.00	"	"	"	"	"	"	
1,2,4-Trichlorobenzene	ND	5.00	"	"	"	"	"	"	
1,1,1-Trichloroethane	ND	5.00	"	"	"	"	"	"	
1,1,2-Trichloroethane	ND	5.00	"	"	"	"	"	"	
Trichloroethene	ND	5.00	"	"	"	"	"	"	
Trichlorofluoromethane	ND	5.00	"	"	"	"	"	"	
1,2,3-Trichloropropane	ND	5.00	"	"	"	"	"	"	
1,2,4-Trimethylbenzene	ND	5.00	"	"	"	"	"	"	
1,3,5-Trimethylbenzene	ND	5.00	"	"	"	"	"	"	
Vinyl acetate	ND	5.00	"	"	"	"	"	"	
Vinyl chloride	ND	5.00	"	"	"	"	"	"	
m,p-Xylene	ND	10.0	"	"	"	"	"	"	
o-Xylene	ND	5.00	"	"	"	"	"	"	
Surrogate: DBFM		*99.6 %*		*86-118*	"	"	"	"	
Surrogate: Toluene-d8		*99.8 %*		*88-110*	"	"	"	"	
Surrogate: 4-BFB		*108 %*		*86-115*	"	"	"	"	

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QUALITY ETHICS SERVICE

Duke Engineering & Svcs - Austin 9111 Research Blvd. Austin TX, 78758	Project: LNG Facility - SBPP Project Number: none Project Manager: Jeff Scheerhorn	**Reported:** 12/06/00 12:19

Volatile Organic Compounds by EPA Method 8260B

Star Analytical, Inc.

SB006 (V011177-12) Solid Sampled: 11/14/00 18:00 Received: 11/17/00 10:00

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
Acetone	ND	250	ug/kg	1	V0K2914	11/27/00	11/27/00	EPA 8260B	
Benzene	ND	50.0	"	"	"	"	"	"	
Bromobenzene	ND	50.0	"	"	"	"	"	"	
Bromodichloromethane	ND	50.0	"	"	"	"	"	"	
Bromoform	ND	50.0	"	"	"	"	"	"	
Bromomethane	ND	50.0	"	"	"	"	"	"	
2-Butanone	ND	100	"	"	"	"	"	"	
n-Butylbenzene	ND	50.0	"	"	"	"	"	"	
sec-Butylbenzene	ND	50.0	"	"	"	"	"	"	
tert-Butylbenzene	ND	50.0	"	"	"	"	"	"	
Carbon disulfide	ND	50.0	"	"	"	"	"	"	
Carbon tetrachloride	ND	50.0	"	"	"	"	"	"	
Chlorobenzene	ND	50.0	"	"	"	"	"	"	
Chloroethane	ND	50.0	"	"	"	"	"	"	
Chloroform	ND	50.0	"	"	"	"	"	"	
Chloromethane	ND	50.0	"	"	"	"	"	"	
2-Chlorotoluene	ND	50.0	"	"	"	"	"	"	
4-Chlorotoluene	ND	50.0	"	"	"	"	"	"	
Dibromochloromethane	ND	50.0	"	"	"	"	"	"	
1,2-Dibromo-3-chloropropane	ND	50.0	"	"	"	"	"	"	
1,2-Dibromoethane	ND	50.0	"	"	"	"	"	"	
Dibromomethane	ND	50.0	"	"	"	"	"	"	
1,2-Dichlorobenzene	ND	50.0	"	"	"	"	"	"	
1,3-Dichlorobenzene	ND	50.0	"	"	"	"	"	"	
1,4-Dichlorobenzene	ND	50.0	"	"	"	"	"	"	
Dichlorodifluoromethane	ND	50.0	"	"	"	"	"	"	
1,1-Dichloroethane	ND	50.0	"	"	"	"	"	"	
1,2-Dichloroethane	ND	50.0	"	"	"	"	"	"	
1,1-Dichloroethene	ND	50.0	"	"	"	"	"	"	
cis-1,2-Dichloroethene	ND	50.0	"	"	"	"	"	"	
trans-1,2-Dichloroethene	ND	50.0	"	"	"	"	"	"	
1,2-Dichloropropane	ND	50.0	"	"	"	"	"	"	
1,3-Dichloropropane	ND	50.0	"	"	"	"	"	"	
2,2-Dichloropropane	ND	50.0	"	"	"	"	"	"	
1,1-Dichloropropene	ND	50.0	"	"	"	"	"	"	
cis-1,3-Dichloropropene	ND	50.0	"	"	"	"	"	"	
trans-1,3-Dichloropropene	ND	50.0	"	"	"	"	"	"	
Ethylbenzene	ND	50.0	"	"	"	"	"	"	
Hexachlorobutadiene	ND	50.0	"	"	"	"	"	"	
2-Hexanone	ND	100	"	"	"	"	"	"	

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Duke Engineering & Svcs - Austin	Project: LNG Facility - SBPP	
9111 Research Blvd.	Project Number: none	**Reported:**
Austin TX, 78758	Project Manager: Jeff Scheerhorn	12/06/00 12:19

Volatile Organic Compounds by EPA Method 8260B

Star Analytical, Inc.

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
SB006 (V011177-12) Solid	**Sampled: 11/14/00 18:00**	**Received: 11/17/00 10:00**							
Isopropylbenzene	ND	50.0	ug/kg	1	V0K2914	11/27/00	11/27/00	EPA 8260B	
p-Isopropyltoluene	ND	50.0	"	"	"	"	"	"	
Methylene chloride	ND	100	"	"	"	"	"	"	
Methyl tert-butyl ether	ND	50.0	"	"	"	"	"	"	
4-Methyl-2-pentanone	ND	100	"	"	"	"	"	"	
Naphthalene	ND	50.0	"	"	"	"	"	"	
n-Propylbenzene	ND	50.0	"	"	"	"	"	"	
Styrene	ND	50.0	"	"	"	"	"	"	
1,1,1,2-Tetrachloroethane	ND	50.0	"	"	"	"	"	"	
1,1,2,2-Tetrachloroethane	ND	50.0	"	"	"	"	"	"	
Tetrachloroethene	ND	50.0	"	"	"	"	"	"	
Toluene	ND	50.0	"	"	"	"	"	"	
1,2,3-Trichlorobenzene	ND	50.0	"	"	"	"	"	"	
1,2,4-Trichlorobenzene	ND	50.0	"	"	"	"	"	"	
1,1,1-Trichloroethane	ND	50.0	"	"	"	"	"	"	
1,1,2-Trichloroethane	ND	50.0	"	"	"	"	"	"	
Trichloroethene	ND	50.0	"	"	"	"	"	"	
Trichlorofluoromethane	ND	50.0	"	"	"	"	"	"	
1,2,3-Trichloropropane	ND	50.0	"	"	"	"	"	"	
1,2,4-Trimethylbenzene	ND	50.0	"	"	"	"	"	"	
1,3,5-Trimethylbenzene	ND	50.0	"	"	"	"	"	"	
Vinyl acetate	ND	50.0	"	"	"	"	"	"	
Vinyl chloride	ND	50.0	"	"	"	"	"	"	
m,p-Xylene	ND	100	"	"	"	"	"	"	
o-Xylene	ND	50.0	"	"	"	"	"	"	
Surrogate: DBFM		*78.8 %*	*76-120*		"	"	"	"	
Surrogate: Toluene-d8		*97.0 %*	*81-117*		"	"	"	"	
Surrogate: 4-BFB		*101 %*	*74-121*		"	"	"	"	

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QUALITY ETHICS SERVICE
RCL Environmental Sciences

Duke Engineering & Svcs - Austin	Project: LNG Facility - SBPP	
9111 Research Blvd.	Project Number: none	**Reported:**
Austin TX, 78758	Project Manager: Jeff Scheerhorn	12/06/00 12:19

Volatile Organic Compounds by EPA Method 8260B

Star Analytical, Inc.

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
SB007 (V011177-13) Solid Sampled: 11/14/00 18:10 Received: 11/17/00 10:00									
Acetone	ND	250	ug/kg	1	V0K2914	11/27/00	11/27/00	EPA 8260B	
Benzene	ND	50.0	"	"	"	"	"	"	
Bromobenzene	ND	50.0	"	"	"	"	"	"	
Bromodichloromethane	ND	50.0	"	"	"	"	"	"	
Bromoform	ND	50.0	"	"	"	"	"	"	
Bromomethane	ND	50.0	"	"	"	"	"	"	
2-Butanone	ND	100	"	"	"	"	"	"	
n-Butylbenzene	ND	50.0	"	"	"	"	"	"	
sec-Butylbenzene	ND	50.0	"	"	"	"	"	"	
tert-Butylbenzene	ND	50.0	"	"	"	"	"	"	
Carbon disulfide	ND	50.0	"	"	"	"	"	"	
Carbon tetrachloride	ND	50.0	"	"	"	"	"	"	
Chlorobenzene	ND	50.0	"	"	"	"	"	"	
Chloroethane	ND	50.0	"	"	"	"	"	"	
Chloroform	ND	50.0	"	"	"	"	"	"	
Chloromethane	ND	50.0	"	"	"	"	"	"	
-Chlorotoluene	ND	50.0	"	"	"	"	"	"	
4-Chlorotoluene	ND	50.0	"	"	"	"	"	"	
Dibromochloromethane	ND	50.0	"	"	"	"	"	"	
1,2-Dibromo-3-chloropropane	ND	50.0	"	"	"	"	"	"	
1,2-Dibromoethane	ND	50.0	"	"	"	"	"	"	
Dibromomethane	ND	50.0	"	"	"	"	"	"	
1,2-Dichlorobenzene	ND	50.0	"	"	"	"	"	"	
1,3-Dichlorobenzene	ND	50.0	"	"	"	"	"	"	
1,4-Dichlorobenzene	ND	50.0	"	"	"	"	"	"	
Dichlorodifluoromethane	ND	50.0	"	"	"	"	"	"	
1,1-Dichloroethane	ND	50.0	"	"	"	"	"	"	
1,2-Dichloroethane	ND	50.0	"	"	"	"	"	"	
1,1-Dichloroethene	ND	50.0	"	"	"	"	"	"	
cis-1,2-Dichloroethene	ND	50.0	"	"	"	"	"	"	
trans-1,2-Dichloroethene	ND	50.0	"	"	"	"	"	"	
1,2-Dichloropropane	ND	50.0	"	"	"	"	"	"	
1,3-Dichloropropane	ND	50.0	"	"	"	"	"	"	
2,2-Dichloropropane	ND	50.0	"	"	"	"	"	"	
1,1-Dichloropropene	ND	50.0	"	"	"	"	"	"	
cis-1,3-Dichloropropene	ND	50.0	"	"	"	"	"	"	
trans-1,3-Dichloropropene	ND	50.0	"	"	"	"	"	"	
Ethylbenzene	ND	50.0	"	"	"	"	"	"	
Hexachlorobutadiene	ND	50.0	"	"	"	"	"	"	
2-Hexanone	ND	100	"	"	"	"	"	"	

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Duke Engineering & Svcs - Austin	Project: LNG Facility - SBPP	
9111 Research Blvd.	Project Number: none	**Reported:**
Austin TX, 78758	Project Manager: Jeff Scheerhorn	12/06/00 12:19

Volatile Organic Compounds by EPA Method 8260B

Star Analytical, Inc.

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
SB007 (V011177-13) Solid	**Sampled: 11/14/00 18:10**	**Received: 11/17/00 10:00**							
Isopropylbenzene	ND	50.0	ug/kg	1	V0K2914	11/27/00	11/27/00	EPA 8260B	
p-Isopropyltoluene	ND	50.0	"	"	"	"	"	"	
Methylene chloride	ND	100	"	"	"	"	"	"	
Methyl tert-butyl ether	ND	50.0	"	"	"	"	"	"	
4-Methyl-2-pentanone	ND	100	"	"	"	"	"	"	
Naphthalene	ND	50.0	"	"	"	"	"	"	
n-Propylbenzene	ND	50.0	"	"	"	"	"	"	
Styrene	ND	50.0	"	"	"	"	"	"	
1,1,1,2-Tetrachloroethane	ND	50.0	"	"	"	"	"	"	
1,1,2,2-Tetrachloroethane	ND	50.0	"	"	"	"	"	"	
Tetrachloroethene	ND	50.0	"	"	"	"	"	"	
Toluene	ND	50.0	"	"	"	"	"	"	
1,2,3-Trichlorobenzene	ND	50.0	"	"	"	"	"	"	
1,2,4-Trichlorobenzene	ND	50.0	"	"	"	"	"	"	
1,1,1-Trichloroethane	ND	50.0	"	"	"	"	"	"	
1,1,2-Trichloroethane	ND	50.0	"	"	"	"	"	"	
Trichloroethene	ND	50.0	"	"	"	"	"	"	
Trichlorofluoromethane	ND	50.0	"	"	"	"	"	"	
1,2,3-Trichloropropane	ND	50.0	"	"	"	"	"	"	
1,2,4-Trimethylbenzene	ND	50.0	"	"	"	"	"	"	
1,3,5-Trimethylbenzene	ND	50.0	"	"	"	"	"	"	
Vinyl acetate	ND	50.0	"	"	"	"	"	"	
Vinyl chloride	ND	50.0	"	"	"	"	"	"	
m,p-Xylene	ND	100	"	"	"	"	"	"	
o-Xylene	ND	50.0	"	"	"	"	"	"	
Surrogate: DBFM		*88.0 %*	*76-120*		"	"	"	"	
Surrogate: Toluene-d8		*96.4 %*	*81-117*		"	"	"	"	
Surrogate: 4-BFB		*100 %*	*74-121*		"	"	"	"	

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Duke Engineering & Svcs - Austin	Project: LNG Facility - SBPP	
9111 Research Blvd.	Project Number: none	**Reported:**
Austin TX, 78758	Project Manager: Jeff Scheerhorn	12/06/00 12:19

Volatile Organic Compounds by EPA Method 8260B

Star Analytical, Inc.

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
SB010 (V011177-16) Solid Sampled: 11/15/00 08:00 Received: 11/17/00 10:00									
Acetone	ND	250	ug/kg	1	V0K2914	11/27/00	11/27/00	EPA 8260B	
Benzene	ND	50.0	"	"	"	"	"	"	
Bromobenzene	ND	50.0	"	"	"	"	"	"	
Bromodichloromethane	ND	50.0	"	"	"	"	"	"	
Bromoform	ND	50.0	"	"	"	"	"	"	
Bromomethane	ND	50.0	"	"	"	"	"	"	
2-Butanone	ND	100	"	"	"	"	"	"	
n-Butylbenzene	ND	50.0	"	"	"	"	"	"	
sec-Butylbenzene	ND	50.0	"	"	"	"	"	"	
tert-Butylbenzene	ND	50.0	"	"	"	"	"	"	
Carbon disulfide	ND	50.0	"	"	"	"	"	"	
Carbon tetrachloride	ND	50.0	"	"	"	"	"	"	
Chlorobenzene	ND	50.0	"	"	"	"	"	"	
Chloroethane	ND	50.0	"	"	"	"	"	"	
Chloroform	ND	50.0	"	"	"	"	"	"	
Chloromethane	ND	50.0	"	"	"	"	"	"	
2-Chlorotoluene	ND	50.0	"	"	"	"	"	"	
4-Chlorotoluene	ND	50.0	"	"	"	"	"	"	
Dibromochloromethane	ND	50.0	"	"	"	"	"	"	
1,2-Dibromo-3-chloropropane	ND	50.0	"	"	"	"	"	"	
1,2-Dibromoethane	ND	50.0	"	"	"	"	"	"	
Dibromomethane	ND	50.0	"	"	"	"	"	"	
1,2-Dichlorobenzene	ND	50.0	"	"	"	"	"	"	
1,3-Dichlorobenzene	ND	50.0	"	"	"	"	"	"	
1,4-Dichlorobenzene	ND	50.0	"	"	"	"	"	"	
Dichlorodifluoromethane	ND	50.0	"	"	"	"	"	"	
1,1-Dichloroethane	ND	50.0	"	"	"	"	"	"	
1,2-Dichloroethane	ND	50.0	"	"	"	"	"	"	
1,1-Dichloroethene	ND	50.0	"	"	"	"	"	"	
cis-1,2-Dichloroethene	ND	50.0	"	"	"	"	"	"	
trans-1,2-Dichloroethene	ND	50.0	"	"	"	"	"	"	
1,2-Dichloropropane	ND	50.0	"	"	"	"	"	"	
1,3-Dichloropropane	ND	50.0	"	"	"	"	"	"	
2,2-Dichloropropane	ND	50.0	"	"	"	"	"	"	
1,1-Dichloropropene	ND	50.0	"	"	"	"	"	"	
cis-1,3-Dichloropropene	ND	50.0	"	"	"	"	"	"	
trans-1,3-Dichloropropene	ND	50.0	"	"	"	"	"	"	
Ethylbenzene	ND	50.0	"	"	"	"	"	"	
Hexachlorobutadiene	ND	50.0	"	"	"	"	"	"	
2-Hexanone	ND	100	"	"	"	"	"	"	

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Duke Engineering & Svcs - Austin	Project: LNG Facility - SBPP	
9111 Research Blvd.	Project Number: none	**Reported:**
Austin TX, 78758	Project Manager: Jeff Scheerhorn	12/06/00 12:19

Volatile Organic Compounds by EPA Method 8260B

Star Analytical, Inc.

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
SB010 (V011177-16) Solid	**Sampled: 11/15/00 08:00**	**Received: 11/17/00 10:00**							
Isopropylbenzene	ND	50.0	ug/kg	1	V0K2914	11/27/00	11/27/00	EPA 8260B	
p-Isopropyltoluene	ND	50.0	"	"	"	"	"	"	
Methylene chloride	ND	100	"	"	"	"	"	"	
Methyl tert-butyl ether	ND	50.0	"	"	"	"	"	"	
4-Methyl-2-pentanone	ND	100	"	"	"	"	"	"	
Naphthalene	ND	50.0	"	"	"	"	"	"	
n-Propylbenzene	ND	50.0	"	"	"	"	"	"	
Styrene	ND	50.0	"	"	"	"	"	"	
1,1,1,2-Tetrachloroethane	ND	50.0	"	"	"	"	"	"	
1,1,2,2-Tetrachloroethane	ND	50.0	"	"	"	"	"	"	
Tetrachloroethene	ND	50.0	"	"	"	"	"	"	
Toluene	ND	50.0	"	"	"	"	"	"	
1,2,3-Trichlorobenzene	ND	50.0	"	"	"	"	"	"	
1,2,4-Trichlorobenzene	ND	50.0	"	"	"	"	"	"	
1,1,1-Trichloroethane	ND	50.0	"	"	"	"	"	"	
1,1,2-Trichloroethane	ND	50.0	"	"	"	"	"	"	
Trichloroethene	ND	50.0	"	"	"	"	"	"	
Trichlorofluoromethane	ND	50.0	"	"	"	"	"	"	
1,2,3-Trichloropropane	ND	50.0	"	"	"	"	"	"	
1,2,4-Trimethylbenzene	ND	50.0	"	"	"	"	"	"	
1,3,5-Trimethylbenzene	ND	50.0	"	"	"	"	"	"	
Vinyl acetate	ND	50.0	"	"	"	"	"	"	
Vinyl chloride	ND	50.0	"	"	"	"	"	"	
m,p-Xylene	ND	100	"	"	"	"	"	"	
o-Xylene	ND	50.0	"	"	"	"	"	"	
Surrogate: DBFM		*88.4 %*		*76-120*	"	"	"	"	
Surrogate: Toluene-d8		*100 %*		*81-117*	"	"	"	"	
Surrogate: 4-BFB		*101 %*		*74-121*	"	"	"	"	

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QUALITY ETHICS SERVICE
ICL Environmental Sciences

Duke Engineering & Svcs - Austin 9111 Research Blvd. Austin TX, 78758	Project: LNG Facility - SBPP Project Number: none Project Manager: Jeff Scheerhorn	**Reported:** 12/06/00 12:19

Volatile Organic Compounds by EPA Method 8260B

Star Analytical, Inc.

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
GW009 (V011177-27) Liquid Sampled: 11/15/00 14:45 Received: 11/17/00 10:00									
Acetone	ND	25.0	ug/l	1	V0K2708	11/21/00	11/21/00	EPA 8260B	
Benzene	ND	5.00	"	"	"	"	"	"	
Bromobenzene	ND	5.00	"	"	"	"	"	"	
Bromodichloromethane	ND	5.00	"	"	"	"	"	"	
Bromoform	ND	5.00	"	"	"	"	"	"	
Bromomethane	ND	5.00	"	"	"	"	"	"	
2-Butanone	ND	10.0	"	"	"	"	"	"	
n-Butylbenzene	ND	5.00	"	"	"	"	"	"	
sec-Butylbenzene	ND	5.00	"	"	"	"	"	"	
tert-Butylbenzene	ND	5.00	"	"	"	"	"	"	
Carbon disulfide	ND	5.00	"	"	"	"	"	"	
Carbon tetrachloride	ND	5.00	"	"	"	"	"	"	
Chlorobenzene	ND	5.00	"	"	"	"	"	"	
Chloroethane	ND	5.00	"	"	"	"	"	"	
Chloroform	ND	5.00	"	"	"	"	"	"	
Chloromethane	ND	5.00	"	"	"	"	"	"	
2-Chlorotoluene	ND	5.00	"	"	"	"	"	"	
4-Chlorotoluene	ND	5.00	"	"	"	"	"	"	
Dibromochloromethane	ND	5.00	"	"	"	"	"	"	
1,2-Dibromo-3-chloropropane	ND	5.00	"	"	"	"	"	"	
1,2-Dibromoethane	ND	5.00	"	"	"	"	"	"	
Dibromomethane	ND	5.00	"	"	"	"	"	"	
1,2-Dichlorobenzene	ND	5.00	"	"	"	"	"	"	
1,3-Dichlorobenzene	ND	5.00	"	"	"	"	"	"	
1,4-Dichlorobenzene	ND	5.00	"	"	"	"	"	"	
Dichlorodifluoromethane	ND	5.00	"	"	"	"	"	"	
1,1-Dichloroethane	ND	5.00	"	"	"	"	"	"	
1,2-Dichloroethane	ND	5.00	"	"	"	"	"	"	
1,1-Dichloroethene	ND	5.00	"	"	"	"	"	"	
cis-1,2-Dichloroethene	ND	5.00	"	"	"	"	"	"	
trans-1,2-Dichloroethene	ND	5.00	"	"	"	"	"	"	
1,2-Dichloropropane	ND	5.00	"	"	"	"	"	"	
1,3-Dichloropropane	ND	5.00	"	"	"	"	"	"	
2,2-Dichloropropane	ND	5.00	"	"	"	"	"	"	
1,1-Dichloropropene	ND	5.00	"	"	"	"	"	"	
cis-1,3-Dichloropropene	ND	5.00	"	"	"	"	"	"	
trans-1,3-Dichloropropene	ND	5.00	"	"	"	"	"	"	
Ethylbenzene	ND	5.00	"	"	"	"	"	"	
Hexachlorobutadiene	ND	5.00	"	"	"	"	"	"	
2-Hexanone	ND	10.0	"	"	"	"	"	"	

The results in this report apply to the samples analyzed in accordance with the chain of custody document. This analytical report must be reproduced in its entirety.

STAR ANALYTICAL

14500 Trinity Boulevard, Suite 106 • Fort Worth, Texas 76155
(817) 571-6800 • Metro (817) 540-6982 • FAX (817) 267-5431

Duke Engineering & Svcs - Austin	Project: LNG Facility - SBPP	
9111 Research Blvd.	Project Number: none	**Reported:**
Austin TX, 78758	Project Manager: Jeff Scheerhorn	12/06/00 12:19

Volatile Organic Compounds by EPA Method 8260B

Star Analytical, Inc.

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
GW009 (V011177-27) Liquid	**Sampled: 11/15/00 14:45**	**Received: 11/17/00 10:00**							
Isopropylbenzene	ND	5.00	ug/l	1	V0K2708	11/21/00	11/21/00	EPA 8260B	
p-Isopropyltoluene	ND	5.00	"	"	"	"	"	"	
Methylene chloride	ND	10.0	"	"	"	"	"	"	
Methyl tert-butyl ether	ND	5.00	"	"	"	"	"	"	
4-Methyl-2-pentanone	ND	10.0	"	"	"	"	"	"	
Naphthalene	ND	5.00	"	"	"	"	"	"	
n-Propylbenzene	ND	5.00	"	"	"	"	"	"	
Styrene	ND	5.00	"	"	"	"	"	"	
1,1,1,2-Tetrachloroethane	ND	5.00	"	"	"	"	"	"	
1,1,2,2-Tetrachloroethane	ND	5.00	"	"	"	"	"	"	
Tetrachloroethene	ND	5.00	"	"	"	"	"	"	
Toluene	ND	5.00	"	"	"	"	"	"	
1,2,3-Trichlorobenzene	ND	5.00	"	"	"	"	"	"	
1,2,4-Trichlorobenzene	ND	5.00	"	"	"	"	"	"	
1,1,1-Trichloroethane	ND	5.00	"	"	"	"	"	"	
1,1,2-Trichloroethane	ND	5.00	"	"	"	"	"	"	
Trichloroethene	ND	5.00	"	"	"	"	"	"	
Trichlorofluoromethane	ND	5.00	"	"	"	"	"	"	
1,2,3-Trichloropropane	ND	5.00	"	"	"	"	"	"	
1,2,4-Trimethylbenzene	ND	5.00	"	"	"	"	"	"	
1,3,5-Trimethylbenzene	ND	5.00	"	"	"	"	"	"	
Vinyl acetate	ND	5.00	"	"	"	"	"	"	
Vinyl chloride	ND	5.00	"	"	"	"	"	"	
m,p-Xylene	ND	10.0	"	"	"	"	"	"	
o-Xylene	ND	5.00	"	"	"	"	"	"	
Surrogate: DBFM		*104 %*	*86-118*		"	"	"	"	
Surrogate: Toluene-d8		*101 %*	*88-110*		"	"	"	"	
Surrogate: 4-BFB		*107 %*	*86-115*		"	"	"	"	

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QUALITY ETHICS SERVICE

Duke Engineering & Svcs - Austin	Project: LNG Facility - SBPP	
9111 Research Blvd.	Project Number: none	**Reported:**
Austin TX, 78758	Project Manager: Jeff Scheerhorn	12/06/00 12:19

Volatile Organic Compounds by EPA Method 8260B

Star Analytical, Inc.

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
GW010 (V011177-28) Liquid	Sampled: 11/15/00 15:00	Received: 11/17/00 10:00							
Acetone	ND	25.0	ug/l	1	V0K2708	11/21/00	11/21/00	EPA 8260B	
Benzene	ND	5.00	"	"	"	"	"	"	
Bromobenzene	ND	5.00	"	"	"	"	"	"	
Bromodichloromethane	ND	5.00	"	"	"	"	"	"	
Bromoform	ND	5.00	"	"	"	"	"	"	
Bromomethane	ND	5.00	"	"	"	"	"	"	
2-Butanone	ND	10.0	"	"	"	"	"	"	
n-Butylbenzene	ND	5.00	"	"	"	"	"	"	
sec-Butylbenzene	ND	5.00	"	"	"	"	"	"	
tert-Butylbenzene	ND	5.00	"	"	"	"	"	"	
Carbon disulfide	ND	5.00	"	"	"	"	"	"	
Carbon tetrachloride	ND	5.00	"	"	"	"	"	"	
Chlorobenzene	ND	5.00	"	"	"	"	"	"	
Chloroethane	ND	5.00	"	"	"	"	"	"	
Chloroform	ND	5.00	"	"	"	"	"	"	
Chloromethane	ND	5.00	"	"	"	"	"	"	
2-Chlorotoluene	ND	5.00	"	"	"	"	"	"	
4-Chlorotoluene	ND	5.00	"	"	"	"	"	"	
Dibromochloromethane	ND	5.00	"	"	"	"	"	"	
1,2-Dibromo-3-chloropropane	ND	5.00	"	"	"	"	"	"	
1,2-Dibromoethane	ND	5.00	"	"	"	"	"	"	
Dibromomethane	ND	5.00	"	"	"	"	"	"	
1,2-Dichlorobenzene	ND	5.00	"	"	"	"	"	"	
1,3-Dichlorobenzene	ND	5.00	"	"	"	"	"	"	
1,4-Dichlorobenzene	ND	5.00	"	"	"	"	"	"	
Dichlorodifluoromethane	ND	5.00	"	"	"	"	"	"	
1,1-Dichloroethane	ND	5.00	"	"	"	"	"	"	
1,2-Dichloroethane	ND	5.00	"	"	"	"	"	"	
1,1-Dichloroethene	ND	5.00	"	"	"	"	"	"	
cis-1,2-Dichloroethene	ND	5.00	"	"	"	"	"	"	
trans-1,2-Dichloroethene	ND	5.00	"	"	"	"	"	"	
1,2-Dichloropropane	ND	5.00	"	"	"	"	"	"	
1,3-Dichloropropane	ND	5.00	"	"	"	"	"	"	
2,2-Dichloropropane	ND	5.00	"	"	"	"	"	"	
1,1-Dichloropropene	ND	5.00	"	"	"	"	"	"	
cis-1,3-Dichloropropene	ND	5.00	"	"	"	"	"	"	
trans-1,3-Dichloropropene	ND	5.00	"	"	"	"	"	"	
Ethylbenzene	ND	5.00	"	"	"	"	"	"	
Hexachlorobutadiene	ND	5.00	"	"	"	"	"	"	
2-Hexanone	ND	10.0	"	"	"	"	"	"	

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Duke Engineering & Svcs - Austin	Project: LNG Facility - SBPP	
9111 Research Blvd.	Project Number: none	**Reported:**
Austin TX, 78758	Project Manager: Jeff Scheerhorn	12/06/00 12:19

Volatile Organic Compounds by EPA Method 8260B

Star Analytical, Inc.

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
GW010 (V011177-28) Liquid	**Sampled: 11/15/00 15:00**	**Received: 11/17/00 10:00**							
Isopropylbenzene	ND	5.00	ug/l	1	V0K2708	11/21/00	11/21/00	EPA 8260B	
p-Isopropyltoluene	ND	5.00	"	"	"	"	"	"	
Methylene chloride	ND	10.0	"	"	"	"	"	"	
Methyl tert-butyl ether	ND	5.00	"	"	"	"	"	"	
4-Methyl-2-pentanone	ND	10.0	"	"	"	"	"	"	
Naphthalene	ND	5.00	"	"	"	"	"	"	
n-Propylbenzene	ND	5.00	"	"	"	"	"	"	
Styrene	ND	5.00	"	"	"	"	"	"	
1,1,1,2-Tetrachloroethane	ND	5.00	"	"	"	"	"	"	
1,1,2,2-Tetrachloroethane	ND	5.00	"	"	"	"	"	"	
Tetrachloroethene	ND	5.00	"	"	"	"	"	"	
Toluene	ND	5.00	"	"	"	"	"	"	
1,2,3-Trichlorobenzene	ND	5.00	"	"	"	"	"	"	
1,2,4-Trichlorobenzene	ND	5.00	"	"	"	"	"	"	
1,1,1-Trichloroethane	ND	5.00	"	"	"	"	"	"	
1,1,2-Trichloroethane	ND	5.00	"	"	"	"	"	"	
Trichloroethene	ND	5.00	"	"	"	"	"	"	
Trichlorofluoromethane	ND	5.00	"	"	"	"	"	"	
1,2,3-Trichloropropane	ND	5.00	"	"	"	"	"	"	
1,2,4-Trimethylbenzene	ND	5.00	"	"	"	"	"	"	
1,3,5-Trimethylbenzene	ND	5.00	"	"	"	"	"	"	
Vinyl acetate	ND	5.00	"	"	"	"	"	"	
Vinyl chloride	ND	5.00	"	"	"	"	"	"	
m,p-Xylene	ND	10.0	"	"	"	"	"	"	
o-Xylene	ND	5.00	"	"	"	"	"	"	
Surrogate: DBFM		*102 %*	*86-118*		"	"	"	"	
Surrogate: Toluene-d8		*103 %*	*88-110*		"	"	"	"	
Surrogate: 4-BFB		*109 %*	*86-115*		"	"	"	"	

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Duke Engineering & Svcs - Austin	Project: LNG Facility - SBPP	
9111 Research Blvd.	Project Number: none	**Reported:**
Austin TX, 78758	Project Manager: Jeff Scheerhorn	12/06/00 12:19

Volatile Organic Compounds by EPA Method 8260B

Star Analytical, Inc.

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
SB019 (V011177-29) Solid Sampled: 11/15/00 15:05 Received: 11/17/00 10:00									
Acetone	ND	250	ug/kg	1	V0K2914	11/27/00	11/27/00	EPA 8260B	
Benzene	ND	50.0	"	"	"	"	"	"	
Bromobenzene	ND	50.0	"	"	"	"	"	"	
Bromodichloromethane	ND	50.0	"	"	"	"	"	"	
Bromoform	ND	50.0	"	"	"	"	"	"	
Bromomethane	ND	50.0	"	"	"	"	"	"	
2-Butanone	ND	100	"	"	"	"	"	"	
n-Butylbenzene	ND	50.0	"	"	"	"	"	"	
sec-Butylbenzene	ND	50.0	"	"	"	"	"	"	
tert-Butylbenzene	ND	50.0	"	"	"	"	"	"	
Carbon disulfide	ND	50.0	"	"	"	"	"	"	
Carbon tetrachloride	ND	50.0	"	"	"	"	"	"	
Chlorobenzene	ND	50.0	"	"	"	"	"	"	
Chloroethane	ND	50.0	"	"	"	"	"	"	
Chloroform	ND	50.0	"	"	"	"	"	"	
Chloromethane	ND	50.0	"	"	"	"	"	"	
2-Chlorotoluene	ND	50.0	"	"	"	"	"	"	
4-Chlorotoluene	ND	50.0	"	"	"	"	"	"	
Dibromochloromethane	ND	50.0	"	"	"	"	"	"	
1,2-Dibromo-3-chloropropane	ND	50.0	"	"	"	"	"	"	
1,2-Dibromoethane	ND	50.0	"	"	"	"	"	"	
Dibromomethane	ND	50.0	"	"	"	"	"	"	
1,2-Dichlorobenzene	ND	50.0	"	"	"	"	"	"	
1,3-Dichlorobenzene	ND	50.0	"	"	"	"	"	"	
1,4-Dichlorobenzene	ND	50.0	"	"	"	"	"	"	
Dichlorodifluoromethane	ND	50.0	"	"	"	"	"	"	
1,1-Dichloroethane	ND	50.0	"	"	"	"	"	"	
1,2-Dichloroethane	ND	50.0	"	"	"	"	"	"	
1,1-Dichloroethene	ND	50.0	"	"	"	"	"	"	
cis-1,2-Dichloroethene	ND	50.0	"	"	"	"	"	"	
trans-1,2-Dichloroethene	ND	50.0	"	"	"	"	"	"	
1,2-Dichloropropane	ND	50.0	"	"	"	"	"	"	
1,3-Dichloropropane	ND	50.0	"	"	"	"	"	"	
2,2-Dichloropropane	ND	50.0	"	"	"	"	"	"	
1,1-Dichloropropene	ND	50.0	"	"	"	"	"	"	
cis-1,3-Dichloropropene	ND	50.0	"	"	"	"	"	"	
trans-1,3-Dichloropropene	ND	50.0	"	"	"	"	"	"	
Ethylbenzene	ND	50.0	"	"	"	"	"	"	
Hexachlorobutadiene	ND	50.0	"	"	"	"	"	"	
2-Hexanone	ND	100	"	"	"	"	"	"	

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Duke Engineering & Svcs - Austin	Project: LNG Facility - SBPP	
9111 Research Blvd.	Project Number: none	**Reported:**
Austin TX, 78758	Project Manager: Jeff Scheerhorn	12/06/00 12:19

Volatile Organic Compounds by EPA Method 8260B

Star Analytical, Inc.

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
SB019 (V011177-29) Solid	**Sampled: 11/15/00 15:05**	**Received: 11/17/00 10:00**							
Isopropylbenzene	ND	50.0	ug/kg	1	V0K2914	11/27/00	11/27/00	EPA 8260B	
p-Isopropyltoluene	ND	50.0	"	"	"	"	"	"	
Methylene chloride	ND	100	"	"	"	"	"	"	
Methyl tert-butyl ether	ND	50.0	"	"	"	"	"	"	
4-Methyl-2-pentanone	ND	100	"	"	"	"	"	"	
Naphthalene	ND	50.0	"	"	"	"	"	"	
n-Propylbenzene	ND	50.0	"	"	"	"	"	"	
Styrene	ND	50.0	"	"	"	"	"	"	
1,1,1,2-Tetrachloroethane	ND	50.0	"	"	"	"	"	"	
1,1,2,2-Tetrachloroethane	ND	50.0	"	"	"	"	"	"	
Tetrachloroethene	ND	50.0	"	"	"	"	"	"	
Toluene	ND	50.0	"	"	"	"	"	"	
1,2,3-Trichlorobenzene	ND	50.0	"	"	"	"	"	"	
1,2,4-Trichlorobenzene	ND	50.0	"	"	"	"	"	"	
1,1,1-Trichloroethane	ND	50.0	"	"	"	"	"	"	
1,1,2-Trichloroethane	ND	50.0	"	"	"	"	"	"	
richloroethene	ND	50.0	"	"	"	"	"	"	
Trichlorofluoromethane	ND	50.0	"	"	"	"	"	"	
1,2,3-Trichloropropane	ND	50.0	"	"	"	"	"	"	
1,2,4-Trimethylbenzene	ND	50.0	"	"	"	"	"	"	
1,3,5-Trimethylbenzene	ND	50.0	"	"	"	"	"	"	
Vinyl acetate	ND	50.0	"	"	"	"	"	"	
Vinyl chloride	ND	50.0	"	"	"	"	"	"	
m,p-Xylene	ND	100	"	"	"	"	"	"	
o-Xylene	ND	50.0	"	"	"	"	"	"	
Surrogate: DBFM		*89.8 %*	*76-120*		"	"	"	"	
Surrogate: Toluene-d8		*97.6 %*	*81-117*		"	"	"	"	
Surrogate: 4-BFB		*102 %*	*74-121*		"	"	"	"	

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QUALITY ETHICS SERVICE

Duke Engineering & Svcs - Austin	Project: LNG Facility - SBPP	
9111 Research Blvd.	Project Number: none	**Reported:**
Austin TX, 78758	Project Manager: Jeff Scheerhorn	12/06/00 12:19

Volatile Organic Compounds by EPA Method 8260B

Star Analytical, Inc.

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
GW013 (V011177-33) Liquid	**Sampled: 11/15/00 17:00**	**Received: 11/17/00 10:00**							
Acetone	ND	25.0	ug/l	1	V0K2708	11/21/00	11/21/00	EPA 8260B	
Benzene	ND	5.00	"	"	"	"	"	"	
Bromobenzene	ND	5.00	"	"	"	"	"	"	
Bromodichloromethane	ND	5.00	"	"	"	"	"	"	
Bromoform	ND	5.00	"	"	"	"	"	"	
Bromomethane	ND	5.00	"	"	"	"	"	"	
2-Butanone	ND	10.0	"	"	"	"	"	"	
n-Butylbenzene	ND	5.00	"	"	"	"	"	"	
sec-Butylbenzene	ND	5.00	"	"	"	"	"	"	
tert-Butylbenzene	ND	5.00	"	"	"	"	"	"	
Carbon disulfide	ND	5.00	"	"	"	"	"	"	
Carbon tetrachloride	ND	5.00	"	"	"	"	"	"	
Chlorobenzene	ND	5.00	"	"	"	"	"	"	
Chloroethane	ND	5.00	"	"	"	"	"	"	
Chloroform	ND	5.00	"	"	"	"	"	"	
Chloromethane	ND	5.00	"	"	"	"	"	"	
2-Chlorotoluene	ND	5.00	"	"	"	"	"	"	
4-Chlorotoluene	ND	5.00	"	"	"	"	"	"	
Dibromochloromethane	ND	5.00	"	"	"	"	"	"	
1,2-Dibromo-3-chloropropane	ND	5.00	"	"	"	"	"	"	
1,2-Dibromoethane	ND	5.00	"	"	"	"	"	"	
Dibromomethane	ND	5.00	"	"	"	"	"	"	
1,2-Dichlorobenzene	ND	5.00	"	"	"	"	"	"	
1,3-Dichlorobenzene	ND	5.00	"	"	"	"	"	"	
1,4-Dichlorobenzene	ND	5.00	"	"	"	"	"	"	
Dichlorodifluoromethane	ND	5.00	"	"	"	"	"	"	
1,1-Dichloroethane	ND	5.00	"	"	"	"	"	"	
1,2-Dichloroethane	ND	5.00	"	"	"	"	"	"	
1,1-Dichloroethene	ND	5.00	"	"	"	"	"	"	
cis-1,2-Dichloroethene	ND	5.00	"	"	"	"	"	"	
trans-1,2-Dichloroethene	ND	5.00	"	"	"	"	"	"	
1,2-Dichloropropane	ND	5.00	"	"	"	"	"	"	
1,3-Dichloropropane	ND	5.00	"	"	"	"	"	"	
2,2-Dichloropropane	ND	5.00	"	"	"	"	"	"	
1,1-Dichloropropene	ND	5.00	"	"	"	"	"	"	
cis-1,3-Dichloropropene	ND	5.00	"	"	"	"	"	"	
trans-1,3-Dichloropropene	ND	5.00	"	"	"	"	"	"	
Ethylbenzene	ND	5.00	"	"	"	"	"	"	
Hexachlorobutadiene	ND	5.00	"	"	"	"	"	"	
2-Hexanone	ND	10.0	"	"	"	"	"	"	

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14500 Trinity Boulevard, Suite 106 • Fort Worth, Texas 76155
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QUALITY ETHICS SERVICE

Duke Engineering & Svcs - Austin	Project: LNG Facility - SBPP	
9111 Research Blvd.	Project Number: none	**Reported:**
Austin TX, 78758	Project Manager: Jeff Scheerhorn	12/06/00 12:19

Volatile Organic Compounds by EPA Method 8260B

Star Analytical, Inc.

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
GW013 (V011177-33) Liquid	**Sampled: 11/15/00 17:00**	**Received: 11/17/00 10:00**							
Isopropylbenzene	ND	5.00	ug/l	1	V0K2708	11/21/00	11/21/00	EPA 8260B	
p-Isopropyltoluene	ND	5.00	"	"	"	"	"	"	
Methylene chloride	ND	10.0	"	"	"	"	"	"	
Methyl tert-butyl ether	ND	5.00	"	"	"	"	"	"	
4-Methyl-2-pentanone	ND	10.0	"	"	"	"	"	"	
Naphthalene	ND	5.00	"	"	"	"	"	"	
n-Propylbenzene	ND	5.00	"	"	"	"	"	"	
Styrene	ND	5.00	"	"	"	"	"	"	
1,1,1,2-Tetrachloroethane	ND	5.00	"	"	"	"	"	"	
1,1,2,2-Tetrachloroethane	ND	5.00	"	"	"	"	"	"	
Tetrachloroethene	ND	5.00	"	"	"	"	"	"	
Toluene	ND	5.00	"	"	"	"	"	"	
1,2,3-Trichlorobenzene	ND	5.00	"	"	"	"	"	"	
1,2,4-Trichlorobenzene	ND	5.00	"	"	"	"	"	"	
1,1,1-Trichloroethane	ND	5.00	"	"	"	"	"	"	
',1,2-Trichloroethane	ND	5.00	"	"	"	"	"	"	
richloroethene	ND	5.00	"	"	"	"	"	"	
Trichlorofluoromethane	ND	5.00	"	"	"	"	"	"	
1,2,3-Trichloropropane	ND	5.00	"	"	"	"	"	"	
1,2,4-Trimethylbenzene	ND	5.00	"	"	"	"	"	"	
1,3,5-Trimethylbenzene	ND	5.00	"	"	"	"	"	"	
Vinyl acetate	ND	5.00	"	"	"	"	"	"	
Vinyl chloride	ND	5.00	"	"	"	"	"	"	
m,p-Xylene	ND	10.0	"	"	"	"	"	"	
o-Xylene	ND	5.00	"	"	"	"	"	"	
Surrogate: DBFM		*104 %*	*86-118*		"	"	"	"	
Surrogate: Toluene-d8		*101 %*	*88-110*		"	"	"	"	
Surrogate: 4-BFB		*108 %*	*86-115*		"	"	"	"	

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Duke Engineering & Svcs - Austin	Project: LNG Facility - SBPP	
9111 Research Blvd.	Project Number: none	**Reported:**
Austin TX, 78758	Project Manager: Jeff Scheerhorn	12/06/00 12:19

Volatile Organic Compounds by EPA Method 8260B

Star Analytical, Inc.

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
SB021 (V011177-34) Solid Sampled: 11/15/00 17:05 Received: 11/17/00 10:00									
Acetone	ND	250	ug/kg	1	V0K2914	11/27/00	11/27/00	EPA 8260B	
Benzene	ND	50.0	"	"	"	"	"	"	
Bromobenzene	ND	50.0	"	"	"	"	"	"	
Bromodichloromethane	ND	50.0	"	"	"	"	"	"	
Bromoform	ND	50.0	"	"	"	"	"	"	
Bromomethane	ND	50.0	"	"	"	"	"	"	
2-Butanone	ND	100	"	"	"	"	"	"	
n-Butylbenzene	ND	50.0	"	"	"	"	"	"	
sec-Butylbenzene	ND	50.0	"	"	"	"	"	"	
tert-Butylbenzene	ND	50.0	"	"	"	"	"	"	
Carbon disulfide	ND	50.0	"	"	"	"	"	"	
Carbon tetrachloride	ND	50.0	"	"	"	"	"	"	
Chlorobenzene	ND	50.0	"	"	"	"	"	"	
Chloroethane	ND	50.0	"	"	"	"	"	"	
Chloroform	ND	50.0	"	"	"	"	"	"	
Chloromethane	ND	50.0	"	"	"	"	"	"	
-Chlorotoluene	ND	50.0	"	"	"	"	"	"	
4-Chlorotoluene	ND	50.0	"	"	"	"	"	"	
Dibromochloromethane	ND	50.0	"	"	"	"	"	"	
1,2-Dibromo-3-chloropropane	ND	50.0	"	"	"	"	"	"	
1,2-Dibromoethane	ND	50.0	"	"	"	"	"	"	
Dibromomethane	ND	50.0	"	"	"	"	"	"	
1,2-Dichlorobenzene	ND	50.0	"	"	"	"	"	"	
1,3-Dichlorobenzene	ND	50.0	"	"	"	"	"	"	
1,4-Dichlorobenzene	ND	50.0	"	"	"	"	"	"	
Dichlorodifluoromethane	ND	50.0	"	"	"	"	"	"	
1,1-Dichloroethane	ND	50.0	"	"	"	"	"	"	
1,2-Dichloroethane	ND	50.0	"	"	"	"	"	"	
1,1-Dichloroethene	ND	50.0	"	"	"	"	"	"	
cis-1,2-Dichloroethene	ND	50.0	"	"	"	"	"	"	
trans-1,2-Dichloroethene	ND	50.0	"	"	"	"	"	"	
1,2-Dichloropropane	ND	50.0	"	"	"	"	"	"	
1,3-Dichloropropane	ND	50.0	"	"	"	"	"	"	
2,2-Dichloropropane	ND	50.0	"	"	"	"	"	"	
1,1-Dichloropropene	ND	50.0	"	"	"	"	"	"	
cis-1,3-Dichloropropene	ND	50.0	"	"	"	"	"	"	
trans-1,3-Dichloropropene	ND	50.0	"	"	"	"	"	"	
Ethylbenzene	ND	50.0	"	"	"	"	"	"	
Hexachlorobutadiene	ND	50.0	"	"	"	"	"	"	
2-Hexanone	ND	100	"	"	"	"	"	"	

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Duke Engineering & Svcs - Austin 9111 Research Blvd. Austin TX, 78758	Project: LNG Facility - SBPP Project Number: none Project Manager: Jeff Scheerhorn	**Reported:** 12/06/00 12:19

Volatile Organic Compounds by EPA Method 8260B

Star Analytical, Inc.

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
SB021 (V011177-34) Solid Sampled: 11/15/00 17:05 Received: 11/17/00 10:00									
Isopropylbenzene	ND	50.0	ug/kg	1	V0K2914	11/27/00	11/27/00	EPA 8260B	
p-Isopropyltoluene	ND	50.0	"	"	"	"	"	"	
Methylene chloride	ND	100	"	"	"	"	"	"	
Methyl tert-butyl ether	ND	50.0	"	"	"	"	"	"	
4-Methyl-2-pentanone	ND	100	"	"	"	"	"	"	
Naphthalene	ND	50.0	"	"	"	"	"	"	
n-Propylbenzene	ND	50.0	"	"	"	"	"	"	
Styrene	ND	50.0	"	"	"	"	"	"	
1,1,1,2-Tetrachloroethane	ND	50.0	"	"	"	"	"	"	
1,1,2,2-Tetrachloroethane	ND	50.0	"	"	"	"	"	"	
Tetrachloroethene	ND	50.0	"	"	"	"	"	"	
Toluene	ND	50.0	"	"	"	"	"	"	
1,2,3-Trichlorobenzene	ND	50.0	"	"	"	"	"	"	
1,2,4-Trichlorobenzene	ND	50.0	"	"	"	"	"	"	
1,1,1-Trichloroethane	ND	50.0	"	"	"	"	"	"	
1,1,2-Trichloroethane	ND	50.0	"	"	"	"	"	"	
richloroethene	ND	50.0	"	"	"	"	"	"	
Trichlorofluoromethane	ND	50.0	"	"	"	"	"	"	
1,2,3-Trichloropropane	ND	50.0	"	"	"	"	"	"	
1,2,4-Trimethylbenzene	ND	50.0	"	"	"	"	"	"	
1,3,5-Trimethylbenzene	ND	50.0	"	"	"	"	"	"	
Vinyl acetate	ND	50.0	"	"	"	"	"	"	
Vinyl chloride	ND	50.0	"	"	"	"	"	"	
m,p-Xylene	ND	100	"	"	"	"	"	"	
o-Xylene	ND	50.0	"	"	"	"	"	"	
Surrogate: DBFM		*90.0 %*	*76-120*		"	"	"	"	
Surrogate: Toluene-d8		*94.6 %*	*81-117*		"	"	"	"	
Surrogate: 4-BFB		*104 %*	*74-121*		"	"	"	"	

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Duke Engineering & Svcs - Austin	Project: LNG Facility - SBPP	
9111 Research Blvd.	Project Number: none	**Reported:**
Austin TX, 78758	Project Manager: Jeff Scheerhorn	12/06/00 12:19

Volatile Organic Compounds by EPA Method 8260B

Star Analytical, Inc.

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
TB001 (V011177-37) Liquid Sampled: 11/02/00 00:00 Received: 11/17/00 10:00									
Acetone	ND	25.0	ug/l	1	V0K2708	11/21/00	11/21/00	EPA 8260B	
Benzene	ND	5.00	"	"	"	"	"	"	
Bromobenzene	ND	5.00	"	"	"	"	"	"	
Bromodichloromethane	ND	5.00	"	"	"	"	"	"	
Bromoform	ND	5.00	"	"	"	"	"	"	
Bromomethane	ND	5.00	"	"	"	"	"	"	
2-Butanone	ND	10.0	"	"	"	"	"	"	
n-Butylbenzene	ND	5.00	"	"	"	"	"	"	
sec-Butylbenzene	ND	5.00	"	"	"	"	"	"	
tert-Butylbenzene	ND	5.00	"	"	"	"	"	"	
Carbon disulfide	ND	5.00	"	"	"	"	"	"	
Carbon tetrachloride	ND	5.00	"	"	"	"	"	"	
Chlorobenzene	ND	5.00	"	"	"	"	"	"	
Chloroethane	ND	5.00	"	"	"	"	"	"	
Chloroform	ND	5.00	"	"	"	"	"	"	
Chloromethane	ND	5.00	"	"	"	"	"	"	
2-Chlorotoluene	ND	5.00	"	"	"	"	"	"	
4-Chlorotoluene	ND	5.00	"	"	"	"	"	"	
Dibromochloromethane	ND	5.00	"	"	"	"	"	"	
1,2-Dibromo-3-chloropropane	ND	5.00	"	"	"	"	"	"	
1,2-Dibromoethane	ND	5.00	"	"	"	"	"	"	
Dibromomethane	ND	5.00	"	"	"	"	"	"	
1,2-Dichlorobenzene	ND	5.00	"	"	"	"	"	"	
1,3-Dichlorobenzene	ND	5.00	"	"	"	"	"	"	
1,4-Dichlorobenzene	ND	5.00	"	"	"	"	"	"	
Dichlorodifluoromethane	ND	5.00	"	"	"	"	"	"	
1,1-Dichloroethane	ND	5.00	"	"	"	"	"	"	
1,2-Dichloroethane	ND	5.00	"	"	"	"	"	"	
1,1-Dichloroethene	ND	5.00	"	"	"	"	"	"	
cis-1,2-Dichloroethene	ND	5.00	"	"	"	"	"	"	
trans-1,2-Dichloroethene	ND	5.00	"	"	"	"	"	"	
1,2-Dichloropropane	ND	5.00	"	"	"	"	"	"	
1,3-Dichloropropane	ND	5.00	"	"	"	"	"	"	
2,2-Dichloropropane	ND	5.00	"	"	"	"	"	"	
1,1-Dichloropropene	ND	5.00	"	"	"	"	"	"	
cis-1,3-Dichloropropene	ND	5.00	"	"	"	"	"	"	
trans-1,3-Dichloropropene	ND	5.00	"	"	"	"	"	"	
Ethylbenzene	ND	5.00	"	"	"	"	"	"	
Hexachlorobutadiene	ND	5.00	"	"	"	"	"	"	
2-Hexanone	ND	10.0	"	"	"	"	"	"	

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Duke Engineering & Svcs - Austin 9111 Research Blvd. Austin TX, 78758	Project: LNG Facility - SBPP Project Number: none Project Manager: Jeff Scheerhorn	**Reported:** 12/06/00 12:19

Volatile Organic Compounds by EPA Method 8260B

Star Analytical, Inc.

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
TB001 (V011177-37) Liquid	**Sampled: 11/02/00 00:00**	**Received: 11/17/00 10:00**							
Isopropylbenzene	ND	5.00	ug/l	1	V0K2708	11/21/00	11/21/00	EPA 8260B	
p-Isopropyltoluene	ND	5.00	"	"	"	"	"	"	
Methylene chloride	ND	10.0	"	"	"	"	"	"	
Methyl tert-butyl ether	ND	5.00	"	"	"	"	"	"	
4-Methyl-2-pentanone	ND	10.0	"	"	"	"	"	"	
Naphthalene	ND	5.00	"	"	"	"	"	"	
n-Propylbenzene	ND	5.00	"	"	"	"	"	"	
Styrene	ND	5.00	"	"	"	"	"	"	
1,1,1,2-Tetrachloroethane	ND	5.00	"	"	"	"	"	"	
1,1,2,2-Tetrachloroethane	ND	5.00	"	"	"	"	"	"	
Tetrachloroethene	ND	5.00	"	"	"	"	"	"	
Toluene	ND	5.00	"	"	"	"	"	"	
1,2,3-Trichlorobenzene	ND	5.00	"	"	"	"	"	"	
1,2,4-Trichlorobenzene	ND	5.00	"	"	"	"	"	"	
1,1,1-Trichloroethane	ND	5.00	"	"	"	"	"	"	
1,1,2-Trichloroethane	ND	5.00	"	"	"	"	"	"	
Trichloroethene	ND	5.00	"	"	"	"	"	"	
Trichlorofluoromethane	ND	5.00	"	"	"	"	"	"	
1,2,3-Trichloropropane	ND	5.00	"	"	"	"	"	"	
1,2,4-Trimethylbenzene	ND	5.00	"	"	"	"	"	"	
1,3,5-Trimethylbenzene	ND	5.00	"	"	"	"	"	"	
Vinyl acetate	ND	5.00	"	"	"	"	"	"	
Vinyl chloride	ND	5.00	"	"	"	"	"	"	
m,p-Xylene	ND	10.0	"	"	"	"	"	"	
o-Xylene	ND	5.00	"	"	"	"	"	"	
Surrogate: DBFM		*105 %*		*86-118*	"	"	"	"	
Surrogate: Toluene-d8		*101 %*		*88-110*	"	"	"	"	
Surrogate: 4-BFB		*105 %*		*86-115*	"	"	"	"	

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QUALITY ETHICS SERVICE
RCL Environmental Sciences

Duke Engineering & Svcs - Austin 9111 Research Blvd. Austin TX, 78758	Project: LNG Facility - SBPP Project Number: none Project Manager: Jeff Scheerhorn	**Reported:** 12/06/00 12:19

Volatile Organic Compounds by EPA Method 8260B

Star Analytical, Inc.

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
TB002 (V011177-38) Liquid	**Sampled: 11/02/00 00:00**	**Received: 11/17/00 10:00**							
Acetone	ND	25.0	ug/l	1	V0K2708	11/21/00	11/21/00	EPA 8260B	
Benzene	ND	5.00	"	"	"	"	"	"	
Bromobenzene	ND	5.00	"	"	"	"	"	"	
Bromodichloromethane	ND	5.00	"	"	"	"	"	"	
Bromoform	ND	5.00	"	"	"	"	"	"	
Bromomethane	ND	5.00	"	"	"	"	"	"	
2-Butanone	ND	10.0	"	"	"	"	"	"	
n-Butylbenzene	ND	5.00	"	"	"	"	"	"	
sec-Butylbenzene	ND	5.00	"	"	"	"	"	"	
tert-Butylbenzene	ND	5.00	"	"	"	"	"	"	
Carbon disulfide	ND	5.00	"	"	"	"	"	"	
Carbon tetrachloride	ND	5.00	"	"	"	"	"	"	
Chlorobenzene	ND	5.00	"	"	"	"	"	"	
Chloroethane	ND	5.00	"	"	"	"	"	"	
Chloroform	ND	5.00	"	"	"	"	"	"	
Chloromethane	ND	5.00	"	"	"	"	"	"	
2-Chlorotoluene	ND	5.00	"	"	"	"	"	"	
4-Chlorotoluene	ND	5.00	"	"	"	"	"	"	
Dibromochloromethane	ND	5.00	"	"	"	"	"	"	
1,2-Dibromo-3-chloropropane	ND	5.00	"	"	"	"	"	"	
1,2-Dibromoethane	ND	5.00	"	"	"	"	"	"	
Dibromomethane	ND	5.00	"	"	"	"	"	"	
1,2-Dichlorobenzene	ND	5.00	"	"	"	"	"	"	
1,3-Dichlorobenzene	ND	5.00	"	"	"	"	"	"	
1,4-Dichlorobenzene	ND	5.00	"	"	"	"	"	"	
Dichlorodifluoromethane	ND	5.00	"	"	"	"	"	"	
1,1-Dichloroethane	ND	5.00	"	"	"	"	"	"	
1,2-Dichloroethane	ND	5.00	"	"	"	"	"	"	
1,1-Dichloroethene	ND	5.00	"	"	"	"	"	"	
cis-1,2-Dichloroethene	ND	5.00	"	"	"	"	"	"	
trans-1,2-Dichloroethene	ND	5.00	"	"	"	"	"	"	
1,2-Dichloropropane	ND	5.00	"	"	"	"	"	"	
1,3-Dichloropropane	ND	5.00	"	"	"	"	"	"	
2,2-Dichloropropane	ND	5.00	"	"	"	"	"	"	
1,1-Dichloropropene	ND	5.00	"	"	"	"	"	"	
cis-1,3-Dichloropropene	ND	5.00	"	"	"	"	"	"	
trans-1,3-Dichloropropene	ND	5.00	"	"	"	"	"	"	
Ethylbenzene	ND	5.00	"	"	"	"	"	"	
Hexachlorobutadiene	ND	5.00	"	"	"	"	"	"	
2-Hexanone	ND	10.0	"	"	"	"	"	"	

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QUALITY ETHICS SERVICE
ICL Environmental Sciences

Duke Engineering & Svcs - Austin 9111 Research Blvd. Austin TX, 78758	Project: LNG Facility - SBPP Project Number: none Project Manager: Jeff Scheerhorn	**Reported:** 12/06/00 12:19

Volatile Organic Compounds by EPA Method 8260B

Star Analytical, Inc.

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
TB002 (V011177-38) Liquid	**Sampled: 11/02/00 00:00**	**Received: 11/17/00 10:00**							
Isopropylbenzene	ND	5.00	ug/l	1	V0K2708	11/21/00	11/21/00	EPA 8260B	
p-Isopropyltoluene	ND	5.00	"	"	"	"	"	"	
Methylene chloride	ND	10.0	"	"	"	"	"	"	
Methyl tert-butyl ether	ND	5.00	"	"	"	"	"	"	
4-Methyl-2-pentanone	ND	10.0	"	"	"	"	"	"	
Naphthalene	ND	5.00	"	"	"	"	"	"	
n-Propylbenzene	ND	5.00	"	"	"	"	"	"	
Styrene	ND	5.00	"	"	"	"	"	"	
1,1,1,2-Tetrachloroethane	ND	5.00	"	"	"	"	"	"	
1,1,2,2-Tetrachloroethane	ND	5.00	"	"	"	"	"	"	
Tetrachloroethene	ND	5.00	"	"	"	"	"	"	
Toluene	ND	5.00	"	"	"	"	"	"	
1,2,3-Trichlorobenzene	ND	5.00	"	"	"	"	"	"	
1,2,4-Trichlorobenzene	ND	5.00	"	"	"	"	"	"	
1,1,1-Trichloroethane	ND	5.00	"	"	"	"	"	"	
1,1,2-Trichloroethane	ND	5.00	"	"	"	"	"	"	
Trichloroethene	ND	5.00	"	"	"	"	"	"	
Trichlorofluoromethane	ND	5.00	"	"	"	"	"	"	
1,2,3-Trichloropropane	ND	5.00	"	"	"	"	"	"	
1,2,4-Trimethylbenzene	ND	5.00	"	"	"	"	"	"	
1,3,5-Trimethylbenzene	ND	5.00	"	"	"	"	"	"	
Vinyl acetate	ND	5.00	"	"	"	"	"	"	
Vinyl chloride	ND	5.00	"	"	"	"	"	"	
m,p-Xylene	ND	10.0	"	"	"	"	"	"	
o-Xylene	ND	5.00	"	"	"	"	"	"	
Surrogate: DBFM		*104 %*		*86-118*	"	"	"	"	
Surrogate: Toluene-d8		*101 %*		*88-110*	"	"	"	"	
Surrogate: 4-BFB		*109 %*		*86-115*	"	"	"	"	

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QUALITY ETHICS SERVICE

Duke Engineering & Svcs - Austin 9111 Research Blvd. Austin TX, 78758	Project: LNG Facility - SBPP Project Number: none Project Manager: Jeff Scheerhorn	**Reported:** 12/06/00 12:19

METALS

Del Mar Analytical, Irvine

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
GW006 (V011177-11) Liquid Sampled: 11/14/00 17:50 Received: 11/17/00 10:00									
Antimony	ND	0.010	mg/l	1	10K2130	11/21/00	11/30/00	EPA 6010B	
Arsenic	ND	0.0050	"	"	"	"	"	"	
Barium	**0.20**	0.010	"	"	"	"	"	"	
Beryllium	ND	0.0040	"	"	"	"	"	"	
Cadmium	ND	0.0050	"	"	"	"	"	"	
Chromium	**0.022**	0.0050	"	"	"	"	"	"	
Cobalt	**0.038**	0.010	"	"	"	"	"	"	
Copper	**0.017**	0.010	"	"	"	"	"	"	
Lead	**0.0090**	0.0050	"	"	"	"	"	"	
Mercury	ND	0.00020	"	"	10K3030	11/30/00	11/30/00	EPA 7470A	
Molybdenum	ND	0.020	"	"	10K2130	11/21/00	11/30/00	EPA 6010B	
Nickel	**0.037**	0.010	"	"	"	"	"	"	
Selenium	**0.014**	0.0050	"	"	"	"	"	"	
Silver	ND	0.010	"	"	"	"	"	"	
Thallium	ND	0.0050	"	"	"	"	"	"	
Vanadium	**0.15**	0.010	"	"	"	"	"	"	
Zinc	**0.074**	0.020	"	"	"	"	"	"	
SB006 (V011177-12) Solid Sampled: 11/14/00 18:00 Received: 11/17/00 10:00									
Antimony	ND	10	mg/kg	1	10K2144	11/21/00	12/03/00	EPA 6010B	
Arsenic	**11**	2.0	"	"	"	"	"	"	
Barium	**83**	1.0	"	"	"	"	12/03/00	"	
Beryllium	ND	0.50	"	"	"	"	"	"	
Cadmium	ND	0.50	"	"	"	"	12/03/00	"	
Chromium	**19**	1.0	"	"	"	"	"	"	
Cobalt	**3.6**	1.0	"	"	"	"	12/03/00	"	
Copper	**46**	1.0	"	"	"	"	"	"	
Lead	**23**	2.0	"	"	"	"	"	"	
Mercury	ND	0.020	"	"	10K2745	11/27/00	11/27/00	EPA 7471A	
Molybdenum	ND	2.0	"	"	10K2144	11/21/00	12/03/00	EPA 6010B	
Nickel	**8.9**	1.0	"	"	"	"	12/03/00	"	
Selenium	ND	2.0	"	"	"	"	12/03/00	"	
Silver	ND	1.0	"	"	"	"	12/03/00	"	
Thallium	ND	10	"	"	"	"	12/03/00	"	
Vanadium	**29**	1.0	"	"	"	"	12/03/00	"	
Zinc	**110**	5.0	"	"	"	"	"	"	

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QUALITY ETHICS SERVICE

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METALS

Del Mar Analytical, Irvine

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
SB007 (V011177-13) Solid Sampled: 11/14/00 18:10 Received: 11/17/00 10:00									
Antimony	ND	10	mg/kg	1	10K2144	11/21/00	12/03/00	EPA 6010B	
Arsenic	**2.0**	2.0	"	"	"	"	"	"	
Barium	**55**	1.0	"	"	"	"	"	"	
Beryllium	ND	0.50	"	"	"	"	"	"	
Cadmium	ND	0.50	"	"	"	"	"	"	
Chromium	**10**	1.0	"	"	"	"	"	"	
Cobalt	**4.4**	1.0	"	"	"	"	"	"	
Copper	**8.6**	1.0	"	"	"	"	"	"	
Lead	**15**	2.0	"	"	"	"	"	"	
Mercury	ND	0.020	"	"	10K2935	11/29/00	11/29/00	EPA 7471A	
Molybdenum	ND	2.0	"	"	10K2144	11/21/00	12/03/00	EPA 6010B	
Nickel	**5.4**	1.0	"	"	"	"	"	"	
Selenium	ND	2.0	"	"	"	"	"	"	
Silver	ND	1.0	"	"	"	"	"	"	
Thallium	ND	10	"	"	"	"	"	"	
Vanadium	**29**	1.0	"	"	"	"	"	"	
Zinc	**27**	5.0	"	"	"	"	"	"	
SB008 (V011177-14) Solid Sampled: 11/14/00 18:30 Received: 11/17/00 10:00									
Antimony	ND	10	mg/kg	1	10K2144	11/21/00	12/02/00	EPA 6010B	
Arsenic	**6.5**	2.0	"	"	"	"	"	"	
Barium	**42**	1.0	"	"	"	"	12/02/00	"	
Beryllium	ND	0.50	"	"	"	"	"	"	
Cadmium	ND	0.50	"	"	"	"	12/02/00	"	
Chromium	**24**	1.0	"	"	"	"	"	"	
Cobalt	**3.6**	1.0	"	"	"	"	12/02/00	"	
Copper	**12**	1.0	"	"	"	"	"	"	
Lead	**53**	2.0	"	"	"	"	"	"	
Mercury	ND	0.020	"	"	10K2935	11/29/00	11/29/00	EPA 7471A	
Molybdenum	ND	2.0	"	"	10K2144	11/21/00	12/02/00	EPA 6010B	
Nickel	**22**	1.0	"	"	"	"	12/02/00	"	
Selenium	ND	2.0	"	"	"	"	12/02/00	"	
Silver	ND	1.0	"	"	"	"	12/02/00	"	
Thallium	ND	10	"	"	"	"	12/02/00	"	
Vanadium	**42**	1.0	"	"	"	"	12/02/00	"	
Zinc	**71**	5.0	"	"	"	"	"	"	

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Duke Engineering & Svcs - Austin 9111 Research Blvd. Austin TX, 78758	Project: LNG Facility - SBPP Project Number: none Project Manager: Jeff Scheerhorn	**Reported:** 12/06/00 12:19

METALS

Del Mar Analytical, Irvine

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
SB012 (V011177-18) Solid Sampled: 11/15/00 08:50 Received: 11/17/00 10:00									
Antimony	ND	10	mg/kg	1	10K2144	11/21/00	12/02/00	EPA 6010B	
Arsenic	7.6	2.0	"	"	"	"	"	"	
Barium	65	1.0	"	"	"	"	12/02/00	"	
Beryllium	ND	0.50	"	"	"	"	"	"	
Cadmium	ND	0.50	"	"	"	"	12/02/00	"	
Chromium	10	1.0	"	"	"	"	"	"	
Cobalt	4.8	1.0	"	"	"	"	12/02/00	"	
Copper	46	1.0	"	"	"	"	"	"	
Lead	24	2.0	"	"	"	"	12/02/00	"	
Mercury	ND	0.020	"	"	10K2935	11/29/00	11/29/00	EPA 7471A	
Molybdenum	ND	2.0	"	"	10K2144	11/21/00	12/02/00	EPA 6010B	
Nickel	240	1.0	"	"	"	"	12/02/00	"	
Selenium	ND	2.0	"	"	"	"	12/02/00	"	
Silver	ND	1.0	"	"	"	"	12/02/00	"	
Thallium	ND	10	"	"	"	"	12/02/00	"	
Vanadium	27	1.0	"	"	"	"	12/02/00	"	
Zinc	21	5.0	"	"	"	"	"	"	
SB017 (V011177-23) Solid Sampled: 11/15/00 13:00 Received: 11/17/00 10:00									
Antimony	ND	10	mg/kg	1	10K2144	11/21/00	12/02/00	EPA 6010B	
Arsenic	12	2.0	"	"	"	"	"	"	
Barium	53	1.0	"	"	"	"	"	"	
Beryllium	ND	0.50	"	"	"	"	"	"	
Cadmium	ND	0.50	"	"	"	"	"	"	
Chromium	11	1.0	"	"	"	"	"	"	
Cobalt	5.4	1.0	"	"	"	"	"	"	
Copper	11	1.0	"	"	"	"	"	"	
Lead	14	2.0	"	"	"	"	"	"	
Mercury	ND	0.020	"	"	10K2935	11/29/00	11/29/00	EPA 7471A	
Molybdenum	ND	2.0	"	"	10K2144	11/21/00	12/02/00	EPA 6010B	
Nickel	16	1.0	"	"	"	"	"	"	
Selenium	ND	2.0	"	"	"	"	"	"	
Silver	ND	1.0	"	"	"	"	"	"	
Thallium	ND	10	"	"	"	"	"	"	
Vanadium	46	1.0	"	"	"	"	"	"	
Zinc	99	5.0	"	"	"	"	"	"	

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QUALITY ETHICS SERVICE
NCL Environmental Sciences

Duke Engineering & Svcs - Austin 9111 Research Blvd. Austin TX, 78758	Project: LNG Facility - SBPP Project Number: none Project Manager: Jeff Scheerhorn	**Reported:** 12/06/00 12:19

METALS

Del Mar Analytical, Irvine

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
GW007 (V011177-24) Liquid Sampled: 11/15/00 12:15 Received: 11/17/00 10:00									
Antimony	ND	0.010	mg/l	1	10K2130	11/21/00	11/30/00	EPA 6010B	
Arsenic	ND	0.0050	"	"	"	"	"	"	
Barium	**0.096**	0.010	"	"	"	"	"	"	
Beryllium	ND	0.0040	"	"	"	"	"	"	
Cadmium	ND	0.0050	"	"	"	"	"	"	
Chromium	ND	0.0050	"	"	"	"	"	"	
Cobalt	**0.011**	0.010	"	"	"	"	"	"	
Copper	ND	0.010	"	"	"	"	"	"	
Lead	ND	0.0050	"	"	"	"	"	"	
Mercury	ND	0.00020	"	"	10K3030	11/30/00	11/30/00	EPA 7470A	
Molybdenum	ND	0.020	"	"	10K2130	11/21/00	11/30/00	EPA 6010B	
Nickel	**0.030**	0.010	"	"	"	"	"	"	
Selenium	**0.0079**	0.0050	"	"	"	"	"	"	
Silver	ND	0.010	"	"	"	"	"	"	
Thallium	ND	0.0050	"	"	"	"	"	"	
Vanadium	**0.016**	0.010	"	"	"	"	"	"	
Zinc	ND	0.020	"	"	"	"	"	"	
GW011 (V011177-31) Liquid Sampled: 11/15/00 16:10 Received: 11/17/00 10:00									
Antimony	ND	0.010	mg/l	1	10K2130	11/21/00	11/30/00	EPA 6010B	
Arsenic	ND	0.0050	"	"	"	"	"	"	
Barium	**0.083**	0.010	"	"	"	"	"	"	
Beryllium	ND	0.0040	"	"	"	"	"	"	
Cadmium	ND	0.0050	"	"	"	"	"	"	
Chromium	ND	0.0050	"	"	"	"	"	"	
Cobalt	**0.011**	0.010	"	"	"	"	"	"	
Copper	ND	0.010	"	"	"	"	"	"	
Lead	ND	0.0050	"	"	"	"	"	"	
Mercury	ND	0.00020	"	"	10K3030	11/30/00	11/30/00	EPA 7470A	
Molybdenum	ND	0.020	"	"	10K2130	11/21/00	11/30/00	EPA 6010B	
Nickel	**0.032**	0.010	"	"	"	"	"	"	
Selenium	**0.013**	0.0050	"	"	"	"	"	"	
Silver	ND	0.010	"	"	"	"	"	"	
Thallium	ND	0.0050	"	"	"	"	"	"	
Vanadium	**0.012**	0.010	"	"	"	"	"	"	
Zinc	ND	0.020	"	"	"	"	"	"	

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Duke Engineering & Svcs - Austin	Project: LNG Facility - SBPP	
9111 Research Blvd.	Project Number: none	**Reported:**
Austin TX, 78758	Project Manager: Jeff Scheerhorn	12/06/00 12:19

METALS

Del Mar Analytical, Irvine

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
GW012 (V011177-32) Liquid	**Sampled: 11/15/00 16:20**	**Received: 11/17/00 10:00**							
Antimony	ND	0.010	mg/l	1	I0K2130	11/21/00	11/30/00	EPA 6010B	
Arsenic	ND	0.0050	"	"	"	"	"	"	
Barium	**0.074**	0.010	"	"	"	"	11/30/00	"	
Beryllium	ND	0.0040	"	"	"	"	"	"	
Cadmium	ND	0.0050	"	"	"	"	11/30/00	"	
Chromium	ND	0.0050	"	"	"	"	"	"	
Cobalt	ND	0.010	"	"	"	"	"	"	
Copper	ND	0.010	"	"	"	"	11/30/00	"	
Lead	ND	0.0050	"	"	"	"	11/30/00	"	
Mercury	ND	0.00020	"	"	I0K3030	11/30/00	11/30/00	EPA 7470A	
Molybdenum	ND	0.020	"	"	I0K2130	11/21/00	11/30/00	EPA 6010B	
Nickel	**0.025**	0.010	"	"	"	"	"	"	
Selenium	**0.014**	0.0050	"	"	"	"	"	"	
Silver	ND	0.010	"	"	"	"	11/30/00	"	
Thallium	**0.0065**	0.0050	"	"	"	"	11/30/00	"	
Vanadium	**0.013**	0.010	"	"	"	"	11/30/00	"	
Zinc	ND	0.020	"	"	"	"	11/30/00	"	

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Duke Engineering & Svcs - Austin	Project: LNG Facility - SBPP	
9111 Research Blvd.	Project Number: none	**Reported:**
Austin TX, 78758	Project Manager: Jeff Scheerhorn	12/06/00 12:19

Chlorinated Herbicides by EPA Method 8151

Sequoia Analytical - Morgan Hill

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
SB003 (V011177-05) Solid	**Sampled: 11/14/00 15:00**	**Received: 11/17/00 10:00**							
2,4-D	ND	40.0	ug/kg	1	0K28020	11/28/00	11/30/00	EPA 8151	
2,4-DB	ND	40.0	"	"	"	"	"	"	
2,4,5-T	ND	40.0	"	"	"	"	"	"	
2,4,5-TP (Silvex)	ND	40.0	"	"	"	"	"	"	
Dalapon	ND	40.0	"	"	"	"	"	"	
Dicamba	ND	40.0	"	"	"	"	"	"	
Dichlorprop	ND	40.0	"	"	"	"	"	"	
Dinoseb	ND	40.0	"	"	"	"	"	"	
MCPA	ND	20000	"	"	"	"	"	"	
MCPP	ND	20000	"	"	"	"	"	"	
Surrogate: Dichlorophenylacetic acid		*124 %*	*30-150*		"	"	"	"	

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QUALITY ETHICS SERVICE
RCL Environmental Sciences

Duke Engineering & Svcs - Austin	Project: LNG Facility - SBPP	
9111 Research Blvd.	Project Number: none	**Reported:**
Austin TX, 78758	Project Manager: Jeff Scheerhorn	12/06/00 12:19

Diesel Hydrocarbons (C12-C24) by EPA Method 8015M (modified) - Quality Control

Star Analytical, Inc.

Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Batch V0K2005 - EPA 3510C										
Blank (V0K2005-BLK1)				Prepared: 11/20/00 Analyzed: 11/22/00						
Diesel Range Hydrocarbons	ND	0.20	mg/l							
Surrogate: o-Terphenyl	*0.083*		"	*0.10*		*83*	*49-167*			
LCS (V0K2005-BS1)				Prepared: 11/20/00 Analyzed: 11/22/00						
Diesel Range Hydrocarbons	0.62	0.20	mg/l	1.0		62	60-130			
Surrogate: o-Terphenyl	*0.11*		"	*0.10*		*110*	*49-167*			
LCS Dup (V0K2005-BSD1)				Prepared: 11/20/00 Analyzed: 11/22/00						
Diesel Range Hydrocarbons	0.59	0.20	mg/l	1.0		59	60-130	5.0	30	A-04
Surrogate: o-Terphenyl	*0.11*		"	*0.10*		*110*	*49-167*			
Duplicate (V0K2005-DUP1)		Source: V011177-02		Prepared: 11/20/00 Analyzed: 11/22/00						
Diesel Range Hydrocarbons	0.28	0.20	mg/l		0.43			42	30	A-03
Surrogate: o-Terphenyl	*0.10*		"	*0.10*		*100*	*49-167*			
Matrix Spike (V0K2005-MS1)		Source: V011177-01		Prepared: 11/20/00 Analyzed: 11/22/00						
Diesel Range Hydrocarbons	1.0	0.20	mg/l	1.0	0.44	56	60-140			M-01
Surrogate: o-Terphenyl	*0.14*		"	*0.10*		*140*	*49-167*			
Batch V0K2206 - EPA 3550										
Blank (V0K2206-BLK1)				Prepared: 11/22/00 Analyzed: 11/28/00						
Diesel Range Hydrocarbons	ND	5.0	mg/kg							
Surrogate: o-Terphenyl	*1.5*		"	*1.7*		*88*	*49-167*			
LCS (V0K2206-BS1)				Prepared: 11/22/00 Analyzed: 11/28/00						
Diesel Range Hydrocarbons	14	5.0	mg/kg	17		82	60-130			
Surrogate: o-Terphenyl	*1.8*		"	*1.7*		*110*	*49-167*			

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Duke Engineering & Svcs - Austin	Project: LNG Facility - SBPP	
9111 Research Blvd.	Project Number: none	**Reported:**
Austin TX, 78758	Project Manager: Jeff Scheerhorn	12/06/00 12:19

Diesel Hydrocarbons (C12-C24) by EPA Method 8015M (modified) - Quality Control

Star Analytical, Inc.

Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Batch V0K2206 - EPA 3550										
LCS Dup (V0K2206-BSD1)				Prepared: 11/22/00 Analyzed: 11/28/00						
Diesel Range Hydrocarbons	20	5.0	mg/kg	17		120	60-130	35	30	A-03
Surrogate: o-Terphenyl	*2.6*		"	*1.7*		*150*	*49-167*			
Matrix Spike (V0K2206-MS1)	Source: V011177-30			Prepared: 11/22/00 Analyzed: 11/28/00						
Diesel Range Hydrocarbons	38	10	mg/kg	33	ND	89	60-140			
Surrogate: o-Terphenyl	*4.3*		"	*3.3*		*130*	*49-167*			
Matrix Spike Dup (V0K2206-MSD1)	Source: V011177-30			Prepared: 11/22/00 Analyzed: 11/28/00						
Diesel Range Hydrocarbons	42	10	mg/kg	33	ND	100	60-140	10	30	
Surrogate: o-Terphenyl	*4.9*		"	*3.3*		*150*	*49-167*			
Batch V0K2711 - EPA 3550										
Blank (V0K2711-BLK1)				Prepared: 11/27/00 Analyzed: 11/29/00						
Diesel Range Hydrocarbons	ND	7.0	mg/kg							
Surrogate: o-Terphenyl	*1.9*		"	*1.7*		*110*	*49-167*			
LCS (V0K2711-BS1)				Prepared: 11/27/00 Analyzed: 11/29/00						
Diesel Range Hydrocarbons	22	7.0	mg/kg	17		130	60-130			
Surrogate: o-Terphenyl	*2.4*		"	*1.7*		*140*	*49-167*			
LCS Dup (V0K2711-BSD1)				Prepared: 11/27/00 Analyzed: 11/29/00						
Diesel Range Hydrocarbons	27	7.0	mg/kg	17		160	60-130	20	30	A-04
Surrogate: o-Terphenyl	*3.1*		"	*1.7*		*180*	*49-167*			*O-02*
Matrix Spike (V0K2711-MS1)	Source: V011177-34			Prepared: 11/27/00 Analyzed: 11/29/00						
Diesel Range Hydrocarbons	25	7.0	mg/kg	17	34	NR	60-140			M-01
Surrogate: o-Terphenyl	*2.6*		"	*1.7*		*150*	*49-167*			

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QUALITY ETHICS SERVICE
RCL Environmental Sciences

Duke Engineering & Svcs - Austin	Project: LNG Facility - SBPP	
9111 Research Blvd.	Project Number: none	**Reported:**
Austin TX, 78758	Project Manager: Jeff Scheerhorn	12/06/00 12:19

Diesel Hydrocarbons (C12-C24) by EPA Method 8015M (modified) - Quality Control

Star Analytical, Inc.

Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Batch V0K2711 - EPA 3550										
Matrix Spike Dup (V0K2711-MSD1)	Source: V011177-34			Prepared: 11/27/00		Analyzed: 11/29/00				
Diesel Range Hydrocarbons	28	7.0	mg/kg	17	34	NR	60-140	11	30	M-01
Surrogate: o-Terphenyl	*2.6*		*"*	*1.7*		*150*	*49-167*			

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9111 Research Blvd.	Project Number: none	**Reported:**
Austin TX, 78758	Project Manager: Jeff Scheerhorn	12/06/00 12:19

Volatile Organic Compounds by EPA Method 8260B - Quality Control

Star Analytical, Inc.

Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Batch V0K2708 - EPA 5030										
Blank (V0K2708-BLK1)				Prepared & Analyzed: 11/21/00						
Acetone	ND	25.0	ug/l							
Benzene	ND	5.00	"							
Bromobenzene	ND	5.00	"							
Bromodichloromethane	ND	5.00	"							
Bromoform	ND	5.00	"							
Bromomethane	ND	5.00	"							
2-Butanone	ND	10.0	"							
n-Butylbenzene	ND	5.00	"							
sec-Butylbenzene	ND	5.00	"							
tert-Butylbenzene	ND	5.00	"							
Carbon disulfide	ND	5.00	"							
Carbon tetrachloride	ND	5.00	"							
Chlorobenzene	ND	5.00	"							
Chloroethane	ND	5.00	"							
Chloroform	ND	5.00	"							
Chloromethane	ND	5.00	"							
2-Chlorotoluene	ND	5.00	"							
4-Chlorotoluene	ND	5.00	"							
Dibromochloromethane	ND	5.00	"							
1,2-Dibromo-3-chloropropane	ND	5.00	"							
1,2-Dibromoethane	ND	5.00	"							
Dibromomethane	ND	5.00	"							
1,2-Dichlorobenzene	ND	5.00	"							
1,3-Dichlorobenzene	ND	5.00	"							
1,4-Dichlorobenzene	ND	5.00	"							
Dichlorodifluoromethane	ND	5.00	"							
1,1-Dichloroethane	ND	5.00	"							
1,2-Dichloroethane	ND	5.00	"							
1,1-Dichloroethene	ND	5.00	"							
cis-1,2-Dichloroethene	ND	5.00	"							
trans-1,2-Dichloroethene	ND	5.00	"							
1,2-Dichloropropane	ND	5.00	"							
1,3-Dichloropropane	ND	5.00	"							
2,2-Dichloropropane	ND	5.00	"							
1,1-Dichloropropene	ND	5.00	"							
cis-1,3-Dichloropropene	ND	5.00	"							

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Duke Engineering & Svcs - Austin	Project: LNG Facility - SBPP	
9111 Research Blvd.	Project Number: none	**Reported:**
Austin TX, 78758	Project Manager: Jeff Scheerhorn	12/06/00 12:19

Volatile Organic Compounds by EPA Method 8260B - Quality Control

Star Analytical, Inc.

Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Batch V0K2708 - EPA 5030										
LCS (V0K2708-BS1)				Prepared & Analyzed: 11/21/00						
Benzene	54.1	5.00	ug/l	50.0		108	76-127			
Chlorobenzene	51.1	5.00	"	50.0		102	75-130			
1,1-Dichloroethene	57.5	5.00	"	50.0		115	58-145			
Toluene	49.4	5.00	"	50.0		98.8	76-127			
Trichloroethene	50.0	5.00	"	50.0		100	71-140			
Surrogate: DBFM	*55.0*		"	*50.0*		*110*	*86-118*			
Surrogate: Toluene-d8	*49.8*		"	*50.0*		*99.6*	*88-110*			
Surrogate: 4-BFB	*55.1*		"	*50.0*		*110*	*86-115*			
LCS Dup (V0K2708-BSD1)				Prepared & Analyzed: 11/21/00						
Benzene	52.7	5.00	ug/l	50.0		105	76-127	2.62	21	
Chlorobenzene	49.8	5.00	"	50.0		99.6	75-130	2.58	21	
1,1-Dichloroethene	56.6	5.00	"	50.0		113	58-145	1.58	22	
Toluene	48.9	5.00	"	50.0		97.8	76-127	1.02	21	
Trichloroethene	48.9	5.00	"	50.0		97.8	71-140	2.22	24	
Surrogate: DBFM	*56.1*		"	*50.0*		*112*	*86-118*			
Surrogate: Toluene-d8	*50.3*		"	*50.0*		*101*	*88-110*			
Surrogate: 4-BFB	*54.4*		"	*50.0*		*109*	*86-115*			
Batch V0K2914 - EPA 5030										
Blank (V0K2914-BLK1)				Prepared & Analyzed: 11/27/00						
Acetone	ND	250	ug/kg							
Benzene	ND	50.0	"							
Bromobenzene	ND	50.0	"							
Bromodichloromethane	ND	50.0	"							
Bromoform	ND	50.0	"							
Bromomethane	ND	50.0	"							
2-Butanone	ND	100	"							
n-Butylbenzene	ND	50.0	"							
sec-Butylbenzene	ND	50.0	"							
tert-Butylbenzene	ND	50.0	"							
Carbon disulfide	ND	50.0	"							
Carbon tetrachloride	ND	50.0	"							
Chlorobenzene	ND	50.0	"							
Chloroethane	ND	50.0	"							

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Duke Engineering & Svcs - Austin	Project: LNG Facility - SBPP	
9111 Research Blvd.	Project Number: none	**Reported:**
Austin TX, 78758	Project Manager: Jeff Scheerhorn	12/06/00 12:19

Volatile Organic Compounds by EPA Method 8260B - Quality Control

Star Analytical, Inc.

Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Batch V0K2914 - EPA 5030										
Blank (V0K2914-BLK1)				Prepared & Analyzed: 11/27/00						
Chloroform	ND	50.0	ug/kg							
Chloromethane	ND	50.0	"							
2-Chlorotoluene	ND	50.0	"							
4-Chlorotoluene	ND	50.0	"							
Dibromochloromethane	ND	50.0	"							
1,2-Dibromo-3-chloropropane	ND	50.0	"							
1,2-Dibromoethane	ND	50.0	"							
Dibromomethane	ND	50.0	"							
1,2-Dichlorobenzene	ND	50.0	"							
1,3-Dichlorobenzene	ND	50.0	"							
1,4-Dichlorobenzene	ND	50.0	"							
Dichlorodifluoromethane	ND	50.0	"							
1,1-Dichloroethane	ND	50.0	"							
,2-Dichloroethane	ND	50.0	"							
1,1-Dichloroethene	ND	50.0	"							
cis-1,2-Dichloroethene	ND	50.0	"							
trans-1,2-Dichloroethene	ND	50.0	"							
1,2-Dichloropropane	ND	50.0	"							
1,3-Dichloropropane	ND	50.0	"							
2,2-Dichloropropane	ND	50.0	"							
1,1-Dichloropropene	ND	50.0	"							
cis-1,3-Dichloropropene	ND	50.0	"							
trans-1,3-Dichloropropene	ND	50.0	"							
Ethylbenzene	ND	50.0	"							
Hexachlorobutadiene	ND	50.0	"							
2-Hexanone	ND	100	"							
Isopropylbenzene	ND	50.0	"							
p-Isopropyltoluene	ND	50.0	"							
Methylene chloride	ND	100	"							
Methyl tert-butyl ether	ND	50.0	"							
4-Methyl-2-pentanone	ND	100	"							
Naphthalene	ND	50.0	"							
n-Propylbenzene	ND	50.0	"							
Styrene	ND	50.0	"							
1,1,1,2-Tetrachloroethane	ND	50.0	"							
1,1,2,2-Tetrachloroethane	ND	50.0	"							

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Duke Engineering & Svcs - Austin 9111 Research Blvd. Austin TX, 78758	Project: LNG Facility - SBPP Project Number: none Project Manager: Jeff Scheerhorn	**Reported:** 12/06/00 12:19

Volatile Organic Compounds by EPA Method 8260B - Quality Control

Star Analytical, Inc.

Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Batch V0K2914 - EPA 5030										
Blank (V0K2914-BLK1)				Prepared & Analyzed: 11/27/00						
Tetrachloroethene	ND	50.0	ug/kg							
Toluene	ND	50.0	"							
1,2,3-Trichlorobenzene	ND	50.0	"							
1,2,4-Trichlorobenzene	ND	50.0	"							
1,1,1-Trichloroethane	ND	50.0	"							
1,1,2-Trichloroethane	ND	50.0	"							
Trichloroethene	ND	50.0	"							
Trichlorofluoromethane	ND	50.0	"							
1,2,3-Trichloropropane	ND	50.0	"							
1,2,4-Trimethylbenzene	ND	50.0	"							
1,3,5-Trimethylbenzene	ND	50.0	"							
Vinyl acetate	ND	50.0	"							
Vinyl chloride	ND	50.0	"							
m,p-Xylene	ND	100	"							
o-Xylene	ND	50.0	"							
Surrogate: DBFM	*516*		"	*500*		*103*	*76-120*			
Surrogate: Toluene-d8	*514*		"	*500*		*103*	*81-117*			
Surrogate: 4-BFB	*537*		"	*500*		*107*	*74-121*			
LCS (V0K2914-BS1)				Prepared & Analyzed: 11/27/00						
Benzene	445	50.0	ug/kg	500		89.0	66-142			
Chlorobenzene	477	50.0	"	500		95.4	60-133			
1,1-Dichloroethene	456	50.0	"	500		91.2	59-172			
Toluene	446	50.0	"	500		89.2	59-133			
Trichloroethene	420	50.0	"	500		84.0	62-137			
Surrogate: DBFM	*498*		"	*500*		*99.6*	*76-120*			
Surrogate: Toluene-d8	*508*		"	*500*		*102*	*81-117*			
Surrogate: 4-BFB	*533*		"	*500*		*107*	*74-121*			

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QUALITY ETHICS SERVICE
RCI Environmental Sciences

Duke Engineering & Svcs - Austin	Project: LNG Facility - SBPP	
9111 Research Blvd.	Project Number: none	**Reported:**
Austin TX, 78758	Project Manager: Jeff Scheerhorn	12/06/00 12:19

Volatile Organic Compounds by EPA Method 8260B - Quality Control

Star Analytical, Inc.

Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Batch V0K2914 - EPA 5030										
LCS Dup (V0K2914-BSD1)				Prepared & Analyzed: 11/27/00						
Benzene	478	50.0	ug/kg	500		95.6	66-142	7.15	21	
Chlorobenzene	510	50.0	"	500		102	60-133	6.69	21	
1,1-Dichloroethene	488	50.0	"	500		97.6	59-172	6.78	22	
Toluene	493	50.0	"	500		98.6	59-133	10.0	21	
Trichloroethene	465	50.0	"	500		93.0	62-137	10.2	24	
Surrogate: DBFM	*522*		"	*500*		*104*	*76-120*			
Surrogate: Toluene-d8	*500*		"	*500*		*100*	*81-117*			
Surrogate: 4-BFB	*526*		"	*500*		*105*	*74-121*			

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QUALITY ETHICS SERVICE
ACL Environmental Sciences

Duke Engineering & Svcs - Austin	Project: LNG Facility - SBPP	
9111 Research Blvd.	Project Number: none	**Reported:**
Austin TX, 78758	Project Manager: Jeff Scheerhorn	12/06/00 12:19

METALS - Quality Control

Del Mar Analytical, Irvine

Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Batch I0K2130 - EPA 3005A										
Blank (I0K2130-BLK1)				Prepared & Analyzed: 11/21/00						
Antimony	ND	0.010	mg/l							
Arsenic	ND	0.0050	"							
Barium	ND	0.010	"							
Beryllium	ND	0.0040	"							
Cadmium	ND	0.0050	"							
Chromium	ND	0.0050	"							
Cobalt	ND	0.010	"							
Copper	ND	0.010	"							
Lead	ND	0.0050	"							
Molybdenum	ND	0.020	"							
Nickel	ND	0.010	"							
Selenium	ND	0.0050	"							
Silver	ND	0.010	"							
Thallium	ND	0.0050	"							
Vanadium	ND	0.010	"							
Zinc	ND	0.020	"							
LCS (I0K2130-BS1)				Prepared & Analyzed: 11/21/00						
Antimony	0.908	0.010	mg/l	1.00		90.8	80-120			
Arsenic	0.842	0.0050	"	1.00		84.2	80-120			
Barium	0.832	0.010	"	1.00		83.2	80-120			
Beryllium	0.916	0.0040	"	1.00		91.6	80-120			
Cadmium	0.902	0.0050	"	1.00		90.2	80-120			
Chromium	0.917	0.0050	"	1.00		91.7	80-120			
Cobalt	0.918	0.010	"	1.00		91.8	80-120			
Copper	0.917	0.010	"	1.00		91.7	80-120			
Lead	0.872	0.0050	"	1.00		87.2	80-120			
Molybdenum	0.825	0.020	"	1.00		82.5	80-120			
Nickel	0.895	0.010	"	1.00		89.5	80-120			
Selenium	0.865	0.0050	"	1.00		86.5	80-120			
Silver	0.463	0.010	"	0.500		92.6	80-120			
Thallium	0.828	0.0050	"	1.00		82.8	80-120			
Vanadium	0.933	0.010	"	1.00		93.3	80-120			
Zinc	0.901	0.020	"	1.00		90.1	80-120			

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QUALITY ETHICS SERVICE
BCL Environmental Sciences

Duke Engineering & Svcs - Austin
9111 Research Blvd.
Austin TX, 78758

Project: LNG Facility - SBPP
Project Number: none
Project Manager: Jeff Scheerhorn

Reported:
12/06/00 12:19

METALS - Quality Control

Del Mar Analytical, Irvine

Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Batch I0K2130 - EPA 3005A										
Matrix Spike (I0K2130-MS1)	Source: IJK0749-01			Prepared & Analyzed: 11/21/00						
Antimony	0.907	0.020	mg/l	1.00	ND	89.8	75-125			RL-3
Arsenic	0.844	0.010	"	1.00	0.072	77.2	75-125			RL-3
Barium	0.757	0.020	"	1.00	ND	75.3	75-125			RL-3
Beryllium	0.853	0.0080	"	1.00	ND	85.3	75-125			RL-3
Cadmium	0.778	0.010	"	1.00	ND	77.8	75-125			RL-3
Chromium	0.823	0.010	"	1.00	ND	82.3	75-125			RL-3
Cobalt	0.798	0.020	"	1.00	ND	79.8	75-125			RL-3
Copper	0.948	0.020	"	1.00	ND	94.3	75-125			RL-3
Lead	0.753	0.010	"	1.00	ND	74.7	75-125			M,RL-3
Molybdenum	0.755	0.040	"	1.00	ND	75.5	75-125			RL-3
Nickel	0.758	0.020	"	1.00	ND	75.8	75-125			RL-3
Selenium	0.849	0.010	"	1.00	ND	84.9	75-125			RL-3
Silver	0.493	0.020	"	0.500	ND	98.6	75-125			RL-3
Thallium	0.626	0.010	"	1.00	ND	62.6	75-125			M,RL-3
Vanadium	0.861	0.020	"	1.00	ND	86.1	75-125			RL-3
Zinc	0.991	0.040	"	1.00	0.049	94.2	75-125			RL-3
Matrix Spike Dup (I0K2130-MSD1)	Source: IJK0749-01			Prepared & Analyzed: 11/21/00						
Antimony	0.920	0.020	mg/l	1.00	ND	91.1	75-125	1.42	20	RL-3
Arsenic	0.871	0.010	"	1.00	0.072	79.9	75-125	3.15	20	RL-3
Barium	0.764	0.020	"	1.00	ND	76.0	75-125	0.920	20	RL-3
Beryllium	0.871	0.0080	"	1.00	ND	87.1	75-125	2.09	20	RL-3
Cadmium	0.786	0.010	"	1.00	ND	78.6	75-125	1.02	20	RL-3
Chromium	0.836	0.010	"	1.00	ND	83.6	75-125	1.57	20	RL-3
Cobalt	0.815	0.020	"	1.00	ND	81.5	75-125	2.11	20	RL-3
Copper	0.964	0.020	"	1.00	ND	95.9	75-125	1.67	20	RL-3
Lead	0.772	0.010	"	1.00	ND	76.6	75-125	2.49	20	RL-3
Molybdenum	0.767	0.040	"	1.00	ND	76.7	75-125	1.58	20	RL-3
Nickel	0.774	0.020	"	1.00	ND	77.4	75-125	2.09	20	RL-3
Selenium	0.873	0.010	"	1.00	ND	87.3	75-125	2.79	20	RL-3
Silver	0.504	0.020	"	0.500	ND	101	75-125	2.21	20	RL-3
Thallium	0.635	0.010	"	1.00	ND	63.5	75-125	1.43	20	M,RL-3
Vanadium	0.881	0.020	"	1.00	ND	88.1	75-125	2.30	20	RL-3
Zinc	0.880	0.040	"	1.00	0.049	83.1	75-125	11.9	20	RL-3

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Duke Engineering & Svcs - Austin	Project: LNG Facility - SBPP	
9111 Research Blvd.	Project Number: none	**Reported:**
Austin TX, 78758	Project Manager: Jeff Scheerhorn	12/06/00 12:19

METALS - Quality Control

Del Mar Analytical, Irvine

Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Batch I0K2144 - EPA 3050B ICP										
Blank (I0K2144-BLK1)				Prepared: 11/21/00 Analyzed: 11/22/00						
Antimony	ND	10	mg/kg							
Arsenic	ND	2.0	"							
Barium	ND	1.0	"							
Beryllium	ND	0.50	"							
Cadmium	ND	0.50	"							
Chromium	ND	1.0	"							
Cobalt	ND	1.0	"							
Copper	ND	1.0	"							
Lead	ND	2.0	"							
Molybdenum	ND	2.0	"							
Nickel	ND	1.0	"							
Selenium	ND	2.0	"							
Silver	ND	1.0	"							
Thallium	ND	10	"							
Vanadium	ND	1.0	"							
Zinc	ND	5.0	"							
LCS (I0K2144-BS1)				Prepared: 11/21/00 Analyzed: 11/22/00						
Antimony	49.5	10	mg/kg	50.0		99.0	80-120			
Arsenic	47.0	2.0	"	50.0		94.0	80-120			
Barium	46.5	1.0	"	50.0		93.0	80-120			
Beryllium	49.0	0.50	"	50.0		98.0	80-120			
Cadmium	48.2	0.50	"	50.0		96.4	80-120			
Chromium	48.7	1.0	"	50.0		97.4	80-120			
Cobalt	48.5	1.0	"	50.0		97.0	80-120			
Copper	50.4	1.0	"	50.0		101	80-120			
Lead	47.9	2.0	"	50.0		95.8	80-120			
Molybdenum	45.2	2.0	"	50.0		90.4	80-120			
Nickel	48.1	1.0	"	50.0		96.2	80-120			
Selenium	45.8	2.0	"	50.0		91.6	80-120			
Silver	25.2	1.0	"	25.0		101	80-120			
Thallium	44.1	10	"	50.0		88.2	80-120			
Vanadium	48.9	1.0	"	50.0		97.8	80-120			
Zinc	46.8	5.0	"	50.0		93.6	80-120			

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STAR ANALYTICAL

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(817) 571-6800 • Metro (817) 540-6982 • FAX (817) 267-5431

QUALITY ETHICS SERVICES
BCL Environmental Sciences

Duke Engineering & Svcs - Austin	Project: LNG Facility - SBPP	
9111 Research Blvd.	Project Number: none	**Reported:**
Austin TX, 78758	Project Manager: Jeff Scheerhorn	12/06/00 12:19

METALS - Quality Control

Del Mar Analytical, Irvine

Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Batch I0K2144 - EPA 3050B ICP										
Matrix Spike (I0K2144-MS1)	Source: IJK0760-01			Prepared: 11/21/00		Analyzed: 11/22/00				
Antimony	46.2	10	mg/kg	50.0	ND	92.4	75-125			
Arsenic	46.6	2.0	"	50.0	ND	93.2	75-125			
Barium	78.9	1.0	"	50.0	33	91.8	75-125			
Beryllium	48.6	0.50	"	50.0	ND	97.1	75-125			
Cadmium	46.3	0.50	"	50.0	ND	92.2	75-125			
Chromium	59.2	1.0	"	50.0	11	96.4	75-125			
Cobalt	51.2	1.0	"	50.0	4.2	94.0	75-125			
Copper	62.4	1.0	"	50.0	11	103	75-125			
Lead	51.2	2.0	"	50.0	5.2	92.0	75-125			
Molybdenum	44.2	2.0	"	50.0	ND	88.4	75-125			
Nickel	53.5	1.0	"	50.0	7.5	92.0	75-125			
Selenium	45.6	2.0	"	50.0	ND	91.2	75-125			
Silver	23.2	1.0	"	25.0	ND	92.8	75-125			
Thallium	39.6	10	"	50.0	ND	79.2	75-125			
Vanadium	81.6	1.0	"	50.0	34	95.2	75-125			
Zinc	74.7	5.0	"	50.0	29	91.4	75-125			
Matrix Spike Dup (I0K2144-MSD1)	Source: IJK0760-01			Prepared: 11/21/00		Analyzed: 11/22/00				
Antimony	46.8	10	mg/kg	50.0	ND	93.6	75-125	1.29	20	
Arsenic	46.4	2.0	"	50.0	ND	92.8	75-125	0.430	20	
Barium	75.0	1.0	"	50.0	33	84.0	75-125	5.07	20	
Beryllium	47.9	0.50	"	50.0	ND	95.7	75-125	1.45	20	
Cadmium	46.1	0.50	"	50.0	ND	91.8	75-125	0.433	20	
Chromium	57.4	1.0	"	50.0	11	92.8	75-125	3.09	20	
Cobalt	51.4	1.0	"	50.0	4.2	94.4	75-125	0.390	20	
Copper	62.5	1.0	"	50.0	11	103	75-125	0.160	20	
Lead	50.1	2.0	"	50.0	5.2	89.8	75-125	2.17	20	
Molybdenum	43.6	2.0	"	50.0	ND	87.2	75-125	1.37	20	
Nickel	53.2	1.0	"	50.0	7.5	91.4	75-125	0.562	20	
Selenium	45.4	2.0	"	50.0	ND	90.8	75-125	0.440	20	
Silver	23.5	1.0	"	25.0	ND	94.0	75-125	1.28	20	
Thallium	39.7	10	"	50.0	ND	79.4	75-125	0.252	20	
Vanadium	77.7	1.0	"	50.0	34	87.4	75-125	4.90	20	
Zinc	73.8	5.0	"	50.0	29	89.6	75-125	1.21	20	

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Duke Engineering & Svcs - Austin	Project: LNG Facility - SBPP	
9111 Research Blvd.	Project Number: none	**Reported:**
Austin TX, 78758	Project Manager: Jeff Scheerhorn	12/06/00 12:19

METALS - Quality Control
Del Mar Analytical, Irvine

Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Batch I0K2745 - EPA 7471A Hg										
Blank (I0K2745-BLK1)				Prepared & Analyzed: 11/27/00						
Mercury	ND	0.020	mg/kg							
LCS (I0K2745-BS1)				Prepared & Analyzed: 11/27/00						
Mercury	0.883	0.020	mg/kg	0.800		110	85-120			
Matrix Spike (I0K2745-MS1)	Source: IJK0863-01			Prepared & Analyzed: 11/27/00						
Mercury	0.656	0.020	mg/kg	0.800	0.082	71.8	65-135			
Matrix Spike Dup (I0K2745-MSD1)	Source: IJK0863-01			Prepared & Analyzed: 11/27/00						
Mercury	0.756	0.020	mg/kg	0.800	0.082	84.2	65-135	14.2	20	
Batch I0K2935 - EPA 7471A Hg										
Blank (I0K2935-BLK1)				Prepared & Analyzed: 11/29/00						
Mercury	ND	0.020	mg/kg							
CS (I0K2935-BS1)				Prepared & Analyzed: 11/29/00						
Mercury	0.832	0.020	mg/kg	0.800		104	85-120			
Matrix Spike (I0K2935-MS1)	Source: IJK0921-16			Prepared & Analyzed: 11/29/00						
Mercury	0.802	0.020	mg/kg	0.800	ND	100	65-135			
Matrix Spike Dup (I0K2935-MSD1)	Source: IJK0921-16			Prepared & Analyzed: 11/29/00						
Mercury	0.814	0.020	mg/kg	0.800	ND	102	65-135	1.49	20	
Batch I0K3030 - EPA 7470A Hg										
Blank (I0K3030-BLK1)				Prepared & Analyzed: 11/30/00						
Mercury	ND	0.00020	mg/l							

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Duke Engineering & Svcs - Austin	Project: LNG Facility - SBPP	
9111 Research Blvd.	Project Number: none	**Reported:**
Austin TX, 78758	Project Manager: Jeff Scheerhorn	12/06/00 12:19

METALS - Quality Control

Del Mar Analytical, Irvine

Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Batch I0K3030 - EPA 7470A Hg										
LCS (I0K3030-BS1)				Prepared & Analyzed: 11/30/00						
Mercury	0.00848	0.00020	mg/l	0.00800		106	90-115			
Matrix Spike (I0K3030-MS1)		Source: IJK0921-06		Prepared & Analyzed: 11/30/00						
Mercury	0.00852	0.00020	mg/l	0.00800	ND	106	75-120			
Matrix Spike Dup (I0K3030-MSD1)		Source: IJK0921-06		Prepared & Analyzed: 11/30/00						
Mercury	0.00852	0.00020	mg/l	0.00800	ND	106	75-120	0	20	

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QUALITY ETHICS SERVICE
RCL Environmental Sciences

Duke Engineering & Svcs - Austin	Project: LNG Facility - SBPP	
9111 Research Blvd.	Project Number: none	**Reported:**
Austin TX, 78758	Project Manager: Jeff Scheerhorn	12/06/00 12:19

Chlorinated Herbicides by EPA Method 8151 - Quality Control

Sequoia Analytical - Morgan Hill

Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Batch 0K28020 - EPA 8151A										
Blank (0K28020-BLK1)				Prepared: 11/28/00 Analyzed: 11/30/00						
2,4-D	ND	40.0	ug/kg							
2,4-DB	ND	40.0	"							
2,4,5-T	ND	40.0	"							
2,4,5-TP (Silvex)	ND	40.0	"							
Dalapon	ND	40.0	"							
Dicamba	ND	40.0	"							
Dichlorprop	ND	40.0	"							
Dinoseb	ND	40.0	"							
MCPA	ND	20000	"							
MCPP	ND	20000	"							
Surrogate: Dichlorophenylacetic acid	*101*		"	*83.3*		*121*	*30-150*			
LCS (0K28020-BS1)				Prepared: 11/28/00 Analyzed: 11/30/00						
2,4-D	66.3	40.0	ug/kg	83.3		79.6	30-150			
2,4,5-T	76.7	40.0	"	83.3		92.1	30-150			
2,4,5-TP (Silvex)	69.6	40.0	"	83.3		83.6	30-150			
Surrogate: Dichlorophenylacetic acid	*97.0*		"	*83.3*		*116*	*30-150*			
LCS Dup (0K28020-BSD1)				Prepared: 11/28/00 Analyzed: 11/30/00						
2,4-D	62.8	40.0	ug/kg	83.3		75.4	30-150	5.42	50	
2,4,5-T	76.0	40.0	"	83.3		91.2	30-150	0.917	50	
2,4,5-TP (Silvex)	72.6	40.0	"	83.3		87.2	30-150	4.22	50	
Surrogate: Dichlorophenylacetic acid	*85.9*		"	*83.3*		*103*	*30-150*			

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QUALITY ETHICS SERVICE
RCL Environmental Sciences

Duke Engineering & Svcs - Austin	Project: LNG Facility - SBPP	
9111 Research Blvd.	Project Number: none	**Reported:**
Austin TX, 78758	Project Manager: Jeff Scheerhorn	12/06/00 12:19

Notes and Definitions

A-03	The RPD value for this QC sample is above the established control limit. Review of associated QC indicates the high RPD does not represent an out of control condition for the batch.
A-04	The spike recovery for this QC sample is outside of established control limits. Review of associated QC indicates the recovery for this analyte does not represent an out of control condition for the batch.
D-22	Chromatogram Pattern: C10 to C28, non-diesel pattern..
D-22a	Chromatogram Pattern: C12 to C28, non-diesel pattern..
D-22b	Chromatogram Pattern: C14 to C28, non-diesel pattern..
D-22c	Chromatogram Pattern: C8 to C28+ late elevated baseline, non-diesel pattern..
D-22d	Chromatogram Pattern: C8 to C28+, late elevated baseline, non-diesel pattern..
D-22e	Chromatogram Pattern: C8 to C28+, non-diesel pattern, late elevated baseline..
M	The MS and/or MSD were outside of the acceptance limits due to sample matrix interference. See Blank Spike (LCS).
M-01	Spike recovery outside control limits due to sample matrix interference.
O-02	Surrogate recovery outside control limits due to interference from coeluting compounds within the sample matrix.
RL-3	Reporting limit raised due to high concentrations of non-target analytes.
DET	Analyte DETECTED
ND	Analyte NOT DETECTED at or above the reporting limit
NR	Not Reported
dry	Sample results reported on a dry weight basis
RPD	Relative Percent Difference

Star Analytical Sample Receipt Log

Duke Eng
1) Client Name

2) Seal(s) intact? Packaging intact?
☑ Yes ☑ Yes
☐ No ☐ No
☐ N/A ☐ N/A 8231 1314 8941

3) Method of Receipt: Tracking # 8231 1314 8930
☐ Star ☐ Client ☐ UPS
☑ Fed Ex ☐ Airborne ☐ _____

11/17/00 1000
4) Date & Time Received at/by Lab

C. Howland
5) Received (into ELM) By

6) Ice used? Packing material used?
☑ Yes ☑ Yes Cooler Temp. 6 °C
☐ No ☐ No Sample Temp. 6 °C

7) Chain of Custody filled out properly?
☑ Yes ☐ No ☐ N/A

8) Does information on custody/traffic reports agree with information on sample tags/labels?
☑ Yes ☐ No

9) Containers supplied by Lab?
☐ Yes ☑ No

10) Correct/Appropriate containers used?
☑ Yes ☐ No

11) Containers Intact?
☑ Yes ☐ No

12) Containers properly preserved?
☑ Yes ☐ No ☐ N/A

13) Headspace in VOAs?
☐ Yes ☑ No ☐ N/A

Container Qty(s) & Description(s)	Sample Number	Sample Letter(s)	Client Sample Identification	Sample Matrix	Sample Date	Sample Control Comments
2 VOA HCl 1L Amb NT	01	A-C	GW001	L	11/14/00	
↓	02	↓	GW002	↓		
Shelby Tube	03	A	SB001	S		
↓	04	↓	2	↓		
↓	05	↓	3	↓		
↓	06	↓	4	↓		
↓	07	↓	5	↓		
2 VOA HCl 1L Amb NT	08	A-C	GW003	L		
↓	09	↓	4	↓		
1L Amb NT	10	A	5	↓		

Additional Comments and/or Problems, Resolutions:

BASED on DRO Results – Per Jeff Schreiber – 11/30/00 09:30 – Cancel VOC's on "08 + 09"

11/30/00 AM2

11/17/00
Date of Log-In

Vol1177
Work Order Number

Page 1 of 4

Duke Eng

1) Client Name

2) Seal(s) intact? Packaging Intact?

☐ Yes ☐ Yes
☐ No ☐ No
☐ N/A ☐ N/A

3) Method of Receipt: Tracking # _____

☐ Star ☐ Client ☐ UPS
☐ Fed Ex ☐ Airborne ☐ _____

4) Date & Time Received at/by Lab

5) Received (Into ELM) By

6) Ice used? Packing material used?

☐ Yes ☐ Yes Cooler Temp. _____ °C
☐ No ☐ No Sample Temp. _____ °C

7) Chain of Custody filled out properly?

☐ Yes ☐ No ☐ N/A

8) Does information on custody/traffic reports agree with information on sample tags/labels?

☐ Yes ☐ No

9) Containers supplied by Lab?

☐ Yes ☐ No

10) Correct/Appropriate containers used?

☐ Yes ☐ No

11) Containers Intact?

☐ Yes ☐ No

12) Containers properly preserved?

☐ Yes ☐ No ☐ N/A

13) Headspace in VOAs?

☐ Yes ☐ No ☐ N/A

Container Qty(s) & Description(s)	Sample Number	Sample Letter(s)	Client Sample Identification	Sample Matrix	Sample Date	Sample Control Comments
2VOA HCl 1L AMBNT 100mL HNO3	11	A-D	GW006	L	11/14/00	
8oz jar	12	A	SB006	S		
Shelby Tube	13		7			
	14		8			
	15		9		11/15/00	
	16		10			
	17		11			
	18		12			
	19		13			
	20		14'			

Additional Comments and/or Problems, Resolutions:

11/17/00
Date of Log-In

VOA177
Work Order Number

Duke Engs
1) Client Name

2) Seal(s) intact? Packaging Intact?
☐ Yes ☐ Yes
☐ No ☐ No
☐ N/A ☐ N/A

3) Method of Receipt: Tracking # _____
☐ Star ☐ Client ☐ UPS
☐ Fed Ex ☐ Airborne ☐ _____

4) Date & Time Received at/by Lab

5) Received (Into ELM) By

6) Ice used? Packing material used?
☐ Yes ☐ Yes Cooler Temp. _____ °C
☐ No ☐ No Sample Temp. _____ °C

7) Chain of Custody filled out properly?
☐ Yes ☐ No ☐ N/A

8) Does information on custody/traffic reports agree with information on sample tags/labels?
☐ Yes ☐ No

9) Containers supplied by Lab?
☐ Yes ☐ No

10) Correct/Appropriate containers used?
☐ Yes ☐ No

11) Containers Intact?
☐ Yes ☐ No

12) Containers properly preserved?
☐ Yes ☐ No ☐ N/A

13) Headspace in VOAs?
☐ Yes ☐ No ☐ N/A

Container Qty(s) & Description(s)	Sample Number	Sample Letter(s)	Client Sample Identification	Sample Matrix	Sample Date	Sample Control Comments
Shelby Tube	21	A	SB015	S	11/15/00	
↓	22	↓	↓ 16	↓	↓	
↓	23	↓	↓ 17	↓	↓	
1L Amb 500mL HNO3	24	A-B	GW007	L		
1L Amb	25	A	↓ 8	↓		
Shelby Tube	26	↓	SB018	S		
2 VOA HCl 1L Amb NT	27	A-C	GW009	L		
↓	28	↓	↓ 10	↓		
Shelby Tube	29	A	SB019	S		
↓	30	↓	↓ 20	↓	↓	

Additional Comments and/or Problems, Resolutions:

11/17/00
Date of Log-In

V011177
Work Order Number

Duke Eng

1) Client Name

2) Seal(s) Intact? Packaging Intact?

☐ Yes ☐ Yes
☐ No ☐ No
☐ N/A ☐ N/A

3) Method of Receipt: Tracking # _____

☐ Star ☐ Client ☐ UPS

☐ Fed Ex ☐ Airborne ☐ _____

4) Date & Time Received at/by Lab

5) Received (into ELM) By

6) Ice used? Packing material used?

☐ Yes ☐ Yes Cooler Temp. _____ °C
☐ No ☐ No Sample Temp. _____ °C

7) Chain of Custody filled out properly?

☐ Yes ☐ No ☐ N/A

8) Does information on custody/traffic reports agree with information on sample tags/labels?

☐ Yes ☐ No

9) Containers supplied by Lab?

☐ Yes ☐ No

10) Correct/Appropriate containers used?

☐ Yes ☐ No

11) Containers Intact?

☐ Yes ☐ No

12) Containers properly preserved?

☐ Yes ☐ No ☐ N/A

13) Headspace in VOAs?

☐ Yes ☐ No ☐ N/A

Container Qty(s) & Description(s)	Sample Number	Sample Letter(s)	Client Sample Identification	Sample Matrix	Sample Date	Sample Control Comments
1L Amb NT 500mL HNO_3	31	A-B	GW011	L	11/15/00	pres @ login
500mL HNO_3	32	A	12	↓	↓	↓
2 VOA HCl 1L Amb NT	33	A-C	13	↓		
Shelby Tube	34	A	SB021	S		
↓	35	↓	22	↓		
1L Amb NT	36	A	GW014	L		
VOA HCl	37	↓	TB001	↓	11/15/00	
↓	38	↓	TB002	↓	↓	

Additional Comments and/or Problems, Resolutions:

11/17/00
Date of Log-In

VOA177
Work Order Number

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QUALITY ETHICS SERVICE
RCL Environmental Sciences

Duke Engineering & Svcs - Austin	Project:	LNG Facility	Sampled:	11/16/00 to 11/22/00
9111 Research Blvd.	Project Number:	none	Received:	11/27/00
Austin, TX 78758	Project Manager:	Jeff Scheerhorn	Reported:	12/14/00 10:57

ANALYTICAL REPORT FOR SAMPLES:

Sample Description	Laboratory Sample Number	Sample Matrix	Date Sampled
SB023	V011230-01	Solid	11/16/00
SB024	V011230-02	Solid	11/16/00
SB025	V011230-03	Solid	11/16/00
SB026	V011230-04	Solid	11/16/00
SB027	V011230-05	Solid	11/16/00
SB028	V011230-06	Solid	11/16/00
SB029	V011230-07	Solid	11/16/00
SB030	V011230-08	Solid	11/16/00
SB031	V011230-09	Solid	11/16/00
SB032	V011230-10	Solid	11/16/00
SB033	V011230-11	Solid	11/16/00
GW015	V011230-12	Liquid	11/16/00
GW016	V011230-13	Liquid	11/20/00
~~T4S001~~	~~V011230-14~~	~~Solid~~	~~11/20/00~~
~~T4S002~~	~~V011230-15~~	~~Solid~~	~~11/20/00~~
~~T4S003~~	~~V011230-16~~	~~Solid~~	~~11/20/00~~
~~T4S004~~	~~V011230-17~~	~~Solid~~	~~11/20/00~~
~~T4S005~~	~~V011230-18~~	~~Solid~~	~~11/20/00~~

Star Analytical, Inc.

Anthony Dilday, Lab Director

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QUALITY ETHICS SERVICE
RCL Environmental Sciences

Duke Engineering & Svcs - Austin	Project:	LNG Facility	Sampled: 11/16/00 to 11/22/00
9111 Research Blvd.	Project Number:	none	Received: 11/27/00
Austin, TX 78758	Project Manager:	Jeff Scheerhorn	Reported: 12/14/00 10:57

ANALYTICAL REPORT FOR SAMPLES:

Sample Description	Laboratory Sample Number	Sample Matrix	Date Sampled
~~T4S019~~	~~V011230-73~~	~~Solid~~	~~11/20/00~~
~~T5S019~~	~~V011230-74~~	~~Solid~~	~~11/21/00~~
~~T6S019~~	~~V011230-75~~	~~Solid~~	~~11/21/00~~
GW017	V011230-76	Liquid	11/22/00
GW018	V011230-77	Liquid	11/22/00
GW019	V011230-78	Liquid	11/22/00

Amended report on 1-12-01, per client request.

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Duke Engineering & Svcs - Austin	Project:	LNG Facility	Sampled: 11/16/00 to 11/22/00
9111 Research Blvd.	Project Number:	none	Received: 11/27/00
Austin, TX 78758	Project Manager:	Jeff Scheerhorn	Reported: 12/14/00 10:57

Diesel Hydrocarbons (C12-C24) by EPA Method 8015M (modified)
Star Analytical, Inc.

Analyte	Batch Number	Date Prepared	Date Analyzed	Specific Method	Reporting Limit	Result	Units	Notes*
SB023			V011230-01				Solid	
Diesel Range Hydrocarbons	V0K3006	11/30/00	12/1/00	EPA 8015 mod.	5.0	**9.7**	mg/kg	D-22i
Surrogate: o-Terphenyl	"	"	"	*49-167*		*110*	%	
SB024			V011230-02				Solid	
Diesel Range Hydrocarbons	V0K3006	11/30/00	12/1/00	EPA 8015 mod.	5.0	**37**	mg/kg	D-22l
Surrogate: o-Terphenyl	"	"	"	*49-167*		*140*	%	
SB025			V011230-03				Solid	
Diesel Range Hydrocarbons	V0K3006	11/30/00	12/1/00	EPA 8015 mod.	5.0	**6.9**	mg/kg	D-22i
Surrogate: o-Terphenyl	"	"	"	*49-167*		*110*	%	
SB026			V011230-04				Solid	
Diesel Range Hydrocarbons	V0K3006	11/30/00	12/1/00	EPA 8015 mod.	5.0	**5.6**	mg/kg	D-22i
Surrogate: o-Terphenyl	"	"	"	*49-167*		*82*	%	
SB027			V011230-05				Solid	
Diesel Range Hydrocarbons	V0K3006	11/30/00	12/1/00	EPA 8015 mod.	5.0	**11**	mg/kg	D-22c
Surrogate: o-Terphenyl	"	"	"	*49-167*		*120*	%	
SB028			V011230-06				Solid	
Diesel Range Hydrocarbons	V0K3006	11/30/00	12/1/00	EPA 8015 mod.	5.0	**12**	mg/kg	D-22c
Surrogate: o-Terphenyl	"	"	"	*49-167*		*120*	%	
SB029			V011230-07				Solid	
Diesel Range Hydrocarbons	V0K3006	11/30/00	12/1/00	EPA 8015 mod.	5.0	**14**	mg/kg	D-22c
Surrogate: o-Terphenyl	"	"	"	*49-167*		*110*	%	
SB030			V011230-08				Solid	
Diesel Range Hydrocarbons	V0K3006	11/30/00	12/4/00	EPA 8015 mod.	5.0	**17**	mg/kg	D-22k
Surrogate: o-Terphenyl	"	"	"	*49-167*		*130*	%	
SB031			V011230-09				Solid	
Diesel Range Hydrocarbons	V0K3006	11/30/00	12/4/00	EPA 8015 mod.	5.0	**34**	mg/kg	D-22k
Surrogate: o-Terphenyl	"	"	"	*49-167*		*180*	%	*O-02*
SB032			V011230-10				Solid	
Diesel Range Hydrocarbons	V0K3006	11/30/00	12/4/00	EPA 8015 mod.	5.0	**17**	mg/kg	D-22k
Surrogate: o-Terphenyl	"	"	"	*49-167*		*120*	%	

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**Refer to end of report for text of notes and definitions.*

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Duke Engineering & Svcs - Austin	Project:	LNG Facility	Sampled: 11/16/00 to 11/22/00
9111 Research Blvd.	Project Number:	none	Received: 11/27/00
Austin, TX 78758	Project Manager:	Jeff Scheerhorn	Reported: 12/14/00 10:57

Diesel Hydrocarbons (C12-C24) by EPA Method 8015M (modified)
Star Analytical, Inc.

Analyte	Batch Number	Date Prepared	Date Analyzed	Specific Method	Reporting Limit	Result	Units	Notes*
SB033			V011230-11				Solid	
Diesel Range Hydrocarbons	V0K3006	11/30/00	12/4/00	EPA 8015 mod.	5.0	**33**	mg/kg	D-22k
Surrogate: o-Terphenyl	"	"	"	*49-167*		*150*	%	
T4S001			V011230-14				Solid	
Diesel Range Hydrocarbons	V0K3006	11/30/00	12/1/00	EPA 8015 mod.	1000	**5200**	mg/kg	D-22e
Surrogate: o-Terphenyl	"	"	"	*49-167*		*NR*	%	*O-03*
T4S002			V011230-15				Solid	
Diesel Range Hydrocarbons	V0K3006	11/30/00	12/4/00	EPA 8015 mod.	5.0	**40**	mg/kg	D-22f
Surrogate: o-Terphenyl	"	"	"	*49-167*		*37*	%	*S-04*
T4S003			V011230-16				Solid	
Diesel Range Hydrocarbons	V0K3006	11/30/00	12/4/00	EPA 8015 mod.	5.0	**44**	mg/kg	D-22f
Surrogate: o-Terphenyl	"	"	"	*49-167*		*46*	%	*S-04*
T4S004			V011230-17				Solid	
Diesel Range Hydrocarbons	V0K3006	11/30/00	12/1/00	EPA 8015 mod.	1000	**9900**	mg/kg	D-22f
Surrogate: o-Terphenyl	"	"	"	*49-167*		*NR*	%	*O-03*
T4S005			V011230-18				Solid	
Diesel Range Hydrocarbons	V0K3006	11/30/00	12/1/00	EPA 8015 mod.	1000	**7500**	mg/kg	D-22f
Surrogate: o-Terphenyl	"	"	"	*49-167*		*NR*	%	*O-03*
TD001			V011230-20				Solid	
Diesel Range Hydrocarbons	V0K3006	11/30/00	12/1/00	EPA 8015 mod.	1000	**6100**	mg/kg	D-22f
Surrogate: o-Terphenyl	"	"	"	*49-167*		*NR*	%	*O-03*
T4S007			V011230-21				Solid	
Diesel Range Hydrocarbons	V0K3006	11/30/00	12/4/00	EPA 8015 mod.	50	**220**	mg/kg	D-22f
Surrogate: o-Terphenyl	"	"	"	*49-167*		*NR*	%	*O-03*
T4S008			V011230-22				Solid	
Diesel Range Hydrocarbons	V0K3006	11/30/00	12/4/00	EPA 8015 mod.	5.0	**29**	mg/kg	D-22g
Surrogate: o-Terphenyl	"	"	"	*49-167*		*160*	%	
T4S009			V011230-23				Solid	
Diesel Range Hydrocarbons	V0K3006	11/30/00	12/4/00	EPA 8015 mod.	50	**310**	mg/kg	D-22f
Surrogate: o-Terphenyl	"	"	"	*49-167*		*NR*	%	*O-03*

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QUALITY ETHICS SERVICE
RCI Environmental Services

Duke Engineering & Svcs - Austin	Project:	LNG Facility	Sampled: 11/16/00 to 11/22/00
9111 Research Blvd.	Project Number:	none	Received: 11/27/00
Austin, TX 78758	Project Manager:	Jeff Scheerhorn	Reported: 12/14/00 10:57

Diesel Hydrocarbons (C12-C24) by EPA Method 8015M (modified)
Star Analytical, Inc.

Analyte	Batch Number	Date Prepared	Date Analyzed	Specific Method	Reporting Limit	Result	Units	Notes*
T6S015			V011230-69				Solid	
Diesel Range Hydrocarbons	V0L1118	12/11/00	12/12/00	EPA 8015 mod.	5.0	**220**	mg/kg	D-22b,H-02
Surrogate: o-Terphenyl	"	"	"	*49-167*		*NR*	*%*	*Q-17*
T4S019			V011230-73				Solid	O-08
Diesel Range Hydrocarbons	V0L1509	12/15/00	12/18/00	EPA 8015 mod.	1000	**5300**	mg/kg	D-22f
Surrogate: o-Terphenyl	"	"	"	*49-167*		*NR*	*%*	*Q-17*
T5S019			V011230-74				Solid	
Diesel Range Hydrocarbons	V0L0412	12/4/00	12/7/00	EPA 8015 mod.	500	**5700**	mg/kg	D-22f
Surrogate: o-Terphenyl	"	"	"	*49-167*		*NR*	*%*	*O-03*
T6S019			V011230-75				Solid	
Diesel Range Hydrocarbons	V0L0412	12/4/00	12/7/00	EPA 8015 mod.	500	**9000**	mg/kg	D-22f
Surrogate: o-Terphenyl	"	"	"	*49-167*		*NR*	*%*	*O-03*
GW017			V011230-76				Liquid	
Diesel Range Hydrocarbons	V0K2910	11/29/00	11/30/00	EPA 8015 mod.	5.0	ND	mg/l	
Surrogate: o-Terphenyl	"	"	"	*49-167*		*100*	*%*	
GW018			V011230-77				Liquid	
Diesel Range Hydrocarbons	V0K2910	11/29/00	11/30/00	EPA 8015 mod.	0.50	ND	mg/l	
Surrogate: o-Terphenyl	"	"	"	*49-167*		*110*	*%*	
GW019			V011230-78				Liquid	
Diesel Range Hydrocarbons	V0K2910	11/29/00	11/30/00	EPA 8015 mod.	0.50	ND	mg/l	
Surrogate: o-Terphenyl	"	"	"	*49-167*		*100*	*%*	

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QUALITY ETHICS SERVICE
BCL Environmental Sciences

Duke Engineering & Svcs - Austin	Project:	LNG Facility	Sampled: 11/16/00 to 11/22/00
9111 Research Blvd.	Project Number:	none	Received: 11/27/00
Austin, TX 78758	Project Manager:	Jeff Scheerhorn	Reported: 12/14/00 10:57

Volatile Organic Compounds by EPA Method 8260B
Star Analytical, Inc.

Analyte	Batch Number	Date Prepared	Date Analyzed	Specific Method	Reporting Limit	Result	Units	Notes*
SB025			V011230-03				Solid	
Acetone	V0L1106	11/30/00	11/30/00	EPA 8260B	250	ND	ug/kg	
Benzene	"	"	"	EPA 8260B	50.0	ND	"	
Bromobenzene	"	"	"	EPA 8260B	50.0	ND	"	
Bromodichloromethane	"	"	"	EPA 8260B	50.0	ND	"	
Bromoform	"	"	"	EPA 8260B	50.0	ND	"	
Bromomethane	"	"	"	EPA 8260B	50.0	ND	"	
2-Butanone	"	"	"	EPA 8260B	100	ND	"	
n-Butylbenzene	"	"	"	EPA 8260B	50.0	ND	"	
sec-Butylbenzene	"	"	"	EPA 8260B	50.0	ND	"	
tert-Butylbenzene	"	"	"	EPA 8260B	50.0	ND	"	
Carbon disulfide	"	"	"	EPA 8260B	50.0	ND	"	
Carbon tetrachloride	"	"	"	EPA 8260B	50.0	ND	"	
Chlorobenzene	"	"	"	EPA 8260B	50.0	ND	"	
Chloroethane	"	"	"	EPA 8260B	50.0	ND	"	
Chloroform	"	"	"	EPA 8260B	50.0	ND	"	
Chloromethane	"	"	"	EPA 8260B	50.0	ND	"	
2-Chlorotoluene	"	"	"	EPA 8260B	50.0	ND	"	
4-Chlorotoluene	"	"	"	EPA 8260B	50.0	ND	"	
Dibromochloromethane	"	"	"	EPA 8260B	50.0	ND	"	
1,2-Dibromo-3-chloropropane	"	"	"	EPA 8260B	50.0	ND	"	
1,2-Dibromoethane	"	"	"	EPA 8260B	50.0	ND	"	
Dibromomethane	"	"	"	EPA 8260B	50.0	ND	"	
1,2-Dichlorobenzene	"	"	"	EPA 8260B	50.0	ND	"	
1,3-Dichlorobenzene	"	"	"	EPA 8260B	50.0	ND	"	
1,4-Dichlorobenzene	"	"	"	EPA 8260B	50.0	ND	"	
Dichlorodifluoromethane	"	"	"	EPA 8260B	50.0	ND	"	
1,1-Dichloroethane	"	"	"	EPA 8260B	50.0	ND	"	
1,2-Dichloroethane	"	"	"	EPA 8260B	50.0	ND	"	
1,1-Dichloroethene	"	"	"	EPA 8260B	50.0	ND	"	
cis-1,2-Dichloroethene	"	"	"	EPA 8260B	50.0	ND	"	
trans-1,2-Dichloroethene	"	"	"	EPA 8260B	50.0	ND	"	
1,2-Dichloropropane	"	"	"	EPA 8260B	50.0	ND	"	
1,3-Dichloropropane	"	"	"	EPA 8260B	50.0	ND	"	
2,2-Dichloropropane	"	"	"	EPA 8260B	50.0	ND	"	
1,1-Dichloropropene	"	"	"	EPA 8260B	50.0	ND	"	
cis-1,3-Dichloropropene	"	"	"	EPA 8260B	50.0	ND	"	
trans-1,3-Dichloropropene	"	"	"	EPA 8260B	50.0	ND	"	
Ethylbenzene	"	"	"	EPA 8260B	50.0	ND	"	

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Duke Engineering & Svcs - Austin	Project:	LNG Facility	Sampled: 11/16/00 to 11/22/00
9111 Research Blvd.	Project Number:	none	Received: 11/27/00
Austin, TX 78758	Project Manager:	Jeff Scheerhorn	Reported: 12/14/00 10:57

Volatile Organic Compounds by EPA Method 8260B
Star Analytical, Inc.

Analyte	Batch Number	Date Prepared	Date Analyzed	Specific Method	Reporting Limit	Result	Units	Notes*
SB025 (continued)			V011230-03				Solid	
Hexachlorobutadiene	V0L1106	11/30/00	11/30/00	EPA 8260B	50.0	ND	ug/kg	
2-Hexanone	"	"	"	EPA 8260B	100	ND	"	
Isopropylbenzene	"	"	"	EPA 8260B	50.0	ND	"	
p-Isopropyltoluene	"	"	"	EPA 8260B	50.0	ND	"	
Methylene chloride	"	"	"	EPA 8260B	100	ND	"	
Methyl tert-butyl ether	"	"	"	EPA 8260B	50.0	ND	"	
4-Methyl-2-pentanone	"	"	"	EPA 8260B	100	ND	"	
Naphthalene	"	"	"	EPA 8260B	50.0	ND	"	
n-Propylbenzene	"	"	"	EPA 8260B	50.0	ND	"	
Styrene	"	"	"	EPA 8260B	50.0	ND	"	
1,1,1,2-Tetrachloroethane	"	"	"	EPA 8260B	50.0	ND	"	
1,1,2,2-Tetrachloroethane	"	"	"	EPA 8260B	50.0	ND	"	
Tetrachloroethene	"	"	"	EPA 8260B	50.0	ND	"	
Toluene	"	"	"	EPA 8260B	50.0	ND	"	
,2,3-Trichlorobenzene	"	"	"	EPA 8260B	50.0	ND	"	
1,2,4-Trichlorobenzene	"	"	"	EPA 8260B	50.0	ND	"	
1,1,1-Trichloroethane	"	"	"	EPA 8260B	50.0	ND	"	
1,1,2-Trichloroethane	"	"	"	EPA 8260B	50.0	ND	"	
Trichloroethene	"	"	"	EPA 8260B	50.0	ND	"	
Trichlorofluoromethane	"	"	"	EPA 8260B	50.0	ND	"	
1,2,3-Trichloropropane	"	"	"	EPA 8260B	50.0	ND	"	
1,2,4-Trimethylbenzene	"	"	"	EPA 8260B	50.0	ND	"	
1,3,5-Trimethylbenzene	"	"	"	EPA 8260B	50.0	ND	"	
Vinyl acetate	"	"	"	EPA 8260B	50.0	ND	"	
Vinyl chloride	"	"	"	EPA 8260B	50.0	ND	"	
m,p-Xylene	"	"	"	EPA 8260B	100	ND	"	
o-Xylene	"	"	"	EPA 8260B	50.0	ND	"	
Surrogate: DBFM	"	"	"	*76-120*		*104*	%	
Surrogate: Toluene-d8	"	"	"	*81-117*		*114*	"	
Surrogate: 4-BFB	"	"	"	*74-121*		*104*	"	

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Duke Engineering & Svcs - Austin	Project:	LNG Facility	Sampled: 11/16/00 to 11/22/00
9111 Research Blvd.	Project Number:	none	Received: 11/27/00
Austin, TX 78758	Project Manager:	Jeff Scheerhorn	Reported: 12/14/00 10:57

Volatile Organic Compounds by EPA Method 8260B
Star Analytical, Inc.

Analyte	Batch Number	Date Prepared	Date Analyzed	Specific Method	Reporting Limit	Result	Units	Notes*
GW015			V011230-12				Liquid	
Acetone	V0L1107	11/29/00	11/29/00	EPA 8260B	25.0	ND	ug/l	
Benzene	"	"	"	EPA 8260B	5.00	ND	"	
Bromobenzene	"	"	"	EPA 8260B	5.00	ND	"	
Bromodichloromethane	"	"	"	EPA 8260B	5.00	ND	"	
Bromoform	"	"	"	EPA 8260B	5.00	ND	"	
Bromomethane	"	"	"	EPA 8260B	5.00	ND	"	
2-Butanone	"	"	"	EPA 8260B	10.0	ND	"	
n-Butylbenzene	"	"	"	EPA 8260B	5.00	ND	"	
sec-Butylbenzene	"	"	"	EPA 8260B	5.00	ND	"	
tert-Butylbenzene	"	"	"	EPA 8260B	5.00	ND	"	
Carbon disulfide	"	"	"	EPA 8260B	5.00	ND	"	
Carbon tetrachloride	"	"	"	EPA 8260B	5.00	ND	"	
Chlorobenzene	"	"	"	EPA 8260B	5.00	ND	"	
Chloroethane	"	"	"	EPA 8260B	5.00	ND	"	
Chloroform	"	"	"	EPA 8260B	5.00	ND	"	
Chloromethane	"	"	"	EPA 8260B	5.00	ND	"	
2-Chlorotoluene	"	"	"	EPA 8260B	5.00	ND	"	
4-Chlorotoluene	"	"	"	EPA 8260B	5.00	ND	"	
Dibromochloromethane	"	"	"	EPA 8260B	5.00	ND	"	
1,2-Dibromo-3-chloropropane	"	"	"	EPA 8260B	5.00	ND	"	
1,2-Dibromoethane	"	"	"	EPA 8260B	5.00	ND	"	
Dibromomethane	"	"	"	EPA 8260B	5.00	ND	"	
1,2-Dichlorobenzene	"	"	"	EPA 8260B	5.00	ND	"	
1,3-Dichlorobenzene	"	"	"	EPA 8260B	5.00	ND	"	
1,4-Dichlorobenzene	"	"	"	EPA 8260B	5.00	ND	"	
Dichlorodifluoromethane	"	"	"	EPA 8260B	5.00	ND	"	
1,1-Dichloroethane	"	"	"	EPA 8260B	5.00	ND	"	
1,2-Dichloroethane	"	"	"	EPA 8260B	5.00	ND	"	
1,1-Dichloroethene	"	"	"	EPA 8260B	5.00	ND	"	
cis-1,2-Dichloroethene	"	"	"	EPA 8260B	5.00	ND	"	
trans-1,2-Dichloroethene	"	"	"	EPA 8260B	5.00	ND	"	
1,2-Dichloropropane	"	"	"	EPA 8260B	5.00	ND	"	
1,3-Dichloropropane	"	"	"	EPA 8260B	5.00	ND	"	
2,2-Dichloropropane	"	"	"	EPA 8260B	5.00	ND	"	
1,1-Dichloropropene	"	"	"	EPA 8260B	5.00	ND	"	
cis-1,3-Dichloropropene	"	"	"	EPA 8260B	5.00	ND	"	
trans-1,3-Dichloropropene	"	"	"	EPA 8260B	5.00	ND	"	
Ethylbenzene	"	"	"	EPA 8260B	5.00	ND	"	

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Duke Engineering & Svcs - Austin	Project:	LNG Facility	Sampled: 11/16/00 to 11/22/00
9111 Research Blvd.	Project Number:	none	Received: 11/27/00
Austin, TX 78758	Project Manager:	Jeff Scheerhorn	Reported: 12/14/00 10:57

Volatile Organic Compounds by EPA Method 8260B
Star Analytical, Inc.

Analyte	Batch Number	Date Prepared	Date Analyzed	Specific Method	Reporting Limit	Result	Units	Notes*
GW015 (continued)			V011230-12				Liquid	
Hexachlorobutadiene	V0L1107	11/29/00	11/29/00	EPA 8260B	5.00	ND	ug/l	
2-Hexanone	"	"	"	EPA 8260B	10.0	ND	"	
Isopropylbenzene	"	"	"	EPA 8260B	5.00	ND	"	
p-Isopropyltoluene	"	"	"	EPA 8260B	5.00	ND	"	
Methylene chloride	"	"	"	EPA 8260B	10.0	ND	"	
Methyl tert-butyl ether	"	"	"	EPA 8260B	5.00	ND	"	
4-Methyl-2-pentanone	"	"	"	EPA 8260B	10.0	ND	"	
Naphthalene	"	"	"	EPA 8260B	5.00	ND	"	
n-Propylbenzene	"	"	"	EPA 8260B	5.00	ND	"	
Styrene	"	"	"	EPA 8260B	5.00	ND	"	
1,1,1,2-Tetrachloroethane	"	"	"	EPA 8260B	5.00	ND	"	
1,1,2,2-Tetrachloroethane	"	"	"	EPA 8260B	5.00	ND	"	
Tetrachloroethene	"	"	"	EPA 8260B	5.00	ND	"	
Toluene	"	"	"	EPA 8260B	5.00	ND	"	
1,2,3-Trichlorobenzene	"	"	"	EPA 8260B	5.00	ND	"	
1,2,4-Trichlorobenzene	"	"	"	EPA 8260B	5.00	ND	"	
1,1,1-Trichloroethane	"	"	"	EPA 8260B	5.00	ND	"	
1,1,2-Trichloroethane	"	"	"	EPA 8260B	5.00	ND	"	
Trichloroethene	"	"	"	EPA 8260B	5.00	ND	"	
Trichlorofluoromethane	"	"	"	EPA 8260B	5.00	ND	"	
1,2,3-Trichloropropane	"	"	"	EPA 8260B	5.00	ND	"	
1,2,4-Trimethylbenzene	"	"	"	EPA 8260B	5.00	ND	"	
1,3,5-Trimethylbenzene	"	"	"	EPA 8260B	5.00	ND	"	
Vinyl acetate	"	"	"	EPA 8260B	5.00	ND	"	
Vinyl chloride	"	"	"	EPA 8260B	5.00	ND	"	
m,p-Xylene	"	"	"	EPA 8260B	10.0	ND	"	
o-Xylene	"	"	"	EPA 8260B	5.00	ND	"	
Surrogate: DBFM	"	"	"	*86-118*		*116*	%	
Surrogate: Toluene-d8	"	"	"	*88-110*		*101*	"	
Surrogate: 4-BFB	"	"	"	*86-115*		*108*	"	

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(817) 571-6800 • Metro (817) 540-6982 • FAX (817) 267-5431

Duke Engineering & Svcs - Austin	Project:	LNG Facility	Sampled: 11/16/00 to 11/22/00
9111 Research Blvd.	Project Number:	none	Received: 11/27/00
Austin, TX 78758	Project Manager:	Jeff Scheerhorn	Reported: 12/14/00 10:57

METALS
Del Mar Analytical, Irvine

Analyte	Batch Number	Date Prepared	Date Analyzed	Specific Method	Reporting Limit	Result	Units	Notes*
SB023			V011230-01				Solid	
Antimony	10K2936	11/29/00	12/5/00	EPA 6010B	10	ND	mg/kg	
Arsenic	"	"	"	EPA 6010B	2.0	**2.8**	"	
Barium	"	"	"	EPA 6010B	1.0	**72**	"	
Beryllium	"	"	"	EPA 6010B	0.50	ND	"	
Cadmium	"	"	"	EPA 6010B	0.50	**1.8**	"	
Chromium	"	"	"	EPA 6010B	1.0	**7.4**	"	
Cobalt	"	"	"	EPA 6010B	1.0	**4.9**	"	
Copper	"	"	"	EPA 6010B	1.0	**7.7**	"	
Lead	"	"	"	EPA 6010B	2.0	**4.5**	"	
Molybdenum	"	"	"	EPA 6010B	2.0	ND	"	
Nickel	"	"	"	EPA 6010B	1.0	**8.6**	"	
Selenium	"	"	"	EPA 6010B	2.0	ND	"	
Silver	"	"	"	EPA 6010B	1.0	ND	"	
Thallium	"	"	"	EPA 6010B	10	ND	"	
Vanadium	"	"	"	EPA 6010B	1.0	**16**	"	
Zinc	"	"	"	EPA 6010B	5.0	**100**	"	
Mercury	10K2935	"	11/29/00	EPA 7471A	0.020	ND	"	
SB031			V011230-09				Solid	
Antimony	10K2936	11/29/00	12/6/00	EPA 6010B	10	ND	mg/kg	
Arsenic	"	"	"	EPA 6010B	2.0	**8.6**	"	
Barium	"	"	"	EPA 6010B	1.0	**29**	"	
Beryllium	"	"	"	EPA 6010B	0.50	ND	"	
Cadmium	"	"	"	EPA 6010B	0.50	ND	"	
Chromium	"	"	"	EPA 6010B	1.0	**4.7**	"	
Cobalt	"	"	"	EPA 6010B	1.0	**2.5**	"	
Copper	"	"	"	EPA 6010B	1.0	**3.6**	"	
Lead	"	"	"	EPA 6010B	2.0	**2.4**	"	
Molybdenum	"	"	"	EPA 6010B	2.0	ND	"	
Nickel	"	"	"	EPA 6010B	1.0	**3.0**	"	
Selenium	"	"	"	EPA 6010B	2.0	ND	"	
Silver	"	"	"	EPA 6010B	1.0	ND	"	
Thallium	"	"	"	EPA 6010B	10	ND	"	
Vanadium	"	"	"	EPA 6010B	1.0	**16**	"	
Zinc	"	"	"	EPA 6010B	5.0	**11**	"	
Mercury	10K2935	"	11/29/00	EPA 7471A	0.020	ND	"	

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Austin, TX 78758	Project Manager:	Jeff Scheerhorn	Reported: 12/14/00 10:57

METALS
Del Mar Analytical, Irvine

Analyte	Batch Number	Date Prepared	Date Analyzed	Specific Method	Reporting Limit	Result	Units	Notes*
SB032			V011230-10				Solid	
Antimony	I0K2936	11/29/00	12/6/00	EPA 6010B	10	ND	mg/kg	
Arsenic	"	"	"	EPA 6010B	2.0	**4.0**	"	
Barium	"	"	"	EPA 6010B	1.0	**53**	"	
Beryllium	"	"	"	EPA 6010B	0.50	ND	"	
Cadmium	"	"	"	EPA 6010B	0.50	ND	"	
Chromium	"	"	"	EPA 6010B	1.0	**10**	"	
Cobalt	"	"	"	EPA 6010B	1.0	**4.2**	"	
Copper	"	"	"	EPA 6010B	1.0	**20**	"	
Lead	"	"	"	EPA 6010B	2.0	**13**	"	
Molybdenum	"	"	"	EPA 6010B	2.0	ND	"	
Nickel	"	"	"	EPA 6010B	1.0	**21**	"	
Selenium	"	"	"	EPA 6010B	2.0	ND	"	
Silver	"	"	"	EPA 6010B	1.0	ND	"	
Thallium	"	"	"	EPA 6010B	10	ND	"	
Vanadium	"	"	"	EPA 6010B	1.0	**42**	"	
Zinc	"	"	"	EPA 6010B	5.0	**38**	"	
Mercury	I0K2935	"	11/29/00	EPA 7471A	0.020	**0.61**	"	
SB033			V011230-11				Solid	
Antimony	I0K2936	11/29/00	12/6/00	EPA 6010B	10	ND	mg/kg	
Arsenic	"	"	"	EPA 6010B	2.0	**5.7**	"	
Barium	"	"	"	EPA 6010B	1.0	**48**	"	
Beryllium	"	"	"	EPA 6010B	0.50	ND	"	
Cadmium	"	"	"	EPA 6010B	0.50	ND	"	
Chromium	"	"	"	EPA 6010B	1.0	**10**	"	
Cobalt	"	"	"	EPA 6010B	1.0	**4.1**	"	
Copper	"	"	"	EPA 6010B	1.0	**11**	"	
Lead	"	"	"	EPA 6010B	2.0	**14**	"	
Molybdenum	"	"	"	EPA 6010B	2.0	ND	"	
Nickel	"	"	"	EPA 6010B	1.0	**20**	"	
Selenium	"	"	"	EPA 6010B	2.0	ND	"	
Silver	"	"	"	EPA 6010B	1.0	ND	"	
Thallium	"	"	"	EPA 6010B	10	ND	"	
Vanadium	"	"	"	EPA 6010B	1.0	**40**	"	
Zinc	"	"	"	EPA 6010B	5.0	**37**	"	
Mercury	I0K2935	"	11/29/00	EPA 7471A	0.020	**0.72**	"	

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9111 Research Blvd.	Project Number:	none	Received: 11/27/00
Austin, TX 78758	Project Manager:	Jeff Scheerhorn	Reported: 12/14/00 10:57

METALS
Del Mar Analytical, Irvine

Analyte	Batch Number	Date Prepared	Date Analyzed	Specific Method	Reporting Limit	Result	Units	Notes*
GW015			V011230-12				Liquid	
Antimony	I0K3043	11/30/00	12/7/00	EPA 6010B	0.010	ND	mg/l	
Arsenic	"	"	"	EPA 6010B	0.0050	ND	"	
Barium	"	"	"	EPA 6010B	0.010	ND	"	
Beryllium	"	"	"	EPA 6010B	0.0040	ND	"	
Cadmium	"	"	"	EPA 6010B	0.0050	ND	"	
Chromium	"	"	"	EPA 6010B	0.0050	ND	"	
Cobalt	"	"	"	EPA 6010B	0.010	ND	"	
Copper	"	"	"	EPA 6010B	0.010	ND	"	
Lead	"	"	"	EPA 6010B	0.0050	ND	"	
Molybdenum	"	"	"	EPA 6010B	0.020	ND	"	
Nickel	"	"	"	EPA 6010B	0.010	ND	"	
Selenium	"	"	"	EPA 6010B	0.0050	ND	"	
Silver	"	"	"	EPA 6010B	0.010	ND	"	
Thallium	"	"	"	EPA 6010B	0.0050	ND	"	
Vanadium	"	"	"	EPA 6010B	0.010	ND	"	
Zinc	"	"	"	EPA 6010B	0.020	ND	"	
Mercury	I0K3030	"	11/30/00	EPA 7470A	0.00020	ND	"	
GW016			V011230-13				Liquid	
Antimony	I0K3043	11/30/00	12/7/00	EPA 6010B	0.010	ND	mg/l	
Arsenic	"	"	"	EPA 6010B	0.0050	**0.12**	"	
Barium	"	"	"	EPA 6010B	0.010	ND	"	
Beryllium	"	"	"	EPA 6010B	0.0040	ND	"	
Cadmium	"	"	"	EPA 6010B	0.0050	ND	"	
Chromium	"	"	"	EPA 6010B	0.0050	ND	"	
Cobalt	"	"	"	EPA 6010B	0.010	ND	"	
Copper	"	"	"	EPA 6010B	0.010	**0.036**	"	
Lead	"	"	"	EPA 6010B	0.0050	ND	"	
Molybdenum	"	"	"	EPA 6010B	0.020	ND	"	
Nickel	"	"	"	EPA 6010B	0.010	ND	"	
Selenium	"	"	"	EPA 6010B	0.0050	ND	"	
Silver	"	"	"	EPA 6010B	0.010	ND	"	
Thallium	"	"	"	EPA 6010B	0.0050	**0.0056**	"	
Vanadium	"	"	"	EPA 6010B	0.010	ND	"	
Zinc	"	"	"	EPA 6010B	0.020	**0.067**	"	
Mercury	I0K3030	"	11/30/00	EPA 7470A	0.00020	ND	"	

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QUALITY ETHICS SERVICE
BCL Environmental Sciences

Duke Engineering & Svcs - Austin	Project:	LNG Facility	Sampled: 11/16/00 to 11/22/00
9111 Research Blvd.	Project Number:	none	Received: 11/27/00
Austin, TX 78758	Project Manager:	Jeff Scheerhorn	Reported: 12/14/00 10:57

Diesel Hydrocarbons (C12-C24) by EPA Method 8015M (modified)/Quality Control
Star Analytical, Inc.

Analyte	Date Analyzed	Spike Level	Sample Result	QC Result	Units	Reporting Limit / Recov. Limits	Recov. %	RPD Limit	RPD %	Notes*
Batch: V0K2910	**Date Prepared: 11/29/00**					**Extraction Method: EPA 3510C**				
Blank	V0K2910-BLK1									
Diesel Range Hydrocarbons	11/30/00			ND	mg/l	0.50				
Surrogate: o-Terphenyl	"	*0.10*		*0.13*	"	*49-167*	*130*			
LCS	V0K2910-BS1									
Diesel Range Hydrocarbons	11/30/00	1.0		1.1	mg/l	60-130	110			
Surrogate: o-Terphenyl	"	*0.10*		*0.14*	"	*49-167*	*140*			
LCS Dup	V0K2910-BSD1									
Diesel Range Hydrocarbons	11/30/00	1.0		1.2	mg/l	60-130	120	30	8.7	
Surrogate: o-Terphenyl	"	*0.10*		*0.15*	"	*49-167*	*150*			
Duplicate	V0K2910-DUP1	V011230-77								
Diesel Range Hydrocarbons	11/30/00		ND	ND	mg/l			30		
Surrogate: o-Terphenyl	"	*0.10*		*0.11*	"	*49-167*	*110*			
Matrix Spike	V0K2910-MS1	V011230-76								
Diesel Range Hydrocarbons	11/30/00	1.0	ND	1.1	mg/l	60-140	110			
Surrogate: o-Terphenyl	"	*0.10*		*0.14*	"	*49-167*	*140*			
Batch: V0K3006	**Date Prepared: 11/30/00**					**Extraction Method: EPA 3550**				
Blank	V0K3006-BLK1									
Diesel Range Hydrocarbons	12/1/00			6.1	mg/kg	5.0				V-2
Surrogate: o-Terphenyl	"	*1.7*		*2.3*	"	*49-167*	*140*			
LCS	V0K3006-BS1									
Diesel Range Hydrocarbons	12/1/00	17		21	mg/kg	60-130	120			
Surrogate: o-Terphenyl	"	*1.7*		*2.6*	"	*49-167*	*150*			
LCS Dup	V0K3006-BSD1									
Diesel Range Hydrocarbons	12/1/00	17		21	mg/kg	60-130	120	30	0	
Surrogate: o-Terphenyl	"	*1.7*		*2.6*	"	*49-167*	*150*			
Matrix Spike	V0K3006-MS1	V011230-02								
Diesel Range Hydrocarbons	12/1/00	17	37	37	mg/kg	60-140	NR			M-01
Surrogate: o-Terphenyl	"	*1.7*		*2.8*	"	*49-167*	*160*			

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Austin, TX 78758	Project Manager: Jeff Scheerhorn	Reported: 12/14/00 10:57

Diesel Hydrocarbons (C12-C24) by EPA Method 8015M (modified)/Quality Control
Star Analytical, Inc.

Analyte	Date Analyzed	Spike Level	Sample Result	QC Result	Units	Reporting Limit / Recov. Limits	Recov. %	RPD Limit	RPD %	Notes*
Matrix Spike Dup	V0K3006-MSD1	V011230-02								
Diesel Range Hydrocarbons	12/1/00	17	37	43	mg/kg	60-140	35	30	15	M-01
Surrogate: o-Terphenyl	"	*1.7*		*2.9*	"	*49-167*	*170*			*O-02*
Batch: V0L0109	Date Prepared: 12/1/00					Extraction Method: EPA 3550				
Blank	V0L0109-BLK1									
Diesel Range Hydrocarbons	12/5/00			5.3	mg/kg	5.0				V-2
Surrogate: o-Terphenyl	"	*1.7*		*2.3*	"	*49-167*	*140*			
LCS	V0L0109-BS1									
Diesel Range Hydrocarbons	12/5/00	17		20	mg/kg	60-130	120			
Surrogate: o-Terphenyl	"	*1.7*		*2.6*	"	*49-167*	*150*			
LCS Dup	V0L0109-BSD1									
Diesel Range Hydrocarbons	12/5/00	17		22	mg/kg	60-130	130	30	9.5	
Surrogate: o-Terphenyl	"	*1.7*		*2.7*	"	*49-167*	*160*			
Matrix Spike	V0L0109-MS1	V011230-37								
Diesel Range Hydrocarbons	12/5/00	17	3200	3600	mg/kg	60-140	NR			M-01
Surrogate: o-Terphenyl	"	*1.7*		*100*	"	*49-167*	*NR*			*O-03*
Matrix Spike Dup	V0L0109-MSD1	V011230-37								
Diesel Range Hydrocarbons	12/5/00	17	3200	3600	mg/kg	60-140	NR	30	0	M-01
Surrogate: o-Terphenyl	"	*1.7*		*110*	"	*49-167*	*NR*			*O-03*
Batch: V0L0302	Date Prepared: 12/1/00					Extraction Method: EPA 3550				
Blank	V0L0302-BLK1									
Diesel Range Hydrocarbons	12/8/00			ND	mg/kg	5.0				
Surrogate: o-Terphenyl	"	*1.7*		*2.1*	"	*49-167*	*120*			
LCS	V0L1509-BS1									
Diesel Range Hydrocarbons	12/18/00	17		18	mg/kg	60-130	110			
Surrogate: o-Terphenyl	"	*1.7*		*2.2*	"	*49-167*	*130*			

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Austin, TX 78758	Project Manager: Jeff Scheerhorn	Reported: 12/14/00 10:57

Diesel Hydrocarbons (C12-C24) by EPA Method 8015M (modified)/Quality Control
Star Analytical, Inc.

Analyte	Date Analyzed	Spike Level	Sample Result	QC Result	Units	Reporting Limit / Recov. Limits	Recov. %	RPD Limit	RPD %	Notes*
Matrix Spike	V0L1509-MS1		V011230-55							
Diesel Range Hydrocarbons	12/18/00	17	7000	7500	mg/kg	60-140	NR			M-01
Surrogate: o-Terphenyl	"	*1.7*		*200*	"	*49-167*	*NR*			*Q-17*
Matrix Spike Dup	V0L1509-MS1		V011230-55							
Diesel Range Hydrocarbons	12/18/00	17	6200	7500	mg/kg	60-140	NR	30	18	M-01
Surrogate: o-Terphenyl	"	*1.7*		*170*	"	*49-167*	*NR*			*Q-17*
Batch: V0L0412	Date Prepared: 12/4/00					Extraction Method: EPA 3550				
Blank	V0L0412-BLK1									
Diesel Range Hydrocarbons	12/7/00			ND	mg/kg	5.0				
Surrogate: o-Terphenyl	"	*1.7*		*2.2*	"	*49-167*	*130*			
LCS	V0L0412-BS1									
Diesel Range Hydrocarbons	12/7/00	17		22	mg/kg	60-130	130			
Surrogate: o-Terphenyl	"	*1.7*		*3.0*	"	*49-167*	*180*			*O-02*
LCS Dup	V0L0412-BSD1									
Diesel Range Hydrocarbons	12/7/00	17		25	mg/kg	60-130	150	30	13	A-04
Surrogate: o-Terphenyl	"	*1.7*		*3.1*	"	*49-167*	*180*			*O-02*
Matrix Spike	V0L0412-MS1		V011230-75							
Diesel Range Hydrocarbons	12/7/00	17	9000	6200	mg/kg	60-140	NR			M-01
Surrogate: o-Terphenyl	"	*1.7*		*260*	"	*49-167*	*NR*			*Q-17*
Matrix Spike Dup	V0L0412-MSD1		V011230-75							
Diesel Range Hydrocarbons	12/7/00	17	9000	6400	mg/kg	60-140	NR	30	3.2	M-01
Surrogate: o-Terphenyl	"	*1.7*		*260*	"	*49-167*	*NR*			*Q-17*
Batch: V0L1118	Date Prepared: 12/11/00					Extraction Method: EPA 3550				
Blank	V0L1118-BLK1									
Diesel Range Hydrocarbons	12/12/00			ND	mg/kg	5.0				
Surrogate: o-Terphenyl	"	*1.7*		*2.0*	"	*49-167*	*120*			
LCS	V0L1118-BS1									
Diesel Range Hydrocarbons	12/12/00	17		19	mg/kg	60-130	110			
Surrogate: o-Terphenyl	"	*1.7*		*2.5*	"	*49-167*	*150*			

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Austin, TX 78758	Project Manager: Jeff Scheerhorn	Reported: 12/14/00 10:57

Diesel Hydrocarbons (C12-C24) by EPA Method 8015M (modified)/Quality Control
Star Analytical, Inc.

Analyte	Date Analyzed	Spike Level	Sample Result	QC Result	Units	Reporting Limit Recov. Limits	Recov. %	RPD Limit	RPD %	Notes*
LCS Dup	V0L1118-BSD1									
Diesel Range Hydrocarbons	12/12/00	17		22	mg/kg	60-130	130	30	15	
Surrogate: o-Terphenyl	"	*1.7*		*2.7*	"	*49-167*	*160*			
Matrix Spike	V0L1118-MS1	V011230-68								
Diesel Range Hydrocarbons	12/12/00	17	6700	8400	mg/kg	60-140	NR			H-02
Surrogate: o-Terphenyl	"	*1.7*		*300*	"	*49-167*	*NR*			*H-02,Q-17*
Matrix Spike Dup	V0L1118-MSD1	V011230-68								
Diesel Range Hydrocarbons	12/12/00	17	6700	9000	mg/kg	60-140	NR	30	6.9	H-02
Surrogate: o-Terphenyl	"	*1.7*		*330*	"	*49-167*	*NR*			*H-02,Q-17*

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QUALITY ETHICS SERVICE
KCL Environmental Sciences

Duke Engineering & Svcs - Austin	Project: LNG Facility	Sampled: 11/16/00 to 11/22/00
9111 Research Blvd.	Project Number: none	Received: 11/27/00
Austin, TX 78758	Project Manager: Jeff Scheerhorn	Reported: 12/14/00 10:57

Volatile Organic Compounds by EPA Method 8260B/Quality Control
Star Analytical, Inc.

Analyte	Date Analyzed	Spike Level	Sample Result	QC Result	Units	Reporting Limit Recov. Limits	Recov. %	RPD Limit	RPD %	Notes*
Batch: V0L1106	**Date Prepared: 11/30/00**				**Extraction Method: EPA 5030**					
Blank	**V0L1106-BLK1**									
Acetone	11/30/00			ND	ug/kg	250				
Benzene	"			ND	"	50.0				
Bromobenzene	"			ND	"	50.0				
Bromodichloromethane	"			ND	"	50.0				
Bromoform	"			ND	"	50.0				
Bromomethane	"			ND	"	50.0				
2-Butanone	"			ND	"	100				
n-Butylbenzene	"			ND	"	50.0				
sec-Butylbenzene	"			ND	"	50.0				
tert-Butylbenzene	"			ND	"	50.0				
Carbon disulfide	"			ND	"	50.0				
Carbon tetrachloride	"			ND	"	50.0				
Chlorobenzene	"			ND	"	50.0				
Chloroethane	"			ND	"	50.0				
Chloroform	"			ND	"	50.0				
Chloromethane	"			ND	"	50.0				
2-Chlorotoluene	"			ND	"	50.0				
4-Chlorotoluene	"			ND	"	50.0				
Dibromochloromethane	"			ND	"	50.0				
1,2-Dibromo-3-chloropropane	"			ND	"	50.0				
1,2-Dibromoethane	"			ND	"	50.0				
Dibromomethane	"			ND	"	50.0				
1,2-Dichlorobenzene	"			ND	"	50.0				
1,3-Dichlorobenzene	"			ND	"	50.0				
1,4-Dichlorobenzene	"			ND	"	50.0				
Dichlorodifluoromethane	"			ND	"	50.0				
1,1-Dichloroethane	"			ND	"	50.0				
1,2-Dichloroethane	"			ND	"	50.0				
1,1-Dichloroethene	"			ND	"	50.0				
cis-1,2-Dichloroethene	"			ND	"	50.0				
trans-1,2-Dichloroethene	"			ND	"	50.0				
1,2-Dichloropropane	"			ND	"	50.0				
1,3-Dichloropropane	"			ND	"	50.0				
2,2-Dichloropropane	"			ND	"	50.0				
1,1-Dichloropropene	"			ND	"	50.0				
cis-1,3-Dichloropropene	"			ND	"	50.0				
trans-1,3-Dichloropropene	"			ND	"	50.0				

Refer to end of report for text of notes and definitions.

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Duke Engineering & Svcs - Austin	Project: LNG Facility	Sampled: 11/16/00 to 11/22/00
9111 Research Blvd.	Project Number: none	Received: 11/27/00
Austin, TX 78758	Project Manager: Jeff Scheerhorn	Reported: 12/14/00 10:57

Volatile Organic Compounds by EPA Method 8260B/Quality Control
Star Analytical, Inc.

Analyte	Date Analyzed	Spike Level	Sample Result	QC Result	Units	Reporting Limit / Recov. Limits	Recov. %	RPD Limit	RPD %	Notes*
Blank (continued)	V0L1106-BLK1									
Ethylbenzene	11/30/00			ND	ug/kg	50.0				
Hexachlorobutadiene	"			ND	"	50.0				
2-Hexanone	"			ND	"	100				
Isopropylbenzene	"			ND	"	50.0				
p-Isopropyltoluene	"			ND	"	50.0				
Methylene chloride	"			ND	"	100				
Methyl tert-butyl ether	"			ND	"	50.0				
4-Methyl-2-pentanone	"			ND	"	100				
Naphthalene	"			ND	"	50.0				
n-Propylbenzene	"			ND	"	50.0				
Styrene	"			ND	"	50.0				
1,1,1,2-Tetrachloroethane	"			ND	"	50.0				
1,1,2,2-Tetrachloroethane	"			ND	"	50.0				
Tetrachloroethene	"			ND	"	50.0				
Toluene	"			ND	"	50.0				
1,2,3-Trichlorobenzene	"			ND	"	50.0				
1,2,4-Trichlorobenzene	"			ND	"	50.0				
1,1,1-Trichloroethane	"			ND	"	50.0				
1,1,2-Trichloroethane	"			ND	"	50.0				
Trichloroethene	"			ND	"	50.0				
Trichlorofluoromethane	"			ND	"	50.0				
1,2,3-Trichloropropane	"			ND	"	50.0				
1,2,4-Trimethylbenzene	"			ND	"	50.0				
1,3,5-Trimethylbenzene	"			ND	"	50.0				
Vinyl acetate	"			ND	"	50.0				
Vinyl chloride	"			ND	"	50.0				
m,p-Xylene	"			ND	"	100				
o-Xylene	"			ND	"	50.0				
Surrogate: DBFM	"	*500*		*523*	"	*76-120*	*105*			
Surrogate: Toluene-d8	"	*500*		*492*	"	*81-117*	*98.4*			
Surrogate: 4-BFB	"	*500*		*535*	"	*74-121*	*107*			
LCS	V0L1106-BS1									
Benzene	11/30/00	500		475	ug/kg	66-142	95.0			
Chlorobenzene	"	500		495	"	60-133	99.0			
1,1-Dichloroethene	"	500		598	"	59-172	120			
Toluene	"	500		458	"	59-133	91.6			
Trichloroethene	"	500		449	"	62-137	89.8			

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QUALITY ETHICS SERVICE
RCL Environmental Sciences

Duke Engineering & Svcs - Austin	Project: LNG Facility	Sampled: 11/16/00 to 11/22/00
9111 Research Blvd.	Project Number: none	Received: 11/27/00
Austin, TX 78758	Project Manager: Jeff Scheerhorn	Reported: 12/14/00 10:57

Volatile Organic Compounds by EPA Method 8260B/Quality Control
Star Analytical, Inc.

Analyte	Date Analyzed	Spike Level	Sample Result	QC Result	Units	Reporting Limit / Recov. Limits	Recov. %	RPD Limit	RPD %	Notes*
LCS (continued)	**V0L1106-BS1**									
Surrogate: DBFM	*11/30/00*	*500*		*580*	*ug/kg*	*76-120*	*116*			
Surrogate: Toluene-d8	*"*	*500*		*487*	*"*	*81-117*	*97.4*			
Surrogate: 4-BFB	*"*	*500*		*545*	*"*	*74-121*	*109*			
LCS Dup	**V0L1106-BSD1**									
Benzene	11/30/00	500		446	ug/kg	66-142	89.2	21	6.30	
Chlorobenzene	"	500		462	"	60-133	92.4	21	6.90	
1,1-Dichloroethene	"	500		477	"	59-172	95.4	22	22.5	A-03
Toluene	"	500		429	"	59-133	85.8	21	6.54	
Trichloroethene	"	500		412	"	62-137	82.4	24	8.59	
Surrogate: DBFM	*"*	*500*		*558*	*"*	*76-120*	*112*			
Surrogate: Toluene-d8	*"*	*500*		*487*	*"*	*81-117*	*97.4*			
Surrogate: 4-BFB	*"*	*500*		*536*	*"*	*74-121*	*107*			
Batch: V0L1107	**Date Prepared: 11/29/00**					**Extraction Method: EPA 5030**				
Blank	**V0L1107-BLK1**									
Acetone	11/29/00			ND	ug/l	25.0				
Benzene	"			ND	"	5.00				
Bromobenzene	"			ND	"	5.00				
Bromodichloromethane	"			ND	"	5.00				
Bromoform	"			ND	"	5.00				
Bromomethane	"			ND	"	5.00				
2-Butanone	"			ND	"	10.0				
n-Butylbenzene	"			ND	"	5.00				
sec-Butylbenzene	"			ND	"	5.00				
tert-Butylbenzene	"			ND	"	5.00				
Carbon disulfide	"			ND	"	5.00				
Carbon tetrachloride	"			ND	"	5.00				
Chlorobenzene	"			ND	"	5.00				
Chloroethane	"			ND	"	5.00				
Chloroform	"			ND	"	5.00				
Chloromethane	"			ND	"	5.00				
2-Chlorotoluene	"			ND	"	5.00				
4-Chlorotoluene	"			ND	"	5.00				
Dibromochloromethane	"			ND	"	5.00				
1,2-Dibromo-3-chloropropane	"			ND	"	5.00				
1,2-Dibromoethane	"			ND	"	5.00				
Dibromomethane	"			ND	"	5.00				

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QUALITY ETHICS SERVICE
RCL Environmental Sciences

Duke Engineering & Svcs - Austin	Project:	LNG Facility	Sampled: 11/16/00 to 11/22/00
9111 Research Blvd.	Project Number:	none	Received: 11/27/00
Austin, TX 78758	Project Manager:	Jeff Scheerhorn	Reported: 12/14/00 10:57

Volatile Organic Compounds by EPA Method 8260B/Quality Control
Star Analytical, Inc.

Analyte	Date Analyzed	Spike Level	Sample Result	QC Result	Units	Reporting Limit / Recov. Limits	Recov. %	RPD Limit	RPD %	Notes*
Blank (continued)	V0L1107-BLK1									
1,2-Dichlorobenzene	11/29/00			ND	ug/l	5.00				
1,3-Dichlorobenzene	"			ND	"	5.00				
1,4-Dichlorobenzene	"			ND	"	5.00				
Dichlorodifluoromethane	"			ND	"	5.00				
1,1-Dichloroethane	"			ND	"	5.00				
1,2-Dichloroethane	"			ND	"	5.00				
1,1-Dichloroethene	"			ND	"	5.00				
cis-1,2-Dichloroethene	"			ND	"	5.00				
trans-1,2-Dichloroethene	"			ND	"	5.00				
1,2-Dichloropropane	"			ND	"	5.00				
1,3-Dichloropropane	"			ND	"	5.00				
2,2-Dichloropropane	"			ND	"	5.00				
1,1-Dichloropropene	"			ND	"	5.00				
cis-1,3-Dichloropropene	"			ND	"	5.00				
trans-1,3-Dichloropropene	"			ND	"	5.00				
Ethylbenzene	"			ND	"	5.00				
Hexachlorobutadiene	"			ND	"	5.00				
2-Hexanone	"			ND	"	10.0				
Isopropylbenzene	"			ND	"	5.00				
p-Isopropyltoluene	"			ND	"	5.00				
Methylene chloride	"			ND	"	10.0				
Methyl tert-butyl ether	"			ND	"	5.00				
4-Methyl-2-pentanone	"			ND	"	10.0				
Naphthalene	"			ND	"	5.00				
n-Propylbenzene	"			ND	"	5.00				
Styrene	"			ND	"	5.00				
1,1,1,2-Tetrachloroethane	"			ND	"	5.00				
1,1,2,2-Tetrachloroethane	"			ND	"	5.00				
Tetrachloroethene	"			ND	"	5.00				
Toluene	"			ND	"	5.00				
1,2,3-Trichlorobenzene	"			ND	"	5.00				
1,2,4-Trichlorobenzene	"			ND	"	5.00				
1,1,1-Trichloroethane	"			ND	"	5.00				
1,1,2-Trichloroethane	"			ND	"	5.00				
Trichloroethene	"			ND	"	5.00				
Trichlorofluoromethane	"			ND	"	5.00				
1,2,3-Trichloropropane	"			ND	"	5.00				
1,2,4-Trimethylbenzene	"			ND	"	5.00				

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Duke Engineering & Svcs - Austin	Project:	LNG Facility	Sampled: 11/16/00 to 11/22/00
9111 Research Blvd.	Project Number:	none	Received: 11/27/00
Austin, TX 78758	Project Manager:	Jeff Scheerhorn	Reported: 12/14/00 10:57

Volatile Organic Compounds by EPA Method 8260B/Quality Control
Star Analytical, Inc.

Analyte	Date Analyzed	Spike Level	Sample Result	QC Result	Units	Reporting Limit / Recov. Limits	Recov. %	RPD Limit	RPD %	Notes*
Blank (continued)	V0L1107-BLK1									
1,3,5-Trimethylbenzene	11/29/00			**ND**	ug/l	**5.00**				
Vinyl acetate	"			**ND**	"	**5.00**				
Vinyl chloride	"			**ND**	"	**5.00**				
m,p-Xylene	"			**ND**	"	**10.0**				
o-Xylene	"			**ND**	"	**5.00**				
Surrogate: DBFM	"	*50.0*		*49.9*	"	*86-118*	*99.8*			
Surrogate: Toluene-d8	"	*50.0*		*50.6*	"	*88-110*	*101*			
Surrogate: 4-BFB	"	*50.0*		*54.5*	"	*86-115*	*109*			
LCS	V0L1107-BS1									
Benzene	11/29/00	50.0		44.6	ug/l	76-127	89.2			
Chlorobenzene	"	50.0		46.9	"	75-130	93.8			
1,1-Dichloroethene	"	50.0		43.3	"	58-145	86.6			
Toluene	"	50.0		45.8	"	76-127	91.6			
Trichloroethene	"	50.0		42.2	"	71-140	84.4			
Surrogate: DBFM	"	*50.0*		*47.6*	"	*86-118*	*95.2*			
Surrogate: Toluene-d8	"	*50.0*		*51.7*	"	*88-110*	*103*			
Surrogate: 4-BFB	"	*50.0*		*53.0*	"	*86-115*	*106*			
LCS Dup	V0L1107-BSD1									
Benzene	11/29/00	50.0		47.5	ug/l	76-127	95.0	21	6.30	
Chlorobenzene	"	50.0		49.6	"	75-130	99.2	21	5.60	
1,1-Dichloroethene	"	50.0		48.0	"	58-145	96.0	22	10.3	
Toluene	"	50.0		47.0	"	76-127	94.0	21	2.59	
Trichloroethene	"	50.0		45.1	"	71-140	90.2	24	6.64	
Surrogate: DBFM	"	*50.0*		*50.3*	"	*86-118*	*101*			
Surrogate: Toluene-d8	"	*50.0*		*50.1*	"	*88-110*	*100*			
Surrogate: 4-BFB	"	*50.0*		*55.9*	"	*86-115*	*112*			

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9111 Research Blvd.	Project Number: none	Received: 11/27/00
Austin, TX 78758	Project Manager: Jeff Scheerhorn	Reported: 12/14/00 10:57

METALS/Quality Control
Del Mar Analytical, Irvine

Analyte	Date Analyzed	Spike Level	Sample Result	QC Result	Units	Reporting Limit / Recov. Limits	Recov. %	RPD Limit	RPD %	Notes*
Batch: I0K2935	Date Prepared: 11/29/00				Extraction Method: EPA 7471A Hg					
Blank	I0K2935-BLK1									
Mercury	11/29/00			ND	mg/kg	0.020				
LCS	I0K2935-BS1									
Mercury	11/29/00	0.800		0.832	mg/kg	85-120	104			
Matrix Spike	I0K2935-MS1		V011230-70							
Mercury	11/29/00	0.800	ND	0.802	mg/kg	65-135	100			
Matrix Spike Dup	I0K2935-MSD1		V011230-70							
Mercury	11/29/00	0.800	ND	0.814	mg/kg	65-135	102	20	1.49	
Batch: I0K2936	Date Prepared: 11/29/00				Extraction Method: EPA 3050B ICP					
Blank	I0K2936-BLK1									
Antimony	12/5/00			ND	mg/kg	10				
Arsenic	"			ND	"	2.0				
Barium	"			ND	"	1.0				
Beryllium	"			ND	"	0.50				
Cadmium	"			ND	"	0.50				
Chromium	"			ND	"	1.0				
Cobalt	"			ND	"	1.0				
Copper	"			ND	"	1.0				
Lead	"			ND	"	2.0				
Molybdenum	"			ND	"	2.0				
Nickel	"			ND	"	1.0				
Selenium	"			ND	"	2.0				
Silver	"			ND	"	1.0				
Thallium	"			ND	"	10				
Vanadium	"			ND	"	1.0				
Zinc	"			ND	"	5.0				
LCS	I0K2936-BS1									
Antimony	12/5/00	50.0		52.3	mg/kg	80-120	105			
Arsenic	"	50.0		46.5	"	80-120	93.0			
Barium	"	50.0		48.2	"	80-120	96.4			
Beryllium	"	50.0		50.7	"	80-120	101			
Cadmium	"	50.0		49.3	"	80-120	98.6			
Chromium	"	50.0		51.8	"	80-120	104			

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9111 Research Blvd.	Project Number: none	Received: 11/27/00
Austin, TX 78758	Project Manager: Jeff Scheerhorn	Reported: 12/14/00 10:57

METALS/Quality Control
Del Mar Analytical, Irvine

Analyte	Date Analyzed	Spike Level	Sample Result	QC Result	Units	Reporting Limit Recov. Limits	Recov. %	RPD Limit	RPD %	Notes*
LCS (continued)	**10K2936-BS1**									
Cobalt	12/5/00	50.0		50.6	mg/kg	80-120	101			
Copper	"	50.0		50.7	"	80-120	101			
Lead	"	50.0		49.0	"	80-120	98.0			
Molybdenum	"	50.0		46.5	"	80-120	93.0			
Nickel	"	50.0		49.2	"	80-120	98.4			
Selenium	"	50.0		49.2	"	80-120	98.4			
Silver	"	25.0		26.4	"	80-120	106			
Thallium	"	50.0		43.4	"	80-120	86.8			
Vanadium	"	50.0		51.2	"	80-120	102			
Zinc	"	50.0		49.4	"	80-120	98.8			
Matrix Spike	**10K2936-MS1**		**V011230-01**							
Antimony	12/5/00	50.0	ND	27.4	mg/kg	75-125	**54.8**			M
Arsenic	"	50.0	2.8	52.5	"	75-125	**99.4**			
Barium	"	50.0	72	150	"	75-125	**156**			M
Beryllium	"	50.0	ND	50.7	"	75-125	**101**			
Cadmium	"	50.0	1.8	50.5	"	75-125	**97.4**			
Chromium	"	50.0	7.4	60.8	"	75-125	**107**			
Cobalt	"	50.0	4.9	55.3	"	75-125	**101**			
Copper	"	50.0	7.7	65.5	"	75-125	**116**			
Lead	"	50.0	4.5	52.4	"	75-125	**95.8**			
Molybdenum	"	50.0	ND	43.7	"	75-125	**87.4**			
Nickel	"	50.0	8.6	55.6	"	75-125	**94.0**			
Selenium	"	50.0	ND	48.3	"	75-125	**95.1**			
Silver	"	25.0	ND	25.4	"	75-125	**102**			
Thallium	"	50.0	ND	41.9	"	75-125	**83.8**			
Vanadium	"	50.0	16	78.6	"	75-125	**125**			
Zinc	"	50.0	100	152	"	75-125	**104**			
Matrix Spike Dup	**10K2936-MSD1**		**V011230-01**							
Antimony	12/5/00	50.0	ND	26.0	mg/kg	75-125	**52.0**	20	**5.24**	M
Arsenic	"	50.0	2.8	49.9	"	75-125	**94.2**	20	**5.08**	
Barium	"	50.0	72	122	"	75-125	**100**	20	**20.6**	R3
Beryllium	"	50.0	ND	50.3	"	75-125	**99.7**	20	**0.792**	
Cadmium	"	50.0	1.8	50.2	"	75-125	**96.8**	20	**0.596**	
Chromium	"	50.0	7.4	59.6	"	75-125	**104**	20	**1.99**	
Cobalt	"	50.0	4.9	56.3	"	75-125	**103**	20	**1.79**	
Copper	"	50.0	7.7	61.3	"	75-125	**107**	20	**6.62**	

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Austin, TX 78758	Project Manager: Jeff Scheerhorn	Reported: 12/14/00 10:57

METALS/Quality Control
Del Mar Analytical, Irvine

Analyte	Date Analyzed	Spike Level	Sample Result	QC Result	Units	Reporting Limit / Recov. Limits	Recov. %	RPD Limit	RPD %	Notes*
Matrix Spike Dup (continued)	**10K2936-MSD1**	**V011230-01**								
Lead	12/5/00	50.0	4.5	52.9	mg/kg	75-125	96.8	20	0.950	
Molybdenum	"	50.0	ND	43.3	"	75-125	86.6	20	0.920	
Nickel	"	50.0	8.6	56.4	"	75-125	95.6	20	1.43	
Selenium	"	50.0	ND	46.5	"	75-125	91.5	20	3.80	
Silver	"	25.0	ND	24.9	"	75-125	99.6	20	1.99	
Thallium	"	50.0	ND	42.6	"	75-125	85.2	20	1.66	
Vanadium	"	50.0	16	76.5	"	75-125	121	20	2.71	
Zinc	"	50.0	100	158	"	75-125	116	20	3.87	
Batch: 10K3030	**Date Prepared: 11/30/00**					**Extraction Method: EPA 7470A Hg**				
Blank	**10K3030-BLK1**									
Mercury	11/30/00			ND	mg/l	0.00020				
LCS	**10K3030-BS1**									
Mercury	11/30/00	0.00800		0.00848	mg/l	90-115	106			
Matrix Spike	**10K3030-MS1**	**V011230-13**								
Mercury	11/30/00	0.00800	ND	0.00852	mg/l	75-120	106			
Matrix Spike Dup	**10K3030-MSD1**	**V011230-13**								
Mercury	11/30/00	0.00800	ND	0.00852	mg/l	75-120	106	20	0	
Batch: 10K3043	**Date Prepared: 11/30/00**					**Extraction Method: EPA 3005A**				
Blank	**10K3043-BLK1**									
Antimony	12/1/00			ND	mg/l	0.010				
Arsenic	"			ND	"	0.0050				
Barium	"			ND	"	0.010				
Beryllium	"			ND	"	0.0040				
Cadmium	"			ND	"	0.0050				
Chromium	"			ND	"	0.0050				
Cobalt	"			ND	"	0.010				
Copper	"			ND	"	0.010				
Lead	"			ND	"	0.0050				
Molybdenum	"			ND	"	0.020				
Nickel	"			ND	"	0.010				
Selenium	"			ND	"	0.0050				
Silver	"			ND	"	0.010				
Thallium	"			ND	"	0.0050				

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9111 Research Blvd.	Project Number: none	Received: 11/27/00
Austin, TX 78758	Project Manager: Jeff Scheerhorn	Reported: 12/14/00 10:57

METALS/Quality Control
Del Mar Analytical, Irvine

Analyte	Date Analyzed	Spike Level	Sample Result	QC Result	Units	Reporting Limit / Recov. Limits	Recov. %	RPD Limit	RPD %	Notes*
Blank (continued)	I0K3043-BLK1									
Vanadium	12/1/00			**ND**	mg/l	**0.010**				
Zinc	"			**ND**	"	**0.020**				
LCS	I0K3043-BS1									
Antimony	12/1/00	1.00		0.992	mg/l	80-120	99.2			
Arsenic	"	1.00		0.953	"	80-120	95.3			
Barium	"	1.00		0.911	"	80-120	91.1			
Beryllium	"	1.00		0.966	"	80-120	96.6			
Cadmium	"	1.00		0.936	"	80-120	93.6			
Chromium	"	1.00		0.932	"	80-120	93.2			
Cobalt	"	1.00		0.935	"	80-120	93.5			
Copper	"	1.00		0.961	"	80-120	96.1			
Lead	"	1.00		0.923	"	80-120	92.3			
Molybdenum	"	1.00		0.878	"	80-120	87.8			
Nickel	"	1.00		0.935	"	80-120	93.5			
Selenium	"	1.00		0.944	"	80-120	94.4			
Silver	"	0.500		0.500	"	80-120	100			
Thallium	"	1.00		0.877	"	80-120	87.7			
Vanadium	"	1.00		0.984	"	80-120	98.4			
Zinc	"	1.00		0.922	"	80-120	92.2			
Matrix Spike	I0K3043-MS1		IJK0684-01							
Antimony	12/1/00	1.00	ND	0.996	mg/l	75-125	99.2			
Arsenic	"	1.00	ND	0.956	"	75-125	95.6			
Barium	"	1.00	0.031	0.964	"	75-125	93.3			
Beryllium	"	1.00	ND	0.972	"	75-125	97.2			
Cadmium	"	1.00	ND	0.940	"	75-125	94.0			
Chromium	"	1.00	0.0086	0.965	"	75-125	95.6			
Cobalt	"	1.00	ND	0.943	"	75-125	93.9			
Copper	"	1.00	ND	0.981	"	75-125	97.5			
Lead	"	1.00	ND	0.928	"	75-125	92.4			
Molybdenum	"	1.00	ND	0.883	"	75-125	88.3			
Nickel	"	1.00	0.025	0.979	"	75-125	95.4			
Selenium	"	1.00	ND	0.944	"	75-125	94.4			
Silver	"	0.500	ND	0.502	"	75-125	100			
Thallium	"	1.00	ND	0.879	"	75-125	87.9			
Vanadium	"	1.00	ND	1.01	"	75-125	101			
Zinc	"	1.00	ND	0.945	"	75-125	93.3			

STAR ANALYTICAL

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QUALITY ETHICS SERVICE
RCL Environmental Sciences

Duke Engineering & Svcs - Austin	Project: LNG Facility	Sampled: 11/16/00 to 11/22/00
9111 Research Blvd.	Project Number: none	Received: 11/27/00
Austin, TX 78758	Project Manager: Jeff Scheerhorn	Reported: 12/14/00 10:57

METALS/Quality Control
Del Mar Analytical, Irvine

Analyte	Date Analyzed	Spike Level	Sample Result	QC Result	Units	Reporting Limit / Recov. Limits	Recov. %	RPD Limit	RPD %	Notes*
Matrix Spike Dup	10K3043-MSD1		IJK0684-01							
Antimony	12/1/00	1.00	ND	1.00	mg/l	75-125	99.6	20	0.401	
Arsenic	"	1.00	ND	0.977	"	75-125	97.7	20	2.17	
Barium	"	1.00	0.031	0.948	"	75-125	91.7	20	1.67	
Beryllium	"	1.00	ND	0.980	"	75-125	98.0	20	0.820	
Cadmium	"	1.00	ND	0.951	"	75-125	95.1	20	1.16	
Chromium	"	1.00	0.0086	0.974	"	75-125	96.5	20	0.928	
Cobalt	"	1.00	ND	0.953	"	75-125	94.9	20	1.05	
Copper	"	1.00	ND	0.987	"	75-125	98.1	20	0.610	
Lead	"	1.00	ND	0.938	"	75-125	93.4	20	1.07	
Molybdenum	"	1.00	ND	0.893	"	75-125	89.3	20	1.13	
Nickel	"	1.00	0.025	0.989	"	75-125	96.4	20	1.02	
Selenium	"	1.00	ND	0.961	"	75-125	96.1	20	1.78	
Silver	"	0.500	ND	0.496	"	75-125	99.2	20	1.20	
Thallium	"	1.00	ND	0.893	"	75-125	89.3	20	1.58	
Vanadium	"	1.00	ND	1.01	"	75-125	101	20	0	
Zinc	"	1.00	ND	0.956	"	75-125	94.4	20	1.16	
Batch: 10K3047	Date Prepared: 11/30/00					Extraction Method: EPA 7471A Hg				
Blank	10K3047-BLK1									
Mercury	11/30/00			ND	mg/kg	0.020				
LCS	10K3047-BS1									
Mercury	11/30/00	0.800		0.797	mg/kg	85-120	99.6			
Matrix Spike	10K3047-MS1		V011230-71							
Mercury	11/30/00	0.800	ND	0.785	mg/kg	65-135	98.1			
Matrix Spike Dup	10K3047-MSD1		V011230-71							
Mercury	11/30/00	0.800	ND	0.851	mg/kg	65-135	106	20	8.07	

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Duke Engineering & Svcs - Austin	Project:	LNG Facility	Sampled: 11/16/00 to 11/22/00
9111 Research Blvd.	Project Number:	none	Received: 11/27/00
Austin, TX 78758	Project Manager:	Jeff Scheerhorn	Reported: 12/14/00 10:57

Notes and Definitions

#	Note
A-03	The RPD value for this QC sample is above the established control limit. Review of associated QC indicates the high RPD does not represent an out of control condition for the batch.
A-04	The spike recovery for this QC sample is outside of established control limits. Review of associated QC indicates the recovery for this analyte does not represent an out of control condition for the batch.
D-22	Chromatogram Pattern: C10 to C22, hydrocarbon pattern..
D-22a	Chromatogram Pattern: C10 to C22, hydrocarbon pattern..
D-22b	Chromatogram Pattern: C10 to C24, hydrocarbon pattern..
D-22c	Chromatogram Pattern: C10 to C28+, non-diesel pattern, late elevated baseline..
D-22d	Chromatogram Pattern: C10 to C28+, non-diesel pattern..
D-22e	Chromatogram Pattern: C12 to C24, hydocarbon pattern..
D-22f	Chromatogram Pattern: C12 to C24, hydrocarbon pattern..
D-22g	Chromatogram Pattern: C12 to C28+, hydrocarbon pattern..
D-22h	Chromatogram Pattern: C12 to C28+, multiple hydrocarbon patterns..
D-22i	Chromatogram Pattern: C12 to C28+, non-diesel pattern, late elevated baseline..
D-22j	Chromatogram Pattern: C12 to C28+, non-diesel pattern..
D-22k	Chromatogram Pattern: C14 to C28+, late elevated baseline..
D-22l	Chromatogram Pattern: C14 to C28+, non-diesel pattern, late elevated baseline..
D-22m	Chromatogram Pattern: C14 to C28+, non-diesel pattern..
H-02	This sample was analyzed outside of EPA recommended hold time.
O-08	The original extraction of this sample yielded QC recoveries outside acceptance criteria. It was re-extracted after the recommended maximum hold time.

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Duke Engineering & Svcs - Austin	Project:	LNG Facility	Sampled: 11/16/00 to 11/22/00
9111 Research Blvd.	Project Number:	none	Received: 11/27/00
Austin, TX 78758	Project Manager:	Jeff Scheerhorn	Reported: 12/14/00 10:57

Notes and Definitions

#	Note
M	The MS and/or MSD were outside of the acceptance limits due to sample matrix interference. See Blank Spike (LCS).
M-01	Spike recovery outside control limits due to sample matrix interference.
O-02	Surrogate recovery outside control limits due to interference from coeluting compounds within the sample matrix.
O-03	The surrogate recovery for this sample is not available due to sample dilution required from high analyte concentration and/or matrix interferences.
O-07	Severe matrix interference. Results were obtained from the most concentrated dilution which yielded acceptable internal standard responses.
Q-17	Surrogate recovery outside control limits due to matrix interference requiring dilution of sample.
R-07	The reporting limit for this analyte has been raised to account for extract appearance.
R3	The RPD exceeded the method control limit due to sample matrix effects.
S-04	The surrogate recovery for this sample is outside of established control limits due to a sample matrix effect.
V-2	Possible laboratory contamination.
DET	Analyte DETECTED
ND	Analyte NOT DETECTED at or above the reporting limit
NR	Not Reported
dry	Sample results reported on a dry weight basis
Recov.	Recovery
RPD	Relative Percent Difference

STAR ANALYTICAL
CHAIN-OF-CUSTODY FORM

14500 Trinity Boulevard, Suite 106
Fort Worth, Texas 76155
(817) 571-6800 • Metro (817) 540-6982 • FAX (817) 267-5431

Company Name: DE+S	Project Name: LNG Facility
Address: 9111 Research Blvd.	Billing Address (if different):
City: Austin State: TX Zip Code: 78758	
Telephone: 512 425 2000 FAX #: 512 425 2099	P.O. #:
Report To: Jeff Schoerhorn Sampler: JDS/KJS	2 Coolers & Samples

Turnaround Time: (Default - 10 Working Days If None Specified)
- ☒ 10 Working Days
- ☐ 7 Working Days
- ☐ 5 Working Days
- ☐ 4 Working Days
- ☐ 3 Working Days
- ☐ 2 Working Days
- ☐ 24 Hours
- ☐ 2 - 8 Hours

Analyses Requested

Client Sample I.D.	Date/Time Sampled	Matrix Desc.	# of Cont.	Cont. Type	Star's Sample #	TPH (DRO)	Title 22 Metals	VOC						Comments
1. SB023	11/16 1030	Soil	1	4oz Jar	Vol230-01	X	X							
2. SB024	1045				02	X								
3. SB025	1100				03	X		X						
4. SB026	1115				04	X								
5. SB027	1125				05	X								
6. SB028	1135				06	X								
7. SB029	1140				07	X								
8. SB030	1150				08	X								
9. SB031	1200				09	X	X							
10. SB032	1215				10	X	X							

Relinquished By: Ken Simpson	Date: 11/22/00	Time: 1200	Received By:	Date:	Time:
Relinquished By:	Date:	Time:	Received By:	Date:	Time:
Relinquished By:	Date:	Time:	Received By:	Date: 11/27/00	Time: 0945

Samples Received in Good Condition? ☑ Yes ☐ No

Samples Cold? ☐ Yes ☑ No

Method of Shipment: Fed-ex

Pink - Client
Yellow - Star
White - Star

STAR ANALYTICAL
CHAIN-OF-CUSTODY FORM

14500 Trinity Boulevard, Suite 106
Fort Worth, Texas 76155
(817) 571-6800 • Metro (817) 540-6982 • FAX (817) 267-5431

Company Name: DE&S	Project Name: LNG Facility / N. Tank Farm
Address: 9111 Research Blvd.	Billing Address (if different):
City: Austin State: TX Zip Code: 78758	
Telephone: 512 4252000 FAX #: 4252099	P.O. #:
Report To: Jeff Scheerhorn Sampler: JDS/KJS	2 Coolers c̄ Samples

Turnaround Time: (Default - 10 Working Days If None Specified)
- ☒ 10 Working Days
- ☐ 7 Working Days
- ☐ 5 Working Days
- ☐ 4 Working Days
- ☐ 3 Working Days
- ☐ 2 Working Days
- ☐ 24 Hours
- ☐ 2 - 8 Hours

Analyses Requested

Client Sample I.D.	Date/Time Sampled	Matrix Desc.	# of Cont.	Cont. Type	Star's Sample #	TPH	PCBs	Title 22 Metals	SVOC	VOC				Comments
1. SB033	11/16 1220	Soil		4oz Jar	V011230-11	X		X						
2. GW015	" 1520	H_2O	3	2-40ml 1-500ml	12			X		X				
3. GW016	11/20 1420	"	1	1-500ml	13			X						
4. TAS001	11/20 1510	Soil	2	4oz Jar	14	X	X							
5. TAS002	1610		~~X~~ 1		15	X	X							
6. TAS003	1625		~~2~~ 2		16	X	X							
7. TAS004	1635				17	X	X							
8. TAS005	1640				18	X	X							
9. TAS006	1650				19			X	X					
10. TD001	1700				20	X	X	X	X					

Relinquished By: Ken Simpson	Date: 11/22/00	Time: 1200	Received By:	Date:	Time:
Relinquished By:	Date:	~~Time:~~	Received By:	Date:	Time:
Relinquished By:	Date:	Time:	Received By: S [signature]	Date: 11/27/00	Time: 0945

Samples Received in Good Condition? ☒ Yes ☐ No Samples Cold? ☐ Yes ☒ No Method of Shipment Fed-ex

Pink - Client
Yellow - Star
White - Star

STAR ANALYTICAL
CHAIN-OF-CUSTODY FORM

14500 Trinity Boulevard, Suite 106
Fort Worth, Texas 76155
(817) 571-6800 • Metro (817) 540-6982 • FAX (817) 267-5431

Company Name: DETS	Project Name: N. Tank Farm
Address: 9111 Research Blvd.	Billing Address (if different):
City: Austin State: TX Zip Code: 78758	
Telephone: 512 425 2000 FAX #: 425 2099	P.O. #:
Report To: Jeff Scheerhorn Sampler: JOS/KJS	

Turnaround Time: (Default - 10 Working Days If None Specified)
- ☒ 10 Working Days
- ☐ 7 Working Days
- ☐ 5 Working Days
- ☐ 4 Working Days
- ☐ 3 Working Days
- ☐ 2 Working Days
- ☐ 24 Hours
- ☐ 2 - 8 Hours

Analyses Requested

Client Sample I.D.	Date/Time Sampled	Matrix Desc.	# of Cont.	Cont. Type	Star's Sample #	TPH DRO	SVOC	Title 22 Metals	PCB	Comments
1. TGSO17	11/21 1615	Soil	1	4oz Jar	104730-71		X	X	X	
2. TGSO18	1620		1		72		X	X	X	
3. TASO19	11/20 1610		1		73	X			X	
4. TMSO19	11/21 1140		1		74	X			X	
5. TGSO19	1555		1		75	X			X	
6. GWO17	11/22 1130	H_2O	1	1L amber	76	X				
7. GWO18	1135		1		77	X				
8. GWO19	1140		1		78	X				
9.										
10.										

Relinquished By: Thom Simpson	Date: 11/22/00	Time: 1200	Received By:	Date: Time:
Relinquished By:	Date:	Time:	Received By:	Date: Time:
Relinquished By:	Date:	Time:	Received By:	Date: 11/27/00 Time: 0945

Samples Received in Good Condition? ☒ Yes ☐ No Samples Cold? ☐ Yes ☒ No Method of Shipment Fed-ex

Pink - Client
Yellow - Star
White - Star