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PRELIMINARY ASSESSMENT/SITE INSPECTION AND CONFIRMATORY SAMPLING REPORT FOR SITE 55 FIBER OPTIC VAULT AREA DRAFT ACTING AS FINAL MCRD PARRIS ISLAND SC

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TETRA TECH NUS

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Preliminary Assessment/Site Inspection and Confirmatory Sampling Report for Site/SWMU 55 Fiber Optic Vault

Marine Corps Recruit Depot

Parris Island, South Carolina

U.S. EPA Identification Number SC6170022762

Southern Division
Naval Facilities Engineering Command

Contract Number N62467-94-D-0888

Contract Task Order 0236

November 2003

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PRELIMINARY ASSESSMENT/SITE INSPECTION AND CONFIRMATORY SAMPLING REPORT for SITE/SWMU 55 FIBER OPTIC VAULT

MARINE CORPS RECRUIT DEPOT
PARRIS ISLAND, SOUTH CAROLINA

COMPREHENSIVE LONG-TERM
ENVIRONMENTAL ACTION NAVY (CLEAN) CONTRACT

Submitted to:
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Naval Facilities Engineering Command
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CERTIFICATION PAGE

REGISTERED SOUTH CAROLINA PROFESSIONAL GEOLOGIST CERTIFICATION

By affixing my seal to this report, I certify that the geologic data and interpretations stated in this *Preliminary Assessment/Site Inspection and Confirmatory Sampling Report for Site/SWMU 55, Fiber Optic Vault* at the Marine Corp Recruit Depot, Parris Island, South Carolina, are true and accurate to the best of my knowledge. I further certify that I am registered to practice geology in the State of South Carolina and that it is within my professional expertise to verify the correctness of this information.

_____ _____

Keith W. Henn, P.G. Date

Registration Number 2242

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ACRONYMS

ATSDR	Agency for Toxic Substances and Disease Registry
B&R Environmental	Brown & Root Environmental
bgs	Below Ground Surface
BTEX	Benzene, Toluene, Ethylbenzene, and Xylenes
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CLEAN	Comprehensive Long-Term Environmental Action Navy
CS	Confirmatory Sampling
CTO	Contract Task Order
DPT	Direct-Push Technology
EC	Electrical Conductivity
ECD	Electron Capture Detector
ESV	Ecological Screening Value
FID	Flame Ionization Detector
HRS	Hazard Rank System
IAS	Initial Assessment Study
ILCR	Incremental Lifetime Cancer Risk
IR	Installation Restoration
MCL	Maximum contaminant level
MCRD	Marine Corps Recruit Depot
mg/kg	Milligrams per Kilogram
MIP	Membrane Interface Probe
msl	Mean Sea Level
MTBE	Methyl Tertiary-Butyl Ether
Navy	United States Navy
NAVFAC	Naval Facilities Engineering Command
NEESA	Naval Energy and Environmental Support Activity
NTU	Nepholometric Turbidity Unit
ORP	Oxidation Reduction Potential
PA	Preliminary Assessment
PAH	Polynuclear Aromatic Hydrocarbon
PCB	Polychlorinated Biphenyl
PID	Photo Ionization Detector
PRG	Preliminary Remediation Goal
PVC	Polyvinyl Chloride
RCRA	Resource Conservation and Recovery Act

SARA	Superfund Amendments and Reauthorization Act
SCDHEC	South Carolina Department of Health and Environmental Control
SI	Site Inspection
SOUTHDIV	Southern Division
SVOC	Semivolatile Organic Compound
SWMU	Solid Waste Management Unit
TCL	Target Compound List
TtNUS	Tetra Tech NUS, Inc.
µg/L	Microgram Per Liter
U.S. EPA	United States Environmental Protection Agency
UST	Underground Storage Tank
VOC	Volatile Organic Compound

1.0 INTRODUCTION

Tetra Tech NUS, Inc. (TtNUS) has prepared this preliminary assessment (PA)/site inspection (SI) and confirmatory sampling (CS) report summarizing record search and field activities conducted at Site/Solid Waste Management Unit (SWMU) 55 – Fiber Optic Vault, located at the Marine Corps Recruit Depot (MCRD) Parris Island, South Carolina. This report was prepared for the United States Navy (Navy) Southern Division (SOUTHDIV) Naval Facilities Engineering Command (NAVFAC) under Contract Task Order (CTO) 0236, for the Comprehensive Long-Term Environmental Action Navy (CLEAN) III Contract Number N62467-94-D-0888.

1.1 REGULATORY SETTING

The Comprehensive Environmental Response, Compensation, and Liability Act of 1980 (CERCLA) and Superfund Amendments and Reauthorization Act of 1986 (SARA) established a program for the cleanup of hazardous waste disposal and spill sites nationwide. This program contains provisions for the cleanup of contamination from past hazardous waste operations and past hazardous material spills and is the framework for Installation Restoration (IR) programs at Navy and Marine Corps installations. The Resource Conservation and Recovery Act (RCRA), as amended, also establishes a cleanup program that provides for current and future hazardous waste management practices, as well as cleanup of past disposal sites at permitted or interim status Navy/Marine Corps installations. NAVFAC is responsible for implementing the IR Program at MCRD Parris Island.

Because of the past activities conducted at the MCRD Parris Island, South Carolina, the MCRD meets criteria for conducting IR activities under the CERCLA regulatory framework. The MCRD also meets the criteria for conducting IR activities under the authority of RCRA because, in the late 1980s, the MCRD submitted a RCRA Part A application. In accordance with RCRA, this action required the MCRD to conduct corrective action for the release of hazardous waste or hazardous constituents from SWMUs. In the early 1990s, the MCRD withdrew its Part A application.

Because of the circumstances surrounding the IR program history at MCRD, discussions have been held among representatives from the Marine Corps, Navy, South Carolina Department of Health and Environmental Control (SCDHEC), and United States Environmental Protection Agency (U.S. EPA) Region 4 to determine the appropriate regulatory framework for conducting IR activities at the MCRD. From these discussions, it has been decided that this report will encompass both CERCLA and RCRA requirements. For ease of reading and clarity, Site/SWMU 55 will be referred to as Site 55 for the remainder of this report.

1.2 SCOPE/OVERVIEW

This report addresses contamination identified during the installation of the fiber optic vault located in the northwestern portion of MCRD Parris Island. The Superfund site identification number for MCRD Parris Island is 0403488. The U.S. EPA identification number is SC6170022762.

Potential contamination was identified at the Fiber Optic Vault in the fall of 2001. Subsequent field investigation activities were conducted in July and December 2002 and July 2003 to further investigate the nature and extent of the contamination. Field activities included a soil and groundwater field screening followed by a groundwater investigation. A summary of the field activities conducted is provided in Section 3.0.

The software package Quickscore was used to assign a score to Site 55 using the U.S. EPA's Hazard Rank System (HRS). Site 55's HRS score resulted in a 50 indicating that a PA/SI is required at this site. A printout of the HRS score sheet is provided in Appendix F.

Analytical results are presented in Appendix A. This appendix contains all analytical results, including positive detections and detection limits for non-detected parameters. Data collected during the July 2003 investigation were entered into a database and full data validation was conducted. Data validation summaries are included in Appendix B.

1.3 FACILITY BACKGROUND

MCRD Parris Island is located along the southern coast of South Carolina, approximately 1 mile south of the city of Port Royal and 3 miles south of the city of Beaufort within Beaufort County. MCRD Parris Island covers approximately 8,047 acres that consist of dry land, salt marshes, saltwater creeks, and ponds, as shown in Figure 1-1. MCRD Parris Island is the reception and recruit training facility for the Marine Corps for enlisted men from states east of the Mississippi River and for enlisted women nationwide. Site 55 is located in the located in the northwestern portion of MCRD Parris Island, as shown on Figure 1-1.

The Depot trains and graduates 17,000 recruits per year with an average daily recruit population of 4,000. Recruits undergo a 12-week training program. The Depot is operated and maintained by a permanent staff of over 2,500 Marines, sailors, and civilians. There are 231 housing units and 125 mobile home spaces for active-duty Marines and sailors at the Depot (MCRD Parris Island, 2000). The populations of Port Royal and the city of Beaufort are estimated to be 3,314 and 9,956 persons, respectively (U.S. Census, 1998).

1.4 REPORT ORGANIZATION

This report is divided into three sections. Section 1.0, the Introduction, presents the regulatory setting at MCRD Parris Island, a scope and overview of the report, the facility background information, and the report organization. Section 2.0, Environmental Setting, briefly describes the climate, topography, surface water drainage, soils, geology, hydrogeology, and ecology at MCRD Parris Island. Sections 3.0 provides a site description, a description of investigation activities, the site-specific geology and hydrogeology, the site-specific ecological setting, the investigation analytical results, and conclusions and recommendations. Appendix A presents analytical data, Appendix B presents data validation information, Appendix C presents site photographs, and Appendix D presents field forms, including chain-of-custody records, sample log sheets, and well permits. Appendix E presents the results of the soil and groundwater screening conducted in July 2002. Appendix F contains the HRS scoring sheets.

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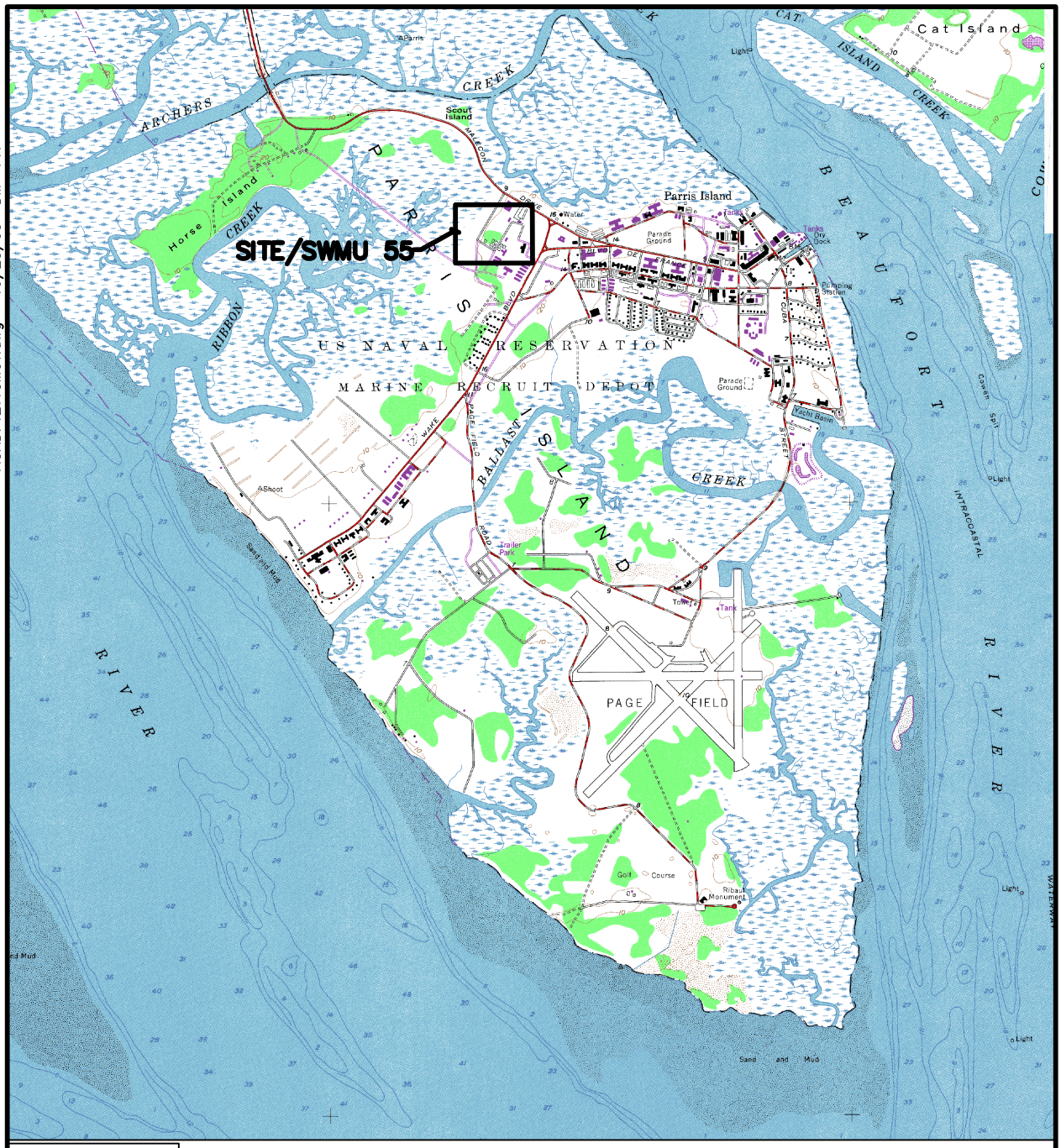

QUADRANGLE LOCATION

0 4000 8000

SCALE IN FEET

SOURCE: USGS QUADRANGLE MAP PARRIS ISLAND, S.C. 1979

DRAWN BY DATE DM 10/23/03			CONTRACT NO. 4211
CHECKED BY DATE		DEPOT/SITE LOCATION MAP MCRD PARRIS ISLAND PARRIS ISLAND, SOUTH CAROLINA	APPROVED BY DATE
COST/SCHED-AREA			APPROVED BY DATE
SCALE AS NOTED			DRAWING NO. FIGURE 1-1 / REV. 0

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2.0 ENVIRONMENTAL SETTING

This section briefly describes the environmental setting at MCRD Parris Island. A more comprehensive description is located in the MCRD Parris Island Master Work Plan [Brown and Root Environmental (B&R Environmental), 1998] and the Initial Assessment Study (IAS) conducted for MCRD Parris Island (NEESA, 1986).

2.1 CLIMATE

MCRD Parris Island is located in the southernmost region of South Carolina, where the climate is milder than elsewhere in the state. This low-lying coastal area has numerous islands, inlets, streams, and marshes and a temperature regime that clearly reflects the influences of its maritime and southerly location. The climate is subtropical, with long and hot summers followed by short and mild winters. Precipitation is abundant, averaging about 49 inches per year and remaining within the range of 40 to 58 inches during most years. Precipitation in the amount of 0.1 inch or more falls an average of about 77 days per year. The annual distribution shows a major monthly maximum of about 7 inches in July and a major monthly minimum of about 2 inches in November. The period from April through October, which includes the growing season for most crops in this area, receives an average of about 34 inches of rain, which is about 70 percent of the annual total.

2.2 TOPOGRAPHY

MCRD Parris Island lies in the Lower Coastal Plain Physiographic Province. Elevations range from sea level to 22 feet above mean sea level (msl). The Depot consists of Parris Island (the largest and most developed island), seven smaller named islands, many small unnamed islands, salt marshes, and related tidal creeks. Because of the low elevation, most of the Depot is located within the 100-year flood plain. The majority of the area of Parris Island north of Ballast Creek, the east-central area of Page Field, and the central part of Horse Island are the only surfaces above the 100-year flood plain (NEESA, 1986).

The Depot covers 8,047 acres: 1,502 acres are devoted to forest management; 744 acres are grass and facilities; 4,344 acres are saltwater marsh; and the remainder consists of creeks, ponds, and causeways. Dry land makes up 3,274 acres (NEESA, 1986).

2.3 SURFACE WATER DRAINAGE

Drainage off the land surface is to the nearest surface water body. Three generally east-west creeks drain much of the Depot. Archers Creek is at the northern boundary of the Depot and connects Battery Creek to the north with the Broad River to the west of Parris Island (see Figure 1-1). Ribbon and Edding

Creeks drain the area between Horse and Parris Islands and flow westward into the Broad River. Ballast Creek enters the Beaufort River and drains central Parris Island. Smaller unnamed creeks drain the areas west and east of Page Field.

The Beaufort and Broad Rivers meet at the southern end of Parris Island to form Port Royal Sound, which extends about 4 miles southeastward to the Atlantic Ocean.

2.4 SOILS

Soil at MCRD Parris Island have been mapped by the United States Soil Conservation Service as both individual soil types and groups of soil (units). The Depot has been mapped as having 15 individual soil types, but only eight types are present beneath the identified sites. Three soil units have been mapped for the Depot (Wando-Seabrook-Seewee, Coosaw-Williman-Ridgeland, Bohicket-Capers-Handsboro Soil Unit). A further discussion of the soil types and soil units identified at the MCRD can be found in the MCRD Parris Island Master Work Plan (B&R Environmental, 1998) and the IAS (NEESA, 1986).

2.5 GEOLOGY

Four geological units in the Beaufort-Jasper County Area are of local interest in terms of groundwater supply and environmental investigations. These units from the oldest (Eocene age) to the youngest (Pleistocene age) are the Santee Limestone, Cooper Marl, Hawthorn Formation, and Pleistocene sands and clays. A further discussion of the geology of the Beaufort-Jasper County area can be found in the MCRD Parris Island Master Work Plan (B&R Environmental, 1998) and the IAS (NEESA, 1986).

2.6 HYDROGEOLOGY

Two primary aquifers are present within the Beaufort-Jasper County Area: the surficial aquifer, comprising Pleistocene age sediments, and the Floridan Aquifer (Santee Limestone). These aquifers are generally separated by the Hawthorn Formation and Cooper Marl, which act as confining units to the underlying Floridan Aquifer.

In the MCRD Parris Island area, the shallow, unconfined aquifer generally consists of permeable, fine to medium, Pleistocene age sand. Groundwater recharge to the unconfined (water-table) aquifer is through precipitation infiltration. Surface relief is relatively low. The area is drained by fresh and brackish water streams inland and by tidal streams along the coast. The water table in the MCRD Parris Island area usually ranges from 0 to 10 feet below ground surface (bgs) and is most commonly found at a depth of 3 feet bgs. Water-table fluctuations are a function of recharge, evaporation, transpiration, and tidal influences and have been observed to be as great as 6.5 feet at some locations (Glowacz et al., 1980).

The direction of groundwater flow in the surficial aquifer is generally toward the nearest surface water body, such as a pond, river, tidal creek, or the ocean.

In the Beaufort-Jasper County Area, the Floridan Aquifer system occurs near the land surface and confining beds vary from essentially 0 to more than 150 feet in thickness. Groundwater in the aquifer occurs in solutionally enlarged openings or cavities in the limestone. In general, groundwater occurs in a series of broadly defined water-bearing (permeable) zones that serve as aquifers and are separated by less permeable bedrock. Two hydrogeologic zones within the Floridan Aquifer are present beneath the MCRD Parris Island area. These two hydrogeologic units include a 200-foot-thick upper hydrogeologic unit and an 800-foot-thick lower hydrogeologic unit. Within each hydrogeologic unit, there is a discrete zone of higher permeability bedrock separated by thick sequences of lower permeability bedrock. The lower hydrogeologic unit has a somewhat lower overall permeability compared to the upper unit.

Based upon previous investigations at MCRD Parris Island, the upper 20 feet of sediment consist of very fine, yellow-brown sand with traces of clay and silt and thin (approximately 6 inches thick), discontinuous layers of greenish-gray silty clay. This aquifer is separated from the underlying regional Tertiary Floridan aquifer by the Hawthorn Formation, a confining unit that extends beneath Parris Island. The surfical aquifer drains to on-site streams and tidal areas within the base. Therefore, contaminants within this unit would discharge to these site streams and tidal areas, which discharge to the Beaufort and Broad Rivers, which form Port Royal Sound.

A further discussion of the hydrogeological characteristics of the Beaufort-Jasper County area can be found in the MCRD Parris Island Master Work Plan (B&R Environmental, 1998) and the IAS (NEESA, 1986).

2.7 WATER USE

Within a 4-mile radius of Parris Island lies the southern portion of the city of Beaufort and the city of Port Royal. Also within this radius are the southern portion of St. Helena Island, Cane Island, Gibbes Island, Daws Island, and the southern tip of Port Royal Island. Potable water in the area is supplied by the Beaufort-Jasper Water and Sewer Authority. Saltwater has encroached into the area over time so that local wells installed in the various aquifers beneath the area are no longer used to supply domestic water. There are, however, wells in the area used by locals for the irrigation of gardens and lawns.

The rivers and waterways adjacent to Parris Island are tidally influenced and contain high saline content waters. Therefore, the rivers and streams are not used as a source of drinking water.

2.8 ECOLOGY

A general discussion of the ecoystems that are present and threatened and endangered plants and animals that occur or potentially occur on MCRD Parris Island can be found in the MCRD Parris Island Master Work Plan (B&R Environmental, 1998) or the IAS (NEESA, 1986). Site-specific ecological discussions can be found Section 3.5.

3.0 SITE 55 - FIBER OPTIC VAULT

3.1 SITE DESCRIPTION/HISTORY

Site 55, Fiber Optic Vault, is located in the northwestern portion of MCRD Parris Island, as shown on Figure 1-1. The vault is located approximately 20 feet east of Atsugi Street, 100 feet southwest of Building 401, and 140 feet northwest of Building 405 (Figure 3-1). The vault is comprised of pre-cast concrete with inner dimensions of 12 feet long, 6 feet wide, and 7 feet deep. The walls include blanked cutouts for fiber optic cables to enter the vault from the north, east, south, and west. The site is relatively flat with both grassy and paved areas present. Overhead power lines are present near the vault and an underground sewer line is located approximately 70 feet to the northeast. Site photographs are provided in Appendix C.

In September 2001 following installation of the vault, petroleum hydrocarbons and water were observed within the vault. A soil sample was collected and sent to General Engineering Laboratory in Charleston, South Carolina for analysis for lead, polychlorinated biphenyls (PCBs), and benzene, toluene, ethylbenzene, and xylene (BTEX). Analytical results for lead and PCBs were below detection limits. Benzene was detected at 19.7 mg/kg, ethylbenzene at 61 milligrams per kilogram (mg/kg), toluene at 51 mg/kg, and xylene at 2,790 mg/kg.

In late October 2001, approximately 0.5 inches of free product was observed in the vault floating on approximately 1 foot of water. Efforts were taken to remove the free product and stop the infiltration of groundwater into the vault by applying a sealing compound to the internal concrete surfaces. In the late fall of 2001, the free product and water in the vault were pumped out and the vault steam cleaned. During early 2002 the water table had fallen and the lower row of cutouts was capped to prevent additional accumulation of fluids. Water/free product was also removed from the vault by TtNUS in March 2003 and the internal concrete surface was resealed at this time.

Based on the presence of free product and the sampling analytical results, the SCDHEC requested that an assessment be performed. Results of the investigation (described in the following sections) indicated the presence of BTEX, naphthalene, and chlorobenzene in groundwater. The site was subsequently transferred by SCDHEC from the underground storage tank (UST) program to the Bureau of Land and Waste Management RCRA Program for oversight.

3.2 INVESTIGATION ACTIVITIES

TtNUS performed field activities at Site 55 in July and December 2002 and July 2003. In July 2002, a soil and groundwater field screening was performed where field personnel collected a total of 19 subsurface soil and 23 groundwater samples using a direct-push technology (DPT) rig equipped with a membrane interface probe (MIP). Samples were analyzed with a mobile laboratory. Both the MIP and DPT rig and mobile laboratory were operated by Columbia Technologies. Five temporary piezometers were also installed to determine free product thickness and water-level elevations.

Based on the July 2002 field screening, 21 monitoring well locations were proposed to and approved by SCDHEC and the monitoring wells were installed in December 2002. In July 2003, 12 of the 21 monitoring wells were developed and sampled. The following sections discuss the activities conducted during the field investigation at Site 55.

3.3.1 Subsurface Soil Sampling

Initial borings involved the use of a MIP with an Electrical Conductivity detector (MIP/EC), to indicate the presence of free product, to determine the extent of surface contamination, and to provide subsurface geologic information. Based on the initial MIP/EC profiling (presented in Appendix E), additional borings were drilled to collect soil and groundwater samples for screening by a mobile laboratory to quantify the extent of contamination in soil and groundwater. The sample locations are designated as FDP01 to FDP21 on Figure 3-1.

The MIP was used in conjunction with DPT drilling initially to collect real time continuous volatile organic compound (VOC) data in the vadose zone. The DPT adapted probe houses a membrane that heated the soil and water up to 250° F, volatilizing the contaminants. The volatiles were then analyzed using a flame ionization detector (FID), a photo ionization detector (PID), and electron capture detector (ECD) resulting in a continuous vertical profile for VOCs. In addition, the MIP recorded soil conductivity utilizing a dipole measurement arrangement at 1-foot intervals. In general, lower soil conductivities indicate sand while higher conductivities are indicative of finer-grained material (e.g., silts and clays). Fifteen DPT/MIP borings were drilled to depths ranging from approximately 14 to 20 feet below ground surface (bgs) to delineate the extent of the contaminated soil and groundwater and to provide lithologic information. Two borings were extended to approximately 41 feet bgs to provide lithologic information to help determine the design of vertical extent monitoring wells. Initial borings were installed at and near the Fiber Optic Vault where the product in groundwater was encountered during construction activities.

Nineteen subsurface soil samples were taken from soil borings drilled by DPT methods in July 2002. The locations of the soil (DPT) borings are shown on Figure 3-1 and a lithologic description of each soil boring

is provided in Appendix D. Based on the initial MIP/EC profiling, soil samples were collected at selected locations and depth intervals using DPT standard operating procedures. Selected samples were analyzed at the mobile laboratory for BTEX, methyl tertiary-butyl ether (MTBE), chlorobenzene, and naphthalene to help define the lateral and vertical extent of contamination. Soil samples were collected continuously from the ground surface to the water table for lithologic classification purposes. Soil samples were collected using a 4-foot sampler with plastic liners.

The subsurface soil samples consisted of generally a tan to brown moist silty fine sand. Soil samples were collected at depths ranging from 3 to 6 feet bgs from the DPT borings for chemical analysis. The soil samples were immediately placed in 2-oz glass jars with minimal headspace and transported to the mobile laboratory for analysis.

3.3.3 Monitoring Well Installation

In December, 2002, 21 monitoring wells (MW-01 to MW-21) were installed at the site by Miller Drilling. Monitoring well locations are shown in Figure 3-2. The wells were installed using hollow-stem auger and mud-rotary drilling. The wells consisted of 2-inch-diameter Schedule 40, flush-joint polyvinyl chloride (PVC) well screen and riser pipe. Screen slot size was 0.01 inch and was installed through the augers for the shallow and intermediate wells. Thirteen of the monitoring wells were completed as shallow wells to an approximate depth of 13-14 feet bgs. The shallow monitoring wells were completed using 10 feet of PVC well screen that “bracketed” the water table. Six monitoring wells were completed as intermediate (“I”) wells ranging in depth from approximately 21 to 27 feet bgs with screen lengths of 3 or 5 feet. Monitoring wells PAI-FOV-MW08D and PAI-FOV-MW13D were completed as deep monitoring wells to a depth of approximately 36 feet bgs with a screened interval of 3 feet. Monitoring well construction sheets are provided in Appendix D.

For deep monitoring wells PAI-FOV-MW08D and PAI-FOV-MW13D that passed through likely shallow contaminated zones, 6-inch diameter steel outer casings were installed to prevent cross contamination of the aquifer below. The outer casings were installed using hollow-stem augers to advance the boring to the confining layer at approximately 29 feet bgs. Upon completion of the boring the casing was set to the desired depth and the annular space tremie grouted from total depth to the surface. After allowing the grout to cure for a minimum of 24 hours, mud-rotary drilling was used to drill through the outer casing to complete the well to the total depth.

Twelve monitoring wells were developed by bailing and surging, or by pumping, as determined by the field geologist. Water quality parameters consisting of pH, specific conductance, temperature, and turbidity were collected during well development. Water quality stabilization was determined using the following criteria: temperature +/- 1.0°C (plus or minus one degree Celsius), pH +/- 0.1unit, and specific

conductivity +/- 10 percent, and turbidity remains within a 10 Nephelometric Turbidity Unit (NTU) range for two consecutive readings. Wells were developed until stability was approved by the field geologist.

3.3.4 Groundwater Sampling

Groundwater Field Screening

During the July 2002 field screening investigation, 23 groundwater samples were collected from 21 DPT borings and two piezometers for on-site analysis at the mobile laboratory. The samples were placed into 40 milliliter vials and immediately analyzed for BTEX, MTBE, chlorobenzene, and naphthalene. The groundwater samples from the shallow water table were taken at screened depths ranging from as shallow as 4 feet to 11 feet bgs. One sample from boring FDP20 was collected from 18 to 22 feet bgs to help determine the vertical extent of the groundwater plume adjacent to the fiber optic vault.

Groundwater Sampling

Groundwater was sampled using low-flow sampling techniques at 12 monitoring wells in July 2003. A peristaltic pump and teflon tubing were used to collect groundwater samples. Groundwater samples from 12 monitoring wells were collected after the required volume of water was purged and after water-quality parameters stabilized. The groundwater sample from each well, with the exception of TCL VOCs, was collected by reducing the flow to minimize volatilization of the sample and by filling the appropriate containers directly from the tubing. The samples were then placed on ice. The groundwater samples were analyzed for target compound list (TCL) VOCs, TCL semivolatile organic compounds (SVOCs), and pesticides/PCBs.

Water quality parameters consisting of pH, specific conductance, temperature, turbidity, dissolved oxygen, and oxidation reduction potential (ORP) were collected during purging of the wells. Table 3-1 summarizes these groundwater-quality parameters. Groundwater low-flow purge sheets and sample log sheets are included in Appendix D.

3.4 SITE-SPECIFIC GEOLOGY/HYDROGEOLOGY

The site includes paved and grassy areas. The paved area at the former parade deck consists of approximately 4 inches of asphalt and gravel. The area at the fiber optic vault is a grassy area that slopes to the northwest and to the southeast (Figure 3-1). The fiber optic vault is one of the highest topographic areas at MCRD Parris Island. The marsh adjacent to the Third Battalion Causeway pond is approximately 1,000 feet to the northwest of the fiber optic vault (see Figure 1-1). The site lies within the 100-year flood zone, as indicated in the Master Work Plan (B&R Environmental, 1998). Recharge to the groundwater in this area is primarily through precipitation.

Subsurface soil samples were collected from the DPT borings for lithologic classification. Based on the soil borings and MIP information the soil at the fiber optic vault consists of light brown to tan, fine to very fine sand to a depth of approximately 6 feet bgs. A greenish-gray silty clay was encountered at a depth of approximately 6 to 8 feet bgs. The uppermost clay varies in thickness but is present at most locations at Site 55. Below the uppermost clay is a tan to greenish-gray, fine sand with thin discontinuous layers of clay that extends to approximately 24 feet bgs where another greenish-gray clay approximately 2 feet thick was encountered. Below this clay layer is a medium gray, medium to fine sand that extends to approximately 29 feet bgs and is underlain another greenish-gray to blue gray clay approximately 1.5 feet thick at PAI-FOV-MW08D and almost 2 feet thick at PAI-FOV-MW13D. This clay is underlain a medium gray, fine sand with clayey intervals to approximately 36 feet bgs where another clay was encountered. A generalized view of the subsurface lithology is presented in Figure 3-3.

The aquifer of interest at Site 55 is the surficial aquifer which consists of medium to fine sand with interbeds of silty clay and clay. This aquifer was investigated to depths of approximately 42 feet. The investigation at Site 55 did not determine the depth to the bottom of the surficial aquifer; however, as discussed in the next paragraph, several clay-rich intervals at about 6 to 8 feet and at 30 feet depth were considered to be aquitards for the shallow groundwater at the site. Based on the regional hydrogeology, the bottom of the surficial aquifer is separated from the underlying regional Tertiary Floridan aquifer by the Hawthorn Formation, a confining unit that extends beneath MCRD Parris Island. Groundwater was first encountered during the investigation at approximately 5 to 6 bgs. Water levels were measured in the 13 shallow, 6 intermediate, and 2 deep monitoring wells at the site (see Table 3-2). These data were used to map the potentiometric surface at the site for the shallow wells (see Figure 3-4)[1]. Based on the potentiometric surface map, the shallow water table at the site appears to slope to the northwest and to the east, and mimics the local topographic high in the vicinity of the site. Although fewer data points are available for the intermediate wells, the groundwater flow at deeper intervals appears to follow the shallow groundwater flow pattern of divergent flow that is generally towards the west and east. Groundwater flow to the northwest appears to discharge at the Third Battalion Causeway Pond. Regardless of the direction of groundwater flow, contaminants migrating in the surficial aquifer are likely to discharge to streams and tidal areas surrounding MCRD, which ultimately discharge to the Beaufort and Broad Rivers which form Port Royal Sound.

The potentiometric data presented in Table 3-2 show that a downward hydraulic gradient exists between the shallow and intermediate/deep intervals as shown by wells within each cluster. Shallow water levels

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1 Vertical coordinate data used to derive the potentiometric surface map were not obtained by a licensed surveyor; consequently, a margin of error may exist.

at the two on-site well clusters (i.e., PAI-FOV-MW-6, PAI-FOV-7I, PAI-FOV-8D and PAI-FOV-MW-11, PAI-FOV-MW12I, PAI-FOV-MW13D) are 0.68 to 1.51 feet higher than the intermediate wells, and 6.63 to 7.16 feet higher than the deep wells at those locations. These water-level differences indicate that the clay-rich beds that lie between the screened intervals of these wells may act to retard vertical groundwater flow. Also, the same hydraulic potentials in concert with the topographic high may suggest that the Site 55 area is a regional recharge area and that the overall groundwater flow pattern at Site 55 may include a downward component of flow.

3.5 SITE-SPECIFIC ECOLOGICAL SETTING

The site is located within an industrialized area of the Depot and because of the industrial character of the area, there are no sensitive terrestrial environments or resources at or near the site. Terrestrial habitat on and near the site is limited to structures, roads, pavement/asphalt, gravel, and turf grass. Therefore, use of the site by ecological receptors is negligible. Ecological receptors that utilize the lawns surrounding the site are limited to a few species of invertebrates, lizards, and birds that are typically found in urban areas.

An active bald eagle nest is located approximately 1,000 feet southwest of the site, and the nearest wetland is located approximately 400 feet west of the site, at the marshy edge of a large impoundment known as third Battalion Pond. Additionally, a surface water body is approximately 700 feet north-northeast of the sites, where a tributary of Archer's Creek is located.

Endangered and threatened species in the vicinity of the site consist of three species that utilize the third Battalion Pond: the bald eagle (*Haliaeetus leucocephalus*), wood stork (*Mycteria americana*), and American alligator (*Alligator mississippiensis*).

3.6 ANALYTICAL RESULTS

The following sections present the analytical results from the July 2002 soil and groundwater field screening and the July 2003 groundwater investigation. Appendix A contains a summary of both detected and non-detected analytical data obtained during the field investigation.

3.6.1 <u>Soil and Groundwater Field Screening</u>

In July 2002, a soil and groundwater field screening was conducted at Site 55. Initial borings involved the use of a MIP/EC to determine the extent of free product and to provide subsurface geologic information. The initial MIP/EC profiling (presented in Appendix E) suggests the presence of petroleum fuels primarily between 7 to 10 feet bgs.

Next, DPT borings (FDP01 to FDP22) were advanced to depths from 8 to 12 feet bgs and used to obtain soil and groundwater samples for screening by a mobile laboratory. A summary of the groundwater data is shown as follows.

Groundwater Data from DPT borings – microgram per linter (µg/L)

	FDP1	FDP2	FDP3	FDP4	FDP5	FDP6	FDP7	FDP8	FDP9	FDP10	FDP11
MTBE	-	-	-	-	-	-	-	-	-	-	-
benzene	-	79	3	280	190	-	-	-	-	16	-
toluene	-	-	-	18	-	-	-	-	-	-	-
chlorobenzene	61	2500	-	3490	2830	-	590	-	-	250	24
ethylbenzene	-	96	-	190	80	-	3	-	-	14	-
m+p xylenes	-	35	-	290	20	-	-	-	-	5	-
o-xylenes	-	26	-	210	20	-	-	-	-	10	-
naphthalene	2	340	-	450	250	-	8	-	-	100	6

	FDP12	FDP14	FDP15	FDP16	FDP17	FDP18	FDP19	FDP20	FDP21	FDP22	PZ3	PZ4
MTBE	-	2	-	-	-	-	-	-	-	-	-	-
benzene	350	340	-	-	74	-	12	24	-	39	-	-
toluene	-	-	-	-	-	-	-	5	-	-	-	-
chlorobenzene	3400	960	39	-	1390	-	310	490	14	2310	23	56
ethylbenzene	560	65	-	-	-	-	-	16	-	-	-	-
m+p xylenes	1500	8	-	-	-	-	-	37	-	-	-	-
o-xylenes	830	20	-	-	-	-	-	26	-	-	-	-
naphthalene	3200	280	-	11	30	-	5	110	5	-	-	-

"-" indicates that the constituent was not detected.

As shown in the table, the results of the field screening indicate contamination of the shallow surficial aquifer. Of the more elevated DPT locations, FDP10, FDP12, FDP14, and FDP20 are located within the vicinity of the fiber optic vault (within the grassy area east of Atsugi Street). Additionally, free product was observed in boring FDP13 directly south of the vault and adjacent to boring FDP20. DPT borings FDP04, FDP05, and FDP07 are located on the opposite side of Atsugi Street to the west of the vault and FDP02, FDP17, and FDP19 are located southwest of the vault.

The presence of BTEX and naphthalene is likely related to a petroleum release. Chlorobenzene is a colorless, flammable liquid that was used in the past to make other chemicals, such as phenol and DDT. Now chlorobenzene is used as a solvent for some pesticide formulations, to degrease automobile parts, and as a chemical intermediate to make several other chemicals (ATSDR, 1999a). The presence of chlorobenzene could be related to the area's proximity to Building 401, the Depot's pesticide mixing building.

Soil analytical data obtained during the screening indicated minimal soil contamination within the DPT borings. Only naphthalene was detected in three borings (FDP-02, FDP-03, FDP-04 at concentrations of 18, 3, and 180 µg/kg, respectively).

3.6.2 July 2003 Groundwater Investigation

Based on the results of the July 2002 field screening, a supplemental groundwater investigation was conducted to isolate/confirm a source area, to characterize the intermediate and deep portions of the surficial aquifer, and to investigate the downgradient shallow surficial aquifer. Because of the limited surface soil detections observed during the field screening, a soil sampling program was not conducted during the July 2003 investigation.

Twenty-one permanent monitoring wells were installed at Site 55 in December 2002 and free product was encountered at shallow monitoring well MW-06. In July 2003, 12 of the wells were sampled (shallow monitoring wells MW-01, MW-10, MW-11, MW-17, MW-19, MW-20 and MW-21, intermediate wells MW-07, MW-12, and MW-18, and deep wells MW-08 and MW-13). The 12 monitoring wells were analyzed for TCL VOCs, SVOCs, pesticides, and PCBs. Unlike the 2002 field screening and during monitoring well installation, free product was not encountered during the July 2003 groundwater sampling event.

Table 3-3 summarizes positive detections of chemicals in the groundwater at Site 55 during the July 2003 sampling event. The table also provides a comparison of the detected concentrations to related human health screening criteria [U.S. EPA Region 9 tapwater preliminary risk goals (PRGs) and Federal maximum contaminant levels (MCLs)]. Tapwater PRGs consist of groundwater concentrations equal to the lower of the incremental lifetime cancer risk (ILCR) of 1.0E-06 or a HQ of 1.0 for noncarcinogenic risk under the potable water use scenario. Detected concentrations are also compared to U.S. EPA Region 4 surface water ecological screening levels (ESVs) (fresh water). This ecological screening assumes that ecological receptors are exposed to the groundwater concentration of the chemical upon its discharge to surface water. However, this screening is a conservative comparison because it assumes that no dispersion of the chemical occurs during discharge to surface water and the nearest surface water body is approximately 1,000 feet away.

VOCs

Eleven VOCs were detected in the groundwater samples. Chlorobenzene was the most widely detected VOC (detected in 10 of 12 samples) and ranged in concentration from 1.8 to 479 µg/L. The highest chlorobenzene detection was observed in shallow monitoring well MW-19 located approximately 350 feet northwest of the vault. The second highest detection (276 µg/L) was observed in intermediate monitoring well MW-12 approximately 120 feet west of the vault. Both concentrations exceeded human health

screening criteria (U.S. EPA Region IX tapwater PRGs and Federal MCLs) and U.S. EPA Region 4 surface water ESVs. The remaining eight chlorobenzene detections ranged from 1.8 to 11.4 µg/L and did not exceed screening criteria. Two of detections observed below screening criteria include the intermediate and deep monitoring wells located just south of the fiber optic vault. July 2003 chlorobenzene concentrations were significantly lower than those observed during the 2002 field screening.

1,4-dichlorobenze was also detected frequently in the groundwater (8 of 12 samples) and ranged in concentration from 0.41 to 28.6 µg/L. The highest 1,4-dichlorobenze detection was observed in shallow monitoring well MW-19, the same monitoring well as the highest chlorobenzene detection. Seven of the eight detections exceeded the U.S. EPA Region IX tapwater PRG while two detections exceeded the U.S. EPA surface water ESV. 1,4-Dichlorobenzene is a chemical used to control moths, molds, and mildew, and to deodorize restrooms and waste containers. It is also called para-DCB or p-DCB. Other names include Paramoth, Para crystals, and Paracide reflecting its widespread use to kill moths (ATSDR, 1999b). As with chlorobenzene, the presence of 1,4-dichlorobenze could be related to the sample locations' proximity to Building 401.

Nine other VOCs were less frequently detected in the groundwater. Benzene, ethlylbenzene, and total xylenes were detected in 4, 3, and 2 of the 12 samples, respectively and were observed at significantly lower concentrations than the 2002 field screening. In 2003, benzene (0.58 to 2.8 µg/L) exceeded its U.S. EPA Region IX tapwater PRG of 0.34 µg/L in all four detected locations. Ethylbenzene (0.22 to 3.2 µg/L) also exceeded its U.S. EPA Region IX tapwater of 2.9 at one location. Other detected VOCs (1,2,4-trichlorobenzene, 1,2-dichlorobenzene, 1,3-dichlorobenzene, acetone, isopropylbenzene, and MTBE) were less frequently observed in groundwater at concentrations less than screening levels. In general, most of the less frequently observed VOCs were detected in intermediate well MW-12 located 120 feet west of the vault and deep well MW-8 located adjacent to the vault.

SVOCs

Ten SVOCs were detected in the groundwater of Site 55. Polynuclear aromatic hydrocarbons (PAHs) consisting of 2-methylnaphthalene, fluoranthene, naphthalene, phenanthrene, and pyrene were detected infrequently and observed in either 1 or 2 of the 12 samples. Of the PAHs detected, only 2-methylnaphthalene was observed above a screening criterion (its U.S. EPA Region IX tapwater PRG of 6.2). Most PAHs detections were observed in intermediate well MW-07 located near the fiber optic vault. PAH detections could be associated with the road surface of nearby Atsugi Street. Automobile exhaust has been reported as a source of PAHs in roadways in several studies (Takada, et. al., 1991, Bradley, et. al., 1994, and Benfenati, et. al., 1992). The presence of PAHs could also be related to a past petroleum release.

Bis(2-ethylhexyl)phthalate (2.9 to 5.0 µg/L) was observed in 5 of the 12 groundwater samples. Only one detection, 5.0 µg/L at intermediate well MW-07, exceeded a screening criterion, the U.S. EPA Region IX tapwater PRG of 4.8 µg/L. However, phthalates are ubiquitous in the environment due to plastic wastes. Additionally, phthalates are also common laboratory contaminants (U.S. EPA, 1999).

The remaining SVOCs (1,1-biphenyl, 3&4-methylphenol, caprolactam, and dibenzofuran) were detected at levels less than screening criteria.

Pesticides

Seven pesticides were detected in the groundwater of Site 55. Pesticides were observed frequently in groundwater and were detected in all but one monitoring well (MW-12). 4,4'-DDT, alpha-BHC, and delta-BHC were the most frequently detected pesticides (detected in 10 or more of the samples). Most detections were observed at levels less than 1 µg/kg; however, samples from shallow wells MW-11 and MW-19, intermediate well MW-07, and deep well MW-08 have higher concentrations with respect to other wells. The presence of pesticides could be related to the sample locations' proximity to Building 401, the pesticide mixing building.

PCBs

PCBs were not detected in Site 55 groundwater. Based on these results, PCBs should not be included future sampling programs at Site 55.

3.7 CONCLUSIONS/FINDINGS

Groundwater contamination is present within the shallow surficial aquifer of Site 55. Chemicals of significance in groundwater detected with the on-site laboratory during the 2002 field screening include chlorobenzene, BTEX, and naphthalene. Fixed-based laboratory results obtained from the July 2003 groundwater investigation confirmed the presence of these chemicals in groundwater; however, they were observed at lower concentrations than those observed during the 2002 field screening. This observation correlates with the finding that free product was encountered during the initial field screening but not during the groundwater sampling event in July 2003. The 2003 investigation also identified the presence of 1,4-dichlorobenzene and seven pesticides in groundwater at concentrations that exceeded both human health (MCLs and tapwater PRGs) and ecological (surface water ESVs – freshwater) screening criteria.

The 2002 field screening indicated minimal contamination in the soil. BTEX, chlorobenzene, and naphthalene analysis performed with the on-site laboratory indicated only three detections of naphthalene in the DPT borings.

3.8 RECOMMENDATIONS

Based on the investigation findings, Site 55 should proceed to a focused remedial investigation to further characterize the nature and extent of contamination related to a potential petroleum and/or pesticide release and to quantify risks posed to human health and the environment. Investigation activities should include the following activities.

- Collect surface and subsurface soil samples and analyze at a fixed-base laboratory to determine/confirm the presence of petroleum-related constituents, chlorobenzene, dichlorobenzene isomers, and pesticides. Geotechnical analysis should also be performed on the subsurface soil samples to obtain data for possible modeling if the site were to proceed to a feasibility study.

- Collect a complete round of groundwater samples from the 21 permanent wells at Site 55 and analyze at a fixed-based laboratory. Also, obtain a round of groundwater-level measurements from the permanent monitoring wells.

- Obtain surveyed horizontal and vertical coordinates for the permanent monitoring wells and produce potentiometric surface maps based on the surveyed data for the July 2003 and proposed round of water-level measurement.

TABLE 3-1

GROUNDWATER QUALITY PARAMETERS (JULY 2003)
SITE 55 - FIBER OPTIC VAULT
MCRD PARRIS ISLAND, SOUTH CAROLINA

Sample ID	Well Depth	pH	Specific Conductance (mS/cm)	Temp. (°C)	Turbidity (NTU)	DO (mg/L)	ORP
PAI-FOV-GW-01-01	shallow	6.11	0.16	27.67	16.7	3.67	59
PAI-FOV-GW-07-01	intermediate	5.71	0.29	24.23	5.69	0.22	25
PAI-FOV-GW-08-01	deep	6.97	0.57	24.43	3.64	0.26	-90
PAI-FOV-GW-10-01	shallow	6.76	0.36	23.72	35.2	3.72	157
PAI-FOV-GW-11-01	shallow	5.89	0.10	27.03	134	3.94	93
PAI-FOV-GW-12-01	intermediate	5.84	0.16	24.37	28.7	3.42	68
PAI-FOV-GW-13-01	deep	6.39	0.55	24.83	3.25	1.92	-80
PAI-FOV-GW-17-01	shallow	5.76	0.28	32.19	15.0	5.96	221
PAI-FOV-GW-18-01	intermediate	5.65	0.79	26.33	1.9	4.52	62
PAI-FOV-GW-19-01	shallow	4.64	0.25	30.4	34.3	4.52	219
PAI-FOV-GW-20-01	shallow	4.33	0.47	23.15	6.5	2.23	297
PAI-FOV-GW-21-01	shallow	4.23	0.61	23.76	6.65	1.02	151

mg/L = milligrams per liter.
ORP = Oxygen Reduction Potential
mS/cm = milliSiemens per centimeter.

TABLE 3-2

GROUNDWATER ELEVATIONS
SITE 55 - FIBER OPTIC VAULT
MCRD PARRIS ISLAND
PARRIS ISLAND, SOUTH CAROLINA

Well No.	Total Depth of Well (ft)	Top of Casing Elevation[1] ft (MSL)	Date Measured	Depth to Free Product (BTOC)	Depth to Water, ft (BTOC)	Groundwater Elevation, ft (MSL)
PAIFOVMW01	12.10	15.02	12/20/2002	ND	6.26	8.76
PAIFOVMW02I	24.80	14.84	12/20/2002	ND	10.17	4.67
PAIFOVMW03	14.15	13.44	12/20/2002	ND	4.75	8.69
PAIFOVMW04	13.30	14.14	12/20/2002	ND	5.37	8.77
PAIFOVMW05I	23.55	14.07	12/20/2002	ND	5.82	8.25
PAIFOVMW06	14.00	18.10	12/20/2002	8.87	8.97	9.13
PAIFOVMW07	26.80	18.12	12/20/2002	ND	9.50	8.62
PAIFOVMW08D	36.00	18.16	12/20/2002	ND	10.38	7.78
PAIFOVMW09	14.00	15.24	12/20/2002	ND	6.22	9.02
PAIFOVMW10	12.00	15.60	12/20/2002	ND	7.06	8.54
PAIFOVMW11	14.10	18.12	12/20/2002	ND	9.10	9.02
PAIFOVMW12I	21.70	18.15	12/20/2002	ND	11.37	6.78
PAIFOVMW13D	35.80	18.06	12/20/2002	ND	9.25	8.81
PAIFOVMW14	13.20	17.16	12/20/2002	ND	8.18	8.98
PAIFOVMW15I	24.00	17.10	12/20/2002	ND	8.34	8.76
PAIFOVMW16	13.60	14.58	12/20/2002	ND	6.11	8.47
PAIFOVMW17	14.00	12.50	12/20/2002	ND	3.62	8.88
PAIFOVMW18I	24.50	12.44	12/20/2002	ND	6.60	5.84
PAIFOVMW19	12.00	11.59	12/20/2002	ND	2.98	8.61
PAIFOVMW20	14.10	9.98	12/20/2002	ND	3.79	6.19
PAIFOVMW21	12.40	10.44	12/20/2002	ND	4.33	6.11

Mean: 4.63

Notes:
MSL - Mean Sea Level
BTOC - Below Top of Casing
ft - feet
ND - Not Detected
NA - Not Available

1 - Data not obtained from a licensed surveyor; consequently, a margin of error may exist.

TABLE 3-3

GROUNDWATER ANALYTICAL RESULTS (POSITIVE DETECTIONS) - JULY 2003
SITE 55 - FIBER OPTIC VAULT
MCRD PARRIS ISLAND, SOUTH CAROLINA

DETECTED CHEMICAL	FREQ. OF DETECT.	MIN. DETECT.	MAX. DETECT.	HUMAN HEALTH SCREENING CRITERIA EPA REGION 9 TAP WATER PRGs(1)	HUMAN HEALTH SCREENING CRITERIA FEDERAL MCLs(2)	EPA REGION 4 SURFACE WATER ESVs(3)	PAI-FOV-GW-01-01	PAI-FOV-GW-07-01	PAI-FOV-GW-08-01	PAI-FOV-GW-10-01	PAI-FOV-GW-11-01	PAI-FOV-GW-12-01	PAI-FOV-GW-13-01	PAI-FOV-GW-17-01	PAI-FOV-GW-18-01	PAI-FOV-GW-19-01	PAI-FOV-GW-20-01	PAI-FOV-GW-21-01
Volatile Organics (ug/L)																		
1,2,4-TRICHLOROBENZENE	3/12	0.42	2.5	190	70	44.9	ND	ND	0.42 J	ND	ND	2.5 J	ND	ND	ND	2 J	ND	ND
1,2-DICHLOROBENZENE	5/12	0.38	10.9	370	600	15.8	ND	ND	0.84 J	ND	0.38 J	10.4	ND	ND	ND	10.9	0.74 J	ND
1,3-DICHLOROBENZENE	2/12	0.44	0.78	5.5	NA	50.2	ND	ND	ND	ND	ND	0.78 J	ND	ND	ND	0.44 J	ND	ND
1,4-DICHLOROBENZENE	8/12	0.41	28.6	**0.5**	75	**11.2**	**1.7 J**	**0.58 J**	**1.9 J**	ND	**1.3 J**	**28.4**	ND	ND	ND	**28.6**	**2.2 J**	0.41 J
ACETONE	1/12	2.5	2.5	610	NA	NA	2.5 J	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
BENZENE	4/12	0.58	2.8	**0.34**	5	53	ND	**0.97 J**	**2.8 J**	ND	ND	**0.58 J**	ND	ND	ND	**2.3 J**	ND	ND
CHLOROBENZENE	10/12	1.8	479	**110**	**100**	**195**	5.8	7.9	8.1	ND	6.7	**276**	ND	1.8 J	11.4	**479**	15.7	2.6 J
ETHYLBENZENE	3/12	0.22	3.2	**2.9**	700	453	ND	0.45 J	**3.2 J**	ND	ND	0.22 J	ND	ND	ND	ND	ND	ND
ISOPROPYLBENZENE	3/12	0.36	0.8	660	NA	NA	ND	ND	0.36 J	ND	ND	0.46 J	ND	ND	ND	0.8 J	ND	ND
METHYL TERT-BUTYL ETHER	1/12	0.5	0.5	13	NA	NA	ND	ND	ND	ND	ND	0.5 J	ND	ND	ND	ND	ND	ND
TOTAL XYLENES	2/12	0.32	0.55	210	10000	NA	ND	0.55 J	0.32 J	ND	ND	ND	ND	ND	ND	ND	ND	ND
Semivolatile Organics (ug/L)																		
1,1-BIPHENYL	3/12	0.58	1.7	300	NA	NA	ND	0.58 J	1.2 J	ND	ND	ND	ND	ND	ND	1.7 J	ND	ND
2-METHYLNAPHTHALENE	2/12	3.7	7.2	**6.2**	NA	NA	ND	**7.2 J**	3.7 J	ND	ND	ND	ND	ND	ND	ND	ND	ND
3&4-METHYLPHENOL	1/12	2.2	2.2	180	NA	NA	ND	ND	ND	ND	ND	ND	2.2 J	ND	ND	ND	ND	ND
BIS(2-ETHYLHEXYL)PHTHALATE	5/12	2.9	5	**4.8**	6	NA	ND	**5 J**	4.6 J	ND	3.4 J	3.5 J	2.9 J	ND	ND	ND	ND	ND
CAPROLACTAM	6/12	4.2	14.3	18000	NA	NA	ND	ND	ND	14.3	11 J	14	6.1 J	ND	ND	ND	4.2 J	5.4 J
DIBENZOFURAN	1/12	0.47	0.47	24	NA	NA	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.47 J	ND	ND
FLUORANTHENE	1/12	1	1	1500	NA	39.8	ND	1 J	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
NAPHTHALENE	2/12	2.3	4.9	6.2	NA	62	ND	2.3 J	4.9 J	ND	ND	ND	ND	ND	ND	ND	ND	ND
PHENANTHRENE	1/12	1.2	1.2	180	NA	NA	ND	1.2 J	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
PYRENE	1/12	0.82	0.82	180	NA	NA	ND	0.82 J	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Pesticides/PCBs (ug/L)																		
4,4'-DDD	6/12	0.017	7.1	**0.28**	NA	**0.0064**	**0.074 J**	**7.1**	**1.6**	**0.017 J**	ND	ND	**0.064 J**	ND	ND	ND	**0.039 J**	ND
4,4'-DDE	1/12	0.024	0.024	0.2	NA	10.5	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.024 J	ND
4,4'-DDT	10/12	0.053	3.3	**0.2**	NA	**0.001**	**0.22 J**	**0.82**	**0.58**	**0.059 J**	**3.3 J**	ND	**0.080 J**	**0.053 J**	**0.058 J**	ND	**0.058 J**	**0.21 J**
ALPHA-BHC	1/12	0.023	46	**0.011**	NA	500	**0.33**	**1.0**	**3.1**	**0.26**	**2.9 J**	ND	**0.023 J**	**0.27 J**	**0.094 J**	**46 J**	**0.25**	**2.9**
BETA-BHC	8/12	0.019	16	**0.037**	NA	5000	**1.2**	**0.23 J**	**0.55**	0.019 J	**16 J**	ND	**0.042 J**	**0.043 J**	ND	**4.1 J**	ND	ND
DELTA-BHC	10/12	0.039	47	**0.011**	NA	NA	**2.3 J**	**2.5**	**3.2**	**0.25**	**47 J**	ND	**0.14**	**0.41 J**	**0.039 J**	**41 J**	ND	**0.43**
GAMMA-BHC (LINDANE)	5/12	0.019	27	**0.052**	**0.2**	**0.08**	ND	**0.13 J**	**0.44**	ND	ND	ND	0.019 J	**0.21 J**	ND	**27 J**	ND	ND

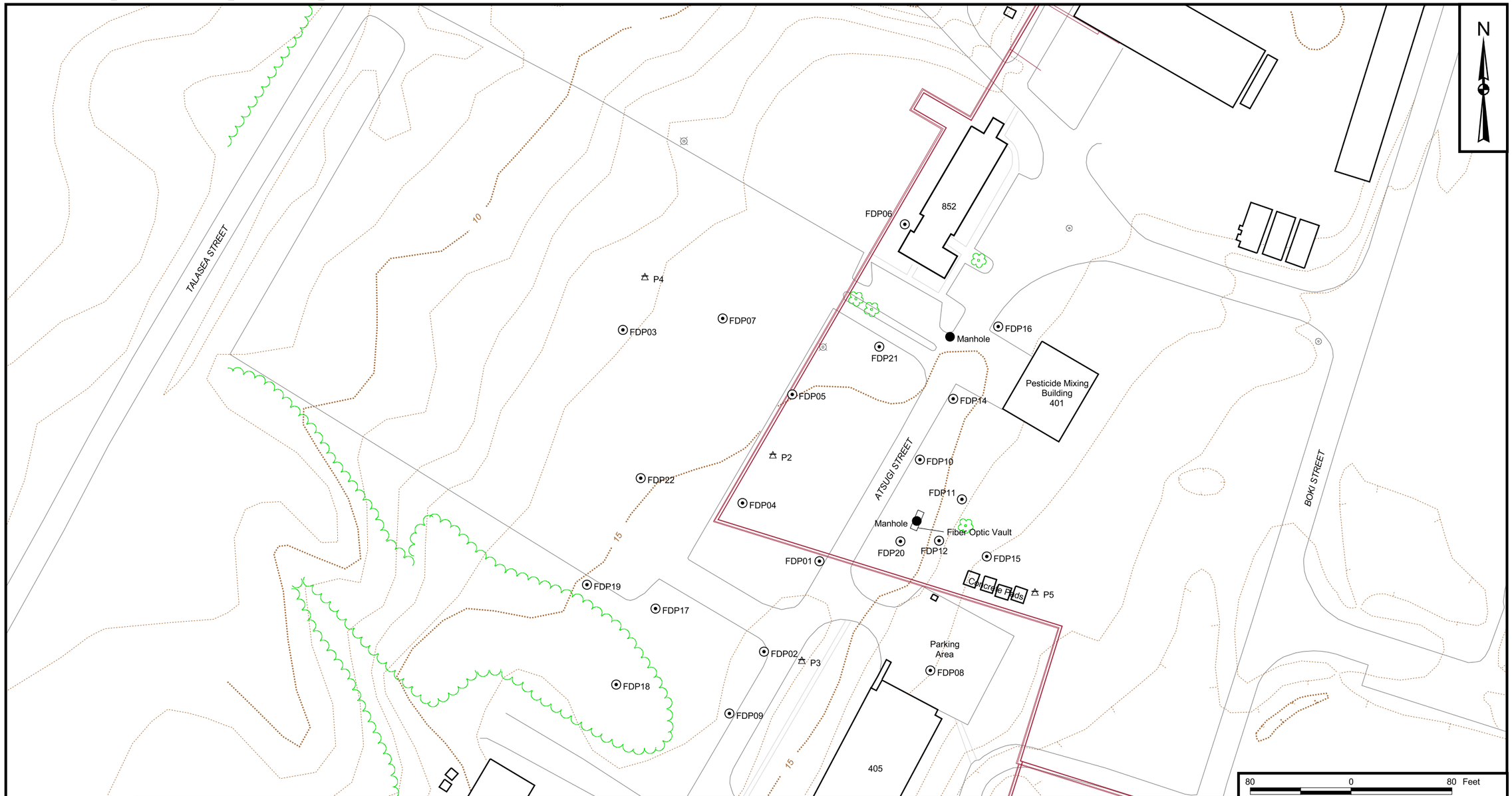
Notes:

1 - U.S. EPA Region 9 Preliminary Remediation Goals, November 2000. (Cancer benchmark value = 1 x 10^{-6}, HI = 1.0.)
2 - National Primary Drinking Water Standards, U.S. EPA, March 2001. EPA 816-F-01-007.
3 - U.S. EPA Ecological Risk Assessment at Military Bases: Process Considerations, Timing of Activities and Inclusion of Stakeholders, December 22, 1998. Freshwater - chronic.

NA = Not applicable/not available.
ND = Net detected
J = Estimated value

0.5 = indicates a criterion has been exceeded
2.3 J = indicates a result has exceeded a criterion

P:\GIS\PARRISISLAND_MCRD\APR\PROPOSED_PLAN.APR SITE55_DPT LOCATIONS 10/27/03 KMP



LEGEND

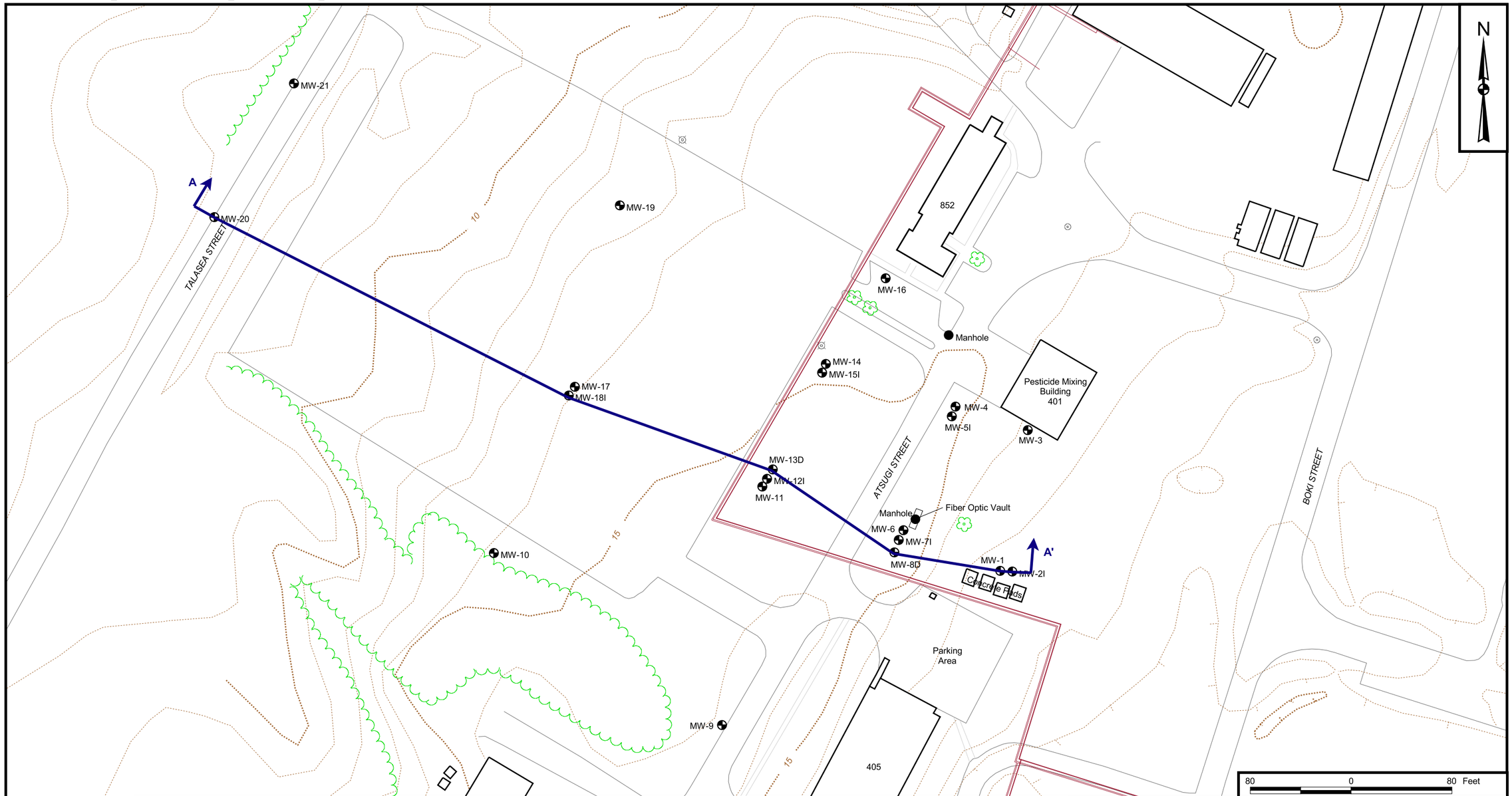
- DPT Location
- Piezometer
- Manhole
- Aerial Pipe
- Topographic Contour
- Tree Line
- Sidewalk
- Road
- Building

DRAWN BY	DATE
K. PEILA	10/21/03
CHECKED BY	DATE
J. BROWN	10/21/03
REVISED BY	DATE
—	—
SCALE	
AS NOTED	

DPT AND PIEZOMETER LOCATIONS
SITE 55 - FIBER OPTIC VAULT
MCRD PARRIS ISLAND
PARRIS ISLAND, SOUTH CAROLINA

CONTRACT NO.	
4211	
OWNER NO.	
—	
APPROVED BY	DATE
DRAWING NO.	REV.
FIGURE 3-1	0

P:\GIS\PARRISISLAND_MCRD\APR\PROPOSED_PLAN.APR SITE55_MW LOCATIONS 10/27/03 KMP



LEGEND

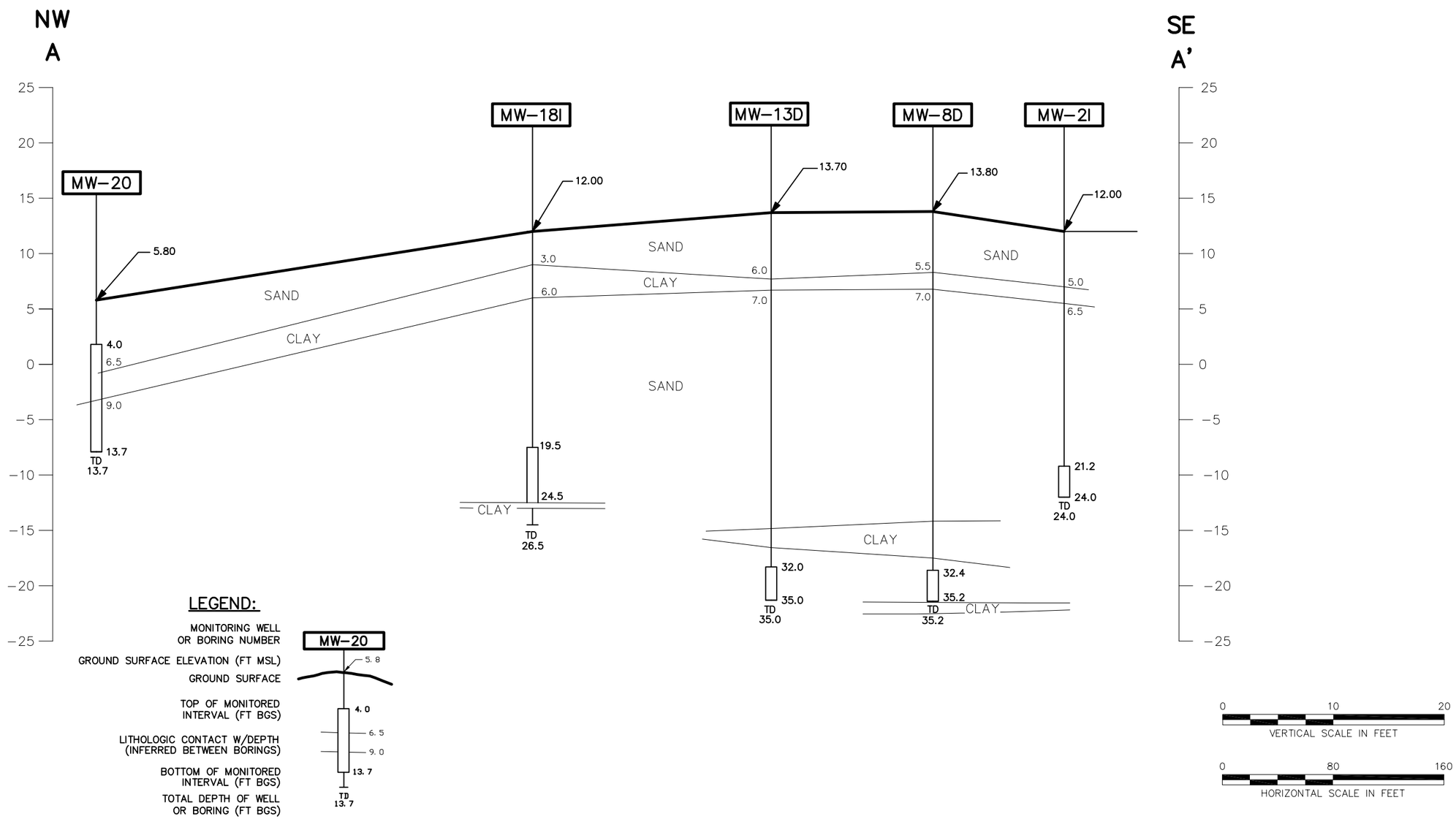
- Monitoring Well
- Manhole
- Aerial Pipe
- Topographic Contour
- Tree Line
- Sidewalk
- Road
- Building
- Cross Section Location A-A'

DRAWN BY	DATE
K. PEILA	10/21/03
CHECKED BY	DATE
J. BROWN	10/21/03
REVISED BY	DATE
—	—
SCALE	
AS NOTED	

PERMANENT MONITORING WELL LOCATIONS
SITE 55 - FIBER OPTIC VAULT
MCRD PARRIS ISLAND
PARRIS ISLAND, SOUTH CAROLINA

CONTRACT NO.	
4211	
OWNER NO.	
—	
APPROVED BY	DATE
	—
DRAWING NO.	REV.
FIGURE 3-2	0

ACAD: 4211GX01.dwg 10/28/03 DM PIT



NO.	DATE	REVISIONS	BY	CHKD	APPD	REFERENCES

DRAWN BY DM DATE 10/23/03
CHECKED BY DATE
COST/SCHED−AREA
SCALE AS NOTED

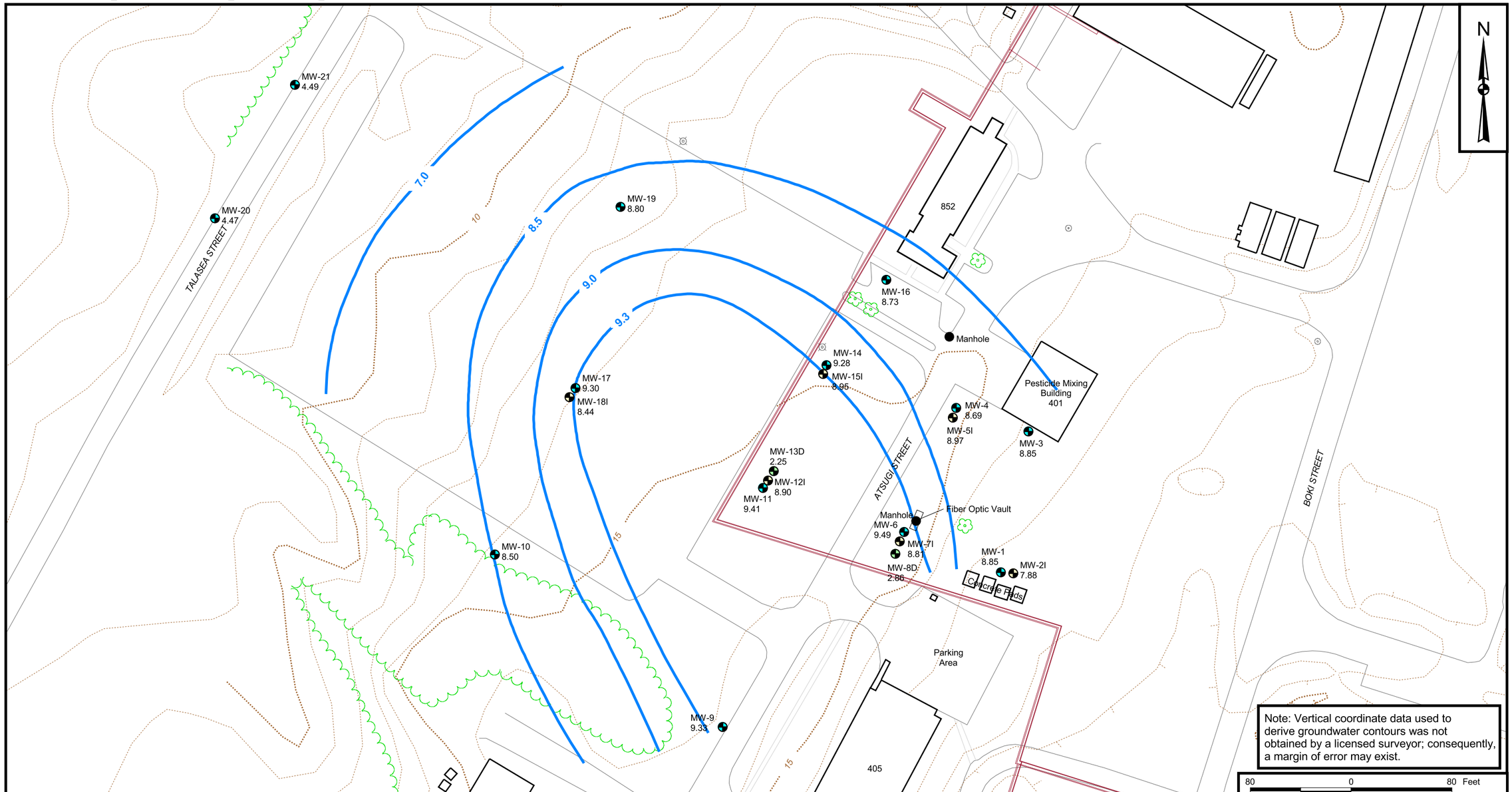
Tetra Tech NUS, Inc.

CROSS SECTION A−A'
SITE 55 − FIBER OPTIC VAULT
MCRD PARRIS ISLAND, SOUTH CAROLINA

CONTRACT NO. 4211
OWNER NO. ————
APPROVED BY DATE
APPROVED BY DATE
DRAWING NO. FIGURE 3−3
REV. 0

FORM CADD NO. TtNUS_BH.DGN − REV 0 − 1/20/98

P:\GIS\PARRISISLAND_MCRD\APR\PROPOSED_PLAN.APR SITE55_MW20030711 10/27/03 KMP



LEGEND

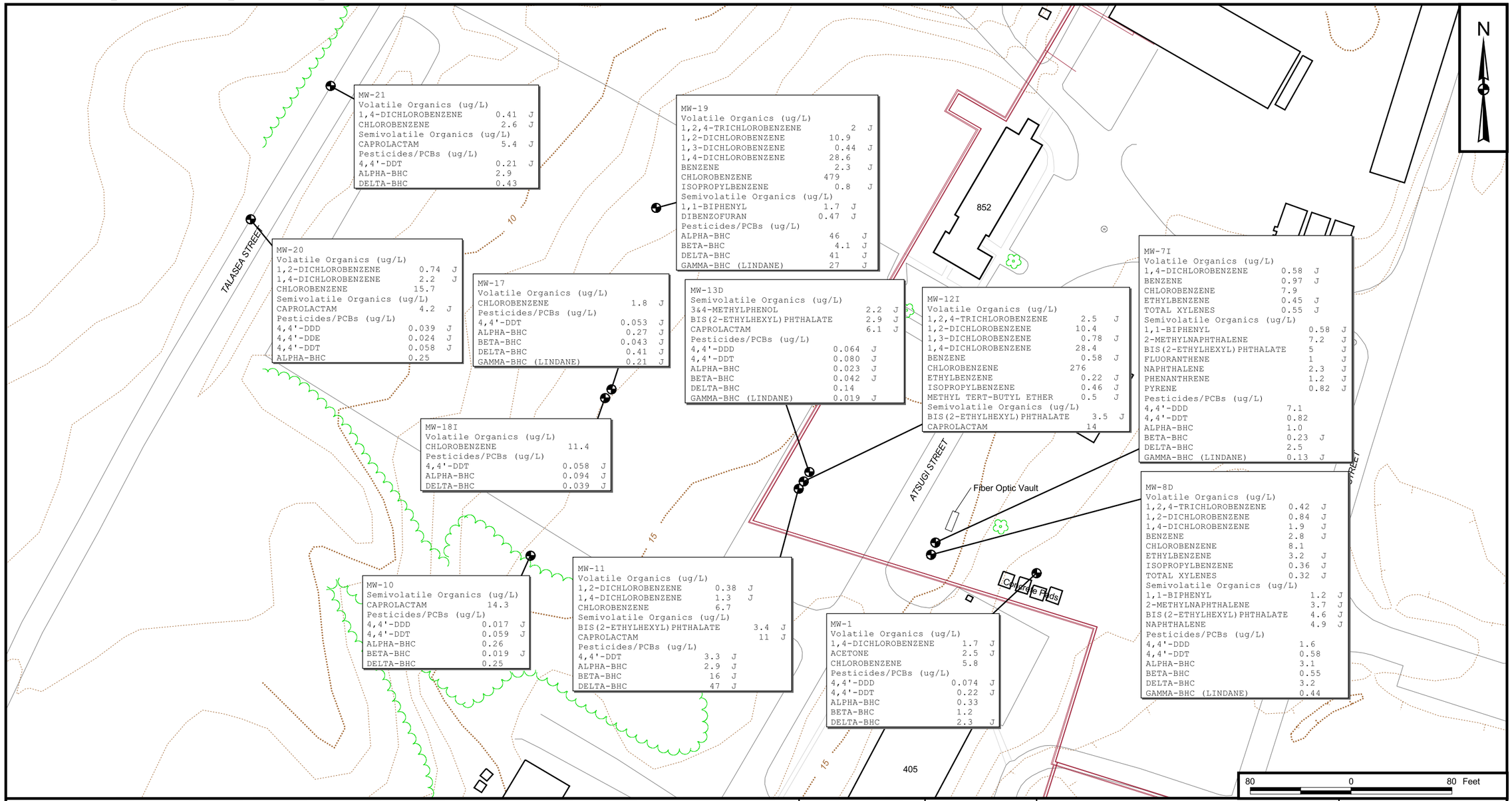
- Shallow Monitoring Well
- Intermediate Monitoring Well
- Deep Monitoring Well
- Manhole
- Aerial Pipe
- Topographic Contour
- Tree Line
- Sidewalk
- Road
- Building
- 4.47 Groundwater Elevation (Mean Sea Level)
- 9.0 Groundwater Contour Shallow Surficial Aquifer

DRAWN BY	DATE
K. PEILA	10/21/03
CHECKED BY	DATE
J. BROWN	10/21/03
REVISED BY	DATE
—	—
SCALE	
AS NOTED	

POTENTIOMETRIC SURFACE MAP
SHALLOW SURFICIAL AQUIFER
07/11/03
SITE 55 - FIBER OPTIC VAULT
MCRD PARRIS ISLAND
PARRIS ISLAND, SOUTH CAROLINA

CONTRACT NO.	
4211	
OWNER NO.	
—	
APPROVED BY	DATE
DRAWING NO.	REV.
FIGURE 3-4	0

P:\GIS\PARRISISLAND_MCRD\APR\PROPOSED_PLAN.APR SITE55_ALLPOSITIVEDETECTIONS 10/27/03 KMP



LEGEND

- Monitoring Well
- Aerial Pipe
- Topographic Contour
- Tree Line
- Sidewalk
- Road
- Building

DRAWN BY	DATE
K. PEILA	10/21/03
CHECKED BY	DATE
J. BROWN	10/21/03
REVISED BY	DATE
—	—
SCALE	
AS NOTED	

GROUNDWATER POSITIVE DETECTIONS
JULY 2003
SITE 55 - FIBER OPTIC VAULT
MCRD PARRIS ISLAND
PARRIS ISLAND, SOUTH CAROLINA

CONTRACT NO.	
4211	
OWNER NO.	
—	
APPROVED BY	DATE
DRAWING NO.	REV.
FIGURE 3-5	0

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APPENDIX A

ANALYTICAL DATA

A.1 SOIL SCREENING DATA

A.2 GROUNDWATER SCREENING DATA

A.3 JULY 2003 GROUNDWATER DATA

A.1 SOIL SCREENING DATA

Samples Collected:	07/23/02 - 07/26/02	Collected by:	E. Renard/B. Howze	Client:	TTNUS
Samples Received:	07/23/02 - 07/26/02	Received by:	D. McInnes	Client Address:	661 Andrerson Drive
Samples Analyzed:	07/23/02 - 07/26/02	Analyzed by:	D. McInnes		Pittsburgh, PA 15220
Samples Reported:	07/26/02	Reported by:	Doug McInnes		
Project Identification:	Parris Island, MRCD	Report Revision:	0.0	Client Contact:	Bryn Howze (865) 803-3027 (cell)
Columbia Job Code:	XYZ0123	Method Deviations:	none	Client Phone:	Shawn Scaff (865) 483-9900
Purchase Order:		Sampling Method:	Direct Push Water and Soil	Client Fax:	(865) 483-2014

USEPA Method 8260 Soil Sample Analysis Results in ug/Kg

Compound	PQL[1] (ug/Kg)	FOVSFB 0106 (ug/Kg)		FOVSFB 0204 (ug/Kg)		FOVSFB 0206 (ug/Kg)		FOVSFB 0305 (ug/Kg)		FOVSFB 0406 (ug/Kg)		FOVSFB 0505 (ug/Kg)		FOVSFB 0605 (ug/Kg)		FOVSFB 0803 (ug/Kg)	
MTBE	5	5	U	5	U	5	U	5	U	50	U	5	U	5	U	5	U
Benzene	5	5	U	5	U	5	U	5	U	50	U	5	U	5	U	5	U
Toluene	5	5	U	5	U	5	U	5	U	50	U	5	U	5	U	5	U
Chlorobenzene	5	5	U	5	U	5	U	5	U	30	J	5	U	5	U	5	U
Ethylbenzene	5	5	U	5	U	5	U	5	U	50	U	5	U	5	U	5	U
m+p Xylene	10	10	U	10	U	10	U	10	U	100	U	10	U	10	U	10	U
o-Xylene	5	5	U	5	U	5	U	5	U	50	U	5	U	5	U	5	U
Naphthalene	5	5	U	5	U	18		3	J	180		5	U	5	U	5	U
Dilution Factor:		1		1		1		1		10		1		1		1	

Compound	PQL[1] (ug/Kg)	FOVSFB 1005 (ug/Kg)		FOVSFB 1105 (ug/Kg)		FOVSFB 1204 (ug/Kg)		FOVSFB 1305 (ug/Kg)		FOVSFB 1405 (ug/Kg)		FOVSFB 1505 (ug/Kg)		FOVSFB 1605 (ug/Kg)		FOVSFB 1704 (ug/Kg)	
MTBE	5	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U
Benzene	5	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U
Toluene	5	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U
Chlorobenzene	5	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U
Ethylbenzene	5	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U
m+p Xylene	10	10	U	10	U	10	U	10	U	10	U	10	U	10	U	10	U
o-Xylene	5	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U
Naphthalene	5	5	U	5	U	5	U	5	U	5	U	5	U	5	U	5	U
Dilution Factor:		1		1		1		1		1		1		1		1	

U: Non-detect result J: Estimated value - less than PQL D: Dilute result
B: Compound found in associated method blank E: Estimated value - greater than upper limit of calibration curve

1 PQL: Practical quantitation limit using the initial calibration curve low point and dilution factors where applicable

SAMPLE NARRATIVE:

Quality Control Analyst: _____

Compound	PQL[1]	FOVSFB	FOVSFB	FOVSFB

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Samples Collected:	07/23/02 - 07/26/02	Collected by:	E. Renard/B. Howze	Client:	TTNUS
Samples Received:	07/23/02 - 07/26/02	Received by:	D. McInnes	Client Address:	661 Andrerson Drive
Samples Analyzed:	07/23/02 - 07/26/02	Analyzed by:	D. McInnes		Pittsburgh, PA 15220
Samples Reported:	07/26/02	Reported by:	Doug McInnes		
Project Identification:	Parris Island, MRCD	Report Revision:	0.0	Client Contact:	Bryn Howze (865) 803-3027 (cell)
Columbia Job Code:	XYZ0123	Method Deviations:	none	Client Phone:	Shawn Scaff (865) 483-9900
Purchase Order:		Sampling Method:	Direct Push Water and Soil	Client Fax:	(865) 483-2014

USEPA Method 8260 Soil Sample Analysis Results in ug/Kg

		1804		1904		2104	
	(ug/Kg)	(ug/Kg)		(ug/Kg)		(ug/Kg)	
MTBE	5	5	U	5	U	5	U
Benzene	5	5	U	5	U	5	U
Toluene	5	5	U	5	U	5	U
Chlorobenzene	5	5	U	5	U	5	U
Ethylbenzene	5	5	U	5	U	5	U
m+p Xylene	10	10	U	10	U	10	U
o-Xylene	5	5	U	5	U	5	U
Naphthalene	5	5	U	5	U	5	U
Dilution Factor:		1		1		1	

Compound	**PQL[1]**
	(ug/Kg)
MTBE	5
Benzene	5
Toluene	5
Chlorobenzene	5
Ethylbenzene	5
m+p Xylene	10
o-Xylene	5
Naphthalene	5
Dilution Factor:	

U: Non-detect result J: Estimated value - less than PQL E: Estimated value - greater than upper limit of calibration curve
B: Compound found in associated method blank D: Dilute result

1 PQL: Practical quantitation limit using the initial calibration curve low point and dilution factors where applicable

SAMPLE NARRATIVE:

Quality Control Analyst: _____

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A.2 GROUNDWATER SCREENING DATA

Samples Collected:	07/23/02 - 07/26/02	Collected by:	E. Renard/B. Howze	Client:	TTNUS
Samples Received:	07/23/02 - 07/26/02	Received by:	D. McInnes	Client Address:	661 Anderson Drive
Samples Analyzed:	07/23/02 - 07/26/02	Analyzed by:	D. McInnes		Pittsburgh, PA 15220
Samples Reported:	07/26/02	Reported by:	Doug McInnes		
Project Identification:	Parris Island, MRCD	Report Revision:	0.0	Client Contact:	Bryn Howze (865) 803-3027 (cell)
Columbia Job Code:	XYZ0123	Method Deviations:	none	Client Phone:	Shawn Scaff (865) 483-9900
Purchase Order:		Sampling Method:	Direct Push Water and Soil	Client Fax:	(865) 483-2014

USEPA Method 8260 Water Sample Analysis Results in ug/L

Compound	PQL[1] (ug/L)	FOVGFB 0110 (ug/L)		FOVGFB 0210 (ug/L)		FOVGFB 0311 (ug/L)		FOVGFB 0412 (ug/L)		FOVGFB 0509 (ug/L)		FOVGFB 0612 (ug/L)		FOVGFB 0710 (ug/L)		FOVGFB 0808 (ug/L)	
MTBE	5	5	U	5	U	5	U	5	U	50	U	5	U	5	U	5	U
Benzene	5	5	U	79		3	J	280	D	190		5	U	7	U	5	U
Toluene	5	5	U	5	U	5	U	18		50	U	5	U	5	U	5	U
Chlorobenzene	5	61		2500	D	5	U	3490	D	2830	D	5	U	590	D	5	U
Ethylbenzene	5	5	U	96		5	U	190	D	80		5	U	3	J	5	U
m+p Xylene	10	10	U	35		10	U	290	D	20	J	10	U	10	U	10	U
o-Xylene	5	5	U	26		5	U	210	D	20	J	5	U	5	U	5	U
Naphthalene	5	2	J	340	D	5	U	450	D	250		5	U	8		5	U
Dilution Factor:		1		1, 20, 50		1		1, 20, 50		10		1		1, 10		1	

Compound	PQL[1] (ug/L)	FOVGFB 0911 (ug/L)		FOVGFB 1010 (ug/L)		FOVGFB 1109 (ug/L)		FOVGFB 1210 (ug/L)		FOVGFB 1410 (ug/L)		FOVGFB 1510 (ug/L)		FOVGFB 1610 (ug/L)		FOVGFB 1710 (ug/L)	
MTBE	5	5	U	5	U	5	U	500	U	2	J	5	U	5	U	5	U
Benzene	5	5	U	16		5	U	350	J	340	D	5	U	5	U	74	
Toluene	5	5	U	5	U	5	U	500	U	5	U	5	U	5	U	5	U
Chlorobenzene	5	5	U	250	D	24		3400		960	D	39		5	U	1390	D
Ethylbenzene	5	5	U	14		5	U	560		65		5	U	5	U	5	U
m+p Xylene	10	10	U	5	J	10	U	1500		8	J	10	U	10	U	10	U
o-Xylene	5	5	U	10		5	U	830		20		5	U	5	U	5	U
Naphthalene	5	5	U	100	D	6		3200		280	D	5	U	11		30	
Dilution Factor:		1		1, 10		1		100		1, 10		1		1		1, 20	

U: Non-detect result J: Estimated value - less than PQL E: Estimated value - greater than upper limit of calibration curve
B: Compound found in associated method blank D: Dilute result

1 PQL: Practical quantitation limit using the initial calibration curve low point and dilution factors where applicable

SAMPLE NARRATIVE:

Quality Control Analyst: _____

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Samples Collected:	07/23/02 - 07/26/02	Collected by:	E. Renard/B. Howze	Client:	TTNUS
Samples Received:	07/23/02 - 07/26/02	Received by:	D. McInnes	Client Address:	661 Andrerson Drive
Samples Analyzed:	07/23/02 - 07/26/02	Analyzed by:	D. McInnes		Pittsburgh, PA 15220
Samples Reported:	07/26/02	Reported by:	Doug McInnes		
Project Identification:	Parris Island, MRCD	Report Revision:	0.0	Client Contact:	Bryn Howze (865) 803-3027 (cell)
Columbia Job Code:	XYZ0123	Method Deviations:	none	Client Phone:	Shawn Scaff (865) 483-9900
Purchase Order:		Sampling Method:	Direct Push Water and Soil	Client Fax:	(865) 483-2014

USEPA Method 8260 Water Sample Analysis Results in ug/L

Compound	PQL[1] (ug/L)	FOVGFB 1810 (ug/L)		FOVGFB 1910 (ug/L)		FOVGFB 2022 (ug/L)		FOVGFB 2110 (ug/L)		FOVGFB 2210 (ug/L)	
MTBE	5	5	U	5	U	5	U	5	U	5	U
Benzene	5	5	U	12		24		5	U	39	
Toluene	5	5	U	5	U	5		5	U	5	U
Chlorobenzene	5	5	U	310	D	490	D	14		2310	E
Ethylbenzene	5	5	U	5	U	16		5	U	5	U
m+p Xylene	10	10	U	10	U	37		10	U	10	U
o-Xylene	5	5	U	5	U	26		5	U	5	U
Naphthalene	5	5	U	5		110	D	5	J	5	U
Dilution Factor:		1		1, 10		1, 10		1		1, 20, 50	

Compound	PQL[1] (ug/L)	FOVGFP 0310 (ug/L)		FOVGFP 0410 (ug/L)	
MTBE	5	5	U	5	U
Benzene	5	5	U	5	U
Toluene	5	5	U	5	U
Chlorobenzene	5	23		56	
Ethylbenzene	5	5	U	5	U
m+p Xylene	10	10	U	10	U
o-Xylene	5	5	U	5	U
Naphthalene	5	5	U	5	U
Dilution Factor:		1		1	

U: Non-detect result J: Estimated value - less than PQL E: Estimated value - greater than upper limit of calibration curve
B: Compound found in associated method blank D: Dilute result

1 PQL: Practical quantitation limit using the initial calibration curve low point and dilution factors where applicable

SAMPLE NARRATIVE:

Quality Control Analyst: _____

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A.3 JULY 2003 GROUNDWATER DATA

order	**001**	**002**	**003**	**004**	**005**	**006**	**007**	**008**	**009**
round	2003Q3	2003Q3	2003Q3	2003Q3	2003Q3	2003Q3	2003Q3	2003Q3	2003Q3
location	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD
nsample	PAI-FOV-GW-01-01	PAI-FOV-GW-07-01	PAI-FOV-GW-08-01	PAI-FOV-GW-10-01	PAI-FOV-GW-11-01	PAI-FOV-GW-12-01	PAI-FOV-GW-13-01	PAI-FOV-GW-17-01	PAI-FOV-GW-18-01
sample	PA1-FOV-GW-01-01	PA1-FOV-GW-07-01	PA1-FOV-GW-08-01	PA1-FOV-GW-10-01	PA1-FOV-GW-11-01	PA1-FOV-GW-12-01	PA1-FOV-GW-13-01	PAI-FOV-GW-17-01	PAI-FOV-GW-18-01
matrix	GW	GW	GW	GW	GW	GW	GW	GW	GW
sacode	NORMAL	NORMAL	NORMAL	NORMAL	NORMAL	NORMAL	NORMAL	NORMAL	NORMAL
gis_date	20030709	20030709	20030709	20030709	20030710	20030710	20030710	20030711	20030711
sample_dat	07/09/03	07/09/03	07/09/03	07/09/03	07/10/03	07/10/03	07/10/03	07/11/03	07/11/03
validated	Y	Y	Y	Y	Y	Y	Y	Y	Y
cto_proj	N4211	N4211	N4211	N4211	N4211	N4211	N4211	N4211	N4211
proj_manag	SLADIC,M	SLADIC,M	SLADIC,M	SLADIC,M	SLADIC,M	SLADIC,M	SLADIC,M	SLADIC,M	SLADIC,M
sort	**c_001**	**c_002**	**c_003**	**c_004**	**c_005**	**c_006**	**c_007**	**c_008**	**c_009**
Volatile Organics (ug/L)									
1,1,1-TRICHLOROETHANE	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U
1,1,2,2-TETRACHLOROETHANE	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U
1,1,2-TRICHLOROETHANE	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U
1,1,2-TRICHLOROTRIFLUOROETHANE	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U
1,1-DICHLOROETHANE	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U
1,1-DICHLOROETHENE	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U
1,2,4-TRICHLOROBENZENE	5 U	5 U	0.42 J	5 U	5 U	2.5 J	5 U	5 U	5 U
1,2-DIBROMO-3-CHLOROPROPANE	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U
1,2-DIBROMOETHANE	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U
1,2-DICHLOROBENZENE	5 U	5 U	0.84 J	5 U	0.38 J	10.4	5 U	5 U	5 U
1,2-DICHLOROETHANE	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U
1,2-DICHLOROPROPANE	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U
1,3-DICHLOROBENZENE	5 U	5 U	5 U	5 U	5 U	0.78 J	5 U	5 U	5 U
1,4-DICHLOROBENZENE	1.7 J	0.58 J	1.9 J	5 U	1.3 J	28.4	5 U	5 U	5 U
2-BUTANONE	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U
2-HEXANONE	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U
4-METHYL-2-PENTANONE	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U
ACETONE	2.5 J	5 U	5 U	5 U	5 UJ	5 U	5 U	5 U	5 U
BENZENE	5 U	0.97 J	2.8 J	5 U	5 U	0.58 J	5 U	5 U	5 U
BROMODICHLOROMETHANE	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U
BROMOFORM	5 U	5 U	5 U	5 U	5 UJ	5 UJ	5 U	5 UJ	5 UJ
BROMOMETHANE	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U
CARBON DISULFIDE	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U
CARBON TETRACHLORIDE	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U
CHLOROBENZENE	5.8	7.9	8.1	5 U	6.7	276	5 U	1.8 J	11.4
CHLORODIBROMOMETHANE	5 U	5 U	5 U	5 U	5 UJ	5 UJ	5 U	5 UJ	5 UJ
CHLOROETHANE	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U
CHLOROFORM	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U
CHLOROMETHANE	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U
CIS-1,2-DICHLOROETHENE	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U
CIS-1,3-DICHLOROPROPENE	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U
CYCLOHEXANE	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U
DICHLORODIFLUOROMETHANE	5 U	5 U	5 U	5 U	5 U	5 U	5 UJ	5 U	5 U
ETHYLBENZENE	5 U	0.45 J	3.2 J	5 U	5 U	0.22 J	5 U	5 U	5 U
ISOPROPYLBENZENE	5 U	5 U	0.36 J	5 U	5 U	0.46 J	5 U	5 U	5 U
METHYL ACETATE	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U
METHYL CYCLOHEXANE	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U
METHYL TERT-BUTYL ETHER	5 U	5 U	5 U	5 U	5 U	0.5 J	5 U	5 U	5 U
METHYLENE CHLORIDE	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U
STYRENE	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U
TETRACHLOROETHENE	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U
TOLUENE	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U
TOTAL XYLENES	5 U	0.55 J	0.32 J	5 U	5 U	5 U	5 U	5 U	5 U

from fov_sam.dbf
from fov_res.dbf
from fov_res.xls
from q:\sql_server\parris_island\upload

order	001	002	003	004	005	006	007	008	009
round	2003Q3	2003Q3	2003Q3	2003Q3	2003Q3	2003Q3	2003Q3	2003Q3	2003Q3
location	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD
nsample	PAI-FOV-GW-01-01	PAI-FOV-GW-07-01	PAI-FOV-GW-08-01	PAI-FOV-GW-10-01	PAI-FOV-GW-11-01	PAI-FOV-GW-12-01	PAI-FOV-GW-13-01	PAI-FOV-GW-17-01	PAI-FOV-GW-18-01
sample	PA1-FOV-GW-01-01	PA1-FOV-GW-07-01	PA1-FOV-GW-08-01	PA1-FOV-GW-10-01	PA1-FOV-GW-11-01	PA1-FOV-GW-12-01	PA1-FOV-GW-13-01	PAI-FOV-GW-17-01	PAI-FOV-GW-18-01
matrix	GW	GW	GW	GW	GW	GW	GW	GW	GW
sacode	NORMAL	NORMAL	NORMAL	NORMAL	NORMAL	NORMAL	NORMAL	NORMAL	NORMAL
gis_date	20030709	20030709	20030709	20030709	20030710	20030710	20030710	20030711	20030711
sample_dat	07/09/03	07/09/03	07/09/03	07/09/03	07/10/03	07/10/03	07/10/03	07/11/03	07/11/03
validated	Y	Y	Y	Y	Y	Y	Y	Y	Y
cto_proj	N4211	N4211	N4211	N4211	N4211	N4211	N4211	N4211	N4211
proj_manag	SLADIC,M	SLADIC,M	SLADIC,M	SLADIC,M	SLADIC,M	SLADIC,M	SLADIC,M	SLADIC,M	SLADIC,M
sort	**c_001**	**c_002**	**c_003**	**c_004**	**c_005**	**c_006**	**c_007**	**c_008**	**c_009**
TRANS-1,2-DICHLOROETHENE	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U
TRANS-1,3-DICHLOROPROPENE	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U
TRICHLOROETHENE	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U
TRICHLOROFLUOROMETHANE	5 UJ	5 UJ	5 UJ	5 UJ	5 U	5 U	5 U	5 U	5 U
VINYL CHLORIDE	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U
Semivolatile Organics (ug/L)									
1,1-BIPHENYL	9.8 U	0.58 J	1.2 J	10 U	11.2 U	11.1 U	9.6 U	9.9 U	10.6 U
2,2'-OXYBIS(1-CHLOROPROPANE)	9.8 U	11.1 U	11.1 U	10 U	11.2 U	11.1 U	9.6 U	9.9 U	10.6 U
2,4,5-TRICHLOROPHENOL	24.5 U	27.8 U	27.8 U	25 U	28.1 U	27.8 U	24 U	24.8 U	26.6 U
2,4,6-TRICHLOROPHENOL	9.8 U	11.1 U	11.1 U	10 U	11.2 U	11.1 U	9.6 U	9.9 U	10.6 U
2,4-DICHLOROPHENOL	9.8 U	11.1 U	11.1 U	10 U	11.2 U	11.1 U	9.6 U	9.9 U	10.6 U
2,4-DIMETHYLPHENOL	9.8 U	11.1 U	11.1 U	10 U	11.2 U	11.1 U	9.6 U	9.9 U	10.6 U
2,4-DINITROPHENOL	24.5 U	27.8 U	27.8 U	25 U	28.1 U	27.8 U	24 U	24.8 U	26.6 U
2,4-DINITROTOLUENE	9.8 U	11.1 U	11.1 U	10 U	11.2 U	11.1 U	9.6 U	9.9 U	10.6 U
2,6-DINITROTOLUENE	9.8 U	11.1 U	11.1 U	10 U	11.2 U	11.1 U	9.6 U	9.9 U	10.6 U
2-CHLORONAPHTHALENE	9.8 U	11.1 U	11.1 U	10 U	11.2 U	11.1 U	9.6 U	9.9 U	10.6 U
2-CHLOROPHENOL	9.8 U	11.1 U	11.1 U	10 U	11.2 U	11.1 U	9.6 U	9.9 U	10.6 U
2-METHYLNAPHTHALENE	9.8 U	7.2 J	3.7 J	10 U	11.2 U	11.1 U	9.6 U	9.9 U	10.6 U
2-METHYLPHENOL	9.8 U	11.1 U	11.1 U	10 U	11.2 U	11.1 U	9.6 U	9.9 U	10.6 U
2-NITROANILINE	24.5 U	27.8 U	27.8 U	25 U	28.1 U	27.8 U	24 U	24.8 U	26.6 U
2-NITROPHENOL	9.8 U	11.1 U	11.1 U	10 U	11.2 U	11.1 U	9.6 U	9.9 U	10.6 U
3&4-METHYLPHENOL	9.8 U	11.1 U	11.1 U	10 U	11.2 U	11.1 U	2.2 J	9.9 U	10.6 U
3,3'-DICHLOROBENZIDINE	9.8 U	11.1 U	11.1 U	10 U	11.2 U	11.1 U	9.6 U	9.9 U	10.6 U
3-NITROANILINE	24.5 U	27.8 U	27.8 U	25 U	28.1 U	27.8 U	24 U	24.8 U	26.6 U
4,6-DINITRO-2-METHYLPHENOL	24.5 U	27.8 U	27.8 U	25 U	28.1 U	27.8 U	24 U	24.8 U	26.6 U
4-BROMOPHENYL PHENYL ETHER	9.8 U	11.1 U	11.1 U	10 U	11.2 U	11.1 U	9.6 U	9.9 U	10.6 U
4-CHLORO-3-METHYLPHENOL	9.8 U	11.1 U	11.1 U	10 U	11.2 U	11.1 U	9.6 U	9.9 U	10.6 U
4-CHLOROANILINE	9.8 U	11.1 U	11.1 U	10 U	11.2 U	11.1 U	9.6 U	9.9 U	10.6 U
4-CHLOROPHENYL PHENYL ETHER	9.8 U	11.1 U	11.1 U	10 U	11.2 U	11.1 U	9.6 U	9.9 U	10.6 U
4-NITROANILINE	24.5 U	27.8 U	27.8 U	25 U	28.1 U	27.8 U	24 U	24.8 U	26.6 U
4-NITROPHENOL	24.5 U	27.8 U	27.8 U	25 U	28.1 U	27.8 U	24 U	24.8 U	26.6 U
ACENAPHTHENE	9.8 U	11.1 U	11.1 U	10 U	11.2 U	11.1 U	9.6 U	9.9 U	10.6 U
ACENAPHTHYLENE	9.8 U	11.1 U	11.1 U	10 U	11.2 U	11.1 U	9.6 U	9.9 U	10.6 U
ACETOPHENONE	9.8 U	11.1 U	11.1 U	10 U	11.2 U	11.1 U	9.6 U	9.9 U	10.6 U
ANTHRACENE	9.8 U	11.1 U	11.1 U	10 U	11.2 U	11.1 U	9.6 U	9.9 U	10.6 U
ATRAZINE	9.8 UR	11.1 UR	11.1 UR	10 UR	11.2 UR	11.1 UR	9.6 UR	9.9 UR	10.6 UR
BENZALDEHYDE	9.8 U	11.1 U	11.1 U	10 U	11.2 U	11.1 U	9.6 U	9.9 U	10.6 U
BENZO(A)ANTHRACENE	9.8 U	11.1 U	11.1 U	10 U	11.2 U	11.1 U	9.6 U	9.9 U	10.6 U
BENZO(A)PYRENE	9.8 U	11.1 U	11.1 U	10 U	11.2 U	11.1 U	9.6 U	9.9 U	10.6 U
BENZO(B)FLUORANTHENE	9.8 U	11.1 U	11.1 U	10 U	11.2 U	11.1 U	9.6 U	9.9 U	10.6 U
BENZO(G,H,I)PERYLENE	9.8 U	11.1 U	11.1 U	10 U	11.2 U	11.1 U	9.6 U	9.9 U	10.6 U
BENZO(K)FLUORANTHENE	9.8 U	11.1 U	11.1 U	10 U	11.2 U	11.1 U	9.6 U	9.9 U	10.6 U
BIS(2-CHLOROETHOXY)METHANE	9.8 U	11.1 U	11.1 U	10 U	11.2 U	11.1 U	9.6 U	9.9 U	10.6 U
BIS(2-CHLOROETHYL)ETHER	9.8 U	11.1 U	11.1 U	10 U	11.2 U	11.1 U	9.6 U	9.9 U	10.6 U

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from q:\sql_server\parris_island\upload

order	001	002	003	004	005	006	007	008	009
round	2003Q3	2003Q3	2003Q3	2003Q3	2003Q3	2003Q3	2003Q3	2003Q3	2003Q3
location	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD
nsample	PAI-FOV-GW-01-01	PAI-FOV-GW-07-01	PAI-FOV-GW-08-01	PAI-FOV-GW-10-01	PAI-FOV-GW-11-01	PAI-FOV-GW-12-01	PAI-FOV-GW-13-01	PAI-FOV-GW-17-01	PAI-FOV-GW-18-01
sample	PA1-FOV-GW-01-01	PA1-FOV-GW-07-01	PA1-FOV-GW-08-01	PA1-FOV-GW-10-01	PA1-FOV-GW-11-01	PA1-FOV-GW-12-01	PA1-FOV-GW-13-01	PAI-FOV-GW-17-01	PAI-FOV-GW-18-01
matrix	GW	GW	GW	GW	GW	GW	GW	GW	GW
sacode	NORMAL	NORMAL	NORMAL	NORMAL	NORMAL	NORMAL	NORMAL	NORMAL	NORMAL
gis_date	20030709	20030709	20030709	20030709	20030710	20030710	20030710	20030711	20030711
sample_dat	07/09/03	07/09/03	07/09/03	07/09/03	07/10/03	07/10/03	07/10/03	07/11/03	07/11/03
validated	Y	Y	Y	Y	Y	Y	Y	Y	Y
cto_proj	N4211	N4211	N4211	N4211	N4211	N4211	N4211	N4211	N4211
proj_manag	SLADIC,M	SLADIC,M	SLADIC,M	SLADIC,M	SLADIC,M	SLADIC,M	SLADIC,M	SLADIC,M	SLADIC,M
sort	**c_001**	**c_002**	**c_003**	**c_004**	**c_005**	**c_006**	**c_007**	**c_008**	**c_009**
BIS(2-ETHYLHEXYL)PHTHALATE	9.8 U	5 J	4.6 J	10 U	3.4 J	3.5 J	2.9 J	9.9 U	10.6 U
BUTYL BENZYL PHTHALATE	9.8 U	11.1 U	11.1 U	10 U	11.2 U	11.1 U	9.6 U	9.9 U	10.6 U
CAPROLACTAM	9.8 U	11.1 U	11.1 U	14.3	11 J	14	6.1 J	0.99 U	1.1 U
CARBAZOLE	9.8 U	11.1 U	11.1 U	10 U	11.2 U	11.1 U	9.6 U	9.9 UJ	10.6 U
CHRYSENE	9.8 U	11.1 U	11.1 U	10 U	11.2 U	11.1 U	9.6 U	9.9 U	10.6 U
DI-N-BUTYL PHTHALATE	9.8 U	11.1 U	11.1 U	10 U	11.2 U	11.1 U	9.6 U	9.9 U	10.6 U
DI-N-OCTYL PHTHALATE	9.8 U	11.1 U	11.1 U	10 U	11.2 U	11.1 U	9.6 U	9.9 U	10.6 U
DIBENZO(A,H)ANTHRACENE	9.8 U	11.1 U	11.1 U	10 U	11.2 U	11.1 U	9.6 U	9.9 U	10.6 U
DIBENZOFURAN	9.8 U	11.1 U	11.1 U	10 U	11.2 U	11.1 U	9.6 U	9.9 U	10.6 U
DIETHYL PHTHALATE	9.8 U	11.1 U	11.1 U	10 U	11.2 U	11.1 U	9.6 U	9.9 U	10.6 U
DIMETHYL PHTHALATE	9.8 U	11.1 U	11.1 U	10 U	11.2 U	11.1 U	9.6 U	9.9 U	10.6 U
DIPHENYLAMINE	9.8 U	11.1 U	11.1 U	10 U	11.2 U	11.1 U	9.6 U	9.9 U	10.6 U
FLUORANTHENE	9.8 U	1 J	11.1 U	10 U	11.2 U	11.1 U	9.6 U	9.9 U	10.6 U
FLUORENE	9.8 U	11.1 U	11.1 U	10 U	11.2 U	11.1 U	9.6 U	9.9 U	10.6 U
HEXACHLOROBENZENE	9.8 U	11.1 U	11.1 U	10 U	11.2 U	11.1 U	9.6 U	9.9 U	10.6 U
HEXACHLOROBUTADIENE	9.8 U	11.1 U	11.1 U	10 U	11.2 U	11.1 U	9.6 U	9.9 U	10.6 U
HEXACHLOROCYCLOPENTADIENE	9.8 UJ	11.1 UJ	11.1 UJ	10 UJ	11.2 UJ	11.1 UJ	9.6 UJ	9.9 UJ	10.6 UJ
HEXACHLOROETHANE	9.8 U	11.1 U	11.1 U	10 U	11.2 U	11.1 U	9.6 U	9.9 U	10.6 U
INDENO(1,2,3-CD)PYRENE	9.8 U	11.1 U	11.1 U	10 U	11.2 U	11.1 U	9.6 U	9.9 U	10.6 U
ISOPHORONE	9.8 U	11.1 U	11.1 U	10 U	11.2 U	11.1 U	9.6 U	9.9 U	10.6 U
N-NITROSO-DI-N-PROPYLAMINE	9.8 U	11.1 U	11.1 U	10 U	11.2 U	11.1 U	9.6 U	9.9 U	10.6 U
NAPHTHALENE	9.8 U	2.3 J	4.9 J	10 U	11.2 U	11.1 U	9.6 U	9.9 U	10.6 U
NITROBENZENE	9.8 U	11.1 U	11.1 U	10 U	11.2 U	11.1 U	9.6 U	9.9 U	10.6 U
PENTACHLOROPHENOL	24.5 U	27.8 U	27.8 U	25 U	28.1 U	27.8 U	24 U	24.8 U	26.6 U
PHENANTHRENE	9.8 U	1.2 J	11.1 U	10 U	11.2 U	11.1 U	9.6 U	9.9 U	10.6 U
PHENOL	9.8 U	11.1 U	11.1 U	10 U	11.2 U	11.1 U	9.6 U	9.9 U	10.6 U
PYRENE	9.8 U	0.82 J	11.1 U	10 U	11.2 U	11.1 U	9.6 U	9.9 U	10.6 U
Pesticides/PCBs (ug/L)									
4,4'-DDD	0.074 J	7.1	1.6	0.017 J	7.8 U	0.11 U	0.064 J	0.11 U	0.038 R
4,4'-DDE	0.49 U	0.099 R	0.54 U	0.11 U	7.8 U	0.11 U	0.12 U	0.11 U	0.022 R
4,4'-DDT	0.22 J	0.82	0.58	0.059 J	3.3 J	0.11 U	0.080 J	0.053 J	0.058 J
ALDRIN	0.24 U	0.24 U	0.27 U	0.054 U	3.9 U	0.054 U	0.058 U	0.054 U	0.048 U
ALPHA-BHC	0.33	1	3.1	0.26	2.9 J	0.054 U	0.023 J	0.27 J	0.094 J
ALPHA-CHLORDANE	0.24 U	0.24 U	0.27 U	0.054 U	3.9 U	0.054 U	0.058 U	0.054 U	0.048 U
AROCLOR-1016	0.50 U	0.50 U	0.50 U	0.49 U	0.49 U	0.48 U	0.52 UJ	0.49 U	0.50 U
AROCLOR-1221	0.50 U	0.50 U	0.50 U	0.49 U	0.49 U	0.48 U	0.52 UJ	0.49 U	0.50 U
AROCLOR-1232	0.50 U	0.50 U	0.50 U	0.49 U	0.49 U	0.48 U	0.52 UJ	0.49 U	0.50 U
AROCLOR-1242	0.50 U	0.50 U	0.50 U	0.49 U	0.49 U	0.48 U	0.52 UJ	0.49 U	0.50 U
AROCLOR-1248	0.50 U	0.50 U	0.50 U	0.49 U	0.49 U	0.48 U	0.52 UJ	0.49 U	0.50 U
AROCLOR-1254	0.50 U	0.50 U	0.50 U	0.49 U	0.49 U	0.48 U	0.52 UJ	0.49 U	0.50 U
AROCLOR-1260	0.50 U	0.50 U	0.50 U	0.49 U	0.49 U	0.48 U	0.52 UJ	0.49 U	0.50 U
BETA-BHC	1.2	0.23 J	0.55	0.019 J	16 J	0.054 U	0.042 J	0.043 J	0.048 U
DELTA-BHC	2.3 J	2.5	3.2	0.25	47 J	0.054 U	0.14	0.41 J	0.039 J
DIELDRIN	0.49 U	0.49 U	0.54 U	0.11 U	7.8 U	0.11 U	0.12 U	0.11 U	0.096 U

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from q:\sql_server\parris_island\upload

order	**001**	**002**	**003**	**004**	**005**	**006**	**007**	**008**	**009**
round	2003Q3	2003Q3	2003Q3	2003Q3	2003Q3	2003Q3	2003Q3	2003Q3	2003Q3
location	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD
nsample	PAI-FOV-GW-01-01	PAI-FOV-GW-07-01	PAI-FOV-GW-08-01	PAI-FOV-GW-10-01	PAI-FOV-GW-11-01	PAI-FOV-GW-12-01	PAI-FOV-GW-13-01	PAI-FOV-GW-17-01	PAI-FOV-GW-18-01
sample	PA1-FOV-GW-01-01	PA1-FOV-GW-07-01	PA1-FOV-GW-08-01	PA1-FOV-GW-10-01	PA1-FOV-GW-11-01	PA1-FOV-GW-12-01	PA1-FOV-GW-13-01	PAI-FOV-GW-17-01	PAI-FOV-GW-18-01
matrix	GW	GW	GW	GW	GW	GW	GW	GW	GW
sacode	NORMAL	NORMAL	NORMAL	NORMAL	NORMAL	NORMAL	NORMAL	NORMAL	NORMAL
gis_date	20030709	20030709	20030709	20030709	20030710	20030710	20030710	20030711	20030711
sample_dat	07/09/03	07/09/03	07/09/03	07/09/03	07/10/03	07/10/03	07/10/03	07/11/03	07/11/03
validated	Y	Y	Y	Y	Y	Y	Y	Y	Y
cto_proj	N4211	N4211	N4211	N4211	N4211	N4211	N4211	N4211	N4211
proj_manag	SLADIC,M	SLADIC,M	SLADIC,M	SLADIC,M	SLADIC,M	SLADIC,M	SLADIC,M	SLADIC,M	SLADIC,M
sort	**c_001**	**c_002**	**c_003**	**c_004**	**c_005**	**c_006**	**c_007**	**c_008**	**c_009**
ENDOSULFAN I	0.24 U	0.24 U	0.27 U	0.054 U	3.9 U	0.054 U	0.058 U	0.054 U	0.048 U
ENDOSULFAN II	0.49 U	0.49 U	0.54 U	0.11 U	7.8 U	0.11 U	0.12 U	0.11 U	0.096 U
ENDOSULFAN SULFATE	0.49 U	0.49 U	0.54 U	0.11 U	7.8 U	0.11 U	0.12 U	0.11 U	0.096 U
ENDRIN	0.49 U	0.49 U	0.54 U	0.11 U	7.8 U	0.11 U	0.12 U	0.11 U	0.096 U
ENDRIN ALDEHYDE	0.49 U	0.49 U	0.54 U	0.11 U	7.8 U	0.11 U	0.12 U	0.11 U	0.096 U
ENDRIN KETONE	0.49 U	0.49 U	0.54 U	0.11 U	7.8 U	0.11 U	0.12 U	0.11 U	0.096 U
GAMMA-BHC (LINDANE)	0.24 U	0.13 J	0.44	0.054 U	3.9 U	0.054 U	0.019 J	0.21 J	0.048 U
GAMMA-CHLORDANE	0.24 U	0.24 U	0.27 U	0.054 U	3.9 U	0.054 U	0.058 U	0.054 U	0.048 U
HEPTACHLOR	0.24 U	0.24 U	0.27 U	0.054 U	3.9 U	0.054 U	0.058 U	0.054 U	0.048 U
HEPTACHLOR EPOXIDE	0.24 U	0.24 U	0.27 U	0.054 U	3.9 U	0.054 U	0.058 U	0.054 U	0.048 U
METHOXYCHLOR	2.4 U	2.4 U	2.7 U	0.54 U	39 U	0.54 U	0.58 U	0.54 U	0.48 U
TOXAPHENE	4.9 U	4.9 U	5.4 U	1.1 U	78 U	1.1 U	1.2 U	1.1 U	0.96 U

from fov_sam.dbf
from fov_res.dbf
from fov_res.xls
from q:\sql_server\parris_island\upload

order	010	011	012
round	2003Q3	2003Q3	2003Q3
location	TBD	TBD	TBD
nsample	PAI-FOV-GW-19-01	PAI-FOV-GW-20-01	PAI-FOV-GW-21-01
sample	PAI-FOV-GW-19-01	PA1-FOV-GW-20-01	PA1-FOV-GW-21-01
matrix	GW	GW	GW
sacode	NORMAL	NORMAL	NORMAL
gis_date	20030711	20030711	20030710
sample_dat	07/11/03	07/11/03	07/10/03
validated	Y	Y	Y
cto_proj	N4211	N4211	N4211
proj_manag	SLADIC,M	SLADIC,M	SLADIC,M
sort	**c_010**	**c_011**	**c_012**
Volatile Organics (ug/L)			
1,1,1-TRICHLOROETHANE	5 U	5 U	5 U
1,1,2,2-TETRACHLOROETHANE	5 U	5 U	5 U
1,1,2-TRICHLOROETHANE	5 U	5 U	5 U
1,1,2-TRICHLOROTRIFLUOROETHANE	5 U	5 U	5 U
1,1-DICHLOROETHANE	5 U	5 U	5 U
1,1-DICHLOROETHENE	5 U	5 U	5 U
1,2,4-TRICHLOROBENZENE	2 J	5 U	5 U
1,2-DIBROMO-3-CHLOROPROPANE	5 U	5 U	5 U
1,2-DIBROMOETHANE	5 U	5 U	5 U
1,2-DICHLOROBENZENE	10.9	0.74 J	5 U
1,2-DICHLOROETHANE	5 U	5 U	5 U
1,2-DICHLOROPROPANE	5 U	5 U	5 U
1,3-DICHLOROBENZENE	0.44 J	5 U	5 U
1,4-DICHLOROBENZENE	28.6	2.2 J	0.41 J
2-BUTANONE	5 U	5 U	5 U
2-HEXANONE	5 U	5 U	5 U
4-METHYL-2-PENTANONE	5 U	5 U	5 U
ACETONE	5 U	5 U	5 U
BENZENE	2.3 J	5 U	5 U
BROMODICHLOROMETHANE	5 U	5 U	5 U
BROMOFORM	5 UJ	5 UJ	5 UJ
BROMOMETHANE	5 U	5 U	5 U
CARBON DISULFIDE	5 U	5 U	5 U
CARBON TETRACHLORIDE	5 U	5 U	5 U
CHLOROBENZENE	479	15.7	2.6 J
CHLORODIBROMOMETHANE	5 UJ	5 UJ	5 UJ
CHLOROETHANE	5 U	5 U	5 U
CHLOROFORM	5 U	5 U	5 U
CHLOROMETHANE	5 U	5 U	5 U
CIS-1,2-DICHLOROETHENE	5 U	5 U	5 U
CIS-1,3-DICHLOROPROPENE	5 U	5 U	5 U
CYCLOHEXANE	5 U	5 U	5 U
DICHLORODIFLUOROMETHANE	5 U	5 U	5 U
ETHYLBENZENE	5 U	5 U	5 U
ISOPROPYLBENZENE	0.8 J	5 U	5 U
METHYL ACETATE	5 U	5 U	5 U
METHYL CYCLOHEXANE	5 U	5 U	5 U
METHYL TERT-BUTYL ETHER	5 U	5 U	5 U
METHYLENE CHLORIDE	5 U	5 U	5 U
STYRENE	5 U	5 U	5 U
TETRACHLOROETHENE	5 U	5 U	5 U
TOLUENE	5 U	5 U	5 U
TOTAL XYLENES	5 U	5 U	5 U

from fov_sam.dbf
from fov_res.dbf
from fov_res.xls
from q:\sql_server\parris_island\upload

order	010	011	012
round	2003Q3	2003Q3	2003Q3
location	TBD	TBD	TBD
nsample	PAI-FOV-GW-19-01	PAI-FOV-GW-20-01	PAI-FOV-GW-21-01
sample	PAI-FOV-GW-19-01	PA1-FOV-GW-20-01	PA1-FOV-GW-21-01
matrix	GW	GW	GW
sacode	NORMAL	NORMAL	NORMAL
gis_date	20030711	20030711	20030710
sample_dat	07/11/03	07/11/03	07/10/03
validated	Y	Y	Y
cto_proj	N4211	N4211	N4211
proj_manag	SLADIC,M	SLADIC,M	SLADIC,M
sort	**c_010**	**c_011**	**c_012**
TRANS-1,2-DICHLOROETHENE	5 U	5 U	5 U
TRANS-1,3-DICHLOROPROPENE	5 U	5 U	5 U
TRICHLOROETHENE	5 U	5 U	5 U
TRICHLOROFLUOROMETHANE	5 U	5 U	5 U
VINYL CHLORIDE	5 U	5 U	5 U
Semivolatile Organics (ug/L)			
1,1-BIPHENYL	1.7 J	11.4 U	10 U
2,2'-OXYBIS(1-CHLOROPROPANE)	11.1 U	11.4 U	10 U
2,4,5-TRICHLOROPHENOL	27.8 U	28.4 U	25 U
2,4,6-TRICHLOROPHENOL	11.1 U	11.4 U	10 U
2,4-DICHLOROPHENOL	11.1 U	11.4 U	10 U
2,4-DIMETHYLPHENOL	11.1 U	11.4 U	10 U
2,4-DINITROPHENOL	27.8 U	28.4 U	25 U
2,4-DINITROTOLUENE	11.1 U	11.4 U	10 U
2,6-DINITROTOLUENE	11.1 U	11.4 U	10 U
2-CHLORONAPHTHALENE	11.1 U	11.4 U	10 U
2-CHLOROPHENOL	11.1 U	11.4 U	10 U
2-METHYLNAPHTHALENE	11.1 U	11.4 U	10 U
2-METHYLPHENOL	11.1 U	11.4 U	10 U
2-NITROANILINE	27.8 U	28.4 U	25 U
2-NITROPHENOL	11.1 U	11.4 U	10 U
3&4-METHYLPHENOL	11.1 U	11.4 U	10 U
3,3'-DICHLOROBENZIDINE	11.1 U	11.4 U	10 U
3-NITROANILINE	27.8 U	28.4 U	25 U
4,6-DINITRO-2-METHYLPHENOL	27.8 U	28.4 U	25 U
4-BROMOPHENYL PHENYL ETHER	11.1 U	11.4 U	10 U
4-CHLORO-3-METHYLPHENOL	11.1 U	11.4 U	10 U
4-CHLOROANILINE	11.1 U	11.4 U	10 U
4-CHLOROPHENYL PHENYL ETHER	11.1 U	11.4 U	10 U
4-NITROANILINE	27.8 U	28.4 U	25 U
4-NITROPHENOL	27.8 U	28.4 U	25 U
ACENAPHTHENE	11.1 U	11.4 U	10 U
ACENAPHTHYLENE	11.1 U	11.4 U	10 U
ACETOPHENONE	11.1 U	11.4 U	10 U
ANTHRACENE	11.1 U	11.4 U	10 U
ATRAZINE	11.1 UR	11.4 UR	10 UR
BENZALDEHYDE	11.1 U	11.4 U	10 U
BENZO(A)ANTHRACENE	11.1 U	11.4 U	10 U
BENZO(A)PYRENE	11.1 U	11.4 U	10 U
BENZO(B)FLUORANTHENE	11.1 U	11.4 U	10 U
BENZO(G,H,I)PERYLENE	11.1 U	11.4 U	10 U
BENZO(K)FLUORANTHENE	11.1 U	11.4 U	10 U
BIS(2-CHLOROETHOXY)METHANE	11.1 U	11.4 U	10 U
BIS(2-CHLOROETHYL)ETHER	11.1 U	11.4 U	10 U

order	**010**	**011**	**012**
round	2003Q3	2003Q3	2003Q3
location	TBD	TBD	TBD
nsample	PAI-FOV-GW-19-01	PAI-FOV-GW-20-01	PAI-FOV-GW-21-01
sample	PAI-FOV-GW-19-01	PA1-FOV-GW-20-01	PA1-FOV-GW-21-01
matrix	GW	GW	GW
sacode	NORMAL	NORMAL	NORMAL
gis_date	20030711	20030711	20030710
sample_dat	07/11/03	07/11/03	07/10/03
validated	Y	Y	Y
cto_proj	N4211	N4211	N4211
proj_manag	SLADIC,M	SLADIC,M	SLADIC,M
sort	**c_010**	**c_011**	**c_012**
BIS(2-ETHYLHEXYL)PHTHALATE	11.1 U	11.4 U	10 U
BUTYL BENZYL PHTHALATE	11.1 U	11.4 U	10 U
CAPROLACTAM	1.1 U	4.2 J	5.4 J
CARBAZOLE	11.1 U	11.4 U	10 U
CHRYSENE	11.1 U	11.4 U	10 U
DI-N-BUTYL PHTHALATE	11.1 U	11.4 U	10 U
DI-N-OCTYL PHTHALATE	11.1 U	11.4 U	10 U
DIBENZO(A,H)ANTHRACENE	11.1 U	11.4 U	10 U
DIBENZOFURAN	0.47 J	11.4 U	10 U
DIETHYL PHTHALATE	11.1 U	11.4 U	10 U
DIMETHYL PHTHALATE	11.1 U	11.4 U	10 U
DIPHENYLAMINE	11.1 U	11.4 U	10 U
FLUORANTHENE	11.1 U	11.4 U	10 U
FLUORENE	11.1 U	11.4 U	10 U
HEXACHLOROBENZENE	11.1 U	11.4 U	10 U
HEXACHLOROBUTADIENE	11.1 U	11.4 U	10 U
HEXACHLOROCYCLOPENTADIENE	11.1 UJ	11.4 UJ	10 UJ
HEXACHLOROETHANE	11.1 U	11.4 U	10 U
INDENO(1,2,3-CD)PYRENE	11.1 U	11.4 U	10 U
ISOPHORONE	11.1 U	11.4 U	10 U
N-NITROSO-DI-N-PROPYLAMINE	11.1 U	11.4 U	10 U
NAPHTHALENE	11.1 U	11.4 U	10 U
NITROBENZENE	11.1 U	11.4 U	10 U
PENTACHLOROPHENOL	27.8 U	28.4 U	25 U
PHENANTHRENE	11.1 U	11.4 U	10 U
PHENOL	11.1 U	11.4 U	10 U
PYRENE	11.1 U	11.4 U	10 U
Pesticides/PCBs (ug/L)			
4,4'-DDD	4.3 U	0.039 J	0.55 U
4,4'-DDE	4.3 U	0.024 J	0.55 U
4,4'-DDT	4.3 U	0.058 J	0.21 J
ALDRIN	2.2 U	0.056 U	0.28 U
ALPHA-BHC	46 J	0.25	2.9
ALPHA-CHLORDANE	2.2 U	0.056 U	0.28 U
AROCLOR-1016	0.52 U	0.52 U	0.48 U
AROCLOR-1221	0.52 U	0.52 U	0.48 U
AROCLOR-1232	0.52 U	0.52 U	0.48 U
AROCLOR-1242	0.52 U	0.52 U	0.48 U
AROCLOR-1248	0.52 U	0.52 U	0.48 U
AROCLOR-1254	0.52 U	0.52 U	0.48 U
AROCLOR-1260	0.52 U	0.52 U	0.48 U
BETA-BHC	4.1 J	0.056 U	0.28 U
DELTA-BHC	41 J	0.056 U	0.43
DIELDRIN	4.3 U	0.11 U	0.55 U

order	**010**	**011**	**012**
round	2003Q3	2003Q3	2003Q3
location	TBD	TBD	TBD
nsample	PAI-FOV-GW-19-01	PAI-FOV-GW-20-01	PAI-FOV-GW-21-01
sample	PAI-FOV-GW-19-01	PA1-FOV-GW-20-01	PA1-FOV-GW-21-01
matrix	GW	GW	GW
sacode	NORMAL	NORMAL	NORMAL
gis_date	20030711	20030711	20030710
sample_dat	07/11/03	07/11/03	07/10/03
validated	Y	Y	Y
cto_proj	N4211	N4211	N4211
proj_manag	SLADIC,M	SLADIC,M	SLADIC,M
sort	**c_010**	**c_011**	**c_012**
ENDOSULFAN I	2.2 U	0.056 U	0.28 U
ENDOSULFAN II	4.3 U	0.11 U	0.55 U
ENDOSULFAN SULFATE	4.3 U	0.11 U	0.55 U
ENDRIN	4.3 U	0.11 U	0.55 U
ENDRIN ALDEHYDE	4.3 U	0.11 U	0.55 U
ENDRIN KETONE	4.3 U	0.11 U	0.55 U
GAMMA-BHC (LINDANE)	27 J	0.056 U	0.28 U
GAMMA-CHLORDANE	2.2 U	0.056 U	0.28 U
HEPTACHLOR	2.2 U	0.056 U	0.28 U
HEPTACHLOR EPOXIDE	2.2 U	0.056 U	0.28 U
METHOXYCHLOR	22 U	0.56 U	2.8 U
TOXAPHENE	43 U	1.1 U	5.5 U

APPENDIX B

DATA VALIDATION LETTERS

Tetra Tech NUS **INTERNAL CORRESPONDENCE**

TO:	**M. SLADIC**	**DATE:**	**OCTOBER 9, 2003**
FROM:	**BERNARD F SPADA III**	**COPIES:**	**DV FILE**

SUBJECT: **ORGANIC DATA VALIDATION- VOC/SVOC/PEST/PCB**
CTO 236, MCRD PARRIS ISLAND
SDG 83846

SAMPLES: 4/Aqueous

PAI-FOV-GW-01-01 PAI-FOV-GW-07-01 PAI-FOV-GW-08-01
PAI-FOV-GW-10-01

OVERVIEW

The sample set for CTO 236 MCRD Parris Island, SDG 83846 consists of four (4) environmental aqueous samples. All samples were analyzed for volatile organic compounds (VOC), semivolatile organic compounds (SVOC), pesticides (PEST), and polychlorinated biphenyls (PCB).

The samples were collected by Tetra Tech NUS on July 9, 2003 and analyzed by General Engineering Laboratories. All analyses were conducted in accordance with Naval Facilities Engineering Service Center (NFESC) Quality Assurance/Quality Control (QA/QC) criteria using SW-846 Method 8260B, 8270C, 8081A, and 8082 analytical and reporting protocols. The data contained in this SDG were validated with regard to the following parameters:

- Data completeness
- * Holding times
- * GC/MS tuning and system performance
- Initial/continuing calibrations
- * Laboratory method and field quality control blank results
- * Surrogate spike recoveries
- * Blank Spike/Blank Spike Duplicate Results
- * Matrix Spike/Matrix Spike Duplicate Results
- * Internal Standard Performance
- * Compound Identification
- * Compound Quantitation
- Detection Limits

The symbol (*) indicates that all quality control criteria were met for this parameter. Problems affecting data quality are discussed below; documentation supporting these findings is presented in Appendix C. Qualified Analytical results are presented in Appendix A. Results as reported by the laboratory are presented in Appendix B.

Volatile

The continuing calibration performed on July 11 at 07:32 exceeded the 25% difference quality control criteria for trichlorofluoromethane. The results for trichlorofluoromethane were qualified as estimated (UJ) in all samples.

Acetone was qualified as estimated (J) in sample PAI-FOV-GW-01-01 because it is a suspected laboratory contaminant.

Semivolatile

The continuing calibration performed on the MSD8 instrument on July 11 at 19:27 exceeded the 25% difference quality control criteria for hexachlorocyclopentadiene. The results for hexachlorocyclopentadiene were qualified as estimated (UJ) in all samples except PAI-FOV-GW-10-01.

The continuing calibration performed on the MSD8 instrument on July 11 at 19:48 was below the 0.05 RRF quality control criteria for atrazine. The results for atrazine were rejected (UR) in all samples except PAI-FOV-GW-10-01.

The continuing calibration performed on the MSD5 instrument on July 15 at 19:15 exceeded the 25% difference quality control criteria for hexachlorocyclopentadiene. The result for hexachlorocyclopentadiene was qualified as estimated (UJ) in sample PAI-FOV-GW-10-01.

The continuing calibration performed on the MSD5 instrument on July 15 at 19:35 was below the 0.05 RRF quality control criteria for atrazine. The result for atrazine was rejected (UR) in sample PAI-FOV-GW-10-01.

The lab file IDs listed on the DFTPP tune report Form V do not match the initial calibration data summary. The validator verified that the initial calibration summary was derived from the correct data by calculating the RRF for pyridine at Level 3 (20 ug/L) using the raw data submitted.

Caprolactam was missing from the EDD for sample PAI-FOV-GW-01-01. The result from the Form I was added to the database.

Pesticides/PCBs

The positive results on the Form I's did not match the EDD. The laboratory was requested to re-submit the EDD with results consistent with the Form I's.

The continuing calibration performed on July 16 at 23:36 exceeded the 15% difference quality control criteria for several compounds on the CLP-2 column. No qualifications were made on this basis because the CLP-1 column was compliant.

Sample PAI-FOV-GW-07-01 exceeded the 15% (and was >100%) difference quality control criteria for 4,4'-DDE. The result for 4,4'-DDE was rejected (R) in sample PAI-FOV-GW-07-01.

Sample PAI-FOV-GW-01-01 exceeded the 25% difference between analytical columns quality control criteria for delta-BHC, and 4,4'-DDD. The results for the aforementioned compounds were qualified as estimated (J).

Sample PAI-FOV-GW-07-01 exceeded the 25% difference between analytical columns quality control criteria for beta-BHC and 4,4'-DDE. The result for beta-BHC was qualified as estimated (J). The result for 4,4'-DDE was rejected (R) because the difference was >100%.

The laboratory reported the pesticide/PCB results to three significant figures. The validation program rounded the results to two significant figures.

Additional Comments

The laboratory did not submit a full data package including raw data as requested in the statement of work. This made it impossible to complete a full data review as was requested with this project. The laboratory was requested to re-submit the data package including the raw data. The laboratory re-submitted the data upon request.

Pesticide results were inconsistently reported. Some samples had the higher value reported and some had the lower value reported. The EDD and Form I also had inconsistent results. The reviewer corrected the results to show only the higher of the two values.

The laboratory did not analyze the complete list of analytes requested in the statement of work. Caprolactam was missing from the SVOC list and methyl acetate was missing from the VOC list. The laboratory was requested to re-quantitate and re-submit the data. The laboratory sent pdf copies of Form Is via e-mail but did not send corresponding EDDs. The re-submitted Form Is were missing one page of two SVOC samples and the VOC method blank. The validator did not request the laboratory to submit the missing pages from the SVOC samples because the pages that were included contained the missing compound (caprolactam). The validator included the incomplete re-submitted Form Is with the original Form Is for these two SVOC samples (PAI-FOV-GW-08-01 and PAI-FOV-GW-10-01). The validator requested the laboratory to send the updated EDDs. The laboratory sent the updated EDDs upon request.

The laboratory was extremely slow and unorganized in responding to requests from the validator causing great delay and extended time for validation of the data. Every time the laboratory was sent a list of items to correct only one item was corrected at a time with no update on the remaining items causing the validator to constantly request the remaining items on the list.

Positive results below the reporting limit were qualified as estimated (J) due to uncertainty near the detection limit.

EXECUTIVE SUMMARY

Laboratory Performance Issues: Qualifications were made based on calibration non-compliances and percent difference between analytical columns.

Other Factors Affecting Data Quality: None.

The data for these analyses were reviewed with reference to the EPA Functional Guidelines for Organic Data Validation (10/99), and the NFESC guidelines "Navy Installation Restoration Program Laboratory Quality Assurance Guide" (September, 1999). The text of this report has been formulated to address only those problem areas affecting data quality.

"I attest that the data referenced herein were validated according to the agreed upon validation criteria as specified in the NFESC guidelines and the Quality Assurance Project Plan (QAPP)."

Tetra Tech NUS
Bernard F Spada III
Chemist/Data Validator

TetraTech NUS
Joseph A. Samchuck
Data Validation Quality Assurance Officer

Attachments:

1. Appendix A - Qualified Analytical Results
2. Appendix B - Results as Reported by the Laboratory
3. Appendix C - Support Documentation

Tetra Tech NUS **INTERNAL CORRESPONDENCE**

TO:	**M. SLADIC**	**DATE:**	**OCTOBER 9, 2003**
FROM:	**SETH C. STAFFEN**	**COPIES:**	**DV FILE**

SUBJECT: **ORGANIC DATA VALIDATION- VOA/SVOA/PEST/PCB**
CTO 236, MCRD PARRIS ISLAND
SDG: 83947

SAMPLES: 5/Aqueous/VOA/SVOA/PEST/PCB

PAI-FOV-GW-11-01	PAI-FOV-GW-12-01	PAI-FOV-GW-13-01
PAI-FOV-GW-20-01	PAI-FOV-GW-21-01	

OVERVIEW

The sample set for CTO 236 MCRD Parris Island, SDG 83947, consists of five (5) aqueous environmental samples. The samples were analyzed for TCL volatile organic compounds (VOA), TCL semivolatile organic compounds (SVOA), TCL pesticides (PEST), and polychlorinated biphenyl (PCB). No field duplicate pairs were included in this SDG.

The samples were collected by Tetra Tech NUS on July 10th and 11th, 2003 and analyzed by General Engineering Laboratories. All analyses were conducted in accordance with Naval Facilities Engineering Service Center (NFESC) Quality Assurance/Quality Control (QA/QC) criteria using SW-846 Methods 8260B, 8270C, 8081A, and 8082 analysis and reporting protocols. The data contained in this SDG were validated with regard to the following parameters:

- Data completeness
- * Holding times
- * GC/MS Tuning
- Initial and continuing calibration
- * Blank results
- Surrogate spike recoveries
- * Internal standard recoveries
- * Blank Spike/Blank Spike Duplicate Results
- Matrix Spike/Matrix Spike Duplicate Results
- Detection Limits
- * Compound Quantitation
- * Compound Identification

The symbol (*) indicates that all quality control criteria were met for this parameter. Problems affecting data quality are discussed below; documentation supporting these findings is presented in Appendix C. Qualified Analytical results are presented in Appendix A. Results as reported by the laboratory are presented in Appendix B.

VOLATILE

The continuing calibration on 7/18/03 at 1019 contained percent differences (%Ds) that exceeded the 25% quality control limit for bromoform and dibromochloromethane. The nondetected results for bromoform and dibromochloromethane were qualified as estimated, UJ, in the associated samples.

The continuing calibration on 7/21/03 at 0742 contained a %D that exceeded the 25% quality control limit for dibromodifluoromethane. The nondetected result for dibromodifluoromethane was qualified as estimated, UJ, in the associated sample.

The continuing calibration on 7/23/03 at 0634 contained %Ds that exceeded the 25% quality control limit for acetone, bromoform, and dibromochloromethane. The nondetected results for acetone, bromoform, and dibromochloromethane were qualified as estimated, UJ, in the associated sample.

The matrix spike duplicate (MSD) %RPD exceeded the quality control limit for chlorobenzene. No qualification action was taken on the unspiked sample PAI-FOV-GW-12-01.

The linear calibration range of the instrument was exceeded by chlorobenzene in sample PAI-FOV-GW-12-01. The result for chlorobenzene was transposed over from the 5X dilution analysis and used for data validation purposes. The other compounds were reported from the undiluted analysis. No qualification action was taken.

SEMIVOLATILE

The continuing calibration on 7/15/03 at 1935 contained relative response factors (RRFs) that were less than the 0.05 quality control limit for atrazine. The nondetected results for atrazine were rejected, UR, in all samples.

The continuing calibration on 7/15/03 at 1915 contained a percent difference (%D) that exceeded the 25% quality control limit for hexachlorocyclopentadiene. The nondetected results for hexachlorocyclopentadiene were qualified as estimated, UJ, in all samples.

Despite the absence of bis(2-ethylhexyl)phthalate in the laboratory method blank, phthalates are common laboratory contaminants. Therefore, the presence of bis(2-ethylhexyl)phthalate in environmental samples is a possible laboratory contaminant. Positive results were qualified as estimated, J.

The laboratory file IDs listed on the DFTPP tune report Form V did not match the initial calibration data summary. The validator verified that the initial calibration summary was derived from the correct data by calculating the RRF for isophorone at Levels 2 (10 ug/L) and 3 (20 ug/L) using the raw data submitted.

Bis(2-ethylhexyl)phthalate was not reported in the EDD for samples PAI-FOV-GW-11-01 and PAI-FOV-GW-12-01.

PESTICIDES

The continuing calibration on 7/21/03 at 1739 contained %Ds that exceeded the 15% quality control limit for a-BHC, b-BHC, d-BHC, g-BHC, aldrin, heptachlor epoxide, Endosulfan I, 4,4'-DDE, 4,4'-DDD, g-chlordane, and a-chlordane on column CLP-1. No qualification action was taken because column CLP-2 was compliant.

The continuing calibration on 7/21/03 at 2045 contained a %D that exceeded the 15% quality control limit for methoxychlor on column CLP-2. No qualification action was taken because column CLP-1 was compliant.

The continuing calibration on 7/21/03 at 2220 contained %Ds that exceeded the 15% quality control limit for d-BHC and methoxychlor on column CLP-2. No qualification action was taken because column CLP-1 was compliant and all results for the previously mentioned compounds were nondetected.

The continuing calibration on 7/31/03 at 1610 contained %Ds that exceeded the 15% quality control limit for heptachlor, aldrin, heptachlor epoxide, endrin, endosulfan I, endosulfan II, 4,4'-DDD, endosulfan sulfate, endrin ketone, endrin aldehyde, and a-chlordane on column CLP-2. The positive result for 4,4'-DDD was qualified as estimated, J, in sample PAI-FOV-GW-20-01 because the result was reported from column CLP-2. No qualification action was taken on the remaining compounds because column CLP-1 was compliant and these results were reported from column CLP-1.

The continuing calibration on 7/31/03 at 1713 contained %Ds that exceeded the 15% quality control limit for b-BHC, heptachlor, heptachlor epoxide, endosulfan I, endrin, endosulfan II, 4,4'-DDD, endosulfan sulfate, endrin ketone, endrin aldehyde, and a-chlordane on column CLP-2. The positive result for 4,4'-DDD was qualified as estimated, J, in sample PAI-FOV-GW-20-01 because the result was reported from column CLP-2. No qualification action was taken on the remaining compounds because column CLP-1 was compliant and these results were reported from column CLP-1.

The continuing calibration on 8/04/03 at 0945 contained a %D that exceeded the 15% quality control limit for endrin ketone on column CLP-1. No qualification action was taken because column CLP-2 was compliant and all results for the previously mentioned compounds were nondetected.

The continuing calibration on 8/04/03 at 1103 contained %Ds that exceeded the 15% quality control limit for heptachlor epoxide, endrin ketone, and a-chlordane on column CLP-2. No qualification action was taken because column CLP-1 was compliant and all results for the previously mentioned compounds were nondetected.

The surrogate recovery of TCX (Tetrachloro-m-xylene), on column CLP-1, exceeded the upper quality control limit in sample PBLK01. No qualification action was taken on a quality control sample.

The following compounds exceeded the 25% or 100% quality control limits for percent difference between analytical columns. Positive results greater than 25% but <100% were qualified as estimated, J.

Sample	Compound	%D	Qualifier
PAI-FOV-GW-11-01	a-BHC	26.1	J
	b-BHC	44.6	J
PAI-FOV-GW-13-01	a-BHC	52.3	J
	4,4'-DDD	55.8	J
PAI-FOV-GW-20-01	4,4'-DDE	95.1	J
	4,4'-DDD	98.0	J

Sample PAI-FOV-GW-11-01 was analyzed at an 80X-dilution. The dilution caused elevated reporting limits.

Sample PAI-FOV-GW-21-01 was analyzed at a 5X-dilution. The dilution caused elevated reporting limits.

The Form Is for the pesticides did not display the result reported in the EDD. The laboratory reported both high and low results.

PCB

The surrogate recovery of decachlorobiphenyl (DCB) fell below the lower quality control limit on both columns for sample PAI-FOV-GW-13-01. The sample was re-extracted outside of quality control holding time. Therefore, the original analysis was used for data validation purposes. Nondetected results in sample PAI-FOV-GW-13-01 were qualified as estimated, UJ, because DCB was out on both columns and DCB is more representative of PCBs than TCX.

Additional Comments

Positive results below the quantitation limit were qualified as estimated, J, due to uncertainty near the detection limit.

The laboratory reported the pesticide/PCB results to three significant figures. The validation program rounded the results to two significant figures. No qualification action was taken on this basis.

The original data package submitted by the laboratory was missing all of the raw data, chromatographs, and quantitation reports for all three fractions. The original data package consisted of only summary forms. The laboratory was contacted and resubmitted a complete data package including all missing data on 8/26/03.

The laboratory did not report results for volatile - methyl acetate and semivolatile - caprolactam in the original or the re-submitted data package. Even though it was requested by the data validator prior to the re-submittal of data on 8/26/03. Methyl acetate and caprolactam were listed as a target compounds in the laboratory statement of work but were not included on the Form Is or EDDs. The laboratory re-submitted corrected Form Is on 9/11/03 and re-submitted the updated EDD on 9/17/03.

The laboratory was extremely slow and unorganized in responding to requests from the data validator causing great delay and extended time for validation of the data. Every time the laboratory was sent a list of items to correct only one item was corrected at a time with no update on the remaining items causing the data validator to constantly request the remaining items on the list.

The sample ids on the Form Is were identified as "PA1". The correct nomenclature is "PAI" The EDD was changed to reflect the appropriate sample id nomenclature.

EXECUTIVE SUMMARY

Laboratory Performance Issues: Several initial and/or continuing calibrations did not met calibration criteria. Bis(2-ethylhexyl)phthalate was detected in the laboratory method blank. Percent difference between column criteria was not met in the pesticide fraction. The laboratory did not submit a complete data package. The laboratory did not submit results for all target compounds requested. Pesticide results were reported inconsistently.

Other Factors Affecting Data Quality: None.

The data for these analyses were reviewed with reference to the EPA Functional Guidelines for Organic Data Validation (October 1999) and the NFESC guidelines "Navy IRCDQM" (September 1999). The text of this report has been formulated to address only those problem areas affecting data quality.

"I attest that the data referenced herein were validated according to the agreed upon validation criteria as specified in the NFESC guidelines and the Quality Assurance Project Plan (QAPP)."

Seth C. Staffen

Environmental Scientist/Data Validator
Tetra Tech NUS

Joseph A. Samchuck

Data Validation Quality Assurance Officer
TetraTech NUS

Attachments:

1. Appendix A - Qualified Analytical Results
2. Appendix B - Results as Reported by the Laboratory
3. Appendix C - Support Documentation

Tetra Tech NUS **INTERNAL CORRESPONDENCE**

TO:	**M. SLADIC**	**DATE:**	**OCTOBER 14, 2003**
FROM:	**SETH C. STAFFEN**	**COPIES:**	**DV FILE**

SUBJECT: **ORGANIC DATA VALIDATION- VOA/SVOA/PEST/PCB**
CTO 236, MCRD PARRIS ISLAND
SDG: 84003

SAMPLES: 3/Aqueous/VOA/SVOA/PEST/PCB

PAI-FOV-GW-17-01 PAI-FOV-GW-18-01 PAI-FOV-GW-19-01

OVERVIEW

The sample set for CTO 236 MCRD Parris Island, SDG 84003, consists of three (3) aqueous environmental samples. The samples were analyzed for TCL volatile organic compounds (VOA), TCL semivolatile organic compounds (SVOA), TCL pesticides (PEST), and polychlorinated biphenyl (PCB). No field duplicate pairs were included in this SDG.

The samples were collected by Tetra Tech NUS on July 11th, 2003 and analyzed by General Engineering Laboratories. All analyses were conducted in accordance with Naval Facilities Engineering Service Center (NFESC) Quality Assurance/Quality Control (QA/QC) criteria using SW-846 Methods 8260B, 8270C, 8081A, and 8082 analysis and reporting protocols. The data contained in this SDG were validated with regard to the following parameters:

- Data completeness
- * Holding times
- * GC/MS Tuning
- Initial and continuing calibration
- Blank results
- Surrogate spike recoveries
- * Internal standard recoveries
- * Blank Spike/Blank Spike Duplicate Results
- * Matrix Spike/Matrix Spike Duplicate Results
- Detection Limits
- * Compound Quantitation
- Compound Identification

The symbol (*) indicates that all quality control criteria were met for this parameter. Problems affecting data quality are discussed below; documentation supporting these findings is presented in Appendix C. Qualified Analytical results are presented in Appendix A. Results as reported by the laboratory are presented in Appendix B.

VOLATILE

The continuing calibration on 7/18/03 at 1019 contained percent differences (%Ds) that exceeded the 25% quality control limit for bromoform and dibromochloromethane. The nondetected results for bromoform and dibromochloromethane were qualified as estimated, UJ, in all samples.

The matrix spike duplicate (MSD) and %RPD exceeded the quality control limits for chlorobenzene. No qualification action was taken because the MS/MSD sample was not part of this SDG.

The linear calibration range of the instrument was exceeded by chlorobenzene in sample PAI-FOV-GW-19-01. The result for chlorobenzene was transposed over from the 10X dilution analysis and used for data validation purposes. The other compounds were reported from the undiluted analysis. No qualification action was taken.

SEMIVOLATILE

The following compound was detected in the laboratory method blank at the maximum concentration indicated below:

Compound	Concentration	Action Level
Bis(2-ethylhexyl) phthalate	2.9 µg/L	29 µg/L

Blank Actions

- Value < Reporting Limit (RL); report RL followed by a U.
- Value > RL and < Action level; report value followed by a U.
- Value > RL and > Action level; report value unqualified.

An action level of 10X (common phthalates) the maximum contaminant concentration was established to evaluate laboratory contamination. Dilution factors and sample aliquots were taken into consideration during the application of all action levels. Bis(2-ethylhexyl)phthalate was qualified as , U, nondetected in the environmental samples.

The continuing calibrations on 7/15/03 at 1935 and 7/18/03 at 1957 contained relative response factors (RRFs) that were less than the 0.05 quality control limit for atrazine. The nondetected results for atrazine were rejected, UR, in the associated samples.

The continuing calibration on 7/15/03 at 1915 contained a percent difference (%D) that exceeded the 25% quality control limit for hexachlorocyclopentadiene. The nondetected results for hexachlorocyclopentadiene were qualified as estimated, UJ, in the associated samples.

The continuing calibration on 7/18/03 at 1957 contained percent differences (%Ds) that exceeded the 25% quality control limit for hexachlorocyclopentadiene and carbazole. The nondetected results for hexachlorocyclopentadiene and carbazole were qualified as estimated, UJ, in sample PAI-FOV-GW-17-01.

The laboratory file IDs listed on the DFTPP tune report Form V did not match the initial calibration data summary. The validator verified that the initial calibration summary was derived from the correct data by calculating the RRF for isophorone at Levels 2 (10 ug/L) and 3 (20 ug/L) using the raw data submitted.

PESTICIDES

The continuing calibration on 08/4/03 at 0945 contained a %D that exceeded the 15% quality control limit for endrin ketone on column CLP-1. No qualification action was taken because column CLP-2 was complaint and the result for the aforementioned compound was nondetect.

The continuing calibration on 08/4/03 at 1103 contained %Ds that exceeded the 15% quality control limit for heptachlor epoxide, endrin ketone, and a-chlordane on column CLP-2. No qualification action was taken because column CLP-1 was complaint and all results for the aforementioned compounds were nondetects.

The continuing calibration on 08/4/03 at 1334 contained %Ds that exceeded the 15% quality control limit for 4,4'-DDT on column CLP-1 and endosulfan sulfate on column CLP-2. No qualification action was taken because the other column was compliant and all results for the aforementioned compounds were nondetects.

The continuing calibration on 08/5/03 at 0941 contained a %D that exceeded the 15% quality control limit for 4,4'-DDD on column CLP-2. No qualification action was taken because in sample PAI-FOV-GW-17-01 the result was nondetect and in sample PAI-FOV-GW-18-01 the result was rejected for a more severe noncompliance.

The surrogate recovery of TCX (Tetrachloro-m-xylene), on column CLP-1, exceeded the upper quality control limit in samples PAI-FOV-GW-17-01 and PAI-FOV-GW-19-01. Positive results reported from column CLP-1 were qualified as estimated, J.

The following compounds exceeded the 25% or 100% quality control limits for percent difference between analytical columns. Positive results greater than 25% but <100% were qualified as estimated, J, and positive results greater than 100% were rejected, UR:

Sample	Compound	%D	Qualifier
PAI-FOV-GW-17-01	a-BHC	53.1	J
	b-BHC	44.3	J
	g-BHC	30.0	J
PAI-FOV-GW-18-01	a-BHC	84.2	J
	d-BHC	33.7	J
	4,4'-DDE	193.7	R
	4,4'-DDD	117.3	R

Sample PAI-FOV-GW-19-01 was analyzed at a 40X dilution. The dilution caused elevated reporting limits.

The laboratory reported positive results from both columns and the higher result was used.

PCB

All quality control parameters were met for this fraction.

Additional Comments

Positive results below the quantitation limit were qualified as estimated, J, due to uncertainty near the detection limit.

The laboratory reported the pesticide/PCB results to three significant figures. The validation program rounded the results to two significant figures. No qualification action was taken on this basis.

The original data package submitted by the laboratory was missing all of the raw data, chromatographs, and quantitation reports for all three fractions. The original data package consisted of only summary forms. The laboratory was contacted and resubmitted a complete data package including all missing data on 8/26/03.

The laboratory did not report results for volatile - methyl acetate and semivolatile - caprolactam in the original or the re-submitted data package. Even though it was requested by the data validator prior to the re-submittal of data on 8/26/03. Methyl acetate and caprolactam were listed as a target compounds in the laboratory statement of work but were not included on the Form Is or EDDs. The laboratory re-submitted corrected Form Is on 9/11/03 and re-submitted the updated EDD on 9/17/03.

The laboratory was extremely slow and unorganized in responding to requests from the data validator causing great delay and extended time for validation of the data. Every time the laboratory was sent a list of items to correct only one item was corrected at a time with no update on the remaining items causing the data validator to constantly request the remaining items on the list.

EXECUTIVE SUMMARY

Laboratory Performance Issues: Several initial and/or continuing calibrations did not met calibration criteria. Bis(2-ethylhexyl)phthalate was detected in the laboratory method blank. Percent difference between column criteria was not met in the pesticide fraction. The laboratory did not submit a complete data package. The laboratory did not submit results for all target compounds requested.

Other Factors Affecting Data Quality: None.

The data for these analyses were reviewed with reference to the EPA Functional Guidelines for Organic Data Validation (October 1999) and the NFESC guidelines "Navy IRCDQM" (September 1999). The text of this report has been formulated to address only those problem areas affecting data quality.

"I attest that the data referenced herein were validated according to the agreed upon validation criteria as specified in the NFESC guidelines and the Quality Assurance Project Plan (QAPP)."

Seth C. Staffen

Environmental Scientist/Data Validator
Tetra Tech NUS

Joseph A. Samchuck

Data Validation Quality Assurance Officer
TetraTech NUS

Attachments:

1. Appendix A - Qualified Analytical Results
2. Appendix B - Results as Reported by the Laboratory
3. Appendix C - Support Documentation

APPENDIX C

SITE PHOTOGRAPHS

View to the east with Fiber Optic Vault manhole, marked utilities (orange pin flags), DPT borings (pink pin flags), and P1 (piezometer 1) at 1” PVC stickup. July 2002.

View to the west with Fiber Optic Vault manhole in center of photo. July 2002.

View to the southwest showing Fiber Optic Vault, marked utilities, and DPT borings. July 2002.

View to the northeast on west side of Building 852 at FMP06/FDP06 (pink pin flag). July 2002.

View to the north looking at Building 450. July 2002.

View to the south at former parade deck area. July 2002.

View to the west at former parade deck area (present scrap storage area). July 2002.

View to the east looking at former parade deck area. July 2002.

View to the north looking at open area and Building 852 (Public Works building). July 2002.

View to the north showing Buildings 401 (pesticide mixing building, right of photo) and 852 (Public Works, left of photo). July 2002.

View in the vault after pumping out. March 2003.

APPENDIX D

FIELD FORMS

D-1 CHAIN OF CUSTODY RECORDS

D-2 SOIL BORING LOGS

D-3 MONITORING WELL CONSTRUCTION SHEETS

D-4 GROUNDWATER SAMPLE LOG SHEETS

D-5 WELL PERMITS

Page: 1 of 1
Project #: N4211
GEL Quote #:
COC Number (1):
PO Number:

GEL Chain of Custody and Analytical Request

General Engineering Laboratories, LLC
2040 Savage Road
Charleston, SC 29407
Phone: (843) 556-8171
Fax: (843) 766-1178

Client Name: Tetra Tech NUS
Phone #: (412) 921-8216
Fax #: (412) 921-8850
Project/Site Name: Fiber Optic Vault /MCRD Parris Island
Address: Pittsburgh, PA
Collected by: Jason Bergeron
Send Results To: Mark Sladic

Sample Analysis Requested (5) (Fill in the number of containers for each test)

	Sample ID 83846%	Date Collected (mm-dd-yy)	Time Collected (Military) (hhmm)	QC Code (2)	Field Filtered (3)	Sample Matrix (4)	Radioactive	TSCA Regulated	Total number of containers	TCL VOA	SVOC	Pesticides	PCBs								<-- Preservative Type (6)
							Should this sample be considered:			HCl	1	1	1								2003074739
001	PAI-FOV-GW-01-01	7/9/3	1520	N	N	GW	N	N	7	3	2	1	1								Comments Note: extra sample is required for sample specific QC
002	PAI-FOV-GW-10-01	"	1945	N	N	"	N	N	7	3	2	1	1								
003	PAI-FOV-GW-07-01	"	1710	N	N	"	N	N	7	3	2	1	1								
004	PAI-FOV-GW-08-01	"	1820	N	N	"	N	N	7	3	2	1	1								

TAT Requested: Normal: _____ Rush: _____ Specify: _____ (Subject to Surcharge) | Fax Results: Yes / No | Circle Deliverable: C of A / QC Summary / Level 1 / Level 2 / Level 3 / Level 4

Remarks: *Are there any known hazards applicable to these samples? If so, please list the hazards*

Chain of Custody Signatures

Relinquished By (Signed)	Date	Time	Received by (signed)	Date	Time
1	7/9/3	1230	1 Lindy Reynolds	7/10/03	1230
2 Lindy Reynolds	7/10/03	1355	2	7/10/03	1345
3			3		

Sample Shipping and Delivery Details

GEL PM:
Method of Shipment: Date Shipped:
Airbill #:
Airbill #:

1.) Chain of Custody Number = Client Determined
2.) QC Codes: N = Normal Sample, TB = Trip Blank, FD = Field Duplicate, EB = Equipment Blank, MS = Matrix Spike Sample, MSD = Matrix Spike Duplicate Sample, G = Grab, C = Composite
3.) Field Filtered: For liquid matrices, indicate with a - Y - for yes the sample was field filtered or - N - for sample was not field filtered.
4.) Matrix Codes: DW = Drinking Water, GW = Groundwater, SW = Surface Water, WW = Waste Water, W = Water, SO = Soil, SD = Sediment, SL = Sludge, SS = Solid Waste, O = Oil, F = Filter, P = Wipe, U = Urine, F = Fecal, N = Nasal
5.) Sample Analysis Requested: Analytical method requested (i.e. 8260B, 6010B/7470A) and number of containers provided for each (i.e. *8260B* - 3, *6010B/7470A* - 1).
6.) Preservative Type: HA = Hydrochloric Acid, NI = Nitric Acid, SH = Sodium Hydroxide, SA = Sulfuric Acid, AA = Ascorbic Acid, HX = Hexane, ST = Sodium Thiosulfate, If no preservative is added = leave field blank

For Lab Receiving Use Only
Custody Seal Intact? YES NO
Cooler Temp: 4 C

WHITE = LABORATORY YELLOW = FILE PINK = CLIENT

Page: 1 of 1
Project #: N4211 CTO 236
GEL Quote #:
COC Number [1]:
PO Number:

GEL Chain of Custody and Analytical Request

20030747543

General Engineering Laboratories, LLC
2040 Savage Road
Charleston, SC 29407
Phone: (843) 556-8171
Fax: (843) 766-1178

Client Name: Tetra Tech NUS
Phone #: (412) 921-8216
Project/Site Name: Fiber Optic Vault / MCRD Parris Island
Fax #: (412) 921-6350
Address: Pittsburgh, PA
Collected by: Jason Bourgeois
Send Results To: Mark Sladic

Sample Analysis Requested [5] (Fill in the number of containers for each test)

	Sample ID 83947%	Date Collected (mm-dd-yy)	Time Collected (Military) (hhmm)	QC Code [2]	Field Filtered [3]	Sample Matrix [4]	Should this sample be considered: Radioactive	TSCA Regulated	Total number of containers	TCL VOA	SVOC	Pest	PCB							<-- Preservative Type (6)	Comments Note: extra sample is required for sample specific QC
										HCl	1	1	1								
001	PAI-FOV-GW-12-01	7-10-3	1845	N	N	GW	N	N	7	3	2	1	1								
002	PAI-FOV-GW-11-01		1710	N	N		N	N	7	3	2	1	1								
003	PAI-FOV-GW-13-01		1620	N	N		N	N	7	3	2	1	1								
004	PAI-FOV-GW-21-01		1450	N	N		N	N	7	3	2	1	1								
005	PAI-FOV-GW-20-01	7-11-3	0910	N	N	GW	N	N	7	3	2	1	1								

TAT Requested: Normal: _____ Rush: _____ Specify: _____ (Subject to Surcharge) | Fax Results: Yes / No | Circle Deliverable: C of A / QC Summary / Level 1 / Level 2 / Level 3 / Level 4

Remarks: *Are there any known hazards applicable to these samples? If so, please list the hazards*

Chain of Custody Signatures

Relinquished By (Signed)	Date	Time	Received by (signed)	Date	Time
1	12/11/3	1410	Octavia Williams	7/11/03	14:10
2			2		
3			3		

Sample Shipping and Delivery Details

GEL PM:
Method of Shipment: Date Shipped:
Airbill #:
Airbill #:

1.) Chain of Custody Number = Client Determined
2.) QC Codes: N = Normal Sample, TB = Trip Blank, FD = Field Duplicate, EB = Equipment Blank, MS = Matrix Spike Sample, MSD = Matrix Spike Duplicate Sample, G = Grab, C = Composite
3.) Field Filtered: For liquid matrices, indicate with a - Y - for yes the sample was field filtered or - N - for sample was not field filtered.
4.) Matrix Codes: DW = Drinking Water, GW = Groundwater, SW = Surface Water, WW = Waste Water, W = Water, SO = Soil, SD = Sediment, SL = Sludge, SS = Solid Waste, O = Oil, F = Filter, P = Wipe, U = Urine, F = Fecal, N = Nasal
5.) Sample Analysis Requested: Analytical method requested (i.e. 8260B, 6010B/7470A) and number of containers provided for each (i.e. *8260B* - 3, *6010B/7470A* - 1).
6.) Preservative Type: HA = Hydrochloric Acid, NI = Nitric Acid, SH = Sodium Hydroxide, SA = Sulfuric Acid, AA = Ascorbic Acid, HX = Hexane, ST = Sodium Thiosulfate, If no preservative is added = leave field blank

For Lab Receiving Use Only
Custody Seal Intact? *YES* *NO*
Cooler Temp: _____ C

WHITE = LABORATORY YELLOW = FILE PINK = CLIENT

Page: 1 of 1
Project #: N4211 CTO 236
GEL Quote #:
COC Number (1):
PO Number:

GEL Chain of Custody and Analytical Request

20070747573

General Engineering Laboratories, LLC
2040 Savage Road
Charleston, SC 29407
Phone: (843) 556-8171
Fax: (843) 766-1178

Client Name: Tetra Tech NUS Phone #: (412) 921-8216
Project/Site Name: Fiber Optic Vault / MCRD Parris Island Fax #: (412) 921-6539
Address: Pittsburgh, PA
Collected by: Jason Bourguet Send Results To: Mark Sadic

Sample Analysis Requested (5) (Fill in the number of containers for each test)

	Sample ID 84003%	Date Collected (mm-dd-yy)	Time Collected (Military) (hhmm)	QC Code (2)	Field Filtered (3)	Sample Matrix (4)	Should this sample be considered: Radioactive	TSCA Regulated	Total number of containers	TCL VOA	SVOC	Pest	PCB								<-- Preservative Type (6)	Comments Note: extra sample is required for sample specific QC
										HCl	/	/	/									
001	PAI-FOV-GW-17-01	7/11/3	1410	N	N	GW	N	N	7	3	2	1	1									
002	PAI-FOV-GW-18-01	"	1515	N	N	GW	N	N	7	3	2	1	1									
003	PAI-FOV-GW-19-01	"	1620	N	N	GW	N	N	7	3	2	1	1									

TAT Requested: Normal: _____ Rush: _____ Specify: _____ (Subject to Surcharge) Fax Results: Yes / No Circle Deliverable: C of A / QC Summary / Level 1 / Level 2 / Level 3 / Level 4

Remarks: *Are there any known hazards applicable to these samples? If so, please list the hazards*

Chain of Custody Signatures

Relinquished By (Signed)	Date	Time	Received by (signed)	Date	Time
1 [signature]	7-11-03	1200	1 [signature]	7-12-03	1200
2			2		
3			3		

Sample Shipping and Delivery Details

GEL PM:
Method of Shipment: Date Shipped:
Airbill #:
Airbill #:

1.) Chain of Custody Number = Client Determined
2.) QC Codes: N = Normal Sample, TB = Trip Blank, FD = Field Duplicate, EB = Equipment Blank, MS = Matrix Spike Sample, MSD = Matrix Spike Duplicate Sample, G = Grab, C = Composite
3.) Field Filtered: For liquid matrices, indicate with a - Y - for yes the sample was field filtered or - N - for sample was not field filtered.
4.) Matrix Codes: DW = Drinking Water, GW = Groundwater, SW = Surface Water, WW = Waste Water, W = Water, SO = Soil, SD = Sediment, SL = Sludge, SS = Solid Waste, O = Oil, F = Filter, P = Wipe, U = Urine, F = Fecal, N = Nasal
5.) Sample Analysis Requested: Analytical method requested (i.e. 8260B, 6010B/7470A) and number of containers provided for each (i.e. *8260B* - 3, *6010B/7470A* - 1).
6.) Preservative Type: HA = Hydrochloric Acid, NI = Nitric Acid, SH = Sodium Hydroxide, SA = Sulfuric Acid, AA = Ascorbic Acid, HX = Hexane, ST = Sodium Thiosulfate, If no preservative is added = leave field blank

For Lab Receiving Use Only
Custody Seal Intact? *YES* *NO*
Cooler Temp: _____ C

WHITE = LABORATORY YELLOW = FILE PINK = CLIENT

Tetra Tech NUS, Inc.

BORING LOG

PROJECT NAME: Fiber Optic Vault
PROJECT NUMBER: N4211
DRILLING COMPANY: Columbia
DRILLING RIG: 6610 DT

BORING No.: FDP01
DATE: 7/25/02
GEOLOGIST: BDH
DRILLER: RB

Sample No. and Type or RQD	Depth (Ft.) or Run No.	Blows / 6" or RQD (%)	Sample Recovery / Sample Length	Lithology Change (Depth/Ft.) or Screened Interval	MATERIAL DESCRIPTION: Soil Density/ Consistency or Rock Hardness	Color	Material Classification	USCS *	Remarks	PID/FID Reading (ppm): Sample	Sampler BZ	Borehole**	Driller BZ**
			2.2										
S-1 @ 0847	4									48			
						tan	Sand, fine						
			3.2						moist	57			
S-2 @ 0900	8						Sand, med to fine		Wet @ ~7'				
						lt gray				37			
									water level @ 7.0' bgs				

* When rock coring, enter rock brokeness.

** Include monitor reading in 6 foot intervals @ borehole. Increase reading frequency if elevated reponse read.

Remarks:

Drilling Area Background (ppm):

Converted to Well: Yes _____ No _____ Well I.D. #: _____

Tetra Tech NUS, Inc.

BORING LOG

PROJECT NAME: Fiber Optic Vault
PROJECT NUMBER: N2411
DRILLING COMPANY: Columbia
DRILLING RIG: 6610DT

BORING No.: FDP02
DATE: 7/25/02
GEOLOGIST: BDH
DRILLER: RB

Sample No. and Type or RQD	Depth (Ft.) or Run No.	Blows / 6" or RQD (%)	Sample Recovery / Sample Length	Lithology Change (Depth/Ft.) or Screened Interval	MATERIAL DESCRIPTION: Soil Density/ Consistency or Rock Hardness	Color	Material Classification	USCS *	Remarks	PID/FID Reading (ppm): Sample	Sampler BZ	Borehole**	Driller BZ**
				0-0.7	loose	red brn	topsoil, silty, grass @ sfc		dry				
S-1			3.2	0.7-1.2	loose	dk gray to blk	cindy, sand		fill, dry	130			
@ 0942				1.2-3.0'	loose	tan	Sand fine to v.f. w/ oyster shells @ top		dry to sl moist				
	4												
S-2			3.1						moist @ ~6'	37			
@ 0954	8								wet @ ~7'				

* When rock coring, enter rock brokeness.

** Include monitor reading in 6 foot intervals @ borehole. Increase reading frequency if elevated reponse read.

Remarks:

Drilling Area Background (ppm):

Converted to Well: Yes _____ No _____ Well I.D. #: _____

Tetra Tech NUS, Inc.

BORING LOG

PROJECT NAME: Fiber Optic Vault
PROJECT NUMBER: N4211
DRILLING COMPANY: Columbia
DRILLING RIG: 6610DT

BORING No.: FDP03
DATE: 7/25/02
GEOLOGIST: BDH
DRILLER: RB

Sample No. and Type or RQD	Depth (Ft.) or Run No.	Blows / 6" or RQD (%)	Sample Recovery / Sample Length	Lithology Change (Depth/Ft.) or Screened Interval	MATERIAL DESCRIPTION: Soil Density/ Consistency or Rock Hardness	Color	Material Classification	USCS *	Remarks	PID/FID Reading (ppm): Sample	Sampler BZ	Borehole**	Driller BZ**
				0-4"			asphalt						
			1.5			gd br	0.6' sd						
S-1 @ 1100						tan	sand, fine to v.f.		dry				
4						to lt gray							
				4.8'									
					fin to med	dgy to gnsl gray	Clay, sl silty sandy @ base		sl moist				
S-2 @ 1104			3.9	6.7'									
8						mottled orange							
						lt gray	6.7-8.0 Sand, silty		moist to wet				

* When rock coring, enter rock brokeness.

** Include monitor reading in 6 foot intervals @ borehole. Increase reading frequency if elevated reponse read.

Remarks:

Drilling Area Background (ppm):

Converted to Well: Yes _____ No _____ Well I.D. #:

Tetra Tech NUS, Inc.

BORING LOG

PROJECT NAME: Tiba O gin Vault
PROJECT NUMBER: N4211
DRILLING COMPANY: Columbia
DRILLING RIG: 6610 DT

BORING No.: FDP04
DATE: 7/25/02
GEOLOGIST: BPH
DRILLER: RB

Sample No. and Type or RQD	Depth (Ft.) or Run No.	Blows / 6" or RQD (%)	Sample Recovery / Sample Length	Lithology Change (Depth/Ft.) or Screened Interval	MATERIAL DESCRIPTION: Soil Density/ Consistency or Rock Hardness	Color	Material Classification	USCS *	Remarks	PID/FID Reading (ppm): Sample	Sampler BZ	Borehole**	Driller BZ**
				0.0'	loose	med br	silt w/roots		grass @ sfc.				
									sl. moist				
			3.0'										
S-1 @ 1327					loose	dk br	Sand, v.f., silty		moist				
	4					to br				50			
			4.0'						wet @ top of clay				
S-2 @ 1334				6.3'									
					firm	gmish	Clay, sl. silty						
	8			8.0'	to firm	gray		slight	petroleum odor @ 8.0'				
S-3 @ 1348			4'							243			
				10.4'	8'-10.4'		Sand, fine to v.f.		wet				
	12												
				fir	10.4'-10.6'		Clay, sl silty		sl moist				
					gmish	gray							
					10.6'-12'		Sand, v.f., silty		wet				
					gmish	gray	petroleum odor						

* When rock coring, enter rock brokeness.

** Include monitor reading in 6 foot intervals @ borehole. Increase reading frequency if elevated reponse read.

Remarks:

Drilling Area Background (ppm):

Converted to Well: Yes _____ No _____ Well I.D. #: _____

Tetra Tech NUS, Inc.

BORING LOG

PROJECT NAME: Fiber Optic Vault
PROJECT NUMBER: N4211
DRILLING COMPANY: Columbia
DRILLING RIG: 6610 DT

BORING No.: FP05
DATE: 7/25/02
GEOLOGIST: BDH
DRILLER: RB

Sample No. and Type or RQD	Depth (Ft.) or Run No.	Blows / 6" or RQD (%)	Sample Recovery / Sample Length	Lithology Change (Depth/Ft.) or Screened Interval	MATERIAL DESCRIPTION: Soil Density/ Consistency or Rock Hardness	Color	Material Classification	USCS *	Remarks	PID/FID Reading (ppm): Sample	Sampler BZ	Borehole**	Driller BZ**
				1.2'	loose	red brn	gravel @ sfc, fine sand		dry				
S-1 @ 1435			3.5		loose	tan	Sand, f. to v.f.		sl. moist	<1			
	4												
									not @ ~5.3				
				5.7'									
S-2 @ 1438			4		fine to med	gnd gray	Clay, sl. silty		sl. moist	2			
	8												
						mottled orange							

* When rock coring, enter rock brokeness.

** Include monitor reading in 6 foot intervals @ borehole. Increase reading frequency if elevated reponse read.

Remarks:

Drilling Area Background (ppm):

Converted to Well: Yes _____ No _____ Well I.D. #: _____

Tetra Tech NUS, Inc.

BORING LOG

PROJECT NAME: Fiber Optic Vault
PROJECT NUMBER: N4211
DRILLING COMPANY: Columbia
DRILLING RIG: 6610 DT

BORING No.: FDP06
DATE: 7/25/02
GEOLOGIST: BDH
DRILLER: RB

Sample No. and Type or RQD	Depth (Ft.) or Run No.	Blows / 6" or RQD (%)	Sample Recovery / Sample Length	Lithology Change (Depth/Ft.) or Screened Interval	MATERIAL DESCRIPTION: Soil Density/ Consistency or Rock Hardness	Color	Material Classification	USCS *	Remarks	PID/FID Reading (ppm): Sample	Sampler BZ	Borehole**	Driller BZ**
						red brn	Grav @ sfc.; sod piece of concrete near sfc		dry				
S-1 @ 1557			3.8'			tan	Sand, V.f.						
	4					tan			sl. moist				
						red brn	from 4'-6.4'						
S-2 @ 1601				6.4'					moist to wet @ 6.3'				
	8		4'			gnish gray	clay, silty ~~mottled rdish brn~~		sl. moist				
				8.2'									
						gnish gray	Sand, clayey fine to V.f.		wet @ 8.2'				
S-3 @ 1610	12		2.5										

* When rock coring, enter rock brokeness.

** Include monitor reading in 6 foot intervals @ borehole. Increase reading frequency if elevated reponse read.

Remarks:

Drilling Area Background (ppm):

Converted to Well: Yes ____ No ____ Well I.D. #: ____

Tetra Tech NUS, Inc.

BORING LOG

PROJECT NAME: Fiber Optic Vault
PROJECT NUMBER: N4211
DRILLING COMPANY: Columbia
DRILLING RIG: 6610DT

BORING No.: FDP08
DATE: 7/25/02
GEOLOGIST: BDH
DRILLER: RB

	Sample No. and Type or RQD	Depth (Ft.) or Run No.	Blows / 6" or RQD (%)	Sample Recovery / Sample Length	Lithology Change (Depth/Ft.) or Screened Interval	MATERIAL DESCRIPTION: Soil Density/ Consistency or Rock Hardness	Color	Material Classification	USCS *	Remarks	PID/FID Reading (ppm): Sample	Sampler BZ	Borehole**	Driller BZ**
					0.8		Bgd	asphalt						
S-1 @ 1755				2.7			Br	Silt, sandy		sl. moist				
							tan	Sand, fine to v.f.		moist				
		4												
S-2 @ 1759				3.2						wet @ ~4.3'				
		8												

* When rock coring, enter rock brokeness.

** Include monitor reading in 6 foot intervals @ borehole. Increase reading frequency if elevated reponse read.

Remarks:

Drilling Area Background (ppm):

Converted to Well: Yes _____ No _____ Well I.D. #: _____

Tetra Tech NUS, Inc.

BORING LOG

PROJECT NAME: Fiber Optic Vault
PROJECT NUMBER: N4211
DRILLING COMPANY: Columbia
DRILLING RIG: 6610 DT

BORING No.: FDP10
DATE: 7/26/02
GEOLOGIST: BDH
DRILLER: RB

Sample No. and Type or RQD	Depth (Ft.) or Run No.	Blows / 6" or RQD (%)	Sample Recovery / Sample Length	Lithology Change (Depth/Ft.) or Screened Interval	MATERIAL DESCRIPTION: Soil Density/ Consistency or Rock Hardness	Color	Material Classification	USCS *	Remarks	PID/FID Reading (ppm): Sample	Sampler BZ	Borehole**	Driller BZ**
				0.5		rd br	Gran @ sfc, Sand						
S-1 @ 0758										<1			
			2.5										
	4												
						tan	Sand, f to v.f.		moist				
										<1			
S-2 @ 0805			2.8						moist to wet				
	8			7.5	fin grnd	gray	Clay, silty						
						tan	Sand, f to v.f.		wet	520			
S-3 @ 0825			4			tt grnd			petroleum odor				
	12					gray							

* When rock coring, enter rock brokeness.

** Include monitor reading in 6 foot intervals @ borehole. Increase reading frequency if elevated reponse read.

Remarks:

Drilling Area Background (ppm):

Converted to Well: Yes _____ No _____ Well I.D. #: _____

Tetra Tech NUS, Inc.

BORING LOG

PROJECT NAME: Fiber Optic Vault
PROJECT NUMBER: N4211
DRILLING COMPANY: Columbia
DRILLING RIG: 6610 DT

BORING No.: FDP11
DATE: 7/26/02
GEOLOGIST: BDH
DRILLER:

Sample No. and Type or RQD	Depth (Ft.) or Run No.	Blows / 6" or RQD (%)	Sample Recovery / Sample Length	Lithology Change (Depth/Ft.) or Screened Interval	MATERIAL DESCRIPTION: Soil Density/ Consistency or Rock Hardness	Color	Material Classification	USCS *	Remarks	PID/FID Reading (ppm): Sample	Sampler BZ	Borehole**	Driller BZ**
				0.6		not Br	Topsoil, Sand		sl moist				
S-1 @ 0800			3	?		tan	Sand, f. to v.f.		moist				
	4												
S-2 @ 0803									wet @ ~7'				
			2.6										
	8												

* When rock coring, enter rock brokeness.

** Include monitor reading in 6 foot intervals @ borehole. Increase reading frequency if elevated reponse read.

Remarks:

Drilling Area Background (ppm):

Converted to Well: Yes _____ No _____ Well I.D. #: _____

Tetra Tech NUS, Inc.

BORING LOG

PROJECT NAME: Fiber Optic Vault
PROJECT NUMBER: N4211
DRILLING COMPANY: Columbia
DRILLING RIG: 6610DT

BORING No.: FDP12
DATE: 7/26/02
GEOLOGIST: BDH
DRILLER: RB

Sample No. and Type or RQD	Depth (Ft.) or Run No.	Blows / 6" or RQD (%)	Sample Recovery / Sample Length	Lithology Change (Depth/Ft.) or Screened Interval	MATERIAL DESCRIPTION: Soil Density/ Consistency or Rock Hardness	Color	Material Classification	USCS *	Remarks	PID/FID Reading (ppm): Sample	Sampler BZ	Borehole**	Driller BZ**
				1.3		rodden	Topsoil, Sand		dry				
						tan	Sand, f. to v.f.		dry to sl. moist				
S-1 @ 0853			3.1							<1			
	4								sl. petroleum odor @ base				
				5.2					moist				
				6.0		gmish gray	Clay, sandy		petroleum odor, sl. moist				
S-2 @ 0856			3.6			gmish gray	Sand, f. to v.f.		petroleum odor, wet				
	8			7.6						217			
						gmish gray	Clay, silty		petroleum odor sl. moist				
									water sample @ product globule				

* When rock coring, enter rock brokeness.

** Include monitor reading in 6 foot intervals @ borehole. Increase reading frequency if elevated reponse read.

Remarks:

Drilling Area Background (ppm):

Converted to Well: Yes _____ No _____ Well I.D. #: _____

Tetra Tech NUS, Inc.

BORING LOG

PROJECT NAME: Fiber Optic Vault
PROJECT NUMBER: N4211
DRILLING COMPANY: Columbia
DRILLING RIG: 6610 DT

BORING No.: FDPB
DATE: 7/26/02
GEOLOGIST: BDH
DRILLER:

	Sample No. and Type or RQD	Depth (Ft.) or Run No.	Blows / 6" or RQD (%)	Sample Recovery / Sample Length	Lithology Change (Depth/Ft.) or Screened Interval	Soil Density/ Consistency or Rock Hardness	Color	Material Classification	USCS *	Remarks	PID/FID Reading (ppm) Sample	Sampler BZ	Borehole**	Driller BZ**
					0.6		medium	Topsoil		dry				
S-1 @ 0852				2.4	1.8			Fill, Sand, f, w/ cinders		dry	<1			
		4					tan	Sand, f to v.f.		sl moist				
										moist				
										petroleum odor	42			
S-2 @ 0855				2.8						wet @ ~ 6-7'				
		8								strong petroleum odor				
					9.8'						193			
S-3 @ 0910				4	10.5	firm	dark gray	Clay, silty, grades into sandy below		sl. moist petroleum odor				
		12												
							dark gray	Sand, f. to v.f.		wet				
										strong petroleum odor				
								free product in this boring						

* When rock coring, enter rock brokeness.

** Include monitor reading in 6 foot intervals @ borehole. Increase reading frequency if elevated reponse read.

Remarks:

Drilling Area Background (ppm):

Converted to Well: Yes _____ No _____ Well I.D. #:

Tetra Tech NUS, Inc.

BORING LOG

PROJECT NAME: Fiber Optic Vault
PROJECT NUMBER: N4211
DRILLING COMPANY: Columbia
DRILLING RIG: 6610DT

BORING No.: FDP14
DATE: 7/26/02
GEOLOGIST: BDH
DRILLER: RB

	Sample No. and Type or RQD	Depth (Ft.) or Run No.	Blows / 6" or RQD (%)	Sample Recovery / Sample Length	Lithology Change (Depth/Ft.) or Screened Interval	MATERIAL DESCRIPTION: Soil Density/ Consistency or Rock Hardness	Color	Material Classification	USCS *	Remarks	PID/FID Reading (ppm): Sample	Sampler BZ	Borehole**	Driller BZ**
					0.6			topsoil		dry				
S-1 @ 1028				2.5										
								Sand, f. to v.f		sl moist				
										to moist				
				3						wet @ 17'				
S-2 @ 1033														
		8			7.4	fin	gnd gray	Clay, sl silty		sl. moist, sl petroleum odor				
							lt brn	Sand, f to v.f.		wet				
				4										
S-3 @ 1040					10.4 / 11									
		12				fin	gnd gray	Clay, silty		sl. moist				
									↖	sl. petroleum odor				
							gnd gray	Sand, f. to v.f.						
								silty il load		sl. petroleum odor				

* When rock coring, enter rock brokeness.

** Include monitor reading in 6 foot intervals @ borehole. Increase reading frequency if elevated reponse read.

Remarks:

Drilling Area Background (ppm):

Converted to Well: Yes _____ No _____ Well I.D. #: _____

Tetra Tech NUS, Inc.

BORING LOG

PROJECT NAME: Fiber Optic Vault
PROJECT NUMBER: N4211
DRILLING COMPANY: Columbia
DRILLING RIG: 6610DT

BORING No.: FDP15
DATE: 7/26/02
GEOLOGIST: BDH
DRILLER:

	Sample No. and Type or RQD	Depth (Ft.) or Run No.	Blows / 6" or RQD (%)	Sample Recovery / Sample Length	Lithology Change (Depth/Ft.) or Screened Interval	MATERIAL DESCRIPTION: Soil Density/ Consistency or Rock Hardness	Color	Material Classification	USCS *	Remarks	PID/FID Reading (ppm): Sample	Sampler BZ	Borehole**	Driller BZ**
					0.8'		red br	topsoil, sand w/ some cinders		dry				
S-1							brn	Sand, f. to m/f		dry to moist				
@				3.1			tan			@ ~4'				
1000		4								wet @ ~5'				
S-2														
@				3.8	6.8'									
1005		8			7.9'	firm	dark gray	Clay, silty		sl moist				
								sand @ base ←		wet				

* When rock coring, enter rock brokeness.

** Include monitor reading in 6 foot intervals @ borehole. Increase reading frequency if elevated reponse read.

Remarks:

Drilling Area Background (ppm):

Converted to Well: Yes _____ No _____ Well I.D. #: _____

Tetra Tech NUS, Inc.

BORING LOG

PROJECT NAME: Fiber Optic Vault
PROJECT NUMBER: N4211
DRILLING COMPANY: Columbia
DRILLING RIG: 6610 DT

BORING No.: FDP16
DATE: 7/26/02
GEOLOGIST: BDH
DRILLER: RB

Sample No. and Type or RQD	Depth (Ft.) or Run No.	Blows / 6" or RQD (%)	Sample Recovery / Sample Length	Lithology Change (Depth/Ft.) or Screened Interval	Soil Density/ Consistency or Rock Hardness	Color	Material Classification	USCS *	Remarks	PID/FID Reading (ppm) Sample	Sampler BZ	Borehole**	Driller BZ**
				0.6			modern topsoil, sand f.						
				1.6			" Sand, f. w/ cinders		dry				
S-1 @ 1128			3.2				shell frags, some gravel (fill)		dry				
	4						tan Sand, f. to v.f.		dry				
							to		moist @				
S-2 @ 1132			2.3				orange Fe (cemented)		~7'				
	8						clayey @ 8-8.5'		wet @ ~8'				
S-3 @ 1140			4.0										
	12												

* When rock coring, enter rock brokeness.

** Include monitor reading in 6 foot intervals @ borehole. Increase reading frequency if elevated reponse read.

Remarks:

Drilling Area Background (ppm):

Converted to Well: Yes ____ No ____ Well I.D. #: ____

Tetra Tech NUS, Inc.

BORING LOG

PROJECT NAME: Fiber Optic Vault
PROJECT NUMBER: N4211
DRILLING COMPANY: Columbia
DRILLING RIG: 6610DT

BORING No.: FDP17
DATE: 7/26/02
GEOLOGIST: BDH
DRILLER:

Sample No. and Type or RQD	Depth (Ft.) or Run No.	Blows / 6" or RQD (%)	Sample Recovery / Sample Length	Lithology Change (Depth/Ft.) or Screened Interval	MATERIAL DESCRIPTION: Soil Density/ Consistency or Rock Hardness	Color	Material Classification	USCS *	Remarks	PID/FID Reading (ppm): Sample	Sampler BZ	Borehole**	Driller BZ**
				0.3		red.br	Sand, fine		dry				
						tan	Sand, f to v.f.						
S-1 @ 1218			3.2						moist @ ~5'				
	4												
									wet @ ~7'				
S-2 @ 1222			3.8										
	8			7.6		gnish gray	Clay, silty		sl moist				
				8.0		tan	Sand, f.		wet				
						to orange br							
S-3 @ 1227			4.0	10.6' 11.0									
	12				fine	gnish gray	Clay, silty		sl moist				
							Sand f, clayey @ top		wet				
							becomes silty						

* When rock coring, enter rock brokeness.

** Include monitor reading in 6 foot intervals @ borehole. Increase reading frequency if elevated reponse read.

Remarks:

Drilling Area Background (ppm):

Converted to Well: Yes ____ No ____ Well I.D. #:

Tetra Tech NUS, Inc.

BORING LOG

PROJECT NAME: Fiber Optic Nash
PROJECT NUMBER: N4211
DRILLING COMPANY: Columbia
DRILLING RIG: 6610 DT

BORING No.: FDP18
DATE: 7/26/02
GEOLOGIST: BDH
DRILLER: RB

Sample No. and Type or RQD	Depth (Ft.) or Run No.	Blows / 6" or RQD (%)	Sample Recovery / Sample Length	Lithology Change (Depth/Ft.) or Screened Interval	MATERIAL DESCRIPTION: Soil Density/ Consistency or Rock Hardness	Color	Material Classification	USCS *	Remarks	PID/FID Reading (ppm): Sample	Sampler BZ	Borehole**	Driller BZ**
				0.7		sat	topsoil						
						tan	Sand f to v.f		moist @ 4'				
S-1 @ 1345			2.9										
	4												
S-2 @ 1350			4										
	8			7.5 / 8.0	firm	gray	clay, silty		sl moist				
						tan	Sand, f to v.f.						
									wet				
S-3 @ 1400			4										
	12			11.2	firm	gray	clay, silty		sl. moist				

* When rock coring, enter rock brokeness.

** Include monitor reading in 6 foot intervals @ borehole. Increase reading frequency if elevated reponse read.

Remarks:

Drilling Area Background (ppm):

Converted to Well: Yes _____ No _____ Well I.D. #: _____

Tetra Tech NUS, Inc.

BORING LOG

PROJECT NAME: Fiber Optic Network
PROJECT NUMBER: N4211
DRILLING COMPANY: Columbia
DRILLING RIG: 6610 DT

BORING No.: FDP19
DATE: 7/26/02
GEOLOGIST: BDH
DRILLER:

Sample No. and Type or RQD	Depth (Ft.) or Run No.	Blows / 6" or RQD (%)	Sample Recovery / Sample Length	Lithology Change (Depth/Ft.) or Screened Interval	MATERIAL DESCRIPTION: Soil Density/ Consistency or Rock Hardness	Color	Material Classification	USCS *	Remarks	PID/FID Reading (ppm): Sample	Sampler BZ	Borehole**	Driller BZ**
				1.2		red br	Topsoil, sand, f w/ concrete frags, gravel		dry (fill)				
S-1 @ 1355			3.5			tan	Sand, f to v f,		sl moist				
	4												
									moist @ 5'				
									wet @ 7.5'				
S-2 @ 1405			4	7.6'									
	8				fine gravel	gray	Clay, sl silty		sl. moist				

* When rock coring, enter rock brokeness.

** Include monitor reading in 6 foot intervals @ borehole. Increase reading frequency if elevated reponse read.

Remarks:

Drilling Area Background (ppm):

Converted to Well: Yes ____ No ____ Well I.D. #:

Tetra Tech NUS, Inc.

BORING LOG

PROJECT NAME: Fibra Optic Vault
PROJECT NUMBER: N4211
DRILLING COMPANY: Columbia
DRILLING RIG: 6610 DT

BORING No.: FDP21
DATE: 7/26/02
GEOLOGIST: BDH
DRILLER: RB

Sample No. and Type or RQD	Depth (Ft.) or Run No.	Blows / 6" or RQD (%)	Sample Recovery / Sample Length	Lithology Change (Depth/Ft.) or Screened Interval	MATERIAL DESCRIPTION: Soil Density/ Consistency or Rock Hardness	Color	Material Classification	USCS *	Remarks	PID/FID Reading (ppm): Sample	Sampler BZ	Borehole**	Driller BZ**
						tan	Sand, f.						
S-1 @ 1605			2.4						moist @ 5'				
	4												
S-2 @ 1612			4	6.3		gmk gray	Clay, sl. silty		sl moist				
	8			7.8'									
						gmk gray	Sand, clayey @ top f.		moist to wet				

* When rock coring, enter rock brokeness.

** Include monitor reading in 6 foot intervals @ borehole. Increase reading frequency if elevated reponse read.

Remarks:

Drilling Area Background (ppm):

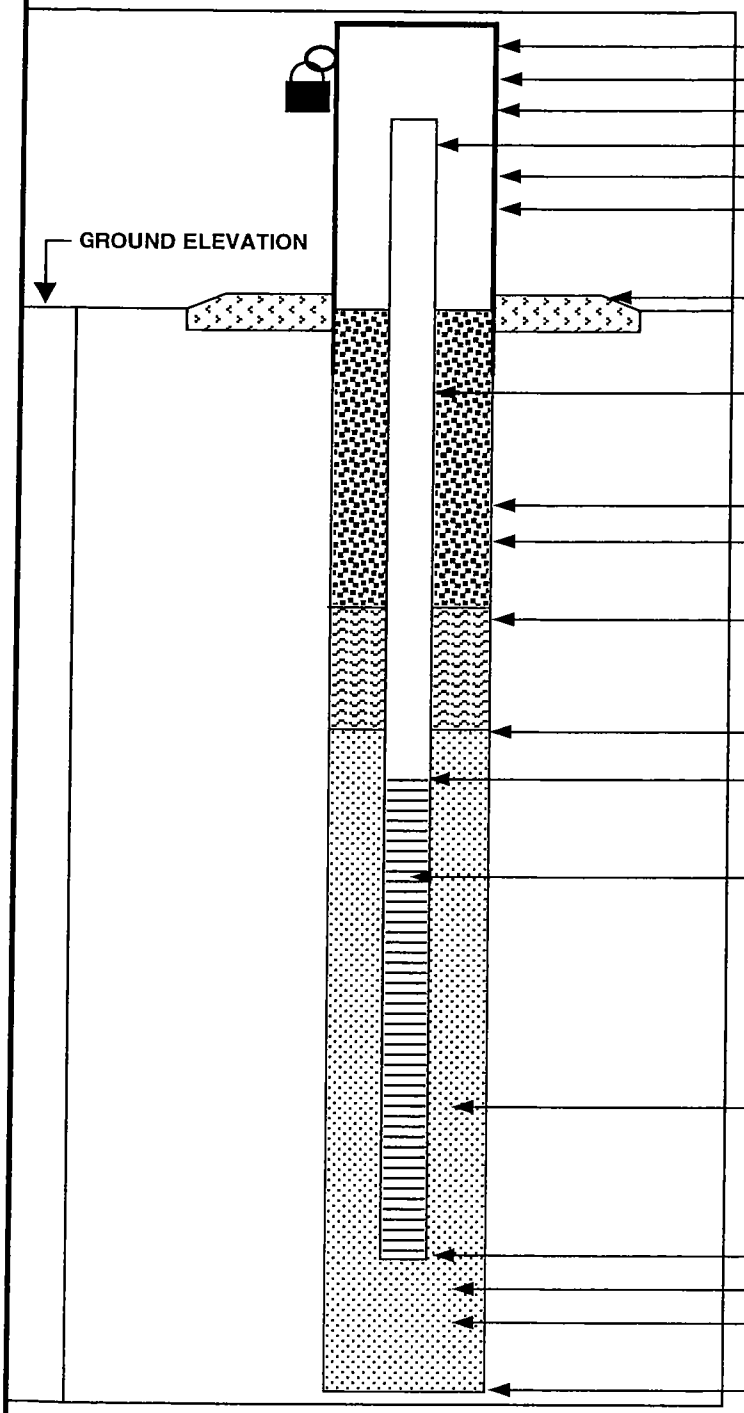
Converted to Well: Yes _____ No _____ Well I.D. #: _____

D-3 MONITORING WELL CONSTRUCTION SHEETS

WELL NO.: PAI-FOV-1

OVERBURDEN MONITORING WELL SHEET

PROJECT	Fiber Optic Vault	LOCATION	MCRD Parris Island	DRILLER	JGW
PROJECT NO.	N4211	BORING		METHOD:	
ELEVATION		DATE	12/11/02	DRILLING	HSA
FIELD GEOLOGIST	BDH			DEVELOPMENT	



ELEVATION OF TOP OF SURFACE CASING:

ELEVATION OF TOP OF RISER PIPE:

STICK-UP TOP OF SURFACE CASING: 2.99'

STICK-UP OF RISER PIPE: 2.88'

I.D. OF SURFACE CASING:

TYPE OF SURFACE CASING: Steel

TYPE OF SURFACE SEAL: concrete

RISER PIPE I.D.: 2"

TYPE OF RISER PIPE: PVC

BOREHOLE DIAMETER: 8.25"

TYPE OF SEAL: NA

ELEVATION / DEPTH OF SEAL: 0.5'

TYPE OF SEAL: bentonite

DEPTH - TOP OF SAND PACK: 1.0'

ELEVATION / DEPTH - TOP OF SCREEN: 2.0'

TYPE OF SCREEN: PVC

SLOT SIZE X LENGTH: 10 X 10'

I.D. OF SCREEN: 2"

TYPE OF SAND PACK: #2

ELEVATION / DEPTH TO BOTTOM OF SCREEN: 12.1'

ELEVATION / DEPTH TO BOTTOM OF SAND PACK: 12.5'

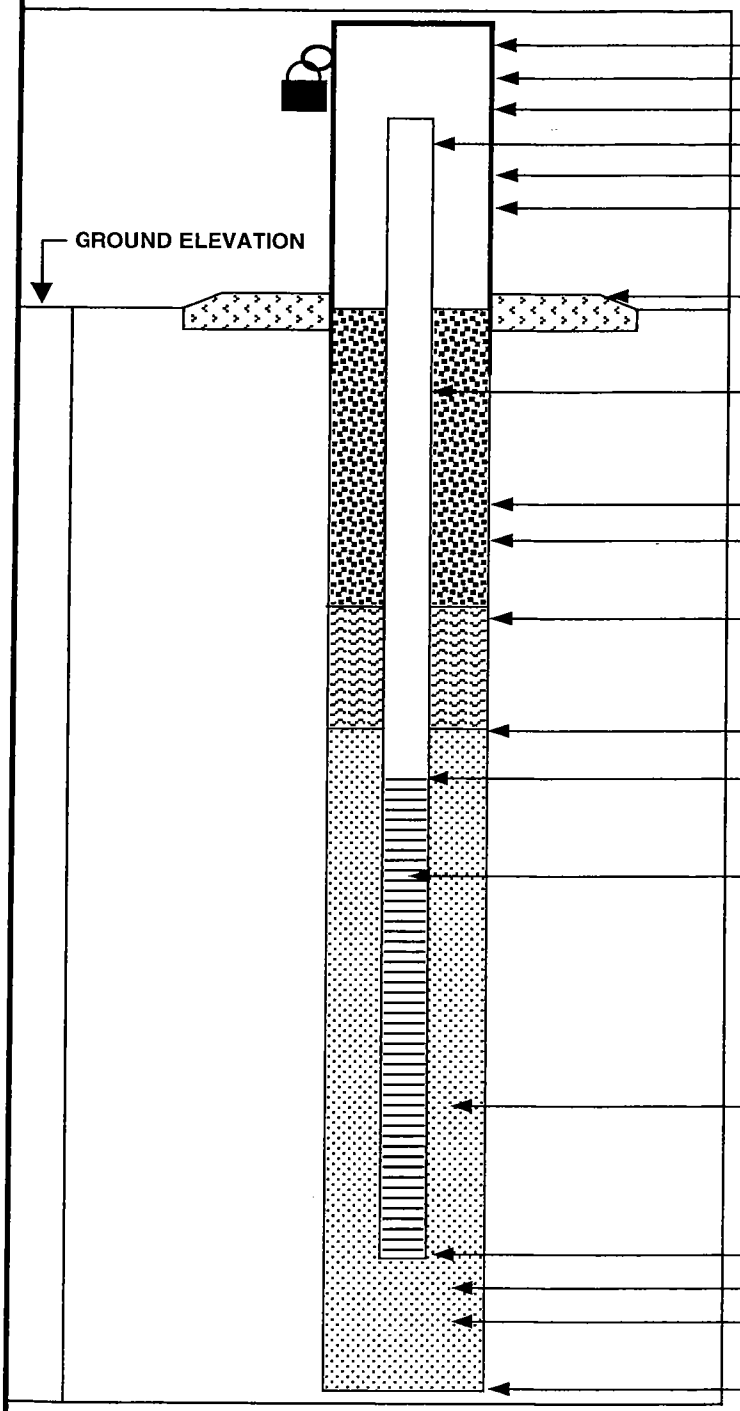
TYPE OF BACKFILL BELOW MONITORING WELL: Sand

ELEVATION / DEPTH TO BOTTOM OF BOREHOLE: 12.5'

WELL NO.: PAI-FOV-2I

OVERBURDEN MONITORING WELL SHEET

PROJECT	Fiber Optic Vault	LOCATION	MCRD Parris Island	DRILLER	JGW
PROJECT NO.	N4211	BORING		METHOD:	
ELEVATION		DATE	12/17/02	DRILLING	HSA
FIELD GEOLOGIST	BDH			DEVELOPMENT	



ELEVATION OF TOP OF SURFACE CASING:

ELEVATION OF TOP OF RISER PIPE:

STICK-UP TOP OF SURFACE CASING: 2.93'

STICK-UP OF RISER PIPE: 2.81'

I.D. OF SURFACE CASING:

TYPE OF SURFACE CASING: Steel

TYPE OF SURFACE SEAL: Concrete

RISER PIPE I.D.: 2"

TYPE OF RISER PIPE: PVC

BOREHOLE DIAMETER: 8.25"

TYPE OF SEAL: grout

ELEVATION / DEPTH OF SEAL: 16'

TYPE OF SEAL: Bentonite

DEPTH - TOP OF SAND PACK: 19.3'

ELEVATION / DEPTH - TOP OF SCREEN: 21.8'

TYPE OF SCREEN: PVC

SLOT SIZE X LENGTH: 10 X 3'

I.D. OF SCREEN: 2

TYPE OF SAND PACK: #2

ELEVATION / DEPTH TO BOTTOM OF SCREEN: 24.8'

ELEVATION / DEPTH TO BOTTOM OF SAND PACK: 25'

TYPE OF BACKFILL BELOW MONITORING WELL: Sand

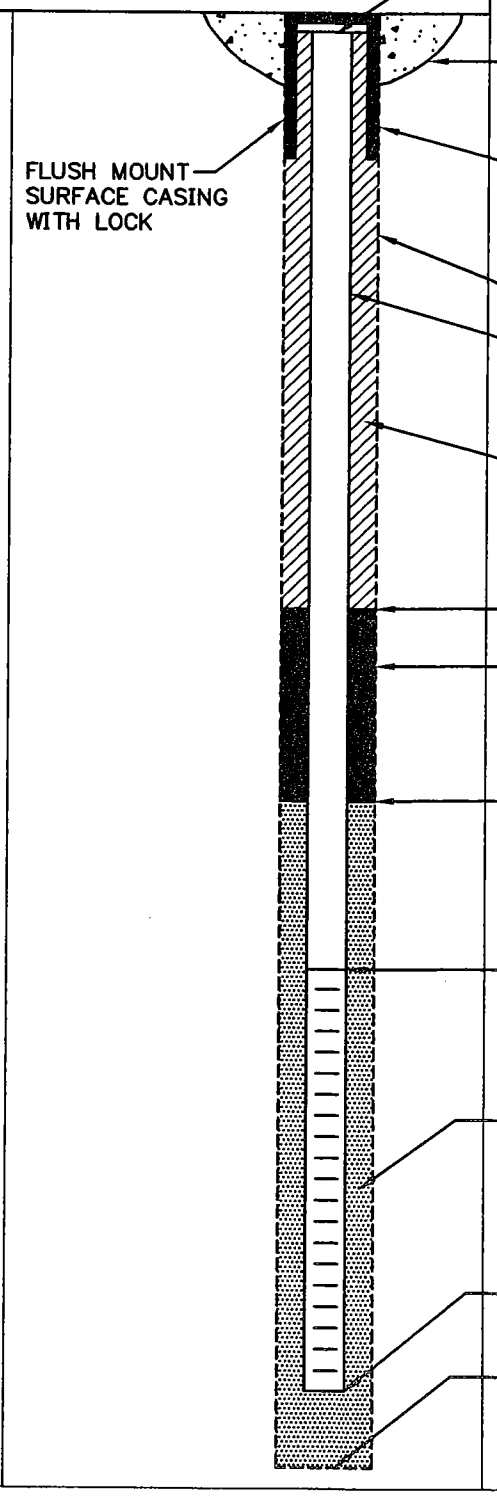
ELEVATION / DEPTH TO BOTTOM OF BOREHOLE: 25'

WELL NO.: PAI-FOV-3

Tetra Tech NUS, Inc.

OVERBURDEN MONITORING WELL SHEET FLUSH - MOUNT

PROJECT Fiber Optic Vault	LOCATION MCRD Parris Island	DRILLER JGW
PROJECT NO. N4211	BORING	DRILLING METHOD HSA
DATE BEGUN 12/11/02	DATE COMPLETED 12/11/02	
FIELD GEOLOGIST BPH		DEVELOPMENT METHOD
GROUND ELEVATION	DATUM	



ELEVATION TOP OF RISER: -0.15'

TYPE OF SURFACE SEAL: Concrete

TYPE OF PROTECTIVE CASING: Steel

I.D. OF PROTECTIVE CASING:

DIAMETER OF HOLE: 8.25"

TYPE OF RISER PIPE: PVC

RISER PIPE I.D.: 2"

TYPE OF BACKFILL/SEAL: NA

ELEVATION/DEPTH TOP OF SEAL: 10.5'

TYPE OF SEAL: Bentonite

ELEVATION/DEPTH TOP OF SAND: 12'

ELEVATION/DEPTH TOP OF SCREEN: 14.15

TYPE OF SCREEN: PVC

SLOT SIZE x LENGTH: 10 X 10'

TYPE OF SAND PACK: #2

DIAMETER OF HOLE IN BEDROCK: NA

ELEVATION / DEPTH BOTTOM OF SCREEN: 14.15

ELEVATION / DEPTH BOTTOM OF SAND: 14.15

ELEVATION/DEPTH BOTTOM OF HOLE: 14.15

BACKFILL MATERIAL BELOW SAND: Sand

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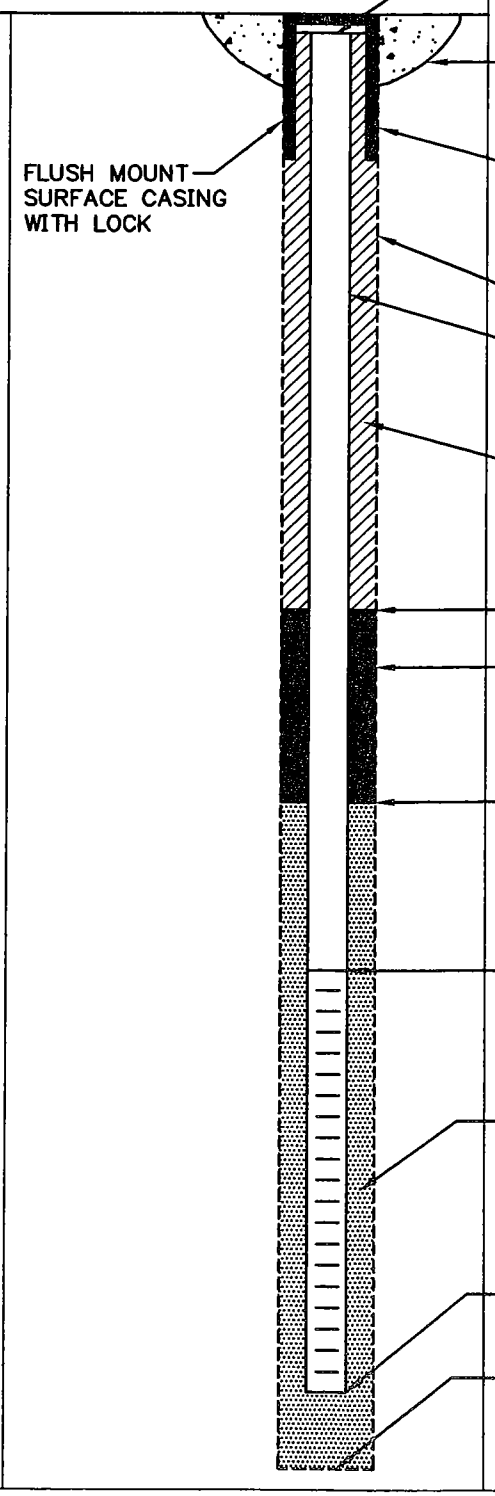
WELL NO.: PAI-FOV-4

Tetra Tech NUS, Inc.

OVERBURDEN MONITORING WELL SHEET FLUSH - MOUNT

PROJECT Fiber Optic Vault	LOCATION MCRD Parris Island	DRILLER JGW
PROJECT NO. N4211	BORING	DRILLING METHOD HSA
DATE BEGUN 12/12/02	DATE COMPLETED 12/12/02	
FIELD GEOLOGIST BDH		DEVELOPMENT METHOD
GROUND ELEVATION	DATUM	



ELEVATION TOP OF RISER:

TYPE OF SURFACE SEAL: Concrete

TYPE OF PROTECTIVE CASING: Steel

I.D. OF PROTECTIVE CASING:

DIAMETER OF HOLE: 8.25"

TYPE OF RISER PIPE: PVC

RISER PIPE I.D.: 2"

TYPE OF BACKFILL/SEAL: NA

ELEVATION/DEPTH TOP OF SEAL: 10.5

TYPE OF SEAL: Bentonite

ELEVATION/DEPTH TOP OF SAND: 12'

ELEVATION/DEPTH TOP OF SCREEN: 13.3'

TYPE OF SCREEN: PVC

SLOT SIZE x LENGTH: 10 X 10'

TYPE OF SAND PACK: #2

DIAMETER OF HOLE IN BEDROCK: NA

ELEVATION / DEPTH BOTTOM OF SCREEN: 13.3'

ELEVATION / DEPTH BOTTOM OF SAND: 14'

ELEVATION/DEPTH BOTTOM OF HOLE: 14'

BACKFILL MATERIAL BELOW SAND: Sand

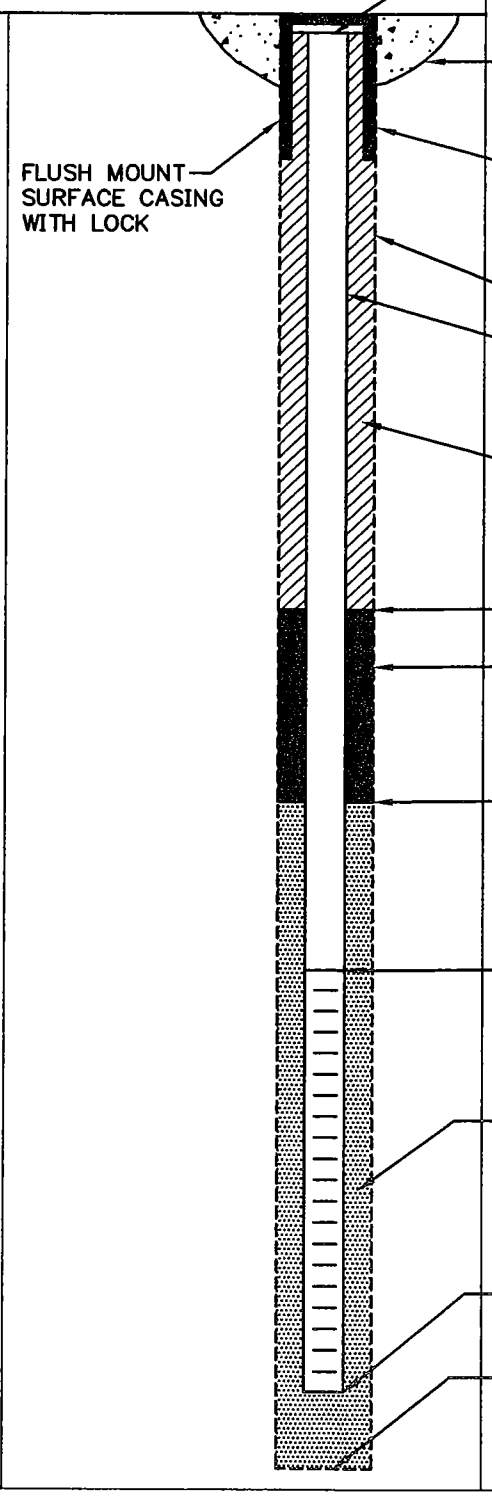
ACAD:FORM_MWFM.dwg 07/20/99 INL

WELL NO.: PAI-FOV-5I

Tetra Tech NUS, Inc.

OVERBURDEN MONITORING WELL SHEET FLUSH - MOUNT

PROJECT Fiber Optic Vault	LOCATION MCRD Parris Island	DRILLER JGW
PROJECT NO. N42110	BORING	DRILLING METHOD HSA
DATE BEGUN 12/13/02	DATE COMPLETED 12/13/02	
FIELD GEOLOGIST BDH		DEVELOPMENT METHOD
GROUND ELEVATION	DATUM	



ELEVATION TOP OF RISER:

TYPE OF SURFACE SEAL: Concrete

TYPE OF PROTECTIVE CASING: Steel

I.D. OF PROTECTIVE CASING:

DIAMETER OF HOLE: 8.25"

TYPE OF RISER PIPE: PVC

RISER PIPE I.D.: 2"

TYPE OF BACKFILL/SEAL: Grout

ELEVATION/DEPTH TOP OF SEAL: 115'

TYPE OF SEAL: Bentonite

ELEVATION/DEPTH TOP OF SAND: 119'

ELEVATION/DEPTH TOP OF SCREEN: 120.55'

TYPE OF SCREEN: PVC

SLOT SIZE x LENGTH: 10 X 3'

TYPE OF SAND PACK: #2

DIAMETER OF HOLE IN BEDROCK: NA

ELEVATION / DEPTH BOTTOM OF SCREEN: 123.55

ELEVATION / DEPTH BOTTOM OF SAND: 124'

ELEVATION/DEPTH BOTTOM OF HOLE: 124'

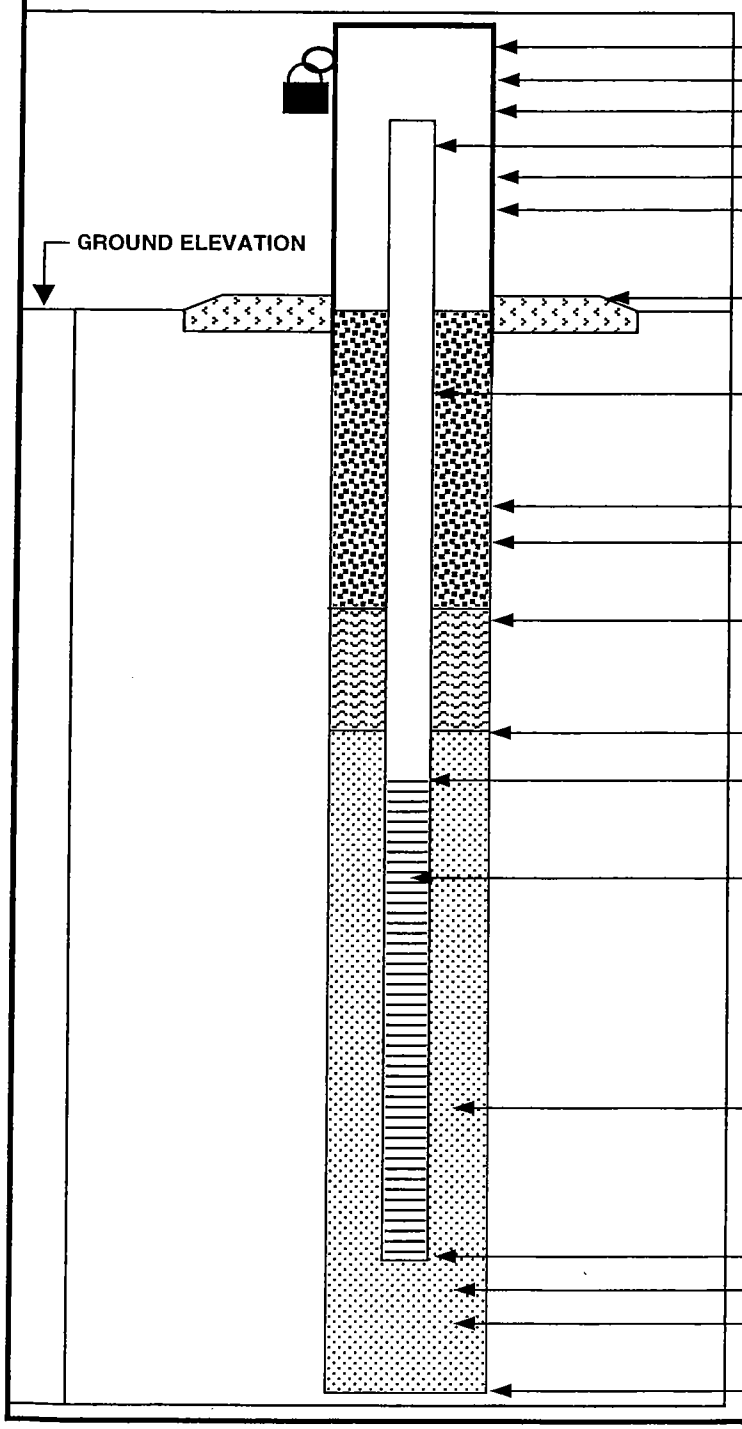
BACKFILL MATERIAL BELOW SAND: Sand

ACAD: FORM_MWFM.dwg 07/20/99 INL

WELL NO.: PAI-FOV-6

OVERBURDEN MONITORING WELL SHEET

PROJECT	Fiber Optic Vault	LOCATION	MCRD Parris Island	DRILLER	JGW
PROJECT NO.	N4211	BORING		METHOD:	
ELEVATION		DATE	12/16/02	DRILLING	HSA
FIELD GEOLOGIST	BDH			DEVELOPMENT	



ELEVATION OF TOP OF SURFACE CASING:

ELEVATION OF TOP OF RISER PIPE:

STICK-UP TOP OF SURFACE CASING: 2.99'

STICK-UP OF RISER PIPE: 2.85'

I.D. OF SURFACE CASING:

TYPE OF SURFACE CASING: Steel

TYPE OF SURFACE SEAL: Concrete

RISER PIPE I.D.: 2"

TYPE OF RISER PIPE: PVC

BOREHOLE DIAMETER: 8.25"

TYPE OF SEAL: NA

ELEVATION / DEPTH OF SEAL: 0.5'

TYPE OF SEAL: Bentonite

DEPTH - TOP OF SAND PACK: 2'

ELEVATION / DEPTH - TOP OF SCREEN: 4'

TYPE OF SCREEN: PVC

SLOT SIZE X LENGTH: 10 X 10'

I.D. OF SCREEN: 2"

TYPE OF SAND PACK: #2

ELEVATION / DEPTH TO BOTTOM OF SCREEN: 14'

ELEVATION / DEPTH TO BOTTOM OF SAND PACK: 14'

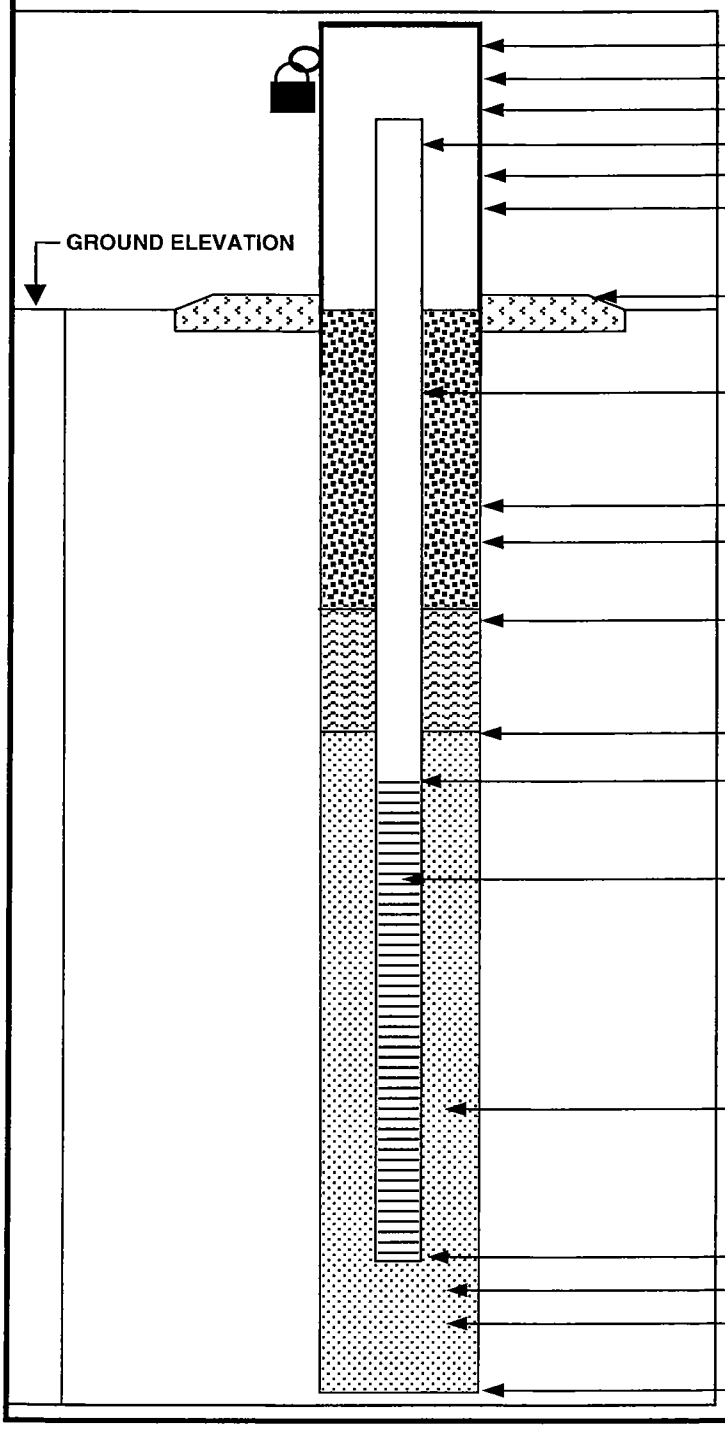
TYPE OF BACKFILL BELOW MONITORING WELL: Sand

ELEVATION / DEPTH TO BOTTOM OF BOREHOLE: 14'

WELL NO.: PAI-FOV-7I

OVERBURDEN MONITORING WELL SHEET

PROJECT	Fiber Optic Vault	LOCATION	MCRD Parris Island	DRILLER	JGW
PROJECT NO.	N4211	BORING		METHOD:	
ELEVATION		DATE	12/16/02	DRILLING	HSA
FIELD GEOLOGIST	BDH			DEVELOPMENT	



ELEVATION OF TOP OF SURFACE CASING:

ELEVATION OF TOP OF RISER PIPE:

STICK-UP TOP OF SURFACE CASING: 2.97'

STICK-UP OF RISER PIPE: 2.86'

I.D. OF SURFACE CASING:

TYPE OF SURFACE CASING: Steel

TYPE OF SURFACE SEAL: Concrete

RISER PIPE I.D.: 2"

TYPE OF RISER PIPE: PVC

BOREHOLE DIAMETER: 8.25'

TYPE OF SEAL: Grout

ELEVATION / DEPTH OF SEAL: 19.5'

TYPE OF SEAL: Bentonite

DEPTH - TOP OF SAND PACK: 22'

ELEVATION / DEPTH - TOP OF SCREEN: 23.8'

TYPE OF SCREEN: PVC

SLOT SIZE X LENGTH: 10 X 3'

I.D. OF SCREEN: 2"

TYPE OF SAND PACK: #2

ELEVATION / DEPTH TO BOTTOM OF SCREEN: 26.8'

ELEVATION / DEPTH TO BOTTOM OF SAND PACK: 27'

TYPE OF BACKFILL BELOW MONITORING WELL: Sand

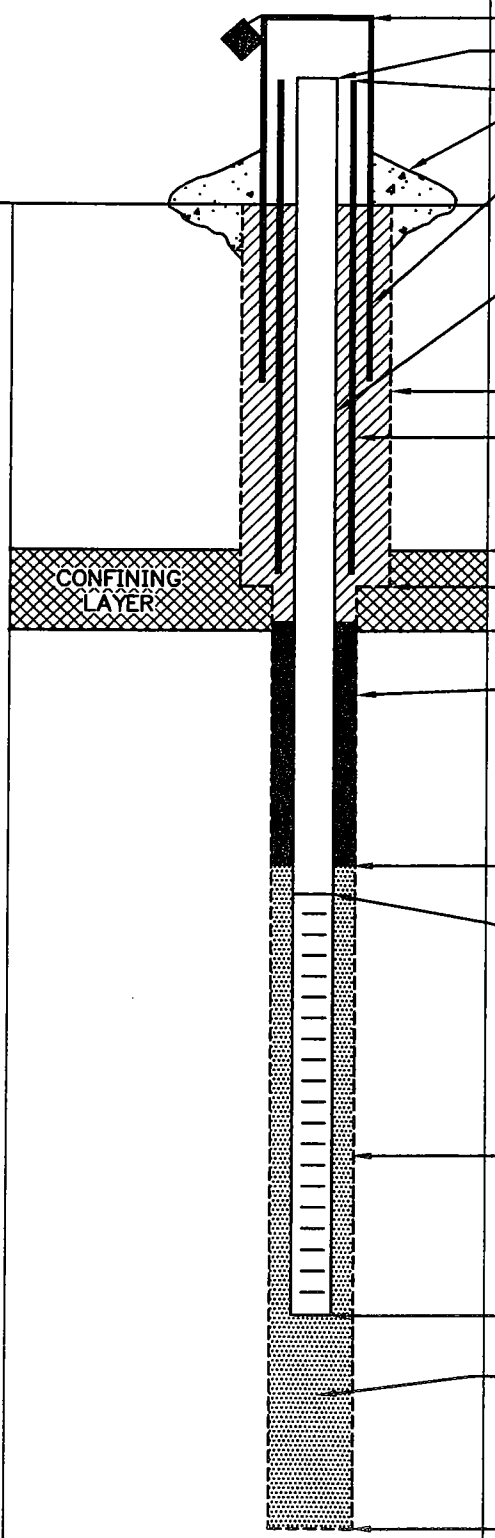
ELEVATION / DEPTH TO BOTTOM OF BOREHOLE: 27'

WELL NO.: PAI-FOV-8D

CONFINING LAYER
MONITORING WELL SHEET

Tetra Tech NUS, Inc.

PROJECT Fiber Optic Fault	LOCATION MCRD Parris Island	DRILLER JGW
PROJECT NO. N42011	BORING	DRILLING METHOD HSA / mud rotary
DATE BEGUN 12/15/02	DATE COMPLETED 12/17/02	
FIELD GEOLOGIST BDH		DEVELOPMENT METHOD
GROUND ELEVATION	DATUM	



ELEVATION/HEIGHT OF TOP OF SURFACE CASING: 12.88'
ELEVATION/HEIGHT OF TOP OF RISER PIPE: 12.78'
ELEVATION/HEIGHT OF TOP OF PERM. CASING: 10
TYPE OF SURFACE SEAL: Concrete

I.D. OF SURFACE CASING:
TYPE OF SURFACE CASING: Steel

RISER PIPE I.D.: 2"
TYPE OF RISER PIPE: PVC

BOREHOLE DIAMETER: 12"

PERM. CASING I.D.: 6"
TYPE OF CASING AND BACKFILL: Steel
Grout

ELEVATION/DEPTH TOP CONFINING LAYER: 129'
ELEVATION/DEPTH BOTTOM OF CASING: 130.5'
ELEVATION/DEPTH BOTTOM CONFINING LAYER: 131.5'

ELEVATION/DEPTH TOP OF SEAL: 125'
TYPE OF SEAL: Bentonite

DEPTH TOP OF SAND PACK: 30.8'

ELEVATION/DEPTH TOP OF SCREEN: 133'
TYPE OF SCREEN: PVC

TYPE OF SAND PACK: #2

BOREHOLE DIA. BELOW CASING: 5.5"

ELEVATION/DEPTH BOTTOM OF SCREEN: 136'

ELEVATION/DEPTH BOTTOM OF SAND PACK: 136'
BACKFILL MATERIAL BELOW SAND: Sand

ELEVATION/DEPTH OF HOLE: 136'

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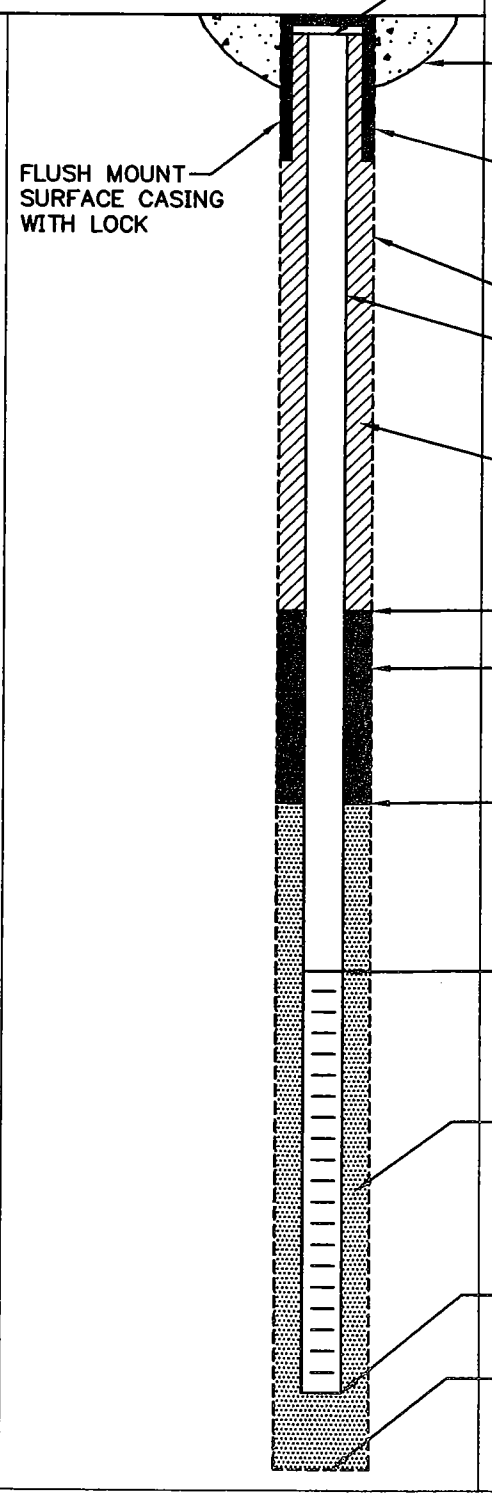
WELL NO.: PA I-FOV-9

Tetra Tech NUS, Inc.

OVERBURDEN MONITORING WELL SHEET FLUSH - MOUNT

PROJECT Fiber Optic Vault	LOCATION MCRD Parris Island	DRILLER JGW
PROJECT NO. N4211	BORING	DRILLING METHOD HSA
DATE BEGUN 12/10/02	DATE COMPLETED 12/10/02	
FIELD GEOLOGIST BDH		DEVELOPMENT METHOD
GROUND ELEVATION	DATUM	



ELEVATION TOP OF RISER:

TYPE OF SURFACE SEAL: Concrete

TYPE OF PROTECTIVE CASING: Steel

I.D. OF PROTECTIVE CASING:

DIAMETER OF HOLE: 8.25"

TYPE OF RISER PIPE: PVC

RISER PIPE I.D.: 2"

TYPE OF BACKFILL/SEAL: NA

ELEVATION/DEPTH TOP OF SEAL: 10.5'

TYPE OF SEAL: Bentonite

ELEVATION/DEPTH TOP OF SAND: 12'

ELEVATION/DEPTH TOP OF SCREEN: 14'

TYPE OF SCREEN: PVC

SLOT SIZE x LENGTH: 10 X10'

TYPE OF SAND PACK: #2

DIAMETER OF HOLE IN BEDROCK: NA

ELEVATION / DEPTH BOTTOM OF SCREEN: 14'

ELEVATION / DEPTH BOTTOM OF SAND: 14'

ELEVATION/DEPTH BOTTOM OF HOLE: 14'

BACKFILL MATERIAL BELOW SAND: Sand

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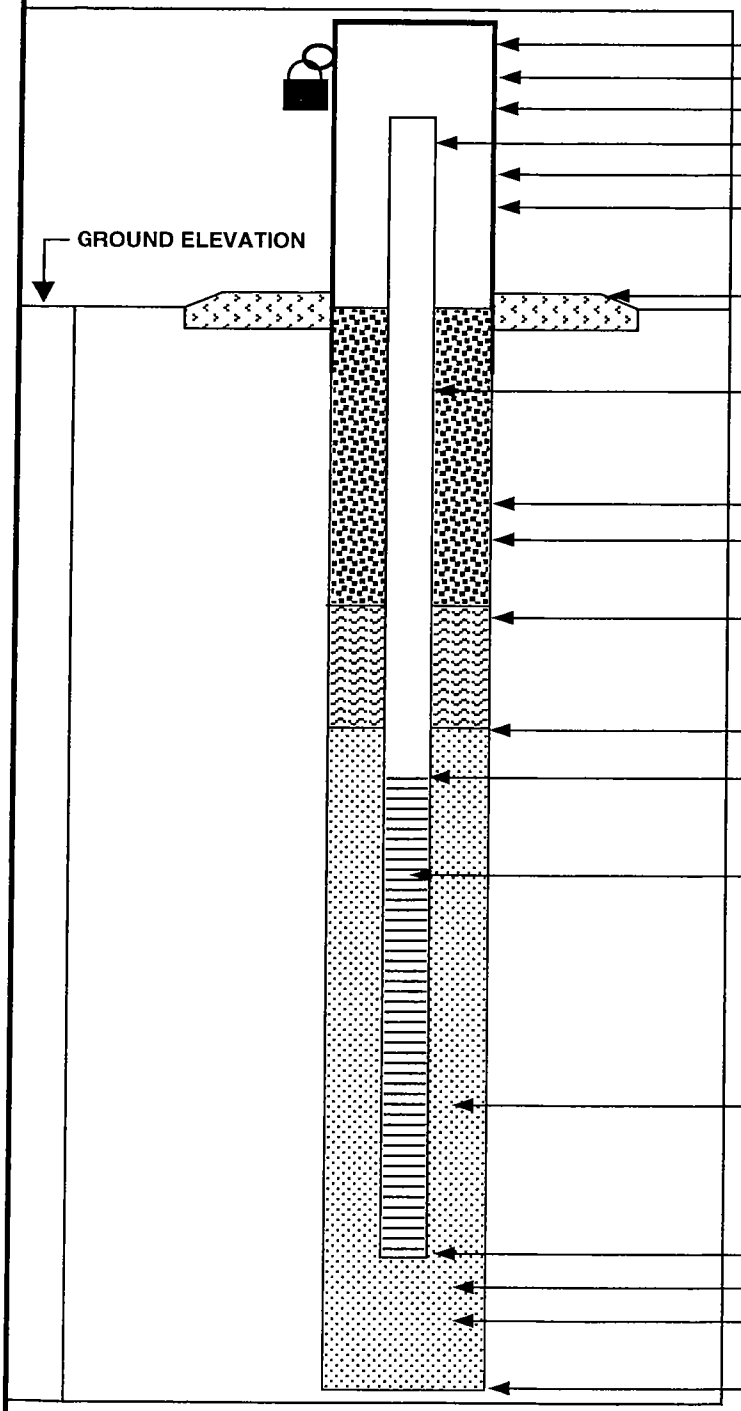
WELL NO.: PAI-FOV-10

OVERBURDEN MONITORING WELL SHEET

PROJECT	Fiber Optic Vault	LOCATION	MCRD Parris Island	DRILLER	JGW
PROJECT NO.	N4211	BORING		METHOD:	
ELEVATION		DATE	12/12/02	DRILLING	HSA
FIELD GEOLOGIST	BDH			DEVELOPMENT	



ELEVATION OF TOP OF SURFACE CASING:

ELEVATION OF TOP OF RISER PIPE:

STICK-UP TOP OF SURFACE CASING: 2.99'

STICK-UP OF RISER PIPE: 2.87'

I.D. OF SURFACE CASING:

TYPE OF SURFACE CASING: Steel

TYPE OF SURFACE SEAL: Concrete

RISER PIPE I.D.: 2"

TYPE OF RISER PIPE: PVC

BOREHOLE DIAMETER: 8.25"

TYPE OF SEAL: NA

ELEVATION / DEPTH OF SEAL: 0.5'

TYPE OF SEAL: Bentonite

DEPTH - TOP OF SAND PACK: 1'

ELEVATION / DEPTH - TOP OF SCREEN: 2'

TYPE OF SCREEN: PVC

SLOT SIZE X LENGTH: 10 X 10'

I.D. OF SCREEN: 2"

TYPE OF SAND PACK: #2

ELEVATION / DEPTH TO BOTTOM OF SCREEN: 12'

ELEVATION / DEPTH TO BOTTOM OF SAND PACK: 12'

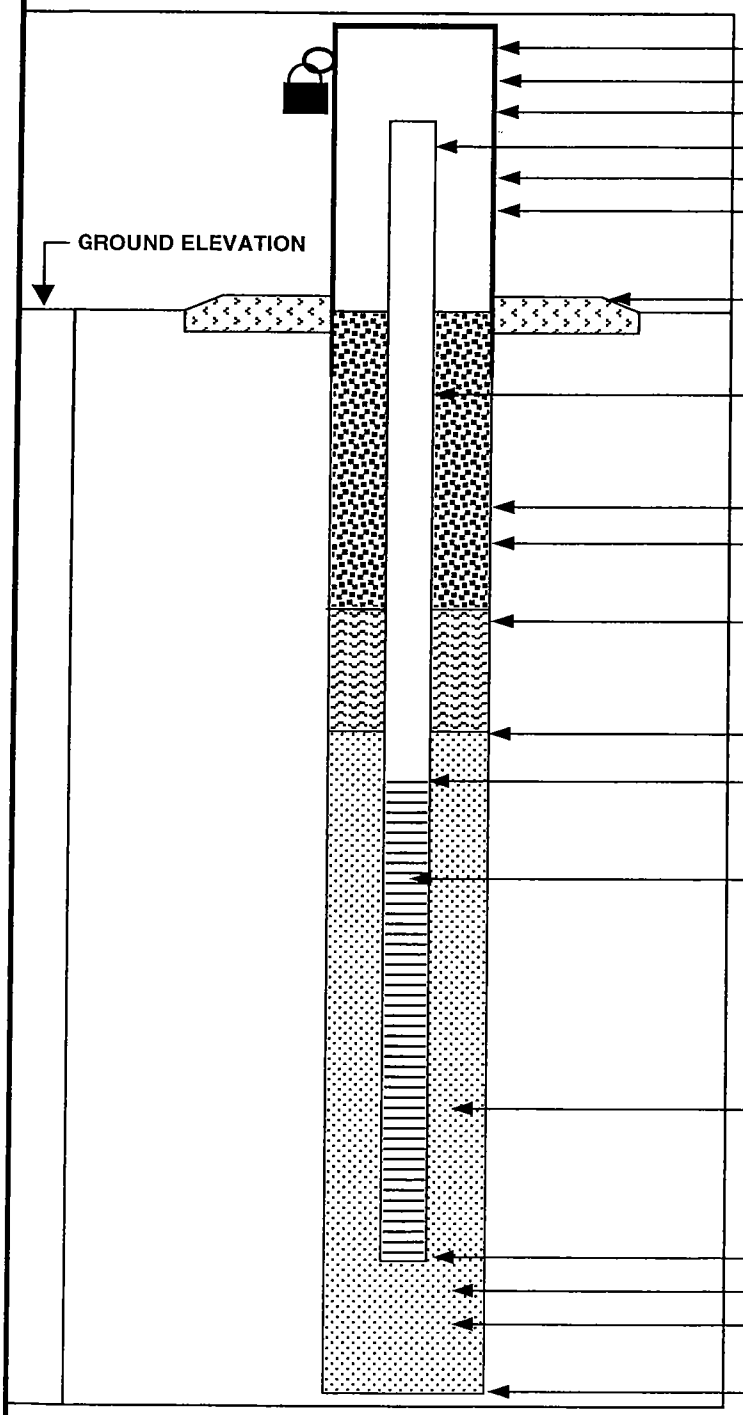
TYPE OF BACKFILL BELOW MONITORING WELL: Sand

ELEVATION / DEPTH TO BOTTOM OF BOREHOLE: 12'

WELL NO.: PAI-FOV-11

OVERBURDEN MONITORING WELL SHEET

PROJECT	Fiber Optic Vault	LOCATION	MCRD Parris Island	DRILLER	JGW
PROJECT NO.	N4211	BORING		METHOD:	
ELEVATION		DATE	12/14/02	DRILLING	HSA
FIELD GEOLOGIST	BDH			DEVELOPMENT	



ELEVATION OF TOP OF SURFACE CASING:

ELEVATION OF TOP OF RISER PIPE:

STICK-UP TOP OF SURFACE CASING: 3.01'

STICK-UP OF RISER PIPE: 2.84'

I.D. OF SURFACE CASING:

TYPE OF SURFACE CASING: Steel

TYPE OF SURFACE SEAL: Concrete

RISER PIPE I.D.: 2"

TYPE OF RISER PIPE: PVC

BOREHOLE DIAMETER: 8.25"

TYPE OF SEAL: NA

ELEVATION / DEPTH OF SEAL: 0.5'

TYPE OF SEAL: Bentonite

DEPTH - TOP OF SAND PACK: 2'

ELEVATION / DEPTH - TOP OF SCREEN: 4.1'

TYPE OF SCREEN: PVC

SLOT SIZE X LENGTH: 10 X 10'

I.D. OF SCREEN: 2"

TYPE OF SAND PACK: #2

ELEVATION / DEPTH TO BOTTOM OF SCREEN: 14.1

ELEVATION / DEPTH TO BOTTOM OF SAND PACK: 14.1

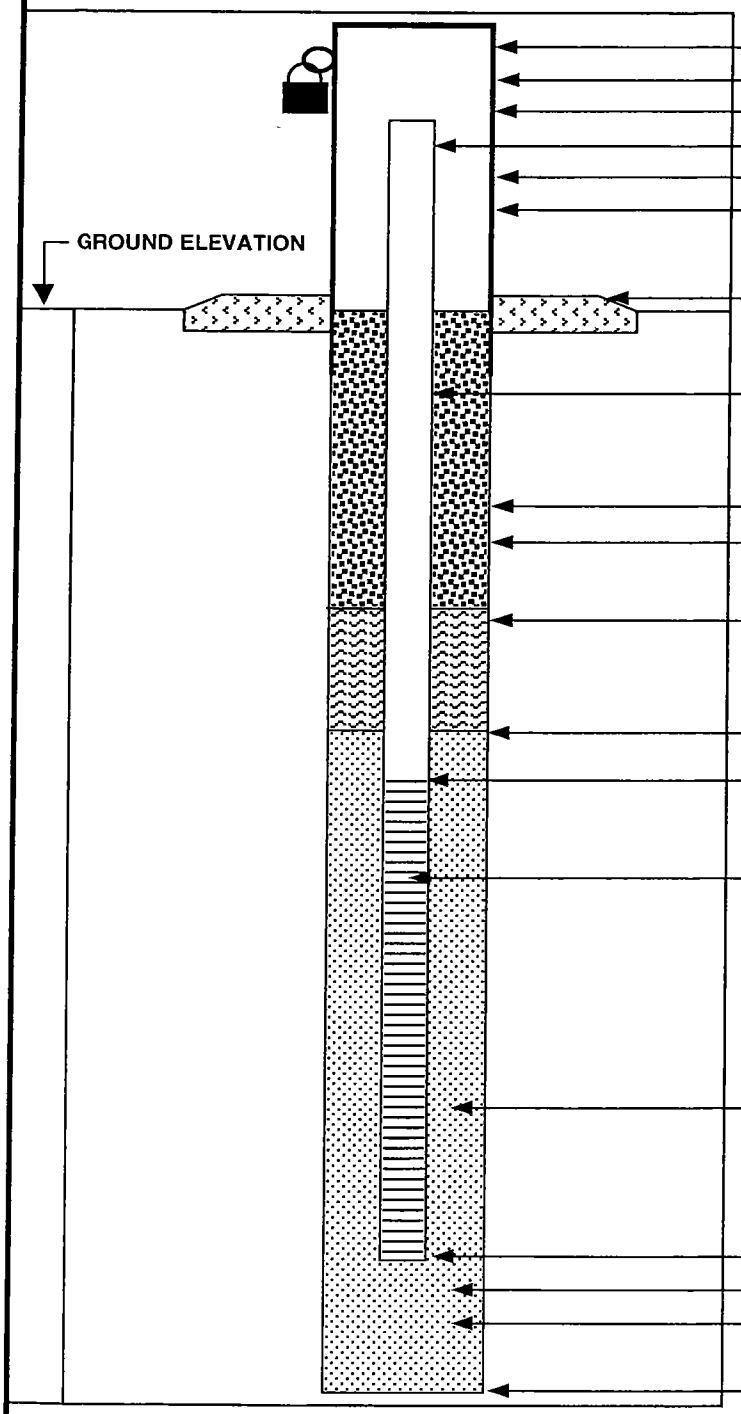
TYPE OF BACKFILL BELOW MONITORING WELL: Sand

ELEVATION / DEPTH TO BOTTOM OF BOREHOLE: 14.1

WELL NO.: PAI-FOV-12I

OVERBURDEN MONITORING WELL SHEET

PROJECT	Fiber Optic Vault	LOCATION	MCRD Parris Island	DRILLER	JGW
PROJECT NO.	N4211	BORING		METHOD:	
ELEVATION		DATE	12/13/02	DRILLING	HSA
FIELD GEOLOGIST	BDH			DEVELOPMENT	



ELEVATION OF TOP OF SURFACE CASING:

ELEVATION OF TOP OF RISER PIPE:

STICK-UP TOP OF SURFACE CASING: 2.96'

STICK-UP OF RISER PIPE: 2.78'

I.D. OF SURFACE CASING:

TYPE OF SURFACE CASING:

TYPE OF SURFACE SEAL: Concrete

RISER PIPE I.D.: 2"

TYPE OF RISER PIPE: PVC

BOREHOLE DIAMETER: 8.25"

TYPE OF SEAL: Grout

ELEVATION / DEPTH OF SEAL: 15'

TYPE OF SEAL: Bentonite

DEPTH - TOP OF SAND PACK: 19'

ELEVATION / DEPTH - TOP OF SCREEN: 18.7'

TYPE OF SCREEN: PVC

SLOT SIZE X LENGTH: 10 X 3'

I.D. OF SCREEN: 2"

TYPE OF SAND PACK: #2

ELEVATION / DEPTH TO BOTTOM OF SCREEN: 21.7'

ELEVATION / DEPTH TO BOTTOM OF SAND PACK: 24'

TYPE OF BACKFILL BELOW MONITORING WELL: Sand

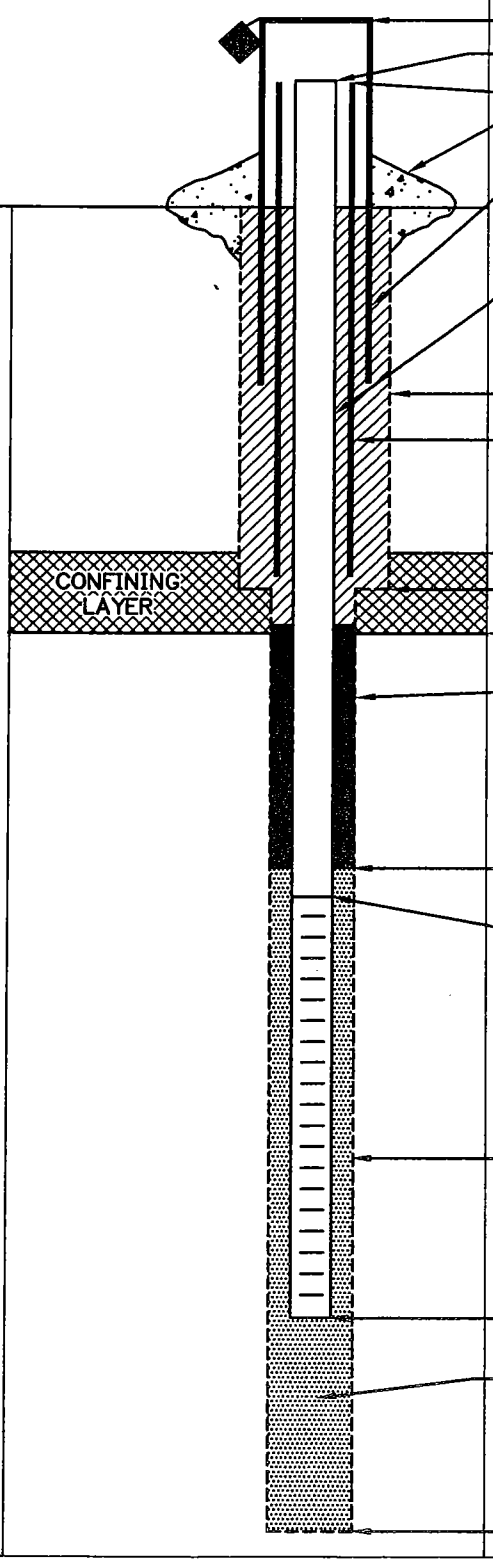
ELEVATION / DEPTH TO BOTTOM OF BOREHOLE: 24'

WELL NO.: PAI-FOV-13D

CONFINING LAYER
MONITORING WELL SHEET

Tetra Tech NUS, Inc.

PROJECT Fiber Optic Vault	LOCATION MCRD Parris Island	DRILLER JGW
PROJECT NO. N4211	BORING	DRILLING METHOD HSA / mud rotary
DATE BEGUN 12/14/02	DATE COMPLETED 12/18/02	
FIELD GEOLOGIST BDH		DEVELOPMENT METHOD
GROUND ELEVATION	DATUM	



ELEVATION/HEIGHT OF TOP OF SURFACE CASING: 12.9'
ELEVATION/HEIGHT OF TOP OF RISER PIPE: 12.83'
ELEVATION/HEIGHT OF TOP OF PERM. CASING: /
TYPE OF SURFACE SEAL: Concrete

I.D. OF SURFACE CASING:
TYPE OF SURFACE CASING: Steel

RISER PIPE I.D.: 2"
TYPE OF RISER PIPE: PVC

BOREHOLE DIAMETER: 12"

PERM. CASING I.D.: 6"
TYPE OF CASING AND BACKFILL: Steel / Grout

ELEVATION/DEPTH TOP CONFINING LAYER: 129.2'
ELEVATION/DEPTH BOTTOM OF CASING: 130.5'
ELEVATION/DEPTH BOTTOM CONFINING LAYER: 131'

ELEVATION/DEPTH TOP OF SEAL: 124.4'
TYPE OF SEAL: Bentonite

DEPTH TOP OF SAND PACK: 30.8'

ELEVATION/DEPTH TOP OF SCREEN: 132.8'
TYPE OF SCREEN: PVC

TYPE OF SAND PACK: #2

BOREHOLE DIA. BELOW CASING: 5.5'

ELEVATION/DEPTH BOTTOM OF SCREEN: 135.8'

ELEVATION/DEPTH BOTTOM OF SAND PACK: 136'
BACKFILL MATERIAL BELOW SAND: Sand

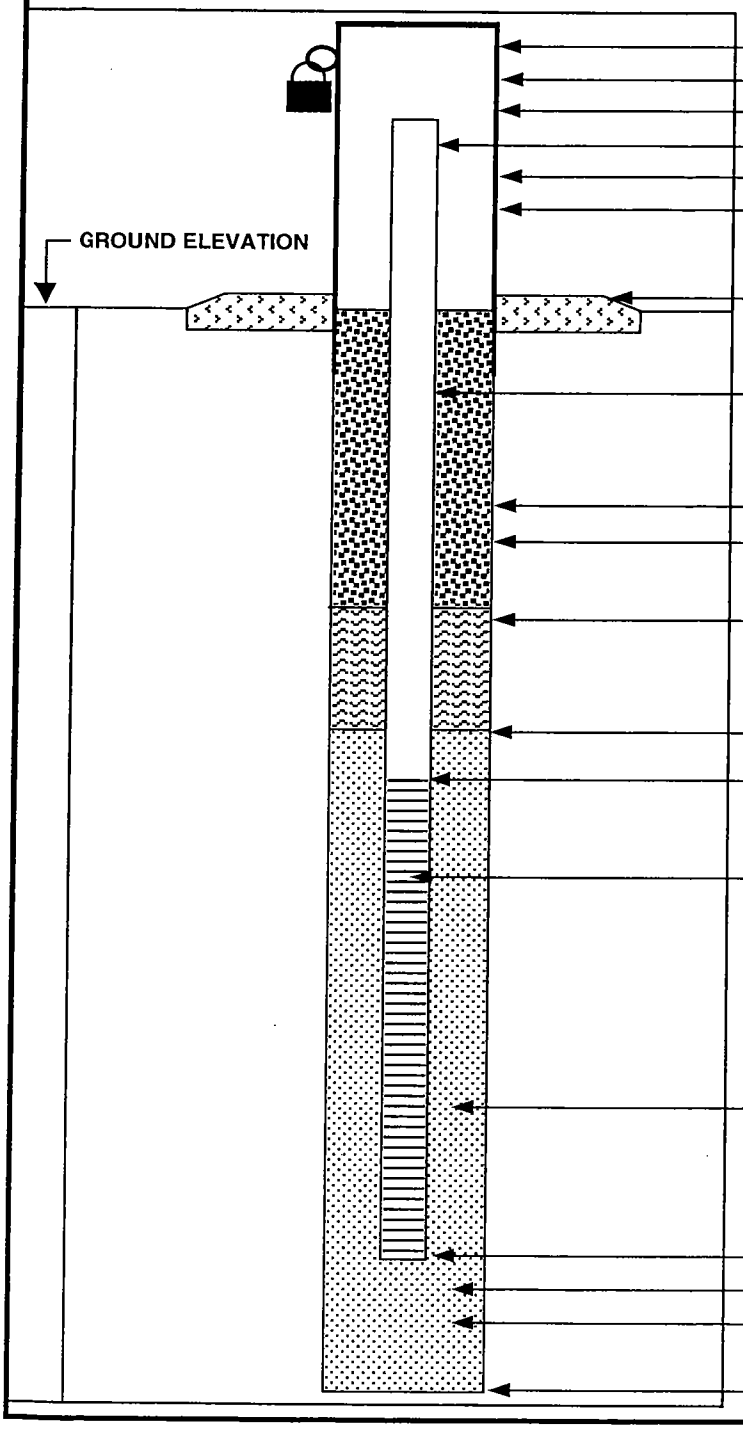
ELEVATION/DEPTH OF HOLE: 136'

ACAD:FORM_CLMW.dwg 07/20/99 INL

WELL NO.: PAI-FOV-14

OVERBURDEN MONITORING WELL SHEET

PROJECT	Fiber Optic Vault	LOCATION	MCRD Parris Island	DRILLER	JGW
PROJECT NO.	N9211	BORING		METHOD:	
ELEVATION		DATE	12/13/02	DRILLING	HSA
FIELD GEOLOGIST	BDH			DEVELOPMENT	



ELEVATION OF TOP OF SURFACE CASING:

ELEVATION OF TOP OF RISER PIPE:

STICK-UP TOP OF SURFACE CASING: 3.02'

STICK-UP OF RISER PIPE: 2.84'

I.D. OF SURFACE CASING:

TYPE OF SURFACE CASING: Steel

TYPE OF SURFACE SEAL: Concrete

RISER PIPE I.D.: 2"

TYPE OF RISER PIPE: PVC

BOREHOLE DIAMETER: 8.25"

TYPE OF SEAL: NA

ELEVATION / DEPTH OF SEAL: 0.5'

TYPE OF SEAL: Bentonite

DEPTH - TOP OF SAND PACK: 2'

ELEVATION / DEPTH - TOP OF SCREEN: 3.2'

TYPE OF SCREEN: PVC

SLOT SIZE X LENGTH: 10 X 10'

I.D. OF SCREEN: 2"

TYPE OF SAND PACK: #2

ELEVATION / DEPTH TO BOTTOM OF SCREEN: 13.2'

ELEVATION / DEPTH TO BOTTOM OF SAND PACK: 14'

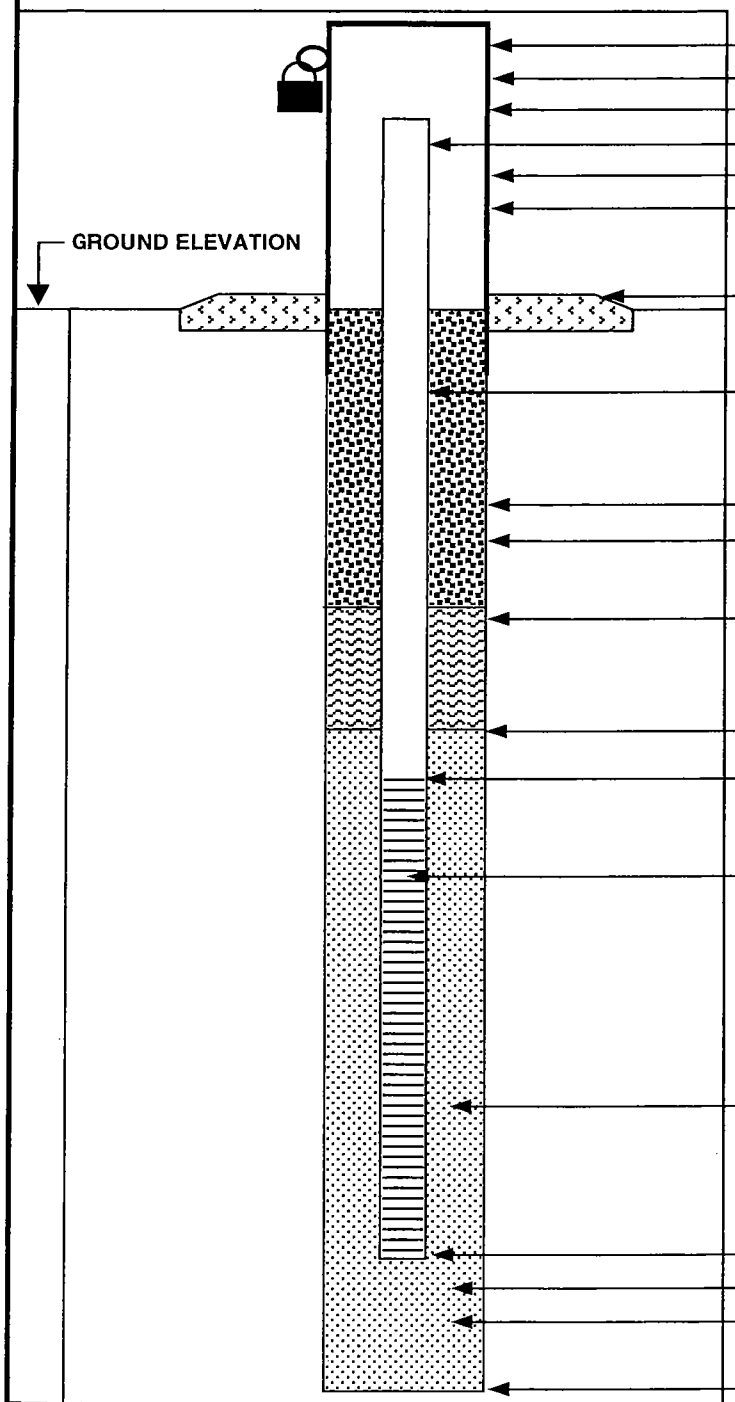
TYPE OF BACKFILL BELOW MONITORING WELL: Bond

ELEVATION / DEPTH TO BOTTOM OF BOREHOLE: 14'

WELL NO.: PAI-FOV-15I

OVERBURDEN MONITORING WELL SHEET

PROJECT	Fiber Optic Vault	LOCATION	MCRD Parris Island	DRILLER	JGW
PROJECT NO.	N4211	BORING		METHOD:	
ELEVATION		DATE	12/13/02	DRILLING	HSA
FIELD GEOLOGIST	BDH			DEVELOPMENT	



ELEVATION OF TOP OF SURFACE CASING:

ELEVATION OF TOP OF RISER PIPE:

STICK-UP TOP OF SURFACE CASING: 3.01'

STICK-UP OF RISER PIPE: 2.73'

I.D. OF SURFACE CASING:

TYPE OF SURFACE CASING: Steel

TYPE OF SURFACE SEAL: Concrete

RISER PIPE I.D.: 2"

TYPE OF RISER PIPE: PVC

BOREHOLE DIAMETER: 8.25"

TYPE OF SEAL: Grout

ELEVATION / DEPTH OF SEAL: 17'

TYPE OF SEAL: Bentonite

DEPTH - TOP OF SAND PACK: 19'

ELEVATION / DEPTH - TOP OF SCREEN: 21'

TYPE OF SCREEN: PVC

SLOT SIZE X LENGTH: 10 X 3'

I.D. OF SCREEN: 2

TYPE OF SAND PACK: #2

ELEVATION / DEPTH TO BOTTOM OF SCREEN: 24'

ELEVATION / DEPTH TO BOTTOM OF SAND PACK: 24'

TYPE OF BACKFILL BELOW MONITORING WELL: Sand

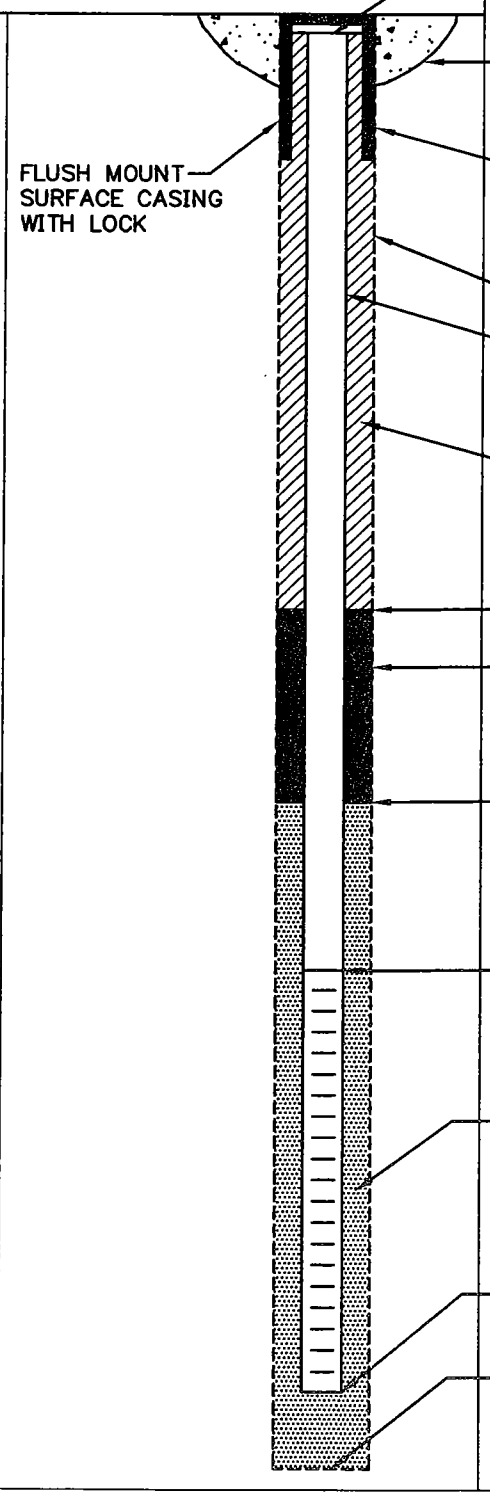
ELEVATION / DEPTH TO BOTTOM OF BOREHOLE: 24'

WELL NO.: PAI-FOV-16

Tetra Tech NUS, Inc.

OVERBURDEN MONITORING WELL SHEET FLUSH - MOUNT

PROJECT Fiber Optic Vault	LOCATION MCRD Parris Island	DRILLER JGW
PROJECT NO. N4211	BORING	DRILLING METHOD HSA
DATE BEGUN 12/11/02	DATE COMPLETED 12/11/02	
FIELD GEOLOGIST BDH		DEVELOPMENT METHOD
GROUND ELEVATION	DATUM	



ELEVATION TOP OF RISER:

TYPE OF SURFACE SEAL: Concrete

TYPE OF PROTECTIVE CASING: Steel

I.D. OF PROTECTIVE CASING:

DIAMETER OF HOLE: 8.25"

TYPE OF RISER PIPE: PVC

RISER PIPE I.D.: 2"

TYPE OF BACKFILL/SEAL: NA

ELEVATION/DEPTH TOP OF SEAL: 10.5'

TYPE OF SEAL: Bentonite

ELEVATION/DEPTH TOP OF SAND: 12'

ELEVATION/DEPTH TOP OF SCREEN: 13.6'

TYPE OF SCREEN: PVC

SLOT SIZE x LENGTH: 10 X 10'

TYPE OF SAND PACK: #2

DIAMETER OF HOLE IN BEDROCK: NA

ELEVATION / DEPTH BOTTOM OF SCREEN: 13.6'

ELEVATION / DEPTH BOTTOM OF SAND: 14'

ELEVATION/DEPTH BOTTOM OF HOLE: 14'

BACKFILL MATERIAL BELOW SAND: Sand

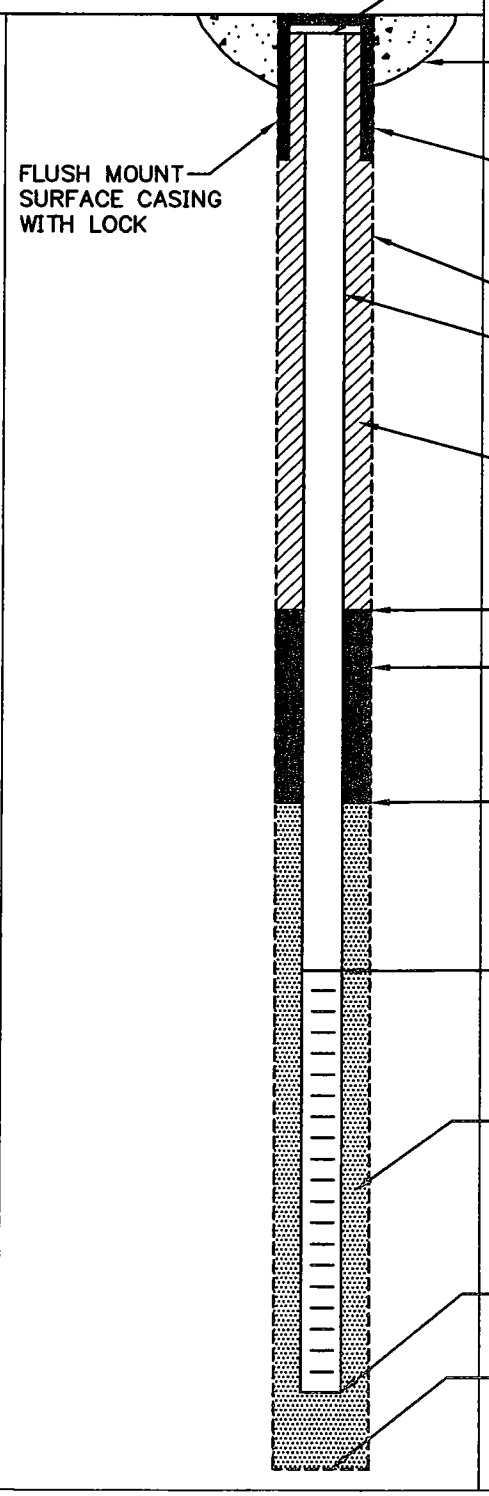
ACAD: FORM_MWFM.dwg 07/20/99 INL

WELL NO.: PAI-FUV-17

Tetra Tech NUS, Inc.

OVERBURDEN MONITORING WELL SHEET FLUSH - MOUNT

PROJECT: Fiber Optic Vault	LOCATION: MKRD Paving Bond	DRILLER: JGW
PROJECT NO.: N7211	BORING:	DRILLING METHOD: HSA
DATE BEGUN: 12/11/02	DATE COMPLETED: 12/11/02	
FIELD GEOLOGIST: BDH		DEVELOPMENT METHOD:
GROUND ELEVATION:	DATUM:	



ELEVATION TOP OF RISER:

TYPE OF SURFACE SEAL: Concrete

TYPE OF PROTECTIVE CASING: Steel

I.D. OF PROTECTIVE CASING:

DIAMETER OF HOLE: 8.25"

TYPE OF RISER PIPE: PVC

RISER PIPE I.D.: 2"

TYPE OF BACKFILL/SEAL: NA

ELEVATION/DEPTH TOP OF SEAL: 10.7'

TYPE OF SEAL: Bentonite

ELEVATION/DEPTH TOP OF SAND: 12'

ELEVATION/DEPTH TOP OF SCREEN: 14'

TYPE OF SCREEN: PVC

SLOT SIZE x LENGTH: 10 X 10'

TYPE OF SAND PACK: #2

DIAMETER OF HOLE IN BEDROCK: NA

ELEVATION / DEPTH BOTTOM OF SCREEN: 14'

ELEVATION / DEPTH BOTTOM OF SAND: 14'

ELEVATION/DEPTH BOTTOM OF HOLE: 14'

BACKFILL MATERIAL BELOW SAND: Sand

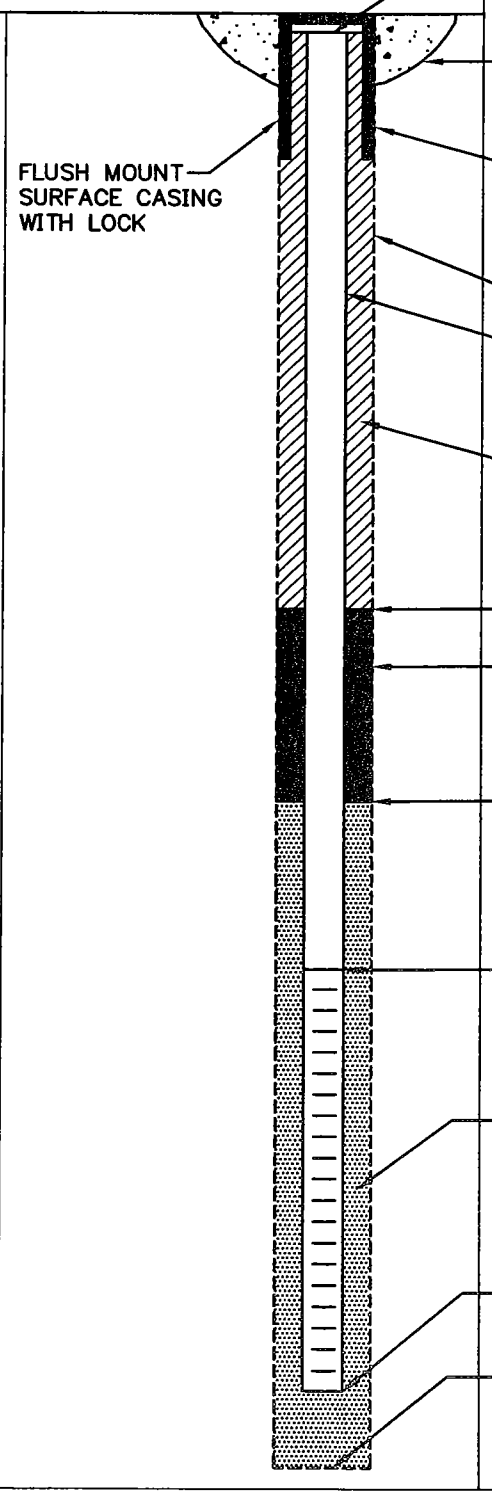
ACAD: FORM_MWFM.dwg 07/20/99 INL

WELL NO.: PAI-FOV-18I

Tetra Tech NUS, Inc.

OVERBURDEN MONITORING WELL SHEET FLUSH - MOUNT

PROJECT Fiber Optic Vault	LOCATION MCRD Parris Island	DRILLER JGW
PROJECT NO. N4241	BORING	DRILLING METHOD HSA
DATE BEGUN 12/12/02	DATE COMPLETED 12/12/02	
FIELD GEOLOGIST BDH		DEVELOPMENT METHOD
GROUND ELEVATION	DATUM	



ELEVATION TOP OF RISER:

TYPE OF SURFACE SEAL: Concrete

TYPE OF PROTECTIVE CASING: Steel

I.D. OF PROTECTIVE CASING:

DIAMETER OF HOLE: 8.25"

TYPE OF RISER PIPE: PVC

RISER PIPE I.D.: 2"

TYPE OF BACKFILL/SEAL: Grout

ELEVATION/DEPTH TOP OF SEAL: 114'

TYPE OF SEAL: Bentonite

ELEVATION/DEPTH TOP OF SAND: 117'

ELEVATION/DEPTH TOP OF SCREEN: 119.5'

TYPE OF SCREEN: PVC

SLOT SIZE x LENGTH: 10 X 5'

TYPE OF SAND PACK: #2

DIAMETER OF HOLE IN BEDROCK: NA

ELEVATION / DEPTH BOTTOM OF SCREEN: 124.5

ELEVATION / DEPTH BOTTOM OF SAND: 124.5

ELEVATION/DEPTH BOTTOM OF HOLE: 124.5

BACKFILL MATERIAL BELOW SAND: Sand

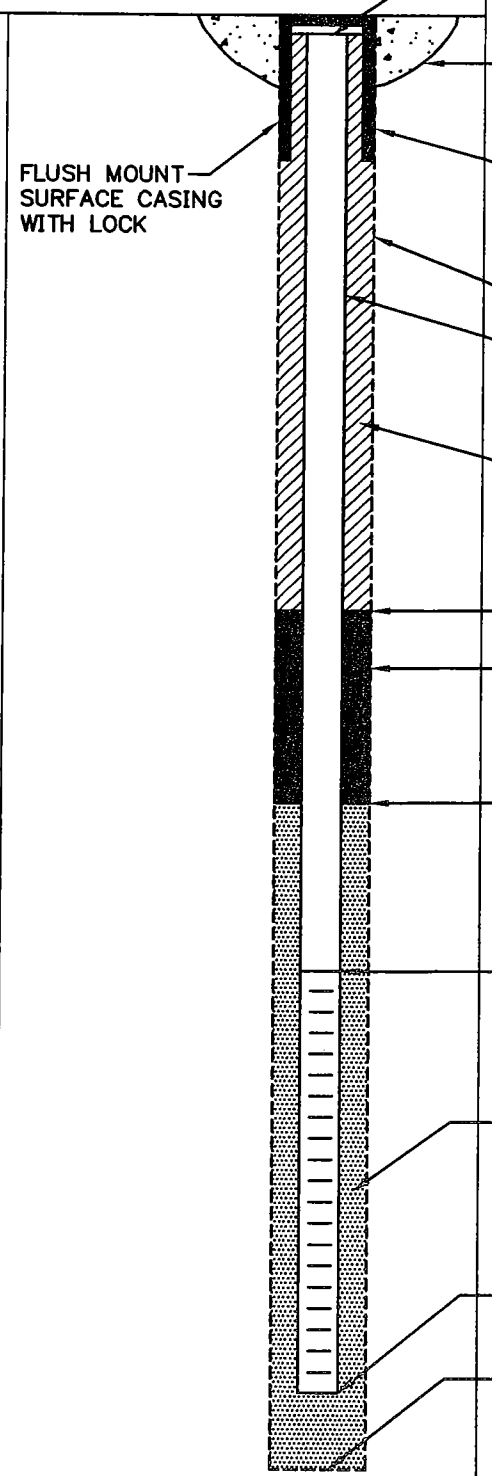
ACAD:FORM_MWFM.dwg 07/20/99 INL

WELL NO.: PAI-FOV-19

Tetra Tech NUS, Inc.

OVERBURDEN MONITORING WELL SHEET FLUSH - MOUNT

PROJECT Fiber Optic Vault	LOCATION MCRD Parris Island	DRILLER JGW
PROJECT NO. N4211	BORING	DRILLING METHOD HSA
DATE BEGUN 12/10/02	DATE COMPLETED 12/10/02	
FIELD GEOLOGIST BDH		DEVELOPMENT METHOD
GROUND ELEVATION	DATUM	



ELEVATION TOP OF RISER:

TYPE OF SURFACE SEAL: Concrete

TYPE OF PROTECTIVE CASING: Steel

I.D. OF PROTECTIVE CASING:

DIAMETER OF HOLE: 8.25"

TYPE OF RISER PIPE: PVC

RISER PIPE I.D.: 2"

TYPE OF BACKFILL/SEAL: Concrete

ELEVATION/DEPTH TOP OF SEAL: 10.7'

TYPE OF SEAL: Bentonite

ELEVATION/DEPTH TOP OF SAND: 11'

ELEVATION/DEPTH TOP OF SCREEN: 12'

TYPE OF SCREEN: PVC

SLOT SIZE x LENGTH: 10 X 10'

TYPE OF SAND PACK: #2

DIAMETER OF HOLE IN BEDROCK: NA

ELEVATION / DEPTH BOTTOM OF SCREEN: 12'

ELEVATION / DEPTH BOTTOM OF SAND: 12'

ELEVATION/DEPTH BOTTOM OF HOLE: 12'

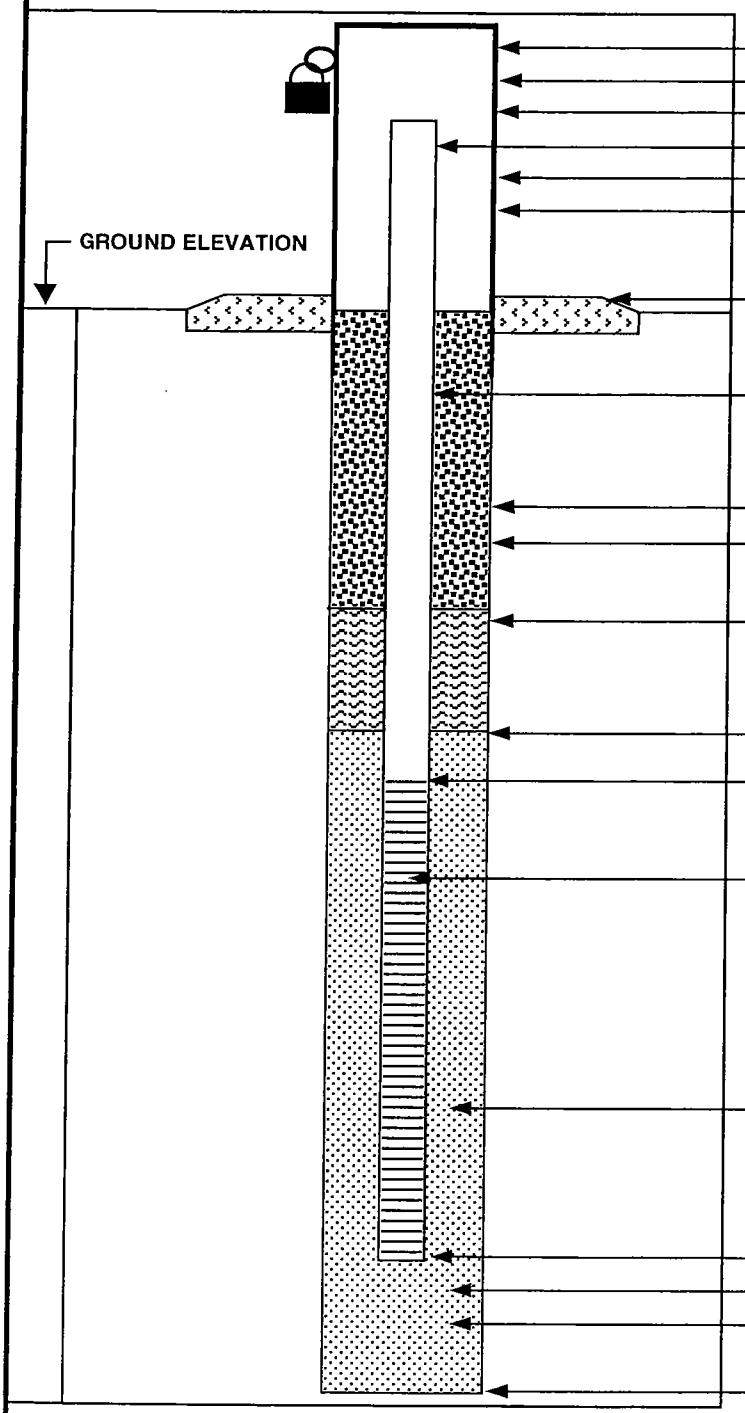
BACKFILL MATERIAL BELOW SAND: Sand

ACAD:FORM_MWFM.dwg 07/20/99 INL

WELL NO.: PAI-FOV-20

OVERBURDEN MONITORING WELL SHEET

PROJECT	Fiber Optic Vault	LOCATION	MCRD Parris Island	DRILLER	JGW
PROJECT NO.	94211	BORING		METHOD:	
ELEVATION		DATE	12/11/02	DRILLING	HSA
FIELD GEOLOGIST	BDH			DEVELOPMENT	



ELEVATION OF TOP OF SURFACE CASING:

ELEVATION OF TOP OF RISER PIPE:

STICK-UP TOP OF SURFACE CASING: 3.07'

STICK-UP OF RISER PIPE: 2.7'

I.D. OF SURFACE CASING:

TYPE OF SURFACE CASING: Steel

TYPE OF SURFACE SEAL: Concrete

RISER PIPE I.D.: 2"

TYPE OF RISER PIPE: PVC

BOREHOLE DIAMETER: 8.25"

TYPE OF SEAL: Grout

ELEVATION / DEPTH OF SEAL: 0.5'

TYPE OF SEAL: Bentonite

DEPTH - TOP OF SAND PACK: 2'

ELEVATION / DEPTH - TOP OF SCREEN: 4.1

TYPE OF SCREEN: PVC

SLOT SIZE X LENGTH: 10 X 10'

I.D. OF SCREEN: 2"

TYPE OF SAND PACK: #2

ELEVATION / DEPTH TO BOTTOM OF SCREEN: 14.1

ELEVATION / DEPTH TO BOTTOM OF SAND PACK: 14.1

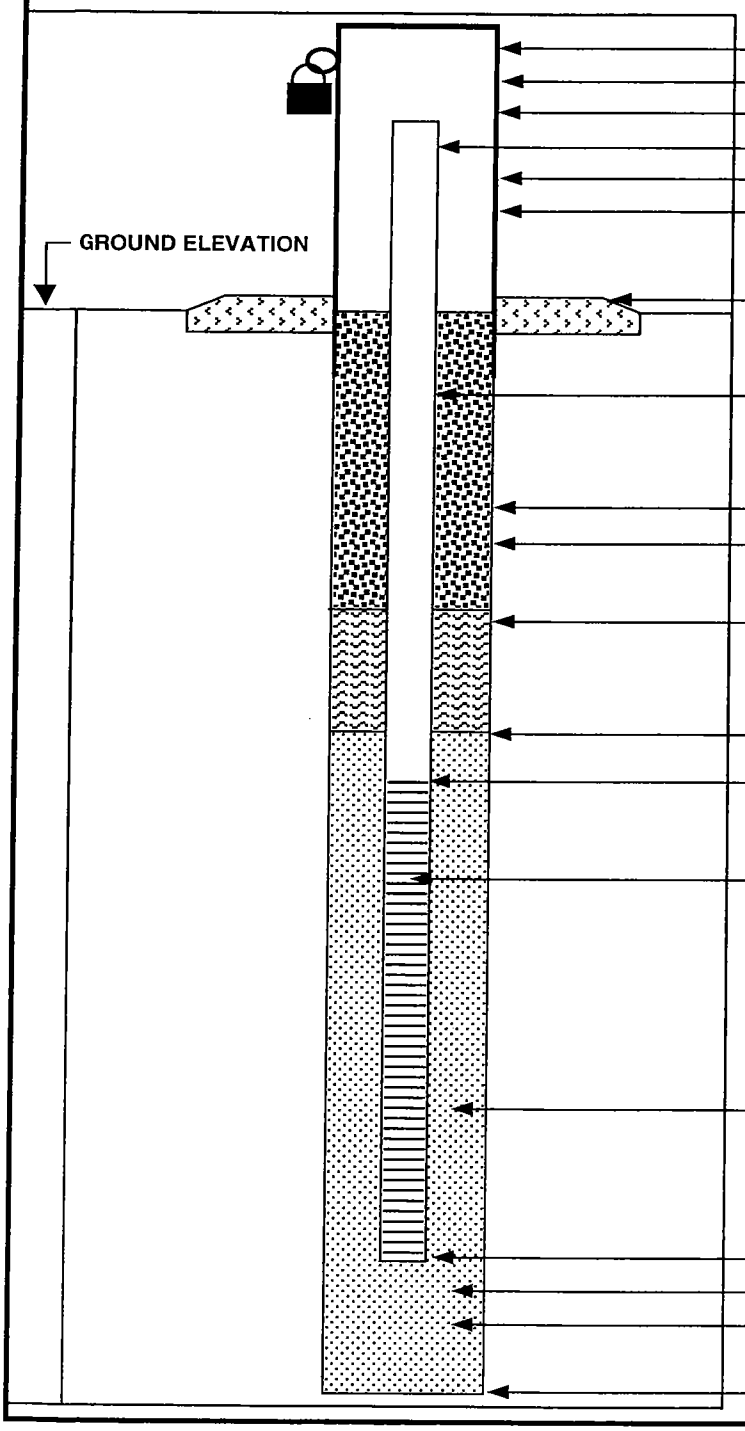
TYPE OF BACKFILL BELOW MONITORING WELL: Sand

ELEVATION / DEPTH TO BOTTOM OF BOREHOLE: 14.1

WELL NO.: PAI - FOV - 21

OVERBURDEN MONITORING WELL SHEET

PROJECT	Fiber Optic Route	LOCATION	MCRD Parris Island	DRILLER	JGW
PROJECT NO.	N4211	BORING		METHOD:	
ELEVATION		DATE	12/11/02	DRILLING	HSA
FIELD GEOLOGIST	BDH			DEVELOPMENT	



ELEVATION OF TOP OF SURFACE CASING:

ELEVATION OF TOP OF RISER PIPE:

STICK-UP TOP OF SURFACE CASING: 2.99'

STICK-UP OF RISER PIPE: 2.82'

I.D. OF SURFACE CASING:

TYPE OF SURFACE CASING: Steel

TYPE OF SURFACE SEAL: Concrete

RISER PIPE I.D.: 2"

TYPE OF RISER PIPE: PVC

BOREHOLE DIAMETER: 8.25"

TYPE OF SEAL:

ELEVATION / DEPTH OF SEAL: 0.5'

TYPE OF SEAL: Bentonite

DEPTH - TOP OF SAND PACK: 1'

ELEVATION / DEPTH - TOP OF SCREEN: 2.4'

TYPE OF SCREEN: PVC

SLOT SIZE X LENGTH: 10 X10'

I.D. OF SCREEN: 2"

TYPE OF SAND PACK: #2

ELEVATION / DEPTH TO BOTTOM OF SCREEN: 12.4'

ELEVATION / DEPTH TO BOTTOM OF SAND PACK: 12.4'

TYPE OF BACKFILL BELOW MONITORING WELL: Sand

ELEVATION / DEPTH TO BOTTOM OF BOREHOLE: 12.4'

D-4 GROUNDWATER SAMPLE LOG SHEETS

Tetra Tech NUS
Groundwater Purging and Sampling Log

Date 7/9/3

Project Site Name:
Project No.: N4211

[ ] Domestic Well Data

[X] Monitoring Well Data

[ ] Other Well Type:

Flow-Thru Cell Make\Model: Horiba U-22

Serial Nos.: 9292036

Sample Location: MW-1

Sample ID No.: PAI-FOV-GW-01-01

Sampled By: JB

C-O-C No.:

PURGING DATA

Casing Size (in.)	Gals. per ft. of Water	Liters per ft. of Water	Time Hr:Min	pH pH units	S.C. mS/cm	Temp. °C	Turbidity NTU	DO mg/L	ORP mV	DTW ft BTOC	Flow Rate ml/min
0.5	0.01	0.038	Initial	6.32	0.16	27.60	99.7	7.36	81	6.23	200
1	0.041	0.155	1st	6.14	0.16	26.89	37.0	2.62	63	6.41	"
2	0.163	0.617	2nd	6.01	0.16	27.07	32.1	3.38	72	6.41	"
4	0.653	2.47	3rd	6.11	0.16	27.67	16.7	3.67	59	6.41	"
6	1.469	5.56									
8	2.611	9.88									
10	4.08	15.44									
	[1 gal. = 3.785 L]										

PID Reading (ppm): Ø

Well Casing Diameter: 2"
Total Well Depth: 14.90
Static Water Level: 6.23
Tube Intake Depth: ~13.5'
Volume 1.4 gal
Start Purge (hr): 1350
End Purge (hr): 1515
Total Purge Time (min): 80
Total Vol. Purged: 4.2 gal

WATER QUALITY SAMPLE PARAMETERS

	Color Description	pH pH units	S.C. mS/cm	Temp. °C	Turbidity NTU	DO mg/L	ORP mV	DTW ft BTOC	Flow Rate ml/min
Date: 7/9/3									
Time: 1520	clear	6.11	0.16	27.67	16.7	3.67	59	6.41	200

ANALYSES INFORMATION

Analysis		Preservative	Container Requirements			Collected
TCL VOCs	8260B	HCl	3	40 ml	glass vials	✓
Dissolved Methane	8XXX	HCL	3	40 ml	glass vials	
Total Lead	6000/7000	HNO_3	1	500 ml	HDPE	
SVOC		—	2 x	1 L	Amber	✓
Pest		—		1	Amber	✓
PCB		—		1	Amber	✓

ADDITIONAL INFORMATION

Comments:

Method:
[✓] Peristaltic Pump
[ ] Centrifugal Pump
[ ] Bladder Pump
[✓] Tube Evacuation
[ ] Vacuum Jug Assembly
[ ] Bailer

Tubing Type:
[ ] Polyethylene
[✓] Teflon
[ ] Teflon-lined Polyethylene

QA\QC SAMPLES

MS/MSD:

Duplicate ID No.:

Signature(s):

Tetra Tech NUS
Groundwater Purging and Sampling Log

Date 7/9/3

Project Site Name:
Project No.: N4211

[ ] Domestic Well Data

[X] Monitoring Well Data

[ ] Other Well Type:

Flow-Thru Cell Make\Model: Horiba U-22

Serial Nos.: 9292036

Sample Location: MW-7I

Sample ID No.: PAI-FOV-GW-07-01

Sampled By: JB

C-O-C No.:

PURGING DATA

Casing Size (in.)	Gals. per ft. of Water	Liters per ft. of Water	Time Hr:Min	pH pH units	S.C. mS/cm	Temp. °C	Turbidity NTU	DO mg/L	ORP mV	DTW ft BTOC	Flow Rate ml/min
0.5	0.01	0.038	Initial	5.65	0.28	25.04	43.7	2.29	53	11.90	350
1	0.041	0.155	1st	5.70	0.29	24.28	17.6	0.25	31	13.20	350
2	0.163	0.617	2nd	5.71	0.29	24.23	5.69	0.22	25	13.49	350
4	0.653	2.47	3rd								
6	1.469	5.56									
8	2.611	9.88									
10	4.08	15.44									
	[1 gal. = 3.785 L]										

PID Reading (ppm): Ø

Well Casing Diameter: 2"
Total Well Depth: 29.62
Static Water Level: 9.45
Tube Intake Depth: ~26'
Volume 3.2 gal
Start Purge (hr): 1550
End Purge (hr): 1710
Total Purge Time (min): 70
Total Vol. Purged: 6.4

WATER QUALITY SAMPLE PARAMETERS

	Color Description	pH pH units	S.C. mS/cm	Temp. °C	Turbidity NTU	DO mg/L	ORP mV	DTW ft BTOC	Flow Rate ml/min
Date: 7/9/3									
Time: 1710	clear	5.71	0.29	24.23	5.69	0.22	25	13.49	350

ANALYSES INFORMATION

Analysis		Preservative	Container Requirements			Collected
TCL VOCs	8260B	HCl	3	40 ml	glass vials	✓
Dissolved Methane	8XXX	HCL	3	40 ml	glass vials	
Total Lead	6000/7000	HNO_3	1	500 ml	HDPE	
SVOC		—	2	L	Amber	✓
Pest		—	1	L	Amber	✓
PCB		—	1	L	Amber	✓

ADDITIONAL INFORMATION

Comments:

Method:
[✓] Peristaltic Pump
[ ] Centrifugal Pump
[ ] Bladder Pump
[✓] Tube Evacuation
[ ] Vacuum Jug Assembly
[ ] Bailer

Tubing Type:
[ ] Polyethylene
[✓] Teflon
[ ] Teflon-lined Polyethylene

QA\QC SAMPLES

MS/MSD:

Duplicate ID No.:

Signature(s):

Tetra Tech NUS
Groundwater Purging and Sampling Log

Date 7/9/3

Page 1 of ___

Project Site Name:
Project No.: N4211

[ ] Domestic Well Data

[X] Monitoring Well Data

[ ] Other Well Type:

Flow-Thru Cell Make\Model: Horiba U-22

Serial Nos.: 9292036

Sample Location: MW-8D

Sample ID No.: PAI-FOV-GW-08-01

Sampled By: JB

C-O-C No.:

PURGING DATA

Casing Size (in.)	Gals. per ft. of Water	Liters per ft. of Water	Time Hr:Min	pH pH units	S.C. mS/cm	Temp. °C	Turbidity NTU	DO mg/L	ORP mV	DTW ft BTOC	Flow Rate ml/min
0.5	0.01	0.038	Initial	6.64	0.54	24.86	6.56	3.28	-42	17.95	300
1	0.041	0.155	137	6.97	0.57	24.43	3.64	0.26	-90	23.34	300
2	0.163	0.617									
4	0.653	2.47									
6	1.469	5.56									
8	2.611	9.88									
10	4.08	15.44									
	[1 gal. = 3.785 L]										

PID Reading (ppm): Ø

Well Casing Diameter: 2"
Total Well Depth: 38.66
Static Water Level: 15.87
Tube Intake Depth: ~37
Volume 3.6
Start Purge (hr): 1730
End Purge (hr): 1815
Total Purge Time (min): 45
Total Vol. Purged: 3.6

WATER QUALITY SAMPLE PARAMETERS

	Color Description	pH pH units	S.C. mS/cm	Temp. °C	Turbidity NTU	DO mg/L	ORP mV	DTW ft BTOC	Flow Rate ml/min
Date: 7/9/3									
Time: 1820	Clear	6.97	0.57	24.43	3.64	0.26	-90	23.34	300

ANALYSES INFORMATION

Analysis		Preservative	Container Requirements			Collected
TCL VOCs	8260B	HCl	3	40 ml	glass vials	✓
Dissolved Methane	8XXX	HCL	3	40 ml	glass vials	
Total Lead	6000/7000	HNO_3	1	500 ml	HDPE	
SVOC		—	2	L	Amber	✓
Pest		—	1	L	Amber	✓
PCB		—	1	L	Amber	✓

ADDITIONAL INFORMATION

Comments:

Method:
[✓] Peristaltic Pump
[ ] Centrifugal Pump
[ ] Bladder Pump
[✓] Tube Evacuation
[ ] Vacuum Jug Assembly
[ ] Bailer

Tubing Type:
[ ] Polyethylene
[✓] Teflon
[ ] Teflon-lined Polyethylene

QA\QC SAMPLES

MS/MSD:

Duplicate ID No.:

Signature(s):

Tetra Tech NUS
Groundwater Purging and Sampling Log

Date 7/9/3

Page 1 of ___

Project Site Name:
Project No.: N4211

[ ] Domestic Well Data

[X] Monitoring Well Data

[ ] Other Well Type:

Flow-Thru Cell Make\Model: Horiba U-22

Serial Nos.: 9292036

Sample Location: MW-10

Sample ID No. PAI-FOV-GW-10-01

Sampled By: JB

C-O-C No.:

PURGING DATA

Casing Size (in.)	Gals. per ft. of Water	Liters per ft. of Water	Time Hr:Min	pH pH units	S.C. mS/cm	Temp. °C	Turbidity NTU	DO mg/L	ORP mV	DTW ft BTOC	Flow Rate ml/min
0.5	0.01	0.038	Initial	7.27	~~0.00~~	~~32.61~~	256	9.49	57	7.45	228
1	0.041	0.155			0.37	25.14			~~130~~		
2	0.163	0.617	1st	6.84	0.38	24.05	90.7	5.86	130	7.68	"
4	0.653	2.47	2nd	6.77	0.37	23.85	57.6	4.56	147	7.60	"
6	1.469	5.56	3rd	6.76	0.36	23.72	35.2	3.72	157	7.61	"
8	2.611	9.88									
10	4.08	15.44									
	[1 gal. = 3.785 L]										

PID Reading (ppm): Ø

Well Casing Diameter: 2"
Total Well Depth: 14.30
Static Water Level: 7.21
Tube Intake Depth: ~13'
Volume 1.1
Start Purge (hr): 1845
End Purge (hr): 1940
Total Purge Time (min): 55
Total Vol. Purged: 3.3

WATER QUALITY SAMPLE PARAMETERS

	Color Description	pH pH units	S.C. mS/cm	Temp. °C	Turbidity NTU	DO mg/L	ORP mV	DTW ft BTOC	Flow Rate ml/min
Date: 7/9/3									
Time: 1945	clear	6.76	0.36	23.72	35.2	3.72	157	7.61	228

ANALYSES INFORMATION

Analysis		Preservative	Container Requirements			Collected
TCL VOCs	8260B	HCl	3	40 ml	glass vials	✓
Dissolved Methane	8XXX	HCL	3	40 ml	glass vials	
Total Lead	6000/7000	HNO_3	1	500 ml	HDPE	
SVOC		—	2	L	Amber	✓
Pest		—	1	L	Amber	✓
PCB		—	1	L	Amber	✓

ADDITIONAL INFORMATION

Comments:

Method:
[✓] Peristaltic Pump
[ ] Centrifugal Pump
[ ] Bladder Pump
[✓] Tube Evacuation
[ ] Vacuum Jug Assembly
[ ] Bailer

Tubing Type:
[ ] Polyethylene
[✓] Teflon
[ ] Teflon-lined Polyethylene

QA\QC SAMPLES

MS/MSD:

Duplicate ID No.:

Signature(s):

Tetra Tech NUS
Groundwater Purging and Sampling Log

Date 7/10/3

Project Site Name:
Project No.: N4211

[ ] Domestic Well Data

[X] Monitoring Well Data

[ ] Other Well Type:

Flow-Thru Cell Make\Model: Horiba U-22

Serial Nos.: 9292036

Sample Location: MW-11

Sample ID No.: DA1-FOV-GW-11-01

Sampled By: JB

C-O-C No.:

PURGING DATA

Casing Size (in.)	Gals. per ft. of Water	Liters per ft. of Water	Time Hr:Min	pH pH units	S.C. mS/cm	Temp. °C	Turbidity NTU	DO mg/L	ORP mV	DTW ft BTOC	Flow Rate ml/min
0.5	0.01	0.038	Initial	6.06	0.10	27.22	5.25	6.90	54	8.92	250
1	0.041	0.155	15'	5.89	0.10	27.03	1.34	3.94	93	9.10	250
2	0.163	0.617									
4	0.653	2.47									
6	1.469	5.56									
8	2.611	9.88									
10	4.08	15.44									
	[1 gal. = 3.785 L]										

PID Reading (ppm): Ø

Well Casing Diameter: 2"

16.80 Total Well Depth: 8.92

Static Water Level: 8.92

Tube Intake Depth: ~15.5'

Volume 1.6

Start Purge (hr): 1645

End Purge (hr): 1710

Total Purge Time (min): 25

Total Vol. Purged: 1.6 gal

WATER QUALITY SAMPLE PARAMETERS

	Color Description	pH pH units	S.C. mS/cm	Temp. °C	Turbidity NTU	DO mg/L	ORP mV	DTW ft BTOC	Flow Rate ml/min
Date: 7/10/3									
Time: 1710	clear	5.89	0.10	27.03	1.34	3.94	93	9.10	250

ANALYSES INFORMATION

Analysis		Preservative	Container Requirements			Collected
TCL VOCs	8260B	HCl	3	40 ml	glass vials	✓
Dissolved Methane	8XXX	HCL	3	40 ml	glass vials	
Total Lead	6000/7000	HNO_3	1	500 ml	HDPE	
SVOC		—	2	L	Amber	✓
Pest		—	1	L	Amber	✓
PCB		—	1	L	Amber	✓

ADDITIONAL INFORMATION

Comments:

Method:
[✓] Peristaltic Pump
[ ] Centrifugal Pump
[ ] Bladder Pump
[✓] Tube Evacuation
[ ] Vacuum Jug Assembly
[ ] Bailer

Tubing Type:
[ ] Polyethylene
[✓] Teflon
[ ] Teflon-lined Polyethylene

QA\QC SAMPLES

MS/MSD:

Duplicate ID No.:

Signature(s):

Tetra Tech NUS
Groundwater Purging and Sampling Log

Date 7/10/3

Project Site Name:
Project No.: N 4211

[ ] Domestic Well Data

[X] Monitoring Well Data

[ ] Other Well Type:

Flow-Thru Cell Make\Model: Horiba U-22

Serial Nos.: 9292036

Sample Location: MW-12

Sample ID No.: PA1-FOV-GW-1201

Sampled By: DJB

C-O-C No.:

PURGING DATA

Casing Size (in.)	Gals. per ft. of Water	Liters per ft. of Water	Time Hr:Min	pH pH units	S.C. mS/cm	Temp. °C	Turbidity NTU	DO mg/L	ORP mV	DTW ft BTOC	Flow Rate ml/min
0.5	0.01	0.038	Initial	5.75	0.16	23.86	210	3.03	98	8.40	270
1	0.041	0.155	1st	5.73	0.16	24.37	88.1	0.55	78	13.43	270
2	0.163	0.617	2nd	5.84	0.16	24.37	28.7	3.42	68	13.33	270
4	0.653	2.47									
6	1.469	5.56									
8	2.611	9.88									
10	4.08	15.44									
	[1 gal. = 3.785 L]										

PID Reading (ppm): Ø

Well Casing Diameter: 2"
Total Well Depth: 24.25
Static Water Level: 8.40
Tube Intake Depth: ~22.0
Volume 2.5
Start Purge (hr): 1730
End Purge (hr): 1840
Total Purge Time (min): 70
Total Vol. Purged: 5.0

WATER QUALITY SAMPLE PARAMETERS

	Color Description	pH pH units	S.C. mS/cm	Temp. °C	Turbidity NTU	DO mg/L	ORP mV	DTW ft BTOC	Flow Rate ml/min
Date: 7/10/3 Time: 1845	clear	5.84	0.16	24.37	28.7	3.42	68	13.33	270

ANALYSES INFORMATION

Analysis		Preservative	Container Requirements			Collected
TCL VOCs	8260B	HCl	3	40 ml	glass vials	✓
Dissolved Methane	8XXX	HCL	3	40 ml	glass vials	
Total Lead	6000/7000	HNO_3	1	500 ml	HDPE	
SVOC		—	2	L	Amber	✓
Pest		—	1	L	Amber	✓
PCB		—	1	L	Amber	✓

ADDITIONAL INFORMATION

Comments:

Method:
[✓] Peristaltic Pump
[ ] Centrifugal Pump
[ ] Bladder Pump
[✓] Tube Evacuation
[ ] Vacuum Jug Assembly
[ ] Bailer

Tubing Type:
[ ] Polyethylene
[✓] Teflon
[ ] Teflon-lined Polyethylene

QA\QC SAMPLES

MS/MSD:

Duplicate ID No.:

Signature(s):

Tetra Tech NUS
Groundwater Purging and Sampling Log

Date 7/10/3

Project Site Name:
Project No.: N4211

[ ] Domestic Well Data

[X] Monitoring Well Data

[ ] Other Well Type:

Flow-Thru Cell Make\Model: Horiba U-22

Serial Nos.: 9292036

Sample Location: MW-13

Sample ID No.: PAI-FOV-GW-13-01

Sampled By: JB

C-O-C No.:

PURGING DATA

Casing Size (in.)	Gals. per ft. of Water	Liters per ft. of Water	Time Hr:Min	pH pH units	S.C. mS/cm	Temp. °C	Turbidity NTU	DO mg/L	ORP mV	DTW ft BTOC	Flow Rate ml/min
0.5	0.01	0.038	Initial	6.02	0.55	24.96	8.53	5.07	-4	15.71	260
1	0.041	0.155	1st	6.39	0.55	24.83	3.25	1.92	-80	15.84	260
2	0.163	0.617									
4	0.653	2.47									
6	1.469	5.56									
8	2.611	9.88									
10	4.08	15.44									
	[1 gal. = 3.785 L]										

PID Reading (ppm): Ø

Well Casing Diameter: 2"
Total Well Depth: 39.20
Static Water Level: 15.71
Tube Intake Depth: ~37.5'
Volume 3.8
Start Purge (hr): 1520
End Purge (hr): 1615
Total Purge Time (min): 55
Total Vol. Purged: 3.8 gal

WATER QUALITY SAMPLE PARAMETERS

	Color Description	pH pH units	S.C. mS/cm	Temp. °C	Turbidity NTU	DO mg/L	ORP mV	DTW ft BTOC	Flow Rate ml/min
Date: 7/10/3									
Time: 1620	Clear	6.39	0.55	24.83	3.25	1.92	-80	15.84	260

ANALYSES INFORMATION

Analysis		Preservative	Container Requirements			Collected
TCL VOCs	8260B	HCl	3	40 ml	glass vials	✓
Dissolved Methane	8XXX	HCL	3	40 ml	glass vials	
Total Lead	6000/7000	HNO_3	1	500 ml	HDPE	
SVOC		—	2	L	Amber	✓
Pest		—	1	L	Amber	✓
PCB		—	1	L	Amber	✓

ADDITIONAL INFORMATION

Comments:

Method:
[✓] Peristaltic Pump
[ ] Centrifugal Pump
[ ] Bladder Pump
[✓] Tube Evacuation
[ ] Vacuum Jug Assembly
[ ] Bailer

Tubing Type:
[ ] Polyethylene
[✓] Teflon
[ ] Teflon-lined Polyethylene

QA\QC SAMPLES

MS/MSD:

Duplicate ID No.:

Signature(s):

Tetra Tech NUS
Groundwater Purging and Sampling Log

Date 7/11/3

Project Site Name:
Project No.: N4211

[ ] Domestic Well Data

[X] Monitoring Well Data

[ ] Other Well Type:

Flow-Thru Cell Make\Model: Horiba U-22

Serial Nos.: 9292036

Sample Location: MW-17

Sample ID No.: PAI-FOU-GW-17-01

Sampled By: JB

C-O-C No.:

PURGING DATA

Casing Size (in.)	Gals. per ft. of Water	Liters per ft. of Water	Time Hr:Min	pH pH units	S.C. mS/cm	Temp. °C	Turbidity NTU	DO mg/L	ORP mV	DTW ft BTOC	Flow Rate ml/min
0.5	0.01	0.038	Initial	5.82	0.27	32.63	21.3	6.11	217	4.05	600
1	0.041	0.155	1st	5.76	0.28	32.19	15.0	5.96	221	4.15	600
2	0.163	0.617									
4	0.653	2.47									
6	1.469	5.56									
8	2.611	9.88									
10	4.08	15.44									
	[1 gal. = 3.785 L]										

PID Reading (ppm): Ø

Well Casing Diameter: 2"
Total Well Depth: 13.67
Static Water Level: 3.69
Tube Intake Depth: ~12.5
Volume 1.6
Start Purge (hr): 1355
End Purge (hr): 1405
Total Purge Time (min): 10
Total Vol. Purged: 1.6

WATER QUALITY SAMPLE PARAMETERS

	Color Description	pH pH units	S.C. mS/cm	Temp. °C	Turbidity NTU	DO mg/L	ORP mV	DTW ft BTOC	Flow Rate ml/min
Date: 7/11/3									
Time: 1410	clear	5.76	0.28	32.19	15.0	5.96	221	4.15	600

ANALYSES INFORMATION

Analysis		Preservative	Container Requirements			Collected
TCL VOCs	8260B	HCl	3	40 ml	glass vials	✓
Dissolved Methane	8XXX	HCL	3	40 ml	glass vials	
Total Lead	6000/7000	HNO_3	1	500 ml	HDPE	
SVOC		—	2	L	Amber	✓
Pest		—	1	L	Amber	✓
PCB		—	1	L	Amber	✓

ADDITIONAL INFORMATION

Comments:

Method:
[✓] Peristaltic Pump
[ ] Centrifugal Pump
[ ] Bladder Pump
[✓] Tube Evacuation
[ ] Vacuum Jug Assembly
[ ] Bailer

Tubing Type:
[ ] Polyethylene
[✓] Teflon
[ ] Teflon-lined Polyethylene

QA\QC SAMPLES

MS/MSD:

Duplicate ID No.:

Signature(s):

Tetra Tech NUS
Groundwater Purging and Sampling Log

Date 7/11/3

Page 1 of ___

Project Site Name:
Project No.: N4211

[ ] Domestic Well Data

[X] Monitoring Well Data

[ ] Other Well Type:

Flow-Thru Cell Make\Model: Horiba U-22

Serial Nos.: 9292036

Sample Location: MW-18

Sample ID No.: PAI-FOV-GW-17-01

Sampled By: JB

C-O-C No.:

PURGING DATA

Casing Size (in.)	Gals. per ft. of Water	Liters per ft. of Water	Time Hr:Min	pH pH units	S.C. mS/cm	Temp. °C	Turbidity NTU	DO mg/L	ORP mV	DTW ft BTOC	Flow Rate ml/min
0.5	0.01	0.038	Initial	5.61	0.77	26.76	24.6	5.67	108	4.09	230
1	0.041	0.155	15	5.65	0.79	26.33	1.9	4.52	62	4.15	230
2	0.163	0.617									
4	0.653	2.47									
6	1.469	5.56									
8	2.611	9.88									
10	4.08	15.44									
	[1 gal. = 3.785 L]										

PID Reading (ppm): Ø

Well Casing Diameter: 2"

Total Well Depth: 24.44

Static Water Level: 3.98

Tube Intake Depth: ~23'

Volume 3.3

Start Purge (hr): 1415

End Purge (hr): 1510

Total Purge Time (min): 55

Total Vol. Purged: 3.3

WATER QUALITY SAMPLE PARAMETERS

	Color Description	pH pH units	S.C. mS/cm	Temp. °C	Turbidity NTU	DO mg/L	ORP mV	DTW ft BTOC	Flow Rate ml/min
Date: 7/11/3									
Time: 1515	Clear	5.65	0.79	26.33	1.9	4.52	62	4.15	230

ANALYSES INFORMATION

Analysis		Preservative	Container Requirements			Collected
TCL VOCs	8260B	HCl	3	40 ml	glass vials	✓
Dissolved Methane	8XXX	HCL	3	40 ml	glass vials	
Total Lead	6000/7000	HNO_3	1	500 ml	HDPE	
SVOC		—	2	L	Amber	✓
Pest		—	1	L	Amber	✓
PCB		—	1	L	Amber	✓

ADDITIONAL INFORMATION

Comments:

Method:
[✓] Peristaltic Pump
[ ] Centrifugal Pump
[ ] Bladder Pump
[✓] Tube Evacuation
[ ] Vacuum Jug Assembly
[ ] Bailer

Tubing Type:
[ ] Polyethylene
[✓] Teflon
[ ] Teflon-lined Polyethylene

QA\QC SAMPLES

MS/MSD:

Duplicate ID No.:

Signature(s):

Tetra Tech NUS
Groundwater Purging and Sampling Log

Date 7/11/3

Page 1 of ___

Project Site Name:
Project No.: N4211

[ ] Domestic Well Data

[X] Monitoring Well Data

[ ] Other Well Type:

Flow-Thru Cell Make\Model: Horiba U-22

Serial Nos.: 9292036

Sample Location: MW-19

Sample ID No.: PAI-FOV-GW-19-01

Sampled By: JB

C-O-C No.:

PURGING DATA

Casing Size (in.)	Gals. per ft. of Water	Liters per ft. of Water	Time Hr:Min	pH pH units	S.C. mS/cm	Temp. °C	Turbidity NTU	DO mg/L	ORP mV	DTW ft BTOC	Flow Rate ml/min
0.5	0.01	0.038	Initial	5.05	0.23	29.94	114	9.86	190	2.20	600
1	0.041	0.155	1st	4.72	0.25	30.41	62.3	3.95	202	3.30	600
2	0.163	0.617	2nd	4.64	0.25	30.40	34.3	4.52	219	3.33	600
4	0.653	2.47									
6	1.469	5.56									
8	2.611	9.88									
10	4.08	15.44									
	[1 gal. = 3.785 L]										

PID Reading (ppm): Ø

Well Casing Diameter: 2"

Total Well Depth: 10.55

Static Water Level: 2.20

Tube Intake Depth: ~9.0

Volume 1.6

Start Purge (hr): 1600

End Purge (hr): 1620

Total Purge Time (min): 20

Total Vol. Purged: 3.2

WATER QUALITY SAMPLE PARAMETERS

	Color Description	pH pH units	S.C. mS/cm	Temp. °C	Turbidity NTU	DO mg/L	ORP mV	DTW ft BTOC	Flow Rate ml/min
Date: 7/11/3									
Time: 1620	Clear	4.64	0.25	30.40	34.3	4.52	219	3.33	600

ANALYSES INFORMATION

Analysis		Preservative	Container Requirements			Collected
TCL VOCs	8260B	HCl	3	40 ml	glass vials	✓
Dissolved Methane	8XXX	HCL	3	40 ml	glass vials	
Total Lead	6000/7000	HNO_3	1	500 ml	HDPE	
SVOC		—	2	L	Amber	✓
Pest		—	1	L	Amber	✓
PCB		—	1	L	Amber	✓

ADDITIONAL INFORMATION

Comments:

Method:
[✓] Peristaltic Pump
[ ] Centrifugal Pump
[ ] Bladder Pump
[✓] Tube Evacuation
[ ] Vacuum Jug Assembly
[ ] Bailer

Tubing Type:
[ ] Polyethylene
[✓] Teflon
[ ] Teflon-lined Polyethylene

QA\QC SAMPLES

MS/MSD:

Duplicate ID No.:

Signature(s):

Tetra Tech NUS
Groundwater Purging and Sampling Log

Date 7/11/3

Page 1 of ___

Project Site Name:
Project No.: N4211

[ ] Domestic Well Data

[X] Monitoring Well Data

[ ] Other Well Type:_____

Flow-Thru Cell Make\Model: Horiba U-22

Serial Nos.: 9292056

Sample Location: MW-20

Sample ID No.: PAI-FOV-GW-20-01

Sampled By: JB

C-O-C No.:_____

PURGING DATA

Casing Size (in.)	Gals. per ft. of Water	Liters per ft. of Water	Time Hr:Min	pH pH units	S.C. mS/cm	Temp. °C	Turbidity NTU	DO mg/L	ORP mV	DTW ft BTOC	Flow Rate ml/min
0.5	0.01	0.038	Initial	5.04	0.51	23.18	24.7	5.61	~~5.61~~	5.85	200
1	0.041	0.155	1st	4.33	0.47	23.15	6.5	2.23	~~2.23~~	6.85	200
2	0.163	0.617							297		
4	0.653	2.47									
6	1.469	5.56									
8	2.611	9.88									
10	4.08	15.44									
	[1 gal. = 3.785 L]										

PID Reading (ppm): Ø

Well Casing Diameter: 2"

Total Well Depth: 17.63

Static Water Level: 5.85

Tube Intake Depth: ~16.5'

Volume 1.9

Start Purge (hr): 0835

End Purge (hr): 0910

Total Purge Time (min): 35

Total Vol. Purged: 1.9

WATER QUALITY SAMPLE PARAMETERS

	Color Description	pH pH units	S.C. mS/cm	Temp. °C	Turbidity NTU	DO mg/L	ORP mV	DTW ft BTOC	Flow Rate ml/min
Date: 7/11/3									
Time: 0910	Clear	4.33	0.47	23.15	6.5	2.23	297	6.85	200

ANALYSES INFORMATION

Analysis		Preservative	Container Requirements			Collected
TCL VOCs	8260B	HCl	3	40 ml	glass vials	✓
Dissolved Methane	8XXX	HCL	3	40 ml	glass vials	
Total Lead	6000/7000	HNO_3	1	500 ml	HDPE	
SVOC		—	2	L	Amber	✓
Pest		—	1	L	Amber	✓
PCB		—	1	L	Amber	✓

ADDITIONAL INFORMATION

Comments:

Method:
[✓] Peristaltic Pump
[ ] Centrifugal Pump
[ ] Bladder Pump
[✓] Tube Evacuation
[ ] Vacuum Jug Assembly
[ ] Bailer

Tubing Type:
[ ] Polyethylene
[✓] Teflon
[ ] Teflon-lined Polyethylene

QA\QC SAMPLES

MS/MSD:

Duplicate ID No.:

Signature(s):

Tetra Tech NUS
Groundwater Purging and Sampling Log

Date 7/10/3

Page 1 of ___

Project Site Name:
Project No.: N4211

[ ] Domestic Well Data

[X] Monitoring Well Data

[ ] Other Well Type:

Flow-Thru Cell Make\Model: Horiba U-22

Serial Nos.: 9292036

Sample Location: MW-21

Sample ID No.: PAI-FOV-GW-~~13~~-01 21

Sampled By: JB

C-O-C No.:

PURGING DATA

Casing Size (in.)	Gals. / Liters per ft. of Water	Time Hr:Min	pH pH units	S.C. mS/cm	Temp. °C	Turbidity NTU	DO mg/L	ORP mV	DTW ft BTOC	Flow Rate ml/min
0.5	0.01 / 0.038	Initial	4.38	0.62	25.36	37.5	3.53	179	6.42	220
1	0.041 / 0.155	1st	4.15	0.61	24.14	16.0	1.05	165	6.55	"
2	0.163 / 0.617	2nd	4.23	0.61	23.76	~~41.0~~	1.02	151	6.68	"
4	0.653 / 2.47					6.65				
6	1.469 / 5.56									
8	2.611 / 9.88									
10	4.08 / 15.44									
	[1 gal. = 3.785 L]									

PID Reading (ppm): Ø

Well Casing Diameter: 2"

Total Well Depth: 15.17

Static Water Level: 6.19

Tube Intake Depth: ~13.5'

Volume 1.4

Start Purge (hr): 1355

End Purge (hr): 1445

Total Purge Time (min): 50

Total Vol. Purged: 2.8

WATER QUALITY SAMPLE PARAMETERS

	Color Description	pH pH units	S.C. mS/cm	Temp. °C	Turbidity NTU	DO mg/L	ORP mV	DTW ft BTOC	Flow Rate ml/min
Date: 7/10/3									
Time: 1450	Clear	4.23	0.61	23.76	6.65	1.02	151	6.68	220

ANALYSES INFORMATION

Analysis		Preservative	Container Requirements			Collected
TCL VOCs	8260B	HCl	3	40 ml	glass vials	✓
Dissolved Methane	8XXX	HCL	3	40 ml	glass vials	
Total Lead	6000/7000	HNO_3	1	500 ml	HDPE	
SVOC		—	2	L	Amber	✓
Pest		—	1	L	Amber	✓
PCB		—	1	L	Amber	✓

ADDITIONAL INFORMATION

Comments:

Method:
[✓] Peristaltic Pump
[ ] Centrifugal Pump
[ ] Bladder Pump
[ ] Tube Evacuation
[✓] Vacuum Jug Assembly
[ ] Bailer

Tubing Type:
[ ] Polyethylene
[✓] Teflon
[ ] Teflon-lined Polyethylene

QA\QC SAMPLES

MS/MSD:

Duplicate ID No.:

Signature(s):

D-5 WELL PERMITS

H E C
OMOTE PROTECT PROSPER
)0 Bull Street
lumbia, SC 29201-1708

MMISSIONER:
Earl Hunter

ARD:
dford W. Wyche
irman

rk B. Kent
e Chairman

ward L. Brilliant, MD
retary

l L. Brazell

tisiana W. Wright

Michael Blackmon

ry R. Chewning, Jr., DMD

12 July 2002

United States Marine Corps
Marine Corps Recruit Depot/Eastern Recruiting Region
Commanding Officer
Attn. NREAO (T. Harrington)
P.O. Box 19001
Parris Island, SC 29905-9001

Re: MCRD – Fiber Optics Vault
Site Identification # 02039
Tier II Assessment Plan received 3 July 2002
Charleston County

Dear Mr. Harrington:

The Department has completed technical review of the referenced document. As submitted, the Tier II Assessment Plan provides an outline of assessment activities designed to determine the source, extent, and severity of hydrocarbon contamination in soil land groundwater at the referenced facility. Specific comments regarding the submitted Tier II Assessment Plan are as follows:

1. Section 4.3.1 Monitoring Well Installation – all monitoring wells at this facility (both temporary and permanent) shall be installed, maintained, and abandoned in accordance with the South Carolina Well Standards R.61-71 dated 26 April 2002 (enclosed). A monitoring well installation permit has been enclosed with this correspondence

2. Section 5.0 Proposed Laboratory Analysis – Sampling parameters, methods, and detection limits for soil and groundwater shall be in accordance with the South Carolina Risk-Based Corrective Action for Petroleum Releases guidance Document dated 15 May 2001. In addition, MCRD shall conduct a full spectrum analysis on the three (3) worst case monitoring wells (based upon field screening) to ascertain whether hazardous substances are present at the site.

The request to initiate assessment activities as outlined in the referenced document is approved for implementation with consideration for the limitations discussed above. The Tier II Assessment report should be submitted to the Department no later than 19 December 2002. Should you have any questions please contact me at 803-898-3553 (office phone), 803-898-3795 (fax) or by e-mail bishopma@dhec.state.sc.us.

Sincerely,

Michael A. Bishop, Hydrogeologist
Groundwater Quality Section
Bureau of Water

Enc: Monitoring Well Approval
SC Well Standards & Regulations R61-71

cc: Low Country District EQC (w/copy of MWA)
Stacey French – BLWM (w/copy of MWA)
Commander, NAVFACENGCOM Southern Division, Attn: Code ES24 (Gabriel Magwood), P.O. Box 190010, North Charleston, SC 29419-9010 (w/copy of MWA)
Technical File (w/copy of MWA)

Jul-19-2002 02:19pm From-LATHAN-WATER MONITERING 803 898 2893 T-065 P.002/003 F-100

H E C

OMOTE PROTECT PROSPER

0 Bull Street
umbia, SC 29201-1708

MMISSIONER:
arl Hunter

ARD:
lford W. Wyche
irman

k B. Kent
Chairman

vard L. Brilliant, MD
retary

L. Brizell

isiana W. Wright

Michael Blackmon

y R. Chewning, Jr., DMD

Date of Issue: 8 July 2002
Approval No: 1436

Monitoring Well Installation Approval

Approval is hereby granted to: United States Marine Corps
Site ID#: 02039 (Fiber Optics Vault)
County: Beaufort

This approval is for the construction of forty (40) temporary monitoring wells and ten (10) permanent monitoring wells in accordance with the construction plans and technical specifications submitted to the Department dated 2 July 2002 and South Carolina Well Standards R.61-71 dated April 2002. The well(s) are to be constructed within the water table aquifer for the intended purpose of monitoring groundwater quality and/or water levels at the referenced facility. Approval is granted with the following conditions:

1. The monitoring wells are to be installed by a well driller certified by the State of South Carolina.

2. The name and address of facility/owner of the well(s); surveyed locations and elevations: drillers certification #, and date drilled; total well depth; screened interval; boring and/or geologists logs; and actual construction details for each well are to be submitted to within thirty days of completion of the last well(s) installed.

3. Each permanent well shall be labeled with an identification plate constructed of a durable material permanently secured to the well where it will be readily visible. The plate is to provide the monitoring well identification # or designation, company name and driller certification #, date of construction, total depth, casing depth, screened interval and static water level.

4. As per R.61-71.H (d) of the April 26, 2002 South Carolina Well Standards, please provide groundwater/soil quality analytical data, water levels and any associated field measurements from the well(s)/soil boring(s) to the Groundwater Quality Section in the Bureau of Water at SCDHEC within thirty (30) days of receipt from the laboratory.

5. Please provide a minimum of 48 hours notice to the SCDHEC **Low Country** District EQC District Office at (843) ~~522-9097~~ 846-1030 prior to initiation of monitoring well installations and/or soil borings.

6. Well construction and sampling derived waste including but not limited to drill cuttings, drilling fluids, and development/purge water should be managed properly and in compliance with applicable requirements. If containerized, each vessel should be clearly labeled with regards to contents, source, and date of activity.

7. Wells shall be abandoned per R.61-71: South Carolina Well Standards - April 2002. Note that temporary wells shall be abandoned within 5 days.

This approval is pursuant to the provisions of Section 44-55-40 of the 1976 South Carolina Code of Laws and the Department of Health and Environmental Control Regulations R61-71.

Approved by:

Michael Bishop, ~~Hydro~~geologist
Groundwater Quality Section
Bureau of Water

SOUTH CAROLINA DEPARTMENT OF HEALTH AND ENVIRONMENTAL CONTROL

Jul-19-2002 02:19pm From-LATHAN-WATER MONITERING 803 898 2893 T-065 P.003/003 F-100

D H E C
OMOTE PROTECT PROSPER
00 Bull Street
lumbia, SC 29201-1708

MONITORING WELL APPROVAL

Approval is hereby granted to:

Commanding Officer
Department of the Navy
SOUTHNAVFACENGCOM
ATTN: Art Sanford (ES322)
2155 Eagle Drive - 29046
North Charleston, South Carolina 29406

Date of Issue: 21 October 2002

Approval Number: HW-02-094

Facility: Marine Corps Recruit Depot
Parris Island, South Carolina
Beaufort County
SC6 170 022 767

For the installation of eleven (11) permanent monitoring wells at the Fiber Optic Vault as follows:

1) Eleven permanent monitoring wells located approximately as specified on the attached figure.
2) The shallow wells will be constructed with ten (10) foot screens that span the water table.
3) The intermediate and deep wells will be constructed with three (3) to five (5) foot screens.
4) The deep wells will be constructed as double-cased (pit-cased) wells.

Conditions:

1) That the monitoring wells be installed by a well driller certified by the state of South Carolina as a Class A driller, or an Environmental Well Driller-Class B or C. And that the certified well driller must be present during all phases of drilling, construction, and completion of these monitoring wells.

2) That investigation derived waste including, but not necessarily limited to, drill cuttings, drilling fluids, development and purge water, be managed properly and in compliance with all applicable requirements. If containerized, each vessel shall be clearly labeled with regard to contents, source, and date of activity.

3) That the latitude, longitude and actual construction details be submitted to the Department within 30 days after installation of the last monitoring well.

4) That the monitoring wells be labeled with an identification plate constructed of a durable material affixed to the casing or surface pad where it is readily visible. The plate shall provide the well identification number, date of construction, static water level and driller name and certification number.

5) A minimum of (48) hours prior to initiation of drilling activities, provide notice to Russell Berry, at the Low Country District EQC Office (843) 846-1030, and myself, Don Hargrove, at (803) 896-4033.

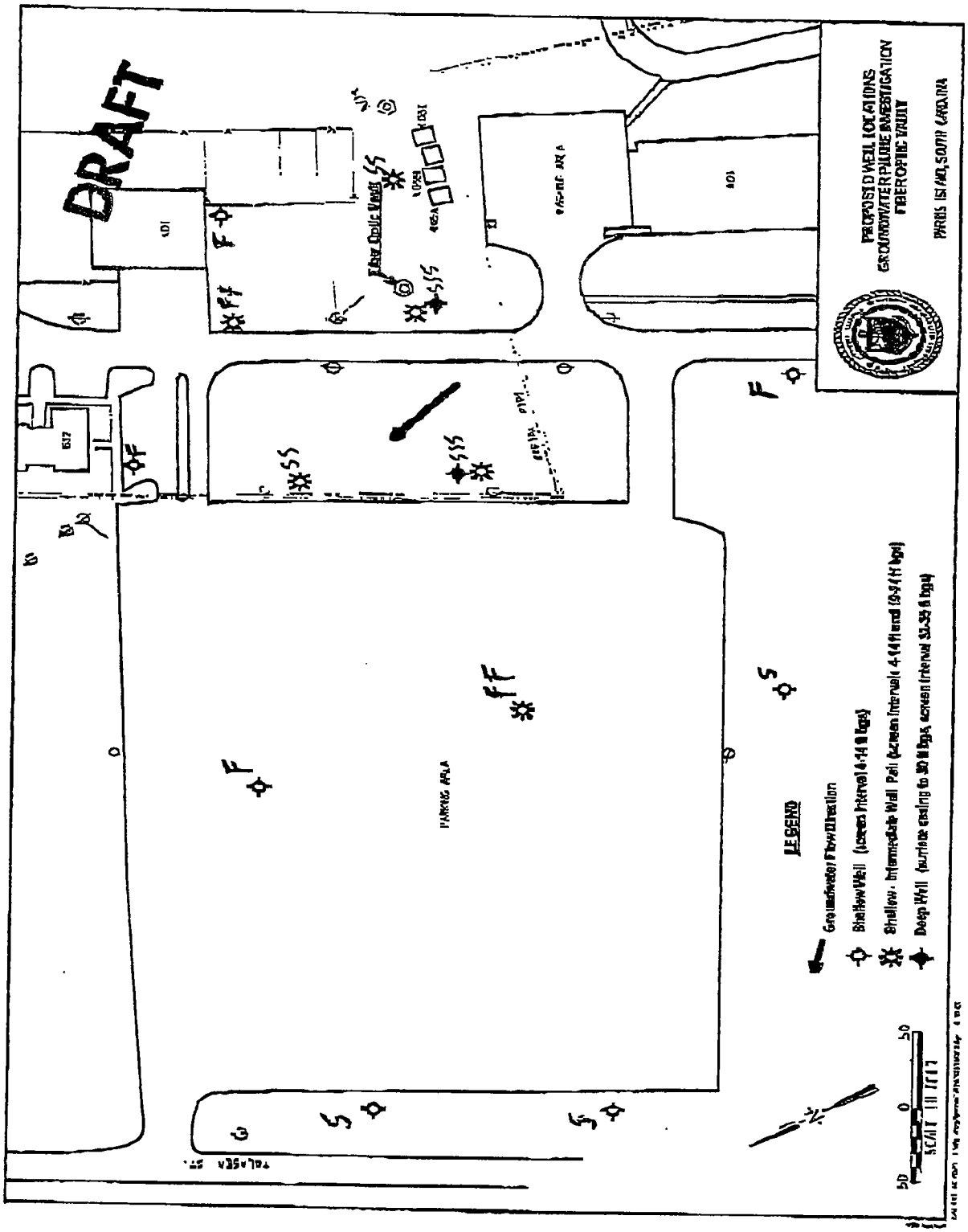
This approval is pursuant to the provisions of Section 44-55-40 of the 1976 South Carolina Code of Laws and the Department of Environmental Control's Regulation R.61-71.

Approval granted by:

Donald C. Hargrove, Hydrogeologist
Bureau of Land and Waste Management
South Carolina Department of Health and
Environmental Control

Attachment: Proposed Well Locations

cc: David Scaturo, Corrective Action Engineering
Russell Berry, Low Country District EQC Office
Robert Pope, Federal Facilities Section, USEPA Region IV



F = Shallow monitoring well

APPENDIX E

SOIL AND GROUNDWATER
MIP FIELD SCREENING REPORT

SmartData Solutions

Source Characterization and Plume Delineation Using Membrane Interface Probe (MIP) and Soil Conductivity (SC) Technologies Parris Island MCRD Beaufort, South Carolina

PREPARED BY

COLUMBIA Technologies, LLC
1450 South Rolling Rd.
Baltimore, Maryland 21227
410-536-9911

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Figure 4. 3D PID Plume, 2.0E+05 uV, with Soil Conductivity, 25 mS/M

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Laboratory Results and Narrative

Performance Test Appendix

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Introduction

Tetra Tech NUS (TTNUS) contracted **COLUMBIA Technologies, LLC (COLUMBIA)** to conduct an investigation of subsurface contamination at Parris Island MCRD, located in Beaufort, South Carolina. This investigation involved delineating the depth and horizontal extent of contamination using Membrane Interface Probe (MIP) and Soil Conductivity (SC) technologies. The purpose of this investigation was to characterize subsurface soils in the vadose and saturated zones and delineate the nature and extent of soil contamination at the site.

The investigation was conducted from July 23rd, 2002 through July 26th, 2002. COLUMBIA personnel on-site during the investigation included Randy Brand, Brian Everett, Douglas McInnes, Edward Renard, Darius Soltes and Michael Schofield.

Objectives

The objectives of the MIP/SC investigation were to:

1. Characterize subsurface soils in the vadose and saturated zones.
2. Delineate the lateral boundaries of the contaminant.
3. Delineate the vertical extent of contamination.

Equipment Description

The MIP/SC probe is approximately 12-inches (30 cm) in length and 1.5-inches (3.8 cm) in diameter. The probe is driven into the ground at the nominal rate of one foot per minute using a Geoprobe® or similar direct push rig.

Soil conductivity, the inverse of soil resistivity, is measured using a dipole arrangement. In this process, an alternating electrical current is transmitted through the soil from the center, isolated pin of the probe. This current is then passed back to the probe body. The voltage response of the imposed current to the soil is measured across these same two points. Conductivity is measured in Siemens/meter, and due to the low conductivity of earth materials, the SC probe uses milliSiemens/meter (mS/m). The probe is reasonably accurate in the range of 5

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to 400 mS/m. In general, at a given location, lower conductivity values indicate larger particles such as sands, while higher conductivities are representative of finer sized particles such as silts and clays.

The MIP portion of the probe was developed and patented by Geoprobe Systems, Inc. The operating principle is based on heating the soil and/or water around a semi-permeable polymer membrane to 121ºC, which allows volatile organic compounds (VOCs) to partition across this membrane. The MIP can be used in saturated or unsaturated soils, as liquid water does not pass through the membrane. Using nitrogen as a carrier gas, which sweeps across the back of the membrane, the VOCs are carried to the installed detectors. It takes approximately 37 seconds for the nitrogen gas stream to travel through 100 feet of inert tubing and reach the detectors.

COLUMBIA utilizes three detectors: a Photo Ionization Detector (PID), a Flame Ionization Detector (FID) and an Electron Capture Detector (ECD), mounted on a laboratory grade Shimadzu Model 14A gas chromatograph. The output signal from the detectors is captured by a MIP data logging system installed on a MIP Field Computer or laptop computer. Conductivity, speed, detector data and temperature are displayed continuously in real time during each push of the probe. In addition, the data logs can be printed for display and analysis following the data logging run or exported to common spreadsheet software for further analysis.

The PID detector consists of a special UV lamp mounted on a thermostat controlled, low volume, flow-through cell. The temperature is adjustable from ambient temperature to 250ºC. The 10.2 electron volt (eV) UV lamp emits energy at a wavelength of 120 nanometers, which is sufficient to ionize most aromatics (benzene, toluene, xylene, etc.) and many other molecules (H_2S, hexane, ethanol) whose ionization potential is below 10.2 eV. The PID also emits a lower response for chlorinated compounds such as TCE and PCE. Methanol and water, which have ionization potentials greater than 10.2 eV, do not respond on the PID. Detection limits for aromatics are in the low picogram range. Since the PID is non-destructive, it is often run first in series with other detectors for multiple analyses

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from a single injection. Use of the PID is mandated in several EPA methods (8021, TO-14 etc.) because of its sensitivity and selectivity.

The most commonly used GC detector is the FID, which responds linearly from its minimum detectable quantity of about 100 picograms. The FID response is very stable from day to day, and is not susceptible to contamination from dirty samples or column bleed. This detector responds to any molecule with a carbon-hydrogen bond, but poorly to compounds such as H_2S, CCl_4, or NH_3. The carrier gas effluent from the GC column is mixed with hydrogen and burned. Hydrogen supports a flame and ionizes the analyte molecules. A collector electrode attracts the negative ions to the electrometer amplifier, producing an analog signal, which is directed to the data system input.

The ECD detector consists of a sealed stainless steel cylinder containing radioactive Nickel-63. The Nickel-63 emits beta particles (electrons), which collide with the carrier gas molecules, ionizing them in the process. This forms a stable cloud of free electrons in the ECD cell. When electro-negative compounds (especially chlorinated, fluorinated or brominated molecules) such as carbon tetrachloride or TCE enter the cell, they immediately combine with the free electrons, temporarily reducing the number remaining in the electron cloud. The detector electronics, which maintain a constant current of about 1 nanoampere through the electron cloud, are forced to pulse at a faster rate to compensate for the decreased number of free electrons. The pulse rate is converted to an analog output, which is transmitted to the data system.

Performance Test

Prior to MIP logging, performance tests with specific compounds are conducted to evaluate the sensitivity of the particular probe to be used and the detectors. For this site, a mixture of toluene, benzene, TCE, and PCE was used. A standard stock solution of 50mg/mL was created with methanol based on the specific density of the particular compound. Aliquots of these solutions were added to 500 mL of DI water to create a concentration of 1 ppm. The heated probe was inserted into this test solution

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and the PID and ECD detector responses were recorded. The FID does not respond strongly to the above compounds at concentrations of 1 ppm. To test the FID, butane is released on the membrane for four seconds. The results of these tests are included in the Performance Test Appendix.

Investigation Methods

MIP/SC profiling was conducted at 17 locations in an area approximately 350 feet by 300 feet, using a Geoprobe? 6610DT track-mounted rig. The results from each location are shown in the Appendix. Maps and 3D graphics of the site have been prepared for easier visualization of the subsurface.

Summary of Results

The soil conductivity data indicates the site consists of coarser grained sandy material, with numerous layers of higher conductivity. The first clay layer, which occurs between six and eight feet below ground surface varies in thickness but occurs throughout the whole site. As most locations did not exceed 20 feet, it is not known if the deeper clay layers stretch throughout the entire site. MIP locations FMP_01 and FMP_14, logged to 42 feet, display layers of higher conductivity at 25 feet to 27 feet, 30 feet to 33 feet, and 34 feet to 41 feet. MIP location FMP_11 showed high conductivity levels at one foot. This is probably due to shallow gravel, as the electrical conductivity portion of the probe often senses the crystal size in the rocks, or possibly the probe passed through a layer of concrete or bentonite.

At this site, the PID and FID responded significantly, which would suggest the presence of petroleum fuels. The majority of the contamination appears to be below the first confining layer, between seven and ten feet. The two deeper locations did not show any deep contamination, although there was no significant shallow response at these locations either. This plume appears to be quite concentrated, as nearly half of the MIP locations, namely FMP_02, FMP_06 & FMP_07, FMP_10 & FMP_11, FMP_13 & FMP_14 and FMP_16 did not show significant response on any detectors.

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Termination of MIP logging at each location was decided by either TTNUS' representative on site or by the MIP operator.

Comparison of Laboratory Results with MIP Data

Water samples were taken at each MIP location, with the exception of FMP_13. The most commonly detected contaminant was chlorobenzene. This is a major constituent of pesticides. Chlorobenzene is a low responder on the MIP system, due to its high boiling point (132?C) and low vapor pressure (12 mm). Also detected was naphthalene and BTEX. Naphthalene has an extremely high boiling point (217?C), which is outside the MIP system's capability, but because it sublimates into gaseous phase directly from solid phase, it may be classified as a low responder on the MIP system. The lower end of the detection limit for the MIP system is between the range of 100 and 1000 ppb for BTEX. In general, correlation between laboratory data and MIP data above this range was good. PID responses (after subtracting the baseline) at locations FMP_04, FMP_05, FMP_03 and FMP_17 measured 2.00E+06 uV, 1.20E+06 uV, 1.00E+05 uV and 2.00E+05 uV, respectively, which correlate with 4478 ug/L, 3100 ug/L, 1500 ug/L and 1464 ug/L of BTEX and chlorobenzene. Sample FOVGFB-0210 showed high results of naphthalene, combined with a FID response of 2.50E+05. This may indicate the presence of diesel fuel.

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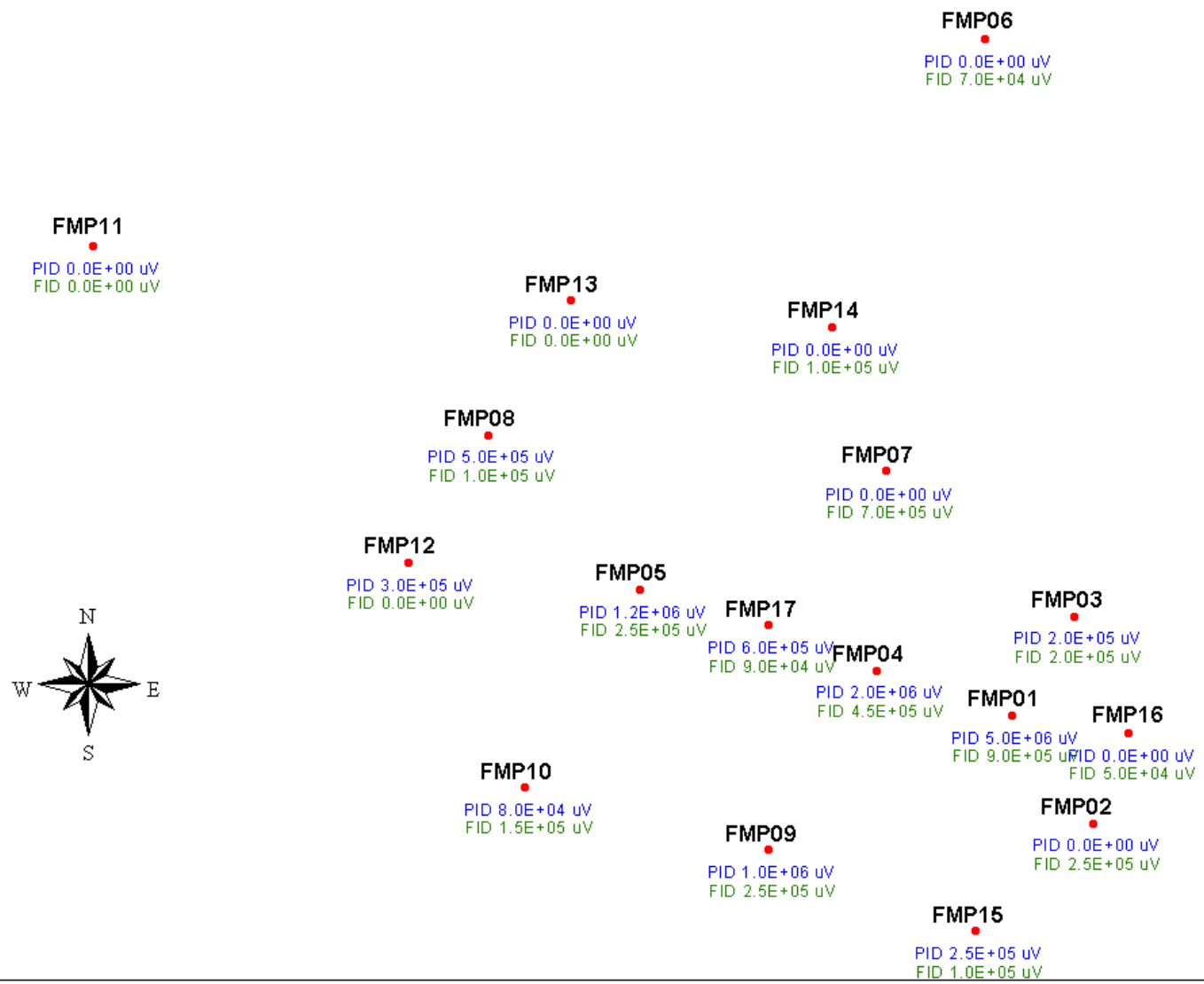

Figure 1
Parris Island MCRD
MIP Locations and Maximum Detector Values
July 23 - 26, 2002

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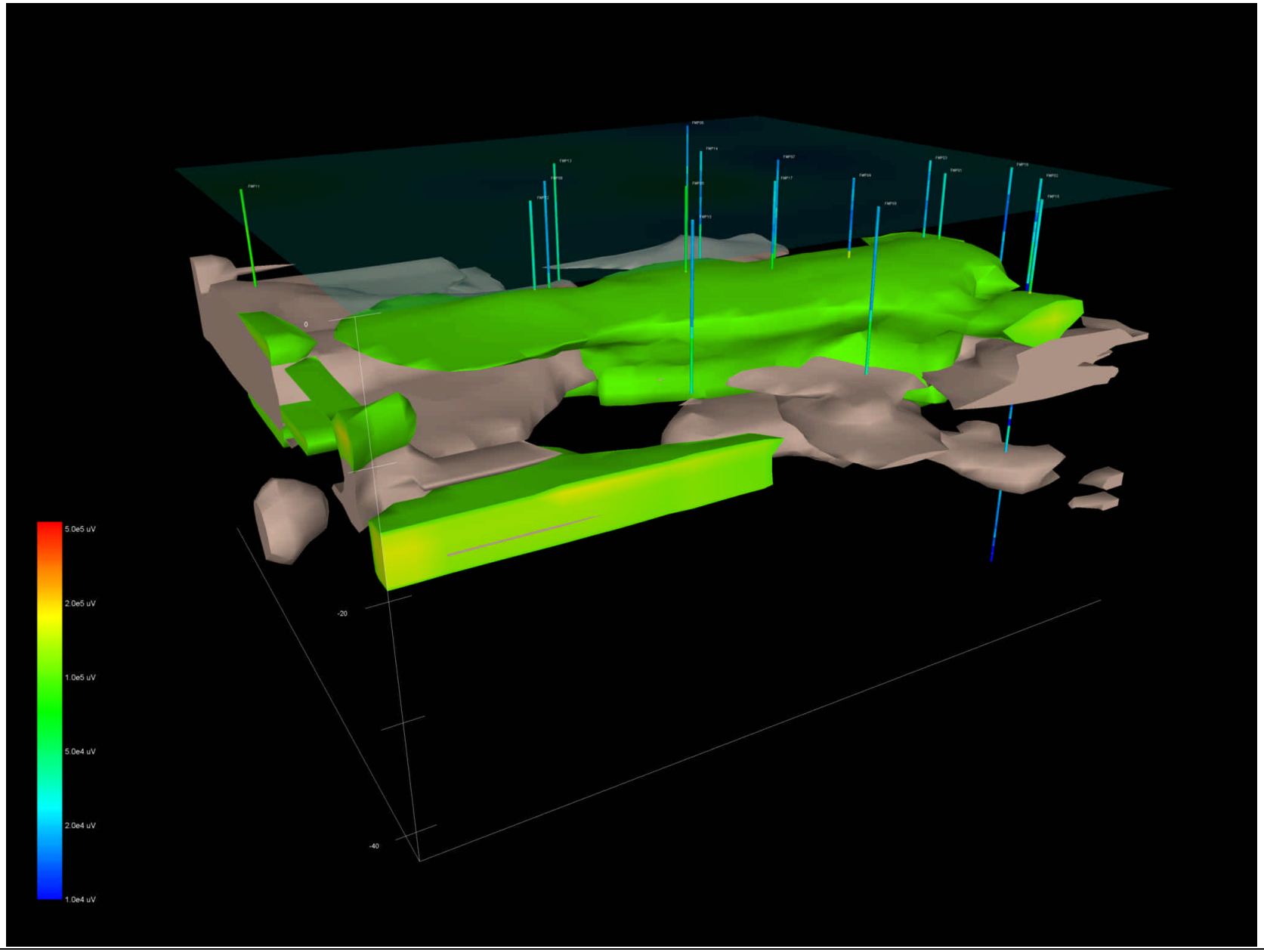

Figure 2
Tetra Tech NUS
Parris Island MCRD
PID Response, 1.0E+05 uV
With Soil Conductivity, 25 mS/M
July 23 – 25, 2002

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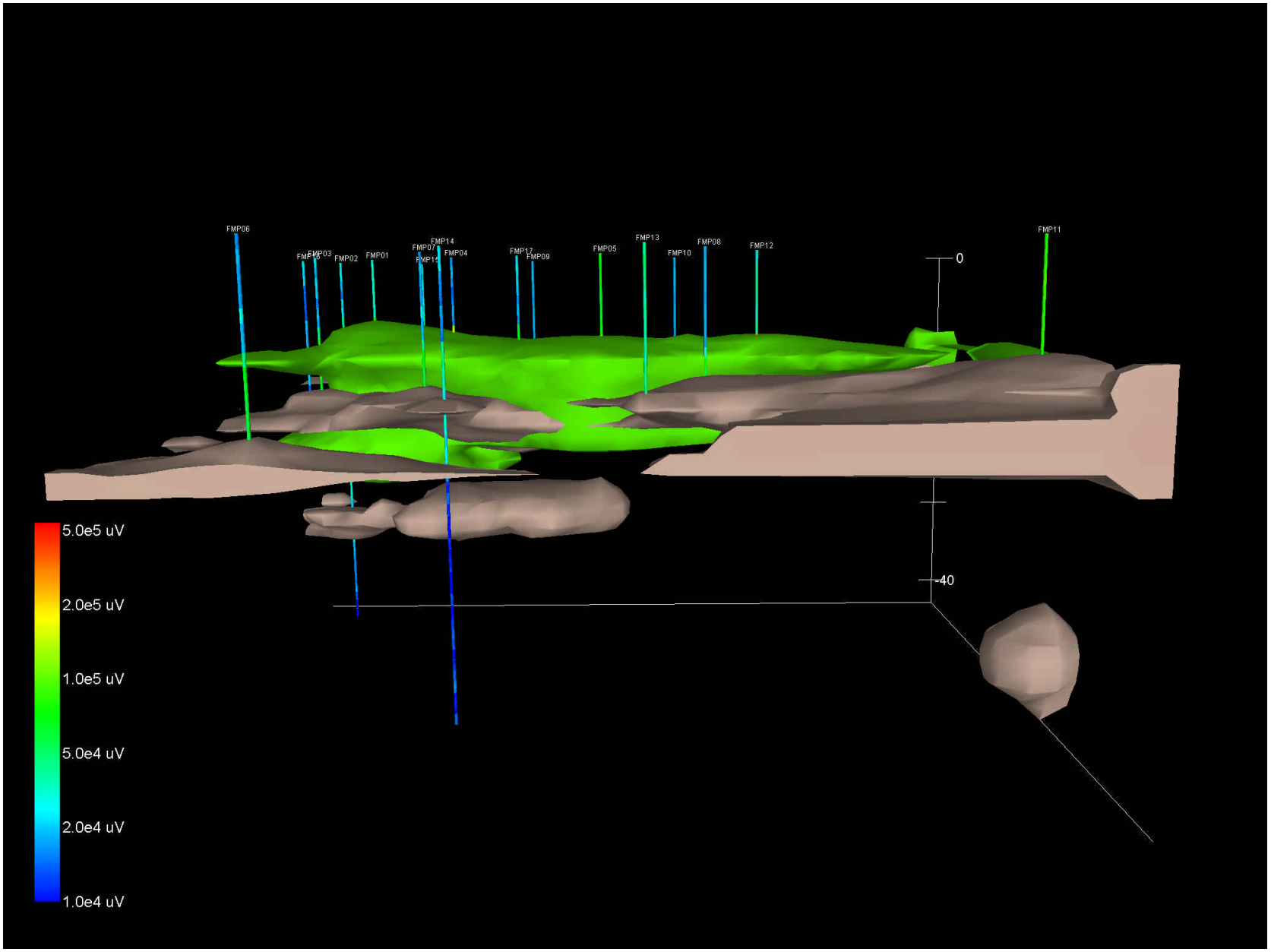

Figure 3
Tetra Tech NUS
Parris Island MCRD
PID Response, 1.0E+05 uV
With Soil Conductivity, 25 mS/M
July 23 – 25, 2002

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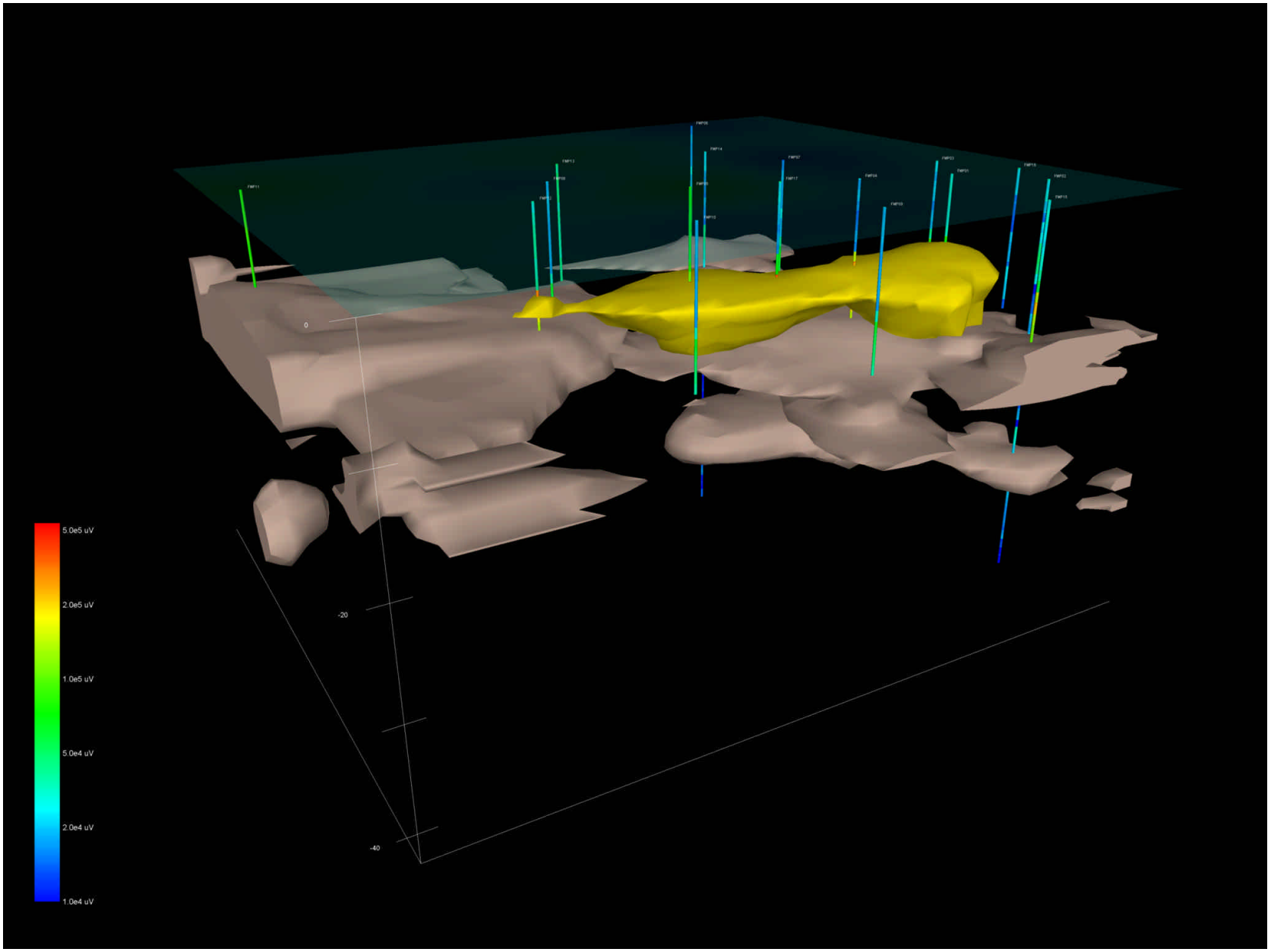

Figure 4
Tetra Tech NUS
Parris Island MCRD
PID Response, 2.0E+05 uV
With Soil Conductivity, 25 mS/M
July 23 – 25, 2002

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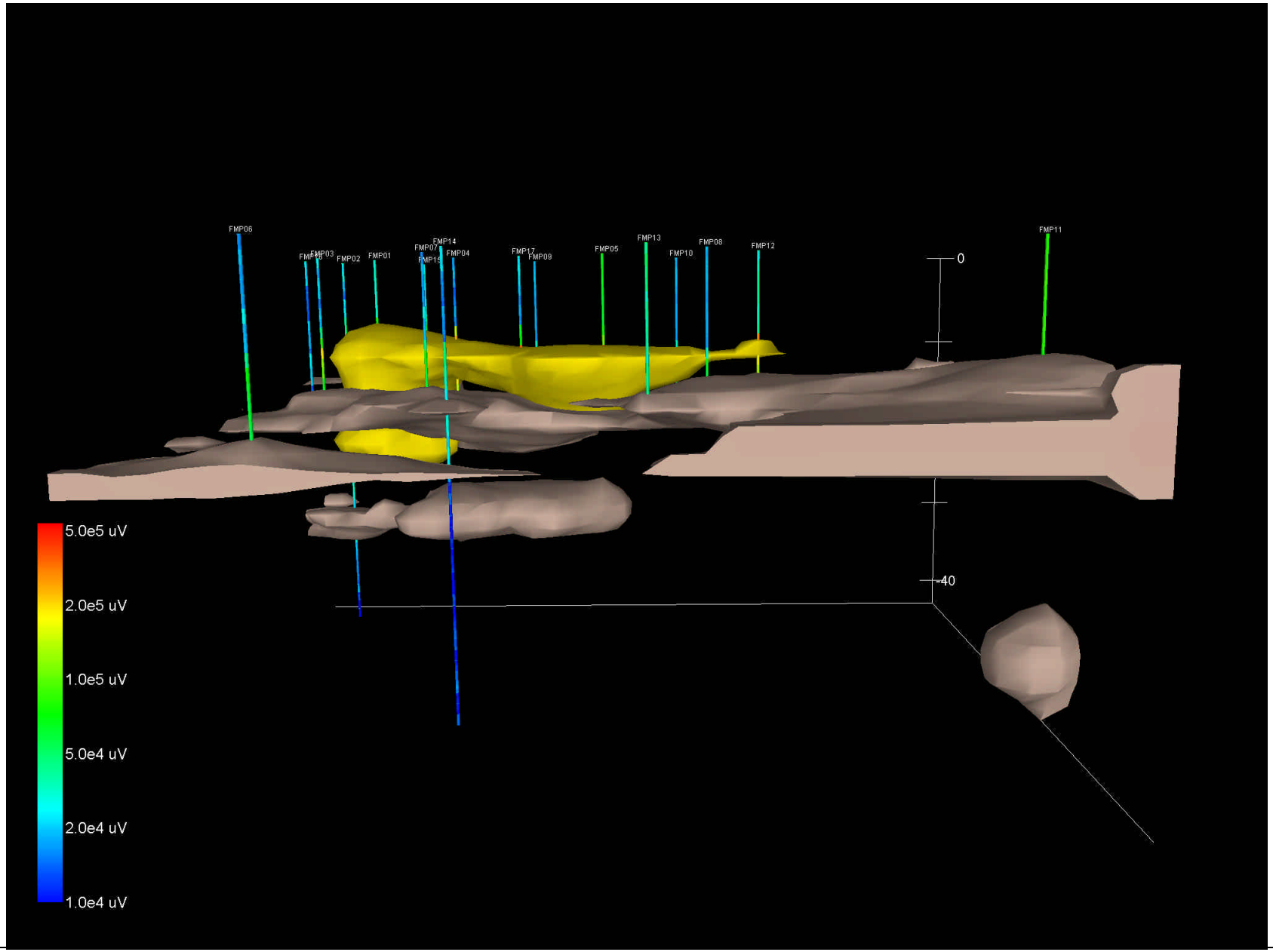

Figure 5
Tetra Tech NUS
Parris Island MCRD
PID Response, 2.0E+05 uV
With Soil Conductivity, 25 mS/M
July 23 – 25, 2002

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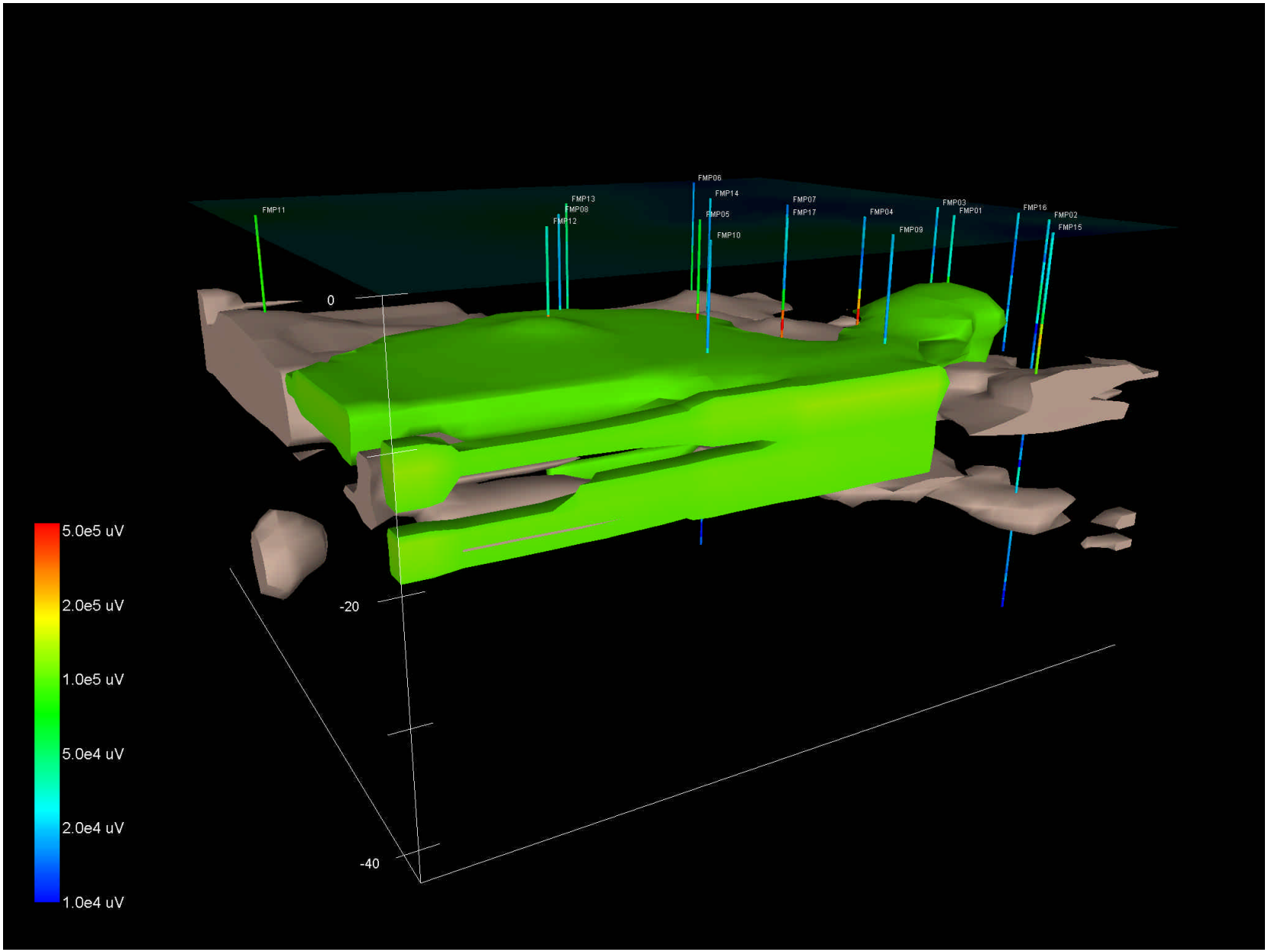

Figure 6
Tetra Tech NUS
Parris Island MCRD
FID Response, 1.0E+05 uV
With Soil Conductivity, 25 mS/M
July 23 – 25, 2002

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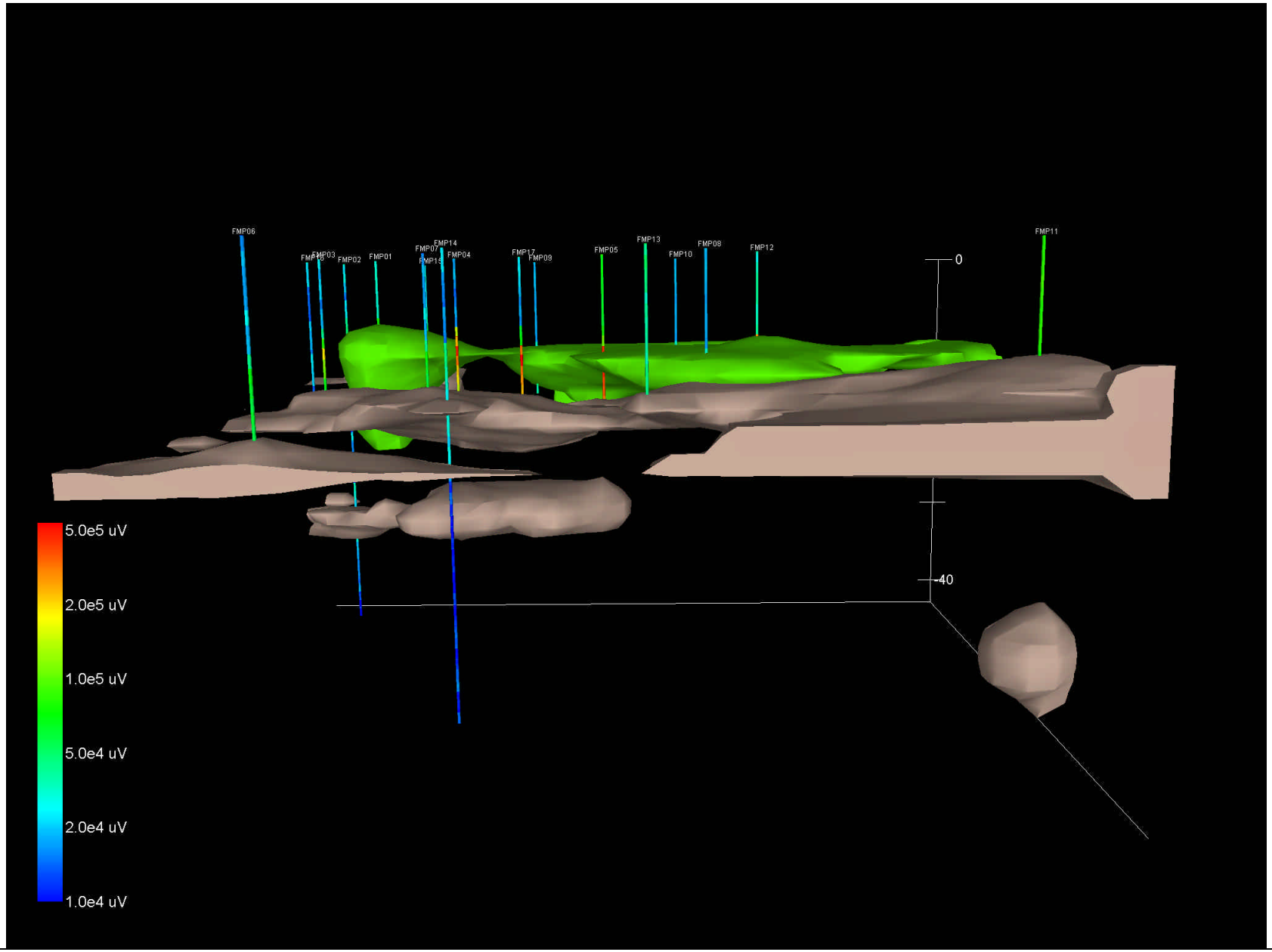

Figure 7
Tetra Tech NUS
Parris Island MCRD
FID Response, 1.0E+05 uV
With Soil Conductivity 25 mS/M
July 23 – 25, 2002

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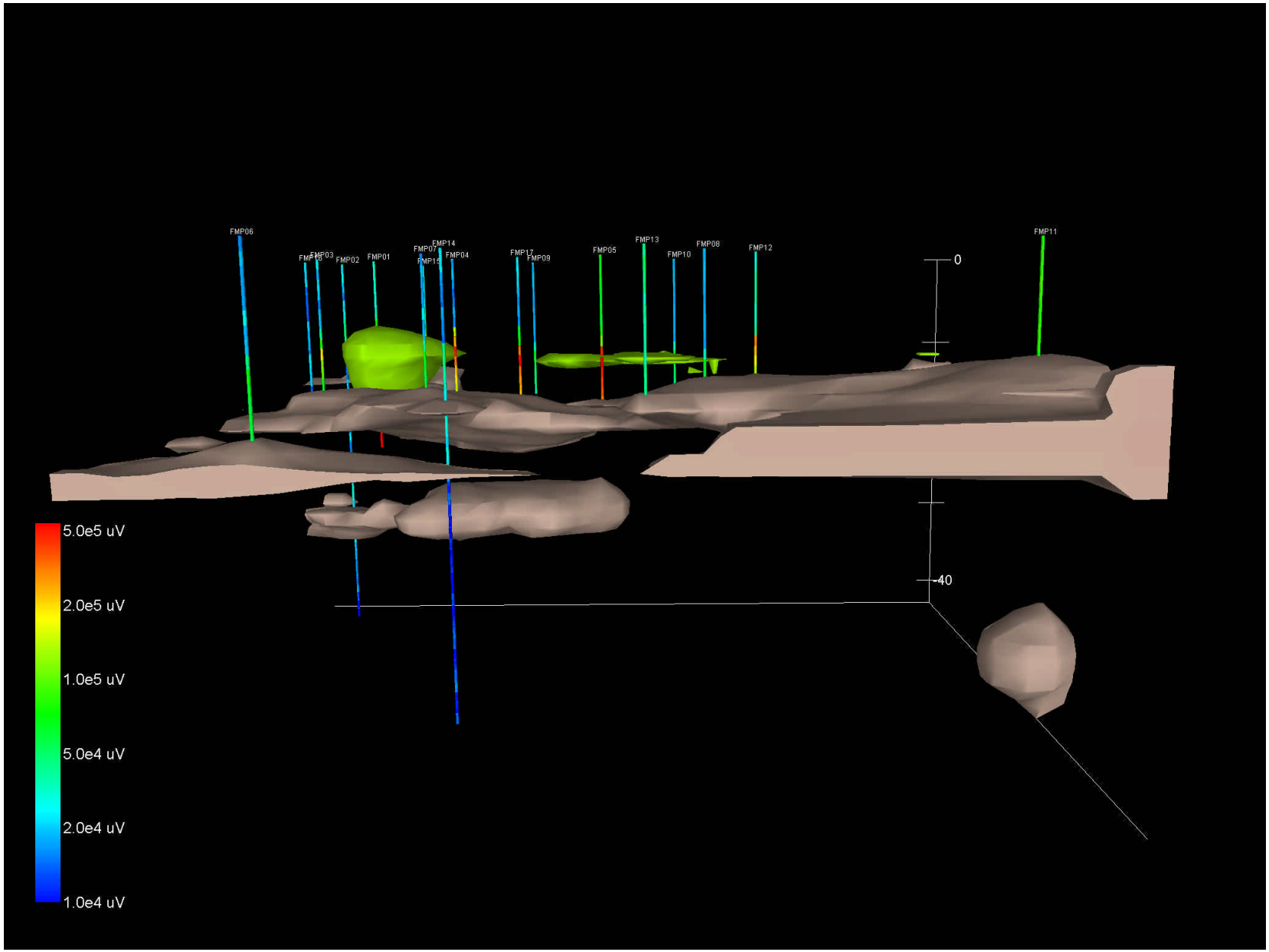

Figure 8
Tetra Tech NUS
Parris Island MCRD
FID Response, 1.3E+05 uV
With Soil Conductivity, 25 mS/M
July 23 – 25, 2002

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APPENDIX F

HRS SCORING SHEET

****** CONFIDENTIAL ******
******PRE-DECISIONAL DOCUMENT ******
****** SUMMARY SCORESHEET ******
****** FOR COMPUTING PROJECTED HRS SCORE ******

****** Do Not Cite or Quote ******

Site Name: Site 55 - Fiber Optic Vault

Region: 4

City, County, State: Beaufort County, SC

Evaluator: Jody Magilson, EIT

EPA ID#: SC6170022762

Date: 10/27/2003

Lat/Long: 32.2/-80.7

T/R/S:

Congressional District: South Carolina 2nd

This Scoresheet is for: PA

Scenario Name: Groundwater HRS Evaluation

Description: This HRS score is in support of a PA for Site 55 - Fiber Optic Vault, Marine Corps Recruit Depot, Parris Island, South Carolina.

	S pathway	S^2 pathway
Ground Water Migration Pathway Score (S_{gw})	100	10000
Surface Water Migration Pathway Score (S_{sw})		
Soil Exposure Pathway Score (S_s)		
Air Migration Score (S_a)		
$S^2_{gw} + S^2_{sw} + S^2_s + S^2_a$		10000
$(S^2_{gw} + S^2_{sw} + S^2_s + S^2_a)/4$		2500
$/ (S^2_{gw} + S^2_{sw} + S^2_s + S^2_a)/4$		50

TABLE 3-1 --GROUND WATER MIGRATION PATHWAY SCORESHEET

Factor categories and factors	Maximum Value	Value Assigned	
Aquifer Evaluated: Surficial - Chlororbenzene			
Likelihood of Release to an Aquifer:			
1. Observed Release	550	0	
2. Potential to Release:			
2a. Containment	10	10	
2b. Net Precipitation	10	10	
2c. Depth to Aquifer	5	5	
2d. Travel Time	35	35	
2e. Potential to Release [lines 2a(2b + 2c + 2d)]	500	500	
3. Likelihood of Release (higher of lines 1 and 2e)	550		500
Waste Characteristics:			
4. Toxicity/Mobility	(a)	1000	
5. Hazardous Waste Quantity	(a)	100	
6. Waste Characteristics	100		18
Targets:			
7. Nearest Well	(b)	0	
8. Population:			
8a. Level I Concentrations	(b)	0	
8b. Level II Concentrations	(b)	0	
8c. Potential Contamination	(b)	2500	
8d. Population (lines 8a + 8b + 8c)	(b)	2500	
9. Resources	5	0	
10. Wellhead Protection Area	20	0	
11. Targets (lines 7 + 8d + 9 + 10)	(b)		2500
Ground Water Migration Score for an Aquifer:			
12. Aquifer Score [(lines 3 x 6 x 11)/82,5000][c]	100		100
Ground Water Migration Pathway Score:			
13. Pathway Score (S_{gw}), (highest value from line 12 for all aquifers evaluated)[c]	100		100

[a] Maximum value applies to waste characteristics category
[b] Maximum value not applicable
[c] Do not round to nearest integer