

7/1/03-01103

Final
Action Memorandum
for Contaminated Sediment in the Pond Area
Site 22
Camp Allen Salvage Yard
Naval Station Norfolk, Norfolk, Virginia



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

Contract No. N62470-95-D-6007

CTO-0199

July 2003

Prepared by

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ACTION MEMORANDUM
POND AREA ADJACENT TO CAMP ALLEN SALVAGE YARD
NAVAL STATION NORFOLK

DATE: July 1, 2003

SUBJECT: Removal Action at the Pond Area Adjacent to the Camp Allen Salvage Yard, Naval Station Norfolk, Norfolk, Virginia

FROM: Commander, Atlantic Division, Naval Facilities Engineering Command

TO: F.F. Aucremanne, CAPT, CEC, USN
Regional Engineer, Acting
By Direction of the Commander, Navy Region, Mid-Atlantic

This Action Memorandum documents approval for the removal action as described herein for the pond area adjacent to the Camp Allen Salvage Yard at Naval Station Norfolk, Norfolk, Virginia. This Action Memorandum serves as the Decision Document for the Engineering Evaluation/Cost Analysis for the pond area.

This decision document represents the selected removal action for the pond area and was developed in accordance with the Comprehensive Environmental Response, Compensation and Liability Act of 1980 as amended, and is consistent with the National Oil and Hazardous Substances Pollution Contingency Plan (NCP). This decision is based on the administrative record for the site.

Conditions at the site meet the NCP Section 300.415(b)(2) criteria for removal. The Naval Facilities Engineering Command recommends approval of the proposed removal action. The total project ceiling is estimated to be \$437,000. Response actions should commence as soon as practical due to the potential threat to the environment from the pond area.

Approved by:


F.F. Aucremanne, CAPT, CEC, USN
Regional Engineer, Acting
By Direction of the Commander, Navy Region, Mid-Atlantic

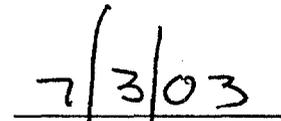

Date

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ACRONYMS AND ABBREVIATIONS

ARAR	Applicable or Relevant and Appropriate Requirement
CASY	Camp Allen Salvage Yard
CERCLA	Comprehensive Environmental Response, Compensation and Liability Act
EE/CA	Engineering Evaluation/Cost Analysis
IR	Installation Restoration
NCP	National Oil and Hazardous Substances Pollution Contingency Plan
PCB	Polychlorinated Biphenyl
USEPA	U.S. Environmental Protection Agency

I. PURPOSE

This Action Memorandum documents approval for the removal action as described herein for the pond area adjacent to the Camp Allen Salvage Yard (CASY) at Naval Station Norfolk, Norfolk, Virginia. This Action Memorandum serves as the Decision Document for the Engineering Evaluation/Cost Analysis (EE/CA) for the pond area adjacent to the CASY included as Appendix A.

This Action Memorandum has been completed in accordance with the removal program requirements defined by the Comprehensive Environmental Response, Compensation and Liability Act of 1980 (CERCLA), as amended, the National Oil and Hazardous Substances Pollution Contingency Plan (NCP), and the U.S. Environmental Protection Agency's (USEPA) Superfund Removal Procedures Action Memorandum Guidance (USEPA, 1990).

The Department of the Navy has broad authority under CERCLA Section 104 and Executive Order 12580 to carry out removal actions when the release is on, or the sole source of the release is from, the Navy installation. The Navy/Marine Corps Installation Restoration (IR) Program was initiated to identify, assess, characterize, and clean up or control contamination from past hazardous waste disposal operations and hazardous material spills at Navy and Marine Corps Activities. This Action Memorandum follows the guidelines published in the Navy/Marine Corps IR Manual dated February 1997 (Naval Facilities Engineering Service Center, 1997). This document addresses a non-time-critical removal action for installing an engineered cover over the pond sediment and land use control planning at the pond area adjacent to the CASY.

II. SITE CONDITIONS AND BACKGROUND

In 1997, Naval Station Norfolk was placed on USEPA's National Priorities List of Superfund sites and is identified in USEPA's Comprehensive Environmental Response, Compensation and Liability Information System as VA6170061463. The following section describes the CASY's features and history. This section also discusses previous site investigations, the current site investigation, and the detected contaminants that necessitated the preparation of the EE/CA.

A. Site Description

The CASY was dedicated to the salvaging and disposal of scrap materials generated by the Navy in the Tidewater area. The Navy managed the facility from 1940 until 1972. The Defense Reutilization and

Marketing Services managed the CASY from 1972 until 1995 when salvage operations were discontinued. The CASY contained buildings and areas where distinct salvage operations were conducted. After salvaging operations stopped, many structures were removed including two railroad spurs for loading and unloading scrap; a bailer/smelter/incinerator; a building that was used for general and transformer storage; a drum storage area located parallel to Ingersoll Street; a drum accumulation area in the northern portion of the site; an all white goods stockpile; and a general scrap stockpile.

1. Removal Site Evaluation

The pond area was identified as a potential area of concern in an Initial Assessment Study conducted by the Navy in 1982. A Preliminary Assessment/Site Inspection and a Remedial Investigation/Feasibility Study have additionally been performed at the site (Baker, 1993, 1999, and 2000). An EE/CA was finalized and made available to the public in February 2002 (Baker, 2002) for the 22-acres of the CASY north and west of the pond area. This EE/CA addressed soils contaminated with inorganics (antimony, arsenic, iron, and lead) as well as polychlorinated biphenyls (PCBs) at levels above USEPA Region III screening levels.

2. Physical Location

The CASY facility is located in the Naval Station Norfolk, south of Chambers Field and Interstate 564, in an area known as Camp Allen. A location map is presented in Figure 1. The CASY consists of approximately 22 acres of level ground surrounded by chain-link and barbed-wire fencing. Facilities surrounding the CASY include the Naval Brig, heliport, the Camp Allen Landfill (Areas A and B), the U.S. Marine Corps Camp Elmore, Norfolk Crossing military housing, the Camp Allen Elementary School, and a civilian community (Glenwood Park). The CASY lies between Areas A and B of the Camp Allen Landfill (which was previously investigated under the IR Program, Site 1). A site layout of the CASY is shown on Figure 2.

Previously, in several studies and reports, the pond area has been included as part of work performed at the CASY. For simplicity in research and review of previous investigations, the pond area will be referred to as being part of the CASY.

3. Site Characteristics

The CASY includes an area of approximately 22 acres of level ground. All of the site salvage or storage areas, structures, and buildings that were active during the salvaging process have been demolished and removed. A paved parking area and the remains of railroad tracks are still present in the southern portion of the site. Historically, the CASY area was covered with stands of hardwoods and vast areas of tidal marsh. Filling operations conducted by the Navy during development of the base has greatly altered the original terrain. The CASY had been an active salvage yard for over 50 years and provides limited habitat for wildlife. The pond area adjacent to the CASY offers limited terrestrial habitat and minimal ecological features. Presently the pond area supports limited aquatic wildlife species, though it offers extremely poor habitat due to its small size, relative isolation from other ecological features, and proximity to developed areas. The pond area, which is less than one acre, serves as a storm water drainage basin. Storm water leaves the pond through a storm sewer that crosses the CASY and discharges to a drainage ditch on the northwest side of Ingersoll Street. In May 1999, the Navy asked the U.S. Army Corps of Engineers to verify that the pond is not a regulated wetland. The U.S. Army Corps of Engineers inspected the site and verified that the pond area is considered upland property and therefore not within their wetland jurisdiction. In 2002, the Navy removed sediment from the storm sewer line that crosses the site and installed a temporary inlet structure where the pond discharges into the storm sewer, minimizing the potential for sediment migration prior to this removal action.

4. Release or Threatened Release into the Environment of a Hazardous Substance, Pollutant, or Contaminant

The medium of concern at the pond area is sediment contaminated with volatiles, semivolatiles, pesticides, PCBs, and inorganics. Analysis of sediment samples indicates that approximately 800 cubic yards of sediment are contaminated.

Additionally, storm water runoff from the site has the potential to transport contaminated sediment to an unnamed tributary to Bousch Creek, which discharges into Willoughby Bay, approximately one mile north of the site.

5. National Priorities List Status

In 1997, Naval Station Norfolk was placed on USEPA's National Priorities List of Superfund sites. Remedial activities are in progress at various designated IR sites located on Naval Station Norfolk including the pond area which is located adjacent to the CASY.

6. Maps, Pictures and Other Graphic Representations

Figures 1 and 2 show a location map and site layout of the CASY, respectively. Figure 3 shows the proposed removal activities for the pond area.

B. Other Action to Date

1. Previous Actions

The CASY was previously identified in the Initial Assessment Study performed in 1982 as a site of potential concern. Several subsequent investigations and actions have taken place at the site and surrounding area. The previous actions, findings, and recommendations can be found in the following reports:

- Initial Assessment Study for Naval Station Norfolk (NEESA, 1983)
- Preliminary Assessment/Site Inspection (Baker, 1993)
- Camp Allen Landfill Remedial Investigation (Baker, 1994a)
- Camp Allen Landfill Feasibility Study (Baker, 1994b)
- Camp Allen Landfill Decision Document (Baker, 1995)
- Camp Allen Salvage Yard PCB-Contaminated Soils EE/CA (Baker, 1997)
- Camp Allen Salvage Yard Non-Time-Critical PCB Removal Action, 1998
- Camp Allen Salvage Yard Remedial Investigation (Baker, 1999)
- Camp Allen Salvage Yard Feasibility Study (Baker, 2000)
- Camp Allen Salvage Yard Hot Spot Study (Baker, 2001a)
- Camp Allen Salvage Yard Proposal to Revise Preliminary Remediation Goals (Baker, 2001b)
- Camp Allen Salvage Yard Metals-Contaminated Soils EE/CA (Baker, 2002)
- Final EE/CA for Contaminated Sediment in the Pond Area (Baker, 2003)

2. Current Actions

The CASY is currently not active as a salvage area. The Navy has plans to use the site as a recreation area in the future. There have been a number of removal actions completed at the CASY. In 2001, the Navy completed a removal action that included more than 16,000 cubic yards of PCB-contaminated and concentrated metals-contaminated soils (hot spots). In 2002, the Navy placed a one-foot soil cover over 22-acres of the CASY.

C. State and Local Authorities' Role

1. State and Local Actions to Date

As previously stated, Executive Order 12580 delegates to the Department of Defense the President's authority to undertake CERCLA response actions. Congress further outlined this authority in the Defense Environmental Restoration Program Amendments, under 10 United States Code Sections 2701 through 2705. CERCLA Section 120 requires the Navy to apply State removal and remedial action law requirements at its facilities.

2. Potential for Continued State/Local Response

The Navy will continue to be the lead agency with funding provided for environmental restoration provided by the Defense Environmental Restoration Program. The USEPA and the Virginia Department of Environmental Quality will continue to be consulted during and until actions addressing the contaminated sediment are determined complete.

III. THREATS TO PUBLIC HEALTH OR WELFARE OR THE ENVIRONMENT, AND STATUTORY AND REGULATORY AUTHORITIES

Section 300.415 of the NCP lists the factors to be considered in determining the appropriateness of a non-time-critical removal action. Paragraphs (b)(2)(i), (iv), and (v) of Section 300.415 apply to the conditions as follows:

300.415(b)(2)(i) “Actual or potential exposures to nearby human populations, animals, or the food chain from hazardous substances or pollutants or contaminants.”

Volatiles, semivolatiles, pesticides, PCBs, and inorganics were identified as ecological contaminants of potential concern because maximum and mean sediment concentrations exceeded screening values. The data demonstrated the need for remedial action at the site, as there is the potential for unacceptable risks for the pathways, receptors, and chemicals evaluated.

300.415(b)(2)(iv) “High levels of hazardous substances or pollutants or contaminants in soils largely at or near the surface, that may migrate.”

High levels of volatiles, semivolatiles, pesticides, PCBs, and inorganics have been detected in the pond area sediment. The site is mostly unvegetated, increasing contaminant migration potential via storm water runoff and infiltration to groundwater.

300.415(b)(2)(v) “Weather conditions that may cause hazardous substances or pollutants or contaminants to migrate or be released.”

Because of the proximity to the coastline, the CASY is subject to storms throughout the late summer and early fall. Winter storms that move along the eastern seaboard are often associated with high winds and precipitation, which could cause the migration of contaminants from the site via storm water runoff.

IV. ENDANGERMENT DETERMINATION

Actual or threatened releases of hazardous substances from this site, if not addressed by implementing the response action discussed in this Action Memorandum, may present an imminent and substantial endangerment to public health, welfare, or the environment.

V. PROPOSED ACTIONS AND ESTIMATED COSTS

A. Proposed Actions

1. Proposed Action Description

The proposed removal action at the CASY will include the installation of a compacted one-foot cover of soil and a cellular concrete block system installed over a geotextile which will cover the pond sediment (approximately 25,500 square feet). The NCP recognizes capping or covering of contaminated material as an appropriate removal alternative for consideration under non-time-critical removal actions (40 CFR

300.415(e)(4)). Land use control planning will also be implemented to ensure that the integrity of the concrete liner will be maintained. The block system consists of a “flexible” concrete revetment which allows the blocks to traverse changes in terrain without disruption of the placement pattern and interlock feature. The cover will be contoured to control erosion and to allow the pond to function as a storm water drainage basin.

The Navy will inspect the block system on an annual basis and after major storm events to ensure that integrity is maintained. Restoration will be performed, as needed, based upon inspection results. Since contaminated sediment that poses a potential ecological risk will remain at the site, land use controls will be required following this action. These controls could include restricted intrusive activities at the site (e.g., excavation, installation of wells, construction) as approved by the Navy.

This action was chosen because it is cost effective, protective, easily implementable, and does not conflict with the future designated uses of the site. This removal option minimizes the potential for direct contact with contaminated sediment and provides a reduction in the mobility of the remaining contaminants by minimizing storm water runoff and the infiltration of precipitation. No further sampling or investigative assessments will be required before the response action can be implemented, as the nature and extent of the contamination has been identified and documented (Baker, 1999 and OHM/IT, 2000 and 2001). The Navy will comply with applicable State and Federal disposal requirements, if any materials require removal and/or disposal off-site.

2. Contribution to Remedial Performance

The removal action will mitigate the potential direct contact threat posed by contaminated sediment and the threat of contaminant release and migration. The removal action will provide a reduction in the mobility of contaminants contained in the sediment by minimizing the infiltration of precipitation. The action will immediately address sediment contamination and the potential ecological risks and will not impede future responses for groundwater contamination. The removal action is compatible with the planned future uses of the site, is consistent with accepted removal practices, and meets the NCP removal criteria.

3. Description of Alternative Technologies

Three alternatives were qualitatively assessed and compared based on their effectiveness, implementability, and cost. The preferred removal action for this site is the most readily implementable,

is cost-effective, and minimizes risks to human health and the environment by preventing direct contact with the remaining contaminated sediment. This action will also provide a reduction in mobility of contaminants contained in the sediment by minimizing infiltration of precipitation. Other alternative technologies evaluated included: 1) No Action 2) Institutional Controls Plus Land use Control Planning, and 3) Excavation/Removal and Off-Site Disposal. The EE/CA provides an in-depth discussion and comparison of the alternative removal options considered for the CASY sediment (Appendix A).

4. Engineering Evaluation/Cost Analysis

As described above, an EE/CA was completed to address the non-time-critical removal action for contaminated sediment at the pond area adjacent to the CASY. The EE/CA was made available to the public for comment on April 30, 2003. No comments were received from the public during the comment period, which ended on May 30, 2003.

5. Applicable or Relevant and Appropriate Requirements

The NCP requires that removal actions attain applicable or relevant and appropriate Federal and State requirements (ARARs) with limited exception, to the extent practicable. ARARs are divided into three categories: chemical-specific, location-specific, and action-specific. Chemical-specific ARARs are particular to individual contaminants. Location-specific ARARs depend upon the location of the contamination and potential restrictions on activities conducted in these areas (i.e., wetlands, floodplains, etc.). Action-specific ARARs govern the remedial actions and are usually technology or activity-based directions or limitations that control actions taken at CERCLA sites.

The analysis of removal alternatives was performed and is presented in the CASY Pond EE/CA. The removal action set forth in this action memorandum will comply with all applicable, relevant, and appropriate environmental and human health requirements, to the extent practicable considering the requirements of the situation.

6. Project Schedule

The proposed project schedule is:

Design and Specifications:	May 2003
Preparation of Removal Action Work Plans:	July 2003
Action Memorandum released:	July 2003
Removal Action:	July 2003 – October 2003

B. Estimated Costs

The estimated costs associated with the removal action are itemized below:

Direct Capital Costs	
General	\$18,000
Site Work	\$20,476
Removal and Disposal	\$217,635
Monitoring and Sampling	\$13,425
Site Restoration	\$62,940
	Subtotal
	\$332,476
Indirect Capital Costs	
Engineering Oversight	\$19,949
Contingency Allowance (15%)	\$49,871
Contract Administration	\$16,624
	Subtotal
	\$86,444
Operation and Maintenance Costs (30 Years)	\$18,047
	Total
	\$437,000

VI. EXPECTED CHANGE IN THE SITUATION SHOULD ACTION BE DELAYED OR NOT TAKEN

If no action is taken or the action is delayed, the potential for direct contact with the contaminants and the threat of migration of contaminants from the site will remain.

VII. OUTSTANDING POLICY ISSUES

There are no outstanding policy issues regarding this action.

VIII. ENFORCEMENT

The Navy can and will perform the proposed response promptly and properly.

IX. RECOMMENDATION

This decision document represents the selected removal action for the pond area adjacent to the CASY, Naval Station Norfolk, Norfolk, Virginia, developed in accordance with CERCLA as amended, and is consistent with the NCP. This decision is based on the administrative record for the site.

Conditions at the site meet the NCP Section 300.415(b)(2) criteria for removal. The Naval Facilities Engineering Command recommends approval of the proposed removal action. The total project ceiling is

estimated to be \$437,000. Response actions should commence as soon as practical due to the potential threat to human health and the environment from the pond area adjacent to the Camp Allen Salvage Yard.

X. REFERENCES

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JAMES RIVER



CHESAPEAKE BAY

ENTRANCE REACH

INSTALLATION PROPERTY BOUNDARY

SALVAGE YARD AREA

NEWPORT NEWS CHANNEL

WILLOUGHBY BAY

BAY

NORFOLK HARBOR REACH

ELIZABETH RIVER

INTERSTATE 564

U.S. ARMY DISPOSAL AREA



LEGEND

- INSTALLATION PROPERTY BOUNDARY
- SURFACE WATER

Source: U.S.G.S. Topographic Map, Norfolk North Quadrangle, VA Photoinspected 1989.

FIGURE 1 LOCATION MAP

CAMP ALLEN SALVAGE YARD NAVAL STATION NORFOLK, NORFOLK, VIRGINIA

61103 RB14

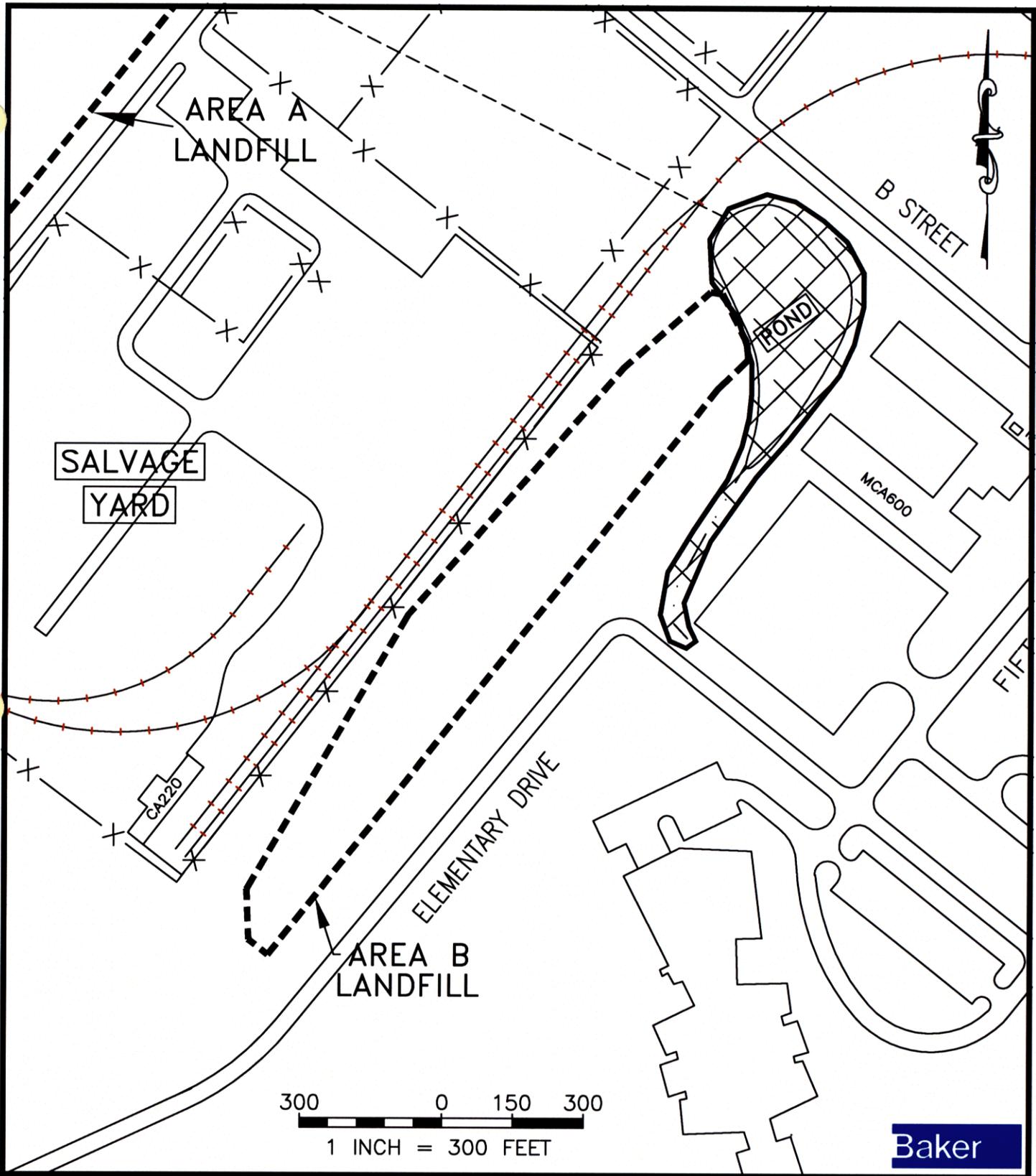


FIGURE 2
SITE LAYOUT

CAMP ALLEN SALVAGE YARD
NAVAL STATION NORFOLK, NORFOLK, VIRGINIA

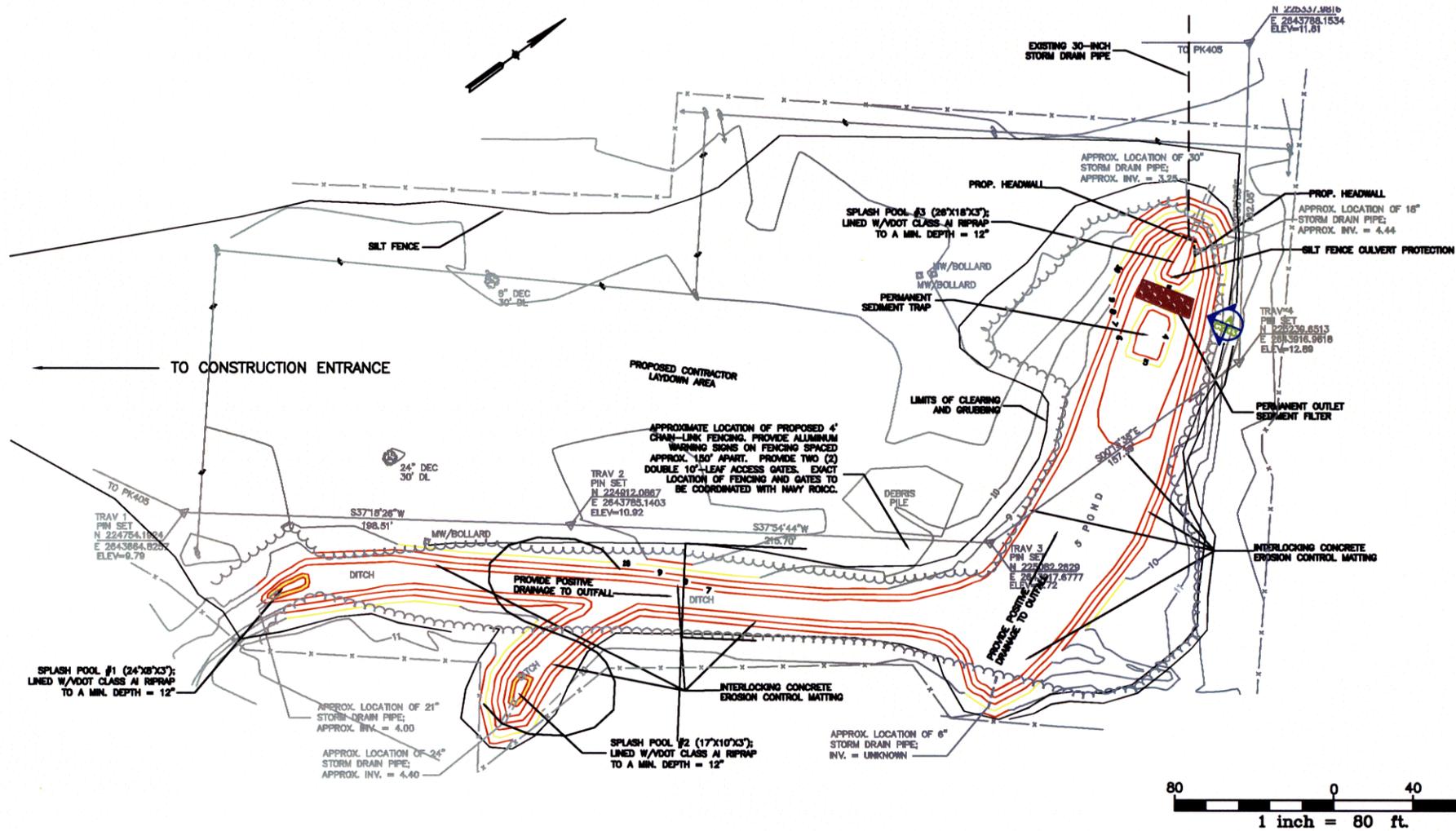


FIGURE 3
PROPOSED REMOVAL ACTIVITIES

CAMP ALLEN SALVAGE YARD
NAVAL STATION NORFOLK, NORFOLK, VIRGINIA

FINAL

**ENGINEERING EVALUATION/COST ANALYSIS (EE/CA)
FOR CONTAMINATED SEDIMENT IN THE POND AREA**

**CAMP ALLEN SALVAGE YARD
SITE 22
NAVAL STATION NORFOLK
NORFOLK, VIRGINIA**

CONTRACT TASK ORDER 0199

JULY 2003

Prepared For

**DEPARTMENT OF THE NAVY
ATLANTIC DIVISION
NAVAL FACILITIES ENGINEERING COMMAND
Norfolk, Virginia**

Under The

**LANTDIV CLEAN Program
Contract N62470-95-D-6007**

**Comprehensive Long-Term
Environmental Action Navy**

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ACRONYMS AND ABBREVIATIONS

ARAR	Applicable or Relevant and Appropriate Requirements
bgs	below ground surface
CAL	Camp Allen Landfill
CASY	Camp Allen Salvage Yard
CERCLA	Comprehensive Environmental Response, Compensation and Liability Act
CFR	Code of Federal Regulations
CNO	Chief Naval Operation
COC	Contaminants Of Concern
COPC	Contaminants Of Potential Concern
DERP	Defense Environmental Restoration Program
DOT	Department of Transportation
EE/CA	Engineering Evaluation/Cost Analysis
ERA	Ecological Risk Assessment
FS	Feasibility Study
HHRA	Human Health Risk Assessment
HI	Hazard Index
HQ	Hazard Quotient
ILCR	Incremental Lifetime Cancer Risk
IR	Installation Restoration
LUC	Land Use Controls
mg/kg	milligram per kilogram
NCP	National Oil and Hazardous Substances Pollution Contingency Plan
ODUSD	Office of the Deputy Under Secretary of Defense
OSHA	Occupational Safety and Health Administration
PA	Preliminary Assessment
PAH	Polynuclear Aromatic Hydrocarbon
PCB	Polychlorinated Biphenyl
RAGS	Risk Assessment Guidance for Superfund
RCRA	Resource Conservation and Recovery Act
RD	Remedial Design
RI	Remedial Investigation
SI	Site Inspection
SVOC	Semivolatile Organic Compounds
TBC	To Be Considered
USC	United States Code
USEPA	U.S. Environmental Protection Agency
VAC	Virginia Administrative Code
VHWMR	Virginia Hazardous Waste Management Regulations
VSWMR	Virginia Solid Waste Management Regulations

EXECUTIVE SUMMARY

This Engineering Evaluation/Cost Analysis (EE/CA) was performed to provide the basis for a non-time-critical removal action for sediment contaminated with metals and polychlorinated biphenyls (PCBs) in the pond area located adjacent to the Camp Allen Salvage Yard (CASY) located at Naval Station Norfolk in Norfolk, Virginia. Studies conducted on the site include: a Preliminary Assessment/Site Inspection (PA/SI) (Baker, 1993), a Remedial Investigation (RI) (Baker, 1999), and a metals "hot spot" study (Baker, 2001a). The results of these investigations identified metals and PCB contamination in the sediments associated with the pond and downstream storm drains. This EE/CA addresses the remediation of the metals and PCB contaminated sediment.

Previously, while RI studies performed at the CASY have included sampling and analysis of media at and surrounding the pond area, references to the pond have typically included the pond within the Camp Allen Landfill (CAL) Area B. For simplicity in research and review of previous investigations the pond area will be referred to as being part of the CASY.

The Navy identified the need for a non-time-critical removal action at the pond area of the CASY following the completion of supplemental soil sampling conducted in the summer of 2001. This data demonstrated more extensive contamination at the CASY than was indicated by previous sampling events. The Navy plans to initiate this removal action to minimize potential exposures to sediments. The Naval Station Norfolk Partnering Team agreed to proceed with an EE/CA for the CASY pond area in October 2002.

Remedial action alternatives evaluated for the pond area included: no action, land use control planning, excavation and off-site disposal of pond sediments, and placing an engineered cover over pond sediments.

Following United States Environmental Protection Agency (USEPA) guidance, each of the selected alternatives was evaluated based on effectiveness, implementability, and cost. The Navy recommends that Alternative 3, the placing of an engineered cover over the pond sediments and land use control planning, be implemented for a non-time critical removal action at the CASY.

1.0 INTRODUCTION

This report presents the EE/CA of removal action options for the metals and PCB contaminated sediment in the pond area within the CASY, Naval Station Norfolk, Virginia. Baker Environmental, Inc. (Baker) has prepared this EE/CA under contract to the Atlantic Division Naval Facilities Command. The development of this EE/CA is based on a Scope of Work/Schedule Modification Request for Contract Task Order 0199, under Comprehensive Long-Term Environmental Action Navy Contract 62470-95-D-6007.

This EE/CA has been conducted in accordance with the removal program requirements defined by the Comprehensive Environmental Response, Compensation and Liability Act of 1980 (CERCLA), as amended, the Superfund Amendments and Reauthorization Act of 1986, the National Oil and Hazardous Substances Pollution Contingency Plan (NCP), and the USEPA's *Guidance on Conducting Non-Time Critical Removal Actions Under CERCLA* (USEPA, 1993).

The Department of the Navy has broad authority under CERCLA Section 104 and Executive Order 12580 to carry out removal actions when the release is on, or the sole source of the release is from, the Department of the Navy installation. The Navy/Marine Corps Installation Restoration (IR) Program was initiated to identify, assess, characterize, and clean up or control contamination from past hazardous waste disposal operation and hazardous material spills at Navy and Marine Corps Activities.

This EE/CA follows the guidelines published in the Navy/Marine Corps IR Manual dated February 1997 (Naval Facilities Engineering Services Center, 1997). This document addresses a non-time-critical removal action for sediment contaminated with metals and/or PCBs from former operations at the CASY.

A non-time-critical removal action is appropriate for a site where action may be delayed for six months or more before cleanup is initiated and includes an analysis of removal alternatives. Potential remediation alternatives are evaluated for effectiveness in minimizing or stabilizing the threat to public health, consistency with anticipated final remedial actions, consistency with applicable or relevant and appropriate requirements (ARARs), and cost effectiveness. Non-time-critical removal actions may be interim or final actions, they may be the first and only action at a site, or one of a series of planned response actions. The NCP recognizes many appropriate removal action options, including site control measures, stabilization, drainage controls, capping, excavation, treatment, and disposal (40 CFR 300.415(e)). The scope of this non-time-critical removal action will address contaminated sediment in the

pond area adjacent to the CASY only and will be determined in this EE/CA. This EE/CA is based on data presented in the following CASY documents: a PA/SI conducted by Baker in 1993, a RI Report for the CAL conducted by Baker in 1994, a RI conducted by Baker in 1996, and an EE/CA for metals contaminated soil conducted by Baker in 2002.

2.0 SITE CHARACTERIZATION

The following sections describe the features and history of the pond area adjacent to the CASY. These sections also discuss previous site investigations, the current site investigation, and the detected contaminants that necessitated the preparation of this EE/CA.

2.1 Site Description

The CASY facility is located in the Naval Station Norfolk, south of Naval Air Station Norfolk and Interstate 564, in an area known as Camp Allen. A location map is shown on Figure 2-1. The CASY consists of approximately 22 acres of level ground surrounded by chain-link and barbed-wire fencing. The CASY lies between Areas A and B of the CAL (which was previously investigated under the IR Program). The pond adjoins the eastern side of the CASY and is just north of the CAL Area B. The pond is approximately one-half acre in size, and serves as a storm water retention basin. Facilities surrounding the CASY include the Naval Brig, heliport, CAL (Areas A and B), the U.S. Marine Corps Camp Elmore, Norfolk Crossing military housing, the Camp Allen Elementary School, and a civilian community (Glenwood Park). In the future, the Navy plans to use the CASY as a recreational area. Figure 2-2 shows the location of the pond and surrounding area.

2.2 Site Background and History

The following paragraphs describe the setting and history of the pond area of the CASY and reviews the previous and current investigations conducted at the site.

2.2.1 Climate

The pond area adjacent to the CASY is in the Tidewater area of Virginia, which is a low-lying peninsula in the Atlantic Coastal Plain Physiographic Province. The climate is classified as oceanic with typically mild winters and long warm summers with high humidity. Precipitation averages 44 inches per year, with the heaviest precipitation occurring during July and August.

2.2.2 Soil

The soil at the pond area of the CASY is classified as Urban Land-Udorthents. This soil consists of graded, cut, filled, or otherwise disturbed by construction and earth moving activities. This soil complex

has an urban setting and occupies gentle slopes and areas of moderately well and poorly drained Udorthents soil.

2.2.3 Surface Drainage

The pond area adjacent to the CASY collects storm water runoff from the areas south of the Salvage Yard Area and from CAL Area B. Water flows to the west from the pond through a culvert under the CASY where it intercepts the Bousch Creek drainage ditch.

2.2.4 Geology

The pond contains sediment that consists of coarse to fine sand, silt, and silty clay, intermixed with organic debris. A medium-brown to gray silty sand underlies the sediment; a watery mud mixed with organic matter overlies the sediment in some areas.

Drilling was conducted at the CASY during the PA/SI (to four feet below ground surface [bgs]) and during the RI (to 20 feet bgs). Additional geological information has been obtained from borings conducted under the CAL RI (Baker, 1994a). Generally, the site is underlain by four strata: 1) fill materials from 0 to 18 feet bgs, 2) silt and sands from 0 or 18 feet to 27 feet or deeper bgs, 3) a confining clay layer (which may be scoured or breached in the vicinity of Camp Allen by historic Bousch Creek) ranging from 0 to 40 feet bgs, and 4) a silt/sand/shell hash unit ranging from 40 to 130 feet bgs.

2.2.5 Hydrogeology

The principle aquifers under the CASY are the unconfined water table aquifer (the Columbia Group) and the Yorktown aquifer. The water table aquifer consists primarily of silts and fine sands from the surface to approximately 25 to 30 feet bgs. Groundwater flow mirrors the surface topography of the area flowing to the north/northwest.

The Yorktown aquifer occurs at a depth of approximately 40 feet and is approximately 90 to 100 feet thick in the vicinity of the site. This aquifer consists of silt, fine to medium to coarse-grained sand, and shell fragments. Groundwater flow is toward the north/northeast.

2.2.6 Groundwater Quality

The quality of the water table aquifer has been affected by the surrounding land use and the tidal impacts. Regionally, the water table aquifer exhibits low amounts of dissolved solids. Chlorides are generally low but can be high adjacent to tidal waters. Hardness ranges from hard to moderately hard. The water table aquifer typically shows low pH values and high iron contents. Generally, the water table aquifer is not suitable for domestic use, but is used for non-potable drinking water uses such as lawn watering. The City of Norfolk prohibits the use of the water table aquifer as a potable water source.

2.2.7 Natural Resources

Historically, the CASY and CAL area was covered with stands of hardwoods and vast areas of tidal marsh. Filling operations conducted by the Navy during development of the Naval Station Norfolk have greatly altered the original terrain. The CASY was formerly an active salvage yard for over 50 years and provides limited habitat for wildlife. The pond area adjacent to the CASY offers limited terrestrial habitat and minimal ecological features. Presently the pond area supports limited aquatic wildlife species, though it offers extremely poor habitat due to its small size, relative isolation from other ecological features, and proximity to developed areas.

2.2.8 History

The CASY was dedicated to the salvaging and disposal of scrap materials generated by the Navy in the Tidewater area. The Navy managed the facility from 1940 until 1972. The Defense Reutilization and Marketing Services managed the CASY from 1972 until 1995. Salvage operations were discontinued in 1995. The CASY contained buildings and areas where distinct salvage operations were conducted. After salvaging operations stopped, the following structures were removed: two railroad spurs for loading and unloading scrap; a bailer/smelter/incinerator formerly located in Building CA220; Building CA193 that was used for general and transformer storage; Building CA194 (site of a 1989 PCB spill); Buildings CA195, CA205, CA212, and CA220; a drum storage area located parallel to Ingersoll Street; a drum accumulation area in the northern portion of the site; an all white goods stockpile; and a general scrap stockpile.

2.2.9 Previous Investigations and Actions

In April of 1982, an Initial Assessment Study was conducted at the Naval Station. The Initial Assessment Study identified 18 sites of concern with regard to potential contamination. The CASY (Site 22) was included as a potential area of concern. Baker performed a PA/SI at the CASY in January 1993 (Baker, 1993). The purpose of the PA/SI was to define the nature, extent, and concentrations of soil contamination within the Salvage Yard and to assess possible health risks to facility workers. No other media were sampled or evaluated. The PA/SI field program involved the collection and analyses of 20 surface (0 to 2 ft bgs) and 20 subsurface (2 to 4 ft bgs) samples, and concrete chip samples. The PA/SI concluded that subsurface soil had been adversely impacted by past facility operations and waste handling practices. Based on the results of the PA/SI, Site 22 was added to the list of sites of concern at the Naval Station.

A RI that characterized past disposal activities was performed in 1993 and 1994 at the CAL Areas A and B (Baker, 1994a). The RI investigation detected volatile organic compounds in both the soils and groundwater and indicated that the CASY may have contributed to the groundwater contamination detected at the landfill. Based on the results of the RI, the Navy completed a Feasibility Study (FS) (Baker, 1994b) and Decision Document (Baker, 1995) that addressed the cleanup of contaminated soil and groundwater at CAL Areas A and B, which adjoin Site 22. Based on the results of the CAL RI/FS, the Navy completed a soil and debris removal action at CAL Area B in January 1995. Approximately 11,500 tons of contaminated soil and debris were removed from CAL Area B. In July 1997, a groundwater remediation system was placed in operation. This system collects and treats volatile organic compounds and metal contaminants in the groundwater underlying the CAL Areas A and B, and the Camp Allen Salvage Yard.

A RI was conducted for the CASY, including the pond area, during the summer of 1996 (Baker, 1999). Data gathered from the RI was used to identify the types, quantities, and locations of contaminants at the site. The RI indicated that semivolatile organic compounds (SVOCs), pesticides, PCBs, and metals have impacted the surface and subsurface soils, groundwater, and sediment. Human health risks in soil were identified from PCBs, antimony, arsenic, lead, and iron.

In September 1997, the Navy performed an EE/CA addressing PCBs in soils at the CASY and issued a public notice of a proposed non-time-critical removal action (Baker, 1997). The intent of this action was to remove PCB contaminated soils from the site. A public information meeting was held and no

additional comments were received. In August 1998, the Navy completed a PCB removal action at the site. More than 2,700 cubic yards of PCB-contaminated soils were removed from the southern portion of the CASY. The extent of this removal action is depicted in Figure 2-3.

In 2001, Baker conducted a metals-contaminated soil investigation to further delineate and characterize the nature and extent of antimony, arsenic, iron, and lead contamination in surface and subsurface soils at the CASY. Six hot spot areas (Figure 2-3) were identified (Baker, 2001a). As an interim measure, the Navy removed more than 16,000 cubic yards of metals contaminated soil. As part of the confirmation sampling associated with the removal action, OHM/IT identified more extensive and widespread metals contamination throughout the CASY (OHM/IT, 2001a). To address this situation, Baker prepared an EE/CA that addressed metals contaminated soil (Baker, 2002). The EE/CA concluded that Alternative 2, On-Site Containment, be implemented for a non-time critical removal action at the CASY.

In the summer of 2002, the Navy executed a removal action addressing the remaining metals-contaminated soils by placing a one-foot cover of clean soil over the entire 22-acre site of the CASY, just north of the pond area.

2.3 Source, Nature, and Extent of Contamination

Based on site history, previous investigations, and RI findings, contamination from prior disposal practices and operating procedures at the CASY have impacted surface and subsurface soils, sediment, and shallow groundwater to various degrees. In general, the primary contaminants of concern (COCs) are several inorganic constituents, and to a lesser extent, specific SVOCs, pesticides, and PCBs. Detailed findings and data evaluation of the nature and extent of contamination are presented in Sections 5.0 and 6.0 of the RI Report (Baker, 1999).

2.4 Analytical Data

Previous investigations of sediments at the CASY have identified isolated, sporadic areas of various inorganic (principally arsenic) and pesticide/PCB constituent concentrations (dieldrin, Aroclor-1260) at levels above screening values. The following paragraphs summarize the analytical results of the most recent sediment investigations.

Sediment samples were collected from the storm sewer located in the northern part of the CASY and from the pond area. Analytical results indicate isolated, sporadic areas of various inorganic (principally

arsenic) and pesticide/PCB constituent concentrations (dieldrin, Aroclor-1260) at levels above screening values. Storm sewer sediments were collected and disposed of in 2002. A temporary inlet structure was also added where the pond discharges into the storm sewer, minimizing the potential for sediment migration prior to removal and/or remedial action.

In December 1998, three sediment samples (CASD-1 through CASD-3) and a duplicate sample collected from the pond were analyzed for selected target compound list and target analyte list constituents. A summary of the nature and extent of contamination, focusing on the primary COCs associated with sediment (the human health risk driver), is presented in Appendix A. Figures 2-4 and 2-5 present sediment sampling locations and a summary of detected concentrations of organic and inorganic compounds, respectively.

Organics were detected in pond sediments (Sample CASD-3) and in the drainage way leading into the pond (Sample CASD-1). Polynuclear aromatic hydrocarbons (PAHs), pesticides, and PCBs were the primary organic compounds detected from this area. Sediment concentrations collected from Sample CASD-3 exceed established criteria for Aroclor-1260 (1 milligram per kilogram (mg/kg); USEPA Final Rule for the disposal of PCBs, June 1998). The Aroclor-1260 contamination is most likely the result of contaminants from the northern area of the CASY.

Numerous inorganics were detected in all of the samples collected from the pond area, with some of these inorganics exceeding the residential risk based concentration. The majority of inorganic exceedances were detected where the pond discharges to the storm sewer inlet point (CASD-3). Arsenic was detected in each of the samples at levels that ranged from 17.4-98.9 mg/kg. Iron, lead, cadmium, and zinc were detected in two of the three samples at the following range levels: iron - 9,950-53,200 mg/kg; lead - 5.1-1,180 mg/kg; cadmium - 10.1-46.9 mg/kg; and zinc - 18.2-1,880 mg/kg. Nickel, silver, and copper were detected from sample CASD-3 within the following ranges: nickel - 34.2-66.4 mg/kg; silver 2.4B-35.1J mg/kg; and copper 3.9-669 mg/kg. The higher levels of contaminants from soil samples taken from the area surrounding the pond at the CASY indicate that runoff in to the pond may be influencing the sediment within the pond and down gradient of the pond.

3.0 STREAMLINED RISK EVALUATION

USEPA's guidance document on conducting non-time-critical removal actions ("NTCRA guidance") (USEPA, 1993) provides that a streamlined risk evaluation be performed as part of the EE/CA. The goals of the streamlined risk evaluation are to: (1) identify contaminants of potential concern (COPCs) at the site, (2) identify potential current and future human exposures that should be prevented, and (3) estimate potential human health and ecological risks associated with exposures to the COPCs if no remedial action is taken.

3.1 Overview of Streamlined Risk Evaluation

USEPA's NTCRA guidance document provides that a separate risk assessment is not required if a quantitative risk assessment (such as that performed in an RI) is available that "identifies pathways of concern and concentration of contaminants above standards." This type of quantitative Human Health Risk Assessment (HHRA) and documentation is available for the CASY in the RI (Baker, 1999), which is in the Naval Station Norfolk Administrative Record. An update of this risk assessment was performed in 2000 and presented to the Naval Station Norfolk Partnering Team. The risk evaluation was performed following USEPA's Risk Assessment Guidance for Superfund (RAGS), Part A, Human Health Evaluation Manual (USEPA, 1989a). The streamlined risk assessment presented in Section 3.2 represents a focused evaluation of the risks presented by sediment in the pond area of the CASY. This streamlined evaluation takes into account the assessment already available for the site as well as the CASY's anticipated future land use.

A Streamlined Ecological Risk Assessment (ERA) was performed at the CASY in accordance with the Navy/Tier II Ecological Risk Assessment approach developed for Region III (CH2M Hill, 1997) and the three-tiered Navy policy for conducting ERAs (CNO, 1999). Other ERA guidance considered include the Framework for Ecological Risk Assessment (USEPA, 1998) and the Region III Interim Ecological Risk Assessment Guidelines (USEPA, 1994a). Issue-specific USEPA guidance and approaches described in the literature were also incorporated into the specific methodologies used in the ecological risk assessment. The ecological risk assessment was performed to investigate potential ecological issues associated with the sediment in the pond area of the CASY. A summary of the streamlined ecological screening is presented in Section 3.3.

3.2 Summary of the Streamlined Human Health Risk Evaluation

The HHRA performed for the pond adjacent to the CASY examined potential risks to human health posed by the presence of chemical constituents detected in groundwater, sediments, and surface water following the 1996 sampling investigation. The storage and salvage activities as well as demolition activities have altered many of the habitats that may have existed previously when the area was part of the historic Bousch Creek drainage system.

The public health risks associated with exposure to contaminated media within the CASY were evaluated in a HHRA that was presented in the RI Report. The HHRA evaluated and assessed the potential public health risks that might result under pre-remediation and potential future land use scenarios. The objectives of this HHRA were to (1) identify COPCs in surface water and sediment; (2) identify potential current and future human exposures that should be prevented; (3) estimate current potential human health risks associated with exposures to COPCs identified in the evaluated media if no remedial action is taken; and (4) estimate future potential human health risks associated with potential exposure pathways identified as being complete under future recreational land use patterns.

The HHRA evaluated the public health risks associated with exposure to contaminated media (sediment) at the site based on contaminant data collected prior to the removal actions performed at the site. Antimony, arsenic, iron, and lead were all identified as COPCs at the site. Since the completion of the RI/FS, the anticipated future land use of the CASY has been identified. The CASY is projected to become a recreational area in the future; there are no plans for the development of the former CASY for residential land use. Nonetheless, following the guidance supporting streamlined risk assessments, the following potential human receptors and exposure pathways were identified and assessed in the risk evaluation for this EE/CA:

- Current Adult and Adolescent (Ages 7-15 Years) Trespassers
 - Accidental ingestion of sediment
 - Dermal contact with sediment

- Future Construction/Utility Workers
 - Accidental ingestion of sediment
 - Dermal contact with sediment

- Future Child (Ages 6-16 Years) Recreational Users
 - Accidental ingestion of sediment
 - Dermal contact with sediment

- Future Adult Groundskeepers
 - Accidental ingestion of sediment
 - Dermal contact with sediment

- Future Adult and Young Child On-Site Residents
 - Accidental ingestion of sediment
 - Dermal contact with sediment

COPCs are chemicals detected at a site that have undergone a conservative screening/selection process, and have been determined to exhibit a potential for adversely impacting public health. Chemicals identified as COPCs are then retained for further quantitative evaluation in the HHRA (Appendix A). The selection of COPCs was done in accordance with the USEPA Region III Technical Guidance on Selecting Exposure Routes and Contaminants of Concern, by Risk-Based Screening, dated January 1993 (USEPA, 1993); USEPA's RAGS Part A; and NBN (1998). Table 3-1 presents a summary of the results of the streamlined HHRA for the pond area. The streamlined HHRA indicates that sediments present no unacceptable human health risks.

**TABLE 3-1
INCREMENTAL LIFETIME CANCER RISKS AND HAZARD INDICES
FOR CURRENT AND FUTURE POTENTIAL HUMAN RECEPTORS**

Receptors	Adult		Young Child/Adolescent	
	Total ILCR	Total HI	Total ILCR	Total HI
Current Adult and Adolescent Trespassers	1.5E-05	0.06	7.4E-06	0.10
Future Adult Construction/Utility Workers	1.9E-06	0.27	NA	NA
Future Adult and Young Child Recreational Users	3.3E-05	0.13	2.9E-05	0.64
Future Adult Groundskeepers	6.6E-05	0.28	NA	NA
Future Adult and Young Child On-Site Residents - RME	3.3E-05	0.17	4.4E-05	1.06

3.3 Summary of the Streamlined Ecological Screening

The Streamlined Ecological Screening, consistent with a Streamlined Ecological Risk Assessment, for the CASY pond was performed to evaluate potential risks to ecological receptors under existing site

conditions, assuming that no remediation is to occur. The Ecological Risk Screening was conducted in accordance with the Navy/Tier II ERA approach developed for Region III (CH2M Hill, 1999), which is based in large part on the eight-step USEPA Superfund ERA process guidance (USEPA, 1997) and the three-tiered Navy policy for conducting ERAs (CNO, 1999). The Streamlined Ecological Screening followed Steps 1, 2, and 3a of the Navy/Tier II approach, including problem formulation, a screening-level ecological effects evaluation, exposure estimate, risk calculation, and refinement.

3.3.1 Environmental Setting/Exposure Routes and Pathways

The storage and salvage activities as well as demolition activities at the CASY have altered many of the habitats that may have existed previously when the area was part of the historic Bousch Creek drainage system. The area is highly industrialized and offers little foraging opportunity or cover for ecological receptors. Presently the pond area represents poor aquatic habitat, even for invertebrate communities and opportunistic, urban-tolerant upper trophic level species. The pond may also serve as a drinking water source for terrestrial receptors utilizing the site. Although an inlet structure now limits surface water flow between the pond and downstream Bousch Creek, a direct pathway and linkage (via the underground storm sewer system) remains in place. Sediments around the storm inlet structure and in the storm sewer were removed in 2002. Complete exposure pathways do exist for receptors utilizing the pond directly, and were evaluated in the Streamlined Ecological Screening using the available sediment data collected from the pond in 1998. No surface water data was available from the pond to evaluate drinking water exposures.

3.3.2 Exposure Point Concentrations - Abiotic Media/Prey Items

Maximum concentrations of COPCs found in sediment were used to conservatively estimate potential chemical exposures for the ecological receptors selected to represent the assessment endpoints at the CASY. The maximum reporting limit for chemicals analyzed for but not detected was also compared to medium-specific screening values. These numbers were used for food web exposure modeling. This was done to ensure that reporting limits are similar to, or less than, chemical concentrations at which potential adverse effects to ecological receptors may occur.

Exposures for upper trophic level receptor species via the food web were determined by estimating the chemical-specific concentrations in each dietary component using uptake and food web models. Incidental ingestion of sediment was also included when calculating the total level of exposure. Not all chemicals were evaluated for food web exposures; only chemicals with the potential to bioaccumulate to

a significant extent were evaluated. Bioaccumulating chemicals were defined as those identified by the USEPA in the document *Bioaccumulative Testing and Interpretation for the Purpose of Sediment Quality Assessment, Status and Needs* (USEPA, 2000a).

3.3.3 Streamlined Risk Calculation

Ecological chemicals of potential concern were selected using the Hazard Quotient (HQ) method. HQs were calculated by dividing the chemical concentration in the medium being evaluated by the corresponding medium-specific screening value or by dividing the exposure dose by the corresponding ingestion screening value. Chemicals with HQs greater than or equal to 1.0 were considered preliminary ecological COPCs.

Results of the risk calculations for community and food web exposures are provided in Appendix B for potential aquatic receptors utilizing the pond adjacent to the CASY. Volatiles, several PAHs and other semivolatiles, pesticides, the PCB Aroclor-1260, and several inorganics were all identified as ecological COPCs because maximum and mean sediment concentrations exceeded screening values. In addition, Aroclor-1260 and the metals arsenic, cadmium, chromium, copper, lead, selenium, zinc had HQ values greater than or equal to 1.0 for one or more of the upper trophic level aquatic receptors evaluated.

There are uncertainties associated with the risk calculation because of the limitations of the available data and the need to make certain assumptions and extrapolations based on incomplete information. However, the data demonstrate the need for further ecological evaluation and/or remedial action at the site, as there is the potential for unacceptable risks for the pathways, receptors, and chemicals evaluated.

3.4 Streamlined Risk Evaluation Conclusion

A removal action is warranted at the pond adjacent to the CASY under the NCP. The following factors, which the NCP considers appropriate for consideration in removal actions, exist at the CASY:

- Actual or potential exposures to nearby human populations, animals, or the food chain from hazardous substances or pollutants or contaminants (40 CFR 300.415 (b)(2)(i));
- High levels of hazardous substances or pollutants or contaminants in sediment largely at or near the surface, that may migrate (40 CFR 300.415 (b)(2)(iv)); and
- Weather conditions that may cause hazardous substances or pollutants or contaminants to migrate or be released (40 CFR 300.415 (b)(2)(v)).

Based on the concentration, the frequency of detection, and the risk characterization results, inorganic and pesticide/PCB concentrations in sediments appear to warrant further actions to prevent or lessen the potential impact to the environment. In order to be protective of the environment, contaminants should be removed and/or remediated to prevent the migration of these contaminants to downstream ecological receptors.

4.0 IDENTIFICATION OF REMOVAL ACTION OBJECTIVES

Previous and current investigations have identified widespread metals contamination in the pond adjacent to the CASY. Therefore, the objective of the removal action for this site is to minimize the potential risks to the environment associated with metals and PCB contaminated sediment.

4.1 Statutory Limits on Removal Actions

The NCP 40 CFR Part 300.415 dictate statutory limits of \$2 million and 12 months on USEPA fund-financed removal actions, with statutory exemptions for emergencies and actions consistent with the remedial action to be taken. This removal action will not be USEPA fund-financed. The Management Guidance for the Defense Environmental Restoration Program (DERP) Office of the Deputy Under Secretary of Defense (ODUSD) (I&E), Sept 2001, recommends that "all response alternatives must meet the threshold requirement of protectiveness of human health and the environment." A time limit is not specified. The Navy/Marine Corps IR Manual does not limit the cost or duration of the removal action; however, cost effectiveness is a recommended criterion for evaluation of the removal action alternatives.

4.2 Removal Action Scope

The scope of the removal action to be initiated at the pond adjacent to the CASY will address all metals and PCB contaminated sediment. The primary contaminants of concern in the sediment are inorganic (principally arsenic) and pesticide/PCB constituent concentration PCBs. Based on the HHRA and ecological screen, groundwater, surface water, and sediment associated with the pond may present unacceptable risks to both human health and the environment. The scope will address the removal or remediation of approximately 820 cubic yards of sediment.

The NCP recognizes capping or covering of contaminated material as an appropriate removal alternative for consideration under non-time-critical removal actions (40 CFR 300.415(e)(4)). Therefore, in this document, Alternative 3, "Engineered cover over sediments plus land use control planning," will be referred to as a "removal action," which is consistent with the NCP.

4.3 Removal Action Schedule

Upon finalization, the EE/CA will be placed in the Administrative Record. A public notice will be published, along with a brief summary of the site, to notify the public that this document is available for

review. The EE/CA is then subject to a 30-day public comment period. Following the public comment period, an Action Memorandum describing the proposed removal action will be issued along with an attached responsiveness summary that contains the Navy's response to any comments that were received on the EE/CA. The Action Memorandum will substantiate the need for the removal action, identify the proposed action, and explain the rationale for the selected removal action.

The scheduled objective for the Removal Action is to complete the action within 12 months of the date on which the Action Memorandum is approved and signed. The start date will be determined by completion and review times necessary to prepare the final EE/CA and the final Action Memorandum.

The schedule will follow this general outline:

- Award of Contract following the approval of the Action Memorandum - 1 to 2 months
- Preparation of Work Plans and Related Shop Drawings - 1 month
- Mobilization - 1 month
- Removal Action - 3 months

4.4 Applicable or Relevant and Appropriate Requirements

One of the main considerations during the development of remedial action alternatives for hazardous waste sites under CERCLA is the degree of human health and environmental protection provided by a given remedy. Section 121 of CERCLA generally requires that remedial alternatives attain or exceed applicable, or relevant and appropriate requirements (ARARs). The purpose of this requirement is to make CERCLA response actions consistent with other pertinent federal and state environmental requirements.

ARARs may include the following:

- Any promulgated, enforceable standard, requirement, criterion, or limitation under federal environmental law.
- Any promulgated, enforceable standard, requirement, criterion, or limitation under a state environmental or facility-siting law that is more stringent than the associated federal standard, requirement, criterion, or limitation.

A requirement may be either "applicable" or "relevant and appropriate," but not both.

Definitions of the two types of ARARs, as well as other "to be considered" (TBC) criteria, are given below:

- Applicable Requirements means those cleanup standards, standards of control, and other substantive environmental protection requirements, criteria, or limitations promulgated under federal or state law that directly and fully address a hazardous substance, pollutant, contaminant, remedial action, location, or other circumstance at a CERCLA site.
- Relevant and Appropriate Requirements means those cleanup standards, standards of control, and other substantive environmental protection requirements, criteria, or limitations promulgated under federal or state law which, while not "applicable" to a hazardous substance, pollutant, contaminant, remedial action, location, or other circumstances at a CERCLA site, do address problems or situations sufficiently similar (relevant) to those encountered at the CERCLA site, that their use is well suited (appropriate) to the particular site. Requirements must be relevant and appropriate to be an ARAR.
- "To be considered" criteria are non-promulgated, non-enforceable guidelines or criteria that may be useful for developing remedial action, or necessary for determining what is protective to human health and/or the environment. Examples of TBC criteria include USEPA Drinking Water Health Advisories, Carcinogenic Potency Factors, and Reference Doses.

ARARs fall into three categories, based on the manner in which they are applied. This characterization is not perfect, as many requirements are combinations of the three types of ARARs. These categories are as follows:

Chemical-Specific: Health-/risk-based numerical values or methodologies that establish concentration or discharge limits for particular contaminants. Examples of contaminant-specific ARARs include Maximum Contaminant Levels and Clean Water Act water quality criteria.

Location-Specific: Restrictions based on the concentration of hazardous substances or the conduct of activities in specific locations. These may restrict or preclude certain remedial actions or may apply only

to certain portions of a site. Examples of location-specific ARARs include Resource Conservation and Recovery Act (RCRA) location requirements and floodplain management requirements.

Action-Specific: Technology- or activity-based controls or restrictions on activities related to specifications. Examples of action-specific ARARs include land disposal requirements and minimum technology requirements under RCRA.

A review of the three categories of ARARs is presented below. It should be noted that many of these regulations are not applicable or relevant and appropriate to the proposed removal actions, but are still listed to document that they were considered in this review.

4.4.1 Chemical-Specific ARARs

- Identification and Listing of Hazardous Waste Under RCRA (40 CFR 261) - The criteria for identifying the characteristics of hazardous waste and for listed hazardous wastes are provided in 40 CFR Part 261. Any wastes found to be RCRA hazardous wastes will be stored, treated and/or disposed according to the applicable regulations. This requirement is relevant and appropriate for the proposed removal actions.
- Federal Ambient Water Quality Criteria (33 USC 1314(a) and 42 USC 9621(d)(92)) - The objective of the Federal Ambient Water Quality Criteria is to restore and maintain the chemical, physical, and biological integrity of the nation's waters. This EE/CA and the proposed removal action do not include the remediation of any surface water; therefore, no surface water criteria will have to be met. The Remedial Action Contractor should take all measures necessary to protect surface water from degradation during the removal action. This requirement is not relevant and appropriate for the proposed removal actions.
- Virginia Water Quality Standards (9 VAC 25-260-5 to 540) - The Virginia Surface Water Standards are those standards set by the Commonwealth of Virginia similar to those standards given by the Clean Water Act. As stated previously, this EE/CA does not include the remediation of surface water. Discharge from the treatment plant currently meets the intent of Virginia water quality standards and the Navy will take necessary precautions to prevent surface water degradation during the removal action. This requirement is not relevant and appropriate for the proposed removal actions.

- Virginia Ambient Air Quality Standards (9 VAC 5-30-10 to 80) - Provides for the control of sources emitting toxic air pollutants into the atmosphere, it requires best available control technology for toxics, emissions quantification, and human health and safety protection demonstration. Based on these regulations, air at and around the CASY will be monitored to ensure compliance with these standards during the remediation process. This requirement is relevant and appropriate for the proposed removal actions.
- National Ambient Air Quality Standards (40 CFR 50 - The Clean Air Act) - The Clean Air Act gives the criteria and requirements for ambient air quality monitoring and the requirements for reporting ambient air quality data and information. Based on these regulations, air at and around the CASY will be monitored to ensure compliance with these standards. The Virginia Department of Environmental Quality implements the National Ambient Air Quality Standards through the Virginia Air Pollution Control Regulations. This requirement is not applicable for the proposed removal actions.

4.4.2 Location-Specific ARARs

- Fish and Wildlife Coordination Act (16 USC 661, et. seq.) - The Fish and Wildlife Coordination Act requires action to protect fish and wildlife from actions modifying streams or areas affecting streams. At this time, there are no plans to disturb or modify any streams in the area. This requirement is not relevant and appropriate for the proposed removal actions.
- Endangered Species Act (16 USC 153; Code of Virginia Sections 29.1-563 through 568, 4 VAC 15-20-130 to 140) - The Endangered Species Act requires action to avoid jeopardizing the continued existence of listed endangered or threatened species or modifications to their habitat. The United States Department of the Interior has been contacted and the Navy has determined that the Peregrine Falcon, a federally endangered species, has been observed regularly at the site. Additionally, the appropriate state agencies will be contacted by the Virginia Department of Environmental Quality to determine if there are any other threatened or endangered species in the area. This requirement is applicable for the proposed removal actions.
- Coastal Zone Management Act (Section 307(c) of 16 USC 1456(c); 15 CFR 930 and 923.45) - The Coastal Zone Management Act requires activities impacting land or water uses in a coastal zone to certify noninterference with coastal zone management. It has been determined that the

site lies within the Virginia coastal zone. The Virginia Coastal Zone Management Office will be contacted to determine what, if any, effect the removal action will have on the Virginia coastal zone, and what actions will have to be taken to be in compliance with this act. A review of the Naval Station Natural Resources Management Plan indicates that while the site lies within the Virginia coastal zone, the planned removal action will not affect land or water uses. This requirement is applicable for the proposed removal actions.

- National Historic Preservation Act (16 USC 469, 36 CFR 469; Code of Virginia 10.1-2200 et seq., 10.1-2300 et seq.) - The Virginia Office of Historic Places was contacted to obtain a list of Historic Places to determine and identify any historic landmarks/places in the general area of the site. There are no buildings listed on the National Register of Historic Places at the CASY. This requirement is not relevant and appropriate for the proposed removal actions.
- Clean Water Act, Section 404 (40 CFR 230, 40 CFR 231) - Section 404 of the Clean Water Act regulates the discharge of dredged or fill material into certain waters (including wetlands). Dredge or fill material should not be discharged into an aquatic ecosystem unless it can be demonstrated that the discharge will not have an adverse impact on the ecosystem. There are no plans to discharge fill material from the removal action into the adjacent wetlands. This requirement is not relevant and appropriate for the proposed removal actions.
- Virginia Wetlands Act, Title 62.1 - This act states that it is public policy of the Commonwealth of Virginia to preserve the wetlands and prevent their despoliation and destruction and to accommodate necessary economic development in a manner consistent with wetlands preservation. This act sets standards that apply to the use and development of wetlands. The Army Corps of Engineers has inspected the site and has verified that the pond area is considered upland property and therefore not within wetlands jurisdiction. There are no other jurisdictional wetlands at the site; the ditch adjacent to the site is manmade. This requirement is not relevant and appropriate for the proposed removal actions.
- Executive Order 11998, Protection of Floodplains - Federal activities in floodplains must reduce the risk of flood loss, minimize the impact of floods on human safety, health, and welfare, and preserve the natural and beneficial values served by floodplains. Any activities associated with the removal action will comply with these requirements. This requirement is applicable for the proposed removal actions.

- Migratory Bird Treaty Act of 1972 (16 USC Section 703) - Protects almost all species of native birds in the U.S. from unregulated “taking” which can include poisoning at hazardous waste sites. Migratory birds have been seen near the CASY. The construction sequence will be modified if any migratory bird species are identified during the project. This requirement is applicable for the proposed removal actions.
- Virginia Endangered Plant and Insect Species Act (Code of Virginia Sections 3.1-1020 to 1030) - Requires actions to conserve endangered or protected plant and insect species. A review of the Naval Station Natural Resources Management Plan and Virginia’s endangered plants and insects listing indicate that there are no endangered plants or insects in the project area. This requirement is not applicable for the proposed removal actions.
- Virginia Natural Areas Preservation Act (Code of Virginia Sections 10.1-209 through 217) - Requires actions to conserve natural preserve areas and manage these areas for long-term protection. Based on a review of the Naval Station Natural Resources Management Plan, a determination was made that this requirement is not applicable for the proposed removal actions.

4.4.3 Action-Specific ARARs

- RCRA Land Disposal Restrictions (40 CFR 268) - 40 CFR Part 268 identifies those RCRA hazardous wastes that are restricted from land disposal. Handling of RCRA hazardous wastes is not anticipated. Waste that is land-disposal-restricted will be shipped off site for disposal with the proper labels, manifests, and notification forms indicating that the waste is land-disposal-restricted. This requirement is relevant and appropriate for the proposed removal actions.
- OSHA (29 CFR 1910, 1926, 1940) - These regulations provide occupational safety and health requirements applicable to workers engaged in on site field activities, including construction and operation of remedial activities. All workers will be made aware of the regulations. The Site Health and Safety Officer will enforce the regulations during all remedial activities. This requirement is applicable for the proposed removal actions.
- Department of Transportation (DOT) Rules for Hazardous Materials Transport (49 CFR 107, 171.1 - 172.558) - Wastes from the remedial activities will be classified for transportation based on the chemicals present in the material. Shipping papers (including hazardous waste manifests)

will be prepared that describe the hazardous material offered for transportation and will include the contents, shipper's name, proper shipping name, hazard class, identification number, total quantity, and certification that the material is presented according to DOT regulations. This requirement is applicable for the proposed removal actions.

- Virginia Solid Waste Regulations (9 VAC 20-80) - The purpose of these regulations is to establish standards and procedures pertaining to the construction, operation, maintenance, closure and post-closure of solid waste management facilities in the Commonwealth of Virginia in order to protect the public health, public safety, the environment, and natural resources. All Virginia Solid Waste Regulations will be strictly adhered to during disposal of uncontaminated rubble from the CASY. This requirement is applicable for the proposed removal actions.
- Virginia Hazardous Waste Management Regulations (9 VAC 20-60) - Because Virginia administers an authorized State RCRA program, the Virginia Hazardous Waste Management Regulations (VHWMR) may serve as the governing ARAR in place of the RCRA regulations contained in the 40 CFR Parts, except for the Land Disposal Restrictions of 40 CFR Part 268. Although hazardous wastes are not anticipated to be encountered, on-site activity will be conducted in accordance with the regulations in order to provide additional environmental and worker protection during the removal action. Any wastes found to be RCRA hazardous wastes will be stored, treated and/or disposed according to the applicable regulations. This requirement is relevant and appropriate for the proposed removal actions.

Excavation/Off-Site Disposal of Soils is regulated under Virginia Waste Management Act, Code of Virginia Sections 10.1-1400 et seq.; VHWMR (9 VAC 20-60-124 to 1505); Virginia Solid Waste Management Regulations (VSWMR) (9 VAC 20-80), as well as RCRA 42 U.S.C. 6901, and the applicable regulations contained in Title 40 of the Code of Federal Regulations; and the U.S. DOT Rules for Transportation of Hazardous Materials, 49 CFR Parts 107 and 171.1-172.558.

- a. If the removal response contemplated involves storage, treatment or disposal of a VHWMR/RCRA hazardous waste, various VHWMR/RCRA requirements may need to be complied with as specified in VHWMR and/or the applicable 40 CFR Parts. Because Virginia administers an authorized state RCRA program, the VHWMR will

serve as the governing ARAR in place of the RCRA regulations contained in the 40 CFR Parts, except for the Land Disposal Restrictions of 40 CFR Part 268.

- b. The transportation of hazardous waste must be conducted in compliance with VHWMR (9 VAC 20-110-10 to 130), Regulations Governing the Transportation of Hazardous Materials, and 49 CFR Parts 107. 171.1-172.558.
 - c. The deposits of any soil, debris, sludge or any other solid waste from a site must be done in compliance with VSWMR (9 VAC 20-80-260 to 270). Contaminated material from the site that is not classified as hazardous may be classified as a special waste under Part VIII of VSWMR. Specific authorization from Virginia Department of Environmental Quality is required before a landfill operator in Virginia can accept special wastes.
- Virginia Stormwater Management Act, Section 10.1 - 603.1 et seq.; Virginia Stormwater Management Regulations (4 VAC 3-20-10 to 251), the Virginia Erosion and Sediment Control Law, Code of Virginia Sections 10.1 - 560 et seq., the Virginia Erosion and Sediment Control Regulations (4 VAC 50-30-10-110), and local stormwater management and sediment and erosion control programs administered by the City - Design plans concerning land disturbing activities will be submitted by the Virginia Department of Environmental Quality - Waste Division to the locality for review before any land disturbing activity. This requirement is applicable for the proposed removal actions.
 - Criteria for Classification of Solid Waste Disposal Facilities and Practices, Solid Waste Disposal (40 CFR 257.3-4) - This regulation requires that a facility or practice shall not cause nonpoint source pollution of waters of the U.S. that violates applicable legal substantive requirements or statewide water quality management plans. The response action may include the disposal of wastes in a solid waste disposal facility. Substantive requirements would be applicable to an onsite disposal facility for nonhazardous wastes. This requirement is relevant and appropriate for the proposed removal actions.

5.0 IDENTIFICATION OF REMOVAL ACTION ALTERNATIVES

The following section presents a discussion of potential removal action technologies for the pond area adjacent to the CASY. Current EE/CA guidance does not require initial screening of alternatives, but a brief evaluation of a focused list of potential technologies is presented to provide a cost-effective evaluation of the remediation alternatives.

5.1 No Action

The “No Action” alternative that is typically evaluated as part of a FS does not meet the objectives of the removal action for the pond adjacent to the CASY. Therefore, in accordance with current EE/CA guidance, the “No Action” alternative will not be evaluated. The general response actions that are applicable to the pond sediment are discussed in the following paragraphs.

5.2 Land Use Control Planning

Land use controls include certain restrictions or administrative actions taken with respect to land, including engineering and institutional controls, arising from the need to reduce risk to human health and the environment from contaminated property. These controls may include deed restrictions, easements, purchases of land, and access restrictions. They may also include periodic monitoring and analysis of soils, sediment, surface water, or groundwater to determine, when or if, a remedial action may be required to protect public health or the environment.

Under this alternative, approximately 1,000 linear feet of fencing would be installed around the pond to limit public access. Warning signs would be installed at each gate entrance to indicate that worker precautions are required when working on the storm drainage system or around the pond. The existing pond would be periodically inspected and maintained, as necessary, to limit surface water infiltration and minimize potential erosion.

The site is currently not used for residential purposes, and there are no plans to close the base or to convert the area to residential use. Current plans call for the site (other than the pond) to be developed into a recreation facility. Under the future recreational land use pattern there are no potential human health risks associated with exposure to the pond sediment. Under this alternative, the site would be given a land use category in a base master plan, or similar planning document, that would restrict invasive construction activities within the pond area. This alternative would also require the use of a Land Use

Control (LUC) Remedial Design (RD) to ensure that the land use controls are periodically inspected and maintained.

5.3 Excavation/Removal and Off-Site Sediment Disposal

This alternative would involve the clearing of trees and shrubs, and the excavation and disposal of sediments from the pond area. Approximately 500,000 gallons of water would be pumped to and treated at the CAL Groundwater Treatment Plant, prior to disposal into Bousch Creek. A minimum of two feet of sediments (approximately 820 cubic yards) from the pond area would be excavated and disposed of off-site at a permitted facility. Excavation activities would involve the physical removal of contaminated sediment by using conventional heavy construction equipment such as backhoes, bulldozers, and loaders. Any wastes found to be RCRA hazardous wastes would be stored, treated, and/or disposed according to the applicable regulations. Approximately 18 inches of clean backfill would be placed in the pond area. An inlet structure would be added to the existing storm sewer piping. Grading and landscaping would complete the site restoration efforts surrounding the pond area.

5.4 Engineered Cover Over Sediments Plus Land Use Control Planning

The NCP recognizes capping of contaminated soils as an appropriate removal alternative for consideration under non-time-critical removal actions (40 CFR 300.415(e)(4)). Under this containment response, the threat to public health would be removed using soil coverage and surface controls, which prevent direct exposure to and migration of contaminants. This alternative would involve the clearing of trees and shrubs, followed by placing engineered fill material in the pond area. Approximately 500,000 gallons of water would be pumped to and treated at the CAL Groundwater Treatment Plant, prior to disposal to Bousch Creek. A minimum of one foot of compacted, engineered fill (approximately 400 cubic yards) would be placed in the pond area. The placement of compacted, engineered fill on top of the existing sediments would minimize contaminants from leaching into the groundwater or surface water. In addition, an articulated concrete block would be placed on top of the one-foot cover. The concrete block system would provide a more rugged barrier that would minimize the chance of someone accidentally digging through the cover system. A suitable inlet structure would be added to the existing storm sewer piping. Grading and landscaping would complete the site restoration efforts surrounding the pond area. Land use control planning described in Section 5.2 would additionally be implemented to ensure the protectiveness of the action.

5.5 Summary

A summary of the identification and screening of the general response actions for the pond area at the CASY is presented in Table 5-1. Based upon the evaluation conducted in this section, the following response actions were retained for further consideration:

- Land Use Control Planning
- Excavation/Removal and Off-Site Sediment Disposal
- Engineered Cover Over Sediments Plus Land Use Control Planning

**TABLE 5-1
PRELIMINARY SCREENING OF REMOVAL ALTERNATIVES**

Response Action	Technology	Screening Comment
Land Use Control Planning	Land Use Restrictions Monitoring Fencing	Retained
Removal	Excavation	Retained
Containment	Capping	Retained

6.0 ANALYSIS OF REMOVAL ACTION ALTERNATIVES

This section provides a detailed analysis of the general response actions retained from Section 5.0. This analysis provides information to compare the alternatives, select an appropriate removal action for the site, and demonstrate that the CERCLA removal selection requirements to be specified in the Action Memorandum have been met. Each alternative was evaluated individually based on the following criteria listed in the USEPA guidance:

- Effectiveness
 - Protectiveness
 - Use of land disposal alternatives
- Implementability
 - Technical Feasibility
 - Availability
 - Administrative Feasibility
- Cost
 - Capital Cost
 - Operation and Maintenance Cost
 - Other Cost

Paralleling the USEPA guidance, the DERP Guidance (ODUSD [I&E], 2001) and the Navy/Marine Corps IR Manual recommend that criteria for evaluating removal alternatives include effectiveness to minimize the threat to public health, consistency with anticipated final remedial action, consistency with ARARs, and cost effectiveness. These three guidance documents formed the basis for this evaluation. Total net present worth costs were based on an annual 5 percent interest rate.

6.1 Alternative 1 - Land Use Control Planning

6.1.1 Description of Alternative

Land use controls would minimize unacceptable risk to receptors. Under Alternative 1, approximately 1,000 linear feet of fencing would be installed around the pond to limit public access. Warning signs would be installed at each gate entrance to indicate that worker precautions are required when working on the storm drainage system or around the pond. The existing soil cover would also be periodically

inspected and maintained, as necessary, to limit surface water infiltration and minimize potential erosion. Long-term management would additionally be performed to ensure continued protectiveness.

The site is currently not used for residential purposes, and there are no plans to close the base or to convert the area to residential use. Current plans call for the site to be developed into a recreation facility. Under Alternative 1, the site would be given a land use category in a base master plan, or similar planning document that would restrict invasive construction activities within the pond area. Alternative 1 would also require the use of a LUC RD to ensure that the land use controls are periodically inspected and maintained.

6.1.2 Effectiveness

Protectiveness

The use of fencing would be an effective method to restrict access to the pond area. Construction activities could pose a short-term exposure to construction workers from inhalation of dust, as the contaminants of concern will remain on site. This exposure would be reduced by implementation of a health and safety plan and the use of dust control procedures. Long-term management will additionally be performed to ensure continued protectiveness.

Alternative 1 would not provide a reduction in the toxicity or volume of contaminants in the pond sediment. There might be a gradual reduction in the toxicity, mobility, or volume of contaminants, however, through the natural processes such as biodegradation and dispersion.

Use of Alternative to Land Disposal

Alternative 1 does not meet the NCP preference of treatment over land disposal.

6.1.3 Implementability

Technical Feasibility and Availability

Alternative 1 would use technologies that are demonstrated and commercially available. Established erosion and sediment controls would also be maintained during the installation of fencing. Site access is readily available and no temporary roads would be required for implementation.

Administrative Feasibility

PCBs and metals-contaminated source material would remain at the CASY in the pond area under this alternative. Therefore, the Navy would implement a LUC RD to insure that land use controls are maintained at the site. Implementing the LUC RD will require administrative input from various Navy resources including financial, legal, and public works resources.

6.1.4 Cost

The total present worth estimated cost of implementation of Alternative 1 is approximately \$170,000. Table 6-1 presents the estimated capital and operation and maintenance costs for Alternative 1.

6.2 Alternative 2 - Excavation and Removal of Sediments, Off-Site Sediment Disposal

6.2.1 Description of Alternative

Alternative 2 would involve the clearing of trees and shrubs, and the excavation and disposal of sediments from the pond area. Approximately 500,000 gallons of water would be pumped to and treated at the CAL Groundwater Treatment Plant, prior to disposal to Bousch Creek. A minimum of one-foot of sediment from the pond area would be excavated and disposed of off-site at a permitted facility (approximately 800 cubic yards). Approximately one-foot of clean backfill would be placed in the pond area. Grading and landscaping would complete the site restoration efforts surrounding the pond area. Contaminated sediments may still remain in the pond, despite the removal of one-foot of sediments.

6.2.2 Effectiveness

Protectiveness

A minimum of one-foot of contaminated sediments would be excavated and disposed of at a permitted facility and clean backfill would be placed in the pond area. This plan would remove most of the contaminated sediments and replace the sediments with clean, uncontaminated soil. This would be protective to human health and the environment.

TABLE 6-1

**COST ESTIMATE: ALTERNATIVE 1 - INSTITUTIONAL CONTROLS PLUS LAND USE CONTROL PLANNING
CAMP ALLEN SALVAGE YARD POND AREA, NAVAL STATION NORFOLK, NORFOLK, VIRGINIA**

Cost Component	Unit	Quantity	Unit Cost	Subtotal Cost	Total Cost	Source	Basis/Comments
DIRECT CAPITAL COSTS							
Fencing	LF	1,000	2.75	2,750			
Subtotal					2,750		
DIRECT CAPITAL COSTS - TOTAL					2,750		
CAPITAL COSTS (DIRECT AND INDIRECT)					2,750		
ANNUAL OPERATION AND MAINTENANCE COSTS							
Sediment Semi-Annual Monitoring							
Sampling - labor	Hr	32	48	1,536		Engr. Est.	Semi-annual sampling event for first 5 years; 16 hours/event
Report Preparation - labor							
Data management	Hr	16	27	432		Engr. Est.	Assumes electronic lab submittal
Report Writing	Hr	16	50	800		Engr. Est.	
Sediment Analysis							
PCB/Pesticides	Sample	16	180	2,880		Baker Average BOAs; 21-day turn around	Semi-annual sampling event for first 5 years; 8 samples/event
TAL/TCL	Sample	16	715	11,440		Baker Average BOAs; 21-day turn around	Semi-annual sampling event for first 5 years; 8 samples/event
Subtotal					17,088		
Sediment Annual Monitoring							
Sampling - labor	Hr	16	48	768		Engr. Est.	Annual sampling event year 6-30; 16 hours/event
Report Preparation - labor							
Data management	Hr	8	27	216		Engr. Est.	Assumes electronic lab submittal
Report Writing	Hr	8	50	400		Engr. Est.	
Sediment Analysis							
PCB/Pesticides	Sample	8	180	1,440		Baker Average BOAs; 21-day turn around	Annual sampling event year 6-30; 8 samples/event
TAL/TCL	Sample	8	715	5,720		Baker Average BOAs; 21-day turn around	Annual sampling event year 6-30; 8 samples/event
Subtotal					8,544		
PRESENT WORTH SEMI-ANNUAL SEDIMENT MONITORING O&M (YR 1-5)					73,982		
PRESENT WORTH ANNUAL SEDIMENT MONITORING O&M (YEAR 6-30)					94,351		
TOTAL NET PRESENT WORTH: ALTERNATIVE 1					170,000	By: SJC Chk: DPJ	Date Completed: July 2003

Use of Alternatives to Land Disposal

Alternative 2 does not meet the NCP preference of treatment over land disposal.

6.2.3 Implementability

Technical Feasibility and Availability

Alternative 2 would use standard earth moving equipment and technologies that are readily available. Conventional erosion and sediment controls would be maintained during the removal activities. Site access is readily available. No temporary roads would be required for machinery access.

Administrative Feasibility

The Navy will commit the necessary administrative resources to insure the implementation of Alternative 2. This could include financial, legal, and public works resources.

6.2.4 Cost

The total estimated present worth cost of implementation of Alternative 2 is approximately \$347,000. Table 6-2 presents the estimated capital and operation and maintenance costs for Alternative 2.

6.3 Alternative 3 - Engineered Cover Over Sediments Plus Land Use Control Planning

6.3.1 Description of Alternative

Alternative 3 would involve the clearing of trees and shrubs, followed by placing engineered fill material in the pond area. Approximately 500,000 gallons of water would be pumped to and treated at the CAL Groundwater Treatment Plant, prior to disposal to Bousch Creek. A minimum of 1 foot of compacted, engineered fill (approximately 400 cubic yards) would be placed in the pond area. Articulated cellular concrete blocks would be placed on top of the one-foot of fill. The placement of compacted, engineered fill and concrete blocks on top of the existing sediments would minimize contaminants from leaching into the groundwater or surface water. Grading and landscaping would complete the site restoration efforts surrounding the pond area. This grading may require excavation and off-site disposal of a minimal amount of sediments to allow for proper storm water drainage. Figure 6-1 shows a typical cross-section

TABLE 6-2

**COST ESTIMATE: ALTERNATIVE 2 - EXCAVATION AND REMOVAL OF SEDIMENTS; OFF-SITE SEDIMENT DISPOSAL
CAMP ALLEN SALVAGE YARD POND AREA, NAVAL STATION NORFOLK, NORFOLK, VIRGINIA**

Cost Component	Unit	Quantity	Unit Cost	Subtotal Cost	Total Cost	Source	Basis/Comments
DIRECT CAPITAL COSTS							
General							
Pre-construction Submittals	LS	1	12,000	12,000		Engr. Est.	Work, E&S, H&S, & QC Plans; Permits; Shop Drawings
Mobilization/Demobilization/Equipment	LS	1	2,000	2,000		Engr. Est.	Includes mob/demob for excavation equipment
Post-Construction Submittals	LS	1	4,000	4,000		Engr. Est.	Record drawings, etc.
General - Subtotal					18,000		
Site Work							
Sediment Dewatering Pad	SY	660	7.10	4,686		Engr. Est.; Means Site Work, 2001, 02340-500-1550	
New Safety Fence	LF	700	2.70	1,890		Engr. Est.; Means Site Work, 2001, 02820-530-7001	
Silt Fencing	LF	1,650	2.00	3,300		Engr. Est.	
Clearing and Grubbing	Acre	2	5,300	10,600		Engr. Est.; Means Site Work, 2001, 02230-200-0010	Brush clearing around pond area
Site Work - Subtotal					20,476		
Removal and Disposal							
Erosion and Sediment Control	LS	1	5,000	5,000		Engr. Est.	Management of Stormwater During Sediment Remediation. Assumes cost split between equipment, labor, and materials.
Dewatering	DAY	30	106.50	3,195		Means Heavy Construction, 2001, 02240-500-0650	
Holding Tank	EA	2	900	1,800			
Excavation of Sediments							Assumes sediments = 25,500 SF x 1.5 ft = 1420 CY
Excavator	DAY	3	730	2,190		Means Heavy Construction, 2001, 01590-200-0200, 02315-400-0250	
Bulldozer	DAY	3	900	2,700		Means Heavy Construction, 2001, 01590-200-4260, 02315-410-4020	
Waste Containment	LS	1	4,500	4,500		Engr. Est	
Disposal							1420 CY+40 CY oversized material=1460 CY(1.62 tons/CY)=2365 tons; 1 roll-off = 15 tons
Pond Sediments - Loading	Box	158	150	23,700		Means Heavy Construction, 2001, 0225-730-0920	
Pond Sediments - Transportation	Mile	31,600	0.43	13,588		Means Heavy Construction, 2001, 0225-730-5100	Assumes 158 truckloads at 200 miles roundtrip
Oversized Waste	Ton	1	20	20		Vendor Quote	Non-hazardous waste
Non-Hazardous Sediment	Ton	2,365	20	47,300		Vendor Quote	
Liquid Waste	GAL	15,000	0.12	1,800		Vendor Quote	E&S and decontamination water
Removal and Disposal Subtotal					105,793		

TABLE 6-2 (CONTINUED)

**COST ESTIMATE: ALTERNATIVE 2 - EXCAVATION AND REMOVAL OF SEDIMENTS; OFF-SITE SEDIMENT DISPOSAL
CAMP ALLEN SALVAGE YARD POND AREA, NAVAL STATION NORFOLK, NORFOLK, VIRGINIA**

Cost Component	Unit	Quantity	Unit Cost	Subtotal Cost	Total Cost	Source	Basis/Comments
Monitoring and Sampling							
Liquid Waste	LS	1	270	270		Engr. Est.	Assumes labor and decon expenses.
Solids	LS	1	650	650		Engr. Est.	Assumes sampling off-site borrow material and waste generation.
Chemical Analysis							
PCBs/Pesticides	EA	3	350	1,050		Engr. Est.	Stormwater
Confirmatory Sampling	EA	3	1,350	4,050		Engr. Est.	TCL/TAL analysis - stormwater
TCLP Waste Characterization (Disposal)	EA	5	1,700	8,500		Engr. Est.	Sediments; 1 sample per 500 tons
PCBs/Pesticides	EA	4	360	1,440		Engr. Est.	Sediments
Borrow Material	EA	1	500	500		Engr. Est.	
Geotechnical Sampling							
Classification	EA	1	75	75		Engr. Est.	Borrow Material
Field Density Tests	LS	1	290	290		Engr. Est.	In-place density testing
Monitoring and Sampling Subtotal					16,825		
Site Restoration							
Backfill and Compaction	CY	1,420	62	88,040			Assumes fill material from off-site source; use of loader and dozer; hauling and compaction.
Revegetation							
Seeding	MSF	12	60	720			Assumes hydroseeding with mulch and fertilizer.
Topsoil	SY	2,500	2.40	6,000			Assumes cost of material and placement.
Demobilization	LS	1	5,000	5,000			Demobilization of temporary facilities and construction equipment.
Site Restoration Subtotal					99,760		
DIRECT CAPITAL COSTS (NON-HAZARDOUS) - TOTAL					260,854		
INDIRECT CAPITAL COSTS (NON-HAZARDOUS)							
Engineering Oversight	LS	1	15,651	15,651		Engr. Est.	Assume 6% of Total Direct Capital Costs
Contingency Allowance	LS	1	39,128	39,128		Engr. Est.	Assume 15% of Total Direct Capital Costs
Contract Administration	LS	1	13,043	13,043		Engr. Est.	Invoicing, project management, field supervision, H&S, etc. (5% of total direct costs)
INDIRECT CAPITAL COSTS (NON-HAZARDOUS) - TOTAL					67,822		
CAPITAL COSTS - NON-HAZARDOUS (DIRECT AND INDIRECT)					328,676		
ANNUAL OPERATION AND MAINTENANCE COSTS							
Landscape/Site Maintenance	MSF	12	64.5	774		Engr. Est.; Means Site Work, 2000, 02935-600-1680	
Miscellaneous Expenses	Event	2	200	400		Engr. Est.	Includes progress reports, etc.
Annual Operation and Maintenance Costs Subtotal					1,174		
PRESENT WORTH ANNUAL O&M COSTS - 30 YEARS					18,047		
TOTAL NET PRESENT WORTH (NON-HAZARDOUS): ALTERNATIVE-2					347,000	By: SJC Chk: DPJ	Date Completed: July 2003

of Alternative 3. Land use control planning, as described in Alternative 1, would additionally be implemented to ensure the protectiveness of the action.

6.3.2 Effectiveness

Protectiveness

Containment of the contaminated sediment would effectively reduce the potential threat to human health and the environment. The cover would provide an immediate elimination in exposures via direct contact with the sediment. The cover would also help to reduce potential off-site migration of contaminants by controlling surface water runoff and erosion. Any releases to groundwater would be contained by extraction wells that surround the CASY and pond area and would be treated by the Camp Allen Groundwater Treatment Plant.

Alternative 3 would not provide an immediate reduction in the toxicity or volume of contaminants in the sediments. There might be a gradual reduction in the toxicity, mobility, or volume of contaminants, however, through the natural processes such as biodegradation and dispersion. As the proposed future use of the site is for recreational ballfields, the additional fill and concrete blocks placed over the existing grade will reduce the exposure pathway of terrestrial organisms to contaminants.

Use of Alternatives to Land Disposal

Alternative 3 does not meet the NCP preference of treatment over land disposal, although the amount of sediments to be disposed would be minimal, and the material may not be classified as a hazardous waste.

6.3.3 Implementability

Technical Feasibility and Availability

Alternative 3 would use standard earth moving equipment and technologies that are readily available. Conventional erosion and sediment controls would be maintained during the removal activities. Site access is readily available. No temporary roads would be required for machinery access.

Administrative Feasibility

Though covered, metals-contaminated source material would remain at the pond area. The Navy will commit the necessary administrative resources to insure the implementation of Alternative 3. This could include financial, legal, and public works resources.

6.3.4 Cost

The total estimated present worth cost of implementation of Alternative 3 is approximately \$437,000. Table 6-3 presents the estimated capital and operation and maintenance costs for Alternative 3.

TABLE 6-3

COST ESTIMATE: ALTERNATIVE 3 - ENGINEERED COVER OVER SEDIMENTS PLUS LAND USE CONTROL PLANNING
CAMP ALLEN SALVAGE YARD POND AREA, NAVAL STATION NORFOLK, NORFOLK, VIRGINIA

Cost Component	Unit	Quantity	Unit Cost	Subtotal Cost	Total Cost	Source	Basis/Comments
DIRECT CAPITAL COSTS							
General							
Pre-construction Submittals	LS	1	12,000	12,000		Engr. Est.	Work, E&S, H&S, & QC Plans; Permits; Shop Drawings
Mobilization/Demobilization/Equipment	LS	1	2,000	2,000		Engr. Est.	Includes mob/demob for excavation equipment
Post-Construction Submittals	LS	1	4,000	4,000		Engr. Est.	Record drawings, etc.
General - Subtotal					18,000		
Site Work							
Sediment Dewatering Pad	SY	660	7.10	4,686		Engr. Est.; Means Site Work, 2001, 02340-500-1550	
New Safety Fence	LF	700	2.70	1,890		Engr. Est.; Means Site Work, 2001, 02820-530-7001	
Silt Fencing	LF	1,650	2.00	3,300		Engr. Est.	
Clearing and Grubbing	Acre	2	5,300	10,600		Engr. Est.; Means Site Work, 2001, 02230-200-0010	Brush clearing around pond area
Site Work - Subtotal					20,476		
Removal and Disposal							
Erosion and Sediment Control	LS	1	5,000	5,000		Engr. Est.	Management of Stormwater During Sediment Remediation. Assumes cost split between equipment, labor, and materials.
Dewatering	DAY	30	106.50	3,195		Means Heavy Construction, 2001, 02240-500-0650	
Holding Tank	EA	2	900	1,800			
Excavation of Sediments (upstream section)							
Excavator	DAY	1	730	730		Means Heavy Construction, 2001, 01590-200-0200, 02315-400-0250	Assumes sediments = 220 CY; Required at upstream and to provide proper grades for drainage.
Bulldozer	DAY	1	900	900		Means Heavy Construction, 2001, 01590-200-4260, 02315-410-4020	
Excavation of Sediments							
Excavator	DAY	2	730	1,460		Means Heavy Construction, 2001, 01590-200-0200, 02315-400-0250	Assumes sediments = (.75)25,500 SF x 1 ft = 710 CY
Bulldozer	DAY	2	900	1,800		Means Heavy Construction, 2001, 01590-200-4260, 02315-410-4020	
Waste Containment	LS	1	4,500	4,500		Engr. Est.	
Lagoons/Basins/Tanks/Dikes							
Endwall Sections	LS	1	4,200	4,200		Engr. Est.	2 endwall sections
Splash Pools	CY	25	39	975		Means Site Work, 2001, 02370-300-0100	
Silt Fence Culvert Protection	LS	1	1,200	1,200		Engr. Est.	
Interlocking Concrete Erosion Control Matting	SF	25,500	5.25	133,875		Vendor Quote	Cover pond surface with interlocking concrete units
Disposal							
Pond Sediments - Loading	Box	105	150	15,750		Means Heavy Construction, 2001, 0225-730-0920	710 CY+220 CY+40 CY oversized material=970 CY(1.62 tons/CY)=1570 tons; 1 roll-off = 15 tons
Pond Sediments - Transportation	Mile	21,000	0.43	9,030		Means Heavy Construction, 2001, 0225-730-5100	Assumes 105 truckloads at 200 miles roundtrip
Oversized Waste	Ton	1	20	20		Vendor Quote	Non-hazardous waste
Non-Hazardous Sediment	Ton	1,570	20	31,400		Vendor Quote	
Liquid Waste	GAL	15,000	0.12	1,800		Vendor Quote	E&S and decontamination water
Removal and Disposal Subtotal					217,635		

TABLE 6-3 (CONTINUED)

**COST ESTIMATE: ALTERNATIVE 3 - ENGINEERED COVER OVER SEDIMENTS PLUS LAND USE CONTROL PLANNING
CAMP ALLEN SALVAGE YARD POND AREA, NAVAL STATION NORFOLK, NORFOLK, VIRGINIA**

Cost Component	Unit	Quantity	Unit Cost	Subtotal Cost	Total Cost	Source	Basis/Comments
Monitoring and Sampling							
Liquid Waste	LS	1	270	270		Engr. Est.	Assumes labor and decon expenses.
Solids	LS	1	650	650		Engr. Est.	Assumes sampling off-site borrow material and waste generation.
Chemical Analysis							
PCBs/Pesticides	EA	3	350	1,050		Engr. Est.	Stormwater
Confirmatory Sampling	EA	3	1,350	4,050		Engr. Est.	TCL/TAL analysis - stormwater
TCLP Waste Characterization (Disposal)	EA	3	1,700	5,100		Engr. Est.	Sediments; 1 sample per 500 tons
PCBs/Pesticides	EA	4	360	1,440		Engr. Est.	Sediments
Borrow Material	EA	1	500	500		Engr. Est.	
Geotechnical Sampling							
Classification	EA	1	75	75		Engr. Est.	Borrow Material
Field Density Tests	LS	1	290	290		Engr. Est.	In-place density testing
Monitoring and Sampling Subtotal					13,425		
Site Restoration							
Backfill and Compaction	CY	810	62	50,220			Assumes fill material from off-site source; use of loader and dozer; hauling and compaction.
Revegetation							
Seeding	MSF	12	60	720			Assumes hydroseeding with mulch and fertilizer.
Topsoil	SY	2,500	2.40	6,000			Assumes cost of material and placement.
Gravel	CY	40	25	1,000			Assumes 25% of surface area at 25,500 SF, 2" deep
Demobilization	LS	1	5,000	5,000			Demobilization of temporary facilities and construction equipment.
Site Restoration Subtotal					62,940		
DIRECT CAPITAL COSTS (NON-HAZARDOUS) - TOTAL					332,476		
INDIRECT CAPITAL COSTS (NON-HAZARDOUS)							
Engineering Oversight	LS	1	19,949	19,949		Engr. Est.	Assume 6% of Total Direct Capital Costs
Contingency Allowance	LS	1	49,871	49,871		Engr. Est.	Assume 15% of Total Direct Capital Costs
Contract Administration	LS	1	16,624	16,624		Engr. Est.	Invoicing, project management, field supervision, H&S, etc. (5% of total direct costs)
INDIRECT CAPITAL COSTS (NON-HAZARDOUS) - TOTAL					86,444		
CAPITAL COSTS - NON-HAZARDOUS (DIRECT AND INDIRECT)					418,920		
ANNUAL OPERATION AND MAINTENANCE COSTS							
Landscape/Site Maintenance	MSF	12	64.5	774		Engr. Est.; Means Site Work, 2000, 02935-600-1680	
Miscellaneous Expenses	Event	2	200	400		Engr. Est.	Includes progress reports, etc.
Annual Operation and Maintenance Costs Subtotal					1,174		
PRESENT WORTH ANNUAL O&M COSTS - 30 YEARS					18,047		
TOTAL NET PRESENT WORTH (NON-HAZARDOUS): ALTERNATIVE-3					437,000	By: SJC Chk: DPJ	Date Completed: July 2003

7.0 COMPARATIVE ANALYSIS

The three alternatives for addressing sediments in the pond area adjacent to the CASY were qualitatively assessed and compared based on the criteria described in Section 6.0: effectiveness, implementability, and cost. A summary of the comparative analysis is shown on Table 7-1.

7.1 Effectiveness

Protectiveness

With respect to sediments, Alternatives 2 and 3 would provide the greatest amount of overall protection. Although the land use control planning would help to minimize the chance of exposure to potential sediment contamination, sediment removal or an engineered cover placed over the sediments would provide added protection.

With respect to potential contamination of sediments, Alternative 1 would provide protection through land use control planning. Alternative 3 would provide a higher level of protection by covering the sediments and implementing land use restrictions. Alternative 2 would provide the highest level of protection through the removal of the sediments.

Use of Alternatives to Land Disposal

None of the alternatives meet the NCP's preference for treatment over land disposal.

Based on this discussion, Alternative 2, excavation and removal of sediments and off-site disposal would provide the highest level of protectiveness.

7.2 Implementability

Technical Feasibility and Availability

All of the alternatives are similar in their technical administration as they are all based on earth moving activities. Excavation, hauling, backfilling, and grading are all common construction activities that are easily implemented for Alternative 2 and Alternative 3. Alternative 2 would require the transportation and disposal of sediments and soils, which are common remedial tasks. Alternative 3 uses standard earth

moving equipment and technologies that are readily available. Though none of the alternatives would be technically difficult to implement, installation of the soil cover would require the least amount of site work and equipment.

Based on this discussion, Alternative 3, the engineered cover over sediments plus land use planning would be the easiest alternative to implement.

Administrative Feasibility

The Navy will commit the necessary administrative resources to insure the implementation of the alternatives.

7.3 Cost

The estimated total net worth costs for Alternatives 1, 2, and 3 are listed below. Capital as well as operation and maintenance costs associated with the alternatives are included in the total cost estimates. Total net present worth costs were based on an annual 5 percent interest rate.

- Alternative 1 - Land Use Control Planning: \$170,000
- Alternative 2 - Excavation and Removal of Sediments, Off-Site Sediment Disposal: \$347,000
- Alternative 3 - Engineered Cover Over Sediments Plus Land Use Control Planning: \$437,000

TABLE 7-1

SUMMARY OF COMPARATIVE ANALYSIS OF ALTERNATIVES
 CAMP ALLEN SALVAGE YARD POND AREA
 NAVAL STATION NORFOLK, NORFOLK, VIRGINIA

Evaluation Criteria	Alternative 1: Land Use Control Planning	Alternative 2: Excavation and Removal of Sediments; Off- Site Sediment Disposal	Alternative 3: Engineered Cover Over Sediments Plus Land Use Control Planning
Effectiveness	<ul style="list-style-type: none"> • Protectiveness <ul style="list-style-type: none"> • Alternative would minimize exposure to potential sediment contamination. • Permanently reduces threat to human health and environment by eliminating potential for direct contact with sediment. • Possibility of short-term exposure to construction workers from dust inhalation. • Use of Alternative to Land Disposal <ul style="list-style-type: none"> • Does not meet the NCP preference of treatment over land disposal. 	<ul style="list-style-type: none"> • Alternative would provide the highest degree of protection to the environment. • Provides immediate elimination in exposures via direct contact with sediment. Also reduces mobility of contaminants contained in sediment by minimizing rainwater infiltration, and reduces off-site migration of contaminants through runoff and erosion. • Possibility of short-term exposure to construction workers from dust inhalation. • Does not meet the NCP preference of treatment over land disposal. 	<ul style="list-style-type: none"> • Alternative would provide a high degree of protection to the environment. • Provides reduction in the mobility of contaminants contained in the sediments by minimizing and reducing off-site migration of contaminants through runoff and erosion. • Would not reduce the toxicity or volume of sediments and so would not be as protective of human health • Possibility of short-term exposure to construction workers from dust inhalation. • Does not meet the NCP preference of treatment over land disposal.
Implementability	<ul style="list-style-type: none"> • Technical Feasibility <ul style="list-style-type: none"> • Minimal worker precautions required. No adverse short-term impacts expected from implementation. 	<ul style="list-style-type: none"> • Excavation and disposal are common construction activities and are easily implemented. • Implementation would require extensive site activities that would disturb sediments, increasing the potential for migration. 	<ul style="list-style-type: none"> • Uses standard earth moving equipment and technologies that are readily available. • Implementation would require extensive site activities that would disturb sediments, increasing the potential for migration.

TABLE 7-1 (Continued)

SUMMARY OF COMPARATIVE ANALYSIS OF ALTERNATIVES
 CAMP ALLEN SALVAGE YARD
 NAVAL STATION NORFOLK, NORFOLK, VIRGINIA

Evaluation Criteria	Alternative 1: Land Use Control Planning	Alternative 2: Excavation and Removal of Sediments; Off- Site Sediment Disposal	Alternative 3: Engineered Cover Over Sediments Plus Land Use Control Planning
<ul style="list-style-type: none"> • Availability • Administrative Feasibility 	<ul style="list-style-type: none"> • Site access and disposal facilities are readily available. No temporary roads are required. • Public may not accept contaminants remaining on site. Comments will be addressed during the public comment period. 	<ul style="list-style-type: none"> • No significant implementation problems. Requires off-site transportation and disposal of sediments, which should be non-hazardous. Requires regulatory approval for liquid disposal. • Public acceptance is anticipated. Comments will be addressed during the public comment period. 	<ul style="list-style-type: none"> • No significant implementation problems. Requires regulatory approval for liquid disposal. • Public acceptance is anticipated. Comments will be addressed during the public comment period.
Cost			
• Capital Cost	\$0	\$329,000	\$419,000
• Operation and Maintenance Costs	\$170,000	\$18,000	\$18,000
• Net Present Worth	\$170,000	\$347,000	\$437,000

8.0 PROPOSED REMOVAL ACTION

The Navy recommends that Alternative 3, Placing Engineered Cover over Sediments in the Pond Area plus Land Use Control Planning, be implemented for a non-time critical removal action at the CASY. The main features of this alternative include:

- Clearing of trees and shrubs.
- Water treated and then pumped to Bousch Creek.
- Engineered fill placed in pond area.
- Installing interlocking concrete block erosion control matting over the pond.
- Inlet structure added to storm piping system.
- Grading and landscaping.
- Land Use Control Planning.

The preferred sediment remedial option Alternative 3 was selected to provide a high level of protection by minimizing the mobility of sediments. Although Alternative 2 is most protective, human health risks have not been identified from the pond area, and a complete ecological risk assessment, which would determine specific ecological cleanup levels, has not been completed. Without specific ecological cleanup goals, the amount of sediment that would need to be removed in Alternative 2 has been estimated at approximately 800 cubic yards, and the actual amount of sediment removed may be more than 800 cubic yards. Therefore, there is a level of uncertainty associated with Alternative 2, which could impact the effectiveness and cost of the alternative. Alternative 3 would minimize the potential for ecological exposures in a more readily implementable manner than Alternative 2, with less uncertainty. The land use control planning associated with Alternative 3 would ensure its long-term effectiveness as a solution. Alternative 3 can be implemented through straightforward technologies that provide a high degree of long-term effectiveness through permanent covering of sediments.

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FIGURES

JAMES RIVER



CHESAPEAKE

BAY

ENTRANCE REACH

INSTALLATION
PROPERTY
BOUNDARY

SALVAGE YARD
AREA

NEWPORT NEWS CHANNEL

WILLOUGHBY

BAY

NORFOLK HARBOR REACH

ELIZABETH RIVER

INTERSTATE
564

U.S. ARMY
DISPOSAL
AREA

4000 0 4000 Feet

Baker

LEGEND

- INSTALLATION PROPERTY BOUNDARY
- SURFACE WATER

Source: U.S.G.S. Topographic Map, Norfolk
North Quadrangle, VA Photinspected 1989.

**FIGURE 2-1
SITE LOCATION MAP**

**CAMP ALLEN SALVAGE YARD
NAVAL STATION NORFOLK, NORFOLK, VIRGINIA**

01103R B2V

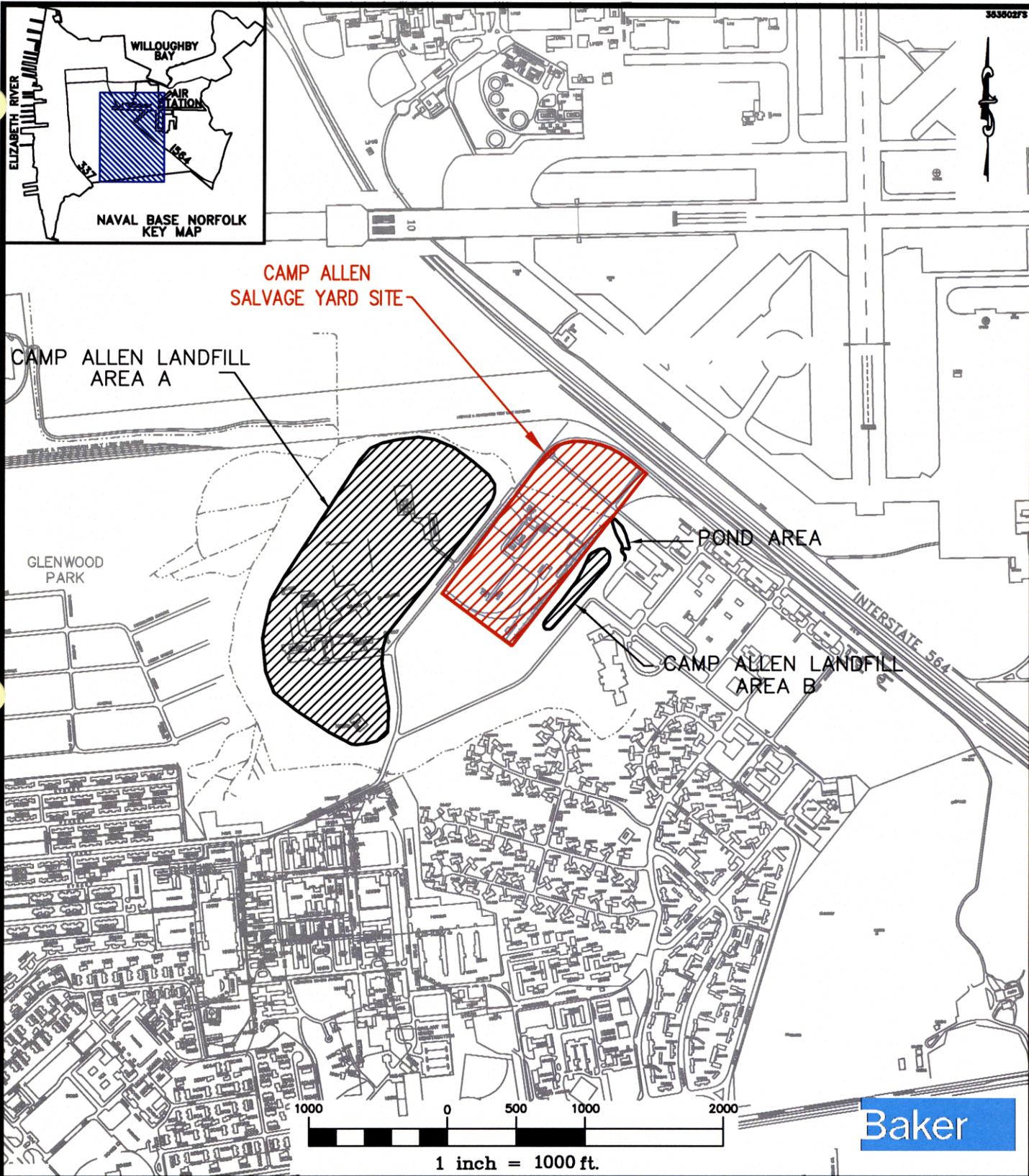
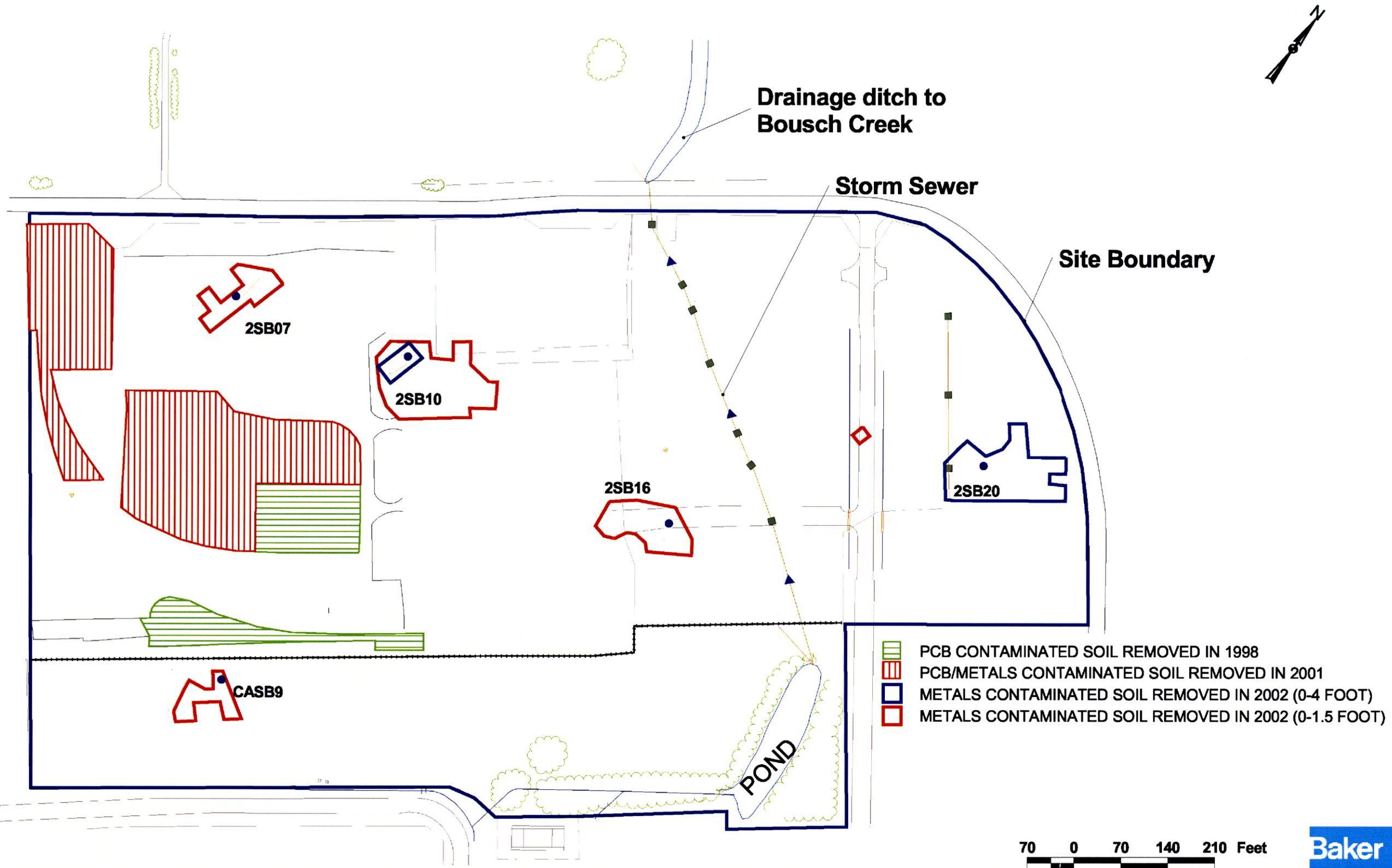


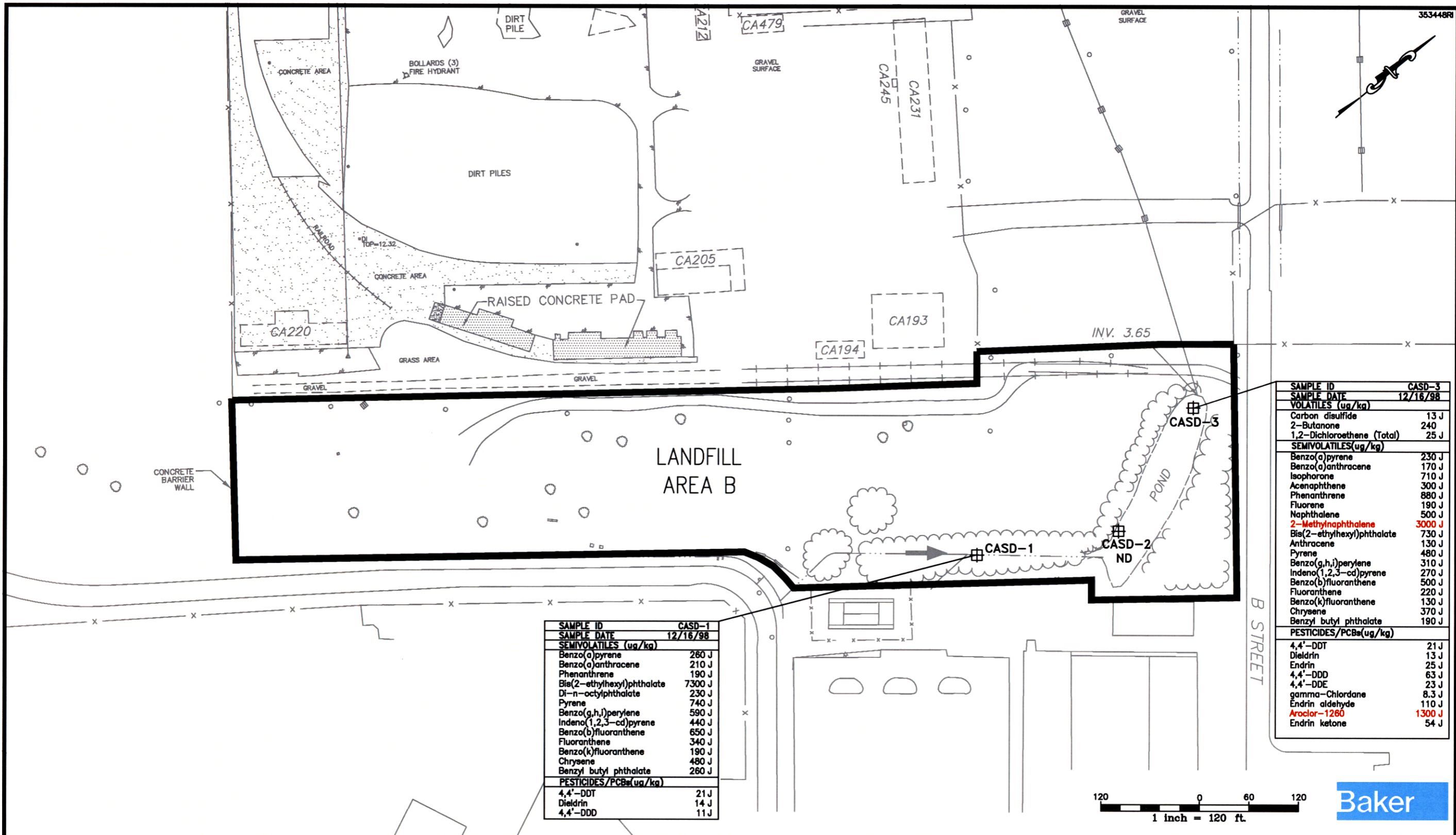
FIGURE 2-2
SITE LAYOUT

CAMP ALLEN SALVAGE YARD
NAVAL STATION NORFOLK, NORFOLK, VIRGINIA



**FIGURE 2-3
EXTENT OF SOIL REMOVAL ACTION**

CAMP ALLEN SALVAGE YARD
NAVAL STATION NORFOLK, NORFOLK, VIRGINIA



SAMPLE ID	CASD-3
SAMPLE DATE	12/16/98
VOLATILES (ug/kg)	
Carbon disulfide	13 J
2-Butanone	240
1,2-Dichloroethene (Total)	25 J
SEMIVOLATILES(ug/kg)	
Benzo(a)pyrene	230 J
Benzo(a)anthracene	170 J
Isophorone	710 J
Acenaphthene	300 J
Phenanthrene	880 J
Fluorene	190 J
Naphthalene	500 J
2-Methylnaphthalene	3000 J
Bis(2-ethylhexyl)phthalate	730 J
Anthracene	130 J
Pyrene	480 J
Benzo(g,h,i)perylene	310 J
Indeno(1,2,3-cd)pyrene	270 J
Benzo(b)fluoranthene	500 J
Fluoranthene	220 J
Benzo(k)fluoranthene	130 J
Chrysene	370 J
Benzyl butyl phthalate	190 J
PESTICIDES/PCBs(ug/kg)	
4,4'-DDT	21 J
Dieldrin	13 J
Endrin	25 J
4,4'-DDD	63 J
4,4'-DDE	23 J
gamma-Chlordane	8.3 J
Endrin aldehyde	110 J
Aroclor-1260	1300 J
Endrin ketone	54 J

SAMPLE ID	CASD-1
SAMPLE DATE	12/16/98
SEMIVOLATILES (ug/kg)	
Benzo(a)pyrene	260 J
Benzo(a)anthracene	210 J
Phenanthrene	190 J
Bis(2-ethylhexyl)phthalate	7300 J
Di-n-octylphthalate	230 J
Pyrene	740 J
Benzo(g,h,i)perylene	590 J
Indeno(1,2,3-cd)pyrene	440 J
Benzo(b)fluoranthene	650 J
Fluoranthene	340 J
Benzo(k)fluoranthene	190 J
Chrysene	480 J
Benzyl butyl phthalate	260 J
PESTICIDES/PCBs(ug/kg)	
4,4'-DDT	21 J
Dieldrin	14 J
4,4'-DDD	11 J

NOTES:
RED VALUE MEETS OR EXCEEDS RESIDENTIAL RBC AND/OR ER-M VALUES
 SAMPLE CONCENTRATIONS GIVEN IN ug/kg

SOURCE: MILLER-STEPHANSON & ASSOCIATE (JUNE 1992);
 PHR&A (MARCH 1998)

LEGEND	
⊞	SEDIMENT SAMPLE
ND	NOT DETECTED
B	DETECTED ABOVE THE IDL BUT BELOW THE CONTRACT REQUIRED REPORTING LIMIT
J	ESTIMATED VALUE
ug/kg	MICROGRAMS PER KILOGRAM (PARTS PER BILLION)
NA	NOT ANALYZED DUE TO INSUFFICIENT VOLUME

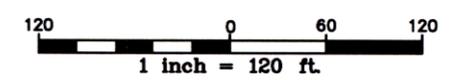
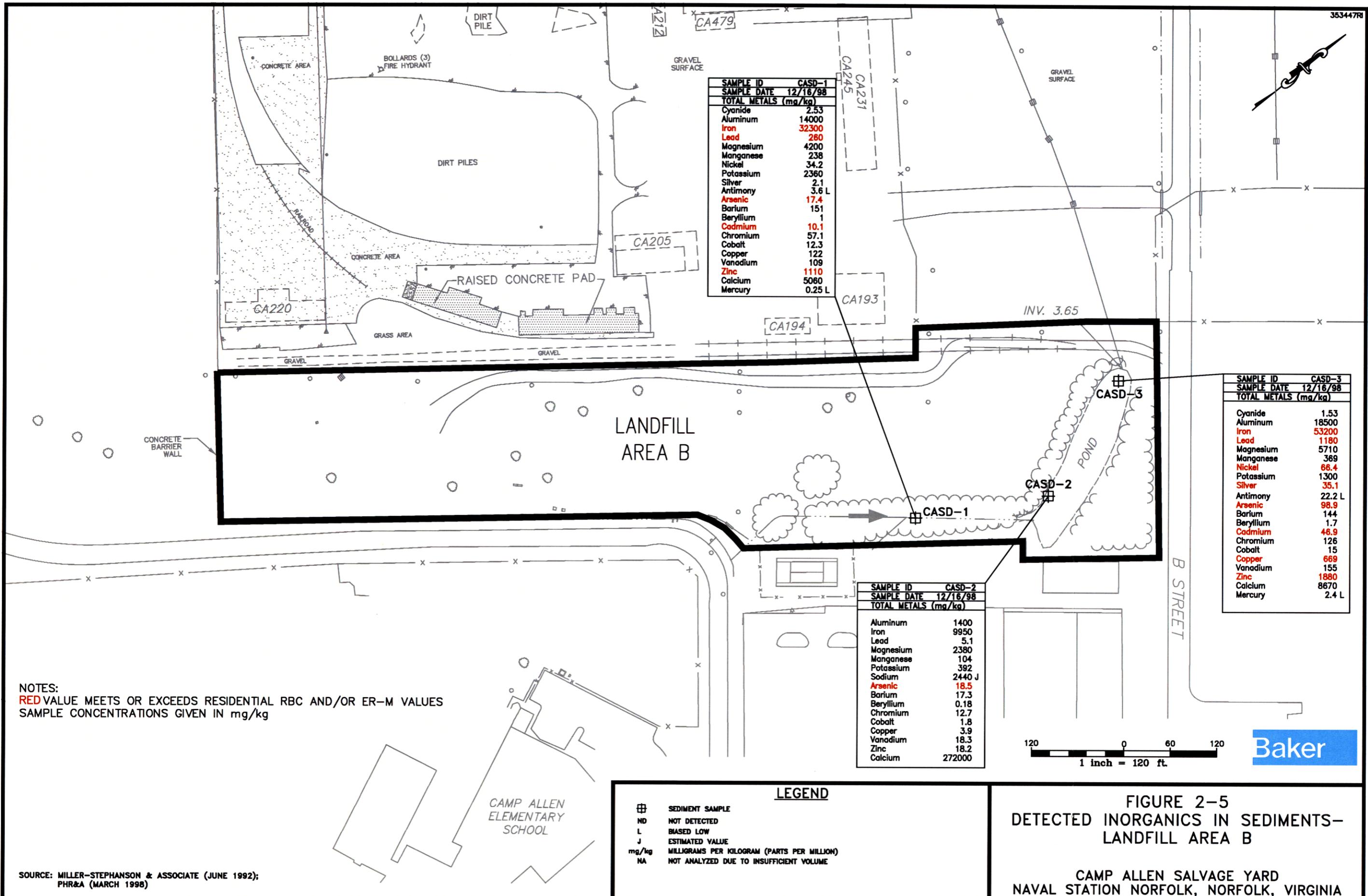


FIGURE 2-4
 DETECTED ORGANIC COMPOUNDS IN
 SEDIMENTS-LANDFILL AREA B

CAMP ALLEN SALVAGE YARD
 NAVAL STATION NORFOLK, NORFOLK, VIRGINIA

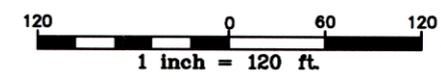


SAMPLE ID	CASD-1
SAMPLE DATE	12/16/98
TOTAL METALS (mg/kg)	
Cyanide	2.53
Aluminum	14000
Iron	32300
Lead	280
Magnesium	4200
Manganese	238
Nickel	34.2
Potassium	2360
Silver	2.1
Antimony	3.6 L
Arsenic	17.4
Barium	151
Beryllium	1
Cadmium	10.1
Chromium	57.1
Cobalt	12.3
Copper	122
Vanadium	109
Zinc	1110
Calcium	5080
Mercury	0.25 L

SAMPLE ID	CASD-3
SAMPLE DATE	12/16/98
TOTAL METALS (mg/kg)	
Cyanide	1.53
Aluminum	18500
Iron	53200
Lead	1180
Magnesium	5710
Manganese	369
Nickel	66.4
Potassium	1300
Silver	35.1
Antimony	22.2 L
Arsenic	98.9
Barium	144
Beryllium	1.7
Cadmium	48.9
Chromium	126
Cobalt	15
Copper	669
Vanadium	155
Zinc	1880
Calcium	8670
Mercury	2.4 L

SAMPLE ID	CASD-2
SAMPLE DATE	12/16/98
TOTAL METALS (mg/kg)	
Aluminum	1400
Iron	9950
Lead	5.1
Magnesium	2380
Manganese	104
Potassium	392
Sodium	2440 J
Arsenic	18.5
Barium	17.3
Beryllium	0.18
Chromium	12.7
Cobalt	1.8
Copper	3.9
Vanadium	18.3
Zinc	18.2
Calcium	272000

NOTES:
RED VALUE MEETS OR EXCEEDS RESIDENTIAL RBC AND/OR ER-M VALUES
 SAMPLE CONCENTRATIONS GIVEN IN mg/kg



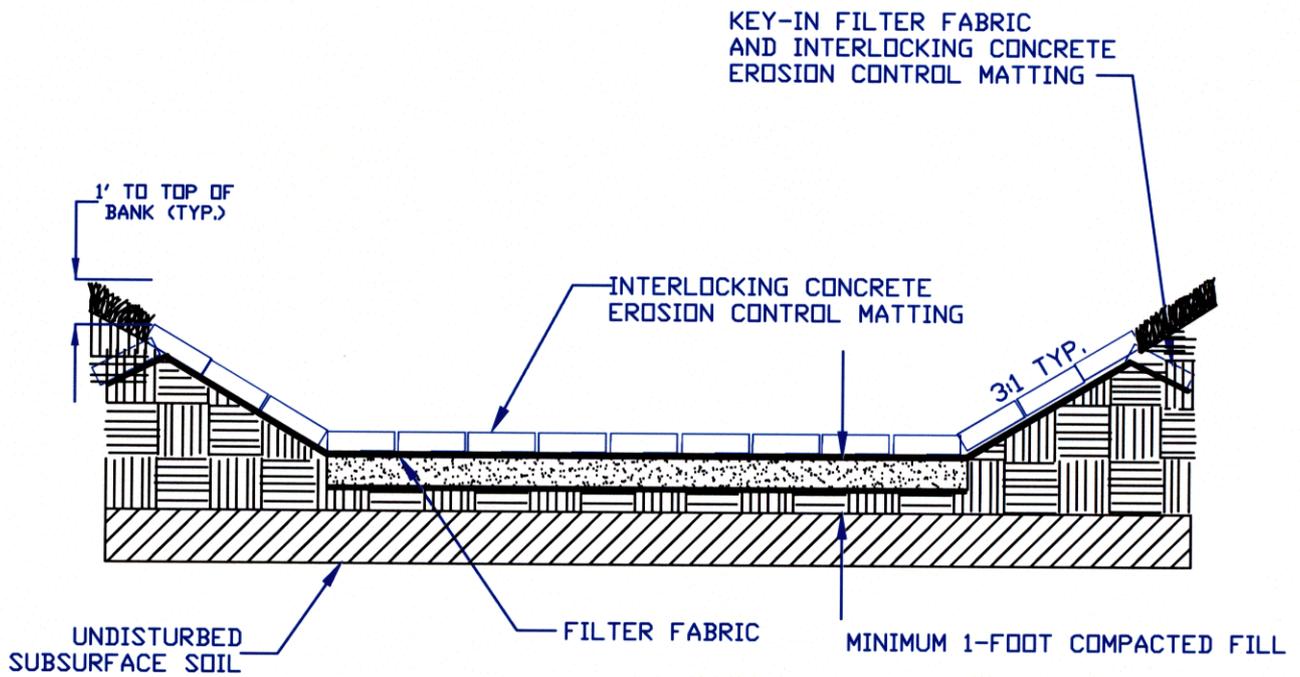
LEGEND

	SEDIMENT SAMPLE
ND	NOT DETECTED
L	BIASED LOW
J	ESTIMATED VALUE
mg/kg	MILLIGRAMS PER KILOGRAM (PARTS PER MILLION)
NA	NOT ANALYZED DUE TO INSUFFICIENT VOLUME

**FIGURE 2-5
 DETECTED INORGANICS IN SEDIMENTS-
 LANDFILL AREA B**

**CAMP ALLEN SALVAGE YARD
 NAVAL STATION NORFOLK, NORFOLK, VIRGINIA**

SOURCE: MILLER-STEPHANSON & ASSOCIATE (JUNE 1992);
 PHR&A (MARCH 1998)



NOT TO SCALE



FIGURE 6-1
 ALTERNATIVE 3 – ENGINEERED COVER OVER SEDIMENTS
 TYPICAL CROSS SECTION

CAMP ALLEN SALVAGE YARD
 NAVAL STATION NORFOLK, NORFOLK, VIRGINIA

APPENDIX A

APPENDIX A
SEDIMENT DATA AND COPC SELECTION SUMMARY
CAMP ALLEN SALVAGE YARD POND AREA
NAVAL STATION NORFOLK, NORFOLK, VIRGINIA

Contaminant ⁽¹⁾	Contaminant Frequency/Range ⁽³⁾		COPC Selection
	No. of Positive Detects/ No. of Samples	Range of Positive Detections	Selected as a COPC?
Volatiles (i g/kg):			
Acetone	2/8	73B - 730B	No
Methylene Chloride	4/8	10B - 26B	No
Carbon Disulfide	1/8	13J	No
2-Butanone	1/8	240	No
Trichloroethene	1/8	5J	No
Toluene	1/8	3J	No
1,2-Dichloroethene (Total)	1/8	25J	No
Semivolatiles (i g/kg):			
Benzo(a)pyrene	4/8	180J - 2,700	Yes
Dibenz(a,h)anthracene ⁽⁴⁾	1/8	580	Yes
Benzo(a)anthracene ⁽⁴⁾	5/8	52J - 2,900	Yes
Isophorone	1/8	710J	No
Acenaphthene	2/8	300J - 880	No
Di-n-butylphthalate	2/8	44J - 830	No
Phenanthrene ⁽⁵⁾	6/8	45J - 3,100	No
Butylbenzylphthalate	0/4	96J - 3,100	No
N-Nitrosodiphenylamine (1)	1/8	140J	No
Fluorene	2/8	190J - 680	No
Carbazole	1/8	810	No
Pentachlorophenol	1/8	100J	No
Naphthalene	2/8	260J - 500J	No
2-Methylnaphthalene	2/8	220J - 3,000J	No
Bis(2-ethylhexyl)phthalate	7/8	76J - 13,000	No
Di-n-octylphthalate	3/8	120J - 280J	No
Anthracene	2/8	130J - 1,400	No
2,4-Dinitrotoluene	1/8	130J	No
Pyrene	7/8	71J - 5,400	No
Dimethylphthalate	1/8	1900	No
Dibenzofuran	1/8	330J	No
Benzo(g,h,i)perylene ⁽⁵⁾	4/8	310J - 2,300	No
Indeno(1,2,3-cd)pyrene ⁽⁴⁾	4/8	270J - 3,000	Yes
Benzo(b)fluoranthene ⁽⁴⁾	5/8	65J - 4,000	Yes
Fluoranthene	7/8	67J - 5,300	No
Benzo(k)fluoranthene ⁽⁴⁾	4/8	130J - 1,600	Yes
Acenaphthylene ⁽⁶⁾	1/8	89J	No
Chrysene ⁽⁴⁾	6/8	45J - 3,200	Yes
Benzyl butyl phthalate	3/4	180J - 260J	No
Pesticides (i g/kg):			
4,4'-DDT	4/8	7.7J - 1,600J	No
gamma-BHC (Lindane)	1/8	260.00	No
Dieldrin	2/8	13J - 14J	No

APPENDIX A
SEDIMENT DATA AND COPC SELECTION SUMMARY
CAMP ALLEN SALVAGE YARD POND AREA
NAVAL STATION NORFOLK, NORFOLK, VIRGINIA

Contaminant ⁽¹⁾	Contaminant Frequency/Range ⁽³⁾		COPC Selection
	No. of Positive Detects/ No. of Samples	Range of Positive Detections	Selected as a COPC?
Endrin	1/8	25J	No
Pesticides (i g/kg) continued:			
4,4'-DDD	5/8	11J - 2,000	No
4,4'-DDE	2/8	23J - 220	No
gamma-Chlordane ⁽⁷⁾	1/8	8.3J	No
Endrin aldehyde ⁽⁸⁾	1/8	110J	No
Endrin Ketone ⁽⁸⁾	1/8	54J	No
PCBs (i g/kg):			
Aroclor-1260	5/8	190J - 6,100J	Yes
Inorganics (mg/kg):			
Aluminum	8/8	1,330 - 18,500	No
Antimony	3/8	3.1L - 22.2L	No
Arsenic	8/8	2.3K - 98.9	Yes
Barium	8/8	17.3 - 151	No
Beryllium	8/8	0.18 - 1.7	No
Cadmium	7/8	2 - 46.9	No
Calcium+	8/8	965 - 272,000	No
Chromium ⁽⁹⁾	5/8	12.7 - 126	No
Cobalt	8/8	1.7 - 15	No
Copper	8/8	3.9 - 669	No
Cyanide	4/8	0.66K - 2.53	No
Iron	8/8	4,420 - 53,200	Yes
Lead ⁽¹⁰⁾	7/8	5.1 - 1,180	No
Magnesium+	8/8	855 - 5,710	No
Manganese	8/8	55.4J - 369	No
Mercury	6/8	0.19L - 2.4L	Yes
Nickel	7/8	5.9 - 66.4	No
Potassium+	7/8	392 - 2,490	No
Selenium	4/8	0.93B - 4.1B	No
Silver	3/8	2.1 - 35.1	No
Sodium+	8/8	56.9 - 2,440J	No
Vanadium	4/8	18.3 - 155	No
Zinc	8/8	18.2 - 1,880	No

APPENDIX A
SEDIMENT DATA AND COPC SELECTION SUMMARY
CAMP ALLEN SALVAGE YARD POND AREA
NAVAL STATION NORFOLK, NORFOLK, VIRGINIA

Notes:

- (1) Organic concentrations reported in $\mu\text{g}/\text{kg}$; inorganic concentrations reported in mg/kg .
 - (2) COC = USEPA Region III COC screening values derived from USEPA Region III Risk Based Concentration Table, dated October 1998 (USEPA, 1998a).
 - (3) B = Analyte detected in laboratory method blank sample.
J = Analyte was positively identified, value is estimated.
K = Estimated value; biased high.
L = Estimated value; biased low.
 - (4) Benzo(a)pyrene was retained due to criteria exceedences; therefore all remaining carcinogenic PAHs were retained since these compounds occur in mixtures.
 - (5) COC screening value for pyrene used as a surrogate.
 - (6) COC screening value for acenaphthene used as a surrogate.
 - (7) COC screening value for chlordane used as a surrogate.
 - (8) COC screening value for endrin used as a surrogate.
 - (9) COC screening value for chromium VI
 - (10) Action level for residential soils (USEPA, 1994b)
- + = Essential Nutrients
ND = Not Detected
NE = Not Established
NA = Not Applicable

APPENDIX B

APPENDIX B-1
FREQUENCY AND RANGE OF SURFACE SEDIMENT DATA COMPARED TO FRESHWATER SEDIMENT SCREENING VALUES
CASY POND
NAVAL STATION NORFOLK, NORFOLK, VIRGINIA

Analyte	Contaminant Frequency/Range					Freshwater Sediment Screening Values (SSV)	Max. HQ	Mean HQ ⁽³⁾	COPC?	Comments
	No. of Positive Detects/No. of Samples	Range of Positive Detections	Range of Non-Detects	Arithmetic Mean (Half Non-Detects)	Value used in Screen					
INORGANICS (mg/kg)										
Aluminum	3/3	1400 - 18500	NA	11300	18500	25500 ^{Buchman 1999}	0.73		No	Below SSL
Antimony	2/3	3.6L - 22.2L	0.32UL - 0.32UL	9	22.2	150	0.15		No	Below SSL
Arsenic	3/3	17.4 - 98.9	NA	45	98.9	8.2	12.06	5.48	Yes	
Barium	3/3	17.3 - 151	NA	104	151	500 ^{Beyer 1990}	0.30		No	Below SSL
Beryllium	3/3	0.18 - 1.7	NA	0.96	1.7	NE	NA	NA	Yes	
Cadmium	2/3	10.1 - 46.9	0.08U - 0.08U	19	46.9	1.2	39.08	15.84	Yes	
Calcium	3/3	5060 - 272000	NA	95243	272000	NE	NA		No	Low Toxicity
Chromium	3/3	12.7 - 126	NA	65	126	81 ^{Long et al. 1995}	1.56	0.81	Yes	
Cobalt	3/3	1.8 - 15	NA	9.7	15	50 ^{Persaud 1993}	0.30		No	Below SSL
Copper	3/3	3.9 - 669	NA	265	669	34	19.68	7.79	Yes	
Cyanide	2/3	1.53 - 2.53	0.26U - 0.26U	1	2.53	0.1 ^{Persaud 1993}	25.30	13.97	Yes	
Iron	3/3	9950 - 53200	NA	31817	53200	188400 ^{Buchman 1999}	0.28		No	Below SSL
Lead	3/3	5.1 - 1180	NA	482	1180	46.7	25.27	10.31	Yes	
Magnesium	3/3	2380 - 5710	NA	4097	5710	NE	NA		No	Low Toxicity
Manganese	3/3	104 - 369	NA	237	369	460 ^{Persaud 1993}	0.80		No	Below SSL
Mercury	2/3	0.25L - 2.4L	0.06UL - 0.06UL	0.89	2.4	0.15	16.00	5.96	Yes	
Nickel	2/3	34.2 - 66.4	1.5U - 1.5U	34	66.4	20.9	3.18	1.62	Yes	
Potassium	3/3	392 - 2490	NA	1394	2490	NE	NA		No	Low Toxicity
Selenium	3/3	0.93B - 4.1B	NA	3	4.1	1 ^{Buchman 1999}	4.10	3.04	Yes	
Silver	2/3	2.4B - 35.1	0.19U - 0.19U	13	35.1	1	35.10	12.53	Yes	
Sodium	3/3	221B - 2440J	NA	998	2440	NE	NA		No	Low Toxicity
Vanadium	3/3	18.3 - 155	NA	94.1	155	57 ^{Buchman 1999}	2.72	1.65	Yes	
Zinc	3/3	18.2 - 1880	NA	1003	1880	150	12.53	6.68	Yes	

APPENDIX B-1
FREQUENCY AND RANGE OF SURFACE SEDIMENT DATA COMPARED TO FRESHWATER SEDIMENT SCREENING VALUES
CASY POND
NAVAL STATION NORFOLK, NORFOLK, VIRGINIA

Analyte	Contaminant Frequency/Range					Freshwater Sediment Screening Values (SSV)	Max. HQ	Mean HQ ⁽³⁾	COPC?	Comments
	No. of Positive Detects/No. of Samples	Range of Positive Detections	Range of Non-Detects	Arithmetic Mean (Half Non-Detects)	Value used in Screen					
Volatiles (ug/kg):										
1,2-Dichloroethene (Total)	1/3	25J - 25J	14U - 30UJ	16	25	NE	NA	NA	Yes	
2-Butanone	1/3	240 - 240	14U - 30UJ	87	240	NE	NA	NA	Yes	
Acetone	0/3	NA	30UJ - 730B	139	730	NE	NA	NA	No	Below SSL
Carbon disulfide	1/3	13J - 13J	14U - 30UJ	12	13	NE	NA	NA	Yes	
Methylene chloride	0/3	NA	10B - 26B	8	26	NE	NA	NA	No	Below SSL
Trichloroethene	1/3	5J - 5J	14U - 36U	10	5	41 Buchman 1999	0.12		No	Below SSL
SEMIVOLATILES (ug/kg)										
2-Methylnaphthalene	1/3	3000J - 3000J	430UJ - 980UJ	1235	3000	70	42.86	17.64	Yes	
Acenaphthene	1/3	300J - 300J	430UJ - 980UJ	335	300	16	18.75	18.75	Yes	
Anthracene	1/3	130J - 130J	430UJ - 980UJ	278	130	85.3	1.52	1.52	Yes	
Benzo(a)anthracene	2/3	170J - 210J	430UJ - 430UJ	198	210	261	0.80		No	Below SSL
Benzo(a)pyrene	2/3	230J - 260J	430UJ - 430UJ	235	260	430	0.60		No	Below SSL
Benzo(b)fluoranthene	2/3	500J - 650J	430UJ - 430UJ	455	650	3200	0.20		No	Below SSL
Benzo(g,h,i)perylene	2/3	310J - 590J	430UJ - 430UJ	372	590	670	0.88		No	Below SSL
Benzo(k)fluoranthene	2/3	130J - 190J	430UJ - 430UJ	178	190	240 Buchman 1999	0.79		No	Below SSL
Benzyl butyl phthalate	2/3	190J - 260J	430UJ - 430UJ	222	260	63	4.13	3.52	Yes	
Bis(2-ethylhexyl)phthalate	2/3	730J - 7300J	430UJ - 430UJ	2748	7300	1300	5.62	2.11	Yes	
Chrysene	2/3	370J - 480J	430UJ - 430UJ	355	480	384	1.25	0.92	Yes	
Di-n-octylphthalate	1/3	230J - 230J	430UJ - 1200UJ	348	230	6200	0.04		No	Below SSL
Fluoranthene	2/3	220J - 340J	430UJ - 430UJ	258	340	600	0.57		No	Below SSL
Fluorene	1/3	190J - 190J	430UJ - 980UJ	298	190	19	10.00	10.00	Yes	
Indeno(1,2,3-cd)pyrene	2/3	270J - 440J	430UJ - 430UJ	308	440	600	0.73		No	Below SSL
Isophorone	1/3	710J - 710J	430UJ - 980UJ	472	710	NE	NA	NA	Yes	
Naphthalene	1/3	500J - 500J	430UJ - 980UJ	402	500	160	3.13	2.51	Yes	
Phenanthrene	2/3	190J - 880J	430UJ - 430UJ	428	880	240	3.67	1.78	Yes	
Pyrene	2/3	480J - 740J	430UJ - 430UJ	478	740	665	1.11	0.72	Yes	
PESTICIDES (ug/kg)										
4,4'-DDD	2/3	11J - 63J	4.4UJ - 4.4UJ	25	63	16	3.94	1.59	Yes	
4,4'-DDE	1/3	23J - 23J	4.4UJ - 9.7UL	10	23	2.2	10.45	4.55	Yes	
4,4'-DDT	2/3	21J - 21J	4.4UJ - 4.4UJ	15	21	1.58	13.29	9.32	Yes	
Dieldrin	2/3	13J - 14J	4.4UJ - 4.4UJ	10	14	2 Persaud 1993	7.00	4.87	Yes	
Endrin	1/3	25J - 25J	4.4UJ - 9.7UL	11	25	3 Persaud 1993	8.33	3.56	Yes	
Endrin aldehyde	1/3	110J - 110J	4.4UJ - 9.7UL	39	110	NE	NA	NA	Yes	
Endrin ketone	1/3	54J - 54J	4.4UJ - 9.7UL	20	54	NE	NA	NA	Yes	
gamma-Chlordane	1/3	8.3J - 8.3J	2.2UJ - 4.9UL	4	8.3	7 Persaud 1993	1.19	0.56	Yes	
PCBS (ug/kg)										
Aroclor-1260	1/3	1300J - 1300J	44UJ - 97UL	457	1300	22.7	57.27	20.12	Yes	