



Naval Facilities Engineering Systems Command Mid-Atlantic
Norfolk, Virginia

Final

**Site Management Plan
Fiscal Years 2023 through 2027**

Allegany Ballistics Laboratory
Rocket Center, West Virginia

December 2022



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Rocket Center, West Virginia

December 2022

Prepared for NAVFAC Mid-Atlantic
by CH2M HILL, Inc.
Herndon, Virginia
Contract N62470-16-D-9000
CTO WE18



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Acronyms and Abbreviations

3DMe-FE	3 Donor Microemulsion Factory Emulsified
ABG	active burning ground
ABL	Allegany Ballistics Laboratory
AOC	Area of Concern
Army	U.S. Army
ASI	Advanced Site Inspection
CCR	Construction Completion Report
CERCLA	Comprehensive Environmental Response, Compensation and Liability Act of 1980
CH2M	CH2M HILL, Inc.
CIP	Community Involvement Plan
COC	constituent of concern
CRS	comprehensive remediation strategy
CS	Confirmation Study
DCE	dichloroethene
DoD	Department of Defense
EAB	enhanced anaerobic biodegradation
EE/CA	Engineering Evaluation/Cost Analysis
ERA	Ecological Risk Assessment
ERN	Environmental Restoration Navy
ESD	Explanation of Significant Difference
ESTCP	Environmental Security Technology Certification Program
FDP	Former Disposal Pit
FFA	Federal Facility Agreement
FFS	Focused Feasibility Study
FLA	Facility Lease Agreement
FS	Feasibility Study
F-Well	Production Well "F"
FY	Fiscal Year
GIS	geographic information system
gpm	gallon per minute
GWTP	groundwater treatment plant
Hercules	Hercules Aerospace Corporation
HHRA	Human Health Risk Assessment
IAS	Initial Assessment Study
IRACR	Interim Remedial Action Completion Report
IRP	Installation Restoration Program
LTM	long-term monitoring
LUC	land use control
MCL	maximum contaminant level
MDE	Maryland Department of the Environment
MNA	monitored natural attenuation
NACIP	Navy Assessment and Control of Installation Pollutants Program
NAVFAC	Naval Facilities Engineering Systems Command

NAVSEA	Naval Sea Systems Command
Navy	Department of the Navy
NCP	National Oil and Hazardous Substances Pollution Contingency Plan
NFA	no further action
NPDES	National Pollutant Discharge Elimination System
NPL	National Priorities List
OABG	outside active burning ground
OU	operable unit
O&M	operations and maintenance
PA/SI	Preliminary Assessment/Site Inspection
PCE	perchloroethylene
PFAS	per- and poly-fluoroalkyl substances
PRAP	Proposed Remedial Action Plan
PRB	permeable reactive barrier
PWA	Production Well "A"
PWC	Production Well "C"
RA	Remedial Action
RAB	Restoration Advisory Board
RA-C	Remedial Action Construction
RA-O	Remedial Action Operation
RACR	Remedial Action Completion Report
RAO	Remedial Action Objective
RC	Response Complete
RCRA	Resource Conservation and Recovery Act
RD	Remedial Design
RDX	1,3,5-trinitro-1,3,5-triazinane
RFA	RCRA Facility Assessment
RI	Remedial Investigation
RI/FS	Remedial Investigation/Feasibility Study
ROD	Record of Decision
SAP	Sampling and Analysis Plan
SMP	Site Management Plan
SRG	site remediation goal
SSA	site screening area
SSP	site screening process
SWMU	solid waste management unit
TCE	trichloroethene
USEPA	United States Environmental Protection Agency
VI	vapor intrusion
VOC	volatile organic compound
VSI	visual site inspection
WVDEP	West Virginia Department of Environmental Protection

Introduction

This document is the Fiscal Year (FY) 2023 through 2027 Site Management Plan (SMP) for the Allegany Ballistics Laboratory (ABL) located in Rocket Center, West Virginia. The SMP has been prepared by CH2M HILL, Inc. (CH2M) for use by Naval Facilities Engineering Systems Command (NAVFAC) Mid-Atlantic Division, Naval Sea Systems Command (NAVSEA), United States Environmental Protection Agency (USEPA) Region III and West Virginia Department of Environmental Protection (WVDEP).

This SMP is organized into five sections as follows:

1. Introduction – This section describes the purpose and organization of the SMP, a facility description, the environmental history, and previous investigations conducted at ABL.
2. Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) Process Activities – This section summarizes the process for environmental investigation and remedial action (RA) for CERCLA Installation Restoration Program (IRP) sites. It also describes how team partnering has been applied to streamline the CERCLA process.
3. Unit Descriptions and Tracking Matrix – This section provides site descriptions, summarizes activities conducted to date including removal activities, and documents the status of each unit.
4. SMP Schedules – This section provides the scheduling assumptions and SMP project schedules.
5. References – This section lists all the references that were consulted for the preparation of this SMP.

1.1 Site Management Plan Purpose

The purpose of this SMP is to provide a management tool for the Department of the Navy (Navy), USEPA, and WVDEP to plan, schedule, and set priorities for environmental remedial response activities to be conducted at ABL. This SMP focuses on activities and schedules for response actions planned from FY 2023 through 2027.

The Plant 1 portion of ABL was proposed by the USEPA for inclusion on the National Priorities List (NPL) in the *Federal Register*, in June 1993. Plant 1 of ABL was added to the NPL in the *Federal Register*, Volume 59, Number 27989, on May 31, 1994. Under the “Federal Facilities” section of the NPL, federal agencies are considered responsible for conducting most of the response actions at facilities under their jurisdiction. A Federal Facilities Agreement (FFA) between USEPA Region III, WVDEP, and the Navy was finalized in January 1998, as required by the National Oil and Hazardous Substances Pollution Contingency Plan (NCP). An SMP was developed as part of the FFA to establish deadlines and milestones for performing the environmental activities and submitting associated deliverables. The SMP is updated annually to revise established schedules for these deadlines and milestones.

The SMP is intended to serve as a comprehensive management and educational tool for current and future remedial project managers or other interested parties, by providing a brief description, history, and summary of previous investigations and RAs for FFA Sites. Laboratory data from previous investigations at these Sites are not included in this SMP; however, references are provided to indicate where such data can be found. Previous reports, analytical data for the facility, and site figures are maintained in a master database linked to Naval Installation Restoration Information Solution. This SMP also presents the rationale for the sequence of past, present, and future environmental investigations and remedial response activities for each Site and the estimated schedule for completion of these activities.

Attachment A provides a comprehensive list of the active sites, solid waste management units (SWMUs), and areas of concern (AOCs) at Plant 1 documented in the FFA (and later added), their status, and anticipated additional activities, where appropriate. **Attachment A-1** provides a comprehensive list of sites, SWMUs, and AOCs managed under CERCLA investigation. Site 13 groundwater is the only remaining site under investigation

with a remedy to be documented in a pending Record of Decision (ROD). Sites are generally broken up by media type into distinct operable units (OUs) to streamline site investigation and cleanup efforts. **Attachment A-2** provides a comprehensive list of sites, SWMUs, and AOCs managed under Resource Conservation and Recovery Act (RCRA) corrective action. **Attachment A-3** provides a comprehensive list of sites, SWMUs, and AOCs that have been closed out and determined to require no further action (NFA).

The following OUs and associated media types have signed RODs and remedies in place: Site 1 OU-3 (groundwater, surface water, and sediment); Site 1 OU-4 (soil); Site 5 OU-1 (surface soil, landfill contents) and Site 5 OU-2 (groundwater, surface water, and sediment); Site 10 OU-5 (groundwater); Site 11 OU-11 (groundwater); and Site 12 OU-8 (groundwater). The ROD for Sites 11 and 12 was combined for efficiency (Navy, 2012). The response is complete for Sites 2, 3, 4B, and 7 through an NFA ROD. Sites 4A and 9 were closed out in the FFA. Site 6 (AOC I) was closed out in a February 2002 Closeout Report. SWMUs 37D, 37E, and 37W groundwater were included in the Building 8 Lab Row investigation, which was closed out with partnering team (Team) concurrence for NFA in October 2015 (CH2M, 2015b). The AOC M debris areas were included with the surface debris removal and addressed as part of the Site 1 OABG RA. To date, 91 of the 92 SWMUs and AOCs identified at ABL during the 1993 RCRA Facility Assessment (RFA) and further evaluations have been investigated and/or remediated and closed out with NFA.

1.2 Facility Description

1.2.1 Facility Name, Location, and Description

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 (**Figure 1-1**). The facility lies between the North Branch Potomac River, to the north and west, and Knobley Mountain, to the south and east. Several small towns are located near the facility, including Short Gap, West Virginia, to the southeast, and Pinto, Maryland, to the north (**Figure 1-2**).

Based on geographic information system (GIS) data updated in 2019, the ABL facility consists of approximately 1,627 acres of land with about 350 buildings (**Figure 1-3**). The facility is divided into three distinct operating plants:

- Plant 1 occupies approximately 1,471 acres (including a large undeveloped area) and is owned by the Navy and leased to a private defense contracting company, herein referred to as the onsite operator, by NAVSEA through a Facilities Lease Agreement (FLA). Approximately 400 acres of Plant 1 (the majority of the developed portion of ABL) is located within the floodplain of the North Branch Potomac River where the river has cut into the base of Knobley Mountain. Of the 12 past or present IRP sites at ABL, 9 sites are located within the developed area of Plant 1, and 3 sites are within the undeveloped area.
- Plant 2 occupies approximately 65 acres and is both owned and operated by the onsite operator. Plant 2 is not included on the NPL.
- Plant 3 occupies approximately 91 acres and is owned by the Navy and leased to the onsite operator by NAVSEA through the FLA. Plant 3 is not located within the floodplain of the North Branch Potomac River. It is situated at the base of Knobley Mountain. This land has not been previously developed.

ABL is located in the Valley and Ridge Physiographic Province near its western boundary with the Allegheny Plateau province and is underlain by sedimentary rocks folded and faulted during the Paleozoic Era. The most significant physiographic feature in the vicinity of ABL is Knobley Mountain, which flanks Plant 1 to the south and east. Knobley Mountain is the surface expression of a portion of the Wills Mountain anticlinorium, the anticlinal axis of which trends approximately N30°E and plunges to the southwest. This anticlinal axis is believed to bisect Plant 1.

Groundwater flow across Plant 1 in the alluvial and shallow bedrock aquifers is generally toward the North Branch Potomac River with no identifiable confining unit separating the two aquifers. The land use surrounding the

facility is primarily rural agricultural, with some forestry. Residents across the North Branch Potomac River in Maryland use bedrock groundwater as a potable water source. Hydraulic data collected to date indicate that the North Branch Potomac River is a hydraulic divide for both alluvial and bedrock groundwater. Alluvial and bedrock groundwater at ABL is believed to discharge to the river, rather than pass beneath it. In the residential areas across the river from ABL, groundwater flow is south toward the river. The North Branch Potomac River is not used as a potable water supply in the vicinity of ABL but may be used for recreational activities such as boating, fishing, and swimming.

1.2.2 Facility History and Current Activities

ABL was constructed in 1942 by the Kelly Springfield Engineering Company for the U.S. Army (Army). At that time, the facility was used as a loading plant for 50-caliber machine gun ammunition for the Army. In 1943, George Washington University assumed management of the facility to conduct research and development of ballistic devices, primarily solid propellant for bazooka ammunition, until 1945. The Navy took ownership of the 400-acre Plant 1 portion of the facility in 1945 and the Aerospace Division of Hercules Aerospace Corporation (Hercules) assumed management of the facility. In 1962, the Navy acquired an additional 1,177 acres of undeveloped land adjacent to Plant 1. In 1964, Hercules signed an FLA and began operating ABL under its own direction. In 1995, Alliant Techsystems, Inc. acquired the Aerospace Division of Hercules and assumed operation of ABL. Subsequent transfers of plant operation have taken place and ABL is currently operated by the onsite operator.

Since 1943, the facility has been used primarily for the research, development, production, and testing of solid propellants and motors for ammunition, rockets, and armaments. Currently, the facility is operated as a highly automated production facility for tactical propulsion systems and composite and metal structures. ABL is a leading producer of tactical rocket motors, gas generators, and conventional warheads for the United States Department of Defense (DoD). The rocket motors produced vary in size and configuration, allowing for a wide range of applications including air-to-air, air-to-surface, surface-to-surface, and surface-to-air missions. Other operating areas include metal fabrication, composite rocket motor and component manufacturing, electronics and fuse manufacturing, medium-caliber ammunition component fabrication, 120-millimeter Load Assemble and Pack-out, and fiber placement component manufacturing.

1.3 Environmental History

In the 1980s, DoD began identifying potential Naval facilities under the Navy Assessment and Control of Installation Pollutants Program (NACIP) (now referred to as the IRP). DoD tasked the Naval Energy and Environmental Support Activity (now referred to as the Naval Facilities Engineering Service Center) with producing preliminary site assessment reports for Naval facilities throughout the United States. After the reports were issued, CERCLA responsibilities under the IRP were transferred to NAVFAC.

1.3.1 National Priorities List

The Plant 1 portion of ABL was proposed by USEPA for inclusion on the NPL in June 1993. The NPL, which was established by CERCLA, is the USEPA's list of the highest-priority hazardous waste sites in the nation. The decision to list a particular site is determined on the basis of calculated risks to human health and the environment. The Plant 1 portion of ABL was added to the NPL at *Federal Register*, Volume 59, Number 27989, on May 31, 1994.

CERCLA is often referred to as "Superfund" because it established a fund for cleaning up abandoned or uncontrolled hazardous waste sites. However, all activities at federal facilities listed on the NPL are funded by the responsible federal agency. In the case of the ABL site, the Navy funds the investigation and remedial activities. To fund these activities at military installations, the DoD set up the Defense Environmental Restoration Account. The Navy's portion of that funding mechanism is known as the Environmental Restoration Navy (ERN) account, which NAVFAC uses to fund CERCLA activities at ABL. Non-ERN funds, such as those available directly through the facility owner (i.e., NAVSEA), may also be used to fund various environmental activities. Although the responsibility for funding and carrying out environmental restoration at ABL rests with the Navy, the NPL listing gives USEPA a specific role in the oversight of these actions.

1.3.2 Installation Restoration Program

In 1975, the DoD began a program to assess past hazardous and toxic materials storage and disposal activities at military installations. The goals of this program, now known as the IRP, were to identify environmental contamination resulting from past hazardous materials management practices, assess the impacts of the contamination on public health and the environment, and provide corrective measures as required to mitigate adverse impacts to the public and the environment.

In 1976, RCRA was passed by Congress to address potentially adverse human health and environmental impacts of hazardous waste management and disposal practices. RCRA was legislated to manage the present and future disposal of hazardous wastes. In 1980, CERCLA, or "Superfund," was passed to investigate and remediate areas resulting from past hazardous waste management practices. This program is administered by USEPA and/or state agencies.

In 1981, the DoD IRP was reauthorized with additional responsibilities and authorities specified in CERCLA delegated to the Secretary of Defense. The Navy subsequently restructured the IRP to match the terminology and structure of the CERCLA Program. The current IRP is consistent with CERCLA and applicable state environmental laws.

The environmental condition of ABL is being investigated through the DoD IRP, which is being conducted in accordance with the applicable federal and state environmental regulations and requirements.

1.3.3 Federal Facility Agreement

Following ABL's listing on the NPL, negotiations on an FFA between USEPA, the State of West Virginia, and the Navy were initiated. Under the "Federal Facilities" section of the NPL, federal agencies are considered responsible for conducting most of the response actions at facilities under their jurisdiction. The FFA agreed upon by the USEPA Region III, WVDEP, and the Navy was finalized in January 1998.

Under the terms and conditions of the FFA, Site Screening Areas (SSAs) are required to be investigated and, if appropriate, remediated in accordance with the NCP, CERCLA, Superfund Amendments and Reauthorization Act, and RCRA. These areas are designated in Appendix A of the FFA. Units that require additional documentation or sampling before a decision is made for NFA or inclusion as an SSA are classified as AOCs, or Appendix B units, in the FFA.

Section VIII paragraph 8.1 of the FFA describes integration of the Navy's obligations under CERCLA and RCRA as follows:

"The Parties intend to integrate the Navy's CERCLA response obligations and RCRA corrective action obligations which relate to the release(s) of hazardous substances, hazardous wastes, pollutants or contaminants covered by this Agreement into this comprehensive Agreement. Therefore, the Parties intend that activities covered by this Agreement will achieve compliance with CERCLA, 42 U.S.C. Section 9601 et seq.; satisfy the corrective action requirements of RCRA Sections 3004(u) and (v), 42 U.S.C. Sections 6924(u) and (v), for a RCRA permit, and RCRA Section 3008(h), 42 U.S.C. Section 6928(h), for interim status facilities; and meet or exceed all applicable or relevant and appropriate Federal and State laws and regulations, to the extent required by CERCLA Section 121, 42 U.S.C. Section 9621, and applicable State law."

USEPA, WVDEP, and the Navy recognize that the requirement to obtain permits for response actions undertaken pursuant to the FFA shall be as provided for in CERCLA and the NCP and that ongoing hazardous waste management activities at ABL may still require the issuance of permits under federal and state laws. This agreement does not affect the requirements, if any, to obtain such permits.

1.3.4 Previous Investigations

This subsection briefly describes environmental investigations conducted at ABL and previous investigations and remedial activities of active sites, SWMUs, and AOCs at Plant 1. Section 3 of this SMP describes how these

investigations relate to the individual sites and units listed below. The approximate location of each IRP site that is under investigation, remediation, long-term monitoring, or has been closed is shown on **Figure 1-3**. As shown on the figure, eight of the IRP sites are located within the 400-acre developed area of Plant 1 (i.e., Sites 1, 2, 3, 4B, 10, 11, 12, and 13). Sites 5 and 7 are located in the largely undeveloped area of Plant 1 to the south.

1.3.4.1 General Investigations

An Initial Assessment Study (IAS) was performed at ABL in 1983 under the NACIP to identify and assess sites posing a potential threat to human health and/or the environment due to contamination from past hazardous materials handling and operations (ESE, 1983). Nine potentially contaminated sites were identified at ABL, based upon information obtained from historical records, photographs, site inspections, and personnel interviews, during the IAS.

These nine sites are:

- Site 1: Northern Riverside Waste Disposal Area (includes SWMUs 1, 6, 7, 8, 11, 20, 22C and 22D)
- Site 2: Previous Burning Ground (1942-1949) (includes SWMU 4)
- Site 3: Previous Burning Ground (1950-1958) (includes SWMU 5)
- Site 4: Spent Photographic Developing Solutions Disposal Sites
 - Site 4A: Spent X-Ray Developing Solution Disposal Site (includes SWMU 19)
 - Site 4B: Spent Photographic Developing Solution Disposal Site (includes SWMU 18)
- Site 5: Inert (Non-Ordnance) Landfill (includes SWMU 5)
- Site 6: Sensitivity Test Area/Surface Water Impoundment
- Site 7: Beryllium Landfill (includes SWMU 10)
- Site 8: Explosives Wastewater Sumps/Catch Basins (includes SWMU 37)
- Site 9: Former Acid Disposal Pit

The following four sites have been added to the IRP at ABL since the IAS:

- Site 10: Former trichloroethene (TCE) Still at Building 157 (includes Site PWA)
- Site 11: Production Well “F” (uncovered and identified during building demolition activities in November 1994 and includes SWMU 36)
- Site 12: Building 167 SWMUs, formerly AOC N (groundwater volatile organic compound [VOC] plume discovered during Phase III SWMU/AOC Investigation)
- Site 13: OU-15 Range Road Area (SWMU 27A)

The approximate location of each site that is under investigation, remediation, long-term monitoring, or has been closed is shown on **Figure 1-3**.

Each of the nine sites identified during the IAS was evaluated for the appropriate constituent of concern (COC), migration pathways, and pollution receptors. The IAS concluded that seven of the nine sites (Sites 1 through 7) posed significant potential threat to human health or the environment and therefore, warranted further evaluation in a Confirmation Study (CS). The IAS concluded that Sites 8 and 9 were not considered to be significant sources of potential contamination due to the small waste quantities and therefore, were not recommended for further study. The IAS also recommended continued groundwater monitoring at PWA and Production Well “C” (PWC) (later named Site 10). Sampling and analysis activities were not performed as part of the IAS.

A CS was initiated in June 1984 and completed in August 1987. Despite the recommendation of the IAS, Site 7 was added for study under the CS. The purpose of the CS was to confirm or refute the existence of the suspected contamination at Sites 1 through 7 identified during the IAS, along with Plant Production Wells in the developed portion of Plant 1 (specifically PWA and PWC, which are now part of Site 10); springs; and the North Branch Potomac River. The results of the CS, documented in the Interim Remedial Investigation (RI) Report (Weston,

1989), were used to recommend further investigation at seven sites (Sites 1, 2, 3, 5, 7, and minimal activity at Site 4 [4A and 4B]) and Site PWA. The Interim RI Report recommended that activities be discontinued at Site 6.

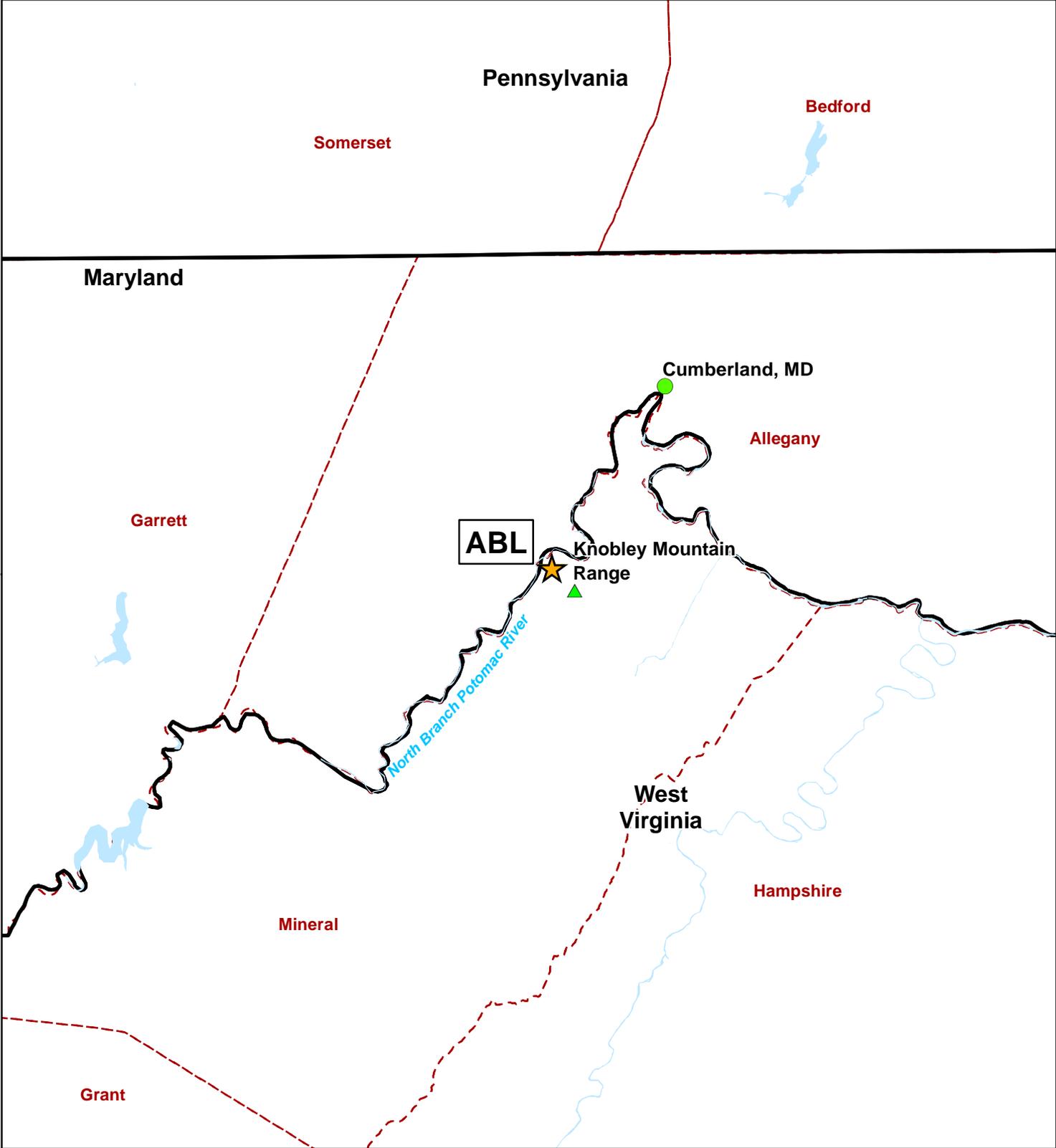
Based upon the results and recommendations of the CS, a Remedial Investigation/Feasibility Study (RI/FS), initiated in May 1992 and completed in October 1992, was conducted to further define the nature and extent of contamination at a number of ABL sites. The RI Report recommended further investigation at Sites 1, 2, 3, 5 and PWA (CH2M, 1996a). Because Site 1 was the largest and most complex Site at ABL, with the highest concentrations and widest variety of constituents detected in soil, groundwater, surface water, and sediment samples, a separate focused RI/FS was recommended at the Site to expedite the evaluation process. The remaining four sites were recommended for further investigation in a Phase II RI.

In 1993, USEPA conducted a Preliminary Review at ABL which involved a review of all relevant USEPA Region III files, including RCRA, CERCLA, Toxic Substance Control Act, air, and water files. Additionally, a Visual Site Inspection (VSI) was conducted at the facility from February 2 through February 4, 1993. The results of the Preliminary Review and VSI were documented in the *Phase II RCRA Facility Assessment for Allegany Ballistics Laboratory* (USEPA, 1993). Based on the results of the RFA, it was recommended that further action be taken at 49 SWMUs and 12 AOCs. After performing a site visit to the SWMUs and AOCs identified during the RFA, the USEPA Region III and WVDEP identified an additional 31 SWMUs and AOCs for a total of 92 units, where further evaluation was recommended.

In 1994, a Phase II RI was conducted to further define the nature and extent of contamination at Sites 2, 3, 4, 5, and PWA. During this investigation, a baseline human health risk assessment (HHRA) and ecological risk assessment (ERA) were performed to evaluate the risk posed by each site. The results of the Phase II RI concluded that RA alternatives should be evaluated for TCE-contaminated soil at Site 3 near Building 151, the solvent storage shed; contaminated soils at Site 4B; contaminated soil and groundwater at the former TCE still area at Site PWA; and the landfill contents and contaminated groundwater at Site 5. Additional site-specific investigations in progress or completed at the time of the signature of the FFA are summarized in **Table 1-1**:

Table 1-1. Summary of Investigations Listed in the Federal Facilities Agreement

Report Title	Report Date
Site 1 Focused RI Report	August 1995
Phase II RI Report for Sites 2, 3, 4B, 5 and 10	August 1996
Site 1 Focused Feasibility Study (FFS)	September 1996
Site 7 Engineering Evaluation/Cost Analysis (EE/CA)	May 1996
Site 5 FFS for Landfill Contents and Soil	August 1996
RI Work Plan for Site 11, "Production Well F", draft Site Inspection Report; and a draft Site Screening Process Workplan	May 1996
Proposed Plan for Groundwater, Surface Water and Sediment for Site 1	November 1996
Proposed Plan for Landfill contents and soil for Site 5	November 1996
Site 1 Phase II Aquifer Test Report	January 1997
ROD for Site 5 Landfill Contents and Surface Soil	February 1997
ROD for Site 1 Groundwater, Surface Water, and Sediment	March 1997
Site 5 Remedial Action Design for Landfill Cap	March 1997
Site 1 Remedial Action Design for Site 1 – Northern Riverside Waste Disposal Area	July 1997
Remedial Action Work Plan for Site 5 – Inert Landfill Cap	August 1997
Phase II Aquifer Test Report for Site 10 – Production Well	October 1997



Legend
States
counties
Water Area

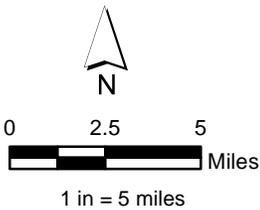
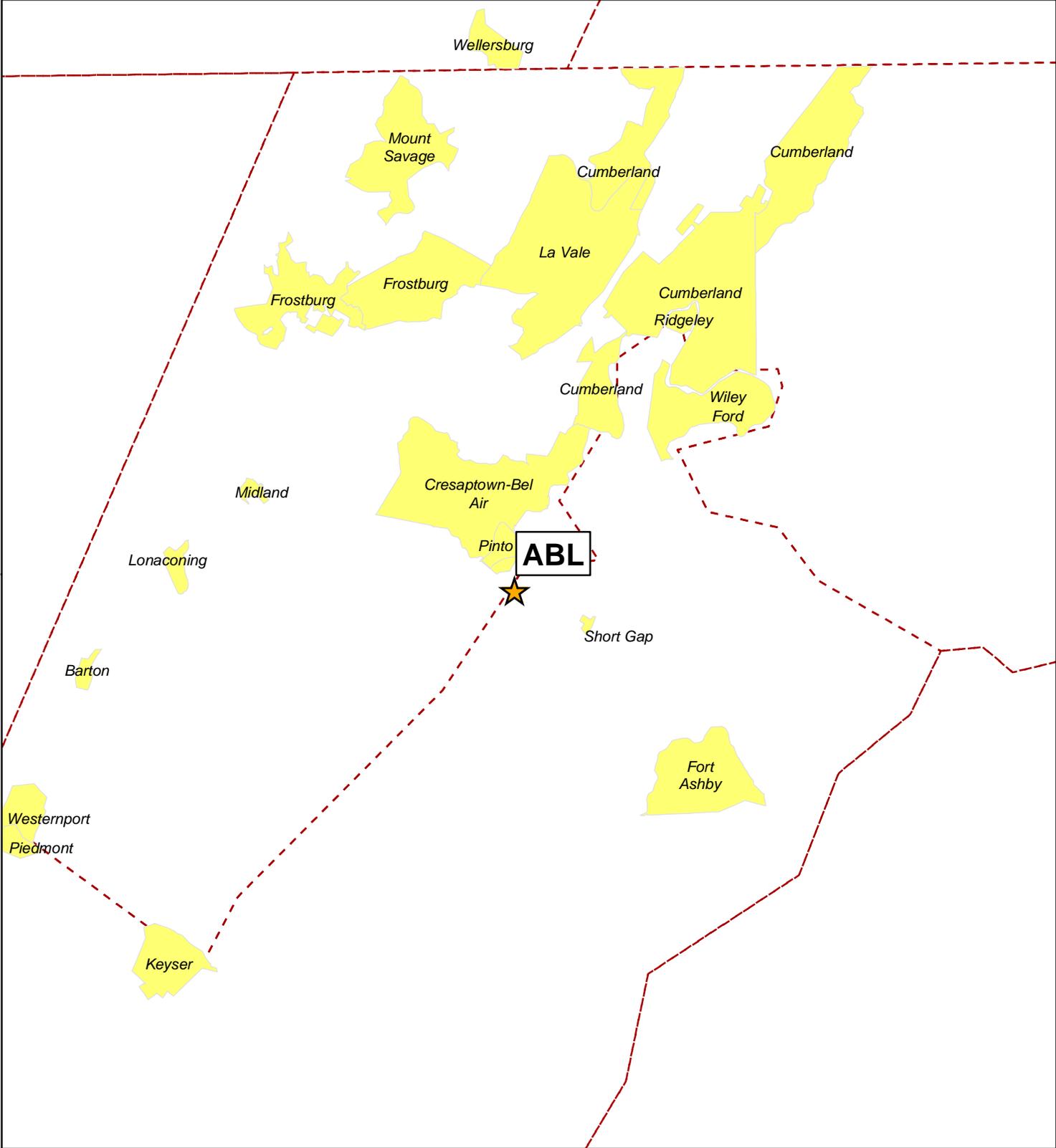


Figure 1-1
Regional Location Map
Site Management Plan
Allegany Ballistics Laboratory
Rocket Center, West Virginia





Legend

-  Counties
-  Populated Areas

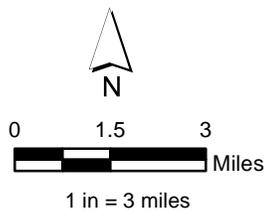
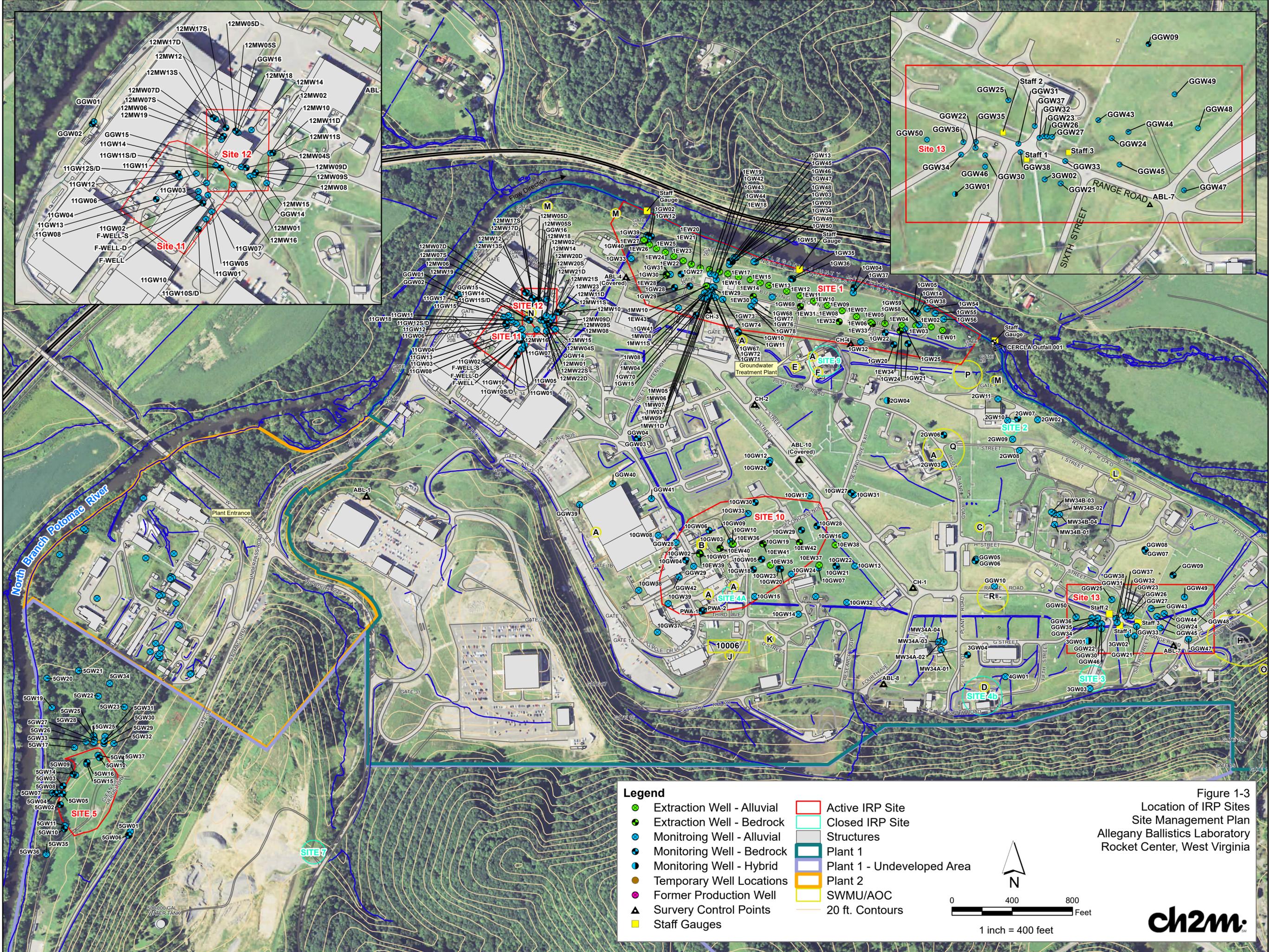


Figure 1-2
Communities Near ABL
Site Management Plan
Allegany Ballistics Laboratory
Rocket Center, West Virginia

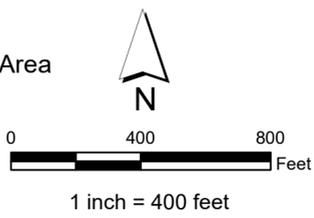




Legend

- Extraction Well - Alluvial
- Extraction Well - Bedrock
- Monitoring Well - Alluvial
- Monitoring Well - Bedrock
- Monitoring Well - Hybrid
- Temporary Well Locations
- Former Production Well
- ▲ Survey Control Points
- Staff Gauges
- Active IRP Site
- Closed IRP Site
- Structures
- Plant 1
- Plant 1 - Undeveloped Area
- Plant 2
- SWMU/AOC
- 20 ft. Contours

Figure 1-3
Location of IRP Sites
Site Management Plan
Allegany Ballistics Laboratory
Rocket Center, West Virginia



CERCLA Process Activities

CERCLA activities at ABL are currently conducted through the IRP. Since 1986, the Navy's IRP has followed the process prescribed by CERCLA regulations and guidance for investigating and addressing environmental contamination. This multi-step process is followed regardless of whether or not a facility is listed on the NPL, unless otherwise directed by a RCRA consent order or other legal instrument.

2.1 CERCLA Process

Because the Navy structured the IRP to be consistent with the terminology and structure of the CERCLA program, the placement of Plant 1 on the NPL has had a limited effect on the cleanup processes that were already established. The IRP at ABL is being implemented in accordance with applicable federal and state environmental regulations and requirements. The CERCLA cleanup process is described further in the following subsection.

2.1.1 CERCLA Investigation Process

The CERCLA investigation process refers to the process of site investigation and RA that is used for CERCLA sites, as shown on **Figure 2-1**.

The objectives of the CERCLA investigation process are to evaluate the nature and extent of contamination at a site and to identify, develop, and implement appropriate RAs in order to protect human health and the environment. The investigation process includes the following major elements:

1. **Preliminary Assessment/Site Inspection (PA/SI):** The PA is the initial process of collecting and reviewing existing information, including historical records; aerial photographs; field inspections; and personnel interviews, to identify specific potentially contaminated sites. If such sites are identified, limited sampling is conducted under the SI to either confirm or deny the presence of contaminants.
2. **Remedial Investigation and Feasibility Study:** If the PA/SI confirms the presence of contamination, the RI is conducted to further evaluate the nature and extent of contamination and to perform an HHRA and ERA. This process is also called "characterization." Using the RI data, the FS is then prepared to evaluate a range of options for environmental remediation, analyzing both available technologies and estimated costs.
3. **Proposed Remedial Action Plan (PRAP) or Proposed Plan:** As a public participation requirement under CERCLA, the preferred environmental restoration strategy, rationale, and the remedial alternatives evaluated in the FS are summarized, either as a fact sheet or as a separate PRAP document. Public review and comment on the fact sheet or PRAP are actively solicited.
4. **Record of Decision (ROD):** The ROD is a public decision document that explains which remedial alternative was selected for a specific site, on the basis of the technical analysis in the RI/FS and consideration of public comments and concerns about the PRAP. All parties directly involved in the restoration program (Navy, USEPA, and WVDEP in the case of ABL) must agree on the selected alternative. Where NFA is required at a site, a no-action ROD would be signed, and the site removed from the program. Subsequent to completion of the ROD, remedial design (RD) and RA activities are initiated.

The PA/SI, RI/FS, PRAP, and ROD documents are maintained by the Navy in the administrative record.

2.1.2 Removal Action Process

Removal actions are implemented to clean up or remove hazardous substances from the environment at a site in order to mitigate the spread of contamination. Removal actions may be implemented at any time during the CERCLA process.

Removal actions are classified as either time-critical or non-time-critical. Actions taken immediately to mitigate an imminent threat to human health and the environment, such as the removal of corroded or leaking drums, are classified as time-critical removal actions. Removal actions that may be delayed for 6 months or more without significant additional harm to human health or the environment are classified as non-time-critical removal actions.

For non-time-critical removal actions, an EE/CA is prepared rather than the more extensive FS. An EE/CA focuses only on the substances to be removed rather than on all contaminants at the site. It is possible for a removal action to become the final RA if the risk assessment results indicate that no further RA is required in order to protect human health and the environment.

2.1.3 Remedial Action Process

Remedial activities may be considered interim RAs or final RAs. Interim RAs are implemented to provide temporary mitigation of human health risks or to mitigate the spread of contamination in the environment. Similar to removal actions, they may be implemented at any time during the RI/FS process. An interim RA is implemented to attain applicable or relevant and appropriate requirements to the extent required by CERCLA or the NCP. It is also consistent with and contributes to the efficient performance of a final RA taken at a site or OU. Examples of interim RAs include installation of a pump-and-treat system for groundwater “hotspot” capture or installation of a fence to prevent direct contact with hazardous materials.

For interim RAs, an FFS may be prepared rather than the more extensive FS. As with the removal action, an interim RA may become the final RA if the risk assessment results indicate that no further RA is required in order to protect human health and the environment. In this case, an NFA ROD would be signed, and the site removed from the IRP upon completion of the interim RA.

If the more extensive FS process is followed, a preliminary/conceptual RD, a pre-final RD, and then a final RD are developed for the final RA at an area or OU. The designed remedial system is then constructed at the site during the Remedial Action Construction (RA-C) phase.

2.1.4 Treatability Studies

Treatability studies are performed to assist in the evaluation of a potentially promising remedial technology. The primary objectives of treatability testing are:

- To provide sufficient data to allow treatment alternatives to be fully developed and evaluated during the FS, and/or
- To support the RD of a selected alternative

Treatability studies may be conducted at any time during the RI/FS process. The need for a treatability study is generally identified during the FS.

Treatability studies may be classified as either bench-scale (laboratory) or pilot-scale (field studies). Bench-scale studies are often sufficient to evaluate performance for technologies that are well developed and tested. For innovative technologies, pilot tests may be required to obtain the desired information. Pilot tests simulate the physical and chemical parameters of the full-scale process and are designed to bridge the gap between bench-scale and full-scale operations.

2.1.5 Remedial Action Operation

Remedial Action Operation (RA-O) includes operations and maintenance (O&M) support required from the completion of the RA-C and any monitoring necessary to ensure the RA is performing as expected. For RA requiring a prolonged RA-O phase to achieve cleanup goals or remedial action objectives (RAOs), an Interim Remedial Action Completion Report (IRACR) documents that the RA-C phase is complete, and the remedy is operating as designed. If RAOs are achieved at the completion of the RA-C phase, or upon achieving the RAOs during the RA-O phase, a Remedial Action Completion Report (RACR) documents that the Response Complete (RC)

milestone is met. During RA-O, a Long-Term Monitoring (LTM) Plan and an O&M Plan may need to be prepared for the site.

2.1.6 Long-term Monitoring

Following the RC milestone, this phase may be required to monitor long-term protectiveness of the remedy. Actions during this phase may involve groundwater monitoring, implementation and management of land use controls (LUCs), and preparation of five-year review reports.

2.1.7 Optimization

At any point in the RA process, optimization alternatives are considered in an effort to augment or enhance an RA already in place.

2.1.8 Site Closeout

This milestone signifies that the site no longer requires active management and monitoring, the remedy is protective of human health and the environment, contaminant levels at the site allow for unrestricted use and unlimited exposure, and there is no expectation of expending additional funding at the site. The site closeout milestone can occur at any stage during the response action, depending upon the investigation results and remediation requirements.

2.2 Status of IRP Sites at ABL

RAs are currently in progress at six OUs: Site 1, OU-3 (groundwater, sediment, and surface water); Site 5, OU-1 (landfill contents and surface soil); Site 5, OU-2 (groundwater, sediment, and surface water); Site 10, OU-5 (groundwater); Site 11, OU-11 (groundwater); and Site 12, OU-8 (groundwater). An RI/FS Report for Site 13 (OU-15) is in progress. The RA for Site 1 OU-4 (soil) included excavation and restoration activities and was completed in April 2021. The Site 1 OU-4 (soil) is currently under long-term management. The status of all IRP Sites at ABL is shown on **Figure 2-1**.

2.3 FFA CERCLA Integration Process

The FFA developed for ABL by the Navy, USEPA Region III, and WVDEP is intended to assist the Navy in meeting the provisions of CERCLA, RCRA, and applicable State law. The FFA establishes a procedural framework and provides detailed guidance on all phases of the remediation process from investigation through RA.

2.3.1 Area of Concern Evaluation

Areas identified as AOCs in the FFA undergo a document evaluation. This document evaluation involves a thorough review of existing or easily obtainable documentation and information on the identified areas. If the Navy, USEPA, and WVDEP agree, then the evaluation could include obtaining discrete samples from the AOC.

The document evaluation also involves assessing information concerning the handling of hazardous wastes at each AOC, the actions taken at each AOC, or actions that will occur under other regulatory programs at each AOC. Based upon the AOC evaluation, a decision is made by the management team of which AOC will proceed to the Site Screening Process (SSP) as SSAs and which AOCs will require NFA and can be closed out. For those AOCs requiring NFA, an AOC closeout document is prepared.

2.3.2 Site Screening Process

The SSP refers to the process described in the FFA that is used to identify whether SSAs should proceed into the RI/FS phase. SSAs are those areas that may pose a threat or that do pose a threat to public health, welfare, or the environment. SSAs can be identified by the Navy, WVDEP, or the USEPA. An SSP work plan is then prepared outlining the activities necessary to determine if there have been releases of hazardous substances, pollutants,

contaminants, hazardous waste, or other hazardous constituents to the environment from the SSAs. After investigation activities have been performed, an SSP report is prepared. The report provides a basis for a determination that either an RI/FS be performed at the SSA or the area does not pose a threat to public health, welfare, or the environment and therefore, should be removed from further study. For SSAs that do not warrant an RI/FS under CERCLA, a brief decision document is prepared and signed by the Navy, USEPA, and WVDEP, in the case of ABL.

Unit Descriptions and Tracking Matrix

The SMP is intended to cover active units (i.e., IRP sites, SSAs, and AOCs) listed in the FFA. The site-specific information provided in this section includes a description of current and planned activities. Since the various environmental investigative programs have used different unit nomenclature throughout the environmental history of the facility, summary tables have been prepared to act as a tracking aid for each unit. The tables include the designation of each unit (name), location, historical dates of operation (if known), a description of the wastes managed, and the current status of each unit. **Attachments A-1** and **A-2** summarize this information for the IRP sites and SWMU/AOC units under CERCLA investigation and RCRA corrective action, respectively. Inactive units that are either closed through a consensus agreement or recommended for NFA are not included in this section; however, they are included in **Attachment A-3**. **Table 3-1** lists the active IRP sites with LUCs per their respective RODs. **Figure 1-3** shows the locations of all monitoring wells at the ABL facility.

3.1 Installation Restoration Program Sites, Investigations, and Remediation Activities

The background information on the IRP sites currently in the CERCLA remedial process and a discussion of ongoing work and planned activities of these sites are described below. The Final Fifth Five-Year Review report, which evaluated the effectiveness of remedies in place at Sites 1, 5, 10, 11, and 12, was finalized in August 2018 (CH2M, 2018). A status update of the issues and recommendations identified in the Fifth Five-Year Review report is provided in **Table 3-2**. This table is periodically reviewed during project meetings with representatives from the Navy, USEPA, and WVDEP. The data for the Sixth Five-Year Review report were collected in May and June 2022 and are currently being evaluated. The Sixth Five-Year Review report is under development and is scheduled for final submission in 2023.

3.1.1 Site 1: Northern Riverside Waste Disposal Area

Site 1 is situated adjacent to the North Branch Potomac River, along the northern border of the developed portion of Plant 1 at ABL. The site boundary encompasses a total of 13.9 acres, with the ABG consisting of 8.5 acres and the OABG consisting of 5.4 acres (**Figure 3-1**). The ABG is currently used for burning reactive wastes and is regulated under a RCRA permit. The 8.5-acre fenced area is mostly covered by mowed grass. An asphalt road spans the east-west length of the fenced area. Although the ABG is operating under a RCRA permit, it includes several historical disposal units, and it was agreed by the Navy and regulatory agencies in April 2009 that this area potentially includes contamination attributed to historical waste burning.

The OABG consists of a 5.4-acre parcel outside of the fenced area that was historically used for the disposal of various wastes (demolition debris, drums, and rocket casings), as well as for burning waste and spreading ash from the early 1960s until approximately 1981. The OABG is no longer in use and the area is not included within the boundaries of the active RCRA permit.

Site 1 was part of a number of investigations conducted at ABL in the 1980s and early-1990s. A Focused RI was conducted in 1994, to fill data gaps that remained at Site 1 after the completion of the RI and to evaluate risk to human health and the environment from Site 1 media (CH2M, 1995b). The results of the Focused RI for Site 1 indicated that VOCs were the most widespread contaminants detected in Site 1 media, with TCE detected most often and at the highest concentrations in soil and groundwater. The Focused RI indicated specific areas and media at Site 1 where RA alternatives should be evaluated in an FFS. These areas included contaminated soil around the solvent disposal pits, north of the east and west ends of the ABG along the river, in the open and inert burn area landfills; contaminated groundwater in both the alluvial and bedrock aquifers; and contaminated surface water and sediment in the North Branch Potomac River, adjacent to Site 1.

In November and December 1994, a residential well sampling event was conducted to determine if COCs detected at ABL had affected the groundwater potentially utilized by residents on the opposite side of the North Branch Potomac River from ABL. Groundwater samples were collected from eight wells at seven residences located along McKenzie Tower Road, directly across the river from Site 1. The Residential Well Sampling Report concluded that it was unlikely residential well water had been affected by groundwater contamination at ABL because VOCs (the primary COCs in groundwater at ABL) were not detected in the residential well samples (CH2M, 1995a).

Information gathered during the RI and Focused RI indicated that VOCs (specifically TCE; 1,2-dichloroethylene [DCE]; 1,1,1-TCE; methylene chloride; and acetone) were the most widespread constituents of potential concern detected at Site 1 in soil, alluvial and bedrock groundwater, surface water, and sediment. A draft FFS was prepared to develop remedial alternatives for all Site 1 media; however, due to the size and complexity of the site, the site was subdivided into two OUs for RA (OU-3 for groundwater, surface water, sediment and OU-4 for soil).

3.1.1.1 Site 1 OU-3 – Groundwater, Surface Water, Sediment

A Final Site 1 FFS for OU-3 was prepared to expedite the RA for these media (CH2M, 1996b). The selected remedy for Site 1 groundwater and the surface water and sediment of the North Branch Potomac River was sitewide groundwater containment and extraction with subsequent onsite treatment and discharge of treated water to the river.

Construction of a groundwater treatment plant (GWTP) to remove hazardous constituents from the extracted groundwater at Site 1 began in September 1997. The treatment plant began continuous operations in September 1998 and is designed to treat up to 300 gallons per minute (gpm) of groundwater extracted from Site 1 (and Site 10). Historically, treatment volume has ranged between 100 and 200 gpm. The Site 1 water treatment plant O&M activities have focused on obtaining hydraulic capture for the alluvial aquifer contaminant plume (**Figure 3-1**) and bedrock contaminant plume (**Figure 3-2**) at Site 1. The treated groundwater is discharged solely to the North Branch Potomac River.

A pilot study was conducted in 2005 to evaluate the effectiveness of using in situ chemical oxidation to reduce contaminant mass in the alluvial and bedrock aquifers in the vicinity of the Former Disposal Pits (FDPs). The results of the study were presented in the *Draft In Situ Chemical Oxidation Pilot Study at the Solvent Disposal Pit Area of Site 1* (CH2M, 2006a).

A pumping test was conducted in Spring 2012 to determine the hydraulic characteristics (e.g., hydraulic conductivity and specific capacity) of the alluvial aquifer for possible optimization alternatives to the Site 1 existing pump and treat groundwater system. An additional extraction well was installed in the ABG, north of FDP 1, in April 2016, as part of a source treatment optimization pilot study. The results indicated favorable conditions for continued mass removal in the FDP 1 area. The additional extraction well continues to operate as part of the Site 1 groundwater remedy (extraction system).

During an initial vapor intrusion (VI) assessment for Site 1 completed in 2013, VI constituents of interest were detected in the groundwater at concentrations that exceeded the industrial and residential VI screening levels. However, it was determined that the characteristics of the buildings at Site 1 prevented a complete and significant VI pathway from occurring. Therefore, it was concluded that there is no unacceptable risk from the VI pathway for the current exposure scenario. Based on the groundwater concentrations, the potential for the VI pathway to be complete or significant cannot be ruled out if new buildings are constructed in the future. LUCs are currently in place to prevent construction of new buildings without evaluation of the potential for VI and/or inclusion of VI mitigation systems in building design (Navy, 2015a).

A baseline river protectiveness study, which included collecting sediment, porewater, and benthic macroinvertebrate samples, was conducted in 2015 to evaluate ecological risks in the North Branch Potomac River adjacent to Site 1 and assess the potential impacts of the Site 1 OABG soil RA on the river. The 2015 results will be used as a baseline for similar sampling efforts to be conducted the summer of 2022, which is two growing

seasons following the completion of the excavation and in-river work as part of the Site 1 soil OU-4 RA. The baseline river protectiveness study results were summarized in a technical memorandum (CH2M, 2020b).

LTM sampling was postponed following the May 2017 sampling event until at least one full growing season following the completion of the Site 1 soil OU-4 RA, which was completed in April 2021. The scope, rationale, and schedule of subsequent LTM sampling events are being discussed and considered by the Partnering Team since the Site 1 soil RA has been completed. An IRACR was finalized in 2015 to document that the OU-3 remedy is in place and operating successfully (CH2M, 2015a). A comprehensive remediation strategy (CRS) framework document was completed to evaluate optimization opportunities for OU-3 (CH2M, 2016c). In addition, groundwater sampling was conducted at Site 1 monitoring and extraction wells during June 2022 in accordance with the Site 1 Five-Year Review Sampling and Analysis Plan (SAP) (Jacobs, 2022a) for use in the Sixth Five-Year Review report evaluation.

O&M activities are routinely conducted at Site 1. The GWTP monitoring results, including the GWTP effluent and VOC emissions, are summarized in monthly Discharge Monitoring Reports which are distributed via email to the Navy, EPA, and WVDEP. In addition, the O&M activities are summarized as part of the annual LTM and O&M progress report for all sites with LTM and/or O&M activities.

Characterization of the OABG subsurface was conducted in March and April 2016 to further understand the lithology and contaminant concentrations in the alluvial zone and evaluate optimization alternatives for OU-3. The results of this investigation were detailed in an *Optimization Characterization Technical Memorandum* (CH2M, 2017d). Additional site characterization data were collected from 2018 through 2021 to optimize the RA for Site 1 OU-3, and the data are reported in the *Draft Remedial Action Optimization, Additional Characterization Report, Site 1 (OU-3: Groundwater, Surface Water, and Sediment) Technical Memorandum* (CH2M, 2022b).

Optimization activities at Site 1 are primarily focused on further delineating contaminants within the OABG, acquiring additional data on the groundwater-surface water interface (GSI), and investigating the bedrock aquifer in order to enhance the current OU-3 remedy. As part of the optimization investigations, a GSI Survey was conducted to analyze river sediment adjacent to Site 1 and identify the interface between groundwater at Site 1 and surface water in the river. This work began in July 2020 and was completed in November 2020. The results of the GSI Survey were detailed in the *Groundwater-Surface Water Investigation Summary, Site 1 Operable Unit 3* (CH2M, 2021b). The Site 1 post-RA river monitoring fieldwork was completed from July through September 2022 and will include bulk sediment sampling, benthic invertebrate toxicity testing, benthic invertebrate community surveys, and evaluation of sediment pore water sampling (was included as part of LTM sampling) to provide multiple lines of evidence on the potential effects of the Site 1 soil RA on ecological receptors in the river. The results of the river monitoring study will be used to quantify and evaluate river protectiveness, confirm concentrations of COCs in river media, optimize and refine the LTM sampling strategy, and further evaluate overall remedy effectiveness following the completion of the Site 1 Soil RA.

3.1.1.2 Site 1, OU-4 – Soil

Using soil data gathered during the Focused RI and previous investigations, a subsequent soil sampling effort was conducted in October 1998 to fill existing data gaps and better delineate areas potentially requiring soil remediation at Site 1. While evaluating available data for the HHRA and ERA, additional data gaps were identified. Therefore, a supplemental investigation was conducted for the surface and subsurface soil at Site 1 in October 2001 (CH2M, 2001) and September 2004. A Final Focused RI for Site 1 Soil was completed in July 2006 (CH2M, 2006b).

In the spring of 2008, test pitting was conducted along the river front at Site 1 in an attempt to better quantify the extent of debris buried in the soil. The results showed that the bulk of the surface and subsurface debris is buried in the western and eastern region of the OABG area. The central region showed no surface or subsurface debris based upon the visual observations and test pits completed in this region. In addition, the results showed a general correlation between elevated COC concentrations and areas where debris was observed in the subsurface.

An FS report for Site 1 soil was finalized in September 2013 to evaluate remedial alternatives for long-term protection of human health and the environment, including protection against contaminants leaching to groundwater (CH2M, 2013b). A Non-Time-Critical Removal Action, consisting of excavation and offsite soil disposal of FDPs 1 and 3 located within the ABG at Site 1, was completed in December 2013 in accordance with the EE/CA (CH2M, 2012). Contaminated soil was excavated to the water table, which averaged between 14 and 15 feet below ground surface. Approximately 1,375 tons of soil were removed from FDP 1 and approximately 1,217 tons of soil removed from FDP 3, as documented in the Construction Completion Report (CCR) (AGVIQ-CH2M, 2014). This interim action was also intended to augment the existing groundwater treatment system by reducing potential VOC source contaminant mass and prevent future leaching to groundwater.

The Navy issued the PRAP for Site 1 soil in March 2014 and issued a ROD for Site 1 soil in September 2014. The selected remedy documented in the ROD for the ABG consists of excavation and offsite disposal of contaminated soil, LUCs, and long-term management. The selected remedy for the OABG consists of removal of surface debris, excavation and offsite disposal of contaminated soil, LUCs, and long-term management.

The RA began in October 2015 with the excavation and soil removal of the ABG, which was completed in November 2015, except for FDP 1, which was completed in August 2017 during the OABG RA. Approximately 3,914 tons of non-hazardous soil were removed within the ABG. The details of the ABG RA are presented in the associated CCR (TtEC, 2018).

The RA basis of design addendum for the OABG was finalized in May 2017 (CH2M, 2017b). The remedy at Site 1 OU-4 (removal of surface debris, excavation of contaminated soils and offsite disposal, and long-term management) is expected to be protective of human health and the environment and the RAOs will be achieved.

The excavation and removal activities at the OABG were conducted from June 2017 to October 2019, followed by site restoration activities, which were completed in April 2021. Approximately 25,977 tons of non-hazardous waste (soil and debris) and 12,644 tons of hazardous waste (soil and debris) were removed within the OABG. The results of the RA activities are presented in the OABG CCR (TtEC, 2022) and RACR (CH2M, 2022a), which were finalized in February 2022 and March 2022, respectively. The RACR documents the achievement of the RAOs along with the Remedy-in-Place and Response Complete determinations for Site 1 Soil (OU-4).

To optimize the VOC mass removal in both OUs in the OABG, the extent of contamination was further delineated in AOC 7 through additional investigations of this area completed in March/April 2016 and December 2018. Using the results of these optimization investigations, additional saturated zone excavation was completed from beneath the designed excavation floor at AOC 7. This excavation was completed in July 2019 to remove the areas of the highest concentrations of VOCs closest to the river. The total volume of excavated material was approximately 500 cubic yards of saturated soil from two separate areas along the riverbank of AOC 7.

3.1.2 Site 5: Inert (Non-ordnance) Landfill

The Site 5 inert landfill operated from the early-1960s to 1985, accepting inert wastes generated by ABL (**Figure 3-3**). The landfill is located on a terrace above the North Branch Potomac River southwest of Plant 1 and south of Plant 2. Inert wastes were defined as wastes neither contaminated with explosives nor generated at an area on the facility where explosives were managed. Wastes reported to have been disposed of at Site 5 include drums that previously contained TCE, methylene chloride, and acetone; fluorescent tubes; unknown laboratory and photographic chemicals; fiberglass and other resin-coated fibers; metal and plastic machining wastes; and construction and demolition debris.

Based upon the results of the RI and Phase II RI activities at Site 5, an FFS for Site 5 Landfill Contents and Surface Soil was prepared (CH2M, 1996c). In general, the IAS, RI, Phase II RI, and monitored natural attenuation (MNA) investigations performed to evaluate the nature and extent of contamination in environmental media at Site 5 concluded low levels of VOCs, semivolatile organic compounds, pesticides, and inorganics were detected in soil samples collected around the perimeter of the landfill. In addition, TCE concentrations up to approximately 100 µg/L have been detected in Site 5 groundwater.

In October 1996, the Navy issued a PRAP for Landfill Contents and Soil for Site 5 and signed a ROD in February 1997 (Navy, 1997). The accepted remedy was landfill capping and LTM of groundwater and stormwater at the site and sediment adjacent to the site. A landfill cap was designed and constructed during the summer of 1997 and was completed in September 1997. An LTM program for groundwater was implemented in 1998 as part of the O&M of the landfill cap remedy.

In November 1999, the Navy implemented an MNA study to evaluate its feasibility as a remedial alternative for Site 5 groundwater. A PA was conducted using existing groundwater data from the LTM program, and based on this screening, an MNA assessment field investigation was conducted. The purpose of this MNA investigation was to delineate the TCE plume boundaries and to collect natural attenuation indicator parameter data. During the investigation, six additional alluvial monitoring wells were installed, following TCE plume delineation using direct-push technology and onsite VOC screening analysis. A groundwater sampling event that included natural attenuation indicator parameters was performed at Site 5 in July 2000 in conjunction with the scheduled LTM event.

The Site 5 HHRA and ERA were revised for groundwater, surface water, and sediment, because a substantial amount of additional data was collected since the risk assessments were last prepared during the 1994 Phase II RI. The updated risk assessments and an evaluation of remedial alternatives for Site 5 groundwater are documented in the *Focused Remedial Investigation and Feasibility Study for Site 5 Groundwater, Surface Water, and Sediment* (CH2M, 2004). A ROD for Site 5 groundwater, surface water, and sediment was signed in February 2006 (Navy, 2006). The remedy selected by the ROD included installation of a permeable reactive barrier (PRB), MNA, LTM, and LUCs. The PRB wall was constructed with zero-valent iron to treat alluvial groundwater downgradient of the Site 5 landfill. This PRB was installed in June 2006. No further action was required for surface water or sediment (Navy, 2006).

An IRACR was finalized in September 2014 to document the construction activities associated with the implementation of RA at Site 5 (CH2M, 2014).

LTM groundwater sampling was conducted in May 2022 in accordance with the Site 5 Five-Year Review SAP (Jacobs, 2022b) for use in the Sixth Five-Year Review report evaluation. The following components of LTM are conducted routinely at Site 5:

- Groundwater Sampling (annually) – Groundwater monitoring is conducted at Site 5 to evaluate the effectiveness of both the landfill cap (OU-1) and the PRB (OU-2). Natural attenuation parameters are collected every five years to ensure geochemistry conditions remain suitable for MNA.
- Groundwater Hydraulic Head Monitoring (annually) – Groundwater elevation data is collected and evaluated to confirm groundwater flow direction in the alluvial and bedrock aquifers and that the PRB is not adversely affecting the potentiometric surface.

The following components of LTM are conducted routinely in accordance with the Site 5 LTM SAP (CH2M, 2017c):

- Landfill Gas Sampling (quarterly and annually) – Landfill gas sampling for methane, lower explosive limit, oxygen and carbon dioxide is being performed on a quarterly basis at seven locations (four landfill gas monitoring wells and three landfill gas vents) in order to determine whether explosive gas is migrating toward nearby facility structures or beyond the facility property boundary. Emissions of VOCs are also measured annually at the three landfill gas vents to ensure that emissions do not exceed 3,000 pounds per year as specified in the ROD (Navy, 1997).
- Leachate Monitoring (quarterly) – Visual leachate monitoring is conducted on a quarterly basis to assess the presence of any leachate from the landfill.

Stormwater sampling was removed from LTM sampling due to inability of sufficient water pooling for sample collection, as specified in the LTM SAP (CH2M, 2017c).

O&M activities of the site related to the landfill cap are also required at Site 5 and consist of:

- Inspection for signs of settling, subsidence, displacement, and erosion
- Drainage system inspection for signs of standing water, erosion, and obstructions
- Inspection of the groundwater monitoring system, landfill gas venting system, and landfill gas monitoring well(s) for signs of damage and tampering
- Inspection of signs for damage, fading, and viewing obstructions
- Roadway inspection for signs of erosion, rutting, physical damage, and obstructions

An Environmental Security Technology Certification Program (ESTCP) project was completed in early 2017 to evaluate the effectiveness and longevity of the PRB in reducing VOC concentrations in groundwater. Activities conducted as part of the study included installation and sampling of eight monitoring wells around the PRB, collection of geochemical and microbial data, water-level monitoring, and collection and evaluation of PRB soil core samples. Information from the ESTCP evaluation indicates that the PRB continues to produce reducing conditions and a “clean front” immediately downgradient of the PRB. The results and conclusions of the ESTCP project were summarized in the ESTCP Final Report (Navy, 2018).

As part of optimization efforts, further evaluation and investigation of the TCE plume in the vicinity, upgradient, and downgradient of the PRB was completed in October 2020. Additionally, a separate background study is being completed to determine background iron and manganese concentrations. This background study will help address whether Site 5 site remediation goals (SRGs) for iron and manganese should be refined from those listed in the ROD due to naturally occurring concentrations. Field activities for the background study and TCE plume investigation were completed in October 2020 and quarterly background sampling is being conducted through fall 2021. The results of the investigation and background study will be documented in a forthcoming technical memorandum that is currently in development.

3.1.3 Site 10: Former TCE Still at Building 157

Site 10 consists of the area around Building 157 and is located within the developed portion of Plant 1, as shown in **Figure 3-4**. To maintain consistency with other numbered IRP Sites at ABL, Site PWA was renamed Site 10 in 1995. Site PWA had been defined and investigated during the CS, RI, and Phase II RI because contamination had been detected in PWA, which was used in the past to supply potable, boiler, and fire-fighting water to the plant. Because VOCs were detected in the well as early as 1980, PWA’s use as a water source was discontinued. It is now believed that contamination in PWA originated, at least in part, from the former TCE still that operated adjacent to Building 157 during 1959 and the early-1960s.

Site 10 was part of a number of investigations conducted at ABL in the 1980s and early-1990s. Information gathered during these investigations indicated that limited VOC soil contamination exists in the vicinity of the former TCE still, but a VOC plume (specifically TCE) is present in both the alluvial and bedrock aquifers at Site 10. Based on the conclusions and recommendations of the Phase II RI and Phase I Aquifer Testing, a draft FFS was prepared to develop RA alternatives for Site 10 soil and groundwater. In order to expedite containment of the groundwater contamination plume, the site was subdivided into OUs for RA. Therefore, the draft FFS was never finalized. Instead, a Final Site 10 FFS for groundwater (OU-5) was prepared to implement an interim RA (CH2M, 1998a).

The Navy issued the PRAP for groundwater at Site 10 in March 1998 and signed an interim ROD in August 1998 (Navy, 1998). The selected interim remedy for Site 10 groundwater was “hot-spot” groundwater extraction with subsequent treatment and discharge of treated water to the river. The selected remedy, which was a modification of one of the alternatives listed in the FFS, was considered an interim action because it did not address the full extent of alluvial and bedrock aquifer contamination. The interim action was intended to contain and remove the most highly contaminated portion of the alluvial aquifer (i.e., TCE contamination greater than 100 µg/L) before

further downgradient migration could occur while other RAs (e.g., monitored natural attenuation) were considered for the less contaminated portion of the aquifers.

Additional soil sampling was performed at Site 10 in June 2000 to further delineate the extent of soil contamination associated with the former TCE still and supplement existing data. The results of supplemental sampling were incorporated into a Risk Assessment Report (CH2M, 2005b). A ROD was developed for Site 10 soil (OU-6) and signed in 2007, which specified NFA for Site 10 soil (Navy, 2007).

After several months of groundwater monitoring at Site 10, it became evident that the existing extraction-well configuration was capturing all but the most northeastern portion of the alluvial-aquifer TCE plume and that the installation of one additional alluvial extraction well might achieve complete plume capture. A direct-push technology groundwater investigation was performed in June 2000 to further delineate the northeastern extent of the alluvial TCE plume and determine the best location for installation of an additional alluvial extraction well. To achieve capture of the alluvial groundwater VOC contamination above Maximum Contaminant Level (MCL) at Site 10, a fourth alluvial extraction well was installed in the suspected northeastern tip of the TCE plume in July 2000. A monitoring well was also installed at the downgradient edge of the alluvial aquifer contaminant plume to verify hydraulic containment.

Hydraulic head data gathered prior to and following extraction system startup at Site 1 has indicated that the vertical hydraulic gradient between the alluvium and bedrock at Site 10 has reversed (i.e., became downward), potentially under the influence of bedrock groundwater extraction at Site 1. To test this hypothesis and to evaluate the need for bedrock extraction at Site 10, an aquifer test was performed in July 2001.

The results of aquifer testing and modeling performed during Phase III aquifer testing indicate that bedrock groundwater extraction at Site 1 is limiting the effectiveness of the alluvial extraction wells at Site 10 in capturing the bedrock groundwater contamination. Groundwater modeling was used to evaluate the most effective way of overcoming the influence of groundwater pumping at Site 1 and determined that the addition of a fourth alluvial extraction well and three bedrock extraction wells at Site 10 would result in groundwater contamination being contained at Site 10. These changes to the extraction system were implemented in February 2003 in accordance with the *Final Work Plan Site 10 Groundwater Extraction System Modification Allegany Ballistics Laboratory* (CH2M, 2002). This modified extraction/treatment system was selected as the final remedial alternative for Site 10 groundwater (as a modification of the interim action) in a ROD signed in September 2005 (Navy, 2004).

Implementation of the interim RA at Site 10 (i.e., installation of three additional groundwater extraction wells) was completed in February 1999, at which time groundwater extraction at Site 10 with subsequent treatment at the Site 1 treatment plant began. An IRACR was finalized in September 2013 to document the RA at Site 10 (CH2M, 2013a).

In accordance with the LTM program for Site 10, water level measurements are collected from the alluvial and bedrock extraction and monitoring wells in order to evaluate the effectiveness of the system to hydraulically contain contaminated portions of the alluvial and bedrock aquifers in order to prevent further migration of contaminated groundwater. Measurements are collected manually on a monthly basis and prior to each groundwater LTM sampling event. LTM sampling is conducted every five years in conjunction with the five-year review reporting. The most recent LTM sampling event took place in June 2022 in accordance with the Five-Year Review SAP (Jacobs, 2022c) and will be evaluated in the Sixth Five-Year Review report.

O&M is conducted routinely at Site 10 and the GWTP and consists of inspection and maintenance of groundwater extraction wells to ensure that they are capable of meeting pumping rates and other required set points and visual inspection of signage. The results of the O&M activities are documented in the monthly Discharge Monitoring Reports provided via email to representatives from the Navy, USEPA, and WVDEP. In addition, a summary of the O&M activities is reported in the annual Progress Report for all IR sites with LTM and O&M requirements as part of the final RA. It should be noted that O&M activities may be altered during the shutdown pilot test, as the Site 10 extraction system will be offline for a period of up to two years.

Based on the VI investigation completed in January 2016, a human health risk screening was conducted in 2017 and two additional rounds of sampling at select buildings to further assess VI were completed in 2020. The results

of the investigations have been documented in a revised Draft VI Report, but the document has not been finalized due to a disagreement between the Navy and USEPA on the exposure attenuation factors that are used to calculate VI risk. An additional sampling event was completed in March 2022 to collect heating season VI sampling data at Building 8. The VI investigation results will be documented in the Sixth Five-Year Review report.

Also, during the January 2016 VI investigation, two basement sumps were identified in the occupied portion of Building 8. The sumps are used to prevent basement flooding through redirection of groundwater seepage to a nearby surface drainage area that ultimately discharges to the North Branch Potomac River. A review of the National Pollutant Discharge Elimination System (NPDES) permit (Permit No. WV0020371) indicated that it allows for the direct discharge of treated industrial wastewater (process, sanitary) and untreated stormwater. In June 2017, a surface water sample was collected from the Building 8 Sump 1, where TCE and perchloroethylene (PCE) were detected. Because of TCE and PCE exceedances of screening levels in the surface water sample, surface water and sediment samples were collected in the drainage ditch downstream from the Building 8 sump discharge. Risk screenings concluded that the results of this sampling indicated no unacceptable ecological or human health risks to receptors. An Explanation of Significant Differences (ESD) document was prepared to amend the ROD to identify the previously unknown exposure pathway for the discharge of the Building 8 sump water into the nearby drainage ditch at Site 10. This ESD was signed on August 29, 2019 (CH2M, 2019b). In addition, the LUC RD for Site 10 will be modified to clarify LUCs and associated monitoring and maintenance requirements to address the exposure pathways and is anticipated to be completed in FY 2023. Currently, the Navy inspects the sumps during the quarterly Site 10 LUC inspections to ensure the sumps remain covered and are operating properly.

An investigation was completed in 2019 to refine the extents of the TCE and PCE plumes at the site. The investigation successfully delineated the PCE and TCE plumes at the site, and the results are documented in the Site 10 TCE and PCE Delineation Technical Memorandum (CH2M, 2021a).

The Fifth Five-Year Review report for ABL, finalized in 2018, determined that the groundwater remedy at Site 10 is protective of human health and the environment in the short-term (CH2M, 2018). However, the Five-Year Review concluded that in order for the remedy to be protective in the long-term for the VI pathway, the following actions are recommended to be taken: 1) Collect additional groundwater data to update the plume configuration and associated LUC boundary to account for the VI pathway as necessary; 2) Further evaluate future VI risk by conducting an HHRA using the sub-slab vapor analytical data collected during the 2016 VI investigation, and considering multiple lines of evidence, to determine if RA is warranted; and 3) Add LUC objectives to the LUC RD. groundwater remedy performance issues remain at the site and that uncertainty associated with the timeframe to achieve RAOs still exists. The Five-Year Review recommended improvement to the existing groundwater remediation system effectiveness. The CRS for Site 10 Groundwater (OU-5) (CH2M, 2016b) was developed following the fourth Five-Year Review and provides a framework for actions to optimize system performance at Site 10. Refinement of the hydrogeologic understanding of Site 10 under non-pumping conditions was recommended.

A pilot test began in the summer of 2020 involving a shutdown of the Site 10 extraction system for up to two years with a groundwater monitoring plan to evaluate plume stability under non-pumping conditions. The two-year pilot test was completed in July 2022. The results of the pilot test will be documented in a forthcoming report.

The alluvial plume configuration is shown in **Figure 3-4**, and the bedrock plume configuration is shown in **Figure 3-5**.

3.1.4 Site 11: Production Well “F” (F-Well)

The historical significance of Site 11 is the former existence of a boiler house (Building 215), fuel oil storage area, and a deep bedrock production well known as Production Well “F” (F-Well) (**Figure 3-6**). The site boundary encompasses approximately 2.3 acres. The original boiler house, built in the late-1950s, was approximately 1,000 square feet and housed a single boiler unit. In 1961, F-Well was installed adjacent to Building 215 to provide

potable water to Plant 1 as well as to the boiler housed in Building 215. Following its installation, attempts to develop F-Well were unsuccessful due to sand flowing into the well through fractures in the bedrock. Because the sand prevented pump operation in the well, F-Well was never put into production. However, it also was never properly abandoned. In 1962, an addition was added to the boiler house that doubled its size and number of boilers. During this expansion, F-Well was covered by the building addition's foundation.

In the late-1980s, the boiler house was decommissioned. Decommissioning activities included removal of the boilers and two 10,000-gallon aboveground storage tanks. Prior to removal of the 55-gallon oil pit and dike walls in 1994, four soil samples were collected from within the diked oil storage area to evaluate the extent of impacted soil. The analytical results suggested soil within the diked area had been impacted by petroleum hydrocarbons. Soil samples collected after removal of the dike wall, oil pit, and all soil within the diked area and demolition of the former boiler house (Building 215) suggest that sufficient soil cleanup had been achieved. After soil removal, Building 421 was constructed adjacent to F-Well. An asphalt parking lot was constructed around F-Well and over the former diked fuel storage area and oil pit.

In 1995, an Advanced Site Inspection (ASI) (CH2M, 1996b) was conducted to characterize potential groundwater and soil contamination in and around F-Well and a former oil pit at the construction site for Building 421. The ASI identified a limited area of soil contamination and a broader area of groundwater contamination in the alluvial and bedrock aquifers. Furthermore, a light non-aqueous phase liquid and a dense non-aqueous phase liquid were detected in F-Well. Prior to the ASI, the facility removed the former oil pit and any visibly contaminated soil.

Based on the findings of the ASI, an RI was initiated at Site 11 in June 1998 to delineate the nature and extent of contamination in the soil and alluvial and bedrock aquifers in the vicinity of F-Well (CH2M, 1998b). The groundwater monitoring phase of the RI was extended to include quarterly groundwater sampling for 1 year. An RI Report was completed in January 2005 that included an HHRA and ERA for Site 11 (CH2M, 2005a). An FS for the combined areas of Site 11 and Site 12 was completed in 2010. The PRAP for Sites 11 and 12 was finalized in March 2011 and identifies the preferred remedial alternative for Site 11 as source zone removal (already completed), focused enhanced anaerobic biodegradation (EAB), monitored natural attenuation, and institutional controls. The ROD for Sites 11 and 12 was signed in January 2012 (Navy, 2012).

Baseline groundwater sampling was conducted in June 2012 to assess the site conditions and achieve an understanding of the current site plume configurations, contaminant concentrations, and existing geochemical properties prior to remedy implementation. The results of the groundwater sampling completed in June 2012 demonstrated a reduction in concentrations of TCE and methylene chloride below SRGs in the bedrock aquifer.

In November 2012, targeted direct remediation was completed by injections of 3 Donor Microemulsion Factory Emulsified (3DMe-FE) substrate in the alluvial aquifer at Site 11. Quarterly monitoring was conducted in the alluvial and bedrock monitoring wells through November 2013 to assess the effectiveness of the remedy in the alluvial aquifer and to determine if injection of EAB substrate is necessary in the bedrock aquifer. The injections in the bedrock aquifer were determined to not be needed based on the post-injection performance monitoring results.

An IRACR was finalized in September 2015 to document that the Site 11 remedy is in place and operating as designed (Navy, 2015b). LTM was initiated in December 2015 and is conducted on an annual basis throughout the remediation phase. During the remediation phase, data are evaluated following each sampling event to determine if concentrations of COCs warrant continued monitoring both for specific analytes and at specific monitoring wells, in accordance with the Sites 11 and 12 Five-Year Review SAP (Jacobs, 2022d). LTM groundwater sampling was completed in May 2022, and the results will be summarized in the Sixth Five-Year Review report.

The 2018 Five-Year Review concluded the remedy at Site 11 (OU-11) is protective of human health and the environment. The VI assessment initiated in 2013 determined the COC plume was no longer present and the VI pathway was not complete and/or significant for current building occupants at Site 11 (OU-11), and a VI investigation was not recommended. Exposure pathways that could result in an unacceptable risk are currently being controlled by LUCs such as site security and signage (CH2M, 2018).

3.1.5 Site 12: Building 167 SWMUs (formerly AOC N)

There are five SWMUs (SWMUs 12, 14, 24S, 37N, and 52) located in the vicinity of Building 167 that are considered part of Site 12 (formerly AOC N). Site 12 is located in the northwestern portion of Plant 1, just north of Site 11, as shown on **Figure 3-6**. The site boundary encompasses approximately 1.6 acres. A list of the SWMUs associated with Building 167 is provided below.

- SWMU 12 Former Alodine Treatment Tank
- SWMU 14 Current Alodine Waste Storage Area I (no longer in use)
- SWMU 24S Building 167 Satellite Accumulation Area I (outside building)
- SWMU 37N Building 167 Wastewater Sump
- SWMU 52 Current Alodine Treatment Tank (no longer in use)

Several investigations have been conducted at two of these units. SWMU 37N and SWMU 52 were included in the scope of the Phase I and Phase II SWMU/AOC Investigations. In addition, a removal action was performed in November 2000 to remove the wastewater sump (SWMU 37N), its contents, and potentially contaminated soil immediately surrounding the unit. The results of the SWMU/AOC Investigations and post-confirmatory soil sampling indicated that several inorganic constituents (i.e., antimony, cadmium, chromium, iron, mercury, and thallium) and several organic constituents (i.e., TCE, 1,4-dichlorobenzene, benzo(a)anthracene, benzo(a)pyrene, and benzo(b)fluoranthene) were detected in soil above risk-based screening criteria. Several inorganic constituents (i.e., aluminum, arsenic, cadmium, chromium, cobalt, iron, manganese, nickel, vanadium, and zinc) and several organic constituents (i.e., 1,1-DCE, TCE, vinyl chloride, 1,2-dichlorobenzene, 1,4-dichlorobenzene, and benzene) were also detected in groundwater above risk-based screening criteria. Therefore, AOC N was recommended for further investigation during a Phase III SWMU/AOC Investigation to further define the nature and extent of contamination at the unit.

During the Phase III SWMU/AOC Investigation, VOC contamination was discovered in the alluvial aquifer. A large area of the plume is centered around Building 167 and contains primarily TCE. The smaller area of the plume is centered around the former SWMU 37N wastewater sump and exhibits high levels of methylene chloride. Based upon these findings, the recommendation was made that AOC N be designated IR Site 12.

Field investigations were initiated in 2003 as part of an RI designed to address data gaps identified following the Phase III SWMU/AOC Investigation (CH2M, 2003). RI activities at Site 12 included the installation and sampling of six alluvial and bedrock groundwater monitoring locations, downhole geophysical surveying (including flow logging and limited packer testing), and dye tracer testing.

Results of the field investigation identified human health and ecological risks from chromium, benzo(a)anthracene, benzo(a)pyrene, and benzo(b)fluoranthene in the soil at the site. In addition, cadmium, mercury, and 1,2-dichlorobenzene were identified as additional COCs for the ecological receptors. Therefore, an EE/CA was prepared in August 2004 that recommended excavating the contaminated soil at Site 12 and disposing of it in an offsite landfill. These activities were completed in 2005 and were documented in the *Final Site 12 Soil Removal Action Report* (CH2M, 2005c). Groundwater data were evaluated in a draft RI report for Site 12 that was issued in February 2007. The RI was finalized in 2009. A combined FS for Sites 11 and 12 was completed in 2010, as discussed above. The PRAP for Sites 11 and 12 was finalized in March 2011 and identified the preferred remedial alternative for Site 11 as focused EAB, MNA, and institutional controls. The combined ROD for Sites 11 and 12 was signed in January 2012 (Navy, 2012).

Baseline groundwater sampling was conducted in June 2012 to assess the site conditions and achieve an understanding of the current site plume configurations, contaminant concentrations, and existing geochemical properties prior to remedy implementation. The results of the groundwater sampling completed in June 2012 demonstrated a reduction in concentrations of TCE and methylene chloride below SRGs in the bedrock aquifer.

In November 2012, targeted direct remediation was completed by injections of 3DMe-FE substrate in the alluvial aquifer at Site 12. Quarterly monitoring was conducted in the alluvial and bedrock monitoring wells through November 2013 to assess the effectiveness of the remedy in the alluvial aquifer and to determine if injection of

3DMe-FE is necessary in the bedrock aquifer. The injections in the bedrock aquifer were determined to not be needed based on the post-injection performance monitoring results.

An IRACR was finalized in September 2015 to document the Site 12 remedy is in place and operating as designed (Navy, 2015b). LTM was initiated in December 2015 and is conducted on an annual basis throughout the remediation phase. During the remediation phase, data are evaluated following each sampling event to determine if concentrations of COCs warrant continued monitoring both for specific analytes and at specific monitoring wells, in accordance with the Sites 11 and 12 Five-Year Review SAP (Jacobs, 2022d). LTM groundwater sampling was completed in May 2022, and the results will be summarized in the Sixth Five-Year Review report.

The 2018 Five-Year Review concluded the groundwater remedy at Site 12 (OU-8) is currently protective of human health and the environment. Exposure pathways are currently being controlled by LUCs such as site security and signage (CH2M, 2018). However, in order for the OU-8 remedy to be protective in the long-term for the VI pathway the following actions are recommended to be taken: 1) Collect additional groundwater data to update the plume configuration and associated LUC boundary to account for the VI pathway as necessary; 2) Further evaluate future VI risk by conducting an HHRA using the sub-slab vapor analytical data collected during the 2016 VI investigation and considering multiple lines of evidence to determine if RA is warranted; and 3) Add LUC objectives to the LUC RD. The LUC objectives will be modified to prevent construction of new buildings, changes in building use, and activities that would compromise the integrity of the building foundations during implementation of the remedial action without further VI investigation and/or inclusion of VI mitigation measures in building design (CH2M, 2018). Additional investigations for the VI pathway at Site 12 were completed in 2020, and the results of the investigations will be documented in a forthcoming VI Report. However, due to a disagreement between USEPA and the Navy associated with the exposure attenuation factors that should be used to calculate VI risk, the deliverable has not been finalized to date. An additional sampling event was completed in March 2022 to collect heating season VI data at Buildings 167 and 214. The VI investigation results will be documented in the Sixth Five-Year Review report.

In addition, the LUC RD for Site 12 will be modified to clarify LUCs and associated monitoring and maintenance requirements to address the exposure pathways and is anticipated to be completed in FY 2023.

3.1.6 Site 13: OU-15 Range Road Area (formerly SWMU 27A)

The Site 13 Range Road Area consists of an area of TCE contamination in alluvial groundwater, at an area where the SWMU 27A drainage ditch crosses Range Road. The Range Road Area is located in the southeastern portion of Plant 1. The current sampling locations for the Range Road Area are shown on **Figure 3-7**.

The Phase III Investigation for Site 13 (formerly known as SWMU 27A) in part sought to identify the source of TCE which had been sporadically detected in various outfalls during the NPDES monitoring program. In the sediment sampling conducted during the Phase III Investigation, TCE was detected in one of the samples collected from the drainage ditch downstream of Site 13, monitored as part of the facility's NPDES program, resulting in the collection and analysis for VOCs of additional surface water samples from the main drainage channel and its tributaries upstream of the sampling location. TCE was consistently detected (at concentrations between 11 and 140 micrograms per liter in surface water samples. Because TCE is no longer used at the facility, contaminated groundwater near the Range Road intersection was believed to be the source of TCE in the drainage ditch. Groundwater samples were collected in 2002 and 2003 to identify the TCE source and better define the extent of VOCs in alluvial groundwater. These grab samples identified an elongated area of dissolved TCE in groundwater, trending to the east-northeast and roughly parallel to the Plant 1 drainage system near the Range Road–H Street intersection. Though there are no known potential sources of TCE at Site 13, a search of historical information conducted during the Phase III Investigation revealed that there was a boiler (Building 106A) northeast of the Range Road and H Street intersection where degreasing operations dating to 1952 were conducted. No potential source of TCE southwest of the intersection was identified. TCE migration along the facility sewer lines from other IRP sites was ruled out because there are no sewer lines located in the immediate vicinity of the intersection.

Additional soil and groundwater studies were conducted as part of Phase IV investigations, which focused on the potential source area of TCE in the vicinity of the former boiler. An initial pilot study was conducted to evaluate

the effectiveness of an in-situ injection in alluvial groundwater to enhance aerobic degradation of VOCs. Groundwater analytical results of the pilot study and follow-up sampling events showed that TCE concentrations were significantly reduced, and TCE anaerobic breakdown products increased in the pilot study area. A similar pattern of reduction in TCE concentrations was observed in SWMU 27A surface water downgradient of the pilot study area. Subsequent to identifying the area for pilot study, higher TCE concentrations were discovered in the area upgradient of the initial pilot study area.

Additional characterization activities were conducted in 2006 following the initial pilot study to delineate the higher concentrations of VOCs in the alluvial aquifer hydraulically upgradient and cross-gradient of the initial pilot study area. Results from the additional characterization activities indicated the highest groundwater concentrations of VOCs in the area between G Street, Range Road, H Street, and the Plant 1 drainage ditch as suggested by previous investigations. It was concluded that additional data would be needed to confirm that TCE in groundwater had been adequately characterized.

Additional data were collected from the alluvial aquifer in February 2008 using multiple passive diffusion bag samplers within select individual monitoring wells. These samples were collected to examine the vertical stratification of VOCs within the alluvial aquifer. The results of the passive diffusion bag sampling did not identify significant vertical stratification of VOC concentrations.

Because no specific historical source or release event has been identified for VOCs at Site 13, a membrane interface probe survey was performed to determine if there was an unidentified VOC source related to light non-aqueous phase liquid or total petroleum hydrocarbons in the vadose zone near the highest concentrations of TCE in groundwater. The soil results of this investigation suggested that the vadose zone source of TCE in groundwater at Site 13 has either degraded or been leached from the soil.

A second pilot study at Site 13 was conducted in 2008 to evaluate the effectiveness of an in situ injection in alluvial groundwater facilitating enhanced reductive dechlorination of VOCs, including TCE, to concentrations approaching their respective MCLs. When compared to the results of the baseline sampling event conducted in August 2008, the reduction in TCE ranged between 80 and 99.9 percent.

The Site 13 SAP (CH2M, 2011) included the sample collection and evaluation of surface water and sediment from the Site 13 drainage ditch system. Subsequently USEPA, WVDEP, and the Navy determined this sampling was not necessary based on the following:

- TCE had not been detected in NPDES permit sampling conducted in the drainage ditch since late 2007.
- Water level data collected in accordance with the November 2011 SAP suggested that the alluvial groundwater was not discharging to the drainage ditch.
- Available data indicated that if a transport pathway from groundwater to surface water and sediment existed, it was intermittent and infrequent and did not present a risk to human health or the environment.
- The decrease in groundwater concentrations following the injections of biostimulating substrate during the pilot study reduced the potential for significant transport should discharge occur.

A combined RI/FS is currently underway. Additional groundwater and soil samples were collected in February and May 2022 as part of the RI data gap investigation and will be evaluated in the RI/FS, which is expected to be completed in FY 2023. The Site 13 PRAP and ROD will be developed to document the final remedy, once it is selected.

3.1.7 Facility-wide Studies

A background study was performed in 2003 to establish background concentrations for soil inorganics at ABL. These background concentrations are being utilized in ongoing HHRAs and ERAs and in developing soil Preliminary Remediation Goals for several sites at the facility.

A planning document for use by the facility and the Navy titled *The Final Construction, Excavation and Groundwater Use Restriction Plan for Installation Restoration Program Sites, Allegany Ballistics Laboratory, Rocket Center, West Virginia* (CH2M, 2005d) was developed as an environmental planning tool for CERCLA sites currently under investigation or with a remedy in place requiring LUCs to prevent receptor exposure hazards. This document is a guide to communicate LUCs at the facility in accordance with the LUC RDs for the respective sites.

A facility-wide VI study was initiated in 2012. The results of the VI investigations were discussed previously in the site-specific sections. Additional investigations at select buildings at Site 10 and Site 12 to further assess potential VI issues have been conducted in 2020 and 2022, as detailed in the site-specific sections. The VI pathway for Site 13 has been incorporated into the RI/FS.

The Community Involvement Plan (CIP) update was finalized in January 2019 (CH2M, 2019a). Results of the CIP and associated recommendations will be implemented to enhance the effectiveness of community involvement communication tasks such as public meetings, fact sheets, repositories, and public notice outlets. The next CIP update will occur concurrently with the Sixth Five-Year Review.

A facility-wide PA for per- and poly-fluoroalkyl substances (PFAS) was completed in 2020 (CH2M, 2020a). The objective of the PA was to determine locations of suspected environmental releases of PFAS. The PA included a review of existing information, such as inspection reports, and permit applications, identification and characterization of potential PFAS releases; interviews with site personnel as a means of validating and verifying data collected during the data review; and site reconnaissance of the facility to identify any evidence of PFAS releases, potential receptors, and migration pathways. The SI phase for PFAS is currently in progress. The PFAS SI SAP was developed in 2020 (CH2M, 2020c) and the subsequent sampling activities were completed in January 2021. The results are being evaluated and will be documented in a forthcoming SI report.

The Fifth Five-Year Review report, signed in August 2018, evaluated the effectiveness of the remedies at Sites 1, 5, 10, 11, and 12 and determined whether they continue to be protective of human health and the environment, in accordance with the requirements set forth in the ROD for each site (CH2M, 2018). Navy signature, along with USEPA and WVDEP concurrence, was provided August 2018. The next Five-Year Review process has begun to include conducting environmental media sampling and the subsequent Five-Year Review report will be completed and signed by August 2023.

Table 3-1. Installation Restoration Program Site and Operable Unit Summary
 Site Management Plan
 Allegany Ballistics Laboratory
 Rocket Center, West Virginia

Site Number	Site Identification	Operable Unit Number	Operable Unit Description	Primary Contaminants of Concern	Record of Decision Signature Date	Land Use Controls
1	Northern Riverside Waste Disposal Area	3	Groundwater, Surface Water, and Sediment	*Groundwater: VOCs (1,1,1-TCA; acetone; cis-1,2-DCE; MC; PCE; TCE; and VC) and Explosives (Perchlorate and RDX) Sediment: VOCs (TCE and VC); SVOCs (anthracene, benzo[a]anthracene, benzo[a]pyrene, chrysene, and fluoranthene); and Metals (Cd and Sb); *Note that COCs were not finalized in the ROD	April 1997	Prohibit onsite use of untreated groundwater.
		4	Soil	Select VOCs, SVOCs, Explosives, and Metals	September 2014	Prevent unrestricted land use by: (1) prohibiting the development and use of the property for residential housing, elementary and secondary schools, child care facilities and playgrounds, and (2) restricting intrusive activities to minimize the potential for human exposure to contamination presenting an unacceptable risk.
5	Inert Landfill	1	Landfill Contents and Surface Soil	VOCs (1,2-DCE); SVOCs (Dibenzo[a,h]anthracene and Pyrene); and Metals (Ar, Cr, Hg, Mn, and Pb)	January 1997	Prohibit onsite exposure to landfill contents and surface soil (Operable Unit 1) and groundwater (Operable Unit 2). Implemented through establishing Institutional Controls prohibiting the use of untreated groundwater and preventing construction, maintenance work, and land use within the restricted area of Site 5.
		2	Groundwater, Surface Water, and Sediment	VOCs (TCE) and Metals (Total and Dissolved Fe and Mn)	December 2005	
10	Former TCE Still at Building 157	5	Groundwater	VOCs (1,1-DCE; 1,2-DCE; MC; PCE; and TCE)	September 2005	Ensure no extraction of groundwater from Site 10, except for purposes of transport to Site 1 for treatment, ensure adequate protection to minimize potentially adverse health and environmental effects of work or development in the restricted area, and ensure adequate protection to maintain the integrity of any current or future remedial equipment or monitoring operation in the restricted area.
11	Production Well "F"	11	Groundwater and Soil	Alluvial Groundwater VOCs (PCE, TCE, VC) and Metals (Total Ba, Cr, and Sb; Total and Dissolved Mn and TI; Dissolved Fe)	January 2012	Prevent exposure to groundwater, within the boundaries of Site 11.
				Bedrock Groundwater VOCs (TCE) and Metals (Total and Dissolved Ar)		
12	Building 167 SWMUs (formerly Area of Concern [AOC] N)	8	Groundwater and Soil	Alluvial Groundwater VOCs (1,2-Dibromo-3-chloropropane; MC; TCE; and VC) and Metals (Dissolved Ar, Mn, and TI)	January 2012	Prevent exposure to groundwater, within the boundaries of Site 12.
				Bedrock Groundwater VOCs (MC and TCE); SVOCs (bis[2-ethylhexyl] phthalate); and Metals (Total Ar, Cr, Mn, Pb; Total and Dissolved TI)		

Note: No Further Action RODs are not included in this table

Ar – Arsenic	PCE – Tetrachlorethene
Ba – Barium	RDX – 1,3,5-Trinitroperhydro-1,3,5-triazine
Cd – Cadmium	ROD – Record of Decision
COC – Contaminant of Concern	TCA – Trichloroethane
Cr – Chromium	TCE – Trichloroethene
DCE – Dichloroethene	Sb – Antimony
Fe – Iron	SVOC – Semi-Volatile Organic Compound
Hg – Mercury	TI - Thallium
MC – Methylene Chloride	VOC – Volatile Organic Compound
Mn – Manganese	VC – Vinyl Chloride
OU – Operable Unit	
Pb – Lead	

Table 3-2. Five-Year Review Issues, Recommendations, and Other Findings

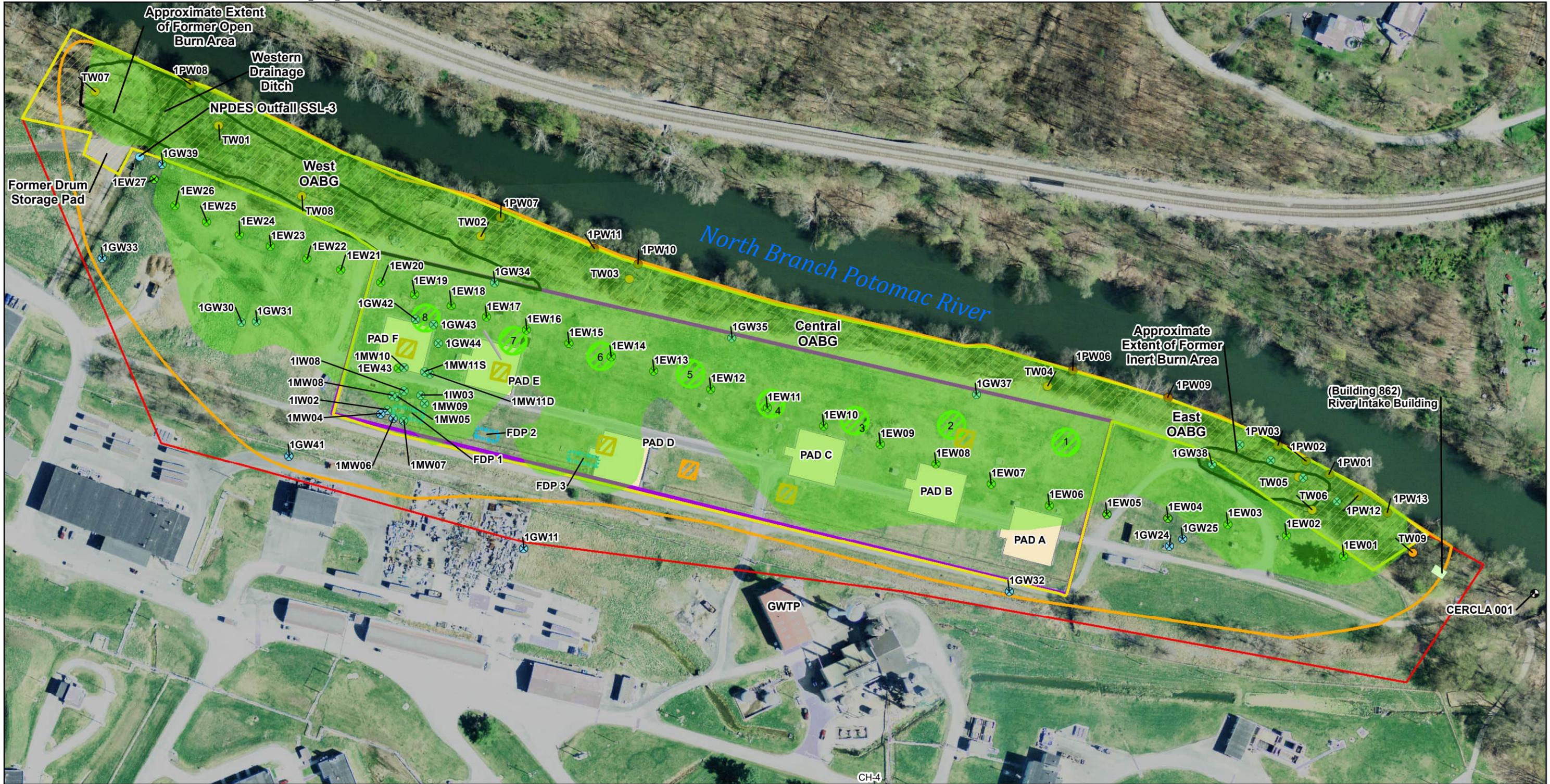
Site Management Plan
 Allegany Ballistics Laboratory
 Rocket Center, West Virginia

Issue	Recommendation	Milestone Date	Progress Toward Goal: December 2022
Site 1			
<p>The data collected during the LTM program indicate that there is a potential negative influence on river receptors adjacent to Site 1.</p>	<p>Completion of the remedy for OU-4 is anticipated to positively impact the OU-3 monitoring results. River protectiveness sampling of sediment, storm water, and biota is scheduled for the summer 2 years following completion of OU-4 soil removal actions.</p> <p>In addition, optimization and characterization evaluations for OU-3 are ongoing, including assessment of potential migration pathways, groundwater discharge locations, and frequency and timing of partial capture loss. Based on results of these evaluations, establishment of site-specific river protectiveness levels will be established. The LTM program will then be modified to better monitor negative influence on potential river receptors.</p>	Sep-20	<p>Ongoing; The OU-4 RA is complete and final restoration activities were completed in April 2021 as established in the RACR completed in March 2022. LTM groundwater sampling will resume with Five-Year Review sampling and Post-RA river monitoring that occurred in Summer 2022. The data will be used to monitor river receptors, establish site-related COCs and LTM criteria, and evaluate remedy protectiveness.</p>
Site 5			
<p>The 2005 ROD estimates that the remedy will restore the aquifers at Site 5 to beneficial use in 16 years.</p>	<p>The remedy construction was completed in 2006. Considering that the remedy has been operating for nearly 50% of the projected duration, a TOR analysis is recommended to refine the remedy life cycle and determine if the existing substrate will continue to operate until the RAO is achieved.</p>	Dec-18	<p>Ongoing; Additional optimization investigations were completed in 2020 and 2021 including a TCE delineation and metals background study. A technical memorandum is being developed to document the results of the investigation.</p>
Site 10			
<p>The VI pathway was not evaluated for Site 10 (OU-5) as part of the RI/FS for this site. Although a VI investigation was conducted in 2016 and the results used to evaluate the current exposure scenario for the Final Addendum to the Comprehensive Fourth Five-Year Review, the report presenting the human health risk assessment for both the current and future exposure pathways has not been completed.</p>	<p>Finalize the VI Human Health Risk Assessment that includes the future exposure scenario evaluation.</p> <p>Modify the LUC RD for Site 10 to include LUCs and associated monitoring that address the potential future VI pathway, accordingly.</p>	Mar-19	<p>Ongoing; VI Investigations were completed in 2019, 2020, and 2022. The results and evaluation are documented in the revised Draft VI Report, which hasn't been finalized due to a disagreement between the Navy and USEPA on the exposure attenuation factors that are used to calculate VI risk. The document will be finalized once an agreement can be made. The LUC RD will be modified to include this potential pathway after the HHRA has been finalized.</p>
Site 12			
<p>The VI pathway was not evaluated for Site 12 (OU-8) as part of the RI/FS for this site. Although a VI investigation was conducted in 2016 and the results used to evaluate the current exposure scenario for the Final Addendum to the Comprehensive Fourth Five-Year Review, the report presenting the human health risk assessment for both the current and future exposure pathways has not been completed.</p>	<p>Finalize the VI Human Health Risk Assessment that includes the future exposure scenario evaluation.</p> <p>Modify the LUC RD for Site 12 to include LUCs and associated monitoring to address the potential future VI pathway, accordingly.</p>	Mar-19	<p>Ongoing; VI Investigations were completed in 2019, 2020, and 2022. The results and evaluation are documented in the revised Draft VI Report, which hasn't been finalized due to a disagreement between the Navy and USEPA on the exposure attenuation factors that are used to calculate VI risk. The document will be finalized once an agreement can be made. The LUC RD will be modified to include this potential pathway after the HHRA has been finalized.</p>

Table 3-2. Five-Year Review Issues, Recommendations, and Other Findings

Site Management Plan
 Allegany Ballistics Laboratory
 Rocket Center, West Virginia

Other Findings	Recommendation	Progress Toward Goal: December 2022
Site 1		
<p>The expected timeframe for RA as described in the ROD was 30 years. Compliance with chemical-specific ARARs (MCLs) for groundwater is not likely to occur within the assumed project life in the ROD. Once the soil source areas are mitigated or removed, it is anticipated that the contaminant mass in groundwater will be reduced.</p>	<p>Optimization analysis is being conducted to determine the time frame and practicability of reaching MCLs. Develop method for utilizing groundwater data to evaluate the potential risks to receptors in the river during capture loss. Consider investigation of contaminant mass stored in bedrock matrix that, if significant, may prolong required project life. Following the completion of the soils remedial action (OU-4), assess the groundwater remedial approach and associated time frames.</p>	<p>The Site 1 optimization investigation activities were completed in February 2021, and the results are documented in the Draft Site 1 Remedial Action Optimization Additional Characterization Report (submitted in August 2022). Further evaluation of the effectiveness of the RA activities on groundwater contamination will continue in 2022 utilizing LTM/Five-Year Review and river monitoring sampling data.</p>
<p>COCs were not specifically identified in the 1997 ROD.</p>	<p>Develop a COC list and establish cleanup levels based on Remedial Investigation and LTM results to date. Document revised COCs and cleanup levels in post-ROD documentation file, as appropriate.</p>	<p>The COC list will be refined following completion of river monitoring, optimization studies, and LTM/Five-Year Review monitoring activities.</p>
<p>Bedrock extraction well EW30 has diminished pumping capacity and attempted refurbishment was unsuccessful. This extraction well is located near a suspected source area near the FDPs and thus may be an important area to optimize extraction of contaminant mass.</p>	<p>Use results of forthcoming Optimization Characterization (which includes characterization of alluvial and bedrock groundwater conditions near the FDPs) and updated groundwater flow model to assess whether EW30 should be replaced, and if so, the optimal location.</p>	<p>Ongoing; Site 1 optimization investigation activities were completed in February 2021, and the results are documented in the Draft Site 1 Remedial Action Optimization Additional Characterization Report (submitted in August 2022).</p>
Site 5		
<p>Iron and Manganese Site Remediation Goals identified in the ROD are not reflective of current toxicity values and do not reflect potential site-specific background concentrations.</p>	<p>Revise the Site Remediation Goals to reflect current toxicity values.</p>	<p>SRGs are anticipated to be updated with the next Site 1 LTM SAP development.</p>
Site 10		
<p>Iron and Manganese Site Remediation Goals identified in the ROD are not reflective of current toxicity values and do not reflect potential site-specific background concentrations.</p>	<p>Revise the Site Remediation Goals to reflect current toxicity values and develop post-ROD documentation file, as appropriate.</p>	<p>The Site 5 metals background study occurred from October 2020 to October 2021 to develop background values for iron and manganese. The results are being evaluated and will be presented in a forthcoming report.</p>
Sites 11 and 12		
<p>Uncertainty exists associated with alluvial and bedrock plume extent and contaminant concentrations in the southwestern portion of the site.</p>	<p>Revise the long-term monitoring well network to include appropriate wells that further define the plume extent and concentrations of TCE and PCE in the southwestern portion of the site.</p>	<p>Site 10 TCE and PCE plume delineation is complete and the associated technical memorandum documenting the results was finalized May 2021. LTM well network was updated in the 2022 Site 10 Five-Year Review SAP based upon the results.</p>
<p>The 2011 ROD does not reflect SRGs based on the most recent toxicity values for OU-11 (Site 11 Groundwater) and OU-8 (Site 12 Groundwater).</p>	<p>Update the Site Remediation Goals to reflect the most recent toxicity values and document accordingly in the post-ROD documentation file, as appropriate.</p>	<p>WVDEP and USEPA agreed to updating the SRGs using the updated USEPA RSLs and the updated SRGs will be documented in an ESD. The ESD will be prepared with the VI update.</p>



Legend

- | | | | |
|---|--|--|---|
| <ul style="list-style-type: none"> ⊗ Extraction Well - Alluvial ⊗ Monitoring Well - Alluvial ● Temporary Well Location - Abandoned ● Pore Water Sample Locations ● NPDES Outfall SSL-3 ⊙ CERCLA 001 | <ul style="list-style-type: none"> Plume boundary for TCE, DCE, and VC greater than screening criteria Approximate location of former burn pans Former Earthen Burn Pads Former Inert and Open Burn Area Former Disposal Pits (FDP) | <ul style="list-style-type: none"> Active Burning Ground Outside Active Burning Ground (OABG) Soil Land Use Control Boundary | <ul style="list-style-type: none"> Current Concrete Burn Pads Restricted Groundwater Use Boundary Site Boundary |
|---|--|--|---|

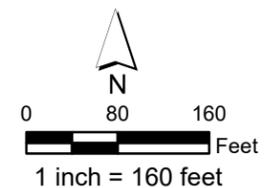
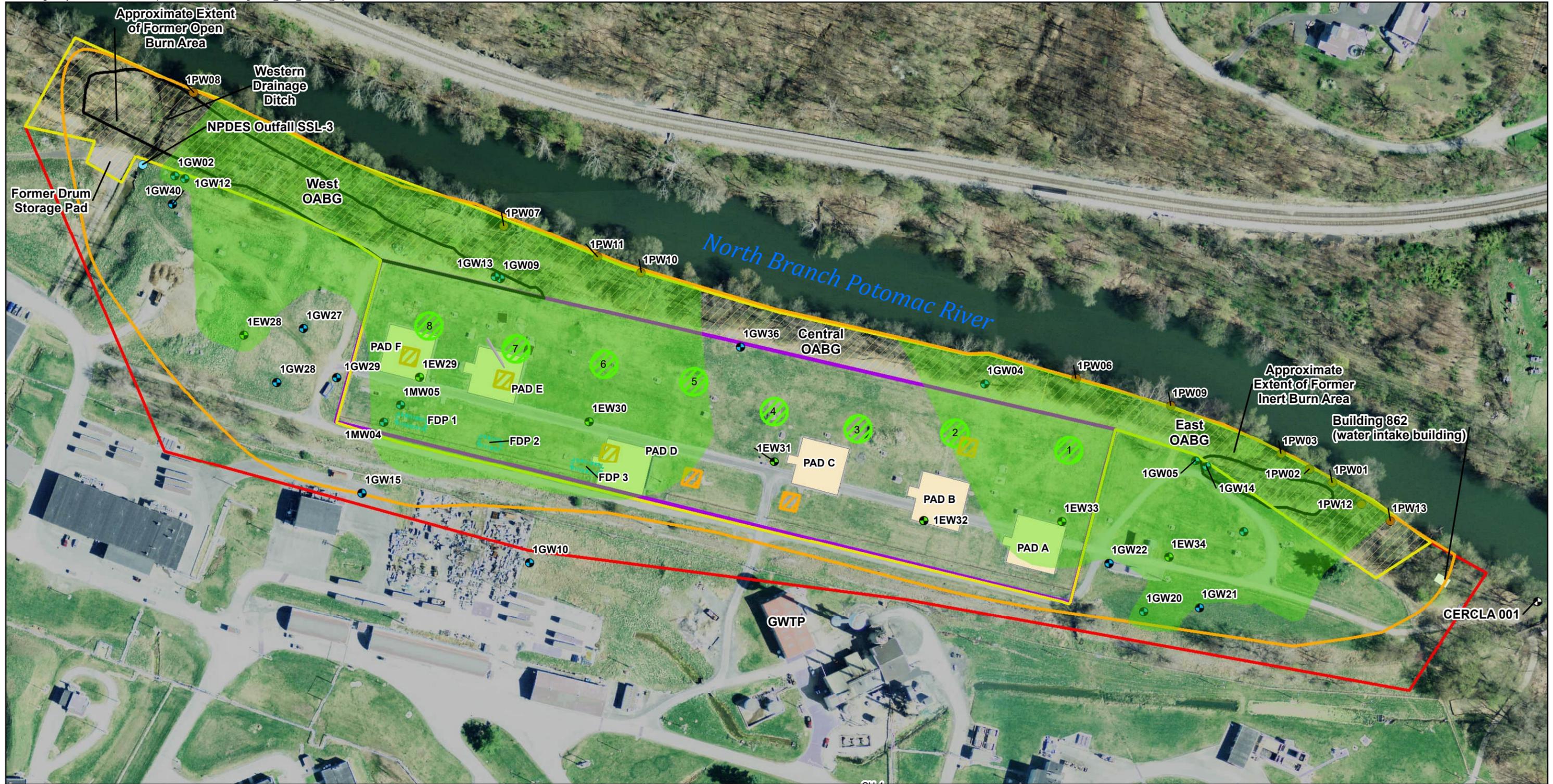


Figure 3-1
Site 1 Alluvial Aquifer
Site Management Plan
Allegany Ballistics Laboratory
Rocket Center, West Virginia



Legend

- | | | |
|---|--|--|
| ● Monitoring Well - Bedrock | ▭ Soil Land Use Control Boundary | ▭ Active Burning Ground |
| ● Extraction Well - Bedrock | ▭ Site Boundary | ▭ Outside Active Burning Ground (OABG) |
| ● Pore Water Sample Locations | ▭ Approximate location of former burn pans | ▭ Current Concrete Burn Pads |
| ● NPDES Outfall SSL-3 | ▭ Former Earthen Burn Pads | ▭ Restricted Groundwater Use Boundary |
| Plume boundary for TCE, DCE, and VC greater than screening criteria | ▭ Former Inert and Open Burn Area | |
| | ▭ Former Disposal Pits (FDP) | |

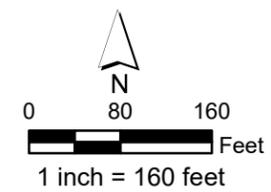
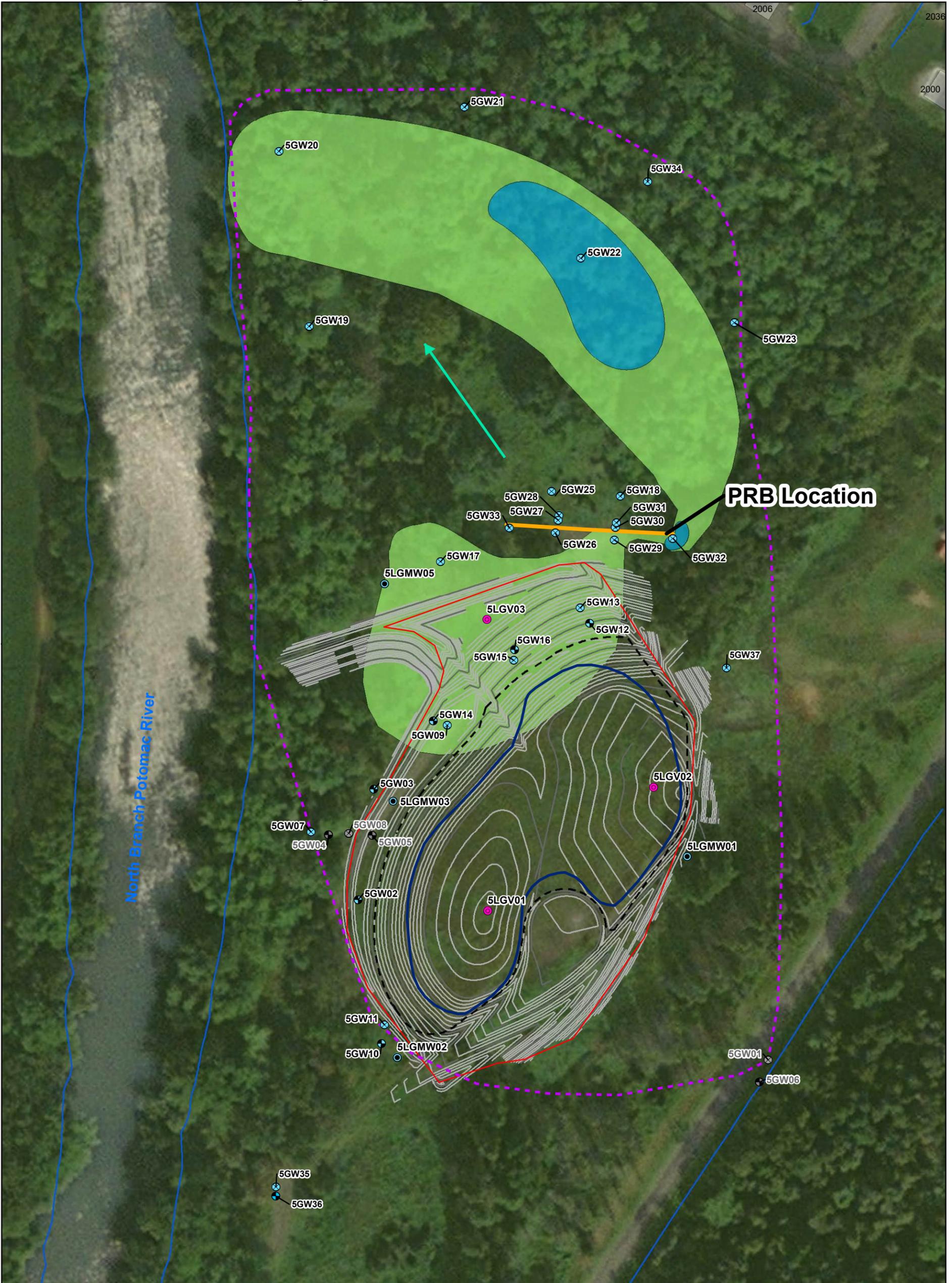


Figure 3-2
 Site 1 Bedrock Aquifer
 Site Management Plan
 Allegany Ballistics Laboratory
 Rocket Center, West Virginia



Legend

- Monitoring Well - Alluvial
- Monitoring Well - Bedrock
- Abandoned Monitoring Well - Alluvial
- Abandoned Monitoring Well - Bedrock
- Landfill Gas Monitoring Well
- Landfill Gas Vent

- Alluvial Groundwater Flow
- Water Body
- PRB
- Edge of Landfill Cap (installed October 1997)
- Edge of Waste
- Buildings

Site 5 Alluvial (September/October 2020 and February 2021 TCE concentrations used for most locations, with June 2017 TCE concentrations considered for perimeter wells)

- 5 - 20
- 20 - 40

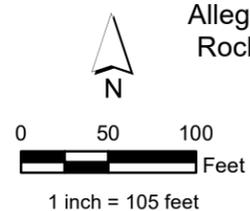
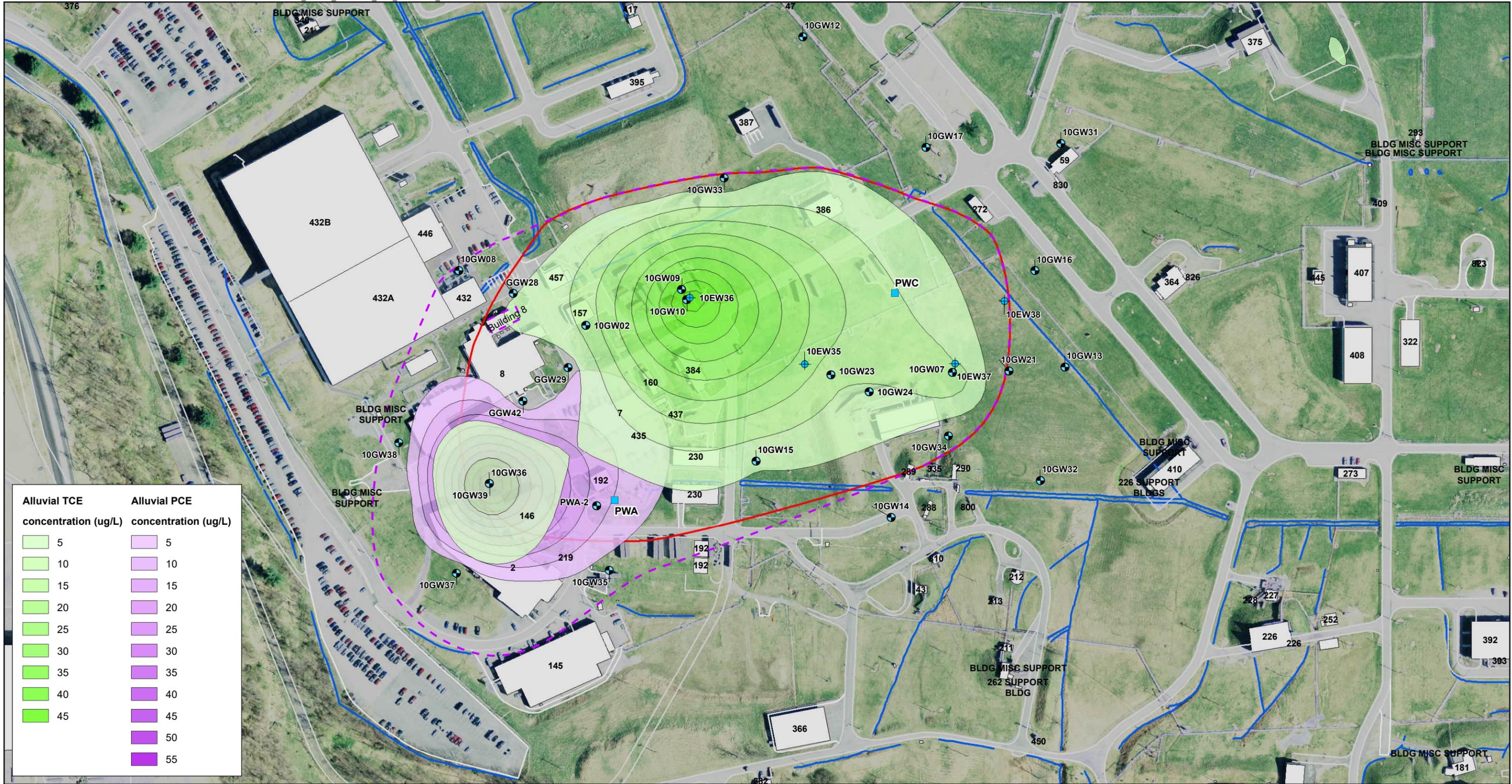


Figure 3-3
Site 5 Layout
Site Management Plan
Allegany Ballistics Laboratory
Rocket Center, West Virginia



Alluvial TCE concentration (ug/L)	Alluvial PCE concentration (ug/L)
5	5
10	10
15	15
20	20
25	25
30	30
35	35
40	40
45	45
	50
	55

- Legend**
- Former Production Wells
 - Monitoring Well - Alluvial
 - ⊕ Extraction Well - Alluvial
 - Roads
 - ~ Surface Water
 - ⌞ Area of Restricted Groundwater Use
 - ▭ Site Boundary
 - ▭ Buildings

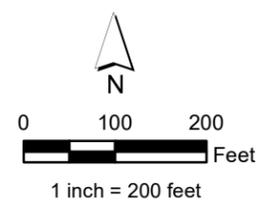
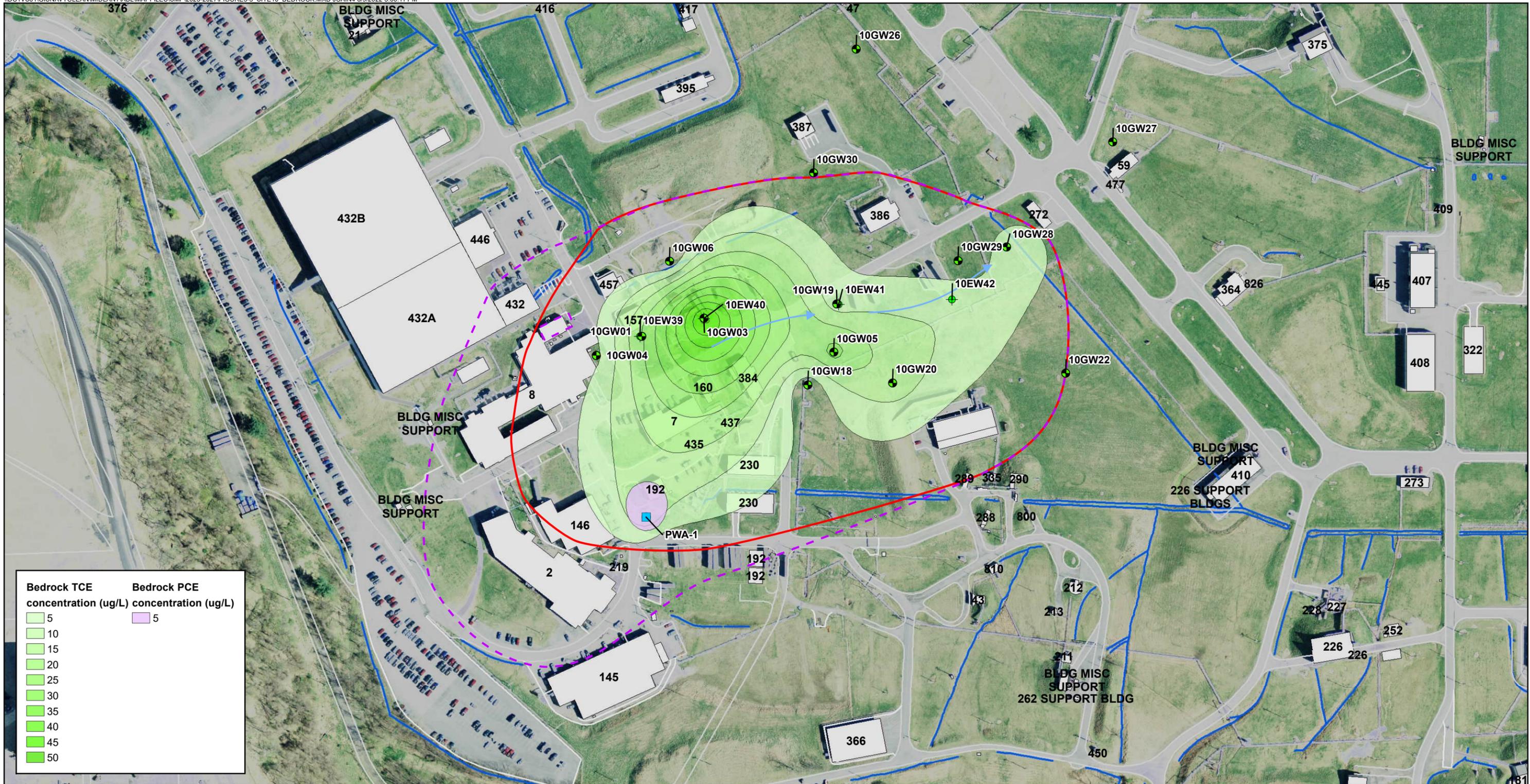


Figure 3-4
 Site 10 Alluvial Aquifer
 Site Management Plan
 Allegany Ballistics Laboratory
 Rocket Center, West Virginia



Bedrock TCE concentration (ug/L)	Bedrock PCE concentration (ug/L)
5	5
10	
15	
20	
25	
30	
35	
40	
45	
50	

- Legend**
- Former Production Well
 - Monitoring Well - Bedrock
 - ◆ Extraction Well - Bedrock
 - Roads
 - Surface Water
 - ▭ Site Boundary
 - ▭ Buildings

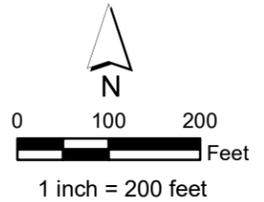
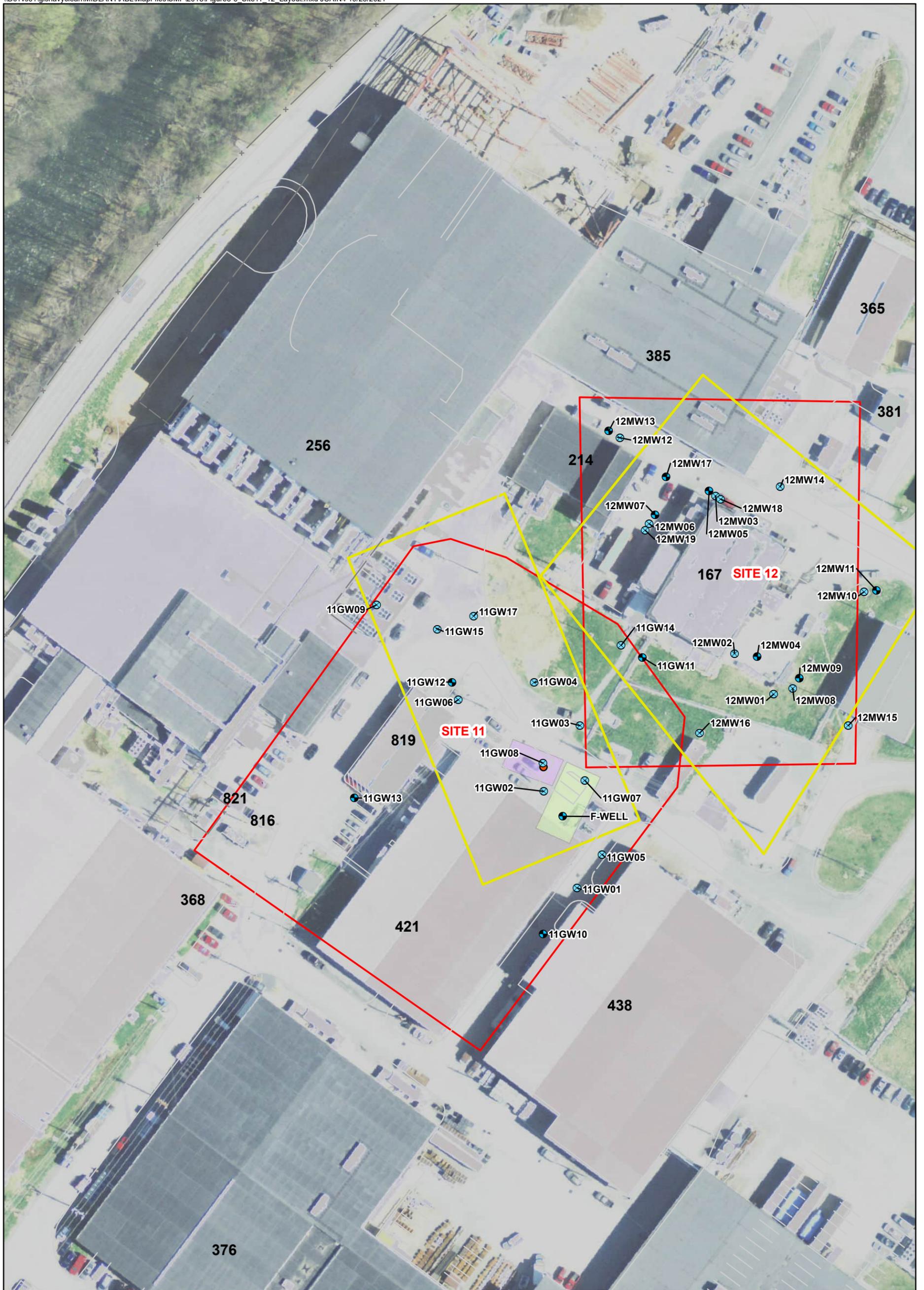


Figure 3-5
Site 10 Bedrock Aquifer
Site Management Plan
Allegany Ballistics Laboratory
Rocket Center, West Virginia



Legend

- Bedrock Monitoring Well
- ⊗ Alluvial Monitoring Well
- Former Oil Pit
- Former Building 215
- Former Diked Fuel Storage Area
- Yellow outline LUC Boundary
- Red outline Site Boundary

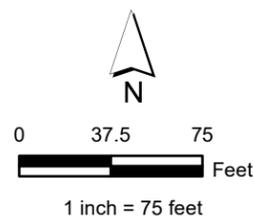


Figure 3-6
 Sites 11 and 12 Layout
 Site Management Plan
 Allegany Ballistics Laboratory
 Rocket Center, West Virginia



- Legend**
- Bedrock Monitoring Well
 - Alluvial Monitoring Well
 - TCE Plume Boundary
 - Site 13 Boundary

Note: The groundwater plume configuration is based on data collected as part of the Remedial Investigation.

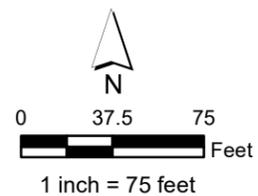


Figure 3-7
Site 13 Range Road Area
Site Management Plan
Allegany Ballistics Laboratory
Rocket Center, West Virginia

Site Management Plan Schedules

This section presents schedules for response actions planned from FY 2023 through FY 2027. Project-specific schedules for active projects will be updated periodically in the SMP. For projects that are active, the current project schedules are presented. For projects that have not yet been initiated or for which project schedules have not been developed, scheduling assumptions are discussed in the following subsections.

4.1 Partnering Team at ABL

Team partnering was introduced to ABL to streamline the cleanup of former disposal sites by using consensus-based site management strategies during the CERCLA process. Originally, the Team consisted of the Navy, USEPA, WVDEP, Maryland Department of Environment (MDE), and Navy's contractors. However, with the exception of the Site 1 design and RA construction components impacting the North Branch Potomac River, MDE is no longer actively involved with the Team. The implementation of the streamlined oversight process has promoted a high degree of communication, understanding, and cooperation among all of the involved groups to help reduce costs and expedite cleanup and closure of IRP sites.

A Technical Review Committee was established at ABL on February 9, 1989, with approximately 20 members. At the December 1994 meeting, the Technical Review Committee began its transition to a RAB to provide active community participation with regards to the IRP. The new RAB was established in April 1995, initially meeting about twice per year. All RAB meetings were open to the general public and were announced by notices published in local newspapers. The RAB has been inactive since 2006, due to lack of public attendance. The CIP update was finalized in January 2019 and evaluated public interest in the RAB. After acquiring and evaluating stakeholder responses and analyzing the community data, the CIP update proposed to formally adjourn the RAB. Specific recommendations for community involvement can be found in the CIP update. The formal RAB adjournment process is scheduled to be completed by the end of 2021 via a RAB adjournment memorandum in accordance with the recommendation in the CIP update (CH2M, 2019a) and following DoD guidance.

The scheduling assumptions presented below represent an ideal flow of work for sites that are addressed through conventional cleanup approach. These assumptions do not account for how the streamlined oversight process may affect schedules and potentially affect the sequence of tasks, as the Team evaluates project progress on an accelerated basis and expedites the decision-making process. The goal of the streamlined oversight process is to streamline the regulatory review processes of implementation, decision-making, reporting, and other environmental regulatory documentation, and to achieve significant savings of time and funds.

4.2 Scheduling Assumptions

Assumptions regarding duration of field investigations, laboratory analyses, data validation, document preparation, document review, and RD/RA are discussed below.

4.2.1 Field Investigation and Laboratory Analysis/Validation

The time required for RI field investigations depends upon the size and complexity of the site and the overall scope of the field investigation (e.g., types of field investigation activities, number of sampling rounds, etc.). Field investigations generally require several weeks to several months to complete.

28 days is the standard turnaround time for approved laboratories under the current Navy CLEAN contracts. Therefore, a 28-day turnaround time and a 14-day duration are generally assumed for standard laboratory analysis and for full validation of laboratory data, respectively. Depending on individual field events, laboratory and validation durations may vary slightly from the standard durations described above.

4.2.2 Document Preparation and Document Review

The time required for document preparation under the CERCLA process has been estimated based on prior experience in preparing the various types of documents. A summary of the estimated times required for development of the various types of documents typically prepared during the CERCLA process is presented in **Table 4-1**. The durations presented in **Table 4-1** represent the time required to prepare the initial draft document and do not include time required for review and subsequent revisions of the document.

The time required for document review generally will vary according to the length and complexity of the document, as well as the availability of resources on the part of the reviewing agencies. In accordance with the FFA, unless mutually agreed upon by the Team, all draft documents will be subject to a 60-day review and comment period. There are two exceptions to the time periods required for review and comment on documents in the FFA. According to the FFA, pre-final RDs will be subject to a 45-day review and comment period and final RDs will be subject to a 14-day review and comment period. In the event that significant changes are made to the design between the pre-final and final designs, the USEPA may extend the review period for another 14 days. As discussed in the FFA, in some cases the review and comment period on draft RDs and RA work plans may need to be expedited for the Navy to satisfy CERCLA requirements.

In many cases, the Navy may choose to have a concurrent review period for draft documents. In those cases, no initial NAVFAC/Activity review would be required for the draft document.

During development of the FY 2020 schedules, USEPA Region III requested an extension for review and finalization timeframes for milestone documents such as PRAPs, RODs, Five-Year Reviews, and ESDs. Therefore, the review schedules outlined in this SMP were extended to accommodate this request.

4.3 Installation Restoration Program Project Schedules

Site-specific schedules are provided in **Figures 4-1** through **4-6**. The basic strategy used during development of the IRP project schedules was to overlap the RI/FS and RD/RA activities to the maximum extent practicable. By overlapping activities, the overall project schedules are compressed without compromising the interdependencies of the various tasks and documents in the CERCLA process. The amount of overlap of tasks was based on the degree of dependency between the various tasks and documents. Key dependencies and related assumptions are outlined below.

- RI: Preparation of the draft RI was assumed to start once all of the validated analytical data have been received. Certain RI tasks can begin before the data are validated; however, in order to prevent duplication of effort, this overlap was assumed to be only 2 weeks.
- FS: Preparation of the draft FS was assumed to begin approximately 4 months following the start of the RI. Many FS tasks are dependent on the nature and extent of contamination, which are generally defined in the RI report. Where appropriate to facilitate document review and improve efficiency, a combined RI/FS may be prepared rather than separate RI and FS documents.
- PRAP and ROD: A preparation of the draft PRAP was assumed to start following receipt of agency comments of the draft final FS, because selection of the proposed RA(s) in the PRAP/ROD is contingent upon agency approval of the recommended alternative.
- Because public comments received during the public comment period must be responded to in the Responsiveness Summary, preparation of the final ROD would not begin until closure of the public comment period.

Table 4-1. Document Preparation Durations

Document	Duration (Months)^a
AOC Close-Out Document	1
SSP Work Plan	1
SSP Report	1-2
Preliminary Assessment/Site Inspection	2
EE/CA	1-2
RI/FS Work SAP	3
RI Report	1-2
Supplemental Investigation SAP	3
Supplemental Investigation Report	1-2
FS	2-3
PRAP	1-2
ROD	1-2
Preliminary/Conceptual RD	2
Pre-Final RD	2
Final RD	1-2
Treatability Study Work Plan	2
Treatability Study Report	1-2
Removal Action Work Plan	2
Removal Action Completion Report	1-2

^a Durations represent estimated time required to complete draft documents.

Figure 4-1
 Site 1 Long Term Groundwater Monitoring Operations and Maintenance Schedule
 Allegany Ballistics Laboratory

ID	Task Name	Duration	Start	Finish	2023				2024				2025				2026				2027			
					Q4	Q1	Q2	Q3																
1	OABG Annual Inspections	1050 days	Tue 8/1/23	Mon 8/9/27																				
2	2023 Restoration Inspection and Maintenance	1 day	Tue 8/1/23	Tue 8/1/23																				
3	2024 Restoration Inspection and Maintenance	1 day	Fri 8/2/24	Fri 8/2/24																				
4	2025 Restoration Inspection and Maintenance	1 day	Tue 8/5/25	Tue 8/5/25																				
5	2026 Restoration Inspection and Maintenance	1 day	Thu 8/6/26	Thu 8/6/26																				
6	2027 Restoration Inspection and Maintenance (RC Milestone)	1 day	Mon 8/9/27	Mon 8/9/27																				
7	Site 1 Annual Long Term Monitoring	1157 ...	Mon 1/2/23	Tue 6/8/27																				
8	LTM UFP SAP	115 d...	Mon 1/2/23	Fri 6/9/23																				
9	UFP SAP Draft Preparation	45 days	Mon 1/2/23	Fri 3/3/23																				
10	UFP SAP Navy and Regulatory Review	60 days	Mon 3/6/23	Fri 5/26/23																				
11	UFP SAP Final	10 days	Mon 5/29/23	Fri 6/9/23																				
12	LTM Sampling	1027 ...	Sat 7/1/23	Tue 6/8/27																				
13	2023 LTM Sampling - Groundwater Monitoring	5 days	Sat 7/1/23	Fri 7/7/23																				
14	2024 LTM Sampling - Groundwater Monitoring	5 days	Sat 6/1/24	Fri 6/7/24																				
15	2025 LTM Sampling - Groundwater Monitoring	5 days	Mon 6/2/25	Fri 6/6/25																				
16	2026 LTM Sampling - Groundwater Monitoring	5 days	Mon 6/1/26	Fri 6/5/26																				
17	2027 LTM Sampling - Groundwater Monitoring	5 days	Wed 6/2/27	Tue 6/8/27																				
18	Sites 1 & 10 GWTP Monthly O&M	1563 ...	Tue 1/3/23	Thu 12/28/28																				
19	2023 Monthly O&M (Corrective maintenance, Monthly Gauging, Monthly Influent Sampling, Quarterly Pressure Tests)	259 days	Tue 1/3/23	Fri 12/29/23																				
20	2024 Monthly O&M (Corrective maintenance, Monthly Gauging, Monthly Influent Sampling, Quarterly Pressure Tests)	260 days	Tue 1/2/24	Mon 12/30/24																				

Project: ABL O&M
 Date: Thu 8/18/22

Task		Project Summary		Inactive Milestone		Manual Summary Rollup		Progress	
Split		External Tasks		Inactive Summary		Manual Summary		Split	
Milestone		External MileTask		Manual Task		Start-only			
Summary		Inactive Task		Duration-only		Finish-only			

Figure 4-2
 Site 5 Long-Term Monitoring Operations and Maintenance Schedule
 Allegany Ballistics Laboratory

ID	Task Name	Physical % Complete	Duration	Start	Finish	2022		2023		2024		2025		2026		2027	
						H1	H2										
1	O&M Quarterly Site 5 Inspection, landfill gas well and vent monitoring, and annual gas well sampling	0%	1306 days	Mon 1/3/22	Thu 12/31/26												
2	2022 Site 5 O&M	0%	260 days	Mon 1/3/22	Fri 12/30/22												
3	Conduct Q4 2022 Quarterly Site 5 Landfill O&M	0%	1 day	Thu 12/15/22	Thu 12/15/22												
4	2023 Site 5 O&M	0%	261 days	Mon 1/2/23	Fri 12/29/23												
5	Conduct Q1 2023 Quarterly Site 5 Landfill O&M	0%	1 day	Wed 3/15/23	Wed 3/15/23												
6	Conduct Q2 2023 Quarterly Site 5 Landfill O&M	0%	1 day	Thu 6/15/23	Thu 6/15/23												
7	Conduct Q3 2023 Quarterly Site 5 Landfill O&M	0%	1 day	Fri 9/15/23	Fri 9/15/23												
8	Conduct Q4 2023 Quarterly Site 5 Landfill O&M	0%	1 day	Fri 12/15/23	Fri 12/15/23												
9	2024 Site 5 O&M	0%	263 days	Mon 1/1/24	Tue 12/31/24												
10	Conduct Q1 2024 Quarterly Site 5 Landfill O&M	0%	1 day	Fri 3/15/24	Fri 3/15/24												
11	Conduct Q2 2024 Quarterly Site 5 Landfill O&M	0%	1 day	Mon 6/17/24	Mon 6/17/24												
12	Conduct Q3 2024 Quarterly Site 5 Landfill O&M	0%	1 day	Mon 9/16/24	Mon 9/16/24												
13	Conduct Q4 2024 Quarterly Site 5 Landfill O&M	0%	1 day	Mon 12/16/24	Mon 12/16/24												
14	2025 Site 5 O&M	0%	261 days	Wed 1/1/25	Wed 12/31/25												
15	Conduct Q1 2025 Quarterly Site 5 Landfill O&M	0%	1 day	Mon 3/17/25	Mon 3/17/25												
16	Conduct Q2 2025 Quarterly Site 5 Landfill O&M	0%	1 day	Tue 6/17/25	Tue 6/17/25												
17	Conduct Q3 2025 Quarterly Site 5 Landfill O&M	0%	1 day	Tue 9/16/25	Tue 9/16/25												
18	Conduct Q4 2025 Quarterly Site 5 Landfill O&M	0%	1 day	Tue 12/16/25	Tue 12/16/25												
19	2026 Site 5 O&M	0%	261 days	Thu 1/1/26	Thu 12/31/26												

Project: ABL O&M
 Date: Thu 8/18/22

Task		Project Summary		Inactive Milestone		Manual Summary Rollup		Progress	
Split		External Tasks		Inactive Summary		Manual Summary		Split	
Milestone		External MileTask		Manual Task		Start-only			
Summary		Inactive Task		Duration-only		Finish-only			

Figure 4-2
 Site 5 Long-Term Monitoring Operations and Maintenance Schedule
 Allegany Ballistics Laboratory

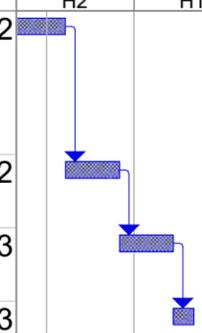
ID	Task Name	Physical % Complete	Duration	Start	Finish	2022		2023		2024		2025		2026		2027	
						H1	H2										
20	Conduct Q1 2026 Quarterly Site 5 Landfill O&M	0%	1 day	Mon 3/16/26	Mon 3/16/26												
21	Conduct Q2 2026 Quarterly Site 5 Landfill O&M	0%	1 day	Mon 6/15/26	Mon 6/15/26												
22	Conduct Q3 2026 Quarterly Site 5 Landfill O&M	0%	1 day	Tue 9/15/26	Tue 9/15/26												
23	Conduct Q4 2026 Quarterly Site 5 Landfill O&M	0%	1 day	Tue 12/15/26	Tue 12/15/26												
24	2027 Site 5 O&M	0%	261 days	Fri 1/1/27	Fri 12/31/27												
25	Conduct Q1 2027 Quarterly Site 5 Landfill O&M	0%	1 day	Tue 3/16/27	Tue 3/16/27												
26	Conduct Q2 2027 Quarterly Site 5 Landfill O&M	0%	1 day	Tue 6/15/27	Tue 6/15/27												
27	Conduct Q3 2027 Quarterly Site 5 Landfill O&M	0%	1 day	Wed 9/15/27	Wed 9/15/27												
28	Conduct Q4 2027 Quarterly Site 5 Landfill O&M	0%	1 day	Wed 12/15/27	Wed 12/15/27												
29	LTM Site 5 Annual Groundwater Sampling	0%	1568 da...	Sat 1/1/22	Fri 12/31/27												
30	2023 LTM Sampling	0%	2 days	Wed 7/5/23	Thu 7/6/23												
31	2024 LTM Sampling	0%	2 days	Wed 7/3/24	Thu 7/4/24												
32	2025 LTM Sampling	0%	2 days	Fri 7/4/25	Mon 7/7/25												
33	2026 LTM Sampling	0%	2 days	Tue 7/7/26	Wed 7/8/26												
34	2027 LTM Sampling	0%	2 days	Thu 7/8/27	Fri 7/9/27												
35	Site 5 TCE Plume Investigation and Background Study	0%	262 days	Fri 4/1/22	Mon 4/3/23												
36	Background Study and TCE Plume Investigation Report	0%	262 days	Fri 4/1/22	Mon 4/3/23												

Project: ABL O&M
 Date: Thu 8/18/22

Task		Project Summary		Inactive Milestone		Manual Summary Rollup		Progress	
Split		External Tasks		Inactive Summary		Manual Summary		Split	
Milestone		External MileTask		Manual Task		Start-only			
Summary		Inactive Task		Duration-only		Finish-only			

Figure 4-2
 Site 5 Long-Term Monitoring Operations and Maintenance Schedule
 Allegany Ballistics Laboratory

ID	Task Name	Physical % Complete	Duration	Start	Finish	2022		2023		2024		2025		2026		2027	
						H1	H2										
37	Draft Site 5 TCE Plume Investigation and Background Study Technical Memorandum	0%	120 days	Fri 4/1/22	Thu 9/15/22												
38	Internal Navy Review Pre-Draft	0%	60 days	Fri 9/16/22	Thu 12/8/22												
39	Regulatory Review of Technical Memorandum	0%	60 days	Fri 12/9/22	Thu 3/2/23												
40	Final Site 5 TCE Plume Investigation and Background Study Technical Memorandum	0%	22 days	Fri 3/3/23	Mon 4/3/23												



Project: ABL O&M Date: Thu 8/18/22	Task		Project Summary		Inactive Milestone		Manual Summary Rollup		Progress	
	Split		External Tasks		Inactive Summary		Manual Summary		Split	
	Milestone		External MileTask		Manual Task		Start-only			
	Summary		Inactive Task		Duration-only		Finish-only			

Figure 4-3
 Site 10 Long-Term Groundwater Monitoring and Operations and Maintenance Schedule
 Allegany Ballistics Laboratory

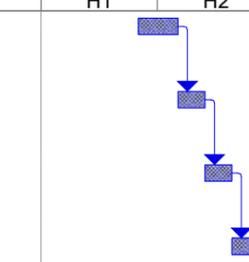
ID	Task Name	Physical % Complete	Duration	Start	Finish	2022		2023		2024		2025		2026		2027	
						H2	H1	H2	H1	H2	H1	H2	H1	H2			
1	Site 10 GWTP Monthly O&M	0%	1305 days	Tue 1/3/23	Mon 1/3/28												
2	2023 Quarterly Pressure Tests, Corrective maintenance, Monthly Gauging	0%	260 days	Tue 1/3/23	Mon 1/1/24												
3	2024 Quarterly Pressure Tests, Corrective maintenance, Monthly Gauging	0%	260 days	Tue 1/2/24	Mon 12/30/24												
4	2025 Quarterly Pressure Tests, Corrective maintenance, Monthly Gauging	0%	262 days	Wed 1/1/25	Thu 1/1/26												
5	2026 Quarterly Pressure Tests, Corrective maintenance, Monthly Gauging	0%	262 days	Thu 1/1/26	Fri 1/1/27												
6	2027 Quarterly Pressure Tests, Corrective maintenance, Monthly Gauging	0%	262 days	Fri 1/1/27	Mon 1/3/28												
7	LTM Site 10 LTM Sampling - Every 5 Years	0%	15 days	Tue 2/9/27	Mon 3/1/27												
8	2027 LTM Sampling	0%	15 days	Tue 2/9/27	Mon 3/1/27												
9	Site 10 Pilot Test Extraction Well Shutdown	0%	225 days	Mon 9/19/22	Fri 7/28/23												
10	Pilot Test Evaluation Report	0%	225 days	Mon 9/19/22	Fri 7/28/23												
11	Draft Technical Memorandum	0%	45 days	Mon 9/19/22	Fri 11/18/22												
12	Navy Review Pre-Draft	0%	60 days	Mon 11/21/22	Fri 2/10/23												
13	Regulatory Review Draft	0%	60 days	Mon 2/13/23	Fri 5/5/23												
14	Final Technical Memorandum	0%	60 days	Mon 5/8/23	Fri 7/28/23												
15	LUC RD Update	0%	126 days	Thu 6/1/23	Thu 11/23/23												

Project: ABL O&M
 Date: Thu 8/18/22

Task		Project Summary		Inactive Milestone		Manual Summary Rollup		Progress	
Split		External Tasks		Inactive Summary		Manual Summary		Split	
Milestone		External MileTask		Manual Task		Start-only			
Summary		Inactive Task		Duration-only		Finish-only			

Figure 4-3
 Site 10 Long-Term Groundwater Monitoring and Operations and Maintenance Schedule
 Allegany Ballistics Laboratory

ID	Task Name	Physical % Complete	Duration	Start	Finish	2022		2023		2024		2025		2026		2027	
						H1	H2										
16	LUC RD Update Preparation	0%	44 days	Thu 6/1/23	Tue 8/1/23												
17	Internal Navy Review Pre-Draft	0%	30 days	Wed 8/2/23	Tue 9/12/23												
18	LUC RD Update Regulatory Review	0%	30 days	Wed 9/13/23	Tue 10/24/23												
19	Final LUC RD	0%	22 days	Wed 10/25/...	Thu 11/23/23												



Project: ABL O&M
 Date: Thu 8/18/22

Task		Project Summary		Inactive Milestone		Manual Summary Rollup		Progress	
Split		External Tasks		Inactive Summary		Manual Summary		Split	
Milestone		External MileTask		Manual Task		Start-only			
Summary		Inactive Task		Duration-only		Finish-only			

Figure 4-4
 Sites 11 and 12 Schedule
 Allegany Ballistics Laboratory

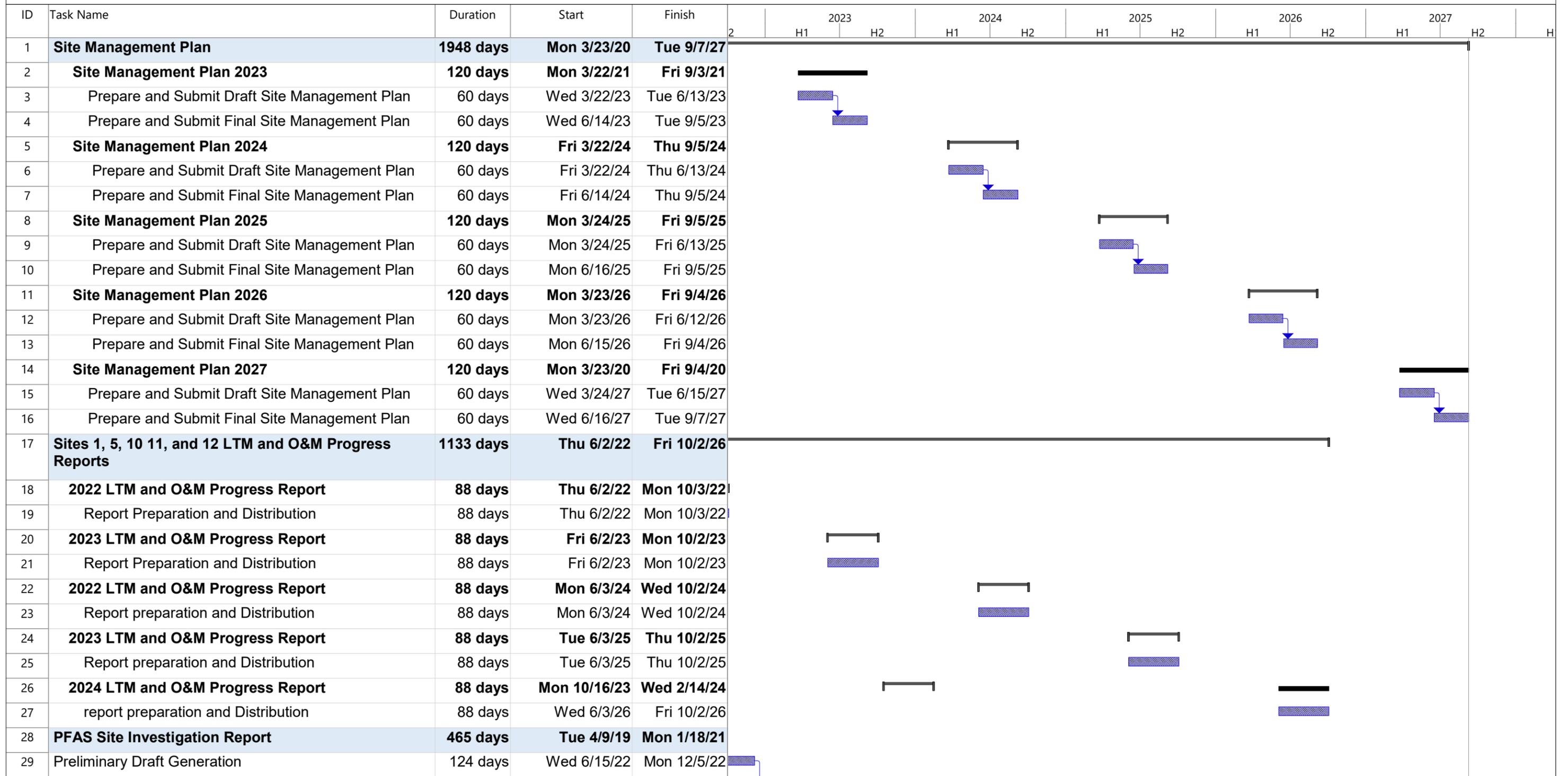
ID	Task Name	Duration	Start	Finish	2023			2024			2025			2026			2027					
					Sep	Jan	May	Sep														
1	LTM Sampling and Evaluation	1039 days	Wed 6/28/23	Mon 6/21/27																		
2	2023 Annual Groundwater LTM Sampling	5 days	Wed 6/28/23	Tue 7/4/23																		
3	2024 Annual Groundwater LTM Sampling	5 days	Mon 6/17/24	Fri 6/21/24																		
4	2025 Annual Groundwater LTM Sampling	5 days	Tue 6/17/25	Mon 6/23/25																		
5	2026 Annual Groundwater LTM Sampling	5 days	Tue 6/16/26	Mon 6/22/26																		
6	2027 Annual Groundwater LTM Sampling	5 days	Tue 6/15/27	Mon 6/21/27																		
7	Site 12 LUC RD Update	126 days	Thu 6/1/23	Thu 11/23/23																		
8	LUC RD Update Preparation	44 days	Thu 6/1/23	Tue 8/1/23																		
9	Internal Navy Review Pre-Draft	30 days	Wed 8/2/23	Tue 9/12/23																		
10	LUC RD Update Regulatory Review	30 days	Wed 9/13/23	Tue 10/24/23																		
11	Final LUC RD	22 days	Wed 10/25/23	Thu 11/23/23																		

Project: 4-4_Sites 11 and 12 Septemb Date: Thu 8/18/22	Task		Project Summary		Inactive Summary		Manual Summary		External Milestone	
	Split		External Tasks		Manual Task		Start-only		Progress	
	Milestone		External Milestone		Duration-only		Finish-only		Deadline	
	Summary		Inactive Milestone		Manual Summary Rollup		External Tasks			

Figure 4-5
 Site 13 (Range Road Area) Schedule
 Allegany Ballistics Laboratory

ID	Task Name	Duration	Start	Finish	Predecessors	Timeline																	
						2023	2024	2025	2026	2027													
1	Site 13 Remedial Investigation/Feasibility Study	173 days	Fri 9/9/22	Tue 2/28/23		Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	
2	Draft Final Report (Incorporate new GW/soil data)	60 days	Fri 9/9/22	Mon 11/7/22																			
3	Internal Navy Review Draft Final	30 days	Tue 11/8/22	Wed 12/7/22	2																		
4	Regulatory Review Draft Final	60 days	Thu 12/8/22	Sun 2/5/23	3																		
5	Response to Comments	7 days	Mon 2/6/23	Sun 2/12/23	4																		
6	Regulatory Concurrence Final	15 days	Mon 2/13/23	Mon 2/27/23	5																		
7	Final Deliverable	1 day	Tue 2/28/23	Tue 2/28/23	6																		
8	PRAP for Site 13	472 days	Wed 3/1/23	Fri 6/14/24																			
9	Pre-Draft Report Development	60 days	Wed 3/1/23	Sat 4/29/23	7																		
10	Internal Navy Review Pre-Draft	30 days	Sun 4/30/23	Mon 5/29/23	9																		
11	Response to Comments	7 days	Tue 5/30/23	Mon 6/5/23	10																		
12	Internal Navy Review Draft	15 days	Tue 6/6/23	Tue 6/20/23	11																		
13	Regulatory Review Draft	268 days	Wed 6/21/23	Thu 3/14/24	12																		
14	Response to Comments	7 days	Fri 3/15/24	Thu 3/21/24	13																		
15	Regulatory Review Draft Final	30 days	Fri 3/22/24	Sat 4/20/24	14																		
16	Response to Comments/Final	7 days	Sun 4/21/24	Sat 4/27/24	15																		
17	Final Deliverable	3 days	Sun 4/28/24	Tue 4/30/24	16																		
18	Public Meeting/Comment Period	45 days	Wed 5/1/24	Fri 6/14/24	17																		
19	ROD for Site 13	694 days	Sun 4/30/23	Sun 3/23/25																			
20	Draft Report Development	217 days	Sun 4/30/23	Sat 12/2/23	9																		
21	Navy/ Regulatory Review of Draft	30 days	Sun 12/3/23	Mon 1/1/24	20																		
22	Response to Comments	32 days	Tue 1/2/24	Fri 2/2/24	21																		
23	EPA Legal Review of Draft	310 days	Sat 2/3/24	Sun 12/8/24	22																		
24	Response to Comments	30 days	Mon 12/9/24	Tue 1/7/25	23																		
25	Regulatory Review Draft Final	20 days	Wed 1/8/25	Mon 1/27/25	24																		
26	Response to Comments	15 days	Tue 1/28/25	Tue 2/11/25	25																		
27	Regulatory Concurrence Final	10 days	Wed 2/12/25	Fri 2/21/25	26																		
28	Navy Signature	29 days	Sat 2/22/25	Sat 3/22/25	27																		
29	Final Deliverable	1 day	Sun 3/23/25	Sun 3/23/25	28																		
30	Site 13 Remedial Design for Groundwater Remediation	333 days	Sun 3/23/25	Wed 2/18/26																			
31	Remedial Design Draft	174 days	Sun 3/23/25	Fri 9/12/25																			
32	Prepare and Submit Draft Remedial Design (30%)	44 days	Sun 3/23/25	Mon 5/5/25	28																		
33	Navy Review (NAVSEA, NAVFAC)	22 days	Tue 5/6/25	Tue 5/27/25	32																		

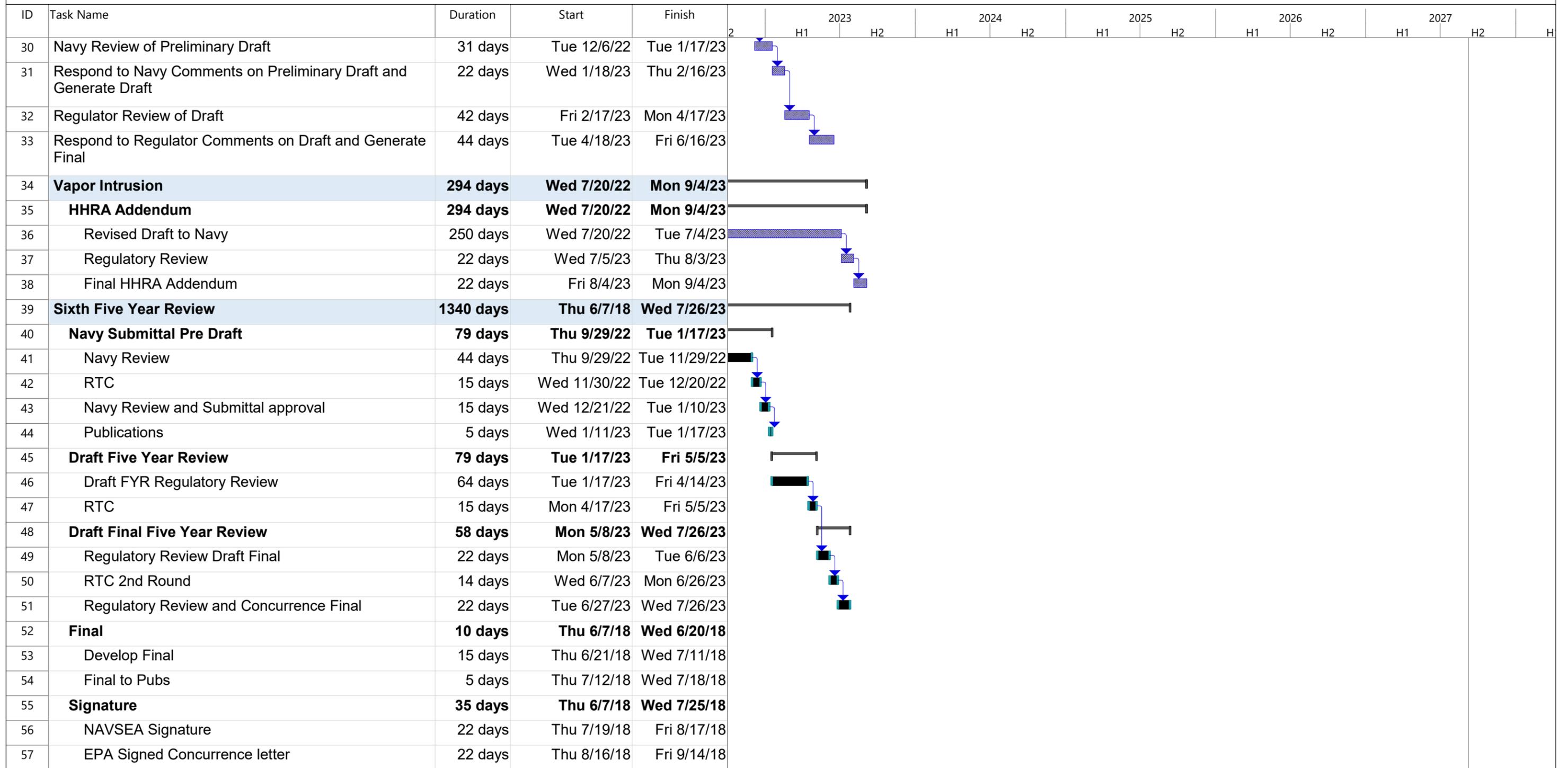
Figure 4-6
Administrative Activities Schedule
Allegany Ballistics Laboratory



Project: Figure 4-5_Admin
Date: Thu 8/18/22

Task		Project Summary		Manual Task		Start-only		Deadline	
Split		Inactive Task		Duration-only		Finish-only		Progress	
Milestone		Inactive Milestone		Manual Summary Rollup		External Tasks		Manual Progress	
Summary		Inactive Summary		Manual Summary		External Milestone			

Figure 4-6
Administrative Activities Schedule
Allegany Ballistics Laboratory



Project: Figure 4-5_Admin
Date: Thu 8/18/22



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Attachment A-1
SWMU, AOC, and IR
Site Description and Status for
Areas under CERCLA Investigation

ATTACHMENT A-1. SWMU, AOC, AND IR SITE DESCRIPTION AND STATUS for AREAS UNDER CERCLA INVESTIGATION
 ALLEGANY BALLISTICS LABORATORY, ROCKET CENTER, WEST VIRGINIA

IR Site ID and Associated SWMUs	Location	Dates of Operation	Description and Wastes Managed Status and Anticipated Additional Activities
IR Site 1 - Northern Riverside Waste Disposal Area:			
<p>Installation Restoration (IR) Site 1, Operable Unit (OU) 3 (Groundwater, Surface Water, and Sediment)</p> <p>Site 1 includes Solid Waste Management Units (SWMUs) 1, 6, 7, 8, 11, 20, and 22C (no further action [NFA]) and 22D (NFA)</p>	Northern perimeter of Plant 1	Late 1950s – 1960s	<p>Description and Wastes Managed See SWMUs 1, 6, 7, 8, 11, 20, and 22C and 22D descriptions on Attachments A-1 and A-2.</p> <p>Status: Remedial Action Operation (RA-O)</p> <p>A Record of Decision (ROD) for Site 1 groundwater remediation was signed in April 1997. Construction of a groundwater treatment plant for treatment of volatile organic compounds (VOCs) was completed and has been operational since September 1998. An additional extraction well was installed on the active burning ground (ABG) in April 2016 as part of a source treatment optimization pilot study. The additional extraction well remains in operation and has been used during the routine operations and maintenance (O&M) activities.</p> <p>An IRACR was finalized in 2015 to document that the OU-3 remedy is in place and operating successfully.</p> <p>The Fifth Five-Year Review Report for Sites 1, 5, 10, 11, and 12 was finalized and signed in August 2018. Evaluation of Site 1 OU-3 determined that the remedy is functioning as intended by the ROD.</p> <p>O&M activities at the site are ongoing and summarized in the Progress Reports. Long-term monitoring (LTM) sampling was temporarily suspended during the OU-4 soil remedial action (RA), which was completed April 2021.</p> <p>Anticipated</p> <p>O&M activities will be summarized in a forthcoming Progress Report. The 2022 LTM groundwater and porewater sampling was completed in June 2022, and the results will be evaluated and reported in the Sixth Five-Year Review</p> <p>A post-RA river protectiveness study, which included a baseline sampling event in 2015, was completed from July through September 2022 and will include bulk sediment sampling, benthic invertebrate toxicity testing, benthic invertebrate community surveys, and evaluation of sediment pore water sampling (included in LTM sampling) to provide multiple lines of evidence on the potential effects of the Site 1 soil RA on ecological receptors in the river. The results of the river monitoring study will be used to quantify and evaluate river protectiveness, confirm concentrations of COCs, optimize and refine the LTM sampling strategy, and further evaluate overall remedy effectiveness.</p> <p>Additional site characterization data were collected from 2018 through 2021 to optimize the RA for Site 1 OU-3 and were evaluated in the draft report (CH2M, 2022b). A groundwater-surface water interface investigation was conducted in the fall and summer seasons of 2020. This investigation utilized a trident probe to investigate the transport pathways and concentrations of contaminants in porewater of the North Branch Potomac River. The results of this investigation will help support the groundwater flux modeling to be developed for Site 1 and are reported in the technical memorandum (CH2M, 2021b).</p> <p>A per- and poly-fluoroalkyl substances (PFAS) Site Investigation (SI) sampling event was completed in January 2021 and the results will be documented in a forthcoming SI report.</p> <p>The Sixth Five Year Review is currently being developed and is due for signature in August 2023.</p> <p>Land Use Controls (LUCs)</p> <p>According to the 1997 ROD (Navy, 1997) and 2015 LUC RD (Navy, 2015a), the following LUCs were identified to achieve remedial action objectives and protect human health and the environment:</p> <ol style="list-style-type: none"> 1) Prohibit activities that would result in contact with alluvial and bedrock aquifer groundwater except for environmental monitoring. 2) Prohibit the withdrawal of alluvial and bedrock aquifer groundwater except for treatment and environmental monitoring. 3) Prohibit changes from current building uses or construction of new buildings without evaluation further of potential vapor intrusion risks and/or implementation of mitigation measures. 4) Prohibit the development and use of the property for residential housing, elementary and secondary schools, child care facilities, and playgrounds. 5) Maintain the integrity of any current or future remedial or monitoring system.
<p>IR Site 1, OU-4 (Soil)</p>	Northern perimeter of Plant 1	Late 1950s – 1960s	<p>Description and Wastes Managed See SWMUs 1, 6, 7, 8, 11, 20, and 22C and 22D descriptions on Attachments A-1 and A-2.</p> <p>Status: Remedial Action Construction (RA-C)</p> <p>A soil removal action in the former disposal pits was completed in November 2013 as part of a non-time-critical removal action.</p> <p>A ROD was completed for Site 1 soil in September 2014. The RA was completed at the ABG in November 2015, with the exception of former disposal pit 1, which was completed in 2017 as part of the OABG RA.</p> <p>The combined Fifth Five-Year Review Report for Sites 1, 5, 10, 11, and 12 was finalized in August 2018. Evaluation of Site 1 OU-4 determined that the RA for soil, once completed, will be monitored to ensure it is functioning as intended by the ROD.</p> <p>Site 1 soil OABG excavation and soil removal activities were completed in October 2019. Additional site restoration work was needed to complete the RA, which was completed in April 2021. Activities were detailed in the OABG Construction Completion Report and OU-4 Remedial Action Completion Report, completed in February and March 2022, respectively.</p> <p>Anticipated</p> <p>A PFAS SI sampling event was completed in January 2021 and the results will be documented in a forthcoming SI report.</p> <p>The Sixth Five Year Review is currently being developed and is due for signature in August 2023.</p> <p>LUCs</p> <p>According to the 2014 ROD (Navy, 2014) and 2015 LUC RD (Navy, 2015a), the following LUCs were identified to achieve remedial action objectives and protect human health and the environment:</p> <ol style="list-style-type: none"> 1) Prohibit the development and use of the property for residential housing, elementary and secondary schools, child care facilities, and playgrounds. 2) Restrict intrusive activities to minimize the potential for human exposure to contamination presenting an unacceptable risk.
<p>SWMU 1, Former Hazardous Waste Storage Area I (The soil at this SWMU is part of IR Site 1 western end subsite [also</p>	West of the ABG	Late 1970s - 1981	<p>Description and Wastes Managed</p> <p>Approximately 360-square-foot pad used for the storage of 55-gallon drums of hazardous waste prior to disposal offsite. The unit managed hazardous wastes F001, F002, F003, F005, D001, D002, and F019 including chlorinated solvents, still bottoms, metal plating pretreatment sludge, and waste acids and bases. A pilot study of a fluidized bed incinerator was conducted on the pad during the early 1980s for the disposal of propellants and explosives. Propellants and explosives were tested at the pilot test incinerator; reportedly the only wastes generated were aluminum oxide, aluminum, potassium chloride, and carbon.</p>

ATTACHMENT A-1. SWMU, AOC, AND IR SITE DESCRIPTION AND STATUS for AREAS UNDER CERCLA INVESTIGATION

ALLEGANY BALLISTICS LABORATORY, ROCKET CENTER, WEST VIRGINIA

IR Site ID and Associated SWMUs	Location	Dates of Operation	Description and Wastes Managed Status and Anticipated Additional Activities
includes SWMUs 11, 22C, and 22D))			<p>Status The Resource Conservation and Recovery Act (RCRA) Facility Assessment (RFA) recommended no further action (NFA) for this SWMU. The soil at this SWMU is part of IR Site 1, OU-4, western end subsite (also includes SWMUs 11, 22C, and 22D)</p>
SWMU 6, ABG	Within the fenced portion of the ABG	1958 - present	<p>Description and Wastes Managed A fenced area measuring 280 feet by 1,250 feet, consisting of 13 current and former burning locations (pads). Typical wastes managed include nitroglycerin, nitrocellulose, ammonium perchlorate, butanetriol trinitrate, HMX, RDX, and various propellants and explosives manufactured from the facility. Approximately 1,000 to 1,750 pounds per day of waste material are estimated to be burned. The unit currently operates under RCRA Permit #WV0170023691.</p> <p>Status This SWMU is being operated under a RCRA Part B permit. Soil and groundwater at this SWMU have been investigated as they pertain to IR Site 1, OU-3 and OU-4, respectively.</p>
SWMU 7, Inert Burning Ground	East of the fenced area containing the ABG	1958 – 1985	<p>Description and Wastes Managed Approximately 20-foot by 20-foot area located outside the fenced area of the ABG. The unit managed waste materials contaminated with explosives, including explosive contaminated waste rags. These rags may also have been contaminated with solvents including methylene chloride and TCE. Open burning of these wastes was conducted here, and the ash was deposited at the unit and in the Inert Landfill (Site 5, previously known as SWMU 9).</p> <p>Status The RFA recommended an RFI and that the RFI be coordinated with the ongoing activities of the Remedial Investigation (RI). See remainder of discussion under IR Site 1, OU-3 and OU-4.</p>
SWMU 8, Acid Disposal Pits	In the southwestern portion of the fenced area containing the ABG	1972 - 1982	<p>Description and Wastes Managed Two unlined, crushed-limestone-filled, earthen pits approximately 20 feet by 5 feet in area and 4 feet in depth. Waste acids and bases generated by laboratory operations were poured into the pit and allowed to percolate through the limestone. It is estimated that approximately 1 gallon of acid per month was disposed of at this unit.</p> <p>Status The RFA recommended an RFI for this SWMU and that the RFI be coordinated with the ongoing activities of the RI. See remainder of discussion under IR Site 1, OU-4.</p>
SWMU 11, Former Burn Cages and Ash Landfill	Northwest portion of Plant 1 between the fence and North Branch Potomac River	prior to 1970 until the 1970s	<p>Description and Wastes Managed Unit consists of an ash landfill and at least two burn cages. The landfill measures approximately 100 feet by 60 feet in area and 12 feet in depth. During the 1960s and 1970s the facility burned paper, cafeteria garbage, packaging materials, and non-explosive materials in open wire mesh cages. The ash generated from the burning was disposed at the landfill located adjacent to the cage areas. The landfill also contains demolition debris, empty solvent drums, and rocket motor casings.</p> <p>Status The RFA recommended an RFI for this SWMU and that the RFI be coordinated with the ongoing activities of the RI. See remainder of discussion under IR Site 1, OU-4.</p>
SWMU 20, Solvent Disposal Pit	In the southwestern portion of the fenced area containing the ABG	Unknown - 1978	<p>Description and Wastes Managed Unlined earthen pit used for the disposal of explosive-contaminated solvents such as TCE, PCE, and 1,1,1-TCA. The wastes were poured into the pit and allowed to percolate into the soil or evaporate; the waste in the pit was then ignited.</p> <p>Status See discussion under IR Site 1, OU-4.</p> <p>Anticipated See discussion under IR Site 1, OU-4.</p>

ATTACHMENT A-1. SWMU, AOC, AND IR SITE DESCRIPTION AND STATUS for AREAS UNDER CERCLA INVESTIGATION

ALLEGANY BALLISTICS LABORATORY, ROCKET CENTER, WEST VIRGINIA

IR Site ID and Associated SWMUs	Location	Dates of Operation	Description and Wastes Managed Status and Anticipated Additional Activities
IR Site 5 - Inert (Non-ordnance) Landfill			
<p>IR Site 5, OU-1 (Landfill contents and Surface Soil) Previously known as SWMU 9</p>	<p>South of Plant 2</p>	<p>1964 - 1988</p>	<p>Description and Wastes Managed Landfill approximately 420 feet long, 110 feet wide, and 20 feet deep. This unit received empty drums, unknown lab and photographic chemicals, scrap metal and plastic, large quantities of broken fluorescent tubes containing mercury, sandblasting grit, wood products, construction debris, fiberglass, and other resin-coated fibers. The empty drums were formerly used to store chemicals such as methylene chloride, TCE, acetone, and ammonium perchlorate. Chunk metallic lead potentially may have been disposed of here.</p> <p>Status: RA-O The RFA recommended an RFI for SWMU 9 and that the RFI be coordinated with the ongoing activities of the RI. A ROD was signed for Site 5 soil and landfill contents (OU-1) on January 1997. Construction of a RCRA Subtitle C landfill cap was completed in October 1997. The combined Fifth Five-Year Review Report for Sites 1, 5, 10, 11, and 12 was finalized and signed in August 2018. Evaluation of Site 5, OU-1 determined that the remedy (landfill cap) is functioning as intended by the ROD. LTM of groundwater is currently conducted on an annual basis. O&M activities at the site are ongoing and are summarized in the Progress Reports.</p> <p>Anticipated LTM and O&M activities from the most recent reporting period will be summarized in the Sixth Five-Year Review Report, which is due for signature in August 2023.</p> <p>LUCs According to the 1997 ROD (Navy, 1997) and 2014 LUC RD, the following LUCs were identified to achieve remedial action objectives and protect human health and the environment: 1) Prohibit digging into or disturbing the existing landfill cap or contents. 2) Restrict intrusive activities to minimize the potential for human exposure to contamination presenting an unacceptable risk.</p>
<p>IR Site 5, OU-2 (Groundwater, Surface Water, and Sediment) Previously known as SWMU 9</p>	<p>South of Plant 2</p>	<p>1964 - 1988</p>	<p>Description and Wastes Managed A draft Focused RI Report for groundwater, surface water, and sediment was submitted in September 2003. A technical memorandum evaluating the results of the Site 5 monitored natural attenuation (MNA) study was submitted in January 2004.</p> <p>Status: RA-O Remedial alternatives for groundwater, surface water, and sediment, as appropriate, are evaluated in the FFS. The RI/FS for Site 5 was completed in September 2004. A Proposed Remedial Action Plan (PRAP) and ROD were prepared in 2005 for Site 5, OU-2. Construction of a permeable reactive barrier (PRB) to treat contaminated groundwater in the alluvial aquifer was completed in June 2006. An Interim Remedial Action Completion Report (IRACR) was finalized in September 2014 to document the construction activities associated with the implementation of RA at Site 5. An Environmental Security Technology Certification Program project was completed in early 2017 to evaluate the effectiveness and longevity of the PRB on reducing TCE concentrations. A final report summarizing the evaluation was completed in 2018. The combined Fifth Five-Year Review Report for Sites 1, 5, 10, 11, and 12 was finalized and signed in August 2018. Evaluation of Site 5, OU-2 determined that the remedy (PRB, MNA, and LTM) is functioning as intended by the ROD. LTM groundwater sampling is currently conducted on an annual basis. O&M activities at the site are ongoing and are summarized as part of the Progress Reports. Further evaluation and investigation of the TCE plume in the vicinity, upgradient, and downgradient of the PRB was completed in October 2020.</p> <p>Anticipated LTM groundwater sampling was completed in June 2022, and the results will be summarized in the Sixth Five-Year Review Report, which is due for signature in August 2023. A PFAS SI sampling event was completed in January 2021 and the results will be documented in a forthcoming SI report. A TCE plume investigation and metals background study were conducted from September 2020 to October 2021. The findings of the TCE plume investigation and background study will be documented in a combined forthcoming technical memorandum.</p> <p>LUCs According to the 2005 ROD (Navy, 2005) and 2014 LUC RD, the following LUCs were identified to achieve remedial action objectives and protect human health and the environment: 1) Ensure no extraction of groundwater, except for monitoring purposes, in the restricted area at Site 5, until the RAOs for OU-2 are met and risks from groundwater use are shown to be reduced to acceptable levels. 2) Ensure no construction, maintenance work, or land use in the restricted area without protections from groundwater contaminants, including vapors. 3) Maintain the integrity of any current or future remedial equipment or remedial monitoring operation in the restricted area.</p>

ATTACHMENT A-1. SWMU, AOC, AND IR SITE DESCRIPTION AND STATUS for AREAS UNDER CERCLA INVESTIGATION

ALLEGANY BALLISTICS LABORATORY, ROCKET CENTER, WEST VIRGINIA

IR Site ID and Associated SWMUs	Location	Dates of Operation	Description and Wastes Managed Status and Anticipated Additional Activities
IR Site 10 – Former TCE Still and Production Well A (PWA)			
IR Site 10, OU-5 (Groundwater)	Near Building 157	1959 – early 1960s	<p>Description and Wastes Managed A TCE groundwater plume has been detected near Building 157. The source is believed to be a former still which operated adjacent to Building 157.</p> <p>Status: RA-O Soil and groundwater at this SWMU have been investigated during the RI; Phase II RI; Phase I and II Aquifer Testing; and 2001 supplemental soil investigation. An interim ROD was signed for groundwater remediation in August 1998. Construction of a groundwater treatment plant was completed and has been operational since September 30, 1998. Groundwater extraction at Site 10 began in February 1999. The groundwater extraction system was modified in February 2003 based on results of the Phase III Aquifer Testing to include an additional alluvial extraction well and four bedrock extraction wells. A Final ROD for Site 10 groundwater was signed in 2005. A groundwater extraction and treatment system is currently being operated and maintained. A Final NFA ROD for Site 10 soil was signed in 2007. The combined Fifth Five-Year Review Report for Sites 1, 5, 10, 11, and 12 was finalized and signed in August 2018. Evaluation of Site 10, OU-5 showed that the remedy (groundwater extraction) is functioning as intended by the ROD. LTM groundwater is currently conducted every five years in conjunction with the Five-Year Review. O&M activities at the site are ongoing and are summarized as part of the annual Progress Reports. An investigation of Sump 1 in Building 8, as well as a drainage ditch downstream of Building 8, was conducted in 2018 and the associated risk screening determined that there were no ecological or human health risks. An Explanation of Significant Differences (ESD) document was prepared to amend the ROD to identify the previously unknown exposure pathway for the discharge of the Building 8 sump water into the nearby drainage ditch at Site 10. The ESD was finalized and signed August 2019.</p> <p>Anticipated Based on the vapor intrusion (VI) investigation completed in January 2016, a human health risk screening was conducted in 2017 and additional investigations at select buildings to further assess VI have been completed in December 2019 and April 2020. The results of the investigations are documented in a draft human health risk assessment (HHRA) Addendum, which has not been finalized as there is a disagreement between the Navy and USEPA on the exposure attenuation factors that are used to calculate VI risk. An additional sampling event was completed in March 2022 to collect heating season VI data at Building 8. The VI investigation results will be documented in the Sixth Five-Year Review report. Currently, the Navy inspects the sumps during the quarterly Site 10 LUC inspections to ensure the sumps remain covered and are operating properly. A TCE and PCE plume delineation investigation, which took place between 2017 and 2019, was reported in a technical memorandum finalized in June 2021 (CH2M, 2021a). An extraction system shutdown pilot test to monitor contaminant migration and degradation under non-pumping conditions began in July 2020 and was completed in August 2022. The shutdown pilot test occurred for a period of two years and included semi-annual groundwater sampling. The results will be documented in a forthcoming technical memorandum. A PFAS SI sampling event was completed in January 2021, and the results will be documented in a forthcoming SI report. LTM groundwater sampling was completed in June 2022, and the results will be summarized in the Sixth Five-Year Review Report, which is due for signature in August 2023.</p> <p>LUCs According to the 2005 ROD (Navy, 2005) and 2013 LUC RD, the following LUCs were identified to achieve remedial action objectives and protect human health and the environment: 1) Ensure no extraction of groundwater from Site 10 except for purposes of transport to Site 1 for treatment (including no extraction of groundwater for use as drinking water) in the restricted area shown on Figure 4 until the RAOs for OU-5 are met and risks from groundwater use are shown to be reduced to acceptable levels. 2) Ensure adequate protection to minimize potentially adverse health and environmental effects of work or development in the restricted area. 3) Ensure adequate protection to maintain the integrity of any current or future remedial equipment or monitoring operation in the restricted area. 4) Implementation of the Construction Excavation and Groundwater Use Restriction Plan.</p>
IR Site 11 - Building 215 (Production Well F)			
IR Site 11, OU-11 (Groundwater) Includes SWMU 36	Eastern portion of Plant 1; north of Buildings. 421 and 438	1961	<p>Description and Wastes Managed This site is the area surrounding and including an 8-inch-diameter water supply well that was never put into production because of sand accumulation. The well was uncovered during demolition of Building 215. Petroleum hydrocarbons and solvents have been found in the well.</p> <p>Status: RA-O Soil and groundwater at this SWMU have been investigated during the RI; Phase II RI; Phase I and II Aquifer Testing; and 2001 supplemental soil investigation. An RI for Site 11 was completed in January 2005. An FS for the combined areas of Sites 11 and 12 was completed in 2010. The ROD was approved and signed in January 2012. The RA, focused enhanced anaerobic biodegradation (EAB) reagent injections, took place in November 2012. In November 2013, quarterly monitoring was initiated to assess the effectiveness of the remedy in the alluvial aquifer and to determine if EAB treatment is necessary in the bedrock aquifer. An IRACR was finalized in September 2015 documenting the remedy is in place and operating successfully. The combined Fifth Five-Year Review Report for Sites 1, 5, 10, 11, and 12 was finalized and signed in August 2018. Evaluation of Site 11, OU-11 showed that the remedy (focused EAB reagent injections) is functioning as intended by the ROD. LTM of groundwater is currently conducted on an annual basis.</p> <p>Anticipated LTM groundwater sampling was completed in June 2022, and the results will be summarized in the Sixth Five-Year Review Report, which is due for signature in August 2023.</p> <p>LUCs According to the 2012 ROD (Navy, 2012) and 2013 LUC RD, the following LUCs were identified to achieve remedial action objectives and protect human health and the environment: 1) Prohibit all activities including the withdrawal of groundwater, except for environmental monitoring and testing.</p>

ATTACHMENT A-1. SWMU, AOC, AND IR SITE DESCRIPTION AND STATUS for AREAS UNDER CERCLA INVESTIGATION

ALLEGANY BALLISTICS LABORATORY, ROCKET CENTER, WEST VIRGINIA

SWMU 36	Building 215	1960s – 1995	<p>Description and Wastes Managed A below-grade circular pit measuring 2 feet in diameter and 2 feet in depth. This unit contained a dark, highly viscous petroleum substance during the RFA site visit. It is assumed that the unit was used as a transfer hose drip catchment.</p> <p>Status The RFA recommended that the integrity of the oil pit be evaluated, and if impaired, soil sampling should be performed. A 55-gallon drum filled with No. 5 fuel oil and adjacent soils were removed to clean the area. Confirmatory soil samples indicated no contamination. Additional soil samples were collected during the Advanced Site Inspection and the Site 11 RI.</p> <p>Anticipated See further discussion under IR Site 11, OU-11.</p>
IR Site 12 - Building 167 SWMUs			
<p>IR Site 12, OU-8 (Groundwater) This IR site was formally known as AOC N, which includes SWMUs 12, 14, 24S, 37N and 52</p>	Outside of Building 167	1978 – 1982	<p>Description and Wastes Managed This site was previously known as AOC N and comprised of five SWMUs (12, 14, 24S, 37N, and 52). See specific descriptions under each of these SWMUs.</p> <p>Status: RA-O AOC N was investigated during the Phase I, Phase II, and Phase III SWMU/AOC investigations. Based on the findings of the Phase III investigation, AOC N has been designated as IR Site 12. A non-time critical removal action was performed for soil at Site 12 soil in 2005. An RI for Site 12 was completed in June 2008. An FS for the combined areas of Site 11 and 12 was completed in 2010. The ROD was approved and signed in January 2012. The RA, focused EAB reagent injections, took place in November 2012. In November 2013, quarterly monitoring was initiated to assess the effectiveness of the remedy in the alluvial aquifer and to determine if EAB treatment is necessary in the bedrock aquifer. An IRACR was signed in September 2015 documenting the remedy is in place and operating successfully. The combined Fifth Five-Year Review Report for Sites 1, 5, 10, 11, and 12 was finalized and signed in August 2018. Evaluation of Site 12, OU-8 showed that the remedy (focused EAB reagent injections) is functioning as intended by the ROD. LTM of groundwater is currently conducted on an annual basis.</p> <p>Anticipated LTM groundwater sampling was completed in June 2022, and the results will be summarized in the Sixth Five-Year Review Report, which is due for signature in August 2023. Based on the VI investigation completed in January 2016, a human health risk screening was conducted in 2017 and additional investigations at select buildings to further assess VI were completed in December 2019 and April 2020. The results of the investigations are documented in a draft HHRA Addendum, which has not been finalized due to a disagreement between the Navy and USEPA on the exposure attenuation factors that are used to calculate VI risk. An additional sampling event was completed in March 2022 to collect heating season VI data at Buildings 167 and 214. The VI investigation results will be documented in the Sixth Five-Year Review report.</p> <p>LUCs According to the 2012 ROD (Navy, 2012) and 2013 LUC RD, the following LUCs were identified to achieve remedial action objectives and protect human health and the environment: 1) Prohibit all activities including the withdrawal of groundwater, except for environmental monitoring and testing.</p>
SWMU 12, Former Alodine Treatment Tank	Building 167	1991 - 1998	<p>Description and Wastes Managed The unit was a 1,000-gallon, open-top, vertical cylinder. Industrial wastewater from the Alodine process (aluminum surface chemical conversion process) was pretreated at the unit for chromium reduction and precipitation. As of 1980, 4,200 gallons of Alodine process wastewater were treated at this unit on a monthly basis.</p> <p>Status The RFA recommended NFA for this SWMU. SWMU 12 was part of the AOC N investigation.</p>
SWMU 37N – Wastewater Sump	Building 226	Between 1940s and 1999	<p>Description and Wastes Managed Unit has received or has potentially received contact cooling water from propellant machining operations, building washdown water from structures at which solid explosives are processed, wastewater containing materials other than propellants and explosives, coolants, oil, solvents, Alodine wastewater, salts, sands, and sediment.</p> <p>Status See discussion under IR Site 12, OU-8.</p>
SWMU 52, Current (no longer in use) Alodine Treatment Tank	South of Building 167	1991 - 1995	<p>Description and Wastes Managed A treatment tank that was open on top with a plastic containment structure (6 feet in diameter by 2 feet deep) beneath it. The tank and containment structure were on a concrete pad. This treatment tank operated at the same location as the former Alodine treatment tank (see SWMU 12 description). This unit managed spent Alodine.</p> <p>Status SWMU 52, part of AOC N, was part of the Phase I, Phase II, and Phase III SWMU/AOC investigations. Based upon the results of the Phase III investigation, AOC N has been re-designated as IR Site 12.</p> <p>Anticipated NFA is planned for SWMU 52, but further investigation is ongoing for IR Site 12, OU-8.</p>

ATTACHMENT A-1. SWMU, AOC, AND IR SITE DESCRIPTION AND STATUS for AREAS UNDER CERCLA INVESTIGATION

ALLEGANY BALLISTICS LABORATORY, ROCKET CENTER, WEST VIRGINIA

IR Site 13 - Range Road Area			
<p>IR Site 13, OU-15 (Groundwater) Previously part of the SWMU 27A investigation. SWMU 27A is closed.</p>	<p>Near Range Road–H Street Intersection</p>	<p>1952</p>	<p>Description and Wastes Managed No reports regarding wastes managed, but boiler operations at Former Building 106A may be the source of contamination in groundwater. SWMU 27A was closed out in December 2006 via closeout report. In 2008, USEPA identified the Range Road Area of SWMU 27A as Site 13, OU-15.</p> <p>Status: RI/FS Phases I through IV soil, groundwater, sediment investigation activities were conducted for SWMU 27A. The anticipated source is no longer present (former boiler building). A Pilot Study was implemented in 2004 with in situ bioremediation to treat the groundwater near the former boiler. Subsequent groundwater delineation activities have been conducted to characterize the nature and extent of contamination.</p> <p>Anticipated An RI/FS Report, summarizing the characterization activities and nature and extent of contamination along with evaluating remedial alternatives, is currently being developed. Additional groundwater and soil samples were collected in February and May 2022 as part of the RI data gap investigation and are being evaluated in the RI/FS, which is anticipated to be completed in 2023. The subsequent PRAP, ROD, and remedial design documents are anticipated to be completed in the respective order after the RI/FS Report is finalized.</p>

Attachment A-2
SWMU, AOC, and IR
Site Description and Status for
Areas under RCRA Corrective Action

ATTACHMENT A-2. SWMU, AOC, AND IR SITE DESCRIPTION AND STATUS for AREAS UNDER RCRA CORRECTIVE ACTION

ALLEGANY BALLISTICS LABORATORY, ROCKET CENTER, WEST VIRGINIA

Site Number	SWMU ID and Name	Location	Dates of Operation	Description and Wastes Managed	Status and Anticipated Additional Activities
NA	SWMU 2, Former Hazardous Waste Storage Area II	Southern portion of Plant 1, adjacent to Building 360	1981 - June 1990	Approximately 40-foot by 100-foot concrete pad designed to manage drums of waste from satellite accumulation areas throughout the plant prior to being shipped offsite. Typical wastes managed included: still bottoms (F001, F002), paint removers (F001, F002, F003, F005), paint-related materials (D001, F001, F002, F003, F005), chromium-containing wastes (D007), lead-containing wastes (D008), and corrosive waste (D002).	<p>Status</p> <p>SWMU 2 was closed out in November 2004 via closeout report. A deed notation was issued in 2005 indicating that SWMU 2 was formerly used as a hazardous waste storage area.</p> <p>Anticipated</p> <p>None</p>
NA	SWMU 3, Current Hazardous Waste Storage Area	Building 366	June 1990 – present	Concrete pad consisting of 40 individually diked and recessed concrete cells (maximum capacity 300 55-gallon drums) for the storage of hazardous wastes. Wastes include: still bottoms (F001, F002), paint removers (F001, F002, F003, F005), paint-related materials (D001, F001, F002, F003, F005), corrosive waste (D002), chromium-containing waste (D007), lead-containing waste (D008), ash from Burning Grounds. In addition, spent solvents, waste motor oil, coolant, antifreeze, cured and uncured resin, waste alcohol, asbestos, waste silver, Alodine solids, and PCB-contaminated materials are also managed in this unit.	<p>Status</p> <p>The RFA recommended no further action for this SWMU. This pad is permitted and managed under RCRA.</p> <p>Anticipated</p> <p>Hazardous waste management permit renewal and continued operation.</p>
NA	SWMU 27A, Plant 1 Drainage Ditch System (Includes SWMU 39)	Throughout the facility	1940s - present	A stormwater drainage system of open earthen drainage ditches, catch basins, and culverts throughout the facility. This system also receives washdown from some of the process buildings (e.g. Bldg. 181) and discharge from the settling basin (SWMU 44, which was removed in 1993).	<p>Status</p> <p>The RFA recommended collecting samples at certain points in the drainage ditch. Additional Plant 1 sediment and surface water samples and background samples were collected in 2002 and 2003 as part of the Phase III SWMU/AOC Investigations. In 2004, soil samples were collected adjacent to SWMU 27A at the Range Road Area to identify potential sources of chlorinated VOCs in alluvial groundwater. Five alluvial monitoring wells were installed at the Range Road Area.</p> <p>Additional sediment samples were collected in 2005 from SWMU 27A to further characterize this area. A Pilot study was also conducted in 2005 adjacent to SWMU 27A at the Range Road Area to evaluate methods to encourage microbial degradation of VOCs in groundwater.</p> <p>SWMU 27A was closed out in December 2006 via closeout report. In 2008, USEPA identified the Range Road Area of SWMU 27A as Site 13, OU-15.</p> <p>Anticipated</p> <p>SWMU 27A is currently regulated under the facility RCRA permit. The Range Road Area of SWMU 27A will continue to be addressed under CERCLA as Site 13 (OU-15), which is described in Attachment A-1.</p>
NA	SWMU 34A and 34B, Oil/Water Separators for air compressors	Bldg. 252 (34A) and 341 (34B)	1991 and 1992 – 2001	Five units located in Buildings 215 (two units), 252, 300, and 341. The primary waste managed by these units is waste lubricating oil from air compressors. The units separate the water from the oil and discharge the water through floor drains to the wastewater treatment plant (SWMU 16).	<p>Status</p> <p>These SWMUs were part of the Phase II SWMU/AOC Investigation. Screening of the data suggest there were TPH levels in the soil and groundwater that required additional evaluation. The air compressor buildings associated with these SWMUs were demolished in 2003. A soil removal action was completed at each SWMU in 2007 as part of the RCRA Corrective Action program by the onsite operator.</p> <p>SWMUs 34A and 34B were closed out in May 2012. A closeout report was prepared and concluded no further remedial action is required as well as unrestricted land use. WVDEP provided a letter of concurrence.</p> <p>Anticipated</p> <p>None</p>
NA	AOC G, SWMU 46, X Range Area	Undeveloped test area east of Plant 1	1944 - present	Area is a static test firing range for rocket motors and igniters that are produced at ABL. This unit manages explosive residuals, which are generated as a result of the rocket motor and igniter testing procedures. Propellants may contain AP, aluminum, NG, nitrate esters, NC, RDX, and HMX as primary ingredients. Firing has led to erosion of the hillside, and residues from fired materials may have reached the soil. Occasionally, rocket motors being tested explode; burning propellant and motor parts are discharged onto the hillside generating small fires.	<p>Status</p> <p>AOC G was closed out in May 2013. A closeout report was prepared and concluded no further remedial action is required. WVDEP provided a letter of concurrence.</p> <p>Anticipated The unit is still in operation with a RCRA subpart B permit in place.</p>

ATTACHMENT A-2. SWMU, AOC, AND IR SITE DESCRIPTION AND STATUS for AREAS UNDER RCRA CORRECTIVE ACTION

ALLEGANY BALLISTICS LABORATORY, ROCKET CENTER, WEST VIRGINIA

Site Number	SWMU ID and Name	Location	Dates of Operation	Description and Wastes Managed	Status and Anticipated Additional Activities
Site 6	AOC I, Sensitivity Test Area and Pond	500 Area	1970s	The sensitivity test area is located approximately 100 feet up-slope of the pond. Since 1989, .50-caliber bullet impact testing and flammability testing of rocket motors have been conducted in this area. This unit includes a pond, which serves as a catch basin for runoff from the sensitivity area. The unit manages explosive residuals transported by stormwater runoff from this area. Water from this pond would flow via tributaries to the North Branch Potomac River. RDX and other explosive constituents were detected in surface water samples.	<p>Status A portion of AOC I (Site 6, the pond) was closed out in February 2002 via closeout report.</p> <p>Anticipated Investigations of this unit are anticipated per the requirements of the RCRA Corrective Action permit.</p>
NA	AOC S, Fenced Westernmost Sensitivity Test Area (formerly a portion of AOC I)	500 Area	Late 1980s – 2002	AOC S, the sensitivity test area, is located on the hillside about 100 feet west of the Site 6 pond. The area was used for .50-caliber bullet impact testing and flammability testing of rocket motors.	<p>Status AOC S was closed out in May 2013. A closeout report was prepared and concluded no further remedial action is required as well as unrestricted land use. WVDEP provided a letter of concurrence. Investigations of this unit are anticipated per the requirements of the RCRA Corrective Action permit.</p>
Site 6	IR Site 6 - Sensitivity Test Area Surface Water Impoundment (This IR site is part of AOC I)	500 Area	1970s	See AOC I description	See AOC I description

Notes:

ABL = Allegany Ballistics Laboratory

AOC = area of concern

AP = ammonium perchlorate

CERCLA = Comprehensive Environmental Response, Compensation, and Liability Act

HMX = Octahydro-1, 3, 5, 7-tetranitro-1, 3, 5, 7-tetrazocine

ID = Identification

IR = Installation Restoration

NA = Not Available

NC = nitrocellulose

NG = nitroglycerin

OU = Operable Unit

PCB = Polychlorinated Biphenyl

RDX = Hexahydro-1, 3, 5-trinitro-1, 3, 5-triazine

RCRA = Resource Conservation and Recovery Act

RFA = RCRA Facility Assessment

SWMU = solid waste management unit

TPH = total petroleum hydrocarbon

USEPA = United States Environmental Protection Agency

VOC = volatile organic compound

WVDEP = West Virginia Department of Environmental Protection

Attachment A-3
SWMU, AOC, and IR
Site Description and Status for
Areas with No Further Action

ATTACHMENT A-3. SWMU, AOC, AND IR SITE DESCRIPTION AND STATUS for AREAS WITH NO FURTHER ACTION

ALLEGANY BALLISTICS LABORATORY, ROCKET CENTER, WEST VIRGINIA

Site Number	SWMU ID and Name	Location	Dates of Operation	Description and Wastes Managed	Status and Anticipated Additional Activities
Site 2	SWMU 4, Former Burning Ground I	On the north side of I Street; southeast of Building 361	1942 – 1949	A former burning ground of approximately 20 feet by 40 feet (gravel covered surface), used for burning waste propellant components and explosives. The exact location and configuration of the burning ground and details of the material burned there are not known. It is assumed that approximately 50 pounds of waste materials per day are estimated to have been burned.	Status The RFA recommended an RFI for this SWMU and that the RFI be coordinated with the ongoing activities of the RI. A final Risk Assessment Report for Sites 2, 3, and 10 was submitted in 2005. An NFA PRAP was prepared in 2006 and an NFA ROD was issued in July 2008.
Site 3	SWMU 5, Former Burning Ground II	West side of Building 362	1950 - 1958	A former burning ground of approximately 40 feet by 200 feet (clay covered surface), used for burning reactive wastes consisting of propellants and explosives. At least a portion of the former burning ground is covered by Building 362. It is assumed that approximately 200 pounds of waste materials per day are estimated to have been burned.	Status The RFA recommended an RFI for this SWMU and that the RFI be coordinated with the ongoing activities of the RI. A final Risk Assessment Report for Sites 2, 3, and 10 was submitted in 2005. An NFA PRAP was prepared in 2006. An NFA ROD for Site 3 was signed in 2007.
Site 7	SWMU 10, Beryllium Landfill	Adjacent to Route 956, southwest of Building 300, the main administration building	1964 – late 1960s	Earthen pit measuring approximately 10 feet by 10 feet in area and 6 feet in depth. A maximum of two pounds of beryllium and 100 pounds of excess lab chemicals were disposed of here. Reportedly, the unit contained several hundred pounds of beryllium-contaminated wiping tissues, gloves, and sample containers. Glassware from the labs was also disposed of at this unit.	Status Soil removal at this site/SWMU was completed under the IR Program in 1994, with final disposition of the wastes in March 1997. A streamlined RI/FS report and PRAP were submitted in June 2001 and a public meeting was held in July 2001. An NFA ROD was signed in September 2001.
NA	SWMU 14, Current (no longer in use) Alodine Waste Storage Area I	Building 167	1991 - 1998	Concrete area used to store Alodine waste and Alodine contaminated rags in 55-gallon drums. The unit measures approximately 20 feet by 10 feet.	Status The RFA recommended NFA for this SWMU. The regulatory agencies agreed with this recommendation under the condition that possible releases from this tank be considered in the investigation of SWMU 52. No further action is planned for SWMU 14.
NA	SWMU 16, Plant 1 Wastewater Treatment System	Building 294	1962 - December 1996	Wastewater treatment plant which treated all the facility's sanitary wastewater along with some industrial wastes from photographic processing and several chemical laboratories. Approximately 1,500 gallons per month of filtered wastewater containing residual RDX (less than 100 mg/L), pre-treated wastewater from the Alodine process, and some water from oil/water separators was discharged to this unit. Also, a portion of the facility's stormwater sewer system was routed to this unit from 1970 until 1984.	Status The RFA recommended that soil samples be collected in the overflow area. These samples were collected during the Phase II RI. The analytical results indicated that no analytes were detected above the USEPA Region III RBC values. Confirmatory soil samples were collected from beneath the treatment plant when it was demolished in May 1998. The data suggested that releases did not occur beneath the treatment plant. No further action is planned for this SWMU.
Site 4B	SWMU 18, Photo Solution Discharge Area I	Adjacent to Building 181	1959 - 1971	An unlined drainage ditch which received discharges of spent photographic and x-ray solutions from developing and processing operations. These solutions likely contained silver, cyanide, and phenol.	Status Surface soil samples were collected during a supplementary investigation in 2001. These data, together with historical and background data, were used to calculate PRGs for soil constituents at the site. In November 2003, a soil removal pilot study removed the majority of the impacted soil at the site. Additional excavation and confirmatory sampling was completed in 2004. A pilot study report for Site 4B was issued in 2005. An NFA PRAP was prepared in 2007.
Site 4A	SWMU 19, Photo Solution Discharge Area II	Adjacent to Building 231	1959 - 1965	Originally thought to have been a shallow gravel-lined pit (French drain) which received spent photographic and x-ray solutions from developing and processing operations. This SWMU was later determined not to have received any of these wastes.	Status The RFA recommended that soil samples be collected around the unit at Building 231. Possible releases from this area have been considered in the investigation of SWMU 26. The building drainage was always connected to the sewage treatment plant and soil testing has confirmed no release. The SWMU was closed out via the FFA under Findings of Fact p 19.
NA	SWMU 21, Building 241 Catch Basin	Building 241	1960s - 1980s	The unit managed water, which may have contained residual explosive materials from testing operations in the Building 241 bunker. The unit is a metal catch basin, the bottom and sides of which consisted of a fine screen which filtered the particulate residue and allowed water to pass through.	Status SWMU 21 was closed out in August 2001 via closeout report.

ATTACHMENT A-3. SWMU, AOC, AND IR SITE DESCRIPTION AND STATUS for AREAS WITH NO FURTHER ACTON
 ALLEGANY BALLISTICS LABORATORY, ROCKET CENTER, WEST VIRGINIA

Site Number	SWMU ID and Name	Location	Dates of Operation	Description and Wastes Managed	Status and Anticipated Additional Activities
NA	SWMU 22, Incinerators SWMU 22A – Explosive Waste Incinerator SWMU 22B - Classified Document Incinerator SWMU 22C - Pilot Fluidized Bed Incinerator SWMU 22D - Non-Explosive Combustible Incinerator (SWMUs 22C and 22D are part of IR Site 1, SWMU 22D is also SWMU 11)	SWMU 22A is located in the south-central portion of Plant 1. SWMU 22B is west of Bldg. 385 in the northeast portion of Plant 1 SWMUs 22C and 22D are in the northwest portion of Plant 1	1942 - 1980s	Comprises an explosive waste incinerator (1942 - 1950s) which treated explosive wastes; classified document incinerator (1942 - 1980s) for scrap paper; pilot fluidized bed incinerator (1980s) for specially prepared propellant and explosive material; and non-explosive combustible incinerator (1960s - 1970s) for facility refuse and non-explosive combustible materials.	Status SWMU 22 (22A, 22B, 22C, and 22D) was closed out in September 2000 via closeout reports.
NA	SWMU 23, Salvage Yard	East of Building 270	1950s - present	Unit managed scrap metals including aluminum and copper, also stored outdated equipment such as compressors, empty drums, and, at one point, spent automotive batteries. In the mid-1990s the western half of this SWMU was deactivated and a building was constructed in that area.	Status SWMU 23 was closed out in September 2000 via closeout report.
SWMU 24S is Part of Site 12; Other SWMUs in this series are not associated with an IR site.	SWMU 24, Satellite Accumulation Areas [24A through 24BB]	Throughout the facility	1940s - present	Several areas throughout the facility used to accumulate waste materials before they are transferred to the current hazardous waste storage area (SWMU 3).	Status SWMU 24G was deleted during the RFA. Based on the October 22, 1997 and the October 14, 1998 agency meetings, no further action was planned for SWMUs 24A, 24B, 24C, 24D, 24F, 24H, 24J through 24Q, 24U, 24W, 24Y, 24Z, 24AA, and 24BB. Further action is planned for SWMU 24S under AOC N (See discussion under SWMU 12). SWMUs 24J and 24V were closed out in September 2000 via closeout reports. SWMUs 24A, 24B, 24C, 24D, 24E, 24F, 24H, 24I, 24K, 24L, 24M, 24N, 24O, 24P, 24Q, 24R, 24T, 24U, 24X, 24Y, 24Z, 24AA, and 24BB were closed out in February 2002 via closeout reports. SWMU 24W was closed out in July 2002 via closeout report AOC N was part of the Phase I, Phase II, and Phase III SWMU/AOC investigations. Based upon the results of the Phase III, AOC N has been re-designated as IR Site 12. Anticipated No further action is planned for SWMU 24S, but further investigation at IR Site 12 (see further details under SWMU 12).
NA	SWMU 25, Solvent Recovery Stills [25A, 25B, and 25C]	Building 8 (25A), Building 167 (25B), and Building 256 (25C)	Various start-up dates from 1970s – mid-1990s	Three solvent recovery stills located inside buildings 8 (25A), 167 (25B), and 256 (25C). All SWMUs managed methylene chloride still bottoms.	Status SWMU 25 (25A, 25B, and 25C) was closed out in February 2002 via closeout report.
NA	SWMU 26, Septic Tank	South of Building 369	1940s - 1960s	Unit managed primarily sanitary wastewater but did manage some industrial wastewater. Industrial wastewater was generated from photographic processes and lab glassware washing. Industrial wastewater potentially contained organic constituents, including acetone and photographic solutions.	Status The contents of the septic tank were characterized, removed, and disposed of as non-hazardous and the tank was closed in place by filling with inert material in 2001. SWMU 26 was closed out in July 2002 via closeout report.
NA	SWMU 28, Silver Recovery Units	Buildings 181 and 300	Bldg. 181, 1971 - present Bldg. 300, 1960s – mid-1990s	Two units that are used to reclaim silver from photographic and x-ray development waste. Once the silver is precipitated, the wastewater is discharged to the plant wastewater treatment system (i.e., SWMU 16).	Status SWMU 28 was closed out in February 2002 via closeout report.

ATTACHMENT A-3. SWMU, AOC, AND IR SITE DESCRIPTION AND STATUS for AREAS WITH NO FURTHER ACTON

ALLEGANY BALLISTICS LABORATORY, ROCKET CENTER, WEST VIRGINIA

Site Number	SWMU ID and Name	Location	Dates of Operation	Description and Wastes Managed	Status and Anticipated Additional Activities
NA	SWMU 29, Dust Collectors and Baghouses [29A through 29K]	Buildings 2 (29A), 8 (29B), 35 (29C), 36 (29D), 145 (29E), 167 (29F), 256 (29G and 29H), 262 (29I), 300 (29J), and 344 (29K)	Various start-up dates from 1955 - present	Comprises dust collection systems to collect material from grit blasting, grinding, and sanding. The material collected consisted primarily of metal grindings and sawdust. Boiler fly ash is collected in the SWMU 29K baghouse. RDX and HMX product are collected in the SWMU 29I baghouse and used for propellant manufacture.	Status SWMU 29 (29A through 29K) was closed out in February 2002 via closeout report.
NA	SWMU 30, Spray Booth Filters	Buildings 8, 167, and 361	Between 1978 and 1991 - 1995	The facility operates several paint and coating spray booths for painting and lining rocket motor cases, wooden signs, and other components. According to the waste profiles, paint wastes contain paint resins, enamels, epoxides, and urethanes. In addition, MEK, MIBK, xylenes, toluene, petroleum distillates, 1,1,1-TCA, and TCE are present in these wastes.	Status SWMU 30 was closed out in February 2002 via closeout report.
NA	SWMU 32, PCB Rags Storage Area	Building 23	1970s - 1980s	An accumulation area measuring approximately 10 feet by 7 feet. The area was located on the second floor of Building 23 and fully enclosed by wooden plank walls and floor. The unit managed one drum of PCB-contaminated rags and one drum containing a PCB capacitor. In addition, a drum containing PCB fluid used for topping off electrical equipment was stored here.	Status SWMU 32 was closed out in February 2002 via closeout report.
NA	SWMU 33, Dumpsters	Throughout the facility	1988 - present	Leased side-loading and top roll-off dumpsters that receive non-hazardous general refuse, including kitchen refuse, paper refuse, non-hazardous cured resin and composite materials, shop waste, waste tires, and non-hazardous ash from burning activities. Spray Booth filters are also disposed in these units.	Status SWMU 33 was closed out in February 2002 via closeout report.
NA	SWMU 35, Paper Mulcher Waste Accumulation Area	Bldg. 1	1983 – 1998	A temporary storage area for paper mulch generated by the facility's SEM Security Disintegrator machine. The unit manages paper mulch generated from classified documents and scrap paper.	Status SWMU 35 was closed out in February 2002 via closeout report.
NA	SWMU 37 - Wastewater Sumps 37A through 37Q, 37S through 37X, except for 37D, 37E, and 37W SWMU 37N – Building 167 was investigated as part of AOC N and is included in Site 11 (see Attachment A-1). SWMU 41 was evaluated with SWMU 37B per FFA.	Building#/SWMU#: 4/37A, 7/37B and BB 12/37C 22/37F 27/37G 32/37H 49/37I 100/37J 103/37K 105/37L 105A/37M 226/37O 248/37P 256/37Q 280/37S 11/37T 22/37U 14/37V 214/37X	Various dates from the 1940s – 1999	Currently 23 units have been identified. These units have received or have potentially received contact cooling water from propellant machining operations, building washdown water from structures at which solid explosives are processed, wastewater containing materials other than propellants and explosives, coolants, oil, solvents, Alodine wastewater, salts, sands, and sediment.	SWMUs 37C, D, E, T and U were removed in June 1998. SWMUs 37A, 37B, 37BB, 37N, 37V, and 37X were removed in 2000/2001. SWMUs 37H, 37K, 37M, and 37O were closed out in September 1999 via closeout reports. SWMUs 37C (soil), 37D (soil), 37I, 37L, and 37P were closed out in September 2000 via closeout reports. SWMUs 37C (groundwater), 37F, 37G, and 37S were closed out in September 2001 via closeout reports. SWMU 37Q closed out in FFA under findings of fact p. 19. SWMUs 37A and 37X were closed out in February 2002 via closeout reports. SWMUs 37B, 37BB, 37J, 37T, and 37U were closed out in July 2002 via closeout reports. SWMU 37E (soil) was closed out in March 2004 via closeout report. SWMU 37I and 37V were closed out in 2005. SWMU 37W (soil) was closed out in April 2010.
NA	SWMU 37D, SWMU37E, and SWMU 37W (Building 8/Lab Row Area)	Building#/ SWMU#: 13/37D 15/37E 8/37W	Various dates from the 1940s – 1999	These units have received or have potentially received contact cooling water from propellant machining operations, building washdown water from structures at which solid explosives are processed, wastewater containing materials other than propellants and explosives, coolants, oil, solvents, Alodine wastewater, salts, sands, and sediment. Used for a variety of research and development purposes.	Status The ABL Partnering Team concurred in 2009 that the groundwater in the Building 8/Lab Row area and downgradient needed to be evaluated and could be combined into one "unit." In 2011, groundwater in the vicinity of several SWMUs near Building 8 was investigated to assess potential impacts. A closeout report for Building 8/ Lab Row Area Groundwater was finalized in October 2015. No further action is required.
NA	SWMU 38, Parts Cleaners	Buildings 7, 145, and 224, and SWMU 24	Various dates from the 1960s - present	Approximately 5-gallon capacity units used to degrease and clean tools and small metal parts. Solvents used in the cleaning process include 1,1,1-TCA and Varsol solvent.	Status SWMU 38 was closed out in February 2002 via closeout report.

ATTACHMENT A-3. SWMU, AOC, AND IR SITE DESCRIPTION AND STATUS for AREAS WITH NO FURTHER ACTON

ALLEGANY BALLISTICS LABORATORY, ROCKET CENTER, WEST VIRGINIA

Site Number	SWMU ID and Name	Location	Dates of Operation	Description and Wastes Managed	Status and Anticipated Additional Activities
NA	SWMU 39, Weir	Near Building 344	1988 - present	A concrete skimmer located along a part of the drainage ditch system (SWMU 27A). This unit was constructed as a contingency measure in the event of a fuel oil release from a boiler at Building 344.	Status The RFA recommended that soil samples be collected around and upstream of the unit. Because these weirs are part of the drainage ditch system on Plant 1, they are associated with SWMU 27A, which is described in Attachment A-2 . Anticipated See discussion under SWMU 27A in Attachment A-2 .
NA	SWMU 40, Laboratory Exhaust Filter	Building 12	1960s (possibly as early as 1940s) – 1998	Disposable filter mechanism located outside of the Strand Bomb Testing Laboratory. It was approximately 18 inches above ground surface, and the majority of the surrounding ground surface was covered with cement. This unit managed combustion products from propellant testing.	Status SWMU 40 was removed June 1998. The SWMU was included in the Phase II SWMU/AOC Investigation. Screening of the confirmatory data suggested the remaining constituent concentrations do not exceed applicable regulatory screening criteria. Therefore SWMU 40 was closed out in July 2002 via closeout report.
NA	SWMU 41, Automotive Maintenance Area Drain	Building 7	1940s – 1998	Below grade collection drain located at Building 7. This unit managed washdown water and liquids from inside the building. Waste oil, coolants, and solvents are used regularly in this area.	Status SWMU 41 was closed out in February 2002 via closeout report
NA	SWMU 42 is now listed as AOC F	See AOC F	See AOC F	See AOC F	See AOC F
NA	SWMU 43, Soil Pile	Building 7	1992	Soil was excavated from the area behind Building 7 in 1992 when seven USTs were removed. The soil was land farmed on a plastic liner in an open area east of Building 7. The soil was reportedly contaminated with diesel and gasoline fuel components from the UST cleanup operations.	Status SWMU 43 was closed out in February 2002 via closeout report.
NA	SWMU 44, Settling Basin	Building 7	1992	When the USTs and surrounding soil were removed from behind Building 7, the excavation pits filled with water. Air stripping was conducted on the water and then the water was pumped to a manmade basin 300 feet north of the former tank area. Here, solids were allowed to settle and water then discharged to the drainage ditch system (SWMU 27A).	Status The RFA recommended water samples be collected at this SWMU. Effluent water samples were collected and evaluated. The WVDEP branch overseeing the activities at this SWMU agreed that no further action was necessary. This SWMU was closed out under FFA findings of fact, p. 19.
NA	SWMU 45, Air Stripper	Building 7	1992	An air stripper was temporarily installed in the excavation pits behind Building 7 (see SWMU 43 and 44 description). The unit received water from the excavation area with a TPH content of less than 10 ppb. The unit was a fully contained, enclosed, above-ground structure.	Status SWMU 45 was closed out in February 2002 via closeout report.
NA	SWMU 46 is now listed as AOC G	See AOC G	See AOC G	See AOC G	See AOC G
NA	SWMU 47 is now listed as AOC H	See AOC H	See AOC H	See AOC H	See AOC H
NA	SWMU 48 is now listed as AOC I	See AOC I	See AOC I	See AOC I	See AOC I
NA	SWMU 49 is now listed as AOC J	See AOC J	See AOC J	See AOC J	See AOC J
NA	SWMU 50 is now listed as AOC K	See AOC K	See AOC K	See AOC K	See AOC K
NA	SWMU 51 is now listed as AOC L	See AOC L	See AOC L	See AOC L	See AOC L
NA	SWMU 53, Former PCB Storage Area	Building 25	1980s - 1990	Fully enclosed wooden shed with a concrete base. 55-gallon drums of PCB material and hydraulic equipment units, which contained PCB oil, were stored at this unit.	Status SWMU 53 was closed out in February 2002 via closeout report.
NA	SWMU 54, Building 7 UST Removal Site	Building 7	1950s - 1992	Former location of seven USTs which held gasoline and diesel. These tanks were removed as part of the facility UST removal program in 1992. This unit was found to contain contaminated soil and water (BTEX associated with gasoline and diesel fuel oil from the former tanks). This SWMU is associated with SWMUs 43, 44, and 45.	Status SWMU 54 was closed out in February 2002 via closeout report.

ATTACHMENT A-3. SWMU, AOC, AND IR SITE DESCRIPTION AND STATUS for AREAS WITH NO FURTHER ACTON

ALLEGANY BALLISTICS LABORATORY, ROCKET CENTER, WEST VIRGINIA

Site Number	SWMU ID and Name	Location	Dates of Operation	Description and Wastes Managed	Status and Anticipated Additional Activities
NA	SWMU 55, Building 2 UST Removal Site	Building 2	1946 - 1991	Former location of two 550-gallon USTs, which were used to store heating oil. These tanks were removed as part of the facility UST removal program in 1991. This unit was found to contain contaminated soil (TPH associated with the heating oil from the former tanks). The contaminated soil was removed and thermally treated to remove the petroleum contamination.	Status The RFA recommended that an RFI be conducted to assess the nature and extent of contamination. A data package including documentation of pre-removal sampling, the removal action taken, confirmatory sampling, and groundwater monitoring was provided to WVDEP and reviewed. The tanks were not regulated, so no formal reporting of the removal effort was required. The work was monitored by the WVDEP and verbal authorization was given to close the excavation. Confirmatory soil sample results were evaluated. Based on the data, the agencies agreed that no further actions were necessary for this SWMU. This SWMU was closed out under FFA findings of fact, p. 19.
NA	SWMU 56, Building 3 UST Removal Site	Building 3	1966 - 1991	Former location of four USTs, which were used to store No. 5 fuel, oil. These tanks were removed as part of the facility UST removal program in 1991. This unit was found to contain contaminated soil from No. 5 fuel oil spill from the former tanks (TPH levels less than 50 ppm). The contaminated soil was removed and thermally treated to remove the petroleum contamination.	Status The RFA recommended that an RFI be conducted to assess the nature and extent of contamination. A data package including confirmatory sampling was provided to WVDEP and reviewed. The tanks were not regulated, so no formal reporting of the removal effort was required. The work was monitored by the WVDEP and verbal authorization was given to close the excavation providing that a groundwater monitoring well was installed in the excavation of Tank 3-1. The well was installed and sampled. The groundwater results were reviewed. Based on the data, the agencies agreed that no further actions were necessary for this SWMU. This SWMU was closed out under FFA findings of fact, p. 19.
NA	SWMU 57, Building 300 UST Removal Site	Building 300	1964 - 1991	Former location of one 15,000-gallon UST which was used to store No. 5 fuel oil. This tank was removed as part of the facility UST removal program in 1991. This unit was found to contain soil with less than 100 ppm TPH.	Status The RFA recommended that an RFI be conducted to assess the nature and extent of contamination. A data package including confirmatory sampling was provided to WVDEP and reviewed. The tank was not regulated, so no formal reporting of the removal effort was required. The work was monitored by the WVDEP. The agencies agreed that no further actions were necessary for this SWMU. This SWMU was closed out under FFA findings of fact, p. 19.
NA	SWMU 58, Building 2 PCB Spill Area	Building 2	Unknown	A PCB spill was reported from hydraulics associated with a large hydraulic press, which had once operated in the building.	Status SWMU 58 was closed out in February 2002 via closeout report.
NA	SWMU 59, Building 3 Drain	Building. 3	Unknown	Unknown	Status SWMU 59 was closed out in February 2002 via closeout report.
NA	SWMU 60, Building 23 Pesticide Storage Area	Building 23	Unknown	Storage area used by a former maintenance supervisor to store tools. Two pesticide spray pump canisters were observed in the area. According to the former maintenance supervisor, the canisters were old fire extinguishers obtained when the fire department disallowed the use of carbon tetrachloride. The extinguishers were filled with methylene chloride and used to remove wasps from work areas. He stated that pesticides were never stored in this area.	Status SWMU 60 was closed out in February 2002 via closeout report.
NA	SWMU CCT, Condensate Catch Tank	Former Large Motor Manufacturing Building	1958 - 1963	SWMU CCT was the condensate collection sump for the steam lines associated with the former Large Motor Manufacturing Building that exploded in 1963.	Status SWMU CCT was removed in 2001 and was closed out in February 2002 via closeout report.
NA	AOC A, Underground Storage Tanks	Several locations in Plant 1	1960s – 1980s	This AOC comprises 14 USTs that were used to store primarily fuel oil. One 1,000-gallon tank adjacent to Building 100 was used to store heptane during experiments conducted in 1972 and 1973. Several of the USTs have been removed and/or closed in place. Seven USTs remain in service; six of these tanks are regulated.	Status AOC A was closed out in February 2002 via closeout report.
NA	AOC B, PCB Transformers Storage Area	East of Building 157	Unknown - 1991 and 1992	Concrete pad measuring approximately 20 feet by 30 feet. This unit served as a staging area for transformers which were designated for reuse at the facility. The transformers contained PCBs. All transformers were removed from the area in 1991 and 1992.	Status AOC B (SWMU 10002) was closed out in September 2000 via closeout report.

ATTACHMENT A-3. SWMU, AOC, AND IR SITE DESCRIPTION AND STATUS for AREAS WITH NO FURTHER ACTON
 ALLEGANY BALLISTICS LABORATORY, ROCKET CENTER, WEST VIRGINIA

Site Number	SWMU ID and Name	Location	Dates of Operation	Description and Wastes Managed	Status and Anticipated Additional Activities
NA	AOC C, Condensate Discharge Area	East of Building 105	Present during RFA site visit (1993)	An earthen area, partially vegetated, which measures approximately 4 feet by 5 feet. A pipe extending from Building 105 discharges warm water with a high iron oxide content.	Status The RFA recommended that soil samples be collected from around the unit. The analytical data from these samples indicated that the condensate comes from steam generated in the boilers at Building 344. The agencies agreed that no further actions are required at this AOC because the condensate discharge will be regulated as Class 5 injection wells or under the NPDES for the facility. This AOC was closed out under FFA findings of fact, p. 20.
NA	AOC D, Building 181 Pit	Adjacent to Building 181	Present during RFA site visit (1993)	Round, vertical, below-grade terracotta pipe located near Building 181 that appeared to be a possible discharge outlet. There was no historical information regarding this unit, but it is believed to be part of the facility's drainage system.	Status The RFA recommended that the integrity of the pit be tested, and if unsound, soil samples be collected around the pit. Documentation and visual inspection of the "pit" by the agencies determined that the "pit" was a manhole for a sewer line to a now-abandoned septic tank and no cracks or evidence of leaking was observed. Therefore, the agencies agreed that no further action was required for this AOC providing that the septic tank and drainage field be included as part of the facility septic tank investigation. This AOC was closed out under FFA findings of fact, p. 20.
NA	AOC E, Above Ground Storage Tanks Spills Area	Building 344	Present during RFA site visit (1993)	These above-ground storage tanks are surrounded by concrete berm that extends 4 feet above ground and 3 feet below ground. During a USEPA inspection, an oil spill was noted within the bermed area. During the RFA site visit, standing water, believed to be condensate discharge, was observed within the bermed area.	Status The RFA suggested that a sampling and monitoring program be implemented. ABL has already completed work (with EPA Region III concurrence) to remove contamination from the area. For this reason, the agencies have agreed that no further action is required for this AOC. This SWMU was closed out under FFA findings of fact, p. 20.
Site 9	AOC F, Acid Neutralization Pit	Near Building 344	1970s - 1992 (however, not used until 1988)	Served as a contingency discharge area for sulfuric acid from a nearby storage tank. In August 1992, the facility replaced the sulfuric acid tank with a self-contained tank; during the replacement operation, a release of approximately 600 gallons of sulfuric acid occurred. The release was neutralized and reported to the National Response Center. The pit was backfilled in late 1992 and no contamination was found.	Status The RFA recommended that soil samples be collected from the pit area and between the pit area and the drainage ditch. Following the collection of samples and an inspection by the WVDEP, the agencies agreed that no further action was required for this AOC. This SWMU was closed out under FFA findings of fact, p. 20.
NA	AOC H, Centrifuge	Undeveloped test area east of Plant 1. Former Building 78	Unknown – 1998	The centrifuge was a circular structure with concrete walls and floor. The centrifuge was used for test firing of rocket motors. The centrifuge was driven by hydraulic pumps that were in turn driven by a diesel motor. For each test, the motor was carried into the centrifuge using a forklift. Once the centrifuge was activated, the motor was fired, and performance data were collected. Periodically, a motor would explode, but the majority of the explosion was contained within the centrifuge. Following an explosion, remains that were dispersed outside the unit were collected for evaluation purposes and disposed of elsewhere. The centrifuge and motor house were demolished in December 1998.	Status AOC H was closed out in February 2002 via closeout report.
NA	AOC J, A and B Ranges	Adjacent to Building 3	1940s - 1970s	This unit consists of two subscale rocket motor static test firing ranges. These ranges likely received propellant residue as a result of rocket motor test firing operations.	Status SWMU 49/AOC J (SWMU 10006) was closed out in September 2000 via closeout report.
NA	AOC K, C Range	Current location of Building 4	1940s	This unit was used for test firing of .50-caliber machine gun ammunition during World War II. Bullets were fired into a sand filled backstop (Building 43) during testing operations. The composition of the bullets is not known. The facility stated that it must be assumed that all projectiles hit a backstop and were contained. Sand from this backstop has been removed and its disposition is not known. Excavations in the area have not shown evidence of projectiles as were found in connection with H Range. The area is now partially paved with the remainder of the area vegetated.	Status The material in the AOC has been removed and the AOC was closed out in September 1999 via closeout report.
NA	AOC L, H Range	North of Bldg. 275	1940s	The unit is believed to have been used as a mortar testing range during World War II. The ballistics characteristics of mortar propellant were tested by firing the materials toward the hillside. This range potentially received propellant and explosive constituents during testing operations.	Status AOC L was closed out in September 1999 via closeout report.

ATTACHMENT A-3. SWMU, AOC, AND IR SITE DESCRIPTION AND STATUS for AREAS WITH NO FURTHER ACTION

ALLEGANY BALLISTICS LABORATORY, ROCKET CENTER, WEST VIRGINIA

Site Number	SWMU ID and Name	Location	Dates of Operation	Description and Wastes Managed	Status and Anticipated Additional Activities
NA	AOC O, Impact Area for Ranges F, G, and H	Hillside at eastern end of Plant 1	mid-1940s	AOC O is the hillside at the eastern end of Plant 1 to where mortars and other munitions were fired. The area is now completely vegetated and bears no readily observable evidence of mortar impact. According to historical information, no explosive warheads were used at F, G, and H Ranges. However, no release controls were associated with the units. Several concrete-filled mortar shells were unearthed in 1991 during construction and found to be inert.	Status AOC O was closed out in July 2001 via closeout report.
NA	AOC P, Former Ground Scar Area	North of former Building 294	Unknown	During the 1992 Aerial Photographic Site Analysis (APSA), USEPA identified a probable burn area located about 500 feet northwest of Site 2 which has been identified as AOC P. Based on the results of the APSA, soil sampling was conducted in this area. AOC P was added to Appendix B of the FFA in April 2002.	Status AOC P was closed out in 2005 via closeout report.
NA	AOC Q, Former Solvent Shed	Near Building 805	Unknown	AOC Q has been identified as the former solvent storage shed area. AOC Q was added to Appendix B of the FFA in April 2002.	Status AOC Q was closed out in 2005 via closeout report.
NA	AOC R, Former Solvent Shed	Near Building 151	Unknown	AOC R has been identified as the former solvent storage shed area. AOC R was added to Appendix B of the FFA in April 2002.	Status AOC R was closed out in 2007 via closeout report.
Site 3	IR Site 3 - Previous Burning Ground (1950 – 1958) (This IR site is also SWMU 5)	West of Building 362 and east of Fifth Street	1950 - 1958	See SWMU 5 description	See SWMU 5 description
Site 4A and Site 4B	IR Sites 4A and 4B – Spent Photographic Developing Solutions Disposal Sites (IR Site 4B is also SWMU 18 IR Site 4A is also SWMU 19)	4B is adjacent to Bldg. 181; 4A is adjacent to Building 231	1959 – 1971	See SWMUs 18 and 19 descriptions	See SWMUs 18 and 19 descriptions
Site 7	IR Site 7 - Beryllium Landfill (This IR site is also SWMU 10)	Off of Route 956	1964 – 1974	See SWMU 10 description	See SWMU 10 description
Site 8	IR Site 8 - Explosives Wastewater Sumps/Catch Basin (This IR includes SWMU 37)	Throughout the facility	1940s – 1999	See SWMU 37 description	See SWMU 37 description
Site 9	IR Site 9 - Former Acid Disposal Pit (This IR site is also AOC F)	Near Building 344	1972 – 1992	See AOC F description	See AOC F description

Notes:

1,1,1-TCA = 1,1,1-trichloroethane

ABL = Allegany Ballistics Laboratory

AOC = Area of Concern

BTEX = Benzene, Toluene, Ethylbenzene, Xylenes

CCT = condensate catch tank

EPA = United States Environmental Protection Agency

FFA = Federal Facilities Agreement

HMX = octahydro-1, 3, 5, 7-tetranitro-1, 3, 5, 7-tetrazocine

ID = identification

IR = Installation Restoration

MEK = methyl ethyl ketone

MIBK = methyl isobutyl ketone

NA = Not Available

NFA = no further action

NPDES = National Pollutant Discharge Elimination System

PCB = polychlorinated biphenyl

ppb = parts per billion

ppm = parts per million

PRAP = Proposed Remedial Action Plan

PRG = preliminary remediation goal

RBC = risk-based concentration

RCRA = Resource Conservation and Recovery Act

RDX = hexahydro-1, 3, 5-trinitro-1, 3, 5-triazine

RFA = RCRA Facility Assessment

RFI = RCRA Facility Investigation

RI = Remedial Investigation

RI/FS = Remedial Investigation/Feasibility Study

ROD = Record of Decision

SEM = Security Engineered Machinery

SWMU = Solid Waste Management Unit

TCE = trichloroethene

TPH = Total Petroleum Hydrocarbon

UST = underground storage tank

WVDEP = West Virginia Department of Environmental Protection