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FINAL THIRD FIVE-YEAR REVIEW REPORT NWS YORKTOWN VA (PUBLIC DOCUMENT)
2/1/2013
CH2M HILL

Final

Third Five-Year Review Report

**Naval Weapons Station Yorktown
Yorktown, Virginia**

Contract Task Order CTO-WE23

February 2013

Prepared for

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

Under the

**NAVFAC CLEAN Program
Contract No. N62470-08-D-1000**

Prepared by



Five-Year Review Report

Naval Weapons Station Yorktown

Yorktown, Virginia

February 2013

This report documents the Five-Year Review for the following sites with a Record of Decision (ROD) for taking action: Sites 1, 6, 7, 12, 16/Site Screening Area (SSA) 16, and 19 at Naval Weapons Station (WPNSTA) Yorktown as required by the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) in accordance with CERCLA §121(c), as amended, and the National Oil and Hazardous Substances Pollution Contingency Plan (NCP), Part 300.430(f)(4)(ii) of the Code of Federal Regulations (CFR).

The Five-Year Review evaluated the effectiveness of each site remedy to determine whether it is protective of human health and the environment in accordance with the requirements set forth in the RODs. This evaluation was accomplished through a review of various reports and documents pertaining to post-remedy implementation activities, analytical data, and findings, and through interviews, site visits, and inspections.

The findings of the 2012 Five-Year Review indicated that the remedies for Site 7, Site 12, and Site 16/SSA16 are protective of human health and the environment. The remedies for Site 1, Site 6, and Site 19 were determined to be short-term protective of human health and the environment with potential issues regarding the future long-term protectiveness identified for the site remedies. The implementation of additional institutional controls (ICs) and additional site investigation activities was recommended for these sites to ensure the continued protectiveness of each remedy.

Approved by:



Captain Lowell D. Crow

Commanding Officer

Naval Weapons Station Yorktown



Date

Executive Summary

The Department of the Navy (Navy) conducted this Five-Year Review for Naval Weapons Station (WPNSTA) Yorktown in Yorktown, Virginia, as required by the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) in accordance with CERCLA §121(c), as amended, and the National Oil and Hazardous Substances Pollution Contingency Plan (NCP), Part 300.430(f)(4)(ii) of the Code of Federal Regulations (CFR). The Report has been prepared in accordance with the United States Environmental Protection Agency (USEPA) *Comprehensive Five-Year Review Guidance* (USEPA, 2001) and summarizes the evaluation of remedies and remedial actions that resulted in hazardous substances, pollutants, or contaminants remaining at sites above levels that allow for unlimited use and unrestricted exposure (UU/UE), and for which there is a Record of Decision (ROD) or Decision Document (DD) in place. The sites with a ROD requiring a Five-Year Review include the following:

- Site 1 – Dudley Road Landfill
- Site 6 – Explosives-Contaminated Wastewater Impoundment, Flume Area and Excavated Area, Buildings 109, 110, and 501
- Site 7 – Plant 3 Explosives-Contaminated Wastewater Discharge Area
- Site 12 – Barracks Road Landfill
- Site 16/Site Screening Area (SSA) 16 – West Road Landfill/Building 402 Metal Disposal Area and Environs
- Site 19 – Conveyor Belt Soils at Building 10

The objective of the Five-Year Review is to evaluate the effectiveness of the remedies to determine whether they continue to be protective of human health and the environment in accordance with the requirements set forth in the RODs. This evaluation was accomplished through a review of various reports and documents pertaining to post-remedy-implementation activities, analytical data, and findings, and through interviews, site visits, and inspections. Current applicable or relevant and appropriate requirements (ARARs) and those specified in each site ROD were reviewed to ensure that all ARARs are met by the site remedies. The community was notified of the review process through public notices in local newspapers published on July 23, 2011, and July 24, 2011, in the *Virginia Gazette* and the *Daily Press*, respectively. The Five-Year Review report identifies any circumstance that may prevent a particular remedy from functioning as designed or providing sufficient protection of human health and the environment. The overall evaluation of the effectiveness of each remedy is presented as a protectiveness statement developed for each site and provided as follows.

As outlined in this Five-Year Review, the remedies for Site 7, Site 12, and Site 16/SSA16 are protective of human health and the environment. The remedies for Site 1, Site 6, and Site 19 were determined to be short-term protective of human health and the environment. The following issues were identified that could affect the future protectiveness of the remedies for Sites 1, 6, and 19 (all other sites were determined protective for the future):

- Site 1 – The extent of the landfill material and landfill cover needs to be delineated to ensure the cover is adequate for future protection.
- Site 6 – The presence of the soil cover at the Site 6 Excavated Area should be verified to ensure that ecological receptors are not exposed to metals-contaminated soils. Further, additional institutional controls (ICs) within the Flume and Impoundment Area are necessary to prevent residential and industrial uses, and additional sampling of the Building 110 flume is necessary to ensure it is not a continuing source of contamination to the site.
- Site 19 – Analytical data are necessary to confirm that soil exceeding industrial screening levels beneath the conveyor belt was removed during the remedial action. The future protectiveness of the site could be affected if elevated contaminant concentrations are present and additional industrial ICs are not maintained.

The 2007 Five-Year Review was signed by the Navy on November 15, 2007, and the USEPA approved the 2007 Five-Year Review on March 24, 2008.

- Site 6 – Due to elevated contaminant concentrations in the Site 6 Impoundment Area, residential and industrial land use controls (LUCs) will be expanded to address this issue.
- Site 6 – The potential for the Building 110 flume to be a continuing contaminant source to the Site 6 Impoundment Area will be evaluated during future site investigation activities.
- Site 7 – The issue of whether upgradient former operational areas could possibly recontaminate the Site 7 drainage area was identified. While not necessary to ensure the protectiveness of the current site remedy, future sampling efforts will evaluate the possibility for recontamination of the Site 7 drainage area from upgradient former operational areas.
- Site 16/SSA 16 – Issues of evaluating the need for LUCs based on current contaminant concentrations and individual target organ effects were identified. While not necessary to ensure the protectiveness of the current site remedy, a data evaluation will be performed to determine whether LUCs may be removed at Site 16/SSA 16 and to identify the path forward for this process.
- Site 19 – Additional investigation will be performed beneath the former conveyor belt area to verify that elevated contaminant concentrations are not present. The LUC requirements will be evaluated following the planned additional site investigation activities.

Protectiveness Statement(s):

The protectiveness of the remedy for each site is summarized as follows:

- Site 1 – The remedy is short-term protective of human health and the environment because ICs are in place that restrict access and prevent residential development or disturbance of the soil cover. However, due to uncertainty regarding the landfill cover extent at Site 1 it may not be protective in the long-term. The extent of the landfill soil cover will be confirmed to ensure the future protectiveness of the remedy. Current ICs restricting residential use of the site must be maintained to ensure protectiveness.
- Site 6 – The remedy is short-term protective of human health and the environment because ICs are in place that restrict access and prohibit activities that interfere with or compromise the integrity of the soil cover in the excavated area. Additionally, ICs restricting residential and industrial use of the Site 6 Impoundment Area are currently enforced to ensure protectiveness. However, due to uncertainty regarding the presence of the soil cover at the Excavated Area portion of Site 6, the remedy may not be protective in the long-term. Therefore, the presence of a soil cover over the excavated area will be confirmed during future investigation activities. This additional investigation is recommended to address uncertainties and ensure future protectiveness of the remedy.
- Site 7 – The remedy is protective of human health and the environment.
- Site 12 – The remedy is protective of human health and the environment.
- Site 16/SSA 16 – The remedy is protective of human health and the environment.
- Site 19 – The remedy is short-term protective of human health and the environment because ICs are enforced at the site to restrict residential development. However, due to uncertainty regarding contaminant concentrations levels remaining at Site 19 following the remedy implementation, the remedy may not be protective in the long-term. Additional investigation activities are necessary to verify that contaminant concentrations that remain in soil are less than the commercial and industrial cleanup levels established in the ROD to ensure the future protectiveness of the remedy.

Other Comments:

None

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Acronyms and Abbreviations

µg/kg	microgram per kilogram
µg/L	microgram per liter
amsl	above mean sea level
AOC	Area of Concern
ARAR	applicable or relevant and appropriate requirement
Baker	Baker Environmental, Inc.
bgs	below ground surface
BTAG	Biological Technical Assistance Group
CAX	Cheatham Annex
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CFR	Code of Federal Regulations
CLEAN	Comprehensive Long-term Environmental Action—Navy
COC	constituent of concern
COPC	constituent of potential concern
CS	Confirmation Study
CTO	Contract Task Order
DCA	dichloroethane
DCE	dichloroethene
DD	Decision Document
DDT	dichlorodiphenyltrichloroethane
DNAPL	dense non-aqueous phase liquid
DNT	dinitrotoluene
DPT	direct-push technology
Eco-SSL	ecological soil screening level
ERA	Ecological Risk Assessment
ESD	Explanation of Significant Differences
ESQD	explosive safety quantity distance
FEAD	Facilities Engineering Acquisition Division
FFA	Federal Facilities Agreement
FS	Feasibility Study
HHRA	Human Health Risk Assessment
HMX	octahydro-1,3,5,7-tetranitro-1,3,5,7-tetrazocine
HRS	Hazard Ranking System
HRSD	Hampton Roads Sanitation District
IAS	Initial Assessment Study
IC	institutional control
ID	identification
LTM	long-term monitoring
LUC	land use control
MCL	maximum contaminant level
mg/kg	milligram per kilogram
MIP	membrane interface probe

NAVFAC	Naval Facilities Engineering Command
Navy	Department of the Navy
NCP	National Oil and Hazardous Substances Pollution Contingency Plan
NEESA	Naval Energy and Environmental Support Activity
NFA	No Further Action
NPDES	National Pollutant Discharge Elimination System
NPL	National Priorities List
OHM	OHM Remediation Services Corporation
OU	operable unit
PAH	polynuclear aromatic hydrocarbon
PCB	polychlorinated biphenyl
PCE	tetrachloroethene
PP	Proposed Plan
RAB	Restoration Advisory Board
RAO	Remedial Action Objective
RBC	Risk-based Concentration
RCRA	Resource Conservation and Recovery Act
RD	Remedial Design
RDX	hexahydro-1,3,5-trinitro-1,3,5-triazine
RG	remediation goal
RGO	remediation goal and objective
RI	Remedial Investigation
RL	remediation level
ROD	Record of Decision
RSL	Regional Screening Level
Shaw	Shaw Environmental and Infrastructure, Inc.
SSA	Site Screening Area
SVOC	semivolatile organic compound
SWMU	solid waste management unit
TAL	Target Analyte List
TCA	trichloroethane
TCE	trichloroethene
TCL	Target Compound List
TNT	trinitrotoluene
USEPA	United States Environmental Protection Agency
USGS	United States Geological Survey
UU/UE	unlimited use and unrestricted exposure
VDEQ	Virginia Department of Environmental Quality
VOC	volatile organic compound
WPNSTA	Naval Weapons Station
yd ³	cubic yard

SECTION 1

Introduction

This document presents the results of the Five-Year Review under the Naval Facilities Engineering Command (NAVFAC) Mid-Atlantic Division, Comprehensive Long-term Environmental Action—Navy (CLEAN) Program, Contract No. N62470-08-D-1000, Contract Task Order (CTO) WE23, as required by the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) §121(c), as amended, and the National Oil and Hazardous Substances Pollution Contingency Plan (NCP), Part 300.430(f)(4)(ii) of the Code of Federal Regulations (CFR). CH2M HILL has prepared this Five-Year Review Report on behalf of the Department of the Navy (Navy) for Naval Weapons Station (WPNSTA) Yorktown, Yorktown, Virginia, in accordance with the United States Environmental Protection Agency (USEPA) *Comprehensive Five-Year Review Guidance* (USEPA, 2001).

The purpose of this Five-Year Review Report is to document the evaluation of the effectiveness of remedies and remedial actions for sites with hazardous substances, pollutants, or contaminants remaining above levels that allow for unlimited use and unrestricted exposure (UU/UE), and for which there are Records of Decision (RODs) or Decision Documents (DDs) in place. The WPNSTA Yorktown sites and Site Screening Areas (SSAs) requiring a Five-Year Review are listed as follows and shown on **Figure 1-1**.

- Site 1 – Dudley Road Landfill
- Site 6 – Explosives-Contaminated Wastewater Impoundment, Flume Area and Excavated Area, Buildings 109, 110 and 501
- Site 7 – Plant 3 Explosives-Contaminated Wastewater Discharge Area
- Site 12 – Barracks Road Landfill
- Site 16/SSA 16 – West Road Landfill/Building 402 Metal Disposal Area and Environs
- Site 19 – Conveyor Belt Soils at Building 10

Sites for which a No Action ROD or DD has been signed and for which no Five-Year Review is necessary include:

- Site 3 – Group 16 Magazine Landfill – ROD for soil (Baker, 1999)
- Site 4 – Burning Pad Residue Landfill – ROD for soil (Baker, 2005b) and ROD for groundwater, surface water, and sediment (CH2M HILL, 2011e)
- Site 5 – Surplus Transformer Storage Area – No Further Action (NFA) DD for soil and groundwater (Baker, 2003a)
- Site 9 – Plant 1 Explosives-Contaminated Wastewater Discharge Area – ROD for soil, surface water, and sediment (Baker, 1998a)
- Site 11 – Abandoned Explosives Burning Pits – ROD for soil (Baker, 2000b) and ROD for groundwater (CH2M HILL, 2010b)
- Site 17 – Holm Road Landfill – ROD for soil (Baker, 2000b) and ROD for groundwater (CH2M HILL, 2010b)
- Site 18 – Building 476 Discharge Area – ROD for soil, groundwater, surface water, and sediment (Baker, 2005a)
- Site 21 – Battery and Drum Disposal Area – ROD for soil (Baker, 2003b) and ROD for groundwater, surface water, and sediment (CH2M HILL, 2011e)
- Site 22 – Burn Pad – ROD for soil, surface water, and sediment (Baker, 2003c) and ROD for surface water and sediment (CH2M HILL, 2011e)

- Site 27 – Building 1751 Chemical Lab Neutralization Unit – ROD for soil, groundwater, surface water, and sediment (Baker, 2006b)
- Site 28 – Building 28 X-Ray Facility Tank Drain Field – ROD for soil, groundwater, surface water, and sediment (CH2M HILL, 2011c)
- Site 29 – Lee Pond – ROD for soil, groundwater, surface water, and sediment (CH2M HILL, 2010a)
- Site 30 – Bracken Road Incinerator and Environs – ROD for soil, groundwater, surface water, and sediment (CH2M HILL, 2010c)
- Site 32 – Wetlands Downgradient of Beaver Pond – ROD for surface water and sediment (CH2M HILL, 2011d)

WPNSTA Yorktown has elected to follow Navy recommendations of conducting an installation-wide Five-Year Review that includes all sites with remedies in place based on the remedy initiation trigger date for the first site. In accordance with the Navy-recommended procedure, a Five-Year Review is required 5 years from the initiation of the first remedial action that leaves hazardous substances, pollutants, or contaminants at a site above levels that allow for UU/UE. If a site contains multiple remedies, all are subject to a Five-Year Review when at least one remedy is initiated.

This Five-Year Review was prepared pursuant to CERCLA §121(c) and the NCP. CERCLA §121(c) states:

If the President selects a remedial action that results in any hazardous substances, pollutants, or contaminants remaining at the site, the President shall review such remedial action no less often than each 5 years after the initiation of such remedial action to assure that human health and the environment are being protected by the remedial action being implemented. In addition, if upon such review it is the judgment of the President that action is appropriate at such site in accordance with section [104] or [106] the President shall take or require such action. The President shall report to the Congress a list of facilities for which such review is required, the results of all such reviews, and any actions taken as a result of such reviews.

USEPA interpreted this requirement further in the NCP at 40 CFR §300.430 (f)(4)(ii), which states:

If a remedial action is selected that results in hazardous substances, pollutants, or contaminants remaining at the site above levels that allow for [UU/UE], the lead agency shall review such action no less often than every 5 years after initiation of the selected remedial action.

The triggering action of the statutory review process was the remedial action for Site 12, as described in the ROD signed by the USEPA on April 16, 1997. This is the third Five-Year Review for WPNSTA Yorktown. The previous Five-Year Review was signed by the Navy on November 15, 2007, and was approved by the USEPA on March 24, 2008, which is the triggering action for this third Five-Year Review, consistent with Section 1.1.3 of the Comprehensive Five-Year Review Guidance (USEPA, 2001). This review was accomplished through a review of various reports and documents pertaining to post-remedy-implementation activities, analytical data, and findings, and through site visits, inspections, and interviews. The community was notified of the review process through public notices in local newspapers published on July 23, 2011, and July 24, 2011, in the *Virginia Gazette* and the *Daily Press*, respectively. Copies of the public notices are provided in **Appendix A**. The 2007 Five-Year Review was signed by the Navy on November 15, 2007, and the USEPA approved the 2007 Five-Year Review on March 24, 2008.



Legend

- Yorktown Naval Weapons Station Base Boundary
- LUC Boundary
- Study Area Boundary



Figure 1-1
 Base Map and Five-Year Review Sites
 2012 Five-Year Review
 WPNSTA Yorktown
 Yorktown, Virginia

Five-Year Review Process

2.1 Administrative Components

WPNSTA Yorktown is a federal facility at which CERCLA activities are funded and implemented by the Navy under the Navy Environmental Restoration Program. The Navy implements CERCLA activities at WPNSTA Yorktown in partnership with the Virginia Department of Environmental Quality (VDEQ) and USEPA.

2.2 Community Involvement

WPNSTA Yorktown established a Community Relations Program in 1991 to promote public participation. The *Community Involvement Plan* (CH2M HILL, 2009) was updated in August 2009. The Navy subsequently established a Restoration Advisory Board (RAB) for WPNSTA Yorktown and WPNSTA Yorktown Cheatham Annex (CAX), composed of community members and representatives of the VDEQ and USEPA. The community was informed of the initiation of the Five-Year Review through public notices published in the *Virginia Gazette* and *Daily Press* on July 23, 2011, and July 24, 2011, respectively. Additional information about the Five-Year Review process was presented to the public during the November 17, 2011, RAB meeting. Community relations activities are documented in the Administrative Record file. The Administrative Record is accessible through the WPNSTA Yorktown Environmental Restoration Program public website at <http://go.usa.gov/yFb> or by contacting the WPNSTA Yorktown Public Affairs Officer at:

Public Affairs Office
P.O. Drawer 160
Yorktown, VA 23691-0160
Phone: (757) 887-4939

Background Information

3.1 Physical Characteristics

WPNSTA Yorktown is a 10,624-acre installation located on the Virginia Peninsula in York and James City Counties and the City of Newport News, Virginia (**Figure 1-1**). WPNSTA Yorktown is bounded on the northwest by CAX and the King's Creek Commerce Center; on the northeast by the York River and the Colonial National Historic Parkway; on the southwest by Route 143 and Interstate 64; and on the southeast by Route 238 and the town of Lackey, Virginia.

WPNSTA Yorktown is situated within the Virginia Coastal Plain Physiographic Province, which is characterized by unconsolidated sediments several thousand feet in thickness according to *Hydrogeologic Framework of the Virginia Coastal Plain* (Meng and Harsh, 1988). The uppermost geologic formations consist of alluvial, colluvial, and marsh deposits that are composed of silt, sand, and pebbles with some clay. The aquifers and confining and semi-confining units relevant to CERCLA investigations at WPNSTA Yorktown are, from youngest to oldest: the Columbia aquifer, the Cornwallis Cave aquifer, and the Yorktown-Eastover aquifer. Groundwater flow directions for all three aquifers are controlled by topography and surface water bodies, with the primary direction of flow being north toward the York River.

3.2 Land and Resource Use

The mission of WPNSTA Yorktown is to provide ordnance, technical support, and related services to sustain the war-fighting capability of the Armed Forces in support of national military strategy. The WPNSTA supports industrial activities and ordnance management and storage associated with the mission, but also supports some residential and recreational land uses. Current land use throughout much of the WPNSTA is restricted within explosive safety quantity distance (ESQD) arcs of munitions storage areas. Much of the WPNSTA is wooded and dissected by ravines and tributaries that drain to the York River. Several unnamed ponds are used for "catch and release" fishing. The main surface water drainage receptors for WPNSTA Yorktown are Felgates Creek, Indian Field Creek, and Ballard Creek, which are not used for recreation within the WPNSTA. These creeks discharge to the York River, which is used for both commercial and recreational purposes.

Groundwater is not used as a beneficial resource at WPNSTA Yorktown. There are no drinking water wells or irrigation wells at or downgradient of the WPNSTA, as the downgradient WPNSTA boundary is Colonial National Historic Parkway and the York River. Public water is supplied to WPNSTA Yorktown and the surrounding area by the City of Newport News Waterworks.

Anticipated land and resource use at WPNSTA Yorktown is not expected to change in the foreseeable future.

3.3 History of Contamination and Initial Response

Established in 1918, WPNSTA Yorktown has provided ordnance support functions including receipt, reclamation, storage, and issuance of mines, depth charges, and related materials; ammunition loading; and torpedo overhaul facilities. These historical land uses and practices at WPNSTA Yorktown have resulted in localized areas of contamination of soil, groundwater, surface water, and sediment. Environmental restoration activities began in 1984 and were modified in 1986 to reflect the requirements of CERCLA. WPNSTA Yorktown was added to the National Priorities List (NPL) based on a Hazard Ranking System (HRS) score of 50 in 1992. The Federal Facilities Agreement (FFA) between the Navy and the USEPA was signed in August 1994.

Site 1 – Dudley Road Landfill

4.1 Site Chronology

1965-1979	Site 1 used for sand mining; two borrow pits were filled with solid waste materials
1979	VDEQ performed a site inspection and the landfill did not meet the Virginia Department of Health requirements regarding the disposal of solid waste
1979-1985	Deficiencies in the landfill were corrected and the landfill received wastes until 1985
1984	Initial Assessment Study (IAS) of WPNSTA Yorktown identified Site 1 as an area of potential contamination
1985	Disposal facility closed
1986	Confirmation Study (CS) Round I investigated groundwater, surface water, and sediment at Site 1
1988	CS Round II further investigated groundwater, surface water, and sediment at Site 1
1991	Remedial Investigation (RI) Interim Report recommended the RI process
1993	RI – Round One investigated all media at Site 1
1995	VDEQ inspection of the closed disposal facility found deficiencies (subsidence and ponding water) on the landfill cover
1997	RI – Round Two investigated all media at Site 1
1997	Hot Spot Delineation investigated surface and subsurface soil
1997	Focused Feasibility Study (FS) performed
1998	Proposed Plan (PP) issued to the public for comment
1999	ROD for soil was signed
2001	Remedial Action conducted to remove metallic debris and arsenic-contaminated soil. A 2-foot-thick soil cover was installed over the excavated area to correct soil cover deficiencies identified in 1995
2000-2005	Long-term monitoring (LTM) performed that included groundwater, surface water, and sediment sampling and analysis
2006	LTM was suspended at the site as site media were still under investigation and LTM was not a requirement of the ROD
2007	Phase I RI - Groundwater
2009	Draft Phase II RI – groundwater, surface water and sediment

4.2 Background

4.2.1 Site History

Site 1 was operated from 1965 to 1979 as a landfill under a VDEQ Conditional Permit (No. 287) for disposal of solid waste materials in borrow pits. Waste disposed of included the following items:

- Asbestos from insulation on steam piping
- Empty oil, grease, paint, and solvent containers
- Nitramine-contaminated carbon

- Household appliances
- Scrap metal banding
- Construction debris
- Tree limbs
- Lumber
- Packaging wastes
- Electrical wires
- Waste oil
- Plastic lens grinding waste

An estimated waste quantity of 17 tons per year for approximately 15 years was disposed at this site. In 1979, the landfill was closed with the exception of plastic lens grinding residue disposal. At the time of the landfill closure, the VDEQ inspected the site and determined that the landfill did not meet the requirements of a permitted landfill. These deficiencies were corrected, and the landfill received plastic lens grinding residue until 1985 when the facility was closed. Documentation of the dates of construction and design of the original soil cover was not identified; however, review of aerial photos from 1986 shows new vegetation being established over much of the site. Based on historical photographs in the *Final Site Photograph Album* (Baker, 1991), a soil cover was in place by 1991. Another inspection of the closed disposal facility in 1995 found deficiencies such as subsidence and ponded water on the landfill cover. In 2001, metal surface debris and 413 tons of arsenic-contaminated waste and soil were removed from Site 1 for offsite disposal. The old landfill area was regraded, covered with 18 inches of backfill and 6 inches of topsoil, and seeded (OHM, 2001).

4.2.2 Physical Characteristics

Site 1 is located in the northern portion of WPNSTA Yorktown (**Figure 1-1**), west of Indian Field Creek and north of an unnamed tributary to the creek (**Figure 4-1**). Site 1 is generally level and grassy with topography that gently slopes to the east with more pronounced slopes east and south toward Indian Field Creek and the unnamed tributary to Indian Field Creek. The area surrounding the landfill is wooded and acts as a riparian buffer for the adjacent Indian Field Creek. In the northern portion of the site, a dirt road traverses the site from west to east.

The hydrogeology at Site 1 consists of the unconfined Columbia aquifer, which is located above the Yorktown confining unit. Depth to groundwater is approximately 3 to 10 feet below ground surface (bgs). The thickness of the Columbia aquifer at Site 1 ranges from 10 to 18 feet. The Yorktown confining unit is truncated in the eastern portion of Site 1 close to Indian Field Creek. Consequently, the overlying Columbia aquifer is hydraulically connected to the underlying Yorktown aquifer in this area. The Yorktown-Eastover aquifer is approximately 100 feet thick in the vicinity of Site 1, as described by the *Geohydrology of the Shallow Aquifer System* (Brockman et al., 1997). The Columbia aquifer groundwater flow is primarily east and south toward Indian Field Creek and its tributary. Yorktown-Eastover groundwater flow is east-southeast toward Indian Field Creek.

4.2.3 Land and Resource Use

Site 1 was historically used for sand mining activities, resulting in the excavation of two borrow pits, which were subsequently filled with waste materials. Mowing of the site is conducted on an annual basis. Currently, there are no surface water or groundwater resource uses at or adjacent to Site 1. The remedy selected in the ROD for Site 1 included land use controls (LUCs). The LUCs that were chosen prohibit activities that interfere with or compromise the integrity of the Site 1 soil cover and prohibit residential development on the site, as cleanup goals were based on commercial and industrial levels (the most likely future land use). The inferred LUC boundary on **Figure 4-1** presents a conservative estimate of the Site 1 LUC area based on available site data as the LUC Remedial Design (RD) has not yet been finalized for this site.

Indian Field Creek discharges to the York River approximately 1 mile downstream of Site 1. The York River is a navigable waterway used for transportation, shipping, fishing, and recreation. There are no potable groundwater wells currently in use within the boundaries of or immediately downgradient of WPNSTA Yorktown. The future

land use (industrial) and absence of groundwater and surface water resource uses are anticipated to remain unchanged.

4.2.4 History of Contamination

Between 1965 and 1979, waste materials including asbestos materials, empty oil, grease, paint and solvent containers, nitramine-contaminated carbon, household appliances, scrap metal banding, construction debris, waste oil, and other materials were disposed of in borrow pits at Site 1. An estimated waste quantity of 17 tons per year for 15 years was disposed at this site.

Contamination of site media is likely due to the presence of waste material at the surface of the landfill, and due to migration of contaminants from the buried waste materials to subsurface soils, groundwater, and potentially into the surface water and sediment of nearby waterways.

Site 1 was identified during the IAS (NEESA, 1984) as an area of potential contamination. Subsequent investigations indicated that waste material and arsenic-impacted soil were present at the surface of the landfill site. Subsequent investigations identified metals impacts (primarily arsenic) in surface and subsurface soil. Volatile organic compound (VOC) (primarily trichloroethene [TCE], cis-1,2-dichloroethene [DCE], and vinyl chloride) and metals impacts were observed in groundwater. Additional investigation of groundwater, surface water, and sediment is planned to evaluate the potential migration of VOC contamination in groundwater and to Indian Field Creek.

4.2.5 Initial Response

After being initially identified, subsequent investigations, including CSs (Dames and Moore, 1986; 1988) and RIs (Baker and Weston, 1993; Baker, 1997a), were conducted to investigate groundwater, soil, surface water, and sediment. Previous investigations included analysis for Target Compound List (TCL) VOCs, TCL semivolatile organic compounds (SVOCs), polychlorinated biphenyls (PCBs), pesticides, explosives, and Target Analyte List (TAL) inorganics. A soil cap was placed over the landfill surface following the landfill closure in 1985; however, very little information is available regarding the initial construction of the landfill cover. VOCs were detected in groundwater with maximum concentrations of TCE at 190 micrograms per liter ($\mu\text{g}/\text{L}$) and 1,2-DCE at 52 $\mu\text{g}/\text{L}$ in the Columbia aquifer. Additionally, TCE was detected at a maximum concentration of 360 $\mu\text{g}/\text{L}$ in the Yorktown-Eastover aquifer. Although chlorinated solvents were detected in groundwater, the primary driver for remedial action at the site was arsenic in site soil, which was detected at concentrations exceeding screening values and background concentrations. A maximum arsenic concentration of 141 milligrams per kilogram (mg/kg) was identified in surface soil in 1997. Additional surface soil samples were collected as part of the *Final Feasibility Study for Sites 1 and 3* (Baker, 1997b) to better define the extent of arsenic in surface soils.

Remedial action alternatives were evaluated in an FS as part of the CERCLA process (Baker, 1997b).

4.2.6 Basis for Taking Remedial Action

Human health risks associated with exposure to soil and groundwater were identified in the 1997 RI conducted by Baker Environmental, Inc. (Baker). The Human Health Risk Assessment (HHRA) identified potential risks above USEPA acceptable levels from exposure to arsenic, beryllium, and iron in surface and subsurface soil at Site 1. Potential cancer risks and non-cancer hazards above acceptable USEPA risk levels for the future adult and child residents were identified at Site 1 based on exposure to chlorinated VOCs in groundwater of the Columbia and Yorktown-Eastover aquifers. The basis for taking action at Site 1 was the human health risks identified by the site investigation activities, the presence of landfill waste potentially containing hazardous substances, and the need for maintenance of the existing soil cover.

4.3 Remedial Actions

4.3.1 Remedy Selection

The Site 1 Remedial Action Objective (RAO) identified in the FS was to mitigate the potential for direct contact with elevated arsenic concentrations in soils. The ROD for Site 1 soil was signed June 1999 and required actions to address soil and waste (NAVFACT, 1999). The selected remedy consisted of the removal and disposal and/or

recycling of surface debris, excavation and offsite disposal of soils with elevated arsenic levels, restoration of the existing soil cover, and implementation of LUCs. The LUCs were implemented to prohibit residential development at the site and activities that interfere with the integrity of the soil cover.

A post-ROD change to the estimated amount of soil to be removed at Site 1 was documented in a *Closeout Memorandum to File for Sites 1, 3, and 11* (Baker, 2006a). The initial ROD estimated 105 cubic yards (yd³) of soil and debris to be removed; however, the actual amount was approximately 260 yd³.

Groundwater, surface water, and sediment were not addressed in the ROD. These media are still under investigation and have not yet been addressed by any remedial action.

4.3.2 Remedy Implementation

According to the *Final Report, Remedial Action, Sites 1 and 3, and SSA 22* (OHM, 2001), remedial actions undertaken at Site 1 pursuant to the 1999 ROD consisted of the removal and disposal of metal surface debris, the excavation and offsite disposal of 413 tons of waste and soil, and the restoration of the soil cover. The material was disposed of at King and Queen Landfill, Little Plymouth, Virginia. Confirmation soil samples verified that arsenic concentrations remaining in place were below the removal action cleanup goal of 63 mg/kg. The excavated area of arsenic-contaminated soil was backfilled with on-base borrow material taken from one of the magazine berms, located off Teague Road. Additionally, a 4-inch layer of topsoil was placed over the excavated area and re-graded to provide natural contours and enhance runoff. Finally, 18 inches of fill soil and 6 inches of topsoil were placed over the regraded landfill area (OHM, 2001). The additional cover area was not surveyed and the extent of it is not well documented. Therefore, the inferred soil cover area is based upon drawings presented in the *Final Report, Remedial Action, Sites 1 and 3, and SSA 22* (OHM, 2001). **Figure 4-1** depicts the location of the inferred LUC boundary area and the current site boundary. Additional investigation is planned for 2013 to confirm that the extent of landfill waste was sufficiently characterized and that the depth and spatial extent of the soil cover are adequate. The ROD applies to site soils and waste and does not address groundwater, sediment, or surface water.

LUCs prohibiting residential development of Site 1 and prohibiting disturbance of the soil cover have been verified by the Navy through routine inspections. Site 1 is inaccessible to the general public; access is controlled by a gate at the entrance. A sign is posted at the entrance indicating that access to the landfill is restricted to authorized personnel. The ROD included routine inspections of the soil cover. Although not required by the ROD, an LTM program for surface water, sediment, and groundwater was implemented at the site to monitor the presence of VOC contamination that could migrate to the surface water and sediment of Indian Field Creek. Because surface water, sediment, and groundwater are still being evaluated and LTM was not a requirement of the ROD, LTM was suspended in 2006 (Baker, 2006c).

4.4 Progress Since Last Five-Year Review

The previous Five-Year Review (CH2M HILL, 2007a) did not identify any issues and concluded that the remedy was functioning as intended by the ROD and was protective of human health and the environment. Implementation of LUCs and routine site inspections have continued since the last review.

LTM of surface water, sediment, and groundwater was conducted from 2000 through 2005 to further assess VOCs detected in these media. The *Final Long-Term Monitoring Report for Sites 1, 3, and 7* (Baker, 2006c) recommended discontinuing LTM at Site 1, as the ROD for Site 1 did not include LTM. No LTM has taken place at Site 1 since 2005.

In 2007, a Phase I Groundwater RI was performed for site groundwater. Analyzed constituents in groundwater were VOCs, SVOCs, pesticides and PCBs, and total and dissolved metals. VOCs (cis-1,2-DCE, TCE, and vinyl chloride) were the only detected constituents at concentrations exceeding regulatory screening criteria (CH2M HILL, 2007b). Additionally, metals constituents were detected exceeding ecological risk screening values, as presented in the *Phase I Remedial Investigation Report for Groundwater at Sites 1, 3, 6, 7, 11, 17, 24, and 25* (CH2M HILL, 2007b).

Phase II RI activities were conducted in 2009 to further assess the nature and extent and potential risk associated with groundwater, surface water, sediment, pore-water, and surface soil, as presented in the *Draft Phase II Remedial Investigation Report, Sites 1 and 3* (CH2M HILL, 2011b). Groundwater was analyzed using a membrane interface probe (MIP), direct-push technology (DPT), and monitoring well sampling methods. Groundwater was analyzed for VOCs and metals. VOCs that exceeded screening values include trichloroethane (TCA), 1,1-DCE, 1,2-DCE, tetrachloroethene (PCE), TCE, and vinyl chloride. Metals that exceeded screening values included total aluminum, total antimony, total arsenic, total cadmium, total chromium, total cobalt, total iron, and total manganese. Sediment and sediment pore water were analyzed for VOCs and metals. No VOCs exceeded screening criteria in sediment or sediment pore-water. Metals that exceeded screening criteria include arsenic, copper, and manganese. One surface soil sample was taken and analyzed for VOCs, as the MIP results indicated elevated contaminant levels in the vadose zone; however, soil results indicated no VOC exceedances of screening criteria in surface soil (CH2M HILL, 2011b).

4.4.1 Data Review

2007 Round I RI

In 2007, a Phase I Groundwater RI was performed for site groundwater. Groundwater was analyzed for VOCs, SVOCs, pesticides and PCBs, and total and dissolved metals. VOCs that exceeded human health screening criteria (maximum contaminant levels [MCLs]) included cis-1,2-DCE, TCE, and vinyl chloride. No SVOCs or pesticides and PCBs exceeded human health screening criteria. Metals exceeded background concentrations, but did not exceed human health screening criteria (CH2M HILL, 2007b). While the 2007 RI identified chlorinated solvents in site groundwater, the nature and extent of the contaminants were not defined. A Round 2 RI was recommended to complete the delineation of the contaminant plume and to perform HHRAs and Ecological Risk Assessments (ERAs).

2009 Round II RI

Phase II RI field activities were conducted from January to September 2009 to further characterize the extent of contamination and assess potential environmental and human health risks associated with exposure to groundwater, surface water, and sediment at Site 1. Additionally, one soil sample was collected during the Phase II RI to investigate possible contamination identified in the unsaturated zone during the MIP investigation.

The MIP data indicated the potential presence of VOCs in the vadose zone at one location at Site 1 (at MIP 21 between 13 and 20 feet bgs). Consequently, one soil sample was collected at MIP 21 from a depth interval of 15 to 19 feet bgs, and analyzed for VOCs using USEPA Method 8260B.

Human health risks associated with exposure groundwater, surface water, and sediment were assessed in the Phase II RI. The HHRA identified potential risks above USEPA acceptable levels for future residents and industrial worker from exposure to cis-1,2-DCE, TCE, arsenic, cobalt, iron, manganese, and additional chlorinated VOCs in groundwater used as a potable water supply. No unacceptable risk (no risk above USEPA acceptable risk levels) was identified to human receptors from surface water or sediment from Indian Field Creek and its tributary adjacent to Site 1. The ERA, performed as part of the Phase II RI, identified no unacceptable risks associated with constituents of concern (COCs) for surface water, sediment, or sediment pore-water at Site 1 (CH2M HILL, 2011b).

Additional surface water, sediment, and pore water samples will be collected during an upcoming investigation to fill spatial data gaps and complete the risk assessment of these media at Site 1. All VOCs were below applicable screening values in the additional soil sample collected during the Phase II RI.

4.4.2 Site Inspections

Site inspections were initiated in September 2003. Since the initiation of the inspections, only minor corrective measures, such as lock replacements on monitoring wells and signage for restrictive access, have been necessary. The purpose of the site inspections is to ensure that the soil cover integrity and site vegetation are maintained. A site inspection was performed in February 2012 with the USEPA and VDEQ as part of this Five-Year Review. An area of erosion was identified along the edge of the landfill (**Appendix B**). Following the site inspection, this area was seeded in the second quarter of 2012 and will continue to be monitored during future site inspections.

Additionally, metallic debris and two tires were observed near the road that crosses the site. This is not debris from the landfill or from beneath the cover, but appears to have been placed there after the remedial action. The metallic debris and tires were also removed from the site in the second quarter of 2012. During this inspection, the posted signs restricting site access were intact and visible; however, the contact information was outdated. The sign contact information was subsequently updated in November 2012. Site monitoring wells appeared to be in good condition.

4.4.3 Interviews

Interviews were conducted with various parties familiar with the site. Ms. Rhonda Mickelborough and Mr. Charlie Wilson, both with the Yorktown Environmental Management Department, were interviewed on December 15 and December 16, 2011, respectively. Mr. John Pulver, also with the Yorktown Environmental Management Department, was interviewed on January 18, 2012, and Ensign Damien Allen, with the Yorktown Facilities Engineering Acquisition Division (FEAD), was interviewed on January 20, 2012. No significant problems regarding the site were identified during the interviews. Documentation of each site interview is presented in **Appendix C**.

4.5 Technical Assessment

Question A: Is the remedy functioning as intended by the DD?

Yes. A review of documents, applicable or relevant and appropriate requirements (ARARs), risk assumptions, and site inspections demonstrate that the soil cover placed at Site 1 is functioning to mitigate the potential for direct contact with elevated arsenic concentrations in soils as intended by the ROD. However, a review of historical documents has revealed uncertainty as to the extent of the Site 1 soil cover. Additional investigation will be performed to ensure the future protectiveness of the remedy. Implementation of LUCs effectively prevents a breach of the soil cover, and inspections ensure that the soil cover integrity is maintained. LUC objectives are to prohibit activities that interfere with or compromise the integrity of the Site 1 soil cover and prohibit residential development on the site. No observations were made that LUCs have been violated or that the soil cover has been disturbed. In 2013, the Navy will conduct additional studies to confirm that the extent of landfill waste was sufficiently characterized and that the depth and spatial extent of the soil cover are adequate. Site 1 signage and the locked gate restricting access to the site are intact and in good repair. All monitoring wells are intact and functioning properly.

Question B: Are the exposure assumptions, toxicity data, cleanup levels, and RAOs used at the time of the remedy selection still valid?

Yes. The physical conditions of Site 1 have not changed since the ROD in a manner that would affect the protectiveness of the remedy. No repairs to the soil cover have been required since the 2002 Five-Year Review; however, maintenance including mowing and seeding of the area identified during the February 2012 inspections has been performed. In 2013, the Navy will conduct additional studies to confirm that the extent of landfill waste was sufficiently characterized and that the depth and spatial extent of the soil cover are adequate. The remedy is in compliance with the ARAR.

The HHRA performed as part of the 1997 RI identified risks above acceptable USEPA risk levels for exposure to surface soil associated primarily with arsenic. Although there have been changes to the screening values used to identify the constituents of potential concern (COPCs) for quantitative risk evaluation, the toxicity values for some of the constituents that were detected in the soil (there were, however, no changes for arsenic, the focus of the remedy), and to methods followed for estimating human health risks (such as new exposure point concentration estimate methods, new dermal exposure assessment guidance, and new inhalation exposure guidance) that may result in calculated risks being higher or lower, these changes would not affect the protectiveness of the remedy selected at the site. A comparison of the screening values used for soil in the 1997 HHRA to current human health risk-based screening values indicated that several carcinogenic PAHs, chromium (assuming all chromium is hexavalent chromium), and cobalt were not COPCs in 1997, but would now be considered COPCs, and beryllium, which was a COPC in 1997, would not be a COPC using current screening levels. The 1997 HHRA indicated potentially unacceptable risks associated with exposure to the soil, and although the changes in the COPCs and to

the toxicity values used in the HHRA calculations would slightly change the calculated risks and hazards, they would not change the overall conclusions of the HHRA or effectiveness of the remedy. Additionally, changes to the methodology used to estimate inhalation risks would not change the results of the HHRA; the inhalation pathway contributed less than 1 percent of the total risks associated with exposure to soil. The implemented remedy, consisting of soil removal, soil cover, and LUCs, prevents any residential exposure and mitigates any risk from the materials remaining in the landfill. The cleanup level used for arsenic in the removal action is still protective of non-residential exposure to arsenic in soil. The remedy is functioning as intended and the soil cover will be maintained as long as wastes remain in place, which will preclude significant direct exposures to the waste materials.

The ERA conducted as part of the 1997 Round 2 RI concluded that there were no significant risks to ecological receptors from exposure to surface soil. While several metals exceeded ecological soil screening values, they did not significantly exceed background. There have been changes in ecological soil screening values subsequent to the completion of the 1997 RI, particularly the introduction of USEPA ecological soil screening levels (Eco-SSLs). Arsenic, in particular, has a lower soil screening value (Eco-SSL) than the value used in the 1997 RI, which would result in its retention as a COC. The Eco-SSL value for arsenic is also less than the soil remediation criteria for arsenic (which was human health-based, as the 1997 ERA did not identify unacceptable ecological risks for surface soil). However, the soil cover in place at Site 1 should preclude significant direct exposures to the waste materials for terrestrial ecological receptors. Information from the 1997 RI and the 2001 Construction Closeout Report indicates that the soil cover exists over those areas where arsenic concentrations exceeded the 18 mg/kg Eco-SSL. Soil sample locations that are suspected to be outside the extent of the soil cover (north of the access road) had arsenic concentrations less than the Eco-SSL value. In 2013, the Navy will conduct additional studies to confirm that the extent of landfill waste was sufficiently characterized and that the depth and spatial extent of the soil cover are adequate.

Question C: Has any other information come to light that could question the protectiveness of the remedy?

Yes. Based upon a review of the *Final Report, Remedial Action, Sites 1 and 3, and SSA 22* (OHM, 2001), the soil cover area was not surveyed and the extent of it is not well documented. In 2013, the Navy will conduct additional studies to confirm that the extent of landfill waste was sufficiently characterized and that the depth and spatial extent of the soil cover are adequate.

4.6 Technical Assessment Summary

The remedy for soil is short-term protective of human health and the environment. No records could be identified that documented a survey of the landfill cover extent. The Navy will perform additional investigation to confirm that the landfill material is adequately covered. There have been no changes in the physical conditions of the site that would affect the protectiveness of the remedy in this area. ARARs for soil remedial actions in the ROD have been met. Although there have been changes to the toxicity factors for some of the contaminants detected at the site and there have been changes to the standard risk assessment methodology that was used in the 1997 RI and the 2009 Phase II RI, these changes would not affect the protectiveness of the remedy, which removed arsenic in concentrations above levels protective of non-residential (human health) exposure and minimizes (through the installation of the soil cover) any residential or ecological exposure to waste in the landfill.

4.6.1 Issues

TABLE 4-1
Site 1 Issues Identified

Issue	Currently Affects Protectiveness (Y/N)	Affects Future Protectiveness (Y/N)
Confirm Extent of Soil Cover*	N	Y

*Currently the cover is assumed to encompass all waste, until any future investigation deems otherwise

4.6.2 Recommendations and Follow-Up Actions

TABLE 4-2

Site 1 Recommendations and Follow-up Actions

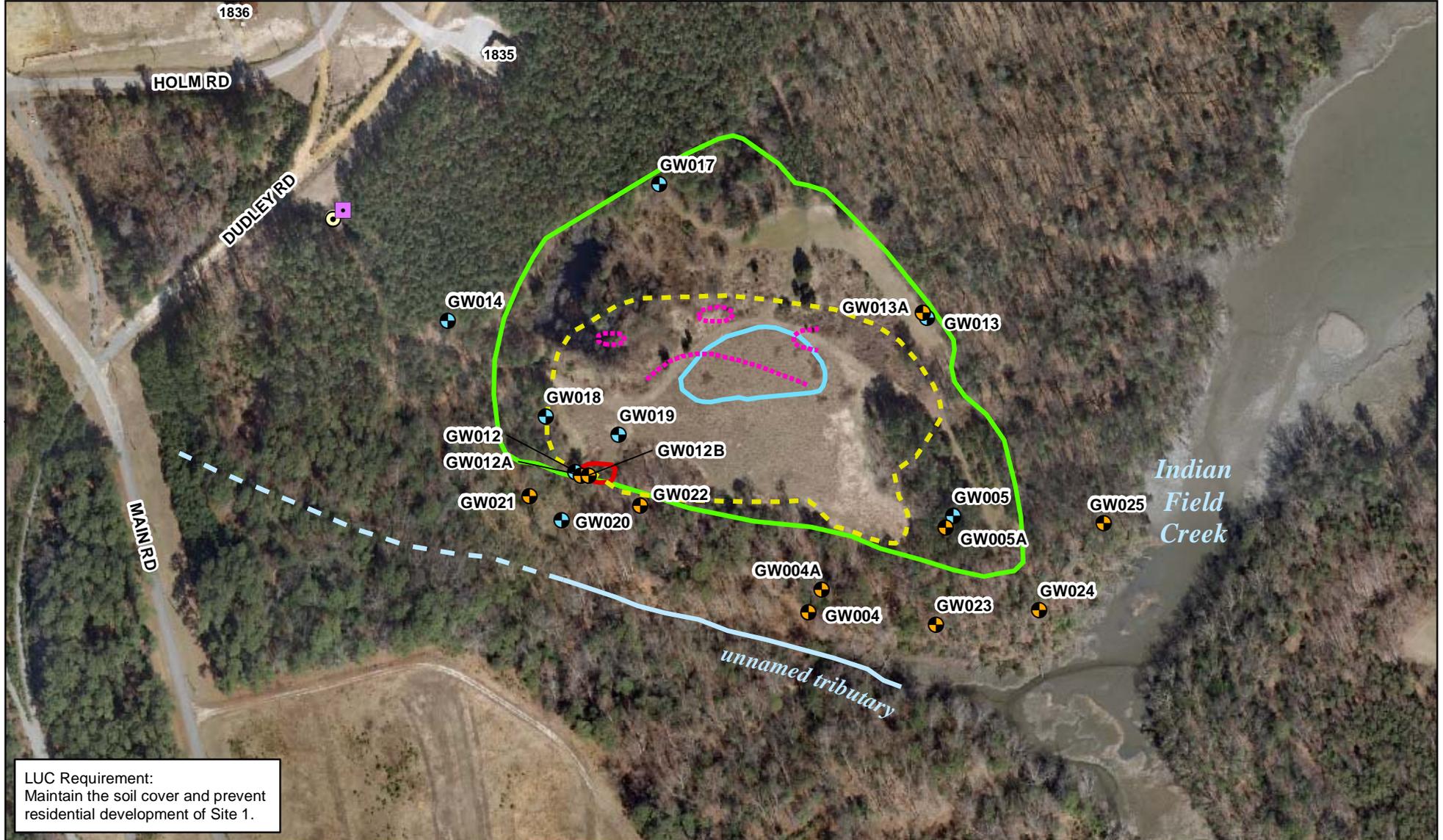
Issue	Recommendations/ Follow-Up Actions	Party Responsible	Oversight Agency	Milestone Date	Affects Protectiveness? (Y/N)	
					Current	Future
Confirm Extent of Soil Cover	Develop Uniform Federal Policy-Sampling and Analysis Plan and conduct investigation	Navy	USEPA	April 2013	N	Y

4.7 Protectiveness Statement

The remedy is short-term protective of human health and the environment because institutional controls (ICs) are in place that restrict access and prevent residential development or disturbance of the soil cover; therefore, the remedy is currently protective. However, due to uncertainty regarding the landfill cover extent at Site 1, the remedy may not be protective in the long-term. Additional investigation will be conducted to confirm that the soil cover adequately covers the landfill area and will be protective in the future. This work is anticipated to be conducted in April 2013 following regulatory approval of the work plan currently under development.

4.8 Next Review

The next Five-Year Review for Site 1 will be completed by February 2018.



LUC Requirement:
Maintain the soil cover and prevent residential development of Site 1.

Legend

- Columbia Aquifer Monitoring Well
- Yorktown-Eastover Aquifer Monitoring Well
- Site Gate
- Site Sign
- Interpreted (Geophysical Survey) Northern Extent of Main Disposal Area (Roy F. Weston, Inc., 1993)
- Intermittent drainage ditch (approximate)
- Approximate Area of Excavation of Arsenic Contaminated Soil
- Area where Landfill Material was Consolidated and Covered in 1999
- Study Area Boundary
- Inferred LUC Boundary

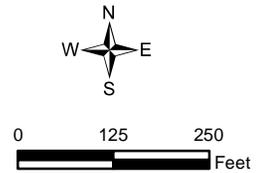


Figure 4-1
Site 1 Location Map
2012 Five-Year Review
WPNSTA Yorktown
Yorktown, Virginia

SECTION 5

Site 6 – Explosives-Contaminated Wastewater Impoundment, Flume Area, and Excavated Area, Buildings 109, 110, and 501

5.1 Site Chronology

1942-1975	Site 6 used as a wastewater (nitramine-contaminated wash-down water) discharge flume and impoundment
1975	A carbon adsorption tower installed to treat wastewater prior to discharge to the Flume Area
1984	IAS identified Site 6 as an area of potential contamination
1986	Effluent from the carbon adsorption tower was diverted to the sanitary sewer and ultimately to Hampton Roads Sanitation District (HRSD)
1986	CS Round I investigated groundwater, surface water, and sediment
1988	CS Round II further investigated groundwater, surface water, and sediment
1991	RI Interim Report prepared to move Site 6 into the RI process
1993	RI – Round One conducted
1998	RI – Round Two conducted
1998	FS conducted
1998	PP issued to the public for comment
1998	ROD for Site 6 soils and sediment signed
1999-2006	Remedial action performed for excavation and <i>ex situ</i> bioremediation of soil and sediment and excavation and <i>in situ</i> bioremediation of soil and sediment in the treatment cells at the Impoundment Area
2000	Baseline LTM of surface water, sediment, and groundwater conducted (further LTM suspended as per the draft Explanation of Significant Differences [ESD])
2007	Phase I RI – groundwater
2011	Phase II RI – groundwater, surface water, and sediment
2012	Technical Memorandum documenting suspension of surface water, sediment, and groundwater LTM until additional site investigation activities have been completed
2012	Memorandum to File that provides clarification on the definition of the boundaries for the Site 6 Flume Area, Impoundment Area, and Excavated Area

5.2 Background

Site 6 is located in the northern portion of WPNSTA Yorktown (**Figure 1-1**) and consists of three areas: an Impoundment Area, a Flume Area, and an Excavated Area (**Figure 5-1**). The Site 6 Impoundment Area historically received wastewater run-off from explosives loading and rinsing operations through a network of flumes. History of the Excavated Area in the northern portion of Site 6 is not documented.

5.2.1 Site History

Flume Area

From 1942 until 2003, two Site 6 buildings, Buildings 109 and 110, were used for explosives reclamation, loading, mixing, and casting. Between 1942 and 1975, wastewater generated during these activities was discharged through a network of concrete flumes into the Site 6 Impoundment Area. This wastewater was reported to have possibly contained explosives (trinitrotoluene [TNT], hexahydro-1,3,5-trinitro-1,3,5-triazine [RDX], and 2,4-dinitrotoluene [DNT]) and solvents (TCE, TCA, and cyclohexanone) according to the *Final Round Two Remedial Investigation Report Sites 6 and 7* (Baker, 1998b). In 1975, a carbon adsorption tower was installed to treat the wastewater prior to discharge into the Flume Area. A National Pollutant Discharge Elimination System (NPDES) permit was granted to allow the discharge of effluent from the carbon adsorption tower containing permissible concentrations of nitramines and nitroaromatics. In 1986, the effluent from the tower was diverted to the sanitary sewer and ultimately to the HRSD, and use of the flumes was discontinued. The Flume Area was originally defined by the ROD as including the Building 109 flume and surrounding wetlands. A 2012 Memorandum to File (NAVFAC, 2012) was approved by the Tier 1 Partnering Team and provided clarification that the Flume Area only consists of the series of flumes between Building 109 and the wetland, but does not include the wetland. The wetland is included as a portion of the Impoundment Area.

Impoundment Area

The Site 6 Impoundment Area consists of the wetland area and impoundment located between the Flume Area and a coffer dam along a small tributary to the main branch of Felgates Creek. The impoundment was created when the coffer dam was built across the headwaters of the tributary in 1942. Wastewater (potentially containing explosives and solvents) was discharged to this area from the flume network from 1942 to 1975. Wastewater containing concentrations of chemicals within levels allowed under the NPDES permit were released to the impoundment between 1975 and 1986. Since 1986, the impoundment has collected only stormwater runoff from the area around Buildings 109 and 110 because wastewater was diverted to the sanitary sewer. Wastewater discharges to the sanitary sewer ceased in 2003 when operations in Buildings 109 and 110 were discontinued (Baker, 1998b).

Excavated Area

An area containing cadmium- and zinc-contaminated soils above ecological screening levels is located northwest of Building 501. This area is currently wooded, but reportedly may have been the soil borrow pit for construction of the coffer dam for the Site 6 impoundment. The 2012 Memorandum to File (NAVFAC, 2012) indicated that uncertainty exists as to the actual location of the Excavated Area. The Excavated Area may be the location identified in the ROD or the area where a ground scar was observed in historical aerial photographs from 1945 to 1951.

5.2.2 Physical Characteristics

Site 6 is primarily a wetland area surrounded by wooded lands. Site 6 topography slopes gently from east to west toward Felgates Creek across much of the site. However, the Impoundment Area is surrounded by very steep slopes. Ground surface elevations are approximately 40 feet above mean sea level (amsl) near Main Road and are less than 10 feet amsl within the Impoundment Area. Stormwater runoff from the site is conveyed into the Impoundment Area, which is characterized as a wetland, the unnamed tributary into which the impoundment drains, and then into Felgates Creek.

The Yorktown-Eastover aquifer is the surficial aquifer at Site 6. This aquifer is composed mostly of fine to coarse grey sand with numerous shell fragments. Clayey organic marsh sediments overlie the sand within the Impoundment Area. The Yorktown-Eastover aquifer is approximately 80 feet thick in the vicinity of Site 6 and is underlain by the Eastover-Calvert confining unit according to *Geohydrology of the Shallow Aquifer System* (USGS, 1997). The water table is variable at the site, ranging from 1 to 35 feet bgs depending on the ground surface elevation. Groundwater generally flows westward toward the impoundment, the tributary, and Felgates Creek.

5.2.3 Land and Resource Use

At present, there is no active use of the site. There are no current surface water or groundwater resource uses. The Navy is currently developing a LUC RD to detail the implementation and reporting requirements for Site 6 LUCs.

Felgates Creek discharges to the York River approximately 0.7 mile downstream of Site 6. The York River is a navigable waterway used for transportation, shipping, fishing, and recreation. There are no potable groundwater wells presently in use within the boundaries of or immediately downgradient of WPNSTA Yorktown. The future land and resource uses are anticipated to remain unchanged from Navy industrial use for the foreseeable future.

5.2.4 History of Contamination

Between 1942 and 1976, the wastewater flumes and Impoundment Area at Site 6 were used for the discharge of nitramine-contaminated wastewater generated during explosives operations to a tributary of Felgates Creek. The wastewater reportedly contained the explosives TNT, RDX, DNT, and the solvents TCE, TCA, and cyclohexanone (Baker, 1998b). In 1975, NPDES discharge limitations and an effluent treatment system were implemented at Site 6. Treated wastewater effluent discharge continued through 1986.

Contaminant impacts to soil, groundwater, sediment, and surface water within the wastewater flume and Impoundment Areas are likely due to the discharge of wastewater contaminated with VOCs, explosives, and metals. Even after the implementation of NPDES discharge limitations and the eventual cessation of discharges to this area, contaminated residue was present within the flume and Impoundment Areas, which served as a continuing source of contamination to all site media. The Site 6 Excavated Area history is unknown, though it may have been the soil borrow pit used during construction of the Site 6 Impoundment Area. There is some uncertainty as to the location of the Site 6 Excavated Area, as subsequent data review efforts identified historical aerial photographs from 1945 and 1951 with a cleared area located approximately 100 feet west of the currently defined cadmium- and zinc-contaminated soils area.

Site 6 was identified during the IAS (NEESA, 1984) as an area of potential contamination. Subsequent investigations of the Building 109 flume and Impoundment Areas identified VOCs (primarily TCE), explosives, and metals impacts in soil, groundwater, surface water, and sediment. Investigation of the Site 6 Excavated Area identified cadmium and zinc contamination of soil. The Building 110 Flume Area was not included in previous site investigation efforts. Additional investigation of groundwater, surface water, and sediment is planned to define the extent and monitor the potential migration of contaminants within site groundwater, sediment, and surface water within the flume and Impoundment Areas.

5.2.5 Initial Response

After being initially identified, subsequent investigation included CSs (Dames and Moore, 1986; 1988) and RIs (Baker and Weston, 1993; Baker, 1997a). Previous investigations included analysis for TCL VOCs, TCL SVOCs, explosives, and TAL inorganic constituents for groundwater, soil, surface water, and sediment. Additionally, soil and groundwater were analyzed for TCL pesticides and PCBs.

Within the Building 109 Flume Area, VOCs were detected in soil at maximum concentrations of vinyl chloride (4,700 micrograms per kilogram [$\mu\text{g}/\text{kg}$]), TCE (3,400 $\mu\text{g}/\text{kg}$), and cis-1,2-DCE (3,100 $\mu\text{g}/\text{kg}$), and explosives were detected at maximum concentrations of TNT (640,000 $\mu\text{g}/\text{kg}$) and octahydro-1,3,5,7-tetranitro-1,3,5,7-tetrazocine (HMX) (61,000 $\mu\text{g}/\text{kg}$) (Baker, 1998b). VOCs were also detected in groundwater at maximum concentrations of TCE (37,000 $\mu\text{g}/\text{L}$), cis-1,2-DCE (26,000 $\mu\text{g}/\text{L}$), and vinyl chloride (21,000 $\mu\text{g}/\text{L}$). Low levels of explosives were also detected in groundwater, with a maximum concentration of RDX of 63 $\mu\text{g}/\text{L}$. Several metals were also detected at concentrations above background in site groundwater (Baker, 1998b).

Within the Impoundment Area, VOCs were detected in sediment at maximum concentrations of TCE (5 $\mu\text{g}/\text{kg}$), 1,1-dichloroethane (DCA) (52 $\mu\text{g}/\text{kg}$), 1,2-DCE (27 $\mu\text{g}/\text{kg}$), and vinyl chloride (63 $\mu\text{g}/\text{kg}$). The SVOC fluoranthene was detected at a maximum concentration of 3,900 $\mu\text{g}/\text{kg}$. Explosives were also detected in sediment at maximum concentrations of TNT (93,000,000 $\mu\text{g}/\text{kg}$), RDX (3,900,000 $\mu\text{g}/\text{kg}$), and HMX (730,000 $\mu\text{g}/\text{kg}$). VOCs

were also detected in surface water at maximum concentrations of 1,1,1-TCA (98 µg/L), 1,1-DCE (5 µg/L), and 1,1-DCA (4 µg/L) (Baker, 1998b).

Within the Excavated Area, metals were detected in soil at maximum concentrations of iron (35,300 mg/kg), aluminum (27,000 mg/kg), and zinc (2,340 mg/kg), which exceeded screening values (Baker, 1998b).

5.2.6 Basis for Taking Remedial Action

The basis for taking action at Site 6 was to address contamination of the Building 109 wastewater flume, contaminated soil and sediment from wastewater discharges, and contaminated soils from the Excavated Area that posed potential unacceptable risks to human health and/or the environment. According to the *Final Record of Decision Operable Unit Nos. XII, XIII, XIV, and XV, Site 6 and Site 7* (NAVFAC, 1998b), constituents to be addressed in soil and sediments from the Impoundment and Flume Area were explosives, chlorinated VOCs, and metals, while cadmium and zinc were to be addressed from the Excavated Area. The ROD identified human health and ecological risks associated with explosives and VOCs in the Building 109 Flume Area of the site. Ecological risks were associated with explosives, VOCs, and metals constituents in the Impoundment Area. However, a removal of sediment was not recommended for sediment within the impoundment because it was determined it would do more harm to ecological receptors than no action. The ROD also identified ecological risks associated with metals in the Site 6 Excavated Area. LTM was required for surface water and sediment because contamination (including nitramines and nitroaromatics, chlorinated VOCs, and inorganics) remained within the Site 6 Impoundment Area. LTM was also required for groundwater contamination (including nitramines and nitroaromatics, chlorinated VOCs, and inorganics) across the site, although this was not to be considered the final remedy.

5.3 Remedial Actions

5.3.1 Remedy Selection

The Site 6 RAOs identified in the *Final Proposed Remedial Action Plan, v2 Sites 6 and 7* (Baker, 1998c) were as follows:

- Mitigate risk from direct exposure to contaminated soil and sediment in the Site 6 Impoundment and Flume Areas
- Mitigate risk to ecological receptors from direct exposure to soil in the Site 6 Excavated Area with contamination above 4.0 mg/kg of cadmium or above 48.4 mg/kg of zinc
- Reduce or eliminate potential sources of VOCs or nitramines from Solid Waste Management Unit (SWMU) 179 and Area of Concern (AOC) C (within the Flume Area)

The ROD for Site 6 soil and sediment was signed in October 1998 (NAVFAC, 1998b). The selected remedy for Site 6 consisted of:

Site 6 Flume Area

- Excavation of soil and sediment contaminated with explosives, chlorinated VOCs, and inorganic constituents from the Building 109 Flume Area to levels appropriate for industrial activity
- *Ex situ* bioremediation of excavated soil and sediment
- Employment of a contingency remedy (low temperature thermal desorption) if necessary to remove remaining chlorinated VOCs from the soil
- Restoration of the Flume Area habitat
- Pressure washing of the flume (SWMU 179), and residue removal and pressure washing of the flume under Building 109
- Removal of explosives-contaminated residue from SWMU 179 and treatment by burning at the WPNSTA's thermal treatment unit

- Clean up to levels appropriate for commercial and industrial use
- LUCs to prevent residential development

Site 6 Excavated Area

- Grading and placement of backfill as a soil cover (minimum 8 inches) to prevent contact with cadmium- and zinc-contaminated surface soil by terrestrial ecological receptors
- LUCs to prohibit activities that could compromise the integrity of the soil cover and to protect terrestrial ecological receptors

Site 6 Impoundment Area Surface Water, Sediment, and Groundwater

The ROD required LTM of surface water, sediment, and groundwater. However, after the baseline round of LTM at Site 6 in 2000, the Team agreed that LTM should be suspended until additional site investigations had been completed. Suspension of LTM until after the planned additional investigation is performed was documented in the *Technical Memorandum for the Suspension of Site 6 Long-term Monitoring Requirements for Operable Unit XV Identified in the 1998 Record of Decision* (CH2M HILL, 2012a). The Tier 1 Partnering Team agreed that this Technical Memorandum was sufficient to document the suspension of LTM and that an ESD would not be needed. Site 6 surface water, sediment, and groundwater are currently being investigated under an Expanded RI.

5.3.2 Remedy Implementation

Implementation of the selected remedy was initiated in 1999. The initial phase of remediation consisted of the construction of a bio-cell, excavation of soil contaminated with inorganics, chlorinated VOCs, and explosives to approximately 4 feet bgs, transportation of explosives-contaminated soil to the bio-cell, flume and drain decontamination, and site restoration. Additionally, polynuclear aromatic hydrocarbon (PAH)-contaminated soil was discovered during remedy implementation and was removed according to the *Final Report, Remedial Action, Site 6* (OHM, 1999). PAH-contaminated soil was excavated to levels that allow for residential activity.

Approximately 11,800 tons of soil and sediment that exceeded the explosives remediation levels (RLs) identified in the ROD were excavated and transported to the bio-cell, where they were treated by *ex situ* biological treatment. In addition to the soil removed from the Flume Area, impacted soil was also excavated from the Impoundment Area to ensure that residual contamination associated with Flume Area was addressed and that the RAOs were met. To allow for adequate treatment time in the bio-cell, implementation of the remedy (removal of soil and sediment and treatment in the bio-cell) continued into 2006. The Construction Completion Report documenting remedy implementation through 2006 was completed in 2008 (Shaw, 2008).

Although placement of a soil cover over the Excavated Area (area of cadmium- and zinc-contaminated soil) was identified as part of the remedy in the ROD, there is no documentation that the soil cover was constructed for the Excavated Area. The area is monitored during routine site inspections, but there is no evidence of a soil cover at the specified location.

LUCs prohibiting residential development of the Flume Area and disturbance of the Excavated Area soil cover have been maintained and verified through routine inspections. Site 6 is inaccessible to the general public. Access to the Site 6 Impoundment Area is restricted by a fence and locked gates at both roads leading into the Building 109 compound area. Signs are posted at both entrances, as well as in the vicinity of the Excavated Area. The LUCs will be maintained until such time as they are no longer required to protect human health or the environment.

5.4 Progress Since Last Five-Year Review

The previous Five-Year Review (CH2M HILL, 2007a) did not identify any issues and concluded that the remedy was functioning as intended by the ROD and is protective of human health and the environment. The implementation of LUCs and routine site inspections has continued since the last review. Following the baseline round of sampling in 2000, LTM at Site 6 was suspended pending completion of additional investigations.

In 2007, a Phase I Groundwater RI was performed for site groundwater. Groundwater was analyzed for VOCs, SVOCs, pesticides and PCBs, explosives, cyanide, and total and dissolved metals. Individual VOCs, explosives, and inorganic constituents exceeded regulatory screening criteria as presented in the *Phase I Remedial Investigation Report for Groundwater at Sites 1, 3, 6, 7, 11, 17, 24, and 25* (CH2M HILL, 2007b).

Phase II RI investigation activities were conducted from March to September 2009 to further characterize the extent of contamination and support an assessment of potential environmental and human health risks associated with exposure to groundwater, surface water, and sediment at Site 6. Assessment of the nature and extent of contamination and potential risk associated with groundwater, surface water, and sediment at Site 6 was completed in the *Final Phase II Remedial Investigation Report, Site 6* (CH2M HILL, 2011a).

Based on the data and findings from the Phase II RI, some delineation and characterization of the horizontal and vertical distribution of contamination within groundwater, surface water, and sediment at Site 6 has been completed, but additional data will need to be collected to proceed with an FS of potential remedial alternatives. A work plan is currently being developed for a Pre-FS sampling event at Site 6. This investigation will be designed to address current data gaps identified by the USEPA in the Site 6 Phase II RI in order to adequately characterize the site and will collect data necessary for preparation of an FS.

In September 2012, the *Technical Memorandum for the Suspension of Site 6 Long-term Monitoring Requirements for Operable Unit XV Identified in the 1998 Record of Decision* (CH2M HILL, 2012a) was approved by the Partnering Team to document suspension of Site 6 LTM until after the planned investigation activities are performed. An attachment to the 2012 Technical Memorandum was a Memorandum to File, originally issued in July 2012 (NAVFAC, 2012). This Memorandum to File clarifies the boundaries of the three main areas of Site 6 identified in the ROD. The revised definitions of the Flume Area, Impoundment Area, and Excavated Area are as follows:

- The Flume Area is the network of concrete flumes that transported wastewater from Building 109 to the wetland. The Flume Area does not include any portion of the wetland.
- The Impoundment Area is the wetland area located between the Flume Area and the coffer dam.
- The Excavated Area cannot be currently defined based on existing site data. There is uncertainty as to whether the Excavated Area is the location identified in the ROD or the area where a ground scar was observed in historical aerial photographs from 1945 to 1951. Additional investigation will be performed to better define the Excavated Area.

5.4.1 Data Review

Phase I RI

In 2007, a Phase I Groundwater RI was performed for site groundwater. Constituents analyzed for in groundwater were VOCs, SVOCs, pesticides and PCBs, explosives, cyanide, and total and dissolved metals. Groundwater impacts were observed for VOCs, explosives, and inorganic compounds. The vertical and horizontal extent of this contamination in groundwater was not fully defined during the RI activities. HHRAs and ERAs were not performed during the Phase I RI. Additional groundwater investigation activities and risk assessments were recommended at the conclusion of this effort (CH2M HILL, 2007b).

2008 Construction Completion Report

Shaw Environmental and Infrastructure, Inc. (Shaw), implemented the ROD-required soil and sediment cleanup action within the Flume Area. Although, the ROD-required action was for the Flume Area only, some of the contaminated sediments within the Impoundment Area were also removed during the actions performed in 2000 and 2006. The Construction Completion Report documents the collection of confirmation samples collected from the floor and side-walls of the excavation. Contaminants exceeding cleanup levels were detected in three of the 20 confirmation samples. Amino-DNT and 2,4,6-TNT exceeded cleanup goals in two of the side-wall samples, and TCE exceeded its cleanup goal in one of the floor samples.

This work is documented in the 2008 Construction Completion Report. However, this report does not indicate whether pressure washing of the Building 110 Flume Area was performed as part of this action.

Phase II RI

Groundwater

TCE is the most widespread COC at Site 6, with a maximum concentration of 280,000 µg/L in site groundwater. The TCE plume generally occurs within and beyond the surface Impoundment Area. TCE concentrations above 11,000 µg/L (1 percent of the solubility of TCE) generally indicate the likely presence of TCE as dense non-aqueous phase liquid (DNAPL). Other chlorinated hydrocarbon compounds (cis-1,2-DCE, trans-1,2-DCE, vinyl chloride, and 1,1-DCE, PCE) were also detected at concentrations exceeding regulatory screening criteria in site groundwater. Explosives were observed within the upper to middle portion of the Yorktown-Eastover aquifer in the downgradient portion of the Impoundment Area. 2,4-DNT, RDX, nitrobenzene, dinitrobenzene, 3-nitrobenzene, and 4-nitrobenzene exceeded tap water Regional Screening Levels (RSLs) in various site monitoring wells. Several metals (antimony, arsenic, chromium, iron, manganese, and zinc) exceeded regulatory screening criteria in site groundwater throughout Site 6 (CH2M HILL, 2011a).

Surface Water and Sediment

Results of the Phase II RI activities indicated that contaminant concentrations in sediment and surface water downstream of the Impoundment Area in Felgates Creek posed no unacceptable risk to current or future trespassers and visitors or future construction workers. However, detections of, 2,4-DNT, cis-1,2-DCE, PCE, and several metals pose an unacceptable risk to potential future residents, industrial workers, and construction workers (CH2M HILL, 2011a).

No VOCs exceeded ecological screening values in surface water, sediment, or pore water (except carbon disulfide in sediment and pore water, which was consistent with background levels in sediment) at Site 6. No explosives exceeded ecological screening values in site surface water. Nitrobenzene and tetryl were detected in one sediment sample location (SD77) above conservative screening values at concentrations of 120J µg/kg and 150J µg/kg, respectively. These explosives were not retained as ecological COPCs when site-specific bioavailability was considered. Several metals (aluminum, arsenic, manganese, nickel, selenium, and vanadium) were detected at concentrations exceeding conservative screening values in site sediment. Several metals (aluminum, manganese, and silver) were detected at concentrations exceeding conservative screening values in site surface water. However, baseline risk estimates for these constituents were acceptable (CH2M HILL, 2011a). No ecological COCs were identified for surface water, sediment, or sediment pore water, and no COCs were identified for food web exposure at Site 6. Therefore, no unacceptable ecological risks were identified and no further evaluation is warranted for ecological receptors (CH2M HILL, 2011a).

5.4.2 Site Inspections

Site inspections were initiated in September 2003. Since the initiation of the inspections, only minor corrective measures, such as lock replacements on monitoring wells and repair of signage for restrictive access, have been necessary. A site inspection was performed in February 2012 as part of the Five-Year Review process, at which time decontamination and demolition of the site buildings was underway. During this inspection, the signs were intact and visible; however, the contact information was outdated. The sign contact information was subsequently updated in November 2012. Site monitoring wells appeared to be in good condition. A visual inspection of the Excavated Area could not confirm a soil cover; however, no disturbance of the area was observed.

5.4.3 Interviews

Interviews were conducted with various parties familiar with the site. Ms. Rhonda Mickelborough and Mr. Charlie Wilson, both with the Yorktown Environmental Management Department, were interviewed on December 15 and December 16, 2011, respectively. Mr. John Pulver, also with the Yorktown Environmental Management Department, was interviewed on January 18, 2012, and Ensign Damien Allen, with the Yorktown FEAD, was interviewed on January 20, 2012. No significant problems regarding the site were identified during the interviews. Documentation of each site interview is presented in **Appendix C**.

5.5 Technical Assessment

Question A: Is the remedy functioning as intended by the DD?

Yes. A review of documents, ARARs, risk assumptions, and site inspections for the Flume and Impoundment Area demonstrate that the remedy of excavation in conjunction with LUCs at Site 6 to prevent residential development is functioning as intended by the ROD. Confirmation sample data were included in a 2008 Construction Completion Report (Shaw, 2008).

LUCs for the Excavated Area are in place to ensure the soil cover integrity is maintained. The site inspection confirmed that soil at the Excavated Area remains undisturbed. However, details within the construction completion report do not confirm that the soil cover is present at the Excavated Area. If a soil cover is not in place, potential unacceptable ecological risks, particularly for zinc (based upon the observed surface soil concentrations documented in the 1998 Round II RI), may occur since the exposure pathway would still be complete. Site 6 signage and the fence and locked gate restricting access to the Site 6 Impoundment Area are intact and in good condition.

Question B: Are the exposure assumptions, toxicity data, cleanup levels, and RAOs used at the time of the remedy selection still valid?

Yes. The physical conditions of Site 6 have not changed since the ROD in a manner that would affect the protectiveness of the remedy. The cleanup levels required by the ROD were based on a current and future use of the site for commercial or industrial purposes.

The HHRA performed as part of the 1998 RI identified risks above acceptable USEPA risk levels for exposure to soil and sediment. Although there have been changes to the screening values used to identify the COPCs for quantitative risk evaluation, the toxicity values for some of the constituents that were detected in the soil and sediment, and to methods followed for estimating human health risks (such as new exposure point concentration estimate methods, new dermal exposure assessment guidance, and new inhalation exposure guidance) that may result in calculated risks being higher or lower, these changes would not affect the protectiveness of the remedy selected at the site. A comparison of the screening values used for soil and sediment in the 1998 HHRA to current human health risk-based screening values indicated that cobalt, chromium (assuming all chromium is hexavalent chromium), and/or vanadium were not surface soil COPCs for any of the surface soil exposure areas in 1998, but would now be considered COPCs at one or more of the areas, and beryllium, which was a surface soil COPC in 1998, would not be a COPC using current screening levels. For subsurface soil, 2,4-DNT, cobalt, and vanadium were not COPCs in the 1998 RI, but would now be considered COPCs based on current screening levels, and 2-amino-4,6-DNT, 4-amino-2,4-DNT, 1,3,5-trinitrobenzene, and beryllium would no longer be considered COPCs. For sediment, cobalt would be considered a COPC for all of the sediment areas based on current screening levels, but was not considered a COPC in the 1998 RI, and beryllium would no longer be a COPC. Additionally, for the Impoundment Area sediment, a number of non-carcinogenic PAHs were considered COPCs, but should not be considered COPCs.

The 1998 HHRA indicated potentially unacceptable risks associated with exposure to the soil and sediment, and although the changes in the COPCs and to the toxicity values used in the HHRA calculations would slightly change the calculated risks and hazards, they would not change the overall conclusions of the HHRA or effectiveness of the remedy. Additionally, changes to the methodology used to estimate inhalation risks would not change the results of the HHRA; the inhalation pathway contributed less than 4 percent of the total risks for each of the media and exposure areas included in the ROD.

The toxicity numbers and assumptions used to calculate the human health risk-based remediation goals (RGs) for a residential receptor have either stayed the same or have become less conservative (the non-cancer toxicity value for 4-amino-2,4-DNT is higher than the value used to calculate the remediation goals and objectives [RGOs]) since the RGOs were calculated. Therefore, the soil remedy remains protective of human health.

The remedy for the Flume Area and the upper portion of the Impoundment Area (where the flume enters) remains protective of ecological receptors since cleanup values were based upon site-specific sediment toxicity tests (using flume sediments and a concentration gradient based upon TNT and RDX) with two species of freshwater invertebrates (*Hyalella ezteca* and *Chironomus tentans*). The results of this testing allowed a sediment cleanup value to be developed only for TNT, which was used to delineate the remediation area. Based upon the ERA conducted as part of the Phase II RI (CH2M HILL, 2011a), ecological risks in the tributary and Felgates Creek downgradient of the impoundment are acceptable.

Question C: Has any other information come to light that could question the protectiveness of the remedy?

Yes. A review of soil sample locations and historical aerial photographs of the Site 6 Excavated Area identified a potential discrepancy with the reported location of the Excavated Area identified in the ROD. While elevated levels of cadmium and zinc were detected in the current LUC area, a cleared area to the west of the currently identified area is apparent in the 1945 and 1951 aerial photographs and may be the actual location of the Excavated Area. Additionally, construction completion documentation regarding placement of a soil cover over the Excavated Area has not been identified and visual evidence of a soil cover is not apparent.

During a review of the 2008 Construction Completion Report (Shaw, 2008), it was determined that industrial cleanup goals had not been achieved in portions of the removal area within the impoundment. In addition, uncertainty exists as to whether pressure washing of the Flume Area associated with Building 110 was performed.

5.6 Technical Assessment Summary

A review of post-removal confirmation samples indicates that sediment concentrations at three of 20 locations within the Impoundment Area do not meet the industrial RGs initially identified for the Flume Area. Based on these data, the Navy will expand the ROD-required LUCs in the wetland area. The ROD currently requires LUCs to prevent residential use of the Flume Area (including the concrete flume from Building 109, as well as the wetlands area immediately around the outfall of the flume). A LUC RD is currently being developed for the Impoundment Area to expand the LUCs and prevent residential or industrial use of this area. The Impoundment Area includes all wetlands between the Flume Area and the coffer dam. As the Building 110 flume was not defined as part of Site 6, it appears that decontamination of the Flume Area from Building 110 was not performed, and this flume may be acting as a contributing source of contamination to the Impoundment Area. Finally, a review of historical aerial photographs identified a possible discrepancy with the reported location of the Site 6 Excavated Area. Specifically, aerial photographs identified a different location as the likely Excavated Area and there is no visual evidence of a soil cap at the current ROD-specified area.

The uncertainty regarding the soil cover at the Site 6 Excavated Area could affect the protectiveness of the remedy for human health and the environment. All ARARs for management of the site have been met. While there have been some changes in the toxicity values for the COCs that were used in the baseline risk assessment, and there have been changes to the ERA methodology (guidance), these changes do not significantly affect the protectiveness of the remedy. Additional investigation is necessary to determine the concentrations of contamination that remains in place within the impoundment, confirm the location of the Excavated Area and confirm the presence of a soil cover in this area, and to evaluate the flume associated with Building 110 to ensure it will remain protective for future use. The Navy is currently planning additional investigations for Site 6 to further evaluate the site.

5.6.1 Issues

TABLE 5-1
Site 6 Issues Identified

Issue	Currently Affects Protectiveness (Y/N)	Affects Future Protectiveness (Y/N)
Uncertainty of location of Excavated Area and placement of soil cover*	N	Y
Sediment concentrations within Impoundment Area exceed industrial RGs initially identified for the Flume Area	N	Y
The Flume Area from Building 110 could be a continuing source to the Site 6 Impoundment Area	N	Y

*Currently the cover is assumed to be in place at the Excavated Area, until any future investigation deems otherwise

5.6.2 Recommendations and Follow-Up Actions

TABLE 5-2
Site 6 Recommendations and Follow-up Actions

Issue	Recommendations/ Follow-Up Actions	Party Responsible	Oversight Agency	Milestone Date	Affects Protectiveness? (Y/N)	
					Current	Future
Uncertainty of location of Excavated Area and placement of soil cover	Evaluate soils from both possible Excavated Areas as part of the future investigation activities planned for Site 6.	Navy	USEPA	August 2013	N	Y
Sediment concentrations within Impoundment Area exceed industrial RGs initially identified for the Flume Area	Enforce residential and industrial LUCs in the Impoundment Area.	Navy	USEPA	August 2013	N	Y
The Flume Area from Building 110 could be a continuing source to the Site 6 Impoundment Area	Collect samples from Flume Area from Building 110 as part of future investigation activities planned for Site 6.	Navy	USEPA	August 2013	N	Y

5.7 Protectiveness Statement

The remedy is short-term protective of human health and the environment because ICs are in place to restrict any residential development or disturbance of the soil cover. Additionally, ICs restricting residential and industrial use of the Site 6 Impoundment Area are currently enforced to ensure protectiveness. However, due to uncertainty regarding the presence of the soil cover at the Excavated Area portion of Site 6, the remedy may not be protective in the long-term. Therefore, the presence of a soil cover over the excavated area will be confirmed during future investigation activities. This additional investigation is recommended to address uncertainties and ensure future protectiveness of the remedy.

5.8 Next Review

The next Five-Year Review for Site 6 will be completed by February 2018.



Legend

- Yorktown Monitoring Wells
- Site Gate
- Site Sign
- Approximate Location of Concrete Flume
- Demolished Building
- Study Area Boundary
- Inferred LUC Boundary
- 2007 Removal Area
- Ground scar identified in aerial photographs (1945-1951)



Figure 5-1
Site 6 Location Map
2012 Five-Year Review
WPNSTA Yorktown
Yorktown, Virginia

Site 7 – Plant 3 Explosives-Contaminated Wastewater Discharge Area

6.1 Site Chronology

1945-1975	Site 7 discharge area received nitroamine-contaminated wastewater from Loading Plant 3
1975-1986	Wastewater was treated in an activated carbon unit, which removed dissolved explosives from the water prior to discharge
1984	Site 7 identified in the IAS of WPNSTA Yorktown as an area of potential contamination
1986	The wastewater was directed to the sanitary sewer system and ultimately to the HRSD
1986	CS Round I investigated groundwater, surface water, and sediment at Site 7
1988	CS Round II further investigated groundwater, surface water, and sediment at Site 7
1991	RI Interim Report recommended moving Site 7 into the RI process
1993	RI – Round One conducted
1995	Soil Characterization Study conducted
1996	Field-Scale Pilot Study completed to treat explosives-contaminated soil and sediment at Site 7
1998	RI – Round Two conducted
1998	FS conducted
1998	PP issued to the public for comment
1998	ROD for Site 7 soils and sediment was signed
2000-2005	LTM conducted for surface water, sediment, and groundwater
2007	Phase I RI – groundwater
2009	LTM conducted for surface water, sediment, and groundwater
2012	Technical Memorandum documenting suspension of surface water and groundwater LTM until additional site investigation activities have been completed.

6.2 Background

Site 7 is a 300-foot-long drainage area that discharged from Building 375 to Felgates Creek. The Site 7 area includes the area surrounding Buildings 375, 502, 503, and 504 (collectively known as Loading Plant 3) as well as a drainage area leading to Felgates Creek in the northern portion of WPNSTA Yorktown (**Figure 1-1**). The Explosives-Contaminated Wastewater Discharge Area is approximately 300 feet long and received nitroamine-contaminated wastewater from Loading Plant 3 from 1945 to 1975 (**Figure 6-1**).

6.2.1 Site History

The wastewater discharged from Plant 3 and into the Site 7 discharge area possibly contained RDX, TNT, cyclohexane, and TCE (NEESA, 1984). From 1975 to 1986, the wastewater was treated in an activated carbon unit, which removed dissolved explosives from the water prior to discharge to the site. After 1986, the carbon-treated wastewater was directed to the sanitary sewer system and ultimately to the HRSD. The site was reverted to a natural drainage area and received no discharge from the Plant 3 complex after 1986.

6.2.2 Physical Characteristics

Site 7 is relatively flat with the exception of the southern drainage area, which consists of a ravine with relatively steep slopes. Additionally, some of the buildings in the study area are surrounded by earthen berms that affect the stormwater runoff direction. The highest elevation of the site is at the entry way to the site along Main Road, which is approximately 40 feet amsl; the topographic low of the site is at the drainage way, where the elevation is less than 10 feet amsl.

At Site 7, the Yorktown-Eastover aquifer occurs at the surface or in some areas is overlain by a thin (no more than a few feet thick) deposit of clayey sediments lithologically consistent with the Yorktown confining unit. The Eastover-Calvert confining unit lies beneath the Yorktown-Eastover aquifer. The water table is variable at the site, ranging from 6 to 35 feet bgs depending on the ground surface elevation and proximity to the unnamed tributary to Felgates Creek. The Yorktown-Eastover aquifer groundwater discharges to Felgates Creek located west-southwest of the site.

6.2.3 Land and Resource Use

Site 7 is located in the restricted portion of WPNSTA Yorktown (that is, access to these areas is not permitted for unauthorized personnel). At present, there are no activities at the site. There are no current surface water or groundwater resource uses. The Navy is currently developing a LUC RD to detail the implementation and reporting requirements for Site 7 LUCs.

Felgates Creek discharges to the York River approximately 1 mile downstream of Site 7. The York River is a navigable waterway used for transportation, shipping, fishing, and recreation. There are no potable groundwater wells currently in use within the boundaries of or immediately downgradient of WPNSTA Yorktown. The future land and resource uses of the site and surrounding area are anticipated to remain unchanged for Navy industrial use into the foreseeable future.

6.2.4 History of Contamination

Between 1945 and 1975, the Site 7 drainage area was used for the discharge of nitramine-contaminated wastewater generated from explosives operations at Loading Plant 3 to Felgates Creek. The wastewater reportedly contained the explosives TNT, RDX, cyclohexane, and TCE (NEESA, 1984). In 1975, NPDES discharge limitations and an effluent treatment system were implemented at Site 7. Treated wastewater effluent discharge continued through 1986.

Contamination of site media within the Site 7 drainage area is likely due to the discharge of wastewater contaminated with VOCs, explosives, and metals that impacted soil, groundwater, sediment, and surface water. Even after the implementation of NPDES discharge limitations and eventual cessation of discharges to this area, contaminated media within the drainage area served as a continuing source of contamination to site media.

Site 7 was identified during the IAS as an area of potential contamination. Subsequent investigations of the drainage area and downstream surface water and sediment identified explosives, VOCs, SVOCs, and metals impacts in soil, groundwater, surface water, and sediment.

6.2.5 Initial Response

After being initially identified, subsequent investigations, including CSs (Dames and Moore, 1986; 1988) and RIs (Baker and Weston, 1993; Baker, 1997a), were conducted to investigate groundwater, soil, surface water, and sediment. Previous investigations were conducted for TCL VOCs, TCL SVOCs, PCBs, pesticides, explosives, and TAL inorganic constituents.

Explosives were detected in soil at maximum concentrations of TNT (640,000 µg/kg), RDX (160,000 µg/kg), and HMX (61,000 µg/kg). Aluminum and arsenic were detected in soil at concentrations exceeding regulatory screening criteria. In site groundwater, low levels of VOCs and explosives were detected with RDX at a concentration of 180 µg/L being the only organic compound exceeding regulatory screening criteria. Numerous metals were identified as ecological COPCs in site groundwater (Baker and Weston, 1993).

Explosives and VOCs were detected in surface water samples collected downstream of the Site 7 discharge area at maximum concentrations of 1,1,1-DCA (240 µg/L), 1,1,1-TCA (15 J µg/L), HMX (0.5 µg/L), and RDX (1.0 µg/L). Metals concentrations in site sediment did not exceed site background levels. VOCs and SVOCs were detected in sediment samples collected downstream of the discharge area. Maximum detected VOC concentrations were carbon disulfide (66J µg/kg) and 2-butanone (43J µg/kg). Maximum detected SVOC concentrations were di-n-butylphthalate (2,700 µg/kg) and phenol (660J µg/kg). Numerous metals were identified as ecological COPCs in site sediment (Baker and Weston, 1993).

In addition to the site investigation activities, a pilot study was conducted at Site 7 in 1996. Approximately 770 yd³ of explosives-contaminated sediment and soil were removed from the Site 7 discharge area during the pilot study. TNT-contaminated soil was excavated and sent to the Site 22 bio-cell. The average TNT concentration of the Site 7 soils entering the bio-cell was over 1,000,000 µg/kg (Baker, 1997c). Confirmation samples were collected from the excavated area. All contaminant concentrations in the confirmation samples were below their established treatment goals with the exception of one sample containing amino-DNT, which exceeded the treatment goal of 80,000 µg/kg in one location, with a concentration of 120,000 J µg/kg. However, the amino-DNT concentration was below the residential Risk-based Concentration (RBC) value of 160,000 µg/kg.

6.2.6 Basis for Taking Remedial Action

The basis for taking action at Site 7 was to address soil and sediment in the wastewater discharge area that exceeded residential screening criteria following the 1996 pilot study removal activity. Groundwater contamination (including nitramines and nitroaromatics, chlorinated VOCs, and inorganics) also remained beneath Site 7. The Site 7 ROD identified human health risk associated with iron in surface soil for child residents. Antimony, cadmium, chromium, copper, lead, mercury, and zinc were identified in soil as posing ecological risks to terrestrial receptors. No unacceptable human health or ecological risks were identified from exposure to surface water or sediment in the unnamed tributary downstream of the discharge area (Baker, 1998b).

6.3 Remedial Actions

6.3.1 Remedy Selection

Although the Site 7 DDs do not specify RAOs, the inferred RAO based on the Site 7 DDs is to mitigate risks for industrial and commercial receptors to contaminated soil and sediment in the Site 7 drainage area. The ROD for Site 7 was signed in October 1998 and specified the implementation of LUCs for soil and sediment and LTM for groundwater. According to the ROD, the removal of contaminated soil and sediment completed during the bioremediation field-scale pilot study conducted in 1996 mitigated potential human health risks for industrial and commercial land use; following implementation of this remedy there are no unacceptable risks to potential ecological receptors from contact with soil and sediment in the drainage area (NAVFAC, 1998b).

- LUCs prohibiting residential use of the Site 7 Explosives-Contaminated Wastewater Discharge Area have been implemented through routine inspections. Site 7 is inaccessible to the general public. The LUCs will be maintained until such time as they are no longer required to protect human health. The LUC boundary is identified on **Figure 6-1**.
- The ROD required LTM of groundwater, although this was not to be considered the final remedy for groundwater at the site. The Navy is currently working with the USEPA and VDEQ to document suspension of LTM for surface water, sediment, and groundwater at the site until the Expanded RI is finalized. Site 7 groundwater is currently being investigated under an Expanded RI.

6.4 Progress Since Last Five-Year Review

The most recent Five-Year Review (CH2M HILL, 2007a) did not identify any issues and concluded that the remedy is functioning as intended by the ROD for soil and sediment in the Site 7 drainage area and is protective of human health and the environment. Implementation of LUCs and routine site inspections have continued since the last review.

Since the ROD was issued, the Explosives Loading Plant 3 (Plant 3) buildings (Buildings 375, 502, 503A, and 504) have been demolished (**Figure 6-1**), and the USEPA has requested that the former buildings' footprints be investigated to confirm that no additional contamination that could adversely affect the Site 7 discharge area and Felgates Creek is present in these areas. LTM of groundwater was initiated in 2000 for VOCs, explosives, and inorganics. Surface water and sediment were included in subsequent LTM efforts. The Navy, USEPA Region 3, and VDEQ agreed that groundwater LTM should be discontinued, as all media, including groundwater, will be included as part of the expanded RI at Site 7. In September 2012, the *Technical Memorandum for the Suspension of Site 7 Long-term Monitoring Requirements for Operable Unit XV Identified in the 1998 Record of Decision* (CH2M HILL, 2012b) was approved by the Partnering Team to document suspension of Site 7 LTM until after the planned investigation activities are performed.

Results of the 2009 LTM effort indicate that the concentrations of explosives in groundwater are continuing to decline following the 1997 removal action, except for RDX in 7GW02, which has increased since the 2005 sampling event (CH2M HILL, 2010d).

6.4.1 Data Review

2007 Phase I RI

In 2007, a Phase I Groundwater RI was performed for site groundwater. Groundwater samples were analyzed for explosives, TAL total and dissolved metals, and cyanide. Explosives detected in groundwater included 2-amino-4,6-DNT, 4-amino-2,6-DNT, HMX, and RDX. Explosives concentrations were consistent with previous site sampling events and indicating decreasing concentration trends over time. Metals concentrations exceeded Base background concentrations for cobalt, manganese, and zinc, but were consistent with upgradient metals concentrations (CH2M HILL, 2007b).

2009 LTM

Previous LTM efforts were conducted at Site 7 in 2000, 2004, and 2005. LTM of groundwater was resumed at Site 7 in 2009. Results of the 2009 LTM effort were documented in the *Final Long-term Monitoring Report, Site 7* (CH2M HILL, 2010d). Five groundwater wells were sampled for explosives and one well was also sampled for TCL VOCs, perchlorate, nitroguanadine, n-nitrosodiphenylamine, and ammonia. Data trends indicate that explosives concentrations in site monitoring wells have decreased over time. Exceedances of explosives, perchlorate, and VOCs were observed in site monitoring wells. As groundwater concentrations have generally decreased over time since the remedy implementation, the Site 7 remedy was determined to be protective of human health and the environment (CH2M HILL, 2010d).

6.4.2 Site Inspections

In accordance with the ROD, site inspections were initiated in May 2000. Since the initiation of the inspections, only minor corrective measures such as replacement of locks on monitoring wells and repair of signage for restrictive access have been necessary. A site inspection was performed in February 2012 as part of the Five-Year Review process. During this inspection, the signs were intact and visible; however, the contact information was outdated and one sign near the Wastewater Discharge had been damaged during a storm but is still functioning as intended. The sign contact information was subsequently updated in November 2012.

6.4.3 Interviews

Interviews were conducted with various parties familiar with the site. Ms. Rhonda Mickelborough and Mr. Charlie Wilson, both with the Yorktown Environmental Management Department, were interviewed on December 15 and December 16, 2011, respectively. Mr. John Pulver, also with the Yorktown Environmental Management Department, was interviewed on January 18, 2012, and Ensign Damien Allen, with the Yorktown FEAD, was interviewed on January 20, 2012. No significant problems regarding the site were identified during the interviews. Documentation of each site interview is presented in **Appendix C**.

6.5 Technical Assessment

Question A: Is the remedy functioning as intended by the DD?

Yes. A review of documents, ARARs, risk assumptions, and site inspections demonstrate that the removal action conducted during the pilot study and subsequent restoration of Site 7 is functioning as intended by the ROD. Implementation of LUCs effectively ensures the site is maintained in accordance with industrial purposes. All existing monitoring wells are intact and functioning properly. Further investigations of groundwater, as well as soil, surface water, sediment, and pore water, at Site 7 are planned as part of the forthcoming RI. Additional monitoring wells may be installed in the future as part of the ongoing investigations.

Question B: Are the exposure assumptions, toxicity data, cleanup levels, and RAOs used at the time of the remedy selection still valid?

Yes. The physical condition of Site 7 has changed since implementation of the remedy (the buildings have been demolished) but not in a way that would affect the protectiveness of the remedy evaluated in this review to human health and the environment. The site remains in compliance with the ARARs. There have been no significant changes to the RAOs, exposure assumptions, or toxicity values used to develop the risk assessment that led to the selection of the remedy.

Although there have been changes to the screening values used to identify the COPCs for quantitative risk evaluation, the toxicity factors for some of the contaminants detected at the site, and there have been changes to the standard risk assessment methodology that was used in the RI, which may result in calculated risks being higher or lower, these changes would not affect the protectiveness of the remedy. A comparison of the screening values used for soil in the 1998 HHRA to current human health risk-based screening values indicated that cobalt and vanadium were not surface or subsurface soil COPCs, and thallium was not a subsurface soil COPC in 1998, but would now be considered COPCs, and beryllium, which was a COPC in 1998, would not be a COPC using current screening levels. Additionally, for sediment, cobalt was not a COPC in 1998 RI, but would be a COPC using current screening levels. The 1998 HHRA indicated potentially unacceptable risks associated with exposure to surface soil, and although the changes in the COPCs and to the toxicity values used in the HHRA calculations would slightly change the calculated risks and hazards, they would not change the overall conclusions of the HHRA or effectiveness of the remedy. Additionally, changes to the methodology used to estimate inhalation risks would not change the results of the HHRA; the inhalation pathway contributed less than 2 percent of the total for soil and sediment risks.

There are no unacceptable risks associated with exposure to shallow subsurface soil, and the LUCs associated with the pilot study soil removal area allow for safe use of the site as an industrial area. Further investigation of groundwater, surface water, sediment, and soil from the footprint of the demolished buildings will be performed in the upcoming RI.

Question C: Has any other information come to light that could question the protectiveness of the remedy?

No. No new information has come to light that would change the protectiveness of the remedy. As stated, additional investigation will be conducted in those areas around the waste water discharge to determine if source areas are present.

6.6 Technical Assessment Summary

The remedy for soil and sediment is protective of human health and the environment and is functioning as intended by the ROD. While buildings have been demolished at Site 7 since the remedy implementation, there have been no changes to the exposure pathways that would affect the protectiveness of the remedy. All ARARs for management of the site have been met. While there have been some changes in the toxicity values for the COCs that were used in the baseline risk assessment, and there have been changes to the ERA methodology (guidance), these changes do not significantly affect the protectiveness of the remedy. Further investigations of groundwater, as well as soil, surface water, sediment, and pore water, at Site 7 are planned as part of the forthcoming RI.

6.6.1 Issues

TABLE 6-1
Site 7 Issues Identified

Issue	Currently Affects Protectiveness (Y/N)	Affects Future Protectiveness (Y/N)
The possibility exists for recontamination of the Site 7 drainage area from upgradient former operational areas	N	N

6.6.2 Recommendations and Follow-Up Actions

TABLE 6-2
Site 7 Recommendations and Follow-up Actions

Issue	Recommendations/ Follow-Up Actions	Party Responsible	Oversight Agency	Milestone Date	Affects Protectiveness? (Y/N)	
					Current	Future
The possibility exists for recontamination of the Site 7 drainage area from upgradient former operational areas	Evaluate the possibility utilizing future sampling activities planned for the former Plant 3 area	Navy	USEPA		N	N

6.7 Protectiveness Statement

The remedy is protective of human health and the environment.

6.8 Next Review

The next Five-Year Review for Site 7 will be completed by February 2018.



LUC Requirement:
Prevent residential development.

Legend

-  Yorktown Monitoring Wells
-  Site Sign
-  Demolished Building
-  Study Area Boundary
-  Land Restriction Area
-  Approximate 1996 Excavation Area (Remediated to Industrial Commercial Level)

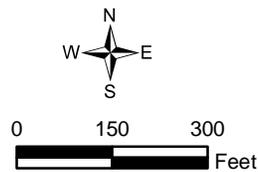


Figure 6-1
Site 7 Location Map
2012 Five-Year Review
WPNSTA Yorktown
Yorktown, Virginia

Site 12 – Barracks Road Landfill

7.1 Site Chronology

1925-1960s	Wastes (incinerator ash, refuse, scrap wood, explosives-contaminated packaging, and possibly solvents) were reportedly disposed of at this landfill
1984	IAS of WPNSTA Yorktown identified Site 12 as an area of potential contamination
1986	CS Round I investigated groundwater, surface water, and sediment at Site 12
1988	CS Round II further investigated groundwater, surface water, and sediment at Site 12
1991	RI Interim Report recommended RI/FS process for Site 12
1992	Resource Conservation and Recovery Act (RCRA) SWMU Investigation conducted
1992	Study Area Analysis provided review of aerial photography of Site 12
1993	RI – Round One conducted
1993	Operable Unit (OU) Evaluation Report provided evaluation of potential site management strategies for Site 12
1994	Habitat Evaluation conducted
1996	RI – Round Two conducted
1996	Independent Sampling Study and Risk Screening conducted at Site 12 to collect “biased” samples for locating potential “hot spots” in areas of staining, drainage, and source locations
1996	FS performed
1996	PP issued for public comment
1997	ROD for soil signed
1997	Navy, USEPA, VDEQ consensus to not include surface water in the LTM plan
1997	Completed Remedial Actions for demolition of incinerator facility, installation of clay cover, re-grading, and erosion control
1998	Final Report prepared for remedial action and restoration of site and adjacent areas
1998	Initiation of LTM
1999	Navy, USEPA, and VDEQ consensus to modify LTM Plan
2003	Navy, USEPA, and VDEQ consensus to modify LTM Plan
2006	Navy, USEPA, and VDEQ consensus to eliminate VOC sampling from the LTM and continue for RCRA 8 metals only
2012	Revised Final ESD to remove LTM requirements and groundwater restrictions from Area B/C and the Wood/Debris Disposal Area and to update and clarify the remaining Site 12 LTM requirements
2012	Draft 2012 LUC RD

7.2 Background

Site 12, the Barracks Road Landfill, is located in the eastern portion of WPNSTA Yorktown (**Figure 1-1**). Site 12 consists of three former disposal areas: Area A, Area B/C, and the Wood/Debris Disposal Area (**Figure 7-1**).

7.2.1 Site History

Area A was the former location of an industrial and non-industrial waste incinerator facility. Ash from the incinerator facility was disposed throughout Area A. This area operated from 1925 to the mid-1960s and received an estimated 1,400 tons of waste, including general refuse, scrap wood, piping, steel containers, and nitramine-contaminated packaging. Wastes were transported to Area A by truck and railcar and open-burned in two incinerators prior to disposal. Incinerator ash was disposed of on the hillside behind the incinerator and spread across the top of Area A. Scrap metal, charred wood, cloth, and glass have been observed in the ash.

Area B/C is located adjacent to the access road leading to the former incinerator facility at Area A. Similar wastes were likely disposed of at Area B/C; however, specific information about disposal operations was not identified in the administrative record.

The Wood/Debris Disposal Area (formerly identified as Site 22 and SWMU 164) was created when lumber, wood pallets, and miscellaneous construction debris were disposed of and pushed into a ravine that leads to Ballard Creek. The disposed material was then covered with soil. The Wood/Debris Disposal Area was reportedly used for disposal of lumber (not matching specifications), wooden pallets, and miscellaneous construction debris that are presently visible in and around Ballard Creek, as documented in the *Final Proposed Remedial Action Plan, Site 12 Barracks Road Landfill* (NAVFAC, 1996).

The *Revised Final Explanation of Significant Differences* (CH2M HILL, 2012c) provided additional clarification regarding the boundaries of and contaminants associated with Site 12. The ESD was approved by the Partnering Team and stated that contaminants associated with Area B/C and the Wood/Debris Disposal Area do not pose an unacceptable risk or the potential to contaminate groundwater, and for this reason groundwater use restrictions and LTM would no longer be enforced in these areas including Ballard Creek. The ESD also determined that chlorinated solvent contamination at Site 12 is attributable to the upgradient Site 31 Barracks Road Industrial Area and is not associated with historical Site 12 activities.

7.2.2 Physical Characteristics

The following is a brief description of each disposal area:

- Area A is 4.4 acres, partially wooded, and includes an area where a former incinerator building and smoke stack were located. The incinerator building contained two incinerators (SWMU 142 and SWMU 143) to burn wastes. Incinerator ash was disposed of in a landfill located within the topographically low area immediately southwest of the incinerator building that drains to Ballard Creek.
- Area B/C of the landfill is located east of Barracks Road and adjacent to the access road to the former incinerator in Area A. It is a 1.6-acre open field with wooded steep slopes and ravines.
- The Wood/Debris Disposal Area (formerly identified as Site 22 and SWMU 164), east of Areas A and B/C, is a 3.3-acre open field with protruding construction debris visible adjacent to Ballard Creek. A ditch with an intermittent stream channel is located adjacent to the Wood/Debris Disposal Area according to the *Final Round Two Remedial Investigation Report for Site 12* (Baker, 1996b).

The topography of the Site 12 disposal areas slopes to the south-southeast from Barracks Road toward Ballard Creek. With the exception of some relatively flat, grassy field areas, Site 12 is predominantly wooded. The Site 12 boundaries have been redefined several times since 1984. Site 12 was initially identified in the IAS (NEESA, 1984) as 2 to 3 acres in area. USEPA identified three areas of primary activity from historical aerial photographs at Site 12, as documented in the *Study Area Analysis* (USEPA, 1992). Based on a 1992 geophysical survey, the Site 12 disposal area was redefined to include the current areas known as Area A and Area B/C. The geophysical data

revealed another fill area located 400 feet east of Facility 587. This area was identified as the wood disposal area (Baker and Weston, 1993), now known as the Wood/Debris Disposal Area.

Site 12 is located within the watershed of Ballard Creek. Surface water within Ballard Creek discharges northeast to the York River. In general, at Site 12 silt and clay are present at the ground surface and extend to a depth of 15 feet bgs, at which point unsaturated fine-grained sand is encountered. Depth to groundwater is approximately 25 to 40 feet bgs. The Cornwallis Cave aquifer underlies this clay layer and represents the shallow aquifer at the site. The Yorktown confining unit is located beneath the Cornwallis Cave aquifer and overlies the Yorktown-Eastover aquifer. Both the Cornwallis Cave aquifer and Yorktown-Eastover aquifer groundwater flow is primarily east-northeast toward the York River and Ballard Creek.

7.2.3 Land and Resource Use

Site 12 proper was used for disposal from 1925 to the mid-1960s. There has been no other land use for the area since disposal activities ceased in the 1960s. Mowing of the site is conducted on an annual basis. There are no current surface water or groundwater resource uses at Site 12. Property and aquifer use restrictions throughout Area A are maintained to ensure groundwater is not used as a potable source. Ballard Creek discharges to the York River, which is a recreational resource. There are no potable groundwater wells presently in use at or downgradient of WPNSTA Yorktown. The future land use and resource uses are anticipated to remain unchanged for the foreseeable future.

7.2.4 History of Contamination

Between 1925 and the 1960s, waste materials including incinerator ash, explosives-contaminated packaging, possibly solvents, and construction debris were disposed of at the Area A landfill at Site 12. The types of waste that were disposed of in Area B/C area are unknown. Wood and construction debris was disposed of in the Wood/Debris Disposal Area. Approximately 1,400 tons of waste material was disposed of at Site 12 during this time frame.

Contamination of site media is likely due to the presence of waste material deposited at this site, and due to migration of contaminants from the waste materials to subsurface soils, groundwater, and potentially into the surface water and sediment of nearby waterways. Impacted site media may also be due to migration of contaminants from upgradient sources not associated with historical Site 12 activities.

Site 12 was identified during the IAS (NEESA, 1984) as an area of potential contamination. Subsequent investigations indicated that metals, pesticides, PAHs, and VOCs had impacted surface and subsurface soil. VOCs, explosives, and metals were observed in groundwater. Sediment associated with Ballard Creek was impacted with PAHs, PCBs, and metals.

7.2.5 Initial Response

After being initially identified, subsequent investigations, including CSs (Dames and More, 1986; 1988) and RIs (Baker and Weston, 1993; Baker, 1996b), were conducted to investigate groundwater, soil, surface water, and sediment. Previous investigations were performed for TCL VOCs, TCL SVOCs, PCBs, pesticides, explosives, and inorganic constituents. VOCs were detected in groundwater with a maximum TCE concentration of 480 µg/L; however, the presence of VOCs was determined to be attributable to historical operations in the industrial area upgradient of Site 12 that had migrated beneath Site 12. Low concentrations of explosives (maximum concentration was of 4-amino-2,6-DNT at 11 µg/L) were detected in groundwater. No pesticides or PCBs were detected in groundwater, with the exception of two groundwater samples (maximum concentration was of endosulfan sulfate at 0.026 J µg/L) (Baker, 1996b).

Metals (primarily lead, mercury, and zinc) exceeded background levels in surface soil. Pesticides, PAHs, and VOCs were also detected in surface and subsurface soil. Elevated metals concentrations were also detected in Ballard Creek surface water samples. VOCs, PAHs, PCBs, and metals were detected in site sediment (Baker, 1996b).

7.2.6 Basis for Taking Remedial Action

Unacceptable human health risks were identified for exposure to Area A surface soil for a future child resident, primarily associated with lead. The potable use of groundwater also was found to pose unacceptable human health risks due to TCE (Baker, 1996b).

Potential terrestrial ecological risks were identified due to the presence of inorganic constituents (lead and cadmium) in Area A surface soil. Pesticides, PCBs, PAHs, and inorganic constituents were found to pose potential risks to aquatic ecological receptors in Ballard Creek surface water and sediment. The presence of inorganic constituents in the surface water of Ballard Creek indicated the potential for moderate ecological risk associated with Area B/C and the Wood/Debris Disposal Area (Baker, 1996b). However, it was determined that dredging the sediment in Ballard Creek would result in greater adverse ecological impact than those potentially posed under existing conditions; therefore, the risks were deemed acceptable.

Remedial action was found to be necessary to address lead in soil in Area A and TCE in shallow groundwater. Based on the absence of unacceptable risk in Area B/C and the Wood/Debris Disposal Area, no remedial action was determined to be necessary for these disposal areas.

7.3 Remedial Actions

7.3.1 Remedy Selection

The Site 12 RAOs identified in the ROD were to prevent erosion of soil in Area A and to prevent the potential for direct exposure to lead at levels greater than 400 mg/kg in soil (Baker, 1996a). The ROD for Site 12 was signed in April 1997 (NAVFAC, 1997). RAOs were developed based on an anticipated future industrial land use, trespasser exposure, and residential exposure scenarios in Area A. Because no unacceptable risks were identified for Area B/C and the Wood/Debris Disposal Area, no action was selected in the ROD for those areas. The selected soil remedy for Area A consisted of:

- Excavating soil, removing surface debris, spreading excavated soil over flat portions of Area A, and backfilling the excavated area with clean soil
- Installation of a geosynthetic clay lines, placing and compacting 12 inches of clay or a material with similar permeability over the excavated soil, and placing 4 inches of topsoil over the clay and clay-equivalent material
- Constructing erosion control measures along the steep slopes located along the stream channel within Area A

For groundwater, the selected remedy in the ROD (as revised by the 2012 ESD) is LUCs, consisting of restrictions throughout Area A to prohibit the use of groundwater as a potable water supply, and LTM in the form of groundwater monitoring of shallow and deep wells. The remedy for surface water and sediment was LTM of Ballard Creek and its tributaries. The objective of the LTM program is to determine the potential impact to shallow groundwater on deeper groundwater and the water quality of Ballard Creek.

As determined in the 2012 ESD (CH2M HILL, 2012c), further evaluation of Site 12 data determined that Area B/C and the Wood/Debris Disposal Area do not pose an unacceptable risk or the potential to contaminate groundwater, and for this reason groundwater use restrictions and LTM would no longer be enforced in these areas including Ballard Creek. Additionally, it was determined that the chlorinated solvent contamination at Site 12 is attributed to the upgradient Site 31 Barracks Road Industrial Area and is not associated with historical Site 12 activities. LTM activities have been modified to reflect this revised understanding of the site.

7.3.2 Remedy Implementation

Remedial action construction for Area A began in July 1997 and consisted of well abandonment, demolition of the incinerator facility, incinerator stack, and a one-story maintenance shed, and implementation of erosion and sediment controls. Metal debris scattered throughout the site was removed and sent to a recycling facility. In addition, the limits of the landfill were defined and contaminated material located outside the limits of the landfill were excavated and placed within the landfill. The landfill was subsequently covered with a geosynthetic clay liner

and soil. Finally, a surface drainage channel (Tri-Lock Block) and settling pond were installed and the site was re-vegetated and restored according to the *Final Report, Remedial Action, Site 12 – Area A* (OHM, 1998).

LUCs prohibiting residential development at the site and interference of the landfill cover were implemented through informal restrictions. The site is inaccessible to the general public since the installation still holds the mission of supporting national military strategy.

The Ballard Creek surface water and sediments were to be monitored to determine temporal effects on the concentration of COCs. During development of the *Final Work Plan for Site 12- Long Term Monitoring Years Two and Three* (Baker, 2000a), it was determined that VOCs in surface water did not present a risk to human health or the environment, and that the monitoring of groundwater would be sufficient because of its direct migration pathway to surface water. As such, the Navy in partnership with USEPA and VDEQ agreed to eliminate surface water sample collection from LTM at Site 12. LTM of groundwater and sediment began in 1998 and is ongoing at Site 12.

7.4 Progress Since Last Five-Year Review

An ESD was developed and approved in October 2012 (CH2M HILL, 2012c). This ESD documents a significant change to the LTM requirement prescribed in the ROD by focusing the monitoring on the potential releases from the waste remaining in Area A at Site 12. The ESD stated that contaminants associated with Area B/C and the Wood/Debris Disposal Area do not pose an unacceptable risk or the potential to contaminate groundwater, and for this reason groundwater use restrictions and LTM would no longer be enforced in these areas, including Ballard Creek. The ESD also determined that chlorinated solvent contamination at Site 12 is attributable to the upgradient Site 31 Barracks Road Industrial Area and is not associated with historical Site 12 activities. The ESD also removed details of the LTM requirement from the ROD (such as monitoring TCE in groundwater and surface water, monitoring PAHs, PCBs, cadmium, manganese, silver, antimony, and beryllium in sediment, and implementing LTM of groundwater across the study area from shallow and deep monitoring wells and LTM of surface water and sediment from Ballard Creek and its tributaries) so that specific sampling requirements can be included in an LTM Work Plan and agreed to by the regulators.

A LUC RD was drafted to satisfy the ROD requirement for LUCs and to restrict residential development at the site. The LUC boundaries identified in the 2012 Draft LUC RD are used as the basis for the Site 12 LUC boundaries presented on **Figure 7-1**.

7.4.1 Data Review

2007 LTM

Results of the LTM data from 2007 were documented in the *Final Long-Term Monitoring Report Site 12, Naval Weapons Station, Yorktown, Virginia* (CH2M HILL, 2008). LTM data do not show any significant increases in concentrations in site groundwater, and arsenic is the only dissolved metal in groundwater exceeding screening values. Because there are no exceedances of screening values for dissolved metals in groundwater with the exception of arsenic (exceedances of total metals attributed to turbidity), the Site 12 remedy is determined to be protective of human health and the environment. LTM data show concentrations in sediment are decreasing and the Site 12 remedy is determined to be protective of human health and the environment, minimizing potential migration of contaminants from the landfill. The LTM report recommended that groundwater and sediment samples be analyzed for select RCRA 8 metals during each Five-Year Review cycle in accordance with the ROD.

7.4.2 Site Inspections

Site inspections have been conducted routinely since 2003 to ensure the landfill cover integrity and site vegetation are maintained. A site inspection performed in February 2012 as part of the Five-Year Review process confirmed that there have been no breaches of the landfill cover and no violations of LUCs resulting in unacceptable exposures. Access is restricted to this area by a cable “fence” along Barracks Road and a locked bar gate at the main entrance to the site; another locked cable gate is in place at a secondary entrance. During this inspection, the signs were intact and visible; however, the contact information was outdated. The sign contact

information was subsequently updated in November 2012. Site monitoring wells appeared to be in good condition. Vegetation was observed between the TriLock Blocks but it is not impacting the functionality of the drainage channel and is not considered to be of concern.

7.4.3 Interviews

Interviews were conducted with various parties familiar with the site. Ms. Rhonda Mickelborough and Mr. Charlie Wilson, both with the Yorktown Environmental Management Department, were interviewed on December 15 and December 16, 2011, respectively. Mr. John Pulver, also with the Yorktown Environmental Management Department, was interviewed on January 18, 2012, and Ensign Damien Allen, with the Yorktown FEAD, was interviewed on January 20, 2012. No significant problems regarding the site were identified during the interviews. Documentation of each site interview is presented in **Appendix C**.

7.5 Technical Assessment

Question A: Is the remedy functioning as intended by the DD?

Yes. Review of documents, ARARs, risk assumptions, and site inspections demonstrate that the landfill cover placed at Site 12 is functioning as intended. LUC objectives are to prohibit activities that interfere with or compromise the integrity of the Site 12 landfill cover and prohibit residential development on the site, including potable groundwater use. Implementation of LUCs effectively prevents breach of the landfill cover and inspections ensure the landfill cover integrity is maintained. No observations were made that LUCs have been violated or that the landfill cover has been disturbed. Furthermore, the Site 12 signage and the fence and locked gate, restricting access to the site, are intact and in good condition. While LTM samples have not been collected since 2007, the next round of LTM is scheduled for 2012 to monitor site groundwater and sediment.

Question B: Are the exposure assumptions, toxicity data, cleanup levels, and RAOs used at the time of the remedy selection still valid?

Yes. The physical conditions of Site 12 have not changed in a way to affect the protectiveness of the remedy. Unacceptable risks are assumed for exposure to landfill materials (primarily lead). Although there have been changes to the screening values used to identify the COPCs for quantitative risk evaluation, the toxicity factors for some of the contaminants detected at the site, and there have been changes to the standard risk assessment methodology that was used in the RI, which may result in calculated risks being higher or lower, these changes would not affect the protectiveness of the remedy. A comparison of the screening values used for soil in the 1996 HHRA to current human health risk-based screening values indicated that chromium (assuming all chromium is hexavalent chromium), cobalt, and/or iron were not soil COPCs in 1996 RI for all of the soil exposure areas, but would now be considered COPCs for one or more of the exposure areas, and 1,3,5-trinitrobenzene, beryllium, and barium, which were COPCs for one or more exposure areas in 1996, would not be COPCs using current screening levels. The 1996 HHRA indicated potentially unacceptable risks associated with exposure to the soil in Area A, and although the changes in the COPCs and to the toxicity values used in the HHRA calculations would slightly change the calculated risks and hazards, they would not change the overall conclusions of the HHRA or effectiveness of the remedy. Additionally, changes to the methodology used to estimate inhalation risks would not change the results of the HHRA; the inhalation pathway contributed less than 1 percent of the total risks associated with soil.

The LUCs and landfill cover prevent any exposure to COCs in the soil and groundwater. The remedy is performing as expected and the landfill cover will be maintained as long as wastes remain in place.

Because the industrial area upgradient of the Site 12 Disposal Areas is the source of VOCs in groundwater and is being addressed separately as Site 31, the objective of LTM for Site 12 is presented in the 2011 ESD, which focuses monitoring on the potential releases from waste remaining in place in the Site 12 Disposal Areas.

Question C: Has any other information come to light that could question the protectiveness of the remedy?

No. No new information has come to light that would change the protectiveness of the remedy.

7.6 Technical Assessment Summary

The remedy is protective of human health and the environment and is functioning as intended by the ROD. There have been no changes in the physical condition of the site or exposure pathways that would affect the protectiveness of the remedy. All ARARs for management of the landfill cover have been met. While there have been some changes in the toxicity values for the COCs that were used in the baseline risk assessment, and there have been changes to the ERA methodology (guidance), these changes do not significantly affect the protectiveness of the remedy. The presence of the cap breaks the ecological exposure pathway to the Area A wastes, and updated ecological screening values for sediment were used to evaluate the LTM sediment data.

7.6.1 Issues

TABLE 7-1

Site 12 Issues Identified

Issue	Currently Affects Protectiveness (Y/N)	Affects Future Protectiveness (Y/N)
No issues identified.	N	N

7.6.2 Recommendations and Follow-Up Actions

TABLE 7-2

Site 12 Recommendations and Follow-up Actions

Issue	Recommendations/ Follow-Up Actions	Party Responsible	Oversight Agency	Milestone Date	Affects Protectiveness? (Y/N)	
					Current	Future
No issues identified.						

7.7 Protectiveness Statement

The remedy is protective of human health and the environment.

7.8 Next Review

The next Five-Year Review for Site 12 will be completed by February 2018.



LUC Requirement: Maintain cap, prevent residential development, and prohibit potable use of groundwater

- Legend**
- Monitoring Well
 - Site Sign
 - Site Gate
 - Trilock Block Drainage Ditch
 - Area A Groundwater LUC
 - ▨ Extent of Landfill Cap and Area A Soil LUC
 - Approximate NFA Area
 - NWS Yorktown Boundary

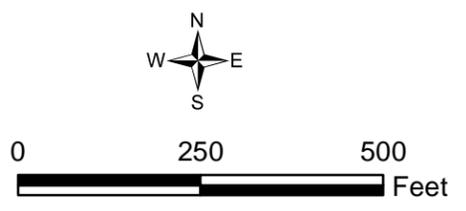


Figure 7-1
 Site 12 Location Map
 2012 Five-Year Review
 WPNSTA Yorktown
 Yorktown, Virginia

SECTION 8

Site 16/SSA 16 – West Road Landfill/Building 402 Metal Disposal Area and Environs

8.1 Site Chronology

1950s-1960s	Site 16 operated as a disposal area and received wastes including dry carbon-zinc batteries, banding materials, pressure-transmitting fluids, unknown types of chemicals, mine casings, construction debris, and drums (containing unknown material)
Pre-1984	SSA 16 used as a metal disposal area
1984	IAS identified Site 16/SSA 16 as an area of potential contamination
1986	CS Round I investigated groundwater, surface water, and sediment at Site 16/SSA 16
1988	CS Round II further investigated groundwater, surface water, and sediment at Site 16/SSA 16
1991	RI Interim Report prepared to move Site 16/SSA 16 into the RI process
1992	Removal of scrap metal located on the ground surface in the northeastern portion of the site with subsequent soil backfilling and revegetation.
1993	RI – Round One conducted for Site 16/SSA 16
1993	Waste Characterization Study conducted involving test trenches
1993	Focused Biological Sampling conducted and Preliminary Risk Evaluation Report prepared
1994	Removal Action conducted to remove surficial waste at Site 16/SSA 16
1995	RI – Round Two conducted at Site 16/SSA 16
1995	PP issued to the public for comment
1995	Close-Out Report written for Site 16/SSA 16
1995	ROD for NFA with LUCs for soil and groundwater

8.2 Background

Site 16 and SSA 16 are located in the northeastern portion of WPNSTA Yorktown (**Figure 1-1**). Site 16, the West Road Landfill, is located adjacent to West Road, near Lee Road on WPNSTA Yorktown. SSA 16, Building 402 Metal Disposal Area and Environs (former SWMU 69), overlies the northern portion of the Site 16 landfill; consequently, these sites have been studied together (**Figure 8-1**).

8.2.1 Site History

The Site 16 disposal area reportedly received waste from 1950 to the early 1960s at an estimated rate of 9 tons per year, including dry carbon-zinc batteries, banding materials, pressure transmitting fluids, other chemicals, and 55-gallon drums with unknown contents (NEESA, 1984). Additional investigations discovered the presence of mine casings, glass containers, cans, and construction debris, as documented in the *Final Round Two Remedial Investigation and Baseline Risk Assessment, Site 16 and Site Screening Area 16* (Baker, 1995).

SSA 16 was historically used for scrap metal storage. Additionally, empty drums and other metal debris were reportedly contained in dumpsters and scattered over the ground surface. SSA 16 was also used for waste container storage prior to the remodeling and conversion of Building 402 into a hazardous waste storage facility (Baker, 1995). Building 402 has since been demolished.

In September 1992, scrap metal was partially removed from the surface along the northeastern section of Site 16. The area was backfilled with soil and re-vegetated according to the *Site 16 West Road Landfill Clearance Sampling and Polychlorinated Biphenyl Screening Report* (Black and Veatch, 1994). In 1994, landfill wastes and debris, including 420 tons of batteries, 60 tons of debris, 125 tons of silica gel, ordnance, and other miscellaneous debris and buried waste were removed from the site, as documented in the *Closeout Report Sites 4, 16, and 21, Battery and Drum Disposal Area* (IT Corporation, 1995).

8.2.2 Physical Characteristics

Site 16 and SSA 16 are approximately 8 acres and 0.4 acre, respectively. The northern portion of Site 16 (including SSA 16) is level and predominantly covered with grass. The remaining portion of Site 16 is mostly wooded. Site 6 and SSA 16 are located upgradient of a wetland adjacent to Felgates Creek that drains into the York River approximately 1.5 miles east of Site 16 and SSA 16 (Baker, 1995). Surface water at this site is conveyed south towards this wetland area and an unnamed tributary to Felgates Creek (**Figure 8-1**).

The Cornwallis Cave aquifer is the surficial aquifer at Site 16 and SSA 16. The aquifer is composed of red and brown sand with some silt, clay, and shell fragments. Unsaturated soils, lithologically consistent with the Columbia aquifer and Cornwallis Cave confining unit, overly the Cornwallis Cave aquifer in the northern portion of Site 16 and SSA 16. Groundwater generally flows south towards Felgates Creek and is encountered between 5 and 35 feet bgs, varying with topography and proximity to Felgates Creek.

8.2.3 Land and Resource Use

Site 16 and SSA 16 were used for disposal and storage activities. Prior to initiation and after termination of these activities, Site 16/SSA 16 was not used for industrial activities. Felgates Creek discharges to the York River approximately 1.5 miles east of Site 16 and SSA 16; the York River is a navigable waterway used for transportation, shipping, fishing, and recreation. There are no potable groundwater wells presently in use within the boundaries or immediately downgradient of WPNSTA Yorktown. The current industrial land use of the WPNSTA and absence of groundwater and surface water resource uses are anticipated to remain unchanged for the foreseeable future. LUCs are maintained at the site in accordance with the ROD.

8.2.4 History of Contamination

Between 1950 and the early 1960s, waste materials including dry carbon-zinc batteries, banding materials, pressure-transmitting fluids, unknown chemicals, ordnance, and construction debris were disposed of at the Site 16 disposal facility. SSA 16 was used as a metal disposal area prior to 1984. Waste was deposited at an estimated rate of 9 tons per year.

Contamination of site media is likely due to the presence of waste material deposited at this site, and due to migration of contaminants from the waste materials to subsurface soils, groundwater, and potentially into the surface water and sediment of nearby waterways.

Site 16/SSA 16 was identified during the IAS (NEESA, 1984) as an area of potential contamination. Subsequent investigations indicated the presence of metals and PCBs in surface soil, and metals in subsurface soil. Low levels of pesticides, VOCs, and SVOCs were detected in site groundwater. Surface water contained low levels of metals, and sediment contained metals, pesticides, and PCBs.

8.2.5 Initial Response

After being initially identified, subsequent investigations including CSs (Dames and Moore, 1986; 1988) and RIs (Baker and Weston, 1993; Baker, 1997a) were conducted to investigate groundwater, soil, surface water, and sediment. Previous investigations were performed for VOCs, SVOCs, PCBs, pesticides, and inorganic constituents. Initial investigations identified elevated concentrations of the metals aluminum, antimony, arsenic, beryllium, cadmium, chromium, cobalt, copper, iron, lead, magnesium, mercury, nickel, selenium, silver, vanadium, and zinc in surface soil. PCBs were also detected in surface soil at concentrations exceeding regulatory screening levels (Aroclor-1254 [2,100 J µg/kg] and Aroclor-1260 [1,400 J µg/kg]). Subsurface soil contained arsenic and iron at concentrations exceeding screening criteria. Groundwater did not contain any constituents exceeding drinking

water standards. Manganese was the only compound exceeding screening criteria in surface water. Chemicals that exceeded the Biological Technical Assistance Group (BTAG) screening levels in sediment included a pesticide (endrin aldehyde), a PCB (Arochlor-1260), and metals (aluminum, arsenic, cadmium, cobalt, copper, iron, and silver).

In 1992, scrap metal removal was performed at the site. An additional removal action for surficial waste was conducted in 1994.

8.2.6 Basis for Taking Remedial Action

Unacceptable human health risks were identified for exposure to subsurface soil for a future adult construction worker. Exposure to surface soil, surface water, sediment, and groundwater was also identified as unacceptable risks for future adult and child residents.

After evaluating background concentrations and the ERA models, the Navy, in partnership with USEPA and VDEQ, agreed there are no unacceptable risks to ecological receptors at Site 16/SSA 16 (CH2M HILL, 2011f). The basis for remedial action was to restrict site use due to identified human health risks.

8.3 Remedial Actions

Although the Site 16/SSA 16 DDs do not specific RAOs, the inferred RAO based on the Site 16/SSA 16 ROD is to mitigate risks for human and ecological receptors to contaminated soil and groundwater associated with the Site 16/SSA 16 disposal area. As stated in the ROD, no further remedial actions, with the exception of LUCs, are necessary to ensure protection of human health and environment. LUCs were implemented at Site 16/SSA 16 for soil and groundwater as a conservative measure. The LUCs prohibit future land development at Site 16/SSA 16 for residential purposes. Aquifer restrictions are also in place to prevent the placement of potable supply wells within the site area.

8.4 Progress Since Last Five-Year Review

The last Five-Year Review (CH2M HILL, 2007a) did not identify any issues and concluded that the remedy is functioning as intended by the ROD for soil and groundwater and is protective of human health and the environment. Implementation of LUCs and routine site inspections have continued since the last review. The Navy, in agreement with USEPA and VDEQ, will perform a limited groundwater investigation to determine if LUCs are still necessary to be protective of human health and the environment.

8.4.1 Site Inspections

In accordance with the ROD, site inspections were initiated in May 2000. Since the initiation of the inspections, only minor corrective measures such as replacement of locks on monitoring wells have been completed. A site inspection was performed in February 2012 as part of the Five-Year Review process. During this inspection, no items of concern were noted.

8.4.2 Interviews

Interviews were conducted with various parties familiar with the site. Ms. Rhonda Mickelborough and Mr. Charlie Wilson, both with the Yorktown Environmental Management Department, were interviewed on December 15 and December 16, 2011, respectively. Mr. John Pulver, also with the Yorktown Environmental Management Department, was interviewed on January 18, 2012, and Ensign Damien Allen, associated with the Yorktown FEAD, was interviewed on January 20, 2012. No significant problems regarding the site were identified during the interviews. It was noted during interviews that Building 402 is currently being reutilized by the Navy for scrap metal storage. Documentation of each site interview is presented in **Appendix C**.

8.5 Technical Assessment

Question A: Is the remedy functioning as intended by the DD?

Yes. Review of documents, ARARs, risk assumptions, and site inspections demonstrate that LUCs at Site 16 and SSA 16 are functioning as intended by the ROD. LUCs were the only actions required by the ROD.

Question B: Are the exposure assumptions, toxicity data, cleanup levels, and RAOs used at the time of the remedy selection still valid?

Yes. The physical condition of Site 16 and SSA 16 has not changed since implementation of the remedy in a way that would affect the protectiveness of human health and the environment. The Site and SSA remain in compliance with the ARARs. Although there have been changes to the screening values used to identify the COPCs for quantitative risk evaluation, the toxicity factors for some of the contaminants detected at the site, and there have been changes to the standard risk assessment methodology that was used in the RI, these changes would not affect the protectiveness of the remedy. A comparison of the screening values used for soil in the 1995 HHRA to current human health risk-based screening values indicated that benzo(b)fluoranthene, cobalt, cyanide, and iron for surface soil, cobalt and iron for subsurface soil, and chromium (assuming all chromium is hexavalent chromium) and cobalt for groundwater were not COPCs in 1995, but would now be considered COPCs, and beryllium for all media and 4,4'-dichlorodiphenyltrichloroethane (DDT) for groundwater, which were COPCs in 1995, would no longer be COPCs using current screening levels. Additionally, prior to including the New Jersey Environmental Protection Agency oral cancer slope factor for hexavalent chromium, USEPA's RSL table presented a Residential Soil RSL for total chromium assuming a one to six (1:6) ratio of hexavalent chromium to trivalent chromium. Assuming this ratio is applicable to soil at Site 16/SSA 16, the maximum concentration of hexavalent chromium (the total measured chromium concentration multiplied by 1/6, or 4.5 mg/kg) would not result in an unacceptable risk associated with exposure to chromium and the total carcinogenic risk for the adult resident would be within USEPA's target risk range. The 1995 HHRA indicated potentially unacceptable risks associated with exposure to the soil and groundwater, and although the changes in the COPCs and to the toxicity values used in the HHRA calculations would slightly change the calculated risks and hazards, they would not change the overall conclusions of the HHRA or effectiveness of the remedy. Additionally, changes to the methodology used to estimate inhalation risks would not change the results of the HHRA; the inhalation pathway contributed less than 3 percent of the total risks associated with exposure to soil.

The results of aquatic surveys at the site indicated that aquatic communities were not impacted and that updated ecological screening values for soil are, in many cases, less conservative than those used in the 1995 ERA. Additionally, ICs prevent any exposure of human receptors to the COCs in soil and groundwater.

Question C: Has any other information come to light that could question the protectiveness of the remedy?

No. No new information has come to light that would change the protectiveness of the remedy.

8.6 Technical Assessment Summary

The remedy for soil is protective of human health and the environment and is functioning as intended by the ROD. There have been no changes in the physical condition of the site or exposure pathways that would affect the protectiveness of the remedy. All ARARs for management of the site have been met. While there have been some changes in the toxicity values for the COCs that were used in the baseline risk assessment, and there have been changes to the ERA methodology (guidance), these changes do not significantly affect the protectiveness of the remedy. The Navy is currently evaluating whether LUCs are necessary at Site 16/SSA 16.

8.6.1 Issues

TABLE 8-1
Site 16 Issues Identified

Issue	Currently Affects Protectiveness (Y/N)	Affects Future Protectiveness (Y/N)
Evaluation of need for LUCs based on current contaminant concentrations and individual target organ effects.	N	N

8.6.2 Recommendations and Follow-Up Actions

TABLE 8-2
Site 16 Recommendations and Follow-up Actions

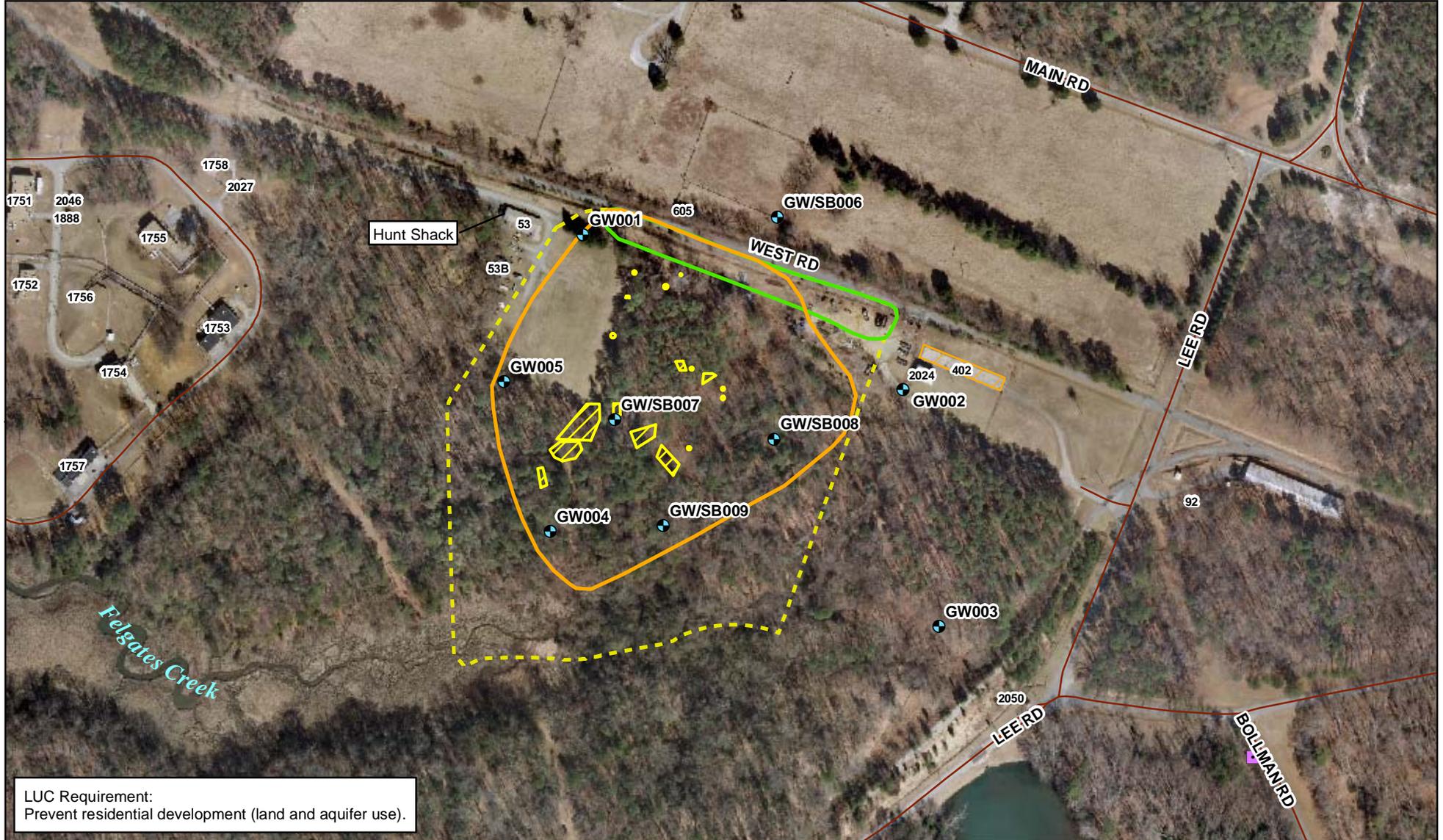
Issue	Recommendations/ Follow-Up Actions	Party Responsible	Oversight Agency	Milestone Date	Affects Protectiveness? (Y/N)	
					Current	Future
Evaluation of need for LUCs based on current contaminant concentrations and individual target organ effects	Determine what data may be necessary to remove LUCs and path forward (for example, ESD for removal of LUCs or development of a LUC RD)	Navy	USEPA	2012	N	N

8.7 Protectiveness Statement

The remedy is protective of human health and the environment.

8.8 Next Review

The next Five-Year Review for Site 16/SSA 16 will be completed by February 2018. However, the Navy is currently in negotiations with the USEPA and VDEQ regarding the need for additional data to support the removal of LUCs. If LUCs are removed, an ESD will be completed to document that NFA is necessary for the site and future Five-Year Reviews will not be necessary.



LUC Requirement:
Prevent residential development (land and aquifer use).

Legend

-  Monitoring Well
-  Demolished Building
-  Waste Removal Area
(Removed During 1994 Removal Action)
-  Approximate Site 16 Study Area Boundary
-  Approximate SSA 16 Study Area Boundary
-  Inferred Site 16/SSA 16 LUC Boundary/Study Area Boundary



Figure 8-1
Site 16 and SSA 16 Location Map
2012 Five-Year Review
WPNSTA Yorktown
Yorktown, Virginia

Site 19 – Conveyor Belt Soils at Building 10

9.1 Site Chronology

1940s-1970s	The conveyor belt transported packaged TNT between Buildings 10 and 98
1973-1974	Undocumented quantity of TNT-contaminated soil was removed from beneath the belt and the surrounding area
1984	IAS of WPNSTA Yorktown identified Site 19 as an area of potential contamination
1986	CS Round I investigated soil at Site 19
1988	CS Round II further investigated soil at Site 19
1991	RI Interim Report recommended the RI process for Site 19
1993	Focused Biological Sampling and Preliminary Risk Evaluation investigated biological tissue, surface water, and sediment
1993	RI – Round I investigated soil, groundwater, and sediment
1995	Habitat Evaluation conducted
1995	Soil Characterization Study conducted
1997	RI – Round II investigated soil and groundwater
1997	FS conducted
1997	PP issued to the public for comment
1998	ROD for soil was signed
1998	Remedial Action to address site soils and dismantle the conveyor belt completed

9.2 Background

9.2.1 Site History

Site 19, Conveyor Belt Soil at Building 10, is located in the eastern portion of WPNSTA Yorktown (**Figure 1-1**). Site 19 is located west of Building 10 and approximately 300 feet south of the Site 9 study area. Site 19 consisted of soils in a 500-foot-long trench beneath a conveyor belt (now removed) and surrounding the conveyor belt (**Figure 9-1**). The conveyor belt was used for transport of packaged TNT from the 1940s to the 1970s. Holes were observed along the floors and walls of the conveyor belt and in the conveyor belt enclosure. The walls and floor of the conveyor belt were periodically sprayed with water to control dust.

9.2.2 Physical Characteristics

Site 19 is grassy with minimal overgrowth. The topography slopes downward to the southwest and to the north towards Site 9. The site is bisected by the trench, situated beneath the location of the former conveyor belt. Site stormwater tends to either flow to this trench (ultimately the stormwater infiltrates into the subsurface) or flows to the north along a concrete drainage way, along the west side of Building 10, connecting Site 19 to Site 9 (ultimately draining into nearby Lee Pond).

The Cornwallis Cave aquifer is the surficial aquifer at Site 19. The orange and brown silts and sands that compose this aquifer extend from the ground surface to approximately 25 feet bgs. The depth to water at the site ranges from 14 to 20 feet bgs, resulting in a saturated thickness of only 6 to 10 feet. The Cornwallis Cave aquifer is underlain by the Yorktown confining unit, ranging in thickness from 15 to 25 feet. Underlying this confining unit is the Yorktown-Eastover aquifer, consisting of fine-grained sand with varying amounts of clay, silt, and marine shell

fragments. Groundwater in the Cornwallis Cave aquifer flows generally south to southwest towards Lee Pond. Groundwater flow in the Yorktown-Eastover aquifer is generally to the west-southwest toward Lee Pond.

9.2.3 Land and Resource Use

The site has not been active for any other land use since operations of the conveyor belt ceased in the 1970s. Vehicular and pedestrian traffic is limited to periodic visits by WPNSTA personnel for maintenance and inspection activities. Buildings around Site 19, including Building 10, have been demolished.

There are no current surface water or groundwater resource uses at Site 19. The current land and resource uses are anticipated to remain unchanged.

9.2.4 History of Contamination

Between the 1940s and the 1970s, the Site 19 conveyor belt was used to transport packaged TNT between Buildings 10 and 98. During operation, the conveyor belt was periodically sprayed with water to control the dust. Holes had been observed along the floor and walls of the conveyor belt.

Contamination of site media is likely due to the deposition of explosives material onto site soils from the conveyor belt. Additionally, the rinse water may have further transported the explosives compounds to the ground surface with potential leaching to groundwater.

Site 19 was identified during the IAS (NEESA, 1984) as an area of potential contamination. Subsequent investigations indicated that explosives- and metals-impacted soil and groundwater were present at Site 19. Additional investigation of soil and groundwater is planned to evaluate the potential migration of site contamination.

9.2.5 Initial Response

An undocumented quantity of TNT-contaminated soil from beneath the conveyor belt and the surrounding area was removed between 1973 and 1974. After being initially identified, subsequent investigations, including CSs (Dames and Moore, 1986; 1988) and RIs (Baker and Weston, 1993; Baker, 1997d), were conducted to investigate soil and groundwater for TCL VOCs, TCL SVOCs, PCBs, pesticides, explosives, and TAL inorganic constituents.

Explosives were detected in site soil at maximum concentrations of amino-DNT (8,200 µg/kg) and 2,4,6-TNT (2,100 µg/kg). Aluminum, an explosives additive, was also detected in site soils at a maximum concentration of 90,600 mg/kg during the RI. Other metals that were also detected above background levels in surface and/or subsurface soil were cadmium, chromium, copper, iron, lead, vanadium, and zinc, according to the *Final Round Two Remedial Investigation Report, Sites 9 and 19* (Baker, 1997d). Explosives were detected in site groundwater along the conveyor belt and downgradient towards Lee Pond at maximum concentrations of RDX (1.1 µg/L), amino-DNT (130 µg/L), and 2,4,6-TNT (38 µg/L). The highest metals concentrations detected in groundwater were located downgradient of the conveyor belt. Aluminum was not detected in site groundwater at concentrations exceeding regulatory screening levels (Baker 1997d).

Remedial action alternatives were evaluated in an FS as part of the CERCLA process. As part of the FS, additional analysis of soils for metals and explosives beneath the conveyor belt identified maximum concentrations of RDX (230 mg/kg), HMX (34 mg/kg), and TNT (35,000 mg/kg) (Baker, 1997e).

9.2.6 Basis for Taking Remedial Action

Human health risks associated with exposure to surface and subsurface soil and groundwater were identified in the 1997 RI conducted by Baker. The HHRA identified potential non-cancer risks above USEPA acceptable levels for exposure to aluminum and arsenic in surface soils for future child residents (Baker, 1997d). Unacceptable cancer and non-cancer risk was also identified for commercial worker exposure to 2,4,6-TNT in surface soil (Baker, 1997d). Additionally, potentially unacceptable non-cancer hazards were identified for future adult and child residents from exposure to explosives constituents in site groundwater. Ecological risks for terrestrial receptors were identified for exposure to phenanthrene, aluminum, copper, iron, lead, mercury, and zinc in surface soil

(Baker, 1997d). The basis for taking action at Site 19 was the human health and ecological risks identified by site investigation activities.

9.3 Remedial Actions

9.3.1 Remedy Selection

The Site 19 RAOs identified in the ROD were to mitigate potential risks to human and ecological receptors from exposure to 2,4,6-TNT, RDX, and aluminum in soils. The ROD for Site 19 soil was signed in March 1998. RLs for 2,4,6-TNT (15 mg/kg) and RDX (5 mg/kg) were determined to be protective for commercial and industrial workers at a risk threshold of 10^{-6} (Baker, 1997d); there were no unacceptable ecological risks associated with these constituents. These site-specific RLs were based on potential exposure scenarios and are considered protective of human health given the limited nature of exposure in the Site 19 area and protective of ecological receptors based on the results of conservative uptake modeling and available literature toxicity information (Baker, 1997e). An RL for aluminum (14,850 mg/kg) was established to address potential ecological risk in soil (NAVFAC, 1998a). The selected remedy consisted of the following:

- Dismantling and disposal of the conveyor belt.
- Removal of explosives-contaminated soils to the RLs. Transport of these soils to a bio-cell for treatment at Site 22. The bio-cell utilizes a carbon source and microbes to degrade the explosive constituents.
- Excavation of aluminum-contaminated surface soils to a depth of 6 inches. Placement of these soils in the excavation trench after removal of the conveyor belt soils to a depth of 4 feet. The resulting excavation was filled with clean topsoil, seeded, and mulched to establish a vegetative cover.
- LUCs to prohibit residential development due to soil impacts.

Groundwater contamination was not addressed by the ROD according to the *Final Record of Decision Operable Unit Nos. VI and VII, Site 9-Plant I Explosives-Contaminated Wastewater Discharge Area and Site 19-Conveyor Belt Soil at Building 10* (NAVFAC, 1998a).

9.3.2 Remedy Implementation

The remedial action was initiated in April 1998. Initially, the conveyor belt was dismantled and disposed. Then, approximately 1,000 yd³ of explosives-contaminated soil was excavated to a depth of between 2 and 4 feet in the conveyor belt trench. These soils were placed in the bio-cell at Site 22. Following treatment, these soils were placed at Site 22 in the area surrounding the bio-cell.

Approximately 60 yd³ of soil with elevated levels of aluminum concentrations (greater than the background level of 14,850 mg/kg) was excavated from around Building 527 to address ecological concerns and was placed in the conveyor belt trench excavation and covered with clean fill and a layer of topsoil and then vegetated (OHM, 2000). After removing soil from the former conveyor belt area, as required by the ROD, 25 confirmation samples were collected from the bottom and sides of the excavation trench. Two of these samples (CTW-W and CTF-001) contained TNT at concentrations higher than the cleanup goal of 15,000 µg/kg, which was designed to protect people in industrial land-use scenarios. One sample was from the bottom of excavation trench; the other was from the side-wall. Both locations are now covered by fill material. All other samples were determined to be below cleanup levels (OHM, 2000). Based on further assessment of the confirmation sampling data, it appears that additional excavation was performed at the elevated concentration location on the bottom of the trench until concentrations were less than cleanup goals. Additional excavation at the side-wall sample exceedance location was not possible due to the presence of Building 98 at the time of the remedy implementation.

LUCs prohibiting residential development of Site 19 have been maintained by the Navy through routine inspections. Site 19 is inaccessible to the general public, with controlled access by the Navy. A formal LUC RD will be submitted for Site 19 following the completion of additional investigation activities.

9.4 Progress Since Last Five-Year Review

The last Five-Year Review conducted in 2007 (CH2M HILL, 2007a) did not identify any issues and concluded that the remedy was functioning as intended by the ROD and was protective of human health and the environment. The continuation of LUCs and routine site inspections has continued for the site.

The Navy intends to further assess the nature, extent, and potential risk associated with groundwater and other media throughout the current Site 19 area (which includes the conveyor belt area) through an additional RI. Due to the recent demolition of Site 19 buildings and structures, an RI Work Plan is currently being developed to fill gaps in the current dataset for Site 19 to help determine the nature and extent of potential contamination in groundwater (and potential for transport to surface water, sediment, and/or pore water) and soil in areas that were previously inaccessible. Additional investigation of the conveyor belt area will be performed to verify that elevated contaminant levels were not left in place following the remedial action. The RI will determine if contamination poses a potential unacceptable human health or ecological risk, and which receptors are potentially at risk. This investigation is scheduled to begin in late 2013.

9.4.1 Data Review

A review of post-removal confirmation soil samples indicates that two post-removal confirmation samples exceeded RGs. Therefore, additional restrictions will be required for these two locations at the site (**Figure 9-1**).

9.4.2 Site Inspections

Site inspections were initiated and conducted in September 2003. Since the initiation of the inspections, only minor corrective measures, such as lock replacements on monitoring wells and repair of signage for restrictive access, have been conducted. A site inspection was performed in February 2012 as part of the Five-Year Review process. During this inspection there were no discrepancies identified with the LUCs. The building demolitions noted during previous site inspections was ongoing and all buildings had been removed. It was also noted that the perimeter fence surrounding the site had been removed. It is recommended that additional LUC signs be considered for each entrance to the site.

9.4.3 Interviews

Interviews were conducted with various parties familiar with the site. Ms. Rhonda Mickelborough and Mr. Charlie Wilson, both with the Yorktown Environmental Management Department, were interviewed on December 15 and December 16, 2011, respectively. Mr. John Pulver, also with the Yorktown Environmental Management Department, was interviewed on January 18, 2012, and Ensign Damien Allen, with the Yorktown FEAD, was interviewed on January 20, 2012. No significant problems regarding the site were identified during the interviews. Ms. Mickelborough indicated that she had concerns regarding the potential for future training activities to dig pits in the area without permission, which would potentially disrupt the aluminum-impacted soil remaining in place at the site. Documentation of each site interview is presented in **Appendix C**.

9.5 Technical Assessment

Question A: Is the remedy functioning as intended by the DD?

Yes. A review of the ROD for Site 19 and construction completion documentation from the remedial action identified some uncertainty regarding the presence of contaminant concentrations in soil exceeding RGs for two locations at the site. However, further review of closeout documentation suggests that the elevated contaminant concentration were removed but not documented properly. Additional investigation of the conveyor belt area will be performed to verify that elevated contaminant levels were not left in place following the remedial action.

Question B: Are the exposure assumptions, toxicity data, cleanup levels, and RAOs used at the time of the remedy selection still valid?

Yes. The physical condition of Site 19 has changed since implementation of the ROD due to the demolition of the existing buildings onsite that is currently being undertaken. This demolition does not affect the protectiveness of the remedy evaluated as part of this review, however. The site remains in compliance with the ARARs. Although

there have been changes to the screening values used to identify the COPCs for quantitative risk evaluation, the toxicity factors for some of the contaminants detected at the site, and there have been changes to the standard risk assessment methodology that was used in the RI, which may result in calculated risks being higher or lower, these changes would not affect the protectiveness of the remedy. A comparison of the screening values used for soil in the 1997 HHRA to current human health risk-based screening values indicated that chromium (assuming all chromium is hexavalent chromium), cobalt, and vanadium for surface soil and cobalt and iron for subsurface soil were not COPCs in 1997, but would now be considered COPCs, and beryllium, which was a COPC in 1997, would not be a COPC using current screening levels. The 1997 HHRA indicated potentially unacceptable risks associated with exposure to the surface soil, and although the changes in the COPCs and to the toxicity values used in the HHRA calculations would slightly change the calculated risks and hazards, they would not change the overall conclusions of the HHRA or effectiveness of the remedy. Since the ERA was completed, USEPA has issued an Eco-SSL document for aluminum. The Eco-SSL for protecting terrestrial receptors from exposure to aluminum in soils is pH-based; no adverse effects are expected if the soil pH exceeds 5.5. Based upon the RI report, soil pH in Site 19 surface soils ranged from 5.6 to 7.1 and thus complies with the Eco-SSL value (indicating acceptable ecological risk).

Question C: Has any other information come to light that could question the protectiveness of the remedy?

Yes. A review of post-removal confirmation soil samples identified some uncertainty regarding the presence of contaminant concentrations in soil exceeding RGs for two locations at the site. Additional investigation of the conveyor belt area will be performed to verify that elevated contaminant levels were not left in place following the remedial action.

9.6 Technical Assessment Summary

The remedy for soil is short-term protective of human health and the environment. Although a review of construction closeout documentation identified some uncertainty regarding the presence of contaminant concentrations in soil exceeding RGs for two locations at the site, further review of closeout documentation suggests that the elevated contaminant concentrations were removed but not documented properly. Additionally, the soil cover at the site prevents contact between any impacted soil and human and ecological receptors. Additional investigation of the conveyor belt area will be performed to verify that elevated contaminant levels were not left in place along the bottom of the trench and to evaluate the locations of elevated contaminant levels left in place at the side-wall location following the remedial action. Although buildings have been demolished at Site 19 since the remedy implementation, there have been no changes to the exposure pathways that would affect the protectiveness of the remedy. All ARARs for management of the soil cover have been met. While there have been some changes in the toxicity values for the COCs that were used in the baseline risk assessment, and there have been changes to the ERA methodology (guidance), these changes do not significantly affect the protectiveness of the remedy.

9.6.1 Issues

TABLE 9-1
Site 19 Issues Identified

Issue	Currently Affects Protectiveness (Y/N)	Affects Future Protectiveness (Y/N)
Uncertainty regarding soil concentrations left in place following the remedy implementation	N	Y

9.6.2 Recommendations and Follow-Up Actions

TABLE 9-2
Site 19 Recommendations and Follow-up Actions

Issue	Recommendations/ Follow-Up Actions	Party Responsible	Oversight Agency	Milestone Date	Affects Protectiveness? (Y/N)	
					Current	Future
Uncertainty regarding soil concentrations left in place following the remedy implementation	Evaluate soils at the former conveyor belt location as part of the future investigation activities	Navy	USEPA	September 2013	N	Y

9.7 Protectiveness Statement

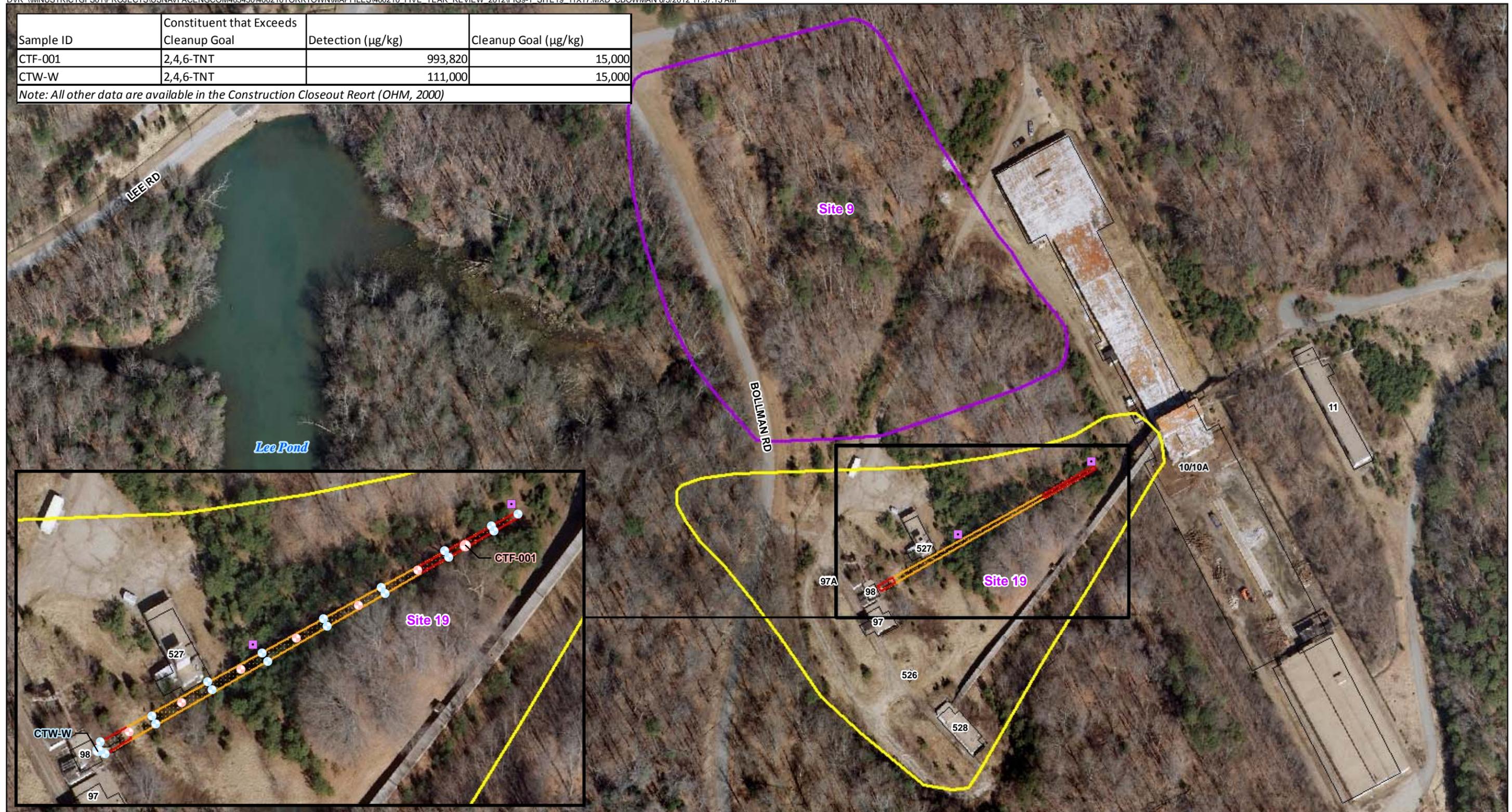
The remedy is short-term protective of human health and the environment because ICs are enforced at the site to restrict residential development. However, due to uncertainty regarding contaminant concentrations levels remaining at Site 19 following the remedy implementation, the remedy may not be protective in the long-term. Additional investigation activities are necessary to verify that contaminant concentrations that remain in soil are less than the commercial and industrial cleanup levels established in the ROD to ensure the future protectiveness of the remedy. It is anticipated that the additional investigation will occur in September 2013.

9.8 Next Review

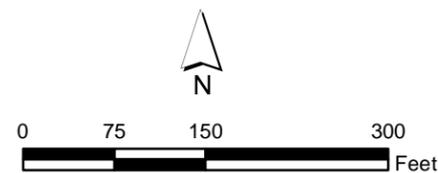
The next Five-Year Review for Site 19 will be completed by February 2018.

Sample ID	Constituent that Exceeds Cleanup Goal	Detection (µg/kg)	Cleanup Goal (µg/kg)
CTF-001	2,4,6-TNT	993,820	15,000
CTW-W	2,4,6-TNT	111,000	15,000

Note: All other data are available in the Construction Closeout Reort (OHM, 2000)



- Legend**
- 1998 Conveyor Belt Floor Confirmation Sample
 - 1998 Conveyor Belt Wall Confirmation Sample
 - Site Sign
 - ▨ LUC to Prohibit Residential Land Use
 - ▨ LUC to Prohibit Digging or Soil Disturbance
 - ▭ Site 9 Study Area Boundary
 - ▭ Site 19 Study Area Boundary



1 inch = 150 feet

Figure 9-1
Site 19 Location Map
2012 Five-Year Review
WPNSTA Yorktown
Yorktown, Virginia

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Appendix A
Public Notices

Norway gunman: 'You're all going to die'

Toll from 2 attacks hits 92 as police response questioned

By HENRY CHU
Tribune Newspapers

OSLO, Norway — The gunman had already spared him once. It wasn't going to happen again.

Minutes before, Adrian Pracon had been trying to swim to safety when he saw the killer point his weapon at him. "Please, no, please!" Pracon screamed. No bullet came.

Now, sprawled facedown on a half-submerged rock, trying to play dead, the 21-year-old sensed the shooter standing almost directly above him, so close that he could feel the heat of the weapon. As the gunman fired at other youths lying on the island's shore, Pracon kept still — even when a shot grazed his shoulder. That apparently convinced the attacker that Pracon was already dead and to move on.

"It was as though he had done this kind of thing before, as if going around and shooting people was totally normal," Pracon told Norway's Aftenposten newspaper. "He said, 'You're all going to die!'"

In harrowing accounts such as Pracon's, the pieces of Friday's blood-soaked drama on Utøya Island began coming together as police pressed on with their investigation into the deadliest day on Norwegian soil since World War II — and found themselves on the defensive over how long it took to stop the carnage.

Authorities said Saturday that the death toll from twin attacks had reached 92, with 85 victims — mostly young people — in the rampage targeting a youth camp of the ruling Labor Party on Utøya. At least seven were killed in a massive bomb blast that occurred shortly before in the center of Oslo, and four people are still missing.

Police said the suspected gunman, Anders Behring Breivik, described as a Christian fundamentalist with extreme right-wing views, put up no resistance when officers arrived on Utøya to apprehend him. He has admitted firing on hundreds of people gathered on the island, outside



MORTEN EDVARSEN/GETTY-APF PHOTO

Rescuers evacuate survivors of Friday's shooting rampage on Utøya, an island outside of Oslo, Norway. A gunman killed at least 85 people, mostly youths, who were attending a summer camp organized by the country's ruling Labor Party.

Oslo, for the summer retreat, police said.

It was a methodical massacre that went on for at least 60 minutes. Terrified youths were hunted down as they covered inside bathrooms, scrambled through bushes on the heavily wooded island and dived into the icy waters to try to escape.

With a sniper's calm, the gunman picked them off on land and in the water, using a handgun and an automatic weapon. Even more frightening, he was dressed in a police uniform, which made some of the desperate survivors uncertain whether help or more hell

had come when the real officers showed up.

"Who could we trust?" a survivor named Kshushajini Gunaratnam wrote on her blog.

Breivik is also suspected of setting off the car bomb in Oslo. An agricultural cooperative reported Saturday that Breivik, 32, had ordered 6 metric tons of artificial fertilizer to be delivered to his farmhouse in Asta, a sparsely populated community about 2 1/2 hours north of Oslo, at the beginning of May.

Because he owned a farm, the purchase, though large, seemed legitimate, authorities said. But such fertilizer can also be used to make explosives, as was the case in the 1995 Oklahoma City bombing, carried out by anti-government Army veteran Timothy McVeigh.

Although the huge explosion was undoubtedly meant to kill on a large scale, it also turned out to be a diversion from — and a set-up for — the real slaughter to come on Utøya, less than an hour away from downtown Oslo.

Simen Mortensen, a volunteer for the summer camp, was stationed on the mainland side of the ferry service to Utøya. He told the Verdens Gang newspaper that a man wearing a police uniform and a bulletproof vest pulled up in a silver vehicle.

"He gets out of the car and shows identification. Says he's been sent to check on security, that this is routine, in connection with the terrorist attack," Mortensen said. "Everything looks fine, and a boat is called to ferry him over to Utøya."

Once on the island, the tall, blond-haired man apparently beckoned unsuspecting campers over to him, telling them he wanted to talk about the explosion in Oslo.

News of the blast had already reached Utøya; the retreat's leaders had called an informational meeting about it, so that attendees could call their families to make sure they were all right, Gunaratnam wrote in her blog.

Then the gunman drew his weapons and opened fire. Tribune Newspapers staff writers Ann Simmons in Los Angeles and Janet Stobart in London contributed.

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PUBLIC NOTICE CERCLA Five-Year Review Naval Weapons Station Yorktown Yorktown, Virginia

The Department of the Navy and the US Environmental Protection Agency (EPA) Region 3, with concurrence from the Virginia Department of Environmental Quality (VDEQ), are beginning the third Five-Year Review of the existing Record of Decision (ROD) documents and associated ongoing remedial (environmental cleanup) actions at Naval Weapons Station Yorktown, located in Yorktown, Virginia. A ROD is a public document explaining the selected remedial action for implementation at a site. A Five-Year Review is required by Section 121 of Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) for remedial actions that result in any hazardous substances, pollutants, or contaminants remaining at the site and is triggered by the initiation of the remedial action, which was selected in the ROD. The purpose of the review is to ensure that these environmental cleanup actions are adequately protecting human health and the environment. The Navy will submit draft findings of the Five-Year Review to EPA and the VDEQ by May 2012. The final report will be made available to the public by November 2012.

RODs and Remedial Actions to be reviewed:
Site 1 – Dudley Road Landfill: The ROD was signed in July 1999 to address contaminated soil and waste material from the Dudley Road Landfill that posed a potential risk to human health and the environment. Volatile organic compounds (VOCs) and metals concentrations exceeding regulatory screening criteria were identified in soil and groundwater. A non-time critical removal action was conducted to remove and dispose of contaminated soil and waste. Following completion of this removal action, remediation goals (RGs) were achieved. However, waste remains in place at the landfill. Therefore, land use controls (LUCs) for soil and long-term monitoring for groundwater, surface water, and sediment were included as part of the remedy.

Site 6 – Explosives-Contaminated Wastewater Impoundment, Flume Area, and Excavation Area, Buildings 109, 110, and 501: The ROD was signed in October 1998 outlining surface debris and contaminated soils and sediment removal as the selected remedy. Explosives residues, VOCs and metals concentrations exceeding regulatory screening criteria were identified in soil, sediment and groundwater. The remedial action was

implemented in 1999, which included excavation of contaminated soil to approximately 4 feet below ground surface, disposal of contaminated soil/sediment, transportation of explosives contaminated soil to a bio-cell treatment area, flume and drain decontamination, and site restoration. A soil cover was then placed over the excavated area. LUCs will remain in place until they are no longer necessary to protect human health and the environment.

Site 7 – Plant 3 Explosives Contaminated Wastewater Discharge Area: The ROD was signed in October 1998 to address contaminants identified in soil. As part of a previous pilot study in 1996, soils contaminated with explosives residues were cleaned up to industrial/commercial levels. Therefore, the ROD identified LUC boundaries to prevent residential development.

Site 12 – Barracks Road Landfill: The ROD was signed in April 1997 to address contamination identified in Area A soil. Lead concentrations exceeding regulatory screening criteria were identified in soil during investigations. A removal action was conducted to remove and dispose of contaminated soil. The removal action conducted at Site 12 reduced concentrations of lead to below established RGs to be protective of future industrial/commercial land use receptors. Because contaminants were not reduced to a level allowing unrestricted land use, LUCs were implemented prohibiting residential development or disturbance of the soil cover at Site 12.

Site 16/SSA 16 – West Road Landfill & Building 402 Metal Disposal Area & Environs: The ROD for soil and groundwater was signed in September 1995. Pesticide and metals concentrations exceeding regulatory screening criteria were identified in soil and groundwater. As most of these contaminants of concern were found at background levels and did not have cumulative target organ effects, the ROD identified no further action necessary for soil and groundwater. LUCs were implemented at the site as a precautionary measure to prevent residential development and placement of potable water supply wells within the area.

Site 19 – Conveyor Belt Soils at Building 10: The ROD was signed in March 1998 to address contaminants identified in surface soil. Explosives residues and metals concentrations exceeding regulatory screening criteria were identified in soil

and groundwater. Waste material and contaminated soils were removed from the conveyor belt area. The removal reduced contaminant levels to industrial/commercial standards in site soils. Therefore, LUCs to prevent residential development are necessary until unrestricted land use levels are achieved. The Remedial Alternatives for each site were selected based on findings contained in documents that are part of the Administrative Record for Naval Weapons Station Yorktown. The Administrative Record provides background information on all of the sites included in the Five-Year Review, as well as remedial investigations conducted at each site. Copies of each ROD and all documents that formed the basis for selection of the remedial action are available in the Administrative Record file:

**Public Affairs Office
Naval Facilities Engineering Command,
Atlantic Division
6506 Hampton Boulevard
Norfolk, VA 23508-1278
(757) 322-8005**

The public is encouraged to participate in this review by submitting any questions, comments or concerns regarding the selection and/or effectiveness of removal actions or selected cleanup remedies for sites on Naval Weapons Station Yorktown to the Naval Weapons Station Yorktown Public Affairs Officer:

**Mark Piggott, Public Affairs Officer, Naval Weapons Station Yorktown
ATTN: Public Affairs Officer
160 Main Road
Yorktown, Virginia 23691-0160
Phone: (757) 887-4939
mark.piggott@navy.mil**

The public has the option of discussing questions, comments or concerns in person during a Restoration Advisory Board (RAB) meeting. NAVFAC, Mid-Atlantic, will hold a RAB Meeting in November 2011. During this meeting, the Naval Weapons Station Yorktown/Chatham Annex RAB will discuss environmental issues and inform the local community about base cleanup activities.

Change is coming

Housekeeping for James City County

By Cortney Langley

JAMES CITY — The Board of Supervisors will consider a slew of ordinance changes on Tuesday.

- Hiking the fee for a bounced check to \$50.
- Affirming name changes of county divisions. Environmental is renamed Engineering & Resource Protection. Code Compliance was changed to Building Safety & Permits. “The name changes are intended to clarify the purpose of these divisions for citizens,” according to a county memo.

- Expanding the county’s options in dealing with property owners who don’t clear waste off their lots or don’t cut the grass. Currently, the county can clean up vacant properties and bill the property owner. The General Assembly recently gave James City authority to do the same on occupied properties.

- Allowing the Police Department to auction unclaimed bicycles after 30 days instead of 60 days. The bikes can also be donated to charity. “This will allow for the [Police Department] to maintain a cleaner, less cluttered storage facility,” according to a memo.

Want to go? The Board of Supervisors will meet at 7 p.m. Tuesday, July 26, in Building F of the County Government Complex, off Mounts Bay Road.



BOARD OF SUPERVISORS

MORE COX

The supervisors will also consider:

- A resolution to encourage Cox Communications to find a replacement as soon as possible for the WWBT Channel 12 that it is canceling. County officials have had several conference calls with Cox executives about the change, and Cox has said that it would try to find a new Richmond station.

- Re-rent space in the Human Services Building for the Olde Towne Medical Center. The five-year lease has an annual rent of \$80,000 for the first year and a 4% annual escalation.

Cleanup, but no repairs

Continued from page 1A

JCSA can help with some landscaping and rudimentary clean-up, but it can’t get into home repairs. “If it’s beyond our ability, we turn it over to our insurance company,” Foster said. “It’s not just this instance.”

Out on Indigo Dam Road, JCSA was able to replace some gravel that had washed out from a driveway, and it cleared out the drainage ditches.

There’s a bitter irony for Ortalan.

She and her husband own the new Nazar Mediterranean Restaurant on Jamestown Road. They have no money for the house because they sank every penny into the restaurant to meet the county’s building demands.

“Everything I did, it was like I had to redo it,” she said. “If I’d known all these things, I never would have started. I’m broke. I can’t do any more. I’ve cashed in everything we’ve got.”



Cortney Langley

After it was patched, the water line break on Indigo Dam Road didn’t look like much, but it created havoc for three homeowners whose claims were denied.

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PUBLIC NOTICE

CERCLA Five-Year Review

Naval Weapons Station Yorktown Yorktown, Virginia

The Department of the Navy and the US Environmental Protection Agency (EPA) Region 3, with concurrence from the Virginia Department of Environmental Quality (VDEQ), are beginning the third Five-Year Review of the existing Record of Decision (ROD) documents and associated ongoing remedial (environmental cleanup) actions at Naval Weapons Station Yorktown, located in Yorktown, Virginia. A ROD is a public document explaining the selected remedial action for implementation at a site. A Five-Year Review is required by Section 121 of Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) for remedial actions that result in any hazardous substances, pollutants, or contaminants remaining at the site and is triggered by the initiation of the remedial action, which was selected in the ROD. The purpose of the review is to ensure that these environmental cleanup actions are adequately protecting human health and the environment. The Navy will submit draft findings of the Five-Year Review to EPA and the VDEQ by May 2012. The final report will be made available to the public by November 2012.

RODs and Remedial Actions to be reviewed:

Site 1 – Dudley Road Landfill: The ROD was signed in July 1999 to address contaminated soil and waste material from the Dudley Road Landfill that posed a potential risk to human health and the environment. Volatile organic compounds (VOCs) and metals concentrations exceeding regulatory screening criteria were identified in soil and groundwater. A non-time critical removal action was conducted to remove and dispose of contaminated soil and waste. Following completion of this removal action, remediation goals (RGs) were achieved. However, waste remains in place at the landfill. Therefore, land use controls (LUCs) for soil and long-term monitoring for groundwater, surface water, and sediment were included as part of the remedy.

Site 6 – Explosives-Contaminated Wastewater Impoundment, Flume Area, and Excavation Area, Buildings 109, 110, and 501: The ROD was signed in October 1998 outlining surface debris and contaminated soils and sediment removal as the selected remedy. Explosives residues, VOCs and metals concentrations exceeding regulatory screening criteria were identified in soil, sediment and groundwater. The remedial action was implemented in 1999, which included excavation of contaminated soil to approximately 4 feet below ground surface, disposal of contaminated soil/sediment, transportation of explosives contaminated soil to a bio-cell treatment area, flume and drain decontamination, and site restoration. A soil cover was then placed over the excavated area. LUCs will remain in place until they are no longer necessary to protect human health and the environment.

Site 7 – Plant 3 Explosives Contaminated Wastewater Discharge Area: The ROD was signed in October 1998 to address contaminants identified in soil. As part of a previous pilot study in 1996, soils contaminated with explosives residues were cleaned up to industrial/commercial levels. Therefore, the ROD identified LUC boundaries to prevent residential development.

Site 12 – Barracks Road Landfill: The ROD was signed in April 1997 to address contamination identified in Area A soil. Lead concentrations exceeding regulatory screening criteria were identified in soil during investigations. A removal action was conducted to remove and dispose of contaminated soil. The removal action conducted at Site 12 reduced concentrations of lead to below established RGs to be protective of future industrial/commercial land use receptors. Because contaminants were not reduced to a level allowing unrestricted land use, LUCs were implemented prohibiting residential development or disturbance of the soil cover at Site 12.

Site 16/SSA 16 – West Road Landfill & Building 402 Metal Disposal Area & Environs: The ROD for soil and groundwater was signed in September 1995. Pesticide and metals concentrations exceeding regulatory screening criteria were identified in soil and groundwater. As most of these contaminants of concern were found at background levels and did not have cumulative target organ effects, the ROD identified no further action necessary for soil and groundwater. LUCs were implemented at the site as a precautionary measure to prevent residential development and placement of potable water supply wells within the area.

Site 19 – Conveyor Belt Soils at Building 10: The ROD was signed in March 1998 to address contaminants identified in surface soil. Explosives residues and metals concentrations exceeding regulatory screening criteria were identified in soil and groundwater. Waste material and contaminated soils were removed from the conveyor belt area. The removal reduced contaminant levels to industrial/commercial standards in site soils. Therefore, LUCs to prevent residential development are necessary until unrestricted land use levels are achieved.

The Remedial Alternatives for each site were selected based on findings contained in documents that are part of the Administrative Record for Naval Weapons Station Yorktown. The Administrative Record provides background information on all of the sites included in the Five-Year Review, as well as remedial investigations conducted at each site. Copies of each ROD and all documents that formed the basis for selection of the remedial action are available in the Administrative Record file:

Public Affairs Office
Naval Facilities Engineering Command, Atlantic Division
6506 Hampton Boulevard
Norfolk, VA 23508-1278
(757) 322-8005

The public is encouraged to participate in this review by submitting any questions, comments or concerns regarding the selection and/or effectiveness of removal actions or selected cleanup remedies for sites on Naval Weapons Station Yorktown to the Naval Weapons Station Yorktown Public Affairs Officer:

Mark Piggott, Public Affairs Officer, Naval Weapons Station Yorktown
ATTN: Public Affairs Officer
160 Main Road
Yorktown, Virginia 23691-0160
Phone: (757) 887-4939
mark.piggott@navy.mil

The public also has the option of discussing questions, comments or concerns in person during a Restoration Advisory Board (RAB) meeting. NAVFAC, Mid-Atlantic, will hold a RAB Meeting in November 2011. During this meeting, the Naval Weapons Station Yorktown/Cheatham Annex RAB will discuss environmental issues and inform the local community about base cleanup activities.

Appendix B
Site Inspection Checklists

Site 1 - Dudley Road Landfill
Naval Weapons Station Yorktown, Yorktown, Virginia

Description: Site 1 - Dudley Road Landfill is a ten-acre area located just north of the headwaters of Indian Field Creek. The solid waste landfill was in use from approximately 1965 to 1979 for general disposal, with one area used for disposal of plastic lens grinding waste until 1983. The landfill received an estimated 255 tons of waste during the time it was in use. Later, the landfill was covered by approximately two feet of soil. Site inspections are performed for the current Site 1 Study Area Boundary. The current land use control requirement is to ensure there is no residential use at the site and the soil cover is not compromised, as specified in the ROD (June 1999) for soil/waste. This site is currently in the Final Phase II RI stage and GW/SW/SD investigation is on going. A LUC RD will be developed for Site 1 upon completion of the remaining investigations. To get to the site, take Dudley Road, the unpaved road to the right of Bldg 1835 (smoke shack). The entrance to the site is gated and locked. There are currently no activities being performed at the site.



Comments: (Provide related question number for each comment)

- (3) Two tires identified during previous inspections are still present
- (5) Site signs have incorrect contact information
- (6) Area of stressed vegetation identified during previous inspections has not recovered

(Enter suggested improvements to this form)

- (3) Contact John Pulver to have the tires/debris removed from the site
 - (5) Update site signs with correct contact information
 - (6) Have John Pulver apply topsoil and seed to stressed vegetation to promote growth
- *Mowing of the landfill area will occur annually. Last mowed July 2011. Will be mowed July 2012.

Adam Forshey/VBO

Inspection performed by: (Print and sign)

Adam J. Forshey

Date
2/21/12

General

1 Is the area free of any indication of recent and/or current intrusive activities (digging, trenching, jack-hammering etc.) within the site boundary, as depicted on the figure, or in the immediate vicinity of the site? If no, mark location of intrusive activities on figure, note extent and purpose.

Yes	No
X	

2 Is the area free of storage of any investigative derived waste (IDW) on site? If no, mark location of IDW on figure, note its condition in the comment section above, and notify the Navy RPM. Indicate if IDW is properly labeled, per example below.

X	
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investigative Derived waste
Purge water from Site XX
January 28, 200X
Do not handle, analysis pending
Contact the Navy RPM, 757-444-3826

3 Is the area free of identifiable concerns, such as signs of dumping of chemicals or debris? If no, annotate these concerns in the comments section above, mark the location of the concern on the figure, and notify the Navy RPM.

X	
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Site Specific

4 Is the site fencing in good condition and the gate locked? If no, describe condition of fence and/or uncontrolled access points, mark deficient location (s) on map, and notify the Navy RPM.

X	
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5 Is the site sign at the entrance gate in good condition? If no, describe condition of sign and notify the Navy RPM.

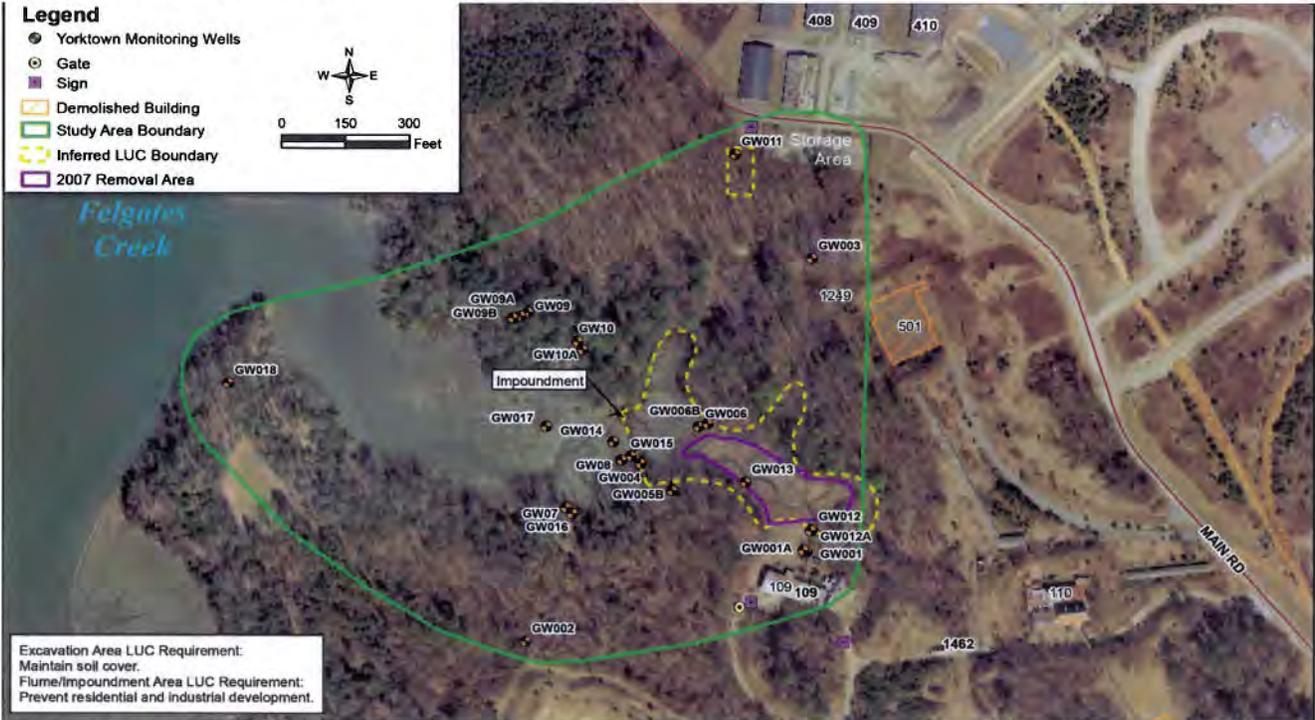
	X
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6 Is the area free of any signs of disturbance (i.e. digging, settlement, cracking, holes, erosion) to the site cover/cap, as depicted on the figure? If no, describe condition of the deficient cover/cap, mark deficient location (s) on map, and notify the Navy RPM.

	X
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**Site 6 - Explosives-Contaminated Wastewater Impoundment
Naval Weapons Station Yorktown, Yorktown, Virginia**

Description: Site 6 is a three-acre, unlined, surface impoundment located in wetlands behind Building 109. This impoundment operated from 1942 to 1975 and received contaminated wastewater and solvents from the explosives reclamation facility at Buildings 109 and 110. Shaw E & I completed the sediment remedial action in Fall 2006; completion included replanting the impoundment with native wetland grasses and plants. Site inspections are performed for the current Site 6 Study Area Boundary. The current land use control requirement is to ensure there is no residential use at the site, as specified in the ROD (October 1998) for soil/SD. The Phase II RI investigation was completed in 2011. A pre-FS sampling investigation is currently planned. An ESD is currently being developed to remove LTM from the ROD while GW/SW/SD investigations are ongoing. A LUC RD will be completed once the ESD is finalized. Demolition activities for Building 109 have begun.



Comments: (Provide related question number for each comment)

- (1) Access to site limited due to ongoing building demolition activities. Intrusive activities are not being performed within the LUC boundaries.
- (5) Site signs have incorrect contact information

(Enter suggested improvements to this form)

- (5) Update site signs with correct contact information

Adam Forshey/VBO

Inspection performed by: (Print and sign)

Adam J. Forshey

2/25/12
Date

General

- 1 Is the area free of any indication of recent and/or current intrusive activities (digging, trenching, jack-hammering etc.) within the site boundary, as depicted on the figure, or in the immediate vicinity of the site? If no, mark location of intrusive activities on figure, note extent and purpose.
- 2 Is the area free of storage of any investigative derived waste (IDW) on site? If no, mark location of IDW on figure, note its condition in the comment section above, and notify the Navy RPM. Indicate if IDW is properly labeled, per example below.
Investigative Derived Waste
Purge water from Site XX
January 28, 200X
Do not handle, analysis pending
Contact the Navy RPM, 757-444-3826
- 3 Is the area free of identifiable concerns, such as signs of dumping of chemicals or debris? If no, annotate these concerns in the comments section above, mark the location of the concern on the figure, and notify the Navy RPM.

Yes	No
	X

X	
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X	
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Site Specific

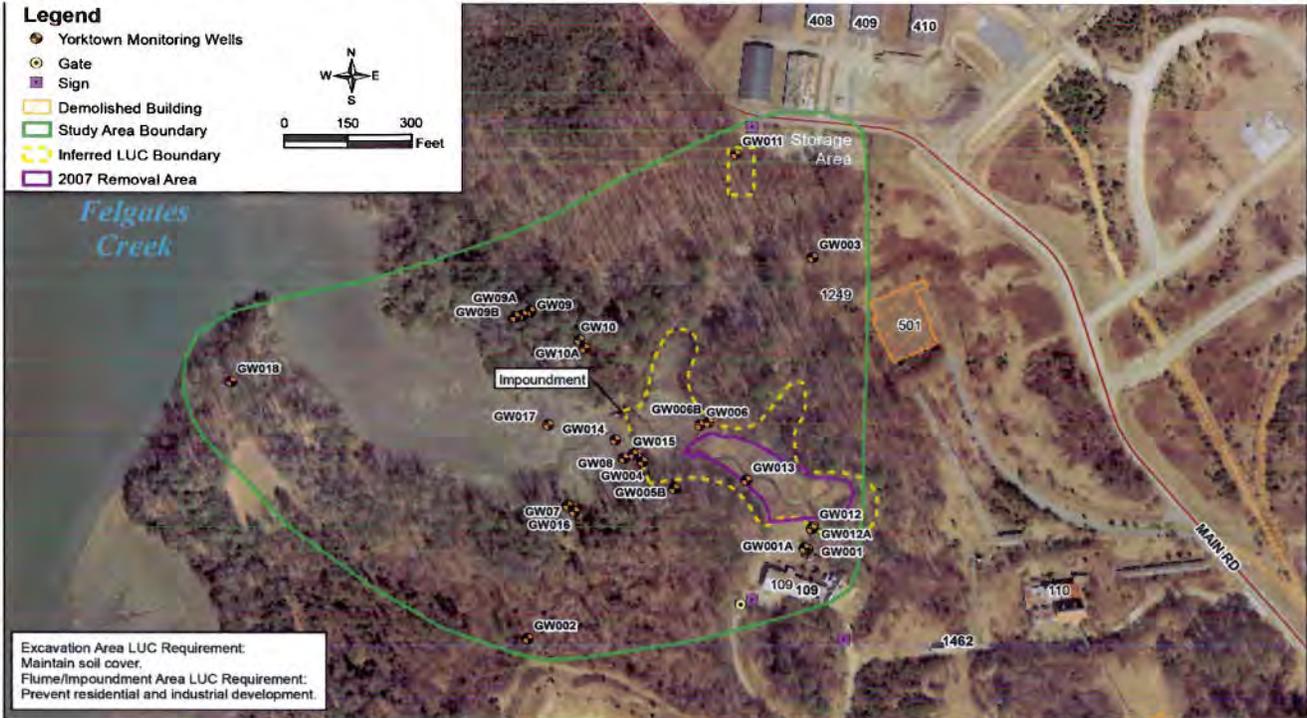
- 4 Is the site gate in good condition and locked? If no, describe condition of the gate and/or uncontrolled access points, mark deficient location (s) on map, and notify the Navy RPM.
- 5 Are the two site signs (locations depicted on the above photo) in good condition? If not, describe condition of signage, and notify the Navy RPM.

X	
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	X
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Site 6 - Excavated Area
Naval Weapons Station Yorktown, Yorktown, Virginia

Description: The Site 6 Excavated Area is approximately 8,378 sf in size and located north of the impoundment area. Access to this area is easiest from Main Road, then enter the woods south of Building 405. There is a sign at the entrance trail and a fairly good trail into the woods. Approximately 30 feet inside the woods is a clearing off to the right and this is the excavated area. This excavated area was identified via aerial photography. According to the ROD, a soil cover was to be placed over the excavated area. Site inspections are performed for the current Site 6 Study Area Boundary. The current land use control requirement is to ensure the integrity of the cover area is not compromised at the site, as specified in the ROD (October 1998) for soil/SD.



Comments: (Provide related question number for each comment)
 (4) Site sign has incorrect contact information

(Enter suggested improvements to this form)
 (4) Update site signs with correct contact information

Adam Forshey/VBO
 Inspection performed by: (Print and sign)

Adam Forshey

2/21/12
 Date

General

- Is the area free of any indication of recent and/or current intrusive activities (digging, trenching, jack-hammering etc.) within the site boundary, as depicted on the figure, or in the immediate vicinity of the site? If no, mark location of intrusive activities on figure, note extent and purpose.
- Is the area free of storage of any investigative derived waste (IDW) on site? If no, mark location of IDW on figure, note its condition in the comment section above, and notify the Navy RPM. Indicate if IDW is properly labeled, per example below.
 Investigative Derived Waste
 Purge water from Site XX
 January 28, 200X
 Do not handle, analysis pending
 Contact the Navy RPM, 757-444-3826
- Is the area free of identifiable concerns, such as signs of dumping of chemicals or debris? If no, annotate these concerns in the comments section above, mark the location of the concern on the figure, and notify the Navy RPM.

Yes	No
X	

X	
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X	
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Site Specific

- Is the site signage in good condition? If no, describe condition of signage and notify the Navy RPM.
- Is the area free of any signs of disturbance (i.e. digging, settlement, cracking, holes, erosion) to the soil cover, as depicted on the figure? If no, describe condition of the deficient cover, mark deficient location (s) on map, and notify the Navy RPM.

	X
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X	
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**Site 7 - Plant 3 Explosives-Contaminated Wastewater Discharge Area
Naval Weapons Station Yorktown, Yorktown, Virginia**

Description: Site 7 is an approximately 300-foot long drainage area located adjacent to wetlands and along a small tributary to Felgates Creek. This drainage area received wastewater from 1945 to 1975. The drainage area was remediated and is to the southwest and downslope of Poe Road. Site inspections are performed for the current Site 7 Study Area Boundary. The current land use control requirement is to ensure there is no residential use at the site, as specified in the ROD (October 1998) for soil/SW/SD/GW. An expanded Phase II RI is currently planned to investigate soil and GW beneath the footprint of the former plant area. An ESD is being developed to remove the LTM requirements while the remaining investigations are being performed. A LUC RD will be completed once the ESD has been finalized. This site was decommissioned in 2009 and therefore no activities are performed on site.



Comments: (Provide related question number for each comment)

(4) Site signs have incorrect contact information and the sign adjacent to the drainage area has been slightly damaged by storms

(Enter suggested improvements to this form)

(4) Update site signs with correct contact information and repair/replace damaged sign during update

Adam Forshey/VBO

Inspection performed by: (Print and sign)

Adam J. Forshey

2/21/12
Date

General

1 Is the area free of any indication of recent and/or current intrusive activities (digging, trenching, jack-hammering etc.) within the site boundary, as depicted on the figure, or in the immediate vicinity of the site? If no, mark location of intrusive activities on figure, note extent and purpose.

Yes	No
X	

2 Is the area free of storage of any investigative derived waste (IDW) on site? If no, mark location of IDW on figure, note its condition in the comment section above, and notify the Navy RPM. Indicate if IDW is properly labeled, per example below.

X	
---	--

Investigative Derived Waste
Purge water from Site XX
January 28, 200X
Do not handle, analysis pending
Contact the Navy RPM, 757-444-3826

3 Is the area free of identifiable concerns, such as signs of dumping of chemicals or debris? If no, annotate these concerns in the comments section above, mark the location of the concern on the figure, and notify the Navy RPM.

X	
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Site Specific

4 Is the site signage in good condition (two site signs - one at the entrance road and one at the edge of the field that leads to the site)? If no, describe condition of signage and notify the Navy RPM.

	X
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5 Is the drainage area, as depicted on the figure, in good condition (i.e., free of sediment buildup and debris)? If not, describe condition and notify the Navy RPM.

X	
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Site 12 - Barracks Road Landfill
Naval Weapons Station Yorktown, Yorktown, Virginia

Description: Site 12 is a four-acre landfill located east of Barracks Road and just northeast of Building 4. This area was in operation from approximately 1925 to the mid-1960s and received an estimated 1,400 tons of waste. Located approximately 400 feet southeast of the landfill is the Wood/Debris Disposal Area. This area consist of a steep ravine in which wooden pallets and construction debris have been disposed. This debris remains on-site. The landfill proper is known as Site 12 Area A and was remediated in 1997. Therefore, a landfill cap exists, and a TriLock Block drainage ditch was installed to direct stormwater away from the cap. The current LUC requirement is to ensure the integrity of the cover is not compromised and groundwater from Area A is not used for residential purposes, as specified in the ROD (May 1997) and as modified in the ESD (Navy 2012). This site is currently in the LTM stage. A LUC RD and RACR are currently being developed. There are currently no activities being performed at the site.



Comments: (Provide related question number for each comment)

(2) Investigative Derived Waste is being stored from Site 31 DPT drilling activities. Staging area is properly maintained and drum is in good condition with proper labeling.

(5) Site signs have incorrect contact information

(7) TriLock blocks in tact but with vegetation growing between them, but function of blocks has not been compromised

(7) Silt fence and debris identified near drainage pond

(Enter suggested improvements to this form)

(5) Update site signs with correct contact information

(7) Continue monitoring vegetation growth in TriLock blocks, and contact John Pulver to remove silt fence and debris in drainage area

*Mowing of the landfill area will occur annually. Last mowed July 2011. Will be mowed July 2012.

Adam Forshey/WBO

Inspection performed by: (Print and sign)

Adam Forshey

2/21/12
Date

General

1 Is the area free of any indication of recent and/or current intrusive activities (digging, trenching, jack-hammering etc.) within the site boundary, as depicted on the figure, or in the immediate vicinity of the site? If no, mark location of intrusive activities on figure, note extent and purpose.

Yes	No
X	

2 Is the area free of storage of any investigative derived waste (IDW) on site? If no, mark location of IDW on figure, note its condition in the comment section above, and notify the Navy RPM. Indicate if IDW is properly labeled, per example below.

	X
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Investigative Derived Waste
Purge water from Site XX
January 28, 200X
Do not handle, analysis pending
Contact the Navy RPM, 757-444-3826

3 Is the area free of identifiable concerns, such as signs of dumping of chemicals or debris? If no, annotate these concerns in the comments section above, mark the location of the concern on the figure, and notify the Navy RPM.

X	
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Site Specific

4 Are the site gates, as depicted on the figure in good condition and locked? If no, describe condition of the gates and/or uncontrolled access points, mark deficient location (s) on map, and notify the Navy RPM.

X	
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5 Is the site signage, as depicted on the figure in good condition? If no, describe condition of signage, mark deficient location (s) on map, and notify the Navy RPM.

	X
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6 Is the area free of any signs of disturbance (i.e. digging, settlement, cracking, holes, erosion) to the landfill cap, as depicted on the figure? If no, describe condition of the deficient cover, mark deficient location (s) on map, and notify the Navy RPM.

X	
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7 Is the TriLock Block drainage ditch, as depicted on the figure, in good condition (i.e., free of debris, erosion, and major settling)? If not, describe condition of the drainage ditch, mark deficient location (s) on map, and notify the Navy RPM.

	X
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Site 16 - West Road Landfill

Naval Weapons Station Yorktown, Yorktown, Virginia

Description: Site 16 - West Road Landfill is an eight-acre area located adjacent to West Road, near the Hunt Shack. This site was operated from the early 1950s to the early 1960s and received approximately 90 tons of waste. The site is wooded, except the northern portion along West Road, which is covered with grasses. Site inspections are performed for the current Site 16 Study Area Boundary. The current land use control requirements are to confirm the site is not being used for residential purposes as specified in the ROD (September 1995) for soil/GW. There is no waste in place at the site. The need for LUCs is currently being re-evaluated as part of a Technical Memorandum. To get to the site turn onto Manley Road from Main Road, then take first left onto West Road. Site 16 is in the wooded area east of the Hunt Shack. The site is used for hunting purposes during appropriate hunting seasons.



Comments: (Provide related question number for each comment)

No issues to note

(Enter suggested improvements to this form)

Inspection performed by: *Adam F. Forshy* ADAM FORSHY Date: 2/21/12

General

- | | Yes | No |
|--|-----|----|
| 1 Is the area free of any indication of recent and/or current intrusive activities (digging, trenching, jack-hammering etc.) within the site boundary, as depicted on the figure, or in the immediate vicinity of the site? If no, mark location of intrusive activities on figure, note extent and purpose. | X | |
| 2 Is the area free of storage of any investigative derived waste (IDW) on site? If no, mark location of IDW on figure, note its condition in the comment section above, and notify the Navy RPM. Indicate if IDW is properly labeled, per example below.

Investigative Derived Waste
Purge water from Site XX
January 28, 200X
Do not handle, analysis pending
Contact the Navy RPM, 757-444-3826 | X | |
| 3 Is the area free of identifiable concerns, such as signs of dumping of chemicals or debris? If no, annotate these concerns in the comments section above, mark the location of the concern on the figure, and notify the Navy RPM. | X | |

Site Specific

None

**Site 19 - Conveyor Belt Soils at Building 10
Naval Weapons Station Yorktown, Yorktown, Virginia**

Description: Site 19 is a 500-foot long soil strip that was located beneath the conveyor belt that ran between Buildings 10 and 98. The conveyor belt was dismantled and the soil underneath was excavated. Site inspections are performed for the current Site 19 Study Area Boundary. The current land use control requirement is to ensure there is no residential use of the conveyor belt area, as specified in the ROD (March 1998) and ESD (Navy 2012) for soil. An RI Investigation for GW is planned for the site. This investigation has also expanded to soil and potentially other media to complete the data gaps in the location of buildings associated with the former plant activities. A LUC RD will be completed once the ESD has been finalized. Site 19 is located on Lee Road between Main and Bollman Roads. The site is currently under decontamination and demolition activities.



- Comments: (Provide related question number for each comment)
- (1) Access to site limited due to ongoing building demolition activities
 - (4) Fencing has been removed from the perimeter of the site
 - (5) Site signs have incorrect contact information

- (Enter suggested improvements to this form)
- (4) Install environmental sign at opening in the gate, identifying no unauthorized access
 - (5) Update site signs with correct contact information

Adam Forshey/VBO

Inspection performed by: (Print and sign)

2/21/12
Date

General

- | | Yes | No |
|--|-----|----|
| 1 Is the area free of any indication of recent and/or current intrusive activities (digging, trenching, jack-hammering etc.) within the site boundary, as depicted on the figure, or in the immediate vicinity of the site? If no, mark location of intrusive activities on figure, note extent and purpose. | | X |
| 2 Is the area free of storage of any investigative derived waste (IDW) on site? If no, mark location of IDW on figure, note its condition in the comment section above, and notify the Navy RPM. Indicate if IDW is properly labeled, per example below. | X | |
| Investigative Derived Waste
Purge water from Site XX
January 28, 200X
Do not handle, analysis pending
Contact the Navy RPM, 757-444-3828 | | |
| 3 Is the area free of identifiable concerns, such as signs of dumping of chemicals or debris? If no, annotate these concerns in the comments section above, mark the location of the concern on the figure, and notify the Navy RPM. | X | |

Site Specific

- | | | |
|---|--|---|
| 4 Is the site fencing in good condition and locked? If no, describe condition of the fence and/or uncontrolled access points, mark deficient location (s) on map, and notify the Navy RPM. | | X |
| 5 Is the site signage in good condition (three signs - one at entrance gate; other two depicted on picture)? If no, describe condition of signage, mark deficient location (s) on map, and notify the Navy RPM. | | X |

Appendix C
Interview Summaries

Yorktown 5-Year Review Interview Summary

Rhonda Mickelborough (December 15, 2011)

Questions: Site 1

1. Are you aware of the remedy at the site? *Yes*
2. Are you aware of the long-term management (LTM) component of the remedy (e.g., land use controls and/or sampling)? *Yes*
3. Have you ever performed or supervised work at the site? If so, please describe the work and indicate if you believe that work adversely impact the remedy and/or LTM requirements? *Only oversight inspections*
4. Are you aware of any concerns regarding the remedy at the site? *Not at this time*
5. Do you have any comments, suggestions or recommendations regarding the site's management? *No*
6. Are you aware of any complaints, violations, or other incidents related to the site? If so, please give details of the events and results of the responses. *No*
7. What is your overall impression of the site? *It is a piece of land that is cut a couple times a year*

Questions: Site 6

8. Are you aware of the remedy at the site? *Yes*
9. Are you aware of the long-term management (LTM) component of the remedy (e.g., land use controls and/or sampling)? *Yes*
10. Have you ever performed or supervised work at the site? If so, please describe the work and indicate if you believe that work adversely impact the remedy and/or LTM requirements? *Yes, we are in the process of demolishing the existing buildings out there. This has been approved through the IR Program manager, and no issues are expected. This will not be impacting removal action areas of the past.*
11. Are you aware of any concerns regarding the remedy at the site? *No*
12. Do you have any comments, suggestions or recommendations regarding the site's management? *No*
13. Are you aware of any complaints, violations, or other incidents related to the site? If so, please give details of the events and results of the responses. *No*
14. What is your overall impression of the site? *It is part of the IR program*

Questions: Site 7

15. Are you aware of the remedy at the site? *Yes*
16. Are you aware of the long-term management (LTM) component of the remedy (e.g., land use controls and/or sampling)? *Yes*
17. Have you ever performed or supervised work at the site? If so, please describe the work and indicate if you believe that work adversely impact the remedy and/or LTM requirements? *Yes, oversight inspections*
18. Are you aware of any concerns regarding the remedy at the site? *No*
19. Do you have any comments, suggestions or recommendations regarding the site's management? *No*
20. Are you aware of any complaints, violations, or other incidents related to the site? If so, please give details of the events and results of the responses. *No*
21. What is your overall impression of the site? *It is part of the IR program*

Questions: Site 12

22. Are you aware of the remedy at the site? *Yes*
23. Are you aware of the long-term management (LTM) component of the remedy (e.g., land use controls and/or sampling)? *Yes*
24. Have you ever performed or supervised work at the site? If so, please describe the work and indicate if you believe that work adversely impact the remedy and/or LTM requirements? *Yes, oversight inspections. Four or five years ago, some surface debris was left in the woodline along the left hand side of the site. We identified the debris and oversaw the clean up.*
25. Are you aware of any concerns regarding the remedy at the site? *No*
26. Do you have any comments, suggestions or recommendations regarding the site's management? *No*
27. Are you aware of any complaints, violations, or other incidents related to the site? If so, please give details of the events and results of the responses. *No*
28. What is your overall impression of the site? *It is part of the IR program*

Questions: Site 16

29. Are you aware of the remedy at the site? *Yes*
30. Are you aware of the long-term management (LTM) component of the remedy (e.g., land use controls and/or sampling)? *Yes*

31. Have you ever performed or supervised work at the site? If so, please describe the work and indicate if you believe that work adversely impact the remedy and/or LTM requirements? *Yes, oversight inspections. Yes, I'm constantly out at the Building 402 metals disposal yard. They collect metals, sort them, and transport the material off site. I have not performed work in the landfill area.*
32. Are you aware of any concerns regarding the remedy at the site? *No*
33. Do you have any comments, suggestions or recommendations regarding the site's management? *No*
34. Are you aware of any complaints, violations, or other incidents related to the site? If so, please give details of the events and results of the responses. *No*
35. What is your overall impression of the site? *The landfill area appears to be in pretty good shape*

Questions: Site 19

36. Are you aware of the remedy at the site? *Yes*
37. Are you aware of the long-term management (LTM) component of the remedy (e.g., land use controls and/or sampling)? *Yes*
38. Have you ever performed or supervised work at the site? If so, please describe the work and indicate if you believe that work adversely impact the remedy and/or LTM requirements? *Yes, periodic inspections, but no other work.*
39. Are you aware of any concerns regarding the remedy at the site? *I have concerns that aluminum impacted soil remains at the site, concerned about potential future training activities in this area, such as when training missions dig pits without permission.*
40. Do you have any comments, suggestions or recommendations regarding the site's management? *We should ensure that the land use controls are implemented to avoid receptor contact with remaining impacted soils.*
41. Are you aware of any complaints, violations, or other incidents related to the site? If so, please give details of the events and results of the responses. *No*
42. What is your overall impression of the site? *It is part of the IR program*

Yorktown 5-Year Review Interview Summary

Charles Wilson (December 16, 2011)

Questions: Site 1

1. Are you aware of the remedy at the site? *Yes, aware that some removal took place and a cap was placed. Every bit of contamination wasn't removed.*
2. Are you aware of the long-term management (LTM) component of the remedy (e.g., land use controls and/or sampling)? *Yes*
3. Have you ever performed or supervised work at the site? If so, please describe the work and indicate if you believe that work adversely impact the remedy and/or LTM requirements? *Yes, I have. In a previous job, I managed Natural resources on Base, we would do mowing in advance of sampling. No adverse impacts of mowing. Vegetation management.*
4. Are you aware of any concerns regarding the remedy at the site? *No, to the best of my knowledge. No issues at all. No development schedule.*
5. Do you have any comments, suggestions or recommendations regarding the site's management? *No, I think everything's fine at the site.*
6. Are you aware of any complaints, violations, or other incidents related to the site. If so, please give details of the events and results of the responses. *No, the site is not near where anybody could have any issues. Pretty hard to get to.*
7. What is your overall impression of the site? *LUCs are working and not having any issues and don't expecting any.*

Questions: Site 6

1. Are you aware of the remedy at the site? *Yes*
2. Are you aware of the long-term management (LTM) component of the remedy (e.g., land use controls and/or sampling)? *Yes*
3. Have you ever performed or supervised work at the site? If so, please describe the work and indicate if you believe that work adversely impact the remedy and/or LTM requirements? *No, never done any work down there. I guess you could say that I've supervised work down there. When the restoration work was done at the impoundment area, we had some people from a local university do some research there, tracking the effectiveness of the restoration work. That was coordinated through my office. They didn't dig in the ground or haul anything away, just did measurements.*
4. Are you aware of any concerns regarding the remedy at the site? *No, not that I'm aware of.*
5. Do you have any comments, suggestions or recommendations regarding the site's management? *No, not any for that site.*

6. Are you aware of any complaints, violations, or other incidents related to the site? If so, please give details of the events and results of the responses. *No, everything's fine.*
7. What is your overall impression of the site? *The work that was done was done well and the remedy seems to be adequate and doing what it's supposed to do.*

Questions: Site 7

1. Are you aware of the remedy at the site? *Yes*
2. Are you aware of the long-term management (LTM) component of the remedy (e.g., land use controls and/or sampling)? *Yes*
3. Have you ever performed or supervised work at the site? If so, please describe the work and indicate if you believe that work adversely impact the remedy and/or LTM requirements? *No*
4. Are you aware of any concerns regarding the remedy at the site? *No, nothing's been communicated to me. A lot of demo in the area, hasn't affected the site at all.*
5. Do you have any comments, suggestions or recommendations regarding the site's management? *No, everything seems to be fine.*
6. Are you aware of any complaints, violations, or other incidents related to the site? If so, please give details of the events and results of the responses. *No*
7. What is your overall impression of the site? *After the work was done and restoration took place, everything worked well and we're not having any problems.*

Questions: Site 12

1. Are you aware of the remedy at the site? *Yes*
2. Are you aware of the long-term management (LTM) component of the remedy (e.g., land use controls and/or sampling)? *Yes, coordinate when people come to do the inspections and samples gets coordinated through our office for access.*
3. Have you ever performed or supervised work at the site? If so, please describe the work and indicate if you believe that work adversely impact the remedy and/or LTM requirements? *Yes, when I had a previous position here I would actually do work at the site, related to maintaining the synthetic liner, in the sense that a lot of the site has mowing to keep roots from penetrating the liner, and now supervise the person who does it. Positive impact on the remedy.*
4. Are you aware of any concerns regarding the remedy at the site? *No, no problems there. Not at the present, we've had to do maintenance type work years and years ago. Everything is doing good at the site.*

5. Do you have any comments, suggestions or recommendations regarding the site's management? *No*
6. Are you aware of any complaints, violations, or other incidents related to the site? If so, please give details of the events and results of the responses. *No*
7. What is your overall impression of the site? *In good shape and that the remedy is working, not having problem with it.*

Questions: Site 16

1. Are you aware of the remedy at the site? *Yes*
2. Are you aware of the long-term management (LTM) component of the remedy (e.g., land use controls and/or sampling)? *Yes*
3. Have you ever performed or supervised work at the site? If so, please describe the work and indicate if you believe that work adversely impact the remedy and/or LTM requirements? *No, never did anything there. Slowly returning to its natural condition.*
4. Are you aware of any concerns regarding the remedy at the site? *No, I don't believe there are any.*
5. Do you have any comments, suggestions or recommendations regarding the site's management? *No, everything seems to be fine.*
6. Are you aware of any complaints, violations, or other incidents related to the site? If so, please give details of the events and results of the responses. *No*
7. What is your overall impression of the site? *Seems to be in fine shape and not having any problems or issues.*

Questions: Site 19

1. Are you aware of the remedy at the site? *Yes*
2. Are you aware of the long-term management (LTM) component of the remedy (e.g., land use controls and/or sampling)? *Yes*
3. Have you ever performed or supervised work at the site? If so, please describe the work and indicate if you believe that work adversely impact the remedy and/or LTM requirements? *N.*
4. Are you aware of any concerns regarding the remedy at the site? *Not aware of any concerns there.*
5. Do you have any comments, suggestions or recommendations regarding the site's management? *No, I don't have any.*
6. Are you aware of any complaints, violations, or other incidents related to the site? If so, please give details of the events and results of the responses. *No there haven't been any.*
7. What is your overall impression of the site? *In good shape and not having any issues.*

Yorktown 5-Year Review Interview Summary

John Pulver (January 18, 2012)

Questions: Site 1

1. Are you aware of the remedy at the site? *Yes*
2. Are you aware of the long-term management (LTM) component of the remedy (e.g., land use controls and/or sampling)? *Yes*
3. Have you ever performed or supervised work at the site? If so, please describe the work and indicate if you believe that work adversely impact the remedy and/or LTM requirements? *Yes, removal of wooded vegetation on the cap. No adverse effects.*
4. Are you aware of any concerns regarding the remedy at the site? *No*
5. Do you have any comments, suggestions or recommendations regarding the site's management? *No*
6. Are you aware of any complaints, violations, or other incidents related to the site? If so, please give details of the events and results of the responses. *No*
7. What is your overall impression of the site? *Just a field, nothing special.*

Questions: Site 6

1. Are you aware of the remedy at the site? *Yes*
2. Are you aware of the long-term management (LTM) component of the remedy (e.g., land use controls and/or sampling)? *Yes*
3. Have you ever performed or supervised work at the site? If so, please describe the work and indicate if you believe that work adversely impact the remedy and/or LTM requirements. *Yes, spraying for invasive plant species. No adverse effects.*
4. Are you aware of any concerns regarding the remedy at the site? *No, but I know there's going to be some more demolition out there because they're removing a building right there at Site 6.*
5. Do you have any comments, suggestions or recommendations regarding the site's management? *After the removal of the building will need to be regraded properly, which I'm sure it will be.*
6. Are you aware of any complaints, violations, or other incidents related to the site? If so, please give details of the events and results of the responses. *No*
7. What is your overall impression of the site? *The site is incomplete because the demo will affect the upstream side, so additional work will need to be done with regrading and seeding.*

Questions: Site 7

1. Are you aware of the remedy at the site? *Yes*
2. Are you aware of the long-term management (LTM) component of the remedy (e.g., land use controls and/or sampling)? *Yes*
3. Have you ever performed or supervised work at the site? If so, please describe the work and indicate if you believe that work adversely impact the remedy and/or LTM requirements? *No*
4. Are you aware of any concerns regarding the remedy at the site? *No*
5. Do you have any comments, suggestions or recommendations regarding the site's management? *No*
6. Are you aware of any complaints, violations, or other incidents related to the site? If so, please give details of the events and results of the responses. *No*
7. What is your overall impression of the site? *I have no impression of it really. Not familiar with the site.*

Questions: Site 12

1. Are you aware of the remedy at the site? *Yes*
2. Are you aware of the long-term management (LTM) component of the remedy (e.g., land use controls and/or sampling)? *Yes*
3. Have you ever performed or supervised work at the site? If so, please describe the work and indicate if you believe that work adversely impact the remedy and/or LTM requirements? *Yes, spraying for invasive plant species and removal of wooded vegetation. No adverse impact.*
4. Are you aware of any concerns regarding the remedy at the site? *No*
5. Do you have any comments, suggestions or recommendations regarding the site's management? *Possibly, there's a BMP pond at the very end of it. Eventually the sediment will have to be removed from the BMP pond.*
6. Are you aware of any complaints, violations, or other incidents related to the site? If so, please give details of the events and results of the responses. *No*
7. What is your overall impression of the site? *It's fine, nothing spectacular.*

Questions: Site 16

1. Are you aware of the remedy at the site? *Yes*
2. Are you aware of the long-term management (LTM) component of the remedy (e.g., land use controls and/or sampling)? *Yes*

3. Have you ever performed or supervised work at the site? If so, please describe the work and indicate if you believe that work adversely impact the remedy and/or LTM requirements? *No*
4. Are you aware of any concerns regarding the remedy at the site? *No*
5. Do you have any comments, suggestions or recommendations regarding the site's management? *No*
6. Are you aware of any complaints, violations, or other incidents related to the site? If so, please give details of the events and results of the responses. *No*
7. What is your overall impression of the site? *None*

Questions: Site 19

1. Are you aware of the remedy at the site? *Yes*
2. Are you aware of the long-term management (LTM) component of the remedy (e.g., land use controls and/or sampling)? *Yes*
3. Have you ever performed or supervised work at the site? If so, please describe the work and indicate if you believe that work adversely impact the remedy and/or LTM requirements? *No*
4. Are you aware of any concerns regarding the remedy at the site? *No*
5. Do you have any comments, suggestions or recommendations regarding the site's management? *Doing demolition in that area, if regrade, make sure they don't get into the contaminated soil.*
6. Are you aware of any complaints, violations, or other incidents related to the site? If so, please give details of the events and results of the responses. *No*
7. What is your overall impression of the site? *None*

Yorktown 5-Year Review Interview Summary

Ensign Damien Allen (January 20, 2012)

Questions: Site 1

1. Are you aware of the remedy at the site? *No*
2. Are you aware of the long-term management (LTM) component of the remedy (e.g., land use controls and/or sampling)? *No*
3. Have you ever performed or supervised work at the site? If so, please describe the work and indicate if you believe that work adversely impact the remedy and/or LTM requirements? *No*
4. Are you aware of any concerns regarding the remedy at the site? *No*
5. Do you have any comments, suggestions or recommendations regarding the site's management? *No*
6. Are you aware of any complaints, violations, or other incidents related to the site? If so, please give details of the events and results of the responses. *No*
7. What is your overall impression of the site? *Not familiar with the site*

Questions: Site 6

1. Are you aware of the remedy at the site? *No*
2. Are you aware of the long-term management (LTM) component of the remedy (e.g., land use controls and/or sampling)? *No*
3. Have you ever performed or supervised work at the site? If so, please describe the work and indicate if you believe that work adversely impact the remedy and/or LTM requirements. *No*
4. Are you aware of any concerns regarding the remedy at the site? *No*
5. Do you have any comments, suggestions or recommendations regarding the site's management? *No*
6. Are you aware of any complaints, violations, or other incidents related to the site? If so, please give details of the events and results of the responses. *No*
7. What is your overall impression of the site? *Not familiar with the site*

Questions: Site 7

1. Are you aware of the remedy at the site? *No*
2. Are you aware of the long-term management (LTM) component of the remedy (e.g., land use controls and/or sampling)? *No*
3. Have you ever performed or supervised work at the site? If so, please describe the work and indicate if you believe that work adversely impact the remedy and/or LTM requirements? *No*
4. Are you aware of any concerns regarding the remedy at the site? *No*
5. Do you have any comments, suggestions or recommendations regarding the site's management? *No*
6. Are you aware of any complaints, violations, or other incidents related to the site? If so, please give details of the events and results of the responses. *No*
7. What is your overall impression of the site? *Not familiar with the site*

Questions: Site 12

1. Are you aware of the remedy at the site? *No*
2. Are you aware of the long-term management (LTM) component of the remedy (e.g., land use controls and/or sampling)? *No*
3. Have you ever performed or supervised work at the site? If so, please describe the work and indicate if you believe that work adversely impact the remedy and/or LTM requirements? *No*
4. Are you aware of any concerns regarding the remedy at the site? *No*
5. Do you have any comments, suggestions or recommendations regarding the site's management? *No*
6. Are you aware of any complaints, violations, or other incidents related to the site? If so, please give details of the events and results of the responses. *No*
7. What is your overall impression of the site? *Not familiar with the site*

Questions: Site 16

1. Are you aware of the remedy at the site? *No*
2. Are you aware of the long-term management (LTM) component of the remedy (e.g., land use controls and/or sampling)? *No*

3. Have you ever performed or supervised work at the site? If so, please describe the work and indicate if you believe that work adversely impact the remedy and/or LTM requirements? *No*
4. Are you aware of any concerns regarding the remedy at the site? *No*
5. Do you have any comments, suggestions or recommendations regarding the site's management? *No*
6. Are you aware of any complaints, violations, or other incidents related to the site? If so, please give details of the events and results of the responses. *No*
7. What is your overall impression of the site? *Not familiar with the site*

Questions: Site 19

1. Are you aware of the remedy at the site? *No*
2. Are you aware of the long-term management (LTM) component of the remedy (e.g., land use controls and/or sampling)? *No*
3. Have you ever performed or supervised work at the site? If so, please describe the work and indicate if you believe that work adversely impact the remedy and/or LTM requirements? *No*
4. Are you aware of any concerns regarding the remedy at the site? *No*
5. Do you have any comments, suggestions or recommendations regarding the site's management? *No*
6. Are you aware of any complaints, violations, or other incidents related to the site? If so, please give details of the events and results of the responses. *No*
7. What is your overall impression of the site? *Not familiar with the site*