

# Site Characterization Report

## Site 520

United States Navy  
Roosevelt Roads Naval Station  
Ceiba, Puerto Rico

Contract Number: N62470-93-D-4021  
April 1999



**BBL**  
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# ***Executive Summary***

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Blasland, Bouck & Lee, Inc. (BBL) conducted a site characterization (SC) for a former industrial gas station at the Roosevelt Roads U.S. Naval Station (NAVSTA Roosevelt Roads) located near the town of Ceiba, Puerto Rico. The SC evaluated the potential impact of the underground storage tanks (USTs) on the soils and groundwater in the area of Site 520, which is located on the western end of the NAVSTA Roosevelt Roads. Site 520 contained four USTs that were previously used to store different petroleum products. The objective of this investigation was to define the areas of potentially impacted soil and groundwater by petroleum hydrocarbons.

The SC field investigation included collecting 73 soil samples from 11 soil borings, performing field screening on the soil samples, performing laboratory analysis of selected samples, performing two falling head tests, measuring groundwater elevations, installing seven groundwater monitoring wells, sampling groundwater from the seven monitoring wells, and collecting information to prepare a qualitative risk assessment.

Elevated concentrations of Total Petroleum Hydrocarbons (TPH) were detected in two soil samples collected at Site 520. The laboratory analytical results indicate that TPH concentrations in soil ranged from less than 10 milligrams per kilogram (mg/kg) to 300 mg/kg.

Concentrations of benzene and BTEX (sum of benzene, toluene, ethylbenzene, and xylenes), in the groundwater samples obtained from two of the monitoring wells (520-MW-1 and 520-MW-2) were above the PREQB target levels. Free product was detected in 520-MW-2 after initial sampling. The thickness of the free product ranged from a few droplets to 0.5 inches (0.04 feet). The PREQB target levels are 5 microgram per liter (ug/L) for benzene and 50 ug/L for BTEX.

Elevated concentrations of total lead above the PREQB target level of 0.015 mg/L were detected in the groundwater samples collected on March 27, 1998 from 520-MW-6, however, lead was not detected in the groundwater samples collected from the remaining wells at Site 520.

Monitoring well 520-MW-6 was resampled on December 18, 1998 using low flow rate purging and sampling to reduce suspended sediment in the sample. Results of the December 18, 1998 sampling event were below the detection limits and indicate that the elevated lead concentrations detected in the unfiltered groundwater samples collected on March 26, 1998 were not indicative of the actual dissolved lead concentrations in the groundwater but were most likely a result of high turbidity (suspended sediment) observed in the samples at the time of collection. In addition, results of the qualitative risk assessment indicate that the human risks associated with Site 520 are extremely low.

The petroleum hydrocarbon impacted soil will remain in place based on the assessment results and the low health hazards associated with it. Natural biodegradation processes (natural attenuation) are expected to reduce the TPH concentrations at Site 520 over time. A passive skimmer will be installed to remove free product in 520-MW-1. Semi-annual groundwater sampling also is recommended at Site 520 to monitor groundwater quality.

# 1. Introduction

The Roosevelt Roads U.S. Naval Station (NAVSTA Roosevelt Roads) authorized Blasland, Bouck & Lee, Inc. (BBL) to perform a Site Characterization (SC) under contract number N62470-93-D-4021. The SC was performed for former underground storage tanks (USTs) 520A, 520B, 520C, and 520D at Site 520 in the NAVSTA Roosevelt Roads. The SC objective was to determine the degree and/or extent of potential impacts to the groundwater and/or soil at Site 520. This report summarizes the work conducted, field investigation results, and remediation recommendations for Site 520.

## 1.1 Site Location

Site 520 is located in the NAVSTA Roosevelt Roads, which is in close proximity to the Ceiba Municipality on the eastern end of Puerto Rico (Figure 1-1). The approximate coordinates for NAVSTA Roosevelt Roads are N 18° 15' 00" latitude and W 65° 39' 30" longitude. A site map showing the location of Site 520 is provided as Figure 1-2, while figure 1-3 shows the topography of Site 520 and surrounding area.

## 1.2 Site Background

Based on information provided by the NAVSTA Roosevelt Roads, Site 520 is a former industrial gas station that had four USTs. The UST system construction details, fuel type, operational time, and storage capacity of each UST are summarized in Table 1-1.

**TABLE 1-1  
UST DESCRIPTIONS**

**Site 520  
Roosevelt Roads, U.S. Naval Station  
Ceiba, Puerto Rico**

<b>UST Number</b>	<b>UST System Construction Details</b>	<b>UST Fuel Type</b>	<b>UST Operational Time</b>	<b>UST Storage Capacity</b>
520A	Tank: Single-Wall Fiberglass Reinforced Plastic Piping: Single-Wall PVC	Waste Oil	1984 to 1993	550 Gallons
520B	Tank: Single-Wall Steel, epoxy-coated Piping: Single-Wall Steel	Super Unleaded Gasoline	1958 to 1993	12,000 Gallons
520C	Tank: Single-Wall Steel, epoxy-coated Piping: Single-Wall Steel	Regular Unleaded Gasoline	1944 to 1993	12,000 Gallons
520D	Tank: Single-Wall Steel Piping: Single-Wall Steel	Diesel Fuel	1979 to 1993	10,000 Gallons

---

Total Petroleum Hydrocarbons (TPH) concentrations ranging from 909 to 3,977 milligrams per kilogram (mg/kg) were detected in soils at Site 520 during the UST removal in 1993.

### **1.3 Previous Investigations**

No previous SC investigations have been conducted at Site 520. The U.S. Navy removed the USTs in 1993. The NAVSTA Roosevelt Roads requested that a SC be performed after the detection of elevated levels of petroleum hydrocarbons in the soil during the removal of the USTs in 1993.

### **1.4 Project Objectives**

The main purpose of the project was to assess the extent of soil and groundwater potential impacts at Site 520. The SC investigation consisted of the installation of soil borings and monitoring wells, and the collection and analysis of groundwater and soil samples.

A total of eleven (11) soil borings and seven (7) monitoring wells were installed at Site 520. Soil and groundwater samples collected from the soil borings and monitoring wells during this investigation were sent to a laboratory for analysis. The final locations of the monitoring wells were based on laboratory analytical results obtained from the soil and water samples collected from the soil borings. Monitoring well top-of-casing elevations and depth-to-water measurements were also collected. Water table elevation contour maps were developed to show the ground-water flow direction. Aquifer tests were performed to determine the hydraulic conductivity of the surficial aquifer. Groundwater flow velocity and gradient were also calculated from the water table elevation data and aquifer test results.



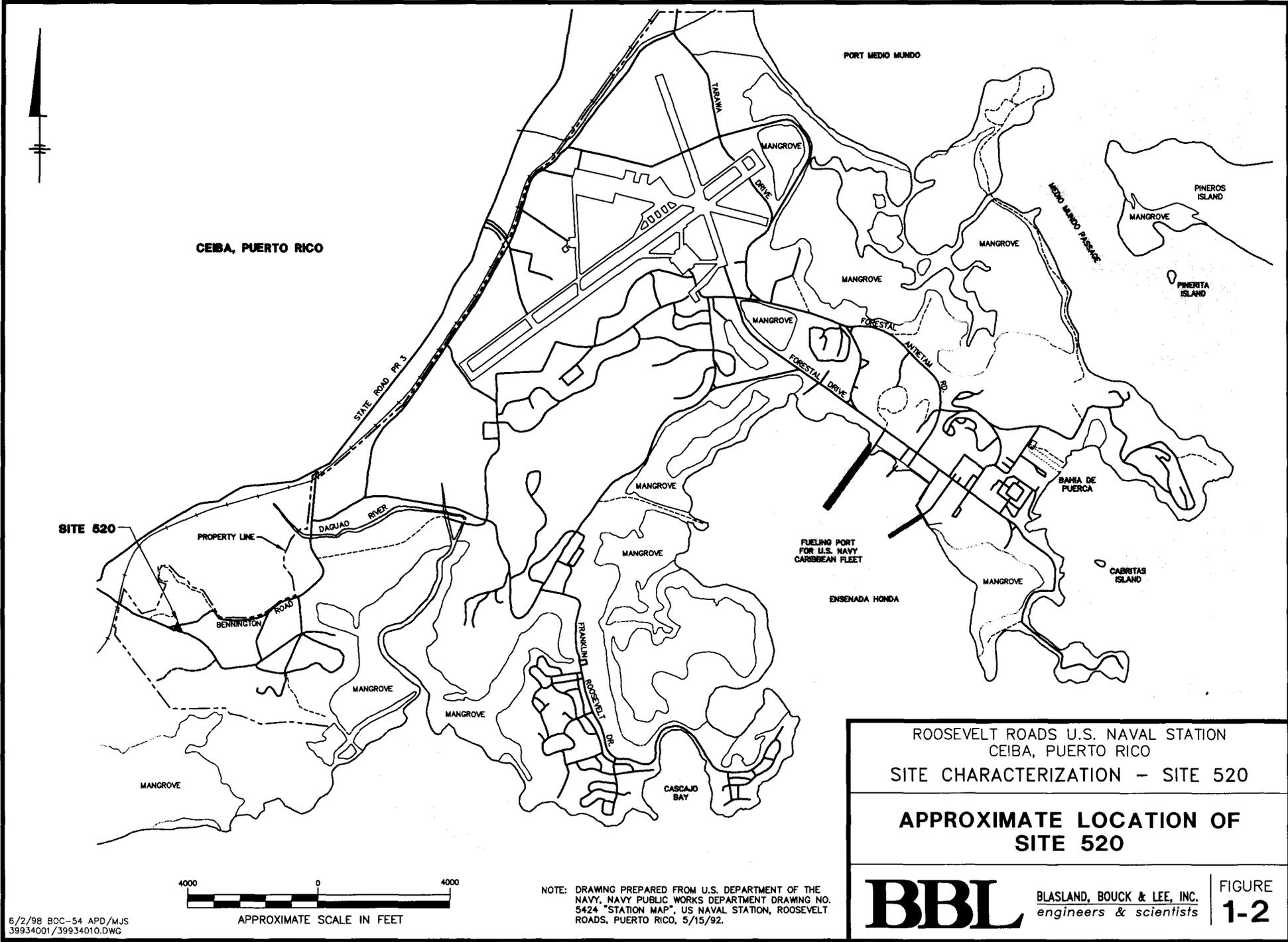
ROOSEVELT ROADS U.S. NAVAL STATION  
 CEIBA, PUERTO RICO  
 SITE CHARACTERIZATION- SITE 520

SITE LOCATION MAP

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**FIGURE  
 1-1**



CEIBA, PUERTO RICO

PORT MEDIO MUNDO

PIÑEROS ISLAND

PIÑERTA ISLAND

SITE 520

PROPERTY LINE

DAGUADO RIVER

BENNINGTON ROAD

MANGROVE

FUELING PORT FOR U.S. NAVY CARIBBEAN FLEET

ENSENADA HONDA

MEDIO MUNDO PASSAGE

CABRITAS ISLAND

BAHIA DE PUERCA

ROOSEVELT ROADS U.S. NAVAL STATION  
CEIBA, PUERTO RICO  
SITE CHARACTERIZATION - SITE 520

APPROXIMATE LOCATION OF  
SITE 520

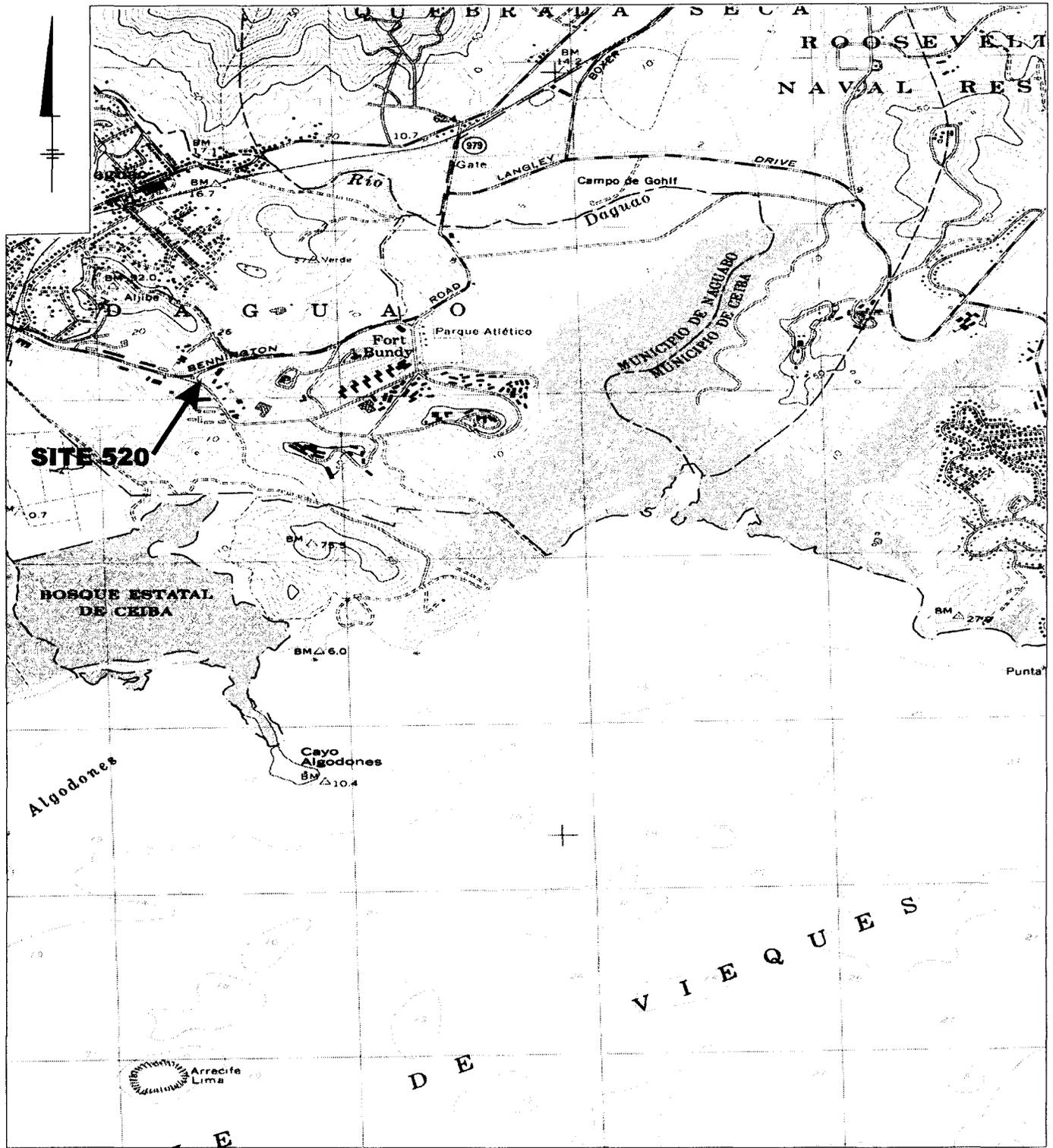


APPROXIMATE SCALE IN FEET

NOTE: DRAWING PREPARED FROM U.S. DEPARTMENT OF THE NAVY, NAVY PUBLIC WORKS DEPARTMENT DRAWING NO. 5424 "STATION MAP", US NAVAL STATION, ROOSEVELT ROADS, PUERTO RICO, 5/15/92.

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FIGURE  
1-2



MAP SOURCE:  
 UNITED STATES GEOLOGIC SURVEY  
 TOPOGRAPHIC QUADRANGLE, 7.5 MIN.  
 SERIES, NAGUABO, PUERTO RICO  
 photo-revised 1982.



4/15/98 BOC-54 MJS  
 39934001/39934003.CDR

ROOSEVELT ROADS U.S. NAVAL STATION  
 CEIBA, PUERTO RICO  
 SITE CHARACTERIZATION- SITE 520

**TOPOGRAPHIC MAP**

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**FIGURE  
 1-3**

## **2. Site Geology/Hydrogeology**

### **2.1 Regional Geology**

The geology of NAVSTA Roosevelt Roads consists of a sequence of intrusive and extrusive volcanic and volcanoclastic lithologies of lower Cretaceous age (M'Gonile, 1979). Much of the U.S. Naval Base is underlain by the Daguoa Formation, which is characterized by interbedded volcanic breccia, lava, subordinate volcanic sandstone, and crystal tuff (M'Gonile, 1979). The Daguoa Formation has an irregular surface and is encountered at various depths across the NAVSTA Roosevelt Roads (BBL, 1994). The Daguoa formation pinches out in the northern part of the NAVSTA Roosevelt Roads giving way to the Fajardo formation. The Fajardo formation is made up of thin-bedded tuffaceous siltstone and sandstone of lower Cretaceous age (Briggs and Aguilar-Cortez, 1980). The largest hills [approximately 300 feet above mean sea level (MSL)] and ridges consist of the Daguoa Formation. The hills are flanked by Quaternary and Holocene fanglomerate and swamp deposits. Quaternary alluvium, slopewash, and fanglomerate deposits compose the broad low-lying areas of NAVSTA Roosevelt Roads (BBL, 1995).

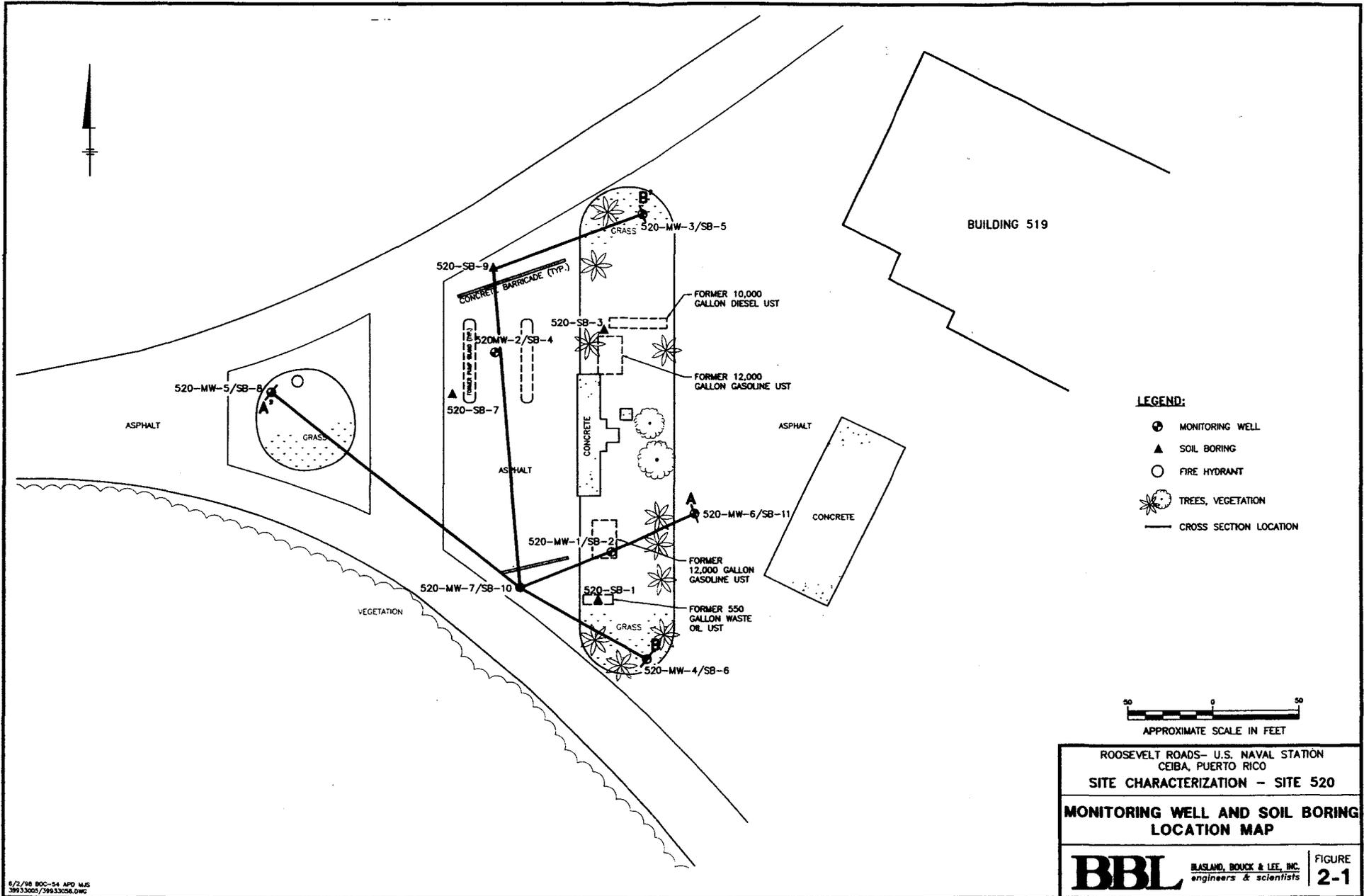
### **2.2 Site Geology**

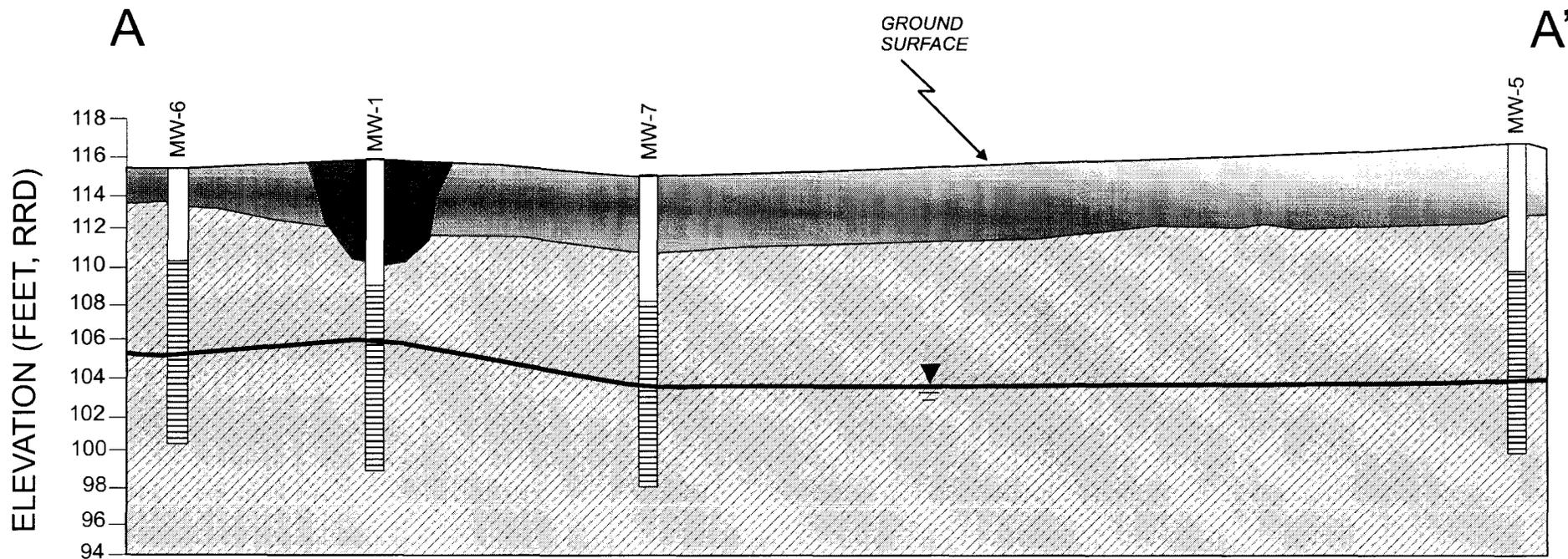
The soil samples collected during the installation of soil borings and monitoring wells were used to describe the site geology. Lithologic descriptions are included within the soil boring logs and monitoring well construction diagrams which are presented as Appendices A and B, respectively.

Site 520 lies on a low-lying area (approximately 15 feet above MSL) that is underlain by the Daguoa Formation that slopes downward to the south. Beneath Site 520, silt and clay, from highly weathered volcanic rock are encountered from within two feet of the ground surface. The colors of the clays are primarily light to dark yellowish brown, light greenish gray/black, light olive brown, and pale green. The colors of the silt and clays were determined with the Munsell soil color system. The clay-rich material beneath this zone is saprolite, a thoroughly decomposed rock formed in place by chemical weathering of igneous and metamorphic rocks. The formation of saprolite usually takes place in tropical or subtropical climates with high humidity. The brown coloring of the weathered volcanic rock is due to iron oxidation. These sediments possess high plasticity and are not easily crumbled under hand pressure. The locations of monitoring wells and soil borings are provided as Figure 2-1. North-south and east-west geologic cross-sections are presented respectively in Figures 2-2 and 2-3. These cross-sections were developed based on the lithology observed during the installation of soil borings and monitoring wells for the SC.

### **2.3 Site Hydrogeology**

Groundwater flow at Site 520 is controlled by several factors, including topography, drainage structures, and areas with fill material (e.g., pea gravel). Mounding of the water table in the vicinity of 520-MW-1 is apparent from the water table elevation contours from two separate dates. The mounding may be attributed to the presence of pea gravel and fill material left in the former UST locations. No distinct flow direction across Site 520 was observed on either of these dates. However, the largest gradient at the site on both dates was toward the southwest. Site 520 is underlain by an unconfined surficial aquifer system, which is composed of sands, silts, and clays. The clays collected at Site 520 are characterized by high plasticity, which indicates that water is present in the pore spaces, however, the specific yield (ratio of the volume of water that drains from a sample under gravity to the total volume of the sample) is very low. The high specific retention (ratio of the volume of water that a sample retains against the pull of gravity to the total volume of the sample) observed in the samples is due to the ionic attraction between positively charged hydrogen bonds in the water molecules and the net negative charges on clay particle surfaces. As a result, the subsurface material displays low hydraulic conductivity in all directions of the flow field. Additionally, results from the falling head tests display evidence of a slow rate of return to static conditions in the monitoring well. A summary of the falling head test results and hydraulic conductivity values are presented in Appendix C.





LEGEND

- |   |                       |   |                        |
|---|-----------------------|---|------------------------|
|  | SILT                  |  | MONITORING WELL RISER  |
|  | CLAY                  |  | MONITORING WELL SCREEN |
|  | FILL                  |   |                        |
|  | WATER TABLE ELEVATION |   |                        |

ROOSEVELT ROADS- U.S. NAVAL STATION  
 CEIBA, PUERTO RICO  
**SITE CHARACTERIZATION - SITE 520**

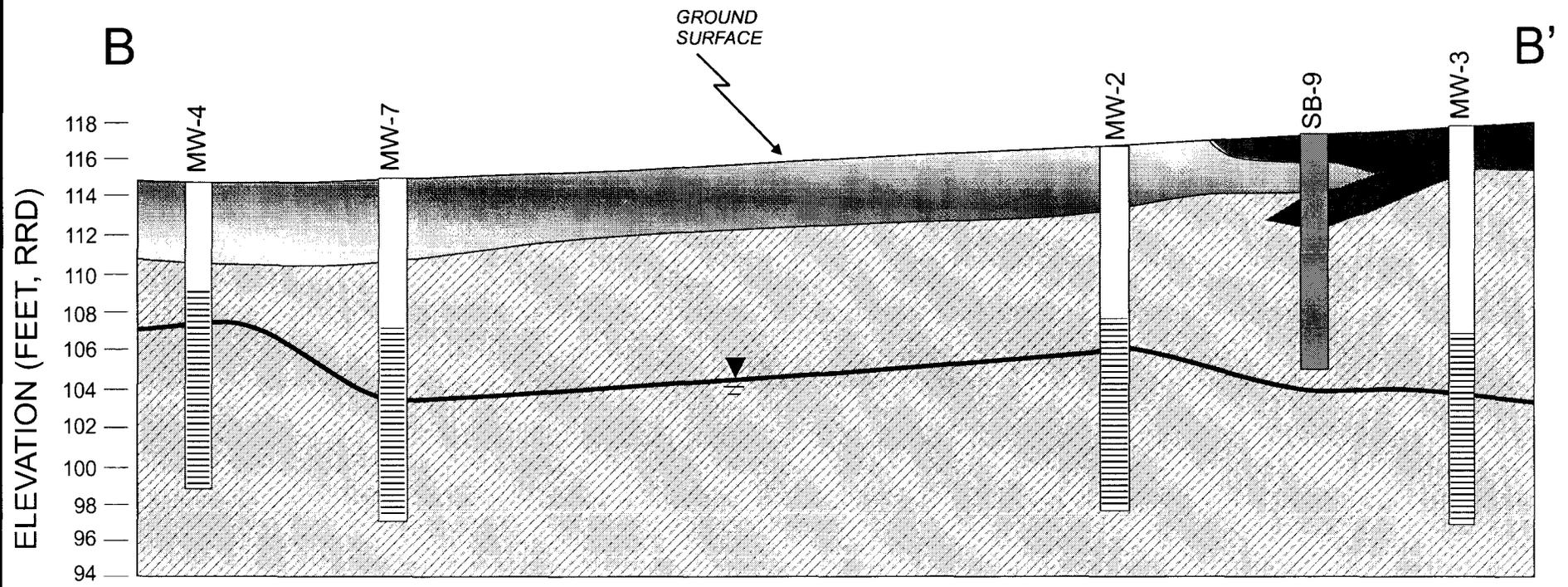
**GEOLOGIC CROSS SECTION  
 A-A'**

NOTE: SEE FIGURE 2-1 FOR THE LOCATION  
 OF GEOLOGIC CROSS SECTION A-A'

NOTE: ELEVATIONS ARE BASED ON NAVSTA  
 ROOSEVELT ROADS DATUM (RRD)

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**FIGURE  
 2-2**



LEGEND

-  SILT
-  CLAY
-  FILL
-  WATER TABLE ELEVATION
-  MONITORING WELL RISER
-  MONITORING WELL SCREEN
-  SOIL BORING

ROOSEVELT ROADS- U.S. NAVAL STATION  
CEIBA, PUERTO RICO

**SITE CHARACTERIZATION - SITE 520**

**GEOLOGIC CROSS SECTION  
B-B'**

NOTE: SEE FIGURE 2-1 FOR THE LOCATION OF GEOLOGIC CROSS SECTION B-B'

NOTE: ELEVATIONS ARE BASED ON NAVSTA ROOSEVELT ROADS DATUM (RRD)

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**FIGURE  
2-3**

### **3. Field Investigations**

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The SC investigations took place continuously from February 23, 1998 through March 27, 1998. Additional filtered and unfiltered ground-water samples were collected from monitoring well 520-MW-6 on December 18, 1998. Assessment activities consisted of the installation of soil borings and monitoring wells, the collection of soil and groundwater samples and aquifer testing. Soil samples were collected at two foot intervals and were screened in the field with an organic vapor analyzer (OVA). Groundwater and soil samples were sent for laboratory analysis. Lithologic data was collected during the installation of monitoring wells and soil borings.

#### **3.1 Drilling**

A description of monitoring well and soil boring installation activities is provided in this section. Geotechnical details pertaining to drilling activities are summarized in Table 3-1 and included in Appendix D.

**TABLE 3-1  
SUMMARY OF APPENDIX D**

<b>Appendix Section</b>	<b>Contents</b>
D-1	Utility Location/Well Permits
D-2	Equipment Decontamination
D-3	Air Monitoring
D-4	OVA Field Screening Methodology
D-5	Monitoring Well Construction
D-6	Monitoring Well Development

On February 17, 1998, an application was submitted to the Puerto Rico Department of Natural Resources to obtain well construction permits (Appendix D-1). In addition, drilling activities at Site 520 began after a utility clearance was performed. The equipment decontamination and air monitoring procedures that were used for drilling are discussed in Appendices D-2 and D-3, respectively.

##### **3.1.1 Soil Boring Installation**

To determine and delineate the extent of petroleum-impacted soils, eleven (11) soil borings (520-SB-1 through 520-SB-11) were installed (Figure 2-1). Soil borings were advanced to the water table using a 2-foot long, stainless-steel, split spoon sampler inside hollow stem augers (HSA). Soil samples were collected continuously in 2-foot intervals until the water table was encountered. Standard penetration test procedures, in accordance with ASTM D-1586, were followed during the collection of soil samples. The surficial soils encountered at Site 520 were described in accordance with the Unified Soil Classification System (USCS). In addition, soil boring lithologic logs are presented in Appendix A.

##### **3.1.2 Soil Field Screening and Sampling**

Soil samples were collected at 2-foot intervals using a split-spoon sampler until the water table was encountered. The samples were placed inside 16-ounce glass jars, covered by a sheet of aluminum foil, and securely capped.

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Approximately five minutes were allowed to elapse before the samples were analyzed with a Model 128 Foxboro Organic Vapor Analyzer (OVA). The methodology used to conduct OVA screening is described in detail in Appendix D-4. The OVA screening results, summarized in Table 3-2, indicate that 20 of the 73 samples screened produced detectable vapors. Thirteen of those 20 samples had net hydrocarbon vapor content (HVC) concentrations above 100 parts per million (PPM). The HVC concentrations ranged from non detect to greater than 1,000 PPM. Methane vapor concentrations ranged from non detect to 400 PPM.

Selected soil samples were collected for laboratory analysis. Laboratory analysis included TPH by Environmental Protection Agency (EPA) Method 9073 and benzene, toluene, ethylbenzene, and xylene (BTEX) by EPA Method 8020. At least two samples from each soil boring were selected for laboratory analysis. Two intervals were used for soil sample collection: from 2 to 6 feet below land surface (BLS) and at least 2 feet above the water table. Laboratory analytical data are presented in Section 4.1.

### **3.1.3 Groundwater Field Screening**

At the time of the soil boring installations, the depth to water across Site 520 ranged from approximately 10 feet BLS to 14 feet BLS (Appendix A). The presence of the water table was determined by the BBL on-site geologist. Following the completion of a soil boring, the HSA was advanced an additional 4 feet into the water table. To allow groundwater recovery in the borehole, the HSA were raised 2 feet. Groundwater samples were then collected from the open borehole with a disposable Teflon™ bailer.

To assist in determining the location of the permanent monitoring wells, Transglobal Environmental Geochemistry (TEG) located in Caguas, Puerto Rico was used to analyze groundwater samples for TPH by EPA method 418.1 within 24 hours. Based on the laboratory analytical data and field observations, seven soil borings (SB-2, SB-4, SB-5, SB-6, SB-8, SB-10 and SB-11) were redrilled and converted to monitoring wells (520-MW-1 to 520-MW-7). The groundwater results analyzed by the local laboratory are summarized in Table 3-3 and included in Appendix E.

### **3.1.4 Monitoring Well Construction**

Seven 2-inch monitoring wells (520-MW-1 through 520-MW-7) were installed to define the maximum horizontal extent of potentially impacted groundwater around Site 520. The wells were installed under the observation of BBL personnel. The well construction materials and equipment were thoroughly decontaminated prior to installation of each well. The development of the wells was accomplished by using a centrifugal pump to remove fine-grained sediments (Table 3-4). A monitoring well completion summary is included in Table 3-5. Monitoring well construction diagrams are presented in Appendix B. A detailed description of monitoring well construction and development procedures is presented in Appendices D-5 and D-6, respectively.

**TABLE 3-2  
ORGANIC VAPOR ANALYSIS OF SOIL**

**Site 520  
Roosevelt Roads, U.S. Naval Station  
Ceiba, Puerto Rico**

Sample Designation	Date Sampled	Sample Depth (ft, BLS)	Total Organic Vapors (PPM)	Total Methane Vapors* (PPM)	Total Petroleum Hydrocarbon Vapors (PPM)
520-SB-1	2/23/98	0-2	<1	N/A	<1
	2/23/98	2-4	<1	N/A	<1
	2/23/98	4-6	<1	N/A	<1
	2/23/98	6-8	8.8	2.8	6.0
	2/23/98**	8-10	NC	NC	NC
520-SB-2	2/23/98	0-2	<1	N/A	<1
	2/23/98	2-4	<1	N/A	<1
	2/23/98	4-6	<1	N/A	<1
	2/23/98	6-8	<1	N/A	<1
	2/23/98	8-10	<1	N/A	<1
	2/23/98**	10-12	>1000	260	>740
2/23/98	12-14	>1000	400	>600	
520-SB-3	2/23/98	0-2	<1	N/A	<1
	2/23/98	2-4	<1	N/A	<1
	2/23/98	4-6	20	12	8
	2/23/98	6-8	52	38	14
	2/23/98	8-10	320	180	140
	2/23/98**	10-12	690	220	470
2/23/98	12-14	NC	NC	N/C	
520-SB-4	2/23/98	0-2	<1	N/A	<1
	2/23/98	2-4	64	48	16
	2/23/98	4-6	140	12	128
	2/23/98	6-8	160	3	157
	2/23/98	8-10	>1000	105	>895
	2/23/98	10-12	>1000	40	>960
	2/23/98**	12-14	>1000	20	>980
2/23/98	14-16	NC	NC	NC	
520-SB-5	2/24/98	0-2	<1	N/A	<1
	2/24/98	2-4	<1	N/A	<1
	2/24/98	4-6	<1	N/A	<1
	2/24/98	6-8	<1	N/A	<1
	2/24/98	8-10	<1	N/A	<1
	2/24/98	10-12	<1	N/A	<1
	2/24/98**	12-14	<1	N/A	<1
	2/24/98	14-16	<1	N/A	<1

520-SB-6	2/24/98	0-2	<1	N/A	<1
	2/24/98	2-4	<1	N/A	<1
	2/24/98	4-6	<1	N/A	<1
	2/24/98	6-8	<1	N/A	<1
	2/24/98	8-10	<1	N/A	<1
	2/24/98	10-12	<1	N/A	<1
	2/24/98**	12-14	<1	N/A	<1
	2/24/98	14-16	<1	N/A	<1
520-SB-7	2/25/98	0-2	>1000	152	>848
	2/25/98	2-4	>1000	<1	>1000
	2/25/98	4-6	500	320	180
	2/25/98	6-8	440	330	110
	2/25/98	8-10	420	400	20
	2/25/98**	10-12	<1	N/A	<1
	2/25/98	12-14	NC	NC	NC
520-SB-8	2/25/98	0-2	<1	N/A	<1
	2/25/98	2-4	<1	N/A	<1
	2/25/98	4-6	<1	N/A	<1
	2/25/98	6-8	<1	N/A	<1
	2/25/98	8-10	<1	N/A	<1
	2/25/98**	10-12	<1	N/A	<1
	2/25/98	12-14	<1	N/A	<1
520-SB-9	2/26/98	0-2	<1	N/A	<1
	2/26/98	2-4	<1	N/A	<1
	2/26/98	4-6	<1	N/A	<1
	2/26/98	6-8	<1	N/A	<1
	2/26/98	8-10	<1	N/A	<1
	2/26/98**	10-12	<1	N/A	<1
	2/26/98	12-14	NC	NC	NC
520-SB-10	2/26/98	0-2	<1	N/A	<1
	2/26/98	2-4	46	38	8
	2/26/98	4-6	24	20	4
	2/26/98	6-8	<1	N/A	<1
	2/26/98	8-10	<1	N/A	<1
	2/26/98**	10-12	<1	N/A	<1
	2/26/98	12-14	NC	NC	NC
520-SB-11	2/26/98	0-2	<1	N/A	<1
	2/26/98	2-4	<1	N/A	<1
	2/26/98	4-6	<1	N/A	<1
	2/26/98	6-8	<1	N/A	<1
	2/26/98	8-10	<1	N/A	<1
	2/26/98**	10-12	<1	N/A	<1
	2/26/98	12-14	<1	N/A	<1

Note : See Figure 3-1 for sample locations

PPM = parts per million

BLS = below land surface

N/A = sample not screened because the total organic vapor concentration was less than 1 PPM

N/C = not collected

\* = Although methane is the primary organic vapor detected, other naturally occurring vapors may be included in this measurement

\*\* = sample collected at or below the water table

**TABLE 3-3  
SUMMARY OF TEG GROUNDWATER ANALYTICAL RESULTS**

**Site 520  
Roosevelt Roads, U.S. Naval Station  
Ceiba, Puerto Rico**

<b>TRANSGLOBAL ENVIRONMENTAL GEOCHEMISTRY</b>	
<b>Sample Number</b>	<b>Modified EPA Method 418.1 TPH (mg/L)</b>
520-SB-2	17
520-SB-3	<10
520-SB-4	23
520-SB-5	<10
520-SB-6	<10
520-SB-7	<10
520-SB-8	<10
520-SB-9	<10
520-SB-10	<10
520-SB-11	<10
<b>PREQB UST Target Levels</b>	<b>50</b>
<b>Notes:</b>  PR EQB = Puerto Rico Environmental Quality Board TPH = Total Petroleum Hydrocarbon mg/L = Milligrams per Liter	

**TABLE 3-4  
MONITORING WELL DEVELOPMENT SUMMARY**

**Site 520  
Roosevelt Roads, U.S. Naval Station  
Ceiba, Puerto Rico**

<b>Well</b>	<b>Development Method</b>	<b>Development Completion Date</b>	<b>Approximate Gallons Developed</b>	<b>Number of Well Volumes Developed</b>
520-MW1	Centrifugal Pump	3/11/98	26	4.16
520-MW2	Centrifugal Pump	3/10/98	18	2.88
520-MW3	Centrifugal Pump	3/10/98	17	2.72
520-MW4	Centrifugal Pump	3/11/98	10.5	1.68
520-MW5	Centrifugal Pump	3/10/98	9	1.44
520-MW6	Centrifugal Pump	3/11/98	6.5	1.04
520-MW7	Centrifugal Pump	3/11/98	7.5	1.2

**TABLE 3-5  
MONITORING WELL COMPLETION SUMMARY**

**Site 520  
Roosevelt Roads, U.S. Naval Station  
Ceiba, Puerto Rico**

<b>Well Designation</b>	<b>520 MW-1</b>	<b>520 MW-2</b>	<b>520 MW-3</b>	<b>520 MW-4</b>	<b>520 MW-5</b>	<b>520 MW-6</b>	<b>520 MW-7</b>
Date Installed	2/27/98	2/27/98	3/2/98	3/2/98	3/3/98	3/4/98	3/5/98
Total Well Depth (ft, BLS)	17.0	19	20	18	17	15	17
Type of Completion	Flush						
Top of Casing Elevation (ft, RRD)	115.99	117.15	117.72	114.93	116.70	115.20	114.67
Casing Type	Schedule 40 PVC						
Casing Length(s)	7	9	10	8	7	5	7
Screen Type	Schedule 40 PVC						
Screen Slot Size (in)	0.10	0.10	0.10	0.10	0.10	0.10	0.10
Screen Length	10	10	10	10	10	10	10
Screen Interval (ft, BLS)	7-17	9-19	10-20	8-18	7-17	5-15	7-17
<p><b>Note: All monitoring wells are 2 inches in diameter</b></p> <p>in = inches  ft = feet  RRD =Roosevelt Roads Datum  BLS = below land surface</p>							

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## 3.2 Aquifer Tests

On March 27, 1998, falling head tests were performed in monitoring wells 520-MW-3 and 520-MW-4. The aquifer hydraulic properties beneath Site 520 were calculated from the data collected during these tests. The falling head test procedure consisted of the following procedures:

- A depth-to-water measurement was taken to determine static conditions in the well.
- A pressure transducer was placed 1 foot off the bottom of the well. The transducer cable was secured in place with the manhole lid to prevent it from shifting during the test.
- The pressure transducer was connected to the data logger.
- The data logger was programmed for the test. This allowed the data logger to convert the pressure transducer readings to feet of head.
- The water level on the data logger was reentered as zero to represent static conditions.
- The data logger started recording at the same time a known volume of potable water was introduced into the well.
- Once the water level returned to within 10 percent of static conditions, the test was stopped.

The falling head test results were plotted on semi-logarithmic graphs and analyzed using the Bouwer and Rice method (Bouwer and Rice, 1976). The hydraulic conductivities calculated from the falling head test ranged from 0.039 feet per day (ft/day) to 1.0 ft/day and averaged 0.70 ft/day. The falling head tests indicated that the surficial clays at Site 520 have very low hydraulic conductivities. The raw data, graphs, and calculations pertaining to the falling head test are presented in Appendix C.

## 3.3 Water Table Elevation Measurements

The top-of-casing elevations of the seven monitoring wells were surveyed by a licensed surveyor and referenced to the NAVSTA Roosevelt Roads datum. On March 16 and 26, 1998, the depth to water for the seven monitoring wells was measured from the top of each well casing with an electronic interface probe, which is accurate to within 0.01 feet. Depth to water measurements, water table elevation data, and monitoring well casing elevation data are presented in Table 3-6. The water level measurements obtained on March 16 and 26, 1998 were used to generate water table elevation maps (Figure 3-1 and Figure 3-2). As shown on Figure 3-1 and Figure 3-2, groundwater appears to be mounding around 520-MW-1. This mounding may be attributed to the high permeability material (pea gravel) that was used to fill the area around the former UST 520B, as a result, the groundwater flow direction in the vicinity of the former UST appears to radiate in all directions. However, field measurements indicate that the gradient toward the southwest is the largest at Site 520.

The ground-water gradient (I) and flow velocity (V) were calculated from the K obtained from the falling head tests and water table elevation data. The groundwater gradient range from 0.05 feet/foot (ft/ft) to 0.08 ft/ft. The flow velocity ranged from 0.08 ft/day to 0.12 ft/day. The calculations used to determine I and V are presented in Appendix C.

## 3.4 Groundwater Sampling

On March 26 and 27, 1998, groundwater samples were collected from the seven monitoring wells. The groundwater samples were transported, on ice, to a certified laboratory via an overnight courier. The samples were analyzed by the following EPA methods: 418.1 (TPH), 8020 (BTEX), 610 (polynuclear aromatic hydrocarbons (PAH)) and 7421 (lead). Groundwater samples from monitoring wells 520-MW-1, 520-MW-4, 520-MW-6, and 520-MW-7 were analyzed for the eight RCRA metals (arsenic, barium, cadmium, chromium, lead, mercury, selenium, and silver). Additional groundwater samples were collected from monitoring well 520-MW-6 on December 18, 1998 for analysis for lead, barium, and chromium.

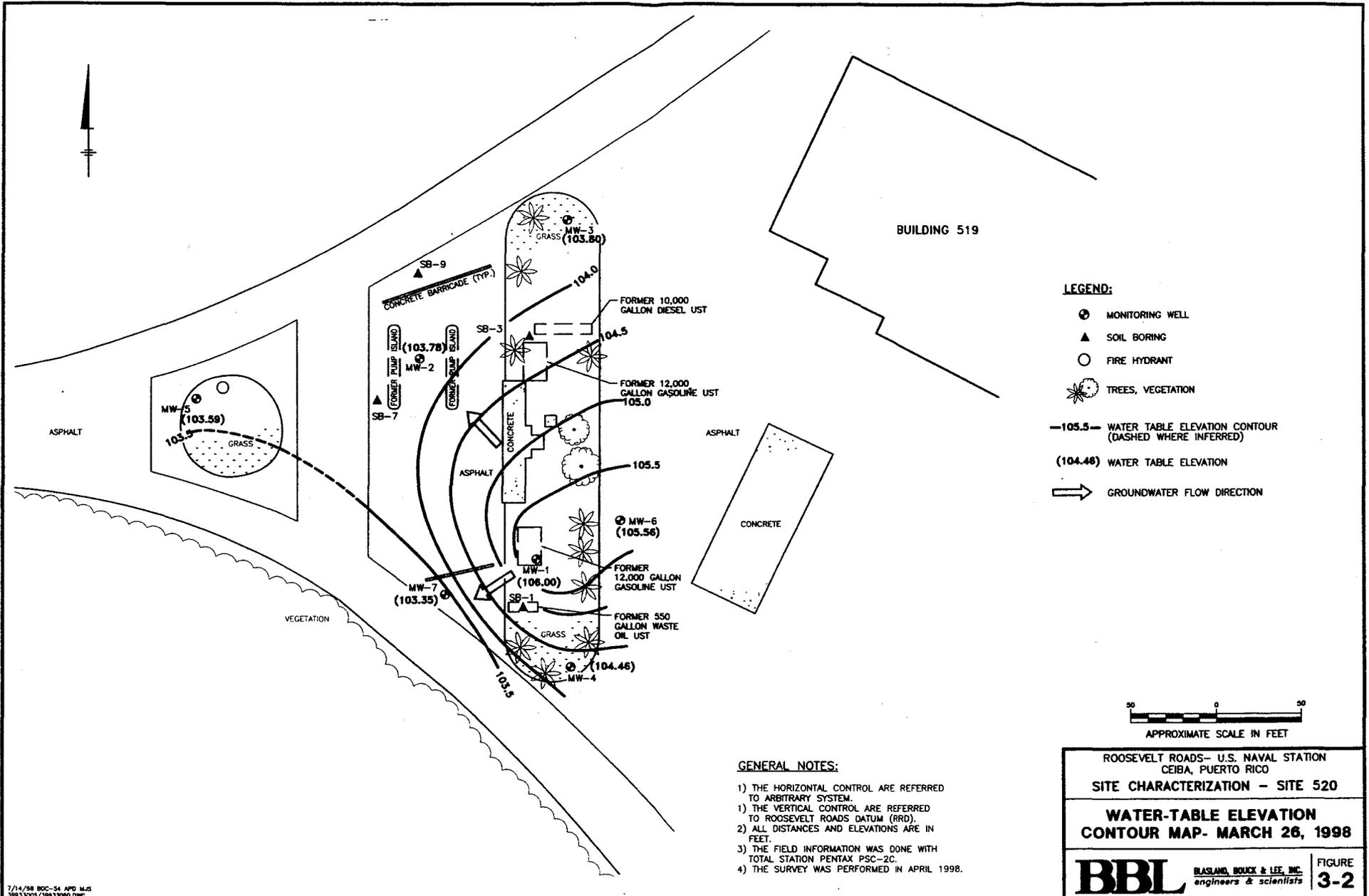
Field blanks, equipment blanks, and trip blanks were collected to ensure that contaminants were not introduced to the water samples before, during, or after sample collection. Groundwater sampling procedures and Quality Assurance/Quality Control (QA/QC) guidelines are detailed in Appendix F.

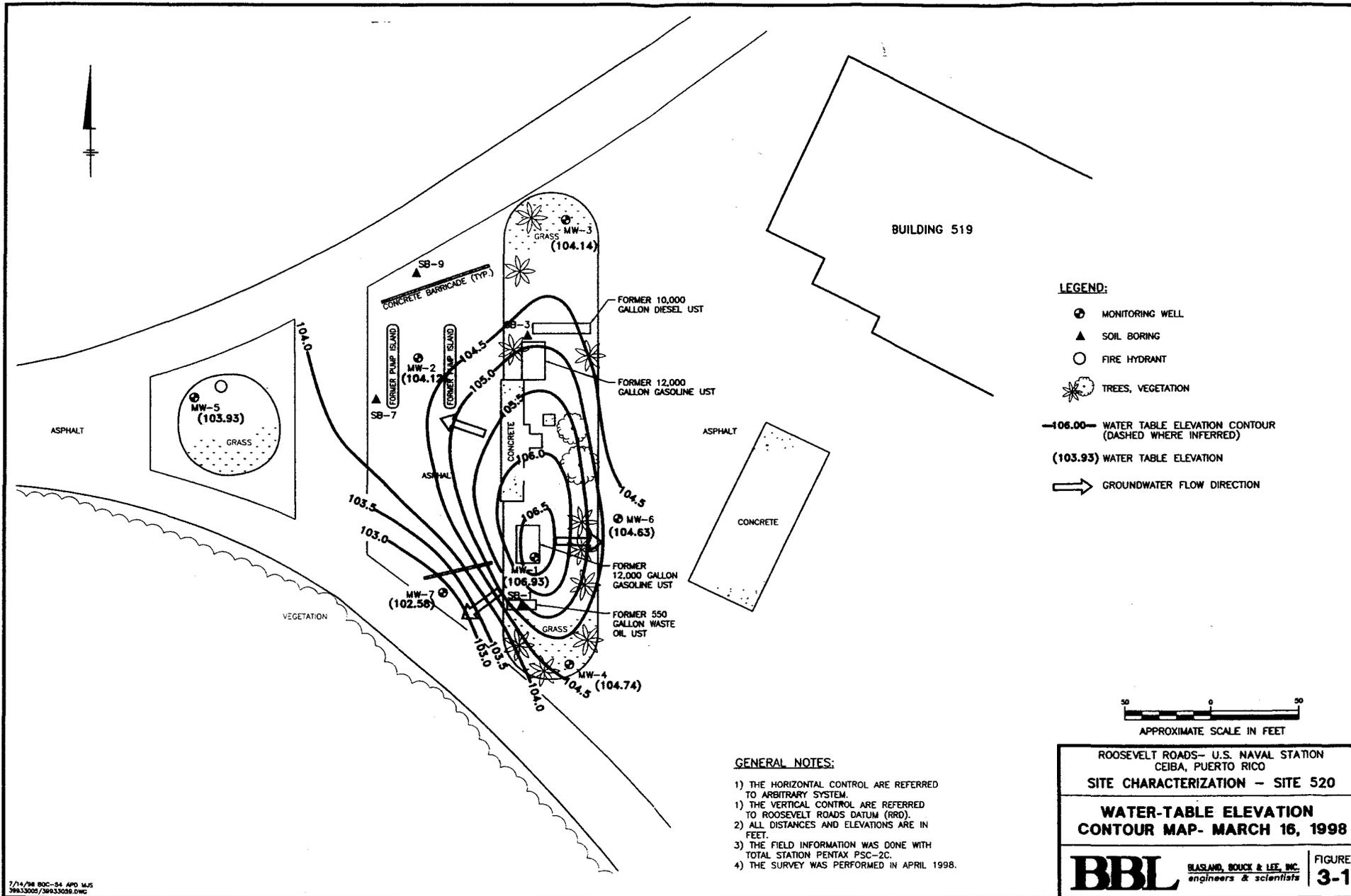
**TABLE 3-6  
WATER TABLE ELEVATION DATA**

**Site 520  
Roosevelt Roads, U.S. Naval Station  
Ceiba, Puerto Rico**

Well Designation	Elevation of Top of Casing (ft, RRD)	March 16, 1998		March 26, 1998	
		Depth to Water (ft)	Water Level Elevation (ft, RRD)	Depth to Water (ft)	Water Level Elevation (ft, RRD)
520-MW-1	115.99	9.06	106.93	9.99	106.00
520-MW-2	117.15	13.03	104.12	13.37	103.78
520-MW-3	117.72	13.58	104.14	13.92	103.80
520-MW-4	114.93	10.19	104.74	10.47	104.46
520-MW-5	116.70	12.77	103.93	13.11	103.59
520-MW-6	115.20	10.57	104.63	9.64	105.56
520-MW-7	114.67	12.09	102.58	11.32	103.35

Note: Top-of-Casing elevations were referenced to Roosevelt Roads Datum  
ft = feet  
RRD = Roosevelt Roads Datum





## **4. Laboratory Analytical Results**

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### **4.1 Soil Analytical Results**

The laboratory analytical data for the soil samples collected during this investigation are summarized in Table 4-1. Soil quality assurance/quality control (QA/QC) data are summarized in Table 4-2. Complete laboratory analytical data of soil samples collected by BBL personnel are presented in Appendix G. The TPH data from the soil samples was used to approximate the maximum horizontal and vertical extent of potentially impacted soil by hydrocarbons. Figure 4-1 shows the concentrations of hydrocarbons in the soil samples. Concentrations of TPH in soils above the PREQB target levels appear to be restricted to two locations.

As shown in Table 4-1 and on Figure 4-1, soil samples 520-SB-1 (6-8) and 520-SB-10 (2-6) were above the PREQB target levels for TPH set at 100 mg/kg. Soil sample 520-SB-1 (6-8), collected from 6 feet to 8 feet BLS, exhibited a TPH concentration of 300 milligrams per kilogram (mg/kg). Soil sample 520-SB-10 (2-6), collected from 2 to 6 feet BLS, exhibited a TPH concentration of 110 mg/kg.

To confirm that the TPH concentrations detected in 520-SB-10 (2-6) were related to petroleum products and not from naturally occurring sources, the soil sample was analyzed for Gasoline Range Organic (GRO) and Diesel Range Organic (DRO) compounds using modified EPA Method 8015. Results of the GRO and DRO analyses were below their respective detection limits and considered inconclusive.

Although PREQB does not have any standards for BTEX in soils, the samples were analyzed to characterize individual constituents. Six samples [520-SB-2 (10-12), 520-SB-3 (8-10), 520-SB-4 (8-10), 520-SB-7 (2-6), 520-SB-9 (2-6), and 520-SB-9 (8-10)] were above the method detection limits for BTEX constituents.

The soil analytical data were used to determine the status of the drill cuttings. Based on the laboratory analytical data, drill cuttings that had TPH and BTEX concentrations below the method detection limits were classified as nonhazardous and spread. The rest of the drill cuttings were containerized in 55-gallon drums for future disposal at a Puerto Rican certified landfill.

### **4.2 Groundwater Analytical Results**

The groundwater laboratory analytical data, summarized in Table 4-3, showed that dissolved concentrations of BTEX above the PREQB target levels were present in two of the monitoring wells (520-MW-1 and 520-MW-2). The groundwater sample from 520-MW-6 contained a total lead concentration of 0.076 mg/L, however, the concentrations of total lead were below method detection limits in the rest of the monitoring wells. Elevated concentrations of barium and chromium were also detected in the groundwater sample from monitoring well 520-MW-6. The PREQB target levels are 5 micrograms per liter (ug/L) for benzene, 50 ug/L for BTEX, 100 milligrams per liter (mg/L) for TPH, and 0.015 mg/L for total lead.

Monitoring well 520-MW-6 was resampled, using low flow rates during purging and sample collection (to reduce suspended sediment in the samples) on December 18, 1998 for filtered (dissolved) and unfiltered (total) lead, barium, and chromium. Lead and chromium were not found above their detection limits (0.0050 mg/L and 0.010 mg/L, respectively) in the unfiltered groundwater sample collected from monitoring well 520-MW-6 on December 18, 1998. Barium was detected at a concentration of 0.33 mg/L in the groundwater samples collected from monitoring well 520-MW-6 on December 18, 1998 (as compared to a concentration of 110 mg/L that was detected during the March 27, 1998 sampling event). The results from the December 18, 1998 sampling event indicate that the elevated metals concentrations detected in the initial, unfiltered groundwater samples collected from monitoring well 520-MW-6 were most likely a result of the high turbidity (suspended sediment) observed in the groundwater sample at the time of collection.

At the time of groundwater sampling, free product was not present in any of the monitoring wells, as a result, all the wells at Site 520 were sampled. After detecting elevated concentrations of BTEX in 520-MW-1 and 520-MW-2, additional assessment activities were conducted and one half inch of free product was encountered in 520-MW-2. Free product was not initially observed in 520-MW-2 most likely because of the low hydraulic conductivity of the soils and the slow rate of recharge observed during subsequent free product measuring events.

The location of the free product plume is in the immediate vicinity of the former pump islands as shown on Figure 4-3. The elevated concentrations of BTEX detected in 520-MW-2 correspond to the former location UST 520B. Dissolved concentrations of BTEX, TPH, and total lead are not present within the rest of the wells (520-MW-3 to 520-MW-7). The groundwater sample analysis is summarized in Table 4-3 and depicted on Figure 4-2. A summary of the QA/QC laboratory analytical data is presented in Table 4-4. The soil, groundwater, and QA/QC laboratory analytical reports are provided in Appendix G.

**TABLE 4-1  
SUMMARY OF SAVANNAH LABORATORIES SOIL ANALYTICAL RESULTS**

**Site 520  
Roosevelt Roads, U.S. Naval Station  
Ceiba, Puerto Rico**

Soil Boring	Savannah Laboratories		
	Date Sampled	EPA Method 418.1 TPH (mg/kg)	EPA Method 8020 Total BTEX (ug/kg)
520-SB-1 (2-6)	2/23/98	94	<20
520-SB-1 (6-8)	2/23/98	300	<20
520-SB-2 (2-6)	2/23/98	<10	<20
520-SB-2 (10-12)	2/23/98	<10	50
520-SB-3 (2-6)	2/23/98	81	<20
520-SB-3 (8-10)	2/23/98	<10	1083
520-SB-4 (2-6)	2/23/98	14	<20
520-SB-4 (8-10)	2/23/98	<10	1847
520-SB-5 (2-6)	2/24/98	<10	<20
520-SB-5 (8-10)	2/24/98	<10	<20
520-SB-6 (2-6)	2/24/98	<10	<20
520-SB-6 (8-10)	2/24/98	<10	<20
520-SB-7 (2-6)	2/25/98	22	232
520-SB-7 (8-10)	2/25/98	<10	<20
520-SB-8 (2-6)	2/25/98	<10	<20
520-SB-8 (8-10)	2/25/98	<10	<20
520-SB-9 (2-6)	2/26/98	38	44.1
520-SB-9 (8-10)	2/26/98	16	865
520-SB-10 (2-6)	2/26/98	110	<20
520-SB-10 (8-10)	2/26/98	<10	<20
520-SB-11 (2-6)	2/26/98	<10	<20
520-SB-11 (8-10)	2/26/98	<10	<20
Puerto Rico EQB UST Target Levels		100	NS

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Notes:	EQB	= Environmental Quality Board
	TPH	= Total Petroleum Hydrocarbons
	Total BTEX	= Sum of Benzene, Toluene, Ethylbenzene, and Xylene
	ug/kg	= Micrograms per Kilogram
	mg/kg	= Milligrams per Kilogram
	NS	= No Standards in Puerto Rico
	UST	= Underground Storage Tanks

TABLE 4-2

SUMMARY OF SAVANNAH SOIL QA/QC ANALYTICAL RESULTS

Site 520  
Roosevelt Roads, U.S. Naval Station  
Ceiba, Puerto Rico

Sample Name	Date Sampled	Sample Matrix	TPH mg/kg	BTEX ug/kg
520 Dup 1 [SB-6 (8-10)]	02/24/98	Soil	<10	<20
520-SB-6 (8-10)	02/24/98	Soil	<10	<20
			mg/L	ug/L
T.B.	02/25/98	Water	NA	<5.0
E.B. (Rinsate)	02/24/98	Water	<1.0	<5.0
E.B. (Rinsate)	02/23/98	Water	<1.0	<5.0
E.B. (Rinsate)	02/25/98	Water	<1.0	<5.0
520 Auger Blank	2/26/98	Water	<1.0	<5.0
T.B.	02/27/98	Water	NA	<5.0
<b>Notes:</b>				
TPH	= Total Petroleum Hydrocarbon			
Total BTEX	= Sum of Benzene, Toluene, Ethylbenzene, and Xylenes			
ug/kg	= Micrograms per Kilogram			
mg/kg	= Milligrams per Kilogram			
ug/L	= Micrograms per Liter			
mg/L	= Milligrams per Liter			
UST	= Underground Storage Tank			
520 Dup 1	= Duplicate Sample of 520-SB-6 (8-10)			
T.B.	= Trip blank, provided by the laboratory			
E.B.	= Equipment blank taken from split spoon rinsate			
NA	= Not Analyzed			

**TABLE 4-3  
SUMMARY OF GROUNDWATER ANALYTICAL RESULTS**

**Site 520  
Roosevelt Roads, U.S. Naval Station  
Ceiba, Puerto Rico**

Parameter	PREQB Target Levels	U.S. EPA MCL	520 MW-1	520 MW-2	520 MW-3	520 MW-4	520 MW-5	520 MW-6	520 MW-7
<b>Date Sampled</b>			03/26/98	03/26/98	03/26/98	03/26/98	03/26/98	03/27/98	03/26/98
Benzene (ug/L)	5	1.0	550	88,000	<1	<1	<1	<1	<1
Toluene (ug/L)	1,000	1,000	38	99,000	<1	<1	<1	<1	<1
Ethylbenzene (ug/L)	700	700	81	3,700	<1	<1	<1	<1	<1
Xylene (ug/l)	10,000	10,000	1,600	27,000	<2	<2	<2	<2	<2
Total BTEX (ug/L)	50	NS	2,269	217,700	<5	<5	<5	<5	<5
MTBE (ug/L)	NS	NS	95	420	<10	<10	<10	<10	<10
PAH (ug/L)	NS	NS	BDL*						
Total Naphthalene (ug/L)	NS	NS	436	<25	<25	124	<25	<25	<25
TPH (mg/L)	50	NS	1.8	21	<1.0	<1.0	<1.0	<1.0	<1.0
Lead (mg/L)	0.015	0.015	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	0.076**	<0.0050

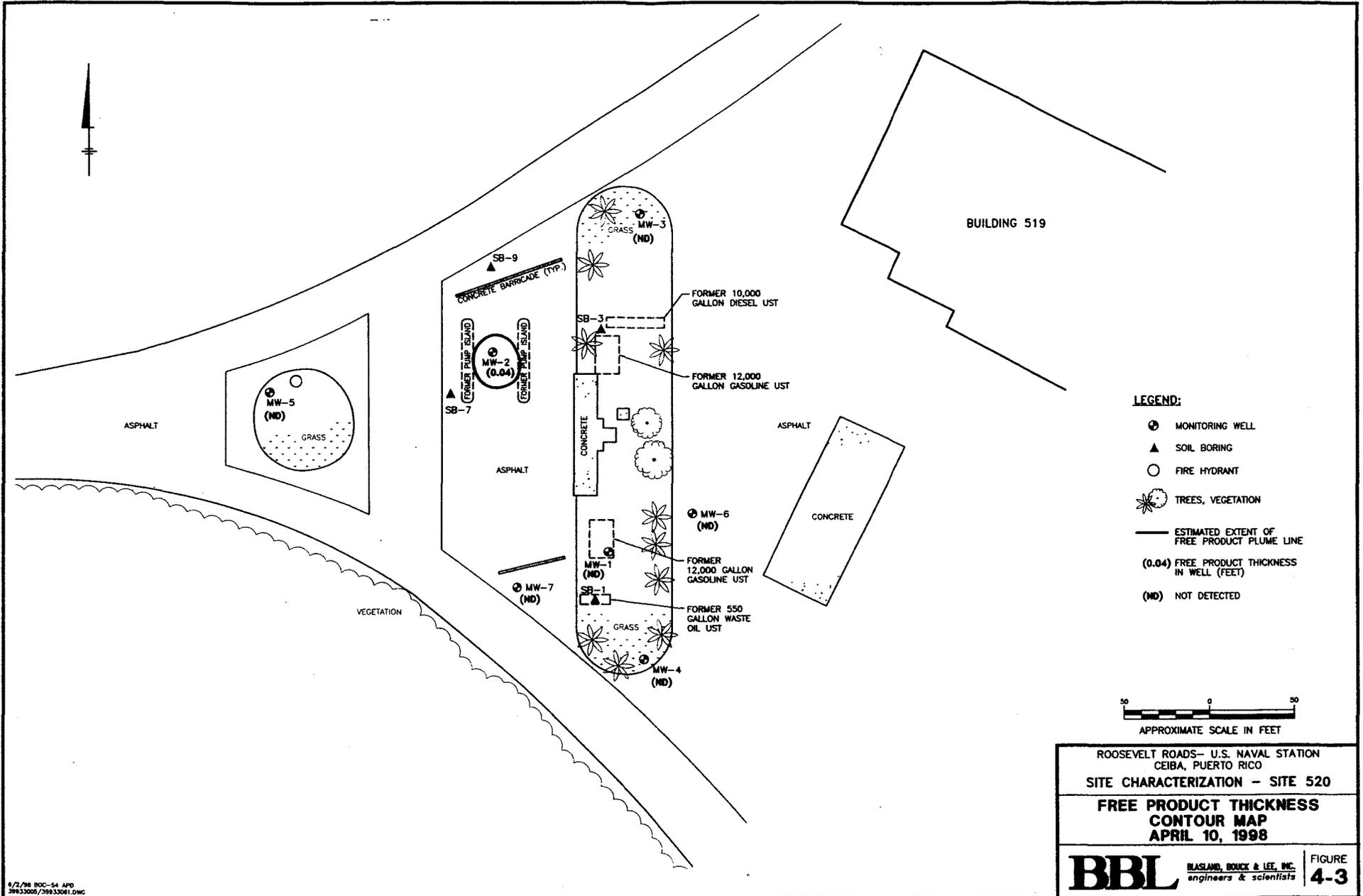
**Note:**

- ug/L = Micrograms per Liter
- mg/L = Milligrams per Liter
- MTBE = Methyl-tert-butyl-ether
- Total BTEX = Sum of Benzene, Toluene, Ethylbenzene, and Xylenes
- PAH = Polynuclear Aromatic Hydrocarbon (excluding naphthalene)
- TPH = Total Petroleum Hydrocarbon by EPA Method 418.1
- NS = No Standard
- MCL = Maximum Contaminant Level
- Total Naphthalene = Sum of Naphthalenes and Methyl-naphthalenes
- BDL = Below Detection Limits
- \* = All PAH compounds excluding naphthalenes were below their respective detection limits
- \*\* = The concentration of unfiltered (total) lead detected in the groundwater samples collected on December 18, 1998 from monitoring well 520-MW-6 was less than the detection limit (<0.0050 mg/L).

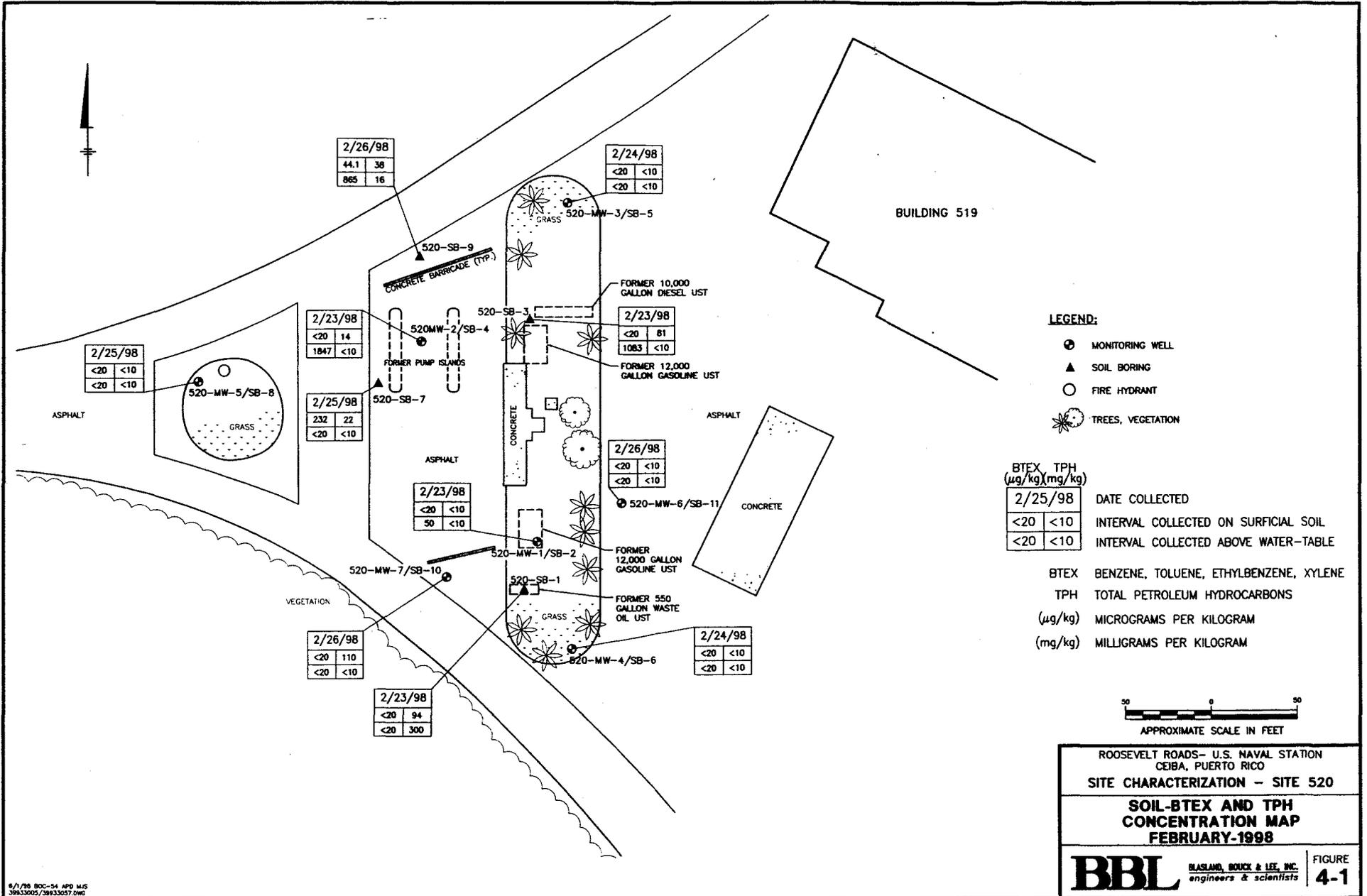
**TABLE 4-4  
SUMMARY OF GROUNDWATER QA/QC ANALYTICAL RESULTS**

**Site 520  
Roosevelt Roads, U.S. Naval Station  
Ceiba, Puerto Rico**

Parameter	EQB Levels	U.S. EPA MCL	520 MW-1 (DUP-1)	Field Blank	Trip Blank	Equipment Blank
<b>Date Sampled</b>			<b>03/26/98</b>	<b>03/26/98</b>	<b>03/26/98</b>	<b>03/26/98</b>
Benzene (ug/L)	5	1.0	470	<1	<1	<1
Toluene (ug/L)	1,000	1,000	38	<1	<1	<1
Ethylbenzene (ug/L)	700	700	62	<1	<1	<1
Xylene (ug/l)	10,000	10,000	1,600	<2	<2	<2
Total BTEX (ug/L)	50	NS	2,170	<5	<5	<5
MTBE (ug/L)	NS	NS	95	<10	<10	<10
PAH (ug/L)	NS	NS	BDL*	BDL*	N/A	BDL*
Total Naphthalenes (ug/L)	NS	NS	348	<25	N/A	<25
TPH (mg/L)	50	NS	2.1	<1.0	N/A	<1.0
Lead (mg/L)	0.015	0.015	<0.005	<0.005	N/A	<0.005
<b>Note:</b>						
ug/L	= Micrograms per Liter					
mg/L	= Milligrams per Liter					
MTBE	= Methyl-tert-butyl-ether					
Total BTEX	= Sum of Benzene, Toluene, Ethylbenzene, and Xylenes					
PAH	= Polynuclear Aromatic Hydrocarbon (excluding naphthalenes)					
TPH	= Total Petroleum Hydrocarbon by EPA Method 418.1					
N/A	= Not Available					
NS	= No Standard					
MCL	= Maximum Contaminant Level					
Total Naphthalenes	= Sum of Naphthalenes and Methylnaphthalenes					
BDL	= Below Detection Limits					
*	= All PAH compounds excluding naphthalenes were below their respective detection limits					







## **5. Qualitative Risk Assessment**

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The objective of the Qualitative Risk Assessment (QRA) is to identify the population that is potentially at risk of exposure to chemicals present in, or released from, soil and groundwater at Site 520. A discussion of exposure pathways and a qualitative evaluation of the magnitude of the risk are presented within this QRA. An exposure pathway is described as the route by which a chemical migrates from the contamination source to a potential receptor. To determine the exposure pathway, the chemical of concern, possible transport media, exposure routes (means by which a chemical comes in contact with a biological receptor), and an analyses of the potential receptors are taken into account. The results of the QRA are used to qualitatively determine the health risk to environmental receptors from the contaminants found at Site 520.

### **5.1 Nature and Extent of Release**

Based on field and laboratory data obtained during groundwater sampling, BBL concluded that dissolved petroleum hydrocarbons and free product were present in the groundwater at Site 520. Laboratory analytical data showed that soils containing elevated levels of TPH above the PREQB target level of 100 mg/kg were present at two locations at Site 520. Total lead was detected in the groundwater sample collected March 27, 1998 from 520-MW-6 above the PREQB of 0.015 mg/L but was not detected above the detection limit (0.0050 mg/L) in the ground-water sample collected on December 18, 1998. The elevated lead concentration detected in the initial, unfiltered groundwater sample collected March 27, 1998 was most likely a result of the high turbidity (suspended sediment) observed in the sample at the time of collection.

### **5.2 Chemicals of Concern**

Petroleum contains a large number of compounds, however, the petroleum-based compounds potentially present in groundwater that represent a potential risk to human health and the environment are volatile organic aromatics (consisting of benzene, toluene, ethylbenzene, and xylene), naphthalene, and lead. Toluene, ethylbenzene, xylenes, and naphthalene are non-carcinogenic compounds; benzene and lead are known human carcinogens. Thus, the qualitative risk assessment will focus on the human health impacts of benzene and lead in the groundwater.

### **5.3 Exposure Assessment**

The exposure assessment examines the potential migratory pathways and the biological receptors affected by the compounds of concern. An exposure assessment also estimates both short and long term assessment in terms of doses by exposure routes.

#### **5.3.1 Human Receptors**

Site 520 is a former industrial gas station that had four USTs. The potential of human contact with the compounds is considered minimal because of the following:

- The impacted groundwater and soils are found in subsurface soils below 2 feet.
- The soils consist of silt and clay minimizing the ability of the soils to spread by wind action.
- The area is covered by vegetation, asphalt, and concrete preventing contact with the compounds of concern.
- The area has restricted access (i.e., authorized personnel only).

#### **5.3.2 Environmental Receptors**

The potential for migration of the compounds of concern to environmental receptors is minimal because the compounds of concern are overlain by clays, which exhibit high plasticity resulting in low hydraulic conductivity. These clays act as a cap, which limit the ability of soils to spread by wind action. Topography at Site 520 is

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characterized by a gentle slope and a possible groundwater flow toward the southwest. The southwest direction of the groundwater flow indicates a possible route toward Bahia de Algodones. Thus, Bahia de Algodones is the primary potential environmental receptor of the compounds of concern.

### **5.3.3 Exposure Pathways**

Exposure pathways are defined as the routes compounds follow from an original source to potential receptors. The mechanism by which the population can come into contact with the compound is also evaluated and taken into consideration by the exposure pathways. The following four elements are required to complete an exposure pathway:

- a source and mechanism of release for a compound of concern (e.g., a storage tank leak);
- a feasible environmental transport route (e.g., dissolved groundwater constituents);
- an exposure point of potential contact with receptors (e.g., a potable well);
- an exposure route allowing receptors to come in contact with the compound(s) (e.g., inhalation of vapors or ingestion of groundwater).

If any of these elements are not present, the exposure pathway is considered incomplete. In Site 520, the first element (a source/mechanism) has been shown to exist. However, the elevated concentration of BTEX and TPH in the groundwater are limited to the former location of the former pump island and UST 520B. Concentrations of TPH and BTEX in the soil above the PREQB target levels were detected in only two locations in and near the former waste oil tank UST.

### **5.3.4 Groundwater Consumption Pathway**

The tropical rain forest (El Yunque) provides the primary source of potable water in eastern Puerto Rico. El Yunque is located approximately 5 miles west of NAVSTA Roosevelt Roads. Based on conversations with U.S. Navy personnel, Puerto Rico Department of Natural Resources personnel, and water supply personnel in the nearby town of Fajardo (Fajardo is located 7 miles northwest of the Naval Station), it was determined that potable water supply for the Naval Station and the towns of Ceiba and Fajardo originates from El Yunque. The Naval Station has a gravity feed distribution system from the rain forest to the water treatment plant on NAVSTA Roosevelt Roads. Due to the availability of surface water in eastern Puerto Rico, groundwater is not exploited as a source of potable water; therefore, this pathway is incomplete.

### **5.3.5 Ingestion Pathway**

The only potential ingestion pathway of the compounds of concern is if excavation or drilling activities were conducted at Site 520. Workers may be exposed, through direct contact, with the soils during these activities. Thus, a minor possibility of an ingestion pathway exists at Site 520. However, because site access is restricted, this exposure pathway is incomplete under current site conditions. Further, proposed construction activities require the approval of the NAVSTA Roosevelt Roads prior to conducting any work at Site 520. Therefore, this exposure pathway is incomplete under current site conditions.

### **5.3.6 Inhalation Pathway**

The only potential inhalation pathway of the compounds of concern is if excavation or drilling activities were conducted at Site 520. Workers may be exposed, through direct contact, with the soils during these activities. Thus, a minor possibility of an inhalation pathway exists at Site 520. However, proposed construction activities require the approval of the NAVSTA Roosevelt Roads prior to conducting any work at Site 520. Therefore, this exposure pathway is incomplete under current site conditions.

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## 5.4 Risk Evaluation

The QRA results indicate that due to the presence of incomplete exposure pathways, the potential for human contact with the compounds of concern is minimum. As described in this section, each viable exposure pathway is incomplete. The missing elements are a viable exposure point and/or a viable exposure route. Thus, the compounds of concern do not present a hazard to personnel who visit, work, or live at the NAVSTA Roosevelt Roads, or the surrounding area.

## **6. Remediation Assessment**

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This section presents the corrective action options that could be implemented to remediate the soil. The advantages and disadvantages of using a specific method at Site 520 are evaluated.

### **6.1 Soil Remediation**

Three common methods of soil remediation include: soil excavation and disposal, soil vapor extraction (SVE), and bioremediation. The advantages and limitations of each method are discussed in the following sections.

#### **6.1.1 Soil Excavation and Disposal**

Excavated soils would be disposed of, off site, in a landfill. Landfilling is the only disposal method for contaminated soil in Puerto Rico because no soil incineration facilities operate on the island. Hydrocarbon impacted soils can be disposed at a certified landfill as long as the soils do not exhibit the RCRA hazardous waste characteristics as defined in 40 CFR 261. However, excavation of impacted soils is not recommended at Site 520 due to the close proximity to living quarters. Additionally, no potential receptors have been identified. Therefore, excavation is not warranted.

#### **6.1.2 Soil Vapor Extraction**

SVE is an effective means of in-situ soil treatment designed to extract volatile organic compounds (VOCs) from the soil. A typical SVE system consists of one or several extraction wells that are under a vacuum. VOCs are removed from the soils by these wells and treated at the land surface by thermal oxidation, catalytic incineration, or carbon adsorption. An SVE system would be ineffective at the site due to the low permeability soils encountered at Site 520. Additionally, no potential receptors have been identified. Therefore, SVE is not warranted.

#### **6.1.3 Bioremediation**

Bioremediation is a method of stimulating indigenous subsurface microorganisms by increasing nutrients and adding electron acceptors to biodegrade the compounds of concern. In-situ bioremediation presents an attractive economical option because the need for excavation, transportation, and disposal of soil is not required. Although bioremediation is an appealing alternative, it is also site-specific and requires a number of parameters to be adequate. The subsurface geology at Site 520 appears to lack an adequate hydraulic conductivity to allow the effective transport of electron acceptors and nutrients throughout the surficial aquifer. This is due to the existence of silt and clay at Site 520 that induce nutrient sorption on the surficial soil. Therefore, the amount of nutrients available for growth is limited. Thus, enhanced bioremediation will not be an effective method of soil remediation.

#### **6.1.4 No Further Action**

Due to the limited volume of soil exceeding PREQB target levels for TPH at Site 520, no further action is recommended. If excavation activities were conducted, the exposure of soils to the air increases the probabilities of contact between the compounds of concern and human receptors. The effectiveness of both SVE and enhanced bioremediation is limited by the low permeability of the subsurface soils. Low permeability soils prevent effective air migration toward the SVE extraction wells and limit the ability of transporting electron receptors and nutrients. However, natural biodegradation processes are expected to reduce the levels of hydrocarbon concentrations in the soils at Site 520 over time.

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## **6.2 Free Product Recovery**

The data collected in the field investigation indicated that one half inch of free product was present in 520-MW-2. To remove the free product at Site 520, three alternatives were evaluated: manual bailing, active skimming, and passive skimming. The advantages and limitations of each method are briefly discussed in the following sections.

### **6.2.1 Manual Bailing**

Manual bailing, the simplest method of free product recovery, consists of lowering a bailer into a well, allowing the bailer to fill with free product, and then withdrawing the bailer from the well. This method is economical for small free product capture volumes that allow for periodic removal from recovery wells. Based on field observations, the free product thickness, and size of the plume, manual bailing is applicable. However, manual bailing is labor intensive and will require trained personnel to periodically remove the free product from the well. As a result, manual bailing is not recommended.

### **6.2.2 Active Skimming**

Active skimming is conducted by using a motorized belt skimmer or an adjustable intake skimmer. The belt skimmer method utilizes a continuous loop of petroleum sorbing material. The petroleum sorbing material moves down into the free product layer, around a pulley, and up to a scraper that removes the petroleum from the belt before it returns to the well. This type of skimmer is effective with viscous free product layers.

A second type of active skimming utilizes an adjustable intake connected to a pump. The intake is maintained in the free product zone and the free product that collects in the recovery well is pumped to an aboveground storage tank. This method is effective with a relatively low viscosity product, and has a high potential to capture large volumes of product. Due to the limited amount of free product and the lack of an available power source at Site 520, active skimming is not recommended.

### **6.2.3 Passive Skimmer**

The passive skimmer method consists either of the selective intake method or the specific gravity method. The selective intake method utilizes a screen that is impervious to water, but allows free product to pass through. Specific gravity skimmers use a buoy that sinks in free product, but floats on water. Due to the limited amount of free product and low hydraulic conductivity of the soils, the selective intake method is a recommended method for Site 520. A typical description of a passive skimmer is provided in Appendix H.

## **6.3 Ground-Water Monitoring**

Semiannual groundwater sampling should be conducted to monitor groundwater at Site 520 for the following EPA methods: 418.1 (TPH), 602 (BTEX), 239 (total lead), and 610 (polynuclear aromatic hydrocarbons (PAH)). Natural biodegradation processes are expected to reduce hydrocarbon concentrations in the groundwater at Site 520 over time. Semiannual sampling will confirm that a reduction in the hydrocarbon concentration is occurring.

# **7. Conclusions and Recommendations**

## **7.1 Conclusions**

The presence of petroleum hydrocarbons in the soil and groundwater was assessed during this site characterization. The elevated concentrations of petroleum hydrocarbons are attributed to the presence of the former UST systems at Site 520.

Topography was characterized by a gentle slope and a possible groundwater flow to the southwest. The water table appears to be mounding in the vicinity of 520-MW-1. Two falling head test were conducted to assess the aquifer properties at Site 520 and it was determined that the soils beneath Site 520 have low hydraulic conductivity. The low hydraulic conductivity is attributed to the lithologic composition (silt and clay) beneath Site 520. The hydraulic gradient and groundwater flow velocity, calculated from water table elevation data and falling head tests, indicate a low groundwater flow velocity.

Laboratory analytical data indicated that concentrations of TPH in the soils were above PREQB target levels in two soil samples. Free-product was encountered in 520-MW-2. Elevated levels of dissolved petroleum hydrocarbons were found in groundwater samples collected from 520-MW-1 and 520-MW-2. An elevated concentration of lead above the PREQB target level was detected in the initial, unfiltered groundwater sample collected from 520-MW-6 on March 27, 1998, but was detected below the PREQB target level (and the laboratory method detection limit) in a groundwater sample collected (using slow flow rates during purging and sampling to reduce suspended sediment in the sample) from monitoring well 520-MW-6 on December 18, 1998. The elevated concentrations of lead, chromium and barium detected in the groundwater samples collected from monitoring well 520-MW-6 on March 27, 1998 were most likely a result of the suspended sediment (turbidity) seen in the groundwater samples at the time of collection and not representative of the dissolved concentrations of these metals present in the groundwater.

A qualitative risk assessment was conducted to assess various exposure pathways. Based on the lack of complete exposure pathways, it was determined that the amount of dissolved hydrocarbons and total lead (not detected in the groundwater sample collected on December 18, 1998 from monitoring well 520-MW-6) in the groundwater and free product present at in 520-MW-1 is not a threat to human health.

## **7.2 Recommendations**

### **7.2.1 Soil**

Based on the information obtained from the field investigation and laboratory analytical data, it is recommended that no corrective measures (no further action) be implemented at Site 520 to remediate the impacted soils. Natural biodegradation processes are expected to reduce the levels of hydrocarbon concentrations in the soils at Site 520. Soils containing concentrations of TPH exceeding 100 mg/kg were containerized in 55-gallon drums. These drums should be properly disposed at a certified Puerto Rican landfill.

### **7.2.2 Groundwater**

Passive skimming to remove the free product within 520-MW-2 is recommended. Semiannual ground-water sampling of the monitoring wells is recommended to monitor the ground-water quality at Site 520.

## 8. References

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Blasland, Bouck & Lee, "*Site Characterization-Site 735- Roosevelt Roads Naval Station, Ceiba, Puerto Rico,*" November 1994.

Blasland, Bouck & Lee, "*Site Characterization-Site 1995- Roosevelt Roads Naval Station, Ceiba, Puerto Rico,*" June 1995.

Blasland, Bouck & Lee, "*Work Plan and Health Plan For Underground Storage Tank Sites Nos. 124, 429R, 520, 729, 520, 732, 734, 1691, and 1738- Roosevelt Roads Naval Station, Ceiba, Puerto Rico*" January 1998.

Briggs, Reginald P. & Aguilar-Cortez, Eduardo, *Geologic Map of the Fajardo and Cayo Icacos Quadrangles, Puerto Rico, United States Geological Survey Investigation Series, Map I-1153, 1980.*

M'Gongile, J.W., *Geologic Map of Naguabo and Part of the Punta Puerca Quadrangle, Puerto Rico, United States Geological Survey Miscellaneous Investigations Series, Map I-1099, 1979.*

# A. Soil Boring Log

Exploration for: <u>Site Characterization</u>		Location		Site 520 Roosevelt Roads U.S. Naval Station Ceiba, Puerto Rico
Date:	<u>Feb 23, 1998</u>	Water Table		10.5 ft BLS
Boring No.:	<u>520-SB-1</u>			
Recorded By:	<u>Pitt Maner</u>			
Drill Type:	<u>B-61</u>			
Weather:	<u>Sunny, 80's</u>			
Sample No.	Type	Depth		Soil Description and Boring Log
		From	To	
1	PH	0	2	Organic silt, moderate yellowish brown (10 YR 5/4); dry
2	HA	2	4	Organic silt, moderate yellowish brown (10 YR 5/4); dry
3	SPT	4	6	Organic clay of low plasticity, grayish olive (10 Y 4/2); dry
4	SPT	6	8	Organic clay of medium plasticity, dark yellowish brown (10 YR 4/2); moist
5	SPT	8	10	N/C
<b>Notes:</b> N/C = Not collected because a concrete pad was encountered PH = post hole HA = hand auger SPT = standard penetration test BLS = below land surface				

# A. Soil Boring Log

Exploration for: <u>Site Characterization</u>		Location		Site 520 Roosevelt Roads U.S. Naval Station Ceiba, Puerto Rico
Date:	<u>Feb 23, 1998</u>	Water Table		9.1 ft BLS
Boring No.:	<u>520-SB-2</u>			
Recorded By:	<u>Pitt Maner</u>			
Drill Type:	<u>B-61</u>			
Weather:	<u>Sunny, 80's</u>			
Sample No.	Type	Depth		Soil Description and Boring Log
		From	To	
1	PH	0	2	Inorganic silt, grayish orange (10 YR 7/4); dry. Pebbles, rock fragments, and shells are present.
2	HA	2	4	Inorganic silt, grayish orange (10 YR 7/4); dry. Pebbles, rock fragments, and shells are present.
3	SPT	4	6	Poorly graded sand with many fines present. very pale orange (10 YR 8/2); dry. Shell fragments are present.
4	SPT	6	8	Silty clay of medium plasticity yellowish brown mixed with an Inorganic clay of high plasticity, dark yellowish orange (10 YR 6/6); moist. Some pebbles are present.
5	SPT	8	10	Inorganic clay of high plasticity, dark yellowish orange (10 YR 6/6) to moderate yellowish brown (10 YR 5/4); moist
6	SPT	10	12	Inorganic clay of high plasticity, mottle light gray (N 7) to light brown (5 YR 5/6); moist. Small volcanoclastics are present
7	SPT	12	14	Inorganic clay of high plasticity, dark yellowish brown (10 YR 4/2); moist. Iron-rich spheres are embedded in the matrix.
Notes: N/C = Not collected because a concrete pad was encountered PH = post hole HA = hand auger SPT = standard penetration test BLS = below land surface				

# A. Soil Boring Log

Exploration for: <u>Site Characterization</u>		Location		
Date: <u>Feb 23, 1998</u>		Site 520		
Boring No.: <u>520-SB-3</u>		Roosevelt Roads U.S. Naval Station		
Recorded By: <u>Pitt Maner</u>		Ceiba, Puerto Rico		
Drill Type: <u>B-61</u>		Water Table		
Weather: <u>Sunny, 80's</u>		5.0 ft BLS		
Sample No.	Type	Depth		Soil Description and Boring Log
		From	To	
1	PH	0	2	Inorganic silt, moderate yellowish brown (10 YR 5/4); dry. Pebbles and rock fragments are present.
2	HA	2	4	Inorganic silt, pale olive and dark yellowish orange (10 Y 6/2 and 10 YR 6/6); dry. Pebbles and rock fragments are present.
3	SPT	4	6	Silty sand with a high percentage of fines, very pale orange (10 YR 8/2); moist. Calcareous shell fragments are present.
4	SPT	6	8	Inorganic clay of high plasticity, olive gray (5 Y 3/2); moist. Pebbles and rock fragments are present.
5	SPT	8	10	Inorganic clay of high plasticity, olive gray (5 Y 3/2); moist. Pebbles and rock fragments are present.
6	SPT	10	12	Inorganic clay of high plasticity, olive gray (5 Y 3/2); moist. Pebbles and rock fragments are present.
7	SPT	12	14	N/C
Notes: N/C = Not collected because a concrete pad was encountered PH = post hole HA = hand auger SPT = standard penetration test BLS = below land surface				

# A. Soil Boring Log

Exploration for: <u>Site Characterization</u>		Location		
Date: <u>Feb 23, 1998</u>		Site 520		
Boring No.: <u>520-SB-4</u>		Roosevelt Roads U.S. Naval Station		
Recorded By: <u>Pitt Maner</u>		Ceiba, Puerto Rico		
Drill Type: <u>B-61</u>		Water Table		
Weather: <u>Sunny. 80's</u>		11.9 ft BLS		
Sample No.	Type	Depth		Soil Description and Boring Log
		From	To	
1	PH	0	2	Inorganic silt, light olive gray (5 Y 5/2) and dusky yellow (5 Y 6/4) ; dry. Pebbles and rock fragments are present.
2	HA	2	4	Silty clay of low plasticity , dark greenish gray (5G 4/1); dry. Weathered rock fragments are present.
3	SPT	4	6	Silty clay of low plasticity , grayish green (5 GY 5/2); dry. Weathered rock fragments are present.
4	SPT	6	8	Inorganic clay of high plasticity, dark yellowish orange (10 YR 6/6); dry. High iron content.
5	SPT	8	10	Silty clay of low to medium plasticity, dark yellowish orange (10 YR 6/6); dry.
6	SPT	10	12	Silty clay of low to medium plasticity, dark yellowish orange (10 YR 6/6); moist. Rock fragments are present.
7	SPT	12	14	Silty clay of low to medium plasticity, dark yellowish orange (10 YR 6/6); moist.
Notes:				
N/C = Not collected because a concrete pad was encountered				
PH = post hole				
HA = hand auger				
SPT = standard penetration test				
BLS = below land surface				

# A. Soil Boring Log

Exploration for: <u>Site Characterization</u>		Location		
Date: <u>Feb 24, 1998</u>		Site 520		
Boring No.: <u>520-SB-5</u>		Roosevelt Roads U.S. Naval Station		
Recorded By: <u>Darving Vargas</u>		Ceiba, Puerto Rico		
Drill Type: <u>B-61</u>		Water Table		
Weather: <u>Sunny, 80's</u>		10.3 ft BLS		
Sample No.	Type	Depth		Soil Description and Boring Log
		From	To	
1	PH	0	2	Inorganic silt, moderate brown (5 YR 3/4); dry. Pebbles and rock fragments are present.
2	HA	2	4	Inorganic clay of high plasticity, light brown (5 YR 5/6); dry.
3	SPT	4	6	Inorganic clay of high plasticity, moderate brown (5 YR 4/4); dry.
4	SPT	6	8	Inorganic clay of high plasticity, moderate brown (5 YR 4/4); dry.
5	SPT	8	10	Inorganic clay of low plasticity, dark yellowish brown (10 YR 6/6) and very pale orange (10 YR 8/2); dry.
6	SPT	10	12	Inorganic clay of low plasticity, dark yellowish brown (10 YR 6/6) (10 YR 8/2); moist.
7	SPT	12	14	Silty clay of low plasticity, dark yellowish brown (10 YR 6/6); moist.
7	SPT	14	16	Silty clay of low plasticity, pale yellowish brown (10 YR 6/2); dry
Notes:				
N/C = Not collected because a concrete pad was encountered				
PH = post hole				
HA = hand auger				
SPT = standard penetration test				
BLS = below land surface				

# A. Soil Boring Log

Exploration for: <u>Site Characterization</u>		Location		
Date: <u>Feb 25, 1998</u>		Site 520		
Boring No.: <u>520-SB-6</u>		Roosevelt Roads U.S. Naval Station		
Recorded By: <u>Darving Vargas</u>		Ceiba, Puerto Rico		
Drill Type: <u>B-61</u>		Water Table		
Weather: <u>Sunny, 80's</u>		9.8 ft BLS		
Sample No.	Type	Depth		Soil Description and Boring Log
		From	To	
1	PH	0	2	Inorganic silt of low plasticity , dusky yellowish green (10 GY 3/2) ; dry. Rock fragments are present.
2	HA	2	4	Inorganic silt of low plasticity , dusky yellowish green (10 GY 3/2) ; dry. Rock fragments are present.
3	SPT	4	5	Inorganic clay of high plasticity, moderate brown (5 YR 4/4); moist.
4	SPT	5	6	Inorganic clay of high plasticity, dusky yellowish brown (10 YR 4/2); moist. Rock fragments are present.
5	SPT	6	8	Inorganic clay of high plasticity, dark yellowish orange (10 YR 6/6); moist
6	SPT	8	10	Inorganic clay of high plasticity, light greenish gray (5 GY 8/1) and dark yellowish orange (10 YR 6/6); moist.
7	SPT	10	12	Inorganic clay of high plasticity, light greenish gray (5 GY 8/1) and dark yellowish orange (10 YR 6/6); moist.
7	SPT	12	14	Inorganic clay of high plasticity, light greenish gray (5 GY 8/1) and dark yellowish orange (10 YR 6/6); moist.
Notes:				
N/C = Not collected because a concrete pad was encountered				
PH = post hole				
HA = hand auger				
SPT = standard penetration test				
BLS = below land surface				

# A. Soil Boring Log

Exploration for: <u>Site Characterization</u>		Location		
Date: <u>Feb 25, 1998</u>		Site 520		
Boring No.: <u>520-SB-7</u>		Roosevelt Roads U.S. Naval Station		
Recorded By: <u>Darving Vargas</u>		Ceiba, Puerto Rico		
Drill Type: <u>B-61</u>		Water Table		
Weather: <u>Sunny, 80's</u>		12.8 ft BLS		
Sample No.	Type	Depth		Soil Description and Boring Log
		From	To	
1	PH	0	2	Inorganic silt of low plasticity, dusky yellowish green (10 GY 3/2); dry. Rock fragments are present.
2	HA	2	4	Inorganic silt of low plasticity, dusky yellowish green (10 GY 3/2); dry. Rock fragments are present.
3	SPT	4	5	Inorganic clay of high plasticity, moderate brown (5 YR 4/4); moist.
4	SPT	5	6	Inorganic clay of high plasticity, dusky yellowish brown (10 YR 4/2); moist. Rock fragments are present.
5	SPT	6	8	Inorganic clay of high plasticity, dark yellowish orange (10 YR 6/6); moist
6	SPT	8	10	Inorganic clay of high plasticity, light greenish gray (5 GY 8/1) and dark yellowish orange (10 YR 6/6); moist.
7	SPT	10	12	Inorganic clay of high plasticity, light greenish gray (5 GY 8/1) and dark yellowish orange (10 YR 6/6); moist.
7	SPT	12	14	Inorganic clay of high plasticity, light greenish gray (5 GY 8/1) and dark yellowish orange (10 YR 6/6); moist.
Notes:				
N/C = Not collected because a concrete pad was encountered				
PH = post hole				
HA = hand auger				
SPT = standard penetration test				
BLS = below land surface				

# A. Soil Boring Log

Exploration for: <u>Site Characterization</u>		Location		
Date: <u>Feb 25, 1998</u>		Site 520		
Boring No.: <u>520-SB-8</u>		Roosevelt Roads U.S. Naval Station		
Recorded By: <u>Darving Vargas</u>		Ceiba, Puerto Rico		
Drill Type: <u>B-61</u>		Water Table		
Weather: <u>Sunny, 80's</u>		11.8 ft BLS		
Sample No.	Type	Depth		Soil Description and Boring Log
		From	To	
1	PH	0	2	Inorganic silt of low plasticity, dark yellowish brown (10 YR 4/2); dry. Rock fragments are present.
2	HA	2	4	Inorganic silt of low plasticity, dark yellowish orange (10 YR 6/6); dry. Rock fragments are present.
3	SPT	4	6	Inorganic clayey silt of low to medium plasticity, dark yellowish orange (10 YR 6/6); dry. Rock fragments are present.
4	SPT	6	8	Inorganic clayey silt of low to medium plasticity, dark yellowish orange (10 YR 6/6); dry. Rock fragments are present.
5	SPT	8	10	Inorganic clayey silt of low plasticity, very pale orange orange (10 YR 8/2); dry
6	SPT	10	12	Inorganic clayey silt of low to medium plasticity, dark yellowish orange (10 YR 6/6); moist. Rock fragments are present.
7	SPT	12	14	Inorganic clayey silt of low to medium plasticity, dark yellowish orange (10 YR 6/6); moist. Rock fragments are present.
Notes:				
N/C = Not collected because a concrete pad was encountered				
PH = post hole				
HA = hand auger				
SPT = standard penetration test				
BLS = below land surface				

# A. Soil Boring Log

Exploration for: <u>Site Characterization</u>		Location		
Date: <u>Feb 25, 1998</u>		Site 520		
Boring No.: <u>520-SB-9</u>		Roosevelt Roads U.S. Naval Station		
Recorded By: <u>Darving Vargas</u>		Ceiba, Puerto Rico		
Drill Type: <u>B-61</u>		Water Table		
Weather: <u>Sunny, 80's</u>		13.7 ft BLS		
Sample No.	Type	Depth		Soil Description and Boring Log
		From	To	
1	PH	0	2	Well graded gravel, grayish brown (5 YR 3/2); dry.
2	HA	2	4	Inorganic clay of high plasticity, dark yellowish brown (10 YR 4/2); dry. Rock fragments are present.
3	SPT	4	6	Poorly graded sand, dark yellowish orange (10 YR 6/6); dry. Rock fragments are present.
4	SPT	6	8	Inorganic clayey silt of low to medium plasticity, dark yellowish orange (10 YR 6/6); dry. Rock fragments are present.
5	SPT	8	10	Silty clay of low to medium plasticity, dark yellowish orange (10 YR 6/6); moist. Rock fragments are present.
6	SPT	10	12	Silty clay of low to medium plasticity, very pale orange (10 YR 8/2); moist. Rock fragments are present.
Notes:				
N/C = Not collected because a concrete pad was encountered				
PH = post hole				
HA = hand auger				
SPT = standard penetration test				
BLS = below land surface				

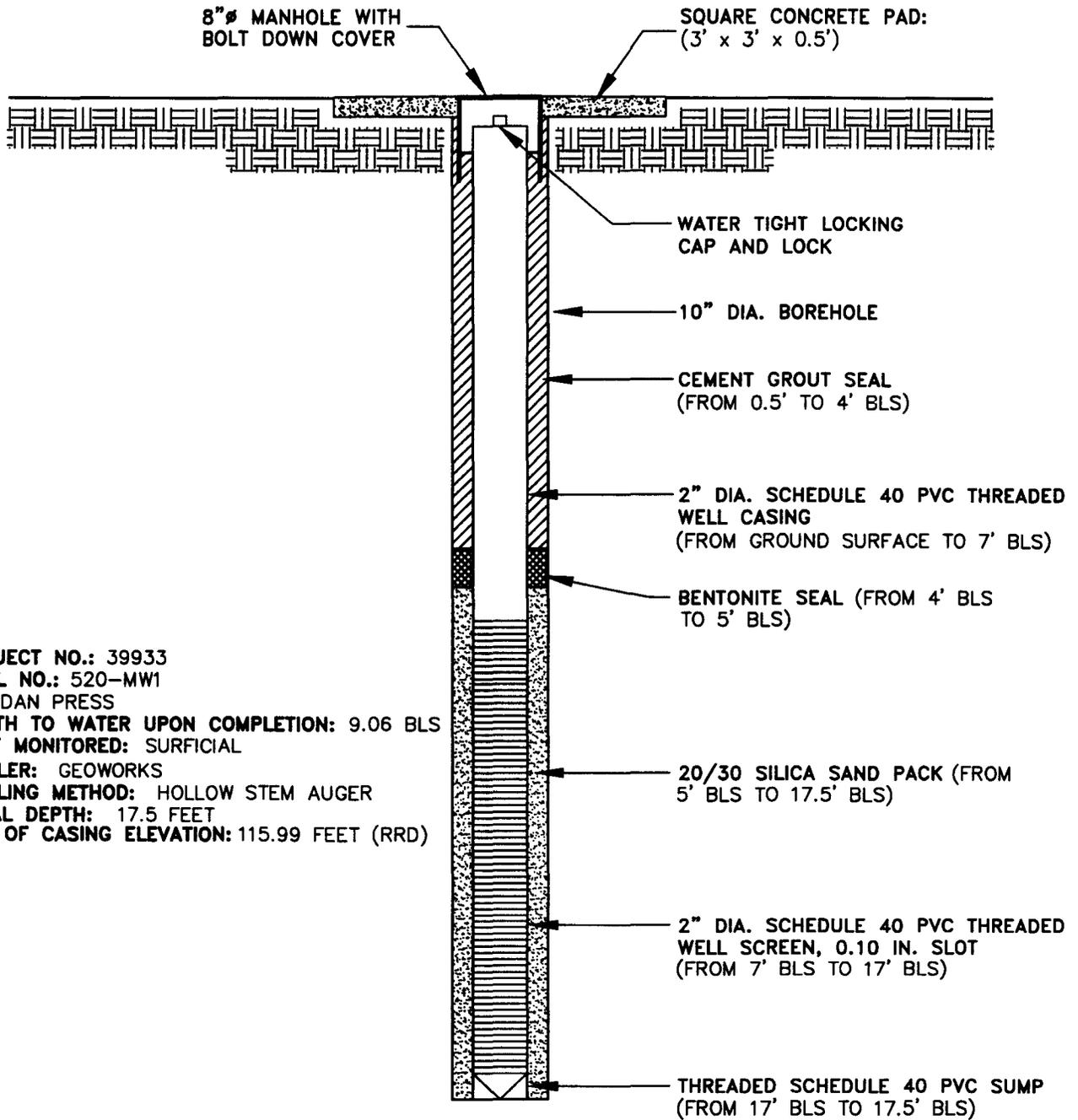
# A. Soil Boring Log

Exploration for: <u>Site Characterization</u>		Location		
Date: <u>Feb 26, 1998</u>		Site 520 Roosevelt Roads U.S. Naval Station Ceiba, Puerto Rico		
Boring No.: <u>520-SB-10</u>				
Recorded By: <u>Darving Vargas</u>				
Drill Type: <u>B-61</u>				
Weather: <u>Sunny, 80's</u>				
		Water Table		
		8.36 ft BLS		
Sample No.	Type	Depth		Soil Description and Boring Log
		From	To	
1	PH	0	2	Inorganic silt of low plasticity, moderate yellowish brown (10 YR 5/4); dry. Rock fragments are present.
2	HA	2	4	Inorganic silt of low plasticity, moderate yellowish brown (10 YR 5/4); dry. Rock fragments are present.
3	SPT	4	6	Inorganic clay of high plasticity, grayish green (10 G 4/2); dry.
4	SPT	6	8	Inorganic clay of high plasticity, dusky yellowish green (10 GY 4/4) and olive gray (5 Y 3/2); dry.
5	SPT	8	10	Inorganic clay of high plasticity, moderate yellowish brown (10 YR 5/4) and moderate brown (5 YR 4/4); dry.
6	STP	10	12	Inorganic clay of high plasticity, moderate brown (5 YR 4/4) and light brown (5 YR 5/6); dry.
7	SPT	12	14	Inorganic clay of high plasticity, moderate brown (5 YR 4/4) and light brown (5 YR 5/6); moist.
Notes: N/C = Not collected because a concrete pad was encountered PH = post hole HA = hand auger SPT = standard penetration test BLS = below land surface				

# A. Soil Boring Log

Exploration for: <u>Site Characterization</u>		Location		
Date: <u>Feb 26, 1998</u>		Site 520		
Boring No.: <u>520-SB-11</u>		Roosevelt Roads U.S. Naval Station		
Recorded By: <u>Darving Vargas</u>		Ceiba, Puerto Rico		
Drill Type: <u>B-61</u>		Water Table		
Weather: <u>Sunny, 80's</u>		4.3 ft BLS		
Sample No.	Type	Depth		Soil Description and Boring Log
		From	To	
1	PH	0	2	Inorganic silt of low plasticity, dark yellowish brown (10 YR 4/2); dry. Rock fragments are present.
2	HA	2	4	Inorganic silty clay of low to medium plasticity, moderate yellowish brown (10 YR 5/4); dry.
3	SPT	4	6	Inorganic silty clay of low to medium plasticity, dark yellowish brown (10 YR 4/2); dry.
4	SPT	6	8	Inorganic silty clay of low to medium plasticity, dark yellowish brown (10 YR 4/2); dry.
5	SPT	8	10	Inorganic clay of high plasticity, dark yellowish orange (10 YR 6/6); dry.
6	STP	10	12	Inorganic clay of high plasticity, dark yellowish orange (10 YR 6/6); dry.
7	SPT	12	14	Inorganic clay of high plasticity, dark yellowish orange (10 YR 6/6); dry.
Notes:				
N/C = Not collected because a concrete pad was encountered				
PH = post hole				
HA = hand auger				
SPT = standard penetration test				
BLS = below land surface				

# 520 - MW1



PROJECT NO.: 39933  
 WELL NO.: 520-MW1  
 BY: DAN PRESS  
 DEPTH TO WATER UPON COMPLETION: 9.06 BLS  
 UNIT MONITORED: SURFICIAL  
 DRILLER: GEOWORKS  
 DRILLING METHOD: HOLLOW STEM AUGER  
 TOTAL DEPTH: 17.5 FEET  
 TOP OF CASING ELEVATION: 115.99 FEET (RRD)

(DRAWING NOT TO SCALE)

RRD = ROOSEVELT ROADS DATUM  
 BLS = BELOW LAND SURFACE

ROOSEVELT ROADS U.S. NAVAL STATION  
 CEIBA, PUERTO RICO  
 SITE CHARACTERIZATION - SITE 520

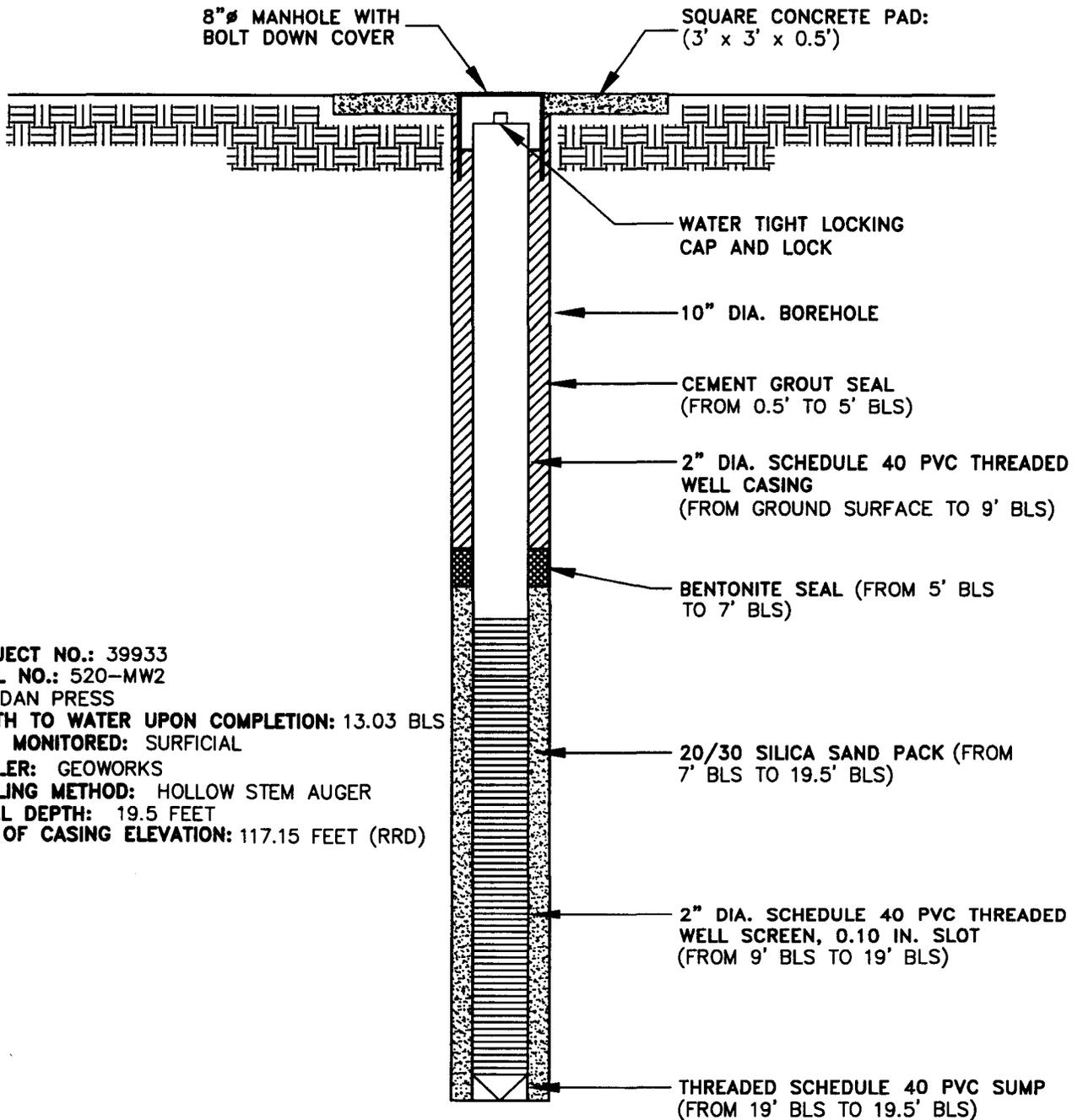
MONITORING WELL 520-MW1  
 CONSTRUCTION DETAILS

**BBL**

BLASLAND, BOUCK & LEE, INC.  
 engineers & scientists

FIGURE  
**B-1**

# 520 - MW2



PROJECT NO.: 39933  
 WELL NO.: 520-MW2  
 BY: DAN PRESS  
 DEPTH TO WATER UPON COMPLETION: 13.03 BLS  
 UNIT MONITORED: SURFICIAL  
 DRILLER: GEOWORKS  
 DRILLING METHOD: HOLLOW STEM AUGER  
 TOTAL DEPTH: 19.5 FEET  
 TOP OF CASING ELEVATION: 117.15 FEET (RRD)

(DRAWING NOT TO SCALE)

RRD = ROOSEVELT ROADS DATUM  
 BLS = BELOW LAND SURFACE

ROOSEVELT ROADS U.S. NAVAL STATION  
 CEIBA, PUERTO RICO  
 SITE CHARACTERIZATION - SITE 520

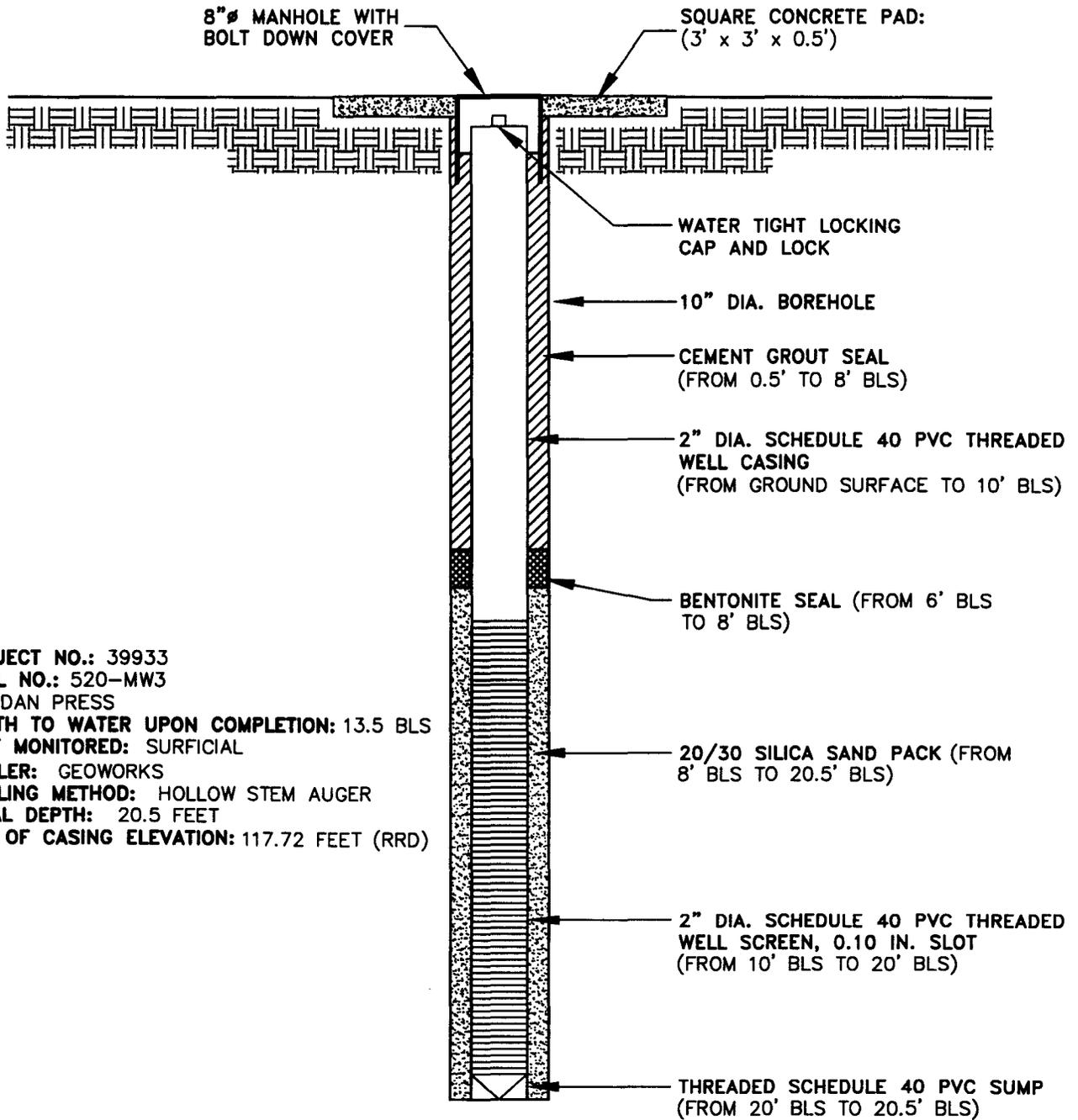
**MONITORING WELL 520-MW2  
 CONSTRUCTION DETAILS**

**BBL**

BLASLAND, BOUCK & LEE, INC.  
 engineers & scientists

FIGURE  
**B-2**

# 520 - MW3



**PROJECT NO.:** 39933  
**WELL NO.:** 520-MW3  
**BY:** DAN PRESS  
**DEPTH TO WATER UPON COMPLETION:** 13.5 BLS  
**UNIT MONITORED:** SURFICIAL  
**DRILLER:** GEOWORKS  
**DRILLING METHOD:** HOLLOW STEM AUGER  
**TOTAL DEPTH:** 20.5 FEET  
**TOP OF CASING ELEVATION:** 117.72 FEET (RRD)

(DRAWING NOT TO SCALE)

RRD = ROOSEVELT ROADS DATUM  
 BLS = BELOW LAND SURFACE

ROOSEVELT ROADS U.S. NAVAL STATION  
 CEIBA, PUERTO RICO  
 SITE CHARACTERIZATION - SITE 520

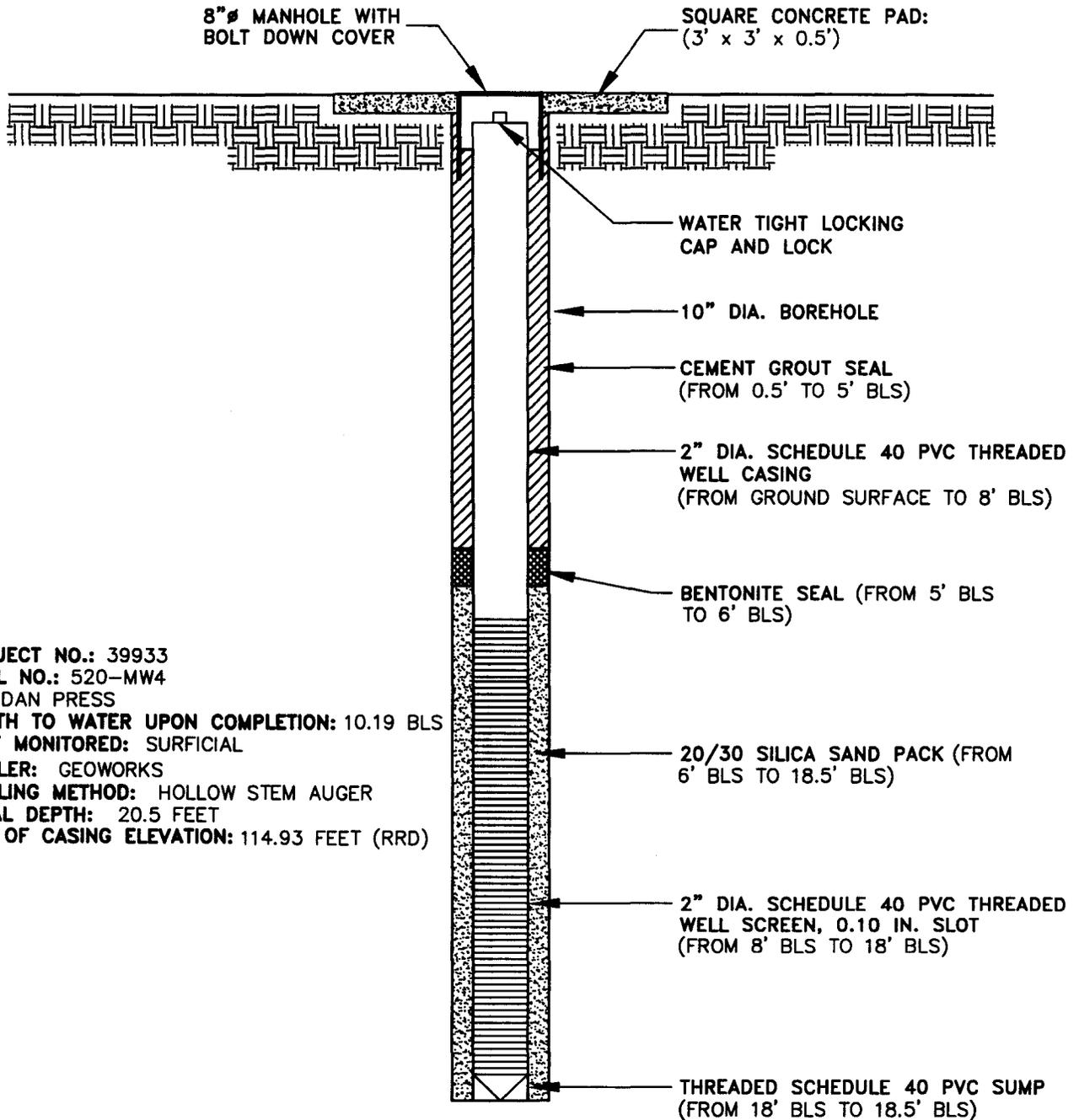
**MONITORING WELL 520-MW3  
 CONSTRUCTION DETAILS**

**BBL**

BLASLAND, BOUCK & LEE, INC.  
 engineers & scientists

FIGURE  
**B-3**

# 520 - MW4



PROJECT NO.: 39933  
 WELL NO.: 520-MW4  
 BY: DAN PRESS  
 DEPTH TO WATER UPON COMPLETION: 10.19 BLS  
 UNIT MONITORED: SURFICIAL  
 DRILLER: GEOWORKS  
 DRILLING METHOD: HOLLOW STEM AUGER  
 TOTAL DEPTH: 20.5 FEET  
 TOP OF CASING ELEVATION: 114.93 FEET (RRD)

(DRAWING NOT TO SCALE)

RRD = ROOSEVELT ROADS DATUM  
 BLS = BELOW LAND SURFACE

ROOSEVELT ROADS U.S. NAVAL STATION  
 CEIBA, PUERTO RICO  
 SITE CHARACTERIZATION - SITE 520

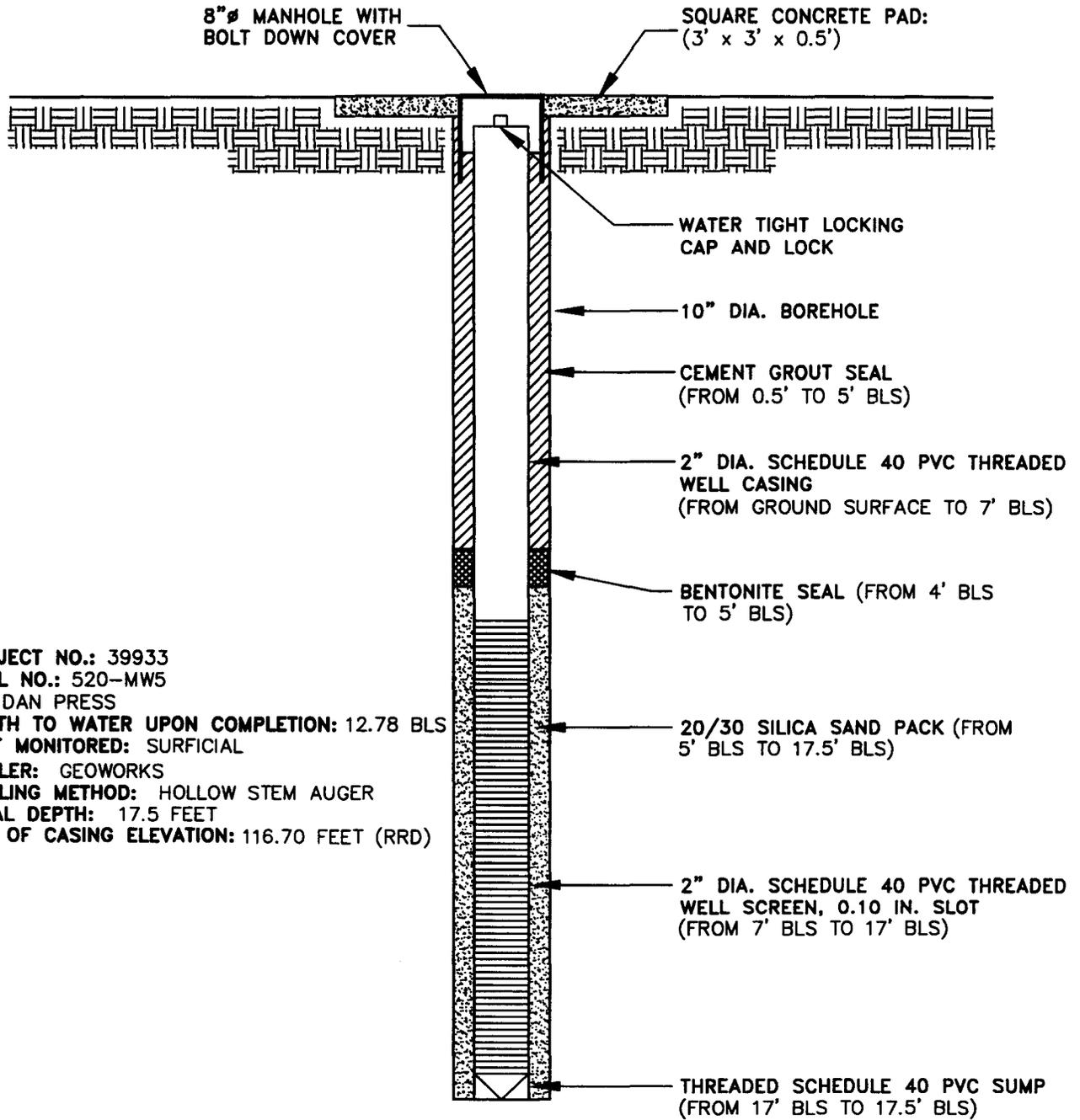
**MONITORING WELL 520-MW4  
 CONSTRUCTION DETAILS**

**BBL**

BLASLAND, BOUCK & LEE, INC.  
 engineers & scientists

FIGURE  
**B-4**

# 520 - MW5



PROJECT NO.: 39933  
 WELL NO.: 520-MW5  
 BY: DAN PRESS  
 DEPTH TO WATER UPON COMPLETION: 12.78 BLS  
 UNIT MONITORED: SURFICIAL  
 DRILLER: GEOWORKS  
 DRILLING METHOD: HOLLOW STEM AUGER  
 TOTAL DEPTH: 17.5 FEET  
 TOP OF CASING ELEVATION: 116.70 FEET (RRD)

(DRAWING NOT TO SCALE)

RRD = ROOSEVELT ROADS DATUM  
 BLS = BELOW LAND SURFACE

ROOSEVELT ROADS U.S. NAVAL STATION  
 CEIBA, PUERTO RICO  
 SITE CHARACTERIZATION - SITE 520

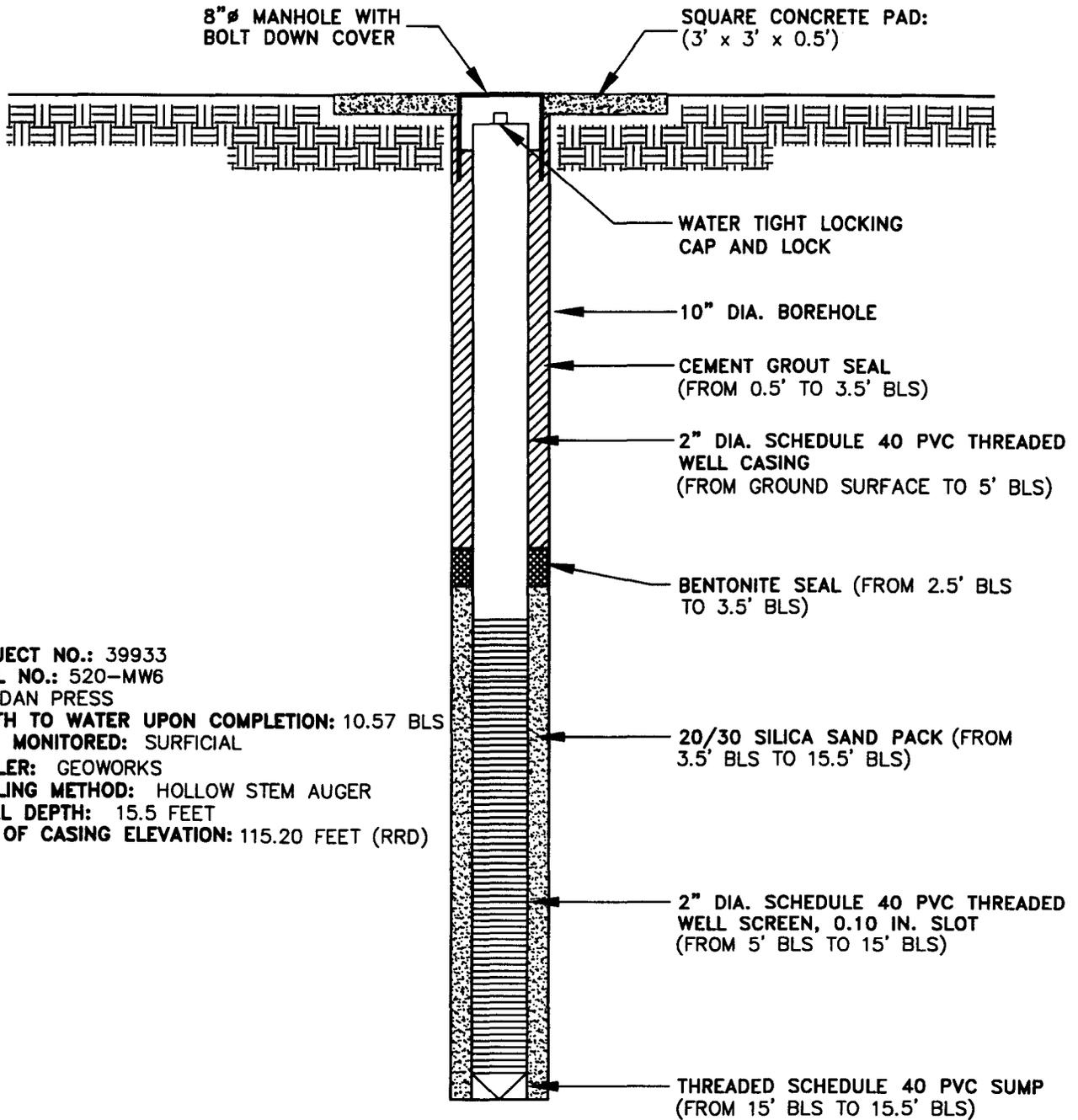
**MONITORING WELL 520-MW5  
 CONSTRUCTION DETAILS**

**BBL**

BLASLAND, BOUCK & LEE, INC.  
 engineers & scientists

FIGURE  
**B-5**

# 520 - MW6



PROJECT NO.: 39933  
 WELL NO.: 520-MW6  
 BY: DAN PRESS  
 DEPTH TO WATER UPON COMPLETION: 10.57 BLS  
 UNIT MONITORED: SURFICIAL  
 DRILLER: GEOWORKS  
 DRILLING METHOD: HOLLOW STEM AUGER  
 TOTAL DEPTH: 15.5 FEET  
 TOP OF CASING ELEVATION: 115.20 FEET (RRD)

(DRAWING NOT TO SCALE)

RRD = ROOSEVELT ROADS DATUM  
 BLS = BELOW LAND SURFACE

ROOSEVELT ROADS U.S. NAVAL STATION  
 CEIBA, PUERTO RICO  
 SITE CHARACTERIZATION - SITE 520

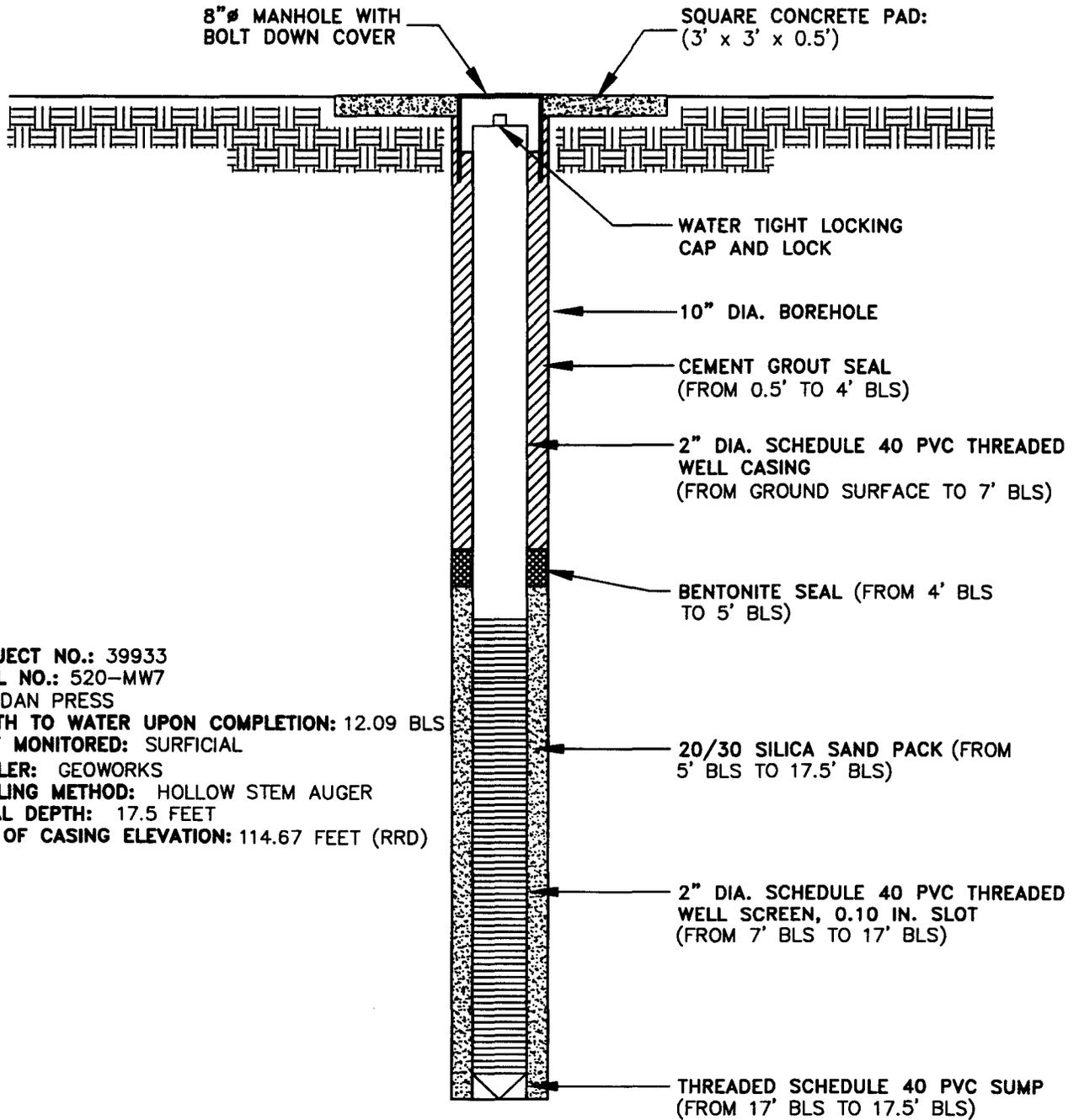
**MONITORING WELL 520-MW6  
 CONSTRUCTION DETAILS**

**BBL**

BLASLAND, BOUCK & LEE, INC.  
 engineers & scientists

FIGURE  
**B-6**

# 520 - MW7



PROJECT NO.: 39933  
 WELL NO.: 520-MW7  
 BY: DAN PRESS  
 DEPTH TO WATER UPON COMPLETION: 12.09 BLS  
 UNIT MONITORED: SURFICIAL  
 DRILLER: GEOWORKS  
 DRILLING METHOD: HOLLOW STEM AUGER  
 TOTAL DEPTH: 17.5 FEET  
 TOP OF CASING ELEVATION: 114.67 FEET (RRD)

(DRAWING NOT TO SCALE)

RRD = ROOSEVELT ROADS DATUM  
 BLS = BELOW LAND SURFACE

ROOSEVELT ROADS U.S. NAVAL STATION  
 CEIBA, PUERTO RICO  
 SITE CHARACTERIZATION - SITE 520

MONITORING WELL 520-MW7  
 CONSTRUCTION DETAILS

**BBL**

BLASLAND, BOUCK & LEE, INC.  
 engineers & scientists

FIGURE  
**B-7**

**Site 520**  
**Roosevelt Roads, U.S. Naval Station**  
**Ceiba, Puerto Rico**

Well No.: 520-MW4  
 Test Date: 3/27/98

Formation Tested: Surficial  
 Falling Head Test

	<u>English Units</u>	<u>Metric Units</u>
Flush Mount	0.00 (ft)	0.00 (cm)
Static Water Level	10.55 (ft)	321.56 (cm)
Depth to Bottom of S (distance from ground level)	18.35 (ft)	559.31 (cm)
Boring Diameter	8 (in)	20.32 (cm)
Casing Diameter	2 (in)	5.08 (cm)
Screen Diameter	2 (in)	5.08 (cm)
Screen Length	10 (ft)	304.8 (cm)
Depth to Boundary (b)	45 (ft)	1371.6 (cm)
Delta H at Time 0	9 (ft)	274.32 (cm)
Delta H at Time t	0.9 (ft)	27.432 (cm)
Time t	2160.00 (sec)	2160 (sec)
Ratio Kh/Kv	1	1
Porosity of Filter Pack	0.3	0.3

<u>HYDRAULIC CONDUCTIVITY</u>	<u>cm/sec</u>	<u>ft/day</u>	<u>gpd/ft<sup>2</sup></u>
K (Bouwer-Rice)	1.4E-04	3.9E-01	2.9E+00
K (Hvorslev Time Lag)	4.6E-05	1.3E-01	9.7E-01
K (Hvorslev Variable Head)	4.6E-05	1.3E-01	9.7E-01

## SLUG TEST WORKSHEET

**Site 520**  
**Roosevelt Roads, U.S. Naval Station**  
**Ceiba, Puerto Rico**

Well Number 520-MW4

Test Date:

3/27/98

### EQUATIONS USED

#### **EQUATION 1: Bower-Rice Method**

$$K = (((Rc^2) * \ln(Re/Rw)) / (2Le)) * (1/T) * \ln(H0/Ht)$$

where:

K = Hydraulic conductivity

Rc = Casing radius

Re = Effective well radius over which the drawdown is dissipated (this value is calculated from predetermined curves)

Rw = Borehole radius

Le = Saturated screen length

H0 = Drawdown in well at time zero: time zero is specified on the slug test curve

Ht = Drawdown in well at time "t": time "t" is specified on the slug test curve

T = Elapsed time from time zero to time "t"

Note: All equations are valid for any consistent set of units

### VARIABLES USED

<u>Variables</u>	<u>English Units</u>	<u>Metric Units</u>
Rc	2 (in)	5.08 (cm)
Rw	4 (in)	10.16 (cm)
Le	10 (ft)	304.8 (cm)
H0	9 (ft)	274.32 (cm)
Ht	0.900 (ft)	27.43 (cm)
T	2160 (sec)	2160 (sec)
b	45 (ft)	1371.60 (cm)

**SLUG TEST WORKSHEET**

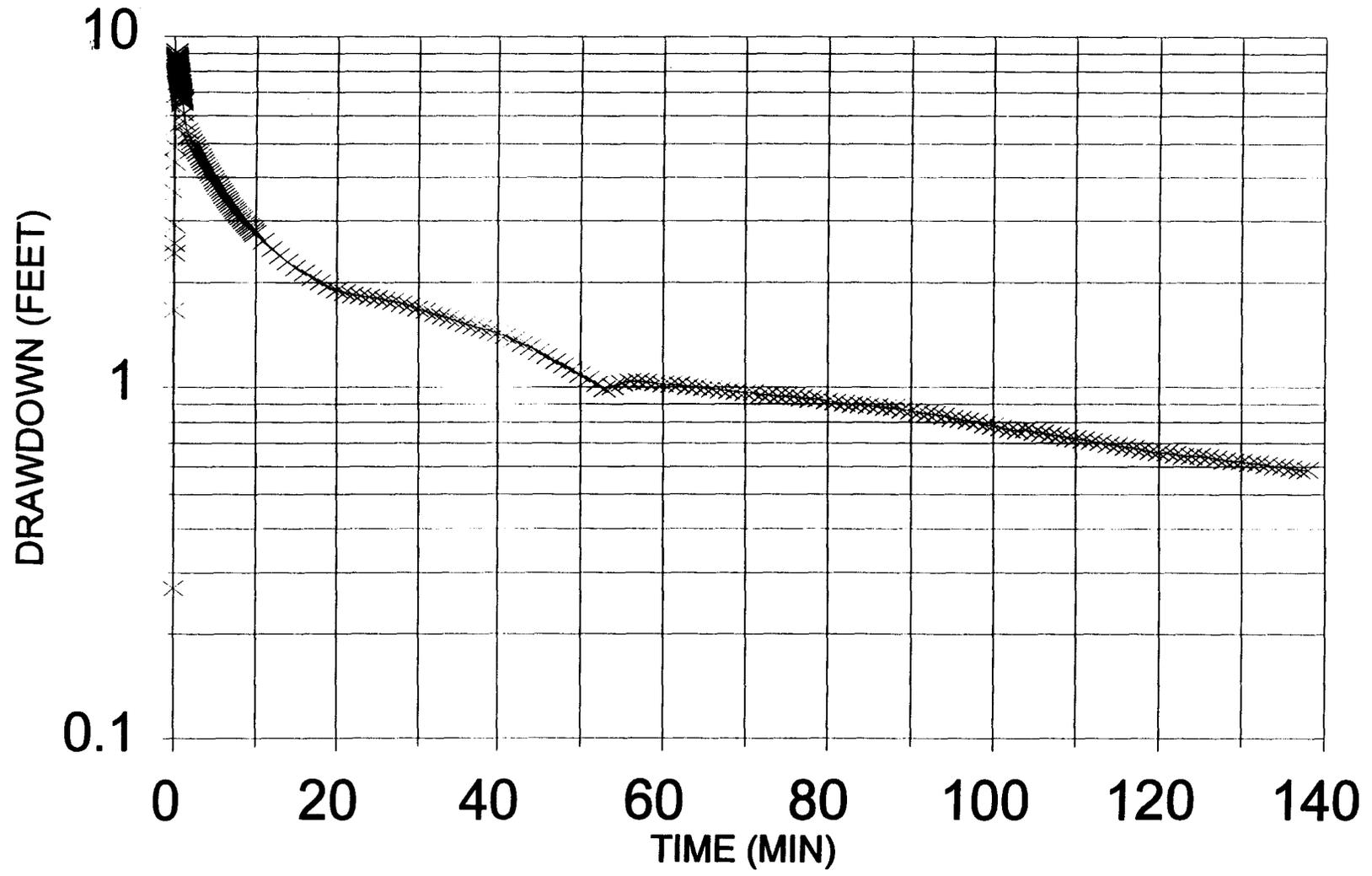
Site 528  
Roosevelt Roads, U.S. Naval Station  
Ceiba, Puerto Rico

Well Number: 620-MM-4

Test date: 3/27/88

Time (min)	Depth (ft)														
0	0	0.2583	-8.874	0.7	-7.282	3.6	-4.411	9.8	-2.785	40	-1.424	71	-0.984	102	-0.782
0.0083	0	0.2686	-8.798	0.7166	-7.254	3.8	-4.336	10	-2.754	41	-1.398	72	-0.951	103	-0.756
0.0166	0	0.278	-8.792	0.7333	-7.21	4	-4.254	11	-2.615	42	-1.361	73	-0.951	104	-0.782
0.025	0	0.2833	-8.704	0.75	-7.172	4.2	-4.178	12	-2.489	43	-1.329	74	-0.945	105	-0.749
0.0333	0	0.2916	-8.686	0.7666	-7.128	4.4	-4.109	13	-2.382	44	-1.298	75	-0.945	106	-0.743
0.0416	0	0.3	-8.622	0.7833	-7.078	4.6	-4.039	14	-2.287	45	-1.26	76	-0.939	107	-0.737
0.05	-0.006	0.3063	-8.553	0.8	-7.034	4.8	-3.964	15	-2.199	46	-1.222	77	-0.932	108	-0.731
0.0583	-0.012	0.3166	-8.534	0.8166	-6.996	5	-3.901	16	-2.13	47	-1.184	78	-0.926	109	-0.724
0.0666	-0.05	0.325	-8.471	0.8333	-6.952	5.2	-3.836	17	-2.06	48	-1.153	79	-0.926	110	-0.718
0.075	-0.472	0.3333	-8.446	0.85	-6.914	5.4	-3.782	18	-1.997	49	-1.121	80	-0.913	111	-0.712
0.0833	-0.27	0.35	-8.338	0.8666	-6.87	5.6	-3.705	19	-1.941	50	-1.083	81	-0.907	112	-0.705
0.0916	-1.657	0.3666	-8.301	0.8833	-6.826	5.8	-3.649	20	-1.897	51	-1.052	82	-0.901	113	-0.699
0.1	-2.413	0.3833	-8.212	0.9	-6.781	6	-3.592	21	-1.865	52	-1.02	83	-0.894	114	-0.693
0.1083	-2.577	0.4	-8.168	0.9166	-6.744	6.2	-3.535	22	-1.84	53	-0.989	84	-0.894	115	-0.686
0.1166	-2.911	0.4166	-8.105	0.9333	-6.706	6.4	-3.485	23	-1.827	54	-1.002	85	-0.888	116	-0.68
0.125	-3.805	0.4333	-8.074	0.95	-6.662	6.6	-3.428	24	-1.815	55	-1.027	86	-0.882	117	-0.674
0.1333	-4.418	0.45	-8.017	0.9666	-6.617	6.8	-3.378	25	-1.796	56	-1.039	87	-0.876	118	-0.668
0.1416	-4.871	0.4666	-7.966	0.9833	-6.58	7	-3.334	26	-1.777	57	-1.039	88	-0.876	119	-0.661
0.15	-5.559	0.4833	-7.91	1	-6.542	7.2	-3.283	27	-1.758	58	-1.033	89	-0.863	120	-0.655
0.1583	-6.252	0.5	-7.859	1.2	-6.082	7.4	-3.239	28	-1.733	59	-1.027	90	-0.857	121	-0.655
0.1666	-6.832	0.5166	-7.821	1.4	-5.716	7.6	-3.195	29	-1.707	60	-1.02	91	-0.85	122	-0.649
0.175	-7.368	0.5333	-7.771	1.6	-5.439	7.8	-3.151	30	-1.676	61	-1.02	92	-0.844	123	-0.642
0.1833	-7.96	0.55	-7.721	1.8	-5.269	8	-3.113	31	-1.651	62	-1.014	93	-0.838	124	-0.642
0.1916	-8.584	0.5666	-7.676	2	-5.155	8.2	-3.069	32	-1.619	63	-1.002	94	-0.831	125	-0.642
0.2	-8.824	0.5833	-7.626	2.2	-5.054	8.4	-3.031	33	-1.594	64	-1.002	95	-0.819	126	-0.636
0.2083	-8.767	0.6	-7.576	2.4	-4.953	8.6	-2.993	34	-1.569	65	-0.995	96	-0.812	127	-0.63
0.2166	-8.691	0.6166	-7.525	2.6	-4.859	8.8	-2.955	35	-1.544	66	-0.989	97	-0.806	128	-0.623
0.225	-8.584	0.6333	-7.481	2.8	-4.764	9	-2.918	36	-1.518	67	-0.983	98	-0.8	129	-0.617
0.2333	-8.609	0.65	-7.431	3	-4.67	9.2	-2.886	37	-1.493	68	-0.976	99	-0.797	130	-0.617
0.2416	-9.044	0.6666	-7.387	3.2	-4.575	9.4	-2.855	38	-1.474	69	-0.97	100	-0.781	131	-0.611
0.25	-9.019	0.6833	-7.342	3.4	-4.493	9.6	-2.817	39	-1.449	70	-0.964	101	-0.768	132	-0.611

### Slug Test Recovery Curve For 520-MW4



**Site 520**  
**Roosevelt Roads, U.S. Naval Station**  
**Ceiba, Puerto Rico**

Well No.: 520-MW3  
 Test Date: 3/27/98

Formation Tested: Surficial  
 Falling Head Test

	<u>English Units</u>	<u>Metric Units</u>
Flush Mount	0.00 (ft)	0.00 (cm)
Static Water Level	13.95 (ft)	425.20 (cm)
Depth to Bottom of S (distance from ground level)	19.75 (ft)	601.98 (cm)
Boring Diameter	8 (in)	20.32 (cm)
Casing Diameter	2 (in)	5.08 (cm)
Screen Diameter	2 (in)	5.08 (cm)
Screen Length	10 (ft)	304.8 (cm)
Depth to Boundary (b)	45 (ft)	1371.6 (cm)
Delta H at Time 0	10.25 (ft)	312.42 (cm)
Delta H at Time t	1.25 (ft)	38.1 (cm)
Time t	900.00 (sec)	900 (sec)
Ratio Kh/Kv	1	1
Porosity of Filter Pack	0.3	0.3

<u>HYDRAULIC CONDUCTIVITY</u>	<u>cm/sec</u>	<u>ft/day</u>	<u>gpd/ft<sup>2</sup></u>
K (Bouwer-Rice)	3.6E-04	1.0E+00	7.5E+00
K (Hvorslev Time Lag)	1.2E-04	3.5E-01	2.6E+00
K (Hvorslev Variable Head)	1.2E-04	3.5E-01	2.6E+00

## SLUG TEST WORKSHEET

**Site 520**  
**Roosevelt Roads, U.S. Naval Station**  
**Ceiba, Puerto Rico**

Well Number 520-MW3

Test Date:

3/27/98

### EQUATIONS USED

#### **EQUATION 1: Bouwer-Rice Method**

$$K = (((Rc^2) * \ln(Re/Rw)) / (2Le)) * (1/T) * \ln(H0/Ht)$$

where:

K = Hydraulic conductivity

Rc = Casing radius

Re = Effective well radius over which the drawdown is dissipated (this value is calculated from predetermined curves)

Rw = Borehole radius

Le = Saturated screen length

H0 = Drawdown in well at time zero: time zero is specified on the slug test curve

Ht = Drawdown in well at time "t": time "t" is specified on the slug test curve

T = Elapsed time from time zero to time "t"

Note: All equations are valid for any consistent set of units

### VARIABLES USED

<u>Variables</u>	<u>English Units</u>	<u>Metric Units</u>
Rc	2 (in)	5.08 (cm)
Rw	4 (in)	10.16 (cm)
Le	10 (ft)	304.8 (cm)
H0	10.25 (ft)	312.42 (cm)
Ht	1.250 (ft)	38.10 (cm)
T	900 (sec)	900 (sec)
b	45 (ft)	1371.60 (cm)

## SLUG TEST WORKSHEET

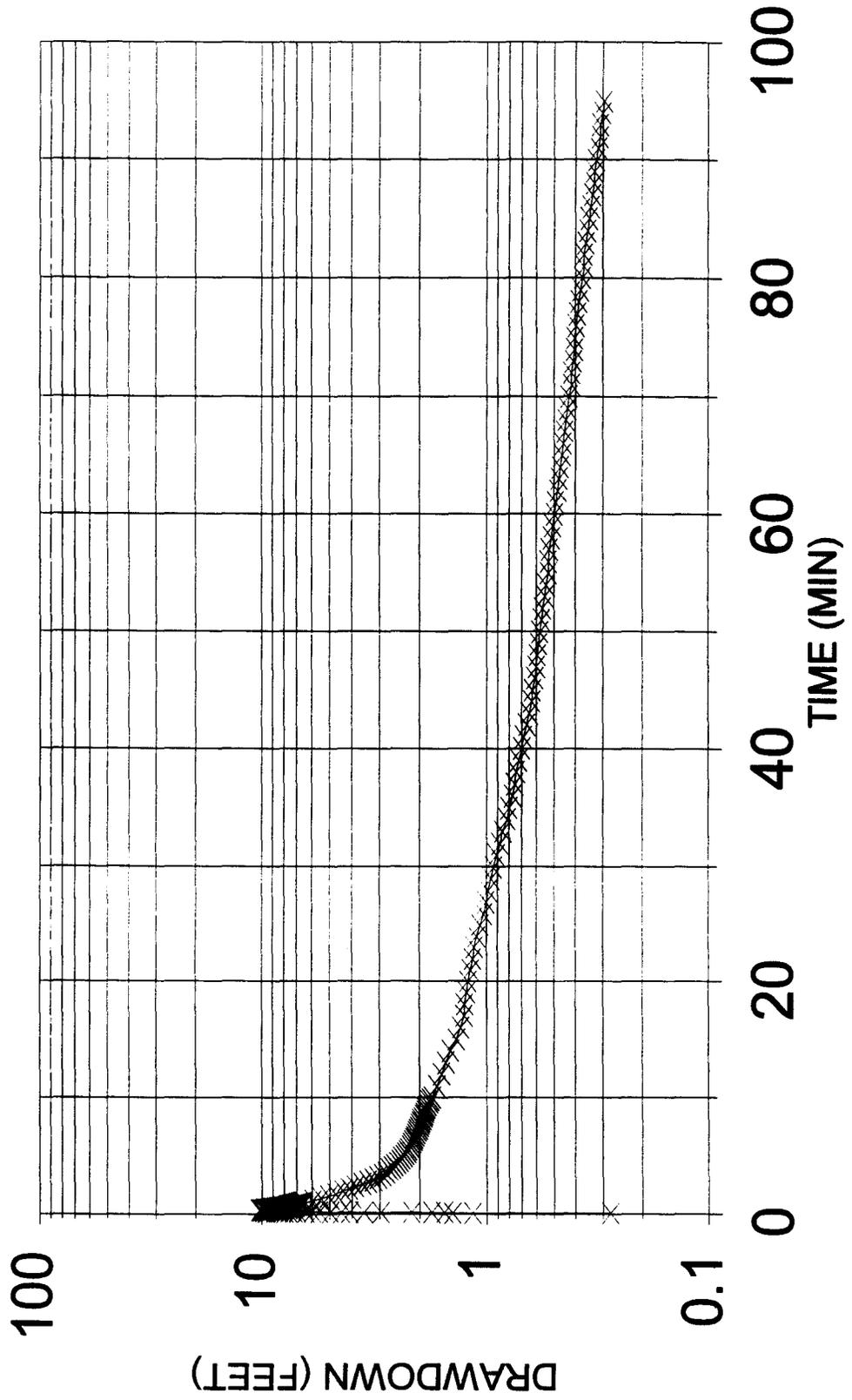
Site 520  
Roosevelt Roads, U.S. Naval Station  
Ceiba, Puerto Rico

Well Number: 520-MW-3

Test date: 3/27/98

Time (min)	Depth (ft)												
0	0	0.2583	-8.13	0.7	-7.575	3.6	-2.804	9.8	-1.777	40	-0.699	71	-0.415
0.0083	0.006	0.2666	-8.363	0.7166	-7.493	3.8	-2.709	10	-1.751	41	-0.686	72	-0.415
0.0166	0	0.275	-8.338	0.7333	-7.418	4	-2.634	11	-1.67	42	-0.661	73	-0.409
0.025	0	0.2833	-8.483	0.75	-7.355	4.2	-2.564	12	-1.588	43	-0.642	74	-0.403
0.0333	0	0.2916	-8.767	0.7666	-7.298	4.4	-2.495	13	-1.518	44	-0.63	75	-0.403
0.0416	0	0.3	-8.76	0.7833	-7.235	4.6	-2.438	14	-1.449	45	-0.623	76	-0.397
0.05	0	0.3083	-9.517	0.8	-7.178	4.8	-2.388	15	-1.381	46	-0.611	77	-0.39
0.0583	0	0.3166	-9.63	0.8166	-7.115	5	-2.338	16	-1.31	47	-0.598	78	-0.384
0.0666	0	0.325	-9.794	0.8333	-7.058	5.2	-2.3	17	-1.266	48	-0.592	79	-0.378
0.075	-0.006	0.3333	-10.223	0.85	-7.008	5.4	-2.262	18	-1.254	49	-0.586	80	-0.371
0.0833	-0.025	0.35	-10.33	0.8666	-6.951	5.6	-2.224	19	-1.228	50	-0.579	81	-0.365
0.0916	-0.037	0.3666	-10.072	0.8833	-6.888	5.8	-2.193	20	-1.209	51	-0.567	82	-0.365
0.1	-0.195	0.3833	-9.901	0.9	-6.838	6	-2.167	21	-1.184	52	-0.56	83	-0.359
0.1083	-0.277	0.4	-9.712	0.9166	-6.787	6.2	-2.142	22	-1.159	53	-0.548	84	-0.352
0.1166	-1.159	0.4166	-9.529	0.9333	-6.731	6.4	-2.117	23	-1.134	54	-0.541	85	-0.348
0.125	-1.424	0.4333	-9.366	0.95	-6.68	6.6	-2.088	24	-1.109	55	-0.529	86	-0.34
0.1333	-1.544	0.45	-9.221	0.9666	-6.63	6.8	-2.073	25	-1.071	56	-0.529	87	-0.334
0.1416	-1.784	0.4666	-9.076	0.9833	-6.579	7	-2.054	26	-1.033	57	-0.523	88	-0.327
0.15	-2.161	0.4833	-8.943	1	-6.529	7.2	-2.029	27	-1.008	58	-0.51	89	-0.327
0.1583	-2.968	0.5	-8.811	1.2	-5.93	7.4	-2.01	28	-0.983	59	-0.504	90	-0.321
0.1666	-3.522	0.5166	-8.678	1.4	-5.464	7.6	-1.991	29	-0.957	60	-0.497	91	-0.315
0.175	-4.083	0.5333	-8.559	1.6	-5.06	7.8	-1.972	30	-0.932	61	-0.491	92	-0.308
0.1833	-4.424	0.55	-8.439	1.8	-4.701	8	-1.953	31	-0.907	62	-0.478	93	-0.308
0.1916	-4.959	0.5666	-8.319	2	-4.386	8.2	-1.934	32	-0.875	63	-0.472	94	-0.302
0.2	-5.558	0.5833	-8.212	2.2	-4.096	8.4	-1.915	33	-0.85	64	-0.466	95	-0.298
0.2083	-5.974	0.6	-8.105	2.4	-3.838	8.6	-1.896	34	-0.812	65	-0.46		
0.2166	-6.371	0.6166	-8.004	2.6	-3.573	8.8	-1.878	35	-0.794	66	-0.453		
0.225	-6.932	0.6333	-7.903	2.8	-3.371	9	-1.865	36	-0.788	67	-0.447		
0.2333	-7.197	0.65	-7.815	3	-3.195	9.2	-1.846	37	-0.749	68	-0.441		
0.2416	-7.582	0.6666	-7.727	3.2	-3.043	9.4	-1.821	38	-0.737	69	-0.434		
0.25	-7.935	0.6833	-7.638	3.4	-2.917	9.6	-1.802	39	-0.718	70	-0.428		

# Slug Test Recovery Curve For 520-MW-3



## CALCULATIONS

**EQUATION 1:       $I = H/D$       Determination of Hydraulic Gradient (I), where:**

I      =      Hydraulic Gradient  
H      =      Difference in water table elevation between 520-MW-1 and 520-MW-7 (ft)  
D      =      Distance between 520-MW-1 and 520-MW-7 (ft)

DATA:

	<u>3/16/98</u>	<u>3/26/98</u>
H      =	4.34	2.67
D      =	54	54

**RESULTS:**

I      =	<b>0.08 ft/ft</b>	<b>0.05 ft/ft</b>
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**EQUATION 2:       $V=K_{avg}I/n_e$       Determination of Ground-Water Flow Velocity (V), where:**

$K_{avg}$    =      Average Hydraulic Conductivity (0.70 ft/day from slug test results)  
I      =      Hydraulic Gradient (ft/ft)  
 $n_e$    =      Effective Porosity (45% or .45, from C.W. Fetter)  
V      =      Velocity (ft/day)

DATA:

	<u>3/16/98</u>	<u>3/26/98</u>
$K_{avg}$ =	0.70	0.70
I      =	0.08	0.05
$n_e$ =	0.45	0.45

**RESULTS:**

V      =	<b>0.12 ft/day</b>	<b>0.08 ft/day</b>
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## ***D-1. Utility Location/Well Permit***

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The tentative locations of the soil borings and monitoring well locations were presented to Caleb Romero (Facilities Management and Utilities Division, Public Works Department) before the initiation of drilling activities. A utility check in the proposed area of investigation was conducted by Mr. Romero. To avoid damaging any potential underground structures, the first two feet of each soil boring and monitoring well were installed with a post hole digger. In addition, a hand auger was used to collect samples from two feet to four feet BLS.

An application requesting well construction permits was submitted to the Puerto Rico Department of Natural Resources on February 17, 1998.

4330  
NO2C-A411  
Jan 20,1998

MEMORANDUM

From: Facilities Management Division, PWD  
To: Pitt T. Maner III, Blasland Bouck & Lee

Subj.: EXCAVATION PERMIT FOR N62470-93-D-4021, VARIOUS SITES  
CHARACTERIZATIONS

Ref. : (a) Personal request

1. The excavation permit is approved based on the existing utilities information contained on existing filed drawings and on contract drawings.
2. Care must be observed during the excavation process and excavation by hand shall be performed whenever utilities are present as shown in project drawings.
3. The contractor will do arrangements for repairs of any utilities damaged or disconnected shown on enclosure(1) after notification to PWD is done.
4. Facilities 1691, 429R and 729 will be scanned prior to excavation by PWD.
5. This permit shall be available at the work site at all times with the provided exhibits if any.
6. For any additional information or assistance to perform excavation, please contact Mr. Caleb Romero, Utilities Engineer, at telephone extensions 4068/4268.

*Caleb Romero*

Received by: \_\_\_\_\_

5090-14-13



DEPARTMENT OF THE NAVY  
U.S. NAVAL STATION, ROOSEVELT ROADS  
PSC 1008 BOX 3001  
FPO AA 34051-0001

5090

Ser N02C-A64/ 0388

17 FEB 1998

Department of Natural Resources  
Box 5887  
Puerta de Tierra, PR 00906

Attention: Ms. Sara Cortez

SUBJECT: PERMIT APPLICATION AND FEE TO INSTALL 45 MONITORING  
WELLS AT THE U.S. NAVAL STATION, ROOSEVELT ROADS

Enclosed is a permit application and fee to install 45 monitoring wells at the US Naval Station, Roosevelt Roads. These wells will be used to collect water samples for laboratory analysis as required by the Environmental Quality Board regulation for Underground Storage Tanks (USTs). The wells will not be used for any type of groundwater production.

Should you have any questions, please contact Mr. Pedro Ruiz, Pollution Abatement Program Manager, Environmental Engineering Division, at 865-4429.

Sincerely,

D. L. DUREN  
Lieutenant Commander, CEC, U.S. Navy  
Assistant Public Works Department  
By direction of the  
Commanding Officer

Enclosure: (1)

Estado Libre Asociado de Puerto Rico  
DEPARTAMENTO DE RECURSOS NATURALES  
San Juan, Puerto Rico

Secretaría Auxiliar de Planificación de Recursos  
SOLICITUD PARA PERMISO DE CONSTRUCCION DE POZO

PARA USO DEL DEPARTAMENTO  
Número de Solicitud \_\_\_\_\_ Fecha de Recibo \_\_\_\_\_

Número de Franquicia \_\_\_\_\_ Número de Reclamo de Derecho Adquirido \_\_\_\_\_

1. Solicitante \_\_\_\_\_ Seguro Social \_\_\_\_\_

Nombre US Naval Station Roosevelt Roads Teléfono (787)885-4429

Dirección Residencial Public Works Dnt Bldg. 31 NAVSTA Roos Rds. Ceiba PR  
Calle Núm. Municipio Zona Postal

Urbanización o Barrio \_\_\_\_\_ Núm. Carr. \_\_\_\_\_ Km. \_\_\_\_\_ Hm. \_\_\_\_\_

Dirección Postal Commanding Officer Attn. Public Works Officer. Code NO2C-A6  
PSC 1008 Box 3021 FPO AA 34051-3021  
Buzón Rural Núm. Apdo. Municipio Zona Postal

2. Propietario de los terrenos donde se construirá el pozo. De ser igual al solicitante, indique IGUAL.

Nombre SAME Teléfono \_\_\_\_\_

Dirección Residencial \_\_\_\_\_  
Calle Núm. Municipio Zona Postal

Urbanización o Barrio \_\_\_\_\_ Núm. Carr. \_\_\_\_\_ Km. \_\_\_\_\_ Hm. \_\_\_\_\_

Dirección Postal \_\_\_\_\_  
Buzón Rural Núm. Apdo. Municipio Zona Postal

Relación del solicitante con el propietario (arrendatario, usufructuario, otro). \_\_\_\_\_

3. Pocero. De ser igual al solicitante, indique IGUAL.

Nombre GeoWorks Inc. Teléfono (787)261-0932

Dirección Residencial Pedro Arcillagos H-10 Septima Seccion Levittown Toa  
Calle Núm. Municipio Zona Postal

Baja 00850

Urbanización o Barrio \_\_\_\_\_ Núm. Carr. \_\_\_\_\_ Km. \_\_\_\_\_ Hm. \_\_\_\_\_

Dirección Postal \_\_\_\_\_  
Buzón Rural Núm. Apdo. Municipio Zona Postal

4. Localización del Pozo

Municipio Ceiba Barrio \_\_\_\_\_

Sector 18° 15' 00" Latitude Finca US Navy Roosevelt Roads  
65° 39' 30" Longitude

Núm. Carr. \_\_\_\_\_ Km. \_\_\_\_\_ Hm. \_\_\_\_\_

5. Cantidad de Agua a Extraerse (en millones de galones al año (MGA))

( \_\_\_\_\_ ) X ( \_\_\_\_\_ ) X ( \_\_\_\_\_ ) X ( \_\_\_\_\_ ) X (60/1,000,000) = \_\_\_\_\_ MGA  
razón de extracción (gpm) horas/día días/semana semanas/año

6. Uso de Agua: ( ) Doméstico ( ) Comercial ( ) Agrícola ( ) Industrial

Describe brevemente la actividad en que se utilizará el agua.

The wells will be installed for monitoring purposes only. No water will be collected from them.

7. Tipo de Pozo:

( ) abasto (X) observación ( ) reserva ( ) barreno de prueba

8. Datos del Pozo:

Profundidad anticipada 25 pies Diámetro del barreno 8 pulg.

Diámetro de la camisa 2 pulg. Tipo de rejilla 0.010

9. Método de Construcción:

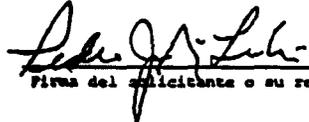
( ) a mano ( ) percusión ( ) rotario (X) OTRO Hollow Stem Auger (HSA)

AUTORIZACION

Autorizo al personal del Departamento de Recursos Naturales a entrar en los terrenos de mi propiedad o uso a inspeccionar el lugar donde se construirá el pozo aquí propuesto, así como cualquier otro lugar que pudiere afectarse con las obras en proyecto.

CERTIFICO: Que la información aquí expuesta es correcta, según mi mejor saber y entender.

28 Jan 98  
FECHA

  
Firma del solicitante o su representante autorizado

Pedro J. Ruiz Lebron  
Nombre del solicitante o su representante autorizado,  
en letra de molde

## ***D-2. Equipment Decontamination***

---

The drilling rig and associated equipment was decontaminated before installing each soil boring and monitoring well. Decontamination procedures included removing loose soils from tools and steam cleaning the equipment. Potable water, from an on-site source, and Alconox (non-phosphate soap) were used in addition to steam cleaning. An equipment decontamination pit was temporarily built with short wooden walls and covered with plastic sheeting.

Equipment decontamination was conducted in a 20-foot by 20-foot pit that had wooden walls with a minimum height of 6-inches . The pit was covered with plastic sheeting to contain any fluids. Decontamination water contained in the pit evaporated before it could be pumped into 55-gallon drums for disposal.

During the installation of the soil borings, the split-spoon sampling equipment was cleaned between each sampling interval by scrubbing the remaining soil off with a brush in soapy water and rinsing in fresh water. The split-spoon equipment was steam cleaned in the decontamination area after each boring was completed.

## D-3. Air Monitoring

During the installation of the soil borings, the breathing zone around the drilling rig was routinely monitored with a Foxboro Model 128 OVA. Results of the daily air monitoring are presented in the table below. The breathing levels never exceeded 1 PPM during the soil boring installations.

PROJECT: <u>Roosevelt Roads U.S. Naval Station-Site 520</u>			
MONITORING INSTRUMENT: <u>128 Foxboro Organic Vapor Analyzer</u>			
AIR MONITOR: <u>Darving Vargas, Pitt Maner</u>			
LEVEL OF PROTECTION: <u>Level D</u>			
ACTIVITY : <u>Soil Boring Installation</u>			
Date	Time	Boring Location	Instrument Reading (ppm)
2/23/98	08:00	520-SB1 Breathing zone behind rig	<1
2/23/98	10:00	520-SB2 Breathing zone behind rig	<1
2/23/98	12:00	520-SB3 Breathing zone behind rig	<1
2/23/98	14:00	520-SB4 Breathing zone behind rig	<1
2/23/98	08:00	520-SB4 Breathing zone behind rig	<1
2/24/98	10:00	520-SB5 Breathing zone behind rig	<1
2/25/98	10:00	520-SB6 Breathing zone behind rig	<1
2/25/98	12:00	520-SB7 Breathing zone behind rig	<1
2/25/98	14:00	520-SB8 Breathing zone behind rig	<1
2/26/98	10:00	520-SB9 Breathing zone behind rig	<1
2/26/98	08:00	520-SB10 Breathing zone behind rig	<1
2/26/98	10:00	520-SB11 Breathing zone behind rig	<1

## ***D-4. OVA Field Screening Methodology***

---

Field screening of the soils with an OVA involved the following: (1) two pint-sized mason jars were half-filled with soil obtained from the split-spoon sampler; (2) the jar tops were covered with aluminum foil and sealed; (3) the jars were placed in a cool area for five minutes to allow the head space to equilibrate; and (4) the headspace was measured with an OVA. Two samples were collected from each interval to measure the head space with and without a charcoal filter; the filter allows differentiation between natural organic vapors (e.g., methane) and hydrocarbon vapors. The difference between the two readings is the net hydrocarbon vapor content attributed to non-naturally occurring sources.

## ***D-5. Monitoring Well Construction***

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The seven monitoring wells (520-MW-1, 520-MW-2, 520-MW-3, 520-MW-4, 520-MW-5, and 520-MW-6, 520-MW-7) were installed using hollow stem augers. The filter pack material consisted of 20/30 grade silica sand. Following the well casing and screen emplacement, the sand material was poured into each borehole annulus to least two feet above the top of the screen interval. To confirm that the filter pack was placed at the proper interval, the depth to sand was continuously measured. A weighted tape measure was used to determine the depth to sand. A 2 to 3-foot bentonite pellet seal was emplaced above the sand pack. Water was added to the bentonite pellets which were allowed to hydrate overnight. The remaining annular space around the well was filled with neat cement to land surface. The monitoring wells were completed with a concrete pad (3-ft x 3-ft x 0.6-ft deep), flush-mounted, bolt down manholes, locking watertight caps, and keyed-alike padlocks. Appendix B contains the construction logs for each of the monitoring wells.

## ***D-6. Monitoring Well Development***

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The monitoring well development was performed with a centrifugal pump. To obtain a representative water sample, development continued until the purge water was free of silt and sand. Well development dates and volumes developed are summarized in Table 3-4.

The development water was containerized in 55-gallon drums. Based on laboratory analytical data, the development water from 520-MW-1 and 520-MW-2 was allowed to evaporate inside the drums. The rest of the development water (520-MW-3 to 520-MW-7) was discharged onto the asphalt road surface adjacent to the site to evaporate.



World Leader In On-Site Sampling and Analysis

February 25, 1998  
TEG Project #98I0224BBL

Mr. Pitt Maner  
BBL, Inc.  
185 N.W. Spanish River Blvd., Suite 110  
Boca Raton, FL 33431

**SUBJECT: DATA REPORT - ROOSEVELT ROADS PROJECT NO. 39933**

Dear Pitt,

Please find enclosed the data report for samples collected by BBL staff from the above referenced project site and delivered to TEG under the proper chain-of-custody protocol. TEG's Puerto Rico-certified chemist conducted the following analyses:

- 5 water samples analyzed for TRPH.
- 1 trip blank water sample analyzed for TRPH.
- Laboratory QA/QC analyses for TRPH.

The results of the analyses are summarized in the attached table. Applicable detection limits, QA/QC data and a chain-of-custody are also included as attachments.

TEG appreciates the opportunity to provide analytical services for this project. If you have any questions relating to the data or report, please do not hesitate to contact us.

Sincerely,  
TEG

Kevin Shelburne  
Principal

Attachments



World Leader In On-Site Sampling and Analysis

**BLASLAND, BOUCK & LEE, INC.  
ROOSEVELT ROADS  
CEIBA, P. R.**

**TEG Project #98I0224BBL**

**TRPH (EPA Method 418.1) ANALYSES OF WATER**

SAMPLE NUMBER	DATE ANALYZED	TRPH (mg/L)
METHOD BLANK	2/25/98	ND
TRIP BLANK	2/25/98	ND
520 SB-2	2/25/98	17
520 SB-3	2/25/98	ND
520 SB-3 dup.	2/25/98	ND
520 SB-4	2/25/98	23
520 SB-5	2/25/98	ND
520 SB-6	2/25/98	ND
<b>DETECTION LIMIT (mg/L)</b>		<b>10</b>

SAMPLING PERFORMED BY BBL PERSONNEL  
"ND" INDICATES NOT DETECTED AT LISTED DETECTION LIMIT  
mg/L = MILLIGRAMS PER LITER  
ANALYSES PERFORMED BY: MARCO A. PEDRAZA  
DATA REVIEWED BY: KEVIN SHELBURNE

Marco A. Pedraza  
Laboratory Manager

Kevin Shelburne  
Principal





### QA/QC REPORT - MS/MSD DATA

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#### MATRIX SPIKE (MS)/MATRIX SPIKE DUPLICATE (MSD)

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TEG Project #9810224BBL

BLASLAND, BOUCK & LEE, INC. 39933

DAILY CALIBRATION DATE : 2/25/98

PROJECT NAME: ROOSEVELT ROADS

---

COMPOUND	SPK CONC (ppm)	MS CONC (ppm)	%REC	MS MSD CONC (ppm)	%REC MSD	RPD	ACCEPTABLE RPD	ACCEPTABLE RECOVERY
TRPH	250	242	97%	244	98%	1%	15%	80% - 120%

---

ppm = PARTS PER MILLION

MS CONC - ANALYZED CONCENTRATION OF SPIKED SAMPLE

% REC - PERCENT RECOVERY OF SPIKE FROM MATRIX

RPD - RELATIVE PERCENT DIFFERENCE BETWEEN MATRIX SPIKE AND MATRIX SPIKE DUPLICATE RECOVERIES

---

ANALYSES PERFORMED BY: MARCO A. PEDRAZA

DATA REVIEWED BY: KEVIN SHELBURNE

TRANSGLOBAL ENVIRONMENTAL GEOCHEMISTRY

PMB 627, HC-01 BOX 29030, CAGUAS, P.R. 00725

TELEPHONE (787) 720-0329 FAX 789-3858



### QA/QC REPORT - CALIBRATION DATA

TEG Project #9810224BBL

BLASLAND, BOUCK & LEE, INC. 39933

DAILY CALIBRATION DATE : 2/25/98

PROJECT NAME: ROOSEVELT ROADS

COMPOUND	DETECTOR	CALIB RANGE	INITIAL		OPENING			CLOSING		
			RF	%RSD	ABS	RF	%DIFF	ABS	RF	%DIFF
TRPH	IR	10 - 1,000	617.89	15.7%	0.417	599.5	3.0%	0.420	595.2	3.7%

CALIB RANGE - RANGE OF CALIBRATION CURVE IS IN ppm

INITIAL RF - AVERAGE RESPONSE FACTOR FROM MULTIPOINT CALIBRATION CURVE

% RSD - LINEARITY OF MULTIPOINT CALIBRATION CURVE (+/- 20% ACCEPTABLE LIMITS)

AREA - AREA COUNTS FROM DAILY CALIBRATION STANDARD

RF - DETECTOR RESPONSE FACTOR FROM MID-POINT CALIBRATION STANDARD

% DIFF - DIFFERENCE, IN PERCENT, BETWEEN THE AVERAGE RF AND THE OPENING OR CLOSING RF (+/- 15% ACCEPTABLE LIMITS)

OPENING - MID-POINT CALIBRATION STANDARD ANALYZED BEFORE SAMPLE ANALYSES BEGIN

CLOSING - MID-POINT CALIBRATION STANDARD ANALYZED AFTER SAMPLES ANALYSES ARE COMPLETE

ANALYSES PERFORMED BY: MARCO A. PEDRAZA

DATA REVIEWED BY: KEVIN SHELBURNE

Client: BBL Date: 2-24-98 Page 1 of 1  
 Address: Boca Raton FL TEG Project # 9810224BBL Outside Lab.# \_\_\_\_\_  
 Phone: 787-860-4538 FAX 787-860-4538 Location: ROOSEVELT ROADS  
 Client Project # 39933 Project Manager: P. Maner Collector: D. Press Date of Collection: 2-24-98

Sample #	Depth	Time	Sample Type	Un- preserved Container Type	VOA 8010	VOA 8020 (BTEX)	VOA 8260	SEMI VOL 8270	TRPH 418.1	TPH 8015 (gasoline)	TPH 8015 (diesel)	TPH 8015 (gas & diesel)	TPH 8015 (oil)	PNA 610/8100	TOTAL LEAD	pH	METALS	RCI	FIELD NOTES / PRESERVATION	Total # of Containers
520 SB-2		0800		40ml glass					3										Samples placed	3
520 SB-3		0810		"					3										on ice immediately	3
520 SB-4		0820		"					3										non preserved	3
Trip Blank		—		"					1											1
520 SB-5		1430		"					3											3
520 SB-6		1530							3											3

RELINQUISHED BY (signature) <u>P. Maner</u>	Date/Time <u>2-24-98 1717</u>	RECEIVED BY (signature) <u>[Signature]</u>	Date/Time <u>2/24/98</u>	Total # of containers <u>16</u>	Chain of Custody seals Y / N / NA <u>NA</u>	TEMPERATURE
RELINQUISHED BY (signature)	Date/Time	RECEIVED BY (signature)	Date/Time	Seals intact? Y / N / NA <u>NA</u>	<u>NA</u>	
				Received good conditions / cold <u>YES</u>	<u>YES</u>	



World Leader In On-Site Sampling and Analysis

March 2, 1998  
TEG Project #98I0227BBL

Mr. Pitt Maner  
BBL, Inc.  
185 N.W. Spanish River Blvd., Suite 110  
Boca Raton, FL 33431

**SUBJECT: DATA REPORT - ROOSEVELT ROADS PROJECT NO. 39933**

Dear Pitt,

Please find enclosed the data report for samples collected by BBL staff from the above referenced project site and delivered to TEG under the proper chain-of-custody protocol. TEG's Puerto Rico-certified chemist conducted the following analyses:

- 3 water samples analyzed for TRPH.
- 1 trip blank water sample analyzed for TRPH.
- Laboratory QA/QC analyses for TRPH.

The results of the analyses are summarized in the attached table. Applicable detection limits, QA/QC data and a chain-of-custody are also included as attachments.

TEG appreciates the opportunity to provide analytical services for this project. If you have any questions relating to the data or report, please do not hesitate to contact us.

Sincerely,  
TEG

Kevin Shelburne  
Principal

Attachments



World Leader In On-Site Sampling and Analysis

**BLASLAND, BOUCK & LEE, INC.  
ROOSEVELT ROADS  
CEIBA, P. R.**

**TEG Project #9810227BBL**

**TRPH (EPA Method 418.1) ANALYSES OF WATER**

<b>SAMPLE NUMBER</b>	<b>DATE ANALYZED</b>	<b>TRPH (mg/L)</b>
METHOD BLANK	3/2/98	ND
TRIP BLANK	3/2/98	ND
520 SB-7	3/2/98	ND
520 SB-7 rep.	3/2/98	ND
520 SB-8	3/2/98	ND
520 SB-9	3/2/98	ND
<b>DETECTION LIMIT (mg/L)</b>		<b>10</b>

SAMPLING PERFORMED BY BBL PERSONNEL  
"ND" INDICATES NOT DETECTED AT LISTED DETECTION LIMIT  
mg/L = MILLIGRAMS PER LITER  
ANALYSES PERFORMED BY: RUTH DONES  
DATA REVIEWED BY: KEVIN SHELBURNE

  
Ruth Dones  
Quality Assurance/Control Manager

  
Kevin Shelburne  
Principal





### QA/QC REPORT - CALIBRATION DATA

TEG Project #9810227BBL  
DAILY CALIBRATION DATE : 3/2/98

BLASLAND, BOUCK & LEE, INC. 39933  
PROJECT NAME: ROOSEVELT ROADS

COMPOUND	DETECTOR	CALIB RANGE	INITIAL		OPENING			CLOSING		
			RF	%RSD	ABS	RF	%DIFF	ABS	RF	%DIFF
TRPH	IR	10 - 1,000	617.89	15.7%	0.442	565.6	8.5%	0.444	563.1	8.9%
CALIB RANGE - RANGE OF CALIBRATION CURVE IS IN ppm INITIAL RF - AVERAGE RESPONSE FACTOR FROM MULTIPOINT CALIBRATION CURVE % RSD - LINEARITY OF MULTIPOINT CALIBRATION CURVE (+/- 20% ACCEPTABLE LIMITS) AREA - AREA COUNTS FROM DAILY CALIBRATION STANDARD RF - DETECTOR RESPONSE FACTOR FROM MID-POINT CALIBRATION STANDARD % DIFF - DIFFERENCE, IN PERCENT, BETWEEN THE AVERAGE RF AND THE OPENING OR CLOSING RF (+/- 15% ACCEPTABLE LIMITS) OPENING - MID-POINT CALIBRATION STANDARD ANALYZED BEFORE SAMPLE ANALYSES BEGIN CLOSING - MID-POINT CALIBRATION STANDARD ANALYZED AFTER SAMPLES ANALYSES ARE COMPLETE										

ANALYSES PERFORMED BY: RUTH DONES  
DATA REVIEWED BY: KEVIN SHELBURNE



**QA/QC REPORT - MS/MSD DATA**

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**MATRIX SPIKE (MS)/MATRIX SPIKE DUPLICATE (MSD)**

TEG Project #9810227BBL

BLASLAND, BOUCK & LEE, INC. 39933

DAILY CALIBRATION DATE : 3/2/98

PROJECT NAME: ROOSEVELT ROADS

---

COMPOUND	SPK CONC (ppm)	MS CONC (ppm)	%REC	MS MSD CONC (ppm)	%REC MSD	RPD	ACCEPTABLE RPD	ACCEPTABLE RECOVERY
TRPH	250	271	108%	268	107%	1%	15%	80% - 120%

---

ppm = PARTS PER MILLION

MS CONC - ANALYZED CONCENTRATION OF SPIKED SAMPLE

% REC - PERCENT RECOVERY OF SPIKE FROM MATRIX

RPD - RELATIVE PERCENT DIFFERENCE BETWEEN MATRIX SPIKE AND MATRIX SPIKE DUPLICATE RECOVERIES

---

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ANALYSES PERFORMED BY: RUTH DONES

DATA REVIEWED BY: KEVIN SHELBURNE

TRANSGLOBAL ENVIRONMENTAL GEOCHEMISTRY

PMB 627, HC-01 BOX 29030, CAGUAS, P.R. 00725

TELEPHONE (787) 720-0329 FAX 789-3858

Client: BBL  
 Address: Boca Raton, FL  
 Phone: 787 860 4538 FAX: 787 860 4538  
 Client Project #: 39933 Project Manager: P. Maner

Date: 2/27/98 Page 1 of 1  
 TEG Project #: 9810227BBL Outside Lab. #: \_\_\_\_\_  
 Location: Roosevelt Roads  
 Collector: D. Press Date of Collection: See note

Sample #	Depth	Time	Sample Type	Container Type	VOA 8010	VOA 8020 (BTEX)	VOA 8260	SEMI VOL 8270	TPH 418.1	TPH 8015 (gasoline)	TPH 8015 (diesel)	TPH 8015 (gas & diesel)	TPH 8015 (oil)	PNA 610/8100	TOTAL LEAD	PH	METALS	RCI	Date Sampled	FIELD NOTES / PRESERVATION	Total # of Containers
520 SB-7		0800	SLW	40ml 5mls					3										2/26/98	Ice	3
520 SB-8		0750	↓						3										2/26/98	Ice	3
520 SB-9		0820	↓						3										2/27/98	Ice	3
Trip Blank		-	-						1										-	Ice	1
																					10

RELINQUISHED BY (signature) Dan Press Date/Time 2/27/98 1550  
 RECEIVED BY (signature) [Signature] Date/Time 2/27/98 16:00  
 RELINQUISHED BY (signature) \_\_\_\_\_ Date/Time \_\_\_\_\_  
 RECEIVED BY (signature) \_\_\_\_\_ Date/Time \_\_\_\_\_

Total # of containers 10  
 Chain of Custody seals Y / N / NA N/A  
 Seals intact? Y / N / NA N/A  
 Received good conditions / cold YES  
 TEMPERATURE 0°C  
ICE BATH  
24 HOUR  
RUSH



World Leader In On-Site Sampling and Analysis

March 2, 1998

RECEIVED TEG Project #98I0302BBL

APR 1 1998

Mr. Pitt Maner  
BBL, Inc.  
185 N.W. Spanish River Blvd., Suite 110  
Boca Raton, FL 33431

BLASLAND, BOUCK & LEE  
BOCA RATON, FL

**SUBJECT: DATA REPORT - ROOSEVELT ROADS PROJECT NO. 39933**

Dear Pitt,

Please find enclosed the data report for samples collected by BBL staff from the above referenced project site and delivered to TEG under the proper chain-of-custody protocol. TEG's Puerto Rico-certified chemist conducted the following analyses:

- 2 water samples analyzed for TRPH.
- 1 trip blank water sample analyzed for TRPH.
- Laboratory QA/QC analyses for TRPH.

The results of the analyses are summarized in the attached table. Applicable detection limits, QA/QC data and a chain-of-custody are also included as attachments.

TEG appreciates the opportunity to provide analytical services for this project. If you have any questions relating to the data or report, please do not hesitate to contact us.

Sincerely,  
**TEG**

Kevin Shelburne  
Principal

Attachments



World Leader In On-Site Sampling and Analysis

**BLASLAND, BOUCK & LEE, INC.  
ROOSEVELT ROADS  
CEIBA, P. R.**

**TEG Project #98I0302BBL**

**TRPH (EPA Method 418.1) ANALYSES OF WATER**

<b>SAMPLE NUMBER</b>	<b>DATE ANALYZED</b>	<b>TRPH (mg/L)</b>
METHOD BLANK	3/2/98	ND
TRIP BLANK	3/2/98	ND
SB-10	3/2/98	ND
SB-10 rep.	3/2/98	ND
SB-11	3/2/98	ND
<b>DETECTION LIMIT (mg/L)</b>		<b>10</b>

SAMPLING PERFORMED BY BBL PERSONNEL  
\*ND\* INDICATES NOT DETECTED AT LISTED DETECTION LIMIT  
mg/L = MILLIGRAMS PER LITER  
ANALYSES PERFORMED BY: RUTH DONES  
DATA REVIEWED BY: KEVIN SHELBURNE

Ruth Dones  
Quality Assurance/Control Manager

Kevin Shelburne  
Principal





**QA/QC REPORT - CALIBRATION DATA**

TEG Project #9810302BBL

BLASLAND, BOUCK & LEE, INC. 39933

DAILY CALIBRATION DATE : 3/2/98

PROJECT NAME: ROOSEVELT ROADS

COMPOUND	DETECTOR	CALIB RANGE	INITIAL		OPENING			CLOSING		
			RF	%RSD	ABS	RF	%DIFF	ABS	RF	%DIFF
TRPH	IR	10 - 1,000	617.89	15.7%	0.446	560.5	9.3%	0.442	565.6	8.5%

CALIB RANGE - RANGE OF CALIBRATION CURVE IS IN ppm  
INITIAL RF - AVERAGE RESPONSE FACTOR FROM MULTIPOINT CALIBRATION CURVE  
% RSD - LINEARITY OF MULTIPOINT CALIBRATION CURVE (+/- 20% ACCEPTABLE LIMITS)  
AREA - AREA COUNTS FROM DAILY CALIBRATION STANDARD  
RF - DETECTOR RESPONSE FACTOR FROM MID-POINT CALIBRATION STANDARD  
% DIFF - DIFFERENCE, IN PERCENT, BETWEEN THE AVERAGE RF AND THE OPENING OR CLOSING RF (+/- 15% ACCEPTABLE LIMITS)  
OPENING - MID-POINT CALIBRATION STANDARD ANALYZED BEFORE SAMPLE ANALYSES BEGIN  
CLOSING - MID-POINT CALIBRATION STANDARD ANALYZED AFTER SAMPLES ANALYSES ARE COMPLETE

ANALYSES PERFORMED BY: RUTH DONES

DATA REVIEWED BY: KEVIN SHELBURNE



### QA/QC REPORT - MS/MSD DATA

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#### MATRIX SPIKE (MS)/MATRIX SPIKE DUPLICATE (MSD)

TEG Project #98I0302BBL  
DAILY CALIBRATION DATE : 3/2/98

BLASLAND, BOUCK & LEE, INC. 39933  
PROJECT NAME: ROOSEVELT ROADS

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COMPOUND	SPK CONC (ppm)	MS CONC (ppm)	%REC	MS MSD CONC (ppm)	%REC	MSD	RPD	ACCEPTABLE RPD	ACCEPTABLE RECOVERY
TRPH	250	269	108%	271	109%		1%	15%	80% - 120%

---

ppm = PARTS PER MILLION

MS CONC - ANALYZED CONCENTRATION OF SPIKED SAMPLE

% REC - PERCENT RECOVERY OF SPIKE FROM MATRIX

RPD - RELATIVE PERCENT DIFFERENCE BETWEEN MATRIX SPIKE AND MATRIX SPIKE DUPLICATE RECOVERIES

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ANALYSES PERFORMED BY: RUTH DONES

DATA REVIEWED BY: KEVIN SHELBURNE

TRANSGLOBAL ENVIRONMENTAL GEOCHEMISTRY  
PMB 627, HC-01 BOX 29030, CAGUAS, P.R. 00725  
TELEPHONE (787) 720-0329 FAX 789-3858



## ***F. Groundwater Sampling Procedures***

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### **Sampling Procedures**

Before each new monitoring well was sampled, the wells were allowed to stabilize for at least 24 hours after installation. To avoid cross-contamination between wells, pre-cleaned, disposable, teflon bailers were used to collect ground-water samples. Prior to sampling groundwater from the new monitoring wells, depth to water was measured and each well was purged of at least three well volumes. The purge procedure was performed by hand bailing using a disposable bailer. During purging, multiple water-quality measurements of pH, temperature, and specific conductance were collected in the field until reaching stabilization. The complete well sampling logs are presented in this Appendix.

Groundwater samples were shipped in sealed coolers packed with ice via an overnight delivery service to Savannah Laboratories & Environmental Services, Inc. (Savannah) in Deerfield Beach, Florida.

### **QA/QC Procedures**

A Field blank was collected at the time that the monitoring wells were sampled. The field blank was analyzed for BTEX by EPA Method 602, PAH's by EPA 610, TPH by EPA Method 418.1, and the eight RCRA metals. The field blank sample was collected by filling the appropriate laboratory containers with distilled water in the area of groundwater collection.

A rinsate blank was collected from a Teflon™ bailer that was used to sample the monitoring wells. The sample was collected by pouring distilled water into the bailer and then collecting a volume of water from the bailer in the appropriate laboratory container.

A duplicate groundwater sample was collected at 520-MW-1. The Laboratory was not informed of the origin of the duplicate sample.

A trip blank consisting of analyte free water was supplied by the laboratory. The trip blank was taken to the sampling site and then returned to the laboratory with the VOA samples.

Project/No. 39933

Page 1 of     

Site Location Roosevelt Roads 520

Site/Well No. MW-1

Coded/  
Replicate No. N/A

Date 3/26-27/98

Weather Overcast, 87°F

Time Sampling  
Began 11:53

Time Sampling  
Completed 13:00

EVACUATION DATA

Description of Measuring Point (MP)	Top of Casing (North Side)	MP Elevation	(feet)
Height of MP Below Land Surface	<u>    </u>	Water-Level Elevation	<u>    </u>
Total Sounded Depth (TD) of Well Below MP	<u>17.37</u> (feet)	Diameter of Casing/ Construction Type	<u>2" Schedule 40 PVC</u>
Depth to Water (DTW) Below MP	<u>9.99</u> (feet)	Gallons Pumped/Bailed Prior to Sampling	<u>3-76</u>
Water Column (WC) in Well (TD - DTW)	<u>7.38</u> (feet)	(GAL x 5 VOL x PUMP RATE)	<u>    </u>
Gallons per Foot (GPF)	<u>0.17</u>	Sampling Pump Intake (feet below land surface)	<u>Bailer</u>
Gallons in Well (WC x GPF)	<u>1.25</u>		

Evacuation Method Peristaltic Pump

SAMPLING DATA/FIELD PARAMETERS

Color      Odor      Appearance      Temperature 28.7 °F

Other (specific ion; OVA; HNU; etc.)     

Specific Conductance, umhos/cm 210 pH 7.19

Sampling Method and Material Dedicated Teflon bailer

Constituents Sampled	Container Description		Preservative
	From Lab	X or BB&L	
1. <u>EPA 8020</u>	<u>3x40ml glass</u>	<u>14°C</u>	<u>HCL</u>
2. <u>EPA 610</u>	<u>1x1 liter amber</u>		<u>Ice</u>
3. <u>EPA 418.1</u>	<u>1x500ml amber</u>		<u>HCL</u>
4. <u>    </u>	<u>    </u>		<u>    </u>
5. <u>    </u>	<u>    </u>		<u>    </u>
6. <u>    </u>	<u>    </u>		<u>    </u>
7. <u>    </u>	<u>    </u>		<u>    </u>

Remarks     

Sampling Personnel Richard Blasland, Dan Pross

WELL CASING VOLUMES			
GAL/FT.	1-1/4" = 0.077	2" = 0.16	3" = 0.37
	1-1/2" = 0.10	2-1/2" = 0.24	4" = 0.65
		3-1/2" = 0.50	6" = 1.46

Project No. 39933 Page 1 of       
 Site Location Roosevelt Roads 520  
 Site/Well No. MW-2 Coded/ Replicate No. N/A Date 3/26-27/98  
 Weather Overcast, 87°F Time Sampling Began 12:29 Time Sampling Completed 14:15

EVACUATION DATA

Description of Measuring Point (MP) Top of Casing (North Side)  
 Height of MP Below Land Surface      (feet) MP Elevation      (feet)  
 Total Bounded Depth (TD) of Well Below MP 19.72 (feet) Water-Level Elevation      (feet)  
 Depth to Water (DTW) Below MP 13.37 (feet) Diameter of Casing/  
 Construction Type 2" Schedule 40 PVC  
 Gallons Pumped/Bailed  
 Prior to Sampling  
 (GAL x 5 VOL x PUMP RATE) 3.29  
 Water Column (WC) In Well  
 (TD - DTW) 6.35 (feet) Sampling Pump Intake  
 (feet below land surface) Bailer  
 Gallons per Foot (GPF) 0.17  
 Gallons in Well  
 (WC x GPF) 1.07

Evacuation Method Peristaltic Pump

SAMPLING DATA/FIELD PARAMETERS

Color      Odor      Appearance      Temperature 29.9 °F

Other (specific ion; OVA; HNU; etc.)     

Specific Conductance, umhos/cm 153 pH 6.86

Sampling Method and Material Dedicated Teflon Bailer

Constituents Sampled	Container Description		Preservative
	From Lab	X or BB&L	
1. <u>EPA 8020</u>	<u>3x40ml glass</u>	<u>    </u>	<u>HCl</u>
2. <u>EPA 610</u>	<u>1x1 liter amber</u>	<u>    </u>	<u>Ice</u>
3. <u>EPA 418.1</u>	<u>1x500ml amber</u>	<u>    </u>	<u>HCl</u>
4. <u>    </u>	<u>    </u>	<u>    </u>	<u>    </u>
5. <u>    </u>	<u>    </u>	<u>    </u>	<u>    </u>
6. <u>    </u>	<u>    </u>	<u>    </u>	<u>    </u>
7. <u>    </u>	<u>    </u>	<u>    </u>	<u>    </u>

Remarks     

Sampling Personnel Don Pross, Richard Blasland

WELL CASING VOLUMES			
GAL/FT.	1-1/4" = 0.077	2" = 0.16	3" = 0.37
			4" = 0.65

Project No. 39933 Page 1 of         
 Site Location Roosevelt Roads 520  
 Site/Well No. MW-3 Coded/ Replicate No. N/A Date 3/26-27/98  
 Weather Overcast, 87°F Time Sampling Began 10:46 Time Sampling Completed 11:00

EVACUATION DATA

Description of Measuring Point (MP) Top of Casing (North Side)  
 Height of MP Below Land Surface        (feet) MP Elevation        (feet)  
 Total Sounded Depth (TD) of Well Below MP 19.75 (feet) Water-Level Elevation        (feet)  
 Depth to Water (DTW) Below MP 13.92 (feet) Diameter of Casing/  
 Construction Type 2" Schedule 40 PVC  
 Gallons Pumped/Bailed  
 Prior to Sampling 2.17  
 (GAL x 5 VOL x PUMP RATE)  
 Water Column (WC) in Well  
 (TD - DTW) 5.83 (feet) Sampling Pump Intake  
 (feet below land surface) Below  
 Gallons per Foot (GPF) 0.17  
 Gallons in Well  
 (WC x GPF) .99  
 Evacuation Method Peristaltic Pump

SAMPLING DATA/FIELD PARAMETERS

Color        Odor        Appearance        Temperature 29.6 °F  
 Other (specific ion; OVA; HNU; etc.)         
 Specific Conductance, umhos/cm 104 pH 7.22  
 Sampling Method and Material Dedicated Teflon Bailer

Constituents Sampled	Container Description		Preservative
	From Lab	X or BB&L	
1. <u>EPA 8020</u>	<u>3x40ml glass</u>	<u>      </u>	<u>100 HCL</u>
2. <u>EPA 610</u>	<u>1x1 liter amber</u>	<u>      </u>	<u>Ice</u>
3. <u>EPA 418.1</u>	<u>1x500ml amber</u>	<u>      </u>	<u>HCL</u>
4. <u>      </u>	<u>      </u>	<u>      </u>	<u>      </u>
5. <u>      </u>	<u>      </u>	<u>      </u>	<u>      </u>
6. <u>      </u>	<u>      </u>	<u>      </u>	<u>      </u>
7. <u>      </u>	<u>      </u>	<u>      </u>	<u>      </u>

Remarks       

Sampling Personnel Richard Blacklock Dan Rose

WELL CASING VOLUMES			
GAL/FT.	1-1/4" = 0.077	2" = 0.16	3" = 0.37
			4" = 0.65

Project No. 39933  
Site Location Roosevelt Roads 520

Page 1 of       

Site/Well No. MW-4 Coded/ Replicate No. N/A

Date 3/26-27/98

Weather Overcast, 87°F

Time Sampling Began 11:22

Time Sampling Completed 11:45

EVACUATION DATA

Description of Measuring Point (MP) Top of Casing (North Side)  
 Height of MP Below Land Surface        (feet)  
 Total Sounded Depth (TD) of Well Below MP 18.35 (feet)  
 Depth to Water (DTW) Below MP 10.47 (feet)  
 Water Column (WC) in Well (TD - DTW) 7.88 (feet)  
 Gallons per Foot (GPF) 0.17  
 Gallons in Well (WC x GPF) 1.33  
 MP Elevation        (feet)  
 Water-Level Elevation        (feet)  
 Diameter of Casing/ Construction-Type 2" Schedule 40 PVC  
 Gallons Pumped/Bailed Prior to Sampling (GAL x 5 VOL x PUMP RATE) 4.02  
 Sampling Pump Intake (feet below land surface) Boiler

Evacuation Method Peristaltic Pump

SAMPLING DATA/FIELD PARAMETERS

Color        Odor        Appearance        Temperature 30.3 °F

Other (specific ion; OVA; HNU; etc.)       

Specific Conductance, umhos/cm 133 pH 7.17

Sampling Method and Material Dedicated Teflon bailer

Constituents Sampled	Container Description		Preservative
	From Lab	X or BB&L	
1. <u>EPA 8020</u>	<u>3 x 40ml glass</u>	<u>      </u>	<u>HCL</u>
2. <u>EPA 610</u>	<u>1 x 1 liter amber</u>	<u>      </u>	<u>Ice</u>
3. <u>EPA 418.1</u>	<u>1 x 500ml amber</u>	<u>      </u>	<u>HCL</u>
4. <u>      </u>	<u>      </u>	<u>      </u>	<u>      </u>
5. <u>      </u>	<u>      </u>	<u>      </u>	<u>      </u>
6. <u>      </u>	<u>      </u>	<u>      </u>	<u>      </u>
7. <u>      </u>	<u>      </u>	<u>      </u>	<u>      </u>

Remarks       

Sampling Personnel Fachal Blalal, Dan Press

WELL CASING VOLUMES			
GAL/FT.	1-1/4" = 0.077	2" = 0.18	3" = 0.37
			4" = 0.65

Project No. 39933 Page 1 of       
 Site Location Roosevelt Roads 520  
 Site/Well No. MW-5 Coded/ Replicate No. N/A Date 3/26-27/98  
 Weather Overcast, 87°F Time Sampling Began 10:58 Time Sampling Completed 11:15

EVACUATION DATA

Description of Measuring Point (MP) Top of Casing (North Side)  
 Height of MP Below Land Surface      (feet) MP Elevation      (feet)  
 Total Sounded Depth (TD) of Well Below MP 17.89 (feet) Water-Level Elevation      (feet)  
 Depth to Water (DTW) Below MP 13.11 (feet) Diameter of Casing/  
 Construction Type 2" Schedule 40 PVC  
 Gallons Pumped/Bailed Prior to Sampling  
 (GAL x 5 VOL x PUMP RATE) 2.44  
 Water Column (WC) in Well (TD - DTW) 4.78 (feet) Sampling Pump Intake (feet below land surface) Bailer  
 Gallons per Foot (GPF) 0.17  
 Gallons in Well (WC x GPF) .81  
 Evacuation Method Peristaltic Pump

SAMPLING DATA/FIELD PARAMETERS

Color      Odor      Appearance      Temperature 29.2 °F  
 Other (specific ion; OVA; HNU; etc.)       
 Specific Conductance, umhos/cm 66 pH 7.75  
 Sampling Method and Material Dedicated Teflon bailer

Constituents Sampled	Container Description		Preservative
	From Lab	X or BB&L	
1. <u>EPA 8020</u>	<u>3x40ml</u>	<u>glass</u>	<u>14°C HCL</u>
2. <u>EPA 610</u>	<u>1x1 liter</u>	<u>amber</u>	<u>Ice</u>
3. <u>EPA 418.1</u>	<u>1x500ml</u>	<u>amber</u>	<u>HCL</u>
4. <u>    </u>	<u>    </u>	<u>    </u>	<u>    </u>
5. <u>    </u>	<u>    </u>	<u>    </u>	<u>    </u>
6. <u>    </u>	<u>    </u>	<u>    </u>	<u>    </u>
7. <u>    </u>	<u>    </u>	<u>    </u>	<u>    </u>

Remarks     

Sampling Personnel Richard Blasland, Dan Pross

WELL CASING VOLUMES			
GAL/FT.	1-1/4" = 0.077	2" = 0.16	3" = 0.37
			4" = 0.65

Project No. 39933 Page 1 of       
 Site Location Roosevelt Roads 520  
 Site/Well No. MW-6 Coded/ Replicate No. N/A Date 3/26-27/98  
 Weather Overcast, 87°F Time Sampling Began 11:33 Time Sampling Completed 1460

EVACUATION DATA

Description of Measuring Point (MP) Top of Casing (North Side)  
 Height of MP Below Land Surface      (feet) MP Elevation      (feet)  
 Total Sounded Depth (TD) of Well Below MP 15.25 (feet) Water-Level Elevation      (feet)  
 Depth to Water (DTW) Below MP 9.64 (feet) Diameter of Casing/  
 Construction Type 2" Schedule 40 PVC  
 Gallons Pumped/ Bailed  
 Prior to Sampling  
 (GAL x 5 VOL x PUMP RATE) 2-86  
 Water Column (WC) in Well  
 (TD - DTW) 5.61 (feet) Sampling Pump Intake  
 (feet below land surface) Packer  
 Gallons per Foot (GPF) 0.17  
 Gallons in Well  
 (WC x GPF) .95  
 Evacuation Method Peristaltic Pump

SAMPLING DATA/FIELD PARAMETERS

Color      Odor      Appearance      Temperature 31.3 °F  
 Other (specific ion; OVA; HNU; etc.)     

Specific Conductance, umhos/cm 206 pH 6.77

Sampling Method and Material Dedicated Teflon bailer

Constituents Sampled	Container Description		Preservative	
	From Lab	X or BBL	HC	HCL
1. <u>EPA 8020</u>	<u>3 x 40ml</u>	<u>glass</u>	<u>HC</u>	<u>HCL</u>
2. <u>EPA 610</u>	<u>1 x 1 liter</u>	<u>amber</u>	<u>Ice</u>	
3. <u>EPA 418.1</u>	<u>1 x 500ml</u>	<u>amber</u>	<u>HCL</u>	
4. <u>    </u>	<u>    </u>	<u>    </u>	<u>    </u>	<u>    </u>
5. <u>    </u>	<u>    </u>	<u>    </u>	<u>    </u>	<u>    </u>
6. <u>    </u>	<u>    </u>	<u>    </u>	<u>    </u>	<u>    </u>
7. <u>    </u>	<u>    </u>	<u>    </u>	<u>    </u>	<u>    </u>

Remarks     

Sampling Personnel Richard Blasland, Dan Press

WELL CASING VOLUMES				
GAL/FT.	1-1/4" = 0.077	2" = 0.16	3" = 0.37	4" = 0.65

Project No. 39933 Page 1 of       
 Site Location Roosevelt Roads 520  
 Site/Well No. MW-7 Coded/ Replicate No. N/A Date 3/26-27/98  
 Weather Overcast, 87°F Time Sampling Began 11:58 Time Sampling Completed 11:15

EVACUATION DATA

Description of Measuring Point (MP) Top of Casing (North Side)  
 Height of MP Below Land Surface      (feet) MP Elevation      (feet)  
 Total Sounded Depth (TD) of Well Below MP 18.0 (feet) Water-Level Elevation      (feet)  
 Depth to Water (DTW) Below MP 11.32 (feet) Diameter of Casing/  
 Construction Type 2" Schedule 40 PVC  
 Gallons Pumped/Balled  
 Prior to Sampling 3.41  
 (GAL x 5 VOL x PUMP RATE)  
 Water Column (WC) in Well  
 (TD - DTW) 6.68 (feet) Sampling Pump Intake  
 (feet below land surface) Water  
 Gallons per Foot (GPF) 0.17  
 Gallons in Well  
 (WC x GPF) 1.13  
 Evacuation Method Peristaltic Pump

SAMPLING DATA/FIELD PARAMETERS

Color      Odor      Appearance      Temperature 31.7 °F  
 Other (specific ion; OVA; HNU; etc.)       
 Specific Conductance, umhos/cm 181 pH 7.66  
 Sampling Method and Material Dedicated Teflon bailer

Constituents Sampled	Container Description From Lab <u>X</u> or BB&L	Preservative
1. <u>EPA 8020</u>	<u>3x40ml glass</u>	<u>14°C HCL</u>
2. <u>EPA 610</u>	<u>1x1 liter amber</u>	<u>Ice</u>
3. <u>EPA 418.1</u>	<u>1x500ml amber</u>	<u>HCL</u>
4. <u>    </u>	<u>    </u>	<u>    </u>
5. <u>    </u>	<u>    </u>	<u>    </u>
6. <u>    </u>	<u>    </u>	<u>    </u>
7. <u>    </u>	<u>    </u>	<u>    </u>

Remarks     

Sampling Personnel Dave Pears, Richard Blodgett

WELL CASING VOLUMES			
GAL./FT.	1-1/4" = 0.077	2" = 0.16	3" = 0.37
			4" = 0.65

WATER SAMPLE LOG

Project/No. 39933.006 Page 1 of 1

Site Location SITE 520 NAUSA Roosevelt Roads, Puerto Rico

Site/Well No. 520-MW-6 Coded/ Replicate No. \_\_\_\_\_ Date 12-18-98

Weather warm, pthly cloudy to overcast Time Sampling Began 0930-1009 (purge) Time Sampling Completed 1555

EVACUATION DATA

Description of Measuring Point (MP) Top of Casing (North Side)  
 Height of MP Below Land Surface \_\_\_\_\_ (feet) MP Elevation \_\_\_\_\_ (feet)  
 Total Sounded Depth (TD) of Well Below MP 15.25 (feet) Water-Level Elevation \_\_\_\_\_ (feet)  
 Depth to Water (DTW) Below MP 4.82 (feet) Diameter of Casing/ Construction Type 2" Schedule 40 PVC  
 Gallons Pumped/Bailed \_\_\_\_\_  
 Water Column (WC) in Well (TD - DTW) 10.43 (feet) Prior to Sampling (GAL x 5 VOL x PUMP RATE) 2.5 gallons. Well went DRY.  
 Gallons per Foot (GPF) 0.16 Sampling Pump Intake (feet below land surface) Entire column of water.  
 Gallons in Well (WC x GPF) 1.67 gals

Evacuation Method Peristaltic pump with disposable poly tubing

SAMPLING DATA/FIELD PARAMETERS

Color clear Odor slight-yes Appearance clear Temperature 32.6 °F

Other (specific ion; OVA; HNU; etc.) \_\_\_\_\_

Specific Conductance, umhos/cm 170 pH Not available - problem with tester (reads 4.14)

Sampling Method and Material Peristaltic pump w poly tubing; 0.45 micron filter (for filtered samples) + 4 feet on

Constituents Sampled	Container Description		Preservative
	From Lab	X or BB&L	
1. <u>EPA 239.2 (Pb) unfiltered*</u>	<u>1x</u>	<u>250ml plastic</u>	<u>HNO<sub>3</sub></u>
2. <u>EPA 239.2 (Pb) filtered*</u>	<u>1x</u>	<u>250 ml plastic</u>	<u>HNO<sub>3</sub></u>
3. _____	_____	_____	_____
4. _____	_____	_____	_____
5. _____	_____	_____	_____
6. _____	_____	_____	_____
7. _____	_____	_____	_____

Remarks \* Analysis for Barium (Ba) (6010) and Chromium (Cr) (6010) Use slow purge. Well dry after 2.5 gallons. Allow well to recharge.

Sampling Personnel Darving Vargas, BBL

GAL./FT.	1-1/4" = 0.077	2" = 0.16	3" = 0.37	4" = 0.65
	1-1/2" = 0.10	2-1/2" = 0.24	3-1/2" = 0.50	6" = 1.46

## CERTIFICATE

I certify that I have reviewed and evaluated all analytical raw data concerning all the samples contained in the Laboratory Report of Analysis for Savannah Laboratories Log Number D8-40388.

I hereby certify that , to the best of my knowlege, the results for log number D8-40388, pages 1-6 (inclusive), signed by Paul Canevaro, are correct and reliable.



# SL SAVANNAH LABORATORIES & ENVIRONMENTAL SERVICES, INC.

414 SW 12th Avenue • Deerfield Beach, Florida 33442 • (954) 421-7400 • Fax (954) 421-2584

LOG NO: D8-40388  
Received: 25 FEB 98  
Reported: 26 FEB 98

Mr. Pitt Maner  
Blasland Bouck & Lee, Inc.  
185 NW Spanish River Boulevard, Suite 110  
Boca Raton, FL 33431

Project: #399.33 (Roosevelt Rds)  
Sampled By: Pitt Maner  
Code: 134680313

## REPORT OF RESULTS

Page 1

LOG NO	SAMPLE DESCRIPTION , SOLID OR SEMISOLID SAMPLES	DATE/ TIME SAMPLED				
40388-1	520 SB-3 (2-6)	02-23-98/1345				
40388-2	520 SB-3 (8-10)	02-23-98/1400				
40388-3	520 SB-2 (2-6)	02-23-98/1115				
40388-4	520 SB-2 (10-12)	02-23-98/1150				
40388-5	520 SB-1 (6-8)	02-23-98/0940				
PARAMETER	40388-1	40388-2	40388-3	40388-4	40388-5	
<b>Aromatic Volatiles (8020)</b>						
Benzene, ug/kg	<5.0	33	<5.0	<25	<5.0	
Chlorobenzene, ug/kg	<5.0	<25	<5.0	<25	<5.0	
1,2-Dichlorobenzene, ug/kg	<5.0	<25	<5.0	<25	<5.0	
1,3-Dichlorobenzene, ug/kg	<5.0	<25	<5.0	<25	<5.0	
1,4-Dichlorobenzene, ug/kg	<5.0	<25	<5.0	<25	<5.0	
Ethylbenzene, ug/kg	<5.0	220	<5.0	<25	<5.0	
Toluene, ug/kg	<5.0	<25	<5.0	<25	<5.0	
Xylenes, ug/kg	<5.0	830	<5.0	50	<5.0	
Methyl-tert-butyl ether (MTBE), ug/kg	<50	<250	<50	<250	<50	
Date Analyzed	02.25.98	02.26.98	02.25.98	02.26.98	02.25.98	
Dilution factor	1	5	1	5	1	
<b>Petroleum Hydrocarbons (9073)</b>						
Petroleum Hydrocarbons, mg/kg	81	<10	<10	<10	300	
Date Extracted	02.25.98	02.25.98	02.25.98	02.25.98	02.25.98	
Date Analyzed	02.25.98	02.25.98	02.25.98	02.25.98	02.25.98	
Percent Solids	84	79	82	80	78	

Validated & Certified by: Michael Ditz  
License No.: 2314

LOG NO: D8-40388  
 Received: 25 FEB 98  
 Reported: 26 FEB 98

Mr. Pitt Maner  
 Blasland Bouck & Lee, Inc.  
 185 NW Spanish River Boulevard, Suite 110  
 Boca Raton, FL 33431

Project: #399.33 (Roosevelt Rds)  
 Sampled By: Pitt Maner  
 Code: 134680313

REPORT OF RESULTS

Page 2

LOG NO	SAMPLE DESCRIPTION , SOLID OR SEMISOLID SAMPLES	DATE/ TIME SAMPLED
40388-6	520 SB-1 (2-6)	02-23-98/0910
PARAMETER	40388-6	
Aromatic Volatiles (8020)		
Benzene, ug/kg		<5.0
Chlorobenzene, ug/kg		<5.0
1,2-Dichlorobenzene, ug/kg		<5.0
1,3-Dichlorobenzene, ug/kg		<5.0
1,4-Dichlorobenzene, ug/kg		<5.0
Ethylbenzene, ug/kg		<5.0
Toluene, ug/kg		<5.0
Xylenes, ug/kg		<5.0
Methyl-tert-butyl ether (MTBE), ug/kg		<50
Date Analyzed		02.25.98
Dilution factor		1
Petroleum Hydrocarbons (9073)		
Petroleum Hydrocarbons, mg/kg		94
Date Extracted		02.25.98
Date Analyzed		02.25.98
Percent Solids		86

Validated & Certified by: Abraham Ortiz  
 License No.: 3314

LOG NO: D8-40388  
 Received: 25 FEB 98  
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Mr. Pitt Maner  
 Blasland Bouck & Lee, Inc.  
 185 NW Spanish River Boulevard, Suite 110  
 Boca Raton, FL 33431

Project: #399.33 (Roosevelt Rds)  
 Sampled By: Pitt Maner  
 Code: 134680313  
 Page 3

REPORT OF RESULTS

LOG NO	SAMPLE DESCRIPTION , LIQUID SAMPLES	DATE/ TIME SAMPLED
40388-7	520 Rinsate Blank	02-23-98/0930
PARAMETER	40388-7	
Aromatic Volatiles (8020)		
Benzene, ug/l		<1.0
Chlorobenzene, ug/l		<1.0
1,2-Dichlorobenzene, ug/l		<1.0
1,3-Dichlorobenzene, ug/l		<1.0
1,4-Dichlorobenzene, ug/l		<1.0
Ethylbenzene, ug/l		<1.0
Toluene, ug/l		<1.0
Xylenes, ug/l		<2.0
Methyl-tert-butyl ether (MTBE), ug/l		<10
Date Analyzed		02.25.98
Dilution factor		1
Petroleum Hydrocarbons (418.1)		
Petroleum Hydrocarbons, mg/l		<1.0
Date Extracted		02.25.98
Date Analyzed		02.25.98

Validated & Certified by: Abraham Ortiz  
 License No.: 2314

LOG NO: D8-40388  
Received: 25 FEB 98  
Reported: 26 FEB 98

Mr. Pitt Maner  
Blasland Bouck & Lee, Inc.  
185 NW Spanish River Boulevard, Suite 110  
Boca Raton, FL 33431

Project: #399.33 (Roosevelt Rds)  
Sampled By: Pitt Maner  
Code: 134680313  
Page 4

REPORT OF RESULTS

LOG NO      SAMPLE DESCRIPTION , LIQUID SAMPLES

-----  
40388-8      Trip Blank  
-----

PARAMETER      40388-8  
-----

Aromatic Volatiles (8020)

Benzene, ug/l	<1.0
Chlorobenzene, ug/l	<1.0
1,2-Dichlorobenzene, ug/l	<1.0
1,3-Dichlorobenzene, ug/l	<1.0
1,4-Dichlorobenzene, ug/l	<1.0
Ethylbenzene, ug/l	<1.0
Toluene, ug/l	<1.0
Xylenes, ug/l	<2.0
Methyl-tert-butyl ether (MTBE), ug/l	<10
Date Analyzed	02.25.98
Dilution factor	1

-----

Validated & Certified by: Abraham Ortiz  
License No.: 2314

# SL SAVANNAH LABORATORIES & ENVIRONMENTAL SERVICES, INC.

414 SW 12th Avenue • Deerfield Beach, Florida 33442 • (954) 421-7400 • Fax (954) 421-2584

LOG NO: D8-40388  
Received: 25 FEB 98  
Reported: 26 FEB 98

Mr. Pitt Maner  
Blasland Bouck & Lee, Inc.  
185 NW Spanish River Boulevard, Suite 110  
Boca Raton, FL 33431

Project: #399.33 (Roosevelt Rds)  
Sampled By: Pitt Maner  
Code: 134680313

REPORT OF RESULTS

Page 5

LOG NO SAMPLE DESCRIPTION , QC REPORT FOR SOLID/SEMISOLID

40388-9 Method Blank  
40388-10 Accuracy (%Rec)  
40388-11 Precision (%RPD)  
40388-12 Reporting Limit (RL)

PARAMETER	40388-9	40388-10	40388-11	40388-12
<b>Aromatic Volatiles (8020)</b>				
Benzene, ug/kg	<5.0	133 %	9.0 %	5.0
Chlorobenzene, ug/kg	<5.0	126 %	0.79 %	5.0
1,2-Dichlorobenzene, ug/kg	<5.0	---	---	5.0
1,3-Dichlorobenzene, ug/kg	<5.0	---	---	5.0
1,4-Dichlorobenzene, ug/kg	<5.0	---	---	5.0
Ethylbenzene, ug/kg	<5.0	---	---	5.0
Toluene, ug/kg	<5.0	128 %	4.7 %	5.0
Xylenes, ug/kg	<5.0	---	---	5.0
Methyl-tert-butyl ether (MTBE), ug/kg	<50	---	---	50
Date Analyzed	02.25.98	---	---	---
<b>Petroleum Hydrocarbons (9073)</b>				
Petroleum Hydrocarbons, mg/kg	<10	62 %*F75	1.6 %	10
Date Extracted	02.25.98	---	---	---
Date Analyzed	02.25.98	---	---	---

Validated & Certified by: Abraham Ortiz  
License No.: 231K

**SL SAVANNAH LABORATORIES**  
**& ENVIRONMENTAL SERVICES, INC.**

414 SW 12th Avenue • Deerfield Beach, Florida 33442 • (954) 421-7400 • Fax (954) 421-2584

LOG NO: D8-40388  
 Received: 25 FEB 98  
 Reported: 26 FEB 98

Mr. Pitt Maner  
 Blasland Bouck & Lee, Inc.  
 185 NW Spanish River Boulevard, Suite 110  
 Boca Raton, FL 33431

Project: #399.33 (Roosevelt Rds)  
 Sampled By: Pitt Maner  
 Code: 134680313

REPORT OF RESULTS

Page 6

LOG NO SAMPLE DESCRIPTION , QC REPORT FOR LIQUID SAMPLES

-----  
 40388-13 Method Blank  
 40388-14 Accuracy (%Rec)  
 40388-15 Precision (%RPD)  
 40388-16 Reporting Limit (RL)  
 -----

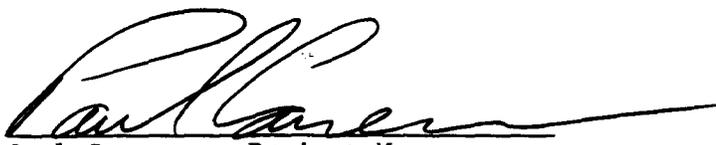
PARAMETER	40388-13	40388-14	40388-15	40388-16
Aromatic Volatiles (8020)				
Benzene, ug/l	<1.0	102 %	3.9 %	1.0
Chlorobenzene, ug/l	<1.0	110 %	4.6 %	1.0
1,2-Dichlorobenzene, ug/l	<1.0	---	---	1.0
1,3-Dichlorobenzene, ug/l	<1.0	---	---	1.0
1,4-Dichlorobenzene, ug/l	<1.0	---	---	1.0
Ethylbenzene, ug/l	<1.0	---	---	1.0
Toluene, ug/l	<1.0	106 %	3.8 %	1.0
Xylenes, ug/l	<2.0	---	---	2.0
Methyl-tert-butyl ether (MTBE), ug/l	<10	---	---	10
Date Analyzed	02.25.98	---	---	---
Petroleum Hydrocarbons (418.1)				
Petroleum Hydrocarbons, mg/l	<1.0	74 %	4.1 %	1.0
Date Extracted	02.25.98	---	---	---
Date Analyzed	02.25.98	---	---	---

Comprehensive Quality Assurance Plan #890142G.

SL Certifications: E86221/86371

Method References: EPA 600/4-79-020 and EPA SW-846.

\*F75 = Matrix spike recoveries were outside advisory limits possibly due to matrix interference present in the sample; therefore, recovery of the laboratory control standard analyzed concurrently with the sample batch has been reported.

  
 Paul Canevaro, Project Manager

Validated & Certified by:   
 License No.: 2314

Final Page Of Report

Laboratories in Savannah, GA • Tallahassee, FL • Tampa, FL • Deerfield Beach, FL • Mobile, AL

# SL SAVANNAH LABORATORIES & ENVIRONMENTAL SERVICES, INC.

## ANALYSIS REQUEST AND CHAIN OF CUSTODY RECORD

- 5102 LaRoche Avenue, Savannah, GA 31404 Phone: (912) 354-7858 Fax: (912) 352-0165
- 2846 Industrial Plaza Drive, Tallahassee, FL 32301 Phone: (904) 878-3994 Fax: (904) 878-9504
- 414 SW 12th Avenue, Deerfield Beach, FL 33442 Phone: (954) 421-7400 Fax: (954) 421-2584
- 900 Lakeside Drive, Mobile, AL 36693 Phone: (334) 666-6633 Fax: (334) 666-6696
- 6712 Benjamin Road, Suite 100, Tampa, FL 33634 Phone: (813) 885-7427 Fax: (813) 885-7049
- 100 Alpha Drive, Suite 110, Destrehan, LA 70047 Phone: (504) 764-1100 Fax: (504) 725-1163

PROJECT REFERENCE <b>Roosevelt Loads DDD</b>		PROJECT NO. <b>39933</b>	P.O. NUMBER	MATRIX TYPE	REQUIRED ANALYSES	PAGE 1 OF 1
PROJECT LOC. (State) <b>AR.</b>	SAMPLER(S) NAME <b>A. Maner</b>	PHONE <b>501 750 3733</b>	FAX <b>787 860 4538</b>	STANDARD REPORT DELIVERY <input type="checkbox"/> EXPEDITED REPORT DELIVERY (surcharge) <input checked="" type="checkbox"/> Date Due: <b>2/24/98</b>		
CLIENT NAME <b>MSL</b>		CLIENT PROJECT MANAGER <b>A. Maner</b>				
CLIENT ADDRESS (CITY, STATE, ZIP) <b>Boca Raton, FL 33431</b>						

SAMPLE DATE	TIME	SL NO.	SAMPLE IDENTIFICATION	NUMBER OF CONTAINERS SUBMITTED						REMARKS		
				AQUEOUS (WATER)	SOLID OR SEMISOLID	AIR	NONAQUEOUS LIQUID (Oil, Solvent, etc)	IC	IC		IC	IC
2/23/98	1345		520 SB-3 (2-6)	X			1	1				Note: 24 hr TAT
2/23/98	1400		520 SB-3 (8-10)	X			1	1				
2/23/98	1115		520 SB-2 (2-6)	X			1	1				
2/23/98	1150		520 SB-2 (10-12)	X			1	1				
2/23/98	0940		520 SB-1 (6-8)	X			1	1				
2/23/98	0910		520 SB-1 (2-6)	X			1	1				
2/23/98	0930		520 Rinse Blank	X					3	1		
2/23/98	0930 (DPP)		Trip Blank	X					3			

RELINQUISHED BY: (SIGNATURE) <i>[Signature]</i>	DATE 2/23/98	TIME 1600	RELINQUISHED BY: (SIGNATURE) <i>[Signature]</i>	DATE 2/23/98	TIME 1600	RELINQUISHED BY: (SIGNATURE)	DATE	TIME
RECEIVED BY: (SIGNATURE)	DATE	TIME	RECEIVED BY: (SIGNATURE)	DATE	TIME	RECEIVED BY: (SIGNATURE)	DATE	TIME

<b>LABORATORY USE ONLY</b>						
RECEIVED FOR LABORATORY BY: (SIGNATURE) <i>[Signature]</i>	DATE 2/25/98	TIME 1100	CUSTODY INTACT <input type="checkbox"/> YES <input type="checkbox"/> NO	CUSTODY SEAL NO. 1	SL LOG NO. 0840388	LABORATORY REMARKS:

## CERTIFICATE

I certify that I have reviewed and evaluated all analytical raw data concerning all the samples contained in the Laboratory Report of Analysis for Savannah Laboratories Log Number D8-40389.

I hereby certify that, to the best of my knowledge, the results for log number D8-40389, pages 1-5 (inclusive), signed by Paul Canevaro, are correct and reliable.



# SL SAVANNAH LABORATORIES & ENVIRONMENTAL SERVICES, INC.

414 SW 12th Avenue • Deerfield Beach, Florida 33442 • (954) 421-7400 • Fax (954) 421-2584

LOG NO: D8-40389  
Received: 25 FEB 98  
Reported: 26 FEB 98

Mr. Pitt Maner  
Blasland Bouck & Lee, Inc.  
185 NW Spanish River Boulevard, Suite 110  
Boca Raton, FL 33431

Project: #399.33 (Roosevelt Rds)  
Sampled By: DP/PM  
Code: 134680313

## REPORT OF RESULTS

Page 1

LOG NO	SAMPLE DESCRIPTION , SOLID OR SEMISOLID SAMPLES	DATE/ TIME SAMPLED
40389-1	520 SB-4 (2-6)	02-23-98/1500
40389-2	520 SB-4 (8-10)	02-23-98/1520
40389-3	520 SB-5 (2-6)	02-24-98/1000
40389-4	520 SB-5 (8-10)	02-24-98/1030
40389-5	520 SB-6 (2-6)	02-24-98/1330

PARAMETER	40389-1	40389-2	40389-3	40389-4	40389-5
<b>Aromatic Volatiles (8020)</b>					
Benzene, ug/kg	<5.0	640	<5.0	<5.0	<5.0
Chlorobenzene, ug/kg	<5.0	<25	<5.0	<5.0	<5.0
1,2-Dichlorobenzene, ug/kg	<5.0	<25	<5.0	<5.0	<5.0
1,3-Dichlorobenzene, ug/kg	<5.0	<25	<5.0	<5.0	<5.0
1,4-Dichlorobenzene, ug/kg	<5.0	<25	<5.0	<5.0	<5.0
Ethylbenzene, ug/kg	<5.0	87	<5.0	<5.0	<5.0
Toluene, ug/kg	<5.0	640	<5.0	<5.0	<5.0
Xylenes, ug/kg	<5.0	480	<5.0	<5.0	<5.0
Methyl-tert-butyl ether (MTBE), ug/kg	<50	<250	<50	<50	<50
Date Analyzed	02.25.98	02.26.98	02.25.98	02.25.98	02.25.98
Dilution factor	1	5/50	1	1	1
<b>Petroleum Hydrocarbons (9073)</b>					
Petroleum Hydrocarbons, mg/kg	14	<10	<10	<10	<10
Date Extracted	02.25.98	02.25.98	02.25.98	02.25.98	02.25.98
Date Analyzed	02.25.98	02.25.98	02.25.98	02.25.98	02.25.98
Percent Solids	86	70	81	82	87

Validated & Certified by: Abraham Ortiz  
License No.: 3314

**SL SAVANNAH LABORATORIES**  
 & ENVIRONMENTAL SERVICES, INC.

414 SW 12th Avenue • Deerfield Beach, Florida 33442 • (954) 421-7400 • Fax (954) 421-2584

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Mr. Pitt Maner  
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 185 NW Spanish River Boulevard, Suite 110  
 Boca Raton, FL 33431

Project: #399.33 (Roosevelt Rds)  
 Sampled By: DP/PM  
 Code: 134680313

REPORT OF RESULTS

Page 2

LOG NO	SAMPLE DESCRIPTION , SOLID OR SEMISOLID SAMPLES	DATE/ TIME SAMPLED	
40389-6	520 Dup 1	02-24-98	
40389-7	520 SB-6 (8-10)	02-24-98/1345	
PARAMETER		40389-6	40389-7
Aromatic Volatiles (8020)			
Benzene, ug/kg		<5.0	<5.0
Chlorobenzene, ug/kg		<5.0	<5.0
1,2-Dichlorobenzene, ug/kg		<5.0	<5.0
1,3-Dichlorobenzene, ug/kg		<5.0	<5.0
1,4-Dichlorobenzene, ug/kg		<5.0	<5.0
Ethylbenzene, ug/kg		<5.0	<5.0
Toluene, ug/kg		<5.0	<5.0
Xylenes, ug/kg		<5.0	<5.0
Methyl-tert-butyl ether (MTBE), ug/kg		<50	<50
Date Analyzed		02.25.98	02.25.98
Dilution factor		1	1
Petroleum Hydrocarbons (9073)			
Petroleum Hydrocarbons, mg/kg		<10	<10
Date Extracted		02.25.98	02.25.98
Date Analyzed		02.25.98	02.25.98
Percent Solids		80	82

Validated & Certified by: Abraham Ortiz  
 License No.: 2314

LOG NO: D8-40389  
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Mr. Pitt Maner  
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 185 NW Spanish River Boulevard, Suite 110  
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Project: #399.33 (Roosevelt Rds)  
 Sampled By: DP/PM  
 Code: 134680313

REPORT OF RESULTS

Page 3

LOG NO	SAMPLE DESCRIPTION , LIQUID SAMPLES	DATE/ TIME SAMPLED
40389-8	Rinsate Blank	02-24-98/1400
PARAMETER	40389-8	
Aromatic Volatiles (8020)		
Benzene, ug/l		<1.0
Chlorobenzene, ug/l		<1.0
1,2-Dichlorobenzene, ug/l		<1.0
1,3-Dichlorobenzene, ug/l		<1.0
1,4-Dichlorobenzene, ug/l		<1.0
Ethylbenzene, ug/l		<1.0
Toluene, ug/l		<1.0
Xylenes, ug/l		<2.0
Methyl-tert-butyl ether (MTBE), ug/l		<10
Date Analyzed		02.25.98
Dilution factor		1
Petroleum Hydrocarbons (418.1)		
Petroleum Hydrocarbons, mg/l		<1.0
Date Extracted		02.25.98
Date Analyzed		02.25.98

Validated & Certified by: Abraham Ortiz  
 License No.: 2314

LOG NO: D8-40389  
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Mr. Pitt Maner  
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Project: #399.33 (Roosevelt Rds)  
 Sampled By: DP/PM  
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REPORT OF RESULTS

Page 4

LOG NO SAMPLE DESCRIPTION , QC REPORT FOR SOLID/SEMISOLID

40389-9 Method Blank  
 40389-10 Accuracy (%Rec)  
 40389-11 Precision (%RPD)  
 40389-12 Reporting Limit (RL)

PARAMETER	40389-9	40389-10	40389-11	40389-12
<b>Aromatic Volatiles (8020)</b>				
Benzene, ug/kg	<5.0	133 %	9.0 %	5.0
Chlorobenzene, ug/kg	<5.0	126 %	0.79 %	5.0
1,2-Dichlorobenzene, ug/kg	<5.0	---	---	5.0
1,3-Dichlorobenzene, ug/kg	<5.0	---	---	5.0
1,4-Dichlorobenzene, ug/kg	<5.0	---	---	5.0
Ethylbenzene, ug/kg	<5.0	---	---	5.0
Toluene, ug/kg	<5.0	128 %	4.7 %	5.0
Xylenes, ug/kg	<5.0	---	---	5.0
Methyl-tert-butyl ether (MTBE), ug/kg	<50	---	---	50
Date Analyzed	02.25.98	---	---	---
<b>Petroleum Hydrocarbons (9073)</b>				
Petroleum Hydrocarbons, mg/kg	<10	62 %	1.6 %	10
Date Extracted	02.25.98	---	---	---
Date Analyzed	02.25.98	---	---	---

Validated & Certified by: Abraham Ortiz  
 License No.: 5314

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LOG NO: D8-40389  
Received: 25 FEB 98  
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185 NW Spanish River Boulevard, Suite 110  
Boca Raton, FL 33431

Project: #399.33 (Roosevelt Rds)  
Sampled By: DP/PM  
Code: 134680313

## REPORT OF RESULTS

Page 5

### LOG NO SAMPLE DESCRIPTION , QC REPORT FOR LIQUID SAMPLES

40389-13 Method Blank  
40389-14 Accuracy (%Rec)  
40389-15 Precision (%RPD)  
40389-16 Reporting Limit (RL)

PARAMETER	40389-13	40389-14	40389-15	40389-16
<b>Aromatic Volatiles (8020)</b>				
Benzene, ug/l	<1.0	102 %	3.9 %	1.0
Chlorobenzene, ug/l	<1.0	110 %	4.6 %	1.0
1,2-Dichlorobenzene, ug/l	<1.0	---	---	1.0
1,3-Dichlorobenzene, ug/l	<1.0	---	---	1.0
1,4-Dichlorobenzene, ug/l	<1.0	---	---	1.0
Ethylbenzene, ug/l	<1.0	---	---	1.0
Toluene, ug/l	<1.0	106 %	3.8 %	1.0
Xylenes, ug/l	<2.0	---	---	2.0
Methyl-tert-butyl ether (MTBE), ug/l	<10	---	---	10
Date Analyzed	02.25.98	---	---	---
<b>Petroleum Hydrocarbons (418.1)</b>				
Petroleum Hydrocarbons, mg/l	<1.0	47 %	4.1 %	1.0
Date Extracted	02.25.98	---	---	---
Date Analyzed	02.25.98	---	---	---

Comprehensive Quality Assurance Plan #890142G.  
SL Certifications: E86221/86371  
Method Reference: EPA 600/4-79-020 and EPA SW-846.

  
Paul Canevaro, Project Manager

Validated & Certified by:   
License No.: 2314

Final Page Of Report

Laboratories in Savannah, GA • Tallahassee, FL • Tampa, FL • Deerfield Beach, FL • Mobile, AL

# SL SAVANNAH LABORATORIES & ENVIRONMENTAL SERVICES, INC.

- 5102 LaRoche Avenue, Savannah, GA 31404 Phone: (912) 354-7858 Fax: (912) 352-0165
- 2846 Industrial Plaza Drive, Tallahassee, FL 32301 Phone: (904) 878-3994 Fax: (904) 878-9504
- 414 SW 12th Avenue, Deerfield Beach, FL 33442 Phone: (954) 421-7400 Fax: (954) 421-2584
- 900 Lakeside Drive, Mobile, AL 36693 Phone: (334) 666-6633 Fax: (334) 666-6696
- 6712 Benjamin Road, Suite 100, Tampa, FL 33634 Phone: (813) 885-7427 Fax: (813) 885-7049
- 100 Alpha Drive, Suite 110, Destrehan, LA 70047 Phone: (504) 764-1100 Fax: (504) 725-1163

## ANALYSIS REQUEST AND CHAIN OF CUSTODY RECORD

24 HR - RUSH

PROJECT REFERENCE <b>Roosevelt Rds Site 520</b>		PROJECT NO. <b>399.33</b>	P.O. NUMBER	MATRIX TYPE	REQUIRED ANALYSES	PAGE 1 OF 1
PROJECT LOC. (State) <b>Puerto Rico</b>	SAMPLER(S) NAME <b>Pan Press / P. Maner</b>	PHONE <b>561-750-3733</b>	FAX <b>787-860-4538</b>	<div style="display: flex; flex-direction: column; align-items: center;"> <div style="writing-mode: vertical-rl; transform: rotate(180deg); font-size: 0.8em;">AQUEOUS (WATER)</div> <div style="writing-mode: vertical-rl; transform: rotate(180deg); font-size: 0.8em;">SOLID OR SEMISOLID</div> <div style="writing-mode: vertical-rl; transform: rotate(180deg); font-size: 0.8em;">AIR</div> <div style="writing-mode: vertical-rl; transform: rotate(180deg); font-size: 0.8em;">NONAQUEOUS LIQUID (Oil solvent etc)</div> </div> <div style="font-size: 0.8em; margin-top: 5px;"> <b>EPA 418.1 250ml glass</b>  <b>EPA 8020 100ml glass</b>  <b>EPA 8020 100ml glass</b>  <b>MLP 418.1 40ml glass</b>  <b>EPA 418.1 500ml glass</b> </div>		
CLIENT NAME <b>BB&amp;L</b>	CLIENT PROJECT MANAGER <b>P. Maner</b>	CLIENT ADDRESS (CITY, STATE, ZIP) <b>Boca Raton, FL</b>				<input type="checkbox"/> STANDARD REPORT DELIVERY <input checked="" type="checkbox"/> EXPEDITED REPORT DELIVERY (surcharge) Date Due: <b>24 HR TAT</b>

SAMPLE		SL NO.	SAMPLE IDENTIFICATION	NUMBER OF CONTAINERS SUBMITTED						REMARKS	
DATE	TIME										
2-23-98	1500	520	SB-4 (2-6)	X		1	1				
2-23-98	1520	520	SB-4 (8-10)	X		1	1				
2-24-98	1000	520	SB-5 (2-6)	X		1	1				
2-24-98	1030	520	SB-5 (8-10)	X		1	1				
2-24-98	1330	520	SB-6 (2-6)	X		1	1				
2-24-98	-	520	520 Pup 1	X		1	1				
2-24-98	1345	520	SB-6 (8-10)			1	1				
2-24-98	1400		Rinsate Blank TRIP Blank			3	1				Do not analyze unless rinsate blank w/ detectable concentration

RELINQUISHED BY: (SIGNATURE) <i>[Signature]</i>	DATE <b>2/17</b>	TIME	RELINQUISHED BY: (SIGNATURE) <i>[Signature]</i>	DATE <b>2-24-98</b>	TIME <b>1530</b>	RELINQUISHED BY: (SIGNATURE)	DATE	TIME
RECEIVED BY: (SIGNATURE)	DATE	TIME	RECEIVED BY: (SIGNATURE)	DATE	TIME	RECEIVED BY: (SIGNATURE)	DATE	TIME

LABORATORY USE ONLY						
RECEIVED FOR LABORATORY BY: (SIGNATURE) <i>[Signature]</i>	DATE <b>2/25/98</b>	TIME <b>1100</b>	CUSTODY INTACT <input type="checkbox"/> YES <input type="checkbox"/> NO	CUSTODY SEAL NO. <b>✓/CS</b>	SL LOG NO. <b>0870389</b>	LABORATORY REMARKS:

ORIGINAL

## CERTIFICATE

I certify that I have reviewed and evaluated all analytical raw data concerning all the samples contained in the Laboratory Report of Analysis for Savannah Laboratories Log Number D8-40411.

I hereby certify that , to the best of my knowlege, the results for log number D8-40411, pages 1-4 (inclusive), signed by Paul Canevaro, are correct and reliable.



LOG NO: D8-40411  
 Received: 26 FEB 98  
 Reported: 27 FEB 98

Mr. Pitt Maner  
 Blasland Bouck & Lee, Inc.  
 185 NW Spanish River Boulevard, Suite 110  
 Boca Raton, FL 33431

Project: #399.33 (Roosevelt Rds)  
 Sampled By: D. Press  
 Code: 13208047

REPORT OF RESULTS

Page 1

LOG NO	SAMPLE DESCRIPTION , SOLID OR SEMISOLID SAMPLES	DATE/ TIME SAMPLED			
40411-1	SB-7 (2-6)	02-25-98/0940			
40411-2	SB-7 (8-10)	02-25-98/1030			
40411-3	SB-8 (2-6)	02-25-98/1330			
40411-4	SB-8 (8-10)	02-25-98/1345			
PARAMETER		40411-1	40411-2	40411-3	40411-4
<b>Aromatic Volatiles (8020)</b>					
Benzene, ug/kg		27	<5.0	<5.0	<5.0
Chlorobenzene, ug/kg		<5.0	<5.0	<5.0	<5.0
1,2-Dichlorobenzene, ug/kg		<5.0	<5.0	<5.0	<5.0
1,3-Dichlorobenzene, ug/kg		<5.0	<5.0	<5.0	<5.0
1,4-Dichlorobenzene, ug/kg		<5.0	<5.0	<5.0	<5.0
Ethylbenzene, ug/kg		69	<5.0	<5.0	<5.0
Toluene, ug/kg		6.0	<5.0	<5.0	<5.0
Xylenes, ug/kg		130	7.0	<5.0	<5.0
Methyl-tert-butyl ether (MTBE), ug/kg		<50	<50	<50	<50
Date Analyzed		02.27.98	02.27.98	02.27.98	02.27.98
<b>Petroleum Hydrocarbons (9073)</b>					
Petroleum Hydrocarbons, mg/kg		22	<10	<10	<10
Date Extracted		02.26.98	02.26.98	02.26.98	02.26.98
Date Analyzed		02.26.98	02.26.98	02.26.98	02.26.98

Validated & Certified by *Abraham Ortiz*  
 License No.: 3314

# SL SAVANNAH LABORATORIES & ENVIRONMENTAL SERVICES, INC.

414 SW 12th Avenue • Deerfield Beach, Florida 33442 • (954) 421-7400 • Fax (954) 421-2584

LOG NO: D8-40411  
Received: 26 FEB 98  
Reported: 27 FEB 98

Mr. Pitt Maner  
Blasland Bouck & Lee, Inc.  
185 NW Spanish River Boulevard, Suite 110  
Boca Raton, FL 33431

Project: #399.33 (Roosevelt Rds)  
Sampled By: D. Press  
Code: 13208047  
Page 2

## REPORT OF RESULTS

LOG NO	SAMPLE DESCRIPTION , LIQUID SAMPLES	DATE/ TIME SAMPLED
40411-5	Rinsate Blank	02-25-98/1430
PARAMETER		40411-5
Aromatic Volatiles (8020)		
Benzene, ug/l		<1.0
Chlorobenzene, ug/l		<1.0
1,2-Dichlorobenzene, ug/l		<1.0
1,3-Dichlorobenzene, ug/l		<1.0
1,4-Dichlorobenzene, ug/l		<1.0
Ethylbenzene, ug/l		<1.0
Toluene, ug/l		<1.0
Xylenes, ug/l		<2.0
Methyl-tert-butyl ether (MTBE), ug/l		<10
Date Analyzed		02.27.98
Petroleum Hydrocarbons (418.1)		
Petroleum Hydrocarbons, mg/l		<1.0
Date Extracted		02.26.98
Date Analyzed		02.26.98

Validated & Certified by: *Mahamud*

License No.: 3314

# SL SAVANNAH LABORATORIES & ENVIRONMENTAL SERVICES, INC.

414 SW 12th Avenue • Deerfield Beach, Florida 33442 • (954) 421-7400 • Fax (954) 421-2584

LOG NO: D8-40411  
Received: 26 FEB 98  
Reported: 27 FEB 98

Mr. Pitt Maner  
Blasland Bouck & Lee, Inc.  
185 NW Spanish River Boulevard, Suite 110  
Boca Raton, FL 33431

Project: #399.33 (Roosevelt Rds)  
Sampled By: D. Press  
Code: 13208047  
Page 3

## REPORT OF RESULTS

LOG NO SAMPLE DESCRIPTION , QC REPORT FOR SOLID/SEMISOLID

40411-6 Method Blank  
40411-7 Accuracy (%Rec)  
40411-8 Precision (%RPD)  
40411-9 Reporting Limit (RL)

PARAMETER	40411-6	40411-7	40411-8	40411-9
<b>Aromatic Volatiles (8020)</b>				
Benzene, ug/kg	<5.0	86 %	2.3 %	5.0
Chlorobenzene, ug/kg	<5.0	88 %	1.1 %	5.0
1,2-Dichlorobenzene, ug/kg	<5.0	---	---	5.0
1,3-Dichlorobenzene, ug/kg	<5.0	---	---	5.0
1,4-Dichlorobenzene, ug/kg	<5.0	---	---	5.0
Ethylbenzene, ug/kg	<5.0	---	---	5.0
Toluene, ug/kg	<5.0	86 %	---	5.0
Xylenes, ug/kg	<5.0	---	0 %	5.0
Methyl-tert-butyl ether (MTBE), ug/kg	<50	---	---	50
Date Analyzed	02.27.98	---	---	---
<b>Petroleum Hydrocarbons (9073)</b>				
Petroleum Hydrocarbons, mg/kg	<10	62 %	1.6 %	10
Date Extracted	02.26.98	---	---	---
Date Analyzed	02.26.98	---	---	---

Validated & Certified by: Blasland

License No.: 2314

# SL SAVANNAH LABORATORIES & ENVIRONMENTAL SERVICES, INC.

414 SW 12th Avenue • Deerfield Beach, Florida 33442 • (954) 421-7400 • Fax (954) 421-2584

LOG NO: D8-40411  
Received: 26 FEB 98  
Reported: 27 FEB 98

Mr. Pitt Maner  
Blasland Bouck & Lee, Inc.  
185 NW Spanish River Boulevard, Suite 110  
Boca Raton, FL 33431

Project: #399.33 (Roosevelt Rds)  
Sampled By: D. Press  
Code: 13208047  
Page 4

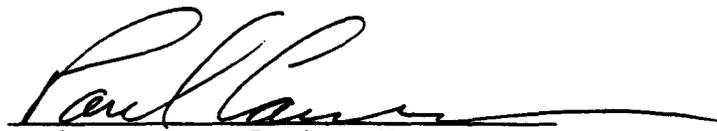
## REPORT OF RESULTS

### LOG NO SAMPLE DESCRIPTION , QC REPORT FOR LIQUID SAMPLES

40411-10 Method Blank  
40411-11 Accuracy (%Rec)  
40411-12 Precision (%RPD)  
40411-13 Reporting Limit (RL)

PARAMETER	40411-10	40411-11	40411-12	40411-13
<b>Aromatic Volatiles (8020)</b>				
Benzene, ug/l	<1.0	80 %	1.2 %	1.0
Chlorobenzene, ug/l	<1.0	78 %	1.3 %	1.0
1,2-Dichlorobenzene, ug/l	<1.0	---	---	1.0
1,3-Dichlorobenzene, ug/l	<1.0	---	---	1.0
1,4-Dichlorobenzene, ug/l	<1.0	---	---	1.0
Ethylbenzene, ug/l	<1.0	---	---	1.0
Toluene, ug/l	<1.0	80 %	2.5 %	1.0
Xylenes, ug/l	<2.0	---	---	2.0
Methyl-tert-butyl ether (MTBE), ug/l	<10	---	---	10
Date Analyzed	02.27.98	---	---	---
<b>Petroleum Hydrocarbons (418.1)</b>				
Petroleum Hydrocarbons, mg/l	<1.0	74 %	4.1 %	1.0
Date Extracted	02.26.98	---	---	---
Date Analyzed	02.26.98	---	---	---

Comprehensive Quality Assurance Plan #890142G.  
SL Certifications: E86221/86371  
Method References : EPA 600/4-79-020 and SW-846.

  
Paul Canevaro, Project Manager

Validated & Certified by:   
License No.: 2314

## CERTIFICATE

I certify that I have reviewed and evaluated all analytical raw data concerning all the samples contained in the Laboratory Report of Analysis for Savannah Laboratories Log Number D8-40437.

I hereby certify that , to the best of my knowlege, the results for log number D8-40437, pages 1-6 (inclusive), signed by Paul Canevaro, are correct and reliable.



LOG NO: D8-40437  
 Received: 28 FEB 98  
 Reported: 04 MAR 98

Mr. Pitt Maner  
 Blasland Bouck & Lee, Inc.  
 185 NW Spanish River Boulevard, Suite 110  
 Boca Raton, FL 33431

Project: #399.33 (Roosevelt Rds)  
 Sampled By: DP/PM  
 Code: 134680313

REPORT OF RESULTS

Page 1

LOG NO	SAMPLE DESCRIPTION , SOLID OR SEMISOLID SAMPLES	DATE/ TIME SAMPLED				
40437-1	520 SB-9 (2-6)	02-26-98/0930				
40437-2	520 SB-9 (8-10)	02-26-98/1010				
40437-3	520 SB-10 (2-6)	02-26-98/1400				
40437-4	520 SB-10 (8-10)	02-26-98/1430				
40437-5	520 SB-11 (2-6)	02-26-98/1530				
PARAMETER	40437-1	40437-2	40437-3	40437-4	40437-5	
<b>Aromatic Volatiles (8020)</b>						
Benzene, ug/kg	38	150*F35	<5.0	<5.0	<5.0	
Chlorobenzene, ug/kg	<5.0	<5.0	<5.0	<5.0	<5.0	
1,2-Dichlorobenzene, ug/kg	<5.0	<5.0	<5.0	<5.0	<5.0	
1,3-Dichlorobenzene, ug/kg	<5.0	<5.0	<5.0	<5.0	<5.0	
1,4-Dichlorobenzene, ug/kg	<5.0	<5.0	<5.0	<5.0	<5.0	
Ethylbenzene, ug/kg	<5.0	25	<5.0	<5.0	<5.0	
Toluene, ug/kg	6.1	540*F35	<5.0	<5.0	<5.0	
Xylenes, ug/kg	<5.0	150	<5.0	<5.0	<5.0	
Methyl-tert-butyl ether (MTBE), ug/kg	<50	<50	<50	<50	<50	
Date Analyzed	03.02.98	03.02.98	03.02.98	03.03.98	03.02.98	
Dilution factor	1	1/5	1	1	1	
<b>Petroleum Hydrocarbons (9073)</b>						
Petroleum Hydrocarbons, mg/kg	38	16	110	<10	<10	
Date Extracted	03.02.98	03.02.98	03.02.98	03.02.98	03.02.98	
Date Analyzed	03.02.98	03.02.98	03.02.98	03.02.98	03.02.98	

Validated & Certified by: *Maham Butig*

License No.: 2314

LOG NO: D8-40437  
 Received: 28 FEB 98  
 Reported: 04 MAR 98

Mr. Pitt Maner  
 Blasland Bouck & Lee, Inc.  
 185 NW Spanish River Boulevard, Suite 110  
 Boca Raton, FL 33431

Project: #399.33 (Roosevelt Rds)  
 Sampled By: DP/PM  
 Code: 134680313

REPORT OF RESULTS

Page 2

LOG NO	SAMPLE DESCRIPTION , SOLID OR SEMISOLID SAMPLES	DATE/ TIME SAMPLED
40437-6	520 SB-11 (8-10)	02-26-98/1545
PARAMETER	40437-6	
Aromatic Volatiles (8020)		
Benzene, ug/kg		<5.0
Chlorobenzene, ug/kg		<5.0
1,2-Dichlorobenzene, ug/kg		<5.0
1,3-Dichlorobenzene, ug/kg		<5.0
1,4-Dichlorobenzene, ug/kg		<5.0
Ethylbenzene, ug/kg		<5.0
Toluene, ug/kg		<5.0
Xylenes, ug/kg		<5.0
Methyl-tert-butyl ether (MTBE), ug/kg		<50
Date Analyzed		03.02.98
Dilution factor		1
Petroleum Hydrocarbons (9073)		
Petroleum Hydrocarbons, mg/kg		<10
Date Extracted		03.02.98
Date Analyzed		03.02.98
Percent Solids		90

Validated & Certified by: Abraham Ortiz  
 License No.: 2314

LOG NO: D8-40437  
Received: 28 FEB 98  
Reported: 04 MAR 98

Mr. Pitt Maner  
Blasland Bouck & Lee, Inc.  
185 NW Spanish River Boulevard, Suite 110  
Boca Raton, FL 33431

Project: #399.33 (Roosevelt Rds)  
Sampled By: DP/PM  
Code: 134680313  
Page 3

REPORT OF RESULTS

LOG NO	SAMPLE DESCRIPTION , LIQUID SAMPLES	DATE/ TIME SAMPLED
40437-7	520 Auger Blank	02-26-98/1045
PARAMETER		40437-7
Aromatic Volatiles (8020)		
Benzene, ug/l		<1.0
Chlorobenzene, ug/l		<1.0
1,2-Dichlorobenzene, ug/l		<1.0
1,3-Dichlorobenzene, ug/l		<1.0
1,4-Dichlorobenzene, ug/l		<1.0
Ethylbenzene, ug/l		<1.0
Toluene, ug/l		<1.0
Xylenes, ug/l		<2.0
Methyl-tert-butyl ether (MTBE), ug/l		<10
Date Analyzed		03.02.98
Dilution factor		1
Petroleum Hydrocarbons (418.1)		
Petroleum Hydrocarbons, mg/l		<1.0
Date Extracted		03.02.98
Date Analyzed		03.02.98

Validated & Certified by: Abraham Ortiz  
License No.: 2314

LOG NO: D8-40437  
Received: 28 FEB 98  
Reported: 04 MAR 98

Mr. Pitt Maner  
Blasland Bouck & Lee, Inc.  
185 NW Spanish River Boulevard, Suite 110  
Boca Raton, FL 33431

Project: #399.33 (Roosevelt Rds)  
Sampled By: DP/PM  
Code: 134680313  
Page 4

REPORT OF RESULTS

LOG NO	SAMPLE DESCRIPTION , LIQUID SAMPLES	DATE SAMPLED
40437-8	Trip Blank	02-27-98
PARAMETER	40437-8	
Aromatic Volatiles (8020)		
Benzene, ug/l		<1.0
Chlorobenzene, ug/l		<1.0
1,2-Dichlorobenzene, ug/l		<1.0
1,3-Dichlorobenzene, ug/l		<1.0
1,4-Dichlorobenzene, ug/l		<1.0
Ethylbenzene, ug/l		<1.0
Toluene, ug/l		<1.0
Xylenes, ug/l		<2.0
Methyl-tert-butyl ether (MTBE), ug/l		<10
Date Analyzed		03.02.98
Dilution factor		1

Validated & Certified by: Abraham Ortiz  
License No.: 3314

LOG NO: D8-40437  
 Received: 28 FEB 98  
 Reported: 04 MAR 98

Mr. Pitt Maner  
 Blasland Bouck & Lee, Inc.  
 185 NW Spanish River Boulevard, Suite 110  
 Boca Raton, FL 33431

Project: #399.33 (Roosevelt Rds)  
 Sampled By: DP/PM  
 Code: 134680313

REPORT OF RESULTS

Page 5

LOG NO	SAMPLE DESCRIPTION , QC REPORT FOR SOLID/SEMISOLID			
40437-9	Method Blank			
40437-10	Accuracy (%Rec)			
40437-11	Precision (%RPD)			
40437-12	Reporting Limit (RL)			
PARAMETER	40437-9	40437-10	40437-11	40437-12
<b>Aromatic Volatiles (8020)</b>				
Benzene, ug/kg	<5.0	88 %	1.1 %	5.0
Chlorobenzene, ug/kg	<5.0	88 %	1.1 %	5.0
1,2-Dichlorobenzene, ug/kg	<5.0	---	---	5.0
1,3-Dichlorobenzene, ug/kg	<5.0	---	---	5.0
1,4-Dichlorobenzene, ug/kg	<5.0	---	---	5.0
Ethylbenzene, ug/kg	<5.0	---	---	5.0
Toluene, ug/kg	<5.0	89 %	2.2 %	5.0
Xylenes, ug/kg	<5.0	---	---	5.0
Methyl-tert-butyl ether (MTBE), ug/kg	<50	---	---	50
Date Analyzed	03.02.98	---	---	---
<b>Petroleum Hydrocarbons (9073)</b>				
Petroleum Hydrocarbons, mg/kg	<10	69 %	0 %	10
Date Extracted	03.02.98	---	---	---
Date Analyzed	03.02.98	---	---	---

Analysed & Certified by: M. A. ...  
 License No.: 2314

# SL SAVANNAH LABORATORIES & ENVIRONMENTAL SERVICES, INC.

414 SW 12th Avenue • Deerfield Beach, Florida 33442 • (954) 421-7400 • Fax (954) 421-2584

LOG NO: D8-40437  
Received: 28 FEB 98  
Reported: 04 MAR 98

Mr. Pitt Maner  
Blasland Bouck & Lee, Inc.  
185 NW Spanish River Boulevard, Suite 110  
Boca Raton, FL 33431

Project: #399.33 (Roosevelt Rds)  
Sampled By: DP/PM  
Code: 134680313  
Page 6

## REPORT OF RESULTS

LOG NO SAMPLE DESCRIPTION , QC REPORT FOR LIQUID SAMPLES

40437-13 Method Blank  
40437-14 Accuracy (%Rec)  
40437-15 Precision (%RPD)  
40437-16 Reporting Limit (RL)

PARAMETER	40437-13	40437-14	40437-15	40437-16
<b>Aromatic Volatiles (8020)</b>				
Benzene, ug/l	<1.0	84 %	2.4 %	1.0
Chlorobenzene, ug/l	<1.0	82 %	2.4 %	1.0
1,2-Dichlorobenzene, ug/l	<1.0	---	---	1.0
1,3-Dichlorobenzene, ug/l	<1.0	---	---	1.0
1,4-Dichlorobenzene, ug/l	<1.0	---	---	1.0
Ethylbenzene, ug/l	<1.0	---	---	1.0
Toluene, ug/l	<1.0	85 %	2.4 %	1.0
Xylenes, ug/l	<2.0	---	---	2.0
Methyl-tert-butyl ether (MTBE), ug/l	<10	---	---	10
Date Analyzed	03.02.98	---	---	---
<b>Petroleum Hydrocarbons (418.1)</b>				
Petroleum Hydrocarbons, mg/l	<1.0	86 %	3.5 %	1.0
Date Extracted	03.02.98	---	---	---
Date Analyzed	03.02.98	---	---	---

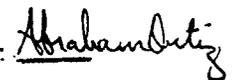
Comprehensive Quality Assurance Plan #890142G.

SL Certifications: E86221/86371

Method Reference: EPA SW-846.

\*F35 = Due to the analyte abundance, target compound concentrations are reported from multiple runs to achieve requested detection limits.

  
Paul Canevaro, Project Manager

Validated & Certified by:   
License No.: 2314

Final Page Of Report

Laboratories in Savannah, GA • Tallahassee, FL • Tampa, FL • Deerfield Beach, FL • Mobile, AL

## CERTIFICATE

I hereby certify that our staff have reviewed and evaluated all analytical raw data concerning laboratory reports of analyses for SL Log No. D840437A, sample 1, and to the best of my knowledge, the results for said log number pages 1-2 (inclusive), signed by Laura B. Snead (SL Project Manager) are correct and reliable.



**SL SAVANNAH LABORATORIES**  
& ENVIRONMENTAL SERVICES, INC.

2846 Industrial Plaza Drive (32301) • P.O. Box 13056 • Tallahassee, FL 32317-3056 • (850) 878-3994 • Fax (850) 878-9504

LOG NO: D8-40437A  
Received: 03 MAR 98  
Reported: 09 MAR 98  
Revised: 17 NOV 98

Mr. Pitt Maner  
Blasland Bouck & Lee, Inc.  
185 NW Spanish River Boulevard, Suite 110  
Boca Raton, FL 33431

Project: #399.33 (Roosevelt Rds)  
Sampled By: DP/PM  
Code: 170281118

REPORT OF RESULTS

Page 1

LOG NO	SAMPLE DESCRIPTION , SOLID OR SEMISOLID SAMPLES	DATE/ TIME SAMPLED
40437A-1	520 SB-10 (2-6)	02-26-98/1400
PARAMETER	40437A-1	
Gasoline Range Organics (8015M)		
Hydrocarbons as GRO, mg/kg	<0.18*F78	
Date Analyzed	03.05.98	
Dilution factor	1	
Petroleum Hydrocarbons by GC (8015 - Extractable)		
Petroleum Hydrocarbons (DRO), mg/kg dw	<10	
Date Extracted	03.04.98	

Validated & Certified by: Abraham Ortiz  
License No.: 3314

LOG NO: D8-40437A  
 Received: 03 MAR 98  
 Reported: 09 MAR 98  
 Revised: 17 NOV 98

Mr. Pitt Maner  
 Blasland Bouck & Lee, Inc.  
 185 NW Spanish River Boulevard, Suite 110  
 Boca Raton, FL 33431

Project: #399.33 (Roosevelt Rds)  
 Sampled By: DP/PM  
 Code: 170281118  
 Page 2

REPORT OF RESULTS

LOG NO	SAMPLE DESCRIPTION , QC REPORT FOR SOLID/SEMISOLID			
40437A-2	Method Blank			
40437A-3	Accuracy (%Rec)			
40437A-4	Precision (%RPD)			
40437A-5	Reporting Limit (RL)			
PARAMETER	40437A-2	40437A-3	40437A-4	40437A-5
Gasoline Range Organics (8015M)				
Hydrocarbons as GRO, mg/kg	<0.18	88 %	8 %	0.18
Date Analyzed	03.05.98	---	---	---
Petroleum Hydrocarbons by GC (8015 - Extractable)				
Petroleum Hydrocarbons (DRO), mg/kg dw	<10	119 %	15 %	10
Date Extracted	03.04.98	---	---	---

Comprehensive Quality Assurance Plan #890142G.  
 SL Certifications: E86221/86371  
 SL Certifications: E87052/87279  
 Method Reference: EPA SW-846.

\*F78 = Sample results are reported on an "as is" basis.

*Paul Canevaro*  
 Paul Canevaro, Project Manager

Validated & Certified by: *Abraham Ortiz*  
 License No.: 3314

# SL SAVANNAH LABORATORIES & ENVIRONMENTAL SERVICES, INC.

- 5102 LaRoche Avenue, Savannah, GA 31404 Phone: (912) 354-7858 Fax: (912) 352-0165
- 2846 Industrial Plaza Drive, Tallahassee, FL 32301 Phone: (904) 878-3994 Fax: (904) 878-9504
- 414 SW 12th Avenue, Deerfield Beach, FL 33442 Phone: (954) 421-7400 Fax: (954) 421-2584
- 900 Lakeside Drive, Mobile, AL 36693 Phone: (334) 666-6633 Fax: (334) 666-6696
- 6712 Benjamin Road, Suite 100, Tampa, FL 33634 Phone: (813) 885-7427 Fax: (813) 885-7049
- 100 Alpha Drive, Suite 110, Destrehan, LA 70047 Phone: (504) 764-1100 Fax: (504) 725-1163

## ANALYSIS REQUEST AND CHAIN OF CUSTODY RECORD

PROJECT REFERENCE <b>Roosevelt Rds Site 520</b>		PROJECT NO. <b>399.33</b>	P.O. NUMBER	MATRIX TYPE	REQUIRED ANALYSES	PAGE 1 OF 1
PROJECT LOC. (State) <b>Puerto Rico</b>	SAMPLER(S) NAME <b>P. Press / P. Maner</b>	PHONE <b>361 750-3733</b>	FAX <b>361-395-0411</b>	AQUEOUS (WATER) SOLID OR SEMISOLID AIR NONAQUEOUS LIQUID (w/ solvent, etc) EPA 410.1 250 ml (2195) EPA 8020 100 ml (2145) EPA 8020 40 ml (2145) EPA 410.1 500 ml glass		
CLIENT NAME <b>BS&amp;L</b>	CLIENT PROJECT MANAGER <b>P. Maner</b>					
CLIENT ADDRESS (CITY, STATE, ZIP) <b>Boca Raton, FL</b>						
<input type="checkbox"/> STANDARD REPORT DELIVERY <input checked="" type="checkbox"/> EXPEDITED REPORT DELIVERY (surcharge) Date Due: <b>Mon 3-2-98</b>						

SAMPLE		SL NO.	SAMPLE IDENTIFICATION	NUMBER OF CONTAINERS SUBMITTED						REMARKS
DATE	TIME			1	2	3	4	5	6	
2-26-98	0930		520 SB-9 (2-6)	X		1	1			
2-26-98	1010		520 SB-9 (8-10)	X		1	1			RUSH TAT
2-26-98	1530		520 SB-11 (2-6)	X		1	1			
2-26-98	1045		520 Auger Blank	X				3	1	← correct date of collection is 2-26-98 pm 2-27-98
2-26-98	1430		520 SB-10 (8-10)	X		1	1			
2-26-98	1400		520 SB-10 (2-6)	X		1	1			
2-26-98	1545		520 SB-11 (8-10)	X		1	1			
2-18-98 <del>2-24-98</del>	1045		TRIP Blank					3		Send COC labels with next shipment

RELINQUISHED BY: (SIGNATURE) <i>Keriberly G. [Signature]</i>	DATE <b>1/16/98</b>	TIME <b>1800</b>	RELINQUISHED BY: (SIGNATURE) <b>P. Maner</b>	DATE <b>2-27-98</b>	TIME <b>1530</b>	RELINQUISHED BY: (SIGNATURE)	DATE	TIME
RECEIVED BY: (SIGNATURE)	DATE	TIME	RECEIVED BY: (SIGNATURE)	DATE	TIME	RECEIVED BY: (SIGNATURE)	DATE	TIME

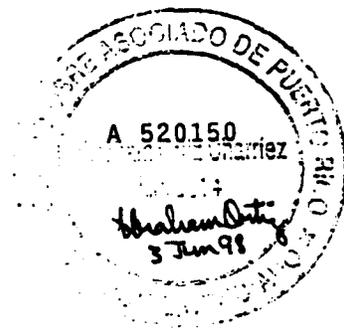
<b>LABORATORY USE ONLY</b>						
RECEIVED FOR LABORATORY BY: (SIGNATURE) <i>[Signature]</i>	DATE <b>2/26/98</b>	TIME <b>1330</b>	CUSTODY INTACT <input type="checkbox"/> YES <input type="checkbox"/> NO	CUSTODY SEAL NO.	SL LOG NO. <b>MS 40437</b>	LABORATORY REMARKS:

ORIGINAL

## CERTIFICATE

I certify that I have reviewed and evaluated all analytical raw data concerning all the samples contained in the Laboratory Report of Analysis for Savannah Laboratories Log Number D8-40675.

I hereby certify that , to the best of my knowlege, the results for log number D8-40675, pages 1-15 (inclusive), signed by Paul Canevaro, are correct and reliable.



LOG NO: D8-40675  
 Received: 28 MAR 98  
 Reported: 08 APR 98

Mr. Pitt Maner  
 Blasland Bouck & Lee, Inc.  
 185 NW Spanish River Boulevard, Suite 110  
 Boca Raton, FL 33431

Project: #399.33 (Roosevelt Rds)  
 Sampled By: RB/DP  
 Code: 12068051  
 Page 1

REPORT OF RESULTS

LOG NO	SAMPLE DESCRIPTION , LIQUID SAMPLES	DATE/ TIME SAMPLED				
40675-1	520 MW-1	03-26-98/1300				
40675-2	520 MW-4	03-26-98/1145				
40675-3	520 MW-6	03-27-98/0800				
40675-4	520 MW-7	03-26-98/1140				
40675-5	520 EQB-1	03-26-98/1245				
PARAMETER	40675-1	40675-2	40675-3	40675-4	40675-5	
<b>Aromatic Volatiles (8020)</b>						
Benzene, ug/l	550*F35	<1.0	<1.0	<1.0	<1.0	
Chlorobenzene, ug/l	<1.0	<1.0	<1.0	<1.0	<1.0	
1,2-Dichlorobenzene, ug/l	<1.0	<1.0	<1.0	<1.0	<1.0	
1,3-Dichlorobenzene, ug/l	<1.0	<1.0	<1.0	<1.0	<1.0	
1,4-Dichlorobenzene, ug/l	<1.0	<1.0	<1.0	<1.0	<1.0	
Ethylbenzene, ug/l	81*F35	<1.0	<1.0	<1.0	<1.0	
Toluene, ug/l	38	<1.0	<1.0	<1.0	<1.0	
Xylenes, ug/l	1600*F42	<2.0	<2.0	<2.0	<2.0	
Methyl-tert-butyl ether (MTBE), ug/l	95	<10	<10	<10	<10	
Date Analyzed	03.30.98	03.30.98	03.30.98	04.30.98	03.30.98	
Dilution factor	1/10/100	1	1	1	1	

Validated & Certified by: *[Signature]*

License No.: 5314

LOG NO: D8-40675  
 Received: 28 MAR 98  
 Reported: 08 APR 98

Mr. Pitt Maner  
 Blasland Bouck & Lee, Inc.  
 185 NW Spanish River Boulevard, Suite 110  
 Boca Raton, FL 33431

Project: #399.33 (Roosevelt Rds)  
 Sampled By: RB/DP  
 Code: 12068051

REPORT OF RESULTS

Page 2

LOG NO	SAMPLE DESCRIPTION , LIQUID SAMPLES	DATE/ TIME SAMPLED				
40675-1	520 MW-1	03-26-98/1300				
40675-2	520 MW-4	03-26-98/1145				
40675-3	520 MW-6	03-27-98/0800				
40675-4	520 MW-7	03-26-98/1140				
40675-5	520 EQB-1	03-26-98/1245				
PARAMETER	40675-1	40675-2	40675-3	40675-4	40675-5	
Polynuclear Aromatic Hydrocarbons (610)						
Acenaphthene, ug/l	<10	<10	<10	<10	<10	
Acenaphthylene, ug/l	<10	<10	<10	<10	<10	
Anthracene, ug/l	<10	<10	<10	<10	<10	
Benzo(a)anthracene, ug/l	<4.0	<4.0	<4.0	<4.0	<4.0	
Benzo(a)pyrene, ug/l	<4.0	<4.0	<4.0	<4.0	<4.0	
Benzo(b)fluoranthene, ug/l	<4.0	<4.0	<4.0	<4.0	<4.0	
Benzo(g,h,i)perylene, ug/l	<10	<10	<10	<10	<10	
Benzo(k)fluoranthene, ug/l	<5.0	<5.0	<5.0	<5.0	<5.0	
Chrysene, ug/l	<5.0	<5.0	<5.0	<5.0	<5.0	
Dibenzo(a,h)anthracene, ug/l	<5.0	<5.0	<5.0	<5.0	<5.0	
Fluoranthene, ug/l	<10	<10	<10	<10	<10	
Fluorene, ug/l	<10	<10	<10	<10	<10	
Indeno(1,2,3-cd)pyrene, ug/l	<5.0	<5.0	<5.0	<5.0	<5.0	
Naphthalene, ug/l	250	76	<5.0	<5.0	<5.0	
Phenanthrene, ug/l	<10	<10	<10	<10	<10	
Pyrene, ug/l	<10	<10	<10	<10	<10	
2-Methylnaphthalene, ug/l	110	26	<10	<10	<10	
1-Methylnaphthalene, ug/l	76	22	<10	<10	<10	
Date Extracted	04.01.98	04.01.98	04.01.98	04.01.98	04.01.98	
Date Analyzed	04.06.98	04.06.98	04.06.98	04.06.98	04.06.98	

Validated & Certified by: *Blasland*

License No.: 3314

LOG NO: D8-40675  
 Received: 28 MAR 98  
 Reported: 08 APR 98

Mr. Pitt Maner  
 Blasland Bouck & Lee, Inc.  
 185 NW Spanish River Boulevard, Suite 110  
 Boca Raton, FL 33431

Project: #399.33 (Roosevelt Rds)  
 Sampled By: RB/DP  
 Code: 12068051

REPORT OF RESULTS

Page 3

LOG NO	SAMPLE DESCRIPTION , LIQUID SAMPLES	DATE/ TIME SAMPLED				
40675-1	520 MW-1	03-26-98/1300				
40675-2	520 MW-4	03-26-98/1145				
40675-3	520 MW-6	03-27-98/0800				
40675-4	520 MW-7	03-26-98/1140				
40675-5	520 EQB-1	03-26-98/1245				
PARAMETER	40675-1	40675-2	40675-3	40675-4	40675-5	
Petroleum Hydrocarbons (418.1)						
Petroleum Hydrocarbons, mg/l	1.8	<1.0	<1.0	<1.0	<1.0	
Date Extracted	03.31.98	03.31.98	03.31.98	03.31.98	03.31.98	
Date Analyzed	03.31.98	03.31.98	03.31.98	03.31.98	03.31.98	
Arsenic (7060)						
Arsenic, mg/l	<0.010	<0.010	0.021	<0.010	<0.010	
Date Analyzed	04.04.98	04.04.98	04.04.98	04.04.98	04.04.98	
Barium (6010)						
Barium, mg/l	35	9.5	110	20	3.1	
Date Analyzed	04.02.98	04.02.98	04.02.98	04.02.98	04.02.98	
Cadmium (6010)						
Cadmium, mg/l	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	
Date Analyzed	04.02.98	04.02.98	04.02.98	04.02.98	04.02.98	
Chromium (6010)						
Chromium, mg/l	<0.010	<0.010	0.13	<0.010	<0.010	
Date Analyzed	04.02.98	04.02.98	04.02.98	04.02.98	04.02.98	
Lead (7421)						
Lead, mg/l	<0.0050	<0.0050	0.076	<0.0050	<0.0050	
Date Analyzed	04.06.98	04.06.98	04.06.98	04.06.98	04.06.98	

Validated & Certified by: H. [Signature]

License No.: 5814

# SL SAVANNAH LABORATORIES & ENVIRONMENTAL SERVICES, INC.

414 SW 12th Avenue • Deerfield Beach, Florida 33442 • (954) 421-7400 • Fax (954) 421-2584

LOG NO: D8-40675  
Received: 28 MAR 98  
Reported: 08 APR 98

Mr. Pitt Maner  
Blasland Bouck & Lee, Inc.  
185 NW Spanish River Boulevard, Suite 110  
Boca Raton, FL 33431

Project: #399.33 (Roosevelt Rds)  
Sampled By: RB/DP  
Code: 12068051

## REPORT OF RESULTS

Page 4

LOG NO	SAMPLE DESCRIPTION , LIQUID SAMPLES	DATE/ TIME SAMPLED				
40675-1	520 MW-1	03-26-98/1300				
40675-2	520 MW-4	03-26-98/1145				
40675-3	520 MW-6	03-27-98/0800				
40675-4	520 MW-7	03-26-98/1140				
40675-5	520 EQB-1	03-26-98/1245				
PARAMETER		40675-1	40675-2	40675-3	40675-4	40675-5
<b>Mercury (7470)</b>						
Mercury, mg/l		<0.00020	<0.00020	0.00032	<0.00020	<0.00020
Date Analyzed		03.30.98	03.30.98	03.30.98	03.30.98	03.30.98
<b>Selenium (7740)</b>						
Selenium, mg/l		<0.0050	<0.0050	<0.025*F65	<0.0050	<0.0050
Date Analyzed		04.06.98	04.06.98	04.07.98	04.02.98	04.06.98
<b>Silver (6010)</b>						
Silver, mg/l		<0.010	<0.010	0.015	<0.010	<0.010
Date Analyzed		04.02.98	04.02.98	04.02.98	04.02.98	04.02.98

Validated & Certified by: Michael De...

License No.: 2374

**SL SAVANNAH LABORATORIES**  
**& ENVIRONMENTAL SERVICES, INC.**

414 SW 12th Avenue • Deerfield Beach, Florida 33442 • (954) 421-7400 • Fax (954) 421-2584

LOG NO: D8-40675  
 Received: 28 MAR 98  
 Reported: 08 APR 98

Mr. Pitt Maner  
 Blasland Bouck & Lee, Inc.  
 185 NW Spanish River Boulevard, Suite 110  
 Boca Raton, FL 33431

Project: #399.33 (Roosevelt Rds)  
 Sampled By: RB/DP  
 Code: 12068051  
 Page 5

REPORT OF RESULTS

LOG NO	SAMPLE DESCRIPTION , LIQUID SAMPLES	DATE/ TIME SAMPLED	
40675-6	520 Field Blank	03-26-98/1230	
40675-7	520 DUP-1	03-26-98	
PARAMETER		40675-6	40675-7
Aromatic Volatiles (8020)			
Benzene, ug/l		<1.0	470*F35
Chlorobenzene, ug/l		<1.0	<1.0
1,2-Dichlorobenzene, ug/l		<1.0	<1.0
1,3-Dichlorobenzene, ug/l		<1.0	<1.0
1,4-Dichlorobenzene, ug/l		<1.0	<1.0
Ethylbenzene, ug/l		<1.0	62*F35
Toluene, ug/l		<1.0	38
Xylenes, ug/l		<2.0	1600*F42
Methyl-tert-butyl ether (MTBE), ug/l		<10	95
Date Analyzed		03.30.98	03.30.98
Dilution factor		1	1/10/100

Validated & Certified by: [Signature]  
 License No.: 2317

LOG NO: D8-40675  
 Received: 28 MAR 98  
 Reported: 08 APR 98

Mr. Pitt Maner  
 Blasland Bouck & Lee, Inc.  
 185 NW Spanish River Boulevard, Suite 110  
 Boca Raton, FL 33431

Project: #399.33 (Roosevelt Rds)  
 Sampled By: RB/DP  
 Code: 12068051

REPORT OF RESULTS

Page 6

LOG NO	SAMPLE DESCRIPTION , LIQUID SAMPLES	DATE/ TIME SAMPLED	
40675-6	520 Field Blank	03-26-98/1230	
40675-7	520 DUP-1	03-26-98	
PARAMETER		40675-6	40675-7
Polynuclear Aromatic Hydrocarbons (610)			
Acenaphthene, ug/l		<10	<10
Acenaphthylene, ug/l		<10	<10
Anthracene, ug/l		<10	<10
Benzo(a)anthracene, ug/l		<4.0	<4.0
Benzo(a)pyrene, ug/l		<4.0	<4.0
Benzo(b)fluoranthene, ug/l		<4.0	<4.0
Benzo(g,h,i)perylene, ug/l		<10	<10
Benzo(k)fluoranthene, ug/l		<5.0	<5.0
Chrysene, ug/l		<5.0	<5.0
Dibenzo(a,h)anthracene, ug/l		<5.0	<5.0
Fluoranthene, ug/l		<10	<10
Fluorene, ug/l		<10	<10
Indeno(1,2,3-cd)pyrene, ug/l		<5.0	<5.0
Naphthalene, ug/l		<5.0	200
Phenanthrene, ug/l		<10	<10
Pyrene, ug/l		<10	<10
2-Methylnaphthalene, ug/l		<10	89
1-Methylnaphthalene, ug/l		<10	59
Date Extracted		04.01.98	04.01.98
Date Analyzed		04.06.98	04.06.98

Validated & Certified by: Blasland Bouck & Lee, Inc.

License No.: 3314

# SL SAVANNAH LABORATORIES

& ENVIRONMENTAL SERVICES, INC.

414 SW 12th Avenue • Deerfield Beach, Florida 33442 • (954) 421-7400 • Fax (954) 421-2584

LOG NO: D8-40675  
 Received: 28 MAR 98  
 Reported: 08 APR 98

Mr. Pitt Maner  
 Blasland Bouck & Lee, Inc.  
 185 NW Spanish River Boulevard, Suite 110  
 Boca Raton, FL 33431

Project: #399.33 (Roosevelt Rds)  
 Sampled By: RB/DP  
 Code: 12068051

REPORT OF RESULTS

Page 7

LOG NO	SAMPLE DESCRIPTION , LIQUID SAMPLES	DATE/ TIME SAMPLED	
40675-6	520 Field Blank	03-26-98/1230	
40675-7	520 DUP-1	03-26-98	
-----			
PARAMETER		40675-6	40675-7
-----			
Petroleum Hydrocarbons (418.1)			
Petroleum Hydrocarbons, mg/l		<1.0	2.1
Date Extracted		03.31.98	03.31.98
Date Analyzed		03.31.98	03.31.98
Arsenic (7060)			
Arsenic, mg/l		<0.010	<0.010
Date Analyzed		04.04.98	04.04.98
Barium (6010)			
Barium, mg/l		3.1	33
Date Analyzed		04.02.98	04.02.98
Cadmium (6010)			
Cadmium, mg/l		<0.0050	<0.0050
Date Analyzed		04.02.98	04.02.98
Chromium (6010)			
Chromium, mg/l		<0.010	<0.010
Date Analyzed		04.02.98	04.02.98
Lead (7421)			
Lead, mg/l		<0.0050	<0.0050
Date Analyzed		04.06.98	04.06.98
Mercury (7470)			
Mercury, mg/l		<0.00020	<0.00020
Date Analyzed		03.30.98	03.30.98

Validated & Certified by: [Signature]  
 License No.: 3314

**SL SAVANNAH LABORATORIES**  
**& ENVIRONMENTAL SERVICES, INC.**

414 SW 12th Avenue • Deerfield Beach, Florida 33442 • (954) 421-7400 • Fax (954) 421-2584

LOG NO: D8-40675  
 Received: 28 MAR 98  
 Reported: 08 APR 98

Mr. Pitt Maner  
 Blasland Bouck & Lee, Inc.  
 185 NW Spanish River Boulevard, Suite 110  
 Boca Raton, FL 33431

Project: #399.33 (Roosevelt Rds)  
 Sampled By: RB/DP  
 Code: 12068051

REPORT OF RESULTS

Page 8

LOG NO	SAMPLE DESCRIPTION , LIQUID SAMPLES	DATE/ TIME SAMPLED	
40675-6	520 Field Blank	03-26-98/1230	
40675-7	520 DUP-1	03-26-98	
PARAMETER		40675-6	40675-7
Selenium (7740)			
Selenium, mg/l		<0.0050	<0.0050
Date Analyzed		04.06.98	04.06.98
Silver (6010)			
Silver, mg/l		<0.010	<0.010
Date Analyzed		04.02.98	04.02.98

Validated & Certified by: [Signature]

License No.: 2324

# SL SAVANNAH LABORATORIES & ENVIRONMENTAL SERVICES, INC.

414 SW 12th Avenue • Deerfield Beach, Florida 33442 • (954) 421-7400 • Fax (954) 421-2584

LOG NO: D8-40675  
Received: 28 MAR 98  
Reported: 08 APR 98

Mr. Pitt Maner  
Blasland Bouck & Lee, Inc.  
185 NW Spanish River Boulevard, Suite 110  
Boca Raton, FL 33431

Project: #399.33 (Roosevelt Rds)  
Sampled By: RB/DP  
Code: 12068051

## REPORT OF RESULTS

Page 9

LOG NO	SAMPLE DESCRIPTION , LIQUID SAMPLES	DATE/ TIME SAMPLED		
40675-8	520 MW-2	03-26-98/1415		
40675-9	520 MW-3	03-26-98/1100		
40675-10	520 MW-5	03-26-98/1115		
PARAMETER		40675-8	40675-9	40675-10
<b>Aromatic Volatiles (8020)</b>				
Benzene, ug/l		88000*F42	<1.0	<1.0
Chlorobenzene, ug/l		<10	<1.0	<1.0
1,2-Dichlorobenzene, ug/l		<10	<1.0	<1.0
1,3-Dichlorobenzene, ug/l		<10	<1.0	<1.0
1,4-Dichlorobenzene, ug/l		<10	<1.0	<1.0
Ethylbenzene, ug/l		3700*F42	<1.0	<1.0
Toluene, ug/l		99000*F42	<1.0	<1.0
Xylenes, ug/l		27000*F42	<2.0	<2.0
Methyl-tert-butyl ether (MTBE), ug/l		420	<10	<10
Date Analyzed		04.02.98	03.30.98	03.30.98
Dilution factor		10/1000/*	1	1

Validated & Certified by: *[Signature]*

License No.: 2312

# SL SAVANNAH LABORATORIES & ENVIRONMENTAL SERVICES, INC.

414 SW 12th Avenue • Deerfield Beach, Florida 33442 • (954) 421-7400 • Fax (954) 421-2584

LOG NO: D8-40675  
Received: 28 MAR 98  
Reported: 08 APR 98

Mr. Pitt Maner  
Blasland Bouck & Lee, Inc.  
185 NW Spanish River Boulevard, Suite 110  
Boca Raton, FL 33431

Project: #399.33 (Roosevelt Rds)  
Sampled By: RB/DP  
Code: 12068051

## REPORT OF RESULTS

Page 10

LOG NO	SAMPLE DESCRIPTION , LIQUID SAMPLES	DATE/ TIME SAMPLED		
40675-8	520 MW-2	03-26-98/1415		
40675-9	520 MW-3	03-26-98/1100		
40675-10	520 MW-5	03-26-98/1115		
PARAMETER		40675-8	40675-9	40675-10
Polynuclear Aromatic Hydrocarbons (610)				
Acenaphthene, ug/l		<10	<10	<10
Acenaphthylene, ug/l		<10	<10	<10
Anthracene, ug/l		<10	<10	<10
Benzo(a)anthracene, ug/l		<4.0	<4.0	<4.0
Benzo(a)pyrene, ug/l		<4.0	<4.0	<4.0
Benzo(b)fluoranthene, ug/l		<4.0	<4.0	<4.0
Benzo(g,h,i)perylene, ug/l		<10	<10	<10
Benzo(k)fluoranthene, ug/l		<5.0	<5.0	<5.0
Chrysene, ug/l		<5.0	<5.0	<5.0
Dibenzo(a,h)anthracene, ug/l		<5.0	<5.0	<5.0
Fluoranthene, ug/l		<10	<10	<10
Fluorene, ug/l		<10	<10	<10
Indeno(1,2,3-cd)pyrene, ug/l		<5.0	<5.0	<5.0
Naphthalene, ug/l		<5.0	<5.0	<5.0
Phenanthrene, ug/l		<10	<10	<10
Pyrene, ug/l		<10	<10	<10
2-Methylnaphthalene, ug/l		<10	<10	<10
1-Methylnaphthalene, ug/l		<10	<10	<10
Date Extracted		04.01.98	04.01.98	04.01.98
Date Analyzed		04.06.98	04.06.98	04.06.98

Validated & Certified by: Richard D. ...

License No.: 2314

**SL SAVANNAH LABORATORIES**  
**& ENVIRONMENTAL SERVICES, INC.**

414 SW 12th Avenue • Deerfield Beach, Florida 33442 • (954) 421-7400 • Fax (954) 421-2584

LOG NO: D8-40675  
 Received: 28 MAR 98  
 Reported: 08 APR 98

Mr. Pitt Maner  
 Blasland Bouck & Lee, Inc.  
 185 NW Spanish River Boulevard, Suite 110  
 Boca Raton, FL 33431

Project: #399.33 (Roosevelt Rds)  
 Sampled By: RB/DP  
 Code: 12068051

REPORT OF RESULTS

Page 11

LOG NO	SAMPLE DESCRIPTION , LIQUID SAMPLES	DATE/ TIME SAMPLED		
40675-8	520 MW-2	03-26-98/1415		
40675-9	520 MW-3	03-26-98/1100		
40675-10	520 MW-5	03-26-98/1115		
PARAMETER		40675-8	40675-9	40675-10
<b>Petroleum Hydrocarbons (418.1)</b>				
Petroleum Hydrocarbons, mg/l		21	<1.0	<1.0
Date Extracted		03.31.98	03.31.98	03.31.98
Date Analyzed		03.31.98	03.31.98	03.31.98
<b>Lead (7421)</b>				
Lead, mg/l		<0.0050	<0.0050	<0.0050
Date Analyzed		04.06.98	04.06.98	04.06.98

Validated & Certified by: Abraham

License No.: 3314

# SL SAVANNAH LABORATORIES & ENVIRONMENTAL SERVICES, INC.

414 SW 12th Avenue • Deerfield Beach, Florida 33442 • (954) 421-7400 • Fax (954) 421-2584

LOG NO: D8-40675  
Received: 28 MAR 98  
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Mr. Pitt Maner  
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Project: #399.33 (Roosevelt Rds)  
Sampled By: RB/DP  
Code: 12068051  
Page 12

## REPORT OF RESULTS

LOG NO	SAMPLE DESCRIPTION , LIQUID SAMPLES	DATE/ TIME SAMPLED
40675-11	520 Trip Blank	03-26-98
PARAMETER	40675-11	
Aromatic Volatiles (8020)		
Benzene, ug/l		<1.0
Chlorobenzene, ug/l		<1.0
1,2-Dichlorobenzene, ug/l		<1.0
1,3-Dichlorobenzene, ug/l		<1.0
1,4-Dichlorobenzene, ug/l		<1.0
Ethylbenzene, ug/l		<1.0
Toluene, ug/l		<1.0
Xylenes, ug/l		<2.0
Methyl-tert-butyl ether (MTBE), ug/l		<10
Date Analyzed		03.30.98
Dilution factor		1

\* = 10000

Validated & Certified by: [Signature]  
License No.: 2314

# SL SAVANNAH LABORATORIES & ENVIRONMENTAL SERVICES, INC.

414 SW 12th Avenue • Deerfield Beach, Florida 33442 • (954) 421-7400 • Fax (954) 421-2584

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Project: #399.33 (Roosevelt Rds)  
Sampled By: RB/DP  
Code: 12068051

## REPORT OF RESULTS

Page 13

LOG NO	SAMPLE DESCRIPTION , QC REPORT FOR LIQUID SAMPLES	DATE/ TIME SAMPLED			
40675-12	Method Blank				
40675-13	Accuracy (%Rec)				
40675-14	Precision (%RPD)				
40675-15	Reporting Limit (RL)				
PARAMETER		40675-12	40675-13	40675-14	40675-15
<b>Aromatic Volatiles (8020)</b>					
Benzene, ug/l		<1.0	93 %	2.2 %	1.0
Chlorobenzene, ug/l		<1.0	97 %	0 %	1.0
1,2-Dichlorobenzene, ug/l		<1.0	---	---	1.0
1,3-Dichlorobenzene, ug/l		<1.0	---	---	1.0
1,4-Dichlorobenzene, ug/l		<1.0	---	---	1.0
Ethylbenzene, ug/l		<1.0	---	---	1.0
Toluene, ug/l		<1.0	94 %	1.1 %	1.0
Xylenes, ug/l		<2.0	---	---	2.0
Methyl-tert-butyl ether (MTBE), ug/l		<10	---	---	10
Date Analyzed		03.30.98	---	---	---

Validated & Certified by: M. Maner

License No.: 3314

# SL SAVANNAH LABORATORIES & ENVIRONMENTAL SERVICES, INC.

414 SW 12th Avenue • Deerfield Beach, Florida 33442 • (954) 421-7400 • Fax (954) 421-2584

LOG NO: D8-40675  
Received: 28 MAR 98  
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Mr. Pitt Maner  
Blasland Bouck & Lee, Inc.  
185 NW Spanish River Boulevard, Suite 110  
Boca Raton, FL 33431

Project: #399.33 (Roosevelt Rds)  
Sampled By: RB/DP  
Code: 12068051  
Page 14

## REPORT OF RESULTS

LOG NO	SAMPLE DESCRIPTION , QC REPORT FOR LIQUID SAMPLES	DATE/ TIME SAMPLED			
40675-12	Method Blank				
40675-13	Accuracy (%Rec)				
40675-14	Precision (%RPD)				
40675-15	Reporting Limit (RL)				
PARAMETER		40675-12	40675-13	40675-14	40675-15
Polynuclear Aromatic Hydrocarbons (610)					
Acenaphthene, ug/l		<10	66 %	12 %	10
Acenaphthylene, ug/l		<10	---	---	10
Anthracene, ug/l		<10	---	---	10
Benzo(a)anthracene, ug/l		<4.0	---	---	4.0
Benzo(a)pyrene, ug/l		<4.0	52 %	0 %	4.0
Benzo(b)fluoranthene, ug/l		<4.0	---	---	4.0
Benzo(g,h,i)perylene, ug/l		<10	---	---	10
Benzo(k)fluoranthene, ug/l		<5.0	---	---	5.0
Chrysene, ug/l		<5.0	---	---	5.0
Dibenzo(a,h)anthracene, ug/l		<5.0	---	---	5.0
Fluoranthene, ug/l		<10	---	---	10
Fluorene, ug/l		<10	55 %	9.1 %	10
Indeno(1,2,3-cd)pyrene, ug/l		<5.0	---	---	5.0
Naphthalene, ug/l		<5.0	54 %	7.4 %	5.0
Phenanthrene, ug/l		<10	---	---	10
Pyrene, ug/l		<10	69 %	8.7 %	10
2-Methylnaphthalene, ug/l		<10	---	---	10
1-Methylnaphthalene, ug/l		<10	---	---	10
Date Extracted		04.01.98	---	---	---
Date Analyzed		04.06.98	---	---	---

Validated & Certified by: H. Chamberlain

License No.: 2314

# SL SAVANNAH LABORATORIES & ENVIRONMENTAL SERVICES, INC.

414 SW 12th Avenue • Deerfield Beach, Florida 33442 • (954) 421-7400 • Fax (954) 421-2584

LOG NO: D8-40675  
Received: 28 MAR 98  
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Mr. Pitt Maner  
Blasland Bouck & Lee, Inc.  
185 NW Spanish River Boulevard, Suite 110  
Boca Raton, FL 33431

Project: #399.33 (Roosevelt Rds)  
Sampled By: RB/DP  
Code: 12068051

## REPORT OF RESULTS

Page 15

LOG NO	SAMPLE DESCRIPTION , QC REPORT FOR LIQUID SAMPLES	DATE/ TIME SAMPLED			
40675-12	Method Blank				
40675-13	Accuracy (%Rec)				
40675-14	Precision (%RPD)				
40675-15	Reporting Limit (RL)				
PARAMETER		40675-12	40675-13	40675-14	40675-15
<b>Petroleum Hydrocarbons (418.1)</b>					
Petroleum Hydrocarbons, mg/l		<1.0	81 %*F82	8.6 %	1.0
Date Extracted		03.31.98	---	---	---
Date Analyzed		03.31.98	---	---	---
<b>Arsenic (7060)</b>					
Arsenic, mg/l		<0.010	84 %	2.4 %	0.010
Date Analyzed		04.04.98	---	---	---
<b>Barium (6010)</b>					
Barium, mg/l		<1.0	118 %	0.84 %	1.0
Date Analyzed		04.02.98	---	---	---
<b>Cadmium (6010)</b>					
Cadmium, mg/l		<0.0050	94 %	9.6 %	0.0050
Date Analyzed		04.02.98	---	---	---
<b>Chromium (6010)</b>					
Chromium, mg/l		<0.010	94 %	1.1 %	0.010
Date Analyzed		04.02.98	---	---	---
<b>Lead (7421)</b>					
Lead, mg/l		<0.0050	92 %	4.3 %	0.0050
Date Analyzed		04.06.98	---	---	---
<b>Mercury (7470)</b>					
Mercury, mg/l		<0.00020	107 %	0 %	0.00020
Date Analyzed		03.30.98	---	---	---

Validated & Certified by: William B. Brite

License No.: 5314

# SL SAVANNAH LABORATORIES & ENVIRONMENTAL SERVICES, INC.

414 SW 12th Avenue • Deerfield Beach, Florida 33442 • (954) 421-7400 • Fax (954) 421-2584

LOG NO: D8-40675  
Received: 28 MAR 98  
Reported: 08 APR 98

Mr. Pitt Maner  
Blasland Bouck & Lee, Inc.  
185 NW Spanish River Boulevard, Suite 110  
Boca Raton, FL 33431

Project: #399.33 (Roosevelt Rds)  
Sampled By: RB/DP  
Code: 12068051

## REPORT OF RESULTS

Page 16

LOG NO	SAMPLE DESCRIPTION , QC REPORT FOR LIQUID SAMPLES	DATE/ TIME SAMPLED			
40675-12	Method Blank				
40675-13	Accuracy (%Rec)				
40675-14	Precision (%RPD)				
40675-15	Reporting Limit (RL)				
PARAMETER		40675-12	40675-13	40675-14	40675-15
Selenium (7740)					
Selenium, mg/l		<0.0050	97 %*F75	0 %	0.0050
Date Analyzed		04.06.98	---	---	---
Silver (6010)					
Silver, mg/l		<0.010	88 %	1.1 %	0.010
Date Analyzed		04.02.98	---	---	---

Comprehensive Quality Assurance Plan #890142G.

SL Certifications: E86221/86371

Method References: EPA SW-846, EPA 600/4-79-020, and EPA 40 CFR Part 136.

\*F35 - Due to the analyte abundance, target compound concentrations are reported from multiple runs to achieve requested detection limits.

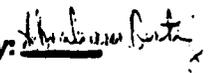
\*F42 - Target compounds were quantitated from a secondary dilution due to analyte abundance in the sample.

\*F65 - Elevated detection limits were reported due to sample matrix interference which required sample or extract dilution.

\*F75 - Matrix spike recoveries were outside advisory limits possibly due to matrix interference present in the sample; therefore, recovery of the laboratory control standard analyzed concurrently with the sample batch has been reported.

\*F82 - Insufficient sample volume was available to perform a batch-specific matrix spike. However, an LCS-analyzed with the sample batch met control criteria.

  
Paul Canevaro, Project Manager

Validated & Certified by:   
License No.: 2314

## CERTIFICATE

I hereby certify that our staff have reviewed and evaluated all analytical raw data concerning laboratory reports of analyses for SL Log No.

T814254, samples 1-9, and to the best of my knowledge, the results

for said log number, pages 1-5 (inclusive), signed by Laura B. Snead (SL

Project Manager) are correct and reliable.



**SL SAVANNAH LABORATORIES**  
 & ENVIRONMENTAL SERVICES, INC.

2846 Industrial Plaza Drive (32301) • P.O. Box 13056 • Tallahassee, FL 32317-3056 • (850) 878-3994 • Fax (850) 878-9504

LOG NO: T8-14254  
 Received: 22 DEC 98  
 Reported: 04 JAN 99

Mr. Pitt Maner  
 Blasland Bouck & Lee, Inc.  
 185 NW Spanish River Boulevard, Suite 110  
 Boca Raton, FL 33431

Project: 900.12 & 339.33 NAVSTA (Roosevelt Rds)  
 Sampled By: Client  
 Code: 18139014

REPORT OF RESULTS

Page 4

LOG NO	SAMPLE DESCRIPTION , LIQUID SAMPLES	DATE/ TIME SAMPLED	
14254-8	520-MW-6	12-18-98/1555	
14254-9	Equipment Blank	12-18-98/1815	
PARAMETER		14254-8	14254-9
Lead (239.2)			
Lead, mg/l		<0.0050	<0.0050
Analysis Date		12.31.98	12.31.98
Barium (6010)			
Barium, mg/l		0.33	<0.010
Analysis Date		12.29.98	12.29.98
Chromium (6010)			
Chromium, mg/l		<0.010	<0.010
Analysis Date		12.29.98	12.29.98

Validated & Certified by: *Abraham Datis*  
 License No: 2314

**SL SAVANNAH LABORATORIES**  
 & ENVIRONMENTAL SERVICES, INC.

2846 Industrial Plaza Drive (32301) • P.O. Box 13056 • Tallahassee, FL 32317-3056 • (850) 878-3994 • Fax (850) 878-9504

LOG NO: T8-14254  
 Received: 22 DEC 98  
 Reported: 04 JAN 99

Mr. Pitt Maner  
 Blasland Bouck & Lee, Inc.  
 185 NW Spanish River Boulevard, Suite 110  
 Boca Raton, FL 33431

Project: 900.12 & 339.33 NAVSTA (Roosevelt Rds)  
 Sampled By: Client  
 Code: 18139014

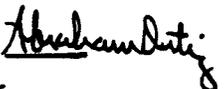
REPORT OF RESULTS

Page 5

LOG NO	SAMPLE DESCRIPTION , QC REPORT FOR LIQUID SAMPLES	DATE/ TIME SAMPLED		
14254-10	Method Blank			
14254-11	Accuracy (‡Rec)			
14254-12	Precision (‡RPD)			
PARAMETER		14254-10	14254-11	14254-12
Lead (239.2)				
Lead, mg/l		<0.0050	92 ‡	1.1 ‡
Analysis Date		12.31.98	12.31.98	---
Barium (6010)				
Barium, mg/l		<0.010	101 ‡	0 ‡
Analysis Date		12.29.98	12.29.98	---
Chromium (6010)				
Chromium, mg/l		<0.010	100 ‡	1.0 ‡
Analysis Date		12.29.98	12.29.98	---

Method: EPA 40 CFR Part 136  
 Florida Dept. of Health Certification No.: E81005  
 FDEP CompQAP No.: 890142G

  
 Laura B. Snead, Project Manager

Validated & Certified by:   
 License No.: 2314

# SL SAVANNAH LABORATORIES

& ENVIRONMENTAL SERVICES, INC.

## ANALYSIS REQUEST AND CHAIN OF CUSTODY RECORD

- 5102 LaRoche Avenue, Savannah, GA 31404
- 2846 Industrial Plaza Drive, Tallahassee, FL 32301
- 414 SW 12th Avenue, Deerfield Beach, FL 33442
- 900 Lakeside Drive, Mobile, AL 36693
- 6712 Benjamin Road, Suite 100, Tampa, FL 33634
- 100 Alpha Drive, Suite 110, Destrehan, LA 70047

- Phone: (912) 354-7858
- Phone: (904) 878-3994
- Phone: (954) 421-7400
- Phone: (334) 666-6633
- Phone: (813) 885-7427
- Phone: (504) 764-1100
- Fax: (912) 352-0165
- Fax: (904) 878-9504
- Fax: (954) 421-2584
- Fax: (334) 666-6696
- Fax: (813) 885-7049
- Fax: (504) 725-1163

PROJECT REFERENCE: NAVSTA Roosevelt Roads  
 PROJECT NO.: 90012 and 399-33  
 P.O. NUMBER: \_\_\_\_\_  
 MATRIX TYPE: 250ml Plastic, 250ml Plastic  
 REQUIRED ANALYSES: \_\_\_\_\_  
 PAGE 1 OF 1

PROJECT LOC (State): Puerto Rico  
 SAMPLER(S) NAME: Darving Vargas  
 PHONE: 561-750-3733  
 FAX: 561-395-8411

CLIENT NAME: BBL  
 CLIENT PROJECT MANAGER: Pitt Maner

CLIENT ADDRESS (CITY, STATE, ZIP): Boca Raton, Florida 33431-4230

STANDARD REPORT DELIVERY:

EXPEDITED REPORT DELIVERY (surcharge):

Date Due: 7 DAY TAT

SAMPLE		SL NO.	SAMPLE IDENTIFICATION	MATRIX TYPE						NUMBER OF CONTAINERS SUBMITTED	REMARKS		
DATE	TIME			AQUEOUS (WATER)	SOLID OR SEMISOLID	AIR	NONAQUEOUS LIQUID (oil, solvent, etc)	H <sub>2</sub> O	HNO <sub>3</sub>				
12-18-98	13:50		730-MW-2	X									
	14:35		729-MW-1	X									← Analyze for Ba also
	15:55		520-MW-6	X									← Analyze for Ba + Cr also
	16:35		860-MW-1	X									
	17:10		860-MW-4	X									
	17:45		124-MW-4	X									
			Duplicate	X									
	18:15		Equipment Blank	X									
	18:45		Field Blank	X									

*Handwritten notes in table:*  
 Contact Project manager with Total (unfiltered) results before analyzing filtered samples.  
 All samples iced immediately.

RELINQUISHED BY: (SIGNATURE) \_\_\_\_\_ DATE: 12/18/98 TIME: 3:30  
 RECEIVED BY: (SIGNATURE) \_\_\_\_\_ DATE: \_\_\_\_\_ TIME: \_\_\_\_\_

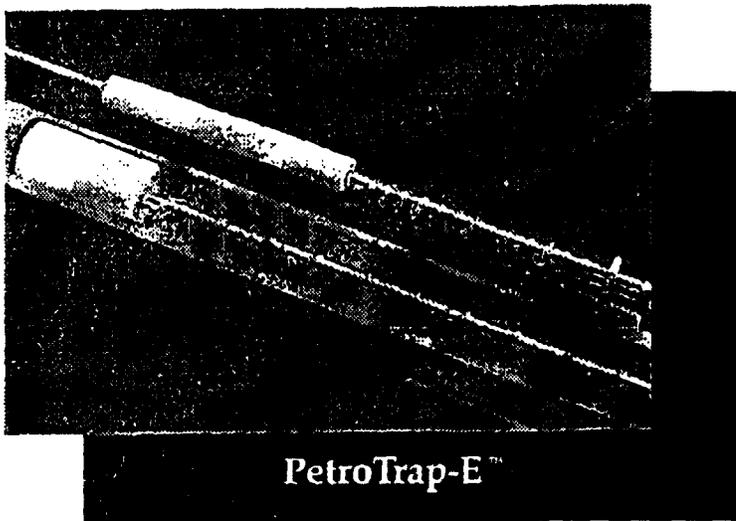
LABORATORY USE ONLY

RECEIVED FOR LABORATORY BY: (SIGNATURE) \_\_\_\_\_ DATE: 12/22/98 TIME: 12:30  
 CUSTODY INTACT:  YES  NO  
 CUSTODY SEAL NO.: \_\_\_\_\_  
 SL LOG NO.: 7814254  
 LABORATORY REMARKS: \_\_\_\_\_

ORIGINAL

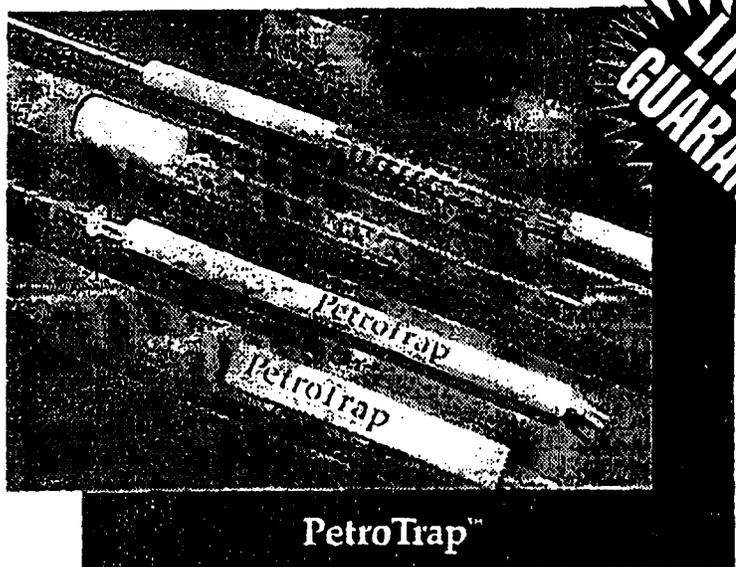
**APPENDIX H**  
**TYPICAL PASSIVE SKIMMER DETAILS**

# Passive Skimmers to Meet the Needs of Every Site...



PetroTrap-E™

## ...and Every Budget



PetroTrap™

### PetroTrap-E™...

The PetroTrap-E™ units have been designed using the same quality manufacturing as the Original PetroTrap™. We have created these low cost alternatives for use on sites with minimal water table fluctuations. The 2" (0.7 Liter) and 4" (2.0 Liter) models feature a 12" buoy travel, a standard 90 day warranty and are competitively priced at \$585.00 and \$635.00 respectively.

### PetroTrap™...

When water table fluctuations are significant and you need your unit to accommodate, look to the original PetroTrap™ for recovery. These units feature a 24" buoy travel and a lifetime warranty which includes replacement of parts for the lifetime of the system.

2" (0.7 Liter) and 4" (2.0 Liter) models are available for recovery of most refined fuels. Please contact EPI with your site specifications or with questions on free product recovery.

Call 1-800-ENVIRO 4

**ENVIRO**  
**PRODUCTS** 

**Description:**

Our unique passive skimmer system which incorporates the use of an active buoy assembly. This buoy assembly removes free product to a sheen.

**PetroTrap™** units can be installed in minutes and are ideal on sites where free product recovery must begin *immediately*. The system employs the use of a collection canister, eliminating the need to run electricity or air lines to the well.

Installation is quick and easy—lower the unit into the well much the same way as a bailer, and suspend it using the lanyard/vent tube (standard 25' length). The unit begins recovering product as soon as product is available. Periodically, the canister is emptied manually through the drain valve at the bottom of the canister.

	4" PetroTrap	2" PetroTrap
<b>Diameter</b>	3.5"	1.75"
<b>Length</b>	61.0"	76.88"
<b>Weight</b>	18 Lbs.	6.25 Lbs.
<b>Volume</b>	2.0 Liters / .53 Gallons <small>(Other Volumes Optional)</small>	0.7 Liters / .20 Gallons <small>(Other Volumes Optional)</small>
<b>Min. Depth of Water Required</b>	29.0"	39.0"

	4" PetroTrap-E	2" PetroTrap-E
<b>Diameter</b>	3.5"	1.75"
<b>Length</b>	49.0"	64.88"
<b>Weight</b>	15 Lbs.	5.25 Lbs.
<b>Volume</b>	2.0 Liters / .53 Gallons <small>(Other Volumes Optional)</small>	0.7 Liters / .20 Gallons <small>(Other Volumes Optional)</small>
<b>Min. Depth of Water Required</b>	29.0"	39.0"

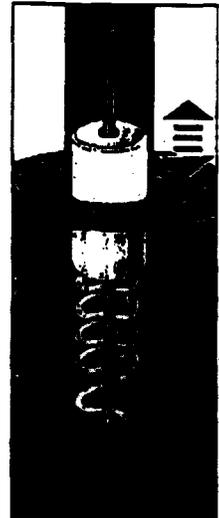
PetroTrap™ is manufactured by Enviro Products Inc. and is part of EPI's line of "Pure & Simple" remediation products.

**Features:**

- No power source required
- Installation takes only minutes
- Effective with petroleum fuels
- Ideal monitoring device to indicate migrating plumes
- Available for 2" and 4" wells

**Materials of Construction:**

- Stainless steel
- Brass
- Polyethylene
- PVC



The PetroTrap™ filter recovers free product to a sheen

**Standard System Includes:**

- PetroTrap™ skimmer assembly (2" or 4" Model)
- 25' suspension hose
- Choice of 2", 4", or 6" locking well cap

**Options:**

- Additional canister which will double the PetroTrap's™ capacity
- Varying lengths of suspension hose



For wells where a high yield of free product is expected, consider using a SkimRite™, EPI's active skimmer system.

*Enviro Products Means Service!*



**Call 1-800-ENVIRO 4**



1431 Rensen Street • Suite A • Lansing, Michigan 48910  
(517) 887-1222 • 1-800-ENVIRO 4 • Fax: (517) 887-8374

## PetroTrap™ Price List

Effective October 30, 1996

	Qty	Price Each	Total Price
<b>PetroTrap™ 4"</b>			\$ 885.00
<b>PetroTrap™ 2"</b>			\$ 885.00
<b>PetroTrap-E™ 2"</b>			\$ 585.00
<b>PetroTrap-E™ 4"</b>			\$ 635.00
<b>PARTS</b>			
Optional Canister (2" or 4")	1.00	\$ 115.00	\$ 115.00
Suspension Hose (per foot)	1.00	\$ 1.17	\$ 1.17
Buoy Assembly	1.00	\$ 172.52	\$ 172.52
Buoy Filter Replacement Kit	1.00	\$ 97.00	\$ 97.00
Buoy Top Cap	1.00	\$ 41.50	\$ 41.50
Buoy Bushing	1.00	\$ 42.10	\$ 42.10
Guide Rod w/ Fittings	1.00	\$ 105.00	\$ 105.00
Coiled Hose	1.00	\$ 23.75	\$ 23.75
Slotted Housing (4" only)	1.00	\$ 185.00	\$ 185.00
Collection Canister	1.00	\$ 238.00	\$ 238.00
Discharge Valve	1.00	\$ 13.50	\$ 13.50
Canister Top Cap (4" only)	1.00	\$ 42.00	\$ 42.00
Canister Top Cap (2" only)	1.00	\$ 38.00	\$ 38.00
Canister Bottom Cap (2" only)	1.00	\$ 38.00	\$ 38.00
4" Locking Well Cap	1.00	\$ 45.00	\$ 45.00
2" Locking Well Cap	1.00	\$ 37.00	\$ 37.00
Aluminum Padlock	1.00	\$ 8.42	\$ 8.42