

Site Characterization Site 734

United States Navy
Roosevelt Roads Naval Station
Ceiba, Puerto Rico

Contract Number: N62470-93-D-
4021

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BBL
BLASLAND, BOUCK & LEE, INC.
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Executive Summary

Blasland, Bouck & Lee, Inc. (BBL) conducted a site characterization (SC) for a former underground storage tank (UST) 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 UST on the soils and groundwater in the area of Site 734, which is located on the western end of the NAVSTA Roosevelt Roads. Site 734 contained a 1,000-gallon UST previously used to store diesel fuel for heating purposes. 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 61 soil samples from 8 soil borings, performing field screening on the soil samples, performing laboratory analysis of selected samples, performing two slug tests, measuring groundwater elevations, installing three groundwater monitoring wells, sampling groundwater from the three monitoring wells, and collecting information to prepare a qualitative risk assessment.

Total Petroleum Hydrocarbons (TPH) above the Puerto Rico Environmental Quality Board (PREQB) target levels of 100 milligrams per kilogram (mg/Kg) were detected in only two samples collected at Site 734. The laboratory analytical results indicate that TPH concentrations in soil ranged from below detection limits to 188 mg/Kg.

The concentrations of benzene, BTEX (sum of benzene, toluene, ethylbenzene, and xylenes), TPH, and total lead in the groundwater samples obtained from the monitoring wells were below the PREQB target levels. The PREQB target levels are 5 microgram 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. Free product was not detected in any of the monitoring wells. Results of the qualitative risk assessment indicate that the human risks associated with Site 734 are extremely low.

Based on the assessment results, the petroleum hydrocarbon impacted soil will remain in place because of the low health hazards associated with it and excavation activities can increase the risk of contact with the compounds of concern. Enhanced in-situ remediation methods are not recommended because the low permeability of the impacted soils. However, natural biodegradation processes (natural attenuation) are expected to reduce the TPH concentrations at Site 734.

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1. Introduction

The United States Naval Station, Roosevelt Roads (NAVSTA Roosevelt Roads) authorized Blasland, Bouck & Lee, Inc. (BBL) to perform a Site Characterization (SC) under the contract number N62470-93-D-4021. The SC was performed for a former underground storage tank (UST) at Site 734 in the NAVSTA Roosevelt Roads. The SC objective was to determine the degree and/or extent of petroleum product contamination to the soil and groundwater at Site 734. This report summarizes the work conducted, field investigation results, and remediation recommendations for Site 734.

1.1 Site Location

Site 734 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 18° 15' 00" latitude and 65° 39' 30" longitude. A site map showing the location of Site 734 is provided as Figure 1-2, while the topography of Site 734 and surrounding area is depicted in Figure 1-3.

1.2 Site Background

Based on information provided by the NAVSTA Roosevelt Roads, Site 734 is the former location of a 1,000 -gallon, single-wall, fiberglass reinforced plastic UST. The piping system consisted of a single wall steel and copper piping. The UST system contained diesel fuel used for heating purposes in Building 734. The tank remained operational from the time it was installed in 1985 to when it was removed in 1996.

Total Petroleum Hydrocarbons (TPH) concentrations ranging from 13,079 milligrams per kilogram (mg/kg) to 18,434 mg/kg were detected in soils at Site 734 during the UST removal in 1996. NAVSTA Roosevelt Roads records indicate that accidental spills did not occur at Site 734.

1.3 Previous Investigations

No previous SC investigations had been conducted at Site 734. The NAVSTA Roosevelt Roads removed the UST in 1996. The NAVSTA Roosevelt Roads requested that a SC be performed after the detection of elevated levels of petroleum hydrocarbons in the soils during the UST removal in 1996.

1.4 Project Objective

The main purpose of the project was to assess the extent of soil and groundwater contamination at the site. The SC investigation consisted of installing soil boring(s) and monitoring wells, and collecting and analyzing soil and groundwater samples.

A total of eight (8) soil borings and three (3) monitoring wells were installed at the site. Soil and groundwater samples collected from the soil borings and monitoring wells installed during this investigation were sent to a laboratory for analysis. The final locations of the monitoring wells were based on the 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 groundwater flow direction. Slug 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 slug test results.

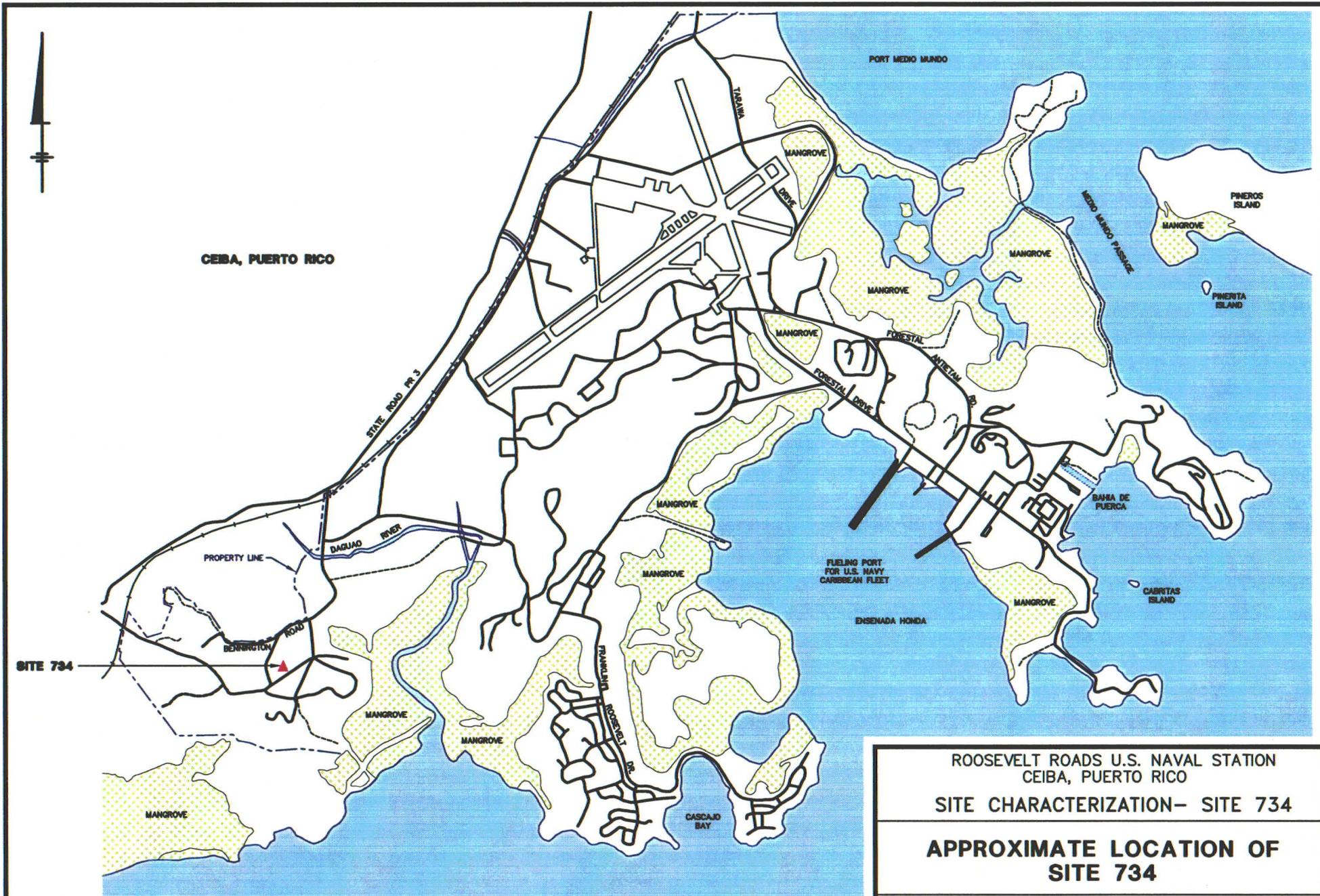


ROOSEVELT ROADS U.S. NAVAL STATION
CEIBA, PUERTO RICO
SITE CHARACTERIZATION- SITE 734

SITE LOCATION MAP

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FIGURE
1-1



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

SITE CHARACTERIZATION— SITE 734

APPROXIMATE LOCATION OF
SITE 734

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FIGURE
1-2

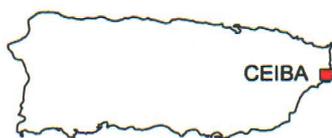


APPROXIMATE SCALE IN FEET

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.



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



APPROXIMATE SCALE IN FEET

CARRIBEAN SEA

ROOSEVELT ROADS U.S. NAVAL STATION
CEIBA, PUERTO RICO
SITE CHARACTERIZATION- SITE 734

TOPOGRAPHIC MAP

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FIGURE
1-3

3/31/98 BOC-54 MJS
39934001/39934002.CDR

2. 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 NAVSTA Roosevelt Roads 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 on 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).

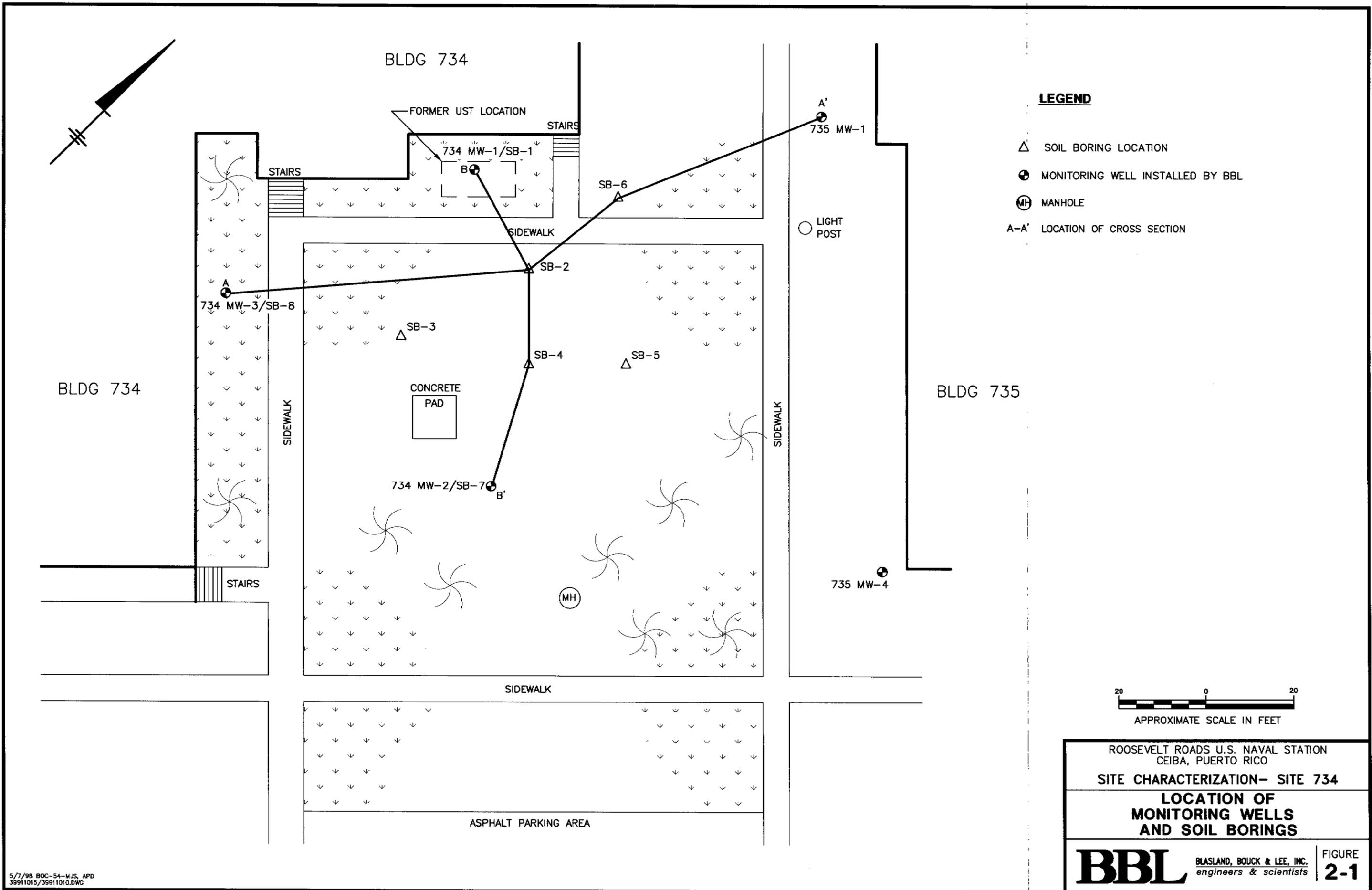
2.2 Site Geology

The soil samples collected during the installations of soil borings and monitoring wells were used to describe the site geology. Complete lithologic descriptions are included within the soil boring logs and monitoring well construction diagrams contained in Appendices A and B, respectively.

As seen in Figure 1-3, Site 734 lies on a small hill (approximately 40 feet above MSL) underlain by the Daguoa Formation that slopes downward to the south. Beneath Site 734, silt and clay, from highly weathered volcanic rock are encountered. The colors of the clays are primarily light to dark yellowish brown, light to moderate 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 saprolite is encountered at approximately 6 to 8 feet below land surface (BLS). 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 are based on the lithology observed during the installation of soil borings and monitoring wells for the SC.

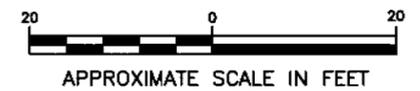
2.3 Site Hydrogeology

Groundwater flow at the site is controlled by elevation differences between adjacent hills. Groundwater flow across the site is to the southeast. Site 734 is underlain by an unconfined surficial aquifer system, which is composed of plastic clays (saprolite). The high plasticity of the subsurface material 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 slug tests display evidence of a slow rate of return to static conditions in the monitoring wells. A summary of the slug test results and hydraulic conductivity values are presented in Appendix C.



LEGEND

- △ SOIL BORING LOCATION
- MONITORING WELL INSTALLED BY BBL
- ⊙ (MH) MANHOLE
- A-A' LOCATION OF CROSS SECTION

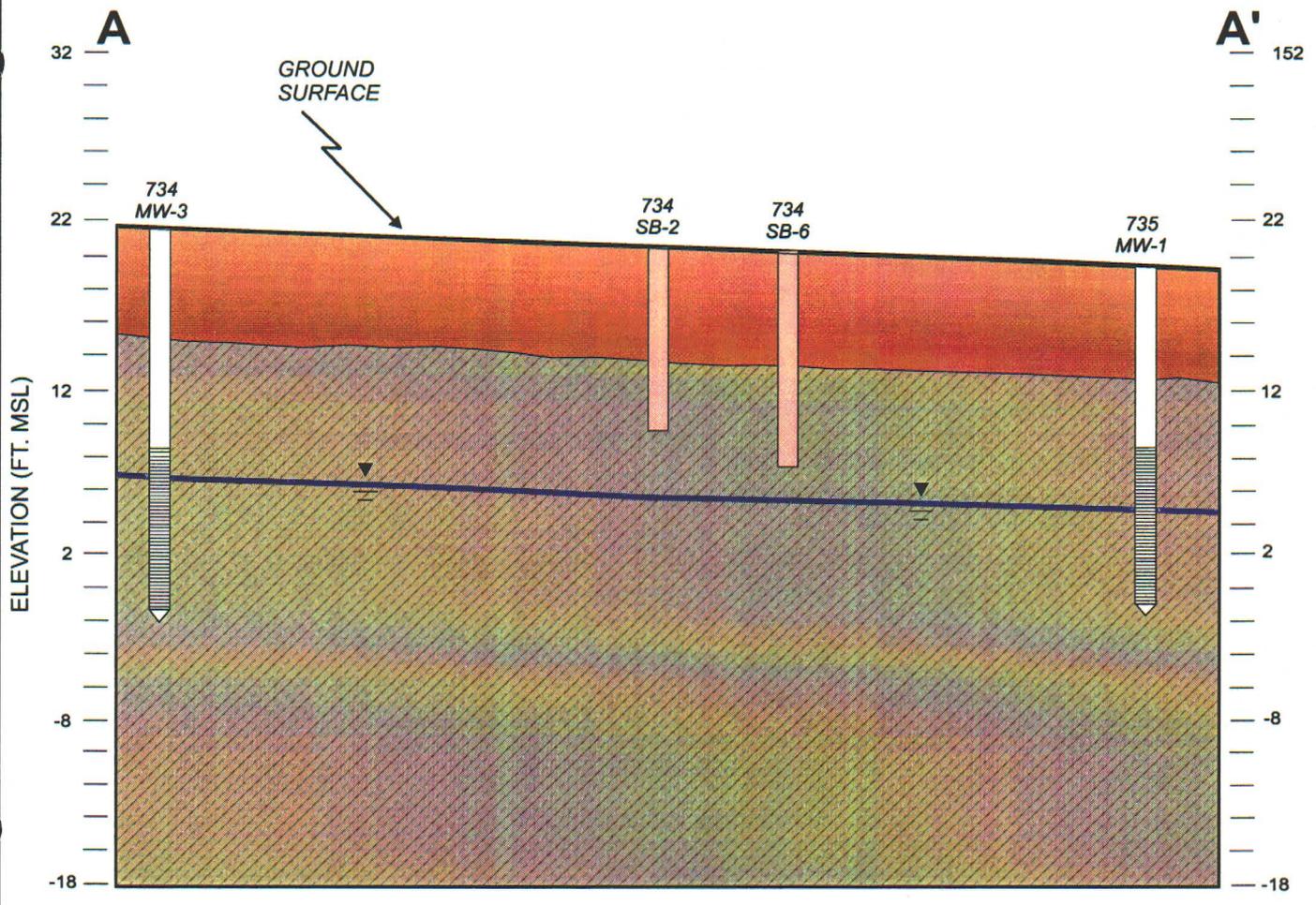


ROOSEVELT ROADS U.S. NAVAL STATION
CEIBA, PUERTO RICO

SITE CHARACTERIZATION- SITE 734

**LOCATION OF
MONITORING WELLS
AND SOIL BORINGS**

BBL BLASLAND, BOUCK & LEE, INC.
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VERTICAL EXAGGERATION - x4.0

LEGEND

-  Silty Clay; varying dark colors
-  Saprolite (Weathered Rock)
-  WATER TABLE ELEVATION
-  SOIL BORING
-  MONITORING WELL RISER
-  MONITORING WELL SCREEN

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

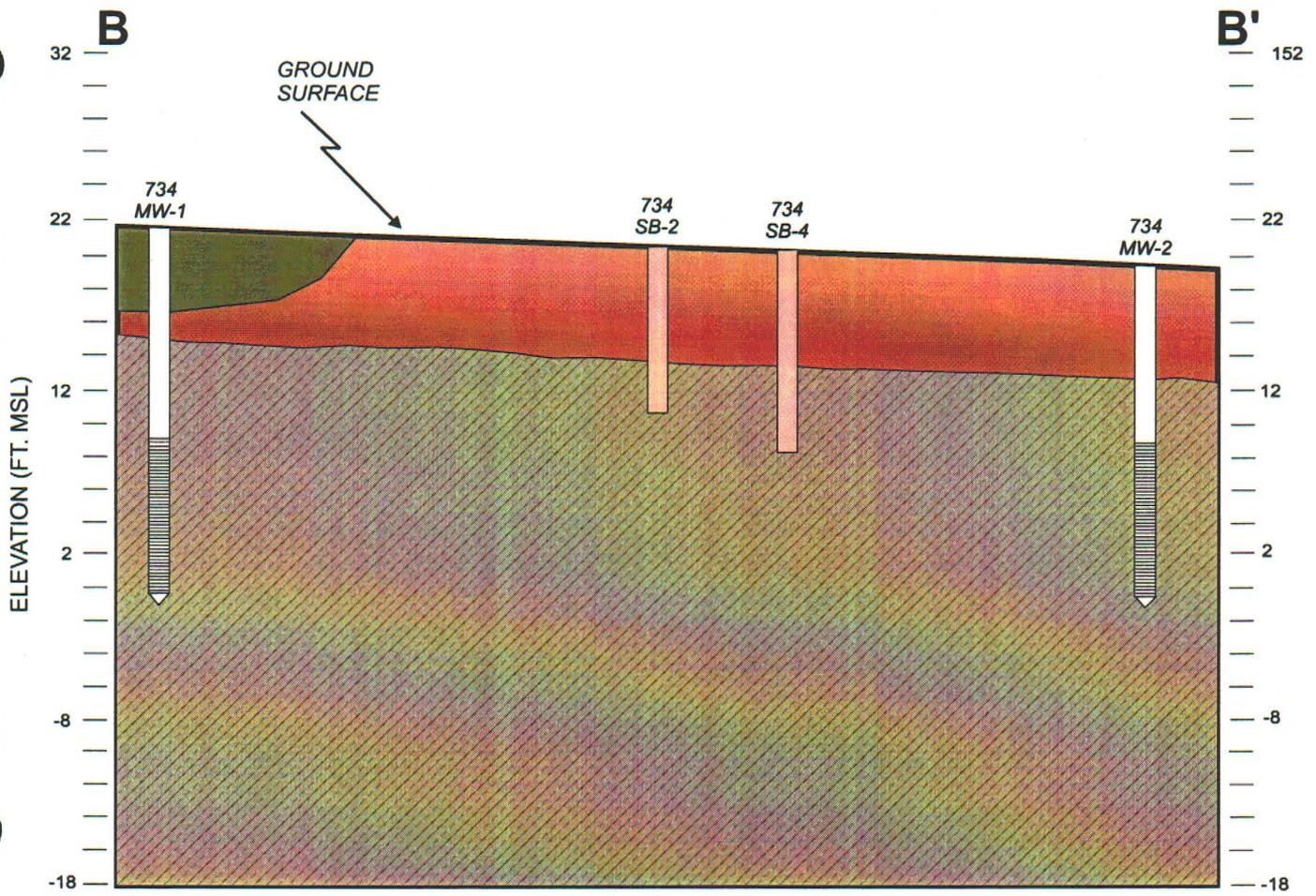
NOTE: ELEVATIONS BASED ON U.S. NAVY DATUM.

ROOSEVELT ROADS U.S. NAVAL STATION
CEIBA, PUERTO RICO
SITE CHARACTERIZATION - SITE 734

GEOLOGIC CROSS SECTION A-A'

BBL BLASLAND, BOUCK & LEE, INC.
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FIGURE 2-2



VERTICAL EXAGGERATION - x4.0

LEGEND

-  Fill
-  Silty Clay; varying dark colors
-  Saprolite (Weathered Rock)
-  WATER TABLE ELEVATION

-  SOIL BORING
-  MONITORING WELL RISER
-  MONITORING WELL SCREEN

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

NOTE: ELEVATIONS BASED ON U.S. NAVY DATUM.

ROOSEVELT ROADS U.S. NAVAL STATION
CEIBA, PUERTO RICO
SITE CHARACTERIZATION - SITE 734

GEOLOGIC CROSS SECTION B-B'

BBL BLASLAND, BOUCK & LEE, INC.
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3. Field Investigations

The SC investigation took place continuously from January 23, 1998 through April 23, 1998. Assessment activities consisted of the installation of soil borings and monitoring wells and the collection of soil and groundwater samples. Soil samples were collected from each soil boring at two foot intervals and were screened in the field with an organic vapor analyzer (OVA). Groundwater and selected soil samples were sent for laboratory analyses. In addition, lithologic data were collected during the installation of monitoring wells and soil borings.

3.1 Drilling

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

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

Appendix Section	Contents
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 the site began after a utility clearance was performed. The equipment decontamination and air monitoring procedures that were used during 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, eight (8) soil borings (734-SB-1 through 734-SB-8) 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 to a depth of 20 feet BLS and every 5 feet beyond 20 feet BLS until the termination of each boring. Standard penetration test procedures, in accordance with ASTM D-1586, were followed during the collection of soil samples. The surficial soils encountered at Site 734 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. 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 14 of the 61 soil samples

screened produced detectable vapors. Three of those 14 samples had net hydrocarbon vapor content (HVC) concentration above 100 PPM. The net HVC concentrations ranged from non-detect to greater than 1,000 PPM. Methane vapor concentrations ranged from non-detect to greater than 1,000 PPM.

Selected soil samples were collected for laboratory analysis. Laboratory analysis included TPH by Environmental Protection Agency (EPA) Method 418.1 and benzene, toluene, ethylbenzene, and xylene (BTEX) by EPA Method 8020. At least two samples from each soil boring were selected for laboratory analyses. Two intervals were used for soil sample collection: from 2 to 6 feet 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 734 ranged from approximately 12 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, two laboratories [Transglobal Environmental Geochemistry (TEG) and Savannah Laboratories and Environmental Services, Inc. (Savannah)] were used to analyze groundwater samples for TPH by EPA method 418.1 within 24 hours. Based on the laboratory analytical data and field observations, three soil borings (SB-1, SB-7, and SB-8) were redrilled and converted to monitoring wells (734 MW-1, 734 MW-2, and 734 MW-3). The groundwater results analyzed by the local laboratory are included in Appendix E and summarized in Table 3-3. Two monitoring wells previously installed during the SC of Building 735, adjacent to Site 734, were utilized to assess Site 734.

3.1.4 Monitoring Well Construction

Three 2-inch monitoring wells were installed to define the horizontal extent of potentially impacted groundwater in and around the area of Site 734. The wells were installed under the observation of BBL personnel. The well construction materials and equipment were decontaminated prior to installation of each well. The development of the wells was accomplished by using a 3-foot disposable Teflon bailer to remove fine-grained sediments (Table 3-4). A detailed description of monitoring well construction and development is presented in Appendices D-5 and D-6, respectively. A monitoring well completion summary is included in Table 3-5. Monitoring well construction diagrams are presented in Appendix B.

In May of 1994, five monitoring wells (735 MW-1, 735 MW-2, 735 MW-3, 734 MW-4, and 735 MW-5) were installed adjacent to building 735. Due to the close proximity of building 735 to Site 734, two of those five monitoring wells (735-MW-1 and 735-MW-4) were used as part of the SC investigation. These wells are constructed similarly to 734 MW-1 through 734 MW-3 except they include aboveground risers. Appendix B contains the monitoring well construction diagrams for these two wells.

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

**Site 734
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)
734-SB-1	1/23/98	0-2	<1	N/A	<1
	1/23/98	2-4	<1	N/A	<1
	1/23/98	4-6	420	420	0
	1/23/98	6-8	>1000	>1000	0
	1/23/98	8-10	N/C	N/C	N/C
	1/23/98	10-15	N/C	N/C	N/C
	1/23/98	15-17**	400	400	0
734-SB-2	1/23/98	0-2	<1	N/A	<1
	1/23/98	2-4	32	32	0
	1/23/98	4-6	150	100	50
	1/23/98	6-8	150	60	90
	1/23/98	8-10	210	200	10
	1/23/98	10-12**	<1	N/A	<1
734-SB-3	1/23/98	0-2	<1	N/A	<1
	1/23/98	2-4	<1	N/A	<1
	1/23/98	4-6	<1	N/A	<1
	1/23/98	6-8	<1	N/A	<1
	1/23/98	8-10	<1	N/A	<1
	1/23/98	10-12	<1	N/A	<1
	1/23/98	12-14**	200	50	150
	1/23/98	14-16	200	25	175
	1/23/98	16-18	900	600	300
	1/23/98	18-20	<1	N/A	<1
	1/23/98	20-22	<1	N/A	<1
	1/23/98	22-24	<1	N/A	<1
	1/23/98	24-26	<1	N/A	<1
734-SB-4	1/26/98	0-2	<1	N/A	<1
	1/26/98	2-4	<1	N/A	<1
	1/26/98	4-6	<1	N/A	<1
	1/26/98	6-8	<1	N/A	<1
	1/26/98	8-10	<1	N/A	<1
	1/26/98	10-12	<1	N/A	<1
	1/26/98	12-14**	<1	N/A	<1

734-SB-5	1/26/98	0-2	<1	N/A	<1
	1/26/98	2-4	<1	N/A	<1
	1/26/98	4-6	<1	N/A	<1
	1/26/98	6-8	<1	N/A	<1
	1/26/98	8-10	<1	N/A	<1
	1/26/98	10-12	<1	N/A	<1
	1/26/98	12-14**	170	25	145
734-SB-6	1/27/98	0-2	<1	N/A	<1
	1/27/98	2-4	<1	N/A	<1
	1/27/98	4-6	<1	N/A	<1
	1/27/98	6-8	<1	N/A	<1
	1/27/98	8-10	<1	N/A	<1
	1/27/98	10-12	<1	N/A	<1
	1/27/98	12-14**	39	10	29
734-SB-7	1/28/98	0-2	<1	N/A	<1
	1/28/98	2-4	<1	N/A	<1
	1/28/98	4-6	<1	N/A	<1
	1/28/98	6-8	<1	N/A	<1
	1/28/98	8-10	<1	N/A	<1
	1/28/98	10-12	<1	N/A	<1
	1/28/98	12-14**	<1	N/A	<1
734-SB-8	2/9/98	0-2	<1	N/A	<1
	2/9/98	2-4	<1	N/A	<1
	2/9/98	4-6	110	60	50
	2/9/98	6-8	<1	N/A	<1
	2/9/98	8-10	<1	N/A	<1
	2/9/98	10-12	12	8	<1
	2/9/98	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 or greater than 1000 PPM and not quantifiable

N/C = not collected

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

** = Interval sampled above the water table

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

**Site 734
Roosevelt Roads, U.S. Naval Station
Ceiba, Puerto Rico**

TRANSGLOBAL ENVIRONMENTAL GEOCHEMISTRY LABORATORIES		SAVANNAH LABORATORIES	
Sample Number	Method 418.1 TPH (mg/L)	Sample Number	Method 418.1 TPH (mg/L)
734 SB-8 (auger)	<10	734 SB-3 (auger)	21.0
		734 SB-5 (auger)	19
		734-SB-6 (auger)	5.6
		734-SB-7 (auger)	1.3
PREQB Target Levels	50	PREQB Target Levels	50
Notes: PREQB = Puerto Rico Environmental Quality Board TPH = Total Petroleum Hydrocarbon Mg/L = Milligrams per Liter			

TABLE 3-4
MONITORING WELL DEVELOPMENT SUMMARY

Site 734
Roosevelt Roads, U.S. Naval Station
Ceiba, Puerto Rico

Well	Development Method	Development Completion Date	Approximate Gallons Developed	Number of Well Volumes Developed
734-MW-1	BAILER	2/13/98	20	3.2
734-MW-2	BAILER	2/13/98	25	4.0
734-MW-3	BAILER	2/20/98	22	3.5

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

**Site 734
Roosevelt Roads, U.S. Naval Station
Ceiba, Puerto Rico**

Well Designation	734-MW-1	734-MW-2	734-MW-3	735-MW-1	735-MW-4
Date Installed	1/28/98	2/3/98	2/13/98	5/5/94	5/6/94
Total Well Depth (ft, BLS)	22	20	23	22.25	22.65
Type of Completion	Flush	Flush	Flush	Stick Up	Stick Up
Top of Casing Elevation (ft)	119.98	119.39	121.27	121.65	120.33
Casing Type	Schedule 40 PVC				
Casing Length (ft)	12	10	13	15	12
Screen Type	Schedule 40 PVC				
Screen Slot Size (in)	0.010	0.010	0.010	0.010	0.010
Screen Length (ft)	10	10	10	10	10
Screen Interval (ft, BLS)	12-22	10-20	13-23	9-19	10-20

Note: All monitoring wells are 2 inches in diameter
 Top-of-casing elevations were referenced to the Roosevelt Roads datum
 in = inches
 ft = feet
 BLS = below land surface

3.2 Slug Tests

On March 20, 1998, slug tests were performed in monitoring wells 734-MW-2 and 734-MW-3. The aquifer hydraulic properties beneath the site were calculated from the data collected during these tests. The slug test procedure consisted of the following list of steps:

- A depth-to-water measurement was taken to determine static conditions in the well
- A pressure transducer was placed 6-inches off the bottom of the well. The transducer 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 programed for the test. This allowed the data logger 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 immediately after five gallons were of water were introduced into the well.
- Once the water level returned to static conditions, the data logger was stopped.

The slug tests results were plotted on semi-logarithmic graphs and analyzed using the Bouwer and Rice method (Bouwer and Rice, 1976). The hydraulic conductivities (K), calculated from the slug test, ranged from 0.99 feet per day (ft/day) to 1.3 ft/day. The slug tests indicated that the surficial clays at Site 734 have very low hydraulic conductivities. The raw data, graphs, and calculations pertaining the slug test are presented in Appendix C.

3.3 Water Table Elevation Measurements

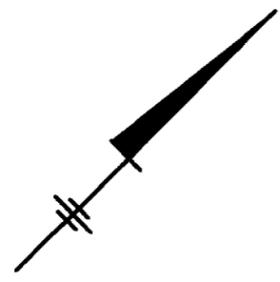
The top-of-casing elevations of the three monitoring wells installed in Site 734 and the two wells previously installed in building 735 were surveyed by a licensed surveyor and referenced to the Roosevelt Roads datum. On March 3, 1998 and April 23, 1998, the depth to water for the five monitoring wells 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 and monitoring well elevation data are presented in Table 3-6. The water level measurements obtained on March 3 and April 23, 1998 were used to generate water table elevation maps (Figure 3-1 and Figure 3-2). As shown on the water table elevation maps (Figure 3 and Figure 3-2), the groundwater flow is generally toward the southeast.

The ground-water gradient (I) and flow velocity (V) were calculated from the K obtained from the slug tests and water table elevation data. The groundwater gradient ranged from 0.11 feet/foot (ft/ft) to 0.33 ft/ft, while the flow velocity ranged from 0.003 ft/day to 0.084 ft/day. The calculations used to determine I and V are presented in Appendix C.

3.4 Groundwater Sampling

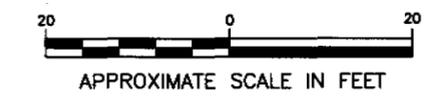
On March 3, 1998, groundwater samples were collected from the three monitoring wells. The groundwater samples were transported, on ice, to a certified laboratory via an overnight courier. The samples were analyzed by the following EPA methods: 418.1 (TPH), 8020 (BTEX), 239 (total lead), and 610 (polynuclear aromatic hydrocarbons [PAH]).

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.



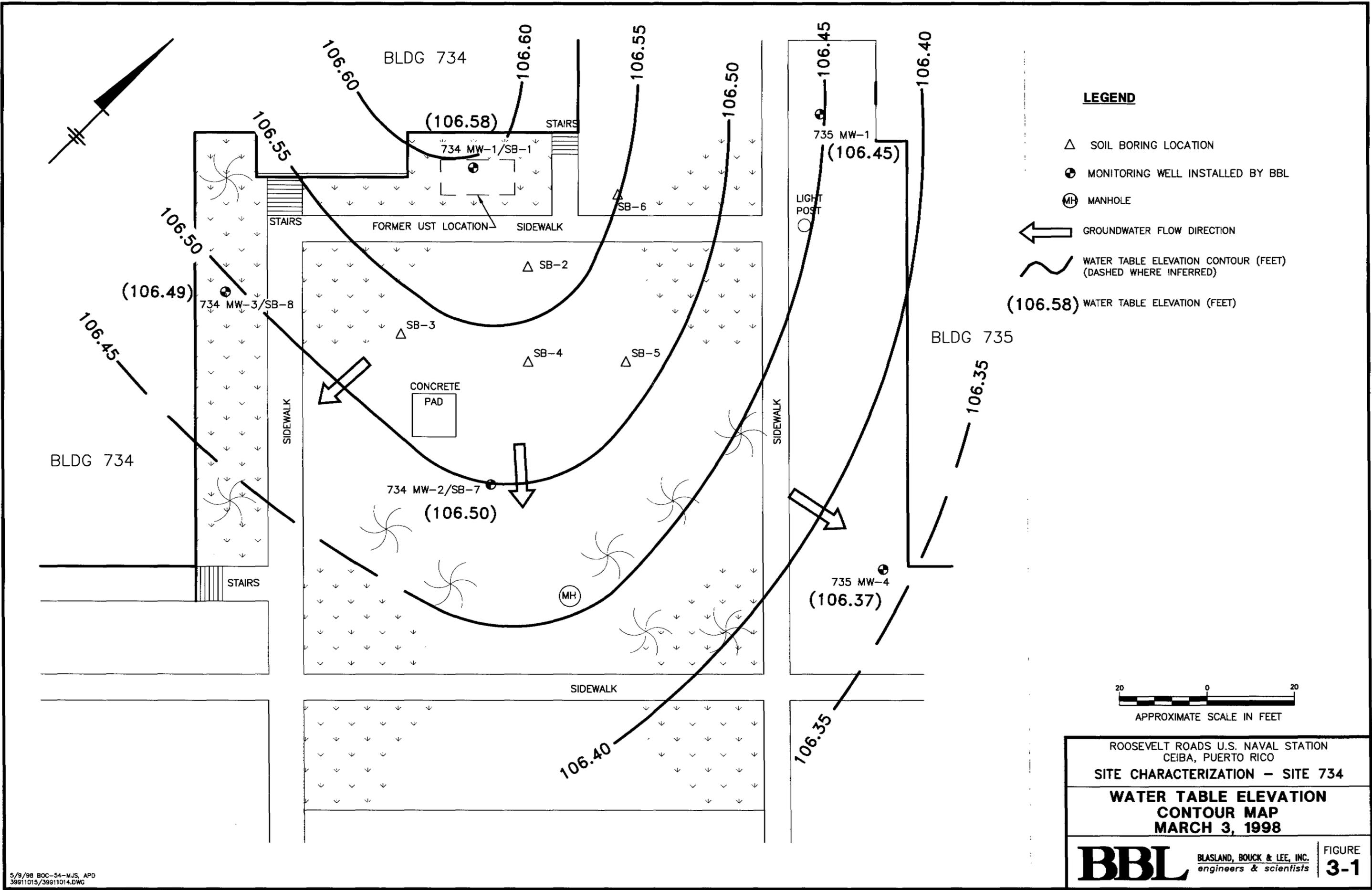
LEGEND

- △ SOIL BORING LOCATION
- ⊕ MONITORING WELL INSTALLED BY BBL
- Ⓜ MANHOLE
- ← GROUNDWATER FLOW DIRECTION
- ~ WATER TABLE ELEVATION CONTOUR (FEET)
(DASHED WHERE INFERRED)
- (106.58) WATER TABLE ELEVATION (FEET)

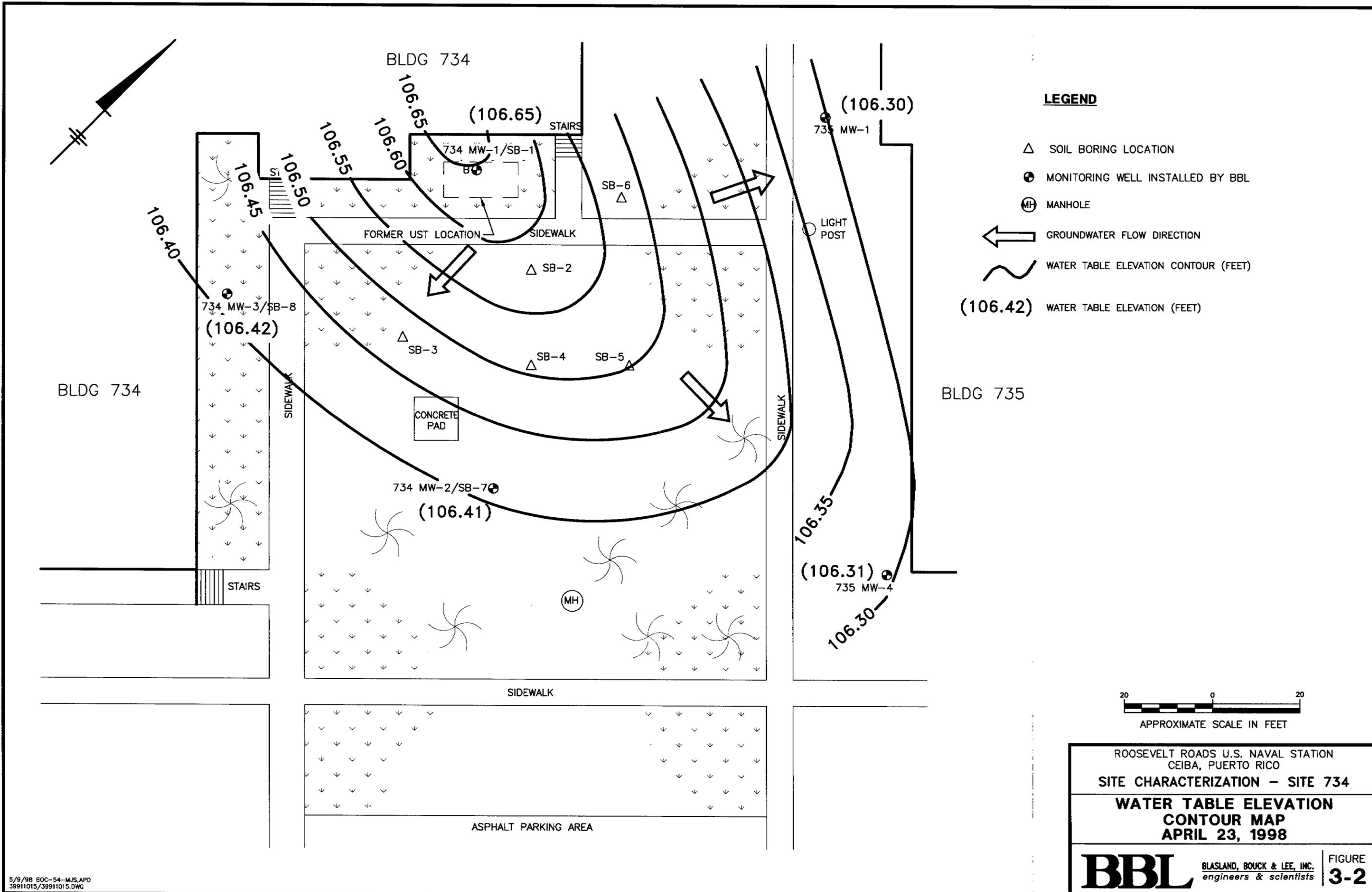


ROOSEVELT ROADS U.S. NAVAL STATION
CEIBA, PUERTO RICO
SITE CHARACTERIZATION - SITE 734
**WATER TABLE ELEVATION
CONTOUR MAP**
MARCH 3, 1998

BBL BLASLAND, BOUCK & LEE, INC.
engineers & scientists **FIGURE 3-1**

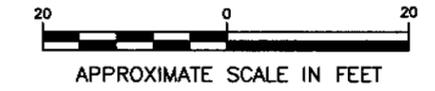


5/9/98 BOC-54-MJS, APD
39911015/39911014.DWG



LEGEND

- △ SOIL BORING LOCATION
- ⊕ MONITORING WELL INSTALLED BY BBL
- ⊙ (MH) MANHOLE
- ← GROUNDWATER FLOW DIRECTION
- ~ WATER TABLE ELEVATION CONTOUR (FEET)
- (106.42) WATER TABLE ELEVATION (FEET)



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

SITE CHARACTERIZATION - SITE 734

**WATER TABLE ELEVATION
CONTOUR MAP**

APRIL 23, 1998

BBL BLASLAND, BOUCK & LEE, INC.
engineers & scientists

FIGURE
3-2

**TABLE 3-6
WATER LEVEL DATA**

**Site 734
Roosevelt Roads, U.S. Naval Station
Ceiba, Puerto Rico**

Well Designation	Elevation of Top of Casing (ft, MSL)	March 3, 1998		April 23, 1998	
		Depth to Water (ft)	Water Level Elevation (ft, MSL)	Depth to Water (ft)	Water Level Elevation (ft, MSL)
734-MW-1	119.98	13.40	106.58	14.33	105.65
734-MW-2	119.39	12.89	106.5	12.98	106.41
734-MW-3	121.27	14.78	106.49	14.85	106.42
735-MW-1	121.65	15.20	106.45	16.35	105.30
735-MW-4	120.33	13.96	106.37	14.02	106.31

NOTE: Top-of-Casing elevations were referenced to the Roosevelt Roads datum

4. Laboratory Analytical Results

4.1 Soil Analytical Results

The laboratory analytical data for the soil samples collected during this investigation are summarized in Table 4-1. Complete laboratory analytical data of samples collected by BBL personnel are presented in Appendix G. The TPH data collected by BBL were used to approximate the maximum horizontal and vertical extent of soil potentially impacted by hydrocarbons. Concentrations of hydrocarbons in the soil samples collected is provided as Figure 4-1. Concentrations of TPH above the PREQB target levels appear to be restricted to one location.

As shown in Table 4-1 and Figure 4-1, only two samples are at or above the PREQB target level of 100 mg/kg for TPH. The sample collected from 4 feet to 6 feet BLS in soil boring 734-SB-2 had a TPH concentration of 100 milligrams per kilogram (mg/kg) and the sample collected from 10 to 13 feet BLS in soil boring 734-SB-7 had a TPH concentration of 188 mg/kg. Additional laboratory analysis by modified EPA method 8015 for the diesel range organic compounds indicated that the elevated TPH concentration in the sample from 10 to 13 feet BLS in soil boring 734-SB-7 was not a result of concentrations of hydrocarbons compounds and appears to be due to interference effects. Elevated levels of TPH in the sample from 4 to 6 feet BLS in soil boring 734-SB-2 is attributed to the former UST at Site 734. Although PREQB does not have any standards for BTEX in soils, the samples were analyzed to characterize individual constituents. The laboratory analytical data indicate that the samples were below the method detection limits for BTEX constituents.

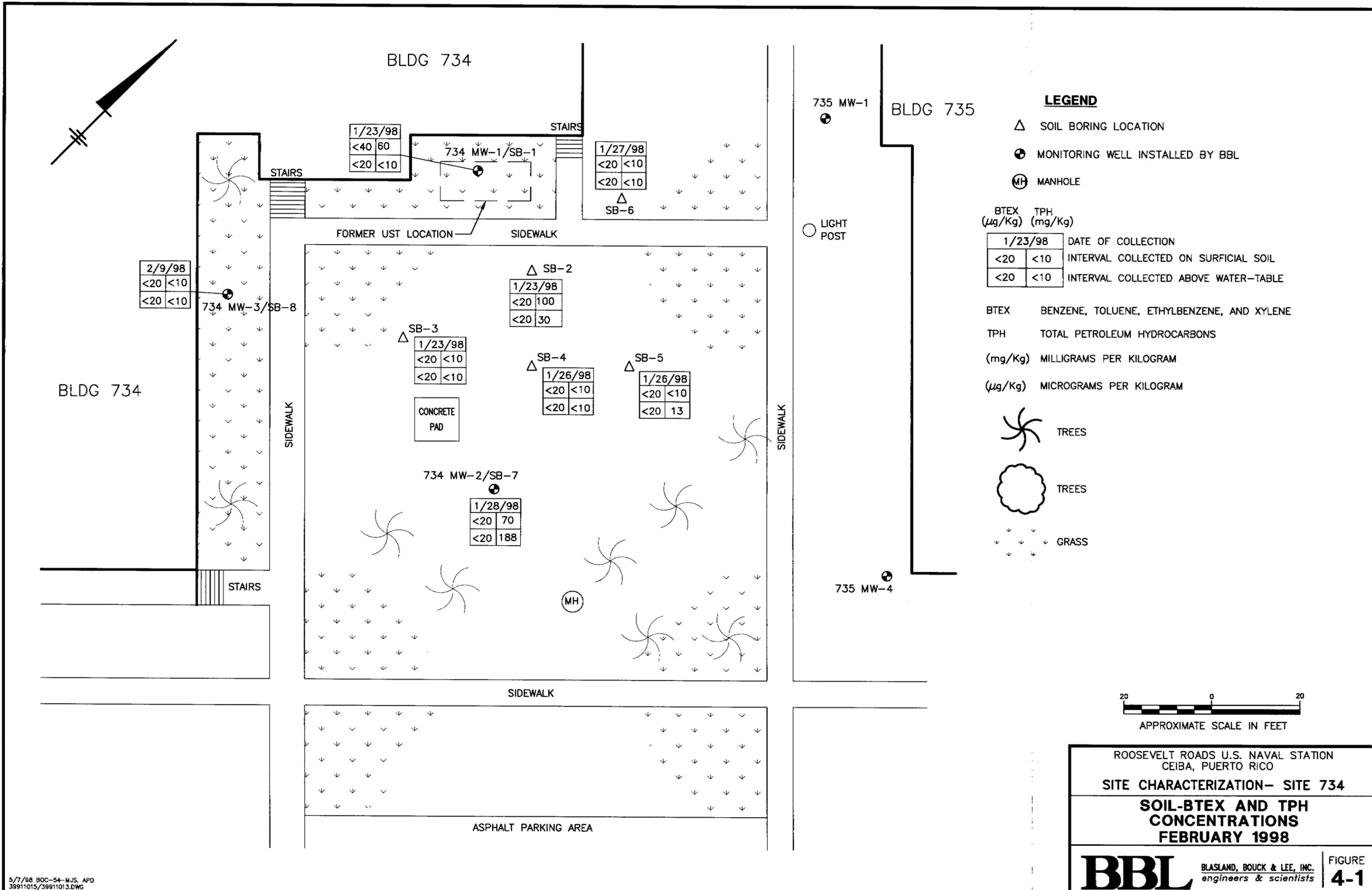
Soil quality assurance/quality (QA/QC) control analytical data are summarized in Table 4-2.

The soil analytical data were used to determine the status of the drill cuttings. Based on the laboratory analytical data, uncontaminated drill cuttings were classified as nonhazardous and spread. Drill cuttings from 734-SB-2 (2-6) and 734-SB-7 (10-13) were containerized in 55-gallon drums for disposal at a Puerto Rico certified landfill.

4.2 Groundwater Analytical Results

The groundwater laboratory analytical data, summarized in Table 4-3, showed that dissolved concentrations of BTEX, and total lead are not present within the wells at Site 734. TPH concentrations were below the PREQB target levels. PREQB defines groundwater to be contaminated if it contains benzene concentrations above 5 micrograms per liter (ug/L), total BTEX concentrations above 50 ug/L, or TPH concentrations above 50 milligrams per liter (mg/L). As summarized in Table 4-3 and depicted in Figure 4-2, the groundwater samples analyzed do not exceed any of the PREQB target levels.

A summary of the QA/QC laboratory analytical data is presented in Table 4-4. The soil, groundwater, and QA/QC analytical laboratory reports are provided in Appendix G.



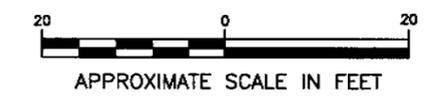
LEGEND

- △ SOIL BORING LOCATION
- ⊕ MONITORING WELL INSTALLED BY BBL
- Ⓜ MANHOLE

BTEX ($\mu\text{g}/\text{Kg}$)	TPH (mg/Kg)	DATE OF COLLECTION
<20	<10	1/23/98
<20	<10	INTERVAL COLLECTED ON SURFICIAL SOIL
<20	<10	INTERVAL COLLECTED ABOVE WATER-TABLE

BTEX BENZENE, TOLUENE, ETHYLBENZENE, AND XYLENE
 TPH TOTAL PETROLEUM HYDROCARBONS
 (mg/Kg) MILLIGRAMS PER KILOGRAM
 ($\mu\text{g}/\text{Kg}$) MICROGRAMS PER KILOGRAM

- TREES
- TREES
- GRASS



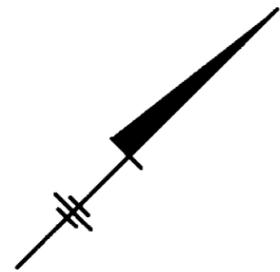
ROOSEVELT ROADS U.S. NAVAL STATION
 CEIBA, PUERTO RICO

SITE CHARACTERIZATION- SITE 734

**SOIL-BTEX AND TPH
 CONCENTRATIONS
 FEBRUARY 1998**

BBL BLASLAND, BOUCK & LEE, INC.
 engineers & scientists **FIGURE 4-1**

5/7/98 BOC-54-MJS, APD
 39911015/39911013.DWG



BLDG 734

FORMER UST LOCATION

STAIRS

<1
<5
1.1

734 MW-1/SB-1

SB-6

735 MW-1

<1
<5
1.1

LIGHT POST

LEGEND

- △ SOIL BORING LOCATION
- MONITORING WELL INSTALLED BY BBL
- ⊕ MANHOLE

<1	BENZENE CONCENTRATIONS(μg/L)
<5	BTEX CONCENTRATIONS(μg/L)
<1	TPH CONCENTRATIONS(Mg/L)



TREES



TREES



GRASS

BLDG 734

<1
<5
1.0

734 MW-3/SB-8

SIDEWALK

CONCRETE PAD

734 MW-2/SB-7

<1
<5
1.0

⊕

SIDEWALK

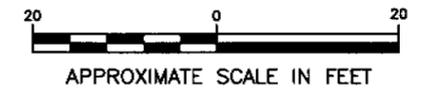
BLDG 735

<1
<5
1.1

735 MW-4

SIDEWALK

ASPHALT PARKING AREA



ROOSEVELT ROADS U.S. NAVAL STATION
CEIBA, PUERTO RICO
SITE CHARACTERIZATION- SITE 734
GROUNDWATER BENZENE, BTEX
AND TPH CONCENTRATIONS
FEBRUARY 29, 1998

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

**Site 734
Roosevelt Roads, U.S. Naval Station
Ceiba, Puerto Rico**

Soil Boring	Date Sampled	Savannah Laboratories	
		Modified EPA Method 418.1 TPH (mg/Kg)	Modified EPA Method 8020 Total BTEX (ug/Kg)
734-SB-1 (4-8)	01/23/98	60	<40*
734-SB-1 (15-17)	01/23/98	<10	<20
734-SB-2 (4-6)	01/23/98	100	<20
734-SB-2 (10-13)	01/23/98	30	<20
734-SB-3 (4-6)	01/23/98	<10	<20
734-SB-3 (10-12)	01/23/98	<10	<20
734-SB-4 (2-6)	01/26/98	<10	<20
734-SB-4 (10-13)	01/26/98	<10	<20
734-SB-5 (2-6)	01/26/98	<10	<20
734-SB-5 (10-13)	01/26/98	17	<20
734-SB-6 (2-6)	01/27/98	<10	<20
734-SB-6 (10-14)	01/27/98	<10	<20
734-SB-7 (2-6)	01/28/98	70	<20
734-SB-7 (10-13)	01/28/98	188	<20
734-SB-8 (2-6)	02/09/98	<10	<20
734-SB-8 (10-13)	02/09/98	<10	<20
PREQB UST Target Levels		100	NS
<p>Notes: PREQB = Puerto Rico Environmental Quality Board TPH = Total Petroleum Hydrocarbons Total BTEX = Sum of Benzene, Toluene, Ethylbenzene, and Xylene Concentrations ug/Kg = Micrograms per Kilogram mg/Kg = Milligrams per Kilogram NS = No Standards in Puerto Rico UST = Underground Storage Tank * = Elevated detection limits were reported due to a sample matrix interference which required sample or extract dilution.</p>			

**TABLE 4-2
SUMMARY OF SOIL QA/QC ANALYTICAL RESULTS**

**Site 734
Roosevelt Roads, U.S. Naval Station
Ceiba, Puerto Rico**

Sample Name	Date Sampled	Sampled Matrix	TPH mg/Kg	BTEX ug/Kg
734-SD-6- (12-14)	1/27/98	Soil	<10	<20
734-SB-6- (12-14)	1/27/98	Soil	<10	<20
			mg/L	ug/L
T.B.	1/26/98	Water	NA	<5
T.B.	1/28/98	Water	NA	<4
T.B.	1/24/98	Water	NA	<4
E.B.	1/26/98	Water	<1	<5
E.B.	1/27/98	Water	<1	<4
E.B.	1/28/98	Water	1.2	<5
Notes:				
T.B.	= Trip blank; provided by the laboratory			
E.B.	= Equipment blank taken from split spoon rinsate			
ug/L	= Micrograms per Liter			
mg/L	= Milligrams per Liter			
ug/Kg	= Micrograms per Kilogram			
mg/Kg	= Milligrams per Kilogram			
734-SD-6 (12-14)	= Duplicate of 734-SB-6 (12-14)			
NA	= Not Analyzed			

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

**Site 734
Roosevelt Roads, U.S. Naval Station
Ceiba, Puerto Rico**

Parameters	PREQB Target Levels	U.S. EPA MCL	734- MW-1	734- MW-2	734- MW-3	735- MW-1	735- MW-4
Date Sampled			3/2/98	3/2/98	3/2/98	3/2/98	3/2/98
Benzene (ug/L)	5	1.0	<1	<1	<1	<1	<1
Toluene (ug/L)	1,000	1,000	<1	<1	<1	<1	<1
Ethylbenzene (ug/L)	700	700	<1	<1	<1	<1	<1
Xylene (ug/l)	10,000	10,000	<2	<2	<2	<2	<2
Total BTEX (ug/L)	50	NS	<5	<5	<5	<5	<5
MTBE (ug/L)	NS	NS	<10	<10	<10	<10	<10
PAH (ug/L)	NS	NS	BDL*	BDL*	BDL*	BDL*	BDL*
Total Naphthalene (ug/L)	NS	NS	<25	<25	<25	<25	<25
TPH (mg/L)	50	NS	1.1	<1	<1	1.1	<1
Lead (mg/L)	0.015	0.015	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050

Note:

- PREQB = Puerto Rico Environmental Quality Board
- 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
- NS = No Standard
- MCL = Maximum Contaminant Level
- Total Naphthalene = Sum of Naphthalenes and Methylnaphthalenes
- BDL = Below Detection Limits
- * = All PAH compounds excluding naphthalenes were below their respective detection limits

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

**Site 734
Roosevelt Roads, U.S. Naval Station
Ceiba, Puerto Rico**

Parameter	PREQB Target Levels	U.S. EPA MCL	Equipment Blank	Field Blank	Trip Blank
Date Sampled			3/2/98	3/2/98	3/2/98
Benzene (ug/L)	5	1.0	<1	<1	<1
Toluene (ug/L)	1,000	1,000	<1	<1	<1
Ethylbenzene (ug/L)	700	700	<1	<1	<1
Xylene (ug/l)	10,000	10,000	<2	<2	<2
Total BTEX (ug/L)	50	N/S	<5	<5	<5
MTBE (ug/L)	N/S	N/S	<1	<10	<10
PAH (ug/L)	N/S	N/S	BDL*	BDL*	N/A
Total Naphthalenes (ug/L)	N/S	N/S	<25	<25	N/A
TPH (mg/L)	50	N/S	<1	<1	N/A
Lead (mg/L)	0.015	0.015	<0.005	<0.005	N/A
Note:					
PREQB	= Puerto Rico Environmental Quality Board				
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 Analyzed				
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				

5. Qualitative Risk Assessment

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 734. A discussion of exposures 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 analysis 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 734.

5.1 Nature and Extent of Release

Based on field and laboratory data obtained during groundwater sampling, BBL concluded that dissolved petroleum hydrocarbons are not present at concentrations above PREQB target levels. Laboratory analytical data indicated that soils exceeding PREQB TPH target levels of 100 mg/Kg are limited to scattered locations at Site 734.

5.2 Chemical 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 734 is the location of a former UST located in the front of Building 734. The building, assigned as enlisted men living quarters, is inhabited by U.S. Navy personnel. The potential of human contact with the compounds is considered minimum because of the following:

- The contamination is 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.
- The area has restricted access (i.e., authorized personnel only)
- A concrete sidewalk is used by personnel when walking past the former UST location preventing contact with soil.

5.3.2 Environmental Receptors

The potential for migration of the compounds of concern to environmental receptors is considered minimal because the TPH concentrations in the groundwater were below the PREQB target level for UST sites. The contaminated soils are overlain by clays, which exhibit high plasticity resulting in low hydraulic conductivity. These clays act as a cap, which limits the ability of soil to spread by wind action. Site 734 is characterized by a gentle slope and a measured groundwater flow to the southeast. The southeast direction of the groundwater flow indicates a possible

route toward Bahia de Algodones. Thus, Bahia de Algodones is the only 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 and ingestion of groundwater).

If any of these elements are not present, the exposure pathway is considered incomplete. In Site 734, the first element (a source/mechanism) has been shown to exist. However, the concentrations of benzene and lead in the groundwater are below PREQB target levels. Thus, the source is limited to a few scattered elevated concentrations of hydrocarbons at Site 734. A discussion of the potential exposure pathways is presented in the following sections.

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 the site. Workers may be exposed, through direct contact, with the soils during these activities. Thus, a minor possibility of an ingestion pathway exists at the site. However, proposed construction activities require the approval of the NAVSTA Roosevelt Roads prior to conducting any work at Site 734. Therefore, this exposure pathway is incomplete under current site conditions.

5.3.6 Inhalation Pathway

Vaporization of compounds from soil and groundwater into the air could lead to the inhalation of the compounds of concern. In addition, contaminated soil particles could be transported by wind if exposed to the land surface. The potential for either of this pathway is minimal, because the contaminated soils are typically encountered at least 2 feet BLS and are covered at the surface by either grass or a concrete sidewalk. Additionally, the soils are composed of plastic clays and silt that are not easily distributed by wind action. Therefore, this exposure pathway is incomplete under current site conditions.

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

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 the site 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 because Puerto Rico lacks incineration facilities. Hydrocarbon impacted soils can be disposed at a certified landfill as long as the soils do not exhibit the Resource Conservation and Recovery Act (RCRA) waste characteristics as defined in 40 CFR 261. However, excavation of contaminated soils is not a viable option at Site 734 due to the close proximity to living quarters. Excavation activities could cause the compounds of concern to be spread by wind action, completing the exposure pathways of petroleum hydrocarbons.

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 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 734.

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 the site lacks 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 silts and clays at the site 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 area of soil exceeding the PREQB target level for TPH at the site, 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 organisms to remediate the contamination. However, natural biodegradation processes are expected to reduce the levels of hydrocarbon concentrations in the soils at Site 734.

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 in soils are attributed to the UST system formerly located at Site 734.

Laboratory analytical data indicated that concentrations of TPH in only two soil samples were above the PREQB target level. Additional laboratory analysis by EPA Method 8015 indicated that the concentration of TPH in one of these samples (734-SB-7 [10-13 feet BLS]) was not attributable to diesel range organic compounds and was probably the result of interference effects. No free-product was encountered in any of the monitoring wells. Additionally, the concentrations of TPH, benzene, BTEX and total lead in the groundwater samples were below the PREQB target levels for UST sites.

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 soil exceeding the PREQB TPH target level of 100 mg/kg present at Site 734 is not a threat to human health.

7.2 Recommendations

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 the site. Natural biodegradation processes are expected to reduce the levels of hydrocarbon concentrations in the soils at Site 734.

8. References

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, 731, 732, 734, 1691, and 1738- Roosevelt Roads Naval Station, Ceiba, Puerto Rico" January 1998.

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.*

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.*

APPENDIX A
SOIL BORING LITHOLOGIC LOGS

A. Soil Boring Log

Exploration for: <u>Site Characterization</u>			Location	
Date: <u>January 23, 1998</u>			Site 734 Roosevelt Roads U.S. Naval Station Ceiba, Puerto Rico	
Boring No.: <u>734-SB-1</u>				
Recorded by: <u>Dan Press</u>				
Drill Type: <u>B-61</u>				
Weather: <u>Sunny, 80's</u>				
			Water Table	
			~12	
Sample No.	Type	Depth		Soil Description and Boring Log
		From	To	
1	PH	0	2	Silty clay, moderate olive brown (5Y 4/4);dry
2	HA	2	4	Silty gravel, moderate olive brown (5Y 4/4);dry
3	SPT	4	6	Inorganic clay of medium plasticity, olive gray (5Y 3/2); wet
4	SPT	6	8	Inorganic clay of medium plasticity, olive gray (5Y 3/2); wet
5	SPT	8	10	Inorganic clay of low plasticity, dusky yellow (5Y 6/4); extremely wet
6	SPT	10	15	Inorganic clay of low plasticity, dusky yellow (5Y 6/4); extremely wet
7	SPT	15	17	Inorganic clay of high plasticity, moderate yellowish brown (10 YR 5/4) and light olive gray (5 GY 6/1);wet
Notes: N/C = Not collected because a hard volcanic rock 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>January 23, 1998</u>			Site 734 Roosevelt Roads U.S. Naval Station Ceiba, Puerto Rico	
Boring No.: <u>734-SB-2</u>				
Recorded by: <u>Albert Naya</u>				
Drill Type: <u>B-61</u>				
Weather: <u>Sunny, 80's</u>				
			Water Table	
			~12	
Sample No.	Type	Depth		Soil Description and Boring Log
		From	To	
1	PH	0	2	Silty clay, moderate olive brown (5Y 4/4); dry
2	HA	2	4	Silty clay, moderate olive brown (5Y 4/4) and dusky brown (5 YR. 2/2); dry
3	SPT	4	6	Silty gravel, grayish blue green (5 BG. 5/2); dry
4	SPT	6	8	Inorganic clay of medium plasticity, dark yellowish orange (10 YR 6/6); dry
5	SPT	8	10	Inorganic clay of high plasticity, moderate brown (5 YR. 4/4); dry
6	SPT	10	12	Inorganic clay of medium plasticity, moderate olive brown (5Y 6/4); wet
Notes: N/C = Not collected because a hard volcanic rock 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>January 23, 1998</u>		Site 734 Roosevelt Roads U.S. Naval Station Ceiba, Puerto Rico	
Boring No.:	<u>734-SB-3</u>			
Recorded by:	<u>Albert Naya</u>			
Drill Type:	<u>B-61</u>			
Weather:	<u>Sunny, 80's</u>			
			Water Table	~13.57
Sample No.	Type	Depth		Soil Description and Boring Log
		From	To	
1	PH	0	2	Silty clay, dark yellowish brown (5 YR. 4/2), dry
2	HA	2	4	Silty clay, dusky yellowish brown (10 YR 2/2); dry
3	SPT	4	6	Silty clay, moderate brown (5 YR 4/4); dry
4	SPT	6	8	Inorganic clay of medium plasticity, moderate yellowish brown (10 YR 5/4); dry
5	SPT	8	10	Inorganic clay of medium to high plasticity, moderate yellowish brown (5 YR. 4/4); dry
6	SPT	10	12	Inorganic clay of medium to high plasticity, moderate brown (5 YR 4/4); dry
7	SPT	12	14	Inorganic clay of high plasticity, pale green (10 G 6/2); dry
8	SPT	14	16	Inorganic clay of high plasticity, pale green (10 G 6/2); dry
9	SPT	16	18	Inorganic clay of high plasticity, pale green (10 G 6/2); dry
10	SPT	18	20	Inorganic clay of high plasticity, very pale green (5 G 8/26), dry
11	SPT	20	22	Inorganic clay of high plasticity, dark yellowish orange (10 Y 6/6)
12	SPT	22	24	Inorganic clay of high plasticity, dark yellowish orange (10 Y 6/6)
13	SPT	24	26	Inorganic clay of high plasticity, dark yellowish orange (10 Y 6/6)

A. Soil Boring Log

Notes:

N/C = Not collected because a hard volcanic rock 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>January 26, 1998</u>	Site 734			
Boring No.: <u>734-SB-4</u>	Roosevelt Roads U.S. Naval Station			
Recorded by: <u>Albert Naya</u>	Ceiba, Puerto Rico			
Drill Type: <u>B-61</u>	Water Table		~13	
Weather: <u>Sunny, 80's</u>				
Sample No.	Type	Depth		Soil Description and Boring Log
		From	To	
1	PH	0	2	Silty clay, dark yellowish orange (10 YR 6/6); dry
2	HA	2	4	Silty clay, light brown (5 YR. 5/6); dry
3	SPT	4	6	Inorganic clay of low plasticity, light brown (5 YR. 5/6); dry
4	SPT	6	8	Inorganic clay of medium plasticity, light brown (5 YR. 5/6); dry
5	SPT	8	10	Inorganic clay of high plasticity, light brown (5 YR. 5/6); dry
6	SPT	10	12	Inorganic clay of high plasticity, light brown (5 YR. 5/6); dry
7	SPT	12	14	Inorganic clay of medium plasticity, light brown (5 YR. 5/6 and pale yellowish green (10 GY 7/2); wet
Notes:				
N/C = Not collected because a hard volcanic rock 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>January 26, 1998</u>			Site 734 Roosevelt Roads U.S. Naval Station Ceiba, Puerto Rico	
Boring No.: <u>734-SB-5</u>				
Recorded by: <u>Albert Naya</u>				
Drill Type: <u>B-61</u>				
Weather: <u>Sunny, 80's</u>				
			Water Table	
			~12	
Sample No.	Type	Depth		Soil Description and Boring Log
		From	To	
1	PH	0	2	Silty clay, moderate yellowish brown (10 YR 5/4); dry
2	HA	2	4	Silty clay, dark yellowish orange (10 YR 6/6); dry
3	SPT	4	6	Inorganic clay of low plasticity, light brown (5 YR. 5/6); dry
4	SPT	6	8	Inorganic clay of medium plasticity, light brown (5 YR. 5/6); dry
5	SPT	8	10	Inorganic clay of high plasticity, moderate yellowish brown (10 YR 5/4); dry
6	SPT	10	12	Inorganic clay of high plasticity, dark yellowish orange (10 YR 6/6); dry
7	SPT	12	14	Inorganic clay of medium plasticity, grayish green (10 G 4/2); dry
Notes: N/C = Not collected because a hard volcanic rock 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>January 27, 1998</u>			Site 734 Roosevelt Roads U.S. Naval Station Ceiba, Puerto Rico Water Table ~13.4	
Boring No.: <u>734-SB-6</u>				
Recorded by: <u>Albert Naya</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	Silty clay, moderate yellowish orange (10 YR 8/6); dry
2	HA	2	4	Silty clay, dark yellowish brown (10 YR 5/4); dry
3	SPT	4	6	Inorganic clay of low plasticity, dark yellowish orange (10 YR 6/6); dry
4	SPT	6	8	Inorganic clay of medium plasticity, dark yellowish orange (10 YR 6/6); dry
5	SPT	8	10	Inorganic clay of high plasticity, dark yellowish brown (10 YR 4/2); dry
6	SPT	10	12	Inorganic clay of high plasticity, pale green (10 G 5/2); dry
7	SPT	12	14	Inorganic clay of medium plasticity, pale green (10 G 6/2); wet
Notes: N/C = Not collected because a hard volcanic rock was encountered PH = post hole HA = hand auger SPT = standard penetration test BLS = below land surface				

A. Soil Boring Log

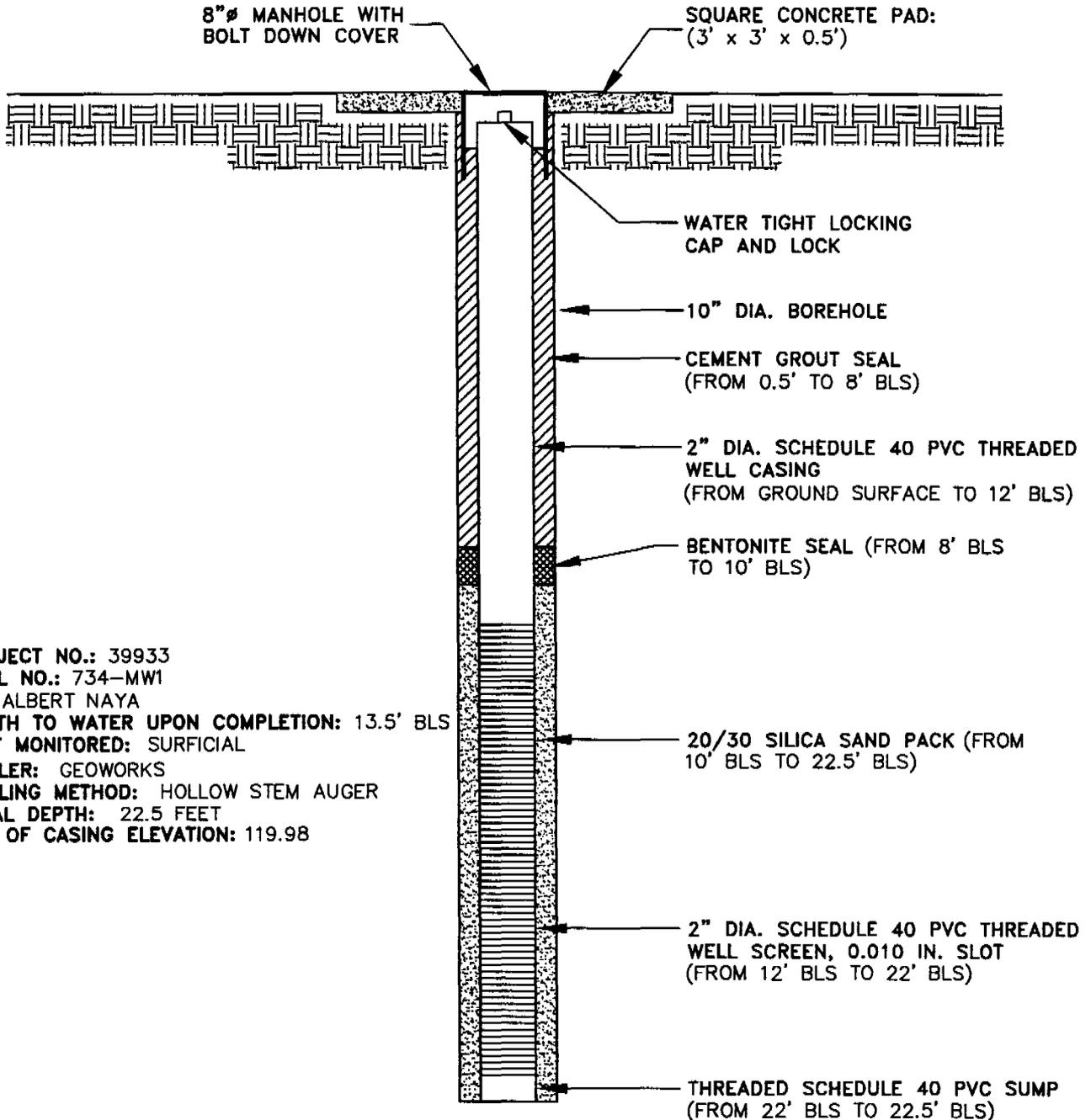
Exploration for: <u>Site Characterization</u>			Location	
Date: <u>January 28, 1998</u>			Site 734 Roosevelt Roads U.S. Naval Station Ceiba, Puerto Rico Water Table ~12.9	
Boring No.: <u>734-SB-7</u>				
Recorded by: <u>Albert Naya</u>				
Drill Type: <u>B-61</u>				
Weather: <u>Sunny, 80's</u>				
Sample No.	Type	Depth		Soil Description and Boring Log
		From	To	
1	PH	0	2	Silty clay, dark yellowish orange (10 YR 6/6); dry
2	HA	2	4	Silty clay, dark yellowish orange (10 YR 6/6); dry
3	SPT	4	6	Silty clay, dark yellowish orange (10 YR 6/6); dry
4	SPT	6	8	Silty clay, dark yellowish orange (10 YR 6/6); dry
5	SPT	8	10	Inorganic clay of medium to high plasticity, light brown (5 YR. 6/2); dry
6	SPT	10	12	Inorganic clay of high plasticity, light brown (5 YR. 6/2); dry
7	SPT	12	14	Inorganic clay of high plasticity, light brown (5 YR. 6/2); dry
Notes: N/C = Not collected because a hard volcanic rock 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>February 2, 1998</u>		Site 734 Roosevelt Roads U.S. Naval Station Ceiba, Puerto Rico	
Boring No.:	<u>734-SB-8</u>			
Recorded by:	<u>Dan Press</u>			
Drill Type:	<u>B-61</u>			
Weather:	<u>Sunny, 80's</u>			
			Water Table	~14
Sample No.	Type	Depth		Soil Description and Boring Log
		From	To	
1	PH	0	2	Silty clay, dark yellowish orange (10 YR 6/6); dry
2	HA	2	4	Silty clay, dark yellowish orange (10 YR 6/6); dry
3	SPT	4	6	Inorganic clay of low plasticity, moderate brown (5 YR 4/4); dry
4	SPT	6	8	Inorganic clay of medium to high plasticity, dark yellowish orange (10 YR 6/6) and pale green (5 G 7/2); dry
5	SPT	8	10	Inorganic clay of medium to high plasticity, light brown (5 YR. 6/6); dry
6	SPT	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); wet
Notes: N/C = Not collected because a hard volcanic rock was encountered PH = post hole HA = hand auger SPT = standard penetration test BLS = below land surface				

APPENDIX B
MONITORING WELL CONSTRUCTION DIAGRAM

734 - MW1



PROJECT NO.: 39933
 WELL NO.: 734-MW1
 BY: ALBERT NAYA
 DEPTH TO WATER UPON COMPLETION: 13.5' BLS
 UNIT MONITORED: SURFICIAL
 DRILLER: GEOWORKS
 DRILLING METHOD: HOLLOW STEM AUGER
 TOTAL DEPTH: 22.5 FEET
 TOP OF CASING ELEVATION: 119.98

(DRAWING NOT TO SCALE)

MSL = MEAN SEA LEVEL
 BLS = BELOW LAND SURFACE

ROOSEVELT ROADS U.S. NAVAL STATION
 CEIBA, PUERTO RICO
 SITE CHARACTERIZATION - SITE 734

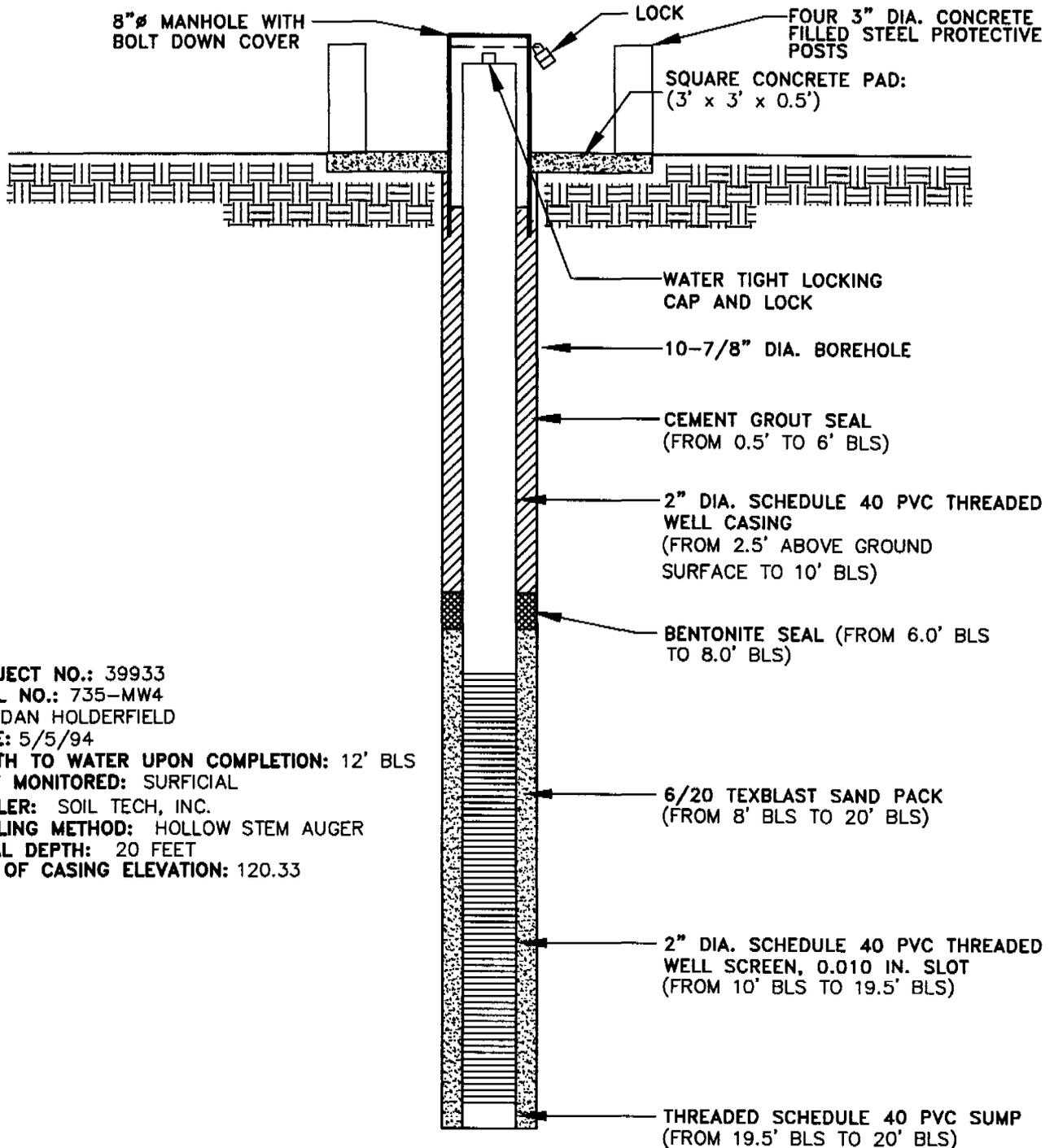
**MONITORING WELL 734-MW1
 CONSTRUCTION DETAILS**

BBL

BLASLAND, BOUCK & LEE, INC.
 engineers & scientists

FIGURE
B-1

735 - MW4



PROJECT NO.: 39933
WELL NO.: 735-MW4
BY: DAN HOLDERFIELD
DATE: 5/5/94
DEPTH TO WATER UPON COMPLETION: 12' BLS
UNIT MONITORED: SURFICIAL
DRILLER: SOIL TECH, INC.
DRILLING METHOD: HOLLOW STEM AUGER
TOTAL DEPTH: 20 FEET
TOP OF CASING ELEVATION: 120.33

(DRAWING NOT TO SCALE)

MSL = MEAN SEA LEVEL
 BLS = BELOW LAND SURFACE

ROOSEVELT ROADS U.S. NAVAL STATION
 CEIBA, PUERTO RICO
 SITE CHARACTERIZATION - SITE 734

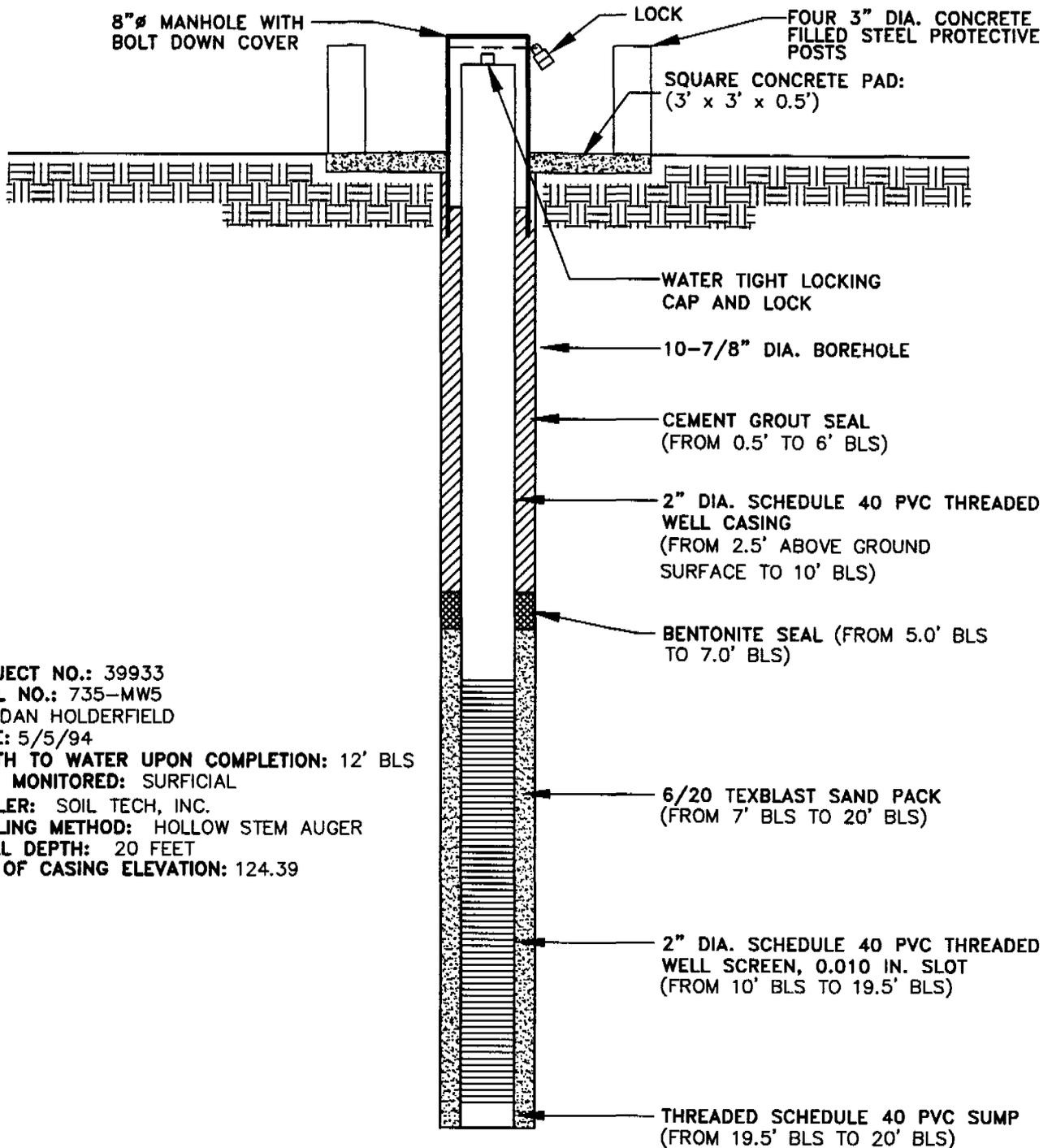
MONITORING WELL 735-MW4
CONSTRUCTION DETAILS

BBL

BLASLAND, BOUCK & LEE, INC.
 engineers & scientists

FIGURE
B-4

735 - MW1



PROJECT NO.: 39933
 WELL NO.: 735-MW5
 BY: DAN HOLDERFIELD
 DATE: 5/5/94
 DEPTH TO WATER UPON COMPLETION: 12' BLS
 UNIT MONITORED: SURFICIAL
 DRILLER: SOIL TECH, INC.
 DRILLING METHOD: HOLLOW STEM AUGER
 TOTAL DEPTH: 20 FEET
 TOP OF CASING ELEVATION: 124.39

(DRAWING NOT TO SCALE)

MSL = MEAN SEA LEVEL
 BLS = BELOW LAND SURFACE

ROOSEVELT ROADS U.S. NAVAL STATION
 CEIBA, PUERTO RICO
 SITE CHARACTERIZATION - SITE 735

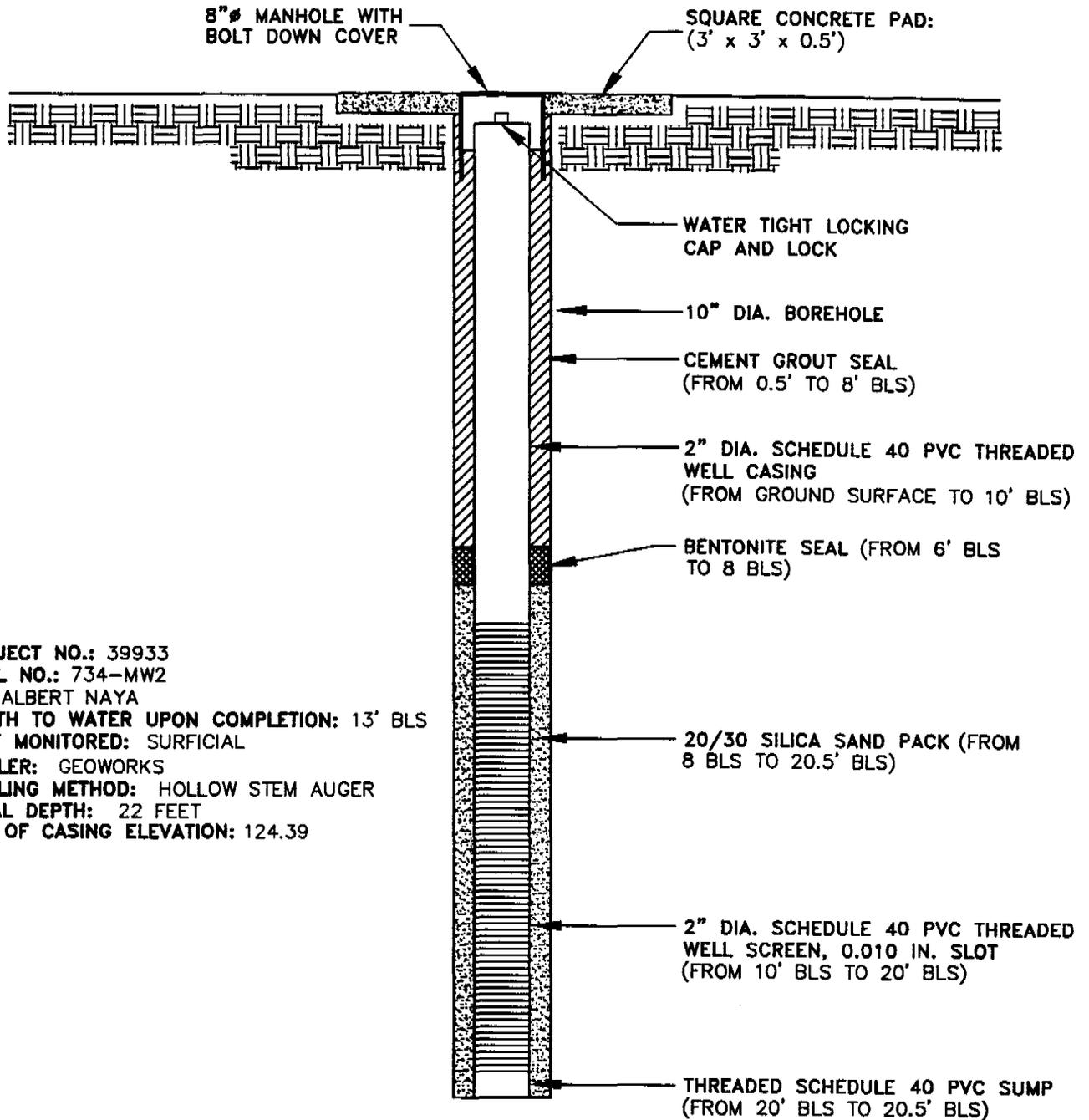
MONITORING WELL 735-MW4
 CONSTRUCTION DETAILS

BBL

BLASLAND, BOUCK & LEE, INC.
 engineers & scientists

FIGURE
B-5

734 - MW2



PROJECT NO.: 39933
 WELL NO.: 734-MW2
 BY: ALBERT NAYA
 DEPTH TO WATER UPON COMPLETION: 13' BLS
 UNIT MONITORED: SURFICIAL
 DRILLER: GEOWORKS
 DRILLING METHOD: HOLLOW STEM AUGER
 TOTAL DEPTH: 22 FEET
 TOP OF CASING ELEVATION: 124.39

(DRAWING NOT TO SCALE)

MSL = MEAN SEA LEVEL
 BLS = BELOW LAND SURFACE

ROOSEVELT ROADS U.S. NAVAL STATION
 CEIBA, PUERTO RICO
 SITE CHARACTERIZATION - SITE 734

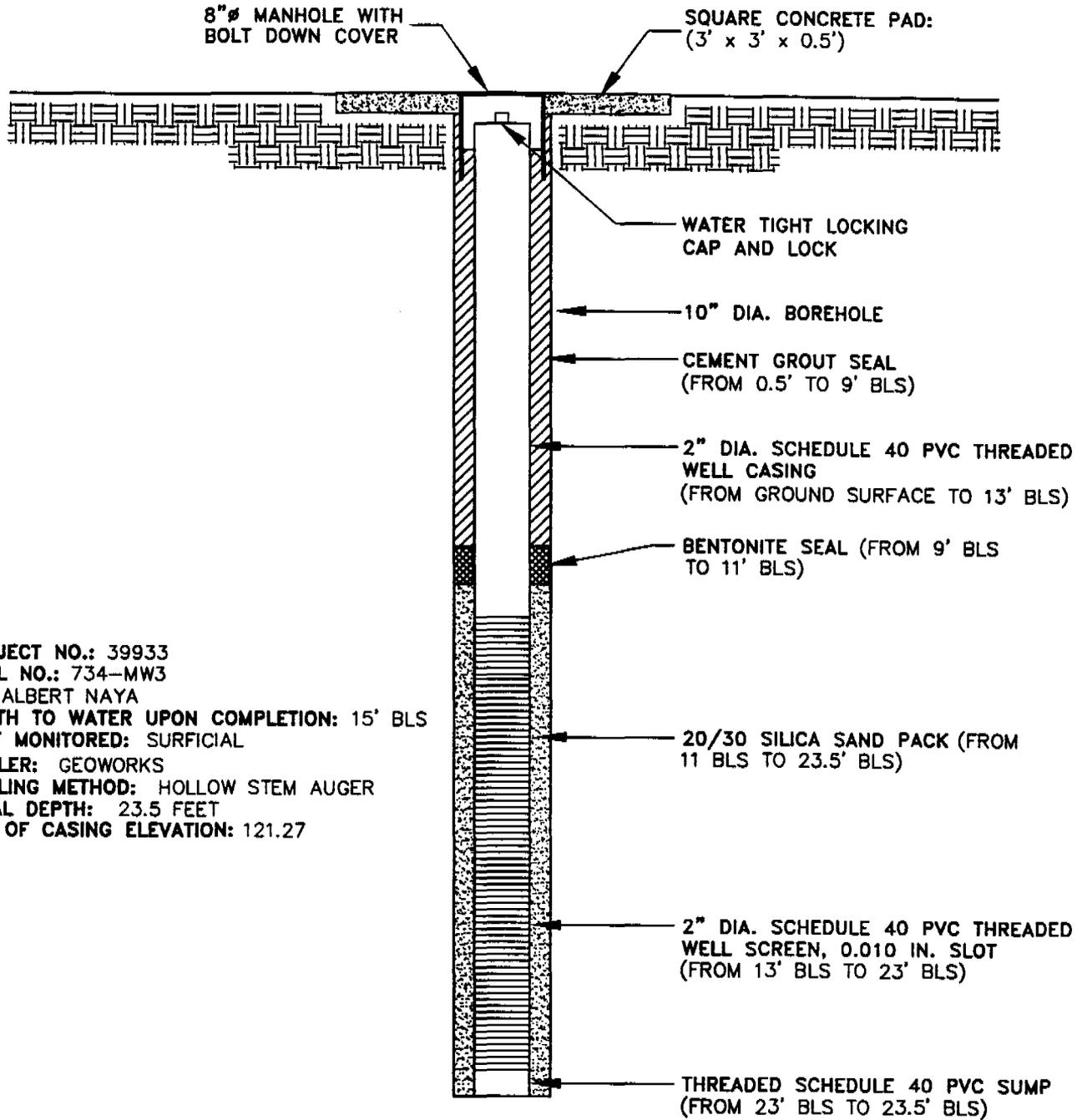
**MONITORING WELL 734-MW2
 CONSTRUCTION DETAILS**

BBL

BLASLAND, BOUCK & LEE, INC.
 engineers & scientists

FIGURE
B-2

734 - MW3



PROJECT NO.: 39933
 WELL NO.: 734-MW3
 BY: ALBERT NAYA
 DEPTH TO WATER UPON COMPLETION: 15' BLS
 UNIT MONITORED: SURFICIAL
 DRILLER: GEOWORKS
 DRILLING METHOD: HOLLOW STEM AUGER
 TOTAL DEPTH: 23.5 FEET
 TOP OF CASING ELEVATION: 121.27

(DRAWING NOT TO SCALE)

MSL = MEAN SEA LEVEL
 BLS = BELOW LAND SURFACE

ROOSEVELT ROADS U.S. NAVAL STATION CEIBA, PUERTO RICO	
SITE CHARACTERIZATION - SITE 734	
MONITORING WELL 734-MW3 CONSTRUCTION DETAILS	
BBL	BLASLAND, BOUCK & LEE, INC. <i>engineers & scientists</i>
FIGURE B-3	

APPENDIX C
SLUG TEST RESULTS AND CALCULATIONS

Site 734
Roosevelt Roads, U.S. Naval Station
Ceiba, Puerto Rico

Well No.: 734-MW2 Formation Tested: Surficial
 Test Date: 3/24/98 Falling Head Test

	<u>English Units</u>	<u>Metric Units</u>
Flush Mount	0.00 (ft)	0.00 (cm)
Static Water Level	12.89 (ft)	392.89 (cm)
Depth to Bottom of S (distance from ground level)	18.89 (ft)	575.77 (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	11 (ft)	335.28 (cm)
Delta H at Time t	1 (ft)	30.48 (cm)
Time t	1020.00 (sec)	1020 (sec)
Ratio Kh/Kv	1	1
Porosity of Filter Pac	0.3	0.3

<u>HYDRAULIC CONDUCTIVITY</u>	<u>cm/sec</u>	<u>ft/day</u>	<u>gpd/ft²</u>
K (Bouwer-Rice)	3.5E-04	9.9E-01	7.4E+00
K (Hvorslev Time Lag)	1.2E-04	3.4E-01	2.6E+00
K (Hvorslev Variable Head)	1.2E-04	3.4E-01	2.5E+00

SLUG TEST WORKSHEET

Site 734
Roosevelt Roads, U.S. Naval Station
Ceiba, Puerto Rico

Well Number: 734-MW2

Test Date:

3/24/98

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	11 (ft)	335.28 (cm)
Ht	1.000 (ft)	30.48 (cm)
T	1020 (sec)	1020 (sec)
b	45 (ft)	1371.60 (cm)

SLUG TEST WORKSHEET

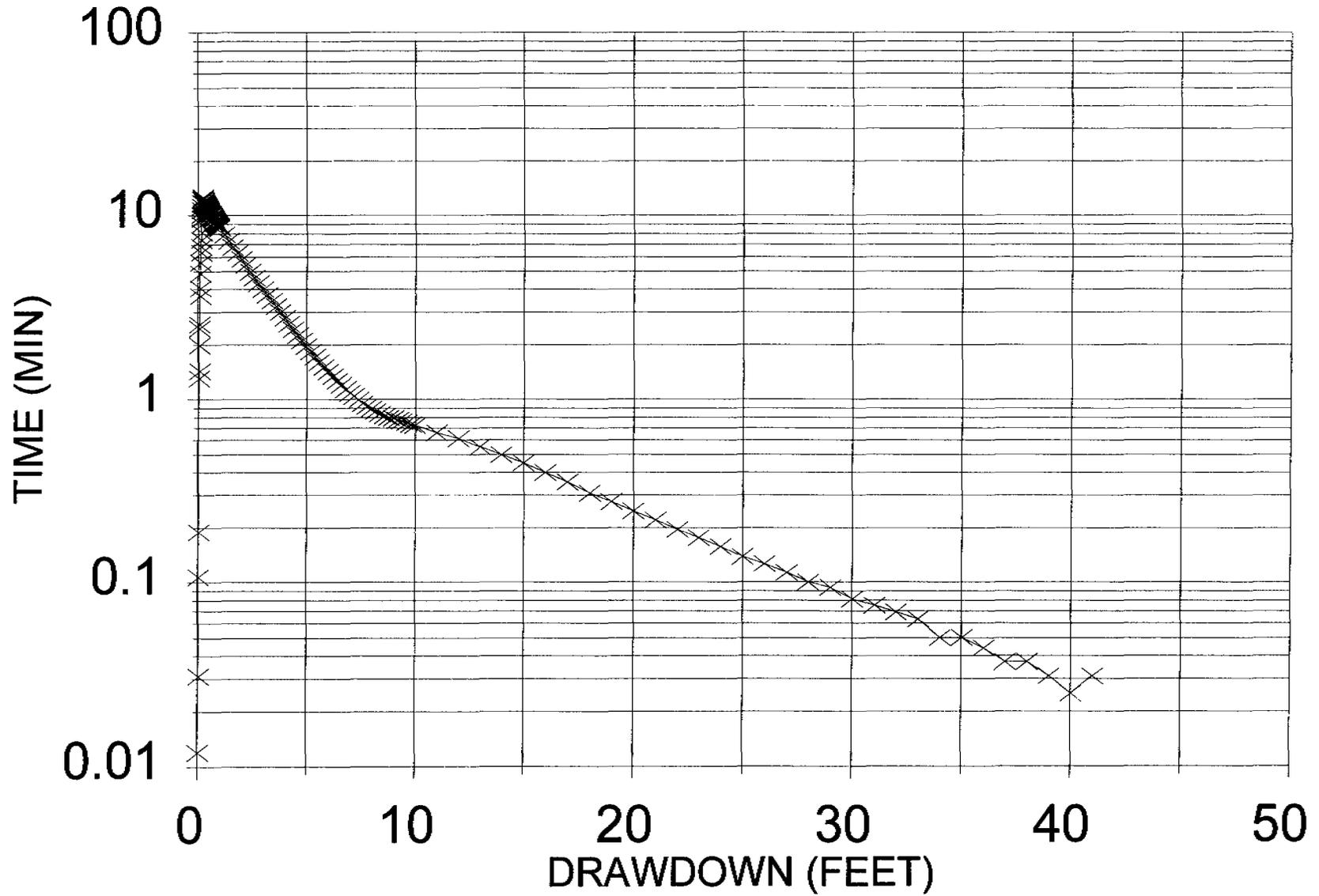
Site 734
Roosevelt Roads, U.S. Naval Station
Ceiba, Puerto Rico

Well Number: 734-MW2

Test Date: 3/24/98

Time (min)	Depth (ft)								
0.1	-3.661	0.3666	-11.396	0.8666	-9.044	5.4	-1.707	17	-0.352
0.1083	-4.046	0.3833	-11.295	0.8833	-8.981	5.6	-1.6	18	-0.308
0.1166	-4.865	0.4	-11.194	0.9	-8.918	5.8	-1.506	19	-0.277
0.125	-5.577	0.4166	-11.118	0.9166	-8.855	6	-1.418	20	-0.245
0.1333	-6.34	0.4333	-11.017	0.9333	-8.798	6.2	-1.336	21	-0.22
0.1416	-6.794	0.45	-10.917	0.95	-8.742	6.4	-1.26	22	-0.195
0.15	-7.443	0.4666	-10.835	0.9666	-8.679	6.6	-1.197	23	-0.176
0.1583	-8.149	0.4833	-10.746	0.9833	-8.622	6.8	-1.134	24	-0.157
0.1666	-9.006	0.5	-10.658	1	-8.559	7	-1.083	25	-0.138
0.175	-9.668	0.5166	-10.576	1.2	-7.903	7.2	-1.039	26	-0.126
0.1833	-10.116	0.5333	-10.488	1.4	-7.304	7.4	-0.995	27	-0.113
0.1916	-10.753	0.55	-10.406	1.6	-6.769	7.6	-0.951	28	-0.1
0.2	-11.251	0.5666	-10.33	1.8	-6.277	7.8	-0.913	29	-0.094
0.2083	-11.749	0.5833	-10.248	2	-5.817	8	-0.888	30	-0.081
0.2166	-12.222	0.6	-10.166	2.2	-5.395	8.2	-0.857	31	-0.075
0.225	-12.568	0.6166	-10.091	2.4	-4.979	8.4	-0.831	32	-0.069
0.2333	-12.625	0.6333	-10.015	2.6	-4.626	8.6	-0.812	33	-0.063
0.2416	-12.348	0.65	-9.939	2.8	-4.298	8.8	-0.794	34	-0.05
0.25	-12.449	0.6666	-9.864	3	-3.995	9	-0.787	35	-0.05
0.2583	-12.171	0.6833	-9.788	3.2	-3.705	9.2	-0.768	36	-0.044
0.2666	-12.108	0.7	-9.719	3.4	-3.447	9.4	-0.756	37	-0.037
0.275	-11.963	0.7166	-9.649	3.6	-3.207	9.6	-0.743	38	-0.037
0.2833	-11.963	0.7333	-9.574	3.8	-2.987	9.8	-0.731	39	-0.031
0.2916	-11.925	0.75	-9.504	4	-2.773	10	-0.718	40	-0.025
0.3	-11.799	0.7666	-9.435	4.2	-2.59	11	-0.655	41	-0.031
0.3083	-11.805	0.7833	-9.372	4.4	-2.407	12	-0.611		
0.3166	-11.73	0.8	-9.303	4.6	-2.237	13	-0.548		
0.325	-11.755	0.8166	-9.233	4.8	-2.086	14	-0.497		
0.3333	-11.635	0.8333	-9.17	5	-1.947	15	-0.447		
0.35	-11.541	0.85	-9.107	5.2	-1.821	16	-0.397		

Slug Test Recovery Curve For 734-MW2



Site 734
Roosevelt Roads, U.S. Naval Station
Ceiba, Puerto Rico

Well No.: 734-MW3
 Test Date: 3/24/98

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	14.78 (ft)	450.49 (cm)
Depth to Bottom of S (distance from ground level)	22.08 (ft)	673.00 (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	11 (ft)	335.28 (cm)
Delta H at Time t	1 (ft)	30.48 (cm)
Time t	690.00 (sec)	690 (sec)
Ratio Kh/Kv	1	1
Porosity of Filter Pac	0.3	0.3

<u>HYDRAULIC CONDUCTIVITY</u>	<u>cm/sec</u>	<u>ft/day</u>	<u>gpd/ft²</u>
K (Bouwer-Rice)	4.6E-04	1.3E+00	9.9E+00
K (Hvorslev Time Lag)	1.6E-04	4.4E-01	3.3E+00
K (Hvorslev Variable Head)	1.6E-04	4.4E-01	3.3E+00

SLUG TEST WORKSHEET

Site 734
Roosevelt Roads, U.S. Naval Station
Ceiba, Puerto Rico

Well Number: 734-MW3

Test Date:

3/24/98

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	11 (ft)	335.28 (cm)
Ht	1.000 (ft)	30.48 (cm)
T	690 (sec)	690 (sec)
b	45 (ft)	1371.60 (cm)

SLUG TEST WORKSHEET

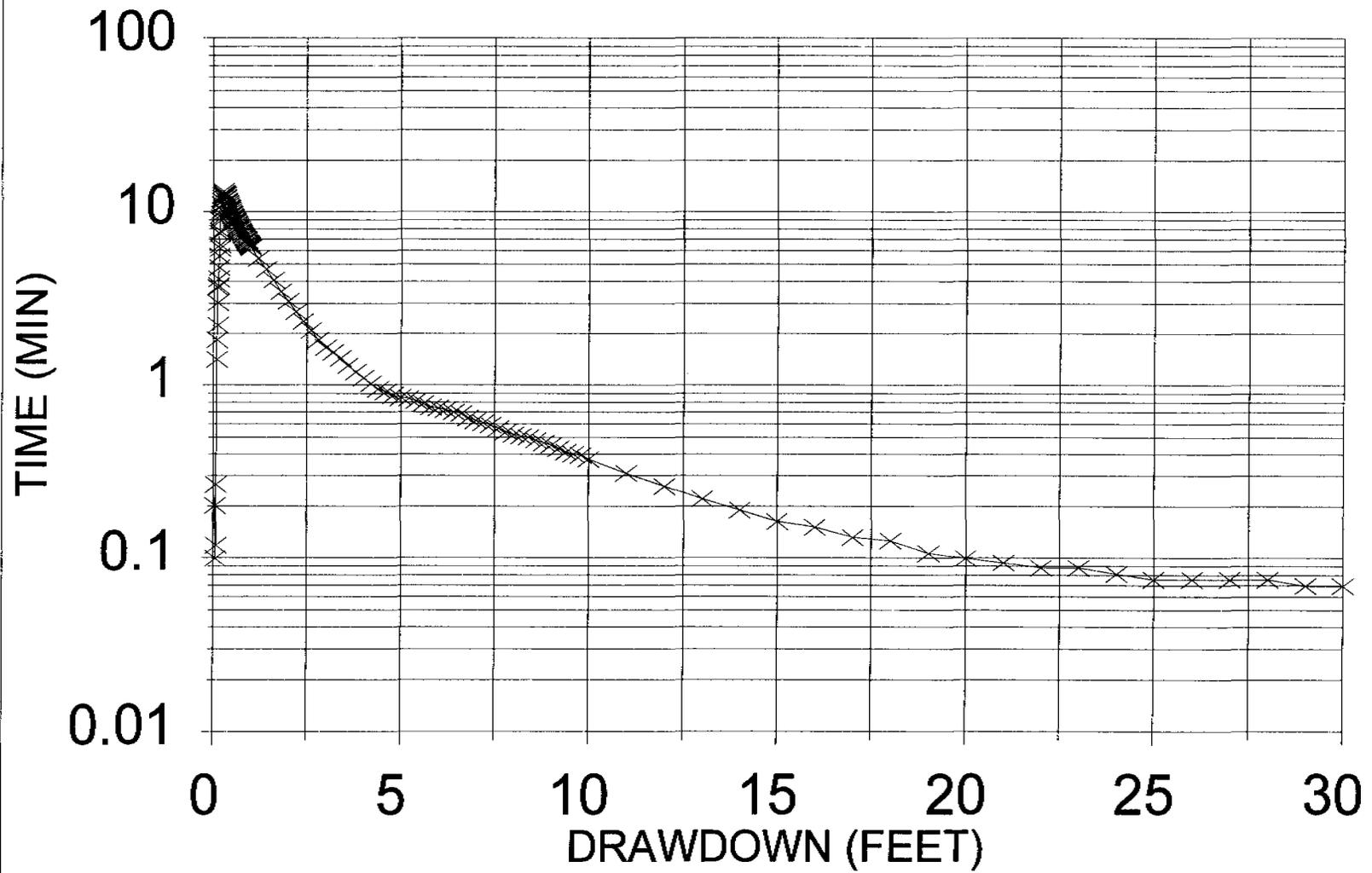
Site 734
Roosevelt Roads, U.S. Naval Station
Ceiba, Puerto Rico

Well Number: 734-MW3

Test Date 3/24/98

Time (min)	Depth (ft)								
0.1	-2.212	0.3833	-11.112	0.9	-6.693	6	-0.737	21	-0.094
0.1083	-2.981	0.4	-10.854	0.9166	-6.605	6.2	-0.718	22	-0.088
0.1166	-3.668	0.4166	-10.677	0.9333	-6.523	6.4	-0.699	23	-0.088
0.125	-3.737	0.4333	-10.444	0.95	-6.435	6.6	-0.68	24	-0.081
0.1333	-4.09	0.45	-10.223	0.9666	-6.353	6.8	-0.649	25	-0.075
0.1416	-4.777	0.4666	-10.009	0.9833	-6.277	7	-0.623	26	-0.075
0.15	-5.521	0.4833	-9.826	1	-6.201	7.2	-0.605	27	-0.075
0.1583	-6.17	0.5	-9.631	1.2	-5.363	7.4	-0.586	28	-0.075
0.1666	-6.428	0.5166	-9.454	1.4	-4.663	7.6	-0.56	29	-0.069
0.175	-7.481	0.5333	-9.278	1.6	-4.027	7.8	-0.535	30	-0.069
0.1833	-7.689	0.55	-9.114	1.8	-3.485	8	-0.516		
0.1916	-8.862	0.5666	-8.962	2	-3.05	8.2	-0.504		
0.2	-9.202	0.5833	-8.805	2.2	-2.653	8.4	-0.497		
0.2083	-9.643	0.6	-8.66	2.4	-2.338	8.6	-0.478		
0.2166	-10.179	0.6166	-8.521	2.6	-2.067	8.8	-0.46		
0.225	-10.929	0.6333	-8.383	2.8	-1.827	9	-0.447		
0.2333	-11.541	0.65	-8.256	3	-1.644	9.2	-0.428		
0.2416	-12.001	0.6666	-8.13	3.2	-1.55	9.4	-0.409		
0.25	-12.373	0.6833	-8.004	3.4	-1.418	9.6	-0.397		
0.2583	-12.758	0.7	-7.885	3.6	-1.291	9.8	-0.39		
0.2666	-13.142	0.7166	-7.771	3.8	-1.184	10	-0.371		
0.275	-13.136	0.7333	-7.664	4	-1.096	11	-0.308		
0.2833	-12.764	0.75	-7.55	4.2	-1.014	12	-0.258		
0.2916	-12.65	0.7666	-7.45	4.4	-0.951	13	-0.22		
0.3	-12.455	0.7833	-7.349	4.6	-0.913	14	-0.189		
0.3083	-12.323	0.8	-7.248	4.8	-0.876	15	-0.163		
0.3166	-12.442	0.8166	-7.147	5	-0.85	16	-0.151		
0.325	-12.052	0.8333	-7.052	5.2	-0.838	17	-0.132		
0.3333	-11.925	0.85	-6.958	5.4	-0.812	18	-0.126		
0.35	-11.579	0.8666	-6.87	5.6	-0.781	19	-0.107		
0.3666	-11.377	0.8833	-6.781	5.8	-0.749	20	-0.1		

Slug Test Recovery Curve For 734-MW3



CALCULATIONS

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

I = Hydraulic Gradient
H = Difference in water table elevation between 734-MW-1 and 734-MW-3 (ft)
D = Distance between 734-MW-1 and 734-MW-3 (ft)

DATA:

	<u>3/2/98</u>	<u>4/23/98</u>
H =	0.08	0.24
D =	73	73

RESULTS:

I = **0.0011 ft/ft 0.0033 ft/ft**

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

K_{avg} = Average Hydraulic Conductivity (1.145 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>3/2/98</u>	<u>4/23/98</u>
K_{avg} =	1.145.	1.145
I =	0.0011	0.0033
n_e =	0.45	0.45

RESULTS:

V = **0.0028 ft/day -0.084 ft/day**

APPENDIX D

D-1. Utility Location/Well Permit

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.



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)

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: _____

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)865-4429

Dirección Residencial Public Works Dpt. 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 Arcillaos H-10 Septima Sección, Levittown, Toa
Calle Núm. Municipio Zona Postal

Baja 00950
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

Describa 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:

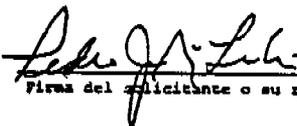
() a mano () percusión () rotario (X) OTRO Hollow Sten Auger (HSA)

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. The decontamination area was located next to the former gas station at Site 520.

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 0 PPM during the soil boring installations.

PROJECT: <u>Roosevelt Roads U.S. Naval Station-Site 734</u>			
MONITORING INSTRUMENT: <u>128 Foxboro Organic Vapor Analyzer</u>			
AIR MONITOR: <u>Albert Naya</u>			
LEVEL OF PROTECTION: <u>Level D</u>			
ACTIVITY : <u>Soil Boring Installation</u>			
Date	Time	Boring Location	Instrument Reading (ppm)
1/23/98	08:00	731-SB1 Breathing zone behind rig	0
1/23/98	10:00	734-SB1 Breathing zone behind rig	0
1/23/98	12:00	734-SB1 Breathing zone behind rig	0
1/23/98	14:00	734-SB2 Breathing zone behind rig	0
1/28/98	16:00	734-SB2 Breathing zone behind rig	0
1/28/98	08:00	734-SB3 Breathing zone behind rig	0
1/28/98	10:00	734-SB4 Breathing zone behind rig	0
1/28/98	12:00	734-SB4 Breathing zone behind rig	0
2/9/98	14:00	734-SB5 Breathing zone behind rig	0
2/10/98	16:00	734-SB7 Breathing zone behind rig	0
2/17/98	08:00	734-SB2 Breathing zone behind rig	0
2/17/98	10:00	734-SB3 Breathing zone behind rig	0
2/11/98	12:00	734-SB4 Breathing zone behind rig	0

D-5. Monitoring Well Construction

The three monitoring wells (734-MW-1, 734-MW-2, and 734-MW-3) 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

The monitoring well development was performed with a hand bailer. 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 3-3.

The development water was containerized in 55-gallon drums. Based on laboratory analytical data, the development water was discharged onto the asphalt road surface adjacent to the site to evaporate.

APPENDIX E
TEG LABORATORY ANALYTICAL RESULTS



World Leader In On-Site Sampling and Analysis

February 10, 1998
TEG Project #98I0209BBL

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:

- 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 #98I0209BBL

TRPH (EPA Method 418.1) ANALYSES OF WATER

SAMPLE NUMBER	DATE ANALYZED	TRPH (mg/L)
METHOD BLANK	2/10/98	ND
734 SB-8 (auger)	2/10/98	ND
734 SB-8 (auger) rep.	2/10/98	ND
732 SB-10(auger)	2/10/98	ND
DETECTION LIMIT (mg/L)		10

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 #9810209BBL

BLASLAND, BOUCK & LEE, INC. 39933

DAILY CALIBRATION DATE : 2/10/98

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%	0.450	555.6	10.1%	0.456	548.2	11.3%
<p>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</p>										

ANALYSES PERFORMED BY: RUTH DONES

DATA REVIEWED BY: KEVIN SHELBURNE



QA/QC REPORT - MS/MSD DATA

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

TEG Project #9810209BBL

DAILY CALIBRATION DATE : 2/10/98

BLASLAND, BOUCK & LEE, INC. 39933

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	280	112%	281	112%		0%	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: 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

APPENDIX F
GROUNDWATER SAMPLING PROCEDURES

F. Groundwater Sampling Procedures

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 groundwater 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

Field blanks were collected at the time that the monitoring wells were sampled. The field blanks were analyzed for BTEX by EPA Method 602 and for TPH by EPA Method 418.1. Field blank samples were collected by filling the appropriate laboratory containers with distilled water in the area of groundwater collection. No constituents were detected above the laboratory detection limits in any of the field blank samples.

An rinsate blank was collected from a decontaminated split-spoon sampler used to install soil borings. The sample was collected by pouring distilled water into an over the split-spoon sampler and by collecting the runoff in the appropriate laboratory container. No constituents were detected above the laboratory detection limits in either of the equipment blank samples.

Project/No. 399.33 Task 003 Page 1 of 5

Site Location NAUSTA Roosevelt Rds, PR Site 734

Site/Well No. 735 MW-1 Coded/ Replicate No. _____ Date 3/2/98

Weather Warm 80s, pty cloudy breeze Time Sampling Began 1118 (begin purge) Time Sampling Completed 1150 (collect samples)

EVACUATION DATA

Description of Measuring Point (MP)	Top of Casing (North Side)		
Height of MP Below Land Surface	(feet)	MP Elevation	<u>NA</u> (feet)
Total Sounded Depth (TD) of Well Below MP	<u>21.05</u> (feet)	Water-Level Elevation	(feet)
Depth to Water (DTW) Below MP	<u>15.21</u> (feet)	Diameter of Casing/	
		Construction Type	<u>2" Schedule 40 PVC</u>
Water Column (WC) in Well		Gallons Pumped/Bailed	
(TD - DTW)	<u>5.84</u> (feet)	Prior to Sampling	<u>4.5</u>
Gallons per Foot (GPF)	<u>0.16</u>	(GAL x 5 VOL x PUMP RATE)	
Gallons in Well	<u>0.93</u>	Sampling Pump Intake	
(WC x GPF)		(feet below land surface)	<u>Bailed</u>

Evacuation Method Teflon bailer - disposable

SAMPLING DATA/FIELD PARAMETERS

Color clear Odor slight Appearance v. slightly turbid Temperature 27.6 °F

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

Specific Conductance, umhos/cm 2250 pH 7.17

Sampling Method and Material Teflon bailer

Constituents Sampled	Container Description		Preservative
	From Lab	X or BB&L	
1. <u>EPA method 8020</u>		<u>3x 40 ml glass</u>	<u>HCL</u>
2. <u>EPA method 610PAHs</u>		<u>1 x 1 liter dark glass</u>	<u>Ø</u>
3. <u>EPA method 418.1</u>		<u>1 x 500 mliter</u>	<u>HCL</u>
4. <u>Total Pb</u>		<u>1 x 250 ml</u>	<u>HNO3</u>
5. _____		_____	_____
6. _____		_____	_____
7. _____		_____	_____

Remarks Field blank collected at 1030. Equipment Blank collected at 1050.

Sampling Personnel P. Maner, D. Vargas BB+L

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

Project/No. 399.33 Task 003 Page 2 of 5

Site Location NAVSTA Roosevelt Rds, PR site 734

Site/Well No. 735 MW-4 Coded/ Replicate No. _____ Date 3/2/99

Weather Warm 80s, pty cloudy, breeze Time Sampling Began 1425 (begin purge) Time Sampling Completed 1500 (collect samples)

EVACUATION DATA

Description of Measuring Point (MP) Top of Casing (North Side)
 Height of MP Below Land Surface _____ (feet) MP Elevation NPT (feet)
 Total Sounded Depth (TD) of Well Below MP 22.46 (feet) Water-Level Elevation _____ (feet)
 Depth to Water (DTW) Below MP 13.96 (feet) Diameter of Casing/ Construction Type 2" Schedule 40 PVC
 Gallons Pumped/Bailed Prior to Sampling _____
 Water Column (WC) in Well (TD - DTW) 8.50 (feet) (GAL x 5 VOL x PUMP RATE) 6.8 gallons
 Gallons per Foot (GPF) 0.16
 Gallons in Well (WC x GPF) 1.36 Sampling Pump Intake (feet below land surface) Bailed

Evacuation Method Teflon bailer - disposable

SAMPLING DATA/FIELD PARAMETERS

Color sl. yellowish Odor none Appearance clear Temperature NA* °F

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

Specific Conductance, umhos/cm NA* pH 7.90

Sampling Method and Material Teflon bailer

Constituents Sampled	Container Description		Preservative
	From Lab	X or BB&L	
1. <u>EPA method 8020</u>	<u>X</u>	<u>3x 40ml glass</u>	<u>HCL</u>
2. <u>EPA method 610 PAH</u>		<u>1x 1 liter dark glass</u>	<u>0</u>
3. <u>EPA method 418.1</u>		<u>1x 500 ml</u>	<u>HCL</u>
4. <u>Total Pb</u>		<u>1x 250 ml</u>	<u>HNO3</u>
5. _____		_____	_____
6. _____		_____	_____
7. _____		_____	_____

Remarks * problem with drift on conductivity/temp. meter. Purge well 5 volumes

Sampling Personnel P. Maher, D. Vargas BB+L

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

Project/No. 399.33 Task 003 Page 3 of 5

Site Location NAVSTA Roosevelt Rds, PR site 734

Site/Well No. 734 mw-2 Coded/ Replicate No. _____ Date 3/2/98

Weather Warm br breeze Time Sampling Began 1520 (begin purg) Time Sampling Completed 1630 (collect sample)
ptly cloudy

EVACUATION DATA

Description of Measuring Point (MP) Top of Casing (North Side)
 Height of MP Below Land Surface _____ (feet) MP Elevation NA (feet)
 Total Sounded Depth (TD) of Well Below MP 18.89 (feet) Water-Level Elevation _____ (feet)
 Depth to Water (DTW) Below MP 12.89 (feet) Diameter of Casing/ Construction Type 2" Schedule 40 PVC
 Gallons Pumped/Bailed Prior to Sampling Bailed dry
 (GAL x 5 VOL x PUMP RATE) after 1.5 gallons
 Water Column (WC) in Well (TD - DTW) 6.00 (feet) Sampling Pump Intake (feet below land surface) Bailed
 Gallons per Foot (GPF) 0.16
 Gallons in Well (WC x GPF) 0.96

Evacuation Method Teflon bailer - disposable

SAMPLING DATA/FIELD PARAMETERS

Color light brown Odor none Appearance turbid Temperature 29.6 °F

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

Specific Conductance, umhos/cm 3330 pH 7.21

Sampling Method and Material Teflon bailer

Constituents Sampled	Container Description	Preservative
1. <u>EPA Method 8020</u>	From Lab <u>X</u> or BB&L _____ <u>3x 40ml glass</u>	<u>HCL</u>
2. <u>EPA Method 610</u>	<u>1x 1 liter dark glass</u>	<u>∅</u>
3. <u>EPA Method 418.1</u>	<u>1x 500ml</u>	<u>HCL</u>
4. <u>Total Ph</u>	<u>1x 250ml</u>	<u>HNO3</u>
5. _____	_____	_____
6. _____	_____	_____
7. _____	_____	_____

Remarks _____

Sampling Personnel P. Maner, D. Vargas BB+L

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

Project/No. 399.33 Task 003 Page 4 of 5
 Site Location NAUSTA Roosevelt Rds, PR Site 734
 Site/Well No. 734 mw-3 Coded/ Replicate No. _____ Date 3/2/98

Weather Warm 80s pty cloudy breeze Time Sampling Began 1532 (begin purge) Time Sampling Completed 1645 (collect samples)

EVACUATION DATA

Description of Measuring Point (MP) Top of Casing (North Side)
 Height of MP Below Land Surface _____ (feet) MP Elevation NA (feet)
 Total Sounded Depth (TD) of Well Below MP 22.08 (feet) Water-Level Elevation _____ (feet)
 Depth to Water (DTW) Below MP 14.78 (feet) Diameter of Casing/ Construction Type 2" Schedule 40 PVC
 Gallons Pumped/Bailed _____
 Water Column (WC) in Well Prior to Sampling _____
 (TD - DTW) 7.30 (feet) (GAL x 5 VOL x PUMP RATE) 6 gallons
 Gallons per Foot (GPF) 0.16
 Gallons in Well (WC x GPF) 1.17 Sampling Pump Intake (feet below land surface) Bailed

Evacuation Method Disposable teflon bailer

SAMPLING DATA/FIELD PARAMETERS

Color pale orange brown Odor none Appearance Slightly turbid Temperature 27.5 °F

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

Specific Conductance, umhos/cm 3740* pH NA *

Sampling Method and Material Teflon bailer

Constituents Sampled	Container Description		Preservative
	From Lab	X or BB&L	
1. <u>EPA method 8020</u>	<u>X</u>	<u>3X 40ml glass</u>	<u>HCL</u>
2. <u>EPA method 610 PAH</u>		<u>1X 1 liter dark glass</u>	<u>Ø</u>
3. <u>EPA method 418.1</u>		<u>1X 500ml</u>	<u>HCL</u>
4. <u>Total Pb</u>		<u>1X 250ml</u>	<u>HNO3</u>
5. _____		_____	_____
6. _____		_____	_____
7. _____		_____	_____

Remarks * Hydac meter not responding properly. Purge well 5 volumes.

Sampling Personnel P. Maner, D. Vargas BB&L

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

Project/No. 399.33 Page 5 of 5

Site Location NAUSTA Roosevelt Rds, PR Site 734

Site/Well No. 734 MW-1 Coded/ Replicate No. _____ Date 3/2/98

Weather Warm 80s, ptly cloudy, breeze Time Sampling Began 1605 (start pump) Time Sampling Completed 1700 (collect samples)

EVACUATION DATA

Description of Measuring Point (MP) Top of Casing (North Side)
 Height of MP Below Land Surface _____ (feet) MP Elevation NA (feet)
 Total Sounded Depth (TD) of Well Below MP 19.05 (feet) Water-Level Elevation _____ (feet)
 Depth to Water (DTW) Below MP 13.41 (feet) Diameter of Casing/ Construction Type 2" Schedule 40 PVC
 Water Column (WC) in Well (TD - DTW) 5.64 (feet) Gallons Pumped/Bailed Prior to Sampling bailed dry at 3.5 gallons
 Gallons per Foot (GPF) 0.16 (GAL x 5 VOL x PUMP RATE)
 Gallons in Well (WC x GPF) 0.90 Sampling Pump Intake (feet below land surface) Bailed

Evacuation Method Disposable teflon bailer

SAMPLING DATA/FIELD PARAMETERS

Color pale yellowish orange Odor yes Appearance turbid Temperature NA* °F

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

Specific Conductance, umhos/cm 3250* pH NA*

Sampling Method and Material Teflon bailer

Constituents Sampled	Container Description		Preservative
	From Lab	X or BB&L	
1. <u>EPA method 8020</u>	<u>X</u>	<u>3x40ml glass</u>	<u>HCL</u>
2. <u>EPA method 610 PAHs</u>		<u>1x1 liter dark glass</u>	<u>Ø</u>
3. <u>EPA method 418.1</u>		<u>1x500 ml</u>	<u>HCL</u>
4. <u>Total Pb</u>		<u>1x250ml</u>	<u>HNO3</u>
5. _____		_____	_____
6. _____		_____	_____
7. _____		_____	_____

Remarks * Hydac meter not responding properly. Bailed well dry before sampling

Sampling Personnel P. Maner, D. Vargas BBFL

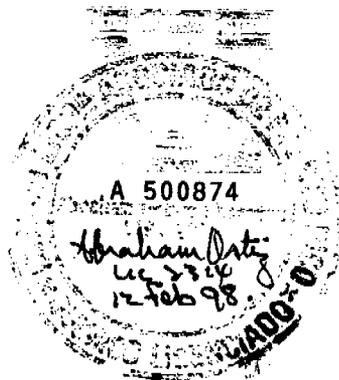
GAL/FT.	1-1/4" = 0.077	2" = 0.16	3" = 0.37	4" = 0.65
	1-1/2" = 0.10	2-1/2" = 0.24	3-1/2" = 0.50	6" = 1.46

APPENDIX G
SAVANNAH LABORATORY ANALYTICAL RESULTS

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 D8-40167.

I hereby certify that , to the best of my knowledge, the results for log number D8-40167, pages 1-4 (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: D8-40167
Received: 24 JAN 98
Reported: 28 JAN 98

Ms. Kathy Luke
Blasland Bouck & Lee, Inc.
185 NW Spanish River Boulevard, Suite 110
Boca Raton, FL 33431

Project: #399.33 (Roosevelt Roads)
Sampled By: DP/AN/PM

REPORT OF RESULTS

Page 1

LOG NO	SAMPLE DESCRIPTION , SOLID OR SEMISOLID SAMPLES	DATE/ TIME SAMPLED			
40167-1	734 SB-1 (4-8)	01-23-98/0920			
40167-2	734 SB-2 (4-6)	01-23-98/1140			
40167-3	734 SB-2 (8-10)	01-23-98/1145			
40167-4	734 SB-1 (15-17)	01-23-98/0945			
40167-5	734 SB-3 (4-6)	01-23-98/1410			
PARAMETER	40167-1	40167-2	40167-3	40167-4	40167-5
Aromatic Volatiles (8020)					
Benzene, ug/kg	<10*F65	<5.0	<5.0	<5.0	<5.0
Chlorobenzene, ug/kg	<10*F65	<5.0	<5.0	<5.0	<5.0
1,2-Dichlorobenzene, ug/kg	<10*F65	<5.0	<5.0	<5.0	<5.0
1,3-Dichlorobenzene, ug/kg	<10*F65	<5.0	<5.0	<5.0	<5.0
1,4-Dichlorobenzene, ug/kg	<10*F65	<5.0	<5.0	<5.0	<5.0
Ethylbenzene, ug/kg	<10*F65	<5.0	<5.0	<5.0	<5.0
Toluene, ug/kg	<10*F65	<5.0	<5.0	<5.0	<5.0
Xylenes, ug/kg	<10*F65	<5.0	<5.0	<5.0	<5.0
Methyl-tert-butyl ether (MTBE), ug/kg	<100*F65	<50	<50	<50	<50
Date Analyzed	01.25.98	01.25.98	01.25.98	01.25.98	01.25.98
Method Number	EPA 8020	EPA 8020	EPA 8020	EPA 8020	EPA 8020
Dilution factor	2	1	1	1	1
Petroleum Hydrocarbons (418.1)					
Petroleum Hydrocarbons, mg/kg	60	100	30	<10	<10
Date Extracted	01.26.98	01.26.98	01.26.98	01.26.98	01.26.98
Date Analyzed	01.26.98	01.26.98	01.26.98	01.26.98	01.26.98
Method Number	EPA 418.1	EPA 418.1	EPA 418.1	EPA 418.1	EPA 418.1

Validated & Certified by: *Abraham Ortiz*

License No.: 2314

LOG NO: D8-40167
Received: 24 JAN 98
Reported: 28 JAN 98

Ms. Kathy Luke
Blasland Bouck & Lee, Inc.
185 NW Spanish River Boulevard, Suite 110
Boca Raton, FL 33431

Project: #399.33 (Roosevelt Roads)
Sampled By: DP/AN/PM

REPORT OF RESULTS

Page 2

LOG NO	SAMPLE DESCRIPTION , LIQUID SAMPLES
40167-6	Trip Blank
PARAMETER	40167-6
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	01.26.98
Method Number	EPA 8020
Dilution factor	1

Validated & Certified by: Abraham Ortiz
License No.: 8314

SL SAVANNAH LABORATORIES & ENVIRONMENTAL SERVICES, INC.

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

LOG NO: D8-40167
Received: 24 JAN 98
Reported: 28 JAN 98

Ms. Kathy Luke
Blasland Bouck & Lee, Inc.
185 NW Spanish River Boulevard, Suite 110
Boca Raton, FL 33431

Project: #399.33 (Roosevelt Roads)
Sampled By: DP/AN/PM

REPORT OF RESULTS

Page 3

LOG NO SAMPLE DESCRIPTION , QC REPORT FOR SOLID/SEMISOLID

40167-7 Method Blank
40167-8 Accuracy (%Rec)
40167-9 Precision (%RPD)
40167-10 Reporting Limit (RL)

PARAMETER	40167-7	40167-8	40167-9	40167-10

Aromatic Volatiles (8020)				
Benzene, ug/kg	<5.0	107 %	5.6 %	5.0
Chlorobenzene, ug/kg	<5.0	104 %	7.7 %	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	104 %	7.7 %	5.0
Xylenes, ug/kg	<5.0	---	---	5.0
Methyl-tert-butyl ether (MTBE), ug/kg	<50	---	---	50
Date Analyzed	01.25.98	---	---	---
Method Number	EPA 8020	---	---	---

Petroleum Hydrocarbons (418.1)				
Petroleum Hydrocarbons, mg/kg	<10	67 %*F75	3.0 %	10
Date Extracted	01.26.98	---	---	---
Date Analyzed	01.26.98	---	---	---
Method Number	EPA 418.1	---	---	---

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: D8-40167
Received: 24 JAN 98
Reported: 28 JAN 98

Ms. Kathy Luke
Blasland Bouck & Lee, Inc.
185 NW Spanish River Boulevard, Suite 110
Boca Raton, FL 33431

Project: #399.33 (Roosevelt Roads)
Sampled By: DP/AN/PM

REPORT OF RESULTS

Page 4

LOG NO SAMPLE DESCRIPTION , QC REPORT FOR LIQUID SAMPLES

40167-11 Method Blank
40167-12 Accuracy (%Rec)
40167-13 Precision (%RPD)
40167-14 Reporting Limit (RL)

PARAMETER	40167-11	40167-12	40167-13	40167-14
Aromatic Volatiles (8020)				
Benzene, ug/l	<1.0	103 %	1.9 %	1.0
Chlorobenzene, ug/l	<1.0	110 %	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	103 %	1.9 %	1.0
Xylenes, ug/l	<2.0	---	---	2.0
Methyl-tert-butyl ether (MTBE), ug/l	<10	---	---	10
Date Analyzed	01.26.98	---	---	---
Method Number	EPA 8020	---	---	---

Comprehensive Quality Assurance Plan #890142G.

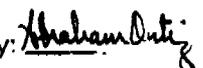
SL Certifications: E86221/86371

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

*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.


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

399.33 Roosevelt Roads

PROJECT REFERENCE LOA 734		PROJECT NO. 399.33	P.O. NUMBER	MATRIX TYPE	REQUIRED ANALYSES	PAGE OF
PROJECT LOC. P.R.	SAMPLER(S) NAME Den Press / Al Naya / Pitt	PHONE (561) 750 5733	FAX	AQUEOUS (WATER) SOLID OR SEMISOLID AIR NONAQUEOUS LIQUID (oil, solvent, etc) 8020 418.1		<input checked="" type="checkbox"/> STANDARD REPORT DELIVERY <input checked="" type="checkbox"/> EXPEDITED REPORT DELIVERY (surcharge) Date Due: _____
CLIENT NAME BST	CLIENT PROJECT MANAGER Kathy Luke					
CLIENT ADDRESS (CITY, STATE, ZIP) Boca Raton, FL						

SAMPLE DATE	TIME	SL NO.	SAMPLE IDENTIFICATION	NUMBER OF CONTAINERS SUBMITTED				REMARKS	
				AQUEOUS	SOLID	AIR	NONAQUEOUS		
1/23/98	0920		734 SB-1 (4-8)	X			1	1	24 HR RUSH TAT FAX Results to 787-860-4538
	1140		734 SB-2 (4-6)	X			1	1	
	1145		734 SB-2 (8-10)	X			1	1	
	0945		734 SB-1 (15-17)	X			1	1	
	-		Trip Blank	X			2	pm	
1/23/98	1410		734 SB-3 (4-6)	X			1	1	

RELINQUISHED BY: (SIGNATURE) <i>Kenibely</i>	DATE 1/16/98	TIME 1800	RELINQUISHED BY: (SIGNATURE) <i>Pmanen</i>	DATE 1-23-98	TIME 1950	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>Alex</i>	DATE 1/24/98	TIME 9:45	CUSTODY INTACT <input type="checkbox"/> YES <input type="checkbox"/> NO	CUSTODY SEAL NO.	SL LOG NO. D840167	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 D8-40181.

I hereby certify that , to the best of my knowlege, the results for log numbers D8-40181, 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: D8-40181
Received: 28 JAN 98
Reported: 29 JAN 98

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

Project: 39933 (Roosevelt Rds. 734)
Sampled By: Pitt Maner

REPORT OF RESULTS

Page 1

LOG NO	SAMPLE DESCRIPTION , SOLID OR SEMISOLID SAMPLES	DATE/ TIME SAMPLED		
40181-1	734 SB-6 (2-6')	01-27-98/0900		
40181-2	734 SB-6 (12-14')	01-27-98/0940		
40181-3	734 SD-6 (12-14')	01-27-98/0940		
PARAMETER		40181-1	40181-2	40181-3
Aromatic Volatiles (8020)				
Benzene, ug/kg		<5.0	<5.0	<5.0
Chlorobenzene, ug/kg		<5.0	<5.0	<5.0
1,2-Dichlorobenzene, ug/kg		<5.0	<5.0	<5.0
1,3-Dichlorobenzene, ug/kg		<5.0	<5.0	<5.0
1,4-Dichlorobenzene, ug/kg		<5.0	<5.0	<5.0
Ethylbenzene, ug/kg		<5.0	<5.0	<5.0
Toluene, ug/kg		<5.0	<5.0	<5.0
Xylenes, ug/kg		<5.0	<5.0	<5.0
Methyl-tert-butyl ether (MTBE), ug/kg		<50	<50	<50
Date Analyzed		01.28.98	01.28.98	01.28.98
Method Number		EPA 8020	EPA 8020	EPA 8020
Dilution factor		1	1	1
Petroleum Hydrocarbons (9073)				
Petroleum Hydrocarbons, mg/kg		<10	<10	<10
Date Extracted		01.28.98	01.28.98	01.28.98
Date Analyzed		01.28.98	01.28.98	01.28.98
Method Number		EPA 9073	EPA 9073	EPA 9073

Validated & Certified by: Thabam Ditz
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: D8-40181
Received: 28 JAN 98
Reported: 29 JAN 98

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

Project: 39933 (Roosevelt Rds. 734)
Sampled By: Pitt Maner

REPORT OF RESULTS

Page 2

LOG NO	SAMPLE DESCRIPTION , LIQUID SAMPLES	DATE/ TIME SAMPLED
40181-4	SB-5	01-27-98/0900
PARAMETER		40181-4
Petroleum Hydrocarbons (418.1)		
Petroleum Hydrocarbons, mg/l		19
Date Extracted		01.28.98
Date Analyzed		01.28.98
Method Number		EPA 418.1

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

SL SAVANNAH LABORATORIES
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LOG NO: D8-40181
Received: 28 JAN 98
Reported: 29 JAN 98

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

Project: 39933 (Roosevelt Rds. 734)
Sampled By: Pitt Maner

REPORT OF RESULTS

Page 3

LOG NO	SAMPLE DESCRIPTION , LIQUID SAMPLES	DATE/ TIME SAMPLED
40181-5	Rinsate Blank	01-27-98/1515
PARAMETER		40181-5
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		<1.0
Methyl-tert-butyl ether (MTBE), ug/l		<10
Date Analyzed		01.28.98
Method Number		EPA 8020
Dilution factor		1
Petroleum Hydrocarbons (418.1)		
Petroleum Hydrocarbons, mg/l		<1.0
Date Extracted		01.28.98
Date Analyzed		01.28.98
Method Number		EPA 418.1

Validated & Certified by: Blasland

License No.: 5314

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Received: 28 JAN 98
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Boca Raton, FL 33431

Project: 39933 (Roosevelt Rds. 734)
Sampled By: Pitt Maner

REPORT OF RESULTS

Page 4

LOG NO	SAMPLE DESCRIPTION , LIQUID SAMPLES	
40181-6	Trip Blank	
PARAMETER		40181-6
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		<1.0
Methyl-tert-butyl ether (MTBE), ug/l		<10
Date Analyzed		01.28.98
Method Number		EPA 8020
Dilution factor		1

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REPORT OF RESULTS

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LOG NO SAMPLE DESCRIPTION , QC REPORT FOR LIQUID SAMPLES

40181-7 Method Blank
40181-8 Accuracy (%Rec)
40181-9 Precision (%RPD)
40181-10 Reporting Limit (RL)

PARAMETER	40181-7	40181-8	40181-9	40181-10

Aromatic Volatiles (8020)				
Benzene, ug/l	<1.0	100 %	3.0 %	1.0
Chlorobenzene, ug/l	<1.0	93 %	2.2 %	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	92 %	1.1 %	1.0
Xylenes, ug/l	<1.0	---	---	1.0
Methyl-tert-butyl ether (MTBE), ug/l	<10	---	---	10
Date Analyzed	01.28.98	---	---	---
Method Number	EPA 8020	---	---	---

Petroleum Hydrocarbons (418.1)				
Petroleum Hydrocarbons, mg/l	<1.0	85 %	2.3 %	1.0
Date Extracted	01.28.98	---	---	---
Date Analyzed	01.28.98	---	---	---
Method Number	EPA 418.1	---	---	---

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Project: 39933 (Roosevelt Rds. 734)
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REPORT OF RESULTS

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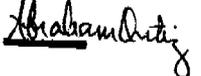
LOG NO SAMPLE DESCRIPTION , QC REPORT FOR SOLID/SEMISOLID

40181-11 Method Blank
40181-12 Accuracy (%Rec)
40181-13 Precision (%RPD)
40181-14 Reporting Limit (RL)

PARAMETER	40181-11	40181-12	40181-13	40181-14
Aromatic Volatiles (8020)				
Benzene, ug/kg	<5.0	92 %	16 %	5.0
Chlorobenzene, ug/kg	<5.0	91 %	11 %	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	94 %	19 %	5.0
Xylenes, ug/kg	<5.0	---	---	5.0
Methyl-tert-butyl ether (MTBE), ug/kg	<50	---	---	50
Date Analyzed	01.28.98	---	---	---
Method Number	EPA 8020	---	---	---
Petroleum Hydrocarbons (9073)				
Petroleum Hydrocarbons, mg/kg	<10	80 %	1.2 %	10
Date Extracted	01.28.98	---	---	---
Date Analyzed	01.28.98	---	---	---
Method Number	EPA 9073	---	---	---

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


Paul Canevaro, Project Manager

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LOG NO: D8-40197A
Received: 02 FEB 98
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Boca Raton, FL 33431

Project: #3933 (Roosevelt Rds)
Sampled By: PM/AN

REPORT OF RESULTS

Page 1

LOG NO	SAMPLE DESCRIPTION , SOLID OR SEMISOLID SAMPLES	DATE/ TIME SAMPLED
40197A-1	734 SB-7 (10-13')	01-28-98/1545
PARAMETER		40197A-1
Petroleum Hydrocarbons by GC (8015 - Extractable)		
Petroleum Hydrocarbons (DRO), ug/kg		<3300
Date Extracted		02.02.98
Date Analyzed		02.03.98
Method Number		MOD 8015

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LOG NO: D8-40197A
Received: 02 FEB 98
Reported: 04 FEB 98

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Project: #3933 (Roosevelt Rds)
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REPORT OF RESULTS

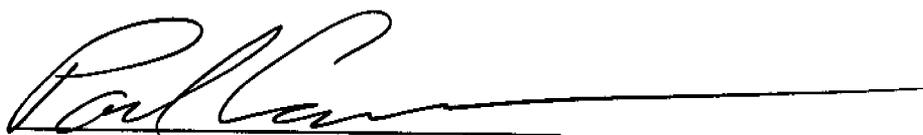
Page 2

LOG NO SAMPLE DESCRIPTION , QC REPORT FOR SOLID/SEMISOLID

40197A-2 Method Blank
40197A-3 Accuracy (%Rec)
40197A-4 Precision (%RPD)
40197A-5 Reporting Limit (RL)

PARAMETER	40197A-2	40197A-3	40197A-4	40197A-5
Petroleum Hydrocarbons by GC (8015 - Extractable)				
Petroleum Hydrocarbons (DRO), ug/kg dw	<3300	72 %	---	3300
Date Extracted	02.02.98	---	---	---
Date Analyzed	02.03.98	---	---	---
Method Number	MOD 8015	---	---	---

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


Paul Canevaro, Project Manager

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LOG NO: D8-40173
Received: 27 JAN 98
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Project: 39933 (Roosevelts Rds. 734)
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REPORT OF RESULTS

Page 1

LOG NO	SAMPLE DESCRIPTION , SOLID OR SEMISOLID SAMPLES	DATE/ TIME SAMPLED				
40173-1	734 SB-5 (2-6')	01-26-98/1300				
40173-2	734 SB-4 (2-6')	01-26-98/1030				
40173-3	734 SB-3 (10-12')	01-26-98/0830				
40173-4	734 SB-4 (10-13')	01-26-98/1120				
40173-5	734 SB-5 (10-13')	01-26-98/1420				
PARAMETER	40173-1	40173-2	40173-3	40173-4	40173-5	
Aromatic Volatiles (8020)						
Benzene, ug/kg	<5.0	<5.0	<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	<5.0	<5.0	<5.0	<5.0	
Toluene, ug/kg	<5.0	<5.0	<5.0	<5.0	<5.0	
Xylenes, ug/kg	<5.0	<5.0	<5.0	<5.0	<5.0	
Methyl-tert-butyl ether (MTBE), ug/kg	<50	<50	<50	<50	<50	
Date Analyzed	01.27.98	01.27.98	01.27.98	01.27.98	01.27.98	
Method Number	EPA 8020	EPA 8020	EPA 8020	EPA 8020	EPA 8020	
Dilution factor	1	1	1	1	1	
Petroleum Hydrocarbons (418.1)						
Petroleum Hydrocarbons, mg/kg	<10	<10	<10	<10	17	
Date Extracted	01.27.98	01.27.98	01.27.98	01.27.98	01.27.98	
Date Analyzed	01.27.98	01.27.98	01.27.98	01.27.98	01.27.98	
Method Number	EPA 418.1	EPA 418.1	EPA 418.1	EPA 418.1	EPA 418.1	

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 Boca Raton, FL 33431

Project: 39933 (Roosevelts Rds. 734)
 Sampled By: PM/AN

REPORT OF RESULTS

Page 2

LOG NO	SAMPLE DESCRIPTION , LIQUID SAMPLES	DATE/ TIME SAMPLED	
40173-6	Rinsate Blank	01-26-98/1130	
40173-7	734 SB-3 (Auger Sample)	01-26-98/0800	
PARAMETER		40173-6	40173-7
Aromatic Volatiles (8020)			
Benzene, ug/l		<1.0	<1.0
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	<1.0
Toluene, ug/l		<1.0	<1.0
Xylenes, ug/l		<2.0	<2.0
Methyl-tert-butyl ether (MTBE), ug/l		<10	<10
Date Analyzed		01.27.98	01.27.98
Method Number		EPA 8020	EPA 8020
Dilution factor		1	1
Petroleum Hydrocarbons (418.1)			
Petroleum Hydrocarbons, mg/l		<1.0	21
Date Extracted		01.27.98	01.27.98
Date Analyzed		01.27.98	01.27.98
Method Number		EPA 418.1	EPA 418.1

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REPORT OF RESULTS

LOG NO	SAMPLE DESCRIPTION , QC REPORT FOR SOLID/SEMISOLID			
40173-8	Method Blank			
40173-9	Accuracy (%Rec)			
40173-10	Precision (%RPD)			
40173-11	Reporting Limit (RL)			
PARAMETER	40173-8	40173-9	40173-10	40173-11
Aromatic Volatiles (8020)				
Benzene, ug/kg	<5.0	108 %	4.6 %	5.0
Chlorobenzene, ug/kg	<5.0	100 %	6.0 %	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	105 %	7.6 %	5.0
Xylenes, ug/kg	<5.0	---	---	5.0
Methyl-tert-butyl ether (MTBE), ug/kg	<50	---	---	50
Date Analyzed	01.27.98	---	---	---
Method Number	EPA 8020	---	---	---
Petroleum Hydrocarbons (418.1)				
Petroleum Hydrocarbons, mg/kg	<1.0	80 %	1.2 %	1.0
Date Extracted	01.27.98	---	---	---
Date Analyzed	01.27.98	---	---	---
Method Number	EPA 418.1	---	---	---

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Project: 39933 (Roosevelts Rds. 734)
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REPORT OF RESULTS

Page 4

LOG NO SAMPLE DESCRIPTION , QC REPORT FOR LIQUID SAMPLES

40173-12 Method Blank
40173-13 Accuracy (%Rec)
40173-14 Precision (%RPD)
40173-15 Reporting Limit (RL)

PARAMETER	40173-12	40173-13	40173-14	40173-15
Aromatic Volatiles (8020)				
Benzene, ug/l	<1.0	101 %	0 %	1.0
Chlorobenzene, ug/l	<1.0	108 %	0.92 %	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	100 %	0 %	1.0
Xylenes, ug/l	<2.0	---	---	2.0
Methyl-tert-butyl ether (MTBE), ug/l	<10	---	---	10
Date Analyzed	01.27.98	---	---	---
Method Number	EPA 8020	---	---	---
Petroleum Hydrocarbons (418.1)				
Petroleum Hydrocarbons, mg/l	<1.0	85 %	2.3 %	1.0
Date Extracted	01.27.98	---	---	---
Date Analyzed	01.27.98	---	---	---
Method Number	EPA 418.1	---	---	---

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


Paul Canevaro, Project Manager

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ANALYSIS REQUEST AND CHAIN OF CUSTODY RECORD

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- 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

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- Phone: (813) 885-7427 Fax: (813) 885-7049
- Phone: (504) 764-1100 Fax: (504) 725-1163

PROJECT REFERENCE Roosevelt Rds. 734		PROJECT NO. 39933	P.O. NUMBER	MATRIX TYPE	REQUIRED ANALYSES	PAGE	OF
PROJECT LOC. (State)	SAMPLER(S) NAME		PHONE	AQUEOUS (WATER) SOLID OR SEMISOLID AIR NONAQUEOUS LIQUID (oil, solvent, etc.) TRPH 418.1 9020	<input type="checkbox"/> STANDARD REPORT DELIVERY <input checked="" type="checkbox"/> EXPEDITED REPORT DELIVERY (surcharge) Date Due: _____		
CLIENT NAME	CLIENT PROJECT MANAGER		FAX				
CLIENT ADDRESS (CITY, STATE, ZIP) Boca Raton, FL							

SAMPLE		SL NO.	SAMPLE IDENTIFICATION	NUMBER OF CONTAINERS SUBMITTED				REMARKS
DATE	TIME							
1-26-98	1300		734 SB-5 (2-6')	X	1	1		
	1030		734 SB-4 (2-6')	X	1	1		
	0820		734 SB-3 (10-12')	X	1	1		
	1130		Rinse Blank	X	1	1	← 4-40ml + 1 4oz jar	
	1120		734 SB-4 (10-13')	X	1	1		
	1420		734 SB-5 (10-13')	X	1	1		
↓	0800		734 SB-3 (auger sample)	X	1	1	← 2-40ml + 1 liter amber	← Need results ASAP
RUSH TAT 24 HR!								

RELINQUISHED BY: (SIGNATURE) <i>Kimberly G. K...</i>	DATE 1/16/98	TIME 1800	RELINQUISHED BY: (SIGNATURE) <i>Pat L. Mann III</i>	DATE 1-26-98	TIME	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>T. U. [Signature]</i>	DATE 1/27/98	TIME 10:10	CUSTODY INTACT <input type="checkbox"/> YES <input type="checkbox"/> NO	CUSTODY SEAL NO.	SL LOG NO. D840173	LABORATORY REMARKS:	

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Boca Raton, FL 33431

Project: #3933 (Roosevelt Rds 734)
Sampled By: PM/AN

REPORT OF RESULTS

Page 1

LOG NO	SAMPLE DESCRIPTION , SOLID OR SEMISOLID SAMPLES	DATE/ TIME SAMPLED	
40197-1	734 SB-7 (2-6')	01-28-98/1500	
40197-2	734 SB-7 (10-13')	01-28-98/1545	
PARAMETER		40197-1	40197-2
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		01.29.98	01.29.98
Method Number		EPA 8020	EPA 8020
Dilution factor		1	1
Petroleum Hydrocarbons (9073)			
Petroleum Hydrocarbons, mg/kg		70	188
Date Extracted		01.29.98	01.29.98
Date Analyzed		01.29.98	01.29.98
Method Number		EPA 9073	EPA 9073

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

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LOG NO: D8-40197
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Boca Raton, FL 33431

Project: #3933 (Roosevelt Rds 734)
Sampled By: PM/AN

REPORT OF RESULTS

Page 2

LOG NO	SAMPLE DESCRIPTION , LIQUID SAMPLES	DATE/ TIME SAMPLED
40197-3	SB-6 (Auger)	01-28-98/0920
PARAMETER		40197-3
Petroleum Hydrocarbons (418.1)		
Petroleum Hydrocarbons, mg/l		5.6
Date Extracted		01.30.98
Date Analyzed		01.30.98
Method Number		EPA 418.1

Verified & Certified by: Abraham Ortiz
No. 3-314

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Project: #3933 (Roosevelt Rds 734)
 Sampled By: PM/AN

REPORT OF RESULTS

Page 3

LOG NO	SAMPLE DESCRIPTION , LIQUID SAMPLES	DATE/ TIME SAMPLED
40197-4	Rinsate Blank	01-28-98/1445
PARAMETER		40197-4
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		01.29.98
Method Number		EPA 8020
Dilution factor		1
Petroleum Hydrocarbons (418.1)		
Petroleum Hydrocarbons, mg/l		1.2
Date Extracted		01.30.98
Date Analyzed		01.30.98
Method Number		EPA 418.1

Validated & Certified by: Abraham Ortiz
 License NO: 8314

SL SAVANNAH LABORATORIES & ENVIRONMENTAL SERVICES, INC.

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LOG NO: D8-40197
Received: 29 JAN 98
Reported: 30 JAN 98

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

Project: #3933 (Roosevelt Rds 734)
Sampled By: PM/AN

REPORT OF RESULTS

Page 4

LOG NO	SAMPLE DESCRIPTION , QC REPORT FOR SOLID/SEMISOLID				
40197-5	Method Blank				
40197-6	Accuracy (%Rec)				
40197-7	Precision (%RPD)				
40197-8	Reporting Limit (RL)				
PARAMETER		40197-5	40197-6	40197-7	40197-8
Aromatic Volatiles (8020)					
Benzene, ug/kg		<5.0	107 %	3.7 %	5.0
Chlorobenzene, ug/kg		<5.0	100 %	4.0 %	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	108 %	2.8 %	5.0
Xylenes, ug/kg		<5.0	---	---	5.0
Methyl-tert-butyl ether (MTBE), ug/kg		<50	---	---	50
Date Analyzed		01.29.98	---	---	---
Method Number		EPA 8020	---	---	---
Dilution factor		1	---	---	---
Petroleum Hydrocarbons (9073)					
Petroleum Hydrocarbons, mg/kg		<10	---	4.3 %	10
Date Extracted		01.29.98	---	---	---
Date Analyzed		01.29.98	---	---	---
Method Number		EPA 9073	---	---	---

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Received: 29 JAN 98
Reported: 30 JAN 98

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Boca Raton, FL 33431

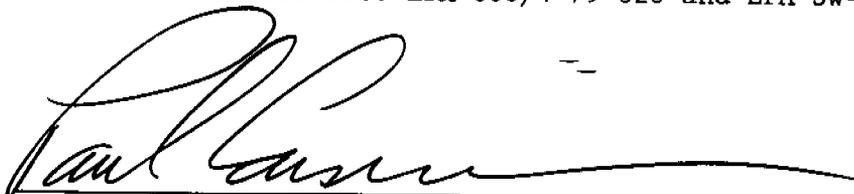
Project: #3933 (Roosevelt Rds 734)
Sampled By: PM/AN

REPORT OF RESULTS

Page 5

LOG NO	SAMPLE DESCRIPTION , QC REPORT FOR LIQUID SAMPLES				
40197-9	Method Blank				
40197-10	Accuracy (%Rec)				
40197-11	Precision (%RPD)				
40197-12	Reporting Limit (RL)				
PARAMETER		40197-9	40197-10	40197-11	40197-12
Aromatic Volatiles (8020)					
Benzene, ug/l		<1.0	96 %	1.0 %	1.0
Chlorobenzene, ug/l		<1.0	90 %	4.4 %	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	93 %	0 %	1.0
Xylenes, ug/l		<2.0	---	---	2.0
Methyl-tert-butyl ether (MTBE), ug/l		<10	---	---	10
Date Analyzed		01.29.98	---	---	---
Method Number		EPA 8020	---	---	---
Petroleum Hydrocarbons (418.1)					
Petroleum Hydrocarbons, mg/l		<1.0	85 %	3.5 %	1.0
Date Extracted		01.30.98	---	---	---
Date Analyzed		01.30.98	---	---	---
Method Number		EPA 418.1	---	---	---

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


Paul Canevaro, Project Manager

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LOG NO: D8-40459
Received: 04 MAR 98
Reported: 12 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: PM/DV
Code: 125980312

REPORT OF RESULTS

Page 1

LOG NO	SAMPLE DESCRIPTION , LIQUID SAMPLES	DATE/ TIME SAMPLED				
40459-1	734 MW-1	03-02-98/1700				
40459-2	734 MW-2	03-02-98/1630				
40459-3	734 MW-3	03-02-98/1645				
40459-4	735 MW-4	03-02-98/1500				
40459-5	735 MW-1	03-02-98/1150				
PARAMETER		40459-1	40459-2	40459-3	40459-4	40459-5
Aromatic Volatiles (8020)						
Benzene, ug/l		<1.0	<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		<1.0	<1.0	<1.0	<1.0	<1.0
Toluene, ug/l		<1.0	<1.0	<1.0	<1.0	<1.0
Xylenes, ug/l		<2.0	<2.0	<2.0	<2.0	<2.0
Methyl-tert-butyl ether (MTBE), ug/l		<10	<10	<10	<10	<10
Date Analyzed		03.06.98	03.05.98	03.05.98	03.05.98	03.06.98

LOG NO: D8-40459
 Received: 04 MAR 98
 Reported: 12 MAR 98

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: PM/DV
 Code: 125980312

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REPORT OF RESULTS

LOG NO	SAMPLE DESCRIPTION , LIQUID SAMPLES	DATE/ TIME SAMPLED				
40459-1	734 MW-1	03-02-98/1700				
40459-2	734 MW-2	03-02-98/1630				
40459-3	734 MW-3	03-02-98/1645				
40459-4	735 MW-4	03-02-98/1500				
40459-5	735 MW-1	03-02-98/1150				
PARAMETER		40459-1	40459-2	40459-3	40459-4	40459-5
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		<5.0	<5.0	<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		<10	<10	<10	<10	<10
1-Methylnaphthalene, ug/l		<10	<10	<10	<10	<10
Date Extracted		03.05.98	03.05.98	03.05.98	03.05.98	03.05.98
Date Analyzed		03.09.98	03.09.98	03.09.98	03.09.98	03.09.98

SL SAVANNAH LABORATORIES
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LOG NO: D8-40459
 Received: 04 MAR 98
 Reported: 12 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: PM/DV
 Code: 125980312

REPORT OF RESULTS

Page 3

LOG NO	SAMPLE DESCRIPTION , LIQUID SAMPLES	DATE/ TIME SAMPLED				
40459-1	734 MW-1	03-02-98/1700				
40459-2	734 MW-2	03-02-98/1630				
40459-3	734 MW-3	03-02-98/1645				
40459-4	735 MW-4	03-02-98/1500				
40459-5	735 MW-1	03-02-98/1150				
PARAMETER		40459-1	40459-2	40459-3	40459-4	40459-5
Petroleum Hydrocarbons (418.1)						
Petroleum Hydrocarbons, mg/l		1.1	<1.0	<1.0	<1.0	1.1
Date Extracted		03.04.98	03.04.98	03.04.98	03.04.98	03.04.98
Date Analyzed		03.05.98	03.05.98	03.05.98	03.05.98	03.05.98
Lead (7421)						
Lead, mg/l		<0.0050	<0.0050	<0.0050	<0.0050	<0.0050
Date Analyzed		03.06.98	03.06.98	03.06.98	03.06.98	03.10.98

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 Received: 04 MAR 98
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Project: #399.33 (Roosevelt Rds)
 Sampled By: PM/DV
 Code: 125980312
 Page 4

REPORT OF RESULTS

LOG NO	SAMPLE DESCRIPTION , LIQUID SAMPLES	DATE/ TIME SAMPLED	
40459-6	Equipment Blank	03-02-98/1050	
40459-7	Field Blank	03-02-98/1030	
PARAMETER		40459-6	40459-7
Aromatic Volatiles (8020)			
Benzene, ug/l		<1.0	<1.0
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	<1.0
Toluene, ug/l		<1.0	<1.0
Xylenes, ug/l		<2.0	<2.0
Methyl-tert-butyl ether (MTBE), ug/l		<10	<10
Date Analyzed		03.05.98	03.05.98

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LOG NO: D8-40459
Received: 04 MAR 98
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Project: #399.33 (Roosevelt Rds)
Sampled By: PM/DV
Code: 125980312

REPORT OF RESULTS

Page 5

LOG NO	SAMPLE DESCRIPTION , LIQUID SAMPLES	DATE/ TIME SAMPLED
40459-6	Equipment Blank	03-02-98/1050
40459-7	Field Blank	03-02-98/1030
PARAMETER	40459-6	40459-7
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	<5.0
Phenanthrene, ug/l	<10	<10
Pyrene, ug/l	<10	<10
2-Methylnaphthalene, ug/l	<10	<10
1-Methylnaphthalene, ug/l	<10	<10
Date Extracted	03.05.98	03.05.98
Date Analyzed	03.09.98	03.09.98
Petroleum Hydrocarbons (418.1)		
Petroleum Hydrocarbons, mg/l	<1.0	<1.0
Date Extracted	03.04.98	03.04.98
Date Analyzed	03.05.98	03.05.98

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LOG NO: D8-40459
Received: 04 MAR 98
Reported: 12 MAR 98

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Project: #399.33 (Roosevelt Rds)
Sampled By: PM/DV
Code: 125980312

REPORT OF RESULTS

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LOG NO	SAMPLE DESCRIPTION , LIQUID SAMPLES	DATE/ TIME SAMPLED
40459-6	Equipment Blank	03-02-98/1050
40459-7	Field Blank	03-02-98/1030
PARAMETER	40459-6	40459-7
Lead (7421)		
Lead, mg/l	<0.0050	<0.0050
Date Analyzed	03.10.98	03.10.98

LOG NO: D8-40459
Received: 04 MAR 98
Reported: 12 MAR 98

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Project: #399.33 (Roosevelt Rds)
Sampled By: PM/DV
Code: 125980312
Page 7

REPORT OF RESULTS

LOG NO SAMPLE DESCRIPTION , LIQUID SAMPLES

40459-8 Trip Blank

PARAMETER 40459-8

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	03.05.98

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LOG NO: D8-40459
 Received: 04 MAR 98
 Reported: 12 MAR 98

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Project: #399.33 (Roosevelt Rds)
 Sampled By: PM/DV
 Code: 160380312
 Page 8

REPORT OF RESULTS

LOG NO SAMPLE DESCRIPTION , QC REPORT FOR LIQUID SAMPLES

 40459-9 Method Blank
 40459-10 Accuracy (%Rec)
 40459-11 Precision (%RPD)
 40459-12 Reporting Limit (RL)

PARAMETER	40459-9	40459-10	40459-11	40459-12
Aromatic Volatiles (8020)				
Benzene, ug/l	<1.0	94 %	2.1 %	1.0
Chlorobenzene, ug/l	<1.0	84 %	3.6 %	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	88 %	5.6 %	1.0
Xylenes, ug/l	<2.0	---	---	2.0
Methyl-tert-butyl ether (MTBE), ug/l	<10	---	---	10
Date Analyzed	03.05.98	---	---	---

LOG NO: D8-40459
 Received: 04 MAR 98
 Reported: 12 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: PM/DV
 Code: 125980312
 Page 9

REPORT OF RESULTS

LOG NO SAMPLE DESCRIPTION , QC REPORT FOR LIQUID SAMPLES

40459-9 Method Blank
 40459-10 Accuracy (%Rec)
 40459-11 Precision (%RPD)
 40459-12 Reporting Limit (RL)

PARAMETER	40459-9	40459-10	40459-11	40459-12
Polynuclear Aromatic Hydrocarbons (610)				
Acenaphthene, ug/l	<10	57 %	3.5 %	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	57 %	3.1 %	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	59 %	3.3 %	10
Indeno(1,2,3-cd)pyrene, ug/l	<5.0	---	---	5.0
Naphthalene, ug/l	<5.0	61 %	3.3 %	5.0
Phenanthrene, ug/l	<10	---	---	10
Pyrene, ug/l	<10	64 %	6.2 %	10
2-Methylnaphthalene, ug/l	<10	---	---	10
1-Methylnaphthalene, ug/l	<10	---	---	10
Date Extracted	03.05.98	---	---	---
Date Analyzed	03.09.98	---	---	---
~ Petroleum Hydrocarbons (418.1)				
Petroleum Hydrocarbons, mg/l	<1.0	81 %*F82	9.9 %	1.0
Date Extracted	03.04.98	---	---	---
Date Analyzed	03.05.98	---	---	---

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Project: #399.33 (Roosevelt Rds)
Sampled By: PM/DV
Code: 125980312
Page 10

REPORT OF RESULTS

LOG NO SAMPLE DESCRIPTION , QC REPORT FOR LIQUID SAMPLES

40459-9 Method Blank
40459-10 Accuracy (%Rec)
40459-11 Precision (%RPD)
40459-12 Reporting Limit (RL)

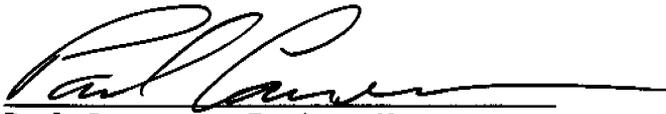
PARAMETER	40459-9	40459-10	40459-11	40459-12
Lead (7421)				
Lead, mg/l	<0.0050	94 %	1.0 %	0.0050
Date Analyzed	03.06.98	---	---	---

Comprehensive Quality Assurance Plan #890142G.

SL Certifications: E86221/86371

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

*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

Final Page Of Report

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

SL SAVANNAH LABORATORIES & ENVIRONMENTAL SERVICES, INC.

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

ANALYSIS REQUEST AND CHAIN OF CUSTODY RECORD

PROJECT REFERENCE <i>Roosevelt Roads (DOD)</i>		PROJECT NO. <i>39933</i>	P.O. NUMBER	MATRIX TYPE	REQUIRED ANALYSES	PAGE <i>1</i> OF <i>1</i>
PROJECT LOC. (State) <i>P.R.</i>	SAMPLER(S) NAME <i>P. Maner / Darling</i>	PHONE <i>561 750 3733</i>	FAX <i>787 860 4538</i>	STANDARD REPORT DELIVERY <input type="checkbox"/> EXPEDITED REPORT DELIVERY (surcharge) <input checked="" type="checkbox"/> Date Due: <i>3/10/98</i>		
CLIENT NAME <i>BBL</i>	CLIENT PROJECT MANAGER <i>P. Maner</i>	CLIENT ADDRESS (CITY, STATE, ZIP) <i>Boca Raton, FL 33487</i>				

SAMPLE DATE	TIME	SL NO.	SAMPLE IDENTIFICATION	NUMBER OF CONTAINERS SUBMITTED							REMARKS	
				AQUEOUS (WATER)	SOLID OR SEMISOLID	AIR	NONAQUEOUS LIQUID (oil, solvent, etc)					
<i>3/2/98</i>	<i>1700</i>		<i>734 MW-1</i>	<i>X</i>			<i>3</i>	<i>1</i>	<i>1</i>	<i>1</i>		
	<i>1630</i>		<i>734 MW-2</i>	<i>X</i>			<i>3</i>	<i>1</i>	<i>1</i>	<i>1</i>		
	<i>1645</i>		<i>734 MW-3</i>	<i>X</i>			<i>3</i>	<i>1</i>	<i>1</i>	<i>1</i>		
			<i>734 MW-4 (DOD)</i>									
	<i>1500</i>		<i>735 MW-4</i>	<i>X</i>			<i>3</i>	<i>1</i>	<i>1</i>	<i>1</i>		
	<i>1150</i>		<i>735 MW-1</i>	<i>X</i>			<i>3</i>	<i>1</i>	<i>1</i>	<i>1</i>		
	<i>1050</i>		<i>Equipment Blank</i>	<i>X</i>			<i>3</i>	<i>1</i>	<i>1</i>	<i>1</i>		
<i>3/2/98</i>	<i>1030</i>		<i>Field Blank</i>	<i>X</i>			<i>3</i>	<i>1</i>	<i>1</i>	<i>1</i>		
			<i>Trip Blank</i>	<i>X</i>			<i>3</i>					

RELINQUISHED BY: (SIGNATURE)	DATE	TIME	RELINQUISHED BY: (SIGNATURE)	DATE	TIME	RELINQUISHED BY: (SIGNATURE)	DATE	TIME
<i>[Signature]</i>			<i>[Signature]</i>	<i>3/3/98</i>	<i>1600</i>			
RECEIVED BY: (SIGNATURE)	DATE	TIME	RECEIVED BY: (SIGNATURE)	DATE	TIME	RECEIVED BY: (SIGNATURE)	DATE	TIME
<i>[Signature]</i>	<i>3/1/98</i>	<i>1600</i>						

LABORATORY USE ONLY						
RECEIVED FOR LABORATORY BY: (SIGNATURE)	DATE	TIME	CUSTODY INTACT	CUSTODY SEAL NO.	SL LOG NO.	LABORATORY REMARKS:
<i>[Signature]</i>	<i>3/4/98</i>	<i>1100</i>	<input type="checkbox"/> YES <input type="checkbox"/> NO		<i>D840459</i>	

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 D8-40271.

I hereby certify that , to the best of my knowlege, the results for log number D8-40271, pages 1-4 (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: D8-40271
Received: 10 FEB 98
Reported: 12 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/AN

REPORT OF RESULTS

Page 1

LOG NO	SAMPLE DESCRIPTION , SOLID OR SEMISOLID SAMPLES	DATE/ TIME SAMPLED		
40271-1	734 SB-8 (2-6)	02-09-98/1035		
40271-2	734 SB-8 (12-14)	02-09-98/1100		
40271-3	731 SB-1 (2-6)	02-09-98/1325		
PARAMETER		40271-1	40271-2	40271-3
Aromatic Volatiles (8020)				
Benzene, ug/kg		<5.0*F78	<5.0*F78	<25*F34
Chlorobenzene, ug/kg		<5.0*F78	<5.0*F78	<25*F34
1,2-Dichlorobenzene, ug/kg		<5.0*F78	<5.0*F78	<25*F34
1,3-Dichlorobenzene, ug/kg		<5.0*F78	<5.0*F78	<25*F34
1,4-Dichlorobenzene, ug/kg		<5.0*F78	<5.0*F78	<25*F34
Ethylbenzene, ug/kg		<5.0*F78	<5.0*F78	<25*F34
Toluene, ug/kg		<5.0*F78	<5.0*F78	<25*F34
Xylenes, ug/kg		<5.0*F78	<5.0*F78	<25*F34
Date Analyzed		02.11.98	02.11.98	02.11.98
Method Number		EPA 8020	EPA 8020	EPA 8020
Dilution factor		1	1	5
Petroleum Hydrocarbons (9073)				
Petroleum Hydrocarbons, mg/kg		<10	<10	1300
Date Extracted		02.09.98	02.09.98	02.09.98
Date Analyzed		02.09.98	02.09.98	02.09.98
Method Number		EPA 9073	EPA 9073	EPA 9073

Validated & Certified by: Abraham Ditzig

License No.: 3314

SL SAVANNAH LABORATORIES
& ENVIRONMENTAL SERVICES, INC.

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LOG NO: D8-40271
Received: 10 FEB 98
Reported: 12 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/AN

REPORT OF RESULTS

Page 2

LOG NO	SAMPLE DESCRIPTION , LIQUID SAMPLES	DATE/ TIME SAMPLED
40271-4	731 Rinsate Blank	02-09-98/1430
PARAMETER		40271-4
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		02.10.98
Method Number		EPA 8020
Dilution factor		1
Petroleum Hydrocarbons (418.1)		
Petroleum Hydrocarbons, mg/l		<1.0
Date Extracted		02.10.98
Date Analyzed		02.11.98
Method Number		EPA 418.1

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: D8-40271
Received: 10 FEB 98
Reported: 12 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/AN

REPORT OF RESULTS

Page 3

LOG NO	SAMPLE DESCRIPTION , QC REPORT FOR SOLID/SEMISOLID			
40271-5	Method Blank			
40271-6	Accuracy (%Rec)			
40271-7	Precision (%RPD)			
40271-8	Reporting Limit (RL)			
PARAMETER	40271-5	40271-6	40271-7	40271-8
Aromatic Volatiles (8020)				
Benzene, ug/kg	<5.0	120 %	0 %	5.0
Chlorobenzene, ug/kg	<5.0	110 %	18 %	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	115 %	8.7 %	5.0
Xylenes, ug/kg	<5.0	---	---	5.0
Date Analyzed	02.11.98	---	---	---
Method Number	EPA 8020	---	---	---
Petroleum Hydrocarbons (9073)				
Petroleum Hydrocarbons, mg/kg	<10	62 %	2.0 %	10
Date Extracted	02.09.98	---	---	---
Date Analyzed	02.09.98	---	---	---
Method Number	EPA 9073	---	---	---

Validated & Certified by: Mr. Abandi

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: D8-40271
Received: 10 FEB 98
Reported: 12 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/AN

REPORT OF RESULTS

Page 4

LOG NO SAMPLE DESCRIPTION , QC REPORT FOR LIQUID SAMPLES

40271-9 Method Blank
40271-10 Accuracy (%Rec)
40271-11 Precision (%RPD)
40271-12 Reporting Limit (RL)

PARAMETER	40271-9	40271-10	40271-11	40271-12
Aromatic Volatiles (8020)				
Benzene, ug/l	<1.0	90 %	1.1 %	1.0
Chlorobenzene, ug/l	<1.0	97 %	2.1 %	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	96 %	3.1 %	1.0
Xylenes, ug/l	<2.0	---	---	2.0
Methyl-tert-butyl ether (MTBE), ug/l	<10	---	---	10
Date Analyzed	02.10.98	---	---	---
Method Number	EPA 8020	---	---	---
Dilution factor	1	---	---	---
Petroleum Hydrocarbons (418.1)				
Petroleum Hydrocarbons, mg/l	<1.0	82 %	1.0 %	1.0
Date Extracted	02.10.98	---	---	---
Date Analyzed	02.11.98	---	---	---
Method Number	EPA 418.1	---	---	---

Comprehensive Quality Assurance Plan #890142G.

SL Certifications: E86221/86371

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

*F34 - Due to the abundance of organics in the sample, dilution was required.

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

Validated & Certified by: Abraham D. ...

License No.: 2314


Paul Canevaro, Project Manager

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
 14 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 Roosevelt Roads		PROJECT NO. 39933	P.O. NUMBER	MATRIX TYPE	REQUIRED ANALYSES	PAGE (/) OF
PROJECT LOC. (State) P.R.	SAMPLER(S) NAME D. Press / A. Naya	PHONE 561 750 3733	FAX 787 860 4538	AQUEOUS (WATER) SOLID OR SEMISOLID AIR NONAQUEOUS LIQUID (oil solvent, etc.) HCL HCL Ice Ice	418.1 250 amber 8020 3x40ml 418.1 glass 8020 glass 4oz glass	STANDARD REPORT DELIVERY <input type="checkbox"/> EXPEDITED REPORT DELIVERY (surcharge) <input checked="" type="checkbox"/> Date Due: 2/11/98
CLIENT NAME BBL		CLIENT PROJECT MANAGER A. Maner				
CLIENT ADDRESS (CITY, STATE, ZIP) Boca Raton, FL						

SAMPLE		SL NO.	SAMPLE IDENTIFICATION	NUMBER OF CONTAINERS SUBMITTED						REMARKS
DATE	TIME			AQUEOUS (WATER)	SOLID OR SEMISOLID	AIR	NONAQUEOUS LIQUID (oil solvent, etc.)			
2/9/98	1035		734 SB-8 (2-6)	X				1	1	
	1100		734 SB-8 (12-14)	X				1	1	
	1325		731 SB-1 (2-6)	X				1	1	
↙	1430		731 Rinse Blank	X	1	3				
-	-		Trip Blank	X		3				

Do not run unless Rinse Blank shows hits

RELINQUISHED BY: (SIGNATURE) <i>[Signature]</i>	DATE 2/9/98	TIME 1700	RELINQUISHED BY: (SIGNATURE) <i>[Signature]</i>	DATE 2/9/98	TIME 1700	RELINQUISHED BY: (SIGNATURE)	DATE	TIME
RECEIVED BY: (SIGNATURE) <i>[Signature]</i>	DATE 2/10/98	TIME 1700	RECEIVED BY: (SIGNATURE)	DATE	TIME	RECEIVED BY: (SIGNATURE)	DATE	TIME

LABORATORY USE ONLY								
RECEIVED FOR LABORATORY BY: (SIGNATURE) <i>[Signature]</i>	DATE 2/10/98	TIME 1030	CUSTODY INTACT <input type="checkbox"/> YES <input type="checkbox"/> NO	CUSTODY SEAL NO.	SL LOG NO. D840271	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 D8-40173.

I hereby certify that , to the best of my knowlege, the results for log number D8-40173, pages 1-4 (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: D8-40173
Received: 27 JAN 98
Reported: 29 JAN 98

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

Project: 39933 (Roosevelts Rds. 734)
Sampled By: PM/AN

REPORT OF RESULTS

Page 1

LOG NO	SAMPLE DESCRIPTION , SOLID OR SEMISOLID SAMPLES	DATE/ TIME SAMPLED			
40173-1	734 SB-5 (2-6')	01-26-98/1300			
40173-2	734 SB-4 (2-6')	01-26-98/1030			
40173-3	734 SB-3 (10-12')	01-26-98/0830			
40173-4	734 SB-4 (10-13')	01-26-98/1120			
40173-5	734 SB-5 (10-13')	01-26-98/1420			
PARAMETER	40173-1	40173-2	40173-3	40173-4	40173-5
Aromatic Volatiles (8020)					
Benzene, ug/kg	<5.0	<5.0	<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	<5.0	<5.0	<5.0	<5.0
Toluene, ug/kg	<5.0	<5.0	<5.0	<5.0	<5.0
Xylenes, ug/kg	<5.0	<5.0	<5.0	<5.0	<5.0
Methyl-tert-butyl ether (MTBE), ug/kg	<50	<50	<50	<50	<50
Date Analyzed	01.27.98	01.27.98	01.27.98	01.27.98	01.27.98
Method Number	EPA 8020	EPA 8020	EPA 8020	EPA 8020	EPA 8020
Dilution factor	1	1	1	1	1
Petroleum Hydrocarbons (9073)					
Petroleum Hydrocarbons, mg/kg	<10	<10	<10	<10	17
Date Extracted	01.27.98	01.27.98	01.27.98	01.27.98	01.27.98
Date Analyzed	01.27.98	01.27.98	01.27.98	01.27.98	01.27.98
Method Number	EPA 418.1	EPA 418.1	EPA 418.1	EPA 418.1	EPA 418.1

Validated & Certified by: Shabana Dutt
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: D8-40173
Received: 27 JAN 98
Reported: 29 JAN 98

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

Project: 39933 (Roosevelts Rds. 734)
Sampled By: PM/AN

REPORT OF RESULTS

Page 2

LOG NO	SAMPLE DESCRIPTION , LIQUID SAMPLES	DATE/ TIME SAMPLED	
40173-6	Rinsate Blank	01-26-98/1130	
40173-7	734 SB-3 (Auger Sample)	01-26-98/0800	
PARAMETER		40173-6	40173-7
Aromatic Volatiles (8020)			
Benzene, ug/l		<1.0	<1.0
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	<1.0
Toluene, ug/l		<1.0	<1.0
Xylenes, ug/l		<2.0	<2.0
Methyl-tert-butyl ether (MTBE), ug/l		<10	<10
Date Analyzed		01.27.98	01.27.98
Method Number		EPA 8020	EPA 8020
Dilution factor		1	1
Petroleum Hydrocarbons (418.1)			
Petroleum Hydrocarbons, mg/l		<1.0	21
Date Extracted		01.27.98	01.27.98
Date Analyzed		01.27.98	01.27.98
Method Number		EPA 418.1	EPA 418.1

Validated & Certified by Abraham Ditz
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: D8-40173
Received: 27 JAN 98
Reported: 29 JAN 98

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

Project: 39933 (Roosevelts Rds. 734)
Sampled By: PM/AN

REPORT OF RESULTS

Page 3

LOG NO SAMPLE DESCRIPTION , QC REPORT FOR SOLID/SEMISOLID

40173-8 Method Blank
40173-9 Accuracy (%Rec)
40173-10 Precision (%RPD)
40173-11 Reporting Limit (RL)

PARAMETER	40173-8	40173-9	40173-10	40173-11
Aromatic Volatiles (8020)				
Benzene, ug/kg	<5.0	108 %	4.6 %	5.0
Chlorobenzene, ug/kg	<5.0	100 %	6.0 %	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	105 %	7.6 %	5.0
Xylenes, ug/kg	<5.0	---	---	5.0
Methyl-tert-butyl ether (MTBE), ug/kg	<50	---	---	50
Date Analyzed	01.27.98	---	---	---
Method Number	EPA 8020	---	---	---
Petroleum Hydrocarbons (9073)				
Petroleum Hydrocarbons, mg/kg	<1.0	80 %	1.2 %	1.0
Date Extracted	01.27.98	---	---	---
Date Analyzed	01.27.98	---	---	---
Method Number	EPA 418.1	---	---	---

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

SL SAVANNAH LABORATORIES & ENVIRONMENTAL SERVICES, INC.

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LOG NO: D8-40173
Received: 27 JAN 98
Reported: 29 JAN 98

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

Project: 39933 (Roosevelts Rds. 734)
Sampled By: PM/AN

REPORT OF RESULTS

Page 4

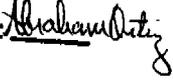
LOG NO SAMPLE DESCRIPTION , QC REPORT FOR LIQUID SAMPLES

40173-12 Method Blank
40173-13 Accuracy (%Rec)
40173-14 Precision (%RPD)
40173-15 Reporting Limit (RL)

PARAMETER	40173-12	40173-13	40173-14	40173-15
Aromatic Volatiles (8020)				
Benzene, ug/l	<1.0	101 %	0 %	1.0
Chlorobenzene, ug/l	<1.0	108 %	0.92 %	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	100 %	0 %	1.0
Xylenes, ug/l	<2.0	---	---	2.0
Methyl-tert-butyl ether (MTBE), ug/l	<10	---	---	10
Date Analyzed	01.27.98	---	---	---
Method Number	EPA 8020	---	---	---
Petroleum Hydrocarbons (418.1)				
Petroleum Hydrocarbons, mg/l	<1.0	85 %	2.3 %	1.0
Date Extracted	01.27.98	---	---	---
Date Analyzed	01.27.98	---	---	---
Method Number	EPA 418.1	---	---	---

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


Paul Canevaro, Project Manager

Validated & Certified by: 
License No.: 2314

SL SAVANNAH LABORATORIES & ENVIRONMENTAL SERVICES, INC.

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LOG NO: D8-40205
Received: 30 JAN 98
Reported: 02 FEB 98

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

Project: #3933 (Roosevelt Rds)
Sampled By: PM/AN

REPORT OF RESULTS

Page 2

LOG NO	SAMPLE DESCRIPTION , LIQUID SAMPLES	DATE/ TIME SAMPLED
40205-5	734 SB-7 (Auger)	01-29-98/0920
PARAMETER		40205-5
Petroleum Hydrocarbons (418.1)		
Petroleum Hydrocarbons, mg/l		1.3
Date Extracted		01.30.98
Date Analyzed		01.30.98
Method Number		EPA 418.1

Validated & Certified by: Abraham Ortiz
License No.: 7314

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 Numbers D8-40197A, and D8-40197.

I hereby certify that , to the best of my knowlege, the results for log numbers D8-40197A pages 1-2(inclusive) and D8-40197, 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: D8-40197A
Received: 02 FEB 98
Reported: 04 FEB 98

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

Project: #3933 (Roosevelt Rds)
Sampled By: PM/AN

REPORT OF RESULTS

Page 1

LOG NO	SAMPLE DESCRIPTION , SOLID OR SEMISOLID SAMPLES	DATE/ TIME SAMPLED
40197A-1	734 SB-7 (10-13')	01-28-98/1545
PARAMETER	40197A-1	
Petroleum Hydrocarbons by GC (8015 - Extractable)		
Petroleum Hydrocarbons (DRO), ug/kg	<3300	
Date Extracted	02.02.98	
Date Analyzed	02.03.98	
Method Number	MOD 8015	

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: D8-40197A
Received: 02 FEB 98
Reported: 04 FEB 98

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

Project: #3933 (Roosevelt Rds)
Sampled By: PM/AN

REPORT OF RESULTS

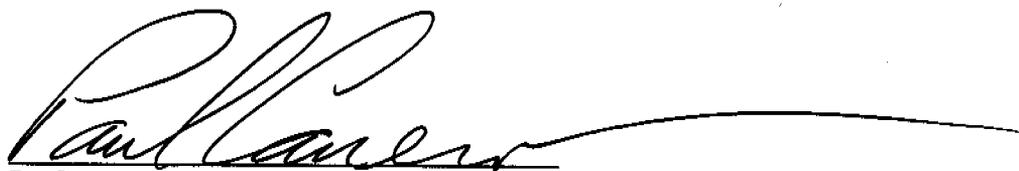
Page 2

LOG NO SAMPLE DESCRIPTION , QC REPORT FOR SOLID/SEMISOLID

40197A-2 Method Blank
40197A-3 Accuracy (%Rec)
40197A-4 Precision (%RPD)
40197A-5 Reporting Limit (RL)

PARAMETER	40197A-2	40197A-3	40197A-4	40197A-5
Petroleum Hydrocarbons by GC (8015 - Extractable)				
Petroleum Hydrocarbons (DRO), ug/kg dw	<3300	72 %	---	3300
Date Extracted	02.02.98	---	---	---
Date Analyzed	02.03.98	---	---	---
Method Number	MOD 8015	---	---	---

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


Paul Canevaro, Project Manager

Validated & Certified by: 
License No.: 2314