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SITE MANAGEMENT PLAN FOR FISCAL YEARS 2011 AND 2012 NWS YORKTOWN VA
05/01/2011
CH2M HILL

Site Management Plan Fiscal Year 2011-2012

Naval Weapons Station Yorktown
Yorktown, Virginia



Prepared for

Department of the Navy
Naval Facilities Engineering Command
Mid-Atlantic

Contract No.
N62470-08-D-1000
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May 2011

Prepared by

CH2MHILL

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Contract Task Order WE23

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Under the

**NAVFAC CLEAN 1000 Program
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Virginia Beach, Virginia

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Acronyms and Abbreviations

amsl	above mean sea level
AOC	Area of Concern
AR	Administrative Record
ARAR	Applicable or Relevant and Appropriate Requirement
AST	aboveground storage tank
BEHP	bis-2-Ethylhexyl phthalate
BERA	Baseline Ecological Risk Assessment
bgs	below ground surface
BHC	beta-benzene hexachloride
bio-cell	bioremediation cell
BTAG	Biological Technical Assistance Group
CAX	Cheatham Annex
CCR	Construction Completion Report
CERCLA	Comprehensive Environmental Response Compensation and Liability Act
CIP	Community Involvement Plan
COC	contaminant of concern
cPAH	carcinogenic polyaromatic hydrocarbon
CR	carcinogenic risk
CTE	central tendency exposure
CVOC	chlorinated volatile organic compound
cy	cubic yards
DCA	dichloroethane
DCE	dichloroethene
DD	Decision Document
DDD	dichlorodiphenyldichloroethane
DDE	dichlorodiphenyldichloroethene
DDT	dichlorodiphenyltrichloroethane
DGM	digital geophysical mapping
DNT	dinitrotoluene
DoD	Department of Defense
EE/CA	Engineering Evaluation/Cost Analysis
EI	ecological index
EOD	Explosive Ordnance Disposal
ER	Environmental Restoration
ERA	Ecological Risk Assessment
ERP	Environmental Restoration Program
ER-L	effects range-low
ER-M	effects range-medium
ESD	Explanation of Significant Difference

ESI	Expanded Site Inspection
FFA	Federal Facilities Agreement
FS	Feasibility Study
ft/day	feet per day
ft ²	square feet
ft ² /day	square feet per day
FY	Fiscal Year
HHRA	Human Health Risk Assessment
HI	hazard index
HMX	octahydro-1,3,5,7-tetranitro-1,3,5,7-tetrazocine
HQ	hazard quotient
HRS	Hazard Ranking System
HRSD	Hampton Roads Sanitation District
IAS	Initial Assessment Study
IRA	Interim Removal Action
IRP	Installation Restoration Program
LTM	long-term monitoring
LUC	land use control
µg/kg	micrograms per kilogram
µg/L	micrograms per Liter
MCL	maximum contaminant level
mg/kg	milligrams per kilogram
mg/L	milligrams per Liter
MRP	Munitions Response Program
MWR	Morale, Welfare, and Recreation
NACIP	Navy Assessment and Control of Installation Pollutants
NAVFAC	Naval Facilities Engineering Command
NCP	National Contingency Plan
NEDED	Naval Explosives Development Engineering Department
NERP	Navy Environmental Restoration Program
NFA	no further action
NPDES	National Pollutant Discharge Elimination System
NPL	National Priorities List
NPS	National Parks Service
NTCRA	Non-Time-Critical Removal Action
OU	operable unit
PA	Preliminary Assessment
PAH	polyaromatic hydrocarbon
PCB	polychlorinated biphenyl
PCE	tetrachloroethene
PP	Proposed Plan

RA	Remedial Action
RAB	Restoration Advisory Board
RACR	Remedial Action Completion Report
RBC	risk-based concentration
RC	response complete
RCRA	Resource Conservation and Recovery Act
RD	Remedial Design
RDX	hexahydro-1,3,5-trinitro-1,3,5-triazine
RG	remediation goal
RI	Remedial Investigation
RI/FS	Remedial Investigation/Feasibility Study
RME	reasonable maximum exposure
ROD	Record of Decision
SARA	Superfund Amendments and Reauthorization Act
SI	Site Investigation
SMP	Site Management Plan
SSA	Site Screening Area
SSP	Site Screening Process
STP	Sewage Treatment Plant
SVOC	semivolatile organic compound
SWMU	Solid Waste Management Unit
TAL	target analyte list
TCA	trichloroethane
TCE	trichloroethene
TCL	target compound list
TM	Technical Memorandum
TNB	trinitrobenzene
TNT	trinitrotoluene
tons/year	tons per year
TPH	total petroleum hydrocarbon
UCL	upper confidence limit
UFP-SAP	Uniform Federal Policy-Sample Analysis Plan
U.S.	United States
USEPA	United States Environmental Protection Agency
UST	underground storage tank
UXO	unexploded ordnance
VC	vinyl chloride
VDEQ	Virginia Department of Environmental Quality
VOC	volatile organic compound
WPNSTA	Naval Weapons Station
WQC	Water Quality Criteria

SECTION 1

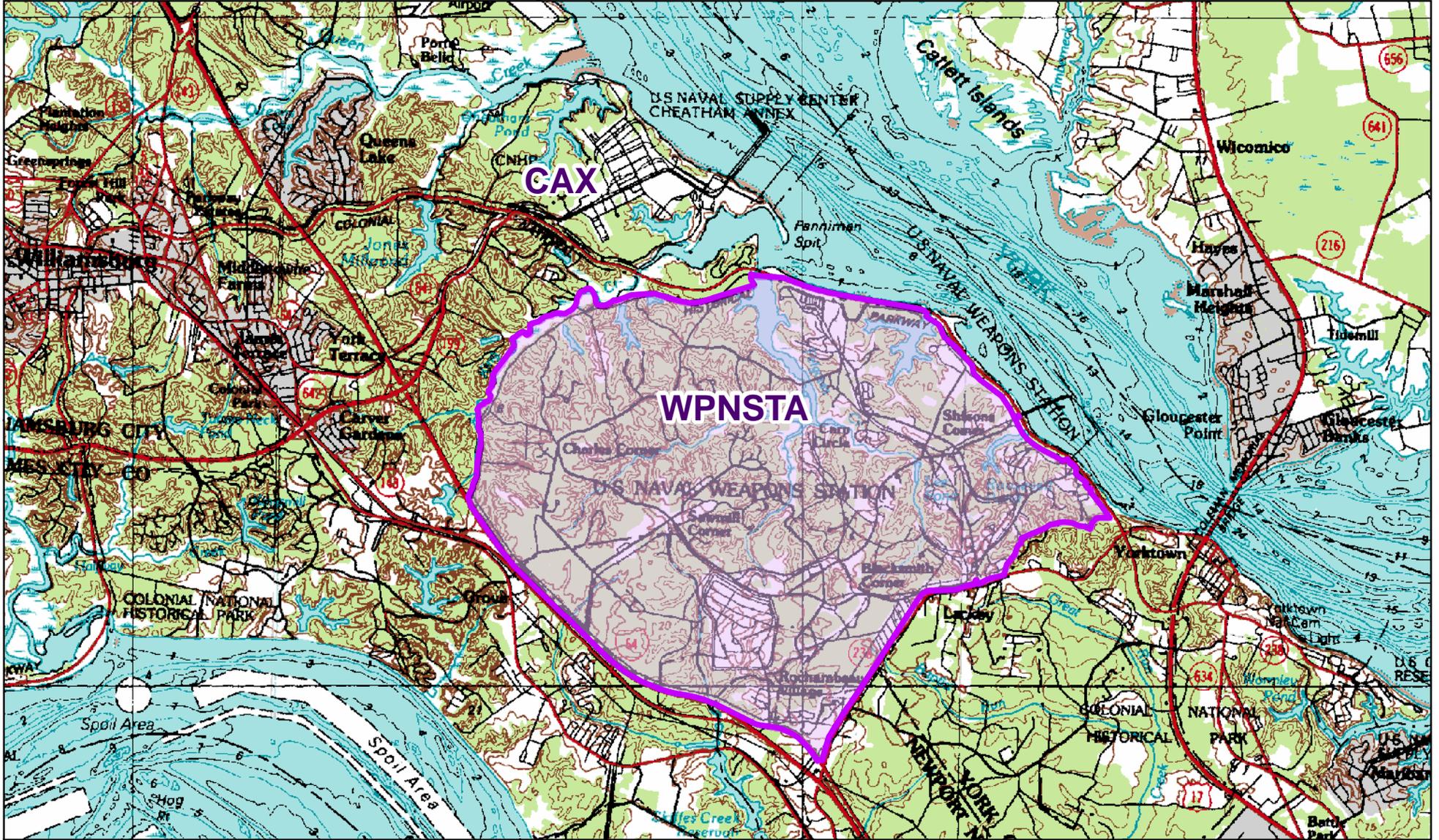
Introduction

This document presents the Fiscal Years (FYs) 2011 through 2012 annual amendment to the Site Management Plan (SMP) for Naval Weapons Station (WPNSTA) Yorktown, Yorktown, Virginia. This SMP meets the requirements of the Federal Facilities Agreement (FFA) (USEPA, 1994) between the Naval Facilities Engineering Command (NAVFAC) Mid-Atlantic Division, Commonwealth of Virginia Department of Environmental Quality (VDEQ), and Region III of the United States Environmental Protection Agency (USEPA) under the Comprehensive Environmental Response Compensation and Liability Act (CERCLA). This annual amendment to the SMP is being submitted per the requirements of the FFA. [Figure 1-1](#) illustrates the location of the Installation within the Commonwealth of Virginia.

The purpose of the SMP is to provide a management tool for NAVFAC Mid-Atlantic, WPNSTA Yorktown, VDEQ, USEPA, and their consultants to use in planning, reviewing, and setting priorities for all response activities to be conducted at WPNSTA Yorktown. The SMP establishes schedules and conceptual approaches for continued CERCLA activities at WPNSTA Yorktown Environmental Restoration (ER) sites. The prioritization of activities, proposed schedules, and work descriptions were jointly developed by the Navy, USEPA, and VDEQ on the basis of goals agreed to by all parties.

The SMP is a working document that is updated annually. The drafting of this SMP was completed in June 2010. Comments received from the USEPA and VDEQ on the draft SMP have been incorporated into this May 2011 revision of the SMP. However, in accordance with the WPNSTA Yorktown FFA, this SMP will not be considered as a final document until funds authorized and appropriated by Congress are received by the Environmental Restoration, Navy Account, so that the planned work for this Fiscal Year (FY), as defined in this SMP, can be accomplished.

This annual SMP amendment will supersede the 2010-2011 SMP.



Legend

 Activity Boundary



0 0.65 1.3
Miles

Figure 1-1
Location of WPNSTA Yorktown
Site Management Plan for FY 2011 to 2012
Naval Weapons Station Yorktown
Yorktown, Virginia

Background and Regulatory Framework

2.1 Activity Description

WPNSTA Yorktown is a 10,624-acre installation located on the Virginia Peninsula in York and James City Counties, Virginia ([Figure 1-1](#)). WPNSTA Yorktown is bounded on the northwest by Cheatham Annex 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.

Originally named the United States (U.S.) Mine Depot, WPNSTA Yorktown was established in 1918 to support the laying of mines in the North Sea during World War I. For 20 years after World War I, the depot continued to receive, reclaim, store, and issue mines, depth charges, and related materials. During World War II, the facility was expanded to include three TNT (TNT) loading plants and new torpedo overhaul facilities. A research and development laboratory for experimentation with high explosives was established in 1944. In 1947, a quality evaluation laboratory was developed to monitor special tasks assigned to the facility which included the design and development of depth charges and advanced underwater weapons. On August 7, 1959, the depot was renamed the U.S. Naval Weapons Station. Today, the primary 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.

2.2 Environmental History

2.2.1 Regulatory History

Comprehensive environmental restoration activities at WPNSTA Yorktown began in 1984 under the Navy Assessment and Control of Installation Pollutants (NACIP) and ER Programs (ERPs). The purpose of the NACIP and ERPs was to identify, assess, characterize, and clean up or control contamination from past waste management activities. The NACIP program was modified into the ERP in 1986 to reflect the requirements of CERCLA as amended by the Superfund Amendments and Reauthorization Act (SARA). The Navy is committed to cleaning up sites that pose a threat to human health or the environment and implementing environmental stewardship practices that ensures Navy waste management operations are in compliance with all federal and state regulations and Navy policy.

On October 15, 1992, WPNSTA Yorktown was added to the National Priorities List (NPL) based on a Hazard Ranking System (HRS) score of 50. An FFA between the Navy and the USEPA was signed August 1994, and incorporated the Resource Conservation and Recovery Act (RCRA) Solid Waste Management Units (SWMUs) at WPNSTA Yorktown, as identified in a 1992 RCRA SWMU Investigation Report (A. T. Kearney, 1992). The FFA Findings of Fact identified 16 Sites (Sites 1, 2, 3, 4, 5, 6, 7, 8, 9, 11, 12, 16, 17, 18, 19, and 21) for Remedial Investigation (RI). Appendix A of the FFA identified 19 Site Screening Areas (SSAs) [SSAs 1-19] for the Site Screening Process (SSP). Subsequent to the FFA, six additional SSAs

(SSA 20 - SSA 25) were identified for consideration in CERCLA. Based on the results of the SSP, SSA 1 (currently Site 23), SSA 6 (currently Site 24), SSA 7 (currently Site 25), SSA 10 (currently Site 28), SSA 16 (currently Site 16), SSA 18 (currently Site 26), SSA 20 (currently Site 29), and SSA 24 (currently Site 30) were determined to warrant Remedial Investigation/ Feasibility Study (RI/FS) efforts under CERCLA. Appendix B of the FFA identified 21 Areas of Concern (AOCs) [AOCs 1 - 21] for desktop audits under CERCLA to determine if the AOCs warranted further consideration in the SSP. With the exception of AOCs 5, 6, and 7, which are associated with SSA 15, the Navy, in partnership with USEPA and VDEQ, agreed that no action was warranted for all other AOCs (Baker, 1997a). However, one additional AOC (AOC 23, currently Site 31) was added in 2007 when it was determined that groundwater in the industrial area upgradient of Site 12 was contaminated with trichloroethene (TCE). In addition, in 2007, the Navy initiated investigation of numerous Munitions Response Program (MRP) sites including the Morale, Welfare, and Recreation (MWR) Skeet Range. Although Site 31 and the MWR Skeet Range were not included in the FFA, investigations at these sites have been or will be conducted following CERCLA guidance and are thus included in this document.

Table 2-1 identifies active sites, SSAs, and AOCs addressed under CERCLA at WPNSTA Yorktown and those in which it was determined that no action or no further action (NFA) is required. **Figure 2-1** shows the location of each site at WPNSTA. Active sites and SSAs are discussed in Section 3. Additional background information for sites and SSAs with no action or NFA determinations prior to 2008 is provided in the FY09-10 SMP, which was identified as a “baseline” SMP in the FY10-11 SMP.

Partnering

The Navy works in partnership with USEPA and VDEQ and has established a formal WPNSTA Yorktown Partnering Team to implement CERCLA. Partnering Team decisions are documented through consensus statements; a summary of Team¹ consensus statements is presented in **Table 2-2**.

2.2.2 Hydrogeologic Setting

WPNSTA Yorktown is situated within the Virginia Coastal Plain Physiographic Province, which is characterized by unconsolidated sediments several thousand feet in thickness (Meng and Harsh, 1988). Deposition and erosion associated with fluctuating sea levels resulted in terraces that decrease in topographic elevation in a stair-step pattern with scarps, oriented north to south, that delineate the eroded shoreline along the toe of each terrace. Two terraces (Lackey Plain and Croaker Flat) are divided by one scarp (the Camp Peary Scarp) within the boundaries of WPNSTA Yorktown.

A total of ten geologic formations have been identified (Brockman et al., 1997) beneath WPNSTA. The uppermost geologic formations consists of alluvial, colluvial, and marsh deposits composed of silt, sand, and pebbles with some clay. The geologic units are grouped into hydrostratigraphic units based upon hydraulic characteristics. The lithologic sequence of aquifers and confining/ semiconfining units relevant to CERCLA investigations at WPNSTA are, from youngest to oldest: the Columbia aquifer, the Cornwallis Cave confining unit, the Cornwallis Cave aquifer, the Yorktown confining unit, and the Yorktown-Eastover

¹ WPNSTA Yorktown and Cheatham Annex (CAX) conducted joint Partnering between 2000 and September 2008, when the bases split into separate Partnering Teams.

aquifer. The groundwater flow is locally controlled by topography with discharge to nearby surface water bodies and a primary flow and discharge direction toward the York River.

In the vicinity of Sites 1, 3, 6, 7, 11, 17, 24, and 25, the Camp Peary Scarp truncates the Columbia aquifer, the Cornwallis Cave confining unit, the Cornwallis Cave aquifer, and some to all of the Yorktown confining unit; hence, the upper units are missing and either the Yorktown aquifer or a thin portion of the Yorktown confining unit, occurs at the surface. In some areas, the Cornwallis Cave aquifer and confining unit are absent and the Columbia aquifer overlies the Yorktown confining unit. Where present, the Columbia aquifer ranges in thickness between 5 and 10 feet thick, with horizontal hydraulic conductivity between about 0.4 to 8 feet per day (ft/day) and vertical hydraulic conductivity between 1.7×10^{-4} and 1.7×10^{-1} ft/day (Brockman et. al., 1997). The dark greenish gray clay and silt of the Yorktown confining unit is absent north of Turkey Road between the west and south branches of Felgates Creek, along the streambeds of Felgates Creek, Indian Field Creek and their unnamed tributaries (Brockman et al., 1997). Where present, the unit is up to 36 feet thick. Vertical hydraulic conductivity of the confining unit ranges from 1.3×10^{-5} ft/day to 7.4×10^{-3} ft/day.

The Yorktown-Eastover aquifer extends across all of WPNSTA Yorktown and ranges between 60 and 100 feet thick. Horizontal hydraulic conductivity ranges from 0.004 to 3 ft/day and vertical hydraulic conductivity ranges between 1.7×10^{-5} and 4.8×10^{-1} ft/day. Transmissivity of the aquifer ranges from 0.5 to 40 square feet per day (ft²/day), with groundwater flow from west-to-east.

2.3 CERCLA Process

The following sections provide an overview of the CERCLA process. The objectives of the CERCLA process are to evaluate the nature and extent of contamination at a site, and to identify, develop, and implement appropriate remedial actions in order to protect human health and the environment. The major elements of the CERCLA process are identified below and described in greater detail in [Table 2-3](#):

- Preliminary Assessment (PA)
- Site Investigation (SI)
- RI/FS
- Treatability Study
- Engineering Evaluation/Cost Analysis (EE/CA) and Removal Action (may be implemented at any time in the CERCLA process)
- Proposed Plan (PP) and Record of Decision (ROD)
- Five Year Review
- Remedial Design (RD) and Remedial Action (RA)
- Post-RA Monitoring and Reporting
- Response Complete (RC)/Remedy In Place

2.3.1 Munitions Response Program

The Department of Defense (DoD) has established the MRP under the Navy Environmental Restoration Program (NERP) to address munitions and explosives of concern (MEC) at other than operational ranges. The DoD and the Navy are establishing policy and guidance for munitions and response actions under the MRP; however, the key program drivers developed to date conclude that munitions response action will be conducted under the process outlined in the National Contingency Plan (NCP) as authorized by CERCLA.

2.3.2 Community Participation

WPNSTA Yorktown and Cheatham Annex (CAX) have developed a Community Involvement Plan (CIP) and established a Restoration Advisory Board (RAB) comprised of members of the community, local environmental group members, and state and federal officials, who meet semiannually to keep the community informed on environmental issues at WPNSTA.

The documents prepared for the program are maintained in the administrative record files for review by the public. The index of WPNSTA Yorktown Administrative Records is available at the information repository.

Documents from the administrative record are available through the NAVFAC ATLANTIC Public Affairs Officer at:

Public Affairs Officer
Naval Facilities Engineering Command
6506 Hampton Boulevard
Norfolk, Virginia 23508-1278
Phone: (757) 322-8005
NFECL_PMO@navy.mil

TABLE 2-1
 Site Summary WPNSTA Yorktown
 FY11-12 SMP

Site Identification	Other Identification		Site Name	Site Description	FFA Status	Current CERCLA Status	Comments/Notes
	IAS (1984) RCRA (1992)	FFA					
Site 1	IAS Site 1	Site 1	Dudley Road Landfill	10 acre landfill with soil cover in place; 1999 removal action of soil/waste	Findings of Fact RI/FS	Post-ROD (soil/waste) RI/FS (GW/SW/SD)	ROD (June 1999) for soil/waste Site Inspections/Five-Year Review (2007) LUC RD is being negotiated with EPA GW/SW/SD investigation on going
Site 2	IAS Site 2	Site 2	Turkey Road Landfill	5 acre landfill; 1994 partial removal action of waste	Findings of Fact RI/FS	MRP	Site was transferred to MRP on June 19, 2007 Funding for MRP site is anticipated for 2011
Site 3	IAS Site 3	Site 3	Group 16 Magazine Landfill	2 acre landfill with soil cover in place; 1999 removal action of soil/waste; 2000 two foot soil cover installed	Findings of Fact RI/FS	Post-ROD (soil/waste) RI/FS (GW/SW/SD)	ROD (June 1999) for soil/waste; Draft ESD (2008) Site Inspections/Five-Year Review (2007) LUC RD is being negotiated with EPA GW/SW/SD investigation on-going
Site 4	IAS Site 4	Site 4	Burning Pad Residue Landfill	10 acre landfill; 1994 removal of action waste, 2003 removal action of soil/waste, 2005 removal action of soil	Findings of Fact RI/FS	Response Complete (soil/waste) PP/ROD (GW/SW/SD)	NFA ROD (September 2005) for soil/waste GW/SW/SD RI (2010)
Site 5	IAS Site 5	Site 5	Surplus Transformer Storage Area	1000 square foot area, stored surplus transformers; 1982 removal action of soil/waste	Findings of Fact RI/FS	Response Complete	NFA ROD (September 1994) for Site 5 all media
Site 6	IAS Site 6	Site 6	Explosives-Contaminated Wastewater Impoundment	Includes the following three areas: flume area, impoundment and excavated area; 2000 removal action of bioremediation cell; wetlands created in impoundment area	Findings of Fact RI/FS	Post-ROD (soil/SW/SD) RI/FS (GW/SW/SD)	ROD (October 1998) for soil/SD LTM of GW/SW/SD (not final remedy for these media) Site Inspections/Five-Year Review (2007) LUC RD is being negotiated with EPA RA soil/sediment completed (2007), CCR (2008) GW/SW/SD investigation on going
Site 7	IAS Site 7	Site 7	Plant 3 Explosives-Contaminated Wastewater Discharge Area	300 foot long drainage and surrounding area; 1996 <i>ex-situ</i> Bioremediation Pilot Study (soil)	Findings of Fact RI/FS	Post-ROD (soil/SW/SD/GW)	ROD (October 1998) for soil/SW/SD/GW Site Inspections/Five-Year Review (2007) LUC RD is being negotiated with EPA LTM GW on going
Site 8	IAS Site 8	Site 8	NEDED Explosives-Contaminated Wastewater Discharge Area	300 foot drainage way and surrounding area; 2007 removal action of soil/SD	Findings of Fact RI/FS	RI/FS/PP/ROD (soil/SW/SD/GW)	NFA consensus statement (May 2008) for soil/SD Draft GW RI 2010
Site 9	IAS Site 9	Site 9	Plant 1 Explosives-Contaminated Wastewater Discharge Area	600 foot natural drainage way; 1994 removal action of soil/SD/waste	Findings of Fact RI/FS	Response Complete (soil/SW/SD) RI/FS (GW)	NFA ROD (March 1998) for soil/SW/SD GW investigation planned (2009) Five-Year Review (2007) GW investigation planned (2009)
Site 11	IAS Site 11	Site 11	Abandoned Explosives Burning Pits	0.5 acre waste disposal/burning area; 2000 removal action of waste ash/soil	Findings of Fact RI/FS	Post-ROD (soil/SW/SD) Post-ROD (GW)	ROD (October 2000) for waste ash/soil Response Complete SW/SD Five-Year Review (2007) RI Addendum Tech Memo HHRA for potable GW use (2008) NFA PP (2009) ROD for GW Complete
Site 12	IAS Site 12	Site 12	Barracks Road Landfill	Includes the following 3 areas; Area A (4 acres), Area B (1.6 acres), Area C (3.3 acres); 1997 removal action of surface debris/onsite buildings and installation of geosynthetic landfill cover	Findings of Fact RI/FS	Post-ROD (soil/SW/SD/GW)	ROD (April 1997) for soil Site Inspections/Five-Year Review (2007) LUC RD is being negotiated with EPA ESD Draft to remove GW VOCs from LTM (2008) LTM GW/SD on going
Site 16 / SSA 16	IAS Site 16	Site 16	West Road Landfill	5 acre landfill; 1992 removal action of surface debris; 1994 removal action of waste/surface debris Site addressed with SSA16 (0.4 acre scarp metal storage area)	Findings of Fact RI/FS	Post-ROD (soil/GW)	ROD (September 1995) for soil/GW Tech Memo for risk management of soil/GW HH risk (February 2007) Five-Year Review (2007) NFA ESD for soil/GW (2009)

TABLE 2-1
 Site Summary WPNSTA Yorktown
 FY11-12 SMP

Site Identification	Other Identification		Site Name	Site Description	FFA Status	Current CERCLA Status	Comments/Notes
	IAS (1984) RCRA (1992)	FFA					
Site 17	IAS Site 17	Site 17	Holm Road Landfill	2 acre landfill; 2000 removal action of soil	Findings of Fact RI/FS	Post-ROD (soil) Post-ROD (GW)	ROD (October 2000) for soil/waste Five-Year Review (2007) Test Pit Tech Memo (2008) demonstrate no waste in place NFA ESD for soil (2008) RI Addendum Tech Memo HHRA for potable GW use (2008) NFA PP (2009) ROD for GW Complete (2010)
Site 18	IAS Site 18	Site 18	Building 476 Discharge Area	1320 feet unlined drainage ditch	Findings of Fact RI/FS	Response Complete (all media)	NFA ROD (September 2005) for all media
Site 19	IAS Site 19	Site 19	Conveyor Belt Soils at Building 10	Area beneath and surrounding former location of conveyor belt; 1998 removal action of soil/conveyor system and backfilled with aluminum-contaminated soil No SD/SW associated with site	Findings of Fact RI/FS	Post-ROD (soil) RI/FS (GW)	ROD (March 1998) for soil Site Inspections/Five-Year Review (2007) LUC RD is being negotiated with EPA GW investigation planned (2009)
Site 21	SWMU 21	Site 21	Battery and Drum Disposal Area	1 acre disposal area; 1994 removal action of waste/soil; 2002 removal action of soil	Findings of Fact RI/FS	Response Complete (soil) PP/ROD (GW/SW/SD)	NFA ROD (September 2003) for soil/waste GW/SW/SD RI (2010)
Site 22	Not Identified	Not Identified	Burn Pad	9 acre burn pad; 2002 removal action of soil	Not identified	Response Complete (soil) PP/ROD (SW/SD) FS (GW)	NFA ROD (September 2003) for soil GW/SW/SD RI (2010)
Site 23	SWMU 99 EPIC 37	SSA 1	Building 428 Teague Road Disposal Area	10.5 acre disposal area; 1994 removal action of surface debris/ash/soil; 2003 removal action of surface debris/soil; 2004 removal action of soil	Appendix A SSA/SSP	RI/FS (all media)	Revised Draft Final Round I RI (2008)
Site 24	IAS Site 14 SWMU 28 EPIC 25	SSA 6	Aviation Field	14 acre grassy storage area with five discontinuous buried debris areas No SD/SW associated with site	Appendix A SSA/SSP	RI/FS (all media)	Revised Draft Final Round I RI (2008) UFP SAP for Supplemental RI (2008)
Site 25	SWMU 25 AOC A, EPIC 22 & 23	SSA 7	Building 373 Rocket Plant	0.14 acres around 500-gallon UST and associated piping; 1996 removal action of tank/piping/soil	Appendix A SSA/SSP	RI/FS (all media)	Revised Draft Final Round I RI (2008)
Site 26	SWMU 87	SSA 18	Building 1816 Mark 48 Waste Otto Fuel Tank	6.7 acres around 2,500-gallon UST and associated piping; 1995 removal action of UST Retained as an IRP site because of VOCs in GW	Appendix A SSA/SSP	RI/FS (all media)	Revised Draft Final Round I RI (2008)
Site 27	SWMU 80 & 81	SSA 9	Building 1751 Chemistry Laboratory Neutralization Unit and Drainage Area	1.9 acres around 4 underground septic tanks and a below-grade cylindrical unit	Appendix A SSA/SSP	Response Complete (all media)	NFA ROD (September 2006) all media
Site 28	SWMU 107	SSA 10	Building 28 X-Ray Facility Tank Drain Field	5.8-acre drain field; septic tank/drain field	Appendix A SSA/SSP	PP/ROD (all media)	Draft BERA (2008)
Site 29	Not Identified	Not Identified	Lee Pond (SSA 20)	4.1 acre pond No soil/GW associated with site	Not identified	PP/ROD (all media)	Final RI 2005 NFA TM all media Draft PP (2008) NFA ROD (February 2010) all media
Site 30 / AOC 22	Not Identified	Not Identified	Bracken Road Incinerator and Environs (former SSA 24)	0.1 acres around former incinerator location; 2008 removal action of soil	Not identified	PP/ROD (all media)	EE/CA (2007) for soil
Site 31 / AOC 23	Not Identified	Not Identified	Barracks Road Landfill Industrial Area	Industrial area (Buildings 3, 4, 5, and 6) VOC GW plume; formerly investigated as Site 12	Appendix B Desktop Audit	RI/FS (GW/SW/SD)	GW investigation ongoing RI Planned (2010)
Site 32 (SSA 25)	Not Identified	Not Identified	Wetlands Downgradient of Beaver Pond	5.6 acre wetland consisting of 2 impoundment areas of Ballard Creek No soil/GW associated with SSA. 2009 removal action of contaminated sediments	Not Identified	PP/ROD (SD)	BERA (2008) EE/CA (2008)
Site 33 (SSA 22 / AOC 4)	Not Identified	Not Identified	Sand Blasting Grit Pile	0.5 acre ordinance sand blast grit area; 1998 removal action of soil/grit	Not Identified	SSP NFA (soil) RI/FS (GW)	NFA for soil Site Screening Process Report 2001 AR# 01350 GW investigation on going

TABLE 2-1
Site Summary WPNSTA Yorktown
FY11-12 SMP

Site Identification	Other Identification		Site Name	Site Description	FFA Status	Current CERCLA Status	Comments/Notes
	IAS (1984) RCRA (1992)	FFA					
Site 34 (SSA 14)	SWMU 72	SSA 14	Building 537 Discharge to Felgates Creek	0.4 acre pipe from Bldg 537; 2007 removal action of soil/SD	Appendix A SSA/SSP	RI (GW/SW)	EE/CA (2005) for soil/SD Post Construction Tech Memo (2008) Draft GW RI 2010
SSA 2	SWMU 54	SSA 2	Former EOD Burning/Disposal Area	4.1 acre storage area for 2 small (3 yd ³) dumpsters; 1994 removal action of surface debris	Appendix A SSA/SSP	SSP NFA	NFA 1992 RCRA SWMU Investigation
SSA 3	SWMU 56, 57, 58, 59	SSA 3	Fire Training Pits and Vicinity	2.7 acre fire training area; 1996 removal action of soil/tanker trailer	Appendix A SSA/SSP	SSP NFA	NFA Site Screening Process Report 2001 AR# 01350
SSA 4	SWMU 102	SSA 4	Weapons Casing/Drum Disposal Area	0.5 acre former disposal area; 1994 removal action of surface debris	Appendix A SSA/SSP	SSP NFA	NFA Site Screening Process Report 2001 AR# 01350
SSA 5	SWMU 101	SSA 5	Bypass Road Landfill	0.9 acre disposal area; 1994 removal action of surface debris	Appendix A SSA/SSP	SSP NFA	NFA Site Screening Process Report 2001 AR# 01350
SSA 8	SWMU 122, 123	SSA 8	Building 350 Rail Roadhouse Maintenance Area Trench Outfall	0.4 acre underground oil/water separator	Appendix A SSA/SSP	SSP NFA	NFA Site Screening Process Report (July 1997) AR# 01.10-07/29/97 0905
SSA 11	SWMU 113	SSA 11	Building 3 Neutralization Unit	0.2 acre drainage system (rectangular tank, trench, and sump)	Appendix A SSA/SSP	SSP NFA	NFA Site Screening Process Report (July 1997) AR# 01.10-07/29/97 0906
SSA 12	SWMU 133, 134; EPIC 41, 42	SSA 12	Public Works Storage Yard/Building 683 Vicinity	1.5 acre storage area comprised of 2 waste accumulation areas (open field and fenced area)	Appendix A SSA/SSP	SSP NFA	NFA Site Screening Process Report (July 1997) AR# 01.10-07/29/97 0907
SSA 13	AOC R	SSA 13	Building 529 Battery Drainage Area	0.5 acre paved area for discharge of washwater into storm drain	Appendix A SSA/SSP	SSP NFA	NFA Site Screening Process Report (July 1997) AR# 01.10-07/29/97 0908
SSA 15	SWMU 127	SSA 15	Sewage Treatment Plant #1 Sludge Drying Beds and Discharge Area	0.3 acre sewage treatment plant; 2001 removal action of imhoff tank, trickling filter, sludge drying bed, and chlorination unit	Appendix A SSA/SSP	Desk Top Audit	Ballard Creek watershed data collected Site 12 LTM Desktop audit to confirm CERCLA documentation for NFA
SSA 17	SWMU 74	SSA 17	Building 1456 Mark 46 Waste Otto Fuel Tank	2.35 acre area around UST and associated piping; 1995 removal action of UST system	Appendix A SSA/SSP	SSP NFA	NFA Site Screening Process Report (March 1996) AR# 03.13-03/18/96 00666
SSA 19	SWMU 31, 32, AOC B	SSA 19	Beaver Road/Ponds 11 and 12 Drainage Area and Environs	164 acres surrounding the open burn/open detonation area	Appendix A SSA/SSP	SSP NFA	NFA Site Screening Process Report (March 1996) AR# 03.13-03/18/96 00667
SSA 21	Not Identified	Not Identified	Roosevelt Pond	22.2 acre pond receiving storm water from industrial area	Not Identified	SSP NFA	NFA Site Screening Process Report 2001 AR# 01350
SSA 23	Not Identified	Not Identified	Coal Storage Area	1 acre coal storage area surrounded by 9-inch thick reinforced concrete wall	Not Identified	SSP NFA	NFA Site Screening Process Report 2001 AR# 01350
AOC 1	AOC O	AOC 1	Building 350 Rail Roadhouse Transformer Pad	Fenced concrete pad outside Building 350	Appendix B Desktop Audit	NFA	NFA Desk Top Audit Decision Document 1997 AR# 01.10-09/23/97 00909
AOC 2	SWMU 128	AOC 2	Building 372 - PW Vehicle Maintenance O/W Separator	Below grade two chambered concrete oil/water separator	Appendix B Desktop Audit	NFA	NFA Desk Top Audit Decision Document 1997 AR# 01.10-09/23/97 00909
AOC 3	AOC J	AOC 3	Blasting Grit Spill Area	Area near Building 1347 where black powdery/glassy material was observed (may result from previous sandblasting activities)	Appendix B Desktop Audit	NFA	NFA Desk Top Audit Decision Document 1997 AR# 01.10-09/23/97 00909
AOC 4	AOC S	AOC 4	Paint Shop Grit Disposal Area	Area of soil and pavement outside building 530 where a container of metal grit was previously stored. Pavement was badly worn and contains staining	Appendix B Desktop Audit	NFA	Desk Top Audit determined site as SSA 22, NFA in SSP
AOC 7	SWMU 177	AOC 7	STP # 4 Sludge Drying Beds	Inactive sewage treatment plant (clarifier, settling tanks, and sludge drying beds); unit managed sanitary waste and possibly explosive contaminated wastewater	Appendix B Desktop Audit	NFA	NFA Desk Top Audit Decision Document 1997 AR# 01.10-09/23/97 00909
AOC 8	SWMU 37	AOC 8	Building 118 Waste Oil O/W Separator	One or two underground oil/water separators of unknown size and construction.	Appendix B Desktop Audit	NFA	NFA Desk Top Audit Decision Document 1997 AR# 01.10-09/23/97 00909
AOC 9	SWMU 147 & 148	AOC 9	Building 683 O/W Separator	50 feet by 50 feet concrete pad used for washing heavy equipment. Wastewater drains to below grade two chambered oil/water separator	Appendix B Desktop Audit	NFA	NFA Desk Top Audit Decision Document 1997 AR# 01.10-09/23/97 00909
AOC 10	EPIC 45	AOC 10	Stoney Point Road Disposal Area (STP # 2)	Area of soil where construction debris from barracks demolition was disposed.	Appendix B Desktop Audit	NFA	NFA Desk Top Audit Decision Document 1997 AR# 01.10-09/23/97 00909
AOC 11	SWMU 174	AOC 11	Building 710 Waste O/W Separator	Below grade two chambered concrete oil/water separator	Appendix B Desktop Audit	NFA	NFA Desk Top Audit Decision Document 1997 AR# 01.10-09/23/97 00909

TABLE 2-1
 Site Summary WPNSTA Yorktown
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Site Identification	Other Identification		Site Name	Site Description	FFA Status	Current CERCLA Status	Comments/Notes
	IAS (1984) RCRA (1992)	FFA					
AOC 12	SWMU 71	AOC 12	Building 457 O/W Separator	Below grade two chambered oil/water separator that received discharge from boiler operations. May be near/assoc/w SSA 14	Appendix B Desktop Audit	NFA	NFA Desk Top Audit Decision Document 1997 AR# 01.10-09/23/97 00909
AOC 13	SWMU 98	AOC 13	Building 370 O/W Separator	Underground oil/water separator; Liquid contents unknown, but suspected to be oil contaminated wastewater from boiler activities	Appendix B Desktop Audit	NFA	NFA Desk Top Audit Decision Document 1997 AR# 01.10-09/23/97 00909
AOC 14	SWMU 160	AOC 14	Building 1811 - Supply Storage Yard	Concrete storage pad where usable materials and waste was stored on and around pad.	Appendix B Desktop Audit	NFA	NFA Desk Top Audit Decision Document 1997 AR# 01.10-09/23/97 00909
AOC 15		AOC 15	Building 1744 Explosive Burning Silo	Building 1744 Explosive Burning Silo	Appendix B Desktop Audit	NFA	NFA Desk Top Audit Decision Document 1997 AR# 01.10-09/23/97 00909
AOC 16	SWMU 107	AOC 16	X-Ray Facility Tank	Below grade two chambered oil/water separator that received discharge from X-ray facility	Appendix B Desktop Audit	NFA	NFA Desk Top Audit Decision Document 1997 AR# 01.10-09/23/97 00909
AOC 17	SWMU 29 EPIC 34	AOC 17	Dredge Material Disposal Area	Vegetated area where dredge spoils from the York River were deposited	Appendix B Desktop Audit	NFA	NFA Desk Top Audit Decision Document 1997 AR# 01.10-09/23/97 00909
AOC 18	AOC M	AOC 18	Code 17 Contaminated Soil Runoff Drainageways	Area of pavement where oil contaminated soil was placed on plastic. Discolored area of pavement caused by drainage from this area and SWMU 104 was observed	Appendix B Desktop Audit	NFA	NFA Desk Top Audit Decision Document 1997 AR# 01.10-09/23/97 00909
AOC 19	SWMU 104	AOC 19	Code 17 Storage Compound	Two fenced-in areas of pavement where contaminated liquid and soil are stored in drums. Discolored area of pavement caused by drainage from this area and AOC M was observed	Appendix B Desktop Audit	NFA	Consensus for NFA September 1997 Partnering Meeting
AOC 20	SWMU 72	AOC 20	NEDED Discharge areas to Felgates Creek	Two pipes discharged explosive contaminated wastewater to Felgates Creek	Appendix B Desktop Audit	NFA	NFA Desk Top Audit Decision Document 1997 AR# 01.10-09/23/97 00909
AOC 21	SWMU 181, 97, 168	AOC 21	West Road Coal Storage Area/Buildings 370 & 708 Coal Storage Piles	Currently known as SSA 23	Appendix B Desktop Audit	NFA	Portion of AOC became SSA 23; Remainder of site NFA as documented in EPA letter July 11, 1995
MWR Skeet Range	Not Identified	Not Identified	MWR Skeet Range	30 acre small arms range	Not identified	MRP	NFA ESI 2008 AR# 02180

Note: Sites 10, 13, 14, and 15 went NFA prior to the FFA. They are listed in the IAS (C.C. Johnson & Associates, Inc. and CH2M HILL, 1984).

Site 20 is documented in the Dames and Moore Confirmation studies (1986 and 1988). It became SSA 18 during an SSP investigation (Baker, 1996 - AR No. 00666) and is later designated as Site 26.

Indicates NFA Site/SSA

- IAS - Initial Assessment Study
- RCRA - Resource Conservation and Recovery Act
- FFA - Federal Facilities Agreement
- SSP - Site Screening Process
- SSA - Site Screening Area
- AOC - Area of Concern
- SWMU - Solid Waste Management Unit
- SD - sediment
- SW - Surface Water
- GW - Groundwater
- NFA - No Further Action
- VOC - Volatile Organic Compound
- UST - Underground Storage Tank
- STP - Sewage Treatment Plant
- RI - Remedial Investigation
- FS - Feasibility Study
- PP - Proposed Plan
- ROD - Record of Decision
- RD - Remedial Design
- LUC - Land Use Control
- O/W - Oil/Water

TABLE 2-2

WPNSTA Yorktown/CAX Partnering Team Consensus Statement Summary
 FY 11-12 SMP

Number	Consensus Statement Summary	Date	Facility	Site 16/SSA 16	AOC	Topic	Consensus Statement
	NA	10/23/2001	WPNSTA	18		Site 18	The Team agreed to separate the Mercury issue from the Site 18 ROD.
	NA	10/23/2001	WPNSTA			Dec. 2002 Partnering Meeting	The team agreed to start at 12:00 noon Monday, December 3, 01 (lunch on own prior to starting) and meet through Wednesday evening with site visits Thursday December 6, 2001.
	NA	12/3/2001	WPNSTA	6, 7		LUCIP Review Sites 6 & 7	state the site size and then the size of the restricted area, annotate Global Position Coordinates (GPS) of restricted area on figures.
	NA	12/3/2001	WPNSTA/CAX			Define Metrics in Partnering Deliverable	Keep as stated in deliverable.
	NA	12/4/2001	WPNSTA	6		Site 6 – Explosives-Contaminated Wastewater Impoundment	This site is former cache where TNT was placed in a hole and stored. The hole was later backfilled. Soil with concentrations of cadmium and zinc were left in the hole and then backfilled with 4 feet of soil. After discussing the conditions of the site, the team agreed to evaluate whether further action was required at this site.
	NA	2/5/2002	WPNSTA	18		Site 18	Because Site 18 is NFA, the team proposed to schedule preparation of documents for this site on the same schedule as Sites 23-26.
	NA	2/5/2002	WPNSTA	2, 8, 14		Sites 2, 8, and SSA 14	Sites 2, 8, and SSA 14 (2 will be a ROD, 8 & SSA 14 will be a ROD) will track on a later schedule than Sites 23-26.
	NA	2/5/2002	WPNSTA	8, 18, SSA 14		RI Sites 8, 18 & SSA 14	Baker will update the report and resubmit for review and comment.
		2/5/2002	WPNSTA/CAX	12		5-Year Review	The team agreed to form a subgroup to research and report out at the March meeting on this issue. The subgroup consists of Bob Stroud and Jennifer Davis.
	NA	2/5/2002	WPNSTA/CAX			2002 Goals Update	The team agreed to include the Goals as part of each meeting's minutes.
	NA	2/5/2002	WPNSTA/CAX			Consensus Statement Documentation	The team agreed to document Consensus Statements by site as an addendum to the Site Management Plan. Mary is to evaluate possible methods (by site, chronologically, etc.) and report back to the team during the March Meeting.
	NA	2/5/2002	WPNSTA/CAX			Draft FFA	Scott Park/Jennifer Davis to prepare Draft FFA Addendum for counsel review and submittal to EPA and DEQ.
1	3/13/2002-1	3/13/2002	WPNSTA/CAX			Documentation of Consensus Statements	The team agreed to document Consensus Statements by site as an addendum to the Site Management Plan. A tracking number will be used to track the documents consisting of date and numerical sequence (i.e.: Month/Day/Year-Number – 3/13/02-1).
2	3/13/2002-2	3/13/2002	WPNSTA	4		Clean-up level	If Site 4 removal action cannot achieve residential levels then Sites 4 and 22 ROD will split into two separate RODS.
3	4/23/2002-3	4/23/2002	WPNSTA/CAX			Identification of new sites	The Team agrees that the FFA (Sections 9.3a and 9.3b) gives the team the authority to add newly identified sites to the SMP.
4	4/24/2002-4	4/24/2002	WPNSTA/CAX			Site Management Plan	The team agreed to go final with the FY 2002/2003 Draft SMP and revise text for the FY 2003/2004 submittal. Baker will provide Final covers for the FY 2002/2003 SMP.
7	4/24/2002-7	4/24/2002	WPNSTA/CAX			Community Relations Plan	The Team agrees to go final with the Community Relations Plan. If appropriate, final covers and spines will be submitted.
8	6/03/2002-8	6/3/2002	WPNSTA	GWOU 1		Groundwater Operable Unit 1 – Work Plan	The Team agrees to investigate and install groundwater monitoring wells if a removal action(s) at site 24 within Groundwater Operable Unit I shows contamination or materials that pose a potential risk to receptors with the potential of exposure to groundwater (waste left in place or confirmatory samples detections exceed PRG).
10	8/6/2002-10	8/6/2002	WPNSTA			Five Year Review Report, WPNSTA Yorktown Sites 1, 6, 7, 12, 16, and 19	The team agrees with the 5-year review Report findings and agrees to go final with the document. Jeff Harlow to pursue signature of the document by Admiral.
12	9/18/2002-12	9/18/2002	WPNSTA/CAX			New technical team member	The Team agreed to add Marlene Ivester as a technical member to the team.
13	9/18/2002-13	9/18/2002	WPNSTA/CAX			Facilitator	The team agreed a facilitator is needed for a few meetings.

TABLE 2-2
 WPNSTA Yorktown/CAX Partnering Team Consensus Statement Summary
 FY 11-12 SMP

Number	Consensus Statement Summary	Date	Facility	Site 16/SSA 16	AOC	Topic	Consensus Statement
14	10/22/2002-14	10/22/2002	WPNSTA			LUCIPs	The Team agreed to revise the LUCIP to incorporate two sections: Site Environmental History and References. Also, the LUCIP will include a brief executive summary of the ROD (about 1 paragraph, similar to the Camp Allen Landfill LUCIP). The numbers of signs for each site is as follows: <ul style="list-style-type: none"> - Site 12: At least four signs, placed at egress points to the site (of the ten proposed, four will be mandatory) - Site 19: At least three signs, placed at egress points to the site - Site 1: At least three signs, placed at egress points to the site - Sites 6 & 7: At least three signs for Site 6 at egress points and one sign at Site 7 egress point
15	10/23/2002-15	10/23/2002	WPNSTA/CAX			N/A	The Team agreed to add a goal to the FY03 Team Goals to be self-facilitating by end of third Quarter 2003 (5 additional meetings).
16	10/23/2002-16	10/23/2002	WPNSTA			GWOU I	The Team agreed that Baker can proceed with submitting the response to comments and with submitting a revised Draft Final Work Plan for GWOU I to the normal distribution list.
17	10/23/2002-17	12/4/2002 Revised	WPNSTA/CAX			WPNSTA-SSAs 3-24; 23-26; 2, 8, 18 & SSA 14; GWOU I, 27-30 CAX-1, 4 & 9, 11, Background Study, NFRAP 2, 3, 5, 6, 9, 10 & 12	The WPNSTA Yorktown/CAX Partnering Team empowers the ecological technical support team to address and resolve ecological issues for various sites at WPNSTA Yorktown/CAX (see table below) to meet the dates and priority specified by the WPNSTA Yorktown/CAX Team, with Ed Corl to take the lead on meeting the schedule determined by the Team. WPNSTA: SSAs 3-24 SSP; 23-26 DF RI; 2, 8, 18 & SSA 14 DF RI; GWOU I Draft WP; 27-30 Draft RI CAX: 1 DF RI; 4 & 9 Draft RI (SERA); 11 Draft RI, Draft Background Study; 2, 3, 5, 6, 9, 10 & 12 Draft NFRAP
18	12/5/2002-18	12/5/2002	WPNSTA/CAX	21, 22		WPNSTA Sites 21 & 22	Based upon EPA Region III comments, Sites 21 and 22 RODs will be rewritten as No Further Action (NFA) RODs with no institutional controls (ICs) because they were remediated to residential levels.
19	12/5/2002-19	12/5/2002	WPNSTA/CAX			Site Action Status Report	The Team agrees to use the SASR as a tracking tool and add it to the standard meeting format.
20	12/5/2002-20	12/5/2002	WPNSTA/CAX			Action Item List	The Team agreed that the Action Item List will be addressed during the Agenda Building Call with respect to whether or not the Action Item has been completed. If completed, a "C" will be put in the Outcome column of the Action Item list and the item will not be addressed during the subsequent Partnering Team Meeting.
21	1/29/2003-21	1/29/2003	WPNSTA/CAX			CAX Site 1 Baseline Risk Assessment	The eco subgroup discussed the issues for the CAX Site 1 RI and determined that a baseline risk assessment was warranted for the wetland area based upon a conference call prior to the December Partnering Meeting. The Navy RPM determined that based upon the existing ROD schedule and funding execution for the site, it was determined that (revised per team concurrence by MM 3/12/03) the ROD and funding schedule could not be met. Therefore, the Navy recommended that an EECA for soils/debris removal at CAX Site 1 would be the best approach. The Team agrees upon this approach.
22	3/13/2003-22	3/13/2003	WPNSTA	23		Confirmation sampling during removal action	At Yorktown Site 23, the Team agrees that the removal action should meet the following goals: Areas A and C are large areas and confirmation sampling will include multiple bottom samples as proposed in the confirmation sampling plan. All other sample locations that exceed cleanup goals at this time will be removed as hot spots.
24	3/13/2003-24	3/13/2003	WPNSTA	4		Site clean-up goals	The team agrees that the ROD for Site 4 should be drafted upon completion of the on-going non-time critical removal action (NTCRA) to ensure that the ROD will be most appropriate in light of final conditions following the NTCRA. The team understands that \$600,000 will be committed in March 2003 to fund the NTCRA and that the Navy RPM projects that the NTCRA may require additional funding at the start of FY04 to complete the clean up.
26	6/17/2003-26	6/17/2003	WPNSTA	24		Groundwater investigation at WPNSTA Site 24 – Aviation Field	Based upon past sample results and the reported solid waste disposed of at WPNSTA Site 24 – Aviation Field, the Partnering Team agrees that a groundwater investigation is not warranted at this time unless the planned removal action at WPNSTA Site 24 can not meet human health or ecological clean-up goals that have yet to be determined for sediment and soil.

TABLE 2-2
 WPNSTA Yorktown/CAX Partnering Team Consensus Statement Summary
 FY 11-12 SMP

Number	Consensus Statement Summary	Date	Facility	Site 16/SSA 16	AOC	Topic	Consensus Statement
30	6/19/2003-30	6/18/2003	WPNSTA	12		Long term monitoring program at WPNSTA Site 12	Based upon the information presented on June 19, 2003 at the Partnering Meeting on the long term monitoring program at WPNSTA Site 12 (years one through five), the Partnering Team agreed to the following: 1. Eliminate LTM monitoring at wells 12GW13 and 12GW4 (located upgradient of site) and collect one round of samples during the next 5 year LTM period at wells 12GW8, 12GW19, 12GW18 and 12GW 18A and analyze for 8 RCRA metals (total metals only). 2. The team agreed to install a new monitoring well, 12GW20, down gradient of well 12GW07 at the site to identify the migration pathway for VOCs. 3. Eliminate sampling at wells 12GW01A, 12GW06 for VOCs because: a. 12GW01A is screened in the deeper aquifer and has no history of detections; b. 12GW06 – concentrations have decreased over time and it is recommended that monitoring at 12GW01 will adequately monitor groundwater pathway. 4. Collect samples from at 10 wells (12GW01, 12GW05, 12GW07, 12GW09, 12GW13, 12GW14, 12GW17, 12GW15, 12GW16, and 12GW20 (new well) every two years and analyze for all VOCs. 5. The team agreed to collect 4 or 5 sediment samples at locations 12SDCWL, 12SD32, 12SD34, 12SD37, and RI sample location SD17 and analyze for the 8 RCRA metals once (in year 9 or 10) in the next 5-year review cycle.
32	12-2-03-32	Dec. 2, 2003	WPNSTA	WPNSTA OB/OD Range		OB/OD Groundwater Monitoring Program	The Partnering Team agrees that the RCRA groundwater monitoring program conducted at the OB/OD Range Site should be discontinued as the CERCLA program will be conducting a media-wide investigation of the site.
33	1-07-04-33	1/7/2004	WPNSTA	23		Site 23 TCRA	With respect to zinc-contaminated soil at Site 23, the Team agrees to stop excavating at Grids 1 through 6, and to place a minimum of 2 feet of clean backfill. We agree that with a minimum of 2 foot of clean fill, there are no current unacceptable ecological risks presented by the soils. With respect to grids 4, 5, and 6, confirmation sampling indicates that zinc concentrations at the bottom of the excavated grids exceed the cleanup goal of 200 mg/kg. The Team agrees that based on the current mission of the WPNSTA, and the location of Site 23 within the blast arc of the pier, it is unlikely that the site would be redeveloped. However, should the soil at grids 4, 5, and 6 be excavated in the future, there is a chance of future ecological risks from zinc in the soil, should this soil be brought back to the surface. However, this potential risk ecological risk is small, given that the overall size of grids 4 5, and 6 is relatively small, and given that if excavation occurred, soil would be mixed with clean fill, and this mixing with the clean fill would lower the overall zinc concentrations. Therefore, the actual chance of potential future ecological risks is minimal, and acceptable.
34	3-9-04-34	3/9/2004	WPNSTA	4		Site 4 Draft ROD	The team will move forward with the preparation of the Draft ROD for WPNSTA Site 4 as cited in the FY 2004 team goals. The document will be for internal team review only pending completion of removal activities at WPNSTA Site 4.
35	3-9-04-35	3/11/2004	CAX	12		Site 12 NFRAP	The team agrees with the NFA remedy for CAX Site 12 – Disposal Site Water Tower based upon the no further action remedy recommended in the Technical Memorandum submitted for review on January 12, 2004. A No Further Response Action Planned (NFRAP) Decision Document with a Final Technical Memorandum as an appendix will be prepared for submittal by March 31, 2004 in accordance with the annual team 2004 goals.
36	3-22-04-36	3/22/2004	CAX	7		CAX Site 7	Based upon the field investigation conducted at CAX Site 7N, as summarized in the Draft Trenching Letter Report dated 19 March 2004, the team has agreed to move forward with a TCRA Action Memorandum as an interim action that will recommend appropriate erosion control and shoreline stabilization for the site. The team also agrees that removal of the CAX Site 7N landfill will be accomplished under an Engineering Evaluation/Cost Analysis (EE/CA) when funding is available. While the team agreed that an esthetic clean up of the beach in the vicinity of the landfill does little to mitigate risk, the team agreed to move forward with a beach cleanup at the request of the Navy.
37	5-18-04-37	5/18/2004	WPNSTA	SSA 25		Planned action for SSA 25	The team agrees, based upon the 2003 limited field investigation, to develop a work plan for the continued investigation of mercury associated with the former STP 2 area, when funding becomes available. The team agrees that the proposed continued investigation is a high priority. The work plan will include a sampling program of sediment and tissue samples of small fish and amphibians or frogs to further assess nature and extent (vertical and lateral) of mercury in Ballard Creek from the Beaver Dam to the next downstream impoundment structure.

TABLE 2-2
 WPNSTA Yorktown/CAX Partnering Team Consensus Statement Summary
 FY 11-12 SMP

Number	Consensus Statement Summary	Date	Facility	Site 16/SSA 16	AOC	Topic	Consensus Statement
38	5-19-04-38	5/19/2004	WPNSTA/CAX			BTAG	The Yorktown/CAX Partnering Team agrees that the role of USEPA BTAG members will be changed from Adjunct Member to Technical Member.
39	6-24-04-39	6/24/2004	WPNSTA	18		Site 18 NFA	Team agrees with No Further Action for WPNSTA Yorktown Site 18.
40	6-24-04-40	6/24/2004	WPNSTA	2, 8, SSA 14		Planned action for Sites 2, 8, SSA 14	Team agrees to perform pre-characterization sampling for WPNSTA Yorktown Sites 2 and 8 and SSA 14. If the sampling shows that the extent of contamination at the sites can be well defined, then the Navy will complete an EE/CA with a removal action and go for a NFA ROD. However, if the sampling indicates that extent of contamination at the sites cannot be well defined, then the Team agrees to go forward with a BERA and follow on FS/PRAP with a ROD with remedy.
41	5-18-05-41	5/18/2005	WPNSTA	OB/OD		Path forward for sampling for planned RI	As presented on May 18, 2005, the Team agrees with Sampling Option 2 for the upcoming field investigation. Sampling Option 2: collect 15 surface soil and 15 subsurface soil samples from within the tree line area, and collect 30 surface soil samples outside the tree line. This option will capture the greatest extent of exposure points for ecological receptors.
42	8-17-05-42	9/26/2005	WPNSTA	SSA 25		Team approval of Draft Work Plan for SSA 25 Mercury Investigation	The Team agrees that the Work Plan for the SSA 25 investigation can be finalized and that field work can be scheduled.
43	4-4-06-43	4/4/2006	WPNSTA	1, 3, 11		Team approval of post-ROD documentation that addresses minor changes in the remedies at Sites 1, 3 and 11 at WPNSTA Yorktown.	<p>The Team understands that the selected remedy documented in the Sites 1 and 3 ROD (Baker, 1999) and the Site 11 ROD (Baker, 2000) estimate an amount of soil that would be removed during the execution of the selected remedies, as noted above. The remedial action closeout reports (OHM, 2001a and 2001b) document that the actions resulted in the removal of 413 tons (260 cy) of soil from Site 1, 284 tons (800 cy) of soil from Site 3, and 655 tons (400 cy) of soil from Site 11.</p> <p>While these increases in quantity constitute changes in the remedy, they are considered minor changes in terms of USEPA guidance on post-ROD changes (USEPA, 1999). A minor change is considered a change that does not have a significant impact on scope, performance, or cost of the remedy, such as a small volume change or a change in the long term monitoring frequency.</p> <p>The Team, therefore, agrees that a Memo to File is appropriate to document these minor changes for Sites 1, 3 and 11. The Memo to File will become part of the WPNSTA Yorktown Administrative Record.</p>
44	7-24-06-44	7/24/2006	WPNSTA	GWOUs		Elimination of GWOU designations	Groundwater at WPNSTA Yorktown will be addressed on a site-specific basis.
45	9-1-06-45	9/1/2006	WPNSTA	12		LTM at Site 12	Elimination of VOC sampling from LTM sampling program at Site 12.
		3/14/2008	WPNSTA	3		LUC not necessary	<p>The Partnering Team agrees to the following:</p> <ol style="list-style-type: none"> 1. Residual levels of cPAHs in the PAH hot-spot are below clean up levels that are protective of human health (4.1 mg/kg) and the environment (44 mg/kg) for UUUE. 2. Soils at the entire site poses no unacceptable risks to human health or the environment 3. No waste material remains at the site and 4. The entire site meets the criteria for UUUE <p>Therefore land use controls are not necessary to protect human health and the environment from exposure to soil at Site 3.</p>
		5/15/2008	WPNSTA	8		NFA for soil and sediment	The Partnering team agrees that, based on the removal action and post-removal confirmation sampling results, no further action for soil or sediment is required at Site 8.
		5/20/2008	WPNSTA	11 and 17		NFA for groundwater	The Partnering team agrees groundwater poses no unacceptable human health or ecological risks, therefore NFA is warranted for groundwater at Sites 11 and 17.
	9-23-09-1	9/26/2009	WPNSTA	Site 16/SSA 16		Withdrawal of ESD and continuation of ICs	The partnering team agreed that the Site 16/SSA 16 Risk Management Technical Memorandum and ESD will be withdrawn and the Institutional Controls, along with Five-Year Reviews, will continue at the site.

TABLE 2-3
Major Elements of the CERCLA Process
FY11-12 SMP

Preliminary Assessment (PA)	Initiation of concern about a site, area, or potential contaminant source. The PA is a limited-scope assessment designed to distinguish between sites that clearly pose little or no threat to human health or the environment and sites that may pose a threat and require further investigation. Environmental samples are rarely collected during a PA. The PA also identifies sites requiring assessment for possible response actions. If the PA results in a recommendation for further investigation, an SI is conducted.
Site Investigation (SI)	Some sites warrant preliminary or interim investigations, studies, or removal/remedial actions. If it is unclear as to whether a site should be included in the CERCLA RI/FS process, an SI is sometimes conducted to make a general determination if activities at the site have impacted environmental media. SIs typically include the collection of environmental and waste samples to determine which hazardous substances are present at a site and to determine if these substances have been released to the environment.
Remedial Investigation (RI)	During an RI, data is collected to characterize site conditions, determine the nature of the waste, assess risk to human health and the environment, and, if necessary, conduct treatability testing to evaluate the potential performance and cost of the treatment technologies being considered.
Treatability Study (TS)	Treatability studies may be conducted at any time during the CERCLA process. The need for a treatability study generally is identified during the FS. Treatability studies may be classified as either bench-scale (laboratory study) or pilot-scale (field studies). For technologies that are well-developed and tested, bench-scale studies are often sufficient to evaluate performance. For innovative technologies, pilot tests may be required to obtain the desired information. Pilot tests simulate the physical and chemical parameters of the full-scale process, and are designed to bridge the gap between bench-scale and full-scale operations. Treatability studies are performed to assist in the evaluation of a potentially promising remedial technology. The primary objectives of treatability testing are to provide sufficient data to allow treatment alternatives to be fully developed and evaluated during the FS and support the remedial design of a selected alternative.
Engineering Evaluation/Cost Analysis (EE/CA) and Interim Removal Action (IRA)	Removal actions are implemented to clean up or remove hazardous substances from the environment at a specific site in order to mitigate the spread of contamination. Removal actions may be implemented at any time during the CERCLA process. Removal actions are classified as either time-critical or non-time-critical actions. Actions taken immediately to mitigate an imminent threat to human health or the environment, such as the removal of corroded or leaking drums, are classified as time-critical removal actions. Removal actions that may be delayed for 6 months or more without significant additional harm to human health or the environment are classified as non-time-critical removal actions (NTCRA). For an NTCRA, an EE/CA is prepared rather than the more extensive FS. An EE/CA focuses only on the substances to be removed rather than on all contaminated substances at the site. It is possible for a removal action to become the final remedial action if the risk assessment results indicate that no further remedial action is required in order to protect human health and the environment.
Feasibility Study (FS)	The FS is the mechanism for the development, screening, and detailed evaluation of alternative remedial actions. The RI and FS can be conducted concurrently; data collected in the RI influences the development of remedial alternatives in the FS, which in turn affect the data needs and scope of treatability studies and additional field investigations. This phased approach encourages the continual scoping of the site characterization effort, which minimizes the collection of unnecessary data and maximizes data quality.
Proposed Plan (PP)	A PP presents the remedial alternatives developed in the FS and recommends a preferred remedial alternative. The public has an opportunity to comment on the PP during an announced formal public comment period. Site information is compiled in an administrative record and placed in the general IR program information repositories established at local libraries for public review. The public comments are reviewed and the responses are recorded in a document called a Responsiveness Summary. At the end of the public comment period, an appropriate remedial alternative is chosen to protect human health and the environment. All parties directly involved in the restoration program (Navy, EPA, and VDEQ) must agree on the selected alternative.
Record of Decision (ROD)	The ROD document is issued to explain the selected remedial action. Public comments received during the PP are addressed as part of the responsiveness summary in the ROD. A notice to the public is issued when the ROD is signed by Navy and EPA following State concurrence.
Remedial Design/Remedial Action (RD/RA)	The final stage in the process is the RD/RA. The technical specifications for cleanup remedies and technologies are designed in the RD phase. If land use controls are a component of the remedy, the Land Use Control Remedial Design is generated during this phase. The RA is the actual construction or implementation phase of the cleanup process.
Remedy In Place	For long-term remedies where it is anticipated that remedial action objectives will be achieved over a long period, the RIP milestone signifies the completion of the remedial action construction phase, and that the remedy has been implemented and has been demonstrated to be functioning as designed (i.e., all testing has been accomplished and the remedy will function properly). Once all RCs and RIPs have been documented for every site at the facility and the terms of the FFA have been met, site closeout and NPL deletion is completed.
Response Complete	Within the CERCLA process there are multiple points at which a decision can be made that no further response action is required; properly documented (necessary regulatory notification or application for concurrence has occurred) these decisions constitute response complete and/or site closeout. RC is the point at which the remedy has achieved the required reduction in risk to human health and the environment (cleanup goals have been met). Response complete is followed by site closeout.
Five Year Review	Five-year reviews generally are required by CERCLA or program policy when hazardous substances remain on site above levels that permit unrestricted use and unlimited exposure. Five-year reviews provide an opportunity to evaluate the implementation and performance of a remedy to determine whether it remains protective of human health and the environment. Generally, reviews are performed 5 years after the initiation of a CERCLA response action, and are conducted every 5 years as long as future uses remain restricted. Five-year reviews for WPNSTA Yorktown are performed by the Navy, the lead agency for the site, but EPA retains responsibility for determining the protectiveness of the remedy.



Legend

- Active RI/FS Sites (one or more media)
- Action SSP Sites/SSAs (one or more media)
- No Further Action RI/FS Sites and SSP SSAs
- MMRP Sites

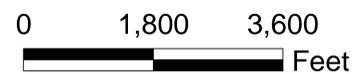


Figure 2-1
 Sites/SSA Locations/AOC Locations/MMRP sites and CERCLA Status
 Site Management Plan for FY 2011 to 2012
 Naval Weapons Station Yorktown
 Yorktown, Virginia

WPNSTA Yorktown Site and SSA Descriptions

This section provides a summary of base-wide investigations as well as a brief history of CERCLA activities (chronology of significant CERCLA documents and milestones), a summary of the nature and extent of potential contamination, potential unacceptable risks, RAs, and CERCLA path forward for each of the sites and the one SSA at WPNSTA. Schedules for this FY 2011-2012 SMP illustrate ongoing and planned CERCLA activities between 2008 and 2013. In addition, this section includes a list of top documents for the Base that should be priority for regulatory review in FY 2011-2012.

3.1 Base-wide Studies

WPNSTA Yorktown initiated its environmental investigation and restoration efforts in 1984 under the NACIP program by conducting an Initial Assessment Study (IAS). The purpose of the IAS was to identify and assess sites posing a potential threat to human health and/or the environment due to contamination from past operations. A total of 19 sites were identified based on information from historical records, aerial photographs, field inspections, and personnel interviews. The IAS concluded that 15 of the 19 sites posed a sufficient threat to human health or the environment to warrant Confirmation Studies (C. C. Johnson & Associates, Inc. and CH2M HILL, 1984).

Confirmation Studies included the collection and analysis of groundwater, sediment, and soil in 1986 and 1988. In 1986, samples were collected from the 15 sites identified in the IAS (Dames & Moore, 1986). The 1988 sampling effort consisted of additional analysis of groundwater, sediment, and soil (Dames & Moore, 1988). In 1992, an RI Interim Report summarized confirmation study results and recommended further RI activities at 14 of the 15 sites (Versar, 1991).

A Focused Biological Sampling and Preliminary Risk Evaluation was completed in 1993 summarizing results of a limited biological tissue, surface water, and sediment sampling effort to evaluate the potential human health risk associated with consumption of fish and shellfish taken from select waters within WPNSTA Yorktown, including Lee Pond, Roosevelt Pond, Felgates Creek, and Indian Field Creek (Baker and Weston, 1993a). A Habitat Evaluation was completed at WPNSTA Yorktown in 1995 that characterized the aquatic and terrestrial habitats at Sites 1, 2, 3, 4, 6, 7, 8, 9, 11, 12, 16, 17, 18, 19, and 21. The evaluation described the major habitat types on or surrounding each site, provided an inventory of vegetative species, and a record of any animal species encountered or suspected to be present (Baker, 1995a).

A Five-Year Review was conducted in both 2002 and 2007 to evaluate the effectiveness of the remedies at sites for which there is a ROD or Decision Document (DD) in place to determine if the remedies continue to be protective of human health and the environment. The 2002 and 2007 Five-Year Reviews included an evaluation of Sites 1, 6, 7, 12, 16, and 19. The 2007 Five-Year Review also included an evaluation of Sites 3, 11, and 17. Both documents concluded that all site remedies were found to be properly implemented and

protective of human health and the environment. The 2007 Five-Year Review recommended Explanations of Significant Differences (ESD), documenting the change in scope, performance, and cost of the remedies selected in the RODs, for Sites 3, 6, 12, 16, and 17.

In March 2009, a draft update to the WPNSTA Yorktown and CAX CIP was prepared to assist the Navy in meeting the needs of the local community for information about, and participation in, the ongoing investigation and remedial processes (CH2M HILL, 2009a). The CIP identifies community concerns about the investigation and restoration of potentially contaminated sites at WPNSTA Yorktown and CAX and outlines community involvement activities to be conducted during the ongoing and anticipated future restoration activities. In general, the local populace trusts the Navy and feels that the Navy has a good relationship with the community.

A summary of the aforementioned documents is presented in the table below.

Document Title /Milestone	Author/Date	Administrative Record (AR) Document Number
Initial Assessment Study of Naval Weapons Station Yorktown	C.C. Johnson/ CH2M HILL ,1984	000247
Confirmation Study Step 1A (Verification), Round One	Dames and Moore, 1986	000256
Confirmation Study Step 1A (Verification), Round Two	Dames and Moore, 1988	000259
Remedial Investigation Interim Report	Versar, 1991	000812
Focused Biological Sampling and Preliminary Risk Evaluation	Baker and Weston, 1993	000310
Five-Year Review Report for Sites 1, 6, 7, 12, 16, and 19	Baker, 2002	001310
Five-Year Review Report for Sites 1, 3, 6, 7, 11, 12, 16/SSA16, 17, and 19	CH2M HILL, 2007	002155
Community Involvement Plan	CH2M HILL, 2009	000007

3.2 Site Descriptions

Background information for sites, SSAs, and AOCs with no action or NFA decisions prior to 2007 is provided in the “baseline” FY08-09 SMP. Sites included in this category are comprised of: Site 5, Site 18, Site 27, SSA 2, SSA 3, SSA 4, SSA 5, SSA 8, SSA 11, SSA 12, SSA 13, SSA 17, SSA 19, SSA 21, SSA 23, AOC 1, AOC 2, AOC 3, AOC 4, AOC 8, AOC 9, AOC 10, AOC 11, AOC 12, AOC 13, AOC 14, AOC 15, AOC 16, AOC 17, AOC 18, AOC 19, AOC 20, and AOC 21. Additional information on these sites, SSAs, and AOCs is also included in [Table 2-1](#).

3.2.1 Site 1—Dudley Road Landfill

3.2.1.1 Site Description

Site 1 is a 10-acre landfill located in the northern portion of WPNSTA Yorktown west of Indian Field Creek and north of an unnamed tributary to the creek ([Figure 3-1](#)). 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 soil-covered landfill is wooded and acts as a riparian buffer for the adjacent Indian Field Creek. Depth to groundwater is approximately between 3 and 10 feet below ground surface (bgs). Groundwater in both the Columbia and Yorktown-Eastover aquifers flows primarily toward Indian Field Creek and its tributary. Indian Field Creek discharges to the York River (approximately 1 mile) downstream of Site 1.

Site 1 was historically used for sand mining activities, resulting in the construction of two borrow pits, which were subsequently filled with waste materials. Between 1965 and 1979, Site 1 was operated as a landfill under a VDEQ Conditional Permit (No. 287) for disposal of solid waste materials in the borrow pits. Disposed waste included, 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; and plastic lens grinding waste. These wastes were estimated at quantities of 17 tons per year (tons/year) for approximately 15 years. In 1979, the landfill was closed except for the disposal of plastic lens grinding residues, which continued for two years after the closure of the main landfill. In 1985, the landfill was closed to the receipt of all waste materials. A summary of relevant documents and action milestones is presented in the table below.

Documents and Milestones

Document Title /Milestone	Author/Date	AR Document Number
Round One Remedial Investigation Report for Sites 1-9, 11, 12, 16-19, and 21	Baker and Weston, 1993	000313
Round Two Remedial Investigation Report, Sites 1 and 3	Baker, 1998	000998
Hot Spot Delineation	Baker, 1997	N/A
Feasibility Study for Sites 1 and 3	Baker, 1997	001158
Proposed Remedial Action Plan for Sites 1 and 3	Baker, 1998	001840
Record of Decision, Operable Unit Nos. VIII and IX, Site 1 and Site 3	Baker, 1999	001000
Remedial Action Report for Sites 1 and 3 and SSA 22	OHM, 2001	001091
Remedial Design for Naval Weapons Station Yorktown Site 1	Baker, 2006	Draft – no AR No
Long-Term Monitoring Report for Sites 1, 3, and 7	Baker, 2006	002075
Phase I Remedial Investigation Report for Groundwater at Sites 1, 3, 6, 7, 11, 17, 24, and 25	CH2M HILL, 2007	002158
Five-Year Review Report for Sites 1, 3, 6, 7, 11, 12, 16/SSA16, 17, and 19	CH2M HILL, 2007	002155

3.2.1.2 Nature and Extent of Potential Contamination

The buried waste at Site 1 is the source of contamination to soil, groundwater, sediment, and surface water. Previous investigations included analysis of soil, groundwater, sediment, and surface water for the target compound list (TCL) volatile organic compounds (VOCs), TCL semivolatile organic compounds (SVOCs), pesticides, polychlorinated biphenyls (PCBs), explosives, and target analyte list (TAL) inorganics. The most recent soil data available is

from the *Remedial Action Report for Sites 1 and 3 and SSA 22* (OHM, 2001a). The most recent sediment and surface water data available is from the *LTM Report for Sites 1, 3, and 7* (Baker, 2006b). The most recent groundwater data available is from the *Phase I RI Report for Groundwater at Sites 1, 3, 6, 7, 11, 17, 24, and 25* (CH2M HILL, 2007a). Surface water and sediment samples were collected near Site 1 as part of an overall evaluation of surface water related to Sites 1 and 3, as they are adjacent to each other and contribute runoff and groundwater discharge to the Indian Field Creek. The current nature and extent of contamination for each media at Site 1, as documented in the above reports, is summarized below.

Soil

During the development of the FS (Baker, 1997b), remediation goals (RGs) were developed for constituents of concern (COCs) identified in soil during previous investigations to be protective of human and ecological receptors under a future commercial/industrial land use scenario. A removal action was conducted beginning in July 1999 to remove and dispose of contaminated soil and waste.

Remediation Goals for COCs in Soil

COC	Arsenic
Remediation Goal (mg/kg)	63

Following the completion of removal activities in April 2000, post-removal confirmation samples indicated that concentrations of all COCs were below established RGs.

Groundwater

Detected concentrations were screened against maximum base-wide background concentrations and maximum contaminant levels (MCLs) in order to aid in determining which sites required further investigation.

Columbia Aquifer

- No pesticides or PCBs were detected and no SVOCs were detected exceeding associated screening values.
- Thirteen VOCs were detected in groundwater, of which three exceeded associated screening values. Detected concentrations of cis 1,2-dichloroethene (1,2-DCE) (130 micrograms per liter [µg/L]), TCE (90 µg/L), and vinyl chloride (VC) (14 µg/L) exceeded the Federal MCLs in one or more samples.
- Nineteen total and eighteen dissolved inorganics were detected, of which one total and one dissolved inorganics exceeded associated screening criteria. Detected concentrations of total (388 µg/L) and dissolved (270 µg/L) aluminum, total (22,800 µg/L) and dissolved (20,200 µg/L) iron, total (2,480 µg/L) and dissolved (2,930 µg/L) manganese, total (12.4 J µg/L) and dissolved (13.1 J µg/L) nickel, total (2,350 µg/L) and dissolved (2,420 µg/L) zinc exceeded the maximum base-wide background concentration in one or more samples; however, no concentrations detected exceeded the Federal MCL. Detected concentrations of total (6.7 µg/L) and dissolved (5.3 µg/L) cadmium exceeded the maximum base-wide background concentrations and the Federal MCL in one or more sample locations.

Yorktown-Eastover Aquifer

- No pesticides or PCBs were detected. Additionally, no SVOCs were detected exceeding associated screening values.
- Thirteen VOCs were detected in groundwater, of which three exceeded associated screening values. Detected concentrations of TCE (760 µg/L), cis-1,2-DCE (160 µg/L), and VC (7 µg/L) exceeded the Federal MCLs in one or more samples.
- Nineteen total and eighteen dissolved inorganics were detected, of which two total and three dissolved inorganics exceeded associated screening values. Detected concentrations of total (1,420 µg/L) and dissolved (2,670 µg/L) aluminum, total (38 µg/L) and dissolved (95.9 µg/L) manganese, and dissolved iron (1,180 µg/L) exceeded the maximum base-wide background concentration in one or more samples; however, no concentrations detected exceeded the Federal MCL.

Surface Water

Indian Field Creek

During long-term monitoring (LTM), there were sporadic detections of cis-1,2-DCE and VC within all of the surface water sample locations. While none of these chlorinated solvent detections exceeded the Biological Technical Assistance Group (BTAG) screening values, these detections indicate possible contaminant migration from groundwater to surface water. There is no indication that surface runoff would cause chlorinated solvents to be detected in the surface water, as there is no evidence of a surface source that would contribute to surface water detections.

Sediment

Indian Field Creek

During LTM, there were sporadic detections of TCE, cis-1,2-DCE, and VC in sediment sample locations. While none of these chlorinated solvent detections exceeded the BTAG screening values, these detections indicate possible contaminant migration from groundwater to sediment.

3.2.1.3 Potential Risks

A summary of the most current risk assessments and risk management considerations for exposure to each site media is provided below.

Soil

A ROD was finalized in July 1999 (Baker, 1999a) to address debris and contaminants identified in surface soil. The removal action conducted at Site 1 reduced concentrations of all COCs to below established RGs previously agreed upon by the Navy and the USEPA, in partnership with the VDEQ. Following the removal action, land use controls (LUCs) were implemented prohibiting residential development of Site 1 and disturbance of the soil cover. LUCs will be required as long as subsurface waste remains in place in order to remain protective of human health and the environment.

Groundwater

The Human Health Risk Assessment (HHRA) conducted as part of the *Round Two Remedial Investigation Report, Sites 1 and 3* (Baker, 1998a) assessed risk to receptors through ingestion, dermal contact, and inhalation of vapors under a potable-use scenario.

Columbia Aquifer

Potential unacceptable non-cancer hazards were identified for future adult and child residents. For future adult residents, the reasonable maximum exposure (RME) non-carcinogenic hazard associated with exposure to groundwater (hazard index [HI] = 3.8) is above the acceptable HI. The central tendency exposure (CTE) non-carcinogenic hazard (HQ = 0.7) is less than the acceptable HI. For future child residents, the non-carcinogenic hazard associated with exposure to groundwater (HI = 6.3) exceeds the target HI. The CTE non-carcinogenic hazard (HQ = 2) also exceeds the target HI.

Yorktown-Eastover Aquifer

Potential unacceptable cancer risks and non-cancer hazards were identified for future adult and child residents. For future adult residents, the RME carcinogenic risk (CR) associated with exposure to groundwater ($CR = 3.2 \times 10^{-4}$) is above the USEPA's target risk range. The CTE carcinogenic risk ($CR = 3.7 \times 10^{-5}$) is within the USEPA's target risk range. The RME non-carcinogenic hazard associated with exposure to groundwater (HI = 3.3) is above the target HI. The CTE non-carcinogenic hazard (hazard quotient [HQ] = 0.6) is less than the target HI. For future child residents, the RME carcinogenic risk associated with exposure to groundwater ($CR = 2 \times 10^{-4}$) is above the USEPA's target risk range. The CTE carcinogenic risk ($CR = 8.2 \times 10^{-5}$) is within the USEPA's target risk range. The RME non-carcinogenic hazard associated with exposure to groundwater (HI = 7.6) is above the target HI. The CTE non-carcinogenic hazard (HI = 1.8) is also above the target HI.

The Environmental Risk Assessment (ERA) did not assess risk posed to ecological receptors due to groundwater exposure because no complete exposure pathway was identified.

Surface Water

Indian Field Creek

As part of the ROD finalized in July 1999 (Baker, 1999a), LTM of surface water is required to ensure that the remedy in place remains protective of human health and the environment. Since concentrations of chlorinated solvents in the surface water samples collected during LTM sampling were less than both BTAG screening values and MCLs, no adverse effects are expected for human or ecological receptors from exposure to surface water.

Sediment

Indian Field Creek

As part of the ROD finalized in July 1999 (Baker, 1999a), LTM of sediment is required to ensure that the remedy in place remains protective of human health and the environment. Since concentrations of chlorinated solvents in the surface water samples collected during LTM sampling were less than both BTAG screening values, no adverse effects are expected for human or ecological receptors from exposure to sediment.

3.2.1.4 Remedial Action(s)

A Non-Time-Critical removal action (NTCRA) was initiated in July 1999 to excavate soil posing potential risks to human health and the environment. Post-excavation samples were collected and compared to RGs. Based on post-removal analytical results, concentrations of all COCs remaining were below RGs. In total, 413 tons of contaminated soils/debris were removed. The excavated area of arsenic-contaminated soil was backfilled with on-base borrow material. Additionally, a 4-inch layer of topsoil was placed on the excavated area and then re-graded to provide natural contours and enhance runoff from Site 1. Eighteen

inches of fill soil and six inches of topsoil were placed on the northern area of the landfill (OHM, 2001a). Following the completion of the NTCRA, LUCs on soil and LTM of groundwater, surface water, and sediment was initiated (Baker, 1999a).

3.2.1.5 Activities Completed FY2010

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 as intended by the ROD.

Fieldwork for the *Phase II RI Report* was completed and reporting is expected in FY2011.

3.2.1.6 CERCLA Path Forward

- Phase II RI Report
- FS/PP/ROD for groundwater, surface water, and sediment, as appropriate
- Remedial Action Completion Report (RACR)
- Five-Year Review for soil (2012)

[Schedule 3-1](#) presents the FY11-12 schedule for Site 1.

3.2.2 Site 3—Group 16 Magazine Landfill

3.2.2.1 Site Description

Site 3, the Group 16 Magazines Landfill is a two-acre wooded area behind the former Group 16 Magazines located in the northern portion of WPNSTA Yorktown west of Indian Field Creek ([Figure 3-2](#)). Site 3 is named for its proximity to the Group 16 Magazines; however, the history of this landfill is unrelated to operations at the magazines. Surface water and groundwater flow to the north/northeast toward Indian Field Creek. The area adjacent to Indian Field Creek is covered by woods that act as a riparian buffer for surface water runoff. North and south of Site 3 are two unnamed tributaries that lead into Indian Field Creek.

The site was originally used for sand mining and consisted of one borrow pit to a depth of 10 feet bgs. Between 1940 and 1970, Site 3 was operated as a landfill. Approximately 90 tons of waste was disposed of in the borrow pit and reportedly included solvents, sludge from boiler cleaning operations, grease trap wastes, Imhoff tank skimmings (containing oil and grease), and animal carcasses. The Site 3 waste boundary was approximated as part of previous investigations including a geophysical survey. Test pit investigations performed in 1997 confirmed the presence of scrap metal, 55-gallon metal drums, grease, wax, lumber, banding, concrete blocks, plastic sheeting, and surface debris. A summary of relevant documents and action milestones is presented in the table below.

Documents and Milestones

Document Title /Milestone	Author/Date	AR Document Number
Round One Remedial Investigation Report for Sites 1-9, 11, 12, 16-19, and 21	Baker and Weston, 1993	000313
Round Two Remedial Investigation Report, Sites 1 and 3	Baker, 1998	000998
Feasibility Study for Sites 1 and 3	Baker, 1997	001158
Proposed Remedial Action Plan for Sites 1 and 3	Baker, 1998	001840

Document Title /Milestone	Author/Date	AR Document Number
Record of Decision, Operable Unit Nos. VIII and IX, Site 1 and Site 3	Baker, 1999	001000
Remedial Action Report for Sites 1 and 3 and SSA 22	OHM, 2001	001091
Long-Term Monitoring Report for Sites 1, 3, and 7	Baker, 2006	002075
Phase I Remedial Investigation Report for Groundwater at Sites 1, 3, 6, 7, 11, 17, 24, and 25	CH2M HILL, 2007	002158
Five-Year Review Report for Sites 1, 3, 6, 7, 11, 12, 16/SSA16, 17, and 19	CH2M HILL, 2007	002155
Post-Remedial Action Site Conditions Technical Memorandum, Site 3	Baker, 2008	002200
Explanation of Significant Differences, Site 3	CH2M HILL, 2008	002351

3.2.2.2 Nature and Extent of Potential Contamination

The waste at Site 3 was the source of potential contamination to soil, groundwater, sediment, and surface water. Previous investigations included analysis of soil, groundwater, sediment, and surface water for TCL VOCs, TCL SVOCs, pesticides, PCBs, explosives, and TAL inorganics. The most recent soil data available is from the *Remedial Action Report for Sites 1 and 3 and SSA 22* (OHM, 2001a). The most recent sediment and surface water data available is from the *LTM Report for Sites 1, 3, and 7* (Baker, 2006b). The most recent groundwater data available is from the *Phase I RI Report for Groundwater at Sites 1, 3, 6, 7, 11, 17, 24, and 25* (CH2M HILL, 2007a). Surface water and sediment samples were collected near Site 3 as part of an overall evaluation of surface water related to Sites 1 and 3, as they are adjacent to each other and contribute runoff and groundwater discharge to the Indian Field Creek. The current nature and extent of contamination for each media at Site 3, as documented in the above reports, is summarized below.

Soil

During the development of the FS (Baker, 1997b), RGs were developed for COCs identified in soil during previous investigations to be protective of human and ecological receptors under a future commercial/industrial land use scenario. A removal action was conducted beginning in July 1999 to remove and dispose of contaminated soil and waste.

Remediation Goals for COCs in Soil

COC	Carcinogenic Poly Hydrocarbons (cPAHs)
Remediation Goal (mg/kg)	10

Following the completion of removal activities in July 1999, post-removal confirmation samples indicated that concentrations of all COCs were below established RGs.

Groundwater

Detected concentrations were screened against maximum base-wide background concentrations and MCLs in order to aid in determining which sites required further investigation.

Yorktown-Eastover Aquifer

- Ten VOCs were detected in groundwater, of which three exceeded associated screening values. Detected concentrations of TCE (120 µg/L), cis-1,2-DCE (320 µg/L), and VC (42 µg/L) exceeded Federal MCL in one or more sampling location.
- Twenty-one total and fifteen dissolved inorganics were detected in groundwater, of which one total and one dissolved inorganic exceeded associated screening values. Detected concentrations of total (55.3 µg/L) and dissolved (57.6 µg/L) manganese exceeded the maximum base-wide background concentration in one or more samples; however, no concentrations detected exceeded the Federal MCL.

Surface Water

Indian Field Creek

During LTM, there were sporadic detections of cis-1,2-DCE and VC within all of the surface water sample locations. While none of these chlorinated solvent detections exceeded the BTAG screening values, these detections indicate probable contaminant migration from groundwater to surface water. There is no indication that surface runoff would cause chlorinated solvents to be detected in the surface water, as there is no evidence of a surface source that would contribute to surface water detections.

Sediment

Indian Field Creek

During LTM, there were sporadic detections of TCE, cis-1,2-DCE, and VC in sediment sample locations. While none of these chlorinated solvent detections exceeded the BTAG screening values, these detections indicate probable contaminant migration from groundwater to sediment.

3.2.2.3 Potential Risks

A summary of the most current risk assessments and risk management considerations for exposure to each site media is provided below.

Soil

A ROD was finalized in July 1999 (Baker, 1999a) to address debris and contaminants identified in surface soil. The removal action conducted at Site 3 reduced concentrations of all COCs to below established RGs previously agreed upon by the Navy and the USEPA, in partnership with the VDEQ. Following the removal action, LUCs were implemented prohibiting residential development of Site 3. However, a review of post-excavation analytical results presented in *Post-Remedial Action Site Conditions Technical Memorandum, Site 3* indicated that the 95 percent upper confidence limit (UCL) for the total cPAHs remaining in soil was below the level allowing for unrestricted land use (1 milligrams per kilogram [mg/kg]). An ESD to the ROD was subsequently signed in December 2008 to document the removal of LUCs for soil and the determination that NFA is required to address soil at Site 3.

Groundwater

Yorktown-Eastover Aquifer

The HHRA conducted as part of the *Round Two Remedial Investigation Report, Sites 1 and 3* (Baker, 1998a) assessed risk to receptors through ingestion, dermal contact, and inhalation of vapors under a potable use scenario. Potential unacceptable cancer risks and non-cancer hazards were identified for future adult and child residents. For future adult residents, the RME carcinogenic risk associated with exposure to groundwater ($CR = 2.8 \times 10^{-4}$) is above the USEPA's target risk range. The CTE carcinogenic risk ($CR = 3.4 \times 10^{-5}$) is within the USEPA's target risk range. The RME non-carcinogenic hazard associated with exposure to groundwater ($HI = 1.4$) is above the target HI. The CTE non-carcinogenic hazard ($HQ = 0.4$) is less than the target HI. For future child residents, the RME carcinogenic risk associated with exposure to groundwater ($CR = 1.6 \times 10^{-4}$) is above the USEPA's target risk range. The CTE carcinogenic risk ($CR = 7.3 \times 10^{-5}$) is within the USEPA's target risk range. The RME non-carcinogenic hazard associated with exposure to groundwater ($HI = 3.3$) is above the target HI. The CTE non-carcinogenic hazard ($HI = 1.2$) is also above the target HI.

The ERA did not assess risk posed to ecological receptors due to groundwater exposure because no complete exposure pathway was identified.

Surface Water

Indian Field Creek

Since the concentrations of chlorinated solvents in the surface water samples were less than both BTAG screening values and MCLs, the LTM report concluded that no adverse effects are likely for human or ecological receptors from exposure to surface water (Baker, 2006b).

Sediment

Indian Field Creek

Since concentrations of chlorinated solvents in the surface water samples collected during LTM sampling were less than both BTAG screening values, the LTM report concluded that no adverse effects are likely for human or ecological receptors from exposure to sediment (Baker, 2006b).

3.2.2.4 Remedial Action(s)

A removal action was initiated in July 1999 to excavate soil posing potential risks to human health and the environment. Based on post-removal analytical results, concentrations of all COCs remaining were below RGs. In total, 284 tons of polyaromatic hydrocarbon (PAH) contaminated soil and landfill waste, consisting of 2,700 tons of galley waste, 50 drums of solidified resin (22 tons), and 127 tons of abandoned dry cell batteries were removed. The excavated area was backfilled with on-base borrow material and re-graded (OHM, 2001a). Following the completion of the NTCRA, LUCs on soil and groundwater and LTM of groundwater, surface water, and sediment was initiated (Baker, 1999a). However, a review of the confirmation samples collected during the removal action revealed that the removal action had reduced concentrations of COCs to levels protective of unrestricted land use. An ESD was finalized in 2008 rescinding LUC and LTM requirements established in the ROD for soil, surface water, and sediment (CH2M HILL, 2008a).

3.2.2.5 Activities Completed FY2010

Fieldwork for the *Phase II RI Report* has been completed and reporting is expected in FY2011.

3.2.2.6 CERCLA Path Forward

- Phase II RI Report
- FS/PP/ROD for groundwater, surface water, and sediment, as appropriate
- RACR

[Schedule 3-2](#) presents the FY11-12 schedule for Site 3.

3.2.3 Site 4—Burning Pad Residue Landfill

3.2.3.1 Site Description

Site 4, the Burning Pad Residue Landfill, consists of a ten-acre open field surrounded by woods in the north-central portion of WPNSTA Yorktown ([Figure 3-3](#)). The site is bordered by Site 22 to the south, by Site 21 and an unnamed tributary leading to the Eastern Branch of Felgates Creek to the southeast, and an intermittent drainage channel to the east. The topography of Site 4 is relatively flat, sloping gently to the south and southwest toward Site 22 and the Eastern Branch of Felgates Creek. Topography to the southeast slopes sharply toward the tributary to the Eastern Branch of Felgates Creek.

Site 4 received an estimated 17 tons of waste per year between 1940 and approximately 1975. Materials reportedly disposed at Site 4 included: carbon-zinc batteries from underwater weapons; burning pad residues (possibly containing aluminum, hexahydro-1,3,5-trinitro-1,3,5-triazine [RDX], TNT, 2,4- dinitrotoluene [2,4-DNT], and octahydro-1,3,5,7-tetranitro-1,3,5,7-tetrazocine [HMX]); tree stumps; fly ash from coal-fired boilers; mine casings; electrical equipment; and transformers. Limits of waste disposal were estimated based on the completion of 28 test pits and a geophysical survey (Baker and Weston, 1993b). Depth of fill material was estimated to be 5 to 10 feet bgs (Baker and Weston, 1993b). An ash pile (estimated to be 6 feet thick and covering an area of approximately 3,000 square feet [ft²]) from the burning of explosives and VOCs at Site 22 was located in the northeast corner of Site 4. A summary of relevant documents and action milestones is presented in the table below.

Documents and Milestones

Document Title /Milestone	Author/Date	AR Document Number
Round One Remedial Investigation Report for Sites 1-9, 11, 12, 16-19, and 21	Baker and Weston, 1993	000313
Engineering Evaluation/Cost Analysis For Sites 4, 16, and 21 Removal Actions	Baker and Weston, 1993	000331
Closeout Report, Sites 4, 16, and 21, Battery and Drum Disposal Area	IT, 1995	000616
Post-Removal Confirmation Sampling Report and Baseline Ecological Risk Assessment (BERA)	Baker, 1995	000660 (Volume I) 000661 (Volume II) 000662 (Volume III)
Round Two Remedial Investigation Report, Sites 4, 21, and 22	Baker, 2001	001296 (Volume I) 001297 (Volume II) 001298 (Volume III)
Feasibility Study, Sites 4, 21, and 22	Baker, 2001	001160
Proposed Remedial Action Plan, Sites 4 and 22	Baker, 2001	001290

Document Title /Milestone	Author/Date	AR Document Number
Project Closeout Report for Site 4 – Burn Pad Residue Landfill	Shaw, 2005	001680
Record of Decision, Site 4 – Burning Pad Residue Landfill	Baker, 2005	002026
Remedial Investigation Report for Groundwater at Sites 4, 21, and 22	CH2M HILL, 2009	000024

3.2.3.2 Nature and Extent of Potential Contamination

The waste at Site 4 was the source of potential contamination to soil, groundwater, sediment, and surface water. Previous investigations included analysis of soil, groundwater, sediment, and surface water for TCL VOCs, TCL SVOCs, pesticides, PCBs, explosives, and TAL inorganics. In addition, surface soil samples were analyzed for dioxin and dibenzofuran. The most recent available data for soil is from the 2001 *Project Closeout Report for Site 4 – Burn Pad Residue Landfill* (Shaw, 2005c). The most recent available groundwater, surface water, and sediment data is from the 2009 *Remedial Investigation Report for Groundwater at Sites 4, 21, and 22* (CH2M HILL, 2009c). Surface water and sediment samples were collected near Site 4 as part of an overall evaluation of surface water related to Sites 4, 21, and 22, as they are adjacent to each other and contribute runoff and groundwater discharge to the Eastern Branch of Felgates Creek. The current nature and extent of contamination for each media at Site 4, as documented in the above reports, is summarized below.

Soil

During the development of the EE/CA (Baker and Weston, 1993c), RGs were established for COCs identified to be protective of a future unrestricted land use scenario. A removal action was conducted beginning in September 2001 to remove and dispose of contaminated soil and waste.

Remediation Goals for COCs in Soil

COC	Total cPAHs	Total PAHs	TNT	Aluminum	Antimony	Arsenic
Remediation Goal (mg/kg)	10	44	44	24,100	11	63.9

COC	Chromium	Copper	Lead	Manganese	Mercury	Zinc
Remediation Goal (mg/kg)	33.5	100	48.7	491	0.24	410

Following the completion of removal activities in September 2003, post-removal confirmation samples indicated that concentrations of all COCs were below established RGs.

Groundwater

3.2.3.3 Yorktown-Eastover Aquifer

- No PCBs or SVOCs were detected. No pesticides detected exceeded associated screening values.
- One VOC was detected in groundwater, which was detected at the associated screening value. Detected concentrations of TCE (1.4 J µg/L) were at the tap water RSL in one sample location.
- Ten explosives were detected in groundwater, of which two exceeded associated screening values. Detected concentrations of 1,3-dinitrobenzene (5.9 µg/L) and RDX (1.9 µg/L) exceeded the tap water RSL, each in one sample location.
- Twenty total and fifteen dissolved inorganics were detected in groundwater, of which four total and one dissolved inorganic exceeded associated screening values. Detected concentrations of total (13.6 µg/L) and dissolved (8.7 J µg/L) arsenic, total (26.4 µg/L) lead, total (465 J µg/L) chromium, and total (1,820 µg/L) manganese exceeded the tap water RSL and/or MCL in one or more sample locations.

3.2.3.4 Groundwater Seeps

- No VOCs or SVOCs detected exceeded associated screening values. No pesticides detected exceeded associated screening values.
- Nine explosives were detected in groundwater seep samples, of which two exceeded associated screening values. Detected concentrations of 1,3-dinitrobenzene (6.9 µg/L) and RDX (37 µg/L) exceeded the tap water RSL multiplied by 10, both in one sample location.
- Nineteen total and ten dissolved inorganics were detected in groundwater seep samples, of which three total inorganics exceeded associated screening values. No dissolved inorganics exceeded associated screening values. Detected concentrations of total (14 µg/L) arsenic, total (35,400 µg/L) iron, and total (16 µg/L) lead exceeded the tap water RSL multiplied by 10 in one or more sample locations.

Surface Water

Eastern Branch of Felgates Creek

- No SVOCs or PCBs were detected. No VOCs or pesticides were detected exceeding associated screening values.
- Six explosives were detected in surface water, of which one exceeded associated screening values. Detected concentrations of RDX (8.8 µg/L) exceeded the tap water RSL multiplied by 10 in one sample location.
- Twenty-two total and fourteen dissolved inorganics were detected in surface water, of which eight total and five dissolved inorganics exceeded associated screening values. Detected concentrations of total (56,200 µg/L) and dissolved (362 µg/L) aluminum, total (26.5 µg/L) and dissolved (5.5 J µg/L) arsenic, total (124 J µg/L) and dissolved (33 µg/L) barium, total (88,800 µg/L) iron, total (64.5 µg/L) lead, total (1,000 µg/L) and dissolved (292 µg/L) manganese, total (5.6 J µg/L) and dissolved (5.7 J µg/L) thallium,

and total (118 µg/L) vanadium exceeded the human health or ecological screening value in one or more samples. Overall, total metals concentrations in surface water are elevated at the mouth of the unnamed tributary relative to the upstream reference sample concentrations. No source for metals contamination has been identified based on the site data, and elevated concentrations are likely a result of suspended sediment.

Sediment

Eastern Branch of Felgates Creek

No SVOCs, pesticides, PCBs, or explosives were detected. No VOCs or inorganics were detected exceeding associated screening values.

3.2.3.5 Potential Risks

A summary of the most current risk assessments and risk management considerations for exposure to each site media is provided below.

Soil

Following the removal action conducted at Site 4, concentrations of all identified COCs were reduced to below the established RGs. The Navy and the USEPA, in partnership with the VDEQ reached consensus that NFA for soil is required. A NFA ROD for site soil was signed in September 2005 (Baker, 2005a).

Groundwater

The HHRA conducted as part of the *RI for Groundwater at Sites 4, 21, and 22* (CH2M HILL, 2009c) assessed risk to receptors through ingestion, dermal contact, and inhalation of vapors under a potable use scenario. As per EPA guidance, carcinogenic risks were only calculated for lifetime child/adult residents. Potential unacceptable non-cancer hazards were identified for future adult and child residents. Potential unacceptable cancer risks were identified for lifetime child/adult residents. The RME non-carcinogenic hazard for future adult residents associated with exposure to groundwater (HI = 2.6) is above the acceptable HI of 1.0. The hazard is primarily associated with ingestion of 1,3-dinitrobenzene (HQ = 1.4). The CTE non-carcinogenic hazard (HQ = 0.41) is less than the acceptable HI of 1.0. The RME non-carcinogenic hazard for future child residents associated with exposure to groundwater (HI = 6) exceeds the acceptable HI of 1.0. The hazard is primarily associated with ingestion of 1,3-dinitrobenzene (HQ = 3.3) and arsenic (HQ = 1.9). The CTE non-carcinogenic hazard (HQ = 1.4) also exceeds the acceptable HI; however, there are no individual target organ/effects with HIs exceeding 1.0. The RME carcinogenic risk for lifetime child/adult residents associated with exposure to groundwater (CR = 2.0×10^{-4}) is above USEPA's target risk range of 10^{-6} to 10^{-4} . The risk is primarily associated with ingestion of RDX (CR = 1.7×10^{-4}), and ingestion and dermal contact with tetrachloroethene (PCE) (CR = 9.4×10^{-5}). The CTE carcinogenic risk associated with exposure to groundwater (5.1×10^{-5}) is within USEPA's target risk range. Arsenic and 1,3-dinitrobenzene were the two main risk drivers in groundwater. However, concentrations of arsenic did not pose risk under the CTE exposure scenario, and none of the concentrations in the dissolved samples exceeded the MCL. Concentrations of arsenic are likely to be related to geochemical conditions rather than a site source and, therefore, no additional action is necessary to address arsenic. 1,3-dinitrobenzene was detected in only one of thirteen samples at a concentration only slightly exceeding the RSL. There were no unacceptable risks associated with this chemical under the CTE scenario, and the original source of this contamination

(the landfill) has been removed. Consequently, no additional action is recommended to address groundwater at Site 4.

The ERA conducted as part of *RI for Groundwater at Sites 4, 21, and 22* (CH2M HILL, 2009c) identified no COCs due to direct contact or food web exposure associated with seep water. Thus, risks to ecological receptors are considered acceptable.

Surface Water

The HHRA conducted as part of the *RI for Groundwater at Sites 4, 21, and 22* (CH2M HILL, 2009c) assessed risk to receptors through incidental ingestion and dermal absorption. No unacceptable cancer risks or non-cancer hazards resulting from exposure to surface water were identified for any receptor.

The ERA conducted as part of the *RI for Groundwater at Sites 4, 21, and 22* (CH2M HILL, 2009c) identified no COCs due to direct contact or food web exposure associated with surface water. Thus, risks to ecological receptors are considered acceptable.

Sediment

The HHRA conducted as part of the *RI for Groundwater at Sites 4, 21, and 22* (CH2M HILL, 2009c) assessed risk to receptors through incidental ingestion and dermal absorption. No unacceptable cancer risks or non-cancer hazards resulting from exposure to sediment were identified for any receptor.

The ERA conducted as part of the *RI for Groundwater at Sites 4, 21, and 22* (CH2M HILL, 2009c) identified no COCs due to direct contact or food web exposure associated with sediment. Thus, risks to ecological receptors are considered acceptable.

3.2.3.6 Remedial Action(s)

A NTCRA was initiated in 1994 to remove surface debris, the ash pile, and buried batteries. Approximately 7,286 tons of waste including concrete, drums, batteries, inert ordnance, cables, construction debris, and roofing shingles were removed from Site 4 (IT, 1995a). A second NTCRA was initiated in 2001 whereby approximately 57,600 tons of waste (construction debris, transformers, drums, and ordnance items) and contaminated soil were excavated (Shaw, 2005a). Based on post-removal analytical results, concentrations of all COCs remaining were below RGs. Due to the extent of the excavation area, funding limitations prohibited the removal of all material and it was temporarily stockpiled onsite. Final removal and offsite disposal of all stockpiled soil and waste was completed in 2005 (Shaw, 2005c). Based on post-removal analytical results, concentrations of all COCs remaining were below RGs. The Navy and the USEPA, in partnership with the VDEQ, agreed that the NTCRA reduced COC concentrations posing no unacceptable risk. A NFA ROD for soil and waste at Site 4 was signed in September 2005 (Baker, 2005a).

3.2.3.7 Activities Completed FY2010

The RI Report for Groundwater at Sites 4, 21, and 22 was completed in November 2009. A PP documenting NFA for groundwater, surface water, and sediment for Site 4 has been developed and submitted for public comments.

3.2.3.8 CERCLA Path Forward

- Finalize NFA PP for groundwater, surface water, and sediment
- ROD for groundwater, surface water, and sediment

Schedule 3-3 presents the FY11-12 schedule for Site 4.

3.2.4 Site 6—Explosives Contaminated Wastewater Impoundment, Flume Area and Excavation Area, Buildings 109, 110 and 501

3.2.4.1 Site Description

Site 6 is located in the northern portion of WPNSTA Yorktown and consists of three areas: an impoundment area, a flume area, and an excavated pit (**Figure 3-4**).

Flume Area

Wastewater possibly containing explosives (TNT, RDX, and 2,4-DNT) and solvents (TCE, trichloroethane [TCA], and cyclohexanone) generated in Building 109 for explosives reclamation and in Building 110 for explosives loading, mixing, and casting, was discharged through a network of flumes into the Site 6 impoundment area between 1942 and 1975 (Baker, 1998b). In 1975, a carbon adsorption tower was installed to treat the contaminated wastewater prior to discharge into the drainage way. A National Pollutant Discharge Elimination System (NPDES) permit was granted to allow the discharge of effluent from the carbon adsorption tower containing acceptable concentrations of nitramines/nitroaromatics. In 1986, the effluent from the carbon adsorption tower was diverted to the sanitary sewer and ultimately to the Hampton Roads Sanitation District (HRSD) (Baker, 1998c).

Impoundment Area

The Site 6 impoundment area is a 3-acre, unlined, surface impoundment adjacent to wetlands along a small tributary to the main branch of Felgates Creek. The surface impoundment was created by building a coffer dam across the headwaters of the small tributary. Wastewater (containing explosives and solvents) was discharged to this area from the flume area between 1942 and 1975. After 1986, the surface impoundment collected only surface runoff from the area around Buildings 109 and 110. Wastewater discharges ceased in 2003 when operations in Buildings 109 and 110 terminated (Baker, 1998c).

Excavated Area

Although not well documented, the Site 6 excavated area may have been the soil borrow pit for construction of the coffer dam for the impoundment; it may have also been used to contain packed explosives. This area is northwest of former Building 501 and is currently wooded.

Site 6 is generally wooded with some open areas near the existing buildings. Site 6 topography generally slopes from east to west toward the impoundment area with ground surface elevations from approximately 40 feet above mean sea level (amsl) near Main Road to less than 10 feet amsl at the impoundment area. Surface water runoff from the site is conveyed to Felgates Creek either directly by overland flow or via tributaries located adjacent to Site 6.

The surface geology at Site 6 is consistent with Yorktown-Eastover aquifer lithology. The depth to groundwater mimics topography ranging from 1 to 35 feet bgs. Groundwater generally flows westward toward the impoundment and Felgates Creek. The Yorktown-

Eastover aquifer is approximately 80 feet thick in the vicinity of Site 6 and is underlain by the Eastover-Calvert confining unit (Brockman et al., 1997).

A summary of relevant documents and action milestones is presented in the table below.

Documents and Milestones

Document Title /Milestone	Author/Date	AR Document Number
Round One RI Report for Sites 1-9, 11, 12, 16-19, and 21	Baker and Weston, 1993	000313
Round Two Remedial Investigation Report, Sites 6 and 7	Baker, 1998	001294 (Volume I) 001295 (Volume II) 001346 (Volume III) 001347 (Volume IV)
Feasibility Study, v2, Sites 6 and 7	Baker, 1998	001077
Proposed Remedial Action Plan, v2, Sites 6 and 7	Baker, 1998	001838
Record of Decision, Operable Unit Nos. XII, XIII, XIV, and XV, Sites 6 and 7	Baker, 1998	001001
Contractor Closeout Report for Site 6 Remediation	OHM, 1999	001221
Five-Year Review Report for Sites 1, 6, 7, 12, 16, and 19	Baker, 2002	001310
Remedial Design for Naval Weapons Station Yorktown Sites 6 and 7	Baker, 2006	002268
Phase I Remedial Investigation Report for Groundwater at Sites 1, 3, 6, 7, 11, 17, 24, and 25	CH2M HILL, 2007	002158
Five-Year Review Report for Sites 1, 3, 6, 7, 11, 12, 16/SSA16, 17, and 19	CH2M HILL, 2007	002155
Draft Final Construction Closeout Report for Site 6 Bioremediation	Shaw, 2008	002354

3.2.4.2 Nature and Extent of Potential Contamination

The sources of potential contamination at Site 6 are related to the wastewater discharge from the network of flumes at the site and the possible storage of explosives within the excavated area. Previous investigations included analysis of soil, surface water, sediment, and groundwater for TCL VOCs, TCL SVOCs, explosives, and TAL inorganics. In addition, soil and groundwater were analyzed for pesticides and PCBs. The most recent surface water data available is from the *Round Two RI Report, Sites 6 and 7* (Baker, 1998c). The most recent groundwater data available is from the 2007 *Phase I RI for Groundwater at Sites 1, 3, 6, 7, 11, 17, 24, and 25* (CH2M HILL, 2007a). The most recent data for soil and sediment data available is from the 2008 *Construction Closeout Report for Site 6 Bioremediation* (Shaw, 2008a). The current nature and extent of contamination for each media at Site 6, as documented in the above reports, is summarized below.

Soil

During the development of the FS (Baker, 1998d), RGs were developed for COCs identified in soil at the excavated area during previous investigations to be protective of human and ecological receptors under a future commercial/industrial land use scenario. A removal action was conducted beginning in August 1998 to remove and treat contaminated soil.

Remediation Goals for COCs in Soil

COC	Cadmium	Zinc
Remediation Goal (mg/kg)	4	48.4

Post-removal confirmation samples indicated that concentrations of all COCs were below established RGs following the completion of removal activities in June 2007.

Groundwater

Detected concentrations were only screened against maximum base-wide background concentrations and MCLs in order to aid in determining which sites required further investigation.

Yorktown-Eastover Aquifer

- No PCBs were detected. No explosives exceeded associated screening values.
- Twelve VOCs were detected in groundwater, of which six exceeded associated screening values. Detected concentrations of 1,1-DCE (23 µg/L), cis 1,2-DCE (550 J µg/L), TCE (36,000 µg/L), and VC (8 K µg/L) exceeded the Federal MCLs in one or more sample locations.
- One SVOC was detected in groundwater, which exceeded associated screening values. Detected concentrations of bis-2-ethylhexyl phthalate (BEHP) (13 µg/L) exceeded the Federal MCL in one sample location; however, BEHP is a common laboratory contaminant and is likely to be site related.
- Five pesticides were detected in groundwater, of which one exceeded associated screening values. Detected concentrations of heptachlor epoxide (13 µg/L) exceeded the Federal MCL in three sample locations.
- Twelve total and nine dissolved inorganics were detected in groundwater, of which three total and five dissolved inorganics exceeded associated screening values. Detected concentrations of total (3,770 µg/L) aluminum, dissolved (5.3 J µg/L) arsenic, total (319 µg/L) and dissolved (332 µg/L) barium, total (21,300 µg/L) and dissolved (11,000 µg/L) iron, total (324 µg/L) and dissolved (287 µg/L) manganese, and total (16,700 µg/L) and dissolved (1980 µg/L) zinc exceeded maximum base-wide background concentrations in one or more samples.

Surface Water*Impoundment Area*

- Four VOCs were detected in surface water, of which one exceeded associated screening values. Detected concentrations of 1,1,2,2-tetrachloroethane (1 J µg/L) exceeded the tap water risk-based concentration (RBC) in one sample location.
- Eight SVOCs were detected in surface water, of which six exceeded associated screening values. Detected concentrations of benzo(a)anthracene (0.9 J µg/L), benzo(a)pyrene (0.6 J µg/L), benzo(b)fluoranthene (0.6 J µg/L), benzo(k)fluoranthene (0.6 J µg/L), chrysene (0.9 J µg/L), and phenanthrene (0.8 J µg/L) exceeded State and/or Federal Water Quality Criteria (WQC) for human health, each in one sample location.

- Three explosives were detected in surface water, all of which exceeded associated screening values. Detected concentrations of 2,4,6-TNT (36 µg/L), HMX (12 µg/L), and RDX (33 µg/L) exceeded the tap water RBC and/or BTAG screening value in one or more sample locations.
- Eighteen total and fifteen dissolved inorganics were detected in surface water, of which fourteen total and five dissolved inorganics exceeded associated screening values. Detected concentrations of dissolved (2.5 µg/L) arsenic and dissolved (173 J µg/L) manganese exceeded ecological screening value, as well as State and/or Federal screening values; however all concentrations detected were below the maximum base-wide background concentrations. Detected concentrations of total (17,900 J µg/L) aluminum, total (10.4 µg/L) arsenic, total (2.1 µg/L) beryllium, total (61.2) and dissolved (198 µg/L) chromium, total (11 µg/L) cobalt, total (50.3 µg/L) copper, total (45,000 J µg/L) iron, total (78.8 J µg/L) lead, total (450 J µg/L) manganese, total (34.3 µg/L) and dissolved (84.2 J) nickel, total (0.21 µg/L) mercury, total (125 µg/L) and dissolved (75.4 µg/L) vanadium, and total (554 µg/L) zinc exceeded the maximum base-wide background concentrations, as well as tap water RBCs, BTAG screening value, and/or State or Federal WQC for human health in one or more locations.

Drainage Area

- No SVOCs, pesticides, PCBs, or explosives were detected.
- Three VOCs were detected in surface water, two of which exceeded associated screening values. Detected concentrations of 1,1- dichloroethane (DCA) (4 J µg/L) and 1,1-DCE (6 J µg/L) exceeded the tap water RBC or Federal WQC for human health, each in two sample locations.
- Eleven total and nine dissolved inorganics were detected in surface water, of which three total and one dissolved inorganics exceeded associated screening values. Detected concentrations of dissolved (1.5 L µg/L) arsenic exceeded State and/or Federal screening values; however all concentrations detected were below the station background concentration. Detected concentrations of total (38.9 L J µg/L) antimony, total (1.6 J µg/L) arsenic, and total (569 µg/L) iron exceeded the maximum background concentrations, ecological screening values, and State and/or Federal WQC for human health in one or more locations.

Tributary

- No pesticides, PCBs, or explosives were detected. No VOCs or SVOCs were detected exceeding screening values.
- Fifteen total and twelve dissolved inorganics were detected in surface water, of which five total and two dissolved inorganics exceeded associated screening values. Detected concentrations of total (1,130 µg/L) aluminum, total (1.8 J µg/L) and dissolved (1.5 J µg/L) arsenic, total (86.1 µg/L) and dissolved (44.4 µg/L) manganese, and total (49.6 µg/L) nickel exceeded ecological screening values, and State and/or Federal screening values; however all concentrations detected were below the maximum station background concentration. Detected concentrations of total (1,530 µg/L) iron exceeded the maximum station background concentration, ecological screening values, and State and/or Federal screening values in one or more locations.

Felgates Creek

- No pesticides, PCBs, or explosives were detected. No VOCs or SVOCs were detected exceeding screening values.
- Twenty total and twelve dissolved inorganics were detected in surface water, of which six total and two dissolved inorganics exceeded associated screening values. Detected concentrations of total (1,360 J µg/L) aluminum, total (1.8 J µg/L) and dissolved (1.5 J µg/L) arsenic, total (4.6 µg/L) cobalt, total (1,980 J µg/L) iron, total (86.1 µg/L) and dissolved (44.4 µg/L) manganese, and total (27.8 K µg/L) nickel exceeded ecological screening values and State and/or Federal screening values; however all concentrations detected were below the maximum station background concentration.

Sediment

During the development of the FS (Baker, 1998d), RGs were developed for COCs identified in sediment at the impoundment area and flume area during previous investigations to be protective of human and ecological receptors under a future commercial/industrial land use scenario. A removal action was conducted beginning in August 1998 to remove and treat contaminated sediment.

Remediation Goals for COCs in Sediment

COC	PCE	TCE	Total 1,2-DCE	1,1,1-TCA	1,1-DCA	cPAHs	Total PAHs	2,4-DNT
Remediation Goal (mg/kg)	7	1.6	3.5	2,700	6,500	0.15	44	60

COC	2,6-DNT	HMX	RDX	1,3,5-TNB	2,4,6-TNT	Cadmium	Nickel	Zinc
Remediation Goal (mg/kg)	29	5.7	1	1	8	10	52	410

Post-removal confirmation samples indicated that concentrations of all COCs were below established RGs following the completion of removal activities in June 2007

3.2.4.3 Potential Risks

A summary of the most current risk assessments and risk management considerations for exposure to each site media is provided below.

Soil

A ROD was finalized in October 1998 (Baker, 1998f) to address debris and contaminants identified in surface soil. The NTCRA conducted at Site 6 reduced concentrations of all COCs to below established RGs previously agreed upon by the Navy and the USEPA, in partnership with the VDEQ. Following the removal action, LUCs were implemented prohibiting residential development of Site 6 and disturbance of the soil cover at the excavated area. Annual inspections of LUCs and yearly reporting are required in order to ensure that the remedy in place remains protective of human health and the environment. The LUCs will be maintained until they are no longer required to protect human health or the environment.

Groundwater

Yorktown-Eastover Aquifer

The HHRA conducted as part of the 1998 *Round Two RI, Sites 6 and 7* (Baker, 1998c) assessed risk to receptors through ingestion, dermal contact, and inhalation of vapors under a non-potable, beneficial use scenario. No unacceptable cancer risks or non-cancer hazards resulting from exposure to groundwater for any receptor. Risks due to potable groundwater use have not yet been quantified.

The ERA conducted as part of the 1998 *Round Two RI, Sites 6 and 7* (Baker, 1998c) did not assess risk posed to ecological receptors due to groundwater exposure because no complete exposure pathway was identified.

Surface Water

The HHRA conducted as part of the 1998 *Round Two RI Report, Sites 6 and 7* (Baker, 1998c) assessed risk to receptors through ingestion and dermal contact. No unacceptable cancer risks or non-cancer hazards resulting from exposure to surface water were identified for any receptor.

The ERA conducted as part of the 1998 *Round Two RI Report, Sites 6 and 7* (Baker, 1998c) identified no COCs due to direct contact or food web exposure associated with surface water. Thus, risks to ecological receptors are considered acceptable.

Sediment

A ROD for Site 6 sediment and flume area residue was signed in October 1998 (Baker, 1998f) to address debris and contaminants identified in sediment. The removal action conducted at Site 6 reduced concentrations of all COCs to below established RGs previously agreed upon by the Navy and the USEPA, in partnership with the VDEQ. Following the removal action, LTM of the Impoundment Area surface water and sediment and Site 6 groundwater began in May 2000. Following the baseline round of sampling, LTM at Site 6 was suspended pending completion of the RA.

3.2.4.4 Remedial Action(s)

Implementation of the selected remedy was initiated in 1999. The initial phase of remediation consisted of the construction of a bioremediation cell (bio-cell) at Site 24, excavation of PAH and explosives contaminated soil to approximately 4 feet bgs, disposal of PAH contaminated soil/sediment, transportation of explosives contaminated soil to the bio-cell, flume and drain decontamination, and site restoration (OHM, 1999). A soil cover was then placed over the excavated area. Soil and sediment that exceeded the RGs was excavated and transported to the bio-cell where it was treated by *ex situ* biological treatment. 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. Approximately 11,800 tons of sediment and soil were treated between 1999 and 2006 in the bio-cell (Shaw, 2008a). Treatment was deemed complete once two consecutive sampling events confirmed soil and sediment contained VOC and explosive concentrations below RGs. LUCs prohibiting residential development of the Site 6 area and disturbance of the excavated area's soil cover have been maintained 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. The LUCs will be maintained until they are no longer required to

protect human health or the environment (Baker, 1998f). LTM of the Impoundment Area surface water and sediment and Site 6 groundwater began in May 2000. Following the baseline round of sampling, LTM at Site 6 was suspended pending completion of the RA; however, an Explanation of Significant Difference (ESD) will be developed to address the suspension of monitoring in order to complete the RI for the site.

3.2.4.5 Activities Completed FY2010

Fieldwork for the *Phase II RI Report* has been completed and reporting is expected in FY2011.

3.2.4.6 CERCLA Path Forward

- ESD to remove monitoring activities for sediment and groundwater
- Phase II RI Report
- FS/PP/ROD for groundwater, surface water, and sediment, as appropriate
- RACR
- Five-Year Review for Soil (2012)

[Schedule 3-4](#) presents the FY11-12 schedule for Site 6.

3.2.5 Site 7—Plant 3 Explosives-Contaminated Wastewater Discharge Area

3.2.5.1 Site Description

Site 7 is located in the northern portion of WPNSTA Yorktown in the vicinity of Poe Road and adjacent to an unnamed tributary leading to Felgates Creek ([Figure 3-5](#)), approximately one mile upstream from the confluence of Felgates Creek and the York River. The site consists of the Plant 3 Explosives-Contaminated Discharge Area, including an approximately 300-foot long drainage area located adjacent to wetlands surrounding an unnamed tributary to Felgates Creek. Depth to groundwater (Yorktown-Eastover aquifer) at the site is variable with topography and ranges between approximately 15 and 25 feet bgs and generally flows westward toward the tributary and Felgates Creek.

Plant 3 was used as a weapons loading facility beginning in 1945. Between 1945 and 1975, wastewater from the Plant was discharged directly into the drainage area. The wastewater possibly contained RDX, TNT, cyclohexane, and TCE (C. C. Johnson & Associates and CH2M HILL, 1984). Between 1975 and 1986, the wastewater was treated in an activated carbon unit, which was designed to remove dissolved explosives from the wastewater prior to discharge. After 1986, the carbon treated wastewater was directed to the sanitary sewer system and ultimately to HRSD. The site has reverted to a natural drainage area and received no discharge from the Plant 3 complex after 1986. A summary of relevant documents and action milestones is presented in the table below.

Documents and Milestones

Document Title /Milestone	Author/Date	AR Document Number
Round One RI Report for Sites 1-9, 11, 12, 16-19, and 21	Baker and Weston, 1993	000313
Report for Field Scale Treatability Study for Site 7 and 22	OHM, 1997	000887
Pilot Study Report for the Explosives-Contaminated Soil at Naval Weapons Station Yorktown	Baker, 1997	001088

Document Title /Milestone	Author/Date	AR Document Number
Round Two Remedial Investigation Report, Sites 6 and 7	Baker, 1998	001294 (Volume I) 001295 (Volume II) 001346 (Volume III) 001347 (Volume IV)
Feasibility Study, v2, Sites 6 and 7	Baker, 1998	001077
Proposed Remedial Action Plan, v2, Sites 6 and 7	Baker, 1998	001838
Record of Decision, Operable Unit Nos. XII, XIII, XIV, and XV, Sites 6 and 7	Baker, 1998	001001
Five-Year Review Report for Sites 1, 6, 7, 12, 16, and 19	Baker, 2002	001310
Long-Term Monitoring Report Sites 1, 3, and 7	Baker, 2006	002075
Remedial Design for Naval Weapons Station Yorktown Sites 6 and 7	Baker, 2006	002268
Phase I Remedial Investigation Report for Groundwater at Sites 1, 3, 6, 7, 11, 17, 24, and 25	CH2M HILL, 2007	002158
Five-Year Review Report for Sites 1, 3, 6, 7, 11, 12, 16/SSA16, 17, and 19	CH2M HILL, 2007	002155

3.2.5.2 Nature and Extent of Potential Contamination

The wastewater discharged from Plant 3 was the source of potential contamination at Site 7. Previous investigations included analysis of soil, surface water, sediment, and groundwater for VOCs, SVOCs, explosives, and inorganics. In addition, soil and groundwater were analyzed for pesticides and PCBs. The most recent soil data available is from the *Round Two RI Report, Sites 6 and 7* (Baker, 1998c). The most recent surface water and sediment data available is from the 2006 *LTM Report Sites 1, 3, and 7* (Baker, 2006b). The most recent groundwater data available is from the 2007 *Phase I RI for Groundwater at Sites 1, 3, 6, 7, 11, 17, 24, and 25* (CH2M HILL, 2007a). The current nature and extent of contamination for each media at Site 7, as documented in the above reports, is summarized below.

Soil

As part of a pilot study, which began in September 1996 (Baker, 1997c), RGs protective of future industrial/commercial land use were developed for COCs identified in soil. Soil from Site 7 was excavated and sent to a bio-cell located at Site 22 for biological remediation.

Remediation Goals for COCs in Soil					
COC	HMX	RDX	1,3,5-TNB	2,4,6-TNT	Amino-DNT
Remediation Goal (mg/kg)	12,000	100	12	30	80

Following the completion of the pilot study in January 1997, concentrations of all COCs were found to be below established RGs. Additional soil sampling was conducted during the *Round Two RI Report, Sites 6 and 7* (Baker, 1998c).

Surface Soil

No SVOCs, explosives, pesticides, or PCBs were detected. No VOCs were detected above screening values.

Twenty-three inorganics were detected, of which thirteen exceeded associated screening values. Detected concentrations of aluminum (19,100 mg/kg), antimony (18.6 L mg/kg), arsenic (11 mg/kg), beryllium (0.95 mg/kg), cadmium (6 mg/kg), and manganese (429 mg/kg) exceeded the residential RBC in one or more sample locations; however, all concentrations detected were below the maximum station background concentrations. Detected concentrations of chromium (40.2 mg/kg), copper (145 mg/kg), iron (28,200 mg/kg), lead (148 mg/kg), mercury (0.53 mg/kg), vanadium (43.8 mg/kg), and zinc (928 mg/kg) exceeded the maximum background concentrations, ecological screening value, and residential RBC in one or more sample locations.

Subsurface Soil

No SVOCs, explosives, pesticides, or PCBS were detected. No VOCs were detected above screening values.

Twenty inorganics were detected, of which seven exceeded associated screening values. Detected concentrations of aluminum (14,000 mg/kg), antimony (16.5 L mg/kg), arsenic (14.5 mg/kg), beryllium (1.7 mg/kg), iron (46,100 mg/kg), and manganese (429 mg/kg) exceeded the Residential RBC in one or more sample locations; however, all concentrations detected were below the maximum station background concentrations. Detected concentrations of chromium (63.4 mg/kg) exceeded both the maximum station background concentrations and the residential RBC in one sample location.

Groundwater

Detected concentrations were only screened against maximum base-wide background concentrations and MCLs in order to aid in determining which sites required further investigation.

Yorktown-Eastover Aquifer

- No VOCs or explosives were detected exceeding associated screening values.
- Eight total and eight dissolved inorganics were detected, of which three total and two dissolved inorganics exceeded associated screening values. Detected concentrations of dissolved (0.82 J µg/L) cobalt, total cyanide (4.5 J µg/L), total (24.7 µg/L) and dissolved (24.7 µg/L) manganese, total (21.9 µg/L) and dissolved (21.9 µg/L) zinc exceeded the maximum base-wide background concentration in one or more samples.

Surface Water

Felgates Creek Tributary

During LTM, there were sporadic detections of toluene and methylene chloride in multiple sample locations. No explosives were detected during any round of sampling. Inorganic detections were generally consistent throughout the rounds, except the final round of sampling, which saw some increases in the number of analytes exceeding the BTAG screening values and/or background levels. Dissolved concentrations of chromium, iron, manganese, and selenium exceeded both BTAG values and background levels during the fifth round of sampling. Concentrations of total antimony, arsenic, chromium, iron, and manganese also exceeded both maximum background concentrations and BTAG screening values during the fifth round of sampling. Only one total inorganics detection, total thallium, exceeded both maximum background concentrations and BTAG screening values during a round other than the fifth round of sampling.

Sediment

Felgates Creek Tributary

As part of a pilot study (Baker, 1997c), RGs were developed for COCs identified in soil and sediment during the previous investigations. Sediment from Site 7 was excavated and sent to a bio-cell located at Site 22 for biological remediation.

Remediation Goals for COCs in Sediment					
COC	HMX	RDX	1,3,5-TNB	2,4,6-TNT	Amino-DNT
Remediation Goal (mg/kg)	12,000	100	12	30	80

Following the completion of the pilot study, concentrations of all COCs were found to be below established RGs. Additional sediment sampling was conducted during the *LTM Sites 1, 3, and 7* (Baker, 2006b).

During LTM, there were sporadic detections of acetone, carbon disulfide, and methylene chloride in multiple sample locations. No explosives were detected during any round of sampling. Inorganic detections were generally consistent throughout all of the sampling rounds. BTAG values and background levels were exceeded for iron, cyanide, and selenium in Round Two, selenium in Round Three, and arsenic in Round Five. During the Round Two RI, there were no organic detections in surface water; however, there were total and dissolved inorganic detections for aluminum, arsenic, manganese, and zinc in this tributary.

3.2.5.3 Potential Risks

A summary of the most current risk assessments and risk management considerations for exposure to each site media is provided below.

Soil

A ROD was finalized in October 1998 (Baker, 1998f) to address contaminants identified in soil. The pilot study conducted at Site 7 reduced concentrations of all COCs to below established RGs, previously agreed upon by the Navy and USEPA, in partnership with the VDEQ, 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 of Site 7. Annual inspections of LUCs and yearly reporting are required in order to ensure that the remedy in place remains protective of human health and the environment.

Groundwater

Yorktown-Eastover Aquifer

The HHRA conducted as part of the 1998 *Round Two RI, Sites 6 and 7* (Baker, 1998c) assessed risk to receptors through ingestion, dermal contact, and inhalation of vapors under a non-potable, beneficial use scenario. No unacceptable cancer risks or non-cancer hazards resulting from exposure to groundwater for any receptor. Risks due to potable groundwater use have not yet been quantified. In addition, there are currently no groundwater wells within or close to the drainage area which received the contaminated wastewater.

The ERA conducted as part of the 1998 *Round Two RI, Sites 6 and 7* (Baker, 1998c) did not assess risk posed to ecological receptors due to groundwater exposure because no complete exposure pathway was identified.

Surface Water

Felgates Creek Tributary

The HHRA conducted as part of the 1998 *Round Two RI, Sites 6 and 7* (Baker, 1998c) assessed risk to receptors through incidental ingestion and dermal absorption of surface water. No unacceptable cancer risks or non-cancer hazards resulting from exposure to surface water for any receptor were identified.

The ERA conducted as part of the 1998 *Round Two RI, Sites 6 and 7* (Baker, 1998c) identified concentrations of aluminum, iron, manganese, and nickel posing potential unacceptable risk to aquatic ecological receptors in surface water from the unnamed tributary leading to Felgates Creek; however, these constituents were below their respective background values.

Sediment

Felgates Creek Tributary

A ROD was finalized in October 1998 (Baker, 1998d) to address contaminants identified in sediment. The pilot study conducted at Site 7 reduced concentrations of all COCs to below established RGs previously agreed upon by the Navy and the USEPA, in partnership with the VDEQ, 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 of Site 7. Annual inspections of LUCs, LTM, and yearly reporting are required in order to ensure that the remedy in place remains protective of human health and the environment.

3.2.5.4 Remedial Action(s)

In 1996, a field-scale pilot study to treat explosives contaminated soil and sediment at Site 7 was conducted. Approximately 770 cubic yards (cy) of soil and sediment were excavated from the drainage area leading to the tributary at Site 7. TNT contaminated soil was excavated and sent to the newly-constructed bio-cell located at Site 22 (Baker, 1997c).

A ROD was signed in October 1998 for site soils and drainage area sediment. The ROD included proposed LUC boundaries. Although the ROD indicated LTM would be conducted for surface water and groundwater, it specified that LTM was not the final remedy for these media. The ROD specified no additional RA for soil and sediment in the drainage way because the field-scale pilot study mitigated potential human health risks and ecological concerns in these media under industrial/commercial land use (Baker, 1998d). LTM of surface water and sediment in Felgates Creek, and groundwater associated with the site was conducted between 2000 and 2005 and included VOCs, explosives, and inorganic analysis. Although groundwater monitoring is included in the LTM program, further investigations of groundwater are currently ongoing. LUCs prohibiting residential use within and around the Site 7 drainage area have been maintained through routine inspections.

3.2.5.5 Activities Completed FY2010

Review of documents, ARARs, risk assumptions, and site inspections demonstrate that the remedy at Site 7 is functioning as intended by the ROD.

Following the completion of the Final LTM Work Plan in December 2008, LTM field activities were conducted and completed in September 2009. A draft LTM Report was submitted in March 2010. The final LTM Report is expected in November 2010.

3.2.5.6 CERCLA Path Forward

- Completion of LTM Report
- ESD to remove LTM of groundwater associated with the discharge area
- Uniform Federal Policy-Sample Analysis Plan (UFP-SAP) for conducting RI of soil and groundwater in the former Plant 3 area
- FS/PP/ROD for all media, as appropriate
- RACR
- Five-Year Review for Soil (2012)

[Schedule 3-5](#) presents the FY11-12 schedule for Site 7.

3.2.6 Site 8—NEDED Explosives-Contaminated Wastewater Discharge Area

3.2.6.1 Site Description

Site 8 is a 300-foot drainage way located along the Eastern Branch of Felgates Creek, approximately 1.5 miles from the confluence of Felgates Creek and the York River ([Figure 3-6](#)). The drainage way lies east of the Naval Explosives Development Engineering Department (NEDED) complex (Building 456). The topography is generally level around Building 456, but slopes steeply into the drainage way. The ground surface is paved with the exception of the wooded western and northern portions of the site. The surficial aquifer within the drainage way at the site is encountered at approximately 6 feet bgs, and flows towards Felgates Creek.

Between 1940 and 1975, Site 8 received wastewater discharge from the NEDED complex. The wastewater reportedly contained unspecified solvents, spent/neutralized acids, and nitramine compounds. In 1974, a carbon adsorption tower was installed to treat the contaminated wastewater prior to discharge. In 1986, the effluent from the tower was diverted from Site 8 to the sanitary sewer serviced by HRSD. Since 1986, the site has reverted to a natural drainage area. A summary of relevant documents and action milestones is presented in the table below.

Documents and Milestones

Document Title /Milestone	Author/Date	AR Document Number
Round One Remedial Investigation Report for Sites 1-9, 11, 12, 16-19, and 21,	Baker and Weston, 1993	00313
Round Two Remedial Investigation Report for Sites 2, 8, 18, and SSA 14	Baker, 2004	01548 (Volume I) 01549 (Volume II)
Engineering Evaluation / Cost Analysis for Contaminated Soil and Sediment at Site 8 and SSA 14	Baker, 2005	02076
Action Memorandum for Contaminated Soil and Sediment at Site 8 and SSA 14	Baker, 2005	01871
Work Plan Interim Removal Action (IRA) at Site 8 and SSA 14	Shaw, 2006	01890

Document Title /Milestone	Author/Date	AR Document Number
Removal Action and Post-Removal Confirmation Sampling Summary Technical Memorandum	CH2M HILL, 2008	02202
Construction Completion Report (CCR)	Shaw, 2009	Pending
Draft Remedial Investigation Report for Groundwater at Sites 8 and 34	CH2M HILL, 2010	Draft – No AR No.

3.2.6.2 Nature and Extent of Potential Contamination

Historical wastewater discharge from the NEDED complex (Building 456) was the source of potential contamination to soil, sediment, surface water, and groundwater at Site 8. Previous investigations have included analysis of soil, groundwater, sediment, and surface water for TCL VOCs, TCL SVOCs, explosives, pesticides, PCBs, and TAL metals. The most recent soil data available is from the 2009 *Construction Completion Report* (Shaw, 2009a). The most recent groundwater, surface water, and sediment data available is from the 2010 *Draft RI for Groundwater* (CH2M HILL, 2010). Surface water and sediment samples were collected near Site 8 as part of an overall evaluation of surface water related to Sites 8 and 34, as they are adjacent to each other and contribute runoff and groundwater discharge to the Eastern Branch of Felgates Creek. The current nature and extent of contamination for each media at Site 8, as documented in the above reports, is summarized below.

Soil

During the development of the EE/CA (Baker, 2005b), RGs were developed for COCs identified in sediment during previous investigations to be protective of human and ecological receptors under an unrestricted land use scenario. A removal action was conducted beginning in February 2007 to remove and dispose of contaminated soil.

Remediation Goals for COCs in Soil

COC	BEHP	Aroclor-1260	Amino-DNTs	HMX	RDX	2,4,6-TNT	Chromium	Iron	Mercury	Vanadium	Zinc
Remediation Goal (mg/kg)	10	0.1	1.3	6.3	21.1	1.3	16.27	11,276	0.1	23.07	50

Post-removal confirmation samples indicated that concentrations of all COCs were below established RGs following the completion of removal activities in September 2008.

Groundwater

Yorktown-Eastover Aquifer

- No pesticides or PCBs were detected.
- Seven VOCs were detected in groundwater, of which four exceeded associated screening values. Detected concentrations of chloroform (3.7 J µg/L), PCE (7.4 J µg/L), TCE (2 J µg/L), VC (1.2 J µg/L), chloroform (3.7 J µg/L) exceeded the tap water RSL and/or the Federal MCL in one or more sample locations. All wells in which VOCs were detected are located west of Building 456.

- One SVOC was detected in groundwater, which exceeded associated screening values. Detected concentrations of BEHP (96 µg/L) exceeded the tap water RSL and MCL in one sample location.
- Ten explosives were detected in groundwater, four of which exceeded associated screening values. Detected concentrations of 2,4,6- TNT (55 µg/L), 4-amino-2,6-DNT (73 µg/L), 2-amino-4,6-DNT (82 µg/L), and RDX (300 µg/L) exceeded the tap water RSL in one or more sample locations. Detected concentrations of explosives were most extensive in the shallow portion of the aquifer between Building 456 and the drainage outfall.
- Eighteen total and fifteen dissolved inorganics were detected in groundwater, of which one total and one dissolved inorganic exceeded associated screening values. Detected concentrations of total (11.5 µg/L) or dissolved (5.8 J µg/L) arsenic exceeded the associated tap water RSL and/or MCL in one or more sample locations.

Surface Water

Eastern Branch of Felgates Creek

- No VOCs, SVOCs, pesticides, or PCBs were detected. No explosives detected exceeded associated screening values.
- Nineteen total and twelve dissolved inorganics were detected in surface water, of which three total and three dissolved inorganics exceeded associated screening values. Detected concentrations of total (574 µg/L) and dissolved (315 K µg/L) aluminum, total (3.7 J µg/L) and dissolved (5.9 J µg/L) arsenic, and total (36.9 µg/L) and dissolved (35.3 J µg/L) barium exceeded the tap water RSL multiplied by 10 and/or the ecological screening value in one or more sample locations. However, concentrations of all inorganics were comparable to upstream reference or groundwater samples and, therefore, are unlikely to be site-related.

Sediment

Eastern Branch of Felgates Creek

During the development of the EE/CA, RGs were developed for COCs identified in sediment during previous investigations to be protective of human and ecological receptors under an unrestricted land use scenario. A removal action was conducted beginning in February 2007 to remove and dispose of contaminated sediment.

Remediation Goals for COCs in Sediment

COC	BEHP	Aroclor-1260
Remediation Goal (mg/kg)	0.18	0.023

Post-removal confirmation samples revealed that total PCB concentrations still exceed the RG (0.145 mg/kg at F53659-4 and 0.130 mg/kg at F53659-12) in the western portion of the site adjacent to the Eastern Branch of Felgates Creek in August 2005. Additional sediment samples were collected within the Eastern Branch of Felgates Creek as part of the *RI for Groundwater* in order to assess potential transport of contaminants from groundwater to nearby sediment.

Eastern Branch of Felgates Creek

- No PCBs were detected in any samples collected.
- Three VOCs were detected in sediment, of which only one exceeded associated screening values. Detected concentrations of carbon disulfide (15 J $\mu\text{g}/\text{kg}$) exceed the ecological screening value in one sample location. Carbon disulfide is a naturally occurring substance that is commonly found in marsh sediments. In addition, this chemical was also detected in a sample from one upstream reference location at similar concentrations. Consequently, concentrations of carbon disulfide are not believed to be site-related.
- Twenty inorganics were detected in sediment, of which three exceeded associated screening values. Detected concentrations of aluminum (26,500 $\mu\text{g}/\text{kg}$), arsenic (13.4 $\mu\text{g}/\text{kg}$), and manganese (412 J $\mu\text{g}/\text{kg}$) exceeded the residential soil RSL multiplied by 10 and ecological screening value in one or more sample locations. However, concentrations of all inorganics were comparable to upstream reference samples and are unlikely to be site-related.

3.2.6.3 Potential Risks

A summary of the most current risk assessments and risk management considerations for exposure to each site media is provided below.

Soil

Following the removal action conducted at Site 8, concentrations of all identified COCs were reduced to below the established RGs. The Navy and the USEPA, in partnership with the VDEQ, reached consensus in May 2008 that NFA for soil is required (April 2007 Partnering Meeting).

Groundwater

The HHRA conducted as part of the 2010 *Draft RI for Groundwater at Sites 8 and 34* (CH2M HILL, 2010) assessed risk to receptors through ingestion, dermal contact, and inhalation of vapors under a potable use scenario. As per EPA guidance, carcinogenic risks were only calculated for lifetime child/adult residents. Potential unacceptable non-cancer hazards were identified for future adult and child residents.

Yorktown-Eastover Aquifer

Potential unacceptable cancer risks were identified for lifetime child/adult residents. The RME non-carcinogenic hazard for future adult residents associated with exposure to groundwater (HI = 8.5) is above the acceptable HI of 1.0. The hazard is primarily associated with ingestion of 2, 4, 6-TNTTNT (HQ = 3.0), 2-amino-4, 6-DNT (HQ = 1.0), 3, 5-dinitroaniline (HQ = 1.2), and 4-amino-2, 6- DNT (HQ = 1.1). The CTE non-carcinogenic hazard (HQ = 0.74) is less than the acceptable HI of 1.0. The RME non-carcinogenic hazard for future child residents associated with exposure to groundwater (HI = 20) exceeds the acceptable HI of 1.0. The hazard is primarily associated with ingestion of 2, 4, 6- TNTTNT (HQ = 7.0), 2-amino-4,6-DNT (HQ = 2.3), 3,5-dinitroaniline (HQ = 2.8), 4-amino-2,6-DNT (HQ = 2.6), and RDX (HQ = 2.2). The CTE non-carcinogenic hazard (HQ = 2.4) also exceeds the acceptable HI of 1.0. The RME carcinogenic risk for lifetime child/adult residents associated with exposure to groundwater (CR = 3.4×10^{-4}) is above USEPA's target risk range of 10^{-6} to 10^{-4} . The risk is primarily associated with ingestion of RDX (CR = 1.7×10^{-4}),

and ingestion and dermal contact with PCE ($CR = 9.4 \times 10^{-5}$). The CTE carcinogenic risk associated with exposure to groundwater (6.1×10^{-5}) is within USEPA's target risk range.

The ERA did not assess risk posed to ecological receptors due to groundwater exposure because no complete exposure pathway was identified.

Surface Water

Eastern Branch of Felgates Creek

The HHRA conducted as part of the 2010 *Draft RI for Groundwater at Sites 8 and 34* (CH2M HILL, 2010) assessed risk to receptors through incidental ingestion and dermal absorption. No unacceptable cancer risks or non-cancer hazards resulting from exposure to surface water along the unnamed tributary to the Eastern Branch of Felgates Creek were identified for any receptor.

The ERA conducted as part of the 2010 *Draft RI for Groundwater at Sites 8 and 34* (CH2M HILL, 2010) identified no COCs due to direct contact or food web exposure associated with surface water. Thus, risks to ecological receptors are considered acceptable.

Sediment

Eastern Branch of Felgates Creek

Following the removal action conducted at Site 8, concentrations of PCBs remained above the RG; however, based on risk management considerations presented in 2008 *Removal Action and Post-Removal Confirmation Sampling Summary Technical Memorandum* (CH2M HILL, 2008a), the Navy and the USEPA, in partnership with the VDEQ reached consensus that NFA for sediment is required. The HHRA conducted as part of the 2010 *Draft RI for Groundwater at Sites 8 and 34* (CH2M HILL, 2010) assessed risk to receptors through incidental ingestion and dermal absorption. No unacceptable cancer risks or non-cancer hazards resulting from exposure to sediment along the unnamed tributary to the Eastern Branch of Felgates Creek were identified for any receptor.

The ERA conducted as part of the 2010 *Draft RI for Groundwater at Sites 8 and 34* (CH2M HILL, 2010) identified no COCs due to direct contact or food web exposure associated with sediment. Thus, risks to ecological receptors are considered acceptable.

3.2.6.4 Remedial Action(s)

A removal action was initiated in February 2007 to excavate soil and sediment posing potential risks to human health and the environment. Excavation was completed in cells, progressing westward from the source area toward Felgates Creek. Post-excavation samples were collected from each cell and compared to RGs, and to background values for naturally occurring and anthropogenic chemicals. Post-removal PCB confirmation samples indicated that PCB concentrations exceeded the sediment RG along the western excavation boundary and in August 2005, the Navy and the USEPA, in partnership with the VDEQ, agreed to halt excavation at the Felgates Creek channel if PCB concentrations continued to exceed the RG. Post-removal confirmation samples and pre-removal grab samples collected from the boundary of Felgates Creek contained elevated levels of PCBs in exceedance of RGs and excavation activities were discontinued. In total, 1,193 tons of contaminated soils/sediment and 44 tons of PCB-contaminated soils were removed (Shaw, 2009a). Following a review of the concentrations remaining on-site and the conservative nature of the established RG for PCBs, a Technical Memorandum (TM) was written to acknowledge the risk-management of

potentially unacceptable ecological risks associated with PCBs in Site 8 sediment (CH2M HILL, 2008a).

3.2.6.5 Activities Completed FY2010

The *Draft Remedial Investigation Report for Groundwater at Sites 8 and 34* was submitted in October 2009.

3.2.6.6 CERCLA Path Forward

- Finalize RI Report for Groundwater
- Complete FS for groundwater
- PP/ROD for all media, as appropriate
- RA for groundwater
- RACR

[Schedule 3-6](#) presents the FY11-12 schedule for Site 8.

3.2.7 Site 9—Plant 1 Explosives-Contaminated Wastewater Discharge Area

3.2.7.1 Site Description

Site 9 is a discharge area that consists of a 600-foot drainage way and the immediate surrounding area ([Figure 3-7](#)). Site 9 is located east of Lee Pond and topographically downgradient of Site 19. The drainage way flows from the northwest portion of Building 10 westward, underneath Bollman Road, and discharges to Lee Pond. Wooded areas immediately surround the drainage way and rip-rap is present along the top of the relatively steep slope leading down into the site. Groundwater is encountered at a depth of 10 to 29 feet bgs within the shallow Cornwallis Cave aquifer and flows to the southwest toward Lee Pond. Within the deeper Yorktown-Eastover aquifer, groundwater is encountered between approximately 39 and 51 feet bgs and flows west/southwest.

Between the late 1930s and 1975, Site 9 was used as a drainage way for Plant 1 (Building 10) explosives-contaminated wastewater and (possibly) organic solvents. A carbon adsorption tower was installed in 1974 to treat the wastewater prior to discharge in accordance with a NPDES permit. In 1986, the effluent from the carbon adsorption tower was diverted to the sanitary sewer and ultimately to HRSD. Wastes including weapons casings and railroad ties were discarded along the drainage way bank prior to flowing under Bollman Road. In addition, on the other side of Bollman Road, several drums were discarded along the drainage way. No information is available regarding the date(s) this material was disposed (Baker, 1994a). The weapon casings, railroad ties and drums were removed along with contaminated soils and sediment in 1994. Currently, the site has reverted to a natural drainage way for surface runoff from surrounding areas and receives no wastewater discharge from the Plant 1 complex. A summary of relevant documents and action milestones is presented in the table below.

Documents and Milestones

Document Title /Milestone	Author/Date	AR Document Number
Round One RI Report for Sites 1-9, 11, 12, 16-19, and 21	Baker and Weston, 1993	000313
Action Memorandum and EE/CA	Baker, 1994	000615
Closeout Report, Sites 2 and 9 and Site Screening Area 4, Mine Casing and Debris Removal Action	IT Corp., 1995	000646
Site 19 and Composites of Site 9, Site 19, SSA 6 & SSA7 Independent Sampling and Risk Screening Report	Black & Veatch, 1996	000781
Round Two Remedial Investigation Report, Sites 9 and 19	Baker, 1997	000889
Feasibility Study Sites 9 and 19	Baker, 1997	000966
Proposed Remedial Action Plan Sites 9 and 19	Baker, 1997	000967
Record of Decision,v3, Operable Unit Nos. VI and VII, Sites 9 and 19	Baker, 1998	002077

3.2.7.2 Nature and Extent of Potential Contamination

The Plant 1 wastewater discharge was the source of potential contamination to soil, sediment, surface water, and groundwater. Previous investigations have included analysis of soil, groundwater, sediment, and surface water for TCL VOCs, TCL SVOCs, explosives, pesticides, PCBs, and TAL metals. The most recent soil, groundwater, surface water, and sediment data available is from the 1997 *Round Two RI, Sites 9 and 19* (Baker, 1997d). The current nature and extent of contamination for each media at Site 9, as documented in the above reports, is summarized below.

Soil

Surface Soil

- No VOCs, pesticides, or explosives were detected exceeding associated screening values.
- Twenty-one SVOCs were detected in surface soil, of which thirteen exceeded associated screening values. Detected concentrations of acenaphthene (120 J $\mu\text{g}/\text{kg}$), anthracene (310 J $\mu\text{g}/\text{kg}$), benzo(a)anthracene (1,100 $\mu\text{g}/\text{kg}$), benzo(a)pyrene (1,200 $\mu\text{g}/\text{kg}$), benzo(b)flouranthene (2,200 $\mu\text{g}/\text{kg}$), benzo(g,h,i)perylene (770 $\mu\text{g}/\text{kg}$), benzo(k)flouranthene (2520 $\mu\text{g}/\text{kg}$), chrysene (1,200 $\mu\text{g}/\text{kg}$), dibenzo(a,h)anthracene (0.16 J mg/kg), flouranthene (2,200 $\mu\text{g}/\text{kg}$), ideno(1,2,2-cd)pyrene (550 $\mu\text{g}/\text{kg}$), phenathrene (1,600 $\mu\text{g}/\text{kg}$) and pyrene (2,000 $\mu\text{g}/\text{kg}$) exceeded the residential RBCs and/or ecological screening values in one or more sample location.
- Nineteen inorganics were detected in surface soil, of which ten exceeded associated screening values. Detected concentrations of aluminum (7,750 mg/kg), arsenic (23.3 K mg/kg), beryllium (0.47 mg/kg), chromium (29.8 mg/kg), manganese (204 mg/kg), nickel (11 mg/kg), and vanadium (68.6 J mg/kg) exceeded the ecological screening value and/or residential RBCs; however, all concentrations detected were below maximum background concentrations. Detected concentrations of copper (26.1 mg/kg), iron (20,200 mg/kg), and lead (68.4 mg/kg) exceeded the maximum

background concentration, as well as the ecological screening value and/or residential RBCs in one or more sample locations.

Subsurface Soil

- No VOCs or pesticides were detected exceeding associated screening values.
- Twenty SVOCs were detected in subsurface soil, of which five exceeded associated screening values. Detected concentrations of benzo(a)anthracene (1,700 µg/kg), benzo(b)fluoranthene (2,500 µg/kg), benzo(a)pyrene (1,700 µg/kg), ideno(1,2,3-cd)pyrene (1,000 µg/kg) and dibenzo(a,h)anthracene (270 J µg/kg) exceeded the residential RBCs in one or more sample location.
- Three explosives were detected in subsurface soil, of which two exceeded associated screening values. Detected concentrations of 2,4,6-TNT (33,000 µg/kg) and amino-DNT (42,000 NJ µg/kg) exceeded the Residential RBCs in one or more sample location.
- Twenty inorganics were detected in subsurface soil, of which nine exceeded associated screening values. Detected concentrations of aluminum (17,000 mg/kg), antimony (5.3 L mg/kg), arsenic (54.7 K mg/kg), beryllium (4.1 mg/kg), cadmium (4.5 mg/kg), chromium (46.5 mg/kg), iron (97,000 mg/kg), manganese (755 J mg/kg), and vanadium (219 J mg/kg) exceeded the Residential RBCs in one or more sample locations.

Groundwater

Cornwallis-Cave Aquifer

- No VOCs and SVOCs were detected exceeding screening values in surface or subsurface groundwater.
- Three explosives were detected in groundwater, all of which exceeded associated screening values. Detected concentrations of 2,4-DNT (2 J µg/L), amino-DNT (4,400 µg/L), and 2,4,6-DNT (880 µg/L) exceeded Tap Water RBCs in one or more samples. In deep groundwater, two explosives were detected, both of which exceeded screening values. Detected concentrations of 1,3,5-trinitrobenzene (1,3,5-TNB) (0.79 µg/L) and amino-DNT (2.6 µg/L) exceeded the tap water RBC, each in one sample.
- Seventeen total and twelve dissolved inorganics were detected in groundwater, of which six total and two dissolved inorganics exceeded associated screening values. Detected concentrations of total (11,800 J µg/L) aluminum, total (28.4 µg/L) and dissolved (25.9 µg/L) arsenic, total (432 J µg/L) and dissolved (419 µg/L) barium, total (34.3 J µg/L) chromium, total (227 µg/L) cyanide, and total (41.2 µg/L) vanadium exceeded tap water RBCs and/or State and Federal MCLs in one or more sample locations. In deep groundwater, eleven total and eleven dissolved inorganics were detected, of which one total and one dissolved inorganics exceeded associated screening values. Detected concentrations of total (2.2 L µg/L) and dissolved (1.8 µg/L) arsenic exceeded the tap water RBC, each in one sample location.

Yorktown-Eastover Aquifer

- Two explosives were detected in groundwater, both of which exceeded screening values. Detected concentrations of 1,3,5-TNB (0.79 µg/L) and amino-DNT (2.6 µg/L) exceeded the tap water RBC, each in one sample.

- Eleven total and eleven dissolved inorganics were detected in groundwater, of which one total and one dissolved inorganics exceeded associated screening values. Detected concentrations of total (2.2 L $\mu\text{g/L}$) and dissolved (1.8 $\mu\text{g/L}$) arsenic exceeded the tap water RBC, each in one sample location.

Surface Water

Drainage to Lee Pond

- No VOCs or SVOCs were detected exceeding screening values in surface water.
- One pesticide was detected in surface water, which exceeded screening values. Detected concentrations of heptachlor epoxide (0.08 K $\mu\text{g/L}$) exceeded State and/or Federal Water Quality Standards in one sample location.
- Eight explosives were detected in surface water, all of which exceeded associated screening values. Detected concentrations of 1,3,5-TNB (0.44 NJ $\mu\text{g/L}$), 1,3-dinitrobenzene (0.46 NJ $\mu\text{g/L}$), 2,4-DNT (6 J $\mu\text{g/L}$), 2,4,6- TNT (480 $\mu\text{g/L}$), 2,6-DNT (4 J $\mu\text{g/L}$), amino-DNT (1,000 $\mu\text{g/L}$), HMX (14 $\mu\text{g/L}$), and RDX (6.1 $\mu\text{g/L}$) exceeded ecological screening value and State and/or Federal WQC for human health in one or more sample locations.
- Fourteen total and fourteen dissolved inorganics were detected, of which three total and two dissolved inorganics exceeded associated screening values. Detected concentrations of total (4.6 $\mu\text{g/L}$) and dissolved (2.1 $\mu\text{g/L}$) arsenic, total (27.7 $\mu\text{g/L}$) cyanide, and total (231 $\mu\text{g/L}$) and dissolved (218 $\mu\text{g/L}$) manganese exceeded the tap water RBC $\times 10$ or the ecological screening value in one or more sample location.

Sediment

Drainage to Lee Pond

- No VOCs were detected above associated screening values.
- Twenty SVOCs were detected in sediment, of which nine exceeded associated screening values. Detected concentrations of acenaphthene (220 J $\mu\text{g/kg}$), acenaphthylene (150 J $\mu\text{g/kg}$), anthracene (750 J $\mu\text{g/kg}$), benzo(a)anthracene (2,400 J $\mu\text{g/kg}$), benzo(b)-flouranthene (2,600 $\mu\text{g/kg}$), benzo(k)flouranthene (970 $\mu\text{g/kg}$), benzo(a)pyrene (2,100 $\mu\text{g/kg}$), dibenzo(a,b)anthracene (300 J $\mu\text{g/kg}$), ideno(1,2,3-cd)pyrene (1,300 $\mu\text{g/kg}$), chrysene (2,600 $\mu\text{g/kg}$), dibenzo(a,h)anthracene (300 J $\mu\text{g/kg}$), phenathrene (3,200 J $\mu\text{g/kg}$), flouranthene (4,600 $\mu\text{g/kg}$), flourene (420 J $\mu\text{g/kg}$), phenathrene (3,200 J $\mu\text{g/kg}$), and pyrene (3,300 $\mu\text{g/kg}$) exceeded the sediment effects range-low (ER-L) and/or the residential RBC $\times 10$ in one or more sample locations.
- Three explosives were detected, all of which exceeded associated screening values. Detected concentrations of 2,4-DNT (3,700 $\mu\text{g/kg}$), amino-DNT (2,300 $\mu\text{g/kg}$), and 2,4,6-DNT (620 $\mu\text{g/kg}$) exceeded residential soil RBCs $\times 10$ in one or more location.
- Nineteen inorganics were detected in sediment, of which four exceeded associated screening values. Detected concentrations of arsenic (55.5 J mg/kg), beryllium (0.85 mg/kg), chromium (47.3 mg/kg), and lead (109 mg/kg) exceeded the sediment ER-Ls and Residential Soil RBCs $\times 10$ in one or more location.

3.2.7.3 Potential Risks

A summary of the most current risk assessments and risk management considerations for exposure to each site media is provided below.

Soil

In March 1998, a ROD was signed indicating that the Navy and the USEPA, in partnership with the VDEQ agreed NFA was required for site soil as potential human health and ecological risks were considered acceptable or manageable for this media (Baker, 1998g).

Groundwater

The HHRA conducted as part of the *Round Two RI Report, Sites 9 and 19* (Baker, 1997d) assessed risk to receptors through ingestion, dermal contact, and inhalation of vapors under a potable use scenario.

Cornwallis-Cave Aquifer

The RME carcinogenic risk for future adult residents associated with exposure to groundwater ($ILCR = 6.3 \times 10^{-4}$) is above USEPA's target risk range of 10^{-6} to 10^{-4} . The risk is primarily associated with exposure to 2,4,6-TNT ($CR = 2.5 \times 10^{-4}$) and dissolved arsenic ($CR = 3.6 \times 10^{-4}$). The CTE carcinogenic risk ($ILCR = 6.8 \times 10^{-5}$) is within the target risk range. The RME non-carcinogenic hazard for future adult residents associated with exposure to groundwater ($HI = 51$) is above the acceptable HI of 1.0. The hazard is primarily associated with exposure to 2,4,6-TNT ($HQ = 48$) and dissolved arsenic ($HQ = 2.4$). The CTE non-carcinogenic hazard ($HI = 12$) also exceeded the target level. The RME carcinogenic risk for future child residents associated with exposure to groundwater ($ILCR = 3.6 \times 10^{-4}$) is above USEPA's target risk range of 10^{-6} to 10^{-4} . The risk is primarily associated with exposure to 2,4,6-TNT ($CR = 1.4 \times 10^{-4}$) and dissolved arsenic ($CR = 2.1 \times 10^{-4}$). The CTE carcinogenic risk ($ILCR = 1.5 \times 10^{-4}$) also exceeds the target risk range. The RME non-carcinogenic hazard for future adult residents associated with exposure to groundwater ($HI = 120$) is above the acceptable HI of 1.0. The hazard is primarily associated with exposure to 2,4,6-TNT ($HQ = 110$) and dissolved arsenic ($HQ = 5.5$). The CTE non-carcinogenic hazard ($HI = 39$) also exceeded the target level.

Yorktown-Eastover Aquifer

No unacceptable cancer risks or non-cancer hazards to future adult residents were identified from exposure to deep groundwater. The RME carcinogenic risk for future child residents associated with exposure to groundwater ($ILCR = 1.5 \times 10^{-5}$) is within the USEPA's target risk range of 10^{-6} to 10^{-4} . The RME non-carcinogenic hazard for future adult residents associated with exposure to groundwater ($HI = 1.4$) is above the acceptable HI of 1.0. The hazard is primarily associated with exposure to 1,3,5-TNB ($HQ=1.0$). The CTE non-carcinogenic hazard ($HI = 0.93$) is below the target level.

The ERA conducted as part of the *Round Two RI Report, Sites 9 and 19* (Baker, 1997d) did not assess risk posed to ecological receptors due to groundwater exposure because no complete exposure pathway was identified.

Surface Water

Drainage to Lee Pond

In March 1998, a ROD was signed indicating that the Navy and the USEPA, in partnership with the VDEQ agreed NFA was required for site surface water as potential human health and ecological risks were considered acceptable or manageable for this media (Baker, 1998g).

Sediment

Drainage to Lee Pond

In March 1998, a ROD was signed indicating that the Navy and the USEPA, in partnership with the VDEQ agreed NFA was required for site sediment as potential human health risks were considered acceptable or manageable for this media. Although conservative modeling predicted some potential for ecological risk at Site 9, it was determined that remediation of the site would generate more harm to the surrounding ecology by destroying habitat and potentially creating erosion problems in the Site 9 drainage ditch. As such, NFA was required for ecological receptors (Baker, 1998g).

3.2.7.4 Remedial Action(s)

A removal action was completed in December 1994 to address surface and subsurface debris. The removal action included the concurrent removal of ordnance and railroad ties to a depth of 4 feet bgs at the lower end of the drainage way before it crosses Bollman Road. The excavated area was backfilled with on-base borrow topsoil and re-graded (IT Corp., 1995b). Following the additional sampling conducted as part of the *Round Two RI, Sites 9 and 19* (Baker, 1997d), a NFA ROD for soil, surface water, and sediment was signed in March 1998 (Baker, 1998g).

3.2.7.5 Activities Completed FY2010

The draft UFP-SAP for Sites 9, 19, and 33 RI for Groundwater was submitted in January 2010.

3.2.7.6 CERCLA Path Forward:

- Finalize UFP-SAP for Sites 9, 19, and 33 RI for Groundwater
- RI/FS/PP/ROD for groundwater
- RACR

[Schedule 3-7](#) presents the FY11-12 schedule for Site 9.

3.2.8 Site 11—Abandoned Explosives Burning Pits

3.2.8.1 Site Description

Site 11, Abandoned Explosives Burning Pits, is a 0.5-acre area located east of Main Road, north of a steep ravine which leads to Indian Field Creek, and just south of Site 17 and west of Site 1 ([Figure 3-8](#)). Site 11 is primarily a grass-covered cleared area surrounded by woods with level topography at approximately 30 feet amsl. Railroad tracks run along the western and northern portions of the site. Surface runoff is southeast to a drainage ditch that is no more than 2 feet deep and is only wet following storm events (i.e., groundwater does not recharge the drainage ditch). This intermittent drainage ditch continues eastward and becomes a tributary to Indian Field Creek.

Burning of explosives was conducted in pits at Site 11 between 1930 and 1950. Solid waste explosives (e.g., TNT, RDX, and HMX), explosives-contaminated sludges, and packaging contaminated with explosives were placed in pits and burned. It is assumed that approximately 200 pounds of explosive residues may have been deposited at the site after 20 years of burning disposal activities (C.C. Johnson & Associates, Inc. and CH2M HILL, 1984). A summary of relevant documents and action milestones is presented in the table below.

Documents and Milestones

Document Title /Milestone	Author/Date	AR Document Number
Round One Remedial Investigation Report for Sites 1-9, 11, 12, 16-19, and 21	Baker and Weston, 1993	000313
Round Two Remedial Investigation Report Sites 11 and 17	Baker, 1998	001553
Feasibility Study Report Sites 11 and 17	Baker, 1999	001573
Proposed Remedial Action Plan Sites 11 and 17	Baker, 1999	001600
Record of Decision, Operable Unit Nos.x and XI, Site 11 and Site 17	Baker, 2000	001094
Remedial Action Report Sites 11 and 17	OHM, 2001	001090
Five-Year Review Report for Sites 1, 3, 6, 7, 11, 12, 16/SSA16, 17, and 19	CH2M HILL, 2007	002115
Phase I Remedial Investigation Report for Groundwater at Sites 1, 3, 6, 7, 11, 17, 24, and 25	CH2M HILL, 2007	002158
Evaluation of Human Health Risk Associated with Potable Use of Groundwater at WPNSTA, Sites 11 and 17 Technical Memorandum	CH2M HILL, 2008	002274

3.2.8.2 Nature and Extent of Potential Contamination

The burning of waste residue may have resulted in potential releases to soil, groundwater, and the intermittent drainage ditch through surface water runoff during storm events. Previous investigations have included analysis of soil and groundwater for TCL VOCs, TCL SVOCs, explosives, pesticides, PCBs, and TAL metals. The most recent soil data available is from the 2001 *Remedial Action Report Sites 11 and 17* (OHM, 2001b). The most current groundwater data is from the 2007 *Phase I RI for Groundwater at Sites 1, 3, 6, 7, 11, 17, 24, and 25* (CH2M HILL, 2007a). The current nature and extent of contamination for each media at Site 11, as documented in the above reports, is summarized below.

Soil

During the development of the FS (Baker, 1999b), RGs were developed for COCs identified in soil during previous investigations to be protective of a future unrestricted land use scenario. A removal action was conducted beginning in May 2000 to remove and dispose of contaminated soil.

Remediation Goals for COCs in Soil

COC	Copper	Mercury
Remediation Goal (mg/kg)	1.4	0.3

Post-removal confirmation samples indicated that concentrations of all COCs were below established RGs following the completion of removal activities in August 2000.

Groundwater

Detected concentrations were screened against maximum base-wide background concentrations and MCLs in order to aid in determining which sites required further investigation.

Columbia/Yorktown-Eastover Aquifer

- No VOCs, SVOCs, or explosives were detected above screening values.
- No total inorganics concentrations exceeded maximum background values in either the Columbia or Yorktown-Eastover aquifer. Detected concentrations of dissolved aluminum and dissolved iron exceeded background concentrations in the Columbia aquifer samples; however, aluminum and iron are not associated with the historical ordnance burning activities at Site 11 and no MCLs exist for these inorganics.

Surface Water

No surface water features are associated with Site 11.

Sediment

No sediment features are associated with Site 11.

3.2.8.3 Potential Risks

A summary of the most current risk assessments and risk management considerations for exposure to each site media are summarized below.

Soil

A ROD was signed in October 2000 (Baker, 2000a) to address contaminants identified in soil. The removal action conducted at Site 11 reduced concentrations of all COCs to below established RGs previously agreed upon by the Navy and the USEPA, in partnership with the VDEQ, to be protective of ecological receptors. Because contaminants were reduced to a level allowing unrestricted land use, NFA is required to address soil at Site 11.

Groundwater

Columbia/Yorktown-Eastover Aquifer

The HHRA conducted as part of the 2008 *Evaluation of Human Health Risk Associated with Potable Use of Groundwater at WPNSTA, Sites 11 and 17 Tech Memo* (CH2M HILL, 2008c) assessed risk to receptors through ingestion, dermal contact, and inhalation of vapors under a potable use scenario. No unacceptable cancer risks or non-cancer hazards resulting from exposure to groundwater for any receptor.

Surface Water

Tributary to Indian Field Creek

Groundwater from Site 11 flows under Site 1 prior to discharging to Indian Field Creek, and potential ecological risks from groundwater discharging to Indian Field Creek are being evaluated directly as part of Site 1 and 3 investigations.

Sediment

Tributary to Indian Field Creek

Groundwater from Site 11 flows under Site 1 prior to discharging to Indian Field Creek, and potential ecological risks from groundwater discharging to Indian Field Creek are being evaluated directly as part of Site 1 and 3 investigations.

3.2.8.4 Remedial Action(s)

A ROD for Site 11 soil was signed in October 2000 (Baker, 2000a) to address risks to ecological receptors from elevated levels of copper and mercury in site soil. The selected remedy was excavation and offsite disposal of an estimated 45 cy of soil, confirmation sampling, followed by backfilling, addition of topsoil, and site restoration. However, in order to achieve clean up goals, the actual removal action consisted of the excavation and offsite disposal of 400 cy (655 tons) of contaminated soil and ash material. Following excavation, clean fill from an on-base source and a minimum of 4-inches of topsoil was placed over the removal area and a vegetative cover was established. Confirmation sample results demonstrated all COCs were below established RGs (OHM, 2001b).

3.2.8.5 Activities Completed FY2010

A NFA ROD for groundwater was finalized in September 2010.

3.2.8.6 CERCLA Path Forward

- RACR

[Schedule 3-8](#) presents the FY11-12 schedule for Site 11.

3.2.9 Site 12—Barracks Road Landfill

3.2.9.1 Site Description

Site 12, the Barracks Road Landfill, currently consists of three former disposal areas: Area A, Area B/C, and the Wood/Debris Disposal Area ([Figure 3-9](#)). 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. Area B/C is located adjacent to the access road leading to the former incinerator facility. Area B/C is an area of uneven terrain where ash may have been disposed. The Wood/Debris Disposal Area was created when lumber, wood pallets, and miscellaneous construction debris were disposed of and pushed into a ravine that leads to Ballard Creek.

Area A

Area A is 4.4 acres, partially wooded, and formerly included an incinerator building and smoke stack that were razed in 1997. The former incinerator building contained two incinerators (SWMUs 142 and 143) to burn wastes. Incinerator ash was disposed of in a topographic low area immediately southwest of the incinerator building that drains to Ballard Creek.

Area B/C

Area B/C east of Barracks Road and adjacent to the access road to the incinerator in Area A is a 1.6 acre open field with wooded steep slopes and ravines.

Wood/Debris Disposal Area

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 (Baker, 1997e).

The topography of Site 12 disposal areas slope 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. An industrial area is located west and north of the Site 12 disposal areas. The former disposal areas at Site 12 operated between 1925 and 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 within the ash. A summary of relevant documents and action milestones is presented in the table below.

Documents and Milestones

Document Title /Milestone	Author/Date	AR Document Number
Study Area Analysis	USEPA, 1992	000289
Round One RI Report for Sites 1-9, 11, 12, 16-19, and 21	Baker and Weston, 1993	000313
Operable Unit Evaluation Report	Baker, 1993	001060
Round Two RI Report Site 12	Baker, 1996	000640
AOC 22, Site 12, and SSA 2, SSA 19 and King Creek Independent Sampling and Risk Screening Report	Black & Veatch, 1996	000669
Feasibility Study Report Site 12	Baker, 1996	000647
Proposed Remedial Action Plan Site 12	Baker, 1996	000654
Record of Decision, Operable Unit Nos. III, IV, and V, Site 12	Baker, 1997	000871
Construction Closeout Report for Site 12 – Area A	OHM, 1998	001154
Long-Term Monitoring Report, Site 12	Baker, 2000	001219
Site 12 Long-Term Monitoring Report - 1998-2003	Baker, 2005	002078
Partnering Team Consensus Statement 9-1-06-45	-----	N/A
Five-Year Review Report for Sites 1, 3, 6, 7, 11, 12, 16/SSA16, 17, and 19	CH2M HILL, 2007	002115
Final Long-Term Monitoring Report	CH2M HILL, 2008	002272

3.2.9.2 Nature and Extent of Potential Contamination

The waste materials burned/disposed of in the Site 12 disposal areas are the sources of potential contamination to site media. Previous investigations have included analysis of soil,

groundwater, sediment, and surface water for TCL VOCs, TCL SVOCs, explosives, pesticides, PCBs, and TAL metals. The most recent soil data available is from the 2000 *Construction Closeout Report for Site 12 – Area A* (OHM, 1998). The most recent groundwater and sediment data available is from the 2008 *Final Long-Term Monitoring Report* (CH2M HILL, 2008d). The current nature and extent of contamination for each media at Site 12, as documented in the above reports, is summarized below.

Soil

During the development of the FS (Baker, 1996b), RGs protective of future commercial/industrial use receptors were developed for COCs identified in Area A soil during the previous investigations. A removal action was conducted beginning in July 1997 to remove and dispose of contaminated soil.

Remediation Goals for COCs in Soil

COC	Lead
Remediation Goal (mg/kg)	400

Following the completion of removal activities in November 1997, post-removal confirmation samples indicated that concentrations of all COCs were below established RGs.

Groundwater

Cornwallis-Cave Aquifer

Elevated concentrations of VOCs and explosives were detected in groundwater samples collected at Site 12; however, they have been attributed to past operations at Site 31 and will be addressed as part of future actions related to that site.

During LTM, four of the eight total RCRA 8 metals were detected in groundwater samples, of which two exceeded screening values. Arsenic (10.3 µg/L) and chromium (549 µg/L) exceeded the RBCs and/or Federal MCLs, both in one sample. The exceedances of metals may be attributable to high turbidity in the sample and may not accurately reflect groundwater quality at the site. No RCRA 8 dissolved inorganics were detected above respective screening values.

Surface Water

Ballard Creek

During development of the Work Plan for Site 12-Long Term Monitoring Years Two and Three (Baker, 2000b), the Navy and the USEPA, in partnership with the VDEQ, agreed to discontinue LTM sampling of surface water because historically detected concentrations of TCE, ranging from non-detect to 6.5 µg/L were far below the Virginia Water Quality Standard for surface water of 807 µg/L.

Sediment

Ballard Creek

During LTM, a total of six RCRA 8 metals were detected in the sediment samples, of which only two exceeded screening values. Arsenic (11.8 mg/kg) and selenium (3.6 mg/kg) exceeded both the RBC and/or BTAG criteria in one or more samples. Exceedances of selenium were not detected in an associated duplicate sample. Although the concentrations

of these two metals exceeded screening values, overall concentration trends have decreased since the landfill cap was installed.

3.2.9.3 Potential Risks

A summary of the most current risk assessments and risk management considerations for exposure to each site media is provided below.

Soil

The ROD was finalized in April 1997 (Baker, 1997g) to address contaminants identified in Area A soil. The removal action conducted at Site 12 reduced concentrations of all COCs to below established RGs previously agreed upon by the Navy and the USEPA, in partnership with the VDEQ, 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. Annual inspections of LUCs and yearly reporting are required in order to ensure that the remedy in place remains protective of human health and the environment. Because no unacceptable risks were identified for Area B/C and the Wood/Debris Disposal Area, no action is required to address soil at these areas.

Groundwater

Cornwallis-Cave Aquifer

Elevated concentrations of VOCs and explosives were detected in groundwater samples collected at Site 12; however, they have been attributed to past operations at Site 31. The WPNSTA Yorktown partnering team signed a consensus statement on October 3, 2006 (Consensus Statement 9-1-06-45), agreeing that this area would be investigated as its own site.

As part of the remedy selected in the 1997 ROD (Baker, 1997g), LUCs consisting of restrictions throughout Area A, Area B/C, and the Wood/Debris Disposal Area to prohibit the use of groundwater as a potable source and groundwater monitoring of shallow and deep wells across the Site 12 Study Area. Because LTM data do not show any significant increases in concentrations, and because there are no exceedances of screening values for dissolved metals in groundwater (exceedances of total metals attributed to turbidity), the Site 12 remedy is determined to be protective of human health and the environment.

Surface Water

Ballard Creek

Following a review of the available data, the WPNSTA Yorktown Partnering Team agreed that current concentrations of VOCs in surface water did not present a risk to human health or the environment (Consensus Statement 9-1-06-45).

Sediment

Ballard Creek

The Ecological Risk Screening conducted as part of the AOC 22, Site 12, and SSA 2, SSA 19 and King Creek Independent Sampling and Risk Screening Report (Black & Veatch, 1996b) identified potential risk to the benthic community due to pesticides/PCBs in sediments. However, sediment in Ballard Creek was not considered for active remediation because it was determined that dredging would result in greater adverse ecological impact than those potentially posed under existing conditions. The ROD finalized in April 1997 (Baker, 1997e) currently requires LTM of sediment in order to ensure that the remedy in place remains

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.

3.2.9.4 Remedial Action(s)

RA construction for Area A began in July 1997 and consisted of monitoring well abandonment; demolition of the incinerator facility, incinerator stack, and a one-story maintenance shed; and implementation of erosion and sediment controls. Metal debris, found scattered throughout the site, was removed and sent to a recycling facility (OHM, 1998). In addition, the limits of the landfill were defined and contaminated material located outside the limits of the landfill were placed within the landfill. The landfill was subsequently capped with a geosynthetic clay liner and covered with soil. Finally, a surface drainage channel (i.e., Tri-Lock Block) and settling pond was installed and the site was revegetated and restored. Following the completion of the NTCRA, LUCs on soil and LTM of groundwater, surface water, and sediment was initiated. However, the Navy and the USEPA, in partnership with the VDEQ, agreed that the monitoring of groundwater would be sufficient to assess movement of contaminants to surface water because of direct migration pathway identified. As such, the surface water sampling has been removed from LTM at Site 12 (Consensus Statement 9-1-06-45).

3.2.9.5 Activities Completed FY2010

Review of documents, ARARs, risk assumptions, and site inspections demonstrate that the soil cover placed at Site 12 is functioning as intended by the ROD.

An ESD to amend the LTM program outlined in the ROD is expected in FY2011. The LTM work plan will be revised to incorporate the clarifications and modifications to the original work plan documented in the ESD.

3.2.9.6 CERCLA Path Forward

- Finalize ESD
- Conduct LTM
- Prepare LUC RD
- Five-Year Review (2012)
- RACR

[Schedule 3-9](#) presents the FY11-12 schedule for Site 12.

3.2.10 Site 16—West Road Landfill and Site Screening Area 16—Building 402 Metal Disposal Area and Environs

3.2.10.1 Site Description

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 Site 16 landfill; consequently these sites have been studied together ([Figure 3-10](#)). The Site 16 disposal area is approximately 8 acres and received waste between 1950 and the early-1960s at an estimated rate of 9 tons/year. Received waste included dry carbon batteries, banding materials, pressure transmitting fluid, other chemicals, and 55-gallon drums with unknown contents (C.C. Johnson &

Associates and CH2M HILL, 1984). SSA 16 is an area approximately 0.4 acres in size and was used for scrap metal storage. 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, 1995c).

The northern portion of Site 16 (including SSA 16), south of railroad tracks, is level and predominantly covered with grass. The remaining portion of Site 16 is wooded. Site 16 is located upgradient of a wetland adjacent to Felgates Creek that drains into the York River approximately 1.5 miles from Site 16 (Baker, 1995c). A summary of relevant documents and action milestones is presented in the table below.

Documents and Milestones

Document Title /Milestone	Author/Date	AR Document Number
Engineering Estimate/Cost Analysis for Sites 4, 16, and 21 Removal Actions	Baker, 1993	000311
Round One RI Report for Sites 1-9, 11, 12, 16-19, and 21	Baker and Weston, 1993	000313
Site 16: West Road Landfill Clearance Sampling and Polychlorinated Biphenyl Screening Report	Black & Veatch, 1994	000676
Closeout Report Sites 4, 16, and 21	IT Corp., 1995	000616
Round Two Remedial Investigation and Baseline Risk Assessment Site 16 and Site Screening Area 16	Baker, 1995	000635 (Volume I) 001177 (Volume II)
Proposed Remedial Action Plan Site 16 and Site Screening Area 16	Baker, 1995	000672
Record of Decision, Operable Unit Nos. II, Site 16 and Site Screening Area 16	Baker, 1995	000671
Five-Year Review Report for Sites 1, 6, 7, 12, 16, and 19	Baker, 2002	001310
Draft Remedial Design for Land Use Controls for Site 16 and SSA 16	Baker, 2006	(Draft – No AR No.)
Considerations for Risk Management at Site 16/Site Screening Area 16	CH2M HILL, 2007	002152
Five-Year Review Report for Site 1, 3, 6, 7, 11, 12, 16/SSA16, 17, and 19	CH2M HILL, 2007	002115

3.2.10.2 Nature and Extent of Potential Contamination

The source of potential contamination is landfill materials from Site 16 / SSA 16. Previous investigations have included analysis of soil, groundwater, sediment, and surface water for TCL VOCs, TCL SVOCs, explosives, pesticides, PCBs, and TAL metals. The most recent soil, groundwater, surface water, and sediment data available is from the 1995 *Round Two RI and Baseline Risk Assessment Site 16 and SSA 16* (Baker, 1995c). The current nature and extent of contamination for each media at Site 16/SSA 16, as documented in the above reports, is summarized below.

Soil

Surface Soil

- No VOCs or pesticides were detected exceeding associated screening values.
- Sixteen SVOCs were detected in surface soil, of which one exceeded associated screening values. Detected concentrations of benzo(a)pyrene (100 J $\mu\text{g}/\text{kg}$) exceeded the residential RBC in one sample location.
- Two PCBs were detected in surface soil, both of which exceeded associated screening values. Detected concentrations of Aroclor-1254 (2,100 J $\mu\text{g}/\text{kg}$) and Aroclor-1260 (1,400 J $\mu\text{g}/\text{kg}$) exceeded both residential and industrial RBCs and BTAG screening values in one or more sample locations.
- Twenty-three inorganics were detected in surface soil, of which twelve exceeded associated screening values. Detected concentrations of aluminum (14,900 J mg/kg), antimony (63.8 J mg/kg), arsenic (20 mg/kg), beryllium (0.79 J mg/kg), cadmium (66.5 mg/kg), chromium (1,060 mg/kg), copper (1,440 mg/kg), iron (217,000 mg/kg), lead (2,160 mg/kg), manganese (875 mg/kg), mercury (3.3 J mg/kg), silver (12.4 mg/kg), and vanadium (60.8 mg/kg) exceeded site-specific background concentrations, residential and industrial RBCs, and BTAG screening values in one or more sample locations.

Subsurface Soil

- No pesticides or PCBs were detected. No VOCs or SVOCs were detected exceeding associated screening values.
- Twenty inorganics were detected in subsurface soil, of which seven exceeded associated screening values. Detected concentrations of aluminum (28,400 mg/kg), antimony (10.1 L mg/kg), arsenic (38.2 L mg/kg), beryllium (2 mg/kg), chromium (56.5 mg/kg), manganese (466 J mg/kg), and vanadium (62.8 mg/kg) exceeded site-specific background concentrations, as well as residential and industrial RBCs in one or more sample locations.

Groundwater

Cornwallis-Cave Aquifer

- Six VOCs were detected in groundwater, of which one exceeded associated screening values. Detected concentrations of 1,1-DCE (2 $\mu\text{g}/\text{L}$) exceeded the tap water RSL at two sample locations.
- Two SVOCs were detected in groundwater, of which one exceeded associated screening values. Detected concentrations of 1,4-dichlorobenzene (2 J $\mu\text{g}/\text{L}$) exceeded the tap water RBC at one sample location.
- Three pesticides were detected in groundwater, of which two exceeded associated screening values. Detected concentrations of 4,4-dichlorodiphenyltrichloroethane (DDT) (0.058 J $\mu\text{g}/\text{L}$) and aldrin (0.043 J $\mu\text{g}/\text{L}$) exceeded the tap water RBC and/or State MCLs, each at one sample location.
- Nineteen inorganics were detected in groundwater, of which four exceeded associated screening values. Detected concentrations of antimony (19.3 J $\mu\text{g}/\text{L}$), arsenic

(5.9 K $\mu\text{g/L}$), beryllium (0.34 J $\mu\text{g/L}$), and manganese (114 $\mu\text{g/L}$) exceeded tap water RBCs and/or Federal MCLs in one or more sample locations.

Surface Water

Felgates Creek

- No SVOCs, PCBs, or pesticides were detected. No VOCs or pesticides were detected exceeding associated screening values.
- Twelve total inorganics were detected in surface water, of which five exceeded associated screening values. Detected concentrations of total (99 J $\mu\text{g/L}$) aluminum, total (2.9 L $\mu\text{g/L}$) arsenic, total (2,000 J $\mu\text{g/L}$) iron, and total (374 $\mu\text{g/L}$) manganese exceeded tap water RBCs \times 10, Federal WQC for human health, and/or BTAG screening values in one or more samples; however, all concentrations detected were below site-specific background. Detected concentrations of lead (5.9 $\mu\text{g/L}$) exceeded both site-specific background concentrations and BTAG screening values.

Sediment

Felgates Creek

- No SVOCs were detected. No VOCs or pesticides were detected exceeded associated screening values.
- One PCB was detected in sediment, which exceeded associated screening values. Detected concentrations of Aroclor-1260 (45 J $\mu\text{g/kg}$) exceeded the BTAG screening value in one sample location.
- Twenty inorganics were detected in sediment, of which exceeded associated screening values. Detected concentrations of aluminum (22,500 mg/kg), arsenic (12.2 mg/kg), beryllium (0.93 mg/kg), manganese (145 L mg/kg), and vanadium (57.6 mg/kg) exceeded the residential RBC \times 10; however no concentration detected exceeded site-specific background concentrations.

3.2.10.3 Potential Risks

A summary of the most current risk assessments and risk management considerations for exposure to each site media is provided below.

Soil

A ROD for soil and groundwater was signed in September 1995 (Baker, 1995d). The selected remedy for Site 16/SSA 16 was NFA with LUCs prohibiting residential development (Baker, 1995a). Periodic inspections are required to ensure that the remedy in place remains protective of human health and the environment.

The HHRA conducted as part of the 2007 *Considerations for Risk Management at Site 16/SSA 16* (CH2M HILL, 2007c) assessed risks to receptors through ingestion and dermal contact.

Surface Soil

Potentially unacceptable non-cancer hazards were identified to future child residents. The RME non-carcinogenic hazard for future adult residents associated with exposure to surface soil. (HI = 1.6) is above the target HI. The hazard is primarily associated with exposure to

antimony (HQ = 0.28), arsenic (HQ = 0.26), cadmium (HQ = 0.24), chromium (HQ = 0.31), and Aroclor 1254 (HQ = 0.23). However there are no cumulative target organ effects.

Subsurface Soil

As part of the 2007 *Considerations for Risk Management at Site 16/SSA 16* (CH2M HILL, 2007c), subsurface samples collected from greater than 15 ft bgs were removed from risk considerations, as a complete exposure pathway at this depth was unlikely. The recalculated total non-carcinogenic hazard (HI = 4.7) exceeds USEPA's target HI. All of the target organs have HIs below 1.0, except for the kidney, primarily associated with exposure to vanadium (HQ = 2.3). However, the maximum concentration of vanadium detected in subsurface soil was below the maximum background concentration. As a result, there are no target organs with HIs above 1, and no unacceptable non-carcinogenic hazard.

The ERA conducted as part of the 1995 *Round Two RI and Baseline Risk Assessment Site 16 and SSA 16* (Baker, 1995c) was identified potential for risk to terrestrial receptors at Site 16/SSA 16. This risk is driven primarily by aluminum, antimony, cadmium and, iron, which may be site-related. However, background concentrations of aluminum, cadmium, and iron were also found to pose risk, indicating that regional conditions are also contributing to potential risks. In addition, a majority of risk levels calculated had a low degree of confidence due to lack of diversity of test species evaluated.

Groundwater

A ROD for Site 16/SSA 16 for groundwater in September 1995 included LUCs prohibiting residential development and disallowing the placement of potable supply wells within the area.

The HHRA conducted as part of the *Considerations for Risk Management at Site 16/SSA 16* (CH2M HILL, 2007c) assessed risk to receptors through ingestion, dermal contact, and inhalation of vapor under a potable use scenario. Potentially unacceptable non-cancer hazards were identified to future adult and child residents.

Cornwallis-Cave Aquifer

The RME non-carcinogenic hazard for future adult residents associated with exposure to groundwater (HI = 1.3) is above the target HI. The hazard is primarily associated with exposure to antimony (HQ = 0.74), arsenic (HQ = 0.24), and manganese (HQ = 0.27). The RME non-carcinogenic hazard for future child residents associated with exposure to groundwater (HI = 3) is above the target HI. The hazard is primarily associated with exposure to antimony (HQ = 1.7), arsenic (HQ = 0.55), and manganese (HQ = 0.64). However, all concentrations of antimony detected were below background concentrations. In addition, the maximum daily intake of manganese (0.003 mg/kg-day) is less than is 0.13 mg/kg-day under which no adverse effects are expected (National Academy of Sciences, 2001).

The ERA conducted as part of the 1995 *Round Two RI and Baseline Risk Assessment Site 16 and SSA 16* (Baker, 1995c) did not assess risk posed to ecological receptors due to groundwater exposure because no complete exposure pathway was identified.

Surface Water

Felgates Creek

The HHRA conducted as part of the 1995 *Round Two RI and Baseline Risk Assessment Site 16 and SSA 16* (Baker, 1995c) assessed risks to receptors through incidental ingestion and dermal absorption. No unacceptable cancer risks or non-cancer hazards resulting from exposure to sediment were identified for any receptor.

The ERA conducted as part of the 1995 *Round Two RI and Baseline Risk Assessment Site 16 and SSA 16* (Baker, 1995c) identified potential risks due to exposure to manganese. Quotient index (QI) ratios for chronic manganese exceeded one, but quotient index ratios for acute manganese were below one. Sediment at Site 16/SSA 16 contained elevated levels of carbon disulfide, toluene, Aroclor-1260, endrin aldehyde, and inorganics. However, the risk to fish and benthic macroinvertebrate populations at Site 16/SSA 16 are low and these populations do not appear to be adversely impacted by these risk levels when compared to background stations. In addition, the quotient index ratios calculated for effects range-medium (ER-M) comparisons were all below one.

Sediment

Felgates Creek

The HHRA conducted as part of the 1995 *Round Two RI and Baseline Risk Assessment Site 16 and SSA 16* (Baker, 1995c) assessed risk to receptors through incidental ingestion and dermal absorption. No unacceptable cancer risks or non-cancer hazards resulting from exposure to sediment were identified for any receptor.

The ERA conducted as part of the 1995 *Round Two RI and Baseline Risk Assessment Site 16 and SSA 16* (Baker, 1995c) identified potential risk due to exposure to carbon disulfide, toluene, Aroclor-1260, endrin aldehyde, and inorganics. However, the risk to fish and benthic macroinvertebrate populations at Site 16/SSA 16 are low and these populations do not appear to be adversely impacted by these risk levels when compared to background stations. In addition, the QI ratios calculated for ER-M comparisons were all below one.

3.2.10.4 Remedial Action(s)

In 1992, scrap metal was partially removed from the surface along the northeastern section of Site 16. The area was backfilled with soil and revegetated (Black & Veatch, 1994). In 1994, the 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 (IT Corp., 1995a). Post-removal soil samples were collected for analysis of VOCs, SVOCs, pesticides, PCBs, and inorganics. Risk based screening values were exceeded for arsenic, beryllium, manganese, benzo(a)pyrene, dieldrin, Aroclor-1254, and Aroclor-1260.

Based on the conclusions from the *Draft Considerations for Risk Management at Site 16/ SSA 16 Technical Memorandum* (CH2M HILL, 2007c), an ESD to the 1995 ROD was planned for 2009 to remove institutional controls for soil and groundwater and allow unrestricted land use. However, the current partnering team agreed to withdraw the ESD since the conclusions in the TM could not be agreed upon.

3.2.10.5 Activities Completed FY2010

Development of the draft RACR began in FY2010 and is anticipated to be finalized in FY2011.

3.2.10.6 CERCLA Path Forward

- Five-Year Review (2012)
- RACR

Schedule 3-10 presents the FY11-12 schedule for Site 16/SSA16.

3.2.11 Site 17—Holm Road Landfill

3.2.11.1 Site Description

Site 17, Holm Road Landfill, is a 2-acre (former) disposal area located south of Holm Road and east of Main Road (**Figure 3-11**). Most of the area is cleared, with woodlands to the south and east and cleared areas with industrial buildings to the north and west. The site lies on a topographically high area with a small (~ 0.5 acre) low lying isolated wetland area created following a soil removal action in 2000 in the north-central part of the site. Surface runoff is overland to offsite drainage ditches that feed tributaries of Indian Field Creek east of the site and to the isolated wetland. Former railroad tracks (now gravel) bisect the western third of the site. In addition, railroad tracks lie along the eastern boundary of the site.

Disposal activities at Site 17 occurred for approximately 10 years between the 1950s and the 1960s. Wastes reportedly disposed included acid batteries from underwater weapons, hydraulic fluids (Dolconik) from the de-milling of torpedoes, other types of hydraulic fluids, drums, and scrap metal. An estimated 60 tons of waste were deposited in the disposal area over a ten year period (C.C. Johnson & Associates, Inc. and CH2M HILL, 1984).

There is no documentation of activities conducted at Site 17 since the cessation of landfill operations until the site was identified during the 1984 IAS. Investigations included sampling and analysis of surface and subsurface soils and groundwater, geophysical surveying and test pitting. No waste was identified in monitoring well borings or test pits excavated during RI activities between 1993 and 1998 (Baker, 1998h). Interviews with Navy personnel report the landfill waste had been removed; however, there is no documentation of construction of a soil cover on the landfill or removal of landfill waste. Test pits activities were conducted in 2007 in an area of previously identified geophysical anomaly to verify the presence or absence of waste at Site 17; no waste observed in the 2007 test pits. A summary of relevant documents and action milestones is presented in the table below.

Documents and Milestones

Document Title /Milestone	Author/Date	AR Document Number
Round One Remedial Investigation Report for Sites 1-9, 11, 12, 16-19, and 21	Baker and Weston, 1993	000313
Round Two Remedial Investigation Report Sites 11 and 17	Baker, 1998	001553
Feasibility Study Report Sites 11 and 17	Baker, 1999	001573
Proposed Remedial Action Plan Sites 11 and 17	Baker, 1999	001600
Record of Decision, Operable Unit Nos.x and XI, Site 11 and Site 17	Baker, 2000	001094
Remedial Action Report Sites 11 and 17	OHM, 2001	001090

Document Title /Milestone	Author/Date	AR Document Number
Statistical Evaluation of Post-Excavation Soil Sampling Data, Site 17 – Holm Road Landfill	Baker, 2005	002212
Phase I Remedial Investigation Report for Groundwater at Sites 1, 3, 6, 7, 11, 17, 24, and 25	CH2M HILL, 2007	002158
Five-Year Review Report for Site 1, 3, 6, 7, 11, 12, 16/SSA16, 17, and 19	CH2M HILL, 2007	002115
Technical Memorandum – Test Pits	CH2M HILL, 2007	002203
Evaluation of Human Health Risk Associated with Potable Use of Groundwater at WPNSTA, Sites 11 and 17 Technical Memorandum	CH2M HILL, 2008	002274
Explanation of Significant Differences, WPNSTA Yorktown, Site 17 – Holm Road Landfill	CH2M HILL, 2008	002205

3.2.11.2 Nature and Extent of Potential Contamination

Historic disposal activities are the source of potential contamination at Site 17. Previous investigations have included analysis of soil and groundwater for TCL VOCs, TCL SVOCs, explosives, pesticides, PCBs, and TAL inorganics. The most recent soil data available is from the 2001 *Remedial Action Report Sites 11 and 17* (OHM, 2001b). The most recent groundwater data available is from the 2007 *Phase I RI for Groundwater at Sites 1, 3, 6, 7, 11, 17, 24, and 25* (CH2M HILL, 2007a). No surface water or sediment features are present on-site. The current nature and extent of contamination for each media at Site 17, as documented in the above reports, is summarized below.

Soil

During the development of the FS (Baker, 1999c), RGs were established for COCs identified in soil to be protective of human and ecological receptors under a future commercial/industrial land use scenario. A removal action was conducted beginning in May 2000 to remove and dispose of contaminated soil and debris.

Remediation Goals for COCs in Sediment

COC	Total PAHs
Remediation Goal (mg/kg)	10

Post-removal confirmation samples indicated that concentrations of all COCs were below established RGs following the completion of removal activities in August 2000.

Groundwater

Detected concentrations were screened against maximum base-wide background concentrations and MCLs in order to aid in determining which sites required further investigation.

Columbia Aquifer

No VOCs or SVOCs were detected. No PCBs or explosives were detected above screening values.

Seventeen total and thirteen dissolved inorganics were detected in groundwater, of which two total and two dissolved inorganics exceeded screening values. Detected concentrations of dissolved (7,370 µg/L) iron and total (239 µg/L) and dissolved (239 µg/L) manganese exceeded corresponding maximum background concentrations. No Federal MCLs exist for these inorganics.

Surface Water

No surface water features exist at Site 17

Sediment

No sediment features exist at Site 17

3.2.11.3 Potential Risks

A summary of the most current risk assessments and risk management considerations for exposure to each site media is provided below.

Soil

A ROD was finalized in October 2000 (Baker, 2000a) to address contaminants identified in soil. The removal action conducted at Site 17 reduced concentrations of all COCs to below established RGs previously agreed upon by the Navy and the USEPA, in partnership with the VDEQ, to be protective of commercial/industrial use scenario receptors. Because the RGs were not established at a level allowing unrestricted land use, LUCs were implemented prohibiting residential development of Site 17. However, a review of post-excavation analytical results presented in *Site 17 Statistical Evaluation of Post-Excavation Soil Sampling Data* (Baker, 2005e) indicated that the 95 percent UCL for the total cPAHs remaining in soil was below the level protective of future unrestricted land use. In addition, based on the *Technical Memorandum – Test Pits* (CH2M HILL, 2007d), there is no significant evidence of waste remaining at the site. Based on these lines of evidence, an ESD was developed to document that NFA is necessary to address soil at Site 17.

Groundwater

Columbia Aquifer

The HHRA conducted as part of the 2008 *Evaluation of Human Health Risk Associated with Potable Use of Groundwater at WPNSTA, Sites 11 and 17 Technical Memorandum* (CH2M HILL, 2008c) assessed risk to receptors through ingestion, dermal contact, and inhalation of vapors under a potable use scenario. No unacceptable cancer risks or non-cancer hazards resulting from exposure to groundwater for any receptor.

The ERA did not assess risk posed to ecological receptors due to groundwater exposure because no complete exposure pathway was identified.

Surface Water

No surface water features exist at Site 17

Sediment

No sediment features exist at Site 17

3.2.11.4 Remedial Action(s)

Remedial activities initiated in May 2000 included the excavation of approximately 940 tons of PAH-contaminated soil to a depth of 2 feet (OHM, 2001b). The material was classified as non-hazardous for offsite disposal. Clean fill from an on-base source was placed within the excavated area and imported topsoil was placed over the impacted area. Following the removal action, LUCs prohibiting residential development were instituted at the site. During development of the RD for LUCs and following review of post-removal confirmation sample results, it was determined that the need for LUCs warranted reconsideration. A review of post-excavation analytical results presented in *Site 17 Statistical Evaluation of Post-Excavation Soil Sampling Data* (Baker, 2005e) indicated that the 95 percent UCL for the total cPAHs remaining in soil was below the level protective of future unrestricted land use. In addition, based on the *Technical Memorandum – Test Pits* (CH2M HILL, 2007d), there is no significant evidence of waste remaining at the site. Based on these lines of evidence, an ESD was developed to document that NFA is necessary to address soil at Site 17.

3.2.11.5 Activities Completed FY2010

A NFA ROD for groundwater was finalized in September 2010.

3.2.11.6 CERCLA Path Forward

- RACR

[Schedule 3-11](#) presents the FY11-12 schedule for Site 17.

3.2.12 Site 19—Conveyor Belt Soils at Building 10

3.2.12.1 Site Description

Site 19 includes soils beneath and surrounding a 500-foot long conveyor belt formerly used to transport packaged TNT from Building 10 to Building 98. Site 19 is located west of Building 10 and 300 feet south of Site 9 ([Figure 3-12](#)). The topography of Site 19 decreases to the north towards Site 9. A topographic low formed by a trench beneath the former conveyor belt bisects the site and receives surface water runoff that either infiltrates the subsurface or flows through drainage channels connecting Site 19 to Site 9 and ultimately discharging to nearby Lee Pond. Depth to groundwater for the Cornwallis-Cave aquifer is typically between 14 and 20 feet bgs with flow generally southwest toward Lee Pond. Groundwater for the Yorktown-Eastover aquifer is typically encountered between 39 and 51 feet bgs with flow generally west to southwest, also toward Lee Pond.

The conveyor belt was used for transport of packaged TNT between the 1940s and the 1970s. As documented in the Round Two RI, 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. Although the area has not been active for any other land use since operations ceased in the 1970's, the site remains relatively cleared and has not been excessively overgrown with vegetation. A summary of relevant documents and action milestones is presented in the table below.

Documents and Milestones

Document Title /Milestone	Author/Date	AR Document Number
Round One Remedial Investigation Report for Sites 1-9, 11, 12, 16-19, and 21	Baker and Weston, 1993	000313
Site 19 and Composites of Site 9, Site 19, SSA 6 & SSA 7 Independent Sampling and Risk Screening Report	Black & Veatch, 1996	000781
Round Two Remedial Investigation Report, Sites 9 and 19	Baker, 1997	000889
Feasibility Study Sites 9 and 19	Baker, 1997	000966
Proposed Remedial Action Plan Sites 9 and 19	Baker, 1997	000967
Record of Decision,v3, Operable Unit Nos. VI and VII, Sites 9 and 19	Baker, 1998	002077
Closeout Report Site 19 Bioremediation	OHM, 2000	001556
Five-Year Review Report for Sites 1, 6, 7, 12, 16, and 19	Baker, 2002	001310
Five-Year Review Report for Site 1, 3, 6, 7, 11, 12, 16/SSA16, 17, and 19	CH2M HILL, 2007	002115

3.2.12.2 Nature and Extent of Potential Contamination

Fine particulates released through the holes and the rinse water sprayed on the conveyor belt were a source of potential contamination to soils and groundwater proximal to the conveyor belt, and sediment located in the concrete drainage way west of the conveyor belt. Previous investigations have included analysis of soil and groundwater for TCL VOCs, TCL SVOCs, explosives, pesticides, PCBs, and TAL inorganics. The most recent groundwater data available is from 1997 *Round Two RI Report, Sites 9 and 19* (Baker, 1997d). The most recent soil data available is from the 2000 *Closeout Report Site 19 Bioremediation* (OHM, 2000). No surface water or sediment features are present on-site. The current nature and extent of contamination for each media at Site 19, as documented in the above reports, is summarized below.

Soil

During the development of the FS (Baker, 1997e), RGs protective of commercial/industrial use scenario receptors were developed for COCs identified in soil during the previous investigations. A removal action was conducted beginning in April 1998 to remove and dispose of contaminated soil.

Remediation Goals for COCs in Soil

COC	2,4,6-TNT	RDX	Aluminum
Remediation Goal (mg/kg)	15	5	14,850

Post-removal confirmation samples indicated that concentrations of all COCs were below established RGs following the completion of removal activities in July 1998.

Groundwater

Cornwallis-Cave Aquifer

- No VOCs and SVOCs were detected exceeding screening values in surface or subsurface groundwater.
- Three explosives were detected in groundwater, all of which exceeded associated screening values. Detected concentrations of 1, 3, 5-TNB (8.5 NJ $\mu\text{g/L}$), 2,4,6-TNT (38 NJ $\mu\text{g/L}$), 2,4/2,6-DNT (0.66 NJ $\mu\text{g/L}$), amino-DNT (130 $\mu\text{g/L}$), and RDX (1.1 $\mu\text{g/L}$) exceeded the Tap Water RBC in one or more sample. In deep groundwater, no explosives were detected.
- Eighteen total and twelve dissolved inorganics were detected in groundwater, of which eight total and one dissolved inorganics exceeded associated screening values. Detected concentrations of total (28,000 J $\mu\text{g/L}$) aluminum, total (41.8 L $\mu\text{g/L}$) arsenic, total (2.7 L $\mu\text{g/L}$) beryllium, total (4.4 $\mu\text{g/L}$) cadmium, total (132 J $\mu\text{g/L}$) chromium, total (60.5 $\mu\text{g/L}$) lead, total (2,850 $\mu\text{g/L}$) and dissolved (2,820 $\mu\text{g/L}$) manganese, and total (285 $\mu\text{g/L}$) vanadium above the Tap Water RBC and/or State and Federal MCLs in one or more sample location.

Yorktown-Eastover Aquifer

No Explosives were detected. No VOCs, SVOCs, or inorganics detected exceeded screening values.

Surface Water

No surface water is associated with Site 19

Sediment

No sediment is associated with Site 19

3.2.12.3 Potential Risks

A summary of the most current risk assessments and risk management considerations for exposure to each site media is provided below.

Soil

A ROD was finalized in October 1998 (Baker, 1998g) to address contaminants identified in surface soil. The pilot study conducted at Site 19 reduced concentrations of all COCs to below established RGs previously agreed upon by the Navy and the USEPA, in partnership with the VDEQ, 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 19.

Groundwater

The HHRA conducted as part of the *Round Two RI Report, Sites 9 and 19* (Baker, 1997d) assessed risk to receptors through ingestion, dermal contact, and inhalation of vapors under a potable use scenario.

Cornwallis-Cave Aquifer

The RME carcinogenic risk for future adult residents associated with exposure to groundwater (ILCR = 7.1×10^{-6}) is within the USEPA's target risk range of 10^{-6} to 10^{-4} . The

RME non-carcinogenic hazard for future adult residents associated with exposure to groundwater (HI = 2.8) is above the acceptable HI of 1.0. The hazard is primarily associated with exposure to 1,3,5-TNB (HQ = 1.7) The CTE non-carcinogenic hazard (HI = 0.88) below the target level. The RME carcinogenic risk for future child residents associated with exposure to groundwater (ILCR = 4.2×10^{-6}) is within the USEPA's target risk range of 10^{-6} to 10^{-4} . The RME non-carcinogenic hazard for future child residents associated with exposure to groundwater (HI = 6.4) is above the acceptable HI of 1.0. The hazard is primarily associated with exposure to 1,3,5-TNB (HQ = 4.1) and 2,4,6-TNT (HQ=1.9) The CTE non-carcinogenic hazard (HI = 2.1) also exceeded the target level.

Surface Water

No surface water is associated with Site 19

Sediment

No sediment is associated with Site 19

3.2.12.4 Remedial Action(s)

Removal of an undocumented quantity of soil from beneath the conveyor belt and the surrounding area was conducted between 1973 and 1974. A ROD for soils was signed in March 1998 (Baker, 1998g) to mitigate the potential for direct contact of 2,4,6-TNT and RDX in soils by human receptors, to prevent ecological effects to terrestrial receptors from exposure to aluminum in soils, and to eliminate the potential migration of these contaminants to other environmental media.

The remedy was initiated April 1998 and included the removal of transite panels and asbestos insulated piping, dismantling and disposal of the conveyor system, excavation of explosives contaminated soils, and confirmation sampling. Approximately 1,000 cy of explosives-contaminated soil were excavated to a depth of 4 feet bgs within the conveyor belt trench. The excavated soils were transported to the bio-cell located at Site 22 for treatment. Following treatment, these soils were distributed to the ground surface, surrounding the bio-cell. Approximately 60 cy of soils with elevated aluminum concentrations were excavated and placed in the conveyor belt trench excavation and covered with clean fill. The site was then restored with topsoil and revegetated, to prevent ecological exposure to elevated aluminum in soil (OHM, 2000).

3.2.12.5 Activities Completed FY2010

The draft UFP-SAP for Sites 9, 19, and 33 RI for Groundwater was submitted in January 2010.

3.2.12.6 CERCLA Path Forward

- Finalize UFP-SAP for Sites 9, 19, and 33 RI for Groundwater
- RI/FS/PP/ROD for groundwater
- Five-Year Review (2012)
- RACR

Schedule 3-12 presents the FY11-12 schedule for Site 19.

3.2.13 Site 21—Battery and Drum Disposal Area

3.2.13.1 Site Description

Site 21, the Battery and Drum Disposal Area, covers approximately one acre in the north-central portion of WPNSTA Yorktown (**Figure 3-13**). Site 21 is an open field surrounded by trees and brush. The site is located immediately adjacent to an unnamed tributary leading southeast to the Eastern Branch of Felgates Creek. West Road marks the northeast boundary of the site, and Sites 4 and 22 are located northwest and southwest of the site, respectively. A gravel access road extends from West Road to the central portion of the site. The topography of Site 21 is relatively flat in the central portion of the site with steep slopes toward the unnamed tributary along the northern, western, and southern boundaries and a gentle slope toward the gravel access road along the northeastern boundary. Site elevations range between five and 45 feet amsl. Depth to groundwater (Columbia aquifer) is approximately 15 feet bgs with flow to the west toward the unnamed tributary to Felgates Creek.

Site 21 was identified as a battery and drum disposal area in November 1990. Site 21 was reportedly used as a land disposal area in the 1950s during which it received an estimated 7,000 tons of waste. Filling operations reportedly occurred three to four times a week. Site reconnaissance, conducted in October 1991, identified exposed waste throughout the site with several areas of concentrated waste disposal (batteries and drums). Empty solvent containers and scrap metal were also observed. A summary of relevant documents and action milestones is presented in the table below.

Documents and Milestones

Document Title /Milestone	Author/Date	AR Document Number
Draft Final Site Inspection Report, Site 21	Baker, 1992	000213
Round One Remedial Investigation Report, Sites 1-9, 11, 12, 16-19, and 21	Baker, 1993	000313
Engineering Estimate/Cost Analysis for Sites 4, 16, and 21 Removal Actions	Baker, 1993	000311
Closeout Report Sites 4, 16, and 21	IT Corp., 1995	000616
Post-Removal Confirmation Sampling Report and Baseline Risk Assessments Sites 4 and 21	Baker, 1995	000660
Round Two Remedial Investigation Report, Sites 4, 21, and 23	Baker, 2001	001296 (Volume I) 001297 (Volume II) 001298 (Volume III)
Feasibility Study Sites 4, 21, and 22	Baker, 2001	001160
Closeout Report Sites 21 and 22	Shaw, 2003	001779
Record of Decision, Operable Unit Nos. XVIII, Site 21	Baker, 2003	001374
Remedial Investigation Report for Groundwater at Sites 4, 21, and 22	CH2M HILL, 2009	000024

3.2.13.2 Nature and Extent of Potential Contamination

Waste disposed of at Site 21 is the source of potential contamination to site media. Investigations have consisted of analysis of soil, groundwater, surface and subsurface soils, surface water and sediment for TCL VOCs, TCL SVOCs, pesticides, PCBs, explosives, TAL inorganics, and total petroleum hydrocarbons (TPHs). The most recent soil data is from the 2003 *Closeout Report Sites 21 and 22* (Shaw, 2003). The most recent groundwater, surface water, and sediment data is from the 2009 *Remedial Investigation Report for Groundwater at Sites 4, 21, and 22* (CH2M HILL, 2009c). Surface water and sediment samples were collected near Site 21 as part of an overall evaluation of surface water related to Sites 4, 21, and 22 as they are adjacent to each other and contribute runoff and groundwater discharge to the Eastern Branch of Felgates Creek. The current nature and extent of contamination for each media at Site 21, as documented in the above reports, is summarized below.

Soil

During the development of the FS (Baker, 2001b), RGs protective of unrestricted land use receptors were developed for COCs identified in soil during the previous investigations. A removal action was conducted beginning in 1994 and 2002 to remove and dispose of contaminated soil and waste.

Remediation Goals for COCs in Soil

COC	Total cPAHs	HMX	Cadmium	Copper	Lead
Remediation Goal (mg/kg)	1	5.7	4	100	48.7

Post-removal confirmation samples indicated that concentrations of all COCs were below established RGs.

Groundwater

Yorktown-Eastover Aquifer

- VOCs were not analyzed for based on the results of previous investigations. No SVOCs, pesticides, PCBs, or TPH were detected.
- Three explosives were detected in groundwater, of which one exceeded associated screening values. Detected concentrations of RDX (3.5 J µg/L) exceeded the tap water RSL in one sample location.
- Twenty total and sixteen dissolved inorganics were detected in groundwater, of which five total and two dissolved inorganics exceeded associated screening values. Detected concentrations of total (12.3 µg/L) and dissolved (6.7 K µg/L) arsenic, total (226 µg/L) chromium, total (30,400 K µg/L) iron, total (17 K µg/L) lead, and total (2,980 µg/L) and dissolved (3,120 µg/L) manganese exceeded the tap water RSL and/or MCL in one or more sample locations.

Groundwater Seeps

VOCs were not analyzed for based on the results of previous investigations. No pesticides, PCBs, or TPH were detected. No SVOCs, explosives, or inorganics were detected exceeding associated screening values.

Surface Water

Eastern Branch of Felgates Creek

- No SVOCs or PCBs were detected. No VOCs or pesticides were detected exceeding associated screening values.
- Six explosives were detected in surface water, of which one exceeded associated screening values. Detected concentrations of RDX (8.8 µg/L) exceeded the human health screening in one sample location.
- Twenty-two total and fourteen dissolved inorganics were detected in surface water, of which eight total and five dissolved inorganics exceeded associated screening values. Detected concentrations of total (56,200 µg/L) and dissolved (362 µg/L) aluminum, total (26.5 µg/L) and dissolved (5.5 J µg/L) arsenic, total (124 J µg/L) and dissolved (33 µg/L) barium, total (88,800 µg/L) iron, total (64.5 µg/L) lead, total (1,000 µg/L) and dissolved (292 µg/L) manganese, total (5.6 J µg/L) and dissolved (5.7 J µg/L) thallium, and total (118 µg/L) vanadium exceeded the human health or ecological screening value in one or more samples. Overall, total metals concentrations in surface water are elevated at the mouth of the unnamed tributary relative to the upstream reference sample concentrations. No source for metals contamination has been identified based on the site data, and elevated concentrations are likely a result of suspended sediment.

Sediment

Eastern Branch of Felgates Creek

No SVOCs, pesticides, PCBs, or explosives were detected. No VOCs or inorganics were detected exceeding associated screening values.

3.2.13.3 Potential Risks

A summary of the most current risk assessments and risk management considerations for exposure to each site media is provided below.

Soil

The removal action conducted at Site 21 reduced concentrations of all COCs to below established RGs previously agreed upon by the Navy and USEPA, in partnership with VDEQ, to be protective of a future unrestricted land use scenario. An NFA ROD for soils was signed in September 2003 (Baker, 2003a).

Groundwater

The HHRA conducted as part of the *RI for Groundwater at Sites 4, 21, and 22* (CH2M HILL, 2009c) assessed risks to receptors through ingestion, dermal contact, and inhalation of vapors. As per EPA guidance, carcinogenic risks were only calculated for lifetime child/adult residents.

Yorktown-Eastover Aquifer

Potential unacceptable non-cancer hazards were identified for future adult and child residents. Potential unacceptable cancer risks were identified for lifetime child/adult residents. The RME non-carcinogenic hazard for future adult residents associated with exposure to groundwater (HI = 5.7) is above the acceptable HI of 1.0. The hazard is primarily associated with exposure to manganese (HQ = 4). The CTE non-carcinogenic hazard (HQ = 0.55) is less than the acceptable HI of 1.0. The RME non-carcinogenic hazard for future child residents associated with exposure to groundwater (HI = 14) exceeds the

acceptable HI of 1.0. The hazard is primarily associated with ingestion of arsenic (HQ = 1.4), iron (HQ = 1.3), and manganese (HQ = 9.7). The CTE non-carcinogenic hazard (HQ = 1.8) also exceeds the acceptable HI; however, there are no individual target organ/effects with HIs exceeding 1.0. The RME carcinogenic risk for lifetime child/adult residents associated with exposure to groundwater (CR = 1.5×10^{-4}) is above USEPA's target risk range of 10^{-6} to 10^{-4} . The risk is primarily associated with exposure to arsenic (CR = 1.5×10^{-4}). The CTE carcinogenic risk associated with exposure to groundwater (4.2×10^{-5}) is within USEPA's target risk range. Arsenic, iron, and manganese were the two main risk drivers in groundwater. However, concentrations of these chemicals did not pose risk under the CTE exposure scenario, and no dissolved concentrations of arsenic exceeded the MCL (there is no MCL for iron or manganese). Iron and manganese are essential human nutrients and were eliminated as COCs because calculated ingestion rates fell below the maximum daily intake that is likely to pose no risk or adverse effects (Institute of Medicine, 2005). Arsenic concentrations may be related to geochemical conditions resulting from the degradation of organic matter rather than a direct site source. Since landfill materials have been removed, it is anticipated that organic landfill materials will no longer create reducing conditions that may result in arsenic mobilization. Therefore, no additional action is recommended to address groundwater at Site 21.

The ERA conducted as part of *RI for Groundwater at Sites 4, 21, and 22* (CH2M HILL, 2009c) identified no COCs due to direct contact or food web exposure associated with seep water. Thus, risks to ecological receptors are considered acceptable.

Surface Water

Eastern Branch of Felgates Creek

The HHRA conducted as part of the *RI for Groundwater at Sites 4, 21, and 22* (CH2M HILL, 2009c) assessed risk to receptors through incidental ingestion, dermal absorption, and inhalation of vapors. No unacceptable cancer risks or non-cancer hazards resulting from exposure to surface water were identified for any receptor.

The ERA conducted as part of the *RI for Groundwater at Sites 4, 21, and 22* (CH2M HILL, 2009c) identified no COCs due to direct contact or food web exposure associated with surface water. Thus, risks to ecological receptors are considered acceptable.

Sediment

Eastern Branch of Felgates Creek

The HHRA conducted as part of the *RI for Groundwater at Sites 4, 21, and 22* (CH2M HILL, 2009c) assessed risk to receptors through incidental ingestion, dermal absorption, and inhalation of vapors. No unacceptable cancer risks or non-cancer hazards resulting from exposure to sediment were identified for any receptor.

The ERA conducted as part of the *RI for Groundwater at Sites 4, 21, and 22* (CH2M HILL, 2009c) identified no COCs due to direct contact or food web exposure associated with sediment. Thus, risks to ecological receptors are considered acceptable.

3.2.13.4 Remedial Action(s)

A removal action in 1994 consisted of excavation and disposal of 6,070 tons of batteries and screened soils, 650 tons of debris, four drums, and 90 tons of soils. With the exception of the contents of the drums that contained elevated lead, the waste and soils were disposed offsite

as non-hazardous wastes. Following the removal action, the area was re-graded and re-vegetated (IT Corp., 1995a). A second removal action was completed in 2002 consisting of the excavation and offsite disposal of approximately 145 cy of soils. Confirmation samples indicated that all potential human health and ecological risks in surface soil at Site 21 were mitigated (Shaw, 2003). An NFA ROD for soils was signed in September 2003 (Baker, 2003a).

3.2.13.5 Activities Completed FY2010

The RI Report for Groundwater at Sites 4, 21, and 22 was completed in November 2009. A PP documenting NFA for groundwater, surface water, and sediment for Site 21 has been developed and submitted for public comments.

3.2.13.6 CERCLA Path Forward

- Finalize NFA PP for groundwater, surface water and sediment
- ROD for groundwater, surface water and sediment

[Schedule 3-13](#) presents the FY11-12 schedule for Site 21.

3.2.14 Site 22—Burn Pad

3.2.14.1 Site Description

Site 22, the Burn Pad, consists of a nine acre area located south of Site 4 ([Figure 3-14](#)). The site is on a flat, elevated plateau with topography sloping steeply to the east, south, and southwest toward the Eastern Branch of Felgates Creek. An access road runs north to south along the west side of Site 4 and provides vehicle access to Site 22 from the north. The site consists of a grassy field surrounded by woods.

Site 22 once contained a 150-foot diameter circular array of 11 steel burning pans which were used for burning waste plastic explosives and spent solvents. Open burning operations at the burn pads ceased in 1994. In addition, Site 22 was also used for the treatment of nitramine-contaminated soils and TNT-contaminated soils. A 153-foot by 86-foot bio-cell was constructed and contaminated soils from Sites 7 and 19 were treated. Bio-cell operations ceased in 1998 and treated (clean) soils were dewatered by being pumped into an impoundment area in a topographical low area directly southeast of the existing bio-cell. Erosion control measures were implemented in 1999 to prevent discharge to the wetlands west of the bio-cell. An earthen dam, built to hold clean soil and water in the impoundment area, was also opened to prevent rainwater from overflowing into Felgates Creek. A summary of relevant documents and action milestones is presented in the table below.

Documents and Milestones

Document Title /Milestone	Author/Date	AR Document Number
Pilot Study Report for the Explosives-Contaminated Soil At The Naval Weapons Station Yorktown	Baker, 1997	001088
Round Two Remedial Investigation Report, Sites 4, 21, and 22	Baker, 2001	001296 001297
Feasibility Study, Sites 4, 21, and 22	Baker, 2001	001160
Proposed Remedial Action Plan, Sites 4 and 22	Baker, 2001	001290
Closeout Report Sites 21 and 22	Shaw, 2003	001779

Document Title /Milestone	Author/Date	AR Document Number
Record of Decision, Site 22 – Burn Pad	Baker, 2003	001375
Remedial Investigation Report for Groundwater at Sites 4, 21, and 22	CH2M HILL, 2009	000024

3.2.14.2 Nature and Extent of Potential Contamination

Historical burning operations are the source for potential contamination of site media. Investigations have consisted of analysis of groundwater, soil, surface water and sediment for VOCs, SVOCs, pesticides, PCBs, inorganics, and explosives. The most recent soil data is from the 2003 *Closeout Report Sites 21 and 22* (Shaw, 2003). The most recent groundwater, surface water, and sediment data is from the 2009 *Remedial Investigation Report for Groundwater at Sites 4, 21, and 22* (CH2M HILL, 2009c). Surface water and sediment samples were collected near Site 22 as part of an overall evaluation of surface water related to Sites 4, 21, and 22 as they are adjacent to each other and contribute runoff and groundwater discharge to the Eastern Branch of Felgates Creek. The current nature and extent of contamination for each media at Site 22, as documented in the above reports, is summarized below.

Soil

During the development of the FS (Baker, 2001b), RGs protective of unrestricted land use scenario receptors were developed for COCs identified in soil during the previous investigations. A removal action was conducted beginning in 2002 to remove and dispose of contaminated soil.

Remediation Goals for COCs in Soil

COC	Total cPAHs	HMX	Cadmium	Copper	Lead
Remediation Goal (mg/kg)	1	5.7	4	100	48.7

Post-removal confirmation samples indicated that concentrations of all COCs were below established RGs.

Groundwater

Yorktown-Eastover Aquifer

- No SVOCs or PCBs were detected.
- Thirteen VOCs were detected in groundwater, of which eight exceeded associated screening values. Detected concentrations of carbon tetrachloride (3.8 J µg/L), chloroform (1.6 J µg/L), benzene (4.8 J µg/L), PCE (3.9 J µg/L), TCE (650 µg/L), cis-1,2-DCE (320 µg/L), 1,1-DCE (200 µg/L), and VC (17 µg/L) exceeded tap water RSL or MCLs in one or more sample locations.
- One pesticide was detected in groundwater, which exceeded associated screening values. Detected concentrations of heptachlor epoxide (0.21 µg/L) exceeded the tap water RSL and/or MCL in one or more sample locations.

- Thirteen explosives were detected in groundwater, of which two exceeded associated screening values. Detected concentrations of 1,3-dinitrobenzene (5.9 µg/L) and RDX (150 µg/L) exceeded the tap water RSL, each in multiple sample locations.
- Nineteen total and sixteen dissolved inorganics were detected in groundwater, of which two total and one dissolved inorganics exceeded associated screening values. Detected concentrations of total (15.5 µg/L) and dissolved (8.8 J µg/L) arsenic and total (1,070 µg/L) manganese exceeded the tap water RSL and/or MCL in one or more sample locations.

Surface Water

Eastern Branch of Felgates Creek

- No SVOCs or PCBs were detected. No VOCs or pesticides were detected exceeding associated screening values.
- Six explosives were detected in surface water, of which one exceeded associated screening values. Detected concentrations of RDX (8.8 µg/L) exceeded the human health screening in one sample location.
- Twenty-two total and fourteen dissolved inorganics were detected in surface water, of which eight total and five dissolved inorganics exceeded associated screening values. Detected concentrations of total (56,200 µg/L) and dissolved (362 µg/L) aluminum, total (26.5 µg/L) and dissolved (5.5 J µg/L) arsenic, total (124 J µg/L) and dissolved (33 µg/L) barium, total (88,800 µg/L) iron, total (64.5 µg/L) lead, total (1,000 µg/L) and dissolved (292 µg/L) manganese, total (5.6 J µg/L) and dissolved (5.7 J µg/L) thallium, and total (118 µg/L) vanadium exceeded the human health or ecological screening value in one or more samples. Overall, total metals concentrations in surface water are elevated at the mouth of the unnamed tributary relative to the upstream reference sample concentrations. No source for metals contamination has been identified based on the site data, and elevated concentrations are likely a result of suspended sediment.

Sediment

Eastern Branch of Felgates Creek

No SVOCs, pesticides, PCBs, or explosives were detected. No VOCs or inorganics were detected exceeding associated screening values.

3.2.14.3 Potential Risks

A summary of the most current risk assessments and risk management considerations for exposure to each site media is provided below.

Soil

The removal action conducted at Site 22 reduced concentrations of all COCs to below established RGs previously agreed upon by the Navy and USEPA, in partnership with VDEQ, to be protective of a future unrestricted land use scenario. An NFA ROD for soils was signed in September 2003 (Baker, 2003b).

Groundwater

The HHRA conducted as part of the *RI for Groundwater at Sites 4, 21, and 22* (CH2M HILL, 2009c) assessed risk to receptors through ingestion, dermal contact, and inhalation of

vapors. As per EPA guidance, carcinogenic risks were only calculated for lifetime child/adult residents.

Yorktown-Eastover Aquifer

Potential unacceptable non-cancer hazards were identified for future adult and child residents and future construction workers. Potential unacceptable cancer risks were identified for lifetime child/adult residents. The RME non-carcinogenic hazard for future adult residents associated with exposure to groundwater (HI = 3.8) is above the acceptable HI of 1.0. There are no individual COPCs with HQs exceeding unity. The CTE non-carcinogenic hazard (HQ = 0.9) is less than the acceptable HI of 1.0. The RME non-carcinogenic hazard for future child residents associated with exposure to groundwater (HI = 8.7) exceeds the acceptable HI of 1.0. The hazard is primarily associated with ingestion of arsenic (HQ = 1.5), heptachlor epoxide (HQ = 2.1), and RDX (HQ = 2). The CTE non-carcinogenic hazard (HQ = 1.5) also exceeds the acceptable HI; however, there are no individual target organ/effects with HIs exceeding 1.0. The RME non-carcinogenic hazard for future construction worker associated with exposure to groundwater (HI = 3.7) exceeds the acceptable HI of 1.0. The hazard is primarily associated with exposure to TCE (HI = 1.3), 1,1-DCE (HI = 0.91), and VC (HI = 0.61). The CTE non-carcinogenic hazard (HQ = 0.45) also exceeds the acceptable HI; however, there are no individual target organ/effects with HIs exceeding 1.0. The RME carcinogenic risk for lifetime child/adult residents associated with exposure to groundwater (CR = 7.6×10^{-4}) is above USEPA's target risk range of 10^{-6} to 10^{-4} . This risk is primarily associated with ingestion of VC (CR = 1.8×10^{-4}), RDX (CR = 1.5×10^{-4}), and arsenic (CR = 1.6×10^{-4}). The CTE carcinogenic risk associated with exposure to groundwater (CR = 1.1×10^{-4}) is also above the USEPA's target risk range. Arsenic, heptachlor epoxide, TCE, VC, and RDX were the main risk drivers in groundwater. However, concentrations of arsenic did not pose risk under the CTE exposure scenario, and dissolved concentrations did not exceed the MCL. Detections may be a result of geochemical conditions rather than a site-related source. Therefore, no additional action is recommended for arsenic. Heptachlor epoxide was detected in a number of samples, but the concentration in only one sample was just slightly greater than the MCL. There is no known historical source of this chemical in groundwater at the site and it is likely a result of base routine pesticide treatment activities. Therefore, no additional action is recommended to address this chemical. Concentrations of TCE, VC, and RDX are widespread across the site concentrations, pose risk, and exceed MCLs. Additional action is necessary to address these chemicals.

The ERA conducted as part of RI for Groundwater at Sites 4, 21, and 22 (CH2M HILL, 2009c) did not assess risk posed to ecological receptors due to groundwater exposure because no complete exposure pathway was identified.

Surface Water

Eastern Branch of Felgates Creek

The HHRA conducted as part of the *RI for Groundwater at Sites 4, 21, and 22* (CH2M HILL, 2009c) assessed risk to receptors through incidental ingestion and dermal absorption. No unacceptable cancer risks or non-cancer hazards resulting from exposure to surface water were identified for any receptor.

The ERA conducted as part of the *RI for Groundwater at Sites 4, 21, and 22* (CH2M HILL, 2009c) identified no COCs due to direct contact or food web exposure associated with surface water. Thus, risks to ecological receptors are considered acceptable.

Sediment

Eastern Branch of Felgates Creek

The HHRA conducted as part of the *RI for Groundwater at Sites 4, 21, and 22* (CH2M HILL, 2009c) assessed risk to receptors through incidental ingestion and dermal absorption. No unacceptable cancer risks or non-cancer hazards resulting from exposure to sediment were identified for any receptor.

The ERA conducted as part of the *RI for Groundwater at Sites 4, 21, and 22* (CH2M HILL, 2009c) identified no COCs due to direct contact or food web exposure associated with sediment. Thus, risks to ecological receptors are considered acceptable.

3.2.14.4 Remedial Action(s)

A removal action in 2002 consisted of excavation and disposal of 3,540 cy of contaminated soil. Based on the removal actions conducted and confirmation sampling results, the Navy and the USEPA, in partnership with the VDEQ, agreed all potential human health and ecological risks for soil at Site 22 were mitigated and an NFA ROD for soil was signed in September 2003 (Baker, 2003b).

3.2.14.5 Activities Completed FY2010

The *RI for Groundwater at Sites 4, 21, and 22* was completed in November 2009. A PP documenting NFA for surface water and sediment for Site 22 has been developed and submitted for public comments. A FS for groundwater is expected in FY2011.

3.2.14.6 CERCLA Path Forward

- FS/PP/ROD for groundwater
- RD/RA, as appropriate

[Schedule 3-14](#) presents the FY11-12 schedule for Site 22.

3.2.15 Site 23—Building 428 Teague Road Disposal Area

3.2.15.1 Site Description

Site 23 (formerly SSA 1), the Building 428 Teague Road Disposal Area, is located northeast of Building 428 along the eastern portion of the WPNSTA Yorktown property boundary ([Figure 3-15](#)). The site encompasses 10.5 acres bisected by a former railroad track. The railroad track was constructed in 1919 and operated until 1989. The track has since been removed and only the ballast and a gravel road that parallels the former track remain. The site generally consists of open, maintained grass-covered areas where disposed materials were removed surrounded by mixed hardwood/pine forest. South of the former railroad tracks, surface runoff flows toward an intermittent unnamed tributary that was dry during the 1997-1998 RI. This drainage lies about 300 feet east-southeast of the site disposal areas and trends to the York River about 1,000 feet east of Site 23. Depth to groundwater (Cornwallis Cave aquifer) is between 8 and 15 feet bgs with flow toward the York River.

Disposal activities at the site reportedly began in 1940 and ceased in 1960 and included the disposal of debris from a pier fire in the mid 1950s. Aerial photography suggests the area was also used for waste storage in 1945. Between 1960 and the present, there is no evidence of additional waste storage/disposal or release, with the exception of a land survey, conducted in 1993, where discrete piles of surface and partially buried debris were identified (concrete rubble; scrap metal; wooden pilings and railroad ties; empty fuel cans; empty, open, and corroded drums; asbestos pipe insulation; and shingles). A summary of relevant documents and action milestones is presented in the table below.

Documents and Milestones

Document Title /Milestone	Author/Date	AR Document Number
Waste Characterization Sampling, SSAs 1, 2, and 5	Baker, 1993	000313
Engineering Evaluation Cost Analysis and Action Memorandum SSA 1, 2, and 5	Baker, 1994	000625
Soil and Debris Removal Action Site Screening Areas 1, 2, and 5	OHM, 1996	000648
Site Screening Process Report Site Screening Areas 1, 6, 7, and 15	Baker, 1996	000663
Final Ecological Cleanup Goals for Soil, Site 23, Teague Road Disposal Area	Baker, 2003	002269
Construction Closeout Report for Site 23	J.A. Jones, 2003	002415
Excavation and Off-site Landfill Disposal, Site 23	UNITEC, 2006	002283
Draft Final Round One Remedial Investigation Report for Sites 23, 24, 25, and 26	Baker, 2008	Will not be finalized - No AR No.
Final Work Plan, Removal Action at Site 23	Shaw, 2009	002423
Draft Final Construction Completion Report at Site 23	Shaw, 2010	Draft – No AR No.

3.2.15.2 Nature and Extent of Potential Contamination

Disposed waste material at Site 23 was the source of potential contamination to soil, groundwater, sediment, and surface water. Previous investigations have included analysis of soil, groundwater, surface water, and sediment for TCL VOCs, TCL SVOCs, explosives, pesticides, PCBs, and TAL metals. The most recent soil, groundwater, surface water, and sediment data available is from the 1996 *SSP for SSAs 1, 6, 7, and 15* (Baker, 1996d). A Round One RI was completed in 2008; however, in accordance with partnering team agreement, this document will not be finalized and is not discussed herein. The current nature and extent of contamination for each media at Site 23, as documented in the above report, is summarized below.

Soil

Surface Soil

- No VOCs or pesticides were detected exceeding associated screening values.
- Twenty-seven SVOCs were detected in surface soil, of which six exceeded associated screening values. Detected concentrations of benzo(a)anthracene (27,000 µg/kg), benzo(b)fluoranthene (49,000 µg/kg), benzo(k)fluoranthene (39,000 µg/kg), benzo(a)pyrene (26,000 µg/kg), indeno(1,2,3cd)pyrene (110,000 µg/kg), and

dibenzo(a,h)anthracene (53,000 J $\mu\text{g}/\text{kg}$) exceeded the residential RBCs in one or more sample location.

- Four explosives were detected in surface soil, of which one exceeded associated screening values. Detected concentrations of 1,3,5-TNB (1,100 $\mu\text{g}/\text{kg}$) exceeded the residential RBC in one sample location.
- Twenty-four inorganics were detected in surface soil, of which six exceeded associated screening values. Detected concentrations of aluminum (12,300 J mg/kg), arsenic (52.7 L mg/kg), beryllium (0.73 mg/kg), cadmium (6.65 mg/kg), lead (457 mg/kg), and manganese (347 mg/kg) exceeded the residential RBC in one or more sample locations; however, all detected concentrations were below maximum background concentrations. Detections of cadmium (6.65 mg/kg) and lead (457 mg/kg) exceeded maximum background concentrations and residential RBCs in one or more sample locations.

Subsurface Soil

- No VOCs, pesticides, PCBs, or explosives were detected exceeding associated screening values.
- Fourteen SVOCs were detected in subsurface soil, of which six exceeded associated screening values. Detected concentrations of benzo(a)anthracene(2,700 $\mu\text{g}/\text{kg}$), benzo(b)fluoranthene(5,100 $\mu\text{g}/\text{kg}$), benzo(k)fluoranthene (12,000 $\mu\text{g}/\text{kg}$), benzo(a)pyrene (3,700 $\mu\text{g}/\text{kg}$), indeno(1,2,3cd)pyrene (890 $\mu\text{g}/\text{kg}$), and dibenzo(a,h)anthracene (280 J $\mu\text{g}/\text{kg}$) exceeded the residential RBCs in one or more sample location.
- Twenty-one inorganics were detected in surface soil, of which five exceeded associated screening values. Detected concentrations of aluminum (8,300 mg/kg), arsenic (24.8 mg/kg), beryllium (3.8 J mg/kg), manganese (351 mg/kg), and thallium (1.6 K mg/kg) exceeded the residential RBC in one or more sample locations.

Groundwater

Cornwallis Cave Aquifer

- No VOCs were detected in groundwater exceeding associated screening values. No SVOCs, pesticides, or PCBs were detected in any groundwater sample.
- Three explosives were detected in groundwater, all of which exceeded screening values. Detected concentrations of 2, 4, 6-TNT (0.6 $\mu\text{g}/\text{L}$) and RDX (9.4 $\mu\text{g}/\text{L}$) exceeded the RBC in one sample location. No groundwater screening values exist for 4,-amino-2, 6-DNT (4.6 $\mu\text{g}/\text{L}$).
- Twenty-one total and eleven dissolved inorganics were detected in groundwater, of which five total and two dissolved inorganics exceeded screening values. It is likely that total inorganic concentrations detected are biased high due to high turbidity in samples collected.
- Detected concentrations of total (76,300 J $\mu\text{g}/\text{L}$) aluminum, total (820 $\mu\text{g}/\text{L}$) barium, total (2.7 $\mu\text{g}/\text{L}$) cadmium, total (4,350 $\mu\text{g}/\text{L}$) and dissolved (173 $\mu\text{g}/\text{L}$) manganese, dissolved thallium (5.4 K $\mu\text{g}/\text{L}$) and total (182 L $\mu\text{g}/\text{L}$) vanadium exceeded the RBC and State and Federal MCLs at one or more sampling location.

Surface water

Tributary to York River

- No explosives were detected in surface water exceeding associated screening values. No VOCs, SVOCs, pesticides, or PCBs were detected in any surface water sample.
- Twenty total inorganics were detected in surface water, of which seven total inorganics exceeded associated screening values. Detected concentrations of total (1.1 µg/L) cadmium, total (25.6 µg/L) chromium, total (57.5 µg/L) copper, total (39,500 µg/L) iron, total (112 µg/L) lead, total (0.31 µg/L) mercury, and total (551 µg/L) zinc exceeded screening values.

Sediment

Tributary to York River

- Eleven SVOCs were detected, of which one exceeded associated screening values. Detected concentrations of benzo(b)fluoranthene (270 J µg/kg) exceeded the sediment ER-L in one sampling location.
- Five pesticides were detected, of which one exceeded associated screening values. Detected concentrations of 4, 4-DDT (1.7 J µg/kg) exceeded the sediment ER-L in two sampling locations.
- Twenty inorganics were detected in sediment, of which one exceeded association screening values. Detected concentrations of mercury (0.3 mg/kg) exceeded the sediment ER-L in one sampling location.

3.2.15.3 Potential Risks

A summary of the most current risk assessments and risk management considerations for exposure to each site media is provided below.

Soil

The Human Health Risk Screening conducted as part of the *SSP for SSAs 1, 6, 7, and 15* (Baker, 1996d) assessed risks to receptors through ingestion.

Surface Soil

Potential unacceptable cancer risks ($CR = 1.1 \times 10^{-4}$) resulting from exposure to surface soil were identified. This risk is primarily associated with a combination of the cPAHs detected in surface soil. No potential unacceptable non-cancer hazards ($HI = 0.77$) resulting from surface soil were identified.

Subsurface Soil

No unacceptable cancer risks ($CR = 3.5 \times 10^{-5}$) or non-cancer hazards ($HI = 0.72$) were identified for subsurface.

An Ecological Risk Assessment (ERA) has not been conducted for site soil.

Groundwater

The Human Health Risk Screening conducted as part of the *SSP for SSAs 1, 6, 7, and 15* (Baker, 1996d) assessed risks to receptors through ingestion under a potable use scenario.

Cornwallis Cave Aquifer

Unfiltered groundwater was analyzed independently of other filtered groundwater collected during the risk assessment. No unacceptable cancer risks ($CR = 1.1 \times 10^{-5}$) resulting from exposure to unfiltered groundwater were identified. Potential unacceptable non-cancer hazards ($HI = 11$) identified were primarily associated with exposure to aluminum ($HQ = 1.3$) and manganese ($HQ = 8.3$) in unfiltered groundwater. No unacceptable cancer risks ($CR = 1.1 \times 10^{-5}$) resulting from exposure to filtered groundwater were identified. Potential unacceptable non-cancer hazards ($HI = 1.6$) identified were primarily associated with exposure to thallium ($HQ = 1.3$) in filtered groundwater.

An ERA will not be conducted for groundwater because no complete exposure pathway exists.

Surface Water

Tributary to York River

A HHRA has not been conducted for surface water.

The Ecological Risk Screening conducted as part of the *SSP for SSAs 1, 6, 7, and 15* (Baker, 1996d) identified potential unacceptable risk to ecological receptors. The risk (ecological index [EI] = 110) is associated with exposure to cadmium (EQ = 2.2), chromium (EQ = 1.7), copper (EQ = 4.8), iron (EQ = 39), lead (EQ = 35), mercury (EQ = 26), and zinc (EQ = 5).

Sediment

Tributary to York River

A HHRA has not been conducted for sediment.

The Ecological Risk Screening conducted as part of the *SSP for SSAs 1, 6, 7, and 15* (Baker, 1996d) identified potential unacceptable risk to ecological receptors. The risk (EI = 3) is associated with exposure to benzo(b)fluoranthene (EQ = 1), 4, 4-DDT (EQ = 1.1), and mercury (EQ = 0.93).

3.2.15.4 Remedial Action(s)

A removal action was conducted during the summer and early fall of 1994 by OHM to address surface debris present at Site 23. Items removed from the site during the removal action included two 55-gallon drums of paint cans/spilled paint; 443 tons of wooden creosote timbers (remains of the burnt pier); 763 tons of ordinary nonhazardous debris; 1,119 tons of debris containing non-friable asbestos; 1,680 pounds of pipe wrapped with friable asbestos; 31 tons of recyclable metal; and two truck batteries. Approximately 5,815 tons of TNT- and TNB-contaminated ash/soil also were removed from an area north of the railroad tracks at the northeast portion of the site. Confirmatory soil samples were collected and the excavated area was backfilled and re-graded (OHM, 1996).

A second removal action was conducted by J.A. Jones in the spring of 2003 to address eight identified hotspots (Areas A - H). During the March 2003 Yorktown Partnering Meeting, the Partnering Team agreed not to include Area G because the concentration of the COC at this location, arsenic, was consistent with Station background concentrations. In total, the removal action included the excavation and off-site disposal of approximately 1,025 tons of contaminated soil and buried debris from the seven areas (J.A. Jones, 2003).

A third removal action was conducted by Universe Technologies, Inc. (UNITEC) in January 2004 to address approximately 2,816 tons of zinc-contaminated soil and debris that remained in Area F following the 2003 action. Floor composite confirmation samples were collected from six grid areas prior to backfilling. Confirmation samples indicated that the zinc cleanup goal was met in the western three grids, but was slightly exceeded in the eastern three grids. This area was backfilled and on January 7, 2004, the WPNSTA Yorktown Partnering Team agreed (Consensus Statement 1-07-04-33) that there was no unacceptable ecological risks from exposure to zinc that remained in eastern grids. The final removal closeout report was finalized in June 2006 (UNITEC, 2006).

At the request of the Navy, Baker conduct a review of the 2003 Draft Removal Action Construction Closeout Report (J.A. Jones, 2003) after it was discovered J.A. Jones had used an incorrect cleanup goal for mercury, 24.0 mg/kg instead 0.24 mg/kg. Baker's evaluation confirmed that mercury remained in soils above the cleanup goal. This evaluation also revealed that some of the COCs for which cleanup goals were developed for the 2003 removal (cPAHs, nPAHs, N-nitrosodi-n-propylamine, 2,4,6-TNT, arsenic, mercury, and zinc) were not included in the confirmation sampling. Based on these discoveries, a further investigation of soils remaining within the footprint of the 2003 removal action areas (Areas A-F and H) was warranted.

In July 2006, Baker conducted an investigation of soils within the footprint of areas addressed during this removal action (Areas A-F and H) in order to recharacterize the footprint of the 2003 removal actions areas (Areas A-F and H). Surface and subsurface soil samples were collected to characterize the former 2003 removal areas and investigate a small depression in the central portion of the site. Samples were analyzed for total metals, low-level PAHs, N-nitrosodi-n-propylamine, and 2, 4, 6-TNT. The results of this soil investigation indicated that contaminants for which cleanup goals were established exceeded their respective goals within Areas A-C (Grids 1-28) and within the small depression. All other former 2003 removal areas (D, E, F, and H) were confirmed to have met cleanup goals.

In June 2009, Shaw Environmental conducted an additional round of soil removal to address the remaining contaminated soil left in place after the 2003 removal action, as identified by the 2006 investigation. A total of 4,513 cubic yards (6,770 tons) of contaminated soil was excavated from eighteen grids and disposed of off-site. Confirmation samples indicated that COCs remained in exceedance of remedial goals; however, due to funding constraints, excavation activities were discontinued. Excavation walls that had not yet been addressed were covered with six mil plastic as an interface between the clean backfill and existing sidewall. These remaining areas will be addressed in the future during a second phase of the removal action (Shaw, 2010).

3.2.15.5 Activities Completed FY2010

Approximately 4,500 cy of contaminated soil were excavated from Site 23 and disposed of offsite. Additional waste delineation activities are anticipated during future investigations. Began draft UFP-SAP for additional RI field activities. Final UFP-SAP is expected in FY2011.

3.2.15.6 CERCLA Path Forward

- Finalize UFP-SAP for RI
- RI field activities
- Phase 2 Soil RA Work Plan
- Phase 2 Soil RA
- CCR
- FS/PP/ROD for all media

[Schedule 3-15](#) presents the FY11-12 schedule for Site 23.

3.2.16 Site 24—Aviation Field

3.2.16.1 Site Description

Site 24, Aviation Field (formerly Site 14, SSA 6, and SWMU 27), is an open grassy area around the helicopter landing pad at WPNSTA Yorktown, just south of the York River ([Figure 3-16](#)). The site is bounded by Bellfield Road to the north, former railroad tracks to the east, Main Road to the south, and storage areas to the west. Although no groundwater wells are present at the site and a water level survey has not been completed, groundwater is expected to flow north toward the York River. A divide runs north to south through the middle of the site causing surface water runoff to flow toward a drainage ditch in the east and toward a drainage ditch in the west. Due to the small elevation change across the site, surface runoff is minimal even after a storm event.

Historically, the site was utilized as an aviation field until 1927, after which it was used for storage of munitions on the surface and in underground caches. The site was also used for storage of miscellaneous debris including batteries and cables. A review of aerial photographs indicates that peak surface storage occurred in 1968. Areas of surface debris are no longer evident at the site. In addition, the area where the helicopter landing pad is currently located may also have been used briefly as an explosives burning area. Sludge from WPNSTA Sewage Treatment Plant (STP) #1 was reportedly dried in the eastern portion of the site. A Daramend™ greenhouse/bio-cell was constructed in 1999 to treat explosive-contaminated soil and sediment from Site 6, and was removed in August 2006 once treatment was complete. A summary of relevant documents and action milestones is presented in the table below.

Documents and Milestones

Document Title /Milestone	Author/Date	AR Document Number
Site Screening Process Report for Site Screening Areas 1, 6, 7 and 15	Baker, 1996	000663
Phase I Remedial Investigation Report for Groundwater at Sites 1, 3, 6, 7, 11, 17, 24, and 25	CH2M HILL, 2007	002158
Draft Final Round One Remedial Investigation for Sites 23, 24, 25, and 26	Baker, 2008	(Will Not Be Finalized – No AR No.)

3.2.16.2 Nature and Extent of Potential Contamination

Several areas of buried debris at Site 24 are the source of potential contamination to soil, groundwater, sediment, and surface water. Based on the geophysical survey results, the

debris is located in five discontinuous areas. The existing test pit data set is limited and does not provide enough spatial coverage to confirm the lateral extent of the waste, determine the thickness of soil cover, or evaluate the total depth of the waste. Previous investigations have included analysis of soil, groundwater, surface water, and sediment for TCL VOCs, TCL SVOCs, explosives, pesticides, PCBs, and TAL metals. The most recent soil and groundwater data is from the 1996 *SSP for SSAs 1, 6, 7, and 15* (Baker, 1996d). A Round One RI was completed in 2008; however, in accordance with partnering team agreement, this document will not be finalized and is not discussed herein. No additional groundwater samples were collected at Site 26 as part of the 2007 *Phase I RI for Groundwater at Sites 1, 3, 6, 7, 11, 17, 24, and 25* (CH2M HILL, 2007a). The current nature and extent of contamination for each media at Site 24, as documented in the above reports, is summarized below.

Soil

Surface Soil

- No explosives were detected. No VOCs detected exceeded associated screening values.
- Sixteen SVOCs were detected in surface soil, of which one exceeded associated screening values. Detected concentrations of benzo(a)pyrene (150 J $\mu\text{g}/\text{kg}$) exceeded the residential RBC at four sample locations; however, all concentrations detected were below base-wide background concentrations.
- Thirteen pesticides were detected in surface soil, of which three exceeded associated screening values. Detected concentrations of alpha-chlordane (1,700 J $\mu\text{g}/\text{kg}$), dieldrin (79 J $\mu\text{g}/\text{kg}$), and gamma chlordane (1,700 $\mu\text{g}/\text{kg}$) exceeded the residential RBC.
- Two PCBs were detected in surface soil, both of which exceeded screening values. Detected concentrations of Aroclor-1254 (4,200 J $\mu\text{g}/\text{kg}$) exceeded the residential RBC in one sample location.
- Twenty-three inorganics were detected in surface soil, of which seven exceeded screening values. Detected concentrations of aluminum (12,600 mg/kg), arsenic (3 mg/kg), beryllium (0.36 mg/kg), and manganese (221 mg/kg) exceeded the RBC; however, all concentrations detected were below base-wide background concentrations. Detected concentrations of antimony (11.9 L mg/kg), cadmium (4.3 mg/kg), and mercury (4.7 mg/kg) exceeded both the maximum background concentrations and residential RBC.

Subsurface Soil – Soil Borings

- No PCBs were detected. No VOCs, SVOCs, or pesticides detected exceeded associated screening values.
- Five explosives were detected in subsurface soil, of which one exceeded associated screening values. Detected concentrations of 1,3,5-TNB (1,200 J $\mu\text{g}/\text{kg}$) exceeded the residential RBC in two locations.
- Twenty-four inorganics were detected, of which eight exceeded associated screening values. Detected concentrations of aluminum (10,300 mg/kg), antimony (4.6 L mg/kg), beryllium (2.1 mg/kg), manganese (269 mg/kg), and thallium (1.2 mg/kg) exceeded residential RBCs; however, all concentrations detected were below base-wide background concentrations. Detected concentrations of arsenic (49.5 L mg/kg), mercury

(4.7 mg/kg), and vanadium (99.3 mg/kg) exceeded both the maximum background concentrations and residential RBCs.

Subsurface Soil – Test Pits

- No VOCs, SVOCs, or detected exceeded associated screening values.
- Seven pesticides were detected in subsurface soil, of which two exceeded associated screening values. Detected concentrations of alpha-chlordane (1,200 J µg/kg) and dieldrin (90 µg/kg) exceeded the residential RBC, each in two sample locations.
- Two PCBs were detected in subsurface, both of which exceeded associated screening values. Detected concentrations of Aroclor-1254 (79,000 µg/kg) and Aroclor-1260 (490 µg/kg) exceeded the residential RBC in multiple sample locations.
- Four explosives were detected in subsurface soil, of which one exceeded associated screening values. Detected concentrations of 1,3,5-TNB (450 J µg/kg) exceeded the residential RBC in one sample location.
- Twenty inorganics were detected in subsurface soil, of which five exceeded associated screening values. Detected concentrations of aluminum (11,600 mg/kg), arsenic (20.2 mg/kg), beryllium (0.84 mg/kg), and manganese (144 J mg/kg) exceeded residential RBCs; however, all concentrations detected were below base-wide background concentrations. Detected concentrations of cadmium (786 mg/kg) exceeded both the maximum background concentrations and residential RBCs in seven sample locations.

Groundwater

Existing groundwater data collected from temporary wells as part of the *SSP for SSAs 1, 6, 7, and 15* were not constructed with filter packs and were not developed. Consequently, analytical samples collected from them may not be representative of aquifer characteristics (CH2M HILL, 2007a).

Columbia Aquifer

- Three VOCs were detected in groundwater, of which one exceeded screening values. Detected concentrations of cis-1, 2-DCE (10 µg/L) exceeded the RBC in one sample location.
- Three explosives were detected in groundwater, of which one exceeded screening values. Detected concentrations of nitrobenzene (3.2 µg/L) exceeded the RBC in one sample location.
- Twenty-one total and seventeen dissolved inorganics were detected in groundwater, of which ten total and three dissolved inorganics exceeded screening values. Detected concentrations of total (98,800 J µg/L) aluminum, total (436 µg/L) arsenic, total (474 µg/L) and dissolved (0.23 µg/L) barium, total (7.8 µg/L) beryllium, total (27.1 µg/L) cadmium, total (500 µg/L) chromium, total (113 µg/L) lead, total (1,690 µg/L) and dissolved (76.7 µg/L) manganese, total (237 µg/L) nickel, dissolved (5.3 µg/L) thallium, and total (603 µg/L) vanadium exceeded the RBC and State and Federal MCLs at one or more sampling location.

Surface Water

No surface water features exist at Site 24.

Sediment

No sediment features exist at Site 24.

3.2.16.3 Potential Risks

A summary of the most current risk assessments and risk management considerations for exposure to each site media is provided below.

Soil

The Human Health Risk Screening conducted as part of the *SSP for SSAs 1, 6, 7 and 15* (Baker, 1996d) assessed risks to receptors through ingestion. No unacceptable cancer risks ($CR = 1.4 \times 10^{-5}$) or non-cancer hazards ($HI = 0.79$) resulting from exposure surface soil were identified. Subsurface soil collected from the test pits was analyzed independently of other subsurface soil collected during the risk assessment. Potential unacceptable cancer risks ($CR = 1.9 \times 10^{-4}$) and unacceptable non-cancer hazards ($HI = 13$) identified were primarily associated with exposure to Aroclor-1254 ($HQ = 8.5$) and cadmium ($HQ = 3.5$) in test pit subsurface soil. No unacceptable cancer risks ($CR = 2.5 \times 10^{-5}$) or non-cancer hazards ($HI = 0.89$) resulting from exposure to other subsurface soil were identified.

An ERA has not been conducted for site soil.

Groundwater*Columbia Aquifer*

Existing groundwater data collected from temporary wells as part of the SSP for SSAs 1, 6, 7, and 15 (Baker, 1996d) are not considered representative of aquifer conditions and should not be used for the purposes of a risk assessment because the temporary wells were not constructed with filter packs and were not developed (CH2M HILL, 2007a).

Surface Water

No surface water features exist at Site 24.

Sediment

No sediment features exist at Site 24.

3.2.16.4 Remedial Action(s)

No CERCLA RAs have taken place at Site 24.

3.2.16.5 Activities Completed FY2010

A UFP-SAP for additional RI field activities was submitted in January 2010. RI field activities were conducted in April and May of 2010.

3.2.16.6 CERCLA Path Forward

- Develop RI Report
- FS/PP/ROD, as appropriate

[Schedule 3-16](#) presents the FY11-12 schedule for Site 24.

3.2.17 Site 25—Building 373 Rocket Plant

3.2.17.1 Site Description

Site 25, the Rocket Plant (formerly SWMU 25 and SSA 7), is located at the end of Main Road, just east of Felgates Creek ([Figure 3-17](#)). Site 25 is relatively flat with a surface depression west of Building 373. The majority of the site consists of paved or grassy areas; however, a wooded area lies just west of the surface depression and separates the site from Felgates Creek. Groundwater flows westward toward Felgates Creek. Surface water generally flows toward Felgates Creek and the surface depression west of Building 373.

Building 373 is an explosives loading plant. Prior to the 1960's, wash/rinse water from the cleanup of formulation/pouring equipment drained into a settling basin within the building for removal of suspended solids. The solids were incinerated and dumped at Site 4 (Burning Pad Residue Landfill). The wash/rinse water was then discharged to Felgates Creek through a discharge pipe. This discharge line was plugged in the early 1980s and a 220-gallon underground storage tank (UST) was installed to contain the wash/rinse water. The UST was a pre-cast concrete pipe installed vertically into the ground with a bottom section cast in the concrete pipe. Once the tank was filled, the water was filtered through a carbon treatment unit and discharged to the sanitary sewer system. The use of the UST was curtailed in the early 1980s when it was replaced with an aboveground storage tank (AST), installed at the north end of the building. Materials contained within the tanks included binders, stabilizers, and explosives.

AOC 7 included what is now the Site 25 Rocket Plant in addition to the Group 18 Magazine and the Main Road Disposal Area. However, these areas were not recommended for further investigation in the 1996 *SSP for SSAs 1, 6, 7, and 15* (Baker, 1996d). A summary of relevant documents and action milestones for Site 25 is presented in the table below.

Documents and Milestones

Document Title /Milestone	Author/Date	AR Document Number
Site Screening Process Report for Site Screening Areas 1, 6, 7 and 15	Baker, 1996	000663
Final Report at Site Screening Areas 3 and 7	OHM, 1997	000893 000892 (Appendix D)
Phase I RI Report for Groundwater at Sites 1, 3, 6, 7, 11, 17, 24, and 25	CH2M HILL, 2007	002158
Draft Final Round One Remedial Investigation for Sites 23, 24, 25, and 26	Baker, 2008	(Will not be finalized – No AR No.)

3.2.17.2 Nature and Extent of Potential Contamination

The wash/rinse water from the cleanup of formulation/pouring equipment was the source of potential contamination at Site 25. Previous investigations have included analysis of soil, groundwater, surface water, and sediment for TCL VOCs, TCL SVOCs, explosives, pesticides, PCBs, and TAL metals. The most recent data available for soil is from the 1996 *SSP for SSAs 1, 6, 7, and 15* (Baker, 1996d). The most recent data available for groundwater is from the 2007 *Phase I RI Report for Groundwater at Sites 1, 3, 6, 7, 11, 17, 24, and 25* (CH2M HILL, 2007a). A Round One RI was completed in 2008; however, in accordance with partnering team agreement, this document will not be finalized and is not discussed herein.

The current nature and extent of contamination for each media at Site 25, as documented in the above reports, is summarized below.

Soil

Surface Soil

- No PCBs were detected. No VOCs, pesticides, or explosives were detected in either surface or subsurface soil.
- Twelve SVOCs were detected in surface soil, of which one exceeded associated screening values. Detected concentrations of benzo(a)pyrene (170 J $\mu\text{g}/\text{kg}$) exceeded the residential RBC in one sample location; however all concentrations detected were below base-wide background concentrations.
- Eighteen inorganics were detected in surface soil, of which four exceeded associated screening values. Detected concentrations of aluminum (8,270 mg/kg), arsenic (2.7 mg/kg), beryllium (0.33 L mg/kg), and manganese (328 L mg/kg) exceeded the residential RBC in one or more locations; however all concentrations detected were below base-wide background concentrations.

Surface Soil – Soil Borings

- No VOCs, SVOCs, pesticides, or explosives were detected in either surface or subsurface soil.
- One PCB was detected in subsurface soil, which exceeded screening values. Detected concentrations of Aroclor-1260 (5,700 K $\mu\text{g}/\text{kg}$) exceeded the RBC in two sample locations.
- Twenty inorganics were detected in subsurface soil, of which six were detected exceeding screening values. Detected concentrations of aluminum (13,300 mg/kg), antimony (2.9 L mg/kg), arsenic (32.3 mg/kg), beryllium (1.9 L mg/kg), and manganese (752 L mg/kg) exceeded the RBC in one or more sample locations; however, all concentrations detected were below maximum background concentrations. Detected concentrations of thallium (2 K mg/kg) exceeded the maximum background concentration and residential RBC in five sample locations.

Surface Soil – Test Pits

- No VOCs, SVOCs, pesticides, or explosives detected exceeded associated screening values.
- One PCB was detected in subsurface soil, which exceeded screening values. Detected concentrations of Aroclor-1260 (980 J $\mu\text{g}/\text{kg}$) exceeded the RBC in two sample locations.
- Thirteen inorganics were detected in subsurface soil, of which four were detected exceeding screening values. Detected concentrations of aluminum (13,600 mg/kg), arsenic (5.6 mg/kg), beryllium (0.78 mg/kg), and manganese (443 mg/kg) exceeded the RBC in one or more sample locations; however all detections were below maximum background concentrations.

Groundwater

Detected concentrations were screened against maximum base-wide background concentrations and MCLs in order to aid in determining which sites required further

investigation. Groundwater was only sampled for explosives and inorganics based on historical information.

Yorktown-Eastover Aquifer

- Two explosives were detected, both of which exceeded associated screening values. Detected concentrations of HMX (32 µg/L) and RDX (35 µg/L) exceeded the tap water RSL, each in one sample location. No MCLs exist for these compounds.
- Twenty-one total and twelve dissolved inorganics were detected in groundwater, of which one total and two dissolved inorganics exceeded associated screening values. Detected concentrations of dissolved (674 µg/L) aluminum and total (7.7 µg/L) and dissolved (1.4 J µg/L) nickel exceeded the maximum background concentration.

Surface Water

Tributary to Felgates Creek

No exceedances of screening values were detected in surface water samples.

Sediment

Tributary to Felgates Creek

- No VOCs, pesticides, PCBs, or explosives were detected.
- Eleven SVOCs were detected in sediment, of which one exceeded associated screening values. Detected concentrations of benzo(k)fluoranthene (0.34 J mg/kg) exceeded the sediment ER-L in one sample location.
- Twenty inorganics were detected in sediment, of which two exceeded associated screening values. Detected concentrations of nickel (21.9 mg/kg) exceeded the sediment ER-L in one sample location; however, all concentrations detected were below maximum background concentrations. Detected concentrations of arsenic (17.1 mg/kg) exceeded both maximum background concentrations and the sediment ER-L in one or more location.

3.2.17.3 Potential Risks

A summary of the most current risk assessments and risk management considerations for exposure to each site media is provided below.

Soil

The Human Health Risk Screening conducted as part of the 1996 *SSP for SSAs 1, 6, 7, and 15* (Baker, 1996d) assessed risks to receptors through ingestion.

Surface Soil

No unacceptable cancer risks ($CR = 1.1 \times 10^{-5}$) resulting from other surface soil were identified. The RME non-carcinogenic hazard for future adult residents associated with exposure to surface soil ($HI = 1.1$) exceeded the USEPA target value.

Subsurface Soil- Soil Borings

No unacceptable cancer risks ($CR = 3.7 \times 10^{-5}$) resulting from other subsurface soil were identified. The RME non-carcinogenic hazard for future adult residents associated with exposure to subsurface soil ($HI = 1.2$) exceeded the USEPA target value.

Subsurface Soil- Test Pits

No unacceptable cancer risks ($CR = 3.2 \times 10^{-5}$) resulting from exposure test pit subsurface soil were identified. The RME non-carcinogenic hazard for future adult residents associated with exposure to test pit subsurface soil ($HI = 1.6$) exceeded the USEPA target value.

An ERA has not been conducted for site soil.

Groundwater

The Human Health Risk Screening conducted as part of the 1996 *SSP for SSAs 1, 6, 7, and 15* (Baker, 1996d) assessed risks to receptors through ingestion under a potable use scenario.

Yorktown-Eastover Aquifer

Unfiltered groundwater was analyzed independently of other filtered groundwater collected during the risk assessment. Potential unacceptable cancer risks ($CR = 2.4 \times 10^{-2}$) identified were primarily associated with exposure to 1, 1-DCE ($CR = 2.2 \times 10^{-2}$) in unfiltered groundwater. Potential unacceptable non-cancer hazards ($HI = 120$) identified were primarily associated with exposure to aluminum ($HQ = 5.6$), antimony ($HQ = 3.6$), arsenic ($HQ = 75$), manganese ($HQ = 22$), thallium ($HQ = 5.3$), and vanadium ($HQ = 4.2$) in unfiltered groundwater. Potential unacceptable cancer risks ($CR = 3 \times 10^{-3}$) identified were primarily associated with exposure to 1, 1-DCE ($CR = 2.5 \times 10^{-3}$) in filtered groundwater. Potential unacceptable non-cancer hazards ($HI = 11$) identified were primarily associated with exposure to antimony ($HQ = 0.91$), arsenic ($HQ = 1.3$), manganese ($HQ = 5.7$), thallium ($HQ = 2.5$) in filtered groundwater.

The ERA conducted as part of the 1996 *SSP for SSAs 1, 6, 7, and 15* (Baker, 1996d) did not evaluate groundwater because no complete exposure pathway exists.

Surface Water

Tributary to Felgates Creek

A HHRA has not been conducted for surface water.

The Ecological Risk Screening conducted as part of the 1996 *SSP for SSAs 1, 6, 7, and 15* (Baker, 1996d) identified no COCs due to exposure associated with surface water. Thus, risks to ecological receptors are considered acceptable.

Sediment

Tributary to Felgates Creek

A HHRA has not been conducted for sediment.

The Ecological Risk Screening conducted as part of the 1996 *SSP for SSAs 1, 6, 7, and 15* (Baker, 1996d) identified potential unacceptable risk to ecological receptors. The risk ($EI = 3.4$) is associated with exposure to benzo(k)fluoranthene ($EQ = 1.3$), arsenic ($EQ = 1.4$), and nickel ($EQ = 0.75$).

3.2.17.4 Remedial Action(s)

The UST, associated piping, and surrounding soils at Site 25 were removed in 1996 (OHM, 1997b).

3.2.17.5 Activities Completed FY2010

Began draft UFP-SAP for additional RI field activities. Final UFP-SAP is expected in FY2011.

3.2.17.6 CERCLA Path Forward

- Finalize UFP-SAP for RI activities
- RI/FS/ PP/ROD, as appropriate

[Schedule 3-17](#) presents the FY11-12 schedule for Site 25.

3.2.18 Site 26—Building 1816 Mark 48 Waste Otto Fuel Tank

3.2.18.1 Site Description

Site 26 (formerly SSA 18) is located in the central portion of the WPNSTA, outside Building 1816 ([Figure 3-18](#)). Site 26 includes a 10,000-gallon concrete UST and network of ancillary drain pipes that were formerly used to store waste Otto fuel. This fuel consisted of a mixture of Otto fuel and water, which may have also contained oil, denatured ethyl alcohol, detergent, and trace amounts of cyanide, halogenated hydrocarbons, and heavy inorganics. In late 1987, waste Otto fuel was discovered leaking from the tank. The fuel was removed, the tank was cleaned, and a RCRA closure permit was filed. In March 1995, the 10,000-gallon waste Otto fuel UST and a nearby 8,000-gallon UST, used to store #2 fuel oil, were removed from the site. Site 26 has been retained as an Installation Restoration Program (IRP) site because of chlorinated VOCs (CVOCs) detected in shallow groundwater. Depth to groundwater in this area is generally 30 feet to the shallow Cornwallis Cave aquifer. The Yorktown confining unit is approximately 25 feet thick at Site 26 and separates the Yorktown-Eastover aquifer from the Cornwallis Cave aquifer. The topography at the site is generally flat at about 70 feet msl. A summary of relevant documents and action milestones is presented in the table below.

Documents and Milestones

Document Title /Milestone	Author/Date	AR Document Number
Action Memorandum, Site Screening Area 18	Environmental and Safety Designs, Inc, 1994	000612
Soil Assessment Report for Site Screening Area 18	Baker, 1994	000619
Site Screening Progress Report for Site Screening Areas 2, 17, 18 and 19	Baker, 1996	000666 (Volume I) 000667 (Volume II)
Draft Final Round One Remedial Investigation Report for Sites 23, 24, 25, and 26	Baker, 2008	(Will not be finalized – No AR No.)

3.2.18.2 Nature and Extent of Potential Contamination

The source of contamination to site media was the contents of the USTs that were removed in 1995. Previous investigations have included analysis of soil and groundwater for TCL VOCs, TCL SVOCs, explosives, pesticides, PCBs, and TAL metals. No surface water or sediment were identified at Site 26. The most recent soil data available is from the 2008 CCR. The most recent soil and groundwater data available is from the 1996 SSP for SSAs 2, 17, 18, and 19 (Baker, 1996e). An RI was completed in 2008; however, in accordance with partnering team agreement, this document will not be finalized and the results are not discussed herein. The current nature and extent of contamination for each media at Site 26, as documented in the above reports, is summarized below.

Soil

- No VOCs detected exceeding screening values. Pesticides, PCBs, and explosives were not detected in any sample collected.
- SVOCs detected consisted of benzo(a)anthracene (1.4 J mg/kg), benzo(b)fluoranthene (1.1 J mg/kg), benzo(a)pyrene (0.9J mg/kg), dibenzo(a,h)anthracene (0.14 J mg/kg). However, all of these were detected below associated base-wide background concentrations.
- Four inorganics were detected exceeding screening values. Detected concentrations of aluminum (12,600 mg/kg), arsenic (1.6 L mg/kg), beryllium (0.34 mg/kg), exceeded RBCs in one or more samples. However, all detected concentrations were below base-wide background concentrations. Detected concentrations of manganese (548 mg/kg) exceeded both RBCs and base-wide background concentrations in five samples.

Groundwater

Cornwallis Cave Aquifer

- No pesticides, PCBs, or select explosives were detected. No SVOCs detected exceeding screening values.
- Three VOCs were detected in shallow groundwater, of which two exceeded associated screening values. Detected concentrations of 1, 1-DCE (160 µg/L) and 1,1,1-TCA (310 µg/L) exceeded the RBC and Virginia State and Federal MCLs in one or more sample locations.
- Detected concentrations of total (10,400 µg/L) aluminum, total (3.8 µg/L) arsenic, total (328 µg/L) manganese, and total (30.6 µg/L) vanadium exceeded both RBCs in one or more samples. However all concentrations detected were below base-wide background concentrations. Detected concentrations of total (81.5 µg/L) chromium exceeded both RBCs, State MCLs, and base-wide background concentrations in one or more sample.

Surface Water

No surface water features exist at Site 26.

Sediment

No sediment features exist at Site 26.

3.2.18.3 Potential Risks

A summary of the most current risk assessments and risk management considerations for exposure to each site media is provided below.

Soil

The Human Health Risk Screening conducted as part of the 1996 *SSP for SSAs 2, 17, 18 and 19* (Baker, 1996e) assessed risks to receptors through ingestion. No unacceptable cancer risks or non-cancer hazards resulting from exposure to surface soil were identified for any receptor.

An Ecological Risk Screening has not been conducted for site soil.

Groundwater

Cornwallis Cave Aquifer

The Human Health Risk Screening conducted as part of the 1996 *SSP for SSAs 2, 17, 18 and 19* (Baker, 1996e) assessed risks to receptors through ingestion. Potentially unacceptable cancer risks ($CR = 3.6 \times 10^{-3}$) were identified associated with exposure to 1, 1-DCE ($CR = 3.6 \times 10^{-3}$). No unacceptable non-cancer hazards ($HI = 0.24$) resulting from exposure to groundwater were identified.

The ERA conducted as part of the 1996 *SSP for SSAs 2, 17, 18 and 19* (Baker, 1996d) did not evaluate groundwater because no complete exposure pathway exists.

Surface Water

No surface water features exist at Site 26.

Sediment

No sediment features exist at Site 26

3.2.18.4 Remedial Action(s)

No CERCLA RAs have taken place at Site 26.

3.2.18.5 Activities Completed FY2010

Began draft UFP-SAP for additional RI field activities. Final UFP-SAP is expected in FY2011.

3.2.18.6 CERCLA Path Forward

- Finalize UFP-SAP for RI activities
- RI/FS/ PP/ROD, as appropriate

[Schedule 3-18](#) presents the FY11-12 schedule for Site 26.

3.2.19 Site 28—Building 28 X-Ray Facility Tank Drain Field

3.2.19.1 Site Description

Site 28 (formerly SSA 10) is a 5.8 acre drain field adjacent to Building 28 and an unnamed tributary that drains into the southern branch of Felgates Creek in the south central portion of WPNSTA Yorktown ([Figure 3-19](#)). The ground surface consists of landscaped lawn and asphalt parking lot. The topography ranges between approximately 65 and 40 feet amsl sloping northeast toward the shallow creek bed tributary with steep eroded sides. The site receives surface water run-off from the access road and surrounding wooded area, which drains into the tributary. Depth to groundwater (Cornwallis aquifer) is between 5 and 14 feet bgs with flow northeast towards an unnamed tributary.

Site 28 consists of a septic tank drain field that received sanitary wastewater from the X-Ray Facility at Building 28 beginning in the late 1960s until 1998, when wastewater was diverted to the sanitary sewer and ultimately to HRSD. Before silver recovery units were installed, the septic tanks may have stored hazardous wastes (Baker, 2005g). A summary of relevant documents and action milestones is presented in the table below.

Documents and Milestones

Document Title /Milestone	Author/Date	AR Document Number
Relative Risk Ranking System, Data Collection Investigation	Baker, 1995	000675
Site Screening Process Report for Site Screening Areas 3, 4, 5, 9, 10, 20, 21, 22, 23, and 24	Baker, 2001	001350 (Volume I) 001351 (Volume II) 001352 (Volume III)
Round One Remedial Investigation for Sites 27, 28, 29 and 30	Baker, 2005	002079
ERA – Step 7	CH2M HILL, 2008	002276

3.2.19.2 Nature and Extent of Potential Contamination

The source of contamination to site media was the drain tanks located at Building 28. Previous investigations have included analysis of soil, groundwater, surface water, and sediment for TCL VOCs, TCL SVOCs, explosives, pesticides, PCBs, and TAL metals. The most recent groundwater data available is from the 2005 *Round One RI for Sites 27, 28, 29 and 30* (Baker, 2005g). The most recent soil, surface water, and sediment data available is from the 2008 *Ecological Risk Assessment – Step 7* (CH2M HILL, 2008f). Silver was considered the primary COC at the site. The current nature and extent of contamination for each media at Site 28, as documented in the above reports, is summarized below.

Soil

Surface Soil

Silver is considered a site related release and was detected in surface soil (21.1 mg/kg). In surface soil, silver was consistently detected in the drainage leading from the site, increasing from 11.9 mg/kg proximal to the drain field to 21.1 mg/kg, 1,500 feet downgradient.

Subsurface Soil

Silver was not detected in subsurface soils.

Groundwater

Cornwallis-Cave Aquifer

- No VOCs or SVOCs were detected in groundwater.
- Fourteen total and fourteen dissolved inorganics were detected in groundwater, of which two total inorganics exceeded associated screening value. No dissolved inorganics exceeded associated screening values. Detected concentrations of total (0.57 J µg/L) chromium and total (21.3 J µg/L) iron exceeded tap water RBCs in one or more sample locations.
- Silver was not detected in groundwater.

Surface Water

Tributary to Felgates Creek

Silver was detected consistently in surface water samples at concentrations ranging between 0.69 J and 4.5 J µg/L.

Sediment

Tributary to Felgates Creek

Silver in sediment increased from 9.3 mg/kg immediately downgradient of the drain field to 47.7 mg/kg, 800 feet downgradient. The concentrations then decreased to 6.5 mg/kg at the furthest downgradient sample.

3.2.19.3 Potential Risks

A summary of the most current risk assessments and risk management considerations for exposure to each site media is provided below.

Soil

The HHRA conducted as part of the 2005 *Round One RI for Sites 27, 28, 29 and 30* (Baker, 2005g) assessed risk to receptors through ingestion and dermal contact. Potential unacceptable non-cancer hazards were identified for future child residents. The RME non-carcinogenic hazard for future child residents associated with exposure to surface (HI = 1.1) and subsurface (HI = 1.5) soil are above the acceptable HI of 1.0. The CTE non-carcinogenic hazard associated with exposure to surface (HI = 0.45) and subsurface (HI = 0.63) soil are below the acceptable HI. Although the total HI for combined surface and subsurface soil exceeds the USEPA's acceptable HI of 1, the non-cancer hazard is considered acceptable because all concentrations of arsenic, iron, and vanadium detected in surface and subsurface soil samples were below the maximum base-wide background concentrations, indicating that the concentrations of these chemicals detected are representative of naturally occurring conditions and not a CERCLA regulated release.

The ERA conducted as part of the *Ecological Risk Assessment – Step 7* (CH2M HILL, 2008f) found negligible risk for terrestrial receptors and earthworm indicator species based on a comparison of screening values and toxicity testing. Thus, risks to ecological receptors are considered acceptable.

Groundwater

Cornwallis-Cave Aquifer

The HHRA conducted as part of the 2005 *Round One RI for Sites 27, 28, 29 and 30* (Baker, 2005g) assessed risk to receptors through ingestion and dermal contact under a potable use scenario. Potential unacceptable human health risks were identified for future child residents. The RME non-carcinogenic hazard for future child residents associated with exposure to groundwater (HI = 1.3). This hazard is primarily associated with exposure to chromium (HQ = 0.72) and iron (HQ = 0.46); however, all concentrations of these inorganics detected were below the maximum base-wide background concentrations. In addition, the CTE non-carcinogenic hazard (HI = 0.83) is below the acceptable HI.

The ERA conducted as part of the 2005 *Round One RI for Sites 27, 28, 29 and 30* (Baker, 2005g) did not evaluate groundwater because no complete exposure pathway exists.

Surface Water

Tributary to Felgates Creek

The HHRA conducted as part of the *Round One RI for Sites 27, 28, 29 and 30* (Baker, 2005g) assessed risk to receptors through ingestion and dermal contact. No unacceptable cancer risks or non-cancer hazards resulting from exposure to groundwater for any receptor.

The ERA conducted as part of the *Ecological Risk Assessment – Step 7* (CH2M HILL, 2008f) found negligible risk for aquatic receptors and fish indicator species based on a comparison of screening values and toxicity testing. Thus, risks to ecological receptors are considered acceptable.

Sediment

Tributary to Felgates Creek

The HHRA conducted as part of the *Round One RI for Sites 27, 28, 29 and 30* (Baker, 2005g) assessed risk to receptors through ingestion and dermal contact. No unacceptable cancer risks or non-cancer hazards resulting from exposure to groundwater for any receptor.

The ERA conducted as part of the *Ecological Risk Assessment – Step 7* (CH2M HILL, 2008f) found negligible risk for aquatic receptors and benthic invertebrate and amphibian indicator species based on a comparison of screening values and toxicity testing. Thus, risks to ecological receptors are considered acceptable.

3.2.19.4 Remedial Action(s)

No CERCLA RAs have taken place at Site 28.

3.2.19.5 Activities Completed FY2010

An NFA PP is expected to be completed in September 2010.

3.2.19.6 CERCLA Path Forward

- NFA ROD

[Schedule 3-19](#) presents the FY11-12 schedule for Site 28.

3.2.20 Site 29—Lee Pond

3.2.20.1 Site Description

Site 29 (formerly SSA 20) is a pond approximately 4.1 acres in size, located in the east central portion of WPNSTA ([Figure 3-20](#)). The pond receives storm water runoff from Building 10 by way of Site 9, located adjacent to the pond and from the industrial area containing Site 19 and SSA 22 (approximately 900 feet from the pond) which are addressed individually under CERCLA. Lee Pond empties into a channel, which in turn flows around Site 16/SSA 16 into Felgates Creek. Depth to groundwater (Cornwallis aquifer) varies with topography and is between three and 33 feet bgs. Groundwater generally flows radially toward the pond across most of the site. In the northwest portion of the site, an engineered dam prevents water from flowing into an unnamed tributary that drains into the Eastern Branch of Felgates Creek. In this area, the surface elevation of the pond is artificially higher than the surrounding groundwater, and there may be some groundwater seepage out of the pond. A summary of relevant documents and action milestones is presented in the table below.

Documents and Milestones

Document Title /Milestone	Author/Date	AR Document Number
Final Focused Biological Sampling and Preliminary Risk Evaluation Report	Baker and Weston, 1993	000310
Lee Pond Independent Fish Sampling	Black & Veatch, 1995	000668
Site Screening Process Report for Site Screening Areas 3, 4, 5, 9, 10, 20, 21, 22, 23, and 24	Baker, 2001	001350 (Volume I) 001351 (Volume II) 001352 (Volume III)
Round One Remedial Investigation for Sites 27, 28, 29 and 30	Baker, 2005	002079
Technical Memorandum; Supplemental Surface Water Sampling and Risk Management of Metals in Soils and Groundwater	CH2M HILL, 2008	002211
Proposed Plan for Site 29 – Lee Pond	CH2M HILL, 2008	Pending
Record of Decision for Site 29 – Lee Pond	CH2M HILL, 2008	Pending

3.2.20.2 Nature and Extent of Potential Contamination

There is no history indicating a source of contamination in Lee Pond. CERCLA sites within the drainage areas to Lee Pond (Sites 9, 19, and SSA 22) are addressed individually. Previous investigations have included analysis of soil, groundwater, surface water, and sediment for TCL VOCs, TCL SVOCs, explosives, pesticides, PCBs, and TAL metals. The most recent data available for soil, groundwater, and sediment is from the 2005 *Round One RI for Sites 27, 28, 29 and 30* (Baker, 2005g). The most recent data available for surface water is from the 2008 *Technical Memorandum; Supplemental Surface Water Sampling and Risk Management of Metals in Soils and Groundwater* (CH2M HILL, 2008g). The current nature and extent of contamination for each media at Site 29, as documented in the above reports, is summarized below.

Soil

Surface Soil

- No PCBs or explosives were detected. No VOCs or pesticides exceeded associated screening values.
- Twelve SVOCs were detected in surface soil, of which seven exceeded associated screening values. Detected concentrations of benzo(a)anthracene (190 J mg/kg), benzo(a)pyrene (170 J mg/kg), benzo(b)fluoranthene (190 J mg/kg), and chrysene (200 J mg/kg) exceeded the residential RBCs; however, all concentrations detected were below maximum background concentrations. Detected concentrations of benzo(k)fluoranthene (170 J mg/kg), carbazole (46 J mg/kg), and indeno(1,2,3-cd)pyrene (110 J mg/kg) exceeded both maximum background concentrations and residential RBCs in one or more sample location
- Twenty-two inorganics were detected in surface soil, of which four exceeded associated screening values. Detected concentrations of arsenic (11.8 mg/kg), iron (21,100 mg/kg), manganese (269 mg/kg), and vanadium (31 mg/kg) exceeded the residential RBCs; however, all concentrations detected were below maximum background concentrations.

Detected concentrations of thallium (6.4 mg/kg) exceeded both maximum background concentrations and residential RBCs in three sample locations.

Subsurface Soil

- No PCBs or explosives were detected. No VOCs, SVOCs, or pesticides exceeded associated screening values.
- Fourteen inorganics were detected in surface soil, of which four exceeded associated screening values. Detected concentrations of aluminum (9,130 mg/kg), arsenic (3.7 J mg/kg), iron (11,500 J mg/kg), and vanadium (23.6 J mg/kg) were detected above their residential RBCs; however, all concentrations detected were below maximum background concentrations.

Groundwater

Cornwallis Cave Aquifer

- No pesticides were detected. No SVOCs exceeded associated screening values.
- Three VOCs were detected in groundwater, of which one exceeded associated screening values. Detected concentrations of chloroform (4 J µg/L) exceeded the tap water RSL; however, chloroform is a common laboratory contaminant and unlikely to be site-related.
- Seven explosives were detected in groundwater, of which four exceeded associated screening values. Detected concentrations of 2,4/2,6-DNT (0.66 NJ µg/L), 2-amino-4,6-DNT (3.4 µg/L), amino DNT (7.3 NJ µg/L), and RDX (2.3 µg/L) exceeded the tap water RSL in one or more sample locations.
- Twenty total and thirteen dissolved inorganics were detected in groundwater, of which nine total and four dissolved exceeded associated screening values. Detected concentrations of total (28,000 J µg/L) aluminum, total (41.8 L µg/L) and dissolved (32.7 µg/L) arsenic, total (529 µg/L) and dissolved (514 µg/L) barium, total (4.4 µg/L) cadmium, total (132 J µg/L) chromium, total (160,000 µg/L) and dissolved (53,500 µg/L) iron, total (60.5 µg/L) lead, total (1,290 µg/L) and dissolved (452 µg/L) manganese, and total (258 µg/L) vanadium exceeded both maximum background concentrations and tap water RBCs in one or more sample locations.

Surface Water

- Surface water was only analyzed for select inorganics, based on the results of previous investigations.
- Of the three total and three dissolved inorganics analyzed for (aluminum, iron, and zinc), two total inorganics exceeded associated screening values. No dissolved inorganics exceeded associated screening values. Detected concentrations of total (1,040 µg/L) aluminum and total (3,990 µg/L) iron exceeded the ecological screening values in multiple sample locations.

Sediment

Surface Sediment

- No PCBs or explosives detected. No VOCs exceeded associated screening values.
- Twenty-one SVOCs were detected in surface sediment, of which eight exceeded associated screening values. Detected concentrations of benzo(a)anthracene (550 µg/kg), benzo(a)pyrene (600 J µg/kg), benzo(b)fluoranthene (860 µg/kg), benzo(k)fluoranthene (860 µg/kg), carbazole (100 J µg/kg), chrysene (630 J µg/kg), dibenz(a,h)anthracene (88 J µg/kg), flouranthene (1,100 µg/kg) indeno(1,2,3-cd)pyrene (440 J µg/kg), phenanthrene (720 µg/kg), and pyrene (1,000 µg/kg) exceeded ecological screening values and/or residential RSLs×10 in one or more sample location.
- Ten pesticides were detected in surface sediments, of which one exceeded associated screening values. Detected concentrations of 4,4'- dichlorodiphenyldichloroethene (DDE) (1.3 J µg/kg) exceeded; however, all concentrations detected were below the maximum background concentration.
- Twenty inorganics were detected in surface sediment, of which seven exceeded associated screening values. Detected concentrations of aluminum (29,700 mg/kg), antimony (8.4 L mg/kg), arsenic (38.8 L mg/kg), chromium (60.5 mg/kg), copper (34.8 mg/kg), iron (39,800 mg/kg), lead (59.6 mg/kg), exceeded ecological screening values and/or residential RSLs×10; however, all concentrations detected were below the maximum background concentration. Detected concentrations of antimony (8.4 L mg/kg), cadmium (131 mg/kg), manganese (533 mg/kg), selenium (2.5 J mg/kg), vanadium (103 mg/kg), and zinc (192 J mg/kg) exceeded maximum background concentration, ecological screening values, and/or residential RSLs×10 in one or more sample location.

Subsurface Sediment

- No PCBs or explosives were detected. No VOCs or SVOCs exceeded associated screening values.
- Eighteen inorganics were detected in subsurface sediment, of which five exceeded associated screening values. Detected concentrations of aluminum (29,700 mg/kg), arsenic (34.8J mg/kg), cadmium (1.6J mg/kg), lead (49.9 mg/kg), and vanadium (77.5 mg/kg) exceeded ecological screening values in one or more sample locations.

3.2.20.3 Potential Risks

A summary of the most current risk assessments and risk management considerations for exposure to each site media is provided below.

Soil

The HHRA conducted as part of the 2008 *Technical Memorandum; Supplemental Surface Water Sampling and Risk Management of Metals in Soils and Groundwater* (CH2M HILL, 2008g) assessed risk to receptors through ingestion and dermal contact. Potential unacceptable non-cancer hazards were identified for future child residents. The RME non-carcinogenic hazard for future adult residents associated with exposure to groundwater (HI = 1.2) is above the acceptable HI, however, there are no individual COPCs or target organ/effects with HIs exceeding 1.0.

ERA conducted as part of the 2008 *Technical Memorandum; Supplemental Surface Water Sampling and Risk Management of Metals in Soils and Groundwater* (CH2M HILL, 2008g) did not assess risk posed to ecological receptors due to soil exposure.

Groundwater

Cornwallis Cave Aquifer

The HHRA conducted as part of the 2008 *Technical Memorandum; Supplemental Surface Water Sampling and Risk Management of Metals in Soils and Groundwater* (CH2M HILL, 2008g) assessed risk to receptors through ingestion and dermal contact under a potable use scenario. As per EPA guidance, carcinogenic risks were only calculated for lifetime child/adult residents. Potential unacceptable non-cancer hazards were identified for future adult and child residents. Potential unacceptable cancer risks were identified for lifetime child/adult residents. The RME non-carcinogenic hazard for future adult residents associated with exposure to groundwater (HI = 2.4) is above the acceptable HI of 1.0. This hazard is primarily associated with ingestion of arsenic (HQ = 1.4). The CTE non-carcinogenic hazard (HI = 0.53) is below the acceptable HI. The RME non-carcinogenic hazard for future child residents associated with exposure to groundwater (HI = 5.6) exceeds the acceptable HI of 1.0. This hazard is primarily associated with ingestion of arsenic (HQ = 3.2) and manganese (HQ = 1.3). The CTE non-carcinogenic hazard (HI = 1.8) also exceeds the acceptable HI of 1.0, however, there are no individual target organ/effects with HIs exceeding 1.0. The RME carcinogenic risk for lifetime child/adult residents associated with exposure to groundwater (CR = 4.1×10^{-4}), associated primarily with exposure to arsenic (CR = 3.4×10^{-4}), exceeds the acceptable risk range of 10^{-6} to 10^{-4} . The CTE carcinogenic risk (CR = 6.1×10^{-5}) is within the acceptable risk range. There are no individual HQs which exceed 1.0 under the CTE scenario for the adult or child resident, and the cancer risk under the CTE scenario is within the acceptable risk range for the lifetime resident. Based on the more realistic CTE scenario, risk is considered acceptable.

ERA conducted as part of the 2008 *Technical Memorandum; Supplemental Surface Water Sampling and Risk Management of Metals in Soils and Groundwater* (CH2M HILL, 2008g) did not assess risk posed to ecological receptors due to groundwater exposure because no complete exposure pathway was identified.

Surface Water

The HHRA conducted as part of the 2005 *Round One RI for Sites 27, 28, 29 and 30* (Baker, 2005g) assessed risk to receptors through incidental ingestion and dermal absorption. No unacceptable cancer risks or non-cancer hazards resulting from exposure to surface water were identified for any receptor.

The ERA conducted as part of the 2005 *Round One RI for Sites 27, 28, 29 and 30* (Baker, 2005g) identified no COCs due to direct contact or food web exposure associated with sediment. Thus, risks to ecological receptors are considered acceptable.

Sediment

The HHRA conducted as part of the 2005 *Round One RI for Sites 27, 28, 29 and 30* (Baker, 2005g) assessed risk to receptors through incidental ingestion and dermal absorption. No unacceptable cancer risks or non-cancer hazards resulting from exposure to surface water were identified for any receptor.

The ERA conducted as part of the 2005 *Round One RI for Sites 27, 28, 29 and 30* (Baker, 2005g) identified no COCs due to direct contact or food web exposure associated with sediment. Thus, risks to ecological receptors are considered acceptable.

3.2.20.4 Remedial Action(s)

No CERCLA RAs have taken place at Site 29. However, RAs have been taken at Sites 9, 19, and Site 33 to remove or cover all contaminated soils and waste sources, eliminating the need for additional actions or the potential for contamination to Lee Pond through surface runoff or erosion.

3.2.20.5 Activities Completed FY2010

A finalized NFA ROD for all media was signed in May 2010.

3.2.20.6 CERCLA Path Forward

CERCLA documentation for Site 29 is complete. No further action or investigation is necessary and the site is closed under CERCLA. Subsequent SMPs will make note of the site closure, but will no longer discuss the site background and investigation history.

3.2.21 Site 30—Bracken Road Incinerator and Environs

3.2.21.1 Site Description

Site 30 (formerly SSA 24 and AOC 22) is a former incinerator area approximately 0.1 acres in size and located north of Site 5 (Surplus Transformer Storage Area), and south of former railroad tracks ([Figure 3-21](#)). The site is situated within a forested area, and the topography ranges between 40 and 20 feet amsl north sloping toward the former railroad tracks. The site receives surface water run-off from surrounding wooded areas and drains into a culvert that runs beneath the former railroad tracks and ultimately into the York River. Depth to groundwater (Cornwallis Cave aquifer) is between nine and 22 feet bgs, with flow northwest towards to the York River. The incinerator was used to burn unknown waste for an unknown period of time. Historical information indicates that Venezuelan crude oil may have been burned at the site in the mid-1970s. A summary of relevant documents and action milestones is presented in the table below.

Documents and Milestones

Document Title /Milestone	Author/Date	AR Document Number
AOC 22, Site 12, and SSA 2, SSA 19 and King Creek Independent Sampling and Risk Screening Report	Black & Veatch, 1996	000669
Site Screening Process Report for Site Screening Areas 3, 4, 5, 9, 10, 20, 21, 22, 23, and 24	Baker, 2001	001350 (Volume I) 001351 (Volume II) 001352 (Volume III)
Round One Remedial Investigation for Sites 27, 28, 29 and 30	Baker, 2005	002079
Engineering Evaluation / Cost Analysis Site 30	Baker, 2007	002037
Construction Completion Report Site 30	Shaw, 2008	002417

Document Title /Milestone	Author/Date	AR Document Number
Draft TM Yorktown Site 30 Groundwater Data Review and Risk Management Consideration	CH2M HILL, 2009	(Draft – No AR No.)
Proposed Plan Site 30	CH2M HILL, 2009	000070

3.2.21.2 Nature and Extent of Potential Contamination

Ash residue from incinerator operations is the source of potential contamination of site media. Previous investigations have included analysis of soil, groundwater, and sediment for TCL VOCs, TCL SVOCs, explosives, pesticides, PCBs, and TAL metals. The most recent groundwater and sediment data available is from the 2005 *Round One RI for Sites 27, 28, 29 and 30* (Baker, 2005g). The most recent soil data available is from the 2008 *Construction Completion Report Site 30* (Shaw, 2008b). The current nature and extent of contamination for each media at Site 30, as documented in the above reports, is summarized below.

Soil

During the development of the EE/CA (Baker, 2007), RGs were developed for COCs identified in soil during previous investigations. A removal action was conducted beginning in March 2008 to remove and dispose of contaminated soil.

Remediation Goals for COCs in Soil

COC	Chromium	Iron	Lead	Mercury	Nickel	Thallium	Vanadium	Zinc
Remediation Goal (mg/kg)	34	46,400	120	0.24	38	1	65	50

Following the completion of removal activities, post-removal confirmation samples indicated that all inorganics were below established RGs or consistent with background values.

Groundwater

Cornwallis-Cave Aquifer

- No pesticides were detected. No SVOCs were detected exceeding screening values.
- Eight VOCs were detected in groundwater, of which three exceeded associated screening values. Detected concentrations of bromodichloromethane (1 J µg/L), chloroform (6 J µg/L), and TCE (6 J µg/L) exceeded the Tap Water RBCs and/or MCLs in one groundwater sample.
- Eleven total and five dissolved inorganics were detected in ground water, of which two total inorganics exceeded associated screening values. Detected concentrations of total (1,740 µg/L) iron and total (4.2 µg/L) vanadium exceeded Tap Water RBCs in one groundwater sample; however all concentrations detected were below base-wide background concentrations.

Surface Water

Drainage to York River

No surface water samples were collected due to a lack of continuous standing water on-site.

Sediment

Drainage to York River

- No pesticides were detected. No VOCs or SVOCs were detected exceeding screening values.
- Twenty-four inorganics were detected in sediment, of which five exceeded associated screening values. Detected concentrations of aluminum (8,330 mg/kg), arsenic (32.5 mg/kg) and chromium (29.9 mg/kg) exceeding residential RBCs; however, all concentrations detected were below the maximum base-wide background concentration. Detected concentrations of iron (39,000 mg/kg) and manganese (254 mg/kg) were detected above both maximum base-wide background and residential RBCs.

3.2.21.3 Potential Risks

A summary of the most current risk assessments and risk management considerations for exposure to each site media is provided below.

Soil

The removal action conducted at Site 30 reduced concentrations of all COCs to below established RGs previously agreed upon by the Navy and the USEPA, in partnership with the VDEQ, to be protective of ecological receptors. Because contaminants were reduced to a level allowing unrestricted land use, NFA is required to address soil at Site 30.

Groundwater

Cornwallis-Cave Aquifer

The HHRA conducted as part of the *Round One RI for Sites 27, 28, 29 and 30* (Baker, 2008g) assessed risk to receptors through ingestion, dermal contact, and inhalation of vapors. Potential unacceptable non-cancer hazards were identified for future child residents. The RME carcinogenic risk for future child residents associated with exposure to groundwater ($CR = 2.7 \times 10^{-5}$) is within the USEPA's target risk range of 10^{-6} to 10^{-4} . The RME non-carcinogenic hazard for future child residents associated with exposure to groundwater ($HI = 2.2$) is above the acceptable HI of 1.0. The hazard is primarily associated with exposure to TCE ($HQ = 1.3$). The CTE non-carcinogenic hazard ($HI = 1.3$) is also above the acceptable HI of 1.0. However, due to the low and isolated nature of the TCE detection it was believed that this detection was a lab artifact and not representative of site conditions. A confirmation DPT groundwater sample collected in the same location did not detect the presence of TCE or any daughter product. Therefore, no release to groundwater has occurred and no unacceptable human health risks were identified.

The ERA conducted as part of the *Round One RI for Sites 27, 28, 29 and 30* (Baker, 2008g) did not assess risk posed to ecological receptors due to groundwater exposure because no complete exposure pathway was identified.

Surface Water

Drainage to York River

The HHRA conducted as part of the *Round One RI for Sites 27, 28, 29 and 30* (Baker, 2008g) did not evaluate risk posed by surface water due to the ephemeral nature of surface water present on-site.

Due to the absence of continuous standing water on-site, the risk associated with surface water could not be directly evaluated at Site 30. As a result, groundwater data was

evaluated as surrogate for surface water by examining the potential migration of contaminants to downgradient habitats. The ERA conducted as part of the *Round One RI for Sites 27, 28, 29 and 30* (Baker, 2008g) concluded that no unacceptable ecological risk for upper and lower level aquatic receptors based on exposures to surface water.

Sediment

Drainage to York River

The HHRA conducted as part of the *Round One RI for Sites 27, 28, 29 and 30* (Baker, 2008g) assessed risk to receptors through incidental ingestion and dermal absorption. No unacceptable cancer risks or non-cancer hazards resulting from exposure to surface water for any receptor.

The ERA conducted as part of the *Round One RI for Sites 27, 28, 29 and 30* (Baker, 2008g) identified no COCs due to direct contact or food web exposure associated with sediment. Thus, risks to ecological receptors are considered acceptable.

3.2.21.4 Removal Action(s)

Following the public comment period and public and regulatory acceptance of the EE/CA, a removal action was initiated in March 2008. Soil and debris were excavated and the old incinerator was removed. Soil was removed to a depth of approximately 4 feet. In total, 2,265 cy (3,398 tons) of contaminated soil, debris, and the concrete incinerator foundation was excavated from Site 30 during removal activities and disposed off-site. Following excavation activities, confirmation samples verified that RGs had been achieved (Shaw, 2008b).

3.2.21.5 Activities Completed FY2010

A NFA ROD for all media was finalized in September 2010.

3.2.21.6 CERCLA Path Forward

CERCLA documentation for Site 30 is complete. No further action or investigation is necessary and the site is closed under CERCLA. Subsequent SMPs will make note of the site closure, but will no longer discuss the site background and investigation history.

[Schedule 3-20](#) presents the FY11-12 schedule for Site 30.

3.2.22 Site 31—Barracks Road Landfill Industrial Area

3.2.22.1 Site Description

Site 31 (formerly AOC 23) consists of an industrial area northwest of Site 12 and SSA 15 ([Figure 3-22](#)). The topography of Site 31 slopes to the northwest toward an unnamed creek. The area is predominantly paved asphalt or covered in gravel. Wooded areas are present on both the northwest and southeast sides of the study area. The industrial area consists of four large buildings (Buildings 3 through 6) and several smaller buildings. Building 3 houses a paint booth, blast booth, satellite accumulation area for aerosol paint cans, and parts washer and is currently used for wing and fin repair. The building was also historically used as a missile component rework facility and a boiler plant. Building 4 is currently used as a storage warehouse. The building was historically used for container repair and testing. Building 5 is currently used for administrative and training purposes and was historically used for mine and depth charge rework. Building 6 is currently used to support public works and utilities maintenance and was historically used for missile component rework

and equipment maintenance. Railroad tracks lie to the northwest of the buildings. A UST used to contain waste oil was previously located by the northern corner of Building 5, but was removed in December 1993 (Baker, 1997g). Two other USTs and one AST were also located onsite and were used for storage of heating oil.

Site 31 was formerly known as either AOC 23 or the area upgradient of Site 12 and was associated with Site 12 until September 2006. At that time a consensus statement was signed indicating the VOC concentrations detected in groundwater was unrelated to Site 12 based on historical site use and spatial distribution. The presence of VOCs was attributed to the industrial area operations upgradient of Site 12. This area is being investigated independently of Site 12. A summary of relevant documents and action milestones is presented in the table below.

Documents and Milestones

Document Title /Milestone	Author/Date	AR Document Number
Study Area Analysis	USEPA, 1992	000289
Round One RI Report for Sites 1-9, 11, 12, 16-19, and 21	Baker and Weston, 1993	000313
Operable Unit Evaluation Report	Baker, 1993	001060
Round Two RI Report Site 12	Baker, 1996	000640
AOC 22, Site 12, and SSA 2, SSA 19 and King Creek Independent Sampling and Risk Screening Report	Black & Veatch, 1996	000669
Feasibility Study Report Site 12	Baker, 1996	000647
Proposed Remedial Action Plan Site 12	Baker, 1996	000654
Record of Decision, Operable Unit Nos. III, IV, and V, Site 12	Baker, 1997	000871
Construction Closeout Report for Site 12 – Area A	OHM, 1998	001154
Long-Term Monitoring Report, Site 12	Baker, 2000	001219
Site 12 Long-Term Monitoring Report - 1998-2000	Baker, 2005	002078
Partnering Team Consensus Statement 9-1-06-45	----	N/A
Work Plan, Site Assessment, Area Upgradient of Site 12	CH2M HILL, 2007	002150
Site Assessment Report Area of Concern 23	CH2M HILL, 2008	002425

3.2.22.2 Nature and Extent of Potential Contamination

Previous investigations included VOC analysis of surface water, and sediment, groundwater for TCL VOCs, TCL SVOCs, explosives, pesticides, PCBs, and TAL metals. The most recent groundwater, surface water, and sediment data available is from the 2009 Site Assessment Report AOC 23 (CH2M HILL, 2008i). Soil is not considered a media of concern at Site 31. The current nature and extent of contamination for each media at Site 31, as documented in the above reports, is summarized below.

Soil

Soil was not considered a media of concern at the site and was not addressed as part of Site 31 investigations.

Groundwater

Columbia Aquifer

- Nine VOCs were detected in groundwater monitoring well samples, of which PCE (3.4J $\mu\text{g/L}$), TCE (5,900 $\mu\text{g/L}$), cis-1,2-DCE (260 $\mu\text{g/L}$), 1,1-DCE (12 $\mu\text{g/L}$), and VC (22 $\mu\text{g/L}$) were detected at concentrations exceeding their respective RSLs and/or MCLs in one or more sample. Six VOCs were detected in the DPT groundwater samples, of which chloromethane (2.5 J $\mu\text{g/L}$), and TCE (7,300 J $\mu\text{g/L}$) exceeding their respective RSLs and/or MCLs in one or more sample.
- Three SVOCs were detected in groundwater monitoring well samples, of which only carbazole (18 $\mu\text{g/L}$) was detected at concentrations exceeding the associated tap water RSL; however, Site 31 is not the likely source of any of these chemicals as they were not detected in the vicinity of the industrial area.
- No pesticides or PCBs were detected in groundwater samples collected. Several explosives were detected in groundwater; however, since all explosives detected were in samples from monitoring wells downgradient of the landfill areas, Site 31 does not appear to be the source of explosives at this site.
- Five inorganics were each detected at concentrations greater than corresponding screening values. Total (11.2 $\mu\text{g/L}$) arsenic, total (1,680 $\mu\text{g/L}$) chromium, total (19 $\mu\text{g/L}$) lead, total (4,820 $\mu\text{g/L}$) and dissolved (4,340 $\mu\text{g/L}$) manganese and total (1,040 $\mu\text{g/L}$) nickel were detected at concentrations exceeding their respective MCL and/or RSLs in one or more groundwater samples.

Groundwater Seeps

Groundwater seep samples were only analyzed for the presence of VOCs. Two VOCs, TCE (130 $\mu\text{g/L}$), and VC (1 J $\mu\text{g/L}$) were detected at concentrations exceeding their respective RSLs and/or MCLs in one or more sample. Results indicate the migration of groundwater contaminants toward surface water bodies to the east and west of the industrial area, further confirming the groundwater divide at the site and the groundwater flow to the east and west.

Surface Water

Surface water samples were only analyzed for the presence of VOCs.

Tributary to Ballard Creek

No VOCs were detected above associated screening values.

Sediment

Sediment samples were only analyzed for the presence of VOCs and AVS/SEM.

Tributary to Ballard Creek

No VOCs were detected exceeding associated screening criteria.

3.2.22.3 Potential Risks

At the present time, neither a HHRA nor an ERA has been conducted at Site 31.

3.2.22.4 Remedial Action(s)

No RAs have been conducted at Site 31.

3.2.22.5 Activities Completed FY2010

RI UFP-SAP is expected in FY2011.

3.2.22.6 CERCLA Path Forward

- RI UFP-SAP
- RI/FS/PP/ROD for groundwater, surface water, and sediment, as appropriate
- RD/RA, as appropriate

[Schedule 3-21](#) presents the FY11-12 schedule for Site 31.

3.2.23 Site 32—Wetlands Downgradient of Beaver Pond

3.2.23.1 Site Description

Site 32 (formerly SSA 25) is located in the extreme eastern portion of WPNSTA Yorktown ([Figure 3-23](#)). The area is approximately 5.6 acres, and is located between two impounded portions of Ballard Creek: a natural beaver dam (Impoundment No. 1) which forms the eastern edge of Beaver Pond and a second impoundment approximately 750 feet downgradient (Impoundment No. 2), whose history of construction has not been determined. Ballard Creek is hydraulically connected for its entire length. Water flows from the erosive, upgradient areas down to Beaver Pond, then over a low area along the northern edge of the beaver dam into the downgradient wetlands, and then through a break in the southern edge of the second impoundment towards the York River. The second impoundment restricts tidal influences from the York River, though the break allows some interaction, the magnitude of which has varied over time. The centerline of Ballard Creek, which meanders throughout the area, marks the property boundary between WPNSTA and the National Parks Service's (NPS) Colonial National Historic Park. Based on its location on Ballard Creek between the two impoundments, the wetlands represent a low energy, bottomland depositional habitat. The topography is characterized by a broad, flat area between steep upland slopes with elevations on the order of 30 to 50 feet amsl.

During its operational period, the STP No. 2 trickling filter discharged via a regulated outfall directly to the wetland area. The trickling filter was installed in 1952 and reportedly managed sanitary waste and used elemental mercury (approximately 4 to 6 ounces) as a water seal in the pivot point. Though this seal was maintained, it is likely that mercury leaked into the trickling filter tank and was subsequently discharged to Site 32 via the STP outfall. It is assumed that treatment operations ceased in the early 1970s, as mercury-sealed trickling filters were banned from use in the state of Virginia in 1971. STP No. 2, prior to being dismantled and removed in 2000, was an inactive treatment plant consisting of a clarifier, settling tanks, and sludge drying beds. The former STP No. 2 clarifier and settling tanks were filled with rainwater and substantial vegetation was growing in drying beds during early assessment activities associated with the WPNSTA ERP (early 1990s). Beaded elemental mercury was discovered around the base of the trickling filter during the demolition process. Twelve drums of mercury-contaminated soils were disposed of and confirmation samples indicated no residual mercury contamination following the removal

of the STP buildings and infrastructure. A summary of relevant documents and action milestones is presented in the table below.

Documents and Milestones

Document Title /Milestone	Author/Date	AR Document Number
Consensus Statement 5-18-04-37	May 18, 2004	N/A
Consensus Statement 8-17-05-42	September 26, 2005	001739
Final Project Plans Step 3B and 4 of the BERA	Baker, 2005	001873
Site 12 Final Long-term Monitoring (LTM) Report (1998-2003)	Baker, 2005	002078
Final Steps 6 and 7 of the Aquatic BERA	CH2M HILL, 2008	002412
Final Engineering Evaluation/Cost Analysis Site Screening Area 25	CH2M HILL, 2009	Pending
Draft Final Construction Completion Report Removal Action at Site 32	Shaw, 2009	Draft – no AR No

3.2.23.2 Nature and Extent of Potential Contamination

Historical discharge from the former STP #2 was the source of potential contamination to sediment and surface water at Site 32. Because discharge occurred directly into the wetland area, soil and groundwater are not considered media of concern at the Site. Previous investigations have included analysis of sediment, and surface water for VOCs, SVOCs, explosives, pesticides, PCBs, and inorganics. The most recent surface water data is from the *Steps 6 and 7 of the Aquatic Baseline Ecological Risk Assessment* (CH2M HILL, 2008j). The most recent sediment data available are from the *2009 CCR Removal Action at Site 32* (Shaw, 2009c). Mercury is considered to be the primary COC at Site 32. The current nature and extent of contamination for each media at Site 32, as documented in the above reports, is summarized below.

Soil

Soil was not considered a media of concern at the site and was not addressed as part of Site 32 investigations.

Groundwater

Groundwater was not considered a media of concern at the site and was not addressed as part of Site 32 investigations.

Surface Water

Ballard Creek

Total mercury (0.126J µg/L) was detected in one sample location, exceeding the BTAG screening value. No dissolved mercury was detected at any sample location.

Sediment

Ballard Creek

During the development of the EE/CA (CH2M HILL, 2009f), RGs were developed for COCs identified in sediment during previous investigations to be protective of a future

unrestricted land use scenario. A removal action was conducted beginning in July 2009 to remove and dispose of contaminated soil and debris.

Remediation Goals for COCs in Sediment

COC	Cadmium	Mercury	Silver
Remediation Goal (mg/kg)	3.8	4.2	102

Post-removal confirmation samples indicated that concentrations of all COCs were below established RGs following the completion of removal activities in September 2009.

3.2.23.3 Potential Risks

A summary of the most current risk assessments and risk management considerations for exposure to each site media is provided below.

Soil

Soil was not considered a media of concern at the site and was not addressed as part of Site 32 investigations.

Groundwater

Groundwater was not considered a media of concern at the site and was not addressed as part of Site 32 investigations.

Surface Water

Ballard Creek

The HHRA conducted as part of the EE/CA (CH2M HILL, 2009f) assessed risk to receptors from exposure to inorganics. The full suite inorganic dataset collected as part of the 2008 BERA (CH2M HILL, 2008j) were compared to the freshwater Federal WQC, tap water regional screening level $\times 10$, and MCL. This evaluation identified no chemicals that are present in surface water above any of these screening criteria, and, as such, there are no potential human health risk from exposure to surface water.

The BERA conducted found negligible risk for benthic invertebrates, amphibians, and fish indicator species based on a comparison of screening values. Thus, risks to ecological receptors are considered acceptable.

Sediment

Ballard Creek

The removal action conducted at Site 32 reduced concentrations of all COCs to below established RGs previously agreed upon by the Navy and the USEPA, in partnership with the VDEQ. Concentrations of COCs on site have been reduced to levels allowing for unrestricted land use.

3.2.23.4 Remedial Action(s)

A NTCRA was initiated in 2009 to remove contaminated sediment. A total of 1,361 cy (2,041 tons) of contaminated sediment was disposed of from Site 32. Following excavation, the area was backfilled with a 3:1 mixture of sand and topsoil, graded, and revegetated with Smooth Alder, Buttonbush, and Bald Cypress. Restoration activities for the embankment and hillside included, backfilling, compacting, grading, fertilizing, and seeding with a grass

seed mixture of Annual Rye Grass, Partridge Pea, Switchgrass, and Virginia Wild Rye Grass (Shaw, 2009c).

3.2.23.5 Activities Completed FY2010

A NTCRA for removal of contaminated sediment was completed in September 2009. Based upon discussions with the VDEQ and USEPA, investigation of the soil and groundwater beneath STP #2 may be required. A NFA PP and ROD for sediment is expected in FY2011.

3.2.23.6 CERCLA Path Forward

- NFA PP/ROD
- Investigation of upgradient soil and groundwater

Schedule 3-22 presents the FY11-12 schedule for Site 32.

3.2.24 Site 33—Sand Blasting Grit Area

3.2.24.1 Site Description

Site 33 (formerly SSA 22 and AOC 4) consists of approximately 0.5 acres located in the eastern portion of WPNSTA Yorktown. Site 33 is bounded to the east and north by Bollman Road to the south by the former location of Building 530, and to the west by unused land (Figure 3-24). A sand blast grit area was adjacent to Building 530, which operated between 1945 and the early to mid 1980s. Bomb fins and wings, inert bomb casings, and various other inert ordnance items were grit blasted in a blasting booth inside Building 530, and outside at the northern end of the building. Grit blasting material may have been composed of coal slag or steel grit. The blasting booth within the building used a dust collector; accumulated dust may have been deposited in the vicinity of the northern side of Building 530.

Site 33 is a mostly cleared grassy area that is generally flat in topography. There are no surface water bodies associated with this SSA. A summary of relevant documents and action milestones is presented in the table below.

Documents and Milestones

Document Title /Milestone	Author/Date	AR Document Number
Navy Final Recommendation for Areas of Concern (SSA 22 is identified as Area of Concern 4)	P.A. Rakowski, P.E., 1995	000355
Site Screening Process Report for Site Screening Areas 3, 4, 5, 9, 10, 20, 21, 22, 23, and 24	Baker, 2001	001350 (Volume I) 001351 (Volume II) 001352 (Volume III)
Remedial Action Report for Sites 1 and 3 and Site Screening Area 22	OHM, 2001	001091

3.2.24.2 Nature and Extent of Potential Contamination

Potential contamination at Site 33 is related to sand blasting activities within and near former Building 530 and the grit pile that was possibly located in the north corner of Building 530. Previous investigations have included analysis of soil and groundwater for VOCs, SVOCs, explosives, pesticides, PCBs, and metals. The most recent soil and groundwater data available is from the 2001 SSP for SSAs 3, 4, 5, 9, 10, 20, 21, 22, 23, and 24

(Baker, 2001d). The current nature and extent of contamination for each media at Site 33, as documented in the above reports, is summarized below.

Soil

A removal action was conducted beginning in July 1999 to remove and dispose of contaminated soil.

Remediation Goals for COCs in Soil

COC	Lead
Remediation Goal (mg/kg)	200

Post-removal confirmation samples indicated that concentrations of all COCs were below established RGs protective of unrestricted site use following the completion of removal activities in August 1999. An NFA Decision Summary for soil was signed May 2004 (Baker, 2004b).

Groundwater

Only one monitoring well was installed at Site 33; however, it was abandoned as part of the removal action.

Cornwallis-Cave Aquifer

- No SVOCs, pesticides, or PCBs were detected.
- Five VOCs were detected in groundwater exceeding associated screening values. 1,1-DCE (2 J $\mu\text{g/L}$), total 1,2-DCE (6 J $\mu\text{g/L}$), chloroform (5 J $\mu\text{g/L}$), and TCE (200 $\mu\text{g/L}$) were detected exceeding the associated RBC values.
- Seven inorganics were detected in groundwater exceeding associated screening values. Total (45,000 $\mu\text{g/L}$) and dissolved (4, 120 $\mu\text{g/L}$) aluminum, dissolved (5.3 $\mu\text{g/L}$) arsenic, dissolved (28.8 $\mu\text{g/L}$) barium, total (3.8 $\mu\text{g/L}$) beryllium, total (137 $\mu\text{g/L}$) chromium, total (88,500 $\mu\text{g/L}$) and dissolved (7,230 $\mu\text{g/L}$) iron, total (48.5 $\mu\text{g/L}$) lead, total (756 $\mu\text{g/L}$) and dissolved (210 $\mu\text{g/L}$) manganese, and total (210 $\mu\text{g/L}$) vanadium were detected exceeding the associated background and RBC values.

Surface Water

No surface water features are present at Site 33.

Sediment

No sediment features are present at Site 33.

3.2.24.3 Potential Risks

A summary of the most current risk assessments and risk management considerations for exposure to each site media is provided below.

Soil

The HHRA conducted as part of the 2001 *SSP for SSAs 3, 4, 5, 9, 10, 20, 21, 22, 23, and 24* (Baker, 2001d) assessed risk to receptors through ingestion of surface and subsurface soil. Potential unacceptable non-cancer hazards were identified for future residents. The non-carcinogenic hazard for future residents associated with exposure to surface soil (HI = 14) is above the acceptable HI of 1.0. The hazard is primarily associated with ingestion of

antimony (HQ = 4), cadmium (HQ = 1.1), chromium (HQ = 2), and iron (HQ = 5.1). The non-carcinogenic hazard for future residents associated with exposure to subsurface soil (HI = 1.3) exceeds the acceptable HI of 1.0. The hazard is primarily associated with ingestion of arsenic (HQ = 0.43) and iron (HQ = 0.83); however, the maximum detected concentrations for these constituents were less than background.

No ERA has been completed to date.

Groundwater

The HHRA conducted as part of the 2001 SSP for SSAs 3, 4, 5, 9, 10, 20, 21, 22, 23, and 24 (Baker, 2001d) assessed risk to receptors through ingestion of filtered and unfiltered groundwater.

Cornwallis-Cave Aquifer

Potential unacceptable non-cancer hazards and cancer risks were identified for future residents. The non-carcinogenic hazard for future residents associated with exposure to unfiltered groundwater (HI = 19) is above the acceptable HI of 1.0. The hazard is primarily associated with ingestion of total aluminum (HQ = 1.2), arsenic (HQ = 7.7), chromium (HQ = 0.76), iron (HQ = 8), manganese (HQ = 0.9), and vanadium (HQ = 0.81). In addition, the carcinogenic risk for future residents associated with exposure to unfiltered groundwater (CR = 2.1×10^{-3}) is above USEPA's target risk range of 10^{-6} to 10^{-4} . The risk is primarily associated with ingestion of TCE (CR = 1.4×10^{-4}) and total arsenic (CR = 1.9×10^{-3}). The non-carcinogenic hazard for future residents associated with exposure to filtered groundwater (HI = 1.5) is above the acceptable HI of 1.0. The hazard is primarily associated with ingestion of dissolved aluminum (HQ = 0.11), arsenic (HQ = 0.48), iron (HQ = 0.66) and manganese (HQ = 0.25). In addition, the carcinogenic risk for future residents associated with exposure to filtered groundwater (CR = 3.4×10^{-4}) is above USEPA's target risk range of 10^{-6} to 10^{-4} . The risk is primarily associated with ingestion of TCE (CR = 1.4×10^{-4}) and dissolved arsenic (CR = 1.2×10^{-4}).

The ERA conducted as part of the 2001 SSP for SSAs 3, 4, 5, 9, 10, 20, 21, 22, 23, and 24 (Baker, 2001d) did not assess risk posed to ecological receptors due to groundwater exposure because no complete exposure pathway was identified.

Surface Water

No surface water features are present at Site 33.

Sediment

No sediment features are present at Site 33.

3.2.24.4 Remedial Action(s)

A removal action was initiated in July 1999 to excavate lead contaminated soil and sandblasting grit between 6 inches and 2 ft bgs. Post-excavation samples were collected from the floor of the excavation areas and compared to the established RG. Based on post-removal analytical results and comparison to the RGs, the RGs were met and excavation was discontinued. In total of 649.44 tons of contaminated soil and grit were removed (OHM, 2001a). An NFA Decision Summary for soil was signed May 2004 (Baker, 2004b).

3.2.24.5 Activities Completed FY2010

The draft UFP-SAP for Sites 9, 19, and 33 RI field activities for groundwater was submitted in January 2010.

3.2.24.6 CERCLA Path Forward

- Finalize UFP-SAP for RI
- RI for groundwater
- FS/PP/ROD for groundwater, as appropriate
- RD/RA, as appropriate

[Schedule 3-23](#) presents the FY11-12 schedule for Site 33.

3.2.25 Site 34—Building 537 Discharge to Felgates Creek

3.2.25.1 Site Description

Site 34 (formerly SSA 14), the Building 537 Discharge to Felgates Creek, is approximately 0.4 acres and is located in the north-central portion of WPNSTA Yorktown ([Figure 3-25](#)). A one-lane asphalt road circles around Buildings 458, 459, 460, 537, and 651, which are concrete bunkers set into a hillside. South of the road, the sparsely wooded terrain slopes steeply to a flat marsh wetland area north of the main channel of the Eastern Branch of Felgates Creek. Site 34 consists of a pipe which originates at Building 537 and extends south to Felgates Creek. Nitramine contaminated wastewater was reportedly discharged through the pipe.

The surface geology at Site 34 consists of approximately ten feet of silt and clay consistent with the Yorktown confining unit. This clay unit overlies the Yorktown-Eastover aquifer which consists predominantly of sand, but includes an approximately ten feet thick clay lens between 30 and 40 feet bgs at Site 34. Depth to groundwater at the site is between 10 and 12 feet bgs. Groundwater and surface water flow south toward the Eastern Branch of Felgates Creek. A summary of relevant documents and action milestones is presented in the table below.

Documents and Milestones

Document Title /Milestone	Author/Date	AR Document Number
Relative Risk Ranking System, Data Collection Investigation	Baker, 1995	000675
Round Two Remedial Investigation Report for Sites 2, 8, 18, and Site Screening Area 14	Baker, 2004	001548 (Volume I) 001549 (Volume II)
EE/CA for Contaminated Soil and Sediment at Site 8 and SSA 14	Baker, 2005	002076
Action Memorandum for Contaminated Soil and Sediment at Site 8 and SSA 14	Baker, 2005	001871
Work Plan Interim Removal Action at Site 8 and SSA 14	Shaw, 2006	001890
Draft Final Construction Completion Report	Shaw, 2009	Draft – No AR No.
SSA 14 Removal Action and Confirmation Sampling Summary Technical Memorandum	CH2M HILL, 2009	Draft – No AR No.
Remedial Investigation Report for Groundwater at Sites 8 and 34	CH2M HILL, 2010	Draft – no AR No

3.2.25.2 Nature and Extent of Potential Contamination

The primary source of contamination was wastewater discharged from the Building 537 pipeline. Previous investigations have included analysis of soil, groundwater, sediment, and surface water for TCL VOCs, TCL SVOCs, explosives, pesticides, PCBs, and TAL metals. The most recent soil data available is from the 2009 *Construction Completion Report* (Shaw, 2009a). The most recent groundwater, surface water, and sediment data available is from the 2010 *RI for Groundwater at Sites 8 and 34* (CH2M HILL, 2010). Surface water and sediment samples were collected near Site 34 as part of an overall evaluation of surface water related to Sites 8 and 34, as they are adjacent to each other and contribute runoff and groundwater discharge to the Eastern Branch of Felgates Creek. The current nature and extent of contamination for each media at Site 34, as documented in the above reports, is summarized below.

Soil

During the development of the EE/CA (Baker, 2005c), RGs protective of unrestricted land use scenario receptors were developed for COCs identified in soil during the previous investigations. A removal action was conducted beginning in February 2007 to remove and dispose of contaminated soil.

Remediation Goals for COCs in Soil

COC	BEPH	HMX	Chromium	Iron	Mercury	Vanadium	Zinc
Remediation Goal (mg/kg)	10	6.3	16.27	11,276	0.1	23.07	50

Post-removal confirmation samples indicated that concentrations of all COCs were below established RGs following the completion of removal activities in September 2008.

Groundwater

Groundwater at Site 34 was not analyzed for SVOCs, pesticides, or PCBs based on historical information.

Yorktown-Eastover Aquifer

- Eleven VOCs were detected in groundwater, of which six exceeding their respective MCLs. Detected concentrations of 1,1,2- TCA (1.6 J µg/L), 1,1-DCA (47 µg/L), 1,2-DCA (2.5 J µg/L), PCE (4.2 J µg/L), TCE (1,400 µg/L), cis-1,2-DCE (130 µg/L) exceeded the tap water RSL and/or MCL in one or more sample locations. Data indicates that VOCs are somewhat constrained to the upper portions of the aquifer.
- Six explosives were detected in groundwater, of which two exceeded associated screening values. Detected concentrations of nitrobenzene (13 µg/L) and RDX (34 µg/L) exceeded the tap water RSL in one or more locations. One or more of the six explosives was detected in every shallow well at the site.
- Eighteen total and twelve dissolved inorganics were detected in groundwater, of which two total and one dissolved inorganics exceeded associated screening values. Detected concentrations of total (33.1 µg/L) and dissolved (4.9 J µg/L) arsenic and total (151 µg/L) chromium were detected concentrations greater than corresponding RSLs and/or Federal MCLs.

Surface Water

Eastern Branch of Felgates Creek

- No SVOCs, pesticides, or PCBs detected. No explosives were detected exceeding associated screening values.
- Four VOCs were detected in surface water, of which one exceeded associated screening values. Detected concentrations of TCE (43 µg/L) exceeded the tap water RSL multiplied by 10.
- Eighteen total and twelve dissolved inorganics were detected in surface water, of which five total and three dissolved inorganics exceeded associated screening values. Detected concentrations of total (2,520 µg/L) and dissolved (317 µg/L) aluminum, total (7.9 J µg/L) and dissolved (4.7 K µg/L) arsenic, total (42.8 J µg/L) and dissolved (38 J µg/L) barium, total (2,880 K µg/L) iron, and total (1.2 J µg/L) silver exceeded ecological screening values and/or tap water RSLs×10 in one or more sample location.

Sediment

Eastern Branch of Felgates Creek

During the development of the EE/CA (Baker, 2005c), RGs were developed for COCs identified in sediment during the previous investigations. A removal action was conducted beginning in February 2007 to remove and dispose of contaminated soil and sediment.

Remediation Goals for COCs in Sediment

COC	BEPH	Selenium
Remediation Goal (mg/kg)	0.18	1

Following the completion of removal activities, post-removal confirmation samples indicated that all COCs were below established RGs. Additional sediment samples were collected within the Eastern Branch of Felgates Creek as part of the 2010 *RI for Groundwater at Sites 8 and 34()* in order to assess potential transport of contaminants from groundwater to nearby sediment.

- No pesticides, PCBs, or explosives were detected
- Three VOC were detected in sediment, one of which exceeded associated screening values. Detected concentrations of carbon disulfide (13 J µg/kg) exceeded the ecological screening value in one sample. These chemicals were also detected in a sample from one upstream reference location. Consequently, these chemicals are not believed to be site-related.
- Twenty inorganics were detected, of which five exceeded associated screening values. Detected concentrations of aluminum (26,500 µg/kg), arsenic (13 µg/kg), manganese (389 J µg/kg), mercury (1.2 µg/kg), silver (1.2 J µg/kg) exceeded the ecological screening value in one or more sample locations. Analytical results indicate that sediment generally indicate minimal impacts from the site.

3.2.25.3 Potential Risks

A summary of the most current risk assessments and risk management considerations for exposure to each site media is provided below.

Soil

The removal action conducted at Site 34 reduced concentrations of all COCs to below established RGs previously agreed upon by the Navy and USEPA, in partnership with the VDEQ. Following the completion of the removal action, no unacceptable risk is posed to current or future receptors due to exposure to soil and NFA for soils is required.

Groundwater

The HHRA conducted as part of the 2010 *RI for Groundwater at Sites 8 and 34* (CH2M HILL, 2010) assessed risk to receptors through ingestion, dermal contact, and inhalation of vapors. As per EPA guidance, carcinogenic risks were only calculated for lifetime child/adult residents.

Yorktown-Eastover Aquifer

Potential unacceptable non-cancer hazards were identified for future adult and child residents. Potential unacceptable cancer risks were identified for lifetime child/adult residents. The RME non-carcinogenic hazard for future adult residents associated with exposure to groundwater (HI = 1.4) is above the acceptable HI of 1.0. However, there are no individual COPCs or target organ/effects with HIs exceeding 1.0. In addition, the CTE non-carcinogenic hazard (HI = 0.47) is below the acceptable HI. The RME non-carcinogenic hazard for future child residents associated with exposure to groundwater (HI = 3.0) exceeds the acceptable HI of 1.0. This hazard is primarily associated with ingestion of arsenic (HQ = 1.0). The CTE non-carcinogenic hazard (HI = 1.2) also exceeds the acceptable HI of 1.0; however, there are no individual COPCs or target organ/effects with HIs exceeding 1.0. The RME carcinogenic risk for lifetime child/adult residents associated with exposure to groundwater (CR = 6.0×10^{-4}), associated with primarily with ingestion of TCE and arsenic, exceeds the acceptable risk range of 10^{-6} to 10^{-4} . The CTE carcinogenic risk (CR = 1.2×10^{-4}) also exceeds the acceptable risk range.

The ERA did not assess risk posed to ecological receptors due to groundwater exposure because no complete exposure pathway was identified.

Surface Water

Eastern Branch of Felgates Creek

The HHRA conducted as part of the 2010 *RI for Groundwater at Sites 8 and 34* (CH2M HILL, 2010) assessed risk to receptors through incidental ingestion and dermal absorption. No unacceptable cancer risks or non-cancer hazards resulting from exposure to surface water were identified for any receptor.

The ERA conducted as part of the 2010 *RI for Groundwater at Sites 8 and 34* (CH2M HILL, 2010) identified no COCs due to direct contact or food web exposure associated with surface water. Thus, risks to ecological receptors are considered acceptable.

Sediment

Eastern Branch of Felgates Creek

The removal action conducted at Site 34 reduced concentrations of all COCs to below established RGs previously agreed upon by the Navy and the USEPA, in partnership with the VDEQ. The HHRA conducted as part of the RI Report for Groundwater assessed risk to receptors through incidental ingestion and dermal absorption. No unacceptable cancer risks or non-cancer hazards resulting from exposure to sediment were identified for any receptor.

Therefore, no unacceptable risk is posed to current or future receptors due to exposure to soil and NFA for sediment is required.

The ERA conducted as part of the 2010 *RI for Groundwater at Sites 8 and 34* (CH2M HILL, 2010) identified no COCs due to direct contact or food web exposure associated with sediment. Thus, risks to ecological receptors are considered acceptable.

3.2.25.4 Removal Action(s)

Following the public comment period and public and regulatory acceptance of the EE/CA, a removal action was initiated in February 2007 to excavate soil and sediment posing potential risks to human health and the environment. Excavation was completed in cells and post-excavation samples were collected from each cell and compared to RGs, and to background values for naturally occurring and anthropogenic chemicals. Based on post-removal analytical results and comparison to all RGs and background values, RGs were met and excavation was discontinued. In total of 1,061 tons of contaminated soil/sediment were removed. The Navy and the USEPA, in partnership with the VDEQ, agreed that confirmation sampling data demonstrated that clean up goals and/or background concentrations were achieved.

3.2.25.5 Activities Completed FY2010

The *Draft Remedial Investigation Report for Groundwater at Sites 8 and 34* was submitted in October 2009.

3.2.25.6 CERCLA Path Forward

- Finalize RI Report for Groundwater
- Complete FS for groundwater
- FS/PP/ROD (for all media)

[Schedule 3-24](#) presents the FY11-12 schedule for Site 34.

3.2.26 Site Screening Area 15—Sewage Treatment Plant #1/Sludge Drying Beds and Discharge Area

3.2.26.1 Site Description

SSA 15 consists of an area approximately 0.3 acres in size and is comprised of the STP #1/Sludge Drying Beds and Discharge Area. It is located in the southeast corner of the WPNSTA, east of Buildings 3 and 4 and south of Site 12 (Barracks Road Landfill) ([Figure 3-26](#)). An Imhoff tank, a trickling filter, a sludge drying bed, and a chlorination unit were once located at SSA 15. Wastewater reportedly entered the Imhoff tank, which operated as a primary settling basin for the waste. The water then was passed through the trickling filter for biological treatment and pumped back to the Imhoff tank for secondary settling. The water was chlorinated in the chlorination unit and discharged to a tributary of Ballard Creek. Sludge from the Imhoff tank was periodically removed and placed in the sludge drying bed. STP #1 received and managed only sanitary waste from physical plants and the Officers' Club located nearby, but may have treated nitramine-containing and other industrial wastewater. WPNSTA personnel have reported that during the operation of STP #1, a mercury-containing bearing on the trickling filter cracked, allowing mercury to be

released. In addition, WPNSTA personnel indicated that sludge from SSA 15 was transported to SSA 6 and land farmed.

Documents and Milestones

Document Title /Milestone	Author/Date	AR Document Number
Site Screening Process Report for Site Screening Areas 1, 6, 7, and 15	Baker, 1996	000663 (Volume I) 000664 (Volume II) 000665 (Volume III)

3.2.26.2 Nature and Extent of Potential Contamination

Historical discharge from the former STP #1 was the source of potential contamination at SSA 15. Surface soil, subsurface soil, groundwater, surface water, and sediment samples were collected and analyzed for VOCs, SVOCs, pesticides, PCBs, explosives and inorganics. The most recent data available for all media is from the 1996 *SSP for SSAs 1, 6, 7, and 15* (Baker, 1996d). Additional sample data was collected in support of the SSP to further evaluate the potential for environmental contaminants; however, this data was not validated through an independent third party process. Therefore, this data is not presented within this section. The current nature and extent of contamination for each media at SSA 15, as documented in the above reports, is summarized below.

Soil

Surface Soil

- No VOCs, SVOCs, or pesticides were detected exceeding associated screening values in surface or subsurface soil samples.
- Twenty-three inorganics were detected, of which four exceeded associated screening values. Detected concentrations of antimony (4 L mg/kg), arsenic (0.61 mg/kg), beryllium (0.61 mg/kg), and manganese (175 mg/kg) exceeded the associated RBC in one or more locations; however, all concentrations detected were below the maximum background concentration.

Subsurface Soil

- No VOCs, SVOCs, or pesticides were detected exceeding associated screening values in surface or subsurface soil samples.
- Twenty-one inorganics were detected, of which six exceeded associated screening values. Detected concentrations of aluminum (9,280 mg/kg), antimony (4.7 L mg/kg), arsenic (29.2mg/kg), beryllium (2.1 mg/kg), manganese (1,300 J mg/kg), and thallium (1.3 L mg/kg) exceeded the associated RBC in one or more locations; however, all concentrations detected were below the maximum background concentration. In general, the detected inorganics are not present in a discernable pattern indicating the presence is attributable to a contaminant source.

Groundwater

Columbia Aquifer

- No SVOCs or PCBs were detected in groundwater samples.
- Eight VOCs were detected in groundwater, of which two exceeded associated screening values. Detected concentrations of 1, 1-DCE (0.6 J µg/L) and TCE (7 µg/L) exceeded the

RBC and/or Virginia and Federal MCLs each in one sample. Total VOC concentrations are highest in samples collected at the western boundary and in the center of the SSA.

- Four pesticides were detected in groundwater, of which two exceeded associated screening values. Detected concentrations of beta-benzene hexachloride (BHC) (0.05 J $\mu\text{g/L}$) and 4, 4-DDT (0.16 J $\mu\text{g/L}$) exceeded the RBC and State MCL, respectively, in a few sample locations.
- Twenty-two total and eleven dissolved inorganics were detected in groundwater, of which three total and one dissolved inorganics exceeded associated screening values. Detected concentrations of total (849 $\mu\text{g/L}$) barium, dissolved (155 $\mu\text{g/L}$) manganese, total (263 $\mu\text{g/L}$) nickel, and total (329 $\mu\text{g/L}$) vanadium exceeded the RBC and/or the Federal MCL at one or more sampling locations.

Surface Water

Tributary to Ballard Creek.

- No SVOCs, pesticides, PCBs, or explosives were detected in surface water samples. No inorganics exceeded associated screening values.
- Five VOCs were detected in surface water, all of which exceeded screening values. Detected concentrations of 1, 1-DCE (1 $\mu\text{g/L}$), cis-1, 2-DCE (77 $\mu\text{g/L}$), 1, 1-DCA (0.5 J), TCE (500 $\mu\text{g/L}$), and VC (2 $\mu\text{g/L}$) were retained as potential COPCs due to a lack of screening criteria. However, because TCE was not detected in other SSA 15 media at higher concentrations, SSA 15 is not the source of TCE in adjacent surface water features. Further investigations of adjacent areas have concluded that the TCE in surface water is related to upgradient, Site 31, currently under investigation.

Sediment

Tributary to Ballard Creek.

- No pesticides, PCBs, or explosives were detected in sediment samples. No VOCs or SVOCs were detected exceeding associated screening values.
- Six pesticides were detected in sediment, of which five exceeded associated screening values. 4, 4- dichlorodiphenyldichloroethane (DDD) (0.00158 $\mu\text{g/kg}$), 4, 4-DDE (0.0022 $\mu\text{g/kg}$), and 4, 4-DDT (0.00158 $\mu\text{g/kg}$), alpha-chlordane (0.0005 $\mu\text{g/kg}$), and gamma-chlordane (0.0005 $\mu\text{g/kg}$) exceeded the sediment screening ER-L and/or ER-M values in one or more sample.
- Eighteen inorganics were detected in sediment, of which one exceeded associated screening values. Detected concentrations of mercury (0.44 mg/kg) exceeded the sediment screening ER-L value in three samples collected; however, mercury was not detected in any other media sampled.

3.2.26.3 Potential Risks

A summary of the most current risk assessments and risk management considerations for exposure to each site media is provided below.

Soil

The Human Health Risk Screening conducted as part of the *SSP for SSAs 1, 6, 7, and 15* (Baker, 1996d) assessed risks to receptors through ingestion. No unacceptable cancer risks or

non-cancer hazards were identified due to exposure to surface soil (HI = 0.95). Potential unacceptable non-cancer hazards were identified due to exposure to subsurface soil (HI = 2) primarily associated with exposure to arsenic (HQ = 0.65) and manganese (HQ = 1.1). However, concentrations of arsenic and manganese detected in subsurface soil were similar to those detected in base-wide background samples.

The Ecological Risk Screening conducted as part of the *SSP for SSAs 1, 6, 7, and 15* did not assess risk posed to ecological receptors by exposure to soil.

Groundwater

Columbia Aquifer

The Human Health Risk Screening conducted as part of the *SSP for SSAs 1, 6, 7, and 15* (Baker, 1996d) assessed risks to receptors through ingestion under a potable use scenario. No unacceptable cancer risks or non-cancer hazards resulting from exposure to groundwater were identified for any receptor.

The Ecological Risk Screening conducted as part of the *SSP for SSAs 1, 6, 7, and 15* (Baker, 1996d) did not assess risk posed to ecological receptors by exposure to groundwater because no complete exposure pathway was identified.

Surface Water

Tributary to Ballard Creek.

The Human Health Risk Screening conducted as part of the *SSP for SSAs 1, 6, 7, and 15* (Baker, 1996d) did not assess risk to human health due to exposure to surface water.

The Ecological Risk Screening conducted as part of the *SSP for SSAs 1, 6, 7, and 15* (Baker, 1996d) identified no COCs due to exposure with surface water. Thus, risks to ecological receptors are considered acceptable.

Sediment

Tributary to Ballard Creek.

The Human Health Risk Screening conducted as part of the *SSP for SSAs 1, 6, 7, and 15* (Baker, 1996d) did not assess risk to human health due to exposure to sediment.

The Ecological Risk Screening conducted as part of the *SSP for SSAs 1, 6, 7, and 15* (Baker, 1996d) identified potential unacceptable risk to ecological receptors. The risk (EI = 99) is associated with exposure to 4, 4-DDD (EQ = 27), 4, 4-DDE (EQ = 12), and 4, 4-DDT (EQ = 40), alpha-chlordane (EQ = 8.2), gamma-chlordane (EQ = 8.8), and mercury (EQ = 2.5). However, because pesticides were applied as part of routine base maintenance and because mercury was not detected in any other site media, the SSP concluded that concentrations of these risk drivers are not site related.

3.2.26.4 Additional Sampling

The inclusion of additional samples collected in the risk assessment resulted in additional unacceptable risk to human and ecological receptors. Potential unacceptable non-cancer hazards to human health were identified due to exposure to surface soil (HI = 5) primarily associated with exposure to arsenic (HQ = 0.59), cadmium (HQ = 1.2), chromium (HQ = 0.64), mercury (HQ = 0.9), silver (HQ = 0.59), and vanadium (HQ = 0.74) from one surface soil sample. Potential unacceptable risks to ecological receptors were identified due to exposure to surface water (EI = 10) primarily associated with exposure to cadmium

(EQ = 1.9) and silver (EQ = 8.3) from one surface water sample. However, this additional sample data was not validated by a third-party and, therefore, is not suitable for use in risk management decisions (Baker, 1996d).

3.2.26.5 Removal Action(s)

In 2001, the Imhoff tank, trickling filter, sludge drying bed, and chlorination unit were removed. Because SSA 15 does not appear to be the source of contamination to surface water and sediment, no further investigation was recommended in the SSP (Baker, 1996). (CERCLA status determinations for AOCs 5, 6, and 7, as identified in the *AOC Decision Signature Page with Attachments* (Baker, 1997h), are pending the CERCLA status decision for SSA 15.)

3.2.26.6 Activities Completed FY2010

The completion of a desktop audit is expected in August 2010 to identify whether additional investigation of the SSA is necessary.

3.2.26.7 CERCLA Path Forward

- Desktop audit

[Schedule 3-25](#) presents the FY11-12 schedule for SSA 15.

3.3 MRP Sites

The MRP sites identified at Yorktown are comprised of the MWR Skeet Range and the Turkey Road Landfill (formerly ERP Site 2). The MWR Skeet Range was identified in a final PA (Malcolm Pirnie, 2005) that also identified three areas as potential MRP sites: the Demolition Range, the Detonator Blasting Pit Area, and the Detonator Pit.

3.3.1 MWR Skeet Range

The MWR Skeet Range is approximately 30 acres used exclusively for recreational purposes between 1980 and 1982 (weekends only); after 1982, the range was used sporadically until it was dismantled in 1994 ([Figure 3-27](#)). Activities were limited to skeet shooting with shotguns from a launching pad, with a 900-foot arc safety danger zone. The site currently is not maintained and not in use. There is no MEC on the site, as only small-caliber ammunition was used. Munitions constituents on the site include lead, antimony, copper, zinc, arsenic, and PAHs from bullets, fragments, bullet jackets, and related sporting material such as clay targets.

Documents and Milestones

Document Title/ Milestone	Author/Date	AR Document Number
Preliminary Assessment, Naval Weapons Station Yorktown	Malcolm Pirnie, 2005	001942
Expanded Site Inspection Report for the Closed MWR Skeet Range and the Closed Marine Pistol and Rifle Range	CH2M HILL, 2008	002180

3.3.1.1 Nature and Extent of Potential Contamination

The source of potential contamination is the spent ammunition (specifically lead shot) and clay targets used at the range. Previous investigations have included analysis of soil for lead and PAHs. The most recent soil data available is from the *2008 Expanded Site Inspection (ESI)* (CH2M HILL, 2008k). A metal detector survey and sieve analysis for lead shot was also conducted during this investigation. The current nature and extent of contamination for each media at the MWR Skeet Range, as documented in the above reports, is summarized below.

Soil

Soil samples were only analyzed for select SVOCs and lead based on historical site use.

Surface Soil

- Seventeen SVOCs were detected in surface soil, of which five exceeded screening values. Detected concentrations of benzo(a)anthracene (920 µg/kg), benzo(a)pyrene (1,400 µg/kg), benzo(a)fluoranthene (620 µg/kg), and indeno(1,2,3-cd)pyrene (330 J µg/kg) exceeded the ecological screening values and residential RBCs in up to two sample locations.
- Lead (218 mg/kg) was found to exceed the ecological screening value at two locations in surface soil.

Subsurface Soil

There were no exceedances of screening values in subsurface soils.

Groundwater

No groundwater samples have been collected at the MWR Skeet Range.

Surface Water

No surface water samples have been collected at the MWR Skeet Range.

Sediment

No sediment samples have been collected at the MWR Skeet Range.

3.3.1.2 Potential Risks

A summary of the most current risk assessments and risk management considerations for exposure to each site media is provided below.

Soil

The human health risk-based screening conducted as part of the 2008 *ESI* (CH2M HILL, 2008k) assessed risk through a risk-ratio comparison. No unacceptable cancer risks or non-cancer hazards resulting from exposure to surface soil were identified for any receptor.

The ecological risk-based screening conducted as part of the 2008 *ESI* (CH2M HILL, 2008k) assessed risk through a risk-ratio comparison. Potentially unacceptable risk to terrestrial plants was identified (HQ = 1.8); however the site is completely vegetated with no obvious signs of stress to the vegetation. Soil screening values based upon other terrestrial receptors are higher than the maximum measured concentration on the site. In addition, exceedances of the screening value for terrestrial plants were low and spatially limited. The site wide mean surface soil concentration for lead (29.8 mg/kg) was considerably less than the ecological screening value of 120 mg/kg (HQ = 0.25). This, combined with the lack of lead

shot in sieve samples, indicates that potential ecological risks on a site-wide basis are acceptable.

Groundwater

No groundwater samples have been collected at the MWR Skeet Range.

Surface Water

No surface water samples have been collected at the MWR Skeet Range.

Sediment

No sediment samples have been collected at the MWR Skeet Range.

3.3.1.3 Removal Action(s)

No CERCLA RAs have taken place at the MWR Skeet Range.

3.3.1.4 Activities Completed FY2010

No new activities have occurred or are anticipated to occur.

3.3.1.5 Path Forward

CERCLA documentation is complete. No CERCLA action is necessary and the site is closed under the MRP. Subsequent SMPs will make note of the site closure, but will no longer discuss the site background and investigation history.

3.3.2 Site 2—Turkey Road Landfill

3.3.2.1 Site Description

Site 2 is a five-acre landfill located east of Turkey Road adjacent to a wetland area on the Southern Branch of Felgates Creek and two unnamed tributaries that border Site 2 ([Figure 3-28](#)). Operations at the landfill reportedly began in the 1940s and ceased in 1981. Wastes disposed in this landfill reportedly included mercury and carbon-zinc batteries, tree stumps and limbs, construction rubble, missile hardware (e.g., wings, fins and power packs), electrical devices, and unidentified drums and/or tanks. An estimated 240 tons of waste were disposed during the period of use. Waste material (e.g. mine casings) was primarily located along the tributaries to the Southern Branch of Felgates Creek. A summary of relevant documents and milestones is presented in the table below.

The Turkey Road Landfill was transferred to the MRP on June 19, 2007.

Documents and Milestones

Document Title/ Milestone	Author/Date	AR Document Number
Round One Remedial Investigation Report for Sites 1-9, 11, 12, 16-19, and 21	Baker and Weston, 1993	000313
Action Memorandum and Engineers Estimate/Cost Analysis	Baker, 1994	000615
Closeout Report, Sites 2 and 9 and Site Screening Area 4, Mine Casing and Debris Removal Action	IT Corp., 1995	000646
Round Two Remedial Investigation Report for Sites 2, 8, 18, and Site Screening Area 14	Baker, 2004	001548
Work Plan for the Pre-Removal Characterization of Soil, Site 2, Site 8, and Site Screening Area 14	Baker, 2005	001687

3.3.2.2 Nature and Extent of Potential Contamination

The source of potential contamination is the waste disposed of in the landfill. Previous investigations have included analysis of soil, groundwater, sediment, and surface water for TCL VOCs, TCL SVOCs, explosives, pesticides, PCBs, and TAL inorganics. The most recent data available for all media is from the 2004 *Round Two RI for Sites 2, 8, 18, and SSA 14* (Baker, 2004a). The current nature and extent of contamination for each media at Site 2, as documented in the above reports, is summarized below.

Soil

Soil samples were not compared against ecological screening values.

Surface Soil

- No VOCs were detected. No pesticides or explosives were detected exceeding associated screening values.
- Twenty-two SVOCs were detected in surface soil, eight of which exceeded the associated screening values. Detected concentrations of benzo(a)anthracene (48,000 µg/kg); benzo(a)pyrene (40,000 µg/kg), benzo(b)fluoranthene (35,000 µg/kg), benzo(k)fluoranthene (33,000 µg/kg), carbazole (6,600 µg/kg), chrysene (50,000 µg/kg), dibenz(a,h)anthracene (11,000 µg/kg), and indeno(1,2,3-cd)pyrene (28,000 µg/kg) exceeded residential RBCs in a majority of sample locations.
- One PCB was detected in surface soil, which exceeded screening values. Detected concentrations of Aroclor-1254 (6,200 µg/kg) exceeded residential RBCs in one sample location.
- Twenty one inorganics were detected in surface soil, of which nine exceeded associated screening values. Detected concentrations of aluminum (11,400 mg/kg), antimony (24.3 mg/kg), arsenic (8.4 mg/kg), cadmium (2,460 mg/kg), copper (14,700 mg/kg), iron (34,500 mg/kg), manganese (307 mg/kg), mercury (16.6 mg/kg), and thallium (26.8 mg/kg) exceeded residential RBCs in one or more samples.

Subsurface Soil

- No VOCs were detected. No pesticides were detected exceeding associated screening values.
- Nineteen SVOCs were detected in subsurface soil, five of which exceeded the associated screening values. Detected concentrations of benzo(a)anthracene (5,000 µg/kg), benzo(a)pyrene (4,700 µg/kg), benzo(b)fluoranthene (5,900 µg/kg), dibenz(a,h)anthracene (800 µg/kg), and indeno(1,2,3-cd)pyrene (3,100 µg/kg) exceeded residential RBCs in a majority of samples locations.
- One PCB was detected in subsurface soil, which exceeded screening values. Detected concentrations of Aroclor-1254 (440 µg/kg) exceeded residential RBCs in two sample locations.
- Twenty-two inorganics were detected in subsurface soil, of which seven were detected exceeding the associated screening values. Detected concentrations of aluminum (11,600 mg/kg), arsenic (13.6 mg/kg), cadmium (7.6 mg/kg), chromium (26.8 mg/kg),

iron (22,300 mg/kg), manganese (478 mg/kg), and thallium (0.96 K mg/kg) were detected exceeding the residential RBCs in one or more samples.

Groundwater

Cornwallis-Cave Aquifer

- No SVOCs, pesticides, PCBs, or explosives were detected.
- Two VOCs were detected in groundwater, both of which exceeded associated screening values. Detected concentrations of 1, 2-DCE (28 µg/L) and VC (17 µg/L) exceeded tap water RBCs, both in one sample location located at the toe of the landfill.
- Fifteen inorganics were detected in groundwater, of which seven exceeded associated screening values. Detected concentrations of aluminum (16,400 milligrams per Liter [mg/L]), arsenic (3.7 mg/L), barium (344 mg/L), cadmium (2.2 mg/L), iron (163,000 mg/L), manganese (7,670 mg/L), and thallium (7.1 K mg/L) exceeded the tap water RBCs and/or Federal MCL in one or more sample location.

Surface Water

Felgates Creek

- No VOCs, SVOCs, pesticides, or PCBs were detected. No explosives were detected above associated screening values.
- Sixteen total inorganics were detected in surface water, of which two exceeded associated screening values. Detected concentrations of aluminum (1/280 mg/L), arsenic (3.2 mg/L), beryllium (3.5 K mg/L), cadmium (5.1 K mg/L), copper (9.7 mg/kg), iron (3,930 mg/L), manganese (282 J mg/L), and nickel (21.9 K mg/L) exceeded the ecological and/or human health screening value in one or more sample locations.

Sediment

Felgates Creek

- No VOCs, pesticides, or PCBs were detected exceeding screening values in sediment samples.
- Eighteen SVOCs were detected in sediment, of which ten exceeded associated screening values. Detected concentrations of BEHP (1,100 µg/kg), benzo(a)anthracene (1,400 µg/kg), benzo(b)fluoranthene (1,600 µg/kg), benzo(k)fluoranthene (720 µg/kg), benzo(a)pyrene (1,300 µg/kg), carbazole (300 J µg/kg), chrysene (1,400 µg/kg), dibenz(a,h)anthracene (190 J µg/kg), indeno(1,2,3-cd)pyrene (890 µg/kg), and phenanthrene (1,800 µg/kg) were detected exceeding the ecological and/or the residential RBC×10, predominately in one sample location.
- Twenty-three inorganics were detected in sediment, of which thirteen exceeded associated screening values. Detected concentrations of aluminum (23,000 mg/kg), arsenic (21.5 mg/kg), barium (109 mg/kg), cadmium (1.5 K mg/kg), cobalt (8.7 mg/kg), iron (45,300 mg/kg), lead (31.8 mg/kg), manganese (673 mg/kg), mercury (0.33 mg/kg), nickel (15.6 mg/kg), selenium (1.9 K mg/kg), silver (24.6 mg/kg), and vanadium (50.4 mg/kg) exceeded ecological and/or residential RBC×10 in one or more sample locations.

3.3.2.3 Potential Risks

A summary of the most current risk assessments and risk management considerations for exposure to each site media is provided below.

Soil

The HHRA conducted as part of the 2004 *Round Two RI for Sites 2, 8, 18, and SSA 14* (Baker, 2004a) assessed risk to receptors through ingestion and dermal contact with soil. Potential unacceptable non-cancer hazards were identified for future adult and child residents. No unacceptable cancer risks to any receptor were identified due to exposure to soil. The RME non-carcinogenic hazard for future adult residents associated with exposure to soil (HI = 1.4) is above the acceptable HI of 1.0. The hazard is primarily associated with dermal contact with and ingestion of cadmium (HQ = 1.08). However, the CTE non-carcinogenic hazard (HQ = 0.24) is less than the acceptable HI of 1.0. The RME non-carcinogenic hazard for future adult residents associated with exposure to soil (HI = 5.4) is above the acceptable HI of 1.0. The hazard is primarily associated with dermal contact with and ingestion of cadmium (HQ = 3.5).

The ERA conducted as part of the 2004 *Round Two RI for Sites 2, 8, 18, and SSA 14* (Baker, 2004a) did not assess risk posed to terrestrial ecological receptors due to soil exposure.

Groundwater

Cornwallis-Cave Aquifer

The HHRA conducted as part of the 2004 *Round Two RI for Sites 2, 8, 18, and SSA 14* (Baker, 2004a) assessed risk to receptors through ingestion, dermal contact, and inhalation of vapors under a non-potable, beneficial use scenario. No unacceptable cancer risks or non-cancer hazards resulting from exposure to groundwater were identified for any receptors evaluated.

The ERA conducted as part of the 2004 *Round Two RI for Sites 2, 8, 18, and SSA 14* (Baker, 2004a) did not assess risk posed to ecological receptors due to groundwater exposure because no complete exposure pathway was identified.

Surface Water

Felgates Creek

The HHRA conducted as part of the 2004 *Round Two RI for Sites 2, 8, 18, and SSA 14* (Baker, 2004a) assessed risk to receptors through ingestion of and dermal contact with surface water. No unacceptable cancer risks or non-cancer hazards resulting from exposure to surface water were identified for any of the receptors evaluated.

The ERA conducted as part of the 2004 *Round Two RI for Sites 2, 8, 18, and SSA 14* (Baker, 2004a) identified no COCs due to direct contact or food web exposure associated with surface water. Thus, risks to ecological receptors evaluated are considered acceptable.

Sediment

Felgates Creek

The HHRA conducted as part of the 2004 *Round Two RI for Sites 2, 8, 18, and SSA 14* (Baker, 2004a) assessed risk to receptors through ingestion of and dermal contact with sediment. No unacceptable cancer risks or non-cancer hazards resulting from exposure to sediment were identified for any of the receptors evaluated.

The ERA conducted as part of the 2004 *Round Two RI for Sites 2, 8, 18, and SSA 14* (Baker, 2004a) identified no COCs due to direct contact or food web exposure associated with sediment. Thus, risks to ecological receptors evaluated are considered acceptable. Though current levels of exposure do not indicate the potential for unacceptable risk to aquatic receptors from PAHs, Aroclor-1254, cadmium, and mercury, the potential for continued source release and future exposures elevated above those measured in the current dataset warrants additional investigation.

3.3.2.4 Remedial Action(s)

A removal action was conducted at Site 2 from September through December 1994. The main objectives of the removal action were to removal all surface and near surface wastes from the designated areas at Site 2 and to restore the site to pre-removal action conditions. Based on historical photographs, waste disposal appears to have been limited to the perimeter of the site. Based on the Closeout Report, 676 tons of non-ordnance wastes and soils were removed from Site 2. Approximately 4,327 ordnance items also were removed from Sites 2, 9, and SSA 4. The closeout report did not distinguish between sites, but indicated that the majority of ordnance came from Site 2. Wastes removed at Site 2 included large concrete masses, asphalt, scrap metal, empty drums, miscellaneous construction/demolition debris, batteries, and ordnance. All ordnance items were certified inert by the unexploded ordnance (UXO) superintendent, either the items were transferred to the NEDED laboratory onsite and verified as inert, or were transferred offsite by the Station Explosive Ordnance Disposal (EOD) staff for final disposition. Excavated areas were backfilled, including a 6-inch layer of topsoil, seeded, and mulched (IT Corp., 1995b). During the field investigations in June 2005 to determine the extent of contamination from polyaromatic hydrocarbons, PCBs, cadmium, and mercury in subsurface soil at the site, an ordnance item was discovered. The item was determined to be inert by EOD; however, because of the identification of a potential MEC item, the site was designated as a Munitions Response Site.

3.3.2.5 Activities Completed FY2010

A digital geophysical mapping (DGM) study was performed in April 2010 to aid in delineating waste. The final TM report is expected in July 2010.

3.3.2.6 Path Forward

As the site is now part of the MR Program, no further CERCLA activity is currently scheduled. A desktop SI report is planned for FY2011 to evaluate the path forward for the site.

3.4 Base-Wide Document Prioritization

Table 3-1 lists the anticipated submittal schedule for documents requiring technical review during FY 11-12. This list is meant to aid in determining document prioritization; however, the actual prioritization of documents will be decided by the Yorktown Partnering Team and informed by annual team goals.

TABLE 3-1
Base-Wide Document Prioritization

Document Title	Draft Submittal Date (Anticipated Quarter)	Regulator Review Date (Anticipated Quarter)
FY11		
SSA 15 Tech Memo	Submitted in FY10	1st Quarter
Sites 6 and 7 ESD	Submitted in FY10	1st Quarter
Sites 8 and 34 FS	Submitted in FY10	1st Quarter
Sites 23, 25, and 26 UFP-SAP	Submitted in FY10	1st Quarter
Site 24 RI	1st Quarter	2nd Quarter
Sites 1 and 3 FS	1st Quarter	2nd Quarter
Sites 9 and 19 RI	1st Quarter	2nd Quarter
Sites 6 FS	2nd Quarter	2nd Quarter
Site 31 RI	2nd Quarter	3rd Quarter
Site 24 FS	3rd Quarter	3rd Quarter
Site 12 LTM Work Plan	3rd Quarter	4th Quarter
Sites 9, 19, and 33 FS	4th Quarter	4th Quarter
FY12		
Site 25 Perchlorate TM	4th Quarter FY 11	1st Quarter
Site 31 FS	4th Quarter FY 11	1st Quarter
Site 12 RD	1st Quarter	2nd Quarter
Sites 23, 25, and 26 RI	1st Quarter	2nd Quarter
Five Year Review Sites 8, 12, 16, 22, 33, 34	1st Quarter	2nd Quarter
Site 22 RD	2nd Quarter	2nd Quarter
Sites 8 and 34 RACR	2nd Quarter	3rd Quarter
Site 12 RACR	3rd Quarter	4th Quarter
Sites 1 and 3 RACR	3rd Quarter	4th Quarter
Site 6 RACR	3rd Quarter	4th Quarter
Site 7 FS	3rd Quarter	4th Quarter
Site 23 FS	4th Quarter	4th Quarter

3.5 Records of Decision

As part of the FFA, fifteen source areas were identified at WPNSTA Yorktown as requiring closeout documentation prior to base closeout:

- Site 1 – Dudley Road Landfill
- Site 2 – Turkey Road Landfill
- Site 3 – Group 16 Magazine Landfill
- Site 4 – Burning Pad Residue Landfill
- Site 6 – Explosives Contaminated Wastewater Impoundment, Flume Area and Excavation Area, Buildings 109, 110 and 501
- Site 7 – Plant 3 Explosives-Contaminated Wastewater Discharge Area
- Site 8 – NEDED Explosives-Contaminated Wastewater Discharge Area
- Site 9 – Plant 1 Explosives-Contaminated Wastewater Discharge Area
- Site 11 – Abandoned Explosives Burning Pits
- Site 12 – Barracks Road Landfill
- Site 16 – West Road Landfill and Site Screening Area 16 - Building 402 Metal Disposal Area and Environs
- Site 17 – Holm Road Landfill
- Site 19 – Conveyor Belt Soils at Building 10
- Site 21 – Battery and Drum Disposal Area
- Site 22 – Burn Pad

Table 3-2 provides a list of those documents that currently have a ROD in place for one or more media, the LTM requirements as applicable, and modifications proposed in upcoming ESDs.

TABLE 3-2
Record of Decision Summary

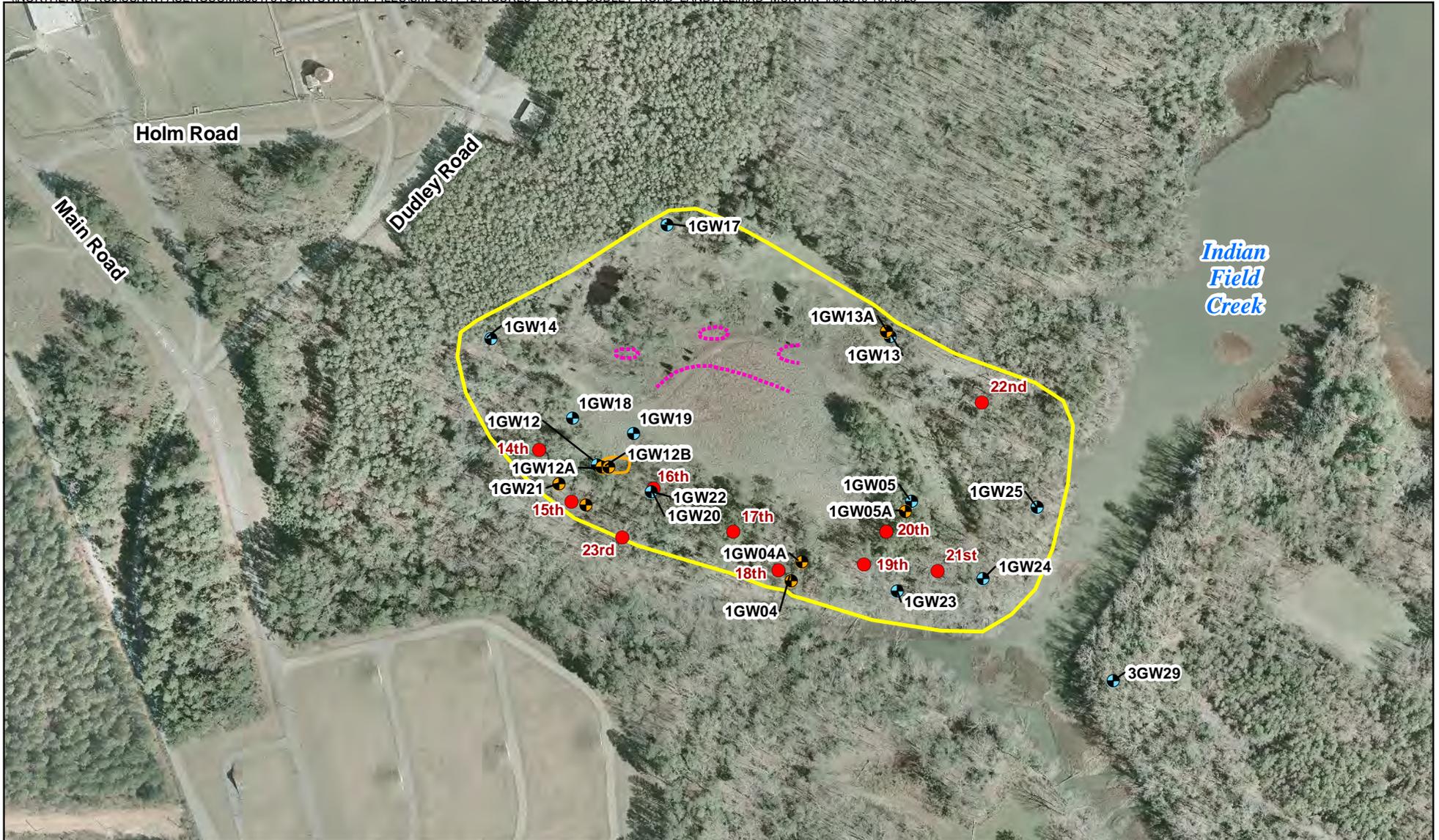
Site	ROD Media	Analytes for LTM	Proposed ESD Modification
Site 1	Soil, Waste	GW, SW, and SD – VOCs	No ESD
Site 3	Soil, Waste	GW - VOCs	Remove LUCs
Site 4	Soil, Waste	No LTM	No ESD
Site 5	All Media	No LTM	No ESD
Site 6	Soil, SW, SD	GW - VOCS, inorganics SD - inorganics	Document more stringent clean-up levels Removal of LTM from SW and SD
Site 7	Soil, GW, SW, SD	GW - Explosives SW/SD - Full Suite	Document more stringent clean-up levels Removal of LTM from SW and SD

Site	ROD Media	Analytes for LTM	Proposed ESD Modification
Site 9	Soil, SW, SD	No LTM	No ESD
Site 11	Soil, Waste	No LTM	No ESD
Site 12	Soil, GW	GW - VOCs, inorganics SD - inorganics	No LTM inspections for Areas B/C and Wood/Debris Disposal Area LTM requirements deferred to work plan No Analysis of VOCs in site media
Site 16/SSA 16	Soil, GW	No LTM	No ESD
Site 17	Soil, Waste	No LTM	Remove LUCs
Site 19	Soil	No LTM	No ESD
Site 21	Soil, Waste	No LTM	No ESD
Site 22	Soil	No LTM	No ESD
Site 29	All Media	No LTM	No ESD

A Five-Year Review is required to evaluate and document effectiveness of remedies and RAs at sites with RODs or DDs. The next Five-Year Review will be conducted in 2012 and will include the following sites:

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

Five-Year reviews will be required for these sites as long as waste remains in place or hazardous substances, pollutants, or contaminants remaining above levels allowing for unrestricted land use.



Legend

-  Columbia Monitoring Wells
-  Yorktown-Eastover Monitoring Wells
-  Study Area Boundary
-  Area of Excavation of Arsenic Contaminated Soil
-  Interpreted (Geophysical Survey) Northern Extent of Main Disposal Area (Roy F. Weston, Inc., 1993)
-  MIP Locations

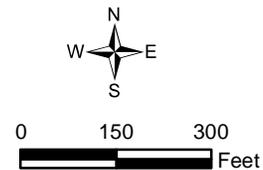
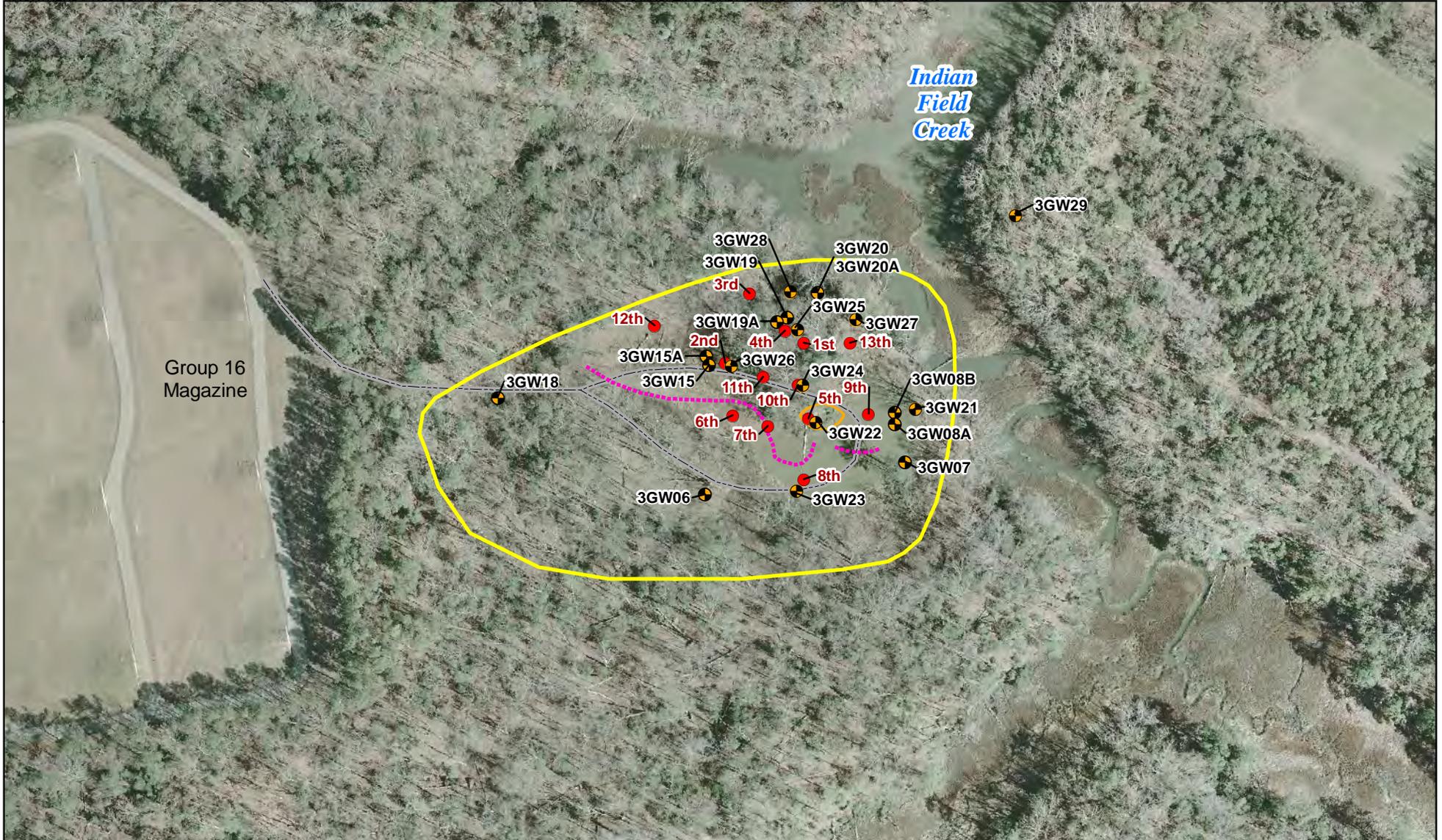


Figure 3-1
 Site 1 - Dudley Road Landfill
 Site Management Plan for FY 2011 to 2012
 Naval Weapons Station Yorktown
 Yorktown, Virginia



Legend

- Yorktown-Eastover Monitoring Wells
- MIP Locations
- Study Area Boundary
- 1999 Removal Area (Soil and Waste)/ Area of Excavation of PAH Contaminated Soil
- Landfill Access Road
- Interpreted (Geophysical Survey) Southern Extent of Waste Boundary (Roy F. Weston, Inc., 1993)

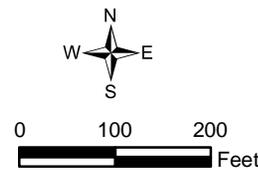
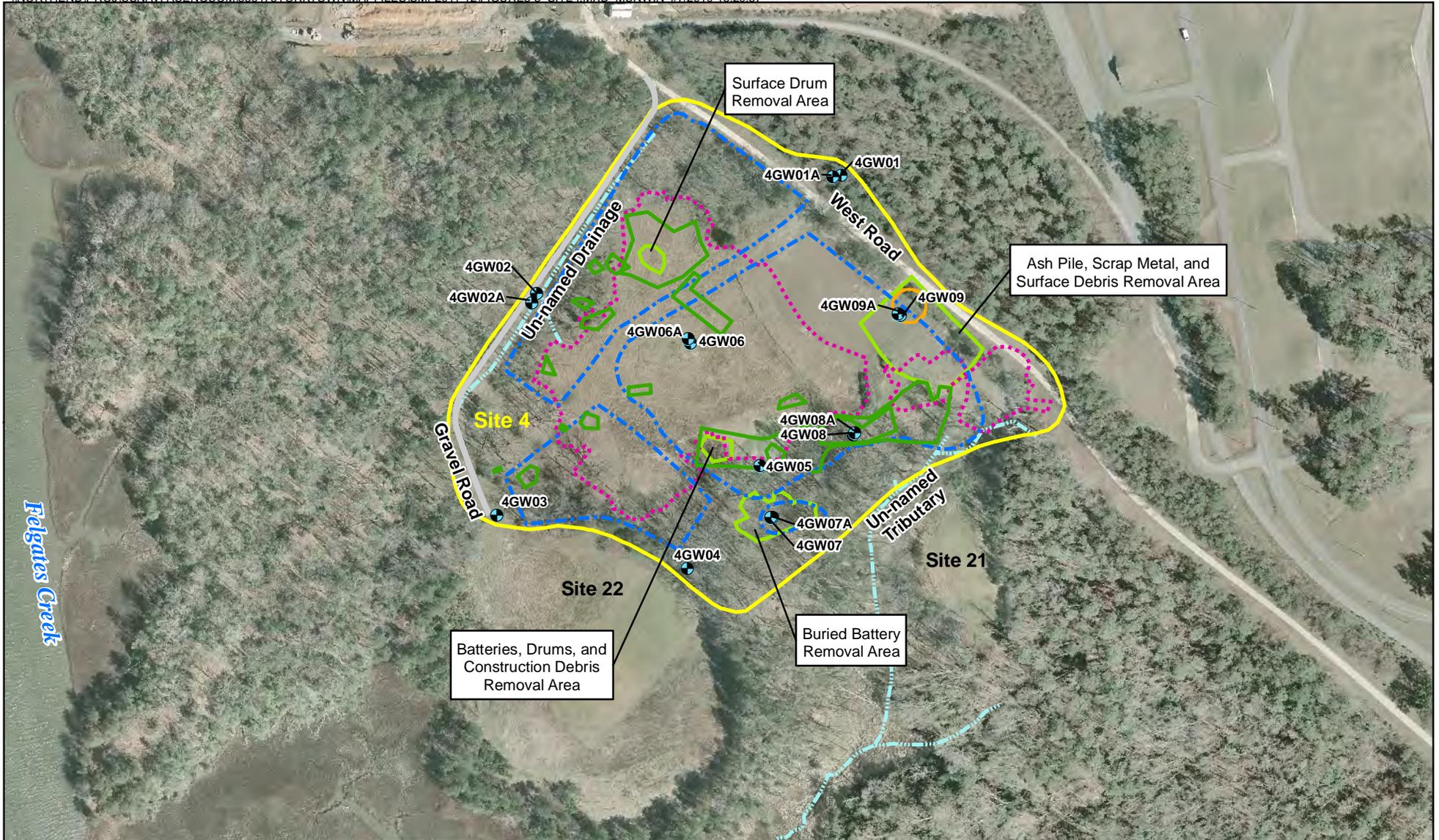


Figure 3-2
Site 3 - Former Group 16 Magazine Landfill
Site Management Plan for FY 2011 to 2012
Naval Weapons Station Yorktown
Yorktown, Virginia

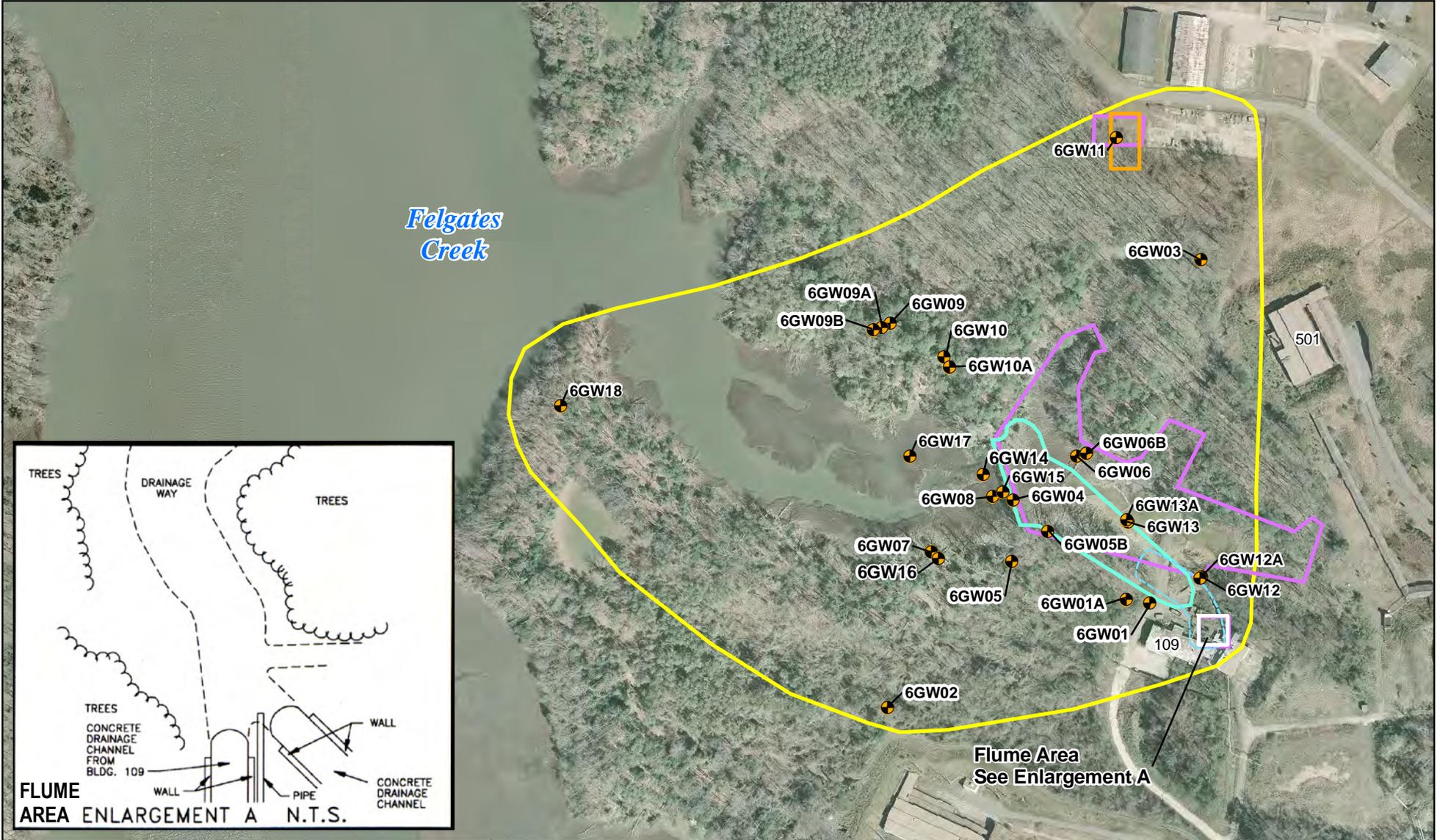


Legend

-  Monitoring Well
-  Study Area
-  Location of Former Ash Pile
-  Drainage
-  Gravel Access Road
-  Approximate Waste Boundary (1992)
-  1994 NTCRA surface Battery/Soil and Surface Debris Removal Area
-  1994 NTCRA Removal Areas
-  2005 NTCRA Removal Areas



Figure 3-3
 Site 4 - Burning Pad Residue Landfill
 Site Management Plan for FY 2011 to 2012
 Naval Weapons Station Yorktown
 Yorktown, Virginia



- Legend**
- Yorktown-Eastover Monitoring Wells
 - ▭ Study Area Boundary
 - ▭ Surface Impoundment Area
 - ▭ Drainage
 - ▭ Excavated Area
 - ▭ LUC Boundary

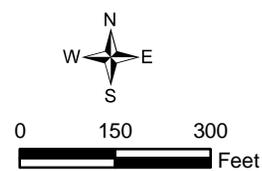


Figure 3-4
 Site 6 - Explosives Contaminated Wastewater Impoundment
 Site Management Plan for FY 2011 to 2012
 Naval Weapons Station Yorktown
 Yorktown, Virginia



- Legend**
- Yorktown-Eastover Monitoring Wells
 - Study Area Boundary
 - ⋯ Drainage
 - ▭ Area of Excavation of Nitroamine / Nitroaromatic Compounds of Contaminated Soil

- ▭ Approximate Excavation Area
- ▭ LUC Boundary

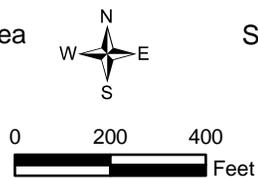


Figure 3-5
 Site 7 - Plant 3 Explosives Contaminated Wastewater Discharge Area
 Site Management Plan for FY 2011 to 2012
 Naval Weapons Station Yorktown
 Yorktown, Virginia



Legend

-  Yorktown-Eastover Monitoring Wells
-  Unable to locate well since Spring 2003, possibly graded over
-  Study Area Boundary
-  Excavated Area
-  Drainage Channel

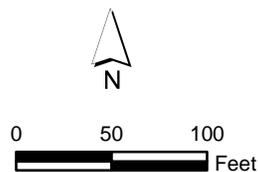
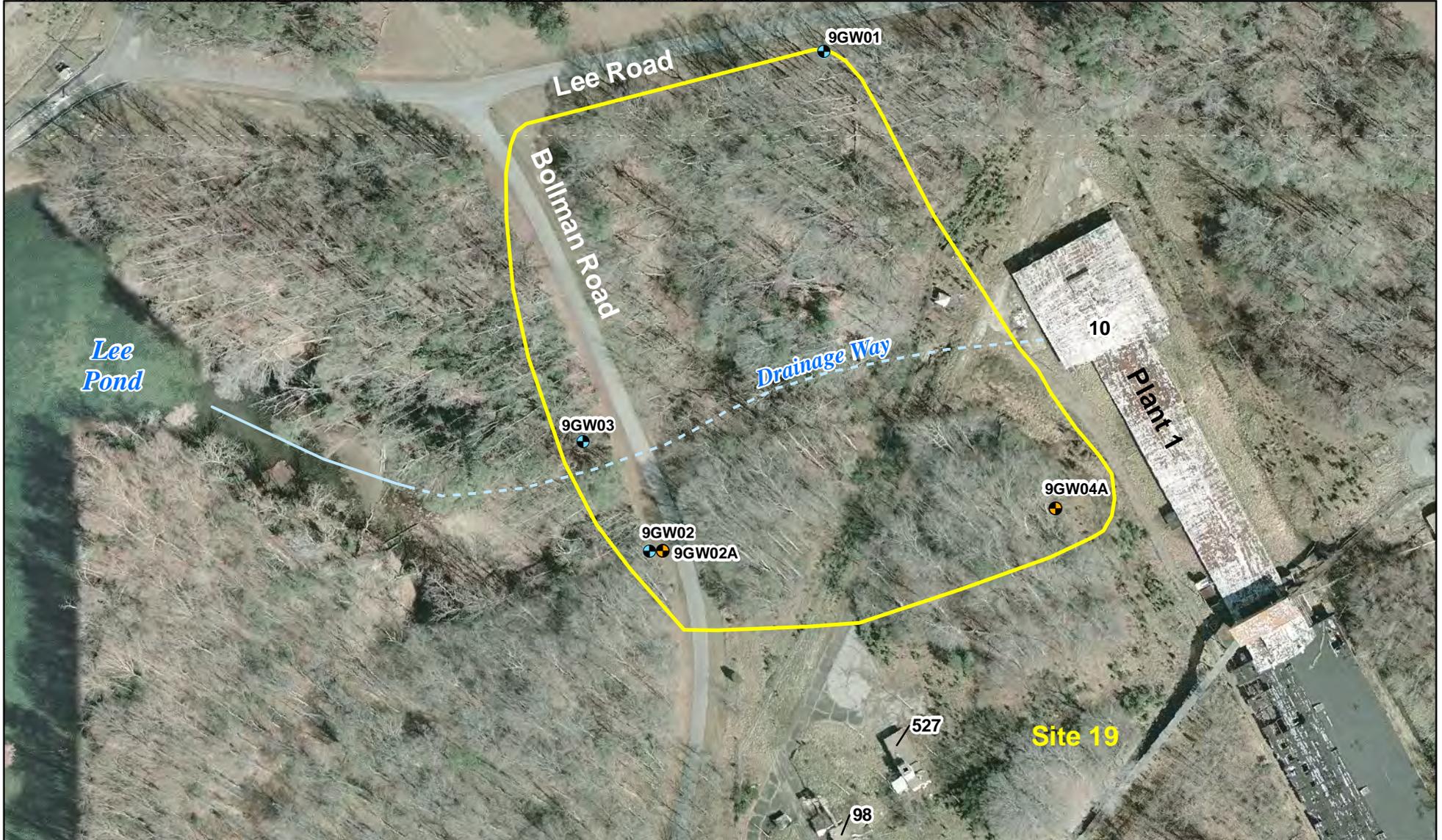


Figure 3-6
Site 8 - NEDED Explosives-Contaminated Wastewater Discharge Area
Site Management Plan for FY 2011 to 2012
Naval Weapons Station Yorktown
Yorktown, Virginia



Legend

-  Study Area Boundary
-  Approximate Area of Removal Action
-  Cornwallis-Cave Aquifer Monitoring Wells
-  Yorktown-Eastover Aquifer Monitoring Wells

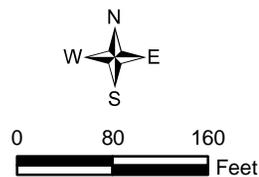


Figure 3-7
Site 9 - Plant 1 Explosives Contaminated
Wastewater Discharge Area
Site Management Plan for FY 2011 to 2012
Naval Weapons Station Yorktown
Yorktown, Virginia



Legend

-  Columbia Monitoring Wells
-  Yorktown-Eastover Monitoring Wells
-  Study Area Boundary
-  Area of Excavation to Remove Copper and Mercury Contaminated Soil
-  Burn Pit Area
-  Unnamed Tributary to Indian Field Creek

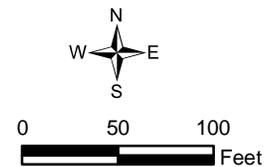
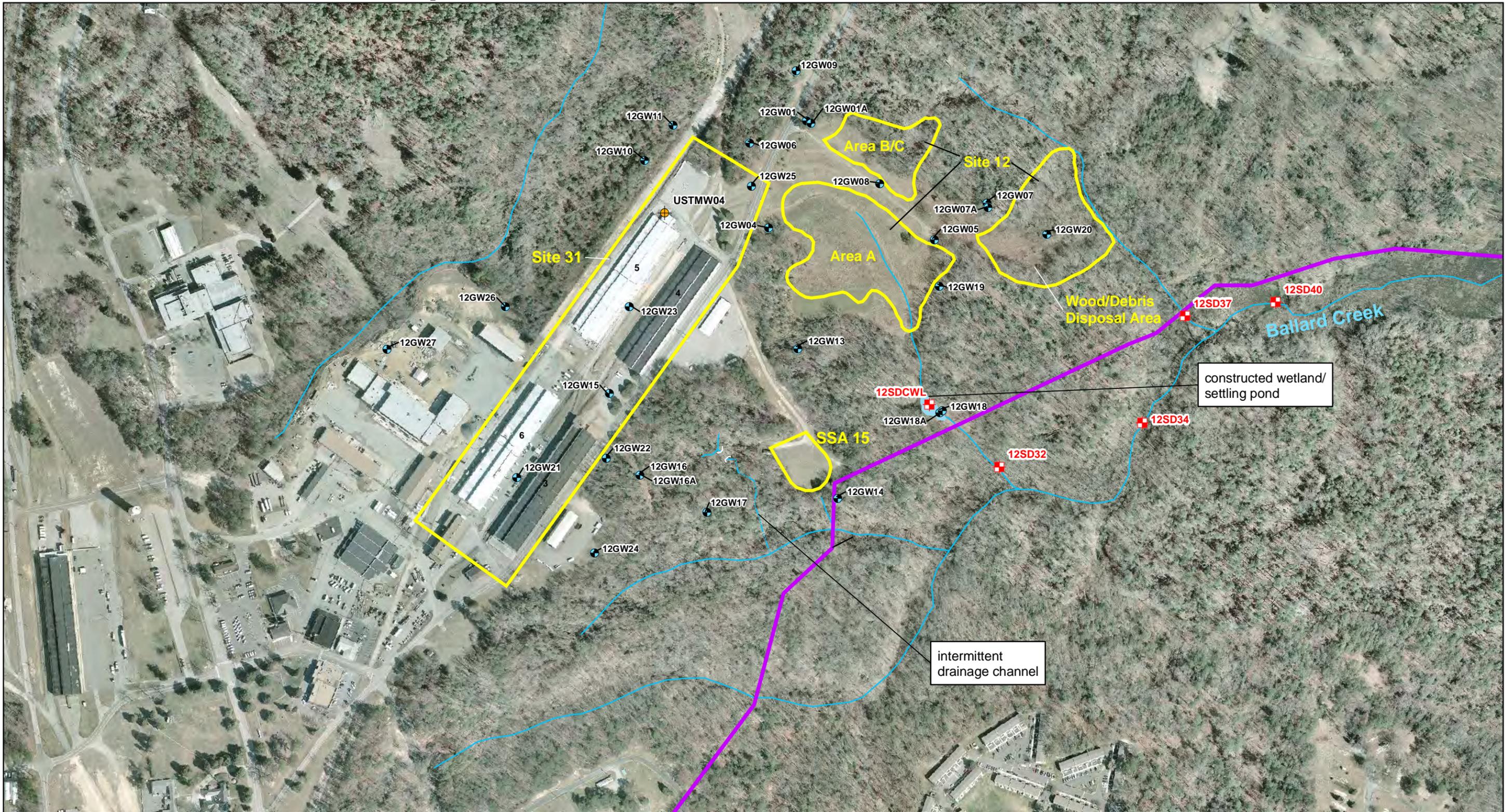


Figure 3-8
Site 11 - Abandoned Explosives Burning Pits
Site Management Plan for FY 2011 to 2012
Naval Weapons Station Yorktown
Yorktown, Virginia



Legend

- Monitoring Wells
- + Sediment Sample Location
- ⊕ Underground Storage Tank Monitoring Well
- Study Area Boundary
- WPNSTA Boundary

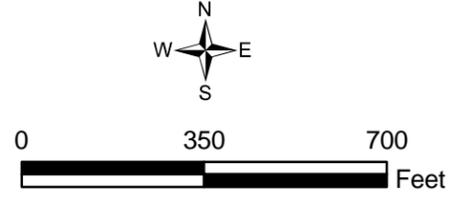


Figure 3-9
 Site 12 - Barracks Road Landfill
 Site Management Plan for FY 2011 to 2012
 Naval Weapons Station, Yorktown
 Yorktown, Virginia



Legend

-  Monitoring Well
-  Approximate SSA 16 Site Boundary
-  Approximate Site 16 Boundary
-  1994 Surface Debris Removal Areas
-  1994 Buried Debris Removal Area

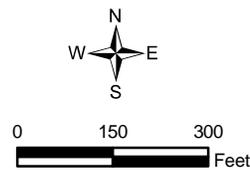
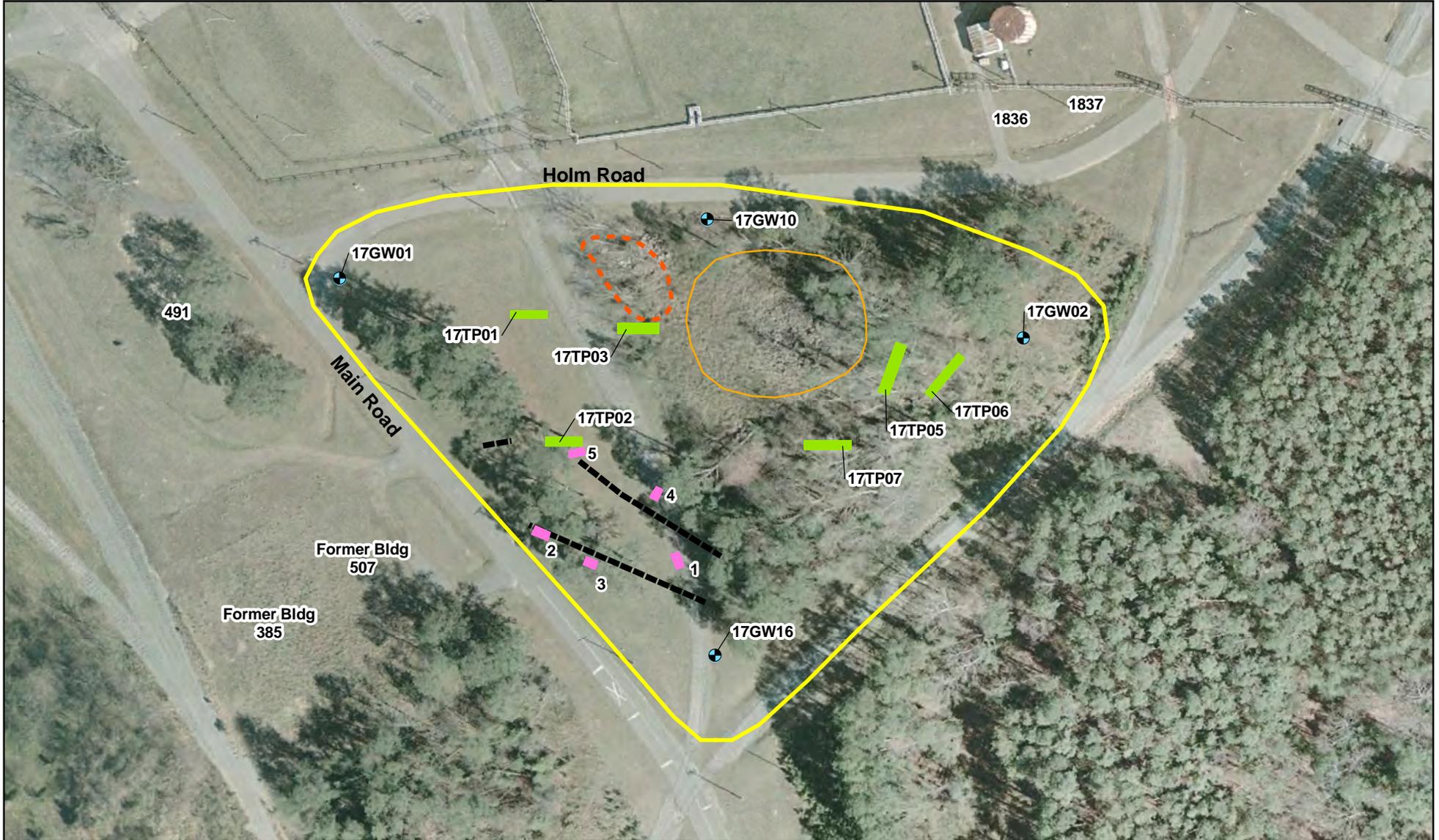


Figure 3-10
Site 16/SSA 16 - West Road Landfill
Site Management Plan for FY 2011 to 2012
Naval Weapons Station Yorktown
Yorktown, Virginia



Legend

-  Columbia Monitoring Wells
-  Yorktown-Eastover Monitoring Wells
-  Study Area Boundary
-  Depression Surface Water
-  2001 Removal Action
-  Test Pit Locations (2007)
-  Round 2 RI Test Pit and Surface Soil Sample Locations (1996)
-  Interpreted Waste Boundary from 1992 geophysical survey (area of anomalies - potential metallic waste)

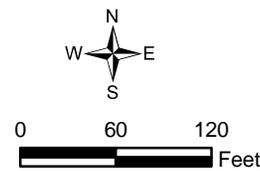


Figure 3-11
 Site 17 - Holm Road Landfill
 Site Management Plan for FY 2011 to 2012
 Naval Weapons Station Yorktown
 Yorktown, Virginia



Legend

 Study Area Boundary

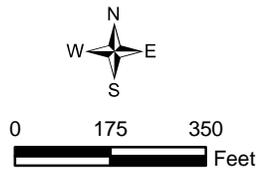
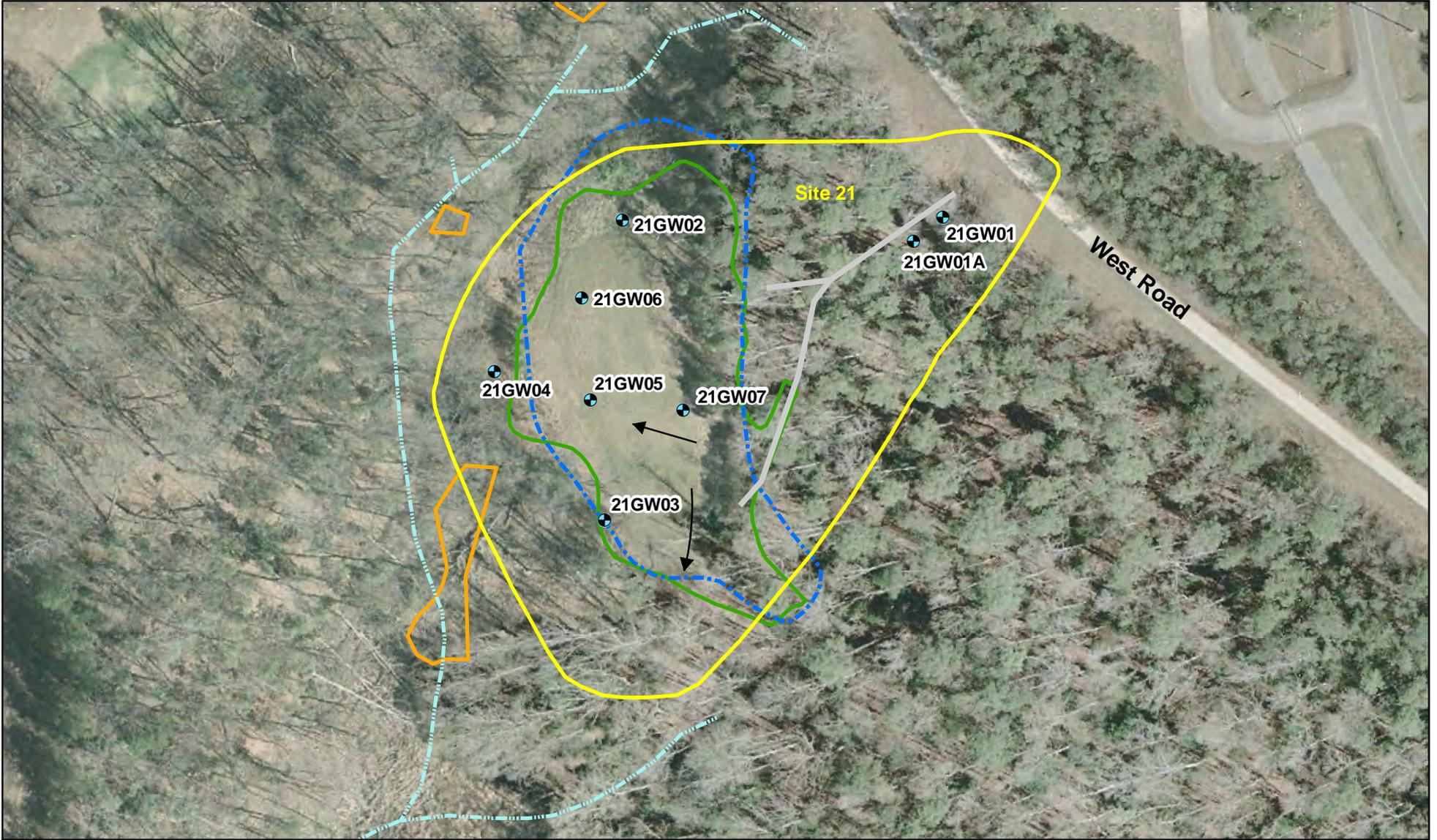


Figure 3-12
Site 19 - Conveyor Belt Soils at Building 10
Site Management Plan for FY 2011 to 2012
Naval Weapons Station Yorktown
Yorktown, Virginia



Legend

-  Monitoring Wells
-  Study Area Boundary
-  Approximate Waste Boundary (1992)
-  1994 NTCRA Battery/Soil and Surface Debris Removal Area
-  2002 NTCRA Removal Area
-  Drainage
-  Gravel Access Road
-  Estimated Groundwater Flow Direction

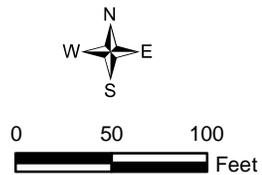
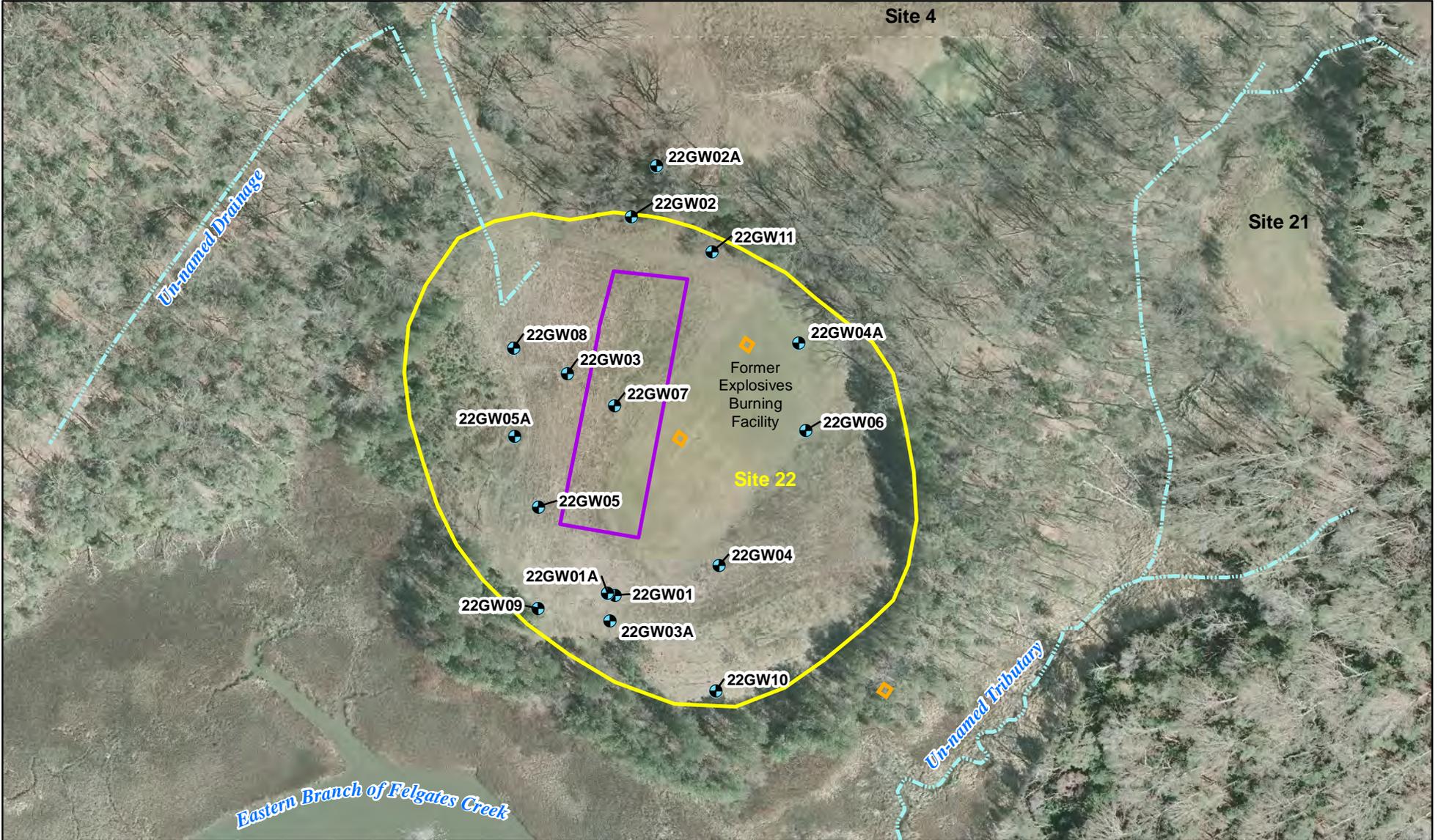


Figure 3-13
Site 21 - Battery and Drum Disposal Area
Site Management Plan for FY 2011 to 2012
Naval Weapons Station Yorktown
Yorktown, Virginia



Legend

-  Monitoring Well
-  Study Area Boundary
-  2002 Removal Action Area
-  Former Biocell Location
-  Drainage

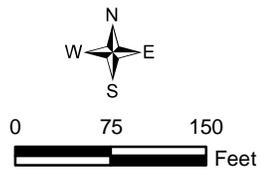


Figure 3-14
Site 22 - Burn Pad
Site Management Plan for FY 2011 to 2012
Naval Weapons Station Yorktown
Yorktown, Virginia



Legend

-  Monitoring Wells
-  Study Area Boundary
-  JA. Jones Removal Area - 2003
-  Unitec Removal Area - 2004
-  Approximate 1994 Removal Area
-  WPNSTA Boundary



Figure 3-15
Site 23 - Building 428 Teague Road Disposal Area
Site Management Plan for FY 2011 to 2012
Naval Weapons Station Yorktown
Yorktown, Virginia



Legend

- Yorktown Base Boundary
- Magnetic Anomalies (SSP, 1994)
- Black Sludge-like Material (SSP, 1996)
- Former Site 6 Bioremediation Treatment Cell Location (removed in 2006)
- Site 24 Investigation Area (former SSA 6 Helicopter Landing Pad)
- Fences
- Drainage Swales



Figure 3-16
 Site 24 - Aviation Field
 Site Management Plan for FY 2011 to 2012
 Naval Weapons Station Yorktown
 Yorktown, Virginia



Legend

- Yorktown-Eastover Monitoring Wells
- ▭ Study Area Boundary
- ▭ Limits of Excavation
- Former Discharge Line

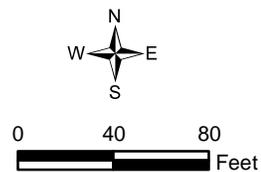


Figure 3-17
Site 25 - Building 373 Rocket Plant
Site Management Plan for FY 2011 to 2012
Naval Weapons Station Yorktown
Yorktown, Virginia



Legend

-  Study Area Boundary
-  Monitoring Well Location

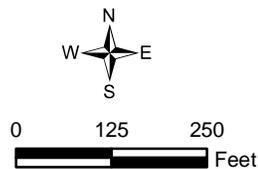
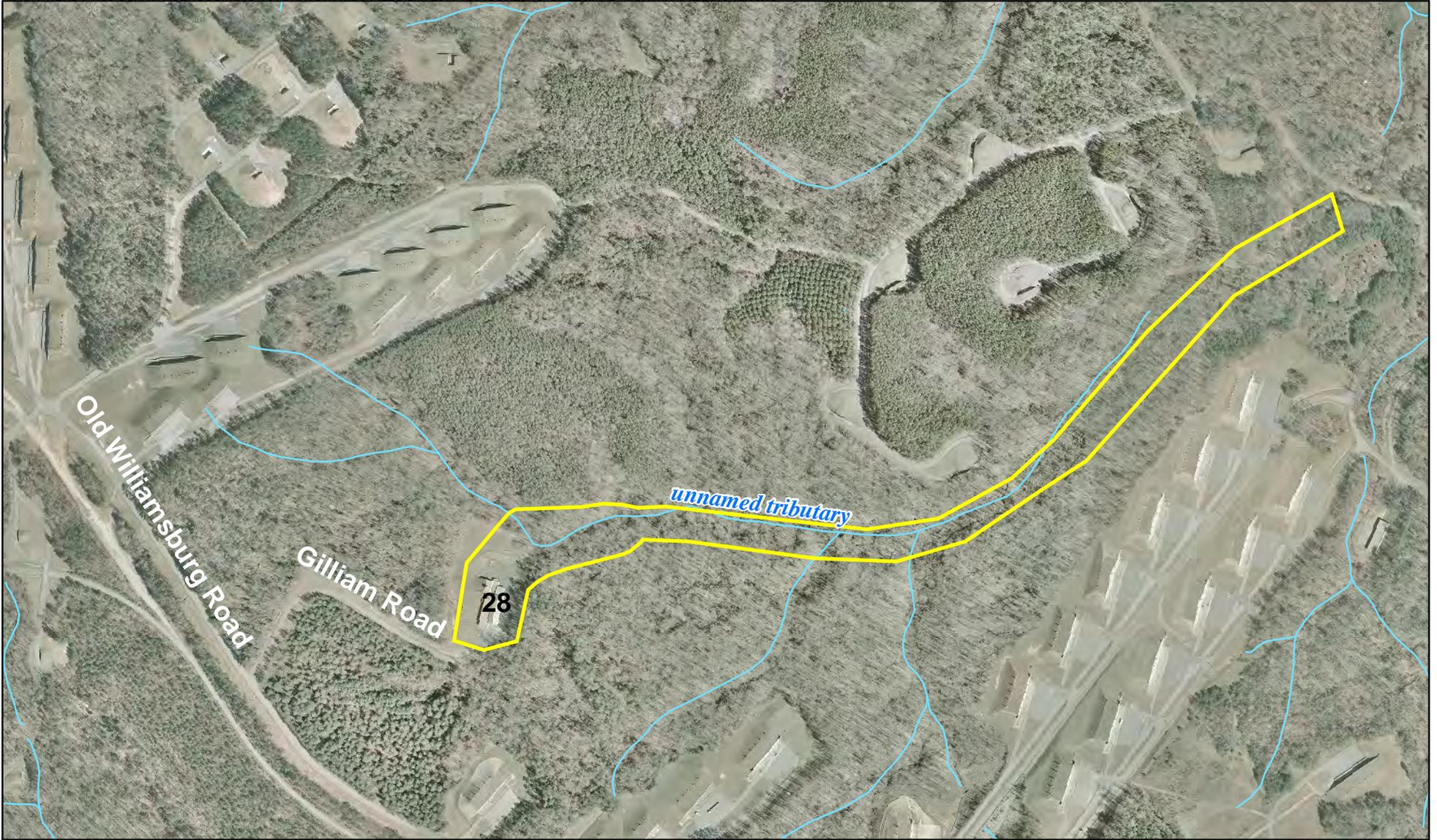


Figure 3-18
Site 26 - Building 1816 Mark 48 Waste Otto Fuel Tank
Site Management Plan for FY 2011 to 2012
Naval Weapons Station Yorktown
Yorktown, Virginia



Legend

 Site Boundary



0 300 600
Feet

Figure 3-19
Site 28 - Building 28 X-Ray Facility Tank Drain Field
Site Management Plan for FY 2011 to 2012
Naval Weapons Station Yorktown
Yorktown, Virginia



Legend

-  Monitoring Wells
-  Study Area Boundary

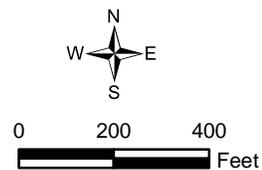


Figure 3-20
Site 29 - Lee Pond
Site Management Plan for FY 2011 to 2012
Naval Weapons Station Yorktown
Yorktown, Virginia

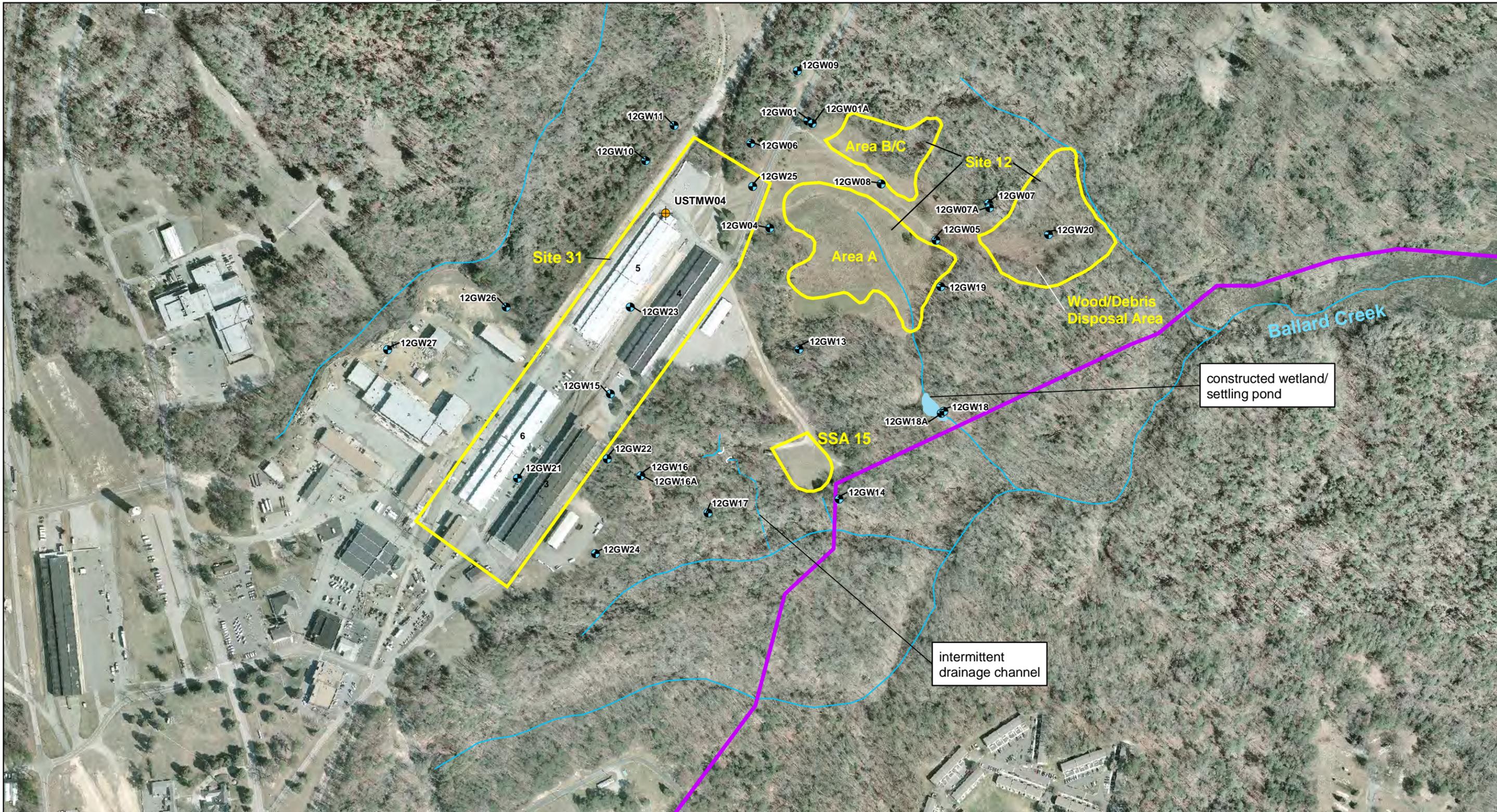


Legend

-  Study Area Boundary
-  Incinerator Chimney



Figure 3-21
Site 30 - Bracken Road Incinerator and Environs
Site Management Plan for FY 2011 to 2012
Naval Weapons Station Yorktown
Yorktown, Virginia



Legend

- Monitoring Wells
- ⊕ Underground Storage Tank Monitoring Well
- Study Area Boundary
- WPNSTA Boundary

Note:
 "Industrial Area" referred to during this investigation consists of Buildings 3, 4, 5, and 6 and the surrounding area that is upgradient of Site 12.

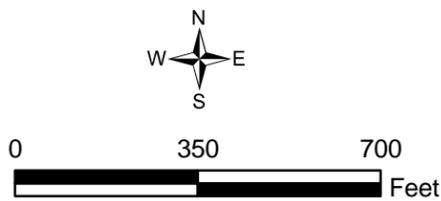
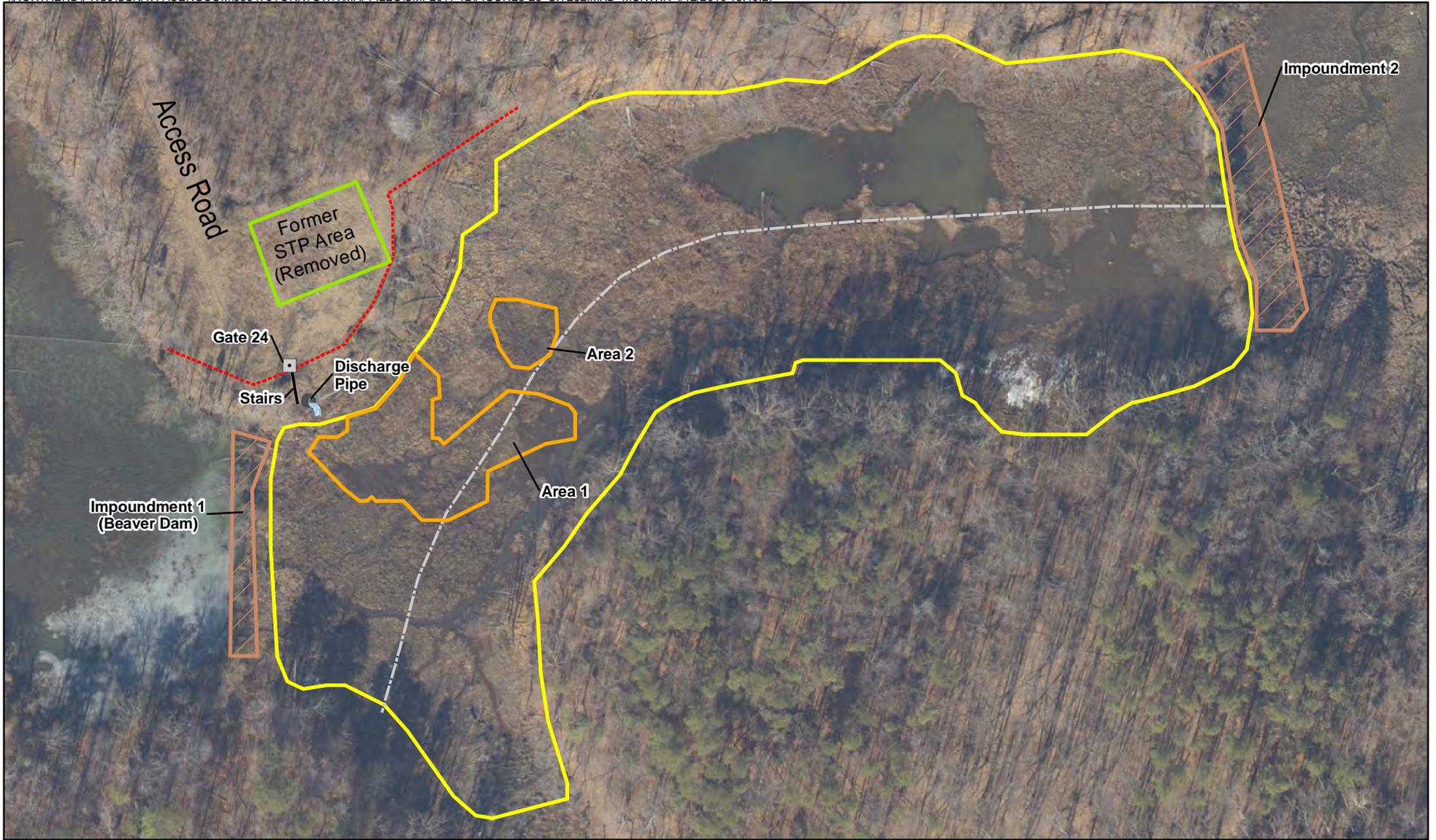


Figure 3-22
 Site 31 - Barracks Road Landfill Industrial Area
 Site Management Plan for 2011 to 2012
 Naval Weapons Station Yorktown
 Yorktown, Virginia



Legend

-  Study Area Boundary
-  Area of Concern
-  Approximate Property Boundary Line
-  Fence

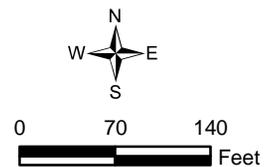


Figure 3-23
Site 32 - Wetlands Downgradient of Beaver Pond
Site Management Plan for FY 2011 to 2012
Naval Weapons Station Yorktown
Yorktown, Virginia



Legend

-  Study Area Boundary
-  Approximate Location of Former Bldg. 530

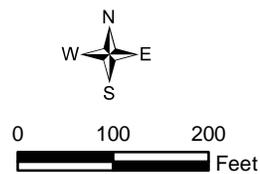
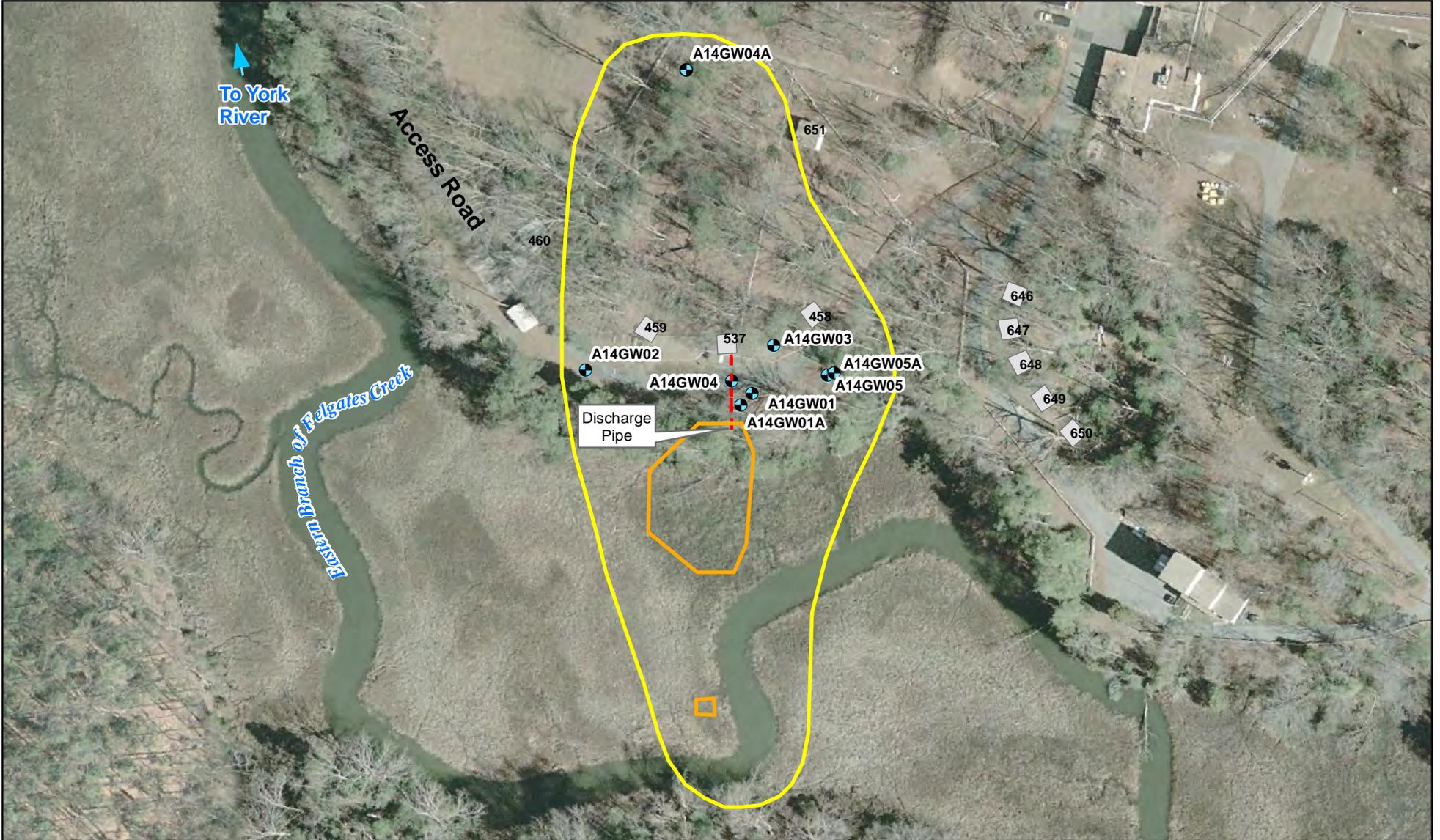


Figure 3-24
Site 33 - Sand Blasting Grit Pile
Site Management Plan for FY 2011 to 2012
Naval Weapons Station Yorktown
Yorktown, Virginia



Legend

-  Monitoring Well
-  Approximate Location of Discharge Pipe
-  Study Area Boundary
-  2007 Removal Action

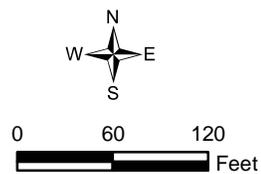


Figure 3-25
Site 34 - Building 537 Discharge to Felgates Creek
Site Management Plan for FY 2011 to 2012
Naval Weapons Station Yorktown
Yorktown, Virginia



Legend

-  Monitoring Wells
-  Study Area Boundary



Figure 3-26
SSA 15 - Sewage Treatment Plant #1
Sludge Drying Beds and Discharge Area
Site Management Plan for FY 2011 to 2012
Naval Weapons Station Yorktown
Yorktown, Virginia



Legend

- MWR Skeet Range
- Study Area Boundary
- Skeet Range Site Features
- Drainage Swale
- WPNSTA Boundary

Note:
All structures associated with the Skeet Range have been demolished.

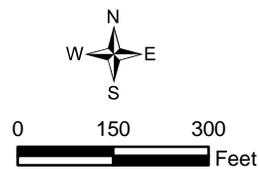


Figure 3-27
MWR Skeet Range
Site Management Plan for FY 2011 to 2012
Naval Weapons Station Yorktown
Yorktown, Virginia



Legend

 Study Area Boundary

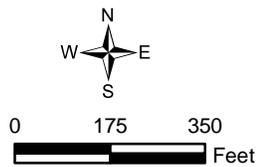


Figure 3-28
Turkey Road Landfill
Site Management Plan for FY 2010 to 2011
Naval Weapons Station Yorktown
Yorktown, Virginia

Schedule 3-1 Site 1 SMP FY11-12

ID	Task Name	Duration	Start	Finish	Predecessors	2010				2011				2012			
						Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4
1	Site 1	2149 days	Tue 8/21/07	Mon 7/8/13													
10	RI Report for GW/SW/SD	588 days	Fri 12/11/09	Thu 7/21/11													
11	Preliminary RI	466 days	Fri 12/11/09	Mon 3/21/11	9												
12	Gov't Comments	18 days	Tue 3/22/11	Fri 4/8/11	11												
13	Issue Draft RI report	7 days	Sat 4/9/11	Fri 4/15/11	12												
14	Regulatory Review	62 days	Sat 4/16/11	Thu 6/16/11	13												
15	Issue Draft Final RI report	21 days	Fri 6/17/11	Thu 7/7/11	14												
16	Issue Final RI report	14 days	Fri 7/8/11	Thu 7/21/11	15												
17	FS Report	194 days	Fri 7/22/11	Tue 1/31/12													
18	Preliminary FS	60 days	Fri 7/22/11	Mon 9/19/11	16												
19	Gov't Comments	30 days	Tue 9/20/11	Wed 10/19/11	18												
20	Issue Draft FS	14 days	Thu 10/20/11	Wed 11/2/11	19												
21	Regulatory Review	62 days	Thu 11/3/11	Tue 1/3/12	20												
22	Issue Draft Final FS	14 days	Wed 1/4/12	Tue 1/17/12	21												
23	Issue Final FS	14 days	Wed 1/18/12	Tue 1/31/12	22												
24	PP	209 days	Wed 2/1/12	Mon 8/27/12													
25	Preliminary PP	30 days	Wed 2/1/12	Thu 3/1/12	23												
26	Gov't Comments	30 days	Fri 3/2/12	Sat 3/31/12	25												
27	Issue Draft PP	15 days	Sun 4/1/12	Sun 4/15/12	26												
28	Regulatory / Legal Review	60 days	Mon 4/16/12	Thu 6/14/12	27												
29	Issue Draft Final PP	15 days	Fri 6/15/12	Fri 6/29/12	28												
30	Public Comment Period	45 days	Sat 6/30/12	Mon 8/13/12	29												
31	Issue Final PP	14 days	Tue 8/14/12	Mon 8/27/12	30												
32	ROD	166 days	Tue 8/28/12	Sat 2/9/13													
33	Preliminary ROD	32 days	Tue 8/28/12	Fri 9/28/12	31												
34	Navy Review	15 days	Sat 9/29/12	Sat 10/13/12	33												
35	Issue Draft ROD	14 days	Sun 10/14/12	Sat 10/27/12	34												
36	Regulatory / Legal Review	60 days	Sun 10/28/12	Wed 12/26/12	35												
37	Issue Draft Final ROD	30 days	Thu 12/27/12	Fri 1/25/13	36												
38	Issue ROD for Signature	15 days	Sat 1/26/13	Sat 2/9/13	37												
46	Five Year Review (2012)	178 days	Sun 8/14/11	Tue 2/7/12													
47	Preliminary Five-Year Review	30 days	Sun 8/14/11	Mon 9/12/11													
48	Gov't Comments	30 days	Tue 9/13/11	Wed 10/12/11	47												
49	Issue Draft Five-Year Review	5 days	Thu 10/13/11	Mon 10/17/11	48												
50	Regulatory Review	60 days	Tue 10/18/11	Fri 12/16/11	49												
51	Public Comment and Issue Final Five-Year Review	53 days	Sat 12/17/11	Tue 2/7/12	50												

Task		Milestone		External Tasks	
Split		Summary		External Milestone	
Progress		Project Summary		Deadline	

Schedule 3-2 Site 3 SMP FY11-12

ID	Task Name	Duration	Start	Finish	2010				2011				2012			
					Qtr 1	Qtr 2	Qtr 3	Qtr 4	Qtr 1	Qtr 2	Qtr 3	Qtr 4	Qtr 1	Qtr 2	Qtr 3	Qtr 4
1	Site 3	2150 days	Mon 8/20/07	Mon 7/8/13												
10	RI Report for GW/SW/SD	588 days	Fri 12/11/09	Thu 7/21/11												
12	Gov't Comments	18 days	Tue 3/22/11	Fri 4/8/11												
13	Issue Draft RI report	7 days	Sat 4/9/11	Fri 4/15/11												
14	Regulatory Review	62 days	Sat 4/16/11	Thu 6/16/11												
15	Issue Draft Final RI report	21 days	Fri 6/17/11	Thu 7/7/11												
16	Issue Final RI report	14 days	Fri 7/8/11	Thu 7/21/11												
17	FS Report	194 days	Fri 7/22/11	Tue 1/31/12												
18	Preliminary FS	60 days	Fri 7/22/11	Mon 9/19/11												
19	Gov't Comments	30 days	Tue 9/20/11	Wed 10/19/11												
20	Issue Draft FS	14 days	Thu 10/20/11	Wed 11/2/11												
21	Regulatory Review	62 days	Thu 11/3/11	Tue 1/3/12												
22	Issue Draft Final FS	14 days	Wed 1/4/12	Tue 1/17/12												
23	Issue Final FS	14 days	Wed 1/18/12	Tue 1/31/12												
24	PP	209 days	Wed 2/1/12	Mon 8/27/12												
25	Preliminary PP	30 days	Wed 2/1/12	Thu 3/1/12												
26	Gov't Comments	30 days	Fri 3/2/12	Sat 3/31/12												
27	Issue Draft PP	15 days	Sun 4/1/12	Sun 4/15/12												
28	Regulatory / Legal Review	60 days	Mon 4/16/12	Thu 6/14/12												
29	Issue Draft Final PP	15 days	Fri 6/15/12	Fri 6/29/12												
30	Public Comment Period	45 days	Sat 6/30/12	Mon 8/13/12												
31	Issue Final PP	14 days	Tue 8/14/12	Mon 8/27/12												
32	ROD	166 days	Tue 8/28/12	Sat 2/9/13												
33	Preliminary ROD	32 days	Tue 8/28/12	Fri 9/28/12												
34	Navy Review	15 days	Sat 9/29/12	Sat 10/13/12												
35	Issue Draft ROD	14 days	Sun 10/14/12	Sat 10/27/12												
36	Regulatory / Legal Review	60 days	Sun 10/28/12	Wed 12/26/12												
37	Issue Draft Final ROD	30 days	Thu 12/27/12	Fri 1/25/13												
38	Issue ROD for Signature	15 days	Sat 1/26/13	Sat 2/9/13												
46	Five Year Review (2012)	178 days	Sun 8/14/11	Tue 2/7/12												
47	Preliminary Five-Year Review	30 days	Sun 8/14/11	Mon 9/12/11												
48	Gov't Comments	30 days	Tue 9/13/11	Wed 10/12/11												
49	Issue Draft Five-Year Review	5 days	Thu 10/13/11	Mon 10/17/11												
50	Regulatory Review	60 days	Tue 10/18/11	Fri 12/16/11												
51	Public Comment and Issue Final Five-Year Review	53 days	Sat 12/17/11	Tue 2/7/12												

Task		Milestone		External Tasks	
Split		Summary		External Milestone	
Progress		Project Summary		Deadline	

Schedule 3-3 Site 4 SMP FY11-12

ID	Task Name	Duration	Start	Finish	2010				2011				2012							
					Qtr 1	Qtr 2	Qtr 3	Qtr 4	Qtr 1	Qtr 2	Qtr 3	Qtr 4	Qtr 1	Qtr 2	Qtr 3	Qtr 4				
1	Site 4	1141 days	Thu 5/1/08	Wed 6/15/11																
9	PP	305 days	Mon 11/23/09	Thu 9/23/10																
10	Preliminary PP	30 days	Mon 11/23/09	Tue 12/22/09																
11	Gov't Comments	7 days	Wed 12/23/09	Tue 12/29/09																
12	Issue Draft PP	105 days	Wed 12/30/09	Tue 4/13/10																
13	Regulatory / Legal Review	62 days	Fri 4/16/10	Wed 6/16/10																
14	Draft Final PP	37 days	Thu 6/17/10	Fri 7/23/10																
15	Public Comment Period	46 days	Mon 7/26/10	Thu 9/9/10																
16	Issue Final PP	14 days	Fri 9/10/10	Thu 9/23/10																
17	ROD	350 days	Thu 7/1/10	Wed 6/15/11																
18	Preliminary ROD	32 days	Thu 7/1/10	Sun 8/1/10																
19	Navy Review	8 days	Mon 8/2/10	Mon 8/9/10																
20	Issue Draft ROD	10 days	Wed 8/11/10	Fri 8/20/10																
21	Regulatory / Legal Review	251 days	Sat 8/21/10	Thu 4/28/11																
22	Issue Draft Final ROD	31 days	Fri 4/29/11	Sun 5/29/11																
23	Issue ROD for Signature	17 days	Mon 5/30/11	Wed 6/15/11																

Task		Milestone		External Tasks	
Split		Summary		External Milestone	
Progress		Project Summary		Deadline	

**Schedule 3-4
Site 6 SMP FY11-12**

ID	Task Name	Duration	Start	Finish	2010				2011				2012							
					Qtr 1	Qtr 2	Qtr 3	Qtr 4	Qtr 1	Qtr 2	Qtr 3	Qtr 4	Qtr 1	Qtr 2	Qtr 3	Qtr 4				
1	WPNSTA Yorktown	2806 days	Mon 8/20/07	Sat 4/25/15																
2	Site 6	2806 days	Mon 8/20/07	Sat 4/25/15																
11	RI Report for GW/SW/SD	448 days	Fri 12/11/09	Thu 3/3/11																
13	Gov't Comments	30 days	Fri 4/2/10	Sat 5/1/10																
14	Issue Draft RI Report	20 days	Sun 5/2/10	Fri 5/21/10																
15	Regulatory Review	140 days	Sat 5/22/10	Fri 10/8/10																
16	Issue Draft Final RI Report	136 days	Sat 10/9/10	Mon 2/21/11																
17	Issue Final RI Report	9 days	Wed 2/23/11	Thu 3/3/11																
18	SAP preparation for pre-FS Sampling	794 days	Fri 3/4/11	Sun 5/5/13																
19	Preliminary SAP and HASP	112 days	Mon 4/4/11	Sun 7/24/11																
20	Laboratory and Data Validation Procurement	40 days	Fri 3/4/11	Tue 4/12/11																
21	Client Review of Preliminary Work Plan	80 days	Mon 7/25/11	Wed 10/12/11																
22	Draft Work Plan	14 days	Fri 10/21/11	Thu 11/3/11																
23	Regulatory Review	60 days	Fri 11/4/11	Mon 1/2/12																
24	Draft Final Work Plan	29 days	Thu 1/19/12	Thu 2/16/12																
58	Five Year Review (2012)	178 days	Sun 8/14/11	Tue 2/7/12																
59	Preliminary Five-Year Review	30 days	Sun 8/14/11	Mon 9/12/11																
60	Gov't Comments	30 days	Tue 9/13/11	Wed 10/12/11																
61	Issue Draft Five-Year Review	5 days	Thu 10/13/11	Mon 10/17/11																
62	Regulatory Review	60 days	Tue 10/18/11	Fri 12/16/11																
63	Public Comment and Issue Final Five-Year Rev	53 days	Sat 12/17/11	Tue 2/7/12																

Task		Progress		Summary		External Tasks		Deadline	
Split		Milestone		Project Summary		External Milestone			

**Schedule 3-5
Site 7 SMP FY11-12**

ID	Task Name	Duration	Start	Finish	2010				2011				2012							
					Qtr 1	Qtr 2	Qtr 3	Qtr 4	Qtr 1	Qtr 2	Qtr 3	Qtr 4	Qtr 1	Qtr 2	Qtr 3	Qtr 4				
1	Site 7	2179 days	Mon 8/20/07	Tue 8/6/13																
10	LTM Report for GW/Soil	436 days	Sat 9/19/09	Sun 11/28/10																
12	Gov't comments	8 days	Mon 2/22/10	Mon 3/1/10																
13	Issue Draft LTM report	1 day	Wed 3/3/10	Wed 3/3/10																
14	Regulatory Review	55 days	Thu 3/4/10	Tue 4/27/10																
15	Issue Draft Final LTM report	64 days	Wed 4/28/10	Wed 6/30/10																
16	Issue Final LTM report	151 days	Thu 7/1/10	Sun 11/28/10																
17	ESD	394 days	Mon 11/29/10	Tue 12/27/11																
18	Preliminary ESD	30 days	Mon 11/29/10	Tue 12/28/10																
19	Navy Review	28 days	Wed 12/29/10	Tue 1/25/11																
20	Issue Draft ESD	156 days	Wed 1/26/11	Thu 6/30/11																
21	Regulatory / Legal Review	60 days	Fri 7/1/11	Mon 8/29/11																
22	Issue Draft Final ESD	30 days	Tue 8/30/11	Wed 9/28/11																
23	Issue Final ESD	90 days	Thu 9/29/11	Tue 12/27/11																
24	SAP and HASP Preparation	264 days	Mon 12/20/10	Fri 9/9/11																
25	Preliminary SAP and HASP - Site 7	116 days	Mon 12/20/10	Thu 4/14/11																
26	Client Review of Preliminary SAP - Site 7	30 days	Fri 4/15/11	Sat 5/14/11																
27	Draft SAP to Regulators - Site 7	14 days	Sun 5/15/11	Sat 5/28/11																
28	Regulatory Review of Draft SAP - Site 7	60 days	Sun 5/29/11	Wed 7/27/11																
29	Draft Final SAP to Regulators - Site 7	14 days	Thu 7/28/11	Wed 8/10/11																
30	Final SAP - Site 7	30 days	Thu 8/11/11	Fri 9/9/11																
31	Investigation Activities	117 days	Thu 8/11/11	Mon 12/5/11																
32	Field Work	117 days	Thu 8/11/11	Mon 12/5/11																
33	Remedial Investigation Reporting - Site 7	208 days	Tue 12/6/11	Sat 6/30/12																
34	Preliminary RI Report	60 days	Tue 12/6/11	Fri 2/3/12																
35	Client Review	30 days	Sat 2/4/12	Sun 3/4/12																
36	Draft RI Report	14 days	Mon 3/5/12	Sun 3/18/12																
37	Regulatory Review	60 days	Mon 3/19/12	Thu 5/17/12																
38	Draft Final RI Report	14 days	Fri 5/18/12	Thu 5/31/12																
39	Final RI Report	30 days	Fri 6/1/12	Sat 6/30/12																
40	FS Report	193 days	Sun 7/1/12	Wed 1/9/13																
41	Preliminary FS	60 days	Sun 7/1/12	Wed 8/29/12																
42	Gov't Comments	29 days	Thu 8/30/12	Thu 9/27/12																
43	Issue Draft FS	14 days	Fri 9/28/12	Thu 10/11/12																
44	Regulatory Review	62 days	Fri 10/12/12	Wed 12/12/12																
45	Issue Draft Final FS	14 days	Thu 12/13/12	Wed 12/26/12																
46	Issue Final FS	14 days	Thu 12/27/12	Wed 1/9/13																
55	Five Year Review (2012)	178 days	Sun 8/14/11	Tue 2/7/12																
56	Preliminary Five-Year Review	30 days	Sun 8/14/11	Mon 9/12/11																
57	Gov't Comments	30 days	Tue 9/13/11	Wed 10/12/11																
58	Issue Draft Five-Year Review	5 days	Thu 10/13/11	Mon 10/17/11																
59	Regulatory Review	60 days	Tue 10/18/11	Fri 12/16/11																
60	Public Comment and Issue Final Five-Year Revi	53 days	Sat 12/17/11	Tue 2/7/12																

Task		Progress		Summary		External Tasks		Deadline	
Split		Milestone		Project Summary		External Milestone			

**Schedule 3-6
Site 8 SMP FY11-12**

ID	Task Name	Duration	Start	Finish	2010				2011				2012							
					Qtr 1	Qtr 2	Qtr 3	Qtr 4	Qtr 1	Qtr 2	Qtr 3	Qtr 4	Qtr 1	Qtr 2	Qtr 3	Qtr 4				
1	Site 8	2366 days	Tue 3/18/08	Mon 9/8/14																
8	RI Report for GW	761 days	Thu 4/30/09	Mon 5/30/11																
9	Issue Draft RI Report	170 days	Thu 4/30/09	Fri 10/16/09																
10	Navy and Regulatory Review	463 days	Mon 10/19/09	Mon 1/24/11																
11	Issue Draft Final RI Report	65 days	Tue 1/25/11	Wed 3/30/11																
12	Issue Final RI Report	61 days	Thu 3/31/11	Mon 5/30/11																
13	FS Report	193 days	Tue 5/31/11	Fri 12/9/11																
14	Preliminary FS	60 days	Tue 5/31/11	Fri 7/29/11																
15	Gov't Comments	30 days	Sat 7/30/11	Sun 8/28/11																
16	Issue Draft FS	14 days	Mon 8/29/11	Sun 9/11/11																
17	Regulatory Review	61 days	Mon 9/12/11	Fri 11/11/11																
18	Issue Draft Final FS	14 days	Sat 11/12/11	Fri 11/25/11																
19	Issue Final FS	14 days	Sat 11/26/11	Fri 12/9/11																
20	PP	209 days	Sat 12/10/11	Thu 7/5/12																
21	Preliminary PP	30 days	Sat 12/10/11	Sun 1/8/12																
22	Gov't Comments	30 days	Mon 1/9/12	Tue 2/7/12																
23	Issue Draft PP	15 days	Wed 2/8/12	Wed 2/22/12																
24	Regulatory / Legal Review	60 days	Thu 2/23/12	Sun 4/22/12																
25	Issue Draft Final PP	15 days	Mon 4/23/12	Mon 5/7/12																
26	Public Comment Period	45 days	Tue 5/8/12	Thu 6/21/12																
27	Issue Final PP	14 days	Fri 6/22/12	Thu 7/5/12																
28	ROD	168 days	Fri 7/6/12	Thu 12/20/12																
29	Preliminary ROD	32 days	Fri 7/6/12	Mon 8/6/12																
30	Navy Review	15 days	Tue 8/7/12	Tue 8/21/12																
31	Issue Draft ROD	14 days	Wed 8/22/12	Tue 9/4/12																
32	Regulatory / Legal Review	62 days	Wed 9/5/12	Mon 11/5/12																
33	Issue Draft Final ROD	30 days	Tue 11/6/12	Wed 12/5/12																
34	Issue ROD for Signature	15 days	Thu 12/6/12	Thu 12/20/12																

Task Progress Summary External Tasks Deadline
 Split Milestone Project Summary External Milestone

**Schedule 3-7
Site 9 SMP FY11-12**

ID	Task Name	Duration	Start	Finish	2010				2011				2012							
					Qtr 1	Qtr 2	Qtr 3	Qtr 4	Qtr 1	Qtr 2	Qtr 3	Qtr 4	Qtr 1	Qtr 2	Qtr 3	Qtr 4				
1	WPNSTA Yorktown	2767 days	Fri 7/3/09	Sat 1/28/17																
2	Site 9	2767 days	Fri 7/3/09	Sat 1/28/17																
3	Work Plan for GW	1040 days	Fri 7/3/09	Mon 5/7/12																
4	Preliminary WP Preparation	60 days	Fri 7/3/09	Mon 8/31/09																
5	Gov't Comments	30 days	Tue 9/1/09	Wed 9/30/09																
6	Comment Resolution	92 days	Thu 10/1/09	Thu 12/31/09																
7	Issue Draft WP	9 days	Mon 1/4/10	Tue 1/12/10																
8	Regulatory Review	85 days	Wed 1/13/10	Wed 4/7/10																
9	Issue Draft Final WP	418 days	Thu 4/8/10	Mon 5/30/11																
10	Issue Final WP	14 days	Tue 5/31/11	Mon 6/13/11																
11	GW Investigation	120 days	Tue 6/14/11	Mon 5/7/12																
12	RI Report for GW	237 days	Tue 5/8/12	Sun 12/30/12																
13	Preliminary RI Report	88 days	Tue 5/8/12	Fri 8/3/12																
14	Gov't Comments	32 days	Sat 8/4/12	Tue 9/4/12																
15	Issue Draft RI Report	21 days	Wed 9/5/12	Tue 9/25/12																
16	Regulatory Review	60 days	Wed 9/26/12	Sat 11/24/12																
17	Issue Draft Final RI Report	22 days	Sun 11/25/12	Sun 12/16/12																
18	Issue Final RI report	14 days	Mon 12/17/12	Sun 12/30/12																

Task		Progress		Summary		External Tasks		Deadline	
Split		Milestone		Project Summary		External Milestone			

Schedule 3-8 Site 11 SMP FY11-12

ID	Task Name	Duration	Start	Finish	2010				2011				2012			
					Qtr 1	Qtr 2	Qtr 3	Qtr 4	Qtr 1	Qtr 2	Qtr 3	Qtr 4	Qtr 1	Qtr 2	Qtr 3	Qtr 4
1	Site 11	1469 days	Fri 1/18/08	Wed 1/25/12												
17	ROD	495 days	Mon 5/18/09	Fri 9/24/10												
18	Preliminary ROD	46 days	Mon 5/18/09	Thu 7/2/09												
19	Navy Review	15 days	Fri 7/3/09	Fri 7/17/09												
20	Issue Draft ROD	91 days	Sat 7/18/09	Fri 10/16/09												
21	Regulatory / Legal Review	153 days	Sat 10/17/09	Thu 3/18/10												
22	Issue Draft Final ROD	74 days	Fri 3/19/10	Mon 5/31/10												
23	Issue ROD for Signature	116 days	Tue 6/1/10	Fri 9/24/10												
24	RACR	148 days	Wed 8/31/11	Wed 1/25/12												
25	Preliminary RACR	32 days	Wed 8/31/11	Sat 10/1/11												
26	Gov't Comments	14 days	Sun 10/2/11	Sat 10/15/11												
27	Issue Draft RACR	14 days	Sun 10/16/11	Sat 10/29/11												
28	Regulatory Review	60 days	Sun 10/30/11	Wed 12/28/11												
29	Issue Draft Final RACR	14 days	Thu 12/29/11	Wed 1/11/12												
30	Issue Final RACR	14 days	Thu 1/12/12	Wed 1/25/12												

Task		Milestone		External Tasks	
Split		Summary		External Milestone	
Progress		Project Summary		Deadline	

**Schedule 3-9
Site 12 SMP FY11-12**

ID	Task Name	Duration	Start	Finish	2010				2011				2012							
					Qtr 1	Qtr 2	Qtr 3	Qtr 4	Qtr 1	Qtr 2	Qtr 3	Qtr 4	Qtr 1	Qtr 2	Qtr 3	Qtr 4				
1	WPNSTA Yorktown	1513 days	Wed 5/14/08	Wed 7/4/12																
2	Site 12	1513 days	Wed 5/14/08	Wed 7/4/12																
3	ESD	1112 days	Wed 5/14/08	Mon 5/30/11																
4	Preliminary ESD	646 days	Wed 5/14/08	Thu 2/18/10																
5	Navy Review	10 days	Fri 2/19/10	Sun 2/28/10																
6	Issue Draft ESD	25 days	Mon 3/1/10	Thu 3/25/10																
7	Regulatory / Legal Review	258 days	Fri 3/26/10	Wed 12/8/10																
8	Issue Draft Final ESD	82 days	Thu 12/9/10	Mon 2/28/11																
9	Issue Final ESD	91 days	Tue 3/1/11	Mon 5/30/11																
10	LTM Work Plan	221 days	Tue 5/31/11	Fri 1/6/12																
11	Preliminary WP Preparation	63 days	Tue 5/31/11	Mon 8/1/11																
12	Gov't Comments	32 days	Tue 8/2/11	Fri 9/2/11																
13	Issue Draft WP	30 days	Sat 9/3/11	Sun 10/2/11																
14	Regulatory Review	61 days	Mon 10/3/11	Fri 12/2/11																
15	Issue Draft Final WP	21 days	Sat 12/3/11	Fri 12/23/11																
16	Issue Final WP	14 days	Sat 12/24/11	Fri 1/6/12																
17	LTM Fieldwork	32 days	Sat 1/7/12	Tue 2/7/12																
18	LUC RD	148 days	Wed 2/8/12	Wed 7/4/12																
19	Preliminary LUC RD	30 days	Wed 2/8/12	Thu 3/8/12																
20	Navy Review	14 days	Fri 3/9/12	Thu 3/22/12																
21	Issue Draft LUC RD	14 days	Fri 3/23/12	Thu 4/5/12																
22	Regulatory / Legal Review	62 days	Fri 4/6/12	Wed 6/6/12																
23	Issue Draft Final LUC RD	14 days	Thu 6/7/12	Wed 6/20/12																
24	Issue Final LUC RD	14 days	Thu 6/21/12	Wed 7/4/12																
25	RACR	146 days	Sat 4/2/11	Thu 8/25/11																
26	Preliminary RACR	29 days	Sat 4/2/11	Sat 4/30/11																
27	Gov't Comments	14 days	Sun 5/1/11	Sat 5/14/11																
28	Issue Draft RACR	14 days	Sun 5/15/11	Sat 5/28/11																
29	Regulatory Review	60 days	Sun 5/29/11	Wed 7/27/11																
30	Issue Draft Final RACR	14 days	Thu 7/28/11	Wed 8/10/11																
31	Issue Final RACR	15 days	Thu 8/11/11	Thu 8/25/11																
32	Five Year Review (2012)	178 days	Sun 8/14/11	Tue 2/7/12																
33	Preliminary Five-Year Review	30 days	Sun 8/14/11	Mon 9/12/11																
34	Gov't Comments	30 days	Tue 9/13/11	Wed 10/12/11																
35	Issue Draft Five-Year Review	5 days	Thu 10/13/11	Mon 10/17/11																
36	Regulatory Review	60 days	Tue 10/18/11	Fri 12/16/11																
37	Public Comment and Issue Final Five-Year	53 days	Sat 12/17/11	Tue 2/7/12																

Task		Milestone		External Tasks	
Split		Summary		External Milestone	
Progress		Project Summary		Deadline	

Schedule 3-10 Site 16 SMP FY11-12

ID	Task Name	Duration	Start	Finish	2010				2011				2012			
					Qtr 1	Qtr 2	Qtr 3	Qtr 4	Qtr 1	Qtr 2	Qtr 3	Qtr 4	Qtr 1	Qtr 2	Qtr 3	Qtr 4
1	WPNSTA Yorktown	751 days	Mon 1/18/10	Tue 2/7/12												
2	Site 16	751 days	Mon 1/18/10	Tue 2/7/12												
3	RACR	225 days	Mon 1/18/10	Mon 8/30/10												
4	Preliminary RACR	73 days	Mon 1/18/10	Wed 3/31/10												
5	Gov't Comments	30 days	Thu 4/1/10	Fri 4/30/10												
6	Issue Draft RACR	28 days	Mon 5/3/10	Sun 5/30/10												
7	Regulatory Review	64 days	Mon 5/31/10	Mon 8/2/10												
8	Issue Draft Final RACR	14 days	Tue 8/3/10	Mon 8/16/10												
9	Issue Final RACR	14 days	Tue 8/17/10	Mon 8/30/10												
10	Five Year Review (2012)	178 days	Sun 8/14/11	Tue 2/7/12												
11	Preliminary Five-Year Review	30 days	Sun 8/14/11	Mon 9/12/11												
12	Gov't Comments	30 days	Tue 9/13/11	Wed 10/12/11												
13	Issue Draft Five-Year Review	5 days	Thu 10/13/11	Mon 10/17/11												
14	Regulatory Review	60 days	Tue 10/18/11	Fri 12/16/11												
15	Public Comment and Issue Final Five	53 days	Sat 12/17/11	Tue 2/7/12												

Task		Milestone		External Tasks	
Split		Summary		External Milestone	
Progress		Project Summary		Deadline	

Schedule 3-11 Site 17 SMP FY11-12

ID	Task Name	Duration	Start	Finish	2010				2011				2012			
					Qtr 1	Qtr 2	Qtr 3	Qtr 4	Qtr 1	Qtr 2	Qtr 3	Qtr 4	Qtr 1	Qtr 2	Qtr 3	Qtr 4
1	Site 17	1290 days	Tue 7/15/08	Wed 1/25/12	[Summary bar]											
17	ROD	495 days	Mon 5/18/09	Fri 9/24/10	[Summary bar]											
18	Preliminary ROD	46 days	Mon 5/18/09	Thu 7/2/09												
19	Navy Review	15 days	Fri 7/3/09	Fri 7/17/09												
20	Issue Draft ROD	91 days	Sat 7/18/09	Fri 10/16/09												
21	Regulatory / Legal Review	153 days	Sat 10/17/09	Thu 3/18/10	[Task bar]											
22	Issue Draft Final ROD	74 days	Fri 3/19/10	Mon 5/31/10	[Task bar]											
23	Issue ROD for Signature	116 days	Tue 6/1/10	Fri 9/24/10	[Task bar]											
24	RACR	148 days	Wed 8/31/11	Wed 1/25/12	[Summary bar]											
25	Preliminary RACR	32 days	Wed 8/31/11	Sat 10/1/11									[Task bar]			
26	Gov't Comments	14 days	Sun 10/2/11	Sat 10/15/11									[Task bar]			
27	Issue Draft RACR	14 days	Sun 10/16/11	Sat 10/29/11									[Task bar]			
28	Regulatory Review	60 days	Sun 10/30/11	Wed 12/28/11									[Task bar]			
29	Issue Draft Final RACR	14 days	Thu 12/29/11	Wed 1/11/12									[Task bar]			
30	Issue Final RACR	14 days	Thu 1/12/12	Wed 1/25/12									[Task bar]			

Task		Milestone		External Tasks	
Split		Summary		External Milestone	
Progress		Project Summary		Deadline	

Schedule 3-12 Site 19 SMP FY11-12

ID	Task Name	Duration	Start	Finish	2010				2011				2012			
					Qtr 1	Qtr 2	Qtr 3	Qtr 4	Qtr 1	Qtr 2	Qtr 3	Qtr 4	Qtr 1	Qtr 2	Qtr 3	Qtr 4
1	WPNSTA Yorktown	2767 days	Fri 7/3/09	Sat 1/28/17												
2	Site 19	2767 days	Fri 7/3/09	Sat 1/28/17												
3	Work Plan for GW	711 days	Fri 7/3/09	Mon 6/13/11												
7	Issue Draft WP	9 days	Mon 1/4/10	Tue 1/12/10												
8	Regulatory Review	85 days	Wed 1/13/10	Wed 4/7/10												
9	Issue Draft Final WP	418 days	Thu 4/8/10	Mon 5/30/11												
10	Issue Final WP	14 days	Tue 5/31/11	Mon 6/13/11												
11	GW Investigation	329 days	Tue 6/14/11	Mon 5/7/12												
12	RI Report for GW	237 days	Tue 5/8/12	Sun 12/30/12												
13	Preliminary RI Report	88 days	Tue 5/8/12	Fri 8/3/12												
14	Gov't Comments	32 days	Sat 8/4/12	Tue 9/4/12												
15	Issue Draft RI Report	21 days	Wed 9/5/12	Tue 9/25/12												
16	Regulatory Review	60 days	Wed 9/26/12	Sat 11/24/12												
17	Issue Draft Final RI Report	22 days	Sun 11/25/12	Sun 12/16/12												
18	Issue Final RI report	14 days	Mon 12/17/12	Sun 12/30/12												
58	Five Year Review (2012)	178 days	Sun 8/14/11	Tue 2/7/12												
59	Preliminary Five-Year Review	30 days	Sun 8/14/11	Mon 9/12/11												
60	Gov't Comments	30 days	Tue 9/13/11	Wed 10/12/11												
61	Issue Draft Five-Year Review	5 days	Thu 10/13/11	Mon 10/17/11												
62	Regulatory Review	60 days	Tue 10/18/11	Fri 12/16/11												
63	Public Comment and Issue Final Five-Year	53 days	Sat 12/17/11	Tue 2/7/12												

Task		Milestone		External Tasks	
Split		Summary		External Milestone	
Progress		Project Summary		Deadline	

Schedule 3-13 Site 21 SMP FY11-12

ID	Task Name	Duration	Start	Finish	2010				2011				2012							
					Qtr 1	Qtr 2	Qtr 3	Qtr 4	Qtr 1	Qtr 2	Qtr 3	Qtr 4	Qtr 1	Qtr 2	Qtr 3	Qtr 4				
1	Site 21	1141 days	Thu 5/1/08	Wed 6/15/11																
9	PP	305 days	Mon 11/23/09	Thu 9/23/10																
10	Preliminary PP	30 days	Mon 11/23/09	Tue 12/22/09																
11	Gov't Comments	7 days	Wed 12/23/09	Tue 12/29/09																
12	Issue Draft PP	105 days	Wed 12/30/09	Tue 4/13/10																
13	Regulatory / Legal Review	62 days	Fri 4/16/10	Wed 6/16/10																
14	Draft Final PP	37 days	Thu 6/17/10	Fri 7/23/10																
15	Public Comment Period	46 days	Mon 7/26/10	Thu 9/9/10																
16	Issue Final PP	14 days	Fri 9/10/10	Thu 9/23/10																
17	ROD	350 days	Thu 7/1/10	Wed 6/15/11																
18	Preliminary ROD	32 days	Thu 7/1/10	Sun 8/1/10																
19	Navy Review	8 days	Mon 8/2/10	Mon 8/9/10																
20	Issue Draft ROD	10 days	Wed 8/11/10	Fri 8/20/10																
21	Regulatory / Legal Review	251 days	Sat 8/21/10	Thu 4/28/11																
22	Issue Draft Final ROD	31 days	Fri 4/29/11	Sun 5/29/11																
23	Issue ROD for Signature	17 days	Mon 5/30/11	Wed 6/15/11																

Task		Milestone		External Tasks	
Split		Summary		External Milestone	
Progress		Project Summary		Deadline	

**Schedule 3-14
Site 22 SMP FY11-12**

ID	Task Name	Duration	Start	Finish	2010				2011				2012							
					Qtr 1	Qtr 2	Qtr 3	Qtr 4	Qtr 1	Qtr 2	Qtr 3	Qtr 4	Qtr 1	Qtr 2	Qtr 3	Qtr 4				
1	Site 22	2024 days	Thu 5/1/08	Thu 11/14/13																
9	FS Report	587 days	Sat 11/21/09	Thu 6/30/11																
11	Gov't Comments	74 days	Wed 2/17/10	Sat 5/1/10																
12	Issue Draft FS	51 days	Mon 5/3/10	Tue 6/22/10																
13	Regulatory Review	97 days	Wed 6/23/10	Mon 9/27/10																
14	Issue Draft Final FS	178 days	Tue 9/28/10	Thu 3/24/11																
15	Issue Final FS	98 days	Fri 3/25/11	Thu 6/30/11																
16	PP	212 days	Fri 7/1/11	Sat 1/28/12																
17	Preliminary PP	30 days	Fri 7/1/11	Sat 7/30/11																
18	Gov't Comments	30 days	Sun 7/31/11	Mon 8/29/11																
19	Issue Draft PP	15 days	Tue 8/30/11	Tue 9/13/11																
20	Regulatory / Legal Review	63 days	Wed 9/14/11	Tue 11/15/11																
21	Issue Draft Final PP	15 days	Wed 11/16/11	Wed 11/30/11																
22	Public Comment Period	45 days	Thu 12/1/11	Sat 1/14/12																
23	Issue Final PP	14 days	Sun 1/15/12	Sat 1/28/12																
24	ROD	135 days	Sun 1/29/12	Mon 6/11/12																
25	Preliminary ROD	30 days	Sun 1/29/12	Mon 2/27/12																
26	Navy Review	15 days	Tue 2/28/12	Tue 3/13/12																
27	Issue Draft ROD	15 days	Wed 3/14/12	Wed 3/28/12																
28	Regulatory / Legal Review	60 days	Thu 3/29/12	Sun 5/27/12																
29	Issue ROD for Signature	15 days	Mon 5/28/12	Mon 6/11/12																
30	Remedial Design	244 days	Tue 6/12/12	Sun 2/10/13																
31	Preliminary RD	61 days	Tue 6/12/12	Sat 8/11/12																
32	Gov't Comments	62 days	Sun 8/12/12	Fri 10/12/12																
33	Issue Draft RD	15 days	Sat 10/13/12	Sat 10/27/12																
34	Regulatory Review	62 days	Sun 10/28/12	Fri 12/28/12																
35	Issue Draft Final RD	30 days	Sat 12/29/12	Sun 1/27/13																
36	Issue Final RD	14 days	Mon 1/28/13	Sun 2/10/13																

Task		Progress		Summary		External Tasks		Deadline	
Split		Milestone		Project Summary		External Milestone			

**Schedule 3-15
Site 23 SMP FY11-12**

ID	Task Name	Duration	Start	Finish	2010				2011				2012							
					Qtr 1	Qtr 2	Qtr 3	Qtr 4	Qtr 1	Qtr 2	Qtr 3	Qtr 4	Qtr 1	Qtr 2	Qtr 3	Qtr 4				
1	Site 23	2211 days	Wed 8/27/08	Mon 9/15/14																
2	Removal Action Work Plan (Phase 1)	211 days	Wed 8/27/08	Wed 3/25/09																
3	Preliminary WP	91 days	Wed 8/27/08	Tue 11/25/08																
4	Gov't Comments	1 day	Wed 11/26/08	Wed 11/26/08																
5	Issue Draft WP	1 day	Thu 11/27/08	Thu 11/27/08																
6	Regulatory Review	61 days	Fri 11/28/08	Tue 1/27/09																
7	Issue Draft Final WP	14 days	Wed 1/28/09	Tue 2/10/09																
8	Issue Final WP	43 days	Wed 2/11/09	Wed 3/25/09																
9	Removal Action	311 days	Thu 3/26/09	Sat 1/30/10																
10	CCR	424 days	Tue 2/2/10	Fri 4/1/11																
11	Preliminary CCR	60 days	Tue 2/2/10	Fri 4/2/10																
12	Gov't Comments	28 days	Sat 4/3/10	Fri 4/30/10																
13	Issue Draft CCR	14 days	Sat 5/1/10	Fri 5/14/10																
14	Regulatory Review	32 days	Sat 5/15/10	Tue 6/15/10																
15	Issue Final CCR	290 days	Wed 6/16/10	Fri 4/1/11																
16	Work Plan for Additional RI Activities	746 days	Mon 10/26/09	Thu 11/10/11																
17	Preliminary UFP-SAP	582 days	Mon 10/26/09	Mon 5/30/11																
18	Gov't Comments	31 days	Tue 5/31/11	Thu 6/30/11																
19	Issue Draft UFP-SAP	30 days	Fri 7/1/11	Sat 7/30/11																
20	Regulatory Review	59 days	Sun 7/31/11	Tue 9/27/11																
21	Issue Draft Final UFP-SAP	30 days	Wed 9/28/11	Thu 10/27/11																
22	Issue Final UFP-SAP Report	14 days	Fri 10/28/11	Thu 11/10/11																
23	RI Field Work	197 days	Fri 11/11/11	Fri 5/25/12																
24	RI Report	271 days	Sat 5/26/12	Wed 2/20/13																
25	Preliminary RI	89 days	Sat 5/26/12	Wed 8/22/12																
26	Gov't Comments	32 days	Thu 8/23/12	Sun 9/23/12																
27	Issue Draft RI report	15 days	Mon 9/24/12	Mon 10/8/12																
28	Regulatory Review	60 days	Tue 10/9/12	Fri 12/7/12																
29	Issue Draft Final RI report	60 days	Sat 12/8/12	Tue 2/5/13																
30	Issue Final RI report	15 days	Wed 2/6/13	Wed 2/20/13																

Task Progress Summary External Tasks Deadline
 Split Milestone Project Summary External Milestone

**Schedule 3-16
Site 24 SMP FY12-13**

ID	Task Name	Duration	Start	Finish	2010				2011				2012				
					Qtr 1	Qtr 2	Qtr 3	Qtr 4	Qtr 1	Qtr 2	Qtr 3	Qtr 4	Qtr 1	Qtr 2	Qtr 3	Qtr 4	
1	Site 24	2705 days	Fri 6/29/07	Sun 11/23/14													
2	RI Report	228 days	Fri 6/29/07	Mon 2/11/08													
3	Preliminary RI	61 days	Fri 6/29/07	Tue 8/28/07													
4	Gov't Comments	30 days	Wed 8/29/07	Thu 9/27/07													
5	Issue Draft RI report	14 days	Fri 9/28/07	Thu 10/11/07													
6	Regulatory Review	61 days	Fri 10/12/07	Tue 12/11/07													
7	Issue Draft Final RI report	62 days	Wed 12/12/07	Mon 2/11/08													
8	RI UFP-SAP (Additional Activities)	506 days	Tue 9/2/08	Wed 1/20/10													
9	Preliminary UFP-SAP Preparation	60 days	Tue 9/2/08	Fri 10/31/08													
10	Gov't Comments	38 days	Mon 11/3/08	Wed 12/10/08													
11	Issue Draft UFP-SAP	249 days	Fri 12/12/08	Mon 8/17/09													
12	Regulatory Review	72 days	Tue 8/18/09	Wed 10/28/09													
13	Issue Draft Final UFP-SAP	70 days	Thu 10/29/09	Wed 1/6/10													
14	Issue Final UFP-SAP	14 days	Thu 1/7/10	Wed 1/20/10													
15	RI Fieldwork	40 days	Mon 4/12/10	Fri 5/21/10													
16	RI Report for Additional Activities	503 days	Sun 6/20/10	Fri 11/4/11													
17	Preliminary RI	346 days	Sun 6/20/10	Tue 5/31/11													
18	Gov't Comments	31 days	Wed 6/1/11	Fri 7/1/11													
19	Issue Draft RI report	30 days	Sat 7/2/11	Sun 7/31/11													
20	Regulatory Review	61 days	Mon 8/1/11	Fri 9/30/11													
21	Issue Draft Final RI report	21 days	Sat 10/1/11	Fri 10/21/11													
22	Issue Final RI report	14 days	Sat 10/22/11	Fri 11/4/11													
23	FS Report	194 days	Sat 11/5/11	Wed 5/16/12													
24	Preliminary FS	60 days	Sat 11/5/11	Tue 1/3/12													
25	Gov't Comments	30 days	Wed 1/4/12	Thu 2/2/12													
26	Issue Draft FS	14 days	Fri 2/3/12	Thu 2/16/12													
27	Regulatory Review	62 days	Fri 2/17/12	Wed 4/18/12													
28	Issue Draft Final FS	14 days	Thu 4/19/12	Wed 5/2/12													
29	Issue Final FS	14 days	Thu 5/3/12	Wed 5/16/12													
30	PP	209 days	Thu 5/17/12	Tue 12/11/12													
31	Preliminary PP	30 days	Thu 5/17/12	Fri 6/15/12													
32	Gov't Comments	30 days	Sat 6/16/12	Sun 7/15/12													
33	Issue Draft PP	15 days	Mon 7/16/12	Mon 7/30/12													
34	Regulatory / Legal Review	60 days	Tue 7/31/12	Fri 9/28/12													
35	Issue Draft Final PP	15 days	Sat 9/29/12	Sat 10/13/12													
36	Public Comment Period	45 days	Sun 10/14/12	Tue 11/27/12													
37	Issue Final PP	14 days	Wed 11/28/12	Tue 12/11/12													
38	ROD	164 days	Wed 12/12/12	Fri 5/24/13													
39	Preliminary ROD	30 days	Wed 12/12/12	Thu 1/10/13													
40	Navy Review	15 days	Fri 1/11/13	Fri 1/25/13													
41	Issue Draft ROD	14 days	Sat 1/26/13	Fri 2/8/13													
42	Regulatory / Legal Review	60 days	Sat 2/9/13	Tue 4/9/13													
43	Issue Draft Final ROD	30 days	Wed 4/10/13	Thu 5/9/13													
44	Issue ROD for Signature	15 days	Fri 5/10/13	Fri 5/24/13													
45	Remedial Action	548 days	Sat 5/25/13	Sun 11/23/14													
46	Remedial Action	548 days	Sat 5/25/13	Sun 11/23/14													

Task		Progress		Summary		External Tasks		Deadline	
Split		Milestone		Project Summary		External Milestone			

Schedule 3-17 Site 25 SMP FY11-12

ID	Task Name	Duration	Start	Finish	2010				2011				2012			
					Qtr 1	Qtr 2	Qtr 3	Qtr 4	Qtr 1	Qtr 2	Qtr 3	Qtr 4	Qtr 1	Qtr 2	Qtr 3	Qtr 4
1	WPNSTA Yorktown	1786 days	Mon 10/26/09	Mon 9/15/14												
2	Site 25	1786 days	Mon 10/26/09	Mon 9/15/14												
3	Work Plan	746 days	Mon 10/26/09	Thu 11/10/11												
4	Preliminary UFP-SAP	582 days	Mon 10/26/09	Mon 5/30/11												
5	Gov't Comments	31 days	Tue 5/31/11	Thu 6/30/11												
6	Issue Draft UFP-SAP	30 days	Fri 7/1/11	Sat 7/30/11												
7	Regulatory Review	59 days	Sun 7/31/11	Tue 9/27/11												
8	Issue Draft Final UFP-SAP	30 days	Wed 9/28/11	Thu 10/27/11												
9	Issue Final UFP-SAP Report	14 days	Fri 10/28/11	Thu 11/10/11												
10	RI Field Work	197 days	Fri 11/11/11	Fri 5/25/12												
11	RI Report	271 days	Sat 5/26/12	Wed 2/20/13												
12	Preliminary RI	89 days	Sat 5/26/12	Wed 8/22/12												
13	Gov't Comments	32 days	Thu 8/23/12	Sun 9/23/12												
14	Issue Draft RI report	15 days	Mon 9/24/12	Mon 10/8/12												
15	Regulatory Review	60 days	Tue 10/9/12	Fri 12/7/12												
16	Issue Draft Final RI report	60 days	Sat 12/8/12	Tue 2/5/13												
17	Issue Final RI report	15 days	Wed 2/6/13	Wed 2/20/13												

Task		Milestone		External Tasks	
Split		Summary		External Milestone	
Progress		Project Summary		Deadline	

Schedule 3-18 Site 26 SMP FY11-12

ID	Task Name	Duration	Start	Finish	2010				2011				2012							
					Qtr 1	Qtr 2	Qtr 3	Qtr 4	Qtr 1	Qtr 2	Qtr 3	Qtr 4	Qtr 1	Qtr 2	Qtr 3	Qtr 4				
1	Site 26	1786 days	Mon 10/26/09	Mon 9/15/14																
2	Work Plan (UFP-SAP)	943 days	Mon 10/26/09	Fri 5/25/12																
3	Preliminary UFP-SAP	582 days	Mon 10/26/09	Mon 5/30/11																
4	Preliminary UFP-SAP	582 days	Mon 10/26/09	Mon 5/30/11																
5	Gov't Comments	31 days	Tue 5/31/11	Thu 6/30/11																
6	Issue Draft UFP-SAP	30 days	Fri 7/1/11	Sat 7/30/11																
7	Regulatory Review	59 days	Sun 7/31/11	Tue 9/27/11																
8	Issue Draft Final UFP-SAP	30 days	Wed 9/28/11	Thu 10/27/11																
9	Issue Final UFP-SAP Report	14 days	Fri 10/28/11	Thu 11/10/11																
10	RI Field Work	197 days	Fri 11/11/11	Fri 5/25/12																
11	RI Report	271 days	Sat 5/26/12	Wed 2/20/13																
12	Preliminary RI	89 days	Sat 5/26/12	Wed 8/22/12																
13	Gov't Comments	32 days	Thu 8/23/12	Sun 9/23/12																
14	Issue Draft RI report	15 days	Mon 9/24/12	Mon 10/8/12																
15	Regulatory Review	60 days	Tue 10/9/12	Fri 12/7/12																
16	Issue Draft Final RI report	60 days	Sat 12/8/12	Tue 2/5/13																
17	Issue Final RI report	15 days	Wed 2/6/13	Wed 2/20/13																

Task		Milestone		External Tasks	
Split		Summary		External Milestone	
Progress		Project Summary		Deadline	

Schedule 3-19 Site 28 SMP FY11-12

ID	Task Name	Duration	Start	Finish	2010				2011				2012							
					Qtr 1	Qtr 2	Qtr 3	Qtr 4	Qtr 1	Qtr 2	Qtr 3	Qtr 4	Qtr 1	Qtr 2	Qtr 3	Qtr 4				
1	Site 28	1358 days	Tue 9/11/07	Mon 5/30/11																
9	PP	409 days	Wed 8/5/09	Fri 9/17/10																
10	Issue Draft PP	66 days	Wed 8/5/09	Fri 10/9/09																
11	Gov't Comments	92 days	Wed 12/9/09	Wed 3/10/10																
12	Issue Draft Final PP	11 days	Fri 3/12/10	Mon 3/22/10																
13	Public Comment Period	45 days	Tue 3/23/10	Thu 5/6/10																
14	Issue Final PP	14 days	Sat 9/4/10	Fri 9/17/10																
15	ROD	375 days	Fri 5/21/10	Mon 5/30/11																
16	Preliminary ROD	41 days	Fri 5/21/10	Wed 6/30/10																
17	Navy Review	15 days	Thu 7/1/10	Thu 7/15/10																
18	Issue Draft ROD	15 days	Fri 7/16/10	Fri 7/30/10																
19	Regulatory / Legal Review	131 days	Sat 7/31/10	Wed 12/8/10																
20	Issue Draft Final ROD	30 days	Thu 12/9/10	Fri 1/7/11																
21	Issue ROD for Signature	143 days	Sat 1/8/11	Mon 5/30/11																

Task		Milestone		External Tasks	
Split		Summary		External Milestone	
Progress		Project Summary		Deadline	

Schedule 3-20 Site 30 SMP FY11-12

ID	Task Name	Duration	Start	Finish	2010				2011				2012			
					Qtr 1	Qtr 2	Qtr 3	Qtr 4	Qtr 1	Qtr 2	Qtr 3	Qtr 4	Qtr 1	Qtr 2	Qtr 3	Qtr 4
1	Site 30	801 days	Wed 7/16/08	Fri 9/24/10												
2	CCR	289 days	Wed 7/16/08	Thu 4/30/09												
3	Preliminary CCR	85 days	Wed 7/16/08	Wed 10/8/08												
4	Gov't Comments	14 days	Thu 10/9/08	Wed 10/22/08												
5	Issue Draft CCR	21 days	Thu 10/23/08	Wed 11/12/08												
6	Regulatory Review	54 days	Thu 11/13/08	Mon 1/5/09												
7	Issue Final CCR	115 days	Tue 1/6/09	Thu 4/30/09												
8	Tech Memo for GW	74 days	Mon 3/2/09	Thu 5/14/09												
9	Pre-Draft Tech Memo	12 days	Mon 3/2/09	Fri 3/13/09												
10	Gov't Comments	2 days	Mon 3/16/09	Tue 3/17/09												
11	Draft Tech Memo	1 day	Wed 3/18/09	Wed 3/18/09												
12	Regulator Comments	34 days	Thu 3/19/09	Tue 4/21/09												
13	Draft Final Tech Memo	14 days	Wed 4/22/09	Tue 5/5/09												
14	Final Tech Memo	9 days	Wed 5/6/09	Thu 5/14/09												
15	PP	290 days	Tue 3/17/09	Thu 12/31/09												
16	Draft PP	79 days	Tue 3/17/09	Wed 6/3/09												
17	Gov't Comments	51 days	Thu 6/4/09	Fri 7/24/09												
18	Draft Final PP	61 days	Mon 8/3/09	Fri 10/2/09												
19	Public Comment Period	45 days	Mon 11/2/09	Wed 12/16/09												
20	Issue Final PP	15 days	Thu 12/17/09	Thu 12/31/09												
21	Record of Decision	355 days	Mon 10/5/09	Fri 9/24/10												
22	Preliminary ROD	80 days	Mon 10/5/09	Wed 12/23/09												
23	Navy Review	15 days	Thu 12/24/09	Thu 1/7/10												
24	Issue Draft ROD	80 days	Mon 10/5/09	Wed 12/23/09												
25	Regulatory / Legal Review	112 days	Thu 12/24/09	Wed 4/14/10												
26	Issue Draft Final ROD	30 days	Sun 5/2/10	Mon 5/31/10												
27	Issue ROD for Signature	116 days	Tue 6/1/10	Fri 9/24/10												

Task		Milestone		External Tasks	
Split		Summary		External Milestone	
Progress		Project Summary		Deadline	

**Schedule 3-21
Site 31 SMP FY11-12**

ID	Task Name	Duration	Start	Finish	2010				2011				2012				
					Qtr 1	Qtr 2	Qtr 3	Qtr 4	Qtr 1	Qtr 2	Qtr 3	Qtr 4	Qtr 1	Qtr 2	Qtr 3	Qtr 4	
1	Site 31	1407 days	Mon 6/1/09	Sun 4/7/13													
2	Work Plan	349 days	Mon 6/1/09	Sat 5/15/10													
3	Preliminary UFP-SAP Preparation	72 days	Mon 6/1/09	Tue 8/11/09													
4	Gov't Comments	30 days	Wed 8/12/09	Thu 9/10/09													
5	Issue Draft UFP-SAP	60 days	Fri 9/11/09	Mon 11/9/09													
6	Regulatory Review	70 days	Thu 12/31/09	Wed 3/10/10													
7	Issue Draft Final UFP-SAP	22 days	Fri 4/9/10	Fri 4/30/10													
8	Issue Final UFP-SAP	13 days	Mon 5/3/10	Sat 5/15/10													
9	Remedial Investigation	70 days	Sun 5/16/10	Sat 7/24/10													
10	Remedial Investigation	70 days	Sun 5/16/10	Sat 7/24/10													
11	RI Report for GW/SW/SD	240 days	Sun 7/25/10	Mon 3/21/11													
12	Preliminary RI	92 days	Sun 7/25/10	Sun 10/24/10													
13	Gov't Comments	30 days	Mon 10/25/10	Tue 11/23/10													
14	Issue Draft RI Report	22 days	Wed 11/24/10	Wed 12/15/10													
15	Regulatory Review	61 days	Thu 12/16/10	Mon 2/14/11													
16	Issue Draft Final RI Report	21 days	Tue 2/15/11	Mon 3/7/11													
17	Issue Final RI Report	14 days	Tue 3/8/11	Mon 3/21/11													
18	FS Report	195 days	Tue 3/22/11	Sun 10/2/11													
19	Preliminary FS	62 days	Tue 3/22/11	Sun 5/22/11													
20	Gov't Comments	30 days	Mon 5/23/11	Tue 6/21/11													
21	Issue Draft FS	14 days	Wed 6/22/11	Tue 7/5/11													
22	Regulatory Review	61 days	Wed 7/6/11	Sun 9/4/11													
23	Issue Draft Final FS	14 days	Mon 9/5/11	Sun 9/18/11													
24	Issue Final FS	14 days	Mon 9/19/11	Sun 10/2/11													
25	PP	210 days	Mon 10/3/11	Sun 4/29/12													
26	Preliminary PP	30 days	Mon 10/3/11	Tue 11/1/11													
27	Gov't Comments	30 days	Wed 11/2/11	Thu 12/1/11													
28	Issue Draft PP	15 days	Fri 12/2/11	Fri 12/16/11													
29	Regulatory / Legal Review	60 days	Sat 12/17/11	Tue 2/14/12													
30	Draft Final PP	15 days	Wed 2/15/12	Wed 2/29/12													
31	Public Comment Period	45 days	Thu 3/1/12	Sat 4/14/12													
32	Issue Final PP	15 days	Sun 4/15/12	Sun 4/29/12													
33	ROD	149 days	Mon 4/30/12	Tue 9/25/12													
34	Preliminary ROD	30 days	Mon 4/30/12	Tue 5/29/12													
35	Navy Review	14 days	Wed 5/30/12	Tue 6/12/12													
36	Issue Draft ROD	14 days	Wed 6/13/12	Tue 6/26/12													
37	Regulatory / Legal Review	62 days	Wed 6/27/12	Mon 8/27/12													
38	Issue Draft Final RD	14 days	Tue 8/28/12	Mon 9/10/12													
39	Issue ROD for Signature	15 days	Tue 9/11/12	Tue 9/25/12													
40	RD	194 days	Wed 9/26/12	Sun 4/7/13													
41	Preliminary RD	60 days	Wed 9/26/12	Sat 11/24/12													
42	Gov't Comments	30 days	Sun 11/25/12	Mon 12/24/12													
43	Issue Draft RD	14 days	Tue 12/25/12	Mon 1/7/13													
44	Regulatory Review	62 days	Tue 1/8/13	Sun 3/10/13													
45	Issue Final RD	14 days	Mon 3/11/13	Sun 3/24/13													
46	Issue Final ROD	14 days	Mon 3/25/13	Sun 4/7/13													

Task		Progress		Summary		External Tasks		Deadline	
Split		Milestone		Project Summary		External Milestone			

**Schedule 3-22
Site 32 SMP FY11-12**

ID	Task Name	Duration	Start	Finish	2010				2011				2012			
					Qtr 1	Qtr 2	Qtr 3	Qtr 4	Qtr 1	Qtr 2	Qtr 3	Qtr 4	Qtr 1	Qtr 2	Qtr 3	Qtr 4
1	Site 32	1189 days	Fri 12/26/08	Wed 3/28/12												
2	Work Plan for Remedial Action	231 days	Fri 12/26/08	Thu 8/13/09												
3	Preliminary WP Preparation	60 days	Fri 12/26/08	Mon 2/23/09												
4	Gov't Comments	30 days	Tue 2/24/09	Wed 3/25/09												
5	Issue Draft WP	14 days	Thu 3/26/09	Wed 4/8/09												
6	Regulatory Review	83 days	Thu 4/9/09	Tue 6/30/09												
7	Issue Draft Final WP	41 days	Wed 7/1/09	Mon 8/10/09												
8	Issue Final WP	3 days	Tue 8/11/09	Thu 8/13/09												
9	Remedial Action	90 days	Fri 9/11/09	Wed 12/9/09												
10	CCR Report	119 days	Thu 12/10/09	Wed 4/7/10												
11	Preliminary CCR	26 days	Thu 12/10/09	Mon 1/4/10												
12	Gov't Comments	32 days	Tue 1/5/10	Fri 2/5/10												
13	Issue Draft CCR	15 days	Mon 2/8/10	Mon 2/22/10												
14	Regulatory Review	30 days	Tue 2/23/10	Wed 3/24/10												
15	Issue Final CCR	14 days	Thu 3/25/10	Wed 4/7/10												
16	PP	333 days	Tue 6/1/10	Fri 4/29/11												
17	Issue Draft PP	63 days	Tue 6/1/10	Mon 8/2/10												
18	Regulatory / Legal Review	155 days	Tue 8/3/10	Tue 1/4/11												
19	Draft Final PP	44 days	Wed 1/5/11	Thu 2/17/11												
20	Public Comment Period	45 days	Sun 2/20/11	Tue 4/5/11												
21	Issue Final PP	24 days	Wed 4/6/11	Fri 4/29/11												
22	ROD	119 days	Sat 4/16/11	Fri 8/12/11												
23	Issue Draft ROD	14 days	Sat 4/16/11	Fri 4/29/11												
24	Regulatory / Legal Review	60 days	Sat 4/30/11	Tue 6/28/11												
25	Issue Draft Final ROD	30 days	Wed 6/29/11	Thu 7/28/11												
26	Issue ROD for Signature	15 days	Fri 7/29/11	Fri 8/12/11												
27	SAP and HASP Preparation	208 days	Tue 12/28/10	Sat 7/23/11												
28	Preliminary SAP and HASP	60 days	Tue 12/28/10	Fri 2/25/11												
29	Client Review of Preliminary SAP	30 days	Sat 2/26/11	Sun 3/27/11												
30	Draft SAP to Regulators	14 days	Mon 3/28/11	Sun 4/10/11												
31	Regulatory Review of Draft SAP	60 days	Mon 4/11/11	Thu 6/9/11												
32	Draft Final SAP to Regulators	14 days	Fri 6/10/11	Thu 6/23/11												
33	Final SAP	30 days	Fri 6/24/11	Sat 7/23/11												
34	Site 32 Investigation Activities	36 days	Fri 7/29/11	Fri 9/2/11												
35	Field Investigation	36 days	Fri 7/29/11	Fri 9/2/11												
36	Site Investigation Reporting	208 days	Sat 9/3/11	Wed 3/28/12												
37	Preliminary SI Report	60 days	Sat 9/3/11	Tue 11/1/11												
38	Client Review	30 days	Wed 11/2/11	Thu 12/1/11												
39	Draft SI Report	14 days	Fri 12/2/11	Thu 12/15/11												
40	Regulatory Review	60 days	Fri 12/16/11	Mon 2/13/12												
41	Draft Final SI Report	14 days	Tue 2/14/12	Mon 2/27/12												
42	Final SI Report	30 days	Tue 2/28/12	Wed 3/28/12												

Task		Progress		Summary		External Tasks		Deadline	
Split		Milestone		Project Summary		External Milestone			

Schedule 3-23 Site 33 SMP FY11-12

ID	Task Name	Duration	Start	Finish	2010				2011				2012			
					Qtr 1	Qtr 2	Qtr 3	Qtr 4	Qtr 1	Qtr 2	Qtr 3	Qtr 4	Qtr 1	Qtr 2	Qtr 3	Qtr 4
1	WPNSTA Yorktown	2767 days	Fri 7/3/09	Sat 1/28/17												
2	Site 33	2767 days	Fri 7/3/09	Sat 1/28/17												
3	Work Plan for GW	711 days	Fri 7/3/09	Mon 6/13/11												
4	Preliminary WP Preparation	60 days	Fri 7/3/09	Mon 8/31/09												
5	Gov't Comments	30 days	Tue 9/1/09	Wed 9/30/09												
6	Comment Resolution	92 days	Thu 10/1/09	Thu 12/31/09												
7	Issue Draft WP	9 days	Mon 1/4/10	Tue 1/12/10												
8	Regulatory Review	85 days	Wed 1/13/10	Wed 4/7/10												
9	Issue Draft Final WP	418 days	Thu 4/8/10	Mon 5/30/11												
10	Issue Final WP	14 days	Tue 5/31/11	Mon 6/13/11												
11	GW Investigation	329 days	Tue 6/14/11	Mon 5/7/12												
12	RI Report for GW	237 days	Tue 5/8/12	Sun 12/30/12												
13	Preliminary RI Report	88 days	Tue 5/8/12	Fri 8/3/12												
14	Gov't Comments	32 days	Sat 8/4/12	Tue 9/4/12												
15	Issue Draft RI Report	21 days	Wed 9/5/12	Tue 9/25/12												
16	Regulatory Review	60 days	Wed 9/26/12	Sat 11/24/12												
17	Issue Draft Final RI Report	22 days	Sun 11/25/12	Sun 12/16/12												
18	Issue Final RI report	14 days	Mon 12/17/12	Sun 12/30/12												

Task		Milestone		External Tasks	
Split		Summary		External Milestone	
Progress		Project Summary		Deadline	

Schedule 3-24 Site 34 SMP FY11-12

ID	Task Name	Duration	Start	Finish	2010				2011				2012							
					Qtr 1	Qtr 2	Qtr 3	Qtr 4	Qtr 1	Qtr 2	Qtr 3	Qtr 4	Qtr 1	Qtr 2	Qtr 3	Qtr 4				
1	Site 34	2370 days	Tue 3/18/08	Fri 9/12/14																
8	RI Report for GW	761 days	Thu 4/30/09	Mon 5/30/11																
9	Issue Draft RI Report	170 days	Thu 4/30/09	Fri 10/16/09																
10	Navy and Regulatory Review	463 days	Mon 10/19/09	Mon 1/24/11																
11	Issue Draft Final RI Report	65 days	Tue 1/25/11	Wed 3/30/11																
12	Issue Final RI Report	61 days	Thu 3/31/11	Mon 5/30/11																
13	FS Report	193 days	Tue 5/31/11	Fri 12/9/11																
14	Preliminary FS	60 days	Tue 5/31/11	Fri 7/29/11																
15	Gov't Comments	30 days	Sat 7/30/11	Sun 8/28/11																
16	Issue Draft FS	14 days	Mon 8/29/11	Sun 9/11/11																
17	Regulatory Review	61 days	Mon 9/12/11	Fri 11/11/11																
18	Issue Draft Final FS	14 days	Sat 11/12/11	Fri 11/25/11																
19	Issue Final FS	14 days	Sat 11/26/11	Fri 12/9/11																
20	PP	209 days	Sat 12/10/11	Thu 7/5/12																
21	Preliminary PP	30 days	Sat 12/10/11	Sun 1/8/12																
22	Navy Review	30 days	Mon 1/9/12	Tue 2/7/12																
23	Issue Draft PP	15 days	Wed 2/8/12	Wed 2/22/12																
24	Regulatory / Legal Review	60 days	Thu 2/23/12	Sun 4/22/12																
25	Issue Draft Final PP	15 days	Mon 4/23/12	Mon 5/7/12																
26	Public Comment Period	45 days	Tue 5/8/12	Thu 6/21/12																
27	Issue Final PP	14 days	Fri 6/22/12	Thu 7/5/12																
28	ROD	168 days	Fri 7/6/12	Thu 12/20/12																
29	Preliminary ROD	32 days	Fri 7/6/12	Mon 8/6/12																
30	Navy Review	15 days	Tue 8/7/12	Tue 8/21/12																
31	Issue Draft ROD	14 days	Wed 8/22/12	Tue 9/4/12																
32	Regulatory / Legal Review	62 days	Wed 9/5/12	Mon 11/5/12																
33	Issue Draft Final ROD	30 days	Tue 11/6/12	Wed 12/5/12																
34	Issue ROD for Signature	15 days	Thu 12/6/12	Thu 12/20/12																

Task		Milestone		External Tasks	
Split		Summary		External Milestone	
Progress		Project Summary		Deadline	

Schedule 3-25 SSA 15 SMP FY11-12

ID	Task Name	Duration	Start	Finish	2010				2011				2012			
					Qtr 1	Qtr 2	Qtr 3	Qtr 4	Qtr 1	Qtr 2	Qtr 3	Qtr 4	Qtr 1	Qtr 2	Qtr 3	Qtr 4
1	WPNSTA Yorktown	740 days	Mon 3/16/09	Fri 3/25/11												
2	SSA 15	740 days	Mon 3/16/09	Fri 3/25/11												
3	Desktop Audit	400 days	Mon 3/16/09	Mon 4/19/10												
4	Preliminary Tech Memo	30 days	Tue 4/20/10	Wed 5/19/10												
5	Gov't Comments	36 days	Thu 5/20/10	Thu 6/24/10												
6	Issue Draft Tech Memo	62 days	Fri 6/25/10	Wed 8/25/10												
7	Regulatory Review	82 days	Thu 8/26/10	Mon 11/15/10												
8	Issue Final Tech Memo	130 days	Tue 11/16/10	Fri 3/25/11												

Task		Milestone		External Tasks	
Split		Summary		External Milestone	
Progress		Project Summary		Deadline	

SECTION 4

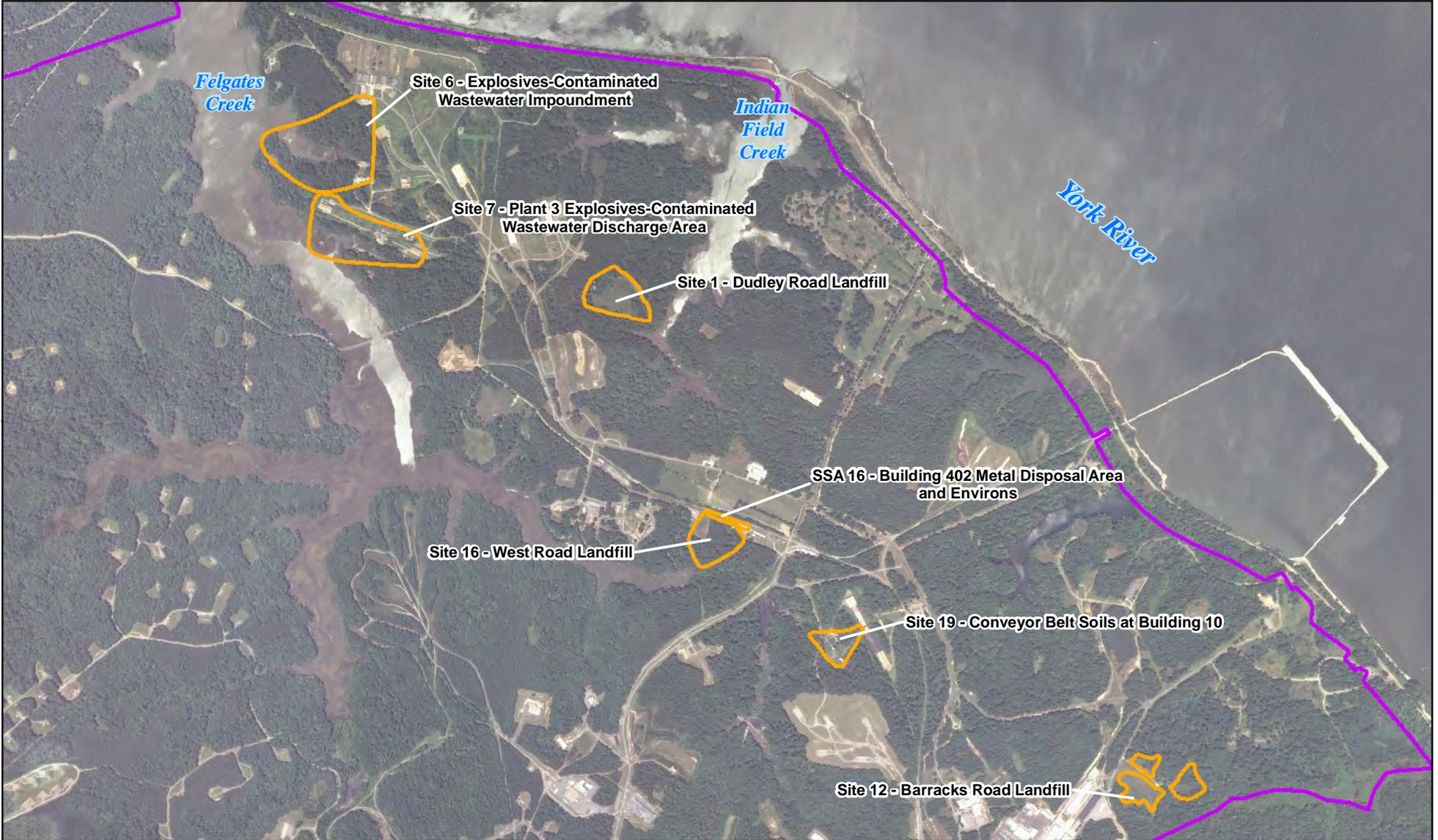
Land Use Planning

Sites with LUCs and the boundaries of potential environmental impact areas are shown on [Figure 4-1](#). The Sites with LUCs in place are:

- Site 1 – Dudley Road Landfill
- Site 6 – Explosive Impoundment, Flume Area and Excavation Area
- Site 7 – Plant 3 Explosives-Contaminated Wastewater Discharge Area
- Site 12 – Barracks Road Landfill
- Site 16/SSA 16 – West Road Landfill
- Site 19 – Conveyor Belt Soils at Building 10

This information is made available on the NAVFAC MIDLANT GeoReadiness website to address environmental considerations during planning and decision making. Contact information is listed below:

Mr. Tom Kowalski
Naval Facilities Engineering Command, Mid Atlantic
9742 Maryland Ave. Bldg N-26
Norfolk, VA 23511-3095



Legend

-  Land Use Control Boundary
-  WPNSTA Boundary

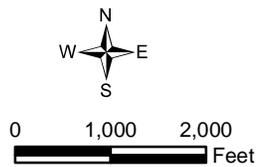


Figure 4-1
WPNSTA LUC Boundary Map
Site Management Plan for FY 2011 to 2012
Naval Weapons Station Yorktown
Yorktown, Virginia

SECTION 5

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