

Final Site Management Plan

Former Nantsemond Ordnance Depot 2015/2016

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ACRONYMS

AC	Ashley Capital
AOC	Area of Concern
ARF	Administrative Record File
AWP	Archaeological Work Plan
BERA	Baseline Ecological Risk Assessment
CERCLA	Comprehensive Environmental Response Compensation and Liability Act
CDD's	Chlorinated dibenzo- <i>p</i> -dioxins
CDF's	Chlorinated dibenzofurans
CA	Corrective Action
COCs	Constituents of Concern
COPCs	Constituents of Potential Concern
CSM	Conceptual Site Model
CTC	Cost to Complete
DERP	Defense Environmental Restoration Program
DMM	Discarded Military Munitions
DNT	Dinitrotoluene
DoD	Department of Defense
EE/CA	Engineering Evaluation/Cost Analysis
EOD	Explosive Ordnance Disposal
ESI	Expanded Site Investigation
ESS	Explosives Safety Submission
FNOD	Former Nansmond Ordnance Depot
FS	Feasibility Study
FUDS	Formerly Used Defense Sites
FUDSMIS	FUDS Management Information System
FY	Fiscal Year
GE	General Electric
GIS	Geographic Information System
GPS	Global Positioning System
HHRA	Human Health Risk Assessment
HRS	Hazard Ranking System
HRSD	Hampton Roads Sanitation District
HSP	Horseshoe Pond
HTRW	Hazardous, Toxic and Radioactive Waste
IAG	Interagency Agreement
IKA	Impregnite Kit Area
JRB	James River Beachfront
LLC	Limited Liability Corporation
LTM	Long Term Monitoring (or Maintenance)
LUC	Land Use Controls
LUCIP	Land Use Control and Implementation Plan
MBG	Main Burning Ground
MC	Munitions Constituents
MD	Munitions Debris
MEC	Munitions and Explosives of Concern
MMRP	Military Munitions Response Program
MQAPP	Master Quality Assurance Project Plan
MW	Monitoring Well
NOFA	No Further Action

NPL	National Priorities List
NRB	Nansemond River Beachfront
NTCRA	Non-Time Critical Removal Action
OE	Ordnance and Explosives
PA	Preliminary Assessment
PAHs	Polycyclic Aromatic Hydrocarbons
PCBs	Polychlorinated Biphenyls
PDT	Project Delivery Team
PP	Proposed Plan
PRP	Potentially Responsible Party
QAPP	Quality Assurance Project Plan
RA	Remedial Action
RAB	Restoration Advisory Board
RCRA	Resource Conservation and Recovery Act
RD	Remedial Design
RI	Remedial Investigation
ROD	Record of Decision
SA	Source Area
SAP	Sampling and Analysis Plan
SARA	Superfund Amendments and Reauthorization Act of 1986
SCR	Site Characterization Report
SHPO	State Historic Preservation Officer
SI	Site Investigation
SLERA	Screening Level Ecological Risk Assessment
SMP	Site Management Plan
SP	Steamout Pond
SVOCs	Semi-volatile Organic Compounds
TAL	Target Analyte List
TCC	Tidewater Community College
TCE	Trichlorethylene
TCL	Target Compound List
TCLP	Toxicity Characteristic Leachate Procedure
TCRA	Time Critical Removal Action
TNT	Trinitrotoluene
TPH	Total Petroleum Hydrocarbons
USACE	United States Army Corps of Engineers
USEPA	United States Environmental Protection Agency
UST	Underground Storage Tank
UXO	Unexploded Ordnance
VDEQ	Virginia Department of Environmental Quality
VDOT	Virginia Department of Transportation
VOCs	Volatile Organic Compounds
WP	Work Plan
WTP	Water Treatment Plant
WWTP	Wastewater Treatment Plant

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FUDSMIS Project # (C03VA0045_ _)	Site Name	Site ID	Category	Phase
1	TNT Source Area	SA-1	HTRW	RI/FS
2	Ordnance/Explosives (OE) OE Land Use Controls	NA	MMRP	Complete
3	Conceptual Site Model	NA	HTRW	Complete
4	Impregnite Kit Area	SA-3	HTRW	Complete
5	Horseshoe Pond	SA-4	HTRW	RD/RA
	Arsenic Investigation Area	AOC-22	HTRW	Complete
6	Main Burning Ground	SA-5	HTRW	RI/FS
7	Not Used	NA	NA	NA
8	Community Relations	NA	NA	NA
9	James River Beachfront	SA-2	HTRW	PP/ROD
	Potential TCE in Groundwater	AOC-19	HTRW	Complete
10	Track K Dump	SA-6	HTRW	Complete
	Pesticide Drum Area	O-7	HTRW	Complete
11	Offshore Area (far)	AOC-3a	HTRW	Complete
	Offshore Area (near)	AOC-3b	HTRW	Complete
	TCC Lake	AOC-5	HTRW	Complete
	Track G Magazine	AOC-10	HTRW	Complete
12	Track H&I Magazines	AOC-11	HTRW	FS
13	Former Steam Heating Plant	AOC-16	HTRW	Complete
	Suspect USTs	AOC-18	HTRW	Complete
14	Streeter Creek	AOC-2	HTRW	Complete
	Track A Possible Disposal Area	AOC-8	HTRW	Complete
	Track A and B Possible Burning Area	AOC-9	HTRW	Complete
15	Nansemond River Beachfront	AOC-1	HTRW	RI/FS
16	Shoreline MEC Areas	NEW SITE	MMRP	RI
	Former Buildings L-11 and L-12	O-6	MMRP	RI
	Athletic Field North	O-4	MMRP	RI

FUDSMIS Project # (C03VA0045_ _)	Site Name	Site ID	Category	Phase
17	GE Pond	AOC-4	HTRW	RI
	Marine Corps Power Generation Fac.	AOC-6	HTRW	RI
	Track J Magazine	AOC-12	HTRW	RI
	Former WWTP Area	AOC-13	HTRW	RI
	Track K Magazine Line	AOC-14	HTRW	RI
	Track K Possible Landfill	AOC-15	HTRW	RI
	Former Water Treatment Plant	AOC-20	HTRW	RI
18	Cantonment Area	NEW SITE	HTRW	SI
	Athletic Field South	O-3	HTRW	SI
19	Former Renovation Plant	AOC-23	HTRW	RI
20	Potential PCB Transformers	AOC-17	HTRW	SI
21	Fuel Storage Tanks	NEW SITE	CON/HTRW	SI
22	J-Lake	AOC-7	HTRW	RI
NA	Officers Club Pool	AOC-21	HTRW	Complete
	Underground Concrete Structure	O-1	HTRW	Complete
	Former Building E-410	O-5	MMRP	Complete

Notes:

- 1) SA – Source Area
AOC – Area of Concern
O – Other Area of Investigation
NA – Not Applicable
- 2) "Complete" status indicates that no further investigation is anticipated for a site.
- 3) Specific information on the historical, current and future activities at each site can be found in Section 4 of this document.
- 4) The table has been updated to reflect the new project structure embodied in the Final Inventory Project Report (INPR), 21 August 2014.

1 Introduction

1.1 Purpose

The purpose of this Site Management Plan (SMP) is to document the history, current status and future plans for environmental investigation and remediation activities at the Former Nansmond Ordnance Depot (FNOD) property. This SMP includes the following:

- A description of regulations and other guidance relevant to the environmental investigation and remediation activities at FNOD.
- A brief history of FNOD.
- A description of the technical approach the US Army Corps of Engineers (USACE) will follow for environmental investigation and remediation activities at FNOD.
- A description of Source Areas (SAs) and Areas of Concern (AOCs) and Other Area of Investigation (O) currently identified at FNOD.
- Proposed activities at each site including short- and long-term milestones and tentative schedules.

The information presented in this FNOD SMP is specifically referenced if it is obtained from existing documents. The location of FNOD is shown in Figure 1-1.

1.2 Regulatory Framework

In 1980, Congress enacted the Comprehensive Environmental Response, Compensation and Liability Act (CERCLA), to respond to threats posed by uncontrolled releases of hazardous substances into the environment. This statute, amended in 1986 by Superfund Amendments and Reauthorization Act (SARA), establishes the process for undertaking remedial actions to mitigate these threats at abandoned sites containing hazardous substances, as well as reporting requirements for releases of hazardous substances. SARA expanded the provisions of CERCLA and added major new authorities. These amendments included the addition of Section 120, Federal Facilities and Section 121, Cleanup Standards. Section 120 requires departments and agencies of the federal government to comply with the provisions of CERCLA as amended by SARA. Section 121 establishes the procedures for the selection of remedial actions and the determination of the degree of remediation.

In 1986, Congress established the Defense Environmental Restoration Program (DERP) at 10 USC §§2701 et seq. This program directs the Secretary of Defense to “carry out a program of environmental restoration at facilities under the jurisdiction of the Secretary.” Executive Order 12580 (EO 12580, January 23, 1987), Superfund Implementation, delegated to the Department of Defense (DoD) the response authority for releases or threatened releases from any facility or vessel under the jurisdiction, custody, or control of DoD, subject to Sections 120 and 121 of SARA. In March 1990, the U.S. Environmental Protection Agency (USEPA) issued a revised National Oil and Hazardous Substances Pollution Contingency Plan (NCP). Under 40 Code of Federal Regulations (CFR) §300.120, DoD is identified as the removal response authority for incidents involving DoD military weapons and munitions or weapons and munitions under the jurisdiction, custody or control of DoD.

Under DERP, the USACE is the agency responsible for environmental restoration at Formerly Used Defense Sites (FUDS). On 22 July 1999, the USEPA placed FNOD on the National Priorities List (NPL) (USEPA Region III, 1999). USEPA listed FNOD as a Non-Federal Facility Superfund Site, as the Federal Government does not currently control any property at FNOD. Because the DoD formerly owned the FNOD property, the USEPA named the DoD as a Potentially Responsible Party (PRP) for addressing environmental issues at FNOD (64 Federal Register No. 140, 39878).

Activities conducted under this SMP for FNOD will be conducted pursuant to CERCLA and under the authority of the DERP and its policies and procedures relating to FUDS. These policies and procedures include the DoD Management Guidance for the DERP dated 28 September 2001 and Engineering Regulation 200-3-1 Environmental Quality, Formerly Used Defense Sites (FUDS) Program Policy. Additionally, activities conducted under this SMP will be conducted in compliance with State and Federal Historic Preservation regulations. To ensure compliance with Section 106 of the National Historic Preservation Act, a Programmatic Agreement was signed by the Norfolk District, USEPA Region III, the Virginia State Historic Preservation Officer (SHPO) and other interested parties.

The Archaeological Work Plan (AWP), appended to the Programmatic Agreement, details how the agreement will be implemented. The AWP was developed and approved by USACE Norfolk District, USEPA Region III and the SHPO. The plan calls for the USACE Project Archaeologist to review work plans, contracts, scopes of work and other planning documents in order to identify possible adverse effects to significant historic properties as a result of site activities. The plan includes a map of areas having high, medium and low probability of archaeological resources. The AWP also provides for review of ground-disturbing activities that occurred prior to implementation of the Programmatic Agreement, monitoring of upcoming ground-disturbing actions in high probability areas and procedures to be followed in the event of an unexpected discovery of archaeological resources (*USACE, 2000 and USACE and USEPA, 2001*). USACE updated the Programmatic Agreement and submitted the updated Agreement for stakeholder review in 2013. USACE expects to finalize the updated Agreement in March 2015.






1.3 Administrative Record/Information Repository

The FNOD Administrative Record contains those documents that form the basis for the selection of the response actions implemented by USACE at FNOD. In January 2014, the FNOD Administrative Record repository was established at the North Suffolk Library, 2000 Bennett's Creek Park Road, Suffolk, VA 23435. A second repository has been established at the Norfolk District USACE, 803 Front Street, Norfolk Virginia. It is available for viewing by appointment by calling Ms. Adriane James at (757) 201-7181.

1.4 Public Involvement

The USACE established a Restoration Advisory Board (RAB) in accordance with FUDS guidance. The RAB meets quarterly and provides a forum for public involvement and input. Citizens are encouraged to attend RAB meetings and may review site documents. The USACE also conducts Public Affairs Workgroup meetings semi-annually. Members of the workgroup include the USACE Project Team, USEPA Region III, Virginia Department of Environmental Quality (VDEQ), RAB Co-chairs, the City of Suffolk and current property owners electing to participate. A monthly RAB update is published and distributed to the RAB members during those months when no RAB meeting is scheduled.

FNOD Primary Points of Contact

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2 FNOD Background

FNOD is located in Suffolk, Virginia and consists of approximately 975 acres. It is bordered by the Nansemond River to the west, the James River to the north and Streeter Creek to the east. The site location and FNOD Site Map are shown on Figures 1-1 and 1-2, respectively.

2.1 History

The land for FNOD was acquired by the Department of Army between 1917 and 1929 by various deeds, easements, permits, and Declarations of Takings. FNOD was constructed between November 1917 and December 1918 to support the Port of Embarkation at Newport News, Virginia and was originally known as Pig Point Ordnance Depot. By 1918,



the original depot included 28 Standard Ammunition Magazines, 25 High Explosive Magazines, 13 Smokeless Powder Magazines, 8 Primer and Fuse Magazines, 1 large warehouse, 16 barracks, 2 Officer's Quarters, a hospital, a garage, a fire house, a machine shop, an electric storage battery charging station and support buildings. Other structures included a pier, jetties, guard towers, mess halls, carpenter shops, a water tower, a renovation and salvage plant, railroad tracks and roads. The depot functioned as a storage and distribution center and performed reconditioning of munitions. Captured enemy munitions were also processed at this location. The depot remained active between World Wars I and II. In 1929, the name of the Depot was officially changed to Nansemond Ordnance Depot. During World War II, FNOD was instrumental in supporting operations at the Hampton Roads Port of Embarkation. This support included the temporary storage and transshipment of various types of ammunition overseas. Toward the end of the war, the mission of FNOD was changed to that of an intermediate and distribution depot and included the reconditioning of ammunition. FNOD also received captured enemy munitions for processing and shipment to U.S. military facilities for technical examination. Numerous historical documents state that tens of thousands of tons of many types of conventional ordnance and chemical warfare munitions were stored and shipped from FNOD.

Depot salvage operations were conducted in the vicinity of the former magazine L-12 foundation. Explosives recovered from salvage operations with no resale value were destroyed by burning at a nearby burning ground on the James River shoreline. Explosive scrap and other residue were also taken to a nearby burning ground for disposal by burning. A "Burning Ground Powder Refuse" was located on the beach near magazine J-2. It appears that the specific location of this burning ground moved southeast over time to a new location northwest of J-2 and TCC Lake (AOC-5). The Main Burning Ground (SA-5) was reached by a rail spur off the "R" line between magazines R-219 and R-218. A popping tank was associated with the burning grounds and was used primarily for the destruction of small arms ammunition and small

explosive filled ammunition parts. In general, artillery shells, bombs, trench-mortar shells and any other explosive items that cannot be burned can be disposed of by detonation. A “Minor Demolition Ground” was located on the northwest side of the Depot in the vicinity of the Nansemond River Beachfront (AOC-1).

In 1950, the depot was transferred to the Department of the Navy and named the Marine Corps Supply Forwarding Annex. In 1960, the depot was declared excess. Of the original 975 .3 acres, 5.87 acres were being used at that time by the State for road rights-of-way. The remaining property was conveyed to the Beazley Foundation and operated as Frederick College until 1968. The Beazley Foundation conveyed 207 to the Virginia Electric Power Company, now Dominion Lands, in 1960. In 1965, the Beazley Foundation conveyed 104 acres to the General Electric Company (GE). Nansemond County acquired a 4.7-acre right-of-way easement for a road in 1966. In 1968, the Academy closed and donated the remaining property (roughly 580 acres) to the Virginia Department of Community Colleges. The Tidewater Community College (TCC) Portsmouth Campus currently occupies the 580 acres, less an 80-acre parcel conveyed to Hampton Roads Sanitation District (HRSD) in 1977.

FNOD came to the attention of the USACE Norfolk District in 1984, when evidence of munitions and explosives of concern (MEC) was discovered (USACE, 1993). The 1984 discovery of “bulk explosives, small arms munitions, and other ordnance items, both spent and unexploded” and a several ton slab of crystalline 2,4,6-trinitrotoluene (TNT) in the TNT Area prompted USEPA to investigate FNOD. A Remedial Investigation (RI) conducted by USEPA resulted in the removal of MEC and contaminated soil from the site. Soil sampling identified several constituents of concern (COCs), including metals and explosives.

USEPA Region III issued a Final Hazard Ranking System (HRS) package in January 1999 (USEPA Region III, 1999). This package was a culmination of multiple investigations conducted at FNOD and resulted in the identification of seven SAs. The SAs were evaluated and hazard exposure pathways were assigned numerical values. The final HRS site score for FNOD was 70.01. A score of 28.5 or higher qualifies a site for placement on the NPL. The SAs identified in the Final HRS package included:

- 1 Removal Area – Residual Contaminated Soil (TNT Area)
- 2 Beachfront Disposal Area (James River Beachfront)
- 3 Impregnation Kit Area
- 4 Horseshoe Pond Disposal Area
- 5A Steamout Pond
- 5B Park Drive Disposal Area/Burning Ground (Main Burning Ground)
- 6 Track K Dump

These six (6) SAs, as well as other Areas of Concerns (AOCs) at FNOD, have been added to the NPL. The FNOD NPL site consists of those areas used to identify the site, as well as any other location to which the same type of contamination as those listed areas has been discovered. The boundaries of the NPL site may change over time, with the identified releases found to be larger or smaller than was originally thought as more was learned about the sources and the migration of contamination.

2.2 Environmental Setting

FNOD is located within the Atlantic Coastal Plain physiographic province of Virginia. The coastal plain is characterized by thick sequences of sedimentary deposits that were formed from erosion of the Appalachian Highlands to the west. The sediments in the area consist of interbedded sands and clays, overlain by alluvium and shallow marine deposits. The surficial soils consist of moderately to well-drained fine sands.

Groundwater flow in the coastal plain is a multi-aquifer system consisting of an eastward-thickening wedge of unconsolidated sediments. The surficial aquifer, the Columbia aquifer, is composed of interbedded gravel, sand, silt, and clay and is unconfined. The aquifer is a major source of recharge to the underlying confined flow system. Average thickness is 30 feet and maximum thickness is no greater than 60 feet. Groundwater depth in the FNOD area is shallow, typically ranging between 5 and 20 feet below ground surface.

FNOD lies within the Chesapeake Bay watershed. The James and Nansemond Rivers border FNOD to the north and west, respectively. The lower James and Nansemond Rivers in the vicinity of FNOD constitute an estuarine environment controlled by the tidal action of the Atlantic Ocean. Chesapeake Bay currents are typically moderate and average less than 0.5 knots (0.57 miles per hour (mph)). The FNOD coastline is vulnerable to storm events, particularly Nor'easters. As a result, the shoreline has been steadily eroding over time, with significant erosion occurring in some areas.

The Suffolk, VA climate is warm during summer, with temperatures in the 70's and cold during winter, with temperatures in the 40's. The warmest month of the year is July, while the coldest month of the year is January. The annual average precipitation at Suffolk is 44.64 inches. Rainfall is fairly evenly distributed throughout the year. The wettest month of the year is August.

2.3 Land Use

The current property owners at FNOD include:

- Tidewater Community College Real Estate Foundation (TCCREF)
- Dominion Lands
- Continental Bridgeway
- Suffolk Towers, Limited Liability Corporation (LLC)
- Bridgeway, LB
- General Electric
- Ashley Capital
- City of Suffolk
- Virginia Department of Transportation (VDOT)
- Hampton Roads Sanitation District (HRSD)
- Lockheed Martin; and
- SYSCO Foods

Land use within the FNOD boundary primarily consists of commercial and light industrial use, with residential developments to east and west. The current property owner boundaries are depicted on Figure 2-1. The use of the FNOD property by the current owners is expected to continue into the near future. Commercial development is also occurring along the southern portion of FNOD and parcels are continually being developed for commercial office and retail space.

An interim Land Use Control Implementation (LUCIP) was developed for FNOD in 2002. Land use restrictions are needed to effectively manage risk (primarily through access restrictions) as investigation and remediation are ongoing. The current depiction of interim land use controls is shown in Figure 2-2. The nature and location of interim land use controls may change as investigation results at FNOD are received and interpreted. Upon completion of investigation and remediation activities at FNOD sites, Final LUCIP will be prepared for each site.

2.4 Community Profile

As Virginia's largest City, Suffolk encompasses 430 square miles of land with woods, lakes, rivers, and rolling terrain. Suffolk's schools and parks, neighborhoods, health care facilities, and utilities help create a successful community.

Native Americans lived off the bountiful land in Suffolk. In 1609, the Nansemond Indians drove out Captain John Smith, who was interested in the oyster beds in the Nansemond River. The river, the commerce it helped create, and the English settlers who recognized the opportunity they would have here, gave birth in 1742 to the Town of Suffolk, which was named after Governor William Gooch's home of Suffolk County, England. Burned by the British in 1779 and damaged by other fires throughout the next century, Suffolk survived to become a city in 1910.

In 1974, the area became the present City of Suffolk, consolidating with the towns of Holland and Whaleysville, and the County of Nansemond. The end result was a new municipality encompassing a total of 430 square miles (half the size of Rhode Island), making it the state's largest city in land area in Virginia and the 11th largest in the country. Suffolk is governed by a city council and a city manager.

2.5 Suffolk Demographics

Updated demographic information was obtained from the City Profile & Statistical Digest FY2011-2012

(http://www.suffolkva.us/files/3813/5241/2486/City_Profile_Statistical_Digest_FY2012-2013.pdf).

Updated demographic information is presented below. In some instances, the most recent demographic information available is from 2013.

- The 2014 population of the City of Suffolk was estimated at 87,831. This represents a 1.6 percent increase from 2013.
- The unemployment rate in 2013 was 6.0 percent.
- The median household income in 2014 was \$65,394. This median income is the second highest in the Hampton Roads region and above the state average of \$61,741.

- The total number of employees located in Suffolk city in First Quarter 2014 was 26,418. The largest major industry sector was Government Total (federal, state, and local) (21 percent of the employment), Health Care and Social Assistance (with 16 percent of the employment), followed by Retail Trade (with 12 percent), and Accommodation and Food Services (with 9 percent).
- The top five employers are the Suffolk Public Schools, City of Suffolk, Science Applications International Corporation, Sentara Healthcare, and WalMart

(Source: The City of Suffolk <http://www.suffolkva.us/bsp/budget/>; Virginia Employment Commission, http://virginialmi.com/report_center/community_profiles/5104000800.pdf

3 Technical Approach

Due to the nature of the activities conducted by the DoD, the FNOD is divided into several smaller sites, categorized as either a SA or AOC. This SMP summarizes the investigations and activities conducted to date for each SA and AOC, and provide work plans and schedules for FY 2015 and beyond.

The six SAs described in the HRS Package and previously identified AOCs are being investigated under the regulatory framework of CERCLA. These investigations are conducted pursuant to the procedures described in the USACE FUDS Manual (USACE, 2004 [ER 200-3-1]). In addition to SAs and AOCs, other locations where past activities may have adversely affected adjacent media (e.g., soil, sediment, surface water, and groundwater) may be identified. New areas of investigation may be identified by examining historical evidence, such as aerial photographs or operational history, or from recent observations such as unearthing of MEC during a storm event. The FNOD Project Delivery Team (PDT), by consensus, determines if a specific area of investigation warrants listing as an AOC. The PDT consists of the USACE Project Manager, the USEPA Remedial Project Manager (RPM) and the VDEQ RPM. The regulatory framework and site evaluation/investigation procedures are discussed in the following sections

3.1 Project Eligibility

When a potential AOC is identified at FNOD, USACE will evaluate the AOC for FUDS eligibility. The eligibility determination is documented in a Findings and Determination of Eligibility (FDE) signed by the USACE Division Commander. The FDE is part of the Inventory Project Report (INPR) prepared for the FUDS property. The INPR identifies projects to be performed at the property.

FUDS are defined as real properties that were under the jurisdiction of the Secretary of Defense and owned by, leased by, or otherwise possessed by the United States (including governmental entities that are the legal predecessors of DoD or its components) and those real properties where accountability rested with DoD but where the activities at the property were conducted by contractors that were transferred from DoD control prior to 17 October 1986. The following property categories are ineligible properties under the FUDS: properties declared excess but not conveyed, non-DoD ownership, state national guard properties, non-US properties, defense plant corporation, civil works properties, acts of war properties, offshore ordnance properties, properties without records, restoration already initiated, duplicate properties, and DoD active installations.

The determination that a project is eligible under the USACE FUDS program has two elements. The first requirement for project eligibility is that the property must be eligible for action under the FUDS program. The second requirement for project eligibility is that there is known or potential contamination or hazards on the eligible property attributable to DoD activities prior to 17 October 1986 requiring action. The determination that a project is eligible for funding under the ER-FUDS account has two elements. The FUDS project screening and identification process may identify potential projects at eligible FUDS properties that, upon further

investigation, are determined ineligible for FUDS. USACE will provide USEPA and VDEQ with notice and opportunity to comment on this determination. Ineligible projects include, but are not limited to: 1) projects where the current owner refuses right of entry; 2) projects where response actions would abate asbestos-containing materials (ACM) or lead-based paints; and 3) projects involving underground storage tanks or other structures that have been beneficially used by any owner subsequent to DoD. Conversely, upon the discovery of new information, the status of a project may change from ineligible to eligible. Additionally, in certain instances, asbestos and lead abatement can be secondary actions.

3.2 Project Categories

When a determination is made that an AOC is eligible under the FUDS program, it is designated as a response site and proposed as a FUDS project. Several sites may be grouped within a single project. Under the USACE FUDS program, eligible projects fall into one of the following categories:

3.2.1 Hazardous, Toxic, and Radioactive Waste (HTRW) Projects

HTRW projects include environmental response actions that are the result of DoD activities related to hazardous substances, pollutants, and contaminants as defined in CERCLA. The list includes:

- Petroleum, oil, or lubricants (POL)
- DoD-unique materials
- Hazardous wastes or hazardous waste constituents
- Low-level radioactive materials or low-level radioactive wastes
- Explosive compounds released to soil, surface water, sediments, or groundwater as a result of ammunition or explosives production or manufacturing at ammunition plants, and
- Drums containing hazardous substances, pollutants, and contaminants

3.2.2 Containerized Hazardous, Toxic, and Radioactive Waste Projects (CON/HTRW)

CON/HTRW projects include response actions to address:

- POL underground storage tanks (USTs), POL aboveground storage tanks (ASTs), abandoned inactive monitoring wells, etc.
- Incidental removal of contaminated soils resulting from a leaking UST or other container.

3.2.3 Military Munitions Response Program (MMRP) Projects

MMRP projects include response actions at FNOD related to MEC, munitions constituents (MC), and Recovered Chemical Warfare Materiel (RCWM) as the result of DoD activities at FUDS. The MMRP project category also includes response actions to address military munitions located off-shore of rivers, lakes, or in marine environments where the munitions were fired from

and/or targeted at eligible FUDS properties. A FUDS off-shore response action will only be considered if these military munitions create an imminent and substantial endangerment to public health or welfare or to the environment as determined by an evaluation of exposure pathways and receptors conducted in accordance with CERCLA and the NCP. Response actions at MMRP projects address:

- MEC, which distinguishes specific categories of military munitions that may pose unique explosives safety risks, includes:
 - Unexploded Ordnance (UXO), as defined in 10 USC 2710(e)(9);
 - Discarded military munitions (DMM), as defined in 10 USC 2710(e)(2); or
 - MC (e.g., TNT, RDX) present in high enough concentrations to pose an explosive hazard.
- MC, which are materials originating from unexploded ordnance, discarded military munitions, or other military munitions, including explosive and non-explosive materials, and emission, degradation, or breakdown elements of such ordnance or munitions [10 USC 2710(e)(4)].
- RCWM.

3.2.4 Building Demolition/Debris Removal (BD/DR) Projects

The BD/DR actions on an eligible FUDS property address the demolition and removal of buildings, structures and debris left in an unsafe condition when DoD exceded the property and/or the date that the disposal agency assumed accountability for the property. For BD/DR projects where hazardous substances are not present, the CERCLA process will not be followed.

3.2.5 Potentially Responsible Party (PRP) Projects

PRP projects are those at which HTRW or MMRP response actions are required and another party, in addition to DoD, is potentially responsible for releases of hazardous substances, pollutants, or contaminants. A PRP is defined in CERCLA Section 107 as any person related to a property that is a:

- Current owner or operator.
- Past owner or operator at the time of disposal of any hazardous substance, pollutant, or contaminant.
- Person who arranges for disposal, treatment, or transport for disposal or treatment of hazardous substances.
- Transporter who has selected the site for the disposal of a hazardous substance.

3.3 Site Evaluation and Investigation

When an AOC is identified at FNOD, USACE will evaluate the site for FUDS eligibility by the following actions:

3.3.1 Inventory Project Report (INPR)

The eligibility of a potential project is documented in a Findings and Determination of Eligibility (FDE). The FDE is a part of the Inventory Project Report (INPR) that, in turn, identifies eligible projects for the FUDS program. During INPR development, USACE coordinates with USEPA, VDEQ, and local officials and solicit their input. This coordination serves to ensure that available environmental information is considered before eligibility determinations are finalized. The complete INPR process is detailed in Appendix B of ER 200-3-1.

3.3.2 FUDS Property Screening (FPS)

The FPS is part of the INPR process. The FUDS Property Screening consists of completion of a CERCLA Preliminary Assessment (PA), the INPR Checklist and a screening Munitions Response Site Prioritization Protocol (MRSP). The FUDS Property Screening is conducted for each new FUDS property following determination of FUDS eligibility in the FDE or for eligible FUDS properties re-examined at the request of a State, USEPA, or other stakeholder. If a new potential HTRW or MMRP project is proposed, the INPR will be amended to confirm the proposed project through the FPS process.

3.3.3 Remedial Preliminary Assessment (PA)

The preliminary assessment (PA) is the first step in the CERCLA process. The purpose of the PA is to: (1) eliminate from further consideration those properties that pose little or no threat to public health or the environment; (2) determine if there is any potential need for removal action; and (3) set priorities for site inspections. During the PA, readily available property information is collected and a property visit is conducted.

The PA report addresses CON/HTRW, HTRW and MMRP aspects of the property and includes: (1) A description of the release or potential release; (2) a description of the probable nature of the release; and (3) a recommendation on whether further action is warranted. Information regarding both MEC and MC aspects of the areas of interest (AIs) is also included in the PA Report. The PA Report is included in the permanent Project

If information collected during the PA indicates that no CERCLA hazardous substances or pollutants and contaminants, or other materials addressed under DERP are present at the property, the USACE will prepare the following documentation:

- Property Declaration Statement
- Documented coordination with regulators pertaining to closeout
- PA Report

Any agreement to remove an AOC from further consideration is documented in the ARF and the SMP.

A PA Report was prepared for the FNOD FUDS property by the USACE. The PA compiled

information obtained through historical research at various archives and records holding facilities and is primarily a textual, cartographic and photographic research and analysis effort. No sampling or quantitative field assessment techniques were conducted to gather data. The PA concentrated on verifying the findings and supplementing the previous investigations and studies. The information collected as part of the PA Report was used to identify additional potential MMRP and HTRW AOCs and provided additional information on existing source areas and AOCs. The PA Report was finalized in November 2012 (USACE, 2012).

3.3.4 Remedial Site Inspection (SI)

The SI is the second component of the Site Evaluation following the PA. Sampling conducted in the SI is limited in nature. The limited focus is to determine whether CERCLA hazardous substances, pollutants, or contaminants or MC are present, not to determine nature and extent of contamination. The objectives of the SI are to: (1) eliminate from further consideration those releases that pose no significant threat to public health or the environment; (2) determine the potential need for removal action; and (3) collect data, as appropriate, to characterize the release for effective and rapid initiation of the Remedial Investigation/Feasibility Study (RI/FS).

When information in the PA indicates the presence of significant HTRW or MMRP contamination, the response process can proceed directly to the RI phase. If contamination is not confirmed, a No DoD Action Indicated (NDAI) decision will be considered. If the presence of contamination is confirmed, the SI will be completed and the project will proceed to the next appropriate phase. Information collected during the SI will also be used to complete the DoD Relative Risk Site Evaluation (RRSE) for HTRW projects or the MRSPF Score for MMRP projects, as appropriate.

When an SI or site characterization shows that there has been no release or the release poses no significant threat to public health, safety, and the environment, USACE will prepare the following documentation:

- Project Declaration Statement
- Documented coordination with regulators pertaining to closeout
- NDAI Explosives Safety Submission (ESS) (for MMRP projects only)
- SI Report

3.3.5 Removal Response Following the SI

Removal actions generally have limited objectives, and typically are short-term actions to mitigate the threat posed by a release or threatened release of hazardous substances or pollutants or contaminants (including MEC and MC). The removal action process is not used to make closeout decisions. All closeout decisions will occur in the remedial process. Removal action is categorized in three ways: (1) emergency, (2) time-critical, and (3) non-time-critical based upon the situation, the urgency and threat of release or potential release, and the subsequent time frame in which the action must be initiated. If an evaluation of the NCP factors and site-specific conditions does not indicate a removal response is appropriate, the response will proceed as a remedial response.

3.3.6 Remedial Investigation/Feasibility Study (RI/FS)

The RI is intended to adequately characterize a site for the purpose of developing and evaluating effective remedial alternatives. In addition, the RI will provide information to assess the potential risks to human health, safety, and the environment that were identified during risk screening in the SI. The primary objective of the FS is to ensure appropriate remedial alternatives are developed and evaluated. A treatability investigation, considered a part of the RI, is an optional step that may be performed when the FS indicates a need for further data to evaluate the feasibility of treatment technologies. During the RI, the following activities will be conducted:

- USACE will coordinate with VDEQ, USEPA, and local officials on identification of ARARs.
- USACE will conduct a baseline risk assessment for HTRW and MC as part of the RI.
- Site remediation goals will be developed subject to restrictions placed on land use at the time of transfer from DoD control and/or future land uses reasonably anticipated at the time of the remedy selection. DoD does not anticipate conducting further environmental restoration activities based solely upon changes in land use initiated by current property owners that would be inconsistent with the previous remediation conducted by DoD or land use restrictions attached to the property.

When the conclusion of a public health evaluation or baseline risk assessment conducted for the RI states that there is no significant threat to public health, safety, or the environment or when a no action alternative is selected, USACE will prepare the following documentation:

- Documented coordination with regulators pertaining to closeout
- NDAI ESS (for MMRP projects only)
- Proposed Plan
- Record of Decision (ROD)

3.3.7 Proposed Plan (PP)

The PP document will summarize the remedial alternatives proposed for a site and will specify the preferred alternative. The PP will be prepared as a fact-sheet or as a document similar to, but shorter and less conclusive than, the ROD.

3.3.8 Record of Decision

The ROD will document the remedial action decisions made at the FNOD FUDS sites. The ROD will identify the remedial alternative chosen for implementation and be based on information from the RI/FS. The ROD will also consider public comments and community concerns.

3.3.9 Public Involvement Requirements

After the ROD is signed, USACE will publish a notice of the availability of the ROD in a major local newspaper of general circulation and make the ROD available for public inspection and copying at or near the FNOD prior to the beginning of any remedial action.

3.3.10 Remedial Design

Detailed designs, plans, specifications, and bid documents for conducting a remedial action at an FNOD FUDS site will be developed during this phase. For projects involving MEC, USACE will prepare an ESS or Chemical Safety Submission (CSS).

3.3.11 Remedial Action (Construction RA-C and Operation RA-O)

The remedial action phase is divided into a construction component (RA-C) and an operations component (RA-O). Long term management activities may be required for projects following the RA-O phase and for MMRP projects. In accordance with CERCLA §300.430(f)(4)(ii), a five year review will be conducted at a site “if a remedial action is selected that results in hazardous substances, pollutants, or contaminants remaining at the site above levels that allow for unlimited use and unrestricted exposure”. This review is conducted to ensure that the remedial actions remain protective of human health, safety, and the environment.

4 Summary of PROJECTs

The tables provided below reflect current year and total projected clean-up cost, active and closed projects, and FY13/FY14 milestone completed at FNOD. The following section summarizes past, present and future activities at each site present on FNOD by project. The Sites are identified as Source Areas (S-XX), AOCs (A-XX) or Other Areas of Investigation (O-XX). In addition, the Formerly Used Defense Site Management Information System (FUDSMIS) Project Number is referenced. The various SAs, AOCs and Other Areas of Investigation are currently being investigated under 22 individual FUDSMIS projects.

The following pages of Section 4.0 include information on the location and size of each site, site history, past and present activities, and presents projected activities for FY14 and beyond. The FNOD Master FUDS Project Schedule is presented in Figure 4-1. The Master Flow Chart indicates the current status of each site – completed work, ongoing activities and projected tasks. This chart assumes a conservative scenario in which at least one AOC in each FUDSMIS project will require a ROD and de-listing in accordance with CERCLA and FUDS regulations. This chart is revised each year as investigations proceed and more information is collected.

Prior Year Funding, Current and Future Estimates:

Total Project Costs for clean-up (Historical and Future in \$K) =_\$74,655.6K		
<u>Fiscal Year</u>	<u>Projected</u>	<u>Actual</u>
<u>FY1984-2012</u>	-	<u>\$55695.3K</u>
<u>FY2013</u>	-	<u>\$1987.1K</u>
<u>FY2014</u>	-	<u>\$4428.4K</u>
<u>FY2015</u>	<u>\$5432.3K</u>	-
<u>FY2016</u>	<u>\$1800.8K</u>	-

Active Projects

Although the USACE FUDS process is on-going and will address other potential sites at FNOD in the future, the USACE FUDS program is currently addressing sites under the active projects listed in Table 1 below. To date, the sites that have been identified for USACE FUDS work include:

Site Name	Site ID	Category	Phase
TNT Source Area	SA-1	HTRW	R/FS
James River Beachfront	SA-2	HTRW	PP/ROD
Horseshoe Pond	SA-4	HTRW	RD/RA
Main Burning Ground	SA-5	HTRW	R/FS
Nansemond River Beachfront	AOC-1	HTRW	R/FS

GE Pond	AOC-4	HTRW	RI
Marine Corps Power Generation Fac.	AOC-6	HTRW	RI
J-Lake	AOC-7	HTRW	RI
Track H&I Magazines	AOC-11	HTRW	FS
Track J Magazine	AOC-12	HTRW	RI
Former WWTP Area	AOC-13	HTRW	RI
Track K Magazine Line	AOC-14	HTRW	RI
Track K Possible Landfill	AOC-15	HTRW	RI
Potential PCB Transformers	AOC-17	HTRW	SI
Former Water Treatment Plant	AOC-20	HTRW	RI
Former Renovation Plant	AOC-23	HTRW	RI
Shoreline MEC Areas	Project 16	MMRP	RI
Cantonment Area	Project 18	HTRW	SI
Fuel Storage Tanks	Project 21	CON/HTRW	SI
Athletic Field South	O-3	HTRW	SI
Athletic Field North	O-4	MMRP	RI
Former Buildings L-11 and L-12	O-6	MMRP	RI
Community Relations	NA	NA	NA

Closed Projects

The projects that have been closed and are not listed in the table above is provided below. They are discussed further in this Site Management Plan. To date, the sites that have been closed include:

Site Name	Site ID	Category
Ordnance/Explosives (OE)	NA	MMRP
OE Land Use Controls		
Conceptual Site Model	NA	HTRW
Impregnate Kit Area	SA-3	HTRW
Track K Dump	SA-6	HTRW
Streeter Creek	AOC-2	HTRW
Track A Possible Disposal Area	AOC-8	HTRW
Offshore Area (far)	AOC-3a	HTRW
Offshore Area (near)	AOC-3b	HTRW
TCC Lake	AOC-5	HTRW
Track A and B Possible Burning Area	AOC-9	HTRW
Track G Magazine	AOC-10	HTRW
Former Steam Heating Plant	AOC-16	HTRW
Suspect USTs	AOC-18	HTRW
Potential TCE in Groundwater	AOC-19	HTRW
Officers Club Pool	AOC-21	HTRW

Arsenic Investigation Area	AOC-22	HTRW
Underground Concrete Structure	O-1	HTRW
Former Building E-410	O-5	MMRP
Pesticide Drum Area	O-7	HTRW

Project Milestone:

A FNOD, a milestone is a reference point in the CERCLA process that marks a major event in a project and is used to monitor the project's progress. The milestones for FNOD project is intended to present a clear sequence of events that will incrementally build up to the completion of the approved project.

FY13 Milestones Completed

Site Name/Site ID	Phase	Completion Date
Impregnite Kit Area	Final RI Report	Apr-13
AOC-11 Track H&I Magazine Line	Final RI Report	Jul-13
Background Study	Final Background Study Report	Sep-13

FY14 Milestones Completed

Site Name/Site ID	Phase	Completion Date
James River Beachfront (SA-2)	Final FS Report	May-14
Impregnite Kit Area (SA-3)	Final Proposed Plan	Jun-14
	Final Record of Decision	Sep-14
Horseshoe Pond (SA-4)	Final Feasibility Study	Apr-14
	Final Proposed Plan	Jun-14
GE Pond and Culvert (AOC-4)	Final SI Report	Sep-14
Marine Corps Power Generating	Final SI Report	Sep-14
AOC-11 Track H&I Magazine Line	Final RI	Jul-13
Track J Magazine Line (AOC-12)	Final SI Report	Sep-14
Former WWTP (AOC-13)	Final SI Report	Sep-14
Abandoned Water Treatment Plant (AOC-20)	Final SI Report	Jun-14
Arsenic Investigation in Groundwater(AOC-22)	Final Proposed Plan	Jun-14
	Final Record of Decision	Sep-14

Schedule Constraints:

- Horseshoe Pond – The signing of the final ROD has been delayed due to legal issues. The ROD is expected to be finalized by the end of July 2015.
- Main Burning Ground - RI activities were conducted in 2009 and 2010 to evaluate any residual contamination that may be present at the MBG. The preliminary findings indicate need for additional data collection as part of the FS to address data gaps. This additional data collection effort will delay the project completion by at least 2 years.

- James River Beachfront - The signing of the final PP has been delayed by more than one year due to legal issues with shoreline restoration. The PP is expected to be finalized by the end of July 2015.
- J-Lake - The additional data collection effort associated with the pipeline will delay the project completion by more than one years.
- Track H and I Magazine Line (AOC-11) – Completion of the FS Report is delayed by one year due to evaluation of the data with the new background study which was conducted in FY13.
- Nansemond River Beachfront (AOC-1) - A RI was initiated in September 2014 to incorporate previously and newly collected data from the MEC intrusive investigation. The completion of the RI Report is delayed by two years due to evaluation of the data with the new background study conducted in FY13 and additional HTRW areas identified during the MEC shoreline study.
- Project 16: MEC Shoreline project – A new project initiated in 2011
- AOC-4, AOC-6, AOC-12, AOC-20, and AOC-23 - Based on the recommendations in the SI Report and the Draft PA, a Remedial investigation is anticipated for these AOCs.
- Project 18: Cantonment Area - A new project initiated in 2014
- Project 21: Fuel Storage Tanks - A new project initiated in 2014

PROJECT C03VA004501 TNT SOURCE AREA (SA-1)

Project Summary: The TNT Source Area (SA) was identified in 1987 when evidence of munitions debris was observed. Subsequent investigations conducted in the SA revealed a slab of crystalline TNT weighing several tons. Multiple removal and remedial activities, as well as several rounds of soil and groundwater sampling, have been conducted in the TNT SA.

TNT SOURCE AREA (SA-1)

History and Past Work: The TNT SA is located on TCC property at the intersection of College Drive and Jamestown Road. The TNT SA was identified in 1987 when evidence of munitions debris was observed. The original extent of the SA was estimated to be approximately 1.87 acres in size and enclosed by a fence. Subsequent investigations conducted in the area revealed a slab of crystalline TNT weighing several tons. The boundaries of the TNT SA were revised on the basis of an evaluation of historical aerial photographs and topographic features observed north of the original



1.87-acre area (USACE, 1993). The SA was determined to be approximately 9.8 acres in size in the Archives Search Report findings. Multiple remediation activities, as well as several rounds of soil and groundwater sampling, have been conducted in the TNT SA since the initial observation of munitions debris. These activities are summarized below:

- In May 1987, an MEC surface sweep was conducted. High Explosives (TNT base), ordnance-related material and scrap metal were collected and disposed of off-site. (ED&GG, 1988)
- During June and July 1987, a Remedial Action Investigation and Ordnance Survey were conducted. MEC in the form of .30 & .45 caliber rifle ammunition, explosive boosters, crystalline TNT, scrap metal, burned out tear gas canisters, and fuses were observed. Soil and groundwater samples were also collected during these investigations (ED&GG, 1987; ED&GG, 1988).
- A surface and subsurface MEC clearance was conducted in December 1988. Several ordnance items and bulk explosives were discovered (EODT, 1989)
- Between November 1989 and February 1991, sampling was conducted as part of an initial RI to evaluate the nature and extent of contamination in soil and groundwater (USEPA Region III, 1999).
- From April through June 1992, bagged, contaminated soil left on site after the 1988 and 1989 MEC investigations, as well as six inches of additional soil beneath the bags, was

screened. The MEC and contaminated soil were disposed of off-site (*IT Corporation, 1992*)

- Additional soil and groundwater investigations were conducted in August 1994 (*CDM, 1996*).
- A geophysical survey was conducted in July 1999 and several magnetic anomalies were discovered (*SAIC, 1999*).
- A removal action was conducted from January 2000 through April 2001 (*UXB, 2001*)
- During March and April 2003, soil and groundwater sampling was conducted to determine the residual extent of soil and groundwater contamination (*USACE, 2003a*).
- In June 2003, approximately 500 pounds of solid TNT were removed through a Time Critical Removal Action (TCRA) (*USACE, 2003b*).
- In 2004, a temporary cover was installed over contaminated soil left in place after the June 2003 removal action (*USACE 2003c; Zapata, 2007*).
- A Revised Draft RI Report was completed in 2008 (*CAPE, 2008*). This RI Report included an evaluation of historical sampling data as well as human health and ecological risk assessments. The RI Report identified several data gaps in soil and groundwater that would need to be addressed in order to fully evaluate the nature and extent of contamination. The Draft RI determined that a FS is needed to evaluate remedial alternatives for the site.
- In 2009, additional soil and groundwater sampling was conducted to address the remaining data gaps from the Draft RI. The results of this sampling are being used to complete the RI and support the evaluation of remedial action objectives and remedial alternatives in the FS as well as the Remedial Design.
- A bench-scale biodegradation study was initiated in 2009. This study, which was being conducted by VERSAR and Virginia Tech, evaluated the biodegradation potential of TNT in groundwater at the site. This study also included the development of a site-specific groundwater model and projections of remediation timeframes. The results of this study will be used to support the FS.
- In 2013, the Draft RI Report was revised to include the additional data, updated human health and ecological risk assessments, and the results of the background data study being conducted by USEPA.
- The Final Revised RI Report is expected to be finalized in July 2015.
- A Work Plan was finalized in October 2014 to address remaining data gaps as part of the FS. A field investigation was conducted in October 2014. Closure of these data gaps are necessary in order to refine FS assumptions regarding volumes of contaminated soil and groundwater to be addressed in the FS.

Future Work: A Supplemental Investigation Report will be prepared to address remaining data gaps. Completion of the Supplemental Investigation Report is currently scheduled for July 2016. The Feasibility Study Report will be initiated in 2015 and will be completed by August 2017. Once a preferred remedial alternative is presented in a Proposed Plan, a ROD can be initiated.

PROJECT C03VA004502 NAB-MMRP Removal Action

Project Summary: MMRP project, Project 02, is addresses Munitions Response Site (MRS) identified as the James River Beach Dump and TNT Disposal Area. The 11.9-acre James River Beach Dump and TNT Disposal Area are located at the confluence of the Nansemond and James Rivers in Suffolk, Virginia. The Army used the MRS for disposal of munitions and disposal of bulk TNT from reconditioning of projectiles during WWII. Known or suspected munitions disposed of include 170 millimeter (mm) German artillery shells, HC smokepots, small arms, 8-inch projectiles, cannon balls, a British 6-inch shrapnel round, boosters, MK II hand grenades, 75mm projectile fuses, 40mm anti-aircraft rounds, and crystalline (bulk) TNT.

Multiple surface clearances and removal actions were conducted between 1987 and 2007 to remove munitions and explosives of concern (MEC), munitions debris (MD) and soil contaminated with munitions constituents (MC) from the MRS. An Engineering Evaluation/Cost Analysis was performed in 1998, and a final removal report was completed in 2008, documenting the removal actions and clearance of MEC to depth.

Future Work: Removal actions under this project have been completed and no further action for MEC or MC is anticipated for this project. MEC Shoreline investigation will be performed under Project 16. Project 02 will proceed to Project Closeout (PCO).

PROJECT C03VA004503 Site-wide Groundwater Model

Project Summary: This project began as a means to address the HTRW areas of concern (AOCs) at FNOD. As these areas were broken out individually, the remaining work on this project was re-directed to completing a site-wide ground water model. The data required for the GW Model, CSM and report has been collected.

Future Work: Any further data requirements will be accomplished within other HTRW projects. Therefore, no further action is anticipated for this project and the project will proceed to PCO.

PROJECT C03VA004504 OU-7 Impregnation Kit Area

Project Summary: The Impregnite Kit Area was a disposal area for impregnite kits. The kits contained XXCC3 and an inert, viscous liquid used to neutralize chemical agent. Historical groundwater data from the Impregnite Kit Area and results of the FNOD site-wide groundwater study will be used to determine the need for further action.

Impregnite Kit Area (SA-3)

History and Past Work: The Impregnite Kit Area is located south of the Ashley Capital Warehouse Facility on the western side of FNOD. This SA was a disposal area for Impregnite Kits. The kits contained XXCC3 and an inert, viscous liquid. XXCC3 is a compound used to neutralize chemical agents, and the kits were likely used as a protective coating on undergarments for military issue chemical suits (*USEPA Region III, 1999*). The Impregnite Kit Area was originally assumed to encompass a rectangular area approximately 7 acres in size. Subsequent investigations resulted in the Project Delivery Team agreeing to reduce the area to a 1.66-acre circle, approximately 207 feet in diameter. Summarized below are the activities that have been conducted in the Impregnite Kit Area.



- In March 1996, Dominion Lands, conducted an environmental screening of several parcels, including the Impregnite Kit Area. Wooden crates containing Impregnite Kits were uncovered. Surface and subsurface soil samples were also collected (Malcolm Pirnie, 1996).
- Soil and waste sampling was conducted in February 1997 (USEPA Region III, 1999).
- In December 1998, a Removal Action was conducted at the Impregnite Kit Area. A total of 860 tons of Impregnite Kit materials and soil were removed and transported to a solid waste landfill (Earth Tech, 1999).
- In July 1999, a confirmation geophysical investigation was performed and confirmation soil samples were collected. This report concluded that no additional sampling was necessary (Micropact, 2000).
- In August 2002, a previously identified magnetic anomaly was investigated and found to contain approximately 10 pounds of non-MEC scrap and one item of MEC scrap (no reference available).
- In October 2002, No Further Action was recommended based on the confirmatory soil sample results (*USACE, 2003d*).

- On 20 March 2003, USEPA Region III issued a Notice of Intent for Partial Deletion (USEPA, 2003d). Soil was delisted in 2003; however, groundwater beneath the Impregnite Kit Area was specifically not included in the partial deletion notice.
- The USACE prepared and submitted a Draft Groundwater Characterization Report for the Impregnite Kit Area to the regulatory agencies in December 2006 (*Malcolm Pirnie, 2006*). The report concluded that No Further Action was necessary for groundwater beneath the Impregnite Kit Area site. However, USEPA responded that additional data was needed in order to make a final determination.
- USACE completed a Final IKA Groundwater Characterization Report in 2013. No elevated levels of constituents (e.g., carbon tetrachloride and zinc) related to impregnite kit materials were observed in groundwater. None of the metals detected in IKA groundwater are primary constituents of the impregnite material and all are naturally occurring. Therefore, No Action is anticipated for groundwater at the IKA.
- A Final IKA Proposed Plan was prepared on 30 June 2014.
- A public comment period was held from June 30 to July 30, 2014. In addition, a public meeting was held on July 10, 2014 to present the Proposed Plan to a broad audience.
- A Final ROD, including a Responsiveness Summary, was finalized in October 2014.

Future Work: The ROD proposed a no further action for groundwater at the Impregnite Kit Area. The final step will be to initiate the delisting of the Impregnite Kit Area from the NPL.

PROJECT C03VA004505 OU-3 Horseshoe Shape Pond

Project Summary: Horseshoe Pond is a suspected dumping area of DoD waste. Laboratory glassware, bottles, film, and other debris have been observed near the pond. AOC-22, Arsenic Investigation Area, is located between the Horseshoe Pond and GE. Project 05 is being expanded to incorporate AOC-22, Arsenic Investigation Area. A localized area of metals and polycyclic aromatic hydrocarbons (PAHs) in soil is present at the Horseshoe Pond. Elevated arsenic concentrations have been detected in the groundwater at both Horseshoe Pond and AOC-22. Therefore, this original HTRW project is being revised to include AOC-22 because of the common concern of arsenic levels in groundwater, the geographic proximity of Horseshoe Pond and AOC-22, and the expected common anticipated response to the arsenic in the groundwater. The inclusion of AOC-22 in Project 5 will also result in management efficiency and should facilitate faster completion of the project.

Area of Concern (AOC) or Source Area (SA)	Description	Function/ Operations
SA-4	Horseshoe Pond	Debris disposal
AOC-22	Arsenic Investigation Area	Elevated As concentrations

Horseshoe Pond Area (SA-4)

History and Past Work: The Horseshoe Pond (HSP) Area is located on Dominion Lands southwest of the warehouse facility and adjacent to the Nansemond River. The SA consists of a pond surrounded by berms and steep banks. The HSP area was initially formed by the placement of dredge spoils associated with the WWII-era P rail line pier. It was used as a waste disposal area for approximately 10 years beginning in the late 1940's. Laboratory glassware, bottles, film, and assorted debris have been observed in the vicinity of the pond. (*USEPA Region III, 1999*) Site plans of the period depict a Pistol and Small Bore Range covering an area, approximately 400 feet by 600 feet, on the southeastern arm of the HSP and overlapping the water. Historical aerial imagery, however, indicates the firing lines were less than 100 feet from the firing line. The western portion of the HSP Area contains wetlands that preclude development. The HSP Area is approximately 1.2 acres in size. Summarized below are the activities that have been conducted in the HSP SA.



- A geophysical survey was conducted in 1996 at the north end of the HSP. Two M-18 smoke grenades were found on the surface (Foster Wheeler, 1998).

- In February 1997, soil, sediment, surface water and probable waste sources in the drainage system were sampled (USEPA Region III, 1999).
- An initial RI was conducted between November 1999 and April 2000. The draft RI Report identified several data gaps to be addressed subsequent investigations (Weston, 2009b).
- In August 2002, previously identified anomalies were investigated and found to contain approximately 10 pounds of non-MEC scrap and one item of MEC scrap (no reference available).
- In 2005, the pond was drained and several previously identified magnetic anomalies were investigated. The anomalies were determined to be non-MEC scrap (Zapata, 2007).
- A Revised Draft RI Report and a Baseline Human Health Risk Assessment (HHRA) were prepared in 2003. Several iterations of the RI Report were prepared since, with the most recent version, the Final RI Report, completed in June 2011. The RI recommended a Focused Feasibility Study (FFS) to address a localized area of metals and polycyclic aromatic hydrocarbons (PAHs) impacted soil at the HSP (Weston, 2011).
- A Final FFS Report was completed in April 2014. The recommend alternative in the FFS was removal of PAH contaminated soil associated with two berms surrounding the pond (Weston 2013).
- A Final Proposed Plan was completed in June, 2014. A public comment period was held from June 30 to July 30, 2014. In addition, a public meeting was held on July 10, 2014 to present the Proposed Plan to a broad audience.
- A Draft ROD, including a Responsiveness Summary, was submitted to the stakeholders on 26 August 2015 for review and comment.
- The ROD is expected to be finalized by the end of August 2015.

Future Work: The Remedial Design will be completed in April 2015. A Remedial Action will follow.

Arsenic Investigation Area (AOC-22)

History and Past Work: AOC-22, Arsenic Investigation Area, is located between the Horseshoe Pond and GE. On a 1952 aerial photograph, a channel can be observed extending from the northernmost leg of Horseshoe Pond to the northeast. GE operated a rail line, which ran parallel to the southern side of the facility. Based on the additional groundwater sampling conducted in 2009, the distribution of arsenic in AOC 22 groundwater has been adequately defined and consists of a localized area. The supporting information for this determination was presented in a



No Action Technical Memorandum. Summarized below are the activities that have been conducted in the Arsenic Investigation Area AOC.

- Groundwater samples were initially collected from GE Monitoring Well 18A In June 1999 and March 2002. Elevated concentrations of total and dissolved arsenic were detected (MWH, 2005).
- During October 2004, ten temporary wells were installed and groundwater samples collected. The results indicated slightly elevated levels of arsenic in the area between the GE warehouse building and Horseshoe Pond (Versar, 2008).
- A Consensus Statement was signed in August 2005 establishing AOC-22 as a new AOC at FNOD (no reference available).
- A site investigation to evaluate groundwater geochemistry and arsenic concentrations in groundwater was completed in 2007. The results identified elevated levels of arsenic in a localized area. The source of arsenic could not be identified and the elevated detections may be due to localized geochemical conditions in groundwater (Versar, 2008). There are currently no complete exposure pathways to the arsenic in groundwater at AOC-22. The report recommended additional monitoring of arsenic in groundwater.
- Additional groundwater sampling was conducted in 2009. A No Action Technical Memorandum evaluating the 2009 results, along with data collected previously from AOC-22, was finalized in October 2012.
- A Final Proposed Plan was prepared in 6 June 2014.
- A public comment period was held from June 30 to July 30, 2014. In addition, a public meeting was held on July 10, 2014 to present the Proposed Plan to a broad audience.
- A Final ROD, including a Responsiveness Summary, was finalized in October 2014.

Future Work: The ROD proposed a no further action for AOC-22. The final step will be to initiate the delisting of AOC-22 from the NPL.

PROJECT C03VA004506 Main Burning Ground

Project Summary: The Main Burning Ground and Steamout Pond (SA-5) have previously been referred to as OU-2 GE Main Burning Ground. Black, tar-like substances, scrap metal, various munitions items, residues from burning small arms and metals, and burn trenches that contained munitions items and debris were present.

Main Burning Ground and Steamout Pond (SA-5)

History and Past Work: The Main Burning Ground (MBG) is located in the eastern half of FNOD on GE Property. It is southeast of the GE Pond and south of Wellner (formerly Park) Drive. The MBG appeared active from at least the 1930s until the late 1950's, first as a burning ground or test area, then as a waste disposal area. The MBG was characterized by ground scars, mounded material, pits, trenches, equipment, and a small structure. The Steamout Pond (SP) first appeared as an excavation in the southeastern half of the MBG in 1952.



Access roads and trenches led to and from the pond. In 1958, it appeared to contain a dark liquid and fed by a ditch containing a dark liquid. By 1963, the area appeared inactive and was becoming re-vegetated (EPIC, 1987; USATEC, 1997). The MGB is approximately 32 acres. The Steamout Pond (SP) is located in the Main Burning Ground and is approximately 1 acre. Summarized below are the activities that have been conducted in the MBG SA.

- Soil, sediment and water samples were initially collected from the MBG in February 1997 (Weston, 1997; Malcolm Pirnie, 2009).
- In conjunction with the EE/CA issued in 1998, a geophysical survey, test pits, and soil sampling were completed at the MBG and SP. MEC, munitions-related items, and possible burn layers were observed during the EE/CA investigation (Foster Wheeler, 1998).
- Between November 1999 and April 2000, an initial RI was conducted at the MGB. The initial RI included sampling of soil, sediment, and water and a limited geophysical investigation. The draft RI Report identified several data gaps that were addressed in a later follow-up RI investigation (Malcolm Pirnie, 2009).
- A MEC investigation was initiated at the MBG through a non time-critical removal action in February 2000. This MEC investigation continued intermittently over the next several years using three UXO contractors.
- A removal action was completed in December 2008. Numerous discarded military munitions (DMM) and munitions debris were removed from the MBG, including whole or partial projectiles, fuses, boosters, grenades and other munitions related items. In total, approximately 70 acres of land were cleared for MEC at the MBG. Over 70 tons of

munitions debris were removed during the action. Additionally, over 400 tons of other non-MEC debris were removed (Zapata, 2007; Weston, 2008).

- Additional RI activities were conducted in 2009 and 2010 to evaluate any residual contamination that may be present at the MBG. Soil, sediment and groundwater sampling were conducted. The sampling results were incorporated into a Revised Draft RI Report, which included revised human health and ecological risk assessments (Arcadis, 2012). The USACE is currently addressing regulatory comments received on the Revised Draft RI Report.
- A Work Plan was submitted to the stakeholders for review in November 2014 to address remaining data gaps as part of the FS. A field investigation will be performed in June 2015. Closure of these data gaps are necessary in order to refine FS assumptions regarding volumes of contaminated soil and groundwater to be addressed in the FS.

Future Work: The RI Report will be finalized in 2015. A Supplemental Investigation Report will be prepared as part of the FS to address remaining data gaps. Completion of the Supplemental Investigation Report is currently scheduled in 2016. The Feasibility Study Report will be initiated in 2016 and will be completed in 2017.

PROJECT C03VA004509 NAB - James River Beachfront

Project Summary: The James River Beachfront (JRB) was used for the disposal of various scrap metal and construction debris and to possibly to burn munitions. HTRW removal actions have been completed. A hardened shoreline revetment was installed in 2005.

James River Beachfront (SA-2)

History and Past Work: The James River Beachfront (JRB) is located on the south bank of the James River on the TCC property directly west of the Interstate 664 Monitor Merrimac Memorial Bridge-Tunnel. The SA is an approximately 500-foot section of shoreline that sharply transitions into a bluff that covers an area of approximately 14 acres. The JRB was used as a general disposal area during World War I. The site was identified as a source area because the bluff had significantly eroded, exposing large amounts of construction debris, inert



170mm German artillery rounds, inert artillery fuses, and containers of various sizes similar to chemical agent storage and transport containers. The bluff is currently covered with grass and is stabilized by a stone revetment. Significant shoreline erosion is occurring immediately west of the revetment. The activities that have been conducted at the JRB SA are summarized below:

- USEPA Region III conducted a removal assessment in November and December 1995. Several magnetic anomalies were identified using surface magnetometry. Three empty 170-mm German High Explosive projectiles were also discovered during the investigation (Weston, 1996).
- An Engineering Evaluation/Cost Analysis (EE/CA) was completed in October 1998 in which surface MEC clearance and Institutional Controls, followed by periodic surface sweeps were recommended (Foster Wheeler, 1998).
- USACE Baltimore District conducted a SI in 1998. Closure of the disposal area in place and installation of permanent shoreline stabilization was recommended, along with further investigation of potential trichloroethylene (TCE) contamination in groundwater (USACE, 1998).
- In August 2000, USACE Norfolk District conducted a Phase I and II level archaeological test in the vicinity of a previously-discovered human burial. The remains were removed in June 2001 and re-interred at an alternate location (Cultural Resources, 2002).
- A Removal Action was completed during the summer of 2001. Approximately 2,600 tons of munitions scrap, debris and soil were removed, including 32 170-mm German projectiles, one 8-inch projectile, and one cannon ball. The Removal Action also included the

construction of a stone revetment to stabilize the JRB slope and shoreline (Weston, 2000; Plexus, 2002).

- A geophysical investigation of the JRB nearshore area was conducted in 2003. Several magnetic anomalies were identified and associated with debris along the JRB shoreline (SAIC, 2004).
- Sediment sampling was conducted at the JRB in 2004. The sediment sampling results were evaluated in a Screening Level Ecological Risk Assessment (SLERA). The SLERA concluded that ecological risks were negligible and that no further action was necessary (SAIC, 2005). However, the SLERA was later refined in the Remedial Investigation to include additional data.
- A RI was conducted for the beach, bluff and upland areas between 2005 and 2009. A Final RI Report, including revised human health and ecological risk assessments, was completed in June 2011 (Weston, 2011). The RI recommended a Focused Feasibility Study (FFS), due to the potential for MEC to be present at the site.
- Significant shoreline erosion is occurring to the west of the stone revetment. A Shoreline Stabilization Study evaluating erosion and potential alternatives at the JRB was prepared in 2009 and finalized in 2011 (SAIC, 2011). The results of the Shoreline Study were included in the Draft FFS (Weston, 2013).
- Due to issues with data usability, the previously collected nearshore sediment data was excluded from the Final RI. Sediment sampling was conducted in May 2011 to replace the excluded data. The results of this sampling were incorporated into a Sediment Sampling Report (Weston, 2012). Based on the results of the sediment sampling, no further investigation is warranted.
- The Final JRB Focused Feasibility Study Report was completed on 29 May 2014.
- A Draft Proposed Plan was submitted to all stakeholders on 20 October, 2014.

Future Work: The Proposed Plan will be finalized in 2015 with a public comment period commencing on October, 2015. The ROD is expected to be finalized in 2016.

Possible TCE Contamination (AOC-19)

History and Past Work: AOC 19, Possible TCE Groundwater Contamination, is located immediately south of the JR James River Beachfront (JRB) Source Area. The AOC was a general disposal area used by the Army during FNOD operations. The size of this AOC has not been determined. Summarized below are the activities that have been conducted in the Possible TCE Groundwater Contamination AOC.

- During a 1998 SI, groundwater monitoring wells were installed. (USACE, 1998).



- During a 1999 EE/CA evaluation, TCE was detected in groundwater collected from one background well at a concentration exceeding regulatory limits (*Weston, 2000*).
- In July 2002, a groundwater monitoring well was installed south of the existing JRB background wells and soil samples were collected (*USACE, 2004*)
- In October 2002, groundwater from the new monitoring well was sampled (*USACE, 2004*).
- Groundwater samples were collected in January and June 2003 (*USACE, 2004*).
- The final quarterly groundwater samples were collected in December 2003. There were no significant detections of TCE in any of the quarterly sampling events. The results of the sampling events are presented in the Final JRB RI Report (*Weston, 2011*).

Future Work: No action is required at AOC-19. Since the investigation activities at AOC-19 were completed in the SI phase, this site does not require formal de-listing or any other site closeout activities.

PROJECT C03VA004510 Track K & Pesticide Drum Area

Project Summary: Project 10 addresses the Track K Dump (SA-6) and the Pesticide Drum Area (O-7). Tires, empty paint cans, appliances, household waste and construction debris were observed in the Track K Dump (SA-6). In 1998, two unsealed, unmarked 55-gallons drums, one empty and one containing an unknown liquid, were found in the Pesticide Drum Area (O-7). The debris and drums were removed.

Track K Dump (SA-6)

History and Past Work: The Track K Dump is located west of South Road in an unused, wooded area of TCC. The Track K Dump was part of the Track K line of magazines and tires and paint cans were piled on and around an old magazine foundation. The tire pile was approximately 1/2 acre in size (250 feet by 100 feet) and the paint cans were scattered over a circular area approximately 12 feet in diameter. Tires and paint cans were removed to access soil in the vicinity of the former K-6 Magazine. Summarized below are the activities that have been conducted in the Track K Dump SA.



- A removal operation was conducted during May and June 2001. Confirmatory soil sample results identified several constituents of potential concern (COPCs).
- In February 2002, additional surface and subsurface soil sampling was performed to further characterize the nature and extent of COPS in soil (HGL, 2005a).
- In April 2002, VDEQ certified that the removal action at the Track K Dump complied with stated regulations (VDEQ, 2002).
- A Final RI Report was issued in August 2005. The results of the HHRA and the SLERA indicated that site soils did not pose an unacceptable risk to human or ecological receptors (HGL, 2005a).
- A Final Proposed Plan recommending No Further Action (NOFA) for site soils was issued in April 2006 (HGL, 2006).
- The Final ROD, which documents the NOFA decision for soils at SA-6, was signed in May 2007 (HGL, 2007).

Future Work: No Further Action is required at SA-6. However, as a NPL Source Area this site will go through the formal de-listing process under CERCLA.

Pesticide Drum Area (O-7)

History and Past Work: The Pesticide Drum Area is identified as Site O-7. In 1998, two unsealed, unmarked 55-gallons drums, one empty and one containing an unknown liquid, were

found on TCC property in a wooded area bounded by Interstate 664, College Drive, and Armistead Avenue. In November 1998, two surface soil samples were analyzed, and the suspect liquid was analyzed in May 1999. Based on the soil and liquid analytical results, an investigation was initiated at the Pesticide Drum Area in early 2000. The drums were removed in November 2000 and screening level soil samples were collected. Based on the sampling results, four additional locations were sampled (surface and subsurface) in February 2002. The validated results were evaluated and dieldrin was determined to be a potential constituent of concern PCOC (HGL, 2007).

During 2004, delineation soil sampling was conducted in order to determine the degree and extent of CPOCs. The RI Report for Pesticide Drum Area was finalized in April 2007 (HGL, 2007). The RI Report concluded that No Further Action was necessary at the site. A Proposed Plan for No Further Action was prepared in January 2008 and a Public Meeting was held (HGL, 2008a). A Final Decision Document documenting No Further Action for the site was signed in June 2008 (HGL, 2008b).

PROJECT C03VA004511 Offshore & Lake Areas

Project Summary: Project 11 addresses the Offshore Area (AOC-3a), Nearshore Area (AOC-3b), and TCC Lake (AOC-5).

Area of Concern (AOC) or Source Area (SA)	Description	Function/Operations
AOC-3a	Offshore Area	Nansemond and James River Shorelines
AOC-3b	Nearshore Area	Nansemond and James River Shorelines
AOC-5	TCC Lake	Possible Debris Disposal
AOC-10	Track G Magazine Line	Primer & Fuse Magazine

Nearshore and Offshore Areas (AOC-3)

History and Past Work: The shoreline, which borders the northern portion of FNOD, is approximately 2 miles long. The Nearshore Area (AOC-3b) is the area extending from the existing shoreline to the Mean Lower Low water mark (MLLW). The Offshore Area (AOC-3a) is the area from MLLW out to approximately 1 mile.

Two piers and a breakwater are known to have existed while FNOD was in operation. The “O” Line railroad pier projected north, approximately 4800 feet, (“mile-long pier”) is visible in a 1925 oblique photo. A 1942 aerial photograph the “P” Line railroad pier projecting to the northwest approximately 500 feet long and a breakwater parallel to the “P” Line pier approximately 780 feet long. During World Wars I and II, the railroad piers were used to load unserviceable ammunition on barges for disposal at sea. By 1963, the longer railroad pier was completely submerged (EPIC, 1987; USACE, 1993; USATEC, 1997). Portions of the mile-long pier and the other railroad pier are still intact. Several known or suspected disposal areas are located on or near the shoreline (Horseshoe Pond, Nansemond River Beachfront, and James River Beachfront). Significant erosion of the shoreline, greater than 300 feet in some areas, has occurred over the past 50 years and exposed assorted debris, including MEC waste, metal, slag, and construction materials (SAIC, 2002). At least one fire occurred at the end of the mile long pier in the 1920s. Summarized below are the activities that have been conducted in the Nearshore and Offshore AOCs.



- Navy divers explored the area around the mile long pier pilings in 1999. No ordnance or hazardous items were observed (*SAIC, 2002*).
- In September 2002, a Baseline Ecological Risk Assessment (BERA) was issued using the results of the Offshore Survey. The BERA concluded that ecological risk from the Offshore Area (AOC3-a) was negligible and no remediation or further action was required (*SAIC, 2003*).
- In June 2001, potential MEC items were observed by VDOT personnel during a geophysical investigation of future bridge locations. Navy EOD divers discovered the search area covered with wood, metal and concrete debris; however, no MEC or MEC related items were recovered.
- In February 2004, a SLERA was issued for the fishing pier area. The SLERA concluded that ecological risk from the fishing pier area was negligible and no remediation or further action was required (*SAIC, 2003*).
- During FY04, a Record of Decision for the Offshore Area (AOC 3a), documenting that No Further Action is needed at the AOC, was approved by the USEPA (*USACE, 2004*).

Future Work: Investigations are complete for the Offshore Area (AOC-3a) and no action is anticipated. Some portions of the Nearshore Area (AOC-3b) have been included in ongoing investigations at sites near the shoreline (NRB (AOC-1) and JRB (SA-2)). The FNOD PDT will identify any other portions of the Nearshore Area that may require investigation through the FUDS process.

TCC LAKE (AOC-5)

History and Past Work: The TCC Lake AOC is on TCC property west of Interstate 664 and adjacent to the James River. The AOC was originally a swampy creek draining into the James River. The lake was created when the creek was dammed and was a possible waste disposal area (*USEPA Region III, 1999*).

A water tank and pump house are located adjacent to the southeast bank of the lake. Several areas of debris (scrap metal, wood, glass, plastic bottles, household items, concrete) are located along the east side of the lake.

Additionally, several pits, mounded areas, depressions and a possible man-made drainage features are located on the east side of the lake. Eight explosives storage structures surrounded the lake while the depot was in operation. Paths leading through the woods from the Track K Ammunition Magazine Line and TCC Lake were observed in 1957 aerial photographs (*USATEC, 1997*). Analysis of past drainage patterns indicate that surface runoff entered the lake from the south and east. (*EPIC, 1987*). The TCC Lake AOC is approximately 14 acres in size. Summarized below are the activities that have been conducted in the TCC Lake AOC.



- USACE performed a visual survey of the TCC Lake in November 1993. Construction debris was observed along the edge of the pond. An excavation, shored with railroad ties, was investigated on the east side of the pond (USACE, 1993).
- An additional site reconnaissance was conducted in November of 1993. More recently deposited debris (petroleum product containers) was observed in one of the former magazines (Foster Wheeler, 1998).
- In November 1995, soil was sampled from an excavation on the east edge of the lake and a trench near Track G, on the south side of the lake (Weston, 1996).
- A site inspection was conducted in January 1996; however, it was limited to a small area of the pond due to dense vegetation (Weston, 1996).
- In February 1997, sediment and surface water samples were collected from TCC Lake. (Foster Wheeler, 1998).
- A multimedia sampling event was conducted from September through November 1997. Surface water, sediment and fish tissue were collected from the lake (Gannett Fleming, 1998).
- During 1997, a geophysical survey was conducted on the south side (Track G area), east side (ground scars between former K-6 & K-7 magazines) and northeast side (unidentified pits near former J-2 magazine) of TCC Lake. Several magnetic anomalies were identified. Soil from one of the pits surveyed on the northeast side of the lake was tested for explosives (Foster Wheeler, 1998).
- In March 2002, a Final Desktop Audit was issued and identified several COCs for further investigation (Micropact, 2002).
- Fish tissue and sediment samples were collected in August 2000 (VDEQ, 2002).
- A geophysical survey of TCC Lake was performed in early June 2003. Several magnetic anomalies were identified (SAIC, 2003).
- An Draft Expanded Site Investigation (ESI) Report, including screening level human health and ecological risk assessments was prepared and submitted in November 2008 (SAIC, 2008). No unacceptable potential human health risk was identified. Minimal potential ecological risk was identified due to PAH detections in sediment. Comments on the Draft ESI Report were received from EPA in August 2009.
- The anomalies identified in 2003 were investigated in 2009 and determined to be non-MEC related (Weston, 2010).
- USEPA accepted responses to comments on the ESI Report in February 2011. SAIC was contracted in 2011 to revise the ESI Report accordingly.
- The Final Revised ESI Report was completed in December 2011.
- A Consensus Document indicating No Further Investigation was signed in May 2012.

Future Work: As indicated in the Consensus Statement, no action is required at AOC-5. A copy of this consensus statement is included in the Appendix. Since the investigation activities at AOC-5 were completed in the SI phase, this site does not require formal de-listing or any other site closeout activities.

Track G Magazine Line (AOC-10)

History and Past Work: The Track G Magazine Line AOC consists of one structure, G-608, located along the southeast edge of TCC Lake. G-608 was a Primer & Fuse Magazine. The General Map, revised in 1937, shows the existence of a tetryl platform east of G-608. A tetryl platform is a loading platform for rail cars where tracks are lower than grade. Based on a review of historical aerial photography, in 1948, an unidentified structure was located southwest of G-608. In 1954, an open storage area was visible in the vicinity of G-608. An unidentified dark-toned material was observed northeast of G-608 in 1958 (*EPIC, 1987; USATEC, 1997*). Summarized below are the activities that have been conducted at the Track G Magazine Line AOC.



- A Work Plan for a SI field investigation was finalized in December 2005 (*HGL, 2005b*).
- The SI field investigation for AOC 10 was completed in conjunction with the field investigation for Tracks H and I (AOC-11) in February 2006. Field activities included both soil and groundwater sampling to investigate the various features identified in historical aerial photography (e.g. ground scars, structures) (*HGL, 2005b*).
- A Draft SI Report, including human health and ecological risk screening, for AOC 10 was submitted to the regulatory agencies in November 2006 (*HGL, 2006b*). The SI sampling indicated elevated levels of pesticides in surface soil and low-level detections of explosives in groundwater.
- An Expanded SI was conducted to delineate pesticides in soil and evaluate the presence of explosives in groundwater. Field work for the ESI was completed in 2007 and the Draft ESI Report was submitted for review in November 2009 (*HGL, 2009a*). Comments on the ESI Report were received in January 2010. Based on the sampling results and discussions with the regulatory agencies, additional groundwater sampling was warranted in order to make a determination on the presence or absence of explosives in groundwater at the site.
- Four additional temporary wells and one permanent well were installed at AOC-10 in February 2011 to further evaluate the presence or absence of explosives in groundwater. The additional groundwater sampling for explosives was conducted in February 2011 and no explosives were detected. The results of all sampling activities at AOC-10 were incorporated into a Revised Expanded SI Report.
- The Final Revised Expanded SI Report was submitted to the regulatory agencies in December 2011.
- A Consensus Document indicating No Further Investigation was signed in May 2012.

Future Work: As indicated in the consensus statement, no action is required at AOC-10. A copy of this consensus statement is included in the Appendix. Since the investigation activities at AOC-10 were completed in the SI phase, this site does not require formal de-listing or any other site closeout activities.

PROJECT C03VA004512 Group B AOCs

Project Summary: Project 12 consisted of Track J Magazine Line (AOC-12)

The Track H and I Magazine Line (AOC-11) include Bldgs. I-1, H-413, D-403, D-404, and E-408. Bldg. I-1 was an Ammunition Magazine, and Bldgs. H-413, D-403, D-404, and E-409 were Smokeless Powder Magazines. A Lumber Treatment Plant (Bldg. 559) was constructed near Bldg. E-408 in AOC-11 in 1953. The Lumber Treatment Plant contained steel dip tanks, a 9,500 gallon chemical storage tank (Bldg. 559-A), and a heating plant (Bldg. 559-B). The treatment process utilized at the Lumber Treatment Plant appears to have been pentachlorophenol (PCP) treatment.

Area of Concern (AOC) or Source Area (SA)	Description	Function/ Operations
AOC-11	Track H and I Magazine Line	Magazines and Lumber Treatment Plant

Track H and I Magazine Line (AOC-11)

Site Summary: This AOC is the rectangular area east of TCC Lake, which includes buildings I-1, H-413, D-403, D-404, and E-408. I-1 was an Ammunition Magazine, and H-413, D-403, D-404, and E-409 were Smokeless Powder Magazines. A review of historical aerial photography indicates that in 1948, ground scars were located southeast of H-413, south of D-403, north of D-404, and south of I-1. In 1954, open storage areas and a vertical tank of unknown use, northeast of E-408, were observed. In 1958, a large ground scar was located south of E-408. In addition, drainage pathways existed across the open storage area, from east to west, across the AOC and emptying into TCC Lake (EPIC, 1987; USATEC, 1997). Summarized below are the activities that have been conducted in the Track H and I Magazine Line AOC.



- A Work Plan for the SSP field investigation was finalized in December 2005 (HGL, 2005c).
- An SI field investigation was completed in conjunction with the field investigation for Track G (AOC 10) in February 2006. Field activities included both soil and groundwater sampling to investigate the various features identified in historical aerial photography (e.g., ground scars, former tank, and structures).
- A Draft SI Report, including human health and ecological risk screening, was prepared in 2009 (HGL, 2009b). The Draft SI indicated elevated PAH concentrations in the locations

of some former drums. The results of the SI indicated that an RI was warranted for the site.

- A Final RI Report was completed in June 2013. The RI recommends that an FS be completed to evaluate remedial alternatives for PAH impacted soils at the site.

Future Work: A FS will be completed in 2016. A Proposed Plan and Record of Decision (ROD) will be prepared upon completion of the FS.

PROJECT C03VA004513 Group C AOCs

Project Summary: Project 13 consisted of Former Steam Heating Plant (AOC-16) and Suspected Underground Storage Tank and Tunnel (AOC-18).

AOC-16, Former Steam Heating Plant, contained three abandoned underground storage tanks (USTs). Each tank had a 25,000-gallon capacity and the tanks, in addition to the piping and related equipment, contained free product. Tidewater Community College removed the Steam Heating Plant in 1993. During December 1994, the USTs and appurtenances were removed, along with 100 cubic yards of contaminated soil. A consensus statement documenting No Further Action at AOC-16 was signed in December 2005.

A Suspected Underground Storage Tank and Tunnel (AOC-18) were thought to exist parallel to the former Track Q line of magazines. A suspected tunnel was identified during a 1999 geophysical survey. The structure was investigated in April 2000. A finding of No Further Action was issued on 23 February 2004.

Area of Concern (AOC) or Source Area (SA)	Description	Function/Operations
AOC-16	Former Steam Heating Plant	Steam Heating Plant
AOC-18	Suspected Underground Storage Tank and Tunnel	UST and Tunnel

Former Steam Heating Plant (AOC-16)

History and Past Work: AOC 16, Former Steam Heating Plant, was located between College Drive and Wellner (formerly Park) Drive at the southern end of Track R. The Steam Plant was used by FNOD and, most recently, by TCC. The Steam Heating Plant AOC is approximately 13,000 square feet (0.3 acres) in size. Summarized below are the activities that have been conducted at the Steam Heating Plant AOC:

- June 1991, a Site Survey Summary identified the presence of three 25,000-gallon abandoned USTs. The tanks, in addition to the piping and related equipment, contained free product (USACE, 1992).
- TCC removed the Steam Heating Plant in 1993.



- During December 1994, the USTs and appurtenances were removed, along with 100 cubic yards of contaminated soil. VDEQ concurred that no further action was required (VDEQ, 1996).
- A Technical Memorandum documenting that the AOC required No Further Action was submitted in September 2005 (USACE, 2005).
- A consensus statement documenting No Further Action at the AOC was signed in December 2005 (USACE, 2005).

Future Work: As indicated in the consensus statement, no action is required at AOC-16. A copy of this consensus statement is included in the Appendix. Since the investigation activities at AOC-16 were completed in the SI phase, this site does not require formal de-listing or any other site closeout activities.

Suspected Underground Storage Tank and Tunnel (AOC-18)

History and Past Work: An UST and tunnel were suspected to exist parallel to the former Track Q line of Magazines, in the northwest portion of FNOD (currently the TCC Truck Driver Training School). Summarized below are the activities that have been conducted in the Suspected UST and Tunnel AOC.

- A suspected tunnel was identified during a 1999 geophysical survey. The structure was investigated in April 2000 (Techlaw, 2001).
- A finding of No Further Action was issued on 23 February 2004 (USACE, 2004).



Future Work: No action is required at AOC-18. Since the investigation activities at AOC-18 were completed in the SI phase, this site does not require formal de-listing or any other site closeout activities.

PROJECT C03VA004514 Track A & B Open Storage Areas

Project Summary: Project 14 consists of Streeter Creek and Lakeview Drive Ground Scars (AOC-2), Track A Magazine Line (AOC-8), and Track A & B Burning Ground (AOC-9).

The Streeter Creek and Lakeview Drive Ground Scars AOC (AOC-2) is located at the east end of former Tracks A & B. A review of historical aerial photography identified several features in the vicinity of AOC-2. The few bunkers that remain are in poor condition and appear to be used by locals for drinking parties. Signs of illegal dumping have been observed, but the debris does not appear to be related to DoD activities. No MEC/MD has been observed in the AOC. The MMRP SI found no constituent concentrations above human health or ecological screening values.

The Track A Magazine Line (AOC-8) was comprised of eight explosive magazines that were oriented east/west in a line. Historical aerial photographs showed potential evidence of ground scarring, mounded materials, and a possible pit. In 1997, a geophysical survey was conducted and no MEC-related items were found. MMRP SI soil samples contained arsenic, vanadium, lead, and selenium concentrations greater than human health and ecological screening values, and vanadium in surface soil.

AOC-9 consisted of explosive magazines oriented east/west in two lines. In 1954, two large ground scars were present between Tracks A and B. In 1956, a ground scar was visible east of B-214. By 1958, debris was located between the two magazine lines. New information contained in the Preliminary Assessment indicates that Bldg. B-209 (509) in AOC-9 was used by the Marine Corps as a repair shop (USACE, 2012).

Area of Concern (AOC) or Source Area (SA)	Description	Function/Operations
AOC-2	Streeter Creek and Lakeview Drive Ground Scars	Stormwater Pond
AOC-8	Track A Magazine Line	Former Power Plant
AOC-9	Track A & B Burning Ground	Explosive magazines/ B-209 repair shop

Streeter Creek and Lakeview Drive Ground Scars (AOC-2)

History and Past Work: The Streeter Creek AOC is located on TCC Property, along the eastern boundary of FNOD, between Interstate 664 and Streeter Creek, at the east end of former Tracks A & B. A review of historical aerial photography identified several features in the vicinity of AOC-2. In 1948, a graded area and debris were identified just south of the AOC-2 boundary, and a thin ground scar was observed near the western edge of the AOC. By 1954, a materials storage area was located northwest of the AOC and three large ground scars (Track A & B Burning Ground) were located west of the AOC. In 1958, a possible fill area existed along the creek bank and a discolored area surrounded High Explosive Magazine B-215. Historical drainage patterns indicate that runoff from the materials storage area, ground scars and possible fill area may have entered the creek (*EPIC*, 1987; Micropact, 2002). The Streeter Creek AOC is approximately 4.5 acres in size. Summarized below are the activities that have been conducted in the Streeter Creek AOC.



- A site visit was conducted by USACE in 1993 in conjunction with the Archives Search Report. Construction debris and evidence of recent dumping were observed, but no munitions were evident (Micropact, 2002).
- In 1997, surface water and sediment samples were collected (on behalf of USEPA) at two locations adjacent to Streeter Creek (Micropact, 2002). Arsenic and iron were identified as COPCs in soil and sediment.
- Another site visit was conducted in July 2000 as part of a Desktop Audit. Two abandoned structures (former magazines) and debris (trash, construction debris, scrap metal) were observed. The Desktop Audit concluded that additional data were needed to fully characterize the site and develop a conceptual site model (CSM) (Micropact, 2002).
- An MMRP SI was completed in February 2012 for AOC-2 to determine the presence or absence of MEC or MC (Alion, 2012). The MMRP SI concluded that No Action was required for MEC or MC.
- A consensus statement documenting No Further Action at the AOC was signed in October 2014 (*USACE*, 2014).

Future Work: The MMRP SI concluded that No Action was required for MEC or MC. The Final Preliminary Assessment indicated that no HTRW investigation is warranted at AOC-2. A copy of this consensus statement is included in the Appendix. Since the investigation activities at AOC-2 were completed in the SI phase, this site does not require formal de-listing or any other site closeout activities.

Track A Magazine Line (AOC-8)

History and Past Work: The Track A Magazine Line AOC is located between College Drive and Streeter Creek. The Track A consisted of eight explosive magazines oriented east/west in a line, numbered A-201 through A-208 (from west to east). In 1948, stains were identified around buildings A-201 and A-203 and mounded material and a possible pit were located between buildings A-207 and A-208. In 1954, additional mounded material was observed between the westernmost buildings and a ground scar was just south of A-205. By 1958, light-toned material and debris were located between the westernmost buildings and a graded area with debris was located south of A-208 (*EPIC, 1987; USATEC, 1997*).



The Track A Explosive Magazine Line AOC is approximately 9.7 acres. A 1997 geophysical survey resulted in no MEC related items being found (*Foster Wheeler, 1998*).

- An MMRP SI was completed in February 2012. The results of the Final MMRP SI indicated no additional MMRP investigation is warranted at AOC-8 (Alion, 2012). The following potentially HTRW unacceptable risks were identified at AOC 8: arsenic in surface and subsurface soil (human health), lead and vanadium in surface soil (ecological).
- A draft final amendment to the MMRP SI was submitted by USACE for Regulatory Review based upon new background values derived for the Former Nansmond Ordnance Depot (FNOD) during 2012 that were not available during the preparation of the Final SI Report.
- A Final SI amendment was completed in September 2013.
- A consensus statement documenting No Further Action at the AOC was signed in October 2014 (*USACE, 2014*).

Future Work: The amendment to MMRP SI concluded that No Action is required for an HTRW SI. A copy of this consensus statement is included in the Appendix. Since the investigation activities at AOC-8 were completed in the SI phase, this site does not require formal de-listing or any other site closeout activities.

Track A & B Burning Ground (AOC-9)

History and Past Work: The Track A and Track B AOC is located between Interstate 664 and Streeter Creek near the Armistead Road overpass. The AOC consisted of explosive magazines oriented east/west in two lines. In 1954, two large ground scars were identified between Tracks A and B. In 1956, a ground scar was observed east of B-214. By 1958, debris was located between the two magazine lines (EPIC, 1987; USATEC, 1997). The Track A & B Burning Ground AOC is approximately 7.7 acres in size. Summarized below are the activities that have been conducted in the Track A & B Burning Ground AOC.



- In February 1997, one soil sample was collected from this area (USEPA Region III, 1999).
- A 1997 geophysical survey resulted in no MEC related items being found (Foster Wheeler, 1998).
- The results of the Final MMRP SI indicate no additional MMRP investigation is warranted at AOC-9 (Alion, 2012). The following potentially HTRW unacceptable risks were identified at AOC 9; arsenic in surface soil (human health) and vanadium in surface soil (ecological).
- A draft final amendment to the MMRP SI was submitted by USACE for Regulatory Review based upon new background values derived for the Former Nansmond Ordnance Depot (FNOD) during 2012 that were not available during the preparation of the Final SI Report.
- A Final SI amendment was completed in September 2013.
- A consensus statement documenting No Further Action at the AOC was signed in October 2014 (USACE, 2014).

Future Work: The amendment to MMRP SI concluded that No Action is required for an HTRW SI. A copy of this consensus statement is included in the Appendix. Since the investigation activities at AOC-9 were completed in the SI phase, this site does not require formal de-listing or any other site closeout activities.

PROJECT C03VA004515 NAB-MMRP Removal Action

Project Summary: Project 15 consisted of the NRB (AOC-1), the former Wastewater Treatment Area (AOC-13), the Arsenic Investigation Area (AOC-22), and the Former Renovation Plant (AOC-23). This project is being revised to include only the NRB (AOC-1). Removal actions have been completed at the NRB (AOC-1) and an RI Report is currently being prepared. The former Wastewater Treatment Area (AOC-13) will be addressed under new HTRW Project 17. The Arsenic Investigation Area (AOC-22) will be addressed under existing HTRW Project 05 and the Former Renovation Plant (AOC-23) will be addressed under new HTRW Project 19.

Asbestos siding, trash, steel rods, slag, and ammunition rounds were observed the NRB (AOC-1) in 1997 and 1999. Bulk TNT was discovered at the NRB (AOC-1) during trenching operations in 2006 and a removal action was conducted. Shoreline protection was emplaced in 2009 in order to protect a heavily eroding area that was damaged during the removal action. An RI Report will be prepared to address any residual munitions constituents (MC) that may be present in soil and sediment.

Area of Concern (AOC) or Source Area (SA)	Description	Function/Operations
AOC-1	NRB	Stormwater Pond

Nansemond River Beachfront (AOC-1)

History and Past Work: The Nansemond River Beachfront (NRB) is located northwest of GE along the Nansemond River on TCC property. It includes a beach and rocky bluff approximately 150 feet in length. The NRB was originally listed as an AOC due to the presence of metal slag. Evaluation of aerial photos indicated evidence of ground disturbance in the area, but the origin of the disturbance was unclear. The NRB is adjacent to several former depot structures including a Wastewater Treatment Plant (AOC-13). MEC has been discovered at AOC-1 and some MEC removal actions have already been completed. Summarized below are the activities that have been conducted in the NRB AOC.



- In October 1997, soil samples were collected in conjunction with an EE/CA (Weston, 1997). Some metal slag and other debris were noted throughout the site. TNT was detected in one soil sample.
- Site visits conducted in September 1999 revealed an eroded narrow shoreline stabilized with riprap. Debris found on the beachfront and protruding from the embankment included

asbestos siding, trash, steel rods, slag, ammunition rounds and an unidentified brown friable material (Weston, 1997).

- A 3-phase offshore investigation was conducted during April, May and June 2000 (SAIC, 2002).
- A removal operation and post-removal confirmation sampling was conducted at the NRB during the summer of 2001 (Plexus, 2002).
- In June 2003, a British 6-inch shrapnel round was found, removed and disposed of. The round was not fused but contained a live (low explosive) expelling charge in the base.
- In July 2003, surface slag, exposed as a result of the eroding shoreline, was removed from the NRB and disposed of off-site.
- A field investigation was completed in 2005, including soil sampling and geophysics was conducted in 2005. Magnetic anomalies were detected along the NRB shoreline (Micropact, 2006).
- Due to the discovery of MEC at the site, a trenching investigation was conducted in the summer of 2006 (Zapata, 2007). Twenty seven (27) lbs of bulk TNT were discovered in one of the trenches. As a result, a removal action was conducted in 2008 and 2009. Over 1200 lbs of TNT and various other MEC items were removed (Weston, 2010).
- Additional shoreline protection was constructed in 2009 in order to protect a heavily eroding area that was damaged during a previous removal action. The shoreline consisted of a breakwater system along with a vegetated beach and slope for habitat enhancement (SAIC, 2009).
- A Draft RI Work Plan was prepared by Weston and submitted to USACE in October 2009 for review and comment. However, the scope of the RI was being reevaluated, pending the results of the 2011 geophysical investigation and intrusive investigation of potential MEC disposal areas along the FNOD shoreline.

Future Work: A RI was initiated in September 2014 to incorporate previously and newly collected data from the MEC intrusive investigation. A FS, PP, and ROD will be conducted following completion of the RI.

PROJECT C03VA004516 Shoreline MEC Areas

Project Summary: Project 16: MMRP – Shoreline MEC Areas addresses areas along the Nansemond and James River shoreline where munitions and explosives of concern (MEC) have been observed or are suspected based on new information presented in the PA and identified by a recent geophysical survey. These areas, collectively known as the Shoreline MEC Areas MRS, consist of a washout area at the NRB (AOC-1), the North Athletic Field Shoreline, and the Former Building L-12 Area as well as other areas identified by a recent geophysical survey (i.e., Phase I MMRP RI) of the shoreline. MEC were exposed at a washout area at the NRB (AOC-1) and North Athletic Field shoreline by Hurricane Ida in 2009. The exposed munitions at the NRB washout area included 71 No 101 British PD fuzes, 28 M51 series PD fuzes (TBar), 94 grenade fuzes, seven 40mm empty projectiles with self-destruct element (unfuzed), one booster cup, two burster tubes, nine 20mm projectiles (unfuzed), two primers, three fuze adapter boosters, and eight unknown fuze components. The North Athletic Field (O-4) MEC consisted of six WWII era MK II hand grenades and five 40mm projectiles, which were removed and destroyed by the Navy EOD. Several Civil War-era cannon balls were unearthed at the NRB (AOC-1) during a sanitary sewer installation project in April 2010. MEC and bulk explosives may be present in the Former Building L-12 area due to the shell renovation activities that were conducted there. Recent geophysical survey data indicate the potential presence of MEC in several areas along the shoreline, in addition to the known areas of MEC described above. Although the HTRW issues associated with Former Buildings L-11 and L-12, as well as the Abandoned Water Treatment Plant have been addressed, potential MMRP issues remain and, thus these features are included in the Shoreline MEC Area MMRP project.

Project 16: MMRP – Shoreline MEC Areas	
Description	Function/ Operations
Nansemond and James River Shoreline	Potential MEC disposal areas
NRB washout area	MEC washout area
North Athletic Field Shoreline (O-4)	MEC washout area
Former Building L-12 Area (O-6)	Munitions renovation

History and Past Work: The Shoreline MRS (the Site) consists of approximately 51 acres (including 11,000 linear feet of eroding shoreline) along the confluence of the James and Nansemond Rivers. During past DoD use of the FNOD, the Site was used for disposal of various materials. Munitions, including raw explosives, could be present within these disposal areas. Ongoing erosion of the MRS has exposed these disposal areas, which contain munitions mixed in with fill material. Summarized below are the activities that have been conducted in the MEC Shoreline MRS.

- During the summer of 2011, digital geophysical mapping (DGM) (Phase I RI) was performed on the Site. The work was completed in August 2011. A Final Geophysical Investigation Report was completed in June 2012.

- An intrusive investigation was conducted in February and March 2014.

Future Work: Additional geophysical and intrusive investigations will be conducted in the vicinity of Area of Interest (AOI)-36/37 due to the discovery of a potential burn pit containing boosters and fuzes wncountered during the Phase II RI field investigation in June 2014. In addition, areas to the south and west will be investigated based on evaluations of historical aerial imagery where potential MEC and munition constituents (MC) may be present due to observed areas of disturbance or dark areas on the aerial imagery. The results of the Phase II RI will be used to identify individual Munitions Response Sites (MRSs) along the FNOD shoreline and determine the need for future MEC Removal Actions.

PROJECT C03VA004517 Legacy SI Sites

Project Summary: Project 17 addresses several AOCs where frequent detections of certain metals, PAHs and pesticide compounds in FNOD soil samples have occurred. These AOCs are the GE Pond Culvert (AOC-4), Marine Corps Power Generation Plant (AOC-6), Track J Magazine Line (AOC-12), Track K Explosive Magazine Line (AOC-14), Track K Landfill (AOC-15), and Abandoned Water Treatment Plant (AOC-20). The Draft ESI Report for AOC-4 indicated some metals and pesticides concentrations in surface water and sediment were above risk-based screening values. The Draft ESI Report for AOC-6 indicated metals, PAHs and pesticide concentrations in soil and groundwater were above risk-based screening values. The Draft SI Reports for AOC-12 and AOC-20 indicated some detection of pesticides and metals were above ecological risk-based screening values. The Draft SI Report for AOC-14 and AOC-15 indicated metals; PAHs and pesticide concentrations in soil and groundwater were above risk-based screening values. A Preliminary Draft SI Report prepared for AOC-20 indicated pesticides and metals were detected in soil above ecological risk-based screening values. Site-wide soil and groundwater studies are being conducted to determine if the detections of metals, PAHs and pesticides at AOCs 4, 6, 12, 14, 15, and 20 are the result of site activities and if any response to these detections is necessary.

Area of Concern (AOC) or Source Area (SA)	Description	Function/Operations
AOC-4	GE Pond Culvert	Stormwater Pond
AOC-6	Marine Corps Power Generation Plant	Former Power Plant
AOC-12	Track J Magazine Line	Primer & Fuse Magazine
AOC-14	Track K Explosive Magazine Line	Magazines and Lumber Treatment Plant
AOC-15	Track K Landfill	Potential Landfill
AOC-20	Abandoned Water Treatment Plant	Water Treatment

GE Pond and Culvert (AOC-4)

History and Past Work: The GE Pond and Culvert AOC are on GE property. The pond is located southeast of the main building and northwest of the MBG. The culvert begins at the northwest edge of the pond, travels north-, northwest under the parking lot and main building, and discharges into the Nansemond River just south of the NRB. The GE Pond was first observed on a 1931 aerial photograph as a shallow depression. By 1958, water filled the pond and it was connected to the Main Burning Ground by a suspected drainage structure. When GE purchased the property in



1966, the pond was functioning as a stormwater basin and would overflow and flood the parking lot during storm events. The culvert was constructed in the late 1960's to divert stormwater runoff from the pond. Stormwater overflow exits the pond through the culvert, which discharges directly to the Nansemond River. The GE Pond is approximately 1 acre in size. The culvert is approximately 1700 feet in length. Summarized below are the activities that have been conducted in the GE Pond and Culvert AOC.

- In February 1997, sediment and water samples were collected from the pond and culvert outfall (IT, 1998). Additional sediment samples were collected from the culvert outfall in December 2001.
- Surface water samples were collected from the pond and sediment samples were collected from the suspected drainage structure in April and July 2003 as part of an SI (USACE, 2003). Some metals and pesticides were detected above risk-based screening values.
- Additional surface water and sediment sampling was performed in September 2006 as part of an Expanded SI (ESI) field investigation. A Draft ESI Report was prepared in February 2010 (ICOR, 2010).
- A Final SI Report was completed in September 2014 (Weston, 2014). Based on the recommendations in the SI Report and the Draft PA, a Remedial investigation is anticipated for AOC-4.
- A contract was awarded in September 2014 to perform a RI at AOC-4.

Future Work: A RI Work Plan will be prepared at AOC-4. Completion of the Work Plan is currently scheduled for April 2016. RI Report will be completed in 2017. A FS, ROD, Remedial Design and Remedial Action may be required, following completion of the RI.

Marine Corps Power Generation Plant (AOC-6)

History and Past Work: The Marine Corps Power Generation Plant AOC is located northeast of the intersection of Armistead Road and College Drive. The power generation building housed a day tank used to fuel a generator, which powered a boiler system. A 12,000-gallon above-ground storage tank (AST) was formerly located outside the building on the east side. The AOC is approximately 2300 square feet in size. Summarized below are the activities that have been conducted in the Marine Corps Power Generation Plant AOC.



- In April 1999, the 12,000-gallon AST, day tank and fuel lines were removed. Soil samples were collected and tested for Total Petroleum Hydrocarbons – Diesel Range Organics (TPH-DRO), PCBs and metals (*Earth Tech*, 1999).
- In 2003, the oil located inside the building was removed to a proper disposal facility (no reference available).
- A field investigation, including surface soil, subsurface soil, and groundwater sampling, was conducted in 2005. The PCB-laden oil on the ground surface just outside the doorway was sampled. The results of this investigation were incorporated into a Draft ESI Report (Malcolm Pirnie, 2007). The Draft ESI Report indicated metals; PAHs and pesticide concentrations in soil and groundwater were above risk-based screening values.
- A Final SI Report was completed in September 2014 (Weston, 2014). Based on the recommendations in the SI Report and the Draft PA, a Remedial investigation is anticipated for AOC-6.
- A contract was awarded in September 2014 to perform a RI at AOC-6.

Future Work: A RI Work Plan will be prepared at AOC-6. Completion of the Work Plan is currently scheduled for April 2016. RI Report will be completed in 2017. A FS, ROD, Remedial Design and Remedial Action may be required, following completion of the RI.

Track J Magazine Line (AOC-12)

History and Past Work: AOC-12 consists of one structure (J-2) and the surrounding area. The J-2 building was a former Ammunition Magazine. A review of historical aerial photography indicates that in 1948, a materials storage area was located immediately east of the building and a possible ground scar was located north of the building (EPIC, 1987; USATEC, 1997).

Summarized below are the activities that have been conducted in the Track J Magazine Line AOC.



- A Sampling and Analysis Plan for a Site Investigation (SI) for AOC 12 was finalized in April 2006 (Cape, 2006a). The field activities consisted of collecting both soil and groundwater samples in strategically placed locations (e.g. ground scar, materials storage area).
- A Preliminary Draft SI Report, which included human health and ecological risk screening, has been prepared. The results did not indicate elevated risk levels based on potential human exposure to the compounds present at AOC-12. There were some detection of pesticides and metals above ecological risk-based screening values. (CAPE, 2007a).
- A Final SI Report was completed in September 2014 (Weston, 2014). Based on the recommendations in the SI Report and the Draft PA, a Remedial investigation is anticipated for AOC-12.
- A contract was awarded in September 2014 to perform a RI at AOC-12.

Future Work: A RI Work Plan will be prepared at AOC-12. Completion of the Work Plan is currently scheduled for April 2016. RI Report will be completed in 2017. A FS, ROD, Remedial Design and Remedial Action may be required, following completion of the RI.

Former Wastewater Treatment Plant (AOC-13)

History and Past Work: The former Wastewater Treatment Plant (WWTP) AOC is located southeast of the Nansemond River Beachfront (NRB). In 1948, a pit was observed at the future location of the WWTP. By 1954, the pit was no longer visible as the WWTP was constructed over it (EPIC, 1987; USATEC, 1997).



- An SI Investigation consisting of soil and groundwater sampling was initiated at AOC-13 in 2005 (Micropact, 2006). There were several detections of metals, PAH and explosives compounds in soil and groundwater above risk-based screening criteria.
- Due to the discovery of MEC at the NRB site (AOC-1), a trenching investigation was conducted in the summer of 2006. During this trenching investigation, approximately 27 lbs of bulk TNT was discovered in one of the trenches. Due to this discovery and the presence of other MEC items at the site, a MEC investigation and removal action was conducted at the NRB (including the area immediately east of AOC-13). *Please refer to AOC-1 for a description of this removal action.*
- The discovery of MEC at AOC-1 resulted in an initial determination to expand the AOC-1 boundary to encompass AOC-13 and perform the AOC-13 investigation concurrently with AOC-1. Subsequent discussions with Headquarters USACE regarding the project structure of FNOD have lead to the determination that the AOC-1 site boundaries should not be expanded to encompass AOC-13.
- A Final SI Report was completed in September 2014 (Weston, 2014). Based on the recommendations in the SI Report and the Draft PA, a Remedial investigation is anticipated for AOC-13.
- A contract was awarded in September 2014 to perform a RI at AOC-13.

Future Work: A RI Work Plan will be prepared at AOC-13. Completion of the Work Plan is currently scheduled for April 2016. RI Report will be completed in 2017. A FS, ROD, Remedial Design and Remedial Action may be required, following completion of the RI.

Track K Magazine Line (AOC-14)

History and Past Work: The Track K Magazine Line AOC encompasses the area of four former Ammunition Magazines oriented north/south in a line, numbered K-5 through K-8. This AOC is located on the west side of TCC Lake. A review of historical aerial photography indicated that, in 1948, a ground scar existed immediately north of Building K-5. In 1954, a ground scar was located north of Bldg K-6. In 1956, two areas of light-toned, disturbed ground were observed north of Bldg K-8. In 1958, a possible stain was observed just west of Bldg K-6, and an excavation was located immediately north of Bldg K-8. In 2002, an area of stressed vegetation was observed north of Bldg K-8. The Track K Dump (SA-6), which lies partially within the AOC-14 boundary, is being investigated as a separate area (*EPIC, 1987; USATEC, 1997*). Summarized below are the activities that have been conducted in the Track K Magazine Line AOC.



- A 1997, geophysical survey conducted in the vicinity of Bldg K-8 resulted in no MEC related items being found (*Foster Wheeler, 1998*).
- A Work Plan to conduct a SI at AOCs 14 and 15 was finalized in February 2006 (*ICOR, 2006*).
- The SI field activities, which included soil and groundwater sampling, were completed in March 2006. The results of the SI field investigation were incorporated into a Draft SI Report (*ICOR, 2009*). The Draft SI Report indicated metals; PAHs and pesticide concentrations in soil and groundwater were above risk-based screening values.
- Weston Solutions was awarded a contract in August 2011 to perform a comparison of the analytical data to the most appropriate risk-screening criteria, comparison to recently completed background study values and complete the SI Report.

Future Work: The SI Report is scheduled for completion in August 2015. A Remedial investigation is anticipated for AOC-14.

Track K Magazine Line Landfill (AOC-15)

History and Past Work: AOC 15, Track K Magazine Line Landfill, is located in the vicinity of former Magazine K-8. According to a review of historical aerial photography, a ground scar existed in 1948 immediately northeast of Platform L-12. Platform L-12 was located approximately 400 feet northwest of Magazine K-8. In 1956, two areas of light-toned, disturbed ground were observed north of Magazine K-8. In 1958, an excavation was located immediately north of Magazine K-8. An area of stressed vegetation can be seen on aerial photos through the 1970's (*EPIC, 1987; USATEC, 1997*).

Summarized below are the activities that have been conducted in the Track K Magazine Line Landfill AOC.

- A geophysical survey was conducted near and north of Magazine K-8 in 1997 (*Foster Wheeler, 1998*).
- A Work Plan to conduct a SI at AOCs 14 and 15 was finalized in February 2006 (*ICOR, 2006*).
- The SI field activities, which included soil and groundwater sampling, were completed in March 2006.
- The results of the SI field investigation were incorporated into a Draft SI Report (*ICOR, 2009*). The Draft SI Report indicated metals; PAHs and pesticide concentrations in soil and groundwater were above risk-based screening values. It has not been determined if these constituents are site-related.
- Weston Solutions was awarded a contract in August 2011 to perform a comparison of the analytical data to the most appropriate risk-screening criteria, comparison to recently completed background study values and complete the Expanded SI Report.

Future Work: The SI Report is scheduled for completion in August 2014. A Remedial investigation is anticipated for AOC-14.

Abandoned Water Treatment Plant (AOC-20)

History and Past Work: AOC-20, Abandoned Water Treatment Plant (WTP), is located between the southeast shore of TCC Lake and Club Drive, west of Smokeless Powder Magazine H-413. The AOC was part of the water supply system for FNOD. The system included three water storage tanks, ten wells, a treatment plant and pumping stations.



The system was designed such that the two smaller, elevated water tanks supplied the western half of the depot, and the Abandoned WTP supplied the eastern section. The site included a million gallon, 95-foot diameter, above ground water storage tank. Two buildings were located immediately south and northeast of the tank, one of which was a pump house. The abandoned water tank is still standing. One diesel pump was used in the system, but the location of the diesel pump is unclear (*USMC, 1955; EPIC, 1987*). The AOC covers approximately ½ acre. Summarized below are the activities that have been conducted in the Abandoned WTP AOC.

- A February 2000 site visit revealed the existence of a possible UST adjacent to the pump house (*Micropact, 2002*).
- A Technical Memorandum for Record was completed in October 2004, documenting the need for further investigation of the suspected UST (no reference available).
- A Sampling and Analysis Plan for an SI at AOC-20 was finalized in April 2006 (*CAPE, 2006b*).

- The SI field activities were completed in July 2006 and consisted of the collection of both soil and groundwater samples in structures and the location of a suspected UST) (CAPE, 2007b).
- A Preliminary Draft SI Report, which included human health and ecological risk screening, was prepared for AOC 20. A trenching investigation conducted in the area of the suspected UST indicated that a UST was not present at the AOC. The sampling results did not indicate any potential human health concerns. Some pesticides and metals were detected above ecological risk-based screening values. (CAPE, 2007). It has not been determined if these detections are site-related.
- A Final SI Report was completed in June 2014 (Weston, 2014). Based on the recommendations in the SI Report and the Draft PA, a Remedial investigation is anticipated for AOC-20.
- A contract was awarded in September 2014 to perform a RI at AOC-20.

Future Work: A RI Work Plan will be prepared at AOC-20. Completion of the Work Plan is currently scheduled for April 2016. RI Report will be completed by February 2017. A FS, ROD, Remedial Design and Remedial Action may be required, following completion of the RI.

PROJECT C03VA004518 Cantonment Area

Project Summary: Project 18 addresses those buildings in the former Cantonment Area and Athletic Field South (O-3) identified during development of the Preliminary Assessment where HTRW may have been used and subsequently released to the environment (USACE, 2012). Operations conducted at these buildings included POL non-tank operations (oil storage, heating operations, fuel pump houses), coal storage, transformer stations, waste treatment in septic tanks, incineration, and miscellaneous shop operations (including vehicle and locomotive maintenance).

The POL non-tank operations at FNOD included oil-fired boilers, heating fuel pump houses, and Oil Houses. The POL non-tank operations that could have potentially released HTRW to the environment during DoD jurisdiction of the property are identified in the table below.

POL-NON-TANK OPERATIONS			
Operation	Building No. Army (Marines)	Fuel Type	Current Status
Oil-Fired Boilers	ZD-10 (107)	Fuel Oil	Removed
Oil-Fired Boilers	ZD-10A (123)	Fuel Oil	Removed
Oil-Fired Boilers	ZO-1 (103)	Fuel Oil	Removed
Oil-Fired Boilers	ZO-2 (102)	Fuel Oil	Removed
Oil-Fired Boilers	ZO-3	Fuel Oil	Removed
Oil-Fired Boilers	ZQ-1 (114)	Fuel Oil	Removed
Oil-Fired Boilers**	ZD-1 (207)	Fuel Oil	Removed
Diesel Generator (50 KVA)	ZB-2 (207)	Diesel Fuel	Removed
Paint Shop/Heating Plant	ZD-12	Fuel Oil	Removed
Electric Generator House (1943)	ZD-12 (214)	Diesel Fuel	Removed
Oil-Fired Boilers**	ZD-2 (205)	Fuel Oil	Removed
Oil-Fired Boilers**	ZD-5 (211)	Fuel Oil	Removed
Oil-Fired Boilers**	ZD-20	Fuel Oil	Removed
Oil House	ZB-7 (204)	Fuel Oil	Removed
Fuel Oil House	ZD-24	Fuel Oil	Removed

**These boilers were not specifically identified as fuel oil-fired; however, they were installed at the same time as the oil-fired units.

The COPCs associated with fuel oil include paraffins, isoparaffins, naphthenes, olefins, and aromatics (BTEX).

Coal storage locations were not identified in the historical documents collected during archives search. It is reasonable to assume that they were stored in the vicinity of use (i.e., next to steam plants, near the locomotive maintenance facility, etc.). Polynuclear aromatic hydrocarbons (PAHs) and acid mine drainage are associated with coal piles and result from the oxidation of pyrite (FeS_2) and various other metal sulfides. As metal sulfides become oxidized, the aqueous environment becomes acidified and rich in a variety of metals, including iron, manganese, lead, mercury, and others. Coal storage operations that could have released HTRW into the environment during DoD jurisdiction of the property are summarized in the table below

Coal Storage Operations		
Operation	Building No. Army (Marines)	Current Status
Heating Plant	ZD-10 (107)	Removed
Back-up Generator (Machine Shop)	ZD-1 (207)	Removed
Steam/Washout Facility	L-12	Removed
Mess Hall	ZQ-12-1941	Removed

The transformers utilized at FNOD at various power supply stations that could have released PCBs to the environment are listed below.

Power Supply Stations		
Operation	Building No. Army (Marines)	Current Status
Transformer (Machine Shop)	ZD-1 (207)	Removed
Transformer Station	ZD-4 (213)	Removed

The three septic tanks that could have potentially released solvents, metals, or explosives (Q-28 only) into the environment are listed below. It is unknown if these septic tanks are still present.

Septic Tanks		
Operation	Building No. Army (Marines)	Current Status
Septic Tank (1938) for Roundhouse/Machine Shop	ZD-33	Not Determined

Buildings 44 (renumbered Z-16) and new Z-16 (moved and renamed Bldg. 300) were utilized as incinerators. Metals and PAHs are potential constituents associated with incinerator operations.

Several miscellaneous shops and operations with the potential for generating HTRW existed on the Depot. These miscellaneous shops and operations include a Lumber Treatment Plant, saw mill, chemical storage, Machine Shops, Maintenance and Repair shops Refrigeration Shop, A Sheet Metal Shop Carpenter Shop, Paint Shops, and Carpenter Shops. The paint pigments used in these miscellaneous shops and operations may have included lead chromates, oxides, sulfates, and zinc chromate. Some commonly used solvents and thinners included benzene, toluene, xylene, carbon tetrachloride, methanol, acetone, ethyl alcohol, and turpentine. It is possible that pentachlorophenol (PCP) was used at Lumber Treatment Plant to treat the lumber. Maintenance and Repair shops would be expected to generate waste brake fluid, lubricating oils, engine oil, and greases, kerosene, gasoline, diesel fuel, and antifreeze (typically ethylene glycol). Paint pigments potentially utilized at vehicle maintenance shops may have included lead chromates, carbonates (white lead), oxides (red lead), and sulfates as well as zinc chromate. Some of the commonly used solvents and thinners were dry-cleaning solvent (petroleum distillate), benzene, toluene, trichloroethylene, xylene, carbon tetrachloride, perchloroethylene, methanol, acetone, ethyl alcohol, and turpentine. The Miscellaneous Shops and Operations with potential for generating HTRW are summarized below.

Operation	Building No. Army (Marines)	Current Status
Saw Mill	ZD-31	Removed
Machine Shop	ZD-1 (207)	Removed
Utilities/Carpenter/Paint Shop	ZD-5 (211)	Removed
Warehouse/Maintenance/Repair Shop	ZB-1 (201)	Removed
Carpenter/Refrigeration Shop	ZD-44 (202)	Removed
Round House/Maintenance Shop	ZB-2 (207)	Removed
Warehouse/Sheet Metal Shop	(227)	Removed
Paint Shop	ZD-8-1942 (210)	Removed
Paint House	ZD-4 (213)	Removed
Paint Shop/Heating Plant	ZD-12	Removed
Paint Shop	ZD-12-1943 (214)	Removed
Garage/Fire House	ZD-2 (205)	Removed
Fire House	ZA-4	Removed
Garage	ZB-5-1941 (212)	Removed
Garage	ZD-37 (603)	Removed
Garage	ZD-39 (602)	Removed
Garage	ZQ-10 (109)	Removed
Garage	ZD-17	Removed
Tire Repair Shop	ZB-7 (204)	Removed

History and Past Work:

Operations conducted at these buildings included POL non-tank operations (oil storage, heating operations, fuel pump houses), coal storage, transformer stations, waste treatment in septic tanks, incineration, and miscellaneous shop operations (including vehicle and locomotive maintenance). Summarized below are the activities that have been conducted at Project 18. Summarized below are the activities that have been conducted at Project 18.

- A contract was awarded in September 2014 to perform a SI at Project 18.

Future Work: A Work Plan will be prepared to conduct a SI at Project 18. Completion of the Work Plan is currently scheduled for January 2016. SI Report will be completed in 2017.

Athletic Field South (O-3) – There is little available information on the history of this area. A single point anomaly investigation (i.e., mag and dig) was completed in 2000 to investigate magnetic anomalies. No MEC items were identified. The results of the PA (see Section 3.3.3) indicate that this was an area that contained buildings used by the Marine Corps that may have utilized hazardous materials.

PROJECT C03VA004519 Renovation Plant

Project Summary: New HTRW Project 19 addresses the Renovation Plant (AOC-23). During DoD occupation, the Renovation Plant was used to renovate ammunition items. In general, renovation operations often required the complete disassembly of the ammunition item and replacement of substandard or unserviceable parts. The renovation plant operations ranged from very simple (e.g., replacement of a suspended fuze with a newer model) to extremely complex operations involving the complete disassembly of the ammunition item, including removal of the explosive charge. A small steaming out unit was established 150 feet northwest of the Boiler Plant (Q-29) for use in steaming out ammunition items as part of the renovation plant operations. Ammunition renovation operations included melt-down, steaming, sandblasting, and painting. Coal storage was noted to have occurred in the vicinity of Q-29. Thus, a potential exists for MC, metals, PAHs, and solvents to remain at the Renovation Plant (AOC-23) from these operations.

Project 19: HTRW – Renovation Plant		
Operation	Building No. Army (Marines)	Current Status
Septic Tank (1941) for Renovation Plant Q-28	ZD-42	Not Determined
Septic Tank (1953) for Laboratory 327	327-B	Not Determined
Magazine, Ammo & Renovation Plant/Warehouse	Q-28 (310)	Removed
Boiler House	Q-29 (315)	Removed
SP Daily Supply/Storage	Q-30 (311)	Removed
TNT Mixing House/Storage	Q-31 (312)	Removed
Painting/Storage	Q-32 (313)	Removed
Painting	Q-33	Removed
Air Compressor	Q-34	Removed

Renovation Plant (AOC-23)

History and Past Work: AOC 23, Renovation Plant, is located north of the GE Building on TCC Property. Currently, the part of this area is used for a Truck Driver Training School. During DoD occupation, the Renovation Plant was used to renovate shells. A review of historical aerial photography indicates that a pit may have existed north of the building in 1948. In 1954, a stain and possible pit were observed northeast of the building. All that currently remains of the Renovation plant is some tile flooring (EPIC, 1987). Summarized below are the activities that have been conducted in the Renovation Plant AOC.



- During an April 2000 geophysical investigation, a subsurface concrete structure was discovered adjacent to Building Q-28 and investigated (Techlaw, 2001).

- A finding of No Further Action was issued in February 2004 for the concrete structure, a suspected underground tunnel (AOC-18) (*USACE, 2004*).
- A Consensus Statement was signed in August 2005 establishing AOC 23 as a new AOC at FNOD (no reference available).
- A SI Work Plan for AOC 23 was finalized in June 2006 (*Micropact, 2006*).
- SI field activities were completed in August 2006. These activities included the installation of several temporary groundwater monitoring wells, two permanent monitoring wells, and soil and groundwater sampling. Some metals and PAHs were detected in soil above risk-based screening values (*Micropact, 2007*). Some VOCs and explosives were detected in groundwater, but below screening values. The Draft SI Report recommended additional investigation at AOC-23 (*Micropact, 2007*).
- A Final SI Report was completed in October 2014 (*Weston, 2014*). Based on the recommendations in the SI Report and the Draft PA, a Remedial investigation is anticipated for AOC-23.
- A contract was awarded in September 2014 to perform a RI at AOC-23.

Future Work: A RI Work Plan will be prepared at AOC-23. Completion of the Work Plan is currently scheduled for April 2016. RI Report will be completed in 2017. A FS, ROD, Remedial Design and Remedial Action may be required, following completion of the RI.

PROJECT C03VA004520 Other HTRW Sites

Project Summary: Project 20 addresses PCB Transformer Removal (AOC-17).

Project 20 will also address any locations of pole-mounted transformers known to have been the site of leaking transformers (collectively identified as AOC-17). To date, no transformer locations have been identified.

Area of Concern (AOC), Study Area (SA), or Operable Unit (OU) No.	AOC, SA, or OU Description	Function/Operations
AOC-17	PCB Transformer Removal	Potential Leaking Transformers

PCB Transformer Removal (AOC-17)

History and Past Work: Electrical power distribution operations at the Depot included transformers located at a battery charging station, electrical sub-stations, and on poles. The battery charging station was located in Bldg ZD-5 and was used to recharge batteries for electrical equipment. The pumping station (Bldg ZD-3) and the machine shop (Bldg ZD-1) had similar transformers for their lighting. By 1937, the transformer station in the machine shop had been moved to Bldg ZD-29 near the main transformer station (Bldg. ZD-4). Numerous transformers were installed on poles. The locations of the pole mounted transformers could not be determined from the available historical record. FNOD-era utility poles may be present at some remote locations. Based on the period of operation, transformers at the battery charging station, electrical sub-stations, and pole-mounted transformers may contain PCB-contaminated oil. To date, no PCB transformers on former FNOD-era utility poles have been observed during ongoing investigations on the property.

Future Work: The need for PCB sampling at the battery charging station (Bldg ZD-5), the pumping station (Bldg ZD-3), the machine shops (Bldgs ZD-1 and ZD-29) and the main transformer station (Bldg. ZD-4) will be evaluated. The potential presence of FNOD-era pole-mounted PCB transformers will continue to be evaluated. If pole-mounted PCB transformers are discovered on the property, the USACE will have the appropriate transformers removed and properly disposed. A Final Report for AOC-17 will be prepared, once the USACE has collected sufficient evidence to determine that no PCB transformers exist on the property.

PROJECT C03VA004521 Fuel Storage Tanks

Project Summary: New CON/HTRW Project 21 addresses those areas identified in the Preliminary Assessment where underground storage tanks (USTs) may still be present (USACE, 2012).

POL Tank Operations				
Operation	Building	Size	Fuel Type	Status
Movie Theater Tank	ZA-2	1,000 gal	Gasoline	ND
Gas and Oil House Tank	ZB-7 (204-A)	13,000 gal	Gasoline	ND
Heating Plant 107 Tank	107-A	ND	Fuel Oil	ND
Heating Plant 107 Tank	107-B	ND	ND	ND
Headquarters Tank	119-A	8,000 gal	Fuel Oil	ND
Fuel Oil Pump House/ Tank	206/206-A	ND	Fuel Oil	ND
Kerosene Tank	222	500 gal	Kerosene	ND
Kerosene Tank	228	1,000 gal	Kerosene	ND
AOC-16				
AOC-16				
AOC-16				
Officers' Club Tank	529-A	2,000 gal	Fuel Oil	ND
AOC-20				
AOC-6				
Oil House	ZB-4-1937 (114-B)	ND	Fuel Oil	ND

ND = Not Determined

History and Past Work:

The potential fuel-related environmental hazards that could exist as a result of operations associated with the diesel fuel, fuel oil, and gasoline tanks include paraffins, isoparaffins, naphthenes, olefins, and aromatics (BTEx). Lead and other compounds have been blended with gasoline, primarily to boost octane levels, since the early 1920s. These compounds included tetraethyl lead, ethylene dibromide, ethylene dichloride, manganese tricarbonyl methylcyclopentadienyl (MMT), tetramethyl lead, tetramethylethyl lead, dimethyldiethyl lead, methyltriethyl lead, and methyltertbutyl ether. The use of leaded gasoline was restricted starting in the 1970's and ultimately prohibited. Summarized below are the activities that have been conducted at Project 21.

- A contract was awarded in September 2014 to perform a Site Characterization Report (SCR) to determine if the suspected USTs are still present.

Future Work: A Work Plan will be prepared to determine if the suspected USTs are still present. Completion of the Work Plan is currently scheduled for April 2016. SCR will be completed in 2017.

PROJECT C03VA004522 J-Lake

Project Summary: New Project 22 addresses J-Lake (AOC-7). In 1948, four Smokeless Powder Magazines, wetlands, and ground scars located east of the wetlands were present at J-Lake (AOC-7). In a 1958 aerial photograph, a possible 55-gallon drum storage area was observed in the materials storage area; mounded material was located between the forks of the lake; and graded areas and fill areas were visible northeast and west of J-Lake (AOC-7). A Draft ESI Report, which included screening level human health and ecological risk assessments, indicated no unacceptable potential human health risks were present. Potential ecological risks are present due to PAH detections in lake sediments.

Previous investigations identified two pipes jutting into the lake in the area where the elevated PAHs were detected. The pipes observed trend toward former Building C-401, which was originally a smokeless powder magazine. In 1950, the USMC converted C-401 into an Officers Quarters and renumbered the building 528. The USMC also installed a septic tank (Bldg. 528-A) just to the south of Bldg 528 and a garage (Bldg. 528-B) further to the south. A fuel oil tank (Bldg. 529-A) was located to the northeast of Bldg. 528. These buildings are no longer present. A site plan from 1955 shows a pipe leading from former Bldg. 528 to J-Lake that corresponds to the exact location of the pipes observed jutting into the lake. The site plan also indicates that former Bldgs. 528, 528-A, 528B, and 529-A may have been interconnected via steam lines or other piping. The site plan indicates that these former buildings may be a source of the PAHs in J-Lake via the observed pipelines.

J-Lake (AOC-7)

History and Past Work: J-Lake is located between Interstate 664 and Streeter Creek, approximately 500 feet from the James River. In 1948, four Smokeless Powder Magazines, wetlands, and ground scars located east of the wetlands were present. By 1954, a fill area in the northeast section of the wetlands resulted in the lake being formed, and a materials storage area was located west of the lake. In 1958, a possible 55-gallon drum storage area was observed in the materials storage area; mounded material was located between the forks of the lake; graded areas and fill areas were northeast and west of the lake (*EPIC, 1987; USATEC, 1997*). In addition to the lake and adjacent wetlands, the AOC includes the woods surrounding and bounded by the forks of the lake, for a total of approximately 5.3 acres. Summarized below are the activities that have been conducted in the J-Lake AOC.



- In 1997, a geophysical survey was performed in the wooded area bounded by the lake where the mounded material and graded and filled areas were formerly located (*Foster Wheeler, 1998*). Also in 1997, multimedia sampling was conducted in the J-Lake area, which included surface water, sediment and fish tissue samples (*Micopact, 2002*).
- A geophysical survey was performed at the J-Lake AOC in July 2003 (*SAIC, 2004*).

- A geophysical survey was conducted during June of 2004 in conjunction with the nearshore investigation of the JRB. The Final Survey Report Geophysical Report was submitted for J-Lake in January 2005 (SAIC, 2005).
- Several magnetic anomalies were identified during the geophysical investigation. These anomalies were later investigated in 2009 and determined to be non-MEC related (Weston, 2010).
- A Final ESI Report, including screening level human health and ecological risk assessments was completed in June 2012 (SAIC, 2012). Potential ecological risks were identified due to PAH detections in sediment. USACE determined that additional investigation is warranted due to PAH detections in J-Lake sediment. The focus of additional investigations will be on potential upland sources (i.e., pipes, tanks) of PAHs in the lake.
- A Final Work Plan was prepared in April 2014 to address remaining data gaps as part of the Focused Supplemental Site Investigation of J-Lake. A field investigation was performed in May 2014.

Future Work: Additional field investigations will be performed in September 2015 to address data gaps. Completion of the Supplemental Investigation Report is currently scheduled for May 2016.

OTHER AREAS OF INVESTIGATION

Other Areas of Investigation (O-XX) are discussed below:

Officer's Club Pool (AOC-21)

Site Summary: The AOC 21, Officer's Pool, was located in the center of the depot between Tracks P and Q, southeast of the former Renovation Plant. The pool was used subsequent to DoD control of FNOD, and it is unknown when it was removed from service. Swimming pool chemicals (chlorine containers) were of concern because of the potentially hazardous container. This AOC is limited to the disinfection facilities at the pool. Summarized below are the activities that have been conducted in the Officers' Club Pool AOC.



- On 3 June 2003, the TCC Facilities Maintenance Department removed the swimming pool chemicals and shipped them to the Chemtron Corporation in Avon, Ohio for disposal (*TCC, 2003*).
- A finding of No Further Action was issued on 23 February 2004 (*USACE, 2004*).

Future Work: No action is required at AOC-21. Since the investigation activities at AOC-21 were completed in the SI phase, this site does not require formal de-listing or any other site closeout activities

Underground Concrete Structure (O-1) – This site was renamed AOC-18 and investigated. Please refer to the summary for AOC-18.

O-2 – Not Used

Building E-410 (O-5) – MEC activities conducted at this site are discussed in Section 5. No additional investigation is anticipated.

5 Munitions and Explosives of Concern (MEC) Activities

• 5.1 Historical Summary

MEC response activities at FNOD began in 1987, soon after the discovery of the crystalline TNT at TCC. The original MEC sites included the TCC Retention Pond (east of the Beazley building), the JRB (SA-2), and the TNT Source Area (SA-1); however, only munitions debris was found at the Retention Pond and JRB.

In 1988, USACE supervised a geophysical survey and anomaly investigation at several locations throughout FNOD where there was the possibility of MEC being present. (Foster Wheeler, 1998).



An Engineering Evaluation/Cost Analysis (EE/CA) for a Non-Time Critical Removal Action (NTCRA) was completed for the whole of FNOD in October of 1998 (Foster Wheeler, 1998). In May 1999, the USACE and USEPA Region III entered into an Inter-Agency Agreement (IAG) to perform a Time Critical Removal Action (TCRA) at five locations on TCC property. The purpose of the TCRA was to locate potential HTRW disposal areas and single MEC items possibly existing in areas not fully investigated under the 1998 Final EE/CA (USEPA, 2000). The geophysical survey areas addressed by the TCRA, and the reasons for their investigation, are listed below:

- 1) TNT Source Area (SA-1) – The area beyond the boundary of previous HTRW and MEC investigations was investigated in order to determine if other disposal activities occurred in the vicinity of the TNT Source Area.
- 2) Athletic Fields (North & South) (O3 & O4) – These areas were included in the survey based on their suspect terrain.
- 3) Renovation Plant Area (AOC-23) - This area was used to renovate shells.
- 4) Buildings L-11 and L-12 (O-6) - These magazines were destroyed by fire.
- 5) Building E-410 (O-5) - This magazine was destroyed by fire.

The geophysical survey on the TNT Source Area, North and South Athletic Fields, and Renovation Plant was initiated in July 1999. Buildings L-11, L-12, and E-410 were surveyed at a later date. Final coordinates of potential disposal areas (pits and trenches) and single point magnetic anomalies were recorded and the locations were flagged for further investigation (UXB, 2002). The 2011 geophysical investigation was used to determine the need for further investigation in these areas (Weston 2012). Additional intrusive investigation is planned for Buildings L-11 and L-12 (see Project 16). No additional investigation is planned for Building E-410.

Removal actions for the TCRA began in March 2000 and were completed on 9 July 2003. Because several dig sheets could not be located, certain anomalies were re-acquired and re-investigated. This effort was completed on 24 June 2004 (Zapata, 2007).

One of the activities stipulated in the IAG was to provide post removal site control. Although a Land Use Control Implementation Plan was signed on 21 August 2002, the key agreements with the City of Suffolk and the major land owner, Virginia Community College System (VCC)/TCC, were not in place until August 2005. A Memorandum of Agreement with The VCC/TCC was signed on 2 February 2005. A final exchange of letters between the USACE and the City of Suffolk agreeing to support land use controls occurred in August 2005. The Final TCRA Report was issued in September 2006 (Zapata, 2007). USEPA officially concurred with the termination of the IAG in a letter dated 26 October 2006.

Two suspect anomalies at the HSP Area were investigated and removed during the week of 20 June 2005. One anomaly was a length of pipe approximately 6 ft by 1 inch with some metal banding material, and the other was coil of wire and a length of pipe approximately 3 ft by 1 inch. In each case, the orientation of the debris created a significant magnetic anomaly signature that could have been ordnance. No further munitions investigation is planned for the HSP Area.

Munitions investigation and removal activities were initiated at the MBG in 2000 through NTCRA. The removal continued in phases over the next few years. A mechanical sifter was placed in operation in 2005 to speed up the sifting operation at the MBG. With experience, production levels increased using the mechanical sifter by a factor of three to as high as six over manual throughput depending on the soil types encountered. The removal action was ultimately completed in December 2008. Numerous discarded military munitions (DMM) and munitions debris were removed from the MBG, including whole or partial projectiles, fuses, boosters, grenades and other munitions related items. In total, approximately 70 acres of land were cleared for MEC at the MBG. Over 70 tons of munitions debris was removed during the action. Additionally, over 400 tons of other non-MEC debris was removed (Zapata, 2007; Weston, 2008).

An initial MEC investigation of three exploratory trenches at the NRB was completed in 2006 and 27 lbs of bulk TNT were found along with large quantities of munitions and MD scrap (Zapata, 2007). As a result, a NTCRA was conducted at the NRB in 2008 and 2009. The NTCRA was completed in 2009 and the removal activities are documented in the Site Specific Final Report (SSFR) (Weston, 2010). Over 1200 lbs of TNT and various other MEC items were removed from the NRB area during this removal action (Weston, 2010).

- 5.2Recent Activities and Future Work

The FNOD shoreline was significantly damaged during two Nor'easter storm events that occurred in November and December 2009. The USACE performed a visual inspection of the entire shoreline following these storm events. Two areas were identified where MEC items had washed out of the bluff during these events. One area was located in a previously inaccessible portion of the NRB and the other area was located on the James River shoreline near the confluence with the Nansemond River. MEC items discovered included MK II hand grenades, 75mm projectile fuses and 40mm anti-aircraft rounds. In response, the USACE requested an Explosives Ordnance Disposal (EOD) team deploy to the areas. The EOD team from Yorktown

Naval Weapons Station responded and collected all MEC items and safely disposed of them at their facility in Yorktown, VA.

Several civil war era cannon balls were unearthed during installation of a sanitary sewer pipe along the NRB in April 2010. Again the USACE requested the services of an EOD team. The Yorktown EOD team collected the cannon balls and safely disposed of them at their facility in Yorktown, VA. The cannon balls were determined to be empty by the EOD team.

In response to the significant erosion and recent MEC discoveries near the FNOD shoreline, the USACE conducted a geophysical investigation in 2011 along the entire FNOD shoreline. The purpose of this investigation was to identify any other potential disposal pits that have not been previously identified. The field work was conducted in July/August 2011 and the Geophysical Investigation Report was completed in June 2012.

Most recently, Hurricane Irene produced additional erosion along the FNOD shoreline in August 2011. Post storm inspections resulted in the discovery of additional MEC items in the same 2 areas as the 2009 Nor'easter storm events. MEC items discovered included MK II hand grenades and 75mm projectile fuses. The land owner called 911 and city of Suffolk fire department responded and requested the services of an EOD team. The Yorktown EOD team collected all MEC items and safely disposed of them at their facility in Yorktown, VA.

An MMRP Remedial Investigation (see Project 16) is ongoing to further investigate and remove (if needed) MEC items from areas identified as potentially containing MEC. An intrusive investigation phase (Phase 2) of this MMRP RI was completed in March 2014.

6 Other FNOD Activities

Presented in this section is information regarding other relevant investigations and activities being conducted at the FNOD. Should the outcome of these investigations indicate the need to conduct further investigations, the FNOD PDT may propose the identification of a new AOC.

- 6.1 Land Use Control Implementation Plan

Land Use Controls (LUCs) include physical, legal or administrative mechanisms that restrict the use of, or limit access to, property at the FNOD. LUCs are being implemented at known or suspected MEC sites to protect human health and the environment where risk is known, suspected, or cannot be totally eliminated. LUCs were an integral part of the 1998 Final EE/CA, the May 1999 Action Memorandum for MEC NTCRAs, the May 1999 Technical Memorandum signed by the Army and the USEPA, and the December 1999 IAG.

Work developing the appropriate LUCs for FNOD began in mid-2000. A LUC Work Group meeting and RAB presentation were conducted in December 2001. Public comment on the LUCs was solicited and taken into consideration while drafting the final LUC Implementation Plan. During 2001, a Land Use Control Assurance Plan, Land use Control Options Paper, Risk Management Strategy Report, and Interim Land Use Control Implementation Plan (LUCIP) were developed. The Final Interim LUCIP was issued in August 2002 (SAIC, 2002).

A memorandum of Agreement with the VCC/TCC was signed on 2 February 2005. A final exchange of letters between the USACE and the City of Suffolk agreeing to support LUCs occurred in August 2005. The FNOD PDT agreed on 4 August 2005 that the above actions constituted material completion of the land use requirements of the IAG.

The remaining munitions response activities at the FNOD are being conducted as a NTCRA. At the completion of the NTCRA, the USACE plans to draft an Abbreviated RI/FS to determine if any additional response is needed. Following DOD/USEPA guidance, if LUCs constitute, or are included in a selected remedy, a Final LUCIP will be part of the resulting Remedial Action. A general summary of current LUCs for the FNOD is depicted on Figure 2-2.

- 6.2 Background Sampling Program

USACE conducted a Background Sampling Program in order to determine background concentrations of selected constituents in soil and groundwater. The results of the Background Sampling Report are used in the risk assessment process to determine if analytical data acquired at the SAs and AOCs are sufficiently different from background levels. The Background Sampling Program field activities (soil and groundwater sampling) were completed in two phases, beginning in November of 1999. Results of the 1st phase were reported in a November 2000 draft report, which recommended additional sampling in order to increase the level of precision and confidence in the data. This second phase of sampling was completed in January 2002. Both soil and groundwater were evaluated for metals, volatile organic compounds (VOCs), semi VOCs (SVOCs), pesticides, PCBs, explosives, lead, cyanide, mercury, and dioxins. The validated results are included in the Final Background Sampling Program Report issued in 2004 (Weston, 2004).

Since the Background Sampling Report was finalized in 2004, several significant sampling events have been conducted across the FNOD. Sampling results appear to indicate a widespread distribution of certain classes of compounds (metals, polycyclic aromatic hydrocarbon compounds [PAHs], and pesticides) throughout the site in both soil and groundwater (GW). The concentrations of these compounds often exceed pre-established risk based screening benchmarks. However, it is not clear if these detections are indicative of a CERCLA release or related to common operations of an industrial site (both during and after DoD use). This uncertainty has significant impact on determining the path forward for many investigations at FNOD. In order to properly demonstrate whether or not a release has taken place at various sites and AOCs within FNOD, an adequate determination of background concentrations of naturally occurring and anthropogenic sources of constituents needed to be adequately addressed site-wide. The FNOD PDT conducted an additional site-wide soil and groundwater Background Study to determine if these detections are the result of individual site activities and if any response to these detections is necessary. The site-wide Background Study is a statistical evaluation of previously collected data. The Final Revised Background Study was completed in October 2013. The results will help to determine if any additional investigation or remediation is needed at several AOCs throughout FNOD.

- 6.3 Hydrologic Conceptual Site Model (CSM)

A hydrologic CSM has been developed to analyze the FNOD hydrologic system by investigating water flow in terms of mass balance and groundwater and surface water budgets throughout the investigational area (Micropact, 2009). A properly calibrated CSM is a numerical model that simulates groundwater flow, providing investigators a means to predict the fate and transport of groundwater constituents.

Data obtained for the CSM included seasonal groundwater and surface water elevations, soil and groundwater constituent concentrations from recent and past investigations, and lithology from soil and monitoring well borings. In addition to site-wide monitoring wells, one off-site deep and shallow well cluster was installed in the Respass Beach Community. Staff gauges were installed in the Nansemond & James Rivers and Streeter Creek (two at each location) and at TCC Lake, J Lake, Horseshoe Pond, GE Pond, and Dominion Pond (one at each location). The eleven staff gauges were used to evaluate surface water interactions within the overall local hydrologic system.

The CSM indicates the following regarding groundwater flow at FNOD:

- The dominant steady-state shallow aquifer flow direction over the majority of the FNOD is north, towards the James River. The CSM indicates that the effect of the Nansemond River appears to be considerably less than previously believed.
- Groundwater flow in the center of the property (Dominion Lands area) is more complex, with some local mounding contributing to seasonal flow direction. Particle tracking analysis has provided investigators with a much better understanding of local flow in this area.
- Groundwater flow into TCC Lake is best characterized as seasonal. During wetter periods, groundwater flows into the lake. As the water level within the lake increases, TCC Lake acts as a discharge source into the surface aquifer. In any case, the dominant groundwater flow direction continues to be northerly.

- On the east side of the FNOD, the CSM clearly demonstrates that Streeter Creek acts as a hydraulic divide, preventing groundwater flow from the FNOD from crossing Streeter Creek and reaching communities on the eastern side. To date, broad-spectrum chemical analyses of shallow and deep wells on both sides of Streeter Creek appear to support the hydrologic interpretation being provided by the CSM.

The hydrologic CSM will undergo continuous refinement as new data (chemical analysis, elevations, permeability and lithology) are collected over time. The most recent version of the Draft CSM report was prepared in October 2009 (Micropact, 2009). Subsequent versions of the CSM will be issued as additional information becomes available.

• 6.4 Residential Well Sampling

The Respass Beach neighborhood, located to the east of the FNOD property boundary and adjacent to Streeter Creek, obtains drinking and household-use water from private and community wells. Groundwater samples were collected from the Respass Beach residential wells on three occasions in order to evaluate the possibility of off-site migration of the FNOD-related constituents. The latest sampling event occurred in April 2002 (Durham, 2002). The neighborhood was divided into quadrants, and two residential wells (one shallow, one deep) were tested in each quadrant, for a total of eight wells tested. The analytical results were validated, and no FNOD-related constituents were detected in the groundwater samples.

The owners of the tested residential wells were notified of the analytical results. The VDEQ Tidewater Regional Office initiated an investigation one location where MTBE (a gasoline additive) was detected and offered the residents an alternate water source, which the residents declined. The City of Suffolk plans to extend municipal water and sewer lines to the Respass Beach Community.

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FIGURES

SCHEDULE

APPENDIX