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REMEDIAL INVESTIGATION/RESOURCE CONSERVATION AND RECOVERY ACT FACILITY INVESTIGATION WORK PLAN FOR SITE 21 AND SITE INSPECTION/CONFIRMATORY SAMPLING WORK PLAN FOR SITE 9, SITE 13C, SITE 27 AND SITE 35 MCRD PARRIS ISLAND SC

8/10/1999

TETRA TECH NUS

Rev. 1
08/10/99

SWMU 21
RI/RFI Work Plan
and
SI/CS Work Plan
for
Site/SWMU 5,
Site 9/SWMU 8, Site 13C/SWMU 13
and SWMUs 27 and 35

Marine Corps Recruit Depot
Parris Island, South Carolina
U.S. EPA Identification Number: SC6 170 022 762

Southern Division
Naval Facilities Engineering Command
Contract Number N62467-94-D-0888
Contract Task Order 0084

August 1999

Rev. 1
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SWMU 21 RI/RFI WORK PLAN
AND
SI/CS WORK PLAN
FOR
SITE/SWMU 5, SITE 9/SWMU 8, SITE 13C/SWMU 13, AND SWMUs 27 AND 35

MARINE CORPS RECRUIT DEPOT
PARRIS ISLAND, SOUTH CAROLINA
U.S. EPA IDENTIFICATION NUMBER
SC6 170 022 762

COMPREHENSIVE LONG-TERM
ENVIRONMENTAL ACTION NAVY (CLEAN) CONTRACT

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Southern Division
Naval Facilities Engineering Command
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AUGUST 1999

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TABLE OF CONTENTS

SECTION		PAGE NO.
ACRONYMS		**v**
1.0	**INTRODUCTION**	**1-1**
1.1	SCOPE AND OBJECTIVE	1-1
1.2	DATA QUALITY OBJECTIVES	1-5
1.3	PLANNING DOCUMENT ORGANIZATION	1-5
2.0	**SITE BACKGROUND**	**2-1**
2.1	SITE DESCRIPTION AND HISTORY	2-1
2.1.1	Site 13C – Inert Disposal Area C	2-1
2.1.2	Site 5 – Former Paint Shop Disposal Area	2-1
2.1.3	Site 9 – Paint Waste Storage Area	2-1
2.1.4	SWMU 21 – Weapons Power Plant Oil/Water Separator	2-7
2.1.5	SWMU 27 – Equipment Parade Deck SAA	2-7
2.1.6	SWMU 35 – DRMO Salvage Storage Area	2-7
2.2	SITE HYDROGEOLOGY	2-11
2.2.1	Surficial Aquifer	2-11
2.2.2	Confining Layer	2-11
2.2.3	Floridan Aquifer	2-11
2.3	STATEMENT OF PROBLEM	2-12
3.0	**PRELIMINARY ASSESSMENT**	**3-1**
3.1	SITE 13C-INERT DISPOSAL AREA C	3-1
3.2	SITE 5 – FORMER PAINT SHOP DISPOSAL AREA	3-1
3.3	SITE 9 – PAINT WASTE STORAGE AREA	3-1
3.4	SWMU 21 – WEAPONS POWER PLANT OIL/WATER SEPARATOR	3-1
3.5	SWMU 27 – EQUIPMENT PARADE DECK SAA	3-2
3.6	SWMU 35 – DRMO Salvage Storage Area	3-2
4.0	**INVESTIGATION SCOPING**	**4-1**
4.1	INVESTIGATION SUMMARY AND RATIONALE	4-1
4.2	ANALYTICAL PARAMETER RATIONALE	4-1
4.2.1	Site 13C – Dredge Spoils Area	4-1
4.2.2	Site 5 – Former Paint Shop Disposal Area	4-4
4.2.3	Site 9 – Paint Waste Storage Area	4-5
4.2.4	SWMU 21 – Weapons Power Plant Oil/Water Separator	4-6
4.2.5	SWMU 27 – Equipment Parade Deck SAA	4-8
4.2.6	SWMU 35 – DRMO Salvage Yard	4-9
5.0	**HUMAN HEALTH AND ECOLOGICAL RISK ASSESSMENT**	**5-1**
5.1	HUMAN HEALTH RISK	5-1
5.2	ECOLOGICAL RISK	5-1
6.0	**FIELD OPERATIONS**	**6-1**
6.1	MOBILIZATION/DEMOBILIZATION	6-1
6.2	SITE RESTORATION	6-1
6.3	DRILLING METHODS	6-1
6.3.1	Hollow-Stem Auger Soil Boring Drilling	6-2

TABLE OF CONTENTS (Continued)

SECTION **PAGE NO.**

6.3.2 Temporary Monitoring Wells Using Hollow-Stem Auger Drilling 6-2
6.3.3 Direct-Push Technology 6-4
6.3.4 Temporary Monitoring Wells Using DPT 6-4
6.4 SURVEYING 6-5
6.5 DECONTAMINATION 6-5
6.6 WASTE HANDLING 6-5

7.0 ENVIRONMENTAL SAMPLING 7-1
7.1 SUMMARY OF ENVIRONMENTAL SAMPLING 7-1
7.2 SAMPLING PROCEDURES 7-1
7.2.1 Site 13C– Inert Disposal Area C (Dredge Spoils Area) 7-1
7.2.2 Site 5 – Former Paint Shop Disposal Area 7-1
7.2.3 Site 9 – Paint Waste Storage Area 7-8
7.2.4 SWMU 21 – Weapons Power Plant Oil/Water Separator 7-8
7.2.5 SWMU 27 – Equipment Parade Deck SAA 7-8
7.2.6 SWMU 35 – DRMO Salvage Storage Area 7-8
7.3 SAMPLE HANDLING 7-13
7.3.1 Sample Containers, Preservation, Holding Times, and Analyses 7-13
7.3.2 Sample Nomenclature 7-13
7.3.3 Sample Documentation, Packaging, and Shipping 7-13
7.3.4 Sample Custody 7-14

8.0 QUALITY ASSURANCE PLAN 8-1

9.0 PROJECT MANAGEMENT ORGANIZATION 9-1
9.1 PROJECT ORGANIZATION 9-1
9.2 PROJECT PERSONNEL Responsibilities 9-1

10.0 DATA QUALITY REQUIREMENTS 10-1
10.1 LABORATORY ANALYSES 10-1
10.2 EXTERNAL (FIELD) QC SAMPLES 10-1
10.2.1 Field QC Sample Types and Frequencies 10-1
10.2.2 Matrix Spike/Duplicate Sample Aliquots 10-2
10.3 BOTTLEWARE REQUIREMENTS 10-2
10.4 SAMPLE CUSTODY AND SHIPMENT 10-2
10.5 INTERNAL (LABORATORY) QC CHECKS 10-2
10.5.1 Laboratory Duplicate, Spike, and Method Blank Analyses 10-2
10.5.2 Other Laboratory QC Checks 10-5
10.6 PROJECT RECORDS 10-5
10.7 DATA REDUCTION, VALIDATION, AND REPORTING 10-5
10.8 PERFORMANCE AND SYSTEM AUDITS 10-6
10.9 CORRECTIVE ACTIONS 10-6
10.10 TRAINING AND QUALITY PLANNING 10-6

REFERENCES R-1

TABLE OF CONTENTS (Continued)

APPENDIX

A REGULATORY COMMENTS AND RESPONSE TO REGULATORY COMMENTS TO THE DRAFT WORK PLAN

TABLES

NUMBER		PAGE NO.
4-1	Investigation Rationale, SWMU 21 and Five SI/CS Sites	4-2
7-1	Summary of Environmental Sampling, SWMU 21 and Five SI/CS Sites	7-2
10-1	Frequency of Field QC Samples	10-1
10-2	Summary of Bottleware, Preservation, and Holding Times, SWMU 21 and Five SI/.CS Sites	10-3
10-3	Frequency of Laboratory QC Checks	10-5

FIGURES

NUMBER		PAGE NO.
1-1	Area Map	1-3
1-2	Data Quality Objectives Process	1-6
2-1	Site/SWMU 13 Inert Disposal Area C	2-3
2-2	Site/SWMU 5 Former Paint Shop Disposal Area	2-5
2-3	Site 9/SWMU 8 Paint Waste Storage Area	2-6
2-4	SWMU 21 Weapons Power Plant Oil/Water Separator	2-8
2-5	SWMU 27 Equipment Parade Deck SAA	2-9
2-6	SWMU 35 DRMO Salvage Yard	2-10
7-1	Site/SWMU 13 Inert Disposal Area C	7-5
7-2	Site/SWMU 5 Former Paint Shop Disposal Area	7-7
7-3	Site 9/SWMU 8 Paint Waste Storage Area	7-9
7-4	SWMU 21 Weapons Power Plant Oil/Water Separator	7-10
7-5	SWMU 27 Equipment Parade Deck SAA	7-11
7-6	SWMU 35 DRMO Salvage Yard	7-12
9-1	Project Personnel Organization	9-2

ACRONYMS

ARARs	Applicable or Relevant and Appropriate Requirements
B&R Environmental	Brown & Root Environmental
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CLEAN	Comprehensive Long-Term Environmental Action Navy
CLPs	Contract Laboratory Procedures
COCs	Chemicals of Concern
CS	RCRA Facility Assessment Confirmatory Sampling
CTO	Contract Task Order
DQO	Data Quality Objective
DPT	Direct-Push Technology
DRMO	Defense Reutilizaton and Marketing Office
EISOPQAM	Environmental Investigations Standard Operating Procedures Quality Assurance Manual
FID	Flame Ionization Detector
FOL	Field Operations Leader
FSP	Field Sampling Plan
HASP	Health and Safety Plan
I.D.	Inside Diameter
IAS	Initial Assessment Study
IDW	Investigation-Derived Waste
IR	Installation Restoration
LQAP	Laboratory Quality Assurance Plan
MCLs	Maximum Contaminant Levels
MCRD	Marine Corps Recruit Depot
msl	Mean Sea Level
NAVFAC	Naval Facilities Engineering Command
NCP	National Contingency Plan
NEESA	Naval Energy and Environmental Support Activity
NFA	No Further Action
NPL	National Priorities List
NSF	National Sanitation Foundation
PAHs	Polynuclear Aromatic Hydrocarbons
PCBs	Polychlorinated Biphenyls

PID	Photoionization Detector
PVC	Polyvinyl Chloride
QA/QC	Quality Assurance/Quality Control
QAM	Quality Assurance Manager
QAP	Quality Assurance Plan
RBCs	Risk-Based Concentrations
RCRA	Resource Conservation and Recovery Act
RFA	RCRA Facility Assessment
RFI	RCRA Facility Investigation
RI	Remedial Investigation
SAA	Satellite Accumulation Area
SARA	Superfund Amendments and Reauthorization Act
SCDHEC	South Carolina Department of Health and Environmental Control
SI	Site Inspection
SOPs	Standard Operating Procedures
SOUTHDIV	Southern Division
SSO	Site Safety Officer
SVOCs	Semivolatile Organic Compounds
SWMU	Solid Waste Management Unit
TAL	Target Analyte List
TCL	Target Compound List
TCLP	Toxicity Characteristic Leaching Procedure
TDS	Total Dissolved Solids
TOM	Task Order Manager
TtNUS	Tetra Tech NUS
U.S. EPA	United States Environmental Protection Agency
U.S.	United States
VOCs	Volatile Organic Compounds

1.0 INTRODUCTION

This work plan has been prepared by Tetra Tech NUS (TtNUS) for the Southern Division (SOUTHDIV) Naval Facilities Engineering Command (NAVFAC) under the Navy Comprehensive Long-Term Environmental Action Navy (CLEAN) Program, Contract Number N62467-94-D-0888, Contract Task Order (CTO) 0084. This work plan outlines the requirements and describes the procedures for performing a remedial investigation (RI)/RCRA facility investigation (RFI) at solid waste management unit (SWMU) 21. Additionally, site inspections (SIs) Confirmatory sampling (CS) will be conducted at five other sites. The RI/RFI and SI/CS sites to be investigated are as follows.

- Site/SWMU 13 (Site 13C) – Inert Disposal Area C (Dredge Spoils Area)
- Site/SWMU 5 (Site 5) – Former Paint Shop Disposal Area
- Site 9/SWMU 8 (Site 9) – Paint Waste Storage Area
- SWMU 21 – Weapons Power Plant Oil/Water Separator
- SWMU 27 – Equipment Parade Deck Satellite Accumulation Area (SAA)
- SWMU 35 – Defense Reutilization and Marketing Office (DRMO) Salvage Storage Area

For ease of reading and clarity, investigation areas with both a site and SWMU designation will be referred to as the name indicated in parenthesis (shown above).

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

1.1 SCOPE AND OBJECTIVE

One aspect of the scope of this investigation is to determine the extent of contamination at SWMU 21. Environmental media will be collected to determine the nature and extent of contamination and identify the effects contaminated media have on human health and the environment.

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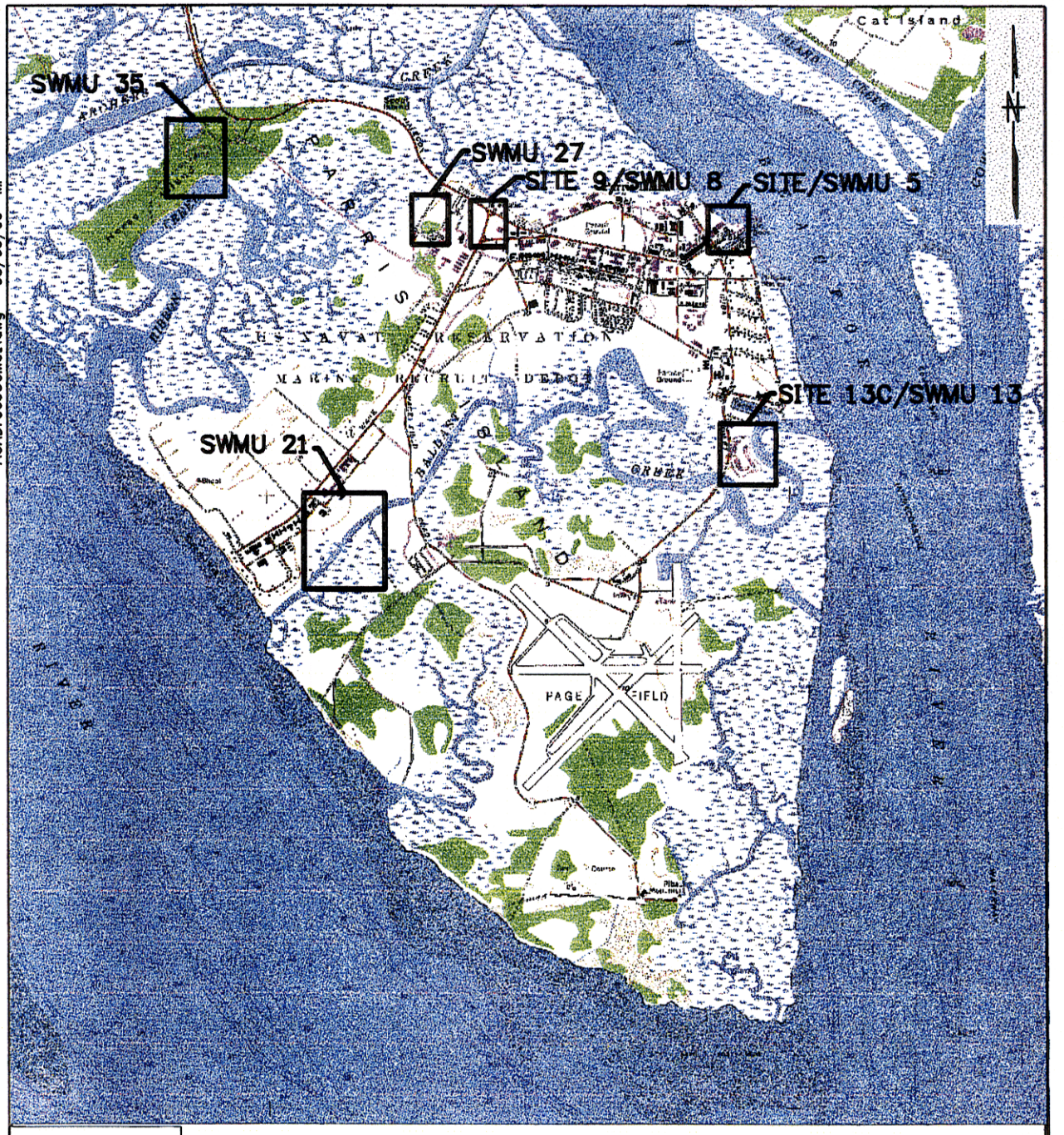

QUADRANGLE LOCATION

0 4000 8000
SCALE IN FEET

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

DRAWN BY HJP DATE 12/30/98	DEPARTMENT OF THE NAVY SOUTHERN DIV FACILITIES ENGINEERING COMMAND	DEPOT/SITE LOCATION MAP MCRD PARRIS ISLAND PARRIS ISLAND, SOUTH CAROLINA	CONTRACT NO. 0095
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COST/SCHED-AREA			APPROVED BY DATE
SCALE AS NOTED			DRAWING NO. FIGURE 1-1 / REV. 0

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Additionally, through confirmatory sampling, this investigation will determine whether contaminant releases have occurred at the five other sites. At each site, environmental media will be collected (e.g., soil and groundwater) and analyzed. Based on the results of this sampling and analytical data collected in 1995, the need for further investigation or no further action decision will be determined.

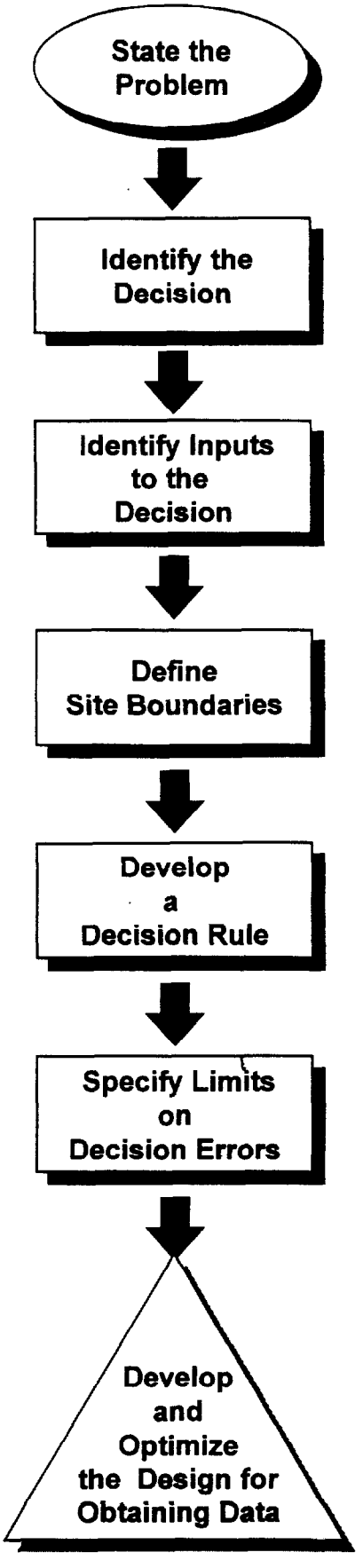
1.2 DATA QUALITY OBJECTIVES

This work plan was developed using the data quality objective (DQO) process. The DQO process is a focused, iterative process for developing data collection designed to support decision-making. The goal of the process is to conduct investigations in an efficient and effective manner without unnecessary precision or redundancy of data. The process consists of seven steps, ordered in a downward decision flow. A flow diagram with descriptions of each step is provided in Figure 1-2. The DQO Process is further explained in Volume I, Section 1.2.2, of the Master Work Plan for MCRD Parris Island (B&R Environmental, 1998).

1.3 PLANNING DOCUMENT ORGANIZATION

This work plan is intended to be used in conjunction with the Master Work Plan for MCRD Parris Island (Volumes I through III) and references the Master Work Plan where appropriate. This work plan includes the site-specific information to be used for sampling at the six sites, and the Master Field Sampling Plan (FSP) and the Master Quality Assurance Plan (QAP) provide general information that is applicable to all sites on MCRD Parris Island. Sections 1.0 through 4.0 of this site-specific work plan identify the project scope and objectives, summarize background information and existing data, and present the conceptual model and proposed sampling. Section 5.0 discusses the proposed methodology for human health and ecological risk assessments that will be conducted. Sections 6.0 and 7.0 present the site-specific FSP and Sections 8.0 through 10.0 describe the Quality Assurance and Quality Control (QA/QC) measures for ensuring that usable data are obtained.

FIGURE 1-2
DATA QUALITY OBJECTIVES PROCESS



- Review of historical & background information (Section 2.0)
- Statement of problem for data collection (Section 2.0)
- Preliminary assessment of existing data (Section 3.0)

- Statement of the action-based decision to resolve problem (Section 4.0)

- Identification of measurable variables and action levels to support decisions (Section 5.0)

- Definition of sampling population, and spatial and temporal boundaries and limitations (Section 4.0)

- Single statement synthesizing previous steps and summarizing how data will be used to make a decision (Master Work Plan, Volume III)
- An "if...then" statement defining values for deciding between alternative actions (Master Work Plan, Volume III)

- Definition of acceptable limits of decision error and potential consequences of incorrect decisions (Decision Document; Master Work Plan, Volume III)

- Development of alternative sampling designs and selection of most effective design for sampling and analysis (Section 4.2)

2.0 SITE BACKGROUND

2.1 SITE DESCRIPTION AND HISTORY

The following sections present descriptions of the areas to be covered under the field investigation and summarize the results of previous investigations. Information summarized in this section is from the Initial Assessment Study (IAS) (NEESA, 1986), the RCRA Facility Assessment (Kearney, 1990), and the Relative Risk Assessment (B&R Environmental, 1996).

2.1.1 Site 13C – Inert Disposal Area C

The Inert Disposal Area C (Site 13C) is located in the east central portion of Parris Island (see Figure 2-1) and overlays the Dredge Spoils Fire Training Pit (Site/SWMU 4). Approximately 100,000 cubic yards of marine dredge spoils have been disposed at Site 13C since 1976.

In 1995, two surface soil (sediment) samples were collected from Site 13C and analyzed for Target Compound List (TCL)/Target Analyte List (TAL) parameters. These samples were found to contain metals at concentrations greater than background and volatile organic compounds (VOCs), polynuclear aromatic hydrocarbons (PAHs), and pesticides/polychlorinated biphenyls (PCBs).

2.1.2 Site 5 – Former Paint Shop Disposal Area

The former paint shop disposal area is a location where dried paint wastes were reportedly placed at the edge of the Beaufort River from the 1930s to the 1960s. In 1972, this area was covered with soils and, later, construction rubble. The location of this area is illustrated on Figure 2-2.

In 1995, two sediment samples along the bank were collected and analyzed for TCL/TAL compounds. Metals at concentrations greater than background, PAHs, VOCs, and pesticides were detected in the sediments at the site.

2.1.3 Site 9 – Paint Waste Storage Area

This area was an unlined pad used to store paint wastes from approximately 1969 to 1984 (see Figure 2-3). In 1984, the upper 6 inches of soil were removed and the area was paved. In 1995, three soil samples were collected from surface areas near the paved area. These samples were found to contain elevated concentrations of several metals, PAHs, VOCs, PCBs, and several pesticides.

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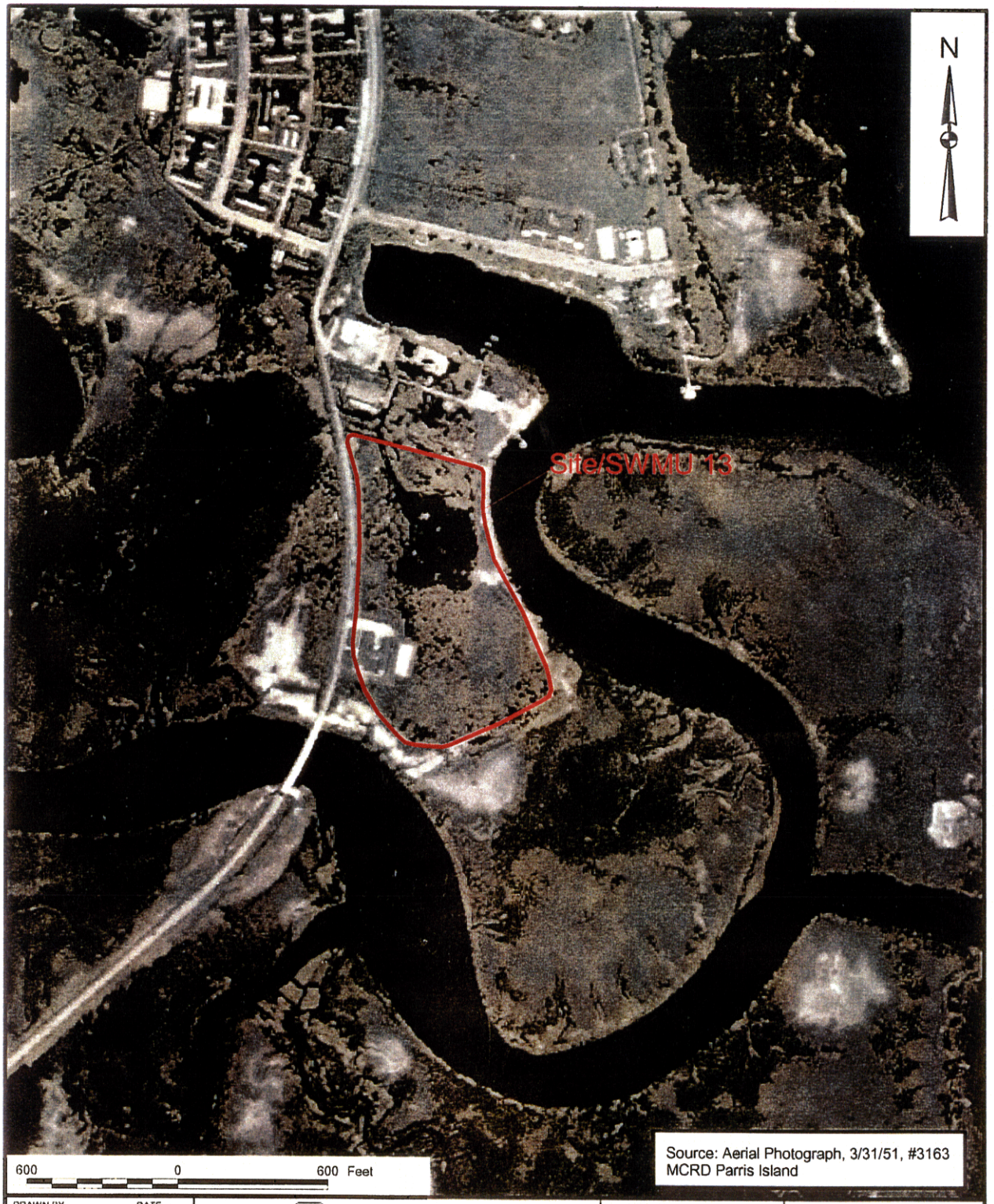

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COST/SCHEDULE-AREA		APPROVED BY — / DATE —	
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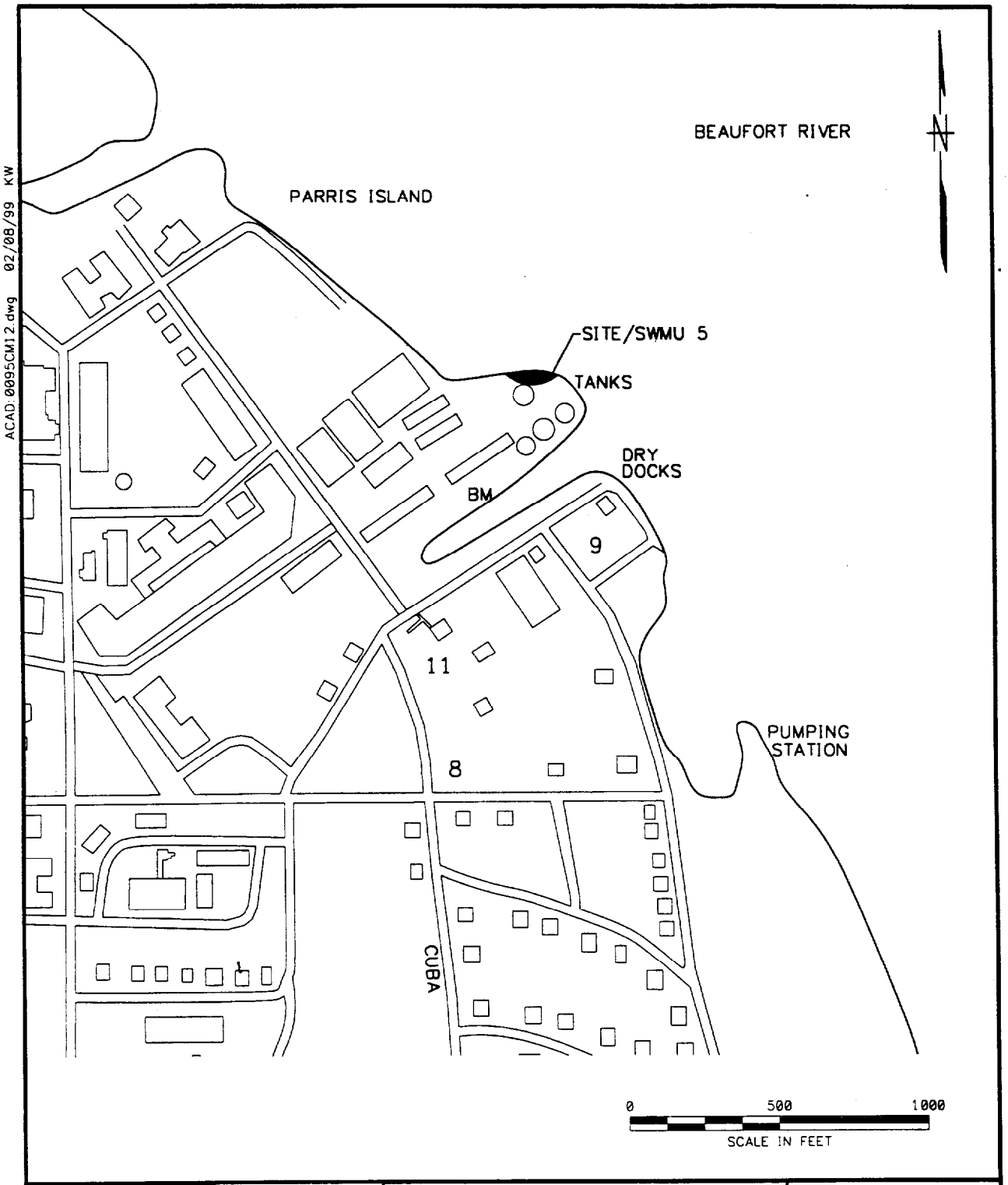

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DRAWN BY KW DATE 2/8/99			CONTRACT NO. 0095
CHECKED BY DATE		SITE/SWMU 5 FORMER PAINT SHOP DISPOSAL AREA MCRD PARRIS ISLAND PARRIS ISLAND, SOUTH CAROLINA	APPROVED BY DATE
COST/SCHED-AREA			APPROVED BY DATE
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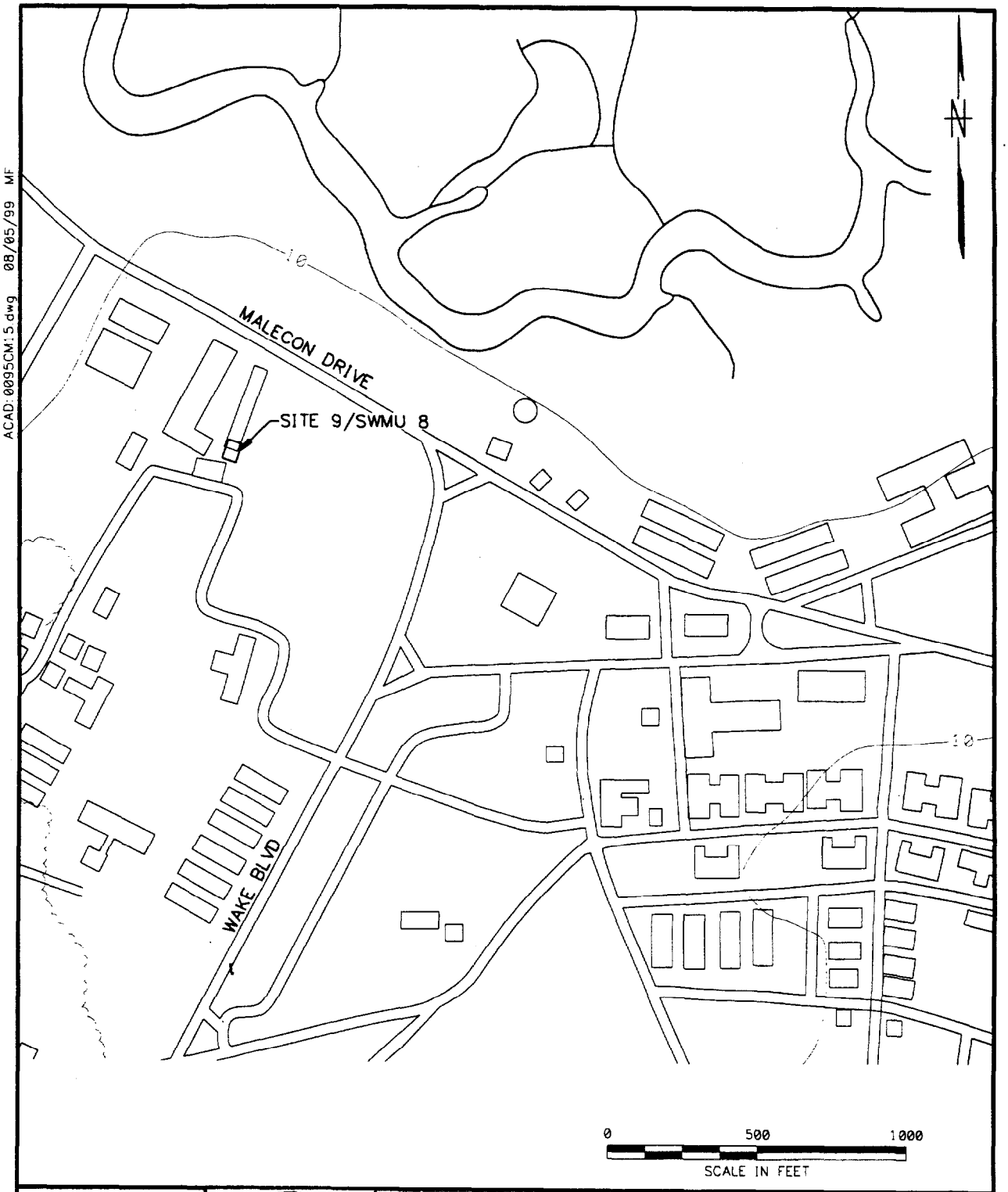

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2.1.4 SWMU 21 – Weapons Power Plant Oil/Water Separator

The oil/water separator has been in use since at least 1978 (based on a name plate on the unit). The separator is designed to handle a maximum of 15 gallons per minute of precipitation from a No. 6 fuel oil aboveground storage tank and associated truck unloading pad. The site was originally considered for investigation because a sump located within the steam plant may have been tied into this separator. This sump could have contained hazardous chemicals, and therefore releases from the separator could impact the receiving stream. Dye testing conducted by MCRD Parris Island on the sump indicated that the sump does not tie into the separator but rather the sump is tied into the sanitary sewer. The location of the oil/water separator is illustrated on Figure 2-4.

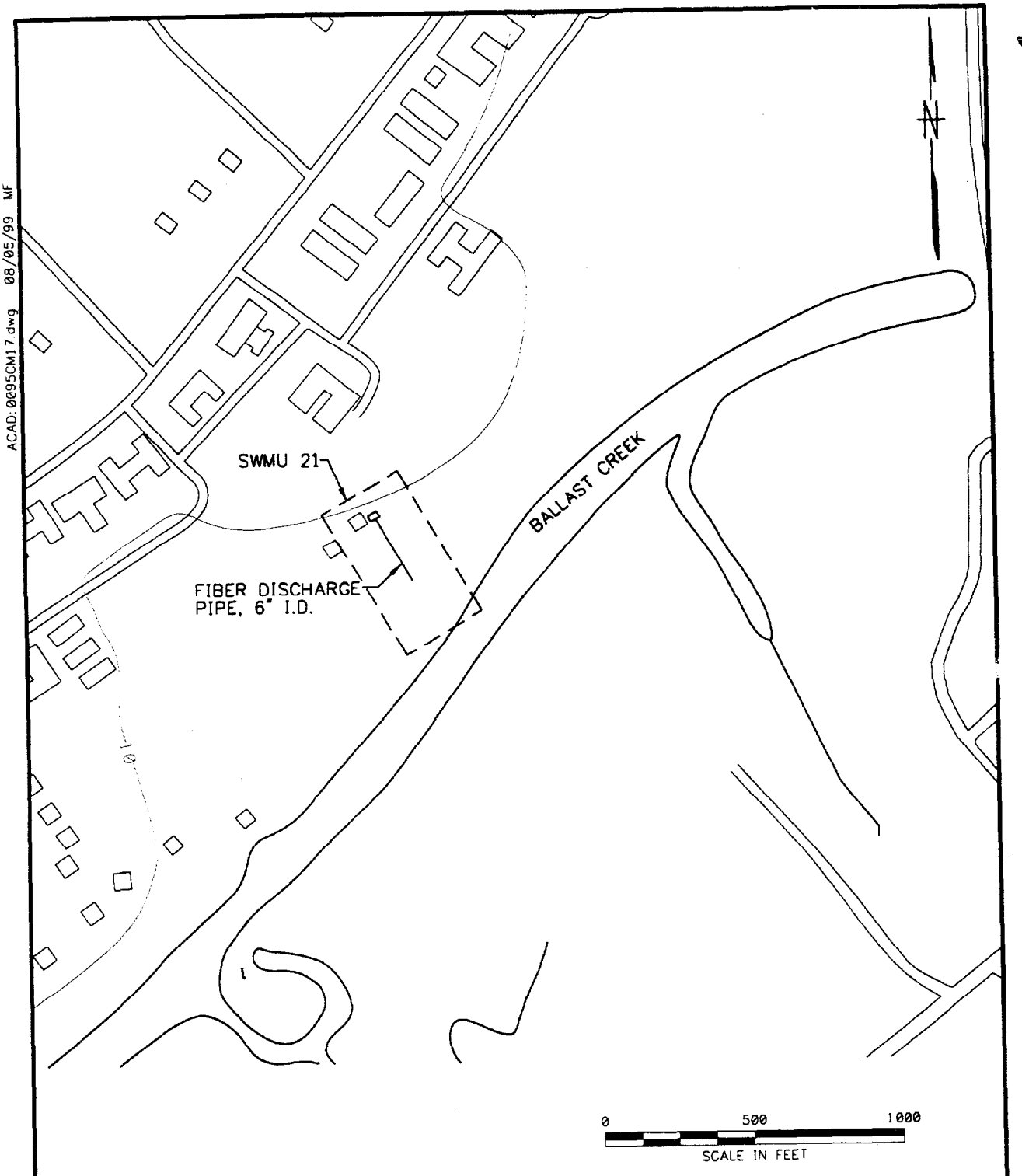
In 1995, one sediment sample was collected at the discharge point of the oil/water separator and analyzed for TCL/TAL parameters. Several metals at concentrations above background were detected. PAHs, one VOC, and one pesticide were also detected.

2.1.5 SWMU 27 – Equipment Parade Deck SAA

SWMU 27 was used for storage of miscellaneous equipment for an unknown period of time. The location of SWMU 27 is illustrated in Figure 2-5. In 1995, two soil samples were collected in the area of the pad. Several metals were detected at concentrations similar to background. In addition, PAHs, VOCs, and pesticides were detected. One area of SWMU 27 was used for storage of transformers. This area was not tested in 1995 to determine if PCB contamination is present.

2.1.6 SWMU 35 – DRMO Salvage Storage Area

The DRMO Salvage Area (illustrated in Figure 2-6) has been used from 1964 to present to inventory miscellaneous salvage material, including waste lead acid batteries. In 1995, three soil samples were collected throughout the area. Several metals were detected at concentrations similar to background. In addition, several PAHs, VOCs, PCBs, and pesticides were detected in site soils. Samples were not collected in the area of the battery storage. As a result, it is unknown whether metal releases have occurred at the battery storage area.



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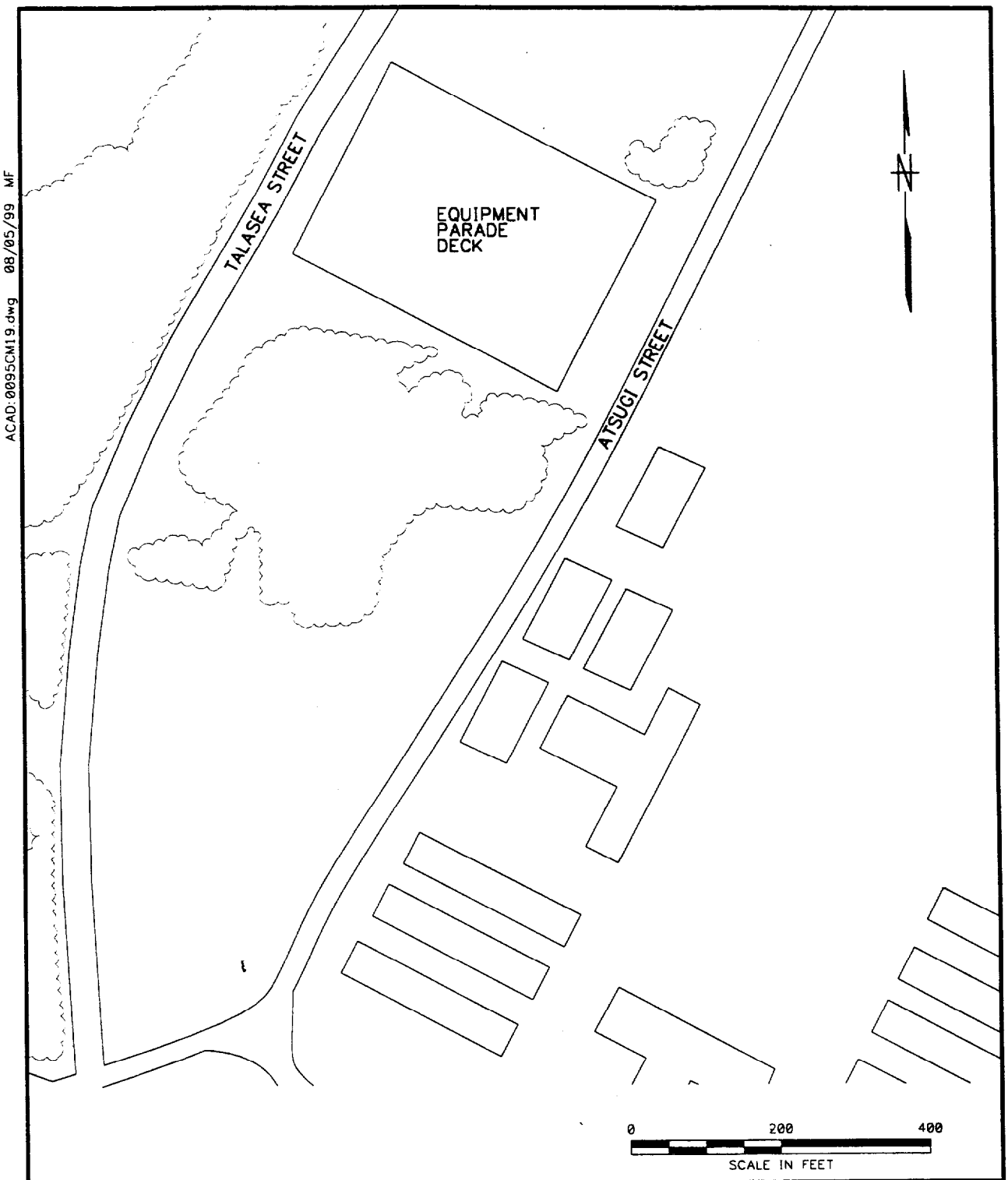

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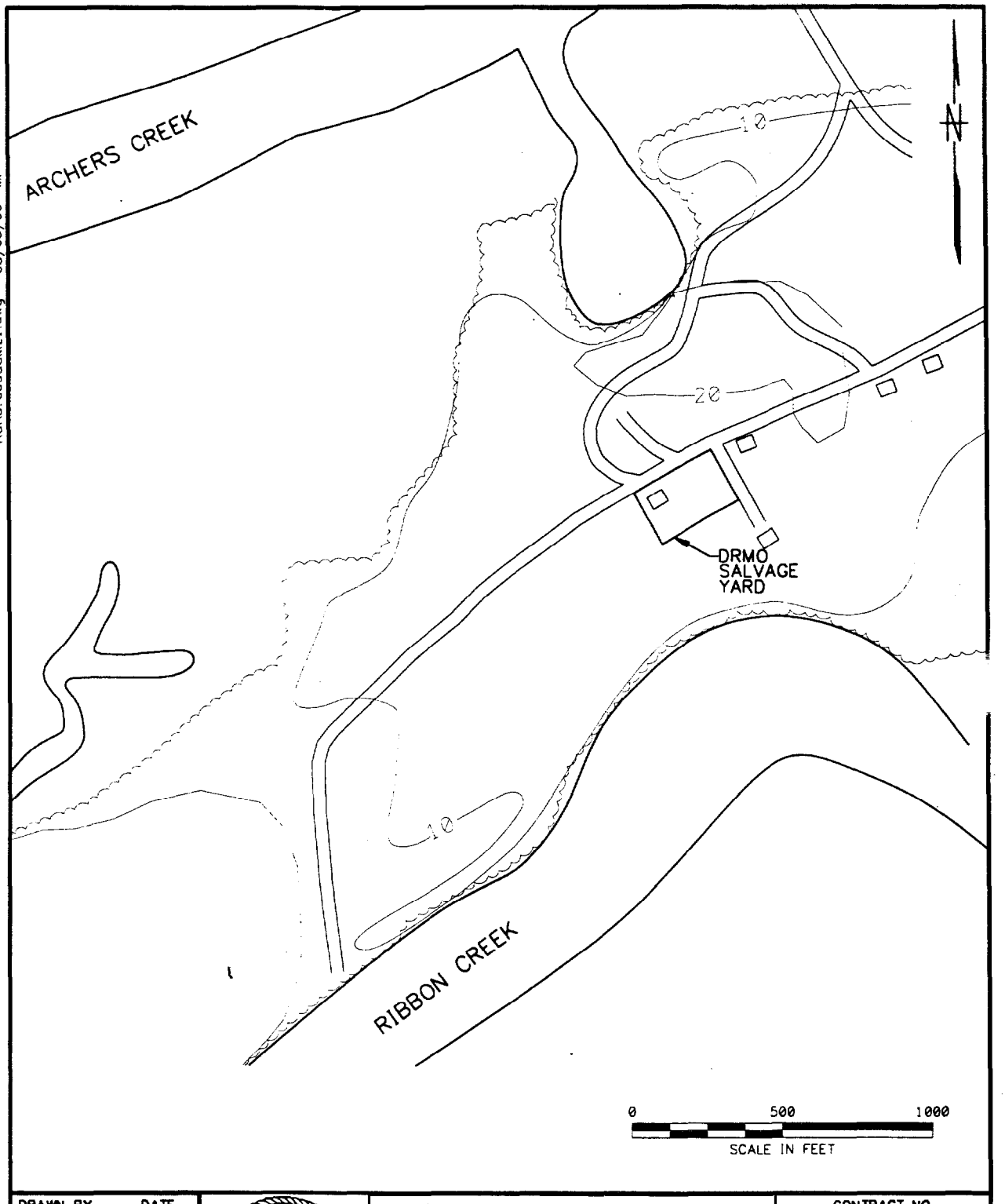

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2.2 SITE HYDROGEOLOGY

A summary of the site hydrogeology for MCRD Parris Island is provided in this section. The site hydrogeology is based on investigations that have been conducted at other sites within MCRD Parris Island.

2.2.1 Surficial Aquifer

The surficial or water-table aquifer is unconsolidated and restricted to the shallow, Pleistocene- to Holocene-age, fine-grained, sedimentary deposits of the Pamplico and Waccamaw Formations (Hughes et al., 1989). Based upon previous investigations at MCRD Parris Island, the upper 20 feet of sediment consists of very fine, yellow-brown sand with traces of clay and silt with thin (approximately 6 inches thick), discontinuous layers of greenish-gray silty clay. The surficial aquifer is estimated to be 30 feet thick in the area. An estimated transmissivity of 1,300 ft^2/day with a storage coefficient of 0.20 has been reported for sands within the shallow deposits (Hassen, 1985). Water-table depths range from 0 to 10 feet, and seasonal changes can be as great as 6.5 feet (NEESA, 1986).

2.2.2 Confining Layer

The surficial aquifer is underlain by the unconsolidated, Miocene-age, Hawthorn Formation (Hughes et al., 1989). The Hawthorn Formation is a geological formation that hydraulically separates the unconfined surficial aquifer from the underlying, artesian Floridan Aquifer. The elevation at the top of the Hawthorn Formation, where present, is reported to be within the range of 30 to 60 feet below mean sea level (msl) at Parris Island. The thickness of the Hawthorn Formation is anticipated to be between 20 to 40 feet (NEESA, 1986). Hughes, et al. (1989) calculated the leakage through the Hawthorn Formation to be 0.0002 ft^3/day for every foot of head difference (using an average formation thickness of 30 feet and vertical hydraulic conductivity of 0.006 ft/day).

2.2.3 Floridan Aquifer

The principal source of groundwater used for consumption in the Beaufort County, South Carolina area is the Floridan Aquifer (Smith, 1987). This artesian aquifer system is contained within the Santee Limestone Formation, has a total depth of approximately 1,000 feet, and is divided into the Upper Unit and the Lower Unit (NEESA, 1986).

2.3 STATEMENT OF PROBLEM

Based previous studies conducted at SWMU 21 and the five SI/CS sites, it has been determined that environmental media may have been affected at these sites and that additional evaluation is required to determine whether further action is needed.

3.0 PRELIMINARY ASSESSMENT

This section presents a discussion of the current assessment of site contamination at SWMU 21 and the five SI/CS sites.

3.1 SITE 13C-INERT DISPOSAL AREA C

Because of the potential for dredge spoils to be contaminated with hazardous constituents from the maintenance of the marina and waterways, surface soil samples were collected in the area of the dredge spoils and analyzed for TCL/TAL parameters. The samples were found to contain metals at concentrations greater than background, and VOCs and some SVOCs.

3.2 SITE 5 – FORMER PAINT SHOP DISPOSAL AREA

In 1995, two sediment samples were collected and analyzed for TCL/TAL compounds. Sample locations were selected based on their proximity to the rear door of Building 177 and because of the observed visual signs of dried paint. Metals at concentrations greater than background, PAHs, VOCs, and pesticides were detected in the sediments near the high tidal mark at the site. However, sediments in the reported area of the former paint shop were not sampled.

3.3 SITE 9 – PAINT WASTE STORAGE AREA

In 1995, three soil samples were collected from surface areas near the paint waste storage area. These samples were found to contain elevated concentrations of several metals, PAHs, VOCs, PCBs, and several pesticides. These data are sufficient to make a determination that site chemicals have impacted area soils. However, it is unknown whether these chemicals have migrated to the groundwater.

3.4 SWMU 21 – WEAPONS POWER PLANT OIL/WATER SEPARATOR

In 1995, one sediment sample was collected at the discharge point of the oil/water separator and analyzed for TCL/TAL parameters. Several metals at concentrations above background and PAHs, one VOC, and one pesticide were detected. The data are sufficient to confirm that a release may have occurred; however, the extent of potential contamination is unknown.

3.5 SWMU 27 – EQUIPMENT PARADE DECK SAA

In 1995, two soil samples were collected in the area of the pad. Several metals were detected at concentrations similar to background. In addition, PAHs, VOCs, and pesticides were detected. However, an area used for the storage of electrical transformers was not characterized during this sampling event and may be potentially contaminated with PCBs.

3.6 SWMU 35 – DRMO SALVAGE STORAGE AREA

In 1995, three soil samples were collected throughout the area. Several metals were detected at concentrations similar to background. In addition, several PAHs, VOCs, PCBs, and pesticides were detected in site soils. However, samples were not collected in the battery storage area. As a result, it is unknown whether metal releases have occurred at the battery storage area.

4.0 INVESTIGATION SCOPING

4.1 INVESTIGATION SUMMARY AND RATIONALE

Table 4-1 presents a summary of the rationale for the analytical program and a summary of the proposed investigation. All data will be collected in accordance with the Master FSP, the Master QAP (B&R Environmental, 1998), and U.S. EPA Region IV Environmental Investigations Standard Operating Procedures Quality Assurance Manual (EISOPQAM) (U.S. EPA, 1996).

4.2 ANALYTICAL PARAMETER RATIONALE

This section provides the rationale for the proposed analytical program to be conducted on the samples collected from SWMU 21 and the five SI/CS sites.

4.2.1 Site 13C – Dredge Spoils Area

No wastes have been identified for Site 13C. However, there is a potential that the sediments may have accumulated hazardous constituents resulting from migration of chemicals through the surface water. Relevant migration properties and the basis for analyte selection are presented below.

Non-chlorinated VOCs and some semivolatile organic compounds (SVOCs) can dissolve into water at concentrations of environmental significance (i.e., greater than groundwater action levels). In addition, they are only weakly adsorbed onto soil particles and therefore can migrate with groundwater.

Because of low water solubility coefficients, PCBs, pesticides, and most SVOCs remain adsorbed onto the soil and do not readily dissolve into groundwater. In addition, once in the groundwater, these chemicals have a high affinity for natural soil/sediment organic contents and do not migrate with the groundwater. Relatively high soil and sediment organic carbon contents found in similar areas at Parris Island support the low potential for migration. Although these constituents would not be expected to be present in the site groundwater, another evaluation of the potential for groundwater contamination will be conducted after receipt of soil data from Site 13C.

A decision to test Site 13C groundwater for SVOCs, PCBs, pesticides will be based on a comparison of the leaching potential of chemical concentrations detected in site soils with groundwater standards (MCLs). The leaching potential will be determined using a conservative assumption of equilibrium

TABLE 4-1

INVESTIGATION RATIONALE
SWMU 21 AND FIVE SI/CS SITES
MCRD PARRIS ISLAND, SOUTH CAROLINA
PAGE 1 OF 2

Site/SWMU	Identified/Suspected Contaminants	Preliminary Assessment	Data Gaps/Needs	Resolution Of Data Gaps/Needs
Site 13C (Inert Disposal Area C – Dredge Spoils Area)	At Site 13C, detections of metals greater than background and VOCs, and SVOCs were observed in surface soil.	Surface soil in the central portion of the dredge spoils has not been characterized.	• Determine whether a significant release of contamination has occurred.	• Analyze one groundwater sample for TCL VOCs plus additional Appendix IX VOCs and TAL Metals plus tin. • Analyze one groundwater sample for TCL VOCs and TAL metals. • Analyze one groundwater sample for TDS. • Collect one surface soil sample in the dredge spoils area and analyze for TCL organics and TAL inorganics plus tin. • Data gaps filled from new and existing data.
Site 5 (Former Paint Disposal Area)	Metals at concentrations greater than background, PAHs, VOCs, and pesticides were detected in the sediments at the site.	Site contaminants may have migrated to nearby sediment.	• Determine whether a significant release of contamination has occurred.	• Analyze one sediment sample for TCL VOCs and SVOCs and TAL metals (Total). • Data gaps filled from new and existing data.
Site 9 (Paint Waste Storage Area)	Surface soils samples were collected near the source area. Elevated concentrations of metals, PAHs, VOCs, PCBs, and pesticides were observed.	Contaminants in surface soil may have migrated to groundwater.	• Determine whether site activities have impacted groundwater.	• Analyze one groundwater sample for TCL VOCs and SVOCs and TAL metals (Total). • Analyze one groundwater sample for TCL VOCs plus Appendix IX constituents and TAL metals plus tin. • Data gaps filled from new and existing data.

TABLE 4-1

INVESTIGATION RATIONALE
SWMU 21 AND FIVE SI/CS SITES
MCRD PARRIS ISLAND, SOUTH CAROLINA
PAGE 2 OF 2

Site/SWMU	Identified/Suspected Contaminants	Preliminary Assessment	Data Gaps/Needs	Resolution Of Data Gaps/Needs
SWMU 21 (Weapons Power Plant Oil/Water Separator)	Sediment was observed to contain metals above background. PAHs, one VOC, and one pesticide were detected.	Data are sufficient to confirm that a release may have occurred; however, the extent of potential contamination is unknown.	• Determine nature and extent of sediment contamination. • Baseline Risk Assessment.	• Analyze one sediment sample for TAL Metals (Total) and TCL SVOCs and PAHs. • Data gaps filled from new and existing data.
SWMU 27 (Equipment Parade Deck SAA)	Soil samples were observed to contain metals similar to background and detections of PAHs, VOCs, and pesticides.	An area used for the storage of transformers was not investigated.	• Determine whether a release of PCBs has occurred.	• Analyze three surface soil samples for TCL PCBs. • Data gaps filled from new and existing data.
SWMU 35 (DRMO Salvage Storage Area)	Soil samples were observed to contain metals similar to background and detections of PAHs, VOCs, PCBs, and pesticides.	An area used for the storage of batteries was not investigated.	• Determine whether a release of battery acid has occurred.	• Analyze three surface soil samples for TAL metals plus tin. • Analyze one groundwater sample for TAL metals plus tin and TDS. • Data gaps filled from new and existing data.

partitioning between soil and groundwater, chemical specific K_d factors, and total organic carbon (TOC) data from other Parris Island sites.

The migration potential for metals is highly variable and includes metal oxidation state, waste matrix, soil cation exchange capacity, anions present in the groundwater, and other groundwater parameters (pH). As a result, the potential for metal migration can not be predicted. Therefore, the soil and groundwater investigation for Site 13C will address metals.

Since the source of potential hazardous constituents in Site 13C soils is uncertain, one soil sample will be collected from the center of the unit and analyzed for TCL/TAL parameters plus tin.

Two groundwater samples are proposed for Site 13C. The groundwater samples will be collected down gradient of Site 13C. Based on the planned proximity of these sample locations to the site, the groundwater samples should also represent the upper bound of hazardous chemicals potentially migrating from these sites. One of the Site 13C groundwater samples will be analyzed for TCL VOCs plus additional Appendix IX VOCs and TAL metals plus tin. The second Site 13C groundwater sample will be analyzed for TCL VOCs and TAL metals. Based on the concentration of SVOCs, pesticides, and PCBs detected at Site 13C soils, the associated groundwater samples may also be analyzed for these constituents.

Additionally, one groundwater sample will be analyzed for total dissolved solids (TDS) to evaluate the potential of the groundwater as a drinking water source. One groundwater sample from Site 13C will undergo this analysis due to the site's proximity to Ballast Creek, a tidally influenced stream.

4.2.2 Site 5 – Former Paint Shop Disposal Area

Based on a record search and personnel interviews conducted during the IAS and RFA, the following wastes may have been managed at Site 5:

- Dried Paint Wastes
- Paint Solvents

Hazardous constituents identified with paint wastes consist of VOCs and metals. Some paints may be oil based and therefore contain SVOCs. Hazardous constituents associated with solvents consist of only

VOCs, (e.g., toluene and methyl ethyl ketone). Relevant migration properties and the basis for analyte selection are presented below.

VOCs and some SVOCs can dissolve into water at concentrations of environmental significance (i.e., greater than surface water action levels). VOCs are only weakly adsorbed onto soil/sediment particles and therefore can migrate with surface water. SVOCs normally adsorb onto soil/sediment particles and do not migrate. Therefore, the sediments will be tested for SVOCs. Since the surface water at Site 5 flushes through the area at a relatively high rate, VOCs remaining in the sediments at this site are unlikely. However, for completeness, the investigation at Site 5 will address VOCs in the sediments.

The migration potential for metals is highly variable and includes metal oxidation state, waste matrix, soil cation exchange capacity, anions present in the surface water, and other surface water parameters (pH). As a result, the potential for metal migration can not be predicted. Therefore, the sediment investigation for Site 5 will address metals.

PCBs, pesticides, and PAHs are not identified as paint- and paint-solvent-related hazardous constituents. As a result, testing for these parameters will not be conducted.

A single sediment sample is proposed for Site 5, with the location to be at the reported disposal area. As a result, this sample will be biased toward the potential for contamination and should represent the upper bound of hazardous chemicals potentially present at the site.

4.2.3 Site 9 – Paint Waste Storage Area

Based on a record search and personnel interviews conducted during the IAS and RFA, the following waste may have been managed at Site 9:

- Paint Wastes

Hazardous constituents identified with paint wastes consist of VOCs and metals. Relevant migration properties and the basis for analyte selection are presented below. Some paints may be oil based and therefore contain SVOCs. However, based on soil testing from 1996, except for PAHs, SVOCs were not detected in site soils. Therefore, SVOCs would not be expected in site groundwater.

VOCs can dissolve into water at concentrations of environmental significance (i.e., greater than groundwater action levels). VOCs are only weakly adsorbed onto soil/sediment particles and therefore

can migrate with groundwater. As a result, a groundwater investigation for Site 9 will address VOCs groundwater. Data from the 1996 investigation will be used to address potential VOC contamination in soils.

The migration potential for metals is highly variable and includes metal oxidation state, waste matrix, soil cation exchange capacity, anions present in the surface water, and other surface water parameters (pH). As a result, the potential for metal migration can not be predicted. Therefore, the groundwater investigation for Site 9 will address metals. Data from the 1996 investigation will be used to address potential metal contamination in soils.

PCBs, pesticides, PAHs, and other semivolatile organics are not identified as paint-waste-related constituents. As a result, testing for these parameters will not be conducted.

Two groundwater samples are proposed for Site 9. One sample will be located just downgradient of the Site (east). The second well will be located to the west, between the site and a nearby groundwater well. As a result, these samples will be biased toward the potential for contamination and should represent the upper bound of hazardous chemicals potentially present at the site.

In order to comply with both Federal and state requirements, the groundwater sample downgradient of Site 9 will be analyzed for TCL VOCs plus additional Appendix IX VOCs and TAL metals plus tin. The other Site 9 groundwater sample will be analyzed for TCL VOCs and TAL metals.

4.2.4 SWMU 21 – Weapons Power Plant Oil/Water Separator

Based on a record search and personnel interviews conducted during the RFA, the following waste may have been managed at SWMU 21:

- Waste Fuels

Hazardous constituents identified with waste fuels consist of VOCs, some SVOCs, and PAHs. In addition, waste fuels can sometimes be contaminated with low concentrations of metals. Relevant migration properties and the basis for analyte selection are presented below.

VOCs and some SVOCs can dissolve into water at concentrations of environmental significance (i.e., greater than surface water action levels). VOCs are only weakly adsorbed onto soil/sediment particles, and therefore can migrate with surface water. Since the surface water at SWMU 21 flushes through the

area at a relatively high rate, VOCs remaining in the sediments at this site are unlikely. In addition, based on sediment testing conducted in 1996, the only VOC detected in the site sediment was carbon disulfide at 3 µg/kg. Carbon disulfide at this concentration is believed to be of natural origin. Carbon disulfide is commonly found in marsh sediments and was detected in two of the six background sediment samples for Parris Island at concentrations of 2 and 7 µg/kg. As a result, additional testing for VOCs will not be conducted.

SVOCs normally adsorb onto soil/sediment particles and do not migrate. Therefore, the sediments will be tested for SVOCs.

Because of low water solubility coefficients, PAHs remain adsorbed onto the soil and do not readily dissolve into surface water. In addition, once in the surface water, these chemicals have a high affinity for natural sediment organic contents and do not migrate with the surface water. Relatively high sediment organic carbon contents found in similar areas at Parris Island support the low potential for migration. Therefore, the sediment investigation for SWMU will address PAHs for sediments. In the event that PAHs are found at significant levels in the source area sediments, they would be addressed in subsequent investigations.

PCBs and pesticides are not identified as fuel-related constituents. As a result, testing for these parameters will not be conducted.

The migration potential for metals is highly variable and includes metal oxidation state, waste matrix, soil cation exchange capacity, anions present in the groundwater, and other groundwater parameters (pH). As a result, the potential for metal migration can not be predicted. Therefore, the sediment investigation for SWMU 21 will address metals.

A single sediment sample is proposed for SWMU 21 at this time. The sample will be collected in a depression just downstream of the discharge point. This depression would act as a deposition area for contaminants. As a result, this sample will be biased toward the potential for contamination and should represent the upper bound of hazardous chemicals potentially present at the site. However, prior to conducting an RFI report for SWMU 21, it is anticipated that additional sampling may be required to better delineate the extent of contamination, if present. The additional sampling would be collected either upstream or downstream of the depression, depending on the results of this phase. If the depression is found to be clean, the testing may be conducted in the drainage swale leading from the discharge pipe to the depression. If significant contamination is found in the depression, then the testing may be conducted in the marsh beyond the depression.

4.2.5 SWMU 27 – Equipment Parade Deck SAA

Based on a record search and personnel interviews conducted during the RFA, the following wastes may have been managed at SWMU 21:

- Metals Parts
- Transformers

Hazardous constituents identified with metals parts consist of only metals. Hazardous constituents identified with transformers consist of PCBs. As a result, site soils can be contaminated with metals and PCBs. Relevant migration properties and the basis for analyte selection are presented below.

Because of low water solubility coefficients, PCBs remain adsorbed onto the soil and do not readily dissolve into groundwater. In addition, once in the groundwater, these chemicals have a high affinity for natural soil organic contents and do not migrate with the groundwater. Relatively high soil organic carbon contents found in similar areas at Parris Island support the low potential for migration. Therefore, the soil investigation for SWMU 27 will address these constituents for soils. However, based on the low probability of presence in the waste and lack of migration potential, groundwater will not be analyzed for PCBs. In the event that these chemicals are found at significant levels in the source area soils, they would be addressed in subsequent investigations.

The migration potential for metals is highly variable and includes metal oxidation state, waste matrix, soil cation exchange capacity, anions present in the groundwater, and other groundwater parameters (pH). As a result, the potential for metal migration can not be predicted. However, since the metals were brought to the SWMU in relatively inert (metallic) form, the potential for the metals to have migrated to the soils is low. The 1996 soil data will be used to evaluate metal releases to soils. In the event that metals are found at significant levels in the source area soils, they would be addressed in subsequent investigations.

VOCs, pesticides, and SVOCs are not identified as SWMU-related constituents. As a result, testing for these parameters will not be conducted.

Three soil samples are proposed for SWMU 27, with the location to be based on personnel with direct knowledge of where the transformers were stored. These samples should represent the upper bound of hazardous chemicals potentially present at the site.

4.2.6 SWMU 35 – DRMO Salvage Yard

Based on a record search and personnel interviews conducted during the RFA, the following wastes may have been managed at SWMU 35:

- Metal Parts
- Lead Acid Batteries

Hazardous constituents identified with metal parts consist of only metals. Hazardous constituents identified with lead acid batteries consist of lead and sulfuric acid. Relevant migration properties and the basis for analyte selection are presented below.

The migration potential for metals is highly variable and includes metal oxidation state, waste matrix, soil cation exchange capacity, anions present in the groundwater, and other groundwater parameters (pH). As a result, the potential for metal migration can not be predicted. However, since most of the metals (except lead acid batteries) were brought to the SWMU in relatively inert (metallic) form, the potential for the metals to have migrated to the soils is low. The 1996 soil data will be used to evaluate metal releases to soils for the majority of the SWMU. In the event that these metals are found at significant levels in the source area soils, they would be addressed in subsequent investigations.

Lead in lead acid batteries is slightly water soluble. Therefore, the soil and groundwater investigation for SWMU 35 in the lead battery acid storage area will address lead.

Sulfuric acid dissolves into water at concentrations of environmental significance. Sulfuric acid is only weakly adsorbed onto soil/sediment particles and therefore can migrate with groundwater. As a result, the groundwater investigation for SWMU 35 in the lead battery acid storage area will address acidity (pH) in groundwater.

VOCs, pesticides, and SVOCs are not identified as SWMU-related constituents. As a result, testing for these parameters will not be conducted.

Three soil samples will be collected for the lead acid battery storage portion of SWMU 35. The soil sample locations are based on personnel with direct knowledge of where the batteries were stored and the visual evidence of cracks in the underlying asphalt. As a result, these samples should represent the

upper bound of hazardous chemicals potentially present at the site. For completeness, the three soil samples will be analyzed for TAL metals plus tin.

One groundwater sample is proposed for battery storage area of SWMU 35. This sample will be located just downgradient of the SWMU. As a result, these samples will be biased toward the potential for contamination and should represent the upper bound of hazardous chemicals potentially present at the SWMU. The groundwater sample will be analyzed for TAL metals plus tin.

Additionally, one groundwater sample will be analyzed for total dissolved solids to evaluate the potential of the groundwater as a drinking water source. A groundwater sample from SWMU 35 will undergo this analysis due to the site's proximity to Ribbon Creek, a tidally influenced stream.

5.0 HUMAN HEALTH AND ECOLOGICAL RISK ASSESSMENT

The following two sections describe the methodology that will be used to complete the human health and ecological risk assessments for SWMU 21.

5.1 HUMAN HEALTH RISK

A quantitative human health risk assessment will be conducted for SWMU 21. This quantitative human health risk assessment will consist of three steps: 1) preliminary review of environmental setting and land-use and 2) preliminary contaminant screening and 3) a baseline risk assessment. Additional details concerning this methodology are provided in Appendix A of the Master Work Plan, Volume III (B&R Evironmental, 1998).

5.2 ECOLOGICAL RISK

A preliminary ecological risk evaluation will be performed for SWMU 21. Analytical data generated under this work plan, as well as historical data from the sites, will be used to determine if measured chemical concentrations pose a potential threat to ecological receptors. The general methodologies that will be used to assess risks to ecological receptors are contained in Appendix B of the Master Work Plan Volume III for MCRD, Parris Island (B&R Environmental, 1998).

The preliminary ecological risk evaluation will consist of a "screening level problem formulation and ecological evaluation" step, including review of historical documents, potential COCs, site characteristics, photographs, maps, and notes from a site visit. Simple food-chain modeling, based on the approach used by the U.S. EPA's Environmental Response Team, will be performed on SWMU 21 data to screen for risk to vertebrate receptors.

6.0 FIELD OPERATIONS

This section outlines the project-specific field investigation activities and procedures to be performed at SWMU 21 and the five SI/CS sites. It is to be used in conjunction with the Master FSP, Volume II of the Master Work Plan for MCRD, Parris Island (B&R Environmental, 1998) and references the Master FSP where appropriate.

Field operation activities to be performed at MCRD Parris Island for this investigation include mobilization of equipment, site restoration, soil boring installation, temporary monitoring well installation, site surveying, equipment decontamination, and waste handling. These activities are discussed in the following sections. Procedures for performing soil, sediment, and groundwater sampling are discussed in Section 7.

All field activities will be performed as described in the Master FSP and as per the Standard Operating Procedures (SOPs) provided in Volume II of the Master Work Plan, except where noted. All well installation activities will be performed under the direction of a state-certified Professional Geologist familiar with all state, federal, and local laws, regulations, and requirements pertaining to the geologist's duties and responsibilities. Additionally, a state-certified driller will be used.

6.1 MOBILIZATION/DEMOBILIZATION

Mobilization activities will be performed in accordance with the procedures outlined in the Master FSP. Field activities associated with SWMU 21 and the five SI/CS sites will be coordinated concurrently.

6.2 SITE RESTORATION

If investigation activities[1] (e.g., monitoring well installation) disturb or alter the landscape, vegetation, or other features of the sites under investigation, the site may require restoration to conditions prior to the investigation. Portions of the sites will be regraded if investigation activities alter the natural contour of the sites. Additionally, all equipment used during the investigation and investigation-derived waste (IDW) will be removed from the sites.

6.3 DRILLING METHODS

The following sections describe several drilling techniques that may be used during field activities at the MCRD Parris Island, South Carolina. Currently, hollow-stem auger and direct-push technologies (DPT)

are being considered. These techniques are discussed in greater detail in SOP GH-1.3, Soil and Rock Drilling Methods, in Appendix B of the Master Work Plan, Volume II.

6.3.1 Hollow-Stem Auger Soil Boring Drilling

One possible method for advancing soil borings is via the hollow-stem auger drilling method. If this method is selected, soil borings will be advanced at temporary monitoring wells locations. The hollow-stem augers will have a minimum inside diameter of 4¼ inches and boreholes will have a minimum diameter of 8¼ inches. The use of drilling fluids is prohibited during soil boring drilling.

Split-spoon samples will be collected continuously from the ground surface to the termination depth of the borings in accordance with ASTM Standard Method D 1586-84. The split-spoon samplers will have a minimum inside diameter (I.D.) of 2 inches and a length of 2 feet. Each split-spoon sample will be field screened with a flame ionization detector (FID) or photoionization detector (PID) upon collection.

A head-space field analysis will be performed. Split-spoon samples will be divided and placed in 8-oz. lithologic sample jars. If readings are detected above background levels or discoloration of the soil is noted, the split-spoon samples will be containerized in 55-gallon drums and stored at the point of generation for additional testing. Otherwise, the split-spoon sample will be spread on the ground near the soil boring with auger cuttings.

A boring log will be maintained, as described in the Master FSP, for each soil boring by the state-certified field geologist. Field screening and head-space analysis results and a lithologic description of each split-spoon sample will be recorded on the boring log. At a minimum, the information outlined in the Master FSP will be recorded on the boring log for each boring.

6.3.2 Temporary Monitoring Wells Using Hollow-Stem Auger Drilling

Monitoring wells will be installed and constructed in accordance with all applicable state of South Carolina regulations (e.g., Code of Laws of South Carolina 1976, Regulation 61-71 Well Standards) and the Master FSP. Prior to the construction of any monitoring well, a request will be submitted to the South Carolina Department of Health and Environmental Control (SCDHEC) for approval. The request will contain the following information:

- Proposed location(s) on a scaled map or plate
- Proposed construction detail
- Intended purpose of the monitoring well(s)

The state also requires a formal submission detailing the activity performed during the installation of the monitoring well(s). A monitoring well record form or other form provided and/or approved by the state will be completed and submitted within 30 days after completion of each monitoring well. The form will contain the following information:

(a) Name and address of facility/owner
(b) Location of monitoring well(s) on a scaled map or plate
(c) Driller and certification number
(d) Date drilled
(e) Driller's or geologist's log
(f) Total depth
(g) Screened interval
(h) Diameter and construction details
(i) Depth to water table with date and time measured
(j) Surveyed elevation of measuring point with respect to an established benchmark
(k) State-certified professional geologist's seal and certification number

Temporary monitoring wells will be installed in accordance with Master FSP, Section 2.3.4, of the Master Work Plan, Volume II (B&R Environmental, 1998) and the Environmental Investigation Standard Operating Procedures and Quality Assurance Manual (EISOPQAM) (U.S. EPA, 1996b). Five shallow temporary monitoring wells (total) will be installed during this investigation to monitor the top of the surficial aquifer at Sites 9 and 13C and SWMU 35. The proposed locations of these temporary monitoring wells are presented in Section 7. The top of the screened interval for the shallow monitoring wells will be placed such that the top of the screen is at or just beneath the water table. Should the hollow-stem auger drilling technique be used to advance soil borings, the temporary monitoring wells will be constructed of 2-inch I.D., flush-threaded Schedule 40 PVC and compatibly threaded Schedule 40 PVC well casing riser.

Well screens for shallow monitoring wells will be 5 feet long with 0.010-inch openings. There is sufficient history from existing wells at other sites within MCRD Parris Island to conclude that these shallow surficial wells will be screened in fine-grained material (silt and fine sand); therefore, the anticipated slot size for the shallow well screens is determined to be 0.010. No filter pack is proposed.

Prior to sampling, all monitoring wells will be partially developed to remove the majority of formation cuttings per the Section 2.3.3, Volume II, of the Master Work Plan with the following exceptions. The pH, temperature, turbidity, and specific conductivity measurements will be collected for the purged water after

each borehole volume is removed. The temporary wells will be developed until these readings become stabilized. A minimum of three and a maximum of 10 well volumes will be removed.

Well installation and abandonment procedures are as follows.

- After the soil boring has been drilled to the desired depth, the temporary monitoring well will be installed through the auguers.
- The augers will be pulled up to the top of the water table and the formation allowed to collapse around the well screen. The augers will be left in the ground during well sample.
- After sampling, the boring will be pressure grouted as the well casing and augers are being withdrawn.

6.3.3 Direct-Push Technology

DPT (e.g., Geoprobe® and Hydropunch®) may be used to obtain soil samples and groundwater samples during this field effort. All subcontracted DPT operations will be overseen by the CLEAN contractor. DPT is a useful screening tool to help focus follow-up chemical sampling activities.

Most DPT equipment is mounted in cargo vans or on the bed of a pickup truck and includes a hydraulic-powered probe for driving and removal of hardened steel sample rods. Many DPT rigs are equipped with an additional air percussion option for penetrating dense material and an electric hammer for drilling through asphalt and concrete. A wide variety of sample rods are utilized by the DPT system for soil, soil-gas, and groundwater sampling.

Should DPT be used, soil samples will be collected every 2 feet until the terminus of the boring. The soils will be scanned and the lithologies characterized as previously described in Section 6.4.1. Soils will be disposed as previously described.

6.3.4 Temporary Monitoring Wells Using DPT

Should DPT be used, 4-foot stainless steel screens will be driven to a depth such that the top of the well screen is at or just below the water table. Groundwater samples will be obtained from the temporary drive points using a peristaltic pump. The pH, temperature, turbidity, and specific conductivity measurements will be collected for the purged water after each temporary well volume is removed. The temporary wells

will be purged prior to sampling until a minimum of three and a maximum of 10 well volumes have been removed and these readings have become stabilized. After sampling, the borings will be pressure grouted as the rods are being withdrawn.

6.4 SURVEYING

All proposed temporary groundwater monitoring wells locations, surface soil, and sediment sample locations will be surveyed. A third-order survey will be conducted by a professional surveyor licensed in the state of South Carolina according to the requirements described in the Master FSP of the Master Work Plan, Volume II (B&R Environmental, 1998).

6.5 DECONTAMINATION

Decontamination of major equipment including all down hole equipment and sampling equipment will be in accordance with the Master FSP and SOP SA-7.1, "Decontamination of Field Equipment and Waste Handling." An area for the decontamination pad for major equipment and a source of potable water for steam washing will be arranged by the FOL through MCRD personnel.

6.6 WASTE HANDLING

All solid and liquid wastes generated as a result of this investigation will be handled in accordance with applicable sections of Management of Remediation Waste Under RCRA (U.S. EPA, 1998) and the procedures described in Section 2.11 of the Master FSP and SOP SA-7.1, "Decontamination of Field Equipment and Waste Handling" (B&R Environmental, 1998), with the following exceptions:

Drill rig or DPT vehicle decontamination fluids will be containerized in 55-gallon drums near the point of decontamination. Pending the results of analytical testing, these decontamination fluids will be discharged to the Depot's wastewater treatment plant.

Personal protection equipment will be placed in a suitable trash receptacle at the Depot.

Auger soil cuttings will be screened with a FID or PID. If readings are detected above background levels or discoloration of the soil is noted, the cuttings will be containerized in 55-gallon drums and stored at the point of generation or the MCRD Parris Island 90-day accumulation area for additional testing. Any soils taken to the 90-day accumulation area will be disposed off site in accordance with applicable regulations. Otherwise, the cuttings will be spread on the ground near the soil boring or used as backfill during temporary monitoring well abandonment.

7.0 ENVIRONMENTAL SAMPLING

This section outlines the environmental sampling program and describes the sampling procedures for the field investigation at SWMU 21 and the five SI/CS sites.

7.1 SUMMARY OF ENVIRONMENTAL SAMPLING

The following sections describe the sampling efforts to be conducted at SWMU 21 and the five SI/CS sites. Table 7-1 summarizes the sampling program for the field investigation. Proposed sampling locations are contingent upon utility location and clearance with MCRD personnel.

7.2 SAMPLING PROCEDURES

The following sections describe sampling procedures that will be followed during field activities at SWMU 21 and the five SI/CS sites. Additionally, the following sections present the proposed sampling locations for field activities. The rationale for any deviation of these sampling locations will be documented in the RI/RFI or SI/CS report.

7.2.1 Site 13C– Inert Disposal Area C (Dredge Spoils Area)

At Site 13C, two surface soil sample will be collected in the center of the dredge spoils area (see Figure 7-1). The surface soil sample will be collected in accordance with the methodologies described in the Master FSP and SOP Number SA-1.3, "Soil Sampling." The surface soil sample will be collected from the 0- to 1-foot sampling interval and will be collected to bias the worst-case scenario based on visual and field instrumentation evaluation.

Also at Site 13C, two temporary monitoring wells will be installed as shown in Figure 7-1. The monitoring wells will be sampled during this investigation in accordance with the U.S. EPA Region IV EISOPQAM and SOP SA-1.1, Section 5.7, "Low Flow Purge and Sampling."

7.2.2 Site 5 – Former Paint Shop Disposal Area

One sediment sample will be collected at the location shown in Figure 7-2. The sample will be collected at a depth of 0 to 6 inches in accordance with the sampling methodologies described in the Master FSP and SOP Number SA-1.2, "Surface Water and Sediment Sampling".

TABLE 7-1

SUMMARY OF ENVIRONMENTAL SAMPLING
SWMU 21 AND FIVE SI/CS SITES
MCRD PARRIS ISLAND, SOUTH CAROLINA
PAGE 1 OF 2

Sample Location	Sample Designation	Sample Depth (Feet below ground surface)	Sample Analysis							
			TCL VOCs	TCL SVOCs	TAL Metals (Total)	Tin	TCL Pesticides	TCL PCBs	TCL PAHs	Total Dissolved Solids
SEDIMENT										
PAI-05-SD-03	PAI-05-SD-03-01	0-0.5	•	•	•					
PAI-21-SD-02	PAI-21-SD-02-01	0-0.5		•	•				•	
SURFACE SOIL										
PAI-13C-SS-03	PAI-13C-SS-03-01	0-1	•	•	•	•	•	•		
PAI-27-SS-03	PAI-27-SS-03-01	0-1						•		
PAI-27-SS-04	PAI-27-SS-04-01	0-1						•		
PAI-27-SS-05	PAI-27-SS-05-01	0-1						•		
PAI-35-SS-04	PAI-35-SS-04-01	0-1			•	•				
PAI-35-SS-05	PAI-35-SS-05-01	0-1			•	•				
PAI-35-SS-06	PAI-35-SS-06-01	0-1			•	•				

TABLE 7-1

SUMMARY OF ENVIRONMENTAL SAMPLING
SWMU 21 AND FIVE SI/CS SITES
MCRD PARRIS ISLAND, SOUTH CAROLINA
PAGE 2 OF 2

Sample Location	Sample Designation	Sample Depth (Feet below ground surface)	Sample Analysis				
			TCL VOCs	Additional Appendix IX VOCs[1]	TAL Metals (Total)	Tin	Total Dissolved Solids
GROUNDWATER							
PAI-09-MW-01(S)	PAI-09-GW-01-01	Shallow Surficial	•	•	•	•	
PAI-09-MW-02(S)	PAI-09-GW-01-01	Shallow Surficial	•		•		
PAI-13C-MW-01(S)[2]	PAI-13-GW-01-01	Shallow Surficial	•	•	•	•	•
PAI-13C-MW-02(S)[2]	PAI-13-GW-02-01	Shallow Surficial	•		•		
PAI-35-MW-01(S)	PAI-35-GW-01-01	Shallow Surficial			•	•	•

1 Consists of the Appendix IX constituents not included within the TCL VOCs list.
2 Based on the concentrations of SVOCs, pesticides, and PCBs in Site 13C soil, groundwater samples may be analyzed for SVOCs, pesticides, and PCBs.

TBD = To Be Determined.

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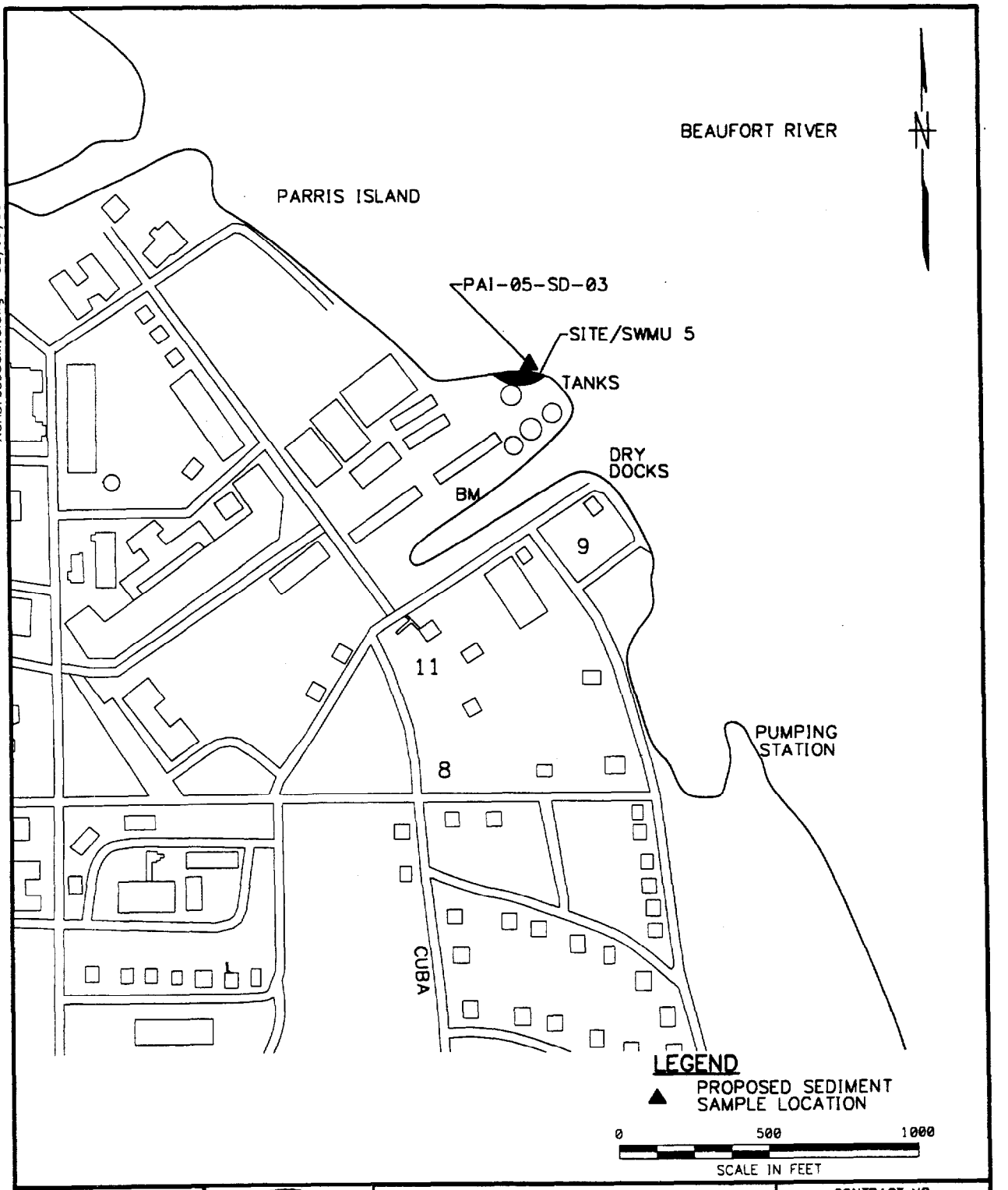
DRAWN BY MJJ / DATE 05August99	Tetra Tech NUS, Inc.	CONTRACT NUMBER 0095	OWNER NO ---
CHECKED BY / DATE ---	SITE/SWMU 13 INERT DISPOSAL AREA C MCRD PARRIS ISLAND PARRIS ISLAND, SOUTH CAROLINA	APPROVED BY --- / DATE ---	
COST/SCHEDULE-AREA		APPROVED BY --- / DATE ---	
SCALE AS NOTED		DRAWING NO FIGURE 7-1	REV 0

P:\GIS\MCRD Parris Island\Aerial Photo1 APR 06August99 MJJ 3/15/51 Blowup Layout

15H403X



ACAD: 0095CM13.dwg 02/11/99 KW

DRAWN BY KW DATE 2/8/99		SITE/SWMU 5 FORMER PAINT SHOP DISPOSAL AREA MCRD PARRIS ISLAND PARRIS ISLAND, SOUTH CAROLINA	CONTRACT NO. 0095
CHECKED BY DATE			APPROVED BY DATE
COST/SCHED-AREA			APPROVED BY DATE
SCALE AS NOTED			DRAWING NO. FIGURE 7-2 REV. 0

FORM CADD NO. SDIV_AV.DWG - REV 0 - 1/20/98

7.2.3 Site 9 – Paint Waste Storage Area

Two temporary monitoring wells will be installed as shown in Figure 7-3. The monitoring wells will be sampled during this investigation in accordance with the U.S. EPA Region IV EISOPQAM and SOP SA-1.1, Section 5.7, "Low Flow Purge and Sampling."

7.2.4 SWMU 21 – Weapons Power Plant Oil/Water Separator

One composite sediment sample will be collected at the location shown in Figure 7-4. This sample point is located where the oil/water separator discharges into a natural stream in a depression. This natural stream flows parallel to a dredged channel shown in Figure 7-4. The sample will be composited from five separate locations within a 10-foot diameter of the depression. The samples will be collected at a depth of 0 to 6 inches. The sediment sample will be collected in accordance with the sampling methodologies described in the Master FSP and SOP Number SA-1.2, "Surface Water and Sediment Sampling."

7.2.5 SWMU 27 – Equipment Parade Deck SAA

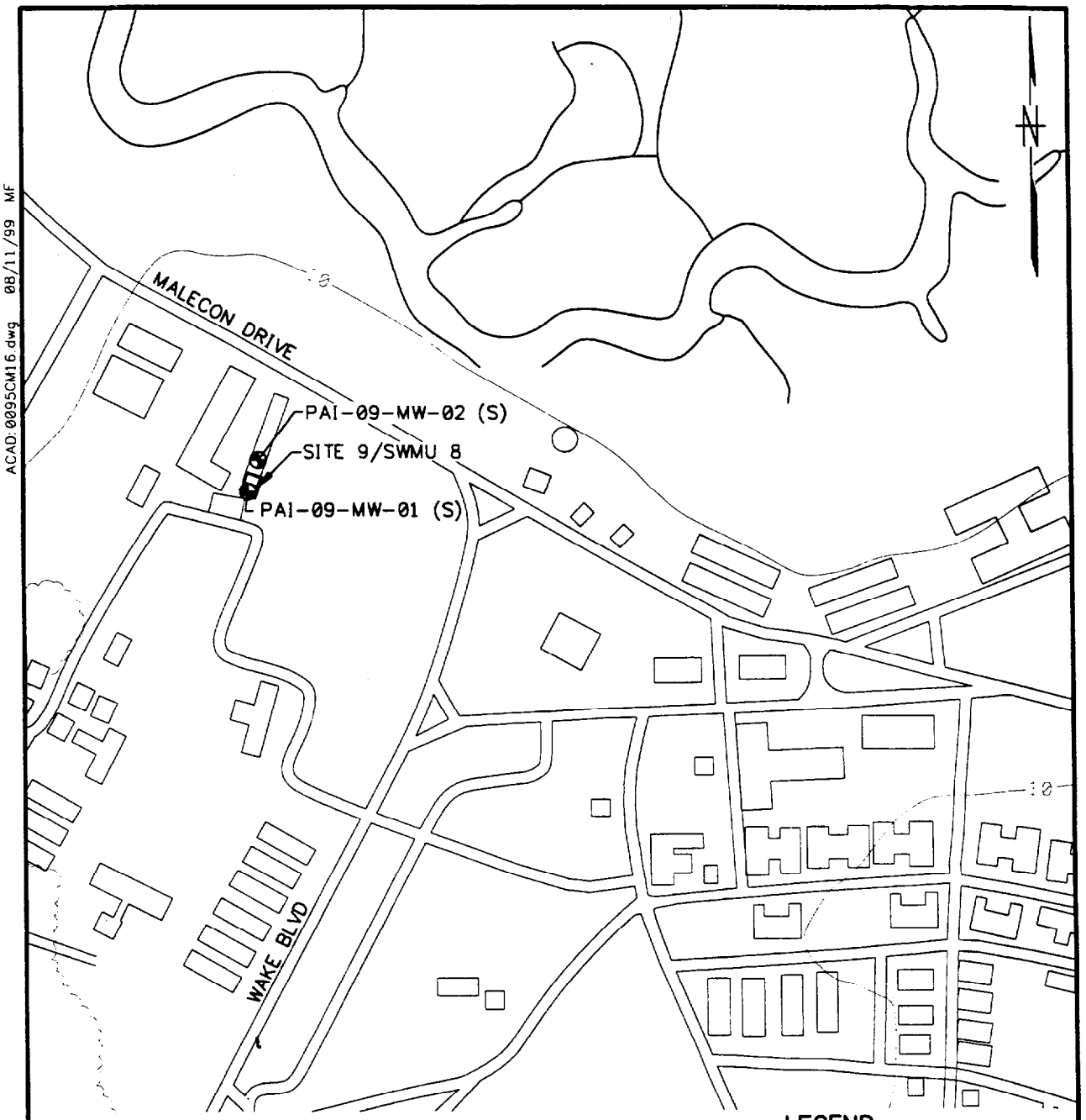
Three surface soil samples will be collected at the location of a former PCB transformer storage area. The suspected location of this storage area is shown on Figure 7-5. MCRD personnel will be consulted to determine the actual location of the former transformer storage area. Surface soil samples will be collected in accordance with the methodologies described in the Master FSP and SOP Number SA-1.3, "Soil Sampling." Samples will be collected from the 0- to 1-foot sampling interval and will be collected to bias the worst-case scenario based on visual and field instrumentation evaluation.

7.2.6 SWMU 35 – DRMO Salvage Storage Area

Three near surface soil samples will be collected at the location of the battery storage area just underneath the concrete pad. The location of this storage area is shown on Figure 7-6. Surface soil samples will be collected in accordance with the methodologies described in the Master FSP and SOP Number SA-1.3, "Soil Sampling." Samples will be collected from the 0- to 1- foot sampling interval and will be collected to bias the worst-case scenario based on visual (cracked concrete) and field instrumentation evaluation.

Additionally, one temporary monitoring well will be installed as shown in Figure 7-6. The monitoring well will be sampled during this investigation in accordance with the U.S. EPA Region IV EISOPQAM and SOP SA-1.1, Section 5.7, "Low Flow Purge and Sampling."

ACAD: 0095CM16.dwg 08/11/99 MF



NOTE: AN ATTEMPT WILL BE MADE TO LOCATE PAI-09-MW-02(S) HYDRAULICALLY DOWN GRADIENT OF PAI-09-MW-01(S); HOWEVER, SURFACE FEATURES AND UTILITIES MAY IMPEDE THIS EFFORT.

LEGEND

PROPOSED MONITORING WELL LOCATION

0 500 1000
SCALE IN FEET

DRAWN BY KW DATE 2/9/99	DEPARTMENT OF THE NAVY ★ SOUTHERN DIV FACILITIES ENGINEERING COMD ★	SITE 9/SWMU 8 PAINT WASTE STORAGE AREA MCRD PARRIS ISLAND PARRIS ISLAND, SOUTH CAROLINA	CONTRACT NO. 0095
CHECKED BY DATE			APPROVED BY DATE
COST/SCHED-AREA			APPROVED BY DATE
SCALE AS NOTED			DRAWING NO FIGURE 7-3 REV. 0

FORM CADD NO. SDIV_AV.DWG - REV 0 - 1/20/98

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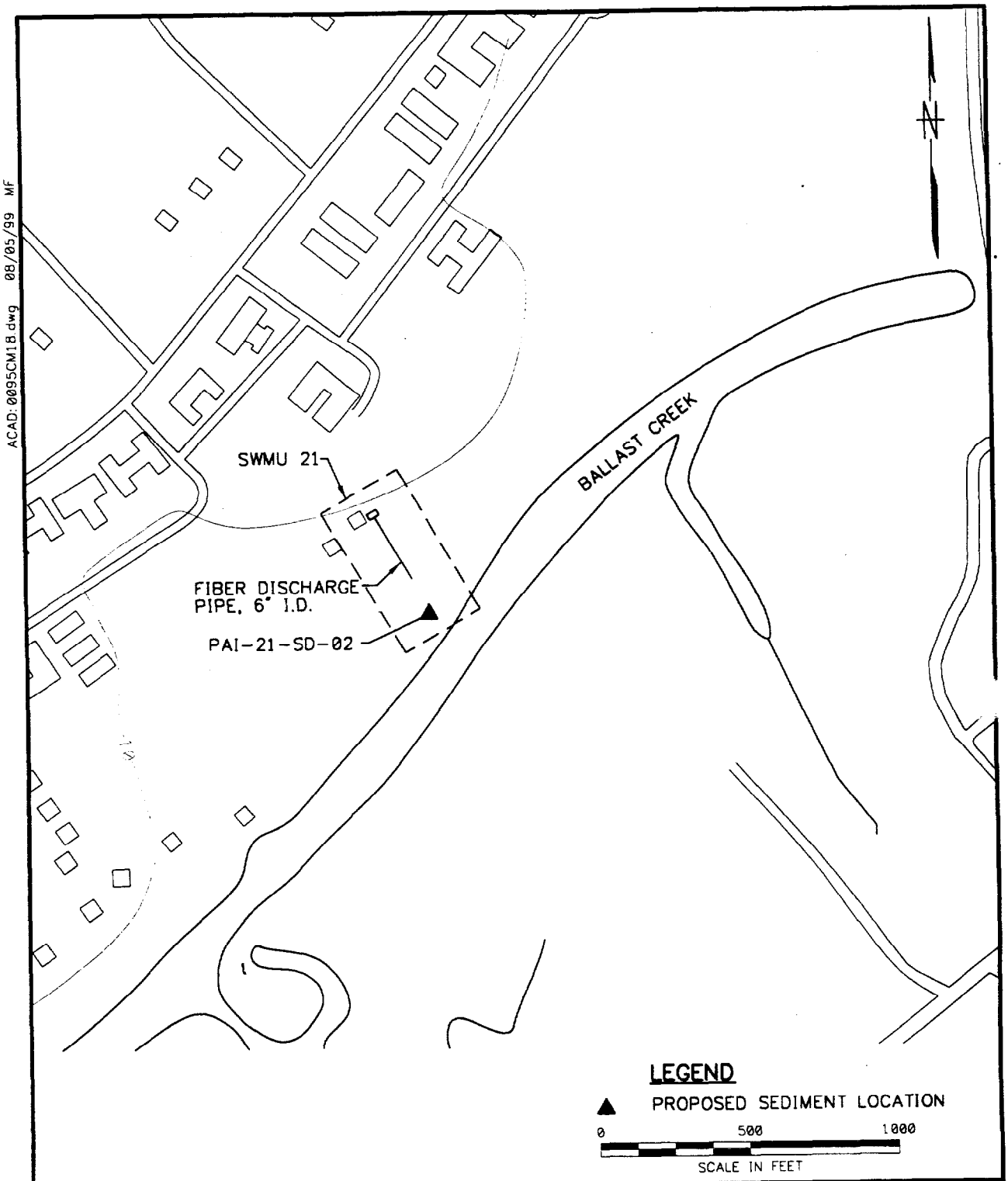
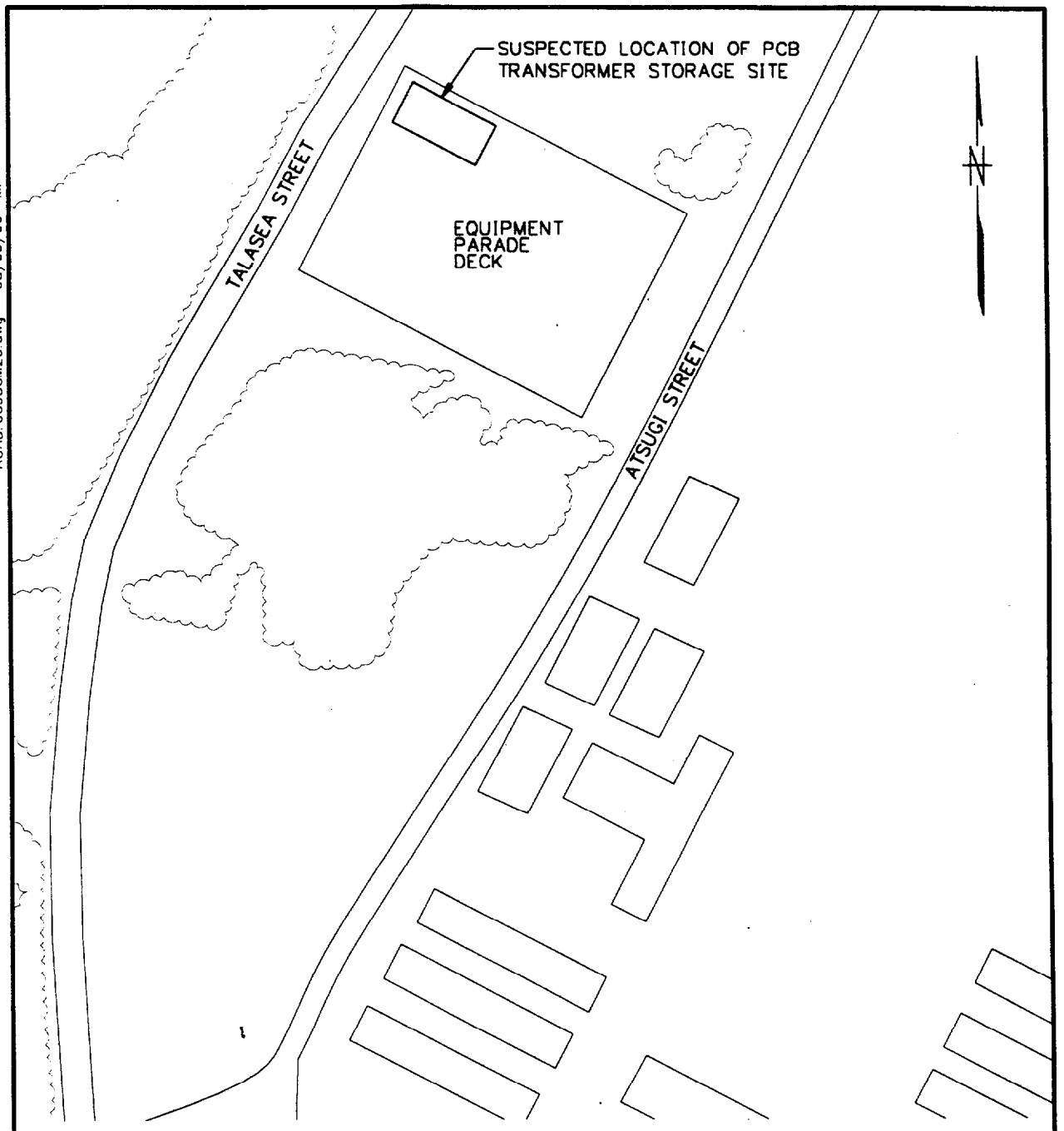


DRAWN BY KW DATE 2/10/99	DEPARTMENT OF THE NAVY SOUTHERN DIV FACILITIES ENGINEERING COMD	SWMU 21 WEAPONS POWER PLANT OIL/WATER SEPARATOR MCRD PARRIS ISLAND PARRIS ISLAND, SOUTH CAROLINA	CONTRACT NO. 0095
CHECKED BY DATE			APPROVED BY DATE
COST/SCHED-AREA			APPROVED BY DATE
SCALE AS NOTED			DRAWING NO. FIGURE 7-4 / REV. 0

FORM CADD NO. SDIV_AV.DWG - REV 0 - 1/20/98

ACAD: 0095CM20.dwg 08/05/99 MF



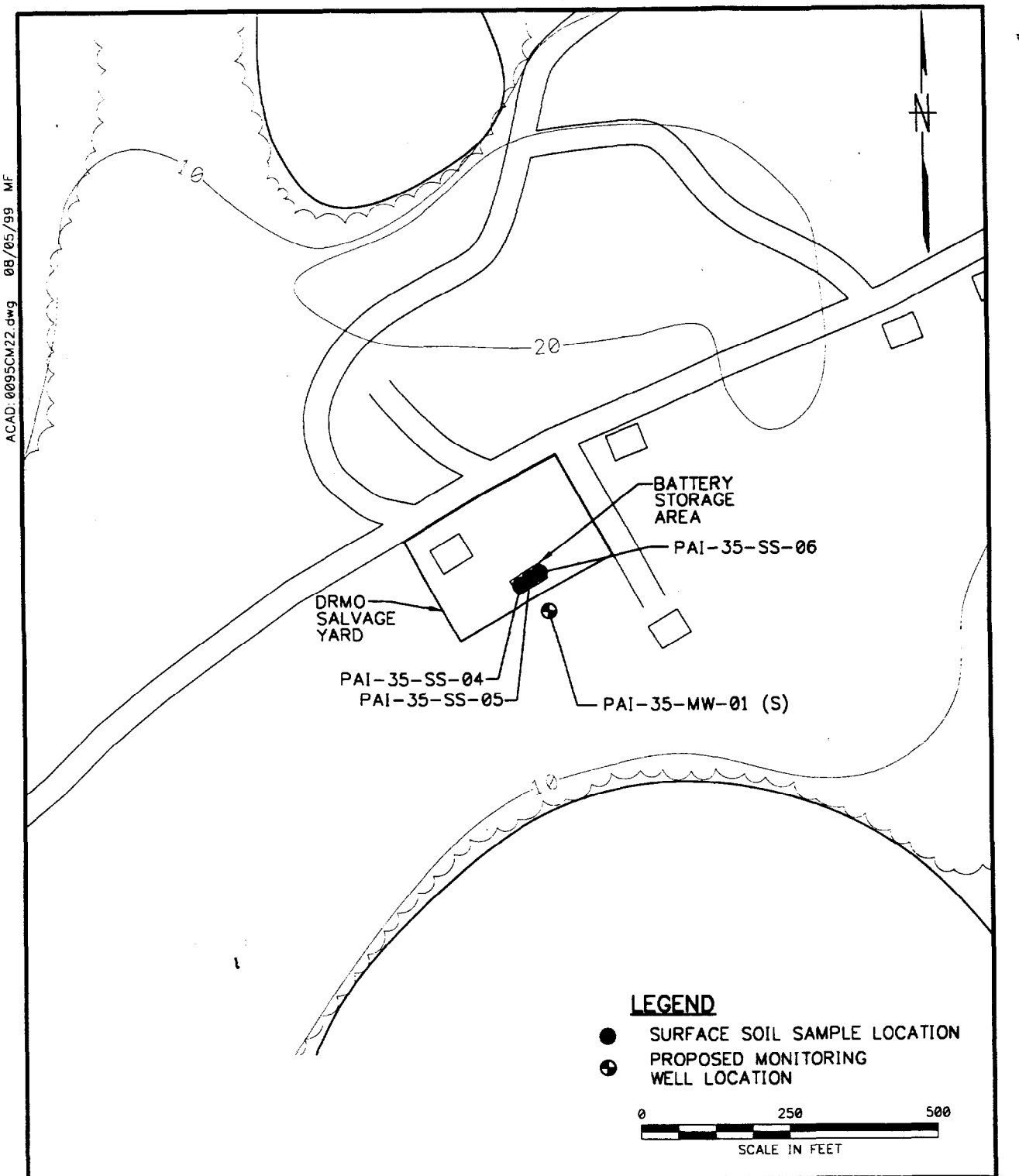
NOTE: THREE SURFACE SOIL SAMPLES (PAI-27-SS-03, PAI-27-SS-04, AND PAI-27-SS-05) WILL BE COLLECTED NEAR THE FORMER STORAGE SITE. LOCATIONS WILL BE VERIFIED IN THE FIELD.

0 200 400
SCALE IN FEET

DRAWN BY KW DATE 2/10/99		SWMU 27 EQUIPMENT PARADE DECK SAA MCRD PARRIS ISLAND PARRIS ISLAND, SOUTH CAROLINA	CONTRACT NO. 0095
CHECKED BY DATE			APPROVED BY DATE
COST/SCHED-AREA			APPROVED BY DATE
SCALE AS NOTED			DRAWING NO. FIGURE 7-5 REV. 0

FORM CADD NO. SDIV_AV.DWG REV 0 - 1/20/98

ACAD: 0095CM22.dwg 08/05/99 MF



DRAWN BY KW DATE 2/10/99	DEPARTMENT OF THE NAVY SOUTHERN DIV FACILITIES ENGINEERING COMD	SWMU 35 DRMO SALVAGE YARD MCRD PARRIS ISLAND PARRIS ISLAND, SOUTH CAROLINA	CONTRACT NO. 0095
CHECKED BY DATE			APPROVED BY DATE
COST/SCHED-AREA			APPROVED BY DATE
SCALE AS NOTED			DRAWING NO. FIGURE 7-6 REV. 0

FORM CADD NO. SDIV_AV.DWG - REV 0 - 1/20/98

7.3 SAMPLE HANDLING

7.3.1 Sample Containers, Preservation, Holding Times, and Analyses

Sample handling includes proper selection of sample containers, preservation, allowable holding times, and analyses. The Master QAP (B&R Environmental, 1998) summarizes the sample handling requirements for this investigation.

7.3.2 Sample Nomenclature

Each sample will be assigned a unique codified sample identification number. The sample nomenclature format described in the Master FSP and B&R Environmental SOP Number CT-04, "Sample Nomenclature," will be used for this investigation. The unique label system established for this sampling event is as follows.

1		2		3		4
AAA-NN	-	AA	-	NNN	-	NN
Site Location and Site Number		Media		Sample Number		Sample Depth/ Round

1	PAI - Parris Island 05 – Site 5 09 – Site 9 13C – Site 13, Area C 21 – SWMU 21 27 – SWMU 27 35 – SWMU 35	2	SD - Sediment SS - Surface Soil GW - Groundwater
3	An ascending sequential number of samples collected	4	Bottom of sample interval or sample round.

7.3.3 Sample Documentation, Packaging, and Shipping

Matrix-specific sample logsheets will be maintained for each sample collected. In addition, sample collection information will be recorded in field notebooks and the site logbook. Further description of sample documentation is provided in the Master FSP and SOP Number SA-6.3, "Field Documentation."

Samples will be packaged and shipped according to the Master FSP and SOP Number SA-6.1, "Non-Radiological Sample Handling."

7.3.4 Sample Custody

Sample custody will be maintained and documented at all times. Custody begins at the time of collection and ends at the time of disposal by the laboratory. The procedures for custody described in the Master FSP and SOP Number SA-6.1 will be implemented for this investigation.

8.0 QUALITY ASSURANCE PLAN

A general discussion of the Data Quality Process is provided in the Master Work Plan (B&R Environmental, 1998). Site-specific data quality objectives are provided in Section 4.0 of this document, and the laboratory DQOs are discussed in Section 10.0 of this document.

9.0 PROJECT MANAGEMENT ORGANIZATION

TtNUS will be responsible for management, implementation, and inspection of the field investigation. TtNUS will coordinate activities with program personnel and MCRD Navy personnel when appropriate.

9.1 PROJECT ORGANIZATION

An organizational chart of the site-specific project personnel for this investigation is provided in Figure 9-1.

9.2 PROJECT PERSONNEL RESPONSIBILITIES

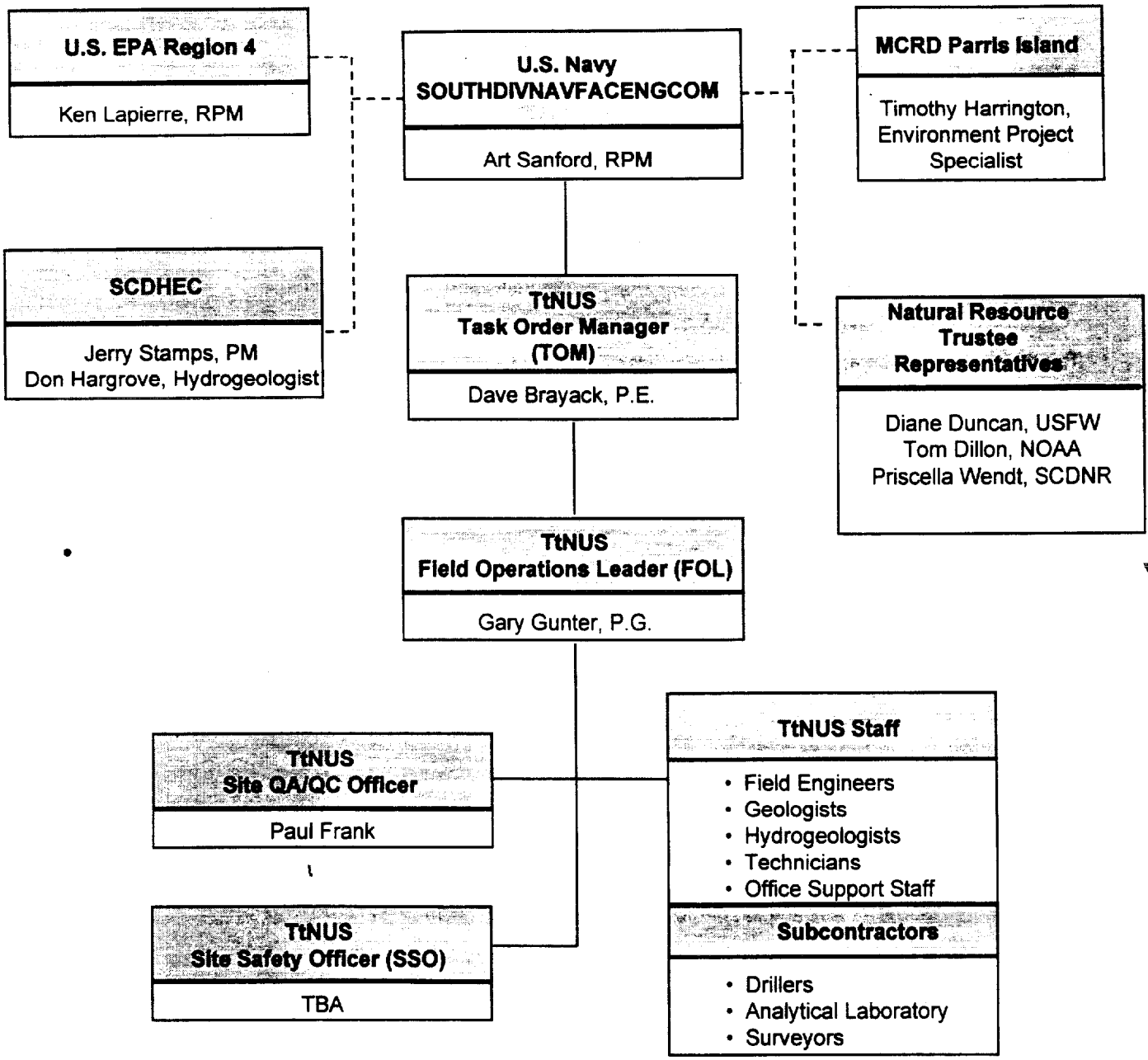
A description of responsibilities of individual project team members is provided below.

The responsibilities of the Task Order Manager (TOM) are provided in the Master Work Plan. The FOL will be responsible for coordinating all site personnel and field activities. The FOL will:

- Act as liaison among the TOM, field team members, Site Safety Officer (SSO), and Site QA/QC officer.
- Supervise all subcontractors.
- Oversee the mobilization and demobilization of all equipment, personnel, and subcontractors and ensure the availability and maintenance of all field sampling and monitoring equipment and materials.
- Oversee the completion of all site documentation.
- Assume custody of all samples and ensure the proper handling and shipment of all samples.
- Resolve all logistical, weather, personnel, and equipment problems that may arise and initiate field change requests after consultation with the TOM, when necessary.

FIGURE 9-1

PROJECT PERSONNEL ORGANIZATION
MCRD PARRIS ISLAND, SOUTH CAROLINA



NOAA: National Oceanic and Atmospheric Administration
PM: Project Manager
RPM: Remedial Project Manager
SCNDR: South Carolina Department of Natural Resources
TBA: To Be Assigned
USFW: U.S. Fish and Wildlife Service

A Professional Geologist certified in the state of South Carolina will provide direction for the well installation activities and review of boring logs.

The Site QA/QC Officer will be responsible for ensuring all site activities are performed according to the QA/QC guidelines outlined in the Master QAP. The Site QA/QC officer will:

- Act as liaison among the TtNUS Quality Assurance Manager (QAM), laboratory, and site personnel.
- Ensure that field duplicates and quality control blanks are collected at the proper frequency and volume.
- Ensure that all measuring and testing equipment is calibrated, used, and maintained in accordance with applicable procedures.
- Manage bottleware procurement and oversee field preservation and filtration activities.

The SSO will advise the FOL on issues of site health and safety. The duties of the SSO are described in the Master Health and Safety Plan (HASP) of the Master Work Plan, Volume II (B&R Environmental, 1998).

10.0 DATA QUALITY REQUIREMENTS

The purpose of this section is to relate the site-specific laboratory analyses and field QA/QC samples to the DQO statements established for this investigation. The Master QAP of the Master Work Plan (Volume II) (B&R Environmental, 1998) is referenced where appropriate.

10.1 LABORATORY ANALYSES

Section 5.0 of the Master QAP (B&R Environmental, 1998) describes the laboratory and methodology requirements for the sample analyses for this investigation. Section 5.5 of the Master QAP (B&R Environmental, 1998) describes the data reporting requirements for this investigation. Section 5.6 of the Master QAP (B&R Environmental, 1998) describes the criteria for laboratory selection. The laboratory selected to perform work at this site must be South Carolina state certified.

10.2 EXTERNAL (FIELD) QC SAMPLES

Section 3.3 of the Master QAP (B&R Environmental, 1998) contains a general description of external quality control measures.

10.2.1 Field QC Sample Types and Frequencies

Table 10-1 summarizes the frequency and type of field QA/QC samples to be collected for this investigation.

TABLE 10-1

FREQUENCY OF FIELD QC SAMPLES
MCRD PARRIS ISLAND, SOUTH CAROLINA

Type Of Sample	Organics	Inorganics
Field Duplicate/ Split Samples	1/10 samples/media	1/10 samples/media
Source Water Blank	1/source/sampling event	1/source/sampling event
Trip Blank (VOCs only)	1/cooler containing VOCs samples	NA
Equipment Rinsate Blank	1/day/matrix	1/day/matrix
Field Blank	As needed; Depends on site conditions	As needed; Depends on site conditions

Detailed descriptions of QC sample types are provided in Sections 3.3.1 through 3.3.5 of the Master QAP of the Master Work Plan (Volume II) (B&R Environmental, 1998).

10.2.2 Matrix Spike/Duplicate Sample Aliquots

Laboratory duplicate and matrix spike samples will be analyzed as described in Section 3.4 of the Master QAP of the Master WP (Volume II) (B&R Environmental, 1998). The field sampling team will provide the appropriate additional sample volume as prescribed by the laboratory requirements. The additional sample aliquots required for analysis of matrix spike/duplicates will be collected with a frequency of 1 per 20 samples per matrix.

10.3 BOTTLEWARE REQUIREMENTS

The bottleware, preservation requirements, and holding times for the analyses proposed for this investigation are provided in Table 10-2. Pre-preserved, certified clean bottleware will be supplied by the laboratory subcontractor.

10.4 SAMPLE CUSTODY AND SHIPMENT

Sample custody procedures are designed to provide proper documentation of sample acquisition and integrity. Sample custody and shipment procedures for this investigation are described in Section 4.0 of the Master QAP of the Master Work Plan (Volume II) (B&R Environmental, 1998).

10.5 INTERNAL (LABORATORY) QC CHECKS

Descriptions of the internal (laboratory) QC check types are provided in Section 6.0 of the Master QAP of the Master Work Plan (Volume II) (B&R Environmental, 1998).

10.5.1 Laboratory Duplicate, Spike, and Method Blank Analyses

Table 10-3 summarizes the frequency and type of laboratory QC checks to be performed for this investigation.

TABLE 10-2

SUMMARY OF BOTTLEWARE, PRESERVATION, AND HOLDING TIMES
SWMU 21 AND FIVE SI/CS SITES
MCRD PARRIS ISLAND, SOUTH CAROLINA
PAGE 1 OF 2

Analysis	Analytical Method	Sample Volume[1]	Bottleware	Preservation[2]	Holding Time[3]
AQUEOUS (GROUNDWATER)					
TCL VOCs	SW-846 8260B	2 x 40 mL	Glass; Teflon-lined septum cap	HCl to pH<2; Cool to 4°C; zero headspace	14 days to analysis
Total TAL Metals	SW-846 6010B/ 7000A Series	1 L	HDPE	HNO_3 to pH<2	6 months to analysis, except Hg (28 days)
Appendix IX Parameter not included in the TCL VOCs	SW-846 8260B	2 x 40mL	Glass; Teflon-lined septum cap	HCl to pH <2; Cool to 4°C; Zero headspace	14 days to analysis
Tin	SW-846 6010B 7000A Series	1 L	HDPE	HNO_3 to pH<2	6 months to analysis
Total Dissolved Solids (TDS)	EPA 160.1	250 mL	Glass or HDPE	Cool to 4°C	7 days to analysis
SOLID (SURFACE & SUBSURFACE SOIL & SEDIMENT)					
TCL VOCs	SW-846 5035/8260B	5 x 5 g	EnCore™ Samplers	Cool to 4°C; At lab sample to be preserved by adding to 5 ml reagent water and then freezing at -10°C	Extract within 48 hours; 14 days to analysis
TCL SVOCs	SW-846 8270C	8 oz.	Glass; Wide-mouth; Teflon-lined cap	Cool to 4°C	14 days to extraction; 40 days from extraction to analysis
TCL PAHs	SW-846 8310	8 oz.	Glass; Wide-mouth; Teflon-lined cap	Cool to 4°C	14 days to extraction; 40 days from extraction to analysis
Total TAL Metals	SW-846 S010B/7000A Series	8 oz.	Glass; Wide-mouth; Teflon-lined cap	Cool to 4°C	6 months, except Hg (28 days)

TABLE 10-2

SUMMARY OF BOTTLEWARE, PRESERVATION, AND HOLDING TIMES
SWMU 21 AND FIVE SI/CS SITES
MCRD PARRIS ISLAND, SOUTH CAROLINA
PAGE 2 OF 2

Analysis	Analytical Method	Sample Volume[1]	Bottleware	Preservation[2]	Holding Time[3]
SOLID (SURFACE & SUBSURFACE SOIL & SEDIMENT – CONTINUED)					
TCL Pesticides	SW-846 8081A	4 oz.	Glass; Wide-mouth; Teflon-lined cap	Cool to 4°C	14 days to extraction; 40 days from extraction to analysis
TCL PCBs	SW-846 8082	4 oz.	Glass; Wide-mouth; Teflon-lined cap	Cool to 4°C	14 days to extraction; 40 days from extraction to analysis
Tin	SW-846 6010B 7000A Series	1 L	HDPE	HNO_3 to pH <2	6 months to analysis

1 Sample volume may vary based on the laboratory.
2 HCl - Hydrochloric acid; HNO_3 - Nitric acid; NaOH - Sodium hydroxide; H_2SO_4 - Sulfuric acid.
3 Holding times are measured from the date of sample collection.
4 NA - Not applicable.

HDPE = High Density Polyethylene

TABLE 10-3

FREQUENCY OF LABORATORY QC CHECKS
MCRD PARRIS ISLAND, SOUTH CAROLINA

Type Of Sample	Organics	Inorganics
Laboratory Duplicate	NA	1/20 samples/media
Matrix Spike	1/20 samples/media	1/20 samples/media
Matrix Spike Duplicate	1/20 samples/media	NA
Surrogate Spike	Each sample for chromatographic analyses	NA
Method Blank	Based on method requirements with a minimum of 1/batch of 20 samples	Based on method requirements with a minimum of 1/batch of 20 samples

10.5.2 Other Laboratory QC Checks

Calibration and preventive maintenance of laboratory instruments are described in Section 6.6 of the Master QAP of the Master Work Plan (Volume II) (B&R Environmental, 1998). Handling and storage of samples, use of qualified technicians, and independent confirmation of data computations and deliverables are described in the Laboratory Quality Assurance Plan (LQAP).

10.6 PROJECT RECORDS

Record keeping and evidentiary file concerns are described in Section 7.0 of the Master QAP of the Master Work Plan (Volume II) (B&R Environmental, 1998). All protocols described therein will be strictly observed.

10.7 DATA REDUCTION, VALIDATION, AND REPORTING

The data generated from this investigation will be validated in accordance with the U.S. EPA National Functional Guidelines for Organic and Inorganic Data Review. The corresponding requirements as discussed in Section 8.0 of the Master QAP , Volume II, (B&R Environmental, 1998) for data assessment, electronic deliverables, and data interpretation and reporting will be followed.

Data validation will consist of either a data review or a full data validation. The full data validation will be performed on a minimum of 10 percent of the data packages received from a laboratory and all analytes will be covered by at least one full data validation. A data review will be performed on the remaining data packages for the purposes of identifying false positive and negative results.

10.8 PERFORMANCE AND SYSTEM AUDITS

The protocol for conducting audits, as outlined in Section 10.0 of the Master QAP, Volume II, (B&R Environmental, 1998), will be followed.

10.9 CORRECTIVE ACTIONS

In the event there are discrepancies in field activities from the established procedures and/or requirements or modifications to the proposed work plan, the procedures established in Section 10 of the Master QAP, Volume II, (B&R Environmental, 1998) for documenting nonconformances will be implemented and, if appropriate, a "Field Task Modification Request Form" completed.

10.10 TRAINING AND QUALITY PLANNING

Training requirements and pro-active management practices are provided in the Master Work Plan, Volume II (B&R Environmental, 1998).

REFERENCES

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U.S. EPA, 1998. Management of Remediation Waste Under RCRA, EPA 530-F-98-026, October.

APPENDIX A

REGULATORY COMMENTS AND RESPONSE TO REGULATORY COMMENTS TO THE DRAFT WORK PLAN

Appendix A

Regulatory Comments and Response to Comments to the Draft Work Plan

The MCRD Parris Island Partnering Team has provided input to the development of this work plan. The U.S. Environmental Protection Agency (U.S. EPA), the South Carolina Department of Health and Environmental Controls (SCDHEC), South Carolina Department of Natural Resources (SCDNR), and the National Oceanic and Atmospheric Administration (NOAA) have provided verbal comments during various Partnering Team meetings that have been incorporated into this work plan. Additionally, written comments have been provided by SCDHEC and U.S. EPA.

SCDHEC Comments on SWMU 21 RI/RFI Draft Work Plan and SI/CS Drat Work Plan for Site/SWMU 4, Site/SWMU 5, Site/SWMU 7, Site 9/SWMU 8, Site 13C/SWMU 13, and SWMUs 27 and 35 Submitted to Navy on April 27, 1999

Don Hargrove's Comments

The Division of Hydrogeology has reviewed the Document listed above. This document (dated 3 March 1999) was received on 4 March 1999. It provides a physical description of the Solid Waste Management Units (SWMUs) listed in the title that includes the history of each SWMU. It briefly describes previous studies performed at some of the SWMUs and indicates that the previous studies suffer from outdated information and/or data gaps. This work plan proposes a sample strategy to fill the data gaps in order to fully characterize the nature and extent of contamination at SWMU 21. It also proposes limited Confirmatory Sampling at the other seven SWMUs in order to determine the presence or absence of contamination.

This document was reviewed with respect to R.61-79 of the South Carolina Hazardous Waste Management Regulations (SCHWMR), and appropriate guidance documents. Based on this review the following comments should be addressed and a revised document submitted:

1a. **Comment:** Title: a) The title should reflect whether this document is a DRAFT or a FINAL document. Please revise.

Response: Agreed. Draft documents will be stamped draft and a green cover will be used to designate a final document.

1b. **Comment:** b) The title incorrectly refers to Confirmatory Sampling (CS) as part of the RCRA Facility Assessment (RFA) process. The CS is actually an intermediate step between an RFA and a RCRA Facility Investigation (RFI). Please revise the title to show Confirmatory Sampling as a stand alone part of the RCRA process.

Response: Terminology was based on the approved Master Work Plan for Parris Island and confirmed in correspondence from the SCDHEC to the Navy in a letter dated July 18, 1995. See Volume I, Table 1-1 and Volume I, Appendix A. Based on discussions with SCDHEC on May 13, 1999, the investigation at the RFA CS sites will be referred to as a CS.

2. **Comment:** Section 1.0, Introduction: This section incorrectly specifies that both an RFI and a CS will be performed at SWMU 21. Please revise the text to specify an RFI only.

Response: The text references the list of sites as "to be investigated". To clarify, the last sentence of the first paragraph will be revised as follows. The RI/RFI and SI/CS sites to be investigated are as follows.

3. **Comment:** Section 4.2.1, TCL and TAL Parameters: The argument for not analyzing for Appendix IX on the groundwater samples is not adequate. The argument for Appendix IX omission must be made on a SWMU by SWMU basis. In order for omission to be granted, the argument must be compelling. Any pertinent documentation that supports this argument must be referenced. Any chemical data presented must be stoichiometrically sound. Please revise the text to either adequately argue for Appendix IX omission on a SWMU by SWMU basis, or include Appendix IX in the groundwater analytical parameters.

Response: In accordance with the methodology agreed to for other site investigations with groundwater testing at MCRD Parris Island, the Navy proposes to analyze a groundwater sample at each groundwater site for the additional Appendix IX constituents within the proposed fraction (e.g. TCL VOCs plus additional Appendix IX VOCs).

In addition, based on discussions with SCDHEC on May 13, 1999, site specific text will be added to Section 4.0 justifying analysis of only the site specific parameters proposed.

4. **Comment:** Section 5.0, Human Health and Ecological Risk Assessment: This entire section should be revised to omit the seven SWMUs proposed for Confirmatory Sampling.

The purpose of Confirmatory Sampling is to determine the presence or absence of contamination at the SWMUs in question. Even if risk management decisions were typically made using CS reports (which they are not), the limited number of samples (i.e., One or two soil and/or groundwater samples) would not be sufficient to adequately quantify risk.

Response: The intent of this section was not to suggest that a human health or ecological risk assessment typically found in an RFI would be conducted. To avoid confusion, Section 5.1.2 and the first and last sentence of Section 5.2 will be modified to eliminate reference to the SI/CS sites.

5. **Comment:** Section 5.2, Ecological Risk: The term "...potentially pose a potential threat..." is redundant. Please revise the text (e.g. "...pose a potential threat...").

   Response: Agreed, the text will be revised.

6. **Comment:** Section 6.4.2, Temporary Monitoring Wells Using Hollow-Stem Drilling: This section should be revised to more clearly describe the method of temporary monitoring well installation using hollow-stem augers.

   Response: Based on discussion after the March 1999 partnering team meeting, the text will be revised as follows.

   In the fifth line of third paragraph of Section 6.4.1, "or used as backfill with auger cutting during temporary monitoring well abandonment" will be deleted.

   The last paragraph of Section 6.4.2 will be deleted and replaced as follows.

   Well installation and abandonment procedures are as follows.

   - After the soil boring has been drilled to the desired depth, the temporary monitoring well will be installed through the augers.
   - The augers will be pulled up to the top of the water table and the formation allowed to collapse around the well screen. The augers will be left in the ground during well sampling.
   - After sampling, the boring will be pressure grouted as the well casing and augers are being withdrawn.

7. **Comment:** Section 6.4.4, Temporary Monitoring Wells using DPT: This section should be revised to include abandonment procedures. The only accepted form of monitoring well abandonment is to pressure grout the well from the bottom to the top. During the course of DPT groundwater sampling, a locally or regionally significant confining layer might be penetrated. If this confining layer <u>is</u> penetrated, the well must be abandoned during initial withdrawal of the DPT equipment. It is not acceptable to completely withdraw the equipment and then attempt to reenter the excavation to pressure grout the well.

   Response: The following will be added to Section 6.4.4

After sampling, the boring will be pressure grouted as the rods are being withdrawn.

8. **Comment:** Figure 7-4, Site 9/SWMU 8, Paint Waste Storage Area: This figure shows a proposed well in the immediate vicinity of preexisting monitoring wells that were used for closure of the Hazardous Waste Storage Unit (SWMU-36). Two points should be brought to light:

a) Not knowing the groundwater flow direction(s) in this area, the proposed well might not be downgradient of SWMU 8. It is also too far away from SWMU 8 for confirmation sampling.

b) The pre-existing monitoring wells should be researched for additional groundwater data, but the proposed well should be relocated closer to SWMU 8.

The text and figures should be revised according to these two points.

Response: The sheds north of Site 9 were field checked on May 11, 1999 and found to consist of relatively open bays. As a result, it is anticipated that a drill rig/DPT rig can be operated in one of the sheds adjacent to Site 9. The figure will be revised to show the sample point in one of the sheds.

The UST monitoring wells were also located in the field. Data from these wells will be researched and if relevant, incorporated into the CS report.

Jerry Stamps, Comments

The Corrective Action Engineering and the Hydrogeology Sections of the South Carolina Department of Health and Environmental Control (Department) have completed the review of the above referenced document which was received on March 4, 1999. The Department has determined that the following comments must be adequately addressed prior to receiving final approval:

1. **Comment:** Title - Please distinguish all documents as being either draft or final.

Response: Agreed. Draft documents will be stamped draft and a green cover will be used to designate a final document.

2. **Comment:** Title - The title should be revised to eliminate the reference to RFAs for SWMUs 4,5,7,8,13,27, and 35. The RFA and the CS are two distinct steps in the RCRA corrective action process and should be addressed as such.

Response: Terminology was based on the approved Master Work Plan for Parris Island and confirmed in correspondence from the SCDHEC to the Navy in a letter dated July 18, 1995. See Volume I, Table 1-1 and Volume I, Appendix A. Based on discussions with SCDHEC on May 13, 1999, the investigation at the RFA CS sites will be referred to as a CS.

3. **Comment:** Page 1-1, First Paragraph, Please remove the reference to RFA.

Response: Terminology was based on the approved Master Work Plan for Parris Island and confirmed in correspondence from the SCDHEC to the Navy in a letter dated July 18, 1995. See Volume I, Table 1-1 and Volume I, Appendix A. Based on discussions with SCDHEC on May 13, 1999, the investigation at the RFA CS sites will be referred to as a CS.

4. **Comment:** Page 2-1, Section 2.2.1, Please describe what measures have been taken to determine the condition of the monitoring wells present at SWMU 4.

Response: The report of monitoring wells at SWMU 4 was further checked in the field on May 11, 1999. Based on this survey, the following will be added to Section 2.2.1. "In May 1999, the area around the former fire training pit was searched and no evidence of the reported monitoring wells were found. "

5. **Comment:** Page 2-6, Section 2.1.3, Please describe what measures have been taken to determine the condition of the monitoring wells present at SWMU 7.

Response: The existing monitoring wells were opened and the water level was checked. The probe was then dropped to the bottom of the well. Obstructions in the well were not observed, indicating the absence of significant root intrusion. A thin layer of silty sand was detected in the bottom of the wells. However, this silty sand is not expected to interfere with the sampling since either the sands will remain on the bottom of the well undisturbed, or the fine grained material will be purged during well development. As a result, the conditions of the wells were determined to adequate for sampling.

On March 11, 1999, the water level in each of the wells was measured. Based on these measurements, the groundwater was determined to be flowing to the west southwest. As a result, one existing monitoring well and two new temporary wells will be used to evaluate the site groundwater. These wells consist of the existing well on the southern edge, one temporary well

on the south west corner, and one temporary well on the western edge. The text and figure will be revised accordingly.

6. **Comment:** Page 4-1, Section 4.2.1, In the team meeting held on January 14 and 15, 1999, it was stated that the above referenced SWMUs would be investigated under the RCRA corrective action process. As such, all investigations should include sampling and analysis for all Appendix IX constituents.

Response: As discussed, under the response to DH comment 3, the Navy proposes to analyze a groundwater sample at each groundwater site for the additional Appendix IX constituents within the proposed fraction (e.g. TCL VOCs plus additional Appendix IX VOCs).

However, the Navy does not agree that all Appendix IX parameters should be analyzed for all samples. Environmental investigations are to be designed in accordance with site history and the type of wastes disposed at the site. For the sites identified in the work plan, there is sufficient knowledge of the history presented in the RFA and summarized in the work plan to identify wastes potentially present. As a result, the investigation and type of analytes can be tailored to the individual sites.

As discussed in the response to DH Comment 3, additional site specific text will be added to Section 4.0 justifying analysis of only the site specific parameters proposed. Draft text was prepared and submitted for review and discussion in May 1999. During the July 1999 partnering team meeting, there was agreement on the text and analyte list for Sites/SWMUs 5, 9/8, 13C, 21, 27, and 35. However, there was not agreement on the analyte list and process for determining the analyte list for Site/SWMU 4 and 7.

As discussed during a follow up teleconference on August 2, 1999, it was determined that final resolution for the Sites/SWMUs 4 and 7 activities could not be resolved in a timely manner. As a result, it was decided that Sites/SWMUs 4 and 7 would be deleted from the SWMU 21 Work Plan and that work on the other Sites/SWMUs would proceed on schedule.

7. **Comment:** Table 4-1, Data Gaps/Needs, Remove the reference to "significant" when referring to releases from SWMUs. The purpose of the confirmatory sampling is to determine if "any" release from the SWMU has occurred.

Response: The approach presented in this table is consistent with the approved Master Work Plan, see Volume III, Section 3.2. Based on discussions with SCDHEC on May 13, 1999, the term significant will be left in the table.

8. **Comment:** Table 4-1, Data Gaps/Needs, Remove human health and ecological screening from the column. These are not activities that are performed at this stage of the RCRA corrective action process. These activities are reserved for the completion of the RFI at which time the nature and extent of contamination is determined.

   Response: The approach presented in this table is consistent with the approved Master Work Plan, see Volume III, Section 3.2. Based on discussions with the SCDHEC on May 13, 1999, reference to human health and ecological screening will be removed from the table.

9. **Comment:** Page 5-1, Section 5.0, Human Health and Ecological Risk Assessments should not be performed for the seven SI/CS sites. These are not activities that are performed at this stage of the RCRA corrective action process. These activities are reserved for the completion of the RFI at which time the nature and extent of contamination is determined.

   Response: As presented in the response to DH comments 4 and 5, the text will be revised to eliminate reference to human health and ecological risk assessments for the RFA CSs.

10. **Comment:** Page 5-1, Section 5.1.1, The word "qualitative" should be changed to "quantitative".

    Response: Agreed.

11. **Comment:** Section 5.1.2, Remove this section, as a human health risk assessment is not relevant to the seven SI/CS sites. The human health risk assessment will be performed upon completion of the RFI, if necessary.

    Response: Agreed.

12. **Comment:** General, Remove all references to risk assessments for the seven SI/CS sites.

    Response: Agreed.

13. **Comment:** Page 6-1, Section 6.3, IDW generated during the test pit operations, and any other investigative activities must be managed in accordance with the guidance Management of Remediation Waste Under RCRA (EPA530-F-98-026, 10/98).

Response: The following will be added to Section 6.6. "IDW management will be conducted in accordance with applicable sections of Management of Remediation Waste Under RCRA (EPA530-F-98-026, 10/98).

14. **Comment:** Page 6-6, Section 6.7. Placing IDW in the 90 day accumulation area may preclude the replacement of the IDW at the SWMU of origination should the IDW be regulated by RCRA.

Response: Any soils taken to the 90 day accumulation area will be disposed off site in accordance with applicable regulations.

15. **Comment:** Table 10-2, In accordance with SW-846 Update III, the correct analytical method for soils and sediments is Method 5035.

Response: Agreed, Method 8035 will be replaced with Method 5035.

16. **Comment:** General, All data generated during the confirmatory sampling activities as outlined in the above referenced document may be used in conjunction with the data collected during the 1996 investigation as referenced in the CS work plan. Please incorporate this 1996 data (including raw data) and sampling locations into the Confirmatory Sampling Report.

Response: Agreed. Although, please note that the locations of the 1996 data were not surveyed. As a result, the locations of these samples will be approximate based on sample notes.

SCDNR Comments on SWMU 21 RI/RFI Draft Work Plan and SI/CS Drat Work Plan for Site/SWMU 4, Site/SWMU 5, Site/SWMU 7, Site 9/SWMU 8, Site 13C/SWMU 13, and SWMUs 27 and 35

The following comments were verbally submitted to the Navy by Priscilla Wendt of the SCDNR during a teleconference of the MCRD Parris Island Partnering Team on May 17, 1999.

1. **Comment:** Page 7-7, Section 7.2.5. SCDNR requests that the sediment samples be collected as a composite sample. The sample would be composited from five separate samples collected within a 10-foot diameter of the location indicated on Figure 7-5.

   Response: Agreed.

2. **Comment:** Page 9-2, Figure 9-1. Change the title block from Natural Trustees to Natural Resource Trustee Representatives.

   Response: Agreed.

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION 4
ATLANTA FEDERAL CENTER
61 FORSYTH STREET
ATLANTA, GEORGIA 30303-8960

May 3, 1999

4WD-FFB

Brigadier General J.R. Battaglini
Commander
Marine Corps Recruiting Depot - Parris Island
P.O. Box 19001
Parris Island, SC 29906-9001

SUBJ: SWMU 21 RI/RFI Work Plan and SI/RFA CS Work Plan for Site/SWMU 5, Site/SWMU 7, Site 9/SWMU 8, Site 13C/SWMU 13, and SWMUs 27 and 35, dated March 1999
Marine Corps Recruiting Depot, Parris Island, SC
EPA ID#: SC6 170 022 767

Dear General Battaglini:

The United States Environmental Protection Agency (EPA) Region 4 has finalized its review of the SWMU 21 RI/RFI Work Plan and SI/RFA CS Work Plan for Site/SWMU 5, Site/SWMU 7, Site 9/SWMU 8, Site 13C/SWMU 13, and SWMUs 27 and 35, dated March 1999. Part of this review included examining the comments submitted by the South Carolina Department of Health and Environmental Control (SCDHEC) on the subject document. EPA has no additional comments to offer on the work plan.

EPA will work with the Marine Corps and the Navy in resolving issues raised by SCDHEC on the work plan. If you have any questions or concerns, please contact me at (404) 562-8526.

Sincerely,

Kenneth R. Lapierre
Remedial Project Manager
DOD Remedial Section

cc: Jerry Stamps, SC DHEC
Art Sanford, Southern Division
Tim Harrington, MCRD
Dave Brayack, Tetratech NUS

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B.1.0 INTRODUCTION

This Work Plan Addendum has been prepared by Tetra Tech NUS, Inc. (TtNUS) for the Southern Division (SOUTHDIV) Naval Facilities Engineering Command (NAVFAC) under the Navy Comprehensive Long-Term Environmental Action Navy (CLEAN) Program, Contract Number N62467-94-D-0888, Contract Task Order (CTO) 0084. This Work Plan Addendum supplements the SWMU 21 RI/RFI Work Plan and SI/CS Work Plan for Site/SWMU 5, Site 9/SWMU 8, Site 13C/SWMU 13 and SWMUs 27 and 35 by including two additional SI/CS sites listed as follows.

- Site/SWMU 4 – Dredge Spoils Area Fire Training Pit
- Site/SWMU 7 – Page Field Fire Training Pit

The location of these sites are illustrated on Figure B-1. For ease of reading and clarity, Site/SWMU 4 and Site/SWMU 7 will be referred to as Site 4 and Site 7, respectively, for the remainder of this appendix.

Through confirmatory sampling, this investigation will determine whether contaminant releases have occurred at Sites 4 and 7. At each site, environmental media will be collected (e.g., soil and groundwater) and analyzed. Based on the results of this sampling as well as available historical data, the need for further investigation or a no further action decision will be determined.

B.2.0 SITE BACKGROUND

B.2.1 SITE DESCRIPTION AND HISTORY/PRELIMINARY ASSESSMENT

The following sections present descriptions of the areas to be covered under the field investigation and summarizes the results of previous investigations. Information summarized in this section is referenced from the Initial Assessment Study (IAS) (NEESA, 1986), RI Verification Step (McClelland, 1990), RCRA Facility Assessment (Kearney, 1990), and Relative Risk Assessment (B&R Environmental, 1996).

B.2.1.1 Site 4 – Dredge Spoils Area Fire Training Pit

The Dredge Spoils Area Fire Training Pit was used from the 1940s to the 1960s to conduct firing fighting exercises. Petroleum-based liquids were placed in a shallow pit, set on fire, and then extinguished. In 1976, the fire training pit was covered with dredge materials from the Marina Basin and Ballast Creek. As a result, there is no current visual evidence of the location of this former pit. Two potential locations of the pit have been identified from an aerial photograph taken in 1951 (see Figure B-2).

In 1996, two surface soil samples were collected from near the dredge spoils area ditch and analyzed for Target Compound List (TCL)/Target Analyte List (TAL) parameters. These samples were found to contain metals at concentrations greater than background and volatile organic compounds (VOCs), polynuclear aromatic hydrocarbons (PAHs), and pesticides/polychlorinated biphenyls (PCBs). However, based on sample depth and location, these results are more likely associated with the dredge spoils that have been placed atop of Site 4 since fire training operations ceased. The data set is not adequate to determine whether contaminants are present in the soils or whether contaminants from the fire training pit are migrating with the groundwater from the unit.

B.2.1.2 Site 7– Page Field Fire Training Pit

The Page Field Fire Training Pit was concrete lined and used from the mid-1960s to 1976 to practice firing fighting techniques. Petroleum-based liquids were placed in a shallow pit, set on fire, and then extinguished. In 1976, a small leak in the unit was noticed. The unit was reportedly used for several months after the leak was discovered. The location of this former unit is shown in Figure B-3.

During the RI Verification Step, a soil gas survey was conducted and groundwater from three monitoring wells were analyzed for priority pollutant VOCs, base/neutral extractables, dissolved Cd, Cr, and Pb, and the indicator parameters pH, total organic carbon, and specific conductance. The RI Verificaiton Step concluded that no organic vapors are present in the soil around the perimeter of Site 7. Chemical analysis of groundwater from existing monitoring wells indicated that VOCs were not detected in groundwater. Inorganic compounds were detected below drinking water standards. However, a complete data set is not available to determine whether contaminants are present in the soils or whether contaminants are migrating with the groundwater from the unit.

B.3.0 INVESTIGATION SCOPING

This section provides the rationale for the proposed analytical program to be conducted on Site 4 and 7 samples. Table B-1 presents a summary of the proposed investigation for Sites 4 and 7. All data will be collected in accordance with the Master FSP, the Master QAP (B&R Environmental, 1998), and U.S. EPA Region IV Environmental Investigations Standard Operating Procedures Quality Assurance Manual (EISOPQAM) (U.S. EPA, 1996).

B.3.1 Site 4 – Dredge Spoils Area Fire Training Pit

Based on a record search and personnel interviews conducted during the IAS and RFA, the following wastes may have been managed at Site 4:

- Waste Fuels
- Waste Oils
- Petroleum-based Solvents

Hazardous constituents identified with Site 4 fuels and oils consist of non-chlorinated VOCs, PAHs, and potentially SVOCs. In addition, waste oils can sometimes be contaminated with low concentrations of metals, PCBs, and pesticides. Hazardous constituents associated with petroleum-based solvents consist of only non-chlorinated VOCs, (e.g. toluene and methyl ethyl ketone). Relevant migration properties and the basis for analyte selection are presented below.

Non-chlorinated VOCs and some SVOCs can dissolve into water at concentrations of environmental significance (i.e. greater than groundwater action levels). In addition, they are only weakly adsorbed onto soil particles, and therefore can migrate with groundwater. As a result, soil and groundwater investigations for Site 4 will address VOCs and SVOCs in both soil and groundwater.

Because of low water solubility coefficients, PCBs, pesticides, and most SVOCs remain adsorbed onto the soil and do not readily dissolve into groundwater. In addition, once in the groundwater, these chemicals have a high affinity for natural soil/sediment organic contents and do not migrate with the groundwater. Relatively high soil and sediment organic carbon contents found in similar areas at Parris Island support the low potential for migration. Therefore, the soil investigation for Site 4 will address these constituents for soils. Although these constituents would not be expected to be present in the groundwater, for completeness, the groundwater will also be analyzed for SVOCs, PCBs and pesticides.

The migration potential for metals are highly variable and include metal oxidation state, waste matrix, soil cation exchange capacity, anions present in the groundwater, and other groundwater parameters (pH). As a result, the potential for metal migration can not be predicted. Therefore, both the soil and groundwater investigation for Site 4 will address metals.

A single soil sample is proposed for Site 4, with the location to be selected in the field based on an extensive test pit program to locate the former fire training pit. This sample will be biased toward the

potential for contamination (e.g. oil staining as evidence of former activities) and as a result should represent the upper bound of hazardous chemicals potentially present at the site.

The soil sample will be analyzed for TCL/TAL list constituents plus tin. The TCL/TAL list plus tin was determined to be appropriate at this site based on the following considerations. Under RCRA, Appendix VIII constituents are one of several factors used to identify hazardous wastes. The Appendix VIII list consists of known toxic chemicals and constituents that vary from being commonly available and used extensively in commerce (e.g. bis 2-ethylhexyl phthalate in plastics and lead in paints and batteries) to being very rare (nicotine) and/or chemically unstable (calcium chromate). As a result, for sites that are not manufacturing plants of known products, the Appendix VIII list usually defaults to the Appendix IX list constituents. The Appendix IX list represents the chemicals of the Appendix VIII list that can be measured and are stable in water. However, the Appendix IX list still includes many chemicals that are very rare outside of specific manufacturing plants or unique chemical products.

Since MRCD Parris Island is not a manufacturing plant and only common commercial products are used, the hazardous constituents considered under the Appendix VIII and Appendix IX lists are not directly applicable. Rather, some of these chemicals are potentially present because they were either directly used at the base such as non-chlorinated solvents, (e.g. toluene) or they may be present as an impurity in other commercial products such as PAHs (a semivolatile organic commonly found in fuels). During the development of the CERCLA regulations, the U.S. EPA reviewed the list of hazardous constituents and developed a list of constituents that are commonly available and at elevated concentrations represent a significant threat to human health and/or the environment (TCL/TAL list). Chemicals on the Appendix IX list that are not present on the TCL/TAL list are uncommon and are only rarely found outside of specific industries or unique products. In addition, when these compound are present, they are usually associated with other more common chemicals found on the TCL/TAL list. Therefore, the TCL/TAL list plus tin is considered viable to adequately characterize potential environmental concerns associated with this site.

Since the fire training area involved a combustion process, the SCDHEC requested that soil testing for TCDD be considered. TCDD is a regulated parameter for incineration of wastes that contain TCDD precursors such as PCBs and pesticides and to a lesser extent other chlorinated organics. TCDD is not a regulated parameter for non chlorinated hydrocarbons such as diesel, even though small amounts of TCDD are formed. Based on the known site history, only fuels and non-chlorinated solvents were burned at this location. Therefore, the approach for this site will be to test the soils for the TCL list, which includes the referenced TCDD precursors. Based on a review of the initial results of constituents and concentrations detected, testing for TCDD will be reconsidered.

One groundwater sample is proposed for Site 4. This sample will be collected downgradient of Site 4 and will be from a location as near Site 4 as feasible. Based on the planned proximity of these sample locations to the sites, the groundwater sample should also represent the upper bound of hazardous chemicals potentially migrating from these sites.

In order to comply with both Federal and state requirements and to avoid multiply mobilizations, the groundwater sample will be analyzed for TCL VOCs, SVOCs, pesticides, and PCBs, plus additional Appendix IX constituents and TAL metals/cyanide plus tin.

B.3.2 Site 7 – Page Field Fire Training Pit

Based on a record search and personnel interviews conducted during the IAS, the following wastes may have been managed at Site 7:

- Waste Fuels
- Waste Oils
- Petroleum-based Solvents

Hazardous constituents identified with fuels and oils consist of non-chlorinated VOCs, PAHs, and potentially some SVOCs. In addition, waste oils can sometimes be contaminated with low concentrations of metals, PCBs, and pesticides. Hazardous constituents associated with petroleum-based solvents consist of only non-chlorinated VOCs, (e.g. toluene and methyl ethyl ketone). Relevant migration properties and the basis for analyte selection are presented below.

Non-chlorinated VOCs and some SVOCs can dissolve into water at concentrations of environmental significance (i.e. greater than groundwater action levels). In addition, they are only weakly adsorbed onto soil particles, and therefore can migrate with groundwater. As a result, soil and groundwater investigations for Site 7 will address VOCs and SVOCs in both soil and groundwater.

Because of low water solubility coefficients, PCBs, pesticides, and most SVOCs remain adsorbed onto the soil and do not readily dissolve into groundwater. In addition, once in the groundwater, these chemicals have a high affinity for natural soil organic contents and do not migrate with the groundwater. Relatively high soil organic carbon contents found in similar areas at Parris Island support the low potential for migration. Therefore, the soil investigation for Site 7 will address these constituents for soils. Although these constituents would not be expected to be present in the groundwater, for completeness, the groundwater will also be analyzed for SVOCs, PCBs and pesticides.

The migration potential for metals are highly variable and include metal oxidation state, waste matrix, soil cation exchange capacity, anions present in the groundwater, and other groundwater parameters (pH). As a result, the potential for metal migration can not be predicted. Therefore, both the soil and groundwater investigation for Site 7 will address metals.

A single soil sample is proposed for Site 7, with the location to be selected in the field based on a test pit program and direction from a base personnel who once trained in the area. This sample will be biased toward the potential for contamination (e.g. oil staining as evidence of former activities) and as a result should represent the upper bound of hazardous chemicals potentially present at the site.

The soil sample will be analyzed for TCL/TAL list constituents plus tin. The TCL/TAL list plus tin was determined to be appropriate at this site based on the following considerations. Under RCRA, Appendix VIII constituents are one of several factors used to identify hazardous wastes. The Appendix VIII list consists of known toxic chemicals and constituents that vary from being commonly available and used extensively in commerce (e.g. bis 2-ethylhexyl phthalate in plastics and lead in paints and batteries) to being very rare (nicotine) and/or chemically unstable (calcium chromate). As a result, for sites that are not manufacturing plants of known products, the Appendix VIII list usually defaults to the Appendix IX list constituents. The Appendix IX list represents the chemicals of the Appendix VIII list that can be measured and are stable in water. However, the Appendix IX list still includes many chemicals that are very rare outside of specific manufacturing plants or unique chemical products.

Since MRCD Parris Island is not a manufacturing plant and only common commercial products are used, the hazardous constituents considered under the Appendix VIII and Appendix IX lists are not directly applicable. Rather, some of these chemicals are potentially present because they were either directly used at the base such as non-chlorinated solvents, (e.g. toluene) or they may be present as an impurity in other commercial products such as PAHs (a semivolatile organic commonly found in fuels). During the development of the CERCLA regulations, the U.S. EPA reviewed the list of hazardous constituents and developed a list of constituents that are commonly available and at elevated concentrations represent a significant threat to human health and/or the environment (TCL/TAL list). Chemicals on the Appendix IX list that are not present on the TCL/TAL list are uncommon and are only rarely found outside of specific industries or unique products. In addition, when these compound are present, they are usually associated with other more common chemicals found on the TCL/TAL list. Therefore, the TCL/TAL list plus tin is considered viable to adequately characterize potential environmental concerns associated with this site.

Since the fire training area involved a combustion process, the SCDHEC requested that soil testing for TCDD be considered. TCDD is a regulated parameter for incineration of wastes that contain TCDD

precursors such as PCBs and pesticides and to a lesser extent other chlorinated organics. TCDD is not a regulated parameter for non chlorinated hydrocarbons such as diesel, even though small amounts of TCDD are formed. Based on the known site history, only fuels and potentially non-chlorinated solvents were burned at this location. Therefore, the approach for this site will be to test the soils for the TCL list, which includes the referenced TCDD precursors. Based on a review of the initial results of constituents and concentrations detected, testing for TCDD will be reconsidered.

Three groundwater samples are proposed for this site. One sample will be located downgradient [PAI-07-MW-04(S)] and two samples will be located upgradient of the pit (PAI7-2 and PAI7-3). From historical information and field measurements, groundwater flows in a westernly direction. Based on the planned proximity of the samples to the site, these groundwater samples should also represent the upper bound of hazardous chemicals potentially migrating from the site. In order to comply with both Federal and state requirements, as wells as avoid multiple mobilizations, all three groundwater samples will be analyzed for TCL VOCs and TAL metals/cyanide, and the downgradient well will also be analyzed for pesticides, PCBs, and additional Appendix IX constituents.

B.4.0 HUMAN HEALTH AND ECOLOGICAL RISK ASSESSMENT

As discussed in the response to SCDHEC comments, comment response 4, page A-3, a human health and ecological risk assessment will not be performed for SI/CS sites.

B.5.0 FIELD OPERATIONS

Field operation activities to be performed at Sites 4 and 7 include mobilization of equipment, test pitting operations, temporary well installation, equipment decontamination, waste handling, site restoration, and site surveying. With the exception of test pitting operations, these activities are discussed in Section 6.0 of the main text of this report and shall be conducted in accordance with the discussed procedures.

Test pitting operations will be performed at Sites 4 and 7 to determine whether there is any remaining evidence of the former fire training pits. Excavated soils will not be considered a waste and will be placed back into the excavation. Test pit operations will be performed in accordance with SOP SA-1.3, Section 5.7, "Excavation and Sampling of Test Pits and Trenches."

B.6.0 ENVIRONMENTAL SAMPLING

The following sections describe sampling procedures that will be followed during field activities at Sites 4 and 7. Proposed sampling locations are contingent upon utility location and clearance with MCRD personnel. The rationale for any deviation of these sampling locations will be documented in the RI/RFI or SI/CS report. Sample handling will be conducted in accordance with Section 7.3 of the main text of this report.

B.6.1 Site 4 – Dredge Spoils Area Fire Training Pit

Initially, two suspected locations (as shown on Figure B-2) will be test pitted to verify the location of the former Dredge Spoils Area Fire Training Pit (Site 4). The suspected location in the southeastern portion of the site (as shown in the arial photograph – Figure B-2) may actually be a naturally-occuring mound of earth (hummock). A hand-dug test pit will be conducted to verify whether this suspected location is of natural orgin. Test pitting operations at the other suspected site will be performed with a backhoe. Once the location of the pit has been verified, one subsurface soil sample will be collected in accordance with the methodologies described in SOP SA-1.3, Section 5.7, "Excavation and Sampling of Test Pits and Trenches."

After the former fire training pit has been located, one temporary monitoring well will be installed downgradient of the fire training pit. The temporary monitoring well will be sampled in accordance with the U.S. EPA Region IV EISOPQAM and SOP SA-1.1, Section 5.7, "Low Flow Purge and Sampling."

B.6.2 Site 7 – Page Field Fire Training Pit

Initially, Site 7 will be test pitted with a backhoe to verify the location of the former Page Field Fire Training Pit. Once the location of the pit has been verified, one subsurface soil sample will be collected at the location of the former fire training pit in accordance with the methodologies described in SOP SA-1.3, Section 5.7, "Excavation and Sampling of Test Pits and Trenches."

One temporary monitoring well will be installed at the western edge of the fire training pit. The temporary monitoring well and two existing monitoring wells (PAI7-2 and PAI7-3) will be sampled in accordance with the U.S. EPA Region IV EISOPQAM and SOP SA-1.1, Section 5.7, "Low Flow Purge and Sampling."

B.7.0 DATA QUALITY REQUIREMENTS

The data quality requirements for the investigation at Sites 4 and 7 consist of the requirements discussed in Section 10.0 of the main text of the report. The bottle requirements for the investigation at Sites 4 and 7 are summarized in Table B-2.

TABLE B-1

SUMMARY OF ENVIRONMENTAL SAMPLING
SITES 4 AND 7
MCRD PARRIS ISLAND, SOUTH CAROLINA

Sample Location	Sample Designation	Sample Depth (Feet below ground surface)	Sample Analysis						
			TCL VOCs	TCL SVOCs	TCL Pesticides	TCL PCBs	TAL Metals (Total)/Cyanide	Tin	Additional App. IX parameters[2]
SUBSURFACE SOIL									
PAI-04-SB-01	PAI-04-SB-01-xx[1]	TBD	•	•	•	•	•	•	
PAI-07-SB-01	PAI-07-SB-01-XX[1]	TBD	•	•	•	•	•	•	
GROUNDWATER									
PAI-04-MW-01(S)	PAI-04-GW-01-01	Shallow Surficial	•	•	•	•	•	•	•
PAI7-2	PAI7-GW2-02	Shallow Surficial	•				•		
PAI7-3	PAI7-GW3-02	Shallow Surficial	•				•		
PAI-07-MW-04(S)	PAI-07-GW-04-01	Shallow Surficial	•	•	•	•	•	•	•

1 XX = Sample depth determined in field.
2 *Consists of the following parameters:*
Additional Appendix IX VOCs
Additional Appendix IX SVOCs
Additional Appendix IX Pesticides
Additional Appendix IX PCBs
Appendix IX Organophosphorus Pesticides
Appendix IX Herbicides
Appendix IX Nonhalogenated Volatile Organic Compounds (Isobutyl alcohol, propionitrile acetonitrile, 1,4-Dioxane, Methacrylonitrile)

TBD = To Be Determined.

TABLE B-2

SUMMARY OF BOTTLEWARE, PRESERVATION, AND HOLDING TIMES
SITES 4 AND 7
MCRD PARRIS ISLAND, SOUTH CAROLINA
PAGE 1 OF 2

Analysis	Analytical Method	Sample Volume[1]	Bottleware	Preservation[2]	Holding Time[3]
AQUEOUS (GROUNDWATER)					
TCL and Appendix IX Volatile Organic Compounds	SW-846 8260B	2 x 40 mL	Glass; Teflon-lined septum cap	HCl to pH<2; Cool to 4°C; Zero headspace	14 days to analysis
TCL and Appendix IX Semivolatile Organic Compounds	SW-846 8270C	2 x 1 L	Amber glass	Cool to 4°C; dark	7 days to extraction; 40 days from extraction to analysis
TCL and Appendix IX Pesticides	SW-846 8081A	2 x 1 L[4]	Amber glass; Teflon-lined cap	Cool to 4°C; dark	7 days to extraction; 40 days from extraction to analysis
TCL and Appendix IX PCBs	SW-846 8082	2 x 1 L[4]	Amber glass; Teflon-lined cap	Cool to 4°C; dark	7 days to extraction; 40 days from extraction to analysis
Total TAL Metals	SW-846 6010B/ 7000A series	1 L	High-Density Polyethylene (HDPE)	HNO_3 to pH<2	6 months, except Hg (28 days)
Tin	SW-846 6010B 7000A Series	1 L	HDPE	HNO_3 to pH<2	6 months to analysis
Cyanide	SW-846 9010B/9012A	500 mL	Glass or HDPE	NaOH to pH>12; Cool to 4°C	14 day to analysis
Appendix IX Organophosphorus Pesticides	SW-846 8141A	2 x 1 L	Amber Glass; Teflon-lined cap	Cool to 4°C ; dark	7 days to extraction; 40 days from extraction to analysis
Appendix IX Herbicides	SW-846 8151A	1 L	Amber Glass; Teflon-lined cap	Cool to 4°C ; dark	7 days to extraction; 40 days from extraction to analysis
Appendix IX Nonhalogenated Volatile Organic Compounds (Isobutyl alcohol, propionitrile acetonitrile, 1,4-Dioxane, Methacrylonitrile)	SW-846 8015B Modified	2 x 40 L	Glass; Teflon-lined septum cap	HCl to pH<2; Cool to 4°C	14 days to analysis

TABLE B-2

SUMMARY OF BOTTLEWARE, PRESERVATION, AND HOLDING TIMES
SITES 4 AND 7
MCRD PARRIS ISLAND, SOUTH CAROLINA
PAGE 2 OF 2

Analysis	Analytical Method	Sample Volume[1]	Bottleware	Preservation[2]	Holding Time[3]
SOLID (SUBSURFACE SOIL)					
TCL Volatile Organic Compounds	SW-846 8260B	5 x 5 g	EnCore Sampler™	Cool to 4°C; At lab add sample to be preserved with either sodium bisulfate solution or by adding to 5 ml reagent water and then freezing at -10°C.	Extract within 48 hours; 14 days to analysis
TCL Semivolatile Organic Compounds	SW-846 8270C	8 oz.	Glass; Wide-mouth; Teflon-line cap	Cool to 4°C	14 days to extraction; 40 days from extraction to analysis
TCL Pesticides	SW-846 8081A	4 oz.	Glass; Wide-mouth; Teflon-lined cap	Cool to 4°C	14 days to extraction; 40 days from extraction to analysis
TCL PCBs	SW-846 8082	4 oz.	Glass; Wide-mouth; Teflon-lined cap	Cool to 4°C	14 days to extraction; 40 days from extraction to analysis
Total TAL Metals and Cyanide	SW-846 6010B/ 7000A series and 9010B/9012A	8 oz.	Glass; Wide-mouth; Teflon-line cap	Cool to 4°C	6 months, except Hg (28 days); cyanide 14 days
Tin	SW-846 6010B 7000A Series	1 L	HDPE	HNO_3 to pH <2	6 months to analysis

1 *Sample volume may vary based on the laboratory.*
2 HCl - Hydrochloric acid; HNO_3 - Nitric acid; NaOH - Sodium hydroxide; H_2SO_4 - Sulfuric acid.
3 Holding times are measured from the date of sample collection.
4 Two 1L bottles of samples are sufficient for pesticides and PCB analyses if both are performed for the same sample.
5 NA - Not applicable.

ACAD: 7803CM05.dwg 11/11/99 DT

QUADRANGLE LOCATION

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

0 4000 8000
SCALE IN FEET

DRAWN BY DLT	DATE 11/11/99	DEPOT/SITE LOCATION MAP MCRD PARRIS ISLAND PARRIS ISLAND, SOUTH CAROLINA	CONTRACT NO. 7803
CHECKED BY	DATE		APPROVED BY DATE
COST/SCHED-AREA			APPROVED BY DATE
SCALE AS NOTED			DRAWING NO. FIGURE B-1 / REV. 0

DEPARTMENT OF THE NAVY · SOUTHERN DIV FACILITIES ENGINEERING COMD

FORM CADD NO. SDIV_AV.DWG - REV 0 - 1/20/98

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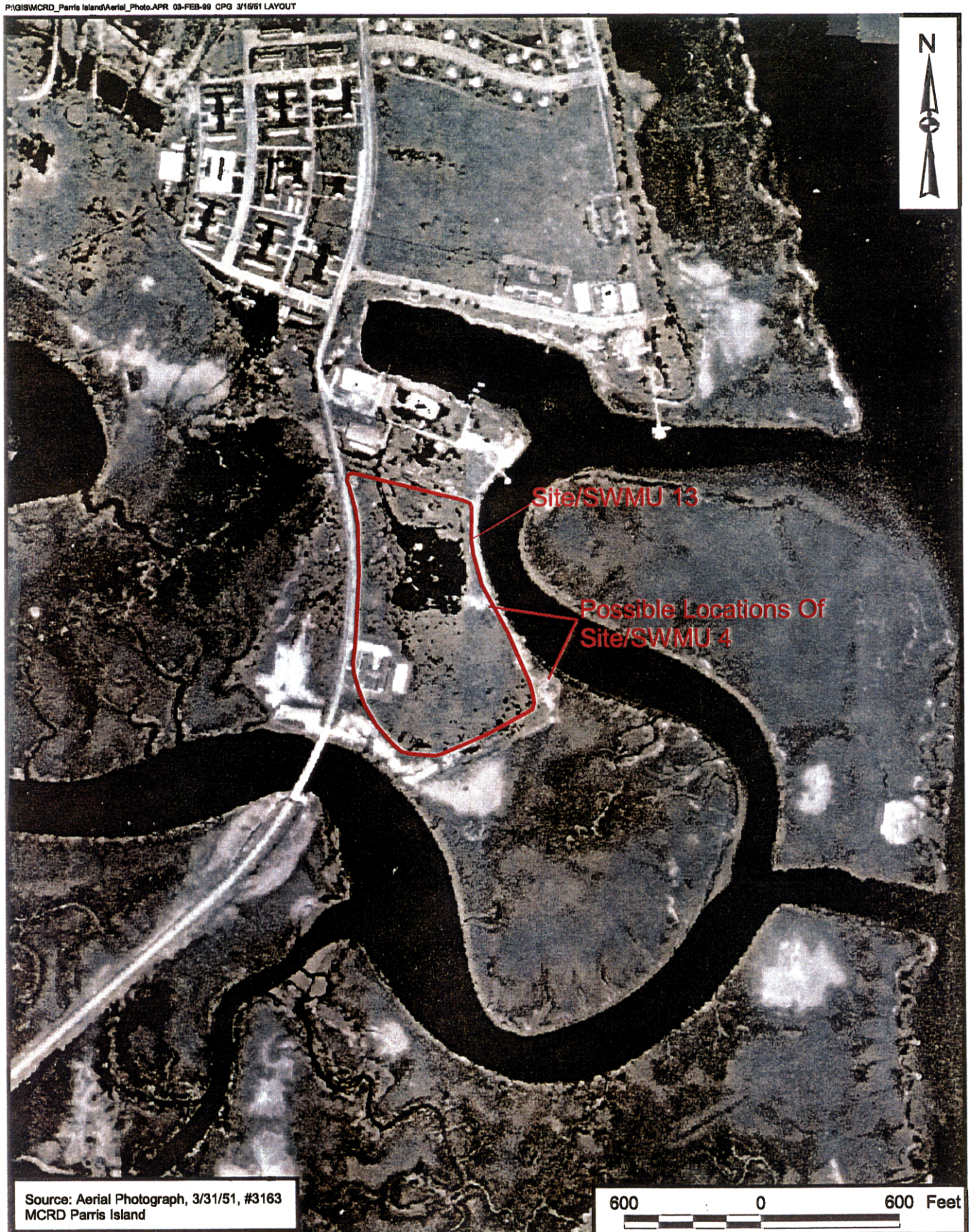
P:\GIS\MCRD_Parris Island\Aerial_Photo.APR 03-FEB-99 CPG 3/15/51 LAYOUT



Source: Aerial Photograph, 3/31/51, #3163
MCRD Parris Island

DRAWN BY CHAD P. GLICK	DATE 03 FEB 99	SITE/SWMU 4 AND SITE/SWMU 13 DREDGE SPOILS AREA FIRE TRAINING PIT AND INERT DISPOSAL AREA C MCRD PARRIS ISLAND PARRIS ISLAND, SOUTH CAROLINA	CONTRACT NUMBER —
CHECKED BY	DATE		APPROVED BY — DATE —
COST/SCHEDULE-AREA —			APPROVED BY — DATE —
SCALE AS NOTED			DRAWING NO. FIGURE B-2 REV 0

P:\GIS\MCRD_Parris Island\Aerial_Photo1.APR 16Nov99 MJJ 4/28/72 Blowup Layout

Source: Aerial Photograph, 4/28/72, #45013 MCRD Parris Island

DRAWN BY MJJ	DATE 03 FEB 99	SITE/SWMU 7 PAGE FIELD FIRE TRAINING PIT MCRD PARRIS ISLAND PARRIS ISLAND, SOUTH CAROLINA	CONTRACT NUMBER 0095
CHECKED BY	DATE		APPROVED BY DATE
COST/SCHEDULE-AREA			APPROVED BY DATE
SCALE AS NOTED			DRAWING NO FIGURE B-3 REV 0

APPENDIX C
WORK PLAN ADDENDUM
SUPPLEMENTAL INVESTIGATION ACTIVITIES AT SITE/SWMU 4
DREDGE SPOILS AREA FIRE TRAINING PIT
MCRD PARRIS ISLAND, SOUTH CAROLINA

Objective

The purpose of this Work Plan Addendum is to propose field activities to further investigate suspected locations of the former fire training pit at Site/SWMU 4 (Site 4) at MCRD Parris Island, South Carolina.

Background

SI/CS investigation activities were conducted at Site 4 in December 1999. At this time, two suspected areas of the former fire-training pit were investigated: 1) a hummock in the southeastern portion of the site and 2) an area based on a 1951 aerial photograph in the east-central portion the site. Three hand-dug test pits were conducted at the hummock. The test pits confirmed that the hummock is of natural origin. Hand-auger borings were also conducted in the vicinity of monitoring well PAI-MW-04-01(S). Although these hand-auger borings indicated no evidence of contamination, survey results indicate that the hand-auger borings were conducted south of the suspected location of the fire training pit.

Proposed Field Activities

To further attempt to locate the suspected location of the fire training pit, hand-auger borings were conducted on April 18-19, 2000 in two additional areas as illustrated in Figure 1 (Insets A and B). Soil from the borings was screened with a photo-ionization detector (PID) and visually inspected for stained soil.

Within the area shown in Inset B (east of the bermed dredge spoils area), black stained soil was observed at PAI-04-SB-16 at a depth of 1.5 to 2.5 feet below ground surface (bgs). Additionally, trace staining was observed in soil boring PAI-04-SB-18 collected north of PAI-04-SB-16. Although no stained soil was observed in PAI-04-SB-17, a PID reading of 51 parts per million (ppm) was measured at a depth between 1.5 and 2.0 ft bgs.

Within the area shown in Inset A (within the bermed dredged spoils area), PID readings of zero ppm were observed in all soil borings. In two of the soil borings (PAI-04-SB-21 and PAI-04-SB-23), trace fragments of black coal material were observed at depths below 2.0 ft bgs; however, this material is not consistent with remnants of fire-training pit activities. In all soil borings, dredge spoil clays were observed in the upper portion of the borings with natural sands or marsh clays observed by 3.5 feet bgs. The results of the hand augers borings are summarized in Table 1.

TABLE 1
HAND AUGER BORING SUMMARY
SITE 4 – DREDGE SPOILS AREA FIRE TRAINING PIT
MCRD PARRIS ISLAND, SOUTH CAROLINA

Boring Number	Highest PID Reading (ppm)	Visual Observations	Corresponding Depth (ft bgs)	Total Depth (ft bgs)
PAI-04-SB-15	8	Brown sand – no staining	0.5 – 1.0 (1)	4
PAI-04-SB-16	0	Natural sands(3) – some black staining	1.5 – 2.5 (2)	4
PAI-04-SB-17	51	Brown-tan sand – no staining	1.5 – 2.0 (1)	4
PAI-04-SB-18	0	Natural sands – trace black staining	1.5 – 2.0 (2)	4
PAI-04-SB-19	NA	Water table encountered	0 – 0.5 (2)	NA
PAI-04-SB-20	0	Dredge spoils (clays) and natural sands	NA	4
PAI-04-SB-21	0	Dredge spoils (clays) and natural sands – traces of coal	3.0 – 3.5 (2)	4
PAI-04-SB-22	0	Dredge spoils (clays) and marsh clays	NA	4
PAI-04-SB-23	0	Dredge spoils (clays) and natural sands – traces of coal	2.5 – 3.0 (2)	4
PAI-04-SB-24	0	Dredge spoils (clays) and natural sands	NA	4
PAI-04-SB-25	0	Dredge spoils (clays) and natural sands	NA	4

1. Depth interval corresponds to PID reading.
2. Depth interval corresponds to visual observation.
3. Natural sands consist of undisturbed medium-grained material characteristic of the area.

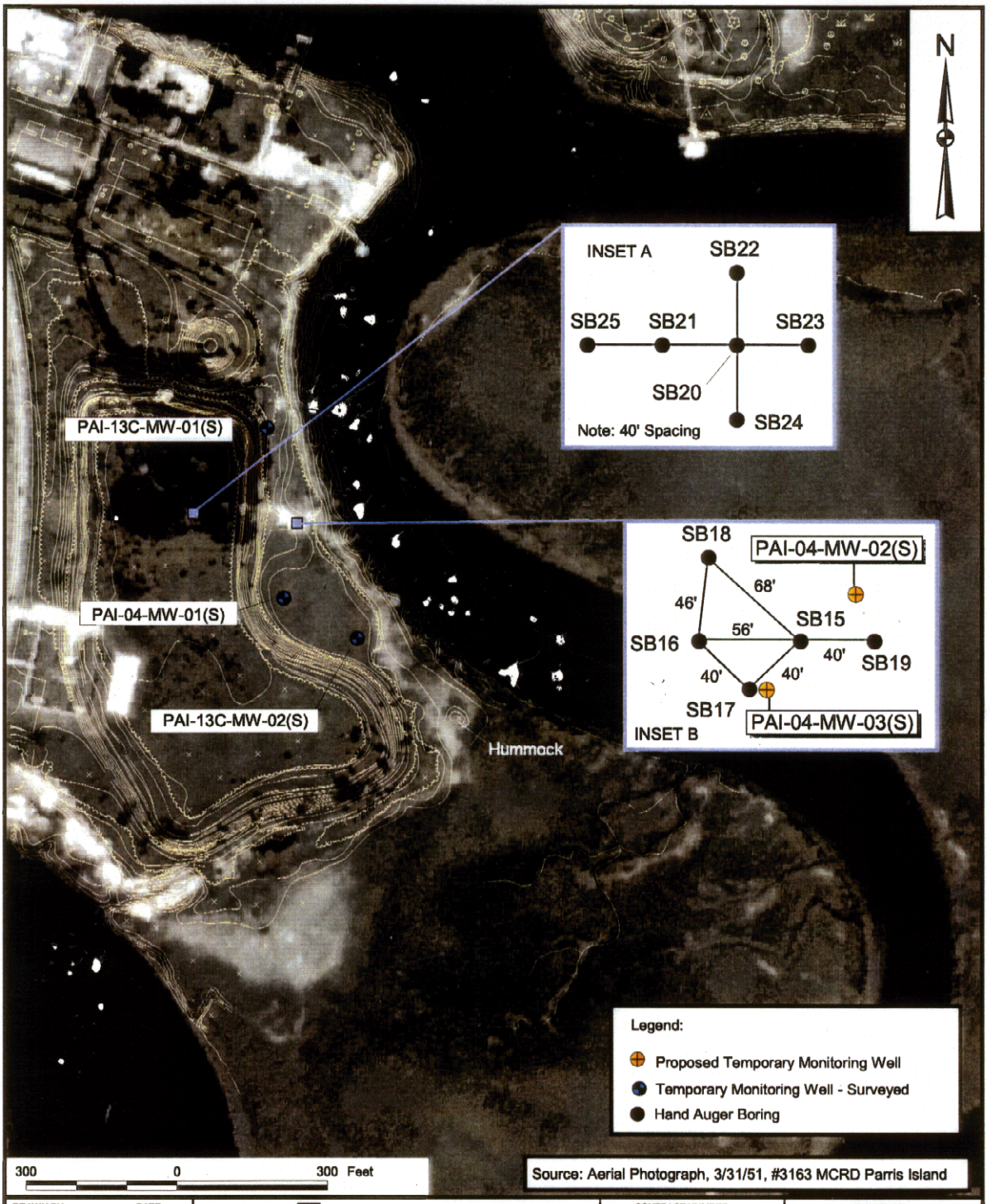
Based on the PID reading of 51 ppm observed in soil boring PAI-04-SB-17, one subsurface soil sample will be collected from PAI-04-SB-17 and sent to a laboratory and analyzed for TCL VOCs (SW-846 8260B) and SVOCs(SW-846 8270C). The soil boring will be rescreened with a PID and the sample will be collected from the depth with the highest PID reading. For collection of the sample that will be analyzed for TCL VOCs, the sample will be a grab sample and will be collected using an En Core® sampler. For all other analytes, the sample will be collected over a 1-foot interval.

Furthermore, based on the black staining observed at PAI-04-SB-16, one soil sample will be collected from this location and analyzed for TCL VOCs (SW-846 8260B), SVOCs(SW-846 8270C), and pesticides/PCBs (SW-846 8081A/8082) and TAL metals/CN plus tin (SW-846 6010B/7000A Series). For collection of the sample that will be analyzed for TCL VOCs, the sample will be a grab sample and will be collected using an En Core® sampler in the stained interval. For all other analytes, the sample will be collected over a 1-foot interval.

Soil borings will be backfilled with soil cuttings. If elevated PID readings or staining are encountered, the soil will be placed at the depth at which the soil was encountered.

Based on the black staining observed in soil boring PAI-04-SB-16 and the trace staining observed in soil boring PAI-04-SB-18, a temporary monitoring well will be installed [PAI-MW-04-02(S)] downgradient of these soil borings. The temporary monitoring well will be installed 10 feet west of the river bank at the approximate location shown in Inset B. The temporary monitoring well will be sampled for TCL VOCs (SW-846 8260B), SVOCs (SW-846 8270C) and pesticides/PCBs (SW-846 8081A/8082), TAL metals/CN plus tin (SW-846 6010B/7000A Series), and additional Appendix IX parameters. Also, one temporary monitoring well [PAI-MW-04-03(S)], will be installed 10 feet downgradient of PAI-04-SB-17 and sampled for TCL VOCs (SW-846 8260B) and SVOCs (SW-846 8270C). One VOC trip blank will be collected. No other QA/QC samples are proposed.

The methods and procedures to be used for well installation, development, purging, and sampling will be performed as indicated of the main text of this work plan (SWMU 21 RI/RFI Work Plan and SI/CS Work Plan).



DRAWN BY T. Beckman	DATE 3-6-00	Tetra Tech NUS, Inc.	CONTRACT NUMBER 0095	OWNER NO. —
CHECKED BY —	DATE —	SITES 4 AND 13C WORK PLAN ADDENDUM MCRD PARRIS ISLAND PARRIS ISLAND, SOUTH CAROLINA	APPROVED BY —	DATE —
COST/SCHEDULE-AREA			APPROVED BY —	DATE —
SCALE AS NOTED			DRAWING NO. FIGURE 1	REV 0

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ATTACHMENT 1
BORING LOGS

Tetra Tech NUS, Inc.

BORING LOG

Page ___ of ___

PROJECT NAME: Parris Island
PROJECT NUMBER: PA1-04-SB-15
DRILLING COMPANY: NA
DRILLING RIG: NA

BORING No.: N0095
DATE: 04/18/00
GEOLOGIST: D. Bragaw / J. Brown
DRILLER: NA

Sample No. and Type or RQD	Depth (Ft.) or Run No.	Blows / 6" or RQD (%)	Sample Recovery / Sample Length	Lithology Change (Depth/Ft.) or Screened Interval	MATERIAL DESCRIPTION: Soil Density/ Consistency or Rock Hardness	Color	Material Classification	USCS*	Remarks	PID/FID Reading (ppm): Sample	Sampler BZ	Borehole**	Driller BZ**
6"-12"						Brown			Natural Soils	8	0		
12"	18"					Brown			Natural Soils	3.5	0		
1.5'	2'					Brown			Natural Soils	0	0		
2.0	2.5'					White	Fine-Grained Sand		Natural Soils	0	0		
2.5'	3.0'					Tan	Silty-clay		Nat. Soils	0	0		
3'	3.5'					Tan	Silty-clay		Nat Soils	0	0		
3.5	4'			Saturated		Tan	Silty-clay		Nat. Soils	0	0		

* When rock coring, enter rock brokeness.

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

Remarks: _____

Drilling Area Background (ppm): ____

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

Tetra Tech NUS, Inc.

BORING LOG

Page ___ of ___

PROJECT NAME: Parris Island
PROJECT NUMBER: N0095
DRILLING COMPANY: NA
DRILLING RIG: NA

BORING No.: PAI-04-SB-16
DATE: 04/18/00
GEOLOGIST: D. Brayack, J. Brown
DRILLER:

Sample No. and Type or RQD	Depth (ft.) or Run No.	Blows/6" or RQD (%)	Sample Recovery / Sample Length	Lithology Change (Depth/ft.) or Screened Interval	MATERIAL DESCRIPTION: Soil Density/Consistency or Rock Hardness	Color	Material Classification	USCS*	Remarks	PID/FID Reading (ppm): Sample	Sampler BZ	Borehole**	Driller BZ**
0.5'	1.0'						Brown Sand		Natural Soils	0	0		
1.0'	1.5'						Brown Sand		Nat. Soils	0	0		
1.5'	2.0'						Black staining at	bottom of Interval		0	0		
2'	2.5'						Brown Sand - Black		staining	0	0		
2.5'	3.0'						Sand - white/Brown			0	0		
3	3.5'						White Sand			0	0		

* When rock coring, enter rock brokeness.

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

Remarks:

Drilling Area Background (ppm):

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

Tetra Tech NUS, Inc.

BORING LOG

Page ___ of ___

PROJECT NAME: Parris Island
PROJECT NUMBER: N0095
DRILLING COMPANY: NA
DRILLING RIG: NA

BORING No.: PAI-04-SB-17
DATE: 04/18/00
GEOLOGIST: J. Brown / D. Bongaik
DRILLER:

Sample No. and Type or RQD	Depth (Ft.) or Run No.	Blows/ 6" or RQD (%)	Sample Recovery / Sample Length	Lithology Change (Depth/Ft.) or Screened Interval	MATERIAL DESCRIPTION: Soil Density/ Consistency or Rock Hardness	Color	Material Classification	USCS *	Remarks	PID/FID Reading (ppm): Sample	Sampler BZ	Borehole**	Driller BZ**
0.5'	1'						Brown Sand			0	0		
1.0'	1.5'						Brown Sand			0	0		
1.5'	2.0'						Brown-Tan sand		51 ppm	51	0		
2'	2.5'						Brown-Tan Sand			8	0		
2.5'	3.0'						Orange Silty Sand			8	0		

* When rock coring, enter rock brokeness

** Include monitor reading in 5 foot intervals @ borehole. Increase reading frequency if elevated reponse read.

Remarks: _____

Drilling Area Background (ppm): ____

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

Tetra Tech NUS, Inc.

BORING LOG

Page ___ of ___

PROJECT NAME: Parris Island
PROJECT NUMBER: N0095
DRILLING COMPANY: NR
DRILLING RIG: NR

BORING No.: PRI-04-SB-18
DATE: 04-18-00
GEOLOGIST: J Brown / A Bragook
DRILLER:

Sample No. and Type or RQD	Depth (Ft.) or Run No.	Blows/6" or RQD (%)	Sample Recovery / Sample Length	Lithology Change (Depth/Ft.) or Screened Interval	MATERIAL DESCRIPTION: Soil Density/Consistency or Rock Hardness	Color	Material Classification	USCS*	Remarks	PID/FID Reading (ppm): Sample	Sampler BZ	Borehole**	Driller BZ**
0.5	1.0'						Brown / Orange Sand			0	0		
1.0	1.5						Brown / Orange Sand			0	0		
1.5	2.0						" " with Trace black			0	0		
2.0	2.5						White Sand			0	0		
2.5	3.0						" , some orange			0	0		
3.0	3.5						White Sand with orange staining damp.			0	0		

* When rock coring, enter rock brokeness

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

Remarks:

Drilling Area Background (ppm):

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

Tetra Tech NUS, Inc.

BORING LOG

Page ___ of ___

PROJECT NAME: Parris Island
PROJECT NUMBER: N0095
DRILLING COMPANY: NA
DRILLING RIG: NA

BORING No.: PAI-04-SB-028
DATE: 4-18-00
GEOLOGIST:
DRILLER: J Brown / D Bropeak

Sample No. and Type or RQD	Depth (Ft.) or Run No.	Blows/ 6" or RQD (%)	Sample Recovery / Sample Length	Lithology Change (Depth/Ft.) or Screened Interval	MATERIAL DESCRIPTION: Soil Density/ Consistency or Rock Hardness	Color	Material Classification	USCS*	Remarks	PID/FID Reading (ppm): Breathe	Sampler BZ	Borehole**	Driller BZ**
0.5	1.0						Clay - Brown			0	0		
1.0	1.5						"		Very hard	0	0		
1.5	2.0						"		"	0	0		
2.0	2.5						"		"	0	0		
2.5	3.0						"		"	0	0		
3.0	3.4						"		"	0	0		
3.4	3.5						Yellow ~~orange~~		Sand	0	0		
3.5	4.0						Orange/Tan Sand			0	0		

* When rock coring, enter rock brokeness

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

Remarks:

Drilling Area Background (ppm):

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

Tetra Tech NUS, Inc.

BORING LOG

Page ___ of ___

PROJECT NAME: Parris Island
PROJECT NUMBER: N0095
DRILLING COMPANY: NA
DRILLING RIG: NA

BORING No.: PAI-04-SB-21
DATE: 04/18/06
GEOLOGIST:
DRILLER: J. Brown / D. Bragaik

Sample No. and Type or RQD	Depth (Ft.) or Run No.	Blows/ 6" or RQD (%)	Sample Recovery / Sample Length	Lithology Change (Depth/Ft.) or Screened Interval	MATERIAL DESCRIPTION: Soil Density/ Consistency or Rock Hardness	Color	Material Classification	USCS*	Remarks	PID/FID Reading (ppm): Sample	Sampler BZ	Borehole**	Driller BZ**
0.5	1.0						Clay Brown			0	0		
1.0	1.5						" "			0	0		
1.5	2.0						" "			0	0		
2.0	2.5						" "			0	0		
2.5	3						Clay - Grey			0	0		
3	3.5						Coal type material white-tan sand		Perhaps old road	0	0		
3.5	4.0						White-Tan Sand			0	0		

* When rock coring, enter rock brokeness

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

Remarks:

Drilling Area Background (ppm):

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

Tetra Tech NUS, Inc.

BORING LOG

Page ___ of ___

PROJECT NAME: Parris Island
PROJECT NUMBER: N0095
DRILLING COMPANY: NA
DRILLING RIG: NA

BORING No.: PAI-04-SB-22
DATE: 04-18-00
GEOLOGIST:
DRILLER: J. Brown / D. Brayset

Sample No. and Type or RQD	Depth (Ft.) or Run No.	Blows/ 6" or RQD (%)	Sample Recovery / Sample Length	Lithology Change (Depth/Ft.) or Screened Interval	MATERIAL DESCRIPTION: Soil Density/ Consistency or Rock Hardness	Color	Material Classification	USCS*	Remarks	PID/FID Reading (ppm): Sample	Sampler BZ	Borehole**	Drilling BZ**
0.5	1.0						Brown Clay		Hard clay	0	0		
1.0	1.5						" "			0	0		
1.5	2.0						" "			0	0		
2.0	2.5						" "			0	0		
2.5	3.0						" "			0	0		
3.0	3.5						Grey-Brown Clay			0	0		
3.5	4.0						Grey Marsh clay			0	0		

* When rock coring, enter rock brokeness

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

Remarks: _____

Drilling Area Background (ppm): ____

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

Tetra Tech NUS, Inc.

BORING LOG

Page ___ of ___

PROJECT NAME: Parris Island
PROJECT NUMBER: N0095
DRILLING COMPANY: NA
DRILLING RIG: NA

BORING No.: PAI-04-SB-23
DATE: 04/19/00
GEOLOGIST:
DRILLER: J. Brown / R. Bryant

Sample No. and Type or RQD	Depth (Ft.) or Run No.	Blows/ 6" or RQD (%)	Sample Recovery / Sample Length	Lithology Change (Depth/Ft.) or Screened Interval	MATERIAL DESCRIPTION: Soil Density/ Consistency or Rock Hardness	Color	Material Classification	USCS*	Remarks	PID/FID Reading (ppm): Sample	Sample BZ	Breathing	Breathing BZ**
0.5'	1'						Brown Clay			0	0		
1	1.5						" "			0	0		
1.5	2						" "			0	0		
2.0	2.5						" "			0	0		
2.5	3.0						Brown Clay with Black Rock Sand		Possibly old road material	0	0		
3.0	3.5						" "		" "	0	0		
3.5	4.0						Orange Sand			0	0		

* When rock coring, enter rock brokeness

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

Drilling Area Background (ppm):

Remarks:

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

Tetra Tech NUS, Inc.

BORING LOG

Page ___ of ___

PROJECT NAME: Parris Island
PROJECT NUMBER: N0095
DRILLING COMPANY: NA
DRILLING RIG: NA

BORING No.: PA1-04-SB-24
DATE: 4/19/00
GEOLOGIST:
DRILLER: J. Bow / D. Bragaw

Sample No. and Type or RQD	Depth (Ft.) or Run No.	Blows/6" or RQD (%)	Sample Recovery / Sample Length	Lithology Change (Depth/Ft.) or Screened Interval	MATERIAL DESCRIPTION: Soil Density/Consistency or Rock Hardness	Color	Material Classification	USCS*	Remarks	PID/FID Reading (ppm): Cuttings	Sampler BZ	Borehole**	Driller BZ**
0.5	1						Brown - Clay			0	0		
1	1.5						" "			0	0		
1.5	2						" "			0	0		
2.5	3						" "			0	0		
3	3.5						Orange - Tan Sand			0	0		
3.5	4.0						" "			0	0		

* When rock coring, enter rock brokeness

** Include monitor reading in 5 foot intervals @ borehole. Increase reading frequency if elevated reponse read.

Drilling Area Background (ppm): ____

Remarks: ____

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

Tetra Tech NUS, Inc.

BORING LOG

Page ___ of ___

PROJECT NAME: Parris Island
PROJECT NUMBER: N0093
DRILLING COMPANY: NA
DRILLING RIG: NA

BORING No.: PAI-04-SB-25
DATE: 4/19/00
GEOLOGIST:
DRILLER: J. Brown / D. Brayack

Sample No. and Type or RQD	Depth (Ft.) or Run No.	Blows/ 6" or RQD (%)	Sample Recovery / Sample Length	Lithology Change (Depth/Ft.) or Screened Interval	MATERIAL DESCRIPTION: Soil Density/ Consistency or Rock Hardness	Color	Material Classification	USCS *	Remarks	PID/FID Reading (ppm): Sample	Sampler BZ	Borehole**	Drilled BZ**
0.5	1.0						Clay - Brown			0	0		
1	1.5						"			0	0		
1.5	2						"			0	0		
2.5	3.0						Clay - Brown			0	0		
3.0	3.5						Sand - Brown			0	0		
3.5	4.0						Orange-Tan Sand			0	0		

* When rock coring, enter rock brokeness

** Include monitor reading in 5 foot intervals @ borehole. Increase reading frequency if elevated reponse read.

Remarks:

Drilling Area Background (ppm):

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

ATTACHMENT 2

RESPONSE TO U.S. EPA COMMENTS

U.S. EPA Remedial Project Manager: Robert Pope

Specific Comments

1. **Comment - Page C-1, 2nd paragraph.** Is there a reason the observed staining and elevated PID readings do not correspond? Were the PID readings taken from headspace, composite sample material, or the open boring? Please clarify and offer additional explanation.

   Response: For fuel-contaminated sites, PID readings are generally indicative of VOCs where as black-stained soils are indicative of non-volatile organics or biomass. Since this site has weathered for 30 or more years, it's not unexpected for VOCs and non-VOCs to be found at different locations. The PID readings were taken within an enclosed portion of the hand auger boring bit, similar to a reading from a split spoon.

   Elevated PID readings are usually an indication of VOCs in the soil. For this reason, a soil sample from PAI-04-SB-17 is proposed for TCL VOC analysis. However, as requested in comment number 5, the soil sample will also be analyzed TCL SVOCs.

   The lack of a PID reading from a soil boring where staining is observed would indicate that VOCs are not likely present at the location. For this reason, a soil sample from PAI-04-SB-16 was not proposed for TCL VOC analysis. However, the black staining observed in the soil boring could result from non-VOC remnants of past fire-training activities; consequently, TCL SVOCs and pesticides/PCBs and TAL inorganic analyses were proposed. However, as requested in comment number 7, the soil sample will also be analyzed TCL VOCs.

2. **Comment - Page C-2, 1st paragraph.** Describe how the borings installed in April, 2000 were backfilled and specify whether the locations were staked and/or surveyed.

   Response: The borings were backfilled with soil cuttings. Soil with elevated PID readings or staining were placed back in the boring at the approximate depth at which the soil was encountered. The two locations (one location with elevated PID readings and one location with stained soil) were marked with survey stakes. The borings have not been surveyed, but are in line-of-sight of two surveyed locations. The distances from the surveyed points to the new locations were measured with a tape measure and documented in the field log book.

3. **Comment - Page C-2, Table 1.** Clarify why the depth intervals chosen for each boring were selected for this table (i.e., are these considered to be representative of the entire boring). Please include boring logs or complete stratigraphic summaries with future submittals.

   Response: All soil borings (with the exception of PAI-04-SB-19) were installed to a depth of 4 feet below ground surface. The table contains a summary of items of interest from the soil borings. The shown depth intervals correspond to either the PID reading observed or the visual observation made. To clarify, the depth interval will be footnoted to indicate whether the interval applies to the PID reading or the visual observation.

   TtNUS intended to include the borings logs within the SI/CS report; however, as requested, the boring logs will be included in the Work Plan Addendum as an attachment.

4. **Comment - Page C-2, Table 1.** Clarify what is meant by "natural sands" in the visual observations (e.g., undisturbed fine to medium grained sand).

   Response: The natural sands consist of undisturbed medium-grained material characteristic of the area. Fill material such as dredge spoils is distinctive at this site.

5. **Comment - Page C-2, 2nd paragraph, 1st sentence.** Recommend including TCL SVOCs for analysis at PAI-04-SB-17, as the field screening method used is not discriminatory and this will allow comparison to other soil and groundwater data.

   Response: Although the PID reading is probably an indication of the presence of VOCs, the sample from location PAI-04-SB-17 will also be analyzed for TCL SVOCs as requested.

6. **Comment - Page C-2, 2nd paragraph, 2nd sentence.** Please specify the estimated sample interval thickness.

   Response: For the collection of soil that will be analyzed for TCL VOCs, the sample will be a grab sample and will be collected using Encore® samplers at the depth of the highest PID reading. For all other analytes, the sample will be collected over a 1-foot interval.

7. **Comment - Page C-2, 2nd paragraph, 3rd sentence.** Recommend including TCL VOCs for analysis at PAI-04-SB-16, as the field screening method used is not discriminatory and this will allow comparison to other soil and groundwater data.

   Response: The sample will be analyzed for TCL VOCs as requested.

8. **Comment - Page C-2, 2nd paragraph, 4th sentence.** Please specify the estimated sample interval thickness.

   Response: For the collection of soil that will be analyzed for TCL VOCs, the sample will be a grab sample and will be collected using Encore® samplers at the depth where visual staining is observed. For all other analytes, the sample will be collected over a 1-foot interval.

9. **Comment - Page C-2, 2nd paragraph.** Please specify or reference the methods/procedures proposed to be used for soil sampling (i.e., collection of VOC samples, sample compositing, etc.). Additionally, describe the proposed method for borehole abandonment.

   Response: In regards to sample collection, please refer to the response to comment 8.

   The borings will be backfilled with soil cuttings. If soil with elevated PID readings or staining is encountered, the soil will be placed at the depth at which the soil was encountered.

10. **Comment - Page C-3, 1st paragraph, 3rd sentence.** Recommend including TCL VOCs for analysis at PAI-MW-04-02(S), as the potential area of contamination has not been established and to allow comparison with other soil and groundwater data.

    Response: The sample will be analyzed for TCL VOCs as requested.

11. **Comment - Page C-3, 1st paragraph, 4th sentence.** Recommend including TCL SVOCs for analysis at PAI-MW-04-03(S), as the potential area of contamination has not been established and to allow comparison with other soil and groundwater data.

    Response: The sample will be analyzed for TCL SVOCs as requested.

12. **Comment - Page C-2, 2nd paragraph.** Please specify or reference the methods/procedures proposed to be used for well installation, development, purging, and sampling.

Response: The methods and procedures to be used for well installation, development, purging, and sampling will be performed as indicated in the main text of the SWMU 21 RI/RFI Work Plan and SI/CS Work Plan for Site/SWMU 5, Site/SWMU 8, Site 13C/SWMU 13 and SWMUs 27 and 35. The 2nd paragraph of Page C-2 will be revised to include a reference to the methods and procedures indicated in the main text.

Please note that Sites/SWMUs 4 and 7 were added to this work plan in an addendum to this Work Plan (added as Appendix B).

The work plan addendum for additional field activities at Site/SWMU 4 (the addendum to which these comments are directed) will be added as Appendix C.