

3/25/05 - 00834

**Final**

**Action Memorandum**  
**Site 7- Amphibious Base Landfill Canal Sediment**  
**Site 8 - Demolition Debris Landfill and Adjacent**  
**Wetland/Aquatic Areas**

**Naval Amphibious Base Little Creek**  
**Virginia Beach, Virginia**

**March 2005**

Prepared for  
**Department of the Navy**  
**Naval Facilities Engineering Command**  
**Mid Atlantic**

**Contract N62470-02-D-3052**

**Contract Task Order 0080**

Prepared by:



**CH2MHILL**

ACTION MEMORANDUM

Site 7- Amphibious Base Landfill Canal Sediment

and

Site 8- Demolition Debris Landfill and Adjacent **Wetland/Aquatic** Areas

Naval Amphibious Base Little Creek, Virginia Beach, **Virginia**

DATE: February 1,2005

SUBJECT: Removal Action at Site 7 and Site 8

FROM: Commander, Naval Facilities Engineering Command, Mid Atlantic

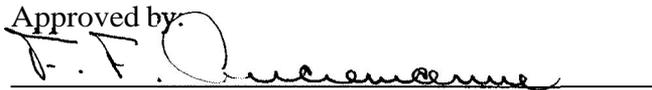
TO: F. F. Aucremanne, CAPT, CEC, USN  
Chief of Staff  
By Direction of the Commander  
Navy Region, Mid-Atlantic

This Action Memorandum documents approval for the removal action as described herein for Site 7 and Site 8 at the Naval Amphibious Base Little Creek, Virginia Beach, Virginia. This Action Memorandum serves as the Decision Document for the Engineering Evaluation/Cost Analysis for Site 7 and Site 8, each of which was prepared under separate cover.

This decision document represents the selected removal actions for Site 7 and Site 8 and was developed in accordance with the Comprehensive Environmental Response, Compensation and Liability Act of 1980 (CERCLA) as amended, and is consistent with the National Oil and Hazardous Substance Pollution Contingency Plan (NCP). This decision is based on the administrative record for the sites.

Conditions at Site 8 and Site 7 meet the NCP section 300.415(b)(2) criteria for removal action. Naval Facilities Engineering Command recommends approval of the proposed removal action. The total project ceiling for Site 8 if approved will be \$1,870,696.53. The total project ceiling for Site 7 if approved will be \$592,214. The Response actions should commence as soon as practical to expedite remediation at Sites 7 and 8.

Approved by:



F. F. Aucremanne, CAPT, CEC, USN  
Chief of Staff  
By Direction of the Commander  
Navy Region, Mid-Atlantic

3-25-05

Date

## **Preamble to the Site 8 Action Memorandum**

### **NAB Little Creek, Virginia Beach, Virginia**

A Technical Memorandum has been prepared and incorporated as an Addendum to the Action Memorandum for a non time critical removal action (NCTRA) at IR Site 8 at NAB Little Creek. The Technical Memorandum was prepared to clarify costs for the alternatives evaluated in the Engineering Evaluation/Cost Analyses (EE/CA) and to provide supporting documentation for the selection of the Preferred Alternative for the Site 8 Interim Remedial Action (IRA). The Technical Memorandum summarizes the comparison of interim remedial action alternatives against the nine criteria as required by the National Contingency Plan and provides additional explanation of cost estimates for the alternatives.

## Site 8 Interim Removal Action Preferred Alternative and Cost Estimate

PREPARED FOR: Navy Region Mid Atlantic  
PREPARED BY: CH2MHILL  
COPIES: Ms. Dawn Hayes/NAVFAC Atlantic  
DATE: March 14, 2005  
PROJECT NUMBER: 315171.EC.AM

### Introduction

The Action Memorandum for a non-time critical removal action (NCTRAs) at IR Site 8 at NAB Little Creek was submitted to the Navy for review and signature in February 2005. Based upon Navy concerns regarding cost differences among the alternatives evaluated in the Engineering Evaluation/Cost Analyses (EE/CAs), additional documentation was requested to support the Preferred Alternative chosen for the Site 8 Interim Remedial Action (IRA) - Alternative 3 - Landfill Excavation, wetlands restoration, and wetlands creation. Supporting documentation is provided in this Technical Memorandum.

### Background

Alternatives evaluated in the EE/CA for Site 8 address the demolition debris landfill and sediment in wetland/aquatic areas at DP13 and Pond 2. The alternatives evaluated included:

Alternative 1: No action;

Alternative 2: Construction of a soil cover on the landfill with Land Use Controls (LUCs). At DP13 the action includes excavation of remaining subsurface debris/sediment, backfill of the area with clean fill, and restoration of the wetlands. At Pond 2 the action includes excavation of debris and bottom sediments from Pond 2 and restoration of the pond;

Alternative 3: Complete removal of the debris landfill, excavation of remaining subsurface debris/sediments around former DP13 and restoration of the wetlands in the area of former DP13, removal of the residual debris and sediment in Pond 2, backfill with granular fill, and construction of tidal wetlands within the area of Pond 2.

These alternatives were developed to mitigate potential risk to human health and the environment due to the presence of subsurface debris with an inadequate soil cover

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(minimum of 2 feet required) currently present on the landfill, and to prevent exposure of ecological receptors in the wetland/aquatic areas where potential risk exists.

## **Description of Alternative 2**

Implementation of the soil cover (Alternative #2) for the demolition debris landfill includes clearing/grubbing, placement of two-foot minimum soil cover, and drainage controls. Additional ecological risk assessment will be needed at the site to define remaining risks presented by wastes left in place. Further, a Feasibility Study will be required to further screen additional remedial action alternatives. A Remedial Design (RD) will be required to document the remedial action. Since debris/waste will remain in place, Land Use Controls (LUCs) must be developed to restrict future site use, including notification on the deed of record that subsurface debris is present at the site. In addition, a long term monitoring and maintenance plan will be required to maintain the integrity of the cover and ensure that groundwater does not become impacted by the debris/waste left in place. The groundwater monitoring/reporting plan will require periodic (likely on a semi-annual basis) sampling and analysis of groundwater, quarterly inspections of the remedy, and an annual summary of activities for submission to the EPA and VDEQ. Regulatory-required 5-year reviews will need to be conducted for the site since waste is left in place.

In wetland aquatic areas (DP13 and Pond 2), Alternative 2 provides for removal of shallow sediment and subsurface debris to a minimum depth of two feet within DP13, backfill with a minimum of six inches of gradual fill to an appropriate elevation to restore the area as tidal wetlands. The bottom of Pond 2 is known to contain at least one steel tank and miscellaneous debris. Alternative 2 provides for clearing submerged debris and shallow bottom sediment from Pond 2 and leaving the area as a pond. For the EE/CA, the extent of sediment excavation was assumed to be the same as Alternative 3; however, the regulatory agencies would likely require additional sampling to better define the extent of sediment removal at DP13 and Pond 2 in the absence of ecological enhancements through wetland creation.

## **Description of Alternative 3**

In Alternative 3, the landfill is excavated and wetlands are created. This alternative will support future land use with unrestricted use and unrestricted exposure (LUCs and monitoring/maintenance not required). The action in wetland aquatic areas is removal of the shallow sediment and subsurface debris at DP13 and Pond 2, restoration of DP13 to wetlands, and the creation of tidal marsh wetlands at Pond 2. Potential ecological risk in wetland aquatic areas has been considered acceptable as negotiated with the USEPA and VDEQ based on the ecological enhancement gained by the creation of wetlands. Therefore, no additional delineation or post-construction sampling will be required.

## **Comparison of Alternatives**

The National Contingency Plan (NCP) outlines the approach for comparing remedial alternatives using nine evaluation criteria. A summary of the evaluation of alternatives against the nine criteria is provided in Table 1. As required by the NCP, the no action

alternative is listed as a baseline for comparison only and is not discussed further. In addition to the nine criteria required by the NCP, the Navy has a preference for remedial actions that result in no restrictions on land use or exposure to site media, and avoids remedial actions with long-term activities. NCP-required 5-year reviews must be conducted at sites where waste is left in place to ensure protection of human health and the environment.

<b>Table 1: Relative Ranking of Alternatives</b>			
<b>NCP Criterion</b>	<b>Alternative 1 - No Action</b>	<b>Alternative 2 - Soil cover, debris removal at DP13 &amp; Pond 2, restoration to existing condition</b>	<b>Alternative 3 - Excavation of landfill, debris removal at DP13 &amp; Pond 2, creation of tidal wetlands</b>
<b>Threshold Criteria</b>			
<b>Overall Protection of Human Health and the Environment</b>	○	○	●
<b>Compliance with ARARs and TBC Criteria</b>	○	●	●
<b>Primary Balancing Criteria</b>			
<b>Long-Term Effectiveness and Permanence</b>	○	○	●
<b>Reduction in Toxicity, Mobility, or Volume</b>	○	○	●
<b>Short-Term Effectiveness</b>	○	●	○
<b>Implementability</b>	●	○	○
<b>Present-Worth Cost</b>	\$0	\$2,220,000	\$1,864,000
<b>Modifying Criteria</b>			
<b>Commonwealth of Virginia Acceptance</b>		○	●
<b>Community Acceptance</b>		○	●
<b>Ranking: ● High ○ Moderate ○ Low</b>			

**Protection of human health and the environment**

Alternative 3 is the most protective of human health and the environment through the complete removal of the debris landfill and the removal of sediment at DP13 and Pond 2 that poses potential ecological risk. Since waste is left in place under Alternative 2, this alternative does not provide the greatest degree of overall protection of human health and the environment. Alternative 1 does not provide protection of human health and the environment, thus it is eliminated from potential selection as a remedial action for this site.

**Compliance with Applicable or Relevant and Appropriate Requirements (ARARs)**

The fundamental purpose of ARARs is to define the minimum level of protection that must be provided by an action selected and implemented under CERCLA. Additional protection may be required to protect human health and the environment as defined in the NCP. Federal ARARs are determined by the lead agency, which in this case is the Department of the Navy. Both Alternative 2 and 3 would comply with ARARs.

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#### Long-term effectiveness and permanence

Alternative 3 would provide the most long-term effectiveness and permanence through the complete removal of the debris landfill and impacted sediment at DP13 and Pond 2.

Alternative 2 would require LUCs and quarterly inspections and physical and chemical monitoring to ensure the effectiveness of the soil cover as a remedy. Since debris is left in place under Alternative 2, this alternative does not provide the greatest degree of long-term effectiveness and permanence, as the potential for exposure is present.

#### Reduction in toxicity, mobility, or volume

Alternative 3 would provide complete reduction in toxicity, mobility, and volume through the complete removal of the debris landfill and impacted sediment at DP13 and Pond 2.

Under Alternative 2, a soil cover will minimize potential leaching of contaminants through the debris landfill, however, this alternative does not provide for reduction in toxicity or volume of waste and the potential for future release is present.

#### Implementability

Both Alternatives 2 and 3 are moderately straightforward to implement. Construction of a soil cover as well as excavation of the construction debris landfill can be implemented using standard equipment and construction practices. Because Alternatives 2 and 3 expose landfilled materials during excavation, health and safety measures are required to ensure worker protection. Implementation of Alternative 2 requires implementation grading plans to ensure proper erosion and runoff control, as well as LUCs with long-term maintenance and monitoring since landfill material is left in place.

#### Short-term effectiveness

Due to the risk of exposure from contaminant release during the entire excavation of the landfill, Alternative 2 is more effective in the short term than Alternative 3. Actions in wetland and aquatic areas are of equally short-term effectiveness. Short-term effects presented from both alternatives include the transportation of wastes from the site to an approved landfill and the removal of sediments in the wetland areas.

#### Cost

Based upon Navy concerns regarding cost differences among the alternatives, the costs were re-evaluated to verify all elements of the proposed alternative were included in the initial cost estimate. The revised cost estimate for Alternative 2 is \$2,220,000 and the revised estimate for Alternative 3 is \$1,864,000.

If the wetland habitat is not created as proposed in Alternative 2, then existing potential ecological risk in Pond 2 and DP13 may need to be further addressed and risk management considerations re-visited by the USEPA and VDEQ. Additional sampling that may result from re-evaluation of risk management considerations were not reflected in the EE/CA for Alternative 2. This includes the development of a Baseline Ecological Risk Assessment (BERA) for wetland aquatic area sediments, a Feasibility Study (FS) based on results of the BERA, a Remedial Design for the selected remedy, and post-ROD monitoring and reporting (LUCs, long-term physical and chemical monitoring, and site inspections, 5-year reviews), and periodic maintenance. It is anticipated that additional requirements associated with implementing alternative 2 will delay remedial action by a minimum of 3 years.

The EE/CA estimate for Alternative 3 included off-site disposal of all excavated materials. Steel and concrete debris are to be recycled. Site soil not impacted by waste and confirmed clean will be utilized as general fill. Subsequent to the completion of the EE/CA, the Navy solicited contractor cost estimates for implementation of Alternative 3. These revised cost estimates are reflected in the Action Memorandum signature page as summarized in the Preamble. A more detailed discussion of cost is presented below.

#### State Acceptance

The State accepts both alternatives 2 and 3, but prefers Alternative 3 due to long-term effectiveness and permanence and reduction in toxicity, mobility, and volume of waste.

#### Community Acceptance

The community supports Alternative 3 because of the ecological enhancements associated with the creation of wetlands, the long-term effectiveness and permanence, and reduction in toxicity, mobility, and volume of waste associated with Alternative 3. In addition, the Chesapeake Bay Program favors Alternative 3.

## Cost Comparison

Cost estimates presented in the EE/CA are estimates based on preliminary assumptions with - 30/+50%. The cost associated with Alternative 2 has been revised for the Action Memorandum to account for development of a BERA, FS, RD, LUCs, long-term monitoring, and additional sampling that will result from re-evaluation of risk management considerations for wetland aquatic areas. The Action Memorandum has been revised to reflect these revised cost estimates.

### **Alternative 2 –Soil Cover with Land Use Controls and Restoration of Wetland/Aquatic areas**

The cost estimate for Site 8 Alternative 2 in the EE/CA is \$1,480,000. However, these costs did not reflect additional sampling that may result from re-evaluation of risk management considerations, completion of a BERA, FS, RD, post-ROD monitoring plans, developing and maintaining LUCs, 5-year reviews, and periodic maintenance. These additional requirements are expected to require several additional years of regulatory reporting before Alternative 2 could be implemented. Additionally, annual costs (assumed for 30 years) associated with LUC inspections and reportings were also not included in the EE/CA. These additional costs are summarized in Table 2. The revised cost estimated for Alternative 2 is \$2,220,000.

### **Alternative #3 Landfill Excavation, Wetland Restoration, and Wetland Creation**

The cost estimate for Site 8 Alternative 3 in the EE/CA is \$3,380,000. The selection of Alternative 3 as the preferred alternative included consideration of the following:

- 1) The potential ecological risk identified at Site 8 would be considered acceptable because of the ecological benefit from wetland habitat creation as agreed to by USEPA and VDEQ. As such, pre- or post-construction confirmation sampling would

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not be required to define the limits of excavation. Lateral extent has been identified; vertical extent in the landfill is dependent upon the depth of buried debris.

- 2) No Land Use Restrictions would be required. Site closure with unrestricted use and unrestricted exposure is a principal goal of the Navy's environmental program, which is achieved with Alternative 3.
- 3) Alternative 3 provides the Navy the opportunity to convert the "dump site" into tidal wetlands within NAB Little Creek. This is highly valued by the regulatory agencies, the public and the Chesapeake Bay Program.

Assumptions included in estimating costs in the EE/CA under Alternative 3 included worst case cost scenarios such as off-site disposal of all excavated materials at a permitted landfill facility and debris depths 3 feet greater than observed during site investigations. Potential savings of approximately \$950,000 not reflected in the EE/CA cost estimate (Table 2) can be attributed to the following factors:

- 1) Recycling of concrete and steel at a significantly less cost than off-site landfill disposal (recycle costs on a per-load basis and off-site disposal on a per-ton basis).
- 2) Soil testing conducted to date has indicated that some excavated soils may be acceptable for re-use as general subsurface fill. Savings associated with re-use include no importing of general fill for site restoration, and no fees associated with off-site disposal of site soils.
- 3) The conceptual wetland creation plan developed in the EE/CA for Alternative 3 is sufficient to support construction activities and a detailed design is not required.

In summary, the revised costs estimates, in contrast to the cost estimated in EE/CA, reflect additional costs associated with additional CERCLA reporting, long-term operation, maintenance, and monitoring, and LUCs that would be required for Alternative 2 where waste are left in place. These additional requirements increase the present worth cost (30 years) of Alternative 2 to \$2,220,000.

For Alternative 3, cost savings are realized from the re-use of excavated soils and recycled steel and concrete. Additionally, Alternative 3 does not require detailed designs to be developed for wetland creation.

Based on the Navy Scope of Work provided to the IRA contractor, the actual cost to implement Alternative 3 at Site 8 is approximately \$1.4-1.8M (based on re-use of soils as general fill and recycling cost for concrete and steel). The resulting cost savings for Alternative 3 is summarized in Table 2 - Summary of Revised Site 8 Cost Estimates. Had these considerations (including no further design being necessary) been considered during the development of the EE/CA, the present worth cost estimate for Alternative 3 would have been \$1,870,000.

Table 2

Alternative 2 Soil Cover with Land Use Controls and Long Term Monitoring Wetland Restoration; Cleanout of Pond 2		
<b>Capital Cost</b>		<b>Schedule</b>
Capital Construction Cost	\$ 607,650.50	2005 - Begin ERA
<b>Additional Costs not considered during EE/CA</b>		2006 - Finalize ERA, Begin FS
Capital Cost		2007 - Finalize FS, Begin Construction Planning
CERCLA Reporting	\$ 550,000.00	2008 - Implement Remedial Activities
Develop Land Use Controls	\$ 18,000.00	2009 - Site Closeout under CERCLA: Develop and Maintain Land Use Controls
	Subtotal \$ 568,000.00	2010 - 2040 - Annual Monitoring and Maintenance
<b>Annual Cost</b>		
Groundwater Monitoring Reporting	\$ 30,000.00	
Maintain Annual Land Use Controls	\$ 24,200.00	
	Subtotal \$ 54,200.00	
<b>Five Year Review</b>	\$ 30,000.00	
	Subtotal \$ 30,000.00	
<b>TOTAL PRESENT VALUE OF ALTERNATIVE 2 INCLUDING 30 YEARS OF OPERATION AND MAINTENANCE</b>		
	\$ 2,571,333	

Alternative 3 Excavation of Landfill and Creation of Tidal Wetlands Excavation, Restoration, and Creation of Wetlands		
<b>Capital Cost</b>		<b>Schedule</b>
Revised Capital Construction Cost	\$ 1,886,210	2005 - Implement NTCRA; Develop Site Closeout Documentation
<b>Cost Savings from EEICA Estimate</b>		2006 - Site Closeout; No Further Action under CERCLA with Unrestricted Land Use
Capital Cost		2006 - 2007 Navy Natural Resource monitoring for establishment of wetlands
Offsite Disposal of all excavated materials	\$ 949,000	
Recycle of Concrete and Metal Debris	\$ (76,500)	
Re-use of on site soil classified as clean fill (4,050 CY/6,609 TN)	\$ 48,600	
Design Costs (10%) - Conceptual Design Utilized	\$ 234,000	
Construction Oversight (15%) - NAVY ROICC [not contracted]	\$ 351,000	
	Subtotal \$ 1,506,100	
<b>EE/CA Estimate - Preferred Alternative</b>	\$ 3,378,000	
Less Estimated Capital Cost Savings	\$ 1,506,100	
	\$ 1,871,900	
	Revised Cost Estimate \$ 1,886,210	
	EE/CA Estimate minus Estimated Cost Savings \$ 1,871,900	
	Percent Difference 0.387%	

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2	Site 8 Removal Action Cost

## Attachments

A	Final EE/CA for Site 7
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# Acronyms and Abbreviations

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ARAR	Applicable or Relevant and Appropriate Requirement
CERCLA	Comprehensive Environmental Response, Compensation & Liability Act of 1980
CFR	Code of Federal Regulations
DERP	Defense Environmental Restoration Program
DoD	Department of Defense
DP	debris pile
EE/ CA	Engineering Evaluation/Cost Analysis
IR	Installation Restoration
NAB	Naval Amphibious Base
NCP	National Oil & Hazardous Substances Pollution Contingency Plan
NFESC	Naval Facilities Engineering Service Center
NPL	National Priority List
NTCRA	Non-Time-Critical Removal Action
PAH	polycyclic aromatic hydrocarbon
RCRA	Resource Conservation and Recovery Act
RI	Remedial Investigation
ROD	Record of Decision
SARA	Superfund Amendments & Reauthorization Act of 1986
USC	United States Code
USEPA	United States Environmental Protection Agency
VDEQ	Virginia Department of Environmental Quality

## I. Purpose

This Action Memorandum documents approval of the proposed removal action for Site 7, the Amphibious Base Landfill Canal Sediment at the Naval Amphibious Base and Site 8, the Demolition Debris Landfill and Adjacent Wetland/Aquatic Areas (NAB) Little Creek, Virginia Beach, Virginia. A non-time critical removal action (NTCRA) is proposed at Site 7 and 8 to address contaminants that have been identified, through previous investigations, as potentially posing a risk to human health and/or the environment. Separate Engineering Evaluations/Cost Analyses (EE/CAs) were prepared for a NTCRA at Site 7 and at Site 8, and are included as Attachments A and B, respectively. This Action Memorandum serves as the Decision Document for these EE/CAs, and for the Navy to conduct the work proposed therein. The alternatives evaluated the EE/CAs are summarized below.

### Site 7

- Alternative #1 - No Action
- Alternative #2 - Removal of Contaminated Sediments and Replacement with Clean Backfill
- Alternative #3 - Removal of Contaminated Sediments and Replacement with Clean Backfill, and Surface Debris Removal

### Site 8

Work Element A: Demolition Debris Landfill—Implement measures at Site 8 that eliminate potential exposure to contents of the landfill by potential human health and ecological receptors and provide a long-term land use management plan for the area.

- No action
- Construction of a soil cover on the landfill with Land Use Controls (LUCs)
- Complete removal of the debris landfill and construction of a tidal wetlands within the excavated area

Work Element B: Wetland/Aquatic Areas—Implement measures at former DP 13 that would eliminate potential risk to ecological receptors in the area and implement measures at Pond 2 that would eliminate potential unacceptable risk to ecological receptors in the sediment.

- No action
- Excavation of remaining subsurface debris/sediments around former DP 13, backfill of the area with clean fill, and restoration of the wetlands in the area of former DP 13; and excavation of debris and bottom sediment from around and within Pond 2 and restoration of the pond
- Excavation of remaining subsurface debris/sediments around former DP 13; removal of residual debris and sediment in Pond 2 and backfill with granular fill; restoration of the wetlands in the area of former DP 13; and construction of tidal wetlands within the area of Pond 2

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This Action Memorandum was completed in accordance with the remedial 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 (SARA), the National Oil and Hazardous Substances Pollution Contingency Plan (NCP), and United States Environmental Protection Agency's (USEPA) *Superfund Removal Procedures - Action Memorandum Guidance* (USEPA, 1990).

## **II. Background and Site Conditions**

### **Facility Background**

NAB Little Creek consists of 2,147 acres located in the northwest corner of Virginia Beach, Virginia adjacent to the Chesapeake Bay (Figure 1-1, Attachment A). The facility is primarily industrial and provides logistic facilities and support services for local commands, organizations, homeported ships, and other United States and allied units to meet amphibious warfare training requirements of the Armed Forces of the United States. NAB Little Creek is also used for recreational, commercial, and residential purposes. Land development surrounding the base is residential, commercial, and industrial. NAB Little Creek (USEPA ID: VA5170022482) was placed on the National Priorities List (NPL) in May 1999. Sites 7 and 8 are among the Installation Restoration (IR) sites being addressed under CERCLA at NAB Little Creek.

### **Site 7 Background**

Site 7, the former Amphibious Base Landfill, consists of approximately 38 acres and is located in the south central part of NAB Little Creek. The landfill is bordered on the east by Helicopter Road, on the south by Amphibious Drive, and on the north by Little Creek Cove (Figure 1-3, Attachment A). Two locked gates control vehicle access to the landfill across access roads on the site's eastern and western sides. A chain link fence runs along the site's southern boundary. Pedestrian access along the eastern and western borders is deterred by dense vegetation. In the western portion of Site 7, a drainage canal runs south to north into Little Creek Cove.

Site 7 operated between 1962 and 1979. Initially, waste disposal operations were conducted as a trench-type landfill with open burning of refuse in the trenches. The landfill was later operated as an area landfill, with refuse spread over the ground and covered regularly. It is estimated that the landfill contains approximately 500,000 cy of waste. Historical records/reports indicate wastes placed in the landfill include non-hazardous solid waste, waste oil, metals, and other unspecified waste. In 1998, 610 cy of debris along the landfill shoreline were removed and a soil cover was placed over the entire landfill area.

### **Site 8 Background**

Site 8, the Demolition Debris Landfill, consists of approximately 2 acres located in the south central portion of NAB Little Creek at the intersection of Amphibious Drive and Helicopter Road (Figure 1-2, Attachment B). Site 8 is situated adjacent to and within tidal wetlands of Little Creek Cove. An observation deck for wildlife is located in the northeastern corner of the site (Figure 1-3, Attachment B). Heavy vegetation minimizes trespassing at the site. An

access road from a previous removal action is present to the southwest of the site; however, a locked gate prevents vehicle access to the site using the access road.

Primarily inert materials were disposed of at the Demolition Debris Landfill, which operated from 1971 to 1979. The landfill was constructed in a pit where the Public Works Center - Transportation Division excavated material to surface parking lots. The bulk of the landfill demolition debris waste is in the central to northeastern area of Site 8 with less than 2 feet of soil cover present over the majority of the landfill. Thickness of waste varies from a few inches to greater than 7 feet, including waste present below the water table. Two ponds are located on the eastern portion of the landfill (Figure 1-3, Attachment B). There is no documented inventory of hazardous waste that were being disposed of at Site 8, although no release controls were in place at the site and a detailed inventory of the materials disposed of is not available. An interim removal action was completed in 2001 to remove surface debris in and around the landfill and wetland areas. Small amounts of visible surface debris currently remain on site.

### **Summary of Actions to Date**

Site 7 and 8 have been characterized under numerous investigations and studies between 1984 and the present. A chronological listing of the investigations and studies is provided below.

#### **Site 7**

- Initial Assessment Study - 1984
- Round 1 Verification Step (RVS)- 1986
- Resource Conservation and Recovery Act (RCRA) Facility Assessment - 1989
- Interim Remedial Investigation - 1991
- Remedial Investigation/Feasibility Study (RI/FS) - 1993 through 1994
- Relative Risk Ranking Survey - 1996
- Feasibility Study - 1997
- Proposed Remedial Action Plan - 1997
- Decision Document - 1998
- Remedial Action - 1998
- Long Term Monitoring - 1998 through 2004
- Revised Remedial Investigation Human Health Risk Assessment - 2004
- Ecological Risk Assessment - 2004
- Canal Sediment Delineation - 2004

These investigations concluded that there are potential human health risks from exposure to landfill contents and contaminated soil, and potential ecological risks from sediment in the central portion of the canal. The focus of this removal action is to address the potential ecological risks associated primarily with metals and pesticides in sediment of the central portion of the canal. It is expected that Land Use Controls (LUCs) will be the preferred remedy to protect human health from exposure to landfill contents at Site 7.

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## Site 8

- Initial Assessment Study - 1984
- Resource Conservation and Recovery Act (RCRA) Facility Assessment - 1989
- Relative Risk Ranking Survey - 1996
- Site Investigation - 1999
- Screening Ecological Risk Assessment - 2000
- EE/CA for Surface Debris Clearing - 2001
- Surface Debris Clearing - 2002
- Soil Cover Survey - 2002
- Remedial Investigation (RI)/Human Health Risk Assessment - 2004

These investigations concluded that landfill contents, iron in soil, and polycyclic aromatic hydrocarbons (PAHs) and metals in sediment, pose potential unacceptable risks to human and ecological receptors. The focus of this removal action is to excavate all landfill materials and impacted soil and sediment to eliminate all unacceptable risk, and construction of tidal wetlands resulting in site closure with unrestricted use and unrestricted exposure.

## III. Proposed Actions

The Site 7 EE/CA was completed to address the potential unacceptable ecological risk associated with the sediment in the central portion of the canal on the western boundary of the site. The Site 8 EE/CA was completed to address landfill contents, soil, and sediment contamination. The EE/CAs support a NTCRA for both Site 7 and 8 at NAB Little Creek.

Three alternatives were assessed for Site 7 canal sediment and the Site 8 landfill and associated wetland/aquatic areas. These alternatives were evaluated and compared based on their effectiveness, implementability, and cost. The EE/CAs for Site 7 (Attachment A) and 8 (Attachment B) describes the alternatives considered for each site in greater detail, and the process by which the alternatives were evaluated, compared and selected. The preferred alternative for each site is briefly described below.

### Site 7

The preferred removal action alternative for Site 7 is the removal of contaminated sediments in the central canal, and backfill with clean fill. An area approximately 885 ft long by 35 ft wide would be excavated to a depth of 1 ft below ground surface (Figure 4-1, Attachment A). Additional material will be removed from the canal where the landfill access road has collapsed into the canal. It is estimated that approximately 1,150 cubic yards of sediment will be removed from the canal, and approximately 450 cubic yards of concrete and debris will be removed from the collapsed landfill access road.

### Site 8

The preferred removal action alternative for Site 8 is the excavation of landfill materials, contaminated soil, and waste and contaminated sediment in adjacent wetland/aquatic areas, and the subsequent restoration and creation of tidal wetlands. The estimated volume of landfill materials and soil to be removed from the site to allow for restoration as a tidal wetland is 15,600 cubic yards (Figures 4-3 through 4-5, Attachment B). The estimated

volume of landfill materials and contaminated sediment to be removed from the wetland/aquatic area is 1,370 cubic yards.

The excavations will be backfilled with clean fill to establish specific elevation(s) for the planting of wetland species. The excavated materials will be hauled off-site for disposal at appropriate facilities or recycled as appropriate.

### ***Contribution to Remedial Performance***

The NTCRAs for Site 7 and 8 will mitigate potential risks to human health and/or the environment while satisfying project implementation and cost requirements. Results of previous investigations for Site 7 and 8 (Section 2) have identified potential risk and delineated the nature and extent of contamination.

### ***Site 7***

The extent of removal in the Site 7 canal is defined by existing samples posing no unacceptable risk, therefore the establishment of a clean up goal for sediment is not necessary. The NAB Little Creek Tier I Partnering Team (Navy, USEPA, VDEQ), agree that, if implemented, the removal action will reduce the low potential ecological risk to an acceptable level, and confirmation sampling for sediment will not be required.

Excavation of contaminated sediment at Site 7 will mitigate the potential risks posed as well as the potential for contaminant release and migration to other site media and off-site. The NTCRA will complete the clean up of sediment posing unacceptable risk to ecological receptors and will allow for site close out with no further remedial actions for sediment. Because waste will remain in place, LUCs and long term monitoring will be required to ensure protection of human health from exposure to landfill contents.

### ***Site 8***

The extent of removal at Site 8 is based on the visual delineation of construction debris materials. Excavation of landfill materials and associated soil and sediment at Site 8 will mitigate the potential risks posed as well as the potential for contaminant release and migration to other site media and off-site. The Navy in partnership with the USEPA and VDEQ agree the removal of construction debris landfill materials will reduce potential risk to acceptable levels and confirmation samples are not required. The NTCRA and subsequent restoration and creation of tidal wetlands will complete the cleanup of Site 8 and allow for unrestricted use and unrestricted exposure for the property.

### ***Applicable or Relevant and Appropriate Requirements***

The NCP requires that removal actions attain Federal and State Applicable or Relevant and Appropriate Requirements (ARARs) with limited exception, to the extent practicable. Analysis of the removal action alternatives for Sites 7 and 8 with the applicable ARARs are presented in the Attached EE/CAs (Appendix B of the Site 7 EE/CA and Appendix C of the Site 8 EE/CA). The removal action set forth in this Action Memorandum will comply with ARARs to the extent practicable.

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### ***Project Schedule***

The Draft Final Site 8 EE/CA was made available to the public for comment for 30 days on December 3,2004. The Draft Final Site 7 EE/CA was made available for 30 days public comment on January 24,2005. No comments were received from the public during the comment period.

The proposed project schedule for is:

Preparation of Work Plan	March 2005
Subcontracting and Mobilization	March -April 2005
Removal Action	May 2005
Construction Completion Report	August 2005

### **Estimated Costs**

The NCP 40 Code of Federal Regulations (CFR) Part 300.415 dictates statutory limits of \$2 million and 12 months of USEPA fund-financed removal actions, with statutory exemption for emergencies and actions consistent with the removal action to be taken. These removal actions will not be USEPA fund-financed. The Navy/Marine Corps IR Manual does not limit the cost or duration of the removal action.

### ***Response Action Contract***

The Navy will contract with environmental remediation contractors to perform the required work associated with Site 7 and 8 at NAB Little Creek. The estimated costs are itemized in Table 1 for Site 7 and Tables 2 and 3 for Site 8.

**TABLE 1**  
**Site 7 Removal Action Cost – Canal Sediment**

Excavation & Removal of Contaminated Sediments	\$277,078.65
Backfill and erosion control	\$21,454.11
<b>Subtotal</b>	<b>\$298,532.76</b>
Contingency (20%)	\$59,706.55
<b>Subtotal</b>	<b>\$358,239.31</b>
General Conditions (10%)	\$35,823.93
Mob/Demob (5%)	\$17,911.97
<b>Subtotal</b>	<b>\$53,735.90</b>
Contractor OH/P (15%)	\$61,796.28
Design Costs (10%)	\$47,377.15
Construction Oversight (15%)	\$71,065.72
<b>Subtotal</b>	<b>\$180,239.15</b>
Total present value of Alternative	\$592,214.36

**TABLE 2**  
**Site 8 Excavation of Landfill and Creation of Tidal Wetlands**

Wetland/Aquatic Areas Excavation & Removal	
Clearing (tree removal, stump removal, grubbing)	\$ 3,230.00
Debris removal, soil removal, dewatering, waste T/D	\$ 129,088.25
Restoration and Creation of Wetlands	
Sand Fill Wetland planting	\$ 18,476.60
Wetland Planting	
<b>Subtotal</b>	<b>\$150,794.85</b>
Excavation of Landfill and Creation of Tidal Wetlands	
Excavation and Removal	
Clearing (tree removal, stump removal, grubbing, temporary roads)	\$ 11,815.00
Debris/Soil excavation, metal/concrete recycling	\$ 522,078.00
Sand Fill, general fill, regarding, wetland planting, seeding	\$40,525.40
<b>Subtotal</b>	<b>\$574,418.40</b>
	\$
Total Construction Cost - Alternative 3	725,213.25
Contingency	\$ 114,883.68
General Conditions	\$ 141,451.53
Mob/Demob	\$ 70,725.77
Contractor OH/P	\$ 244,003.89
<b>Total present value of Alternative</b>	<b>\$1,870,696.53</b>

### State and Local Authority's Role

Under Executive Order 12580, the President delegates authority to undertake CERCLA response actions to the Department of Defense (DoD). Congress further outlined this authority in the Defense Environmental Restoration Program (DERP) Amendments, under 10 United States Code (USC) Sections 2701 through 2705. CERCLA Section 120 requires the Navy to apply state removal and remedial action law requirements at its facilities.

The Navy will continue to be the lead agency and the Navy's environmental restoration program will continue to be the exclusive source of funding for remedial actions on NAB Little Creek property. As members of the NAB Little Creek Tier I Partnering Team, the USEPA and Virginia Department of Environmental Quality (VDEQ) will continue to be consulted until actions addressing the contaminated area are complete.

## IV. Threats to Public Health, 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 NTCRA. Paragraphs (b)(2)(i), (iv), and (v) of Section 300.415 apply to the conditions as follows:

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

At Site 7, pesticides and metals are present in sediment at concentrations that pose potential risk to ecological receptors. Landfilling activities in past years contributed to this contamination. At Site 8, iron is present in soil and PAHs and metals are present in the sediment at concentrations that pose a potential risk to human health or the environment.

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

The sediment at Site 7 and both the soil and the sediment at Site 8 are located near the surface, and are therefore susceptible to transport via storm water flows and may migrate from the site.

300.451 (b)(2)(v) *"Wenfher conditions that may cause hazardous substances or pollutants or contaminants to migrate or be released."*

Because of the proximity to the mid-Atlantic coastline, Site 7 and Site 8 are subject to storms throughout the late summer and early fall. In addition, winter storms that move along the eastern seaboard are often associated with high winds and precipitation. Each of these storms may be capable of causing the migration of contaminants.

## **V. Endangerment Determination**

Actual or threatened releases of pollutants and contaminants from Sites 7 and 8, if not addressed by implementing the response action discussed in this Action Memorandum, may present an endangerment to public health, welfare, or the environment.

## **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 Sites 7 and 8 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 actions for Site 7 and 8 at NAB Little Creek, Virginia Beach, Virginia, developed in accordance with CERCLA as amended,

and is consistent with the NCP. This decision is based on the Administrative Record file for NAB Little Creek Sites 7 and 8.

Conditions at the site meet the NCP section 300.415(b)(2) criteria for removal action. The Naval Facilities Engineering Command, in cooperation with the USEPA and VDEQ, recommends approval of the proposed remedial action. If approved, the total project ceiling for Site 7 will be \$592,214. The total project ceiling for Site 8 if approved will be \$1,870,696.53. Response actions should commence as soon as practical, due to the potential threat to human health and/or the environment from Sites 7 and 8.

## X. References

A.T. Kearny, Inc., 1989. *Revised Phase II RCRA Facility Assessment Report*, Naval Amphibious Base, Little Creek, Norfolk, Virginia. March 1989.

Baker Environmental, Inc., 1996. *Final Relative Risk Ranking System Data Collection Sampling and Analysis Report*, Naval Amphibious Base, Little Creek, Norfolk, Virginia. January 1996.

CH2M HILL, 1997. *Project Plans for the Long-Term Monitoring Program at Site 7*, Naval Amphibious Base Little Creek, Virginia Beach, Virginia, October 1997.

CH2M HILL, 1998. *Decision Document, Site 7*, Naval Amphibious Base Little Creek, Virginia Beach, Virginia, January 1998.

CH2M HILL, 1999. *Final Site Investigation Report, SWMU 3 and Site 8*. NAB Little Creek, Virginia Beach, Virginia. December 1999.

CH2M HILL, 2000. *Final Screening Ecological Risk Assessment, IR Sites 5, 7, 8, 9, 10, 11, 12, 13, and 16 and SWMU 3*, Naval Amphibious Base Little Creek, Virginia Beach, Virginia. June 2000.

CH2M HILL, 2001. *Draft Revised Project Plans for the Long-Term Monitoring Program at Site 7 (Rounds 5 through 10)*, Naval Amphibious Base Little Creek, Virginia Beach, Virginia, February 2001.

CH2M HILL, 2001. *Final Engineering Evaluation/Cost Analysis (EE/CA) for Site 8, Demolition Debris Landfill*, Naval Amphibious Base Little Creek, Virginia Beach, Virginia, August 2001.

CH2M HILL, 2002. *Close Out Report, Surface Debris Clearing Activities at Site 8, Demolition Debris Landfill*, NAB Little Creek, Virginia Beach, Virginia. June 2002.

CH2M HILL, 2002. *Technical Memorandum: Results of Site 8 Soil Cover Survey*. June 2002.

CH2M HILL, 2004. *Final Ecological Risk Assessment for Site 8 Demolition Debris Landfill*, Naval Amphibious Base Little Creek, Virginia Beach, Virginia, April 2004.

CH2M HILL, 2004. *Final Remedial Investigation/Human Health Risk Assessment for Site 8 Demolition Debris Landfill*, Naval Amphibious Base Little Creek, Virginia Beach, Virginia, April 2004.

CH2M HILL, 2004. *Final Remedial Investigation/Human Health Risk Assessment for Site 7*, NAB Little Creek, Virginia Beach, Virginia, November 2004.

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CH2M HILL, 2004. *Final Ecological Risk Assessment for Site 7, NAB Little Creek, Virginia Beach, Virginia*, November 2004.

Foster Wheeler Environmental Corporation (FWES), 1994. *Final Remedial Investigation/Feasibility Study*, Naval Amphibious Base Little Creek, Virginia Beach, Virginia, November 1994.

NFESC, 2001. *Navy/Marine Corps IR Manual*.

R.S. Means, 2001. *Heavy Construction Cost Data*. 2001.

R.S. Means, 2001. *Site Work and Landscape Cost Dntn*. 2001.

R.S. Means, 2002. *Environmental Cost Data – Assemblies*. 2002.

Rogers, Golden, and Halpern, 1984. *Initial Assessment Study of Naval Amphibious Base Little Creek, Norfolk, Virginia*. December 1984.

USEPA, 1990. *Superfund Removal Procedures Action Memorandum Guidance*. December 1990.

USEPA, 1993. *Guidance on Conducting Non-Time Critical Removal Actions Under CERCLA*, PB93-963402. August 1993.

USEPA, Updated May 2002. NPL Site Narrative Listing.  
<http://epa.gov/reg3hwmd/npl/VA5170022482.htm>

## **Attachments**

**Attachment A**

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**Final  
Engineering Evaluation/Cost Analysis (EE/CA)  
for  
Amphibious Base Landfill  
Site 7**

**Naval Amphibious Base Little Creek  
Virginia Beach, Virginia**

Prepared for:

**Navy CLEAN III Program**

**Contract No. N62470-02-D-3052  
Contract Task Order – 0058**

Prepared by:



**February 2005**

# Executive Summary

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This report presents an Engineering Evaluation/Cost Analysis (EE/CA) for a non-time-critical removal action (NTCRA) for Site 7, Amphibious Base Landfill, at the Naval Amphibious Base (NAB) Little Creek, Virginia Beach, Virginia. Site 7, formerly the Amphibious Base Landfill, is located in the south-central part of NAB Little Creek. The area of the landfill has been determined to be approximately 38 acres. It is bordered on the east by Helicopter Road, on the south by Amphibious Drive, and on the north by Little Creek Cove. In the western portion of Site 7, a drainage canal runs south to north. Sediments in this drainage canal are the principal source of potential ecological risk at Site 7; therefore, these sediments are the focus of this EE/CA and the NTCRA for the site.

Previous investigations have been completed at Site 7 to identify the nature and extent of contamination. The landfill area covers approximately 38 acres and contains approximately 500,000 cubic yards (cy) of waste. The Amphibious Base Landfill operated from 1962 through 1979. Landfill contents likely include non-hazardous solid waste from base housing and other residential activities at the installation; however, specific records concerning the types and quantities of waste placed at the landfill are not available. Because the landfill was the recipient of all the wastes produced at NAB Little Creek, it may have also received potentially hazardous materials.

Waste oils and metals segregated from the wastes were placed in the landfill starting in 1970. A hazardous waste management plan was not implemented until 1979, the year in which the landfill was closed. Until 1979, the landfill operated under a Commonwealth of Virginia solid waste permit. The permit was terminated in 1982 and the landfill was considered closed. After closure, the landfill area continued to be used as a metal collection and transfer site, temporary storage for wastes, and burn area for scrap wood and trees. Open burning was halted in 1984, and waste storage activities were moved in 1994. Also in 1994, the landfill was reportedly covered with approximately 24 inches of compacted soil and 2-3 inches of topsoil cover, and a vegetative cover was established to mitigate dermal contact with surface soils. The thickness of the soil cover was largely confirmed by soil borings collected in preparation for the soil cover constructed in 1998. The landfill waste is located an average of 30 inches below the ground surface.

The Navy signed a final Decision Document (DD) for Site 7 in January 1998. In June 1998, remedial actions were completed at Site 7. The remedy included the removal of 610 cy of debris along the landfill shoreline. Approximately 8,640 cy of clean fill and 11,260 cy of topsoil were placed on the landfill during the remedial action. A 12- to 18-inch thick fill layer was placed over some areas of the landfill where cover was inadequate, and a 6- to 8-inch topsoil cover was placed over the entire landfill area.

The base was placed on the NPL in 1999. As a result, the Remedial Investigation/Human Health Risk Assessment (RI/HHRA) was revised in accordance with EPA guidelines for conducting HHRA's and incorporated data from the original RI/Feasibility Study (RI/FS) (FWES, November 1994) and the recent long-term monitoring (LTM) data at Site 7. The HHRA indicated that no unacceptable risks or hazards exist, based on current site use.

However, several future scenarios resulted in the potential for unacceptable risks from exposure to soil and use of groundwater as a potable supply. The revised Ecological Risk Assessment (ERA) was submitted as a separate document from the RI/HHRA (CH2M HILL, 2004b). The available data suggest that potential exposures and risks to lower trophic level receptors are possible in the central portion of the drainage canal. In sediments collected from the central portion from the drainage canal, copper, lead, aroclor-1260, and five pesticides were identified as potential risk drivers.

The purpose of this NTCRA is to eliminate potential unacceptable ecological risk at Site 7 through excavation of sediment in the drainage canal on the west side of Site 7. In addition, a site survey conducted in September 2004 identified surface debris such as concrete, timbers, and metal pipes along the eastern shoreline of the canal and other areas within the site. It is estimated that approximately 10,000 cy of surface debris are present; this debris does not pose unacceptable ecological risk. The Navy, in partnership with the United States Environmental Protection Agency (USEPA), and the Virginia Department of Environmental Quality (VDEQ) agrees to move forward with an Interim Removal Action (IRA) at Site 7 in the western drainage canal between sample location SD-218 and just north of the abutment to Amphibious Drive to remove sediment presenting potential risk identified in the ERA. Sediment will be excavated to a depth of 1 ft and backfilled with 1 ft of clean fill, and no confirmation sampling will be required. Following successful completion of the IRA, the Navy, USEPA, and VDEQ agree that Site 7 would present no unacceptable ecological risk.

This EE/CA presents the scope of the engineering measures used to develop the remedial action alternatives evaluated to perform this NTCRA. The following alternatives were evaluated:

- Alternative #1 - No Action
- Alternative #2 - Removal of Contaminated Sediments and Replacement with Clean Backfill
- Alternative #3 - Removal of Contaminated Sediments and Replacement with Clean Backfill, and Surface Debris Removal

Alternative #1 (No Action) does not meet the objectives of the NTCRA to eliminate potential ecological risk. As such, implementation of this alternative is not recommended. Alternative #2 (Removal of Contaminated Sediments and Replacement with Clean Backfill) does not include the removal of surface debris, which is considered a good housekeeping and habitat improvement measure as the site continues through the CERCLA process. However, Alternative 2 will address all ecological risk at the site while excluding debris removal actions.

Alternative #3 meets the objectives of the NTCRA through removal of contaminated sediments and replacement with clean backfill to eliminate potential unacceptable risk to ecological receptors in the sediment of the drainage canal. The removal of the surface debris, while considered to be an ecological benefit, does not further reduce risk while increasing the cost. Therefore, Alternative #2 is the recommended alternative.

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# Acronyms and Abbreviations

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ARAR	Applicable or Relevant and Appropriate Requirement
BRA	Phase 1 Baseline Risk Assessment
CERCLA	Comprehensive Environmental Response Compensation and Liability Act
CFR	Code of Federal Regulations
CLEAN	Comprehensive Long-Term Environmental Action Navy
COC	Chemical of Concern
COPC	Constituents of Potential Concern
cy	Cubic Yards
DD	Decision Document
EE/CA	Engineering Evaluation and Cost Analysis
ERA	Ecological Risk Assessment
FS	Feasibility Study
FWES	Foster Wheeler Environmental Services
HI	Hazard Index
HHRA	Human Health Risk Assessment
HRSD	Hampton Roads Sanitation District
IAS	Initial Assessment Study
IEUBK	Integrated Exposure Uptake Biokinetic
IR	Installation Restoration
IRA	Interim Removal Action
IRI	Interim Remedial Investigation
LANTDIV	Naval Facilities Engineering Command, Atlantic Division
LTM	Long term monitoring
MCL	Maximum Contaminant Level
NAB	Naval Amphibious Base
NAVFAC	Naval Facilities Engineering Command, Atlantic Division (formerly LANTDIV)
NCP	National Oil and Hazardous Substance Pollution Contingency Plan
NPL	National Priority List
NTCRA	Non-Time Critical Removal Action
OSHA	Occupational Safety and Health Administration
PAH	Polycyclic Aromatic Hydrocarbon
PCB	Polychlorinated Biphenyl
PRAP	Proposed Remedial Action Plan

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RA	Removal Action
RAB	Remediation Advisory Board
RAC	Remedial Action Contractor
RAO	Removal Action Objective
RBC	Risk Based Concentration
RCRA	Resource Conservation and Recovery Act
RFA	RCRA Facility Assessment
RGH	Rogers, Golden, and Halpern
RI	Remedial Investigation
RI/FS	Remedial Investigation /Feasibility Study
RME	Reasonable Maximum Exposure
RRRS	Relative Risk Ranking System
RVS	Round 1 Verification Step
SARA	Superfund Amendments and Reauthorization Act
SERA	Screening Ecological Risk Assessment
SI	Site Investigation
SVOC	Semi-Volatile Organic Compound
TAL	Target Analyte List
TCL	Target Compound List
TCLP	Toxicity Characteristic Leachate Procedure
USEPA	United States Environmental Protection Agency
VDEQ	Virginia Department of Environmental Quality
VOC	Volatile Organic Compound
VSWMR	Virginia Solid Waste Management Regulations
VSWCB	Virginia State Water Control Board
WQS	Water Quality Standards

## SECTION 1

# Introduction

---

This report presents an Engineering Evaluation/Cost Analysis (EE/CA) for a non-time-critical removal action (NTCRA) for Site 7, Amphibious Base Landfill, at the Naval Amphibious Base (NAB) Little Creek, Virginia Beach, Virginia. The EE/CA is prepared under the Naval Facilities Engineering Command, Atlantic Division (NAVFAC ATLANTIC) Navy Contract N62470-02-D-3052, Navy Comprehensive Long-Term Environmental Action Navy (CLEAN) III, Contract Task Order-0058.

A general map of NAB Little Creek is illustrated in Figure 1-1. A detailed map showing the location of Site 7 is provided in Figure 1-2. Previous site inspections identified Site 7 as requiring environmental consideration due to analytical data indicating potential site contamination. Several constituents of potential concern (COPCs) were identified during a June 2000 Screening Ecological Risk Assessment (SERA) (CH2M HILL, 2000). The COPCs were further evaluated during the Remedial Investigation/Human Health Risk Assessment (RI/HHRA) (CH2M HILL, 2004a) and Ecological Risk Assessment (ERA) (CH2M HILL, 2004b) to identify chemicals of concern (COCs) posing potential risk. The COCs, located in the sediments of the drainage canal in the western portion of the landfill, include copper, lead, Arochlor-1260 (a PCB), and five pesticides, 4,4'-DDE, 4,4'-DDT, dieldrin, endrin, and endrin ketone. A site layout map is presented in Figure 1-3.

The following information is presented within this EE/CA for Site 7:

- Site description
- Identification of the removal action objectives
- Description of removal action elements
- Identification of the removal action alternatives and technologies
- Recommendation of a preferred removal alternative
- Schedule for the selected removal alternative

## 1.1 Regulatory Background

This document is issued by the U.S. Department of the Navy, lead agency responsible for remediation of Site 7 in partnership with the United States Environmental Protection Agency (USEPA) Region III and the Virginia Department of Environmental Quality (VDEQ), under Section 104 of the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) and the Superfund Amendments and Reauthorization Act (SARA) of 1986.

Section 104 of CERCLA and SARA allows an authorized agency to provide for remedial action and to remove, or arrange for removal of, hazardous substances, pollutants, or contaminants at any time, or to take any other response measures consistent with the National Oil and Hazardous Substance Pollution Contingency Plan (NCP) as deemed necessary to protect public health or welfare and the environment.

The NCP, 40 Code of Federal Regulations (CFR) 300, provides regulations for implementing CERCLA and SARA and regulations specific to removal actions. The NCP defines a removal action as the “cleanup or removal of released hazardous substances from the environment, such actions as may be necessary to monitor, assess, and evaluate the threat of release of hazardous substances, the disposal of removed material, or the taking of such other actions as may be necessary to prevent, minimize, or mitigate damage to the public health or welfare or to the environment, which may otherwise result from a release or threat of release.” A removal action is being considered for the portion of Site 7 where sediments in the drainage canal are impacted by copper, lead, PCBs, and pesticides from historic landfill runoff. This removal action is not time-critical. NTCRAs are defined in 40 CFR 300.415(b)(4) as “actions pertaining to an imminent threat to human health and the environment and that have planning periods of 6 months or more.” For time-critical removal actions, activities shall begin as soon as possible to “abate, prevent, minimize, stabilize, mitigate, or eliminate the threat to public health or welfare of the United States or the environment” (40 CFR 300.415(b)(3)).

The 40 CFR 300.415 requires the lead agency to conduct an EE/CA when an NTCRA is planned for a site. The goals of an EE/CA are to identify the objectives of the removal action and to analyze the effectiveness, implementability, and cost of various alternatives that may satisfy these objectives. An EE/CA documents the removal action alternatives and selection process. Where the extent of the contamination is well defined and limited in extent, NTCRAs also allow for the expedited cleanup of sites in comparison to the remedial action process under CERCLA.

Community involvement requirements for NTCRAs include preparing an EE/CA and making it available for public review and comment for a period of 30 days. An announcement of the 30-day public comment period on the EE/CA is required in a local newspaper. Written responses to significant comments will be summarized in an Action Memorandum and included in the Administrative Record.

## 1.2 Purpose and Objectives

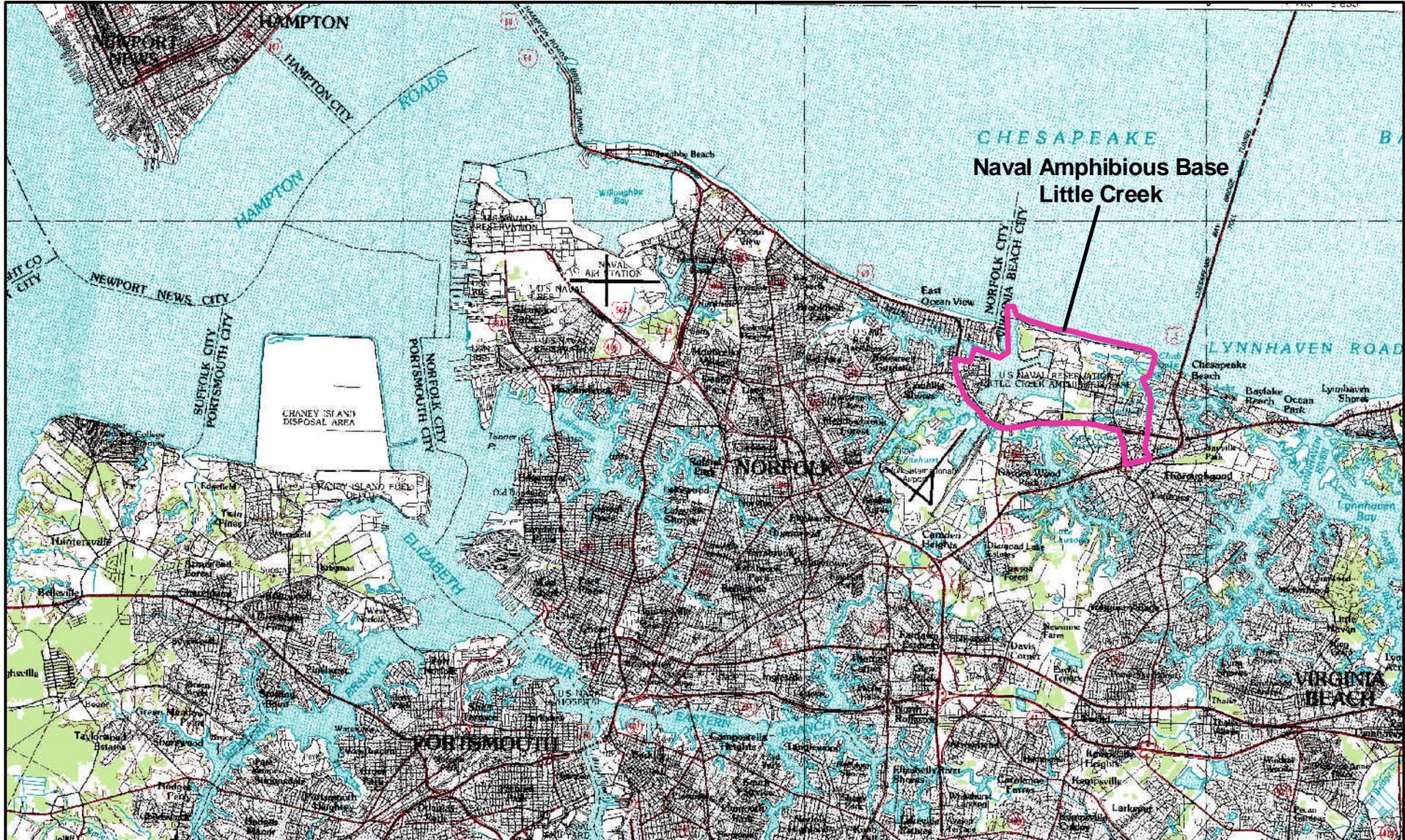
Submittal of this document fulfills the requirements for NTCRAs as defined by CERCLA, SARA, and the NCP. This EE/CA has been prepared in accordance with USEPA’s guidance document *Superfund, Guidance on Conducting Non-Time-Critical Removal Actions under CERCLA*, PB93-963402, January 1993.

This EE/CA compares three removal alternatives based on their technical feasibility, ability to protect human health and the environment, ability to prevent the potential release of hazardous constituents, and cost. Individual goals of this EE/CA are to:

1. Satisfy environmental review and public information requirements for removal actions.
2. Satisfy administrative record requirements for documenting the removal action selection.
3. Provide a framework for evaluating and selecting alternative technologies.

The objective of this NCTRA for Site 7 is to remove sediment in the drainage canal containing elevated levels of metals, PCBs, and pesticides, and reduce the potential risk to the environment throughout Site 7. The alternatives evaluated are:

- Alternative #1: No Action
- Alternative #2: Removal of Contaminated Sediment and Replacement with Clean Backfill
- Alternative #3: Removal of Contaminated Sediment and Replacement with Clean Backfill, and Surface Debris Removal

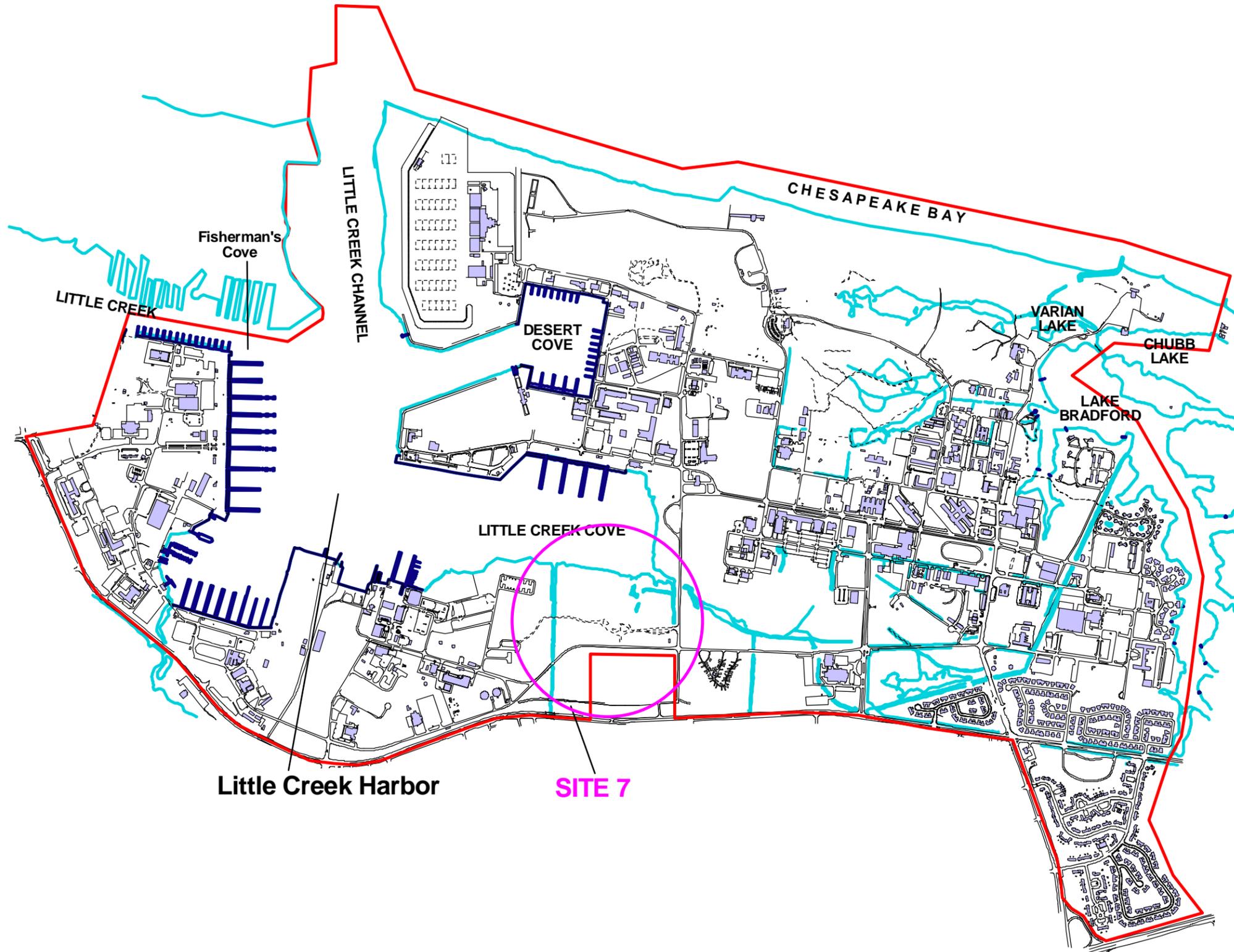


**LEGEND**

 Activity Boundary



Figure 1-1  
Site 7 - EE/CA  
Base Location Map  
NAB Little Creek  
Virginia Beach, Virginia



**LEGEND**

-  Sites
-  Building
-  Activity Boundary
-  Roads
-  Piers and Docks
-  Shore Lines



0 1000 2000 3000 4000 Feet



Figure 1-2  
Site 7 - EE/CA  
Site Location Map  
NAB Little Creek  
Virginia Beach, Virginia

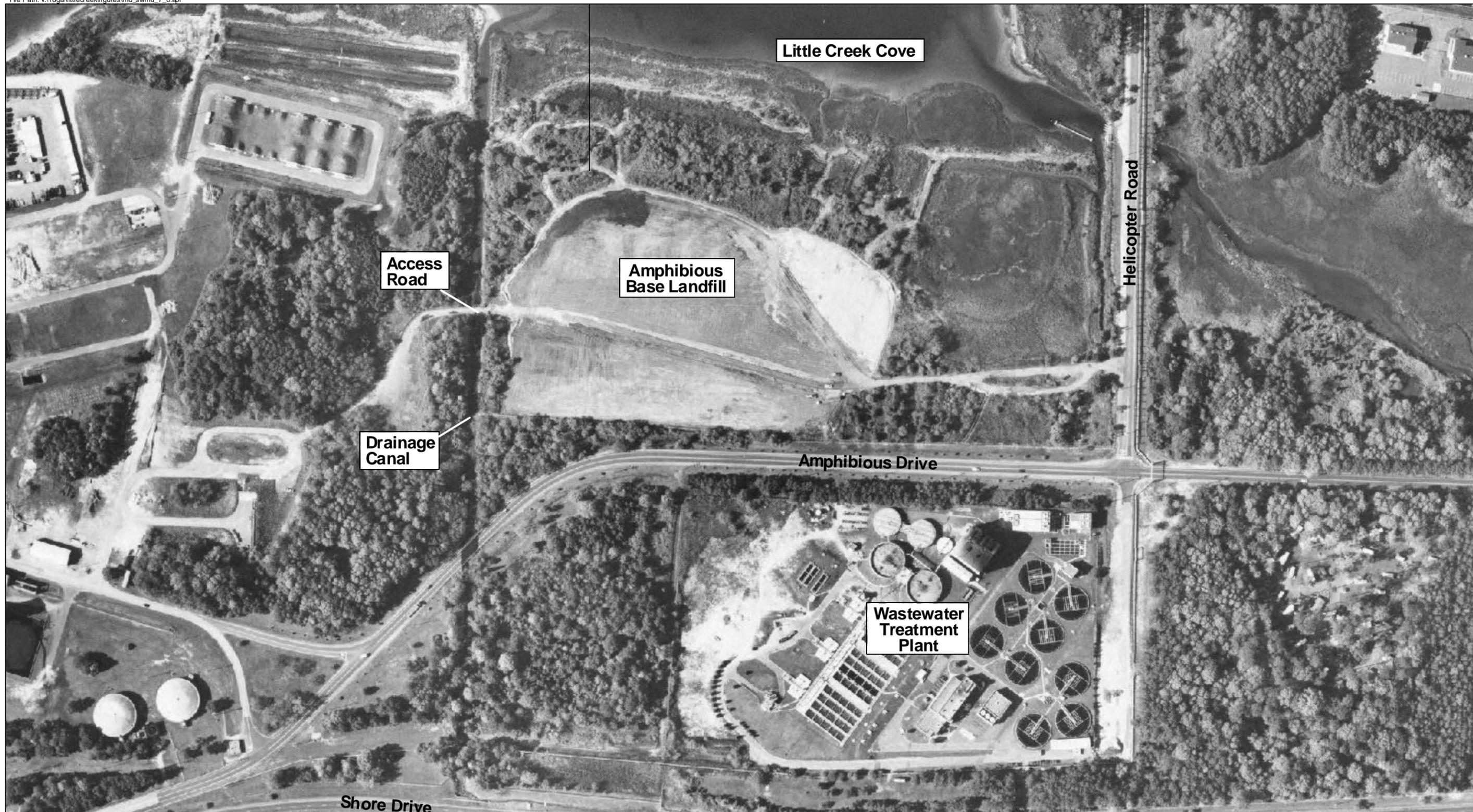


Figure 1-3  
Site 7 - EE/CA  
Site Layout Map  
NAB Little Creek  
Virginia Beach, Virginia

## SECTION 2

# Site Characterization

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This section provides a brief summary of background information for NAB Little Creek and Site 7. It also discusses previous environmental investigations and actions that took place at Site 7.

## 2.1 Site Description and Background

### 2.1.1 NAB Little Creek

NAB Little Creek provides logistic facilities and support services for local commands, organizations, homeported ships, and other United States and allied units to meet the amphibious warfare training requirements of the Armed Forces of the United States. The 61 piers surrounding Little Creek Channel provide docking for approximately 43 Navy vessels homeported at Little Creek (NPL Site Narrative Listing website, 1998; Department of Navy Environmental Program website, 1997).

The eastern portion of the base is located in the northwest corner of Virginia Beach, Virginia and the western portion of the base is located adjacent to the City of Norfolk, Virginia (Figure 1-1). The area surrounding this 2,147-acre base is low lying and relatively flat with several fresh water lakes (Chubb Lake, Varian Lake, Lake Bradford, Little Creek Reservoir/Lake Smith, and Lake Whitehurst) located on or adjacent to the base. Little Creek Reservoir/Lake Smith, located upgradient of the base, serves as a secondary drinking water supply for parts of the City of Norfolk.

NAB Little Creek is primarily an industrial facility centered around three saltwater bodies: Little Creek Cove, Desert Cove, and Little Creek Channel that connects the coves with the Chesapeake Bay. In addition to industrial land use, NAB Little Creek is also used for recreational, commercial, and residential purposes. Specifically, the southeast corner of the base has been developed for residential use. Land development surrounding the base is residential, commercial, and industrial.

NAB Little Creek was commissioned on July 30, 1945, by combining four contiguous activities. The Navy began purchasing land in the area from private estates and the Pennsylvania Railroad just prior to World War II. The first activity to be commissioned was the Amphibious Training Base in the southwestern corner of the present base near Little Creek Harbor. The mission of the base was the training of landing craft personnel for operational assignments. The second activity was the Construction Battalion Training Center, which occupies most of the current acreage of the facility. The third and fourth activities were the U.S. Naval Section Base and the Armed Guard Training Center, respectively. Over the last 53 years, NAB Little Creek has expanded in both area and the complexity of its mission and has added new activities.

## 2.1.2 Site 7

Site 7, formerly the Amphibious Base Landfill, operated between 1962 and 1979. The site is located in the south central part of NAB Little Creek. The area of the landfill has been determined to be approximately 38 acres (Figure 1-3). It is bordered on the east by Helicopter Road, on the south by Amphibious Drive, and on the north by Little Creek Cove. Two locked gates control vehicle access to the landfill across access roads on the site's eastern and western sides. A chain link fence runs along the site's southern boundary. Little Creek Cove borders the site's northern boundary. Pedestrian access along the eastern and western borders is deterred by dense vegetation. In the western portion of Site 7, a drainage canal runs south to north into Little Creek Cove.

The area immediately surrounding Site 7 is primarily industrial and includes the base's former construction debris landfill to the east, a wastewater treatment plant operated by Hampton Roads Sanitation District (HRSD) to the south, and the base's Duration Force Vehicle Compound and an ammunition magazine to the west. The nearest full-time residents to the site are approximately 2,000 feet to the southeast. The location of the nearest water supply well is approximately 1 mile to the southeast of the base; in addition, there are no water supply wells downgradient (north) of Site 7, between the site and Little Creek Cove.

The Amphibious Base Landfill was initially operated as a trench-type landfill with open burning of refuse in the trenches. Trenches were excavated to a depth where groundwater filled the trench as quickly as it could be excavated. This commonly resulted in standing water in the trenches during waste disposal operations. The manner in which the landfill was operated makes it difficult to establish the degree of combustion or fate of any particular item disposed in the landfill. The landfill was later operated as an area landfill, with refuse spread over the ground and covered regularly. This aspect of the operation has resulted in the current surface topography and elevation.

It is estimated that the landfill contains approximately 500,000 cy of waste (RGH, 1984). A significant majority of this total is presumed to be composed of non-hazardous solid waste from base housing and other residential activities at the installation. Specific records documenting the types and quantities of waste placed in the landfill are not available. Because the landfill received all waste generated by NAB Little Creek during its operation, it likely received potentially hazardous materials.

Waste oils and metals segregated from the wastes were placed in the landfill starting in 1970. A hazardous waste management plan for the base was not implemented until 1979, the year the landfill closed. After closure, the landfill continued to be used as a metal collection and transfer site, temporary storage site for wastes, and a burn area for scrap wood and trees. Open burning was halted in 1984. Waste storage activities at the site ceased permanently in 1994; reportedly, the landfill was covered with approximately 24 inches of compacted soil and 2-3 inches of topsoil cover, and a vegetative cover was established to mitigate dermal contact with surface soils.

The Navy signed a Final Decision Document (DD) for Site 7 in January 1998 (prior to NAB Little Creek becoming an NPL site). In June 1998, remedial actions were completed at Site 7. The remedy included the removal of 610 cy of debris along the landfill shoreline. Approximately 8,640 cy of clean fill and 11,260 cy of topsoil were placed on the landfill during the remedial action. A 12- to 18-inch thick fill layer was placed over some areas of

the landfill where cover was inadequate, and a 6- to 8-in. topsoil cover was placed over the entire landfill area. A long-term monitoring (LTM) plan was proposed; eleven rounds of LTM at Site 7 have since been completed.

## 2.2 Previous Site Investigations

Previous investigations that have been conducted at Site 7 include the Initial Assessment Study (IAS), the Round 1 Verification Step (RVS), the Interim Remedial Investigation (IRI), the Remedial Investigation/Feasibility Study (RI/FS), Feasibility Study Revision, the Proposed Remedial Action Plan (PRAP), Final Decision Document (DD), Remedial Action (RA) - Soil Cover, Canal Sediment Delineation, Ecological Risk Assessment (ERA) and Remedial Investigation/Human Health Risk Assessment (RI/HHRA).

### 2.2.1 Initial Assessment Study (IAS)

An IAS at NAB Little Creek was completed in December 1984 by Rogers, Golden, and Halpern (RGH, 1984) of Philadelphia, Pennsylvania. The purpose of the IAS was to identify and assess sites posing a potential threat to human health or the environment due to contamination resulting from prior hazardous waste management activities. The study consisted of the collection and evaluation of archival and activity records relating to waste generation, handling and disposal, the characterization of physical conditions at the site such as soil and hydrogeology, and the identification of migration pathways and potential receptors.

The IAS concluded that Site 7 posed a potential threat to human health and the environment, and therefore warranted further evaluation in a confirmation study. The confirmation study was to include quarterly sampling for 1 year. Nine groundwater monitoring wells, fully penetrating the uppermost water-bearing zone, the Columbia Aquifer, were recommended to be installed around the perimeter of the landfill. Two groundwater level monitoring points were recommended for installation in the landfill itself, penetrating at least 5 feet below the water table. Three surface water level measuring points were specified to permit correlation of surface and groundwater flow regimes. Two surface water samples were also recommended, along the detailed reconnaissance of the landfill to identify any visible signs of contamination and establish boundaries of the disposal area. Concerns of the IAS included the delineation of the landfill, especially the southern boundary, and its closest approach to Lake Smith Reservoir. These recommendations were incorporated into the "*Round 1 Verification Step*" (RVS) described below.

### 2.2.2 Round 1 Verification Step (RVS)

A RVS was conducted as the first step in the confirmation study process, in October 1986 (CH2M HILL, 1986). The purpose of the study was to verify the presence and/or absence of contamination at Site 7. The scope of work for the RVS activities at Site 7 was established based in part on the recommendations presented in the IAS.

As part of the work conducted for the RVS, nine groundwater samples, five surface water samples, and five sediment samples were collected. Nine monitoring wells were installed at Site 7 to facilitate the collection of the groundwater samples. Five surface water and

sediment samples were collected to investigate impacts on nearby surface water bodies and determine whether contaminated run-off was migrating from Site 7.

The results of the RVS report indicated that little or no contamination was migrating from the landfill. However, because the source of the elevated inorganic constituents in the groundwater and surface water could not be adequately assessed, the RVS recommended that the second round of samples be collected from the nine monitoring wells and the five surface water locations. In addition, the report also recommended that three surface water samples be collected at locations farther from the landfill shoreline (approximately 300 feet), and that one surface water sample be collected from the drainage canal east of the landfill to assist in determining the source of surface water contamination.

### 2.2.3 Interim Remedial Investigation (IRI)

The IRI was conducted in 1991 by Ebasco Environmental Consultants to address the recommendations of the RVS and determine whether further characterization activities or remedial actions (RAs) were warranted at Site 7 (Ebasco, 1991). Additional sampling was performed per the recommendations of the RVS.

The IRI concluded the second round of sampling conducted at Site 7 confirmed the interpretations presented in the RVS report that the landfill was not releasing contaminants to the groundwater. The IRI recommended that the status of the landfill be determined with regard to Virginia Solid Waste Management Regulations (VSWMR). Also, to complete a risk assessment, a limited program of soil sampling was recommended in the bare areas used for staging at that time.

### 2.2.4 Remedial Investigation/Feasibility Study (RI/FS)

During 1993 and 1994, FWES conducted a RI/FS (FWES, 1994) of Site 7 and the other sites identified in the IAS. The investigation included surface and subsurface soil, surface water, sediment, and groundwater sampling. In addition to the analytical sampling, a tidal survey, surface soil characterization, and subsurface soil permeability testing were conducted.

The subsurface soil, surface soil, and sediment sample results were compared to the soil concentrations listed in the USEPA Region III Risk-Based Concentration (RBC) Table for residential soils. These RBCs were used as screening criteria. The groundwater sample results were compared to both the Federal Maximum Contaminant Levels (MCLs) and the Virginia State Water Control Board (VSWCB) Water Quality Standards (WQSs), September 1992. Furthermore, groundwater results were compared to background concentrations prior to COC determination (Allied Environmental, 1991). The Federal MCLs and VSWCB WQSs were applied to surface water sample results for comparison purposes only.

The RI/FS included a “Phase 1 Baseline Risk Assessment” (BRA) for ecology and human health. Based on the results of the RI, the ecological assessment concluded that copper, lead, and zinc exceeded criteria in the open water around Site 7. Exceeded standards suggest that these chemicals may enter the food chain and cause adverse acute and chronic effects on some resident wildlife. In the sediment, zinc was determined to be a possible contaminant that may enter the food chain as well.

The Human Health Risk Assessment that was performed based on the BRA and RI results concluded that lead concentrations detected in the surface soil, groundwater, and surface water at Site 7 pose a health risk for children from 0 to 7 years of age. The Integrated Exposure Uptake Biokinetic (IEUBK) model results showed that there is a high probability that child blood levels exceed USEPA's blood level of concern. However, the only risk for the current scenario at Site 7 appears to be via surface water ingestion for a trespasser child, with arsenic being the risk driver. A number of health risks exist for the future scenario, including ingestion of surface soil, subsurface soil, groundwater, and surface water for a resident child, with arsenic, iron, and manganese contributing substantially to the index exceedances.

The BRA concluded that carcinogenic and non-carcinogenic risks exist at Site 7 for a number of media, pathways, and receptors. Site 7 remedial activities were recommended to reduce several metals, specifically lead, and the PCB Aroclor-1260, when present in the surface water, groundwater, and surface soil. Additional investigations were recommended to confirm these findings, augment this study, and accurately delineate the location of the risk-controlling chemicals for design purposes.

FWES prepared the FS to make preliminary assessments of the remedial action to be implemented and to identify data gaps requiring further investigation. In the FS, the remediation alternatives dealt primarily with the covering of the landfill area. The FS recommendations were that the landfill be covered with a layer of topsoil and vegetative cover, the groundwater and surface water be monitored, and that institutional controls be placed on the property to prevent potential risks to human health.

### 2.2.5 Feasibility Study Revision

In 1997, FWES revised the FS created in 1994 to provide a more detailed analysis of remedial alternatives. Prior to 1997, subsurface soils had not been fully investigated. The FS was also revised to focus on the intent of site remediation under the IR program, which is to mitigate human health risks rather than restore the site to natural conditions. Further assessments of ecological risks were also addressed in the 1997 FS. Alternative actions for soils/wastes, groundwater, and surface water were discussed in the FS. For soils, the remedial actions evaluated included soil containment with a multi-media cap, soil/waste removal for offsite disposal, and soil treatment using chemical fixation in specific areas. For groundwater, the remedial action alternatives included the use of a multi-media cap, vertical barriers to groundwater flow, and ex-situ treatment of the groundwater with chemical precipitation. For surface water, the remedial action alternatives included vertical barriers, storm water collection, and run-on/run-off controls. Additionally, land use restrictions in conjunction with, or in lieu of, remedial action were evaluated. A "no action" alternative was presented for comparison purposes. Based upon the detailed analysis and comparison of alternatives, FWES recommended that institutional controls be adopted at Site 7 and the landfill surface be covered with soil and seeded to promote a vegetative cover at the site.

### 2.2.6 Proposed Remedial Action Plan (PRAP)

In October 1997, CH2M HILL prepared a PRAP to present the recommendations of the FS to the public (CH2M HILL, 1997b). The PRAP summarized the findings of the RI, the BRA, and the remedial alternatives presented in the FS. FWES's recommendation that Site 7 be placed

under institutional controls and have a soil cover placed over the landfill was highlighted as the preferred alternative. The PRAP was presented to the NAB Little Creek Restoration Advisory Board (RAB) on June 17, 1997. Meeting attendees included VDEQ and USEPA regulators, representatives from NAVFAC ATLANTIC (formerly LANTDIV), representatives from NAB Little Creek, and CH2M HILL.

### 2.2.7 Decision Document (DD)

In January 1998, CH2M HILL produced a final DD for Site 7 (CH2M HILL, 1998). The DD reiterated the preferred action for Site 7 institutional controls in conjunction with the placement of a soil/vegetative cover on the landfill area. This remedy was selected because it was protective of human health and the environment, it complied with federal and state requirements, which were legally applicable or relevant and appropriate to the remedial action, and it was cost-effective.

### 2.2.8 Remedial Action (RA) – Debris Removal and Cover

During 1998, the Navy implemented the preferred alternative at Site 7. The remedial action followed the *Draft Work Plan for Debris Removal Activities at Site No. 7* (OHM, 1997) and was based on a design by CH2M HILL. Debris piles including concrete and metal were removed from the site and disposed at an offsite landfill by OHM Remediation Services Corporation (OHM, 1999). Tire piles were recycled. The top surface of the landfill received a cover of topsoil, approximately 6 inches thick, and was subsequently seeded. The soil cover work was conducted by Hudgins Contracting Corporation. The areal extent of the soil cover is approximately 14 acres.

### 2.2.9 Canal Sediment Delineation

In January 2004, CH2M HILL sampled sediments within the drainage canal located along the western edge of the landfill (Appendix A). Samples were collected in the canal to determine the spatial extent of the elevated concentrations of the chemicals of concern (COCs) identified in the Final Ecological Risk Assessment (ERA) (CH2M HILL, November 2004). In the draft ERA, it was determined that sediment sample location SD202, located in the drainage canal, reflected the area of highest potential ecological risk (Figure 2-1).

Sediment sample results indicated exceedances of ecological screening values in the canal. However, in many cases, these exceedances were only slightly above conservative screening values used in the earliest stages of an ERA (i.e., Steps 2 and 3A) and the data showed much variability.

### 2.2.10 Ecological Risk Assessment (ERA)

The *Final Ecological Risk Assessment, Site 7 – Amphibious Base Landfill, Naval Amphibious Base Little Creek, Virginia Beach, Virginia*, was completed in November 2004 (CH2M HILL, November, 2004). The assessment concluded that potential risks in aquatic/wetland areas with good habitat quality were generally low. The highest potential risks in wetland/aquatic habitats on Site 7 were in the central portion of the drainage canal. In sediments in the central portion of the canal, copper, lead, Aroclor-1260, and five pesticides were identified as COCs. The highest concentrations of copper and Aroclor-1260, and most of the pesticides were confined to the northern portion of the drainage canal at sample location

SD202. The likely source is landfill wastes placed in this area prior to the soil cover and canal bank stabilization. In addition, the culvert under the access road is collapsed, which would also likely cause sediments and other solid debris to be collected in the general area of sample location SD202 during ebb tides, and not be transported toward Little Creek Cove. The available data suggest that potential exposures and risks to lower trophic level receptors are possible in the central portion of the drainage canal.

### 2.2.11 Remedial Investigation and Revised Human Health Risk Assessment (RI/HHRA)

In April 2004, the Draft Final *Remedial Investigation/ Revised Human Health Risk Assessment for Site 7 Naval Amphibious Base Little Creek, Virginia Beach, Virginia* (CH2M HILL, 2004a) was completed. The RI/HHRA was developed as a revision to the 1994 RI/HHRA performed by FWES to meet the current regulatory requirements, and to include results from the long-term monitoring program.

Information collected during the RI conducted by FWES in 1994 and the long-term monitoring program currently in place at Site 7 indicated that the different media contain several contaminants that exceed corresponding screening criteria. Contaminants included: in groundwater, various volatile organic compounds (VOCs), semivolatile organic compounds (SVOCs), pesticides/polychlorinated biphenyls (PCBs), and inorganics; in surface water, VOCs and inorganics; in sediment, SVOCs, pesticides/PCBs, and inorganics; and in surface and subsurface soils, SVOCs, pesticides/PCBs, and inorganics.

Lead concentrations in soil were compared to the USEPA residential child soil screening value of 400 mg/kg as determined by the IEUBK Model. Based on the results of the IEUBK model, lead concentrations in the combined surface and subsurface soil located in the weigh station area may pose a very small risk to future residents (children 0 to 7 years).

The revised HHRA initially identified arsenic and vanadium as COPCs in sediment in the drainage canal. Reasonable Maximum Exposure (RME) risk estimates for exposure to sediment from the drainage canal was evaluated for an adult and adolescent visitor/trespasser. The noncarcinogenic hazards associated with exposure to drainage canal sediment by adult and adolescent visitors/trespassers are below USEPA's target hazard index (HI) of 1.0. The carcinogenic risks associated with exposure to all of the sediment data by these receptors are below or within USEPA's target risk of  $1 \times 10^{-6}$  to  $1 \times 10^{-4}$ .

In conclusion, the revised HHRA indicates that no unacceptable risks or hazards to the current/future adult or adolescent trespasser/visitor exist with regard to sediment in the drainage canal. In addition, there are no unacceptable health risks to the current/future site worker with regard to sediment in the drainage canal.

Based on the investigations discussed, the Navy, in partnership with the USEPA, and VDEQ, agrees to move forward with an IRA at Site 7 in the western drainage canal between SD-218 and just north of the abutment to Amphibious Drive to remove sediment presenting potential risk identified in the ERA. Sediment will be excavated to a depth of 1 ft and backfilled with 1 ft of clean fill as part of the IRA. No confirmation sampling will be needed. The Navy, USEPA, and VDEQ also agree that remaining sediments at Site 7 present no acceptable risk.

### 2.2.12 Debris Assessment

Site visits were conducted in September, November, and December of 2004 to locate debris piles and assess the extent and volume. Debris was found mainly on the eastern shoreline of the drainage canal. It is estimated that approximately 10,000 cy of debris are present. Debris observed included concrete, timbers, tires, corrugated metal, and other assorted debris.



**LEGEND**

- Sediment Sample Locations
- ∩ Shoreline

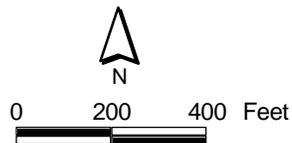


Figure 2-1  
Site 7 - EE/CA  
Sediment Sample Locations  
NAB Little Creek  
Virginia Beach, Virginia

# Identification of Objectives

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## 3.1 Statutory Limits on Removal Action

The NCP 40 CFR Part 300.415 dictates statutory limits of \$2 million and 12 months of USEPA fund-financed removal actions, with statutory exemptions for emergencies and actions consistent with the remedial action to be taken. However, this removal action will not be USEPA fund-financed. The Navy/Marine Corps Installation Restoration (IR) Manual does not limit the cost or duration of the removal action; nonetheless, cost effectiveness is a recommended criterion for the evaluation of removal action alternatives.

## 3.2 Removal Action Scope and Objective

### 3.2.1 Removal Action Objective (RAO)

The RAO for this interim action is to implement measures at Site 7 that would reduce or eliminate COCs that pose potential unacceptable potential ecological risk. Sediment in the central portion of the canal has been identified as the principal source of potential ecological risk; the Navy in partnership with the USEPA and VDEQ agree that ecological risk at Site 7 would be acceptable following removal of sediment in the central portion of the canal.

### 3.2.2 Removal Action Scope

In the preparation of this EE/CA, three removal action alternatives were scoped and developed to meet the RAO. The scope of the engineering measures for each removal alternative consists of:

- Alternative #1 - No Action: the no action alternative implies that no removal work will be done at this site.
- Alternative #2 - Removal of Contaminated Sediments and Replacement with Clean Backfill: direct excavation of the PCB-, metal-, and pesticide-impacted sediment, and restoration to pre-existing conditions. Approximately 1 ft of contaminated sediment would be excavated. The excavated area would be backfilled with approximately 1 ft of clean fill.
- Alternative #3 - Removal of Contaminated Sediments, and Replacement with Clean Backfill, and Surface Debris Removal: direct excavation of the PCB-, metal-, and pesticide-impacted sediment, and restoration to pre-existing conditions. Approximately 1 ft of contaminated sediment would be excavated. The excavated area would be backfilled with approximately 1 ft of clean fill. In addition, approximately 10,000 cy of surface debris would be removed from this site.

### 3.3 Determination of Removal Schedule

The EE/CA will be placed in the Administrative Record, and notice of its availability for public review along with a brief summary will be published in the local newspaper. The EE/CA will then be subjected to a 30-day public comment period. The public comment period will be held from January 24, 2004 – February 24, 2005. A public information session will also be held during or immediately following the public comment period, if requested. Following the public comment period, if comments are received, a Responsiveness Summary summarizing responses to significant comments will be prepared and included in the Administrative Record. Since this removal action has been designated non-time-critical, the start date will be determined by factors other than the urgency of the threat. A possible factor may include weather conditions. The total project period is predicted to last 7 months, from the end of the of the public comment period to completion of this removal action. Critical milestone periods are summarized below:

- EE/CA Public Comment Period – 1 month
- Preparation of Work Plan – 1 month
- Subcontracting and Mobilization – 2 months
- Removal Action – 2 months
- Report Writing – 2 months

The removal action time frame includes the time required for mobilization and setup of equipment, and performing the selected removal action. Section 4.0 provides details regarding the amount of time necessary to complete the removal action.

### 3.4 Applicable or Relevant and Appropriate Requirements

The removal action will, to the extent practicable, comply with applicable or relevant and appropriate requirements (ARARs) under federal and state environmental laws, as described in 40 CFR 300.415. Appendix B contains the ARAR tables and provides a summary of each potentially related environmental law. Other federal and state advisories, criteria, or guidance will, as appropriate, be considered in formulating the removal action. Applicable requirements are those requirements specific to the conditions at Site 7 and the surrounding vicinity that satisfy all jurisdiction prerequisites of the law or requirements. Relevant and appropriate requirements are those that do not have jurisdiction authority over the particular circumstances at Site 7 and surrounding vicinity, but are meant to address similar situations, and therefore are suitable for use at Site 7. Federal ARARs are determined by the lead agency, which in this case is the Department of the Navy. As outlined by 40 CFR 300.415(j), the lead agency may consider the urgency of the situation and the scope of the removal action to be conducted in determining whether compliance with ARARs is practicable. The NCP, 40 CFR 300.400(g)(2), specifies factors to consider in determining what requirements of other environmental laws are relevant and appropriate:

- The purpose of the requirement in relation to the purpose of CERCLA
- The media regulated by the requirement
- The substance(s) regulated by the requirement

# Description of Removal Action Alternatives

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Three removal alternatives were developed for Site 7. Based on investigations conducted at the site, sediments in the drainage canal to the west of the landfill pose a low potential risk to ecological receptors. No risk to human health was identified under the current land use scenario. Alternatives evaluated in this EE/CA include a no action alternative, a contaminated sediment removal and replacement with clean fill alternative, and an alternative to remove both the remaining surface debris and the contaminated sediments, which will be replaced with clean fill.

## 4.1 Alternatives description

Historical investigations indicate PCBs, metals, and pesticides are COCs within the drainage canal in the western portion of Site 7. The objective of the removal action is to eliminate ecological risks associated with these COCs by excavating contaminated sediments in the drainage canal. Other areas of the site posing low ecological risk are considered acceptable. A summary of the alternatives and their evaluation is provided in Table 4-1.

The removal action alternatives developed for the Amphibious Base landfill drainage canal include:

- Alternative #1 - No Action
- Alternative #2 - Removal of Contaminated Sediments and Replacement with Clean Backfill
- Alternative #3 - Removal of Contaminated Sediments and Replacement with Clean Backfill, and Surface Debris Removal

### 4.1.1 Alternative #1: No Action

The no action alternative implies that no removal work will be done at this site. The site will be left as it currently exists, leaving the sediment in place.

### 4.1.2 Alternative #2: Removal of Contaminated Sediments and Replacement with Clean Backfill

This alternative proposes that contaminated sediments in the drainage canal be excavated. Figure 4-1 shows the location of the contaminated sediments to be excavated. An area approximately 885 ft long by 35 ft wide would be excavated to a depth of 1 ft bgs. Additional material will be removed from the canal where the landfill access road has collapsed into the canal. It is estimated that approximately 450 cubic yards of concrete and debris will be removed at that location. The southern boundary of the area to be excavated is the north abutment of the bridge for Amphibious Drive; the northern boundary of the area to be excavated is sample location SD218. The alternative would involve rerouting tidal and storm water around the removal action area of the drainage canal; this could be

accomplished with the installation of a portable dam system at both ends of the removal area. Installation of a portable dam system will isolate the area identified for sediment removal to facilitate dewatering operations. The portable dam will prevent the infiltration of water into the area identified for removal. As sediment excavation will be conducted sequentially in sections, a third, smaller portable dam will be installed at the end of one section at a time. Once installed, two pumps will dewater the excavation area and transfer the water to the opposite canal side of the portable dam. The excavation would be backfilled with 1 foot of clean fill. The smaller portable dam will then be removed and placed in the appropriate location for the next section. The process will repeat itself until the portion of the canal designated for removal has been excavated and backfilled. Excavated sediment will be placed in one of four containment cells to be dewatered. Drying agent may be applied to the sediment. Collected water from the dewatering process will be collected and stored in an onsite holding tank. Both the excavated sediment and water in the holding tank would be sampled for TCLP waste characterization, transported and appropriately disposed. For this EE/CA, excavated sediment is assumed to be non-hazardous and would be placed in a subtitle D landfill.

### 4.1.3 Alternative #3: Removal of Contaminated Sediments, Replacement with Clean Backfill, and Surface Debris Removal

This alternative proposes that, in addition to sediment removal in the canal, approximately 10,000 cy of debris be removed from the site during the NTCRA. Contaminated sediments in the drainage canal and the collapsed landfill access road material would be excavated as described for Alternative #2. Figure 4-2 shows the location of the debris to be considered for removal and the extent of the excavation of contaminated sediments. An area approximately 885 ft long by 35 ft wide would be excavated to a depth of 1 ft bgs. This alternative would involve the same process for sediment excavation as described in Section 4.1.2.

## 4.2 Evaluation of Alternatives

The *effectiveness* of a technology refers to its capability of removing the specific items in the volumes required, the degree to which the technology achieves the RAO, and the reliability and performance of the technology over time, including protection of human health and the environment, compliance with ARARs to the extent practical, long-term effectiveness and permanence, reduction in the toxicity, mobility or volume, and short-term effectiveness.

The *ease of implementation* of a technology refers to the availability of commercial services to support it, the constructability of the technology under specific site conditions, and the acceptability of the technology to all parties involved (regulators, public, owner, etc.), including technical feasibility, administrative feasibility, availability of services, support agency acceptance, and community acceptance.

For the *detailed cost analysis* of the alternatives, the expenditures required to complete each measure were estimated in terms of capital costs to complete initial construction activities. Capital costs consist of direct and indirect costs. Direct costs include the cost of construction, equipment, land and site development, treatment, transportation, and disposal. Indirect costs include engineering expenses, license or permit costs, and contingency allowances.

The costs estimated are provided to an accuracy of +50% and -30%. The alternative cost estimates are in 2004 dollars and based on information published by R.S. Means *Site Work and Landscape Cost Data* and *Environmental Cost Data – Assemblies*. In addition, costs from similar projects were used to develop the alternative cost estimates. Where R.S. Means data were not available or not applicable, phone quotes, similar projects, or engineering estimates were used for unit pricing. Refer to Appendix C for all cost estimate details pertaining to each alternative discussed in the following sections.

The alternatives under consideration for the Amphibious Base Landfill drainage canal include:

- No Action
- Removal of Contaminated Sediments and Replacement with Clean Backfill
- Removal of Contaminated Sediments, Replacement with Clean Backfill, and Surface Debris Removal

#### 4.2.1 Alternative #1

The no action alternative implies that no removal work will be done at Site 7. The site will be left as it currently exists, leaving the surface debris and sediments in place in the drainage canal. Selection of this alternative does not satisfy the objectives of this EE/CA, protecting the environment, and is not desirable because contamination could migrate further into the surrounding media over time. There is no cost associated with this no action alternative.

#### 4.2.2 Alternative #2

This alternative proposes the removal of contaminated sediments and the excavated area to be backfilled with clean fill, however, surface debris would remain in place. Selection of this alternative is desirable because it satisfies the objective of this EE/CA, which is to mitigate potential ecological risk. The surface debris that would remain on site does not pose unacceptable ecological or human health risk.

The capital cost to complete the contaminated sediment removal is approximately \$592,000. Table C-1 in Appendix C contains a preliminary cost estimate for this alternative.

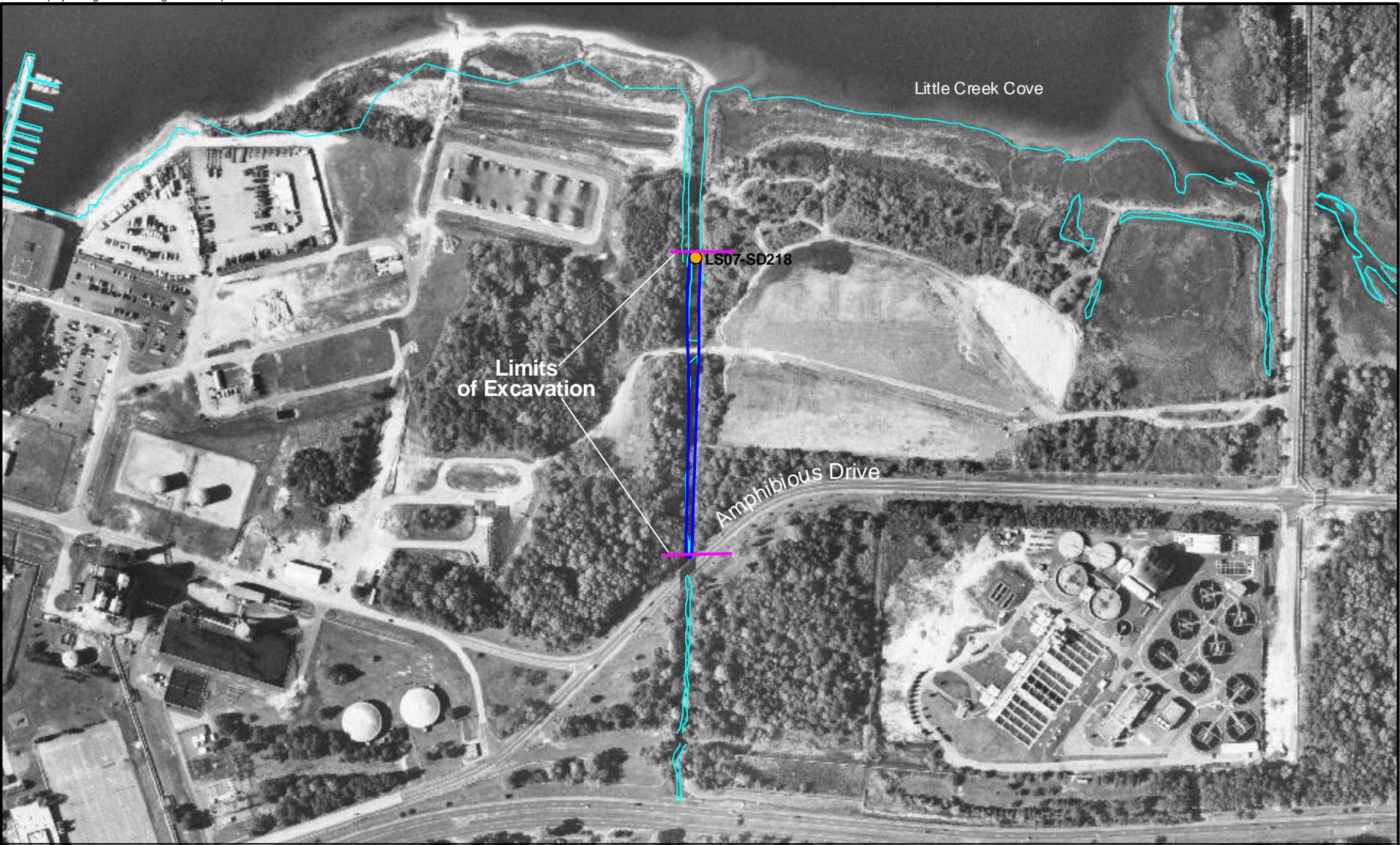
#### 4.2.3 Alternative #3

This alternative proposes the removal of surface debris from the site and excavation of contaminated sediments in the drainage canal. The excavated area would be backfilled with clean fill. This alternative is not recommended. This alternative fulfills the objective of this EE/CA, to mitigate ecological risk. It also provides for greater enhancement of the site and improved habitat quality, however, removing the surface debris results in significant additional cost with no additional ecological or human health benefit.

The capital cost to complete surface debris removal, removal of contaminated sediments, and replacement with clean fill is approximately \$2,509,000. This cost assumes that no special access requirements will be needed. Table C-2 in Appendix C contains a preliminary cost estimate for this alternative.

TABLE 4-1  
 Evaluation of Remedial alternatives  
*Site 7 Amphibious Base Landfill*  
*NAB Little Creek*  
*Virginia Beach, Virginia*

Alternative	Description	Effectiveness	Ease of Implementation	Cost
Alternative #1 – No Action	No removal work performed. Site left “as is.”	The short- and long-term effectiveness is low. The contaminated soils will remain in place and exposure risks will not change.	Easy. No action to implement.	\$0
Alternative #2 – Removal of Contaminated Sediments and Replacement with Clean Backfill	Approximately 1,150 cy of sediment will be removed. Excavated area will be backfilled with clean material. Approximately 450 cy of material from the collapsed landfill access road will be removed.	Both short- and long-term effectiveness is moderately high, as contaminated sediment will be removed from the canal.	Implementation would be moderate. A general contractor specializing in excavation/earthwork could readily perform the removal action. Only one contractor/equipment mobilization would be necessary to complete the removal action. Dewatering would be required.	Capital Cost \$592,000
Alternative #3 – Surface Debris Removal, Removal of contaminated sediments, and Replacement with Clean Backfill	Approximately 10,000 cy of surface debris would be removed from the shoreline at the site. In addition, approximately 1,150 cy of sediment will be removed. Excavated area will be backfilled with clean material. Approximately 450 cy of material from the collapsed landfill access road will be removed.	Both short- and long-term effectiveness is high, as surface debris and contaminated sediment will be removed from the canal.	Implementation would be moderate. A general contractor specializing in excavation/earthwork could readily perform the removal action. Only one contractor/equipment mobilization would be necessary to complete the removal action. Dewatering would be required.	Capital Cost \$2,509,000



**LEGEND**

-  Sediment Sample Location
-  Area of Excavation
-  Limits of Excavation
-  Shoreline

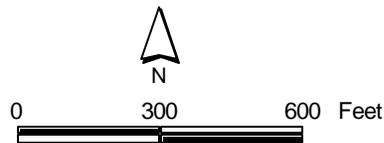
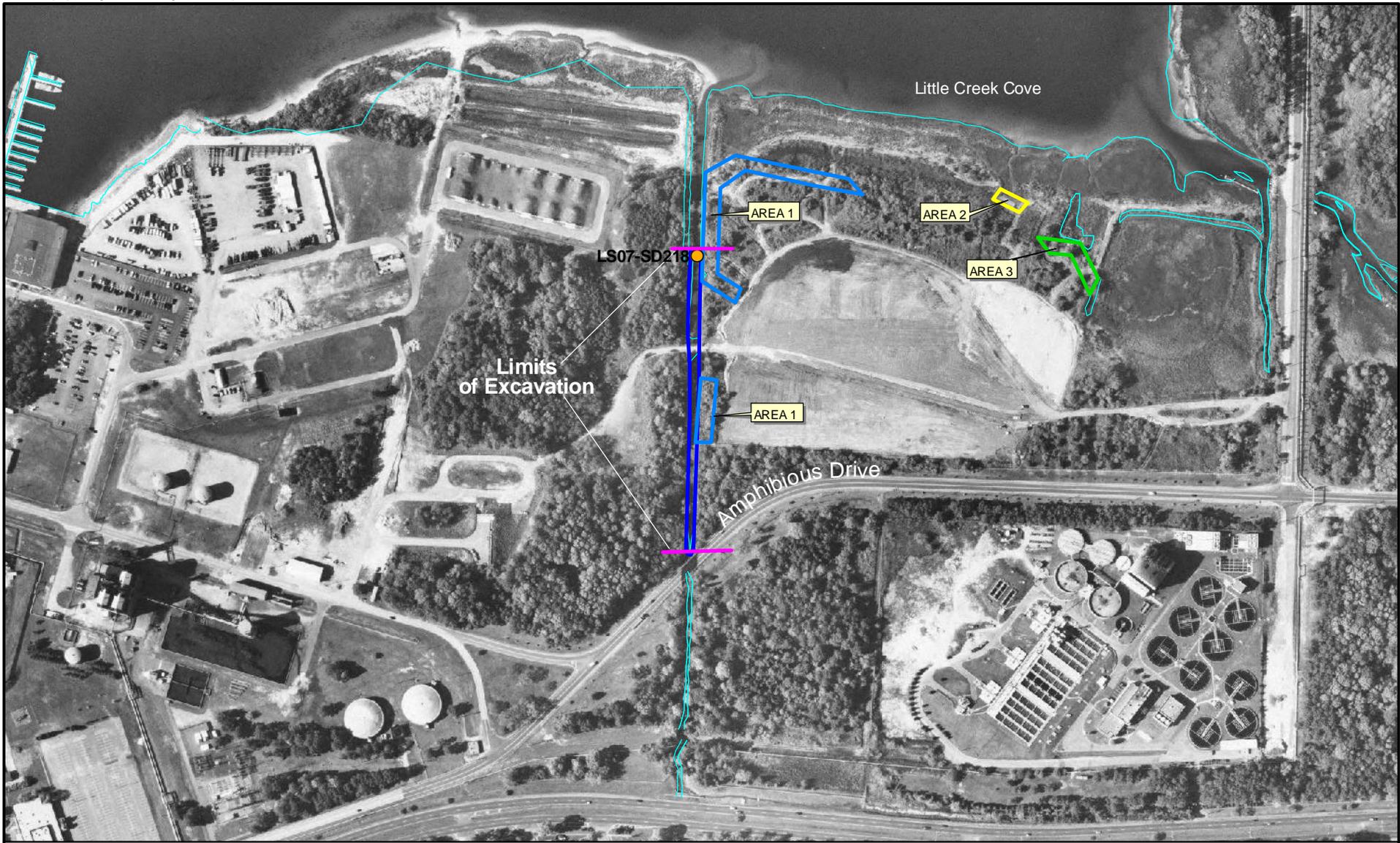


Figure 4-1  
Site 7 - EE/CA  
Alternative #2 - Removal of Contaminated Sediments  
and Replacement with Clean Backfill  
NAB Little Creek  
Virginia Beach, Virginia



LEGEND	
Sediment Sample Location	Area 1
Area of Excavation	Area 2
Limits of Excavation	Area 3
Shoreline	

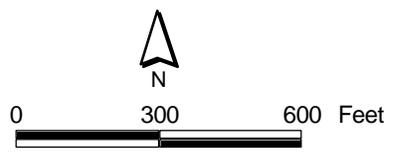


Figure 4-2  
Site 7 - EE/CA  
Alternative #3 - Debris Removal, Removal of Contaminated  
Sediments, and Replacement with Clean Backfill  
NAB Little Creek  
Virginia Beach, Virginia

## SECTION 5

# Comparative Analysis

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Section 5.0 provides a comparative analysis of the three removal alternatives presented in Section 4.0 to assist the decision-making process by which a removal action will be selected. In Section 4.0, these alternatives were evaluated according to their effectiveness (including protection of human health and the environment, compliance with ARARs to the extent practical, short- and long-term effectiveness, and reduction in toxicity, mobility, or volume), ease of implementation (including technical and administrative feasibility, availability of services, support agency acceptance, and community acceptance), and cost. In this section, the alternatives are directly compared for each of the three criteria.

Levels of effectiveness were assessed based upon the number of “effectiveness criteria” that would be satisfied by each alternative. The “effectiveness criteria,” from the USEPA guidance document *Guidance on Conducting Non-Time Critical Removal Actions Under CERCLA (EPA/540-R-93-057)*, are identified as:

- Protection of human health;
- Protection of workers during implementation;
- Protection of environment;
- Compliance with ARARs;
- Level of treatment and containment expected; and
- Residual effect concerns.

Levels of implementability were assessed based upon the number of “implementability criteria” satisfied by each alternative. The “implementability criteria,” from the USEPA guidance document on conducting NTCRA Under CERCLA (EPA 540-R-93-057), are as follows:

1. Construction and operational considerations
2. Demonstrated performance/useful life
3. Adaptable to environment conditions
4. Contributes to remedial performance
5. Can be implemented in 1 year
6. Availability of equipment, personnel and services, outside laboratory testing capacity, and offsite treatment and disposal capacity
7. Permits required
8. Easements or rights-of-way required
9. Impact on adjoining property
10. Ability to impose institutional controls

Evaluation of implementability essentially assesses the technical and administrative feasibility of completing each task. The technical feasibility consists of items 1 through 6 above, and the administrative feasibility involves items 7 through 10.

## 5.1 Remedial Alternative Comparison

TABLE 5-1  
Remedial Alternative Comparison

Alternative	Effectiveness	Implementation	Cost
Alternative #1 – No Action	Not Effective	Easy	No cost
Alternative #2 – Removal of Contaminated Sediments and Replacement with Clean Backfill	Effective	Moderate	Moderate
Alternative #3 – Removal of Contaminated Sediments, Replacement with Clean Backfill, and Surface Debris Removal	Effective	Moderate	High

Alternative #1, “No Action,” is not effective in that it does not accomplish the objective of this NTCRA, which is to mitigate potential ecological risk. Although this alternative is easy to implement and there is no cost associated with it, it is not a desirable alternative, because the overall objectives are not met.

Alternative #2, “Removal of Contaminated Sediments and Replacement with Clean Backfill,” is effective in that it accomplishes the objective of this NTCRA, which is to mitigate potential ecological risk. Because this alternative is effective in achieving the objective at a moderate cost, it is the recommended alternative.

Alternative #3, “Removal of Contaminated Sediments, Replacement with Clean Backfill, and Surface Debris Removal” is effective in reducing potential ecological risk, is moderately easy to implement, but has a higher cost associated with debris removal. Alternative #3 is not recommended because, although it achieves the objective, the additional surface debris results in a significant cost increase with no additional benefit.

## SECTION 6

# Recommended Alternative

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This EE/CA was performed in accordance with current USEPA and Navy guidance documents for a NTCRA under CERCLA. The purpose of this EE/CA was to identify and analyze alternatives to mitigate potential ecological risk associated with contaminated sediments in the drainage canal on the western portion of Site 7. Three alternatives were identified, evaluated, and ranked.

The comparative analysis of the alternatives included evaluating the effectiveness, implementability, and cost of each. The evaluation of effectiveness included reviewing the protectiveness of the alternative; compliance with ARARs to the extent practical; long-term effectiveness and permanence, reduction in toxicity, mobility or volume, short-term effectiveness, and its ability to meet the removal action objective. Implementability included looking at the technical feasibility, availability, and administrative feasibility of the alternatives. The evaluation of cost included a review of capital cost.

Based on the comparative analysis of the alternatives completed in Section 5.0, the recommended removal action is Alternative #2. The selection of this alternative provides the best short- and long-term effectiveness by removing the sediments in the drainage canal along the western side of the site currently posing a potential ecological risk.

## SECTION 7

# References

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- A.T. Kearney, 1989. *RCRA Facilities Assessment (RFA)*.
- Baker Environmental, Inc., 1996. *Relative Risk Ranking System (RRRS) and Revised RRRS*, January 1996.
- CH2M HILL, 1986. *Final Progress Report Round 1 Verification Step*. October 1986.
- CH2M HILL, 1997b. *Proposed Remedial Action Plan, Site 7*. October 1997b.
- CH2M HILL, 1998. *Decision Document, Site 7*. January 1998.
- CH2M HILL, 2000. *Five Year Site Management Plan: Fiscal Year 2000 – Naval Amphibious Base Little Creek, Virginia Beach, Virginia*, May 2000.
- CH2M HILL, 2000. *Screening Ecological Risk Assessment – IR Sites 5, 7, 8, 9, 10, 11, 12, 13, and 16, and SWMU 3, Naval Amphibious Base Little Creek, Virginia Beach, Virginia*, June 2000.
- CH2MHILL, 2002. *Draft Ecological Risk Assessment Site 7 – Naval Amphibious Base Little Creek, Virginia Beach, Virginia*, December 2002.
- CH2M HILL, 2004. *Canal Sediment Delineation Results and Recommended Path Forward for Site 7 – The Amphibious Base Landfill, NAB Little Creek, Virginia Beach, Virginia*, March 2004.
- CH2M HILL, 2004a. *Remedial Investigation/Human Health Risk Assessment for Site 7 – Naval Amphibious Base Little Creek, Virginia Beach, Virginia*, April 2004.
- CH2M HILL, 2004b. *Ecological Risk Assessment Site 7 – Naval Amphibious Base Little Creek, Virginia Beach, Virginia*, April 2004.
- CH2M HILL, 2004. *Long-term Monitoring Report for Round 10 and Round 11 at Site 7, Naval Amphibious Base Little Creek, Virginia Beach, Virginia*, June 2004.
- CH2M HILL, 2004. *Site 7 Shoreline Debris Survey and Site Visit, Naval Amphibious Base Little Creek, Virginia Beach, Virginia*, October 2004.
- Department of the Navy (DON) Environmental Restoration Plan for Fiscal Years 1998-2002, September 1997 (Department of Navy Environmental Program website, 1997).
- DON Environmental Program; Little Creek Naval Amphibious Base (<http://5yrplan.nfesc.navy.mil/installs/a109.pdf>).
- Ebasco Environmental Consultants, 1991. *Draft Final Interim Remedial Investigation*, November 1991.
- Foster Wheeler Environmental Corporation, 1994. *Final Remedial Investigation/Feasibility Study*, November 1994.

- Foster Wheeler Environmental Corporation, 1997. *Draft Final Feasibility Study*, February 1997.
- NPL Site Narrative Listing, Website, 1998.
- OHM Remediation Services Corporation, 1997. *Draft Work Plan for Debris Removal Activities at Site No. 7*, July 1997.
- Rogers, Golden, and Halpern, Initial Assessment Study (IAS), 1984.
- R.S. Means, 2001. *Heavy Construction Cost Data*. 2001.
- R.S. Means, 2001. *Site Work and Landscape Cost Data*. 2001.
- R.S. Means, 2002. *Environmental Cost Data – Assemblies*. 2002.
- USEPA, Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA), <http://www4.law.cornell.edu/uscode/42/ch103.html>
- USEPA, Guidance on Conducting Feasibility Studies (EPA/540/G-89/400)
- USEPA, Guidance on Conduction Non-Time Critical Removal Actions (EPA/540-R-93-057)
- USEPA, National Contingency Plan (NCP), <http://www.epa.gov/oilspill/lawsregs.htm>
- USEPA, Region III Risk-Based Concentration Table, April 12, 1999.
- USEPA, Superfund Amendments and Reauthorization Act of 1986 (SARA), <http://www4.law.cornell.edu/uscode/42/ch103.html>
- USEPA, *Superfund, Guidance on Conducting Non-Time Critical Removal Actions Under CERCLA*, PB93-963402, January 1993.
- USEPA, Updated May 2002.k NPL Site Narrative Listing.  
<http://epa.gov/reg3hwmd/super/VA/naval-amphibious/pad.htm>.

**Appendix A**  
**Canal Sediment Delineation Results and**  
**Recommended Path Forward for Site 7**

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# Canal Sediment Delineation Results and Recommended Path Forward for Site 7 - The Amphibious Base Landfill, NAB Little Creek, Virginia Beach, Virginia

PREPARED FOR: NAB Little Creek Tier I Partnering Team

PREPARED BY: CH2M HILL

DATE: March 1, 2004

## Background

This memorandum presents the results of sediment samples collected in the canal located on the western edge of Site 7 and discusses the recommended path forward for actions related to the canal.

Surface water and sediment samples are collected semi-annually as part of a long-term monitoring program (LTM) from 13 locations at Site 7 (Figure 1). Seven of these are located in the canal, and one is located at the mouth of the canal in Little Creek Cove (Figure 1). The LTM program, initiated in 1998, consisted of seven sediment locations (SD201 through SD207). Six additional sediment locations (SD208 through SD213) were added to the LTM program beginning in Round 5. Semi-annual LTM at SD201 through SD213 has continued through the present Round 10 LTM event, which was completed in September 2003.

During development of the Draft ERA for Site 7 (December 2002), it was determined that sediment location SD202, located in the canal along the western edge of the Site 7 landfill, reflected the area of highest potential ecological risk. This sample location is situated just south of the culvert under the gravel road used for landfill access.

## Sampling Activities

To further assess the spatial extent of the elevated chemical concentrations identified in the Draft ERA associated with SD202, five additional sediment samples (SD214 through SD218; Figure 1) were collected from the canal. These additional samples were taken during the Round 8 LTM activities (November 2002), as recommended in the Draft ERA report. These additional samples were evaluated in an addendum to the Site 7 Draft ERA (February 2003). Eight additional sediment samples (SD219 through SD226; Figure 2) were collected in January 2004 to further evaluate the extent of these elevated chemical concentrations and, if warranted based upon potential risk, assess the feasibility of a potential interim removal action. Seven of the sediment samples were located south of the culvert at 25 foot increments extending to SD216. One sample was also collected north of the culvert between the previous sampling location SD217 and LTM sampling location SD202 (Figure 2). The January 2004 data have not yet been validated.

These 8 sediment samples were analyzed for selected SVOCs, pesticides, PCBs, and metals. Figure 2 illustrates the sampling locations and selected constituents exceeding ecological

screening values. Table 1 lists the analytical results for the selected constituents (and identifies exceedances of ecological screening values) from Round 8 LTM activities (sediment samples in the portion of the canal around SD202 only), Rounds 9 and 10 LTM activities (SD202 only), and the January 2004 sampling (SD219 through SD226).

Sediment sample results indicate exceedances of ecological screening values in the canal (Table 1; Figure 2). However, in many cases, these exceedances are only slightly above conservative screening values used in the earliest stages of an ERA (i.e., Steps 2 and 3A) and the data show much variability.

## **Discussion**

The NAB Little Creek Tier I Partnering Team held a conference call on February 19, 2004 to discuss the analytical results of the canal sediment samples and a proposed sediment removal boundary in the canal adjacent to Site 7. Participants on the conference call included VDEQ, USEPA, and the Navy. It was noted during the call that the Region 3 BTAG would be consulted on the findings of the sediment samples and consideration of a potential interim removal action.

The Draft ERA (conducted through Step 3 of the ERA process) indicated potential risks are possible to lower trophic level receptors from exposure to canal sediments in the vicinity of sample SD202. However exposures are likely to be limited by the small size and low quality of the available habitat in the canal. Furthermore, the potential risk conclusion was based solely upon analytical chemistry data; no site-specific ecological studies have been conducted to date at Site 7. The samples collected in November 2002, March 2003, September 2003, and January 2004 provided additional data to delineate chemical concentrations in canal sediments for the area around sample SD202.

A potential interim removal action (IRA) has been considered to excavate sediment in the canal to a depth of one foot between sample locations SD217 and SD216, and backfill the excavation with a foot of clean material. The objective of the removal action in the canal was to achieve no further action (NFA) for sediment in the canal adjacent to Site 7 by eliminating potential ecological exposures in the area around sample SD202. Consensus by the NAB Little Creek Tier I Partnering Team was requested during the February 19, 2004 conference call for development of an EE/CA to address potential removal of sediment in the canal at Site 7 (as outlined above). However, after further review of the data related to the canal and consultation with ecological technical support, it is considered premature to conduct an IRA at this time. The rationale for re-considering an IRA in the Site 7 canal is based upon the following:

- ? Potential uncertainties associated with achieving a consensus decision of NFA following implementation of an interim removal action,
- ? The need to establish site-specific remedial action clean up goals prior to an IRA, and
- ? Ecological screening values are not designed to be used as clean up goals due to their non site-specificity and conservative nature. The exceedances of these screening values in canal sediment may not actually pose a risk due to site-specific factors.

The Draft ERA was conducted through Step 3. Finalizing this report (per the recommendations in the draft report and the response to comments) and then completing the ERA process (i.e., Steps 4-8) will allow for a site-specific determination of ecological risk at Site 7. While there may be merit in conducting limited IRAs based upon the results of a Screening Ecological Risk

Assessment in some instances, it is important to ensure the cost-effectiveness of such an action prior to its implementation. At this time, the uncertainties associated with an IRA for canal sediments are high. It is therefore recommended that the ERA process at Site 7 be completed to better define the site-specific ecological risk from exposure to sediment in the canal. If unacceptable ecological risk is indicated at the conclusion of the ERA process from exposure to canal sediment, then preliminary remediation goals can be developed based upon the resulting site-specific data. It is also recommended that development of a reference data set for sediment be considered as part of Steps 4-6 of the ERA process.

- The actions or activities regulated by the requirement
- Variations, waivers, or exemptions of the requirement
- The type of place regulated and the type of place affected by the release or CERCLA action
- The type and size of the facility or structure regulated by the requirement or affected by the release
- Consideration of the use or potential use of affected resources in the requirement

In some circumstances, a requirement may be relevant to the particular site-specific situation but may not be appropriate because of differences in the purpose of the requirement, the duration of the regulated activity, or the physical size or characteristic of the situation it is intended to address. There is more discretion in the judgment of relevant and appropriate requirements than in the determination of applicable requirements.

Three classifications of requirements are defined by USEPA in the ARAR determination process: chemical-specific, location-specific, and action-specific.

*Chemical-specific ARARs* are health or risk management-based numbers or methodologies that result in the establishment of numerical values for a given media that would meet the NCP “threshold criterion” of overall protection of human health and the environment. These requirements generally set protective cleanup concentrations for the chemicals of concern in the designated media, or set safe concentrations of discharge for remedial activity. Federal and Commonwealth of Virginia chemical-specific regulations that have been reviewed are summarized in Appendix B.

*Location-specific ARARs* restrict remedial activities and media concentrations based on the characteristics of the surrounding environments. Location-specific ARARs may include restrictions on remedial actions within wetlands or floodplains, near locations of known endangered species, or on protected waterways. The federal and Commonwealth of Virginia location-specific regulations that have been reviewed are summarized in Appendix B.

*Action-specific ARARs* are requirements that define acceptable treatment and disposal procedures for hazardous substances. Federal and Commonwealth of Virginia Action-specific ARARs that may affect the development and conceptual arrangement of remedial alternatives are summarized in Appendix B.

### 3.5 General Disposal Requirements

Excavated sediments from the removal action outlined in this EE/CA at Site 7 are assumed to be non-hazardous. Excavated materials will be sampled for toxicity characteristic leachate procedure (TCLP) waste characterization prior to disposal. Any materials that appear to be potentially hazardous will be set aside until analytical testing can be performed to confirm its nature. Non-hazardous materials will be disposed of in a local Navy-approved and permitted subtitle D landfill. Any materials classified as hazardous will be appropriately disposed.

Site 7  
Sediment Sample Summary  
NAB Little Creek  
Virginia Beach, VA

Sample ID	LS07-SD218-02D	LS07-SD217-02D	LS07-SD226-04A	LS07-SD202-02D	LS07-SD202P-02D	LS07-SD202-03A	LS07-SD202P-03A	LS07-SD202-03C	LS07-SD202P-03C	LS07-SD219-04A
Sample Date	11/06/02	11/06/02	1/27/04	11/07/02	11/07/02	03/18/03	03/18/03	09/02/03	09/02/03	1/27/04
Total Metals (MG/KG)										
Arsenic	0.71 U	1.40 J	4.1	8.10	7.10	3.20	5.80	9.50	9.40	8.1
Copper	3.10 J	24.9	26.7	141	54.6	11.6	18.7	38.8 J	40.4 J	36
Cyanide	0.031 U	0.032 U	1.4 UN	0.078 J	0.047 U	NA	NA	1.09 U	1.13 U	1.8 UN
Lead	1.80	11.5	21.1 *	52.5	39.6	7.10 J	12.4 J	28.6	35.4	26.7 *
Mercury	0.050 U	0.050 U	0.062 J	0.18	0.073 U	0.10 U	0.15	0.20 U	0.25	0.19
Selenium	0.71 U	0.73 U	2.5 J	1.50 J	1.10 U	0.62 U	0.82 U	1.30 UL	1.30 UL	2.6 J
Zinc	11.8 J	49.3 J	112	470 J	184 J	80.5	98.6	203 J	184 J	232
Pesticide/Polychlorinated Biphenyls (UG/KG)										
4,4'-DDE	4.20 U	4.20 U	5.2 U	7.40	5.10 J	3.50 U	4.50 U	7.10 U	7.50 U	5.9 U
Aroclor-1260	42.0 U	58.0	46 J	260 J	410	35.0 U	45.0 U	71.0 U	75.0 U	59 U
Dieldrin	4.20 U	4.20 U	5.2 U	2.80 J	3.30 J	3.50 U	4.50 U	7.10 U	7.50 U	5.9 U
Semivolatile Organic Compounds (UG/KG)										
Acenaphthene	420 U	420 U	520 U	29.0 J	650 U	350 U	450 U	720 U	740 U	590 U
Fluorene	420 U	420 U	520 U	44.0 J	650 U	350 U	450 U	720 U	740 U	590 U

 Shading denotes and exceedance as compared to ecological screening values in Site 7 ERA  
 U Not detected  
 J Reported value is estimated  
 NA Not Analyzed  
 L Reported value is biased low  
 \* duplicate imprecision  
 N spike recoveries were not within limits

Site 7  
Sediment Sample Summary  
NAB Little Creek  
Virginia Beach, VA

Sample ID	LS07-SD220-04A	LS07-SD220P-04A	LS07-SD221-04A	LS07-SD222-04A	LS07-SD223-04A	LS07-SD224-04A	LS07-SD225-04A	LS07-SD216-02D	LS07-SD215-02D
Sample Date	1/27/04	1/27/04	1/27/04	1/27/04	1/27/04	1/27/04	1/27/04	11/06/02	11/06/02
Total Metals (MG/KG)									
Arsenic	3.3	2.1 J	6	9.9	8.3	10	5.4	11.4	1.10 J
Copper	17.7	6.3	26.6	52.9	34.9	44.3	13.4	53.3	8.00
Cyanide	1.3 UN	1.3 UN	1.6 UN	2 UN	1.8 UN	1.9 UN	1.6 UN	0.35 J	0.029 U
Lead	13.7 *	6.5 *	24.9 *	38.4 *	24.5 *	29.9 *	14.1 *	40.5	3.50
Mercury	0.055 J	0.043 J	0.082 J	0.18 J	0.086 J	0.12 J	0.045 J	0.086 J	0.060 U
Selenium	1.2 J	1.5 J	2.9 J	4.6 J	3.3 J	4.3 J	1.5 J	1.30 J	0.67 U
Zinc	106	42.3	117	314	215	265	64.2	195 J	22.0 J
Pesticide/Polychlorinated Biphenyls (UG/KG)									
4,4'-DDE	4.8 U	4.7 U	4.4 U	6.1 U	6.4 U	6.4 U	5 U	5.90 U	4.00 U
Aroclor-1260	120	100	190	200	180	170	73	200 J	27.0 J
Dieldrin	4.8 U	4.7 U	4.4 U	6.1 U	6.4 U	6.4 U	5 U	5.90 U	4.00 U
Semivolatile Organic Compounds (UG/KG)									
Acenaphthene	480 U	470 U	440 U	610 U	640 U	650 U	500 U	20.0 J	400 U
Fluorene	480 U	470 U	440 U	610 U	640 U	650 U	500 U	590 U	400 U

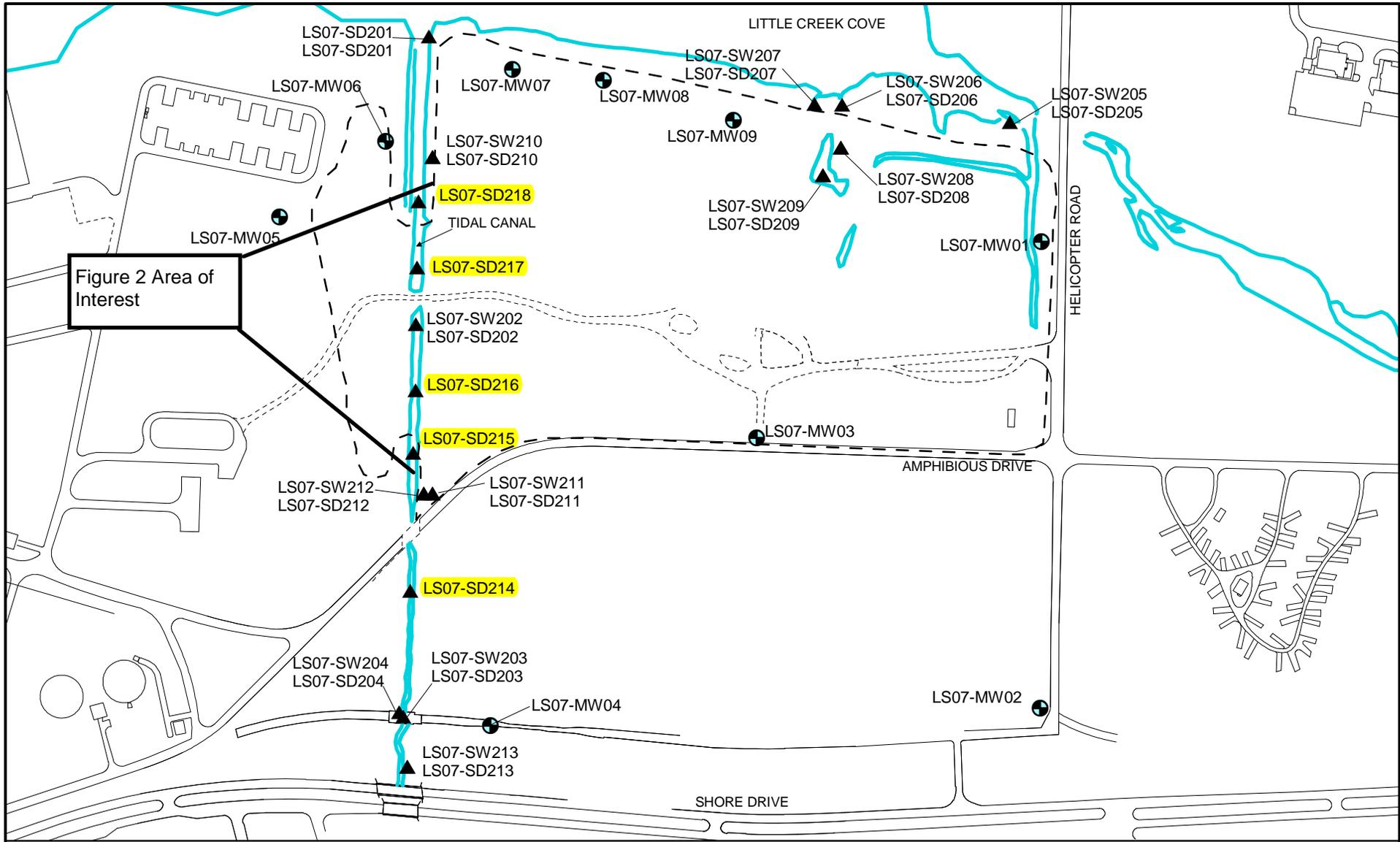


Figure 2 Area of Interest

**LEGEND**

- ▲ Sediment Sample Location (highlighted locations represent one-time only Round 8 samples)
- Groundwater Data Collection Point
- Site Boundary

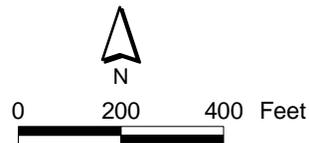
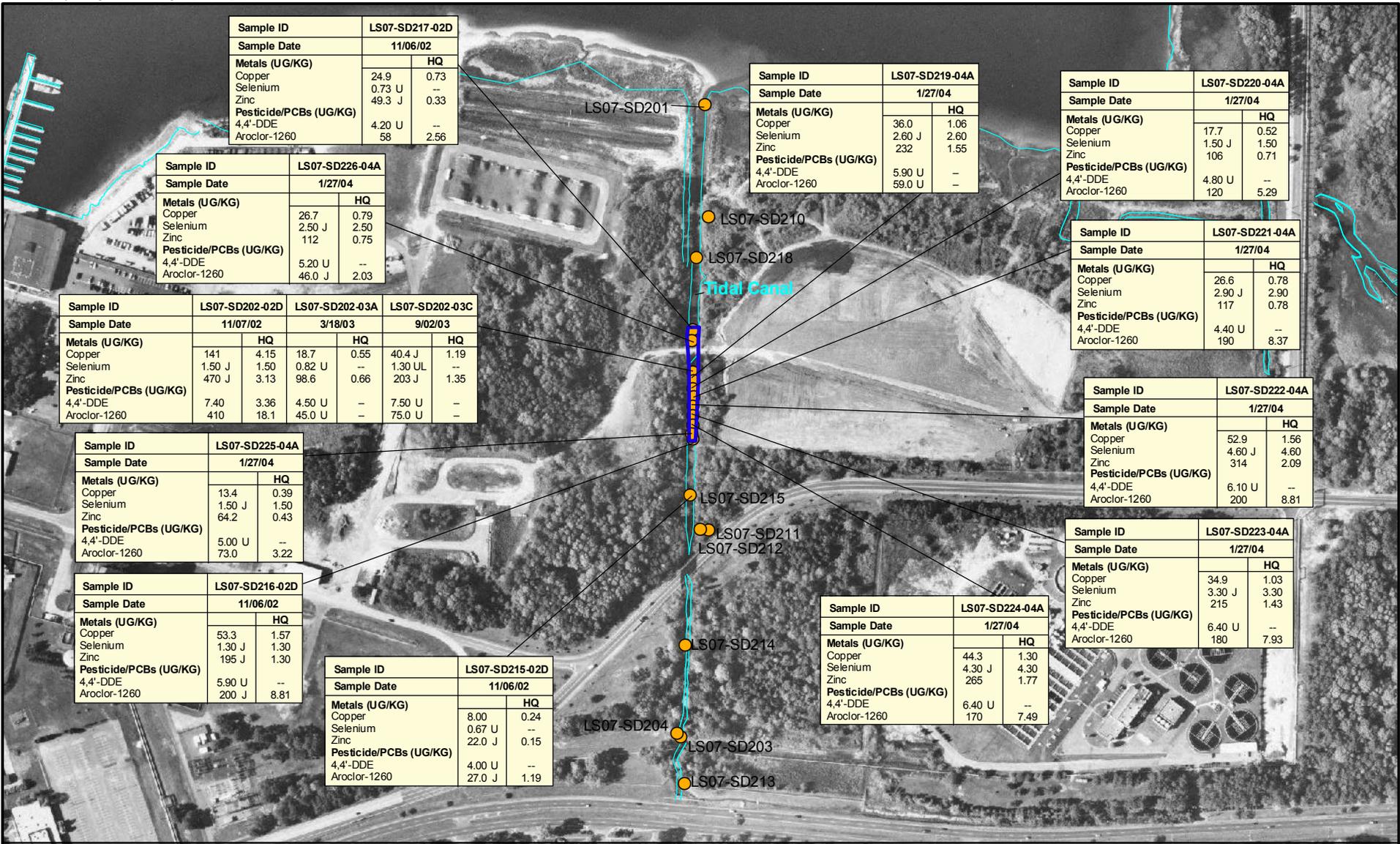


Figure 1  
Site 7 - Sampling Locations

Naval Amphibious Base Little Creek  
Virginia Beach, Virginia



Sample ID		LS07-SD217-02D	
Sample Date		11/06/02	
Metals (UG/KG)			HQ
Copper	24.9		0.73
Selenium	0.73 U		--
Zinc	49.3 J		0.33
Pesticide/PCBs (UG/KG)			
4,4'-DDE	4.20 U		--
Aroclor-1260	58		2.56

Sample ID		LS07-SD226-04A	
Sample Date		1/27/04	
Metals (UG/KG)			HQ
Copper	26.7		0.79
Selenium	2.50 J		2.50
Zinc	112		0.75
Pesticide/PCBs (UG/KG)			
4,4'-DDE	5.20 U		--
Aroclor-1260	46.0 J		2.03

Sample ID		LS07-SD202-02D	LS07-SD202-03A	LS07-SD202-03C		
Sample Date		11/07/02	3/18/03	9/02/03		
Metals (UG/KG)			HQ	HQ		
Copper	141	4.15	18.7	0.55	40.4 J	1.19
Selenium	1.50 J	1.50	0.82 U	--	1.30 UL	--
Zinc	470 J	3.13	98.6	0.66	203 J	1.35
Pesticide/PCBs (UG/KG)						
4,4'-DDE	7.40	3.36	4.50 U	--	7.50 U	--
Aroclor-1260	410	18.1	45.0 U	--	75.0 U	--

Sample ID		LS07-SD225-04A	
Sample Date		1/27/04	
Metals (UG/KG)			HQ
Copper	13.4		0.39
Selenium	1.50 J		1.50
Zinc	64.2		0.43
Pesticide/PCBs (UG/KG)			
4,4'-DDE	5.00 U		--
Aroclor-1260	73.0		3.22

Sample ID		LS07-SD216-02D	
Sample Date		11/06/02	
Metals (UG/KG)			HQ
Copper	53.3		1.57
Selenium	1.30 J		1.30
Zinc	195 J		1.30
Pesticide/PCBs (UG/KG)			
4,4'-DDE	5.90 U		--
Aroclor-1260	200 J		8.81

Sample ID		LS07-SD215-02D	
Sample Date		11/06/02	
Metals (UG/KG)			HQ
Copper	8.00		0.24
Selenium	0.67 U		--
Zinc	22.0 J		0.15
Pesticide/PCBs (UG/KG)			
4,4'-DDE	4.00 U		--
Aroclor-1260	27.0 J		1.19

Sample ID		LS07-SD219-04A	
Sample Date		1/27/04	
Metals (UG/KG)			HQ
Copper	36.0		1.06
Selenium	2.60 J		2.60
Zinc	232		1.55
Pesticide/PCBs (UG/KG)			
4,4'-DDE	5.90 U		--
Aroclor-1260	59.0 U		--

Sample ID		LS07-SD220-04A	
Sample Date		1/27/04	
Metals (UG/KG)			HQ
Copper	17.7		0.52
Selenium	1.50 J		1.50
Zinc	106		0.71
Pesticide/PCBs (UG/KG)			
4,4'-DDE	4.80 U		--
Aroclor-1260	120		5.29

Sample ID		LS07-SD221-04A	
Sample Date		1/27/04	
Metals (UG/KG)			HQ
Copper	26.6		0.78
Selenium	2.90 J		2.90
Zinc	117		0.78
Pesticide/PCBs (UG/KG)			
4,4'-DDE	4.40 U		--
Aroclor-1260	190		8.37

Sample ID		LS07-SD222-04A	
Sample Date		1/27/04	
Metals (UG/KG)			HQ
Copper	52.9		1.56
Selenium	4.60 J		4.60
Zinc	314		2.09
Pesticide/PCBs (UG/KG)			
4,4'-DDE	6.10 U		--
Aroclor-1260	200		8.81

Sample ID		LS07-SD223-04A	
Sample Date		1/27/04	
Metals (UG/KG)			HQ
Copper	34.9		1.03
Selenium	3.30 J		3.30
Zinc	215		1.43
Pesticide/PCBs (UG/KG)			
4,4'-DDE	6.40 U		--
Aroclor-1260	180		7.93

Sample ID		LS07-SD224-04A	
Sample Date		1/27/04	
Metals (UG/KG)			HQ
Copper	44.3		1.30
Selenium	4.30 J		4.30
Zinc	265		1.77
Pesticide/PCBs (UG/KG)			
4,4'-DDE	6.40 U		--
Aroclor-1260	170		7.49

**LEGEND**

- Sediment Sampling Location
- ~ Area of Interest (Sample Results in Table 2)

J - Analyte present. Reported value is estimated.  
 U - Not detected  
 L - Report value is biased low.  
 HQ - Hazard Quotient

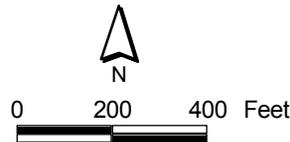


Figure 2  
 Sample Results  
 Site 7 Canal Area of Interest  
 NAB Little Creek  
 Virginia Beach, Virginia

**Appendix B**  
**ARAR Tables**

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**Table B-5  
Federal Action-Specific ARARs  
N AB Little Creek, Virginia Beach, Virginia**

Action	Requirement	Prerequisite	Citation	ARAR Determination	Comment
<b>Clean Air Act (CAA) 40 USC 7401 et seq.*</b>					
Discharge to air	National Primary and Secondary Ambient Air Quality Standards (NAAQS) - standards for ambient air quality to protect public health and welfare (including standards for particulate matter and lead).	Contamination of air affecting public health and welfare	40 CFR Sections 50.4 - 50.12	Not Applicable	Not an ARAR; Federal NAAQS are non-enforceable standards. May be TBC for site activities.
<p>* Statutes and policies, and their citations are provided as headings to identify general categories of ARARs. Specific potential ARARs are addressed in the table below each general heading.</p> <p>ARARs - Applicable or relevant and appropriate requirements</p> <p>CFR - Code of Federal Regulations</p> <p>TBC - To Be Considered</p>					

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- B-3 Federal Location-Specific ARARs
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**Table B-1  
Federal Chemical-Specific ARARs  
NAB Little Creek, Virginia Beach, Virginia**

<b>Requirement</b>	<b>Prerequisite</b>	<b>Citation</b>	<b>ARAR Determination</b>	<b>Comment</b>
<b>Soil</b>				
Toxicity Characteristic Leaching Procedure (TCLP) regulatory levels	Hazardous waste treatment, storage, or disposal	40 CFR, Section 261.24	Applicable	Disposal of excavated sediment will be characterized by TCLP to verify disposal requirements.
Definition of RCRA Hazardous Waste	Waste soil	40 CFR Sections 261.21, 261.22(a)(1); 261.23; 261.24(a)(1); and 261.100	Applicable	Available data on materials requiring excavation as part of the interim removal action at Site 7 do not indicate hazardous waste characterization is likely. Characterization testing prior to disposal will verify non-hazardous (or hazardous) nature of materials being removed from the site.
Chemical-specific risk-based concentration (RBC) screening levels	CERCLA site	EPA Region III RBC Tables	TBC	RBCs to screen against site concentrations as a preliminary indicator of the presence of risk. RBCs for sediment are multiplied by 10 to assess risk to human health due to limited exposure risk.
<b>Groundwater</b>				
<b>Safe Drinking Water Act (SDWA), 42 USC 300*</b>				
National primary drinking water standards are health-based standards for public water systems (maximum contaminant levels [MCLs]).	Public water system	40 CFR Part 141 Subparts B & G	Relevant but Not Applicable	The interim removal action will not contact groundwater within the limits of removal, and no public water systems are affected by the remedial action. Site 7 will require temporary dewatering of surface waters connected to Little Creek Cove and Lake Smith.
Maximum contaminant level goals [MCLGs] pertain to known or anticipated adverse health effects (also known as recommended maximum contaminant levels).	Public water system	40 CFR Part 141, Subpart F	Relevant but Not Applicable	The interim removal action will not contact groundwater within the limits of removal, and no public water systems are affected by the remedial action. Only surface waters connected to Little Creek Cove and Lake Smith will be addressed for the sediment removal at Site 7. Dewatering is necessary to facilitate excavation; surface waters have not been impacted by metals in sediment.

**Table B-1  
Federal Chemical-Specific ARARs  
NAB Little Creek, Virginia Beach, Virginia**

Requirement	Prerequisite	Citation	ARAR Determination	Comment
National secondary drinking water regulations are standards for the aesthetic qualities of public water systems (secondary MCLs [SMCLs]).	Public water system	40 CFR Part 143, excluding 143.5(b)	Relevant but Not Applicable	The interim removal action will not contact groundwater within the limits of removal, and no public water systems are affected by the remedial action. Only surface waters connected to Little Creek Cove and Lake Smith will be addressed for the sediment removal at Site 7. Dewatering is necessary to facilitate excavation; surface waters have not been impacted by metals in sediment.
Risk Based Concentrations (RBCs)	Public water system	EPA Region III RBC Tables	Relevant but Not Applicable	The interim removal action will not contact groundwater within the limits of removal, and no public water systems are affected by the remedial action. Only surface waters connected to Little Creek Cove and Lake Smith will be addressed for the sediment removal at Site 7. Dewatering is necessary to facilitate excavation; surface waters have not been impacted by metals in sediment.
<p>* Statutes and policies, and their citations, are provided as headings to identify general categories of potential ARARs for the convenience of the reader. Listing the statutes and policies does not indicate that DON accepts the entire statutes or policies as potential ARARs. Specific potential ARARs are addressed in the table below each general heading; only substantive requirements of the specific citations are considered potential ARARs.</p> <p>ARARs - Applicable or relevant and appropriate requirements            CFR - Code of Federal Regulations            TBC - To Be Considered            VHWMRs - Virginia Hazardous Waste Management Regulations</p>				

**Table B-2**  
**Virginia Chemical-Specific ARARs**  
**NAB Little Creek, Virginia Beach, Virginia**

Requirement	Prerequisite	Citation	ARAR Determination	Comment
<b>Soil</b>				
<b>Virginia Hazardous Waste Management Regulations (VHWMRs)</b>				
Definition of RCRA Hazardous Waste	Waste soil/sediment	9 VAC 20-60 et al	Applicable	Disposal of excavated sediment will be characterized for disposal.
<b>Virginia Solid Waste Management Regulations (VSWMRs)</b>				
Specific regulations for the handling of "Special Wastes"	Waste must meet the determination of a Virginia "special waste"	9 VAC 20-80 et al	Not Applicable	Sediment and surface debris are not anticipated to be classified as "special waste".
<b>Groundwater</b>				
<b>Virginia Drinking Water Standards*</b>				
Primary drinking water standards are health-based standards for public water supplies (primary maximum contaminant levels [PMCLs]).	Public water system.	12 VAC 5-590-10	Relevant but Not Applicable	The interim removal action will not contact groundwater within the limits of removal, and no public water systems are affected by the remedial action. Surface water will be removed from the area at Site 7 proposed for excavation.
Secondary drinking water regulations are chemical based standards for qualities of public water supplies (secondary MCLs [SMCLs]).	Public water system.	12 VAC 5-590-390	Relevant but Not Applicable	The interim removal action will not contact groundwater within the limits of removal, and no public water systems are affected by the remedial action. Surface water will be removed from the area at Site 7 proposed for excavation.

**Table B-2**  
**Virginia Chemical-Specific ARARs**  
**NAB Little Creek, Virginia Beach, Virginia**

Requirement	Prerequisite	Citation	ARAR Determination	Comment
<b>Virginia Groundwater Standards (VGWS)*</b>				
Establishes groundwater standards for State Antidegradation Policy.	Standards are used when no MCL is available.	9 VAC 25-260-190 to 220	Relevant but Not Applicable	Groundwater will not be encountered during removal action activities at Site 7.
<p>*Statutes and policies, and their citations, are provided as headings to identify general categories of potential ARARs for the convenience of the reader. Listing the statutes and policies does not indicate that Navy accepts the entire statutes or policies as potential ARARs. Specific potential ARARs are addressed in the table below each general heading; only substantive requirements of the specific citations are considered potential ARARs.</p> <p>ARARs - Applicable or relevant and appropriate requirements</p> <p>CFR - Code of Federal Regulations</p> <p>TBC - To be considered</p> <p>VAC - Virginia Administrative Code</p>				

**Table B-3  
Federal Location-Specific ARARs  
NAB Little Creek, Virginia Beach, Virginia**

Location	Requirement	Prerequisite	Citation	ARAR Determination	Comment
<b>Executive Order 11988, Protection of Floodplain*</b>					
Within floodplain	Actions taken should avoid adverse effects, minimize potential harm, restore and preserve natural and beneficial values.	Action that will occur in a floodplain, i.e., lowlands, and relatively flat areas adjoining inland and coastal waters and other flood-prone areas.	40 CFR Part 6, Appendix A; excluding Sections 6(a)(2), 6(a)(4), 6(a)(6); 40 CFR 6.302	Applicable	Removal activities may require compliance with this order. Measures required may include erosion control.
<b>Executive Order 11990, Protection of Wetlands*</b>					
Wetland	Action to minimize the destruction, loss, or degradation of wetlands.	Wetland as defined by Executive Order 11990 Section 7.	40 CFR 6, Appendix A; excluding Sections 6(a)(2), 6(a)(4), 6(a)(6); 40 CFR 6.302	Relevant and Appropriate	Federal or State regulated wetlands are present at the site. Nationwide Permit No. 38 allows for activities in wetlands to contain, stabilize, or remove hazardous or toxic materials. "Notification" is required to the District Engineer and the wetlands on the site should be delineated. Activities undertaken entirely on a CERCLA site by authority of CERCLA as approved or required by EPA, are not required to obtain permits under Section 404 of the Clean Water Act or Section 10 of the Rivers and Harbors Act. NWP 38 notification will put in place coordination with natural resource and historic resource trustees regarding the potential to adversely affect threatened and endangered species and sites protected under the National Historic Preservation Act.

**Table B-3  
Federal Location-Specific ARARs  
NAB Little Creek, Virginia Beach, Virginia**

Location	Requirement	Prerequisite	Citation	ARAR Determination	Comment
<b>Clean Water Act, Section 404*</b>					
Wetland	Action to prohibit discharge of dredged or fill material into wetland without permit.	Wetland as defined by Executive Order 11990 Section 7.	40 CFR 230.10; 40 CFR 231 (231.1, 231.2, 231.7, 231.8)	Relevant and Appropriate	Non-time critical removal action at Site 7 will include removal and replacement of impacted sediments that currently exceed environmental screening criteria and pose a potential ecological risk. This area does not contain significant ecological (wetland) habitat as it serves as a stormwater discharge point. Activities undertaken entirely on a CERCLA site by authority of CERCLA as approved or required by EPA, are not required to obtain permits under Section 404 of the Clean Water Act or Section 10 of the Rivers and Harbors Act.
<b>Endangered Species Act of 1978*</b>					
Endanger- ed species	Action to ensure that any action is not likely to jeopardize the continued existence of endangered or threatened species or adversely affect its critical habitat.	Applies to actions that affect endangered or threatened species or their habitat.	16 USC 1531 50 CFR Part 402	Relevant and Appropriate	Except for the occasional transient individuals, no federally listed or proposed endangered species are known to exist at Site 7. Therefore, the requirements of the Endangered Species Act of 1973 (16 USC 1536(a)) will not be applicable to the removal action.
<b>Federal Fish and Wildlife Conservation Act</b>					
Fish and Wildlife	Requires that activities avoid, minimize, or compensate for impacts to fish and wildlife and their habitats.	Applies to actions that affect fish and wildlife and their habitat.	16 USC §662 et seq.	Relevant and Appropriate	The drainage canal currently contains sediments that pose a potential risk to ecological receptors. Excavation of impacted sediments and replacement with clean fill is expected to eliminate potential receptor risk.

**Table B-3  
Federal Location-Specific ARARs  
NAB Little Creek, Virginia Beach, Virginia**

<b>Location</b>	<b>Requirement</b>	<b>Prerequisite</b>	<b>Citation</b>	<b>ARAR Determination</b>	<b>Comment</b>
<b>Coastal Zone and Management Act</b>					
Coastal Zone	Requires that activities conducted within a coastal zone be consistent with an approved state management program.	Applies to sites located within a coastal zone.	16 USC §1451 et seq.	Relevant and Appropriate	Site 7 is located within the coastal zone. Activities will be conducted in accordance with an approved state management program.
<b>National Historical Preservation Act of 1966 (NHPA) and Archaeological Resources Protection Act of 1979</b>					
Historical Locations and Archaeological Artifacts	Provides for the recovery and preservation of historical and archaeological significant artifacts. Implementing regulations for NHPA (36 CFR Part 65) establish the National Register of Historic Places and provide for preservation of historic properties and minimization of damage to historic landmarks.	Applies to historical properties and landmarks, and archaeological artifacts.	NHPA: 16 USC §470; 36 CFR Part 65. Archaeological Resources Protection Act.	Relevant and Appropriate	Based upon historical site use and available information, it is not likely that historical landmarks or artifacts exist at Site 7 or surrounding vicinities.
<p>* Statutes and policies, and their citations are provided as headings to identify general categories of potential ARARs for the convenience of the reader. Listing the statutes and policies does not indicate that Navy accepts the entire statutes or policies as potential ARARs. Specific potential ARARs are addressed in the table below each general heading; only substantive requirements of the specific citations are considered potential ARARs.</p> <p>ARARs - Applicable or relevant and appropriate requirements            CFR - Code of Federal Regulations            NWP - Nationwide Permit            USC - United States Code</p>					

**Table B-4  
Virginia Location-Specific ARARs  
NAB Little Creek, Virginia Beach, Virginia**

Location	Requirement	Prerequisite	Citation	ARAR Determination	Comment
<b>Virginia State Water Control Laws and Virginia Wetlands Regulations*</b>					
Wetland	Action to minimize the destruction, loss, or degradation of wetlands.	Wetland as defined by Virginia statutory provision.	General Provisions Relating to Marine Resources Commission, Va. Code Ann., 28.2-1300 to 1320 (1998); Wetlands Mitigation Compensation Policy, 4 VAC 20-390-10 to 50.	Applicable	Federal and/or state regulated wetlands are present at the site which could be impacted by the non time critical removal action at Site 7. The process of excavating in wetlands is marginally regulated at this time. Virginia's draft regulation, Virginia Administrative Code, 9 VAC 25-210 et seq establishes excavation and related activities as a regulated activity. Although CERCLA actions do not require permits in wetlands, the VDEQ (along with the USACE as the lead agency in CWA Section 404 actions) work with project proponents to meet the intent of the law, including compensatory mitigation.
<b>Chesapeake Bay Preservation Act and Chesapeake Bay Preservation Area Designation and Management Regulations*</b>					
Chesapeake Bay areas	Under these requirements, certain locally designated tidal and nontidal wetlands, as well as other sensitive land areas, may be subject to limitations regarding land-disturbing activities, removal of vegetation, use of impervious cover, erosion and sediment control, stormwater management, and other aspects of land use that may have effects on water quality.	Federally owned area designated as a Chesapeake Bay Preservation area.	Chesapeake Bay Preservation Act, Va. Code Ann., 10.1-2100 to 2116; Chesapeake Bay Preservation Area Designation and Management Regulations, 9 VAC 10-20-10 to 280	TBC	This requirement is not an ARAR since the area affected by the removal action is federally owned and the Cities of Virginia Beach and Norfolk do not have jurisdiction over NAB Little Creek.
<b>Coastal Zone Management Act; NOAA Regulations of Federal Consistency with approved State Coastal Zone Management Programs</b>					
Within coastal zone	Conduct activities within a coastal Management Zone in a manner consistent with local requirements.	Activities affecting the coastal zone including lands thereunder and adjacent shore land.	Section 307(c) of 16 USC 1456(c); also see 15 CFR 930 and 923.45	TBC	This requirement is not an ARAR since the Commonwealth of Virginia does not have jurisdiction over the federally owned NAB Little Creek.

**Table B-4  
Virginia Location-Specific ARARs  
NAB Little Creek, Virginia Beach, Virginia**

Location	Requirement	Prerequisite	Citation	ARAR Determination	Comment
<b>Virginia Endangered Species</b>					
Critical habitat upon which endangered species or threatened species depend.	Action to conserve endangered species or threatened species, including consultation with the Virginia Board of Game and Inland Fisheries.	Determination of effect upon endangered or threatened species or its habitat.	Virginia Code Ann. §§ 29.1-563 to 570 (1998)  <i>Definitions and Miscellaneous in General</i> , 4 VAC 15-20-130 to 140  Endangered Plant and Insect Species Act, Va. Code Ann. 3.1-1020 to 1030 (1998)	Relevant and Appropriate	Except for occasional transient individuals, no federally listed or proposed endangered species are known to exist at Site 7. Therefore, the requirements of the Endangered Species Act of 1973 (16 USC 1536(a)) will not be applicable to removal action.
<b>Virginia Natural Areas Preserves Act*</b>					
Natural preserves area	Action to conserve natural preserve areas and restrict certain activities in these areas	Applicable to sites that meet natural preserve area criteria as determined by the Virginia Department of Conservation and Recreation	Code of Virginia Sections 10.1-209 through 217	Relevant and Appropriate	Site 7 is not a natural preserves area.
<b>Virginia Endangered Plant and Insect Species Act; Virginia Board of Game and Inland Fisheries*</b>					
Endangered plant and insect species	Action to conserve endangered or protected plant and insect species	Applies to actions that affect endangered or protected plant and insect species.	Code of Virginia Sections 29.1-100 and 29.1-565  2 VAC 5-320-10	Relevant and Appropriate	No rare plant or insect species are known to occur in the vicinity of Site 7.

**Table B-4**  
**Virginia Location-Specific ARARs**  
**NAB Little Creek, Virginia Beach, Virginia**

Location	Requirement	Prerequisite	Citation	ARAR Determination	Comment
<p>* Statutes and policies, and their citations, are provided as headings to identify general categories of potential ARARs for the convenience of the reader. Listing the statutes and policies does not indicate that Navy accepts the entire statutes or policies as potential ARARs. Specific potential ARARs are addressed in the table below each general heading; only substantive requirements of the specific citations are considered potential ARARs.</p> <p>ARARs - Applicable or relevant and appropriate requirements</p> <p>CFR - Code of Federal Regulations</p> <p>CWA - Clean Water Act</p> <p>NOAA - National Oceanic and Atmospheric Administration</p> <p>TBC - To Be Considered</p> <p>USACE - United States Army Corps of Engineers</p> <p>VAC - Virginia Administrative Code</p> <p>VDEQ - Virginia Department of Environmental Quality</p>					

**Table B-6  
Virginia Action-Specific ARARs  
NAB Little Creek, Virginia Beach, Virginia**

Action	Requirement	Prerequisite	Citation	ARAR Determination	Comment
<b>Virginia Pollutant Discharge Elimination System (VPDES) Permit Regulations*</b>					
Discharge of Treated Water to Surface Waters, and certain storm water discharges	Regulated point-source discharges through VPDES permitting program. Permit requirements include compliance with corresponding water quality standards, establishment of a discharge monitoring system, and completion of regular discharge monitoring records.	Applicable to discharge of treated water to surface water, and to storm water discharges from certain facilities, including landfills.	9 VAC 25-31-10 to 940	Applicable	The facility has several VPDES permits. Construction activities will conform to 9 VAC 25-180-10 et seq for stormwater discharges from construction activities.
<b>Virginia Hazardous Waste Management Regulations (VHWMRs)</b>					
Hazardous Waste Staging, Transport, and Disposal	These regulations and laws define the requirements for the management of hazardous wastes. Any disposal facility must be properly permitted and in compliance with all operational and monitoring requirements of the permit and regulations.	Wastes must meet definition of hazardous waste.	9 VAC 20-60-420 to 500	Not Applicable	All information indicates excavation of soil/sediment will not required disposal as hazardous waste.
<b>Virginia Solid Waste Management Regulations (VSWMRs)</b>					
Solid Waste Staging, Transport, and Disposal	These regulations and laws define the requirements for the management of solid wastes. Any disposal facility must be properly permitted and in compliance with all operational and monitoring requirements of the permit and regulations.	Wastes must meet definition of solid waste.	9 VAC 20-80 et al	Applicable	Applicable to management and staging, transportation, and offsite disposal of any debris classified as a solid waste.
Off-site Disposal	Provides criteria for determining if solid waste disposal facility poses an adverse effect on human health or environment.	Permitted solid waste landfill.	9 VAC 20-80 et al	TBC	TBC for determining suitable offsite disposal facilities for non-hazardous waste. Applicable for onsite determination of disposal. Offsite disposal is not an ARAR.

**Table B-6  
Virginia Action-Specific ARARs  
NAB Little Creek, Virginia Beach, Virginia**

Action	Requirement	Prerequisite	Citation	ARAR Determination	Comment
<b>Virginia Air Pollution Control Regulations*</b>					
Discharge to air	Virginia Ambient Air Quality Standards - standards for ambient air quality to protect public health and welfare (including standards for particulate matter and lead).	Contamination of air affecting public health and welfare.	9 VAC 5-30-10 to 180	Applicable	Applicable for all site removal activities that may generate air discharges such a fugitive dust.
Discharge of visible emissions and fugitive dust	Fugitive dust/emissions may not be discharged to the atmosphere at amounts in excess of standards.	Any source of fugitive dust/ emissions.	9 VAC 5-50-60 to 120	Applicable	Applicable for any site removal activities that generate fugitive dust.
Discharge of toxic pollutants	Toxic pollutants may not be discharged to the atmosphere at amounts in excess of standards.	Any emission from the disturbance of soil, or treatment of soil or water, that do not qualify for the exemptions under Rule 4-3.	9 VAC 5-50-160 to 230	Applicable	Applicable for any site removal activities that generate toxic air pollutants. No toxic air pollutants are anticipated as part of this NTCRA.

**Table B-6  
Virginia Action-Specific ARARs  
NAB Little Creek, Virginia Beach, Virginia**

Action	Requirement	Prerequisite	Citation	ARAR Determination	Comment
<b>Virginia Stormwater Management Regulations and Virginia Erosion and Sediment Control Regulations</b>					
Stormwater Management	Regulates stormwater management and erosion/ sedimentation control practice.	Land disturbing activities.	<i>Stormwater Management Act, VA Code Ann. §§ 10.1-603.1 to 603.15 (1998);</i>  <i>Stormwater Management Regulations, 4 VAC 3-20-10 to 251</i>  Erosion and Sediment Control Law, Va. Code Ann. §§ 10.1-560 to 571 (1998); Erosion and Sediment Control Regulations, 4 VAC 50-30-10 to 110	Applicable	Applicable for any site removal activities involving surface water runoff and erosion. The NTCRA will include erosion and sediment control for stormwater.
<p>* Statutes and policies, and their citations, are provided as headings to identify general categories of potential ARARs. Specific ARARs are addressed in the table below each general heading.</p> <p>ARAR - Applicable or relevant and appropriate requirement</p> <p>CFR - Code of Federal Regulations</p> <p>NTCRA - Non-time critical removal action</p> <p>TBC - To Be Considered</p> <p>VAC - Virginia Administrative Code</p>					

**Appendix C**  
**Cost Estimates**

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TABLE C-1

Cost Estimate for Alternative #2: Excavation of Contaminated Sediments and Backfill with Clean Fill

Site 7 EE/CA

NAB Little Creek

Virginia Beach, VA

Cost Item	Unit	Quantity	Unit Cost	Cost	Cost Estimate Reference
<b>Excavation &amp; Removal of Contaminated Sediments</b>					
Clearing	AC	0.5	\$ 2,100.00	\$ 1,050.00	recent similar project
Tree removal*	EA	200	\$ 49.17	\$ 9,834.54	Means**, 02905-925-4200
Dewatering*	8 HR DY	40	\$ 260.07	\$ 10,402.76	Means**, 02230-500-0650
Aquadam, 6' height	EA	2	\$ 6,000.00	\$ 12,000.00	recent similar project
Aquadam, 3' height	EA	1	\$ 3,000.00	\$ 3,000.00	recent similar project
Long reach excavator	WK	6	\$ 3,000.00	\$ 18,000.00	recent similar project
Dump truck (on tracks)	EA/MO	2	\$ 12,000.00	\$ 24,000.00	recent similar project
20,000-gal tank	DY	40	\$ 35.00	\$ 1,400.00	recent similar project
Containment cell (30' x 30')					
HDPE liner*	SF	3600	\$ 0.14	\$ 511.40	Means**, 01500-800-0300
hay bales*	LF	480	\$ 2.90	\$ 1,389.95	Means**, 02370-150-1250
Excavation of sediment (wet)	CY	1150	\$ 5.00	\$ 5,750.00	recent similar project
Drying agent	CY	575			
multiply by 1.10 for TN	TN	630	\$ 28.00	\$ 17,640.00	recent similar project
Dried sediment (multiply by 1.42 for dewatered TN)	TN	1630			
Removal of remains of access road (dry soil)	CY	225	\$ 5.00	\$ 1,125.00	recent similar project
multiply by 1.55 for TN	TN	350			
Removal of remains of culvert (concrete)	CY	225	\$ 5.00	\$ 1,125.00	recent similar project
multiply by 1.89 for TN	TN	430			
Waste characterization (TCLP)	EA	3	\$ 750.00	\$ 2,250.00	recent similar project
Waste T/D (solids)	TN	3040	\$ 50.00	\$ 152,000.00	recent similar project
Waste T/D (water)	GAL	24000	\$ 0.65	\$ 15,600.00	recent similar project
<b>Backfill and erosion control</b>					
Sand Fill	CY	1200	\$ 15.00	\$ 18,000.00	recent similar project
Erosion control mat*	SY	700	\$ 0.47	\$ 328.91	Means**, 02370-550-0070
Tree planting*	EA	200	\$ 15.63	\$ 3,125.20	Means**, 02912-350-0320
<b>Excavation/Backfill Subtotal</b>				<b>\$ 298,532.76</b>	
Contingency (20%)				\$ 59,706.55	
<b>Subtotal</b>				<b>\$ 358,239.31</b>	
General Conditions (10%)				\$ 35,823.93	
Mob/Demob (5%)				\$ 17,911.97	
<b>Subtotal</b>				<b>\$ 411,975.21</b>	
Contractor OHP/P (15%)				\$ 61,796.28	
<b>EXCAVATION/BACKFILL TOTAL</b>				<b>\$ 473,771.49</b>	
Design Costs (10%)				\$ 47,377.15	
Construction Oversight (15%)				\$ 71,065.72	
<b>TOTAL COST OF ALT 2</b>				<b>\$ 592,214.36</b>	

\*Base costs used are 2001 dollars. A factor of +3% per year was used to adjust cost.

\*\*R.S. Means, *Site Work and Landscape Cost Data*, 2001.

## Assumptions

1. trees will be cut down to 6"
2. felled trees will be disposed of off site
3. 6" stumps and roots will be left to aid in slope stabilization
4. Dewatering includes 2 4" pumps, 8 hrs/day
5. 1 ft excavation
6. 1 ft backfill
7. tank will be used to store water from dewatered excavated sediment
8. 4 containment cells used for dewatering
9. sediment will be dewatered/dried, then hauled for disposal
10. erosion control mats used for slope stabilization in areas of exposed soils (may not be needed)

TABLE C-2

Cost Estimate for Alternative #3: Debris Removal, Removal of Contaminated Sediments and Backfill with Clean Fill

Site 7 EE/CA

NAB Little Creek

Virginia Beach, VA

Cost Item	Unit	Quantity	Unit Cost	Cost	Cost Estimate Reference
<b>Debris Removal</b>					
Pre-removal survey	HR	16	\$ 65.00	\$ 1,040.00	recent similar project
Temporary access road	EA	1	\$ 5,000.00	\$ 5,000.00	recent similar project
Excavation of debris (concrete)	CY	8000	\$ 11.00	\$ 88,000.00	recent similar project
multiply by 1.89 for TN	TN	15120			
Excavation of debris (other)	CY	2000	\$ 11.00	\$ 22,000.00	recent similar project
multiply by 0.95 for TN	TN	1900			
Waste characterization (TCLP)	EA	2	\$ 750.00	\$ 1,500.00	recent similar project
Waste T/D (solids)	TN	17000	\$ 50.00	\$ 850,000.00	recent similar project
<b>Excavation &amp; Removal of Contaminated Sediments</b>					
Clearing	AC	0.5	\$ 2,100.00	\$ 1,050.00	recent similar project
Tree removal*	EA	200	\$ 49.17	\$ 9,834.54	Means**, 02905-925-4200
Dewatering*	8 HR DY	40	\$ 260.07	\$ 10,402.76	Means**, 02230-500-0650
Aquadam, 6' height	EA	2	\$ 6,000.00	\$ 12,000.00	recent similar project
Aquadam, 3' height	EA	1	\$ 3,000.00	\$ 3,000.00	recent similar project
Long reach excavator	WK	6	\$ 3,000.00	\$ 18,000.00	recent similar project
Dump truck (on tracks)	EA/MO	2	\$ 12,000.00	\$ 24,000.00	recent similar project
20,000-gal tank	DY	40	\$ 35.00	\$ 1,400.00	recent similar project
Containment cell (30' x 30')					
HDPE liner*	SF	3600	\$ 0.14	\$ 511.40	Means**, 01500-800-0300
hay bales*	LF	480	\$ 2.90	\$ 1,389.95	Means**, 02370-150-1250
Excavation of sediment (wet)	CY	1150	\$ 5.00	\$ 5,750.00	recent similar project
Drying agent	CY	575	\$ 28.00	\$ 16,100.00	recent similar project
multiply by 1.10 for TN	TN	630			
(multiply by 1.42 for dewatered TN)	TN	1630			
Removal of remains of access road (dry soil)	CY	225	\$ 5.00	\$ 1,125.00	recent similar project
multiply by 1.55 for TN	TN	350			
Removal of remains of culvert (concrete)	CY	225	\$ 5.00	\$ 1,125.00	recent similar project
multiply by 1.89 for TN	TN	430			
Waste characterization (TCLP)	EA	3	\$ 750.00	\$ 2,250.00	recent similar project
Waste T/D (solids)	TN	3040	\$ 50.00	\$ 152,000.00	recent similar project
Waste T/D (water)	GAL	24000	\$ 0.65	\$ 15,600.00	recent similar project
<b>Backfill and erosion control</b>					
Sand Fill	CY	1200	\$ 15.00	\$ 18,000.00	recent similar project
Erosion control mat*	SY	700	\$ 0.47	\$ 328.91	Means**, 02370-550-0070
Tree planting*	EA	200	\$ 15.63	\$ 3,125.20	Means**, 02912-350-0320
<b>Removal/Excavation/Backfill Subtotal</b>				<b>\$ 1,264,532.76</b>	
Contingency (20%)				\$ 252,906.55	
<b>Subtotal</b>				<b>\$ 1,517,439.31</b>	
General Conditions (10%)				\$ 151,743.93	
Mob/Demob (5%)				\$ 75,871.97	
<b>Subtotal</b>				<b>\$ 1,745,055.21</b>	
Contractor OH/P (15%)				\$ 261,758.28	
<b>REMOVAL/EXCAVATION/BACKFILL TOTAL</b>				<b>\$ 2,006,813.49</b>	
Design Costs (10%)				\$ 200,681.35	
Construction Oversight (15%)				\$ 301,022.02	
<b>TOTAL COST OF ALT 3</b>				<b>\$ 2,508,516.86</b>	

\*Base costs used are 2001 dollars. A factor of +3% per year was used to adjust cost.

\*\*R.S. Means, *Site Work and Landscape Cost Data*, 2001.

## Assumptions

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1. trees will be cut down to 6"
2. felled trees will be disposed of off site
3. 6" stumps and roots will be left to aid in slope stabilization
4. Dewatering includes 2 4" pumps, 8 hrs/day
5. 1 ft excavation
6. 1 ft backfill
7. tank will be used to store water from dewatered excavated sediment
8. 4 containment cells used for dewatering
9. sediment will be dewatered/dried, then hauled for disposal
10. erosion control mats used for slope stabilization in areas of exposed soils (may not be needed)
11. removal of miscellaneous surface debris assumes access is possible without special consideration
12. debris removal volumes are assumed to be 80% concrete and 20% timber/soil/metal.

**Attachment B**

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Final

**Engineering Evaluation/Cost Analysis  
for Demolition Debris Landfill & Adjacent  
Wetland/Aquatic Areas  
Site 8**

**Naval Amphibious Base Little Creek  
Virginia Beach, Virginia**

**Contract Task Order 0080**

**January 2005**

Prepared for

**NAVFAC Atlantic**

Under the

**CLEAN III Program**

**Contract N62470-02-D-3052**

Prepared by



**CH2MHILL**

**Virginia Beach, Virginia**

# Executive Summary

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This report presents an Engineering Evaluation and Cost Analysis (EE/CA) for a non-time-critical removal action (NTCRA) at Site 8, Demolition Debris Landfill, at the Naval Amphibious Base (NAB) Little Creek in Virginia Beach, Virginia. Site 8 is located in the south portion of the Base, east of the intersection of Amphibious Drive and Helicopter Road. Site 8 was formerly used as a borrow source for material to surface parking lots, and then later used as a disposal area for demolition debris material from throughout the Base. Two distinct elements of Site 8 are being addressed in this EE/CA as part the NTCRA for the site. These elements are:

- A. Demolition Debris Landfill – area formerly used for the disposal of solid wastes.
- B. Wetland/Aquatic Areas – former Debris Pile (DP) 13 and Pond 2. Former DP 13 is a wetland area containing residual subsurface debris. Pond 2 is adjacent to the eastern portion of the landfill and contains submerged waste, including a steel tank, and wood and metal debris.

Previous investigations have been completed at Site 8 to identify the nature and extent of debris and associated potential contamination. Historical records indicate the site was used in the late 1970s as a disposal area of primarily inert materials. Wastes reportedly discarded in the landfill include concrete piping, concrete debris, wooden pilings, at least two empty steel storage tanks, paint cans, waste containers, mercury-contaminated carpeting from the demolition of a dental clinic, debris from buildings destroyed by fire, and debris removed from the bar screen in the Base sewage pump stations. Approximately 4,840 cubic yards (cy) of waste were estimated to be contained in the landfill intermixed with soil (*Five Year Site Management Plan, NAB Little Creek, CH2M HILL, May 2000*).

During December 2000, CH2M HILL performed a surface debris survey at the Demolition Debris Landfill. Approximately 650 cy of surface debris was identified throughout the site. A removal action was conducted in 2002 to remove the surface debris identified during the investigation. Trenching activities were also conducted to verify the extent (lateral and vertical) of the debris within the landfill. Based on these efforts, the boundary of the landfill was revised to be smaller than previously estimated. Remedial Investigation sampling was conducted following the debris removal in January and February of 2002. Sample locations, while biased toward the former debris pile sites, covered the entire site. Groundwater, surface water, sediment, and surface/subsurface soil were sampled. The data were used for the Remedial Investigation (RI), Human Health Risk Assessment (HHRA), and Ecological Risk Assessment (ERA).

Based on data presented in the RI, potable use of shallow groundwater poses a potential risk, due principally to a point location of elevated arsenic (LS08-MW04) and vanadium (LS08-MW05). The arsenic and vanadium are not believed to be related to the Demolition Debris Landfill as highest concentrations are side-gradient to the landfill, arsenic is not a contaminant of concern in Site 8 soils, and there is no definable plume. The Navy, in

partnership with the United States Environmental Protection Agency (USEPA) Region III and the Virginia Department of Environmental Quality (VDEQ), agrees the elevated arsenic and vanadium in groundwater is not associated with a CERCLA release from Site 8, and that potential groundwater risk associated with Site 8 is acceptable. Nonetheless, to ensure protection of human health and the environment, the Navy will further assess groundwater in the area of elevated arsenic and vanadium separate from the CERCLA actions being conducted at Site 8. The Navy, the USEPA, and VDEQ agree that LS08-MW04 and LS08-MW05 will be monitored within the boundary of Site 7, immediately west of Site 8, as part of the long-term-monitoring (LTM) associated with Site 7.

The ERA concluded the potential ecological risks associated with sediment are low for site-related chemicals, and are principally limited to former DP 13 and Pond 2. The Navy, EPA, and VDEQ agree, based on the results of the risk assessment, that current risks posed by sediment and groundwater are within an acceptable level. The Navy, in partnership with the EPA and VDEQ, agree that, if implemented, the recommended alternatives evaluated in this EE/CA will further reduce the low potential ecological risk, such that confirmation sampling for soil and sediment will not be required as a result of the removal action and wetland creation.

The purpose of this NTCRA is to eliminate exposure of receptors to potential risk associated with debris and contaminants at Site 8. Alternatives were evaluated for each work element to determine a cost-effective means of completing the NTCRA to meet the following objectives:

- Work Element A: Demolition Debris Landfill – Implement measures at Site 8 that eliminate potential exposure to contents of the landfill by potential human health and ecological receptors and provide a long-term land use management plan for the area.
- Work Element B: Wetland/Aquatic Areas – Implement measures at former DP 13 that would eliminate potential risk to ecological receptors in the area and implement measures at Pond 2 that would eliminate potential unacceptable risk to ecological receptors in the sediment.

In the preparation of this EE/CA, several remedial action alternatives were scoped and developed to meet the NTCRA objectives. This EE/CA presents the scope of the engineering measures used to develop the remedial action alternatives evaluated to perform this NTCRA. If the recommended alternatives evaluated in this EE/CA are implemented, low potential ecological risk will be further reduced such that confirmation sampling for soil and sediment will not be required as a result of the removal action and wetland creation.

For Work Element A, the following alternatives were evaluated:

1. No action
2. Construction of a soil cover on the landfill with Institutional Controls (ICs)
3. Complete removal of the debris landfill and construction of a tidal wetlands within the excavated area

For Work Element B, the following alternatives were evaluated:

1. No action
2. Excavation of remaining subsurface debris/sediments around former DP 13, backfill of the area with clean fill, and restoration of the wetlands in the area of former DP 13; and excavation of debris and bottom sediment from around and within Pond 2 and restoration of the pond
3. Excavation of remaining subsurface debris/sediments around former DP 13; removal of residual debris and sediment in Pond 2 and backfill with granular fill; restoration of the wetlands in the area of former DP 13; and construction of tidal wetlands within the area of Pond 2

For both work elements, Alternative 1 (No Action) does not meet the objectives of the NTCRA to eliminate risk to human health and the environment. As such, implementation of this alternative is not recommended.

For Work Element A, Alternative 2 is effective in reducing exposure to human health and the environment, but requires ICs and long-term operation and maintenance (O&M) to control future land use and to provide for future cover maintenance, inspections, and groundwater assessment monitoring because the landfill contents will remain in place. Alternative 3 meets the objectives and presents an opportunity to create a wetland habitat with unrestricted land use; there are no O&M requirements associated with this alternative once the wetlands are established. Therefore, Alternative 3 is recommended for Work Element A.

For Work Element B, Alternative 3 is recommended over Alternative 2, as it provides an opportunity to enhance the tidal wetland area and expand the wetlands to tie into Alternative 3 for Work Element A. In addition, backfill within Pond 2 will expand the tidal wetland area and eliminate potential ecological risk. The cleanout of Pond 2 will require excavation below the water surface. Selection of Alternative 3 for Work Elements A and B will meet the objectives of this EE/CA for Site 8 at NAB Little Creek.

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# Acronyms and Abbreviations

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ARARs	applicable or relevant and appropriate requirements
bgs	below ground surface
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CFR	Code of Federal Regulations
CLEAN	Comprehensive Long-Term Environmental Action Navy
COPC	contaminant of potential concern
CTO	Contract Task Order
cy	cubic yard(s)
DDE	dichlorodiphenyldichloroethylene
DDT	dichlorodiphenyltrichloroethane
DP	Debris Pile
EE/CA	Engineering Evaluation/Cost Analysis
ERA	Ecological Risk Assessment
HHRA	Human Health Risk Assessment
HQ	Hazard Quotient
IAS	Initial Assessment Study
IC	Institutional Control
IR	Installation Restoration
LTM	long-term monitoring
MCL	Maximum Contaminant Level
NAB	Naval Amphibious Base
NAVFAC MID-ATLANTIC	Naval Facilities Engineering Command, Atlantic Division
NCP	National Oil and Hazardous Substance Pollution Contingency Plan
NFA	No Further Action
NPL	National Priorities List
NTCRA	non-time-critical removal action
O&M	Operations and Maintenance
PAH	polycyclic aromatic hydrocarbon
PCB	polychlorinated biphenyl
PWC	Public Works Center
RAO	Remedial Action Objective
RBC	Risk-Based Concentration
RCRA	Resource Conservation and Recovery Act

RFA	RCRA Facility Assessment
RI	Remedial Investigation
ROD	Record of Decision
RRRS	Relative Risk Ranking System
RVS	Round 1 Verification Step
SARA	Superfund Amendments and Reauthorization Act
SERA	Screening Ecological Risk Assessment
SI	Site Investigation
SVOC	semivolatile organic compound
TAL	Target Analyte List
TCL	Target Compound List
USEPA	United States Environmental Protection Agency
VDEQ	Virginia Department of Environmental Quality
VOC	volatile organic compound

## SECTION 1

# Introduction

---

This report presents an Engineering Evaluation/Cost Analysis (EE/CA) for a non-time-critical removal action (NTCRA) for Site 8, Demolition Debris Landfill, at the Naval Amphibious Base (NAB) Little Creek, Virginia Beach, Virginia. The EE/CA is prepared under the Naval Facilities Engineering Command, Mid-Atlantic Division (NAVFAC MID-ATLANTIC) Comprehensive Long-Term Environmental Action Navy (CLEAN) Contract Number N62470-02-D-3052, Contract Task Order (CTO) 080.

A general location map of NAB Little Creek is illustrated in Figure 1-1. A detailed map showing the location of Site 8 is provided in Figure 1-2. Previous site inspections identified Site 8 as requiring environmental consideration due to visual observation of surface demolition debris and analytical data indicating potential site contamination. Several contaminants of potential concern (COPCs) were identified during a December 1999 Site Investigation (SI)(CH2M HILL, 1999). The COPCs identified in soil and groundwater include dieldrin, iron, mercury, arsenic, and manganese. These COPCs were further evaluated during the Remedial Investigation/Human Health Risk Assessment (RI/HHRA) and Ecological Risk Assessment (ERA) (through Step 3) (CH2M HILL, April 2004). A site layout map is presented in Figure 1-3.

The following information is presented within this EE/CA:

- Site description
- Identification of the removal action objectives
- Description of response action elements
- Identification of the removal action alternatives and technologies
- Recommendation of a preferred removal alternative
- Schedule for the selected removal alternative

## 1.1 Regulatory Background

This document is issued by the U.S. Department of the Navy, lead agency responsible for remediation of Site 8, in partnership with the United States Environmental Protection Agency (USEPA) Region III and the Virginia Department of Environmental Quality (VDEQ), under Section 104 of the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) and the Superfund Amendments and Reauthorization Act (SARA) of 1986.

Section 104 of CERCLA and SARA allows an authorized agency to remove, or arrange for removal of, and to provide for remedial action relating to hazardous substances, pollutants, or contaminants at any time, or to take any other response measures consistent with the National Oil and Hazardous Substance Pollution Contingency Plan (NCP) as deemed necessary to protect public health or welfare and the environment.

The NCP, 40 Code of Federal Regulations (CFR) 300, provides regulations for implementing CERCLA and SARA, and regulations specific to removal actions. The NCP defines a removal action as the “cleanup or removal of released hazardous substances from the environment, such actions as may be necessary to monitor, assess, and evaluate the threat of release of hazardous substances; the disposal of removed material; or the taking of such other actions as may be necessary to prevent, minimize, or mitigate damage to the public health or welfare or to the environment, which may otherwise result from a release or threat of release.” Removal actions are being considered for each of the work elements. These removal actions are not time-critical. NTCRAs are defined in 40 CFR Section 300.415(b)(4) as “actions pertaining to an imminent threat to human health and the environment and that have planning periods of 6 months or more.” For time-critical removal actions, activities shall begin as soon as possible to “abate, prevent, minimize, stabilize, mitigate, or eliminate the threat to public health or welfare of the United States or the environment” (40 CFR Section 300.415(b)(3)).

The 40 CFR Section 300.415 requires the lead agency to conduct an EE/CA when a NTCRA is planned for a site. The goals of an EE/CA are to identify the objectives of the removal action and to analyze the effectiveness, implementability, and cost of various alternatives that may satisfy these objectives. An EE/CA documents the removal action alternatives and selection process. Where the extent of the contamination is well defined and limited in extent, NTCRAs also allow for the expedited cleanup of sites in comparison to the remedial action process under CERCLA.

Community involvement requirements for NTCRAs include preparing an EE/CA and making it available for public review and comment for a period of 30 days. An announcement of the 30-day public comment period on the EE/CA is required in a local newspaper. Written responses to significant comments will be summarized in an Action Memorandum and included in the Administrative Record.

## 1.2 Purpose and Objectives

Submittal of this document fulfills the requirements for NTCRAs defined by CERCLA, SARA, and the NCP. This EE/CA has been prepared in accordance with USEPA’s guidance document *Guidance on Conducting Non-Time-Critical Removal Actions Under CERCLA*, PB93-963402, August 1993.

The EE/CA compares several remedial alternatives based on their technical feasibility, ability to protect human health and the environment, ability to prevent the potential release of hazardous constituents, and cost. Individual goals of this EE/CA are to: (1) satisfy environmental review and public information requirements for removal actions, (2) satisfy Administrative Record requirements for documenting the removal action selection, and (3) provide a framework for evaluating and selecting alternative technologies.

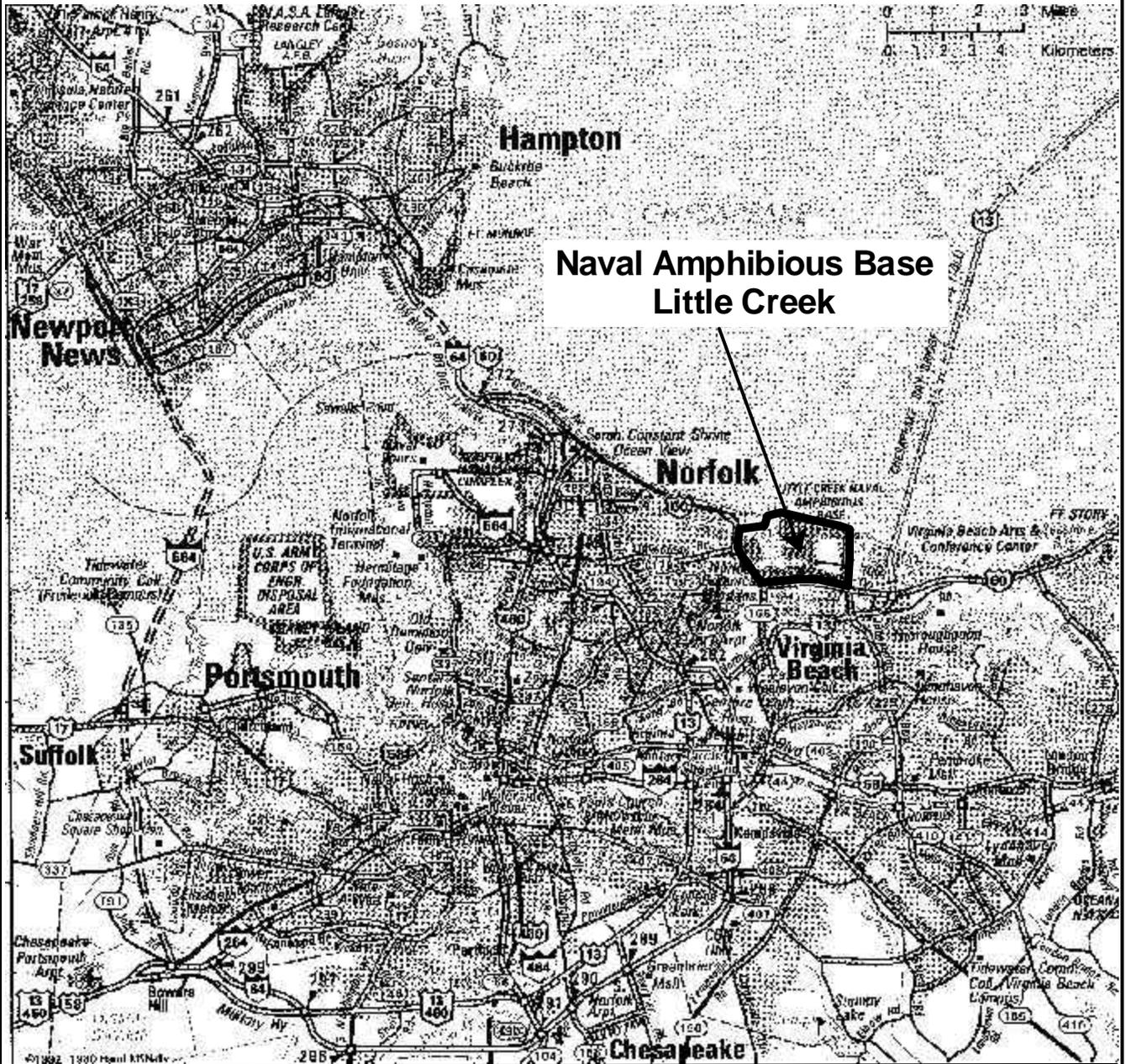
The objective of this NTCRA is to evaluate long-term landfill remediation to be protective of human health and the environment and to reduce or eliminate compounds determined to pose potential unacceptable risk to ecological receptors in the sediments in DP 13 and Pond 2. The following alternatives were evaluated:

Work Element A (Demolition Debris Landfill):

1. No action
2. Construction of a soil cover on the landfill with Institutional Controls (ICs)
3. Complete removal of the debris landfill and construction of a tidal wetlands within the excavated area

Work Element B (Wetland/Aquatic Area):

1. No action
2. Excavation of remaining subsurface debris/sediments in former Debris Pile (DP) 13, backfill of the area with clean fill, and restoration of the wetlands; and excavation of debris and bottom sediment from Pond 2 and restoration of the pond
3. Excavation of remaining subsurface debris/sediments in former DP 13; removal of residual debris and sediment in Pond 2 and backfill with granular fill; restoration of tidal wetlands in the area of former DP 13; and construction of tidal wetlands within the area of Pond 2

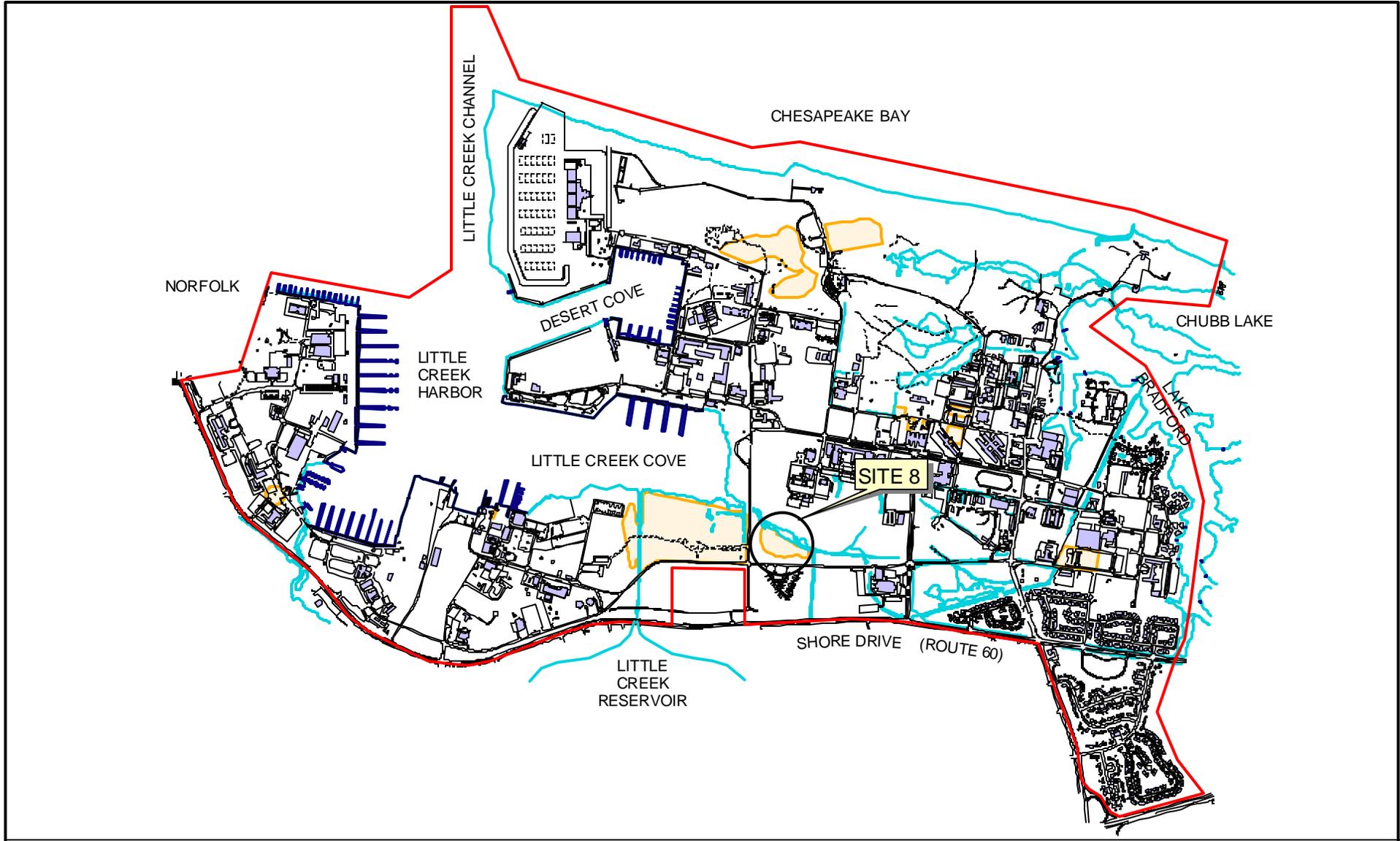


**Naval Amphibious Base  
Little Creek**

Source: Rand McNally

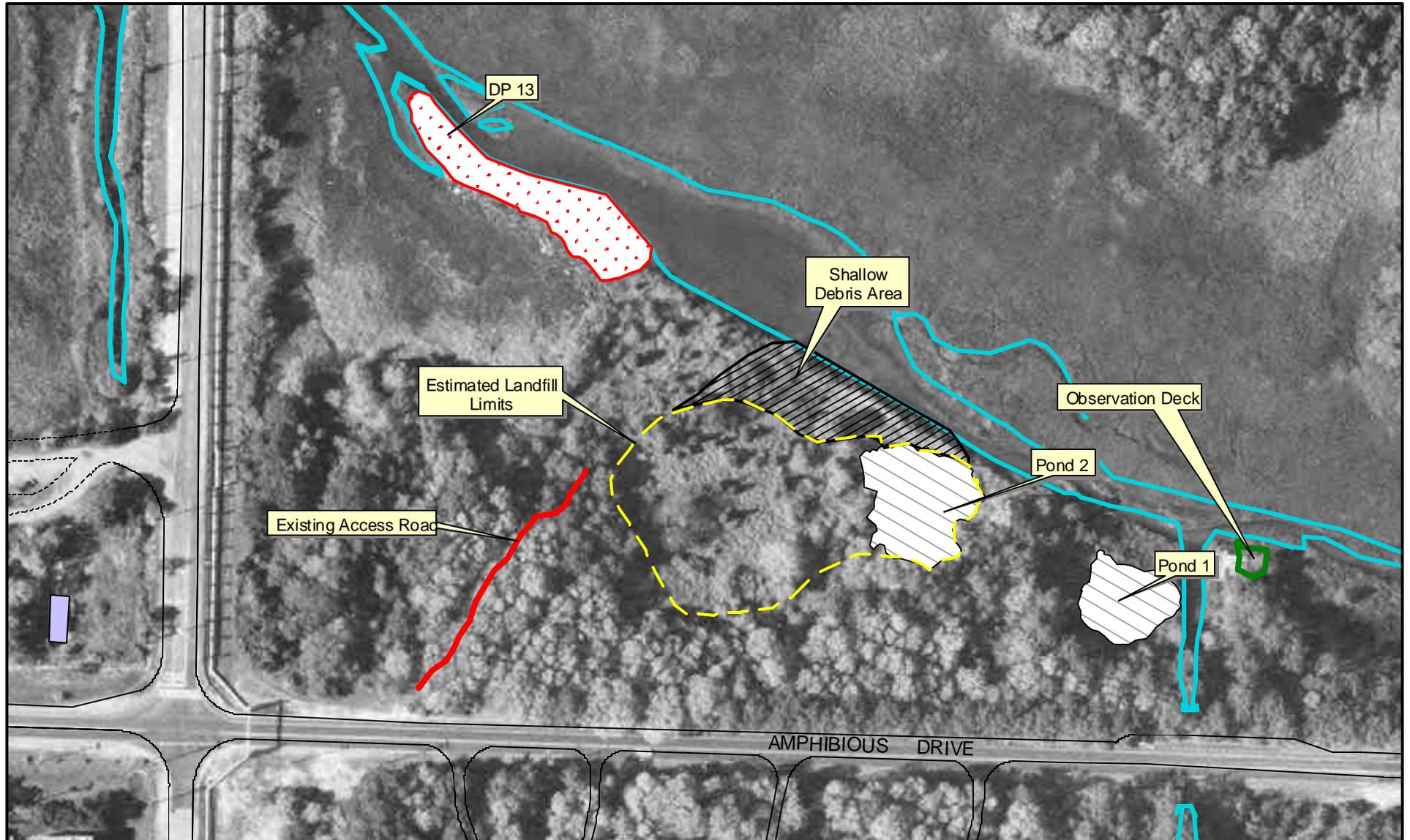


Figure 1-1  
Regional Location Map  
Site 8 EE/CA  
NAB Little Creek  
Virginia Beach, Virginia



0 1000 2000 Feet

Figure 1-2  
Site Location Map  
Site 8 EE/CA  
NAB Little Creek  
Virginia Beach, Virginia



**LEGEND**

-  Existing Access Roads
-  Estimated Landfill Limits
-  Water Features
-  Ponds
-  Debris Pile

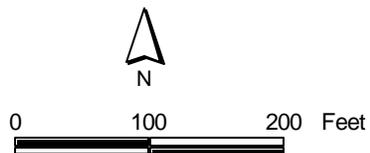


Figure 1-3  
Site Layout  
Site 8 EE/CA  
NAB Little Creek  
Virginia Beach, Virginia

## SECTION 2

# Site Description and Previous Investigations

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This section provides a brief summary of background information for NAB Little Creek and Site 8. It also discusses previous environmental investigations and actions that took place at Site 8.

## 2.1 Site Description and Background

### 2.1.1 NAB Little Creek

NAB Little Creek provides logistic facilities and support services for local commands, organizations, home-ported ships, and other United States and allied units to meet the amphibious warfare training requirements of the Armed Forces of the United States. The 61 piers surrounding Little Creek Channel provide docking for approximately 43 Navy vessels home-ported at Little Creek (National Priorities List [NPL] Site Narrative Listing website, 1998; Department of Navy Environmental Program website, 1997).

The eastern portion of the Base is located in the northwest corner of Virginia Beach, Virginia, and the western portion of the Base is located adjacent to the City of Norfolk, Virginia (Figure 1-1). The area surrounding this 2,147-acre base is low lying and relatively flat with several fresh water lakes (Chubb Lake, Varian Lake, Lake Bradford, Little Creek Reservoir/Lake Smith, and Lake Whitehurst) located on or adjacent to the Base.

NAB Little Creek is primarily an industrial facility centered around three saltwater bodies: Little Creek Cove, Desert Cove, and Little Creek Channel, which connects the coves with the Chesapeake Bay. In addition to industrial land-use, NAB Little Creek is also used for recreational, commercial, and residential purposes.

NAB Little Creek was commissioned on July 30, 1945, by combining four contiguous activities. The Navy began purchasing land in the area from private estates and the Pennsylvania Railroad just prior to World War II. The first activity to be commissioned was the Amphibious Training Base in the southwestern corner of the present base near Little Creek Harbor. The mission of the Base was the training of landing craft personnel for operational assignments. The second activity was the Construction Battalion Training Center, which occupies most of the current acreage of the facility. The third and fourth activities were the U.S. Naval Section Base and the Armed Guard Training Center, respectively. Over the last 59 years, NAB Little Creek has expanded in both area and the complexity of its mission and has added new activities.

### 2.1.2 Site 8

The Demolition Debris Landfill, Site 8, is located on the northeast corner of the intersection of Amphibious Drive and Helicopter Road. It was operated from 1971 through 1979 as a disposal area of primarily inert materials. Prior to landfilling activities, the Public Works Center (PWC) Transportation Division had excavated material from the site to surface

parking lots. A Site Location Map is presented as Figure 1-2. The Amphibious Base Landfill (Site 7) was in operation during the same time as the Demolition Debris Landfill and is located directly across Helicopter Road from the Demolition Debris Landfill. Site 7 received the bulk of the waste disposed of on the Base including municipal solid waste and likely some hazardous waste.

Site 8 is situated adjacent to and within wetlands that are fed by a drainage canal from Lake Bradford, stormwater from on- and off-base properties, and possibly discharge from the surficial aquifer. The wetlands drain into Little Creek Cove and experience tidal fluctuations. A Watchable Wildlife Area is located on the northeastern corner of the site.

Wastes reportedly contained within the landfill include concrete piping, concrete debris, wooden pilings, at least two empty steel storage tanks (approximately 250- to 500-gallon capacity), paint cans, metal containers, mercury-contaminated carpeting from the demolition of a dental clinic, debris from buildings destroyed by fire, and debris removed from the bar screen in the Base sewage pump stations. Approximately 4,840 cubic yards (cy) of waste intermixed with soil were estimated to be contained in the landfill (*Five Year Site Management Plan, NAB Little Creek, CH2M HILL, May 2000*).

The Demolition Debris Landfill waste is laterally non-contiguous and was disposed of to a depth of at least 5.5 ft over an approximate 4-acre area. The landfill was constructed in a pit where the PWC—Transportation Division had excavated material from the site to surface parking lots. On the western portion of the landfill, wooden pilings, empty metal waste containers, paint cans, concrete piping, and other concrete construction debris were placed directly on the ground surface. On the eastern and southern edges of the landfill, some wastes appear to be buried in elongated trenches. Two ponds were identified on the eastern portion of the landfill. The surface debris clearing action completed in 2002 removed approximately 650 cy of materials located on and around the landfill, including surrounding wetland areas. Concrete debris was the only visible waste in the vicinity of Pond 1. Pond 2 is located about 150 ft northwest of Pond 1. At least one steel tank, metal debris, and some waste containers were partially submerged in Pond 2. Landfill debris was disposed of to the edge of the wooded area bounding the southern portion of the landfill. Figure 1-3 shows the layout of the site.

There is no documented inventory of hazardous waste that was being disposed of at Site 8, although no release controls were in place at the site and a detailed inventory of the materials disposed of is not available. Access to the area is unrestricted. Heavy vegetation minimizes trespassing at the site. An access road from a previous removal action is present to the southwest of the site; however, a locked gate prevents access to the site via the access road.

## 2.2 Previous Site Investigations

Previous investigations conducted at the site include the Initial Assessment Study (IAS), the Resource Conservation and Recovery Act (RCRA) Facility Assessment (RFA), the Relative Risk Ranking System (RRRS), the Site Investigation (SI), and a Screening Ecological Risk Assessment (SERA) (along with several other Installation Restoration (IR) sites at NAB Little Creek), the RI/HHRA, and a Draft Baseline ERA (through Step 3).

## 2.2.1 Initial Assessment Study

The IAS at NAB Little Creek was completed in December 1984 (Rogers, Golden, and Halpern, 1984). The purpose of the IAS was to identify and assess sites posing a potential threat to human health or the environment resulting from prior hazardous waste management activities. The study entailed the collection and evaluation of archival and activity records relating to waste generation, handling, and disposal; characterization of physical conditions at the site; and identification of migration pathways and potential receptors.

Based on the finding that contaminants from disposal areas may migrate toward surface water bodies, the IAS presented a number of detailed recommendations concerning the installation and sampling of monitoring wells; the sampling of surface soil, surface water, and sediment; and the types of laboratory analyses to be completed. These recommendations, with slight changes, became the scope of work for the Round 1 Verification Step (RVS). Seventeen sites were examined during the IAS at NAB Little Creek. It was determined that Site 8 did not pose an environmental or human health threat due to the nature of the fill material, the normal vegetative cover material, and the lack of seepage from the landfill face. No other action was recommended for Site 8.

## 2.2.2 RCRA Facility Assessment and Relative Risk Ranking Survey

The Demolition Debris Landfill was originally identified in the RFA conducted in 1989 as a potential site affected by contamination and was included in the Navy's RRRS. Five surface soil (0 to 6 in. below ground surface (bgs)), four subsurface soil ranging from 1 to 4 ft bgs, and three groundwater samples were collected from 1-in. monitoring wells and analyzed for volatile organic compounds (VOCs), semivolatile organic compounds (SVOCs), pesticides/polychlorinated biphenyls (PCBs), and metals during the RRRS. A high risk ranking was assigned to the site primarily due to the presence of metals in soil and groundwater (manganese, arsenic, beryllium, aluminum, vanadium, antimony, chromium, lead, and zinc). Additionally, VOCs, SVOCs, and Pesticides/PCBs were detected. The analytical results of the RRRS were not validated.

## 2.2.3 Site Investigation

An SI was conducted at Site 8 (CH2M HILL, 1999) to further characterize potential contamination and determine whether additional environmental characterization and/or remediation activities were warranted. The investigation consisted of the collection of eight subsurface and surface soil samples, four sediment samples, and the installation and sampling of five groundwater monitoring wells. Samples were analyzed for Target Compound List (TCL) VOCs, TCL SVOCs, TCL pesticides and PCBs, Target Analyte List (TAL) total metals, TAL dissolved metals (groundwater only), and cyanide. Metals and dieldrin (soil only) were identified as possible site related COPCs. Based on the results and conclusions of the SI, additional data evaluation and a remedial investigation were recommended for Site 8.

## 2.2.4 Screening Ecological Risk Assessment

A multi-site Screening ERA was conducted at NAB Little Creek in June 2000. The risk conclusions drawn from the Screening ERA at Site 8 (*Final Screening Ecological Risk*

*Assessment, Installation Restoration (IR) Sites 5, 7, 8, 9, 10, 11, 12, 13, and 16 and SWMU 3, CH2M HILL, June 2000*) found potential risks in most media to be low. The data used to complete the Screening ERA was collected during the 1998 SI at Site 8. The risk assessment concluded that low potential ecological risks were present primarily due to inorganics in groundwater discharging to sediment and surface water, and pesticides, PAHs, and metals in sediment and soil at the site. Potential risks to ecological receptors from surface water exposures were not evaluated because no surface water samples were collected.

## 2.2.5 Surface Debris Clearing

A total of 650 cy of miscellaneous wooden, concrete, and metal debris was removed from the ground surface at Site 8 during the completion of a Surface Debris Clearing activity conducted in 2002. This action was evaluated in the *Final Engineering Evaluation/Cost Analysis for Site 8* (CH2M HILL, October 2001). All materials were stockpiled, separated, and disposed of offsite in approved disposal facilities or recycled, if appropriate. Completion of the debris removal included constructing a temporary laydown/stockpile area of crushed concrete over woven geotextile near Amphibious Drive, performing work in such a manner to minimize disturbance to high quality wetlands (*Spartina*), and site restoration in areas used to construct access roads. Those wetland (*Phragmites*) areas disturbed during the surface debris clearing were monitored during the growing season to verify that additional planting/re-vegetation would not be necessary. Immediately following the completion of debris clearing activities, the RI sampling at Site 8 was initiated. Surface debris clearing activities were summarized in the *Close Out Report, Surface Debris Clearing Activities at Site 8, Demolition Debris Landfill* (CH2M HILL, June 2002).

## 2.2.6 Remedial Investigation/Human Health Risk Assessment/Ecological Risk Assessment

### 2.2.6.1 Summary of Findings

An RI was conducted at Site 8 to define the nature and extent of contamination, assess the fate and transport of contaminants, and quantitatively assess human health and ecological risk. RI activities included identifying and evaluating existing information for the site; conducting a soil cover survey to determine the thickness of the soil cap overlying the landfill; conducting trenching to determine the depth and lateral extent of debris in the landfill; conducting a wetland delineation; and conducting soil, groundwater, surface water, and sediment sampling.

The results of the investigation were presented in the *Final Remedial Investigation/Human Health Risk Assessment for Site 8 Demolition Debris Landfill, Naval Amphibious Base Little Creek, Virginia Beach, Virginia*, CH2M HILL, April 2004. The primary contaminants identified in the RI include PAHs, pesticides/PCBs, and inorganics. For current site use, there are no unacceptable human health risks or hazards. Future exposure to combined surface and subsurface soil by a future child resident may result in a noncarcinogenic hazard slightly above the USEPA's target hazard of one, which is mainly associated with iron. Risks associated with exposure to the combined surface and subsurface soil by all of the other potential future receptors are within USEPA's target levels. Future potable use of Columbia Aquifer groundwater, while highly unlikely, would result in an unacceptable risk and

hazard to both child and adult residents, industrial workers, and construction workers; the carcinogenic risk is associated with arsenic.

Potential site-related ecological risks in wetland/aquatic areas of the site were generally low and were spatially restricted (Table 2-1). PAHs were highest in the vicinity of former DP 13 and may represent a potential risk to lower trophic level receptors in the sediments and, to a lesser extent, the wetland soils of this area. Risks to lower trophic level receptors in Pond 2 are possible from exposure to metals, especially zinc. COPCs identified at Pond 2 include: aluminum, iron, and manganese in the surface waters, and barium, selenium, zinc, and 4,4'-DDE in the sediments.

The complete and critical exposure pathways are direct exposure of lower trophic level wetland receptors to PAHs in the sediments of the tidal wetlands (likely to be restricted to the area near former DP 13) and direct exposure of lower trophic level wetland/aquatic receptors to aluminum, iron and manganese in the surface water, and to barium, selenium, zinc, and 4,4'-DDE in the sediments, of Pond 2.

Trenching activities conducted in 2002 as part of the RI revealed that the bulk of the landfill waste is in the central to northeastern area of Site 8 with less than 2 ft of soil cover present over the majority of the landfill limits. Thickness of waste varies from a few inches to greater than 7 ft and contains mostly metal and concrete debris. Several of the test trenches revealed waste below the water table. Results of the Soil Cover Survey are included in the Technical Memorandum, *Results of the Soil Cover Survey* (CH2M HILL, June 12, 2002), which is presented as Appendix A.

#### 2.2.6.2 RI/HHRA/ERA Recommendations/Considerations for EE/CA

Data collected and evaluated during the RI are sufficient to evaluate remedial alternatives for development of this EE/CA for the site. While there are no human health risks under current site use, there is potential risk for unrestricted use/unrestricted exposure associated with landfill debris; the alternatives evaluated in this EE/CA were developed to eliminate this risk.

Based on data presented in the RI, potable use of shallow groundwater poses a potential risk, due principally to a point location of elevated arsenic (LS08-MW04 and LS08-MW05). The arsenic is not believed to be related to the demolition debris landfill as highest concentrations are side-gradient to the landfill, arsenic is not a COC in Site 8 soils, and there is no definable plume. The Navy, in partnership with the EPA and VDEQ agree the elevated arsenic in groundwater is not associated with a CERCLA release from Site 8, and that potential groundwater risk associated with Site 8 is acceptable. Nonetheless, to ensure protection of human health and the environment, the Navy will further assess groundwater in the area of elevated arsenic separate from the CERCLA actions being conducted at Site 8. The Navy, the EPA, and VDEQ agree that this area of elevated arsenic will be investigated within the boundary of the Site 7 Landfill, immediately west of Site 8, and that these groundwater monitoring wells (LS08-MW04 and LS08-MW05) will be monitored as part of the long-term-monitoring (LTM) associated with Site 7.

The ERA concluded the potential ecological risks associated with sediment are low for site-related chemicals, and are principally limited to former DP 13 and Pond 2 (Table 2-1). The Navy, EPA, and VDEQ agree, based on the results of the risk assessment, that current risks posed by sediment and groundwater are within an acceptable level. The Navy, in partnership with the EPA and VDEQ, agree that, if implemented, the recommended alternatives evaluated in this EE/CA will further reduce the low potential ecological risk, such that confirmation sampling for soil and sediment will not be required as a result of the removal action and wetland creation.

TABLE 2-1  
 Summary of Ecological COCs  
 NAB Little Creek, Virginia Beach, VA

Chemical	Tidal Wetlands	Pond 1	Pond 2
<b>Inorganics</b>			
Aluminum			
Barium			X
Iron			
Manganese			
Selenium		X	X
Zinc			X
<b>Pesticides/PCBs</b>			
alpha-Chlordane	X		
gamma-Chlordane	X		
4,4'-DDE	X		X
4,4'-DDT	X		
<b>Semivolatile Organic Compounds</b>			
PAHs	X		

Shaded cells indicate chemicals that are not likely to be site related

# Identification of Objective

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## 3.1 Statutory Limits on Removal Action

The NCP 40 CFR Part 300.415 dictates statutory limits of \$2 million and 12 months of 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 Navy/Marine Corps IR Manual does not limit the cost or duration of the removal action; however, cost-effectiveness is a recommended criterion for the evaluation of removal action alternatives.

## 3.2 Remedial Action Objective and Scope

### 3.2.1 Remedial Action Objective (RAO)

The proposed RAO is to implement measures at Site 8 that would reduce or eliminate COPCs that pose potential unacceptable human health risk to due to exposure of the landfill contents, and potential ecological risk in sediment. Specifically, the RAO for each work element is:

- Work Element A – Demolition Debris Landfill: Implement measures at Site 8 that would eliminate potential for exposure to the landfill contents that pose potential unacceptable risk to human health and the environment.
- Work Element B – Wetland/Aquatic Area: Implement measures that would reduce or eliminate debris/sediment in wetland/pond areas that pose potential unacceptable risk to ecological receptors.

### 3.2.2 Removal Action Scope

In the preparation of this EE/CA, several removal action alternatives were scoped and developed to meet the objectives listed above. The scope of the engineering measures for each removal alternative developed is defined in this section.

For Work Element A – Demolition Debris Landfill, the alternatives are the following:

1. No action: The no action alternative implies that no removal work will be done at this site.
2. Construction of a soil cover on the landfill: The entire landfill area would be capped with 2 ft of clean soil. This option would incorporate actions for erosion protection, re-vegetation where applicable (site restoration), maintenance and performance monitoring (inspections and groundwater assessment), and ICs (define and manage future land use).

3. Removal of waste and construction of wetlands: Complete removal of landfill contents and construction of tidal wetlands within the excavated area further reducing the potential human health and ecological risk, such that confirmation sampling for soil and sediment will not be required.

For Work Element B— Wetland/ Aquatic Areas, the alternatives are the following:

1. No action: The no action alternative implies that no removal work will be done at this site.
2. Excavation and restoration: Excavation of remaining subsurface debris/sediments in former DP 13, backfill of the area with clean fill, restoration of the tidal wetlands; and excavation of debris and bottom sediment from around and within Pond 2. Excavation of debris and restoration of the tidal wetlands will further reduce low potential ecological risk, and backfilling with clean fill will eliminate the need for confirmation sampling.
3. Excavation, restoration, and creation of tidal wetlands: Excavation of remaining subsurface debris/sediments in former DP 13; removal of residual debris and sediment in Pond 2 and backfill with granular fill; restoration of tidal wetlands in the area of DP 13, and construction of tidal wetlands within the area of Pond 2. Excavation of debris and restoration and construction of tidal wetlands will further reduce low potential ecological risk, and backfilling with clean fill will eliminate the need for confirmation sampling.

### 3.3 Determination of Removal Schedule

The EE/CA was placed in the Administrative Record, and notice of its availability for public review along with a brief summary was published in the local newspaper. The EE/CA was subjected to a 30-day public comment period. The public comment period was held from December 2, 2004 – January 2, 2005. A public information session would have also been held during or immediately following the public comment period, if requested. Had public comments been received, following the public comment period, a Responsiveness Summary summarizing responses to significant comments will be prepared and included in the Administrative Record; however, no public comments were received. Since this removal action has been designated non-time critical, the start date will be determined by other factors. A possible factor may include weather conditions.

The total project period is predicted to last 15 months from the end of the of the public comment period through completion of removal actions. Critical milestone periods related to the EE/CA are summarized below:

- EE/CA Public Comment Period – 1 month
- Subcontracting and Mobilization – 2 months
- Removal Action – 8 months
- CERCLA Documentation – 4 months

The estimated timeframe includes the time required for mobilization and setup of equipment and performing the selected removal actions. Additionally, monitoring will be

conducted under the wetland restoration alternative to ensure survival of the new plant species. Section 4 provides details regarding the amount of time necessary to complete the removal actions.

### 3.4 Applicable or Relevant and Appropriate Requirements

The removal action will, to the extent practicable, comply with applicable or relevant and appropriate requirements (ARARs) under federal and state environmental laws, as described in 40 CFR 300.415. Appendix B contains the ARAR tables and provides a summary of each potentially related environmental law. Other federal and state advisories, criteria, or guidance will be considered, as appropriate, in formulating the removal action. Applicable requirements are those requirements specific to the conditions at Site 8 and the surrounding vicinity that satisfy all jurisdiction prerequisites of the law or requirements. Relevant and appropriate requirements are those that do not have jurisdiction authority over the particular circumstances at Site 8 and surrounding vicinity, but are meant to address similar situations, and therefore, are suitable for use at this site. Federal ARARs are determined by the lead agency, which in this case is the Department of the Navy. As outlined by 40 CFR 300.415(j), the lead agency may consider the urgency of the situation and the scope of the removal action to be conducted in determining whether compliance with ARARs is practicable.

The NCP, 40 CFR 300.400(g)(2), specifies factors to consider in determining what requirements of other environmental laws are relevant and appropriate:

- Purpose of the requirement in relation to the purpose of CERCLA
- Medium (or media) regulated by the requirement
- Substance(s) regulated by the requirement
- Actions or activities regulated by the requirement
- Variations, waivers, or exemptions of the requirement
- Type of place regulated and the type of place affected by the release or CERCLA action
- Type and size of the facility or structure regulated by the requirement or affected by the release
- Consideration of the use or potential use of affected resources in the requirement

In some circumstances, a requirement may be relevant to the particular site-specific situation but not appropriate because of differences in the purpose of the requirement, the duration of the regulated activity, or the physical size or characteristic of the situation it is intended to address. There is more discretion in the judgment of relevant and appropriate requirements than in the determination of applicable requirements.

Three classifications of requirements are defined by USEPA in the ARAR determination process: chemical-specific, location-specific, and action-specific.

*Chemical-specific ARARs* are health or risk management-based numbers or methodologies that result in the establishment of numerical values for a given medium that would meet the NCP “threshold criterion” of overall protection of human health and the environment. These requirements generally set protective cleanup concentrations for the chemicals of concern in the designated media, or set safe concentrations of discharge for remedial

activity. Federal and Commonwealth of Virginia chemical-specific regulations that have been reviewed are summarized in Appendix B.

*Location-specific ARARs* restrict remedial activities and media concentrations based on the characteristics of the surrounding environments. Location-specific ARARs may include restrictions on remedial actions within wetlands or floodplains, near locations of known endangered species, or on protected waterways. Federal and Commonwealth of Virginia location-specific regulations that have been reviewed are summarized in Appendix B.

*Action-specific ARARs* are requirements that define acceptable treatment and disposal procedures for hazardous substances. Federal and Commonwealth of Virginia action-specific ARARs that may affect the development and conceptual arrangement of remedial alternatives are summarized in Appendix B.

## SECTION 4

# Description of Removal Action Alternatives

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Two removal action elements are planned for Site 8. One action will include the Demolition Debris Landfill (Work Element A). The second action will include the Wetland/Aquatic Area, consisting of former DP 13 and Pond 2 (Work Element B).

Based on investigations conducted at the site, sediment near DP 13 and within Pond 2 poses a low potential risk to ecological receptors. These areas are proposed for removal action under each alternative evaluated in this EE/CA. While no risk to human health was identified under the current land use scenario, prior surface and subsurface disposal of construction and demolition debris within the limits of Site 8 has taken place. Alternatives evaluated in this EE/CA include an option for a soil cover and ICs to prevent potential exposure to buried wastes and an option for complete removal of landfill contents to eliminate potential future exposure.

The alternatives for this NTCRA were considered for each work element using professional judgment and information from previous investigations. Prior to finalizing the removal action design, the waste and associated sediments will be sampled for waste characterization analysis to verify that the waste-stream is non-hazardous for waste disposal. In addition, the required no action alternative was evaluated for comparative purposes.

## 4.1 Alternatives Description—Work Element A (Demolition Debris Landfill)

The removal action alternatives developed for Work Element A (Demolition Debris Landfill) include:

1. No action
2. Construction of a soil cover
3. Complete removal of subsurface debris within the landfill and construction of a tidal wetlands within the excavated area

### 4.1.1 Alternative 1—No Action

The no action alternative implies that no removal work will be done at this site. The site will be left as it currently exists, leaving the buried waste in place, as well as the surrounding waste-impacted soils.

### 4.1.2 Alternative 2—Soil Cover

This alternative proposes that no excavation activity take place under Work Element A. Instead, the entire landfill area would be capped with clean soil. Figure 4-1 shows the conceptual layout for placing a soil cover at Site 8. Figure 4-2 presents a schematic of a typical soil cover that would be used in this alternative. This cover would incorporate

actions for erosion protection, re-vegetation (site restoration), maintenance and performance monitoring (groundwater assessment and soil cover inspection), and ICs (future land use management). The approximate acreage of the Demolition Debris Landfill that would require covering is 1.5 acres.

### 4.1.3 Alternative 3—Excavation of Landfill Materials and Construction of Tidal Wetlands

This alternative consists of the direct excavation of buried waste, including all buried debris and impacted soils comprising the demolition debris landfill. Figure 4-3 shows the conceptual layout of the landfill excavation limits. Figures 4-4 and 4-5 present two cross-sections demonstrating the thickness of topsoil and waste layers across the site. Following excavation of the landfill material at Site 8, the area will be backfilled with clean fill as required to establish specific elevations for tidal wetland species planting to create a tidal wetland in the excavated area.

Volumetric calculations used for estimating material quantities to be excavated from the landfill were based on findings presented in the Technical Memorandum, *Results of Site 8 Soil Cover Survey* (CH2M HILL, 2002) (see Appendix A) and the Conceptual Wetlands Creation Plan (see Appendix D). The test pit/trench excavations performed for this investigation indicated the presence of construction and demolition debris, including scrap metal, concrete, and wood. Soil types were inconsistent throughout the area identified as the former landfill, which corresponds to random fill used to supplement the demolition debris that was placed at Site 8. Waste thickness and quantity was variable throughout the landfill. It was encountered as close as the ground surface and ranged in thickness from a few inches to greater than 7 ft bgs. For the purpose of the volume estimate, it is assumed that the waste extends down to an elevation of 2.0 ft. A soil cover ranging in depth from zero to 3 ft exists over the landfill area. The soil cover was thinnest over the northwestern portion of Site 8, where debris was noted at 2 ft or less, and greatest in the southern and western portions of the site.

The total material (landfill contents) to be removed and disposed off site under Alternative 3 would be approximately 15,600 cy; this includes approximately 10,500 cy of buried waste and impacted soil, 1,980 cy of topsoil overlying the layer of buried waste, and an additional 3,100 cy of soil to construct a perimeter tidal flooding ditch. It is possible that elevation requirements for the creation of tidal wetlands within the footprint of the landfill will be lower than the elevation required to excavate debris if the waste does not extend as deep as assumed. As such, additional excavation may be required.

Upon removal of all waste and associated soils, the excavated area would be replaced with clean fill where required to establish specific elevation(s) for the planting of wetlands species. The excavated materials would be hauled offsite for disposal at appropriate facilities or recycled as appropriate. Site restoration would take place thereafter, including the construction of a tidal wetlands environment. A period of post wetland construction monitoring will be conducted by the Navy Regional Natural Resources program to ensure the success of the wetlands. Monitoring by the Regional Natural Resources program will be a post-ROD event and include visual site inspections to ensure the vegetation has successfully populated the newly created wetlands. Further upon award of the interim

remedial action, a contract requirement to ensure successful vegetation for at least one growing season will issues.

## 4.2 Alternatives Description- Work Element B (Wetland/Aquatic Areas)

The removal action alternatives developed for the Work Element B (Wetland/Aquatic Areas) include:

1. No action
2. Excavation and restoration
3. Excavation and restoration of impacted tidal wetlands

### 4.2.1 Alternative 1—No Action

The no action alternative implies that no removal/remedial actions will be conducted in the wetlands/aquatic areas of Site 8.

### 4.2.2 Alternative 2—Excavation and Restoration

Excavation and restoration implies using excavation equipment to excavate the waste and impacted sediments from former DP 13 and Pond 2 and restoring them to their original wetland condition. The sediments around former DP 13 will be excavated. The area will then be backfilled and the wetlands will be restored. The debris and bottom sediments in and around Pond 2 will be excavated and Pond 2 will be restored as a pond. Figure 4-6 shows the conceptual layout of the limits of former DP 13 to be excavated. A 2-ft excavation over the entire area is assumed to remove the waste and establish the wetland elevation. If the material at the bottom of the excavation is unsuitable for wetlands (sandy base soil capable of supporting tidal wetland plant species), additional material may be excavated and replaced with granular fill. The wetland plants will then be restored. Debris will also be removed from around and within Pond 2. Nuisance water management may be required during excavation to assist in confirming debris removal. Nuisance water will not be discharged to surface waters. Shallow bottom sediments posing a potential ecological risk will be excavated along with buried debris. The pond will then be restored to its original condition.

The total material to be excavated under Alternative 2 would be approximately 1,370 cy; this includes 960 cy from former DP 13 and 410 cy from Pond 2. Upon removal of all remaining debris and associated sediment, the excavated DP 13 area would be backfilled with approximately 250 cy of general fill and 270 cy of sand to establish specific elevation(s) for the restoration of the wetlands. Pond 2 would not require significant backfill, as it would remain a pond; however, a minimum of 1 ft of clean sand, or 410 cy, would be placed in the bottom of the pond. The excavated materials would be hauled off site for proper disposal.

### 4.2.3 Alternative 3—Excavation, Restoration, and Creation of Tidal Wetlands

This alternative differs from Alternative 2 in that following excavation to remove waste and associated sediment, a tidal wetland area will be created in the area of Pond 2. The area of

former DP 13 will be restored as a tidal wetland, as in Alternative 2. Figure 4-7 shows the conceptual layout of the tidal wetland.

The volume of waste to be excavated will be the same as for Alternative 2. The total material to be excavated under Alternative 3 would be approximately 1,370 cy; this includes 960 cy from DP 13 and 410 cy from Pond 2. In addition, nuisance water management will be necessary in Pond 2 to facilitate removal of debris and shallow bottom sediment. Pond 2 will be backfilled with clean fill as needed for wetland construction. It is estimated that 3,320 cy of general fill and 200 cy of sand will be required to backfill Pond 2 to the elevation required to establish the tidal wetland. Nuisance water from Pond 2 (which is tidally influenced) will be managed within the site without being discharged to surface waters. Nuisance water will be managed in the excavated upland debris area located within the site boundaries where a tidal wetland will be created.

Appendix D presents the Conceptual Wetlands Creation Plan and includes the Site Plan, Excavation Plan, Restoration Plan, and Cross Sections. A period of post wetland construction monitoring will be conducted by the Navy Regional Natural Resources program to ensure the success of the wetlands. Monitoring by the Regional Natural Resources program will be a post-ROD event and include visual site inspections to ensure the vegetation has successfully populated the newly created wetlands. Further, upon award of the interim remedial action, a contract requirement to ensure successful vegetation for at least one growing season will be included.

### 4.3 Evaluation of Alternatives

The *effectiveness* of a technology refers to its capability of removing the specific items in the volumes required, the degree to which the technology achieves the RAO, and the reliability and performance of the technology over time, including protection of human health and the environment, compliance with ARARs to the extent practical, long-term effectiveness and permanence, reduction in toxicity, mobility or volume, and short-term effectiveness.

The *ease of implementation* of a technology refers to the availability of commercial services to support it, the constructability of the technology under specific site conditions, and the acceptability of the technology to all parties involved (regulators, public, owner, etc.), including technical feasibility, administrative feasibility, availability of services, support agency acceptance, and community acceptance.

For the *detailed cost analysis* of alternatives, the expenditures required to complete each measure were estimated in terms of capital costs to complete initial construction activities. For the alternatives evaluated for each work element, there are some cost factors consistent with each alternative, and therefore have no impact on comparison of relative costs for the different alternatives.

Annual operation and maintenance (O&M) costs for maintenance and performance monitoring were evaluated only for Work Element A Alternative 2. The remaining alternatives for Work Elements A and B, Alternatives 1 and 3, did not require O&M. Costs were estimated for a groundwater assessment program and a maintenance and inspection program for the soil cover with Alternative 2 of Work Element A. Given these values, a

present-worth calculation for Alternative 2 of Work Element A has been made for comparison.

Capital costs consist of direct and indirect costs. Direct costs include the cost of construction, equipment, land and site development, treatment, transportation, and disposal. Indirect costs include engineering expenses, license or permit costs, and contingency allowances. Annual O&M costs are post-construction costs required to ensure the continued effectiveness of the remedial action. Present worth calculations are based on a 3.5-percent discount rate, as applicable for 2004. Appendix C, Table C-5 provides a cost comparison of combinations of alternatives for Work Elements A and B.

The costs estimated are provided to an accuracy of +50 percent and -30 percent. The alternative cost estimates are in 2004 dollars and based on information published by R.S. Means *Site Work and Landscape Cost Data* (2001) and *Environmental Cost Data – Assemblies* (2002). In addition, costs from similar projects were used to develop the alternative cost estimates. Where R.S. Means data were not available or not applicable, phone quotes, similar projects, or engineering estimates were used for unit pricing. Please refer to Appendix C for all cost estimate details pertaining to each alternative discussed in the following sections.

## 4.4 Alternatives Evaluation—Work Element A (Demolition Debris Landfill)

The alternatives under consideration for Work Element A (Demolition Debris Landfill) include:

1. No action
2. Construction of a soil cover
3. Complete removal of subsurface debris within the landfill and construction of a tidal wetlands within the excavated area

Table 4-1 presents a comparison of these alternatives with respect to effectiveness, ease of implementation, and cost. The waste in the landfill area has been determined to be non-hazardous based on previous waste characterization sampling results; therefore, the need for a hazardous waste disposal facility was not considered in the evaluation and cost of alternatives. Site restoration will take place following the completion of the selected alternative for all but the “no action” alternative, including the construction of a soil cover (Alternative 2) or tidal wetlands (Alternative 3). Appendix C contains the preliminary cost estimates for the Demolition Debris Landfill. Should the assumption that the materials to be excavated from within this area are non-hazardous for disposal prove to be false, a significant cost increase will occur due to handling and disposal of hazardous materials.

### 4.4.1 Alternative 1—No Action

The no action alternative implies that no removal work will be done at this site. The site will be left as it currently exists, leaving the buried waste in place, as well as the surrounding soils. Because all of the waste will remain onsite, and possibly infiltrate further into the surrounding media over time, selection of this alternative is not desirable. Although this alternative is the

least expensive, it does not satisfy the objectives of this EE/CA, including protecting human health and the environment.

#### 4.4.2 Alternative 2—Soil Cover

This alternative proposes that no excavation activity take place. Instead, the entire landfill area would be covered with a 2-ft soil cover.

The capital cost to complete capping of the Demolition Debris Landfill with a 2-ft soil cover is approximately \$567,000. An additional \$292,000 of annual O&M costs, including maintenance and groundwater sampling for a period of 30 years, brings the total present worth of this alternative to \$859,000. Table C-1 in Appendix C contains a preliminary cost estimate for this alternative.

#### 4.4.3 Alternative 3—Excavation of Landfill Materials and Construction of Tidal Wetlands

This alternative consists of the direct excavation of buried waste at the Demolition Debris Landfill and creation of tidal wetlands in the excavated area.

The estimated capital cost to complete direct excavation, fill activities, and site restoration at Work Element A is \$2,927,000. Actual excavation and fill quantities may vary based on the materials and quantities of waste encountered during construction; however, a significant variation is not anticipated. There are no O&M costs associated with this alternative. Table C-2 in Appendix C contains a preliminary cost estimate for this alternative.

### 4.5 Alternatives Evaluation—Work Element B (Wetland/Aquatic Areas)

The alternatives evaluated for Work Element B (Wetland/Aquatic Areas) include:

1. No action
2. Excavation and restoration
3. Excavation, restoration, and creation of a tidal wetlands

Table 4-2 presents the comparison of these alternatives with respect to the factors discussed above: effectiveness, ease of implementation, and cost. Prior to finalizing the removal action design, the waste and impacted sediments will be sampled for waste characterization analysis to classify this waste-stream (hazardous or non-hazardous) for waste disposal purposes; however, for waste disposal cost estimating in this EE/CA, these sediments are assumed to be non-hazardous. Once the removal action is completed, site restoration activities, including either restoration to pre-existing conditions or the construction of a tidal wetlands, will be conducted. Detailed cost estimates for each alternative discussed below are presented in Appendix C. Should the assumption that the materials to be excavated from within this area are non-hazardous for disposal prove to be false, a significant cost increase will occur due to handling and disposal of hazardous materials.

### 4.5.1 Alternative 1—No Action

The no action alternative implies that no removal work will be conducted at Work Element B. This area will be left as it currently exists, leaving all waste and impacted sediments in place. Because the waste will remain onsite, and possibly infiltrate further into the surrounding media over time, selection of this alternative is not desirable. Although it is the least expensive alternative, it does not satisfy the objectives of this EE/CA, including protecting human health and the environment.

### 4.5.2 Alternative 2—Excavation and Restoration

Direct excavation implies using excavation equipment to remove the required amount of waste and sediments from the area of concern. The excavated area will be backfilled with clean fill to support wetland plant species, followed by site restoration activities.

The capital cost to complete excavation, fill activities, and site restoration at Work Element B is \$329,000. There are no O&M costs associated with this alternative. Detailed cost estimates for Work Element B are presented in Appendix C, Table C-3.

### 4.5.3 Alternative 3—Excavation, Restoration, and Creation of a Tidal Wetlands

As discussed in the summary of Alternative 2, the waste and associated sediments will be removed using excavation equipment and the excavated area will be backfilled in with clean fill to support wetland plant species, followed by site restoration activities including the construction of tidal wetlands at Pond 2. The capital cost to complete excavation, restoration, and tidal wetlands creation at Work Element B is \$451,000. There are no O&M costs associated with this alternative. Detailed cost estimates for Work Element B are presented in Appendix C, Table C-4.

**TABLE 4-1**

Evaluation of Remedial Alternatives: Work Element A—Demolition Debris Landfill  
*NAB Little Creek, Virginia Beach, Virginia*

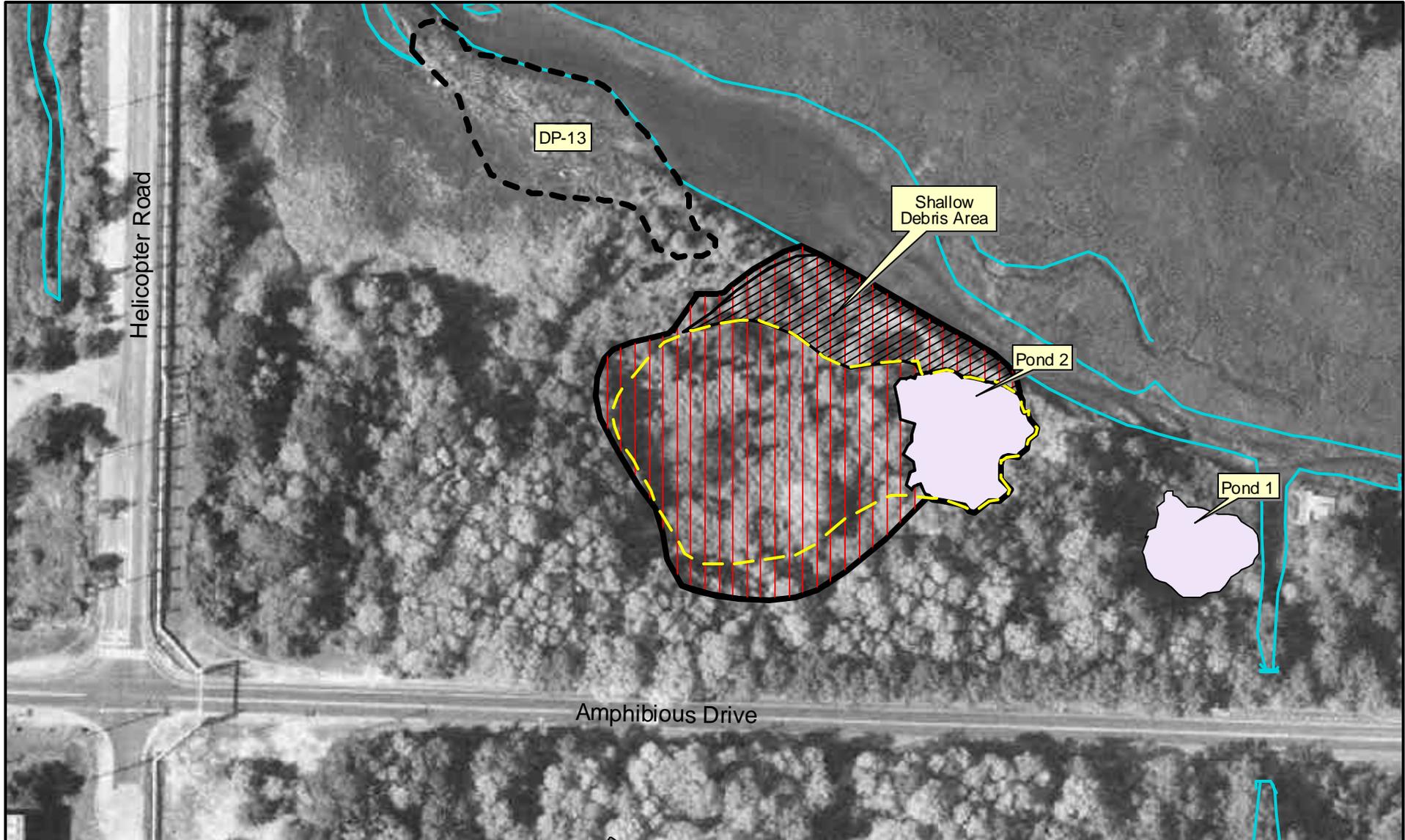
<b>Alternative</b>	<b>Description</b>	<b>Effectiveness</b>	<b>Ease of Implementation</b>	<b>Cost</b>
Alternative #1—No Action	No removal work performed. Site left “as is”.	The effectiveness of this alternative is low, as the debris remains onsite, and may migrate into surrounding environmental media over time.	Easy. No action to implement.	\$0.
Alternative #2—Soil Cover/Institutional Controls	Approximate 1.5-acre soil cover. ICs and post-closure activities required.	Landfill contents are covered to prevent future exposure. Long-term maintenance (inspection and monitoring) is required to verify alternative effectiveness.	Significant amount of site clearing, grubbing, and grading to establish soil cover. Construction efforts are typical tasks for an earthwork/site grading contractor.	Capital Cost \$567,000  Present Worth (including 30-year O&M) \$859,000
Alternative #3—Excavation of Landfill Materials and Construction of Tidal Wetlands	Approximately 15,600 cy of waste and impacted soils to be excavated and disposed offsite. Fill with general fill and planting sand layer, site restoration, and construction of tidal wetlands within footprint of excavation. No ICs required.	Very effective in eliminating risk to future potential receptors. Provides opportunity for environmental enhancement through construction of wetlands. Once tidal wetland is established, no operation and/or maintenance is required to verify effectiveness.	Implementation would be moderate, but require a contractor experienced in construction of tidal wetlands. A contractor would be responsible for performing removal action, backfill activities and site restoration as tidal wetlands. Wetlands will be constructed in accordance with an approved Wetlands Mitigation Plan.	Capital Cost \$2,927,000

TABLE 4-2

Evaluation of Remedial Alternatives: Work Element B—Wetland/Aquatic Areas

NAB Little Creek, Virginia Beach, Virginia

Alternative	Description	Effectiveness	Ease of Implementation	Capital Cost
Alternative #1—No Action	No removal work performed. Site left “as is”.	The effectiveness of this alternative is low, as the debris remains onsite, and could possibly migrate even further into surrounding environmental media over time.	Easy. No action to implement.	\$0
Alternative #2—Excavation and Restoration	Excavate debris and contaminated soil/sediment in DP 13 and Pond 2. Replace with clean fill and restore tidal wetlands environment at DP 13. Pond 2 will remain as tidally influenced pond following construction.	Effective in reducing/eliminating risk. Provides protective removal of existing contaminants in the sediments for human health and the environment. Opportunity for environmental enhancement through restoration of impacted wetlands.	Implementation would be relatively moderate. A general contractor specializing in excavation/earth work would readily perform the removal action and site restoration. Dewatering of Pond 2 to remove large submerged debris and impacted sediment will require management of nuisance water. Wetlands will be restored in accordance with an approved wetlands mitigation plan.	Capital Cost \$329,000
Alternative #3—Excavation, Restoration, and Creation of Tidal Wetlands	Excavate debris and contaminated soil in DP 13 and Pond 2. Replace with clean fill and restore tidal wetlands environment at DP 13. Dewater Pond 2 and convert Pond 2 area to a tidal wetlands.	Effective in reducing/eliminating risk. Provides protective cover of any potential remaining contaminants in the sediments for human health and the environment. Opportunity for environmental enhancement of impacted wetlands and through construction of wetlands.	Implementation of excavation work would be straightforward. A general contractor specializing in excavation/earth work would readily perform the removal action and general site restoration. Dewatering of Pond 2 to remove large submerged debris and impacted sediment will require management of nuisance water. Wetlands will be restored in accordance with an approved wetlands mitigation plan.	Capital Cost \$451,000



**LEGEND**

-  Limits of Landfill Cover
-  Shallow Debris Area
-  Water Features
-  Ponds
-  Estimated Landfill Limits

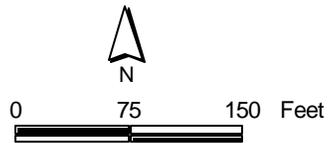


Figure 4-1  
Site 8 - Work Element A  
Demolition Debris Landfill - Alternative 2  
EE/CA  
NAB Little Creek  
Virginia Beach, Virginia

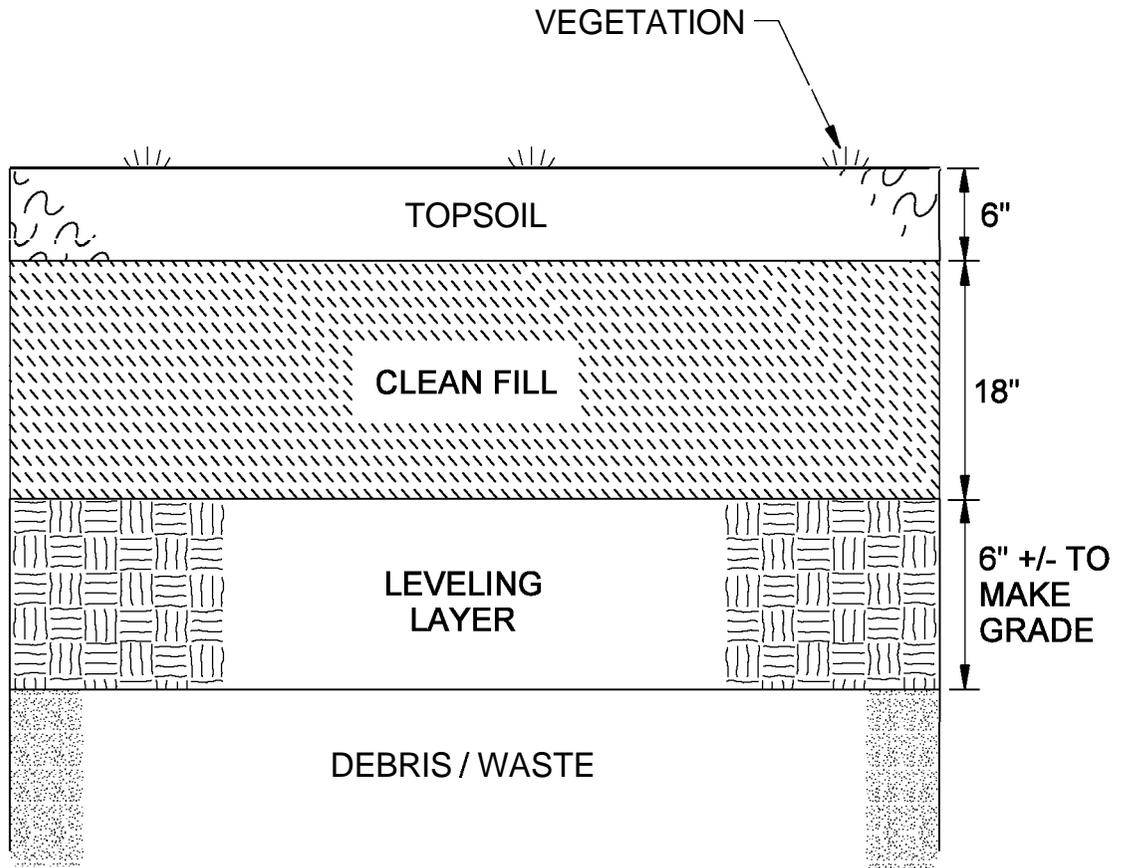
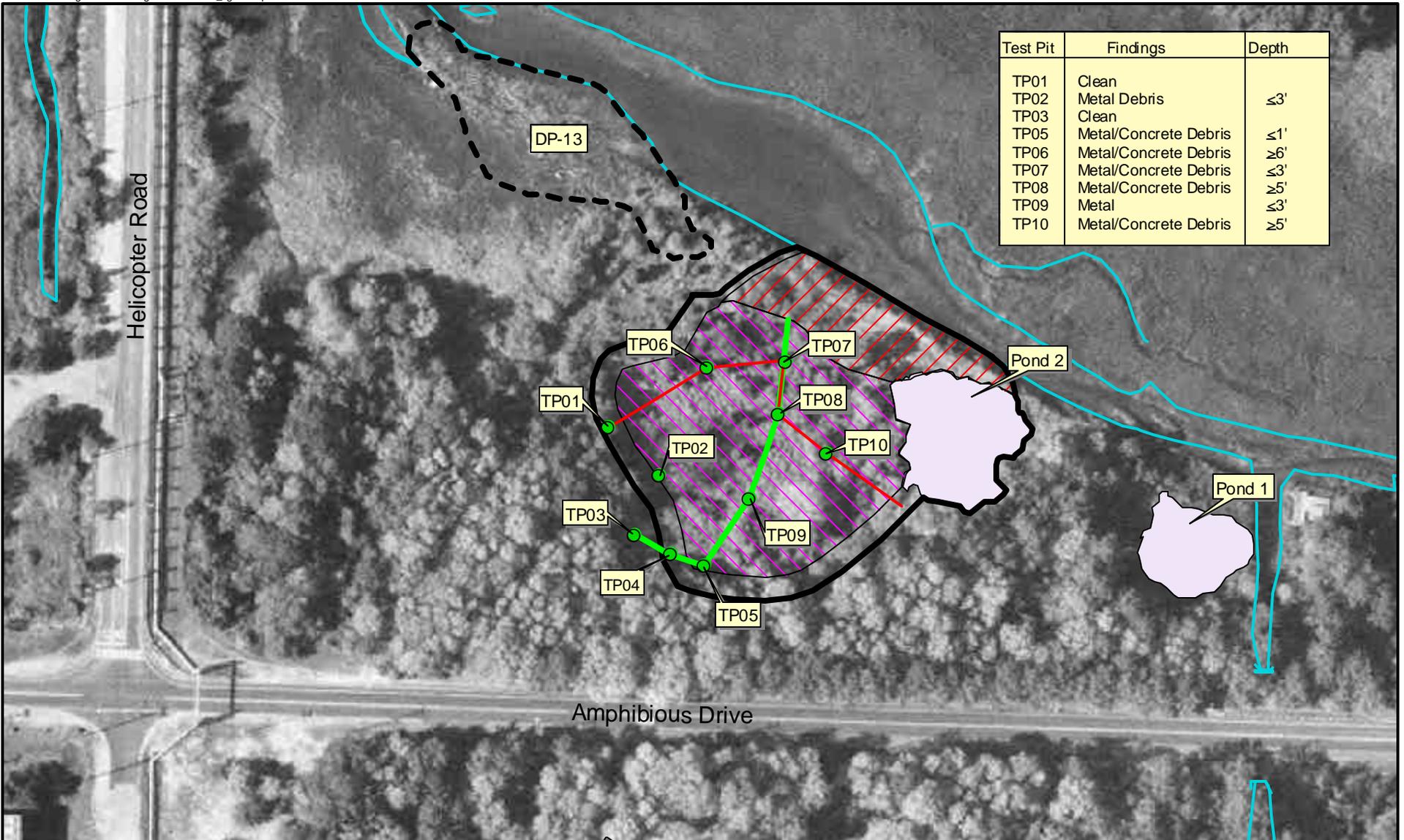


FIGURE 4-2  
WORK ELEMENT A-DEMOLITION DEBRIS  
LANDFILL-ALTERNATIVE 2  
SOIL COVER - TYPICAL SECTION

Site 8 EE/CA  
NAB Little Creek,  
Virginia Beach, Virginia



Test Pit	Findings	Depth
TP01	Clean	
TP02	Metal Debris	≤3'
TP03	Clean	
TP05	Metal/Concrete Debris	≤1'
TP06	Metal/Concrete Debris	≥6'
TP07	Metal/Concrete Debris	≤3'
TP08	Metal/Concrete Debris	≥5'
TP09	Metal	≤3'
TP10	Metal/Concrete Debris	≥5'

**LEGEND**

- Test Pit Locations
- Excavation Limits
- ~ Water Features
- Ponds

- Shallow waste
- Deep waste (to 7' bgs)
- Cross-section A - A'
- Cross-section B - B'

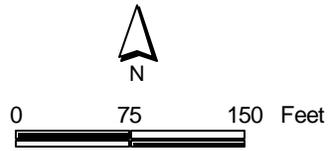
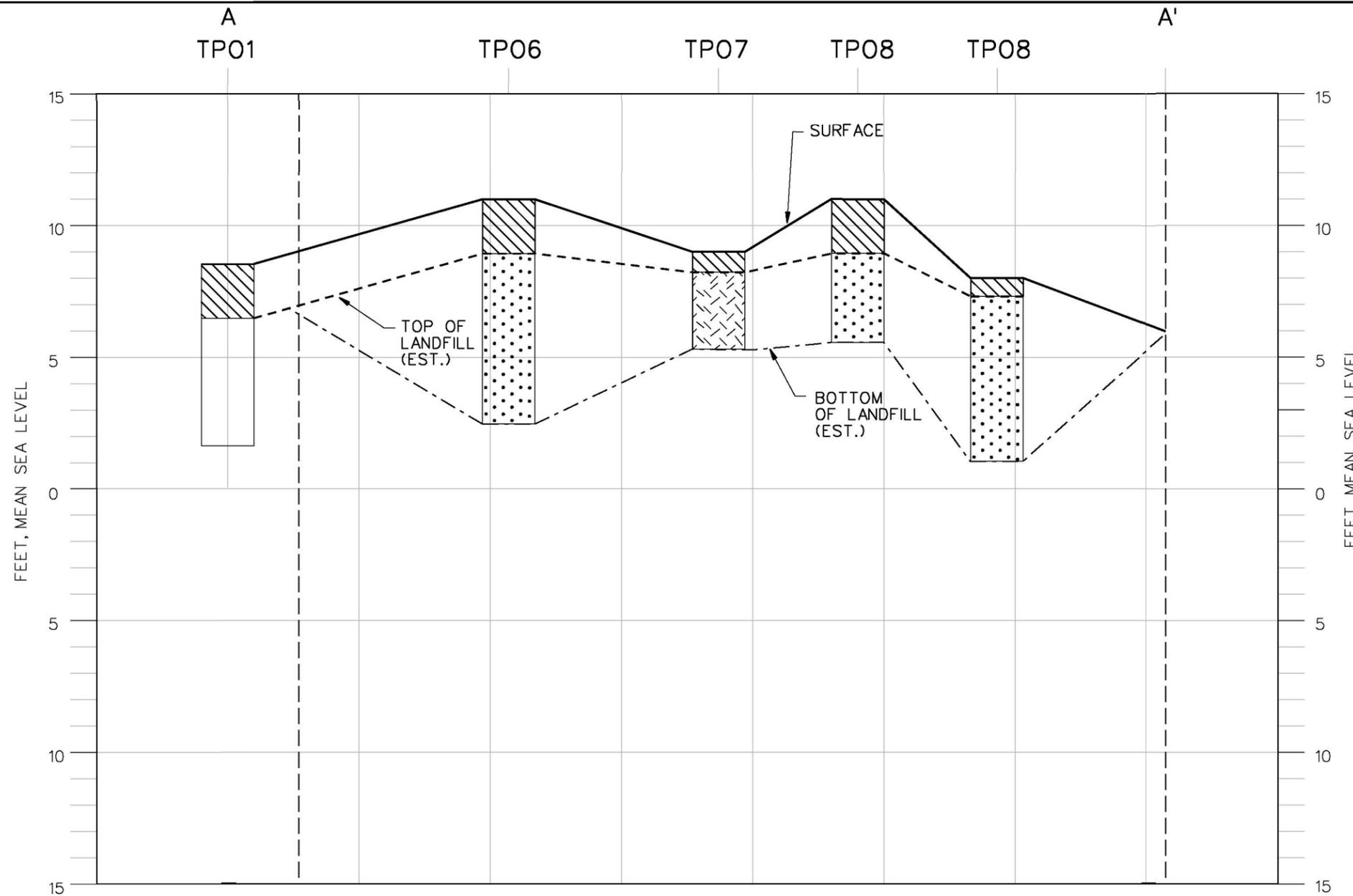
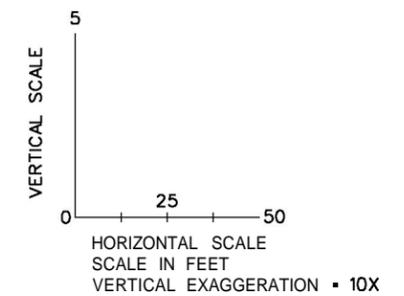


Figure 4-3  
 Site 8 - Work Element A  
 Demolition Debris Landfill - Alternative 3  
 EE/CA  
 NAB Little Creek  
 Virginia Beach, Virginia



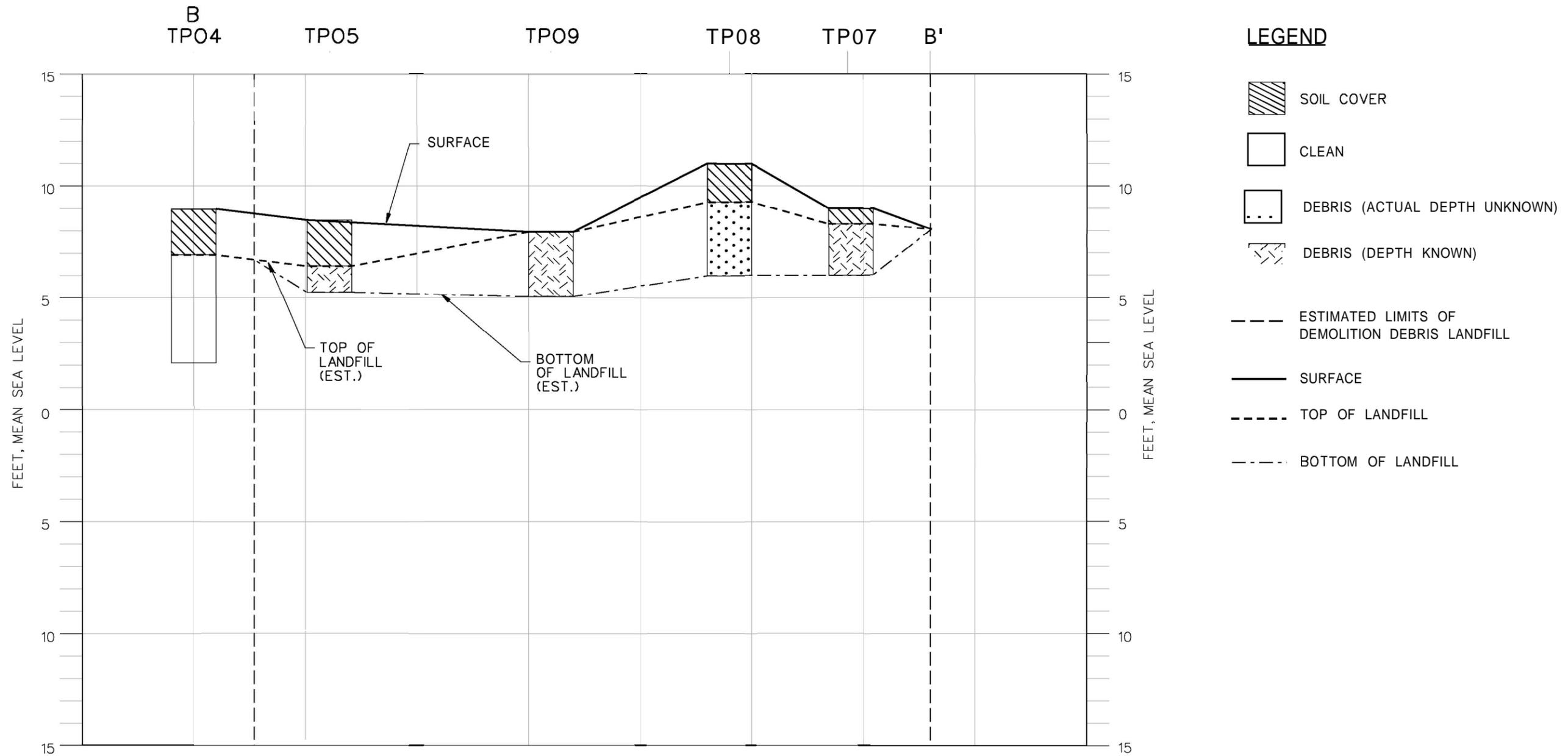
**LEGEND**

- SOIL COVER
- CLEAN
- DEBRIS (ACTUAL DEPTH UNKNOWN)
- DEBRIS (DEPTH KNOWN)
- ESTIMATED LIMITS OF DEMOLITION DEBRIS LANDFILL
- SURFACE
- TOP OF LANDFILL
- BOTTOM OF LANDFILL



**FIGURE 4-4**  
**SITE 8 EE/CA**  
**LANDFILL CROSS-SECTION A-A'**  
**NAB LITTLE CREEK**

Virginia Beach, Virginia  
 Reference: 2002 Trenching activities and Soil Cover survey, CH2M HILL



- LEGEND**
-  SOIL COVER
  -  CLEAN
  -  DEBRIS (ACTUAL DEPTH UNKNOWN)
  -  DEBRIS (DEPTH KNOWN)
  -  ESTIMATED LIMITS OF DEMOLITION DEBRIS LANDFILL
  -  SURFACE
  -  TOP OF LANDFILL
  -  BOTTOM OF LANDFILL

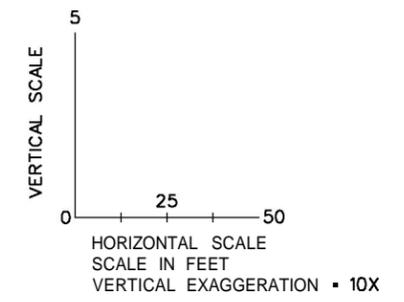
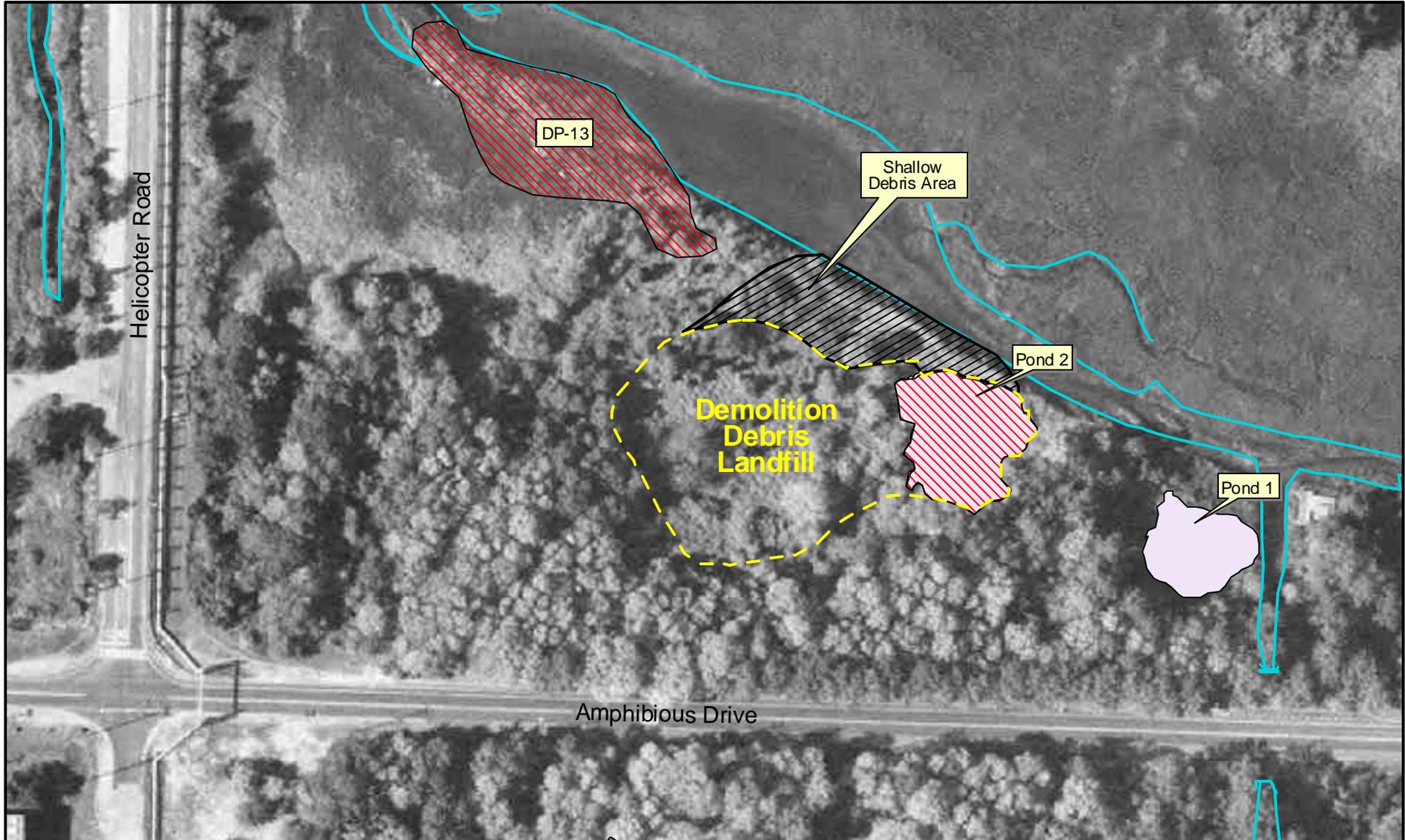


FIGURE 4-5  
 SITE 8 EE/CA  
 LANDFILL CROSS-SECTION B-B'  
 NAB LITTLE CREEK

Virginia Beach, Virginia  
 Reference: 2002 Trenching Activities and Soil Cover Survey, CH2M HILL



**LEGEND**

-  Limits of Demolition Debris Landfill
-  Limits of DP13 and Pond 2 Excavation
-  Water Features
-  Ponds
-  Estimated Landfill Limits

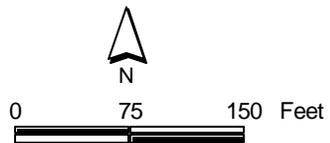
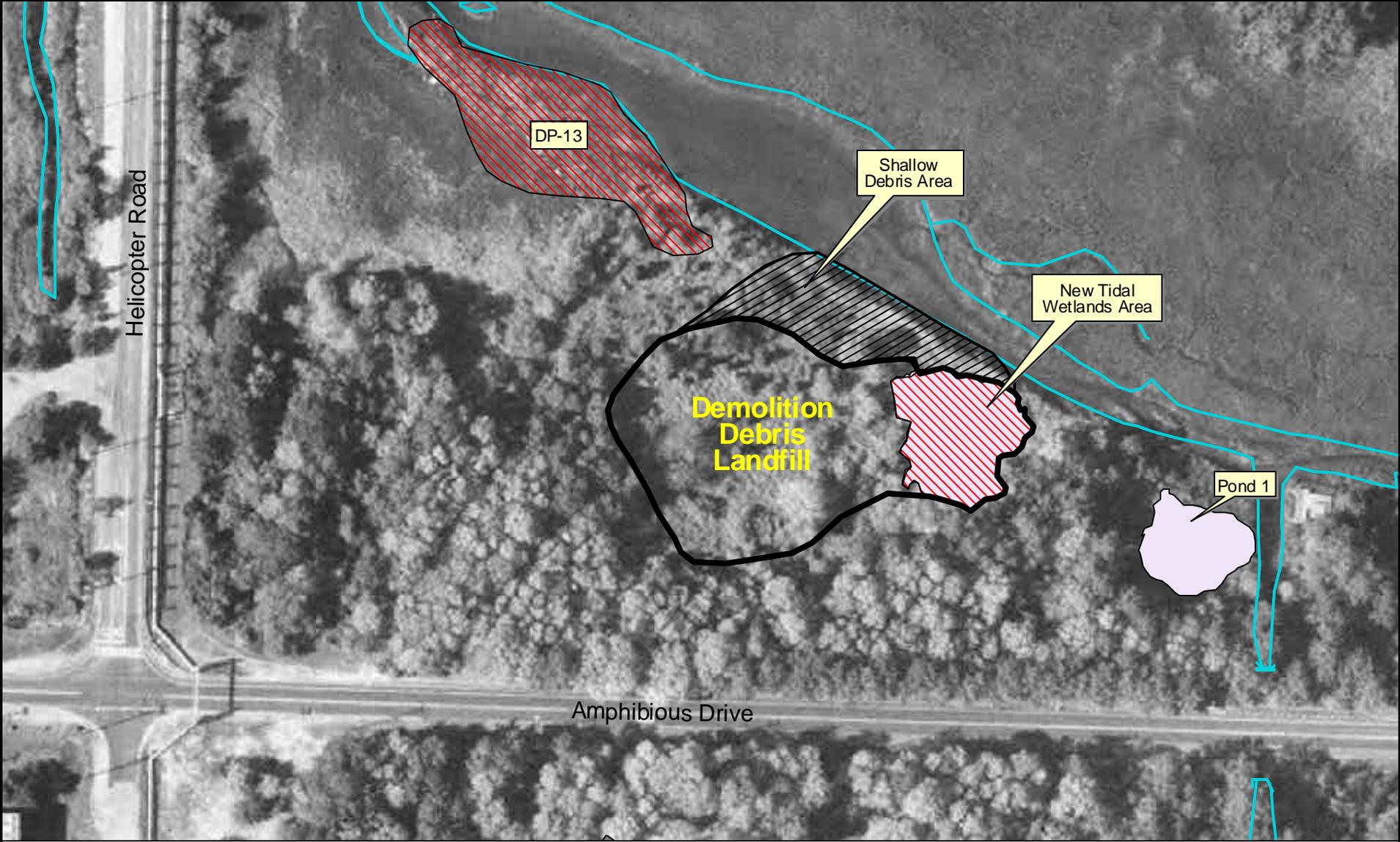


Figure 4-6  
Site 8 - Work Element B  
Wetland/Aquatic Areas - Alternative 2  
EE/CA  
NAB Little Creek  
Virginia Beach, Virginia



**LEGEND**

-  Limits of Demolition Debris Landfill
-  Limits of DP13 and Pond 2 Excavation
-  Water Features
-  Ponds

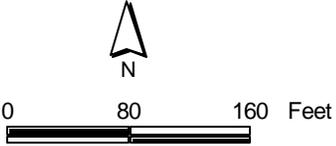


Figure 4-7  
Site 8 - Work Element B  
Wetland/Aquatic Areas - Alternative 3  
EE/CA  
NAB Little Creek  
Virginia Beach, Virginia

## SECTION 5

# Comparative Analysis

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Section 5 provides a comparative analysis of the alternatives presented in Section 4 for each Work Element Area. In Section 4, these alternatives were evaluated according to their effectiveness (including protection of human health and the environment, compliance with ARARs to the extent practical, long-term effectiveness and permanence, reduction in toxicity, mobility or volume, and short-term effectiveness), ease of implementation (including technical feasibility, administrative feasibility, availability of services, support agency acceptance, and community acceptance), and cost. In this section, the alternatives are directly compared to one another for each of these three criteria.

Levels of effectiveness were assessed based on the number of “effectiveness criteria” that would be satisfied by each alternative. The “effectiveness criteria,” from the USEPA guidance document on conducting NTCRA under CERCLA (EPA/540-R-93-057), are identified as:

- Protection of human health
- Protection of workers during implementation
- Protection of environment
- Compliance with ARARs
- Level of treatment and containment expected
- Residual effect concerns

Levels of implementability were assessed based on the number of “implementability criteria” satisfied by each alternative. The “implementability criteria,” from the USEPA guidance document on conducting NTCRA under CERCLA (EPA 540-R-93-057), are as follows:

- Construction and operational considerations
- Demonstrated performance/useful life
- Adaptable to environmental conditions
- Contributes to remedial performance
- Can be implemented in 1 year
- Availability of equipment, personnel and services, outside laboratory testing capacity, and offsite treatment and disposal capacity
- Permits required
- Easements or rights-of-way required
- Effect on adjoining property
- Ability to impose institutional controls

Evaluation of implementability essentially assesses the technical and administrative feasibility of completing each task. The technical feasibility consists of items 1 through 6 above, and the administrative feasibility involves items 7 through 10.

From this analysis, it should become clear which alternative is preferable in each category and, consequently, which will be selected for implementation at Site 8.

## 5.1 Work Element A—Demolition Debris Landfill

TABLE 5-1  
Remedial Alternative Comparison, Work Element A—Demolition Debris Landfill

Alternative	Effectiveness	Implementation	Cost
Alternative 1—No Action	Not Effective	Straightforward	No cost
Alternative 2—Soil Cover/ICs	Effective	Moderate	Moderate
Alternative 3—Excavation of Landfill Materials and Construction of Tidal Wetlands	Highly Effective	Moderate	Expensive

Alternative 1 – No Action is not effective in that it does not accomplish the goals of protecting human health and the environment. Although this alternative is easy to implement, and there is a very minimal cost associated with it, it is not a desirable alternative because the overall objectives are not met.

Alternative 2 – Soil Cover/ICs is effective in reducing risk to human health and the environment, is moderate to implement, and has a moderate cost associated with it. However, this alternative is not as effective as Alternative 3 – Excavation of Landfill Materials and Construction of Tidal Wetlands.” Direct excavation at Work Element A would eliminate risk altogether since all waste and associated soil/sediment would be entirely removed from the site. This approach is more effective than placing a soil cover over the area, as in Alternative 2, where waste would still remain onsite, and would require ICs be put in place as well as O&M to ensure the effectiveness of the action is maintained. Although Alternative 3 may be more complex and costly to implement, the overall short-term and long-term effectiveness and permanence of this approach makes it the most desirable alternative. Alternative 3 also allows an opportunity for environmental enhancement through the construction of tidal wetlands area following the excavation and backfill activities.

Alternative 3 is the preferred alternative because of its high level of efficiency in meeting the objectives of this EE/CA, its moderate ease of implementation, and the lack of IC requirements and subsequent O&M.

## 5.2 Work Element B—Wetland/Aquatic Areas

TABLE 5-2  
Remedial Alternative Comparison, Work Element B—Wetland/Aquatic Areas

Alternative	Effectiveness	Implementation	Cost
Alternative 1—No Action	Not Effective	Straightforward	No cost
Alternative 2—Excavation and Restoration	Highly Effective	Moderate	Moderate
Alternative 3—Excavation, Restoration, and Creation of Tidal Wetlands	Highly Effective	Moderate	Moderate

Alternative 1—No Action is not effective in that it does not accomplish the goals of protecting human health and the environment. Although this alternative is easy to implement, and there is a very minimal cost associated with it, it is not a desirable alternative because the overall objectives are not met.

Alternative 2—Excavation and Restoration and Alternative 3—Excavation, Restoration, and Creation of Tidal Wetlands are both highly effective in reaching the goal of this EE/CA, which is to eliminate risk to human health and the environment. Both consist of directly excavating wastes and sediments from the former DP 13 area and Pond 2. Because Alternative 3 also allows an opportunity for environmental enhancement through the construction of a tidal wetlands area within the entire footprint of impacted areas at Site 8 following the excavation and backfill activities, Alternative 3 is the preferred alternative.

## SECTION 6

# Recommended Alternatives

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This EE/CA is prepared in accordance with current USEPA and Navy guidance documents for a NTCRA under CERCLA. The purpose of this EE/CA is to identify and analyze alternatives to address waste and associated media currently present at NAB Little Creek Site 8. Three alternatives were evaluated for waste and impacted soils for Work Element A (Demolition Debris Landfill) and three alternatives were evaluated for waste and impacted sediments at Work Element B (Wetland/ Aquatic Areas).

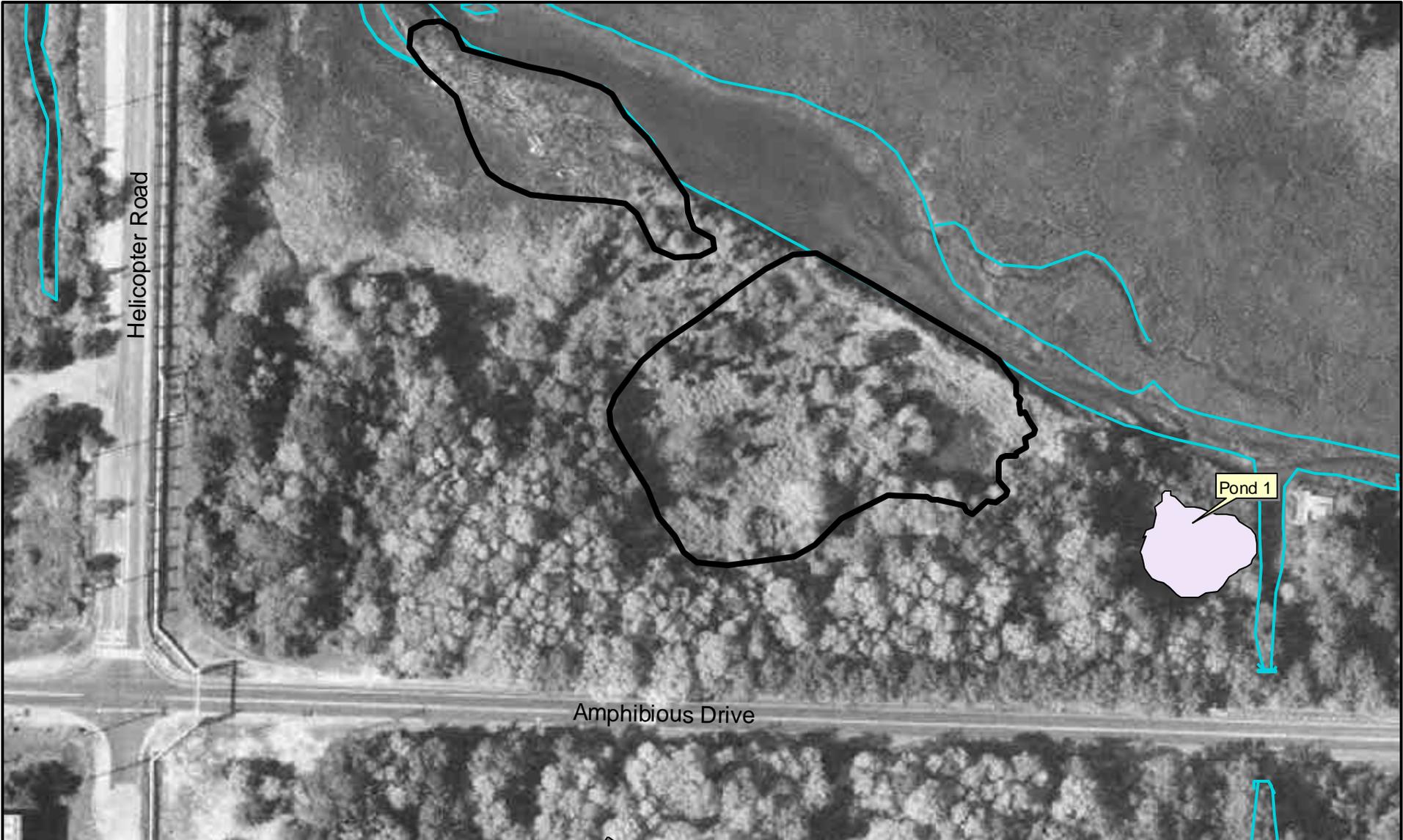
The comparative analysis of the alternatives included evaluating the effectiveness, implementability, and cost of each. The evaluation of effectiveness included reviewing the protectiveness of the alternative; compliance with ARARs to the extent practical; long-term effectiveness and permanence; reduction in toxicity, mobility or volume; short-term effectiveness; and its ability to meet the removal action objectives. Implementability included looking at the technical feasibility, availability, and administrative feasibility support agency acceptance, and community acceptance of the alternatives. The evaluation of cost included an estimate of capital cost.

In addition, the Navy, in partnership with the EPA and VDEQ, agrees to consider low potential sediment risk acceptable. The risk will be further reduced by removing landfill debris from the upland area, DP 13, and Pond 2, and creating wetlands in the former upland debris removal area, with adequate backfill to sustain a viable wetland habitat, a non time critical removal action. No confirmation sampling for soil and sediment will be required as a result of the removal action and wetland creation. Based on the results of the risk assessment, current risks posed by sediment and groundwater are within an acceptable level.

The path forward for Site 8 is implementation of the removal action and No Further Action (NFA) for Site 8 following construction closeout, pending any unforeseen issues, and that the NFA Record of Decision (ROD) for Site 8 will contain language that dictates the Navy will monitor wetlands through the regional natural resource program.

Based on the comparative analysis of the removal alternatives completed in Section 5 and the information in the previous paragraph, the recommended removal action for Work Element A (Demolition Debris Landfill) is Alternative 3 – Excavation of Landfill Materials and Construction of Tidal Wetlands. The recommended alternative for Work Element B (Wetland/ Aquatic Areas), based on a similar comparative analysis, is Alternative 3 – Excavation, Restoration, and Creation of Tidal Wetlands. Figure 6-1 presents a conceptual layout of the two recommended alternatives. The Conceptual Wetlands Creation Plan is provided as Appendix D.

These recommended alternatives for both Work Elements A and B effectively meet the goals of this EE/CA, while satisfying project implementation and costs requirements.



**LEGEND**

-  Limits of Excavation / Tidal Wetlands Areas
-  Water Features
-  Ponds



Figure 6-1  
Recommended Alternatives  
EE/CA  
NAB Little Creek  
Virginia Beach, Virginia

## SECTION 7

# References

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- CH2M HILL, 1999. *Final Site Investigation Report, SWMU 3 and IR Site 8, NAB Little Creek, Virginia Beach, Virginia.*
- CH2M HILL, June 2000. *Final Screening Ecological Risk Assessment, IR Sites 5, 7, 8,9,10,11,12,13, and 16 and SWMU 3, NAB Little Creek, Virginia Beach, Virginia.*
- CH2M HILL, 2000. *Five Year Site Management Plan: Fiscal year 2000, Naval Amphibious Base Little Creek, Virginia Beach, Virginia.* May 2000.
- CH2M HILL, 2001. *Engineering Evaluation/Cost Analysis (EE/CA) for Site 8, Demolition Debris Landfill, Naval Amphibious Base Little Creek, Virginia Beach, Virginia, August 2001.*
- CH2M HILL, June 2002. *Close Out Report, Surface Debris Clearing Activities at Site 8, Demolition Debris Landfill), NAB Little Creek, Virginia Beach, Virginia.*
- CH2M HILL, 2002. *Technical Memorandum: Results of Site 8 Soil Cover Survey, Naval Amphibious Base Little Creek, Virginia Beach, Virginia, June 2002.*
- CH2M HILL, 2003. *Ecological Risk Assessment for Site 8 Demolition Debris Landfill, Naval Amphibious Base Little Creek, Virginia Beach, Virginia, February 2003.*
- CH2M HILL, 2004. *Remedial Investigation/Human Health Risk Assessment for Site 8 Demolition Debris Landfill, Naval Amphibious Base Little Creek, Virginia Beach, Virginia, April 2004.*
- R.S. Means, 2001. *Heavy Construction Cost Data.* 2001.
- R.S. Means, 2001. *Site Work and Landscape Cost Data.* 2001.
- R.S. Means, 2002. *Environmental Cost Data – Assemblies.* 2002.
- Rogers Golden and Harpern (RGH). December 1984. *Initial Assessment Study of Naval Amphibious Base Little Creek, Norfolk, Virginia.*
- USEPA, Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA), <http://www4.law.cornell.edu/uscode/42/ch103.html>
- USEPA, 1993. *Guidance on Conducting Non-Time Critical Removal Actions Under CERCLA, PB93-963402.* August 1993.
- USEPA, National Contingency Plan (NCP), <http://www.epa.gov/oilspill/lawsregs.htm>
- USEPA, Superfund Amendments and Reauthorization Act of 1986 (SARA), <http://www4.law.cornell.edu/uscode/42/ch103.html>
- USEPA, Updated May 2002.k NPL Site Narrative Listing. <http://epa.gov/reg3hwmd/super/VA/naval-amphibious/pad.htm>.

Appendix A  
Results of Site 8 Soil Cover Survey

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## Results of Site 8 Soil Cover Survey

PREPARED FOR: Dawn Hayes/LANTDIV

COPIES: Mary Cooke/USEPA Region III  
Robert Weld/VDEQ  
Randy Sawyer/Regional Engineer  
Matt Louth/CH2M HILL

PREPARED BY: Paul Landin/CH2M HILL

DATE: June 12, 2002

This Technical Memorandum presents the trenching activities and soil cover survey performed at Site 8 at Naval Amphibious Base (NAB) Little Creek in Virginia Beach, Virginia. Site 8, the Demolition Debris Landfill, is located in the south central portion of the base, east of the intersection of Amphibious Drive and Helicopter Road. The site was used from 1971 through 1979 for the disposal of primarily inert materials. Landfill contents, which include utility poles, at least two tanks, paint cans, waste containers, construction debris, concrete piping, burned building debris, and debris removed from the bar screen in the base sewage pump stations, were reportedly buried to a depth of at least 3-feet in unlined excavations. During the Site Investigation (SI) conducted in 1998 by CH2M HILL, landfill debris was observed to a maximum depth of 5.5 ft bgs. No release controls were in place at the site and no waste inventory is available.

As part of the Site 8 Remedial Investigation several tasks were performed to assess the soil cover. Trenching and augering activities were conducted to more accurately delineate the landfill boundary corresponding to waste placement areas and to evaluate the thickness of the landfill cap. The information presented in this Technical Memorandum will be used for the basis of design report for the remedial design(s) to be developed for the landfill at Site 98 as part of the RI/FS.

### Trenching Activities

Ten test trenches were excavated to further assess the depth and volume of the subsurface debris and confirm the lateral extent of the former landfill at Site 8 (Figure 1). Figure 1 demonstrates the limits of the landfill as estimated from previous investigations conducted at Site 8. The trenches were excavated to a depth of up to 7 feet using a backhoe. Soil descriptions were logged and removal material was observed for signs of debris (Attachment 1).

The soil was typically composed of a brown sandy silt to a depth of one foot followed by a soft clay extending to the limits of excavation (trenches TP02 through TP06). Topsoil over stiff brown sandy clay (at TP01 and TP07) and clean grey sands (trenches TP08 through TP10) were also encountered. Soil types were inconsistent throughout the area identified as the former landfill, which corresponds to random fill used to supplement the demolition debris that was placed at Site 8.

Landfill wastes identified during trenching activities included concrete, steel scrap, piping, cables, rebar, and asphalt. Debris thickness and quantity was variable throughout the former landfill. Debris was encountered as close as the ground surface and ranged in thickness from a few inches to a depth that exceeded 7 feet bgs. The debris encountered at TP06 was too large to allow further excavation and the vertical extent was not completely defined; however it was observed that waste extends below the groundwater.

The horizontal limits of the landfill, as estimated from the trenching data (revised from previous estimates), are shown in Figure 2. Based upon observations made during the field activities conducted as part of the RI at Site 8, the limits of the debris appear to extend north to the shoreline of the channel. The southern and western limits are relatively well defined by TP01, TP03, and TP04 in which no debris was encountered.

### Soil Cover Survey

A 50-foot by 50-foot grid was staked out over the area identified as the landfill (Figure 1) by a licensed surveyor (PHR&A of Virginia Beach, Virginia) for the purpose of obtaining a topographical survey by measuring the elevation at each grid point (Figure 3). The survey was also used to determine soil cap thickness and corresponding waste elevation during the field data acquisition, and will be used for any subsequent remedial design conducted at the site. A hand auger was advanced into the soil at each grid intersection. Soil lithology, depth to debris, and signs of debris were recorded in a fieldbook at each grid intersection.

The soil cap depths ranged from 0 – 3 feet and averaged approximately 1.5 feet. In general, areas of relatively low topography correspond to a thinner soil cap. The soil cover was thinnest over the northwestern portion of Site 8, where debris was noted at 2 feet or less, and in places appeared at or just below the ground surface. Soil cover greater than 2 feet thick was observed in the southern and western portions of the site. The soil cap thickness, as estimated by measurements at each grid node, is depicted as isopach contours in Figure 4. Attachment 2 provides horizontal and vertical survey information, and soil cover thickness at each grid node.

Although the northernmost portion of the former landfill at Site 8 (specifically, the slightly elevated berm situated between Site 8 and the tidal channel) does not appear to be part of the subsurface debris placement areas utilized for disposal, there was evidence of subsurface debris during the soil cover survey. The presence of shallow subsurface debris in this area of the site is likely due to debris settling into the soft wetland soils after placement on the surface. Due to the proximity of this area to surface water (and related very shallow groundwater table) to this shallow subsurface debris, it is unlikely that this area was used for subsurface debris disposal.

Waste placement is clearly identified along the southern limits of the site, as evidenced by the presence of a former excavation line and established forest. The western limits of waste placement are also quite well defined and correspond approximately to the tree line. Waste placement to the east appears to extend into Pond 2 (as was observed during the surface debris clearing activities recently completed at Site 8). The excavation line observed along the southern part of the site (remaining from former borrow operations conducted at the site) was found to essentially wrap around the southeastern corner of the former landfill area and tie into Pond 2. Shallow subsurface debris was found in auger holes located along the north side of the site, between the former landfill area and the channel. Subsurface debris found in this relatively well-vegetated area appears to have either been disposed of by rather long trench-and-fill methods, or by shallow subsurface disposal. This was

indicated by the presence of several large trees (age estimated greater than 30 years) in the area in which this debris was encountered, which were likely in place when debris disposal was occurring at Site 8.

## Conclusions

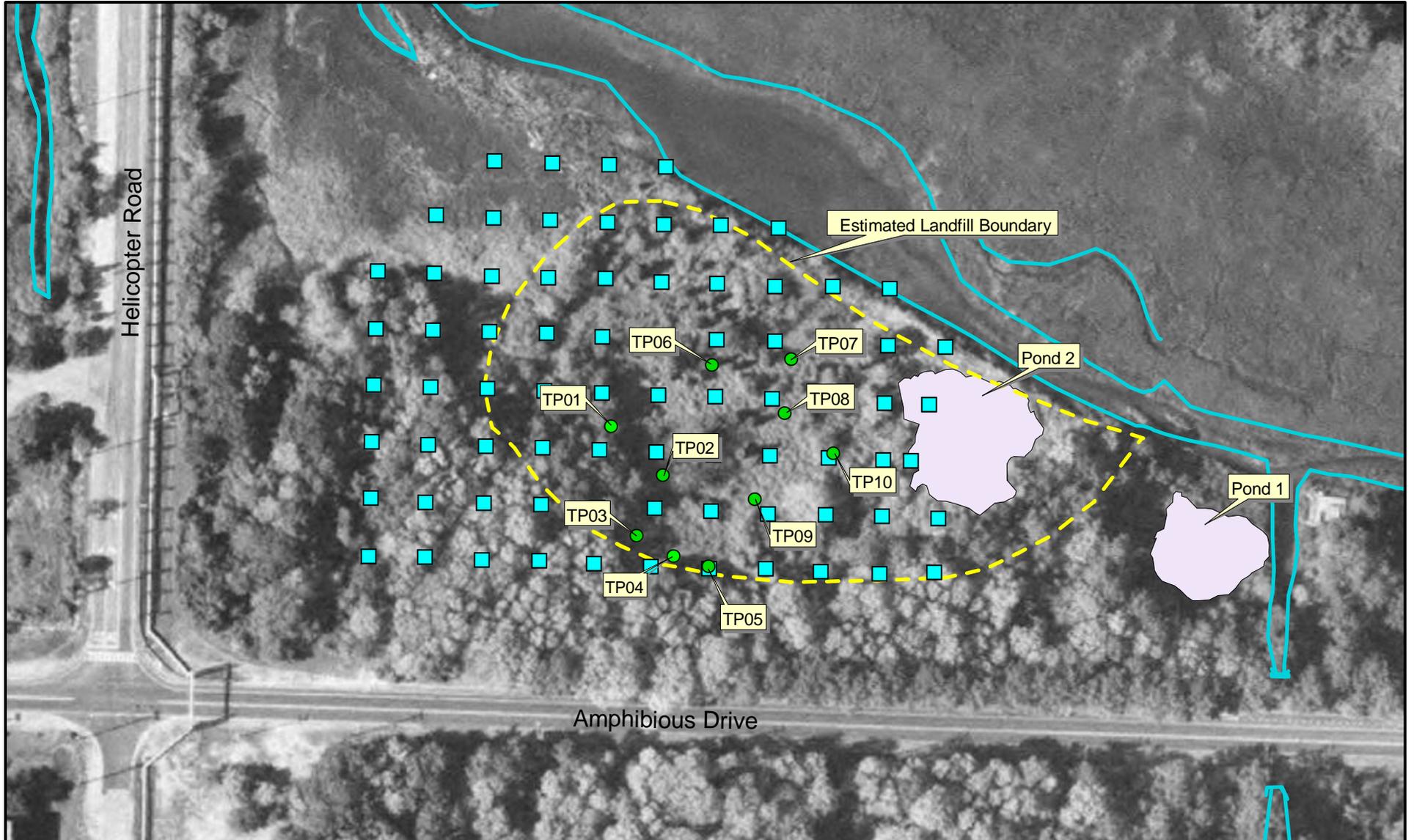
The test trenches and soil cover survey locate the bulk of the landfill waste in the central to northeastern area of Site 8 with less than two feet of soil cover present over the majority of the landfill limits. Thickness of the waste varies from a few inches to greater than 7 feet and contains mostly various metal (scrap, cables, sheets) and concrete debris. Several of the test trenches indicate waste disposal to depths below the water table at Site 8. Generally, metal debris was found in the upper (4 feet bgs up to ground surface) portion of the landfill and concrete debris was found in the lower portion (4 to 7 feet bgs) of the landfill.

As evidenced by the very shallow depth to debris during the soil cover survey, the existing soil cover survey does not consist of two contiguous feet of soil fill. Due to the age and placement methods of waste at Site 8, the site is classified as an unpermitted facility per Virginia Solid Waste Management Regulations (VSWMR). The applicable section of the Virginia Administrative Code (VAC) VSWMR is § 9 VAC 20-80-200, "Unpermitted Solid Waste Management Facilities."

According to VSWMR, the waste shall be removed and managed in accordance with applicable requirements, unless, as a conditional alternative to the removal of waste, the owner can demonstrate the facility will not pose a threat to human health or the environment. In this case, the facility may be "closed in place" under an administrative or judicial order. The demonstration for the closure in place includes information on the type, source, and nature of the wastes contained within the landfill and that the site location meets the siting requirements of VSWMR. Since this site is located on property owned by the United States Government, the full interpretation of the site status (with respect to VSWMR) would likely be negotiated between the Navy and the Virginia Department of Environmental Quality (VDEQ).

CH2M HILL has recently completed the field sampling portion of a Remedial Investigation (RI) at Site 8. The sampling consisted of the collection of groundwater from existing site monitoring wells, surface and subsurface soil sampling (0 - 6", 6-12", and 12-24" intervals), sediment, and surface water samples. The results of this sampling will be presented in a RI Report for Site 8 that includes discussion on the nature and extent of any contamination encountered, fate and transport of potential contaminants, and a Human Health Risk Assessment (HHRA). Simultaneous to the RI/HHRA, CH2M HILL is also conducting an Ecological Risk Assessment (ERA) on the data obtained during the RI sampling. These reports will discuss any potential threats to human health or the environment from Site 8 should be sufficient to assess the needs for further action at Site 8.

Based upon the findings of the RI/HHRA and ERA, certification may be made by a professional engineer or qualified groundwater scientist, that in his (her) professional judgment, the facility may be closed with waste left in place without posing a threat to human health or the environment. This certification will be evaluated by VDEQ and a decision will be rendered regarding the acceptance of the certification. Closure in place would likely require the placement of a contiguous soil cap over the area identified as the landfill containing subsurface debris during this investigation. Data gathered (topographical survey and soil cover thickness) is sufficient to generate the design of a landfill cap to meet VSWMR requirements.



**LEGEND**

-  Test Pit Locations
-  Soil Cover Survey Grid Points
-  Water Features
-  Estimated Landfill Boundary
-  Ponds

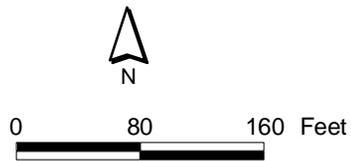
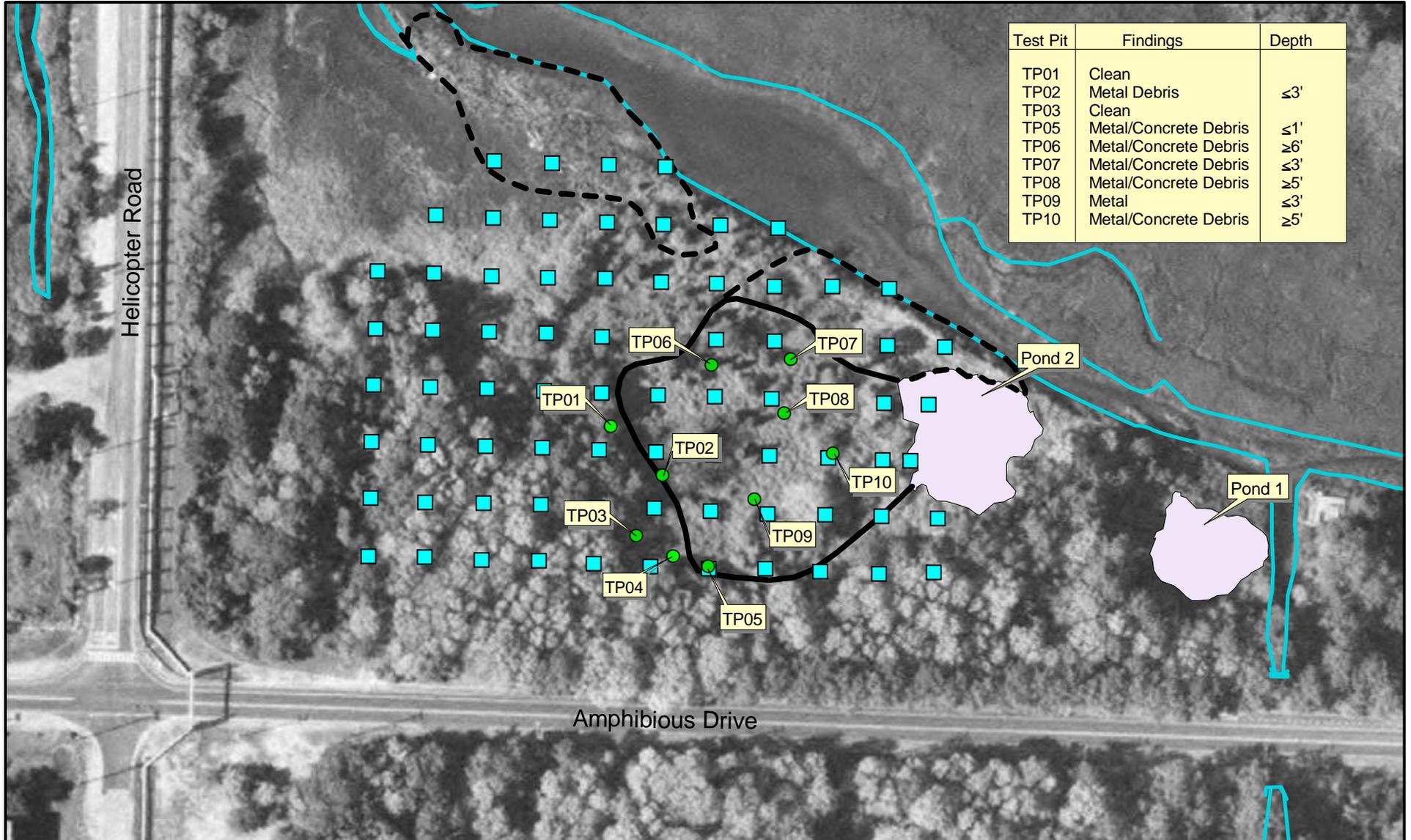


Figure 1  
Site 8 - Test Pit Locations  
NAB Little Creek  
Virginia Beach, Virginia

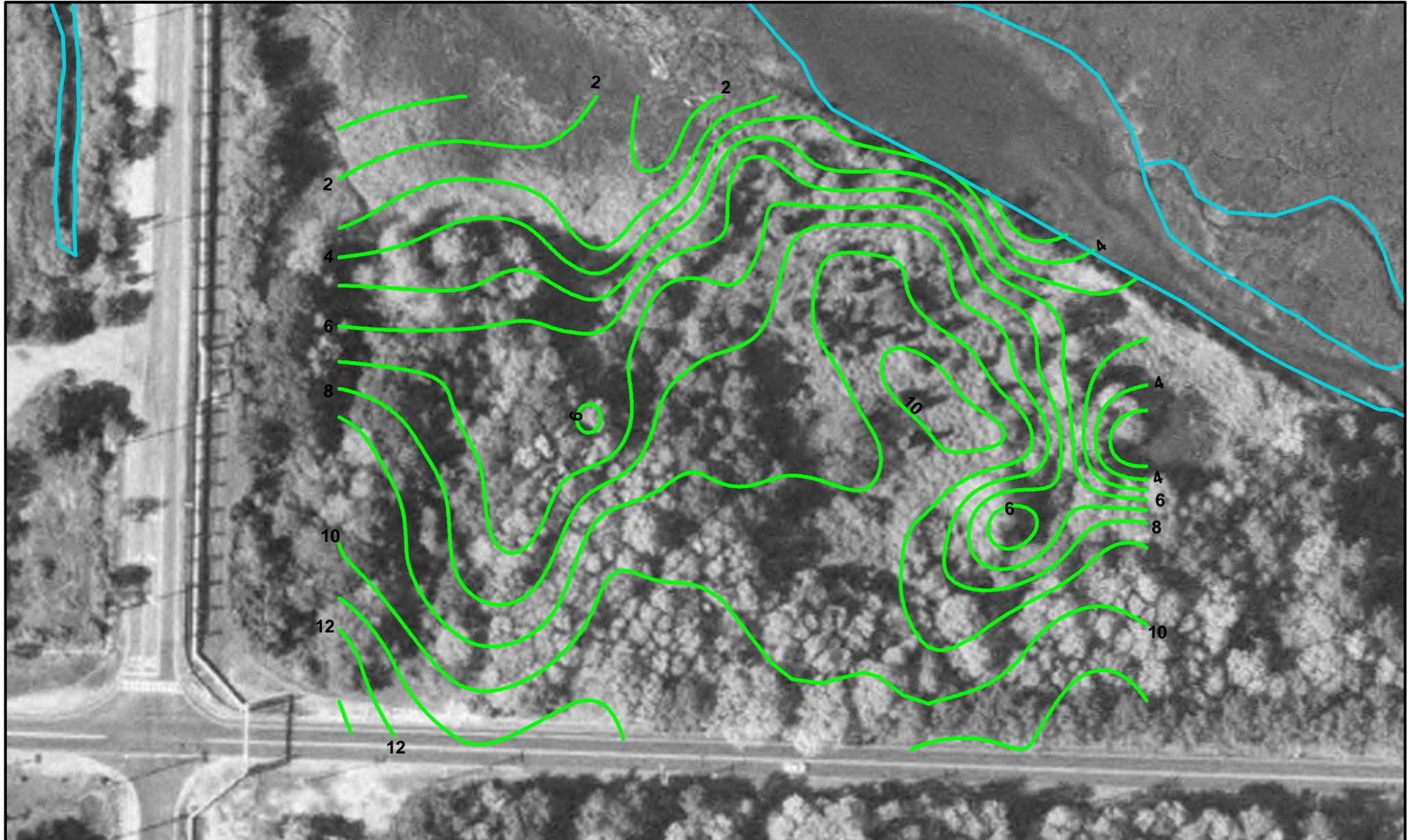


**LEGEND**

- Test Pit Locations
- Soil Cover Survey Grid Points
- ~ Water Features
- Ponds
- Shallow 0-1' to waste
- Deep 2-5' or Greater



Figure 2  
Site 8 - Test Pit Locations  
NAB Little Creek  
Virginia Beach, Virginia



**LEGEND**

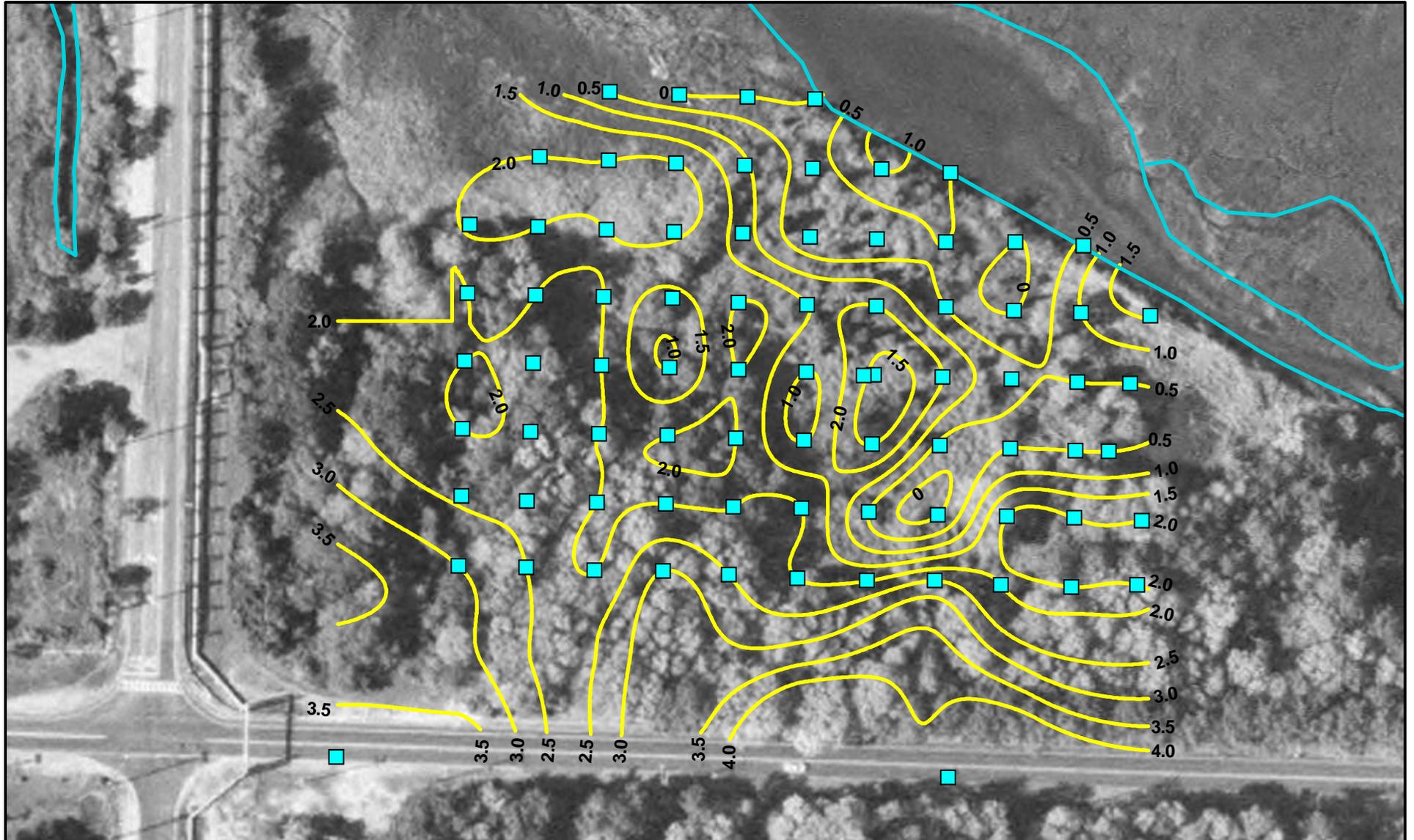
-  Water Features
-  Topographic Contours



0 70 140 Feet



Figure 3  
Site 8 - Topographic Map  
NAB Little Creek  
Virginia Beach, Virginia



**LEGEND**

-  Water Features
-  Isopach Contours
-  Soil Cover Survey Grid Points



0 70 140 Feet



Figure 4  
Site 8 - Thickness of Soil Cover  
NAB Little Creek  
Virginia Beach, Virginia

**ATTACHMENT 1**  
**PHOTOGRAPHIC LOG OF TRENCHING**  
**ACTIVITIES**

NAB Little Creek  
Site 8 Demolition Debris Landfill CTO-198  
Surface Debris Clearing  
Photo Log

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(Photo #1 , 1233 hrs., 01/11/2002, 100-0080F)

Debris Pile 13 : Viewed from east to west, approximately 90% of wooden debris removed.



(Photo #3 , 1235 hrs., 01/11/2002, 100-0082F)

Debris Pile 13: Viewed from west to east, approximately 90% of wooden debris removed and approximately 70% of total debris removed.



(Photo #4 , 1237 hrs., 01/11/2002, 100-0083F)

Debris Pile 14: with some wood pilings removed, approximately 20%. Removal began 11:15 AM.



(Photo #6 , 1248 hrs., 01/14/2002, 100-0101F)

Debris Pile 13: Clearing of DP13 in progress, viewed south to north.



(Photo #7 , 1249 hrs., 01/14/2002, 100-0102F)

Debris Pile 13: DP13 viewed east to west.



(Photo #9 , 1310 hrs., 01/17/2002, 100-0107F)

Debris Pile 13/14: DP 13/14 full extent, viewed from east to west, after most of debris had been removed. Remaining surface debris was removed by hand.



(Photo #11 , 1310 hrs., 01/17/2002, 100-0109F)  
Debris Pile 13: Equipment moving large concrete debris.



(Photo #11 , 0852 hrs., 01/28/2002, 100-01112F)

Debris Pile 13: Turbidity curtain adjacent to DP13, viewed east to west during high tide.



(Photo #09 , 0830 hrs., 01/30/2002, 100-0117F)  
Pond # 2: Metal debris removed from Pond #2.



(Photo #10 , 0839 hrs., 01/30/2002, 100-0118F)

Pond # 2: Gas cylinder found near Pond #2. Cylinder was removed from site and found to contain ammonia. Cylinder handling was completed by Hiller Systems, Inc. of Chesapeake, VA.



(Photo #12 , 1050 hrs., 02/5/2002, 100-0121F)

Site entrance: Tank taken from DP-16 in Pond #2 and metal box taken from old southeastern limit of the landfill (DP-22) in a 20cy roll off for disposal.



(Photo #13 1508 hrs., 02/14/2002, 100-0152F)  
Debris Pile 13: Wetlands bank after debris removal, adjacent to DP13,  
viewed west to east. Below: DP 13 prior to debris clearing.





(Photo #14 , 1512 hrs., 02/14/2002, 100-0156F)

Debris Pile 13: Wetlands bank after debris removal, adjacent to DP13, viewed west to east.



(Photo #15 , 0835 hrs., 01/28/2002, 100-0116F)  
Debris Pile 9: Viewed from north. Clearing of surface debris in DP-9 with access through phragmites located to the south of spartina.

**ATTACHMENT 2**  
**SURVEY DATA AND SOIL COVER THICKNESS**

**ATTACHMENT 2  
NAB LITTLE CREEK  
SITE 8 GRID LOCATION, ELEVATION AND DEPTH OF COVER**

<b><u>DESCRIPTION</u></b>	<b><u>NORTHING</u></b>	<b><u>EASTING</u></b>	<b><u>ELEVATION</u></b>	<b><u>DEPTH OF COVER</u></b>
GRID 101	3499210.3	12166709.2	9.8	2.5
GRID 102	3499207.4	12166759.5	9.2	2.0
GRID 103	3499205.6	12166810.5	8.8	2.0
GRID 104	3499205.7	12166860.0	8.2	2.5
GRID 105	3499203.0	12166908.4	7.8	2.0
GRID 106	3499201.2	12166960.0	9.3	2.0
GRID 107	3499202.7	12167008.1	9.5	2.0
GRID 108	3499249.8	12167011.6	7.9	2.0
GRID 109	3499251.8	12166962.1	7.2	2.0
GRID 110	3499253.1	12166913.1	5.6	2.0
GRID 111	3499253.7	12166862.3	8.7	0.0
GRID 112	3499256.0	12166812.0	9.1	0.5
GRID 113	3499258.5	12166762.6	9.3	2.0
GRID 114	3499259.5	12166712.8	9.2	2.0
GRID 115	3499261.9	12166663.1	9.2	2.0
GRID 116	3499263.2	12166612.6	8.5	2.0
GRID 117	3499313.3	12166614.4	6.1	2.0
GRID 118	3499311.8	12166664.5	8.5	2.0
GRID 119	3499310.0	12166714.5	8.6	2.0
GRID 120	3499308.3	12166764.3	8.7	1.0
GRID 121	3499305.9	12166814.3	8.9	2.0
GRID 122	3499304.8	12166863.6	10.0	0.4
GRID 123	3499302.8	12166915.4	9.7	0.5
GRID 124	3499300.9	12166963.3	5.8	0.5
GRID 125 OS	3499300.4	12166987.4	3.2	See Note
GRID 126 OS	3499349.9	12167003.3	4.2	0.5
GRID 127	3499351.1	12166964.5	5.5	0.5
GRID 128	3499353.1	12166916.3	8.3	See Note
GRID 129	3499354.8	12166865.8	10.1	1.5
GRID 130	3499356.5	12166815.7	9.8	See Note
GRID 131	3499358.2	12166766.0	8.7	1.0
GRID 132	3499360.1	12166716.5	8.3	2.0
GRID 133	3499361.8	12166666.1	7.8	1.0

**ATTACHMENT 2  
NAB LITTLE CREEK  
SITE 8 GRID LOCATION, ELEVATION AND DEPTH OF COVER**

<b><u>DESCRIPTION</u></b>	<b><u>NORTHING</u></b>	<b><u>EASTING</u></b>	<b><u>ELEVATION</u></b>	<b><u>DEPTH OF COVER</u></b>
GRID 134	3499363.5	12166616.0	6.5	2.0
GRID 135	3499413.5	12166617.8	5.0	2.0
GRID 136	3499412.2	12166668.0	7.5	See Note
GRID 137	3499409.4	12166716.6	7.3	2.0
GRID 138	3499407.7	12166766.9	8.9	1.5
GRID 139	3499406.7	12166817.2	9.4	1.5
GRID 140	3499405.7	12166868.3	8.4	0.5
GRID 141	3499403.3	12166918.0	7.2	0.0
GRID 142	3499401.6	12166967.4	5.4	1.0
GRID 143	3499399.8	12167017.8	3.7	See Note
GRID 145	3499451.0	12166968.9	3.7	See Note
GRID 146	3499453.4	12166919.2	3.5	0.0
GRID 147	3499453.6	12166868.2	7.7	0.5
GRID 148	3499455.8	12166817.7	8.6	0.2
GRID 149	3499457.1	12166768.9	8.3	0.2
GRID 150	3499460.0	12166719.5	6.4	See Note
GRID 151	3499461.1	12166669.4	5.0	See Note
GRID 152	3499462.7	12166619.8	2.5	2.0
GRID 153	3499513.2	12166621.4	2.3	2.0
GRID 154	3499511.5	12166670.9	2.3	2.0
GRID 155	3499509.8	12166721.1	6.2	See Note
GRID 156	3499507.7	12166771.0	5.2	See Note
GRID 157	3499506.9	12166820.9	4.9	1.0
GRID 158	3499504.3	12166871.7	4.0	0.5
GRID 162	3499558.2	12166772.6	3.7	0.0
GRID 163	3499560.0	12166723.0	2.5	0.0
GRID 164	3499561.4	12166673.1	1.6	0.0
GRID 165	3499212.9	12166661.3	9.9	3.0
GRID 166	3499213.3	12166611.0	9.7	2.0
GRID 167	3499215.5	12166561.2	7.4	2.5
GRID 168	3499216.7	12166511.5	7.9	3.0
GRID 169	3499267.7	12166513.5	7.6	See Note
GRID 170	3499264.0	12166561.6	6.5	See Note

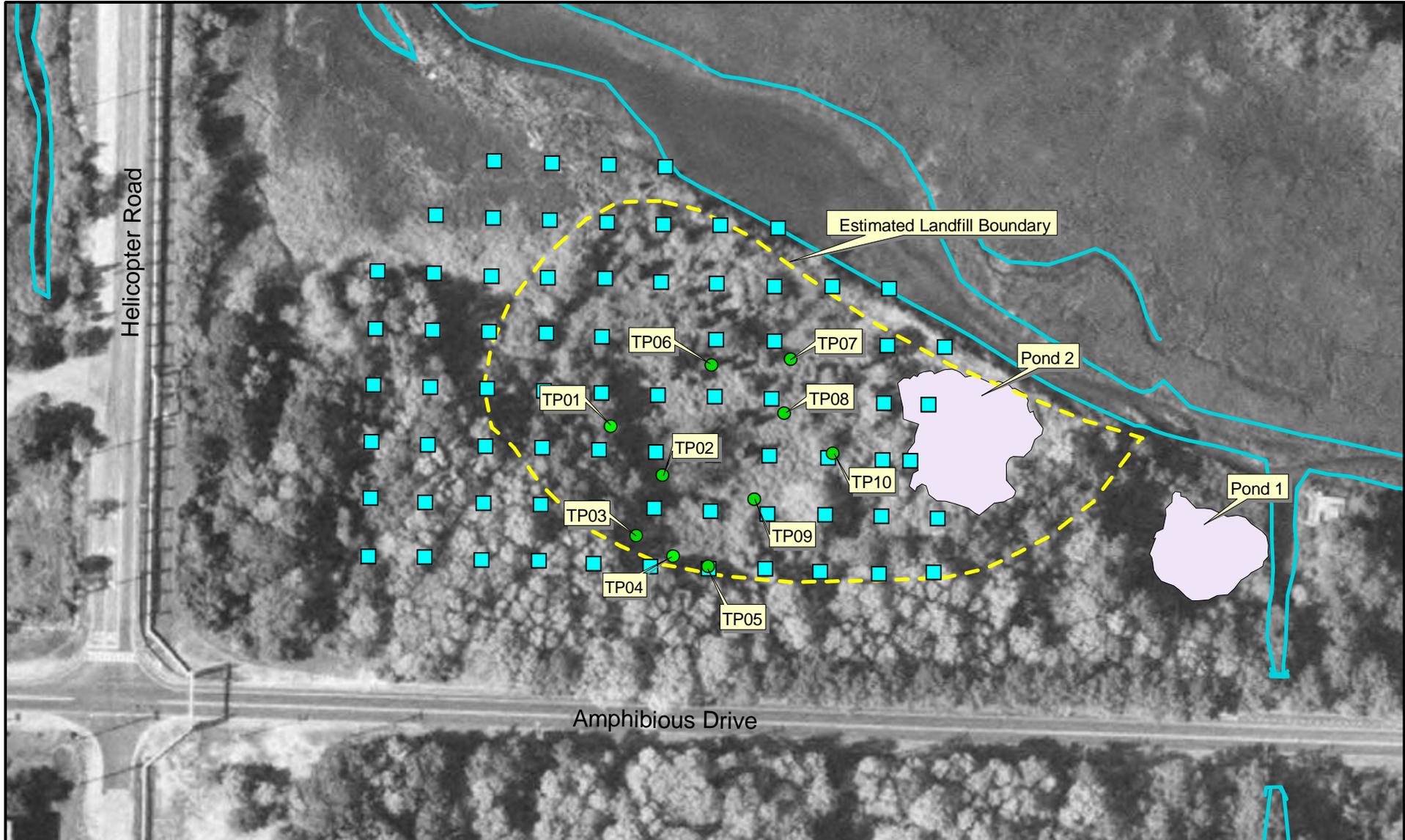
**ATTACHMENT 2  
NAB LITTLE CREEK  
SITE 8 GRID LOCATION, ELEVATION AND DEPTH OF COVER**

<b><i>DESCRIPTION</i></b>	<b><i>NORTHING</i></b>	<b><i>EASTING</i></b>	<b><i>ELEVATION</i></b>	<b><i>DEPTH OF COVER</i></b>
GRID 171	3499314.6	12166564.2	6.8	See Note
GRID 172	3499316.7	12166514.4	7.0	2.0
GRID 173	3499366.7	12166516.0	6.7	2.0
GRID 174	3499365.0	12166566.1	6.5	See Note
GRID 175	3499414.8	12166568.1	5.5	2.0
GRID 176	3499416.4	12166518.1	5.1	2.0
GRID 177	3499466.7	12166519.7	4.1	See Note
GRID 178	3499465.0	12166569.5	3.8	2.0
GRID 179	3499515.7	12166570.9	2.2	2.0
GRID 180	3499563.2	12166622.1	0.7	0.0
TRV 1	3499077.405	12166422.5	9.89	See Note
TRV 2	3499062.161	12166870.12	10.80	See Note
TRV 3	3499356.004	12166808.05	9.50	See Note

NOTE: SOIL COVER THICKNESS NOT OBTAINED DUE TO OVERLAPPING DATA POINTS  
OR BASED UPON FIELD OBSERVATION OF LOCATION

COORDINATES ARE ON THE VIRGINIA STATE PLANE COORDINATE SYSTEM,  
SOUTH ZONE, NAD 83/86, U.S. SURVEY FOOT

ELEVATIONS ARE ON NGVD 29 (1972)



**LEGEND**

-  Test Pit Locations
-  Soil Cover Survey Grid Points
-  Water Features
-  Estimated Landfill Boundary
-  Ponds

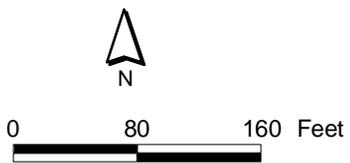
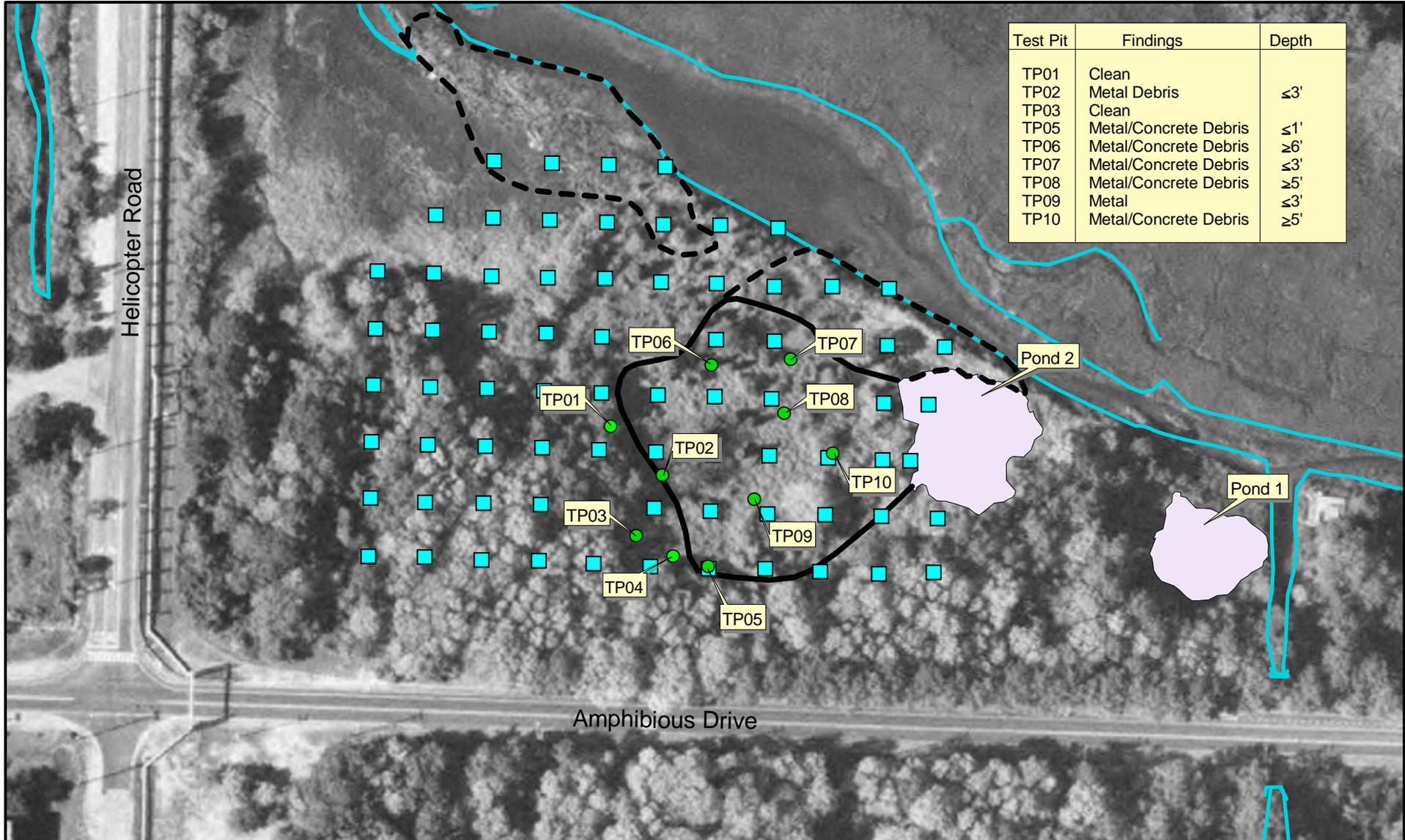


Figure 1  
Site 8 - Test Pit Locations  
NAB Little Creek  
Virginia Beach, Virginia



**LEGEND**

- Test Pit Locations
- Soil Cover Survey Grid Points
- ~ Water Features
- Ponds
- Shallow 0-1' to waste
- Deep 2-5' or Greater

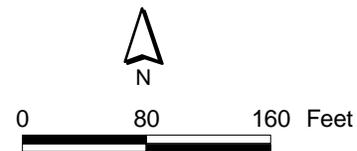
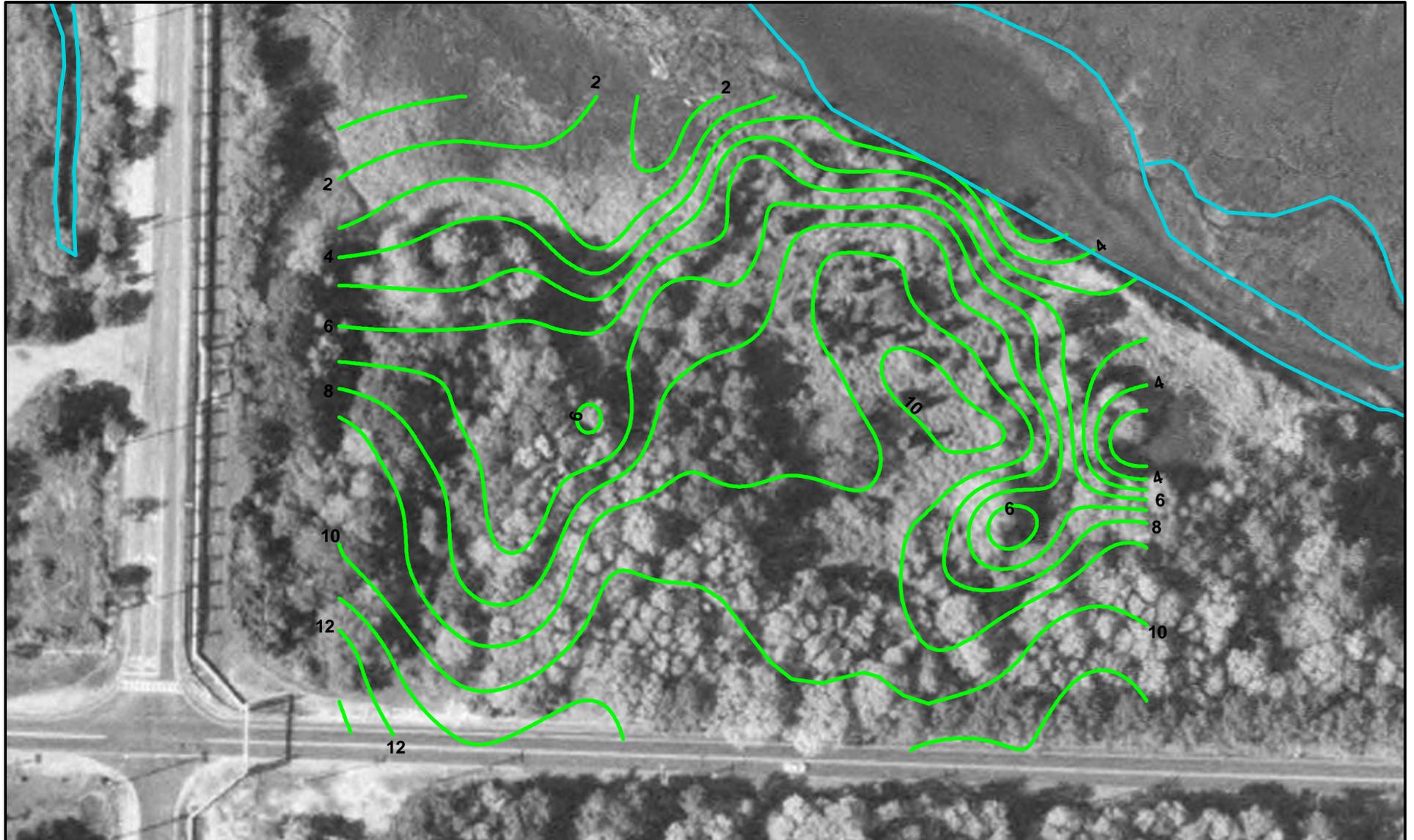


Figure 2  
 Site 8 - Test Pit Locations  
 NAB Little Creek  
 Virginia Beach, Virginia



**LEGEND**

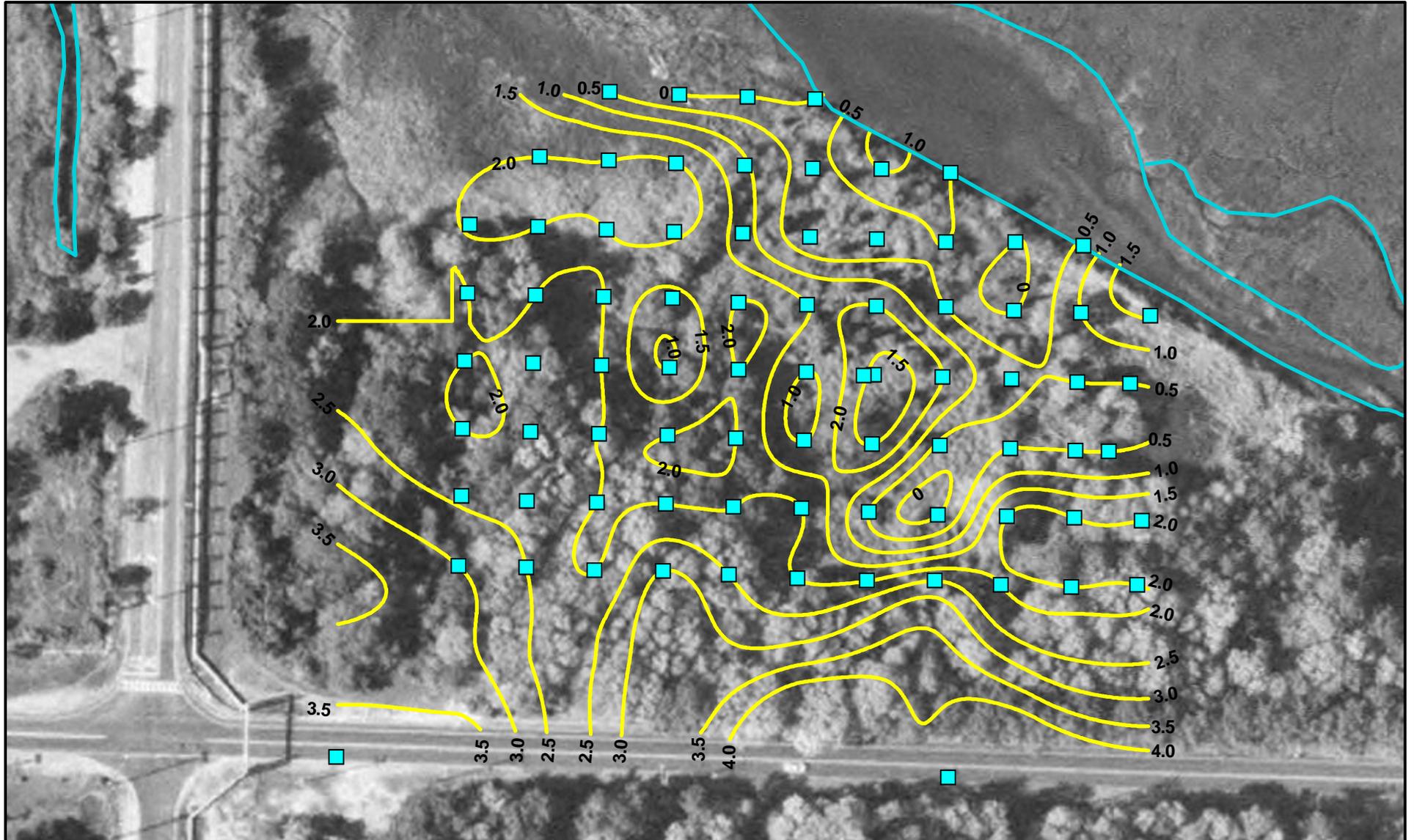
-  Water Features
-  Topographic Contours



0 70 140 Feet



Figure 3  
Site 8 - Topographic Map  
NAB Little Creek  
Virginia Beach, Virginia



**LEGEND**

-  Water Features
-  Isopach Contours



0 70 140 Feet

Figure 4  
Site 8 - Thickness of Soil Cover  
NAB Little Creek  
Virginia Beach, Virginia

## Appendix B ARAR Tables

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# Contents

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## Tables

- B-1 Federal Chemical-Specific ARARs
- B-2 Virginia Chemical-Specific ARARs
- B-3 Federal Location-Specific ARARs
- B-4 Virginia Location-Specific ARARs
- B-5 Federal Action-Specific ARARs
- B-6 Virginia Action-Specific ARARs

**Table B-1  
Federal Chemical-Specific ARARs  
NAB Little Creek, Virginia Beach, Virginia**

<b>Requirement</b>	<b>Prerequisite</b>	<b>Citation</b>	<b>ARAR Determination</b>	<b>Comment</b>
<b>Soil/Sediment</b>				
Toxicity Characteristic Leaching Procedure (TCLP) regulatory levels	Hazardous waste treatment, storage, or disposal	40 CFR, Section 261.24	Applicable	Soil and sediment removed during the interim removal action will be characterized for disposal using TCLP
Definition of RCRA Hazardous Waste	Waste soil	40 CFR Sections 261.21, 261.22(a)(1); 261.23; 261.24(a)(1); and 261.100	Applicable	Applicable for determining whether waste is hazardous.  See Table A-2, Virginia Chemical Specific-ARARs, as Virginia has lead RCRA Regulatory Authority.
Chemical-specific risk-based concentration (RBC) screening levels	CERCLA site	EPA Region III RBC Tables	TBC	Risk-based concentrations are considered as a preliminary indicator of the presence of risk. Based on site data and human health risk results, no human health risks were identified for site soils or sediment based upon current site use.

**Groundwater**

**Safe Drinking Water Act (SDWA), 42 USC 300\***

National primary drinking water standards are health-based standards for public water systems (maximum contaminant levels [MCLs]).	Public water system	40 CFR Part 141 Subparts B & G	Not Applicable	The non-time critical removal action is being completed to address landfill waste/soil and adjacent sediment. Groundwater will only be encountered as nuisance water in any excavation below site groundwater levels.
Maximum contaminant level goals [MCLGs] pertain to known or anticipated adverse health effects (also known as recommended maximum contaminant levels).	Public water system	40 CFR Part 141, Subpart F	Not Applicable	The non-time critical removal action is being completed to address landfill waste/soil and adjacent sediment. Groundwater will only be encountered as nuisance water in any excavation below site groundwater levels.
National secondary drinking water regulations are standards for the aesthetic qualities of public water systems (secondary MCLs [SMCLs]).	Public water system	40 CFR Part 143, excluding 143.5(b)	Not Applicable	The non-time critical removal action is being completed to address landfill waste/soil and adjacent sediment. Groundwater will only be encountered as nuisance water in any excavation below site groundwater levels.
Risk Based Concentrations (RBCs)	Public water system	EPA Region III RBC Tables	Not Applicable	The non-time critical removal action is being completed to address landfill waste/soil and adjacent sediment. Groundwater will only be encountered as nuisance water in any excavation below site groundwater levels.

\* Statutes and policies, and their citations, are provided as headings to identify general categories of potential ARARs for the convenience of the reader. Listing the statutes and policies does not indicate that DON accepts the entire statutes or policies as potential ARARs. Specific potential ARARs are addressed in the table below each general heading; only substantive requirements of the specific citations are considered potential ARARs.

ARARs - Applicable or relevant and appropriate requirements

CFR - Code of Federal Regulations

TBC - To Be Considered

VHWMRs - Virginia Hazardous Waste Management Regulations

**Table B-2  
Virginia Chemical-Specific ARARs  
NAB Little Creek, Virginia Beach, Virginia**

Requirement	Prerequisite	Citation	ARAR Determination	Comment
<b>Soil/Sediment</b>				
<b>Virginia Hazardous Waste Management Regulations (VHWMRs)</b>				
Definition of RCRA Hazardous Waste	Waste soil	9 VAC 20-60 et al	Applicable	TCLP sampling will be conducted to characterize landfill waste, soil, and adjacent sediment for disposal off site.
<b>Virginia Solid Waste Management Regulations (VSWMRs)</b>				
Specific regulations for the handling of "Special Wastes"	Waste must meet the determination of a Virginia "special waste"	9 VAC 20-80 et al	Relevant and Appropriate	Materials to be removed will be evaluated for classification as "special waste" per VSWMR.
<b>Groundwater</b>				
<b>Virginia Drinking Water Standards*</b>				
Primary drinking water standards are health-based standards for public water supplies (primary maximum contaminant levels [PMCLs]).	Public water system.	12 VAC 5-590-10	Not Applicable	The non-time critical removal action is being completed to address landfill waste/soil and adjacent sediment. Groundwater will only be encountered as nuisance water in any excavation below site groundwater levels.
Secondary drinking water regulations are chemical based standards for qualities of public water supplies (secondary MCLs [SMCLs]).	Public water system.	12 VAC 5-590-390	Not Applicable	The non-time critical removal action is being completed to address landfill waste/soil and adjacent sediment. Groundwater will only be encountered as nuisance water in any excavation below site groundwater levels.

**Table B-2**  
**Virginia Chemical-Specific ARARs**  
**NAB Little Creek, Virginia Beach, Virginia**

Requirement	Prerequisite	Citation	ARAR Determination	Comment
<b>Virginia Groundwater Standards (VGWS)*</b>				
Establishes groundwater standards for State Antidegradation Policy.	Standards are used when no MCL is available.	9 VAC 25-260-190 to 220	Not Applicable	The non-time critical removal action is being completed to address landfill waste/soil and adjacent sediment. Groundwater will only be encountered as nuisance water in any excavation below site groundwater levels.
<p>*Statutes and policies, and their citations, are provided as headings to identify general categories of potential ARARs for the convenience of the reader. Listing the statutes and policies does not indicate that Navy accepts the entire statutes or policies as potential ARARs. Specific potential ARARs are addressed in the table below each general heading; only substantive requirements of the specific citations are considered potential ARARs.</p> <p>ARARs - Applicable or relevant and appropriate requirements</p> <p>CFR - Code of Federal Regulations</p> <p>TBC - To be considered</p> <p>VAC - Virginia Administrative Code</p>				

**Table B-3  
Federal Location-Specific ARARs  
NAB Little Creek, Virginia Beach, Virginia**

Location	Requirement	Prerequisite	Citation	ARAR Determination	Comment
<b>Protection of Floodplain*</b>					
Within floodplain	Actions taken should avoid adverse effects, minimize potential harm, restore and preserve natural and beneficial values.	Action that will occur in a floodplain, i.e., lowlands, and relatively flat areas adjoining inland and coastal waters and other flood-prone areas.	40 CFR Part 6, Appendix A; excluding Sections 6(a)(2), 6(a)(4), 6(a)(6); 40 CFR 6.302	Applicable	Removal activities may require compliance with this order. Measures required may include erosion control.
<b>Protection of Wetlands*</b>					
Wetland	Action to minimize the destruction, loss, or degradation of wetlands.	Wetland as defined by Executive Order 11990 Section 7.	40 CFR 6, Appendix A; excluding Sections 6(a)(2), 6(a)(4), 6(a)(6); 40 CFR 6.302	Relevant and Appropriate	Federal or State regulated wetlands are present at the site. Nationwide Permit No. 38 allows for activities in wetlands to contain, stabilize, or remove hazardous or toxic materials. "Notification" is required to the District Engineer and the wetlands on the site should be delineated. Activities undertaken entirely on a CERCLA site by authority of CERCLA as approved or required by EPA, are not required to obtain permits under Section 404 of the Clean Water Act or Section 10 of the Rivers and Harbors Act. NWP 38 notification will put in place coordination with natural resource and historic resource trustees regarding the potential to adversely affect threatened and endangered species and sites protected under the National Historic Preservation Act.

**Table B-3  
Federal Location-Specific ARARs  
NAB Little Creek, Virginia Beach, Virginia**

<b>Location</b>	<b>Requirement</b>	<b>Prerequisite</b>	<b>Citation</b>	<b>ARAR Determination</b>	<b>Comment</b>
<b>Clean Water Act, Section 404*</b>					
Wetland	Action to prohibit discharge of dredged or fill material into wetland without permit.	Wetland as defined by Executive Order 11990 Section 7.	40 CFR 230.10; 40 CFR 231 (231.1, 231.2, 231.7, 231.8)	Relevant and Appropriate	Non-time critical removal action at Site 8 will include removal and restoration of wetland sediments. Activities undertaken entirely on a CERCLA site by authority of CERCLA as approved or required by EPA, are not required to obtain permits under Section 404 of the Clean Water Act or Section 10 of the Rivers and Harbors Act.
<b>Endangered Species Act of 1978*</b>					
Endangered species	Action to ensure that any action is not likely to jeopardize the continued existence of endangered or threatened species or adversely affect its critical habitat.	Applies to actions that affect endangered or threatened species or their habitat.	16 USC 1531 50 CFR Part 402	Relevant and Appropriate	Except for the occasional transient individuals, no federally listed or proposed endangered species are known to exist at Site 8. Therefore, the requirements of the Endangered Species Act of 1973 (16 USC 1536(a)) will not be applicable to the removal action.
<b>Federal Fish and Wildlife Conservation Act</b>					
Fish and Wildlife	Requires that activities avoid, minimize, or compensate for impacts to fish and wildlife and their habitats.	Applies to actions that affect fish and wildlife and their habitat.	16 USC §662 et seq.	Relevant and Appropriate	Site Restoration at Site 8, including the tidally influenced wetland area of Site 8 adjacent to Little Creek Cove, will provide enhanced habitat for fish and wildlife species.
<b>Coastal Zone and Management Act</b>					
Coastal Zone	Requires that activities conducted within a coastal zone be consistent with an approved state management program.	Applies to sites located within a coastal zone.	16 USC §1451 et seq.	Relevant and Appropriate	Site 8 and surrounding vicinity is located within the coastal zone. Activities will be conducted in accordance with an approved state management program.

**Table B-3  
Federal Location-Specific ARARs  
NAB Little Creek, Virginia Beach, Virginia**

Location	Requirement	Prerequisite	Citation	ARAR Determination	Comment
<b>National Historical Preservation Act of 1966 (NHPA) and Archaeological Resources Protection Act of 1979</b>					
Historical Locations and Archaeological Artifacts	Provides for the recovery and preservation of historical and archaeological significant artifacts. Implementing regulations for NHPA (36 CFR Part 65) establish the National Register of Historic Places and provide for preservation of historic properties and minimization of damage to historic landmarks.	Applies to historical properties and landmarks, and archaeological artifacts.	NHPA: 16 USC §470; 36 CFR Part 65. Archaeological Resources Protection Act.	Relevant and Appropriate	Based upon historical site use and filling activities that were conducted in the vicinity, it is not likely that historical landmarks or artifacts exist at Site 8 and surrounding vicinity.
<p>* Statutes and policies, and their citations are provided as headings to identify general categories of potential ARARs for the convenience of the reader. Listing the statutes and policies does not indicate that Navy accepts the entire statutes or policies as potential ARARs. Specific potential ARARs are addressed in the table below each general heading; only substantive requirements of the specific citations are considered potential ARARs.</p> <p>ARARs - Applicable or relevant and appropriate requirements            CFR - Code of Federal Regulations            NWP - Nationwide Permit            USC - United States Code</p>					

**Table B-4  
Virginia Location-Specific ARARs  
NAB Little Creek, Virginia Beach, Virginia**

Location	Requirement	Prerequisite	Citation	ARAR Determination	Comment
<b>Virginia State Water Control Laws and Virginia Wetlands Regulations*</b>					
Wetland	Action to minimize the destruction, loss, or degradation of wetlands.	Wetland as defined by Virginia statutory provision.	General Provisions Relating to Marine Resources Commission, Va. Code Ann., 28.2-1300 to 1320 (1998); Wetlands Mitigation Compensation Policy, 4 VAC 20-390-10 to 50.	Applicable	Federal and/or state regulated wetlands are present at the site which could be impacted by the non time critical removal action at the site. The process of excavating in wetlands is marginally regulated at this time. Virginia's draft regulation, Virginia Administrative Code, 9 VAC 25-210 et seq establishes excavation and related activities as a regulated activity. Although CERCLA actions do not require permits in wetlands, the VDEQ (along with the USACE as the lead agency in CWA Section 404 actions) work with project proponents to meet the intent of the law, including compensatory mitigation.
<b>Chesapeake Bay Preservation Act and Chesapeake Bay Preservation Area Designation and Management Regulations*</b>					
Chesapeake Bay areas	Under these requirements, certain locally designated tidal and nontidal wetlands, as well as other sensitive land areas, may be subject to limitations regarding land-disturbing activities, removal of vegetation, use of impervious cover, erosion and sediment control, stormwater management, and other aspects of land use that may have effects on water quality.	Federally owned area designated as a Chesapeake Bay Preservation area.	Chesapeake Bay Preservation Act, Va. Code Ann., 10.1-2100 to 2116; Chesapeake Bay Preservation Area Designation and Management Regulations, 9 VAC 10-20-10 to 280	TBC	This requirement is not an ARAR since the area affected by the removal action is federally owned and the City of Virginia Beach does not have jurisdiction over Naval Amphibious Base Little Creek .
<b>Coastal Zone Management Act; NOAA Regulations of Federal Consistency with approved State Coastal Zone Management Programs</b>					
Within coastal zone	Conduct activities within a coastal Management Zone in a manner consistent with local requirements.	Activities affecting the coastal zone including lands thereunder and adjacent shore land.	Section 307(c) of 16 USC 1456(c); also see 15 CFR 930 and 923.45	TBC	This requirement is not an ARAR since the Commonwealth of Virginia does not have jurisdiction over the federally owned Naval Amphibious Base Little Creek.

**Table B-4  
Virginia Location-Specific ARARs  
NAB Little Creek, Virginia Beach, Virginia**

Location	Requirement	Prerequisite	Citation	ARAR Determination	Comment
<b>Virginia Endangered Species</b>					
Critical habitat upon which endangered species or threatened species depend.	Action to conserve endangered species or threatened species, including consultation with the Virginia Board of Game and Inland Fisheries.	Determination of effect upon endangered or threatened species or its habitat.	Virginia Code Ann. §§ 29.1-563 to 570 (1998)  <i>Definitions and Miscellaneous in General</i> , 4 VAC 15-20-130 to 140  Endangered Plant and Insect Species Act, Va. Code Ann. 3.1-1020 to 1030 (1998)	Relevant and Appropriate	Except for occasional transient individuals, no federally listed or proposed endangered species are known to exist at Site 8. Therefore, the requirements of the Endangered Species Act of 1973 (16 USC 1536(a)) will not be applicable to the removal action.
<b>Virginia Natural Areas Preserves Act*</b>					
Natural preserves area	Action to conserve natural preserve areas and restrict certain activities in these areas	Applicable to sites that meet natural preserve area criteria as determined by the Virginia Department of Conservation and Recreation	Code of Virginia Sections 10.1-209 through 217	Relevant and Appropriate	Site 8 is not a natural preserve area.
<b>Virginia Endangered Plant and Insect Species Act; Virginia Board of Game and Inland Fisheries*</b>					
Endangered plant and insect species	Action to conserve endangered or protected plant and insect species	Applies to actions that affect endangered or protected plant and insect species.	Code of Virginia Sections 29.1-100 and 29.1-565  2 VAC 5-320-10	Relevant and Appropriate	No rare plant or insect species are known to occur in the vicinity of Site 8.

**Table B-4**  
**Virginia Location-Specific ARARs**  
**NAB Little Creek, Virginia Beach, Virginia**

Location	Requirement	Prerequisite	Citation	ARAR Determination	Comment
<p>* Statutes and policies, and their citations, are provided as headings to identify general categories of potential ARARs for the convenience of the reader. Listing the statutes and policies does not indicate that Navy accepts the entire statutes or policies as potential ARARs. Specific potential ARARs are addressed in the table below each general heading; only substantive requirements of the specific citations are considered potential ARARs.</p> <p>ARARs - Applicable or relevant and appropriate requirements</p> <p>CFR - Code of Federal Regulations</p> <p>CWA - Clean Water Act</p> <p>NOAA - National Oceanic and Atmospheric Administration</p> <p>TBC - To Be Considered</p> <p>USACE - United States Army Corps of Engineers</p> <p>VAC - Virginia Administrative Code</p> <p>VDEQ - Virginia Department of Environmental Quality</p>					

**Table B-5  
Federal Action-Specific ARARs  
NAB Little Creek, Virginia Beach, Virginia**

Action	Requirement	Prerequisite	Citation	ARAR Determination	Comment
<b>Clean Air Act (CAA) 40 USC 7401 et seq.*</b>					
Discharge to air	National Primary and Secondary Ambient Air Quality Standards (NAAQS) - standards for ambient air quality to protect public health and welfare (including standards for particulate matter and lead).	Contamination of air affecting public health and welfare	40 CFR Sections 50.4 - 50.12	Relevant and Appropriate	No discharges to air are anticipated other than fugitive dust.
<p>* Statutes and policies, and their citations are provided as headings to identify general categories of ARARs. Specific potential ARARs are addressed in the table below each general heading.</p> <p>ARARs - Applicable or relevant and appropriate requirements</p> <p>CFR - Code of Federal Regulations</p> <p>TBC - To Be Considered</p>					

**Table B-6  
Virginia Action-Specific ARARs  
NAB Little Creek, Virginia Beach, Virginia**

Action	Requirement	Prerequisite	Citation	ARAR Determination	Comment
<b>Virginia Pollutant Discharge Elimination System (VPDES) Permit Regulations*</b>					
Discharge of Treated Water to Surface Waters, and certain storm water discharges	Regulated point-source discharges through VPDES permitting program. Permit requirements include compliance with corresponding water quality standards, establishment of a discharge monitoring system, and completion of regular discharge monitoring records.	Applicable to discharge of treated water to surface water, and to storm water discharges from certain facilities, including landfills.	9 VAC 25-31-10 to 940	Applicable	The facility has several VPDES permits, but none are immediately present in the vicinity of Site 8. Construction activities will conform to 9 VAC 25-180-10 et seq for storm water discharges from construction activities.
<b>Virginia Hazardous Waste Management Regulations (VHWMRs)</b>					
Hazardous Waste Staging Transport, and Disposal	These regulations and laws define the requirements for the management of hazardous wastes. Any disposal facility must be properly permitted and in compliance with all operational and monitoring requirements of the permit and regulations.	Wastes must meet definition of hazardous waste.	9 VAC 20-60-420 to 500	Relevant and Appropriate	Soil and sediment excavated during the interim removal action will be characterized for disposal, although all existing data indicate waste will be non-hazardous, any identified hazardous waste will be managed as appropriate in accordance with VHWMRs
<b>Virginia Solid Waste Management Regulations (VSWMRs)</b>					
Solid Waste Staging Transport, and Disposal	These regulations and laws define the requirements for the management of solid wastes. Any disposal facility must be properly permitted and in compliance with all operational and monitoring requirements of the permit and regulations.	Wastes must meet definition of solid waste.	9 VAC 20-80 et al	Applicable	Applicable to management and staging, transportation, and off-site disposal of any debris classified as a solid waste.
Off-site Disposal	Provides criteria for determining if solid waste disposal facility poses an adverse effect on human health or environment.	Permitted solid waste landfill.	9 VAC 20-80 et al	TBC	TBC for determining suitable off-site disposal facilities for non-hazardous waste. Applicable for on-site determination of disposal. Off-site disposal is not an ARAR.

**Table B-6  
Virginia Action-Specific ARARs  
NAB Little Creek, Virginia Beach, Virginia**

Action	Requirement	Prerequisite	Citation	ARAR Determination	Comment
<b>Virginia Air Pollution Control Regulations*</b>					
Discharge to air	Virginia Ambient Air Quality Standards - standards for ambient air quality to protect public health and welfare (including standards for particulate matter and lead).	Contamination of air affecting public health and welfare.	9 VAC 5-30-10 to 180	Applicable	Applicable for all site removal activities that may generate air discharges. No discharges to air are anticipated other than fugitive dust.
Discharge of visible emissions and fugitive dust	Fugitive dust/emissions may not be discharged to the atmosphere at amounts in excess of standards.	Any source of fugitive dust/emissions.	9 VAC 5-50-60 to 120	Applicable	Applicable for any site removal activities that generate fugitive dust.
Discharge of toxic pollutants	Toxic pollutants may not be discharged to the atmosphere at amounts in excess of standards.	Any emission from the disturbance of soil, or treatment of soil or water, that do not qualify for the exemptions under Rule 4-3.	9 VAC 5-50-160 to 230	Applicable	Applicable for any site removal activities that generate toxic air pollutants. No toxic air pollutants are anticipated as part of this NTCRA.

**Table B-6  
Virginia Action-Specific ARARs  
NAB Little Creek, Virginia Beach, Virginia**

Action	Requirement	Prerequisite	Citation	ARAR Determination	Comment
<b>Virginia Stormwater Management Regulations and Virginia Erosion and Sediment Control Regulations</b>					
Stormwater Management	Regulates stormwater management and erosion/ sedimentation control practice.	Land disturbing activities.	<i>Stormwater Management Act</i> , VA Code Ann. §§ 10.1-603.1 to 603.15 (1998);  <i>Stormwater Management Regulations</i> , 4 VAC 3-20-10 to 251  Erosion and Sediment Control Law, Va. Code Ann. §§ 10.1-560 to 571 (1998); Erosion and Sediment Control Regulations, 4 VAC 50-30-10 to 110	Applicable	Applicable for any site removal activities involving surface water runoff, nuisance groundwater infiltration, and erosion. The NTCRA will include erosion and sediment control for storm water; and, storage, treatment, and discharge of nuisance groundwater infiltration.
* Statutes and policies, and their citations, are provided as headings to identify general categories of potential ARARs. Specific ARARs are addressed in the table below each general heading. ARAR - Applicable or relevant and appropriate requirement CFR - Code of Federal Regulations NTCRA - Non-time critical removal action TBC - To Be Considered VAC - Virginia Administrative Code					

## Appendix C Cost Estimates

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**Table C-1**  
**Cost Estimate for Work Element A Alternative #2: Soil Cover with Institutional Controls**  
**Site 8 EE/CA**  
**NAB Little Creek**  
**Virginia Beach, Virginia**

Cost Item	Unit	Quantity	Unit Cost	Cost	Cost Estimate Reference
<b>Cap</b>					
Clearing	AC	1.5	\$ 2,100.00	\$ 3,150.00	recent similar project
Tree Removal	EA	15	\$ 180.00	\$ 2,700.00	recent similar project
Stump Removal	EA	15	\$ 70.00	\$ 1,050.00	recent similar project
Grubbing	AC	1.5	\$ 1,200.00	\$ 1,800.00	recent similar project
Grading Fill	CY	4700	\$ 12.00	\$ 56,400.00	recent similar project
Topsoil	CY	1400	\$ 22.00	\$ 30,800.00	recent similar project
Fine Grading	SY	7260	\$ 0.50	\$ 3,630.00	recent similar project
Ditch Linings (permanent ECM)	SY	600	\$ 7.00	\$ 4,200.00	recent similar project
Seeding	AC	1.5	\$ 2,000.00	\$ 3,000.00	recent similar project
Waste T/D (vegetation)	TN	675	\$ 50.00	\$ 33,750.00	recent similar project
<b>Construction Subtotal</b>				<b>\$ 140,480.00</b>	
<b>Yearly Groundwater Monitoring</b>					
labor*	HR	80	\$ 63.65	\$ 5,092.32	Means**, 33-02-0107
analysis, metals*	EA	10	\$ 454.22	\$ 4,542.24	Means**, 33-02-1620
analysis, PAHs*	EA	10	\$ 168.77	\$ 1,687.68	Means**, 33-02-1629
analysis, pesticides*	EA	10	\$ 241.09	\$ 2,410.90	Means**, 33-02-1617
<b>Annual monitoring cost</b>				<b>\$ 13,733.14</b>	
<b>Annual Maintenance</b>					
mowing	SF	261360	\$ 0.0034	\$ 888.62	recent similar project
inspection*	HR	20	\$ 63.65	\$ 1,273.08	Means**, 33-02-0107
<b>Annual maintenance cost</b>				<b>\$ 2,161.70</b>	
<b>Annual Cost Subtotal</b>				<b>\$ 15,894.84</b>	
<b>Present Value of Monitoring &amp; Maintenance (30 Yrs)</b>				<b>\$ 292,338.66</b>	
<b>Monitoring, maintenance, and construction subtotal</b>				<b>\$ 432,818.66</b>	
Contingency (20%)				\$ 86,563.73	
<b>Subtotal</b>				<b>\$ 519,382.39</b>	
General Conditions (10%)				\$ 51,938.24	
Mobilization/Demobilization (5%)				\$ 25,969.12	
<b>Subtotal</b>				<b>\$ 597,289.75</b>	
Contractor OH/P (15%)				\$ 89,593.46	
<b>Subtotal</b>				<b>\$ 686,883.22</b>	
Design Costs (10%)				\$ 68,688.32	
Construction Oversight (15%)				\$ 103,032.48	
<b>TOTAL PRESENT VALUE COST OF WEA Alt 2</b>				<b>\$ 858,604.02</b>	

<b>ANNUAL O&amp;M COST</b>	<b>\$ 15,894.84</b>
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\*Base costs used are 2001 or 2002 dollars. A factor of +3% per year was used to adjust cost.

\*\*R.S. Means, *Environmental Remediation Cost Data - Assemblies*, 2002.

\*\*\*R.S. Means, *Site Work and Landscape Cost Data*, 2001.

Assumptions

- 15 trees to be removed
- 40 hours bi-annually for inspection
- 2-person sampling team
- annual groundwater sampling
- quarterly mowing
- 6" equivalent of mulched vegetation (for waste tonnage calculation)

**Table C-2**  
**Cost Estimate for Work Element A Alternative #3: Excavation, Restoration, and Creation of Wetlands**  
**Site 8 EE/CA**  
**NAB Little Creek**  
**Virginia Beach, VA**

Cost Item	Unit	Quantity	Unit Cost	Cost	Cost Estimate Reference
<b>Excavation &amp; Removal</b>					
Clearing	AC	1.5	\$ 2,100.00	\$ 3,150.00	recent similar project
Tree Removal	EA	15	\$ 180.00	\$ 2,700.00	recent similar project
Stump Removal	EA	15	\$ 70.00	\$ 1,050.00	recent similar project
Grubbing	AC	1.5	\$ 1,200.00	\$ 1,800.00	recent similar project
Excavation/Stockpile	CY	0	\$ 5.00	\$ -	recent similar project
Temporary Roads (geotextile)	SY	425	\$ 1.40	\$ 595.00	recent similar project
Temporary Roads (aggregate)	TN	140	\$ 18.00	\$ 2,520.00	recent similar project
Debris Removal (Dry)	CY	3160	\$ 11.00	\$ 34,760.00	recent similar project
multiply by 1.62 for TN	TN	5119			
Soil Removal (Dry)	CY	5910	\$ 5.00	\$ 29,550.00	recent similar project
multiply by 1.42 for TN	TN	8392			
Debris Removal (Wet)	CY	5250	\$ 22.00	\$ 115,500.00	recent similar project
multiply by 1.62 for TN	TN	8505			
Soil Removal (Wet)	CY	1310	\$ 10.00	\$ 13,100.00	recent similar project
multiply by 1.62 for TN	TN	2122			
Waste T/D	TN	24139	\$ 50.00	\$ 1,206,930.00	recent similar project
<b>Restoration and Creation of Wetlands</b>					
Sand Fill	CY	730	\$ 15.00	\$ 10,950.00	recent similar project
General Fill (off site)	CY	480	\$ 12.00	\$ 5,760.00	recent similar project
Regrading	SY	5932	\$ 0.50	\$ 2,966.00	recent similar project
Wetland Planting	AC	1.25	\$ 35,000.00	\$ 43,750.00	recent similar project
Seeding	AC	0.25	\$ 2,000.00	\$ 500.00	recent similar project
<b>Construction Subtotal</b>				<b>\$ 1,475,581.00</b>	
Contingency (20%)				\$ 295,116.20	
<b>Subtotal</b>				<b>\$ 1,770,697.20</b>	
General Conditions (10%)				\$ 177,069.72	
Mob/Demob (5%)				\$ 88,534.86	
<b>Subtotal</b>				<b>\$ 2,036,301.78</b>	
Contractor OH/P (15%)				\$ 305,445.27	
<b>CONSTRUCTION TOTAL</b>				<b>\$ 2,341,747.05</b>	
Design Costs (10%)				\$ 234,174.70	
Construction Oversight (15%)				\$ 351,262.06	
<b>TOTAL COST OF ALT 3</b>				<b>\$ 2,927,183.81</b>	

**Assumptions**

waste is 80%/20% waste/soil  
backfilled per restoration plan, 6" sand layer  
water table at 3 ft bgs  
15 trees to be removed

**Table C-3**  
**Cost Estimate for Work Element B Alternative #2: Excavation and Restoration**  
**Site 8 EE/CA**  
**NAB Little Creek**  
**Virginia Beach, Virginia**

Cost Item	Unit	Quantity	Unit Cost	Cost	Cost Estimate Reference
<b>Excavation &amp; Removal</b>					
Clearing	AC	0.6	\$ 2,100.00	\$ 1,260.00	recent similar project
Tree Removal	EA	5	\$ 180.00	\$ 900.00	recent similar project
Stump Removal	EA	5	\$ 70.00	\$ 350.00	recent similar project
Grubbing	AC	0.6	\$ 1,200.00	\$ 720.00	recent similar project
Debris Removal (Dry)	CY	0	\$ 11.00	\$ -	recent similar project
multiply by 1.62 for TN	TN	0			
Soil Removal (Dry)	CY	0	\$ 5.00	\$ -	recent similar project
multiply by 1.42 for TN	TN	0			
Debris Removal (Wet)	CY	1050	\$ 22.00	\$ 23,100.00	recent similar project
multiply by 1.62 for TN	TN	1701			
Soil Removal (Wet)	CY	320	\$ 10.00	\$ 3,200.00	recent similar project
multiply by 1.62 for TN	TN	518			
dewatering*	8 HR DY	10	\$ 735.41	\$ 7,354.05	Means**, 02230-500-1100
Waste T/D (total)	TN	1895	\$ 50.00	\$ 94,750.00	recent similar project
waste T/D (vegetation)	TN	340			
waste T/D (soil and waste)	TN	2219			
<b>Restoration of DP13</b>					
General Fill	CY	250	\$ 12.00	\$ 3,000.00	recent similar project
Sand Fill	CY	680	\$ 15.00	\$ 10,200.00	recent similar project
Wetland Planting	AC	0.6	\$ 35,000.00	\$ 21,000.00	recent similar project
<b>Construction Subtotal</b>				<b>\$ 165,834.05</b>	
Contingency (20%)				\$ 33,166.81	
<b>Subtotal</b>				<b>\$ 199,000.86</b>	
General Conditions (10%)				\$ 19,900.09	
Mob/Demob (5%)				\$ 9,950.04	
<b>Subtotal</b>				<b>\$ 228,850.99</b>	
Contractor OH/P (15%)				\$ 34,327.65	
<b>CONSTRUCTION TOTAL</b>				<b>\$ 263,178.64</b>	
Design Costs (10%)				\$ 26,317.86	
Construction Oversight (15%)				\$ 39,476.80	
<b>TOTAL COST OF ALT 2</b>				<b>\$ 328,973.30</b>	

\*Base costs used are 2001 dollars. A factor of +3% per year was used to adjust cost.

\*\*R.S. Means, *Site Work and Landscape Cost Data*, 2001.

**Assumptions:**

- 1ft excavation for shallow waste
- additional 1 ft excavation for proper elevation of wetland
- all excavation is below water table
- 10 days of dewatering using 2 6" centrifugal pumps
- 1ft backfilled in DP13
- waste is 80%/20% waste/soil
- 5 trees to be removed
- 6" equivalent of mulched vegetation (for waste tonnage calculation)

**Table C-4**  
**Cost Estimate for Work Element B Alternative #3: Excavation, Restoration, and Creation of Wetlands**  
**Site 8 EE/CA**  
**NAB Little Creek**  
**Virginia Beach, Virginia**

Cost Item	Unit	Quantity	Unit Cost	Cost	Cost Estimate Reference
<b>Excavation &amp; Removal</b>					
Clearing	AC	0.6	\$ 2,100.00	\$ 1,260.00	recent similar project
Tree Removal	EA	5	\$ 180.00	\$ 900.00	recent similar project
Stump Removal	EA	5	\$ 70.00	\$ 350.00	recent similar project
Grubbing	AC	0.6	\$ 1,200.00	\$ 720.00	recent similar project
Debris Removal (Dry)	CY	0	\$ 11.00	\$ -	recent similar project
multiply by 1.62 for TN	TN	0			
Soil Removal (Dry)	CY	0	\$ 5.00	\$ -	recent similar project
multiply by 1.42 for TN	TN	0			
Debris Removal (Wet)	CY	1050	\$ 22.00	\$ 23,100.00	recent similar project
multiply by 1.62 for TN	TN	1701			
Soil Removal (Wet)	CY	320	\$ 10.00	\$ 3,200.00	recent similar project
dewatering*	8 HR DY	10	\$ 735.41	\$ 7,354.05	Means**, 02230-500-1100
multiply by 1.62 for TN	TN	518			
Waste T/D	TN	2219	\$ 50.00	\$ 110,970.00	recent similar project
<b>Restoration and Creation of Wetlands</b>					
Sand Fill	CY	470	\$ 15.00	\$ 7,050.00	recent similar project
General Fill (off-site)	CY	3570	\$ 12.00	\$ 42,840.00	recent similar project
Wetland Planting	AC	0.85	\$ 35,000.00	\$ 29,750.00	recent similar project
<b>Construction Subtotal</b>				<b>\$ 227,494.05</b>	
Contingency (20%)				\$ 45,498.81	
<b>Subtotal</b>				<b>\$ 272,992.86</b>	
General Conditions (10%)				\$ 27,299.29	
Mob/Demob (5%)				\$ 13,649.64	
<b>Subtotal</b>				<b>\$ 313,941.79</b>	
Contractor OH/P (15%)				\$ 47,091.27	
<b>CONSTRUCTION TOTAL</b>				<b>\$ 361,033.06</b>	
Design Costs (10%)				\$ 36,103.31	
Construction Oversight (15%)				\$ 54,154.96	
<b>TOTAL COST OF ALT 3</b>				<b>\$ 451,291.33</b>	

Assumptions

- waste is 80%/20% waste/soil
- water table at 3 ft bgs
- 15 trees to be removed
- waste is 80%/20% waste/soil
- 5 trees to be removed

**Table C-5**  
**Cost Comparison of Combined Alternatives**  
**Site 8 EE/CA**  
**NAB Little Creek**  
**Virginia Beach, Virginia**

<b>Combination of Alternatives</b>	<b>Cost</b>
WEA* Alternative #1 and WEB** Alternative #1	minimal
WEA Alternative #1 and WEB Alternative #2***	\$ 328,973.30
WEA Alternative #1 and WEB Alternative #3	\$ 36,103.31
WEA Alternative #2*** and WEB Alternative #1	\$ 858,604.02
WEA Alternative #2*** and WEB Alternative #2***	\$ 1,187,577.32
WEA Alternative #2*** and WEB Alternative #3	\$ 894,707.33
WEA Alternative #3 and WEB Alternative #1	\$ 2,927,183.81
WEA Alternative #3 and WEB Alternative #2***	\$ 3,256,157.11
WEA Alternative #3 and WEB Alternative #3	\$ 2,963,287.11

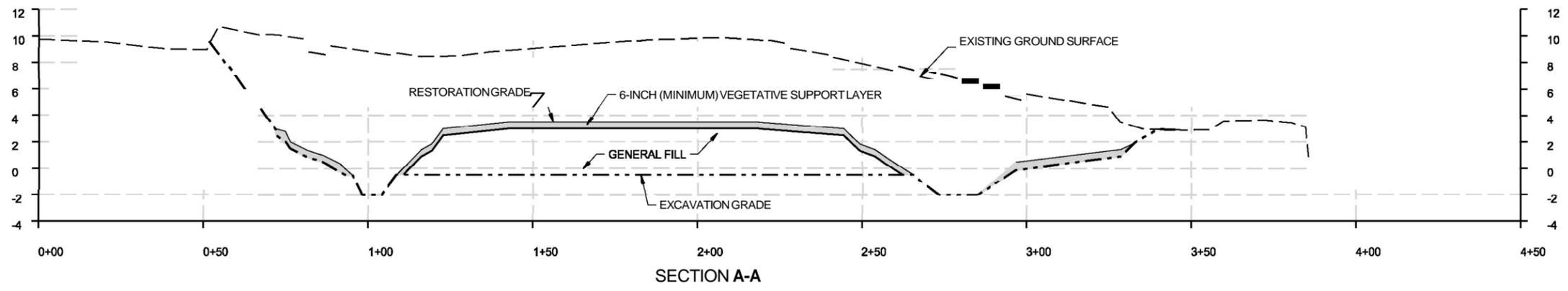
\*WEA = Work Element A, Demolition Debris Landfill

\*\*WEB = Work Element B, Wetland/Aquatic Area

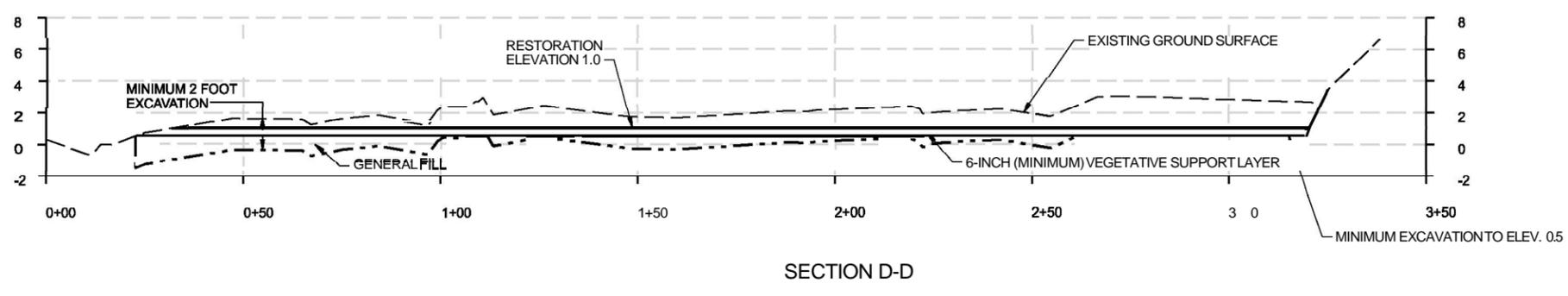
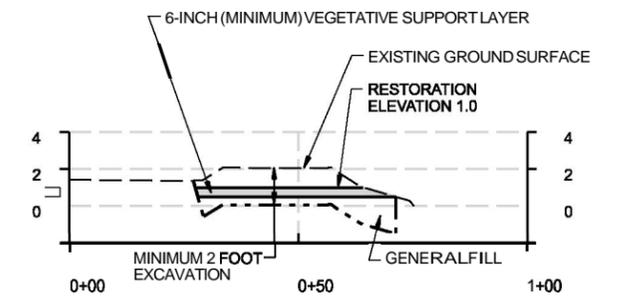
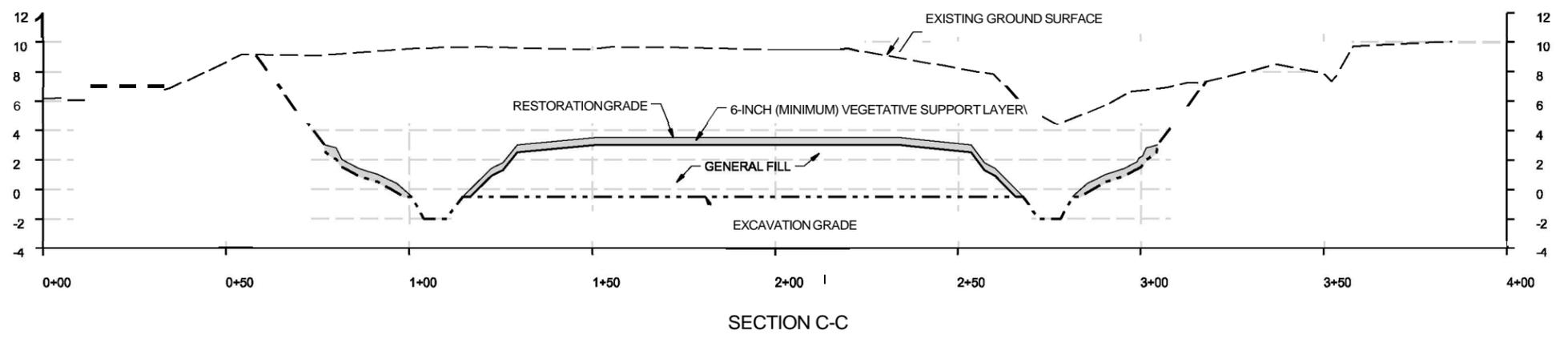
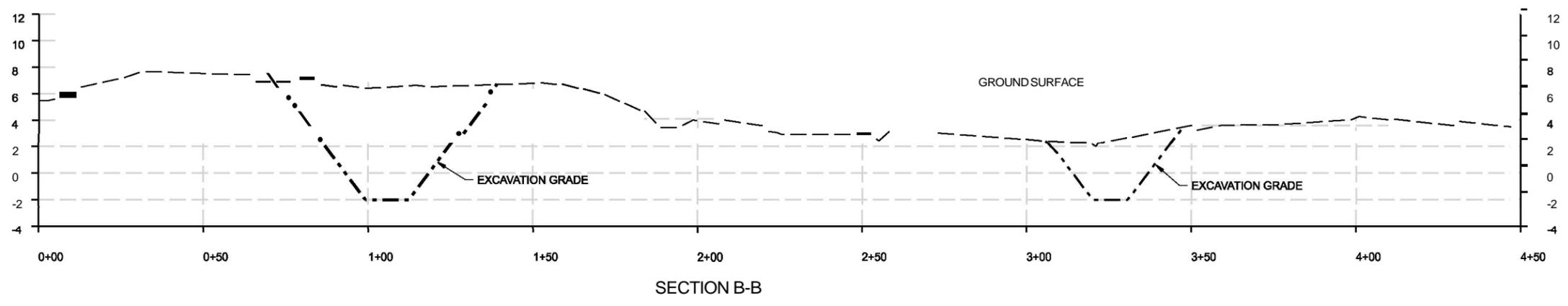
\*\*\* does not include annual O&M costs

**Appendix D**  
**Conceptual Wetlands Creation Plan**

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NOTE:  
 THE 6-INCH (MINIMUM) VEGETATIVE SUPPORT LAYER WILL BE SANDY BASE MATERIAL CAPABLE OF SUPPORTING NATIVE WETLAND SPECIES. GENERAL FILL MATERIAL (SAND OR CLAY, SOME SILT, OR COMBINATIONS) MAY BE USED AS GRADING FILL WHERE NECESSARY.



CROSS SECTIONS  
 SITE 8  
 NAB LITTLE CREEK  
 WETLAND RESTORATION



HELICOPTER ROAD

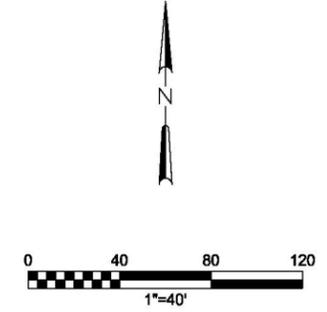
AMPHIBIOUS DRIVE

**NOTES:**

1. EXCAVATION ELEVATIONS REQUIREMENTS WITHIN THE AREA OF TIDAL SALT MARSH CREATION TO PROVIDE MINIMUM 6 INCHES SAND BACKFILL TO MEET RESTORATION ELEVATION REQUIREMENTS. TEST PITS EXCAVATED IN 2002 INDICATED SUBSURFACE DEBRIS WAS PRESENT TO A DEPTH OF GREATER THAN 6 FT BELOW GROUND SURFACE (APPROX. ELEV. 3.0). EXCAVATION ELEVATIONS BASED UPON EXCAVATION TO ELEV. -0.5 FT. ACTUAL SUBSURFACE DEBRIS DEPTHS MAY VARY.
2. POND ADJACENT TO LANDFILL CONTAINS AT LEAST ONE SUBMERGED STEEL TANK AND WOOD DEBRIS NOT REMOVED DURING 2002 SURFACE DEBRIS CLEARING. DEBRIS TO BE REMOVED TO THE EXTENT PRACTICABLE INCLUDING DEWATERING MEASURES. DEWATERING FLUIDS TO BE MANAGED IN ACCORDANCE WITH APPROVED NUISANCE WATER MANAGEMENT PLAN.
3. CONSTRUCTION TRAFFIC ALONG AMPHIBIOUS DRIVE WILL BE MANAGED IN ACCORDANCE WITH APPROVED WORK PLAN.

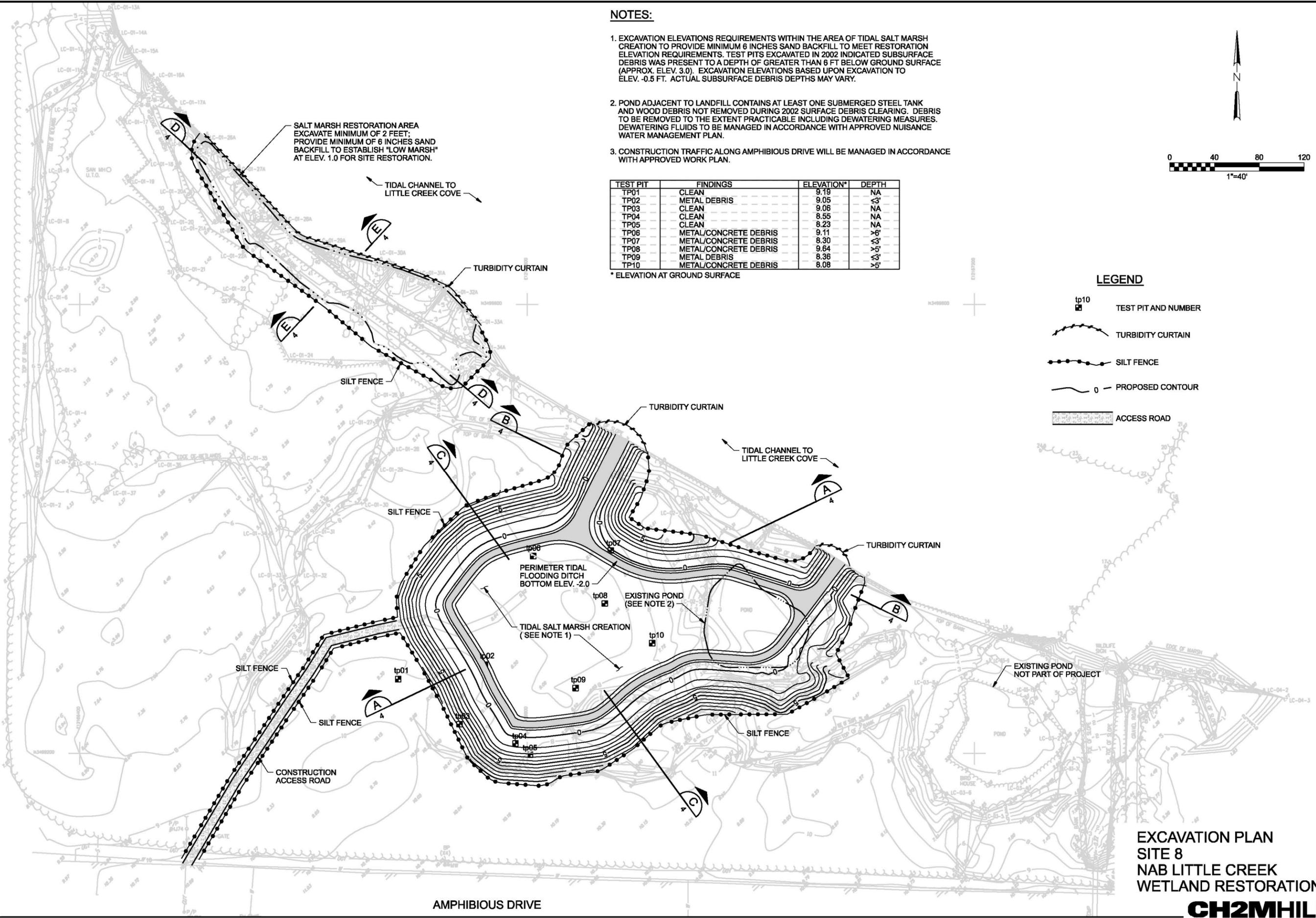
TEST PIT	FINDINGS	ELEVATION*	DEPTH
TP01	CLEAN	9.19	NA
TP02	METAL DEBRIS	9.05	<3'
TP03	CLEAN	9.08	NA
TP04	CLEAN	8.55	NA
TP05	CLEAN	8.23	NA
TP06	METAL/CONCRETE DEBRIS	9.11	>6'
TP07	METAL/CONCRETE DEBRIS	8.30	<3'
TP08	METAL/CONCRETE DEBRIS	9.64	<3'
TP09	METAL DEBRIS	8.36	<3'
TP10	METAL/CONCRETE DEBRIS	8.08	>5'

\* ELEVATION AT GROUND SURFACE



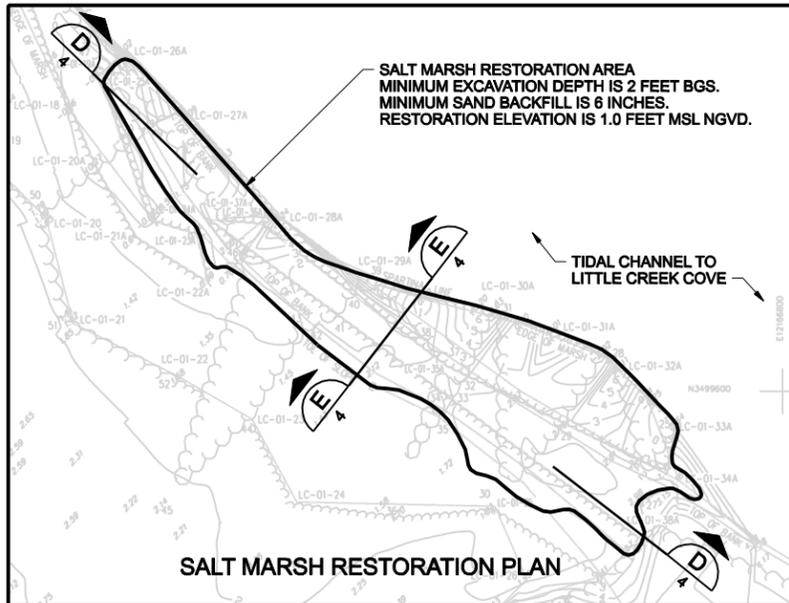
**LEGEND**

- TEST PIT AND NUMBER
- TURBIDITY CURTAIN
- SILT FENCE
- PROPOSED CONTOUR
- ACCESS ROAD

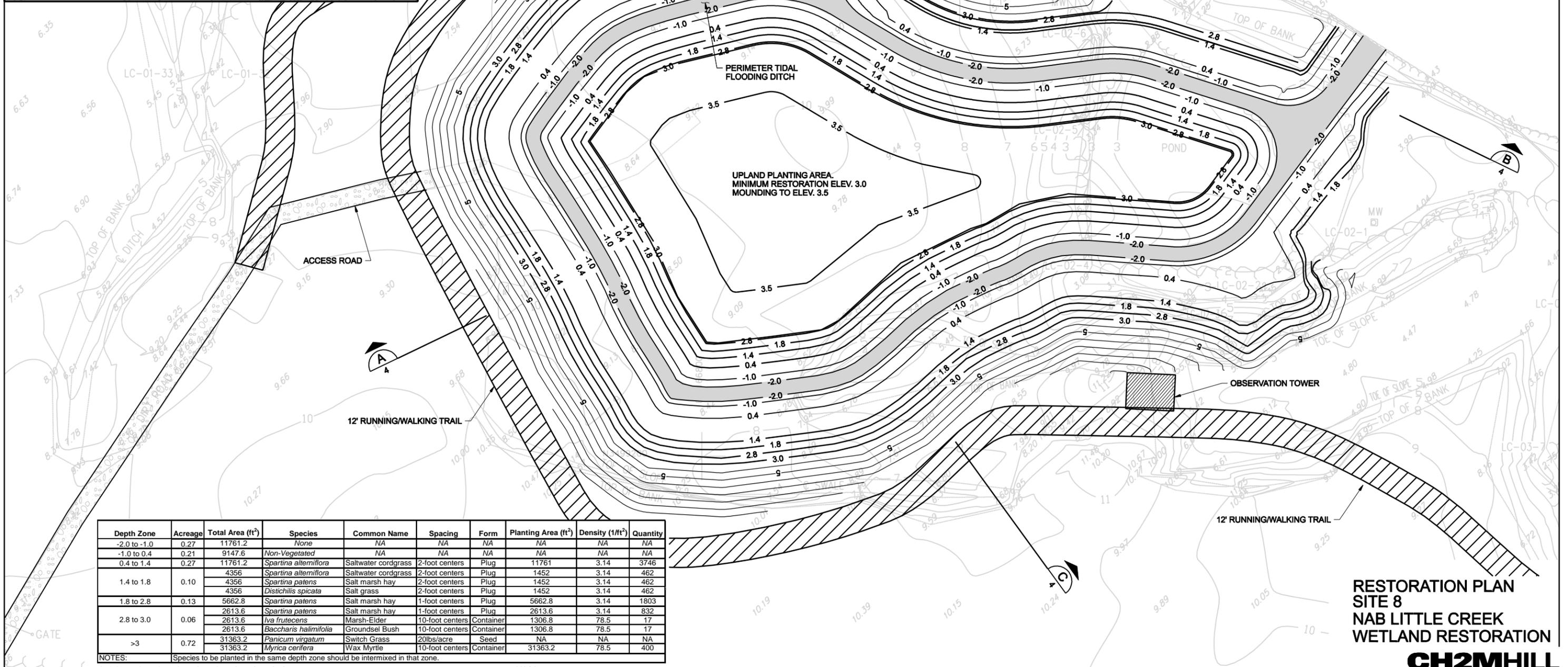
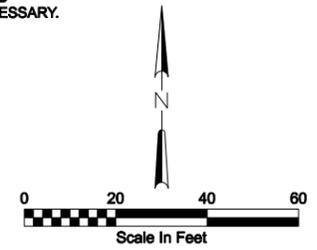


EXCAVATION PLAN  
 SITE 8  
 NAB LITTLE CREEK  
 WETLAND RESTORATION





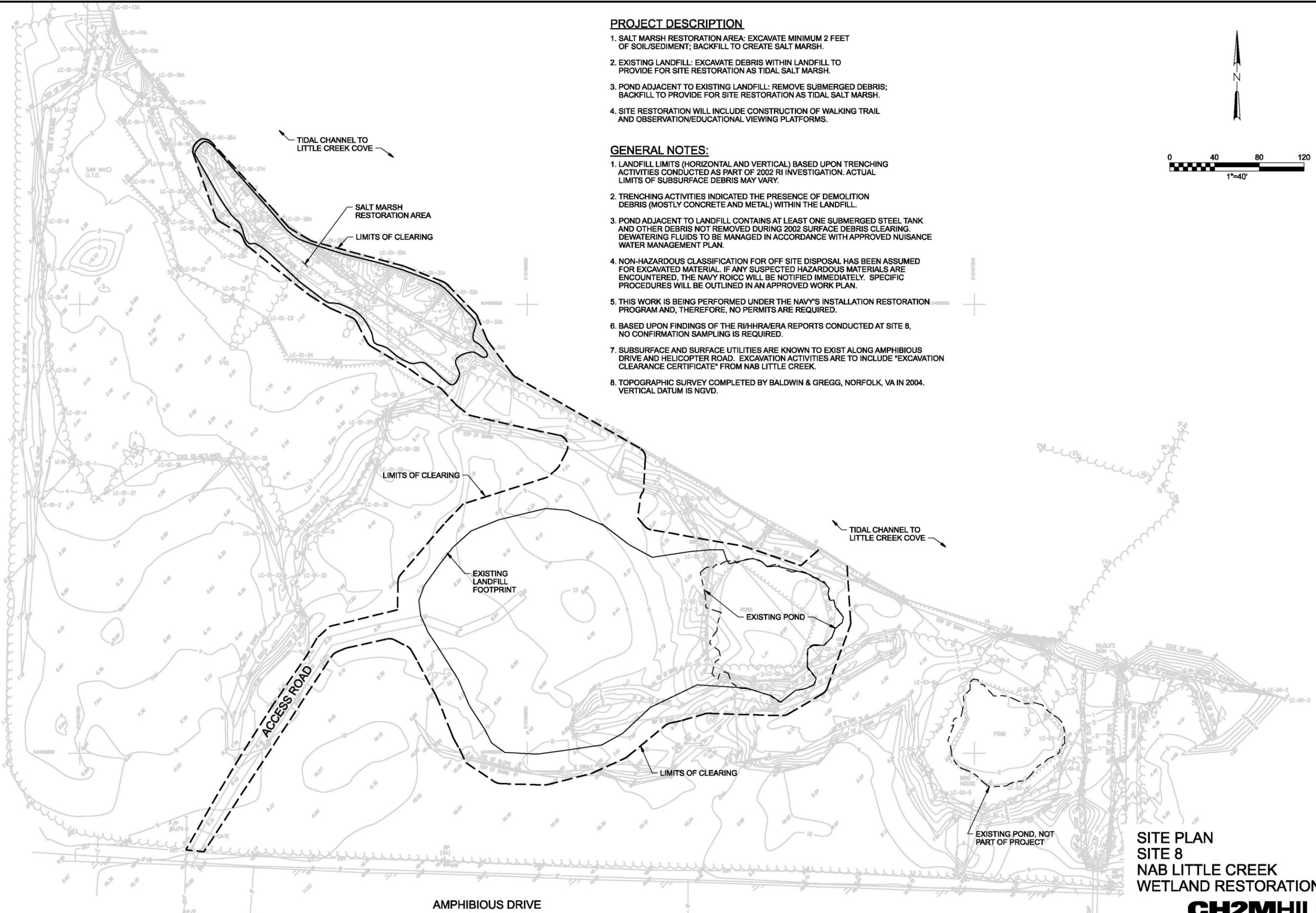
NOTE:  
 THE 6-INCH (MINIMUM) VEGETATIVE SUPPORT LAYER WILL BE A SANDY BASE MATERIAL CAPABLE OF SUPPORTING NATIVE WETLAND SPECIES. GENERAL FILL MATERIAL (SAND OR CLAY, SOME SILT, OR COMBINATIONS) MAY BE USED AS GRADING FILL WHERE NECESSARY.



Depth Zone	Acreage	Total Area (ft <sup>2</sup> )	Species	Common Name	Spacing	Form	Planting Area (ft <sup>2</sup> )	Density (1/ft <sup>2</sup> )	Quantity
-2.0 to -1.0	0.27	11761.2	None	NA	NA	NA	NA	NA	NA
-1.0 to 0.4	0.21	9147.6	Non-Vegetated	NA	NA	NA	NA	NA	NA
0.4 to 1.4	0.27	11761.2	<i>Spartina alterniflora</i>	Saltwater cordgrass	2-foot centers	Plug	11761	3.14	3746
1.4 to 1.8	0.10	4356	<i>Spartina alterniflora</i>	Saltwater cordgrass	2-foot centers	Plug	1452	3.14	462
		4356	<i>Spartina patens</i>	Salt marsh hay	2-foot centers	Plug	1452	3.14	462
		4356	<i>Distichlis spicata</i>	Salt grass	2-foot centers	Plug	1452	3.14	462
1.8 to 2.8	0.13	5662.8	<i>Spartina patens</i>	Salt marsh hay	1-foot centers	Plug	5662.8	3.14	1803
		2613.6	<i>Spartina patens</i>	Salt marsh hay	1-foot centers	Plug	2613.6	3.14	832
		2613.6	<i>Iva frutescens</i>	Marsh-Elder	10-foot centers	Container	1306.8	78.5	17
2.8 to 3.0	0.06	2613.6	<i>Baccharis halimifolia</i>	Groundsel Bush	10-foot centers	Container	1306.8	78.5	17
		31363.2	<i>Panicum virgatum</i>	Switch Grass	20lbs/acre	Seed	NA	NA	NA
>3	0.72	31363.2	<i>Myrica cerifera</i>	Wax Myrtle	10-foot centers	Container	31363.2	78.5	400

NOTES: Species to be planted in the same depth zone should be intermixed in that zone.

HELICOPTER ROAD



**PROJECT DESCRIPTION**

1. SALT MARSH RESTORATION AREA: EXCAVATE MINIMUM 2 FEET OF SOIL/SEDIMENT; BACKFILL TO CREATE SALT MARSH.
2. EXISTING LANDFILL: EXCAVATE DEBRIS WITHIN LANDFILL TO PROVIDE FOR SITE RESTORATION AS TIDAL SALT MARSH.
3. POND ADJACENT TO EXISTING LANDFILL: REMOVE SUBMERGED DEBRIS; BACKFILL TO PROVIDE FOR SITE RESTORATION AS TIDAL SALT MARSH.
4. SITE RESTORATION WILL INCLUDE CONSTRUCTION OF WALKING TRAIL AND OBSERVATION/EDUCATIONAL VIEWING PLATFORMS.

**GENERAL NOTES:**

1. LANDFILL LIMITS (HORIZONTAL AND VERTICAL) BASED UPON TRENCHING ACTIVITIES CONDUCTED AS PART OF 2002 RI INVESTIGATION. ACTUAL LIMITS OF SUBSURFACE DEBRIS MAY VARY.
2. TRENCHING ACTIVITIES INDICATED THE PRESENCE OF DEMOLITION DEBRIS (MOSTLY CONCRETE AND METAL) WITHIN THE LANDFILL.
3. POND ADJACENT TO LANDFILL CONTAINS AT LEAST ONE SUBMERGED STEEL TANK AND OTHER DEBRIS NOT REMOVED DURING 2002 SURFACE DEBRIS CLEARING. DEWATERING FLUIDS TO BE MANAGED IN ACCORDANCE WITH APPROVED NUISANCE WATER MANAGEMENT PLAN.
4. NON-HAZARDOUS CLASSIFICATION FOR OFF SITE DISPOSAL HAS BEEN ASSUMED FOR EXCAVATED MATERIAL. IF ANY SUSPECTED HAZARDOUS MATERIALS ARE ENCOUNTERED, THE NAVY ROICC WILL BE NOTIFIED IMMEDIATELY. SPECIFIC PROCEDURES WILL BE OUTLINED IN AN APPROVED WORK PLAN.
5. THIS WORK IS BEING PERFORMED UNDER THE NAVY'S INSTALLATION RESTORATION PROGRAM AND, THEREFORE, NO PERMITS ARE REQUIRED.
6. BASED UPON FINDINGS OF THE RI/HRA/ERA REPORTS CONDUCTED AT SITE 8, NO CONFIRMATION SAMPLING IS REQUIRED.
7. SUBSURFACE AND SURFACE UTILITIES ARE KNOWN TO EXIST ALONG AMPHIBIOUS DRIVE AND HELICOPTER ROAD. EXCAVATION ACTIVITIES ARE TO INCLUDE "EXCAVATION CLEARANCE CERTIFICATE" FROM NAB LITTLE CREEK.
8. TOPOGRAPHIC SURVEY COMPLETED BY BALDWIN & GREGG, NORFOLK, VA IN 2004. VERTICAL DATUM IS NGVD.

**SITE PLAN  
SITE 8  
NAB LITTLE CREEK  
WETLAND RESTORATION**

**CH2MHILL**

AMPHIBIOUS DRIVE

**Attachment C**

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ore fully described in the  
6985 Bonnot Drive, Nor-

deposit of \$6,000.00 or  
will be required in cash,  
within twenty (20) days of  
it. Additional terms to be  
mpt to collect on a debt  
or that purpose.

**PLLC**, 803 Sycolin Road,  
777-2448, website:  
12578954

c, VA 23504 In execution  
l amount of \$36,000.00,  
from Carolyn Lee dated  
rk's Office of the Circuit  
strument 000027598, at  
ie payment of the Note  
holder of said Note, the  
for sale at public auction  
St. Paul's Blvd., Norfolk,  
o'clock am the property  
bove address and briefly  
ights, with improvements  
of \$2,500.00, or 10% of  
or certified check, will be  
it within fifteen (15) days  
may be announced at the  
Debt Collection Practices  
st collector attempting to  
and any information we  
uel I. White, P.C., Substi-  
om a debt collector. For  
C. (2136-04/CONV) 209  
a 23462 757-457-1460 -  
iAP627832

12618804



## HEARINGS

### NOTICE OF NAVY'S INVITATION FOR PUBLIC COMMENT ON THE Engineering Evaluation/Cost Analysis For

#### Installation Restoration Site 7

#### Naval Amphibious Base Little Creek, Virginia Beach, Virginia

The Department of the Navy (DoN) invites public comment on the Engineering Evaluation/Cost Analysis (EE/CA) for Installation Restoration Site (IR Site) 7. The focus of the EE/CA is the drainage canal on the western portion of the site. Site 7 is located at the intersection of Helicopter Road and Amphibious Drive within NAB Little Creek on the southern-central portion of the facility. The EE/CA presents and evaluates alternatives for non-time critical removal actions (NTCRAs) to address contaminated sediments.

In accordance with 40 CFR Section 300.415, an EE/CA is required when a NTCRA is planned for the site. The goals of an EE/CA are to identify the objectives of the removal action and to analyze the effectiveness, implementability, and cost of various alternatives that may satisfy these objectives. An EE/CA documents the removal action alternatives and selection process.

The EE/CA is based upon the findings of previous site-related documents contained in the DoN's Administrative Record for NAB Little Creek. The Administrative Record can provide you with important background and site investigation information about IR Site 7. The Information Repository and the EE/CA are located for public review at the following location during normal business hours:

Central Library  
4100 Virginia Beach Boulevard  
Virginia Beach, Virginia 23452  
(757) 431-3100

Provide written comments on the EE/CA from January 24, 2005 through February 24, 2005. Send all written comments on or before (postmark by) February 24, 2005 to the following address:

Ms. Lora Fly, Code N455  
Commander, Navy Region Mid-Atlantic  
Regional Environmental Group  
Naval Weapons Station Yorktown  
Building 406, Spring Road  
Yorktown, VA 23691  
Phone (757) 887-4933  
Fax (757) 887-4478  
flylb@pwcno.navy.mil

If requested, a public meeting will be held by representatives of the DoN to clarify questions or comments to the EE/CA that was developed to support these NTCRAs.

VP Jan. 24, 2005

12618500

ads can only be accessed by providing identification number and Box No. to: The Virginian-Pilot. All customers with box no. ads needing assistance please call 446-2419 after 1 p.m.

**\$65.00** CHARGE TO  
ADVERTISER FOR REPLIES  
MAILED

**\$40.00** CHARGE TO  
ADVERTISER FOR REPLIES  
PICKED UP AT NEWSPAPER

All Pick Up or Mail Box replies will be active for 15 days.

### EMPLOYMENT POLICY

Advertising for jobs that require an investment on the part of the applicant prior to being considered for employment must indicate that there is a fee. Advertising for jobs that require the successful applicant to make an investment must contain the words "investment required" in the ad. The investment may be in the nature of purchasing or paying a deposit on a sales kit. We will not knowingly accept any advertisement contrary to this policy.

### Accounting/ Finance

**ACCOUNTANT** - Experience needed for one of our clients. Real Estate Property Management experience pref'd. Please send resumes & salary requirements to Zukerman & Associates, 168 Business Park Dr., Suite 202, Va. Beach, VA 23462, Attn: Christine. No phone calls please.

ACCOUNTING /

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**NOTICE OF NAVY'S INVITATION  
FOR PUBLIC COMMENT ON THE  
Engineering Evaluation/Cost Analysis  
For**

**Installation Restoration Site 8**

**Naval Amphibious Base Little Creek, Virginia Beach, Virginia**

The Department of the Navy (DoN) invites public comment on the Engineering Evaluation/Cost Analysis (EE/CA) for Installation Restoration Site (Site) 8. Site 8 is a demolition debris landfill located on the northeast corner of the intersection of Helicopter Road and Amphibious Drive within Naval Amphibious Base (NAB) Little Creek on the south-central portion of the facility. Site 8 contains two areas of concern: an upland landfill/pond and a former debris pile. The EE/CA presents and evaluates alternatives for non-time critical removal actions (NTCRAs) to address landfill debris and contaminated soil and sediment. In accordance with 40 CFR Section 300.415, an EE/CA is required when a NTCRA is planned for a site. The goals of an EE/CA are to identify the objectives of the removal action and to analyze the effectiveness, implementability, and cost of various alternatives that may satisfy these objectives. An EE/CA documents the removal action alternatives and selection process.

The EE/CA is based upon the findings of previous site-related documents contained in the DoN's Administrative Record for NAB Little Creek. The Administrative Record can provide important background and site investigation information about Site 8. The Administrative Record and the EE/CA are located for public review at the following location during normal business hours:

Central Library  
4100 Virginia Beach Boulevard  
Virginia Beach, Virginia 23452  
(757) 431-3100

The public is invited to provide written comments on the EE/CA from December 1, 2004 through January 1, 2005. Send all written comments postmarked on or before January 1, 2005 to the following address:

Ms. Lora Fly, Code N455  
Commander, Navy Region Mid-Atlantic  
Regional Environmental Group  
Naval Weapons Station Yorktown  
Building 406, Spring Road  
Yorktown, VA 23691  
Phone (757) 887-4933  
Fax (757) 887-4478  
flylb@pwcnorva.navy.mil

If requested, a public meeting will be held by representatives of the DoN to clarify public questions or comments on the EE/CA that support the NTCRAs.

VP Dec. 2, 2004

12368695

# Responsiveness Summary

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The *Engineering Evaluation and Cost Analysis for Demolition Debris Landfill & Adjacent Wetland/Aquatic Areas, Site 8* was available for public comment at Central Library in Virginia Beach, Virginia from December 3, 2004 through January 3, 2005. Copies of the public notice made available in *The Virginian-Pilot* are included in this attachment.

The *Engineering Evaluation and Cost Analysis for Site 7-Amphibious Base Landfill* was available for public comment at Central Library in Virginia Beach, Virginia from January 24, 2005 through February 24, 2005. Copies of the public notice made available in *The Virginian-Pilot* are included in this attachment.

No public comments on the *Engineering Evaluation and Cost Analysis for Demolition Debris Landfill & Adjacent Wetland/Aquatic Areas, Site 8* or the *Engineering Evaluation and Cost Analysis for Site 7-Amphibious Base Landfill* were submitted to the Navy for consideration.