

07.06-3/1/2000-00502

152830.SP.UD-19z
2-22-00.wdc.ada

Final
2000 SWMU Management Plan
Oceana Naval Air Station,
Virginia Beach, Virginia



Prepared for

Department of the Navy
Atlantic Division
Naval Facilities Engineering Command
Norfolk, Virginia

Contract No. N62470-93-D-4072

CTO-0105

March 2000

Prepared by

CH2MHILL

Baker

Environmental, Inc.

CDM

Federal Programs Corp.

07.06-3/1/2000-00502

**Final
2000 SWMU Management Plan
Naval Air Station, Oceana
Virginia Beach, Virginia**

Prepared for

**Atlantic Division Naval
Facilities Engineering Command
Norfolk, Virginia**

Contract N62470-93-D-4072

Prepared by



CH2MHILL

March 2000

Table of Contents

Section	Page
1 Introduction.....	1-1
1.1 SMP Organization	1-1
1.2 NASO Operations.....	1-1
1.3 Regulatory Framework.....	1-2
1.4 Previous Studies	1-2
1.4.1 Initial Characterizations	1-2
1.4.2 Phase I RFI Investigation.....	1-5
1.4.3 Phase II RFI Investigation	1-5
1.4.4 Corrective Measures Studies.....	1-5
1.4.5 Phase III RFI	1-5
1.4.6 Follow-on Investigation.....	1-6
2 Solid Waste Management Units.....	2-1
2.1 Category 1 - SWMUs that Require no Further Study, Remediation, or Risk Assessment (2D, 18, 19, 20, and 23).....	2-1
2.1.1 SWMU 2D - Line Shack 125 Disposal Area	2-1
2.1.2 SWMU 18 - Hazardous Waste Storage, Building 204.....	2-4
2.1.3 SWMU 19 - Waste Oil Storage Area, Building 541	2-4
2.1.4 SWMU 20 - Waste Oil Storage Area, Building 543	2-5
2.1.5 SWMU 23 - Bowser, Building 830	2-5
2.2 Category 2 - SWMUs that Require no Further Study or Remediation, but Require Further Consideration for Ecological Risk (11, 16/16GC, 21, 22, 25, and 26).....	2-6
2.2.1 SWMU 11 - Fire-Fighting Training Area.....	2-6
2.2.2 SWMU 16/16GC - Pesticide Storage Area.....	2-7
2.2.3 SWMU 21 - Transformer Storage Yard.....	2-8
2.2.4 SWMU 22 - Construction Debris Landfill.....	2-8
2.2.5 SWMU 25 - Inert Landfill	2-9
2.2.6 SWMU 26 - Fire-Fighting Training Area, Building 220	2-9
2.3 Category 3 - SWMUs that Currently Require Additional Study or Remediation but do not Require Further Consideration for Ecological Risk (2C, 2E, and 24).....	2-10
2.3.1 SWMU 2C - Line Shack 400 Disposal Area.....	2-10
2.3.2 SWMU 2E - Line Shack 109 Disposal Area	2-12
2.3.3 SWMU 24 - Bowser, Building 840	2-13
2.4 Category 4 - SWMUs that Currently Require Additional Corrective Action under CERCLA and Require Further Consideration for Ecological Risk (1, 2B, and 15).....	2-15
2.4.1 SWMU 1 - West Woods Oil Disposal Pit	2-15
2.4.2 SWMU 2B—Line Shack 130-131 Disposal Area	2-18
2.4.3 SWMU 15 - Abandoned Tank Farm	2-19
3 SWMU Management Schedules.....	3-1
4 References.....	4-1

Table of Contents (Continued)

Tables	Page
1-1 RCRA Solid Waste Management Units	1-4
2-1 Current Status Summary of IRP SWMUs, Oceana SMP, February 2000	2-2
Figures	
1-1 Locations of SWMUs	1-3
2-1 Locations of SWMUs	2-3
3-1 Category 1 - SWMUs 2D, 18, 19, 20, and 23 Project Completion Schedule	3-2
3-2 Category 2 - SWMUs 11, 16/16GC, 21, 22, and 26 Project Completion Schedule	3-3
3-3 Category 2 - SWMU 25, Project Completion Schedule	3-4
3-4 Category 3 - SWMU 2C Project Completion Schedule	3-5
3-5 Category 3 - SWMU 2E Project Completion Schedule.....	3-6
3-6 Category 3 - SWMU 24 Project Completion Schedule	3-7
3-7 Category 4 - SWMU 01 Project Completion Schedule	3-8
3-8 Category 4 - SWMU 2B Project Completion Schedule.....	3-9
3-9 Category 4 - SWMU 15 Project Completion Schedule	3-10

1 Introduction

This document is the fourth update to the Solid Waste Management Unit (SWMU) Management Plan (SMP) for the Naval Air Station, Oceana (NASO). The purpose of the SMP is to provide a management tool for LANTDIV, EPA, VDEQ, and Activity personnel to be used in planning, scheduling, and setting priorities for environmental remedial response activities to be conducted at NASO. This SMP provides long-term projections for the cleanup process in accordance with the Navy's Installation Restoration Program (IRP) and focuses on upcoming activities that are planned in 2000. The SMP will be updated periodically to revise priorities of activities as additional information becomes available.

The SMP presents the rationale for ongoing and proposed environmental investigations and remedial response activities for each SWMU and the estimated schedule for completion of these activities. Detailed activity schedules are provided for calendar year 2000.

Previous SWMU investigations have been conducted under provisions of the Resource Conservation and Recovery Act (RCRA) Corrective Action program. As of July 1998, future cleanup activities will be accomplished under provisions of CERCLA, within the framework of a new administrative procedure. Under the new administrative procedure, the Navy and the EPA will reach concurrence on the classification of each SWMU through a Federal Facilities Agreement (FFA) in lieu of scoring each SWMU for the National Priorities List (NPL). If the FFA process fails then the base will be subject to listing on the NPL. The FFA will supercede and rescind the RCRA 3008 (h) consent order. However, the EPA can still stipulate penalties through the FFA.

1.1 SMP Organization

The SMP is organized as follows: Chapter 1 includes an introduction to the plan and a summary of prior investigations. Chapter 2 documents the history and proposed activities for active SWMUs. Chapter 3 presents the management schedules for active SWMUs at NASO. A list of references contained in this SMP is given at the end of this report.

1.2 NASO Operations

NASO has been in existence since 1940 when it was established as a small auxiliary airfield. Since 1940, NASO has grown to more than 16 times its original size and is now a 6,000-acre master jet base supporting a community of more than 9,100 Navy personnel and 11,000 dependents. The primary mission of NASO is to provide the personnel, operations, maintenance, and training facilities to ensure that fighter and attack squadrons on aircraft carriers of the U.S. Atlantic Fleet are ready for deployment.

In 1981, NASO initiated a comprehensive hazardous waste collection and recycling program to prevent releases of hazardous wastes to the environment. The program involved constructing waste controls such as oil and water separators near aircraft cleaning and maintenance areas, and working closely with various shops to ensure that wastes were

properly contained, segregated, labeled, and collected. NASO also monitors discharges within drainages on and off the station as part of its National Pollution Discharge Elimination System (NPDES) monitoring to prevent the discharge of contamination beyond the limits of the station.

1.3 Regulatory Framework

A total of 60 SWMUs were recommended for study in the draft RCRA Consent Order issued by the U.S. Environmental Protection Agency (EPA). After reviewing the results of the Interim RFI, the Navy and EPA determined that only 19 SWMUs required investigation under the RCRA consent order; the remainder of the RFA identified SWMUs are regulated under other federal and/or state programs.

Because of the proximity of four of the RFA SWMUs, they were consolidated into two; therefore, 17 SWMUs were in the RCRA Facility Investigation (RFI) under the consent order. Figure 1-1 shows the location of each SWMU.

The Consent Order specified four RCRA corrective action steps that would be required for the SWMUs. These were:

- Interim Measures, including the preparation of a community relations plan and other plans for future work
- The RFI
- A corrective measures study (CMS) to identify appropriate remediation technologies and approaches to remediate SWMUs that require cleanup
- A corrective measures implementation of the selected remedies

The following text summarizes the previous studies as conducted under the RCRA corrective action.

1.4 Previous Studies

Seven studies within the RCRA corrective action process and three studies under the IRP prior to RCRA corrective action have been conducted at Oceana. The IRP was designed to identify and correct problems of environmental contamination caused by past operations at naval facilities. Several SWMU-specific studies are currently proposed. These studies will be conducted under CERCLA. The prior and proposed SWMU investigations are summarized in Table 1-1. A brief description of each study is documented below.

1.4.1 Initial Characterizations

The first stage of the Installation Restoration program at NASO was the completion of an Initial Assessment Study (IAS) in 1984 (RGH, 1984). The IAS recommended field investigations for six SWMUs at NASO to confirm whether hazardous constituents had been released to the environment. In response to the IAS, the Round I Verification Study was performed in 1986 (CH2M HILL, 1986), and the Line Shack SWMU Inspection followed in

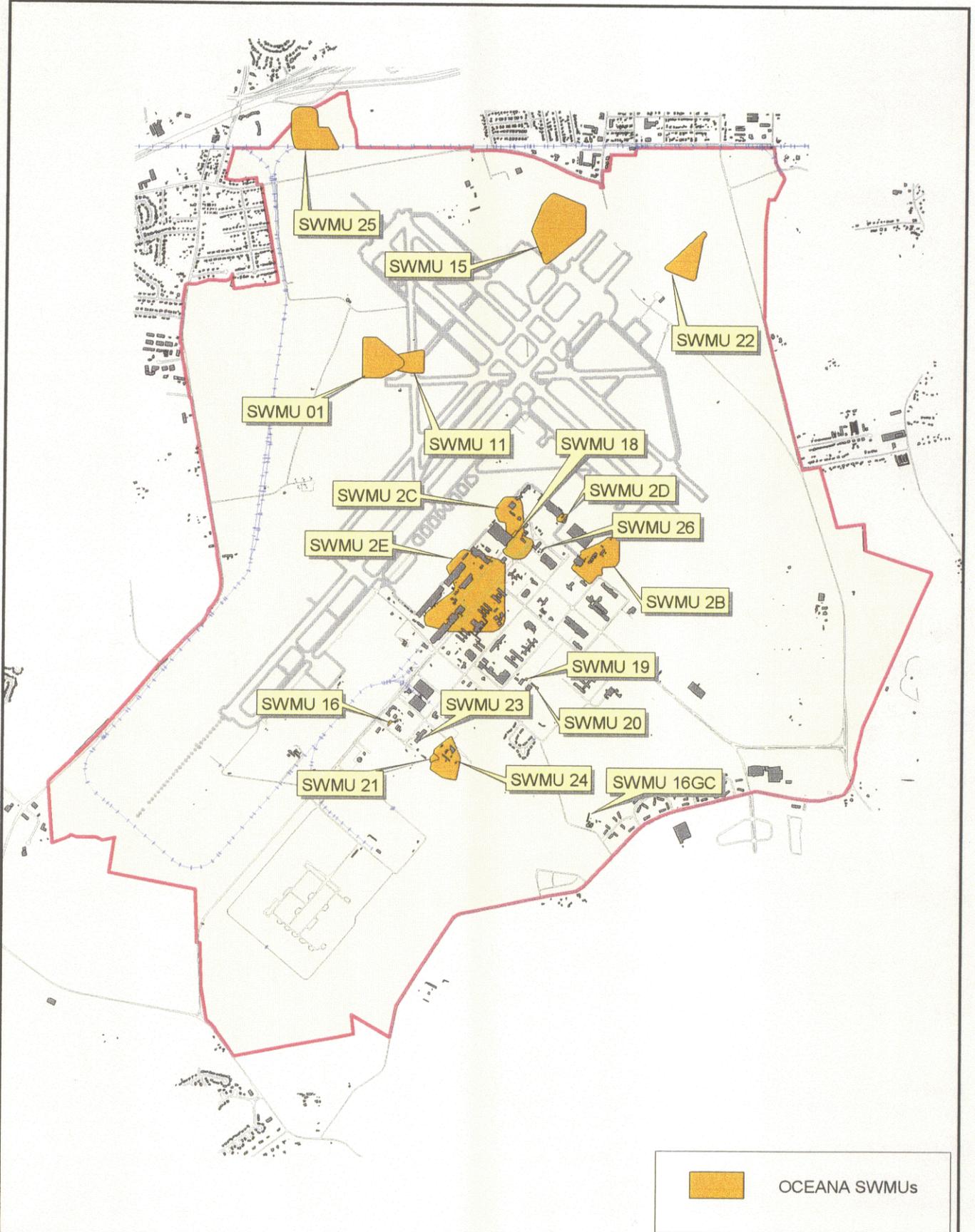


Figure 1-1
IRP SWMUs
NAS Oceana, Virginia Beach, Virginia

CH2M HILL

00502 E 019

1988 (CH2M HILL, 1989). The Line Shack inspection focused on the areas around Line Shacks 130 and 400, which are SWMUs 2B and 2C, respectively. Individual SWMU histories are documented in Section 2.

TABLE 1-1
RCRA Solid Waste Management Units
Naval Air Station, Oceana

RFI SWMU No.	RFA SWMU No.	Description
1	57	West Woods Oil Disposal Pit
2B	51	Line Shack 130-131
2C	52	Line Shack 400
2D	53	Line Shack 125
2E	1 & 54	Line Shack 109
11	62 & 63	Fire Fighting Training Ring
15	58	Abandoned Tank Farm, Old CPO Club
16 16GC	95	Pesticide Storage Area, Bldg. 821 Golf Course Support Facilities
18	3	Hazardous Waste Storage Area, Bldg. 204
19	71	Waste Oil Storage Areas, Bldg. 541
20	72	Waste Oil Storage Areas, Bldg. 543
21	97	Transformer Storage Yard, Bldg. 830
22	22	Construction Debris Landfill
23	78	Bowser, Bldg. 830
24	79	Bowser, Bldg. 840
25	25	Inert Landfill
26	65	Fire Fighting Burn Pit, Bldg. 220

Application of RCRA corrective action began in June 1988, when U.S. Environmental Protection Agency (EPA) contractors conducted a RCRA Facility Assessment (RFA) of the base. The RFA identified all SWMUs previously studied under the IRP as solid waste management units (SWMUs). Several additional SWMUs were identified and reviewed during the RFA. According to RCRA protocol, an RFI should follow the RFA when known or potential contamination warrants further study.

Prior to the initiation of a full-scale RFI, CH2M HILL conducted an Interim RFI in August 1990 to guide the RFI's scope of work. The Interim RFI continued the investigation of six SWMUs, which were originally studied under the Navy's Installation Restoration Program, and also initiated work at four other SWMUs. The field activities were oriented towards guiding a decision on whether a given SWMU should be included for study under the RFI. The Interim RFI recommended additional work at 6 of the 10 SWMUs studied, but at four SWMUs, no further investigation was recommended.

1.4.2 Phase I RFI Investigation

The first phase of the RFI was conducted in 1992 and 1993 and was finalized in December 1993. Seventeen SWMUs were investigated during the Phase I RFI. As a result of this investigation, SWMUs were reclassified into four categories: (1) SWMUs that could advance to a Corrective Measure Study (CMS), (2) SWMUs that required additional characterization under a second phase of the RFI, (3) SWMUs where contamination, specifically of soil, could be remediated immediately on the basis of the existing data, and (4) SWMUs requiring no additional study or remediation. The SWMUs were divided into separate study tracks on the basis of these recommendations. Multiple rounds of regulatory comments on the Phase I and Phase II RFIs were addressed and resolved during the scoping and implementation of the RFI Phase III investigation.

1.4.3 Phase II RFI Investigation

A Phase II RFI was conducted in early 1994 on five SWMUs (SWMUs 2D, 2E, 15, 24, and 25) that required additional characterization. This work is described in the draft final Phase II RFI report of February 1995. Multiple rounds of regulatory comments on the Phase I and Phase II RFIs were addressed and resolved during the scoping and implementation of the RFI Phase III investigation.

1.4.4 Corrective Measures Studies

A CMS was conducted for SWMUs contaminated with petroleum-oil-lubricants (POL) wastes (SWMUs 11, 18, 19, 20, and 24 soils). *The Final Corrective Measures Study for Petroleum Contaminated Soils (POL CMS)* (October 1994) and the *Excavation, Transportation and Disposal of Petroleum Contaminated Soils* report (April 1995) describe the sampling conducted to delineate specific areas of contamination and the interim cleanup action to address these areas of contaminated soils.

A CMS investigation was performed for SWMUs 1, 2B, and 2C in 1994-1995. The results of this investigation are documented in the *Final Corrective Measures Study of SWMUs 1, 2B, and 2C, Naval Air Station Oceana, Virginia Beach, Virginia* (November 1995). This document included some additional characterization work after the Phase I RFI, primarily work needed to refine the selection of the remediation approaches.

As a follow-up to the Phase II RFI, three SWMUs (2E, 15, and 24 [groundwater only]) were investigated further in the fall of 1994. The results of this investigation are documented in the *Draft-Final Corrective Measures Study of SWMUs 2E, 15, and 24, Naval Air Station Oceana, Virginia Beach, Virginia* (March 1996).

1.4.5 Phase III RFI

The EPA issued comments on the RFI Phase I, RFI Phase II RFI, the POL-CMS, and the *Excavation, Transportation and Disposal of Petroleum Contaminated Soils Report* in fall of 1997. Data gaps identified in these reports were used to scope the field work for the Phase III RFI. The initial Phase III RFI field investigation was completed in December 1997. SWMUs investigated included 1, 2B, 2C, 2D, 18, 21, 24, 25, and 26. A draft-final report was submitted to the EPA for review and comment in July 1998. Due to regulatory comments on the draft-final report, additional fieldwork was required. Upon completion of the

additional fieldwork, the *Final RCRA Facility Investigation Report – Phase III, Naval Air Station Oceana, Virginia Beach, Virginia* was submitted in August 1999.

The Navy's response to comments on the Phase I RFI, the Phase II RFI, the POL-CMS, the Excavation, Transportation and Disposal of Petroleum Contaminated Soils report, and the findings of the Phase III RFI support the determination of no further action (NFA) at 11 NASO SWMUs (SWMUs 2D, 11, 16/16GC, 18, 19, 20, 21, 22, 23, 25, and 26). The NFA determination was based primarily upon human health risk consideration. It was agreed the EPA's Biological Technical Assistance Group (BTAG) would forgo a review of previous RCRA reports and the Phase III RFI as the Navy will further evaluate ecological concerns at all NASO SWMUs within the ecological risk assessment (ERA) process required under CERCLA.

1.4.6 Follow-on Investigation

In addition to conducting an ERA at all NASO SWMUs, as required for SWMU closeout under CERCLA, the Navy is proceeding with a human health risk assessment (HHRA) at SWMUs 1, 2B, 2C, 2E, 15, and 24. Additional sampling was conducted at SWMUs 1, 15, and 24 in November 1998 and June 1999 to fill data gaps required for the completion of the HHRA and ERAs for those SWMUs. Following the HHRA for these SWMUs, a feasibility study (FS) is planned to determine potential remedial alternatives. A proposed remedial action plan (PRAP) and record of decision (ROD) will be prepared for each NASO SWMU to document the selected remedial alternative, this includes those SWMUs recommended for NFA status.

1.4.6.1 Ecological Risk Assessments

The Navy prepared a Screening Ecological Risk Assessment for SWMUs 2C, 2D, 2E, 18, 19, 23, and 24. This report, *Screening Ecological Risk Assessment SWMUs 2C, 2D, 2E, 18, 19, 20, 23, and 24, Naval Air Station, Oceana, Virginia Beach, Virginia* (October 1999) proposes no further action for ecological concerns at these eight SWMUs due to lack of complete exposure pathways.

The Navy prepared and submitted a Technical Memorandum to describe the technical approach to be used to conduct the ecological risk assessments at SWMUs 1, 2B, 11, 15, 16/16GC, 21, 22, 25, and 26. As complete exposure pathways do exist at these SWMUs, a screening risk characterization and SWMU-specific baseline ERA problem formulation will be required. This tech memo provides the "road map" to the ERA process for these SWMUs, identifies data gaps, and recommends a sampling approach to fill the identified data gaps. The additional sampling at various SWMUs, as recommended in the final ERA technical approach memorandum, were collected in December 1999.

2 Solid Waste Management Units

The SWMUs at the NASO can be grouped into categories by considering the additional work required for SWMU closeout. Table 2-1 summarizes the current status of each Oceana SWMU. Figure 2-1 shows the locations of each SWMU by category, as described in the following sections. Each category and the SWMUs which fall under them are described in this section.

2.1 Category 1 - SWMUs that Require no Further Study, Remediation, or Risk Assessment (2D, 18, 19, 20, and 23)

Five of the eleven NASO SWMUs (SWMUs 2D, 18, 19, 20, and 23) that require no further action for human health based on the investigation results documented in the Final Phase III RFI published in August 1999, also require no further ecological risk consideration. Ecological concerns were addressed the *Final Screening Ecological Risk Assessment, SWMUs 2C, 2D, 2E, 18, 19, 20, 23, and 24, Oceana Naval Air Station, Virginia, Beach, Virginia* (October 1999). The screening ERA established that there is no pathway for contamination to reach ecological receptors at these SWMUs; therefore, the screening ERA concluded that no further evaluation in the ecological risk assessment process is required. The Navy plans to prepare a PRAP and ROD to document the NFA determination at these SWMUs.

2.1.1 SWMU 2D - Line Shack 125 Disposal Area

Line Shack 125 was constructed in 1963 and has been used since then for aircraft cleaning and maintenance along with equipment and material storage. The IAS identified SWMU 2D as an area where waste chemicals from aircraft cleaning and maintenance activities were disposed. Potential contaminants that may have been released from 1963 until the early 1980s include oil, hydraulic fluid, PD-680, and aromatic hydrocarbons used for lubrication, paint stripping waste, and grease. The SWMU slopes slightly to the west toward the wooded area, which occurs off the flight line, water resources in this area are limited to a short ditch, which occurs in the southeastern corner of the wooded area that directs stormwater to the southwest. With the exception of the wooded area, lawn grasses occur over most of the unpaved portion of the SWMU.

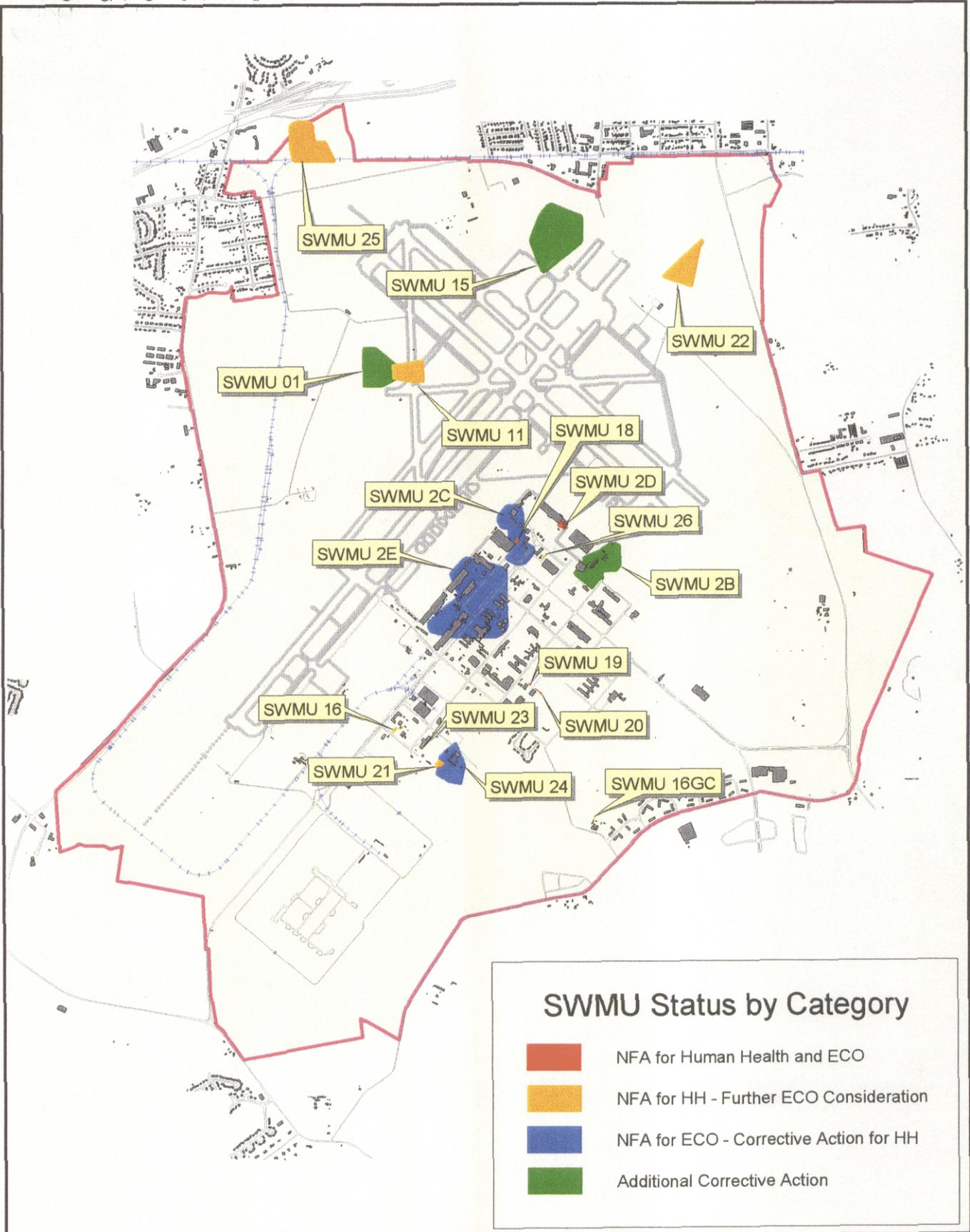
2.1.1.1 Investigation Status

Previous investigations performed at SWMU 2D include the *RCRA Facility Investigation (RFI) Final Report-Phase I* (December 1993), the *RFI Draft Final Report-Phase II* (February 1995), and *Phase III RCRA Facility Investigation Report* (August 1999). These reports conducted under RCRA support the NFA determination for human health consideration. The NFA determination for ecological concerns for SWMUs 2D was established in the *Final Screening Ecological Risk Assessment, SWMUs 2C, 2D, 2E, 18, 19, 20, 23, and 24, Oceana Naval Air Station, Virginia, Beach, Virginia* (January 2000).

TABLE 2-1
 Current Status Summary of IRP SWMUs, February 2000
 Naval Air Station, Oceana, SWMU Management Plan for FY 2000

SWMU	IAS	RFA	Interim RFI	Phase I RFI	POL CMS	Phase II RFI	CMS	Phase III RFI	BLRA & FS	PRAP	ROD	NFA		Comments
												HH	ERA	
1 West Woods Oil Pit	1984	1988	1991	1993			1995	1998	√ 2000	√ 2000	√ 2000			Free-product recovery underway, LTM proposed
2B Line Shack 130-131	1984	1988	1991	1993			1995	1998	2000	2001	2001			
2C Line Shack 400	1984	1988	1991	1993			1995	1998	2000	2001	2001		X	ERA-NFA Recommended in Screening ERA; HRC and/or NoVOCs remediation proposed
2D Line Shack 125	1984	1988	1991	1993			1995	1998		√ 2000	√ 2000	X	X	HH-NFA Recommended in Phase III RFI; ERA-NFA Recommended in Screening ERA
2E Line Shack 109, Bldg. 23	1984	1988	1991	1993			1995	1996	2000	2001	2001		X	ERA-NFA Recommended in Screening ERA
11 Fire Fighting Training Ring	1984	1988	1991	1993	1994					2000	2001	X		HH-NFA Recommended in POL Removal Report
15 Abandoned Tank Farm,	1984	1988		1993			1995	1996	√ 2000	√ 2000	√ 2000			MNA proposed
16 Pesticide Storage Area, Bldg. 821	1984	1988		1993						2000	2001	X		HH-NFA Recommended per Phase I RFI
16GC Golf Course Support Facilities		1988		1993						2000	2001	X		HH-NFA Recommended per Phase I RFI
18 Haz. Waste Storage Area, Bldg. 204		1988		1993	1994			1998		√ 2000	√ 2000	X	X	HH-NFA Recommended in Phase III RFI; ERA-NFA Recommended in Screening ERA
19 Waste Oil Storage Areas, Bldg. 541		1988		1993	1994					√ 2000	√ 2000	X	X	HH-NFA Recommended in POL Removal Report; ERA-NFA Recommended in Screening ERA
20 Waste Oil Storage Areas, Bldg. 543		1988		1993	1994					√ 2000	√ 2000	X	X	HH-NFA Recommended in POL Removal Report; ERA-NFA Recommended in Screening ERA
21 Transformer Storage Yard, Bldg. 830		1988		1993				1998		2000	2001	X		HH-NFA Recommended in Phase III RFI
22 Construction Debris Landfill		1988		1993						2000	2001	X		HH-NFA Recommended per Phase I RFI
23 Bowser, Bldg. 830		1988		1993						√ 2000	√ 2000	X	X	HH-NFA Recommended per Phase I RFI; ERA-NFA Recommended in Screening ERA
24 Bowser, Bldg. 840		1988		1993	1994	1995	1996	1998	√ 2000	√ 2000	√ 2000		X	ERA-NFA Recommended in Screening ERA; LTM Proposed
25 Inert Landfill		1988		1993			1995	1998		2002	2002	X		HH-NFA Recommended in Phase III RFI
26 Fire Fighting Burn Pit, Bldg. 220		1988		1993				1998		2000	2001	X		HH-NFA Recommended in Phase III RFI

LEGEND:	1998 - Year Activity Completed (fiscal year)	CMS - Corrective Measures Study	MNA - Monitored Natural Attenuation
√ 1998 - Activity In Progress & expected completion	RD - Remedial Design	ORC - Oxygen-Release Compound	
2000 - Activity Planned & expected completion	RA - Remedial Action/Removal Action	Excavation, Transportation, and Disposal of Petroleum Contaminated Soils, ENSI, April 26, 1995 - POL Removal Report	
PA - Preliminary Assessment	PRAP - Proposed Remedial Action Plan	Screening Ecological Risk Assessment SWMUs 2C, 2D, 2E, 18, 19, 20, 23 and 24, Naval Air Station, Oceana, Virginia Beach, Virginia (January 2000) - Screening ERA	
IAS - Initial Assessment Study	ROD - Record of Decision or Decision Document		
RFA - RCRA Facility Assessment	NFA - No Further Action		
RFI - RCRA Facility Investigation	X - Applicable to the SWMU		
POL - Petroleum-Oil-Lubricant SWMUs	LTM - Long-Term Monitoring		



0 2000 4000 6000 Feet

Figure 2-1
IRP SWMUs
NAS Oceana, Virginia Beach, Virginia

CH2M HILL

00502E024

2.1.1.2 Current Status

The Navy will prepare a PRAP and ROD documenting the NFA determination for both human health and ecological concerns in 2000.

2.1.2 SWMU 18 - Hazardous Waste Storage, Building 204

SWMU 18 consists of two hazardous waste storage areas near Building 200 adjacent to B Avenue. The storage area closest to Building 200 is approximately 15 by 25 feet, and stores fewer than 10 drums. The walls, roof, and entranceway of the accumulation area are secured by a chain-link fence. 55-gallon drums rest on a raised concrete slab floor. Under the current hazardous waste management program, these drums are stored for a period of less than 90 days. The newer hazardous waste storage shed has existed for at least 15 years. Materials typically stored at the shed may include double-bagged empty oil/paint cans and oily rags, and drums of oil, paint thinner, paint remover, jet fuel, solvents, asbestos, PD 680, hydraulic fluid, freon, neutralized battery acid, and electric coolant oil.

2.1.2.1 Investigation Status

Previous investigations performed at SWMU 18 include the *RCRA Facility Investigation (RFI) Final Report-Phase I* (December 1993), the *Final Corrective Measures Study for Petroleum Contaminated SWMUs (POL CMS)* (October 1994), the *Excavation, Transportation and Disposal of Petroleum Contaminated Soils* report (April 1995), and *Phase III RCRA Facility Investigation Report* (August 1999). These reports conducted under RCRA support the NFA determination for human health consideration. The NFA determination for ecological concerns for SWMUs 18 was established in the *Final Screening Ecological Risk Assessment, SWMUs 2C, 2D, 2E, 18, 19, 20, 23, and 24, Oceana Naval Air Station, Virginia, Beach, Virginia* (October 1999).

2.1.2.2 Current Status

The Navy will prepare a PRAP and ROD documenting the NFA determination for both human health and ecological concerns in 2000.

2.1.3 SWMU 19 - Waste Oil Storage Area, Building 541

SWMU 19 is near Building 541, which has been the Navy Exchange Gas Station since 1972 (RGH, 1984). This SWMU is a 50 square foot area where waste oil, solvents, and transmission, brake, and hydraulic fluids were stored in 55-gallon steel drums directly on the ground. The waste fluids and oil were generated by automobile repair and maintenance work at the station (RGH, 1984). An empty 55-gallon drum was observed in the grassy area immediately northeast of the gas station during RFI activities. During the VSI, inspectors noticed soil staining and dead grass in the same area; only one drum was observed and there were no release-control mechanisms in place.

2.1.3.1 Investigation Status

Previous investigations performed at SWMU 19 include the *RCRA Facility Investigation (RFI) Final Report-Phase I* (December 1993), the *Final Corrective Measures Study for Petroleum Contaminated SWMUs (POL CMS)* (October 1994), and the *Excavation, Transportation and Disposal of Petroleum Contaminated Soils* report (April 1995). These reports conducted under RCRA support the NFA determination for human health consideration. The NFA

determination for ecological concerns for SWMUs 19 was established in the *Final Screening Ecological Risk Assessment, SWMUs 2C, 2D, 2E, 18, 19, 20, 23, and 24, Oceana Naval Air Station, Virginia, Beach, Virginia* (October 1999).

2.1.3.2 Current Status

The Navy will prepare a PRAP and ROD documenting the NFA determination for both human health and ecological concerns in 2000.

2.1.4 SWMU 20 - Waste Oil Storage Area, Building 543

SWMU 20 is on the grounds of Building 543, the Auto Hobby Shop. The auto hobby shop is a self-help automotive garage where Navy personnel can work on their cars when off duty. It has been in existence since 1976 (RGH, 1984). Waste motor oil, hydraulic fluid, automotive transmission fluid, and PD 680 and other solvents were stored in 55-gallon drums directly on the ground at this SWMU. A strip of grass and bare ground approximately 150 feet long and 3 feet wide runs between the asphalt next to Building 543 and a larger grass area outside the fence. Soil staining, dead grass, and two 55-gallon steel drums were observed on this strip.

2.1.4.1 Investigation Status

Previous investigations performed at SWMU 20 include the *RCRA Facility Investigation (RFI) Final Report-Phase I* (December 1993), the *Final Corrective Measures Study for Petroleum Contaminated SWMUs (POL CMS)* (October 1994), and the *Excavation, Transportation and Disposal of Petroleum Contaminated Soils* report (April 1995). These reports conducted under RCRA support the NFA determination for human health consideration. The NFA determination for ecological concerns for SWMUs 20 was established in the *Final Screening Ecological Risk Assessment, SWMUs 2C, 2D, 2E, 18, 19, 20, 23, and 24, Oceana Naval Air Station, Virginia, Beach, Virginia* (January 2000).

2.1.4.2 Current Status

The Navy will prepare a PRAP and ROD documenting the NFA determination for both human health and ecological concerns in 2000.

2.1.5 SWMU 23 - Bowser, Building 830

SWMU 23 is adjacent to Building 830, which has housed the Public Works Transportation Division since 1954. The SWMU has been the storage location of a bowser used to collect waste motor oil drained from the heavy and light equipment of the Public Works fleet. The waste oil drained into a 55-gallon drum, which had been cut in half, and was then pumped into the 500-gallon bowser outside Building 830. Approximately 1,500 to 2,000 gallons are generated each year. After the bowser was full, it was transferred to the Fuel Division Storage Yard for transfer to storage tanks (RGH, 1984). During the VSI, waste oil was visible on the shop floor surrounding the 55-gallon drum and heavy staining was seen on the ground below the waste oil bowser. Current practice is to pump waste oil into 55-gallon drums and transport the drums to the base hazardous waste lot, where they are transferred to the Defense Reutilization Management Office (DRMO) and then disposed of or recycled appropriately. The bowzers are no longer used and were not present at the time of RFI

sampling activities. The area where the bowser was parked is now covered by an asphalt parking lot.

2.1.5.1 Investigation Status

The previous investigation of SWMU 23, the *RCRA Facility Investigation (RFI) Final Report-Phase I* (December 1993), supported the NFA determination for human health consideration. The NFA determination for ecological concerns for SWMUs 23 was established in the *Final Screening Ecological Risk Assessment, SWMUs 2C, 2D, 2E, 18, 19, 20, 23, and 24, Oceana Naval Air Station, Virginia, Beach, Virginia* (October 1999).

2.1.5.2 Current Status

The Navy will prepare a PRAP and ROD documenting the NFA determination for both human health and ecological concerns in 2000.

2.2 Category 2 - SWMUs that Require no Further Study or Remediation, but Require Further Consideration for Ecological Risk (11, 16/16GC, 21, 22, 25, and 26)

The remaining six NASO SWMUs (SWMUs 11, 16/16GC, 21, 22, 25, and 26) that require no further action for human health, based on the Final Phase III RFI published in August 1999, require some additional consideration for ecological risk consideration. The technical approach for conducting ERAs was developed by the Navy and EPA's Biological Technical Assistance Group (BTAG). The *Technical Memorandum - Ecological Risk Assessment Approach for SWMUs 1, 2B, 11, 15, 16, 21, 22, 25, and 26, Naval Air Station Oceana, Virginia Beach, Virginia* (January 2000) will be followed in the preparation of all NASO ERAs.

2.2.1 SWMU 11 - Fire-Fighting Training Area

SWMU 11 consists of two fire-fighting training rings and their immediate surroundings. The SWMU is on the west side of NASO at the intersection of two abandoned runways. From the early 1960s until the mid-1970s, two fire-fighting practice sessions were conducted each weekend as part of training exercises (RGH, 1984). Waste oil, fuel, chlorinated and aromatic hydrocarbons, and hydraulic fluid were poured into the center of the abandoned runway, ignited, and extinguished. In the mid-1970s, a fire pit with an earthen outer berm was built (RGH, 1984). Discussions with officials from the Public Works Department indicated that the waste fuels and water would overflow the earthen berm occasionally (R.E. Wright Associates, 1983). The Initial Assessment Study (IAS) reported that the area directly west of the fire training pits on the west side of the abandoned runway was used for the disposal of waste fuels and lubricants by land farming (R.E. Wright Associates, 1983). Land farming entailed spreading hydrocarbon products over a large area, followed by tilling the soil to enhance volatilization and biodegradation. Personnel from the Environmental Division at NASO could not confirm that the land farming occurred. The types of soils and the amount of fuel in the soils could not be determined, so the potential impact of this practice and its location could not be confirmed.

2.2.1.1 Investigation Status

Previous investigations performed at SWMU 11 include the *RCRA Facility Investigation (RFI) Final Report-Phase I* (December 1993), the *Final Corrective Measures Study for Petroleum Contaminated SWMUs (POL CMS)* (October 1994), and the *Excavation, Transportation and Disposal of Petroleum Contaminated Soils* report (April 1995). These reports conducted under RCRA support the NFA determination for human health consideration

2.2.1.2 Current Status

Surface water and sediment data gaps from a wetland near SWMU 11 were identified during the development of the *Technical Memorandum – Ecological Risk Assessment Approach for SWMUs 1, 2B, 11, 15, 16, 21, 22, 25, and 26, Naval Air Station Oceana, Virginia Beach, Virginia* (January 2000). Therefore, additional sampling was conducted in December 1999 to support the Screening ERA for SWMU 11. At the completion of the ERA, the Navy will prepare a PRAP and ROD for this SWMU.

2.2.2 SWMU 16/16GC - Pesticide Storage Area

SWMU 16 consists of two different pesticide storage areas. One area is adjacent to the pesticide shop at Building 821 in the Public Works Compound and the other is at the Golf Course Maintenance Shop (SWMU 16GC). The IAS stated that rinse water from the pesticide-mixing tank was discharged directly onto the ground at the pesticide shop near Building 821 between 1968 and 1982 (RGH, 1984). The pesticides used at this location include 2,4-D, 2,4,5-T, baygon heptachlor, malathion, dursban, nibaryl, aldrin, chlordane, bromacil, warfarin, and DDT. Contamination may have resulted from washing out pesticide containers and equipment during the 15-year life of the pesticide shop.

The pesticide storage area at the NASO Golf Course has existed since 1956 (RGH, 1984). Pesticides were stored in the Golf Course Barn, Building 798 (RGH, 1984). Materials stored in the barn included fungicides, such as Daconil, Chipco 26019, and dursban; herbicides, including Daconte 6; and Oursban, an insecticide (RGH, 1984). Since 1982, 55-gallon drums of pesticides drained from the spray tank have been removed by Public Works as part of the hazardous waste pickup program (RGH, 1984). Before 1982, residual pesticides were rinsed over a concrete rinsing pad outside Building 798 (RGH, 1984). This rinse water flowed into a shallow drainage ditch adjacent to Building 798.

2.2.2.1 Investigation Status

Previous investigation of SWMU 16/16GC, the *RCRA Facility Investigation (RFI) Final Report-Phase I* (December 1993) supports the NFA determination for human health consideration.

2.2.2.2 Current Status

Surface water and sediment data gaps from a wetland near SWMU 11 were identified during the development of the *Technical Memorandum – Ecological Risk Assessment Approach for SWMUs 1, 2B, 11, 15, 16, 21, 22, 25, and 26, Naval Air Station Oceana, Virginia Beach, Virginia* (January 2000). Therefore, additional sampling was conducted in December 1999 to support the Screening ERA for SWMU 11. At the completion of the ERA, the Navy will prepare a PRAP and ROD for this SWMU.

2.2.3 SWMU 21 - Transformer Storage Yard

SWMU 21 is located in the southwestern corner of the Public Works Transportation Yard, approximately 400 feet southeast of Building 830. Transformers were stored in two gravel areas between the sand loaders and the yard's chain-link fence. In the past, old electrical transformers, which were known to contain PCBs, were stored on pallets over bare ground at this SWMU until they could be disposed of (RGH, 1984). The Public Works Transportation Yard has been in use since the early 1950's; however, it is unclear how long this area has been used for transformer storage (RGH, 1984). Transformers have been stored in the yard since at least 1982 when a transformer leaked a significant quantity of transformer oils, and the Navy hired a contractor to clean up the spill (RGH, 1984). Two transformers without release controls were seen leaking oil onto the ground during the Visual SWMU Inspection (VSI) (USEPA, 1988). Vegetation behind and downgradient from the transformers appeared to be dead (USEPA, 1988).

2.2.3.1 Investigation Status

Previous investigations performed at SWMU 2D include the *RCRA Facility Investigation (RFI) Final Report-Phase I* (December 1993), and *Phase III RCRA Facility Investigation Report* (August 1999). These reports conducted under RCRA support the NFA determination for human health consideration.

2.2.3.2 Current Status

Previous RFI data and the process outlined in the *Technical Memorandum - Ecological Risk Assessment Approach for SWMUs 1, 2B, 11, 15, 16, 21, 22, 25, and 26, Naval Air Station Oceana, Virginia Beach, Virginia* (January 2000) will be used to conduct the Screening ERA for SWMU 21. At the completion of the ERA, the Navy will prepare a PRAP and ROD for this SWMU.

2.2.4 SWMU 22 - Construction Debris Landfill

SWMU 22 is approximately 600 to 1,000 feet west of Oceana Boulevard and 1,500 feet north of the VACAPES complex. The landfill is an approximately 0.5-acre unlined facility that was in use at the time of the VSI. No release controls were observed (USEPA, 1988). The age of the landfill is unknown, but it was first discovered in 1986 (USEPA, 1988). The former permit status of this landfill is not known. Although the Navy designated and permitted this landfill for construction debris, controls on the landfill's waste stream did not prevent the disposal of other types of waste. Essentially only surface dumping occurred at this SWMU and was confined to inert objects such as major appliances, furniture, and aircraft components. These objects have been removed and the area replanted as part of ecological restoration activities being conducted on the base. There have been no documented releases from this SWMU.

2.2.4.1 Investigation Status

Previous investigation of SWMU 22, the *RCRA Facility Investigation (RFI) Final Report-Phase I* (December 1993) supports the NFA determination for human health consideration.

2.2.4.2 Current Status

Surface soil data gaps at SWMU 22 were identified during the development of the *Technical Memorandum – Ecological Risk Assessment Approach for SWMUs 1, 2B, 11, 15, 16, 21, 22, 25, and 26, Naval Air Station Oceana, Virginia Beach, Virginia* (January 2000). Therefore, additional sampling was conducted in December 1999 to support the Screening ERA for SWMU 22. At the completion of the ERA, the Navy will prepare a PRAP and ROD for this SWMU.

2.2.5 SWMU 25 - Inert Landfill

SWMU 25 is a landfill located north of Potters Road on 26 acres of land. The landfill primarily contains construction debris and demolished concrete. According to the RCRA Facility Assessment (RFA), the facility is unlined and was used as a borrow pit. The pit was excavated in a fine, sandy loam soil that has a moderately high hydraulic conductivity. Eventually, the pit filled with water and was used as a local dump. Borrow areas east of the landfill have also filled with water. NASO purchased the land in 1979 and received a permit from the Virginia Department of Health on May 24, 1979, permitting the disposal of inert solid waste. Waste disposal may have begun as early as 1978 (USEPA, 1988). NASO does not currently dispose of inert demolition debris at this SWMU. Uncontrolled community waste disposal of unknown materials took place before NASO's purchase of the SWMU.

2.2.5.1 Investigation Status

Previous investigations performed at SWMU 25 include the *RCRA Facility Investigation (RFI) Final Report-Phase I* (December 1993), the *RFI Draft Final Report-Phase II* (February 1995), and *Phase III RCRA Facility Investigation Report* (August 1999). These reports conducted under RCRA support the NFA determination for human health consideration.

2.2.5.2 Current Status

The Navy is planning on recycling the concrete at SWMU; this project is expected to take 18 months to complete. Following the completion of the concrete recycling project, the SWMU will be restored as a warm-water fishery and/or general upland habitat. At the completion of the SWMU restoration project, a Screening ERA for SWMU 25 will be conducted followed by a PRAP and ROD.

2.2.6 SWMU 26 - Fire-Fighting Training Area, Building 220

SWMU 26 consisted of partially buried drum or small tank with the top removed that measured 3-feet wide by 4-feet high and was inset approximately three feet below grade. The tank formed a burn pit that was used for firefighting training. The tank was located southeast of Building 220, the base's fire station. POL and fuel-contaminated objects were placed in the pit and were ignited. Burn residue and water were periodically pumped out of the tank to the adjacent ditch. During the VSI, inspectors observed that staining in the ground that extended to the adjacent drainage ditch. The burn pit had no release controls at the time of the VSI (USEPA, 1988). The tank has been removed and the area returned to grade since at least 1990.

2.2.6.1 Investigation Status

Previous investigations performed at SWMU 26 include the *RCRA Facility Investigation (RFI) Final Report-Phase I* (December 1993), and *Phase III RCRA Facility Investigation Report* (August 1999). These reports conducted under RCRA support the NFA determination for human health consideration.

2.2.6.2 Current Status

Surface soil data gaps at SWMU 26 were identified during the development of the *Technical Memorandum – Ecological Risk Assessment Approach for SWMUs 1, 2B, 11, 15, 16, 21, 22, 25, and 26, Naval Air Station Oceana, Virginia Beach, Virginia* (January 2000). Therefore, additional sampling was conducted in December 1999 to support the Screening ERA for SWMU 22. At the completion of the ERA, the Navy will prepare a PRAP and ROD for this SWMU.

2.3 Category 3 - SWMUs that Currently Require Additional Study or Remediation but do not Require Further Consideration for Ecological Risk (2C, 2E, and 24)

SWMUs 2C, 2E, and 24 require additional investigation to determine the appropriate remedial action, if any, at these SWMUs. The additional investigations include a HHRA to determine potential risk associated with these SWMUs, and an FS to develop remedial alternatives to remedy the identified risk. The selected remedial alternative will be documented in a PRAP and ROD for each of these SWMUs. Ecological concerns for 2C, 2E, and 24 were addressed the *Final Screening Ecological Risk Assessment, SWMUs 2C, 2D, 2E, 18, 19, 20, 23, and 24, Oceana Naval Air Station, Virginia, Beach, Virginia* (October 1999). The screening ERA established that there is no pathway for contamination to reach ecological receptors at these SWMUs; therefore, the screening recommended SWMUs 2C, 2E, and 24 for no further evaluation in the ecological risk assessment process.

2.3.1 SWMU 2C - Line Shack 400 Disposal Area

SWMU 2C is encompassed by Line Shack 400 and Buildings 301, 401, and 404. This general area, which is part of FITWING, has been and continues to be used for aircraft maintenance and cleaning. In earlier years, Navy personnel disposed of various maintenance and cleaning chemicals similar to those discharged at SWMU 2B. These chemicals potentially include waste oil, hydraulic fluid, PD 680, paint stripper, thinner, Turco, naphtha, and B&D 3400 Engine Cleaner (RGH, 1984). Waste disposal occurred near Line Shack 400 starting in 1963, the year the line shack was constructed, until the early 1980s, when a hazardous waste recovery program was instituted (RGH, 1984). The area around the line shack originally had an earthen surface but it was capped with 15 inches of concrete in the early 1980s (RGH, 1984). A disposal area southwest of Building 400 was reported to be visible in 1971 air photographs reviewed during the IAS (RGH, 1984). It is not known if the soil was removed and if so, where it was taken for disposal (RGH, 1984).

2.3.1.1 Investigation Status

Two environmental investigations at SWMU 2C preceded the Phase I RFI (1) the Line Shack SWMU Inspection in 1988, and (2), the Interim RFI in 1990. These studies indicated that groundwater at SWMU 2C is contaminated with chlorinated VOCs over a broad area.

In 1993 CH2M HILL conducted a Phase I RFI to delineate the areal and vertical extent of the groundwater contaminant plume and the identify probable contaminant source areas in soil. Results are documented in the *RCRA Facility Investigation Final Report – Phase I, Naval Air Station Oceana, Virginia Beach, Virginia*, December 1993.

Subsequently, CH2M HILL conducted a CMS in 1995 to further delineate the areal extent of the groundwater contaminant plume and further identify probable contaminant source areas in soil to support a remediation strategy. Results are documented in the *Final Corrective Measures Study for SWMUs 1, 2B, and 2C, Oceana Naval Air Station, Virginia Beach, Virginia*, November 1995.

Follow-on sediment sampling was conducted by CH2M HILL as part of the Phase III RFI. Phase III RFI Results are documented in the *Final RCRA Facility Investigation Report – Phase III, Naval Air Station Oceana, Virginia Beach, Virginia*, August 1999.

Investigation results indicated that vinyl chloride and 1,2-dichloroethylene are the primary chlorinated VOC groundwater contaminants at SWMU 2C. The contaminant plume extends from the flight line area to the south-southeast, across London Bridge Road. During the Phase I RFI a low concentration of 1,2-dichloroethylene was detected in a well screened in the deep aquifer. The same well was sampled during the follow-on CMS and had no detection of 1,2-dichloroethylene.

A suspected contaminant source area near Building 400 was not precisely located despite the numerous soil samples collected in this area. A suspected contaminant source area near the southeastern corner of Building 301 was verified through soil sampling and the detection of chlorinated VOCs. In the CMS, the evaluation of remedial alternatives resulted in the recommendation of the following remedial action: groundwater contaminant plume containment and source-area extraction with groundwater treatment using air stripping. This alternative was not implemented to allow additional investigation into emerging innovative groundwater remediation technologies. Sediment samples collected during the Phase III RFI indicated that the sediments are contaminated with PAHs at levels that exceed ecological screening levels.

In July 1999, the Navy completed one round of groundwater sampling from 19 monitoring wells to support a human health risk assessment and to identify the current location of contaminant plumes at SWMU 2C.

2.3.1.2 Current Status

The Navy is planning a HHRA for SWMU 2C which will be conducted following the assumptions and protocol as agreed upon with the EPA. Following the risk assessments, the Navy will proceed with a focused FS, a PRAP, and a ROD for SWMU 2C.

The Navy anticipates implementing an innovative groundwater remediation technology to address the contamination at SWMU 2C. A draft-final work plan was submitted to the EPA in March 1998 that defined sampling tasks and field investigation procedures for

performing for an Oxygen Release Compound (ORC) pilot study. This draft-final document, dated March 1998, is currently being reviewed by the EPA. In addition, the Air Force is looking for pilot study SWMU for an innovative groundwater remediation technology it is developing. SWMU 2C is being considered by Air Force as a potential study SWMU for this remediation technology, Reductive Anaerobic Biological In-Situ Treat Technology (RABITT).

In pursuit of determining the applicability of an innovative groundwater remediation technology at SWMU 2C, a direct push technology (DPT) groundwater investigation to further delineate contamination "hot spots" defined by the July 1999 groundwater sampling event. The work plan for this investigation, *Work Plan Addendum, Direct Push Technology Investigation, Supplemental Activities, SWMU 2C*, December 1999, will be implemented in February 2000.

2.3.2 SWMU 2E - Line Shack 109 Disposal Area

SWMU 2E is the area bounded by Hangar 23, Line Shack 109, Building 110, and a steam line along First Street. Because Line Shack 109 was constructed in 1963, it has been used for aircraft cleaning and maintenance, and equipment and material storage. The IAS identified this unit as a location where waste chemicals from the Navy's cleaning and maintenance activities were disposed (RGH, 1984). These wastes potentially include oil, PD 680, aromatic hydrocarbons, and hydraulic fluid (RGH, 1984). There was reported to be a POL disposal area on the ground behind Line Shack 109 along the flight line fence (RGH, 1984). At the time of the IAS, a waste oil bowser and hazardous waste drums were seen on the ground along the fence (RGH, 1984). Waste oil also was reportedly funneled into a manhole near Line Shack 109 (RGH, 1984). This practice damaged electrical circuits that were encased in the manhole and prompted a cleanup of the manhole. This manhole is between Line Shack 109 and Hanger 23 near the northwest corner of Line Shack 109. A temporary hazardous waste storage area was constructed next to the fence near Hangar 23 between 1984 and 1988.

2.3.2.1 Investigation Status

The IAS identified the SWMU 2E area as a waste disposal area. After the RFA, the area was designated as SWMU 51 and SWMU 1. During the interim RI in 1990 the areas were investigated together and were merged to become SWMU 2E. Low concentrations of VOCs were detected in groundwater and floating free-phase product identified as diesel fuel was discovered. Subsequent investigations of SWMU 2E were focused on the characterization and extent of free-phase product. The Navy instituted a program of product recovery which involved trenching to determine the areal extent of the product and bailing product from wells.

SWMU 2E was investigated during two phases of the RFI. Phase I was completed in 1993 and Phase II was completed in 1995. The purpose of the RFIs were to delineate the source area and the extent of subsurface free product and to determine the nature and extent of the dissolved-phase groundwater contaminant plume. Results of the RFIs are documented in the *RCRA Facility Investigation Final Report - Phase I, Naval Air Station Oceana, Virginia Beach, Virginia*, December 1993 and the *RCRA Facility Investigation Report - Phase II, Naval Air Station Oceana, Virginia Beach, Virginia*, February 1985.

In 1995, CH2M HILL conducted a CMS to further delineate the areal and vertical extent of the dissolved-phase groundwater contaminant plume. Results are documented in the *Final Corrective Measures Study for SWMUs 2E, 15, and 24, Oceana Naval Air Station, Virginia Beach, Virginia*, March 1996.

Results of the investigations indicated that soil around the source area (Building 109) is contaminated with petroleum products as evidenced by elevated concentrations of TPH and PAHs. Several BTEX and TPH compounds were detected in surface and subsurface soil samples. Groundwater contamination at SWMU 2E consists of free product floating on the water table and dissolved-phase product in the shallow aquifer. Free product, identified as diesel fuel is found in wells near Building 109 at a thickness in the aquifer of less than ¼ inch. The dissolved-phase contamination consists of volatile and semivolatile petroleum compounds and chlorinated VOCs. The petroleum contamination is primarily BTEX and diesel-related compounds and the chlorinated VOC contamination is composed primarily of vinyl chloride and 1,2-dichloroethylene.

In the CMS, the evaluation of remedial alternatives resulted in the recommendation of the following remedial action:

- Groundwater contaminant plume containment and source-area extraction with groundwater treatment using air stripping
- Pilot testing of innovative technologies for remediation of chlorinated VOC-contaminated groundwater
- Bioremediation through injection of air and nutrients

Cost evaluation of a source extraction and treatment system and a failed "bio-slugging" pilot test have lead the Navy to pursue additional investigation into emerging innovative groundwater remediation technologies for SWMU 2E.

2.3.2.2 Current Status

The Navy is planning a HHRA for SWMU 2E which will be conducted following the assumptions and protocol as agreed upon with the EPA. Following the risk assessments, the Navy will proceed with a focused FS, a PRAP, and a ROD for SWMU 2E.

2.3.3 SWMU 24 - Bowser, Building 840

SWMU 24 is an area near Building 840 which contained a waste-oil bowser. The Naval Construction Battalion (SEABEES) has been based in Building 840 since 1972. The SEABEES are involved in construction at Oceana NAS and other local naval installations (RFA, 1988). Waste solvents and oils generated at the equipment maintenance garage in Building 840 were hand carried and poured into the bowser, which was typically located in the southernmost corner of the SEABEE compound (RFA, 1988). The bowser was then transported to the tank farm for disposal (RFA, 1988). During the VSI, heavy staining of the ground was observed in the area surrounding the waste oil bowser at Building 840 (RFA, 1988). Current practice is to dispose of waste oil in drums that are transported to the base hazardous waste lot, where they are transferred to the DRMO and disposed or recycled appropriately. The bowsers are no longer used.

2.3.3.1 Investigation Status

The 1993 RFI field investigation was the first investigation of SWMU 24. However, environmental problems at this SWMU were first recognized during the RFA when oil staining was observed in SWMU surface soil surrounding a used oil bowser. SWMU 24 was investigated during three phases of the RFI. Phase I was completed in 1993, Phase II was completed in 1995, and Phase III was completed in 1997.

In 1993, CH2M HILL conducted a Phase I RFI to delineate the source area and the extent of POL-contaminated soil. Results of the Phase I RFI are documented in the *RCRA Facility Investigation Final Report – Phase I, Naval Air Station Oceana, Virginia Beach, Virginia*, December 1993. Soil sampling results indicated that this SWMU should be characterized for soil removal. The *Final Corrective Measures Study for Petroleum Contaminated SWMUs, Oceana Naval Air Station, Virginia Beach, Virginia*, October 1994 delineated the soils for removal at SWMU 24. During the review of the POL-CMS and the *Excavation, Transportation and Disposal of Petroleum Contaminated Soils* report (April 1995), the EPA requested additional confirmatory sampling at SWMU 24. In 1997, CH2M HILL conducted confirmatory subsurface soil sampling at SWMU 24 to confirm that the POL soil removal was effective. Results of the soil sampling are documented in the *Final RCRA Facility Investigation Report – Phase III, Naval Air Station Oceana, Virginia Beach, Virginia*, August 1999.

During the POL CMS, groundwater contamination was discovered. The SWMU was added to the 1995 Phase II RFI scope of work to address groundwater contamination. CH2M HILL conducted the CMS for groundwater in 1995. Results are documented in the *Final Corrective Measures Study for SWMUs 2E, 15, and 24, Oceana Naval Air Station, Virginia Beach, Virginia*, March 1996. Results of the investigations indicated that groundwater at SWMU 24 is contaminated with chlorinated VOCs and BTEX. Chlorinated VOC contaminants are widely distributed across the SWMU and consist of vinyl chloride, 1,2-dichloroethylene, and trichloroethylene.

In the CMS, the evaluation of remedial alternatives resulted in the recommendation of the following remedial action for groundwater:

- Monitor down-gradient edge of the contaminant plume
- Conduct pilot test(s) at the chlorinated solvent source areas or hot spots to evaluate innovative technologies for remediation of groundwater. A potential pilot test will evaluate the effectiveness of in-well air stripping.
- The results of the pilot test will be evaluated for full-scale implementation

In late 1996 and early 1997 an in-well aeration pilot study was initiated at SWMU 24. As documented in the *Final Report on the Pilot Test of the NoVOCs In-situ Aeration Technology at RCRA SWMU 24, Oceana Naval Air Station, Virginia Beach, Virginia*, April 1997 contaminant concentrations in the source area were dramatically reduced. However, some outlying areas of the contaminant plume were not treated and additional remediation was recommended. In July 1998, a final work plan for a direct push technology (DPT) investigation to provide additional SWMU characterization was submitted to the RCRA EPA and VDEQ. The objectives of this investigation were to (1) to evaluate where current plume boundaries are located, (2) install an additional NoVOCs™ treatment well and groundwater monitoring points, (3) remediate any areas of significant groundwater

contamination, and (4) collect sufficient data to evaluate groundwater remediation success using the NoVOCs™ system. In addition, the monitoring wells at SWMU 24 were sampled to support a planned HHRA for this SWMU.

Results of the DPT investigation and the groundwater sampling are documented in the *Final Technical Memorandum for the Groundwater Sampling at SWMU 24, Oceana Naval Air Station, Virginia Beach, Virginia*, January 2000. The Navy has determined that the installation of a second NoVOCs™ well at SWMU 24 is not economically feasible due to the limited areal and vertical extent of VOCs in groundwater at concentrations exceeding the MCL.

2.3.3.2 Current Status

The Navy is conducting a HHRA for SWMU 24 which will be conducted following the assumptions and protocol outlined in the *Proposed Methods for Preparing the Human Health Risk Assessment for SWMU 24 at Naval Air Station Oceana* (October 1999). Following the risk assessments, the Navy will proceed with a focused FS, a PRAP, and a ROD for SWMU 24.

In June of 1999, the Navy met with EPA and John Wilson from the EPA/ORD to discuss the implementation of MNA at SWMU 15. SWMU 24 groundwater contamination was addressed at that meeting as well. Based upon the technical discussion of SWMU 24 groundwater conditions it was determined that the Navy propose periodic long-term monitoring of the groundwater for 1,2-DCE in the planned FS. It is anticipated that long-term monitoring will be included in the selected remedial action for SWMU 24. The Navy will prepare a long-term monitoring plan in conjunction with the development of the MNA plan for SWMU 15. The Navy proposes to use the 1998 groundwater data as baseline data for periodic long-term monitoring.

2.4 Category 4 - SWMUs that Currently Require Additional Corrective Action under CERCLA and Require Further Consideration for Ecological Risk (1, 2B, and 15)

SWMUs 1, 2B, and 15 require additional investigation to determine the appropriate remedial action, if any, at these SWMUs. The additional investigations include a HHRA and ERA to determine potential risk associated with these SWMUs, and an FS to develop remedial alternatives to remedy the identified risk. The selected remedial alternative will be documented in a PRAP and ROD for each of these SWMUs. The technical approach for conducting ERAs was agreed to the *Technical Memorandum – Ecological Risk Assessment Approach for SWMUs 1, 2B, 11, 15, 16, 21, 22, 25, and 26, Naval Air Station Oceana, Virginia Beach, Virginia* (January 2000).

2.4.1 SWMU 1 - West Woods Oil Disposal Pit

The West Woods Oil Disposal Pit is located in the northwest part of NASO, approximately 1,000 feet west of abandoned Runway 9 and the fire fighting training area. According to the IAS, the unit was originally an open pit in which an estimated 110,000 gallons of waste oil, fuels (such as JP-5, JP-3, and AVGAS), PD 680, various chlorinated and aromatic hydrocarbons (trichlorotrifluoromethane, benzene, toluene, and naphtha), aircraft-

maintenance chemicals, paints, paint thinners and strippers, and agitine were disposed of from the mid-1950s to the late 1960s (RGH, 1984). Drilling at this unit also has shown that metal, concrete, and other debris were disposed of in the pit or were included in the fill material. On the basis of a 1958 aerial photograph of the unit, the pit appears to have been approximately 50 to 100 feet in diameter.

In the late 1960s, the pit flooded and its contents are believed to have washed into the main drainage ditch, 100 feet west of the oil disposal pit. As a result, waste disposal ceased and the pit was filled with soil (RGH, 1984). The NAS boundary is approximately 1,000 to 2,000 feet west or northwest of the oil pit.

2.4.1.1 Investigation Status

SWMU 1 has been investigated on five occasions. The Initial Assessment Study (IAS), conducted in 1984, identified the SWMU and inventoried the types of waste liquids disposed of in the pit. In 1986, CH2M HILL conducted a Phase I Verification Study, which was followed by the Interim RFI in 1991. These two investigations showed that the groundwater is contaminated locally with compounds associated with petroleum Hydrocarbons (TPH). Sediment samples taken from the drainage ditch west of the former West Woods Oil Pit contained petroleum constituents.

In 1993, CH2M HILL conducted a Phase I RFI investigation to determine the vertical and lateral extent of groundwater contamination and the hydraulic characteristics and flow regime of the shallow aquifer. This investigation also characterized the type and extent of soil contamination in the vicinity of the pit to confirm earlier data on the contamination of the surface water and sediment and to determine if sediment and surface water contamination extended as far as the culvert 1000 feet downstream of the area adjacent to the pit. During the RFI, high concentrations of free petroleum products were detected in several borings including those north of the pit. Results are documented in the *RCRA Facility Investigation Final Report – Phase I, Naval Air Station Oceana, Virginia Beach, Virginia*, December 1993.

Consequently, in 1994-1995, CH2M HILL performed a CMS field investigation to determine the extent of soil contamination in order that a remedy might be designed, should there be a risk posed by the contamination at the SWMU. Results are documented in the *Final Corrective Measures Study for SWMUs 1, 2B, and 2C, Naval Air Station Oceana, Virginia Beach, Virginia*, November 1995.

Trenching was performed at the SWMU to determine the thickness of free product in the subsurface. The trenching confirmed the presence of free product contamination in soil on top of the water table. Product thickness was determined to be approximately 0.04 feet, much less than the thickness that accumulated in some wells and piezometers. An extraction well and monitoring system were installed at SWMU 1 to test the viability of extracting free product from the top of the water table. The objective of the system was to create a cone of depression in the water-table at the extraction well to enhance the flow and collection of free product. Two pilot tests were completed, however, no free product was recovered during either test due to the tightness of the silts that contained the product.

Groundwater sampling completed during the CMS indicated that groundwater is essentially not contaminated with dissolved-phase VOCs or PAHs. The groundwater was sampled for PAHs and VOCs as part of the RFI. No PAHs were detected. Two of six wells

contained BTEX at 67 ppb (1-MW4) and 16 ppb (1-MW5). Well 1-MW4 also contained 2 ppb of 1,1-DCA. From data collected during the RFI and CMS at SWMU 1, only one BTEX constituent was detected in groundwater at concentrations that exceed the MCLs. This was benzene detected at 6 ug/L in 1993. The MCL is 5 ug/L. Benzene exceeded the MCL in well 1-MW4. This well contains free product. Other wells that contained free product did not have BTEX constituents that exceeded the MCL.

In the CMS, the evaluation of remedial alternatives resulted in the recommendation of the following remedial action: pulsed-pump extraction of free product.

In 1997, CH2M HILL conducted a Phase III RFI of SWMU 1. As part of this investigation, IMS Environmental installed two solar-powered skimmers each equipped with a recovery pump that can extract product from two wells simultaneously, and began recovering the free phase petroleum product found in 1-MW4, 1-MW5, 1-PZ3, and 1-PZ5. The skimmers contain product recovery pumps attached to a hydrophobic screen that is centered across the water table in a well. A timer on the pumps is set to automatically initiate the pumping cycle for approximately 2 minutes per hour. The accumulation tanks are periodically emptied by the Navy. Also, confirmatory subsurface soil samples were collected at locations where low levels of dioxins were detected during Phase I. Phase III FRI Results are documented in the *Final RCRA Facility Investigation Report – Phase III, Naval Air Station Oceana, Virginia Beach, Virginia*, August 1999.

In December 1998, groundwater was sampled from SWMU monitoring wells and piezometers in support of risk assessment and long-term monitoring. Analytical results indicate that the shallow groundwater at SWMU 01 contains low concentrations of benzene and one PAH, specifically benzo(a)pyrene at concentrations that exceed MCLs and EPA Region III RBCs for tap water. The waste-oil product floating on the water table was sampled and a fingerprint analysis indicated that it is degraded kerosene. Results of the groundwater sampling are documented in the *Final Technical Memorandum for the Groundwater Sampling at SWMU 1, Naval Air Station Oceana, Virginia Beach, Virginia*, January 2000. This technical memorandum recommended the collection of sediment and surface water samples to fill identified data gaps required to complete the planned ERA and HHRA for this SWMU.

In July 1999, surface soil, surface water, and sediment samples were collected as SWMU 1 in support of ecological and human health risk assessment. The analytical results of that sampling event are documented in the *Draft Human Health Risk Assessment of SWMUs 01 15, and 24, Naval Air Station Oceana, Virginia Beach, Virginia*, March 2000, and the *Draft Screening Ecological Risk Assessment SWMU 01 and 15, Naval Air Station Oceana, Virginia Beach, Virginia*, March 2000.

2.4.1.2 Current Status

The Navy is conducting a HHRA and ERA for SWMU 1. The HHRA will be conducted following the assumptions and protocol outlined in the *Proposed Methods for Preparing the Human Health Risk Assessment for SWMU 1, West Woods Disposal Pit at Naval Air Station Oceana* (October 1999). The ERA will be conducted following the process defined in the *Technical Memorandum – Ecological Risk Assessment Approach for SWMUs 1, 2B, 11, 15, 16, 21, 22, 25, and 26, Naval Air Station Oceana, Virginia Beach, Virginia* (January). Following the risk assessments, the Navy will proceed with a focused FS, a PRAP, and a ROD for SWMU 1.

It is anticipated that long-term monitoring will be included in the selected remedial action for SWMU 1. A draft-final long-term monitoring work plan was submitted to the EPA in November 1997 that defines sampling tasks and field investigation procedures that would be performed during confirmatory long-term monitoring of groundwater at SWMU 1. In the regulatory comments, the EPA indicated that they could support the technical assessment of implementing monitored natural attenuation (MNA) through their office of research and development (ORD).

In June of 1999, the Navy met with EPA and John Wilson from the EPA/ORD to discuss the implementation of MNA at SWMU 15. SWMU 1 groundwater contamination was addressed at that meeting as well. Based upon the technical discussion of SWMU 1 groundwater conditions it was determined that the Navy propose periodic long-term monitoring of the groundwater for benzene in the planned FS. In the interim, free-product removal using the solar powered free-product skimmers will continue until no additional free product is recoverable from existing wells at SWMU 1. The Navy will prepare a long-term monitoring plan in conjunction with the development of the MNA plan for SWMU 15. The Navy proposes to use the 1998 groundwater data as baseline data for periodic long-term monitoring.

2.4.2 SWMU 2B—Line Shack 130-131 Disposal Area

SWMU 2B is located southeast of the main MATWING hangar 122. The unit includes Line Shacks 130 through 134, the five aircraft cleaning stations northeast of Line Shack 130 and the meadow and forested area outside the flight line fence.

2.4.2.1 Investigation History

Prior the RFI, SWMU 2B was investigated in three previous studies: (1) the IAS, (2) the Line Shack SWMU Inspection in 1988, and (3), the Interim RFI in 1990. These studies indicated that groundwater at SWMU 2B is contaminated with chlorinated organics from at least two sources. Also, contamination was detected in sediments collected from a surface-water drainage channel adjacent to the SWMU.

The IAS states that potential contaminants at SWMU 2B may include: oil, hydraulic fluid, turco, paint stripper and thinners, PD 680, and aromatic hydrocarbons (naphtha, benzene, toluene and derivatives), all of which were used in aircraft maintenance activities (RGH, 1984). These waste oils and aircraft-maintenance chemicals were disposed of adjacent to the line shacks in unknown amounts beginning in 1963, when the line shacks were constructed, until the early 1980s (RGH, 1984). A hazardous waste collection and recycling program has been in force throughout the base since 1981. During the 1980s, an oil-water separator system was installed in the aircraft cleaning area northeast of Line Shack 130 to separate oil from wash water flowing from the aircraft cleaning area.

In 1993, CH2M HILL conducted a Phase I RFI to (1) define the sources of groundwater contamination, (2) define the source areas through soil sampling, and (3) define the effects of groundwater discharge to surface water and sediment quality. Results are documented in the *RCRA Facility Investigation Final Report – Phase I, Naval Air Station Oceana, Virginia Beach, Virginia*, December 1993.

In 1995, CH2M HILL performed a CMS. The objectives of the CMS were to further delineate the extent of groundwater, soil, and surface water/sediment contamination and to

determine the need for remedial activities. Results are documented in the *Final Corrective Measures Study for SWMUs 1, 2B, and 2C, Oceana Naval Air Station, Virginia Beach, Virginia*, November 1995.

Follow-on sediment sampling was conducted by CH2M HILL as part of the Phase III RFI. Phase III FRI Results are documented in the *Final RCRA Facility Investigation Report – Phase III, Naval Air Station Oceana, Virginia Beach, Virginia*, August 1999.

Soil samples collected at SWMU 2B during the Phase I RFI and CMS have not contained significant concentrations of chlorinated VOCs, even when sampling was focused in areas with the highest concentrations of chlorinated VOCs in groundwater. The soil sampling results indicate that the source areas are probably limited in areal extent. Shallow groundwater at SWMU 2B is contaminated with TCE, 1,2-dichloroethylene, and vinyl chloride. The deep aquifer is not contaminated with chlorinated VOCs. Low levels of chlorinated VOCs were detected in surface water and sediment in both the RFI and the CMS. Sediment samples collected during the Phase I and III RFI have shown the sediments to be contaminated with PAHs at levels that exceed ecological screening levels.

In the CMS, the evaluation of remedial alternatives resulted in the recommendation of the following remedial action: groundwater contaminant plume containment and source-area extraction with groundwater treatment using air stripping. This alternative was not implemented to allow additional investigation into emerging innovative groundwater remediation technologies.

2.4.2.2 Current Status

The Navy is planning a HHRA and ERA for SWMU 2B. The HHRA will be conducted following the assumptions and protocol as agreed upon with the EPA. The ERA will be conducted following the process defined in the *Technical Memorandum – Ecological Risk Assessment Approach for SWMUs 1, 2B, 11, 15, 16, 21, 22, 25, and 26, Naval Air Station Oceana, Virginia Beach, Virginia* (January). Following the risk assessments, the Navy will proceed with a focused FS, a PRAP, and a ROD for SWMU 2B.

The reach of the drainage channel that has contained the contaminated sediments is currently being re-engineered to accommodate the construction of additional maintenance hangers and a parking lot. Much of the old drainage channel is expected to be altered or filled in. Construction in the area began in winter of 1998 and is expected to be completed in FY02.

2.4.3 SWMU 15 - Abandoned Tank Farm

This unit is located in the former North Station area, approximately 800 feet northwest of Runway 23R and 1,000 feet northeast of the area used to store recreation vehicles near the old CPO officers' club. The abandoned tank farm served as the primary source of aircraft fuel for the North Station area when it was active from the mid-1950s to the mid-1970s. The tank farm consisted of six tanks: a 414,000-gallon tank used to store JP-3, two 50,000-gallon concrete tanks used for aviation gas, and three adjacent 12,000- to 18,000-gallon tanks believed to be used for automotive fuel, kerosene, or lube oil (RGH, 1984).

According to a report by R. E. Wright Associates, the tanks were emptied of fuel and filled with water after they were abandoned (R. E. Wright Associates, 1983). Tank G-5 was later

used to store waste oil. The tanks and their associated piping were dismantled and removed in the mid-1980s. With the exception of some mounded earth near the former location of tank G-9, no signs of the locations of the tanks or their associated piping were observed during the RFI. Their locations were inferred from historical maps of the North Station area.

2.4.3.1 Investigation Status

The first environmental investigation at the tank farm was conducted in 1982. Free-phase product was discovered in test pits and well borings. The 1984 IAS identified the tank farm as a potential hazard. The 1988 RFA identified the tank farm as SWMU 15 and documented recommendations for additional investigation.

SWMU 15 was investigated during two phases of the RFI. Phase I was completed in 1993 and Phase II was completed in 1995. The purpose of the RFIs were to characterize the extent of soil and groundwater contamination. Results of the RFIs are documented in the *RCRA Facility Investigation Final Report – Phase I, Naval Air Station Oceana, Virginia Beach, Virginia*, December 1993 and the *RCRA Facility Investigation Report – Phase II, Naval Air Station Oceana, Virginia Beach, Virginia*, February 1985.

A CMS was initiated in 1995. Results are documented in the *Final Corrective Measures Study for SWMUs 2E, 15, and 24, Oceana Naval Air Station, Virginia Beach, Virginia*, March 1996. The purpose of the CMS was to define the extent of the groundwater contaminant plume, characterize surface soil contamination, and obtain treatability data on contaminated soil and groundwater.

Results of the investigations indicated that surface soils were found to contain elevated TPH and PAH concentrations and subsurface soils were found to contain elevated concentrations of BTEX, TPH, and PAH compounds. Groundwater was found to contain elevated concentrations of BTEX, TPH, and PAH compounds and free-phase product. Vinyl chloride and isomers of 1,2-dichloroethylene were also detected at low concentrations in a few locations.

In the CMS, the evaluation of remedial alternatives resulted in the recommendation of the following remedial action:

Soil:

- Excavation of approximately 20,000 cy of contaminated soil to be processed in an on-SWMU biopile with nutrient insemination and aeration
- Confirmatory sampling of biopile and excavation perimeter
- Replacement of treated soil into the excavation after remediation

Groundwater:

- Monitored natural attenuation (MNA) of groundwater

A preliminary remediation goal (PRG) was calculated for Benzene in groundwater and a soil leaching model was completed to determine the appropriate contaminant level to use as a soil cleanup level. Soil within the area that exceeded the cleanup level was excavated in 1996 and placed in the biopile.

In September 1998, a final work plan was submitted to the EPA that defined the confirmation soil sampling tasks and field investigation procedures for soil remediation at SWMU 15. The principal goals of the confirmation sampling were to: (1) determine the contaminant concentrations in the remaining soil around the perimeter of the excavation area, (2) determine the residual contaminant concentrations in the soil within the biopile area, and (3) support a human health risk assessment of the biopile soil.

2.4.3.2 Current Status

The *Draft Final Technical Memorandum for the Soil Sampling at SWMU 15, Oceana Naval Air Station, Virginia Beach, Virginia*, April 1999, will be updated and expanded to include all biopile confirmation sampling results include elements of the biological treatment project remedial design, the HHRA performed on the biologically treated soils, and construction report to produce a close-out/construction complete report for the SWMU 15 Bioremediation Project.

The Navy is conducting a HHRA and ERA for SWMU 15. The HHRA will be conducted following the assumptions and protocol outlined in the *Proposed Methods for Preparing the Human Health Risk Assessment for SWMU 15, Abandoned Tank Farm at Naval Air Station Oceana* (October 1999). The ERA will be conducted following the *Technical Memorandum – Ecological Risk Assessment Approach for SWMUs 1, 2B, 11, 15, 16, 21, 22, 25, and 26, Naval Air Station Oceana, Virginia Beach, Virginia* (January). Following the risk assessments, the Navy will proceed with a focused FS, a PRAP, and a ROD for SWMU 1.

It is anticipated that MNA will be included in the selected remedial action for SWMU 15. A draft-final long-term monitoring work plan was submitted to the EPA in November 1997 that defined sampling tasks and field investigation procedures that would support long-term monitoring for natural attenuation of groundwater contamination at SWMU 15. The objectives of the monitoring plan were to (1) establish hydrodynamic monitoring requirements for long-term monitoring, (2) define long-term monitoring data collection, interpretation, and management strategies, and (3) establish and document SWMU-specific long-term monitoring requirements in a modular format. In the regulatory comments, the EPA indicated that they could support the technical assessment of implementing monitored natural attenuation (MNA) through their office of research and development (ORD). In June of 1999, the Navy met with EPA to discuss the implementation of MNA at SWMU 15. John Wilson from the EPA ORD directed the assessment of SWMU 15 and a plan was developed to assess SWMU 15 for MNA as a selected remedial alternative.

A work plan to demonstrate the applicability of MNA at SWMU 15, *Work Plan Addendum, Sediment, Surface Water, and Surface Soil Sampling at Multiple SWMUs for Support Ecological Risk Assessment, Direct Push Technology Investigation to Support MNA at SWMU 15, and Monitored Natural Attenuation Study at SWMU 1*, December 1999, will be implemented in January 2000. Following this investigation, long-term monitoring plan that includes MNA at SWMU 15 will be developed in conjunction with EPA ORD.

3 SWMU Management Schedules

This section contains schedules for the categories of SWMUs discussed in Chapter 2. SWMUs in Category 1 (SWMUs 2D, 18, 19, 20, and 23) follow the same schedule for SWMU close-out, Figure 3-1. The SWMUs in Category 2, except SWMU 25 (SWMUs 11, 16/16GC, 21, 22, and 26) follow the same schedule for SWMU close-out, Figure 3-2. The schedule for SWMU 25, which includes the concrete recycling project, is provided as Figure 3-3. The schedules for the remaining six SWMUs (SWMUs 1, 2B, 2C, 2E, 15, and 24) are provided as Figures 3-4 through 3-9, organized by category.

In each of these schedules, the length of each bar represents the time allocated to accomplish the task. The schedules were developed on the basis of currently available information and are intended to be adjusted periodically to reflect changes to the installation restoration program. Therefore, the schedules should be used as guidance for estimated times and duration of major scheduled.

SMP Schedule for Category 1 - SWMUs 2D, 18, 19, 20, and 23

ID	Task Name	Duration	Start	Finish	1st Quarter			2nd Quarter			3rd Quarter					
					Jan	Feb	Mar	Apr	May	Jun	Jul	Aug				
1	Proposed Remedial Action Plan	60 days	Mon 01/24/00	Fri 04/14/00												
2	PRAP for SWMUs 2D, 18, 19, 20, and 23	60 days	Mon 01/24/00	Fri 04/14/00												
3	Submit Draft PRAP for SWMUs 2D, 18, 19, 20, and 23	0 days	Tue 02/29/00	Tue 02/29/00												
4	Submit Final PRAP for SWMUs 2D, 18, 19, 20, and 23	0 days	Fri 04/14/00	Fri 04/14/00												
5	Record of Decision Documentation	90 days	Mon 04/17/00	Fri 08/18/00												
6	ROD for SWMUs 2D, 18, 19, 20, and 23	90 days	Mon 04/17/00	Fri 08/18/00												
7	Submit Draft ROD for SWMUs 2D, 18, 19, 20, and 23	0 days	Fri 06/16/00	Fri 06/16/00												
8	Submit Final ROD for SWMUs 2D, 18, 19, 20, and 23	0 days	Fri 08/18/00	Fri 08/18/00												

Figure 3-1
Date: Tue 02/22/00

Task



Milestone

Summary

SMP Schedule for Category 2 - SWMUs 11, 16/16GC, 21, 22, and 26

ID	Task Name	Duration	Start	Finish	1st Quarter			2nd Quarter			3rd Quarter			4th Quarter		
					Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1	Ecological Risk Assessment	62 days	Fri 02/18/00	Mon 05/15/00												
2	Conduct Ecological Risk Assessment Screen	17 days	Fri 02/18/00	Mon 03/13/00												
3	Submit Ecological Risk Assessment Screen	0 days	Mon 03/13/00	Mon 03/13/00												
4	Prepare Ecological Risk Assessment	45 days	Tue 03/14/00	Mon 05/15/00												
5	Submit Draft Ecological Risk Assessment	0 days	Mon 04/17/00	Mon 04/17/00												
6	Submit Final Ecological Risk Assessment	0 days	Mon 05/15/00	Mon 05/15/00												
7	Proposed Remedial Action Plan	60 days	Tue 05/16/00	Mon 08/07/00												
8	Prepare PRAP for SWMUs 11, 16/16GC, 21, 22, & 26	60 days	Tue 05/16/00	Mon 08/07/00												
9	Submit Draft PRAP	0 days	Sun 07/02/00	Sun 07/02/00												
10	Submit Final PRAP	0 days	Mon 08/07/00	Mon 08/07/00												
11	Record of Decision Documentation	90 days	Tue 08/08/00	Mon 12/11/00												
12	Prepare ROD for SWMUs 11, 16/16GC, 21, 22, & 26	90 days	Tue 08/08/00	Mon 12/11/00												
13	Submit Draft ROD	0 days	Sun 10/22/00	Sun 10/22/00												
14	Submit Final ROD	0 days	Mon 12/11/00	Mon 12/11/00												

Figure 3-2
Date: Tue 02/22/00

Task Milestone Summary

SMP Schedule for Category 2 - SWMU 25

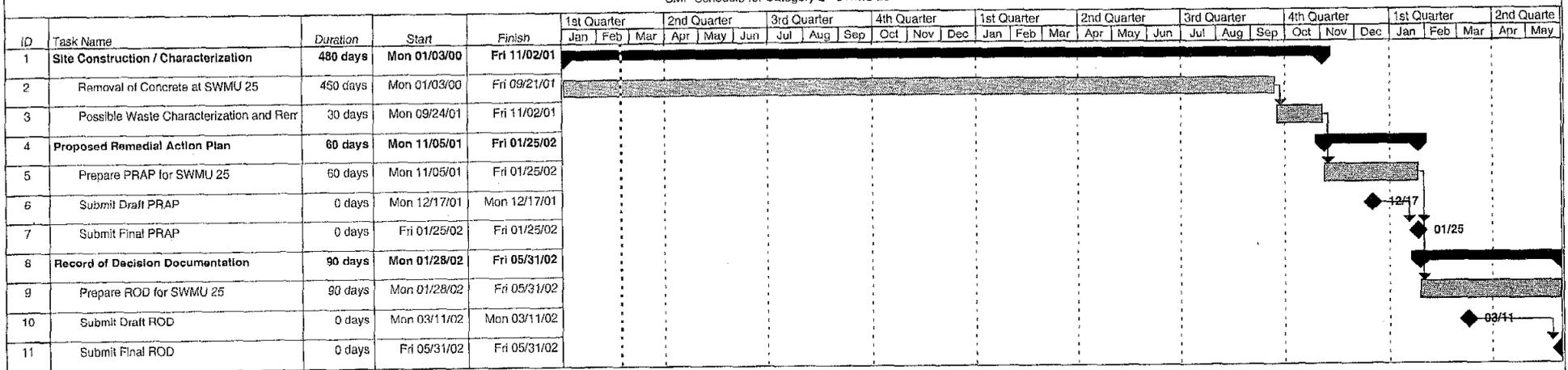


Figure 3-3
Date: Tue 02/22/00

Task [shaded box] Milestone ◆ Summary [arrow]

SMP Schedule for Category 3 - SWMU 2C

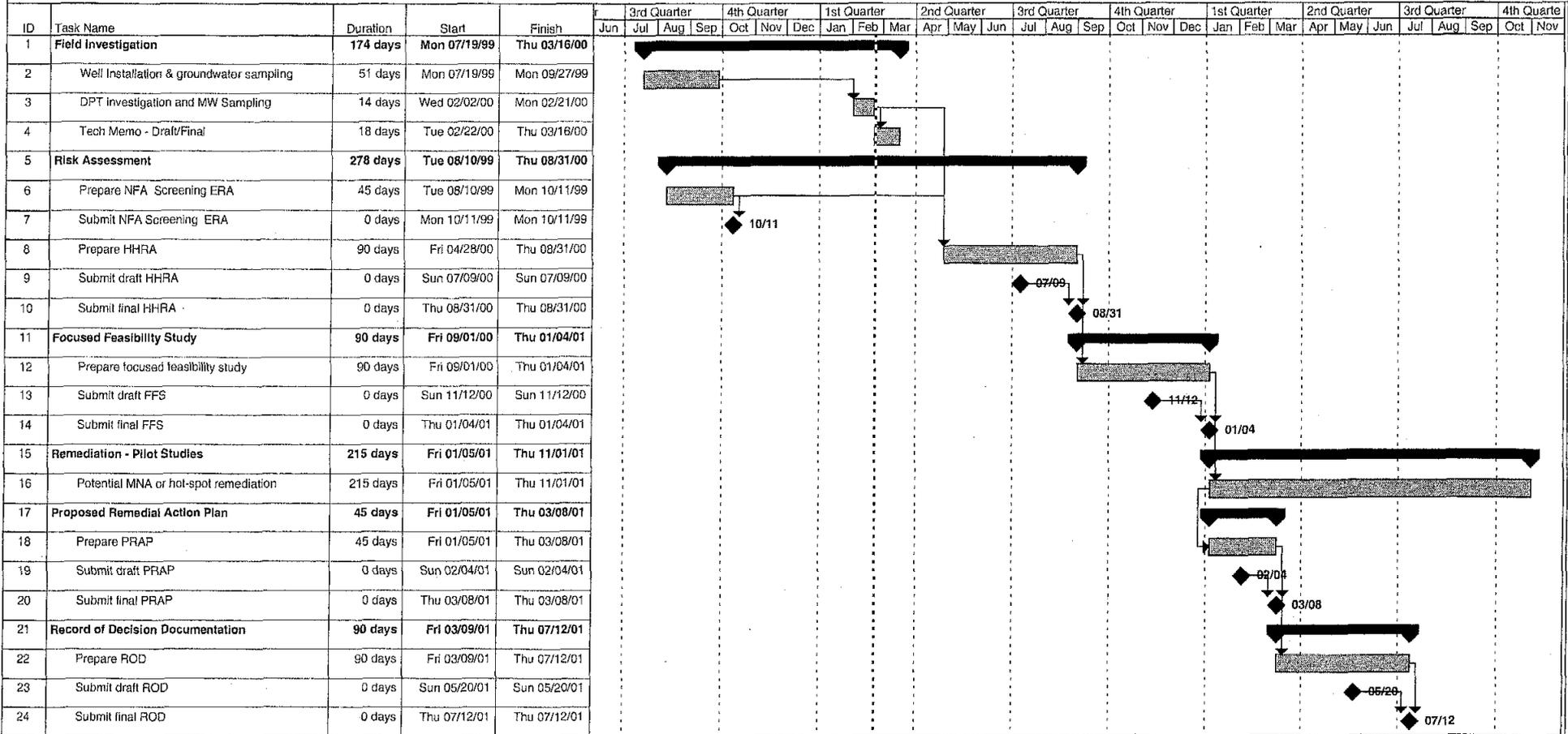


Figure 3-4
Date: Tue 02/22/00

Task



Milestone



Summary



SMP Schedule for Category 3 - SWMU 2E

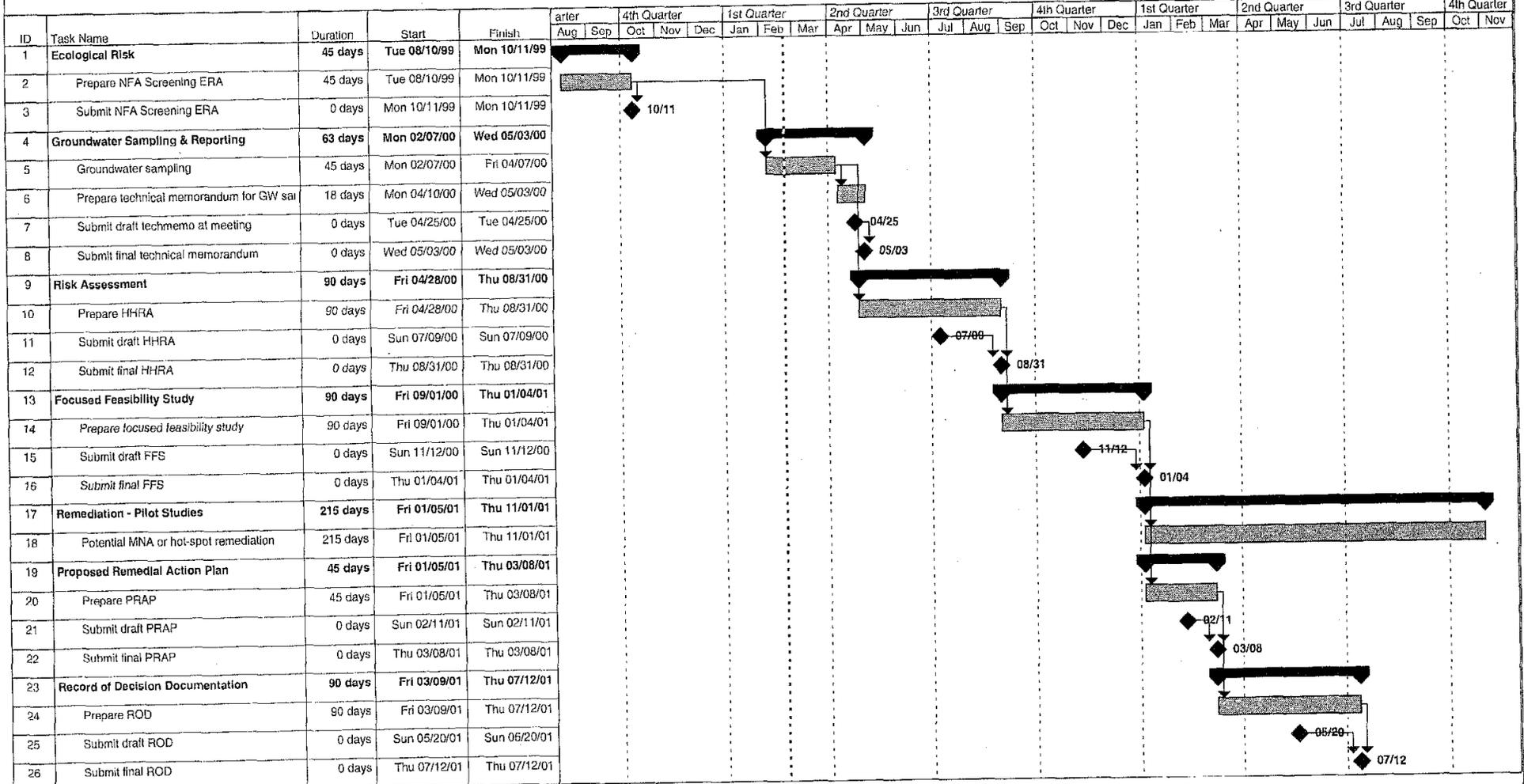


Figure 3-5
Date: Tue 02/22/00

Task Milestone Summary

SMP Schedule for Category 3 - SWMU 24

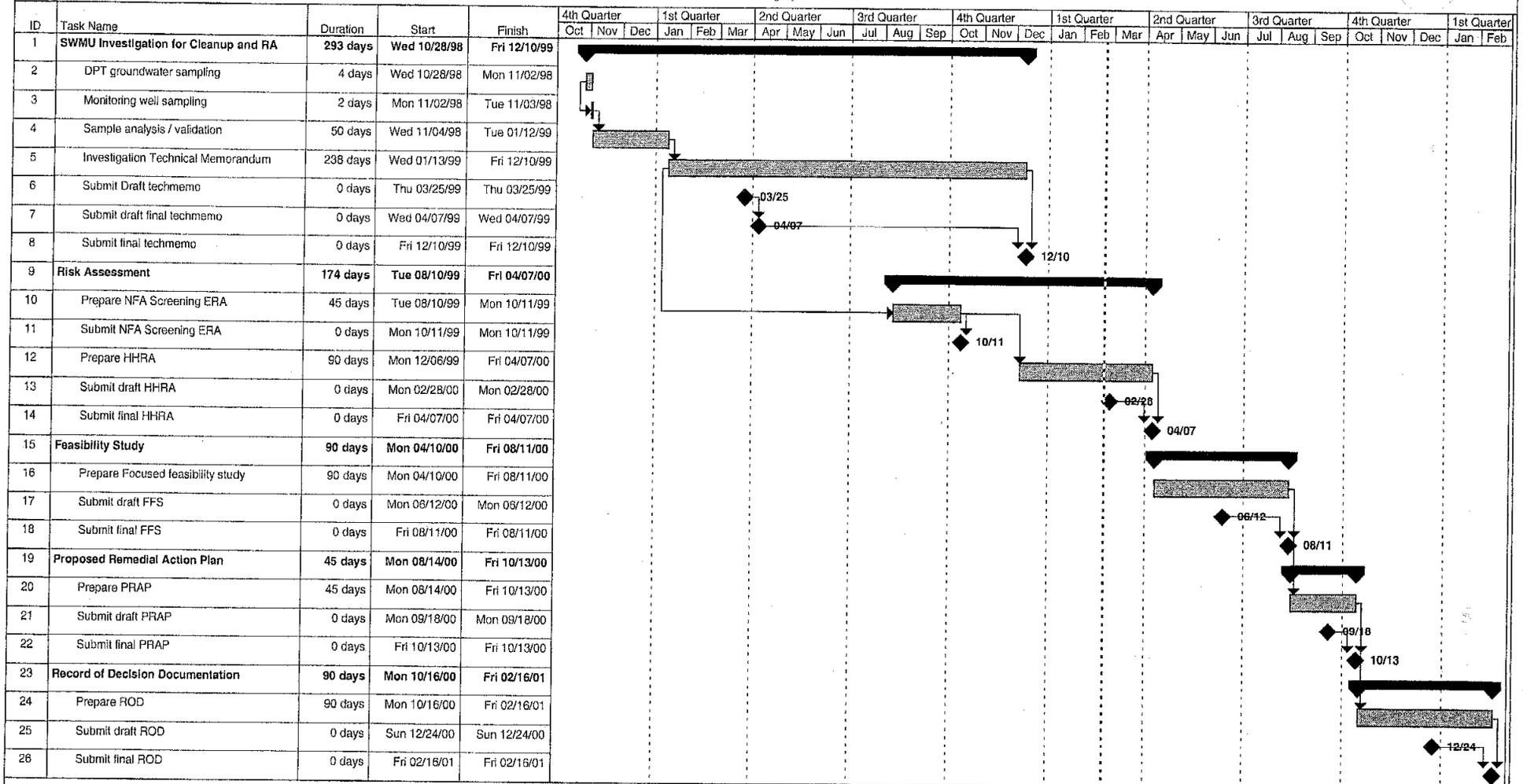


Figure 3-6
Date: Tue 02/22/00

Task [shaded box] Milestone ◆ Summary [arrow]

SMP Schedule for Category 4 - SWMU 01

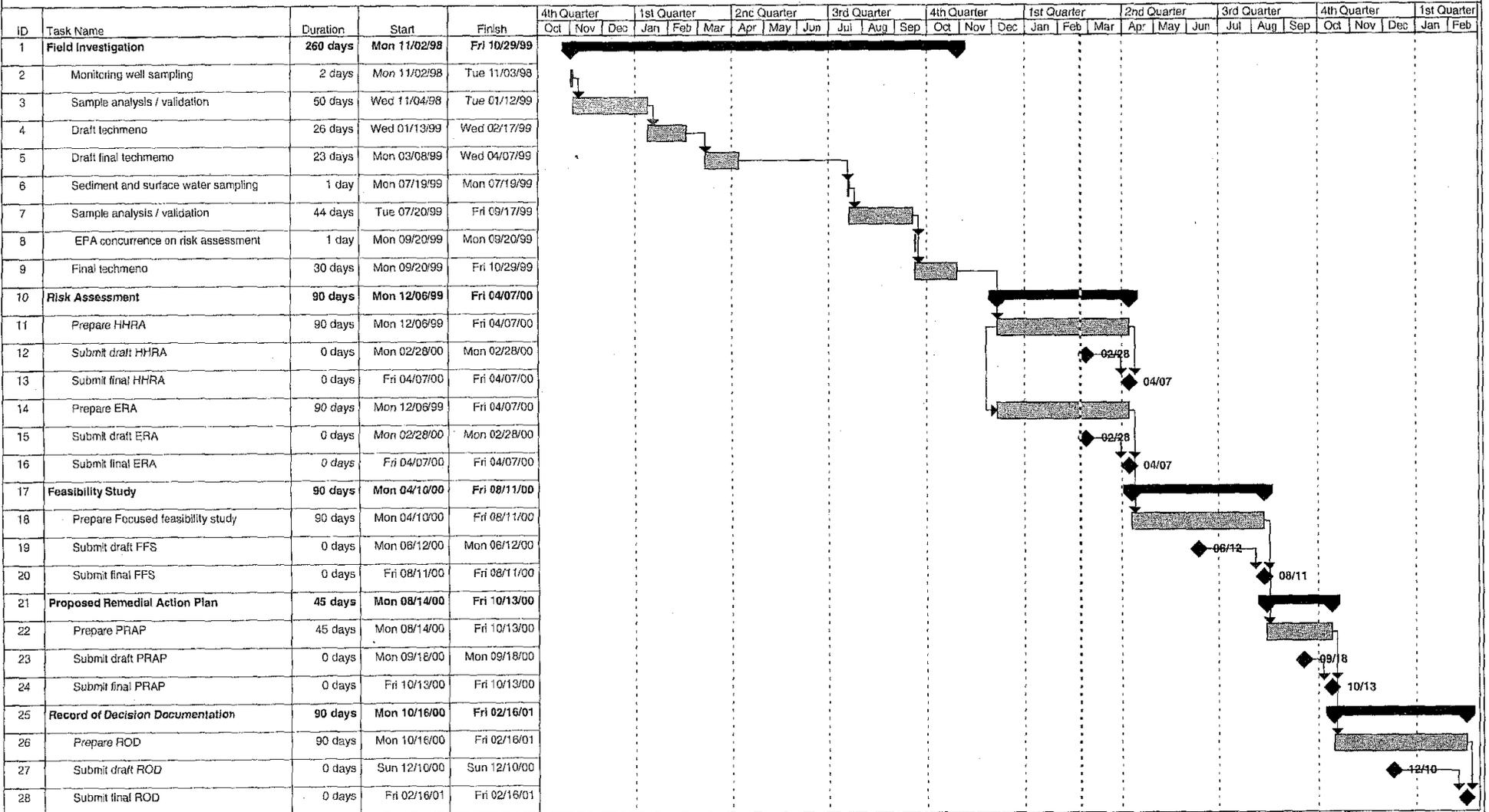


Figure 3-7
Date: Tue 02/22/00

Task [Task bar] Milestone [Milestone diamond] Summary [Summary bar]

SMP Schedule for July 4 - SWMU 2B

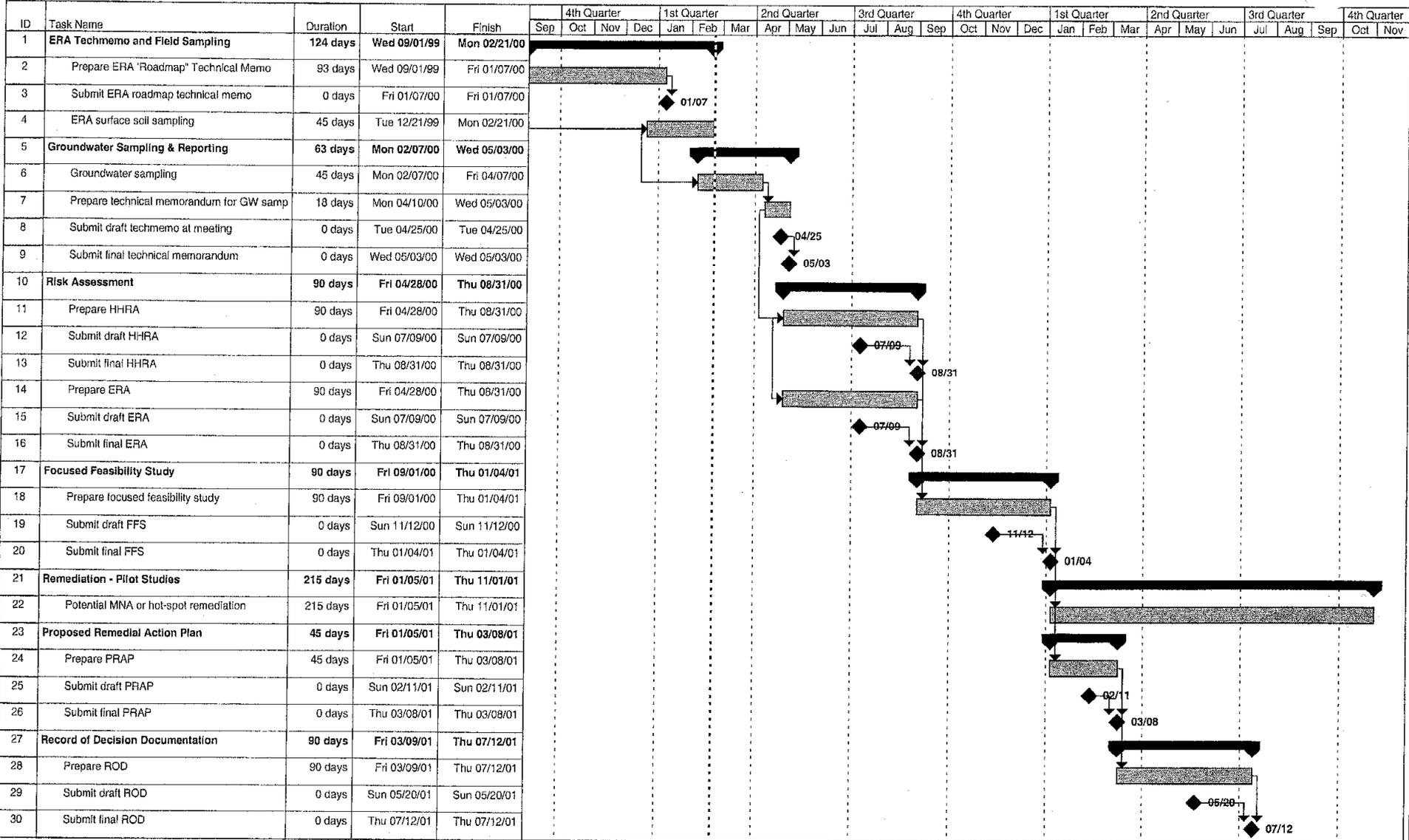


Figure 3-8
Date: Tue 02/22/00

Task [shaded bar] Milestone ◆ Summary [thick bar]

SMP Schedule for Category 4 - SWMU 15

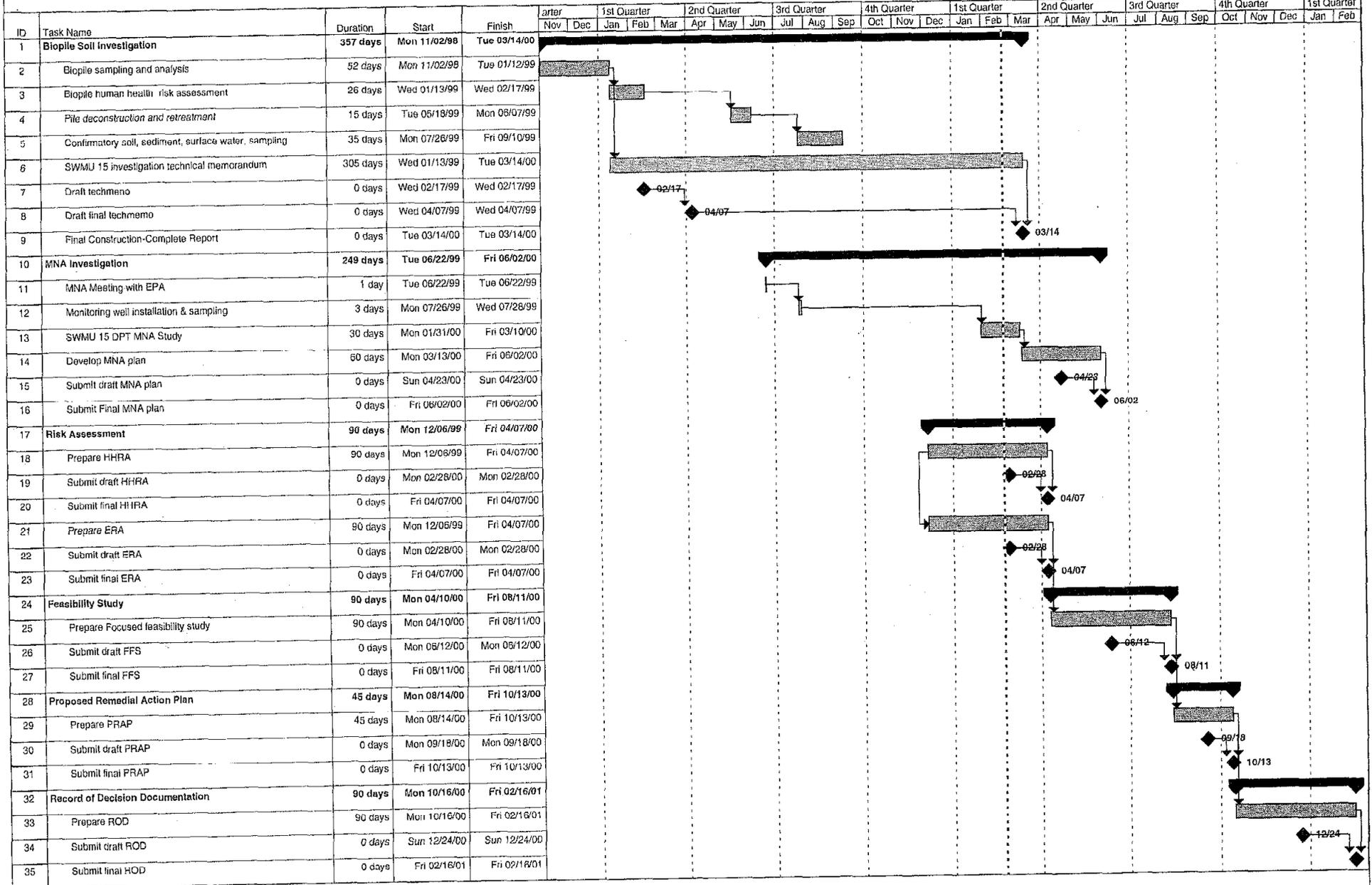


Figure 3-9
Date: Tue 02/22/00

Task [shaded box] Milestone [diamond] Summary [arrow]

4 References

- CH2M HILL. 1986. Final Progress Report Round 1 Verification Step, Naval Air Station, Oceana. October 1986.
- CH2M HILL. 1992. RCRA Facility Investigation, Final Work Plan. June 1992.
- CH2M HILL. 1993. RCRA Facility Investigation, Final Report. December 1993.
- CH2M HILL. 1993a. Final Work Plan Addendum for building 301 Area, December 1993.
- CH2M HILL. 1993b. Draft Final Work Plan for CMS at Petroleum SWMUs. November 1993.
- CH2M HILL. 1993c. Draft Final Work Plan Addendum for Phase 2 RFI. December 1993.
- CH2M HILL. 1993d. Draft Final Work Plan for CMS SWMUs 1, 2B, and 2C. November 1993.
- CH2M HILL, December 1993. RCRA Facility Investigation, Final Report—Phase I, Naval Air Station Oceana, Virginia, Beach, Virginia.
- CH2M HILL, October 1994. Final Corrective Measures Study for Petroleum Contaminated SWMUs, Oceana Naval Air Station, Virginia, Beach, Virginia.
- CH2M HILL, February 1995. Draft Final Report on the Phase II RCRA Facility Investigation of SWMUs 2D, 2E, 15, 24, and 25, Oceana Naval Air Station, Virginia, Beach, Virginia.
- CH2M HILL, November 1995. Final Corrective Measures Study for SWMUs 1, 2B, and 2C, Oceana Naval Air Station, Virginia, Beach, Virginia.
- CH2M HILL, March 1996. Draft Final Corrective Measures Study for SWMUs 2E, 15, and 24, Oceana Naval Air Station, Virginia, Beach, Virginia.
- CH2M HILL, January 2000. Final Technical Memorandum for the Groundwater Sampling at SWMU 1, Oceana Naval Air Station, Virginia, Beach, Virginia.
- CH2M HILL, April 1999. Draft Final Technical Memorandum for the Soil Sampling at SWMU 15, Oceana Naval Air Station, Virginia, Beach, Virginia.
- CH2M HILL, October 1999. Final Screening Ecological Risk Assessment, SWMUs 2C, 2D, 2E, 18, 19, 20, 23, and 24, Oceana Naval Air Station, Virginia, Beach, Virginia.
- CH2M HILL, January 2000. Final Technical Memorandum for the Groundwater Sampling at SWMU 24, Oceana Naval Air Station, Virginia, Beach, Virginia.
- CH2M HILL, January 2000. Final Technical Memorandum - Ecological Risk Assessment Approach, SWMUs 1, 2B, 11, 15, 16, 21, 22, 25, and 26, Oceana Naval Air Station, Virginia, Beach, Virginia.
- ENSCI Env. Inc. 1995. Excavation, Transportation, and Disposal of Petroleum Contaminated Soils. April 26, 1995.

REFERENCES

EPA, 1989. *Interim Final RCRA Facility Investigation (RFI) Guidance*. Development of an RFI Work Plan and General Considerations for RCRA Facility Investigations. EPA 530/SW-89-031, Waste Management Division, Office of Solid Waste, U.S. EPA.

R. E. Wright Associates, Inc. 1983. *Extent of Subsurface Fuel Contamination, Oceana Naval Air Station*. Middletown, Pennsylvania. February 1983.

Rogers, Golden & Halpern. December 1984. *Initial Assessment Study, Naval Air Station Oceana, Virginia Beach, Virginia*. Prepared for Navy Assessment and Control of Installation Pollutants Department, Naval Energy and Environmental Support Activity, Port Hueneme, California. In association with BCM Eastern, Inc. NEESA 13-067. Philadelphia, Pennsylvania.

U.S. Environmental Protection Agency. July 27, 1990. *Corrective Action for Solid Waste Management Units (SWMUs) at Hazardous Waste Management Facilities*. Proposed rule amending 40 CFR Parts 264, 265, 270 and 271, Resource Conservation and Recovery Act. 55 Federal Register 145: 30798-30884.

U.S. Environmental Protection Agency. May 1989. *Development of an RFI Work Plan and General Considerations for RCRA Facility Investigations*. Interim Final RCRA Facility Investigation (RFI) Guidance, Volume I of IV. Office of Solid Waste, Waste Management Division. EPA 530/SW-89-031. OSWER Directive 9502.00-6D.

United States Environmental Protection Agency. 1988. *RCRA Facility Assessment, Phase II Report, Oceana Naval Air Station*. VA2170024606. August 1988.

United States Environmental Protection Agency. March 1990. *Resource Conservation and Recovery Act Corrective Action Consent Order for Oceana NAS*. VA2170024606.

United States Navy. 1957. *Plot Plan Oldside Area, NASO, Drawing 0-103*. Drawing revised 1952, 1955, and 1957. Date of original drawing not indicated.