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FINAL ENGINEERING EVALUATION/COST ANALYSIS SITE 1 FORMER DISPOSAL PITS 1
AND 3 (SOIL) ALLEGANY BALLISTICS LABORATORY ROCKET CENTER WV
5/1/2012
CH2M HILL

Final

**Engineering Evaluation/Cost Analysis
Site 1
Former Disposal Pits 1 and 3 (Soil)**

Allegany Ballistics Laboratory
Rocket Center, West Virginia



Prepared for

Department of the Navy

**Naval Facilities Engineering Command
Mid-Atlantic**

Contract No.
N62470-08-D-1000
CTO-WE13

May 2012

Prepared by

CH2MHILL

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**Action Memorandum
Site 1
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**Allegany Ballistics Laboratory
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Contract Task Order – WE13

May 2012

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Under the

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

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CH2MHILL

Chantilly, Virginia

DECLARATION

ACTION MEMORANDUM

**Site 1
Former Disposal Pits 1 and 3 (Soil)**

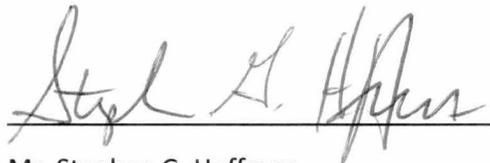
**Allegany Ballistics Laboratory
Rocket Center, West Virginia**

DATE: August 27, 2012
SUBJECT: Excavation of Soil and Offsite Disposal of Contaminated Soil at Site 1, Former Disposal Pits 1 and 3, ABL, Rocket Center, West Virginia
FROM: Commander, Naval Facilities Engineering Command, Mid-Atlantic
TO: Mr. Stephen G. Hoffman

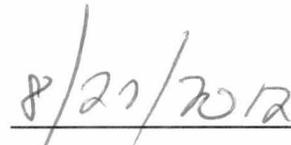
This Action Memorandum documents approval for excavation and offsite disposal of unsaturated soil at Former Disposal Pits 1 and 3 at Site 1, ABL, Rocket Center, West Virginia. This Action Memorandum serves as the Decision Document for selection of the non-time critical removal action as evaluated in the Engineering Evaluation/Cost Analysis at Site 1, prepared under separate cover and developed in accordance with the Comprehensive Environmental Response, Compensation, and Liability Act 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.

Conditions at Site 1 meet the NCP Section 300.415(b)(2) criteria for removal. Naval Facilities Engineering Command Mid-Atlantic recommends approval of the proposed removal action. The total project ceiling if approved will be \$2,171,000. Response actions should commence as soon as practical to expedite the removal of contaminated soil at the site.

Approved by:



Mr. Stephen G. Hoffman
Director
Program Management Office (PMO)
Information Technology (SEA 04FP)



Date

Contents

Acronyms and Abbreviations.....	vii
I. Purpose	9
II. Site Conditions and Background.....	9
A. Site Description.....	9
1. Removal Site Evaluation	10
2. Physical Location	11
3. Site Characteristics	11
4. Release or Threatened Release into the Environment of a Hazardous Substance, Pollutant, or Contaminant	11
5. National Priorities List Status.....	11
6. Maps, Pictures, and Other Graphic Representations	12
B. Other Actions.....	12
1. Previous Actions	12
2. Current Actions.....	12
C. State and Local Authority’s Role.....	12
1. State and Local Actions to Date.....	12
2. Potential for Continued State/Local Response.....	12
III. Threats to Public Health, Welfare or the Environment, and Statutory and Regulatory Authorities	13
IV. Endangerment Determination.....	13
V. Proposed Actions and Estimated Cost	13
A. Proposed Actions.....	13
1. Proposed Action Description	13
2. Contribution to Remedial Performance	14
3. Description of Alternatives Technologies.....	14
4. Applicable or Relevant and Appropriate Requirements.....	14
5. Project Schedule	14
B. Estimated Costs	15
1. Response Action Contract	15
VI. Expected Change in the Situation Should Action Be Delayed or Not Taken	16
VII. Outstanding Policy Issues.....	16
VIII. Enforcement	17
IX. Recommendation	17
X. References	17

Tables

- 1 Soil Removal Action Cost—Alternative 2

Figures

- 1 Site Location
- 2 Site Layout
- 3 Removal Areas

Attachments

- A Final EE/CA for Site 1 – FDPs 1 and 3 Soil
- B Public Notice and Responsiveness Summary

Acronyms and Abbreviations

ABG	Active Burning Ground
ABL	Allegany Ballistics Laboratory
ARAR	Applicable or Relevant and Appropriate Requirement
bgs	below ground surface
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act of 1980
CFR	Code of Federal Regulations
COC	constituent of concern
DERP	Defense Environmental Restoration Program
DNAPL	dense non-aqueous phase liquid
DoD	Department of Defense
EE/CA	Engineering Evaluation/Cost Analysis
ER	Environmental Restoration
FDP	Former Disposal Pit
FS	Feasibility Study
gpm	gallon per minute
HHRA	Human Health Risk Assessment
IR	Installation Restoration
MEC	munitions and explosives of concern
MIP	Membrane Interface Probe
NACIP	Navy Assessment and Control of Installation Pollutants
NAVFAC	Naval Facilities Engineering Command
Navy	Department of the Navy
NCP	National Oil and Hazardous Substances Pollution Contingency Plan
NPL	National Priorities List
NTCRA	Non-time-critical Removal Action
OABG	Outside Active Burning Ground
PCE	tetrachloroethylene
RCRA	Resource Conservation and Recovery Act
RI	Remedial Investigation
ROD	Record of Decision
SAP	Sampling and Analysis Plan
SARA	Superfund Amendments and Reauthorization Act of 1986
SVOC	semivolatile organic compound
TCA	trichloroethane
TCE	trichloroethylene
TCLP	Toxicity Characteristic Leaching Procedure
UFP	Uniform Federal Policy
USC	United States Code
USEPA	United States Environmental Protection Agency
UXO	Unexploded Ordnance
UU/UE	unlimited use and unrestricted exposure
VOC	volatile organic compound

WVDEP West Virginia Department of Environmental Protection
WWTP Wastewater Treatment Plant
yd³ cubic yard

I. Purpose

This Action Memorandum documents approval for a Non-time-critical Removal Action (NTCRA) to address source area soil at Former Disposal Pits (FDPs) 1 and 3 at Site 1, Allegany Ballistics Laboratory (ABL), Rocket Center, West Virginia. The Engineering Evaluation/Cost Analysis (EE/CA) focused on the volatile organic compound (VOC) source areas in the unsaturated soil at FDPs 1 and 3 that are the result of past operations at the site and contribute to groundwater contamination at Site 1. Potentially unacceptable risks to human health from exposure to soil at Site 1 will be addressed as part of the final remedy for the site. A pump and treat system is currently in place at Site 1 to prevent or minimize groundwater migration to the adjacent river and reduce concentrations of VOCs with a goal of achieving MCLs. It is expected the NTCRA will enhance the effectiveness of the groundwater treatment system by reducing potential contaminant source mass to prevent future leaching to groundwater.

This Action Memorandum serves as the Decision Document for the selection of the NTCRA, as evaluated in the EE/CA (**Attachment A**), for source area soil at Site 1 and for the Department of the Navy (Navy) to conduct the work proposed therein. The alternatives evaluated in the Site 1 EE/CA are summarized as follows.

- **Alternative 1:** No Action
- **Alternative 2:** 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 (USEPA) *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

Since 1943, the ABL facility has been used primarily for research, development, testing, and production of solid propellants and motors for ammunition, rockets, and armaments. ABL consists of Plant 1 and Plant 2. Plant 1 is a government-owned, contractor-operated research, development, and production facility. Plant 2 is exclusively owned and operated by the contractor. Site 1 is an 11-acre area located adjacent to the North Branch Potomac River along the northern border of the developed portion of Plant 1, located in the northern portion of ABL (**Figure 1**). Site 1 consists of the 8-acre Active Burning Ground (ABG) area, currently permitted under the Resource Conservation and Recovery Act (RCRA) (RCRA Permit: WV0170023691), and the 3-acre Outside Active Burning Ground (OABG) area (**Figure 2**). Within the ABG area, Site 1 contains several historical burn pads and three FDPs (FDP 1, FDP 2, and FDP 3). The ABG area is currently fenced and predominantly covered by mowed grass. An asphalt road spans the east-west length of the fenced area. Six active steel burn pans are present on the existing concrete pads within the ABG area. The OABG area is predominantly wooded and contains a former drum storage pad and two former open burn areas with associated waste disposal areas. There are no surface water features located within the Site 1 ABG; a permitted outfall, located within the OABG area conveys stormwater runoff to the adjacent North Branch Potomac River.

1. Removal Site Evaluation

Between 1959 and the mid-1990s, eight earthen pads were used to burn solvents and explosive waste generated at the facility. Each burn pad reportedly handled specific types of wastes, including explosive wastes, chemical laboratory wastes, solid propellants, and reactive solvents. When burned, the reactive solvents were typically absorbed into sawdust prior to burning (CH2M HILL, 1996). Historical disposal of spent acid and solvents occurred in the three FDPs between the 1970s and 1980s. Materials were allowed to percolate into the ground surface and were then ignited to burn off reactive filtrate. Reportedly, trichloroethylene (TCE) was the primary solvent disposed of in the pits. According to facility personnel, approximately 1,000 pounds of TCE per month were disposed of in the pits. Additionally, approximately 5 pounds per year of tetrachloroethylene (PCE) and 1,1,1-trichloroethane (TCA) were also disposed. While awaiting disposal, spent solvents were stored at the former drum storage pad within the OABG area. The open burn areas located within the OABG area were used to burn inert material and solid waste. Ash from the burn areas was spread in the associated former disposal areas. In addition to ash, other debris, including demolition debris, concrete rubble, drums, and rocket casings, has been observed in the former disposal areas.

Environmental investigation efforts at Site 1 were initiated under the Navy Assessment and Control of Installation Pollutants (NACIP) Program by conducting an Initial Assessment Study in 1983, followed by a Confirmation Study between 1984 and 1987 (Weston, 1987). The results of the Confirmation Study were documented in an Interim Remedial Investigation (RI) Report in 1989 (Weston, 1989). Based upon the results of the Interim RI, an RI was completed at Site 1 in 1992 (CH2M HILL, 1996). As part of RI activities, historical aerial photographs were reviewed to determine the type and extent of disposal activities at Site 1. Groundwater, soil, surface water, and sediment samples were collected to determine the nature and extent of contamination, and well testing, fracture-orientation evaluation, and water level measurements were conducted to evaluate groundwater hydrogeologic conditions. Results of the RI indicated VOCs, particularly TCE, were the primary constituents detected in soil and groundwater at Site 1 and surface water and sediment of the North Branch Potomac River. The primary source of VOCs was found to be the FDPs. SVOCs, explosives, metals, and dioxins were also detected in site soil. The RI recommended additional investigation to determine the nature and extent of contamination in site media.

A Focused RI was conducted in 1994 to supplement Site 1 data collected during the RI and to re-evaluate potential risks to human health and the environment from contaminants in Site 1 media (CH2M HILL, 1995). The Focused RI field activities consisted of groundwater, soil, soil gas, surface water, and sediment sampling; well testing; fracture-orientation evaluation; and water level measurements. VOCs, semivolatile organic compounds (SVOCs), explosives, and metals were detected in site media. VOCs were the most prevalent constituents in Site 1 media, with TCE detected most frequently and at the highest concentrations in soil and groundwater. Results indicate that VOC contamination in soil is concentrated in localized areas within Site 1, primarily in the vicinity of the solvent disposal pits and in two areas north of the east and west ends of the OABG area along the river. These areas may act as continuing sources of potential groundwater contamination. VOCs, SVOCs, and metals were detected in surface water and sediment upstream, downstream, and adjacent to Site 1, with the highest concentrations detected adjacent to Site 1. Potentially unacceptable human health risk from exposure to soil and groundwater were identified. No risk to human health was identified for surface water and sediment. Potentially unacceptable ecological risks from exposure to soil and sediment were also identified. The Focused RI recommended remedial alternatives be evaluated for specific areas and media, including contaminated soil at the FDPs, among other locations at Site 1.

A Focused Feasibility Study (FS) was completed for groundwater, surface water, and sediment in 1996 (CH2M HILL, 1996) and a Record of Decision (ROD) was signed in May 1997 outlining the selected remedy for Site 1 groundwater and North Branch Potomac River surface water and sediment as site-wide groundwater containment with subsequent onsite treatment and discharge (Navy, 1997). Remedial action was initiated in 1997 and is currently operational.

Prior to evaluation of remedial alternatives for soil, several supplemental investigations were conducted to adequately delineate the nature and extent of soil contamination at Site 1 and to assess potential risks associated with exposure to soil. Additional soil, sediment, and surface water samples were collected in 1998, 2001, and

2004. Results of these investigations were documented in a Focused RI for Site 1 soil completed in 2006 (CH2M HILL, 2006). Soil sample results indicate the presence of chlorinated solvents in soil at FDPs 1 and 3 and in the vicinity of the former open burn areas and associated disposal areas. Soil at FDP 2 did not contain detectable concentrations of chlorinated solvents. To evaluate risk, the site was separated into three areas: the FDP area, the ABG area, and the OABG area. Risks to human health and the environment from exposure to soil were identified in each area from exposure to VOCs, SVOCs, metals, explosives, and/or dioxins. The Focused RI recommended remedial alternatives be developed to address areas where potentially unacceptable human health and ecological risks in soil at Site 1 were identified.

A Membrane Interface Probe (MIP) and FLUTE liner investigation was conducted in 2009 and 2010 to determine if dense non-aqueous phase liquid (DNAPL) is present in unsaturated soil at the FDPs (CH2M HILL, 2010). Results of the investigation did not indicate the presence of DNAPL in the vadose zone underlying the FDPs.

Remedial alternatives to address human health and ecological risks associated with exposure to site soil are being evaluated as part of the FS process. The final remedy for soil will be documented in a ROD. The removal action objective for NTCRA described herein is to reduce the contaminant source present in the unsaturated soil at FDP 1 and FDP 3, in order to enhance the ability of the groundwater remedy to restore the aquifers to beneficial use. The EE/CA was prepared in 2012 to evaluate alternatives for achieving this objective and recommended excavation and offsite disposal of source-area unsaturated soils and site restoration to pre-construction conditions (CH2M HILL, 2012). The EE/CA describes the nature and extent of the source areas identified through previous investigations at Site 1 and the objectives of the NTCRA and discusses and analyzes the removal alternatives that were considered for this site.

2. Physical Location

ABL consists of approximately 1,634 acres located in Mineral County, in the northeastern part of West Virginia, approximately 10 miles southwest of Cumberland, Maryland, along the West Virginia and Maryland border. The facility lies between the North Branch Potomac River to the north and west and Knobly Mountain to the south and east. Several small towns are near the facility, including Short Gap, West Virginia, to the southeast, and Pinto, Maryland, to the north. A location map is provided as **Figure 1**.

3. Site Characteristics

Site 1 is an 11-acre area located adjacent to the North Branch Potomac River along the northern border of the developed portion of Plant 1 located in northern portion of ABL. The site historically consisted of eight earthen burn pads, three FDPs, two open burn areas with associated disposal areas, and one drum storage pad. The earthen burn pads are no longer used and are generally overgrown by vegetation. The FDPs were backfilled following cessation of historical activities and are currently grass-covered, with the exception of the eastern edge of FDP 3, which underlies a portion of the Pad D active concrete and steel burning pad. The former open burning areas and associated disposal areas are no longer in use and are covered with vegetation. The asphalt drum storage pad is still present; however, it is no longer used for drum storage. Six steel burning pads located at the site are currently operational.

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

Based on the data and results of the Interim RI, RI, Focused RIs, and supplemental investigations, it was determined that there are potentially unacceptable risks to human health and the environment from exposure to constituents, primarily VOCs, in soil and groundwater. No risk to human health was identified for surface water and sediment. Potentially unacceptable ecological risks were identified for exposure to soil and sediment.

5. National Priorities List Status

The Plant 1 portion of ABL was placed on the National Priorities List (NPL) on May 31, 1994 (USEPA ID: WV0170023691). Plant 2 is not on the NPL. Site 1 is among the IR sites being addressed under CERCLA at ABL.

6. Maps, Pictures, and Other Graphic Representations

Several figures are included in the Action Memo that provide graphical representation of Site 1 and the planned removal action. These include:

- **Figure 1** - Site Location
- **Figure 2** - Site Layout
- **Figure 3** - Removal Areas

Additional figures included as part of the EE/CA (**Attachment A**) include:

- **Figure 2-4** - Conceptual Removal Area Cross-section
- **Figure 4-1** - Injection and Monitoring Well Locations

B. Other Actions

1. Previous Actions

No previous actions have been completed for FDP 1 and FDP 3 soil at Site 1.

2. Current Actions

A ROD was signed for Site 1 groundwater, surface water, and sediment in May 1997. The ROD outlined the selected remedy for Site 1 groundwater, surface water, and sediment as site-wide alluvial and bedrock groundwater containment with subsequent onsite treatment and discharge of treated water to the river and/or the facility's steam generation plant. Construction of a groundwater treatment facility to remove hazardous constituents from the extracted groundwater at Site 1 began in September 1997. The treatment plant began continuous operation in September 1998 and has treated an average of 140 gallons per minute (gpm) of groundwater (combination of flow from Sites 1 and 10) since that time. Regular monitoring of water levels in the extraction and monitoring well network and the influent and effluent concentrations from the treatment plant have been conducted since the system began operation, and currently occurs monthly. The data generated by these monitoring activities are provided to the state and USEPA as a means of continuous system performance evaluation.

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 (DoD). Congress further outlined this authority in the Defense Environmental Restoration Program (DERP) Amendments, under 10 United States Code (USC) Sections 2701 through 2705. CERCLA Section 120 requires the Navy to apply 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 ABL property. As a member of the ABL Partnering Team, the West Virginia Department of Environmental Protection (WVDEP) 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 applies to the 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 Interim RI, RI, Focused RIs, and supplemental investigations, it was determined that there are potentially unacceptable risks to human health from exposure to soil and groundwater at Site 1. No potentially unacceptable ecological risks were identified.

IV. Endangerment Determination

Actual or threatened releases of pollutants and contaminants from FDP 1 and FDP 3 at Site 1, if not addressed by implementing the removal action discussed in this Action Memorandum, may present an endangerment to human health and the environment.

V. Proposed Actions and Estimated Cost

A. Proposed Actions

The scope of the removal action to be initiated at Site 1 includes removal of the VOC source area in the unsaturated soils at FDPs 1 and 3. This removal action will enhance the ability of the groundwater remedy to address potentially unacceptable risks to human health from exposure to groundwater at Site 1. The final remedy for soil at Site 1 is currently being evaluated as part of the FS process.

1. Proposed Action Description

The preferred removal action alternative for Site 1 is that the VOC source soils at FDPs 1 and 3 be excavated, removed, disposed offsite, and replaced with clean fill and seeded to restore current site conditions. The NCP recognizes soil removal and backfill as an appropriate removal alternative for consideration under NTCRA's (40 Code of Federal Regulations [CFR] 300.415[e][6]). Therefore, this Action Memorandum and the EE/CA refer to Alternative 2, Excavation Offsite Disposal, as a "removal action," which is consistent with the NCP. **Figure 3** presents the proposed removal areas.

Prior to excavation activities, injection and monitoring wells located within the vicinity of the FDP 1 will be abandoned. The need for additional injection or monitoring well installation will be evaluated during future groundwater optimization efforts.

Additionally, prior to excavation, erosion and sediment controls, consisting of perimeter controls surrounding the removal areas and stockpiles or mixing areas, will be established. Contaminated soil in the removal areas will be excavated to a depth of 14 feet below ground surface (bgs) or until groundwater is reached. The proposed removal area excavation volume is approximately 440 cubic yards (yd³) of contaminated soil. To provide stabilization, excavation sidewalls will be sloped or benched. To allow for this additional excavation, a portion of the existing fence line may require temporary relocation. This additional soil will also require offsite disposal; however, this material will be segregated from the FDP removal area material for characterization as hazardous or non-hazardous prior to disposal. Because Pit 3 is located adjacent to an active burning pad (rocket tie down assembly) that cannot be disturbed, engineered sidewall stabilization (such as a retaining wall or soldier piles and lagging wall) will be required for this portion of the excavation.

Upon completion of the excavation activities, post-removal soil samples will be collected for use during the final soil remedy selection process. Soil samples will be collected from the excavation sidewalls only and analyzed for

the Human Health Risk Assessment (HHRA) constituents of concern (COCs) identified in the 2006 Focused RI (TCE, dioxin, arsenic, iron, manganese, thallium, and vanadium), as well as any additional COCs agreed to by the ABL Partnering Team, consisting of representatives from the Navy, USEPA, and WVDEP. Once samples have been collected, a marker (such as a layer of geotextile fabric) will be placed within each pit prior to backfilling and restoration of the site to denote the areas in which the remedial action was completed. The excavations will be backfilled using an offsite fill material and will be restored to the original grade and seeded.

Excavated soil from the FDP removal areas will be managed as listed hazardous waste (F002) because of the associated past disposal activities (such as the disposal of spent chlorinated solvents). The excavated soil will be stockpiled onsite in a lined and bermed containment staging area for subsequent offsite disposal. Material excavated from the sidewalls for stabilization will be staged separately, sampled for Toxicity Characteristic Leaching Procedure (TCLP) waste characterization parameters, transported, and appropriately disposed based upon the results of the TCLP analysis.

2. Contribution to Remedial Performance

The ultimate goal for Site 1 is to maintain current industrial land use. The NTCRA will remove potential contaminant source soils in the unsaturated zone at FDPs 1 and 3 from the site and eliminate the potential for contaminants leaching to groundwater, thus enhancing the ability of the groundwater remedy to return the aquifers to beneficial use, while satisfying project implementation and cost requirements. Excavation will be deemed complete when the lateral and vertical extent of removal, as defined in the EE/CA (**Attachment A**) by existing samples and physical boundaries, has been achieved. As a result, confirmation samples are not required upon completion of excavation activities. The need for additional remedial action to mitigate risk from exposure to soil based on current and future projected land use will be evaluated in an FS.

3. Description of Alternatives Technologies

Two alternatives were assessed for the impacted soil areas. These alternatives were evaluated and compared based on their effectiveness, implementability, and cost. The EE/CA (**Attachment A**) describes the alternatives considered in greater detail, as well as the process by which the alternatives were evaluated, compared, and selected.

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. The selected removal action set forth in this Action Memorandum may not comply with ARARs under federal and state environmental laws. Removal actions generally focus on the stabilization or threat of a release and the mitigation of near-term threats. ARARs that are within the scope of such removal actions are therefore only those ARARs that must be attained in order to eliminate the near-term threats. In accordance with 40 CFR Part 300, Section 430, Paragraph (f)(1)(ii)(c), the Navy will waive the ARAR pertaining to closure of surface impoundments since the proposed action is an interim measure that will become part of a remedial action that will meet the ARAR. Other federal and state advisories, criteria, or guidance were considered, as appropriate, in formulating the removal action alternatives. Analysis of the removal action alternatives for Site 1 soil with the applicable ARARs is presented in the attached EE/CA (**Attachment A**).

5. Project Schedule

The public notice of availability for the EE/CA was published April 15, 2012, and the EE/CA was made available for public review and comments from April 15, 2012, through May 25, 2012. The public notice and responsiveness summary are included as **Attachment B**. No public comments were received.

The proposed estimated project schedule is:

- EE/CA Public Comment Period 45 days
- Design, Work Plan, Subcontracting, and Mobilization 6 months
- Removal Action 3 months
- Construction Completion Documentation 4 months

B. Estimated Costs

The NCP 40 CFR 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 an environmental remediation contractor to perform the required work associated with the removal action at Site 1. The estimated costs are itemized in **Table 1**. Detailed costs estimates are provided in the EE/CA (Attachment A). Costs were estimated using R.S. Means' *Site Work and Landscape Cost Data* (R.S. Means, 2011), vendor quotes, recent similar projects, or engineering estimates. The costs estimated are provided to an accuracy of +50 percent and -30 percent.

TABLE 1

SITE 1 FDP SOIL REMOVAL ACTION COST—ALTERNATIVE 2

	Non-Hazardous Sidewall Material	Hazardous Sidewall Material
Site Preparation		
Field Office/Temporary Utilities	\$2,233	\$2,233
Work Plan/UFP SAP	\$20,000	\$20,000
Safety Fence	\$260	\$260
Temporary Chain Link Fence	\$5,430	\$5,430
Utility Locate	\$2,000	\$2,000
Site Survey (Boundary)	\$2,375	\$2,375
Monument Establishment	\$636	\$636
Erosion and Sediment Controls Installation		
Silt Fence	\$4,500	\$4,500
Soil Containment Berm	\$8,582	\$8,582
Environmental Safety Controls		
Dust Control	\$10,400	\$10,400
UXO Technician	\$22,500	\$22,500
Well Abandonment		
2-inch well abandonment	\$8,690	\$8,690
6-inch well abandonment	\$18,158	\$18,158
Excavation and Removal		
Clearing and grubbing	\$6,100	\$6,100
Engineered sidewall stabilization	\$83,300	\$83,300
Excavation (source area)	\$8,470	\$8,470
Excavation (sidewalls for stabilization)	\$6,006	\$6,006
Waste Characterization Sampling	\$2,155	\$2,155
Post Excavation Sampling		
Post Excavation Sampling	\$38,880	\$38,880

TABLE 1

SITE 1 FDP SOIL REMOVAL ACTION COST—ALTERNATIVE 2

	Non-Hazardous Sidewall Material	Hazardous Sidewall Material
Hazardous Waste Transportation and Disposal		
Transportation and Landfill Disposal, Soil	\$178,200	\$467,775
Dump Truck Transportation Minimum Charge	\$26,895	\$70,599
Loading Soil into Truck	\$946	\$2,483
Non-Hazardous Waste Transportation and Disposal		
Transportation and Landfill Disposal, Soil	\$92,267	\$0
Dump Truck Transportation Minimum Charge	\$43,704	\$0
Loading Soil into Truck	\$1,537	\$0
Transportation and Disposal, Decontamination Water	\$1,000	\$1000
Site Restoration		
Non-woven Geotextile Fabric	\$1,153	\$1,153
Backfill Material	\$28,875	\$28,875
Topsoil	\$1,386	\$1,386
Seed, fertilizer, and mulch	\$1,319	\$1,319
Survey (topographic)	\$3,900	\$3,900
Subtotal	\$631,858	\$829,165
General Conditions (10%)	\$63,186	\$82,917
Mobilization/Demobilization (5%)	\$31,593	\$41,458
Subtotal	\$726,637	\$953,540
Contingency (20%)	\$145,327	\$190,708
Subtotal	\$871,964	\$1,144,248
Performance Bond (2%)	\$17,439	\$22,885
Total	\$889,403	\$1,167,133
Design Costs (6%)	\$53,364	\$70,028
Project Management (8%)	\$71,152	\$93,371
Construction Oversight (10%)	\$88,940	\$116,713
Total Capital Cost of Alternative 3	\$1,103,000	\$1,447,000
-30%	\$772,000	\$1,013,000
+50%	\$1,655,000	\$2,171,000

Notes:

SAP – Sampling and Analysis Plan

UFP – Uniform Federal Policy

UXO – Unexploded Ordnance

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

If no action is taken or the action is delayed, the potential for source areas in the unsaturated soil that are responsible for contributing to groundwater contamination will remain. Potential unacceptable human health risk from exposure to soil will remain at the site following the action. The need for additional remedial action to mitigate remaining risk from exposure to soil based on current and future projected land use will be evaluated in an FS.

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 decision document presents the selected removal action for Site 1 at ABL, Rocket Center, West Virginia, developed in accordance with CERCLA, as amended, and is consistent with the NCP. This decision is based on the Administrative Record file for ABL.

Conditions at the site meet the NCP Section 300.415(b)(2) criteria for removal action. The Naval Facilities Engineering Command (NAVFAC) Mid-Atlantic, in cooperation with USEPA Region III and WVDEP, recommends approval of the proposed removal action. If approved, the total project ceiling for Site 1 will be \$2,171,000 (using +50 percent of the assumed hazardous sidewall material cost estimate as provided in the EE/CA). Response actions should commence as soon as practical, due to the potential threat to the environment from Site 1.

X. References

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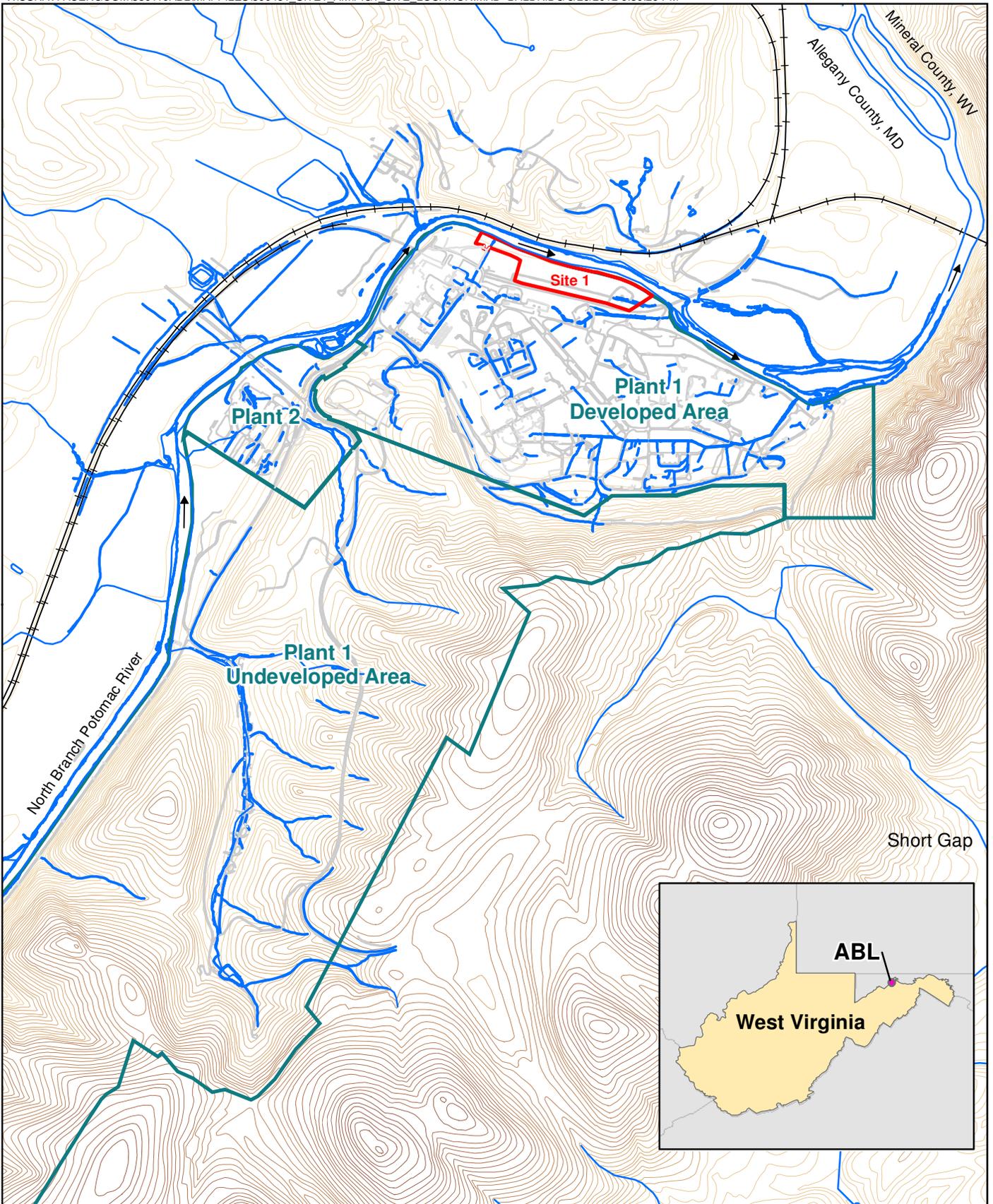
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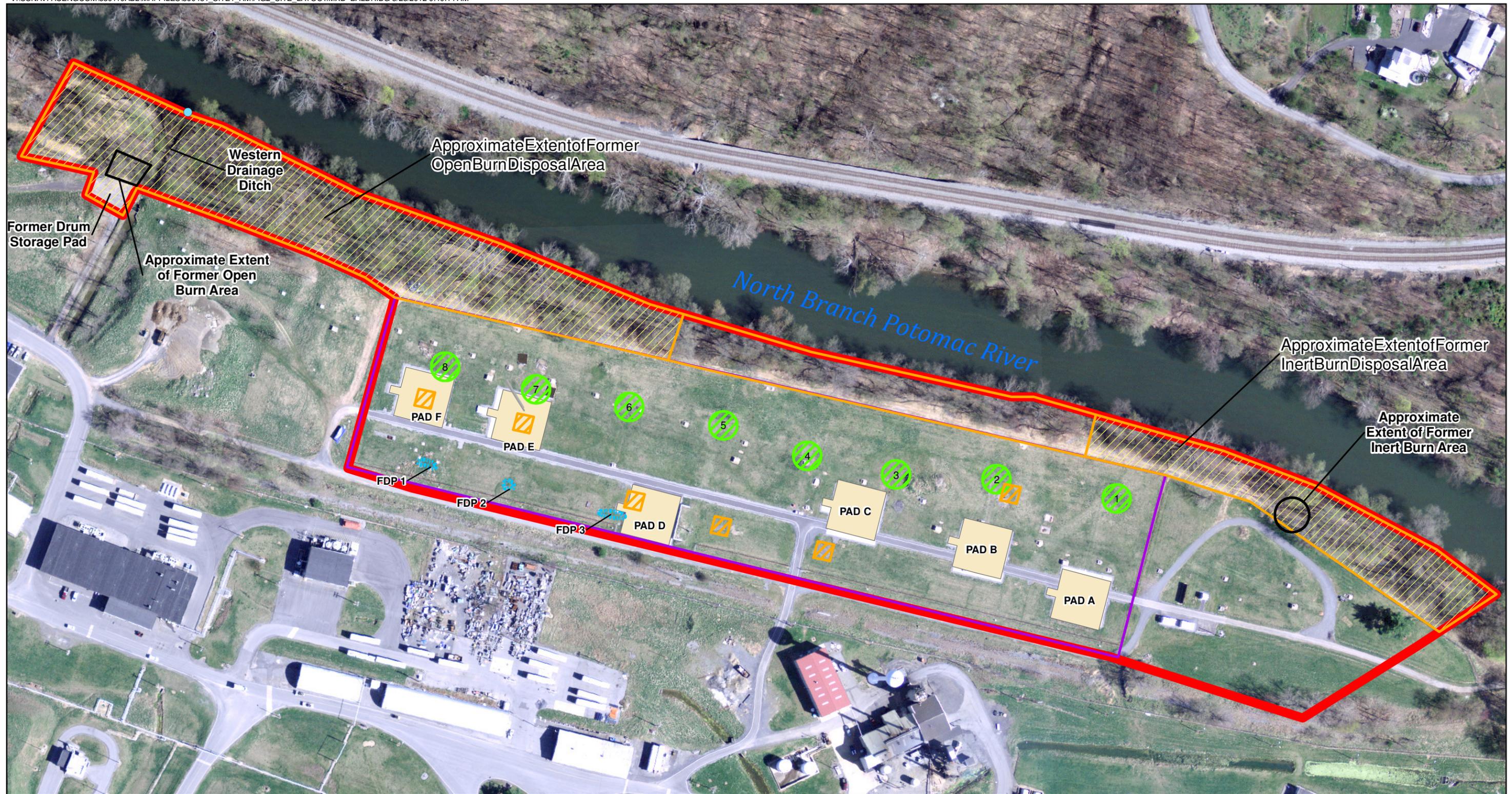
Legend
➔ Flow Direction



0 450 900 1,800
Feet

1 inch = 1,800 feet

Figure 1
Site Location
Site 1 FDP Soil Action Memorandum
Allegany Ballistics Laboratory, Rocket Center, West Virginia



- Legend**
- NPDES Outfall SSL-3
 - Former Inert and Open Burn Area
 - Former Disposal Pits (FDP)
 - Outside Active Burning Ground (OABG)
 - Former Burn Disposal Areas
 - Active Burning Ground
 - Approximate location of former burn pans
 - Former Earthen Burn Pads
 - Current Concrete Burn Pads
 - Site 1 Boundary

Figure 2
 Site Layout
 Site 1 FDP Soil Action Memorandum
 Allegany Ballistics Laboratory, Rocket Center, West Virginia



Removal Area Boundary at FDP-1 (coordinates in State Plane, feet)		
	Northing	Easting
1-1	388658.03	2155963.09
1-2	388657.24	2155972.97
1-3	388653.32	2155982.18
1-4	388646.06	2155988.67
1-5	388639.76	2155982.33
1-6	388643.21	2155973.23
1-7	388645.67	2155963.76
1-8	388651.49	2155956.68

Removal Area Boundary at FDP-3 (coordinates in State Plane, feet)		
	Northing	Easting
3-1	388576.03	2156254.24
3-2	388574.91	2156264.13
3-3	388572.92	2156272.84
3-4	388570.31	2156283.36
3-5	388565.51	2156287.09
3-6	388560.83	2156282.80
3-7	388561.33	2156272.57
3-8	388563.65	2156262.58
3-9	388565.41	2156252.59
3-10	388572.18	2156245.83

- Legend**
- Removal Area Boundary Vertex
 - Engineered Excavation Stabilization
 - Proposed Relocated Fence Line
 - Existing Fence Line
 - Approximate Limits of Excavation (Including Sloping for Excavation Sidewall Stabilization)

- Former Disposal Pits (FDP)
- Removal Area
- Active Burning Ground

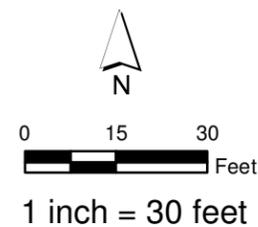


Figure 3
Removal Areas
Site 1 FDP Soil Action Memorandum
Allegany Ballistics Laboratory, Rocket Center, West Virginia

Attachment A
Final EE/CA for Site 1 - FDPs 1 and 3 Soil

Final

Site 1
Former Disposal Pits 1 and 3 (Soil)
Engineering Evaluation and Cost Analysis

Allegany Ballistics Laboratory
Mineral County, West Virginia

Contract Task Order – WE13

May 2012

Prepared for

Department of the Navy
Naval Facilities Engineering Command
Mid-Atlantic

Under the

Navy CLEAN 1000 Program
Contract Number N62470-08-D-1000

Prepared by



CH2MHILL

Chantilly, Virginia

Executive Summary

This report presents an Engineering Evaluation and Cost Analysis (EE/CA) for a non-time-critical removal action (NTCRA) for the unsaturated soil beneath Former Disposal Pits (FDPs) 1 and 3. This removal action (RA) is intended to address source areas in the unsaturated soil that are primarily responsible for contributing to groundwater contamination within the Active Burning Grounds (ABGs) at Site 1, Allegany Ballistics Laboratory (ABL), Rocket Center, West Virginia.

Site 1 is adjacent to the North Branch Potomac River, which borders the site to the north, along the northern border of the developed portion of Plant 1. Site 1 contains several historical disposal units within the 8-acre ABG area, which is currently permitted under the Resource Conservation and Recovery Act (RCRA) (RCRA Permit: WV0170023691). The ABG is used to burn reactive waste in designated areas. Historical disposal of spent acid and solvents occurred in three FDPs located in the southwestern portion of the ABG area. Reportedly, trichloroethene (TCE) was the primary spent solvent disposed in the pits.

The historical site activities at the FDPs are considered the primary source of volatile organic compound (VOC) contamination in groundwater at Site 1. Soil data collected during previous investigations (CH2M HILL, 2006) show the highest concentrations of chlorinated solvent contamination is located in FDPs 1 and 3. FDP 2 did not contain detectable chlorinated solvents. Therefore, FDP 2 is not considered a primary source of the groundwater contamination and is not included as part of the RA addressed by this EE/CA. Currently, Site 1 groundwater is undergoing containment to prevent or minimize groundwater migration to the river. Site groundwater is a separate operable unit (OU) from soil.

The RA considered in this EE/CA addresses unsaturated soil in FDP 1 and FDP 3 and is intended to supplement the final remedy for Site 1 soil. The final remedy for Site 1 soils (OU4) is currently being evaluated as part of the Feasibility Study (FS) process. This RA is also intended to augment the existing groundwater treatment system by reducing potential contaminant source mass to prevent future leaching to groundwater.

The removal action objective (RAO) for this RA is to reduce the source present in the unsaturated soil beneath FDP 1 and FDP 3, in order to enhance the ability of the groundwater remedy to restore the aquifers to beneficial use. The extent of the removal area will be based on a combination of previous sampling results, historical documentation of the FDP locations, and geophysical survey results indicating the location of the FDPs.

This EE/CA evaluated the following alternatives to achieve the RAO:

- **Alternative 1** – No Action
- **Alternative 2** – Excavation and Offsite Disposal

Alternative 1 does not meet the RAO to reduce the contaminant source mass present in the unsaturated soil beneath FDP 1 and FDP 3. However, this alternative is provided as a basis for comparison.

Alternative 2 includes excavation of the removal area, transportation and offsite disposal of waste soils, and backfill of the excavation to the original grade with offsite fill material. This alternative removes potential contaminant source soils in the unsaturated zone from the site and eliminates the potential for contaminants leaching into groundwater. The cost for implementing this alternative is dependent upon the results of waste characterization sample results for the sidewall material. The estimated cost if the sidewall material is disposed of as non-hazardous is \$1,103,000. The estimated cost if the sidewall material is disposed of as hazardous is \$1,447,000.

The National Oil and Hazardous Substances Pollution Contingency Plan, also known as the National Contingency Plan (NCP), requires a 45-day public comment period for the EE/CA. An EE/CA Action Memorandum, which documents the selected alternative, will be signed by the Navy following the public comment period on the EE/CA. All formal documents associated with the NTCRA will then be placed in the Administrative Record, which

includes records of the Comprehensive Environmental Response, Compensation, and Liability Act of 1980 (CERCLA) activities at ABL. The Administrative Record is located online and is accessible via the internet. A public repository of selected documents and assistance in accessing the administrative record is available at the LaVale Public Library in LaVale, Maryland, and the Fort Ashby Public Library in Fort Ashby, West Virginia.

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 ABL Description and Background	2-1
2.2 Site 1 Description and Background.....	2-1
2.3 Previous Investigations.....	2-2
2.3.1 Initial Assessment Study (1983).....	2-2
2.3.2 Confirmation Study (1987)	2-2
2.3.3 Interim Remedial Investigation (1989).....	2-2
2.3.4 RI (1996).....	2-2
2.3.5 Focused RI (1995)	2-3
2.3.6 Supplemental Investigations (2001-2004).....	2-3
2.3.7 Focused RI (2006)	2-3
2.3.8 Membrane Interface Probe and FLUTe Liner Investigation (2010).....	2-4
2.4 Risk Assessment Summary and Basis for Action	2-4
2.4.1 Risk Assessment Summary	2-4
2.4.2 Basis for Removal Action	2-4
2.5 Development of Removal Area.....	2-4
3 Identification of Removal Action Objectives	3-1
3.1 Statutory Limits on Removal Actions.....	3-1
3.2 Removal Action Objective	3-1
3.3 Removal Action Schedule	3-1
3.4 Applicable or Relevant and Appropriate Requirements.....	3-1
4 Identification and Analysis of Removal Action Alternatives	4-1
4.1 Identification of Removal Action Alternatives.....	4-1
4.2 Description of Removal Action Alternatives.....	4-1
4.2.1 Alternative 1 – No Action	4-1
4.2.2 Alternative 2 – Excavation and Offsite Disposal.....	4-1
4.3 Evaluation Criteria	4-2
4.4 Evaluation of Alternatives.....	4-4
5 Comparative Analysis of Removal Action Alternatives	5-1
5.1 Comparative Criteria.....	5-1
5.1.1 Effectiveness.....	5-1
5.1.2 Implementability	5-1
5.1.3 Cost.....	5-1
6 Recommended Removal Action Alternative	6-1
7 References	7-1

Appendixes

- A ARAR Tables
- B Cost Analysis

Tables

- 4-1 Evaluation of Removal Alternatives

Figures

- 2-1 Site Location
- 2-2 Site Layout
- 2-3 Removal Areas
- 2-4 Conceptual Removal Area Cross Section
- 4-1 Injection and Monitoring Well Locations

Acronyms and Abbreviations

ABG	Active Burning Ground
ABL	Allegany Ballistics Laboratory
ARAR	Applicable or Relevant and Appropriate Requirement
bgs	below ground surface
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act of 1980
CFR	Code of Federal Regulations
COC	contaminant of concern
CS	Confirmation Study
DNAPL	dense non-aqueous phase liquid
DoD	Department of Defense
DPT	direct-push technology
EE/CA	Engineering Evaluation and Cost Analysis
ERA	Ecological Risk Assessment
FDP	Former Disposal Pit
FS	Feasibility Study
ft ²	square feet
GOCO	government-owned, contractor-operated
HHRA	Human Health Risk Assessment
IAS	Initial Assessment Study
IRP	Installation Restoration Program
MEC	Munitions and Explosives of Concern
MIP	membrane interface probe
NACIP	Navy Assessment and Control of Installation Pollutants Program
Navy	Department of the Navy
NCP	National Oil and Hazardous Substances Pollution Contingency Plan (also known as the National Contingency Plan)
NPL	National Priorities List
NTCRA	non-time-critical removal action
O&M	operation and maintenance
OABG	Outside Active Burning Ground
OU	operable unit
PCE	tetrachloroethene
PPE	personal protective equipment
RA	removal action
RAO	removal action objective
RCRA	Resource Conservation and Recovery Act
RI	Remedial Investigation
SARA	Superfund Amendments and Reauthorization Act of 1986
SVOC	semivolatile organic compound
TCA	trichloroethane
TCE	trichloroethene
USEPA	United States Environmental Protection Agency

VOC volatile organic compound
WVDEP West Virginia Department of Environmental Protection
yd³ cubic yard

SECTION 1

Introduction

This Engineering Evaluation and Cost Analysis (EE/CA) evaluates two removal action (RA) alternatives for the unsaturated soil within Former Disposal Pits (FDPs) 1 and 3, which are expected to pose the highest potential as sources for contamination to groundwater within the Active Burning Ground (ABG) situated at Site 1, Allegany Ballistics Laboratory (ABL), in Rocket Center, West Virginia. This EE/CA has been developed to address only the contaminant source area located in the unsaturated soil beneath FDPs 1 and 3 and proposes a non-time-critical removal action (NTCRA) for these areas of Site 1.

ABL is a Department of the Navy (Navy)-owned, contractor-operated (ATK Tactical Systems Company, LLC) research, development, and production facility located in Mineral County, West Virginia. A detailed description and history of the facility is presented in the *Final Focused Remedial Investigation for Site 1 Soil, Operable Unit 4, at Allegany Ballistics Laboratory, Rocket Center, West Virginia* (CH2M HILL, 2006). The following information is presented in this EE/CA:

- Site description and background of FDPs 1 and 3 at Site 1
- Development of potential source area boundaries for removal
- Identification of removal action objective (RAO) and Applicable or Relevant and Appropriate Requirements (ARARs)
- Identification of RA alternatives
- Development and comparison of RA alternatives
- Recommendation of a preferred alternative

1.1 Regulatory Background

This document is being prepared under the authority of the Navy, the lead agency responsible for the Installation Restoration Program (IRP) at ABL according to the January 1987 Executive Order 12580. This Executive Order delegated the President's authority under the Comprehensive Environmental Response, Compensation, and Liability Act of 1980 (CERCLA) and the Superfund Amendments and Reauthorization Act of 1986 (SARA) to federal agencies such as the United States Department of Defense (DoD) and the Navy. As a result, the Navy was given responsibility for conducting response actions to cleanup actual or potential releases of hazardous substances, pollutants, or contaminants at its facilities.

The lead agency is required by the Code of Federal Regulations (CFR), Title 40, Section 300.415 (40 CFR 300.415) to conduct an EE/CA when an NTCRA is planned for a site. The EE/CA is prepared to identify the objectives of the RA and analyze the effectiveness, implementability, and cost of various RA alternatives that may satisfy these objectives. This EE/CA documents the process used to develop RA alternatives and to select the preferred alternative. This EE/CA is being issued by the Navy, the lead agency, in partnership with the United States Environmental Protection Agency (USEPA) Region 3 and the West Virginia Department of Environmental Protection (WVDEP), the support agencies.

The National Oil and Hazardous Substances Pollution Contingency Plan, also known as the National Contingency Plan (NCP), requires a 45-day public comment period for the EE/CA. The EE/CA Action Memorandum, which documents the selected alternative, will be signed by the Navy following the public comment period on the EE/CA. All formal documents associated with the NTCRA then will be placed in the Administrative Record, which includes records of CERCLA activities at ABL. The Administrative Record is located online and is accessible via the internet. A public repository of selected documents and assistance in accessing the administrative record is available at the LaVale Public Library in LaVale, Maryland, and the Fort Ashby Public Library in Fort Ashby, West Virginia.

1.2 Purpose and Objectives

Submittal of this document fulfills the requirements for NTCRAs defined by CERCLA, SARA, and the NCP. This EE/CA has been prepared in accordance with the USEPA guidance entitled *Conducting Non-Time-Critical Removal Actions Under CERCLA* (USEPA, 1993). The primary objective of this EE/CA is to identify a preferred alternative to address source areas in the unsaturated soil that are primarily responsible for contributing contamination to groundwater within FDPs 1 and 3, prior to implementation of the final remedy for Site 1 soil. The RA considered in this EE/CA addresses primary source soils in the unsaturated zone of the FDPs. The final remedy for Site 1 soils (Operable Unit [OU] 4) is currently being evaluated as part of the Feasibility Study (FS) process. This RA is also intended to augment the existing groundwater treatment system by reducing potential contaminant source mass to prevent future leaching to groundwater.

This EE/CA develops and compares two RA alternatives based on the following criteria:

- Technical feasibility
- Ability to protect human health and the environment
- Ability to prevent further release of hazardous constituents
- Relative cost

Additionally, this EE/CA will:

- Satisfy environmental review and public participation requirements for RAs
- Satisfy administrative requirements for documenting the RA selection
- Provide a framework for evaluating and selecting RA alternatives and associated technologies

Site Characterization

2.1 Allegany Ballistics Laboratory Description and Background

ABL is located in Mineral County, in the northeastern part of West Virginia, approximately 10 miles southwest of Cumberland, Maryland, along the West Virginia and Maryland border. The facility lies between the North Branch Potomac River to the north and west and Knobly Mountain to the south and east. Several small towns are near the facility, including Short Gap, West Virginia, to the southeast, and Pinto, Maryland, to the north (Figure 2-1).

ABL consists of approximately 1,634 acres of land and about 350 buildings. The facility is divided into two distinct operating plants, Plant 1 and Plant 2 (Figure 2-1). Plant 1 at ABL is a government-owned, contractor-operated (GOCO) research, development, and production facility. Plant 2 at ABL is exclusively owned and operated by the contractor. Plant 1 is owned by the Navy and leased to its operator, ATK Tactical Systems Company LLC, by the Naval Sea Systems Command through a Facilities Use Contract. Plant 1, approximately 1,577 acres in area, is divided into developed and undeveloped areas. Plant 2 is owned and operated by ATK Tactical Systems Company LLC and occupies the remaining 57 acres.

Since 1943, the ABL facility has been used primarily for research, development, testing, and production of solid propellants and motors for ammunition, rockets, and armaments. The manufacturing of solid propellant rocket motors can be summarized, for the purposes of this report, into three basic steps. The first step produces the rocket casing. The next step involves mixing the ingredients (such as nitroglycerin and nitrocellulose) to make the solid propellant. The third step involves filling the casing with the propellant. During this process, four general waste types are generated—spent solvents, reactive or ordnance materials, inert or non-ordnance materials, and solid waste.

Solvents are used at ABL to degrease cases, mix propellants, clean mixing bowls used for making propellant, and to clean molds and tools used in the overall process. Historically, the primary solvents used at ABL were acetone, methylene chloride, trichloroethene (TCE), and 1,1,1-trichloroethane (TCA). Each of these solvents has been used to varying degrees over the years. Acetone was the primary solvent used from 1942 until 1959. Although acetone was used after 1959 and is still used today, TCE was commonly used from 1959 until the late 1970s. Reportedly, the use of TCE was minimized in the 1980s. In the effort to minimize the use of TCE, the use of 1,1,1-TCA began in the late 1980s, but it is no longer used. Use of methylene chloride began in the late 1960s, but that practice has also been discontinued. Currently, acetone, pentane, and kerosene are the primary solvents used at ABL.

2.2 Site 1 Description and Background

Site 1 is adjacent to the North Branch Potomac River, which borders the site to the north, along the northern border of the developed portion of Plant 1. Site 1 contains several historical disposal units within the 8-acre ABG area (Figure 2-2), which are currently permitted under the Resource Conservation and Recovery Act (RCRA) (RCRA Permit: WV0170023691). The remaining area of Site 1 is identified as the Outside Active Burning Ground (OABG) area.

The ABG is used to burn reactive waste in designated areas. Reactive waste generated at ABL is defined as waste material that, because of its composition, may burn violently or detonate. Historical disposal of spent acid and solvents occurred in three disposal pits located inside the boundary of the ABG area. After the materials percolated into the ground, it was reported that the pit was ignited to burn off reactive filtrate. The pits were operated during the 1970s and 1980s and have since been backfilled. Reportedly, TCE was the primary spent solvent that was disposed in the pits, which are believed to be one of the primary sources of volatile organic compounds (VOCs) at Site 1 (CH2M HILL, 1996). TCE has been detected at elevated concentrations (relative to the remainder of the ABG) in the unsaturated soil beneath FDPs 1 and 3. FDP 2 does not contain detectable chlorinated solvents. These findings were supported as a result of a membrane interface probe (MIP) study done over this area, discussed as follows. Therefore, FDPs 1 and 3 are considered the primary sources of VOCs, and the

unsaturated soil in these pits will be addressed by this EE/CA. FDP 2 is not considered a source of contamination to groundwater and is not considered further in this document.

As shown on Figure 2-2, FDPs 1 and 3 are located in the southwestern portion of the ABG area. The size and location of the FDPs are based upon the historical boundaries of the FDPs documented in the Confirmation Study (CS) (Weston, 1987). This document identified the pits using visual observation of ground scarring, as well as a geophysical investigation of the pit areas. The disposal pits are described as being approximately 10 feet wide and ranging in length from approximately 15 to 40 feet (Figure 2-3). The depths of the pits were estimated at 3 to 5 feet below ground surface (bgs). According to facility personnel, approximately 1,000 pounds of TCE per month were disposed of in the pit(s) between 1970 and 1978. Disposal of tetrachloroethene (PCE) and 1,1,1-TCA in the pit(s) was less than 5 pounds per year.

From 1972 to 1982, waste acids and bases generated by laboratory operations were disposed of by pouring them into pit(s) that had been lined with limestone. According to facility personnel, approximately 1 gallon of waste acid per month was disposed of in the pit(s) until disposal practices ceased.

2.3 Previous Investigations

Multiple previous investigations have been conducted within the Site 1 area, including the FDPs, ABG, and OABG. The historical site activities at the FDPs are considered the primary source of VOC contamination in groundwater at Site 1. Currently, site groundwater is undergoing containment to prevent or minimize groundwater migration to the river. Site groundwater is considered a separate OU from soil. The following is a summary of investigations conducted that evaluated soils within FDPs at Site 1.

2.3.1 Initial Assessment Study (ESE Inc, 1983)

An Initial Assessment Study (IAS) was performed at ABL in 1983 under the Navy Assessment and Control of Installation Pollutants Program (NACIP). The purpose of the IAS was to identify and assess sites that might pose a threat to human health or the environment as a result of the former hazardous materials handling and operations at a facility.

Nine potentially contaminated sites, including Site 1, were identified based on information obtained from historical records, photographs, site inspections, and personnel interviews. The IAS concluded that these sites did not pose an immediate threat. However, results of the IAS indicated the need for a CS at seven of the nine sites, including Site 1, to assess the potential impacts on human health and the environment by suspected contaminants.

2.3.2 Confirmation Study (Weston, 1987)

Based on the IAS recommendations and in accordance with the NACIP, a CS was initiated in June 1984 and completed in August 1987. The CS focused on identifying the existence, concentration, and extent of contamination at the seven sites recommended for further investigation in the IAS. Field activities conducted under the CS included monitoring well installation; groundwater, surface water, sediment, and soil gas sample collection and analysis; and a geophysical survey inside the ABG area at Site 1 in the vicinity of the FDPs. The results of this geophysical survey, as well as visual surface scarring identified in the vicinity of the FDPs, were used to document the location of the disposal pits (Figure 2-3).

2.3.3 Interim Remedial Investigation (Weston, 1989)

As a result of the SARA of October 1986, the Navy changed its NACIP terminology and scope under the IRP to follow the rules, regulations, guidelines, and criteria established by USEPA for the Superfund program. Accordingly, the results of the CS were documented in the Interim Remedial Investigation (RI) report (Weston, 1989), which recommended further RI activities for six of the seven sites identified in the IAS, including Site 1.

2.3.4 Remedial Investigation (CH2M HILL, 1996)

Based on the recommendations of the Interim RI report and in accordance with the Navy's modified IRP policy, Hercules Aerospace Company (a former ABL operator), contracted CH2M HILL to conduct an RI. Field work was completed in 1992; however, the RI report was not finalized until 1996 (CH2M HILL, 1996). During the RI,

historical aerial photographs were reviewed to identify the type and location of potential waste disposal activities at Site 1 and other sites. A focused facility audit was also conducted to identify possible sources of contamination.

Field activities during the RI consisted of installation of monitoring wells, soil sampling, groundwater sampling, surface water and sediment sampling, well testing, a fracture-orientation investigation, and water-level measurements. A variety of analytical methods and techniques were employed during the RI.

In June 1993, USEPA proposed the Plant 1 portion of the ABL facility for inclusion on the National Priorities List (NPL), based on its estimated potential risks to human health and the environment. The Plant 1 portion of ABL was added to the NPL in the *Federal Register*, Volume 59, Number 27989, on May 31, 1994. Plant 2 is not on the NPL.

The results of the 1992 RI are presented in the *Remedial Investigation of the Allegany Ballistics Laboratory* report (CH2M HILL, 1996). VOCs, particularly TCE, were the primary constituents detected in soil, groundwater (in both alluvial and bedrock aquifers), surface water, and sediment samples collected at and adjacent to Site 1. The FDPs were found to be the primary sources of VOC contamination at Site 1.

The 1996 RI report recommended additional investigation at Site 1 to further evaluate the nature and extent of contamination in soil, groundwater, surface water, and sediment.

2.3.5 Focused Remedial Investigation (CH2M HILL, 1995)

A Focused RI was conducted in 1994 to supplement Site 1 data collected during the RI and to re-evaluate potential risks to human health and the environment from contaminants in Site 1 media. The results are presented in the *Focused Remedial Investigation of Site 1 at Allegany Ballistics Laboratory Superfund Site* report (CH2M HILL, 1995). The results of the Focused RI confirmed that VOCs, semivolatile organic compounds (SVOCs), explosives, and metals were identified as chemicals of potential concern at Site 1. VOCs were the most widespread contaminants detected in Site 1 media, with TCE detected most often and at the greatest concentrations in soil and groundwater.

The Focused RI identified specific areas and media at Site 1 where remedial action alternatives should be evaluated in a Focused FS. These areas of contaminated soil included the FDPs, among other locations at Site 1.

2.3.6 Supplemental Investigations (2001-2004)

The results of the 1992 RI, 1994 Focused RI, 1995 Focused FS (CH2M HILL, 1995), and the 1998 soil level delineation indicated that additional data needed to be collected to adequately delineate the nature and extent of soil contamination at Site 1 and to assess the associated potential risks. Additional soil, sediment, and surface water samples were collected in February and October of 2001 and in July and September of 2004.

In 2001, a soil investigation was conducted to assess current conditions of soil within the ABG to support its continuing operation. The objectives of collecting the data were to assess potential risk to human health and the environment resulting from operation of the ABG.

In July 2004, soil and tissue sampling (earthworms) was conducted to support Step 4 of the baseline Ecological Risk Assessment (ERA). In September 2004, a supplemental investigation of the soil at Site 1 in support of both the human health and ERAs was conducted to obtain additional nature and extent data and to adequately assess potential human and ecological risks for Site 1 soil.

2.3.7 Focused Remedial Investigation (CH2M HILL, 2006)

A Focused RI was completed for Site 1 to provide an evaluation of the nature and extent of the soil contamination at the site and the potential risks that soil contamination might pose to human receptors under residential and industrial scenarios, as well as to ecological receptors. The discussions and assessment presented in the Focused RI were based on data collected as part of the 2001 and 2004 supplemental investigations, as well as data from previous investigations.

Based on the results of the risk assessments, it was recommended that an FS be prepared to evaluate remedial alternatives to address potential risks identified for soil in the FDPs and OABG areas at Site 1.

2.3.8 Membrane Interface Probe and FLUTE Liner Investigation (CH2M HILL, 2010)

An MIP and FLUTE liner studies were completed at the location of the FDPs at Site 1 between December 2009 and March 2010. The objective of the investigations was to determine if dense non-aqueous phase liquid (DNAPL) was present in the unsaturated zone (ground surface to approximately 15 feet bgs). The MIP investigation included 55 sampling locations. Twenty-one of the 55 locations had an MIP response indicating that further investigation with the FLUTE liners was warranted, to evaluate the presence or absence of DNAPL.

The FLUTE liner investigation was conducted during a second mobilization to the site. Twenty-one FLUTE liners were emplaced in the vadose zone and shallow aquifer to a maximum depth of 13.5 feet bgs. None of the FLUTE liners indicated the presence of DNAPLs in the vadose zone. The MIP and FLUTE liner investigations were presented in the *Allegany Ballistics Laboratory Site 1 Membrane Interface Probe and FLUTE Liner Investigation Results Technical Memorandum* (CH2M HILL, 2010).

2.4 Risk Assessment Summary and Basis for Action

2.4.1 Risk Assessment Summary

A Human Health Risk Assessment (HHRA) and an ERA for all of Site 1 soil (ABG and OABG areas) was performed as part of the *Focused Remedial Investigation for Site 1 Soil* (CH2M HILL, 2006). Contaminants of concern (COCs) were identified for each portion of the site based on these risk assessments, including the FDPs. This EE/CA is intended to address contaminants in unsaturated soils beneath FDP 1 and FDP 3 that contribute to groundwater contamination through leaching. Risks for future residents exposed to soils in the FDPs were identified for TCE, dioxin, and select metals (see Section 2.3.7). The primary COC driving removal of the soils beneath the FDPs is the leaching of TCE to groundwater. Other COCs present in the unsaturated soils within the FDPs will be addressed through the removal of the VOC source mass.

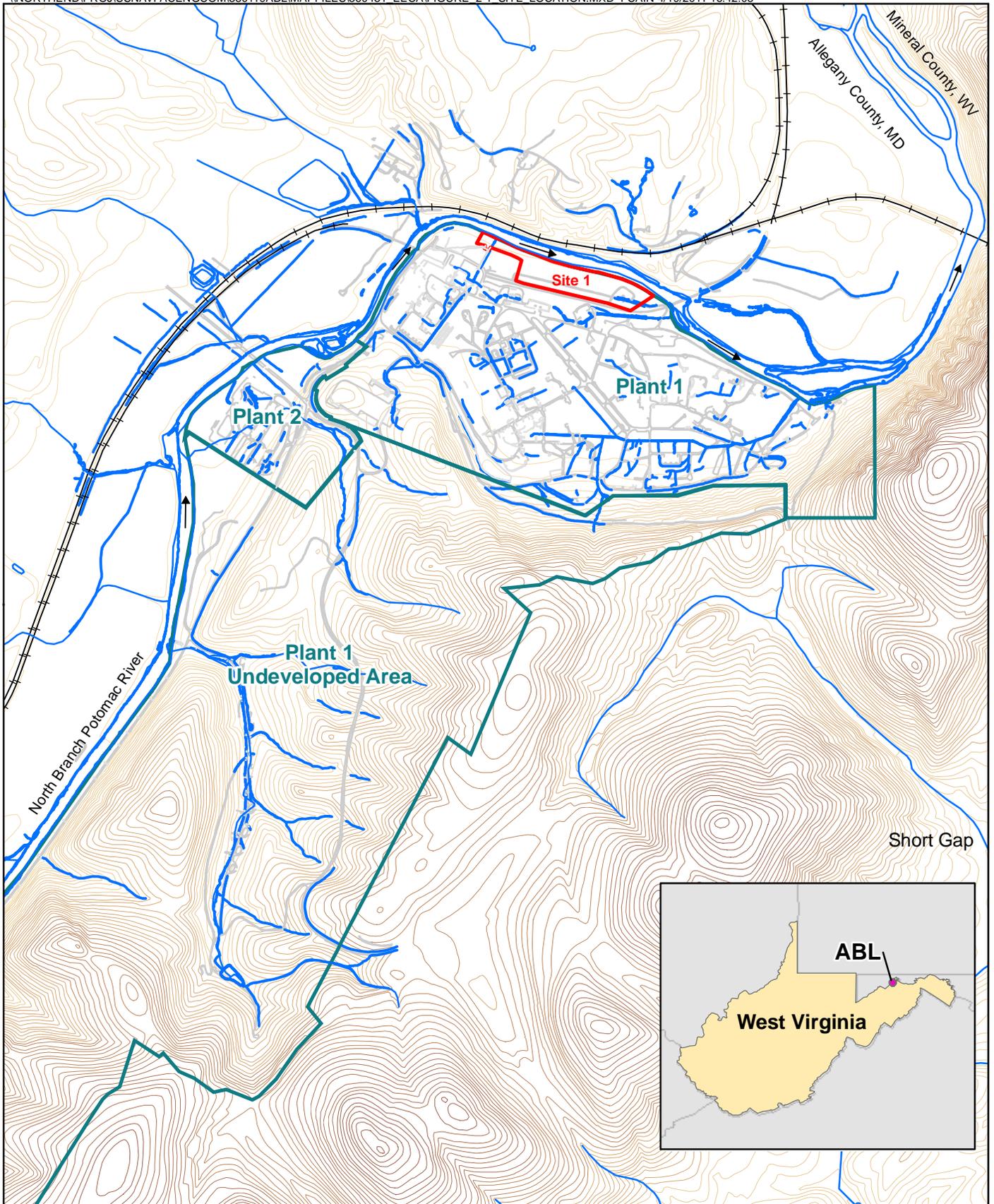
2.4.2 Basis for Removal Action

It is expected that the RA will be completed prior to implementation of the final remedial action for Site 1 soil. As a result of previous investigations, the Navy, in partnership with WVDEP and USEPA, agree that an RA is desired for FDP 1 and FDP 3 to reduce the contaminant source present within the unsaturated soil beneath the FDPs. This action will enhance the ability of the groundwater remedy to restore the aquifers to beneficial use. The FDPs are believed to be the primary source of contamination to groundwater in the unsaturated soil. Removal of the unsaturated soil in the FDPs where elevated levels of VOCs have been detected will eliminate leaching of VOCs from the FDPs to groundwater. Based upon previous sample results discussed in the 2006 Focused RI (CH2M HILL, 2006), as well as in the 2010 MIP study (CH2M HILL, 2010), FDP 1 and FDP 3 contain elevated levels of VOCs. By removing VOC source mass, additional co-located COCs identified in the 2006 Focused RI will also be addressed. Potential contaminant source soils will be removed from the unsaturated zone beneath FDPs 1 and 3. It is understood that the final remedial action for this area will be determined in the forthcoming Record of Decision for Site 1 Soil.

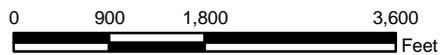
2.5 Development of Removal Area

The soil removal areas comprise the unsaturated soil beneath FDP 1 and FDP 3 that is primarily responsible for contributing to groundwater contamination within the ABGs at Site 1. The removal area boundary was developed based on historical information that documents the location of the FDPs using geophysical survey results and ground scarring at the site (Weston, 1987). Previous sampling results confirmed the presence of VOC concentrations within FDP 1 and FDP 3 that require removal. The removal areas are presented on Figure 2-3. The approximate areas of FDPs 1 and 3 are 235 square feet (ft²) and 330 ft², respectively. To further assure removal of the potential source area, the initial removal area includes a 2-foot buffer surrounding the locations of the FDPs (Figure 2-3). Including the 2-foot buffer, the removal areas for FDPs 1 and 3 are approximately 400 ft² and 450 ft², respectively. The removal will be performed from the ground surface to groundwater, which is assumed not to be greater than 14 feet bgs. A cross-sectional view of the excavations is provided on Figure 2-4 (note that the

excavation design presented in this figure is conceptual only; the actual specifications of the excavation stabilization will be included as part of a separate engineered design).

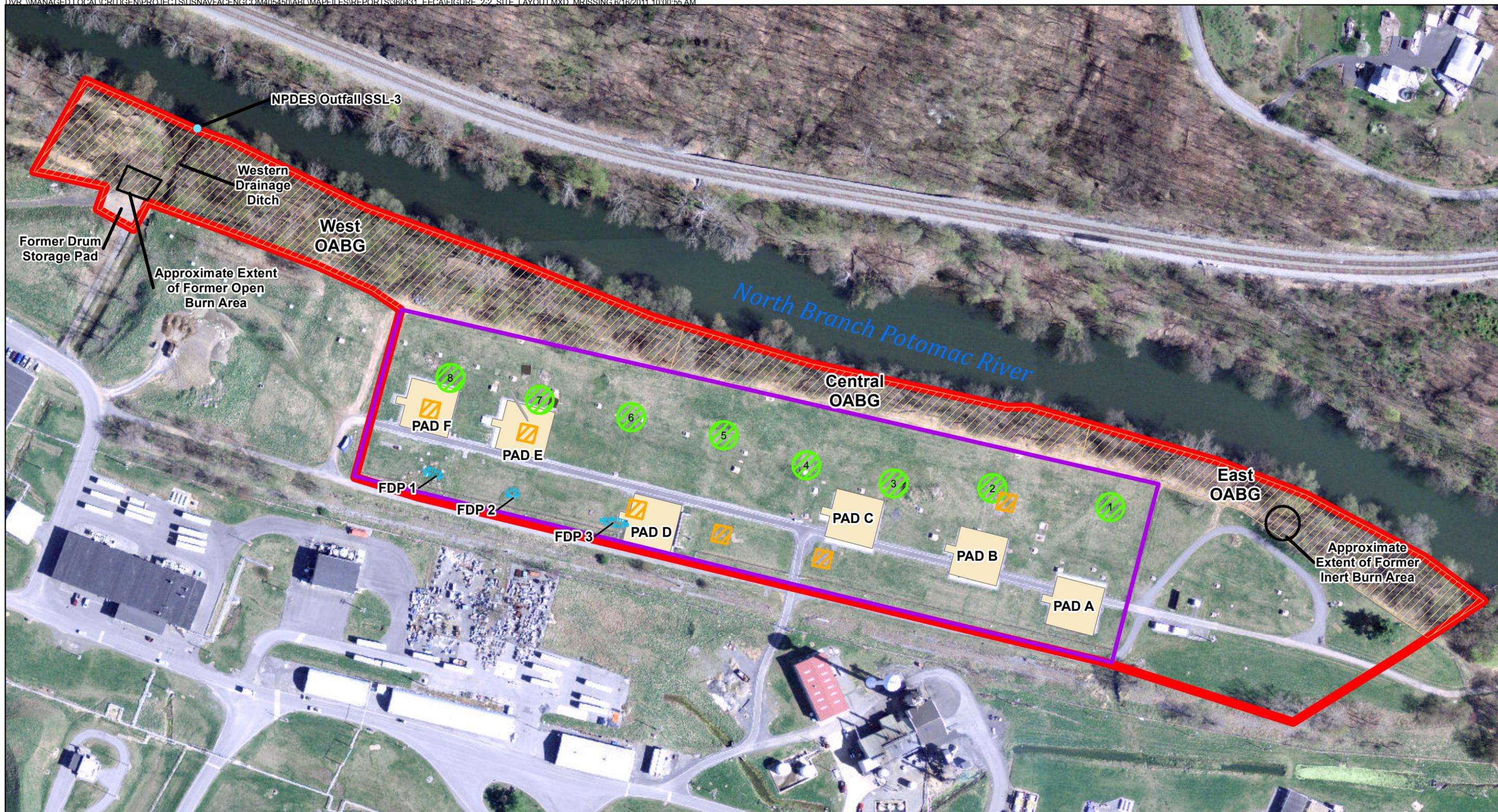


Legend
➔ Flow Direction



1 inch = 1,800 feet

Figure 2-1
Site Location
Site 1 FDP Soil EE/CA
Allegany Ballistics Laboratory, Rocket Center, West Virginia



- Legend**
- NPDES Outfall SSL-3
 - ▭ Former Inert and Open Burn Area
 - Former Disposal Pits (FDP)
 - Former Earthen Burn Pads
 - Active Burning Ground
 - Approximate location of former burn pans
 - Outside Active Burning Ground (OABG)
 - Current Concrete Burn Pads
 - Site 1 Boundary

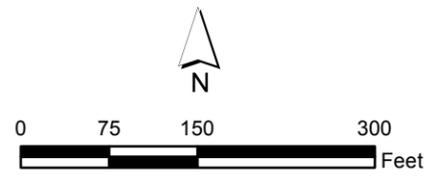


Figure 2-2
 Site Layout
 Site 1 FDP Soil EE/CA
 Allegany Ballistics Laboratory, Rocket Center, West Virginia



Removal Area Boundary at FDP-1 (coordinates in State Plane, feet)		
	Northing	Easting
1-1	388658.03	2155963.09
1-2	388657.24	2155972.97
1-3	388653.32	2155982.18
1-4	388646.06	2155988.67
1-5	388639.76	2155982.33
1-6	388643.21	2155973.23
1-7	388645.67	2155963.76
1-8	388651.49	2155956.68

Removal Area Boundary at FDP-1 (coordinates in State Plane, feet)		
	Northing	Easting
3-1	388576.03	2156254.24
3-2	388574.91	2156264.13
3-3	388572.92	2156272.84
3-4	388570.31	2156283.36
3-5	388565.51	2156287.09
3-6	388560.83	2156282.80
3-7	388561.33	2156272.57
3-8	388563.65	2156262.58
3-9	388565.41	2156252.59
3-10	388572.18	2156245.83

- Legend**
- ⊕ Removal Area Boundary Vertex
 - Engineered Excavation Stabilization
 - Excavation Cross Sections
 - Proposed Relocated Fence Line
 - Existing Fence Line
 - Approximate Limits of Excavation (Including Sloping for Excavation Sidewall Stabilization)
 - ⊕ Former Disposal Pits (FDP)
 - ▨ Removal Area
 - Active Burning Ground

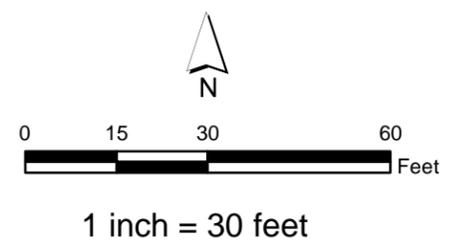
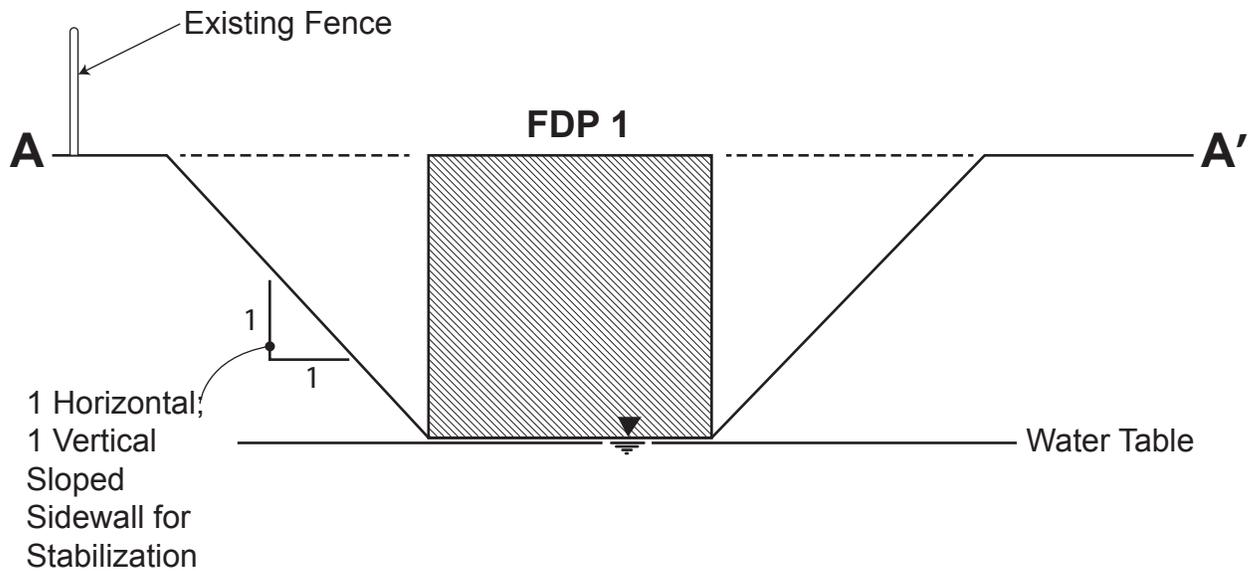
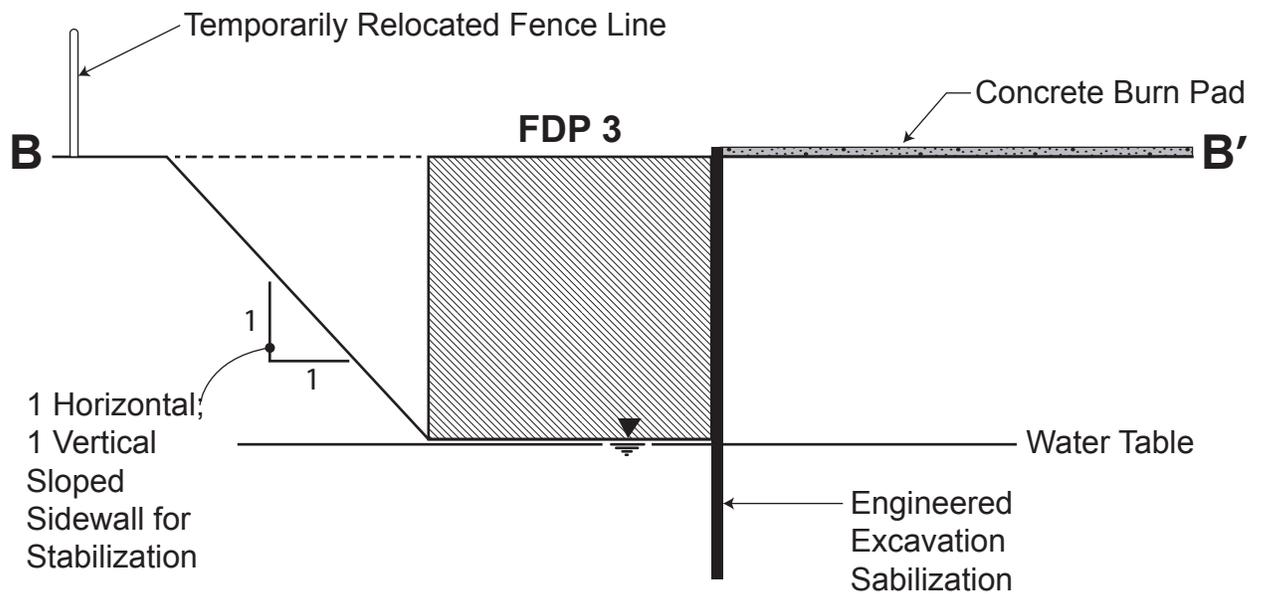


Figure 2-3
Removal Areas
Site 1 FDP Soil EE/CA
Allegany Ballistics Laboratory, Rocket Center, West Virginia



Cross Section A-A'



Cross Section B-B'

Notes:

- 1.) Actual Slope or Benching Specifications for Excavation Sidewall Stabilization to be Included as Part of a Separate Engineered Design.
- 2.) Actual Engineered Excavation Stabilization Details to be Included as Part of a Separate Engineered Design.

Legend

 FDP Removal Area

FIGURE 2-4

Conceptual Removal Area Cross Section

Site 1 FDP Soil EE/CA

Allegany Ballistics Laboratory, Rocket Center, West Virginia

Identification of Removal Action Objectives

3.1 Statutory Limits on Removal Actions

The Navy and Marine Corps Installation Restoration Manual does not limit the cost or duration of the RA; however, cost effectiveness is a recommended criterion for evaluation of RA alternatives. No other statutory limits exist for the proposed NTCRA.

3.2 Removal Action Objective

The RA considered in this EE/CA will augment the existing groundwater treatment system by removing the contaminant source, therefore, reducing or eliminating leaching of COCs to groundwater.

The RAO is to reduce the contaminant source present in the unsaturated soil beneath FDP 1 and FDP 3 in order to enhance the ability of the groundwater remedy to restore the aquifers to beneficial use. The RAO will be accomplished through removal of contaminated source soils from the unsaturated soil beneath FDP 1 and FDP 3. As previously described, this removal will be limited to source areas in the unsaturated soil that are primarily responsible for contributing VOCs to groundwater within the ABGs at Site 1. Co-located COCs will also be addressed by the VOC removal. The basis for the extent of the removal area is discussed in Section 2.5.

The selected RA alternative may not comply with ARARs under federal and state environmental laws. RAs generally focus on the stabilization or threat of a release and the mitigation of near-term threats. ARARs that are within the scope of such RAs are therefore only those ARARs that must be attained in order to eliminate the near-term threats. In accordance with 40 CFR Part 300, Section 430, Paragraph (f)(1)(ii)(c), the Navy will waive the ARAR pertaining to closure of surface impoundments since the action being considered in the EE/CA is an interim measure that will become part of a remedial action that will meet the ARAR. Other federal and state advisories, criteria, or guidances were considered, as appropriate, in formulating the RA alternatives.

3.3 Removal Action Schedule

Since this RA has been designated an NTCRA, the start date will be determined by factors other than the urgency of the threat. Possible factors include weather conditions, availability of resources, and site constraints. The total project period is predicted to last 14 months, from the beginning of the public comment period to completion of the construction completion documentation. Critical milestone periods are summarized as follows:

- EE/CA Public Comment Period - 45 days
- Design, Work Plan, Subcontracting, and Mobilization - 6 months
- RA - 3 months
- Construction Completion Documentation - 4 months

The RA time frame includes the time required for mobilization and setup of equipment and for performance of the selected RA.

3.4 Applicable or Relevant and Appropriate Requirements

Applicable requirements are those requirements specific to the RA for the FDPs at the Site 1 that satisfy all jurisdiction prerequisites of the law. Relevant and appropriate requirements are those that do not have jurisdiction authority over the FDPs, but are meant to address similar situations, and are therefore suitable for use at the FDPs. Federal ARARs are determined by the lead agency, which in this case is the Navy. As outlined by 40 CFR 300.415(J), the lead agency may consider the urgency of the situation and the scope of the RA to be conducted in determining whether compliance with ARARs is practicable. NCP, 40 CFR 300.400(g)(2), specifies the following factors to consider in determining what requirements of other environmental laws are relevant and appropriate:

- The purpose of the requirement in relation to the purpose of CERCLA
- The media regulated by the requirement
- The substance(s) regulated by the requirement
- The actions or activities regulated by the requirement
- Variation, waivers, or exemptions of the requirement
- The type of place regulated and type of place affected by the release of the CERCLA action
- The type and size of the facility or structure regulated by the requirement or affected by the release
- Consideration for the use or potential use of affected resources in the requirement

In some circumstances, a requirement may be relevant to the particular site-specific situation but may not be appropriate because of differences in the purpose of the requirement, the duration of the regulated activity, or the physical size or characteristic of the situation it is intended to address.

Three classifications of requirements are defined by USEPA in the ARAR determination process: chemical-specific, location-specific, and action-specific.

Chemical-specific ARARs are health- or risk-management-based numbers or methodologies that result in the establishment of numerical values for a given media that would meet the NCP “threshold criterion” of overall protection of human health and the environment. These requirements generally set protective cleanup concentrations for the chemicals of concern in the designated media, or they set safe concentrations of discharge for remedial activity. Chemical-specific ARARs are listed and described in Appendix A.

Location-specific ARARs restrict activities based on the characteristics of the surrounding environments. Location-specific ARARs may include restrictions on actions within wetlands or floodplains, near locations of known endangered species, or on protected waterways. Federal location-specific and State of West Virginia location-specific ARARs are summarized in Appendix A.

Action-specific ARARs are requirements that define acceptable procedures related specifically to the type of activity being performed. Federal action-specific and State of West Virginia action-specific ARARs that may affect the development and conceptual arrangement of RA alternatives are summarized in Appendix A.

Identification and Analysis of Removal Action Alternatives

4.1 Identification of Removal Action Alternatives

The following RA alternatives have been identified for evaluation:

- **Alternative 1** – No Action
- **Alternative 2** – Excavation and Offsite Disposal

4.2 Description of Removal Action Alternatives

4.2.1 Alternative 1 – No Action

The no action alternative implies that no removal work will be done. The area will be left as it currently exists, leaving the potential VOC source mass in place and untreated.

4.2.2 Alternative 2 – Excavation and Offsite Disposal

Alternative 2 includes the excavation and offsite disposal of contaminant source soils from beneath FDP 1 and FDP 3. The elements of this removal are discussed in this section. Although Munitions and Explosives of Concern (MEC) are not anticipated within the removal areas, qualified MEC support personnel will provide construction support for all intrusive activities. The MEC support personnel will directly observe intrusive activities in order to achieve maximum operational safety and efficiency. The MEC support will be responsible for identifying any potential MEC-related items through the use of magnetometers and visual observation during all intrusive activities. No intrusive activities may take place without the presence of MEC support.

Prior to excavation activities, utility locating will be performed around the areas to be disturbed to identify any underground and overhead utilities that may impact the RA. Injection and monitoring wells located within the vicinity of FDP 1 that were part of a former groundwater pilot study will be abandoned. The locations of the injection and monitoring wells around FDP 1 are provided on Figure 4-1. It is assumed that up to 17 wells near FDP 1 will require abandonment, which may include those outside of the boundary of the FDP, to accommodate excavation and sidewall stabilization and sloping. Because the pilot study is over, it is assumed that the injection and monitoring wells will be abandoned and replacement of the wells will not be required; however, if a subset of wells do not require removal for stabilization, they may be maintained for potential future monitoring activities. Well depths range between 25 and 90 feet.

Erosion and sediment controls will be established prior to excavation. Specific controls and other field implementation procedures will be developed in the RA work plan and reviewed by the facility to assure they adhere to safety requirements for work within the ABG. The erosion and sediment controls will be installed and maintained in accordance with the WVDEP *Erosion and Sediment Control Best Management Practice Manual*. Erosion and sediment controls will consist of perimeter controls surrounding the removal areas and stockpiles or mixing areas.

Excavation of the identified removal areas will be performed as shown on Figure 2-3 and discussed in Section 2.5 for FDP 1 and FDP 3. A portion of the existing fence line may require temporary relocation during excavation activities (Figure 2-3). The FDP 1 removal area (including a 2-foot buffer) is approximately 400 ft². The FDP 3 removal area (including a 2-foot buffer) is approximately 450 ft². Excavation of the removal areas will be performed to a depth of 14 feet bgs or until groundwater is reached. For estimating purposes, it is assumed that groundwater will be at 14 feet bgs in all locations. The total volume of soil anticipated for removal from the FDP removal areas is approximately 440 cubic yards (yd³). Additional soils will be excavated to provide stabilization for the excavation sidewalls, as necessary. This material will also require offsite disposal. The sidewall material will be

segregated from the FDP removal area material for characterization as hazardous or non-hazardous prior to disposal.

Excavated soil from the FDP removal areas will be managed as listed hazardous waste (F002) because of the associated past disposal activities (such as the disposal of spent chlorinated solvents). The excavated soil will be stockpiled onsite in a lined and bermed containment staging area for subsequent offsite disposal. The containment area will be capable of containing all soils from the FDP removal areas. Material excavated from the sidewalls for stabilization will be staged separately onsite for characterization and offsite disposal. The sidewall material will be disposed of appropriately (either hazardous or non-hazardous) based upon the sampling results.

FDP 3 is located adjacent to an active burning pad (rocket tie down assembly) that cannot be disturbed. Therefore, engineered sidewall stabilization (such as a retaining wall or soldier piles and lagging wall) will be required for this portion of the excavation. The appropriate engineering controls for stabilization will be documented, in detail, in work planning and design documentation separate from this EE/CA. It is assumed that all other sidewalls will be sloped or benched to stabilize the excavation sidewalls. For the purposes of cost estimating, a 1:1 horizontal to vertical slope was assumed for excavation activities on all sidewalls except for those adjacent to the burn pad. A conceptual excavation cross-section is presented on Figure 2-4.

Upon completion of the excavation activities, post-removal samples will be collected for use during the final remedy selection. The post-removal sampling details will be described in a work plan. It is assumed that discrete samples will be collected from each of the excavation sidewalls, including soils from adjacent to the engineered sidewall stabilization (possibly via hand auger, direct-push technology [DPT], drilling, or similar methods). Samples are not assumed for the floor of the excavation because the removal will be performed to groundwater. The samples will be analyzed for the HHRA COCs identified in the 2006 Focused RI (TCE, dioxin, arsenic, iron, manganese, thallium, and vanadium), as well as any additional COCs agreed to by the ABL Partnering Team. Once samples have been collected, a marker (such as a layer of geotextile fabric) will be placed within each pit prior to backfilling and restoration of the site to denote the areas in which the RA was completed. The excavations will be backfilled using an offsite fill material and will be restored to the original grade. Backfill material will be placed in 12- to 18-inch lifts and will be field compacted using excavation equipment. The removal areas will be restored to pre-excavation grade. Vegetative stabilization through native grasses will consist of spreading native grass seed over all portions of the site that are disturbed by the RAs. Erosion and sediment controls will remain in place until site restoration has been completed.

Waste characterization sampling will be performed on the stockpiled material for offsite disposal requirements. Based upon former disposal activities and site knowledge, it is assumed that the excavated FDP removal area material will be F-Listed hazardous waste. Hazardous waste soils will be disposed at an approved offsite hazardous waste disposal facility. The excavated sidewall material, however, will be disposed appropriately based on characterization results. It is assumed that the disposal facility for all material will be located approximately 300 miles from site and that waste material will be transported to the disposal facility via truck.

4.3 Evaluation Criteria

This subsection provides the screening analysis of the RA alternatives detailed in Section 4.4 against the criteria. This analysis provides information to compare the alternatives, select an appropriate RA for the site, and demonstrate that the CERCLA removal selection requirements have been met. Each alternative was comparatively evaluated in more detail based on the following criteria:

- Effectiveness
- Implementability
- Relative Cost

The “effectiveness” of a technology refers to the degree to which the technology achieves the RAO and the reliability and performance of the technology over time. Levels of effectiveness were assessed based upon the effectiveness criteria that would be satisfied by each alternative. The “effectiveness criteria,” from the USEPA

guidance document *Guidance on Conducting Non-Time Critical Removal Actions Under CERCLA* (USEPA, 1993), are identified as:

- Protection of human health
- Protection of workers during implementation
- Protection of environment
- Compliance with ARARs
- Level of treatment and containment expected
- Residual effect concerns

The “implementability” (or ease of implementation) of a technology refers to the availability of commercial services to support said technology, the constructability of the technology under specific site conditions, and the acceptability of the technology to all parties involved (such as regulators, the public, or owner). Levels of implementability were assessed based upon the “implementability criteria” satisfied by each alternative. The implementability criteria, from the USEPA guidance document on conducting NTCRA under CERCLA (USEPA, 1993), are as follows:

- 1) Construction and operational considerations
- 2) Demonstrated performance and useful life
- 3) Adaptable to environment conditions
- 4) Contributes to remedial performance
- 5) Can be implemented in a year
- 6) Availability of equipment, personnel and services, outside laboratory testing capacity, and offsite treatment and disposal capacity
- 7) Permits required
- 8) Easements or rights-of-way required
- 9) Impact on adjoining property
- 10) Ability to impose land use controls

Evaluation of implementability essentially assesses the technical feasibility, availability of resources, and administrative feasibility of completing each task. The technical feasibility consists of previously listed items 1 through 5, the availability of resources involves item 6, and the administrative feasibility involves items 7 through 10.

The estimated costs include the expenditures required to complete each alternative in terms of capital costs, including direct and indirect costs, to complete initial construction activities. Direct costs include cost of construction, equipment, land and site development, treatment, transportation, and disposal. Indirect costs include engineering expenses and contingency allowances. A detailed cost analysis is included in Appendix B. Zero cost is associated with the “No Action” Alternative since no activities are planned. Only capital costs were calculated for Alternative 2. No present-worth cost was estimated because no ongoing activities, periodic inspections, or operation and maintenance (O&M) activities will be necessary with these alternatives. The costs estimates are provided to an accuracy of +50 percent and -30 percent. The alternative costs are in 2011 dollars and are based on information available at the time of this EE/CA. The actual cost of the project will depend on the final scope and design of the selected RA, the schedule of implementation, competitive market conditions, and other variables. Estimates are based on information published in R.S. Means’ *Site Work and Landscape Cost Data* (R.S. Means, 2011), vendor quotes, recent similar projects, or engineering estimates.

4.4 Evaluation of Alternatives

Table 4-1 provides a summary of the alternative evaluation with respect to effectiveness, ease of implementation, and cost.

TABLE 4-1
 Evaluation of Removal Alternatives
 EE/CA for Site 1
 Allegany Ballistics Laboratory
 Rocket Center, West Virginia

Alternative	Description	Effectiveness	Ease of Implementation	Present Worth Cost
Alternative 1 No Action	No removal work performed. Site will be left "as is".	Not Effective	Easily Implementable	No Cost
	<p><i>Protectiveness</i> The potential VOC source soils and other COCs are left onsite and constituents may migrate into groundwater over time.</p> <p><i>Compliance with ARARs</i> This alternative does not comply with chemical-specific ARARs. Location- and action-specific ARARs do not apply.</p> <p><i>Ability to Achieve Removal Action Objectives</i> This alternative does not meet the removal action objectives.</p>	<p><i>Technical Feasibility</i> No action to implement</p> <p><i>Availability of Resources</i> No resources required</p> <p><i>Administrative Feasibility</i> This alternative has the potential for contaminant leaching to groundwater.</p>		\$0
Alternative 2 Excavation and Offsite Disposal	Excavate potential contaminant source soil located in the unsaturated zone beneath FDPs 1 and 3 and dispose of the contaminated soils offsite.	Effective	Moderately Difficult to Implement	High
	<p><i>Protectiveness</i> This alternative removes potential contaminant source mass from the FDPs and eliminates the potential for contaminants leaching into groundwater from FDPs 1 and 3. This alternative potentially exposes workers to contaminated materials during construction; workers would be required to receive training and use personal protective equipment. Because excavated soil will be transported off site, this alternative has a slight risk of exposing the surrounding communities to the contaminants during transport. To prevent exposure to the community, trucks will not be overloaded and will be lined and covered prior to leaving the site. This alternative will require a significant amount of hauling for transportation and disposal of the soils at an offsite disposal facility, making it a less sustainable alternative.</p> <p><i>Compliance with ARARs</i> This alternative complies with chemical-, location-, and action-specific ARARs.</p> <p><i>Ability to Achieve Removal Action Objectives</i> This alternative meets the removal action objectives.</p>	<p><i>Technical Feasibility</i> Methods for excavation and backfill are well-established and can be completed with conventional equipment in a relatively short time frame. Precautionary measures for MEC oversight are required and increase the difficulty of implementation. Additionally, removal of the soils adjacent to the existing burn pad cannot be properly sloped to prevent impacts to the burn pad; therefore, stabilization of the side walls of the excavation would be necessary, which increases the difficulty of implementation.</p> <p><i>Availability of Resources</i> Equipment, personnel, and services required for implementation of this alternative are readily available in the area. MEC support personnel are not standard but are available. Offsite disposal capacity for the excavated material is available; however, it is assumed the material excavated will require disposal at a hazardous waste facility and will require transport to a non-local hazardous waste disposal facility.</p> <p><i>Administrative Feasibility</i> This alternative is administratively feasible. It will require proper transportation and disposal documentation and disposal documentation at an offsite hazardous disposal facility.</p>	<p>Capital Costs assuming Non-Hazardous Sidewall Disposal - \$1,103,000</p> <p>Range Costs assuming Non-Hazardous Sidewall Disposal (-30% to +50%) - \$772,000 to \$1,655,000</p> <p>Capital Costs assuming Hazardous Sidewall Disposal - \$1,447,000</p> <p>Range Costs assuming Hazardous Sidewall Disposal (-30% to +50%) - \$1,013,000 to \$2,171,000</p>	



- Legend**
- Injection Well
 - Extraction Well - Bedrock
 - Monitoring Well
 - Former Disposal Pits (FDP)
 - Approximate Potential Source Area
 - Active Burning Ground

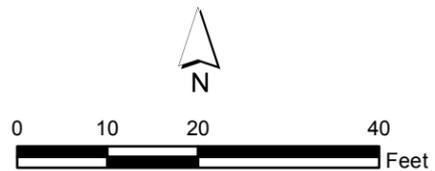


Figure 4-1
Injection and Monitoring Well Locations
Site 1 FDP Soil EE/CA
Allegany Ballistics Laboratory, Rocket Center, West Virginia

Comparative Analysis of Removal Action Alternatives

5.1 Comparative Criteria

This section provides a comparative analysis of the RA alternatives to assist in the decision making process by which an alternative will be selected. In previous sections, the alternatives were independently screened according to their effectiveness, ease of implementation, and cost. In this section, the alternatives are compared to each other for their relative merits. This analysis will help determine which alternative is preferable for each criterion and, consequently, which alternative will be recommended for implementation at Site 1.

5.1.1 Effectiveness

Alternative 1 is not effective. It is not protective, does not comply with ARARs, and does not achieve the RAO of this EE/CA. Alternative 2 is effective in meeting the RAO because it will result in removal of the contaminant source mass in the unsaturated soils beneath FDPs 1 and 3. Alternative 2 includes removing and disposing of contaminated soils offsite. Given the appropriate training and personal protective equipment (PPE), Alternative 2 is protective to workers during construction. Because excavated materials from Alternative 2 would require transportation and offsite disposal, there is the potential for exposing surrounding communities to the contaminants during transport and disposal. Alternative 2 has sustainability concerns because a significant amount of hauling would be required to transport and dispose of the excavated soil at an offsite hazardous waste disposal facility, and disposal may result in long-term concerns or additional treatment by the disposal facility. Alternative 2 achieves the chemical-, location-, and action-specific ARARs.

5.1.2 Implementability

Alternative 1 involves no action and therefore is easily implemented. Alternative 2 is technically and administratively feasible, and resources for implementing this alternative are readily available. Alternative 2 can be accomplished utilizing standard construction methods and readily available resources. Alternative 2 is complicated by the need for sidewall stabilization (particularly adjacent to the existing burn pad) and an engineered design for the excavation. Additionally, this alternative requires MEC oversight and support, which is not considered standard for most construction activities. Alternative 2 is also complicated slightly because of the additional disposal permitting and transportation and disposal documentation necessary for offsite disposal of the excavated soils.

5.1.3 Cost

Alternative 1 has no cost and is therefore the least expensive. Two cost estimates are included in Appendix B and summarized in Table 4-1 for Alternative 2. One cost estimate is included that assumes non-hazardous disposal of the excavated sidewall material, and the other cost estimate assumes hazardous disposal of the excavated sidewall material. Alternative 2 assuming non-hazardous disposal of the sidewall material is estimated at \$1,103,000 (-30% = \$772,000, +50% = \$1,655,000). Alternative 2 assuming hazardous disposal of the sidewall material is estimated at \$1,447,000 (-30% = \$1,013,000, +50% = \$2,171,000).

SECTION 6

Recommended Removal Action Alternative

Based on the comparative analyses of the alternatives completed in Section 5, the recommended alternative is excavation and offsite disposal, as described in Alternative 2. Although there are significant costs associated with this alternative, and it may be moderately difficult to implement, it satisfies the RAO.

Alternative 2 will require the excavation of the potential contaminant source mass from the unsaturated zone beneath FDPs 1 and 3. The soils will be disposed of offsite, and the site will be restored. Upon completion of the RA, the potential source of COCs to groundwater in the unsaturated soil of FDPs 1 and 3 will be removed from the site, and no further action will be necessary for the FDP source areas prior to implementation of the final remedial alternative for Site 1.

SECTION 7

References

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Appendix A
ARAR Tables

A.1 Potential ARARs

Section 300.430 of the National Contingency Plan (NCP) requires that remedial actions implemented under CERCLA comply with the requirements of federal and state environmental laws, regulations, standards, criteria, and limits that are legally determined to be ARARs. To be applicable, a state or federal requirement must directly and fully address the circumstances at a site and satisfy all of the jurisdictional prerequisites for legal applicability. A requirement that is not applicable may be relevant and appropriate if it addresses situations sufficiently similar to be of use in evaluating the site.

Only substantive requirements can be ARARs; administrative requirements such as permits, reporting, recordkeeping, or consultation with administrative bodies are not ARARs. Non-promulgated advisories or guidance issued by federal or state governments are not legally binding and are not ARARs. However, such advisories or guidance may be useful and are “to be considered” (TBC) during the identification of ARARs. TBCs are intended to complement the use of ARARs and may be used to establish remedial action objectives in circumstances for which ARARs do not exist.

Pursuant to EPA's guidance, ARARs are generally divided into three categories:

- **Chemical-specific ARARs** establish numerical standards limiting the concentrations of substances in the medium of concern and/or the medium affected by the removal action.
- **Location-specific ARARs** are restrictions or considerations placed on the conduct of activities in specific locations.
- **Action-specific ARARs** are technology-based or activity-based restrictions controlling the removal action, and include performance and design standards.

Using the available investigation data, and considering the likely remedial technologies for the chemicals of concern (COCs), it is possible to produce a preliminary list of project-specific ARARs. Tables A-1 through A-3 summarize the chemical-specific, location-specific, and action-specific ARARs that have been identified for the Former Disposal Pit (FDP) Source Removal EE/CA.

TABLE A-1
 Chemical-Specific Applicable or Relevant and Appropriate Requirements
 FDP Source Removal EE/CA
 Site 1, Allegany Ballistics Laboratory
 Rocket Center, West Virginia

Media	Citation	Requirement	Prerequisites	Determination	Alternative(s)	Comments
<i>No Federal :Chemical-Specific ARARs Apply</i>						
<i>West Virginia Chemical-Specific ARARs</i>						
Soil	47 CSR 12-3.2b	Soil must not be an ongoing source of groundwater contamination	The presence of contamination in the soil that has the potential to leach into groundwater	Applicable	2	Applicable to this action because soil that has the potential to be a source of groundwater contamination is being removed
ARAR	Applicable or Relevant and Appropriate Requirements			O&M	Operation and Maintenance	
CFR	Code of Federal Regulations			TBC	To be considered	
CSR	Code of State Regulations			USC	United States Code	

TABLE A-2

Location-Specific Applicable or Relevant and Appropriate Requirements

*FDP Source Removal EE,CA**Site 1, Allegany Ballistics Laboratory**Rocket Center, West Virginia*

Location	Citation	Requirement	Prerequisites	Determination	Alternative(s)	Comments
<i>Federal :Location-Specific ARARs</i>						
Within a migratory flyway	16 USC 703	The unregulated taking of migratory birds, their nests, or their eggs are prohibited.	Presence of migratory birds	Applicable	2	If migratory birds, or their nests or eggs, are identified during the response action, activities will not destroy the birds, nests or eggs.
<i>West Virginia Location-Specific ARARs</i>						
Within 100-year Floodplain	33 CSR 20-7.2 only as it incorporates 40 CFR 264.1(j)(7) by reference	Facility must be designed, constructed, operated, and maintained to avoid washout if located within the 100 year floodplain.	Operation of a hazardous waste facility within the 100-year floodplain	Relevant and Appropriate	2	Portions of the site are within the 100-year flood zone. Relevant and Appropriate for areas where hazardous waste is accumulated onsite for less than 90 days.
ARAR	Applicable or Relevant and Appropriate Requirements			O&M	Operation and Maintenance	
CFR	Code of Federal Regulations			TBC	To be considered	
CSR	Code of State Regulations			USC	United States Code	

TABLE A-3
 Action-Specific Applicable or Relevant and Appropriate Requirements
FDP Source Removal EE/CA
Site 1, Allegany Ballistics Laboratory
Rocket Center, West Virginia

Action	Citation	Requirement	Prerequisite	Determination	Alternative(s)	Comments
<i>Federal Action-Specific ARARs</i>						
Storage of fuels and oils (petroleum and non-petroleum) onsite	40 CFR 112.1(b) through (d), 112.3 [excluding paragraph f], 112.5 through 8, and 12,	If storage capacity limits are exceeded a Spill, Prevention, Control, and Countermeasures Plan must be prepared and implemented with procedures, methods, equipment, and other requirements to prevent the discharge of into or upon the navigable waters of the United States.	The total capacity for oils storage onsite in containers with a capacity of 55 gallons or more is equal to or greater than 1,320 gallons at any time.	Applicable	2	It is anticipated that fuels or other chemicals may be stored onsite. If the storage capacity in containers that are 55 gallons or greater is equal to or exceeds 1,320 gallons a Spill Prevention, Control, and Countermeasure (SPCC) Plan must be prepared and implemented. Containers include oil and fuel reservoirs in equipment.
Construction activities that result in the contamination of equipment, structures, or soil	40 CFR 264.114 excluding other regulations cited by reference	Contaminated equipment, structures, and soil must be decontaminated, disposed of, or otherwise managed as specified by unit-specific closure requirements	Partial or final closure of a RCRA permitted unit	Relevant and Appropriate	2	Relevant and appropriate because Site 1 was never a permitted unit. This citation defers to other unit-specific criteria if the specify another management alternative. Since Site 1 was never a permitted unit, alternative management may be achieved in accordance with other ARARs cited for this action. Additionally, any unit-specific closure criteria that are applicable or relevant and appropriate have been included as ARARs. Procedures for decontamination, disposal, or other management will be included in the work plan.
Closure and Post-Closure Care of a Surface Impoundment with waste in place	33 CSR 20-7.2 only as it incorporates 40 CFR 264.228(a)(2) and (b) [excluding (b)(2) and limiting the referenced citations to include only 40 CFR 264.117 (a)(1) and (c)]	Details the requirements of closing a surface impoundment including elimination of free liquids, stabilizing remaining wastes to a bearing capacity sufficient to support final cover; covering the surface impoundment with a final cover. Also specifies the performance standards for the final cover.	Closure of a surface impoundment with waste left in place	Relevant and appropriate	2	Relevant and appropriate because the regulation was subsequent to disposal activities, however the solvent pits are sufficiently similar to a surface impoundment to include the closure and post closure care requirements This ARAR may be waived pursuant to 40 C.F.R. section 300.430(f)(1)(ii)(C)(1) pending a final decision on Soil Remediation for the FDPs that attains the requirements of the ARAR.

TABLE A-3

Action-Specific Applicable or Relevant and Appropriate Requirements

*FDP Source Removal EE,CA**Site 1, Allegany Ballistics Laboratory**Rocket Center, West Virginia*

Action	Citation	Requirement	Prerequisite	Determination	Alternative(s)	Comments
Closure of a Surface Impoundment without waste in place	33 CSR 20-7.2 only as it incorporates 40 CFR 264.228(a)(1)	Remove or decontaminate all waste residues, contaminated containment system components (liners, etc.), contaminated subsoils, and structures and equipment contaminated with waste and leachate, and manage them as hazardous waste as appropriate	Closure of a surface impoundment without leaving waste in place	Relevant and appropriate	2	Relevant and appropriate because the regulation was subsequent to disposal activities, however the solvent pits are sufficiently similar to a surface impoundment to include the closure and post closure care requirements. Since the solvent pits are unlined it is unlikely that contaminated residues can be completely removed, however if they can be removed no cap or post-closure care for this area will be required. This ARAR may be waived pursuant to 40 C.F.R. section 300.430(f)(1)(ii)(C)(1) pending a final decision on Soil Remediation for the FDPs that attains the requirements of the ARAR.
<i>West Virginia Action-Specific ARARs</i>						
Abandonment of Monitoring Wells	47 CSR 58-4.2	Subsurface borings shall be constructed, operated and closed in a manner that protects groundwater.	Abandonment of Monitoring wells.	Applicable	2	Monitoring wells will be abandoned during the removal action.
Staging of Hazardous Waste in piles	33 CSR 20-7.2 only as it incorporates 40 CFR 264.554(d)(1)(ii), (d)(2), (j)(1), (j)(2)	A staging pile must be 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.	Staging hazardous wastes in piles onsite in support of remedial actions	Relevant and appropriate	2	These requirements are applicable to operating a corrective action management unit and therefore relevant and appropriate for this action. Staging piles will be designed and operated in accordance with these standards.
Generation of Fugitive Dust	45 CSR 17-3.1	Particulate matter emissions are not allowed beyond the boundary of the property on which they originate	Generation of dust	Applicable	2	Reasonable actions will be taken to control dust emissions during construction.
Operation of a Hazardous waste unit	45 CSR 25-4.3	Owners and operators of hazardous waste treatment storage and disposal facilities must design, construct, maintain, and operation to minimize the release of hazardous waste constituents, toxic mists, fumes, dusts, or gases to the air.	Onsite hazardous waste units	Relevant and Appropriate	2	Relevant and appropriate for the design and management of areas where hazardous waste is accumulated is for less than 90 days.

TABLE A-3

Action-Specific Applicable or Relevant and Appropriate Requirements

*FDP Source Removal EE/CA**Site 1, Allegany Ballistics Laboratory**Rocket Center, West Virginia*

Action	Citation	Requirement	Prerequisite	Determination	Alternative(s)	Comments
Management of treatment chemicals or waste onsite	47 CSR 58-4.3.b	New areas used for storage shall be designed, constructed and operated to prevent release of contaminants to groundwater.	Staging of raw materials, products or wastes onsite	Applicable	2	Areas where treatment chemicals are stored or where hazardous wastes are stored or treated will be designed, constructed, and managed to protect groundwater.
Hazardous waste accumulation in containers	33 CSR 20-5.1 only as it incorporates 40 CFR 262.34 (a) (1)(i), (2), (3), and 40 CFR 265.171 through 174	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.	Accumulate hazardous waste in containers onsite.	Applicable	2	Hazardous waste is expected to be generated and staged onsite in containers for less than 90 days.
Discharge to waters of the State (including groundwater)	47 CSR 2-3.2.	Lists adverse conditions not allowed in State waters, (including groundwater) which must be prevented during remediation.	Potential adverse affects to groundwater or surface water from solid wastes or material stored at the site.	Applicable	2	Wastes and materials (including soil stockpiled for backfill) that are stored at the site during remedial actions will be managed so as not to impact the waters of the State via leachate, runoff, or discharge.
ARAR	Applicable or Relevant and Appropriate Requirements		FR	Federal Regulation		
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act		PRB	permeable reactive barrier		
CFR	Code of Federal Regulations		RCRA	Resource Conservation and Recovery Act		
CSR	Code of State Regulations		TSDF	hazardous waste Treatment, Storage, and/or Disposal Facility		

Appendix B

Cost Analysis

Cost Estimate for Alternative 2: Excavation and Offsite Disposal (assumes Non-Hazardous Sidewall Material)

Site 1 - Former Disposal Pits

Allegany Ballistics Laboratory

Rocket Center, West Virginia

Description: Alternative 2 (Excavation and Offsite Disposal) includes removal of potential source VOC mass beneath FDPs 1 and 3. The total area of FDPs plus buffer excavation is approximately 850 ft². Excavation depth is assumed to be from 0-14 ft bgs or groundwater (whichever is encountered first). The total removal volume is estimated to be 440 cubic yards (not including sidewall material).

Cost Item	Unit	Quantity	Unit Cost	Cost	Cost Estimate Reference	Assumptions and Notes
Site Preparation Activities						
Field Office/Temp Utilities	MO	6	\$ 372.17	\$ 2,233.02	RS Means, 01 52 13.20 -0250 & -0700. Delivery based on RS Means, 01 52 13.20-0800	Assume monthly rental with AC. Assumes 6 months for removal action. Approximate delivery costs of \$1000 (assumes 200 miles delivery round trip), cost factored into monthly estimate.
Work Plan/UFP-SAP	LS	1	\$ 20,000.00	\$ 20,000.00	Engineers Estimate	
Safety Fence (4' tall x 100 long rolls)	EA	10	\$ 26.00	\$ 260.00	Vendor Quote - Home Depot Online (see attached screenshot, April 2011)	Assume around construction area (approximately 1000 lf)
Temporary Chainlink Fence (surround excavation areas)	LF	600	\$ 9.05	\$ 5,430.00	RS Means, 01 56 26.50-0200	Assume around FDP 1 and 3 (approx 600 lf total)
Utility Locate	LS	1	\$ 2,000.00	\$ 2,000.00	Engineers Estimate	
Site Survey (Boundary)	AC	1	\$ 2,375.00	\$ 2,375.00	RS Means, 02 21 13.13-0400	Assume 1 acre minimum (actual removal area size less than .1 acre)
Establish Monuments	EA	3	\$ 212.00	\$ 636.00	RS Means, 02 21 13.13-0600	Assume placement of 3 monuments
Erosion and Sediment Controls Installation						
Silt Fence	LF	900	\$ 5.00	\$ 4,500.00	RS Means, 31 25 14.16-1000, adjusted based on quantity, installation, and removal	Assume Silt Fence around FDP 1 and 3 (600 lf total) plus an additional 50% for stockpile area (300 lf)
Soil Containment Berm	LS	1	\$ 8,582.00	\$ 8,582.00	RS Means, 02 56 13.10 -0620 & 1120	Assume a 2500 sq ft containment pad with 80 mil poly liner and cover and 6" sand buffer in base of pad. Assume berms will be constructed of excavated overburden. Includes base poly and a poly cover.
Environmental Safety Controls						
Dust Control (assume onsite water source)	DY	20	\$ 520.00	\$ 10,400.00	Corporate Historical Data	Assume dust control necessary during excavation, T&D, and backfill (approximately 20 days)
UXO Technician during intrusive activities	DY	30	\$ 750.00	\$ 22,500.00	Corporate Historical Data	Assume intrusive activities for 30 days (includes well abandonment, E&S, excavation, backfill, etc). Assumes Navy CLEAN multiplier to \$30 raw labor rate. Assumes 10 hour days.
Well Abandonment						
2" well abandonment	LF	355	\$ 24.48	\$ 8,690.40	Navy CLEAN Drilling BOA rates	Assumes abandonment of 12 alluvial monitoring wells
6" well abandonment	LF	450	\$ 40.35	\$ 18,157.50	Navy CLEAN Drilling BOA rates	Assumes abandonment of 5 bedrock wells
Excavation and Removal						
Clearing & grubbing	AC	1	\$ 6,100.00	\$ 6,100.00	RS Means, 31 11 10.10-0160	Assume light clearing and grubbing of construction area (round up to 1 full acre)
Engineered Sidewall Stabilization (near Burn Pad)	SF	1,400	\$ 59.50	\$ 83,300.00	RS Means, 31 52 16.10 -2000 + additional engineering costs	Actual engineered sidewall stabilization to be implemented will be determined through engineered design during work planning. This cost estimate assumes Soldier Beams and Lagging wall. No hydrostatic head and piles left in place. Assume installed to between 23-35 ft. Approximate wall area requiring stabilization is 100 ft x 14 ft deep (total 700 sf)
Excavation (source area)	CY	440	\$ 19.25	\$ 8,470.00	RS Means, 02 56 13.10 -0030	Assumes level D PPE only. Assumes Removal area (240 sq.ft. for FDP1, 330 sq.ft. for FDP3) plus 2-foot buffer where possible (total 400 sq.ft. FDP1, 450 sq.ft. FDP3). Removal from 0-14 ft equals 440 CY.
Excavation (sidewalls for stabilization)	CY	715	\$ 8.40	\$ 6,006.00	RS Means, 31 23 16.13 -0900	Based on figure for LOE and a 1:1 slope +20%
Waste characterization Sampling (for Offsite Disposal)	EA	3	\$ 718.46	\$ 2,155.38	Corporate Historical Data	Assumes full suite. 1 sample per 500 cy. 1 sample for source area and 2 samples for sidewall excavation.
Hazardous Waste Transportation and Disposal						
Transportation and Landfill Disposal, Hazardous	TON	660	\$ 270.00	\$ 178,200.00	Corporate Historical Data	Assumes FDP volume plus buffer hazardous
Dump Truck Transportation Minimum Charge (16 CY/truck, 300 miles)	MI	8250	\$ 3.26	\$ 26,895.00	Corporate Historical Data	Assume 1.5 ton per cy conversion
Loading Soil Into Truck	CY	440	\$ 2.15	\$ 946.00	Corporate Historical Data	
Non-Hazardous Waste Transportation and Disposal						
Transportation and Landfill Disposal, Non-Hazardous	TON	1072.5	\$ 86.03	\$ 92,267.18	Corporate Historical Data	Assumes Sidewall material non-hazardous
Dump Truck Transportation Minimum Charge (16 CY/truck, 300 miles)	MI	13406.25	\$ 3.26	\$ 43,704.38	Corporate Historical Data	Assume 1.5 ton per cy conversion
Loading Soil Into Truck	CY	715	\$ 2.15	\$ 1,537.25	Corporate Historical Data	
Post excavation Sampling	EA	40	\$ 972.00	\$ 38,880.00	Navy CLEAN Laboratory BOA Rates	Assume 5 discrete samples from each excavation sidewall (no floor sample needed because excavation will stop at groundwater). For ABG COCs only
Non-Woven Geotextile Fabric Excavation Marker	SY	725	\$ 1.59	\$ 1,152.75	RS Means, 31 32 19.16 1550	Assume coverage area of approximately 4200 sq ft (estimated by area of sidewalls plus floor of both excavations +10%)
Backfill (offsite material)	CY	1155	\$ 25.00	\$ 28,875.00	RS Means, 31 23 23.15 -4000	Assume offsite borrow source for common earthen fill. Assumes field compaction with excavator
Topsoil	CY	42	\$ 33.00	\$ 1,386.00	RS Means, 31 05 13.10-0800	Estimated as 6" layer over entire disturbed area (approximately 2500 sq ft)
T&D of decon water (includes Manifests)	EA	5	\$ 200.00	\$ 1,000.00	Engineers Estimate (based on previous Navy CLEAN BOA rates)	Assumes 5 drums generated from equipment decon. Assume F-listed hazardous waste disposal required.
Site Survey (topographic)	AC	1	\$ 3,900.00	\$ 3,900.00	RS Means, 02 21 13.09 -0100	Assume 1 acre minimum (actual removal area size less than .1 acre)
Seed, fertilize, & Mulch (per thousand sq ft)	MSF	2.5	\$ 527.50	\$ 1,318.75	RS Means, 32 91 13.16-0380, 32 91 13.23-4150, & 32 92 19.13-0800	Assumed area approximately 2500 sq ft
Subtotal				\$ 631,857.60		
General Conditions (10%)				\$ 63,185.76	RS Means, Page ix, General Conditions.	
Mobilization/Demobilization (5%)				\$ 31,592.88	Recent similar projects.	
Subtotal				\$ 726,636.24		
Contingency (20%)				\$ 145,327.25	RS Means, 01 21 16.16.50 -0020.	
Subtotal				\$ 871,963.49		
Performance Bond (2%)				\$ 17,439.27	Engineers Estimate	
TOTAL				\$ 889,402.76		
Design Costs (6%)				\$ 53,364.17	RS Means, 01 11 31.30 0900	
Project Management (8%)				\$ 71,152.22	EPA guidance	
Construction Oversight (10%)				\$ 88,940.28	EPA guidance	
TOTAL COST OF ALTERNATIVE 2 (this alternative does not require LUCs, O&M, or LTM)				\$1,103,000	-30% = \$772,000 +50% = \$1,655,000	

References and Source Notes

- Base costs used are 2011 dollars.
- RS Means (Site): RS Means, *Site Work and Landscape Cost Data*, 30th Annual Edition, 2011.
- EPA 540-R-00-002, "A Guide to Developing and Documenting Cost Estimates During the Feasibility Study", July 2000.
- Corporate Historical Data include projects performed in Rocket Center, WV; Williamsburg, VA; and Virginia Beach, VA
- This estimate assumes no applicable sales taxes
- Assumes no additional excavation will be required beyond the identified source areas (not including sidewall stabilization)
- Contractor OH/P is factored into the line item costs

NOTE: 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 guaranty 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 majored 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.

- LS - Lump Sum
- SY - Square Yard
- LF - Linear Foot
- DY - Day
- EA - Each
- AC - Acre
- CY - Cubic Yard
- MI - Miles
- MO - Month
- MSF - per thousand square feet

TABLE B-1b

Cost Estimate for Alternative 2: Excavation and Offsite Disposal (assumes Hazardous Sidewall Material)

Site 1 - Former Disposal Pits

Allegany Ballistics Laboratory

Rocket Center, West Virginia

Description: Alternative 2 (Excavation and Offsite Disposal) includes removal of potential source VOC mass beneath FDPs 1 and 3. The total area of FDP and Buffer excavation is approximately 850 ft². Excavation depth is assumed to be from 0-14 ft bgs or groundwater (whichever is encountered first). The total removal from FDP volume is estimated to be 440 cubic yards (not including sidewall material).

Cost Item	Unit	Quantity	Unit Cost	Cost	Cost Estimate Reference	Assumptions and Notes
Site Preparation Activities						
Field Office/Temp Utilities	MO	6	\$ 372.17	\$ 2,233.02	RS Means, 01 52 13.20 -0250 & -0700. Delivery based on RS Means, 01 52 13.20-0800	Assume monthly rental with AC. Assumes 6 months for removal action. Approximate delivery costs of \$1000 (assumes 200 miles delivery round trip), cost factored into monthly estimate.
Work Plan/UFP-SAP	LS	1	\$ 20,000.00	\$ 20,000.00	Engineers Estimate	
Safety Fence (4' tall x 100 long rolls)	EA	10	\$ 26.00	\$ 260.00	Vendor Quote - Home Depot Online (see attached screenshot, April 2011)	Assume around construction area (approximately 1000 lf)
Temporary Chainlink Fence (surround excavation areas)	LF	600	\$ 9.05	\$ 5,430.00	RS Means, 01 56 26.50-0200	Assume around FDP 1 and 3 (approx 600 lf total)
Utility Locate	LS	1	\$ 2,000.00	\$ 2,000.00	Engineers Estimate	
Site Survey (Boundary)	AC	1	\$ 2,375.00	\$ 2,375.00	RS Means, 02 21 13.13-0400	Assume 1 acre minimum (actual removal area size less than .1 acre)
Establish Monuments	EA	3	\$ 212.00	\$ 636.00	RS Means, 02 21 13.13-0600	Assume placement of 3 monuments
Erosion and Sediment Controls Installation						
Silt Fence	LF	900	\$ 5.00	\$ 4,500.00	RS Means, 31 25 14.16-1000, adjusted based on quantity, installation, and removal	Assume Silt Fence around FDP 1 and 3 (600 lf total) plus an additional 50% for stockpile area (300 lf)
Soil Containment Berm	LS	1	\$ 8,582.00	\$ 8,582.00	RS Means, 02 56 13.10 -0620 & 1120	Assume a 2500 sq ft containment pad with 80 mil poly liner and cover and 6" sand buffer in base of pad. Assume berms will be constructed of excavated overburden. Includes base poly and a poly cover.
Environmental Safety Controls						
Dust Control (assume onsite water source)	DY	20	\$ 520.00	\$ 10,400.00	Corporate Historical Data	Assume dust control necessary during excavation, T&D, and backfill (approximately 20 days)
UXO Technician during intrusive activities	DY	30	\$ 750.00	\$ 22,500.00	Corporate Historical Data	Assume intrusive activities for 30 days (includes well abandonment, E&S, excavation, backfill, etc). Assumes Navy CLEAN multiplier to \$30 raw labor rate. Assumes 10 hour days.
Well Abandonment						
2" well abandonment	LF	355	\$ 24.48	\$ 8,690.40	Navy CLEAN Drilling BOA rates	Assumes abandonment of 12 alluvial monitoring wells
6" well abandonment	LF	450	\$ 40.35	\$ 18,157.50	Navy CLEAN Drilling BOA rates	Assumes abandonment of 5 bedrock wells
Excavation and Removal						
Clearing & grubbing	AC	1	\$ 6,100.00	\$ 6,100.00	RS Means, 31 11 10.10-0160	Assume light clearing and grubbing of construction area (round up to 1 full acre)
Engineered Sidewall Stabilization (near Burn Pad)	SF	1,400	\$ 59.50	\$ 83,300.00	RS Means, 31 52 16.10 -2000 + additional engineering costs	Actual engineered sidewall stabilization to be implemented will be determined through engineered design during work planning. This cost estimate assumes Soldier Beams and Lagging Wall. No hydrostatic head and piles left in place. Assume installed to between 23-35 ft. Approximate wall area requiring stabilization is 100 ft x 14 ft deep (total 700 sf)
Excavation (source area)	CY	440	\$ 19.25	\$ 8,470.00	RS Means, 02 56 13.10 -0030	Assumes level D PPE only. Assumes Removal area (240 sq.ft. for FDP1, 330 sq.ft. for FDP3) plus 2-foot buffer where possible (total 400 sq.ft. FDP1, 450 sq.ft. FDP3). Removal from 0-14 ft equals 440 CY.
Excavation (sidewalls for stabilization)	CY	715	\$ 8.40	\$ 6,006.00	RS Means, 31 23 16.13 -0900	Based on figure for LOE and a 1:1 slope +20%
Waste characterization Sampling (for Offsite Disposal)	EA	3	\$ 718.46	\$ 2,155.38	Recent similar project	Assumes full suite. 1 sample per 500 cy. 1 sample for source area and 2 samples for sidewall excavation.
Hazardous Waste Transportation and Disposal						
Transportation and Landfill Disposal, Hazardous	TON	1732.5	\$ 270.00	\$ 467,775.00	Recent Similar Project	Assumes FDPs and Sidewall are disposed of as hazardous
Dump Truck Transportation Minimum Charge (16 CY/truck, 300 miles)	MI	21656.25	\$ 3.26	\$ 70,599.38	Recent Similar Project	Assume 1.5 ton per cy conversion
Loading Soil Into Truck	CY	1155	\$ 2.15	\$ 2,483.25	Recent Similar Project	
Post excavation Sampling	EA	40	\$ 972.00	\$ 38,880.00	Navy CLEAN Laboratory BOA Rates	Assume 5 discrete samples from each excavation sidewall (no floor sample needed because excavation will stop at groundwater). For ABG COCs only
Non-Woven Geotextile Fabric Excavation Marker	SY	725	\$ 1.59	\$ 1,152.75	RS Means, 31 32 19.16 1550	Assume coverage area of approximately 4200 sq ft (estimated by area of sidewalls plus floor of both excavations +10%)
Backfill (offsite material)	CY	1155	\$ 25.00	\$ 28,875.00	RS Means, 31 23 23.15 -4000	Assume offsite borrow source for common earthen fill. Assumes field compaction with excavator
Topsoil	CY	42	\$ 33.00	\$ 1,386.00	RS Means, 31 05 13.10-0800	Estimated as 6" layer over entire disturbed area (approximately 2500 sq ft)
T&D of decon water (includes Manifests)	EA	5	\$ 200.00	\$ 1,000.00	Engineers Estimate (based on previous Navy CLEAN BOA rates)	Assumes 5 drums generated from equipment decon. Assume f-listed hazardous waste disposal required.
Site Survey (topographic)	AC	1	\$ 3,900.00	\$ 3,900.00	RS Means, 02 21 13.09 -0100	Assume 1 acre minimum (actual removal area size less than .1 acre)
Seed, fertilize, & Mulch (per thousand sq ft)	MSF	2.5	\$ 527.50	\$ 1,318.75	RS Means, 32 91 13.16-0380, 32 91 13.23-4150, & 32 92 19.13-0800	Assumed area approximately 2500 sq ft
Subtotal				\$ 829,165.43		
General Conditions (10%)				\$ 82,916.54	RS Means, Page ix, General Conditions.	
Mobilization/Demobilization (5%)				\$ 41,458.27	Recent similar projects.	
Subtotal				\$ 953,540.24		
Contingency (20%)				\$ 190,708.05	RS Means, 01 21 16 16.50 -0020.	
Subtotal				\$ 1,144,248.29		
Performance Bond (2%)				\$ 22,884.97	Engineers Estimate	
TOTAL				\$ 1,167,133.25		
Design Costs (6%)				\$ 70,028.00	RS Means, 01 11 31.30 0900	
Project Management (8%)				\$ 93,370.66	EPA guidance	
Construction Oversight (10%)				\$ 116,713.33	EPA guidance	
TOTAL COST OF ALTERNATIVE 2 (this alternative does not require LUCs, O&M, or LTM)				\$1,447,000		
					-30% = \$1,013,000	
					+50% = \$2,171,000	

References and Source Notes

- Base costs used are 2011 dollars.
- RS Means (Site): RS Means, *Site Work and Landscape Cost Data*, 30th Annual Edition, 2011.
- EPA 540-R-00-002, "A Guide to Developing and Documenting Cost Estimates During the Feasibility Study", July 2000.
- Corporate Historical Data include projects performed in Rocket Center, WV; Williamsburg, VA; and Virginia Beach, VA
- This estimate assumes no applicable sales taxes
- Assumes no additional excavation will be required beyond the identified source areas (not including sidewall stabilization)
- Contractor OH/P is factored into the line item costs

NOTE: 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 guaranty 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 majored 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.

- LS - Lump Sum
- SY - Square Yard
- LF - Linear Foot
- DY - Day
- EA - Each
- AC - Acre
- CY - Cubic Yard
- MI - Miles
- MO - Month
- MSF - per thousand square feet

Attachment B
Public Notice and Responsiveness Summary

PUBLIC NOTICE



Public Comment Invited on the Engineering Evaluation/Cost Analysis for Site 1 Former Disposal Pits at Allegany Ballistics Laboratory

In accordance with the requirements of the Comprehensive Environmental Response, Compensation and Liability Act (CERCLA) of 1980, the U.S. Department of the Navy invites public comment on the proposed removal action at Site 1 (Operable Unit 4) located at Allegany Ballistics Laboratory, Rocket Center, West Virginia. Public comment begins on **April 15, 2012** and ends on **May 25, 2012**.

A copy of the Engineering Evaluation/Cost Analysis for Site 1 can be obtained from the information repositories shown below.

The proposed action for the Site 1 Former Disposal Pits is soil excavation, offsite disposal of removed soils, and backfill of the excavation to the original grade with offsite soil fill material. This removal action is considered interim and is being performed to supplement the final selected remedy for soils at Site 1..

A public repository of selected documents for Site 1 and assistance in accessing the administrative record is available at the following locations:

Fort Ashby Public Library

IGA Plaza, P.O. Box 74
Fort Ashby, WV 26719
(304) 298-4493

LaVale Library

815 National Highway
LaVale, MD 21502
(301) 729-0855

The EE/CA for Site 1 is available for public inspection along with the administrative record on the public website (see below) under the "Administrative Records" tab.

Website: <http://go.usa.gov/TsM>

Written comments should be postmarked by the closing date of May 25, 2012 to:

Mr. Thomas Kreidel
NAVFAC Mid-Atlantic
9742 Maryland Avenue
Norfolk, VA 23511