N00109.AR.003040
NWS YORKTOWN
5090.3a

FINAL ACTION MEMORANDUM FOR SITE 24 AVIATION FIELD NWS YORKTOWN VA
03/01/2016
CH2M HILL

Final

Action Memorandum for Site 24 - Aviation Field

Naval Weapons Station Yorktown
Yorktown, Virginia

Contract Task Order WE90

March 2016

Prepared for

Department of the Navy
Naval Facilities Engineering Command
Mid-Atlantic

Under the

NAVFAC CLEAN 8012 Program
Contract N62470-11-D-8012

Prepared by

Virginia Beach, Virginia

FINAL
ACTION MEMORANDUM FOR SITE 24 – AVIATION FIELD

Naval Weapons Station Yorktown
Yorktown, Virginia

DATE: March 23, 2016

SUBJECT: Removal Action at Site 24 – Aviation Field, Naval Weapons Station Yorktown, Yorktown, Virginia

FROM: Naval Facilities Engineering Command Mid-Atlantic

TO: Captain Paul Haebler
Commanding Officer Naval Weapons Station Yorktown

This Action Memorandum serves as the Decision Document for selection of the Non-Time Critical Removal Action (NTCRA) at Site 24, Naval Weapons Station Yorktown, in Yorktown, Virginia. The NTCRA will consist of the excavation and offsite disposal of waste and impacted soil, as evaluated in the Engineering Evaluation/Cost Analysis (EE/CA) for Site 24, prepared under separate cover. This Action Memorandum was developed in accordance with the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) of 1980, as amended, and is consistent with the National Oil and Hazardous Substances Pollution Contingency Plan (NCP). This decision is based on the Administrative Record for the site. The NTCRA represents the final action for the site.

Conditions at Site 24 meet the NCP Section 300.415(b)(2) criteria for a removal action. Naval Facilities Engineering Command Mid-Atlantic recommends approval of the proposed removal action. The total project ceiling, if approved, will be $3,920,000. Response actions should commence as soon as practical to expedite the removal of waste and impacted soil at the site.

Approved by:

3/23/16

Captain Paul Haebler
Commanding Officer Naval Weapons Station Yorktown
Yorktown, Virginia

Date

Contents

Acronyms and Abbreviations ..... **vii**

I. Purpose **1**

II. Site Conditions and Background **1**

A. Site Description 1

1. Removal Site Evaluation 2
2. Physical Location 2
3. Site Characteristics 2
4. Release or Threatened Release into the Environment of a Hazardous Substance, Pollutant, or Contaminant 2
5. National Priorities List Status 3
6. Maps, Pictures, and Other Graphic Presentations 3

B. Other Actions 3

1. Previous Actions 3
2. Current Actions 3

C. State and Local Authority's Role 3

1. State and Local Actions to Date 3
2. Potential for Continued State and Local Response 3

III. Threats to Public Health, Welfare, or the Environment and Statutory and Regulatory Authorities **3**

IV. Endangerment Determination **4**

V. Proposed Actions and Estimated Cost **4**

A. Proposed Actions 4

1. Proposed Action Description 4
2. Contribution to Remedial Performance 5
3. Description of Alternative Technologies 5
4. Applicable or Relevant and Appropriate Requirements 5
5. Project Schedule 5

B. Estimated Costs 5

1. Response Action Contract 5

VI. Expected Change in the Situation Should Action Be Delayed or Not Taken **6**

VII. Outstanding Policy Issues **7**

VIII. Enforcement **7**

IX. Recommendation **8**

X. References **8**

Attachments

1 Final EE/CA for Site 24 – Aviation Field
2 Public Notices

Tables

1 Site 24 – Aviation Field Removal Action Cost – Alternative 3

Figures

1 Site Location and Layout Map
2 Site 24 Source Area Map
3 Removal Action Area

Acronyms and Abbreviations

ARAR	applicable or relevant and appropriate requirement
bgs	below ground surface
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act of 1980
CLEAN	Comprehensive Long-term Environmental Action – Navy
COC	constituent of concern
E&S	erosion and sediment
EE/CA	Engineering Evaluation/Cost Analysis
ER	Environmental Restoration
IAS	Initial Assessment Study
IR	Installation Restoration
JIEDDO	Joint Improvised Explosive Device Defeat Organization
Navy	Department of the Navy
NCP	National Oil and Hazardous Substances Pollution Contingency Plan
NTCRA	Non-Time Critical Removal Action
PCB	polychlorinated biphenyl
PRG	preliminary remediation goal
RI	Remedial Investigation
SARA	Superfund Amendments and Reauthorization Act of 1986
SSP	Site Screening Process
TNT	trinitrotoluene
USEPA	United States Environmental Protection Agency
VDEQ	Virginia Department of Environmental Quality
WPNSTA	Naval Weapons Station

I. Purpose

This Action Memorandum documents approval of a Non-Time Critical Removal Action (NTCRA) to address waste and impacted soil at Site 24, Naval Weapons Station (WPNSTA) Yorktown, in Yorktown, Virginia. The Engineering Evaluation/Cost Analysis (EE/CA) for Site 24 (**Attachment 1**) focused on remedial alternatives to address potential unacceptable human health risks from exposure to contaminants in surface and subsurface soil, as well as subsurface debris, and potential unacceptable ecological risks from exposure to contaminants in localized, spatially limited areas of surface soil. This Action Memorandum serves as the Decision Document for the selection of the NTCRA, as evaluated in the EE/CA (**Attachment 1**), and for the Department of the Navy (Navy) to conduct the work proposed therein. The alternatives evaluated in the EE/CA are summarized as follows:

- Alternative #1—No action
- Alternative #2—Soil cover
- Alternative #3—Excavation and offsite disposal

This Action Memorandum was completed in accordance with the remedial program requirements defined by the Comprehensive Environmental Response, Compensation, and Liability Act of 1980 (CERCLA), as amended, the Superfund Amendments and Reauthorization Act of 1986 (SARA), the National Oil and Hazardous Substances Pollution Contingency Plan (NCP), and the United States Environmental Protection Agency's (USEPA's) *Guidance on Conducting Non-Time-Critical Removal Actions Under CERCLA* (USEPA, 1993).

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

II. Site Conditions and Background

A. Site Description

Originally named the United States 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 trinitrotoluene (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 United States WPNSTA. 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.

The Site 24 investigation area is approximately 34 acres and consists of approximately 14 acres of an open, grassy field surrounding an active helicopter landing pad in the northern portion of WPNSTA Yorktown, just south of the York River (**Figure 1**). Existing structures at Site 24 include a concrete helicopter landing pad and several gravel roads that connect to a Joint Improvised Explosive Device Defeat Organization (JIEDDO) battle course (**Figure 1**). Railroad tracks that were once present onsite have been removed; however, the stone beds used as the foundation for the tracks remain. Site 24 was also historically used as an aviation field, consisting of airplane hangars and runways, until 1927. After World War I, the site was reportedly used for storing munitions until they were recovered and used during World War II. Site 24 was also used until the mid-1980s for storing and burying miscellaneous materials, including munitions debris, rocket motor casings, batteries, cables, parachutes, and

metal and construction debris. Burning of explosives-contaminated waste and other Base waste may also have occurred at the site. A bioremediation cell (**Figure 1**), constructed on the northern side of the site in 1999 to treat contaminated soil and sediment from nearby Site 6, was removed from Site 24 in December 2006 once treatment activities were completed (Shaw, 2008).

1. Removal Site Evaluation

The primary source of contamination at Site 24 is associated with the disposal/burial areas (Areas B, C, E and F [**Figure 2**]). Impacts to site media could also be associated with a small area with black sludge-like material of unknown origin on the ground surface (Area D [**Figure 2**]). However, Area D soil and groundwater analytical results collected in Area D during previous investigations did not identify potential risks and no further action was recommended and subsequently approved by the USEPA and Virginia Department of Environmental Quality (VDEQ) for Area D. Site 24 has been characterized under several investigations and studies between 1984 and 2014. A complete summary of the previous investigations, along with figures showing the test pit, soil sampling, and drainage ditch sampling locations and conceptual site model, is presented in the EE/CA provided as **Attachment 1**. The results of investigation activities, including geophysical surveying, soil sampling, and test pitting, indicated that the extent of buried debris has been delineated and is limited to six small (each with a footprint less than 2,000 square feet), discontinuous disposal areas (Disposal Areas B [north and south], C, E, and F [north and south] [**Figure 3**]). Waste debris was found to consist of miscellaneous metal debris, metal banding material, inert ordnance debris, and empty and rusted 55-gallon drums. No ash was observed within any of the test pits. Based on the potential unacceptable risks identified in the Human Health and Ecological Risk Assessments, action was only determined to be necessary for the human health-based site constituents of concern (COCs) (Aroclor-1254, aluminum, cadmium, and copper) in surface and subsurface soil within the six discontinuous disposal areas, and for two ecological risk-based COCs (arsenic and mercury) in three localized, spatially limited soil hotspots (A06SS11, YS24-SS04, and YS24-SS31) [**Figure 3**]) with elevated concentrations that may pose risks to lower-trophic-level ecological receptors (plants and soil invertebrates).

2. Physical Location

WPNSTA Yorktown is a 10,624-acre installation located on the Virginia Peninsula in York and James City counties and the city of Newport News, Virginia (**Figure 1**). 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. The Site 24 investigation area is approximately 34 acres and consists of approximately 14 acres of an open, grassy field surrounding an active helicopter landing pad in the northern portion of WPNSTA Yorktown, just south of the York River (**Figure 1**).

3. Site Characteristics

The Site 24 investigation area is approximately 34 acres and consists of approximately 14 acres of an open, grassy field surrounding an active helicopter landing pad in the northern portion of WPNSTA Yorktown, just south of the York River (**Figure 1**). The site is bounded by the WPNSTA Yorktown installation fence line to the north, former railroad tracks to the east, and Main Road to the south. A JIEDDO battle course (formerly storage areas) is located in the western portion of the site and along the western perimeter of the site (**Figure 1**). Existing structures at Site 24 include a concrete helicopter landing pad and several gravel roads that connect to the JIEDDO battle course (**Figure 1**). Railroad tracks that were once present onsite have been removed; however, the stone beds used as the foundation for the tracks remain.

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

Based on the data and results of the Initial Assessment Study (IAS) (Johnson/CH2M HILL, 1984), Site Screening Process (SSP) (Baker, 1996), Remedial Investigation (RI) (CH2M HILL/Baker, 2008; CH2M HILL, 2014), and other supplemental investigations, it was determined that there are potentially unacceptable risks to human health and the environment posed by exposure to waste and polychlorinated biphenyls (PCBs) (aroclor-1254) and metals (aluminum, cadmium, and copper) in soil within six discontinuous waste disposal areas and metals (arsenic and

mercury) in surface soil in three isolated hotspot areas. No potentially unacceptable risk to human health and the environment were identified from exposure to groundwater or drainage ditch soil, except for the isolated drainage ditch surface soil hotspot (YS24-SS31) (**Figure 3**).

5. National Priorities List Status

WPNSTA Yorktown was placed on the National Priorities List on October 15, 1992 (USEPA ID: VA8170024170). Site 24 is among the IR sites being addressed under CERCLA at WPNSTA Yorktown.

6. Maps, Pictures, and Other Graphic Presentations

Several figures are included in the Action Memorandum that provide graphical representations of Site 24 and the planned removal action. These include:

Figure 1 – Site Location and Layout Map

Figure 2 – Site 24 Source Area Map

Figure 3 – Removal Action Area

Additional figures that are part of the EE/CA (**Attachment 1**) include:

Figure 2-3 – Pre-2010 Remedial Investigation Sample Locations

Figure 2-4 – Comprehensive Test Pit Locations

Figure 2-5 – Comprehensive Soil Sample Locations

Figure 2-6 – Comprehensive Drainage Ditch Soil Sample Locations

Figure 2-7 – Conceptual Site Model

Figure 2-8 – Proposed Removal Action Areas

B. Other Actions

1. Previous Actions

No previous actions have been completed for Site 24.

2. Current Actions

No current actions are being completed for Site 24.

C. State and Local Authority's Role

1. State and Local Actions to Date

Under Executive Order 12580, the President delegates authority to undertake CERCLA response actions to the Department of Defense. Congress further outlined this authority in the Defense Environmental Restoration Program Amendments, under 10 United States Code Sections 2701 through 2705. CERCLA Section 121 requires the Navy to apply certain state removal and remedial action law requirements at its facilities.

2. Potential for Continued State and Local Response

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

III. Threats to Public Health, Welfare, or the Environment and Statutory and Regulatory Authorities

Section 300.415 of the NCP lists the factors to be considered in determining the appropriateness of an NTCRA. Paragraph (b)(2)(i) of Section 300.415 describes the necessary conditions as follows:

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

Based on the data and results of the IAS, SSP, RI, and other supplemental investigations, it has been determined that there are potentially unacceptable risks to human health and the environment posed by exposure to waste and PCBs (aroclor-1254) and metals (aluminum, cadmium, and copper) in soil within six discontinuous waste disposal areas and metals (arsenic and mercury) in surface soil in three isolated hotspot areas. No potentially unacceptable risks to human health and the environment were identified from exposure to groundwater or drainage ditch soil, except for the isolated drainage ditch surface soil hotspot (YS24-SS31).

IV. Endangerment Determination

Actual or threatened releases of pollutants and contaminants from Site 24 soil, if not addressed by implementing the response action discussed in this Action Memorandum, may present an endangerment to human and ecological receptors.

V. Proposed Actions and Estimated Cost

A. Proposed Actions

The scope of the removal action to be initiated at Site 24 includes removal of waste and impacted soil (**Figure 3**).

1. Proposed Action Description

The preferred removal action alternative for waste and impacted soil at Site 24, as presented in the EE/CA (**Attachment 1**), is Alternative 3, which consists of excavation, backfilling, and offsite disposal of waste and impacted soil from the six discontinuous waste disposal areas and impacted surface soil from the three isolated hotspot areas.

Alternative 3 includes site preparation, excavation and offsite disposal, and site restoration, and is summarized as follows and detailed in the EE/CA (**Attachment 1**).

Site preparation activities will include setup of a staging area and facilities, installation of erosion and sediment (E&S) controls, and installation of a construction entrance. Before offsite disposal of impacted soil and waste from the removal areas occurs, pre-excavation waste characterization samples will be collected to determine if the waste is hazardous or non-hazardous for disposal purposes.

The impacted soil and waste from the six discontinuous disposal areas and impacted surface soil from the three isolated hotspot areas will be excavated to varying depths ranging from 2 to 13 feet below ground surface (bgs). For excavation areas deeper than 5 feet bgs, sloping or shoring would be required to ensure safety. The excavated soil and waste will be transported offsite to a USEPA offsite-rule-approved disposal facility. The excavation, offsite disposal, and backfilling will be performed using mechanical earthwork equipment (such as excavators, bulldozers, front end loaders, and dump trucks).

Before backfilling at the site occurs, post-excavation confirmation samples will be collected, and the results compared against the soil preliminary remediation goals (PRGs) for the soil removal in Areas B, C, E, and F and against the soil PRGs for the hotspot soil removals, to confirm the horizontal and vertical extents of the excavations are sufficient. Following completion of the excavation activities, a topographic survey of the site will be completed to capture the lateral and vertical extent of the excavation areas. Following completion of the topographic survey, clean general fill will be used to bring the grade to within 6 inches of the final grade, followed by the placement of a 6-inch layer of clean topsoil to support vegetation growth. General fill and topsoil will be imported from an offsite source and certified as clean through analytical testing and be in compliance with the soil classification results detailed in the EE/CA (**Attachment 1**).

Areas disturbed during the removal action will be stabilized by seeding with native species of grasses. In areas where the excavation extent intersects the JIEDDO battle course, course access will be temporarily restricted during excavation activities and the disturbed sections of the course will be restored following completion of the

excavation. All equipment, materials, and temporary E&S controls will be removed from the site. Upon approval from the Navy that final site stabilization has been achieved, E&S controls will be removed and the associated materials disposed offsite.

2. Contribution to Remedial Performance

This NTCRA will mitigate potentially unacceptable human health risks from exposure to soil within six discontinuous waste disposal areas through the removal of waste and PCB- and metals-contaminated soil and mitigate potentially unacceptable ecological risks from exposure to surface soil within three isolated hotspot areas through the removal of metals-contaminated surface soil. Excavation will be deemed complete when the lateral and vertical extents of removal have been achieved and post-excavation confirmation sampling results in the remaining soil are below the soil PRGs. Removal of waste and impacted soil during the NTCRA will contribute to the effectiveness of the long-term site remedy by eliminating the exposure pathways and mitigating potentially unacceptable risks requiring remedial action under CERCLA within the site.

3. Description of Alternative Technologies

Three alternatives were assessed for addressing soil within Site 24. These alternatives were evaluated and compared based upon their effectiveness, implementability, and cost. The EE/CA (**Attachment 1**) describes the considered alternatives in greater detail, as well as the process by which the alternatives were selected, evaluated, and compared.

4. Applicable or Relevant and Appropriate Requirements

The NCP requires that removal actions attain federal and state applicable or relevant and appropriate requirements (ARARs) with limited exception, to the extent practicable. Analysis of the removal action alternatives for Site 24 soil with the applicable ARARs is presented in the attached EE/CA (**Attachment 1**). The removal action set forth in this Action Memorandum will comply with ARARs to the extent practicable.

5. Project Schedule

The public notices of availability for the EE/CA were published on September 5, 2015, and the EE/CA was made available for public review and comment from September 8, 2015 through October 8, 2015. The public notices are included as **Attachment 2**. No public comments were received.

The proposed project schedule for the removal action is:

- EE/CA Public Comment Period – 30 days
- Subcontracting, Work Plan, and Mobilization—6 months
- Removal Action—4 months
- CERCLA Documentation—4 months

B. Estimated Costs

The NCP 40 Code of Federal Regulations Part 300.415 dictates statutory limits of $2 million and 12 months of USEPA-fund-financed removal actions, with statutory exemption for emergencies and actions consistent with the removal action to be taken. This removal action will not be USEPA-fund-financed. The Navy ER Program does not limit the cost or duration of the removal action (Navy, 2006).

1. Response Action Contract

The Navy will contract with environmental remediation contractors to perform the required work associated with the Site 24 removal action. The estimated costs are itemized in **Table 1**. Detailed cost estimates are provided in the EE/CA (**Attachment 1**). The estimated costs are provided to an accuracy range of +50 percent and -30 percent.

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

There is no expected change in the situation should action be delayed or not taken. The current potential unacceptable human health and ecological risks would still remain at the site if the proposed action is not taken at this time or is delayed.

TABLE 1
Site 24 – Aviation Field Removal Action Cost – Alternative 3

Site Preparation	
Work Planning Documents	$47,000
Mobilization and Site Setup	$14,000
Pre-Excavation Waste Characterization Sampling	$15,100
Site Management	$69,000
Excavation and Offsite Disposal	
Excavate and Load Material	$82,300
Transportation and Disposal of Excavated Material	$1,097,200
Post-Excavation Confirmation Sampling	$35,900
Site Restoration	
Fill Material Delivery and Placement	$397,700
Topographic Surveys	$6,300
Grading and Seeding	$17,100
JIEDDO Battle Course Repairs	$4,200
Demobilization	$5,800
Subtotal	$1,791,600
Contingency (25 percent)	$447,900
Construction Management (10 percent)	$179,200
Project Management (8 percent)	$143,300
Subtotal	$2,562,000
Performance Bond (2 percent)	$51,200
Total Capital Cost of Alternative 3	**$2,613,000**
-30 percent	$1,829,000
+50 percent	$3,920,000

Note:
Base costs used are 2014 dollars. Cost estimate prepared using costs from RS Means: Facilities Construction Cost Data, 2013 + 1.9% average 2014 escalation (Global Insight), recent similar projects, and Navy Comprehensive Long-term Environmental Action – Navy (CLEAN) laboratory basic ordering agreement rates.

VII. Outstanding Policy Issues

There are no outstanding policy issues regarding this action.

VIII. Enforcement

The Navy can and will perform the proposed response promptly and properly.

IX. Recommendation

This Action Memorandum documents the selected removal action for waste and impacted soil at Site 24, WPNSTA Yorktown, in Yorktown, Virginia, developed in accordance with CERCLA, as amended, and consistent with the NCP. This decision is based on the results of earlier investigations and evaluations documented in the Administrative Record file for WPNSTA Yorktown.

Conditions at the site meet the NCP section 300.415(b)(2) criteria for a removal action. Naval Facilities Engineering Command Mid-Atlantic, in cooperation with USEPA Region 3 and VDEQ, recommends approval of the proposed removal action. If approved, the total project ceiling will be $3,920,000 (using +50 percent of the cost estimate as provided in the EE/CA). The response action is due to the potential threat to human health and the environment from conditions at Site 24.

X. References

Baker Environmental, Inc. (Baker). 1996. *Final Site Screening Process Report for Site Screening Areas 1, 6, 7, and 15, Naval Weapons Station Yorktown, Yorktown, Virginia.* March.

C.C. Johnson & Associates, Inc. and CH2M HILL (Johnson/CH2M HILL). 1984. *Initial Assessment Study of Naval Weapons Station Yorktown, Yorktown, Virginia.* July.

CH2M HILL and Baker Environmental, Inc. (CH2M HILL/Baker). 2008. *Round One Remedial Investigation Report For Sites 23, 24, 25, and 26, Naval Weapons Station Yorktown, Yorktown, Virginia.* Revised Draft Final. February.

CH2M HILL. 2014. *Final Remedial Investigation Report, Site 24, Naval Weapons Station Yorktown, Yorktown, Virginia.* April.

Naval Facilities Engineering Command (NAVFAC). 2006. *Navy Environmental Restoration Program Manual.*

Department of the Navy (Navy). 2006. *Department of Navy Environmental Restoration Program Manual.* November.

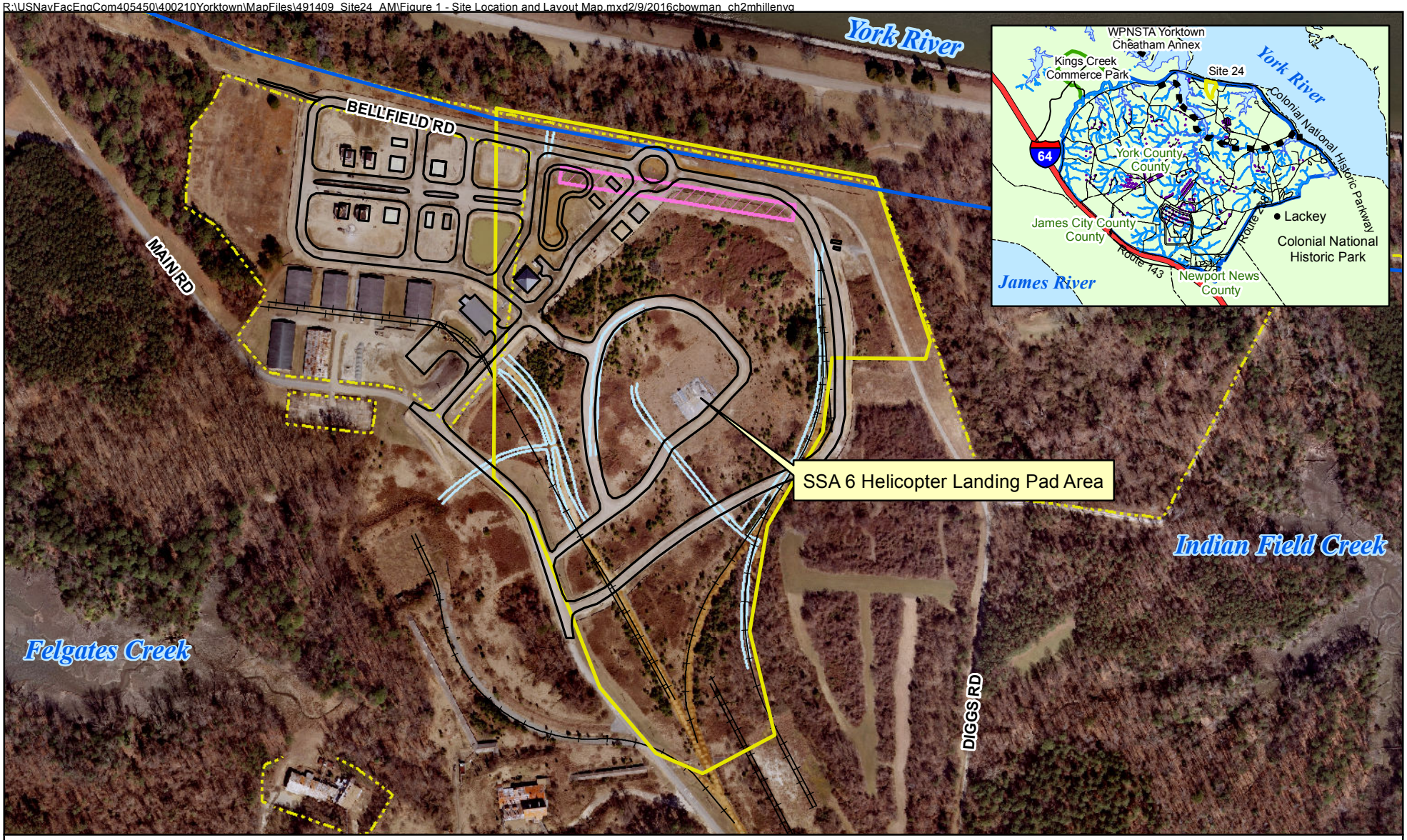
Shaw Environmental and Infrastructure (Shaw). 2008. *Final Construction Completion Report for Site 6 Bioremediation, Naval Weapons Station Yorktown, Yorktown, Virginia.* October.

United States Environmental Protection Agency (USEPA). 1993. *Guidance on Conducting Non-Time Critical Removal Actions Under CERCLA,* PB93-963402. August.

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

Figures

R:\USNavFacEngCom405450\400210Yorktown\MapFiles\491409_Site24_AM\Figure 1 - Site Location and Layout Map.mxd2/9/2016cbowman_ch2mhillenvg



Legend

- Fences
- Former Railroad Tracks
- Drainage Swales
- Yorktown Base Boundary
- Site 24, the Aviation Field, Investigation Area (former SSA 6 Helicopter Landing Pad)
- Former Site 6 Bioremediation Treatment Cell Location (removed in 2006)
- JIEDDO Battle Course

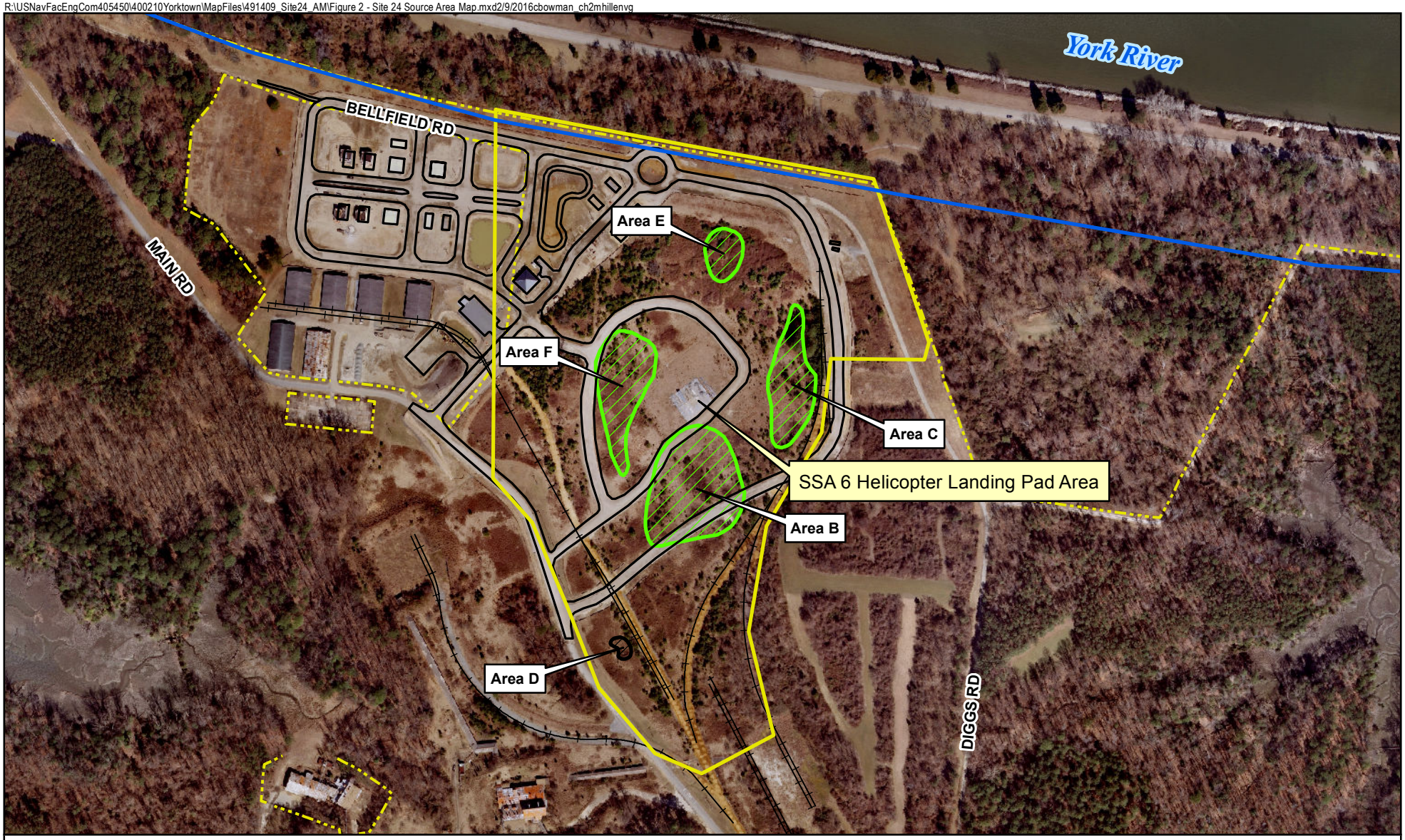
N
W E
S

0 200 400
Feet

Figure 1
Site Location and Layout Map
Site 24 Action Memorandum
Naval Weapons Station Yorktown
Yorktown, Virginia

ch2m

R:\USNavFacEngCom405450\400210Yorktown\MapFiles\491409_Site24_AM\Figure 2 - Site 24 Source Area Map.mxd2/9/2016cbowman_ch2mhillenvg



Legend

- Fences
- Former Railroad Tracks
- Magnetic Anomalies
- Black Sludge-like Material
- Yorktown Base Boundary
- Site 24, the Aviation Field, Investigation Area (former SSA 6 Helicopter Landing Pad)
- JIEDDO Battle Course

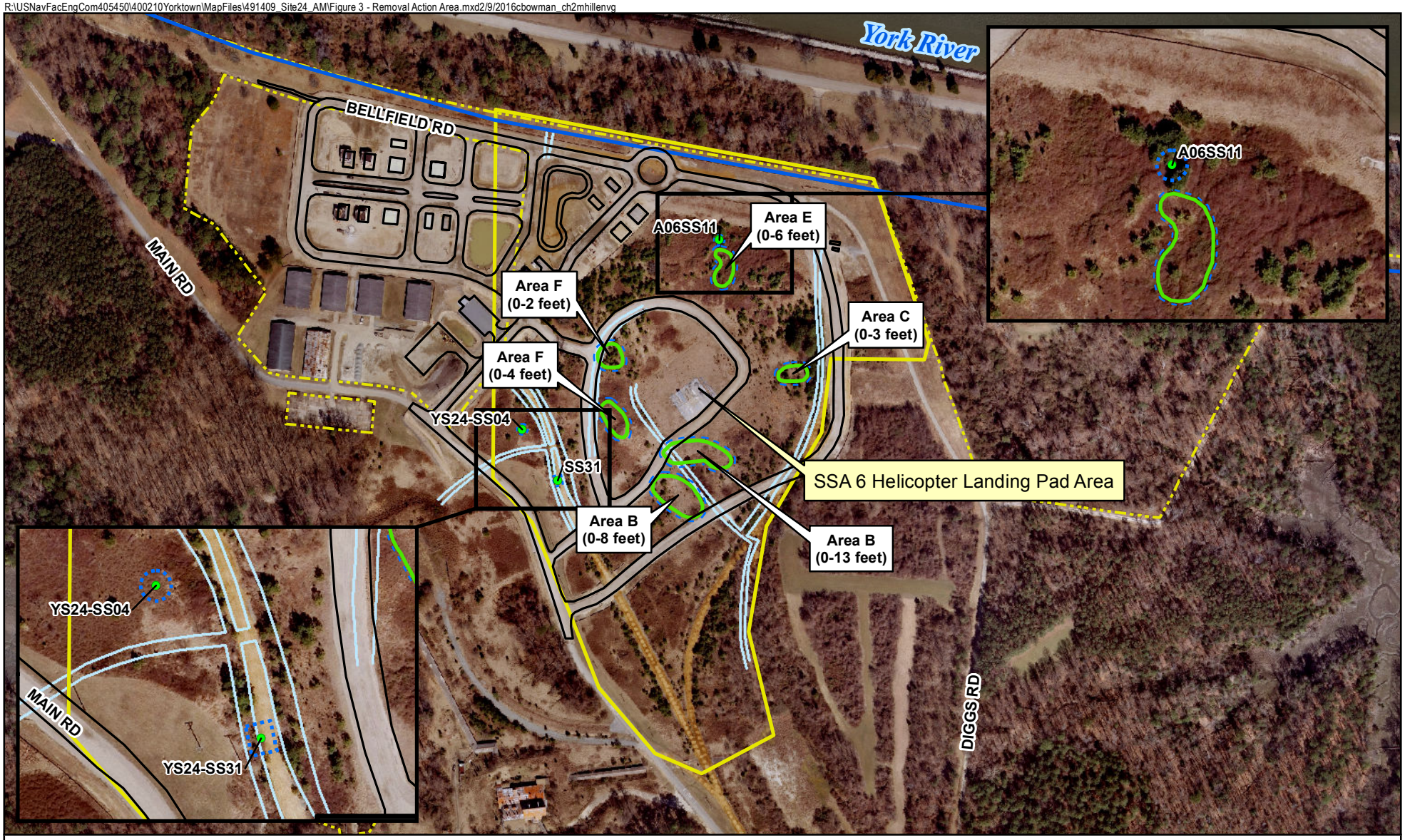
N
W E
S

0 200 400
Feet

Figure 2
Site 24 Source Area Map
Site 24 Action Memorandum
Naval Weapons Station Yorktown
Yorktown, Virginia

ch2m

R:\USNavFacEngCom405450\400210Yorktown\MapFiles\491409_Site24_AM\Figure 3 - Removal Action Area.mxd2/9/2016cbowman_ch2mhillenvg



Legend

- Surface Soil Sample Locations (0-6 inches)
- Waste Disposal Areas
- Approximate Extent of Excavation
- Drainage Swales
- Fences
- Yorktown Base Boundary
- Site 24, the Aviation Field, Investigation Area (former SSA 6 Helicopter Landing Pad)
- JIEDDO Battle Course

N
W E
S

0 200 400
Feet

Figure 3
Removal Action Area
Site 24 Action Memorandum
Naval Weapons Station Yorktown
Yorktown, Virginia

ch2m

Attachment 1
Final EE/CA for Site 24 – Aviation Field

Final

Engineering Evaluation/Cost Analysis
Site 24 — Aviation Field

Naval Weapons Station Yorktown
Yorktown, Virginia

Contract Task Order WE90

July 2015

Prepared for

Department of the Navy
Naval Facilities Engineering Command
Mid-Atlantic

Under the

NAVFAC CLEAN 8012 Program
Contract N62470-11-D-8012

Prepared by

CH2MHILL

Virginia Beach, Virginia

Executive Summary

This report presents an Engineering Evaluation and Cost Analysis (EE/CA) for a non-time-critical removal action (NTCRA) at Site 24, Naval Weapons Station (WPNSTA) Yorktown, Yorktown, Virginia. Site 24, the Aviation Field, is located in the northern portion of WPNSTA Yorktown and consists of approximately 14 acres of mixed brush, small trees, and gravel roads surrounding a helicopter landing-pad. Previous site investigations at Site 24 have identified potential unacceptable risks to human health and the environment posed by exposure to waste and impacted soil in six discontinuous waste disposal areas and impacted surface soil in three isolated "hotspot" areas.

The goals of the EE/CA are to present the objective of the removal action, identify removal action alternatives to achieve those objectives, and evaluate the effectiveness, implementability, and cost of those alternatives. The removal action objective is to prevent direct exposure to waste and contaminants posing unacceptable risks in surface and subsurface soil by human and ecological receptors.

The following three removal action alternatives were identified and evaluated:

1. No action: No action would be conducted; the site would remain "as is."
2. Soil Cover: Construction of a soil cover over the waste and impacted soil posing potential human health risks within six discontinuous disposal areas and three isolated hotspot areas posing potential ecological risks at Site 24. Additional future actions would include periodic inspections and maintenance of the soil cover, implementation of land use controls to prevent unauthorized disturbance of the cover, Five-Year Reviews to ensure that the remedy remains protective of human health and the environment, and groundwater long-term monitoring in conjunction with the Five-Year Reviews to ensure that contaminants from impacted soil and waste are not leaching into groundwater.
3. Excavation and Offsite Disposal: Excavation of waste and impacted soil from the six discontinuous disposal areas and impacted surface soil from the three isolated hotspot areas to depths ranging from 2 to 13 feet below the ground surface, offsite disposal of the excavated material, post-excavation confirmation sampling, and backfilling the excavation areas with clean fill material.

Alternative 1 does not meet the objective of the removal action; however, it is provided as a basis for comparison. Alternatives 2 and 3 are comparable in their ability to protect human health and the environment, ability to achieve the removal action objective, ease of implementability, and compliance with applicable, relevant, and appropriate requirements. Alternative 2 is less expensive than Alternative 3; however, because waste and impacted soil posing a potential risk to human health and the environment would be left in place under Alternative 2, there is a greater magnitude of risk remaining after installation of the soil cover, such that land use controls, operation and maintenance, groundwater long-term monitoring, and Five-Year Reviews would be required to ensure the remedial action remains protective over time. Therefore, the recommended removal action alternative is Alternative 3, because it results in the complete removal of waste and impacted soil and allows for unlimited use and unrestricted exposure following completion of a no action Record of Decision.

In accordance with the National Oil and Hazardous Substance Pollution Contingency Plan, this EE/CA will be placed in the Administrative Record and notice of its availability for public review, along with a brief summary of the EE/CA, will be published in the local newspaper. The EE/CA will then be available for review during a 30-day public comment period. A public information session may be held during or immediately following the public comment period, if requested. Following the public comment period, if comments are received, a Responsiveness Summary documenting responses to significant comments will be prepared and included in an Action Memorandum, which will be placed in the Administrative Record.

Contents

Executive Summary ..... **iii**

Acronyms and Abbreviations ..... **vii**

1 Introduction **1-1**
1.1 Regulatory Background 1-1
1.2 Purpose and Objectives 1-2

2 Site Characterization **2-1**
2.1 Site Background 2-1
2.1.1 Naval Weapons Station Yorktown 2-1
2.1.2 Site 24 2-1
2.2 Summary of Previous Investigations 2-2
2.2.1 Initial Assessment Study (1984) 2-2
2.2.2 Site Screening Process (Baker, 1996) 2-2
2.2.3 Draft Round One Remedial Investigation (Final version never submitted) 2-3
2.2.4 Remedial Investigation Report (CH2M HILL, 2014) 2-3
2.2.5 Risk Summary 2-4
2.2.6 Nature and Extent of Contamination 2-6
2.3 Determination of Removal Action Areas 2-6
2.3.1 Discontinuous Waste Disposal Areas 2-6
2.3.2 Isolated Hot Spot Areas 2-6
2.4 Development of Cleanup Goals 2-7

3 Identification of Removal Action Objectives **3-1**
3.1 Statutory Limits on Removal Action 3-1
3.2 Removal Action Objective 3-1
3.3 Determination of Removal Action Schedule 3-1
3.4 Applicable or Relevant and Appropriate Requirements 3-1
3.5 General Disposal Requirements 3-2

4 Description and Evaluation of Removal Action Alternatives **4-1**
4.1 Description of Removal Action Alternatives 4-1
4.1.1 Alternative 1: No Action 4-1
4.1.2 Alternative 2: Soil Cover 4-1
4.1.3 Alternative 3: Excavation and Offsite Disposal 4-2
4.2 Evaluation of Alternatives 4-4
4.2.1 Evaluation Criteria 4-4
4.2.2 Effectiveness 4-4
4.2.3 Implementability 4-4
4.2.4 Cost 4-5
4.2.5 Evaluation of Alternatives 4-5

5 Comparative Analysis of Removal Action Alternatives **5-1**
5.1 Effectiveness 5-1
5.2 Implementability 5-1
5.3 Cost 5-1

6 Recommended Removal Action Alternative **6-1**

7 References **7-1**

Appendixes

A Historical Aerial Photographs
B Applicable or Relevant and Appropriate Requirements Tables
C Cost Estimates

Tables

2-1 Risk Summary for Site Management
2-2 Calculation of Human-Health Based Soil Preliminary Remediation Goals
2-3 Summary of Human-Health Based Soil Preliminary Remediation Goals for Soil Removal in Areas B, C, E, and F
2-4 Summary of Ecological Based Soil Preliminary Remediation Goals for Hotspot Soil Removal
4-1 Evaluation of Removal Action Alternatives
5-1 Removal Action Alternative Comparison

Figures

2-1 Site Location and Layout Map
2-2 Site 24 Source Area Map
2-3 Pre-2010 Remedial Investigation Sample Locations
2-4 Comprehensive Test Pit Locations
2-5 Comprehensive Soil Sample Locations
2-6 Comprehensive Drainage Ditch Soil Sample Locations
2-7 Conceptual Site Model
2-8 Proposed Removal Action Areas
4-1 Proposed Removal Action Alternatives Layout

Acronyms and Abbreviations

AR	Administrative Record
ARAR	applicable or relevant and appropriate requirement
ASTM	American Society for Testing and Materials
bgs	below ground surface
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CFR	Code of Federal Regulations
COC	constituent of concern
E&S	erosion and sediment
EE/CA	Engineering Evaluation and Cost Analysis
ER	environmental restoration
ERA	ecological risk assessment
FS	Feasibility Study
ft^2	square foot/feet
HHRA	human health risk assessment
HI	hazard index
IAS	Initial Assessment Study
JIEDDO	Joint Improvised Explosive Device Defeat Organization
LTM	long-term monitoring
LUC	land use control
mg/kg	milligram(s) per kilogram
NAVFAC	Naval Facilities Engineering Command
Navy	Department of the Navy
NCP	National Oil and Hazardous Substance Pollution Contingency Plan
NTCRA	non-time-critical removal action
O&M	operation and maintenance
PCB	polychlorinated biphenyl
PRG	preliminary remediation goal
RI	Remedial Investigation
RSL	regional screening level
SARA	Superfund Amendments and Reauthorization Act
SSA	site screening area
SSP	site screening process
SVOC	semivolatile organic compound
TAT	turnaround time
TNT	trinitrotoluene
TPH	total petroleum hydrocarbons
USEPA	United States Environmental Protection Agency
VDEQ	Virginia Department of Environmental Quality
VOC	volatile organic compound
WPNSTA	Naval Weapons Station
yd^3	cubic yard

SECTION 1

Introduction

This report presents an Engineering Evaluation and Cost Analysis (EE/CA) for a non-time-critical removal action (NTCRA) to address potential unacceptable human health risks from exposure to contaminants in surface and subsurface soil, as well as subsurface debris, and potential unacceptable ecological risks from exposure to contaminants in localized, spatially limited areas of surface soil at Site 24, Aviation Field, Naval Weapons Station (WPNSTA) Yorktown, Yorktown, Virginia. Site investigations have indicated that groundwater and drainage ditch soil, except for the isolated drainage ditch surface soil hotspot (YS24-SS31), require no further action; therefore, these media will not be addressed by this EE/CA. This EE/CA has been prepared under the Naval Facilities Engineering Command (NAVFAC) Atlantic Comprehensive Long-term Environmental Action – Navy Contract N62470-11-D-8012, Contract Task Order WE90.

The following information is presented within this EE/CA:

- Site characterization summary
- Identification of the removal action objective
- Schedule for the removal action
- Description of removal action elements
- Identification of the removal action alternatives and technologies
- Recommendation of a preferred removal action alternative

1.1 Regulatory Background

This document is issued by the Department of the Navy (Navy), the lead agency responsible for environmental remediation at Site 24, in partnership with the United States Environmental Protection Agency (USEPA) Region III and the Virginia Department of Environmental Quality (VDEQ), under Section 104 of the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) and the Superfund Amendments and Reauthorization Act (SARA) of 1986.

Section 104 of CERCLA and SARA allow an authorized agency to provide for remedial action and to remove, or arrange for removal of, hazardous substances, pollutants, or contaminants at any time, or to take any other response measures consistent with the National Oil and Hazardous Substance Pollution Contingency Plan (NCP) as deemed necessary to protect public health or welfare and the environment. The NCP, Title 40 of the Code of Federal Regulations (CFR), Section 300, provides regulations for implementing CERCLA and SARA and regulations specific to removal actions. The NCP defines a removal action as:

> [The] *cleanup or removal of released hazardous substances from the environment, such actions as may be necessary to monitor, assess, and evaluate the threat of release of hazardous substances; the disposal of removed material; or the taking of such other actions as may be necessary to prevent, minimize, or mitigate damage to the public health or welfare or to the environment, which may otherwise result from a release or threat of release.*

An NTCRA is being considered for Site 24 to mitigate potential unacceptable human health risks from exposure to contaminants in surface and subsurface soil, as well as subsurface debris, and potential unacceptable ecological risks from exposure to contaminants in localized, spatially limited areas of surface soil. NTCRAs are defined in 40 CFR 300.415(b)(4) as “actions pertaining to an imminent threat to human health and the environment […] that have planning periods of 6 months or more.” Under 40 CFR 300.415, the lead agency is required to conduct an EE/CA when an NTCRA is planned for a site. The goals of an EE/CA are to identify the objectives of the removal action and to analyze the effectiveness, implementability, and cost of various alternatives that may satisfy these objectives. An EE/CA documents the removal action alternatives and selection process. Where the extent of the contamination is well-defined and limited in extent, NTCRAs also allow for the expedited cleanup of sites under CERCLA.

Community involvement requirements for NTCRAs include making the EE/CA available for public review and a comment period of 30 days. An announcement of the public review and comment period is required in a local newspaper. Written responses to significant comments will be summarized in a Responsiveness Summary that will be included in an Action Memorandum, which will be placed in the Administrative Record (AR) file for WPNSTA Yorktown.

1.2 Purpose and Objectives

Submittal of this EE/CA is the first step in fulfilling the requirements for NTCRAs defined by CERCLA, SARA, and the NCP. This EE/CA has been prepared in accordance with USEPA's guidance document *Guidance on Conducting Non-Time-Critical Removal Actions Under CERCLA* (USEPA, 1993). The purposes of this EE/CA are to:

- Satisfy environmental review and public information requirements for removal actions
- Satisfy AR requirements for documenting the removal action selection
- Provide a framework for evaluating and selecting removal action alternative technologies

The objective of the removal action is to implement measures to mitigate potential unacceptable risks to human health receptors from exposure to contaminants in surface and subsurface soil, as well as subsurface debris, and potential unacceptable risks to ecological receptors from exposure to contaminants in localized, spatially limited areas of surface soil at Site 24. Site investigations have indicated that groundwater and drainage ditch soil, except for the isolated drainage ditch surface soil hotspot (YS24-SS31), require no further action; therefore, these media will not be addressed by this EE/CA.

This EE/CA compares and evaluates the following three removal action alternatives based on their technical feasibility, ability to protect human health and the environment, ability to prevent the potential continued or future release of hazardous constituents, and cost:

- **Alternative 1**—No Action
- **Alternative 2—**Soil Cover
- **Alternative 3—**Excavation and Offsite Disposal

SECTION 2

Site Characterization

This section provides background information on the facility and Site 24, including environmental activities that have taken place at Site 24, focusing on soil and subsurface debris.

2.1 Site Background

2.1.1 Naval Weapons Station Yorktown

WPNSTA Yorktown is a 10,624-acre installation located on the Virginia Peninsula in York and James City counties and the city of Newport News, Virginia (**Figure 2-1**). 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 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 trinitrotoluene (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 United States WPNSTA. 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.

Comprehensive Environmental Restoration (ER) activities at WPNSTA Yorktown began in 1984 under the Navy Assessment and Control of Installation Pollutants and ER Program. On October 15, 1992, WPNSTA Yorktown was added to the National Priorities List, which required all subsequent ER activities to be conducted under CERCLA. The Navy and USEPA executed a Federal Facilities Agreement in August 1994, which incorporated the Resource Conservation and Recovery Act Solid Waste Management Units and identified 16 sites.

2.1.2 Site 24

Site 24, the Aviation Field, consists of approximately 14 acres of an open, grassy field surrounding an inactive helicopter landing pad in the northern portion of WPNSTA Yorktown, just south of the York River (**Figure 2-1**). The site is bounded by the WPNSTA Yorktown installation fence line to the north, former railroad tracks to the east, and Main Road to the south. A Joint Improvised Explosive Device Defeat Organization (JIEDDO) battle course (formerly storage areas) is located in the western portion of the site and along the western perimeter of the site (**Figure 2-1**). The Site 24 boundary is consistent with the Site Screening Area (SSA) 6 Helicopter Landing Pad Area, as identified in the Site Screening Process (SSP) report (Baker, 1996). Existing structures at Site 24 include a concrete helicopter landing pad and several gravel roads that connect to the JIEDDO battle course (**Figure 2-1**). Railroad tracks that were once present onsite have been removed; however, the stone beds used as the foundation for the tracks remain. A bioremediation cell (**Figure 2-1**), constructed on the northern side of the site in 1999 to treat contaminated soil and sediment from nearby Site 6, and it was removed from Site 24 in December 2006 once treatment activities were completed (Shaw, 2008).

Site 24 was historically used as an aviation field, consisting of airplane hangars and runways, until 1927. After World War I, the site was reportedly used for storing munitions until they were recovered and used during World War II. Site 24 was also used until the mid-1980s for storing and burying miscellaneous materials, including munitions debris, rocket motor casings, batteries, cables, parachutes, and metal and construction debris. Burning of explosives-contaminated waste and other Base waste may also have occurred at the site. The primary source of contamination at Site 24 is associated with the disposal/burial areas (Areas B, C, E and F [**Figure 2-2**]). Impacts to

site media could also be associated with a small area with black sludge-like material of unknown origin on the ground surface (Area D).

A review of historical photographs confirmed the reported past site activities (CH2M HILL, 2010). An undated photograph (**Appendix A**) provided by USEPA appears to be the earliest picture of the site, based on the presence of airplane hangars that are absent in a photograph taken in 1945 and historical accounts of site use. The undated photograph shows the northeast portion of the site and contains a number of unknown structures with an aerial sign that reads "TNT DANGER." Although it is not known what these structures are or what they were used for, it is speculated that they are aboveground TNT caches, as implied by the aerial sign. In addition, because of uncertainties surrounding this photograph (date, photographer's location, etc.), it is not possible to precisely identify the former locations of the structures except to indicate that they are located in the northeast corner of the site, based on the location of Bellfield Road in the photograph. By 1945, these structures had been removed. No further significant changes were observed in a photograph taken in 1951, but the 1963 photograph showed that a variety of storage containers were present throughout the northern portion of the site. Land disturbance was also visible in the vicinity of the present-day helicopter pad. Increased storage and land disturbance were observed in a 1968 photograph. A 1972 photograph depicts a reduction in storage corresponding with an increase in land disturbance within the site area. By the time a photograph was taken in 1981, the storage containers had been limited to the western storage area (outside of the Site 24 boundary), and the area where land disturbance was previously observed had been restored. In addition, the existing helicopter landing pad had been constructed. Other than increased vegetation, no significant environmental changes were observed in the 1981 and 1993 photographs.

2.2 Summary of Previous Investigations

2.2.1 Initial Assessment Study (1984)

The Initial Assessment Study (IAS) at WPNSTA Yorktown was documented in the report titled *Initial Assessment Study of Naval Weapons Station Yorktown, Virginia* (C.C. Johnson & Associates, Inc. and CH2M HILL, 1984). The IAS was conducted to identify and assess sites posing a potential threat to human health and the environment due to contamination from previous waste management activities, which included the Aviation Field (identified as Site 14 in the IAS, a portion of which is included within the Site 24 study area). Activity records relating to waste generation, handling, and disposal were reviewed; physical conditions at the site were characterized; and migration pathways and potential receptors were identified. The IAS concluded that the burning of explosives, and possibly Base wastes, may have occurred in the vicinity of the current helicopter landing pad area for a very short time in the 1930s, and that no known or suspected hazardous wastes were present at the site.

2.2.2 Site Screening Process (Baker, 1996)

Following completion of the IAS, the Aviation Field (Site 14) was renamed SSA 6. An SSP was conducted at SSA 6 to investigate whether conditions at SSA 6 and other SSAs warranted initiation of the Remedial Investigation/Feasibility Study (RI/FS) process. SSA 6 consisted of the SSA 6 Storage Area, the SSA 6 Sludge Disposal Area, and the SSA 6 Helicopter Landing Pad Area (currently Site 24). Results from two surface soil samples collected in 1990, north of Buildings 407 and 408 (within the former Site 14 study area), a 1994 geophysical survey, and 1994 SSP sampling activities (**Figure 2-3**) were included in the SSP and are discussed as follows.

1990 Surface Soil Samples

Two surface soil samples (Samples A and B) were collected from the SSA 6 Storage Area, north of Buildings 407 and 408. The two samples were analyzed for mercury and polychlorinated biphenyls (PCBs). Mercury was not detected in either surface soil sample. Aroclor-1254 was detected at concentrations of 4.4 milligrams per kilogram (mg/kg) and 2.1 mg/kg, which exceeded the 1993 USEPA risk-based concentration of 0.74 mg/kg; however, additional investigation efforts in this area were not recommended.

1994 Surface Geophysical Survey

In 1994, a geophysical survey was conducted to identify areas of buried debris and fill material (**Figure 2-2**). With the use of electromagnetic terrain conductivity, magnetometry, and ground-penetrating radar techniques, four major disposal areas (Areas B, C, E, and F), one minor disposal area (Area G), and one area of black sludge-like material (Area D) were identified within the SSA 6 Helicopter Landing Pad Area (currently Site 24). The geophysical survey did not include the SSA 6 Storage Area because of interference caused by surface metal (debris piles and buildings) or the SSA 6 Sludge Disposal Area (Area A) because of heavy vegetation.

1994 SSP Field Activities

As part of the 1994 SSP field activities, nine test pits were excavated and 28 surface soil samples, 54 subsurface soil samples, and 10 hydropunch groundwater samples were collected from SSA 6 (**Figure 2-3**).

Test pits were excavated in each of the disposal areas identified during the surface geophysical survey (Areas B, C, E, F, and G), as well as in two additional areas identified as possible burial areas by WNPSTA Yorktown employees (Areas H and I). Buried materials, including metal banding, pipes, metal grating, wire, and inert ordnance components (activating devices and rocket motor casings), were identified between 2 and 13 feet below ground surface (bgs) within the Helicopter Landing Pad Area (Areas B, C, E, and F). Metal banding and strapping were identified between the ground surface and 1.5 feet bgs within the SSA 6 Storage Area (Area H). No buried debris was identified within Areas G and I.

Analytical results indicated the presence of volatile organic compounds (VOCs), semivolatile organic compounds (SVOCs), pesticides, PCBs, and inorganic constituents in soil (surface and subsurface) and groundwater samples. In general, however, identified potential risks were related to exposure to soil and groundwater within the SSA 6 Helicopter Pad Landing Area. As a result, further RI/FS efforts were recommended for the SSA 6 Helicopter Pad Landing Area. The SSA 6 Helicopter Pad Landing Area is now referred to as Site 24. In addition, no further action was recommended and subsequently approved by the USEPA and VDEQ for the SSA 6 Sludge Disposal Area and the SSA 6 Storage Area; therefore, no additional investigation activities were conducted at these sites and they are not discussed further in this EE/CA.

2.2.3 Draft Round One Remedial Investigation (Final version never submitted)

The Round One RI at Site 24, conducted in September 1997, consisted of a surface soil investigation to obtain information to be used in baseline Human Health Risk Assessments (HHRAs) and Ecological Risk Assessments (ERAs) and to further evaluate the nature of surface soil contamination at the site. The results of this investigation were documented in the *Draft Final Remedial Investigation Report for Sites 23, 24, 25, and* 26 (Draft Final RI report) (Baker, 2002). Five surface soil samples were collected from Site 24 during this investigation (**Figure 2-3**). Sample locations were just south and east of the test pits from which the soil samples with high concentrations of PCBs and cadmium were detected during the SSP investigation (TP02 and TP03). These data and the data collected during the SSP were used to conduct HHRAs and ERAs; however, during the August 2007 WPNSTA Yorktown Partnering Meeting, the Navy decided that the investigation efforts conducted during the Round One RI were insufficient to adequately characterize the nature and extent of contamination and to assess risks at Site 24. Consequently, the team recommended the removal of Site 24 from the Round One RI report and the collection of additional soil and groundwater data.

2.2.4 Remedial Investigation Report (CH2M HILL, 2014)

The Round Two RI at Site 24, during which field investigations were conducted in 2010 and 2013, consisted of delineating buried debris through test pitting (**Figure 2-4**); surface and subsurface soil sampling (**Figure 2-5**), including waste, below waste, and drainage ditch area sampling (**Figure 2-6**); monitoring well installation; groundwater monitoring and sampling; and hydraulic conductivity “slug” testing to characterize the nature and extent of buried debris and contamination in soil and groundwater; and to assess via an HHRA and ERA the potential risks posed by exposure to contamination by human and ecological receptors, respectively. The results of this investigation are documented in the *Final Remedial Investigation Report, Site 24* (CH2M HILL, 2014). The following investigation activities were conducted:

- Excavation of 69 test pits
- Collection of 3 surface soil samples from inside the disposal areas, and 18 surface soil samples from outside the disposal areas
- Collection of nine shallow subsurface soil samples, three deep subsurface soil samples from within the buried debris boundaries, eight deep subsurface soil samples from outside of the buried debris boundaries, and two test pit subsurface soil samples
- Collection of 10 drainage surface soil samples
- Installation and sampling of nine shallow and two deep monitoring wells
- Hydraulic conductivity "slug" testing

The results of the risk assessments showed that groundwater and drainage ditch soil do not pose potential unacceptable risk for human or ecological receptors and are not significant transport media for site-related constituents to the York River, Felgates Creek, or Indian Field Creek. Therefore, no further action is necessary to address groundwater and drainage ditch soil, except for the isolated drainage ditch surface soil hotspot (YS24-SS31) (CH2M HILL, 2014). These media will not be discussed further and are not addressed by this EE/CA.

The report recommended completing a NTCRA based on the potential unacceptable risks from exposure to waste materials and constituents of concern (COCs) in soil within the six discontinuous waste disposal areas and three small isolated areas with elevated mercury and arsenic in surface soil.

The HHRA identified potential cancer risks outside the waste disposal areas to hypothetical future lifetime residents exposed to hexavalent chromium in combined surface and subsurface soil. Within the waste disposal areas, potential unacceptable human health risk was assumed for contact with the waste material by all receptors, and the HHRA identified potential cancer risks to hypothetical future lifetime residents exposed to hexavalent chromium in combined surface and subsurface soil, as well as potentially unacceptable risks for child residents exposed to Aroclor-1254, aluminum, cadmium, and copper. The ERA concluded that for terrestrial habitats, risks for lower-trophic-level receptors (plants and invertebrates) were generally acceptable on a site-wide basis, particularly given the current and future land use (training facility). However, a few small, isolated areas with relatively high concentrations of mercury (area of sample A06SS-11) and arsenic (area of samples YS24-SS31 and YS24-SS04) in surface soil were identified. In these localized and spatially limited areas, risks to some lower trophic level receptors may exist but were not expected to result in unacceptable food web exposure risks.

2.2.5 Risk Summary

Human Health Risk Summary

A baseline HHRA was conducted to evaluate exposure to waste and chemical constituents in surface soil and combined surface and subsurface soil for the following human receptors: current/future industrial worker (conservatively representative of current military personnel using site for training activities), current/future trespasser/visitor (adult and adolescent), future resident (adult and child), and future construction worker.

Exposures and risks were evaluated separately for four soil exposure areas: soil samples collected from the waste areas, soil samples collected from the sludge area, soil samples collected from outside the waste (and sludge) area, and soil samples collected from across the entire site (including the waste area and area outside of the waste, but not the sludge area).

There are no unacceptable non-cancer hazards or cancer risks associated with current site use (which includes exposure to surface soil) for any of the four soil exposure areas.

Exposure to combined surface and subsurface soil within the waste areas could result in potentially unacceptable non-cancer hazards for future child residents. Although the future construction worker's total hazard index (HI) (HI = 4) and child resident's total HI (HI = 2) were greater than 1, when these are segregated by the target organ/critical effect, each HI is less than the USEPA's threshold of 1. Potential unacceptable cancer risks were identified for lifetime residents exposed to chromium (based on the assumption all detected chromium was

hexavalent chromium) in combined surface and subsurface soil within the waste areas. Samples collected during the RI were analyzed for total chromium. Trivalent chromium is most prevalent in the environment and is expected to reflect the majority of the total chromium concentration. Because trivalent chromium is not considered a potential carcinogen and trivalent chromium is the more prevalent form in the environment, the cancer risks based on the assumption that all detected chromium was hexavalent chromium is a conservative overestimate of risk. Furthermore, if all detected chromium is assumed to be trivalent, the lifetime resident cancer risk is within the USEPA acceptable risk range. Additionally, the detected total chromium concentrations in soil at Site 24 are consistent with background concentrations at WPNSTA Yorktown.

Potential unacceptable cancer risks were identified for future lifetime residents exposed to chromium (based on the assumption all detected chromium was hexavalent chromium) in combined surface and subsurface soil from outside the waste disposal areas. However, similar to the assessment of risk for exposure to soil within the waste disposal areas, there would be no unacceptable risk associated with exposure to chromium in site-wide soil if it were assumed that all detected chromium is trivalent. Non-cancer hazards for all receptors associated with exposure to combined surface and subsurface soil from outside the waste disposal areas were within acceptable levels.

There are no unacceptable non-cancer hazards or cancer risks associated with current or future exposure scenarios for the sludge area soils.

Exposure to site-wide soil (which includes surface and subsurface soil from the waste areas and areas outside of the waste, but not the sludge area) may result in unacceptable cancer risks for future lifetime residents associated with exposure to chromium, based on the assumption all detected chromium was hexavalent chromium. However, similar to the assessment of risk for exposure to soil within the waste disposal areas, there would be no unacceptable risk associated with exposure to chromium in site-wide soil if it were assumed that all detected chromium is trivalent.

Although there are potential non-cancer hazards associated with future child resident exposure to Aroclor-1254 and cadmium in site-wide soils, the highest concentrations across the site are associated with the waste area soil. Aroclor-1254 was only detected in samples from within the waste area. Cadmium was detected in samples from inside and outside the waste area; however, there were no exceedances of the soil residential regional screening level (RSL) for cadmium from samples outside of the waste disposal areas. Although the future construction worker's total HI (HI = 1) is equal to 1, when these are segregated by the target organ/critical effect, each HI is less than the USEPA's threshold of 1. Within the waste disposal areas, exposure by child (HI = 21) and lifetime residents (cancer risk = 3×10^{-4}) to combined surface and subsurface soil could result in potentially unacceptable risk associated with exposure to Aroclor-1254, aluminum, cadmium, and copper. Therefore, if a removal action focused on the waste disposal areas removed this soil, there would no longer be any unacceptable human health risk associated with exposure to soil across the site.

The COCs identified for the soil within the waste disposal areas were Aroclor-1254, aluminum, cadmium, and copper. Additionally, although not specifically evaluated, potential unacceptable human health risk was assumed for contact with the waste material by all receptors. The results of the baseline HHRA are summarized in **Table 2-1**.

Ecological Risk Summary

An ERA was conducted to evaluate exposure to waste and chemical constituents in surface soil for the following ecological receptors: lower–trophic-level receptors (plants and invertebrates) and upper-trophic- level receptors (birds and mammals).

Exposures and risks were evaluated separately for four soil exposure areas: soil samples collected from the waste areas, soil samples collected from the sludge area, soil samples collected from outside the waste (and sludge) area, and soil samples collected from drainage ditch soil.

The ERA concluded that for terrestrial habitats, risks for lower-trophic-level receptors are generally acceptable on a site-wide basis, particularly given the current and future land use (training facility). However, a few small,

isolated areas were identified with concentrations of mercury (4.7 mg/kg; area of sample A06SS-11) and arsenic (151 and 70.4 mg/kg; area of samples YS24-SS31 and YS24-SS04, respectively) in surface soil that exceeded their respective ecological screening values. In these localized, spatially limited "hot spot" areas, risks to some lower-trophic-level receptors may exist. Although there is no site-wide risk from the concentrations of either arsenic or mercury in the hot spot areas, the RI recommended addressing these areas during an NTCRA and the recommendation was agreed upon during the February 2012 Tier I Partnering Team meeting. There were no unacceptable risks associated with food web exposures.

2.2.6 Nature and Extent of Contamination

A graphical representation of the conceptual site model for Site 24 is shown in **Figure 2-7**.

Buried Debris

The results of pre-RI investigation activities, including geophysical surveying, soil sampling, and test pitting, indicated that buried debris was not located in Areas A, D, G, H, and I (**Figure 2-3**). RI test pitting activities indicated that the extent of buried debris has been delineated and is limited to six small (each with a footprint less than 2,000 square feet [ft^2]), discontinuous disposal areas (Disposal Areas B [north and south], C, E, and F [north and south]). Waste debris consisted of miscellaneous metal debris, metal banding material, inert ordnance debris, and empty and rusted 55-gallon drums. No ash was observed within any of the test pits.

Soil

Based on the potential unacceptable risks identified in the HHRA and ERA, action was only determined to be necessary for the human health-based site COCs (Aroclor-1254, aluminum, cadmium, and copper) in surface and subsurface soil within the six discontinuous disposal areas, and for two ecological risk-based COCs (arsenic and mercury) in the three localized, spatially limited soil hotspots with elevated concentrations that may pose risks to lower-trophic-level ecological receptors (plants and soil invertebrates).

2.3 Determination of Removal Action Areas

The following areas have been identified for this removal action:

2.3.1 Discontinuous Waste Disposal Areas

A total of six discontinuous waste disposal areas were identified during the RI as posing potential human health risks from exposure to site COCs (Aroclor-1254, aluminum, cadmium, and copper) in surface and subsurface soil. The vertical and horizontal extents of waste within these discontinuous waste disposal areas to be addressed under this NTCRA have been adequately delineated during the Site 24 RI and consist of the limits of waste shown on **Figure 2-8**. The total footprint area and volume of the six discontinuous waste disposal areas are 40,570 ft^2 (0.93 acres) and 11,267 cubic yards (yd^3), respectively. The total volume does not include additional excavation for sloping of the removal areas for excavations deeper than 5 feet bgs. The excavation depths and total footprint areas for the six discontinuous waste disposal areas are listed below:

- Area B – 0 to 13 feet bgs 10,960 ft^2
- Area B – 0 to 8 feet bgs 11,555 ft^2
- Area C – 0 to 3 feet bgs 4,190 ft^2
- Area E – 0 to 6 feet bgs 4,645 ft^2
- Area F – 0 to 2 feet bgs 4,010 ft^2
- Area F – 0 to 4 feet bgs 5,210 ft^2

2.3.2 Isolated Hot Spot Areas

A total of three isolated hot spot areas, with elevated concentrations of arsenic and mercury, have been identified during the RI as potentially posing risks to lower-trophic-level ecological receptors (plants and soil invertebrates) in surface soil. The locations of the three isolated hot spot areas are shown on **Figure 2-8**. For two of the areas (A06SS04 and YS24-SS04), the extent of the removal area is approximately 707 ft^2 (assuming a 15-foot radius around the sample location) at a depth of 2 feet bgs, for a total volume of 105 yd^3. For the isolated area in the

drainage ditch (YS24-SS31), the initial extent of the removal area is approximately 750 ft^2 (assuming the drainage ditch is 25 feet wide and that soil removal extends 15 feet upgradient and 15 feet downgradient of the sample location) at a depth of 2 feet bgs, for a total volume of 56 yd^3.

2.4 Development of Cleanup Goals

To meet the removal action objective, preliminary remediation goals (PRGs) were established. The human-health-based PRGs for the site COCs were calculated and are summarized in **Tables 2-2 and 2-3**, respectively. The calculations in **Table 2-2** are based on the site-specific exposure data presented in the HHRA. The ratio between the target carcinogenic risk and the calculated carcinogenic risk or the target HI and calculated HI for a specific receptor due to a specific chemical (from the HHRA) was used to calculate the PRG. The ratio is multiplied by the exposure point concentration (from the HHRA) to calculate the PRG. The residential PRGs shown in **Table 2-3** were chosen for the human-health based PRGs. The human-health based PRGs summarized in **Table 2-3** are applicable for the six discontinuous disposal areas.

The PRGs for the areas of elevated mercury and arsenic concentrations are ecologically based and are summarized in **Table 2-4**. The PRG for arsenic is based on the ecological screening values (terrestrial plants), whereas the PRG for mercury is based on the maximum surface soil background concentration, which exceeded the ecological screening values.

Table 2-1

Risk Summary for Site Management

Site 24 Engineering Evaluation/Cost Analysis

Naval Weapons Station Yorktown

Yorktown, Virginia

Media	Industrial	Construction	Adult Resident	Child Resident	Lifetime Resident
Waste Area Soils	HI < 1	Target Organ HI's<1	Target Organ HI's < 1	HI = 21 (Aroclor-1254, Aluminum, Cadmium, and Copper)	N/A
	CR within acceptale range	CR within acceptable range	N/A	N/A	CR = $3x10^{-4}$ (chromium)
Sludge Area Soils	HI<1	HI < 1	HI < 1	HI < 1	N/A
	CR within acceptale range	CR within acceptable range	N/A	N/A	CR within acceptable range
Site Wide Soils	HI<1	Target Organ HI's<1	HI < 1	HI = 6 (Aroclor-1254 and cadmium)	N/A
	CR within acceptale range	CR within acceptable range	N/A	N/A	CR = $2x10^{-4}$ (chromium)
Outside Waste Area Soils	HI < 1	HI < 1	HI < 1	HI = 1	N/A
	CR within acceptable range	CR within acceptable range	N/A	N/A	CR = $2x10^{-4}$ (chromium)

HI = Hazard Index

CR = Cancer Risk

N/A = Not Applicable

*No unacceptable groundwater risks

*No unacceptable risk to tresspasser/visitor

TABLE 2-2

Calculation of Human-Health Based Soil Preliminary Remediation Goals

Site 24 Engineering Evaluation/Cost Analysis

WPNSTA Yorktown

Yorktown, Virginia

Residential Child, Noncarcinogenic based PRG

Chemical	Exposure Point Concentration[1] (mg/kg)	Hazard Quotient[1]				PRG - 0.1 (mg/kg)	PRG - 1.0 (mg/kg)	PRG - 3.0 (mg/kg)	target organ	Target HQ[2]	Recommended PRG[2]
		Inh	Ing	Der	Total						
Aroclor-1254	1.2E+01	--	7.4E+00	2.9E+00	1.0E+01	1.1E-01	1.1E+00	3.4E+00	Ocular, Finger and Toe Nails	1	1.1E+00
Aluminum	9.0E+04	--	1.1E+00	3.2E-02	1.2E+00	7.6E+03	7.6E+04	2.3E+05	Neurological	1	7.6E+04
Cadmium	5.0E+02	--	6.4E+00	7.2E-01	7.2E+00	7.0E+00	7.0E+01	2.1E+02	Kidney	1	7.0E+01
Copper	5.2E+03	--	1.6E+00	4.6E-02	1.7E+00	3.0E+02	3.0E+03	9.1E+03	Gastrointestinal	1	3.0E+03

Lifetime Resident, Carcinogenic based PRG

Chemical	Exposure Point Concentration[3] (mg/kg)	Carcinogenic Risk[1]				PRG - 10^{-6} (mg/kg)	PRG - 10^{-5} (mg/kg)	PRG - 10^{-4} (mg/kg)	Target Risk[3]	Recommended PRG[3]
		Inh	Ing	Der	Total					
Aroclor-1254	1.2E+01	--	3.6E-05	1.6E-05	5.2E-05	2.2E-01	2.2E+00	2.2E+01	1.0E-05	2.2E+00
Aluminum	9.0E+04	--	N/A	N/A	N/A	N/A	N/A	N/A		N/A
Cadmium	5.0E+02	--	N/A	N/A	N/A	N/A	N/A	N/A		N/A
Copper	5.2E+03	--	N/A	N/A	N/A	N/A	N/A	N/A		N/A

Construction Worker, Noncarcinogenic based PRG

Chemical	Exposure Point Concentration[1] (mg/kg)	Hazard Quotient[1]				PRG - 0.1 (mg/kg)	PRG - 1.0 (mg/kg)	PRG - 3.0 (mg/kg)	target organ	Target HQ[2]	Recommended PRG[2]
		Inh	Ing	Der	Total						
Aroclor-1254	1.2E+01	--	9.1E-01	2.6E-01	1.2E+00	9.9E-01	9.9E+00	3.0E+01	Immune System	1	9.9E+00
Aluminum	9.0E+04	--	2.1E-01	4.4E-03	2.2E-01	4.2E+04	4.2E+05	1.3E+06	Neurological	1	4.2E+05
Cadmium	5.0E+02	--	1.2E+00	9.8E-02	1.3E+00	3.9E+01	3.9E+02	1.2E+03	Kidney	1	3.9E+02
Copper	5.2E+03	--	1.2E+00	2.5E-02	1.2E+00	4.2E+02	4.2E+03	1.3E+04	Gastrointestinal	1	4.2E+03

Construction Worker, Carcinogenic based PRG

Chemical	Exposure Point Concentration[1] (mg/kg)	Carcinogenic Risk[1]				PRG - 10^{-6} (mg/kg)	PRG - 10^{-5} (mg/kg)	PRG - 10^{-4} (mg/kg)	Target Risk[3]	Recommended PRG[3]
		Inh	Ing	Der	Total					
Aroclor-1254	1.2E+01	--	7.8E-07	2.2E-07	1.0E-06	1.2E+01	1.2E+02	1.2E+03	1.0E-05	1.2E+02
Aluminum	9.0E+04	--	NA	NA	N/A	N/A	N/A	N/A		N/A
Cadmium	5.0E+02	--	NA	NA	N/A	N/A	N/A	N/A		N/A
Copper	5.2E+03	--	N/A	N/A	N/A	N/A	N/A	N/A		N/A

Notes:

Der - Dermal

HQ - Hazard quotient

Inh - Inhalation

Ing - Ingesstion

mg/kg - Milligrams per kilogram

N/A - Not Applicable

PRG - Preliminary Remediation Goal

For noncarcinogens: PRG = (Exposure Point Concentration x Target Hazard Quotient)/ Total Hazard Quotient

For carcinogens: PRG = (Exposure Point Concentration x Target Risk)/Total Carcinogenic Risk

1. Exposure point concentrations, hazard quotients, and carcinogenic risks from human health risk assessment in April 2014 Yorktown Site 24 Final RI.
2. Target HQ chosen so that target organ/effect hazards do not exceed 1. Recommended PRG calculated using target HQ.
3. Target carcinogenic risk chosen so that total carcinogenic risk does not exceed 10^{-4}. Recommended PRG calculated using target HQ.

TABLE 2-3

Summary of Human-Health Based Preliminary Remediation Goals for Soil Removal in Areas B, C, E, and F

Site 24 Engineering Evaluation/Cost Analysis

WPNSTA Yorktown

Yorktown, Virginia

Constituent	Residential PRGs (mg/kg)	Basis of PRG	Construction Worker PRGs (mg/kg)	Basis of PRG	Selected PRGs (mg/kg)
Aroclor-1254	1.1E+00	HI = 1	1.7E+01	HQ = 1	**1.12**
Aluminum	7.6E+04	HI = 1	4.2E+05	HQ = 1	**76,084**
Cadmium	7.0E+01	HI = 1	3.9E+02	HQ = 1	**70**
Copper	3.0E+03	HI = 1	1.7E+04	HQ = 1	**3,043**

Notes:

CR = Cancer Risk

HI = Hazard Index

HQ = Hazard Quotient

mg/kg - Milligrams per kilogram

PRG - Preliminary Remediation Goal

TABLE 2-4

Summary of Ecological Based Preliminary Remediation Goals for Hotspot Soil Removal

Site 24 Engineering Evaluation/Cost Analysis

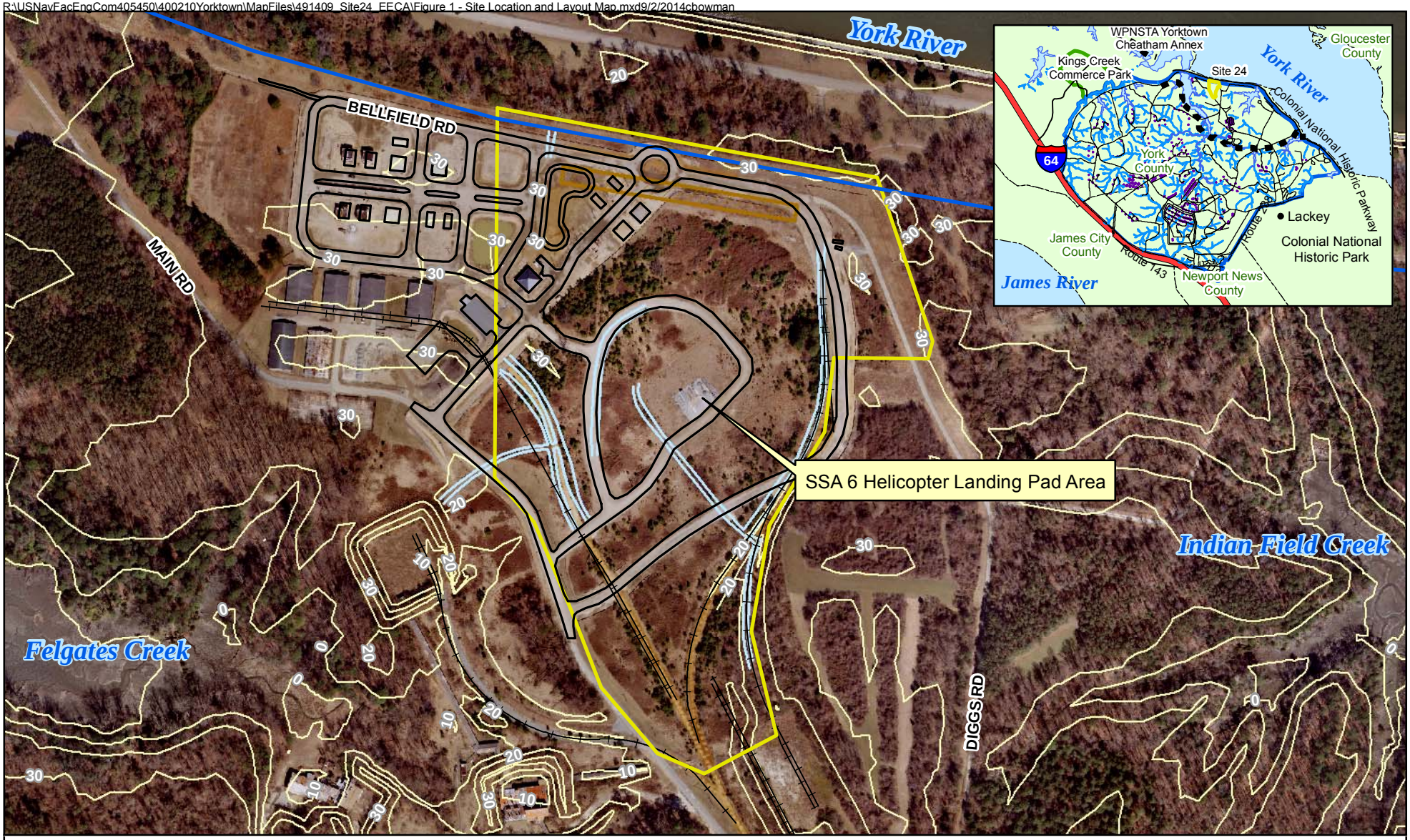
WPNSTA Yorktown

Yorktown, Virginia

Chemical	Ecological Soil Screening Value	Basis	Background - Surface Soil		Selected PRG[1]
			95% UTL	Maximum	
Metals (mg/kg)					
Arsenic	18.0	Eco-SSL (plant)	6.36	6.00	**18.0**
Mercury	0.10	ORNL (soil invertebrate)	0.11	0.24	**0.24**

Notes:
mg/kg - Milligrams per kilogram
PRG - Preliminary Remediation Goal
UTL - Upper tolerance limit
Eco-SS - Ecological sol screeing level
ORNL - Oak Ridge National Laboratory
[1] Applies only to soil within the 0 - 24 inch depth range

R:\USNavFacEngCom405450\400210Yorktown\MapFiles\491409_Site24_EECA\Figure 1 - Site Location and Layout Map.mxd9/2/2014cbowman



Legend

- Fences
- Former Railroad Tracks
- Elevation Contour (10 ft interval)
- Drainage Swales
- Yorktown Base Boundary
- Site 24, the Aviation Field, Investigation Area (former SSA 6 Helicopter Landing Pad)
- Former Site 6 Bioremediation Treatment Cell Location (removed in 2006)
- JIEDDO Battle Course

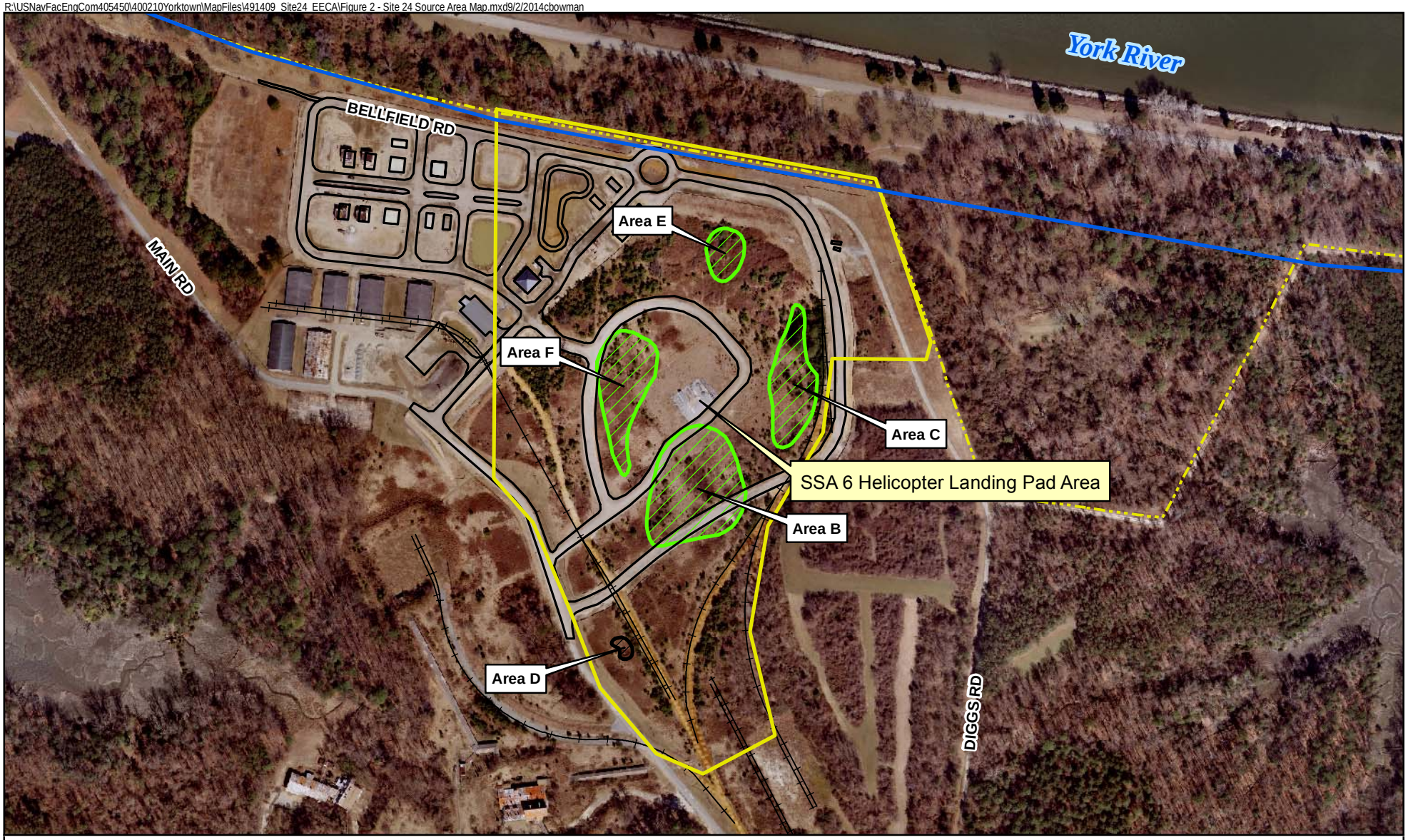
N
W E
S

0 200 400
Feet

Figure 2-1
Site Location and Layout Map
Site 24 Engineering Evaluation/Cost Analysis
Naval Weapons Station Yorktown
Yorktown, Virginia

CH2MHILL

R:\USNavFacEngCom405450\400210Yorktown\MapFiles\491409_Site24_EECA\Figure 2 - Site 24 Source Area Map.mxd9/2/2014cbowman



Legend

- Fences
- Former Railroad Tracks
- Magnetic Anomalies
- Black Sludge-like Material
- Yorktown Base Boundary
- Site 24, the Aviation Field, Investigation Area (former SSA 6 Helicopter Landing Pad)
- JIEDDO Battle Course

N
W E
S

0 200 400
Feet

Figure 2-2
Site 24 Source Area Map
Site 24 Engineering Evaluation/Cost Analysis
Naval Weapons Station Yorktown
Yorktown, Virginia

CH2MHILL

R:\USNavFacEngCom405450\400210Yorktown\MapFiles\491409_Site24_EECA\Figure 3 - Pre-2010 RI Sample Locations.mxd8/15/2014cbowman

Legend

- Yorktown Base Boundary
- Magnetic Anomalies (SSP, 1994)
- Black Sludge-like Material (SSP, 1996)
- SSA 6 Sludge Disposal Area (SSP, 1996)
- SSA 6 Boundary
- Site 14 Boundary (IAS, 1984)
- Site 24, the Aviation Field, Investigation Area (former SSA 6 Helicopter Landing Pad)
- Fences
- Drainage Swales
- Test Pit Locations (SSP, 1996)
- Soil Boring/Temporary Monitoring Well Locations (SSP, 1996)
- Soil Boring (SSP, 1996)
- Surface Soil Sample Location (1990)
- Surface Soil Sample Location (SSP, 1996)
- Surface Soil Sample Location (1997)

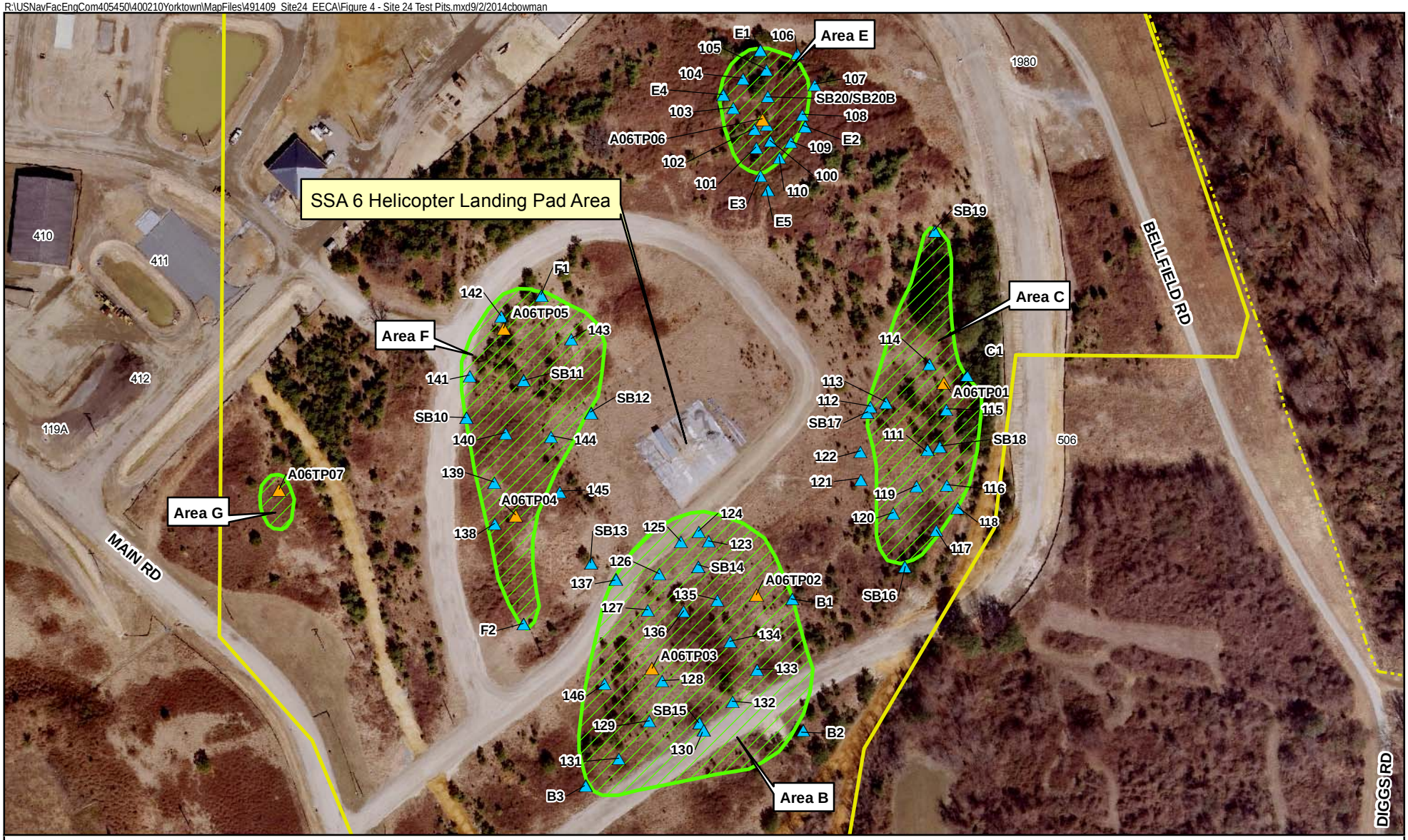
N
W E
S

0 400 800
Feet

Figure 2-3
Pre-2010 Remedial Investigation Sample Locations
Site 24 Engineering Evaluation/Cost Analysis
Naval Weapons Station Yorktown
Yorktown, Virginia

CH2MHILL

R:\USNavFacEngCom405450\400210Yorktown\MapFiles\491409_Site24_EECA\Figure 4 - Site 24 Test Pits.mxd9/2/2014cbowman



Legend

- Test Pit Locations (2010)
- Test Pit Locations (SSP, 1996)
- Fences
- Magnetic Anomalies (SSP, 1994)
- Site 24, the Aviation Field, Investigation Area (former SSA 6 Helicopter Landing Pad)

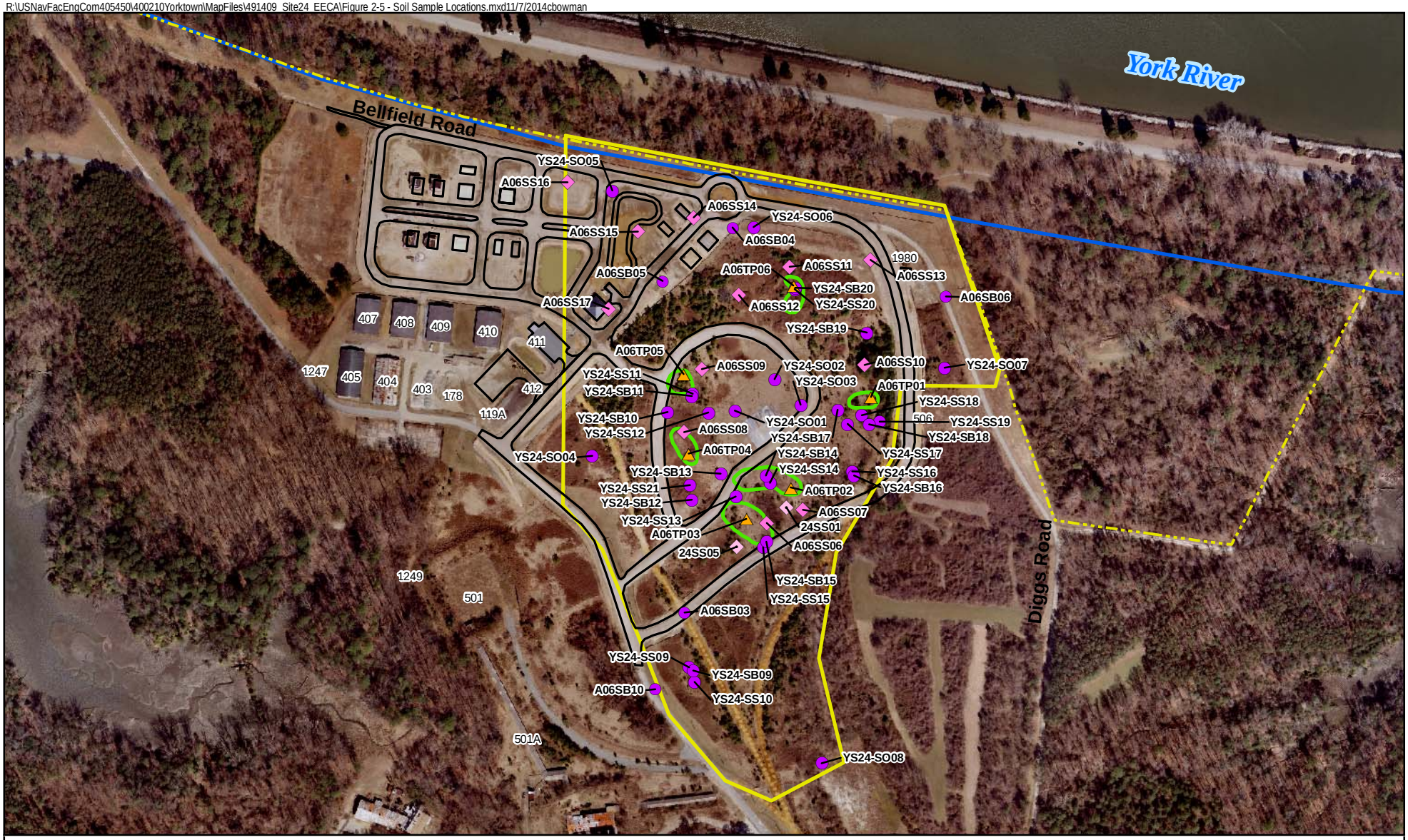
N
W E
S

0 85 170
Feet

Figure 2-4
Comprehensive Test Pit Locations
Site 24 Engineering Evaluation/Cost Analysis
Naval Weapons Station Yorktown
Yorktown, Virginia

CH2MHILL

R:\USNavFacEngCom405450\400210Yorktown\MapFiles\491409_Site24_EECA\Figure 2-5 - Soil Sample Locations.mxd11/7/2014cbowman



Legend

- Soil Sample Location (2010 RI)
- Surface Soil Sample Location (SSP, 1996)
- Surface Soil Sample Location (1997)
- Test Pit Locations (SSP, 1996)
- Fences
- Yorktown Base Boundary
- Site 24, the Aviation Field, Investigation Area (former SSA 6 Helicopter Landing Pad)
- Waste Areas
- JIEDDO Battle Course

N
W E
S

0 200 400
Feet

Figure 2-5
Comprehensive Soil Sample Locations
Site 24 Engineering Evaluation/Cost Analysis
Naval Weapons Station Yorktown
Yorktown, Virginia

CH2MHILL

R:\USNavFacEngCom405450\400210Yorktown\MapFiles\491409_Site24_EECA\Figure 2-6 - Comprehensive Drainage Soil Sample Locations.mxd11/7/2014cbowman

Legend

- Surface Soil Sample Location (2010 RI)
- Surface Soil Sample Location (1997)
- Fences
- drainage
- Site 24, the Aviation Field, Investigation Area (former SSA 6 Helicopter Landing Pad)
- Naval Weapons Station Boundary
- Waste Areas
- JIEDDO Battle Course

N
W E
S

0 200 400
Feet

Figure 2-6
Comprehensive Drainage Soil Sample Locations
Site 24 Engineering Evaluation/Cost Analysis
Naval Weapons Station Yorktown
Yorktown, Virginia

CH2MHILL

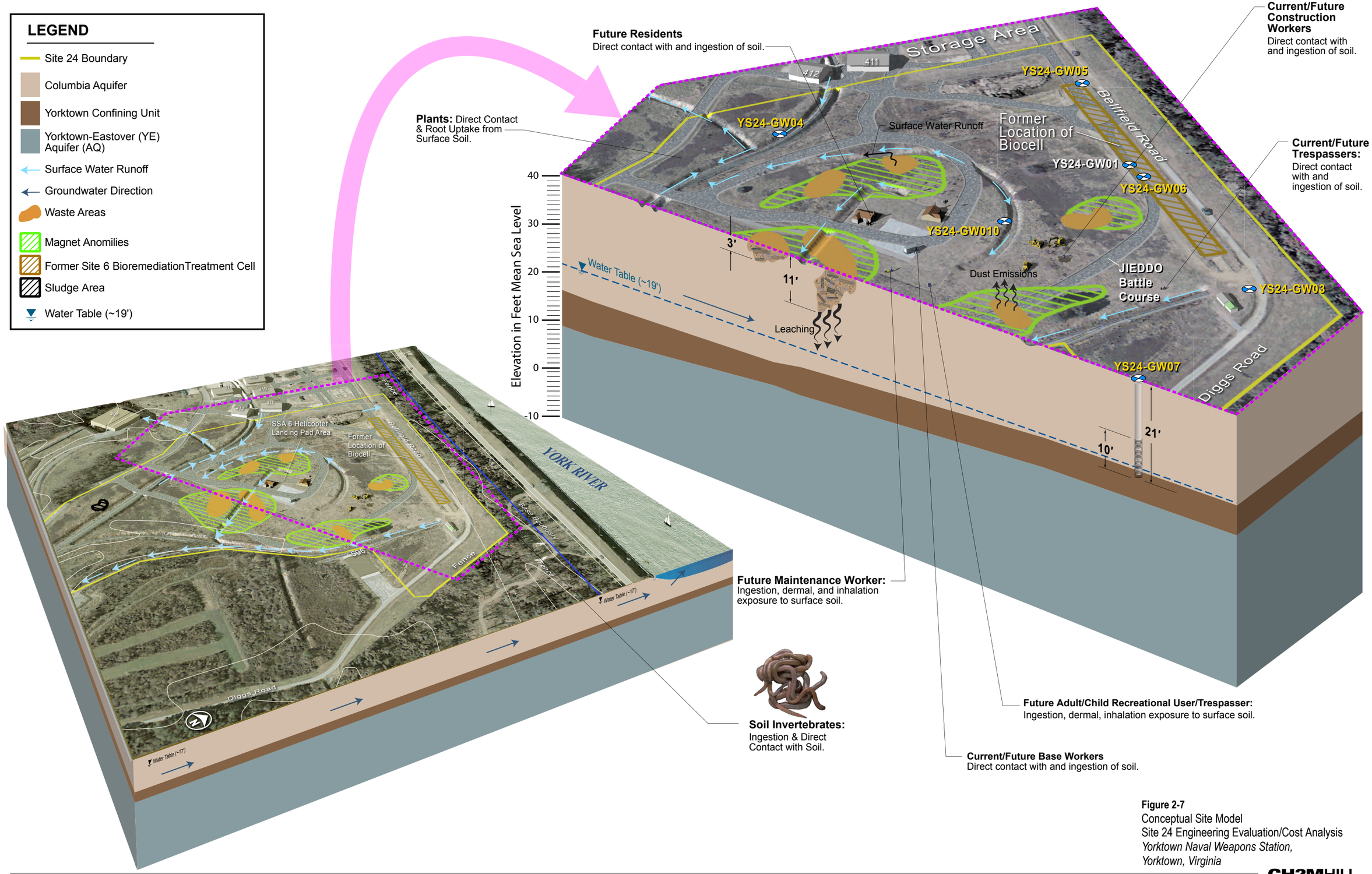
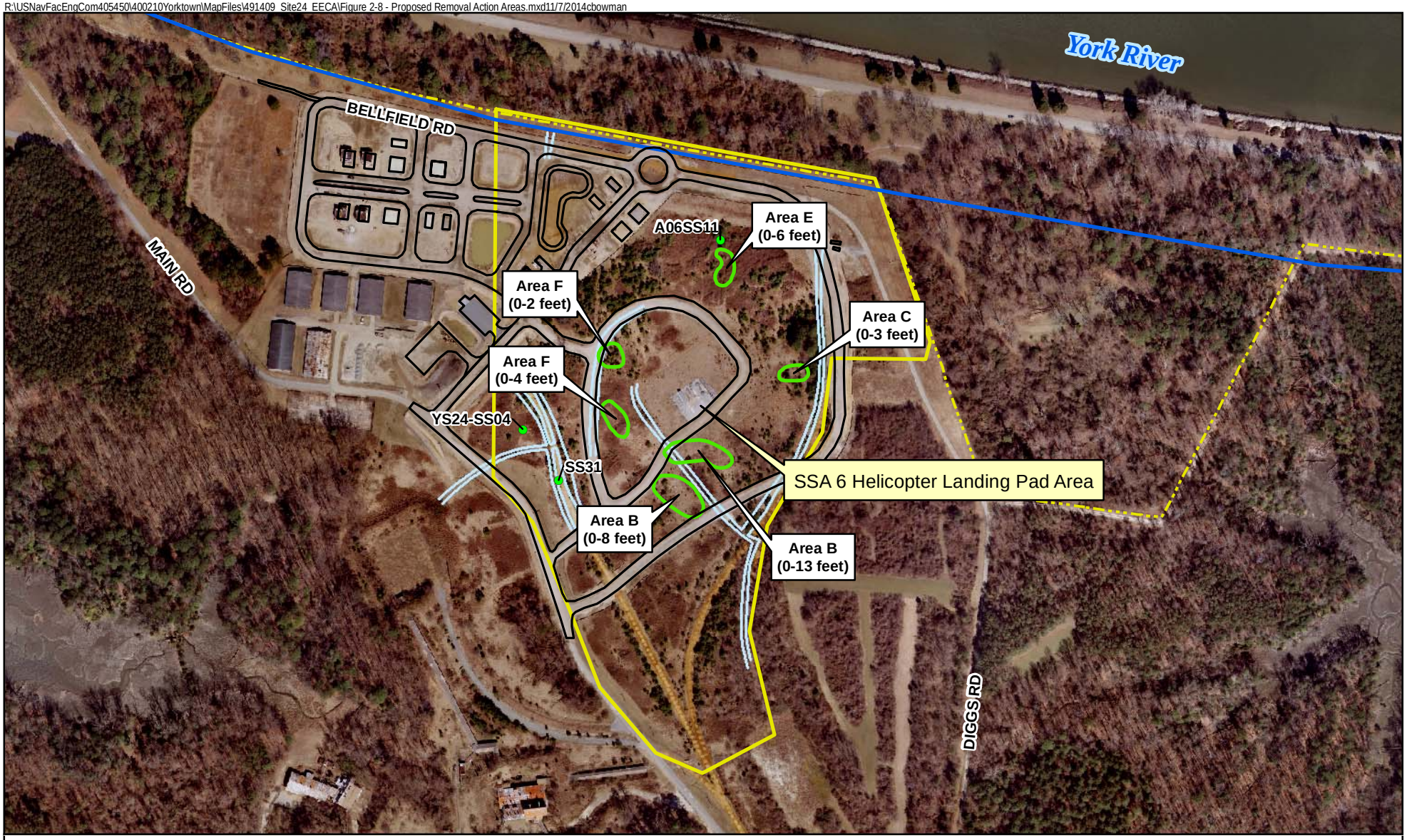


Figure 2-7
Conceptual Site Model
Site 24 Engineering Evaluation/Cost Analysis
Yorktown Naval Weapons Station,
Yorktown, Virginia

R:\USNavFacEngCom405450\400210Yorktown\MapFiles\491409_Site24_EECA\Figure 2-8 - Proposed Removal Action Areas.mxd11/7/2014cbowman



Legend

- Isolated Hotspot Surface Soil Sample Location (0-6 inches)
- Fences
- Yorktown Base Boundary
- Waste Disposal Areas
- Site 24, the Aviation Field, Investigation Area (former SSA 6 Helicopter Landing Pad)
- JIEDDO Battle Course

N
W E
S

0 200 400
Feet

Figure 2-8
Proposed Removal Action Areas
Site 24 Engineering Evaluation/Cost Analysis
Naval Weapons Station Yorktown
Yorktown, Virginia

CH2MHILL

SECTION 3

Identification of Removal Action Objectives

3.1 Statutory Limits on Removal Action

The NCP, 40 CFR Part 300.415, dictates statutory limits of $2 million and a 12-month duration for USEPA fund-financed removal actions, with statutory exemptions for emergencies and actions consistent with the remedial action to be taken. However, this removal action will not be USEPA fund-financed. The Navy and Marine Corps installation restoration manual (Navy, 2001) does not limit the cost or duration of removal actions; nonetheless, cost-effectiveness is a recommended criterion for the evaluation of removal action alternatives and is discussed in Sections 4 and 5.

3.2 Removal Action Objective

The removal action objective is to prevent direct exposure to waste and contaminants posing unacceptable risks in surface and subsurface soil by human and ecological receptors. The removal action will be considered complete when this objective is met.

3.3 Determination of Removal Action Schedule

This EE/CA will be made available for a 30-day public comment period. Notice of its availability for public review, along with a brief summary of the EE/CA, will be published in two local newspapers – *Daily Press* and *The Virginia Gazette*. The public comment period is scheduled to be from March 2, 2015 to April 17, 2015. A public information session will be held during or immediately following the public comment period, if requested. If comments are received during the public comment period, a Responsiveness Summary documenting responses to significant comments will be prepared and included in an Action Memorandum, which will be placed in the AR for WPSNTA Yorktown. The AR file can be found on the WPNSTA Yorktown Public ER Program web site at http://go.usa.gov/DynG. The AR is also available for public review by appointment through the NAVFAC Mid-Atlantic Public Affairs Office[1].

Because this removal action has been designated as non-time-critical, the start date of the removal action will be determined by factors other than the urgency of the threat. Possible factors include weather, the availability of resources, and site constraints. The total project period is anticipated to last 15 months from the beginning of the public comment period to completion of the associated construction completion documentation. Critical milestone periods for the removal action are as follows:

- EE/CA public comment period—30 days
- Subcontracting, work plan, and mobilization—6 months
- Removal action—4 months
- CERCLA documentation—4 months

3.4 Applicable or Relevant and Appropriate Requirements

The removal action will, to the extent practicable, comply with applicable or relevant and appropriate requirements (ARARs) under federal and state environmental laws, as described in 40 CFR 300.415. As outlined by 40 CFR 300.415(j), the lead agency may consider the urgency of the situation and the scope of the removal action to be conducted in determining whether compliance with ARARs is practicable.

---

[1] NAVFAC Mid-Atlantic
Public Affairs Office
9742 Maryland Avenue
Norfolk, VA 23511-3095
(757) 445-8732, ext. 3096
wpnsta.pao@navy.mil

Applicable requirements are clean-up standards, standards of control, and other substantive environmental protection requirements, criteria, or limits promulgated under federal or state environmental or facility siting laws that specifically address a hazardous substance, pollutant, contaminant, remedial action, location, or other circumstance. Relevant and appropriate requirements are clean-up standards, standards of control, and other substantive environmental protection requirements, criteria, or limits promulgated under federal or state law that, although not applicable to a hazardous substance, a pollutant, a contaminant, a remedial action, or other circumstances at a CERCLA site, address problems or situations sufficiently similar to those encountered at the CERCLA site so that their use is well suited to the particular site. Other federal and state advisories, criteria, and/or guidance, such as risk assessment calculations, will be considered as needed in formulating the removal action; however these are neither promulgated nor enforceable and therefore not ARARs. The Navy, as the lead agent, has reviewed federal and state requirements and determined that those listed in **Appendix B** are affiliated with the proposed removal action at Site 24.

Three classifications of ARARs are defined by USEPA: chemical-specific, location-specific, and action-specific.

Chemical-specific ARARs are promulgated and enforceable standards for specific chemicals that establish concentrations of contaminants for a given medium. These standards are established as ARARs when they have a direct effect on the implementation of a remedial action. Promulgated and enforceable standards were reviewed and no federal or Virginia chemical-specific ARARs have been identified for the remedial alternatives proposed for Site 24 (**Appendix B,** Tables B-1 and B-2).

Location-specific ARARs are promulgated and enforceable standards that restrict remedial activities and media concentrations based on the characteristics of the surrounding environments. Location-specific ARARs may include restrictions on remedial actions within wetlands or coastal areas, near locations of known endangered species, or on protected waterways. The federal location-specific ARARs for Site 24 are summarized in **Appendix B,** Table B-3. No Virginia location-specific ARARs have been identified for Site 24 (**Appendix B,** Table B-1 and B-2).

Action-specific ARARs are promulgated and enforceable standards that govern activities that will be performed during the response actions such as waste management, dust control, and erosion control. Federal and Virginia action-specific ARARs have been identified for Site 24 (**Appendix B,** Tables B-5 and B-6).

3.5 General Disposal Requirements

Waste disposal procedures implemented for the removal action will be in accordance with the state and federal laws and regulations that govern offsite disposal. For the purposes of this EE/CA, the cost estimates were based on the assumption that excavated soil and miscellaneous debris will be non-hazardous. Waste characterization testing will be conducted in accordance with the requirements of state and federal regulations. All materials will be disposed in a state-permitted disposal facility that is approved by the Navy and is permitted to accept CERCLA waste.

SECTION 4

Description and Evaluation of Removal Action Alternatives

The alternatives for this removal action were considered using professional judgment and information from previous environmental activities. Alternatives were evaluated based on effectiveness, implementability, and cost. The no action alternative was evaluated for comparative purposes.

4.1 Description of Removal Action Alternatives

4.1.1 Alternative 1: No Action

With this alternative, no action would be conducted and no controls would be implemented. The area would be left as it currently exists, leaving the surface soil, subsurface soil, and subsurface debris posing potential human health risks and the localized, spatially limited areas of surface soil posing potential ecological risks in place. Therefore, in accordance with CERCLA (Section 121[c]), as amended by SARA, the site would be reviewed every 5 years. It is assumed that the current level of maintenance would be sustained.

4.1.2 Alternative 2: Soil Cover

This alternative consists of construction of a soil cover over the six discontinuous waste disposal areas and three isolated soil hot spot areas (**Figure 4-1**). As a result of impacted soil and waste remaining onsite, land use controls (LUCs), operation and maintenance (O&M), groundwater long-term monitoring (LTM), and Five-Year Reviews would be required and would be implemented indefinitely. “Green” and sustainable remediation best management practices that can be implemented with this alternative include truck and equipment idling control, use of cover material that is sourced nearby to minimize emissions resulting from truck transportation, and vegetating the cover with locally available, low-maintenance grasses and plants.

Site Preparation

Site preparation activities would include setup of a staging area and facilities, installation of erosion and sediment (E&S) controls, and installation of a construction entrance. Before construction begins, typical temporary E&S controls would be implemented, such as a silt fence and hay bales installed around areas to be disturbed at topographic lows. Permanent E&S controls after construction would include appropriate grading and site vegetation. Additional details would be provided in the E&S Control Plan to be included with the Removal Action Work Plan.

Soil Cover

A soil cover would be installed over the surface of a 42,734-ft^2 (0.98-acre) area that includes the six discontinuous waste disposal areas and three isolated hot spot areas. A 2-foot-thick soil cover consisting of 18 inches of general fill, topped by 6 inches of topsoil and permanent seeding, would be placed over the surface area of the waste disposal areas and hot spot areas. The final desired as-built slope of the soil cover would be constructed to promote positive drainage off the soil cover and to provide a smooth transition to the surrounding native ground surface. Hauling and backfilling would be performed using mechanical earthwork equipment (such as bulldozers and dump trucks). Specific details would be added during the development of the Removal Action Work Plan.

General fill and topsoil would be delivered to the site from an offsite source meeting the following requirements:

- Certified as clean through analytical testing for target compound list VOCs, SVOCs, pesticides/PCBs, and metals, and comparison to USEPA RSLs, WPNSTA Yorktown background levels, and ecologically protective values
- Contains less than 50 mg/kg TPH and less than 10 mg/kg total benzene, toluene, ethylbenzene, and xylenes
- Material in compliance with American Society for Testing and Materials (ASTM) D2487 Soil Classification Groups GW, GP, GM, SW, SP, SM, SC, and ML, or any combination of these groups, that is free of the

following: rock or gravel larger than 75 mm (3 inches) in any dimension, debris, waste, frozen materials, vegetation, and other deleterious matter

The general fill and topsoil data analysis and soil classification results will be provided to the USEPA and VDEQ prior to onsite use of the material and will be included in the final construction closeout report.

Site Restoration

Areas disturbed during the removal action would be stabilized by seeding with native species of grasses. In areas where the soil cover intersects the JIEDDO battle course, the course would have to be altered to accommodate the soil cover while still providing course access for facility personnel. In the area of the drainage ditch isolated hot spot (YS24-SS31) as well as along the edge of two waste disposal areas (Areas B and F), the drainage ditch would have to be re-routed around the soil cover to continue to provide site drainage. All equipment, materials, and temporary E&S controls would be removed from the site. More specific details would be provided in the Removal Action Work Plan.

Land Use Controls, Operation and Maintenance, and Groundwater Long-Term Monitoring

As a result of impacted soil and waste remaining onsite, LUCs, O&M, groundwater LTM, and Five-Year Reviews will be required to ensure the following:

- Soil cover remains in place and continues to be protective of human health and the environment
- Contaminants from impacted soil and waste are not leaching into groundwater
- Land use remains the same and the cover is not disturbed without appropriate notification/authorization

The LUCs would include signs at designated locations along the site boundary prohibiting unauthorized disturbances of the soil cover. The LUC boundary would be included in the WPNSTA Yorktown master plan and geographic information system. The O&M would include quarterly inspections of the cover for the first 2 years, followed by annual inspections, and soil cover and vegetative maintenance as required (assumed every 5 years). A groundwater LTM sampling and analysis plan would be developed, and groundwater sampling would be conducted annually for the site COCs. The LUCs, O&M, groundwater LTM, and Five-Year Reviews would be implemented indefinitely; however, a period of 30 years was used for cost-estimating purposes.

4.1.3 Alternative 3: Excavation and Offsite Disposal

This alternative consists of excavation and backfilling of the six discontinuous waste disposal areas and three isolated hotspot areas (**Figure 4-1**). No LUCs and O&M are required for this alternative because the impacted soil and waste would be removed from the site. “Green” and sustainable remediation best management practices that can be implemented with this remedy include truck and equipment idling control, use of backfill material that is sourced nearby to minimize emissions from truck transportation, vegetating the cover with locally available and low-maintenance grasses and plants, using a nearby disposal facility to minimize truck emissions, and recovering metal debris that can be recycled to avoid disposal.

Site Preparation

Site preparation activities would include setup of a staging area and facilities, installation of E&S controls, and installation of a construction entrance. Before construction begins, typical temporary E&S controls would be implemented, such as a silt fence and hay bales installed around areas to be disturbed at topographic lows and soil stockpiles. Permanent E&S controls after construction would include appropriate grading and site vegetation. Specific details would be provided in the E&S Control Plan to be included with the Removal Action Work Plan.

Pre-Excavation Waste Characterization Sampling

Before offsite disposal of impacted soil and waste from the removal areas occurs, pre-excavation waste characterization samples would be collected. For cost estimating purposes, it was assumed that pre-excavation waste characterization sampling would be conducted at a frequency of 1 sample per 1,000 yd^3 for full toxicity characteristic leaching procedure (VOCs, SVOCs, metals, herbicides, and pesticides), reactivity (cyanide and sulfide), ignitability, corrosivity, total petroleum hydrocarbons (TPH)-diesel range organics, and TPH-gasoline range organics with 7-day turnaround time (TAT). Additional waste characterization samples would be necessary

if post-excavation confirmation samples collected from the removal areas indicate that additional excavation is required (see the Confirmation Sampling section below). The additional samples would be collected at the same frequency and analyzed for the same analytical parameters as the pre-excavation waste characterization samples.

Excavation and Offsite Disposal

The impacted soil and waste from the six discontinuous disposal areas and impacted surface soil from the three isolated hotspot areas would be excavated to varying depths ranging from 2 to 13 feet bgs. An estimated total of 12,191 yd^3 of material would be excavated, which includes additional material removed from excavations deeper than 5 feet bgs. For excavations deeper than 5 feet bgs, sloping or shoring would be required to ensure safety. For cost estimating purposes, it was assumed that the excavations deeper than 5 feet bgs are in Occupational Safety and Health Administration Type A soil at a 0.75H:1V slope. For the excavations deeper than 5 feet bgs (Area B at 13 feet bgs and 8 feet bgs and Area E at 6 feet bgs), it was assumed that an additional volume of 763 yd^3 (505 yd^3 from Area B [13 feet bgs excavation], 190 yd^3 from Area B [8 feet bgs excavation], and 68 yd^3 from Area E [6 feet bgs excavation]) would be removed as a result of sloping or shoring and that the additional volume of soil removed would be reused as general fill in the deeper portions of the excavation areas. The water table at the site is approximately 19 feet bgs and should not be encountered during excavation; therefore, no dewatering is anticipated. The excavated soil and waste, which was assumed to be non-hazardous for cost estimating purposes, would be transported offsite to a USEPA offsite-rule-approved disposal facility. The excavation, offsite disposal, and backfilling would be performed using mechanical earthwork equipment (such as excavators, bulldozers, front end loaders, and dump trucks). Exact details would be provided during the development of the Removal Action Work Plan.

Post-Excavation Confirmation Sampling

Before backfilling the site occurs, post-excavation confirmation samples would be collected, and the results compared against the soil PRGs for the soil removal in Areas B, C, E, and F (**Table 2-3**) and against the soil PRGs for the hotspot soil removal (**Table 2-4**), to confirm the horizontal and vertical extents of the excavations are sufficient. For cost estimating purposes, it was assumed the six discontinuous disposal areas confirmation sampling would be conducted at a frequency of one floor sample per every 5,625 ft^2 (75- by 75-foot grid) and four wall samples (evenly spaced around the perimeter of each disposal area) per disposal area. The disposal area confirmation samples would be analyzed for the site COCs (Aroclor-1254, aluminum, cadmium, and copper) with a 7-day TAT. For the three isolated hotspot areas, it was assumed that post-excavation confirmation samples would be collected at a frequency of one floor sample and four wall samples per hot spot and analyzed for arsenic and mercury with a 7-day TAT.

Backfill

Following completion of the excavation activities, a topographic survey of the site would be completed to capture the lateral and vertical extent of the excavation areas.

An estimated total of approximately 15,238 loose yd^3 of clean fill material would be brought in (approximately 1,082 yd^3 of topsoil and approximately 14,156 yd^3 of general fill) to be used to backfill the excavation area to match the surrounding grade. General fill would be used to bring the grade to within 6 inches of the final grade, followed by the placement of a 6-inch topsoil layer to support vegetation growth.

General fill and topsoil would be delivered to the site from an offsite source meeting the following requirements:

- Certified as clean through analytical testing for target compound list VOCs, SVOCs, pesticides/PCBs, and metals, and comparison to USEPA RSLs, WPNSTA Yorktown background levels, and ecologically protective values
- Contains less than 50 mg/kg TPH and less than 10 mg/kg total benzene, toluene, ethylbenzene, and xylenes
- Material in compliance with ASTM D2487 Soil Classification Groups GW, GP, GM, SW, SP, SM, SC, and ML, or any combination of these groups, that is free of the following: rock or gravel larger than 75 mm (3 inches) in any dimension, debris, waste, frozen materials, vegetation, and other deleterious matter

The general fill and topsoil data analysis and soil classification results will be provided to the USEPA and VDEQ prior to onsite use of the material and will be included in the final construction closeout report.

Following completion of backfilling activities, a topographic survey of the site would be conducted to confirm that the elevations are consistent with the pre-existing grade.

Site Restoration

Areas disturbed during the removal action would be stabilized by seeding with native species of grasses. In areas where the excavation extent intersects the JIEDDO battle course, course access would be temporarily restricted during excavation activities and the disturbed sections of the course would be restored following completion of the excavation. All equipment, materials, and temporary E&S controls would be removed from the site. More specific details would be provided in the Removal Action Work Plan.

4.2 Evaluation of Alternatives

4.2.1 Evaluation Criteria

The criteria used to evaluate the removal action alternatives are based on *Guidance on Conducting Non-Time-Critical Removal Actions Under CERCLA*, PB93-963402 (USEPA, 1993).

4.2.2 Effectiveness

The *effectiveness* criterion addresses the expected results of the removal action alternatives. It includes two major subcategories: protectiveness and ability to achieve the removal action objective.

- Protectiveness
  - Protective of public health and community
  - Protective of workers during implementation
  - Protective of the environment
  - Compliant with ARARs
- Ability to achieve removal action objective
  - Ability to meet the expected level of treatment or containment
  - Has no residual effect concerns
  - Maintain long-term control

4.2.3 Implementability

The *implementability* criterion encompasses the technical and administrative feasibility of the removal action. It includes three subcategories: technical feasibility, availability of resources, and administrative feasibility.

- Technical feasibility
  - Construction and operational consideration
  - Demonstrated performance and useful life
  - Adaptability to environmental conditions
  - Contribution to performance of long-term removal actions
  - Implementation within the allotted time
- Availability of resources
  - Availability of equipment
  - Availability of personnel and services
  - Laboratory testing capacity
  - Offsite treatment and disposal capacity
  - Post-removal action site control
- Administrative feasibility

- Required permits and/or easement or rights-of-way
- Impacts on adjoining property
- Ability to impose institutional controls
- Likelihood of obtaining exemptions from statutory limits (if needed)

4.2.4 Cost

The *cost* criterion encompasses the life-cycle costs of a project, including the projected implementation costs and the long-term O&M costs of the remedial action. For the detailed cost analysis, the expenditures required to complete each alternative were estimated in terms of capital costs, including direct and indirect costs, to complete initial construction activities. Direct costs include the cost of construction, equipment, land and site development, treatment, transportation, and disposal. Indirect costs include engineering expenses and contingency allowances.

Future post-construction costs (that is, periodic inspections and maintenance) would be required to ensure the continued effectiveness of Alternative 2 (Soil Cover). The future costs were calculated using an assumed inflation rate of 3.9 percent for a 30-year time-frame. After inflating the future costs, they were analyzed using present worth, which discounts all future costs to a common base year (2014). Present-worth analysis allows the cost of the removal action to be compared on the basis of a single figure representing the amount of money that, if invested in the base year and disbursed as needed, would be sufficient to cover all costs associated with the life of the removal action. The present-worth calculations included an assumed discount rate of 3.9 percent (White House OMB, 2013). Although a Five-Year Review would be required for Alternative 1, the future costs associated with the review were assumed to be covered by another WPNSTA Yorktown site because the Five-Year Reviews are conducted per facility; therefore, there is no cost for Alternative 1.

The estimated costs are provided to an expected accuracy of +50 percent and -30 percent. The alternative cost estimates are in 2014 dollars and the unit pricing is based on costs from similar projects, vendor quotes, or engineering estimates. The enclosed Engineer's Estimate (**Appendix C**) is only an estimate of possible construction costs for budgeting purposes.

4.2.5 Evaluation of Alternatives

Table 4-1 summarizes the results of the alternative evaluation with respect to effectiveness, ease of implementation, and cost.

TABLE 4-1

Evaluation of Removal Action Alternatives

Site 24 Engineering Evaluation/Cost Analysis

WPNSTA Yorktown

Yorktown, Virginia

Alternative	Description	Effectiveness	Implementability	Cost
Alternative 1 - No Action	No removal action work performed; site left "as is."	Will not meet removal action objective, comply with ARARs, reduce volume or mobility of contamination, or provide any short- or long-term protectiveness	No action to implement	**$0**
Alternative 2 - Soil Cover	Construct a soil cover over 6 discontinuous waste disposal areas and 3 isolated hot spot areas. Future actions include LUCs, O&M, groundwater LTM, and Five-Year Reviews to ensure soil cover remains in place and continues to be protective of human health and the environment, contaminants from impacted soil and waste are not leaching into groundwater, land use remains the same, and the cover is not disturbed without appropriate notification/authorization.	Protective of human health and the environment because it prevents direct exposure to impacted soil and waste posing potential risks; potential short-term risks to site workers exposed to contaminated materials during construction would be managed through training and use of personal protective equipment. Complies with the ARARs. Achieves the removal action objective. Long-term protectiveness achieved provided the soil cover is maintained and LUCs are in place. Poses a potential environmental impact primarily associated with the transportation and operation of the mechanical earthwork equipment.	Components are well established and can be completed with conventional equipment in a relatively short time-frame. Because impacted soil and waste remains onsite, LUCs, O&M, groundwater LTM, and Five-Year Reviews will be required.	Capital Cost: $375,000 Present Value of LUCs, O&M, groundwater LTM, and Five-Year Reviews: $628,000 **Total Present Value of Alternative: $1,003,000**

TABLE 4-1

Evaluation of Removal Action Alternatives

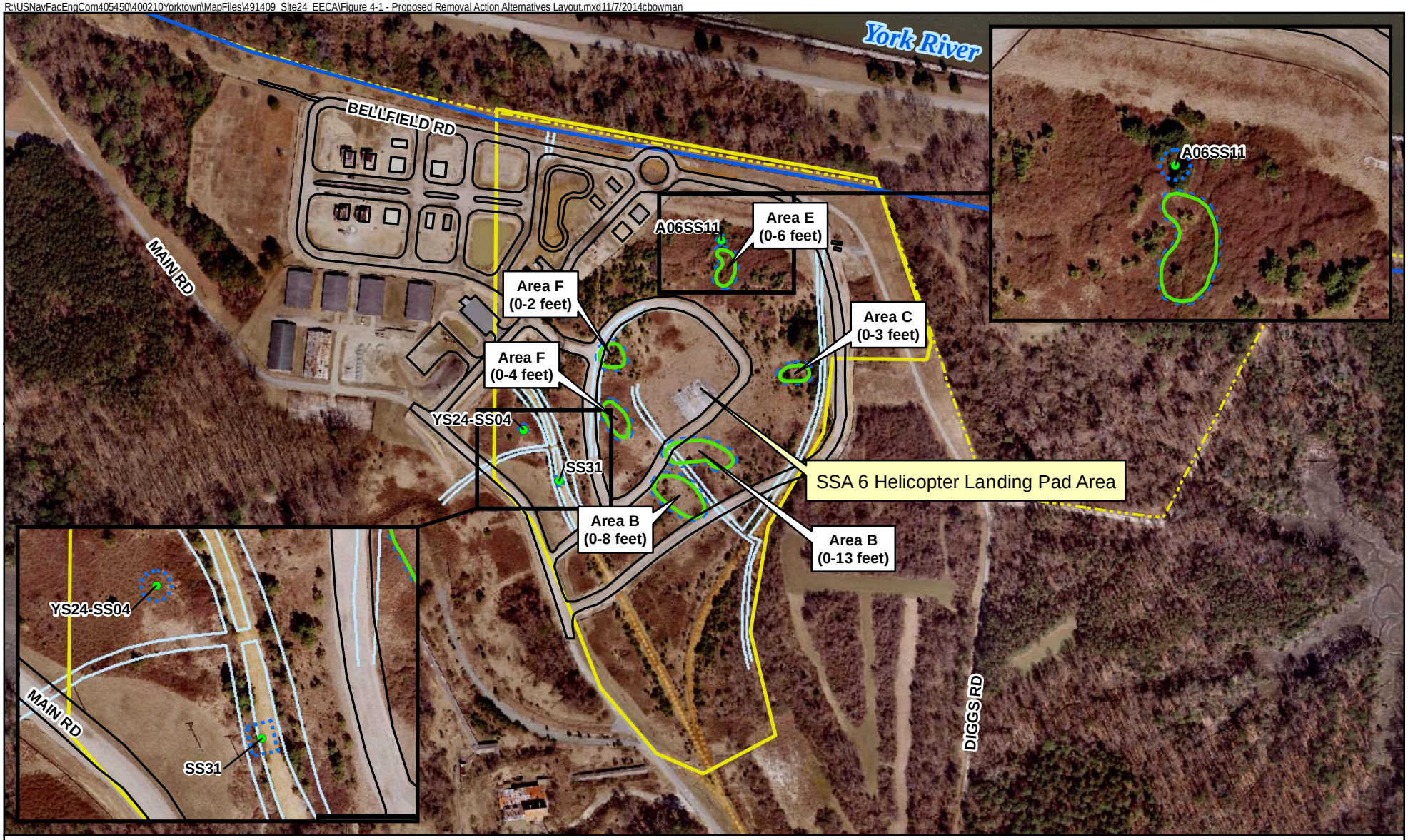
Site 24 Engineering Evaluation/Cost Analysis

WPNSTA Yorktown

Yorktown, Virginia

Alternative	Description	Effectiveness	Implementability	Cost
Alternative 3 - Excavation and Offsite Disposal	The impacted soil and waste from the 6 discontinuous disposal areas and impacted surface soil from the 3 isolated hotspot areas would be excavated to varying depths ranging from 2 to 13 feet bgs. Excavated material would be transported offsite for disposal. Post-excavation confirmation sampling would be completed followed by backfilling the excavation areas.	Protective of human health and the environment because it prevents direct exposure to the waste and impacted soil posing potential risks; potential short-term risks to site workers exposed to contaminated material would be managed through training and use of personal protective equipment; potential short-term risks to the community as a result of the waste and impacted soil being transported offsite would be managed by ensuring that trucks are not overloaded and are covered prior to leaving the site. Complies with the ARARs. Achieves the removal action objective. Long-term protectiveness would be achieved because no waste or impacted soil posing potential risk would remain onsite. Poses a potential environmental impact primarily associated with the transportation and disposal of the excavated waste and impacted soil.	Components are well established and can be completed with conventional equipment in a relatively short time-frame.	**$2,613,000**

R:\USNavFacEngCom405450\400210Yorktown\MapFiles\491409_Site24_EECA\Figure 4-1 - Proposed Removal Action Alternatives Layout.mxd11/7/2014cbowman



Legend

- Surface Soil Sample Locations (0-6 inches)
- Waste Disposal Areas
- Approximate Extent of Soil Cover (Alternative 2) or Excavation (Alternative 3)
- Fences
- Yorktown Base Boundary
- Site 24, the Aviation Field, Investigation Area (former SSA 6 Helicopter Landing Pad)
- JIEDDO Battle Course

N W E S

0 200 400 Feet

Figure 4-1
Proposed Removal Action Alternatives Layout
Site 24 Engineering Evaluation/Cost Analysis
Naval Weapons Station Yorktown
Yorktown, Virginia

CH2MHILL

SECTION 5

Comparative Analysis of Removal Action Alternatives

Section 5 expands on the evaluation of the alternatives by providing a comparative analysis to assist the decision-making process in which a removal action will be selected. In Section 4, these alternatives were described according to their effectiveness, ease of implementation, and cost. In this section, the alternatives are compared to one another for each of the three criteria.

Table 5-1 summarizes the results of the alternatives comparison. Comparative terms used in **Table 5-1** are defined relative to the other alternatives.

5.1 Effectiveness

Alternative 1 would not be effective because it would not be protective of human health and the environment, would not comply with ARARs, and would not achieve the removal action objective of this EE/CA. Alternatives 2 and 3 would be effective because they would both be protective of human health and the environment, comply with ARARs, and be able to achieve the removal action objective. However, because waste and impacted soil posing a potential risk to human health would be left in place as part of Alternative 2, that alternative results in a greater magnitude of risk remaining after the removal action than Alternative 3.

As a result of the waste remaining onsite as part of Alternative 2, there would be the potential for contaminants from impacted soil and waste to leach into the groundwater or migrate to the surrounding soil via excavation of soil by burrowing animals over time. Alternative 3 would result in the removal of the waste and impacted soil and, therefore, would eliminate the potential for contaminants to leach into the groundwater or migrate to the surrounding soil.

Alternative 3 would not require any additional engineering, planning, and/or implementation controls to monitor the continued effectiveness following completion of the removal action due to the removal of waste and impacted soil, whereas Alternative 2 would require LUCs, O&M, groundwater LTM, and Five-Year Reviews to maintain protectiveness. Alternative 3 is the most effective alternative in reducing toxicity, mobility, and volume because it results in the removal and offsite disposal of waste and impacted soil.

Alternative 2 would permanently alter the topography of the site. Following construction activities, once site restoration is complete and vegetation has re-established, there would be no changes to the ground surface under Alternative 3.

In conclusion, Alternative 3 was considered more effective than Alternative 2.

5.2 Implementability

Alternative 1 requires no implementation and is, therefore, the easiest to implement. Alternatives 2 and 3 would both be moderately easy to implement because they are technically and administratively feasible and the resources needed to implement the alternatives are readily available. Both alternatives would be completed using common construction practices and in a short time-frame. However, because Alternative 3 would include excavation to an assumed maximum depth of 13 feet bgs, resulting in the need for additional measures to maintain the sidewalls of the excavation, that alternative would be more difficult to implement than Alternative 2.

5.3 Cost

Alternative 1 is the least expensive alternative and Alternative 3 is the most expensive alternative. The cost estimates for the alternatives are provided in **Appendix C** and summarized in **Table 4-1**.

TABLE 5-1

Removal Action Alternative Comparison

Site 24 Engineering Evaluation/Cost Analysis

WPNSTA Yorktown

Yorktown, Virginia

Alternative	Effectiveness	Implementation	Cost
Alternative 1 – No Action	Least Effective	Easiest	Least Expensive
Alternative 2 – Soil Cover	Effective	Moderately Easy	Moderately Expensive
Alternative 3 – Excavation and Offsite Disposal	Most Effective	Moderately Easy, but Most Difficult of the Three Alternatives	Moderately Expensive and Most Expensive of the Three Alternatives

SECTION 6

Recommended Removal Action Alternative

Alternatives 2 and 3 are comparable in their ability to protect human health and the environment, ability to achieve the removal action objective, ease of implementability, and compliance with ARARs. Alternative 2 is less expensive than Alternative 3; however, because waste and impacted soil posing a potential risk to human health would be left in place, Alternative 2 requires LUCs, O&M, and groundwater LTM to ensure the removal action remains protective over time.

Based on the evaluation of the trade-offs between the alternatives, the recommended removal alternative is Alternative 3, Excavation and Offsite Disposal. Alternative 3 consists of excavating the impacted soil and waste from the six discontinuous disposal areas and impacted surface soil from the three isolated hotspot areas to depths ranging from 2 to 13 feet bgs, offsite disposal of the excavated material, post-excavation confirmation sampling, and backfilling the excavation areas. The end result of Alternative 3 provides for unlimited use/unrestricted exposure and does not require inspection, maintenance, and monitoring activities to ensure long-term protectiveness.

Navy, USEPA, and VDEQ representatives were involved with the development of the recommended alternative through the Tier I Partnering Team process and will have the opportunity to comment on the recommendation during the regulatory review period for this EE/CA. Following the regulatory review period, a 30-day public comment period will be held to assess public acceptance of the recommended alternative. If comments are received, a Responsive Summary addressing significant comments will be prepared as part of the Action Memorandum and included in the AR, along with the final EE/CA.

SECTION 7

References

Baker Environmental, Inc. (Baker). 1996. *Final Site Screening Process Report for Site Screening Areas 1, 6, 7, and 15, Naval Weapons Station Yorktown, Yorktown, Virginia.* March.

Baker Environmental, Inc. (Baker). 2002. *Draft Final Remedial Investigation Report for Sites 23, 23, 25, and 26, Naval Weapons Station Yorktown, Yorktown, Virginia.* February.

C.C. Johnson & Associates, Inc. and CH2M HILL. 1984. *Initial Assessment Study of Naval Weapons Station Yorktown, Yorktown, Virginia.* July.

CH2M HILL, Inc. and Baker Environmental (CH2M HILL/Baker). 2008. *Round One Remedial Investigation Report For Sites 23, 24, 25, and 26, Naval Weapons Station Yorktown, Yorktown, Virginia.* Revised Draft Final. February.

CH2M HILL. 2010. *Site 24 Remedial Investigation Work Plan, Naval Weapons Station Yorktown, Yorktown, Virginia.*

CH2M HILL. 2014. *Final Remedial Investigation Report, Site 24, Naval Weapons Station Yorktown, Yorktown, Virginia.* April.

Navy. 2001. *Navy/Marine Corps Installation Restoration Manual*. June.

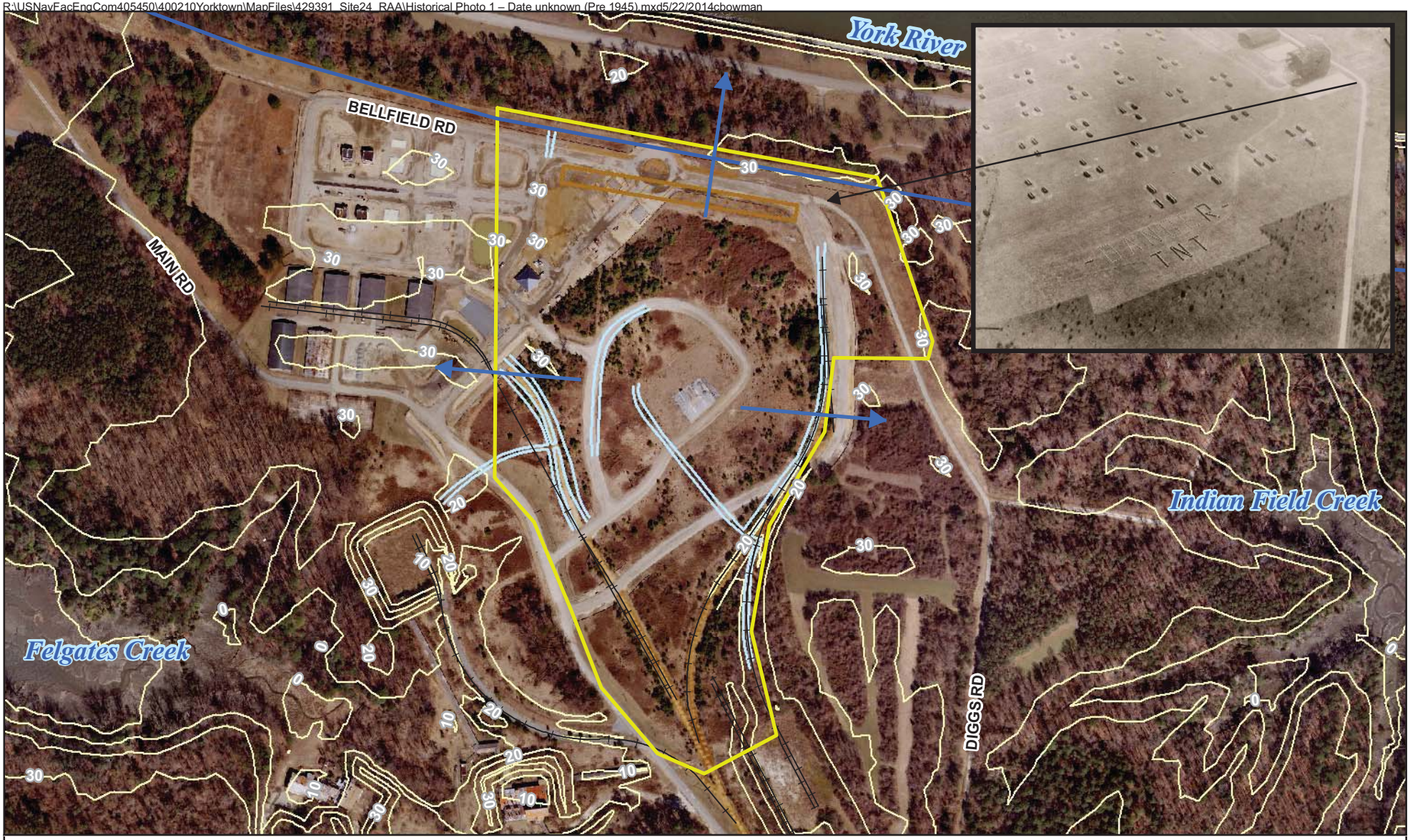
Shaw Environmental and Infrastructure (Shaw). 2008. *Site 6 Construction Completion Report (draft), Naval Weapons Station Yorktown, Yorktown, Virginia.*

United States Environmental Protection Agency (USEPA). 1993. *Guidance on Conducting Non-Time Critical Removal Actions Under CERCLA,* PB93-963402. December 1993.

White House Office of Management and Budget (White House OMB). 2013. *Circular No. A-94 Appendix C, Revised December 2013. Discount Rates for Cost-Effectiveness, Lease Purchase, and Related Analyses – Real Discount Rates: Real Interest Rates on Treasury Notes and Bonds of Specified Maturities.* Available at: http://www.whitehouse.gov/omb/circulars/a094/a94_appx-c.html.

Appendix A
Historical Aerial Photographs

R:\USNavFacEngCom405450\400210Yorktown\MapFiles\429391_Site24_RAA\Historical Photo 1 – Date unknown (Pre 1945).mxd5/22/2014cbowman



Legend

- Fences
- Former Railroad Tracks
- Elevation Contour (10 ft interval)
- Drainage Swales
- Yorktown Base Boundary
- Site 24, the Aviation Field, Investigation Area (former SSA 6 Helicopter Landing Pad)
- Former Site 6 Bioremediation Treatment Cell Location (removed in 2006)
- Groundwater Flow Direction

N W E S

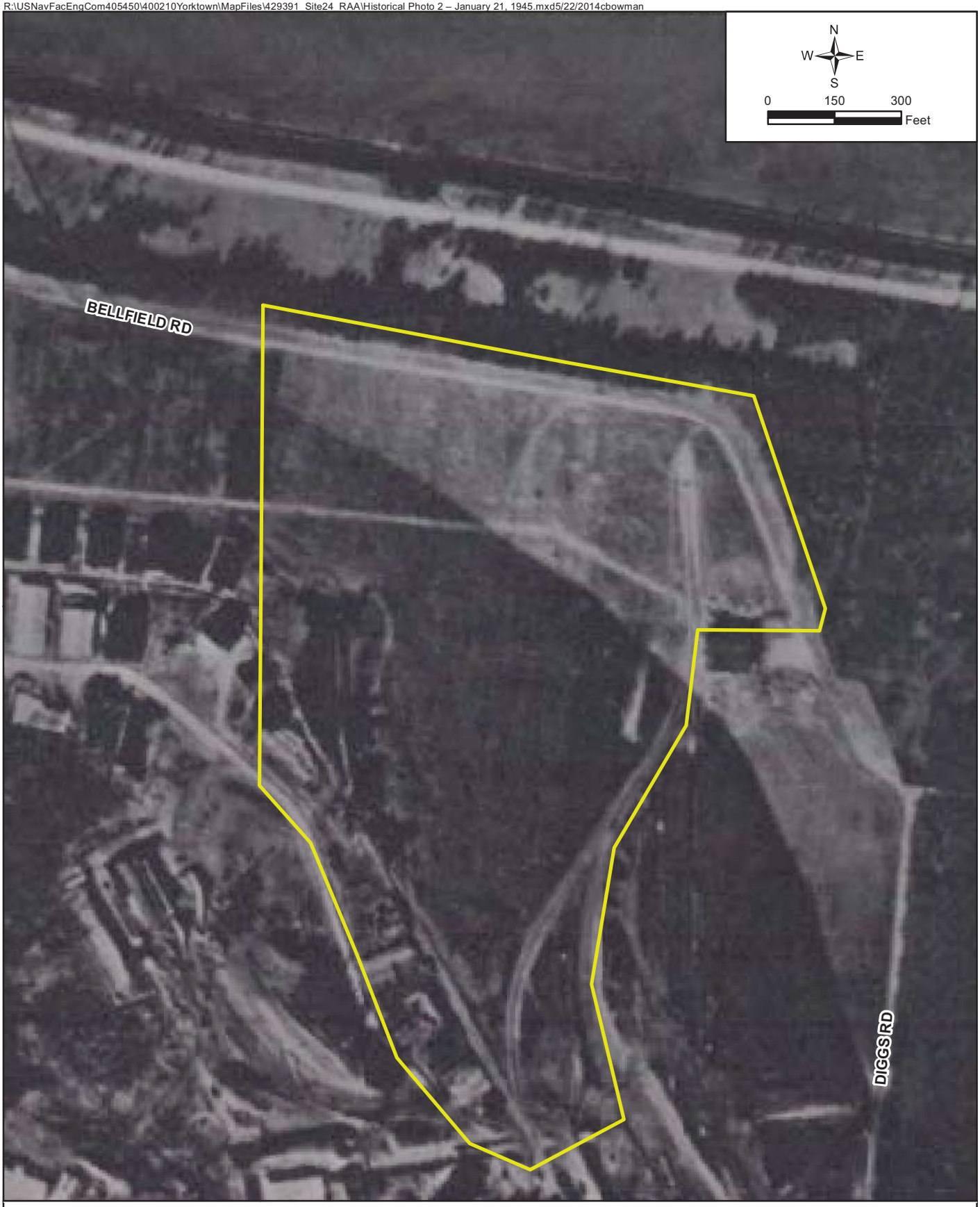
0 200 400 Feet

Historical Photo 1 – Date unknown (Pre 1945)
Site 24 Engineering Evaluation/Cost Analysis
Naval Weapons Station Yorktown
Yorktown, Virginia

The photograph is believed to have been taken prior to 1945 due to the presence of airplane hangers in the northeast portion of the site. An aerial sign clearly indicates the presence of explosives, however, it is unknown if the items were located or stored in the structures observed in the picture.

CH2MHILL

R:\USNavFacEngCom405450\400210Yorktown\MapFiles\429391_Site24_RAA\Historical Photo 2 – January 21, 1945.mxd5/22/2014cbowman



Legend

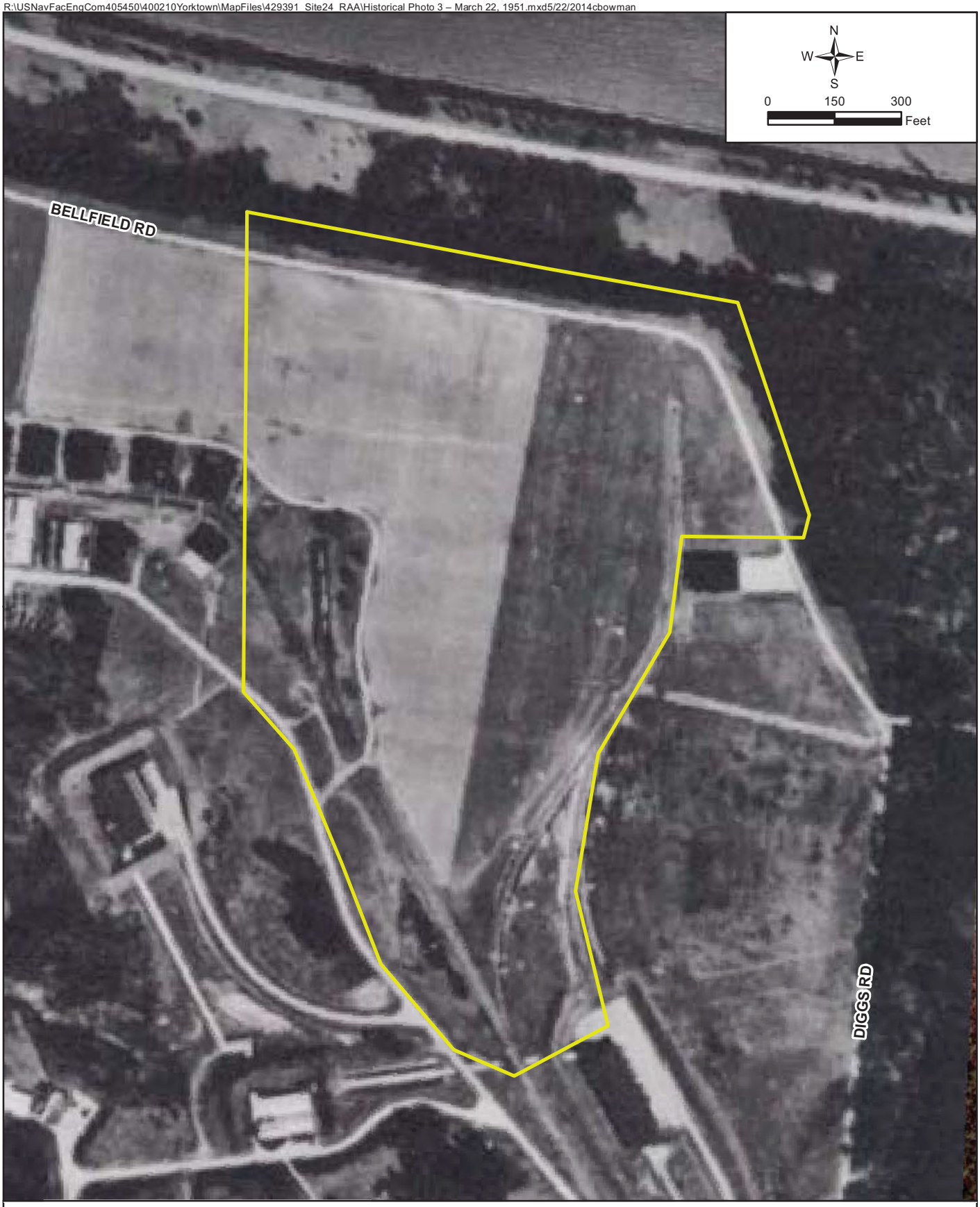
Site 24, the Aviation Field, Investigation Area (former SSA 6 Helicopter Landing Pad)

Historical Photo 2 – January 21, 1945
Site 24 Engineering Evaluation/Cost Analysis
Naval Weapons Station Yorktown
Yorktown, Virginia

The photograph shows the site area following its use as an airfield. Limited storage and ground disturbance is observed.

CH2MHILL

R:\USNavFacEngCom405450\400210Yorktown\MapFiles\429391_Site24_RAA\Historical Photo 3 – March 22, 1951.mxd5/22/2014cbowman



Legend

Site 24, the Aviation Field, Investigation Area (former SSA 6 Helicopter Landing Pad)

Historical Photo 3 – March 22, 1951
Site 24 Engineering Evaluation/Cost Analysis
Naval Weapons Station Yorktown
Yorktown, Virginia

Little change is observed in the site area between 1945 and 1951.

CH2MHILL

R:\USNavFacEngCom405450\400210Yorktown\MapFiles\429391_Site24_RAA\Historical Photo 4 – June 4, 1963.mxd5/22/2014cbowman

Legend

Site 24, the Aviation Field, Investigation Area (former SSA 6 Helicopter Landing Pad)

Ground storage can be observed in the northwest portion of the site. Additionally, some land disturbance is visible in the central portion of the site where the present-day helicopter pad exists.

Historical Photo 4 – June 4, 1963
Site 24 Engineering Evaluation/Cost Analysis
Naval Weapons Station Yorktown
Yorktown, Virginia

CH2MHILL

R:\USNavFacEngCom405450\400210Yorktown\MapFiles\429391_Site24_RAA\Historical Photo 5 – March 27, 1968.mxd5/22/2014cbowman

Legend

Site 24, the Aviation Field, Investigation Area (former SSA 6 Helicopter Landing Pad)

Increased ground storage can be observed in the northwest portion of the site. Land disturbance is still visible in the central portion of the site where the present-day helicopter pad exists.

Historical Photo 5 – March 27, 1968
Site 24 Engineering Evaluation/Cost Analysis
Naval Weapons Station Yorktown
Yorktown, Virginia

CH2MHILL

R:\USNavFacEngCom405450\400210Yorktown\MapFiles\429391_Site24_RAA\Historical Photo 6 – July 27, 1972.mxd5/22/2014cbowman

Legend

Site 24, the Aviation Field, Investigation Area (former SSA 6 Helicopter Landing Pad)

Historical Photo 6 – July 27, 1972
Site 24 Engineering Evaluation/Cost Analysis
Naval Weapons Station Yorktown
Yorktown, Virginia

Ground storage has decreased in the northern portion of the site, however, there is a notable increase in land disturbance.

CH2MHILL

R:\USNavFacEngCom405450\400210Yorktown\MapFiles\429391_Site24_RAA\Historical Photo 7 – March 26, 1981.mxd5/22/2014cbowman

Legend

Site 24, the Aviation Field, Investigation Area (former SSA 6 Helicopter Landing Pad)

Ground storage is no longer present within the site boundary. The site area has been restored and no land disturbance is observed. Additionally, the helicopter pad has been constructed.

Historical Photo 7 – March 26, 1981
Site 24 Engineering Evaluation/Cost Analysis
Naval Weapons Station Yorktown
Yorktown, Virginia

CH2MHILL

R:\USNavFacEngCom405450\400210Yorktown\MapFiles\429391_Site24_RAA\Historical Photo 8 – April 4, 1993.mxd5/22/2014cbowman

Legend

Site 24, the Aviation Field, Investigation Area (former SSA 6 Helicopter Landing Pad)

Historical Photo 8 – April 4, 1993
Site 24 Engineering Evaluation/Cost Analysis
Naval Weapons Station Yorktown
Yorktown, Virginia

Little change is observed in the site area between 1981 and 1993.

CH2MHILL

Historical Photo 9 – November 1994

Material encountered during trenching activities at Site 24 Aviation Field

Appendix B
Applicable or Relevant and Appropriate Requirements Tables

Acronyms and Abbreviations

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

References

Commonwealth of Virginia, 2013. Preliminary Identification, Applicable or Relevant and Appropriate Requirements.

USEPA, 1998. *CERCLA Compliance with Other Laws Manual: Interim Final* . Office of Emergency and Remedial Response. EPA/540/G-89/006.

USEPA, 1998. *CERCLA Compliance with Other Laws Manual: Part II. Clean Air Act and Other Environmental Statutes.* Office of Emergency and Remedial Response. EPA/540/G-89/009.

USEPA, 1998. RCRA, Superfund & EPCRA Hotline Training Manual. Introduction to Applicable or Relevant and Appropriate Requirements. EPA540-R-98-020.

Table B-1
Federal Chemical-Specific ARARs
Site 24
Naval Weapons Station Yorktown, Virginia

Media	Requirement	Prerequisite	Citation	Alternative	ARAR/TBC Determination	Comment

No Federal Chemical-Specific ARARs apply.

Table B-2
Virginia Chemical-Specific ARARs
Site 24
Naval Weapons Station Yorktown, Virginia

Media	Requirement	Prerequisite	Citation	Alternative	ARAR Determination	Comment

No Virginia Chemical-Specific ARARs apply.

Table B-3
Federal Location-Specific ARARs
Site 24
Naval Weapons Station Yorktown, Virginia

Location	Requirement	Prerequisite	Citation	Alternative	ARAR Determination	Comment
Migratory Bird Treaty Act						
Migratory bird area	Protects almost all species of native birds in the United States from unregulated taking.	Presence of migratory birds.	16 USC 703	2, 3	Applicable	The site is located in the Atlantic Migratory Flyway. If migratory birds, or their nests or eggs, are identified at the site, operations will not destroy the birds, nests, or eggs.
Coastal Zone Management Act						
Coastal zone or area that will affect the coastal zone	Federal activities must be consistent with, to the maximum extent practicable, state coastal zone management programs.	Virginia coastal zone management program enforceable policies:	15 CFR 930.33(a)(1), (c); .36(a), (b); .39(b)(c)	2, 3	Applicable	Activities at Site 24 that will affect Virginia's coastal zone will be consistent to the maximum extent practicable with Virginia's enforceable policies. Activites performed on-site and in compliance with CERCLA are not subject to adminsitrative review; however the substantive requirements of making a consistency determination will be met.

Table B-4
Virginia Location-Specific ARARs
Site 24
Naval Weapons Station Yorktown, Virginia

Location	Requirement	Prerequisite	Citation	Alternative	ARAR Determination	Comment

No Virginia Location-Specific ARARs apply.

Table B-5
Federal Action-Specific ARARs
Site 24
Naval Weapons Station Yorktown, Virginia

Action	Requirement	Prerequisite	Citation	Alternative	ARAR Determination	Comment
Installing soil cover at a facility that did not receive waste after 1991	Design requriements are provided for the closure of solid waste sites	Closure of a municipal solid waste site	40 CFR 258.60(a)	2	Relevant and Appropriate	Requirements are relevant and appropriate because there are no provisions for facilities that did not receive waste after 1991 in the state of Virginia.
Accumulation of bulk PCB remediation waste onsite for less than 180 days	PCB remediation waste may be accumulated on site or site of generation for up to 180 days so long as the waste is placed in a pile designed and operated to control dispersal of the waste by wind, does not generate leachate, and storage site must have a liner that is designed, constructed and installed to prevent any migration of wastes off or through the linder into the adjacent subsurface soil, groundwater, or surface water.	Accumulation of bulk PCB remediation waste	40 CFR 761.65 (c)(9)	2,3	Applicable	This requirement is only applicable if PCB remediation waste is generated and managed onsite. PCB remediation waste will be managed in accordance with these requirements.

Table B-6
Virginia Action-Specific ARARs
Site 24
Naval Weapons Station Yorktown, Virginia

Action	Requirement	Prerequisite	Citation	Alternative	ARAR Determination	Comment
Erosion and Sediment Control						
Erosion and deposits of soil/sediment caused by land disturbing activities	Regulations for the effective control of soil erosion, sediment deposition and nonagricultural runoff which must be met in any control program to prevent the unreasonable degradation of properties, stream channels, waters and other natural resources.	Construction activities that will disturb more than 10,000 square feet of land.	9 VAC 25-840-40(1); (2); (3); (4); (17); (18); (19)(h), (i)	2, 3	Relevant and Appropriate	Erosion control measures will be implemented for the construction activities.
	Establishes required plans and best management practices to prevent storm water pollution from discharges related to construction activity. Properties and receiving waterways downstream of any land-disturbing activity shall be protected from erosion and damage due to changes in runoff rate of flow and hydrologic characteristics, including but not limited to, changes in volume, velocity, frequency, duration, and peak flow rate of stormwater runoff.	Construction activities that will disturb more than one acre of land or that have a the potential to significantly contribute to a violation of a water quality standard or for significant contribution of pollutants to surface waters.	9 VAC 25-870-54(A, B, and D), 55 (B)(1-8)	2, 3	Relevant and Appropriate	Site activities have the potential to impact to the downgradient unnamed tributary and wetland. Storm water pollution prevention best management practices will be implemented during construction. Activites performed on-site and in compliance with CERCLA are not subject to adminsitrative review; however the substantive requirements of the regulations and permit will be followed.
Fugitive Dust Control						
Generation of fugitive dust	Regulations regarding reasonable precautions to prevent particulate matter from becoming airborne.	Conducting any activity which may cause particulate matter to become airborne.	9 VAC 5-50-90	2 , 3	Applicable	Dust control measures will be implemented during activities at the site.
Waste Management						
Management of non-hazardous solid waste in containers	Establishes standards and procedures pertaining to the management of non-hazardous solid wastes in containers. Nonputrescible wastes must be stored in appropriate containers and not staged for more than 90 days.	Generation of non-hazardous solid waste that is managed onsite in containers.	9 VAC 20-81-95(D)(10)(b)	2, 3	Applicable	It is anticipated that some wastes (such as decontamination fluids) may be generated and managed onsite in containers. Based on the analytical results from previous investigations, it is expected that these wastes will be non-hazardous solid waste. Wastes will be characterized prior to offsite disposal.
Management of non-hazardous solid waste in waste piles	Establishes standards and procedures pertaining to the construction,management, and closure of waste piles being used to manage non-hazardous solid wastes.	Generation of non-hazardous solid waste that is managed onsite in piles.	9 VAC 20-81-330(F), 340(F), 360(1)(a)	3	Applicable	It is anticipated that soil will be excavated and managed in a waste pile prior to disposal offsite. Based on the analytical results from previous investigations, it is anticipated that excavated soil will be characterized as non-hazardous solid waste.

Table B-6
Virginia Action-Specific ARARs
Site 24
Naval Weapons Station Yorktown, Virginia

Action	Requirement	Prerequisite	Citation	Alternative	ARAR Determination	Comment
Accumulation of hazardous waste in containers onsite for less than 90 days	Hazardous waste may be accumulated on site in containers for up to 90 days so long as the containers are in good condition, compatible with the waste being stored, and labeled with the words "Hazardous Waste" and the date that accumulation began. The containers must also be kept closed unless adding or removing waste and inspected weekly.	Accumulation of hazardous waste in containers onsite.	9 VAC 20-60-262 only as it incorporates 40 CFR 262.34 (a) (1)(i), (2), (3)	2,3	Applicable	This requirement is only applicable if hazardous waste is generated and managed onsite in containers. Containers will be managed in accordance with these requirements.
Accumulation and/or treatment of hazardous waste in staging piles onsite	A staging pile must me designed constructed and maintained to prevent the migration of hazardous constituents other media. The design must consider location, hydrogeology, and any other factors that may reasonably influence the migration of hazardous constituents. Closure requirements are also included.	Accumulation or treatment of hazardous wastes in staging piles onsite	9 VAC 20-60-264 only as it incorporates 40 CFR 264.554(d)(1)(ii), (d)(2), (j)(1), (j)(2)	2, 3	Applicable	This requirement is only applicable if hazardous waste is generated and managed onsite in staging piles. Piles will be designed and managed in accordance with these requirements.

Appendix C
Cost Estimates

TABLE C-1

Engineer's Cost Estimate for Alternative 2: Soil Cover

Engineering Evaluation and Cost Analysis for Site 24- Aviation Fiela

Naval Weapons Station Yorktown

Yorktown, Virginia

Description: Alternative 2 consists of installing a 2 ft soil cover, consisting of 18 inches of general fill followed by 6 inches of topsoil and permanent seeding, over a 0.98 acre area which includes the disposal areas and the three hotspot areas. LUCs, O&M, groundwater LTM, and five-year reviews would be implemented for the soil cover area.

Description of Service/Items	Unit	Quantity	Unit Price	Total	Assumptions
Work Planning Documents					
Construction Work Plan	Lump Sum	1	$20,000.00	$20,000.00	Includes draft and final submission and Erosion and Sediment Control Plan.
EM385 Health and Safety Plan	Lump Sum	1	$12,000.00	$12,000.00	Includes draft and final submission and AHAs.
Construction Completion Report	Lump Sum	1	$15,000.00	$15,000.00	Includes draft and final submission.
Work Planning Documents Total				***$47,000***	
Mobilization/Demobilization and Site Setup					
Mobilization/Demobilization	Each	2	$5,823.59	$11,647.17	Includes mobilization and demobilization of all equipment and materials necessary to perform the work. [RSMeans Crew #B-1, #B-10L, #B-10T, and #B-12A]
Construction Entrance Temporary Road	square yard	94	$15.34	$1,441.58	One 70'x12' and 6" thick with #1 VDOT stone. [RSMeans #01-55-23.50 (0100)]
Material Staging Area for Fill Material	Lump Sum	1	$1,500.00	$1,500.00	Assumes 50' x 50' area. Includes 3 rolls of poly sheeting and silt fence; removal included
Portable Toilet and Handwash Station	Week	2	$100.00	$200.00	Based on quote from recent similar project.
Trimble GPS	Week	1	$525.00	$525.00	For identifying soil cover areas.
Mobilization/Demobilization and Site Setup Total				***$15,314***	
Site Management					
Site Superintendent	Hour	140	$58.50	$8,190.00	Assumes 14 10-hour days to complete work.
H&S/QC Manager	Hour	140	$52.00	$7,280.00	Assumes 14 10-hour days to complete work
Project Vehicle (Pickup Truck)	Week	3	$745.00	$2,235.00	Includes fuel and rental vehicle. Assumes 1 truck for Site Management [Hertz Equipment Rental = 1 each @ $605/week plus 1 each @ $140/week (35 gallons @ $4/gallon for fuel). Onsite for duration of field work.
Site Management Total				***$17,705***	
Material Delivery and Placement					
Fill Material Source Sampling	Each	2	$593.00	$1,186.00	Assumes 7 day TAT and 1 sample per offsite borrow source. Samples analyzed for VOCs, SVOCs, pesticides, PCBs, and metals. BOA rates
Topsoil material and delivery	cubic yard	989	$35.00	$34,615.00	Includes 6" of topsoil over a 0.98 acre area; assume 1.25 cy loose/in-place and production rate of 500 cy per day. Based on recent similar projects.
General fill material and delivery	cubic yard	2965	$23.00	$68,195.00	Includes 1.5' of general fill over a 0.98 acre area; assume 1.25 cy loose/in-place and production rate of 500 cy per day. Based on recent similar projects.
Topsoil and General Fill Placement	cubic yard	3,954	$3.50	$13,839.00	Engineer's Estimate. Includes labor and equipment. Assumes 1.25 cy loose/in-place and production rate of 400 cy per day.
Material Delivery and Placement Total				***$117,835***	
Site Restoration					
Grading	square yard	4744	$2.91	$13,825.63	Includes grading the soil cover areas. [RSMeans #31-22-16.10 (1050)]
Seeding	Lump Sum	1	$3,240.30	$3,240.30	Includes seed and straw for all disturbed areas. Assumes the area to be restored is less than 1 acre. [RSMeans #32-92-19.14 (0800)]
JIEDDO Battle Course Repairs	square yard	345	$12.23	$4,218.66	Assumes repairs to gravel course will be needed for 60'x35' and 25'x40' areas with 6" thick layer of crusher run gravel. [RSMeans #01-55-23.50 (0100)]
Drainage Ditch Re-Routing	Linear Feet	210	$7.75	$1,627.50	Assumes drainage ditch will need to be re-routed to accommodate soil cover over isolated hot spot area in drainage ditch. Includes labor, equipment, and material. Includes permanent seeding and erosion control matting. Assumes excess soil would be placed at bottom of drainage ditch soil cover. Based on recent similar projects.
Site Restoration Total				***$22,912***	
LUCs and Groundwater LTM Plan					
Sign (small)	Each	2	$90.00	$180.00	Assumes 24" x 24" white sign with black lettering.
Survey Plat	Each	1	$6,000.00	$6,000.00	Includes field surveying, data evaluation, reporting, filing fees, and labor.
Groundwater Monitoring Sampling and Analysis Plan	Each	1	$30,000.00	$30,000.00	Assumes that the groundwater monitoring sampling and analysis plan will be utilized throughout the life of the remedy.
LUCs and Groundwater LTM Plan Total				***$36,180***	
Subtotal				$256,946	
Contingency (25%)			25.0%	$64,236	
Construction Management (10%)			*10.0%*	$25,695	
Project Management (8%)			*8.0%*	$20,556	
Subtotal				$367,433	
Performance Bond (2%)			2.0%	$7,349	Industry Average
TOTAL CAPITAL COST				**$375,000**	
Operations and Maintenance (O&M) for Soil Cover (1 to 30 Years)					
LUC and Cover Quarterly Inspections	Each	8	$2,500.00	$20,000.00	Assumes 2 years of quarterly inspections. Includes reporting. Engineer's estimate based on recent similar projects.
Annual LUC and Cover Inspections	Each	28	$2,500.00	$70,000.00	Engineer's estimate based on recent similar projects.
Annual Groundwater LTM	Each	30	$20,000.00	$600,000.00	Engineer's estimate based on recent similar projects. Assume 11 monitoring wells, 3 QA/QC samples, and 3 10-hour days per event. Includes all labor, equipment, and materials as well as data analysis and reporting. Analytical data laboratory analysis and data validation costs based on 2014 Navy CLEAN BOA rates; analysis includes aroclor-1254, aluminum, cadmium, and copper.
5-Year Review and Report	Each	6	$20,000.00	$120,000.00	Engineer's estimate based on recent similar projects. Includes soil cover and vegetative maintenance.
Subtotal				$810,000	
Contingency (25%)			25.0%	$202,500	
Project Management (8%)			*8.0%*	$64,800	
TOTAL O&M COST				**$1,077,000**	
Total O&M Cost Per Year				$35,900	
Total Years of O&M				30	
Discount Rate				3.90%	
Discount Factor				17.50	
Total Present Value of O&M Cost				**$628,000**	
TOTAL PRESENT VALUE of ALTERNATIVE				**$1,003,000**	
			+50%	**$1,505,000**	
			-30%	**$702,000**	

References and Source Notes

- Base costs used are 2014 dollars.
- RS Means: Facilities Construction Cost Data, 2013 + 1.9% average 2014 escalation factor (Global Insight).
- Recent similar projects include construction projects in Cheatham Annex in Williamsburg, VA; JEB Little Creek in Virginia Beach, VA; NAS Oceana in Virginia Beach, VA; SJCA in Chesapeake, VA; and NSN in Norfolk, VA.
- Discount factor established per "Revisions to OMB Circular A-94 on Guidelines and Discount Rates for Benefit-Cost Analysis", OSWER Directive No. 9355.3-20,December 26, 2013.

Assumptions and Exclusions

1. Mobilization includes utility clearance.

2. The enclosed Engineer's Estimate is only an estimate of possible construction costs for budgeting purposes. This estimate is limited to the conditions existing at its issuance and is not a guarantee of actual price or cost. Uncertain market conditions such as, but not limited to: local labor or contractor availability, wages, other work, material market fluctuations, price escalations, force majeure events, and developing bidding conditions etc may affect the accuracy of this estimate. CH2M Hill is not responsible for any variance from this estimate or actual prices and conditions obtained. This is an order-of-magnitude cost estimate that is expected to be within +50 to -30 percent of the anticipated costs in the EE/CA.

TABLE C-2

Engineer's Cost Estimate for Alternative 3: Excavation and Offsite Disposal

Engineering Evaluation and Cost Analysis for Site 24- Aviation Fiela

Naval Weapons Station Yorktown

Yorktown, Virginia

Description: Alternative 3 consists of excavating the disposal and hotspot removal areas. A total of 12,191 yd^3 of material will be excavated from the disposal and hotspot removal areas at varying excavation depths from 2 to 13 ft bgs and backfilled.

Description of Service/Items	Unit	Quantity	Unit Price	Total	Assumptions
Work Planning Documents					
Construction Work Plan	Lump Sum	1	$20,000.00	$20,000.00	Includes draft and final submission and Erosion and Sediment Control Plan
EM385 Health and Safety Plan	Lump Sum	1	$12,000.00	$12,000.00	Includes draft and final submission and AHAs
Construction Completion Report	Lump Sum	1	$15,000.00	$15,000.00	Includes draft and final submission
Work Planning Documents Total				***$47,000***	
Mobilization/Demobilization and Site Setup					
Mobilization/Demobilization	Each	2	$5,823.59	$11,647.17	Includes mobilization and demobilization of all equipment and materials necessary to perform the work. [RSMeans Crew #B-1, #B-10L, #B-10T, and #B-12A]
Construction Entrance Temporary Road	square yard	94	$15.34	$1,441.58	One 70'x12' and 6" thick with #1 VDOT stone. [RSMeans #01-55-23.50 (0100)]
Material Handling Area	Lump Sum	1	$2,500.00	$2,500.00	Assumes 100' x 100' area. Includes impermeable liner, straw bale berm, sandbags, and 3" layer of sand over the impermeable liner to protect the liner; setup and removal included (based on recent similar project).
Material Staging Area for Fill Material	Lump Sum	1	$1,500.00	$1,500.00	Assumes 50' x 50' area. Includes 3 rolls of poly sheeting and silt fence; removal included
Silt Fence	Linear Feet	250	$4.50	$1,125.00	Includes all labor, equipment, and materials. Assumes installation around areas to be disturbed at topographic lows. Based on quote from recent similar project.
Portable Toilet and Handwash Station	Week	11	$100.00	$1,100.00	Based on quote from recent similar project.
Trimble GPS	Week	1	$525.00	$525.00	For identifying soil removal areas.
Pre-Excavation Waste Characterization Sampling	Each	12	$1,257.70	$15,092.40	Assumes 1 sample per 1,000 cy for full TCLP (VOCs, SVOCs, metals, herbicides, and pesticides), reactivity (cyanide and sulfide), ignitability, corrosivity, TPH-DRO, and TPH-GRO with 7 day TAT. BOA rates.
Mobilization/Demobilization and Site Setup Total				***$34,931***	
Site Management					
Site Superintendent	Hour	550	$58.50	$32,175.00	Assumes 55 10-hour days to complete work.
H&S/QC Manager	Hour	550	$52.00	$28,600.00	Assumes 55 10-hour days to complete work
Project Vehicle (Pickup Truck)	Week	11	$745.00	$8,195.00	Includes fuel and rental vehicle. Assumes 1 truck for Site Management [Hertz Equipment Rental = 1 each @ $605/week plus 1 each @ $140/week (35 gallons @ $4/gallon for fuel). Onsite for duration of field work.
Site Management Total				***$68,970***	
Post-Excavation Confirmation Sampling					
Disposal Area Confirmation Sampling	each	32	$1,089.03	$34,848.96	Assumes 7 day TAT; 1 floor sample per every 5,625 ft^2 (75' x 75' grid) and 4 wall samples per disposal area. Samples analyzed for aroclor-1254, aluminum, cadmium, and copper. BOA rates used.
Hotspot Area Confirmation Sampling	each	15	$68.78	$1,031.70	Assumes 7 day TAT; 1 floor sample and 4 wall samples per hotspot. Samples analyzed for arsenic and mercury in hotspot areas. BOA rates used.
Post-Excavation Confirmation Sampling Total				***$35,881***	
Excavation					
Excavate and Load Material	Ton	18,287	$4.50	$82,289.25	Engineer's Estimate. Assumes 1.5 tons/cy for soil with debris and production rate of 825 tons per day. Includes labor and equipment. Assumes OSHA Type A soil with sloping at 0.75H:1V for excavations deeper than 5 ft bgs.
Transportation and Disposal					
T&D of Excavated Soil and Waste	Ton	18,287	$60.00	$1,097,190.00	Assumes 1.5 tons/cy. Includes labor and equipment. Based on recent similar project.
Excavation, Transportation, and Disposal Total				***$1,179,479***	
Material Delivery and Placement					
Fill Material Source Sampling	Each	2	$593.00	$1,186.00	Assumes 7 day TAT and 1 sample per offsite borrow source. Samples analyzed for VOCs, SVOCs, pesticides, PCBs, and metals. BOA rates
Topsoil material and delivery	cubic yard	1,082	$35.00	$37,852.50	Includes 6" of topsoil over a 0.98 acre area to include sloped excavations for areas deeper than 5 ft bgs; assume 1.25 cy loose/in-place and production rate of 550 cy per day. Based on recent similar projects.
General fill material and delivery	cubic yard	13,393	$23.00	$308,044.75	Includes general fill to within 6" of pre-excavation elevation to include sloped excavations for areas deeper than 5 ft bgs. Assumes 1.25 cy loose/in-place, 763 cy of excavated material from the sidewalls of excavations deeper than 5 ft bgs will be reused, and production rate of 550 cy per day. Based on recent similar projects.
Topsoil and General Fill Placement	cubic yard	14,475	$3.50	$50,661.63	Engineer's Estimate. Includes labor and equipment. Assumes 1.25 cy loose/in-place and production rate of 400 cy per day.
Material Delivery and Placement Total				***$397,745***	
Surveying					
Post-Excavation Topographic Survey	Day	1	$3,160.00	$3,160.00	Assumes 1 10-hour day to complete the survey. Includes mobilization/demobilization, survey data evaluation/reporting, and all labor, equipment, and materials. Assumes 2-man surveying crew. BOA rates used.
As-Built Topographic Survey	Day	1	$3,160.00	$3,160.00	Assumes 1 10-hour day to complete the survey. Includes mobilization/demobilization, survey data evaluation/reporting, and all labor, equipment, and materials. Assumes 2-man surveying crew. BOA rates used.
Surveying Total				***$6,320***	
Site Restoration					
Grading	square yard	4744	$2.91	$13,825.63	Includes grading the backfilled areas. [RSMeans #31-22-16.10 (1050)]
Seeding	Lump Sum	1	$3,240.30	$3,240.30	Includes seed and straw for all disturbed areas. Assumes the area to be restored is less than 1 acre. [RSMeans #32-92-19.14 (0800)]
JIEDDO Battle Course Repairs	square yard	345	$12.23	$4,218.66	Assumes repairs to gravel course will be needed for 60'x35' and 25'x40' areas with 6" thick layer of crusher run gravel. [RSMeans #01-55-23.50 (0100)]
Site Restoration Total				***$21,285***	
Subtotal				$1,791,611	
Contingency (25%)			25.0%	$447,903	
Construction Management (10%)			*10.0%*	$179,161	
Project Management (8%)			*8.0%*	$143,329	
Subtotal				$2,562,003	
Performance Bond (2%)			2.0%	$51,240	Industry Average
TOTAL CAPITAL COST				**$2,613,000**	
			+50%	**$3,920,000**	
			-30%	**$1,829,000**	

References and Source Notes

- Base costs used are 2014 dollars.
- RS Means: Facilities Construction Cost Data, 2013 + 1.9% average 2014 escalation (Golbal Insight)
- Recent similar projects include construction projects in Cheatham Annex in Williamsburg, VA; JEB Little Creek in Virginia Beach, VA; NAS Oceana in Virginia Beach, VA; SJCA in Chesapeake, VA; and NSN in Norfolk, VA.

Assumptions and Exclusions

1. Mobilization includes utility clearance.

2. The enclosed Engineer's Estimate is only an estimate of possible construction costs for budgeting purposes. This estimate is limited to the conditions existing at its issuance and is not a guarantee of actual price or cost. Uncertain market conditions such as, but not limited to: local labor or contractor availability, wages, other work, material market fluctuations, price escalations, force majeure events, and developing bidding conditions etc may affect the accuracy of this estimate. CH2M Hill is not responsible for any variance from this estimate or actual prices and conditions obtained. This is an order-of-magnitude cost estimate that is expected to be within +50 to -30 percent of the anticipated costs in the EE/CA.

Attachment 2
Public Notices

Book focuses on Warner's bipartisan efforts

It sure looks like a campaign biography — a smiling face, American flag and the politician's name in big letters — but the just released "Mark Warner The Dealmaker: From Business Success to the Business of Governing" is not a signal that the senator plans to run for president, both author Will Payne and "afterword" writer Quentin Kidd said. (Warner has been expressing support for Hillary Clinton.)

Payne is a political strategist whose first vote was for Warner — John Warner, that is, when he won reelection in 1996, fending off Mark Warner's hard-fought initial foray into electoral politics. As a General Assembly aide, Payne saw Warner in action, as a Democratic governor working with a Republican-controlled General Assembly. He liked the way Warner could work across the partisan divide — so much so that he led the "Virginians for Mark Warner" campaign, his first effort in a statewide contest and his first for a Democrat, when Warner (Mark, that is) ran for Senate in 2008.

It wasn't long after Warner's victory that Payne thought of a book, one that would focus on how a politician from one party negotiated the tricky waters of cooperating with politicians from the other. He said he did not ask Warner for a green light, and only conducted his first interview with Warner after eight months of interviewing others. Payne sent a copy to Warner only last Friday.

"I'm wondering what he's going to say," he said.

The book is published by Arcadia Publishing and can be purchased online at arcadiapublishing.com.

When money talks

What's the difference between support and endorsement?

About $500 — at least, in one of the hottest House of Delegates races this year, Del. David Yancey, R-Newport News, versus Newport News School Board member Shelly Simonds, the Democratic candidate.

The $500 is what the Virginia Education Association, the state's teachers union, gave Yancey's campaign last October, noting on its check that it was a "silver sponsor."

The endorsement is what the association, a political powerhouse in Capitol Square, gave Simonds last month.

The difference drew a sharply worded news release from the association after the Republican Party sent out a mailer with a picture of Yancey and two smiling high school students looking at a computer screen in what Shad Plank still calls a school library.

Travis Fain and Dave Ress
Shad Plank

At the bottom of the mailer is a big red apple and the words "has received support from the Virginia Education Association."

The VEA's response, disputing the "support claim, said "Del. David Yancey needs to earn the backing of the VEA Fund, not appropriate it."

That $500, the association said, was a "small payment to attend a reception fundraiser" for Yancey. But it complained that Yancey never bothered to fill in its endorsement questionnaire.

That "silver sponsor" check was what Yancey aide Gretchen Heal looked up when she proofread the state party's mailer. "I thought support, like you think child support — a payment," she said. "I thought they supported us because of our positions on their issues." Yancey doesn't fill out any questionnaires from lobbying groups, even though it does tend to miff them, she said.

The VEA likes Simonds' stand on funding public schools, making teaching a more attractive profession and cutting reliance on standardized tests.

As of June 30, though, the association had not contributed to her campaign fund.

Small bill, big benefit

It seemed like an obvious issue to state Sen. Mamie Locke, D-Hampton, when a constituent, facing her family's third uprooting as her husband was about to be transferred to a duty station overseas, asked this:

If you don't really have a choice about leaving a job because the military sends your spouse overseas, why can't you get unemployment insurance?

Locke's constituent had missed out twice before, losing jobs because she wanted to stay with her husband.

Why not indeed? Locke thought.

"It's not like it's really a choice, if you want to keep your family together," Locke said.

Virginia's strict rules for getting unemployment insurance say you can't get it if you leave voluntarily — but, as plenty of military spouses know, it doesn't feel voluntary when orders come.

Locke began pushing for a change.

Eventually, her pitch that Virginia's military families are a big economic asset resonated with business leaders. So did her suggestion that helping out military spouses wouldn't break the bank at the unemployment trust fund. The General Assembly last year enacted her bill.

After a year, the results are in. For the fiscal year ended June 30, benefits to military trailing spouses totaled just under $659,000.

A total of 212 received the benefit.

For Locke, the first number confirms her view that the cost would be reasonable.

And the second confirms that the need is there.

Eschewing the sound bite?

Here's a surprise: on an issue that's long generated sound bites and votes, members of Congress are beginning to think of new approaches, says Rep. Robert C. "Bobby" Scott, D-Newport News.

The issue is criminal justice — or, to be exact, the way we tend to send lots of people to prison for really long periods of time.

Scott is pumped these days about the support for change that he's seeing from both parties. Some 20 Republicans (including Rep. Scott Rigell, R-Virginia Beach) and 20 Democrats (led by Scott) have joined forces to sponsor a 144-page measure for sweeping reform of federal criminal policy.

"You just don't see 20 Republicans and 20 Democrats on a major bill," Scott said. "That's bipartisanship. ... Usually, when we say a bill is bipartisan, it means there are 80 sponsors from one party and two from the other."

The bill includes measures Scott has long advocated: funding for early intervention to steer kids at risk of going wrong to better paths, alternatives to prison for nonviolent first offenders and different approaches to punishment than the mandatory minimum sentences that make such great sound bites.

Not everyone on either side of the aisle is happy with everything in the bill, Scott says. But enough are happy with the idea of a fairer, less costly and more effective system that he thinks, this time, reform is coming.

Labor Day picnic

Rep. Bobby Scott, by the way, hosts his 39th annual Labor Day Celebration on Monday, Sept. 7, at his family's home, 914 Shore Drive in Newport News from 3 p.m. to 6 p.m. All are invited!

Fain can be reached at tfain@dailypress.com or 757-525-1759; Ress at dress@dailypress.com or 757-247-4535. Read The Shad Plank blog at shadplank.com and follow The Shad Plank on Facebook at facebook/shadplank.

NAVFAC Naval Facilities Engineering Command

Public Notice of
Navy's Invitation for Public Comment on the Engineering Evaluation/Cost Analysis for Site 24 – Aviation Field at Naval Weapons Station Yorktown

The Naval Facilities Engineering Command (NAVFAC), Mid-Atlantic, invites the public to provide comments on the proposed removal action at Site 24 at Naval Weapons Station Yorktown, Yorktown, Virginia. The removal action, consisting of the removal of approximately 12,200 cubic yards of impacted soil and waste, is detailed in the Final Engineering Evaluation/Cost Analysis (EE/CA) report. The document will be available for public review at the following location:

York County Public Library – Yorktown
8500 George Washington Memorial Hwy
Yorktown, Virginia 23692
(757) 890-3377

The public is invited to provide written comments on the EE/CA during the period of September 8, 2015 through October 8, 2015. Send all written comments postmarked on or before October 8, 2015 to the following address:

NAVFAC MID ATLANTIC
Building N-26, Rm 3300
ATTN: Bryan Peed
9742 Maryland Avenue
Norfolk, Virginia 23511-3095
Bryan.Peed@navy.mil
Phone: 757-341-0480

If requested, a public meeting will be held by representatives of the Navy to clarify public questions or comments on the EE/CA.

THE OMF DIFFERENCE

THE ORIGINAL MATTRESS FACTORY

MADE IN AMERICA

Experience an Original

Eliminating the middleman and providing great value.

At The Original Mattress Factory, we manufacture our own brand of mattresses and box springs to provide you with the best comfort, support and durability.

Straight from our factory to you...

1 Factory

2 Delivery

3 Customer

- Over 150 years of combined industry experience!
- No pressure sales. Everyday low factory direct pricing. We are here to educate. Friendly, courteous, knowledgeable sales staff.
- Top of line Orthopedic series queen sets starting at $799! 2-sided mattress, real working box springs.
- Efficient, courteous delivery service available.
- Adjustable beds and Specialty foam available.
- 11 Factories, 100+ factory stores for your convenience.

Come visit one of our locally owned and operated factories where we make two-sided mattresses and real working modular box springs.

Visit us on the web: www.originalmattress.com

BBB ACCREDITED BUSINESS A+

In front of Lowe's/Power Plant
2071 W. Mercury Blvd.
Hampton, Virginia 23666
(757) 262-0035

In front of Kohl's/Trader Joe's
12551 Jefferson Avenue
Newport News, VA 23602
(757) 877-6690

In front of Lowe's
800 E. Rochambeau Dr. Unit B
Williamsburg, Virginia 23188
(757) 476-2000

144 E. Little Creek Road
Norfolk, Virginia 23505
(757) 588-1990

1508 Sam's Circle
Chesapeake, Virginia 23320
(757) 312-9500

4240 Portsmouth Boulevard
Chesapeake, Virginia 23321
(757) 465-2322

3750 Virginia Beach Boulevard
Virginia Beach, Virginia 23452
(757) 486-2400

Client Name: CH2M Hill-Virginia Beach
Advertiser: Main/A004/ALL
Section/Page/Zone: Public Notice
Description:
Ad Number: 3556820-1
Insertion Number:
Size: 3 x 5.25
Color Type: B&W

Daily Press
Publication Date: 09/05/2015
This E-Sheet(R) is provided as conclusive evidence that the ad appeared in Daily Press on the date and page indicated. You may not create derivative works, or in any way exploit or repurpose any content.

Product: VABroadsheet PubDate: 09-05-2015 Zone: ALL Edition: Gazette Folio: 13A User: broughton Time: 09-04-2015 20:48 Color: K Notes:

PHOTO SUBMITTED BY THRIVENT FINANCIAL

Thrivent Financial celebrates grand opening

Thrivent Financial celebrated its grand opening and ribbon-cutting July 29. Thrivent offers a broad range of financial products and services and financial guidance for life events, such as education funding, retirement and legacy strategies. The local office is located at 5248 Olde Towne Road, Suite 3. Hours are by appointment. For more information, contact Ron Adolphi at 757-903-2722 or email ron.adolphi@thrivent.com or visit the organization online at thrivent.com.

BUSINESS NOTES

■ **Cushman & Wakefield | Thalhimer** reported the following recent lease transactions in greater Williamsburg: **Williamsburg Drug Co**. renewed its lease of 2,948 square feet in Marketplace Shopping Center at 240 McLaws Circle. **Starbucks Coffee Company** renewed its lease of 2,331 square feet in Marketplace Shopping Center at 240 McLaws Circle. **Subway** renewed its lease of 1,960 square feet in Marketplace Shopping Center at 240 McLaws Circle. **Chesapeake Bay Management Company** leased 1,700 square feet at 287 McLaws Circle, Suite 1.

■ **Custom-Made Fitness** is now offering a Bone Builders Program. This program is specialized for those people with osteoporosis, at risk for osteoporosis or for those who want to maintain bone health. For more information, call 757-345-2246 or check cmfwilliamsburg.com.

Martinez

Berberabe

■ **CENTURY 21 Nachman Realty** recognized **Jackie Berberabe** as top listing agent and **Courtney Martinez** as top sales agent for August.

Learn to Invest
from someone who teaches Modern Retirement Planning™
Classes start Oct 17 & 27

T. H. MacDonnell, ChFC
Chartered Financial Consultant
Jamestown Financial Group
Local Instructor for
Modern Retirement Planning™
www.modernretirementplanning.com
888.218.1188
Securities & advisory services offered through Centaurus Financial, Inc., a registered broker/dealer and registered investment advisor, member FINRA/SIPC. Modern Retirement Planning™, Centaurus Financial, Inc., and Jamestown Financial Group are not affiliated.

www.lindaberryman.com

Lean on me for Superior Service!
2013 & 2014 Top Listing & Sales Agent
Williamsburg Office
Linda Lee Berryman
CRS, GRI, ABR, SRES,
Associate Broker
757.532.7749 Direct
linda.berryman@bhhstowne.com
BERKSHIRE HATHAWAY HomeServices | Towne Realty
4135 Ironbound Rd., Williamsburg, VA 23188
© 2015 BHH Affiliates LLC. An independently owned and operated broker member of BHH Affiliates LLC.

NAVFAC
Naval Facilities Engineering Command

Public Notice of
Navy's Invitation for Public Comment on the Engineering Evaluation/Cost Analysis for Site 24 – Aviation Field at Naval Weapons Station Yorktown

The Naval Facilities Engineering Command (NAVFAC), Mid-Atlantic, invites the public to provide comments on the proposed removal action at Site 24 at Naval Weapons Station Yorktown, Yorktown, Virginia. The removal action, consisting of the removal of approximately 12,200 cubic yards of impacted soil and waste, is detailed in the Final Engineering Evaluation/Cost Analysis (EE/CA) report. The document will be available for public review at the following location:

York County Public Library – Yorktown
8500 George Washington Memorial Hwy
Yorktown, Virginia 23692
(757) 890-3377

The public is invited to provide written comments on the EE/CA during the period of September 8, 2015 through October 8, 2015. Send all written comments postmarked on or before October 8, 2015 to the following address:

NAVFAC MID ATLANTIC
Building N-26, Rm 3300
ATTN: Bryan Peed
9742 Maryland Avenue
Norfolk, Virginia 23511-3095
Bryan.Peed@navy.mil
Phone: 757-341-0480

If requested, a public meeting will be held by representatives of the Navy to clarify public questions or comments on the EE/CA.

Make vagazette.com your HOME PAGE

Crème-De-Le-Crème
Style, Quality, Value!

3117 Hollow Oak Drive • Stonehouse

Design perfection describes the ambiance of this uniquely detailed home. Are you looking for a home suitable to live in—together with your parents or an adult child? This all brick, custom one-owner home with minimal maintenance has everything you're looking for—and more! Situated on 1.2 acres on a quiet cul-de-sac this transitional master piece is ready for the buyers looking for that 'special home'. Some of the many unique delights, features and amenities you'll discover are:

- Approximately 4,476 square feet of comfortable, open, flowing living space with both formal and casual areas.
- Welcoming foyer blends into a gracious living/gathering area with one of three fireplaces.
- An adjoining great room with fireplace is conveniently located to the kitchen, living room and formal dining area.
- One of two streamlined open kitchens with lustrous maple cabinets, abundant granite counters and storage, with casual dining area and lower level deck/rear yard access for additional entertaining.
- Three master retreats on the first, second and lower level, all with private baths.
- An additional bedroom on the patio level has a spacious closet and ready for sweet dreams!
- The lower level apartment has the third fireplace with built in storage in the family room, full kitchen, office/den or play room, together with a media area with French Doors to an extraordinary private and peaceful patio.
- MLS No. 30047108
- Offered for $575,000

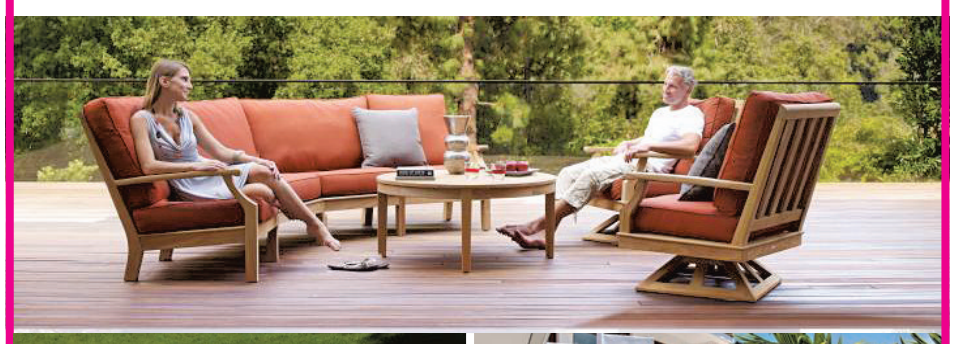
All you want and more! All you'd expect and more!
COME — ENJOY THE GOOD LIFE
AND VACATION ALL YEAR ROUND!

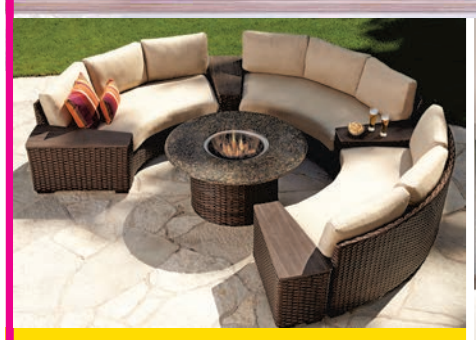
Susan Spellman
Local Presence
International Coverage

Direct Desk Line 757.564.6580
Email spellrealtor@cox.net
Visit our new offices at
5234 Monticello Avenue
www.susanspellman.com
LONG & FOSTER REALTORS

Labor Day Weekend Sale

Big discounts throughout the store
on in-stock wicker, aluminum, teak, & polymer dining sets and sofa/loveseat sets!
Don't miss it!





BIG SAVINGS ON IN-STOCK COLLECTIONS
JUST IN TIME FOR
FALL ENTERTAINING!

Celebrating 27 years in 2015
WILLIAMSBURG WICKER & PATIO
VG 2014 BEST OF WILLIAMSBURG
Voted #1 Best of Williamsburg! Outdoor Patio Furniture
757-565-3620 • www.williamsburgwicker.com • 7422 Richmond Road
MON.-SAT. 9:30AM-5:30PM • SUNDAY BY APPOINTMENT