04.05-09/01/94-00127

FINAL
CORRECTIVE MEASURES PLAN

SITE 16
PCB CAPACITOR SPILL, POLE NO. 425
NAVAL AMPHIBIOUS BASE LITTLE CREEK
VIRGINIA BEACH, VIRGINIA

CONTRACT TASK ORDER 0240

Prepared For:

NAVAL FACILITIES ENGINEERING COMMAND
ATLANTIC DIVISION
Norfolk, Virginia

Under:

Contract N62470-89-D-4814

Prepared By:

FOSTER WHEELER ENVIRONMENTAL SERVICES
Livingston, New Jersey

through

BAKER ENVIRONMENTAL, INC.
Coraopolis, Pennsylvania

SEPTEMBER 1994

TABLE OF CONTENTS

Page

1.0 INTRODUCTION 1-1

1.1 Purpose and Objectives 1-1
1.2 Report Organization 1-2

2.0 SITE CHARACTERIZATION 2-1

2.1 Site Description 2-3
2.1.1 Climate 2-3
2.1.2 Geology and Hydrogeology 2-6
2.2 Site Investigations 2-6
2.2.1 Initial Assessment Study 2-6
2.2.2 Preliminary Site Inspection 2-7
2.2.3 Site Inspection 2-7
2.3 Site Conditions That Justify a Corrective Measure 2-13

3.0 CORRECTIVE ACTION SCOPE AND OBJECTIVES . . . 3-1

3.1 Cleanup Goals 3-1
3.2 Corrective Action Scope 3-1
3.3 Corrective Action Schedule 3-3
3.4 Applicable or Relevant and Appropriate Requirements (ARARs) 3-4
3.4.1 Chemical-specific ARARs 3-4
3.4.2 Location-specific ARARs 3-4
3.4.3 Action-specific ARARs 3-4

4.0 IDENTIFICATION AND EVALUATION OF REMEDIAL ALTERNATIVES 4-1

4.1 Alternative 1 : Institutional Control 4-1
4.1.1 Effectiveness 4-2
4.1.2 Implementability 4-2
4.1.3 Costs 4-3
4.2 Alternative 2 : Excavation and Off-Site Landfilling 4-3
4.2.1 Effectiveness 4-5
4.2.2 Implementability 4-6
4.2.3 Costs 4-6
4.3 Alternative 3 : Excavation and Off-Site Incineration 4-6
4.3.1 Effectiveness 4-9
4.3.2 Implementability 4-9
4.3.3 Costs 4-10
4.4 Alternative 4 : Excavation and On-site Treatment - Thermal 4-10
4.4.1 Effectiveness 4-12
4.4.2 Implementability 4-13
4.4.3 Costs 4-14
4.5 Alternative 5 : Excavation and On-site Treatment - Solvent Extraction 4-14
4.5.1 Effectiveness 4-16
4.5.2 Implementability 4-17
4.5.3 Costs 4-18

5.0 RECOMMENDED CORRECTIVE ACTION 5-1

LIST OF TABLES

Table		Page
2-1	Preliminary Site Inspection Summary of Sampling Results	2-9
2-2	Site Inspection Summary of Samples Collected	2-10
2-3	Site Inspection Summary of PCBs Detected in Surface Soil with Associated Quality Control Samples	2-14
4-1	Cost Breakdown - Alternative 1 - Institutional Controls	4-4
4-2	Cost Breakdown - Alternative 2 - Excavation and Off-Site Landfilling	4-7
4-3	Cost Breakdown - Alternative 3 - Excavation and Off-Site Incineration	4-11
4-4	Cost Breakdown - Alternative 4 - On-Site Treatment (Thermal)	4-15
4-5	Cost Breakdown - Alternative 5 - On-Site Treatment (Solvent Extraction)	4-19
5-1	Comparative Analysis of Alternatives	5-2

LIST OF FIGURES

Figures		Page
2-1	Site Location Map	2-2
2-2	Base Location Map with Site Location	2-4
2-3	Site 16 - PCB Capacitor Spill, Pole No. 425	2-5
2-4	Site 16 - Preliminary Site Inspection Sampling Locations	2-8
2-5	Site 16 - Site Inspection Sampling Locations, 0-6 Inch Interval	2-11
2-6	Site 16 - Site Inspection Sampling Locations, 6-12 Inch Interval	2-12
3-1	Area Targeted for Remediation	3-2

1.0 INTRODUCTION

This report presents the Corrective Measures Plan (CMP) for the PCB Capacitor Spill, Pole No. 425 Site, hereafter referred to as Site 16, located at the Naval Amphibious Base (NAB) Little Creek, Virginia Beach, Virginia. This CMP has been prepared by Foster Wheeler Environmental Services (FWES), as part of the Baker Environmental, Inc. (Baker) Team, under contract to the Atlantic Division (LANTDIV) Naval Facilities Engineering Command.

This CMP report has been based on site investigations conducted to-date, which include an Initial Assessment Study (IAS) dated December 1984, a Preliminary Site Inspection (PSI) dated July 1991, as well as a Site Inspection (SI) conducted by the Baker Team in 1993. These investigations have identified an area of contamination at Site 16 due to a release of dielectric fluid from a capacitor formerly attached to Pole No. 425. The report will present corrective measures for this area of concern.

NAB Little Creek will become a Resource Conservation and Recovery Act (RCRA) permitted facility in the near future. This CMP has been prepared in anticipation of the future needs for RCRA compliance. The typical RCRA procedure is to perform a RCRA Facility Investigation (RFI) and follow it up with a Corrective Measures Study (CMS) to evaluate potential remedies; a Corrective Action Plan (CAP) is prepared subsequent to remedy selection. However, Site 16 is physically small, and the corrective measure is already "known" due to the nature and extent of contamination observed during the SI. Therefore, a CMP is prepared following guidance provided by EPA Region III. In this manner, the CMS and CAP are combined to reduce the paperwork and to expedite the corrective action.

1.1 Purpose and Objectives

The purpose of this CMP is to evaluate the potential remedial alternatives for the area of concern identified at Site 16 and to recommend a corrective measure based on this analysis.

The objective of this CMP report is to provide a brief analysis of remedial alternatives. This analysis is conducted following the guidelines of the Comprehensive Environmental Response, Compensation and Liability Act of 1980 (CERCLA), the Superfund Amendments and Reauthorization Act of 1986 (SARA), Resource Recovery and Conservation Act (RCRA) of 1984, and the National Oil and Hazardous Substances Contingency Plan (NCP). The recent EE/CA Guidance for Non-Time-Critical Removal Actions dated August 1993 has also been referenced.

This CMP also follows the guidelines published in the Navy/Marine Corps IR Manual dated February, 1992, since the Department of the Navy (DON) has broad authority under CERCLA Section 104 and Executive Order 12580 to carry out removal actions when the release is on, or the sole source of the release is from, the DON installation. The Navy/Marine Corps Installation Restoration (IR) Program was initiated to identify, assess, characterize, and clean up or control contamination from past hazardous waste disposal operations and hazardous material spills at Navy and Marine Corps activities.

1.2 Report Organization

A detailed description of the site, its background, the investigations to date and the nature and extent of contamination is presented in Section 2.0 of this report. Section 3.0 defines the scope of the proposed corrective action and provides a rationale to justify such an action. Section 4.0 provides a description and evaluation of potential remedial alternatives for the site contaminants. Section 5.0 compares the remedial alternatives and presents the recommended remedial approach.

2.0 SITE CHARACTERIZATION

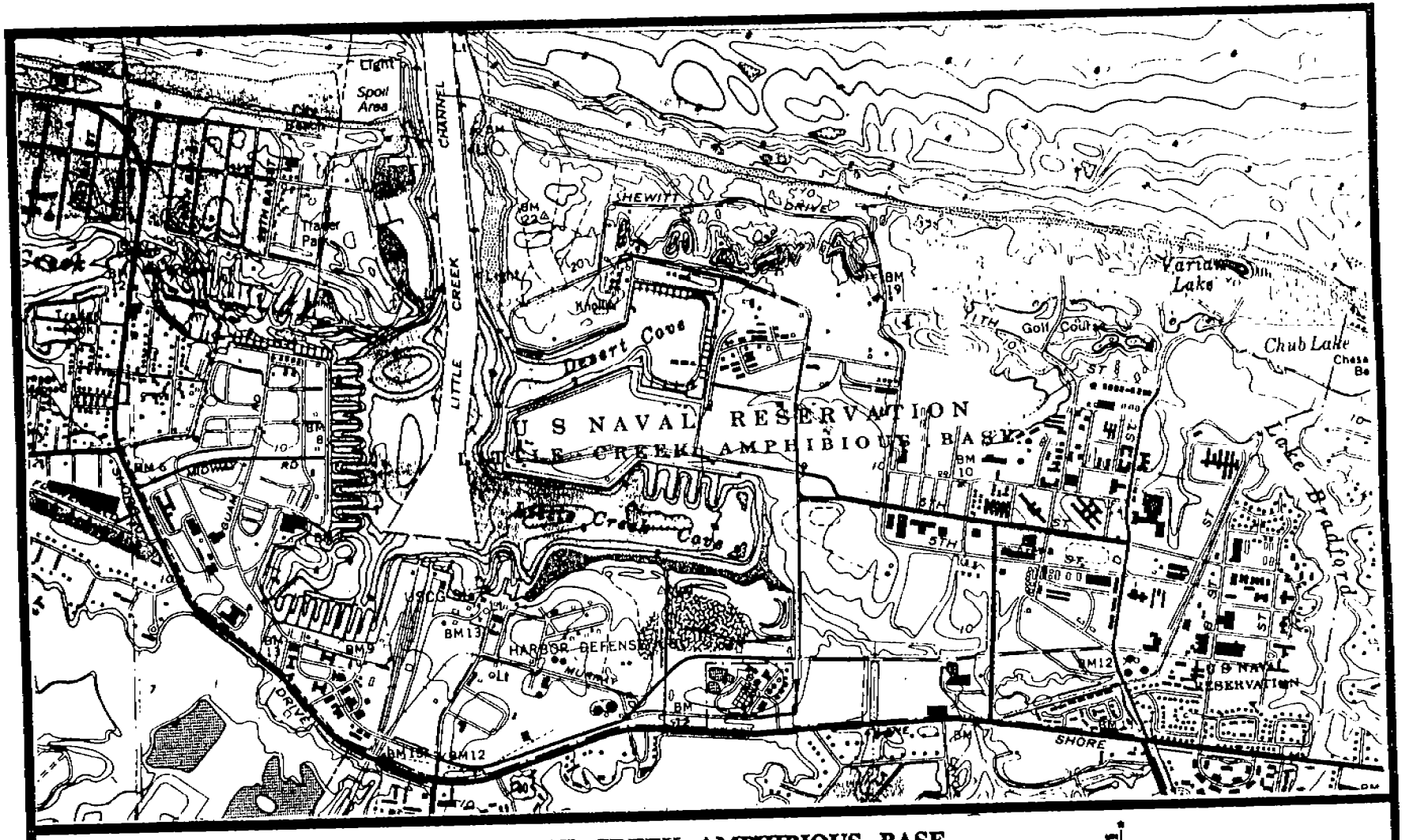
NAB Little Creek, Virginia Beach, Virginia, provides logistic facilities and support services to local commands, organizations, homeported ships, etc., to meet the amphibious warfare training requirements of the Armed Forces of the United States. The facility is adjacent to the city line of Norfolk. The area surrounding this 2,147-acre facility is low lying and relatively flat with several fresh water lakes. Chub Lake, Lake Bradford, Little Creek Reservoir/Lake Smith, and Lake Whitehurst are located on or adjacent to the facility.

NAB Little Creek is located in the Atlantic Coastal Plain physiographic province in southeastern Virginia, as shown in **Figure 2-1**. This portion of Virginia is referred to as the Hampton Roads area. The facility is bounded on the north by the Chesapeake Bay, on the south by Shore Drive, and on the east by Lake Bradford; the facility's west boundary just stretches over the Norfolk-Virginia Beach border. The central portion of the base is composed of Little Creek Cove, Desert Cove, and the Little Creek channel that connects with the Bay. All of the installation lies within the jurisdictional boundary of Virginia Beach.

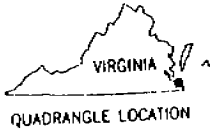
Use of land at the base is largely industrial, while land development surrounding the site is primarily suburban and industrial. The industrial development supports the many large shipyards in the area. NAB Little Creek was commissioned on July 30, 1945 by combining four contiguous activities. The Navy began purchasing land in the area from private estates and the Pennsylvania Railroad just prior to the outbreak of World War II. The first activity to be commissioned was the Amphibious Training Base in the southwestern corner of the present base near Little Creek Harbor. The base's mission was the training of landing craft personnel for operational assignments. Over the last fifty years, NAB Little Creek has expanded both in area and in the complexity of its mission (PSI, 1991).

At full complement, NAB Little Creek currently has approximately 13,650 personnel. The base population increases during the summer, when much of the amphibious training of Navy and Marine Corps Reservists occurs. Approximately thirty five ships are homeported at the base at the present time. (SI, 1994)

Environmental investigations at NAB Little Creek sites were initially documented in the IAS (NEESA 13-066). In 1975, the Department of Defense initiated a program to investigate past disposal sites at military installations. This program, the Navy Assessment and Control of Installation Pollutants (NACIP), called for a three-phase operation. Phase One was the IAS, which was to identify potentially contaminated areas. Phase Two was the Confirmation Study

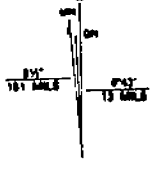


LITTLE CREEK AMPHIBIOUS BASE
VIRGINIA BEACH, VIRGINIA
SITE LOCATION MAP



QUADRANGLE LOCATION

Little Creek, VA Quadrangle
7.5 Minute Series (Topographic)



UTM GRID AND 1986 MAGNETIC NORTH DECLINATION AT CENTER OF SHEET

Figure 2-1
Scale: 1" = 2000'

Prepared by:
Foster Wheeler Enviresponse, Inc.

Date: March 21, 1994

to verify or characterize the contamination. Phase Three is expected to include the Remedial Action. The program was changed in 1986 to reflect the requirements of the Superfund Amendment and Reauthorization Act (SARA) and now is called the Installation Restoration Program (IRP).

2.1 Site Description

Figure 2-2 presents the location of Site 16 on the base. The specific area of the PCB capacitor spill around Pole No. 425 at Site 16 is shown on **Figure 2-3**. Pole No. 425 is located approximately 300 feet east of the intersection of Amphibious Drive and Helicopter Road on the south side of Amphibious Drive, approximately 12 feet from the road. This area of the facility is relatively level with a preferred direction of runoff to the north toward a swampy area in the woods, approximately 300 feet north of the road. During heavy rainstorms, water ponds in the grassy area where the pole is located between Amphibious Drive and the wooded area to the south until it reaches the level of the road and then drains to the north. An above-ground steam line parallels Amphibious Drive in this area and is located between Pole No. 425 and the woods, approximately 25 feet south of Amphibious Drive (PSI, 1991).

A campground is located in the wooded area south of Amphibious Drive. Access to the camping area is gained by two driveways located 50 feet east and 50 feet west of Pole No. 425. During installation of the electrical hookup to the campground, a ditch was excavated from Pole No. 425, passing southward through the woods, approximately 40 feet, to the area that had been cleared for the campground. The depth of the ditch was approximately two feet. After completion of the electrical hookup, the area was regraded and revegetated.

2.1.1 Climate

The climate of the Hampton Roads area is effected by the proximity of the Chesapeake Bay and the Atlantic Ocean. These two large water bodies attenuate seasonal climatic changes resulting in mild winters and warm summers.

Average total annual precipitation is 45 inches. The maximum 24-hour rainfall reported at Norfolk was 11.4 inches in August, 1964 (1992 Local Climatological Data, Annual Summary with Comparative Data, ISSN 0198-5345, National Oceanic and Atmospheric Administration).

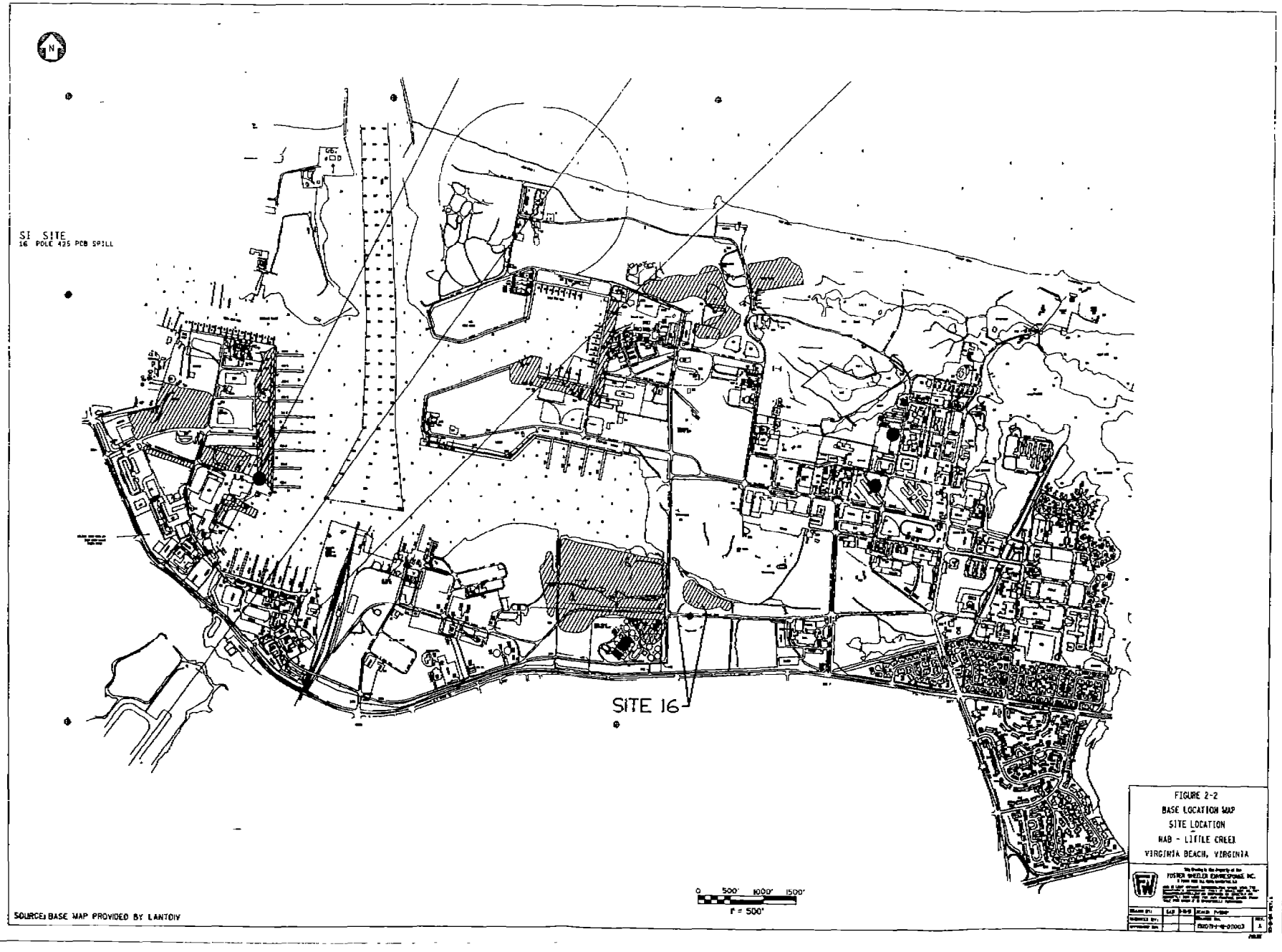


FIGURE 2-2
BASE LOCATION MAP
SITE LOCATION
NAB - LITTLE CREEK
VIRGINIA BEACH, VIRGINIA

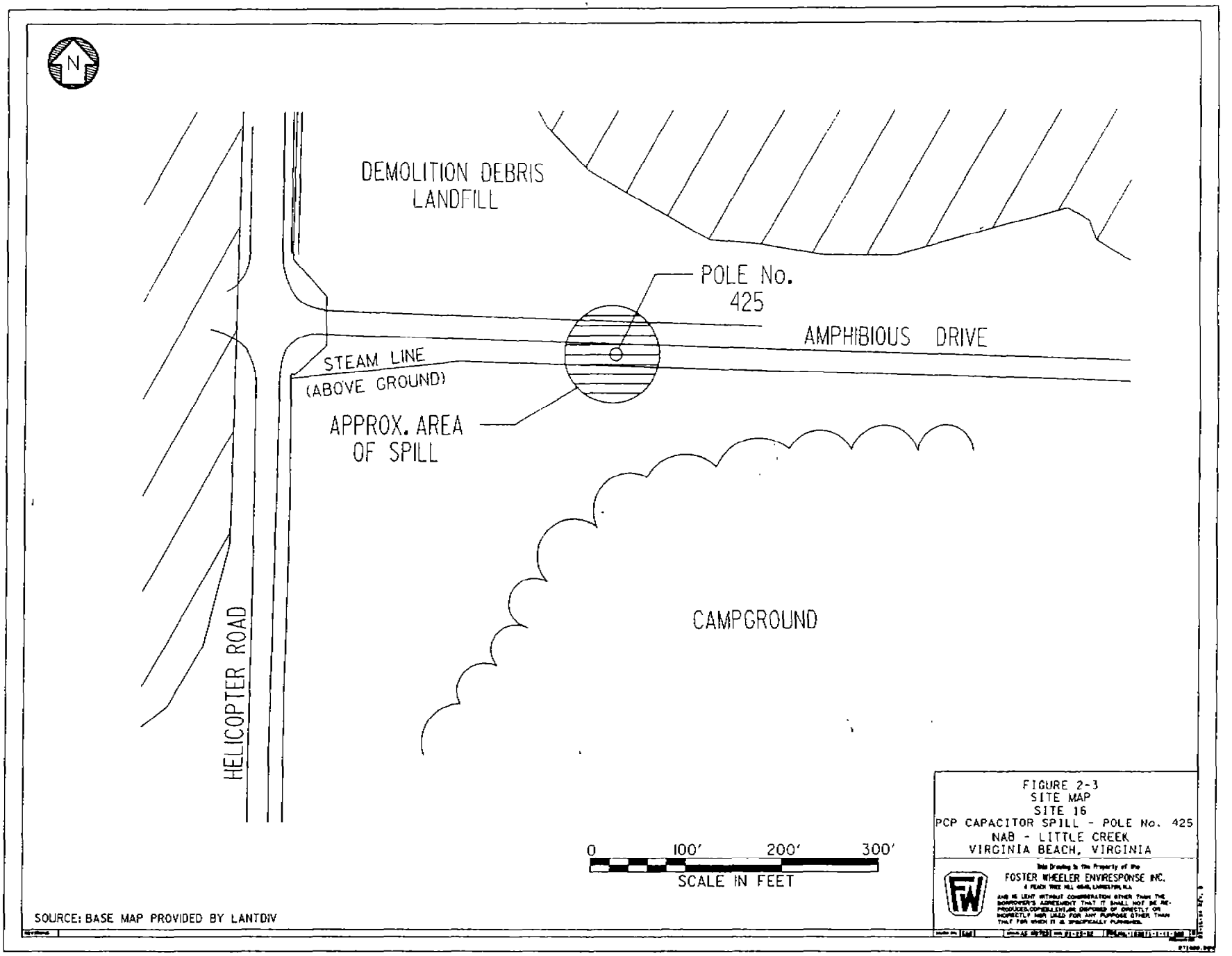


FIGURE 2-3
SITE MAP
SITE 16
PCP CAPACITOR SPILL - POLE No. 425
NAB - LITTLE CREEK
VIRGINIA BEACH, VIRGINIA

This Drawing is the Property of the
FOSTER WHEELER ENVIRESPONSE INC.
4 PEACH TREE HILL ROAD, LANCASTER, N.J.
AND IS LENT WITHOUT CONSIDERATION OTHER THAN THE BORROWER'S AGREEMENT THAT IT SHALL NOT BE REPRODUCED, COPIED, LENT, OR DISPOSED OF DIRECTLY OR INDIRECTLY NOR USED FOR ANY PURPOSE OTHER THAN THAT FOR WHICH IT IS SPECIFICALLY FURNISHED.

c:\192071\071800.dgn Mar. 21, 1994 13:28:59

Snowfall in the area averages approximately 7.2 inches per year. Temperatures for the region range from a winter average of 42°F to a summer average of 77°F. The hottest temperature recorded was 104°F in August 1980, and the lowest temperature on record for the area was -3°F in January 1985. Relative humidity in the area ranges from an average of 58 percent at mid-afternoon to an average high of approximately 78 percent at dawn. The prevailing wind direction is to the northeast with an average speed of 10.6 mph (NOAA, 1992).

2.1.2 Geology and Hydrogeology

The Hampton Roads area has low subdued relief. Elevations at NAB Little Creek range from mean sea level along the Chesapeake Bay and Little Creek Cove to elevations as high as 40 feet above mean sea level at some of the larger dunes along the Bay. The average elevation for the facility is about 10 feet above mean sea level. The primary surface features of the Hampton Roads area are the many rivers, lakes and marsh areas.

As topographic relief across the site is slight, surface water or groundwater that is not intercepted by receptors may generally flow northward into either of the lakes located in the eastern part of the Base or into Chesapeake Bay. At the site any underground utilities might intercept groundwater flow and, in the case of the linear utilities, act to channel the flow.

Though no groundwater monitoring wells exist on-site, nearby wells indicate a depth to groundwater of approximately 4 - 6 feet below ground level in the area.

2.2 Site Investigations

2.2.1 Initial Assessment Study (IAS)

The IAS did not recommend a confirmation study at this site. Less than five gallons of dielectric fluid were found missing from the capacitor, formerly attached to Pole No. 425, after a lightning strike in the early 1980s (IAS, 1984). The capacitor has since been removed from the pole, but the pole is still in use. There is no visible evidence currently at the site that would indicate a spill of PCB-laden fluid. Under Navy's initiative, approximately one inch of topsoil was removed from around the base of the pole immediately after the incident. A soil sample taken from this site after the incident and shallow excavation revealed a PCB concentration of 1,000 mg/l. IAS recommended only mitigation measures for Site 16. The site was studied further during the PSI.

2.2.2 Preliminary Site Inspection (PSI)

A total of four soil samples were collected at Site 16 during the PSI conducted in July 1991. The sampling locations are shown on **Figure 2-4**. The results of the sampling are provided in **Table 2-1**.

Detectable concentrations were present at all four sampling locations. Higher concentrations of Aroclor 1242, 750,000 ug/kg at 16-SS03 and 810,000 ug/kg for one of two samples collected at 16-SS04, were located to the north and west of Pole No. 425.

The PSI recommended the area be fenced and labelled as contaminated. Sampling of both surface and subsurface soils should be conducted to define the areal and vertical extent of the PCB contamination. The PSI also recommended the contaminated soil be removed, using the most stringent clean-up level as a guideline due to the proximity of the campground, and placed in a TSCA-approved landfill.

2.2.3 Site Inspection

The Baker Team conducted an SI at Site 16 in conjunction with an RI/FS performed at other IR sites. The investigation consisted of a field screening, surface soil sampling, and surveying. Field activities were completed in June 1993. **Table 2-2** presents a sampling summary of Site 16 for this investigation.

Forty-eight surface soil samples were collected for field screening. Field screening was conducted using the Dexsil L2000 PCB/Chloride Analyzer. The soil samples were collected from twenty-four grid nodes shown on **Figures 2-5** and **2-6** at depth intervals of 0-6 inches and 6-12 inches. These figures also present the Dexsil field screening results. The grid nodes were determined using a 10 foot by 10 foot grid system. The system is susceptible to false positive readings for PCBs due to other organic chlorine containing compounds which may be present in the soil. For this reason, the screening was used only to delineate the maximum possible area of PCB contamination.

Ten surface soil samples were collected at Site 16 from areas identified during the field screening as "hot spots." The number of soil samples was equally divided between depths ranging from 0 to 6 inches and 6 to 12 inches. The area to be sampled was first cleared of any grass, twigs, or stones. A stainless steel spoon was used to place the sample directly into a pre-

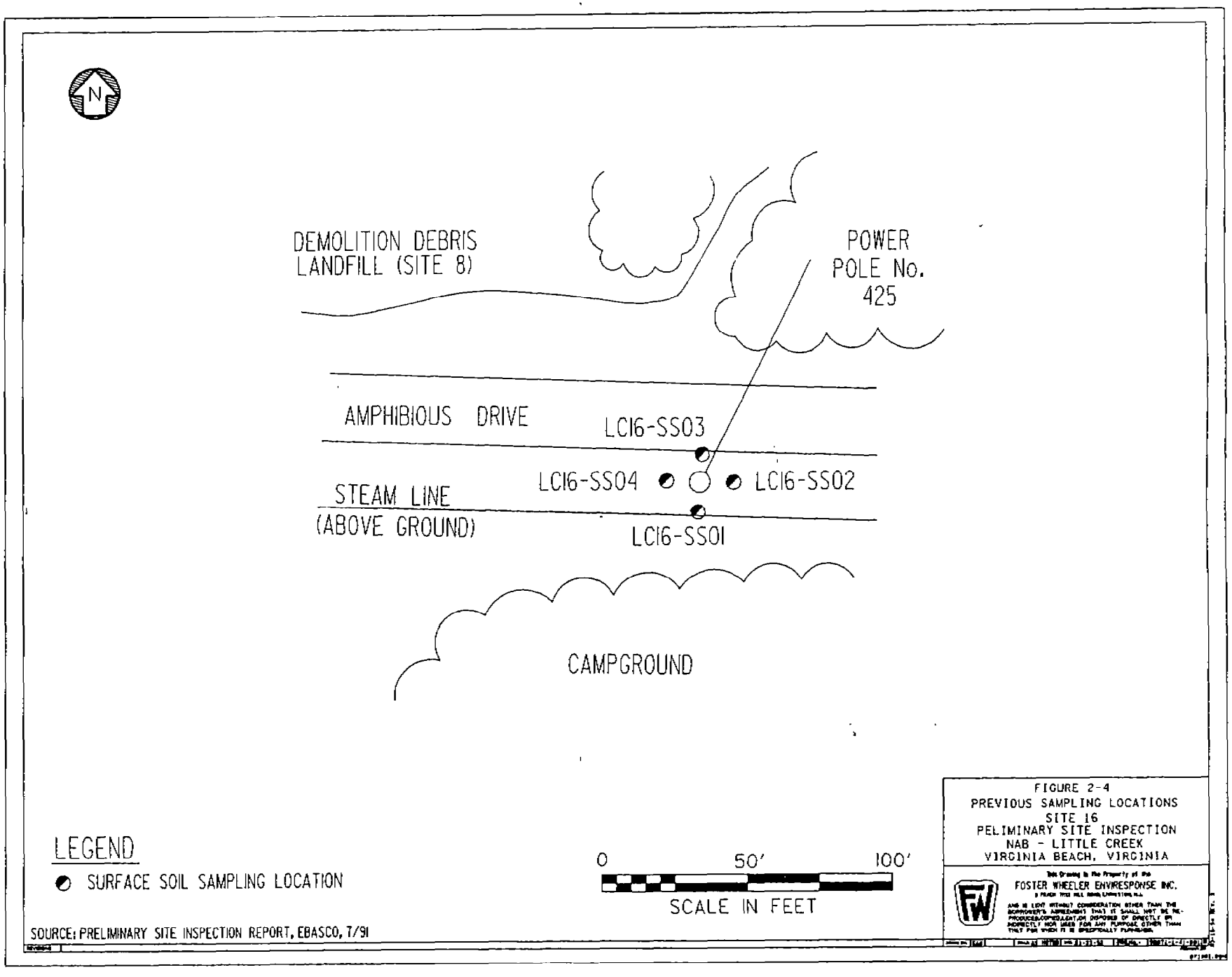


FIGURE 2-4
PREVIOUS SAMPLING LOCATIONS
SITE 16
PELIMINARY SITE INSPECTION
NAB - LITTLE CREEK
VIRGINIA BEACH, VIRGINIA

SOURCE: PRELIMINARY SITE INSPECTION REPORT, EBASCO, 7/91

c:\192071\071801.dgn Mar. 21, 1994 13:36:37

TABLE 2-1

SUMMARY OF ANALYTICAL RESULTS FOR SURFACE SOIL SAMPLES
SITE 16: PCB CAPACITOR SPILL, POLE NO. 425
NAB LITTLE CREEK
VIRGINIA BEACH, VIRGINIA
PRELIMINARY SITE INSPECTION
JULY 1991

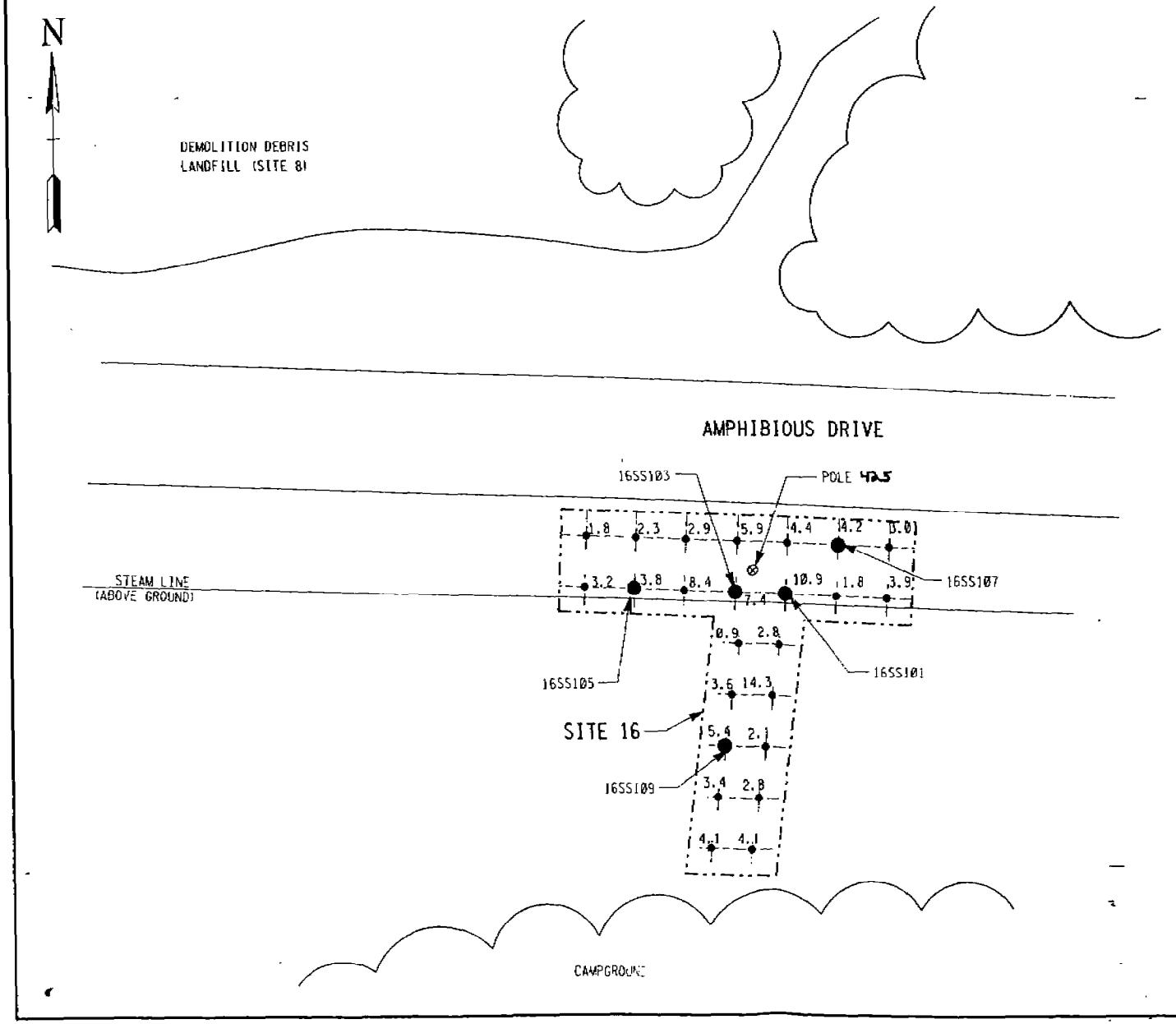
PARAMETER	16-SS01	16-SS02	16-SS03	16-SS04
PCBs (ug/kg)				
AROCLOR 1242	14,000	15,000	750,000	810,000

TABLE 2-2

SAMPLING SUMMARY
SITE 16 – PCB CAPACITOR SPILL, POLE NO. 425
NAB LITTLE CREEK
VIRGINIA BEACH, VIRGINIA

MEDIA	SAMPLE DESIGNATION	SAMPLE LOCATION	TOTAL NUMBER OF SAMPLES PER MEDIA	LABORATORY ANALYSIS
SURFACE SOIL SCREENING	16SSS-101 16SSS-101D 16SSS-102 16SSS-102D 16SSS-103 16SSS-103D 16SSS-104 16SSS-104D 16SSS-105 16SSS-105D 16SSS-106 16SSS-106D 16SSS-107 16SSS-107D 16SSS-108 16SSS-108D 16SSS-109 16SSS-109D 16SSS-110 16SSS-110D 16SSS-111 16SSS-111D 16SSS-112 16SSS-112D 16SSS-113 16SSS-113D 16SSS-114 16SSS-114D 16SSS-115 16SSS-115D 16SSS-116 16SSS-116D 16SSS-117 16SSS-117D 16SSS-118 16SSS-118D 16SSS-119 16SSS-119D 16SSS-120 16SSS-120D 16SSS-121 16SSS-121D 16SSS-122 16SSS-122D 16SSS-123 16SSS-123D 16SSS-124 16SSS-124D	16SSS-101 16SSS-101D 16SSS-102 16SSS-102D 16SSS-103 16SSS-103D 16SSS-104 16SSS-104D 16SSS-105 16SSS-105D 16SSS-106 16SSS-106D 16SSS-107 16SSS-107D 16SSS-108 16SSS-108D 16SSS-109 16SSS-109D 16SSS-110 16SSS-110D 16SSS-111 16SSS-111D 16SSS-112 16SSS-112D 16SSS-113 16SSS-113D 16SSS-114 16SSS-114D 16SSS-115 16SSS-115D 16SSS-116 16SSS-116D 16SSS-117 16SSS-117D 16SSS-118 16SSS-118D 16SSS-119 16SSS-119D 16SSS-120 16SSS-120D 16SSS-121 16SSS-121D 16SSS-122 16SSS-122D 16SSS-123 16SSS-123D 16SSS-124 16SSS-124D	48	PCB Field Analysis Using the Dexsil L2000
SURFACE SOIL	16SS-101 16SS-102 16SS-103 16SS-104 16SS-105 16SS-106 16SS-107 16SS-108 16SS-109 16SS-110	16SS-101 16SS-102 16SS-103 16SS-104 16SS-105 16SS-106 16SS-107 16SS-108 16SS-109 16SS-110	10	PCBs TOC

NOTES:
1) TCL PCBs indicates Polychlorinated Biphenyls
2) TOC indicates Total Organic Carbon
3) D indicates a soil sample from a deeper depth, 6" to 12" as compared to 0" to 6".



NOTES:

1. EACH GRID EQUALS APPROX. 10'-0"

LEGEND

- SITE BOUNDARY
- • FIELD SCREENING SAMPLES USING DEXSIL L-2000
- 10.9 ● FIELD SCREENING SAMPLES USING DEXSIL AND SENT TO LAB.
- 16SS101 IDENTIFICATION NUMBER FOR THE SAMPLE SUBMITTED TO THE LABORATORY.
- 4.4 RESULTS OF FIELD SCREENING (IN ppm)

REV.	DATE	DESCRIPTION	APPR.
A	10-29-93	DRAFT TO LANTDIV	

REVISIONS

FIGURE 2-5

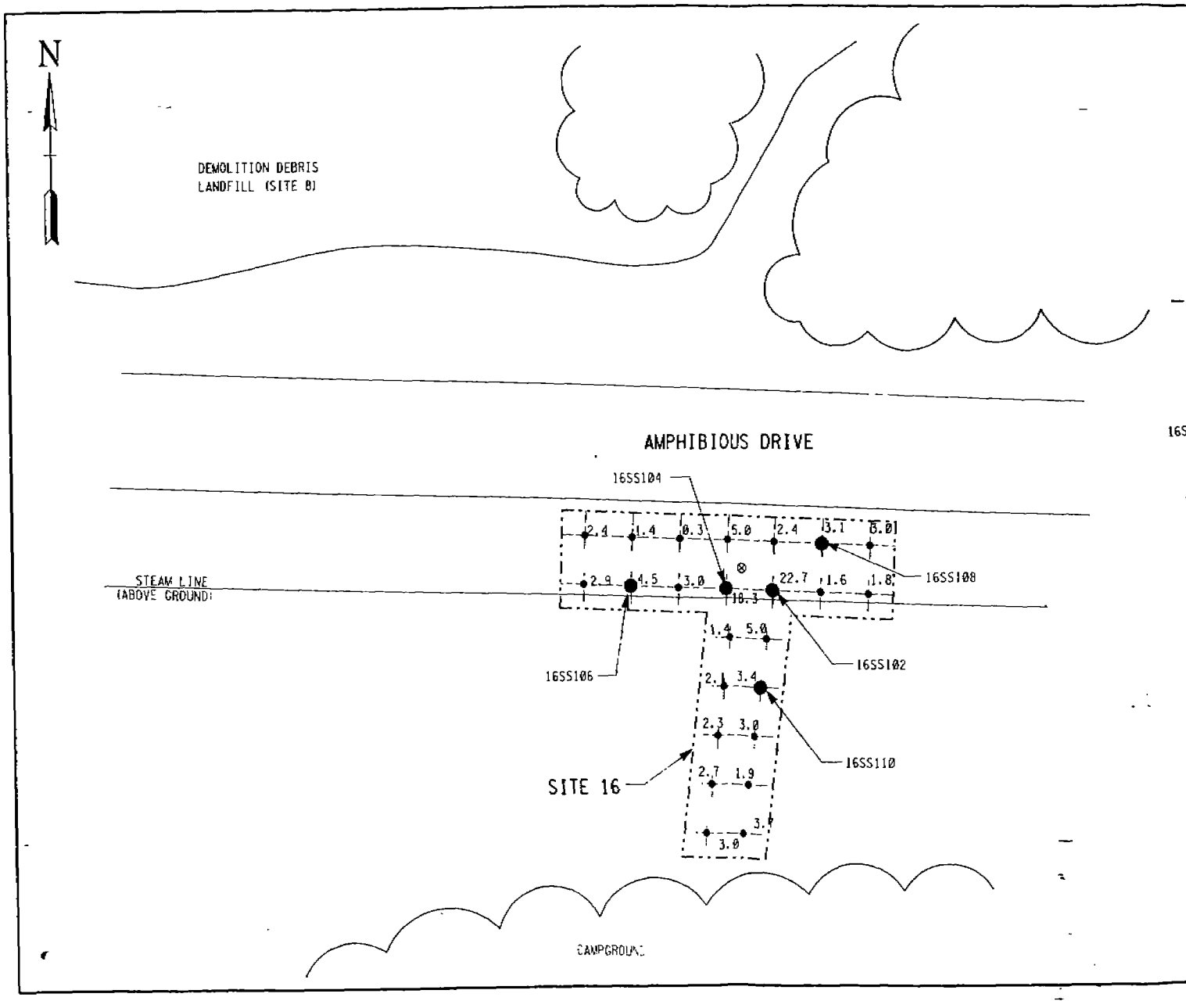
SAMPLING LOCATIONS
SAMPLE DEPTHS OF 0"-6"
SITE 16
NAB - LITTLE CREEK
VIRGINIA BEACH, VIRGINIA

This drawing is the property of the
FOSTER WHEELER ENVIRONMENTAL SERVICES
LIVINGSTON, NEW JERSEY
AND IS LENT WITHOUT CONSIDERATION OTHER THAN THE BORROWER'S AGREEMENT THAT IT SHALL NOT BE REPRODUCED, COPIED, LENT, OR DISPOSED OF DIRECTLY OR INDIRECTLY NOR USED FOR ANY PURPOSE OTHER THAN THAT FOR WHICH IT IS SPECIFICALLY FURNISHED.

DRAWN BY:	SAW	10/19/93	SCALE: GRID	
CHECKED BY:			DRAWING No.	REV.
APPROVED BY:			192071-4-48-1601	A

FWESD4.REF

DATE PLOT NO
13 16 MAR 94



NOTES:

1. EACH GRID EQUALS APPROX. 10'-0"

LEGEND

- SITE BOUNDARY
- • FIELD SCREENING SAMPLES USING DEXSIL L-2000
- 22.7 ● FIELD SCREENING SAMPLES USING DEXSIL AND SENT TO LAB.
- 16SS102 IDENTIFICATION NUMBER FOR THE SAMPLE SUBMITTED TO THE LABORATORY.
- 4.4 RESULTS OF FIELD SCREENING (IN ppm)

REV.	DATE	DESCRIPTION	APPR.
A	10-29-93	DRAFT TO LANTDIV	

REVISIONS

FIGURE 2-6

SAMPLING LOCATIONS
SAMPLE DEPTHS OF 6"-12"
SITE 16
NAB - LITTLE CREEK
VIRGINIA BEACH, VIRGINIA

This Drawing is the property of the
FOSTER WHEELER ENVIRONMENTAL SERVICES
LIVINGSTON, NEW JERSEY
AND IS LENT WITHOUT CONSIDERATION OTHER THAN THE BORROWER'S AGREEMENT THAT IT SHALL NOT BE REPRODUCED, COPIED, LENT, OR DISPOSED OF DIRECTLY OR INDIRECTLY NOR USED FOR ANY PURPOSE OTHER THAN THAT FOR WHICH IT IS SPECIFICALLY FURNISHED.

DRAWN BY:	SAW	10/19/93	SCALE: GRID	
CHECKED BY:			DRAWING No. 192071-4-48-1602	REV. A
APPROVED BY:				

FWESD4.REF

cleaned sample container supplied by the laboratory. The surface soil samples were analyzed for PCBs and TOC.

PCBs (Aroclor-1248) were detected at eight of the ten sampling locations. The highest concentration of PCBs detected was an estimated 2,100 mg/kg (2,100,000 ug/kg) at 16SS-103, which is well above the TSCA cleanup requirement (40 CFR 761 Subpart G) of 10 mg/kg. **Table 2-3** presents a summary of PCBs detected in surface soil and associated quality control samples. This table contains the results of the analysis conducted with the highest dilution, since analysis at lower dilutions provided results which were outside the linear range of instrument calibration. The laboratory reported both the results, at lower and higher dilution, for five of the ten samples analyzed for PCBs at Site 16.

2.3 Site Conditions That Justify a Corrective Measure

Sampling and analysis activities at Site 16 have confirmed PCB contamination in the soil surrounding Pole No. 425. Because the levels of PCBs detected are above TSCA guidelines, and the site's proximity to a campground and Amphibious Drive, a Corrective Measure is recommended.

Potential exposure scenarios which can cause human health risks are: utility workers performing electrical maintenance at the pole, base personnel passing within close proximity of the site, or Navy personnel vacationing in the campground.

TABLE 2

SUMMARY OF PCBs
DETECTED IN SURFACE SOIL SAMPLES
AND ASSOCIATED QUALITY CONTROL SAMPLES
SITE 16 – PCB CAPACITOR SPILL – POLE NO. 425
NAVAL AMPHIBIOUS BASE – LITTLE CREEK
VIRGINIA BEACH, VIRGINIA
MAY 14, 1993

SAMPLE LOCATION/NUMBER SAMPLE MATRIX UNITS	16SS–101 Soil ug/kg	16SS–102 Soil ug/kg	16SS–103 Soil ug/kg	16SS–104 Soil ug/kg	16SS–105 Soil ug/kg	16SS–106 Soil ug/kg	16SS–107(1) Soil ug/kg	16SS–108 Soil ug/kg
PCBs: Aroclor–1248	29,000 DJ	12,000 DJ	2,100,000 DJ	43,000 DJ	8,300 DJ	2,500 J	880	ND
TOTAL PCBs:	29,000 DJ	12,000 DJ	2,100,000 DJ	43,000 DJ	8,300 DJ	2,500 J	880	ND

SAMPLE LOCATION/NUMBER SAMPLE MATRIX UNITS	16SS–109 Soil ug/kg	16SS–110 Soil ug/kg	16SS–111 (Duplicate 16SS–110) Soil ug/kg	16SS–ER1 Water ug/L	16SS–ER2 Water ug/L	16SS–ER3 Water ug/L	16SS–ER4 Water ug/L
PCBs: Aroclor–1248	1,600 J	ND	ND	ND	ND	ND	ND
TOTAL PCBs:	1,600 J	ND	ND	ND	ND	ND	ND

NOTES:
ND indicates compound was not detected
ug/kg indicates micrograms per kilogram
ug/L indicates micrograms per liter
D indicates quatitation performed on the diluted sample
J indicates an estimated value
(1) indicates a matrix spike/matrix spike duplicate (MS/MSD) sample was collected with this sample
ER indicates equipment rinsate blank

3.0 CORRECTIVE ACTION SCOPE AND OBJECTIVE

3.1 Cleanup Goals

The objective of this corrective action is to remediate the contaminated soils within the Site 16 boundaries in order to reduce the potential threat to human health and the environment.

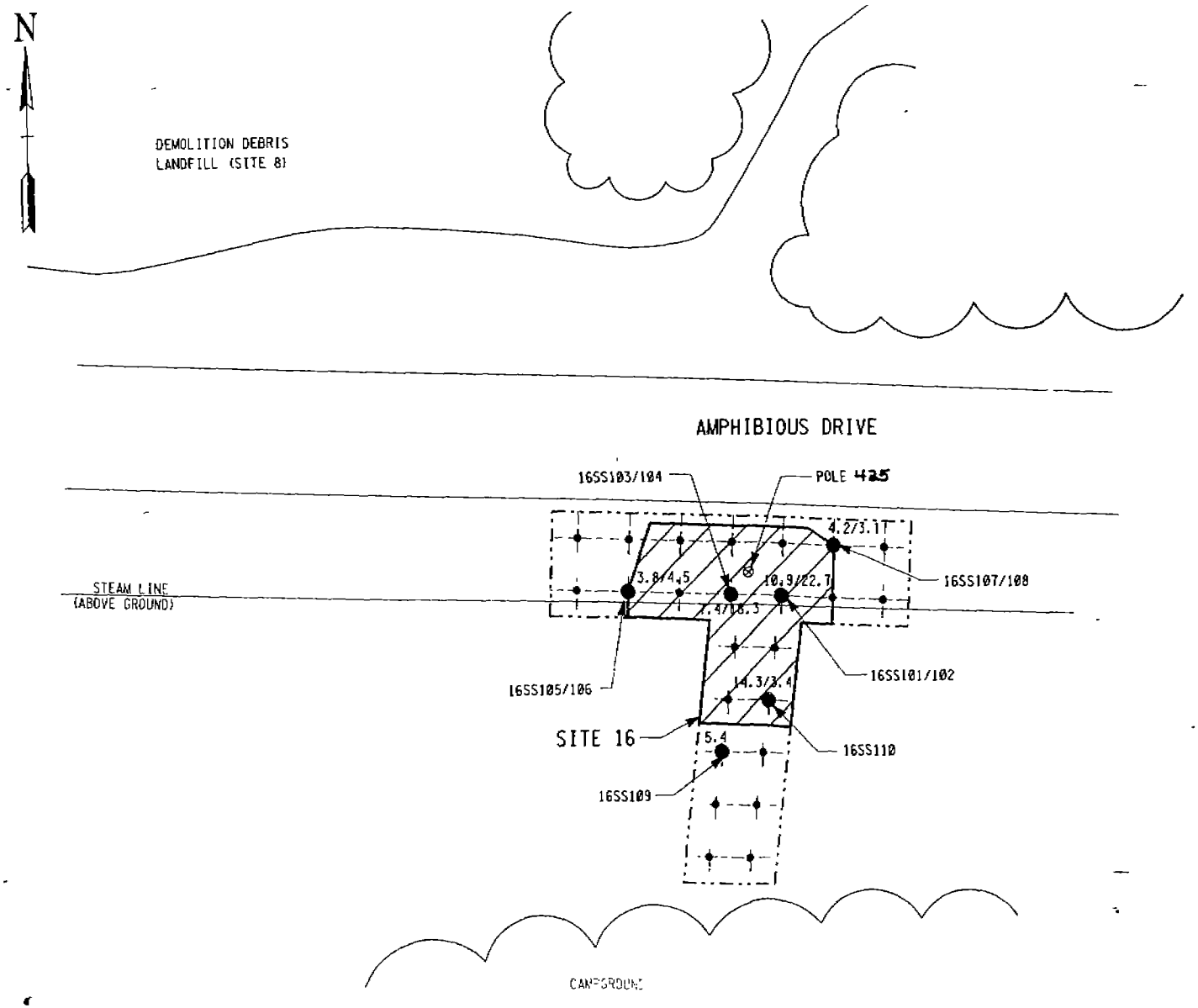
Toxic Substances Control Act (TSCA), 40 CFR 761 Subpart G, determines the PCB Spill Cleanup Policy for release of materials containing PCBs at concentrations of 50 ppm or greater. This policy specifically mandates cleanup for spills which occur after May 4, 1987. Although cleanup of prior spills is at EPA's discretion, it is desirable to meet the standards established under TSCA. Requirements for decontaminating spills in restricted access areas stipulates a level of 25 ppm, or 50 ppm provided a warning is displayed. Non-restricted access areas are required to be cleaned up to 10 ppm by weight, as per 40 CFR 761.125 (c)(4)(v). In addition, the excavated areas will have to be replaced by clean soils, containing less than 1 ppm of PCBs.

Currently, contaminated soils at Site 16 lie within a fenced area. Yet, occasional trespassing from the nearby campground can not be ruled out. Corrective action is required, since the observed PCB levels are well above 50 ppm. Therefore, a prudent objective of the remedial action is to restore the site in order to allow unrestricted access. Therefore, a cleanup goal of 10 ppm is proposed.

It is recognized that the EPA "Guidance on Remedial Actions for Superfund Sites with PCB Contamination" recommends 1 ppm as an initial action level and leaves acceptance of higher action level to the State agency. The only residential area near the site is the campground located at least 100 feet away from the site. The campground users are transitory and it is highly unlikely that the campground patrons will access the site due to its proximity to the road and the heavy concentration of weeds and brush buffering the site from the campground. Therefore, a 10 ppm action level was deemed acceptable. In addition, for active remediation options, discussed in Section 4.0, at least two feet of clean fill will be used to cover the excavated areas of the site.

3.2 Corrective Action Scope

The scope of this corrective action includes the Site 16 area identified in **Figure 3-1**. The area targeted for this corrective action is delineated based on the soil sampling conducted to-date.



NOTES:

1. EACH GRID EQUALS APPROX. 10'-0"

LEGEND

- SITE BOUNDARY
- FIELD SCREENING SAMPLES USING DEXSIL L-2000
- 4.2/3.1 NODES FOR WHICH SAMPLES WERE SENT TO THE LABORATORY WITH RESULTS.
- AREA TARGETED FOR REMEDIATION

REV.	DATE	DESCRIPTION	APPR.
A	10-29-93	DRAFT TO LANTDIV	

REVISIONS

FIGURE 3-1

AREA TARGETED FOR REMEDIATION
SITE 16
NAB - LITTLE CREEK
VIRGINIA BEACH, VIRGINIA

This Drawing is the property of the
FOSTER WHEELER ENVIRONMENTAL SERVICES
LIVINGSTON, NEW JERSEY
AND IS LENT WITHOUT CONSIDERATION OTHER THAN THE BORROWER'S AGREEMENT THAT IT SHALL NOT BE RE-PRODUCED, COPIED, LENT, OR DISPOSED OF DIRECTLY OR INDIRECTLY NOR USED FOR ANY PURPOSE OTHER THAN THAT FOR WHICH IT IS SPECIFICALLY FURNISHED.

DRAWN BY:	SAW	8/19/93	SCALE: GRID	
CHECKED BY:			DRAWING No.	REV.
APPROVED BY:			192071-4-48-1632	A

FWESD4.REF

Approximately 1,080 square feet of the site is considered as the area of concern, as compared to the entire site area of 2,300 square feet. The targeted area includes the locations where PCB levels above 10 ppm have been detected, and also those locations where the probability of such PCB levels is high. The approximate area identified in Figure 3-1 is 1,080 square feet. Using a depth of 2 feet for excavation depth, this represents 80 cubic yards (cy). The corrective action will consist of excavation, storage, sampling, treatment or disposal of soils from the affected areas, and subsequent restoration of the disturbed areas.

A list of the items of work involved in this corrective action varies with remedial alternatives. Hence, such a list is presented with the discussion of alternatives in Section 4.0.

3.3 Corrective Action Schedule

The schedule objective for the corrective action is completion within six (6) months from the time of approval of this CMP. The start date will be determined by factors such as weather conditions, availability of resources, normal procurement periods, and other activities at the site. Review periods and public comment periods will not affect the time-frame, since these issues will be accounted for prior to the finalization of the CMP.

A preliminary breakdown of the schedule is provided below:

- CMP Approval : Day Zero
- Design Completed : Day 30
- Corrective Action Commences : Day 60
- Corrective Action Completion : Day 120

The actual number of days of site activity is expected to be no more than 2-3 weeks. The intermediate waiting period will be required for analyses of post-excavation samples and disposal characterization, if any. This schedule is expected to be similar for all alternatives. This schedule can be expedited if 48-hour turnaround for laboratory analyses of post-excavation samples is requested at an additional cost.

3.4 Applicable or Relevant and Appropriate Requirements (ARARs)

3.4.1 Chemical-Specific ARARs

The chemical-specific ARARs have been identified in Section 3.1. Other ARARs are presented below.

3.4.2 Location-Specific ARARs

- Endangered Species Act (16 USC 153) - The Endangered Species Act requires action to avoid jeopardizing the continued existence of listed endangered or threatened species or modifications to their habitat. There are no endangered species observed at the site in the area targeted for corrective action.

- National Historic Preservation Act - The area targeted for corrective action has been heavily disturbed by construction activities prior to site contamination. Therefore, it is the opinion of the LANTDIV cultural resources specialist that the proposed action will have no effect on historic resources.

3.4.3 Action-Specific ARARs

The following action specific ARARs are relevant to the planned remedial activities:

1. Excavation/Off-site Disposal of Soils is regulated under Virginia Waste Management Act, Code of Virginia Sections 10.1-1400 et seq.; Virginia Hazardous Waste Management Regulations (VHWMR) (VR 672-10-1); Virginia Solid Waste Management Regulations (VSWMR) (VR 672-20-10), as well as the Resource Conservation and Recovery Act (RCRA), 42 U.S.C. 6901, and the applicable regulations contained in Title 40 of the Code of Federal Regulations; and the U. S. Department of Transportation Rules for Transportation of Hazardous Materials, 49 CFR Parts 107, 171.1-172.558.

    a. If the remedial response contemplated involves storage, treatment or disposal of a VHWMR/RCRA hazardous waste, various VHWMR/RCRA requirements may need to be complied with as specified in VHWMR and/or the applicable 40 CFR

Parts. Because Virginia administers an authorized state RCRA program, the Virginia Hazardous Waste Management Regulations (VHWMR) will serve as the governing ARAR in place of the RCRA regulations contained in the 40 CFR Parts, except for the Land Disposal Restrictions of 40 CFR Part 268.

b. The transportation of hazardous waste must be conducted in compliance with VHWMR (VR 672-10-1) Part V (Manifest Regulations for Hazardous Waste Management),and Part VII (Regulations Applicable to Transporters of Hazardous Waste), VHWMR (VR 672-30-1) Regulations Governing the Transportation of Hazardous Materials, and 49 CFR Parts 107, 171.1-172.558.

c. The deposits of any soil, debris, sludge or any other solid-waste from a site must be done in compliance with VSWMR (VR 672-20-10). Contaminated material from the site that is not classified as hazardous may be classified as a special waste under Part VIII of VSWMR. Specific authorization from VDWM is required before a landfill operator in Virginia can accept special wastes.

2. Land Disturbing Activities are regulated under the Virginia Stormwater Management Act, Sec. 10.1-603.1 et seq.; Virginia Stormwater Management Regulations (VR 215-02-00), the Virginia Erosion and Sediment Control Law, Section 10.1-560 et seq., the Virginia Erosion and Sediment Control Regulations (VR 625-02-00). However, the authority to approve erosion and sedimentation control plans at Navy sites has been delegated to LANTDIV; therefore, no permits will be required. Plans will be reviewed by LANTDIV for compliance with the Virginia Erosion and Sediment Control Law.

The following regulations should be referenced on an as-needed basis during the corrective action:

- RCRA Standards for Owners and Operators of Hazardous Waste Treatment, Storage, and Disposal Facilities (40 CFR 264) - This regulation play a role in determining the final destination of the excavated soils or other disposal materials from the site. 40 CFR Part 264 regulates the treatment, storage and disposal of hazardous waste. It will be determined which chemicals found on site are RCRA listed or characteristic hazardous wastes. If RCRA hazardous wastes are found to be present on site, all applicable rules and regulations as stated in 40 CFR Part 264 will be followed and the appropriate coordination will be obtained.

- RCRA Land Disposal Restrictions (40 CFR 268) - 40 CFR Part 268 identifies those RCRA hazardous wastes that are restricted from land disposal. Waste that is land disposal restricted would be shipped off site for disposal with the proper labels, manifests, and notification forms indicating that the waste is land disposal restricted.

- OSHA (29 CFR 1910, 1926, 1940) - These regulations provide occupational safety and health requirements applicable to workers engaged in on site field activities. It is required that the regulations be followed for site workers during construction and operation. Therefore, all workers will be made aware of the regulations and they will be enforced by the Site Health and Safety Officer during all site activities.

- DOT Rules for Hazardous Materials Transport (49 CFR 107, 171.1 - 171.500) -The wastes from the removal activities will be classified for transportation based on the chemicals present in the material. Shipping papers (including hazardous waste manifests) will be prepared that describe the hazardous material offered for transportation and will include contents, shipper's name, proper shipping name, hazard class, identification number, total quantity, and certification that the material is presented according to DOT regulations. All wastes will be packaged according to DOT regulations with the proper markings on each container.

4.0 IDENTIFICATION AND EVALUATION OF REMEDIAL ALTERNATIVES

The following section identifies remedial action alternatives applicable to Site 16. Analyses of five alternatives are presented to address the corrective action scope identified in Section 3.2. These alternatives are compared and a proposed corrective action is selected in Section 5.0.

The alternative evaluation is conducted to develop a comparative basis for each alternative. Each alternative will be analyzed based on the criteria cited in the Navy/Marine Corps Installation Restoration (IR) Manual, which parallels the EPA Guidance for Non-Time Critical Removal Actions. This manual recommends that criteria for evaluation of remedial alternatives include the following:

- Effectiveness to minimize the threat to public health;
- Consistency with anticipated final remedial action;
- Consistency with ARARs, and;
- Cost effectiveness.

Alternative 1 consists of Institutional Controls and does not involve any active remediation. General work items which are common to alternatives 2 through 5 include the following:

1) Excavation and remediation of approximately 80 cubic yards of PCB-impacted soils. This volume is calculated as a 1,080 square foot surface area multiplied by an average of 2 feet in depth;

2) Post-remedial confirmatory sampling and analysis;

3) Dewatering of standing water prior to excavation and storm water management during excavation;

4) Demarkation of below ground utility lines.

The shaded areas on Figure 3-1 depict the area to be remediated.

4.1 Alternative 1: Institutional Controls

Institutional controls, such as the implementation of a quarterly groundwater monitoring program, construction of a fence around the contaminated area to restrict access, or other controls to restrict use of the contaminated areas, are non-engineering solutions imposed to

prevent unregulated access to the site or movement of contaminated media. This alternative would also entail the preparation of administrative mandates such as deed restrictions. Implementation of this alternative would entail the following general items of work:

(1) Preparation of a mandate restricting use of the site.

(2) Preparation of a mandate prohibiting intrusive activities into the site soils.

(3) Fortification of the existing fence encircling the site;

(4) Implementation of a long-term groundwater monitoring program, including installation of a downgradient monitoring well and periodic sampling and analysis;

(5) Preparation of annual reports which assess the site conditions based on results of groundwater monitoring, including a potential recommendation for remedial action.

4.1.1 Effectiveness

Protectiveness : PCBs have been found in the site soils. Groundwater sampling has not been conducted in this area. Although PCBs are relatively insoluble and generally do not migrate rapidly through soil, these constituents can eventually reach the groundwater. If the prohibition against conducting intrusive activities at the site is upheld, the impacted soils may not pose an immediate risk to human health and the environment. However, if constituents of concern are left in the soils, it is possible that the soils will eventually contaminate the groundwater and may pose a risk to human life or the environment. Although a groundwater monitoring program will signal if groundwater is contaminated, it will not directly protect the groundwater.

This alternative will not be effective in attaining the chemical-specific ARARs since impacted soils would remain in-place.

Use of Alternatives to Land Disposal : This evaluation criteria is not applicable to this alternative.

4.1.2 Implementability

Technical Feasibility : The implementation of a groundwater monitoring program is routine and feasible. The preparation of annual reports is also routine and feasible.

Availability : Equipment, materials, and laborers (EM&L) to implement this alternative are readily available.

Administrative Feasibility : The implementation of this alternative would not require permitting; however, the preparation and enforcement of institutional mandates may be difficult or impossible. Also, the likelihood of public, state, and federal acceptance is low since PCBs are considered to be highly toxic. The schedule to implement this alternative would be contingent on the efficiency of administrative procedures.

4.1.3 Costs

Total costs to implement this alternative are approximately $53,400. Details of these costs are presented in **Table 4-1**.

4.2 Alternative 2: Excavation and Off-Site Landfilling

Off-site disposal at a TSCA-approved landfill was identified as a potential alternative because of the nature of constituents and expectation that this alternative will provide an effective method of remediation. Implementation of this alternative entails excavation of the contaminated soils, transportation of the soils to an off-site landfill, and backfilling of excavated areas with suitable soils. The soils to be backfilled would require certification, by the contractor supplying backfill materials, that these soils do not contain chemical constituents at concentrations above allowable levels.

This alternative consists of the following items of work:

(1) Implementation of a logistical plan to abet construction.

(2) Evaluation of the necessary permitting requirements. It should be verified that the transportation and disposal contractors have the required permits.

(3) Site preparation, such as: clearing and stockpiling of rubble pile; clearing and grubbing of surface to be excavated; installation of erosion and sedimentation control structures.

(4) Excavation, transportation, and disposal of approximately 80 cubic yards of impacted soils to an approved landfill. Two Chemical Waste Management landfills, one at Model City, New York, and the other at Emelle, Alabama, will accept PCB-contaminated soils.

(5) Post-Excavation verification by sampling and analysis. Frequency of post-excavation soil sampling of PCB-impacted sites is determined using the USEPA " Field Manual for Grid Sampling of PCB Spill Sites to Verify Cleanup", document reference number

TABLE 4–1

COST BREAKDOWN
ALTERNATIVE 1 – INSTITUTIONAL CONTROLS
NAB LITTLE CREEK
VIRGINIA BEACH, VIRGINIA

DESCRIPTION	QUANTITY	UNIT	UNIT COST	TOTAL
DIRECT COSTS				
Deed Restrictions	1	allowance	$5,000.00	$5,000
* Groundwater Sampling	30	year	$1,000.00	$15,420
* Groundwater Analysis	30	year	$200.00	$3,084
TOTAL DIRECT COSTS				$23,504
INDIRECT COSTS				
Engineering/Design	1	allowance	$25,000.00	$25,000
TOTAL INDIRECT COSTS				$25,000
SUBTOTAL				$48,504
Contingency (10%)				$4,850
* TOTAL ESTIMATED COST				$53,354

* Yearly costs related to implementation of monitoring well program have been converted to Net Present Value, based on an annual discount rate of 5% for 30 years

EPA-560/5-86-017. In accordance with this document, 37 post-excavation samples are required. Analysis of the samples would be for PCBs. Items 3-5 would be repeated if post-excavation sampling and analysis dictates that more soil should be remediated. The number of post-excavation samples may be reduced since the SI has already delineated the extent of contamination.

(6) Backfilling and regrading with approximately 100 cubic yards of clean, certified backfill material. The increase in volume of soil required to restore the original surface grade accounts for compaction. The excavated areas will be receive at least two feet of topsoil cover in this manner.

(7) Restoration in-kind of original site features, such as ground cover and other vegetation.

(8) After completion of all of the activities associated with this remedial action, a report should be prepared documenting the results.

4.2.1 Effectiveness

Protectiveness: Removal and off-site disposal of contaminated material from Site 16 will mitigate the risk of releases of contamination to the groundwater and other areas. The PCB-impacted soils would be removed, thereby eliminating current and potential sources of groundwater contamination and the risk of future dermal contact or ingestion by humans or animals.

This alternative ensures long-term protection of the environment since it is permanent in nature. Compliance with all chemical-specific and location-specific ARARs is expected. Confirmatory samples would further ensure compliance with chemical-specific ARARs. On-site activities and off-site transport and disposal would comply with all action-specific ARARs.

Short-term impact on the health of the site workers will be mitigated by using appropriate measures such as dust control and containment of excavated waste. The short-term protectiveness of this alternative is moderate; since the potential exists for dermal contact with constituents of concern as a result of excavation, and airborne emissions during transportation.

Use of Alternatives to Land Disposal: This alternative does not employ an alternative to land disposal.

4.2.2 Implementability

Technical Feasibility: Excavation and removal of soils up to 2 feet is a demonstrated and commercially available technology nationwide. Excavation of site soils is manageable due to the level terrain, relatively shallow depth of excavation, and ease of access to the site, with the exception of utility lines near the impacted area. Sampling and analysis techniques are routine and feasible. All ARARs will be met by implementing this alternative.

Availability: Equipment, materials, and personnel to implement this alternative are readily available. Availability of a proper staging area for the excavated soils should be checked with the base personnel, since they will be kept on-site during the pre-disposal analysis. Availability of disposal facilities is not expected to be a significant concern; although all commercial landfills do not accept TSCA waste such as PCBs. Two Chemical Waste Management landfills, one at Model City, New York, and the other at Emelle, Alabama, will accept PCB-contaminated soils.

Administrative Feasibility: Transportation and disposal facilities would be required to have appropriate permits. Transportation would be performed by licensed hazardous waste haulers. As with any off-site alternative, material loads being removed from the site would require transportation manifests and waste profiles. This corrective action can be completed within a relatively short period of time of a couple of months. The likelihood of public and state acceptance of this alternative is moderate to high since the contamination will be permanently removed from the site, but the potential for short-term impacts due to excavation and transportation exists.

4.2.3 Costs

Total costs to implement this alternative are approximately $96,000. The cost include transportation to the Chemical Waste Management's landfill in Model City, New York. Details of the costs are shown in **Table 4-2**. An alternate landfill facility is located in Emelle, Alabama, also operated by Chemical Waste Management.

4.3 Alternative 3: Excavation and Off-Site Incineration

Off-site disposal at a RCRA-approved incinerator was identified as a potential alternative because of the nature of constituents and expectation that this alternative will provide an effective method

TABLE 4–2

COST BREAKDOWN
ALTERNATIVE 2 – EXCAVATION AND OFFSITE LANDFILLING
NAB LITTLE CREEK
VIRGINIA BEACH, VIRGINIA

DESCRIPTION	QUANTITY	UNIT	UNIT COST	TOTAL
DIRECT COSTS				
Excavation	80	cubic yds	$4.00	$320
*Transportation & Disposal	80	cubic yds	$520.00	$41,600
Clean Fill	100	cubic yds	$8.25	$825
Sampling and Analysis (Post–Ex)	37	each	$175.00	$6,475
Site Work (Grading, Restoration)	1,250	square ft	$2.00	$2,500
Erosion and Sedimentation Control	1	allowance	$5,000.00	$5,000
TOTAL DIRECT COSTS				$56,720
INDIRECT COSTS				
Engineering/Design	1	allowance	$25,000.00	$25,000
Construction Misc.	1	months	$5,000.00	$5,000
TOTAL INDIRECT COSTS				$30,000
SUBTOTAL				$86,720
Contingency (10%)				$8,672
TOTAL ESTIMATED COST				$95,392

*T&D includes taxes, tipping, and load fees. Based on vender quotes.

of remediation. Implementation of this alternative entails excavation of the contaminated soils, transportation of the soils to an off-site incinerator, and backfilling of excavated areas with suitable soils. The soils to be backfilled would require certification, by the contractor supplying backfill materials, that these soils do not contain constituents of concern at concentrations above allowable levels.

Implementation of this alternative would entail identical items of work as Alternative 2, with the exception of the disposal method, as follows:

(1) Implementation of a logistical plan to abet construction.

(2) Evaluation of the necessary permitting requirements. It should be verified that the transportation and disposal contractors have the required permits.

(3) Site preparation, such as: clearing and stockpiling of rubble pile; clearing and grubbing of surface to be excavated; installation of erosion and sedimentation control structures.

(4) Excavation, transportation, and disposal of approximately 80 cubic yards of impacted soils to an approved incinerator.

(5) Post-Excavation verification by sampling and analysis. Frequency of post-excavation soil sampling of PCB-impacted sites is determined using the USEPA " Field Manual for Grid Sampling of PCB Spill Sites to Verify Cleanup", document reference number EPA-560/5-86-017. In accordance with this document, 37 post-excavation samples are required. Analysis of the samples would be for PCBs. Items 3-5 would be repeated if post-excavation sampling and analysis dictates that more soil should be remediated. The number of post-excavation samples may be reduced since the SI has already delineated the extent of contamination.

(6) Backfilling and regrading with approximately 100 cubic yards of clean, certified backfill material. The increase in volume of soil required to restore the original surface grade accounts for compaction. The excavated areas will be receive at least two feet of topsoil cover in this manner.

(7) Restoration in-kind of original site features, such as ground cover and other vegetation.

(8) After completion of all of the activities associated with this remedial action, a report should be prepared documenting the results.

4.3.1 Effectiveness

Protectiveness : This alternative is very effective in eliminating risks to human health and the environment posed by the site. Excavation ensures that most or all of the impacted soils will be removed from the environment. High-temperature incineration is the most effective treatment method for destroying PCBs. All ARARs would potentially be met by implementing this method. The long-term protectiveness of this alternative is high.

Short-term impact on the health of the site workers will be mitigated by using appropriate measures such as dust control and containment of excavated waste. The short-term protectiveness of this alternative is moderate, since the potential exists for dermal contact with constituents of concern as a result of excavation and airborne emissions during transportation.

Use of Alternatives to Land Disposal : This will be an effective alternative to land disposal if the incinerator utilized for disposal participates in a borrow recycling program and the treated soils are recyclable.

4.3.2 Implementability

Technical Feasibility: Excavation and removal of soils up to 2 feet is a demonstrated and commercially available technology nationwide. Excavation of site soils is manageable due to the level terrain, relatively shallow depth of excavation, and ease of accessibility at the site, with the exception of utility lines near the impacted area. Sampling and analysis techniques are routine and feasible. All ARARs will be met by implementing this alternative.

Availability : EM&L to implement the excavation and transportation of this alternative are readily available. Incinerators which accept PCB-impacted soils are limited. Soils may have to be transported to Port Arthur, Texas. This will effect transportation costs.

Administrative Feasibility : The implementation of this alternative is routine and feasible. As with Alternative 2, containers being removed from the site would require transportation manifests and waste profiles. This corrective action can also be completed within a relatively short period of time of a couple of months. The likelihood of public and state acceptance of this alternative is moderate. This acceptance may not be as forthcoming as alternative 2, since general public opinion is mounting against incineration.

4.3.3 Costs

Total costs to implement this alternative are approximately $296,000. Costs are very high due to tipping fees and transportation. Details of these costs are presented in **Table 4-3**.

4.4 Alternative 4: Excavation and On-Site Treatment - Thermal

On-site thermal treatment was identified as a potential alternative because of the nature of constituents and expectation that this alternative will provide an effective method of remediation. Implementation of this alternative entails excavation of the contaminated soils, stockpiling, treatment by a mobile truck-mounted thermal destruction unit, and backfilling of excavated areas with clean, suitable soils. It is anticipated that the treated soils will be deemed suitable for backfilling. Backfill soils may consist of the soils originally excavated, depending upon the residual PCB concentrations after treatment. The soils to be backfilled would require certification, by the contractor supplying backfill materials, that these soils do not contain constituents of concern at concentrations above allowable levels.

Implementation of this alternative would entail the following items of work:

(1) Implementation of a logistical plan to abet construction.

(2) Procurement of all necessary permits to begin construction. Additional permit applications may be required prior to receiving approval of the proposed treatment method. These permits are related to regulations governed under RCRA and ensure the adequate protection of air, environmental surroundings, and personnel involved in the work.

(3) Site preparation, such as: clearing and stockpiling of rubble pile; clearing and grubbing of surface to be excavated; installation of erosion and sedimentation control structures.

(4) Excavation of approximately 80 cubic yards of impacted soils.

(5) Post-Excavation verification by sampling and analysis. Frequency of post-excavation soil sampling of PCB-impacted sites is determined using the USEPA " Field Manual for Grid Sampling of PCB Spill Sites to Verify Cleanup", document reference number EPA-560/5-86-017. In accordance with this document, 37 post-excavation samples are required. Analysis of the samples would be for PCBs. Items 3-5 would be repeated if post-excavation sampling and analysis dictates that more soil should be remediated. The number of post-excavation samples may be reduced since the SI has already delineated the extent of contamination.

TABLE 4--3

COST BREAKDOWN
ALTERNATIVE 3 -- EXCAVATION AND OFFSITE INCINERATION
NAB LITTLE CREEK
VIRGINIA BEACH, VIRGINIA

DESCRIPTION	QUANTITY	UNIT	UNIT COST	TOTAL
DIRECT COSTS				
Excavation	80	cubic yds	$4.00	$320
*Transportation and Disposal	80	cubic yds	$2,800.00	$224,000
Clean Fill	100	cubic yds	$8.25	$825
Sampling And Analysis (Post--Ex)	37	each	$175.00	$6,475
Site Work (Grading, Restoration)	1,250	square ft	$2.00	$2,500
Erosion and Sedimentation Control	1	allowance	$5,000.00	$5,000
TOTAL DIRECT COSTS				$239,120
INDIRECT COSTS				
Engineering/Design	1	allowance	$25,000.00	$25,000
Construction Misc.	1	months	$5,000.00	$5,000
TOTAL INDIRECT COSTS				$30,000
SUBTOTAL				$269,120
Contingency (10%)				$26,912
TOTAL ESTIMATED COST				$296,032

*T&D includes taxes, tipping, and load fees. Based on vender quotes.

(6) Mobilization and treatment of soils by processing through the on-site thermal treatment unit. PCBs are typically destroyed thermally at high temperatures; however, innovative methods have been employed utilizing low-temperature thermal desorption methods to effectively treat PCB-impacted soils to within cleanup levels. Processed and treated soils will be staged for immediate post-treatment verification.

(7) Post-treatment verification of treated soils by composite sampling and analysis. Frequency of post-treated soil sampling cannot be determined at this time, since this program will be dictated by the conditions established in the on-site treatment permit. It is anticipated that one composite sample may be required for each 100 cubic yards of material treated. Using this frequency as a baseline estimate, only 1 sample will be required to certify the material as clean backfill.

(8) Backfilling and regrading with approximately 100 cubic yards of clean, certified backfill material. The increase in volume of soil required to restore the original surface grade accounts for compaction. Of this 100 cubic yards, it is anticipated that approximately 65 cubic yards can be recovered from the treatment unit for use as backfill. The additional 35 cubic yards must be provided from an off-site borrow source. The excavated areas will be receive at least two feet of topsoil cover in this manner.

(9) Demobilization of the on-site thermal treatment unit.

(10) Restoration in-kind of original site features, such as wetlands (if required), ground cover, and other vegetation.

(11) After completion of all of the activities associated with this remedial action, a report should be prepared documenting the results.

4.4.1 Effectiveness

Protectiveness : This alternative poses a protective method for eliminating risks to human health and the environment posed by the site. Excavation ensures that most or all of the impacted soils will be removed from the environment. On-site thermal treatment of PCBs poses certain risks inherent to this method of treatment, especially if high-temperatures are intended. All ARARs would potentially be met by implementing this method. The long-term protectiveness of this alternative is high.

Short-term impact on the health of the site workers will be mitigated by using appropriate measures such as dust control and containment of excavated waste. The short-term protectiveness of this alternative is low, since the potential exists for dermal contact with constituents of concern as a result of excavation and operations. Additionally, the risk of injury during operation of the treatment system is high due to the torrid temperatures and potential air emissions which may be encountered by workers.

Use of Alternatives to Land Disposal : This alternative is very effective as an alternative to land disposal. First, because this alternative will generate clean material, there will be no need to "dispose" of the soils at a landfill. Second, since this alternative is conducted on-site, backfilling is simplified. A borrow source would not be necessary, except for providing nominal backfill materials to supplement soils processed through the treatment unit.

4.4.2 Implementability

Technical Feasibility :

This alternative is designed to meet ARARs, particularly a SARA requirement that the preferred remedial actions should be on-site and permanently destroy site contaminants. Sampling and analysis techniques are routine and feasible. Excavation of site soils is manageable due to the level terrain, relatively shallow depth of excavation, and ease of accessibility at the site, with the exception of utility lines near the impacted area. All ARARs will be met by implementing this alternative.

On-site thermal treatment, although more difficult than utilizing an off-site incinerator, is a proven and common procedure. Improvements to mobile treatment units have rendered thermal treatment possible even for non-combustible contaminants. Emissions control and temperature management are key concerns when thermal treatment of PCBs is conducted, because improper thermal treatment of PCBs produces extremely harmful emissions. In addition, on-site treatment would require a considerably longer duration for completion of site activities than alternatives 1 through 3.

The technical feasibility of this alternative is moderate to low, compared with other alternatives, because of the effort required to implement the alternative in comparison with the amount of soils to be remediated.

Availability : EM&L to implement the excavation portion of this alternative are readily available. EM&L to implement the treatment portion of this alternative are somewhat limited, for example due to the need for specialty skills required to operate the treatment system. Willingness of vendors to mobilize in a cost-effective manner for such a small treatment volume, is a serious concern.

Administrative Feasibility : The implementation of this alternative may require several federal permits. The duration of the corrective action may also be significantly longer than alternatives

2-3. Consequently, the administrative feasibility for this alternative is moderate to low. The likelihood of public and state acceptance of this alternative is also moderate to low, because of the risks associated with potential on-site emissions during excavations and operations, and unfavorable public perception of incineration of PCBs.

4.4.3 Costs

Total costs to implement this alternative are approximately $141,900. Details of these costs are presented in **Table 4-4**.

4.5 Alternative 5: Excavation and On-Site Treatment - Solvent Extraction

On-site treatment by solvent extraction was identified as a potential alternative because of the nature of constituents and expectation that this alternative will provide an effective method of remediation. Implementation of this alternative entails excavation of the contaminated soils, stockpiling, treatment by a mobile truck-mounted soil processing unit, use of extraction solvents, and backfilling of excavated areas with clean, suitable soils. It is anticipated that the treated soils will be deemed suitable for backfilling. Backfill soils may consist of the soils originally excavated, depending upon the residual PCB concentrations after treatment. The soils to be backfilled would require certification, by the contractor supplying backfill materials, that these soils do not contain constituents of concern at concentrations above allowable levels.

Implementation of this alternative would entail the following items of work:

(1) Implementation of logistical plan to abet construction.

(2) Procurement of all necessary permits to begin construction. Additional permit applications may be required prior to receiving approval of the proposed treatment method. These permits are related to regulations governed under RCRA and ensure the adequate protection of air, environmental surroundings, and personnel involved in the work.

(3) Site preparation, such as: clearing and stockpiling of rubble pile; clearing and grubbing of surface to be excavated; installation of erosion and sedimentation control structures.

(4) Excavation of approximately 80 cubic yards of impacted soils.

TABLE 4–4

COST BREAKDOWN
ALTERNATIVE 4 – ON SITE TREATMENT (THERMAL)
NAB LITTLE CREEK
VIRGINIA BEACH, VIRGINIA

DESCRIPTION	QUANTITY	UNIT	UNIT COST	TOTAL
DIRECT COSTS				
Treatability Study	1	allowance	$10,000.00	$10,000
Excavation	80	cubic yds	$4.00	$320
*Thermal Treatment	80	cubic yds	$800.00	$64,000
Clean Fill	40	cubic yds	$8.25	$330
Sampling and Analysis (Post–Ex)	37	each	$175.00	$6,475
Sampling/Analysis (post–treatment)	2	each	$175.00	$350
Site Work (Grading, Restoration)	1,250	square ft	$2.00	$2,500
Erosion and Sedimentation Control	1	allowance	$5,000.00	$5,000
TOTAL DIRECT COSTS				$88,975
INDIRECT COSTS				
Engineering/Design	1	allowance	$35,000.00	$35,000
Construction Misc.	1	months	$5,000.00	$5,000
TOTAL INDIRECT COSTS				$40,000
SUBTOTAL				$128,975
Contingency (10%)				$12,898
TOTAL ESTIMATED COST				$141,873

*Thermal Treatment includes mobilization and demobilization, set up of the treatment unit, processing of soils, management of by–products (if any). Based on vender quotes.

(5) Post-Excavation verification by sampling and analysis. Frequency of post-excavation soil sampling of PCB-impacted sites is determined using the USEPA " Field Manual for Grid Sampling of PCB Spill Sites to Verify Cleanup", document reference number EPA-560/5-86-017. In accordance with this document, 37 post-excavation samples are required. Analysis of the samples would be for PCBs. Items 3-5 would be repeated if post-excavation sampling and analysis dictates that more soil should be remediated. The number of post-excavation samples may be reduced since the SI has already delineated the extent of contamination.

(6) Mobilization and treatment of soils by processing through the on-site solvent extraction treatment unit. By-products of solvent extraction include spent solvents, sludge, and treated soils. Processed and treated soils will be staged for immediate post-treatment verification.

(7) Post-treatment verification of treated soils by composite sampling and analysis. Frequency of post-treated soil sampling cannot be determined at this time, since this program will be dictated by the conditions established in the on-site treatment permit. It is anticipated that one composite sample may be required for each 100 cubic yards of material treated. Using this frequency as a baseline estimate, only 1 sample will be required to certify the material as clean backfill.

(8) Backfilling and regrading with approximately 100 cubic yards of clean, certified backfill material. The increase in volume of soil required to restore the original surface grade accounts for compaction. Of this 100 cubic yards, it is anticipated that approximately 70 cubic yards can be recovered from the treatment unit for use as backfill. The additional 30 cubic yards must be provided from an off-site borrow source. The excavated areas will be receive at least two feet of topsoil cover in this manner.

(9) Demobilization of the on-site solvent extraction treatment unit.

(10) Restoration in-kind of original site features, such as wetlands (if required), ground cover, and other vegetation.

(11) After completion of all of the activities associated with this remedial action, a report should be prepared documenting the results.

4.5.1 Effectiveness

Protectiveness: This alternative poses a protective method for eliminating risks to human health and the environment posed by the site. Excavation ensures that most or all of the impacted soils will be removed from the environment. On-site solvent extraction treatment of PCBs poses certain risks related to introducing solvents to the area, however these risks would be minimized since implementation of this alternative would be conducted ex-situ. All ARARs would

potentially be met by implementing this method. The long-term protectiveness of this alternative is high.

Short-term impact on the health of the site workers will be mitigated by using appropriate measures such as dust control and containment of excavated waste. The short-term protectiveness of this alternative is low, since the potential exists for dermal contact with constituents of concern as a result of excavation and operations. Additionally, the risk of injury during operation of the treatment system is high due to the presence of extracting solvents and potential air emissions.

Use of Alternatives to Land Disposal : This alternative is very effective as an alternative to land disposal. First, because this alternative will generate clean material, there will be no need to "dispose" of the soils at a landfill. Second, since this alternative is conducted on-site, backfilling is simplified. A borrow source would not be necessary, except for providing nominal backfill materials to supplement soils processed through the treatment unit. However, any sludge generated from the solvent extraction operations will have to be landfilled.

4.5.2 Implementability

Technical Feasibility :

This alternative is designed to meet ARARs, particularly a SARA requirement that the preferred remedial actions should be on-site and permanently destroy site contaminants. Excavation of site soils is manageable due to the level terrain, relatively shallow depth of excavation, and ease of accessibility at the site, with the exception of utility lines near the impacted area. Sampling and analysis techniques are routine and feasible. All ARARs will be met by implementing this alternative.

On-site treatment by solvent extraction, although more complicated than utilizing an off-site alternative, is a proven and common procedure. Control of by-products produced by the treatment system would be the key concern if treatment by solvent extraction were implemented. Additionally, on-site treatment would require a considerably longer duration for completion of site activities than alternatives 1 through 3.

The technical feasibility of this alternative is moderate to low, compared with other alternatives, because of the effort required to implement the alternative in comparison with the amount of soils to be remediated.

Availability : EM&L to implement the excavation portion of this alternative are readily available. EM&L to implement the treatment portion of this alternative are somewhat limited, for example due to the need for specialty skills required to operate the treatment system. Willingness of vendors to mobilize in a cost-effective manner for such a small treatment volume, is a serious concern.

Administrative Feasibility : The implementation of this alternative may require several federal permits. The duration of the corrective action may also be significantly longer than alternatives 2-3. Consequently, the administrative feasibility for this alternative is moderate to low. The likelihood of public and state acceptance of this alternative is also moderate to low, because of the risks associated with potential on-site emissions during excavations and operations, and the lack of definitive results using this on-site treatment methodology.

4.5.3 Costs

Total costs to implement this alternative are approximately $196,000. Details of these costs are presented in **Table 4-5**.

TABLE 4–5

COST BREAKDOWN
ALTERNATIVE 5 – ON SITE TREATMENT (SOLVENT EXTRACTION)
NAB LITTLE CREEK
VIRGINIA BEACH, VIRGINIA

DESCRIPTION	QUANTITY	UNIT	UNIT COST	TOTAL
DIRECT COSTS				
Treatability Study	1	allowance	$15,000.00	$15,000
Excavation	80	cubic yds	$4.00	$320
*Solvent Extraction	80	cubic yds	$1,350.00	$108,000
Clean Fill	40	cubic yds	$8.25	$330
Sampling And Analysis (Post–Ex)	37	each	$175.00	$6,475
Sampling/Analysis (post–treatment)	2	each	$175.00	$350
Site Work (Grading, Restoration)	1,250	square ft	$2.00	$2,500
Erosion and Sedimentation Control	1	allowance	$5,000.00	$5,000
TOTAL DIRECT COSTS				$137,975
INDIRECT COSTS				
Engineering/Design	1	allowance	$35,000.00	$35,000
Construction Misc.	1	months	$5,000.00	$5,000
TOTAL INDIRECT COSTS				$40,000
SUBTOTAL				$177,975
Contingency (10%)				$17,798
TOTAL ESTIMATED COST				$195,773

*Solvent Extraction includes mobilization and demobilization, set up of the treatment unit, processing of soils, management of by–products. Based on vender quotes.

5.0 RECOMMENDED CORRECTIVE ACTION

Table 5-1 provides a comparative evaluation for each of the five remedial alternatives. The objective of the table is to provide a justification for proposing a remedial action, based on a rating system. The use of a rating system, such as the one used in the table, is a common method used while conducting Feasibility Studies under CERCLA as a way of presenting the comparison of alternatives.

The rating system depicted in the table is implemented by assigning each of the three criteria (effectiveness, implementability, and cost) a weight in parts of 100-percent. Effectiveness is assigned 35-percent, implementability is assigned 40-percent, and cost is assigned 25-percent. This balance is based on engineering judgement and is designed to serve the intent of the prevalent environmental policy.

Further, each sub-criteria (e.g. protectiveness) is assigned a portion of the total weight assigned to each criteria. "Protectiveness" is assigned 20-percent and "Use of Alternatives to Land Disposal" is assigned 15-percent, which totals 35-percent for the effectiveness criteria.

A rating between 1 and 5 (best to worst) is given under each sub-criteria to indicate an alternative's relative strength/weakness compared to each of the other alternatives. The rating is then multiplied by the weight of the sub-criteria to calculate the weighted rating for each alternative. The total rating for each alternative is a summation of each weighted rating. The lowest total rating receives the number 1 ranking. Alternative 1 is carried out as an example, as follows:

1) The protectiveness of alternative 1 is rated as least effective, compared with the other alternatives, and is given a 5. The 5 rating is multiplied by the 20 weight, equalling 100 weighted rating, as shown in the 3rd column of the table.

2) The use of alternatives to land disposal for alternative 1 is rated as least effective and is given a 5. Since alternative 1 would effectively result in land disposing the constituents of concern in an unprotected condition, alternative 1 receives a lower rating than alternative 2. The 5 rating is multiplied by the 15 weight, equalling a 75 weighted rating, as shown in the 5th column.

3) The technical feasibility of alternative 1 is rated as most feasible, since implementation of alternative 1 requires very little technical expertise. The 1 rating multiplied by 15 weight equals a 15 weighted rating, as shown in column 7.

TABLE 5–1

COMPARATIVE ANALYSIS OF ALTERNATIVES
NAB LITTLE CREEK
VIRGINIA BEACH, VIRGINIA

ALTERNATIVE	EFFECTIVENESS				IMPLEMENTABILITY						COST (25%)		TOTAL RATING	RANK
	Protective–ness (20%)		Alternative to Land Disposal (15%)		Technical Feasiblity (15%)		Availability (10%)		Administrative Feasiblity (15%)					
Alternative 1	5	100.00	5	75.00	1	15.00	1	10.00	5	75.00	1	25.00	300.00	3
Alternative 2	2	40.00	4	60.00	2	30.00	2	20.00	2	30.00	2	50.00	230.00	1
Alternative 3	2	40.00	2	30.00	2	30.00	3	30.00	3	45.00	5	125.00	300.00	3
Alternative 4	3	60.00	1	15.00	3	45.00	4	40.00	4	60.00	3	75.00	295.00	2
Alternative 5	3	60.00	2	30.00	3	45.00	4	40.00	4	60.00	4	100.00	335.00	5

Alternative 1 = Institutional Controls
Alternative 2 = Excavation and Offsite Landfilling
Alternative 3 = Excavation and Offsite Incineration
Alternative 4 = Excavation and Onsite Thermal Treatment
Alternative 5 = Excavation and Onsite Solvent Extraction

4) The availability of resources to implement alternative 1 is rated as most feasible, since implementation of alternative 1 requires very few and common resources. The 1 rating multiplied by 10 weight equals a 10 weighted rating, as shown in column 9.

5) The administrative feasibility of alternative 1 is rated as least feasible, since this alternative would not be considered as appropriate by regulatory agencies after a tremendous administrative effort have already been put into. It would be difficult to justify that any other remedial action would not be in the best interest of human health and the environment. The 5 rating multiplied by 15 weight equals a 75 weighted rating, as shown in column 11.

6) The cost of alternative 1 is rated as the most cost-effective. The 1 rating multiplied by 25 weight equals a 25 weighted rating, as shown in column 13.

7) The total rating, after summing all weighted ratings, is 300 as shown in column 14.

8) The rank of alternative 1 is 3rd in comparison to all other alternatives, as shown in the last column. The alternative is tied with alternative 3 for the 3rd place.

The recommended correction action is selected based on the alternative receiving the best rank. As shown by Table 5-1, Alternative 2 - Excavation and Off-site Landfilling, is the recommended corrective action. Therefore, the proposed activities would consist of the excavation of the contaminated soils, transportation of the soils to a RCRA-permitted landfill also approved for accepting TSCA waste, and backfilling of excavated areas with suitable soils.