

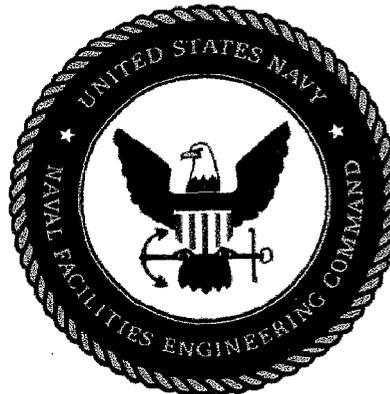
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Draft Final

2000 – 2001

Site Management Plan

**Naval Station Norfolk
Norfolk, Virginia**



Prepared for

Department of the Navy

Atlantic Division

Naval Facilities Engineering Command

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Acronyms

Activity	Naval Base, Norfolk
AOCs	Areas of Concern
ARAR	applicable or relevant and appropriate requirements
AST	aboveground storage tank
BTEX	benzene, toluene, ethylbenzene, and xylene
CASY	Camp Allen Salvage Yard
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act ("Superfund")
CHF	contaminant hazard factor
CI	Confirmatory Investigation
CS	confirmation study
DEQ	Department of Environmental Quality
DoD	Department of Defense
DPVE	dual-phase vapor extraction
EE/CA	Engineering Evaluation and Cost Analysis
EO	Enforcement Order
EPA	U.S. Environmental Protection Agency
EPIC	EPA Photographic Interpretation Center
ER-M	Effects Range-Medium
FEMA	Federal Emergency Management Agency
FFA	Federal Facility Agreement
FFS	Fire Fighting School
FS	feasibility study
FY	fiscal year
HM	hazardous materials
HRSD	Hampton Roads Sanitation District
HWAA	Hazardous Waste Accumulation Area
IAS	Initial Assessment Study
IWMP	Industrial Wastewater Management Plan
IRA	interim remedial action
IRP	Installation Restoration Program
IRPRI	IRP Remedial Investigation
IWTP	Industrial Wastewater Treatment Plant
LANTDIV	Atlantic Division, Naval Facilities Engineering Command
LTM	long-term monitoring
MPF	migration pathway factor

Acronyms (Continued)

NAS	Naval Air Station
NSN	Naval Station, Norfolk
NE	not evaluated
NFA	No Further Action
NFESC	Naval Facilities Engineering Support Center
NPDES	National Pollution Discharge Elimination System
NPL	National Priorities List
OU	Operable Unit
O/WS	oil/water separator
PA	preliminary assessment
PCB	polychlorinated biphenyl
PP	petroleum product
PRAP	Proposed Remedial Action Plan
PWC	public works command
QADSY	Q-Area Drum Storage Yard
RA	Risk Assessment
RAB	restoration advisory board
RAO	remedial action operation
RBC	risk-based concentration
RC	response complete
RCRA	Resource Conservation and Recovery Act
RD	remedial design
RF	receptor factor
RFA	RCRA Facility Assessment
RI	Remedial Investigation
RIP	Remedy in Place
ROD	Record of Decision or Decision Document
RRR	relative risk ranking
SAA	satellite accumulation area
SI	Site Investigation
SMP	Site Management Plan
SSA	Site Screening Area
SVE	soil-vapor extraction
SVOC	semivolatile organic compound
SWMU	solid waste management unit
TPH	total petroleum hydrocarbons
UST	underground storage tank
VDEQ	Virginia Department of Environmental Quality
VHWMR	Virginia Hazardous Waste Management Regulations
VOC	volatile organic compound
WDA	Waste Disposal Area

1 Introduction

This report presents the Draft Final Site Management Plan (SMP) for FY 2001 for the Naval Station, Norfolk (NSN) located in Norfolk, Virginia. This report has been prepared by CH2M HILL for use by Atlantic Division, Naval Facilities Engineering Command (LANTDIV), U.S. Environmental Protection Agency Region III (EPA Region III), Virginia Department of Environmental Quality (VDEQ), and Naval Base, Norfolk (Activity) personnel.

1.1 Purpose of the Site Management Plan

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 NSN. This SMP focuses on upcoming activities that are planned in FY 2001 and future years. Naval Station, Norfolk (NSN), was proposed for inclusion on the National Priorities List (NPL) in the *Federal Register*, Volume 16, Number 117, on June 17, 1996. NBN was added to the NPL in April 1, 1997. NSN was proposed under the "Federal Facilities" section of the NPL in which federal agencies are considered responsible for conducting most of the response actions at facilities under their jurisdiction. A Federal Facility Agreement (FFA) between EPA Region III and NBN was finalized in February, 1999. With the final FFA in place, EPA's role at the site is less extensive than at other NPL sites without FFAs; however, EPA continues to function in an oversight role for the management and cleanup of the Installation Restoration Program (IRP) sites and solid waste management units (SWMUs) at NSN.

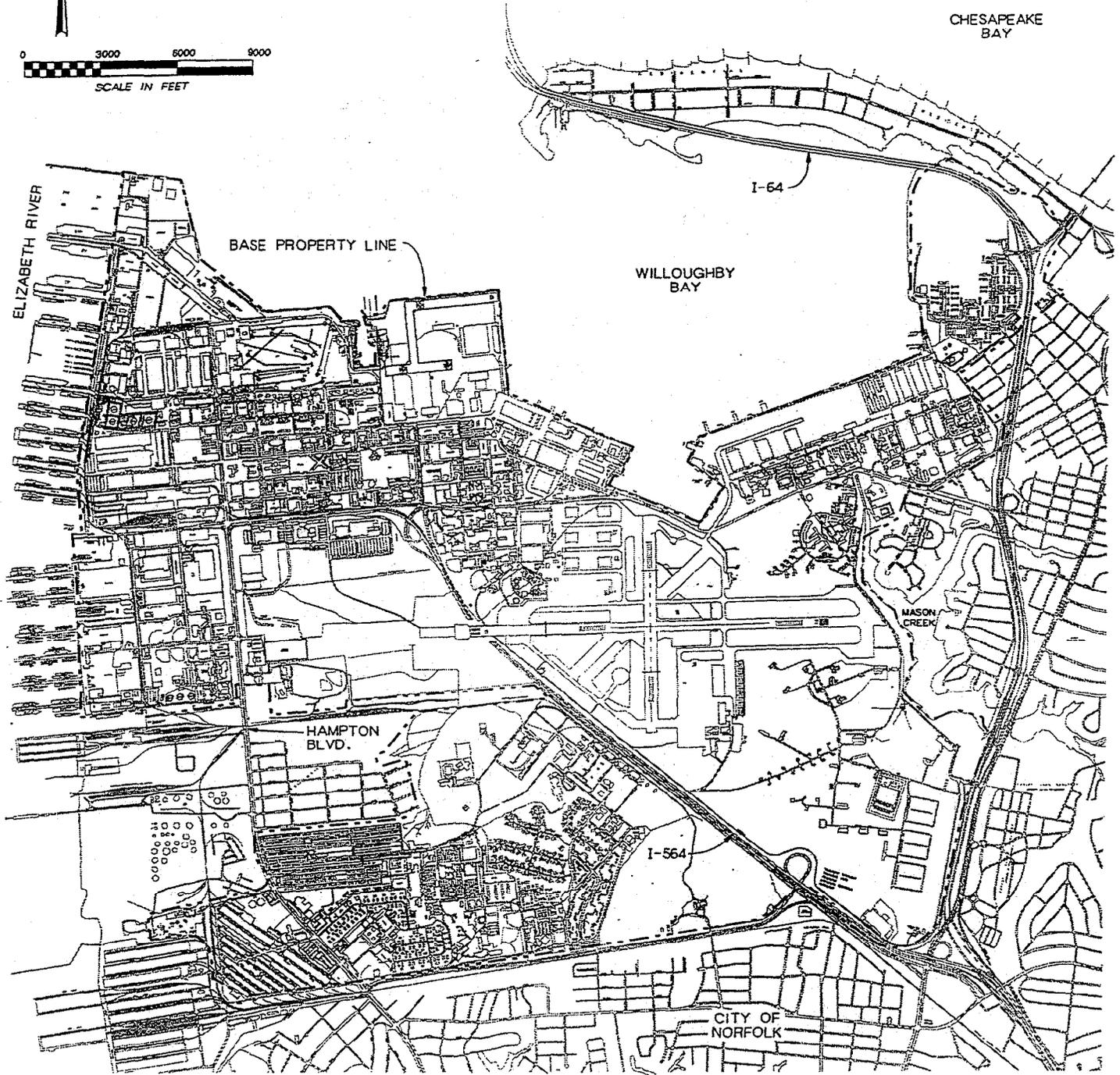
This version of the SMP does not update the prior ranking of the sites at NBN. It is anticipated that the sites undergoing site characterization will be re-ranked in a future update of the SMP. The framework and procedures for future ranking are provided in this SMP.

The SMP presents the rationale for the sequence of environmental investigations and remedial response activities to be completed for each site and the estimated schedule for completion of these activities. Detailed activity schedules are provided for calendar year 2000 and FY 2001.

1.2 Facility Description

1.2.1 Facility Location/Physical Description

NSN is the largest naval base in the United States. It is situated on 4,631 acres of land (A.T. Kearny, 1991) in the northwest portion of the City of Norfolk, Virginia. The location of the NSN is shown in Figure 1-1. NBN is bounded on the north by Willoughby Bay, on the west by the confluence of the Elizabeth and James Rivers, and on the south and east by the City of Norfolk. A portion of the NSN eastern boundary is formed by Mason Creek.



LEGEND

----- PROPERTY BOUNDARY -
NORFOLK NAVAL BASE

Figure 1-1
INSTALLATION LOCATION MAP
Naval Base Norfolk

CH2MHILL

NSN includes approximately 4,000 buildings, 20 piers, and an airfield. The western portion of NSN is a developed waterfront area containing the piers and facilities for loading, unloading, and servicing naval vessels. Land use in the surrounding area is commercial, industrial, and residential. The waterfront area south of the NSN provides shipping facilities for several large industries. A network of rail lines is located in the area to service nearby industries. Residential areas surround the NSN to the south and east. Willoughby Spit, a low-density residential area located northeast of the NSN, is also used for recreational activities.

A number of other military installations are located within a 25-mile radius of the NSN. These include Fort Monroe and Langley Air Force Base to the north, Navy Amphibious Base—Little Creek and Fort Story to the east, Naval Air Station Oceana to the southeast, Norfolk Naval Shipyard and St. Juliens Creek Annex to the south, and Naval Supply Center-Craney Island Fuel Terminal to the southwest.

1.2.2 Facility History and Mission

NSN began operations in 1917, when the U.S. Navy acquired 474 acres of land to develop a naval base to support World War I activities. Bulkheads were built along the coast to extend available land. After dredge and fill operations, the total land under Navy control was 792 acres.

An additional 143 acres of land were acquired in 1918 and officially commissioned for the Naval Air Station (NAS). From 1936 until 1940, improvements to the piers and expansion of supplies/material handling facilities were completed.

During World War II (between 1940 and 1945), major construction projects were completed, including a power plant, numerous runways and hangars, a tank farm, and several barracks/housing complexes. During this time, the area of the NSN expanded to over 2,100 acres. After World War II, the NSN continued to acquire land through various types of land transfers and dredge and fill operations conducted in areas of Mason Creek and Bousch Creek Basins and Willoughby Bay.

During its history, NSN has expanded to become the world's largest naval installation, with 105 ships home-ported in Norfolk. The Base currently has 20 piers handling approximately 3,100 ship movements annually.

The mission of NSN is to provide fleet support and readiness for the U.S. Atlantic Fleet.

1.2.3 Operations/Process Descriptions

NSN operates in various capacities to provide support to vessels, aircraft, and other activities. The NSN includes many tenants, each performing different operations. The majority of operations involve servicing and maintenance of vessels and aircraft.

Service and maintenance of ships include defueling, refueling, utilities hook-up, on-board maintenance, and coordination of ship movements in the harbor. Other functions include loading, unloading, and handling of fuels and oils used aboard the vessels. Ship and aircraft repair operations reportedly include paint stripping, patching, parts cleaning, repainting, engine overhauls, sandblasting, and metal-plating processes.

1.3 Environmental Setting

1.3.1 Topography and Surface Water Hydrology

Topographically, NSN is nearly level. Elevations on the NSN range from sea level at the north and west boundaries to approximately 15 feet above sea level in central portions of the NSN.

Four major surface water features surround the greater Norfolk area, including the James River, Elizabeth River, Willoughby Bay, and Chesapeake Bay, all of which are tidal in nature in this area.

The majority of surface water on the NSN flows to either Mason Creek or to the remnants of Bousch Creek. The main channel of Bousch Creek was filled during development of the NSN and replaced by a network of drainage ditches and culverts. Due to the proximity of tidal waters and the low relief of the land, both Mason Creek and the remnant tributaries of Bousch Creek are tidal throughout the NSN. Both creeks discharge to Willoughby Bay, and ultimately, to the Chesapeake Bay. Some surface water runoff from the NSN discharges directly to the Elizabeth River.

A Federal Emergency Management Agency (FEMA) flood insurance study established that the 100-year floodplain elevation at the NSN is 8.5 feet above sea level (A.T. Kearny, 1991). Therefore, portions of the NSN adjacent to Willoughby Bay and the Elizabeth River are within the 100-year floodplain.

1.3.2 Geology and Hydrogeology

NSN is in the outer Atlantic Coastal Plain Physiographic Province, which is characterized by low elevations and gently sloping relief. The Base is underlain by more than 2,000 feet of gently dipping sandy sediment, ranging in age from Recent to Lower Cretaceous. Table 1-1 contains a stratigraphic column of hydrogeologic units of southeast Virginia.

The uppermost geologic unit is the Columbia Group, composed of the Sand Bridge Formation and the underlying Norfolk Formation. The Columbia Group is approximately 60 feet thick. The upper 20 to 40 feet consist of unconsolidated fine sands and silts of low to moderate permeability. The lower 20 to 40 feet consist of relatively impermeable silt, clay, and sandy clay. The Yorktown Formation underlies the Columbia Group. The Yorktown Formation is approximately 90 to 100 feet thick in the vicinity of the Base. It consists of moderately consolidated coarse sand and gravel with abundant shell fragments.

Two significant aquifer systems in the area are the water-table aquifer in the upper 20 to 40 feet of the Columbia Group and the underlying Yorktown Aquifer. The water-table aquifer reportedly is thin and consists of discontinuous heterogeneous sand and shell lenses. The depth to the water table is usually less than 8 feet. The Yorktown Aquifer is semiconfined beneath a clay layer in the upper Yorktown Formation. Water-bearing zones in the Yorktown Aquifer consist of fine to coarse sand, gravel, and shells.

Table 1-1
Stratigraphic and Hydrogeologic Units
of Southeast Virginia
(From Harsh and Laczniak, 1990)

Geologic Age		Group	Stratigraphic Formation	Hydrogeologic Unit
Period	Epoch			
Quaternary	Holocene	Columbia	Holocene Deposits	Columbia Aquifer
	Pleistocene		Undifferentiated Deposits	
Tertiary	Pliocene	Chesapeake	Yorktown Formation	Yorktown Confining Unit
			Eastover Formation	Yorktown- Eastover Aquifer
	Miocene		St. Mary's Formation	St. Mary's Confining Unit
			Choptank Formation	St. Mary's- Choptank Aquifer
			Calvert Formation	Calvert Confining Unit
	Oligocene		Pamunkey	Old Church Formation
		Chickahominy Formation		
	Piney Point Formation			
	Eocene	Nanjemoy Formation		Nanjemoy- Marlboro Clay Confining Unit
		Marlboro Clay		
	Paleocene	Aquia Formation		Aquia Aquifer
		Brightseat Formation		Brightseat- Upper Potomac Confining Unit
Cretaceous	Late Cretaceous	Potomac Formation		Brightseat- Upper Potomac Aquifer
			Middle Potomac Confining Unit	
	Early Cretaceous		Middle Potomac Aquifer	
			Lower Potomac Confining Unit	
			Lower Potomac Aquifer	

1.4 Environmental History

1.4.1 Installation Restoration Program

Naval Station, Norfolk (NSN), was proposed for inclusion on the National Priorities List (NPL) in the *Federal Register*, Volume 16, Number 117, on June 17, 1996. NSN was added to the NPL in April 1, 1997. Now that NSN is on the NPL, the Navy and the EPA approve all Records of Decision (RODs) with state concurrence. Prior to delisting NFA ROD(s) will be signed to formally document site-close-out through the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) process.

In 1975, the Department of Defense (DoD) began a program to assess past hazardous and toxic materials storage and disposal activities at military installations. The goals of this program, now known as the IRP, were to identify environmental contamination resulting from past hazardous materials management practices, to assess the impacts of the contamination on public health and the environment, and to provide corrective measures as required to mitigate adverse impacts to public health and the environment.

The environmental condition of the NSN is being investigated through the Department of Defense's IRP. The IRP is being conducted in accordance with applicable federal and state environmental regulations and requirements.

In 1976, the Resource Conservation and Recovery Act (RCRA) was passed by Congress to address potentially adverse human health and environmental impacts of hazardous waste management and disposal practices. RCRA was legislated to manage the present and future disposal of hazardous wastes. In 1980, CERCLA, or "Superfund," was passed to investigate and remediate areas resulting from past hazardous waste management practices. This program is administered by EPA or state agencies.

In 1981, the DoD's IRP was re-issued, with additional responsibilities and authorities specified in CERCLA delegated to the Secretary of Defense. The Navy subsequently restructured the IRP to match the terminology and structure of the EPA CERCLA Program. The current IRP is consistent with CERCLA and applicable state environmental laws. The CERCLA process is further discussed in Section 4 of this SMP.

Team partnering was introduced to NSN in October 1996, to streamline the cleanup of former disposal sites by using consensus-based site management strategies during the CERCLA process. The partnering team (the Team) consists of LANTDIV, the Activity, EPA Region III, VDEQ, and CH2M HILL and other Navy contractors. The Team has streamlined the site investigation and remediation process to reduce costs and expedite cleanup and closure at IRP sites. Section 4 of this SMP discusses how team partnering has been applied within the CERCLA process in detail.

1.4.2 Previous Investigations

1.4.2.1 Basewide Investigations

Previous basewide investigations completed through the IRP include the Initial Assessment Study (IAS), dated February 1983; the IRP Remedial Investigation—Interim Report (IRPRI), dated March 1988; a RCRA Facility Assessment (RFA), completed for the NSN in March

1992; EPA Aerial Photographic Site Analysis, Norfolk Naval Base, Norfolk Virginia dated September 1994; Phase I Relative Risk Ranking System Data Collection Sampling and Analysis Report, dated January 1996 (RRR – Phase I); and a Relative Risk Ranking System Data Collection Sampling and Analysis Report Phase II, dated December 1996 (RRR – Phase II).

1.4.3 Site Classification

1.4.3.1 Installation Restoration Program Sites

The purpose of the 1983 IAS was to identify and assess sites posing a potential threat to human health and/or the environment due to contamination from past hazardous materials handling and operations. A total of 18 potentially contaminated sites were identified based on information obtained from historical records, photographs, site inspections, and personnel interviews. Several of the IAS sites also have separate designations under the RFA. The 18 IAS sites and RFA designations are:

- Site 1—Camp Allen Landfill
- Site 2—NM Area Slag Pile
- Site 3—Q-Area Drum Storage Yard
- Site 4—Transformer Storage Area P-71 RFA M-5
- Site 5—Pesticide Disposal Site
- Site 6—CD Landfill
- Site 7—Inert Chemical Landfill RFA L-3
- Site 8—Asbestos Landfill RFA L-4
- Site 9—Q-Area Landfill RFA L-5
- Site 10—Apollo Disposal Site RFA M-23
- Site 11—Repair Shop Drains
- Site 12—Alleged Mercury Disposal Site RFA M-35
- Site 13—Past Wastewater Outfalls RFA TP-10/M-45
- Site 14—Oil Spill-Piers 4, 5, and 7 RFA M-24
- Site 15—Oil Spill-Piers 20, 21, and 22
- Site 16—Fire, Building X-136
- Site 17—Fire, Building SDA-215 RFA C-25/AOC E
- Site 18—Former NM Waste Storage RFA M-26

Each of the 18 sites was evaluated for the type of contamination, migration pathways, and pollutant receptors. The IAS concluded that 6 of the 18 sites posed sufficient threats to human health or the environment to warrant further evaluation in a confirmation study. Sampling and analysis were not performed as part of the IAS.

Confirmation Studies were performed for the six sites, which were recommended for further investigation in the IAS (Sites 1 through 6) to confirm or refute the existence of the suspected contamination. This effort for five of the six sites was documented in the 1988 IRPRI Report. An independent Confirmation Study was performed by the Navy on Site 6-CD Landfill. The objectives of the Confirmation Studies were to determine the extent of contamination, develop and evaluate economically feasible remedial alternatives, and recommend a remedial action.

Since the IAS, the Navy identified and added four sites (Sites 19 through 22) to the IRP:

- Site 19—Buildings V60/V90 RFA M-34
- Site 20—LP-20 Site
- Site 21—Building W-316 RFA M-9/M-10
- Site 22—Camp Allen Salvage Yard RFA C-14

Close-out reports documenting the no further action (NFA) determination for eight of the IRP Sites (IR Sites 7, 8, 9, 10, 12, 16, 17, and 18) were prepared and approved by the Naval Base Partnering Team as part of a "Consensus Agreement" for reference in the FFA. For IR Sites 7, 8, 12, 16, and 17, soil contaminant levels were compared only to industrial risk-based concentrations (RBCs), and any areas that exceed residential RBC values will require institutional controls that will be documented in accordance with the CERCLA process. IRP Sites 13, 14, and 15 were recommended for no further action under CERCLA in the FFA as these sites are being addressed under the jurisdiction of other environmental programs (underground storage tank or VPDES).

With the exception of those sites where soil contaminant levels were compared only to industrial RBCs, the status of the remaining IRP sites is summarized in Table 1-2. A base map of the NSN, showing the locations of the IRP sites and their current status in the remedial process, is provided as Figure 1-2. As an indicator of the progress made in cleaning up sites, this figure can be compared to Figure 1-3 which shows the cleanup status of these sites in March 1997.

1.4.3.2 Solid Waste Management Units

In March 1992, a RCRA Facility Assessment (RFA) was completed for NSN. This study was a basewide inventory of existing solid waste management units (SWMUs) and other Areas of Concern (AOCs). A total of 274 SWMUs and 10 AOCs were tentatively identified in this study. The September 1994 EPA Photographic Interpretation Center (EPIC) study of aerial photography identified 37 potential Waste Disposal Areas (WDAs). Of the sites identified by the RFA and EPIC studies, 148 were identified as potentially contaminated by the Navy/EPA project management team. The RRR—Phase I report provided the project management team sampling results for 45 of the 148 identified sites. Of the sites sampled as part of the RRR—Phase I report, the Navy identified 25 for additional evaluation and possible investigation; these 25 sites were identified as SWMUs in the FY1996 SMP. The following list of these SWMUs includes the site's corresponding RFA/EPIC study identification:

- SWMU 1—SP-2B Accumulation Area RFA C-83
- SWMU 2—Building Z-309 Ash Hopper Storage Area RFA M-13/M-14
- SWMU 3—Building Z-309 Oil/Lubricant Storage Area RFA AOC B
- SWMU 4—PWC Sandblast Area RFA M-19/M-20; EPIC WDA-1
- SWMU 5—LF-61 Waste Holding Tank RFA M-36
- SWMU 6—Building V-28 Waste Pit RFA M-31
- SWMU 7—LF-18 Aircraft Ramp EPIC WDA-3
- SWMU 8—Firefighting Training School EPIC WDA-20
- SWMU 9—LP-200/MAC Terminal EPIC WDA- 28/29

Table 1-2
Current Status (February, 2000) Summary IRP Sites

Site	PA or IAS	SI or CS	EE/CA	Work Plans	RI	FS	PRAP	ROD	RD	RA Construct	RA Ops	Comments
CERCLA INVESTIGATION IN PROGRESS												
Site 2 – NM Slag Pile – All Media	1983*	1988**		1996, 1998	√	√	1999 [†]	2000 [†]				ROD anticipated to be finalized in summer 2000. Sediments removed in December 1999
Site 22 – Camp Allen Salvage Yard Removal Action	1994	1994	1998	1996	√	√	FY1999 [†]	FY1999 [†]	√	√		Portion of the site designated for removal action. Remedial process continuing for remainder of site.
REMEDY IN PLACE (Ongoing O&M and LTM)												
Site 6 – CD Landfill OU1 Sediments OU2 Landfill Cap	1983*	1991		1993	1995	1995	1996 1998	1996 FY1999 [†]	1996 FY1999 [†]	√ (1999) FY1999 [†]		Removal of contaminated sediments partially completed in fall 1997. Cap construction completed in December 1999. Post closure monitoring began in January 2000..
Site 1 – Camp Allen Landfill	1983*	1988**		1991	1994	1994	1995	1995	1996	1997	√	Removal action (soil) completed. Construction of Groundwater Pump and Treat and DPVE systems complete. Remediation systems in operation. Long-term monitoring to evaluate system effectiveness in progress.
Site 3 – Q-Area Drum Storage Yard	1983*	1988**		1991	1996	1996	1996	1996	1996	1998	√	Construction of Air Sparge/SVE system complete. Remediation systems in operation. Long-term monitoring planned to evaluate effectiveness in progress.
Site 20 – Building LP-20 Site	1991	1991		1994	1996	1996	1996	1996	1997	1998	√	Construction of Air Sparge/SVE system to address TPH and chlorinated solvents in groundwater complete. Remediation systems in operation. Long-term monitoring to evaluate effectiveness underway.
RESPONSE COMPLETE/NFA												
Site 4 – P-71 Transformer Storage	1983*	1988**		1991	1991	1991	1991	1992	1991	1992		Cleanup completed. Groundwater monitoring completed in 1995.
Site 5 – Pesticide Disposal Site	1983*	1988** 1998***	1998							FY1999 [†]		Pesticide-contaminated soil removal action. Completed in November 1999.

**Table 1-2
Current Status (February, 2000) Summary IRP Sites**

Site	PA or IAS	SI or CS	EE/CA	Work Plans	RI	FS	PRAP	ROD	RD	RA Construct	RA Ops	Comments
Site 19 - Buildings V-60/V-90	1988	1988		1989	1989	1989	1989	1990	1989	1991		Building demolition and site cleanup completed.
Site 21 - Building W-316	1996	1996	1997	1996								PCB-contaminated soil removal action completed in March 1998.

LEGEND:

1993 - Year Activity Completed (fiscal year)
 X - Activity Completed (date unknown)
 √ - Activity In Progress (expected completion)
 † - Activity Planned
 PA - Preliminary Assessment
 IAS - Initial Assessment Study
 SI - Site Inspection
 CS - Confirmation Study
 EE/CA - Engineering Evaluation/Cost Analysis

RI - Remedial Investigation
 FS - Feasibility Study
 PRAP - Proposed Remedial Action Plan
 ROD - Record of Decision or Decision Document
 RD - Remedial Design
 RA - Remedial Action/Removal Action
 TBA - To Be Addressed
 NFA - No Further Action
 Construct - Construction Phase

Ops - Operations Phase

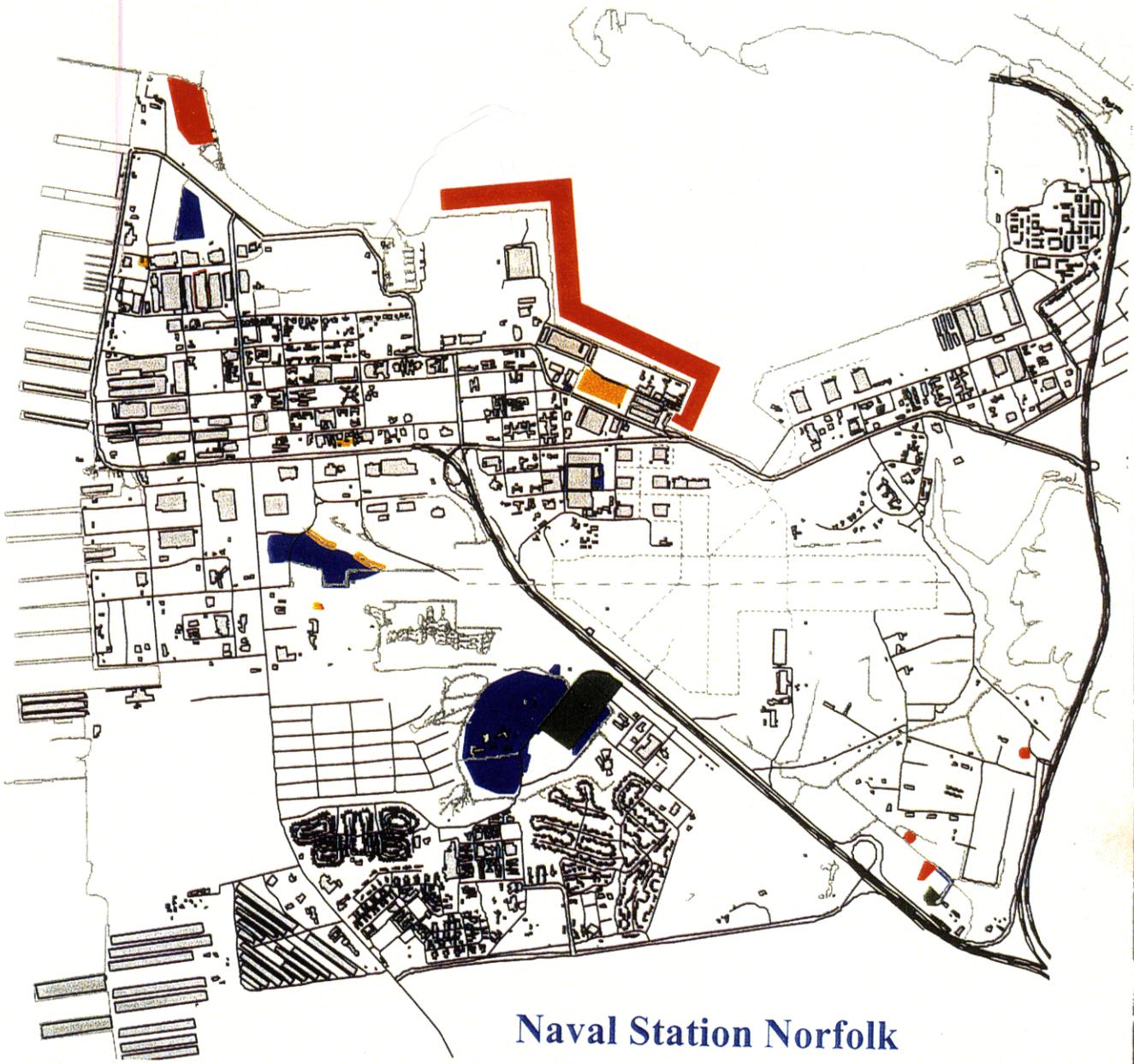
*Refers to "Initial Assessment Study of Sewells Point Naval Complex," dated February 1983.

**Refers to "Installation Restoration Program Investigation Interim Report," dated March 1988.

***CH2M HILL SI completed February 1998.



CHESAPEAKE BAY



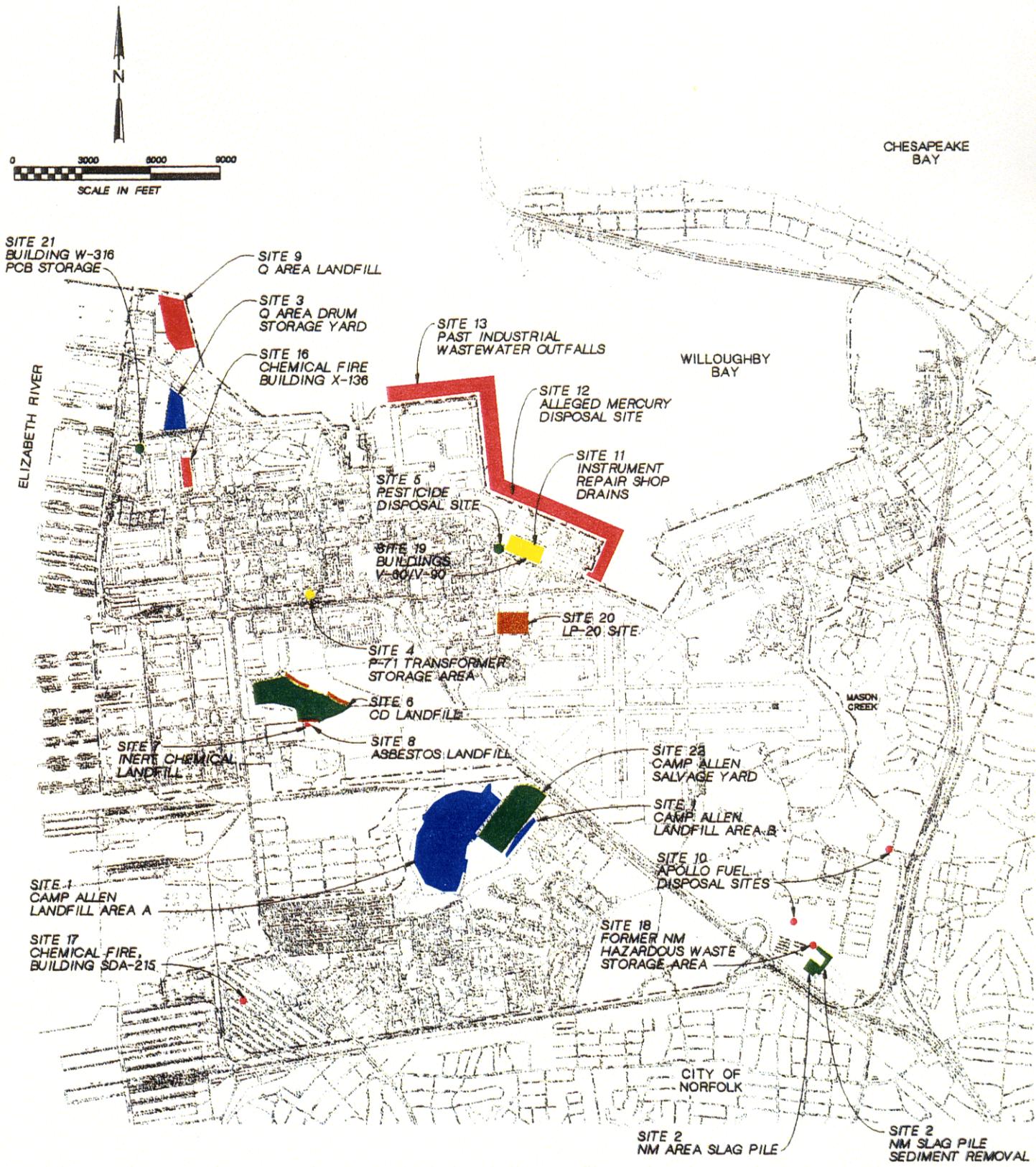
Naval Station Norfolk

IR Sites - Current Status



- NFA Sites Per Close-out Reports
- Remedial/Removal Action Complete
- Remedial/Removal Action in Progress
- Remedial/Site Investigation in Progress

Figure 1-2
BASE MAP WITH IRP SITE LOCATIONS
AND CURRENT CLEAN-UP STATUS
Naval Base Norfolk



LEGEND

- NFA SITES PER IAS RECOMMENDATION
- REMEDIAL/REMOVAL ACTION COMPLETE
- REMEDIAL/REMOVAL ACTION IN PROGRESS
- REMEDIAL/SITE INVESTIGATION IN PROGRESS
- REMEDIAL DESIGN IN PROGRESS

Figure 1-3
 IRP SITE CLEAN-UP STATUS
 AS OF MARCH 1997 (DATE OF PRIOR SMP)
 Naval Base Norfolk

- SWMU 10—LP-200/MAC Terminal/East EPIC WDA- 31/32/35
- SWMU 11—Old Weapons Station Entrance EPIC WDA 33/34
- SWMU 12—Disposal Area Near NM-37 EPIC WDA-36
- SWMU 13—Disposal Area PWC Operations, Near NM-71 EPIC WDA-37
- SWMU 14—Q-50 Satellite Accumulation Area RFA C-17
- SWMU 15—W-130 Accumulation Area RFA C-27
- SWMU 16—NM-37 Accumulation Area RFA C-54
- SWMU 26—Old Mounds Northeast of NM-140/141 EPIC WDA-21
- SWMU 27—Mason Creek Embankment EPIC WDA-30
- SWMU 28—Probable Solid Waste Disposal South of CEP 201 EPIC WDA-11
- SWMU 29—Solid Waste Disposal Area/CD-3/CD-4 EPIC WDA-12
- SWMU 30—Sludge Fill Disposal Area/
Marshy Area South of Runway EPIC WDA-15/16/17
- SWMU 32—Solid Waste Disposal Area CEP-160
Embankment EPIC WDA-5
- SWMU 33—Debris Piled at Seawall/Corner of Sustain Pier EPIC WDA-6
- SWMU 34—Solid Waste Disposal Area CEP 200 EPIC WDA-7
- SWMU 35—Solid Waste Disposal Area CEP 196/
Resolute Embankment EPIC WDA-8

To provide additional site data, a Phase II RRR sampling event was conducted in September 1996 with the results documented in the RRR—Phase II report. During FFA negotiations conducted in 1997 and 1998, the Navy/EPA project management team, in consultation with the Naval Base Partnering Team, identified several of the 148 sites to be included as SWMUs in the FY1997 SMP. These SWMUs (and corresponding RFA/EPIC study identification numbers) are:

- SWMU 24—Building LF-53 Trenches RFA M-39
- SWMU 36—Stormwater Drainage System RFA M-44
- SWMU 37—Q-82/78 Former PWC Parking EPIC WDA-2
- SWMU 38—CD Area behind the Compost Yard EPIC WDA-13
- SWMU 39—Open Dump/Boundary of Camp Allen Landfill EPIC WDA-18/19
- SWMU 40—MCA-603 Pits EPIC WDA-22
- SWMU 41—Disposal Area, CA-99 Golf Course EPIC WDA-23
- SWMU 42—CEP 201 Area EPIC WDA-9

Based upon the results of the two RRR studies, available historical operating data, and visual site inspections, the project management team recommended 10 SWMUs (SWMUs 5, 7, 11, 13, 15, 24, 26, 27, 29, and 30) for no further action under CERCLA in the FFA. Any areas that exceed residential RBC values but not industrial will require institutional controls for industrial land use that will be documented in accordance with the CERCLA process.

Ongoing remediation is being conducted at SWMU 37, the Q-82/78 Former PWC Parking Area, in accordance with the Virginia Underground Storage Tank (UST) regulations. The Commonwealth of Virginia Department of Environmental Quality (VDEQ) is providing oversight of the site remediation. Therefore, the project management team reviewed information pertaining to the Site Characterization and Corrective Action Plan and has determined that no further action under CERCLA is required.

The NSN stormwater drainage system (SWMU 36, RFA M-44) is undergoing a \$10 million rehabilitation project. The project includes the inspection, assessment, and required repair/replacement of the entire stormwater drainage system. Therefore, the project management team determined that no further action under CERCLA is required.

A SWMU Confirmatory Investigation (CI) was conducted at SWMUs 1, 4, 6, and 8 in 1996. The results of the CI were documented in the *Draft Report for the Solid Waste Management Unit Confirmatory Investigation Report*, CH2M HILL, dated November 18, 1996. The results of the investigation identified lead contamination in the soil at SWMU 1 and a removal action was conducted at the site in October 1997; therefore, the project management team determined no further action under CERCLA is required. The results from the CI also indicated that additional characterization is still needed at SWMUs 4, 6, and 8.

A confirmatory Site Investigation (SI) was initiated in the summer of 1998 for SWMUs 9, 10, 12, 14, 16, 28, 32, 33, 34, 35, 38, 40, 41, and 42. The objectives of the SI are to determine the extent of contamination at each SWMU, to develop and evaluate economically feasible remedial alternatives for remedial action at contaminated SWMUs, and to close out qualified sites.

The current status of SWMUs under investigation at NSN is summarized in Table 1-3. A base map of the NSN, showing the locations of the SWMU sites and their current status in the remedial process, is provided as Figure 1-4. As an indicator of the progress made in cleaning up SWMU sites, this figure can be compared to Figures 1-5 which shows the clean-up status of these sites in March 1997.

1.4.3.3 No Further Action Sites

The remaining 148 sites previously identified were individually evaluated during the No Further Action (FFA) negotiations between the Navy and the EPA. These sites were not previously discussed in the SMP. The project management team determined no further action is required for these sites; the following site information is the basis of the NFA determination.

The project management team conducted site visits and reviewed existing documentation and operational procedures, and determined no further action under CERCLA is warranted at the following sites:

- RFA C-4: Building CA-483 (A) Satellite Accumulation Area
- RFA C-5: Building CA-483 (B) Satellite Accumulation Area
- RFA C-6: Building CA-483 (C) Satellite Accumulation Area
- RFA C-7: Building CA-483 (D) Satellite Accumulation Area
- RFA C-18: Building Z-309 Satellite Accumulation Area
- RFA C-26: Building CA-501 Satellite Accumulation Area
- RFA C-61: Building LP-20 (A) Satellite Accumulation Area
- RFA C-79: LP Fuel Farm Satellite Accumulation Area
- RFA M-18: Sanitary Sewers
- RFA M-22: Sewage Waste Oil Barges
- RFA M-46: P-1 Pond
- RFA R-3: LF-68 Former Hazardous Waste Storage Area

**Table 1-3
February 2000 Status Summary SWMU Sites
Naval Station Norfolk Site Management Plan**

SWMU	Phase 1 RRR*	Phase 2 RRR**	Work Plans	PA/SI	SI/CI/ SSI***	EE/CA	Decision Document	RD	RA Construction	Comments
2. Building Z-309 Ash Hopper Storage Area	1996	1996								Close- Out Report was completed in May, 2000 .
3. Building Z-309 Oil/Lubricant Storage Area	1996	1996								Close- Out Report was completed in May, 2000 .
4. PWC Sandblast Area	1996	1996	1996	1996						Site will be investigated during the summer of 2001 as a SSA under the FFA.
6. Building V-28 Waste Pit	1996		1996	1996	1998,1999					Site will be further investigated based on the results of the SI.
8. FIRE FIGHTING SCHOOL	1996		1996	1996	1999					Close- Out Report is scheduled to be completed in May, 2000 .
9. LP-200/MAC Terminal	1996		1998	1998						Site was investigated as an AOC with SWMU 10 SSI Underway.
10. LP-200/MAC Terminal/East	1996	1996	1998	1998						Site was investigated as a AOC with SWMU 9 under the FFA. SSI Underway.
12. Disposal Area Near NM-37	1996	1996	1998	1998						Site will be investigated during 2000 as a SSA with SWMU 16
14. Q-50 Satellite Accumulation Area	1996	1996	1998	1998						Site was investigated as an AOC under the FFA. SSI Underway.
16. NM 37 Accumulation Area	1996	1996	1998	1998						Site will be investigated during 2000 as a SSA with SWMU 12
28. Probable Solid Waste Disposal South of CEP 201	1996		1998	1998						Streamlined Risk Assessment was submitted in May 2000.
32. Solid Waste Disposal Area CEP 160/161 Embankment	1996		1998	1998						Streamlined Risk Assessment was submitted in May 2000.
33. Debris Piled at Seawall	1996		1998	1998						Streamlined Risk Assessment was submitted in May 2000.
34. Solid Waste Disposal Area CEP 200	1996		1998	1998						Streamlined Risk Assessment was submitted in May 2000.
35. Solid Waste Disposal Area CEP 196/Resolute Embankment	1996		1998	1998						Streamlined Risk Assessment was submitted in May 2000.
38. CD Area behind Compost Yard		1996	1998	1998						Site will be investigated in 2000 as an AOC under the FFA. SSI Underway.
39. Open Dump and Disposal Area near boundary of Camp Allen Landfill										Site will be investigated in 2000 as an AOC under the FFA. SSI Underway
40. MCA-603 Pits			1998	1998						Close- Out Report was completed in May, 2000 .

**Table 1-3
February 2000 Status Summary SWMU Sites
Naval Station Norfolk Site Management Plan**

SWMU	Phase 1 RRR*	Phase 2 RRR**	Work Plans	PA/SI	SI/CI/ SSI***	EE/CA	Decision Document	RD	RA Construction	Comments
41. Disposal Area, CA-99 Golf Course			1998	1998						Close- Out Report was completed in May, 2000 .
42. CEP 201 Area	1996	1996	1998	1998						Close- Out Report was completed in May, 2000 .

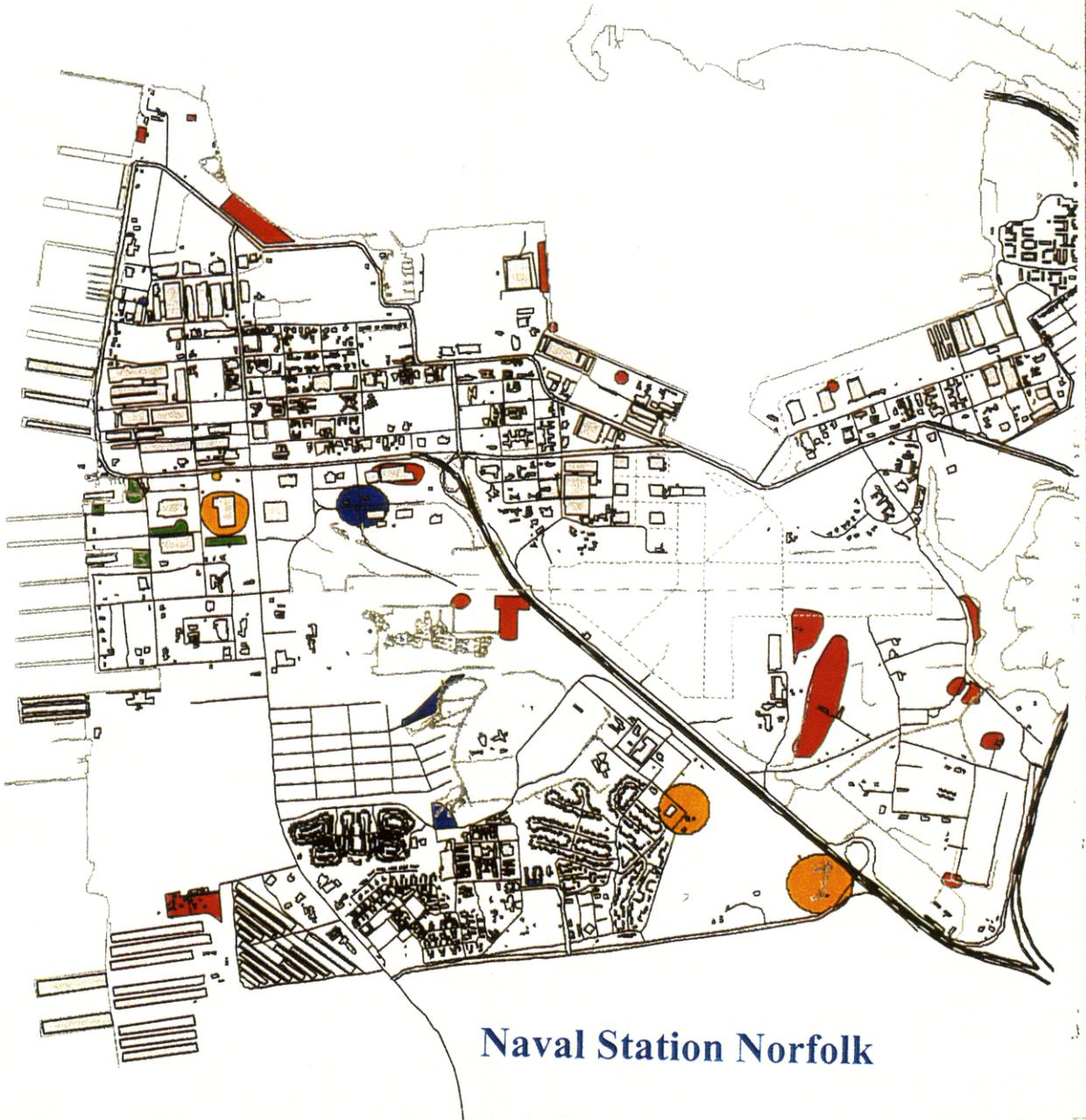
LEGEND:

1996 - Year Activity Completed (fiscal year)
 X - Activity Completed (date unknown)
 √ - Activity In Progress (expected completion)
 0 - Activity Planned
 AOC - Area of Concern
 CI - Confirmatory Investigation
 EE/CA - Engineering Evaluation/Cost Analysis
 PA - Preliminary Assessment
 RA - Remedial Action/Removal Action
 RD - Remedial Design

RRR - Relative Risk Ranking Study
 SI - Site Inspection/Investigation
 SSA - Site Screening Area
 SSI - Supplemental Site Investigation
 SWMU - Solid Waste Management Unit
 Construct - Construction
 * - Phase I RRR sampling was performed in October, 1995
 ** - Phase II RRR sampling was performed in September, 1996
 *** - Site will move into the RI phase of the IRP Process if additional site characterization is required.



CHESAPEAKE BAY



Naval Station Norfolk

-  NFA per FFA / Cleanup Complete
-  Streamlined Risk Assessment
-  Closeout Through Screening
-  Site Screening Area
-  To Be Determined

Figure 1-4
BASE MAP
WITH ADDITIONAL SWMU LOCATIONS
AND CURRENT CLEAN-UP STATUS
Naval Base Norfolk

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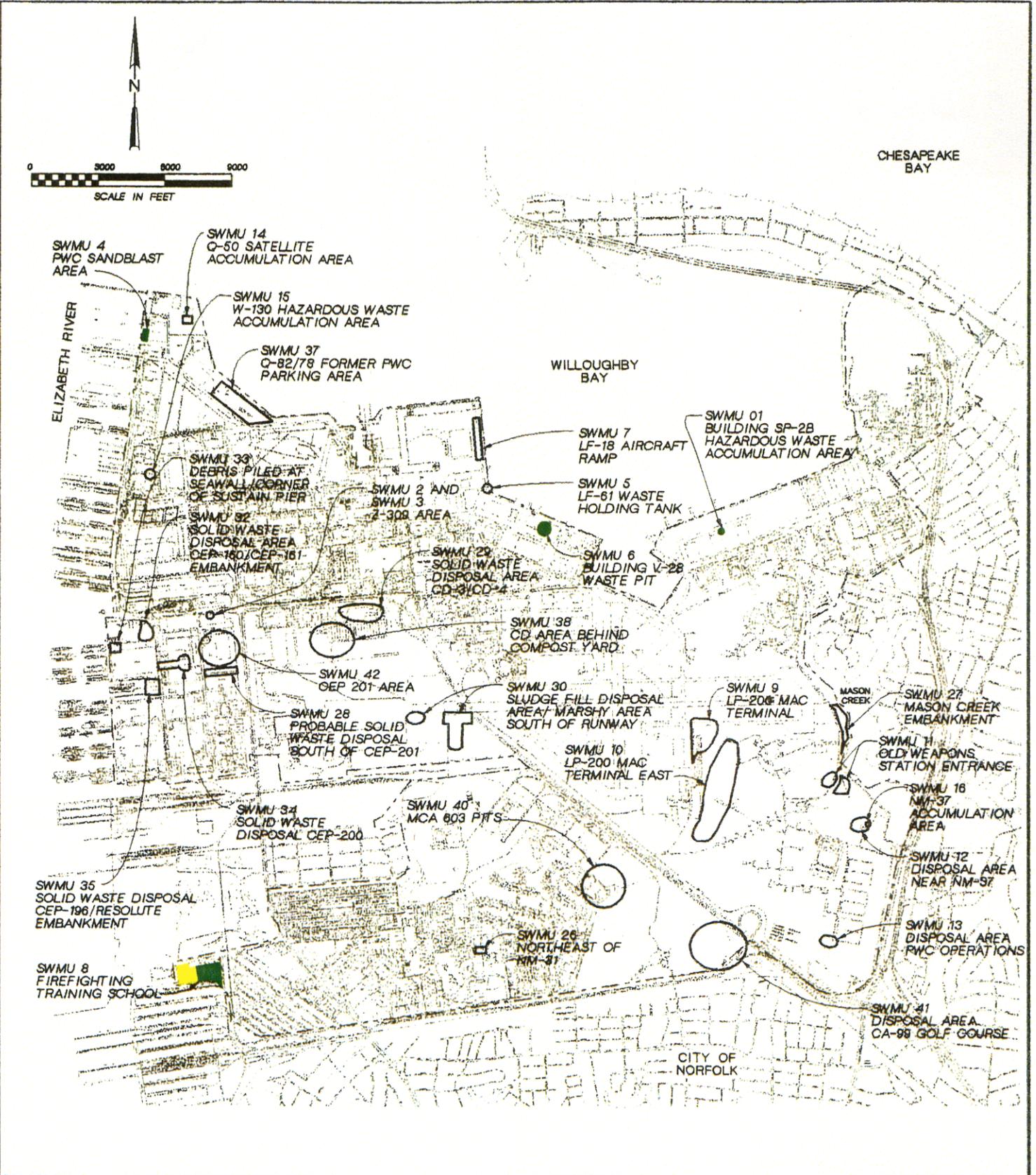


Figure 1-5
 ADDITIONAL SWMU CLEAN-UP STATUS
 AS OF MARCH 1997 (DATE OF PRIOR SMP)
 Naval Base Norfolk

- EPIC WDA-14: Building U-40
- EPIC WDA-24: Building LP-3
- EPIC WDA-25: Building SP-367
- EPIC WDA-26: Building SP-86

The project management team evaluated sampling data from the two RRR reports (January 1996 and December 1996), reviewed historical operating data, and conducted site field visits. Based on this analysis, the project management team recommended that no further action is required under CERCLA for the following sites:

- RFA C-9: Building W-7 (Pier 7) Accumulation Area
- RFA C-27: Building W-130 Satellite Accumulation Area
- RFA C-33: Building V-88 Satellite Accumulation Area
- RFA C-36: Building LF-53 Satellite Accumulation Area
- RFA C-71: Building SP-10 Satellite Accumulation Area
- RFA C-80: Building LP-100 Satellite Accumulation Area
- RFA C-81: Building LF-59 Satellite Accumulation Area
- RFA C-82: Building LF-60 Satellite Accumulation Area
- RFA M-36: Building LF-61 Waste Tank Area (SWMU 5)
- RFA M-39: Building LF-53 Trenches (SWMU 24)
- EPIC WDA-3: Building LF-18 Aircraft Ramp (SWMU 7)
- EPIC WDA-4: Building V-82 Area
- EPIC WDA-12: Building CD-2/CD-3
- EPIC WDA-15/16/17: Marshy Area south of runway (SWMU 30)
- EPIC WDA-21: Northeast of Building NH-140/141 (SWMU 26)
- EPIC WDA-27: Building SP-85 Area
- EPIC WDA-30: Mason Creek Embankment (SWMU 27)
- EPIC WDA-33/34: NM-43 Old Weapons Station Entrance (SWMU 11)
- EPIC WDA-37: Building NM-71

The satellite accumulation areas (SAAs) are container storage areas used to manage various types of wastes generated from operations in the building. The SAAs are in areas designated for industrial land use; therefore the project management team compared available analytical data to industrial screening levels. No organic compounds were detected at levels exceeding industrial RBC values at any of the SAA locations. Areas that exceed residential RBC values will require institutional controls that will be documented in accordance with the CERCLA process.

Thirty-eight of the sites are oil/water separators (O/WSs), pretreatment devices used to manage oily wastewater from various activities. No releases have been specifically identified for these units.

The following 10 O/WSs are connected with the stormwater system and the documentation of integrity and functionality inspections of the units is provided. This documentation is on file with EPA Region III. The project management team recommended no further action under CERCLA for these O/WSs.

- RFA O-2: A-81 Building (integrity inspection)
- RFA O-4: A-Area (integrity inspection)
- RFA O-11: LF-60 Building (integrity inspection)
- RFA O-31: LP-167 Area 1 (cleaned/inspected per BRAC action)
- RFA O-34: LP-167 Area 4 (cleaned/inspected per BRAC action)
- RFA O-35: LP-167 Area 5 (cleaned/inspected per BRAC action)
- RFA O-46: SP-313 (integrity inspection)
- RFA O-50: V-15 Building (cleaned/inspected per BRAC action)
- RFA O-60: Firefighting School (integrity inspection)
- RFA W-4: Q-50 (integrity inspection)

NSN has implemented a program to inspect and monitor sources discharging to the Hampton Roads Sanitation District (HRSD) under the NSN Industrial Wastewater Management Plan (IWMP). The following 14 O/WSs are managed under the IWMP program. Relevant documentation is on file with EPA Region III. Therefore, the project management team has recommended no further action under CERCLA for these O/WSs.

- RFA O-1: A-80 Building
- RFA O-3: A-127 Building
- RFA O-7: CEP-188 Building
- RFA O-10: LF-59 Building
- RFA O-23: LP-20 Building
- RFA O-32: LP-167 Area 2
- RFA O-33: LP-167 Area 3
- RFA O-36: LP-167 Area 6
- RFA O-43: SP-38 Building
- RFA O-45: SP-296 Hanger
- RFA O-55: V-49 S Area 5
- RFA O-56: V-49 W Area 6
- RFA O-59: W-6 Building
- RFA T-13: W-388

Demolition is planned or has been completed for 10 O/WSs in NBN's effort to eliminate excess structures to reduce infrastructure. Documentation for the O/WS demolition projects is on file with EPA Region III. Therefore, the project management team has recommended no further action under CERCLA for these O/WSs.

- RFA O-8: LF-38 Building (demolition planned - FY99)
- RFA O-24: LP-22 Building (demolition complete - FY98)
- RFA O-27: LP-48 Building (demolition complete - FY98)
- RFA O-30: LP-78 Building (demolition complete - FY97)
- RFA O-37: LP-176 Building (demolition complete - FY98)
- RFA O-57: V-146 Building (demolition complete - FY97)
- RFA O-61: Firefighting School (demolition complete - FY92)
- RFA O-62: Firefighting School (demolition complete - FY92)
- RFA T-31: MCE-57-1 (demolition complete - FY97)
- RFA TP-6: FFS Wastewater Pit (demolition planned - FY99)

Four O/WSs are currently inactive due to BRAC closure of NBN tenants. Cleaning of these devices has been performed as part of the facility closure process and verified with NBN personnel. Relevant documentation is on file with EPA Region III. Therefore, the project management team has recommended no further action under CERCLA for these O/WSs.

- RFA O-9: LF-53 Building
- RFA O-25: LP-32 Building
- RFA O-51: V-27 Area 1
- RFA O-52: V-28 Area 2

The following 34 underground storage tanks (USTs)/aboveground storage tanks (ASTs) have either been removed and certified as closed by the Commonwealth of Virginia, or are active tanks and are regulated by the VDEQ. Records of removal and other pertinent information are on file with the EPA Region III. The project management team recommended no further action at these sites.

- RFA T-3: Wastewater Tank 3 Building CEP-200 (VDEQ regulated)
- RFA T-10: W-7 Building (VDEQ regulated)
- RFA T-12: W-388 Building high flashpoint tank (VDEQ regulated)
- RFA T-28: NH-94-1W Building (VDEQ regulated)
- RFA T-29: NH-94-2W Building (VDEQ regulated)
- RFA T-14: A-81 Building (removed)
- RFA T-15: A-80 Building Tank No. 1 (removed)
- RFA T-16: A-80 Building Tank No. 2 (removed)
- RFA T-17: Fire Fighting School (removed)
- RFA T-20: CEP-188 Building (removed)
- RFA T-21: V-49 Building (removed)
- RFA T-22: U-132 calibration fluid (removed)
- RFA T-23: U-132 varsol (removed)
- RFA T-24: U-132 waste oil (removed)
- RFA T-26: NH-34 Building (removed)
- RFA T-27: NH-35 Building (removed)
- RFA T-30: MCE-225-4 Building (removed)
- RFA T-32: W-6-1 (removed)
- RFA T-33: W-6-2 (removed)
- RFA T-34: W-6-3 (removed)
- RFA T-35: W-6-4 (removed)
- RFA T-36: W-196 Building (removed)
- RFA T-37: LAFB Building (removed)
- RFA T-38: NM-59 Building (removed)
- RFA AOC C: Building V-93-1 (removed)
- RFA AOC C: Building V-93-2 (removed)
- RFA AOC C: Building V-93-3 (removed)
- RFA AOC C: Building V-112-1 (removed)
- RFA AOC C: Building V-112-2 (removed)
- RFA AOC C: Building V-112-3 (removed)
- RFA AOC C: Building NM-71-A (removed)

- RFA AOC C: Building NM-71-B (removed)
- RFA AOC C: Building U-117 (removed)
- RFA AOC C: Building CA-501-1 (removed)

1.4.3.4 FFA Site Screening Areas

Site Screening Areas (SSAs) are areas that pose a threat, or that may potentially pose a threat, to public health, welfare, and the environment. SSAs may expand or contract in size during the site investigation as information becomes available indicating the extent of contamination and area needing to be studied. In the NSN FFA, four SSAs are identified:

- SSA 1 Q-72 Sandblast Area? (SWMU 4; RFA M-19/M-20; EPIC WDA-1)
- SSA 2 V-28 Waste Pit (SWMU 6; RFA M-31)
- SSA 3 Fire Fighting School (SWMU 8; EPIC WDA-20),
- SSA 4 NM-37 Area (SWMU 12; EPIC WDA-36); (SWMU 16; RFA C-54)

Site investigations were completed during 1998 or 1999 at each of the SSAs. The investigations at each of the areas detected levels of site related constituents above risk-based concentrations (RBCs). A background investigation is currently underway to assess if the levels also exceed background levels. Based on this information either no further action or institutional controls will be recommended for each of these sites.

1.4.3.5 FFA Areas of Concern

The FFA signed by EPA on February 18, 1999 listed eight Areas of Concern (AOCs) as sites under evaluation to determine if the sites should proceed in the screening process and be investigated as SSAs, or whether the information under review supports a no further action determination. The documentation and sampling of each of these areas was discussed at the Tier I Partnering meeting on March 16, 1999. Based on the documentation and discussions the Navy proposed to categorize the AOCs in a letter to EPA dated May 03, 1999 as follows:

Proceed to the SSP as SSAs for the following AOCs:

- AOC 2 MAC Area (SWMU 9; EPIC WDA-28/29)
(SWMU 10; EPIC WDA-31/32/35)
- AOC 4 Q-50 PWC Accumulation Area (SWMU 14; RFA C-17)
- AOC 5 CD Area behind the Compost Yard (SWMU 38; EPIC WDA-13)

In May 2000 the Project Managers of the Naval Station Norfolk Tier I Partnership approved the Closeout Report and reached a consensus that: "no further action is required and the land use will be unrestricted" at the following AOCs:

- AOC 1 Building Z-309 Area (SWMU 2; RFA M-13/14)
(SWMU 3 RFA AOC B)
- AOC 3 CEP 201 Area (SWMU 42; EPIC WDA-9/10)
(separated from other AOC 3 sites)
- AOC 7 MCA-603 Pits (SWMU 40; EPIC WDA-22)

AOC 8 CA-99 Golf Course Disposal Area (SWMU 41; EPIC WDA-23)

In May, 2000 the Project Managers of the Naval Station Norfolk Tier I Partnership also approved the Streamlined Risk Assessment Report and reached a consensus that "no further action is required and the land use will be unrestricted" at the following sites:

AOC 3 CEP Area (SWMU 28; EPIC WDA-11)
 (SWMU 32; EPIC WDA-5)
 (SWMU 33; EPIC WDA-6)
 (SWMU 34; EPIC WDA-7)
 (SWMU 35; EPIC WDA-8)

During June 2000 a geophysical survey was completed to determine the location of soil and groundwater samples to be collected for screening purposes. The classification of the site will be based on the analytical results of the samples.

AOC 6 Open Dump and Disposal Area (SWMU 39; EPIC WDA-18/19)
 at Boundary of Camp Allen Landfill

1.5 Format of the Site Management Plan

This SMP consists of five sections.

- **Section 1, Introduction**, describes the scope and purpose of the SMP, provides a description and history of NBN, summarizes the environmental setting and previous environmental investigations conducted at NBN, and provides the FFA site classification and supporting rationale for these determinations.
- **Section 2, Site Descriptions**, provides specific information regarding each of the IRP sites. Site-specific information includes physical characteristics of the site, a description of past activities conducted at the site, and known contaminants in each site media. A site map is provided for each site. Inactive sites, and sites that are either closed out through a consensus agreement or recommended for no further action, are not included in this section.
- **Section 3, Screening, Categorizing and Prioritizing Sites** describes the procedures for screening, categorizing and prioritizing sites based on human health and ecological risk. The system has been developed to establish priorities for cleanup actions, such that the "high" risk sites are addressed first.
- **Section 4, CERCLA Process Activities**, summarizes the processes of investigation, feasibility study, and remedial action for CERCLA (IRP) sites. It also describes how team partnering has been applied to streamline the CERCLA process.
- **Section 5, Site Management Plan Schedules**, provides scheduling assumptions and SMP project schedules.

2 Site Descriptions

This section provides specific information regarding the Installation Restoration Program (IRP) sites and solid waste management units (SWMUs) at NSN. Site-specific information includes site physical characteristics, a description of past activities conducted at the site, and known contaminants in each site media. In addition, the current status of each site in the IRP is briefly discussed. A site map is provided for the IRP and SWMU sites. However, inactive sites that were either closed out through a consensus agreement or recommended for no further action do not have site-specific information.

2.1 Installation Restoration Program Sites

The IRP sites currently not closed-out or recommended for no further action are described below. Several IRP sites documented in the FY1996 SMP have been removed from this section of the SMP, based upon their inactive closure status (including Site 4, Sites 7 through 19, and Site 21). The following site descriptions include physical characteristics, past activities, detected contaminants, and future remediation plans for each site if known.

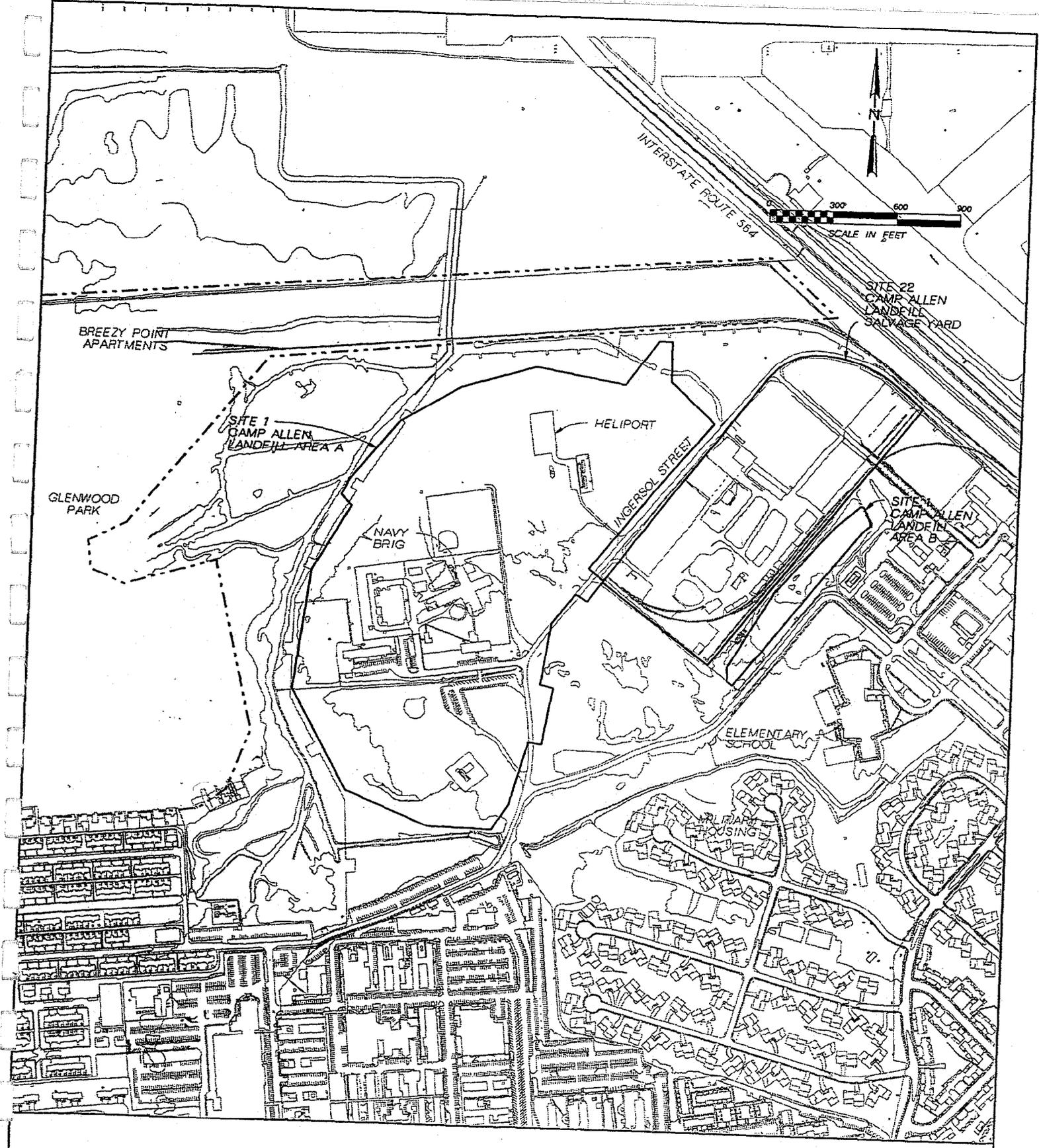
Site 1—Camp Allen Landfill

The Camp Allen Landfill site includes two distinct areas (Area A, the 45-acre landfill, and Area B, the 2-acre fire disposal area), as shown in Figure 2-1. The Area A landfill, which operated from the mid-1940s until approximately 1974, was used for the disposal of metal plating and parts cleaning sludges, paint-stripping residue, various chlorinated organic solvents, overage chemicals, pesticides, asbestos, incinerator ash, fly and bottom ash from the Base power plant, and miscellaneous debris. Wastes from a fire at the Camp Allen Salvage Yard (Site 22), including drums containing various chemicals, were buried in trenches at Area B in 1971.

Contamination from prior disposal practices at the Camp Allen Landfill site has affected surface and subsurface soil, sediment, surface water, and groundwater. The primary contaminants found at the site in all media are volatile organic compounds (VOCs). Areas of inorganic contamination of surface water and sediments in the surrounding drainage ditches and in the onsite pond also were detected. Groundwater contamination was found in both the water-table aquifer and the Yorktown Aquifer in Areas A and B. The presence of contamination in the deeper Yorktown Aquifer is thought to be due to the lack of a confining layer between the two aquifers beneath much of the Camp Allen Landfill area.

Currently, the Base brig facility and a heliport are located over a portion of the Area A landfill. Area B is not currently used. Areas A and B are soil-covered and vegetated to minimize surface erosion. Both areas are adjacent to tidal drainage ditches that convey stormwater run-off to Willoughby Bay.

A non-time-critical removal action was implemented in May 1994 and completed in January 1995 at Area B. The primary source areas of contamination were removed. The Camp Allen Landfill site remedial investigation and feasibility study (RI/FS) was completed in 1994. A Decision Document was signed in July 1995 requiring localized treatment of groundwater



LEGEND

----- PROPERTY BOUNDARY -
 NORFOLK NAVAL BASE

Figure 2-1
 SITE MAP
 SITE 1 - CAMP ALLEN LANDFILL AND
 SITE 22 - CAMP ALLEN SALVAGE YARD
 Naval Base Norfolk

and soil using vacuum extraction. Plans for remediation of the site called for implementation of a groundwater extraction and treatment system in Areas A and B, and dual-phase vapor extraction (DPVE) for "hot spots" identified in the Area A landfill.

Continuous operation of the groundwater extraction and treatment system began in November, 1998 : pump-and-treat systems for groundwater remediation were installed in Area A (for Yorktown groundwater in the western part of the area and for surficial groundwater in the northern part of the area) and in Area B (for both surficial and Yorktown groundwater). The DPVE system was completed and began operation in May 1998. Groundwater samples were collected from monitoring wells in March 1997 and June 1998 to provide baseline information on water quality before the extraction system was started. The extraction wells were sampled in August 1997 to provide information on water quality prior to system startup. Ecological sampling of surface water and sediment was performed in fall 1997.

The long-term monitoring plan for the Camp Allen Landfill groundwater remediation system calls for annual sampling of 49 wells and 5 stream locations for VOCs over 5 years, then sampling every 2 years thereafter. The first round of sampling was completed during May, 1999 and a second round of sampling was completed in March 2000. During the summer of 2000 aquifer pumping tests was completed and during the fall of 2000 groundwater modeling will be completed to delineate the extent of the capture zones for the individual extraction wells. In addition, the monitoring data and the system operational data collected by OHM Remediation Services Corp. (OHM) will be reviewed quarterly to assess the performance of the remediation system. Based on this review, both the treatment system operations and the monitoring program will be adjusted to optimize the efficiency of the system operations.

Site 2—NM Slag Pile

The NM Slag Pile, shown in Figure 2-2, is an approximately 1-acre disposal area for slag generated by an aluminum smelting operation. During the 1950s and 1960s, the Navy conducted aluminum smelting in the NM area of the Base. During the smelting operation, the slag pile area was defined by a lack of vegetation around the site. The surface of the site has since been regraded and vegetated. Currently, a portion of the slag pile area is covered by a gravel parking lot.

The potential for site contamination from metals, including chromium, cadmium, and zinc, was identified in the 1983 IAS. Trace amounts of inorganics were detected in surface soil, surface water and sediment samples taken during the 1988 Interim RI. However, the samples were taken after site regrading and placement of gravel surfacing at the site. Since these activities disturbed the surface soil, these analytical results may not be representative of potential subsurface contamination at the site.

The ongoing remedial investigation has indicated high levels of lead contamination in the subsurface soil as well as in the sediments. Sediment and surface soil sampling was conducted in February of 1998 to delineate the contamination limits for a sediment removal action. Figure 2-2 illustrates the boundaries for the sediment removal action at the site. Initially, sediment contamination was being addressed separately from other media through an engineering evaluation and cost analysis (EE/CA). Design plans and specifications for the sediment removal action were prepared in the spring and early summer

1998. The Final RI and FS documents for the entire site were completed in August and September 1998, respectively. A final Draft of the ROD was submitted in July, 1999. The Final Remedial Action Design for the sediment removal program was submitted in September, 1999. The sediments were removed in November 1999 and final asphalt paving was completed in February, 2000. However, final approval of the ROD has not been completed as of July, 2000.

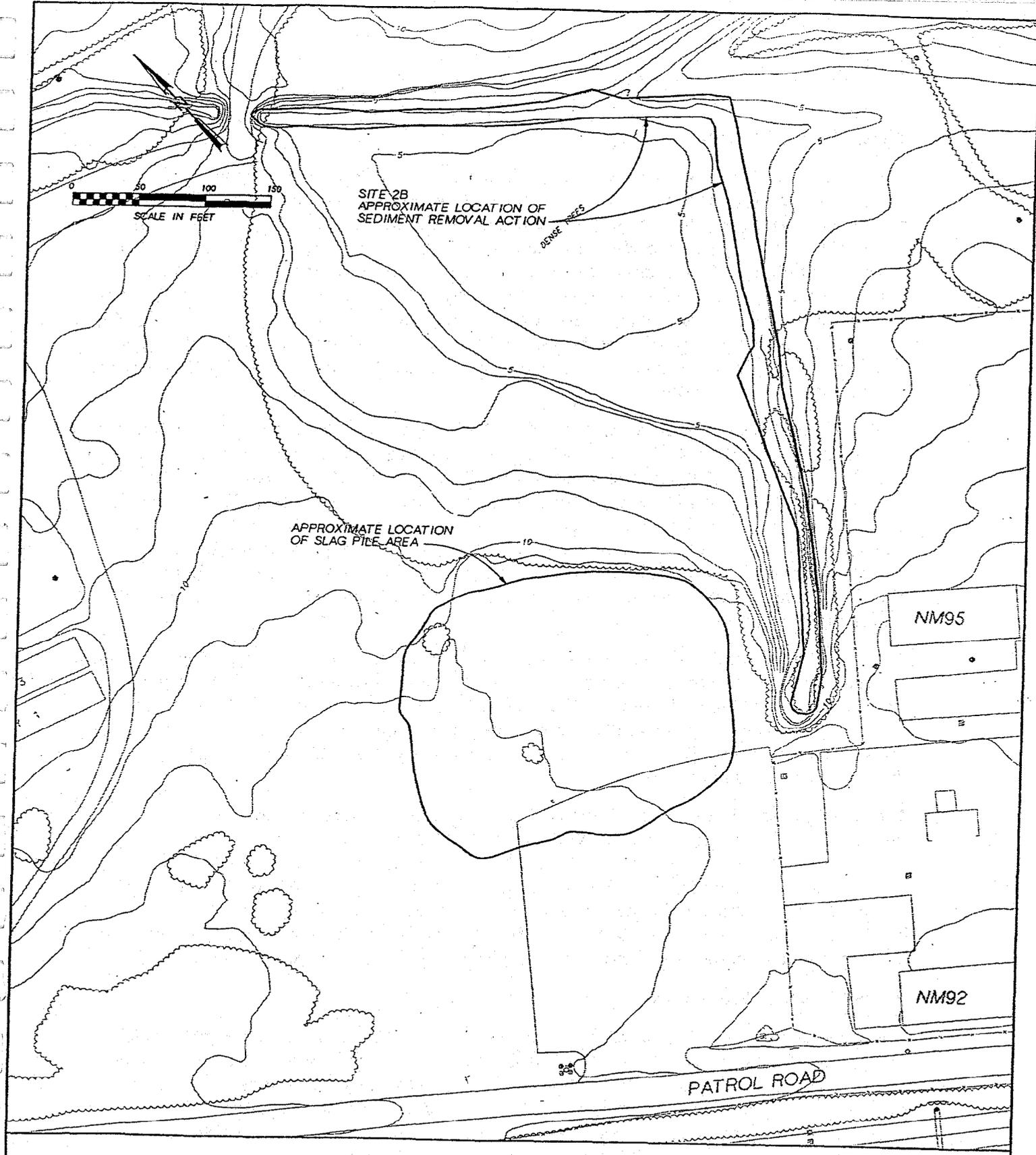


Figure 2-2
 SITE MAP
 SITE 2 - NM AREA SLAG PILE
 Naval Base Norfolk

Site 3—Q-Area Drum Storage Yard

The Q-Area Drum Storage Yard (QADSY), shown on Figure 2-3, was previously a compound that occupied approximately 5 acres in the northwest corner of the NBN near the carrier piers. This area of the NBN was created by dredging operations in the early 1950s. The QADSY was an open earthen yard that was used from the 1950s until the late 1980s to store tens of thousands of drums. Most of the drums contained new petroleum products, various chlorinated organic solvents, paint thinners, and pesticides. Previous investigations showed dark stains on the soil and oil-saturated soil throughout the storage yard, indicating past spills. The northern portion of the yard, which was used to store leaking or damaged drums and hazardous materials, was particularly stained. These drums have been removed, and the site is not currently used.

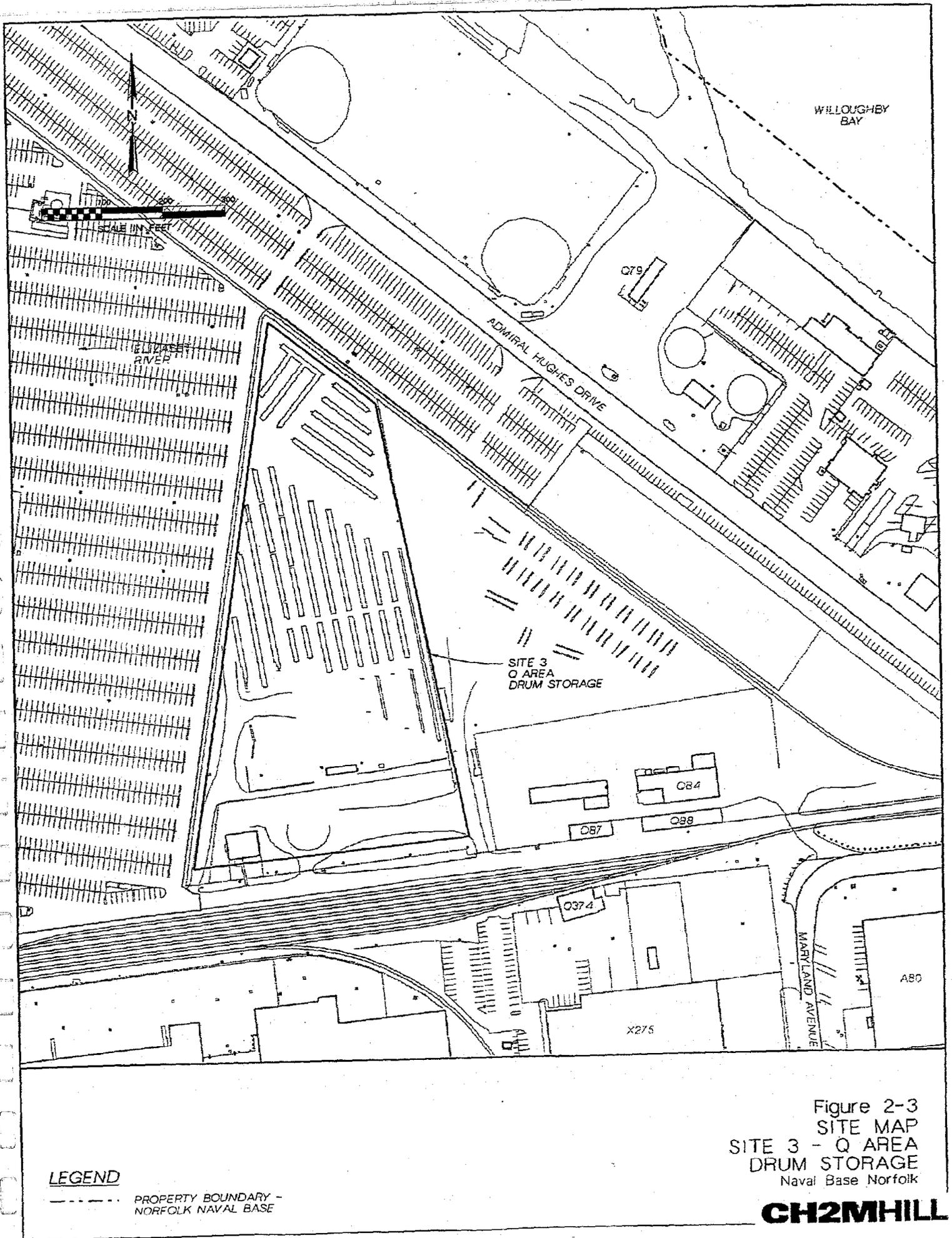
An RI/FS for this site was completed in 1996. The RI revealed soil contaminated with total petroleum hydrocarbons (TPH), VOCs, and pesticides. In addition, VOC contamination was found in onsite and offsite groundwater. The shallow groundwater beneath the hazardous materials (HM) area and the northern portion of the petroleum products (PP) area was the most severely affected. Some low VOC levels were also observed in the deep wells. This may be due to the lack of a confining layer between the two aquifers in this area. The general extent of the groundwater plume, which affects approximately 29 acres beneath the fleet parking area west of the site, has been defined with monitoring-well and direct-push groundwater sampling.

The Decision Document for the site was signed in November 1996 and calls for remediation by air sparging and soil-vapor extraction. A pilot treatability study was performed and the system was constructed. The remediation system began operations at AOC 2 and AOC 1 on August 18, 1998 and August 20, 1998, respectively. Several monitoring wells were sampled for VOCs in February 1998 and in May 1998 to provide baseline water-quality data before the remediation system was started.

The long-term monitoring plan for the QADSY currently includes the semi-annual sampling of 15 monitoring wells for VOCs and TRPH. The first two rounds of monitoring were completed in 5/99, 8/99 and 2/00. Based on the significant reduction of VOC concentrations during the first year of operation, the system operation was modified to a two week cycle of pulsing during September, 1999. The system operational data collected by OHM and the monitoring data collected by CH2M HILL will be reviewed quarterly so that the system operations and monitoring program can be adjusted as necessary.

Site 5—Pesticide Disposal Site

The Pesticide Disposal Site, located southeast of Building V-95, consists of a former french drain (as shown in Figure 2-4). A pest control shop was operated from the late 1960s until 1973 in the vicinity of Building V-95. Reportedly, approximately 100 gallons of pesticide rinse water used at this pest control shop was disposed of in a drain, along with intermittent discharge of over-age concentrated pesticides. The types of pesticides disposed of in the drain included chlordane, malathion, DDT, DDD, and dieldrin. The drain, referred to as a "former french drain," consists of a 28-inch-diameter culvert placed vertically into a gravel filled hole. The shop has since been demolished and its exact location is unknown. There is no visible sign of the former french drain on the ground surface, so it is referred as



WILLOUGHBY BAY

ELIZABETH RIVER

ADMIRAL HUGHES DRIVE

SITE 3
Q AREA
DRUM STORAGE

O84

O87

O88

O374

X275

MARYLAND AVENUE

A80

LEGEND

----- PROPERTY BOUNDARY -
NORFOLK NAVAL BASE

Figure 2-3
SITE MAP
SITE 3 - Q AREA
DRUM STORAGE
Naval Base Norfolk

CH2MHILL

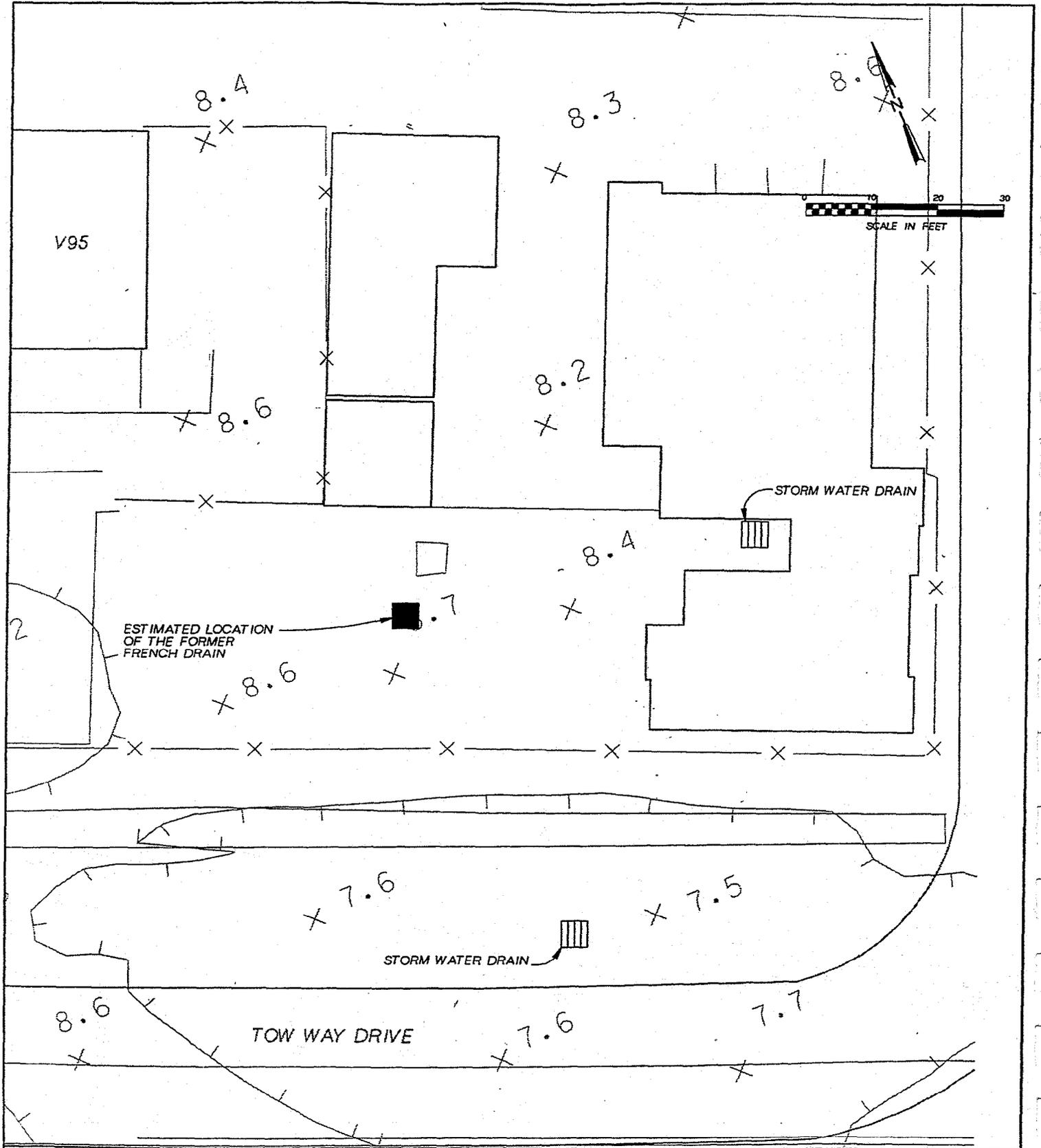


Figure 2-4
SITE MAP
SITE 5 - PESTICIDE DISPOSAL AREA
Naval Base Norfolk

the "former french drain" in figures. The location of the drain has been estimated based on previous investigations and a geophysical survey of the site. Currently, this area is fenced off and is used for storage of other materials.

A study performed in 1988 revealed pesticide contamination in the soil but no contamination of the shallow groundwater (one monitoring well was installed) in the vicinity of the site. The site soil analysis indicated elevated levels of all the pesticides noted above. Concentrations of DDT and DDD were highest in the surface soil and gradually decreased with depth.

An RI was conducted in the fall of 1996 (Phase I) and the spring of 1997 (Phase II). The focus of the RI was to characterize pesticide contamination around the location of the french drain. Pesticides were not detected in groundwater during the Phase I field investigation. During Phase II, concentrations of the pesticides DDT, DDD, and endrin that exceeded EPA Region III tap water risk-based concentrations (RBCs) were detected in a monitoring well installed directly adjacent to and downgradient of the french drain. A well 20 feet downgradient of the drain had no groundwater exceedances. Phase II surface soil samples had one detect of dieldrin that exceeded EPA Region III industrial soil RBCs. Phase II subsurface soil from the well boring directly adjacent to the french drain contained 4,4'-DDD that exceeded the RBC screening level for industrial soil.

A soil removal action was initiated in the spring of 1999 to remove the contaminated soil surrounding the drain and the removal of the drain. Based on the results of confirmation sampling, additional soil removal was completed in November, 1999. The final soil removal and site restoration was completed in December, 1999. A Closeout report will be completed in July, 2000.

Site 6—CD Landfill

The CD Landfill site occupies approximately 22 acres and is located just east of Hampton Boulevard and south of the Naval Exchange, as illustrated in Figure 2-5. The site incorporates two areas of landfilling operations; the easternmost (unpermitted) section and the western (permitted) section. The unpermitted portion of the landfill operated from 1974 to 1979 and was used for demolition debris and inert solid waste, fly ash, and incinerator residue.

In October 1979, the Naval Facilities Engineering Command received a permit from the Virginia Department of Health to use the landfill (western portion) for disposal of demolition debris and other non-putrescible wastes, excluding fly ash, incinerator residues, chemicals, and asbestos. Blasting grit used for sandblasting cadmium-plated aircraft parts was deposited at the landfill until 1981 when the blasting grit was tested and found to exceed the EP toxicity limit for cadmium. The grit was classified as a hazardous waste and onsite disposal of the material ceased. Landfilling operations continued in the western portion of the site until 1987. At the time the landfill permit was granted, a portion of the southeast corner of the site was removed and regraded to allow for runway expansion at the Naval Air Station (NAS). The design of the runway expansion specified that excess material was to be spread over the landfill and not removed from the site.

In 1993, Seabee Road was constructed over the site and opened to the public. Construction plans required only the addition of fill material; no cutting or grading into the existing

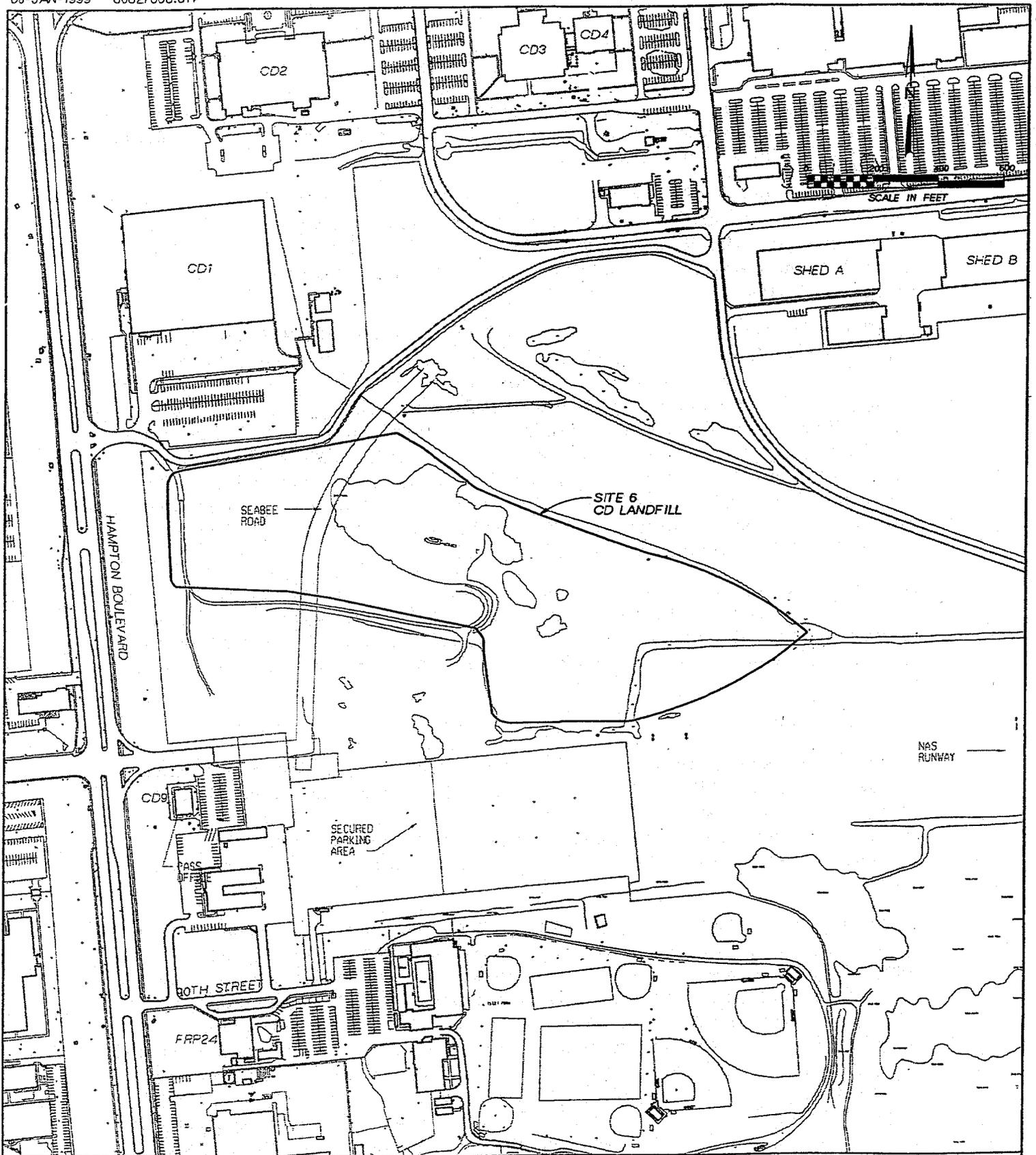


Figure 2-5
SITE MAP
SITE 6 - CD LANDFILL
Naval Base Norfolk

landfill occurred. Most of the existing debris mounds situated in the north-central portion of the landfill were leveled and spread around the site to reduce the amount of standing water which accumulated after rain events.

The results of several investigations guided the scoping of the RI, performed in 1993 and 1994. The RI was completed in three separate rounds of sampling. Soil, sediment, groundwater, and surface water samples were collected. As a result of the RI/RA Report, an FS was prepared in July 1996 to address contaminated media at the CD Landfill site. Potential risks associated with contaminants in the soil, sediments, and groundwater (including surface water) were identified and guided the development and evaluation of the media-specific remedial action alternatives. In addition to the FS, a separate geostatistical analysis was performed to evaluate and better define the areas of sediment contamination.

A Decision Document for OU1 was prepared in October 1996. This document outlined a removal action for sediments at the CD Landfill that exceeded the ER-M levels. Removal of heavy metal and pesticide-contaminated sediments was partially completed in the fall 1997 but was postponed during the winter because of inclement weather. When the OU2 landfill cap was designed, the cap was extended to cover the remaining contaminated sediments, so no further removal will be required. In June 1997, the Partnering Team agreed to an additional sampling event to characterize the fill material and determine closure requirements. A statistical sampling approach was developed to determine within a specified confidence interval whether the fill material would be classified as hazardous. All of the samples collected and analyzed during the June event were below the regulatory standards. Based on the statistical findings, the fill material at the CD Landfill is not considered a hazardous waste and it was agreed that the site would be closed under the under the Virginia Solid Waste Management Regulations for a construction/demolition/debris landfill.

A PRAP for OU2, issued June 1, 1998, identified the preferred alternative, a synthetic flexible liner capping system with groundwater monitoring with institutional controls, for the CD Landfill. The final ROD was issued on September 28, 1998. The final landfill cap design was issued in October 1998. The construction of the landfill cap was completed in December 1999. A Post-Closure Plan, completed in December 1999, requires post-closure groundwater and surface water monitoring, annual inspections and maintenance of the landfill's environmental controls for ten years after the closure was completed. The groundwater monitoring program consists of initially monitoring eight monitoring wells on a quarterly basis for one year than semi-annual monitoring for selected analytical parameters. The first two quarters of groundwater monitoring was completed in January and April, 2000.

Site 20—LP-20 Site

The LP-20 Site is one of many large buildings located northwest of the NAS main runway, as shown in Figure 2-6. Currently, the building houses the public works command's (PWC's) Transportation Department. In the past, a portion of the building was used for aircraft engine overhaul and maintenance, which included a cleaning shop and a metal-plating operation. A large fuel storage area, known as LP fuel farm, is located south of the building.

Previous investigations of adjacent property, including the LP fuel farm, led to the installation of a product recovery system. Groundwater monitoring in the area was instituted to measure the effectiveness of the product recovery system.

A PA/SI completed in 1991 identified TPH and chlorinated solvents in the groundwater east and south of the site. An RI/FS for the LP-20 Site was completed in 1996.

The November 1996 Decision Document for the site called for remediation by air sparging and soil-vapor extraction. The construction was completed and the system began operating in April 14, 1998. Several monitoring wells were sampled for VOCs in February 1998 to provide baseline water-quality data before the remediation system was started. As of December, 1999 over 3,600 pounds of VOCs were removed since system startup.

The long-term monitoring plan for LP-20 currently consists of semi-annual sampling of 15 monitoring wells VOCs. The first two rounds of the monitoring program were completed in 11/98, 5/99 and 2/00. The monitoring data showed that the VOC concentrations generally decreased by 25% to 75% since system startup. However, selected VOC concentrations remained above cleanup criteria. The monitoring data and system operations data will be evaluated on a quarterly basis to evaluate system performance and make adjustments as necessary.

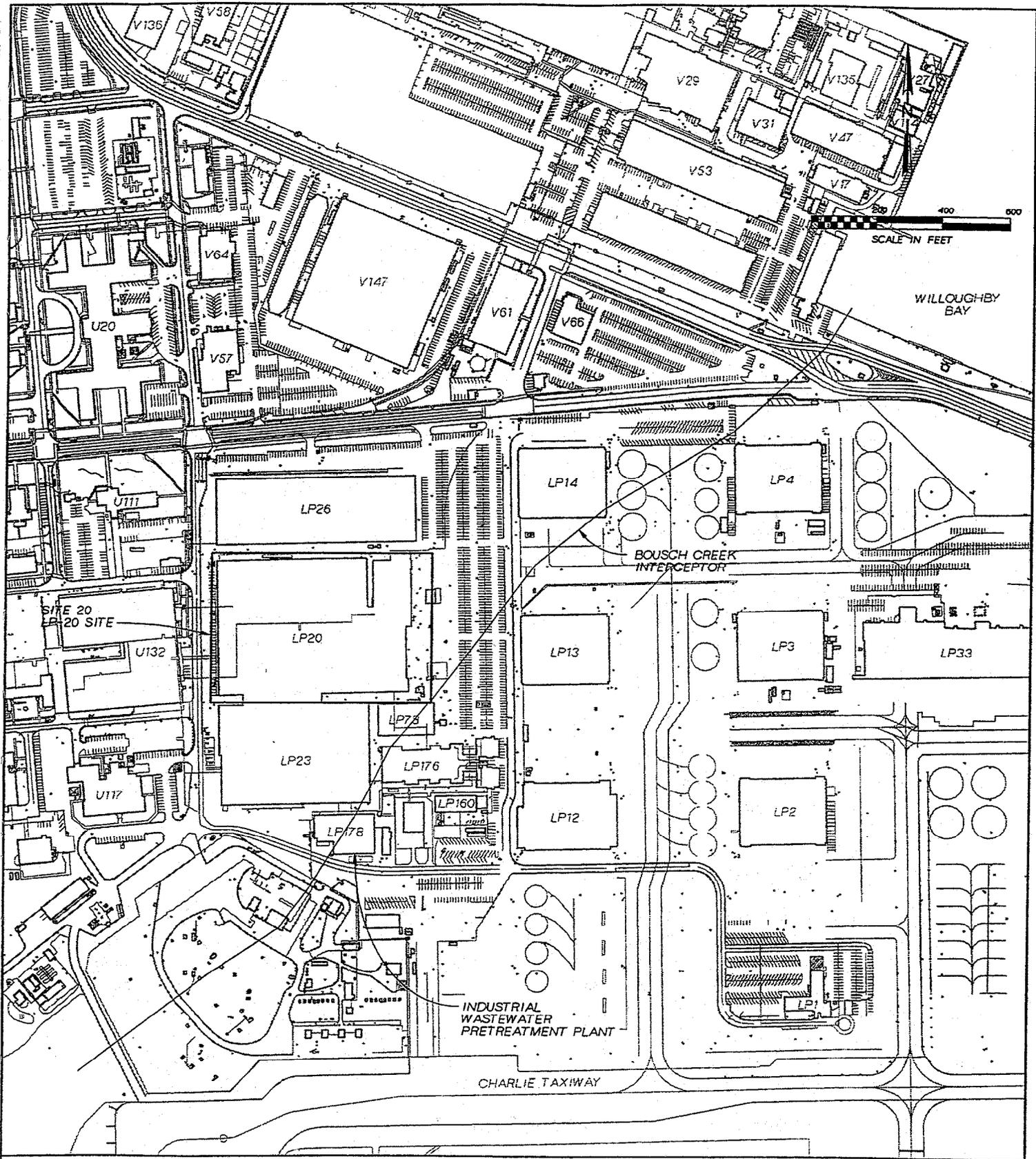


Figure 2-6
 SITE MAP
 SITE 20 - LP-20 SITE
 Naval Base Norfolk

Site 22—Camp Allen Salvage Yard

The Camp Allen Salvage Yard (CASY), operated from the 1940s until 1995 for salvaging and processing of scrap materials generated at Naval Base, Norfolk. The CASY is located between Area A and Area B of the Camp Allen Landfill Site, as shown on Figure 2-1. Figure 2-7 illustrates the layout of the CASY. CASY activities have included storage and management of waste oils and chemicals, used chemicals, and scrap industrial/commercial equipment. Metal smelting and miscellaneous burning also occurred at the CASY. Various recycling activities have been performed at the salvage yard. The facility was also used to store acids, paint thinners, solvents, pesticides, and transformers. A PCB spill occurred at the CASY in 1989 when a transformer was damaged by a forklift. The PWC responded to the spill and conducted a preliminary cleanup at that time.

A PA/SI was completed for the CASY in May 1994. The investigation results indicated that surface soil and subsurface soil were contaminated with polychlorinated biphenyls (PCBs), pesticides, and metals. The shallow and deep groundwater aquifers in the vicinity are known to be contaminated as shown from the results of the RI at the Camp Allen Landfill. However, groundwater contamination in the area will be addressed by the Camp Allen Landfill cleanup action currently being implemented.

The extent of other contamination at this site is being addressed through the RI/FS. A soil removal action was conducted for a portion of the site in the summer/fall of 1998. However, during confirmatory investigations, elevated cadmium levels were found at the site. Additional supplemental investigation activities were conducted to further delineate contaminant levels at the site. Additional sampling was conducted in December 1998 to fill gaps in the historical data from the northern portion of the CASY.

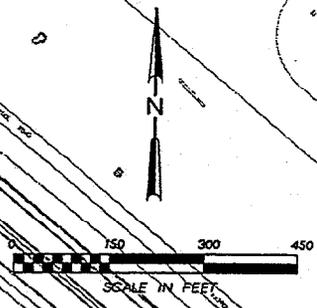
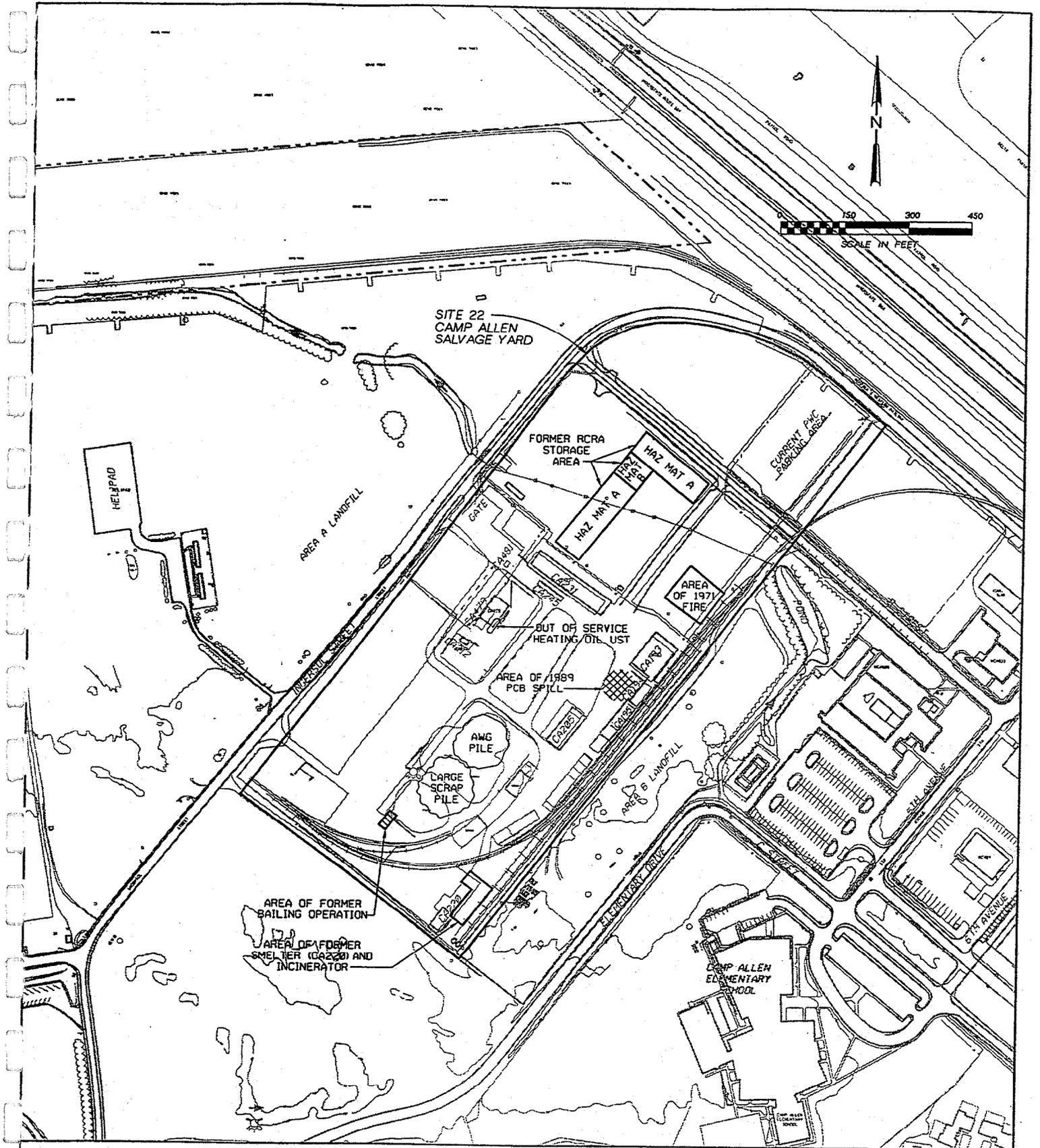
→ A Draft ROD was submitted in October 1999. The Final RI Report and Risk Assessment were submitted in November, 1999. A Proposed Remedial Action Plan for the Northern Area is currently being developed by Baker Environmental..

2.2 Solid Waste Management Units

The solid waste management unit (SWMU) sites currently not closed out or recommended for no further action are described in this section. These SWMUs are listed as SSAs or AOCs in the FFA (see Sections 1.4.3.4 and 1.4.3.5). The following site descriptions include physical characteristics, past activities, detected contaminants, and future remediation plans for each site. As previously stated, a SI is currently in progress for SWMUs 9, 10, 12, 14, 16, 28, 32, 33, 34, 35, 38, 40, 41, and 42. The objectives of the SI are to determine the extent of contamination at each SWMU, to develop and evaluate economically feasible remedial alternatives for remedial action at contaminated SWMUs, and to close out qualified sites.

SWMU 2—Building Z-309 Former Ash Hopper Storage Area

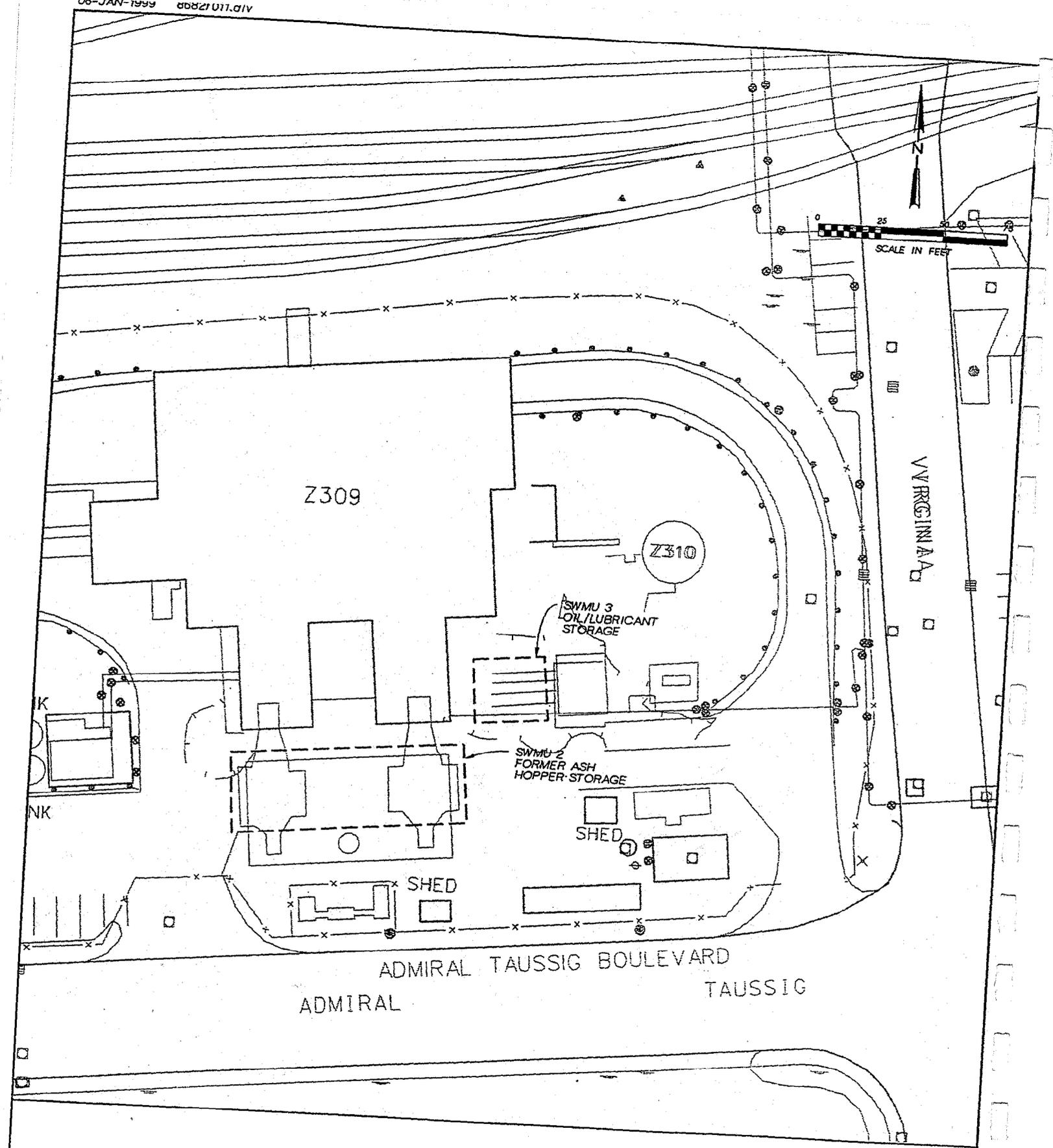
This unit is located adjacent to Building Z-309, in the western portion of the Base, as shown in Figure 2-8. This unit managed ash from boiler operations and operated from 1967 until 1986 when the Building Z-309 salvage fuel boilers ceased burning municipal waste; the site was identified as M-13/14 in the RFA. This unit received ash from boiler operations in



LEGEND

-  AREA OF KNOWN PCB SPILL
-  PROPERTY BOUNDARY - NORFOLK NAVAL BASE

Figure 2-7
 SITE MAP
 SITE 22 - CAMP ALLEN SALVAGE YARD
 Naval Base Norfolk



LEGEND

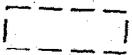
 ESTIMATED EXTENT OF SOLID WASTE MANAGEMENT UNIT

Figure 2-8
 SITE MAP
 SWMU 2 - BUILDING Z-309
 FORMER ASH HOPPER AND
 SWMU 3 - BUILDING Z-309
 OIL/LUBRICANT STORAGE
 Naval Base Norfolk

Building Z-309 and was emptied daily while in operation. Collected ash was sent to an off-site solid waste landfill. This unit is a steel hopper approximately 30 feet by 30 feet and elevated 12 to 15 feet off the ground. It is underlain by a concrete base sloped to a drain, and is surrounded on three sides by a 3-inch asphalt berm. Black stains were observed on the concrete base below this unit. This portion of Z-309 was demolished in the rehabilitation of the facility in 1998.

In the RFA, a moderate potential for release to the soil/groundwater was determined due to the presence of soil surrounding the concrete pad. It was recommended that soil sampling be performed at this unit to determine if a release of contaminants from the unit has occurred. Analysis of soil samples for metals and semivolatiles was recommended. Sampling and analysis of the surface and subsurface soil were performed in 1995-1996 during the RRR studies.

During May 2000 a Closeout Report was approved by the Naval Station Norfolk Partnership and a consensus was reached by the Partnership that no further action is required at SWMU 2 and the land use will be unrestricted. The rationale for the no further action were: 1) the only RBC exceedences were for soils, there were no exceedences in groundwater, 2) the samples were collected prior to renovation, 2) the ash hopper was removed to below grade in 1997, and 3) the site was renovated with new backfill and pavement.

SWMU 3—Building Z-309 Oil/Lubricant Storage Area

This area is located adjacent to Building Z-309 (see Figure 2-8) in the northwest portion of the Base. The area was used for storage of oils and lubricants used in the Z-309 area; the site was identified as AOC B in the RFA. Drums were stored horizontally on racks approximately 18 inches above a soil and gravel base. The area has a 2-foot wide by 6-inch berm on one side. The base of the area directly underneath the drums was observed to be heavily stained and partially covered with absorbent. Drip pans were present beneath the drum racks. This portion of Z-309 was demolished in the rehabilitation of the facility in 1998.

In the RFA, a high potential for release to the soil and groundwater was determined due to the presence of heavily stained soil beneath the drum racks. Soil sampling was recommended at this unit to determine if a release of contaminants from the unit has occurred. Analysis of soil samples for semivolatiles was recommended. Soil and groundwater sampling was performed in 1995 during the RRR study. Additional surface soil sampling was performed in 1996 during the Phase II RRR study. Semivolatile organic compounds (SVOCs) were detected in the soil during both sampling events. SWMU 3 will be investigated with SWMU 2 as an AOC in accordance with the FFA. After further analysis of the site, comprehensive recommendations regarding further actions will be made.

During May 2000 a Closeout Report was approved by the Naval Station Norfolk Partnership and a consensus was reached by the Partnership that no further action is required at SWMU 3 and the land use will be unrestricted. The rationale for the no further action were: 1) the only RBC exceedences were for soils, there were no exceedences in groundwater, 2) the samples were collected prior to renovation, 2) the Oil/Lube Storage Area was removed to below grade in 1997, and 3) the site was renovated with new backfill and pavement.

2.2.1 Additional Non-IRP Sites in Basewide Inventory

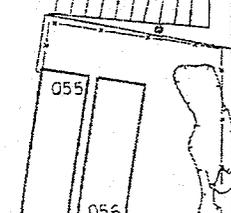
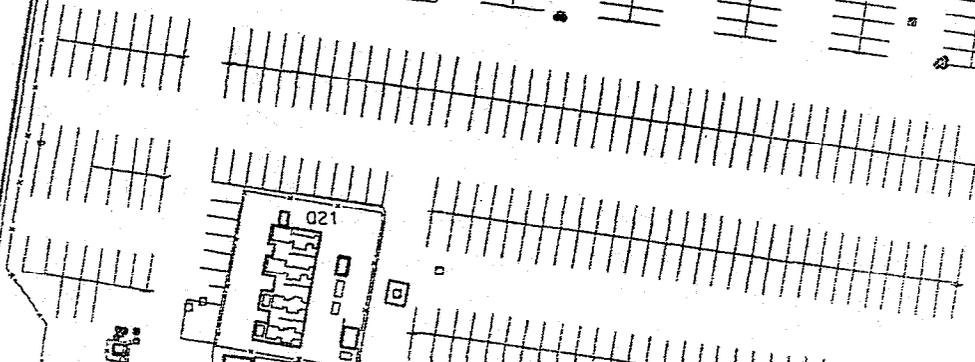
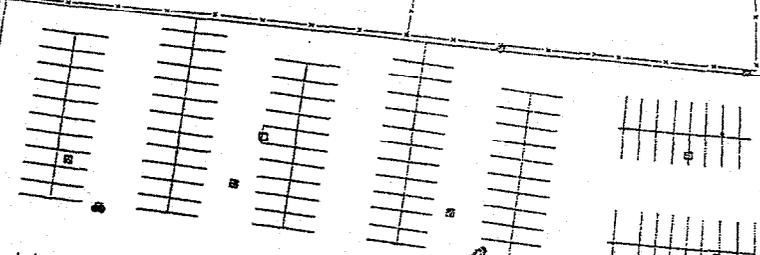
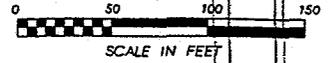
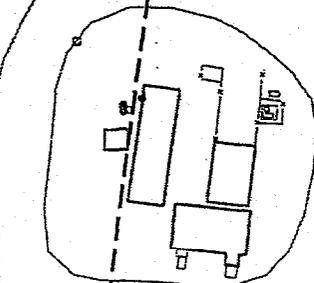
SWMU 4—PWC Sandblast Area

This area is located in the northwestern corner of the NBN adjacent to Building Q-72 and is shown in Figure 2-9. The site, identified as M-19/20 I in the RFA and WDA-1 in the EPIC study, is adjacent to the Elizabeth River and has been used to perform sandblasting of barges since 1972. Sandblasting grit was observed on the soil in the vicinity of the site. The site is approximately one-half acre and is underlain by soil. Stormwater runoff and spray from operations at the site discharge to the Elizabeth River. This discharge is allowed by a National Pollution Discharge Elimination System (NPDES) permit for the site.

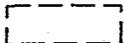
ELIZABETH RIVER

Q72

SWMU 4
PWC SANDBLAST AREA



LEGEND



ESTIMATED EXTENT OF SOLID WASTE MANAGEMENT UNIT



PROPERTY BOUNDARY - NORFOLK NAVAL BASE

Figure 2-9
SITE MAP
SWMU 4 - PWC SANDBLAST AREA
Naval Base Norfolk

CH2MHILL

The site previously stored sandblasting grit generated from the sandblasting of barges. Indications are that this material migrates to the Elizabeth River during periods of precipitation. Sampling and analysis were performed in 1995 during the RRR study and a "high" risk for soil was identified.

A SWMU Confirmatory Investigation (CI) was performed at SWMU 4 late in 1996. The results indicated metals and SVOC contamination in the soil. Based upon these data, the partnering team identified SWMU 4 as warranting further investigation. Because SWMU 4 is currently an active site it will be investigated as an SSA at a later date in accordance with the FFA.

SWMU 6—Building V-28 Waste Pit

This site consists of a subsurface concrete pit used to hold wastes from a metal-plating shop within Building V-28, which was demolished in 1998. Figure 2-10 illustrates the location of V-28 Waste Pit identified as M-31 in the RFA. The ground surface of the entire area is covered with approximately 6 inches of concrete. The area is located between Buildings V-28 and V-4. Willoughby Bay is located approximately 200 feet north of the site.

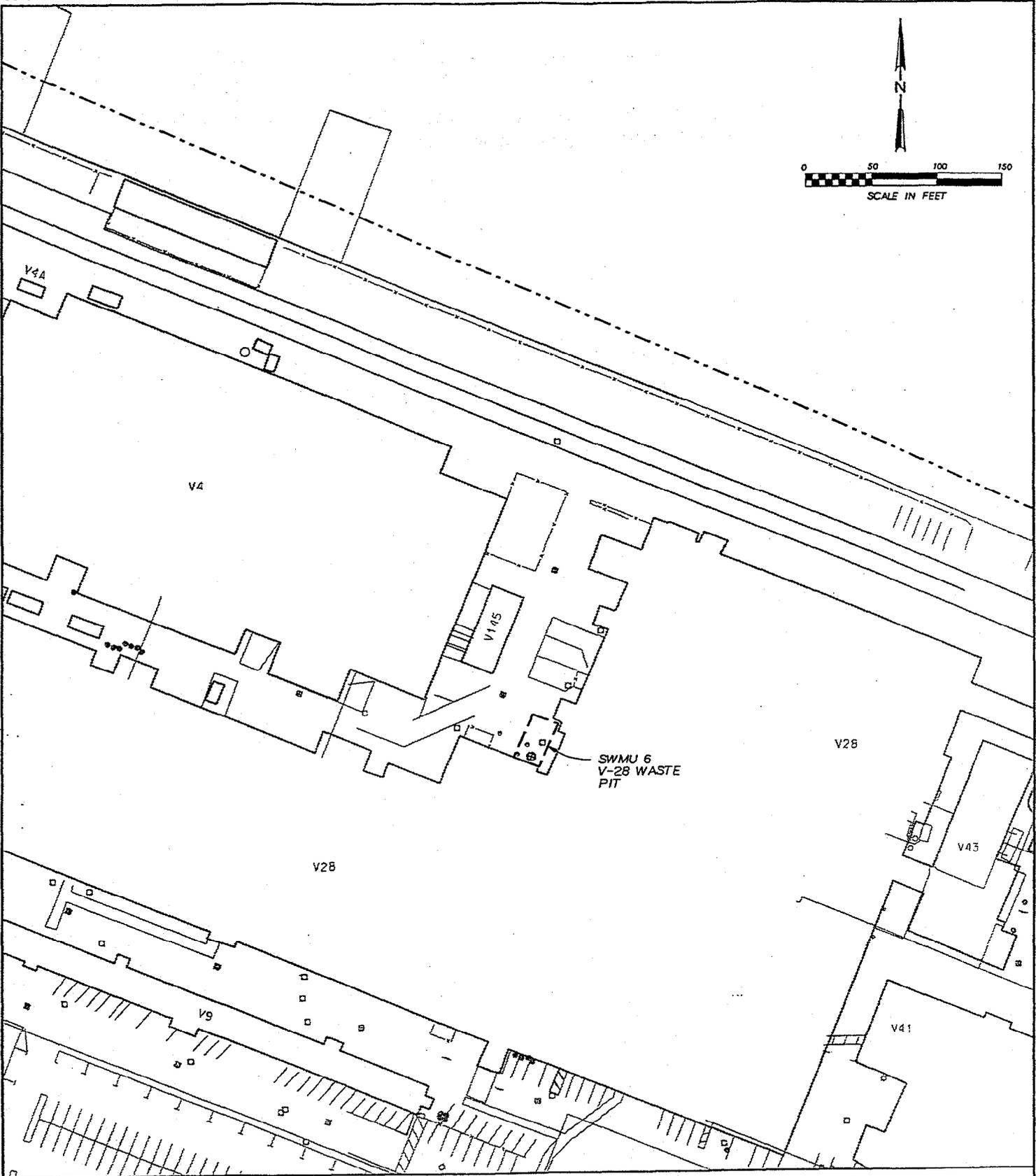
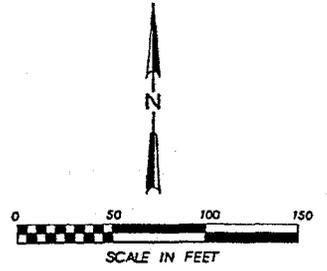
The concrete sump located outside of Building V-28 was used to collect metal plating wastes. The plating operations were discontinued in late 1987. No history of releases is associated with this unit. Sampling and analysis of the groundwater and subsurface soil were performed in 1995 during the RRR study and a "medium" risk was identified for groundwater. A SWMU CI was performed at SWMU 6 late in 1996. The results indicated lead contamination in the groundwater and 1,1-DCE was detected in the furthest downgradient well. Based on this information, A SWMU Supplemental Investigation was completed in July 1998 which detected lead, arsenic, and 1,1-DCE in the groundwater at levels above the RBCs. As a result, additional investigations were conducted during the spring of 2000 and a Supplemental Investigation Report for these investigations is scheduled to be completed in the fall of 2000.

SWMU 8—Fire Fighting School

The Fire Fighting School (FFS) is located in the extreme southwest portion of the NBN, near the Norfolk International Terminal (Figure 2-11). The area is used by Navy personnel to train personnel in extinguishing various types of fires under a variety of conditions. Aerial photographs from 1949 through 1990, which were evaluated during the EPIC, study indicated petroleum staining of the surface at the site. This site was identified as WDA-20 in the final EPIC report. This staining is likely from fuel oil used in fire fighting training activities. In 1991-1992, the portions of FFS facility were demolished and reconstructed with more efficient and more environmental friendly fuel sources for the fire fighting training devices. A key feature of the site is the presence of a slurry wall constructed to separate the "new" and "old" areas of the site. The fire training sites are surrounded by drainage basins to collect water runoff and access to the site is restricted during nonworking hours.

In the "old" area, there are three fire pits and two buildings that were used to practice fire fighting techniques. The ground surface is entirely covered with asphalt and concrete. Site sampling and analysis was done in the "old" area in 1995 during the RRR study and a "high" risk was identified for groundwater. A SWMU CI was performed at SWMU 8 late in 1996. Benzene and 1,2-DCA were detected in the groundwater in concentrations exceeding

the RBCs for tap water. PWC Norfolk completed remediation and closure of the "old" portion of the site under the UST Program. Remedial action at the site included:



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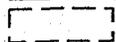
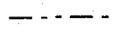
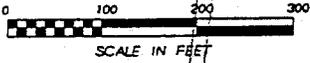
-  ESTIMATED EXTENT OF SOLID WASTE MANAGEMENT UNIT
-  PROPERTY BOUNDARY - NORFOLK NAVAL BASE

Figure 2-10
 SITE MAP
 SWMU 6 - V-28 WASTE PIT
 Naval Base Norfolk



SCALE IN FEET

SWMU 8
FIRE TRAINING
SCHOOL

NINTH ST.

APPROXIMATE LOCATION
OF SLURRY WALL

SDA327

SDA287

SDA286

SDA328

SDA329

SDA330

BURN
PITS

RAILROAD

STREET

EIGHTH

STREET

EIGHTH

STREET

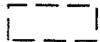
"NEW AREA"

"OLD AREA"

SEVENTH STREET

STREET

LEGEND



ESTIMATED EXTENT OF SOLID
WASTE MANAGEMENT UNIT



PROPERTY BOUNDARY -
NORFOLK NAVAL BASE

Figure 2-11
SITE MAP
SWMU 8 - FIRE FIGHTING SCHOOL
Naval Base Norfolk

- Demolition of training buildings, concrete pads, and other obsolete structures
- Flush and clean underground pipelines
- Disconnect and cap exposed pipe inlets and valves
- Clean, fill, and close the oil/water separator and containment pits
- Perform sampling when soil is visibly stained
- Cap site with asphalt covering

Six USTs have already been removed and soil samples were collected under four of the USTs. The samples were analyzed for TPH and benzene, toluene, ethylbenzene, and xylene (BTEX) constituents and the results were below the state permit limit. PWC is preparing site characterization reports.

Based on the uncertainty of slurry wall construction, whether any contamination exists on the "new" side of the slurry wall, the extent of remedial actions that have been conducted in the "new" area, and other environmental concerns, the partnering team decided to designate the site as two operable units with the "new" area listed as a Findings of Fact site and the "old" area as an SSA area in the FFA.

Based on the results of the Confirmation Study, additional groundwater investigations were completed during August 1999. Groundwater samples were collected at four locations and at three depths per each location. The results of the investigation revealed that, with the exception of low levels of a few petroleum-related constituents, the VOC concentrations detected were below the RBCs. As a result, the Tier I Partnering Team reached a consensus at the December 1999 meeting that the site should be classified as a no further action site. The Site Closure Report is scheduled to be completed in September 2000.

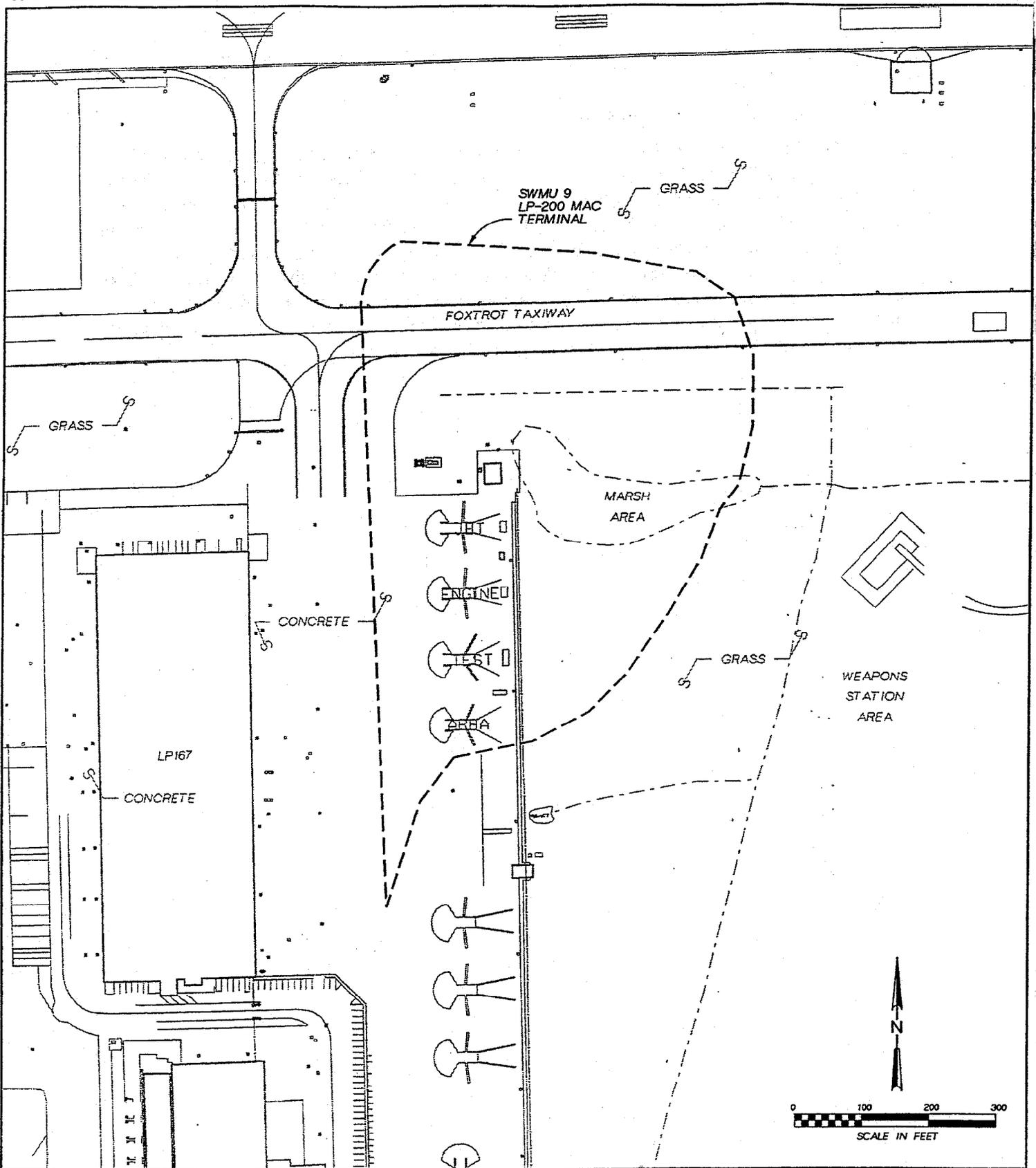
SWMU 9—LP-200 MAC Terminal

The LP-200 MAC Terminal area is located east of Building LP-167 and south of the taxiway for Runway 28 (Figure 2-12). Aerial photographs from 1949 through 1954 evaluated during the EPIC study indicate a solid waste and fill disposal area consisting of coarse-textured materials with possible discarded objects visible. This site was identified as WDA-328/29 in the final EPIC report. The area immediately east of Building LP-167 has a concrete surface and is used as a run-up area for jet engine aircraft. The land located east of the engine run-up area is grass covered and is drained by a surface water drainage ditch that parallels the taxiway. From the vegetation present along the ditch, it appears that the ditch is wet year round. Access to this area is restricted to personnel performing aircraft maintenance activities.

Sampling and analysis of the surface soil were performed in 1995 during the RRR study. After further analysis of the site, SWMU 9 was investigated with SWMU 10 as an AOC under the FFA. A Supplemental SWMU Investigation for this AOC, completed in July 1998, detected concentrations of arsenic, iron and thalium in the groundwater at levels exceeding the RBCs. As a result, subsequent investigations have been completed in 1999 and 2000 to evaluate the groundwater impacts at this site. The Supplemental Site Investigation Report for the investigation is scheduled to be completed in the fall of 2000.

SWMU 10—LP-200 MAC Terminal East

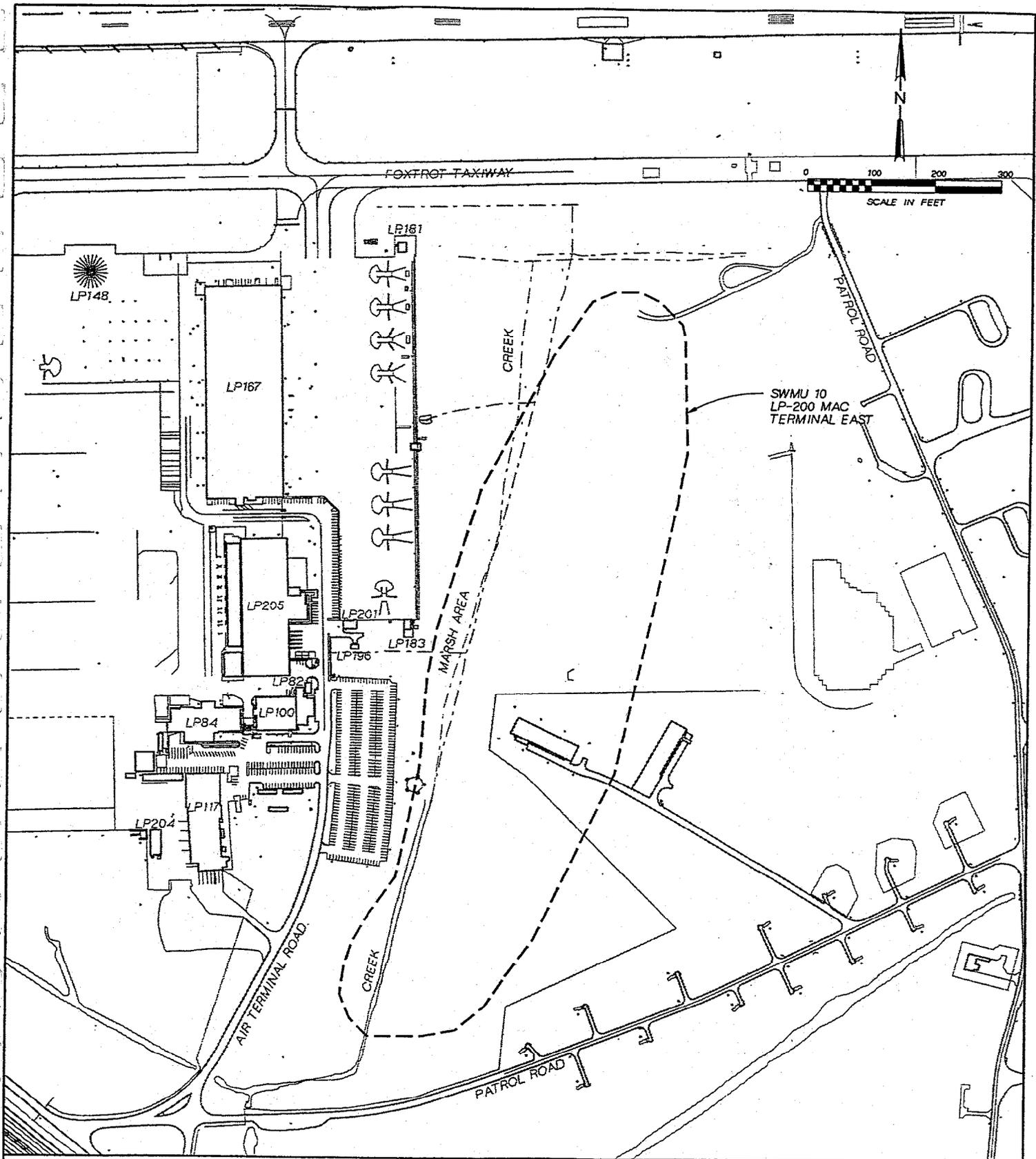
The LP-200 MAC Terminal East is shown in Figure 2-13. Aerial photographs from 1954 through 1990 evaluated during the EPIC study indicate small disturbed and graded areas with possible disposal activities observed at various locations. This site was identified as WDA-31/32/35 in the final EPIC report. The site extends from the MAC Terminal parking area, northward to just south of the Runway 28 taxiway. The site includes a portion of the Weapons Station near Building NM-25. The site is entirely grass or shrub covered. Portions of the site are mowed periodically in the vicinity of the MAC Terminal and Building NM-25. A drainage ditch intercepts the southern portion of the site and then parallels the western boundary. The drainage ditch is influenced by the tide.



LEGEND

 ESTIMATED EXTENT OF SOLID WASTE MANAGEMENT UNIT

Figure 2-12
 SITE MAP
 SWMU 9 - LP-200 MAC TERMINAL
 Naval Base Norfolk



LEGEND

ESTIMATED EXTENT OF SOLID
 WASTE MANAGEMENT UNIT

Figure 2-13
 SITE MAP
 SWMU 10 - LP-200 MAC TERMINAL EAST
 Naval Base Norfolk

Sampling and analysis of the surface soil and groundwater were performed in 1995-1996 during the RRR studies. After further analysis of the site, SWMU 10 was investigated with SWMU 9 as an AOC under the FFA.

A Supplemental SWMU Investigation for this AOC, completed in July 1998, detected concentrations of arsenic, iron, manganese nickel and thallium in the groundwater at levels exceeding the RBCs. As a result, subsequent investigations have been completed in 1999 and 2000 to evaluate the groundwater impacts at this site. The Supplemental Site Investigation Report for the investigation is scheduled to be completed in the fall of 2000.

SWMU 12—Disposal Area Near NM-37

Figure 2-14 illustrates the location of the disposal area near building NM-37. An aerial photograph from 1958 evaluated during the EPIC study indicates a possible disposal area marked by ground surface scarring. This site was identified as WDA-36 in the final EPIC report. Building NM-37 is a vehicle maintenance building located within the Weapons Station area. The facility services trucks, forklifts, and other military vehicles within the Weapons Station. The ground surface in the immediate vicinity of Building NM-37 is covered with an asphalt surface. The surrounding area is well vegetated and heavily wooded. The facility operates two Hazardous Waste Accumulation Areas (HWAAs). One is a metal container that is apparently used to store fuel for mowers, oils, and hydraulic fluids. This HWAA is located directly north of the building. The second area is a hazardous waste storage area located on the northwest side of the building. This HWAA is used for the storage of solvents and paints. The HWAA has a concrete block wall approximately 2 feet high and is enclosed on three sides by a chain-link fence. It is covered by an aluminum roof and has a concrete floor for containment.

Sampling and analysis of the surface soil were performed in 1995-1996 during the RRR studies. After further analysis of the site, SWMU 12 was investigated with SWMU 16 as a SSA under the FFA. A supplemental SWMU investigation for this SSA, completed in July 1998, detected arsenic and iron concentrations in the soils above the RBCs. In addition, Dieldrin, chloroform, arsenic and thallium were detected in the groundwater at levels exceeding the RBCs. The investigation recommended institutional controls to restrict access to this area. A geophysical survey was completed at the site in July, 2000. Based on the results of this study, a supplemental investigation of the site will be completed in the fall of 2000.

SWMU 14—Q-50 Satellite Accumulation Area

The Q-50 Satellite Accumulation Area is located in the northeast corner of the NBN, as shown in Figure 2-15. The site consists of a grass-covered field and a concrete storage approximately 15 feet by 25 feet. Q-50 was a 90-day HWAA where waste generated throughout the base was processed (sampled, identified, labeled, and packaged) before being shipped to storage and eventual disposal. The site was identified in the RFA as C-17. Petroleum staining at several areas was observed during previous site visits.

Sampling and analysis of the surface soil were performed in 1995 during the RRR study. Additional surface soil and groundwater sampling was performed in 1996 during the Phase II RRR study. VOCs, SVOCs, pesticides, and PCBs were detected in the soil and groundwater.

A SWMU Supplemental Investigation was completed in July 1998 which detected several VOCs, SVOCs, PCBs, antimony, barium and lead in the groundwater at levels above the RBCs. As a result, additional investigations have been conducted in 1999 and 2000 to assess the extent of groundwater impacts. The report for these investigations is scheduled to be completed in the fall of 2000.

SWMU 16—NM-37 Accumulation Area

The NM-37 Accumulation Area contains stressed vegetation and is located northeast of building NM-37, as shown in Figure 2-14. The site was identified in the RFA as C-54. Building NM-37 is a vehicle maintenance building located within the Weapons Station area.

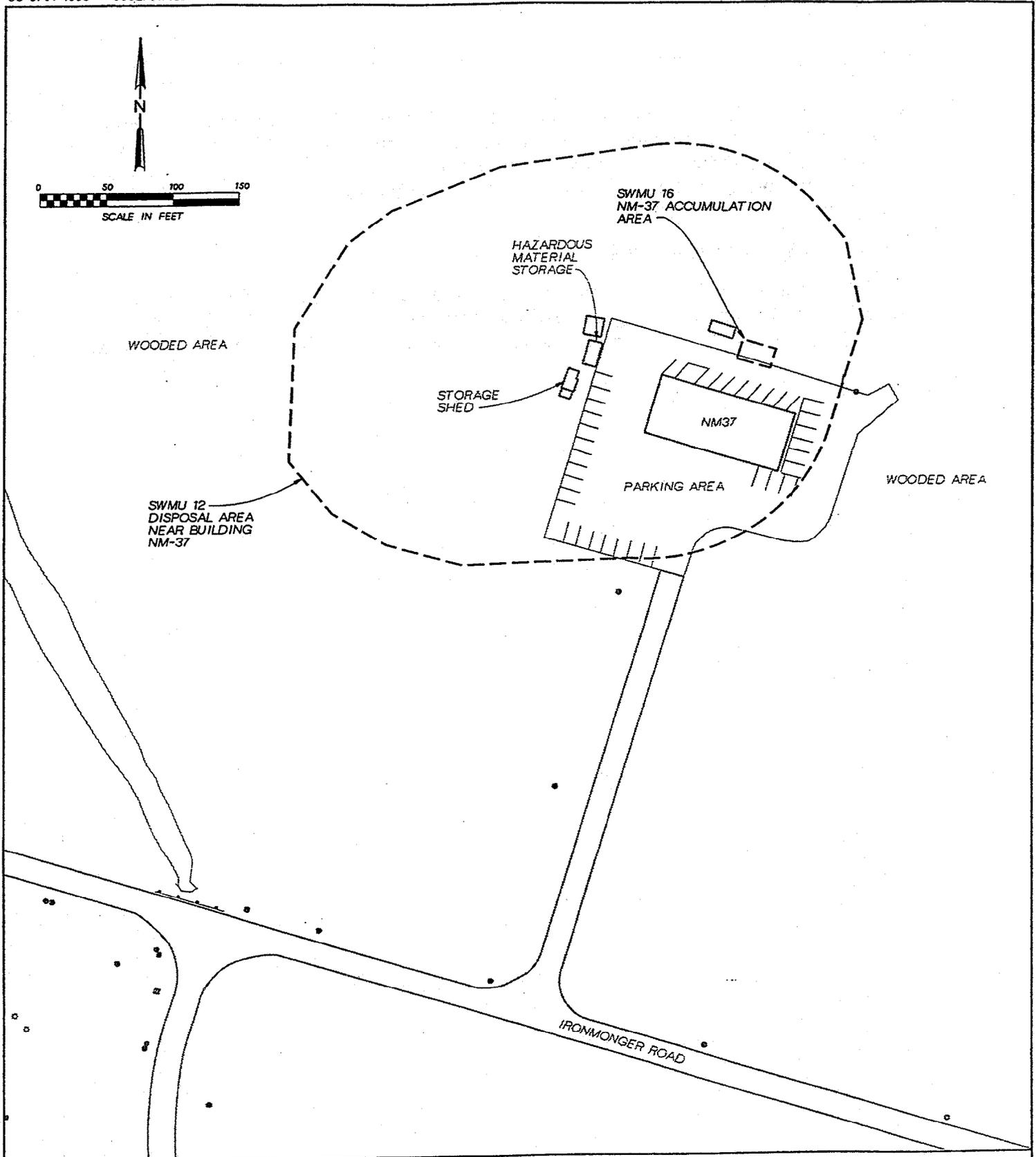
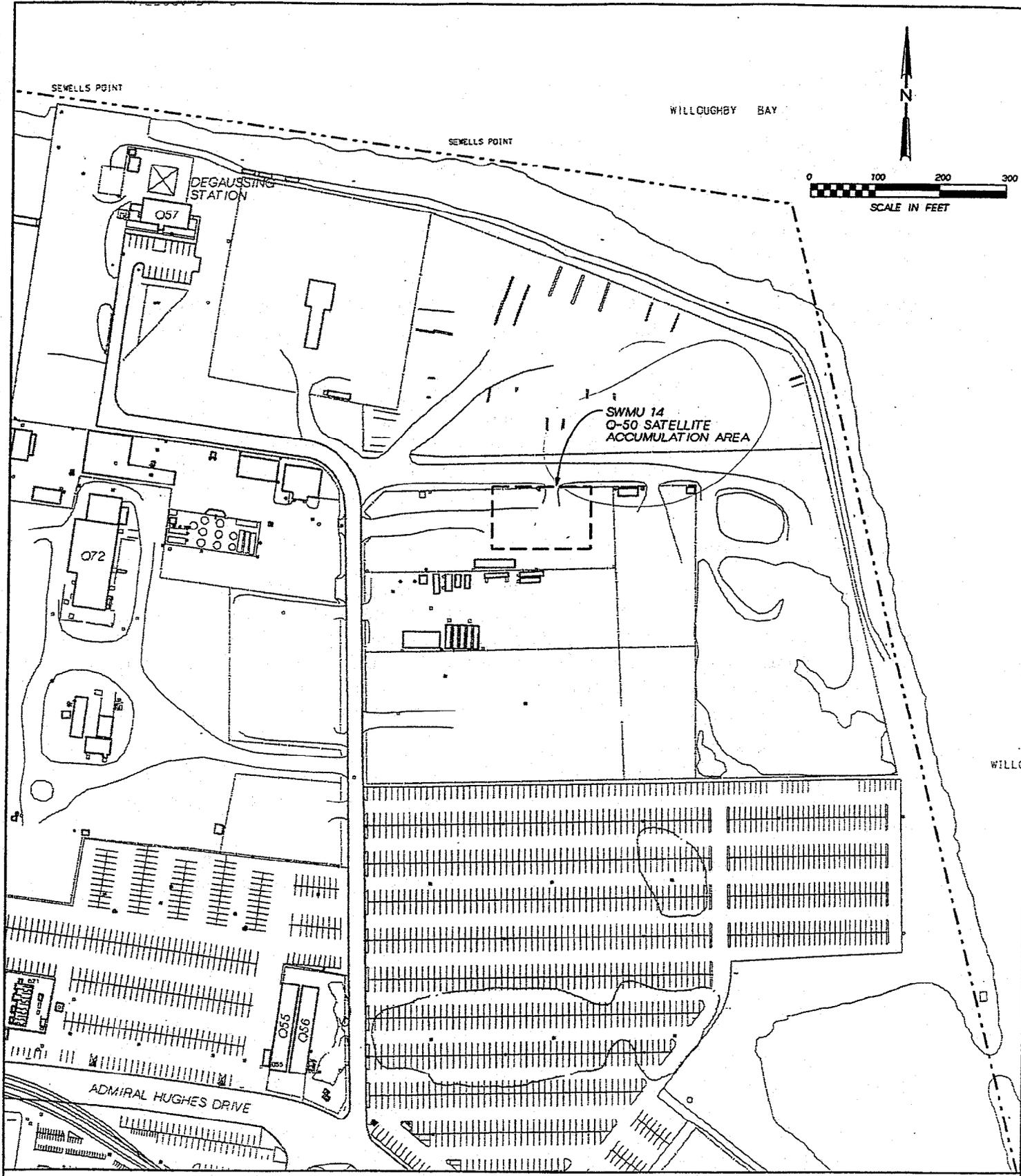


Figure 2-14
 SITE MAP
 SWMU 12 - DISPOSAL AREA
 SWMU 16 - ACCUMULATION AREA
 NEAR BUILDING NM-37
 Naval Base Norfolk



LEGEND

-  ESTIMATED EXTENT OF SOLID WASTE MANAGEMENT UNIT
-  PROPERTY BOUNDARY - NORFOLK NAVAL BASE

Figure 2-15
SITE MAP
SWMU 14 - Q-50 SATELLITE
ACCUMULATION AREA
Naval Base Norfolk

The facility services trucks, forklifts, and other military vehicles within the Weapons Station. The ground surface in the immediate vicinity of Building NM-37 is covered with an asphalt surface. However, the surrounding area is well vegetated and heavily wooded.

The NM-37 Accumulation Area is designated to accumulate waste materials. Although there is no history of releases, areas of stressed vegetation were observed during earlier site visits. Sampling and analysis of the surface soil and groundwater were performed in 1995 during the RRR study and a risk of "low" was identified for soil and groundwater. Additional surface soil sampling was performed in 1996 during the Phase II RRR study.

A supplemental SWMU investigation for this SSA, completed in July 1998, detected arsenic and iron concentrations in the soils above the RBCs. In addition, dieldrin, chloroform, arsenic and thallium were detected in the groundwater at levels exceeding the RBCs. A geophysical survey was completed at the site in July, 2000. Based on the results of this study, a supplemental investigation of the site will be completed in the fall of 2000.

SWUM 28—Probable Solid Waste Disposal South of CEP 201

The SWMU is located on an asphalt surface south of Building CEP 201 and is shown in Figure 2-16. An aerial photograph from 1982 evaluated during the EPIC study indicates a solid waste and disposal area with dark-toned mounds of material, debris, and probable earthen materials intermixed with debris. This site was identified as WDA-11 in the final EPIC report. This area is a storage facility for large objects or equipment awaiting shipment. Tractor trailers are also kept in the area until they are needed for material transportation.

Sampling and analysis of the subsurface soil were performed in 1995 during the RRR study and a risk of "low" was identified for ecology in the surface water. A supplemental SWMU investigation for this AOC, completed in July 1998, detected levels of benzo(a)pyrene and arsenic in the soils that exceeded the RBCs.

In May, 2000 the Naval Station Norfolk Tier I Partnership approved the Streamlined Risk Assessment Report for SWMU 28 and reached a consensus that "no further action is required and the land use will be unrestricted."

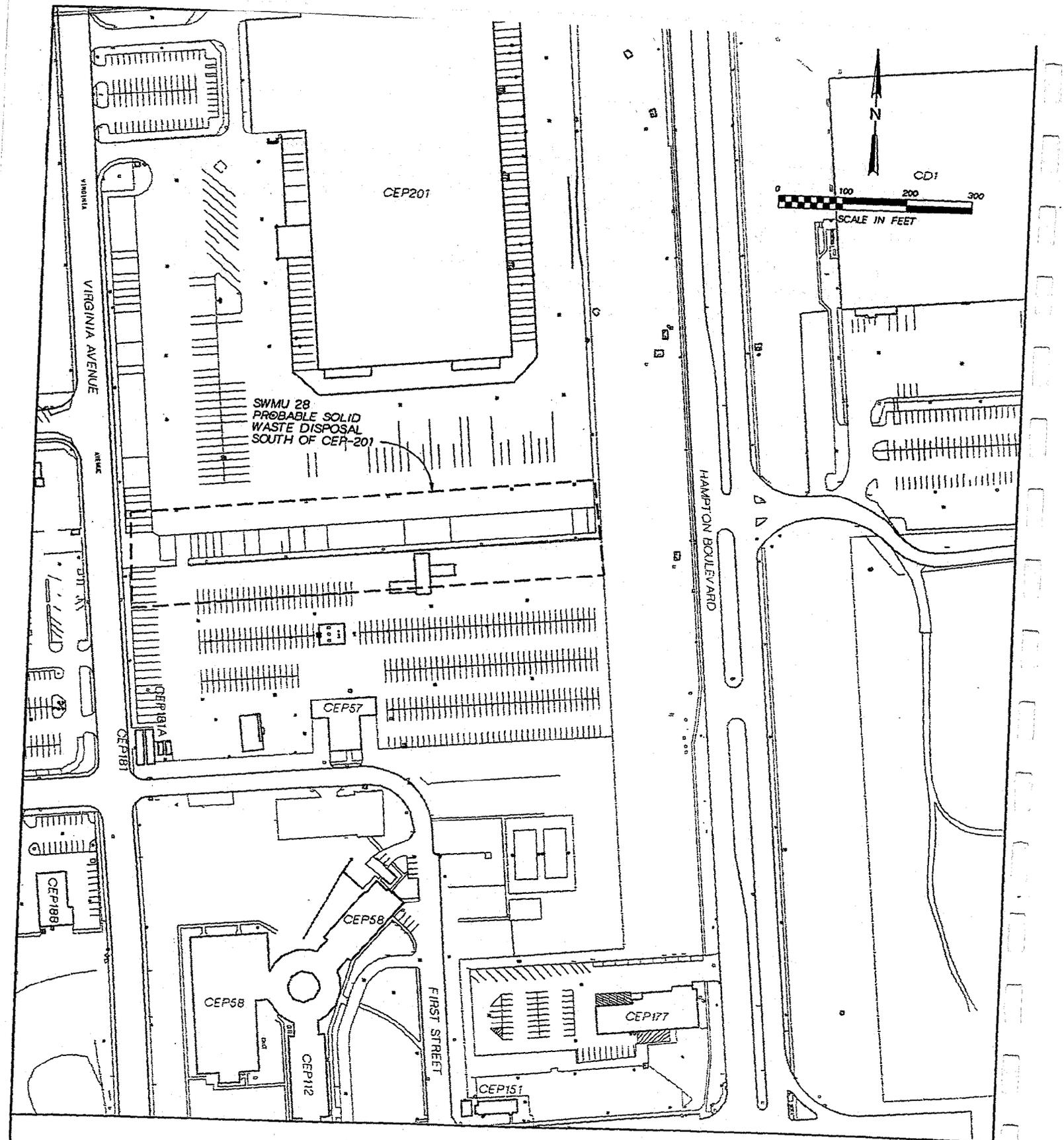
SWMU 32—Solid Waste Disposal Area/CEP-160/161 Embankment

This SWMU is a gravel parking lot located in the pier area that was formerly used for waste and fill disposal (Figure 2-17). Aerial photographs from 1968 and 1982 evaluated during the EPIC study indicate that this area was used for waste and fill disposal. This site was identified as WDA-5 in the final EPIC report. The site is situated in the southwest corner of the intersection of Admiral Taussig Boulevard and Second Street. The site is divided by a chain-link fence and an aboveground steam line. The western portion of the parking lot is currently being used by pier workers. The eastern side of the lot is presently being re-graded with additional soil. Surface waters drain to a drainage ditch located on the southern side of the site. These waters discharge directly to the Elizabeth River.

Sampling and analysis of the subsurface soil were performed in 1995 during the RRR study. SVOCs were detected in the soil and a "low" risk was identified for the soil.

A supplemental SWMU investigation for this AOC, completed in July 1998, detected levels of benzo(a)pyrene and arsenic in the soils that exceeded the RBCs. A soil background study is currently underway to assess if the constituents detected above RBCs in the soil are attributed to background conditions.

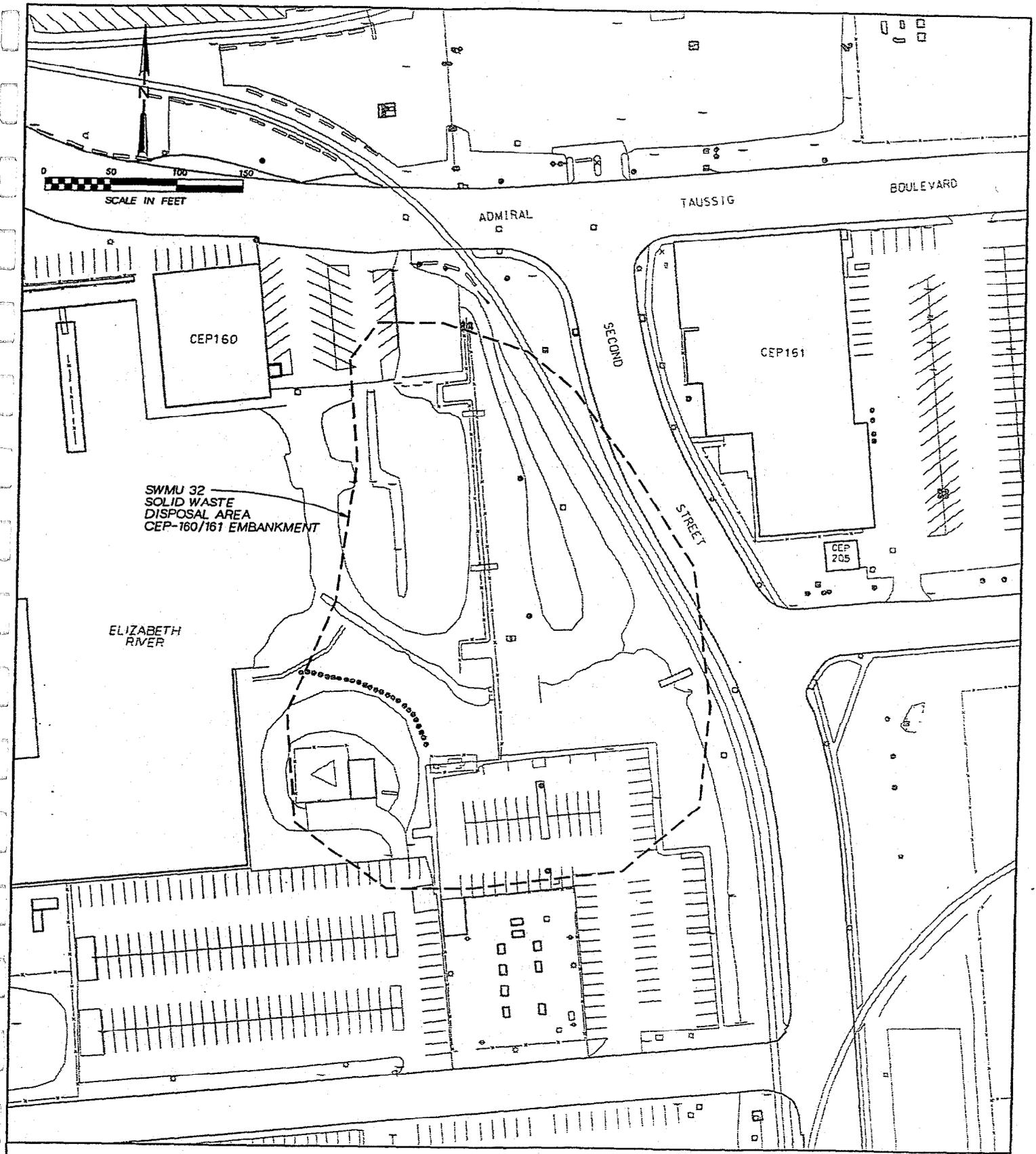
In May, 2000 the Naval Station Norfolk Tier I Partnership approved the Streamlined Risk Assessment Report for SWMU 32 and reached a consensus that "no further action is required and the land use at the site will be unrestricted".



LEGEND

 ESTIMATED EXTENT OF SOLID WASTE MANAGEMENT UNIT

Figure 2-16
SITE MAP
SWMU 28 - PROBABLE SOLID WASTE
DISPOSAL SOUTH OF CEP-201
Naval Base Norfolk



LEGEND

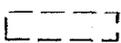
 ESTIMATED EXTENT OF SOLID WASTE MANAGEMENT UNIT

Figure 2-17
 SITE MAP
 SWMU 32 - SOLID WASTE DISPOSAL
 AREA CEP-160/161 EMBANKMENT
 Naval Base Norfolk

SWMU 33—Debris Piled at Seawall/Corner of Sustain Pier

This former debris pile, shown in Figure 2-18, is located at the floating dry-dock USS Sustain. An aerial photograph from 1963 indicates that debris was mounded and buried in this area. This site was identified as WDA-6 in the final EPIC report. The western side of the site is adjacent to the Elizabeth River while the northern side of the site borders the dry-dock area. A gravel parking lot is located south of the dry-dock area. The site extends across both the dry-dock area and the parking lot. A portion of the site is covered with asphalt while the parking area has a gravel surface. An SAA is also located within the area. Access to the dry-dock portion of the site is restricted by U.S. Navy personnel.

Sampling and analysis of the subsurface soil were performed in 1995 during the RRR study. VOCs and SVOCs were detected in the soil and a "low" risk was identified for soil.

A supplemental SWMU investigation for this AOC, completed in July 1998, detected levels of benzo(a)pyrene and arsenic in the soils that exceeded the RBCs. A soil background study is currently underway to assess if these constituents are attributed to background conditions.

In May, 2000 the Project Managers of the Naval Station Norfolk Tier I Partnership approved the Streamlined Risk Assessment Report for SWMU 33 and reached a consensus that "no further action is required at the site and the land use will be unrestricted".

SWMU 34—Solid Waste Disposal Area CEP 200

This SWMU is a grass covered mounded disposal area located between Building CEP-156 to the north and Building CEP-200 to the south. Figure 2-19 illustrates the location of this site. Aerial photographs from 1963 evaluated during the EPIC study indicate that debris was stored in this area. This site was identified as WDA-7 in the final EPIC report. The length of the site extends from Second Street eastward until nearly reaching Virginia Avenue. The crest of the mound is approximately 10 feet above the surrounding ground surface.

Sampling and analysis of the subsurface soil were performed in 1995 during the RRR study. SVOCs were detected in the soil and a "low" risk was identified for the soil.

A supplemental SWMU investigation for this AOC, completed in July 1998, detected levels of benzo(a)pyrene and arsenic in the soils that exceeded the RBCs. A soil background study is currently underway to assess if these constituents are attributed to background conditions.

In May, 2000 the Naval Station Norfolk Tier I Partnership approved the Streamlined Risk Assessment Report for SWMU 34 and reached a consensus that "no further action is required and the land use at the site will be unrestricted".

SWMU 35—Solid Waste Disposal Area CEP 196/Resolute Embankment

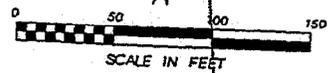
This solid waste disposal site is located in an area east of the floating dry-dock USS Resolute. Figure 2-19 illustrates the location of this site. An aerial photograph from 1982 evaluated during the EPIC study indicates that this area was used for waste and fill

disposal. This site was identified as WDA-8 in the final EPIC report. A portion of the site forms a peninsula that extends into the Elizabeth River. The peninsula is grass covered while the northern portion of the site is situated within an asphalt parking lot. The areas of the site that border the waterfront are lined with large rocks to prevent erosion. Second Street is located immediately east of the site area.

Sampling of the subsurface soil and analysis for VOCs, SVOCs, metals, and cyanide were performed in 1995 during the RRR study. VOCs, SVOCs, and metals were detected in the soil and a "low" risk was identified for the soil.

FLEET LANDING

N



CEP196

CEP 195 (SUSTAIN PIER)

CEP196

CEP196

ELIZABETH RIVER

SWMU 33
DEBRIS PILED AT
SEAWALL/CORNER
OF SUSTAIN PIER

CEP203

CEP203

EP174 (PIER 25)

LEGEND

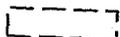
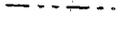
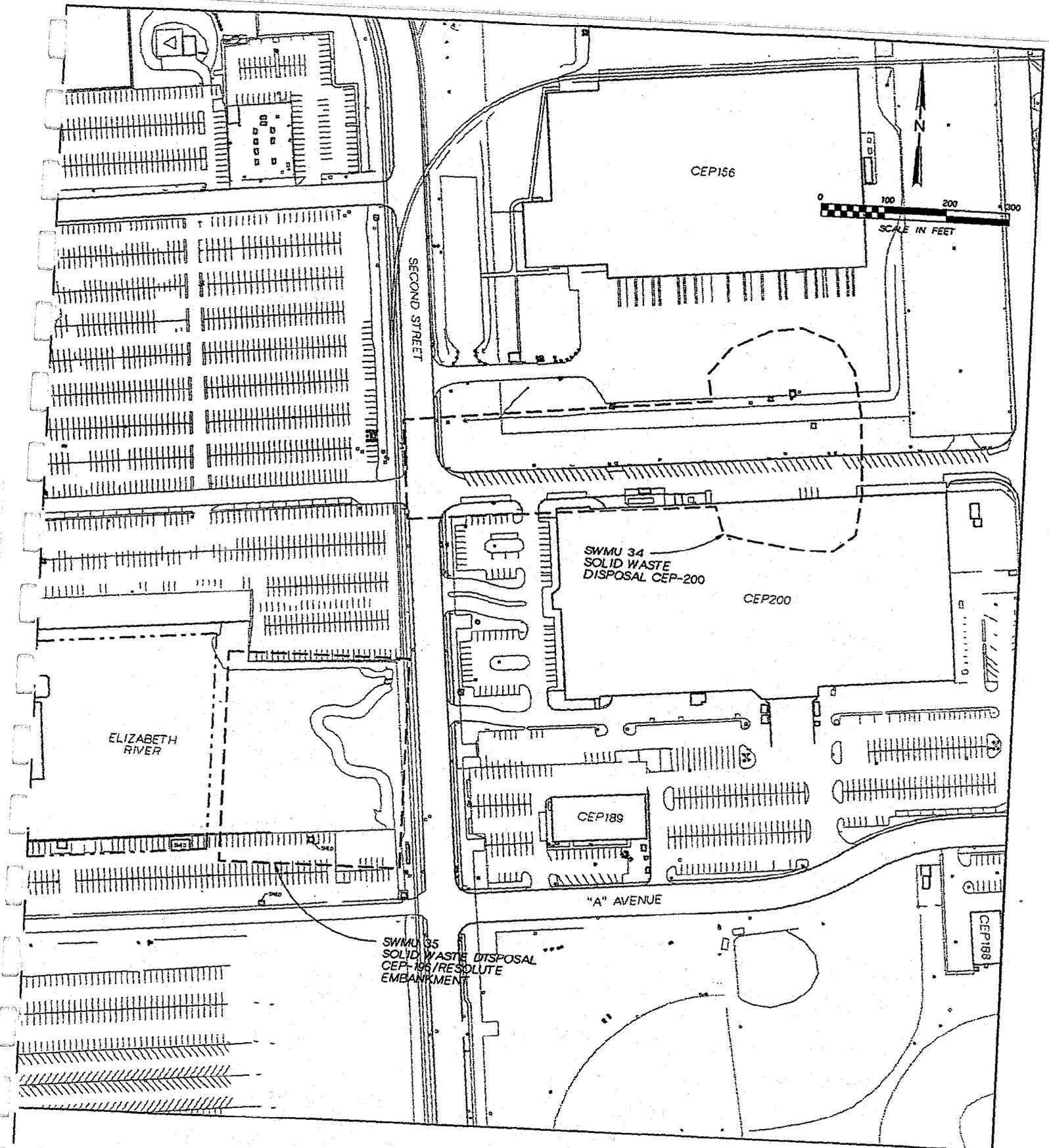
-  ESTIMATED EXTENT OF SOLID WASTE MANAGEMENT UNIT
-  PROPERTY BOUNDARY - NORFOLK NAVAL BASE

Figure 2-18
SITE MAP
SWMU 33 - DEBRIS PILED AT
SEAWALL/CORNER OF SUSTAIN PIER
Naval Base Norfolk



LEGEND

- ESTIMATED EXTENT OF SOLID WASTE MANAGEMENT UNIT
- PROPERTY BOUNDARY - NORFOLK NAVAL BASE

Figure 2-19
 SITE MAP
 SWMU 34 - SOLID WASTE DISPOSAL
 CEP-200 AND SWMU 35 - SOLID WASTE
 DISPOSAL CEP-196 RESOLUTE/EMBANKMENT
 Naval Base Norfolk

A supplemental SWMU investigation for this AOC, completed in July 1998, detected levels of benzo(a)pyrene, benzo(a)anthracene, dibenz(a,h)anthracene and arsenic in the soils that exceeded the RBCs. A soil background study is currently underway to assess if these constituents are attributed to background conditions.

In May, 2000 the Naval Station Norfolk Tier I Partnership approved the Streamlined Risk Assessment Report for SWMU 35 and reached a consensus that "no further action is required and the land use at the site will be unrestricted" at the following sites:

SWMU 38—CD Area behind Compost Yard

The site is located south of the Navy exchange/Commissary plaza and northeast of the CD Landfill area. An aerial photograph from 1987 and 1991 evaluated during the EPIC study indicates that this area may have been used for disposal of construction materials. This site was identified as WDA-13 in the final EPIC report. The area is an open field with tall grass and a thick low brush. The field was noted to contain an area that is encircled by a low soil mound feature. Figure 2-20 illustrates the location of this site. Sampling of the surface soil and analysis for VOCs, SVOCs, and metals were performed in 1996 during the Phase II RRR study. SVOCs and metals were detected in the soil.

A supplemental SWMU investigation for this AOC, completed in July 1998, detected levels of benzo(a)pyrene, benzo(b)fluoranthene, iron and arsenic in the soils that exceeded the RBCs. Recent aerial photos show that the site may have been located further to the north than determined for the supplemental investigation. In addition, a soil background study is currently underway to assess if the constituents detected in the vicinity of the site are attributed to background conditions. The results of these studies, due to be completed in the fall of 2000, will determine the future actions, if any, are required for the site.

SWMU 39—Open Dump and Disposal Area Near the Boundary of the Camp Allen Landfill

SWMU 39 is listed as an AOC in the Draft FFA and identified in the EPIC photos as an open dump; however, no background information is available for the site.

A review of available historical aerial photographs is currently underway to further refine the site boundaries identified in the EPIC photos. In addition, a geophysical survey was completed at the site in July 2000 to assess if there are any buried materials at the site. Based on the results of the geophysical survey soil samples will be collected and analyzed. The results of this investigation is scheduled to be completed in the fall of 2000.

SWMU 40—MCA-603 Pits

SWMU 40 is located east of 9th Street, between C and A Streets, in a grassy field (Figure 2-21). Aerial evaluated during the EPIC study noted two pits, one containing liquid, at this site. The site was identified as WDA-22 in the final EPIC report. The area is used for recreational purposes and contains several baseball diamonds and a soccer field.

A SWMU Supplemental Investigation, completed in October 1998, detected arsenic in the soils at levels slightly exceeding background concentration and the residential RBC, suggesting the constituent may not be site related. The investigation also detected antimony

and thallium in groundwater at levels above the tap water RBCs. However, the shallow aquifer is not used a potable water supply source. Based on the results of this investigation, the NSN Tier I Partnership reached a consensus that no further action is required for the soils and institutional controls are required for the groundwater to prohibit it's future use as a source of potable water. A Close-Out Report, reflecting this status, was completed in May 2000.

SWMU 41—Disposal Area, CA-99 Golf Course

SWMU 41 is located immediately west of the I-564/Terminal Boulevard interchange, next to the CA-99 golf course (Figure 2-22). Aerial evaluated during the EPIC study noted disturbed ground attributed to possible disposal activities at this location. The site was identified as WDA-23 in the final EPIC report. The area presently contains a pond with recreational facilities.

A SWMU Supplemental Investigation, completed in October 1998, detected arsenic and benzo(a)pyrene in the soils at levels slightly exceeding background concentration and the residential RBC, suggesting the constituents may not be site related. The investigation also detected manganese in groundwater at levels above the tap water RBCs. However, the shallow aquifer is not used a potable water supply source. Based on the results of this investigation, the NSN Tier I Partnership reached a consensus that no further action is required for the soils and institutional controls are required for the groundwater to prohibit it's future use as a source of potable water. A Close-Out Report, documenting this site status, was completed in May 2000.

SWMU 42—CEP 210 Area

The site is located south of Building CEP-201. Aerial photographs from 1949 and 1958 evaluated during the EPIC study indicate that debris was disposed of in this area. This site was identified as WDA-9 (1949) and WDA-10 (1958) in the final EPIC report. The area is entirely covered with asphalt except for a 5-foot-wide grass area that extends through the center of the site. Figure 2-23 illustrates the location of the site. Underground electrical lines, which service overhead light poles, are located within this grassy area. The area serves as a storage facility for large objects or equipment awaiting shipment. Tractor trailers are also kept in the area until they are needed for material transport.

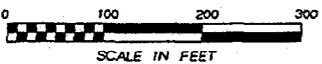
P7B

TAUSSIG BOULEVARD

PUMP HOUSE

GATE

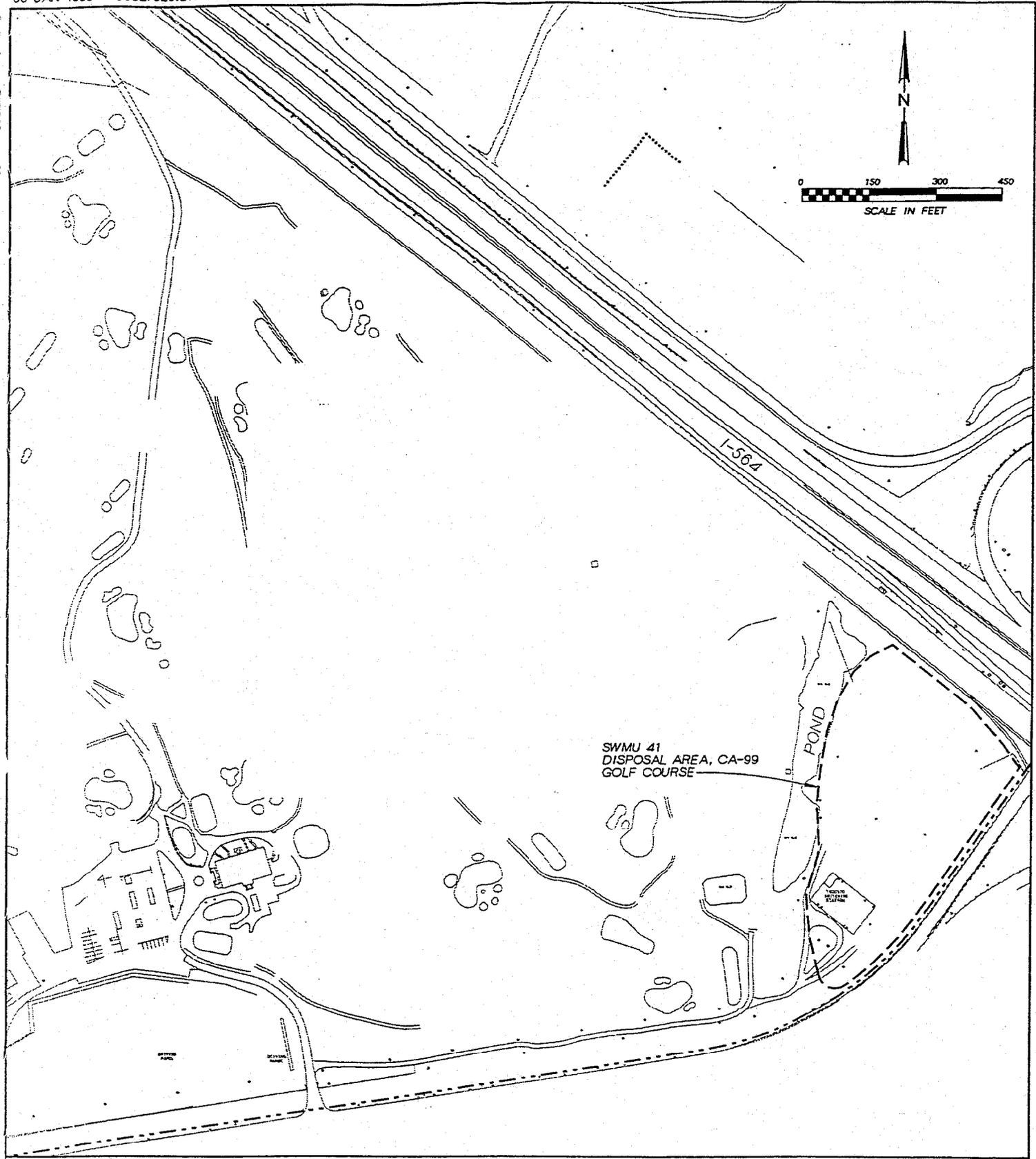
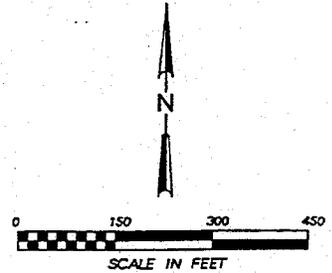
SWMU 38
CD AREA BEHIND COMPOST YARD



LEGEND

 ESTIMATED EXTENT OF SOLID WASTE MANAGEMENT UNIT

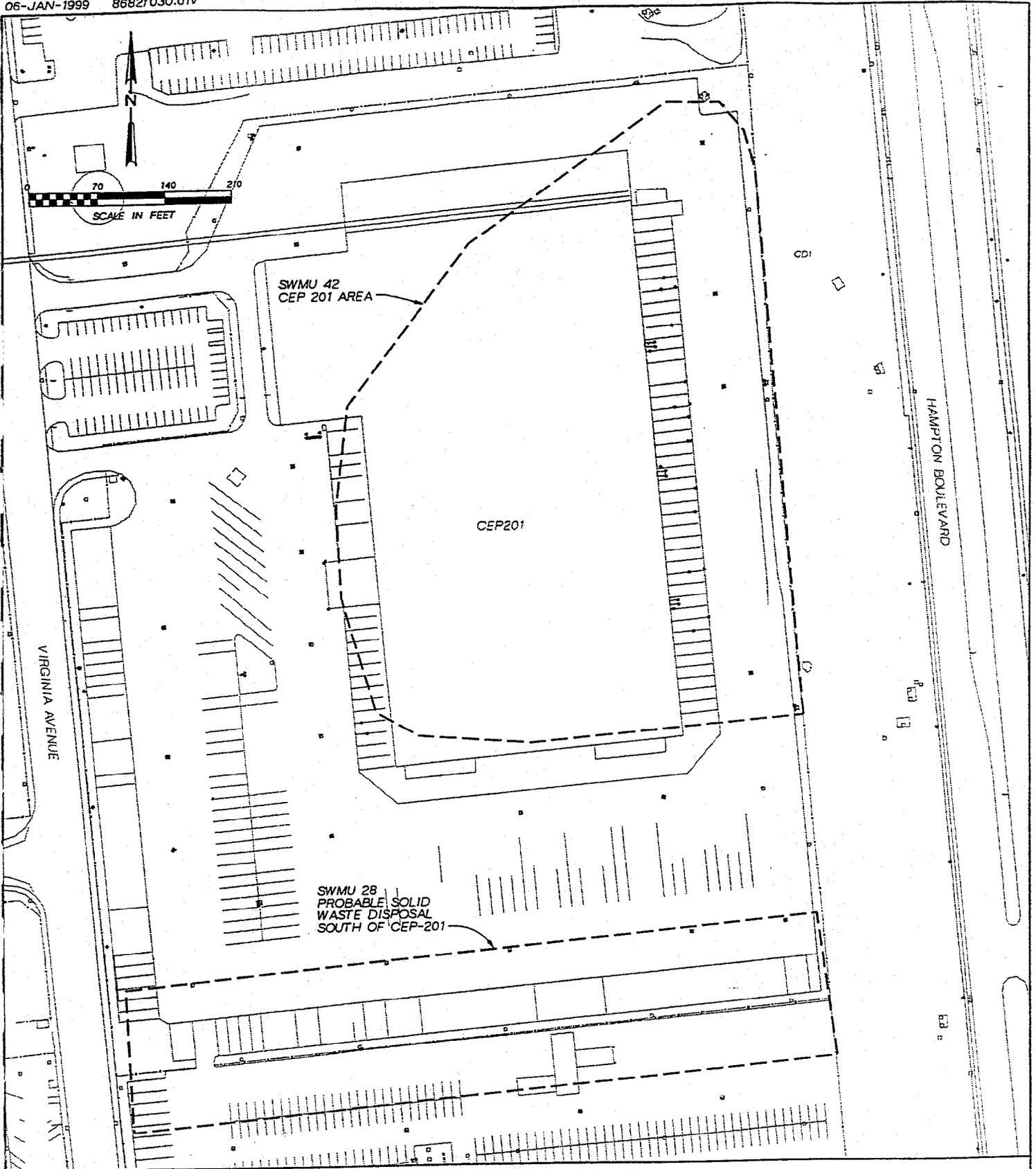
Figure 2-20
SITE MAP
SWMU 38 - CD AREA BEHIND COMPOST YARD
Naval Base Norfolk



LEGEND

-  ESTIMATED EXTENT OF SOLID WASTE MANAGEMENT UNIT
-  PROPERTY BOUNDARY - NORFOLK NAVAL BASE

Figure 2-22
 SITE MAP
 SWMU 41 - DISPOSAL AREA, CA-99 GOLF COURSE
 Naval Base Norfolk



LEGEND

 ESTIMATED EXTENT OF SOLID WASTE MANAGEMENT UNIT

Figure 2-23
 SITE MAP
 SWMU 42 - CEP 201 AREA
 Naval Base Norfolk

Sampling of the surface soil and analysis for VOCs, SVOCs, pesticides/PCBs, and metals were performed in 1996 during the Phase II RRR study.

A SWMU Supplemental Investigation, completed in October 1998, detected arsenic and in the soils at levels slightly exceeding background concentration and the residential RBC, suggesting the constituents may not be site related. The investigation also detected manganese, iron, thallium and arsenic in groundwater at levels above the tap water RBCs. However, the shallow aquifer is not used a potable water supply source. Based on the results of this investigation, the NSN Tier I Partnership reached a consensus that no further action is required for the soils and institutional controls are required for the groundwater to prohibit it's future use as a source of potable water. A Close-Out Report, documenting this site status, was completed in May 2000.

3 Screening, Categorizing and Prioritizing Sites at Naval Station Norfolk

3.1 Federal Facilities Agreement

On February 18, 1999 the US EPA Region III and the Department of the Navy entered into a Federal Facility Agreement (FFA) for Naval Station Norfolk. One of the objectives of the FFA is to define a Site Screening Process (SSP) that is intended to provide a simplified investigative method whereby identified Site Screening Areas (SSAs) and Areas of Concern (AOCs) can be evaluated to determine whether Remedial Investigations are required for these areas. The Site Screening Process implemented by the NSN Tier I Partnering Team is illustrated in Figure 3-1 through 3-3 and is outlined below.

3.1.1 Determining Site Screening Areas

If EPA or the Navy determines that an area on the Naval Station, which has not been previously been identified as a SSA, poses a threat to public health or the environment, the other party shall be notified. The parties will then have forty-five (45) days from the notification to discuss the site conditions and whether to agree whether the site shall be addressed under the Federal Facility Agreement as an SSA.

3.1.2 Establishing a Site Screening Area

Any site that is established as an SSA will be added to the list of SSAs included in Appendix B of the FFA as an additional SSA to be investigated and possibly remediated in accordance with the requirements of the FFA. For any SSAs established the Navy shall include in the next Draft Amended Site Management Plan propose a time schedule for the submittal of an SSP Work Plan. This schedule shall be approved in accordance with Section XI of the FFA.

3.1.3 Site Screening Process

The Navy shall submit to the EPA a SSP Work Plan which outlines the activities necessary to determine if there has been a release of hazardous constituents to the environment. The scope of work shall be mutually agreed to by EPA and the Navy. The SSP Work Plan shall also include a schedule for the submittal of the SSP report. This schedule will also be incorporated into the Site Management Plan. The SSP shall also include the following:

- 1) Upon conclusion of an SSP, the Navy shall submit to the EPA a draft SSP Report which shall provide the basis for a determination that either: a) an RI/FS be performed on the area addressed by the SSP or, b) the area does not pose a threat to the environment and therefore the area should be removed from further study under the FFA.
- 2) Within sixty (60) days of receipt of the final SSP Report, the EPA and the Navy

will determine if the SSA(s) will require a RI/FS.

- 3) For those SSAs which the EPA and Navy agree do not warrant an RI/FS, the Navy shall prepare a Decision Document that reflects that agreement. The agreement is to be signed by all the Project Managers.
- 4) For those SSAs that are to proceed with an RI/FS, Operable Units will be established. A schedule for the submission of the RI/FS Work Plan(s) is to be developed and incorporated into the next update of the Site Management Plan

3.1.4 Areas of Concern

For those areas that have been identified as Areas of Concern (AOC) the Navy and EPA will go through a screening process that will include the following/:

- 1) A document evaluation will be undertaken to review existing documentation and assessing information concerning the handling of hazardous waste at each AOC. The evaluation could also include (if agreed to by both EPA and the Navy) discrete sampling without developing a work plan.
- 2) Based on the document evaluation the Project Managers will decide which AOCs will proceed to the SSP as SSAs and which AOCs will require no further action .
- 3) For those AOCs that will not proceed to the SSP the Navy shall prepare, with EPA assistance, a brief AOC Close-Out Document. The EPA shall provide a response to the Navy within thirty (30) days of receipt of the supporting documentation.
- 4) Those AOCs which are not agreed upon by EPA and the Navy to be closed out will proceed to the Site Screening Process. These sites will have schedules established for submittal of SSP work Plans. The schedules will be incorporated into the Site Management Plan.

3.2 Site Screening Process Tools

Although the Federal Facilities Agreement (FFA) provides an outline of the Site Screening Process (SSP) for closing out Site Screening Areas (SSA), the FFA does not provide a detailed process for site screening. As a result, The Tier I Partnering Team has developed several tools for rapidly screening a site to determine whether the site will require a full RI/FS or if it can be removed from further study if it doesn't pose a threat to the environment. The following section describes the screening tools utilized at Naval Station Norfolk.

3.2.1 Relative Risk Ranking

The Department of the Defense (DoD) developed a relative risk framework to evaluate the potential risk posed by a site in relation to other sites. The relative risk evaluation of NSN sites will be performed to give each of the sites a relative risk designation. Relative risk is a management tool that uses actual media concentrations, potential exposure, and potential migration to indicate which sites may pose a risk to human health and the environment. Based on the relative risk results, the Navy can focus available resources for study and

remediation on the sites ranked "high."

This version of the SMP does not update the prior ranking of the sites at NBN. The decision to defer the re-ranking of sites is based on the fact that the sites discussed in this SMP are either undergoing remediation, are in an active site characterization phase, or have been closed out based on a determination of no significant risk to human health or the environment. It is anticipated that the sites undergoing site characterization will be re-ranked in a future update of the SMP. The framework for future ranking is provided below.

The primary factors considered in the relative risk methodology are human health and ecological risks associated with exposure to constituents at the site. The site ranking is based on the best information available at the time the report is submitted. The relative risk model is both quantitative and qualitative in nature.

To initially categorize the sites, contaminant hazard factors (CHF) for human health and ecological risk are calculated based on available chemical data at the time the ranking is performed for each site. The CHF values are determined by dividing the maximum detected concentration of particular compounds in the environmental media (groundwater, soil, surface water, and sediment) by the appropriate corresponding screening value. To perform this analysis, the most up-to-date version of the relative risk-ranking model should be used.

For the quantitative screening analysis, human health risk will be evaluated assuming that the groundwater is used as drinking water (both ingestion and inhalation exposure scenarios will be included in the drinking water determination). To be conservative, soil ingestion will be assumed under a residential-use scenario. Ecological risk will be determined for the aquatic environment only (surface water and sediment), because benchmark values for terrestrial ecological risk are not readily available.

Once the quantitative assessment is complete, a qualitative assessment addressing potential exposure pathways and potential contaminant transport will be performed. This analysis will be conducted to ensure that sites where human and/or ecological exposure to the contaminated media exists and/or the potential for contaminant migration is significant will be ranked higher than sites with less potential to impact human health and the environment. This analysis will be performed by qualitative analysis of the CHFs, receptor factors (exposure potential), and migration pathway factors (contaminant transport potential), as described in the following sections.

A detailed description of the procedures and equations used to complete the relative risk ranking of the sites at NSN is included in the *1999-2000 Site Management Plan, Naval Station Norfolk*.

3.2.2 Aerial Photo Analysis

The September 1994 EPA Photographic Interpretation Center (EPIC) study of aerial photography identified 37 potential Waste Disposal Areas (WDAs) at NSN. This study provided a useful tool for identifying potential SSAs for further investigation by identifying such potential indicators of contamination as: disturbed areas, ponded liquids, excavated areas, fill areas, stressed vegetation and discolored soils.

However, a more detailed review of additional aerial photos and field verification can also provide supporting documentation for removing sites from further study. Examples of this

photographic documentation include: demonstrating that the disturbed areas are associated with new building construction activities, confirming that ponded areas are attributed to natural drainage patterns, illustrating from historical photos that disturbed areas occurred over a short duration.

3.2.3 Geoprobe Sampling

The use of direct push soil and groundwater sampling techniques, such as the Geoprobe, can provide a rapid, cost-effective alternative to traditional sampling techniques to collect screening data to remove sites from further investigations. These techniques offer the following advantages over traditional sampling method: the need for the installation of permanent wells may be reduced or eliminated, the generation of IDW wastes is minimized, the level of decontamination is reduced, accessibility is much easier than drilling equipment and the samples can be collected much more rapidly.

Although the Geoprobe data generally provides representative soil analytical data, the groundwater data can be used only on a qualitative basis for risk assessments due to: 1) the data cannot be reproduced like well data and 2) metals data may not be representative due to the high turbidity of the samples. However, the data generated from the Geoprobe investigations can be used to provide a conservative assessment of the nature and extent of soil and groundwater contamination at a particular site. Confirmation data may be required with the installation of monitoring wells, however, the number of wells will likely be significantly reduced.

3.2.4 Streamlined Risk Assessments

SWMUs 28, 32, 33, 34 and 35 are AOCs where the available data indicated that while these sites seemed to pose minimal risk to human health or the environment a comprehensive, a more quantitative risk evaluation was warranted before a determination could be made on whether the sites could be closed as NFA sites, or classified as an SSA for further investigation. Conversely, the slight exceedances above the risk-based criteria did not justify a full-scale risk assessment for these sites. Therefore, a streamlined risk assessment process has been applied to these sites which is described below.

Concentrations of detected chemicals were compared to the following current USEPA screening and regulatory screening criteria for each sample matrix: risk-based concentrations (RBCs) for residential and industrial soil, USEPA tap water RBCs and drinking water Maximum Contaminant Levels (MCLs) for groundwater, and the USEPA Region III Biological Technical Assistance Group (BTAG) screening values for surface water and sediment. The SWMUs were initially categorized based on the comparison to screening and regulatory criteria (comparison criteria).

In addition, the maximum, minimum, arithmetic mean, and median concentrations for the contaminants exceeding the comparison criteria were calculated using the detected concentrations from all samples collected during the RRR Study and the SWMU Supplemental Investigation. Although these values were not used in determining the recommendations for each SWMU, this evaluation was performed to identify the detected range for contaminants exceeding the comparison criteria.

For SWMUs 28, 32, 33, 34 and 35, the screening level risk characterization indicated that while these sites seemed to pose minimal risk to human health or the environment, a more

quantitative risk evaluation was warranted before a determination could be made on whether the sites could be closed as NFA sites, or if further investigation or remedial measures were warranted. The "streamlined" risk assessments (SRAs) were developed for each of these SWMUs. These results will be combined with the results of the current basewide background study, and final risk management decisions will be made.

Figure 3-1
Screening, Categorizing, and
Prioritizing Sites at NSN

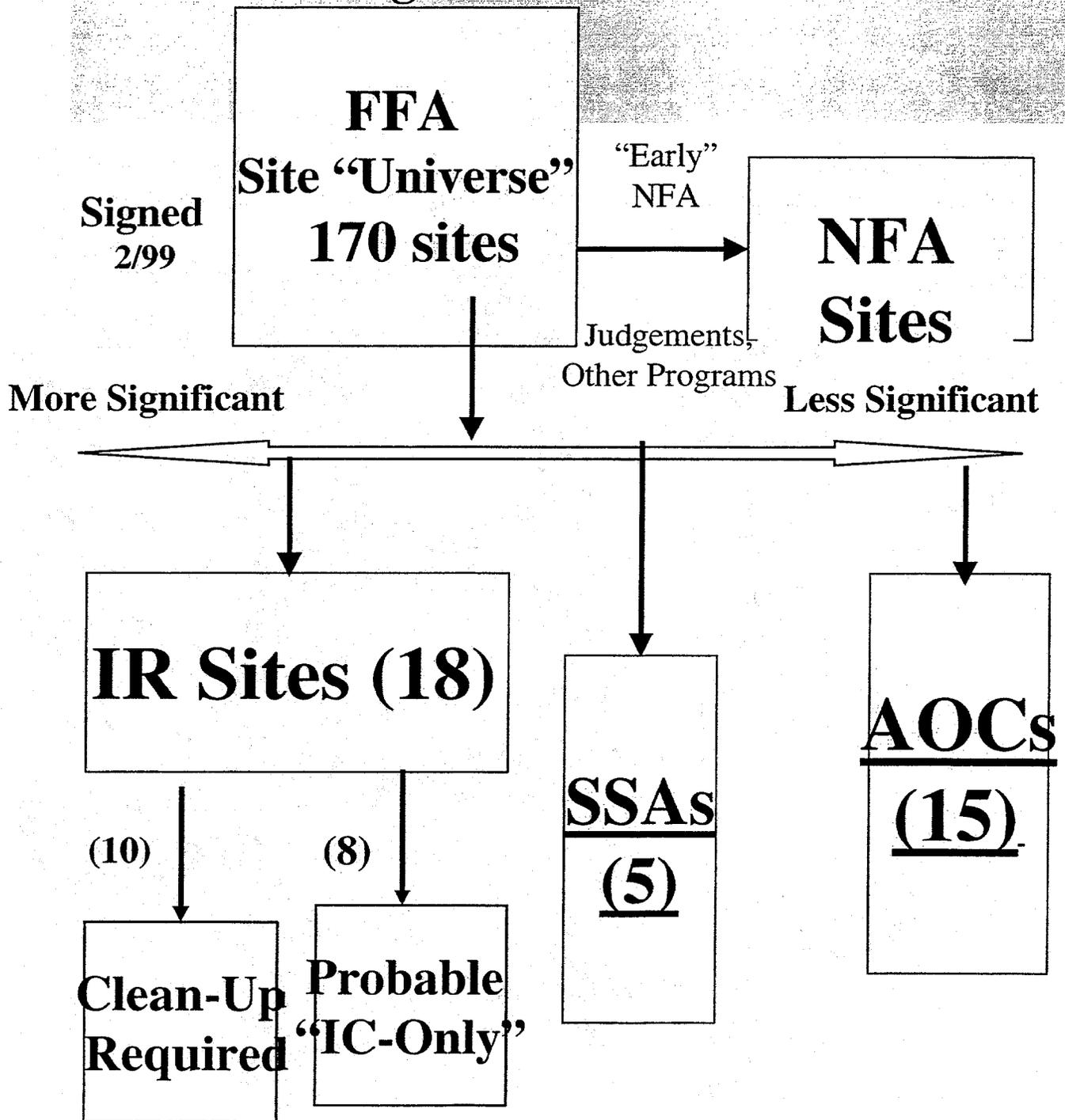


Figure 3-2 Screening, Categorizing, and Prioritizing Sites at NSN

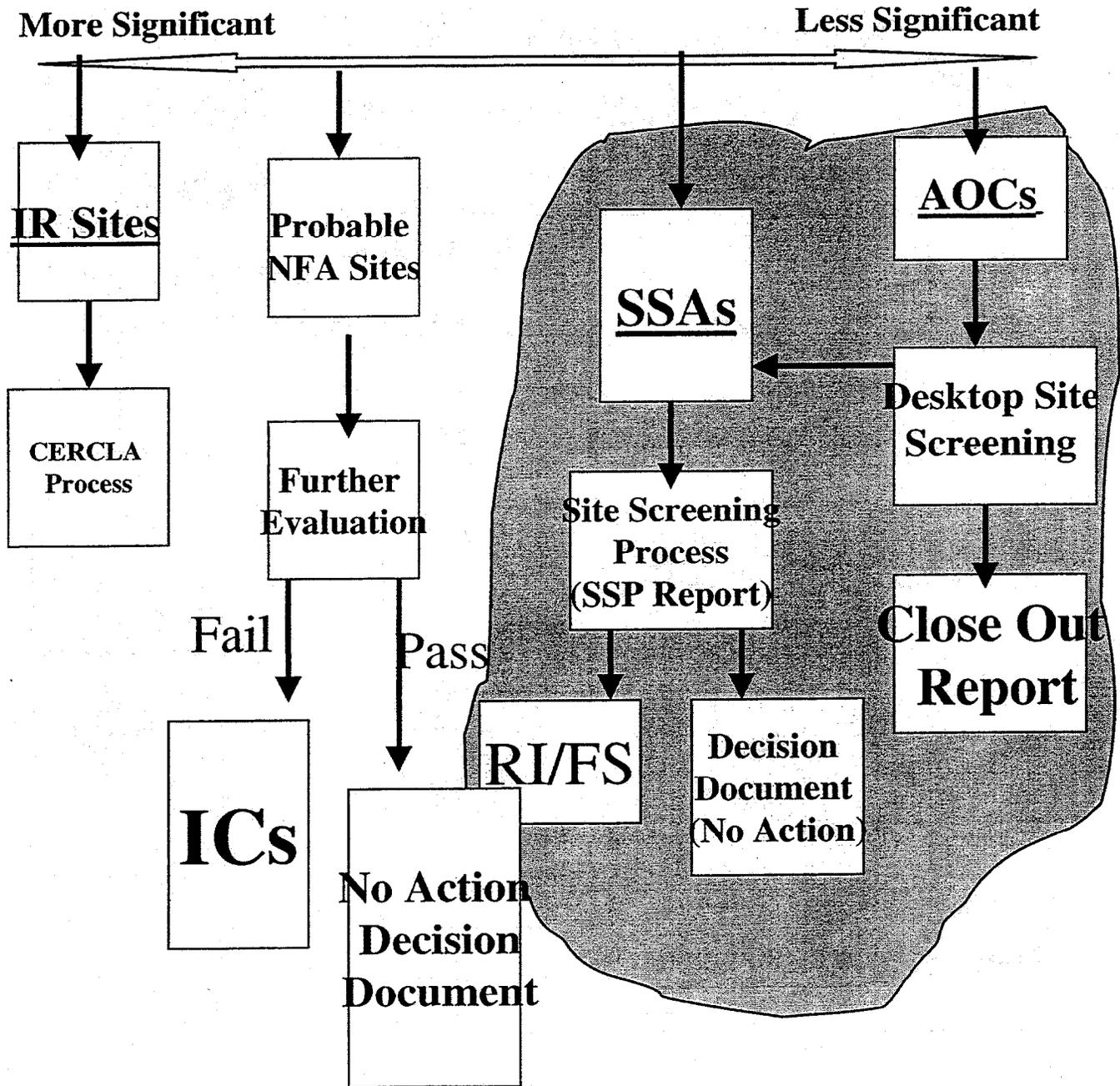
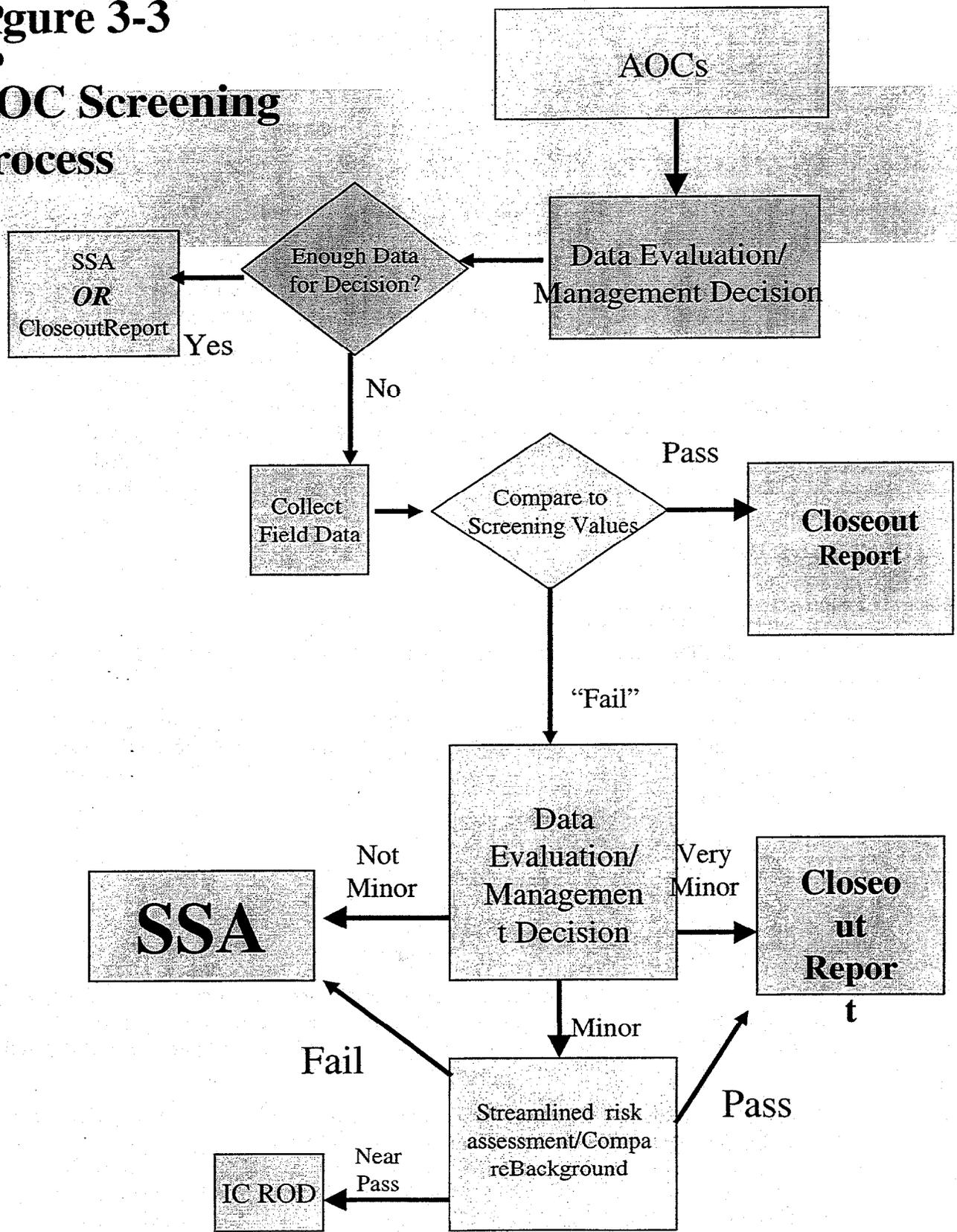


Figure 3-3

AOC Screening Process



4 CERCLA Process Activities

As previously discussed (in Section 1), the NBN was listed on the EPA CERCLA NPL on April 1, 1997. The Base is being investigated through the Installation Restoration Program (IRP). Because the Navy structured the IRP to be consistent with the terminology and structure of the CERCLA Program, the placement of NBN on the CERCLA NPL has had a limited effect on the cleanup processes that were already established. The CERCLA cleanup process is described below. The IRP at NBN is being implemented in accordance with applicable federal and state environmental regulations and requirements.

The Federal Facility Agreement (FFA) developed for NBN by EPA Region III and the Navy will assist the Navy to meet the provisions of CERCLA, RCRA, and applicable state law. The FFA will establish a procedural framework and provide detailed guidance on all phases of the remedial process from investigation through remedial action. The FFA also incorporates the effects of team partnering on the remediation process. The modified remedial process, incorporating the provisions of the FFA, is discussed in this section.

4.1 CERCLA Process

4.1.1 CERCLA RI/FS Process

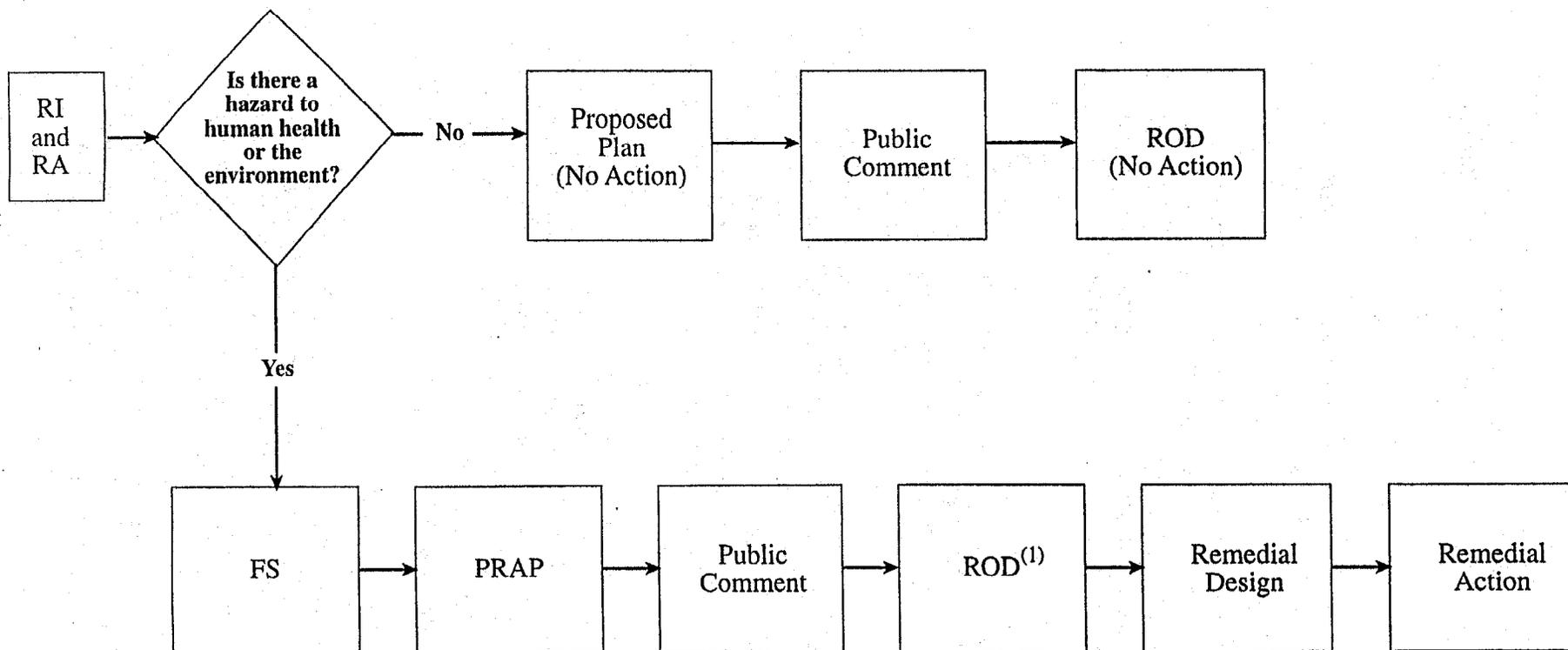
The CERCLA RI/FS process refers to the process of site investigation and remedial action that is used for CERCLA sites.

The objectives of the CERCLA RI/FS process are to evaluate the nature and extent of contamination at a site, and to identify, develop, and implement appropriate remedial actions in order to protect human health and the environment. The RI/FS process includes the following major elements:

- RI—Remedial Investigation
- RA—Risk Assessment
- FS—Feasibility Study
- PRAP—Proposed Remedial Action Plan
- ROD—Record of Decision or Decision Document

These steps ultimately lead to either implementation of a remedial design/remedial action or the decision to take no action at the site, as illustrated in Figure 4-1. Where no further action is required at a site, a no-action ROD would be signed and the site removed from the program.

The RI, RA, FS, and PRAP documents are maintained in information repositories for review by the public. A formal public comment period and a public meeting (if required) generally follow the issuance of the Final PRAP. Public comments received on the Final PRAP are addressed as part of the Responsiveness Summary in the ROD. Subsequent to completion of the ROD, remedial design/remedial action activities are initiated. In accordance with



RI = Remedial Investigation

RA = Baseline Risk Assessment (human health and ecological risks)

FS = Feasibility Study

PRAP = Proposed Remedial Action Plan

ROD = Record of Decision or Decision Document (including Responsiveness Summary)

⁽¹⁾*Includes summary of any Interim Remedial Actions or Removal Actions*

Figure 4-1
CERCLA RI/FS PROCESS
NAVAL BASE NORFOLK SITE MANAGEMENT PLAN

CERCLA, remedial action is required to begin within 15 months of the Final ROD. The RI/FS process is currently in progress at two NBN sites: the Camp Allen Salvage Yard and the NM Slag Pile.

4.1.2 Removal Action Process

Removal actions are implemented to cleanup or remove hazardous substances from the environment at a site in order to mitigate the spread of contamination. Removal actions may be implemented at any time during the RI/FS process.

Removal actions are classified as either time-critical or non-time-critical. Actions taken immediately to mitigate an imminent threat to human health or the environment, such as the removal of corroded or leaking drums, are classified as time-critical removal actions. Removal actions that may be delayed for 6 months or more without significant additional harm to human health or the environment are classified as non-time-critical removal actions.

For non-time-critical removal actions, an Engineering Evaluation/Cost Analysis (EE/CA) is prepared rather than the more extensive FS. An EE/CA focuses only on the substances to be removed rather than on all contaminated substances at the site. It is possible for a removal action to become the final remedial action if the risk assessment results indicate that no further remedial action is required in order to protect human health and the environment.

A non-time-critical soil removal action was completed at Area B of the Camp Allen Landfill in 1994; however, this was not considered a final remedy for the site. A soil removal action also was completed in the Q-Area that involved the removal of 750 cubic yards of petroleum-contaminated soil from the northwest corner of the site to allow construction of a parking lot. In addition, a soil removal action was completed in the NM Area (Taussig Can Area) in 1979 with the approval of the Commonwealth of Virginia. A monitoring well also was installed at this location.

Since the FY1996 SMP, a soil removal action was completed at the Building W-316 site that involved the removal of PCB-contaminated soil and a removal action was completed at the SP-2B Accumulation Area that involved the removal of lead-contaminated soil. A removal action is in progress for heavy metal and pesticide-contaminated sediment at the CD Landfill under OU1. Non-time critical removal actions are planned in 1998 for pesticide-contaminated soil at the Pesticide Disposal site, PCB-contaminated soil at the Camp Allen Salvage Yard, and lead-contaminated sediment at the NM Slag Pile.

4.1.3 Remedial Action Process

Remedial actions may be considered interim remedial actions (IRA) or final remedial actions. Interim remedial actions are implemented to provide temporary mitigation of human health risks or to mitigate the spread of contamination in the environment. Similar to removal actions, they may be implemented at any time during the RI/FS process. An IRA is implemented to attain applicable or relevant and appropriate requirements (ARARs) to the extent required by CERCLA or the NCP. It is also consistent with and contributes to the efficient performance of a final remedial action taken at an area or Operable Unit. Examples of interim remedial actions include installation of a pump-and-treat system for product recovery from the groundwater or installation of a fence to prevent direct contact with hazardous materials.

For interim remedial actions, a focused feasibility study (FFS) is prepared rather than the more extensive FS. As with the removal action, an IRA may become the final remedial action if the risk assessment results indicate that no further remedial action is required in order to protect human health and the environment. In this case, a no-action ROD would be signed and the site removed from the program upon completion of the interim remedial action.

Following the more extensive FS process, a preliminary/conceptual remedial design, a prefinal remedial design, and then a final remedial design are developed for final remedial action at an area or Operable Unit. After completion of the remedial action at each area or Operable Unit, a Remedial Action Completion Report will be prepared. If necessary, a Long-term Monitoring Plan and an Operation and Maintenance Plan will also be prepared for each remedial action site.

Since the FY1996 SMP, remedial actions have been constructed at three sites at NBN, the Camp Allen Landfill, the LP-20 site and at the Q-Area Drum Storage Area. A groundwater extraction and treatment system and dual-phase vacuum extraction (DPVE) system became operational at the Camp Allen Landfill in July 1997. An air sparge/soil vapor extraction (SVE) system to address chlorinated solvents in the groundwater at LP-20 started operations on April 14, 1998. An air sparge/SVE system to address TPH and chlorinated solvents in the groundwater started operations at the Q-Area Drum Storage Area in AOC 2 and AOC 1 on August 18, 1998 and August 20, 1998, respectively. Baseline monitoring, supplemental testing, and long-term monitoring is under way for all three sites.

4.1.4 Treatability Studies

Treatability studies are performed to assist in the evaluation of a potentially promising remedial technology. The primary objectives of treatability testing are:

- to provide sufficient data to allow treatment alternatives to be fully developed and evaluated during the FS, and/or
- to support the remedial design of a selected alternative

Treatability studies may be conducted at any time during the RI/FS process. The need for a treatability study is generally identified during the FS.

Treatability studies may be classified as either bench-scale (laboratory study) or pilot-scale (field studies). Bench-scale studies are often sufficient to evaluate performance for technologies that are well developed and tested. For innovative technologies, pilot tests may be required to obtain the desired information. Pilot tests simulate the physical and chemical parameters of the full-scale process, and are designed to bridge the gap between bench-scale and full-scale operations.

Pilot-scale treatability studies had been conducted at the Camp Allen Landfill Site to evaluate air stripping and DPVE technologies. Additionally, SVE and air sparging pilot-scale treatability studies were completed at the Q-Area Drum Storage Area and LP-20 site.

4.2 FFA CERCLA Integration Process

4.2.1 AOC Evaluation

Areas identified as Areas of Concern (AOCs) in the FFA, will undergo a document evaluation. This document evaluation will involve a thorough review of existing or easily obtainable documentation and information on the identified sites. If the Navy and EPA agree, the evaluation could include obtaining discrete samples from the AOC without the development of a work plan. If both parties do not agree, the AOC evaluation process will continue without the performance of sampling.

The document evaluation will also involve assessing information concerning the handling of hazardous wastes at each AOC, the actions taken at each AOC, or actions that will be occurring under other regulatory programs at each AOC. Based on the AOC evaluation, a decision will be made by the management team of which AOCs will proceed to the Site Screening Process as SSAs and which AOCs will require no further action and can be closed out. For those AOCs requiring no further action, an AOC Close-Out document will be prepared.

4.2.2 Site Screening Process

The Site Screening Process (SSP) refers to the process described in the FFA that will be used to identify whether SSAs should proceed into the RI/FS process under CERCLA. SSAs are those areas that may pose a threat, or potential threat, or that do pose a threat, or potential threat to public health, welfare, or the environment. SSAs can be identified by either the Navy or EPA. An SSP work plan will be prepared outlining the activities necessary to determine if there have been releases of hazardous substances, pollutants, contaminants, hazardous waste, or other hazardous constituents to the environment from the SSAs. After investigation activities have been performed, an SSP report will be prepared. The report provides the basis for a determination that either (1) an RI/FS be performed at the SSA or (2) the area does not pose a threat, or potential threat to public health, welfare, or the environment and therefore should be removed from further study. For SSAs that do not warrant an RI/FS under CERCLA, a brief decision document will be prepared and signed by all project managers on the management team.

5 Site Management Plan Schedules

This section presents project-specific schedules for projects that are or potentially will be active in 2000 or 2001. Project-specific schedules for active projects will be updated periodically in the SMP. Potentially active projects for 1999, for which project-specific schedules have been developed, are summarized in Table 5-1 and Figure 5-1.

5.1 Team Partnering at Naval Base Norfolk

In October 1996, LANTDIV convened an environmental partnership among the Navy, restoration advisory board (RAB), EPA, VDEQ, and Navy's contractors. The partnership is implementing an approach to site remediation referred to as streamlined oversight. The implementation of the streamlined oversight process has promoted a higher degree of communication, understanding, and cooperation among all of the involved groups.

The scheduling assumptions presented below represent an ideal flow of work for sites that are addressed through the conventional cleanup approach. These assumptions do not account for how the streamlined oversight process may affect schedules and potentially affect the sequence of tasks, as the partnership evaluates project progress on an accelerated basis, and expedites the decision-making process. The goal of the streamlined oversight process is to streamline the regulatory review processes of implementation, decision-making, reporting, and other environmental regulatory documentation, and to achieve significant savings of time and funding. To date, the streamlined oversight process is estimated to have saved over \$4.0 million in remediation costs and 24 months in cleanup schedules in comparison to conventional cleanup approaches. Team partnering accomplishments are summarized in Appendix A.

5.2 Scheduling Assumptions

Assumptions regarding duration of field investigations, laboratory analyses, data validation, document preparation, document review, and remedial design/remedial action are discussed below.

Table 5-1
Active Projects for 2000/2001
Naval Station, Norfolk Site Management Plan

Active Project	Estimated Milestone Dates
Site 1 - Camp Allen Landfill Long-term Groundwater Monitoring Ecological monitoring of sediments and surface water	Construction Complete 1997
Site 2 - NM Slag Pile RI/FS NM Slag Pile PRAP/ROD NM Slag Pile RA	Completed 1998 Revised Final ROD to be submitted in August 2000 Sediments removed in December 1999
Site 3 - Q-Area Drum Storage Yard RA Long-term Groundwater Monitoring Plan	Construction Complete August 1998 Sampling completed in February August 2000
Site 5 - Pesticide Disposal Site RI/FS Pesticide Disposal Site RA	Completed 1998 Soils removal completed December 1999 Close-Out Report to be completed in July 2000
Site 6a - CD Landfill OU1 Sediment RA CD Landfill OU2 Landfill Cap ROD CD Landfill OU2 Landfill Cap RD CD Landfill OU2 Landfill Cap RA CD Landfill OU2 Post Closure Monitoring	Construction Complete 1998 Complete September 1998 Complete October 1998 Complete December 1999 Sampling scheduled for January, April, July and October, 2000
Site 20 - LP-20 Site RA Long-term Groundwater Monitoring Plan	Construction Complete April 1998 Sampling scheduled for February 2000 and February 2001
Site 22 - Camp Allen Salvage Yard RI/FS Camp Allen Salvage Yard PRAP/ROD Camp Allen Salvage Yard Soil RD/RA	In Progress Fiscal Year 1999 In Progress
Supplemental Site Investigations: SWMUs 9 & 10 - LP-200/MAC Terminal Area SWMUs 12 & 16 - NM-37 Accumulation and Disposal Areas SWMU 14 - Q-50 Satellite Accumulation Area SWMU 38 - CD Area behind the Compost Yard	In Progress Draft Report scheduled for October 2000 Additional investigations scheduled for summer 2000 Draft Report scheduled for March 2001 Draft Report scheduled for November 2000

SWMU 39	Investigation scheduled for February 2000
Streamlined Risk Assessments SWMU 28 - Probable SWD Area South of CEP-201 SWMU 32 - SWD Area CEP-160/161 Embankment SWMU 33 - Debris Piled at Seawall/Corner of Sustain Pier SWMU 34 - SWD Area CEP-200 SWMU 35 - SWD Area CEP-196 Resolute Embankment	Streamlined Risk Assessment Report submitted May 2000
Close-Out Reports SWMU 40 - MCA-603 Pits SWMU 41 - Disposal Area, CA-99 Golf Course SWMU 42 - CEP-201 Area	Draft Close-Out-Report submitted May 2000

**Table 5-2
Document Preparation Durations
Naval Base Norfolk Site Management Plan**

Document	Duration (Months) ⁽¹⁾
AOC Close-Out Document	1
SSP Work Plan	1
SSP Report	1-2
Preliminary Assessment/Site Inspection	2
Engineering Evaluation/Cost Analysis	1-2
RI/FS Work Plans	2
Remedial Investigation Report	3-4
Supplemental Investigation Work Plans	2
Supplemental Investigation Report	3-4
Feasibility Study	3-4
Proposed Plan	2
Record of Decision	2
Preliminary/Conceptual Remedial Design	2
Pre-Final Remedial Design	2
Final Design	1-2
Treatability Study Work Plan	2
Treatability Study Report	1-2
Removal Action Work Plan	2
Removal Action Completion Report	1-2
⁽¹⁾ Durations represent estimated time required to complete Draft Documents.	

SWMU 39	Investigation scheduled for February 2000
Streamlined Risk Assessments SWMU 28 - Probable SWD Area South of CEP-201 SWMU 32 - SWD Area CEP-160/161 Embankment SWMU 33 - Debris Piled at Seawall/Corner of Sustain Pier SWMU 34 - SWD Area CEP-200 SWMU 35 - SWD Area CEP-196 Resolute Embankment	Draft Streamlined Risk Assessment Report scheduled for February 2000
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SSP Report	1-2
Preliminary Assessment/Site Inspection	2
Engineering Evaluation/Cost Analysis	1-2
RI/FS Work Plans	2
Remedial Investigation Report	3-4
Supplemental Investigation Work Plans	2
Supplemental Investigation Report	3-4
Feasibility Study	3-4
Proposed Plan	2
Record of Decision	2
Preliminary/Conceptual Remedial Design	2
Pre-Final Remedial Design	2
Final Design	1-2
Treatability Study Work Plan	2
Treatability Study Report	1-2
Removal Action Work Plan	2
Removal Action Completion Report	1-2
⁽¹⁾ Durations represent estimated time required to complete Draft Documents.	

5.2.1 Field Investigation and Laboratory Analysis/Validation

The time required for RI field investigations depends on the size and complexity of the site and the overall scope of the field investigation (i.e., types of field investigation activities, number of sampling rounds, etc.). Generally, field investigations require from 2 to 6 months to complete.

A 30-day turnaround time was assumed for laboratory analysis. Twenty-eight days is the standard turnaround time for Naval Facilities Engineering Support Center (NFESC)-approved laboratories under the current Navy CLEAN Contract. A 14-day duration was assumed for validation of laboratory data.

5.2.2 Document Preparation and Document Review

The time required for document preparation under the RI/FS process (see Section 4.1) has been estimated based on prior experience in preparing the various types of documents. A summary of the estimated times required for development of the various types of documents typically prepared during the RI/FS process is presented in Table 5-2. The durations presented in Table 5-2 represent the time required to prepare the initial draft document and do not include time required for review and subsequent revisions of the document.

The time required for document review generally will vary according to the length and complexity of the document, as well as the availability of resources on the part of the reviewing agency. In accordance with the draft Federal Facility Agreement (FFA), unless mutually agreed upon by the project management team, all draft documents will be subject to a 60-day review and comment period. Exceptions to the time periods required for review and comment on draft documents are identified in the FFA, prefinal remedial designs, and final remedial designs. Prefinal remedial designs will be subject to a 45-day review and comment period and final remedial designs will be subject to a 14-day review and comment period. In the event that significant changes are made to the design between the prefinal and final designs, the EPA may extend the review period by another 14 days. As discussed in the draft FFA, in some cases the review and comment period on draft remedial designs and remedial action work plans may need to be expedited for the Navy to satisfy CERCLA requirements.

The following corresponding document review periods were assumed for the purposes of this SMP:

- Working Draft: 30-day review by LANTDIV/Activity
- Draft Document: 60-day review by Regulatory Agencies
- Working Draft Final Document: 15-day review by LANTDIV/Activity
- Draft Final Document: 60-day review by Regulatory Agencies

In many cases, the Navy may choose to have concurrent review periods for draft final documents. In those cases, no separate LANTDIV/Activity review would be required for a working draft final document.

For this SMP, it was assumed that 30 days would be required by the consultant to incorporate LANTDIV and regulatory agency comments on the draft document and to prepare and submit the draft final document. Also, it was assumed that 15 days would be

Table 5-2

[The table content is extremely faint and illegible due to low contrast and scan quality. It appears to be a multi-column table with several rows of text.]

required by the consultant to incorporate LANTDIV and regulatory comments on the draft final document and to prepare and submit the final document.

5.2.3 Data Gap Analysis and Supplemental Investigations

The schedules in this SMP reflect the fact that once the results of an investigation have been evaluated and draft (or draft final) reports have been submitted, it is common for data gaps to be identified that will need to be filled before risk management decisions can be made and remedial or removal alternatives can be defined. In fact, it is rare that all pertinent questions for risk assessment and the nature and extent of contamination are answered in a single phase of investigation. In past SMPs, the schedules for RI/FS projects did not account for multiple phases of investigation and were, therefore, unrealistically short. For the purposes of this SMP, it is assumed that data gap analyses and supplemental investigations will be performed following the review of both the draft and draft final reports.

The steps required for each phase of data gap analysis and supplemental investigations are:

1. Draft Document Review by LANTDIV/agencies complete (as previously shown)
2. Data Gap Analysis: 15 days
3. Work Plan for Supplemental Investigations: 15 days
4. LANTDIV/Agency Review of Supplemental Work Plan: 30 days
5. Mobilize for Field Investigation: 15 days
6. Supplemental Field Investigation (depends upon size of field effort): 15 to 30 days
7. Laboratory Analysis: 30 days
8. Data Validation: 15 days
9. Data Evaluation: 10 days
10. Prepare Draft Final Report (as previously shown)

Steps 2 to 9 above, are estimated to require approximately 6 months to complete and are often left out when project schedules are established. Following the draft final document review, it is common for additional data gaps to be identified. This results in steps 2 to 9 above being repeated and another 6 months elapsing before the final report can be prepared. The inclusion of data gap analysis and supplemental investigations after both the draft report and the draft final report are estimated to extend project schedules by about a year in comparison to an "ideal" RI/FS where no data gaps are identified after the first phase of investigation was completed.

Through team partnering, the data gap and supplemental investigation phases of a project can be significantly shortened through several steps:

- Environmental data are summarized and presented to the partnering team in tables and graphical form as soon as the data are available.
- As a team, the data are reviewed, data gaps are identified, and additional investigations (if necessary) are scoped during meetings. Although the team develops the scope of additional work based on a consensus, it is understood that additional data gaps may be identified once new results are in.
- The final document deliverable is not prepared and submitted until there is consensus that all significant data gaps have been filled.

5.2.4 Remedial Design/Remedial Action

The time required for remedial design/remedial action (RD/RA) depends on the type and complexity of the proposed remedial action. For example, the remedial design of a groundwater pump-and-treat system generally is much more complex than the remedial design for a soil removal/offsite disposal remedial action. Therefore, the groundwater pump-and-treat remedial design process may require up to one year, whereas the soil removal/off-site disposal remedial design may require less than 3 months. Similarly, the groundwater pump-and-treat system may operate for a long time (10 to 20 years for remedial action), whereas the soil removal/off-site disposal remedial action may be completed in less than one year. Therefore, schedules for RD/RA activities are only provided for projects where the type of remedial action to be performed is known. The remaining sites are only scheduled up through the ROD phase of the RI/FS process.

5.3 IRP Site Project Schedules

Project-specific schedules for IRP projects that are or potentially will be active in 2000 and 2001 are presented in Figure 5-1.

The basic strategy used during development of the IRP project schedules was to overlap the RI/FS and RD/RA activities to the maximum extent practicable. By overlapping activities, the overall project schedules are compressed without compromising the interdependencies of the various tasks and documents in the RI/FS process. The amount of overlap of tasks was based on the degree of dependency between the various tasks and documents. Key dependencies and related assumptions are outlined below.

- Remedial Investigation (RI): Preparation of the draft RI was assumed to start once all of the analytical data have been received, but before data validation. Certain RI tasks can begin before the data are validated. However, in order to prevent duplication of effort, this overlap was assumed to be only 2 weeks.
- Feasibility Study (FS): Preparation of the draft FS was assumed to begin approximately 4 months following the start of the RI. Many FS tasks are dependent on the nature and extent of contamination, which are generally defined in the RI report.
- Proposed Remedial Action Plan (PRAP): Preparation of the draft PRAP was assumed to start following receipt of agency comments of the draft final FS, because selection of the proposed remedial action(s) in the PRAP is contingent upon agency approval of the recommended alternative.
- Record of Decision or Decision Document (ROD): Preparation of the draft ROD was assumed to begin following receipt of agency comments on the draft final PRAP. Since public comments received during the public comment period must be responded to in the ROD, preparation of the final ROD would not begin until closure of the public comment period.

Appendix A

Team Partnering Accomplishments: Streamlining Cleanup at Naval Base Norfolk Through Team Partnering

Developing Tools to Streamline Cleanups

Many of the site-specific accomplishments described above were aided by the Team's success in developing tools, such as basewide documents and consensus agreements, to expedite planning activities and to tackle difficult technical issues.

Basewide Master Project Plan

The Team compiled a Master Project Plan for all activities to be performed under the Installation Prioritization Program at the Base. The Master Plan defines standard operating procedures (SOPs) for health and safety, field sampling, quality assurance, managing wastes generated during field investigations. The regulatory agencies reviewed and approved the Master Plan. With the Master Plan basewide SOPs, the need to develop lengthy site-specific plans for every site was eliminated. Work plan review time was minimized and the Master Plan can be used by any Navy contractor performing remediation work on the Base. Savings will be realized during the planning phase of a new site investigation.

Consensus Agreements

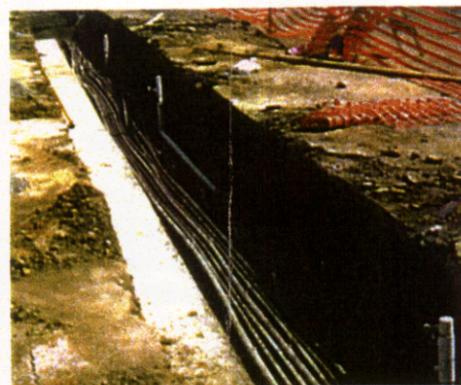
When the Team first convened, members of each organization discussed the kinds of technical issues that typically are difficult and time-consuming to solve. For these issues, Team members and technical specialists within their organizations worked together to agree on assumptions and technical approaches that would be used on all investigations at the Base. Once finalized, these "consensus agreements" are signed and incorporated into the permanent record of the Team.

Ongoing Remediation at the Base

While the Team has focused on sites that are at early stages of the cleanup process, major remediation activities are in progress at other sites on the Base. At the Camp Allen Landfill, a groundwater remediation system is in operation, pumping out contaminated groundwater, removing contaminants, and returning clean water to Bousch Creek. At the LP-20 site, a system that removes and treats contaminants from the groundwater and from the soil will be in operation in early 1998.



The groundwater treatment system at the Camp Allen Landfill removes both heavy metals and chlorinated organic compound contaminants from the groundwater.



An innovative remedial approach at the LP-20 site uses air sparging to remove organic contamination from the groundwater and soil-vapor extraction (SVE) to pull contaminants from the soil above the groundwater. Air sparging and SVE wells were installed in several trenches (above). Each well is controlled individually to optimize its effectiveness (below).



Looking Forward

The savings in cleanup costs and schedules that were achieved by the Base Partnering Team in 1997 represent a significant accomplishment for all of the member organizations. The commitment of each organization to the partnering process, and the trust that has developed among members of the Team provide the foundation that has enabled the Team to be successful. The Team is proud of the successes achieved in 1997, and is carrying this process forward at the Base.

Definitions:

Remedial Investigation/Feasibility Study (RI/FS):

An RI is an in-depth study of the nature and extent of contamination at a site. An FS is a detailed evaluation of potential cleanup alternatives for a site.

Record of Decision (ROD): The ROD is a public document that explains which cleanup alternative (from the FS) will be used to clean up a site.

Remedial Actions and Removal Actions:

Remedial actions and removal actions are the actual construction or implementation phase of site cleanup. In general, remedial actions are more comprehensive than removal actions. Removal actions, which can be implemented more quickly than remedial actions, may become the final remedial action if there are no further risks to human health and the environment after the removal action is completed.

Non-time-Critical Removal Actions: A non-time-critical removal action is undertaken where contaminants do not present such an imminent threat to human health or the environment that contaminants need to be cleaned up immediately (in 6 months or less).

Engineering Evaluation/Cost Analysis (EE/CA):

An EE/CA is an evaluation of cleanup alternatives prepared to support a decision for a non-time-critical removal action.

The core members of the partnering team are:

Tim Reisch, Naval Base Norfolk

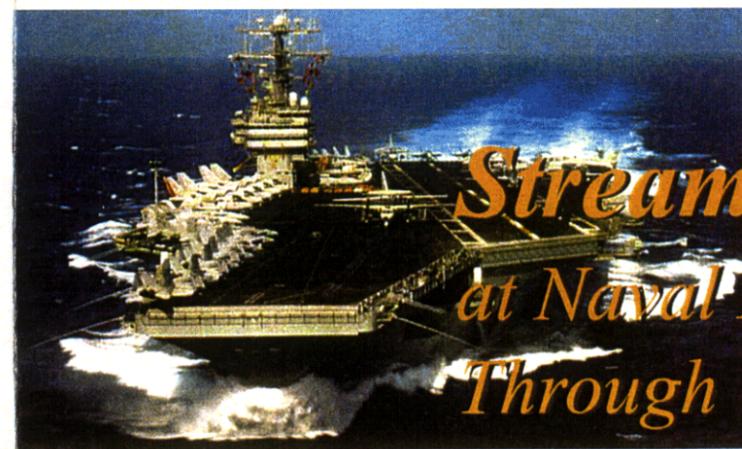
Randy Jackson, Naval Facilities Engineering Command, Atlantic Division

Devlin Harris, Virginia Department of Environmental Quality

Harry Harbold, US EPA Region III

Mike Tilchin, CH2MHILL

For additional information on cleanup activities at Naval Base Norfolk, please contact Tim Reisch (757/322-2896) or Randy Jackson (757/322-4587).



Streamlining Cleanup at Naval Base Norfolk Through Team Partnering

Mission Statement: To protect human health and the environment, and streamline the cleanup of Naval Base Norfolk, Virginia, through the use of innovative, consensus-based site management strategies.

Introduction

Partnering is a process by which several organizations with shared interests work as a team to achieve mutually beneficial goals. Team partnering was introduced at Naval Base Norfolk (the Base) in October 1996, to streamline the cleanup of former disposal sites by using innovative, consensus-based site management strategies. The partnering team (the Team) includes personnel from the Base, Naval Facilities Engineering Command, U.S. Environmental Protection Agency Region III, Virginia Department of Environmental Quality, and CH2M HILL and other Navy contractors. During 1997, the Team focused its efforts on six sites in various stages of cleanup. The Team also developed strategies and procedures designed to improve the quality and consistency of cleanup actions taken at the Base, both for these sites and for future cleanup work.

In evaluating its accomplishments in 1997, and projecting what would have been achieved without the team partnering, the Team went through a detailed process of developing cost estimates and cleanup schedules, both with and without partnering. The Team estimates that approximately \$3.75 million in project costs will be saved and cleanup milestones will be achieved as much as 2 years earlier.

How the Partnership Works

Each organization came to the partnership with the mutual goal of protecting human health and the environment by efficiently and effectively cleaning up contaminated sites at the Base. The Team discussed the organizational structures and goals of each member organization, the priorities for cleanup, and then reached consensus on those priorities. Remediation goals were established, and schedules for achieving these goals were set. The scope of site investigations and cleanups is discussed at regular meetings, milestone schedules are established, and responsibilities are assigned. At the

conclusion of each meeting, the Team develops the agenda for the next meeting. The decisions of the Team serve as a "driver" for executing work. Results from investigations and from scientific and engineering evaluations are presented to the Team as soon as they are available, unlike the "typical" process of generating a series of lengthy documents, where each draft document leads to a series of separate reviews. The Team is constantly looking for opportunities to do a better and faster job of reducing risks to human health and the environment.

\$3.75 million in project costs will be saved and cleanup milestones will be achieved as much as 2 years earlier.



Estimated Time and Cost Savings Achieved Through Partnering

Site and Action	Cost Savings	Time Savings
Camp Allen Salvage Yard Removal Action	\$50,000	18 months
CD Landfill Closure	\$3,500,000	24 months
Building W-316 PCB Removal	\$20,000	18 months
Pesticide Drain RI/FS and Removal Action	\$50,000	12 months
Building SP-2B Expedited Removal Action	\$50,000	6 months
Slag Pile RI/FS and Sediment Removal Action	\$80,000	18 months

Accomplishments in 1997

For each site that the Team addressed, the cleanup activity is briefly described, the approach that would have been followed without the partnering process is discussed, followed by a summary of how partnering improved the cleanup.

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Camp Allen Salvage Yard Removal Action

The 27-acre Camp Allen Salvage Yard operated from the 1940s until 1995 for salvaging and disposing of scrap materials generated at the Base and in the Tidewater area. In 1993, a preliminary assessment/site investigation (PA/SI) was conducted to collect soil and groundwater data for the site.

Original Approach

Following a review of data collected from the PA/SI, a remedial investigation and feasibility study (RI/FS) would be conducted over 2 to 3 years to determine the remedial action required.

How Partnering Was Applied

After reviewing soil and groundwater sampling data collected during the initial site investigation, the Team determined that polychlorinated biphenyl (PCB) contamination in the soil was the only contaminant of concern at the site, and recommended non-time-critical removal. The Team reached consensus on cleanup goals for both surface soil and subsurface soil after completing a focused risk assessment. An engineering evaluation/cost analysis (EE/CA) identified excavation and offsite treatment of 12,000 cubic yards of soil as the most cost-effective removal alternative. Funding was obtained and the work is expected to be completed in 1998.

Project Highlights

- Used the partnering approach that led to an expedited plan for quickly reducing the most serious risk at the site.
- Avoided long-term RI/FS and design process for cleanup of PCB-contaminated soil.
- Saved approximately 18 months in document review time and project implementation.
- Saved approximately \$50,000 in design costs.

CD Landfill Closure

The 25-acre CD Landfill was used for disposing of unblasting and construction waste from 1974 to 1987. In 1996, an RI/FS was completed and a Decision Document signed requiring excavation of nearby sediment that had been contaminated by runoff from the landfill.

Original Approach

A decision on closure requirements for the landfill was on hold because of unresolved issues between the Navy and the regulatory agencies concerning the technical requirements for capping the landfill. The regulatory agencies initially recommended that a cap be constructed over the entire site that met the technical requirements for a hazardous waste landfill.

How Partnering Was Applied

Through a process referred to as "joint scoping," the Team developed a sampling plan to determine the waste characteristics of the landfill. After reviewing the new sampling data, the regulatory agencies accepted the recommendation of the Team to close the landfill with a cap designed for landfills with nonhazardous wastes. The project had been delayed for more than a year before the capping issue was resolved, and more delays seemed likely. The trust that developed through the partnering process enabled the organizations to overcome a roadblock to closing the site.

Project Highlights

- Improved communication and decision making between the Navy and the regulatory agencies.
- Saved \$3.5 million in construction costs using the alternate cap design.
- Saved approximately 24 months in resolving the technical approach and in document review time.

Building W-316 PCB Removal

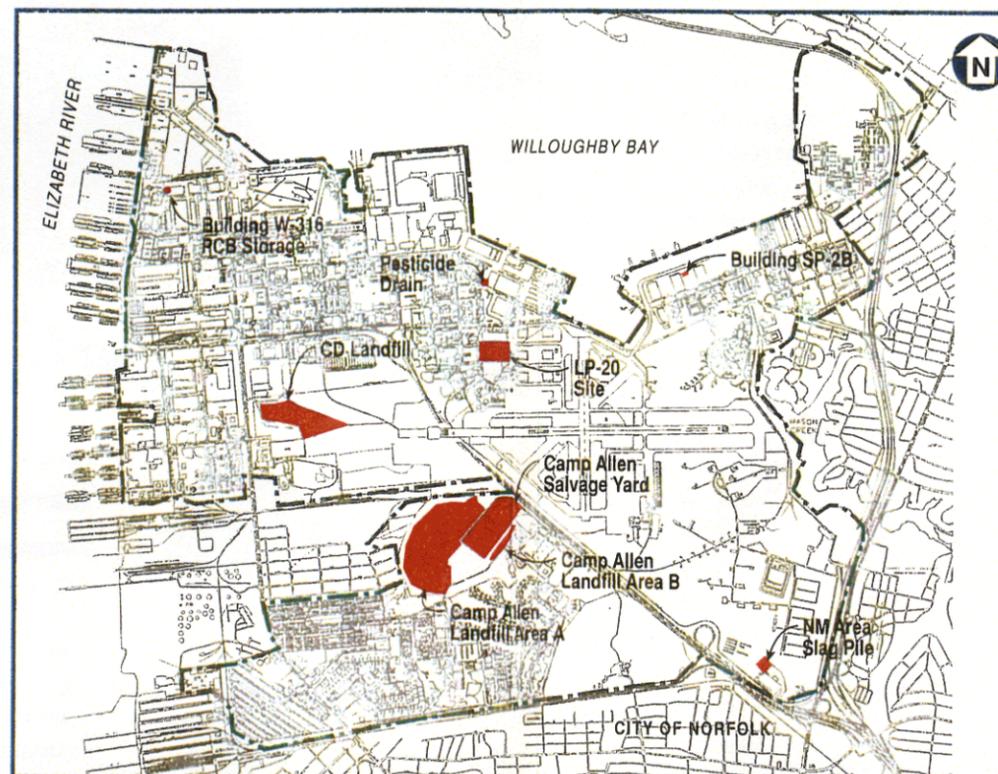
Building W-316, the Public Works Center PCB storage facility, was used to temporarily store electrical transformers and other PCB-contaminated waste before disposal. Soil sampling during an initial site investigation indicated that the storage yard outside the building has elevated levels of PCBs from the equipment in the area.

Original Approach

An RI/FS would be conducted over several years to determine the remedial action required.

How Partnering Was Applied

The contaminated area is small and a full-scale RI/FS was not warranted. The Team was able to expedite site remediation by reaching consensus to conduct a PCB removal action under the authority of the Toxic Substances Control Act. Between 300 and 400 cubic yards of contaminated soil will be



excavated and disposed of offsite and confirmatory sampling will be conducted to confirm that site cleanup levels are achieved.

Project Highlights

- Accelerated the project schedule by at least 1 year.
- Eliminated the need for detailed design and construction documents.
- Saved approximately \$20,000 in contracting and project management costs.

Pesticide Drain RI/FS and Removal Action

The Pesticide Disposal Site is composed of a vertical subsurface drain pipe that historically was used to dispose of pesticide rinse water from a pest control shop. A PA/SI and follow-up sampling identified pesticide contamination in subsurface soil near the drain pipe.

Original Approach

A detailed investigation, followed by the preparation of RI/FS reports and a Record of Decision (ROD) would be developed.

How Partnering Was Applied

The Team recommended a more focused follow-up sampling program to determine the extent of soil contamination and groundwater flow direction.

Results showed that removing approximately 55 cubic yards of soil would eliminate potential risks. The Team agreed that the contamination could be addressed through an expedited removal action. An EE/CA was prepared instead of a more extensive FS. With reduced costs and an expedited approach, funding for the removal action is expected to be available more quickly.

Project Highlights

- An RI/FS and a ROD were not required, saving time and money over more complex site investigation approaches.
- Conducted a focused review of existing data and information.
- Eliminated the need for detailed design and construction documents.
- Saved approximately \$50,000 by implementing a focused removal action.
- Saved approximately 12 months.

Building SP-2B Expedited Removal Action

The SP-2B Accumulation Area was a small wooden structure that was formerly used to temporarily store industrial wastes in closed drums. A preliminary sampling study identified elevated levels of lead in soil.

Original Approach

Either a traditional RI/FS or a removal action would be conducted.

How Partnering Was Applied

The Team jointly scoped a removal action and confirmatory sampling scheme and agreed to proceed without submitting a work plan because of the small volume of contaminated soil to be removed. Scheduling the removal action concurrently with another ongoing remedial action saved money in contracting and site mobilization costs. The project team will sign a closeout report at the completion of the project.

Project Highlights

- Saved \$50,000 in project costs.
- Accelerated project schedule by 6 months compared with a routine removal action.

RI/FS Study and Removal Action for NM Slag Pile

The NM Slag Pile is a former disposal area for slag from an aluminum smelting operation active during the 1960s. The contractor presented a preliminary work plan to conduct an RI/FS to the partnering team at its kickoff meeting. Only limited field work had been done at the site before that time.

Original Approach

A detailed work plan would be prepared and a multiyear RI/FS would be conducted. Data gaps would not be identified until the RI/FS report was submitted for review. Design and construction of a remedy would be on hold until all site characterization, risk assessment, feasibility studies, and decision documents for the entire site were completed.

How Partnering Was Applied

The Team reduced the number of documents reviewed and review time by joint scoping and reviewing data as they became available. Technical

subgroups were formed to help identify the data gaps that needed to be filled in order to complete the investigation of the site and conduct the risk assessments. The joint scoping process was used to plan additional fieldwork targeted at filling the data gaps. The contractor submitted the RI report and the human health risk assessment in September 1997. The fieldwork and the RI report were completed 1 year ahead of schedule.

The Team determined that the nature and extent of contamination in sediment in streams and drainageways affected by the site were well defined, even though additional investigations were required to determine the extent of contamination in other media. Sediment was separated from the remainder of the site for an early removal action to reduce ecological risks.

Project Highlights

- Eliminated several drafts of work plans and reports by resolving issues in Team meetings.
- Streamlined data review during meetings.
- Resolved complex risk-related issues by using small subgroups of technical experts from each Team organization.
- Reduced field schedules by approximately 6 months.
- Reduced cost of field investigations by approximately \$40,000.
- Will remediate contaminated stream sediment ahead of other media requiring additional risk characterization.
- Will evaluate removal alternatives for sediment through an EE/CA, rather than an FS, saving approximately \$40,000.
- Will clean up sediment as a removal action.

