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FINAL ACTION MEMORANDUM FOR COMPLETION OF TIME-CRITICAL REMOVAL ACTION
AT SOLID WASTE MANAGEMENT UNIT 3 (SWMU 3) PIER 10 SANDBLAST YARD JEB
LITTLE CREEK VA
6/1/2013
CH2MHILL

Final

**Action Memorandum
for Completion of Time-Critical Removal Action at
Solid Waste Management Unit 3 – Pier 10 Sandblast Yard**

**Joint Expeditionary Base Little Creek
Virginia Beach, Virginia**

Contract Task Order WE34

June 2013

Prepared for

**Naval Facilities Engineering Command
Mid-Atlantic**

Under the

**NAVFAC CLEAN 1000 Program
Contract N62470-08-D-1000**

Prepared by



CH2MHILL

Virginia Beach, Virginia

Final

**ACTION MEMORANDUM FOR COMPLETION OF TIME-CRITICAL REMOVAL ACTION AT
SOLID WASTE MANAGEMENT UNIT 3 – PIER 10 SANDBLAST YARD**

**Joint Expeditionary Base Little Creek
Virginia Beach, Virginia**

DATE:

SUBJECT: Time-Critical Removal Action at Solid Waste Management Unit 3 – Pier 10 Sandblast Yard, Joint Expeditionary Base Little Creek, Virginia Beach, Virginia

FROM: Naval Facilities Engineering Command, Mid-Atlantic

TO: F.E. Hughlett
Captain, United States Navy

This Action Memorandum documents approval for addressing soil and sediment contamination through excavation, where feasible, offsite disposal of soil and sediment, and site restoration to include construction of a stormwater management retention feature, placement of a reactive sediment amendment, and/or placement of a clean sand layer at Solid Waste Management Unit (SWMU) 3, Joint Expeditionary Base Little Creek, Virginia Beach, Virginia. This Action Memorandum serves as the Decision Document for selection of the Time-Critical Removal Action (TCRA) in accordance with the Comprehensive Environmental Response, Compensation, and Liability Act of 1980, as amended, and is consistent with the National Oil and Hazardous Substances Pollution Contingency Plan (NCP). This decision is based on the administrative record for the site. It is expected the TCRA will prevent sediment from re-contaminating areas addressed as part of the ongoing Non Time-Critical Removal Action (NTCRA) and address localized areas of elevated lead concentrations in soil as well as mitigate remaining ecological risks in sediment at SWMU 3. Following completion of the TCRA no further action will be required for these media, and will be documented in a forthcoming Proposed Plan and Record of Decision.

Conditions at SWMU 3 meet the NCP Section 300.415(b)(2) criteria for removal. Naval Facilities Engineering Command, Mid-Atlantic recommends approval of the proposed removal action. The total project ceiling if approved will be \$3,285,500. Response actions should commence as soon as practical to prevent the re-contamination of areas being addressed as part of the ongoing NTCRA.

Approved by:



F.E. Hughlett
Captain, United States Navy
Commander
Joint Expeditionary Base Little Creek-Fort Story



Date

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Acronyms and Abbreviations

ABM	abrasive blast material
ARAR	applicable or relevant and appropriate requirement
BERA	Baseline Ecological Risk Assessment
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act of 1980
CFR	Code of Federal Regulations
COC	contaminant of concern
COPC	contaminant of potential concern
DO	dissolved oxygen
DoD	Department of Defense
EE/CA	Engineering Evaluation/Cost Analysis
ER	environmental restoration
ER-L	effects range low
ER-M	effects range median
ERA	Ecological Risk Assessment
FS	Feasibility Study
HHRA	Human Health Risk Assessment
JEB	Joint Expeditionary Base
mg/kg	milligram per kilogram
N/A	not applicable
NAB	Naval Amphibious Base
NAVFAC	Naval Facilities Engineering Command
Navy	Department of the Navy
NCP	National Oil and Hazardous Substances Pollution Contingency Plan
NFA	no further action
NPL	National Priorities List
NTCRA	Non-time-critical Removal Action
PAH	polycyclic aromatic hydrocarbon
PCE	tetrachloroethylene
PEL	probable effects level
PRG	preliminary remediation goal
RGH	Rogers, Golden, and Halpern
RI	Remedial Investigation
RQ	remediation quotient
RSL	regional screening level
SERA	Screening Ecological Risk Assessment
SI	Site Investigation
SRI	Supplemental Remedial Investigation
SVOC	semivolatile organic compound
SWMU	Solid Waste Management Unit
TBC	to-be-considered
TCRA	Time-critical Removal Action
TEL	threshold effects level

USC United States Code
USEPA United States Environmental Protection Agency
VDEQ Virginia Department of Environmental Quality
VOC volatile organic compound
VPDES Virginia Pollution Discharge Elimination System

I. Purpose

This Action Memorandum documents the Time-critical Removal Action (TCRA) at Solid Waste Management Unit (SWMU) 3, Joint Expeditionary Base (JEB) Little Creek, Virginia Beach, Virginia. A TCRA is necessary to prevent sediment from re-contaminating areas addressed as part of the ongoing Non Time-Critical Removal Action (NTCRA), address localized areas of elevated lead concentrations in soil and mitigate potential ecological risks associated with exposure to copper, lead, nickel, tin, and zinc in remaining sediment. Performing an action other than a TCRA would require a planning period of at least six months which could potentially allow storm events to move contaminated sediment from the remaining areas into those areas currently being dredged and backfilled during the ongoing NTCRA. This Action Memorandum serves as the decision document to conduct the TCRA.

This Action Memorandum was prepared 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, the National Oil and Hazardous Substances Pollution Contingency Plan (NCP), and the United States Environmental Protection Agency's (USEPA's) *Superfund Removal Guidance For Preparing Action Memoranda* (USEPA, 2009).

The Department of the Navy (Navy) has broad authority under CERCLA Section 104 and Executive Order 12580 to carry out remedial actions when the release is on, or when the sole source of the release is from, a Navy installation. The Navy and Marine Corps Installation Restoration Program was initiated to identify, assess, characterize, and cleanup or control contamination from past hazardous waste disposal operations and hazardous material spills at Navy and Marine Corps activities. This Action Memorandum follows the guidelines published in the *Environmental Restoration Program Manual* (Navy, 2006) and the *USEPA Superfund Removal Guidance for Preparing Action Memoranda* (USEPA, 2009).

II. Site Conditions and Background

On October 1, 2009, Hampton Roads' first Department of Defense (DoD) Joint Base was established. This new installation comprises the former Naval Amphibious Base (NAB) Little Creek and the former Army Post Fort Story; the new name for the combined installation is JEB Little Creek-Fort Story. With the formation of this new command, the Navy assumes responsibility for management of both properties and will now merge public meetings regarding the ongoing environmental restoration (ER) programs. However, separate records will be maintained to ensure the integrity of ongoing efforts at both properties. When required for public notices and distributions, the former bases are identified jointly as JEB Little Creek-Fort Story. For ER Program documents, the bases are referred to separately as JEB Little Creek or JEB Fort Story. The former NAB Little Creek was placed on the USEPA National Priorities List (NPL) on May 10, 1999 (USEPA Identification: VA5170022482).

A. Facility and Site Description

The former NAB Little Creek began operations as a permanent base in 1946. The base's mission was the training of landing craft personnel for operational assignments. JEB Little Creek has expanded in both area and the complexity of its mission over the past 65 years. Base personnel provide logistics facilities and support services for local commands, organizations, home-ported ships, and other United States and allied units to meet amphibious warfare-training requirements of the United States armed forces. Past and present operations at JEB Little Creek include vehicle and boat maintenance, boat painting and sandblasting, construction and repair of buildings and piers, mixing and application of pesticides, electroplating of musical instruments, laundry and dry cleaning, medical and dental treatment, and the generation of steam for heat. Land development surrounding the base is residential, commercial, and industrial.

SWMU 3, the Pier 10 Sandblast Yard, is located in a developed area on Little Creek Harbor's western side (**Figure 1**). The terrestrial portion of SWMU 3 includes a fenced area containing Buildings 1263 and 1268, used as a repair shop and wood storage area, and two concrete pads formerly used for sandblasting operations (**Figure 2**).

Within the fenced area, the ground surface is generally covered in concrete, asphalt, or gravel. Little to no vegetation covers unpaved areas. A small, grassy picnic area is located outside the fence. A catch basin connected to Virginia Pollution Discharge Elimination System (VPDES) permitted Outfall 008 (Permit Number VA0079928) conveys surface runoff from the site into Little Creek Harbor via a discharge point located under Pier 10, approximately 35 feet from its easternmost edge. Under the current VPDES permit, VA0079928, Outfall 008 is defined as a stormwater outfall and has no monitoring requirements. Additionally, runoff from SWMU 3 flows directly into Little Creek Harbor as sheet flow. The aquatic portion of the site, located in Little Creek Harbor, is an approximately 5 acre area of sediment encompassing the Pier 10 floating dry dock and its associated anchoring system, as well as the recreational marina used by active and non-active duty service members. In addition to floating dry dock and marina activities, Little Creek Harbor is currently used for dive team training. A public health restriction on shellfish consumption and a fish consumption advisory are currently in place for Little Creek. For security purposes recreational swimming is not permitted in Little Creek Harbor; however, the facility currently allows recreational fishing from the pier located behind Building 1604.

1. Removal Site Evaluation

SWMU 3 was used for sandblasting boats between 1962 and 1984. Sandblasting activities took place on a 0.04-acre concrete pad located to the west of Building 1263 (RGH, 1984). After 1984, anchors and chains were sandblasted on the concrete pad. The used sandblast material was periodically sampled and the results indicated the sandblast residue was not hazardous. Paint chips and blast grit covered the unpaved ground south of the pad to the water's edge and the near-shore bottom of Little Creek Harbor. In 1982, a fence was installed around the sandblasting area to limit access to the site and to minimize windblown sandblast materials from migrating outside the fenced area. In 1995, the concrete pad was taken out of service, and a new sandblasting area was constructed in the northwestern corner of the site. The new sandblasting area consisted of a 0.4-acre concrete pad surrounded by a 4- to 5-foot-high concrete wall. All sandblasting operations at SWMU 3 ceased in 1996 when a new indoor sandblasting facility, CB125, was completed adjacent to SWMU 7b.

Historical releases from SWMU 3 likely occurred when sandblasting residue was lying directly on the ground surface. Prior to 1993, runoff from sandblasting operations occurred as sheet flow to Little Creek Harbor. In 1993, a catch basin connected to a VPDES-permitted outfall was constructed to receive runoff from various areas. Following construction of the new concrete pad surrounding the catch basin, surface water drainage from the more recent sandblasting area flowed to this catch basin and emptied into Little Creek Harbor via VPDES-permitted Outfall 008 (Permit Number VA0079928). Currently, residual abrasive blast material (ABM) is present on the unpaved ground surface south of the concrete pad to the water's edge and in Little Creek Harbor sediment in the vicinity of Pier 10, the recreational marina, and south to Pier 8.

SWMU 3 has been characterized under several investigations and studies between 1989 and 2010. **Table 1** provides a chronological list and summary of previous investigations conducted at SWMU 3. Sediment and soil sample locations are depicted on **Figure 3**. The respective investigations are a part of the Administrative Record file for JEB Little Creek and can be referenced for further details regarding specific sampling strategies, media investigations, and when and where the sampling was performed.

No potentially unacceptable risks to human health from exposure to soil, surface water, or sediment were identified during the previous investigations. Although no potentially unacceptable site-wide risk was identified from exposure to soil, localized areas of elevated lead concentrations [>400 milligrams per kilogram (mg/kg)] were identified, primarily along the rip-rap shoreline. No potentially unacceptable risk associated with direct exposure or potable use of groundwater was identified. No current vapor intrusion pathway is present at SWMU 3; however, potential future risks associated with vapor intrusion are currently being evaluated as part of a risk assessment update. If potentially unacceptable risk is identified, land use restrictions prohibiting changes in existing building use and new building construction without further evaluation of potential risk from vapor intrusion may be necessary.

There are no potentially unacceptable ecological risks from exposure to groundwater, soil, or surface water at SWMU 3. Potentially unacceptable risks to lower-trophic-level receptors from exposure to copper, lead, nickel, tin, and zinc in sediment were identified.

To address site risks, the following removal action objective was established for sediment at SWMU 3:

- Reduce potential ecological risks associated with exposure to copper, lead, nickel, tin, and zinc in sediment

To meet the removal action objective for sediment, preliminary remediation goals (PRGs) were established. As detailed in the SWMU 3 Engineering Evaluation/Cost Analysis (EE/CA) for completion of the ongoing NTCRA (CH2M HILL, 2012c), the sediment PRGs were established by considering metals concentrations, ABM content, and urban background values. The PRGs for the site sediment contaminants of concern (COCs) are shown in **Table 2**.

To define the area of sediment requiring action under CERCLA, a “remediation quotient” (RQ) was calculated as the ratio of the PRG to the sediment concentration. The lateral remediation area boundary was determined by calculating the RQ for each of the five COCs using the most recent complete round of surface sediment data available, collected in 2010 as part of the benthic invertebrate evaluation (CH2M HILL, 2012a). The site was broken down using a grid with 100-by-100-foot grid cells; a grid cell was defined as being “impacted” if the RQ for one or more individual COCs exceeded 1.5 and the average RQ for the five COCs exceeded 1. The area requiring CERCLA sediment remediation is depicted on **Figure 4**.

Although no potentially unacceptable risk from exposure to site soil has been identified, the Navy is proactively addressing areas of elevated lead concentrations (>400 mg/kg) to further eliminate the potential for any future exposure. Based upon data collected as part of the Remedial Investigation (RI), the proposed soil removal area is depicted on **Figure 5**.

The Dredge Removal Area that is being addressed under the ongoing SWMU 3 NTCRA to address potential ecological risks from exposure to sediment surrounding the floating dry dock and anchoring system is shown on **Figure 6**. The removal areas to be addressed under this TCRA include the Rip-Rap Shoreline Area, Bulkhead Shoreline Area, and Marina Area (**Figure 6**).

TABLE 1
Previous Studies and Investigations Summary

Previous Study / Investigation	Date	Investigation Activities
Site Investigation (SI) (CH2M HILL, 1999)	1998	Groundwater, surface soil, subsurface soil, and sediment samples were collected to verify the presence or absence of contamination and to conduct a human health risk screening. Volatile organic compounds (VOCs), metals, and/or polycyclic aromatic hydrocarbons (PAHs) were detected in groundwater, soil, and sediment above human health screening criteria and contaminants of potential concern (COPCs) were identified for each medium. Additionally, ABM was observed on the ground surface and in near-shore sediment. The SI recommended a Screening Ecological Risk Assessment (SERA) to identify potentially complete exposure pathways for ecological receptors and an RI to define the nature and extent of contamination in site media.
SERA (CH2M HILL, 2000)	2000	A screening ecological risk assessment (SERA), constituting Steps 1 and 2 of the Ecological Risk Assessment (ERA) process, was completed using data collected as part of the SI. Based upon a comparison of groundwater, surface soil, and sediment concentrations to screening values, inorganic and organic COPCs were identified for each medium. The SERA concluded that the potential for ecological risk is moderate to high based upon the potential exposure to metals in sediment and soil; an additional evaluation of potential ecological risk (Step 3) was recommended.
Baseline Ecological Risk Assessment (BERA) (CH2M HILL, 2001)	2001	A BERA, constituting Step 3 of the ERA process, was completed using data collected as part of the SI. The BERA concluded that, although terrestrial habitat size and quality are limited at SWMU 3, detected concentrations of select metals and one semi-volatile organic compound (SVOC) in soil exceeded ecological screening values and/or basewide background concentrations, and may pose potentially unacceptable risks to lower-trophic-level receptors in soil. Only zinc was identified as posing a potential unacceptable risk to upper-trophic-level terrestrial receptors. Potentially unacceptable risks to lower-trophic-level receptors were identified associated with exposure to select metals, PAHs, and one SVOC in sediment; however, potential risks to upper-trophic-level aquatic receptors were negligible.

TABLE 1
Previous Studies and Investigations Summary

Previous Study / Investigation	Date	Investigation Activities
RI/Human Health Risk Assessment (HHRA)/ERA (CH2M HILL, 2005)	2002	Soil, groundwater, sediment, and surface water samples were collected to define the nature and extent of contamination and to evaluate potential human health and ecological risks. No potentially unacceptable human health or ecological risks associated with exposure to site soil were identified; however, individual detections of lead in soil exceeded the residential RSL and were determined to require further action. Potentially unacceptable risks associated with future potable use of groundwater were identified as a result of VOCs, SVOCs, and metals. SVOCs and metals were detected in surface water but the concentrations did not pose potentially unacceptable risk to human health or the environment. No potentially unacceptable human health risk was identified from exposure to sediment; however, potentially unacceptable ecological risks to lower-trophic-level receptors exposed to metals and PAHs in sediment were identified. Additionally, evidence of petroleum impacts to subsurface sediment was noted. The RI recommended additional investigation of groundwater and sediment to identify contaminant sources, delineate the nature and extent of contamination, and further assess potential human health and ecological risks. Additionally, the RI concluded that ABM residues in soil are a potential continuing source of contaminants to Little Creek Harbor and recommended that the residues be removed to eliminate this transport pathway.
Supplemental Remedial Investigation (SRI)/HHRA/ERA (CH2M HILL, 2009b)	2007/2008	<p>Soil, groundwater, and sediment samples were collected to identify the source and extent of VOCs in groundwater and associated human health risks, define the extent of ABM in sediment, and assess the correlation between ABM content and metals concentrations in sediment. PAHs in sediment were determined to not be site-related and therefore were not investigated as part of the SRI. Additional surface sediment samples were collected from Little Creek Cove for establishment of urban background sediment values for comparison to site-specific sediment samples.</p> <p>No source for VOCs in groundwater was identified. The HHRA identified potentially unacceptable risks to human health associated with exposure to tetrachloroethylene (PCE), vinyl chloride, dibenzofuran, arsenic, iron, manganese, and thallium in groundwater. However, based upon additional groundwater data collected as part of the SRI and a comparison of constituent concentrations to background concentrations, the risks associated with PCE, dibenzofuran, arsenic, iron, manganese, and thallium were considered acceptable and the RI recommended a risk management decision of no further action (NFA) for these constituents. There is no current vapor intrusion exposure pathway. However, due to the presence of VOCs in groundwater, and the uncertainties associated with quantifying risks associated with the potential future vapor intrusion pathway, it is assumed vapor intrusion from shallow groundwater into indoor air could pose unacceptable risks to future receptors. The eastern extent of ABM in sediment was defined; however, uncertainty in the extent to the north and along the bulkhead by the marina was identified. Additionally, the presence of petroleum in subsurface sediment was noted. The SRI concluded that ABM content is significantly correlated with metals concentrations and is a good indicator of impacts from historical sandblasting activities. The SRI recommended an evaluation of remedial alternatives to address COCs in groundwater (vinyl chloride) and sediment (copper, lead, nickel, tin, and zinc). Additionally, ABM and lead in soil will be addressed during remedial action at the site. NFA for surface water is warranted.</p>
Pre-Feasibility Study (FS) Sediment Investigation (Remediation Boundary Delineation) (CH2M HILL, 2009a)	2009	Surface and subsurface sediment sampling was conducted to delineate a remediation area boundary and define sediment dewatering and disposal characteristics for evaluation of remedial alternatives in an FS. The lateral and vertical extent of CERCLA remediation was adequately delineated in accordance with the established PRGs (Table 2). In addition, the extent of the petroleum-impacted sediment within the remediation area was delineated for consideration during alternative development. Sediment dewatering and disposal characterization testing indicated sediment is non-hazardous and that both passive (geotextile tube) and mechanical (belt filter) dewatering technologies would be effective.

TABLE 1
Previous Studies and Investigations Summary

Previous Study / Investigation	Date	Investigation Activities
Pre-FS Sediment Investigation (Benthic Invertebrate Evaluation) (CH2M HILL, 2012a)	2010	<p>Surface sediment sampling was conducted to evaluate the current condition of the benthic invertebrate community within the remediation boundary and determine if the condition of the benthic community is correlated with the concentration of COCs and ABM content in sediment. Data indicated that the condition of the benthic community was positively correlated to COC concentrations and ABM content, with the portion of the site with the highest concentrations of metals and ABM content (Near Shore Area and portions of the Marina) typically having the most developed benthic invertebrate community relative to other areas of the site (Dry Dock and Offshore Areas), where metals concentrations and ABM content are typically lower. Additionally, data indicated low bioavailability of metals in sediment. Non-CERCLA-related physical conditions at the site (that is, low dissolved oxygen [DO] and high percentage of fine-grained sediment) were generally better predictors of the condition of the benthic community, indicating that these non-CERCLA-related conditions may have a stronger impact on the survival of the benthic invertebrate community.</p> <p>The evaluation concluded that although other non-CERCLA-related factors may be having more of an impact on the condition of the benthic invertebrate community, the magnitude of metals concentrations may potentially result in unacceptable risks to ecological receptors should these physical characteristics change over time; therefore, remedial action at SWMU 3 was determined to be warranted. The evaluation recommended that, given the current physical characteristics in the Dry Dock and Offshore Areas (primarily low bottom DO concentrations), it is unlikely that a benthic invertebrate community that would approach that in a similar urban reference area would be established following remedial action; therefore, the remedial action objective established for the site should focus on the reduction of metals concentrations and not the establishment of a benthic invertebrate community.</p>
Risk Assessment Update (CH2M HILL, 2012b)	2011	<p>As a result of updates made to the conceptual site model, the viability of the future potable use scenario as an applicable human health exposure pathway for groundwater at the site and the human health and ecological risks associated with groundwater discharge to surface water were evaluated. Based upon aquifer characteristics, the lack of potential downgradient users, and USEPA restriction against potable use of groundwater characterized as having a high-to-intermediate degree of interconnection with an adjacent surface water body, the Navy, in partnership with USEPA and VDEQ, agreed that potable use of groundwater is not a viable exposure scenario for human health risk evaluation at SWMU 3. Revision to the human health and ecological risk evaluations did not identify potentially unacceptable risk associated with the discharge of groundwater to surface water. Therefore, the Navy, in partnership with USEPA and VDEQ, agreed that no further evaluation of the groundwater to surface water transport pathway at SWMU 3 was warranted.</p>
SWMU 3 EE/CA and Action Memorandum (CH2M HILL, 2012c)	2012	<p>In December 2012, an EE/CA was prepared to evaluate NTCRA alternatives to mitigate potential unacceptable ecological risks in sediment surrounding the dry dock and its anchoring system. The recommended removal action included dredging of impacted sediment, offsite disposal, and placement of a clean sand layer within the removal area shown on Figure 6.</p> <p>A public notice was issued in <i>The Virginian-Pilot</i> on November 1, 2012, and the EE/CA was made available to the public from November 1, 2012, to December 15, 2012. No comments were received and an Action Memorandum was signed by the Navy on December 17, 2012, to implement the recommended alternative presented in the EE/CA. The NTCRA was initiated on February 18, 2013, and is currently ongoing.</p>

TABLE 2
Sediment PRGs

Copper		Lead		Nickel		Tin		Zinc	
Sediment									
TEL	18.7	TEL	30.2	TEL	15.9	Mean Background	8.61	TEL	124
ER-L	34.0	Mean Background	45.2	ER-L	20.9	Max Background	9.80	ER-L	150
PEL	108	ER-L	46.7	Mean Background	23.2	1% ABM	11.2	PEL	271
Mean Background	155	Max Background	67.6	1% ABM	26.2	ER-L	N/A	Mean Background	290
Max Background	184	1% ABM	107	Max Background	26.5	ER-M	N/A	ER-M	410
1% ABM	232	PEL	112	PEL	42.8	TEL	N/A	Max Background	421
ER-M	270	ER-M	218	ER-M	51.6	PEL	N/A	1% ABM	454

Notes:

Gray shaded cells indicate the selected PRG. All values in mg/kg.

ER-L – effects range low

ER-M – effects range median

N/A – not applicable

PEL – probable effects level

TEL – threshold effects level

2. Physical Location

JEB Little Creek consists of approximately 2,215 acres in the northwest portion of Virginia Beach, Virginia, adjacent to the Chesapeake Bay (**Figure 1**). The facility centers around four saltwater bodies: Little Creek Harbor, Little Creek Cove, Desert Cove, and Little Creek Channel, which connects the coves and harbor with the Chesapeake Bay. Several freshwater lakes (Chubb Lake, Lake Bradford, Little Creek Reservoir and Lake Smith, and Lake Whitehurst) are also located on or adjacent to the facility. SWMU 3, the Pier 10 Sandblast Yard, is located in a developed area on Little Creek Harbor's western side.

3. Site Characteristics

SWMU 3 is a 30-acre area located in a developed area on Little Creek Harbor's western side (**Figure 2**). The site was historically used for sandblasting boats, anchors, and chains on a 0.04-acre concrete pad located to the west of Building 1263. An additional sandblasting area was located in the northwestern corner of the site and consisted of a 0.4-acre concrete pad surrounded by a 4- to 5-foot-high concrete wall. Both concrete pads are still present; however, neither concrete pad has been used for sandblasting activities since 1996. The aquatic portion of the site, located in Little Creek Harbor, consists of the Pier 10 floating dry dock and its associated anchoring system, as well as a recreational marina used by military dependents and former active duty service members. In addition to floating dry dock and marina activities, Little Creek Harbor is currently used for dive team training. A public health restriction on shellfish consumption and a fish consumption advisory are currently in place for Little Creek. For security purposes recreational swimming is not permitted in Little Creek Harbor; however, the facility currently allows recreational fishing from the pier located behind Building 1604.

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

Based on the data and results of the SI (CH2M HILL, 1999), RI (CH2M HILL, 2005), SRI (CH2M HILL, 2009a), and other supplemental investigations, it was determined that there are potentially unacceptable risks to the environment (lower-trophic-level receptors) from exposure to metals (copper, lead, nickel, tin, and zinc) in sediment. No potentially unacceptable ecological risk from exposure to groundwater, soil, or surface water was identified. No potentially unacceptable risk to human health was identified for groundwater, soil, surface water, or sediment. Although no site-wide risk from exposure to soil was identified as part of the HHRA, localized areas of elevated lead concentrations (> 400 mg/kg) have been detected.

Approximately 4.79 acres of sediment and 0.2 acres of soil require action under CERCLA. An ongoing NTCRA for dredging and backfill will address approximately 2.61 acres of the total sediment area. The TCRA will address the remaining 2.18 acres of sediment and 0.2 acres of soil thereby preventing impacted sediment from re-contaminating those areas addressed as part of the ongoing NTCRA and mitigating potential ecological risks in remaining sediment.

5. National Priorities List Status

The former NAB Little Creek was placed on the NPL on May 10, 1999. SWMU 3 is among the IR sites being addressed under CERCLA at JEB Little Creek.

6. Maps, Pictures, and Other Graphic Presentations

Several figures are included in this Action Memorandum to provide graphical representations of SWMU 3 and the planned removal action. These include:

Figure 1 – SWMU 3 Location Map

Figure 2 – SWMU 3 Boundary and Immediate Vicinity

Figure 3 – Previous Sample Locations

Figure 4 – Sediment Remediation Area

Figure 5 – Exceedances of Soil PRG

Figure 6 – Removal Action Area

B. Other Actions

1. Previous Actions

No previous actions have been completed for SWMU 3.

2. Current Actions

An NTCRA is currently being performed at SWMU 3 to address potential ecological risks from exposure to sediment surrounding the floating dry dock and anchoring system (**Figure 6**). It is expected that the NTCRA will mitigate risks in sediment surrounding the floating drydock and anchoring system at SWMU 3 and no further action will be required for these areas, to be documented in a forthcoming Proposed Plan and Record of Decision. Remaining areas of the site were not addressed as part of the NTCRA as a result of ongoing discussion regarding risk management considerations, as well as the technical feasibility of taking an action in these areas.

C. State and Local Authority's Role

1. State and Local Actions to Date

Under Executive Order 12580, the President delegates authority to undertake CERCLA response actions to the DoD. Congress further outlined this authority in the Defense Environmental Restoration Program Amendments, under 10 United States Code Sections 2701 through 2705. CERCLA Section 120 requires the Navy to apply state removal and remedial action requirements at its facilities to the extent that the requirements are applicable, or relevant and appropriate for the response action.

2. Potential for Continued State and Local Response

The Navy will continue to be the lead agency, and the Navy's ER Program will continue to be the exclusive source of funding for remedial actions on JEB Little Creek property. As members of the JEB Little Creek Tier I Partnering Team, USEPA and VDEQ will continue to be consulted until actions addressing the contaminated area are complete.

At the local level, the general public is involved through yearly meetings of the Restoration Advisory Board. This TCRA Action Memorandum will be available to the public during the public comment period, and a public notice will be placed in *The Virginian-Pilot* within 60 days of the commencement of the TCRA.

III. 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 TCRA. Paragraphs (b)(2)(i) of Section 300.415 apply to the conditions as follows:

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

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

Based on the data and results of the SI, RI, SRI, and other supplemental investigations, it was determined that metals (copper, lead, nickel, tin, and zinc) are present in sediment at concentrations that pose potentially unacceptable risks to lower-trophic-level receptors (benthic macroinvertebrates). No potentially unacceptable ecological risk from exposure to groundwater, soil, or surface water was identified. No potentially unacceptable human health risk was identified from exposure to groundwater, soil, surface water, or sediment. Although no site-wide risk from exposure to soil was identified as part of the HHRA, localized areas of elevated lead concentrations (> 400 mg/kg) have been detected.

IV. Endangerment Determination

Actual or threatened releases of pollutants and contaminants from SWMU 3 soil and sediment, if not addressed by implementing the response action discussed in this Action Memorandum, may present an endangerment to public health, welfare, and the environment.

V. Proposed Actions and Estimated Cost

A. Proposed Actions

To address soil and remaining sediment at SWMU 3, the scope of the removal action will include excavation, where feasible, offsite disposal of soil and sediment, and site restoration to include construction of a stormwater management retention feature, sediment amendment, and/or placement of a clean sand layer. For the purpose of developing the removal action descriptions presented as follows, the site remediation area has been separated into the following: 1) Rip-rap Shoreline Area (soil and sediment), 2) Bulkhead Shoreline Area (sediment only), and 3) Marina Area (sediment only) (**Figure 6**).

1. Proposed Action Description

Short-term monitoring will be required during the construction phase to protect human health and the environment. Monitoring requirements may include erosion and sediment controls, turbidity and water quality monitoring, and noise monitoring. Monitoring requirements will be defined during the work planning phase.

Rip-Rap Shoreline Area

Soil

The proposed removal action for impacted soil within this area consists of excavation, offsite disposal, and site restoration to include limited backfill and construction of a stormwater management retention feature. Following completion of the pre-excavation delineation sampling, the soil removal areas will be excavated and the

excavated material will be placed into the material handling area. To facilitate excavation of all soil and sediment, existing concrete rip-rap will be removed and cleaned prior to re-use as bank stabilization or transported to a Navy-approved offsite facility for recycling. The excavated soil will be staged onsite, sampled for waste characterization, stabilized (if needed), and disposed of at a USEPA Off-Site-Rule-approved disposal facility. If not already determined through pre-excavation delineation sampling, prior to backfilling the excavation area, post-excavation confirmation sampling will be conducted to verify that the horizontal and vertical extents of soil excavation have resulted in the removal of elevated concentrations (> 400 mg/kg) of lead. Following completion of excavation and confirmation sampling activities, the soil removal area will be restored through backfilling the removal area with the re-used concrete rip-rap (if deemed appropriate), new rip-rap, imported clean general fill, topsoil to match the surrounding grade, and by constructing a stormwater management retention feature to capture sheet flow from the dry dock maintenance area.

Sediment

The proposed removal action for impacted sediment within this area consists of excavation, offsite disposal, and sand layer placement. The vertical depth of sediment removal required to mitigate ecological risks associated with copper, lead, nickel, tin, and zinc in sediment was previously delineated as part of the SWMU 3 NTCRA delineation sampling event conducted in December 2012.

Prior to beginning excavation activities, the shoreline removal area will be dewatered through the use of a temporary dam system such as AquaDam or PortaDam. A turbidity curtain will be placed outside of the temporary dam structure and will surround the work area. Once the diversion structure and turbidity curtain are in place, the water between the temporary dam and the shoreline will be pumped to the outside of the dam and discharged into the adjacent harbor within the turbidity curtain. No treatment of the surface water prior to discharge will be conducted. When water levels are low or when there is otherwise sediment in the water being pumped (near the completion of initial dewatering and during subsequent dewatering during construction activities), a filter bag or similar may be used to reduce the turbidity prior to discharge. Monitoring for visual changes in turbidity and sheen will be conducted. No effluent sampling will be conducted.

Excavation will be completed to previously established vertical depths using a long-reach excavator that will be located on land. The excavated material will be placed in an upland material handling area for waste characterization sampling, drying and solidification (if needed), and offsite disposal at a USEPA Off-Site-Rule-approved disposal facility. Fluids resulting from the excavated material will be containerized, characterized for disposal, and disposed offsite at a USEPA Off-Site-Rule-approved disposal facility. Following completion of excavation activities, the site will be restored through placement of imported clean sand. Field measurements will be completed as the work progresses to confirm that contract excavation depths and fill requirements were achieved. No analytical confirmation sampling will be completed following sediment excavation.

Bulkhead Area and Marina Areas

Sediment removal in the bulkhead and marina areas cannot be achieved without overcoming major technical, administrative, and financial obstacles. Per facility direction, sediment cannot be dredged within 50 feet of the bulk-head shoreline and 10 feet of piers without the potential for structural impacts to the surrounding area. In addition, the recreational marina piers are in poor condition and would likely require replacement if excavation of sediment is conducted in close proximity. Therefore, as a part of site restoration activities, a reactive amendment will be placed in these areas to address potential risks associated with metal COCs in sediment by reducing their bioavailability in pore water. Reduction of metals concentrations in pore water can be accomplished using a sequestration agent that will adsorb or otherwise modify dissolved-phase COCs. With any amendment, the goal is to apply the reactive materials to the sediment surface and allow natural mixing of particles and bio-assisted mixing (bioturbation) to work the amendment into the surface sediment. Sequestration agents can be applied alone or as a coating on a dense granular core to improve placement quality control and to resist erosion. The required dosage of amendment needed is dependent on COC concentrations and sediment grain size. The most suitable sequestration agent and required dosage for the site will be determined using available site data during the work planning phase. For cost estimating purposes in this Action Memorandum, it is assumed that a maximum

of a 2-inch layer of metals-sequestering reagent coupled with AquaGate, a semi-permeable clay dense aggregate delivery system, will be utilized for the amendment of the bulkhead and marina areas.

The Navy, in partnership with USEPA and VDEQ, agrees that the ecological services value associated with excavation of sediment to the extent feasible coupled with site restoration, including placement of a reactive amendment, will compensate for and/or mitigate any low potential ecological risks remaining at the site. Therefore, successful placement of the reactive amendment will be verified by collecting sediment cores, allowing for visual confirmation of thickness. No post-amendment monitoring will be required.

2. Contribution to Remedial Performance

This TCRA will prevent sediment from re-contaminating areas addressed as part of the ongoing NTCRA, address localized areas of elevated lead concentrations (> 400 mg/kg) in soil and mitigate potentially unacceptable ecological risks from exposure to remaining sediment at SWMU 3. The removal action will be deemed successful when:

- Rip-rap Shoreline Area
 - Pre-delineation lateral and vertical excavation boundaries have been achieved or post-excavation confirmation sampling (where applicable) indicates elevated lead concentrations in soil have been removed and site restoration through backfill and/or construction of the bio-retention area has been completed
 - Lateral and vertical extent of sediment removal, previously defined, has been achieved and the prescribed thickness of sand backfill has been placed
- Bulkhead Shoreline and Marina Areas
 - Prescribed thickness of reactive amendment as determined during the work planning phase has been placed

It is expected that the TCRA, in combination with the ongoing NTCRA, will mitigate risks in sediment and address localized areas of elevated concentrations of lead in soil at SWMU 3 and no further action will be required for these media, to be documented in a forthcoming Proposed Plan and Record of Decision. Groundwater will be addressed separately as part of the final remedy for the site.

3. Applicable or Relevant and Appropriate Requirements

As required by Section 121 of CERCLA, remedial actions carried out under Section 104 or secured under Section 106 must attain the levels of standards of control for hazardous substances, pollutants, or contaminants specified by the applicable or relevant and appropriate requirements (ARARs) of federal and state environmental laws and state facility-siting laws, unless waivers are obtained. However, as required by USEPA's policy 40 Code of Federal Regulations (CFR) Section 300.415(j), ARARs will be identified and attained for removal actions to the extent practicable. Two factors will be applied to determine whether the identification and attainment of ARARs is practicable in a particular removal situation: (1) the urgency of the situation and (2) the scope of the removal action to be conducted.

ARARs are identified by the USEPA as either being applicable to a situation or relevant and appropriate to it. These distinctions are critical to understanding the constraints imposed on response alternatives by environmental regulations other than CERCLA. The following definitions of ARARs are from the USEPA guidance (USEPA, 1998).

- "Applicable" requirements are standards and other environmental protection requirements of federal or state law dealing with a hazardous substance, pollutant, contaminant, action being taken, location, or other circumstance at a CERCLA site.
- "Relevant and appropriate" requirements are standards and environmental protection criteria of federal or state law that, although not "applicable" to a hazardous substance, pollutant, contaminant, action being taken, location, or other circumstance, address problems or situations sufficiently similar to those encountered at the CERCLA site that their use is well suited to the particular site. The procedure to determine

if a requirement is relevant and appropriate is a two-step process. A requirement is “relevant” if it addresses problems or situations sufficiently similar to the circumstances of the proposed response action. A requirement is “appropriate” if it would also be well suited to the conditions of the site.

A requirement may be “relevant” to a particular situation but not “appropriate,” given site-specific circumstances; such a requirement would not be an ARAR for the site. A requirement that is relevant and appropriate must be met as if it were applicable.

“To-be-considered” (TBC) criteria are non-promulgated advisories or guidance issued by federal or state government that are not legally binding, and do not have the status of potential ARARs. TBCs are evaluated along with ARARs and may be implemented when ARARs are not fully protective of human health and the environment.

Another factor in determining which response requirements must be met is whether the requirement is substantive or administrative. Onsite CERCLA response actions must meet substantive requirements but not administrative requirements. Substantive requirements are those dealing directly with actions or with conditions in the environment. Administrative requirements implement the substantive requirements by prescribing procedures such as fees, permitting, and inspection that make substantive requirements effective. This distinction applies to onsite actions only; offsite response actions are subject to all applicable standards and regulations, including administrative requirements such as permits.

Three classifications of requirements are defined by USEPA in the ARAR determination process: chemical-specific, location-specific, and action-specific. Chemical-specific ARARs apply to individual contaminants. Location-specific ARARs depend upon the location of the contamination and potential restrictions on activities conducted in these areas (such as wetlands, flood plains, and so forth). Action-specific ARARs govern the removal action and are usually technology- or activity-based directions or limitations that control actions taken at CERCLA sites. In addition to ARARs, the lead and support agencies may, as appropriate, identify other advisories, criteria, or guidance TBCs that may be useful in developing CERCLA remedies.

Attachment A presents the ARARs for the TCRA. The TCRA set forth in this Action Memorandum will comply with ARARs to the extent practicable.

4. Project Schedule

TABLE 3
Project Schedule

Activities	Dates (MM-DD-YY)	
	Anticipated Date of Initiation	Anticipated Date of Completion
Action Memorandum	02-18-13	05-31-13
Implementation Phase	02-18-13	06-30-13
Field Work	07-01-13	08-31-13
Completion Report	09-01-13	09-30-13
Public Notice*	07-01-13	07-01-13
Public Comment Period	07-06-13	08-06-13

*Public notice is required within 60 days of initiation of onsite activities.

Factors that may affect the TCRA schedule primarily relate to document review periods and inclement weather.

B. Estimated Costs

The NCP 40 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. This removal action will not be USEPA-fund-financed. The Navy ER Program does not limit the cost or duration of the removal action (Navy, 2006).

1. Response Action Contract

The Navy will contract with environmental remediation contractors to perform the required work associated with SWMU 3. The estimated costs are itemized in **Attachment B**. The estimated costs are provided to an accuracy of +50 percent and -30 percent.

VI. Expected Change in the Situation Should Action Be Delayed or Not Taken

If the proposed action is not taken at this time or is delayed, the impacted sediment and soil within the removal areas will remain as a continuing source of contamination within SWMU 3, posing a potential threat to human health and the environment. Performing an action other than a TCRA would require a planning period of at least six months which could potentially allow storm events to move contaminated sediment from the remaining areas into those areas currently being dredged and backfilled during the ongoing NTCRA. Such re-contamination could renew the risk to sediment which the ongoing NTCRA is designed to mitigate, and partially undo the NTCRA. If at least six months were to elapse following completion of the NTCRA and start of the TCRA, it may be necessary to re-sample areas previously cleaned up to ensure recontamination had not occurred and, in a worst case scenario, require additional action in previously addressed areas. The NTCRA is anticipated to be completed in May 2013; therefore, a six month planning period would coincide with hurricane season. The timeframe of completing a TCRA following completion of the ongoing NTCRA would eliminate the potential for re-contamination and the need for re-sampling.

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 Action Memorandum documents the selected removal action to address soil and remaining sediment at SWMU 3, JEB Little Creek, Virginia Beach, Virginia, developed in accordance with CERCLA, as amended, and not inconsistent with the NCP. This decision is based on the results of earlier investigations and evaluations documented in the Administrative Record file for JEB Little Creek.

Conditions at the site meet the NCP section 300.415(b)(2) criteria for a removal action. Naval Facilities Engineering Command (NAVFAC) Mid-Atlantic, in cooperation with USEPA Region 3 and VDEQ, recommends approval of the proposed removal action. If approved, the total project ceiling will be \$3,285,500 (using +50 percent of the cost estimate as provided in Attachment B). The response action is due to the potential threat to human health and the environment from SWMU 3, and should commence as soon as practical to mitigate the potential threat to human health and the environment and prevent impacted soil and sediment from re-contaminating areas addressed as part of the ongoing NTCRA.

X. References

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

CH2M HILL. 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*. June.

CH2M HILL. 2001. *Draft Baseline (Step 3) Ecological Risk Assessment for IR Sites 7, 8 and SWMU 3, NAB Little Creek, Virginia Beach, Virginia*. January.

CH2M HILL. 2005. *Final Remedial Investigation, Human Health Risk Assessment, and Ecological Risk Assessment for SWMU 3, Pier 10 Sandblast Yard, Naval Amphibious Base Little Creek, Virginia Beach, Virginia*. August.

CH2M HILL. 2009a. *Work Plan for Pre-Feasibility Study Sediment Sampling SWMU 3, Pier 10 Sandblast Yard, Naval Amphibious Base Little Creek, Virginia Beach, Virginia*. February.

CH2M HILL. 2009b. *Final Supplemental Remedial Investigation, Human Health Risk Assessment, and Ecological Risk Assessment for SWMU 3, Pier 10 Sandblast Yard, Naval Amphibious Base Little Creek, Virginia Beach, Virginia*. August.

CH2M HILL. 2012a. *Benthic Invertebrate Evaluation, SWMU 3 – Pier 10 Sandblast Yard, Joint Expeditionary Base Little Creek, Virginia Beach, Virginia*. December.

CH2M HILL. 2012b. *Final Risk Assessment Update – Evaluation of Future Potable Use of Groundwater and Groundwater Discharge to Surface Water at SWMU 3-Pier 10 Sandblast Yard*. July.

CH2M HILL. 2012c. *Final Engineering Evaluation/Cost Analysis and Action Memorandum for SWMU 3 – Pier 10 Sandblast Yard*. December.

Navy. 2006. *Department of Navy Environmental Restoration Program Manual*. November.

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

United States Environmental Protection Agency (USEPA). 1998. OSWER Publication 9234.1-01. "CERCLA Compliance with Other Laws Manual, Part I (Interim Final)". August. EPA/540/G-89/006, PB90-272535.

USEPA. 2009. *Superfund Removal Guidance for Preparing Action Memoranda*.

Figures

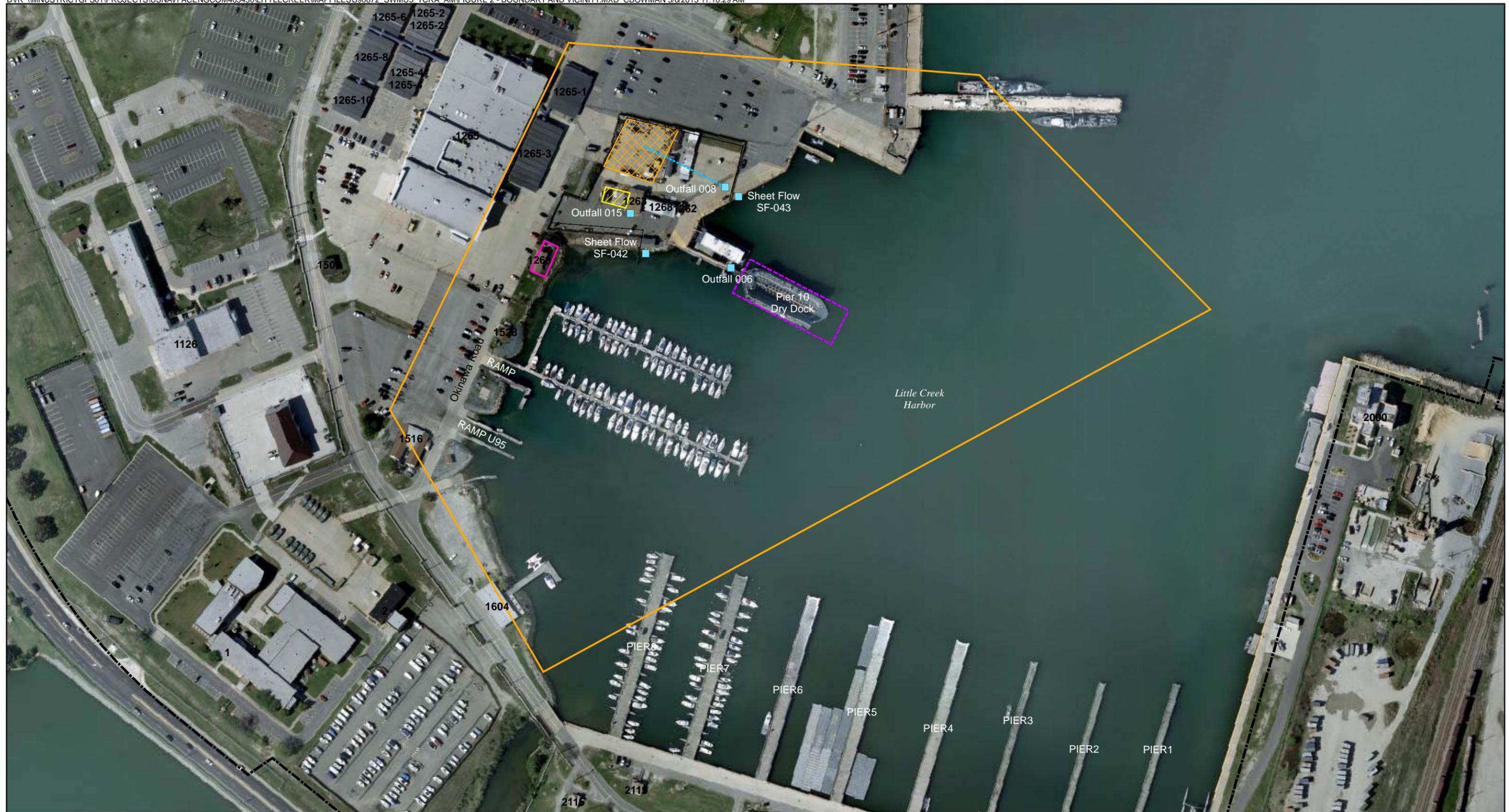


Legend

-  Installation Boundary
-  SWMU 3 Study Area Boundary



Figure 1
SWMU 3 Location Map
SWMU 3 TCRA Action Memorandum
JEB Little Creek
Virginia Beach, Virginia



- Legend**
- Outfall Locations
 - Underground Drain Pipe
 - ▭ Picnic Area
 - ▭ Fenced Area
 - ▭ 1999 Dredging Limits
 - ▭ SWMU 3 Study Area Boundary

- ▭ Former Sandblasting Area (1962-1995)
- ▭ More Recent Sandblasting Area (1995-1996)

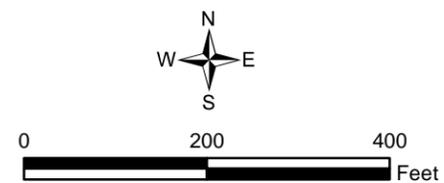
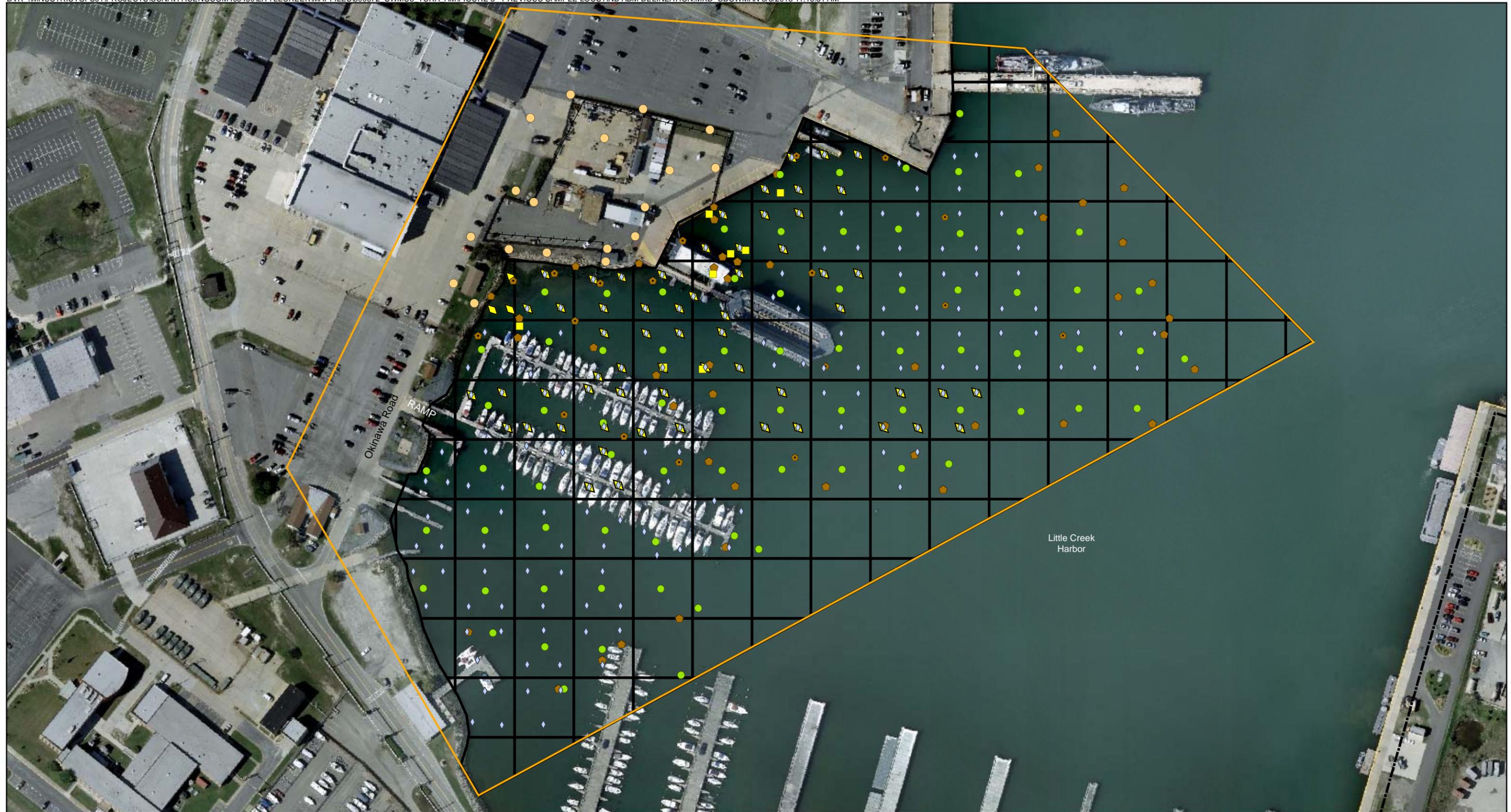


Figure 2
 SWMU 3 Boundary and Immediate Vicinity
 SWMU 3 TCRA Action Memorandum
 JEB Little Creek
 Virginia Beach, Virginia



- Legend**
- Surface/Subsurface Soil Sample Locations
 - Subsurface Sediment Sample Location
 - ◆ Surface/Subsurface Sediment Sample Location
 - ◆ Surface Sediment Sample Location
 - ◇ 2010 Composite Surface Sediment Sample Location
 - 2010 Vertical Delineation Sampling Location
 - ◀ 2012 Composite Subsurface Sediment Sample Locations
- Study Area Boundary

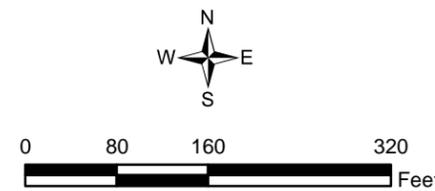
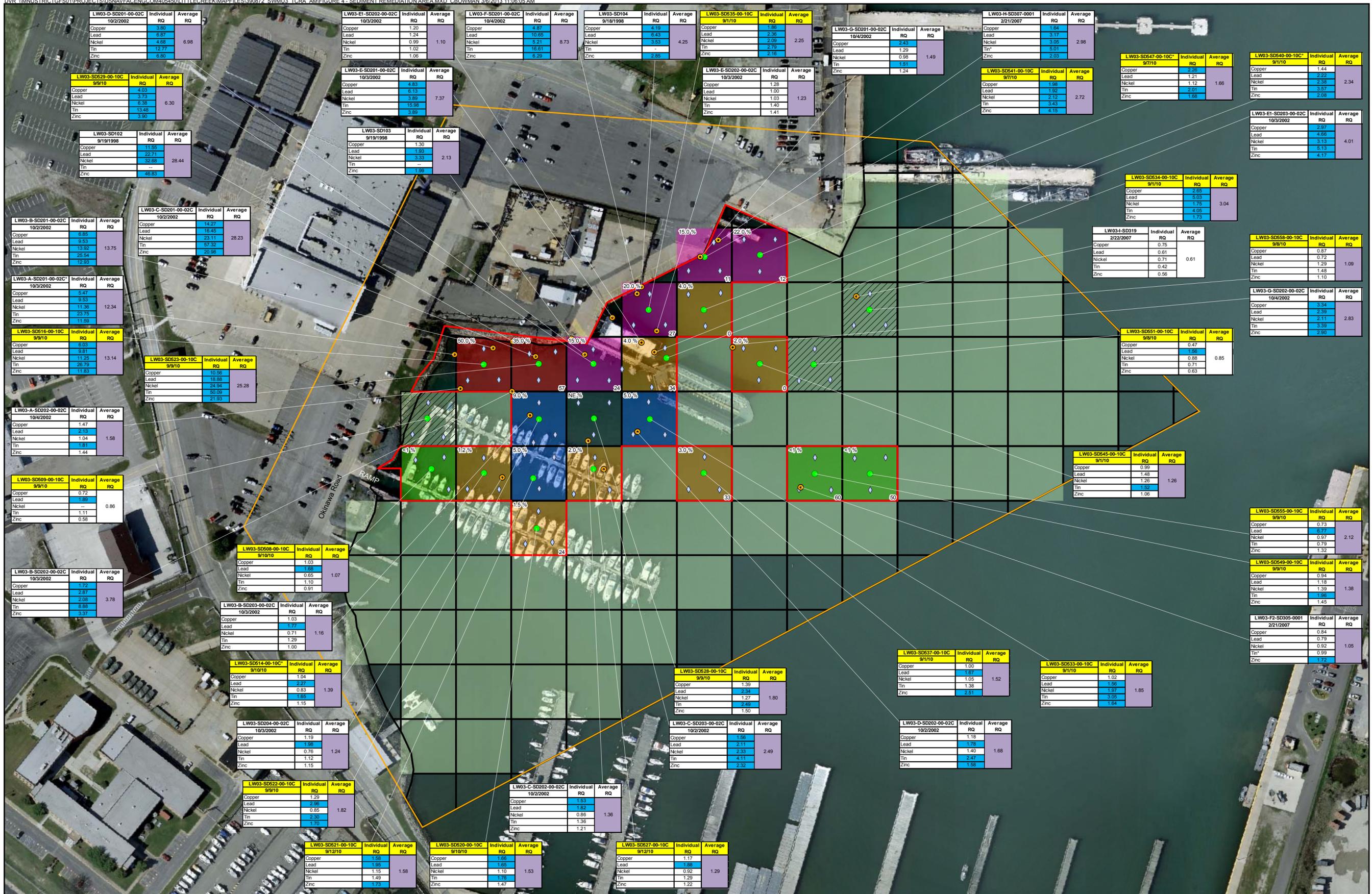


Figure 3
Previous Sample Locations
SWMU 3 TCRA Action Memorandum
JEB Little Creek
Virginia Beach, Virginia



- Legend**
- Surface Sediment Sample Locations
 - ◇ 2010 Composite Surface Sediment Sample Locations
 - 2010 Surface Water Quality Sample Locations
 - ▨ Grids with exceedances of only one RQ criteria, not included in remediation area
 - ▭ Remediation Area

2010 Surface Sediment ABM Content

- Green: ≤ 1%
- Yellow: 1-5%
- Orange: 5-10%
- Red: 10-30%
- Purple: >30%

SWMU 3 Study Area Boundary

Grid determined to require no CERCLA remedial action per 2002, 2007, 2009, and 2010 data

0 60 120 240 360 Feet

Notes:

- * - Duplicate sample collected. Most conservative result reported.
- Depth (in inches) of POL noted in bottom right corner of grid, where applicable.
- Surface sediment ABM content (per August/September 2010 sampling) noted in % in top of grid
- Blue shading indicates individual RQ > 1.5
- Purple shading indicates average RQ > 1.0
- Yellow shading in text box headers indicates data collected in 2010

Figure 4
Sediment Remediation Area
SWMU 3 TCRA Action Memorandum
JEB Little Creek
Virginia Beach, Virginia



- Legend**
- Surface/Subsurface Soil Sample Locations
 - ▭ SWMU 3 Study Area Boundary
 - ▭ Soil Removal Area

Shading indicates detections of lead in soil > 400 mg/kg

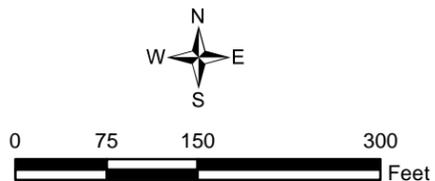
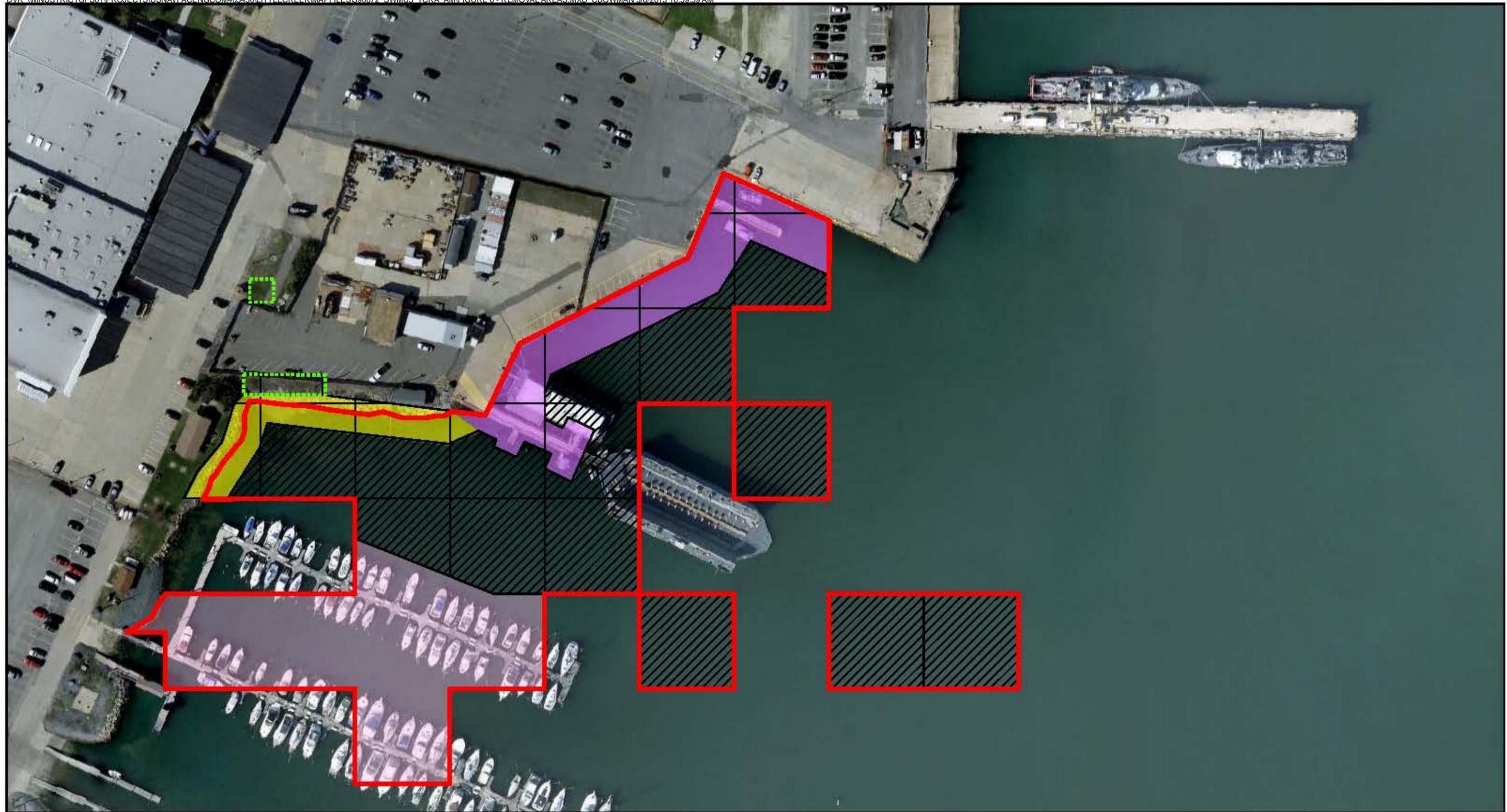


Figure 5
 Preliminary Soil Removal Areas
 SWMU 3 TCRA Action Memorandum
 JEB Little Creek
 Virginia Beach, Virginia



- Legend**
- Soil Removal Area
 - Dredge Removal Area
 - Bulkhead Shoreline Area
 - Rip-Rap Shoreline Area
 - Marina Area
 - Remediation Area

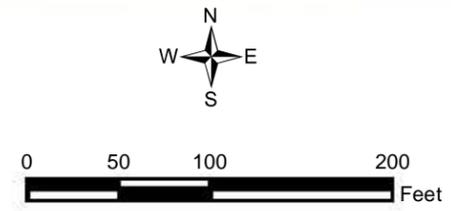


Figure 6
Removal Action Area
SWMU 3 TCRA Action Memorandum
JEB Little Creek
Virginia Beach, Virginia

Attachment A
ARARs

Acronyms and Abbreviations

ARAR	Applicable or relevant and appropriate requirement	POTW	Publicly Owned Treatment Works
BTAG	Biological Technical Assistance Group	ppm	Parts per Million
CERCLA	Comprehensive Environmental Response, Compensation and Liability Act	RBC	Risk-Based Concentrations
CFC	Chlorofluorocarbon	RCRA	Resource Conservation and Recovery Act
CFR	Code of Federal Regulations	SDWA	Safe Drinking Water Act
DCR	Virginia Department of Conservation and Recreation	SMCL	Secondary Maximum Contaminant Level
DNH	Division of Natural Heritage	TBC	To Be considered
MCL	Maximum Contaminant Level	TCLP	Toxicity Characteristic Leaching Procedure
MCLG	Maximum Contaminant Level Goal	TSCA	Toxic Substance Control Act
NAAQS	National Ambient Air Quality Standards	USACE	US Army Corps of Engineers
NESHAPs	National Emission Standards for Hazardous Air Pollutants	USC	United States Code
NPDES	National Pollutant Discharge Elimination System	USEPA	United States Environmental Protection Agency
NSDWRs	National Secondary Drinking Water Regulations	VA	Virginia
NSPS	New Source Performance Standards	VAC	Virginia Administrative Code
PCB	Polychlorinated biphenyls	VMRC	Virginia Marine Resource Commission
PMCL	Primary Maximum Contaminant Level	VPA	Virginia Pollutant Abatement
		VPDES	Virginia Pollutant Discharge Elimination System

References

- Commonwealth of Virginia, 2004. Preliminary Identification, Applicable or Relevant and Appropriate Requirements.
- USEPA, 1998. *CERCLA Compliance with Other Laws Manual: Interim Final*. Office of Emergency and Remedial Response. EPA/540/G-89/006.
- USEPA, 1998. *CERCLA Compliance with Other Laws Manual: Part II. Clean Air Act and Other Environmental Statutes*. Office of Emergency and Remedial Response. EPA/540/G-89/009.
- USEPA, 1998. RCRA, Superfund & EPCRA Hotline Training Manual. Introduction to Applicable or Relevant and Appropriate Requirements. EPA540-R-98-020.

TABLE A-1

Federal Chemical-Specific ARARs

SWMU 3 TCRA Action Memorandum

JEB Little Creek, Virginia

Media	Requirement	Prerequisite	Citation	ARAR Determination	Comment
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No Federal Chemical-Specific ARARs apply.

TABLE A-2

Virginia Chemical-Specific ARARs

SWMU 3 TCRA Action Memorandum

JEB Little Creek, Virginia

Media	Requirement	Prerequisite	Citation	ARAR Determination	Comment
<i>Wastewater Treatment</i>					
Surface Water	Contains minimum standards for surface water quality. No discharge to surface water may cause these criteria to be violated.	Applicable to any discharge of industrial wastewater to state waters.	9 VAC 25-260-140(B) only as it pertains to Copper (CAS #7440-50-8), Lead (CAS #7439-92-1), Nickel (CAS #7440-02-0), Zinc (CAS #7440-66-6); 310(z); 9 VAC 25-260-520.3a	Applicable	The removal action will include discharge of dewatering fluids to Little Creek Harbor. Based on this process, the sediment COCs with specific limits have criteria listed that will be controlled as part of the discharge. Treatment of the dewatering fluids to concentrations that are below background is not required. However, contaminated sediment must be prevented from discharging back to Little Creek Harbor while dewatering occurs. Effluent sampling will not be required during discharge activities. Monitoring for visual changes in turbidity and sheen will be conducted.

TABLE A-3

Federal Location-Specific ARARs

SWMU 3 TCRA Action Memorandum

JEB Little Creek, Virginia

Location	Requirement	Prerequisite	Citation	ARAR Determination	Comment
<i>Migratory Flyway</i>					
Migratory bird area	Protects almost all species of native birds in the United States from unregulated taking.	Presence of migratory birds.	<i>Migratory Bird Treaty Act</i> ; 16 USC 703	Applicable	SWMU 3 is located in the Atlantic Migratory Flyway. If migratory birds, or their nests or eggs, are identified at SWMU 3, operations will not destroy the birds, nests or eggs.
<i>Coastal Zone</i>					
Coastal zone or area that will affect the coastal zone	Federal activities must be consistent with, to the maximum extent practicable, State coastal zone management programs. Federal agencies must comply with the consistency requirements of 15 CFR § 930.	Actions that may affect identified coastal zone resources or uses	15 CFR 930.33(a)(1); .36(a); .39(a) and (b).	Applicable	Activities at SWMU 3 that will affect Virginia's coastal zone will be consistent to the maximum extent practicable with Virginia's enforceable policies. Activities performed on-site and in compliance with CERCLA are not subject to administrative review; however the substantive requirements of making a consistency determination will be met.

TABLE A-4

Virginia Location-Specific ARARs

SWMU 3 TCRA Action Memorandum

JEB Little Creek, Virginia

Location	Requirement	Prerequisite	Citation	ARAR Determination	Comment
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No Virginia Location-Specific ARARs apply.

TABLE A-5

Federal Action-Specific ARARs

SWMU 3 TCRA Action Memorandum

JEB Little Creek, Virginia

Action	Requirement	Prerequisite	Citation	ARAR Determination	Comment
<i>Dredge and Fill</i>					
Discharge of dredge-and-fill	No discharge of dredged or fill material will be allowed unless appropriate and practicable steps are taken that minimize potential adverse impacts of the discharge on the aquatic ecosystem.	Discharges of dredged or fill material to surface waters, including wetlands.	40 CFR 230.10, (d)	Applicable	Onsite actions may include removal or replacement of sediments as well as dewatering. These actions will be taken in accordance with the substantive provisions of Nationwide Permit 38. Steps will be taken to minimize the impacts to the ecosystem.

TABLE A-6

Virginia Action-Specific ARARs

SWMU 3 TCRA Action Memorandum

JEB Little Creek, Virginia

Action	Requirement	Prerequisite	Citation	ARAR Determination	Comment
Dredge and Fill					
Dredging, filling, and/or discharging pollutants into, or adjacent to, surface waters (including wetlands)	Regulations for activities undertaken in State surface waters	Activities such as dredging, filling, or discharging any pollutant into or adjacent to surface waters, or otherwise altering the physical, chemical, or biological properties of surface waters; excavating in wetlands; or conducting the following activities in a wetland: 1. New activities to cause draining that significantly alters or degrades existing wetland acreage or functions. 2. Filling or dumping. 3. Permanent flooding or impounding. 4. New activities that cause significant alteration or degradation of existing wetland acreage or functions.	9 VAC 25-210-115(C)(1)	Relevant and Appropriate	Relevant and appropriate because the action will not result in a net loss of wetland area. The removal area at SMWU 3 will be excavated to remove the impacted soil and sediment and restore the site through construction of a bioretention area, placement of reactive amendment material, or placement of clean sand. The clean sand layer will provide a layer of clean fill over the dredged area which will eliminate the need for post-dredging confirmation sampling. The substantive provisions of these regulations will be met, however onsite CERCLA actions are not subject to permitting.
Discharge of untreated surface water back to Little Creek	General criteria for water quality including the control of the following: floating debris, oil, scum, and other floating materials; toxic substances (including those which bioaccumulate); substances that produce color, tastes, turbidity, odors, or settle to form sludge deposits; and substances which nourish undesirable or nuisance aquatic plant life. Effluents which tend to raise the temperature of the receiving water will also be controlled.		9 VAC 25-260-20(A)	Applicable	The response action will not alter the chemical properties of the surface water. Appropriate steps will be taken to prevent the discharge of the listed contaminants.
Design of weep water containment area	Discharges subject to Virginia Pollutant Abatement permitting may allow point source discharges only if a storm event exceeding the 25-year, 24-hour storm occurs	Discharge of wastewater subject to VPA permitting	9 VAC 25-32-30(A)	Relevant and Appropriate	Relevant and appropriate because discharges of unfiltered weep water would be regulated under VPDES regulations, however since sediments are contaminated they must be prevented from discharging to the water body. The weep water containment area will be designed to withstand the 25-year, 24-hour storm to protect against discharges of untreated weep water from the containment area.

TABLE A-6

Virginia Action-Specific ARARs

SWMU 3 TCRA Action Memorandum**JEB Little Creek, Virginia**

Action	Requirement	Prerequisite	Citation	ARAR Determination	Comment
Point source discharges of wastewater to surface water	The following point source discharges are prohibited: 1. Discharge into state waters sewage, industrial wastes, other wastes, or any noxious or deleterious substances; or 2. Discharges that otherwise alter the physical, chemical or biological properties of such state waters and make them detrimental to the public health, or to animal or aquatic life, or to the use of such waters for domestic or industrial consumption, or for recreation, or for other uses.	Point source discharge to surface water.	9 VAC 25-31-50(A)	Applicable	Contaminated sediments must be prevented from discharging to the water body. No analytical sampling is required, however a filter bag will be used. The substantive provisions of these regulations will be met, however onsite CERCLA actions are not subject to permitting.
Erosion and Sedimentation Control					
Erosion and deposits of soil/sediment caused by land disturbing activities	Regulations for the effective control of soil erosion, sediment deposition and nonagricultural runoff which must be met in any control program to prevent the unreasonable degradation of properties, stream channels, waters and other natural resources.	Construction activities that will disturb more than 10,000 square feet of land.	4 VAC 50-30-40-2; 12; 14; 15; and 19(k)	Applicable	Erosion control measures will be implemented for the removal activities.
Dust Control					
Generation of fugitive dust	Regulations regarding reasonable precautions to prevent particulate matter from becoming airborne.	Conducting any activity which may cause particulate matter to become airborne.	9 VAC 5-50-90	Applicable	Dust control measures will be implemented during activities at the site.
Waste Management					
Handling and storage of solid waste onsite in waste piles	Establishes standards and procedures pertaining to the management of solid wastes in stockpiles.	On-site management of wastes that meet the definition of solid waste in piles.	9 VAC 20-81-330(F)(1); 330(F)(2)(a)(1), (e),(f); 330(F)(4)	Applicable	Excavated soil and sediment will be staged onsite in piles during the response action and will be managed in accordance with these requirements.
Staging of solid waste onsite in containers	Establishes criteria for the proper management of solid wastes.	Management of solid wastes onsite in containers	9 VAC 20-81-95(D)(10)(b)	Applicable	It is anticipated that some wastes (such as decontamination fluids) may be generated and managed onsite in containers. Based on the analytical results from previous investigations, it is expected that these wastes will be non-hazardous solid waste. Wastes will be characterized prior to offsite disposal.

TABLE A-6

Virginia Action-Specific ARARs

SWMU 3 TCRA Action Memorandum

JEB Little Creek, Virginia

Action	Requirement	Prerequisite	Citation	ARAR Determination	Comment
Accumulation of hazardous waste in containers onsite for less than 90 days	Hazardous waste may be accumulated on site in containers for up to 90 days so long as the containers are in good condition, compatible with the waste being stored, and labeled with the words "Hazardous Waste" and the date that accumulation began. The containers must also be kept closed unless adding or removing waste and inspected weekly.	Accumulation of hazardous waste in containers onsite.	9 VAC 20-60-262 only as it incorporates 40 CFR 262.34 (a) (1)(i), (2), (3), and 40 CFR 265.171 through 174	Applicable	It is possible that hazardous waste will be generated and staged onsite in containers. These requirements will be met if hazardous waste is generated.
Accumulation and/or treatment of hazardous waste in staging piles onsite	A staging pile must be designed, constructed, and maintained to prevent the migration of hazardous constituents to other media. The design must consider location, hydrogeology, and any other factors that may reasonably influence the migration of hazardous constituents. Closure requirements are also included.	Accumulation or treatment of hazardous wastes in staging piles onsite	9 VAC 20-60-264 only as it incorporates 40 CFR 264.554(d)(1)(ii), (d)(2), (j)(1), (j)(2)	Applicable	These requirements are applicable only if hazardous waste is generated and staged onsite in piles. Staging piles will be designed and operated in accordance with these standards; however, since this is a CERCLA action no permit will be required.

Attachment B
Cost Estimate

TABLE B-1

SWMU 3 TCRA Cost Estimate

SWMU 3 TCRA Action Memorandum

JEB Little Creek

Virginia Beach, Virginia

Description: Sediment excavation in the shoreline removal area, sediment and rip-rap excavation in the rip-rap removal area, and soil excavation in the upland soil removal areas. The sediment area that is inaccessible via dredging or excavating will be amended. The total area to be addressed by the removal action is 2.3 acres.

Description of Service/Items	Unit	Quantity	Unit Price	Total	Assumptions
Work Planning Documents					
Construction Work Plan	Lump Sum	1	\$50,000.00	\$ 50,000.00	
EM385 Health and Safety Plan	Lump Sum	1	\$20,000.00	\$ 20,000.00	
RIP-RAP SHORELINE AND SOIL REMOVAL AREAS					
Mobilization/Demobilization					
Mobilization/Demobilization	Each	2	\$15,000.00	\$ 30,000.00	Includes mobilization of all equipment and materials necessary to perform the work to include materials for construction material handling area, material staging area, and picnic facility, long reach excavator and box dump truck.
Material Handling Area (150 ft x 200 ft)	Lump Sum	1	\$2,500.00	\$ 2,500.00	Includes impermeable liner, berm, silt fence, sandbags, and 3" layer of sand over the impermeable liner to
Sand material and delivery	cubic yard	278	\$18.00	\$ 5,004.00	3" layer of sand over the impermeable liner in material handling area to protect the liner
Poly Sheeting	Roll	3	\$50.00	\$ 150.00	Assumes 6mm 15'x200' rolls; 3 rolls for material handling area
Material Staging Area for Sand/Stone (100 ft x 100 ft)	Lump Sum	1	\$870.00	\$ 870.00	Includes 3 rolls of poly sheeting and silt fence; removal included
Security Fence	Linear Feet	250	\$10.75	\$ 2,687.50	Temporary Fencing, chain link, rented up to 12 months, 6' high, 11 ga, up to 1000'
Fence Removal/Installation (chain link w/barb wire)	Linear Feet	250	\$32.00	\$ 8,000.00	Assumes fence will have to be removed during performance of the work and replaced prior to demobilization
Construction Crew					
Site Superintendent	Hour	200	\$55.90	\$ 11,180.00	Assumes 20 10-hour days to complete work
Heavy Equipment Operator	Hour	600	\$40.30	\$ 24,180.00	Assumes 20 10-hour days to complete work and 3 operators. One on each excavator and one in box dump truck.
Laborer	Hour	600	\$27.30	\$ 16,380.00	Assumes 20 10-hour days to complete work and 3 laborers. One to spot excavator, one to watch loading, and one at material handling area
H&S Manager	Hour	200	\$51.82	\$ 10,364.00	Assumes 20 10-hour days to complete work
QC Manager	Hour	200	\$45.50	\$ 9,100.00	Assumes 20 10-hour days to complete work
Heavy Equipment					
Long Reach Excavator	Month	1	\$14,990.00	\$ 14,990.00	Includes fuel [Hertz Equipment Rental = \$9,990/month plus \$1,250/week (250 gal. @ \$5/gal)]for diesel fuel].
Excavator	Month	1	\$11,600.00	\$ 11,600.00	Includes fuel [Hertz Equipment Rental = \$6,600/month plus \$1,250/week (250 gal. @ \$5/gal)]for diesel fuel]. Located at staging area to load box dump truck and haul trucks.
Box Dump Truck	Month	1	\$21,600.00	\$ 21,600.00	12-14 cy capacity, 2 trucks, one for impacted material and one for clean fill material. Includes fuel and rental vehicle. [Hertz Equipment Rental = 2 each @ \$5,800/month plus 2 each @ \$1,250/week (250 gallons @ \$5/gallon for diesel fuel).
Project Vehicle (Pickup Truck)	Month	1	\$7,380.00	\$ 7,380.00	Assumes 1 truck for Site Superintendent and 2 for Construction crew. Includes fuel and rental vehicle. [Hertz Equipment Rental = 3 each @ \$1,900/month plus 3 each @ \$140/week (35 gallons @ \$4/gallon for fuel).
Lead Hotspot Removal					
Silt Fence	Linear Feet	480	\$3.55	\$ 1,704.00	Includes silt fence for the 30' x 30' area and 150' x 30' area.
Excavate and Load Material	Ton	350	\$4.50	\$ 1,575.00	Engineer's Estimate. Assumes 1.5 tons/cy. 3 hotspots, 30'x30' area to 1 ft deep for one upland hotspot and 150'x30' area accounts for the 2 shoreline hotspots
Topsoil material and delivery	cubic yard	149	\$21.00	\$ 3,129.00	3 hotspots, 30'x30' area to 1 ft deep for one upland hotspot and 150'x30' area accounts for the 2 shoreline hotspots, backfill with 6" topsoil and 6" general fill; assume 1.35 cy loose/in-place and 10% loss
General fill material and delivery	cubic yard	149	\$15.00	\$ 2,235.00	3 hotspots, 30'x30' area to 1 ft deep for one upland hotspot and 150'x30' area accounts for the 2 shoreline hotspots, backfill with 6" topsoil and 6" general fill; assume 1.35 cy loose/in-place and 10% loss
Site restoration	Lump Sum	1	\$2,918.50	\$ 2,918.50	Includes seed and straw. Assumes disturbed area is less than 1 acre. [RSMans #32-92-19.14 (0800)]
Bioretention Area					
Fine Grading (up to 15,000 square yards)	square yard	37	\$3.25	\$ 120.37	Assumes 100' by 10' area. Recent similar project.
Bioretention Area Excavation	cubic yard	37	\$8.75	\$ 324.07	Assumes 1 ft depth over 100' by 10' area. Recent similar project.
Bioretention Area Planting (Trees-Evergreen)	Each	10	\$250.00	\$ 2,500.00	Material and Placement. Recent similar project. Assumes 100' by 10' area with planting 10' on center.
Bioretention Area Planting (Shrubs)	Each	40	\$40.00	\$ 1,600.00	Material and Placement. Recent similar project. Assumes 100' by 10' area with planting 5' on center.
Bioretention Area Installation	square foot	1,000	\$9.63	\$ 9,630.00	Recent similar project. Includes mulch placement, non-woven geotextile, erosion and sediment controls, filter media, and soil. Assumes 100' by 10' area.
Post-Excavation Confirmation Sampling					
Confirmation Sampling (Lead Only) [24 hr TAT]	Each	15	\$263.47	\$ 3,952.05	Assumes 24 hour TAT and 5 samples per location (1 floor and 4 wall) for Lead Hotspot Removal Areas.
Shoreline Removal					
Temporary Diversion Structure Installation/Removal	Linear Feet	400	\$95.00	\$ 38,000.00	Assumes Portadam. Includes layout, site preparation, installation and removal of the containment system. Includes all labor, equipment, and materials.
Temporary Diversion Structure Initial Dewatering	Day	2	\$2,545.00	\$ 5,090.00	Assumes Portadam. Includes all labor, equipment, and materials
Temporary Diversion Structure Maintenance Dewatering	Day	10	\$325.00	\$ 3,250.00	Assumes Portadam. Includes all labor, equipment, materials, and maintenance dewatering for up to 10 days
Excavate and Load Material	Ton	2,501	\$4.50	\$ 11,254.50	Engineer's Estimate. Assumes 1.5 tons/cy.
Sand material and delivery	cubic yard	2,588	\$18.00	\$ 46,584.00	Assumes 1.35 cy loose/in-place and 15% loss
Class 1 riprap material and delivery	ton	665	\$45.00	\$ 29,920.00	Assumes 1.6 tons/cy and 10% loss (assumes 340 linear feet of shoreline with average width of 20' and 18" of riprap)
Geotextile fabric	square yard	756	\$1.00	\$ 755.56	Place underneath riprap (assumes 340 linear feet of shoreline with average width of 20')
Waste Disposal Preparation					
T&D (Soil and Sediment)	Ton	3,080	\$75.00	\$ 231,004.58	Assumes 1.5 tons/cy, non-hazardous. Includes 10% portland cement by weight for stabilization
Recycling (Riprap)	Ton	604	\$25.00	\$ 15,111.11	Assumes 1.6 tons/cy, non-hazardous
Waste Characterization Sampling	Each	3	\$2,675.00	\$ 8,025.00	Assumes 1 sample per 750 cy for full TCLP (VOCs, SVOCs, metals, herbicides, and pesticides), BTEX, PCBs, TPH, EOX, dioxins, reactivity, ignitability, and corrosivity. Includes volume of soil and sediment only for 72
Portland Cement for Waste Stabilization	Ton	280	\$185.00	\$ 51,801.03	Assumes 10% portland cement by weight for sediment and soil from shoreline and lead hotspot removal areas. Assumes material from shoreline and lead hotspot removal areas will fail Lead TCLP for landfill disposal
Lead TCLP Sampling of Stabilized Material	Each	3	\$175.00	\$ 525.00	Assumes 1 sample per 750 cy for Lead TCLP and 72-hour TAT
Miscellaneous					
Picnic Facility	Lump Sum	1	\$8,000.00	\$ 8,000.00	Includes demolition, disposal, and replacement of picnic area
Portable Toilet and Handwash Station	Month	1	\$100.00	\$ 100.00	Includes weekly cleaning
Trimble GPS	Day	3	\$75.00	\$ 225.00	For marking out lead hotspot removal area and extent of shoreline removal area
Rolloff Dumpster	Each	1	\$350.00	\$ 350.00	20 cy dumpster assumes 4 tons per pickup and 1 pickup
Construction Completion Report	Lump Sum	1	\$20,000.00	\$ 20,000.00	
BULKHEAD SHORELINE AND MARINA AREAS					
Site Preparation Activities					
Mobilization	Lump Sum	1	\$30,000.00	\$ 30,000.00	- Includes mobilization of crane w/dredge bucket, barge, and all equipment and personnel required to perform the work
Turbidity Curtain	Linear Feet	460	\$30.00	\$ 13,800.00	- Assumes 460 linear feet along the water side border of the amendment area which will be moved to cover the 400 linear feet needed to surround the Pier 10 and Marina areas - Includes labor and boat for installation, removal, and periodic maintenance
Sediment Amendment					
Sorbster™ Amended Material Purchase	Ton	756	\$ 550.00	\$ 415,693.06	- Includes cost for purchase and 15% loss - Assumes 1.3 ton/yard ³ and Sorbster™ as the chosen amendment material
Sorbster™ Amended Material Delivery	Per Truck	35	\$ 2,500.00	\$ 87,500.00	- Includes cost for delivery and 15% loss - Assumes 22 tons per truckload
Dive Support	Lump Sum	1	\$ 35,000.00	\$ 35,000.00	- Includes 2 divers, 2 tether handlers, and dive supervisor for placement in Marina Area. Recent similar project.
Placement of Sorbster™ Amended Material	Square Foot	81,900	\$ 1.60	\$ 131,040.00	- Includes use of spreader (tug-operated barge w/ excavator, hopper feeder, and truck-mounted conveyor system), fuel, and labor. Assumes a 2" layer over 81,900 ft ²
Site Restoration					
Confirmation Sediment Core Collection	Each	1	\$ 13,624.00	\$ 13,624.00	- Assumes 1 core per grid to 1 ft bss and work performed by 3-man vibracore crew - Includes mobilization/demobilization, labor, equipment, and material for 2 days of vibracoring
Demobilization	Lump Sum	1	\$ 15,000.00	\$ 15,000.00	- Includes demobilization of crane w/dredge bucket, barge, and all equipment and personnel required to perform the work
Subtotal				\$1,487,326	
Contingency (10%)				\$148,733	
Project Management (10%)				\$148,733	
Subtotal				\$1,784,792	
Performance Bond and Insurance (4%)				\$71,392	Industry Average
Subtotal				\$1,856,183	
Design Costs (10%)				\$185,618	
Construction Oversight (8%)				\$148,495	
TOTAL CAPITAL COST				\$2,190,300	+50%
					\$3,285,500
					-30%
					\$1,533,300

Notes
1. Base costs used are 2013 dollars.
2. The enclosed Engineer's Estimate is only an estimate of possible construction costs for budgeting purposes. This estimate is limited to the conditions existing at its issuance and is not a guarantee of actual price or cost. Uncertain market conditions such as, but not limited to: local labor or contractor availability, wages, other work, material market fluctuations, price escalations, force majeure events, and developing bidding conditions etc may affect the accuracy of this estimate. CH2M Hill is not responsible for any variance from this estimate or actual prices and conditions obtained.