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Site Specific Work Plan
U.S. Naval Ammunition Storage Detachment
Vieques Island, Puerto Rico

Prepared for

Department of the Navy
Atlantic Division
Naval Facilities Engineering Command

Under the
LANTDIV CLEAN II Program
Contract No. N62470-95-D-6007
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Prepared by

CH2MHILL

Tampa, Florida

April 2000

Work Plan

Expanded Preliminary Assessment/Site Investigation

Naval Ammunition Support Detachment

Vieques Island, Puerto Rico

CTO Task Order 031

March 2000

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SECTION 1

Introduction

This work plan describes the expanded Preliminary Assessment/Site Investigation (PA/SI) to be completed at various Solid Waste Management Units (SWMUs) and Areas of Concern (AOCs) at the U.S. Naval Ammunition Storage Detachment (NASD) in Vieques, Puerto Rico. This work plan is based on a scope of work provided by Naval Facilities Engineering Command (NAVFACENGCOM) LANTDIV as part of Navy Contract N62470-95-D-6007, Navy Comprehensive Long-Term Environmental Action Navy (CLEAN), District III, Contract Task Order-31.

The Navy conducted a PA/SI for SWMUs 5, 6, and 7 in 1988. The U.S. Environmental Protection Agency (USEPA) evaluated the PA/SI and determined that the NASD did not score high enough to be included on the National Priorities List (NPL). This work plan was developed to investigate sites that may need further work before the property can be transferred to the Puerto Rican government as mandated by the President of the U.S. on January 31, 2000. The NASD property will be transferred to Puerto Rico on December 31, 2000.

The general background and physical setting of the NASD is described in Sections 3 and 4 of the Master Project Plan, prepared by CH2M HILL in March 2000. The following SWMUs are addressed in this SWMU Supplemental Investigation Work Plan:

- SWMU 04 - Inactive Waste Explosive Open Burn/Detonation Area
- SWMU 05 – IRFNA/MAF-4 Disposal Site
- SWMU 06 – Mangrove Disposal Site
- SWMU 07- Quebrada Disposal Site
- SWMU 10 – Waste Paint and Solvents Disposal Site
- SWMU 14 – Wash Rack
- SWMU 15 – Waste Transportation Vehicle Area
- AOC C - Drainage Ditch in the Vicinity of the Transportation Shop
- UST Site 2016 AOC - E
- UIC Septic Tank Site AOC - F

Figure 1-1 shows the locations of Vieques Island and Puerto Rico. Figure 1-2 shows the locations of the SWMUs and AOCs included in this investigation. Figure 1-3 shows the SWMUs and AOCs in the public works area. An initial evaluation of each site, based upon the results of previous investigations (if any) and the rationale that supports the sampling tasks is presented in Section 2 of this site-specific work plan. Section 3 describes the technical approach to sampling tasks. Section 4 presents general information regarding project management and staff organization. Section 5 documents the anticipated subcontract services required for completion of tasks documented in this work plan. Section 6 presents the schedule for the completion of these tasks.

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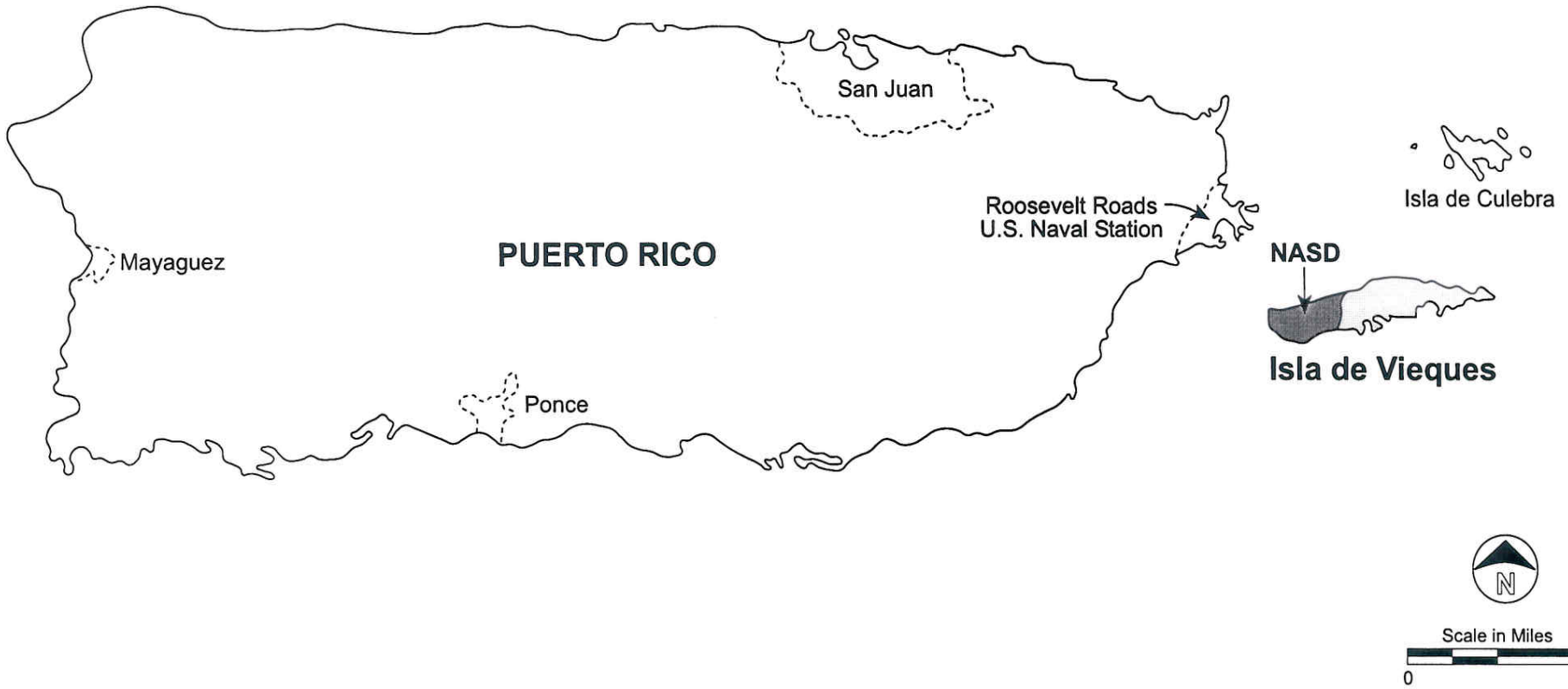

FIGURE 1-1
Site Location Map

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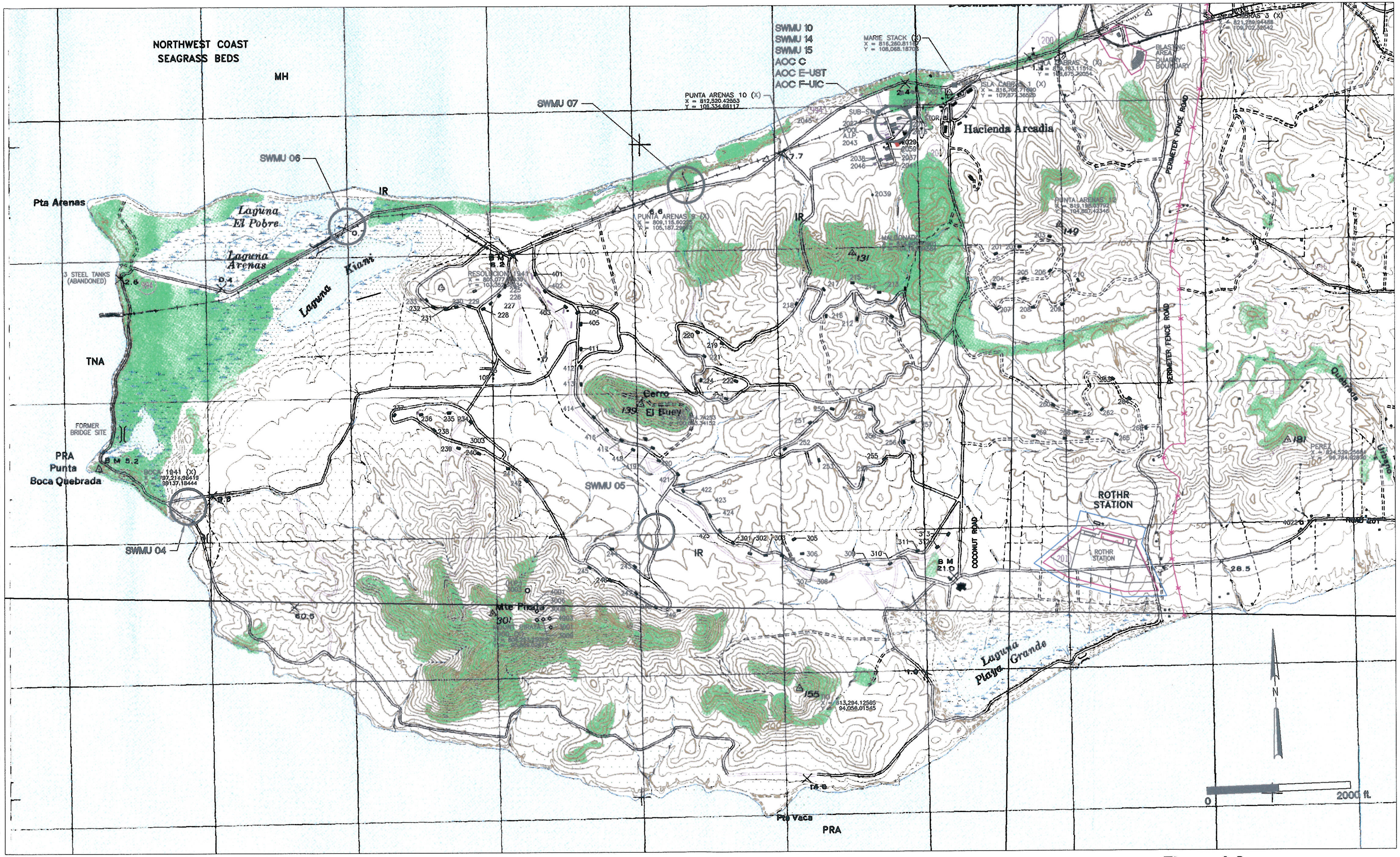

Figure 1-2
SITE LOCATION MAP
Naval Ammunition Support Detachment, Vieques Island

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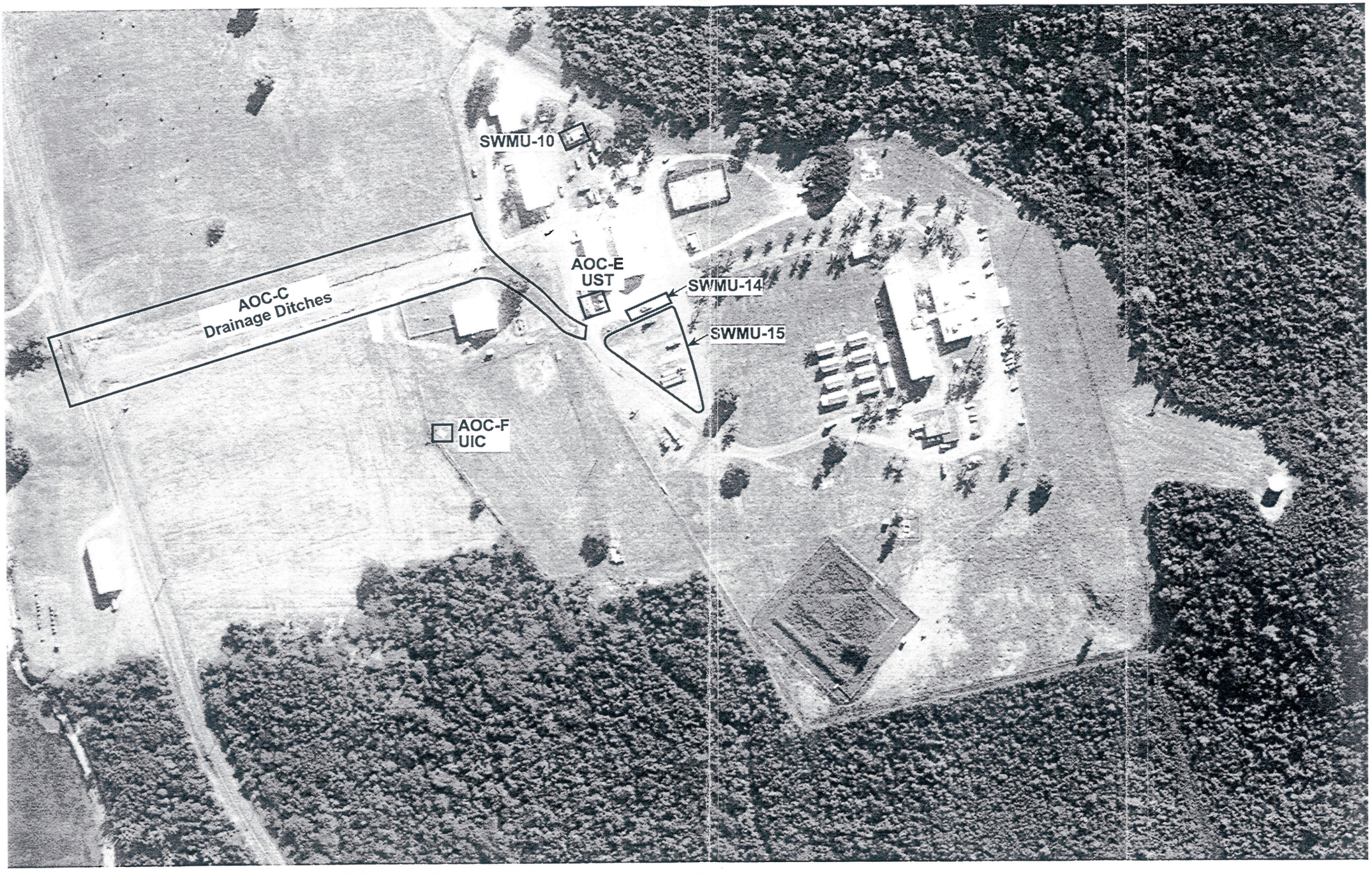

FIGURE 1-3
Location of SWMUs and AOCs in Public Works Area

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SECTION 2

Initial Evaluation and Sampling Rationale

This section presents an initial evaluation of available background information and existing conditions for the sites included in this investigation. Eight of the sites were identified as possible/confirmed waste disposal areas or AOCs during the Resource Conservation Recovery Act (RCRA) Facility Assessment (RFA) in 1988. Other sites identified during the RFA were not recommended for further sampling. Two additional sites (UST 2016 and UIC Septic Tank) are included as part of this expanded PA/SI. The rationale for execution of sampling is also documented. SWMU-specific sampling techniques and analytical methods proposed for the SWMU investigations are documented in Section 3. The project schedule is presented in Section 6.

The history of previous investigations at these sites varies. Relevant analytical protocols, results and conclusions from each study are summarized in site-specific sections below. Studies performed in these areas include Environmental Science and Engineering, Inc. (ESE), which completed a Confirmation Study in 1988 for SWMUs 5, 6, and 7. Additionally, an Initial Assessment Study of these sites was completed by Greenleaf/Telesca Inc., in September 1984 and an RCRA RFA was conducted by A.T. Kearny, Inc., in 1988. CH2M HILL completed the Site Characterization Study for UST Site 2016 in April 1999.

2.1 Qualitative Ecological Survey

A qualitative ecological survey will be performed at SWMU 04, SWMU 05, SWMU 06, SWMU 07, and the general area around the NASD public works buildings. The public works area includes SWMU 10, SWMU 14, SWMU 15, AOC C, AOC E (UST 2016), and AOC F (UIC Septic Tank). The qualitative ecological survey is a walk-through survey that includes a description of the site features such as topography, drainage, plants, animals, habitat, and any endangered or threatened species.

2.2 Qualitative Risk Assessment

A qualitative risk assessment will be performed for each site. The validated laboratory data will be screened against risk-based criteria from EPA Region III and background concentrations. Sites with values below screening criteria and/or background concentrations will be recommended for no further action. Sites with values above screening criteria and/or background concentrations will be recommended for further study through the CERCLA Remedial Investigation (RI) process.

2.3 SWMU 04 - Inactive Waste Explosive Open Burn/ Detonation Range

2.3.1 Site Summary

The inactive open burn/detonation unit (SWMU 04) was utilized for thermal destruction of waste munitions, fuels or propellants. The material to be burned was placed in the open burn area and a squib or other detonator was placed in the waste material. The open burn was then initiated from a safe distance using electrical detonation. In addition, material from the rework of munitions (loose powder and primers) and flares and cartridge-activated devices may also have been disposed at the unit. The inactive open burn/detonation area reportedly has been swept for live munitions by an Explosive Ordnance Demolition (EOD) team from NASD.

SWMU 04 is approximately 0.5 miles long and 200 yards wide, and is located approximately 0.5 miles from the Caribbean Sea in the southwest corner of Vieques Island. A Navy Assessment and Control of Installation Pollutants Initial Assessment Study (NACIP IAS) report indicates that this unit may have been used as early as the 1940s, and known to have been operated from 1969 to about 1979. SWMU 04 has been inactive since the early 1980s.

2.3.2 Previous Investigation Results

No investigations have been performed to date.

2.3.3 Sampling Rationale

The site is overgrown with vegetation and locating the actual burn pit area is very difficult. Historical aerial photographs will be examined to identify the burn area. In addition, surface geophysical surveys, including magnetometer and/or electromagnetic, will be performed to locate areas of metallic debris. Monitoring wells will be installed (one upgradient background well and three downgradient wells) to determine whether groundwater has been impacted. Approximately 12 soil borings will be installed in the open burn area. One surface soil sample (0 to 6 inches) and one subsurface soil (5-foot) sample will be collected from each of the 12 soil borings. Soils will be screened in the field with an organic vapor meter (OVM). Soil and groundwater samples will be analyzed for metals, volatile organic compounds (VOCs), semi-volatile organic compounds (SVOCs), pesticides, polychlorinated biphenyls (PCBs), and explosives (8330). Low-flow groundwater sampling methods will be used where feasible.

2.4 SWMU 05 - IRFNA/MAF-4 Disposal Site

2.4.1 Site Summary

This inactive unit is the site where, in 1975, approximately 7,000 pounds of fuel were emptied from leaking drones into a low spot in a road near Building 422. The NACIP IAS Report states that the Quebrada where the disposal took place is in the probable surface recharge area for one of the few naturally occurring springs on the island that flows year-round. The site lies less than 2 miles from Cattle Cooperative Well 3PW01 and a spring, which were used by the local cattle cooperative until 1992.

The fuel contained 5,275 pounds of inhibited red fuming nitric acid (IRFNA) and 1,775 pounds of mixed amine fuels (MAF-4) which were emptied into the Quebrada. Although it is likely that much of the material was volatilized or has biodegraded, site investigations evaluated the possibility of persistent nitrogen-containing chemicals being present in the soil.

2.4.2 Previous Investigation Results

In April, 1988, ESE prepared a Confirmation Study to determine possible dispersion and migration of specific chemicals at Roosevelt Roads and NASD, Vieques for the Atlantic Division, Naval Facilities Engineering Command. The objective of this confirmation study was to determine if specific toxic or hazardous materials have contaminated the environment as a result of Navy activities. During this investigation, Cattle Cooperative Well 3PW01 was sampled for pH and Priority Pollutants. Zinc was the only constituent detected from this sampling, with a concentration of 0.469 milligrams per liter (mg/L). There were no soil borings installed at this site location, because much of the material probably was volatized or has biodegraded.

2.4.3 Sampling Rationale

CH2M HILL will install four soil borings to a 20-foot depth along the Quebrada, as shown in Figure 2-1. Analysis of samples taken at the surface and depths of 5, 10, 15, and 20 feet will be conducted for VOCs, SVOCs. Soil samples will be screened in the field with an OVM. A total of 20 samples will be collected (5 at each of the 4 locations).

2.5 SWMU 06 - Mangrove Disposal Site

2.5.1 Site Summary

The Mangrove Disposal Site is located in an 18-acre oceanside mangrove swamp in Laguna Arenas along North Shore Road (Route 70) on the NASD. There is no known history of permits pertaining to this site. The disposal site was in use during the 1960s and 1970s, and was used as a base disposal area.

The waste materials extend northeast from the Laguna Kiani Bridge approximately 300 feet into the mangrove swamp for about 100 to 120 feet in a northerly direction, and about 10 feet in a southerly direction from North Shore Road. All types of trash were disposed at this site, including cans of lubricants and oil, solvents, paints and rubble. An IAS team has estimated that approximately 800 cubic yards of material were disposed, including approximately 6,400 pounds of potentially hazardous material. Much of the waste is scrap metal and solid waste. During a March 3, 2000 site inspection, potential explosive components were observed at this site.

2.5.2 Previous Investigation Results

In April, 1988, ESE prepared a Confirmation Study to determine possible dispersion and migration of specific chemicals at Roosevelt Roads and NASD, Vieques for the Atlantic Division, Naval Facilities Engineering Command. The objective of this Confirmation Study was to determine whether specific toxic or hazardous materials have contaminated the environment as a result of Navy activities. The results of this study are summarized below.

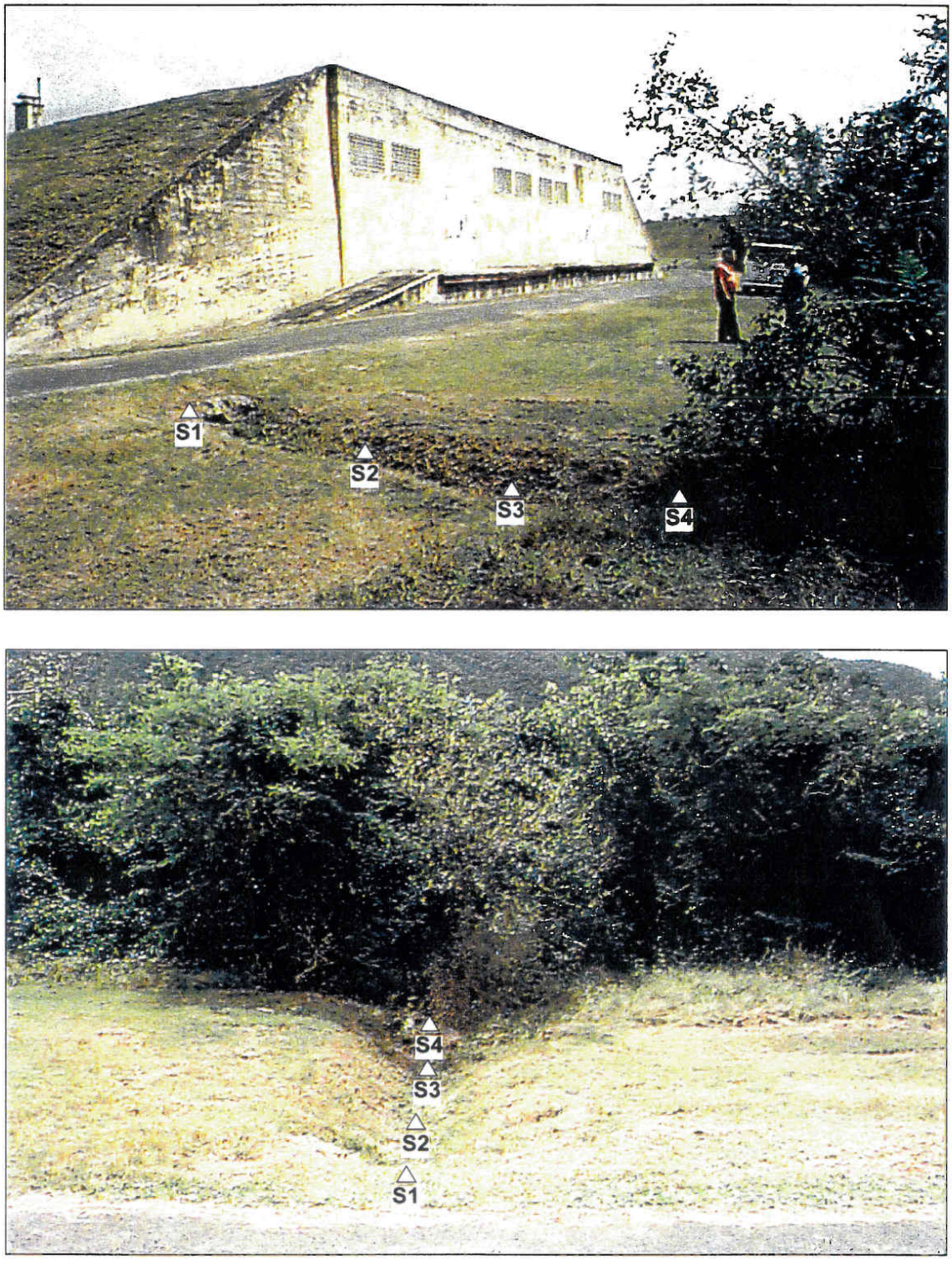

Figure 2-1
SWMU 05: IRFNA/MAF-4 DISPOSAL SITE
SOIL SAMPLING LOCATIONS (closeup)
NASD, Vieques Island, Puerto Rico

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No groundwater samples were taken at this site, because the RFA report (October, 1988) recommended a soil, surface water and sediment investigation for the mangrove disposal site. The RFA report recommended that additional groundwater investigations may be necessary depending on the results of the confirmation study. The confirmation study concluded that no further investigation was necessary.

2.5.2.1 Surface Water and Sediment Samples

Five surface water and sediment samples were analyzed for pH, chromium (total and hexavalent), lead, VOCs, xylene, methyl ethyl ketone, and methyl isobutyl ketone. The surface water test results found elevated total lead and chromium levels, but the levels were within ambient water quality criteria, and drinking water criteria.

2.5.2.2 Soil Boring Samples

Eight soil samples were analyzed for pH, chromium (total and hexavalent), lead, VOCs, xylene, methyl ethyl ketone, and methyl isobutyl ketone. No elevated levels of any of the constituents were detected in the soil. However, chromium and lead were found in the sediment samples. These levels were not significant when compared to background element concentrations found in soils.

2.5.3 Sampling Rationale

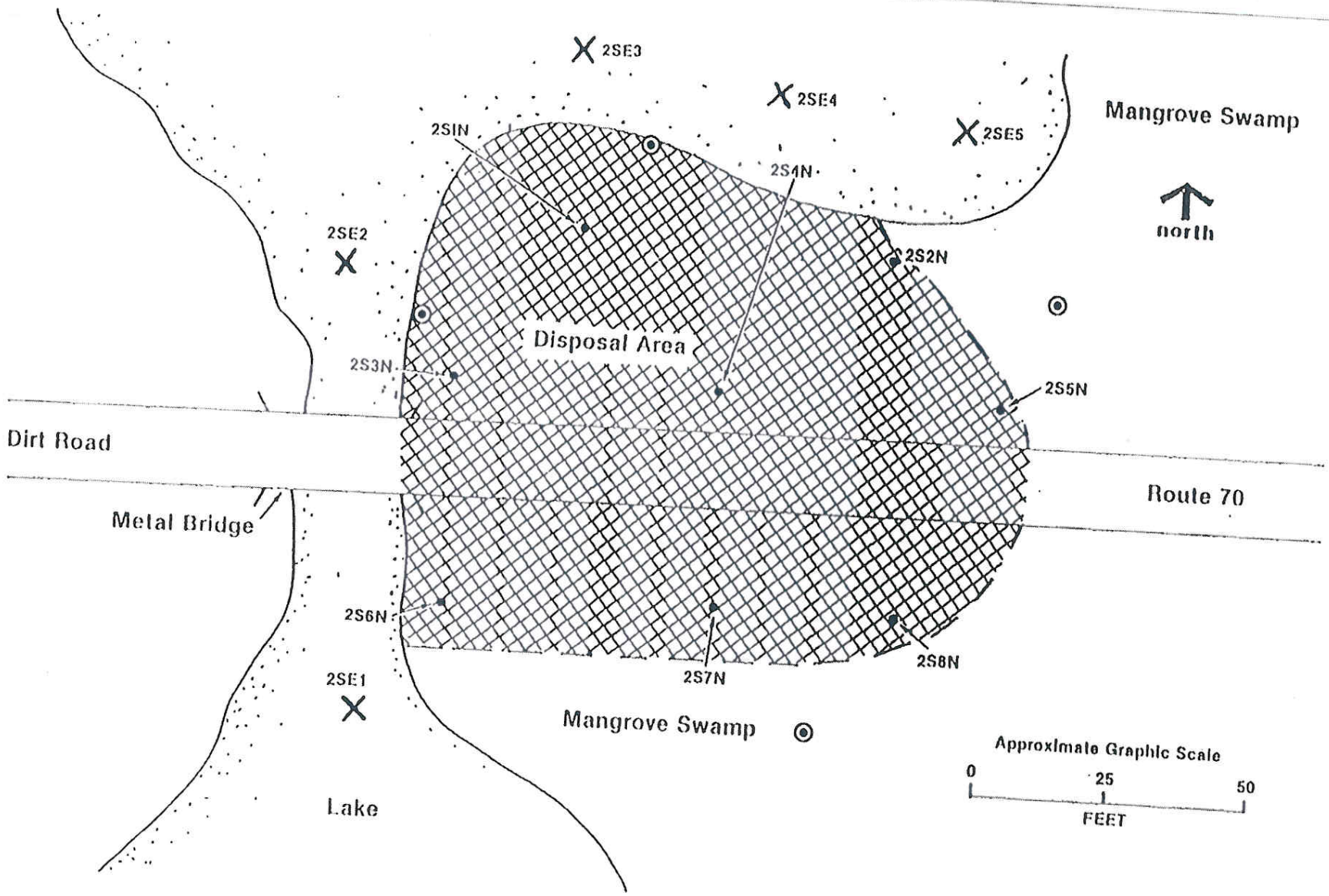
A surface geophysical survey will be conducted to delineate potential areas at buried metallic waste. Magnetic and/or electromagnetic geophysical methods will be used. Figure 2-2 shows proposed locations for four new groundwater wells (three downgradient wells, one upgradient background well), five surface water/sediment samples; eight surface soil samples, and eight subsurface (above the water table) samples. Analyses will be conducted for metals, VOCs, SVOCs, pesticides, PCBs, and explosives. Low-flow groundwater sampling methods will be used. Additionally, two surface water/sediment samples will be collected from a background (unaffected) area of the lagoon.

2.6 SWMU 07 - Quebrada Disposal Site

2.6.1 Site Summary

The Quebrada Disposal Site encompasses an area of approximately 5 acres. The landfill site was used between the early 1960s and late 1970s.

The Quebrada varies from 20 to 30 feet wide and 10 to 20 feet deep. It is estimated more than 1,500 cubic yards (500 feet x 20 feet x 4 feet) of material are present at the site. An IAS conducted by Greenleaf/Telesca, Inc., in 1984 made the assumption that no more than one percent of the material was hazardous, based on the low level of industrial-type activity. One percent of 1,500 cubic yards is 15 cubic yards; using the figure of roughly 800 pounds per cubic yard for municipal garbage, approximately 12,000 pounds or six tons of hazardous material may have been disposed of at this site.



LEGEND
- ⊙ Monitor Well
- • Soil Sample
- X Sediment & Surface Water Sample

SOURCE: ESE, 1985.

Figure 2-2
SWMU 06: MANGROVE DISPOSAL SITE MAP AND SAMPLING LOCATIONS
NASD, Vieques Island, Puerto Rico

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2.6.2 Previous Investigation Results

In April 1988, ESE prepared a Confirmation Study to determine possible dispersion and migration of specific chemicals at Roosevelt Roads and NASD, Vieques for the Atlantic Division, Naval Facilities Engineering Command. The objective of this Confirmation Study was to determine whether specific toxic or hazardous materials have contaminated the environment as a result of Navy activities. The results of this study are summarized below.

2.6.2.1 Groundwater

Three monitoring wells were installed and sampled for pH, priority pollutants, oil and grease, VOCs, methyl ethyl ketone, methyl isobutyl ketone, ethylene dibromide, chromium (total and hexavalent), xylene, and lead. Results from the groundwater analysis showed that metals concentrations exceeded drinking water criteria and ambient water quality criteria. It was assumed that the groundwater data was analyzed for total (unfiltered) metals. However, this information was not apparent in the report. A confirmatory sampling that includes total metals and semi-volatile compounds will be conducted.

2.6.2.2 Soils

A total of six soil samples were analyzed for pH, oil and grease, VOCs, methyl ethyl ketone, methyl isobutyl ketone, ethylene dibromide, chromium (total and hexavalent), xylene, and lead. Soil and sediment sampling showed no elevated levels of any of constituents of concern for this site.

2.6.3 Sampling Rationale

After inspecting the disposal area on March 21, 2000, it was apparent that a geophysical survey is not required for this site. All of the debris is lying on a very steep slope of a narrow ravine. Site access prohibits the use of surface geophysics and all the waste is visible. Sampling locations at the Quebrada Site are shown in Figure 2-3 and include resampling of three monitoring wells, six surface soil sites, and three sediment sites. Low-flow groundwater sampling methods will be used where feasible. Analyses will be conducted for metals, VOCs, SVOCs, pesticides, and PCBs to provide verification of previous study results at the Quebrada Site and to determine if no further action is necessary at this site. If the previously installed monitoring wells cannot be located, replacement wells will be installed.

2.7 SWMU 10 - Waste Paint and Solvents Disposal Site

2.7.1 Site Summary

The Waste Paint and Solvents Disposal Site consists of an area of soil outside the Paint Locker, Building 4001, which was used for the open dumping of waste paints and solvents. SWMU 10 has been in use since the mid-1970s.

Approximately 1 pint of waste paint and thinner is generated from brush cleaning operations. It was estimated that approximately 2 gallons of waste paint and solvent were disposed monthly. Waste paints and solvents are now transferred to NSRR for proper disposal.

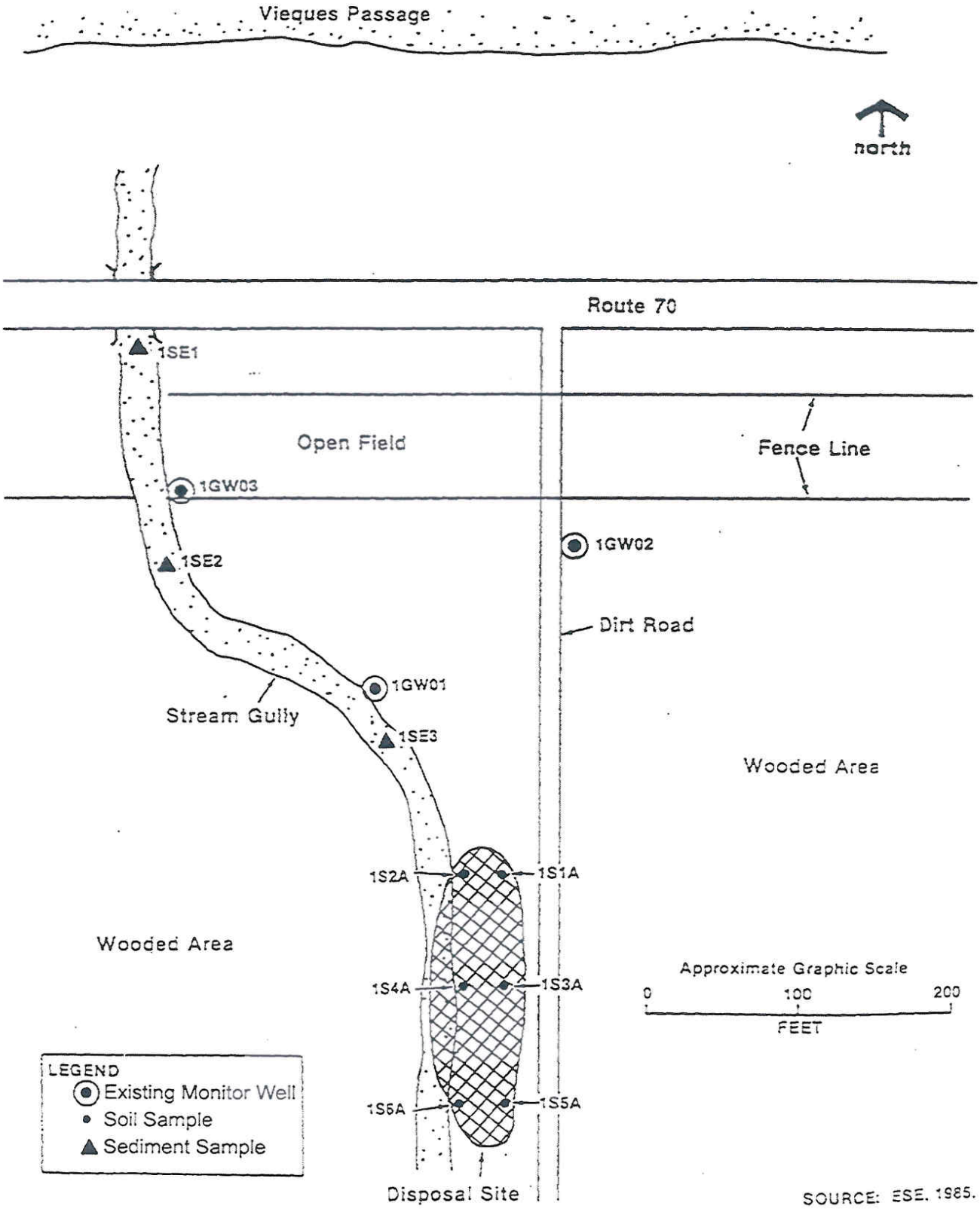

Figure 2-3
SWMU 07: QUEBRADA DISPOSAL SITE MAP AND SAMPLING LOCATIONS
NASD, Vieques Island, Puerto Rico

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2.7.2 Previous Investigation Results

No previous sampling has been conducted at this site.

2.7.3 Sampling Rationale

Surface soil samples will be collected at approximately 10 locations evenly spaced (approximately 20 feet) around the perimeter of the building. Ten subsurface samples will also be collected at a depth of 5 feet. The samples will be analyzed for metals, VOCs, SVOCs, pesticides, and PCBs. Figure 2-4 shows the soil sampling locations in front of Building 4001, while Figure 2-5 shows the soil sampling locations behind Building 4001.

2.8 SWMU 14 - Wash Rack

2.8.1 Site Summary

This unit is located near the Transportation Shop (Building 2016) and has been in use since the late 1970s. The area is a concrete driveway with 4-inch curbs on each side and ramps on each end, measuring approximately 20 feet long by 10 feet wide. The area is primarily used for cleaning Navy vehicles. Facility personnel stated that degreasing solvents are occasionally used in this area to facilitate cleaning. A swale at the end of the unit facilitates the discharge of runoff water to a ditch which eventually discharges to the Atlantic Ocean.

2.8.2 Previous Investigation Results

No previous sampling has been conducted at this site.

2.8.3 Sampling Rationale

Up to 14 surface soil samples and 14 subsurface (to 5 feet) will be collected around the perimeter of the wash rack. Samples will be screened in the field with an OVM. One monitoring well will be installed downgradient of the washrack and one monitoring well will be installed upgradient. Three sediment samples will be collected from the oil/water separator area. Soil, sediment, and groundwater samples will be analyzed for metals, VOCs, SVOCs, pesticides, and PCBs. Figure 2-6 shows the locations of surface soil samples (soil borings) and monitoring wells for SWMU 14. Potential soil/sediment contamination runoff from the wash rack in downgradient unlined ditches will be addressed in the sampling plan for AOC-C Drainage Ditch in the vicinity of the transportation area.

2.9 SWMU 15 - Waste Transportation Vehicle

2.9.1 Site Summary

This unit is a Navy truck located in the vicinity of the Transportation Shop which contained numerous drums of a waste labeled as caustic DOO2 (EPA code for corrosive waste). It has been determined that the drums contain one of the components of napalm from USNSRR. Napalm is composed of fuel and a gel. The truck contained 55-gallon metal drums, and overpack drums suggesting that the material inside may have leaked at one time from a

LEGEND
△ Surface Soil Sample Location

Figure 2-4
SWMU 10: WASTE PAINT AND SOLVENTS DISPOSAL SITE
NASD, Vieques Island, Puerto Rico

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LEGEND
△ Surface Soil Sample Location

Figure 2-5
WASTE PAINT AND SOLVENTS DISPOSAL SITE
NASD, Vieques Island, Puerto Rico

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LEGEND
△ Surface Soil Sample Location
○ Monitoring Well Location

Figure 2-6
SWMU 14: WASH RACK
NASD, Vieques Island, Puerto Rico

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drum or another source. The drums were subsequently shipped to NSRR and properly disposed of in the early 1990s. The truck and drums are no longer located at NASD.

2.9.2 Previous Investigation Results

No previous sampling has been conducted at this site.

2.9.3 Sampling Rationale

Up to 16 surface soil samples will be collected on a grid (spaced 20 feet apart) in the immediate area of vehicle parking lot. One monitoring well will be installed downgradient of the site. Soil and groundwater samples will be analyzed for metals, VOCs, SVOCs, pesticides, and PCBs. Figure 2-7 shows the locations of surface soil samples and monitoring well.

2.10 AOC C - Drainage Ditch in the Vicinity of Transportation Shop Area

2.10.1 Site Summary

Two ditches near the transportation shop routinely handle stormwater runoff during rain events. An oily sheen was observed in one of the ditches during the visual site inspection. It is unknown whether hazardous constituents are routinely discharged to the ditch, which ultimately drains to the Atlantic Ocean.

2.10.2 Previous Investigation Results

No previous sampling has been conducted at this site.

2.10.3 Sampling Rationale

Fifteen surface soil samples will be collected along the two ditches approximately every 100 feet. Two sediment samples will be collected at the catch basins in the ditch area. One monitoring well will be installed downgradient of the outfall. Samples will be analyzed for metals, VOCs, SVOCs, pesticides, and PCBs. Figures 2-8 and 2-9 show the locations of surface soil samples in the two ditches.

Also, 20 subsurface soil samples will be collected from an old septic tank in the ditch area. Samples will be collected from all four sides of the septic tank at depths of 5, 10, 15, 20, and 25 feet. Additionally, one monitoring well will be installed and sampled downgradient from the old septic tank. Samples will be analyzed for the same parameters as the surface soil samples.

2.11 AOC F - UIC Septic System Site

2.11.1 Site Summary

The UIC No. 13 is located near the Enlisted Men's (EM) Club and has a capacity of 1,500 gallons. In 1997 this UIC was scheduled to be closed. A sampling and testing program was conducted in July 1997. Results of the soil sampling showed exceedances of water

LEGEND
△ Surface Soil Sample Location
○ Monitoring Well Location

Vehicles will be moved and 16 samples collected on a grid pattern

Figure 2-7
SWMU 15: WASTE TRANSPORTATION VEHICLE
NASD, Vieques Island, Puerto Rico

CH2MHILL

LEGEND
△ Surface Soil Sample Location

Figure 2-8
AOC-C: DRAINAGE DITCH IN THE VICINITY OF TRANSPORTATION SHOP AREA
NASD, Vieques Island, Puerto Rico

CH2MHILL

LEGEND
△ Surface Soil Sample Location

Figure 2-9
AOC-C: DRAINAGE DITCH IN THE VICINITY OF TRANSPORTATION SHOP AREA
NASD, Vieques Island, Puerto Rico

CH2MHILL

quality standards for several parameters. The Navy has proposed a site characterization to further investigate the presence of these contaminants in the soil or groundwater around the UIC.

The site characterization will consist of collecting soil samples from selected depths around the UIC and analyzing the soil samples for the parameters that exceeded the water quality standards.

2.11.2 Previous Investigation Results

Soil samples were collected in July 1997. Several metals exceeded criteria.

2.11.3 Sampling Rationale

The tank is approximately 5 to 10 feet below ground. The sampling program was developed by PREQB's UIC section. Soil borings will be installed on all four sides of the tank. Twenty subsurface soil samples will be collected from depths of 5, 10, 15, 20, and 25 feet. Five monitoring wells will be installed around the tank. Soil and groundwater samples will be analyzed for metals, VOCs, SVOCs, pesticides, and PCBs. Proposed sampling locations are shown in Figure 2-10.

2.12 Site 2016 UST AOC E

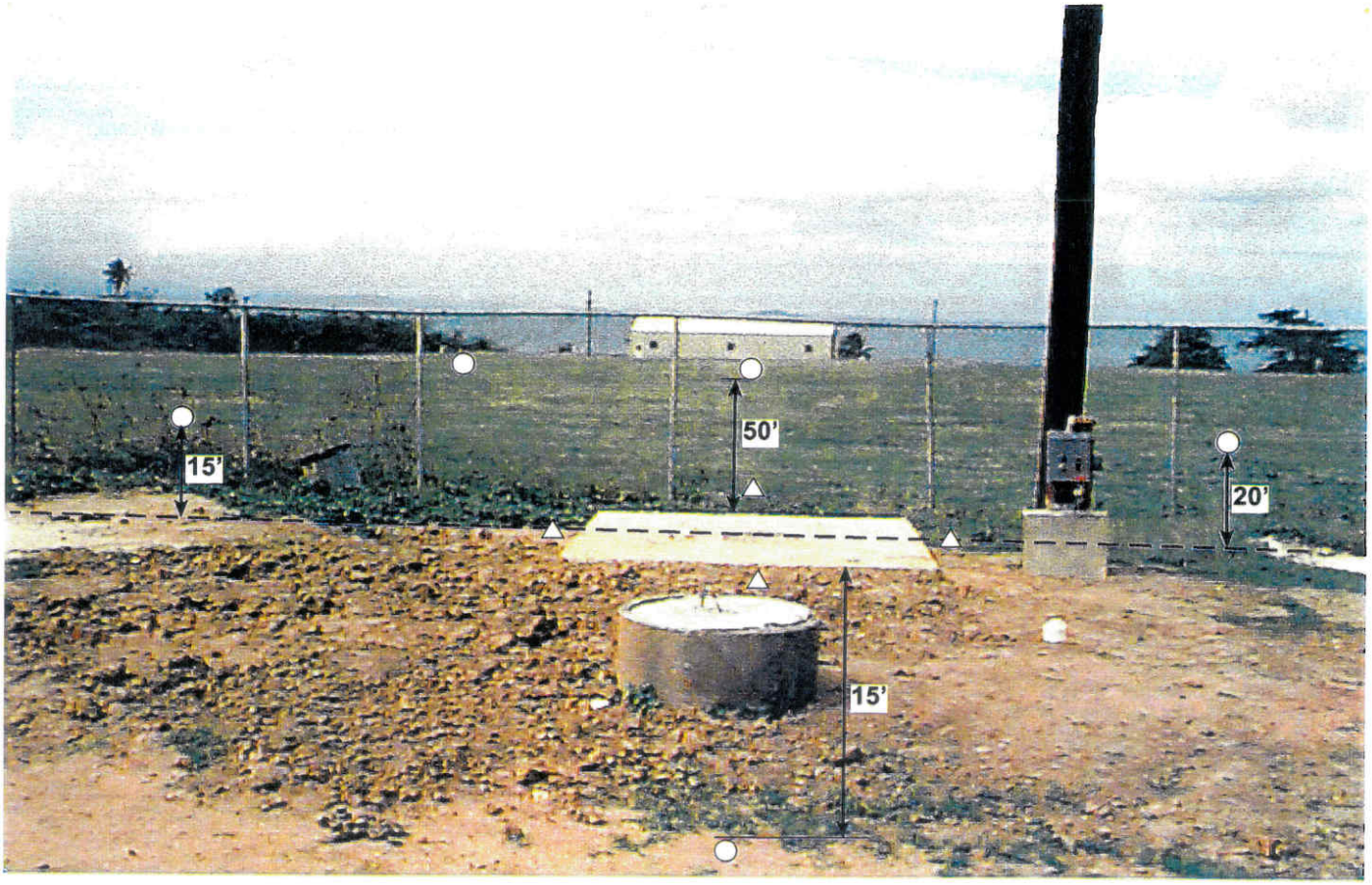
2.12.1 Site Summary

UST Site 2016 is located near the northwest corner of Building 2016 and is the former location of a 550-gallon, single-wall, steel waste oil UST. The piping system associated with the UST consisted of single-wall steel pipes. The UST was installed in 1970 to store waste oil generated from vehicle maintenance activities that take place in Building 2016.

As part of UST removal activities conducted at Site 2016, soil samples collected and submitted for laboratory analysis detected total petroleum hydrocarbon (TPH) concentration ranging from 568 to 1,790 milligrams per kilogram (mg/kg). Navy personnel indicated that no accidental spills associated with the UST at Site 2016 had occurred at the site.

2.12.2 Previous Investigation Results

A site characterization investigation was conducted by CH2M HILL and reported in April 1999 to the Puerto Rico Environmental Quality Board (PREQB). A total of five soil borings and three monitoring wells were installed at the site. The purpose of the site investigation was to assess the horizontal and vertical extent of potential impacts from the UST on soil and groundwater at Site 2016. Based on information obtained from the field investigation, no corrective measures were recommended. However, because of exceedances of PREQB target levels in selected soil and groundwater samples, natural attenuation was cited for natural reduction of contaminant concentrations. Exceedences of PREQB target levels are summarized below. However, due to the fact that the NASD is scheduled to be transferred to Puerto Rico by December 31, 2000, natural attenuation is not a practical remedy and further investigation is required.



LEGEND
△ Soil Boring
○ Monitoring Well

Figure 2-10
AOC-E: UIC SEPTIC SITE NO. 13 GROUNDWATER AND SOIL SAMPLING LOCATIONS
NASD, Vieques Island, Puerto Rico

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2.12.2.1 Groundwater

Laboratory analytical data showed the dissolved concentration of benzene detected at monitoring well (MW) 1 was 17 micrograms per liter (µg/L) which exceeds the PREQB target level of 5 µg/L. MW 1 is located in the vicinity of the former UST. Dissolved concentrations of toluene, ethylbenzene, Xylenes, total recoverable hydrocarbons, TPH, or polynuclear aromatic hydrocarbons were not detected above laboratory limits at any of the monitoring wells.

2.12.2.2 Soils

Laboratory analytical data showed that TPH was detected in soil boring SB1 (nearest to the UST) from the 45 to 47-foot interval at a concentration of 42,000 mg/kg, which is above the PREQB target level of 100 mg/kg for this constituent. Other soil samples taken at this site were below PREQB target levels.

2.12.3 Sampling Rationale

Due to the exceedences of PREQB target levels in both the soil and groundwater, resampling will occur at each monitoring well location sampled during CH2M HILL's Site Characterization Investigation (April 1999). Additionally, three new wells will be installed in the immediate area of the UST to determine extent of benzene contamination. Groundwater flow direction at the site is shown in Figure 2-11. Proposed sampling locations are shown in Figure 2-12. One well will be installed cross-gradient of the UST and two wells will be installed downgradient of the UST.

Groundwater samples will be analyzed for metals, VOCs, SVOCs, pesticides, and PCBs.

General Notes:
1) The horizontal control are referred to an arbitrary system.
2) The vertical control are referred to a mean sea level system (by USGS Datum).
3) All distances and elevations are in feet.
4) The survey was performed between September and October of 1998.

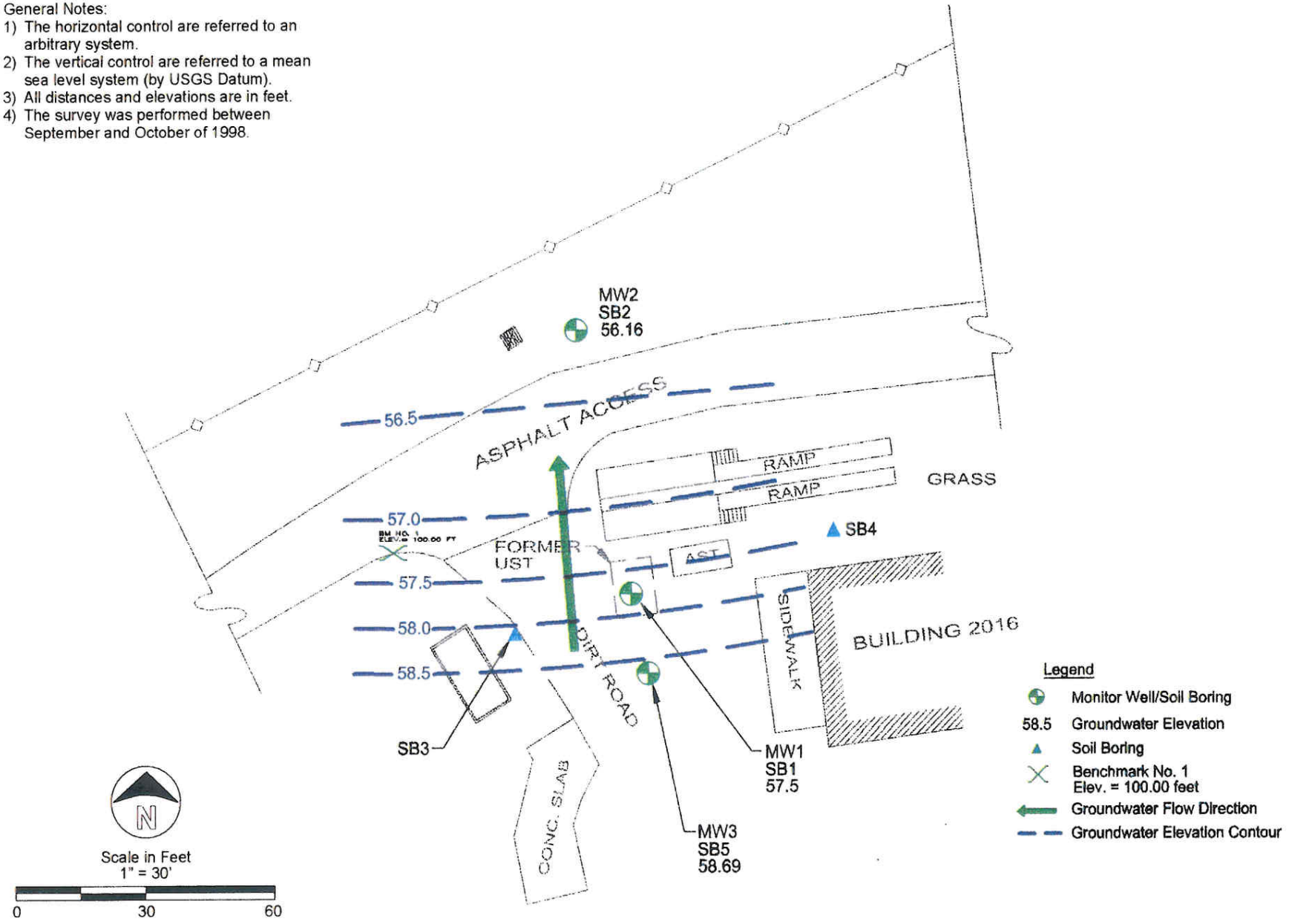

FIGURE 2-11
Groundwater Flow Direction, September 11, 1998
Site 2016, Roosevelt Roads Naval Station, Puerto Rico

CH2MHILL

General Notes:
1) The horizontal control are referred to an arbitrary system.
2) The vertical control are referred to a mean sea level system (by USGS Datum).
3) All distances and elevations are in feet.
4) The survey was performed between September and October of 1998.

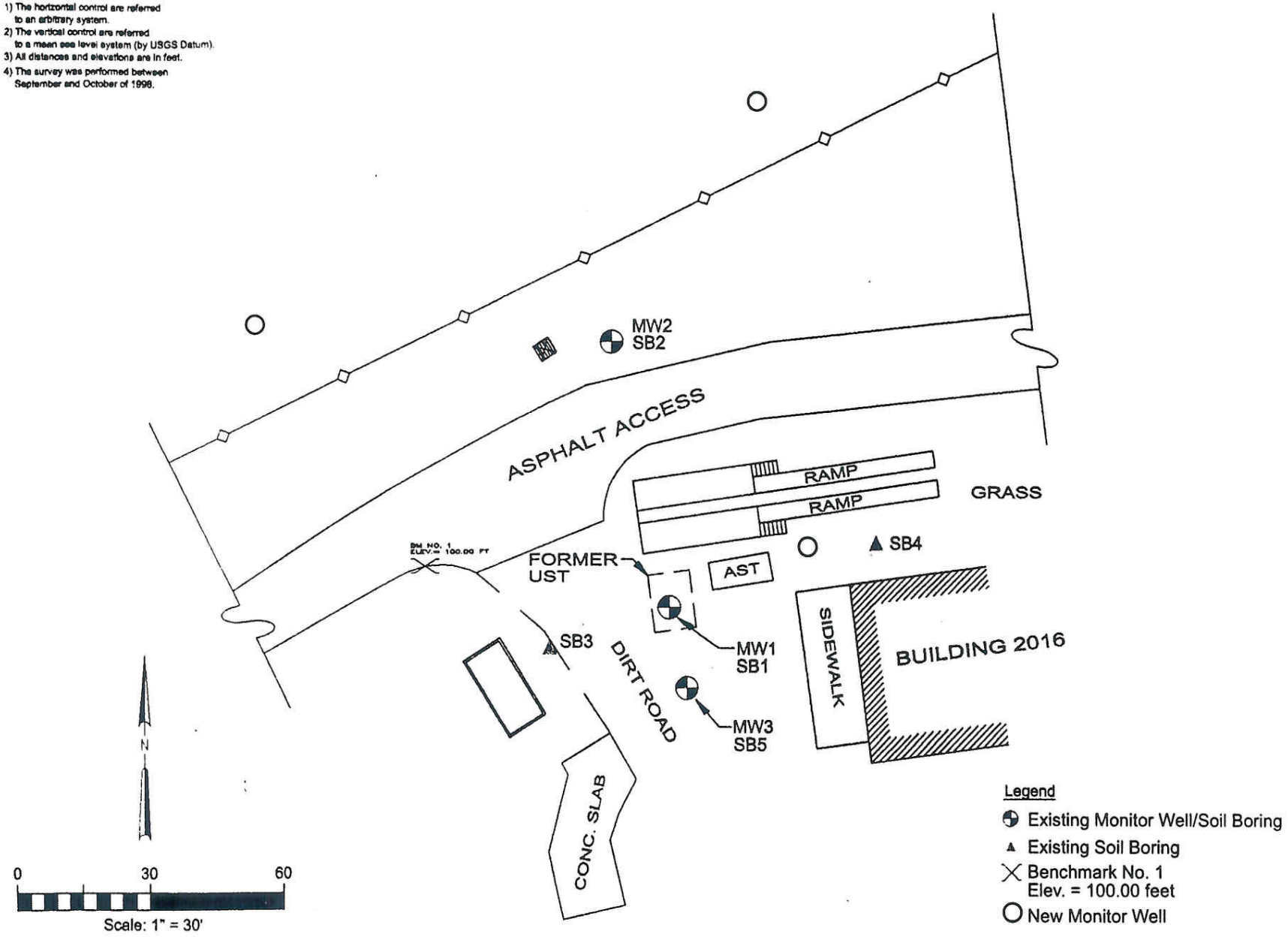

Figure 2-12
AOC-F: UST SITE 2016 PROPOSED SAMPLE LOCATIONS
NASD, Vieques Island, Puerto Rico

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SECTION 3

Technical Approach and Investigation Procedures

This section details the technical approach developed to perform the sampling activities included in this investigation. The goal of the sampling effort is to supplement data collected during previous investigations at NASD, and to make a recommendation for additional action or no further action for each site based on the data interpretation. A review of the available analytical data collected during previous investigations was performed, and sampling locations were selected based on this review and on observations made during the onsite visit.

The tasks included in the technical approach are listed below. The remainder of this section provides detailed discussions of investigation procedures.

- Task 1: Project Planning
- Task 2: Field Investigation
- Task 3: Sample Analysis and Validation
- Task 4: Data Evaluation
- Task 5: Investigation Reports
- Task 6: Engineering Estimates/Cost Analysis (EE/CA) Reports

3.1 Task 1: Project Planning

This task consists of the preparation of Project Plans associated with the Site Investigations. Meetings and project management activities are also documented.

3.1.1 Work Plan

A Master Work Plan (WP), Master Sampling and Analysis Plan (SAP), and Master Health and Safety Plan (HASP) are prepared for guidance on the activities to be performed at each site location (Master Project Plan, Volumes I and II, AFWTF Vieques, Puerto Rico, December 1999). The Master SAP consists of three documents: the Master Field Sampling Plan (FSP), the Master Quality Assurance Project Plan (QAPP), and the Master Investigation-Derived Waste Management Plan (IDWMP). The Master Plans will provide the background information needed to understand base-wide site conditions, the approach to be used for investigations, and general types of activities to be accomplished.

This work plan supplements the Master Plan and will present site-specific information for each SWMU and AOC. The HASP, FSP, QAPP, and IDWMP are presented as checklists of items based on the existing Master Work Plans (including other supporting documentation, and additions/deviations from the Master Plan), and are submitted within this document.

Upon authorization from LANTDIV to proceed with the project, background information will be reviewed and an initial site visit will be conducted by CH2M HILL personnel as part of the work plan development. The purpose of the site visit is to evaluate the present site conditions, select sampling locations, and identify any potential modifications to the Scope of Work based on these conditions.

3.1.2 Meetings

During the course of the investigations, meetings will be held to discuss the proposed project schedule and findings with LANTDIV, PREQB, USEPA, and NSRR. CH2M HILL will provide minutes of the meetings to the participants. One site visit was performed during work plan preparation.

3.1.3 Project Management

The activities involved in project management include daily technical support and guidance, budget and schedule review and tracking, preparation and review of invoices, personnel resources planning and allocation, subcontractor coordination, preparation of monthly progress reports, and communication and coordination of events with LANTDIV, PREQB, USEPA, and NSRR.

3.2 Field Investigation

This task involves efforts related to fieldwork support, the field investigation, and surveying.

3.2.1 Field Work Support

Fieldwork support includes subcontractor procurement, mobilization, and utility clearance, as described in the following subsections.

3.2.1.1 Subcontractor Procurement

As part of the initial field mobilization to NASD, CH2M HILL will procure drilling of soil borings, monitoring well installations, analytical laboratory, and data validation services for work at the Base. The subcontracted analytical laboratory will meet CLP quality control.

3.2.1.2 Mobilization/Demobilization

Mobilization includes procurement of necessary field equipment and initial transport to the site. Equipment and supplies will be brought to the site when the CH2M HILL field team mobilizes for field activities.

Demobilization activities include time for Investigation Derived Waste (IDW) sampling and general site restoration prior to the return transport of field equipment and crew. IDW generated during field activities will be containerized in 55-gallon drums. Equipment decontamination fluids will be containerized in 55-gallon drums for storage. The 55-gallon drums will be properly labeled and stored at a location designated by LANTDIV and NASD prior to disposal. The drilling subcontractor is responsible for containerizing the IDW and storing it in a central location.

It is anticipated that the IDW generated will be disposed of as non-hazardous waste. If it is determined that the IDW is hazardous, the drums will be shipped to NSRR and properly disposed of.

3.2.1.3 Utility Clearance

Utility clearances will be performed prior to the start of any subsurface investigation activities at the site. CH2M HILL will coordinate subsurface utility clearances with Public Works Center (PWC) at the Base. CH2M HILL will be responsible for insuring that all appropriate contacts have been made with Base personnel and that clearances have been given for proposed subsurface sampling locations, including marking of utilities near the areas of proposed subsurface sampling locations, prior to the initiation of field operations. Additionally, a surface geophysical survey will be conducted in the public works area to map utilities. Sites that have potential unexploded ordinance (UXO) will be cleared using a UXO subcontractor and Navy EOD personnel. At this time, SWMU 04 and SWMU 06 may have potential UXO and soil borings and monitoring well sites will be cleared before drilling occurs.

3.2.2 Field Sampling Activities

The goal of the sampling effort is to supplement data collected during previous investigations conducted at NASD and determine if either additional action is necessary or no further action is necessary at each of the sites. A description of these activities with supporting rationale is provided is proposed in Section 2. The number of samples to be collected from each medium of concern at each unit is also summarized in Table 3-1.

3.2.3 Soil Sampling Procedures

Table 3-2 presents the required containers, preservatives, and holding times for soil samples.

3.2.3.1 Soil Sampling Techniques

The investigation involves the collection of both surface and subsurface soil samples. The applicable Standard Operating Procedures (SOPs) for the collection of soil samples from Volume 2 of the Master Project Plan are included with the Field Sampling Plan checklist located in the Appendix of this work plan.

3.2.4 Groundwater Sampling Procedures

Table 3-2 presents the required containers, preservatives, and holding times for groundwater samples.

3.2.4.1 Groundwater Sampling Technique

The investigation sampling involves the collection of groundwater samples at several SWMUs. The applicable SOPs for the collection of groundwater samples from Volume 2 of the Master Project Plan are included with the Field Sampling Plan checklist located in the Appendix to this work plan.

TABLE 3-1
Analytical Sample Summary for Supplemental SWMUs Sampling* March 2000

Media	Analysis	Method	SWMU 4	SWMU 5	SWMU 6	SWMU 7	SWMU 10	SWMU 14	SWMU 15	AOC C	AOC F	AOC E	Field QC	Total Number of Samples
Groundwater	TCL VOCs	CLP SOW	4		4	3		2	1	1	5	6	8	**34**
	TAL metals	CLP SOW	4		4	3		2	1	1	5	6	6	**32**
	SVOCs	CLP SOW	4		4	3		2	1	1	5	6	6	**32**
	PCBs	CLP SOW	4		4	3		2	1	1	5	6	6	**32**
	Chlorinated Pesticides	CLP SOW	4		4	3		2	1	1	5	6	6	**32**
	Explosives	SW846 8330	4		4									**8**
Surface Water	TCL VOCs	CLP SOW			7								3	**10**
	TAL metals	CLP SOW			7								2	**9**
	SVOCs	CLP SOW			7								2	**9**
	PCBs	CLP SOW			7								2	**9**
	Chlorinated Pesticides	CLP SOW			7								2	**9**
	Explosives	SW846 8330			7								2	**9**
Sediment	TCL VOCs	CLP SOW			7	3				2			4	**16**
	TAL metals	CLP SOW			7	3				2			3	**15**
	SVOCs	CLP SOW			7	3				2			3	**15**
	PCBs	CLP SOW			7	3				2			3	**15**
	Chlorinated Pesticides	CLP SOW			7	3				2			3	**15**
	Explosives	SW846 8330			7	3							3	**13**
Surface Soil	TCL VOCs	CLP SOW	12	4	8	6	10	14	16	15			30	**115**
	TAL metals	CLP SOW	12	4	8	6	10	14	16	15			25	**110**
	SVOCs	CLP SOW	12		8	6	10	14	16	15			25	**106**
	PCBs	CLP SOW	12		8	6	10	14	16	15			25	**106**
	Chlorinated Pesticides	CLP SOW	12		8	6	10	14	16	15			25	**106**
	Explosives	SW846 8330	12		8								7	**27**
Subsurface Soil	TCL VOCs	CLP SOW	12	16	8		10	14		20	20		30	**130**
	TAL metals	CLP SOW	12	16	8		10	14		20	20		25	**125**
	SVOCs	CLP SOW	12		8		10	14		20	20		25	**109**
	PCBs	CLP SOW	12		8		10	14		20	20		25	**109**
	Chlorinated Pesticides	CLP SOW	12		8		10	14		20	20		25	**109**
	Explosives	SW846 8330	12		8								7	**27**

TABLE 3-2
Required Containers, Preservatives, And Holding Times For Soil And Sediment Samples

Analysis	Matrix	Method	Container	Preservation	Maximum Hold Time
VOC	Soil/Sediment	CLP SOW	4 each 5-g En Core™ sampler	4°C	48 hours to preservation and 14 days from preservation to analysis
SVOC	Soil/Sediment	CLP SOW	8-oz. Glass jar [1]	4°C	7 days to extraction and 40 days from extraction to analysis
Organochlorine Pesticides	Soil/Sediment	CLP SOW	8-oz. Glass jar [1]	4°C	7 days to extraction and 40 days from extraction to analysis
PCB	Soil/Sediment	CLP SOW	8-oz. Glass jar [1]	4°C	7 days to extraction and 40 days from extraction to analysis
Explosives	Soil/Sediment	SW-846 8330	4-oz. Glass jar [1]	4°C	7 days to extraction and 40 days from extraction to analysis
TAL Metals	Soil/Sediment	CLP SOW	4-oz. Glass jar [1]	4°C	6 months, 28 days for mercury
TAL Metals	Water	CLP SOW	1000 mL poly	HNO_3 to pH<2, 4°C	6 months, 28 days for mercury
VOC	Water	CLP SOW	3x40 mL vials [1]	HCl to pH<2, 4°C	14 days
Organochlorine Pesticides	Water	CLP SOW	2X1000 mL amber [1]	4°C	7 days to extraction and 40 days from extraction to analysis
Explosives	Water	SW-846 8330	1 Liter Amber	4°C	7 days to extraction and 40 days from extraction to analysis
SVOC	Water	CLP SOW	1 Liter Amber	4°C	7 days to extraction and 40 days from extraction to analysis
PCB	Water	CLP SOW	2X1000 mL amber [1]	4°C	7 days to extraction and 40 days from extraction to analysis

1) Use Teflon-lined caps.

3.2.5 Sampling Equipment Decontamination

All non-disposable sampling equipment will be decontaminated immediately after each use. The applicable SOPs for the decontamination of personnel and equipment from Volume 2 of the Master Project Plan are included with the Field Sampling Plan checklist.

3.2.6 Sample Designation

Sampling locations and samples collected during the investigation will be assigned unique designations to allow the sampling information and analytical data to be entered into the existing Geographic Information System (GIS) Data Management system. The existing designation scheme for NASD will be followed by field personnel. The following sections describe the sample designation specifications.

3.2.6.1 Specifications for Field Location Data

Field station data is information assigned to a physical location in the field at which some sort of sample is collected. For example, a soil boring that has been installed will require a name that will uniquely identify it with respect to other soil boring locations, or other types of sampling locations. The station name provides for a key in the database to which any samples collected from that location can be linked, to form a relational database.

A listing of the location identification numbers will be maintained by the field team leader, who will be responsible for enforcing the use of the standardized system during all field activities. Each station will be designated by an alphanumeric code that will identify the stations location by facility, site type, site number, station type, and sequential station number. The scheme that will be used to identify field station data is documented in Table 3-3.

TABLE 3-3
Field Station Scheme

First Segment	Second Segment	
Facility, Station Type, Site Number	**Station Type**	**Station Number, Qualifier**
AAANNN	**AA**	**NNNA**
Facility: ND = NASD Station Type: S = Site W = SWMU O = Operable Unit U = UST A = AOC Site Number: 04 SWMU 4 05 SWMU 5 06 SWMU 6 07 SWMU 7 10 SWMU 10 14 SWMU 14 15 SWMU 15 C – AOC C E – AOC E F – AOC F	Station Type: SB = Subsurface Soil Sample Location SD = Sediment Sample Location SS = Surface Soil Sample Location SW = Surface Water Sample Location GW = Groundwater Sample Location Station Number: Sequential Station Number Qualifier: S = Shallow D = Deep K = Background	

Notes:
"A" = alphabetic
"N" = numeric

3.2.6.2 Specifications for Analytical Data

Analytical data will be generated through sampling of various media at NASD. Each analytical sample collected will be assigned a unique sample identifier. The scheme used as a guide for labeling analytical samples in the field is documented below. The format that will be used for electronic deliverables from the analytical laboratory and the data validator is documented below.

3.2.6.3 Sample Identification Scheme

A standardized numbering system will be used to identify all samples collected during water, soil, and sediment sampling activities. The numbering system will provide a tracking procedure to ensure accurate data retrieval of all samples taken. A listing of the sample identification numbers will be maintained by the field team leader, who will be responsible for enforcing the use of the standardized numbering system during all sampling activities. Sample identification for all samples collected during the investigations will use the following format.

Each sample will be designated by an alphanumeric code that will identify the facility, site, matrix sampled, and contain a sequential sample number. QA/QC samples will have a unique sample designation. The general guide for sample identification is documented in Table 3-4. If one qualifier is pertinent to the sample ID but another is not, only the Table 3-3 applicable qualifiers will be used. A non-utilized character space does not have to be maintained.

TABLE 3-4
Sample Designation Scheme

First Segment	Second Segment		Third Segment
Facility, Station, and Site Number	**Sample Type**	**Sample Location + Sample Qualifier**	**Additional Qualifiers (sample depth, sampling round, etc.)**
AAANN	**AA**	**NNNA or NNAA**	**ANN or NNNN**
Facility: ND = NASD Station Type: S = Site W = SWMU O = Operable Unit U = UST A = AOC Site Number: 04 SWMU 4 05 SWMU 5 06 SWMU 6 07 SWMU 7 10 SWMU 10 14 SWMU 14 15 SWMU 15 C = AOC C E = AOC E F = AOC F	Sample Type: DS = Direct Push - Soil DW = Direct Push - Water SD = Sediment SS = Surface Soil TB = Trip Blank EB = Equipment Blank FB = Field Blank FD = Field Duplicate Sample Location: 1. Station Samples (NNA) NNA - refers to sequential station number NNA - letter qualifier for Deep, Shallow, or Composite, sample (if applicable). 2. QC Samples (NNN) NNN - numbered sequentially for each type of blank (i.e., 1, 2, etc.) collected for that day's sampling NNN - refers to month of sampling event Sample Qualifiers: F = filtered sample P = duplicate sample K = background sample		Additional Qualifiers: 1. Monitoring Well Groundwater Sample (refers to sampling round for that well): R01 - Round 1 R02 - Round 2 R03 - Round 3 2. Direct Push Subsurface Sample (refers to depth of sample): Enter depth of top of sample interval 3. QC Samples NNNN - refers to day and year of sampling event

Notes:
"A" = alphabetic
"N" = numeric

3.2.6.4 Electronic Deliverable File Format

An offsite laboratory will analyze the supplemental SWMU investigation samples and tabulate the results in an electronic format specified by CH2M HILL. The data validator will add data validation qualifiers to the table of analytical results. In addition to hard copy data package deliverable, CH2M HILL will receive an electronic file from the data validator in a table format that will facilitate downloading into a database. The format that will be used for electronic deliverables is tabulated in Table 3-5.

TABLE 3-5
Analytical Data Electronic Deliverable

Analytical data must be delivered in a format compatible with Microsoft Access 2.0 or 7.0		
Field Name	**Field Type**	**Description**
Sample_ID	A20	The CH2M HILL sample ID (taken from the Chain of Custody)
Sample_Analysis	A5	The analysis performed on the sample. We classify our samples into six main groups: VOA, SVOA, INORG, PEST, WCHEM, and FMETAL (for filtered samples).
Date_Analyzed	D	The date the sample was analyzed.
Date_Received	D	The date the sample was received in the lab.
Date_Collected	D	The date the sample was collected.
Lab_Sample_ID	A15	The lab sample ID.
Dilution_Factor	N	The dilution factor used, if applicable.
SDG_Number	A6	The SDG number.
CAS_Number	A6-A2-A1	CAS Number of the compound being analyzed (Note that the CAS number must consist of three number segments of defined length, separated by dashes).
Chem_Name	A50	The compound being analyzed.
Ana_Value	N	The analytical result.
Std_Qual	A5	The lab qualifiers, if any (e.g., U, UJ, B)
DV_Qual	A5	The data validation qualifier (e.g., J, R)
Units	A10	The unit of the result (e.g., MG/L)
Detect_Limit	N	The detection limit for the compound.
Method	A15	Analytical method used to analyze the sample fraction.

3.2.7 Surveying

Sampling locations at each SWMU will be horizontally located using a global positioning system (GPS) following field activities. All survey data will be tied in to the Base coordinate system.

3.3 Task 3: Sample Analysis and Validation

This task involves efforts related to the sample management and data validation. CH2M HILL will be responsible for tracking sample analysis and obtaining results from the laboratory. The analytical data generated during the SWMUs investigation field program will be validated by an independent data validation subcontractor according to EPA's *Functional Guidelines for Data Validation* (EPA, 1994).

3.3.1 Sample Analysis

All analyses of soil, sediment, and groundwater will be conducted at a contracted laboratory that fulfills all requirements of the U.S. Navy's QA/QC Program Manual and EPA's CLP and SW 846 (for methods not covered by CLP). The laboratory must follow the scope of work prepared by the project team. A signed certificate of analysis will be provided with each laboratory data package, along with a certificate of compliance certifying that all work was performed in accordance with the CLP SOW. All analyses will be performed following the highest level of Navy guidance. Analyses will include the proper ratio of field QC samples recommended by CLP guidance for the DQOs.

This task includes checking the data from the laboratory and converting it into an electronic format that can be readily incorporated into the GIS Data Management system for NASD

3.3.1.1 Field Quality Control Procedures

Quality control duplicate samples and blanks are used to provide a measure of the internal consistency of the samples and to provide an estimate of the components of variance and the bias in the analytical process. The QAPP provides details with regard to the number and frequency of field QC samples to be collected during the investigation.

3.3.1.2 Blanks

Blanks provide a measure of cross-contamination sources, decontamination efficiency, and other potential errors that can be introduced from sources other than the sample. ASTM Type I water will be used for blanks. Four types of blanks can be generated during sampling activities: trip blanks, field blanks, equipment rinsate blanks, and temperature blanks.

One trip blank will be included in each cooler used for the daily shipment of VOC samples. If more than one cooler is being sent on a given day, all of the VOC samples should be placed in one cooler, if possible, to minimize the number of trip blanks needed. The trip blanks will be prepared before each sampling event, shipped or transported to the field with the sampling bottles, and returned unopened for analysis. Trip blanks will indicate if there is contamination during shipment to the field, from storage in the field, or from shipment from the field to the analytical laboratory.

One field blank will be collected per sampling event. If sampling events extend beyond one week (five working days) or for windy and dusty field conditions, the number of field blanks should be increased. Field blanks are used to determine the chemical quality of water used for such procedures as decontamination and blank collection.

One equipment blank per sample matrix will be obtained for each day of sampling. Equipment blanks will give an indication of the efficiency of decontamination procedures.

EPA has recently requested that a temperature blank be included in each cooler containing samples for CLP analyses so that the laboratory can record the temperature without disturbing the samples. The temperature blank will be labeled, but will not be given a sample number nor will be listed as a sample on the COC form.

3.3.1.3 Duplicates

Field duplicate samples will be collected at a frequency of 1 field duplicate per 10 field samples per matrix. The locations from which the duplicates are taken will be selected randomly. Each duplicate sample will be split evenly into two sample containers and submitted for analysis as two independent samples.

3.3.1.4 Matrix Spike/Matrix Spike Duplicate (MS/MSD)

Matrix spike/matrix spike duplicate (MS/MSD) samples will be collected at a frequency of 1 MS/MSB for every 20 field samples collected. Analytical results of these samples indicate the impact of the matrix (water, soil, sediment) on extracting the analyte for analysis. MS/MSD samples give an indication of the laboratory's analytical accuracy and precision within the sample matrix. Data validators will use these results to evaluate the accuracy of the analytical data.

3.3.2 Data Validation

Analytical results will be validated by CH2M HILL subcontractors approved by the Navy. Data validators will use EPA Region III guidance (Functional Guidelines).

The hardcopy data packages will be reviewed by the subcontractor chemists using the process outlined in EPA's *Functional Guidelines for Evaluating Data* (EPA, 1994). Areas of review included (when applicable to the method) holding time compliance, calibration verification, blank results, matrix spike precision and accuracy, method accuracy as demonstrated by laboratory confirmation samples (LCSs), field duplicate results, surrogate recoveries, internal standard performance, and interference checks. A data review worksheet will be completed for each of these data packages and any non-conformance will be documented. This data review and validation process is independent of the laboratory's checks and focuses on the usability of the data to support the project data interpretation and decision-making processes.

Data that are not within the acceptance limits will be appended with a qualifying flag, which consists of a single or double-letter abbreviation that reflects a problem with the data. The following flags will be used in the evaluation:

U - Undetected. Analyte was analyzed for but not detected above the method detection limit.

UJ - Detection limit estimated. Analyte was analyzed for, and qualified as not detected. The result is estimated.

J - Estimated. The analyte was present, but the reported value may not be accurate or precise.

R - Rejected. The data are unusable. (NOTE: Analyte/compound may or may not be present.)

Numerical sample results that are greater than the method detection limit (MDL) but less than the laboratory reporting limit (RL) are qualified with a "J" for estimated as required by EPA's *Functional Guidelines* (EPA, 1994).

3.4 Task 4: Data Quality Evaluation

Analytical data will be collected during this investigation in the form of laboratory analytical results and the database will be populated with data validation qualifier results.

The data quality evaluation (DQE) is the quantitative and qualitative evaluation of overall trends in the project-specific database. The objective of the DQE process is to understand the effects of the overall analytical process on data usability to support project-specific data quality objectives (DQOs). The DQE includes an analysis of the effect of the specific sample matrix on the overall analytical process.

The DQE deliverable is a DQE Technical Memorandum (TM) that can be used by the project team to readily understand project-specific data usability. Topics to be addressed in the DQE TM include the following:

- *Potential blank contamination*—the effect on the usability of data for compounds detected in both the field or laboratory blank samples and the corresponding field samples
- *Laboratory performance*—evaluation of the recovery for blank spike samples such as the LCS, calibration criteria, etc.
- *Potential matrix interferences*—evaluation of the accuracy and precision for surrogates, spiked field samples, and duplicate field sample results
- *Assessment of PARCCs*—comparison of DV findings with PARCCs (precision, accuracy, representativeness, comparability, and completeness)

This task also includes the evaluation of validated laboratory data and field-generated data. The data evaluation will include incorporation of historical data from the previous investigations, tabulation of the data, and generation of figures and/or tables associated with data (e.g., sampling location maps).

3.5 Task 5: Investigation Reports

A Draft Expanded PA/SI Report will be prepared for submittal to LANTDIV, NSRR, USEPA, and PREQB. Based on the evaluation of the results presented in the Draft Report, a Final Report will be prepared.

SECTION 4

Project Management and Staffing

The CH2M HILL Task Manager designated for the oversight of this project is Mr. Marty Clasen. Mr. Clasen will be supported by Mr. John Tomik, who serves as Activity Manager for Vieques Island. Mr. Clasen will be responsible for such activities as technical support and oversight, budget and schedule review and tracking, preparation and review of invoices, personnel resources planning and allocation, and coordination with LANTDIV, NSRR, USEPA, and subcontractors.

The SWMU investigation field program (soil and groundwater sampling) will be performed by qualified CH2M HILL staff members. CH2M HILL will notify LANTDIV, NSRR, and USEPA which CH2M HILL personnel will mobilize to the site prior to initiating field activities.

SECTION 5

Contractual Services

This section documents the anticipated subcontract services required for the completion of tasks documented in this work plan. The supplemental SWMU investigations will require subcontract services from the following:

- Hollow Stem Auger and Air Rotary Drilling
- Surface Geophysical Survey
- Analytical Laboratory
- Data Validation
- Surveying
- ECO Surveys

SECTION 6

Project Schedule

This section documents the project schedule and the due dates of deliverables. Table 6-1 shows a breakdown on primary deliverables and assumed intervals for governmental review. Longer periods of review will result in an extended schedule.

TABLE 6-1
Proposed Project Milestones

Expanded PA/SI Investigation, Contract Task Order 0031			
	Date From Notice to Proceed		
Key Project Milestones	**Start**	**End**	**Duration**
Notice to Proceed	0	0	0
Prepare Draft Work Plans (WP, HASP, FSP, QAPP, and IDWMP)	2/15/00	2/29/00	15
Submit Draft Work Plans (WP, HASP, FSP, QAPP, and IDWMP)	3/2/00	3/2/00	0
Navy and PREQB Review of Draft Work Plans	3/2/00	3/24/00	22
Prepare and submit Final Work Plans (WP, HASP, FSP, QAPP, and IDWMP)	3/24/00	4/15/00	22
Procure Subcontractors/Mobilize	3/17/00	4/2/00	15
Conduct Field Investigation	4/2/00	6/15/00	72
Laboratory Analyses	4/08/00	6/30/00	82
Data Validation/Management	6/15/00	7/15//00	30
Data Evaluation	6/15/00	7/31/00	13
Prepare Draft Reports	7/31/00	8/31/00	30
Submit Draft Reports	8/31/00	8/31/00	0
Navy and PREQB Review of Draft Reports	8/31/00	9/15/00	15
Prepare Final Reports	9/15/00	9/30/00	15
Submit Final Reports	10/01/00	10/01/00	0

APPENDIX

Checklists For Field Sampling and Analysis Plan

APPENDIX

Site-Specific Investigation-Derived Waste Plan Checklist

This checklist supplements the Master IDW Plan with site-specific information. Once completed for a specific project, it provides necessary IDW information for each investigation. It is to be taken into the field with the Master IDW Plan.

Site: NASD

1. IDW Media:
   - X_____Soil cuttings
   - X_____Well development or purge water
   - X_____Decontamination residual soil and wastewater
   - X_____PPE or disposable equipment
   - _____Other _____

2. Expected Regulatory Status:
   - _____Hazardous
   - _____Solid Waste
   - X_____Unknown
   - X_____Other Waste management activities regulated by OSHA Hazwoper standard (1910.120)

3. Site Location: Decontamination fluids and PPE will be generated at all SWMUs.

4. Nature of Contaminants Expected:
   - X_____Petroleum contamination
   - X_____Polyaromatic hydrocarbon
   - X_____Pesticides
   - X_____Herbicides
   - X_____PCBs
   - X_____Metals
   - X_____Other - Contaminant concentrations from previous analytical results were very low for all of the above.

5. Volume of IDW Expected:
   - X_____Drums - Maximum of 6. One for decontamination Fluids, four for drilling cuttings and one for PPE and other disposable items.
   - _____Cubic Yards
   - _____Tons
   - _____Gallons

6. Compositing Strategy for Sample Collection: No IDW sampling planned. Will base disposal decisions on analytical results from sampling.

7. IDW Storage

X_____As per Master IDW Plan _____Other_____

8. Waste Disposal

X_____As per Master IDW Plan _____Other_____

Site-Specific Quality Assurance Project Plan Checklist

This checklist supplements the Master QAPP with site-specific information. Once completed for a specific project, it provides necessary quality assurance information for each investigation. It is to be taken into the field with the Master QAPP.

Site: NASD

1. List sampling tasks: groundwater and subsurface soil sampling, surface soil sampling, and monitoring well installations.

2. List data quality objectives: The objective of the SWMU Investigation is to determine the need for further action at each of the SWMUs. Previous analytical data and the analytical data generated from the Investigation will be reviewed and a recommendation for no further action or additional investigation will be made based on the data.

3. Organization:

LANTDIV Navy Technical Representative	Chris Penny / LANTDIV
PREQB Federal Facilities Project Manager	Miguel Maldonado / PREQB
CH2M HILL Activity Manager	John Tomik / CH2M HILL
Quality Control Senior Review	Kevin Sanders / CH2M HILL
Technical Project Manager	Marty Clasen/ CH2M HILL
Field Team Leader	Rick Gorsira / CH2M HILL

4. Table of samples with analyses to be performed and associated QC samples included in the SWMU Investigation Workplan.

5. Analytical Quantitation Limits:

   X_____As per Master QAPP

   _____Other

6. QA/QC Acceptance Criteria (e.g., precision, accuracy)

   X_____As per Master QAPP _____Other (attached)

7. Data reduction, validation, and reporting:

   X_____As per Master QAPP _____Other (attached)

8. Internal QC Procedures (field and laboratory):
   X_____As per Master QAPP _____Other (attached)

9. Corrective Action:
   X_____As per Master QAPP _____Other (attached)

10. Other deviations from Master QAPP - None

Site-Specific Field Sampling Plan Checklist

This checklist supplements the Master Field Sampling Plan with site-specific information. Once completed for a specific project, it provides necessary field sampling information for each investigation. It is to be taken into the field with the Master FSP.

Site: NASD

1. Tasks to be performed:

X_____Geophysical surveys
_____Soil gas surveys
X_____Surface water and sediment sampling
X_____Surface soil sampling
X_____Soil boring installation
X_____Subsurface soil sampling
X_____Monitoring well installation and development
_____Monitoring well abandonment
X_____Groundwater sampling
X_____In-situ groundwater sampling
_____Aquifer testing
X_____Hydrogeologic measurements
_____Biota sampling
_____Trenching
_____Land surveying
X_____Investigation derived waste sampling
X_____Decontamination
_____Other_____

2. Field measurements to be taken:

X_____temperature
X_____pH
_____dissolved oxygen
X_____turbidity
X_____specific conductance
X_____organic vapor monitoring
X_____geophysical parameters (list):
X_____electromagnetic induction
_____ground-penetrating radar
X_____surveying
_____magnetometry
X_____global positioning system
_____soil gas parameters (list):
_____combustible gases
X_____water-level measurements
_____pumping rate
_____other_____

3. Sampling program (nomenclature, etc.):

_____As per Master FSP X_____Other As presented in the PA/SI Investigation Workplan

4. Map of boring and sampling locations (attach to checklist): See Workplan.
5. Table of field samples to be collected: See Investigation Workplan.

6. Applicable SOPs or references to specific pages in Master FSP: The following SOPs from Volume 2 of the Master Project Plans are to be implemented.

- Geoprobe Soil Sample Collection

- Shallow Soil Sampling
- Monitoring Well Installation
- Homogenization of Soil and Sediment Samples
- VOC Sampling - Water
- Field Filtering
- Chain-of-Custody
- Packaging and Shipping Procedures
- Field Rinse Blank Preparation
- Decontamination of Personnel and Equipment
- Disposal of Fluids and Solids

7. Site-specific procedures or updates to protocols established in the Master FSP:

Described in the Workplan.

Site-Specific Health and Safety Plan

This checklist must be used in conjunction with the Master HASP. This checklist is intended for use by CH2M HILL employees only. All CH2M HILL employees performing tasks under this checklist must read and sign both this checklist and the Master HASP and agree to abide by their provisions (see EMPLOYEE SIGNOFF attached to the checklist.

Site: NASD

Location(s) SWMU Location Map and Individual SWMU figures are included in the Workplan.

This document shall be maintained on site with the Master Health and Safety Plan. It will include as attachments from the Work Plan a site map and the site characterization and objectives for this site.

The procedures described in the Master Health and Safety Plan will be followed unless otherwise specified in this Site-Specific Health and Safety Plan.

1. HAZWOPER-Regulated Tasks

_____Test pit and excavation
X_____Soil boring installation
X_____Geoprobe boring
X_____Geophysical surveys
_____Hand augering
X_____Subsurface soil sampling
X_____Surface soil sampling
_____Soil gas surveys
X_____Sediment sampling
X_____Monitoring well/drive point installation
_____Monitoring well abandonment
X_____Groundwater sampling
_____Aquifer testing
X_____Hydrologic measurements
X_____Surface water sampling
_____Biota sampling
X_____Investigation-derived waste (drum) sampling and disposal
_____Observation of loading of material for offsite disposal
_____Oversight of remediation and construction
_____Other_____

2. Hazards of Concern: (Check as many as are applicable. Refer to Section 3 of Master H&S Plan for control measures):

X_____Heat stress
_____Cold stress
_____Buried utilities, drums, tanks
_____Inadequate illumination
X_____Drilling
_____Heavy equipment
_____Working near water
_____Flying debris
_____Gas cylinders
X_____Noise
X_____Slip, trip, or fall hazards
X_____Back injury
_____Confined space entry
_____Trenches, excavations
_____Protruding objects
X_____Vehicle traffic
_____Ladders, scaffolds
_____Fire
_____Working on water
_____Snakes or insects
X_____Poison ivy, oak, sumac
X_____Ticks
_____Radiological
_____Other_____

3. Contaminants of Concern (List if known. Refer to Table 3.8 of the Master HASP contaminant-specific information

PCBs Metals VOCs

PNAs SVOCs

4. Personnel (List CH2M HILL field team members :

Field team leader(s) Rick Gorsira

Site safety coordinator(s) Rick Gorsira

Field team members Karen Karvazy, Emiliano Cabale, Hector Hernandez, Gabe Silva, Katie Swanson

5. Contractors/Subcontractors

X_____Procedures as per Master HASP

X_____Other

Name: To be added _____ _____

Contact: To be added _____ _____

Telephone: To be added _____ _____

6. Level of personal protective equipment (PPE) required: D
Refer to Table 5.1 of Master HASP, CH2M HILL SOPs HS-07 and HS-08, and Respiratory Protection, Section 2 of the Site Safety Notebook.

7. Air monitoring instruments to be used (refer to Master HSP for action levels):

X_____OVM 10.6 _____FID

_____CGI _____Dust monitor

_____O_2

8. Decontamination procedures:

_____As per Section 7 of Master HASP

X_____Other As described in the SWMU Investigation Workplan.

9. List any other deviations or variations from the Master HASP: None

10. Emergency Response (Check that all names and numbers are correct on page 47 of Master HASP and attach corrected page to this checklist)

11. Map to hospital (Highlight route to hospital from site and attach to this checklist)

12. Emergency Contacts (Check that all names and numbers are correct on page 49 of Master HASP and attach corrected page to this checklist)

13. Approval. This prepared site-specific checklist must be approved by John Longo/NJO or Laura Johnson/NJO or their authorized representative

    Name Title: Health and Safety Manager Date:

    (Signature will be included in the Final HASP)

14. Employee Signoff. All CH2M HILL employees working at the site must sign the attached Employee Signoff for the checklist as well as for the Master HASP.

_____Site

HASP Checklist Employee Signoff

The employees listed below have been given a copy of both this health and safety plan checklist and the Master HSP, have read and understood them, and agree to abide by their provisions.

EMPLOYEE NAME	EMPLOYEE SIGNATURE AND DATE

UNDERGROUND INJECTION CONTROL (UIC) FACILITIES,
NAVAL AMMUNITION SUPPORT DETACHMENT, VIEQUES, PUERTO RICO

	Existing Facility Name/ Location	UIC Construction permit Application submitted	UIC Construction Permit Received	UIC Operation Permit Application submitted	UIC Operation Permit Received
1	WWTP Lagoon System NASD Vieques	Yes	No See note 1.	Yes	No
2	EM Club NASD Vieques	Yes	Yes	Yes	Yes
3	Bldg 2015 NASD Vieques	No	No	No	No
4	Bldg 2023 NASD Vieques	Yes	Yes	Yes	Yes

Table Notes:

1. Since the WWTP Lagoon System was a pre-existing facility which pre-dates the UIC regulations, it may be grandfathered and not require that a UIC Construction Permit be obtained from the EQB prior to them issuing the UIC Operation Permit.