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FINAL TIME-CRITICAL REMOVAL ACTION WORK PLAN FOR SOLID WASTE MANAGEMENT UNIT 3 (SWMU3) PIER 10 SANDBLAST YARD JEB LITTLE CREEK VA
6/1/2013
CH2MHILL

**Final**

# Time-Critical Removal Action Work Plan
# 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

**Department of the Navy**
**Naval Facilities Engineering Command**
**Mid-Atlantic**

Under the

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

Prepared by

CH2MHILL®

**Virginia Beach, Virginia**

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# Acronyms and Abbreviations

| | |
|---|---|
| AM | Action Memorandum |
| CERCLA | Comprehensive Environmental Response Compensation and Liability Act |
| CLEAN | Comprehensive Long-term Environmental Action—Navy |
| COC | constituent of concern |
| CTO | Contract Task Order |
| DFOW | definable feature of work |
| EE/CA | Engineering Evaluation/Cost Analysis |
| ERA | Ecological Risk Assessment |
| $ft^2$ | square feet |
| HHRA | Human Health Risk Assessment |
| HSP | Health and Safety Plan |
| IAS | Initial Assessment Study |
| JEB | Joint Expeditionary Base |
| mg/kg | milligrams per kilogram |
| NAB | Naval Amphibious Base |
| NAVFAC | Naval Facilities Engineering Command |
| NTCRA | Non-Time-Critical Removal Action |
| OSR | Offsite Rule |
| PAC | powdered activated carbon |
| PRG | preliminary remediation goal |
| QA | quality assurance |
| QC | quality control |
| QCP | Quality Control Plan |
| RA | removal action |
| RAC | Remedial Action Contract |
| RCM | Reactive Core Mat |
| RCRA | Resource Conservation and Recovery Act |
| RI | Remedial Investigation |
| ROD | Record of Decision |
| RRRS | Relative Risk Ranking System |
| RQ | remediation quotient |
| RSL | regional screening level |
| SERA | Screening Ecological Risk Assessment |
| SERDP | Strategic Environmental Research and development Program |
| SI | Site Investigation |
| SRI | Supplemental Remedial Investigation |
| SWMU | solid waste management unit |
| SWPPP | Stormwater Pollution Prevention Plan |
| TCLP | Toxicity Characteristic Leaching Procedure |
| TCRA | Time-Critical Removal Action |

| | |
|---|---|
| U.S. | United States |
| VDOT | Virginia Department of Transportation |
| ZVI | zero valent iron |

SECTION 1

# Introduction

CH2M HILL has been contracted by the Department of the Navy, Naval Facilities Engineering Command (NAVFAC) Mid-Atlantic Division to prepare a Work Plan to support a Time-Critical Removal Action (TCRA) at Solid Waste Management Unit (SMWU) 3 - Pier 10 Sandblast Yard, 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 [> 400 milligrams per kilogram (mg/kg)] 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 Work Plan has been prepared under NAVFAC Atlantic's Comprehensive Long-term Environmental Action—Navy (CLEAN) Contract No. N62470-08-D-1000, Contract Task Order (CTO) WE34. This Work Plan provides information and the technical approach for the TCRA selected in the *Action Memorandum for Completion of Time-Critical Removal Action at Solid Waste Management Unit 3 – Pier 10 Sandblast Yard* (CH2M HILL, 2013a), hereinafter referred to as the SWMU 3 Action Memorandum (AM).

The Navy will procure a Remedial Action Contract (RAC) Contractor to implement the SWMU 3 TCRA. The Navy's RAC Contractor is responsible for providing a site-specific Health and Safety Plan (HSP) to the Navy for review and approval. The Quality Control Plan (QCP) (**Appendix A**) provided in this Work Plan is general guidance for the process to be followed during TCRA-related construction activities to meet Work Plan objectives. The Navy's RAC Contractor will develop a more detailed project-specific QCP. CH2M HILL will provide engineering and technical support during construction.

## 1.1 Site Location, Description, and History

JEB Little Creek covers approximately 2,215 acres in the northwest portion of Virginia Beach, Virginia, adjacent to the Chesapeake Bay (**Figure 1-1**). JEB Little Creek (formerly known as Naval Amphibious Base [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 logistic facilities and support services for local commands, organizations, home-ported ships, and other United States (U.S.) and allied units to meet amphibious warfare–training requirements of the U.S. 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 the west side of Little Creek Harbor. SWMU 3 was used for sandblasting activities between 1962 and 1995. Boats, anchors, and chains were sandblasted on a concrete pad located on the western side of Building 1263 between 1962 and 1995. In 1995, the concrete pad was removed and a new sandblasting area was constructed in the northwestern corner of the site. The use of this new area was discontinued in 1996 when sandblasting activities were moved to an indoor facility (CB 125). Little Creek Harbor is located east of the SWMU 3 historic sandblasting areas. A marina for base personnel is located south of SWMU 3 and Little Creek Channel, leading to the Chesapeake Bay, is located east of Little Creek Harbor. Little Creek Channel has been regularly dredged since 1928, and in 1995 approximately 2 to 5 feet of sediment were removed from the area around Pier 10.

Historical releases at SWMU 3 likely occurred from accumulation of sandblast residue laying 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 was constructed that transported surface water drainage to a permitted outfall (Outfall

008) (Permit Number VA0079928) discharging to Little Creek Harbor. Under the permit, Outfall 8 has no monitoring requirements. Runoff from some areas of SWMU 3 may continue to flow directly into the harbor.

Previous investigations conducted at SWMU 3 include an Initial Assessment Study (IAS) (RGH, 1984), Resource Conservation and Recovery Act (RCRA) Facility Assessment (RFA) (A. T. Kearney, 1989), Relative Risk Ranking System (RRRS) (Baker, 1996), Site Investigation (SI) (CH2M HILL, 1999), Screening Ecological Risk Assessment (SERA) (CH2M HILL, 2000), Remedial Investigation (RI)/Human Health Risk Assessment (HHRA)/Ecological Risk Assessment (ERA) (CH2M HILL, 2005), and Supplement Remedial Investigation (SRI) (CH2M HILL, 2009). Investigation activities have included the sampling and analysis of all site media (soil, groundwater, surface water, and sediment). No potentially unacceptable risks to human health from exposure to soil, surface water, or sediment were identified during the previous investigations; however, some of the lead concentrations detected in soil were above the residential regional screening level (RSL) and require action. No potentially unacceptable risk associated with direct exposure to or potable use of groundwater was identified. However, potential future risks associated with vapor intrusion are currently being evaluated. 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 (i.e. benthic macro-invertebrates) from exposure to copper, lead, nickel, tin, and zinc in sediment were identified.

## 1.2 Project Objectives

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, 2012a). The PRGs for the site sediment are shown in **Table 1-1**.

TABLE 1-1
Sediment PRGs

| Copper | Lead | Nickel | Tin | Zinc |
|---|---|---|---|---|
| Sediment | | | | |
| 232 | 107 | 26.5 | 11.2 | 410 |

All values in milligrams per kilogram (mg/kg).

To define the lateral area of sediment requiring action under Comprehensive Environmental Response Compensation and Liability Act (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 and complete round of surface sediment data available, collected in 2010 as part of the Benthic Invertebrate Evaluation (CH2M HILL, 2012b). The site was broken down into a grid with 100-foot by 100-foot grid cells. A grid cell is defined as impacted if the RQ for one or more individual COCs exceeds 1.5 and the average RQ for the five COCs exceeds 1.0. The area requiring CERCLA action for sediment is depicted on **Figure 1-2**.

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 in 2002 as part of the RI at SWMU 3, the estimated soil removal areas are depicted on **Figure 1-3**. Prior to execution of the TCRA, soil delineation sampling will be conducted to refine the areas of elevated lead concentrations.

The Dredge Removal Area, where action is being undertaken as part of the ongoing SWMU 3 NTCRA to address potential ecological risks from exposure to sediment surrounding the floating dry dock and anchoring system, is shown in **Figure 1-4**. The removal areas to be addressed under this TCRA include the Soil Removal Area, Rip-Rap Shoreline Area (soil and sediment), Bulkhead Area, and Marina Area (**Figure 1-4**).

# 1.3 Proposed Actions

The following paragraphs describe the proposed actions as presented in the authorizing SWMU 3 AM to support the TCRA. Additional details for each of the areas/actions are presented in **Section 2**. To facilitate excavation of all soil and sediment, existing rip rap will be removed and cleaned prior to re-use as bank stabilization or transported to a Navy-approved offsite facility for recycling.

## 1.3.1 Rip-Rap Shoreline Area

### Soil

The proposed removal action for localized areas of elevated lead concentrations (>400 mg/kg) in soil consists of excavation, offsite disposal, and site restoration to include construction of a retention feature for stormwater runoff from the adjacent parking lot. Pre-confirmation soil sampling will be conducted to delineate the lateral and vertical extent of soil removal required surrounding the preliminary removal areas (Figure 1-4). A minimum of two feet of excavation depth will be needed in the stormwater retention feature area (Figure 1-4); therefore, pre-confirmation soil sampling will not be conducted in this area. Depth of soil excavation in this area will be determined by post-excavation confirmation soil sampling. The soil removal areas will be excavated and the excavated material will be placed into a material handling area. The excavated soil will be staged onsite, sampled for waste characterization, and disposed of at a USEPA Offsite Rule (OSR)-approved disposal facility. Following completion of excavation activities, the soil removal areas will be restored through backfilling with clean fill and topsoil to match the surrounding grade, by constructing a retention feature to capture sheet flow from the dry dock maintenance area, and bank stabilization with rip-rap.

### Sediment

The proposed removal action for impacted sediment within this area consists of excavation, offsite disposal, and placement of clean sand as backfill. The vertical depth of sediment removal required to mitigate potential 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. 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, separate from excavated soil, sampled for waste characterization sampling, followed by drying and solidification (if needed), with offsite disposal at a USEPA OSR-approved disposal facility. Following completion of excavation activities, the site will be restored through placement of clean sand as backfill. Field measurements will be completed as the work progresses to confirm that previously established contract excavation depths and fill requirements are achieved. Because pre-delineation of required depths was completed, no analytical confirmation sampling will be completed following sediment excavation.

## 1.3.2 Bulkhead Area and Marina Areas

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. The goal is to apply the reactive materials to the sediment surface and allow natural physical and bio-assisted mixing (bioturbation, the reworking of sediments by animals or plants through burrowing, ingestion and defecation of sediment grains) to work the amendment into the sediment surface. Sequestration agents can be applied alone or incorporated into a coating on a dense granular core to improve placement quality control (QC) and erosion resistance. 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.

The Navy, in partnership with USEPA and VDEQ, has determined 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 to enable physical measurement of amendment thickness but no post-amendment monitoring will be required.

DVR \\MNUSTRICTGFS01\PROJECTS\USNAVFACENGCOM405450\LITTLECREEK\MAPFILES\411286_SWMU3_TCRA_WP\FIGURE 1-1 - BASE LOCATION MAP.MXD CELEFTHERIADIS 4/3/2013 11:05:30 AM

**Legend**

- Installation Boundary
- SWMU 3 Study Area Boundary

N
W E
S

0 1,500 3,000
Feet

Figure 1-1
SWMU 3 Location Map
SWMU 3 TCRA Work Plan
JEB Little Creek
Virginia Beach, Virginia

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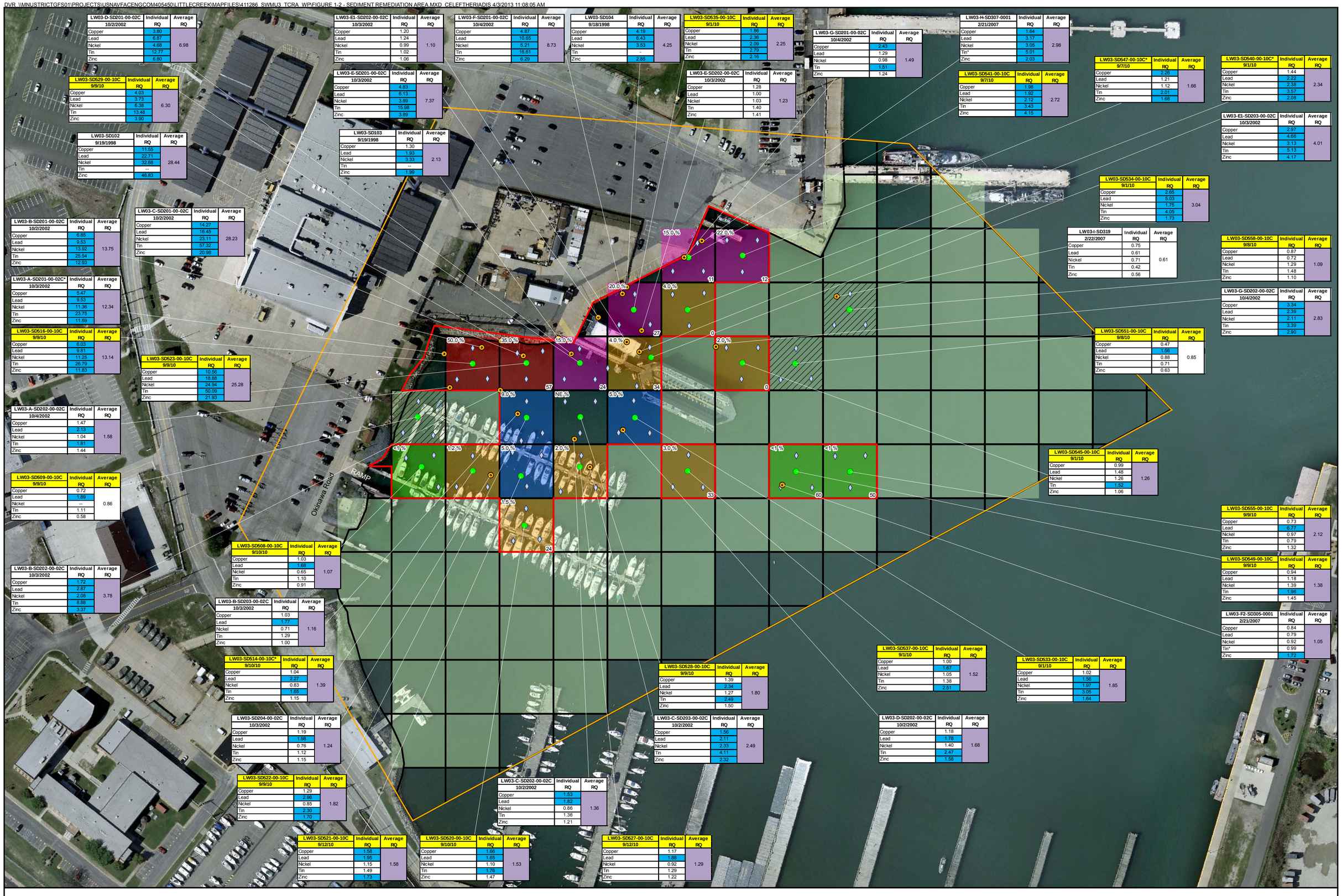
DVR \\NNUSTRICTGFS01\PROJECTS\USNAVFACENGCOM405450\LITTLECREEK\MAPFILES\411286_SWMU3_TCRA_WP\FIGURE 1-2 - SEDIMENT REMEDIATION AREA.MXD CELEFTHERIADIS 4/3/2013 11:08:05 AM




| LW03-D-SD201-00-02C 10/2/2002 | Individual RQ | Average RQ |
|---|---|---|
| Copper | 3.80 | 6.98 |
| Lead | 6.87 | |
| Nickel | 4.68 | |
| Tin | 12.77 | |
| Zinc | 6.80 | |

| LW03-SD529-00-10C 9/9/10 | Individual RQ | Average RQ |
|---|---|---|
| Copper | 4.03 | 6.30 |
| Lead | 3.73 | |
| Nickel | 6.38 | |
| Tin | 13.48 | |
| Zinc | 3.90 | |

| LW03-SD102 9/19/1998 | Individual RQ | Average RQ |
|---|---|---|
| Copper | 11.55 | 28.44 |
| Lead | 22.71 | |
| Nickel | 32.68 | |
| Tin | -- | |
| Zinc | 46.83 | |

| LW03-B-SD201-00-02C 10/2/2002 | Individual RQ | Average RQ |
|---|---|---|
| Copper | 6.85 | 13.75 |
| Lead | 9.53 | |
| Nickel | 13.92 | |
| Tin | 25.54 | |
| Zinc | 12.93 | |

| LW03-A-SD201-00-02C* 10/3/2002 | Individual RQ | Average RQ |
|---|---|---|
| Copper | 5.47 | 12.34 |
| Lead | 9.53 | |
| Nickel | 11.36 | |
| Tin | 23.75 | |
| Zinc | 11.59 | |

| LW03-SD516-00-10C 9/9/10 | Individual RQ | Average RQ |
|---|---|---|
| Copper | 6.03 | 13.14 |
| Lead | 9.81 | |
| Nickel | 11.25 | |
| Tin | 26.79 | |
| Zinc | 11.83 | |

| LW03-A-SD202-00-02C 10/4/2002 | Individual RQ | Average RQ |
|---|---|---|
| Copper | 1.47 | 1.58 |
| Lead | 2.13 | |
| Nickel | 1.04 | |
| Tin | 1.81 | |
| Zinc | 1.44 | |

| LW03-SD509-00-10C 9/9/10 | Individual RQ | Average RQ |
|---|---|---|
| Copper | 0.72 | 0.86 |
| Lead | 1.59 | |
| Nickel | -- | |
| Tin | 1.11 | |
| Zinc | 0.58 | |

| LW03-B-SD202-00-02C 10/3/2002 | Individual RQ | Average RQ |
|---|---|---|
| Copper | 1.72 | 3.78 |
| Lead | 2.87 | |
| Nickel | 2.08 | |
| Tin | 8.88 | |
| Zinc | 3.37 | |

| LW03-E1-SD202-00-02C 10/3/2002 | Individual RQ | Average RQ |
|---|---|---|
| Copper | 1.20 | 1.10 |
| Lead | 1.24 | |
| Nickel | 0.99 | |
| Tin | 1.02 | |
| Zinc | 1.06 | |

| LW03-E-SD201-00-02C 10/3/2002 | Individual RQ | Average RQ |
|---|---|---|
| Copper | 4.83 | 7.37 |
| Lead | 6.13 | |
| Nickel | 3.89 | |
| Tin | 15.98 | |
| Zinc | 3.89 | |

| LW03-SD103 9/19/1998 | Individual RQ | Average RQ |
|---|---|---|
| Copper | 1.30 | 2.13 |
| Lead | 1.93 | |
| Nickel | 3.33 | |
| Tin | -- | |
| Zinc | 1.99 | |

| LW03-C-SD201-00-02C 10/2/2002 | Individual RQ | Average RQ |
|---|---|---|
| Copper | 14.27 | 28.23 |
| Lead | 16.45 | |
| Nickel | 23.11 | |
| Tin | 57.32 | |
| Zinc | 20.98 | |

| LW03-SD523-00-10C 9/9/10 | Individual RQ | Average RQ |
|---|---|---|
| Copper | 10.56 | 25.28 |
| Lead | 18.88 | |
| Nickel | 24.94 | |
| Tin | 50.09 | |
| Zinc | 21.93 | |

| LW03-SD508-00-10C 9/10/10 | Individual RQ | Average RQ |
|---|---|---|
| Copper | 1.03 | 1.07 |
| Lead | 1.68 | |
| Nickel | 0.65 | |
| Tin | 1.10 | |
| Zinc | 0.91 | |

| LW03-B-SD203-00-02C 10/3/2002 | Individual RQ | Average RQ |
|---|---|---|
| Copper | 1.03 | 1.16 |
| Lead | 1.77 | |
| Nickel | 0.71 | |
| Tin | 1.29 | |
| Zinc | 1.00 | |

| LW03-SD514-00-10C* 9/10/10 | Individual RQ | Average RQ |
|---|---|---|
| Copper | 1.04 | 1.39 |
| Lead | 2.27 | |
| Nickel | 0.83 | |
| Tin | 1.65 | |
| Zinc | 1.15 | |

| LW03-SD204-00-02C 10/3/2002 | Individual RQ | Average RQ |
|---|---|---|
| Copper | 1.19 | 1.24 |
| Lead | 1.98 | |
| Nickel | 0.76 | |
| Tin | 1.12 | |
| Zinc | 1.15 | |

| LW03-SD522-00-10C 9/9/10 | Individual RQ | Average RQ |
|---|---|---|
| Copper | 1.29 | 1.82 |
| Lead | 2.96 | |
| Nickel | 0.85 | |
| Tin | 2.30 | |
| Zinc | 1.70 | |

| LW03-SD521-00-10C 9/12/10 | Individual RQ | Average RQ |
|---|---|---|
| Copper | 1.58 | 1.58 |
| Lead | 1.95 | |
| Nickel | 1.15 | |
| Tin | 1.49 | |
| Zinc | 1.73 | |

| LW03-SD520-00-10C 9/10/10 | Individual RQ | Average RQ |
|---|---|---|
| Copper | 1.66 | 1.53 |
| Lead | 1.65 | |
| Nickel | 1.10 | |
| Tin | 1.76 | |
| Zinc | 1.47 | |

| LW03-SD527-00-10C 9/12/10 | Individual RQ | Average RQ |
|---|---|---|
| Copper | 1.17 | 1.29 |
| Lead | 1.88 | |
| Nickel | 0.92 | |
| Tin | 1.29 | |
| Zinc | 1.22 | |

| LW03-C-SD202-00-02C 10/2/2002 | Individual RQ | Average RQ |
|---|---|---|
| Copper | 1.53 | 1.36 |
| Lead | 1.82 | |
| Nickel | 0.86 | |
| Tin | 1.38 | |
| Zinc | 1.21 | |

| LW03-SD528-00-10C 9/9/10 | Individual RQ | Average RQ |
|---|---|---|
| Copper | 1.39 | 1.80 |
| Lead | 2.34 | |
| Nickel | 1.27 | |
| Tin | 2.49 | |
| Zinc | 1.50 | |

| LW03-C-SD203-00-02C 10/2/2002 | Individual RQ | Average RQ |
|---|---|---|
| Copper | 1.56 | 2.49 |
| Lead | 2.11 | |
| Nickel | 2.33 | |
| Tin | 4.11 | |
| Zinc | 2.32 | |

| LW03-SD537-00-10C 9/1/10 | Individual RQ | Average RQ |
|---|---|---|
| Copper | 1.00 | 1.52 |
| Lead | 1.67 | |
| Nickel | 1.05 | |
| Tin | 1.38 | |
| Zinc | 2.51 | |

| LW03-D-SD202-00-02C 10/2/2002 | Individual RQ | Average RQ |
|---|---|---|
| Copper | 1.18 | 1.68 |
| Lead | 1.78 | |
| Nickel | 1.40 | |
| Tin | 2.47 | |
| Zinc | 1.58 | |

| LW03-SD533-00-10C 9/1/10 | Individual RQ | Average RQ |
|---|---|---|
| Copper | 1.02 | 1.85 |
| Lead | 1.56 | |
| Nickel | 1.97 | |
| Tin | 3.05 | |
| Zinc | 1.64 | |

| LW03-SD535-00-10C 9/1/10 | Individual RQ | Average RQ |
|---|---|---|
| Copper | 1.93 | 2.25 |
| Lead | 2.36 | |
| Nickel | 2.09 | |
| Tin | 2.79 | |
| Zinc | 2.16 | |

| LW03-SD104 9/18/1998 | Individual RQ | Average RQ |
|---|---|---|
| Copper | 4.19 | 4.25 |
| Lead | 6.43 | |
| Nickel | 3.53 | |
| Tin | - | |
| Zinc | 2.85 | |

| LW03-F-SD201-00-02C 10/4/2002 | Individual RQ | Average RQ |
|---|---|---|
| Copper | 4.67 | 8.73 |
| Lead | 10.65 | |
| Nickel | 5.21 | |
| Tin | 16.61 | |
| Zinc | 6.29 | |

| LW03-E-SD202-00-02C 10/3/2002 | Individual RQ | Average RQ |
|---|---|---|
| Copper | 1.28 | 1.23 |
| Lead | 1.00 | |
| Nickel | 1.03 | |
| Tin | 1.40 | |
| Zinc | 1.41 | |

| LW03-G-SD201-00-02C 10/4/2002 | Individual RQ | Average RQ |
|---|---|---|
| Copper | 2.43 | 1.49 |
| Lead | 1.29 | |
| Nickel | 0.98 | |
| Tin | 1.51 | |
| Zinc | 1.24 | |

| LW03-H-SD307-0001 2/21/2007 | Individual RQ | Average RQ |
|---|---|---|
| Copper | 1.64 | 2.98 |
| Lead | 3.17 | |
| Nickel | 3.05 | |
| Tin* | 5.01 | |
| Zinc | 2.03 | |

| LW03-SD541-00-10C 9/7/10 | Individual RQ | Average RQ |
|---|---|---|
| Copper | 1.98 | 2.72 |
| Lead | 1.92 | |
| Nickel | 2.12 | |
| Tin | 3.43 | |
| Zinc | 4.15 | |

| LW03-SD547-00-10C* 9/7/10 | Individual RQ | Average RQ |
|---|---|---|
| Copper | 2.26 | 1.66 |
| Lead | 1.21 | |
| Nickel | 1.12 | |
| Tin | 2.01 | |
| Zinc | 1.68 | |

| LW03-SD540-00-10C* 9/1/10 | Individual RQ | Average RQ |
|---|---|---|
| Copper | 1.44 | 2.34 |
| Lead | 2.22 | |
| Nickel | 2.38 | |
| Tin | 3.57 | |
| Zinc | 2.08 | |

| LW03-E1-SD203-00-02C 10/3/2002 | Individual RQ | Average RQ |
|---|---|---|
| Copper | 2.97 | 4.01 |
| Lead | 4.66 | |
| Nickel | 3.13 | |
| Tin | 5.13 | |
| Zinc | 4.17 | |

| LW03-SD534-00-10C 9/1/10 | Individual RQ | Average RQ |
|---|---|---|
| Copper | 2.65 | 3.04 |
| Lead | 5.03 | |
| Nickel | 1.75 | |
| Tin | 4.05 | |
| Zinc | 1.73 | |

| LW03-I-SD319 2/22/2007 | Individual RQ | Average RQ |
|---|---|---|
| Copper | 0.75 | 0.61 |
| Lead | 0.61 | |
| Nickel | 0.71 | |
| Tin | 0.42 | |
| Zinc | 0.56 | |

| LW03-SD558-00-10C 9/8/10 | Individual RQ | Average RQ |
|---|---|---|
| Copper | 0.87 | 1.09 |
| Lead | 0.72 | |
| Nickel | 1.29 | |
| Tin | 1.48 | |
| Zinc | 1.10 | |

| LW03-G-SD202-00-02C 10/4/2002 | Individual RQ | Average RQ |
|---|---|---|
| Copper | 3.34 | 2.83 |
| Lead | 2.39 | |
| Nickel | 2.11 | |
| Tin | 3.39 | |
| Zinc | 2.90 | |

| LW03-SD551-00-10C 9/8/10 | Individual RQ | Average RQ |
|---|---|---|
| Copper | 0.47 | 0.85 |
| Lead | 1.56 | |
| Nickel | 0.88 | |
| Tin | 0.71 | |
| Zinc | 0.63 | |

| LW03-SD545-00-10C 9/1/10 | Individual RQ | Average RQ |
|---|---|---|
| Copper | 0.99 | 1.26 |
| Lead | 1.48 | |
| Nickel | 1.26 | |
| Tin | 1.52 | |
| Zinc | 1.06 | |

| LW03-SD555-00-10C 9/9/10 | Individual RQ | Average RQ |
|---|---|---|
| Copper | 0.73 | 2.12 |
| Lead | 6.77 | |
| Nickel | 0.97 | |
| Tin | 0.79 | |
| Zinc | 1.32 | |

| LW03-SD549-00-10C 9/9/10 | Individual RQ | Average RQ |
|---|---|---|
| Copper | 0.94 | 1.38 |
| Lead | 1.18 | |
| Nickel | 1.39 | |
| Tin | 1.96 | |
| Zinc | 1.45 | |

| LW03-F2-SD305-0001 2/21/2007 | Individual RQ | Average RQ |
|---|---|---|
| Copper | 0.84 | 1.05 |
| Lead | 0.79 | |
| Nickel | 0.92 | |
| Tin* | 0.99 | |
| Zinc | 1.72 | |

## 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
- SWMU 3 Study Area Boundary
- Grid determined to require no CERCLA remedial action per 2002, 2007, 2009, and 2010 data

**2010 Surface Sediment ABM Content**

- ≤ 1%
- 1-5%
- 5-10%
- 10-30%
- >30%

N W E S

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 1-2
Sediment Remediation Area
SWMU 3 TCRA Work Plan
JEB Little Creek
Virginia Beach, Virginia

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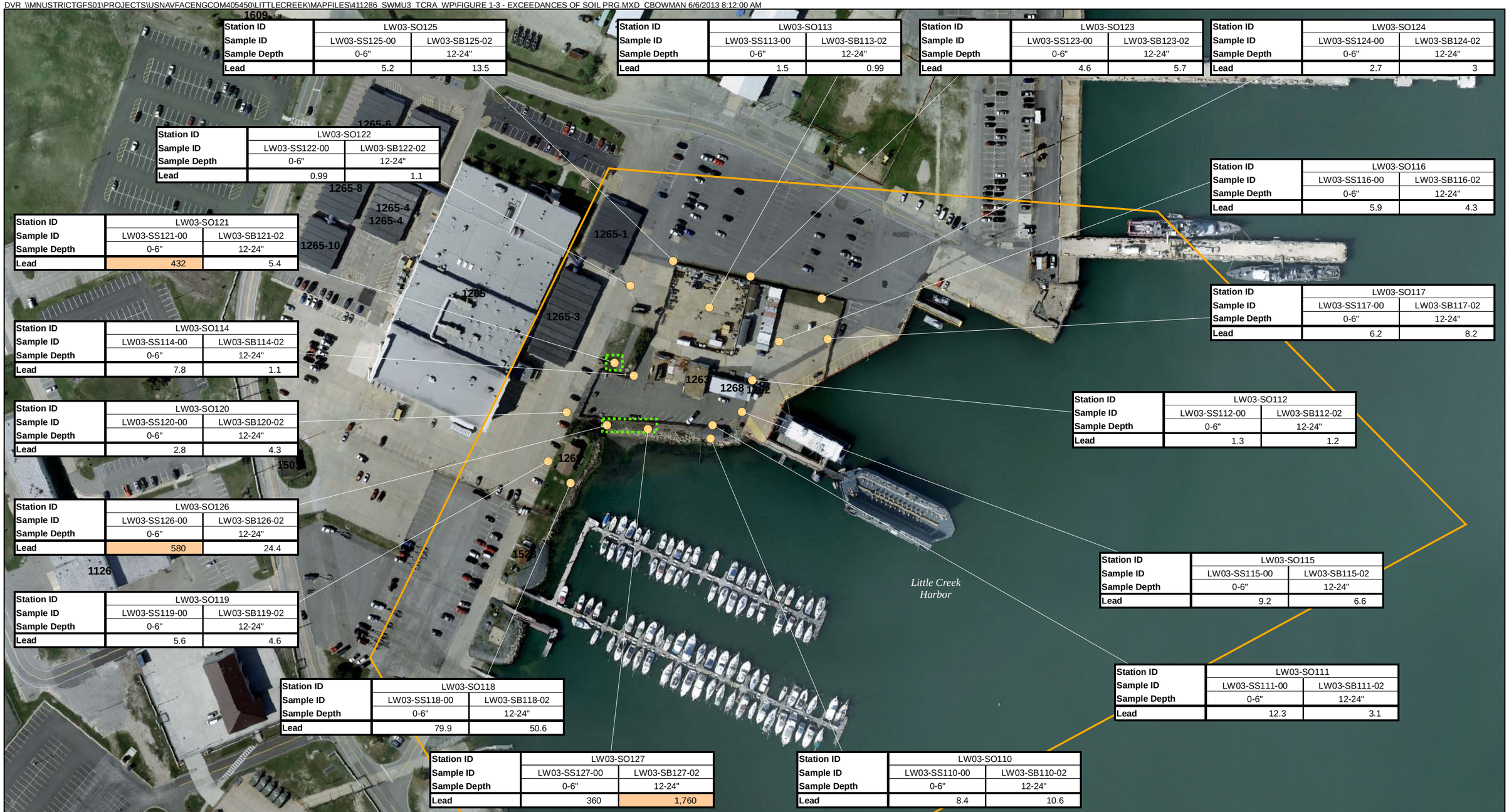
DVR \\MNUSTRICTGFS01\PROJECTS\USNAVFACENGCOM405450\LITTLECREEK\MAPFILES\411286_SWMU3_TCRA_WP\FIGURE 1-3 - EXCEEDANCES OF SOIL PRG.MXD CBOWMAN 6/6/2013 8:12:00 AM




| Station ID | LW03-SO125 | |
|---|---|---|
| Sample ID | LW03-SS125-00 | LW03-SB125-02 |
| Sample Depth | 0-6" | 12-24" |
| Lead | 5.2 | 13.5 |

| Station ID | LW03-SO113 | |
|---|---|---|
| Sample ID | LW03-SS113-00 | LW03-SB113-02 |
| Sample Depth | 0-6" | 12-24" |
| Lead | 1.5 | 0.99 |

| Station ID | LW03-SO123 | |
|---|---|---|
| Sample ID | LW03-SS123-00 | LW03-SB123-02 |
| Sample Depth | 0-6" | 12-24" |
| Lead | 4.6 | 5.7 |

| Station ID | LW03-SO124 | |
|---|---|---|
| Sample ID | LW03-SS124-00 | LW03-SB124-02 |
| Sample Depth | 0-6" | 12-24" |
| Lead | 2.7 | 3 |

| Station ID | LW03-SO122 | |
|---|---|---|
| Sample ID | LW03-SS122-00 | LW03-SB122-02 |
| Sample Depth | 0-6" | 12-24" |
| Lead | 0.99 | 1.1 |

| Station ID | LW03-SO116 | |
|---|---|---|
| Sample ID | LW03-SS116-00 | LW03-SB116-02 |
| Sample Depth | 0-6" | 12-24" |
| Lead | 5.9 | 4.3 |

| Station ID | LW03-SO121 | |
|---|---|---|
| Sample ID | LW03-SS121-00 | LW03-SB121-02 |
| Sample Depth | 0-6" | 12-24" |
| Lead | 432 | 5.4 |

| Station ID | LW03-SO117 | |
|---|---|---|
| Sample ID | LW03-SS117-00 | LW03-SB117-02 |
| Sample Depth | 0-6" | 12-24" |
| Lead | 6.2 | 8.2 |

| Station ID | LW03-SO114 | |
|---|---|---|
| Sample ID | LW03-SS114-00 | LW03-SB114-02 |
| Sample Depth | 0-6" | 12-24" |
| Lead | 7.8 | 1.1 |

| Station ID | LW03-SO112 | |
|---|---|---|
| Sample ID | LW03-SS112-00 | LW03-SB112-02 |
| Sample Depth | 0-6" | 12-24" |
| Lead | 1.3 | 1.2 |

| Station ID | LW03-SO120 | |
|---|---|---|
| Sample ID | LW03-SS120-00 | LW03-SB120-02 |
| Sample Depth | 0-6" | 12-24" |
| Lead | 2.8 | 4.3 |

| Station ID | LW03-SO126 | |
|---|---|---|
| Sample ID | LW03-SS126-00 | LW03-SB126-02 |
| Sample Depth | 0-6" | 12-24" |
| Lead | 580 | 24.4 |

| Station ID | LW03-SO115 | |
|---|---|---|
| Sample ID | LW03-SS115-00 | LW03-SB115-02 |
| Sample Depth | 0-6" | 12-24" |
| Lead | 9.2 | 6.6 |

| Station ID | LW03-SO119 | |
|---|---|---|
| Sample ID | LW03-SS119-00 | LW03-SB119-02 |
| Sample Depth | 0-6" | 12-24" |
| Lead | 5.6 | 4.6 |

| Station ID | LW03-SO111 | |
|---|---|---|
| Sample ID | LW03-SS111-00 | LW03-SB111-02 |
| Sample Depth | 0-6" | 12-24" |
| Lead | 12.3 | 3.1 |

| Station ID | LW03-SO118 | |
|---|---|---|
| Sample ID | LW03-SS118-00 | LW03-SB118-02 |
| Sample Depth | 0-6" | 12-24" |
| Lead | 79.9 | 50.6 |

| Station ID | LW03-SO127 | |
|---|---|---|
| Sample ID | LW03-SS127-00 | LW03-SB127-02 |
| Sample Depth | 0-6" | 12-24" |
| Lead | 360 | 1,760 |

| Station ID | LW03-SO110 | |
|---|---|---|
| Sample ID | LW03-SS110-00 | LW03-SB110-02 |
| Sample Depth | 0-6" | 12-24" |
| Lead | 8.4 | 10.6 |

**Legend**

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

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

N
W E
S

0 75 150 300
Feet

Figure 1-3
Preliminary Soil Removal Areas
SWMU 3 TCRA Work Plan
JEB Little Creek
Virginia Beach, Virginia

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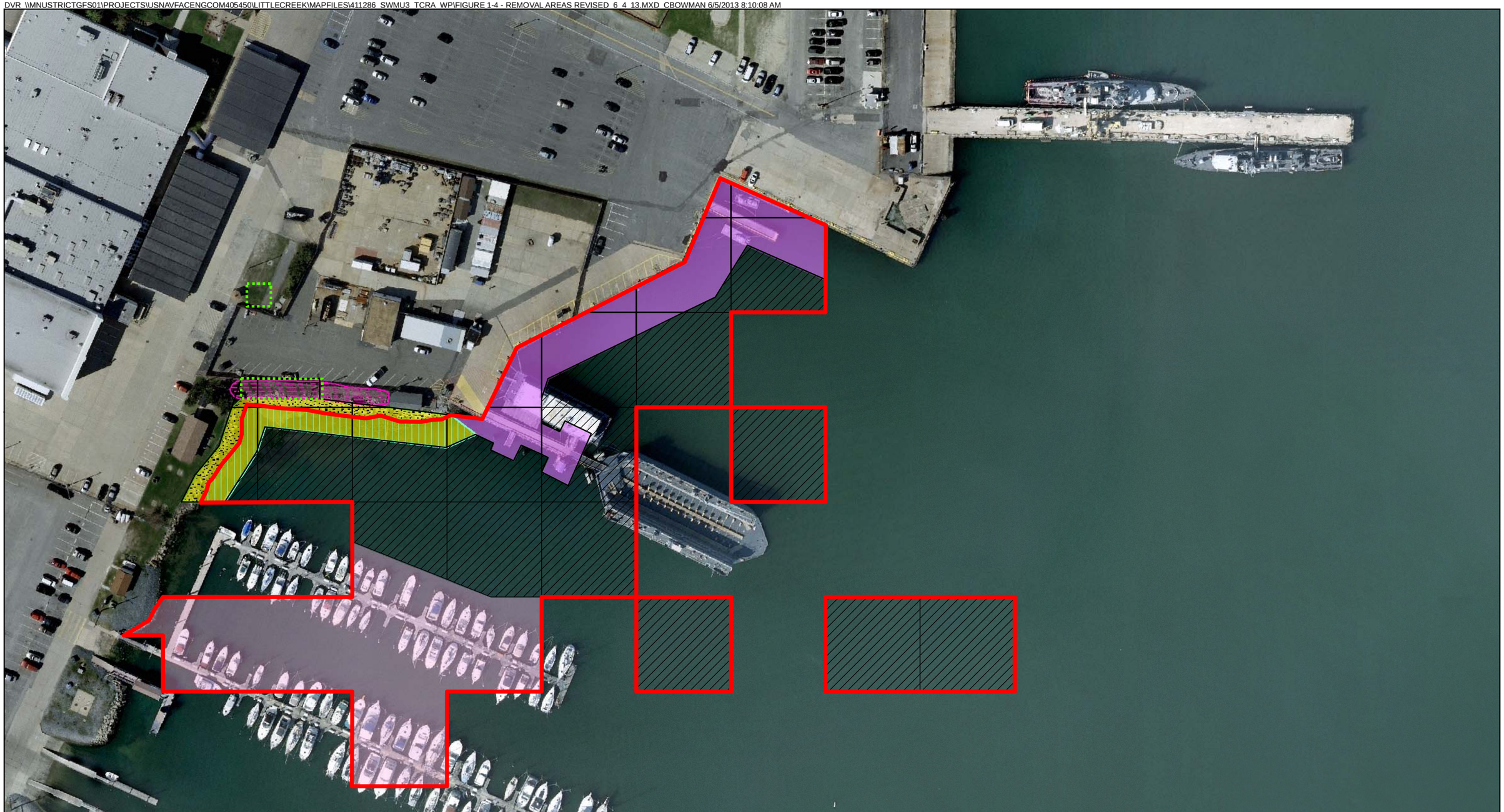
DVR \\MNUSTRICTGFS01\PROJECTS\USNAVFACENGCOM405450\LITTLECREEK\MAPFILES\411286_SWMU3_TCRA_WP\FIGURE 1-4 - REMOVAL AREAS REVISED_6_4_13.MXD CBOWMAN 6/5/2013 8:10:08 AM



**Legend**

- Preliminary Area of Lead Soil Removal
- NTCRA Dredge Removal Area
- Sediment Removal Area
- RipRap/Bank to be Stabilized
- Retention Swale to be Constructed as Part of Site Restoration
- Bulkhead Shoreline Area
- Rip-Rap Shoreline Area
- Marina Area
- Sediment Remediation Area

N
W E
S

0 50 100 200
Feet

Figure 1-4
Removal Action Area
SWMU 3 TCRA Work Plan
JEB Little Creek
Virginia Beach, Virginia

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SECTION 2

# Project Description and Work Features

This section provides an overview of the implementation of the project and describes the planning and execution of project tasks. The scope of work is to implement the TCRA for SWMU 3. Activities for the TCRA described in this Work Plan include sediment and soil excavation in the rip-rap shoreline area and placement of a reactive amendment in the bulkhead and marina areas.

The definable features of work (DFOWs) were developed for the TCRA for the purpose of planning and executing the project, implementing QC, and developing health and safety requirements. The DFOWs developed to support this Work Plan and associated with the execution of the scope of work are as follows:

- Utility locating and clearance
- Mobilization and site preparation
- Installation of temporary water diversion structure
- Removal and stockpile of existing rip rap (broken concrete)
- Soil and sediment removal
- Waste management/disposal of excavated materials
- Placement of sediment amendment
- Site restoration – backfill and construct stormwater retention feature
- Demobilization

The procedures for the implementation of the QCP are outlined in **Appendix A,** an Environmental Protection Plan is provided in **Appendix B,** a Waste Management Plan is provided in **Appendix C**, and a Stormwater Pollution Prevention Plan (SWPPP) is provided in **Appendix D**.

## 2.1 Pre-Construction Meeting

A Pre-Construction Meeting is to be scheduled with representatives from the Navy approximately 2 weeks prior to mobilization to coordinate such items as the project schedule and construction activities to be performed, traffic routes (facility preferences), reporting requirements, and other items warranting discussion.

## 2.2 Pre-Construction Investigation Sampling–Soil Removal Areas

Prior to conducting the TCRA, pre-confirmation lead soil sampling will be conducted to support the removal action for areas where lead has previously been identified as exceeding 400 mg/kg. The pre-confirmation lead soil sampling will delineate the excavation limits, outside of the retention feature, prior to mobilization. The sampling will be conducted to define the vertical and horizontal limits of excavation within the grassy area in the vicinity of previously collected soil sample LW03-SO121 (**Figure 1-3**) for the TCRA and west of the retention feature, which currently encompasses the area surrounding previously collected soil samples LW03-SO126 and LW03-SO127. Because a minimum of two feet of excavation is needed for construction of the retention feature, pre-confirmation lead soil sampling will not be conducted in this area. Following excavation and prior to construction of the retention feature, floor samples will be collected to confirm that the excavation in this area has sufficiently removed the localized areas of elevated lead concentrations (> 400 mg/kg) in soil. The Navy's RAC Contractor will be responsible for excavating to the defined limits. All sampling will be completed by CH2M HILL. Utility clearance will be conducted prior to initiation of sampling in this area.

## 2.3 Mobilization and Site Preparation

Mobilization will occur following the completion of the pre-construction meeting and following the notice to proceed from the Navy. Mobilization consists of establishing site personnel; having equipment, temporary facilities, and materials delivered to the site; establishing laydown and staging areas; and establishing erosion and

sediment controls. Efforts will be coordinated with the JEB Little Creek Port Operations and Little Creek Harbor Operations to minimize impacts to the installation.

The adjacent parking lots will be used for the laydown area for a construction trailer and portable facilities. Temporary stockpile areas will be necessary for the temporary placement of rip rap to be removed and re-used, as well as for excavated soil and sediment. Saturated soil and sediment will be maintained separately in a bermed and lined containment cell to promote drying and contain excess water. The exact location of laydown and material storage/staging areas will be determined prior to site work through coordination with the Navy.

Subsurface utility clearance will be completed through notification/coordination with Miss Utility of Virginia and a subcontracted third-party utility locator. No intrusive activities will begin until the utility clearance has been completed. Based upon available mapping used to generate this Work Plan, only subsurface stormwater drainage pipes are believed to be in the vicinity of the TCRA. There are overhead electric lines on the north shoreline to be excavated that will require either temporary relocation or removal from service. A fence located along the top of this slope will also need to be temporarily relocated during construction activities.

## 2.4 Installation of Temporary Water Diversion Structure

A temporary dam/diversion structure such as AquaDam or PortaDam will be necessary along the shoreline to keep tidal surface waters out of the shoreline and sediment excavation area along the toe of the riprap. Based upon bathymetry survey data collected to support the dredge operations within the harbor, water depths of 3 to 8 feet at mean lower low water are expected in the area where the temporary dam/diversion structure will be placed (approximately 40 feet offshore). Tidal fluctuations of approximately 3 feet are anticipated. This depth approximation provides a buffer zone to account for sloughing of wet sediments as they are excavated. A 4-foot excavation depth 20 feet from the toe of the shoreline riprap is required within the sediment area; assuming a slope of 5H:1V or 6H:1V, an offset distance of 20 to 25 feet from the excavation area will be necessary (equating to 40 to 45-foot total distance from the shoreline).

Two common types of temporary diversion structures are commercially available: Aquadam (a bladder that is filled with water at a height greater than the anticipated depth of water) and Portadam (a framed structure covered by a membrane). Each is suitable for the task and either may be used. A turbidity curtain and oil containment boom will be placed on the harbor side of the temporary diversion structure. Once the diversion structure and turbidity curtain are in place, the water between the structure and the shoreline will be pumped and discharged into the adjacent harbor at a point located between the dam and the turbidity curtain/containment boom. The dewatered condition will be maintained by pumping. When water levels are low or when the water being pumped has a high sediment content (e.g., near the completion of initial dewatering and during construction activities), a means of reducing the turbidity will be necessary prior to discharge. A filter bag on the discharge piping will be used to remove sediment from the pumped waters.

## 2.5 Soil and Sediment Removal

The shoreline embankment is currently covered with broken concrete that serves as rip rap for bank stabilization. Prior to excavation, the concrete will be removed and staged for re-use as bank stabilization during restoration. Prior to re-use, large pieces of concrete will be broken into smaller pieces; protruding rebar will be cut off; and, soil/sediment adhering to the concrete will be removed.

Excavation activities will be completed in the soil and sediment areas identified in **Figures 2-1 and 2-2**. Soil areas outside of the retention feature will be excavated based upon the results of the pre-confirmation lead soil sampling. A minimum of two feet will be excavated for construction of the retention feature. Following removal of the soil at the top of the bank in the retention feature area, post-excavation confirmation floor samples will be collected to ensure that excavation activities have sufficiently addressed the localized areas of elevated lead concentrations (> 400 mg/kg) in soil. The near shore sediments require removal to vertical depth previously delineated as part of the SWMU 3 NTCRA delineation sampling event conducted in December 2012. Sediment removal to 4 feet is required on the east-facing shoreline. The south-facing shore line requires removal to 4 feet in the western portion and 3 feet in the eastern portion.

Excavation of the retention feature area and the near shore sediments will be completed using a long reach excavator from the top of the shoreline. For the soil excavation, a side slope at a minimum of 1H:1V is assumed to be necessary. If groundwater is at a shallower depth than 4 feet, or if the excavation sidewalls are not stable, then the side slope may need to be less steep. For the sediment excavation, a side slope of 5H:1V to 6H:1V is anticipated due to the saturated nature of the materials to be excavated. Field trials during construction will be necessary to determine the slope and offset to achieve the 20 foot distance from toe of riprap necessary to reach the excavation depth of 3 or 4 feet, as required. As noted for the setup of the temporary diversion structure above, the placement of the diversion structure will need to provide the offset distance from the excavation area to account for sloughing of sediments.

Excavation depths will be field surveyed/measured to confirm that excavation depths are achieved. In the event that sloughing of the excavated sediment materials is immediate, making post-excavation depth confirmation to 3 or 4 feet difficult without additional stabilization measures, documentation (including a photographic record) will be kept of the excavation activities. Total depth can be documented through electronic measurements on the removal equipment and total volume removed can be tracked and compared to the original volume (in-place) to verify actual quantity removed if the excavation depth cannot be maintained in the saturated sediments. The removed volume measurements will need to account for bulking that is likely to occur after the sediments is removed.

Excavated materials will be staged on-site at the approved location for the lined and bermed containment cell. For work planning purposes, the containment cell is estimated to be 150 feet by 200 feet. The excavated soil will be stockpiled separate from excavated sediment. All material will be covered while the material is characterized by the Toxicity Characteristic Leaching Procedure (TCLP) to confirm its disposition prior to disposal. The frequency of testing will be as required by the disposal facility based upon the waste profile. Non-hazardous characterization is assumed; if confirmed by TCLP results, the soil will be transported to a landfill permitted to accept it (e.g., by USEPA OSR). Excavated sediment will be allowed to dry/dewater for transport. Material sampling requirements will be determined by the disposal facility. Fluids remaining in the containment cell will be containerized, characterized for disposal by TCLP, and disposed offsite at a facility permitted to accept the waste.

## 2.6 Backfill and Site Restoration

Soil removal areas outside the retention feature will be backfilled to match surrounding grade with clean fill, dressed with topsoil, and seeded. Chemical concentrations in each source of soil backfill material brought to the site for use must be lower than the criteria listed in **Table 2-1**. Backfill materials will be lightly compacted with the excavator.

A retention feature will be constructed as depicted on **Figure 1-4** and in **Appendix D** (Figure 2). The swale will serve to retain and filter runoff from the adjacent parking lot, which is an estimated drainage area of 0.34 acres. The retention feature will be narrow and flat and parallel to the parking lot. The available width between the parking lot and top of rip rap bank is approximately 13 feet. This narrow space is insufficient for a typical stormwater system as defined in the *Virginia Stormwater Management Handbook* (“the Handbook”) (VDCR, 1999). Due to the narrow size, a hybrid stormwater system is proposed (Figure 2 in the SWPPP [**Appendix D**]) to capture and filter the first half-inch of stormwater runoff from the 0.34 acre parking lot. The hybrid system is a combination of a retention basin, bioretention area, and grassed swale as outlined in the Handbook. The bottom width of the retention feature is 3 feet, the depth is 1 foot, and the side slopes are at 3H:1V. A grassed spillway will convey flows in excess of the half-inch of runoff into the riprap and ultimately into Little Creek Harbor, while the captured half-inch will infiltrate through the swale bottom. The retention feature will be vegetated with grass rather than wetland plantings, due to limited bottom planting area and to limit necessary maintenance.

Upon completion of sediment excavation activities, a minimum of 2 feet of clean sand will be backfilled in the sediment removal area that will be submerged following construction activities. The shoreline embankment above the water line will be backfilled with a layer of clean sand, a non-woven geotextile, a layer of Virginia Department of Transportation (VDOT) No. 1 stone, the re-used broken concrete that currently serves as bank stabilization, and finished with a top layer of VDOT-class A1 rip rap. To the extent practicable, the embankment

will be stabilized to match the pre-construction configuration. Slopes greater than 3H:1V are not anticipated. The toe of the reconstructed slope is to be graded to its pre-construction horizontal and vertical location. The removal of the rip rap and underlying soil is to provide access to the near-shore sediments requiring removal. The depth of excavation beneath the rip-rap will be to the extent necessary to provide for removal of the sediment. A typical detail of bank restoration is provided in Figure 2 in the SWPPP (**Appendix D**).

## 2.7 Placement of Sediment Amendment – Bulkhead and Marina Areas

Potential sediment amendments were evaluated in a Technical Memorandum, *Sediment Amendment Selection, Solid Waste Management Unit 3* (CH2M HILL, 2013b). Based upon that evaluation, two amendments were recommended: AquaGate™ +PAC and AquaGate™ +Sorbster™. This memorandum is included as **Appendix E**. Final selection of the amendment will be made by the Navy's RAC contractor.

### 2.7.1 Placement

The dense aggregate amendment will be manufactured offsite, transported, and delivered to site by truckload or Super-Sak, depending on the storage restrictions determined by the Navy's RAC Contractor. The laydown area must be sufficient to manage a minimum of a 3-working-day supply of material to facilitate the construction schedule. If the reactive amendment is necessary to be stored on site, it will be stored either in its shipping container or covered and protected.

Dense aggregate amendment delivery is typically performed by placing the material in open water areas using an excavator bucket or clamshell. Where the reach of a long-arm excavator is insufficient, the amendment can be placed using a stone slinger. In the Bulkhead Area, it is anticipated that all of the amendment can be placed with a long-arm excavator. In areas outside the reach of a long-arm excavator, the amendment will be placed with an environmental bucket or clamshell. Material delivery is typically controlled by sifting the amendment through the teeth of a bucket over an area and to an approximate thickness corresponding to the volume in the bucket. In areas with physical obstructions such as the dry dock and Marina Area, the amendment may be placed by hand or via a tremie pipe. In both instances, underwater diver assistance would be required. Confirmation core samples will be taken to verify the amount and uniformity of the amendment over the target area. The placement method will be adjusted if the quality assurance/quality control (QA/QC) measurements indicate inadequate coverage.

### 2.7.2 Dosage

The reactive amendment will be applied to the sediment surface and gradually mix into the sediment through bioturbation. The amendment is expected to initially mix into the surficial sediment through natural particle sieving due to variations in particle size and weight, which occurs rapidly as a result of energy generated at the time of placement. The target thickness for the amendment layer is expected to be approximately 2 inches on average. The 2 inch average thickness for the amendment layer is based upon previously conducted laboratory studies and what has been implemented at other similar project sites[1].

### 2.7.3 Quality Assurance/Quality Control

Placement will be verified by collecting sediment cores, allowing for visual confirmation of amendment layer thickness at the time of construction. For this site, one core per 1,000 square feet ($ft^2$) of treatment area will be collected, resulting in approximately 10-12 cores. However, more frequent coring during initial placement may be warranted to ensure that the placement methods are accurately delivering the amendment. The amendment thickness measurements should be taken from the midpoint of the mixing zone[2] to the surface of the amendment. It will be important to maintain an inventory of the amendment delivered to the site, moved from the shore to the sediment (i.e., number of buckets, bucket volume, and percent full per bucket), and estimates

[1] The actual target thickness of the amendment layer will be based upon testing and/or data supplied by the manufacturer for the selected amendment coupled with professional judgment.

[2] The mixing zone is the top layer where the amendment is intermixed with the surface of the sediment. Because it is not a definitive line, the midpoint is recommended for thickness measurements. The mixing zone will be identified in the field by a combination of physical characteristics, including grain size and color differences.

provided by core measurements. The Navy's RAC Contractor will be responsible for collection of all data and routine submission of data to the Navy so that independent quantity calculations can be performed.

## 2.8 Construction Completion Report

Following completion of the TCRA, a Construction Completion Report will be completed to document all activities performed. This report will include a summary of activities completed; disposal certificates; daily reports; QC reports; photographic documentation of all activities, including cores; and other information as warranted.

## 2.9 Base Access

All contractors working on base will be required to have a RapidGATE pass. If necessary, alternate means of access will need to be coordinated with the Navy during the construction planning process and at the pre-construction meeting.

## 2.10 Work Hours

The work hours for construction activities are projected to be 7:00 AM to 5:00 PM, Monday through Friday, except during federal and state holidays. Equipment, supplies, and materials will be received or shipped during the defined work hours.

Extended work hours or weekend work hours will be coordinated with the Navy prior to the start of work. Depending on the magnitude of adverse weather and its potential impact to the project schedule, time lost during the scheduled work week may be made up by extending work days or by working on weekends (if approved).

Material deliveries and onsite stockpiles need to be planned and coordinated to avoid down-time or delays.

## 2.11 Traffic Routes and Gate Access

The details for site access, site personnel access, and heavy truck haul routes will be coordinated with the Navy during the construction planning process and at the pre-construction meeting. Construction traffic related to material transport to or from the site, equipment delivery or pickup, or otherwise requiring access for a specific purpose, will need to enter through the truck inspection at Gate 3. The approved haul route will be posted at the project site and provided to drivers.

Table 2-1
Clean Fill Screening Criteria
JEB Little Creek
Virginia Beach, Virginia

| | Background Native - Surface Soil | Background Native - Subsurface Soil | Residential Soil RSLs* | BTAG Region III Soil Backfill Values** | Marine Sediment Benchmarks*** |
|---|---|---|---|---|---|
| **Chemical Name** | | | | | |
| | | | | | |
| **Volatile Organic Compounds (UG/KG)** | | | | | |
| 1,1,1-Trichloroethane | -- | -- | 8,700,000 | -- | 856 |
| 1,1,2,2-Tetrachloroethane | -- | -- | 560 | -- | 202 |
| 1,1,2-Trichloro-1,2,2-trifluoroethane(Freon-113) | -- | -- | 43,000,000 | -- | -- |
| 1,1,2-Trichloroethane | -- | -- | 1,100 | -- | 570 |
| 1,1-Dichloroethane | -- | -- | 3,300 | -- | -- |
| 1,1-Dichloroethene | -- | -- | 240,000 | -- | 2,780 |
| 1,2,4-Trichlorobenzene | -- | -- | 22,000 | 20,000 | 473 |
| 1,2-Dibromo-3-chloropropane | -- | -- | 5 | -- | -- |
| 1,2-Dibromoethane | -- | -- | 34 | -- | -- |
| 1,2-Dichlorobenzene | -- | -- | 1,900,000 | -- | 989 |
| 1,2-Dichloroethane | -- | -- | 430 | -- | -- |
| 1,2-Dichloropropane | -- | -- | 940 | -- | -- |
| 1,3-Dichlorobenzene | -- | -- | -- | -- | 842 |
| 1,4-Dichlorobenzene | -- | -- | 2,400 | 20,000 | 460 |
| 2-Butanone | -- | -- | 28,000,000 | -- | -- |
| 2-Hexanone | -- | -- | 210,000 | -- | -- |
| 4-Methyl-2-pentanone | -- | -- | 5,300,000 | -- | -- |
| Acetone | -- | -- | 61,000,000 | -- | -- |
| Benzene | -- | -- | 1,100 | -- | 137 |
| Bromodichloromethane | -- | -- | 270 | -- | -- |
| Bromoform | -- | -- | 62,000 | -- | 1,310 |
| Bromomethane | -- | -- | 7,300 | -- | -- |
| Carbon disulfide | -- | -- | 820,000 | -- | -- |
| Carbon tetrachloride | -- | -- | 610 | -- | 7,240 |
| Chlorobenzene | -- | -- | 290,000 | 50 | 162 |
| Chloroethane | -- | -- | 15,000,000 | -- | -- |
| Chloroform | -- | -- | 290 | -- | -- |
| Chloromethane | -- | -- | 120,000 | -- | -- |
| Cumene | -- | -- | 2,100,000 | -- | -- |
| Cyclohexane | -- | -- | 7,000,000 | -- | -- |
| Dibromochloromethane | -- | -- | 680 | -- | -- |
| Dichlorodifluoromethane (Freon-12) | -- | -- | 94,000 | -- | -- |
| Ethylbenzene | -- | -- | 5,400 | 50 | 305 |
| Methyl acetate | -- | -- | 78,000,000 | -- | -- |
| Methyl-tert-butyl ether (MTBE) | -- | -- | 43,000 | -- | -- |
| Methylcyclohexane | -- | -- | -- | -- | -- |
| Methylene chloride | -- | -- | 56,000 | -- | -- |
| Styrene | -- | -- | 6,300,000 | 100 | 7,070 |
| Tetrachloroethene | -- | -- | 22,000 | -- | 190 |
| Toluene | -- | -- | 5,000,000 | 50 | 1,090 |
| Trichloroethene | -- | -- | 910 | -- | 8,950 |
| Trichlorofluoromethane(Freon-11) | -- | -- | 790,000 | -- | -- |
| Vinyl chloride | -- | -- | 60 | -- | -- |
| Xylene, total | -- | -- | 630,000 | 50 | -- |
| cis-1,2-Dichloroethene | -- | -- | 160,000 | -- | -- |
| cis-1,3-Dichloropropene | -- | -- | 1,700 | -- | -- |
| m- and p-Xylene | -- | -- | 590,000 | -- | -- |
| o-Xylene | -- | -- | 690,000 | -- | -- |
| trans-1,2-Dichloroethene | -- | -- | 150,000 | -- | -- |
| trans-1,3-Dichloropropene | -- | -- | 1,700 | -- | -- |

Table 2-1
Clean Fill Screening Criteria
JEB Little Creek
Virginia Beach, Virginia

| | Background Native - Surface Soil | Background Native - Subsurface Soil | Residential Soil RSLs* | BTAG Region III Soil Backfill Values** | Marine Sediment Benchmarks*** |
|---|---|---|---|---|---|
| | | | | | |
| **Semi-volatile Organic Compounds (UG/KG)** | | | | | |
| 1,1-Biphenyl | -- | -- | 51,000 | 60,000 | -- |
| 2,4,5-Trichlorophenol | -- | -- | 6,100,000 | 4,000 | 819 |
| 2,4,6-Trichlorophenol | -- | -- | 44,000 | 9,000 | 2,650 |
| 2,4-Dichlorophenol | -- | -- | 180,000 | 20,000 | -- |
| 2,4-Dimethylphenol | -- | -- | 1,200,000 | -- | -- |
| 2,4-Dinitrophenol | -- | -- | 120,000 | 20,000 | -- |
| 2,4-Dinitrotoluene | -- | -- | 1,600 | -- | -- |
| 2,6-Dinitrotoluene | -- | -- | 61,000 | -- | -- |
| 2-Chloronaphthalene | -- | -- | 6,300,000 | -- | -- |
| 2-Chlorophenol | -- | -- | 390,000 | 7,000 | 344 |
| 2-Methylnaphthalene | -- | -- | 230,000 | -- | 20.2 |
| 2-Methylphenol | -- | -- | 3,100,000 | -- | -- |
| 2-Nitroaniline | -- | -- | 610,000 | -- | -- |
| 2-Nitrophenol | -- | -- | 390,000 | 7,000 | -- |
| 3,3'-Dichlorobenzidine | -- | -- | 1,100 | -- | 2,060 |
| 3-Nitroaniline | -- | -- | -- | -- | -- |
| 4,6-Dinitro-2-methylphenol | -- | -- | 4,900 | -- | -- |
| 4-Bromophenyl-phenylether | -- | -- | -- | -- | -- |
| 4-Chloro-3-methylphenol | -- | -- | 6,100,000 | -- | -- |
| 4-Chloroaniline | -- | -- | 2,400 | 20,000 | -- |
| 4-Chlorophenyl-phenylether | -- | -- | 310,000 | -- | -- |
| 4-Methylphenol | -- | -- | 6,100,000 | -- | -- |
| 4-Nitroaniline | -- | -- | 24,000 | -- | -- |
| 4-Nitrophenol | -- | -- | 4,800 | 7,000 | -- |
| Acenaphthene | -- | -- | 3,400,000 | 20,000 | 6.71 |
| Acenaphthylene | -- | -- | 3,400,000 | -- | 5.87 |
| Acetophenone | -- | -- | 7,800,000 | -- | -- |
| Anthracene | -- | -- | 17,000,000 | 100 | 46.9 |
| Atrazine | -- | -- | 2,100 | -- | -- |
| Benzaldehyde | -- | -- | 7,800,000 | -- | -- |
| Benzo(a)anthracene | -- | -- | 150 | -- | 74.8 |
| Benzo(a)pyrene | -- | -- | 15 | 100 | 88.8 |
| Benzo(b)fluoranthene | -- | -- | 150 | -- | -- |
| Benzo(g,h,i)perylene | -- | -- | 1,700,000 | -- | -- |
| Benzo(k)fluoranthene | -- | -- | 1,500 | -- | -- |
| Butylbenzylphthalate | -- | -- | 260,000 | -- | 16,800 |
| Caprolactam | -- | -- | 31,000,000 | -- | -- |
| Carbazole | -- | -- | -- | -- | -- |
| Chrysene | -- | -- | 15,000 | -- | 108 |
| Di-n-butylphthalate | -- | -- | 6,100,000 | 200,000 | 1,160 |
| Di-n-octylphthalate | -- | -- | 730,000 | -- | -- |
| Dibenz(a,h)anthracene | -- | -- | 15 | -- | 6.22 |
| Dibenzofuran | -- | -- | 78,000 | -- | 7,300 |
| Diethylphthalate | -- | -- | 49,000,000 | 100,000 | 218 |
| Dimethyl phthalate | -- | -- | -- | 200,000 | -- |
| Fluoranthene | -- | -- | 2,300,000 | 100 | 113 |
| Fluorene | -- | -- | 2,300,000 | 30,000 | 21.2 |
| Hexachlorobenzene | -- | -- | 300 | -- | -- |
| Hexachlorobutadiene | -- | -- | 6,200 | -- | -- |
| Hexachlorocyclopentadiene | -- | -- | 370,000 | 10,000 | 139 |
| Hexachloroethane | -- | -- | 12,000 | -- | 804 |
| Indeno(1,2,3-cd)pyrene | -- | -- | 150 | -- | -- |
| Isophorone | -- | -- | 510,000 | -- | -- |
| Naphthalene | -- | -- | 3,600 | 100 | 34.6 |
| Nitrobenzene | -- | -- | 4,800 | 40,000 | -- |
| Pentachlorophenol | -- | -- | 890 | 5,000 | 7,970 |
| Phenanthrene | -- | -- | 17,000,000 | 100 | 86.7 |
| Phenol | -- | -- | 18,000,000 | 30,000 | -- |
| Pyrene | -- | -- | 1,700,000 | 100 | 153 |
| bis(2-Chloro-1-methylethyl) ether | -- | -- | -- | -- | -- |
| bis(2-Chloroethoxy)methane | -- | -- | 180,000 | -- | -- |
| bis(2-Chloroethyl)ether | -- | -- | 210 | -- | -- |
| bis(2-Ethylhexyl)phthalate | -- | -- | 35,000 | -- | 182 |
| n-Nitroso-di-n-propylamine | -- | -- | 69 | -- | 422,000 |
| n-Nitrosodiphenylamine | -- | -- | 99,000 | 20,000 | -- |
| Total PAHs, LMW | -- | -- | -- | 29,000 | 655 |
| Total PAHs, HMW | -- | -- | -- | 11,000 | 312 |

Table 2-1
Clean Fill Screening Criteria
JEB Little Creek
Virginia Beach, Virginia

| | Background Native - Surface Soil | Background Native - Subsurface Soil | Residential Soil RSLs* | BTAG Region III Soil Backfill Values** | Marine Sediment Benchmarks*** |
|---|---|---|---|---|---|
| | | | | | |
| **Pesticide/Polychlorinated Biphenyls (UG/KG)** | | | | | |
| 4,4'-DDD | | | 2,000 | -- | 1.22 |
| 4,4'-DDE | 240 | 240 | 1,400 | -- | 2.07 |
| 4,4'-DDT | 140 | 6.2 | 1,700 | 210 | 3.89 |
| Aldrin | -- | -- | 29 | -- | -- |
| Aroclor-1016 | -- | -- | 3,900 | -- | -- |
| Aroclor-1221 | -- | -- | 140 | -- | -- |
| Aroclor-1232 | -- | -- | 140 | -- | -- |
| Aroclor-1242 | -- | -- | 220 | -- | -- |
| Aroclor-1248 | -- | -- | 220 | -- | -- |
| Aroclor-1254 | -- | -- | 220 | -- | 63.3 |
| Aroclor-1260 | -- | -- | 220 | -- | -- |
| Dieldrin | -- | -- | 30 | 49 | 0.72 |
| Endosulfan I | -- | -- | 370,000 | -- | -- |
| Endosulfan II | -- | -- | 370,000 | -- | -- |
| Endosulfan sulfate | -- | -- | 370,000 | -- | 0.357 |
| Endrin | -- | -- | 18,000 | -- | 2.67 |
| Endrin aldehyde | -- | -- | 18,000 | -- | -- |
| Endrin ketone | -- | -- | 18,000 | -- | -- |
| Heptachlor | -- | -- | 110 | -- | -- |
| Heptachlor epoxide | -- | -- | 53 | -- | 0.6 |
| Methoxychlor | -- | -- | 310,000 | -- | 29.6 |
| Toxaphene | -- | -- | 440 | -- | -- |
| alpha-BHC | -- | -- | 77 | -- | 1,360 |
| alpha-Chlordane | -- | -- | 1,600 | -- | -- |
| beta-BHC | -- | -- | 270 | -- | -- |
| delta-BHC | -- | -- | 270 | -- | -- |
| gamma-BHC (Lindane) | -- | -- | 520 | -- | 0.32 |
| gamma-Chlordane | -- | -- | 1,600 | -- | -- |
| Total PCBs | -- | -- | -- | 371 | 40 |
| | | | | | |
| **Total Metals (MG/KG)** | | | | | |
| Aluminum | 12000 | 12000 | 77,000 | -- | -- |
| Antimony | -- | -- | 31 | 2.7 | -- |
| Arsenic | 5.6 | 5.6 | 0 | 18 | 7.24 |
| Barium | 154 | 154 | 15,000 | 330 | -- |
| Beryllium | 0.7 | 0.7 | 160 | 40 | -- |
| Cadmium | -- | -- | 70 | 3.6 | 0.68 |
| Calcium | 1817 | 1817 | -- | -- | -- |
| Chromium | 14 | 14 | 0 | -- | 52.3 |
| Cobalt | 15 | 15 | 23 | 13 | -- |
| Copper | -- | -- | 3,100 | 70 | 18.7 |
| Cyanide | -- | -- | 22 | 5 | -- |
| Iron | 31000 | 31000 | 55,000 | 2,000 | -- |
| Lead | 110 | 16.4 | 400 | 110 | 30.2 |
| Magnesium | 986 | 986 | -- | -- | -- |
| Manganese | 411 | 411 | 1,800 | 220 | -- |
| Mercury | -- | -- | 23 | 0.00051 | 0.13 |
| Nickel | 8.1 | 8.1 | 1,500 | 38 | 15.9 |
| Potassium | 1373 | 1373 | -- | -- | -- |
| Selenium | -- | -- | 390 | 0.5 | -- |
| Silver | -- | -- | 390 | 42 | 0.73 |
| Sodium | 63 | 63 | -- | -- | -- |
| Thallium | -- | -- | 1 | 1 | -- |
| Tin | -- | -- | 47,000 | 51.5 | -- |
| Vanadium | 22.4 | 22.4 | 390 | 78 | -- |
| Zinc | 123 | 39 | 23,000 | 120 | 124 |
| | | | | | |
| **9VAC20-80-700(D)(5) (MG/KG)** | **SCREENING CONCENTRATION** | | | | |
| BTEX (SW 846 METHOD 8021B)**** | 10 | | | | |
| TPH (SW846 METHOD 5035/8015B) | 50 | | | | |

Note: The most stringent of applicable criteria will be used.

-- No criteria established

ND - Compounds considered not detected during Background Investigation and UTLs were not established

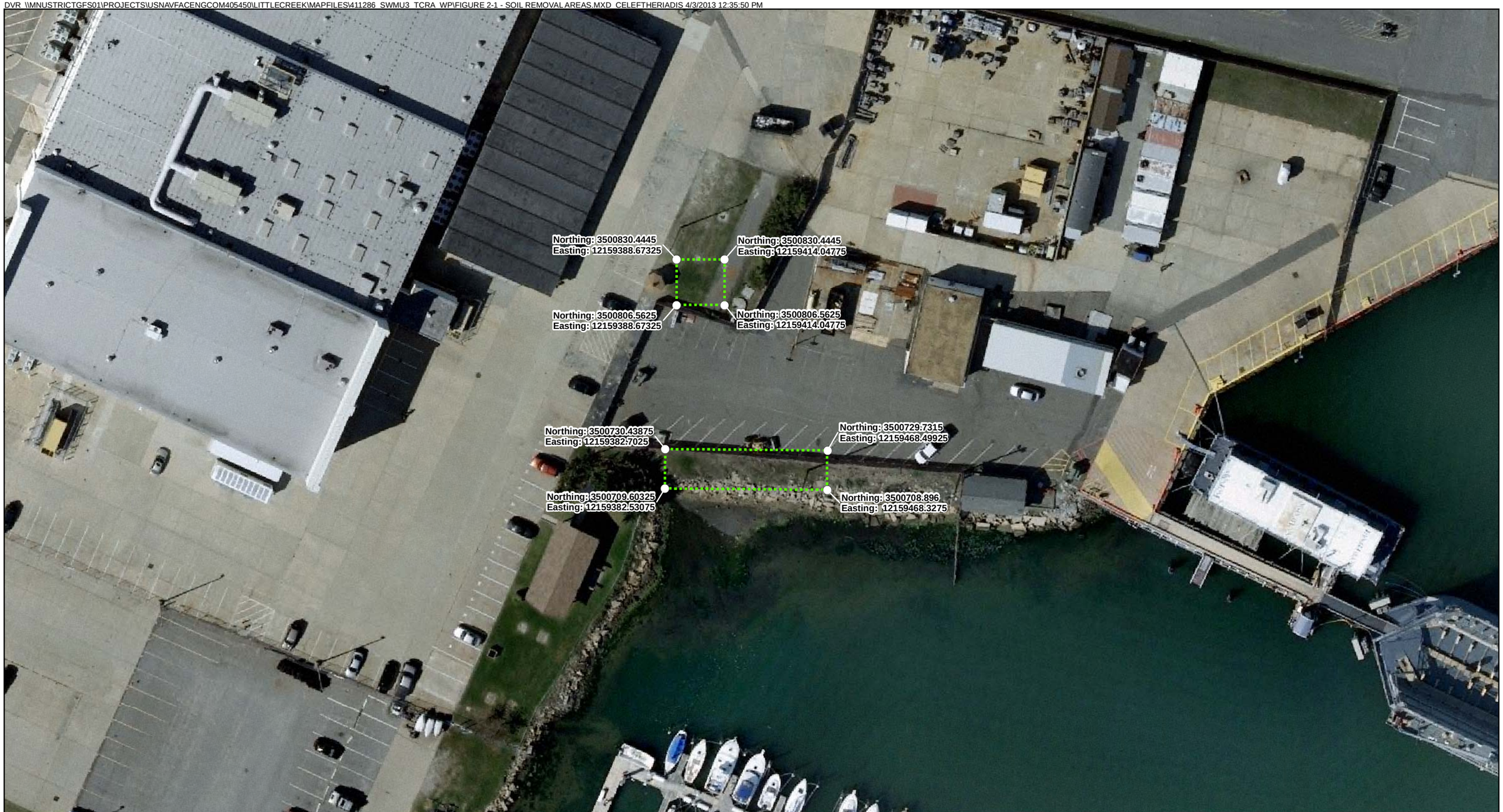
*RSL is Residential Regional Screening Level, EPA November 2012

**For comparison against upland soil backfill only

***For comparison against Little Creek Harbor sand backfill only

****TCL VOC RESULTS WILL BE USED IN LIEU OF SW846 8021B FOR SCREENING PURPOSES

DVR \\MNUSTRICTGFS01\PROJECTS\USNAVFACENGCOM405450\LITTLECREEK\MAPFILES\411286_SWMU3_TCRA_WP\FIGURE 2-1 - SOIL REMOVAL AREAS.MXD CELEFTHERIADIS 4/3/2013 12:35:50 PM




**Legend**

Soil Removal Area

N
W E
S

0 25 50 100
Feet

Figure 2-1
Soil Removal Area
SWMU 3 TCRA Work Plan
JEB Little Creek
Virginia Beach, Virginia

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DVR \\MNUSTRICTGFS01\PROJECTS\USNAVFACENGCOM405450\LITTLECREEK\MAPFILES\411286_SWMU3_TCRA_WP\FIGURE 2-2 - RIP-RAP SHORELINE AREA.MXD CELEFTHERIADIS 4/3/2013 1:08:46 PM

**Legend**
- Dredge Removal Area
- Rip-Rap Shoreline Area
- Remediation Area

Note:
Excavation is 20 ft from end of Rip-Rap into waterway

N
W E
S

0 15 30 60
Feet

Figure 2-2
Rip-Rap Shoreline Area
SWMU 3 TCRA Work Plan
JEB Little Creek
Virginia Beach, Virginia

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DVR \\MNUSTRICTGFS01\PROJECTS\USNAVFACENGCOM405450\LITTLECREEK\MAPFILES\411286_SWMU3_TCRA_WP\FIGURE 2-3 - BULKHEAD SHORELINE AND MARINA AREAS.MXD CELEFTHERIADIS 4/3/2013 12:34:57 PM

**Legend**

- Bulkhead Shoreline Area
- Marina Area

N
W E
S

0 40 80 160
Feet

Figure 2-3
Bulkhead Shoreline and Marina Areas
SWMU 3 TCRA Work Plan
JEB Little Creek
Virginia Beach, Virginia

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SECTION 3

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# Appendix A
# Quality Control Plan

# Time-Critical Removal Action Work Plan
# Solid Waste Management Unit – Pier 10 Sandblast Yard
# Quality Control Plan

## Join Expeditionary Base Little Creek
## Virginia Beach, Virginia

**Contract Task Order WE34**

**June 2013**

Prepared for

**Department of the Navy**
**Naval Facilities Engineering Command**
**Mid-Atlantic**

Under the

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

Prepared by

CH2MHILL®

**Virginia Beach, Virginia**

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A Example Project QC Forms

# Acronyms and Abbreviations

| | |
|---|---|
| AHA | activity hazard analysis |
| APP | Accident Prevention Plan |
| CO | Contracting Officer |
| CPR | Contractor Production Report |
| CQCR | Contractor QC Report |
| DFOW | definable feature of work |
| H&S | health and safety |
| PM | Project Manager |
| QA | quality assurance |
| QC | quality control |
| QCP | Quality Control Plan |
| RFI | Request for Information |
| SHSO | Site Health and Safety Officer |
| SOP | standard operating procedure |
| STC | Senior Technical Consultant |
| TO | Task Order |

SECTION 1

# Introduction

CH2M HILL has prepared this Quality Control Plan (QCP) describing the quality control (QC) processes for the implementation of a time-critical removal action (TCRA) at SMWU 3, Pier 10 Sandblast Yard, at Joint Expeditionary Base (JEB) Little Creek. This QCP was prepared under Contract No. N62470-08-D-1000, Contract Task Order (CTO) Number WE34, in support of the TCRA Work Plan. The exact details for the QC program are to be developed and implemented by the contractor performing the TCRA.

The TCRA Work Plan presents the specific activities associated with the removal action at SWMU 3.

## 1.1 Scope of Work

The purpose of this QCP is to outline the general QC procedures to be employed by the contractor implementing the TCRA.

The following activities are anticipated to be performed:

- Mobilization and Site Preparation
- Installation of Temporary Diversion Dam, Turbidity Curtain, Erosion and Sediment Controls, and Temporary Containment Cell
- Soil Excavation (Lead Contamination in Two Defined Areas)
- Riprap Shoreline Excavation/Near-Shore Sediment Excavation
- Shoreline Restoration
- Construction of Bioretention Feature
- Waste Management and Offsite Disposal
- Demobilization

## 1.2 Project Background

JEB Little Creek covers approximately 2,215 acres in the northwest portion of Virginia Beach, Virginia, adjacent to the Chesapeake Bay. JEB Little Creek (formerly known as Naval Amphibious Base [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 logistic facilities and support services for local commands, organizations, home-ported ships, and other United States (U.S.) and allied units to meet amphibious warfare–training requirements of the U.S. 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, Pier 10 Sandblast Yard, is located in a developed area on the west side of Little Creek Harbor. SWMU 3 was used for sandblasting activities between 1962 and 1995. Boats, anchors, and chains were sandblasted on a concrete pad located on the western side of Building 1263 between 1962 and 1995. In 1995, the concrete pad was removed and a new sandblasting area was constructed in the northwestern corner of the site. The use of this new area was discontinued in 1996 when sandblasting activities were moved to an indoor facility (CB 125). Little Creek Harbor is located west of the sandblasting area. A public marina for dependents is located south of SWMU 3 and Little Creek Channel, leading to the Chesapeake Bay, is located west of Little Creek Harbor. Little Creek Channel

has been regularly dredged since 1928, and in 1995 the approximately 2 to 5 feet (ft) of sediment was removed from the area around Pier 10.

Historical releases at SWMU 3 likely occurred when sandblasting residue was laying 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 was constructed that transported surface water drainage to a VDEQ permitted outfall (Outfall 008) (Permit Number VA0079928) discharging to Little Creek Harbor. Under the VDEQ permit, Outfall 8 has no monitoring requirements. Runoff from some areas of SWMU 3 may continue to flow directly into the harbor.

Risks to human health have been identified for future potable use of site groundwater. Lead concentrations in soil in two areas exceed the residential soil lead screening value of 400 mg/kg. Additionally, potential ecological risks associated with metals in sediment have been identified for lower trophic receptors.

## 1.3 Project Objective

To address the identified site risks to soil and sediment, the following removal action objectives were established for sediment and soil at SWMU 3:

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

SECTION 2

# Organization and Responsibilities

This section discusses the key roles and responsibilities of the likely project team members.

## 2.1 Quality Management Roles and Responsibilities

Individual roles and responsibilities of project personnel are summarized in Table 2-1.

### 2.1.1 Program Quality Manager

The Program Quality Manager is responsible for developing, maintaining, and ensuring implementation of the quality program on this project. This responsibility includes oversight of activities performed under the guidance of this QCP, conducting periodic reviews of the processes being implemented, and implementing continuous improvement evaluations of the quality program.

### 2.1.2 Project Health and Safety Manager

The Project Health and Safety Manager is responsible for developing, maintaining, and ensuring implementation of the health and safety (H&S) program on this project. This responsibility includes general oversight of activities performed, conducting periodic reviews and inspections of the H&S procedures being implemented, evaluating any H&S concerns raised by the project team over the course of the project, providing guidance on any H&S issues raised by the team to ensure the safety of project personnel, and implementing continuous improvement evaluations of the H&S program.

### 2.1.3 Project Manager

The Project Manager (PM) is responsible for the overall execution of the TO. The PM provides the managerial and administrative skills to ensure that resource allocation, planning, execution, and reporting to meet contract and TO requirements. The PM is ultimately accountable for all work activities undertaken on this project. The global quality-related responsibilities of the PM can include, but are not limited to, the following:

- Organizes the project team and assigns responsibilities
- Understands the contract and scope of work for the specific project
- Communicates to the project team regarding client requirements and quality assurance/quality control (QA/QC) practices
- Identifies, documents, and notifies the client and project team of changes in the scope of work, project documentation, and activities
- Supervises preparation and approval of project-specific procedures, work plans, and QA project plans
- Approves project construction methodologies
- Disseminates project-related information from the client such as design bases, input parameters, and drawings
- Serves as liaison for communications with the client and subcontractors
- Serves as liaison between the project team and off-site project support
- Determines whether drawings require independent review
- Investigates nonconformance and implementation of corrective actions
- Evaluates the effect of nonconformance on the project and the appropriateness for reporting such items to the client and provides appropriate documentation for reporting
- Verifies that changes, revisions, and rework are subject to the same QC requirements as the original work

- Serves as final reviewer prior to release of project information
- Approves and signs outgoing correspondence

The PM may delegate some of these responsibilities to the Site Superintendent, Quality Control Manager, or others, as appropriate, who will remain onsite for the duration of project field activities.

### 2.1.4 Site Superintendent

The Site Superintendent is responsible for executing construction activities. In addition, the Site Superintendent is responsible for ensuring that the construction is conducted in accordance with the work plan, ensuring appropriate personnel are performing certain tasks, the construction methodology, quality, and safety of the project and the project team during the field work. The Site Superintendent will assist the PM in ensuring that sufficient resources are allocated to maintain project schedule and budget and will provide daily feedback to the PM on project progress, issues requiring resolution, and other project-specific issues, as required. The quality-related responsibilities of the Site Superintendent include, but are not limited to, the following:

- Notifies the PM if the project cannot be completed with regard to quality, schedule, or cost
- Provides oversight and control of subcontractor services
- Serves as liaison for communications with the project staff and subcontractors, as well as with the onsite client representatives
- Continuously monitors work progress, quality, safety, and adherence to authorized work scopes, budgets, and schedules
- Aids in the preparation of construction submittals
- Initiates corrective actions for non-conformance identified onsite
- Leads weekly status meetings
- Reviews the project work plans regularly
- Interfaces daily with the subcontractors
- Prepares and submits Requests for Information (RFIs) and routes them to the PM and Technical Lead for review and approval

### 2.1.5 Site Health and Safety Officer

The Site Health and Safety Officer (SHSO) is responsible for administering the provisions of the Accident Prevention Plan (APP) during the fieldwork. The SHSO will ensure that proper H&S precautions are considered and conducted during project implementation. Responsibilities include, but are not limited to, the following:

- Provides H&S oversight of the field team and coordinates with subcontractor H&S representatives
- Serves as liaison for H&S communications with the project staff and subcontractors as well as program H&S team
- Continuously monitors implementation of H&S practices and has the authority to stop work when deemed appropriate
- Aids in the preparation of H&S documentation
- Initiates corrective actions for non-conformance identified onsite
- Leads daily H&S meetings

### 2.1.6 Project QC Manager

The Project QC Manager is responsible for the execution of the project's construction quality control system and communicates the onsite QC program policies, objectives, and procedures to the project team and subcontractors

during project meetings and informal discussions. Onsite technical personnel, which may include a construction QC manager, engineers, chemists, geologists, and scientists, will assist the Project QC Manager in monitoring, controlling, and documenting the quality of the onsite construction, surveying, and other activities. All documentation related to the control of the quality of the project, including analytical test results, inspections, material test results, and audits, will be reviewed or prepared by the Project QC Manager. The Project QC Manager's duties include the following:

- Implementation and documentation of the three phases of quality control
- Control testing
- Document control
- Review of submittals
- Completion inspection
- Records Maintenance and Filing
- Audits and surveillance

The Project QC Manager will also coordinate with and assist the Navy representatives in the performance of QA audits and inspections.

## 2.2 Outside Organizations and Subcontractors

The contractor assumes overall responsibility for ensuring conformance of subcontracted materials and services to quality requirements. However, it is the responsibility of the subcontractor to plan, manage, and accomplish their activities in accordance with the plans, specifications, and local, state, and federal regulations.

Subcontractors include those organizations supplying services to the project. Subcontractors report directly to the Site Superintendent and are responsible for completing the project-specific activities assigned to them. Subcontractors are also responsible for meeting the quality requirements for materials and workmanship as defined by the Project QC Manager. Subcontractors will verify that construction activities and materials comply with the requirements of the contract plans and specifications.

TABLE 2-1

**Roles, Responsibilities, and Authorities of Key Project Personnel**

| Role | Responsibility | Authority |
|---|---|---|
| PM | Management and technical direction of work<br>Communicate with Navy Remedial PM and Navy technical representative<br>Subcontractor management<br>Select staff<br>Develop Work Plan and supporting plans<br>Meet TO performance objectives<br>Prepare status reports<br>Prepare field change requests | Approve subcontractor selection<br>Approve invoices to the Navy<br>Approve baseline schedule<br>Stop work at the site for any reason<br>Approve payment to vendors and suppliers<br>Approve payment to subcontractors<br>Review technical qualifications of subcontractors<br>Respond to Change Notices |
| Site Superintendent/ Construction Manager | Responsible for all site activities<br>Provide direction to field personnel and subcontractors<br>Onsite construction management<br>Provide daily status reports<br>Implement Work Plan<br>Review subcontractor qualifications<br>Stop work for unsafe conditions or practices | Stop site work as necessary<br>Approve corrective action for site inspections and assessments<br>Approve materials and labor costs for site operations<br>Resolve field personnel and/or subcontractor interface issues<br>Approve daily and weekly status reports |
| Project QC Manager | Monitor and oversee implementation compliance with scope of work<br>Document inspections to ensure compliance<br>Review requests for changes in scope of work<br>Recommend improvements in work techniques or metrics<br>Monitor and report on subcontractor quality and quantities<br>Maintain Submittal Register | Complete daily quality report<br>Monitor and report on subcontractor quality and quantities<br>Conduct inspections to ensure compliance<br>Stop work for non-compliant operations<br>Maintain rework items list |
| SHSO | Monitor and report on field personnel and/or subcontractor safety and health performance<br>Record and report safety statistics<br>Conduct needed site safety and health orientation and daily safety meetings<br>Maintain environmental log<br>Stop work for unsafe practices or conditions | Stop work for unsafe practices or conditions<br>Enforce site-specific Accident Prevention Plan<br>Set weekly safety objectives<br>Approve resumption of work for resolved safety issues |

TABLE 2-1

**Roles, Responsibilities, and Authorities of Key Project Personnel**

| Role | Responsibility | Authority |
|---|---|---|
| Program Quality Manager | Coordinate with the Project QC Manager on QCP implementation<br>Provide oversight of the Project QC Manager's role<br>Monitor and audit project quality implementation | Review and oversight of QCP implementation<br>Coordination with Project Quality Manager and PM on corrective actions |
| Program H&S Manager | Coordinate with the SHSO on H&S implementation<br>Provide oversight of the SHSO's role<br>Monitor and audit project H&S implementation | Review and oversight of APP implementation<br>Coordination with SHSO and PM on H&S corrective actions |

SECTION 3

# Construction Quality Control

The Project QC Manager and the Construction Manager (Site Superintendent) shall ensure conformance with the project QC requirements. The Project QC Manager shall perform final inspections of the materials and the overall work activities. These inspections are performed to ensure safe, efficient, high- quality work is performed, while meeting the objectives and requirements of the plans and specifications.

The project tasks are grouped into definable features of work (DFOWs), which are work activities that are significant enough to warrant separate inspections. The DFOWs anticipated for this project are:

- Mobilization and Site Preparation
- Installation of Temporary Diversion Dam, Turbidity Curtain, Erosion and Sediment Controls, and Temporary Containment Cell
- Soil Excavation (Lead Contamination in Two Defined Areas)
- Riprap Shoreline Excavation/Near-Shore Sediment Excavation
- Placement of Amendment
- Site Restoration
- Construction of Bioretention Feature
- Waste Management and Offsite Disposal
- Demobilization

## 3.1 Procedures for Performing the Three Phases of Control

Each of the anticipated DFOWs is to be completed in accordance with the three phases of control—preparatory, initial, and follow-up.

### 3.1.1 Preparatory Phase

The preparatory phase culminates with the planning and design process. Successful completion of the Preparatory Phase verifies that the TO delivery and project plans have been completed and are ready to be implemented. For each DFOW established in the QCP, the following events must be performed during the preparatory phase by the Project QC Manager in conjunction with the Site Superintendent and the SHSO responsible for the DFOW:

1. Confirm that the appropriate technical specifications are incorporated into the project work plan and review specifications.
2. Confirm that the appropriate contract drawings are incorporated into the project work plan and review drawings.
3. Verify that all shop drawings and submittals have been approved by the proper approving authority (including factory test results, when required).
4. Confirm that the testing plan coincides with the work plan and that adequate testing is called for to assure quality delivery.
5. Confirm definition of preliminary work required at the TO work site and examine the TO work area to confirm required preliminary work has been properly completed.
6. Confirm availability of required materials and equipment. Examine materials and equipment to confirm compliance with approved submittals and procedures. Examine mock-ups and any sample work product to confirm compliance with approved submittals.

7. Review the site H&S plan and activity hazard analysis (AHA) to ensure that safety concerns are adequately addressed and applicable safety requirements have been incorporated into the plan. Confirm that the appropriate material safety data sheets have been identified and properly submitted.
8. Discuss construction methods to be employed during the activity. Identify checkpoints and areas of evaluation that will allow confirmation that the appropriate quality of construction is being achieved.
9. Confirm permits and other regulatory requirements are met.

The Navy's Contracting Officer (CO) or designated representative must be notified at least 2 working days in advance of each preparatory phase. Results of the activity are to be documented in the Preparatory Phase Report and attached to the Contractor QC Report (CQCR).

### 3.1.2 Initial Phase

The initial phase occurs at the startup of each construction activity associated with a specific DFOW. The initial phase confirms that the QCP is being effectively implemented and the desired results are being achieved. As is the case with the preparatory phase, proper notification to the Navy's CO or designated representative is required when crews are ready to start work on a DFOW.

During the initial phase, the initial segment of the DFOW is observed and inspected to ensure that the work complies with contract and specification requirements. The initial phase should be repeated when acceptable levels of specified quality are not being met.

The following shall be performed for each DFOW:

1. Establish the quality of workmanship required to properly deliver the TO in accordance with contract requirements. The Project QC Manager ensures that the Site Superintendent has made the work crews aware of expectations associated with the construction methods established under the preparatory phase. This assurance is to be achieved via observation of the initial work activities as well as interaction with the Site Superintendent and responsible subcontractor.

2. Resolve conflicts. The Project QC Manager will guide the Site Superintendent and responsible foreman in resolving conflicts. Should conflicts arise in establishing the baseline quality for the DFOW, the responsibility to resolve the conflict falls to the Project QC Manager. Should the conflict not be resolved in a manner that satisfies the contract requirements, the Project QC Manager must elevate the conflict to the Project Manager and, if needed, the Program Quality Manager and issue a non-conformance report. The Project QC Manager may direct a "stop work" order for that activity, with the concurrence of the Project Manager, should the issue jeopardize the results of the DFOW or put the TO at risk of non-compliant performance.

3. Evaluate the site APP and Activity Hazard Analyses (AHAs) against actual work conditions with the Site Superintendent and responsible foreman to ensure that the AHA conducted to prepare the plan adequately addressed field conditions. Confirm that applicable safety requirements are being implemented during construction activities.

4. Observe and evaluate the performance of testing technicians. Confirm with the Site Superintendent and/or responsible subcontractor that testing is being performed in accordance with the testing plan and that all required protocols are being observed. Review all reports and documentation associated with extraction, packaging, transporting, and testing of samples. Note any discrepancies and direct correction accordingly.

Upon completion of the initial phase activities, results are to be documented in the CQCR. Should results be unsatisfactory, the initial phase will be rescheduled.

### 3.1.3 Follow-up Phase

Completion of the initial phase of QC activity then leads directly into the follow-up phase, which addresses the routine day-to-day activities on the construction site. Inspection activities associated with each DFOW are to be documented in the CQCR. Specific concerns associated with the follow-up include:

- Inspection of the work activity to ensure work is in compliance with the contracted remedial action
- Evaluation and confirmation that the quality of workmanship is being maintained at a level no less than that established during the initial phase
- Evaluation and confirmation that required testing is being performed in accordance with procedures established during the preparatory phase and confirmed during the initial phase
- Confirmation that non-conforming work is being corrected promptly and in accordance with the direction provided by the Project QC Manager

The follow-up phase inspections should be performed daily, or as identified in the QCP until the completion of each DFOW.

SECTION 4

# Testing Requirements

Laboratories performing testing or analysis of materials and environmental samples, or craftsman performing independent testing will be certified or qualified to perform the respective testing. This section summarizes the onsite field testing planned for the project. Samples of media requiring definitive chemical analyses will be performed by an approved offsite laboratory.

Individuals performing sampling will provide evidence of meeting the experience and training requirements in the Navy's *Installation Restoration Program Chemical Data Quality Manual* (IR CDQM) (FESC SP-2056-ENV, Naval Facilities Engineering Service Center [NFESC], 1999).

## 4.1 Certification of Chemical Laboratories

Environmental testing laboratories that will be used are to be accredited by National Environmental Laboratory Accreditation and the Department of Defense Environmental Laboratory Accreditation Program for all sample analyses.

## 4.2 Test Plan and Log

The field testing and monitoring requirements are shown in Table 4-1. A Testing Plan and Log is to be used to record the results of testing.

TABLE 4-1

Testing Requirements

| Test/Inspection | Requirement/Reference | Frequency |
|---|---|---|
| Clean Fill from off-site source | Table 2 in Work Plan | One per source |
| Riprap | VESCH STD 3.19, Class A1<br>$D_{15}$ Weight = 15 lbs<br>Mean $D_{15}$ Spherical Diameter = 0.7 ft<br>Mean $D_{50}$ Spherical Diameter = 0.9 ft | Once per Load delivered |
| Paint Filter Liquids Test for Disposal | Pass (no liquids during 5 minute filter) /SW-846 Method 9095B | Sample per batch (500 ) cubic yards of stabilized sediment after three consecutive passing tests; once per 1,000 cubic yards thereafter |
| Waste Characterization | As required by receiving facility | As required by receiving facility |
| Amendment Placement | TBD | TBD |

SECTION 5

# Project Meetings

## 5.1 Pre-construction Meeting

The PM is to schedule and administer a pre-construction meeting at the site after Notice to Proceed and before the start of construction at the site. During the conference, ground rules and understandings will be established with the Navy, its stakeholders, and the contractor. The purpose of this meeting is to ensure that all parties involved in the project understand and agree on the project goals and objectives, schedule, submittal requirements, documentation requirements, change management processes and procedures, construction means and methods, reporting and communication requirements, H&S requirements and protocols, etc.

The meeting agenda will include the following:

- Designation of responsible personnel
- Lines of authority and communication
- H&S requirements and procedures
- Use of the site for storage, vehicle parking, access routes, and other site requirements
- Facility security and other requirements
- Coordination with other contractors and owner
- Temporary facilities and controls provided
- Field offices
- Survey, containment facility, and layout
- Security and housekeeping procedures
- Progress schedules
- Procedures for testing and inspection
- Procedures for maintaining record documents
- Procedures for processing field decisions, submittals, substitutions, applications for payments, proposal requests, field orders, work change directives, change orders, and closeout procedures

Minutes of the meeting are to be prepared by the contractor and distributed to the participants and those affected by decisions made.

## 5.2 Coordination and Mutual Understanding Meeting

Before the start of any onsite activities, the PM and Project QC Manager will meet with the Navy's CO or designated representative to review the QCP and the QC Program required by the contract. The purpose of the meeting will be to confirm that the Project QC Manager and Navy's CO or designated representative clearly understand and agree on:

- Specific QC points of concern on the features of work
- Forms to be used on the project and the correct protocol for use of each form
- Administration of both onsite and offsite work
- Duties and responsibilities of all contractor personnel on the site

The meeting will be attended by the PM, Project QC Manager, Site Superintendent, and SHSO. The meeting can also be combined with the pre-construction conference. Minutes of the meeting will be prepared by the Project QC Manager.

## 5.3 QC Meeting

After the start of site work, the Project QC Manager will conduct QC meetings at a frequency established as necessary by the pace of the work, or as required by the Navy's CO or designated representative. Typically,

meetings are expected to occur at least weekly or more frequently, depending on the project needs. Conducting the meetings and preparing the meeting minutes are responsibilities of the Project QC Manager. Annotation of conducting the meeting will be made in the daily CQCR. The meeting will be attended by the Site Superintendent, SHSO, and the foreman responsible for the upcoming work. The Navy's CO or designated representative will be invited to all meetings. To optimize time, these meetings should be held in conjunction with other meetings (for example progress meetings, weekly safety meetings) where possible. At a minimum, the following will be accomplished at each meeting:

- Review of previous meeting minutes
- Review of the project schedule
  - Work or testing accomplished since the last meeting
  - Rework items identified since the last meeting
- Rework items completed since the last meeting
- Submittal status
  - Submittals reviewed since the last meeting
  - Submittals expected within the next 2-week window
- Review of the work scheduled over the next 2-week window
  - Establish completion targets for any outstanding rework
  - Identify and schedule any DFOWs requiring preparatory phase activities
  - Identify and schedule any DFOWs requiring initial phase activities
  - Identify and schedule any DFOWs requiring follow-up phase activities
  - Identify any testing required in support of or confirming remedial activities
  - Review status of any offsite activities
  - Identify any special documentation requirements for either production or QC
  - Address and resolve any production or QC problems
- Identify any activities or items that may require revising this QCP and annotate any recommendations
- Identify any production or QC procedures that may be less effective than anticipated and may require revising the project delivery or Contingency Plan and annotate any recommendations
- Identify any safety concerns relative to any work activity

SECTION 6

# Reporting, Field Records, and Construction Documentation

Implementation of this QCP is documented and reported to the Navy CO or designated representative using a series of reports and deliverables. These deliverables, the parties responsible for preparing them, and their frequency and content are listed in Table 6-1. Examples of these forms and reports are included in Attachment A.

TABLE 6-1
Reporting and Field Documentation Required

| Report or Documentation Requirement | Completed By | Delivered To | Frequency | Report Description |
|---|---|---|---|---|
| Contractor Production Report | Site Superintendent | Project QC Manager | Daily, for each TO – original and one copy due by 10:00 AM next working day after each day that work is performed | Documents daily construction activity on each site. |
| Contractor Quality Control Report (CQCR) | Project QC Manager | Navy CO | Daily, for the preceding business day - original and one copy due by 10:00 AM next working day after each day that work is performed | Documents the daily qc activity for each to. Includes the contractor production reports. |
| Testing Plan and Log | Project QC Manager | Navy CO | Monthly – due by end of each month | Defines and records results of all onsite testing, to be maintained at time of testing, or when laboratory results are received. |
| Monthly Summary of Field Tests | Project QC Manager | Navy CO | Monthly, attached to the last CQCR submitted for each reporting period – original and one copy due at the end of each month | Summarizes all testing activity conducted for the reporting period with test results (pass/fail). |
| QC Meeting Minutes | Project QC Manager | Navy CO | As attachment to appropriate CQCR – due within 2 calendar days of the meeting | Minutes of each QC meeting held. |
| Rework Items List | Project QC Manager | Navy CO | Monthly, attached to the last CQCR submitted for each reporting period – one copy by last working day of the month | Documents re-work items not corrected on same day as discovery. Includes items identified by both CH2M HILL and Navy CO or designated representative. |
| Submittal Register | Project QC Manager and Site Superintendent | Navy CO | Maintained through life of TO | A part of each TO's Construction Quality Plan; may also be provided by Navy CO for deliverables. |
| As-built Records | Project QC Manager and Site Superintendent | Navy CO | Maintained in field through life of each to certify complete and accurate by Project QC Manager upon completion. Included in construction completion report | Requirements specified in each TO's Construction Quality Plan; to be maintained at job site and inspected by QC personnel to ensure daily upkeep. Certificate of accuracy required from Project QC Manager. |
| Photographic Record | Site Superintendent | Navy CO | Maintained in field through life of TO | Photographic record showing construction progress, special situations. Specific requirements for photographic documentation, processing, storage. |
| Transportation and Disposal Log | Project QC Manager | Transportation and Disposal Coordinator | Monthly and maintained in field through life of TO | Tracks waste on the project from generation to final disposition. |

CO = Contracting Officer
CQCR = contractor quality control report
TO = task order

SECTION 7

# Quality Control Documentation

## 7.1 Contractor Production Report

Contractor Production Reports (CPRs) are required for each day that work is performed and will be attached to the CQCR prepared for the same day. The CPR is the daily record of operations on the job site and must be kept current. These reports are the official record of work performance and compliance with project plans, drawings, and specifications. It is therefore critical that the reports are correct and timely.

The CPRs will account for each calendar day throughout the life of the contract. The reporting of work will be identified by terminology consistent with the construction schedule. CPRs will be prepared, signed, and dated by the Site Superintendent and will contain the following information:

- Date of report, report number, name of contractor, contract number, title, location of contract, and Site Superintendent present.
- Weather conditions in the morning and in the afternoon, including maximum and minimum temperatures.
- List of contractor and subcontractor personnel on the work site, their trades, employer, work location, description of work performed, and hours worked.
- List of job safety actions taken and safety inspections conducted. Indicate that safety requirements have been met, including the results of the following:
  - Was a job safety meeting held? (if YES, attach a copy of the meeting minutes)
  - Were there any lost time accidents? (if YES, attach a copy of the completed Occupational Safety and Health Administration report.)
  - Was trenching, scaffold, high-voltage electrical, or high work done? (If YES, attach a statement or checklist showing inspection performed.)
  - Was hazardous material or waste released into the environment? (If YES, attach description of incident and proposed action.)
- List of equipment and material received each day that is incorporated into the job.
- List of construction and plant equipment on the work site during the number of hours used, idle, and down for repair.
- “Remarks” section containing pertinent information such as directions received, problems encountered during construction, work progress and delays, conflicts or errors in the drawings or specifications, field changes, safety hazards encountered, instruction given and corrective actions taken, delays encountered, and a record of visitors to the work site.

The CPR form provided in Attachment A will be used on this project.

## 7.2 Contractor Quality Control Report

The CQCR documents the quality activities on the project. CQCRs are required for each day that work is performed and for every 7 consecutive calendar days of no work, submitted on the last day of that no-work period. The CQCR is the daily records of QC actions performed on the job site and must be kept current. These reports are the official record of work performance and compliance with project plans, drawings, and specifications. It is therefore critical that the reports are correct and timely.

Each calendar day throughout the life of the contract is accounted for in the CQCR. The reporting of work will be identified by terminology consistent with the construction schedule. CQCRs are prepared, signed, and dated by the Project QC Manager and will contain the following information:

- Control phase and DFOW.
- Results of the preparatory phase meetings held, including the location of the DFOW and a list of personnel present at the meeting. Verify in the report that for this DFOW, the drawings and specifications have been reviewed, submittals have been approved, materials comply with approved submittals, materials are stored properly, preliminary work was done correctly, the testing plan has been reviewed, and work methods and schedule have been discussed.
- Results of the initial phase meetings held, including the location of the DFOW and a list of personnel present at the meeting. Verify in the report that for this DFOW the preliminary work was done correctly, samples have been prepared and approved, the workmanship is satisfactory, test results are acceptable, work is in compliance with the contract, and the required testing has been performed. Include a list of personnel who performed the tests.
- Results of the follow-up phase inspections held, including the location of the DFOW. Verify in the report for this DFOW that the work complies with the contract as approved in the initial phase and that required testing has been performed. Include a list of personnel who performed the tests.
- Results of the three phases of control for offsite work, if applicable, including actions taken.
- List of rework items identified, but not corrected by close of business.
- As rework items are corrected, provide a revised rework items list along with the corrective action taken. (Note: All rework will be non-fee bearing).
- “Remarks” section containing pertinent information such as directions received, QC problem areas, deviations from the QCP, construction deficiencies encountered, QC meetings held, acknowledgment that as-build drawings have been updated, corrective direction given by the Project QC Manager, and corrective action taken.
- CQCR certification

The CQCR form and Preparatory Phase Report included in Attachment A will be used on this project.

## 7.3 Project Files

Documentation generated by the QC system must be maintained in an orderly fashion. It is suggested that the Project QC Manager maintains a series of 3-ring binders for ready reference. These should be arranged by category and tabbed to include the following items:

- CPR
- CQCR
- H&S Reports
- Rework items lists
- Testing plan and log
- Monthly summary of field tests
- Submittal Register
- Contract modifications and RFIs arranged in numerical order
- Correspondence
- Non-compliance notices and corrective actions
- Photos and photo logs
- Waste disposal records

## 7.4 Field Documentation Operating Procedures

The objective of the field documentation operating procedures is to ensure that appropriate project information is documented in logbooks during construction. This documentation is important for communicating activities with other project team members and the Navy personnel.

QC observations, inspections, and records of general QC activities on a regular basis are as follows:

- Record daily progress and associated QA and QC sampling
- Record construction operations, sequence, staging, and so forth
- Maintain waste disposal records
- Describe deviations from expected conditions, unexpected problems, and their resolution

## 7.5 Field Logbook

The Project QC Manager will maintain a record of daily QC activities during construction in a field logbook that will be available upon request for review. Information recorded in the CPR and CQCR will be supplemented with information contained in the logbook, but the intent is not to repeat information. As an operating procedure for logbook entries, the following items will be recorded, at a minimum:

- Date, project name, and location
- Daily start time
- Summary of weather conditions
- General description of work activities, size of work crew, and the equipment and personnel onsite
- Duration of lunch break
- Start time and duration of downtime resulting from equipment breakdown or weather
- Summaries of QC meetings and actions recommended to be performed
- QC-testing equipment and personnel
- Identification of work locations
- Description of materials delivered to the site, including QC data provided by the suppliers
- Record of decisions made regarding defective work, corrective measures implemented, or both
- Field tests
- Sampling activities
- Signature or initial at the bottom of each page of the field log. Each entry should be dated in order to show that notes are being taken on a daily basis. A line-through will be placed on any portion of a logbook page that is unused. No correction fluid may be used.

The Project QC Manager will sign or initial the bottom of each page of the field log and date the entry in order to show that notes are being taken on a daily basis. A line-through will be placed on any portion of a logbook page that is unused.

SECTION 8

# Construction Quality Control Submittals

Construction QC submittals are generated by either the Project QC Manager or the subcontractor during or immediately before construction to demonstrate compliance with the project plans. Submittal requirements will be tabulated in the Submittal Register according to the requirements identified in the project plans.

The Project QC Manager will monitor submittal activities to verify:

- Submittal completeness
- Required submittal inclusion
- Submittal schedule status
- Current submittal status
- Resubmittals

The QC Manager will log and track submittals in the Submittal Register. Specific responsibilities regarding submittals are as follows:

- Coordinating submittal actions
- Maintaining necessary submittal records in an organized fashion
- Maintaining and tracking submittals in the Submittal Register
- Reviewing and certifying submittals for compliance with the project plans, drawings, and specifications
- Approving submittals except those designated to be approved by the Navy and stakeholders
- Checking material and equipment delivered to the project for compliance with the project plans, drawings, and specifications

Certain designated submittals require approval by authorities other than the Project QC Manager (such as the PM, technical lead and lead engineer, or other qualified persons). In such cases, the Project QC Manager forwards the submittal to the PM or project engineer who routes the submittal to the appropriate approver.

The Site Superintendent/Construction Manager and Project QC Manager are responsible for coordinating the submittal transmittal and approval process and for following through to ensure that the process does not adversely affect the project schedule.

## 8.1 Submittal Review and Control

The contractor shall control and schedule submittals and will document the process in the Submittal Register. The Project QC Manager is responsible for updating the Submittal Register at least once a week and forwarding a copy of the submittal register to the PM and Program Quality Manager at the end of each month of project work. Each submittal will be routed on a standard submittal form. Units of weights and measures used on the submittals will be consistent with those used in the project documents.

Each submittal will be reviewed for completeness and compliance with contract requirements by individuals qualified to perform the review of that specific item. The submittal reviewers and approvers will be designated before construction.

The Project QC Manager will certify that the submittal is in compliance with the project requirements. Submittals that do not comply with the requirements will be returned to the originator for correction and re-submittal. Substitutions or variations of specified requirements will be clearly noted. Certification of the approved submittals will be indicated by signing or initialing and dating the submittal form by the Project QC Manager. Submittals include the following:

- Personnel qualifications
- Product data
- Permits
- Samples
- Catalog cuts and pages
- Production, inspection, and test reports
- Material certifications
- Progress reports, safety reports, and manpower reports
- Red-line drawing and as-built or certified data
- QC records and certifications
- Sample and test results
- QC reports
- Construction photographs and photo logs
- Contract closeout documents
- Completed hazardous waste manifests and disposal certificates

SECTION 9

# Change Control

Changes to final designs, final project plans, and field changes are subject to design verification measures commensurate with those applied to the draft project plans. The PM approves work plan changes in consultation with the technical lead or lead engineer.

Requests for Information RFIs will be used to communicate and document clarifications as well as modifications requested by the subcontractor. The RFIs will be tracked and logged by the Project QC Manager to ensure that each RFI is fully addressed and that changes to the plans, drawings, and specifications are completely and accurately documented.

## 9.1 Construction Changes

Changes to materials, supplies, work approaches, and corrective actions during construction will be documented in an overall effort to support sound engineering judgment and cost-effective project delivery. Changes during construction will be documented using the RFI process.

The RFI process involves either the subcontractor or the Project QC Manager identifying the situation in the field that requires change. When a change is identified by the subcontractor, the subcontractor reports the concern to the Project QC Manager. The Project QC Manager then prepares an internal RFI, identifying the concern, and forwards it to the PM. The PM reviews and either approves or forwards to the relevant personnel needed for approval. The RFI will contain the TO number, an RFI identification number, and a title to facilitate RFI tracking. The RFIs are numbered sequentially for individual TOs and filed at the job site with the PM and the design team. The response should include a narrative explanation of the resolution, with any drawings or specifications required to complete the work as attachments. The response is returned to the PM and forwarded to the Project QC Manager and Construction Manager for field implementation.

The RFI process is a field construction tool for documenting changed field conditions or other issues that may require a deviation from project requirements identified in the drawings and specifications. The RFI is intended to obtain input and concurrence from the lead engineer responsible for the development of the project plans. Approval of the RFI by the lead engineer does not constitute approval for the contractor or its subcontractors to perform work that is outside of the project scope or budget. If issues identified in the RFI may require a change to the project scope, schedule, or budget, this should be clearly conveyed in the RFI. In such instances, it is the responsibility of the PM to work closely with the Contract Administrator to seek and obtain proper approval from the Navy (according to established contractual procedures) before implementing the change recommended in the RFI.

SECTION 10

# Noncompliance and Corrective Actions

The Project QC Manager will notify the subcontractor of any detected noncompliance with the project requirements. The subcontractor will take immediate corrective action after receipt of such notice. Such notice, when delivered to the subcontractor at the work site, will be deemed sufficient notification. If the subcontractor fails or refuses to comply promptly, the Project QC Manager may issue an order stopping all or part of the work until satisfactory corrective action has been taken. Noncompliance notification or stop work orders will be documented in the Daily Report. Completion of corrective action will be noted on the CQCR. Verification of the corrective action and its results will be performed by the Project QC Manager and documented in the CQCR.

## 10.1 Corrective Measure Plan

Resolution of failing test results or noncompliance reports will be completed through a corrective measure plan. The corrective measure plan will be developed and documented by the Project QC Manager in conjunction with the PM. The agreed-upon plan will be implemented and documented by the Project QC Manager, who also will be responsible for its completion.

**ATTACHMENT A**

# Project QC Forms

- Example Submittal Register
- Example Testing Plan and Log
- Example Transportation and Disposal Log
- Example Monthly Summary Report of Field Tests
- Example Photo Log
- Example Preparatory Phase Checklist
- Example Contractor Production Report
- Example Contractor Quality Control Report
- Example Request for Information Log

| Contractor<br>Contract<br>Contract No. | **CONTRACTOR PRODUCTION REPORT**<br>(ATTACH ADDITIONAL SHEETS IF NECESSARY) | DATE OF REPORT:<br>REVISION NO:<br>REVISION DATE: |
|---|---|---|
| TO NO: | PROJECT NAME/LOCATION: | REPORT NO: |
| PROJECT NO: | SUPERINTENDENT: / SITE H&S SPECIALIST: | |
| AM WEATHER: | PM WEATHER: / MAX TEMP: F | MIN TEMP: F |

**SUMMARY OF WORK PERFORMED TODAY**

**JOB SAFETY**

| | | |
|---|---|---|
| Was A Job Safety Meeting Held This Date? | ☐ Yes ☐ No | **TOTAL WORK HOURS ON JOB SITE THIS DATE** (Including Continuation Sheets) |
| Were there any lost-time accidents this date? (If Yes, attach copy of completed OSHA report) | ☐ Yes ☐ No | On-Site Hours |
| Was a Confined Space Entry Permit Administered This Date? (If Yes, attach copy of each permit) | ☐ Yes ☐ No | Subcontractor On-Site Hours |
| Was Crane/Manlift/Trenching/Scaffold/HV Elec/High Work/Hazmat Work Done?? (If Yes, attach statement or checklist showing inspection performed) | ☐ Yes ☐ No | **Total On-Site Hours This Date** |
| Was Hazardous Material/Waste Released into the Environment? (If Yes, attach description of incident and proposed action) | ☐ Yes ☐ No | Cumulative Total of Work Hours From Previous Report<br>Total Work Hours From Start of Construction |

**SAFETY ACTIONS TAKEN TODAY/SAFETY INSPECTIONS CONDUCTED** (Include Safety Violations, Corrective Instructions Given, Corrective Actions Taken, and Results of Safety Inspections Conducted):

**EQUIPMENT/MATERIAL RECEIVED TODAY TO BE INCORPORATED IN JOB**

| DESCRIPTION OF EQUIPMENT/MATERIAL RECEIVED | MAKE/ MODEL/ MANUFACTURER | EQUIPMENT/ LOT NUMBER | INSPECTION PERFORMED BY | NUMBER/ VOLUME/ WEIGHT |
|---|---|---|---|---|
| | | | | |
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**EQUIPMENT USED ON JOB SITE TODAY.**

| EQUIPMENT DESCRIPTION | EQUIPMENT MAKE/MODEL | SAFETY CHECK PERFORMED BY | NUMBER OF HOURS | | |
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| | | | USED | IDLE | REPAIR |
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**CHANGED CONDITIONS/DELAY/CONFLICTS ENCOUNTERED** (List any conflicts with the delivery order [i.e., scope of work and/or drawings], delays to the project attributable to site and weather conditions, etc.)**:**

**VISITORS TO THE SITE:**

**LIST OF ATTACHMENTS** (OSHA report, confined space entry permit, incident reports, etc.):

**SAFETY REQUIREMENTS HAVE BEEN MET** ☐

SUPERINTENDENT'S SIGNATURE DATE

| | | |
|---|---|---|
| | **CONTRACTOR PRODUCTION REPORT**<br>(ATTACH ADDITIONAL SHEETS IF NECESSARY) | DATE OF REPORT:<br>REVISION NO:<br>REVISION DATE: |
| TO NO: | PROJECT NAME/LOCATION: | REPORT NO: |
| PROJECT NO: | SUPERINTENDENT: | SITE H&S SPECIALIST: |

**WORK PERFORMED TODAY**

| EMPLOYEE | WORK PERFORMED | EMPLOYER | FEMALE? | MINORITY? | TITLE/TRADE | HRS |
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*INCLUDE ALL PERSONNEL WORK HOURS IN THE TOTAL WORK HOURS ON JOB SITE*

**SAFETY REQUIREMENTS HAVE BEEN MET** ☐

SUPERINTENDENT'S SIGNATURE

DATE

| Company<br>Contract Name<br>Contract Number | **CONTRACTOR QUALITY CONTROL REPORT**<br>(ATTACH ADDITIONAL SHEETS IF NECESSARY) | REPORT DATE:<br>REVISION NO:<br>REVISION DATE: |
|---|---|---|
| CTO NO: | PROJECT NAME/LOCATION: | REPORT NO: |
| PROJECT NO: | PROJECT QC MANAGER: | SITE H&S SPECIALIST: |

**SAFETY MEETINGS AND INSPECTIONS :**

| | | | |
|---|---|---|---|
| WAS A SAFETY MEETING HELD THIS DAY? | ☐ YES | ☐ NO | IF YES, ATTACH SAFETY MEETING MINUTES |
| WAS CRANE USED ON THE SITE THIS DAY? | ☐ YES | ☐ NO | IF YES, ATTACH DAILY CRANE REPORT OF INSPECTION AND CONTRACTOR CRANE OPERATION CHECKLIST |

**DEFINABLE FEATURES OF WORK STATUS**

| DFOW No. | Definable Feature Of Work | Preparatory | Initial | Follow-Up |
|---|---|---|---|---|
| | | ☐ | ☐ | ☐ |
| | | ☐ | ☐ | ☐ |
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**PREPARATORY**

WAS PREPARATORY PHASE WORK PERFORMED TODAY? ☐ YES ☐ NO

IF YES, FILL OUT AND ATTACH SUPPLEMENTAL PREPARATORY PHASE CHECKLIST.

| DFOW No.(from list above). | TASK/ACTIVITY | PREPARATORY PHASE REPORT NO. |
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## INITIAL AND FOLLOW-UP FEATURE OF WORK COMMENTS

| DFOW No.(from list above) | Phase | Comment/Finding/Action |
|---|---|---|
| | Initial ☒<br>Follow up ☐ | |
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| **REWORK ITEMS IDENTIFIED TODAY (NOT CORRECTED BY CLOSE OF BUSINESS)** | | | **REWORK ITEMS CORRECTED TODAY (FROM REWORK ITEMS LIST)** | |
|---|---|---|---|---|
| TASK/ACTIVITY | DATE ISSUED | DESCRIPTION | TASK/ACTIVITY | CORRECTIVE ACTION(S) TAKEN |

| | **CONTRACTOR QUALITY CONTROL REPORT**<br>(ATTACH ADDITIONAL SHEETS IF NECESSARY) | REPORT DATE: REVISION NO:<br><br>REVISION DATE: |
|---|---|---|
| CTO NO: | PROJECT NAME/LOCATION: | REPORT NO: |
| PROJECT NO: | PROJECT QC MANAGER: | SITE H&S SPECIALIST: |

**SAMPLING/TESTING PERFORMED**

| SAMPLING/TESTING PERFORMED | SAMPLING/TESTING COMPANY | SAMPLING/TESTING PERSONNEL |
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**MATERIALS/EQUIPMENT INSPECTION (Materials received and inspected against specifications)**

| MATERIAL/EQUIPMENT DESCRIPTION | SPECIFICATION | MATERIAL ACCEPTED? | COMMENT/REASON/ACTION |
|---|---|---|---|
| | | YES ☐ NO ☐ | |
| | | YES ☐ NO ☐ | |
| | | YES ☐ NO ☐ | |
| | | YES ☐ NO ☐ | |

**SUBMITTALS INSPECTION / REVIEW**

| SUBMITTAL NO | SUBMITTAL DESCRIPTION | SPEC/PLAN REFERENCE | SUBMITTAL APPROVED? | COMMENT/REASON/ACTION |
|---|---|---|---|---|
| | | | YES ☐ NO ☐ | |
| | | | YES ☐ NO ☐ | |

**OFF-SITE SURVEILLANCE ACTIVITIES, INCLUDING ACTIONS TAKEN**:

**ACCUMULATION/STOCKPILE AREA INSPECTION**

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| INSPECTION PERFORMED BY: | | | | SIGNATURE OF INSPECTOR: | | | |
| ACCUMULATION/ STOCKPILE AREA LOCATION | | | | | | | |
| NO OF CONTAINERS: | | NO OF TANKS: | N/A | NO OF ROLL-OFF BOXES: | | NO OF DRUMS: | |

INSPECTION RESULTS:

**TRANSPORTATION AND DISPOSAL ACTIVITIES/SUMMARY/QUANTITIES: N/A**

**GENERAL COMMENTS** (rework, directives, etc.):

*On behalf of the contractor, I certify that this report is complete and correct and equipment and material used and work performed during this reporting period is in compliance with the contract drawings and specifications to the best of my knowledge except as noted in this report.*

PROJECT QC MANAGER'S SIGNATURE DATE

*On behalf of the contractor, I attest that the work for which payment is requested, including stored material, is in compliance with contract requirements.*

PROJECT QC MANAGER'S SIGNATURE DATE

# Monthly Summary Report of Field Tests

| **Start Date:** | **End Date:** | **Submittal Date:** | **Submitted By:** |
|---|---|---|---|
| **Contract Number:** | **TO No.:** | **TO Title:** | **Location:** |

| **Type of Test Required** | **Date of Test** | **Reporting Laboratory** | **Test Results** |
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# Photo Log

| TO Number | Project Number | Project Name | Site | Photo Number | Date | Time | Task and Description | View Direction | Taken By |
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# Request For Information Log

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|---|---|---|---|---|---|---|---|---|
| | | **Project Name:** | | | | **Project Number:** | | |
| | | **Field Quality Manager:** | | | | | | |
| **RFI #** | **Description of Issue** | **Submitted To** | **Date** | **Returned To** | **Date** | **Response/Disposition** | **Status** | **Comment** |
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TRANSPORTATION AND DISPOSAL LOG

| TO No | Project No | Project Name | Site Description | Container Type | Container Designation | Waste Profile Sample No | Contractor | Transporter | Date Transported | Transporter EPA ID | Load ID | Disposal Facility | Disp Fac EPA ID | Media | Waste Type (Haz, Nonhaz, TSCA) | Waste Code/ Haz Waste No | Disposal Date | Manifest Number | Disposal Treatment Method ( Enter disposal quantity under appropriate method) | | | | | Certificate of Disp/ Destruc Date | Comments/Notes | File Status (see note) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | | | | | | | | | | | Incineration | Recycle | Landfill | Other | Unit | | | |

Notes:
File Status Codes
1 = Need Manifest
2 = Need Weight Ticket
3 = Need CD
4 = File Complete

# Testing Plan and Log

| | | TO No.: | | TO Title: | | | | Location: | | |
|---|---|---|---|---|---|---|---|---|---|---|
| Spec Section and Paragraph | Test Required | Proposed Lab | Sampled By | Tested By | Test Location | Frequency | Date Test Made | Test Results | Date Results Forwarded | Remarks |
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# Submittal Register

Contract Number: N62470-08-D-1006 | TO No.: 011 | TO Title: MCB Quantico | Location: Quantico, VA | Contractor:

| Spec Section | Item Description | Para. Number | Approving Authority | Other Reviewers | Submittal Number | Scheduled Submission Date | Contractor Review Date | Contractor Disposition | Contractor Transmit Date | QC Admin Received Date | QC Disposition | QC Admin Transmit Date | Contracting Officer Received | Contracting Officer Disposition | Contracting Officer Return | Remarks |
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# Appendix B
# Environmental Protection Plan

# Environmental Protection Plan

The Environmental Protection Plan consists of general procedures that will be implemented to prevent pollution and protect the existing environmental resources. The purpose of this plan is to provide specific requirements and procedures to protect the environment during implementation of the TCRA at SWMU 3, Pier 10 Sandblast Yard, within Joint Expeditionary Base (JEB) Little Creek, Virginia Beach, Virginia.

## 1. Pre-Remedial Action Environmental Condition

A site visit was conducted on April 17, 2013 to 1) assess the pre-removal action environmental conditions, 2) identify the existing environmental resources that may be affected by the removal action activities, and 3) identify the protection needed to minimize or eliminate impacts to the extent practicable. TCRA activities are anticipated to begin in late spring or early summer of 2013.

SWMU 3 is a 30-acre area located in a developed area on Little Creek Harbor's western side (Figure 1). The site was historically used for sandblasting 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 within Little Creek Harbor, consists of the Pier 10 floating dry dock and its associated anchoring system, as well as a recreational marina used by active military and former active duty service members. In addition to floating dry dock activities, Little Creek Harbor is currently used for dive team training. Recreational swimming, fishing, and crabbing are not permitted in Little Creek Harbor.

The proposed TCRA consists of soil excavation and backfill, embankment excavation, backfill, and stabilization, near shore sediment removal and backfill (up to 20 feet off shore at the toe of slope, not including distance of offset to account for sloughing), and the placement of a sediment amendment in areas where excavation is not feasible.

## 2. Objectives

The objectives for this removal action are to:

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

To meet these objectives, the work will involve the following activities:

- Install erosion/ sediment controls and the temporary water diversion structure, as specified in the Storm Water Pollution Prevention Plan.
- Excavate soil from the upland soil areas where lead concentrations exceed 400 mg/kg, backfill with borrow from an approved source, and restore the areas (one excavation area is to be restored as a retention feature stormwater management feature for sheet flow runoff from an adjacent parking lot).
- Riprap Shoreline Area (soil and sediment)- Remove existing broken concrete riprap and excavate the soil beneath to a total depth of 4 feet from the current ground surface; excavate the near-shore (to a distance of 20 feet from the toe of slope) sediments to a depth of 3 feet (one grid) 4 feet (two grids). The embankment will be restored to its pre-construction configuration using a non-woven geotextile, gravel, clean backfill, re-use of the concrete rip rap, and new rip rap. Sand backfill (minimum of 2 feet) will be applied to the sediment removal area.
- Bulkhead and Marina Area - placement of a reactive amendment on the subaqueous sediment to sequester metal COCs that may be contributing to pore water toxicity.

# 3. Chemical Inventory Control

Consistent with the requirements of Section 311 of the Emergency Planning and Community Right-to-Know Act, an inventory of any chemicals and hazardous materials brought onsite must be maintained.

The Site Health and Safety Coordinator shall request Material Safety Data Sheets (MSDSs) from the subcontractors and the vendors for any chemicals delivered to the site.

The Site Health and Safety Coordinator will perform the following activities:

- Train employees on required site-specific hazard communication (HAZCOM).
- Confirm the inventory of chemicals brought on site by subcontractors is available.
- Obtain an MSDS for each hazardous chemical before or as the chemicals arrive on the site.
- Label chemical containers with the identity of the chemical and with hazard warnings, if applicable.

# 4. Waste Transportation and Disposal

Solid wastes will be transported offsite to permitted facilities for disposal. It is anticipated that all soil and sediment will be non-hazardous. Containerized water from the containment cell and dewatering fluids will also require disposal at facility permitted for CERCA Off-Site Rule disposal. Additionally, some of the concrete riprap which is currently in place may not be able to be reused and may require offsite recycling or disposal. All transport vehicles are to be weighed at the disposal facility upon arrival at the facility and after unloading to determine the actual quantity of waste disposed.

Sludge or sediments collected from filtering discharge water may be added to the contaminated soil for disposal. The Waste Management Plan provides more detail on how wastes will be handled, transported, and disposed.

# 5. Protection of Existing Resources

Air quality, water resources, land resources (trees and shrubs), and fish and wildlife shall be protected during project activities as described below.

## 5.1 Protection of Air Quality

Construction activities shall be kept under surveillance, management, and control to minimize the discharge of any air pollutants. Although the field activities will likely result in minimal discharge of some air pollutants, the following general practices are to be implemented to protect air quality:

- Construction equipment shall be maintained within manufacturer's recommendations to ensure minimal discharge of exhaust emissions.
- Dust emissions shall be controlled during earth-disturbing activities using misting of water, as needed.
- Traffic routes shall be designated to limit the area that is disturbed.
- Haul roads shall be maintained and watered to reduce dust, as necessary.
- Travel speeds over unpaved areas shall be limited to reduce dust levels.
- Completed areas shall be seeded or otherwise stabilized to reduce dust levels.
- Burning shall not be allowed as a means of clearing.
- Equipment will be operated in a manner to minimize airborne particulates whenever possible (e.g., the drop height of excavators will be limited).

Water trucks with sprinkling attachments shall be utilized, as necessary, to control dust. The water source for the trucks is to be approved by the base prior to utilization. Wastewater from the sediment drying area, decon area or any containerized wastewater cannot be used. Water shall be applied in sufficient volumes to prevent creation of

dust, but excessive watering that may result in runoff, ponding, or mud that may be transferred to the haul roads is not acceptable. Work may be suspended because of dust generation that cannot effectively be mitigated.

## 5.2 Protection of Water Resources/Erosion Control

Controlling stormwater run-on and run-off and preventing erosion and sedimentation is the primary water resource concern during construction activities. Various temporary and permanent erosion and sediment controls (ESCs) are to be used during earth moving/land disturbing activities. All ESCs shall comply with the manufacturer's installation specifications and the Virginia Erosion and Sediment Control Handbook provided by the Virginia Department of Conservation and Recreation (DCR), where applicable. A SWPPP with specific ESC details is provided as Appendix D.

### 5.2.1 Temporary Erosion and Sediment Controls

Erosion and sediment control measures are discussed in the SWPPP.

## 5.3 Protection of Land Resources

All reasonable attempts shall be made to minimize landscape disturbance beyond the planned limits. This includes the trimming of trees instead of removal, wherever possible. Operation of equipment shall be limited to the confines of the work area to minimize the potential for residual damage to landscape features.

Land resources (e.g., trees and shrubs) shall be preserved in their present condition or restored as near as possible to their natural appearance. Trees outside of any clearing limits are to be protected during excavation or filling activities within the root zone, wherever possible. No ropes, cables, or guy lines are to be fastened or attached to any existing trees for anchorage unless specifically authorized by the Base. Where authorized, the trunk shall be wrapped with sufficient thickness of a material such as burlap or rags over which softwood cleats will be tied before any rope, cable, or wire is placed. Where trees may be defaced, bruised, injured, or otherwise damaged by equipment or construction operations, boards, planks, or poles may be placed around them for protection. Rocks that are displaced into uncleared areas shall be removed. Monuments, markers, or other similar structures shall be protected before beginning construction operations. Revegetation will take place in accordance with the SWPPP and the erosion and sediment control plans.

Excavated soil or sediment that is stockpiled on-site shall be in a bermed, covered, or otherwise protected to prevent the potential of runoff.

## 5.4 Protection of Fish and Wildlife

Construction operations shall be managed to the extent practicable minimize interference with fish and/or wildlife habitat. Care shall be taken to ensure that temporary erosion and sediment controls are installed to prevent stormwater discharges. Installation of the temporary diversion structure during low tide cycles (as possible) will minimize this potential.

A turbidity curtain and oil containment boom will be used as a secondary measure for the riprap shoreline excavation of soil and sediment. During the placement of the sediment amendment to the submerged sediment surface, a turbidity curtain and oil containment boom will be utilized around localized areas (e.g., the marina area will have limitations on space/obstructions).

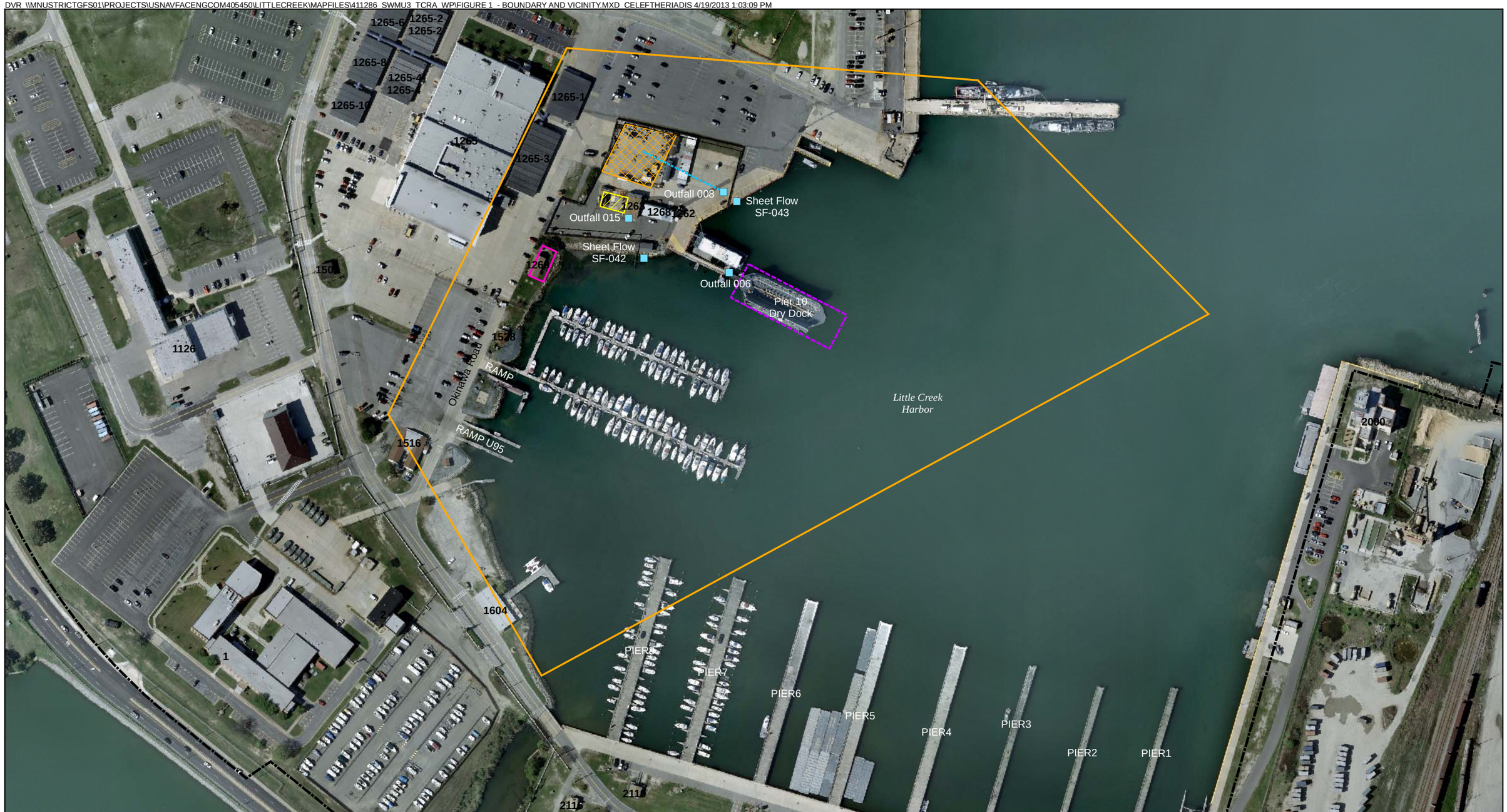
# 6. Site Restoration

In general, site restoration activities shall include the following activities:

- Grade all disturbed areas and re-seed areas to restore vegetation as specified in the final design.
- Decontaminate facilities, equipment, and materials before their final removal from the site.
- Upon completion of final equipment decontamination, remove any decontamination support features (such as a pad or wash units). Properly dispose of any items that cannot be decontaminated and/or materials (such as plastic sheeting) used in decontamination activities.

- Remove all temporary construction features, such as haul roads, work areas, stockpiles, structures, fencing, and waste staging or storage areas in accordance with project requirements and directions provided by the Navy representative.

DVR \\MNUSTRICTGFS01\PROJECTS\USNAVFACENGCOM405450\LITTLECREEK\MAPFILES\411286_SWMU3_TCRA_WP\FIGURE 1 - BOUNDARY AND VICINITY.MXD CELEFTHERIADIS 4/19/2013 1:03:09 PM




**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)

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0 100 200 400 Feet

Figure 1
SWMU 3 Boundary and Immediate Vicinity
SWMU 3 TCRA Work Plan
JEB Little Creek
Virginia Beach, Virginia

CH2MHILL

# Appendix C
# Waste Management Plan

# Waste Management Plan

This Waste Management Plan has been prepared to outline non-hazardous waste management and disposal requirements for wastes generated during the TCRA at SWMU 3, JEB Little Creek. The following wastes will be generated during the remediation activities:

- Potentially contaminated environmental media from a CERCLA site, including:
  - An estimated 3,080 tons of contaminated soils/sediment
  - Aqueous waste resulting from soil/sediment dewatering operations, stockpile runoff, and decontamination water
  - Decontamination and dewatering pad construction materials
  - Filter media from sediment filter bags
- Miscellaneous solid waste may include packaging for remediation equipment and supplies and personal protective equipment (PPE)
- Existing broken concrete serving as riprap that cannot be re-used may be recycled.

Since it is anticipated that waste generated from these activities will be non-hazardous, *the procedures and practices in this Waste Management Plan pertain to management and disposal of non-hazardous waste only*. While many of these procedures and practices outlined in this section are also applicable to hazardous waste, this plan will need to be modified to include hazardous waste requirements in the event that hazardous waste is generated.

The subsections below outline waste characterization, waste management, shipping documentation, transportation, and record keeping requirements for the anticipated non-hazardous waste streams.

# 1. Waste Characterization

Debris and wood waste from clearing activities, miscellaneous solid waste including packaging for remediation equipment/supplies, and PPE will be characterized using process knowledge and classified as construction and demolition debris or municipal solid waste and therefore not require tracking. Potentially contaminated environmental media (soil, sediment, and aqueous wastes) will be characterized as described below.

## 1.1 Upland Soil Areas and Riprap Shoreline Area

Composite samples for waste characterization will be collected from both the excavated soil in the upland soil removal areas and soil excavated along the riprap shoreline beneath the existing riprap. Sediment from the near-shore excavation area of the riprap shoreline will also be sampled. If generated, fluids from the dewatered sediment in the containment cell will also be sampled for disposal. Characterization samples will be analyzed for the following Resource Conservation and Recovery Act (RCRA) toxicity characteristics using EPA methods:

- Toxicity Characteristic Leaching Procedure (TCLP) VOCs by Methods 1311/8260B
- TCLP SVOCs by Methods 1311/8270C
- TCLP pesticides by Methods 1311/8081A
- TCLP herbicides by Methods 1311/8151A
- TCLP metals by Methods 1311/6010B/7000
- Ignitability by Methods 1010/1030
- Corrosivity by Method 9045C

Samples will immediately be secured, packaged securely in a cooler containing ice, and shipped for next day delivery to the analytical laboratory.

# 2. Waste Management

## 2.1 General Waste Management Requirements

As noted above under waste characterization, debris and wood waste from clearing activities, miscellaneous solid waste including packaging for remediation equipment/supplies, and PPE will be characterized as construction and demolition debris or municipal solid waste and therefore not require tracking for disposal. Potentially contaminated environmental media (soil, sediment, and aqueous wastes) will be contained and characterized prior to offsite disposal as described below.

## 2.2 Upland Soil Areas and Riprap Shoreline Area

A bermed and lined containment cell (estimated to be 150 feet by 200 feet) will be constructed on site for the placement of excavated soil and sediment for staging while characterization tests are analyzed and offsite disposal is coordinated. The soil, which is presumed to be essentially dry based upon the relatively shallow excavation depths, will be stored in a separate area within the containment cell and covered. The sediment, which is assumed to be saturated upon removal, will be placed into the containment cell for drying and solidification. If excess water is generated as the sediment is placed and settles, the water will be extracted with a sump pump, containerized in an appropriate container (drums or on-site storage tank depending upon the estimated quantity to be handled), and sampled for disposal. Portland cement may be added (assumed 10%) to aid in bulking/drying the sediment for transport.

## 2.3 Waste Containers

All containers brought to the site for the purpose of containerizing waste are to be inspected upon arrival at the site for equipment disrepair and any suspected contamination or contents. If a container contains waste and/or is suspected to be contaminated upon arrival or is in disrepair, it shall be immediately rejected and documented. Wastes shall be accumulated and staged in an area identified or approved by Navy personnel. Spill control equipment (e.g., sorbent pads) will be available in the waste accumulation areas, and where liquids are transferred from one vessel to another.

### 2.3.1 Tanks

- Tanks will be inspected upon arrival onsite for signs of deterioration and contamination. Any tank arriving onsite with contents or in poor condition shall be rejected.
- Tanks shall be provided with covers and secondary containment.
- Each tank shall be labeled.
- Tanks are not to be located near a stormwater inlet or conveyance.

### 2.3.2 Lined Roll-off Boxes

- Roll-off boxes are to be inspected upon arrival onsite. Any roll-off containers arriving with contents or signs of deterioration shall be rejected.
- When not in use, securely fastened covers shall be on all roll-off boxes.
- Old labels are to be removed.
- Roll-off containers are to be inspected by the transporter after removal of the liner and decontaminated in the event of evidence of liner failure (prior to use in a subsequent shipment).
- Free liquids, other than an incidental amount, are not be added to waste in a roll-off box.
- Roll-off containers are to be filled until half-full, or otherwise monitored to ensure compliance with Department of Transportation weight restrictions.
- Roll-off boxes may not be located near a stormwater inlet or conveyance.

### 2.3.3 Waste Handling Pad

Waste and debris will be stored in the waste handling pad area. This area will be managed in such a manner as to maintain good housekeeping, and to prevent the spread of contamination.

- Debris and soil will be placed on a barrier to prevent cross-contamination.
- Absorbent pads are to be placed under damaged or leaking equipment.
- The material handling pad shall be covered as necessary to prevent accumulation of stormwater.
- The perimeter berm for the waste handling pad shall be constructed of hay bales or clean soil.
- Accumulation start dates are to be documented in the daily production reports and Quality Control Reports and on the Waste Tracking Log.

### 2.3.4 Soil Stockpiles

- Stockpiles of contaminated soil should be located near the excavation areas and within the laydown area.
- Stockpiles shall be provided with liner, cover, and perimeter berm to prevent release or infiltration of liquids.
- Minimum 10- and 6-mil polyethylene sheeting are to be used for liners and covers, respectively.
- The perimeter berm shall be constructed of clean materials (such as hay bales under the liner) and allow for collection of any free liquids draining from the stockpile.
- Accumulated free liquids are to be pumped to a container or tank.
- Covers and perimeter berms are to be secured in place when not in use and at the end of each workday, or as necessary to prevent wind dispersion or run-off from precipitation events.
- Construction materials for the stockpiles that contact contaminated soil shall be disposed of as contaminated debris.
- Accumulation start dates shall be recorded on a log or a sign located at the stockpile.
- Soil stockpiles are not be located near a stormwater inlet or conveyance.

## 2.4 Waste Storage Time Limit

Wastes shall be removed from the site as soon as possible, but will not be stored for more than 90 days from the date of generation (i.e., the day that a waste is first placed in a stockpile or container [such as a drum, roll-off box, or tank]).

## 2.5 Labels

Waste containers are to be labeled in accordance with 49 Code of Federal Regulation (CFR) 172, 173, and 178. Labels shall include the type of waste, location from which the waste was generated, and accumulation start date. One of the following labels are to be used on containers/drums, roll-off boxes, and tanks, as appropriate:

- “Analysis Pending” or “Waste Material” - Temporary or handwritten label until analytical results are received and reviewed. This label shall include the accumulation start date.
- “Non-Hazardous Waste” - Preprinted labels with the following information:
  - Accumulation start date
  - Generator name:
  - EPA ID number
  - Waste-specific information (e.g., soil)

## 2.6 Inspection of Waste Storage Areas

Waste accumulation/storage areas shall be inspected for malfunctions, deterioration, discharges, and leaks that could result in a release. Containers, tanks, and roll-off boxes (for leaks, signs of corrosion, or signs of general deterioration) are to be inspected at least weekly.

Any deficiencies observed or noted during inspection are to be corrected immediately. Appropriate measures may include transfer of waste from leaking container to new container, replacement of liner or cover, or repair of containment berm.

Inspections shall be recorded. Any deficiencies noted and how a deficiency was corrected is to be documented. Copies of the report shall be maintained onsite, and available for review.

# 3. Shipping Documentation

## 3.1 Waste Profiles

Waste characterization information for wastes is to be documented on a waste profile form provided by the designated offsite treatment or disposal facility as part of the waste acceptance process. The profile is to be reviewed, approved, and signed approved by a Naval Facilities Engineering Command representative. Signed profile(s) will then be submitted to the designated disposal facility for acceptance approval.

The profile typically requires the following information including but not limited to:

- Generator information including name, address, contact, and phone number
- Site name including street/mailing address
- Process generating waste (e.g., soil and debris removal)
- Source of contamination (e.g., former debris landfill)
- Historical use for area
- Waste composition (e.g., 95 percent soil, 5 percent debris)
- Physical state of waste (e.g., solid, liquid, etc.)
- Applicable hazardous waste codes (not anticipate for this project)

A designated disposal facility approved copy of the waste profile shall be received prior to scheduling of offsite transportation of the waste.

## 3.2 Waste Manifests

Prior to offsite disposal of any waste, a waste approval package for each waste stream shall be prepared. This package includes a waste profile naming the Navy as the generator of the waste, analytical summary table(s) applicable to the waste, a completed waste manifest, and any other applicable information necessary for the Navy to complete its review of the disposal package and signature as the generator.

The signed profile is then submitted to the designated offsite disposal facility for acceptance and approval. Once the approval letter is received from the designated facility, transportation can be scheduled.

Each load of waste material shall be manifested prior to leaving the site. At a minimum, the manifest form is to include the following information:

- Generator information including name, address, contact, and phone number
- Transporter information including name, address, contact and phone number
- Designated facility information including name, address, phone number
- Site name including street/mailing address
- Type and number of container
- Quantity of waste (volumetric estimate)
- Task order or job number
- Profile number
- 24-hour Emergency phone number

Additionally, each shipment of waste will also have a weight ticket. This form also requires the generator signature and submission to the designated facility.

The generator and the transporter must sign the manifest prior to the load of waste leaving the site. The original signed manifest is returned to the address of the generator.

# 4. Transportation

Each transportation vehicle shall be inspected upon arrival onsite. Vehicles in poor condition, containing contamination, or otherwise not meeting the applicable standards will be turned away. Each transportation vehicle and load of waste is to be inspected before leaving the site. Transportation of non-hazardous wastes (Non-RCRA/Non-Toxic Substances Control Act) is to be completed by a transporter licensed for commercial transportation. A copy of the documentation indicating that the selected transporter has appropriate licenses is to be submitted for review and approval prior to transporting waste material.

The transporter is to observe the following practices when hauling and transporting wastes offsite:

- Minimize impacts to general public traffic.
- Repair road damage caused by construction and/or hauling traffic.
- Clean up material spilled in transit.
- Line and cover trucks/trailers used for hauling contaminated materials to prevent releases and spread of contamination.
- Decontaminate vehicles prior to re-use in hauling different material, other than hauling contaminated material.
- Seal trucks transporting liquids (if necessary).

All personnel involved in offsite disposal activities shall follow appropriate safety and spill response procedures.

The transporter is for weighing loads at a certified scale to confirm load weights. For each load of material, weight measurements are to be obtained for each full and empty container, dump truck, or tanker truck. Disposal quantities are to be based on the difference of weight measurements between the full and empty container, or dump truck. Weights shall be recorded on the waste manifest.

# 5. Disposal of Waste Streams

The following non-hazardous wastes are anticipated to be disposed offsite at a Subtitle D landfill:

- Large items encountered (e.g, buried anchors or other metal items) will be cleaned of sediment and set aside for disposal or recycling, as appropriate.
- Soil/sediment (dried/solidified for transport and disposal)
- Debris
  - Construction/demolition debris that cannot be recycled
  - Discarded materials used in decontamination, plastic sheeting, sampling materials, and personal protective clothing
  - Municipal solid waste (i.e., domestic refuge) including glass bottles, soda cans, ceramic pieces
- Cleared vegetation, including tree stumps

Offsite treatment or disposal facilities will use the waste profile and supporting documentation (e.g., analytical data) to determine acceptance of the waste.

Consistent with the Offsite Rule (OSR), wastes generated from a CERCLA project may only be transferred to offsite facilities that has been determined acceptable by the EPA Regional Offsite Contact (40 CFR 300.40). The contractor must verify that an offsite facility has OSR approval, prior to use. It assumed that this policy only applies to contaminated soil/sediment/dewatering fluids/decontamination water generated during the removal action.

The designated disposal facility is responsible for providing a copy of the fully executed waste manifest and a certificate of treatment or disposal for each load of waste received.

# 6. Recordkeeping

Final documentation including copies of the final facility-signed waste shipping documents, certificates of disposal and weight tickets shall be provided to the Navy in the completion report or as requested. Original final facility-signed waste shipping documents shall be sent directly to the Navy Point of Contact from the selected end disposal facility.

The following records and documents shall be maintained:

- Transportation and offsite disposal records, including:
  - Profiles and associated characterization data
  - Manifests, Land Disposal Restriction notifications/certifications, bills of lading, and weight tickets
  - Designated offsite facility waste receipts, certificates of disposal/destruction
  - Designated recycling facility weight tickets
- Training records
- Inspection records

# Appendix D
# Stormwater Pollution Prevention Plan

# Stormwater Pollution Prevention Plan
# Solid Waste Management Unit – Pier 10 Sandblast Yard
# Stormwater Pollution Prevention Plan

## Join Expeditionary Base Little Creek
## Virginia Beach, Virginia

**Contract Task Order WE34**

**June 2013**

Prepared for

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**Naval Facilities Engineering Command**
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# Acronyms and Abbreviations

| | |
|---|---|
| APP | Accident Prevention Plan |
| BMP | Best Management Practices |
| INRMP | Integrated Natural Resource Management Plan |
| MSDS | Material Safety Data Sheet |
| NOAA | National Oceanic and Atmospheric Administration |
| NPDES | National Pollutant Discharge and Elimination System |
| SWPPP | Stormwater Pollution Prevention Plan |
| TMDL | Total Maximum Daily Load |
| USFWS | United States Fish and Wildlife Service |
| VDACS | Virginia Department of Agriculture and Consumer Services |
| VDCR | Virginia Department of Conservation and Recreation |
| VDGIF | Virginia Department of Game and Inland Fisheries |

SECTION 1

# Introduction

This Stormwater Pollution Prevention Plan (SWPPP) has been developed to support the excavation and restoration activities associated with a Time-Critical Removal Action (TCRA) at SWMU 3, Small Boat Sandblast Yard, Joint Expeditionary Base (JEB) Little Creek, Virginia Beach, Virginia.

Because the TCRA at SWMU 3 is being completed under the Comprehensive Environmental Response, Compensation and Liability Act (CERCLA), no permits are required; however, the activities must comply with the substantive requirements that are applicable or relevant and appropriate to the action [CERCLA 121(e)]. Accordingly, the SWPPP was developed following the substantive requirements of the General Permit for Discharges of Stormwater from Construction Activities, Permit No. VAR10 and is consistent with the *Virginia Department of Conservation and Recreation (VDCR) Virginia Erosion and Sediment Control Handbook.*

This plan provides an overview of construction activities and includes procedures that will be implemented during construction activities to prevent or reduce pollutants in stormwater discharges. Each of the following elements is addressed:

- Site Description
- Identification of potential sources of pollutants
- Description of control measures or Best Management Practices (BMPs) that will be implemented to control pollutants in stormwater discharges
- Procedures for maintaining control measures
- Inspection procedures
- Identification of non-stormwater discharges

## 1.1 Changes to the SWPPP

This plan will be modified when there is a change in design, operation, or maintenance in construction activities. The plan will also be revised if procedures or controls prove to be ineffective in preventing or significantly minimizing pollutants from potential sources.

The SWPPP will be updated to reflect modifications to stormwater control measures made in response to a change in design, construction, operation, or maintenance at the construction site that has or could have a significant effect on the discharge of pollutants to the waters of the United States that has not been previously addressed in the SWPPP.

The SWPPP will be revised if, during inspections or investigations, it is determined that the existing control measures are ineffective in minimizing pollutants in stormwater discharges from the construction site. Revisions to the SWPPP will include additional or modified control measures designed to correct problems identified.

SECTION 2

# Site Description

JEB Little Creek covers approximately 2,215 acres in the northwest portion of Virginia Beach, Virginia, adjacent to the Chesapeake Bay. JEB Little Creek (formerly known as Naval Amphibious Base [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 logistic facilities and support services for local commands, organizations, home-ported ships, and other United States (U.S.) and allied units to meet amphibious warfare–training requirements of the U.S. 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 the west side of Little Creek Harbor. SWMU 3 was used for sandblasting activities between 1962 and 1995. Boats, anchors, and chains were sandblasted on a concrete pad located on the western side of Building 1263 between 1962 and 1995. In 1995, the concrete pad was removed and a new sandblasting area was constructed in the northwestern corner of the site. The use of this new area was discontinued in 1996 when sandblasting activities were moved to an indoor facility (CB 125). Little Creek Harbor is located west of the sandblasting area. A public marina for dependents is located south of SWMU 3 and Little Creek Channel, leading to the Chesapeake Bay, is located west of Little Creek Harbor. Little Creek Channel has been regularly dredged since 1928, and in 1995 the approximately 2 to 5 feet (ft) of sediment was removed from the area around Pier 10.

Historical releases at SWMU 3 likely occurred when sandblasting residue was laying 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 was constructed that transported surface water drainage to a VDEQ permitted outfall (Outfall 008) (Permit Number VA0079928) discharging to Little Creek Harbor. Under the VDEQ permit, Outfall 8 has no monitoring requirements. Runoff from some areas of SWMU 3 may continue to flow directly into the harbor.

## 2.1 Description of Construction Activities

TCRA activities for this SWPPP will include soil excavation and restoration in two upland areas that have been impacted by lead; excavation and restoration of an existing riprap shoreline; near-shore sediment removal and backfill/restoration; and placement of an amendment to the submerged sediment surface in the bulkhead and marina areas.

### 2.1.1 Construction Activities by Area

Construction activities at SWMU 3 – soil removal areas:

- Excvation of shallow soil (estimated two feet or less)
- Backfill with clean fill
- Seeding/restoration

Construction activities at SWMU 3 - Rip-Rap Shoreline Area include:

- Removal and staging existing broken concrete riprap
- Excavation of the embankment beneath the riprap to a maximum depth of 4 feet (total) and restoration of the embankment to pre-construction grades
- Excavation of near-shore sediments (up to 20 lateral feet from the toe of the slope) to a maximum depth of 4 feet and backfill with clean sand

- Disposal of water from sediment dewatering activities

Construction activities at SWMU 3 – Bulkhead and Marina Areas

- Placement of an amendment on submerged sediment

### 2.1.2 Potential Sources of Pollutants from Construction Activities

The potential sources of pollutants that could be discharged in stormwater during construction activities include:

- Excavation and backfill
- Vehicle and equipment fueling
- Dewatering operations
- Vehicle and equipment decontamination areas
- Loading and unloading areas
- Vehicle and equipment maintenance areas
- Soil stockpile areas/containment cells
- Waste and material storage areas

## 2.2 Affected Area of the Site

The location of SWMU 3 is shown on the figures provided in the Sections 1 and 2 of the TCRA Work Plan. The total disturbed area is estimated to be less than one acre. The soil removal areas are small (estimate 25 ft square each) and are anticipated to be completed in one day. The riprap shore line area is estimated to be approximately 400 feet in length, with a distance into the Little Creek harbor of approximately 40 feet (including offset to account for sediment sloughing for a total of approximately 16,000 sq. ft) as demonstrated in Figure 2, Attachment 1. This area will be dewatered through installation of a temporary diversion structure.

## 2.3 Site Map

Figures 1 through 5 in Attachment 1 to this SWPPP in the Work Plan drawings illustrate the general concept of the proposed improvements, and includes the following, as applicable:

- Areas of soil disturbance
- Locations of major structural and nonstructural control measures identified in the SWPPP, including those that will be permanent after construction activities have been completed
- Locations where stabilization practices are expected to occur
- Locations of surface waters
- Locations where concentrated stormwater discharges
- There are no known stormwater drop inlets within the anticipated work area to be protected; however, this must be verified at the onset of construction activities and protection added to prevent potential contamination from site work being discharged to the inlet.
- One outfall pipe is located within the rip-rap bank shoreline. This outfall is to be protected and re-constructed.
- Locations of other potential pollutant sources, such as vehicle fueling, storage of chemicals, concrete wash-out areas, sanitary waste facilities, including those temporarily placed on the construction site, etc.
- Areas where final stabilization has been accomplished
- Erosion and sediment control details
- The map and drawings will be updated to reflect any warranted changes or additions. Inspections may reveal necessary revisions and the map and drawings may be manually updated.

## 2.4 Topography

Topography within JEB Little Creek is generally flat to very gentle slope with runoff toward surface water bodies within the facility.

## 2.5 Receiving Waters

Stormwater from the site activities discharges to Little Creek Harbor, which discharges into the Chesapeake Bay.

## 2.6 Impaired Waters

Little Creek (as part of the James River Basin) is classified as a category 5C impaired waterway by the Commonwealth of Virginia. Waters categorized as 5A, 5B, or 5D in the 2012 Impaired Waters List are waters that DEQ believes need to have a total maximum daily load (TMDL) study. 5C waters are believed to be impaired due to natural conditions. Little Creek Harbor is not specifically listed in the 2012 list of Category 5 impaired waters. (http://www.deq.state.va.us/Portals/0/DEQ/Water/WaterQualityAssessments/IntegratedReport/2012/ir12_Appendix1a_Category5_List.pdf)

## 2.7 Non-Stormwaters

Non-stormwater discharge of water from Little Creek Harbor will occur after the temporary diversion structure is in place. This will consist of transferring waters to the outside of the work area.

## 2.8 Endangered/Threatened Species

A review of applicable or relevant and appropriate requirements was completed to support the Action Memorandum for the TCRA at SMWU 3. Per Navy policy, state-listed species are protected through the implementation of an Integrated Natural Resource Management Plan (INRMP). Compliance with the INRMP constitutes compliance with all substantive requirements in the regulations for this action.

SECTION 3

# Best Management Practices for Stormwater Pollution Prevention

The BMPs described below will be used to minimize stormwater discharges from the TCRA-related construction activities.

## 3.1 Control Measures for Pollutant Sources during Construction Activities

The potential pollutant sources are described in Section 2.1.2. Specific measures to control pollutant discharges from these sources include:

- Excavation and Backfill Activities: see Section 3.2.
- **Vehicle and Equipment Fueling Areas**: All fueling areas will have temporary secondary containment around the fuel tanks, and spill control/response equipment. See Section 3.4. No refueling of equipment being used for the TCRA-related construction activities will be conducted on or over water.
- **Vehicle and Equipment Decontamination Areas**: Vehicles and equipment will be decontaminated prior to leaving the site. A temporary decontamination area will be established, as necessary, and located within the construction site. If fluids are necessary for decontamination, the liquids and solids generated will be contained, collected, sampled, and disposed of at an appropriate location.
- **Loading and Unloading Areas**: Any soil/sediment or other materials spilled during loading or unloading will be cleaned up immediately. This includes soil/sediment on the outside of trucks (side rails), ground, and road surfaces.
- **Vehicle and Equipment Maintenance Areas**: If vehicle or equipment maintenance is necessary, it will be performed off site or in an area designated for this purpose. Any spills will be cleaned up immediately. Precautions will be taken to prevent the release of pollutants to the environment from vehicle and equipment maintenance. Precautions will include the use of drip pans, mats, and other similar methods. No vehicle wash water will be allowed to run off the construction site.
- **Soil/Sediment Stockpile Areas (Containment Cells)**: Stockpiles of soil and sediment are placed on plastic sheeting reasonably near the excavation and within the disturbed area. Stockpiles of saturated sediment will be contained inside a bermed area to prevent run-on and run-off from direct release to the environment. The base and berms of the containment area will be lined. Liners and covers are a minimum of 6-mil polyethylene and berms consist of hay bales placed beneath the liner. Covers and perimeter berms will be secured in place when not in use and at the end of each workday, or as necessary to prevent wind damage or runoff during precipitation events.
- **Waste and Material Storage Areas**: Materials on the sites will be stored in areas designated for that purpose. Materials will be stored in an area that does not receive a substantial amount of runoff from upland areas and does not drain directly to a waterbody or stormwater inlets, and will be sheltered from rainfall. Waste and material containers will be kept closed (except to add or remove waste/material). See also Section 3.3.
- **Offsite Vehicle Tracking**: Construction vehicles will remain on existing paved surfaces. The vehicle decontamination and loading/unloading area controls will prevent tracking sediment onto unprotected areas, where it would be carried into waterways.

## 3.2 Erosion and Sediment Controls

Construction activities will be implemented to attain the following goals and criteria, as applicable:

- Implement erosion and sediment controls during construction to retain sediment onsite to the extent practicable.
- Select, install, and maintain control measures in accordance with manufacturer's specifications and standard engineering practices. If periodic inspections or other information indicate that a control measure has been used inappropriately or incorrectly, that control measure will be modified or replaced, as necessary.
- In the event that sediment escapes the construction site, remove offsite accumulations of sediment to minimize offsite impacts.
- Implement construction practices that prevent litter, construction debris, and chemicals exposed to stormwater from becoming a pollutant source for stormwater discharges.
- Erosion and sediment runoff is controlled through the use of structural and/or stabilization practices. Structural control practices may include the use of silt fence, turbidity curtains, pump around diversions with portable dams, inlet and outlet protection, etc. Stabilization practices may include temporary or permanent seeding, mulching, geotextiles, sod stabilization, vegetative buffer strips, protection of trees, preservation of mature vegetation, etc.

Table 3-1 lists several structural and stabilization measures that may be used to manage the water from the construction site. Figures/drawings presenting the approximate locations of erosion and sediment control measures are are provided in this SWPPP.

TABLE 3-1
**Structural and Stabilization Measures**
*SWMU 3, JEB Little Creek*

| Control Measure | Location | Description of Control Measure |
|---|---|---|
| Silt Fence (VESCH std 3.05) | Along the perimeter of excavation areas. | Used to protect streams or wetland areas, to prevent erosion, and to keep sediment onsite. Silt fence consists of posts with filter fabric stretched across the posts. The lower end of the fence fabric is vertically trenched and covered with backfill. This prevents water from passing by the fence without first being filtered. The fabric allows for the water to pass offsite while retaining the sediment onsite. A variation with chain link fence reinforcement, known as super silt fence, is frequently used for larger drainage areas or close to surface water. |
| Turbidity Curtains (VESCH std 3.26 and 3.27) | Tidal and non-tidal watercourses where intrusion into watercourse by construction activities and subsequent sediment movement is unavoidable. | Used to protect streams or rivers, to minimize or prevent sediment transport from the disturbed area adjacent to or within a body of water. Turbidity curtains consist of a floating geotextile material secured to either posts or buoys on each end. The lower end of the curtains anchored and secured in the bed of the watercourse. This prevents sediment from passing under the curtain once settled. |
| Temporary Seeding (VESCH std 3.31) | Disturbed areas where the construction activity has temporarily ceased for more than 21 days. Seeding is to be implemented within 14 days of activity ceasing. | Growing of a short-term vegetative cover on disturbed areas that may be in danger of erosion. |
| Preservation of Natural Vegetation (VESCH std 3.38) | Wherever practical. | Wherever possible, existing vegetation should be retained. It minimizes erosion potential and protects water quality. The preservation of natural vegetation between the silt fence and stream will provide additional water quality improvement prior to the stormwater entering State or U.S. waters. |
| Permanent Seeding (VESCH std 3.32) or Sod (VESCH std 3.33) | On appropriate disturbed areas once construction is complete and within 14 days. | Provides permanent stabilization to the soil and reduces erosion. |

TABLE 3-1
**Structural and Stabilization Measures**
*SWMU 3, JEB Little Creek*

| Control Measure | Location | Description of Control Measure |
|---|---|---|
| Pump Around Diversion with Portable Dams (Practice 5.1 and 5.4) | Establish work area for near shore sediment excavation to be seprated from tidal waters of Little Creek Harbor | Temporary diversion feature to separate work site from the influence of tidal waters. |
| Sediment filter bag | Dewatering discharge when potential for sediment in pumped waters exists. | Reduced sediment from pump around diversion discharge. |
| Inlet Protection (VESCH std 3.08) | Drop inlets in adjacent parking lots | Prevents sediment from entering, accumulating and being transferred by a culvert and associated drainage system prior to permanent stabilization of a disturbed area. To provide erosion control at culvert inlets during the phase of the project where elevations and drainage patterns change, causing original measures to be ineffective or in need of removal. |
| Outlet Protection (VESCH std 3.18) | Means of preventing scour from dewatering discharge; replacement outlet protection for existing pipes with bank stabilization area. | Protects the channel from scour erosion and provides flow velocity reduction and energy dissipation for flow exiting the culvert. Composed of riprap or an synthetic product. |
| Soil Stabilization Blankets and Matting (VESCH std 3.36) | Along the channel and the shoreline. | Provides ground cover during vegetative re-establishment, increases water retention for better germination and growth, and increases erosion resistance. Both biodegradable and long life products may be used. |
| Retention Swale with Vegetated Spillway (VESCH std 3.03 and 3.06, modified) | Top of slope/edge of parking lot area for south-facing embankment | Enhance the quality of sheetflow stormwater runoff from the adjacent parking lot. |

## 3.3 Material Handling

The following material handling procedures will be implemented during construction activities:

- Waste containers (solid and liquid) will be emptied frequently enough to prevent from overflowing. The area will be kept free of trash and spills. Liquid waste containers, such as waste oil, will have secondary containment.
- Trash receptacles will be equipped with covers.
- Storage containers (drums, bags, etc.) will be stored away from traffic to prevent accidental spills.
- Containers will be kept closed, except to add or remove material, as necessary.
- Containers will be stored in such a manner to prevent corrosion that could result from contact between the container and the ground, resulting in a release.
- Containers will be labeled to show name and type of substance, health hazards, and other appropriate information.
- Material Safety Data Sheets (MSDS) for substances used or stored onsite will be available for review and use.
- Containment cells used to dry and stockpile contaminated sediment will be constructed in a manner to prevent leakage.

Materials stored onsite will be inventoried and records of the inventories will be maintained at the site field office.

## 3.4 Spill Prevention, Control, and Response

The following procedures will be followed for the prevention and mitigation of minor spills and releases during construction activities.

General spill prevention procedures follow:

- Fuel and waste containers/tanks shall be bermed or otherwise contained to prevent releases. The bermed volume shall be equal to the full capacity of the container(s)/ tank(s). When practicable, for areas on soil, the area inside the berm will be covered with an oil resistant membrane to minimize soil contamination in the event of a spill. Additionally, if practicable, these areas will be sheltered from precipitation to prevent overflow of the bermed volumes.
- Fueling operations and vehicle/equipment maintenance shall be performed at designated facilities, when practical.
- Drip pans and tarpaulins will be used during maintenance and fueling to capture minor spills and leaks during fueling and maintenance.
- Each location having fueling operations, fuel containers/tanks, and/or waste container/tanks shall have a sufficient number of spill kits to contain minor spills and leaks.

Detailed spill response procedures are provided in the the Spill Response section of the Accident Prevention Plan. The general procedures for spill response are as follows:

- Assure personal safety, then evaluate the area and nature of the spill.
- Identify the source and stop the flow of pollutants, if it can be done safely.
- Contain the spill with absorbent materials or by berming the area.
- Remove and contain the spilled material, contaminated media, and cleanup material, and transport to the designated location for collection of such material.
- Contact the appropriate personnel listed in the Spill Response Plan.
- Record pertinent facts.

## 3.5 Measures to Protect Threatened and Endangered Species

It is not anticipated that threatened and endangered species or critical habitats will be encountered in the course of the TCRA activities; however, if any are suspected or found at the site, work will be stopped and the situation will be evaluated in coordination with the Navy.

## 3.6 Measures to Protect Historic Places

There are no known historic places within the work area.

## 3.7 Other Controls

Employee Training: The site contractor staff as well as applicable subcontractor personnel are to be trained and aware of the requirements of this SWPPP.

SECTION 4

# Maintenance

All erosion and sediment control measures and other protection measures will be maintained in effective operating condition. Maintenance will be performed when necessary. Specific maintenance requirements include, but are not limited to:

- Sediment and other debris collected behind silt fence or check dams will be removed, prior to reaching one fourth the height of the barrier.
- Sediment will be removed from vehicle decontamination areas and loading/unloading areas, based on visual inspection. Sweeping and vacuuming are preferable to washing to remove sediment. If pavement washing is used, the runoff must be filtered prior to reaching the waterway.
- Visually monitoring of the water quality in Little Creek Harbor is to be conducted during construction activities for signs of increased turbidity or the development of sheens. If either are observed, the work operations shall be reviewed to assess the potential cause and if deemed to be related to site activities, alternative work means will be evaluated.
- The turbidity curtain and oil containment boom are to be continuously monitored for location and continuity to ensure that it is functioning as intended.

SECTION 5

# Inspections

Inspections will be performed to review the areas for evidence of, or the potential for, sediment and other pollutants leaving the site. The controls identified in Section 3 will be inspected to verify they are being implemented properly.

As necessary, the SWPPP will be revised to incorporate any changes that come about as a result of the inspection. Changes that affect the description of pollutant sources or the pollution prevention control measures will be made to the SWPPP within 7 days of the inspection. A record of the inspections will be maintained at the construction field office as part of the SWPPP.

## 5.1 Requirements during Construction

The following areas will be inspected:

- Disturbed areas that have not been finally stabilized
- Loading/unloading and storage areas that are exposed to precipitation
- Structural control measures
- Vehicle decontamination areas

These areas will be inspected at a frequency of every 7 days, or at least once every 14 calendar days and within 24 hours following any runoff producing storm event.

Inspections are to be recorded on the SWPPP Inspection Checklist, provided in Attachment 2. A copy of the detailed area drawings will be used during inspections and will be manually updated during inspections, as necessary, to reflect any changes or additions to the following features:

- Construction site boundaries
- Areas of soil disturbance
- Areas that will not be disturbed
- Approximate slopes after major grading
- Areas used for storage of materials, soil, or waste
- Locations of major erosion control features/structures (silt fence, turbidity curtain, etc.)
- Springs, streams, wetlands, and other surface waters
- Stormwater discharge locations

Inspectors must look for evidence of, or the potential for, pollutants entering a stormwater conveyance system or the adjacent waterbody. Control measures identified in the SWPPP will be inspected for proper installation, maintenance, and operation. Discharge locations, where accessible, will be inspected to ascertain whether control measures are effective in minimizing impacts to receiving waters. Where discharge locations are inaccessible, nearby downstream locations will be inspected to the extent that such inspections are practicable. Locations where vehicles enter or exit the site will be inspected for evidence of offsite sediment tracking.

The updated drawings and Inspection Checklists will be maintained in the field office. Table 5-1 provides stormwater BMP inspection/maintenance guidelines.

TABLE 5-1
Stormwater Inspection/Maintenance Guidelines
*SWMU 3, JEB Little Creek*

| |
|---|
| **Silt Fence And Turbidity Curtains** |
| Is the silt fence/turbidity curtain damaged, collapsed, untrenched, or ineffective? |
| Is the silt fence/turbidity curtain properly installed and positioned? |
| Has sediment been removed from behind silt fence? |
| **Temporary Seeding** |
| Is the seeding protected by mulch or matting? |
| Has any erosion occurred in the seeded area? |
| Any evidence of vehicle tracking on seeded areas? |
| **Vehicle Tracking** |
| Has sediment been tracked onto paved roads, has it been scraped and swept up? |

## 5.2 Requirements Prior to Final Stabilization

Where areas have been temporarily stabilized, inspections may be reduced to one a month. A record of these inspections is to be maintained.

SECTION 6

# Retention of Records

A copy of this SWPPP and all inspection reports are required to be maintained at the field office during the duration of the construction period, project initiation through final stabilization. The SWPPP, inspection records, and reports will be retained for a period of at least 3 years from the date the areas are finally stabilized.

# Attachment 1
# Erosion and Sediment Control Plan

# N62470-08-D-1000 SWMU3, TCRA
# PIER 10 SANDBLAST YARD
# JOINT EXPEDITIONARY BASE LITTLE CREEK
# VIRGINIA BEACH, VIRGINIA
# EROSION AND SEDIMENT CONTROL DRAWINGS

VICINITY MAP
NTS

N

| FIGURE NO. | FIGURE TITLE |
|---|---|
| 1 | COVER SHEET/INDEX |
| 2 | EROSION AND SEDIMENT CONTROL PLAN |
| 3 | EROSION AND SEDIMENT CONTROL NARRATIVE |
| 4 | EROSION AND SEDIMENT CONTROL DETAILS |
| 5 | EROSION AND SEDIMENT CONTROL DETAILS |

LOCATION MAP
NTS

N

For Information Regarding
This Project, Contact:

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PHONE (757) 671-6238
paul.landin@ch2m.com

JUNE 2013

FIGURE 1
COVER SHEET/INDEX

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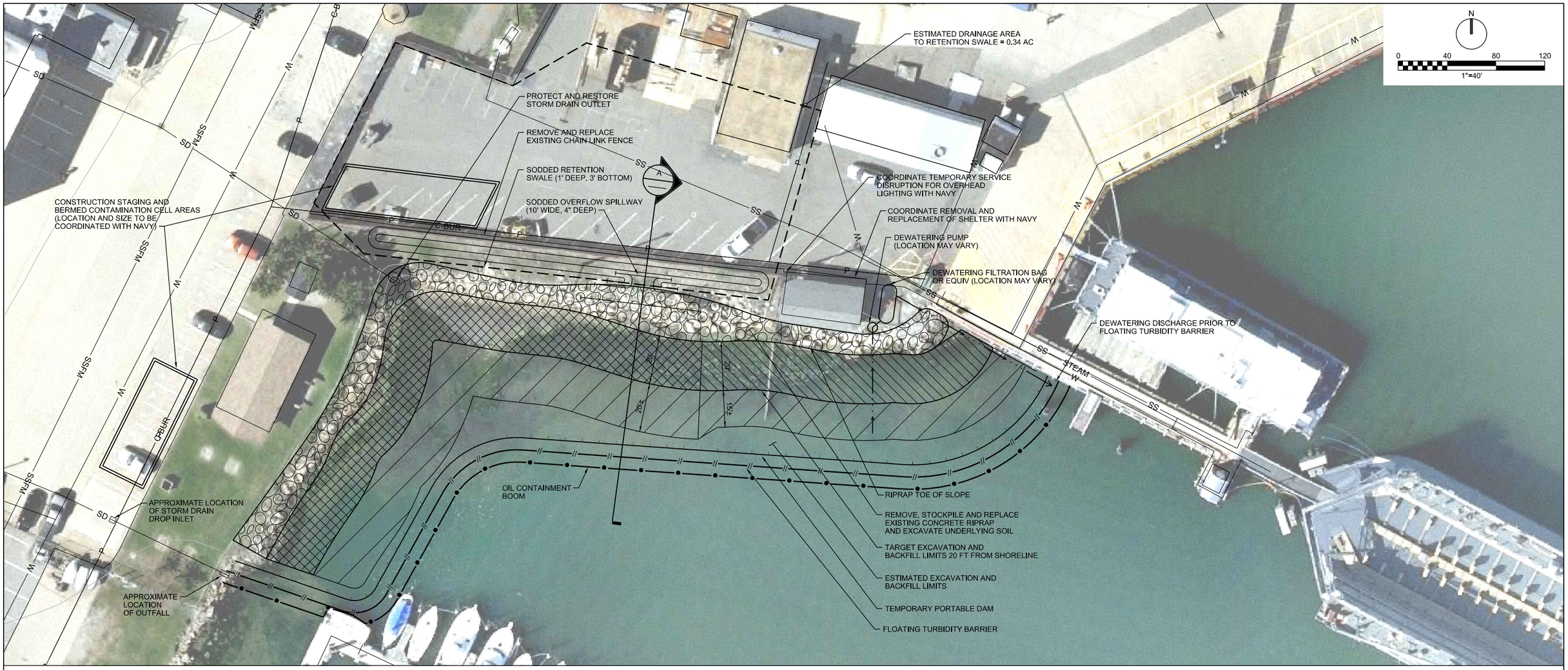


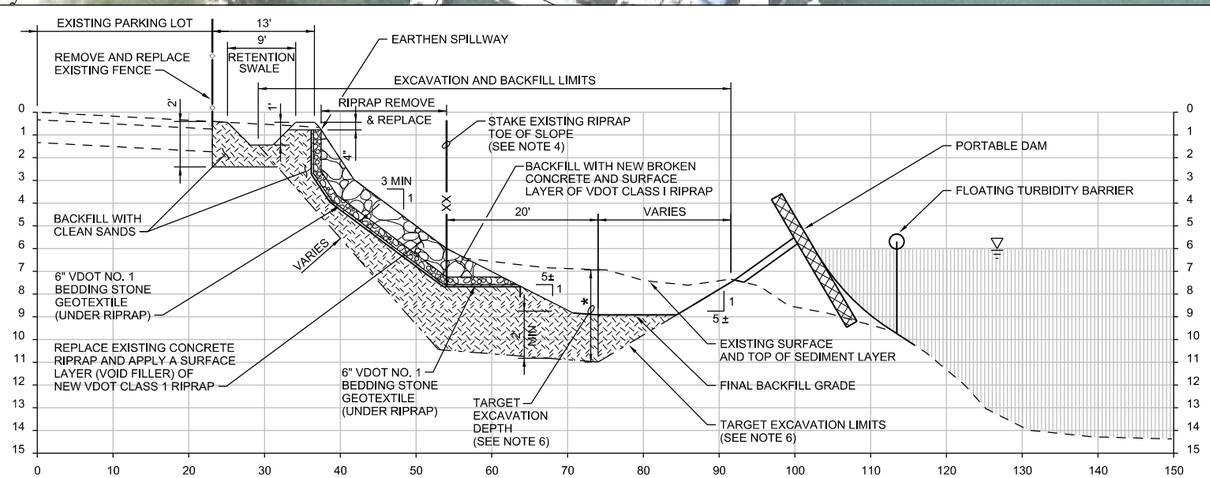


A TYPICAL SECTION
NTS

## LEGEND

- SEDIMENT REMOVAL AREA 3 FOOT TARGET DEPTH
- SEDIMENT REMOVAL AREA 4 FOOT TARGET DEPTH
- RIPRAP SHORELINE
- TEMPORARY PORTABLE DAM
- TURBIDITY CURTAIN
- OIL CONTAINMENT BOOM

NOTES:

1. ESTABLISH TEMPORARY DIVERSION STRUCTURE AND TURBIDITY CURTAIN.
2. LOCATE DROP INLETS THAT MAY BE AFFECTED BY CONSTRUCTION ACTIVITIES AND PROTECT FROM POTENTIAL SITE RELEASES OF CONTAMINATION DURING CONSTRUCTION.
3. DEWATER INSIDE OF TEMPORARY DIVERSION STRUCTURE. DISCHARGE PUMPED WATER IN ACCORDANCE WITH SWPPP (NO DISCHARGE OF TURBID WATER).
4. MARK EXISTING RIPRAP TOE OF SLOPE ALONG SHORELINE WITH STAKES FOR REFERENCE POINT. REMOVE EXISTING CONCRETE RIPRAP FROM SHORELINE. STAGE ON-SITE FOR REUSE DURING RESTORATION ACTIVITIES.
5. EXCAVATE SOIL BENEATH THE REMOVED RIPRAP TO THE EXTENT NECESSARY TO PROVIDE ACCESS FOR EXCAVATION AT THE TOE OF SLOPE FOR SEDIMENT REMOVAL.
6. EXCAVATE SEDIMENT FROM THE TOE OF SLOPE TO A DISTANCE OF 20 FEET INTO THE HARBOR TO A TARGET DEPTH OF 3 OR 4 FEET BELOW THE EXISTING (ORIGINAL) SEDIMENT SURFACE. A SLOPE OF 5H:1V IS ESTIMATED TO ACCOUNT FOR SLOUGHING ON THE HARBOR SIDE OF THE EXCAVATION. IF THE TARGET EXCAVATION DEPTH IS NOT FEASIBLE DURING CONSTRUCTION DUE TO EXCESSIVE SLOUGH IN THE SATURATED SEDIMENT, A MINIMUM DEPTH OF 2 FEET IS REQUIRED.
7. EXCAVATED SOIL AND SEDIMENT IS TO BE STAGED IN THE CONTAINMENT CELL(S) FOR DISPOSAL CHARACTERIZATION AND DEWATERING PRIOR TO LOADING FOR OFFSITE DISPOSAL.
8. PARTIALLY RESTORE THE EXCAVATED SEDIMENT WITH A MINIMUM OF 2 FEET OF CLEAN SAND.
9. RESTORE THE SHORELINE WITH A LAYER OF GEOTEXTILE, A LAYER OF VDOT NO. 1 BEDDING STONE, THE REUSED CONCRETE RIPRAP, AND A NEW SURFACE LAYER (VOID FILLER) OF CLASS A1 RIPRAP. SEED THE GROUND SURFACE WITHIN THE RETENTION SWALE AND ALL OTHER DISTURBED AREAS. INSTALL SILT FENCE TO REMAIN IN PLACE UNTIL VEGETATION IS ESTABLISHED.

FIGURE 2
EROSION AND SEDIMENT CONTROL PLAN

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## SOIL EROSION CONTROL NARRATIVE

SOIL EROSION CONTROL NARRATIVE

**PROJECT DESCRIPTION:** THIS PROJECT CONSISTS OF REMEDIATION RELATED TO CONTAMINATED SOIL AND NEAR-SHORE CONTAMINATED SEDIMENT, AND CONSISTS OF WORK ON BOTH THE LAND AND ALONG THE EDGE OF LITTLE CREEK HARBOR. EARTHWORK ON LAND AND IN THE NEAR-SHORE SEDIMENTS CONSIST OF EXCAVATION AND BACKFILL. AN ENHANCEMENT TO THE QUALITY OF STORMWATER RUNOFF FROM AN ADJACENT PARKING LOT WILL BE IMPROVED BY THE ADDITION OF A RETENTION SWALE STORMWATER MANAGEMENT FEATURE.

**EXISTING SITE CONDITIONS:** SWMU 3 IS LOCATED NEAR THE SOUTHWEST CORNER OF LITTLE CREEK HARBOR. THE PROJECT SITE CONSISTS OF A THIN GRAS STRIP OF LAND, A RIPRAP (BROKEN CONCRETE) STABILIZED EMBANKMENT, AND NEAR-SHORE SEDIMENTS THAT HAVE BEEN IMPACTED BY PREVIOUS NAVY OPERATIONS.

**ADJACENT AREAS:** PARKING LOTS BORDER THE SITE TO THE NORTH AND WEST. A MARINA AND LITTLE CREEK HARBOR BORDER THE PROJECT SITE TO THE WEST AND EAST, RESPECTIVELY.

**SOILS:** THE DISTURBED AREA INCLUDES:

| SOIL TYPE | ERODIBILITY K FACTOR |
|---|---|
| 42 - URBAN LAND | N/A |
| W - WATER | N/A |

**CRITICAL AREAS:** THE ENTIRE PROJECT IS IN A CRITICAL AREA DUE TO ITS IMMEDIATE PROXIMITY TO THE CHESAPEAKE BAY.

**OFF-SITE AREAS:** THERE ARE NO OFF-SITE AREAS OF LAND DISTURBANCE.
**PHASING:** EROSION CONTROL PRACTICES FOR THIS PROJECT ARE IMPLEMENTED AS A SINGLE PHASE DURING CONSTRUCTION ACTIVITIES. NO NEW STORMWATER MANAGEMENT INFRASTRUCTURE IS BEING BUILT.

**THIS EROSION AND SEDIMENT CONTROL PLAN AND NARRATIVE IS INTENDED TO DEFINE THE PRINCIPLES AND PRACTICES TO BE ADAPTED AS NEEDED DURING CONSTRUCTION, WITH AGREEMENT FROM THE NAVY.**

**EROSION AND SEDIMENT CONTROL MEASURES AND SEQUENCING:**

SEDIMENT CONTROL MEASURES SHALL BE INSTALLED AS A FIRST STEP IN REMOVAL OF EXISTING GROUND COVER OR DEMOLITION WITH POTENTIAL FOR RUNOFF OF CONTAMINANTED SOIL OR SEDIMENT. THE MEASURES SHALL BE INSTALLED IN THE ORDER SHOWN:

1. INSTALL TEMPORARY PORTABLE DAM IN LITTLE CREEK HARBOR TO PROVIDE FOR DEWATERING OF WORK AREA ASSOCIATED WITH THE RIPRAP EMBANKMENT AND NEAR-SHORE SEDIMENT EXCAVATION AREA. LOCATION TO BE FIELD-DETERMINED BASED UPON BATHYMETRY DATA AND TO PROVIDE AN OFFSET TO ACCOUNT FOR SLOUGHING OF SATURATED SEDIMENT DURING EXCAVATION. TYPE I TURBIDITY CURTAIN (VESCH STD 3.27) INSTALLED OUTSIDE (HARBOR SIDE) OF THE TEMPORARY DIVERSION STRUCTURE WILL PROVIDE SECONDARY MEASURE TO PREVENT THE RELEASE OF SEDIMENT. THE DEWATERING OF THE WORK AREA WILL BE ACCOMPLISHED USING PUMPS. DEWATERING OPERATIONS ARE TO BE COMPLETED BY PUMPING; SEDIMENT REMOVAL MEANS ARE REQUIRED (E.G. A NON-WOVEN GEOTEXTILE FILTRATION BAG) ON THE DISCHARGE PIPE/HOSE WHEN SEDIMENTS ARE LIKELY TO BE PRESENT. THE DISCHARGE PIPE/HOSE IS TO DISCHARGE INSIDE OF THE TYPE I TURBIDITY CURTAIN.

2. PROVIDE VESCH STD 3.05 SILT FENCE (SF) AT THE DOWNHILL SIDE OF UNPAVED AREAS DISTURBED BY CONSTRUCTION AND NOT ALREADY CONTAINED BY THE TEMPORARY PORTABLE DAM.

3. CONSTRUCT THE TEMPORARY CONTAINMENT CELL FOR THE PLACEMENT OF EXCAVATED SOIL AND SEDIMENT. THE CONTAINMENT CELL IS TO BE BERMED AND LINED AS TO PREVENT THE DISCHARGE OF FLUIDS RESULTING FROM THE DEWATERING OF SATURATED SOIL OR SEDIMENT. THE CONTAINMENT CELL IS TO BE COVERED AS TO PREVENT PRECIPITATION FROM CONTRIBUTING TO THE AMOUNT OF WATER CONTAINED WITHIN THE CELL. THE BOTTOM OF THE CONTAINMENT CELL IS TO BE PROTECTED WITH AN INITIAL LAYER OF SOIL AS TO PREVENT DAMAGE DURING PLACEMENT AND REMOVAL OF STAGED MATERIALS.

4. NO OFF-ROAD ACCESS IS ANTICIPATED FOR TRUCKS HAULING MATERIALS TO AND FROM THE PROJECT SITE. AS SUCH, A VESCH STD 3.02 CONSTRUCTION ENTRANCE IS NOT ANTICIPATED. A MEANS OF IMMEDIATE CLEAN UP OF PAVED LOADING AREAS (E.G., MANUALLY OR WITH THE USE OF A STREET SWEEPER) WILL BE REQUIRED. SEE SECTION 3.1 OF THE SWPPP NARRATIVE.

**EROSION AND SEDIMENT CONTROL MAINTENANCE: ALL MEASURES REQUIRE ONGOING MAINTENANCE TO FUNCTION PROPERLY. RESPONSIBLE LAND DISTURBER SHALL INSPECT CONTROLS AND DIRECT MAINTENANCE. SEDIMENT MUST BE REMOVED FROM SILT FENCES PRIOR TO REACHING HALF THE HEIGHT OF THE BARRIER. IF PONDING OCCURS AT ANY FILTERING DEVICE, THE DEVICE IS TO BE DRAINED IN SUCH A WAY AS TO PREVENT THE DISCHARGE OF ACCUMULATED SEDIMENT. ANY SEDIMENT TRACKED ONTO TO STREETS/PARKING LOTS IS TO BE REMOVED BY SWEEPING OR SCRAPING AT THE END OF EACH WORK DAY.**

**VEGETATIVE PRACTICES:**

**1.** TOPSOIL IS TO BE STOCKPILED SEPARATELY FROM SUBSOIL. TOPSOIL SHALL BE AMENDED TO MEET THE FOLLOWING:

A. SOLIDS CONSIST OF NOT LESS THAN 4% STABLE ORGANIC GROWTH
B. pH LEVELS SHALL BE ADJUSTED AS NECESSARY TO MEET THE NEEDS OF THE PROPOSED PLANTS
C. SOLUBLE SALTS SHALL NOT EXCEED 500 ppm
D. TOPSOIL DEPTH SHALL BE A MINIMUM OF 4 INCHES

2. TEMPORARY SEEDING: ALL DENUDED AREAS LEFT DORMANT FOR 30 DAYS SHALL RECEIVE TEMPORARY SEEDING.

3. PERMANENT SEEDING: ANY AREA LEFT DORMANT FOR A YEAR SHALL RECEIVE PERMANENT SEEDING

**PERMANENT STABILIZATION:** PERMANENT STABILIZATION SHALL CONSIST OF CLEAN GRAVEL OR RE-ESTABLISHED TURF GRASS/MEADOW. PERFORMANCE STANDARDS SHALL CONFIRM TO THE REQUIREMENTS OF THE CONTRACT DOCUMENTS AND TO THE RELEVANT VESCH STANDARDS (3.30 TOPSOILING, 3.31 TEMPORARY SEEDING, 3.32 PERMANENT SEEDING [SEED MIX CHARTS AND MAINTENANCE/INSPECTION REQUIREMENTS], 3.33 SODDING, AND 3.35 MULCHING).

**VIRGINIA GENERAL EROSION AND SEDIMENT CONTROL NOTES**

ES-1 UNLESS OTHERWISE INDICATED, ALL VEGETATIVE AND STRUCTURUAL EROSION AND SEDIMENT CONTROL PRACTICES ARE TO BE CONSTRUCTED AND MAINTAINED ACCORDING TO MINIMUM STANDARDS AND SPECIFICATIONS OF THE VESCH, TECHNICAL BULLETINS NO. 1 AND NO. 4, AND 4VAC-50-30.

ES-2 THE PLAN APPROVING AUTHORITY MUST BE NOTIFIED ONE WEEK PRIOR TO THE PRE-CONSTRUCTION CONFERENCE, ONE WEEK PRIOR TO THE COMMENCEMENT OF LAND DISTURBING ACTIVITY, AND ONE WEEK PRIOR TO THE FINAL INSPECTION. *NOTE: THIS PROJECT IS BEING COMPLETED UNDER CERCLA AND THIS PLAN SERVES TO MEET THE SUBSTANTIVE INTENT ONLY.*

ES-3 ALL EROSION AND SEDIMENT CONTROLS ARE TO BE PLACED PRIOR TO OR AS THE FIRST STEP OF CLEARING.

ES-4 A COPY OF THE EROSION AND SEDIMENT CONTROL PLAN SHALL BE MAINTAINED AT THE SITE AT ALL TIMES.

ES-5 PRIOR TO COMMENCING LAND DISTURBING ACTIVITIES IN AREAS OTHER THAN INDICATED ON THESE PLANS (INCLUDING, BUT NOT LIMITED TO, OFF-SITE BORROW OR WASTE AREAS), THE CONTRACTOR SHALL SUBMIT A SUPPLEMENTALRY EROSION AND SEDIMENT CONTROL PLAN.

ES-6 THE CONTRACTOR IS RESPONSIBLE FOR INSTALLATION OF ANY ADDITIONAL MEASURES NECESSARY TO PREVENT EROSION AND SEDIMENTATION AS DETERMINED BY THE PLAN APPROVING AUTHORITY.

ES-7 ALL DISTURBED AREAS ARE TO DRAIN TO APPROVED SEDIMENT CONTROL MEASURES AT ALL TIMES DURING LAND DISTURBING ACTIVITIES AND DURING SITE DEVELOPMENT UNTIL FINAL STABILIZATION IS ACHIEVED.

ES-8 DURING DEWATERING OPERATIONS, WATER SHALL BE PLACED INTO A FILTERING DEVICE TO MINIMIZE THE POTENTIAL FOR THE RELEASE OF SEDIMENT.

ES-9 THE CONTRACTOR SHALL INSPECT ALL EROSION CONTROL MEASURES PERIODICALLY AND AFTER EACH RUNOFF-PRODUCING RAINFALL EVENT. ANY NECESSARY REPAIRS OR CLEANUP TO MAINTAIN THE EFFECTIVENESS OF THE EROSION CONTROL DEVICES SHALL BE MADE IMMEDIATELY.

## VIRGINIA- GENERAL EROSION CONTROL NOTES

ES-1 UNLESS OTHERWISE INDICATED, ALL VEGETATIVE AND STRUCTURAL EROSION AND SEDIMENT CONTROL PRACTICES SHALL BE CONSTRUCTED AND MAINTAINED ACCORDING TO MINIMUM STANDARDS AND SPECIFICATIONS OF THE VIRGINIA EROSION AND SEDIMENT CONTROL HANDBOOK (VESCH), TECHNICAL BULLETINS NO.1 AND NO.4, AND VIRGINIA REGULATIONS 4VAC-50-30.

ES-2 THE PLAN APPROVING AUTHORITY MUST BE NOTIFIED ONE WEEK PRIOR TO THE PRE-CONSTRUCTION CONFERENCE, ONE WEEK PRIOR TO THE COMMENCEMENT OF LAND DISTURBING ACTIVITY, AND ONE WEEK PRIOR TO FINAL INSPECTION.

ES-3 ALL EROSION AND SEDIMENT CONTROL MEASURES ARE TO BE PLACED PRIOR TO OR AS THE FIRST STEP OF CLEARING.

ES-4 A COPY OF THE APPROVED EROSION AND SEDIMENT CONTROL PLAN SHALL BE MAINTAINED AT THE SITE AT ALL TIMES.

ES-5 PRIOR TO COMMENCING LAND DISTURBING ACTIVITIES IN AREAS OTHER THAN INDICATED ON THESE PLANS (INCLUDING, BUT NOT LIMITED TO, OFF-SITE BORROW OR WASTE AREAS), THE CONTRACTOR SHALL SUBMIT A SUPPLEMENTARY EROSION CONTROL PLAN TO THE OWNER FOR REVIEW AND APPROVAL BY THE PLAN APPROVING AUTHORITY.

ES-6 THE CONTRACTOR IS RESPONSIBLE FOR INSTALLATION OF ANY ADDITIONAL EROSION CONTROL MEASURES NECESSARY TO PREVENT EROSION AND SEDIMENTATION AS DETERMINED BY THE PLAN APPROVING AUTHORITY.

ES-7 ALL DISTURBED AREAS ARE TO DRAIN TO APPROVED SEDIMENT CONTROL MEASURES AT ALL TIMES DURING LAND DISTURBING ACTIVITIES AND DURING SITE DEVELOPMENT UNTIL FINAL STABILIZATION IS ACHIEVED.

ES-8 DURING DEWATERING OPERATIONS, WATER SHALL BE PUMPED INTO AN APPROVED FILTERING DEVICE.

ES-9 THE CONTRACTOR SHALL INSPECT ALL EROSION CONTROL MEASURES PERIODICALLY AND AFTER EACH RUNOFF PRODUCING RAINFALL EVENT. ANY NECESSARY REPAIRS OR CLEANUP TO MAINTAIN THE EFFECTIVENESS OF THE EROSION CONTROL DEVICES SHALL BE MADE IMMEDIATELY.

## SEEDING AND FERTILIZER

**TEMPORARY SEEDING:** REFER TO VESCH STD 3.31

| DATES | SPECIES | RATES(LB/AC) |
|---|---|---|
| SEP 1 - FEB 15 | 50/50 ANNUAL RYEGRASS | 50-100 |
| FEB 16 - APR 30 | ANNUAL RYEGRASS | 60-100 |
| MAY 1 - AUG 31 | GERMAN MILLET | 50 |

**FERTILIZER:** 10-10-10 AT 10 LB / 1000 SF OR AS DETERMINED BY A CERTIFIED SOIL TEST
50% OR MORE OF THE NITROGEN SHALL BE IN SLOWLY AVAILABLE FORM

**PULVERIZED AGRICULTURAL LIMESTONE:** 90 LB/ 1000 SF
OR AS DETERMINED BY SOILS TEST

**MULCH:** 45 LBS / 1000 SF STRAW MULCH OR TEMPORARY EROSION CONTROL BLANKET

**PERMANENT SEEDING: REFER TO VESCH STD 3.32-D**

SITE SPECIFIC SEEDING MIXTURES FOR COASTAL PLAIN AREA:

COMMEN BERMUDAGRASS @ 75 LBS/ACRE

ADDITIONALLY, USE SEASONAL NURSE CROP IN ACCORDANCE WITH DATES BELOW:

| | |
|---|---|
| FEB - APR | ANNUAL RYE |
| MAY - AUG | FOXTAIL MILLET |
| SEP - NOV 15 | ANNUAL RYE |
| NOV 16 - JAN | WINTER RYE |

**FERTILIZER:** 10-20-10 AT 12 LB / 1000 SF OR AS DETERMINED BY SOIL TEST 50% OR MORE OF THE NITROGEN SHALL BE IN SLOWLY AVAILABLE FORM
**PULVERIZED AGRICULTURAL LIMESTONE:** 90 LB/ 1000 SF
OR AS DETERMINED BY SOILS TEST
**MULCH:** 45 LBS / 1000 SF STRAW OR TEMPORARY EROSION CONTROL BLANKET.

**TEMPORARY AND PERMANENT SEEDING NOTES:**

1. SOIL TEST IS NECESSARY TO DETERMINE THE ACTUAL AMOUNT OF LIME REQUIRED TO ADJUST THE pH OF SITE, AND THE CONTENT AND RATE OF FERTILIZER.

2. INCORPORATE THE LIME AND FERTILIZER INTO THE TOP 4 - 6 INCHES OF THE SOIL BY DISKING OR OTHER MEANS.

3. WHEN APPLYING SLOWLY AVAILABLE NITROGEN USE RATES AVAILABLE IN TECHNICAL BULLETIN No. 4

4. WATER AND MAINTAIN PLANTED GRASSES A MINIMUM OF 60 DAYS OR UNTIL VEGETATION IS SUFFICIENTLY ESTABLISHED.

## RESPONSIBLE LAND DISTURBER CERTIFICATION

THE CONTRACTOR MUST OBTAIN AND MAINTAIN "RESPONSIBLE LAND DISTURBER" CERTIFICATION FROM THE VIRGINIA DEPARTMENT OF CONSERVATION AND RECREATION THROUGHOUT THE DURATION OF THE PROJECT. CERTIFICATION TRAINING MATERIALS AND ONLINE TEST ARE AVAILABLE AT:
(http://www.dcr.virginia.gov/soil_&_water/es_rld.shtml#downloads)

ALL EROSION CONTROL PRACTICES SHALL BE INSPECTED DAILY BY THE DCR CERTIFIED RESPONSIBLE LAND DISTURBER. ANY DAMAGED STRUCTURAL PRACTICES OR SEEDED AREAS SHALL BE REPAIRED BY THE CLOSE OF THE WORK DAY.

INSPECTION RECORDS SHALL BE SIGNED AND DATED BY THE DCR CERTIFIED RESPONSIBLE LAND DISTURBER AND INCLUDED IN THE CONSTRUCTION STORMWATER POLLUTION PREVENTION PLAN (SWPPP) DOCUMENTATION. INSPECTION REPORTS SHALL DOCUMENT WHETHER ESC MEASURES ARE EFFECTIVE IN PREVENTING SEDIMENT AND CONSTRUCTION CHEMICALS / MATERIALS FROM ENTERING THE STORM SYSTEM. LOCATIONS, CONSTRUCTION ACTIVITY DESCRIPTIONS, AND POLLUTION PREVENTION MEASURES SHALL BE DOCUMENTED. CORRECTIVE ACTIONS SHALL BE DOCUMENTED. CITY AND STATE INSPECTORS MAY AUDIT INSPECTION RECORDS.

## STORMWATER RUNOFF - ADEQUATE OUTFALL NARRATIVE:

THIS PROJECT DOES NOT INCREASE THE PEAK RUNOFF FLOW RATE.

## VIRGINIA- EROSION CONTROL MINIMUM STANDARDS 4VAC-50-30-40

MS1. PERMANENT OR TEMPORARY SOIL STABILIZATION SHALL BE APPLIED TO DENUDED AREAS WITHIN SEVEN (7) DAYS AFTER FINAL GRADE IS REACHED ON ANY PORTION OF THE SITE. TEMPORARY SOIL STABILIZATION SHALL BE
APPLIED WITHIN SEVEN (7) DAYS TO DENUDED AREAS THAT MAY NOT BE AT FINAL GRADE BUT WILL REMAIN DORMANT FOR LONGER THAN THIRTY (30) DAYS. PERMANENT STABILIZATION SHALL BE APPLIED TO AREAS THAT ARE TO BE LEFT DORMANT FOR MORE THAN ONE (1) YEAR.
**SITE: APPLICABLE. SEE NARRATIVE UNDER "PERMANENT STABILIZATION".**

2. SOIL STOCKPILES AND BORROW AREAS SHALL BE STABILIZED OR PROTECTED WITH SEDIMENT TRAPPING MEASURES.
**SITE: APPLICABLE. SEE NARRATIVE UNDER "EROSION CONTROL MEASURES AND SEQUENCING"**

3. A PERMANENT VEGETATIVE COVER SHALL BE ESTABLISHED ON DENUDED AREAS NOT OTHERWISE PERMANENTLY STABILIZED. PERMANENT VEGETATION SHALL NOT BE CONSIDERED ESTABLISHED UNTIL A GROUND COVER IS ACHIEVED THAT IS UNIFORM, MATURE ENOUGH TO SURVIVE AND WILL INHIBIT EROSION.
**SITE: APPLICABLE.**

4. SEDIMENT BASINS AND TRAPS, PERIMETER DIKES, SEDIMENT BARRIERS AND OTHER MEASURES INTENDED TO TRAP SEDIMENT SHALL BE CONSTRUCTED AS A FIRST STEP IN ANY LAND-DISTURBING ACTIVITY AND SHALL BE MADE FUNCTIONAL BEFORE UPSLOPE LAND DISTURBANCE TAKES PLACE.
**SITE: APPLICABLE TO SF SHOWN ON PLANS. SEE VIRGINIA GENERAL EROSION CONTROL**

5. STABILIZATION MEASURES SHALL BE APPLIED TO EARTHEN STRUCTURES SUCH AS DAMS, DIKES, AND DIVERSIONS IMMEDIATELY AFTER INSTALLATION.
**SITE: NOT APPLICABLE. MEASURES NOT USED.**

6. SEDIMENT TRAPS AND SEDIMENT BASINS SHALL BE DESIGNED AND CONSTRUCTED BASED UPON TOTAL DRAINAGE AREA TO BE SERVED BY THE TRAP OR BASIN.

a. THE MINIMUM STORAGE CAPACITY OF A SEDIMENT TRAP SHALL BE 134 CUBIC YARDS PER ACRE OF DRAINAGE AREA AND THE TRAP SHALL ONLY CONTROL DRAINAGE AREAS LESS THAN THREE (3) ACRES.

b. SURFACE RUNOFF FROM DISTURBED AREAS THAT IS COMPRISED OF FLOW FROM DRAINAGE AREAS GREATER THAN OR EQUAL TO THREE (3) ACRES SHALL BE CONTROLLED BY A SEDIMENT BASIN. THE MINIMUM STORAGE CAPACITY OF A SEDIMENT BASIN SHALL BE 134 CUBIC YARDS PER ACRE OF DRAINAGE AREA. THE OUTFALL SYSTEM SHALL, AT A MINIMUM, MAINTAIN THE STRUCTURAL INTEGRITY OF THE BASIN DURING A 25-YEAR STORM OF 24-HOUR DURATION. RUNOFF COEFFICIENTS USED IN RUNOFF CALCULATIONS SHALL CORRESPOND TO A BARE EARTH CONDITION OR THOSE CONDITIONS EXPECTED TO EXIST WHILE THE SEDIMENT BASIN IS UTILIZED.
**SITE: NOT APPLICABLE**

7. CUT AND FILL SLOPES SHALL BE DESIGNED AND CONSTRUCTED IN A MANNER THAT WILL MINIMIZE EROSION. SLOPES THAT ARE FOUND TO BE ERODING EXCESSIVELY WITHIN ONE (1) YEAR OF PERMANENT STABILIZATION SHALL BE PROVIDED WITH ADDITIONAL SLOPE STABILIZING MEASURES UNTIL THE PROBLEM IS CORRECTED.
**SITE: APPLICABLE.**

8. CONCENTRATED RUNOFF SHALL NOT FLOW DOWN CUT OR FILL SLOPES UNLESS CONTAINED WITHIN AN ADEQUATE TEMPORARY OR PERMANENT CHANNEL, FLUME, OR SLOPE DRAIN STRUCTURE.
**SITE: NOT APPLICABLE. NO CONCENTRATED RUNOFF OR LONG SLOPES.**

9. WHENEVER WATER SEEPS FROM A SLOPE FACE, ADEQUATE DRAINAGE OR OTHER PROTECTION SHALL BE PROVIDED.
**SITE: NOT APPLICABLE.**

10. ALL STORM SEWER INLETS THAT ARE MADE OPERATIONAL DURING CONSTRUCTION SHALL BE PROTECTED SO THAT SEDIMENT-LADEN WATER CANNOT ENTER THE CONVEYANCE SYSTEM WITHOUT FIRST BEING FILTERED OR OTHERWISE TREATED TO REMOVE SEDIMENT.
**SITE: NO NEW INLETS AS PART OF PROJECT, BUT THE PRINCIPLE APPLIES TO WORK DOWNSTREAM OF EXISTING STORM OUTFALLS.**

11. BEFORE NEWLY CONSTRUCTED STORMWATER CONVEYANCE CHANNELS OR PIPES ARE MADE OPERATIONAL, ADEQUATE OUTLET PROTECTION AND ANY REQUIRED TEMPORARY OR PERMANENT CHANNEL LINING SHALL BE INSTALLED IN BOTH THE CONVEYANCE CHANNEL AND RECEIVING CHANNEL.
**SITE: APPLICABLE TO WORK DOWNSTREAM OF OUTFALL PIPES.**

12. WHEN WORK IN A LIVE WATERCOURSE IS PERFORMED, PRECAUTIONS SHALL BE TAKEN TO MINIMIZE ENCROACHMENT, CONTROL SEDIMENT TRANSPORT AND STABILIZE THE WORK AREA TO THE GREATEST EXTENT POSSIBLE DURING CONSTRUCTION. NONERODIBLE MATERIAL SHALL BE USED FOR THE CONSTRUCTION OF CAUSEWAYS AND COFFERDAMS. EARTHEN FILL MAY BE USED FOR THESE STRUCTURES IF ARMORED BY NONERODIBLE COVER MATERIALS.
**SITE: APPLICABLE.**

13. WHEN A LIVE WATERCOURSE MUST BE CROSSED BY CONSTRUCTION VEHICLES MORE THAN TWICE IN ANY SIX-MONTH PERIOD, A TEMPORARY VEHICULAR STREAM CROSSING CONSTRUCTED OF NONERODIBLE MATERIAL SHALL BE PROVIDED.
**SITE: POTENTIALLY APPLICABLE.**

14. ALL APPLICABLE FEDERAL, STATE, AND LOCAL REGULATIONS PERTAINING TO WORKING IN OR CROSSING LIVE WATERCOURSES SHALL BE MET.
**SITE: APPLICABLE. AS PART OF THE CERCLA PROGRAM, SUBSTANTIVE REQUIREMENTS MUST BE MET, BUT ADMINISTRATIVE REQUIREMENTS DO NOT.**

15. THE BED AND BANKS OF A WATERCOURSE SHALL BE STABILIZED IMMEDIATELY AFTER WORK IN THE WATERCOURSE IS COMPLETED.
**SITE: APPLICABLE.**

16. UNDERGROUND UTILITY LINES SHALL BE INSTALLED IN ACCORDANCE WITH THE FOLLOWING STANDARDS IN ADDITION TO OTHER APPLICABLE CRITERIA:

a. NO MORE THAN 500 LINEAR FEET OF TRENCH MAY BE OPENED AT ONE TIME.

b. EXCAVATED MATERIAL SHALL BE PLACED ON THE UPHILL SIDE OF TRENCHES.

c. EFFLUENT FROM DEWATERING OPERATIONS SHALL BE FILTERED OR PASSED THROUGH AN APPROVED SEDIMENT TRAPPING DEVICE, OR BOTH, AND DISCHARGED IN A MANNER THAT DOES NOT ADVERSELY AFFECT FLOWING STREAMS OR OFF-SITE PROPERTY.

d. MATERIAL USED FOR BACKFILLING TRENCHES SHALL BE PROPERLY COMPACTED IN ORDER TO MINIMIZE EROSION AND PROMOTE STABILIZATION.

e. RESTABILIZATION SHALL BE ACCOMPLISHED IN ACCORDANCE WITH THESE REGULATIONS.

f. APPLICABLE SAFETY REGULATIONS SHALL BE COMPLIED WITH.
**SITE: NOT APPLICABLE.**

17. WHERE CONSTRUCTION VEHICLES ACCESS ROUTES INTERSECT PAVED OR PUBLIC ROADS, PROVISIONS SHALL BE MADE TO MINIMIZE THE TRANSPORT OF SEDIMENT BY VEHICULAR TRACKING ONTO THE PAVED SURFACE, WHERE SEDIMENT IS TRANSPORTED ONTO A PAVED OR PUBLIC ROAD SURFACE, THE ROAD SURFACE SHALL BE CLEANED THOROUGHLY AT THE END OF EACH DAY. SEDIMENT SHALL BE REMOVED FROM THE ROADS BY SHOVELING OR SWEEPING AND TRANSPORTED TO A SEDIMENT CONTROL DISPOSAL AREA. STREET WASHING SHALL BE ALLOWED ONLY AFTER SEDIMENT IS REMOVED IN THIS MANNER. THIS PROVISION SHALL APPLY TO INDIVIDUAL DEVELOPMENT LOTS AS WELL AS TO LARGER LAND-DISTURBING ACTIVITIES.
**SITE: APPLICABLE.**

18. ALL TEMPORARY EROSION AND SEDIMENT CONTROL MEASURES SHALL BE REMOVED WITHIN THIRTY (30) DAYS AFTER FINAL SITE STABILIZATION OR AFTER THE TEMPORARY MEASURES ARE NO LONGER NEEDED, UNLESS OTHERWISE AUTHORIZED BY THE LOCAL PROGRAM AUTHORITY. TRAPPED SEDIMENT AND THE DISTURBED SOIL AREAS RESULTING FROM THE DEPOSITION OF TEMPORARY MEASURES SHALL BE PERMANENTLY STABILIZED TO PREVENT FURTHER EROSION AND SEDIMENTATION.
**SITE:APPLICABLE. COORDINATE WITH FACILITY ENVIRIONMENTAL OFFICER.**

19. PROPERTIES AND WATERWAYS DOWNSTREAM FROM DEVELOPMENT SITES SHALL BE PROTECTED FROM SEDIMENT DEPOSITION, EROSION AND DAMAGE DUE TO INCREASES IN VOLUME, VELOCITY AND PEAK FLOW RATE OF STORMWATER RUNOFF FOR THE STATED FREQUENCY STORM OF 24-HOUR IN ACCORDANCE WITH THE FOLLOWING STANDARDS AND CRITERIA:

a. CONCENTRATED STORMWATER RUNOFF LEAVING A DEVELOPMENT SITE SHALL BE DISCHARGED DIRECTLY INTO AN ADEQUATE NATURAL OR MAN-MADE RECEIVING CHANNEL, PIPE OR STORM SEWER SYSTEM. FOR THOSE SITES WHERE RUNOFF IS DISCHARGED INTO A PIPE OR PIPE SYSTEM, DOWNSTREAM STABILITY ANALYSES AT THE OUTFALL OF THE PIPE OR PIPE SYSTEM SHALL BE PERFORMED.

b. ADEQUACY OF ALL CHANNELS AND PIPES SHALL BE VERIFIED IN THE FOLLOWING MANNER:

(1) DEMONSTRATE THAT THE TOTAL DRAINAGE AREA TO THE POINT OF ANALYSIS WITHIN THE CHANNEL IS ONE HUNDRED TIMES GREATER THAN THE CONTRIBUTING DRAINAGE AREA OF THE PROJECT; OR

(2) NATURAL CHANNELS SHALL BE ANALYZED BY THE USE OF A 2YEAR STORM TO VERIFY THAT STORMWATER WILL NOT CHANNEL BANKS NOR CAUSE EROSION OF CHANNEL BED OR BANKS.

ALL PREVIOUSLY CONSTRUCTED MAN-MADE CHANNELS SHALL BE ANALYZED BY THE USE OF A 10-YEAR STORM TO VERIFY THAT STORMWATER WILL NOT OVERTOP ITS BANKS AND BY THE USE OF A 2-YEAR STORM TO DEMONSTRATE THAT STORMWATER WILL NOT CAUSE EROSION OF CHANNEL BED OR BANKS; AND PIPES AND STORM SEWER SYSTEMS SHALL BE ANALYZED BY THE USE OF A 10-YEAR STORM TO VERIFY THAT STORMWATER WILL BE CONTAINED WITHIN THE PIPE OR SYSTEM.

IF EXISTING NATURAL RECEIVING CHANNELS OR PREVIOUSLY CONSTRUCTED MAN-MADE CHANNELS OR PIPES ARE NOT ADEQUATE, THE APPLICANT SHALL:

(1) IMPROVE THE CHANNELS TO A CONDITION WHERE A 10-YEAR STORM WILL NOT OVERTOP THE BANKS AND A 2-YEAR STORM WILL NOT CAUSE EROSION TO THE CHANNEL BED OR BANKS; OR

(2) IMPROVE THE PIPE OR PIPE SYSTEM TO A CONDITION WHERE THE 10-YEAR STORM IS CONTAINED WITHIN THE APPURTENANCES;

(3) DEVELOP A SITE DESIGN THAT WILL NOT CAUSE THE PREDEVELOPMENT PEAK RUNOFF RATE FROM A 2-YEAR STORM TO INCREASE WHEN RUNOFF OUTFALLS INTO A NATURAL CHANNEL OR WILL NOT CAUSE THE PRE-DEVELOPMENT PEAK RUNOFF RATE FROM A 10-YEAR STORM TO INCREASE WHEN RUNOFF OUTFALLS INTO A MAN-MADE CHANNEL; OR

(4) PROVIDE A COMBINATION OF CHANNEL IMPROVEMENTS, STORMWATER DETENTION OR OTHER MEASURES WHICH IS SATISFACTORY TO THE PLAN APPROVING AUTHORITY TO PREVENT DOWNSTREAM EROSION.

a.THE APPLICANT SHALL PROVIDE EVIDENCE OF PERMISSION TO MAKE THE IMPROVEMENTS.

b.ALL HYDROLOGIC ANALYSES SHALL BE BASED ON THE EXISTING ATERSHED CHARACTERISTICS AND THE ULTIMATE DEVELOPMENT OF THE SUBJECT PROJECT.

c.IF THE APPLICANT CHOOSES AN OPTION THAT INCLUDES STORMWATER DETENTION, HE/SHE SHALL OBTAIN APPROVAL FROM THE LOCALITY OF A PLAN FOR MAINTENANCE OF THE DETENTION FACILITIES. THE PLAN SHALL SET FORTH THE MAINTENANCE REQUIREMENTS OF THE FACILITY AND THE PERSON RESPONSIBLE FOR PERFORMING THE MAINTENANCE.

d.OUTFALL FROM A DETENTION FACILITY SHALL BE DISCHARGED TO A RECEIVING CHANNEL, AND ENERGY DISSIPATORS SHALL BE PLACED AT THE OUTFALL OF ALL DETENTION FACILITIES AS NECESSARY TO PROVIDE A STABILIZED TRANSITION FROM THE FACILITY TO THE RECEIVING CHANNEL.

e. ALL ON-SITE CHANNELS MUST BE VERIFIED TO BE ADEQUATE.

f.INCREASED VOLUMES OF SHEET FLOWS THAT MAY CAUSE EROSION OR SEDIMENTATION ON ADJACENT PROPERTY SHALL BE DIVERTED TO A STABLE OUTLET, ADEQUATE CHANNEL, PIPE OR PIPE SYSTEM, OR TO A DETENTION FACILITY.

g.IN APPLYING THESE STORMWATER MANAGEMENT CRITERIA, INDIVIDUAL LOTS OR PARCELS IN A RESIDENTIAL, COMMERCIAL OR INDUSTRIAL DEVELOPMENT SHALL NOT BE CONSIDERED TO BE SEPARATE DEVELOPMENT PROJECTS, INSTEAD, THE DEVELOPMENT, AS A WHOLE, SHALL BE CONSIDERED TO BE A SINGLE DEVELOPMENT PROJECT. HYDROLOGIC PARAMETERS THAT REFLECT THE ULTIMATE DEVELOPMENT CONDITION SHALL BE USED IN ALL ENGINEERING CALCULATIONS.

ALL MEASURES USED TO PROTECT PROPERTIES AND WATERWAYS SHALL BE EMPLOYED IN A MANNER WHICH MINIMIZES IMPACTS ON THE PHYSICAL, CHEMICAL, AND BIOLOGICAL INTEGRITY OF RIVERS, STREAMS AND OTHER WATERS OF THE STATE.
**SITE: THE POST-DEVELOPED RUNOFF IS THE SAME AS PRE-DEVELOPED. NO IMPERVIOUS COVER IS INSTALLED DURING THE PROJECT.**

FIGURE 3
EROSION AND SEDIMENT
CONTROL NARRATIVE

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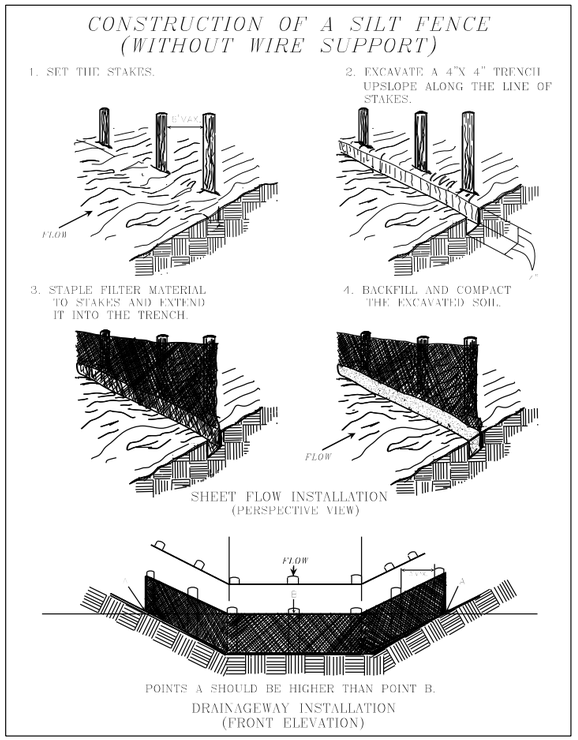
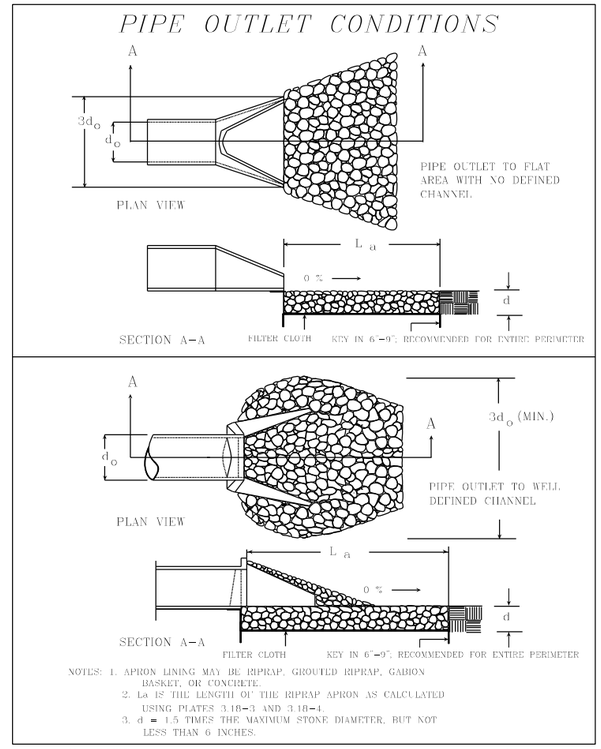



SOURCE: Adapted from Installation of Straw and Fabric Filter Barriers for Sediment Control,VA. DSWC
Sherwood and Wyant

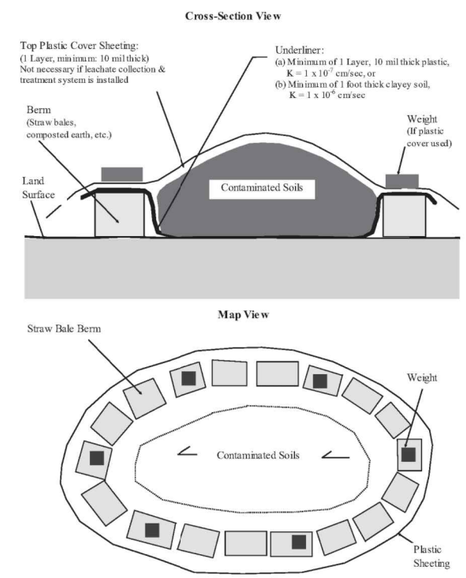
PLATE. 3.05-2

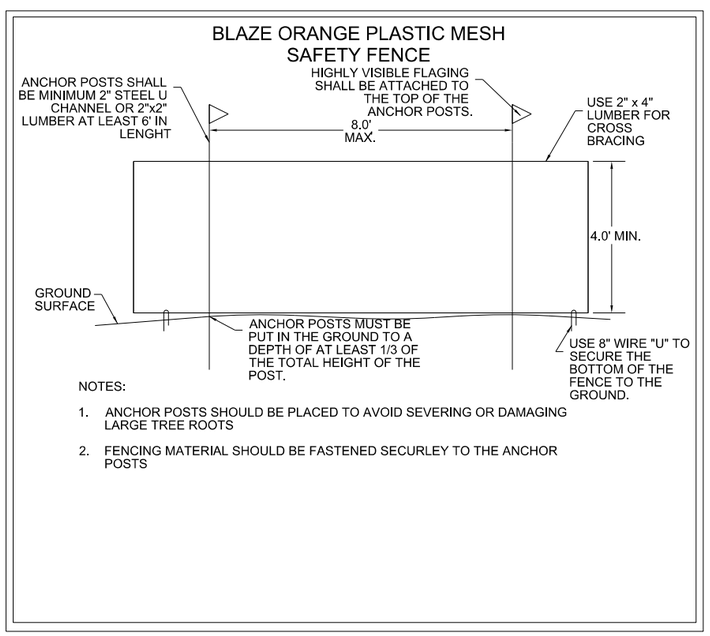


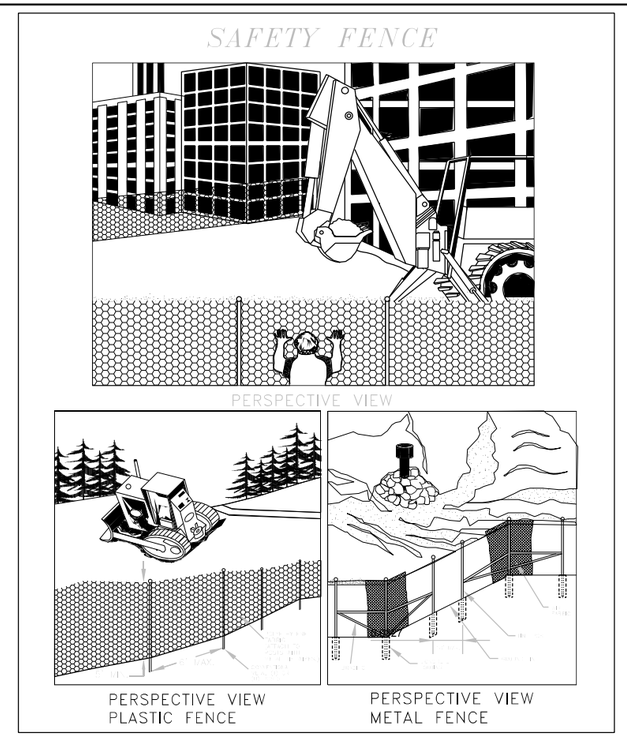

Source: Va. DSWC

Plate 3.18-1

FIGURE 2
DIAGRAM FOR TEMPORARY CONTAINMENT
OF STRUCTURAL SOIL AND SEDIMENT



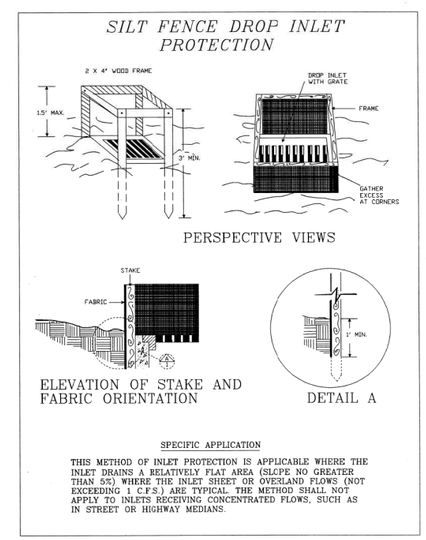




SOURCE: CONWED PLASTICS
VDOT ROAD AND BRIDGE STANDARDS
VA. DSWC

PLATE. 3.1-1

1992 3.07




Source: N.C. Erosion and Sediment Control Planning and Design Manual, 1988

Plate 3.07-1

III - 35

FIGURE 4
EROSION AND SEDIMENT
CONTROL DETAILS

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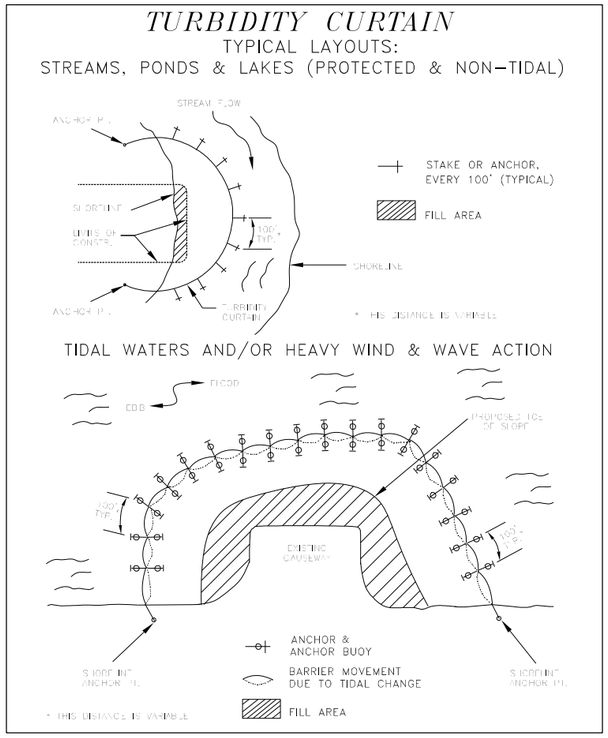
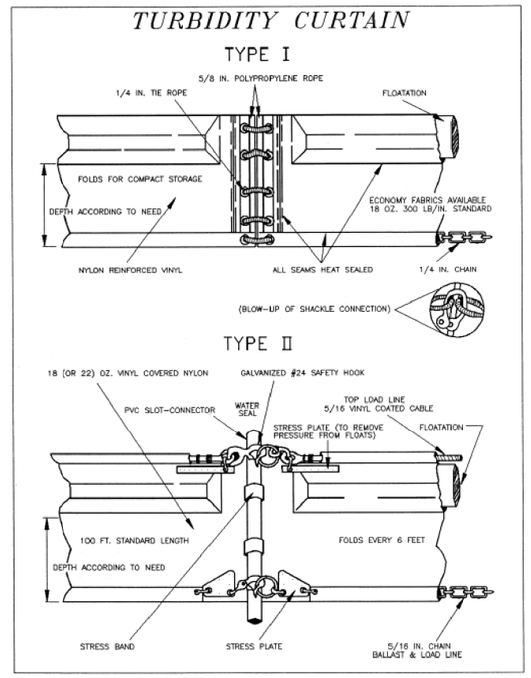
FILENAME: 005-C-04_411286.dgn PLOT DATE: 2013\06\06 PLOT TIME: 2:29:11 PM




SOURCE: ADAPTED FROM FLORIDA DEPARTMENT OF TRANSPORTATION ROAD AND DESIGN SPECIFICATIONS

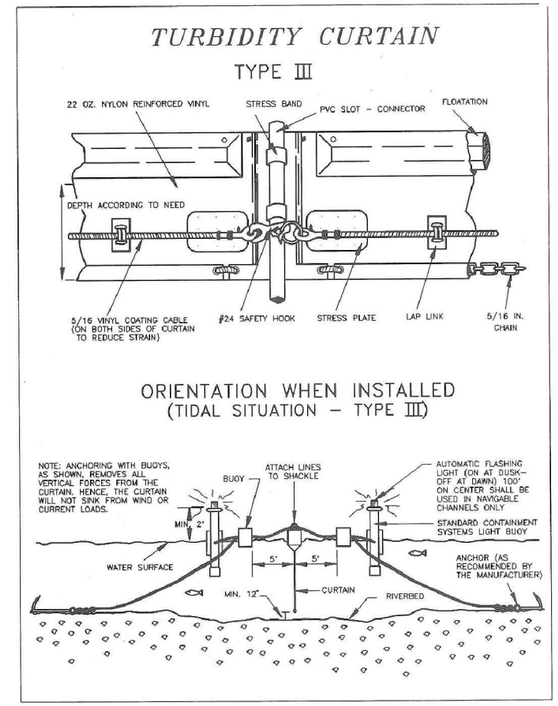
PLATE. 3.27-3





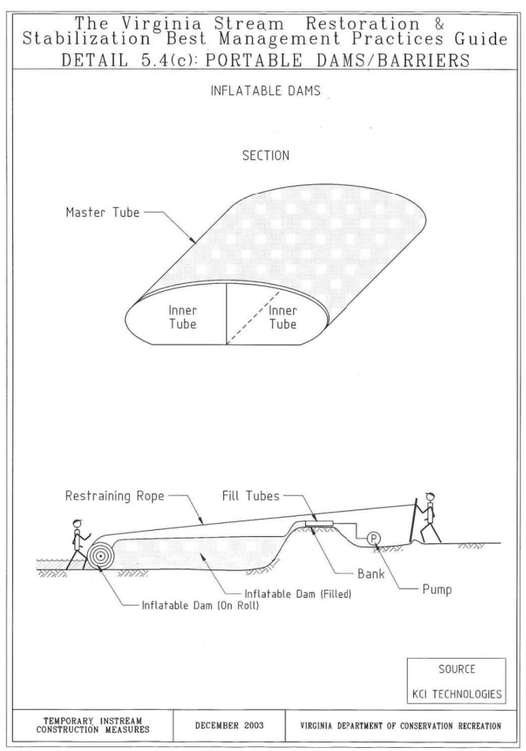

Source: American Boom and Barrier Corp. product literature

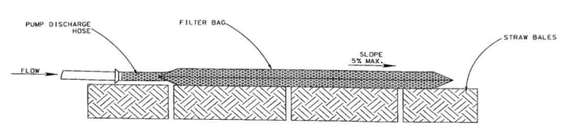
Plate 3.27-1




Source: Adapted from American Boom and Barrier Corp. and VDOT Standard Sheets

Plate 3.27-2




DEWATERING FILTRATION BAG

CONSTRUCTION SPECIFICATIONS

1. FILTER BAG SHALL BE OF NON-WOVEN GEOTEXTILE FABRIC WITH A MINIMUM SURFACE AREA OF 225 SQUARE FEET PER SIDE.

2. ALL STRUCTURAL SEAMS SHALL BE SEWN WITH A DOUBLE STITCH USING A DOUBLE NEEDLE MACHINE WITH HIGH STRENGTH THREAD. SEAM STRENGTH SHALL WITHSTAND 100 POUNDS/INCH USING ASTM D-4884 TEST METHOD.

3. FILTER BAG SHALL HAVE A SLEEVE LARGE ENOUGH TO ACCOMODATE A 4 INCH DIAMETER PUMP DISCHARGE HOSE.

4. SLEEVE SHALL BE SEALED TIGHTLY AROUND THE PUMP DISCHARGE HOSE WITH A STRAP OR SIMILAR DEVICE TO PREVENT UNFILTERED WATER FROM ESCAPING.

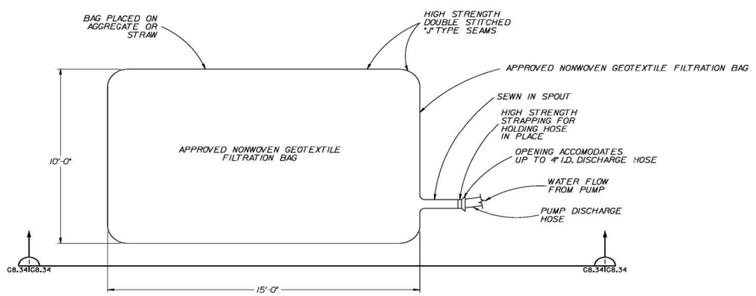
5. FILTER BAG SHALL BE PLACED ON STRAW BALES LOCATED ON A LEVEL OR GENTLY SLOPING (5% MAXIMUM) STABILIZED AREA.

6. PUMPING RATE SHALL BE CONTROLLED TO PREVENT EXCESSIVE PRESSURE WITHIN THE FILTER BAG. AS THE BAG FILLS WITH SEDIMENT, THE PUMPING RATE SHALL BE REDUCED.

7. FILTER BAG SHALL BE DEWATERED, REMOVED AND DISPOSED OF UPON COMPLETION OF PUMPING OPERATIONS OR AFTER IT HAS REACHED CAPACITY, WHICHEVER OCCURS FIRST. THE DEWATERED SEDIMENT FROM THE BAG SHALL BE SPREAD IN AN APPROVED UPLAND AREA AND STABILIZED BY END OF THE WORK DAY. THE SURFACE AREA BENEATH THE DEWATERING BAG SHALL BE RESTORED TO ORIGINAL CONDITIONS UPON REMOVAL OF THE DEVICE.

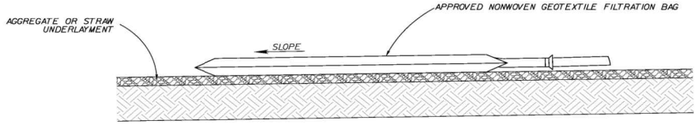
8. THE GEOTEXTILE FABRIC SHALL MEET THE FOLLOWING MINIMUM REQUIREMENTS WITH PROPERTIES DETERMINED IN ACCORDANCE WITH THE FOLLOWING PROCEDURES:

| | | |
|---|---|---|
| WEIGHT | 10 OZ/YD | ASTM D-3776 |
| GRAB TENSILE STRENGTH | 210 LB | ASTM D-4632 |
| PUNCTURE | 150 LB | ASTM D-4833 |
| FLOW RATE | 70 GAL/MIN/SF | ASTM D-4491 |
| PERMITIVITY | 1.3 SEC-1 | ASTM D-4491 |
| UV RESISTANCE | 70% | ASTM D-4355 |
| APPARENT OPENING SIZE (AOS) | 0.04-0.08 MM | ASTM D-4751 |




DEWATERING FILTRATION BAG DETAIL 1 G3.01G8.34

G3.11
G3.12
G3.22
G3.23
G3.24
G3.25
G8.01
G8.11




DEWATERING FILTRATION BAG SECTION 1 G8.34G8.34

FIGURE 5
EROSION AND SEDIMENT CONTROL DETAILS

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# Attachment 2
# SWPPP Inspection Checklist

Department of Conservation & Recreation
CONSERVING VIRGINIA'S NATURAL AND RECREATIONAL RESOURCES

# VSMP CONSTRUCTION PERMIT INSPECTION REPORT Attachment 2B

Project Name: _____ Permit Number: _____

Project Address: _____ County/City: _____

Project Operator: _____ Operator Telephone: _____

Operator Address: _____ County/City: _____ ZIP: _____

Inspector Name: _____ Inspection Date: _____ Time: _____

***Legal Status*** (Check one only)

*Federal* ☐ *State* ☐ *Public* ☐ *Private* ☐

***Nature of Project*** (Check all that apply)

*Commercial* ☐ *Industrial* ☐ *Residential* ☐ *Road* ☐ *Utility* ☐ *Agriculture* ☐ *Other:* _____

***General Stormwater Pollution Prevention Plan Information***

| | Yes | No |
|---|---|---|
| Copy of permit | | |
| Copy of permit coverage letter | | |
| Approved ESC plan or agreement in lieu of a plan | | |

| | Yes | No |
|---|---|---|
| SWPPP prepared and available on site | | |
| SWPPP signed/certified by operator | | |
| Approved stormwater management plan (if applicable) | | |

***Specific SWPPP Information***

(If information is not applicable indicate so in comments/notes)

| SWPPP CONTENT | | Yes | No | Comments/Notes |
|---|---|---|---|---|
| **§ II D.1.a** | *Description & function of project* | | | |
| **§ II D.1.b** | *Sequence & timing of land-disturbance activities* | | | |
| **§ II D.1.c** | *Estimate of total land-disturbance area including off-site areas* | | | |
| **§ II D.1.d** | *Description of potential pollution sources (fuel, chemical storage, sanitary waste, etc.)* | | | |
| **§ II D.1.e** | *Identification of nearest receiving waters* | | | |
| **§ II D.1.f** | *Location & description of industrial activity discharges covered by this permit (dedicated asphalt & concrete plants)* | | | |
| **§ II D.1.g** | *Site map indicating:* | | | |
| | 1. Direction of final storm flows & slopes | | | |
| | 2. Areas of disturbed & undisturbed sites | | | |
| | 3. Location of controls | | | |
| | 4. Location of stabilization practices | | | |
| | 5. Surface body water including wetlands | | | |
| | 6. Location of stormwater discharges | | | |
| | 7. Location of off-site areas | | | |
| | 8. Location of potential pollution sources | | | |
| | 9. Areas of final stabilization | | | |

| POLLUTANT REDUCTION CONTROLS | | Yes | No | Comments/Notes |
|---|---|---|---|---|
| **§ II D.2.** | *Description of pollution controls to be implemented & operator responsible for implementation of the control measures* | | | |
| **§ II** | *For ESC plans incorporated by reference: plan is approved by the locality or by appropriate plan-approving authority* | | | |
| **EROSION AND SEDIMENT CONTROLS** | | **Yes** | **No** | *Comments/Notes* |
| **§ II D.2.a. (1)** | *Stabilization practices* | | | |
| | (a) Dates of major grading activities | | | |
| | Dates when grading temporarily or permanently cease | | | |
| | Dates when stabilization measures are initiated | | | |
| | (b) Stabilization measures initiated within 7 days after construction has temporarily or permanently ceased {except as provided in §II D.2.a (1) (c), (d), & (e)} | | | |
| **§ II D.2.a. (2)** | *Structural practices* | | | |
| | (a) Sediment basin for disturbed areas of 3 acres or greater or equivalent control measures provided until final stabilization | | | |
| | (b) Where basins are not attainable, smaller sediment traps or at a minimum silt fence, vegetative buffer strips or equivalent sediment controls are installed for all down and side slope boundaries as appropriate | | | |
| | (c) Sediment traps are used for areas < 3 acres or at a minimum silt fence, vegetative buffer strips or equivalent sediment controls are required for all down and side slope boundaries as appropriate | | | |
| **§ II D.2.b.** | *Management practices* | | | |
| | (1) Control measures properly selected, installed and maintained | | | |
| | (2) Off-site sediment accumulation removed to minimize off-site impacts | | | |
| | (3) Litter, construction debris, and chemicals prevented from becoming a pollutant source | | | |
| **§ II D.2.c.** | *Stormwater management* | | | |
| | (1) Calculations supporting all post-construction stormwater management measures to be installed and measures designed and installed in accordance with applicable local and state requirements | | | |

| | | | | |
|---|---|---|---|---|
| | (2) Technical explanation for practices selected to control pollutants and flows that exceed predevelopment levels | | | |
| | (3) Outflows from stormwater facility or conveyance system discharge to an adequate channel (no significant changes in the hydrologic regime of receiving water) | | | |
| **§ II D.2.d.** | *Other controls* | | | |
| | (1) Measures to prevent discharge of solid materials to surface waters | | | |
| | (2) Construction entrance (MS-17) | | | |
| | (3) Compliance with state or local waste disposal, sanitary sewer or septic system regulations | | | |
| | (4) Description of construction and waste materials, updates, controls to reduce storage, and storage practices | | | |
| | (5) Description of pollutant sources from areas other than construction (dedicated asphalt or concrete plants) and control measures to be used at those sites | | | |
| **§ II D.2.e.** | *SWPPP consistent with applicable requirements for ESC & SW management* | | | |
| | **MAINTENANCE OF CONTROLS** | ***Yes*** | ***No*** | *Comments/Notes* |
| **§ II D.3.a** | *Description and schedule of procedures to maintain all controls in effective operational condition* | | | |
| **§ II D.4.b.** | *Existing BMPs modified or additional BMPs installed prior to next storm event. (If impractical to implement prior to storm event, documented in SWPPP)* | | | |

| | | | | |
|---|---|---|---|---|
| | **INSPECTIONS** | ***Yes*** | ***No*** | *Comments/Notes* |
| **§ II D.4.** | *Conducted by "Qualified Personnel"* | | | |
| **§ II D.4.a.** | *Once every 14 days and within 48 hours after any runoff producing storm event* | | | |
| **§ II D.4.b.** | *Inspection of discharge locations to ascertain whether ESC measures are effective in preventing significant impact to receiving waters* | | | |
| **§ II D.4.c.** | *Linear projects inspected 0.25 miles above and below each access point* | | | |
| **§ II D.4.d.** | *Based on results of inspections, the site, activity description, and pollution prevention measures are modified as appropriate within 7 calendar days following the inspection* | | | |

| | | | | |
|---|---|---|---|---|
| **§ II D.4.e** | *Report summarizing scope of inspection* | | | |
| | 1. Locations of pollutant discharges | | | |
| | 2. Locations of BMPs needing maintenance | | | |
| | 3. Locations of inadequate or failed BMPs | | | |
| | 4. Locations where BMPs are needed | | | |
| | 5. Corrective action required | | | |

| **NONSTORMWATER DISCHARGE MANAGEMENT** | | ***Yes*** | ***No*** | *Comments/Notes* |
|---|---|---|---|---|
| **§ II D.5** | *SWPPP identifies all allowable discharges* | | | |
| | a. Fire fighting controls | | | |
| | b. Fire hydrant flushing | | | |
| | c. Vehicle washing (no detergent) | | | |
| | d. Water used for dust control | | | |
| | e. Potable water source | | | |
| | f. Water for hydrostatic testing of pipelines | | | |
| | g. Building washing (no detergent) | | | |
| | h. Pavement washwaters (no hazardous materials or detergent used on pavement) | | | |
| | i. Air conditioner or compressor condensation is uncontaminated | | | |
| | j. Uncontaminated ground water or springs | | | |
| | k. Foundation or footing drains | | | |
| | l. Uncontaminated excavation dewatering | | | |
| | m. Landscape irrigation | | | |

Department of Conservation & Recreation
CONSERVING VIRGINIA'S NATURAL AND RECREATIONAL RESOURCES

# STORMWATER PROGRAMS SITE INSPECTION REPORT

Project Name: _____ Permit Number: _____

Project Address: _____ County/City: _____

Inspector Name: _____ Inspection Date: _____ Time: _____

## *STAGE OF CONSTRUCTION*

*Pre-Construction Conference* ☐ *Building Construction* ☐ *Construction of SWM Facilities* ☐
*Clearing & Grubbing* ☐ *Finish Grading* ☐ *Maintenance of SWM Facilities* ☐
*Rough Grading* ☐ *Final Stabilization* ☐ *Other*_____ ☐

| *Item#* | *State Regulation*[1] | | | *Description and Location of condition observed*[2]*, Recommended Corrective Actions, and Other Comments/Notes* |
|---|---|---|---|---|
| | | *Initial* | *Repeat* | |
| | | | | |
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(1) Refers to applicable regulation found in the most recent publication of the *Virginia Erosion and Sediment Control Regulations* (4VAC50-30) or the *Virginia Stormwater Management Program Permit Regulations* (4VAC50-60).
(2) Note whether or not off-site damage resulting from the condition observed was evident during the inspection.

**RECOMMEDED CORRECTIVE ACTION DEADLINE DATE**: _____ **Re-inspection Date:** _____

The recommended corrective action deadline date applies to all conditions noted on this report unless otherwise noted. If listed condition(s) currently constitute non-compliance and/or corrective actions are not completed by the deadline, a **NOTICE OF CORRECTIVE ACTION** and/or other enforcement actions may be issued to the entity responsible for ensuring compliance on the above project.

Inspector: _____ _____
Signature Date

Acknowledgement of on-site receipt: _____ _____ _____
Print Name Signature Date

# Appendix E
# Technical Memorandum: Sediment Amendment Selection

# Sediment Amendment Selection
# Solid Waste Management Unit 3
# Joint Expeditionary Base Little Creek
# Virginia Beach, Virginia
# April 2013

## Description of Sequestering Amendment Technology

### Amendments

Researchers have demonstrated that the bioavailability of sediment contaminants can be reduced by the addition of sorbent amendments. The upper biologically active zone (BAZ) is the primary source of exposure to benthic organisms and to the water column leading to bioaccumulation in the food web. The addition of amendments to the biologically active sediment layer (typically the top 6-12 inches of sediment) sequesters the contaminants in the sediment, improving pore water quality. Amendments sequester contaminants that would otherwise enter pore water through dissolution from impacted sediments and/or advective transport from impacted groundwater. The use of amendments to actively sequester contaminants in sediment is less energy-intensive, expensive and disruptive than conventional remediation technologies such as dredging. This method does not address deep sediment contaminants but rather captures potentially mobile contaminants in pore water within the area of application.

Various amendments are used to sequester contaminants. The selection of amendment(s) depends on the type(s) of contaminant as well as placement conditions and other factors. Activated carbon (AC) is often used for persistent organic pollutants (e.g. polychlorinated biphenols [PCBs]) (Zimmerman et. al., 2004; Millward et. al., 2004; Ghosh, 2008). Organoclays are generally used to adsorb non-aqueous phase liquid (NAPL) (Ghosh, 2008). A variety of amendments including AC, apatite and chemisorptive media are used to sequester inorganic contaminants (Ghosh, 2008). Bentonite and other clay minerals are used as general sequestration amendments to adsorb a broad range of contaminants. Numerous studies have been conducted in the laboratory to determine the relative efficiency of amendments for sequestering individual contaminants as well as solutions of composite contaminants. Information on different types of amendments and the benefits of using one amendment over another is provided below.

### Delivery Technologies

Multiple delivery technologies can be used to administer amendments. Amendments that are being applied to reduce flux of contaminants to the water column from porewater expression and advective transport are often applied as an engineered cap with a reactive layer of the amendment media. This delivery approach is generally referred to as a Reactive Core Mat™ (RCM) and includes an engineered geosynthetic to contain the media.

Amendments can also be administered to the sediment directly either alone or as mixed with sand. When applied alone, the media generally are incorporated into the sediment by bioturbation. Some of the challenges in applying media are related to differences in the specific gravity of the media and water, and the permanence of the media placement to allow time for the organisms to incorporate the media into the sediment. To aid in incorporation and permanence, delivery mechanisms have been developed including mechanical injection and delivery in pelletized form. Additionally, a dense aggregate delivery system incorporating a dense granular core with amendment adhesion system has

been developed. This system weights the amendment so that it can sink through the water column and then resists erosion after deposition on the sediment bed, increasing permanence.

When applied with sand or alone as an active cap layer, the resultant material is generally used to replace the existing sediment BAZ. The material provides a clean substrate for benthic recolonization with some capacity to remediate impacted porewater that is transported via advection or pore water expression.

## Identification of Amendments Used for Metals Sequestration

A comprehensive study of various amendments including multiple chemisorptive media was completed as part of a research grant for the Strategic Environmental Research and Development Program (SERDP) (Ghosh, 2008). The study, entitled "*Rational Selection of Tailored Amendment Mixtures and Composites for In Situ Remediation of Contaminated Sediments*" identified a list of 75 potential amendments with the objective of developing sorbent mixtures and composites that can stabilize organic and inorganic compounds in sediment. Subsequent to that study, Knox and others (2010) researched amendments to address inorganics in "*Sequestering Agents for Metal Immobilization – Application to the Development of Active Caps in Fresh and Salt Water Sediments*." This study evaluated phosphates, organoclays, AquaBlok amended materials, zeolites and biopolymers for their ability to remove inorganics from pore water. These studies, combined with work performed at the University of Toledo (Collins et al., 2013) and U.S. Army Corps of Engineers (Ruiz, 2013) have been used in preparing the following description of amendments applicable to metals sequestration.

### Apatite

Apatite is a phosphate mineral existing in nature as both a geological deposit and from bones and teeth of animals. The microstructure of apatite has many active sites to chemically bond both inorganic as well as organic contaminants. Apatite has been shown to effectively bind diffusing metals via surface adsorption as well as precipitation. Studies cited found apatite to be one of the more effective reagents at binding inorganics with slightly better performance in freshwater compared to saltwater. Apatite has a specific gravity of approximately 3.2 making it relatively easy to place and resist erosion. One limitation cited for apatite is that it has the potential to increase the phosphate level of the receiving water which is disallowed in some water bodies. Another limitation is that phosphate from fish bones is not readily commercially available; geologic deposits in several locations in the U.S. can supply the material although neither source customarily provides apatite for use in the sediment remediation market and both would require advanced scheduling/ notification for delivering significant quantities.

### Activated Carbon

AC has been widely studied because it is a multi-functional sorbent for both organics and inorganics. A study conducted on the Grasse River in New York showed that application of AC to the surface of the sediment resulted in a 93% reduction in PCB concentrations in species for a 2.5% AC (dry weight) amendment (USEPA, 2007). Activated carbon is available in powdered or granular form (PAC or GAC) and the specific gravity varies widely from less than 1 to approximately 2. One of the historical challenges posed by use of AC was in the application of the material to the surface of the sediment due to its relatively low density. However, in the past several years, AC has been formulated to be applied directly via injection (PAC) and in pelletized form (SediMite™) as well as part of a dense granular aggregate system (AquaGate+PAC™). Due to the expense of AC, alternative sources of carbon have been investigated and have been shown to be effective on a pilot scale albeit not as effective as AC. Additionally, natural organic matter present at the site can reduce the performance of AC in addressing inorganics; therefore, it is important to consider natural organic matter present at the site during design

(Sharma et al., 2009). AC has been deployed in the field as AquaGate+PAC™. Field deployment as injected PAC and SediMite™ has only been accomplished at a pilot scale.

### Chemisorptive Media

Chemisorptive media consist of a wide range of materials which have an affinity for sequestering contaminants from solution. The goal is to formulate media that will have an affinity for both inorganics and organics so that when amending sediment, fewer media types will be required to manage typical sediments. To make chemisorptive media more effective for treating inorganics, materials that enhance sorption and precipitation processes have been developed. A medium based on sulfide complexation has been patented by MAR Systems. Ongoing research at the University of Toledo has shown that the MAR Systems media outperformed bentonite and organoclay for sequestering all metals tested except lead (Messner, 2011) while the same materials were found nearly equally reactive for PCBs. Compared to AC, the MAR Systems product (Sorbster™) was found to be slightly more reactive. The primary challenge facing use of chemisorptive media is that it is not widely commercially available. Sorbster™ is one chemisorptive amendment that is commercially available and has a specific gravity of greater than 3. It can be delivered to the sediment surface alone or adhered onto a dense granular delivery media to increase its resistance to erosion. Because Sorbster™ is a relatively new medium, there are no known field scale projects in which it has been deployed.

### Steel Slag

Iron and steel slag, due to availability and beneficial reuse aspects, has been under investigation for metals sorption both in engineered systems and in the environment. While most of the applications have focused on use in immobilizing contaminants using stabilization/solidification technology, there have been demonstration projects including Torch Lake (Houghton, MI) and others where steel slag has been used as an amendment in sand caps to aid in immobilization of arsenic and copper (Ruiz, 2013). Steel slag has a specific gravity of over 3 and can be placed with or without sand. While slag has been demonstrated in laboratory studies to immobilize some metals, field demonstration projects have yet to be conducted in the U.S. A field demonstration project has been conducted in Japan where sand and steel slag were placed in an oceanic environment to suppress the elutriation of sea salts from the seabed. Steel slag with a resultant pH of 12 was found to improve benthic colonization under these particular site specific conditions. While steel slag presents the challenge of increased pH and lack of demonstration at a field scale level in the U.S., it offers the distinct benefit over other amendments in that it is a beneficial use material and as such, is very cost effective.

### Organoclay

Organoclay is a montmorillinite clay amended with quanternary amine salt making it hydrophobic and selectively oleophilic. In the sediment remediation arena, it has been primarily used for NAPL-impacted sediment because of its ability to sequester nonpolar compounds. In the 2010 study by Knox and others, organoclay manufactured by Biomin, Inc. was used to sequester inorganic contaminants and was found to perform effectively in both fresh and salt water for a range of inorganics. The primary challenge associated with organoclay use is the cost – it is up to twice the cost of other successful metal sequestering amendments. Consequently, if the application does not involve NAPL, it is not cost effective to use organoclays. Organoclay has been used in field scale remediation projects in the US both as an amendment with sand, applied directly to the sediment surface either in pelletized form or as part of a dense-graded aggregate delivery system, or as an RCM (which has been the most widely used means of deploying organoclay).

### Bentonite/Attapulgite

Bentonite is a common clay mineral used in the manufacture of AquaBlok™, a commercially available dense aggregate delivery system. Clays are highly polarized and have the ability to form ionic bonds with inorganics and organics. In a study by Knox and others (2010), bentonite-administered as AquaBlok™ - was found to remove most metals from solution in both freshwater and seawater with the exception of selenium. Attapulgite is another common clay mineral with better performance for bonding metals in seawater. AquaBlok™ delivery systems are capable of delivering either type of mineral. These clays have been found to provide adequate sorption of inorganics in many applications; however, the use of specific metals-sequestering amendments has shown better performance and for that reason, the sole use of bentonite or attapulgite may be insufficient. AquaBlok™ manufactures dense graded aggregate product for both low permeability and permeable applications using both types of clay. The permeable formulation is referred to as AquaGate™. Both are commercially available and have been used in field scale applications in the U.S.

## Comparative Analysis

A comparative analysis of each amendment described above is summarized in Table 1.

## Recommendation

After review of potential amendments and investigation of commercial availability within the timeframe required for the project, two amendments are recommended: AquaGate™ +PAC and AquaGate™ +Sorbster™. The latter has demonstrated higher affinity for metals sequestration in bench scale tests compared to the former; however, AquaGate™ +PAC has been used in a very similar application at a project site in Bremerton, WA at the Puget Sound Naval Shipyard and Intermediate Maintenance Facility and has been demonstrated to be successfully placed (Johnston, 2012). While AquaGate™ +Sorbster™ would be applied in a similar manner, this material has not been used at full scale construction to date. AquaGate™ +PAC appears to be slightly more cost effective; however, actual contractor bid pricing has not been received. It is anticipated that either material would deliver adequate inorganic sequestration from pore water and overall reduction in risks to the benthic invertebrate community. Final selection of the material will be conducted during the material procurement process.

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**Table 1 – Comparative Analysis**

| Amendment | Advantages | Disadvantages | Retained for Consideration? | If not Retained, Why? |
|---|---|---|---|---|
| Apatite | Binds both by precipitation as well as ionic bonding and found effective for most metals<br><br>Found to be one of the most effective amendments tested | Increases phosphate level<br><br>Commercial availability is limited<br><br>Has not been manufactured as part of a dense aggregate product<br><br>May not be erosion resistant<br><br>Not demonstrated at full scale | No | Suppliers of apatite have not been substantively involved in production of material for the sediment remediation market so generating the supply needed in time for project is likely not possible |
| Activated Carbon<br><br>(AquaGate™ +PAC and SediMite™) | Found to be effective for most metals<br><br>Can be incorporated into a wide variety of products<br><br>Demonstrated at full scale | While commercially available as a pelletized product, material may not be readily available for shipment<br><br>More expensive than clay minerals but less expensive than organoclay<br><br>Due to low erosion resistance, short term loss of material may occur due to high energy environment in the absence of armoring (particularly for SediMite™ which is half dense as AquaGate™ +PAC | Yes as AquaGate™ +PAC as it is commercially available in the timeframe required | SediMite™ was not retained because the material may be more subject to erosion and could not be delivered in the timeframe required for the project |
| Chemisorptive Media (Sorbster™) | Found to be highly effective for most metals<br><br>Can be incorporated into a dense graded aggregate product<br><br>Commercially available in the timeframe needed | Not demonstrated at full scale | Yes as AquaGate™ +Sorbster™ as it is commercially available in the timeframe required and is more erosion resistant than as Sorbster™ alone | Although Sorbster™ may be applied directly to sediment without a dense graded aggregate delivery system, due to the potential for erosion in the application area, Sorbster™ is not retained as delivered on its own. |

| Amendment | Advantages | Disadvantages | Retained for Consideration? | If not Retained, Why? |
|---|---|---|---|---|
| Steel Slag | Found to be highly effective for some metals<br>Very cost effective as slag is generated as a waste product<br>Beneficial reuse of waste product so has better sustainability | Not demonstrated at full scale<br>Elevates pH (approx. 12)<br>Been investigated as amendment for application with sand cover | No | While steel slag shows promise as a metals sequestering amendment, bench scale data generated to date are not sufficient to consider a remediation program with no post-installation monitoring component |
| Organoclay | Effective for non-polar contaminants therefore can treat metals in association with NAPL compounds<br>Can be incorporated into a wide variety of products<br>Demonstrated at full scale | Expensive compared to other amendments | No | Due to availability of other effective amendments at a lower cost, this amendment is not retained |
| Bentonite/<br>Attapulgite | Moderately effective over wide range of contaminants<br>Can be formulated to be effective in salt water environments<br>Lowest cost of all potential amendments<br>Commercially available as AquaGate™ and AquaBlok™<br>Demonstrated at full scale | Not as effective as other amendments | Possibly as AquaGate™ | Clay mineral amendments are effective at adsorbing a wide range of metals to some degree. Other amendments passing screening are more effective, however, and may be preferable. If retained, attapulgite mineral should be considered because of its salt water resistance. |