

**FINAL**

**RCRA FACILITY INVESTIGATION WORK PLANS  
NAVAL STATION ROOSEVELT ROADS  
PUERTO RICO**

**ADDENDUM 1  
TOW WAY FUEL FARM - SWMU 7  
TOW WAY FUEL FARM DISPOSAL PITS -  
SWMU 8**

**NAVAL STATION  
ROOSEVELT ROADS, PUERTO RICO**

**CONTRACT TASK ORDER 0173**

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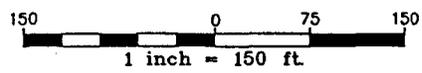
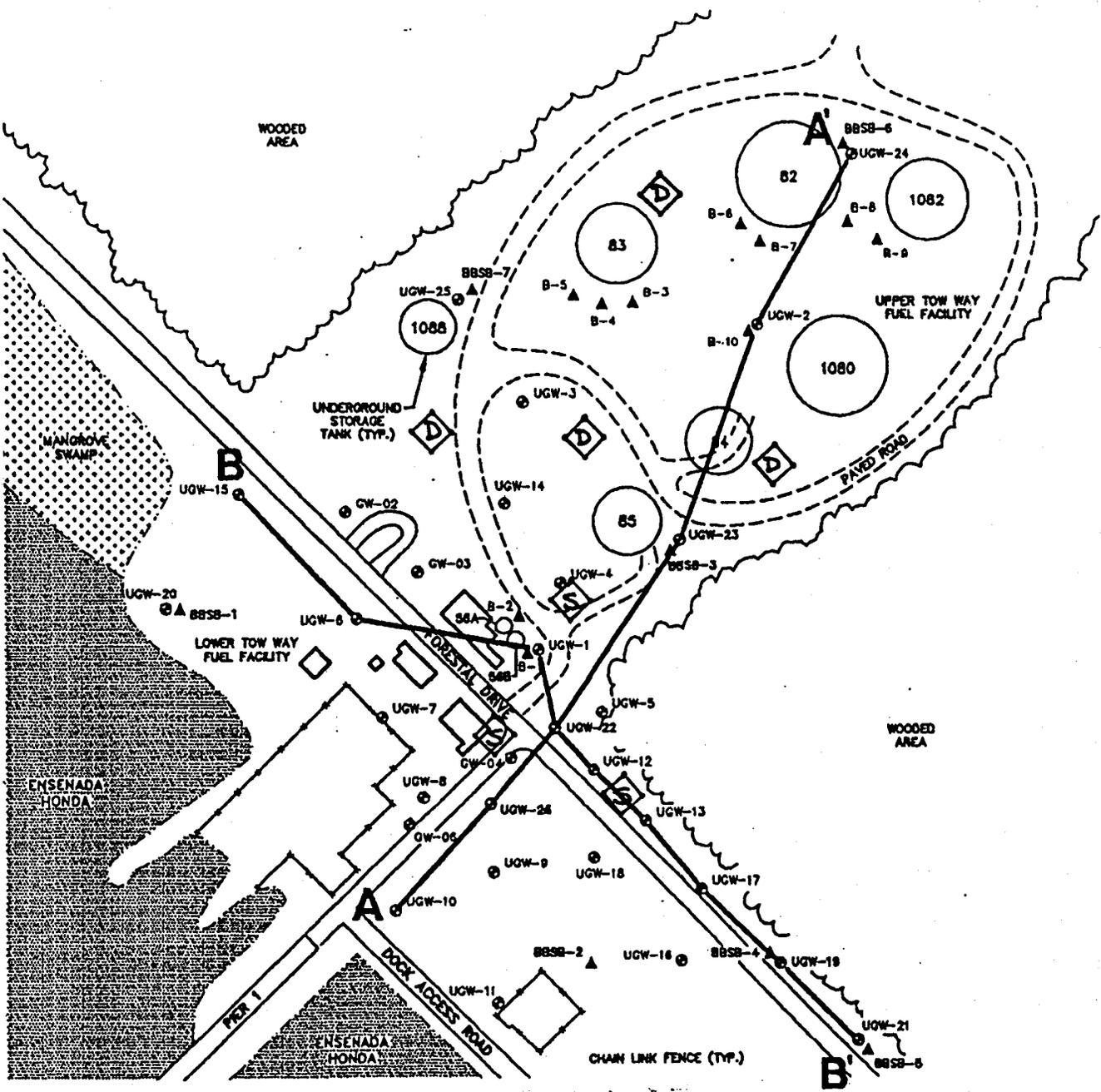
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## **1.0 INTRODUCTION**

The Tow Way Fuel Farm has been subjected to intense scrutiny over the past several years because of its operational history which has included spills/releases of refined petroleum totaling an estimated one million gallons. Work to date has been performed to address requirements of the Puerto Rico Environmental Quality Board's UST regulations. Roosevelt Roads is now in possession of a Final RCRA permit which contains corrective action provisions to address Solid Waste Management Units (SWMU) at the base. Because of the broader scope of corrective action as compared to UST regulations, the EPA has determined that the Tow Way Fuel Farm area will be included in the RCRA Facility Investigation (RFI) required to fulfill corrective action requirements.

The Tow Way Fuel Farm area is actually classified as two separate SWMUs in the permit. SWMU 7, Tow Way Fuel Farm, includes the entire fuel farm area from essentially the top of the hill to the toe of the slope, across Forrestal Drive, and the flat area between the road and Ensenada Honda (see Figure 1). The sediments within the Honda are separately addressed within Area of Concern (AOC) D (Ensenada Honda Sediments). Sampling locations for the sediments are shown on Figure 4-4 of the Final RFI Workplans (Baker, September 1995). The second area is SWMU 8 - Tow Way Fuel Farm Sludge Disposal Pits. The pits, all of which are contained within the general area comprising SWMU 7, are unlined excavations used to dispose of sludges resulting from tank cleaning. Originally, the locations of the pits were totally unknown but recent information from a long-term facility employee has identified three locations of pit disposal. While knowledge of these locations is important, the proposed investigations include other areas where disposal may have occurred.

The two individual SWMUs are intimately related since SWMU 8 is totally contained within SWMU 7. Therefore, the two investigatory programs are designed to be interrelated especially in terms of characterizing the geology, hydrogeology and contaminant profile of both sites. It is the general approach to characterize the site for possible corrective measures by media. The free product plume is presently being addressed through the free product recovery system. Groundwater and/or soil (subsurface or surface) remediation, if necessary, will be done on a site wide basis.



**Baker**  
Baker Environmental, Inc.

**LEGEND**

- ◊ EXISTING MONITORING WELL
- ▲ EXISTING SOIL BORING
- ◊ PROPOSED DEEP WELL
- ◊ PROPOSED SHALLOW BORING

SOURCE: BLASLAND, BOUCK & LEE, INC.

**FIGURE 1**  
**PROPOSED BORING/WELL LOCATIONS**  
**SWMUs 7 AND 8**  
**TOW WAY FUEL FARM**  
**NAVAL STATION ROOSEVELT ROADS**  
**PUERTO RICO**

Based on this, the focus of the efforts for SWMU 7 will be to complete characterization of the site while that for SWMU 8 will be to identify pit locations, characterize contents and assess risk.

The scope of investigatory work described in subsequent sections of this addendum only addresses the actual work elements at each site. All the other elements normally comprising Work Plans (e.g., Health and Safety Plan, Quality Assurance Project Plans) rely on the Final RCRA Facility Investigation Work Plan (Baker, September, 1995). All sampling will be conducted in accordance with the applicable SOP contained in Appendix B of the Data Collection Quality Assurance Plan.

## **2.0 SWMU 7 - TOW WAY FUEL FARM**

As indicated previously, significant characterization of this site has already been performed. The results of these efforts have been most recently summarized in:

"Corrective Action Plan, Tow Way Fuel Facility, Roosevelt Roads Naval Station,  
Ceiba, Puerto Rico"

(Blasland, Bouck and Lee, Inc., September (1994)).

This document and earlier ones have been used as the basis for site understanding.

The Site Characterization Report (Blasland, Bouch and Lee, Inc., April, 1994) and the Corrective Action Plan were thoroughly reviewed by the EPA with the results of this review provided to the Navy in a letter dated April 13, 1995. The review identified a number of data gaps in site characterization that are addressed in this addendum. In addition, the review extensively commented on various aspects of the free product recovery system and the final possible corrective measures which may be needed. This addendum does not attempt to provide investigatory efforts to "fine tune" the free product recovery system nor does it discuss eventual possible remediation. It does, in keeping with the intent of the RFI process, contain work elements which are designed to provide adequate site characterization information for the subsequent assessment of appropriate corrective measures should they be required.

## **2.1 Subsurface Investigations**

This section discusses:

- A deep boring program
- A shallow boring program
- The installation of piezometers
- Associated sampling and analysis

### **2.1.1 Deep Boring Program**

#### **2.1.1.1 Drilling Program**

A total of four deep borings will be advanced at the site in the approximate locations shown on Figure 1. The locations have been selected to provide reasonable coverage of the site without duplicating characterization efforts from previous investigations.

At each location, a boring will be advanced using hollow stem-augers to auger refusal at the top of competent rock. Each boring will be continuously sampled to provide a complete and detailed record of the local unconsolidated material stratigraphy. The boring will be continued from auger refusal using NX (or NQ) sized rock coring equipment to a point a minimum of twenty-five feet into competent rock or a minimum of 10 feet into the bedrock aquifer whichever is deeper. The core will be examined visually to verify rock classification and to ascertain the number and condition of bedrock fractures (e.g., joints, stress relief features). Upon reaching hole completion depth, the hole will be reamed using a tricone bit to a minimum of four inches. Reaming will be performed only in the fractured bedrock zone; any hole remaining below this will be backfilled with bentonite pellets.

Upon completion of augering, coring, reaming, and backfilling (if necessary), a two-inch diameter PVC well will be installed in the boring. It is the intent of this well to provide information strictly from the fractured bedrock zone and therefore, the screen length will be selected such that only this zone is monitored.

Rising head slug tests will be performed in each deep well following completion of well development. This testing will be done in accordance with the applicable SOP as contained in the Final RFI Work Plan.

#### 2.1.1.2 Laboratory Testing

##### *Chemical Analyses*

At each location, a total of three samples will be obtained for laboratory analysis. The first sample will be taken from immediately below the root zone to a depth of approximately one foot. The second sample will be obtained from a two foot zone below the groundwater table. The final sample will be taken from a zone within the water table that visually evidences contamination, that has measurable organics when scanned with a PID or that is representative of subsurface conditions.

The samples will be analyzed for volatile organics, semivolatile organics and RCRA metals and TPH. This limited list is deemed appropriate since the only possible contamination in this area is limited to that related to petroleum products. A summary of the number of samples and analytical methods is provided on Table 1.

##### *Physical Analyses*

A bulk sample of each unconsolidated stratigraphic unit between the surface and the fractured bedrock will be collected. Each sample will be analyzed in a geotechnical laboratory for grain size (including hydrometer) and dry density. Should a significant clay or clay-rich unit be found that could act as an aquatard, a Shelby Tube undisturbed sample will be taken. In addition to grain size and dry density, these samples will be subjected to laboratory permeability testing and will be measured for Atterberg limits.

#### 2.1.1.3 Piezometer Installation

Two or three drive point piezometers will be installed in conjunction with each of the four deep borings. These will typically be 3/4 inch black iron pipe with a screened drive point (alternate

**TABLE 1**

**SUMMARY OF SAMPLING AND ANALYTICAL PROGRAM  
SWMUs 7 AND 8  
NAVAL STATION ROOSEVELT ROADS, PUERTO RICO**

SWMU	Media	Number of Samples	Analyses Required	Analytical Methods
7	Subsurface Soils <sup>(1)</sup> Above Water Table Below Water Table	13	Volatile Organics Semivolatile Organics RCRA Metals TPH	8240 8270 SW-846 Modified 8015
		17		
		4 <sup>(2)</sup>	Corrective Measures Data: Grain Size (Hydrometer) Moisture Content Permeability and Atterberg Limits if applicable	ASTM D422 ASTM D698
	Surface Soil	7	Volatile Organics Semivolatile Organics RCRA Metals	8240 8270 SW-846
	Groundwater	11	Volatile Organics Semivolatile Organics Dissolved RCRA Metals pH Specific Conductance Temperature	8240 8270 SW-846 9045 9050 170.1
8	Surface Soils	4	Volatile Organics Semivolatile Organics RCRA Metals TPH	8240 8270 SW-846 Modified 8015
	Subsurface Soils	21 (Test Pit Samples)	Volatile Organics Semivolatile Organics RCRA Metals TPH	8240 8270 SW-846 Modified 8015
	Subsurface Soils/Waste	18 (Trench Samples)	Volatile Organics Semivolatile Organics RCRA Metals TPH	8240 8270 SW-846 Modified 8015

construction may be considered depending upon availability of equipment in Puerto Rico). The piezometers will be driven to the desired depth to measure potentiometric head.

The zones to be monitored will be the stratigraphic unit immediately above fractured bedrock and the top of the water table aquifer (the actual monitoring point will be placed approximately three feet into the first water bearing unit to ensure that installation will not be dry as a result of seasonal water level fluctuations. If a sufficient thickness of unconsolidated materials is present (defined as twenty or more feet between drive points) an intermediate depth piezometer will be installed approximately halfway between the other two.

The purpose of these nested piezometers is twofold. First, essentially same groundpoint monitoring of different depths will allow an understanding of vertical head distribution. This is especially important in assessing whether the area is one of recharge or discharge and whether there are confining units present. Second, the information obtained will be valuable in assessing applicability of certain groundwater treatment options should corrective measures be required.

### **2.1.2 Shallow Boring Program**

A total of three shallow soil borings will be made at the locations shown on Figure 1. The purpose of these borings, located as they are within the free product plume, is to assess whether subsurface soils above and below the water table are contaminated with petroleum hydrocarbons. To achieve this, the program which follows will be performed.

1. The three shallow borings will be continuously sampled starting from one foot below ground surface. Each sample will be visually examined and will be screened with a PID or FID. Up to three samples from each hole of soil above the water table will be selected based on the screening criteria with the object being to analyze the samples with the highest potential to exhibit contamination. Should no sample indicate the presence of hydrocarbon contamination, the sample zone from immediately above the water table will be submitted for analysis [Note: this data will be combined with that available from the Site Characterization Report to provide full characterization of the vadose zone soils]. No depth to groundwater in the area of these proposed borings was provided in the SCR because of

free product causing measurement difficulties. Based on information from more distant wells at approximately the same elevation, groundwater is expected to occur somewhere between 6 and 12 feet below ground surface.

2. One sample will be obtained from a point 1-3 feet below the water table and submitted for analysis. Another sample will be obtained in the zone 7-9 feet below the water table. If this sample exhibits visible contamination or elicits a response on the PID/FID, it will be submitted for analysis. Should no contamination be evident, the boring will be terminated.

If contamination is found, the boring will be extended to 15 feet with the zone 13-15 feet submitted for analysis if evidence of contamination is present.

Borings will be terminated at a point 15 feet below the water table.

3. All samples submitted to the laboratory will be analyzed for volatile and semivolatile organics, RCRA metals and TPH.

The numbers of samples and analytical protocols are summarized on Table 1.

## **2.2 Surface Soil Investigation**

A total of seven surface soil samples will be obtained and analyzed in the program. The locations for these samples will coincide with the four deep and three shallow borings discussed previously. Each sample will be analyzed for volatile and semivolatile organics and RCRA metals. This limited list of analytical parameters was selected based on the end use of the data which is to perform a human health risk assessment for surface soils.

## **2.3 Hydrogeological Investigations**

The hydrogeology of the area has been reasonably well established by previous investigations. While this is the case, data gaps exist that may have significant impact on the ability to select the

appropriate corrective measure should the need for one become apparent. It is the purpose of these miscellaneous hydrogeological investigations to address the identified data gaps.

### **2.3.1 Tidal Influence Investigation**

It is not known at this time what, if any, impact the tides have on groundwater elevations. To gain an understanding of tidal influence, a two-day program of water level measurements will be undertaken as part of the RFI.

The program will consist of the following:

1. An electric data logger will be placed at the pier to monitor Ensenada Honda tidal fluctuation. Continuous measurements will be obtained over a 48-hour period.
2. Wells UGW-8, UGW-4, and UGW-2 will be equipped with pressure transducers for continuous monitoring of water levels within the wells for 48 hours.
3. Wells UGW-6, UGW-14, GW-03, UGW-3, UGW-23, UGW-20, UGW-15 and UGW-25 will be monitored once an hour by hand using an electronic water level indicator.

[Note: It is the intent to provide three cross-sectional groups of wells for the tidal influence study. Should any of the wells cited above be unavailable through structural damage or free product recovery operations, other wells will be substituted as necessary to maintain the intent of the program.]

4. The tidal influence study will be conducted immediately prior to the limited pump testing program so that pre-pumping water levels can be established.

### **2.3.2 Limited Pump Testing**

A broad scale pump test is not deemed appropriate for two reasons:

- Free product recovery which is presently underway may be negatively impacted.
- Petroleum contamination may be drawn downwards into presently uncontaminated soils by lowering the water level in areas of free product occurrence.

Based on these considerations, only small scale and highly localized testing will be performed.

The four deep borings with their associated drive points provide ideal locations for limited scale testing. At each location, the deep, two-inch well will be pumped and the piezometers will be monitored. Should significant water be available (i.e., sustainable pumping of one plus gpm) from the deep well, the test will be expanded to a 24-hour pump test with monitoring occurring at the four deep installations, the associated piezometers and such other wells (e.g., UGW-2, 3, 4, and 23) as may be deemed appropriate during the field program.

Pre-pumping water levels will be obtained from the Tidal Influence Investigation described in Section 2.3.1.

All water produced will be containerized (drums or tankage) for eventual disposal.

### **2.3.3 Groundwater Elevation Measurements**

During the course of the field investigations, a minimum of one round of groundwater elevations will be obtained from all the wells and piezometers. This will provide a single point-in-time measurements for construction of new groundwater potentiometric surface maps. Measurements will be taken using an interphase probe capable of detecting and measuring free product layers. This information will allow new free product thickness maps to be made.

### **2.3.4 Groundwater Sampling**

A total of eleven groundwater samples will be obtained during the SWMU 7 investigations. Four of the samples will be from the four deep wells described earlier. The remaining seven will be obtained from the following existing wells:

- UGW-2
- UGW-3
- UGW-7
- UGW-10
- UGW-16
- UGW-20
- GW-03

All groundwater samples will be analyzed for volatile and semivolatile organics and dissolved RCRA metals. The sampling and analytical program is summarized on Table 1.

The intent of this groundwater sampling program is to characterize contamination (if any) in the fractured bedrock zone and to assess the extent of dissolved petroleum contamination in the surficial aquifer. The deep zone will be addressed by sampling the deep wells. The remaining wells are all located outside the delineated free product plume. Sampling these wells will provide information regarding the extent and concentration of petroleum constituents in the general area, will provide some indication of what may be releasing through recharge to Ensenada Honda and will provide some input in the human health risk assessment (although no exposure pathway to groundwater is envisioned).

### **3.0 SWMU 8 - TOW WAY FUEL FARM DISPOSAL PITS**

This section of the addendum describes the investigations proposed for SWMU 8. Please note that this proposal contains elements designed to address comments received by the Navy on September 29, 1995 and October 2, 1995 (by facsimile) in the Draft review letter (with attachment). Once accepted by all parties, this will comprise Section 4.2.5 of the Final RFI workplans for NSRR; therefore, as much of the original wording of that section has been retained as possible.

SWMU 8 addresses three recently discovered pits and possible other pits within the Tow Way Fuel Farm that were used for sludge disposal. Whenever fuel (especially heavier end fuels) tanks are cleaned out there is a certain amount of sludge present at the bottom. Pre-RCRA regulations, it was common industry practice to excavate a pit near tank access points for the disposal of the sludges.

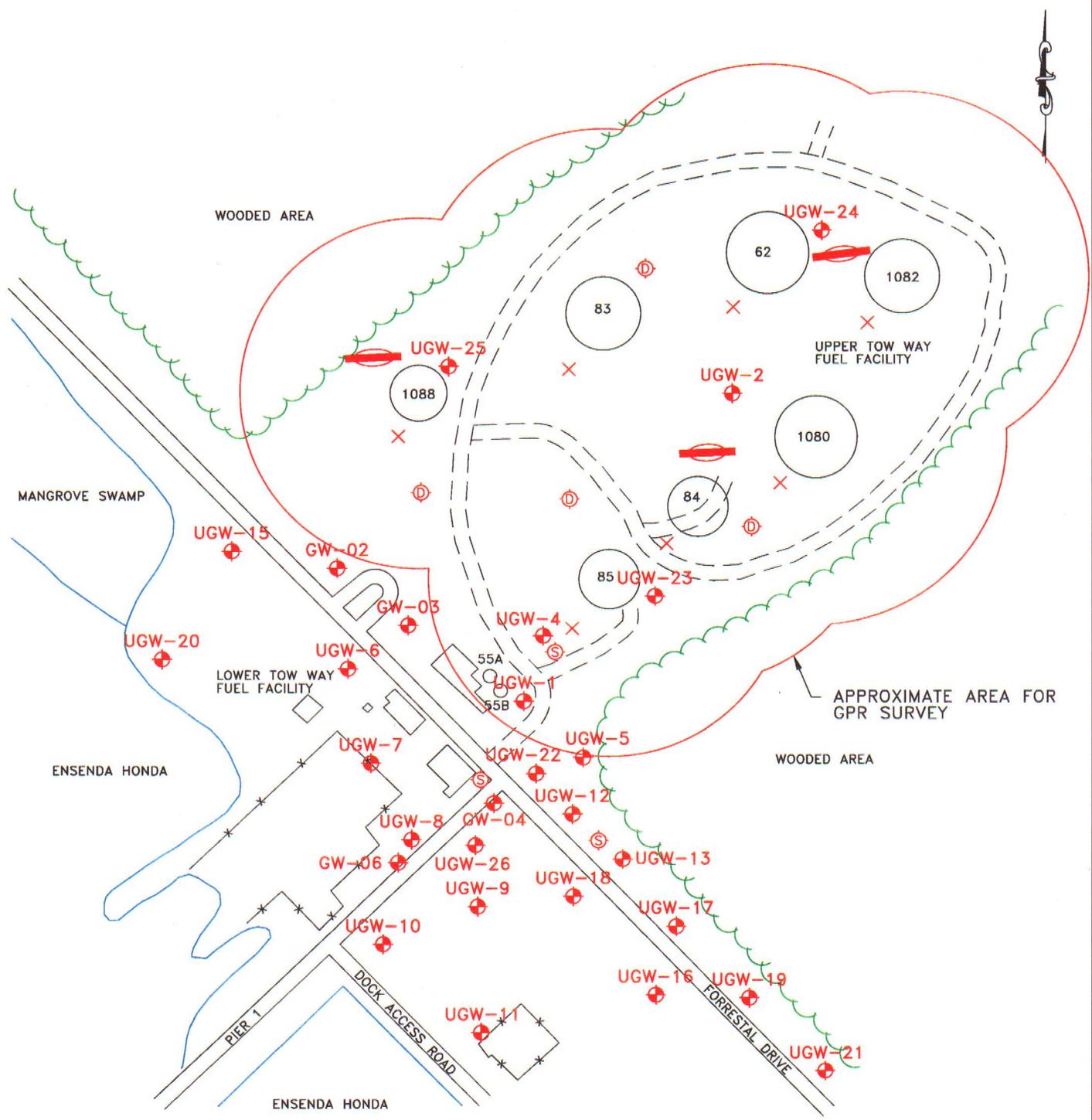
The Navy reportedly followed this technique at the Tow Way Fuel Farm. Repeated site inspections and a review of historical air photos has failed to provide an indication of the pit locations; however, recently a long-term employee identified three locations of pits. Figures 4-4 and 4-5 of the Final RFI Workplans provide a general overview of the site. Figure 2 of this addendum contains similar information.

The initial investigatory step at this unit will be to conduct a limited GPR survey in the areas around the tanks. The GPR survey will be performed in concentric rings around each tank. Rings will be spaced 5 feet apart to a point 75 feet from the tank. Spacing of GPR rings will be 10 feet to 145 feet from the tank. In many areas within the Tow Way, the grids from one tank will overlap those from others. Grids will be blended together where this occurs. Approximate areas to be examined are shown on Figure 2. The area shown includes some apparent fringes of dense jungle. During the field program, an assessment will be made of the impacted jungle area and the grid modified as appropriate.

It should be noted that the GPR effort will be extended into the areas of known pits. Since there is no surface expression of these pits, attempts will be made to locate them using GPR first. It is the intention that, by looking with the GPR in known pit areas, a GPR signature of disposal pits will be obtained making the locating of additional pits (if present) somewhat easier. In addition, other areas which may be suspected of being disposal areas based on observations made during the field program will be subjected to a GPR Survey conducted on a 10-foot grid. The lateral extent of the grid in these areas will be field determined.

A total of seven test pits (minimum dimensions to be 10 feet long by 4 feet wide with depth to be determined by equipment capabilities) will be excavated at the site. The general locations are shown on Figure 2. The test pits will be excavated based on GPR results in areas where possible pit disposal is indicated.

At each test pit location, up to three subsurface samples will be collected. One sample will be collected of the disposed sludge and one soil sample will be collected at a point approximately two feet below the disposed sludge. A third subsurface sample will be collected just above the water table. The deepest subsurface sample (just above the water table) may not be collected if the water



**LEGEND**

- ⊕ - PROPOSED DEEP WELL
- ⊙ - PROPOSED SHALLOW WELL
- ⊕ (with red circle) - PROPOSED SHALLOW WELL
- (with red outline) - APPROXIMATE LOCATION OF FORMER DISPOSAL PIT
- × - PROPOSED TEST PIT LOCATION
- (red line) - PROPOSED TEST TRENCH LOCATION

SOURCE: BLASLAND, BOUCK, & LEE, INC.

**FIGURE 2**  
**PROPOSED WELL LOCATIONS**  
**SWMUs 7 AND 8**  
**TOW WAY FUEL FARM**

NAVAL STATION ROOSEVELT ROADS  
 PUERTO RICO

table is encountered a short distance below the intermediate sample (two feet below the pit). All samples will be analyzed for volatile and semivolatile organics, RCRA metals, and TPH. The sampling and analytical program for SWMU 8 is summarized on Table 1.

An exploratory test trench will be excavated at each known pit location. The trench will be aligned along the long axis of the pit as indicated by GPR results. The sampling strategy for the trenches will be the same as that followed for the pits except that, should a disposal pit be found, depth discrete samples will be obtained every 10 feet along the long axis of the pit with a minimum of two sets of samples taken from each trench in a disposal pit. The trench will be continued, working in both directions, until the lateral extent of the disposal pit is discovered. [Note: The minimum dimensions for each test trench will be 20 feet lateral and 8 feet vertical.] One cross trench will be excavated at the center of a definite pit to assess the extent of the waste. Samples will be obtained, in accordance with the previously indicated criteria, at 10 foot intervals from the center of the pit. If the width of the pit is less than 20 feet, no additional samples will be obtained (since representative samples will have been obtained from the longitudinal axis sampling). All samples will be analyzed for volatile and semivolatile organics, RCRA metals and TPH. The number of samples and analytical methods are summarized on Table 1.

Four surface soil samples will be obtained to provide information for the risk assessment. These samples will be obtained from stained areas, areas that overlie sludge pits or in localized depressions. Analysis will be conducted for volatile and semivolatile organics, RCRA metals, and TPH. The surface soil program is summarized on Table 1.

Groundwater, by virtue of previously detected releases, is a media of concern for the RFI. As described for the soils program, a comprehensive groundwater monitoring system has been installed in the area of the Tow Way which is capable of providing continuing characterization of groundwater conditions. The monitoring program is shown on Figure 4-5. Wells on the site were sampled for VOCs and TPH which is adequate for purposes of the RFI since only contamination from fuels is expected. Finally, there is presently in place and operating a free product recovery system which, as product is removed, works to limit continuing release of petroleum constituents to groundwater.

#### **4.0 SCHEDULE**

Figure 3 contains the project schedule for Operable Unit 2 which includes the Tow Way Fuel Farm (SWMUs 7 and 8).

**FIGURE 3**  
**PROJECT SCHEDULE**  
**OPERABLE UNIT 2**  
**NSRR**

	1996												1997												1998												1999											
	J	F	M	A	M	J	J	A	S	O	N	D	J	F	M	A	M	J	J	A	S	O	N	D	J	F	M	A	M	J	J	A	S	O	N	D	J	F	M	A	M	J	J	A	S	O	N	D
Workplan Addendum Approved	◆																																															
Subcontractor Procurement/Mobilization																																																
Field Investigation																																																
Laboratory Analysis and Validation																																																
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Field Investigations																																																
RFI Report																																																
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Final <sup>(3)</sup>																																																
CMS Reporting																																																
Corrective Measure Design																																																
Corrective Measure Implementation																																				Determined by Scope of Corrective Measure												

<sup>(1)</sup> Quarterly reports addressing all corrective action activities (including OU2) will be provided throughout this report.

<sup>(2)</sup> Includes 30-day review period.

<sup>(3)</sup> Draft Final and Final will pend completion of additional investigations if required.